RESOLUTION NO. 25-9470

A RESOLUTION OF THE CITY OF SANTA CLARA, CALIFORNIA, APPROVING THE 2025 UPDATE TO THE SEWER SYSTEM MANAGEMENT PLAN (SSMP)

WHEREAS, the San Francisco Regional Water Quality Control Board and the California State Water Resources Control Board have both independently mandated that all sanitary sewer system operators within the San Francisco region and within the State of California, respectively, prepare and implement Sanitary Sewer Management Plans ("SSMP");

WHEREAS, the City operates and maintains a sanitary sewer collection system within the city limits and the City Council of the City of Santa Clara is the governing body of the City's sewer utility;

WHEREAS, the State Water Resources Control Board requires that the SSMP be updated every 6 years and adopted by the City Council at a regular or special meeting to ensure that the City Council is aware of the scope of the SSMP and its potential impacts; and

WHEREAS, City Staff has prepared an updated Sewer System Management Plan ("SSMP") to supersede the 2019 Sanitary Sewer Management Plan.

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NOW THEREFORE, BE IT RESOLVED BY THE CITY OF SANTA CLARA AS FOLLOWS:

1. Approval of SSMP. The Council has reviewed and hereby approves the SSMP, including the data and information set forth therein. The City will implement the management plan of the sanitary sewer collection system in accordance with the SSMP.

2. Effective date. This resolution shall become effective immediately.

I HEREBY CERTIFY THE FOREGOING TO BE A TRUE COPY OF A RESOLUTION PASSED AND ADOPTED BY THE CITY OF SANTA CLARA, CALIFORNIA, AT A REGULAR MEETING THEREOF HELD ON THE 15TH DAY OF JULY, 2025, BY THE FOLLOWING VOTE:

AYES:	COUNCILORS:	Chahal, Cox, Gonzalez, Hardy, Jain, and Park, and Mayor Gillmor
NOES:	COUNCILORS:	None
ABSENT:	COUNCILORS:	None
ABSTAINED:	COUNCILORS:	None

ATTEST: _____
NORA PIMENTEL, MMC
ASSISTANT CITY CLERK
CITY OF SANTA CLARA

Attachments incorporated by reference:
1. Sewer System Management Plan 2025 Update
2. Appendices A-I
3. Appendices J-M

City of Santa Clara Water & Sewer Utility

Sewer System Management Plan

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ELEMENT 1: GOAL AND INTRODUCTION

REQUIREMENTS

The goal of the Sewer System Management Plan (Plan) is to provide a plan and schedule to:

- *Properly manage, operate, and maintain all parts of the Enrollee's sanitary sewer system(s),*
- *Reduce and prevent spills,*
- *Contain and mitigate spills that do occur.*

The collection system agency must develop goals to properly manage, operate, and maintain all parts of its wastewater collection system

1.1 Regulatory Context

REQUIREMENTS

The Plan Introduction section must provide a general description of the local sewer system management program and discuss Plan implementation and updates.

The City of Santa Clara Water & Sewer Utilities Department (Utility) has prepared this Sewer System Management Plan (SSMP) to comply with the San Francisco Bay Regional Water Quality Control Board (RWQCB) and the State Water Resources Control Board (SWRCB) General Order 2022-0103-DWQ (see Appendix A). The SSMP is intended to:

- Provide sufficient planning, description of resources and direction for staff to maintain, manage and repair the Utility's sanitary sewer collection and conveyance system such that all sewer flows delivered to the Utility's system are conveyed safely to the publicly owned wastewater treatment plant (San José – Santa Clara Regional Wastewater Facility) without spills.
- The SSMP includes actions to minimize the number and severity of spills and to help mitigate the impact of spills on the environment.

The SSMP supports and supplements the Utility's existing operations and maintenance program and goals by providing consolidated guidelines and procedures for the Utility's sewer system management. The SSMP will also contribute to the proper management of the collection system by memorializing these activities.

In addition, a sewer system capacity study has been performed and was updated in 2016 to determine any improvements needed to ensure the system has adequate capacity to convey all peak flows, for current and future development, including allowances for storm waters that may enter into the sewer system. The City is currently in the process of developing an update to its Sanitary Sewer Master Plan, which includes the development of an "all-pipes" model, revised system-wide capacity studies, and an updated Capital Improvement Program. The Sanitary Sewer Master Plan is expected to be completed by the end of 2025 and before the next Sewer System Management Plan Update, and revised findings and recommendations will be included in the next Sewer System Management Plan. A draft of the in-progress report can be found in Appendix J.

1.2 Sewer System Management Plan Update Schedule

REQUIREMENTS

The Plan Introduction section must include a schedule for the Enrollee to update the Plan, including the schedule for conducting internal audits. The schedule must include milestones for incorporation of activities addressing prevention of sewer spills.

In accordance with Statewide Sanitary Sewer Systems General Order 2022-0103-DWQ, the current SSMP Update is due May 2, 2025, with subsequent updates every 6 years. The next SSMP Update will be due May 2, 2031.

The audit period for the next planned Sewer System Management Plan audit will initiate November 2, 2025, and be completed by May 2, 2028. The audit should be submitted to the California Integrated Water Quality System (CIWQS) and will provide coverage through November 2, 2028 (by 6-months after the end of the 3-year audit period).

In order to prevent spills within its service area, the Utility implements system-wide condition assessment using closed-circuit television (CCTV) and routine & scheduled preventative maintenance including inspection, jetting, and repairs. A summary of these activities to be completed during the future 6-year SSMP update cycle is listed below, and further documented in Element 4 (Operation & Maintenance Program):

- CCTV Inspection/Jetting – 8-year cycle last started April 2023 and is anticipated to be completed by April 2031.
- Force Main Assessment & Rehabilitation – Currently in-progress and is anticipated to be completed by the end of 2025.
- Lift/Pump Station Maintenance & Rehabilitation – Ongoing. Preventative maintenance is completed weekly, while pump servicing and repair is completed bi-annually in spring and fall.
- Flow Monitoring and Capacity Studies, Sanitary Sewer Master Plan – Draft Sanitary Sewer Master Plan is currently in progress and is anticipated to be completed by the end of 2025.
- New Vehicle and Equipment Purchases – Completed as needed based on replacement cycles.
- National Association of Sewer Service Companies (NASSCO) Pipeline Assessment Certification Program (PACP) Training – Completed every three years based on certification date.

In addition, the Utility maintains a spill emergency response plan to mitigate spills if they occur, and performs long term system evaluation and capacity planning to meet future demands. These items are documented further in Element 4: Operation & Maintenance Program, Element 6: Spill Emergency Response Plan, and Element 8: System Evaluation, Capacity Assurance, Capital Improvements in the SSMP.

1.3 Sewer System Asset Overview

REQUIREMENTS

The Agency Sewer System Management Plan must have an Introduction section to provide a description of the Agency-owned assets and service area including but not limited to:

- *Location, including county(ies)*
- *Service area boundary (see specific requirements contained in Specifications 5.14 and Attachment E1, requiring an electronic Sanitary Sewer System Service Area Boundary Map submitted to CIWQS).*
- *Population and community served.*
- *System size, including total length in miles, length of gravity mainlines, length of pressurized (force) mains, and number of pump stations and siphons.*
- *Structures diverting stormwater to the sewer system.*
- *Data management systems.*
- *Sewer system ownership and operation responsibilities between Enrollee and private entities for upper and lower sewer laterals.*
- *Estimated number or percent of residential, commercial, and industrial service connections.*
- *Unique service boundary conditions and challenge(s).*
- *Reference to the Enrollee's up to-date map of its sanitary sewer system, as required in section 4.1 (Updated Map of Sanitary Sewer System) of this Attachment.*

The Utility owns and operates the sanitary sewer system serving the City of Santa Clara, located in Santa Clara County, California. The California Water Environmental Association's Santa Clara Valley Section has recognized the Utility with Collection System of the Year (Medium Size Category) for 2020, 2023, and 2024, highlighting the Utility's work to protect public health and the environment through its continued maintenance of it's wastewater collection, treatment, and disposal system.

A map of the Utility's sanitary sewer system and service area can be found in Appendix D. A detailed electronic Sanitary Sewer System Service Area Boundary Map has been submitted to CIWQS, as required by Specifications 5.14 and Attachment E1.

The sewer system serves a population of approximately 131,000, and provides service to residential, commercial, and industrial users within its service area as quantified in Table 1-1 below. The Utility also accepts flow from Cupertino Sanitary District (CUSD) under an agreement executed in 1985.

Table 1-1: Service Connections by Service Type

User Type	Number of Service Connections
Residential	18,656
Commercial	2,012
Industrial	688
Institutional	384

The sewer system infrastructure is comprised of approximately 288 miles of sewer main, 5,300 sewer manholes, 3 miles of pressurized (force) mains, 7 pump and lift stations, and 52 sewer system consists of approximately 288 miles of sewer mains. The decade of construction, size, and material of mains are shown in Table 1-2 on the following page.

Table 1-2: Sanitary Sewer Pipeline Inventory

Material and Size	Decade of Construction											Total (ft)	% of Total
	Unspecified	1930's and earlier	1940's	1950's	1960's	1970's	1980's	1990's	2000's	2010's	2020's		
Vitrified Clay Pipe (VCP)													
Unknown	14,639		411	205	3,189		204					18,649	1.26%
4 in.				22			275			527		824	0.06%
6 in.	966	74,671	22,566	67,545	19,237	7,124	2,801	2,739	518	801		198,967	13.47%
8 in.	9,023	5,210	17,650	328,475	204,792	46,811	9,320	7,779	9,045	1,325		639,429	43.28%
10 in.	51	128	2,805	61,018	37,739	6,475	4,232	6,923	11,242	1,442		132,056	8.94%
12 in.	4,889	772	1,966	35,914	61,293	86,888	9,259	14,264	5,818	4,002	862	225,926	15.29%
14 in.					284	183				507		974	0.07%
15 in.	822		2,995	20,541	18,542	12,922	1,875	1,484	373	2,549	151	62,254	4.21%
16 in.					1,418	1,123		65				2,607	0.18%
18 in.			1,398	9,457	18,738	7,373	5,362	3,269	1,045	917		47,560	3.22%
20 in.										599		599	0.04%
21 in.	1,522			2,016	3,483	3,565	1,055		671			12,312	0.83%
24 in.	3,280			9,840	6,450	15,884	5,011	840	1,137	929		43,371	2.94%
27 in.			116	2,648	5,513	706		33	575	2,437		12,028	0.81%
30 in.	1,228	15	645	875	6,746	7,003		25	248	3,992		20,777	1.41%
33 in.			1,079	522	5,890	4,367			258	101		12,216	0.83%
36 in.				1,114	1,972	1,663	11,972					16,720	1.13%
39 in.					2,262	1,199						3,461	0.23%
42 in.	1,937			3,602	2,233	3,216	484					11,471	0.78%
45 in.				288	364	795						1,447	0.10%
48 in.	3,139			1,169		6,172	343		2,524	283		13,630	0.92%
Sub Total (ft)	297,499	80,797	51,631	545,251	400,143	213,468	52,194	37,422	33,454	20,410	1,013	1,477,279	100.00%
Reinforced Concrete (RCP)													
20 in.						77						77	0.33%
24 in.			457	6,481	395	408	445					8,186	34.80%
27 in.			442	1,507		385			993			3,327	14.14%
30 in.			524	3,707	672	635						5,538	23.55%
33 in.				1,946	920			115				2,980	12.67%
36 in.				1,136		725	406			22		2,289	9.73%
42 in.				430	257	438						1,124	4.78%
Sub Total (ft)	0	0	1,423	15,206	2,244	2,668	851	115	993	22	0	23,522	100.00%
Polyethylene (PE)													
6 in.				31				70				102	0.73%
8 in.				135						718		853	6.12%

10 in.				588			205			270		1,063	7.62%
12 in.	306			1,893				148		2,309		4,656	33.39%
15 in.							203					203	1.46%
18 in.				284								284	2.03%
21 in.				736						2,427		3,163	22.68%
24 in.				1,179		373		340		1,030		2,922	20.95%
27 in.						401						401	2.88%
30 in.								236				236	1.70%
33 in.				62								62	0.44%
Sub Total (ft)	306	0	0	4,907	0	774	409	794	0	6,754	0	13,944	100.00%
Polyvinyl Chloride (PVC)													
6 in.	67			66								133	21.16%
8 in.					73							73	11.61%
10 in.					71							71	11.32%
18 in.					97							97	15.50%
27 in.											254	254	40.41%
Sub Total (ft)	67	0	0	66	241	0	0	0	0	0	254	628	100.00%
Unknown													
Unknown	1,411											1,411	44.79%
8 in.	244							55				298	9.47%
10 in.	246											246	7.80%
12 in.	1,152											1,152	36.56%
21 in.	34											34	1.07%
24 in.	10											10	0.31%
Sub Total (ft)	3,095	0	0	0	0	0	0	55	0	0	0	3,150	100.00%
Total (ft)	300,967	80,797	53,054	565,430	402,628	216,911	53,454	38,386	34,446	27,186	1,267	1,518,524	

Although private property owners own the entire length of the service lateral associated with their property, the Utility will clear blockages from the property line clean out to the City sewer main ("service the lower lateral") as a courtesy service to the public; provided a property line cleanout exists, and the Utility is made aware of any problems or backups. Overall lateral maintenance and repair is sole responsibility of property owner.

The Utility has offers inexpensive clean out installations for all customer classes, including residential, commercial, industrial, and institutional. The Utility utilizes installed property line clean outs in order to provide maintenance to lower laterals as a courtesy when requested by customers.

The sanitary sewer system also includes two large pump stations, each with a flow meter, and five smaller unmetered lift stations. All stations have radio telemetry to monitor operating status.

Pump and Lift Station information is included in the following table:

Table 1-3: Pump & Lift Station Equipment

Station	**Equipment**
Rabello Pump Station	Eight 60 horsepower Flygt 3202 Pumps 600 kW diesel generator
Northside Pump station	Four 70 horsepower Flygt 3356 Pumps 350 kW diesel generator
Tasman	Two 10 horsepower Flygt 3127 Pumps
Westside	Two 10 horsepower Flygt 3127 Pumps
Primavera	Six 10 horsepower Flygt 3127 pumps, 75 KW Generator (LPG fuel primary with natural gas backup)
De La Cruz	Two 10 horsepower Flygt 3127 Pumps, 50KW diesel generator (Trailer mount)
Stadium Pump Station	6 Flygt Pumps (4 - 15hp model 3153 and 2 - 10hp model 3127), 80 kw diesel generator

All sewer pumps utilize industry-leading equipment that is not only efficient but features the latest advancements in no-clog impeller designs that are superior to technology used previously. The Utility standardizes pump product lines enabling each station to have a backup pump readily available at the sewer shop.

In December 2020, the Utility completed work to upgrade the core hardware, software, and network equipment supporting the Utility's supervisory controls and data acquisition (SCADA) System. This SCADA upgrade was intended to provide a state-of-the-art SCADA system deployed on a fast, reliable, redundant, and secure fiber optic ring, and to provide increased functionality in sewer facility site monitoring and control. This upgrade included 2 new servers, 3 workstations and 4 client PC's, as well as 8 new managed switches and 4 uninterruptable power supplies. The upgrade involved re-deploying the network over a newly installed, purpose-built, fiber optic ring, connecting key sites at the Corporation Yard SCADA building, the Corporation Yard Ops center, the Emergency Operations Center, and the Data Center at City Hall. The Utility also deployed a second

antenna and master radio at the Corporation Yard to rectify a “single point of failure” problem that had previously existed on the Utility’s legacy radio network. As part of this SCADA upgrade, all sewer pump stations were upgraded and converted to the new fiber network.

The Utility owns and operates the sanitary sewer system, with exceptions as described below:

- Sewer Laterals – Pursuant to City Ordinance 1901 passed 11/27/2012, property owners are responsible for maintenance and operation of the entire lateral up to the wye connection to the public main.
- Private Onsite Sewer Systems – Private onsite sewer systems are the responsibility of the property owner for the associated property, up to the connection to the public main or manhole.
- Sewer Maintained by Other Agencies – City of San Jose and City of Sunnyvale own and maintain a portion of sewer lines within City of Santa Clara right-of-way, as shown in provided sewer maps.

The Utility’s sewer system includes several instances of unique constraints and boundary conditions.

- Siphons – The Utility’s sewer system includes 59 siphons as listed in Table 4-6.
- Transportation Agency Right-of-Way – Caltrans owns the right-of-way along El Camino Real and the highways/freeways traversing the City. County owns the right-of-way along the expressways traversing the City. Encroachment permitting and/or maintenance agreements are required to perform work in their respective right-of-way.
- Rail Agency Right-of-Way – Rail belonging to United Pacific Railroad (UPRR), Caltrain, and other transit agencies traverse the City, resulting in utility constraints across rail agency right-of-way. Encroachment permitting and/or maintenance agreements are required to perform work in their respective right-of-way.
- Surface Water Right-of-Way – Santa Clara Valley Water District (SCVWD) owns the right-of-way along Guadalupe River, Calabazas Creek, San Tomas Aquino Creek, and Saratoga Creeks traversing the City, resulting in utility constraints crossing and adjacent to surface waters. Encroachment permitting and/or maintenance agreements are required to perform work in SCVWD right-of-way.
- Department of Toxic Substances Control (DTSC) Regulated Sites – Several locations in City right-of-way are considered DTSC Regulated Sites due to contaminated soils. DTSC must be notified prior to work in these locations.
- Cupertino Sanitary District Tributary Lines – The Utility has an agreement with CUSD to convey flows through the Utility’s sanitary sewer system to the Regional Wastewater Facility (RWF).

ELEMENT 2: ORGANIZATION

REQUIREMENTS

The Plan must identify organizational staffing responsible and integral for implementing the local Sewer System Management Plan through an organizational chart of other similar narrative documentation that includes:

- *(a) The name of the Legally Responsible Official as required in section 5.1 (Designation of a Legally Responsible Official) of this General Order.*
- *(b) The position titles, telephone numbers, and email addresses for management, administrative, and maintenance positions responsible for implementing specific Sewer System Management Plan elements.*
- *(c) Organizational lines of authority.*
- *(d) Chain of communication for reporting spills from receipt of a complaint or other information, including the person responsible for reporting spills to the State and Regional Water Board and other agencies if applicable (For example, county health officer, county environmental health agency, and State Office of Emergency Services).*

Authorized Representative

The Utility's authorized representative in all wastewater collection system matters is the Director of Water and Sewer Utilities. The Water and Sewer Superintendent is authorized as the legally responsible official (LRO) to certify electronic spill reports submitted to the Boards. The Assistant Director and Director of the Water and Sewer Utilities are also authorized as LROs and can certify electronic spill reports.

Responsibility for SSMP Implementation

The Water and Sewer Operations Manager and the Water and Sewer Superintendent are responsible for implementing and maintaining all elements of the SSMP to ensure it is up to date.

Spill Reporting Chain of Communication

The staff positions of Water and Sewer Maintenance Worker, Sewer Inspection Technician, Equipment Operator, Pump Maintenance Technician, Utility Crew Supervisor, or those employees responding to the spill are all responsible for estimating the volume of any spill. The Water and Sewer Operations Manager, Water and Sewer Superintendent, and Assistant Sanitary Sewer Superintendent are responsible for verifying the data collected in the field and reporting all sewer spills per the reporting requirements of both the State Water Resources Control Board (State Water Board) and the Regional Water Quality Control Board (RWQCB).

Table 2-1 contains the City's Key Emergency Contact Information and Attachment H documents the Chain of Communication for Responding to spills and Flow charts for Spill Notification and Reporting to Regulatory Agencies.

Table 2-1: City Key Emergency Contact List

Name	Business Hours	After Hours
John Ramirez Director (LRO)	408-615-2018	*On File
VACANT Assistant Director (LRO)	408-615-2011	*On File
Ahmed Aly, P.E. Principal Engineer	408-615-2014	*On File
Lawrence Tam, P.E. Utility Operations Engineer	408-615-2036	*On File
Garrett Brown Water and Sewer Superintendent (LRO)	408-615-2071	*On File
Daniel Bobias Assistant Sewer Superintendent (Data Submitter)	408-615-2068	*On File
Wendy Kwong Water and Sewer Compliance Manager	408-615-2006	*On File
Colleen Trostle Public Works Compliance Manager	406-615-3099	*On File
Craig Mobeck Director Public Works	408-615-3001	*On File
Dave Staub Deputy Director of Public Works	408-615-3080	*On File

*Emergency after-hours and personal contact numbers are on file with key agencies, the wastewater treatment facility, and key operational staff. Call down list is maintained and revised as necessary.

Organization Discussion

The City of Santa Clara is a charter city with a council-adopted municipal code. The municipal government provided by this Charter is the “council-manager” form of government. The City’s chief executive officer is the City Manager, who has appointing authority for all staff, including staff for the water and sewer utilities. An Organization Chart is attached as Figure-2-1. The chain of command for the sewer system includes:

- Director of Water and Sewer Utilities
- Assistant Director of Water and Sewer Utilities
- Utility Operations Engineer
- Principal Engineer
- Compliance Manager
- Code Enforcement Officer
- Code Enforcement Technician
- Utility Business Systems Manager
- Utility Business Systems Specialist
- Water and Sewer Operations Manager
- Water and Sewer Superintendent
- Assistant Sanitary Sewer Superintendent
- Utility Crew Supervisors

- Equipment Operators
- Sewer Inspection Technician
- Pump Maintenance Technician
- Water and Sewer Maintenance Workers

Discussion of General Responsibilities Water and Sewer Utilities:

The following is a brief discussion of the general responsibilities of staff positions in the Water and Sewer Utilities department.

Director of Water and Sewer Utilities: Directs the Department of Water and Sewer Utilities in the planning, design, installation, operation, repair, and maintenance of the Utility's water supply and distribution system, and the operation, repair, and maintenance of the Utility's sanitary sewage collection system.

Assistant Director of Water and Sewer Utilities: Under the direction of the Director of Water and Sewer Utilities: plans, develops, coordinates, and directs the activities of the Water and Sewer Utilities and plans, organizes, and administers operations and maintenance activities related to the sanitary sewer system.

Principal Engineer/Utility Operations Engineer: Under the direction of the Assistant Director of Water and Sewer Utilities, plans, develops, coordinates the activities of the Water and Sewer Utilities including but not limited to construction and operations and maintenance related to sanitary sewer system.

C*ompliance Manager*: Under the direction of the Assistant Director of Water and Sewer Utilities: manages water and sewer utility compliance with applicable regulations, standards and policies governed by Federal, State and local regulatory agencies, and when necessary direct corrective action.

Code Enforcement Officer: Under the direction of the Compliance Manager, manages Fat, Oil and Grease (FOG) program and coordinates with Sanitary Sewer Operations staff, the customers, other City Departments and regulatory agencies.

Code Enforcement Technician: Assist the Code Enforcement Officer in FOG plan reviews and inspection program.

Utility Business Systems Manager: Under the direction of the Assistant Director manages the Lucity sewer work order system for the sewer cleaning, assessment and repair. Coordinates with the engineers, Public Works Department, contractors, sewer operations staff on sewer information and updates the database and GIS maps.

Utility Business Systems Specialist: Assists Utility Business Systems Manager in coordinating and managing the sewer work order system, Lucity database and GIS maps.

Water and Sewer Operations Manager: Under the direction of the Assistant Director of the Water and Sewer Utility: plans, organizes and directs the work of field forces engaged in the construction, maintenance and operation of the Utility's sanitary sewer collection system.

Water and Sewer Superintendent: Under the direction of the Water and Sewer Operations Manager: plans, organizes and directs the work of field forces engaged in the construction, maintenance and operation of the Utility's sanitary sewer collection system.

Assistant Sanitary Sewer Superintendent: Under the direction of either/or Water and Sewer Operations Manager and Water and Sewer Superintendent assigns, reviews and supervises the work of utility crews engaged in the operation and maintenance of Utility's sanitary sewage collection system and storm drain pump stations.

Utility Crew Supervisor: Under the direction of the Assistant Sanitary Sewer Superintendent, supervises the work of an assigned crew in a specialty area typically, but not limited to: sewer construction and maintenance, pumps and pump station repair, station generators and electrical/control appurtenances, sewer main cleaning and televising, and related maintenance of sewer conveyance system.

Equipment Operator: Under direction of the Utility Crew Supervisor, performs skilled work in the maintenance, construction and operation of streets, water, recycled water, and/or sewer systems using medium and heavy power-driven equipment as a major assignment.

CCTV Inspection Technician: Under direction of the Utility Crew Supervisor, performs inspection of sanitary sewer mains, laterals, and manholes using specialized video inspections and associated software for ongoing condition assessments of sanitary sewer infrastructure.

Pump Maintenance Technician: Under direction of the Utility Crew Supervisor, performs installation, operation, and routine maintenance of wastewater related pumps and pump stations and their appurtenances.

Water and Sewer Maintenance Worker I & II: Under direction of the Utility Crew Supervisor, independently or as a member of a crew, performs skilled work in the construction, maintenance and operation of the water, recycled water and sewer systems.

Discussion of General Responsibilities Public Works:

The following is a brief discussion of the general responsibilities of staff positions in the Department of Public Works.

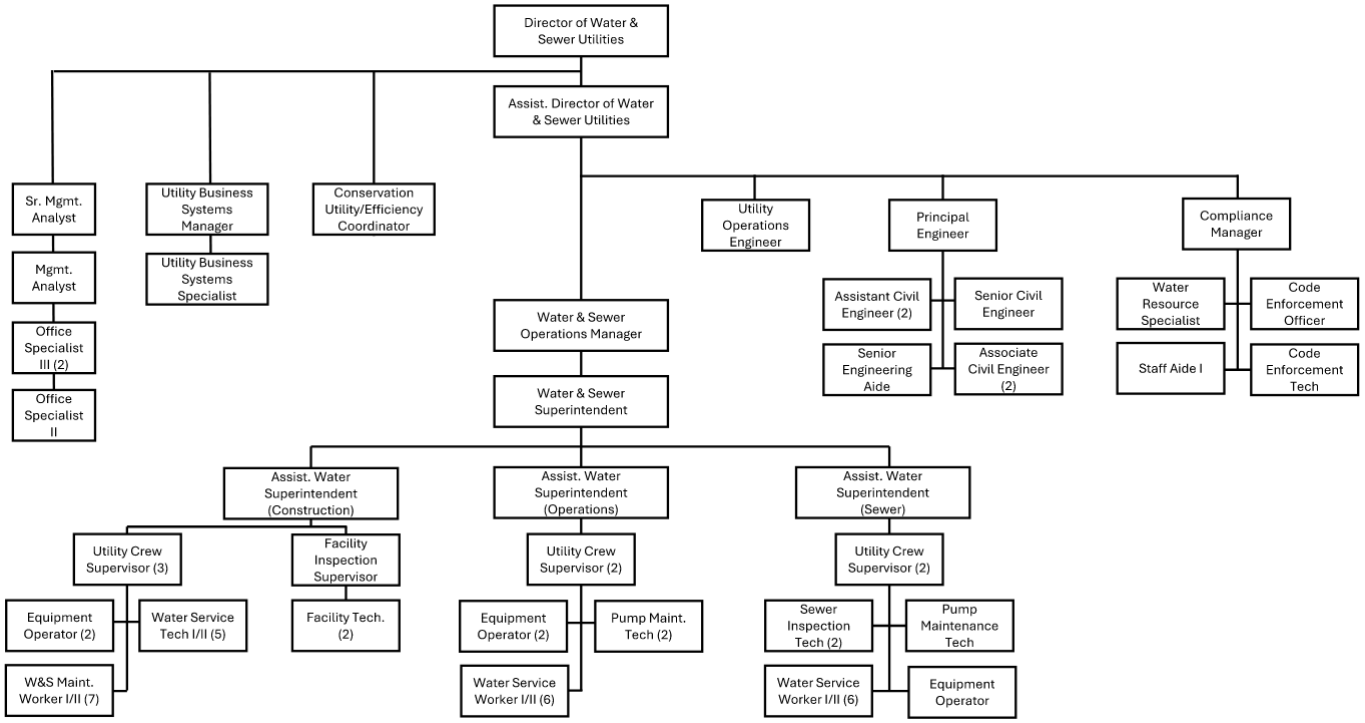
Director of Public Works: Plans long range projects and gives overall direction to the work of the Public Works Department and directs the preparation of plans, specifications, estimates and contracts for public works projects including streets, sewers, storm drains, transportation and municipal or public structures and buildings.

Principal Engineer: Under direction of the Director of Public Works: assigns, directs and supervises professional and sub-professional employees engaged in a variety of public works projects from early planning stages through final construction and acceptance, including the sewer system.

Senior/Associate/Assistant Civil Engineer: Under the direction of the Principal Engineer: conducts studies and analysis of engineering projects or problems and prepares technical reports on matters of public interest. Prepares plans, specification and cost estimates for a variety of construction and maintenance projects including streets, storm drains, sewers, traffic signals and other public facilities.

Public Works Inspector: Under general supervision performs inspections for compliance with plan and specification requirements, keeps daily records of work performed, performs quantity calculations and accounting, and monitors project safety of construction projects within street rights-of-way on City property.

Figure 2-1: Existing Organizational Structure



ELEMENT 3: LEGAL AUTHORITY

REQUIREMENTS

The Agency Sewer System Management Plan must include copies or an electronic link to the Enrollee's current sewer system use ordinances, service agreements and/or other legally binding procedures to demonstrate the Enrollee possesses the necessary legal authority.

(a) Prevent illicit discharges into its sanitary sewer system (I&I); unauthorized stormwater, chemical dumping, unauthorized debris; roots; fats, oils, and grease; and trash, including rags and other debris that may cause blockages.

(b) Collaborate with storm sewer agencies to coordinate emergency spill responses, ensure access to storm sewer systems during spill events, and prevent unintentional cross connections of sanitary sewer infrastructure to storm sewer infrastructure.

(c) Require that sewers and connections be properly designed and constructed.

(d) Ensure access for maintenance, inspection, and/or repairs for portions of the service lateral owned and/or operated by the enrollee.

(e) Enforce any violation(s) of ordinances, service agreements, or other legally binding procedures.

(f) Obtain easement accessibility agreements for locations requiring sewer system operations and maintenance, as applicable.

The legal authority of the City of Santa Clara rests in the City's charter (ref: Section 400, Article IV Powers) and is adopted by City code. (Copies of current City of Santa Clara codes are available on line at: http://www.codepublishing.com/ca/santaclara/frameless/)

The City of Santa Clara's Ordinance number 1839 adopted an updated and revised Chapter 13.10 for the Code of the City of Santa Clara, California on November 24, 2009. Chapter 13.10 (entitled "Sewers") of Title 13 (entitled "Public Services") is attached as Appendix B.

Title 17 (see Appendix B) addresses general design criteria as well as design requirements specific to sewer design. 17.05.630 requires use of City's Standard Design Criteria as adopted by the City Engineer, which includes the following ordinance sections:

Section 17.05.630	Design
Section 17.15.220	Rules and Regulations for Sewer System development – Sanitary Sewer and Storm Drains

Demonstration of Legal Authority

Title 13, chapter 13.10 "Sewers" codifies all requirements related to sewers and specific to waste discharge requirements for the sanitary sewer system.

A copy of the Legal Authority Checklist is attached as Table 3-1.
This checklist is provided as a short-cut tool for RWQCB inspection and auditing procedures to the Sewer Ordinance.

The Utility also maintains an Enforcement Response Plan (Appendix C) which serves as a step-by-step guidance document for sewer user compliance.

Table 3-1 GWDR Legal Authority Checklist

GWDR Requirement	Agency Code Reference	Adequate to Meet SSMP Requirements?
Public Sewers		
Ability to prevent illicit discharges into the wastewater collection system	13.10.230 - 13.10.410	Yes
Ability to limit the discharge of fats, oils, and grease and other debris that may cause blockages	13.10.270 13.10.280	Yes
Ability to require that sewers and connections be properly designed and constructed	13.10.030, 17.05.630 17.15.220 17.15.280	Yes
Ability to require proper installation, testing, and inspection of new and rehabilitated sewers	13.10.040, 17.15.280	Yes
Laterals		
Provide clear support for Agency responsibility (upper and/or lower lateral) and policies (e.g. courtesy cleaning, repair, cleanout installation)	13.10.040	Yes
Ensure access for maintenance, inspection, or repairs for portions of the service lateral owned or maintained by the Agency	13.10.040	Yes
Ability to control infiltration and inflow (I/I) from private service laterals	13.10.230	Yes
Satellite Collection Systems		
Ability to control infiltration and inflow (I/I) from satellite collection systems	13.10.230	Yes
FOG Source Control		
Requirements for the installation of grease removal devices (GRD)	13.10.380	Yes
Ability to set design standards for GRDs	13.10.210, 13.10.270	Yes
Ability to set maintenance requirements for GRDs	13.10.380	Yes
Ability to require application of best management practices	13.10.210	Yes
Ability to require record keeping and reporting of GRD maintenance and repair	13.10.520	Yes
Authority to inspect grease producing facilities	13.10.570	Yes
Enforcement		
Ability to enforce any violation of the Agency's sewer ordinances	13.10.530 – 13.10.660	Yes
Other Requirements (Recommended but not required by GWDR)		
Define lateral ownership and maintenance responsibility	City Ordinance 1901	Yes
Prohibit vandalism	California Penal Code 594(c)(2)	Yes
Ability to deal effectively with private lateral problems (e.g. force property owner to correct failed/plugged private building sewer)	8.30.040	Yes

ELEMENT 4: OPERATION & MAINTENANCE PROGRAM

4.1 Updated Map of Sewer System

REQUIREMENTS

The Plan must include the items listed below that are appropriate and applicable to the Enrollee's system.

An up-to-date map(s) of the sanitary sewer system, and procedures for maintaining and providing State and Regional Water Board staff access to the map(s). The map(s) must show gravity line segments and manholes, pumping facilities, pressure pipes and valves, and applicable stormwater conveyance facilities within the sewer system service area boundaries.

The Utility prepares and updates the sanitary sewer system maps (block books) continuously in CAD and/or GIS map and publishes compiled updates approximately every 4 years.

These updates are based on as-built information collected by the City's Public Works Field Services Division inspection staff and Sewer Division operations and maintenance personnel.

The following information is included in current map books:

- force mains
- manholes
- direction of flow
- laterals (with dimensions)
- diameter of mains
- year pipe installed
- lift stations
- chart station
- other sewer mains (not City)
- private mains
- manhole numbers
- flushing inlet
- depth of manhole
- pipe materials
- siphons
- pump stations
- private systems
- distance between manholes

Since the block book itself constitutes more than one hundred pages it is only referenced in this document. Appendix D shows Index sheet for the block book for the Utility's collection system.

4.2 Preventative Operation and Maintenance Activities

REQUIREMENTS

A scheduling system and a data collection system for preventative operation and maintenance activities conducted by staff and contractors.

The scheduling system must include:

(a) Inspection and maintenance activities

(b) Higher-frequency inspections

(c) Maintenance of known problem areas including areas with tree root problems

(d) Regular visual and closed-circuit television (CCTV) inspections of manholes and sewer pipes.

The data collection system must document the data from system inspection and maintenance activities, including system areas/components prone to root-intrusion potentially resulting in system backup and/or failure.

Goals of the Preventative Maintenance Program

The main objectives of the preventative maintenance program are to:

- Maximize service life of the City's sanitary sewer system
- Avoid major failures of the system
- Minimize sanitary sewer overflows and backups
- Respond appropriately to customer concerns and requests.

Major components of the program are identified as follows:

- Prioritize cleaning and maintenance of sewer system components
- Customer service
- Ongoing condition assessment
- Capital Improvement Program
- Staff training and providing adequate resources like combination cleaning trucks, CCTV cameras, etc.
- Maintenance of sanitary sewer system maps, equipment and supplies inventories
- Use of SCADA systems to monitor and control sewer facilities remotely.
- Use of a computerized maintenance management system (CMMS) at any time to manage assets and track work orders for scheduled preventative maintenance and customer requests.

Previous documentation of the Utility's maintenance strategies includes a 2009 Sewer System Management Plan, adopted by City Council in April 2009, a 2014 Sewer System Management Plan, adopted by City Council in February 2014, and a 2019 Sewer System Management Plan, adopted by City Council on April 7, 2020. The listed documents provide basic instructions and schedules for inspecting, cleaning, and servicing the Utility's sewer system facilities and maintaining records of the work completed. The current SSMP documented here is an update and supersedes the previous SSMPs. The Utility strives to balance its strong emphasis on customer service with a comprehensive and efficient preventative maintenance program that prevents spills.

Scheduled Preventative Maintenance

Main Line Maintenance – Cleaning and Repairs
The Assistant Sanitary Sewer Superintendent is responsible for ensuring that tasks are completed in line with the stated goals of the system. Regular review of the data collected and organized with CMMS is a tool for making decisions about redistribution of tasks and labor, and also to meet the Utility's overall goals. The Assistant Sanitary Sewer Superintendent, Engineering Administration, and Asset Management staff responsibilities include the following:

- Planning
- Purchasing
- Oversight
- Safety Program
- Service Contracts (Engineering)
- Reporting
- Tailgate Meetings
- QA/QC Work Orders

Crews are responsible for operations and maintenance activities as detailed in the following table:

Table 4-1: Crew Responsibilities

Task Description	Number of Staff Required
Jetting/Hydro Flushing	2
High Frequency Cleaning (HFC) Inspection and Cleaning	2-4[1]
Vac-Con (jetting smaller mains)	2[1]
Respond to Service Calls	1-2
Run generators	1
Manhole Inspection/cleaning	2[1]
Manhole repairs	3-4[1]
Inspect and Clean Siphons as Needed	2-3[1]
Repairs (mains)	3-4[1]
Televise laterals	2 [2]
Televise Mains	2-4[1]
Saw cuts	2-3
Locate laterals	2
Cleanout installations	3-4 [2]
Root Control (mains)	2
Lift/Pump station preventative maintenance (PM)	1-3
Lift/Pump station major maintenance (MM)	4[1]
Manage work performed by service contracts	1
Develop and implement standard operating procedures (SOPs)	1
Develop PM/MM Programs	1
Shop work	As needed
Programs	As needed
Tailgate Meetings	all

[1] May be performed by service contract
[2] When requested by customer

An example of a typical weekly calendar of tasks for sanitary sewer crews are depicted in the tables below, with the numbers indicating the number of staff members each task requires:

Table 4-2: Example of Crew Weekly Tasks

Monday	Tuesday	Wednesday	Thursday	Friday
- Lift Stations – Pull pumps and do required maintenance (3) - Perform Lateral Repairs (3) - Jetting – smaller streets (2) - Respond to Service Calls (2) - CCTV Mains (2)	- Lift Stations – Pull pumps and do required maintenance (3) - Perform Lateral Repairs (3) - Install cleanouts (3) - Jetting – smaller streets (2) - Respond to Service Calls (2) - CCTV Mains (3)	- Lift Stations – Pull pumps and do required maintenance (3) - Pumps (1) - Install cleanouts (3) - Jet (2) - Jetting – smaller streets (2) - Respond to Service Calls (2) - CCTV Mains (3)	- Pumps and Preventative Maintenance (3) - Lift Stations – run generator, trans. Pumps, work in shop (2) - Jetting – larger mains streets (3) - Respond to Service Calls (2) - CCTV Mains (2)	- Catch up on assignments as needed. Off every other week - Half crew – cover assignments as needed

The Utility's goal is to clean and inspect the entire length of their sewer system within 8 years. This includes replacing deficient mains identified by the NASSCO PACP pipe rating system. Regular jetting is scheduled for 36 weeks of the year, which allows time for storm season preparations. HFC's and siphons, however, are cleaned monthly throughout the year. The current inspection and cleaning cycle began April 2023, and is anticipated to be completed by April 2031.

Cleaning is done systematically by location throughout the City, thereby assuring that all mains are included in each cleaning cycle. Crews begin the cycle at the southern part of the City (higher elevation) and works towards the northern part of the City (lower elevation), progressing through the map books. Condition assessment is performed in conjunction with cleaning. CCTV videos and reports are uploaded and stored in the Utility's CMMS. If a defect is observed that may require immediate attention, it is reported to the Assistant Sanitary Sewer Superintendent to assess next steps and whether an emergency repair is warranted.

The Crew Supervisor sets priorities for completing repairs, based on the condition of the main and the potential impacts.

Crews are responsible for documenting the work that they complete each day. The Utility utilizes a Computerized Maintenance Management System (CMMS) software system called Lucity which maintains all work completed by maintenance crew staff. The Utility also utilizes an inspection management software called ITpipes to integrate inspection data into the CMMS.

Routine Main Line Maintenance
The Utility records details of main line maintenance, including date, location, feet, findings, manhole assessment, television work, names of staff completing work, and other comments. An example of a data sheet printout from Lucity can be found in Appendix L.

Areas Needing More Frequent Cleaning (HFC's or Higher Frequency Cleanings)
The Utility has identified "HFC's" throughout the City, which are locations in the sewer system that need more frequent cleaning to prevent buildup of grease inside the lines, obstructions, backflow, and spills (Table 4-3). The typical causes for HFCs include:

- Gravity lines with minimal slope
- Commercial FOG
- Surcharging
- Residential FOG
- Root problems
- Smaller siphons

Some HFC's remain the same over time, especially flat lines and smaller siphons.
Others are added to or removed from the list as problems are resolved and new problems are identified.

HFC's are identified during routine cleaning and entered into Lucity. Problem areas are noted in the work order system at the time they are identified, and then transferred to the list of HFC's for further attention. New/recently problematic HFC areas are televised and either cleaned or repaired and assessed as to causality; with any findings used to revise the HFC list based on best management practices.

Crews have a goal of cleaning all HFC's monthly or as close to 30 days apart as possible. Lucity keeps track of the list as they are cleaned, thereby recording their progress and assuring that all HFC's are cleaned regularly. Siphons are inspected regularly and jetted as necessary. A list of siphons is located in Table 4-4.

Table 4-3: List of High Frequency Cleaning Segments

LOCATION	MANHOLES	FEET	ISSUE	SIZE	NOTES
Hilmar/Park	28-28/20	186	Flat line/odor	6”	Flush
Cypress Alley	5-16/12	909	Flat line/odor	6”	Flush
Monroe/Rip Miller	27-19/10	534	Flat line/odor	6”	Flush
Jackson	45-86/85	1177	Flat line/odor	6”	Flush
Sherwood	39-17/27,17,23	314	Flat line/odor	8”	Flush
Coleman/Carl	48-22/21	455	Flat line/odor	8”	Flush
Civic Center/Main	46-87/47-44	275	Flat line/odor	6”	Flush
Lafayette/Yerba Buena	113-3/114-22	636	Flat line/odor	12”	Flush
GAP/Yerba Buena/Lafayette	103-33/113-2	1.105	Flat line/odor	12”	Flush
Nelo/Victor	88-23/78-27	404	Flat line/odor	12”	Flush
Stevens Creek/HP Parking Lot	10-75/80	1,227	Flat line	8”	Inspect flow
Lawrence/Tracy	11-76/78	273	Flat line	10”	Inspect flow
ECR/Jackson/Civic Center	43-93/86	354	Flat line	6”	Inspect flow
Wood Duck	30-36/17	556	Flat line	8”	Inspect flow
Cabrillo	41-14/18	742	Flat line	8”	Inspect flow
Reeve	46-85/47-38	388	Flat line	8”	Inspect flow
Scott/Jay	65-14/11	385	Flat line	12”	Inspect flow
Stevens Creek/Woodhams	2-32/27	354	Grease	8”	Jet
Calabazas Ct/Via Dondera	32-34/48	695	Grease	6”	Jet
ECR/Calabazas	32-4/5	55	Grease	10”	Jet
Avenida de Guadalupe	95-3/1	41	Grease	8”	Jet
Memorex/Richard	56-34/32	386	Grease	12”	Jet
Robert/De la Cruz	57-16/58-17	921	Grease	10"	Jet
Robert/De la Cruz	56-21/17	106	Grease	6”	Jet
Richard	56-32/26	220	Grease	10”	Jet
Memorex	56-47/56-26	1,318	Grease	10”	Jet
Agate	53-4/52-16	1,018	Grease	8”	Jet
Agate/Mead	52-15/62-50	602	Grease	10”	Jet
Mead	62-23/50	281	Grease	10”	Jet
Clyde/Orkney	87-25/13	184	Grease	8”	Jet
Clyde	86-23/21,18/36	231	Grease	8”	Jet
Main/Memorex	46-2/56-47	113.8	Grease	10”	Jet
Lehigh	21-75/80	205	Flat line/odor	8”	Flush
SC International Swim Center	23-7/24-17	181	Flat line/odor	8”	Flush
Poplar	28-1/91	361	Flat line/odor	8”	Flush
Sherwood/Portola	39-24/27	609	Flat line/odor	8”	Flush
Mauricia	13-97/99	257	Flat line	8”	Inspect flow
Miles/Saratoga Creek	23-11/12	178	Flat line	8”	Inspect flow
SC International Swim Center	23-89/5	125	Flat line	8”	Inspect flow
N. Winchester	26-38/32	258	Flat line	10”	Inspect flow
California	26-39/28	508	Flat line	6”	Inspect flow
Moonlite/Bowe	33-22/9	847	Flat line	8”	Inspect flow
Kiely/El Sobrante	33-35/34	54	Flat line	15”	Inspect flow
Chapman	39-1/19	95	Flat line	8”	Inspect flow
Main St/UPRR	46-1/56-46	142	Flat line	10”	Inspect flow
Jackson	46-93/86	336	Flat line	8”	Inspect flow
San Tomas Expwy	55-22/11	551	Flat line	12”	Inspect flow
Walsh	57-2/3	343	Flat line	15”	Inspect flow
Mathew	57-38/35	208	Flat line	18”	Inspect flow
Mathew	57-38/58	344	Flat line	24”	Inspect flow

Central/Lafayette	66-40/38	546	Flat line	12”	Inspect flow
Central/Lafayette	66-41/40	546	Flat line	10”	Inspect flow
Los Olivos	25-82/74	378	Grease	8”	Jet
Cheeney	85-17/30	435	Grease	6”	Jet
Clyde	86-18/36	66	Grease	8”	Jet
Clyde	86-23/21	134	Grease	8”	Jet
Clyde/Montague	87-25/13	184	Grease	10”	Jet
Avenida de Guadalupe	95-3/1	41	Grease	8”	Jet

Table 4-4: Siphons to be Inspected and Jetted as Necessary

	BB Page	Location	MH From/To	Size and Material
1	14	222 Saratoga Ave. & San Tomas Expwy	14-61/62	10" VCP
2	14/15	Saratoga Ave. & Sutter Ave.	14-65/15-62	10” VCP
3	20	3800-3750 Homestead Rd. & Calabazas Creek	20-26/18	24" PE
4	20	3800-3750 Homestead Rd. & Calabazas Creek	20-26/18	24" PE
5	20	3800-3750 Homestead Rd. & Calabazas Creek	20-16/17	16" PE
6	22	2960 Homestead Rd. & Saratoga Creek	22-64/102	8" CIP
7	23	830-900 Kiely Blvd. near Saratoga Creek	23-15/14	8" VCP
8	23	830-900 Kiely Blvd. near Saratoga Creek	23-15/14	12” VCP
9	31	3770 Flora Vista Dr. & Calabazas Creek	31-24/25	24" DIP
10	32	South Side El Camino Real & Calabazas Creek	32-2/102	8” PVC
11	32	South Side El Camino Real & Calabazas Creek	32-2/102	10” PVC
12	33	2570 El Camino Real & Calabazas Creek	33-9/10	8" CIP
13	42	3205 Cabrillo Ave. & Calabazas Creek	42-30/31	6" CIP
14	46	Cabrillo Ave. & Main St.	46-114/115	6” PE
15	46	Cabrillo Ave. & Main St.	46-114/115	6” PE
16	52	3250 Monroe St. & Calabazas Creek	52-123/124	8" PE
17	52	3250 Monroe St. & Calabazas Creek	52-123/124	8" PE
18	52	3289 Agate Dr. & Calabazas Creek	52-3/5	8" CIP
19	52	Machado Ave. & Calabazas Creek	52-116/119	12" PE
20	52	Machado Ave. & Calabazas Creek	52-116/119	12" PE
21	54	2149 Hoover Dr. & Saratoga Creek	54-79/78	10" VCP
22	54	2149 Hoover Dr. & Saratoga Creek	54-79/78	10" VCP
23	54	2400 Walsh & San Tomas Aquino Creek	54-94/95	18" PE
24	54	2400 Walsh & San Tomas Aquino Creek	54-94/95	18" PE
25	55	2001 Walsh Ave. & Scott Blvd.	55-51/52	20" PE
26	55	2001 Walsh Ave. & Scott Blvd.	55-51/52	20" PE
27	56	982 Walsh Ave. & Lafayette St.	56-58/59	20" PE
28	56	982 Walsh Ave. & Lafayette St.	56-58/59	20" PE
29	62	Central Expwy & Calabazas Creek	62-9/10	16" DIP
30	62	Central Expwy & Calabazas Creek	62-7/12	8" VCP
31	62	Central Expwy & Calabazas Creek	62-7/12	10” VCP
32	64	2400 Walsh Ave. & San Tomas Aquino Creek	64-34/36	15" VCP
33	64	2400 Walsh Ave. & San Tomas Aquino Creek	64-34/36	8" VCP
34	67	De la Cruz Blvd. & Central Expwy.	67-21/29	24” DIP

35	67	De la Cruz Blvd. & Central Expwy.	67-21/29	24” DIP
36	68	Seaboard Ave. & Guadalupe River	68-10/7	24" RCP
37	68	Seaboard Ave. & Guadalupe River	68-10/7	15" RCP
38	68	Seaboard Ave. & Guadalupe River	68-9/6	24” VCP
39	68	Seaboard Ave. & Guadalupe River	68-9/6	15” VCP
40	68	Airport Property & Hwy 101	68-15/16	24" CIPP
41	68	Airport Property & Hwy 101	68-15/12	24" DIP
42	72	East Side Calabazas Creek Near Tannery Way	72-12/11	20” CIP
43	72	East Side Calabazas Creek Near Tannery Way	72-12/11	20” CIP
44	85	2250 Agnew Rd. & Lakeshore Dr.	85-86/85	16” PE
45	93	Old Glory Ln. & Great America Pkwy.	93-50/48	12" VCP
46	93	Old Glory Ln. & Great America Pkwy.	93-50/48	24" VCP
47	93	Old Glory Ln. & Great America Pkwy.	93-51/49	18" VCP
48	93	Old Glory Ln. & Great America Pkwy.	93-51/49	24" VCP
49	93	Old Glory Ln. & Great America Pkwy.	93-51/49	24" VCP
50	95	Lafayette St. & San Francisco Hetch-Hetchy Potable Water Main Right of Way	95-45/44	15” VCP
51	95	Lafayette St. & San Francisco Hetch-Hetchy Potable Water Main Right of Way	95-45/44	18” VCP
52	95	Lafayette St. & San Francisco Hetch-Hetchy Potable Water Main Right of Way	95-45/44	18” VCP
53	96	4750 Lick Mill Blvd. & Hetch Hetchy R/W	96-14/13	15" PE
54	96	4750 Lick Mill Blvd. & Hetch Hetchy R/W	96-14/13	10" PE
55	103	5300 Great America Pkwy & San Tomas Aquino Creek	103-19/16	24” VCP
56	103	5300 Great America Pkwy & San Tomas Aquino Creek	103-19/16	12” VCP
57	103	Great America Pkwy. & San Tomas Aquino Creek	103-20/18	18" VCP
58	103	Great America Pkwy. & San Tomas Aquino Creek	103-20/18	24" VCP
59	103	Great America Pkwy. & San Tomas Aquino Creek	103-20/18	24" VCP

Pump Station Maintenance

The Utility divides pump and lift station maintenance into two categories: routine preventative maintenance and major maintenance. Currently, sanitary sewer crews are responsible for completing both routine and major maintenance activities.

Table 4-5: Pump Station Inspection and Maintenance Schedule

	Pump Stations: Northside and Rabello		**Unmetered Lift Stations: Tasman, De La Cruz, Primavera, Westside & Stadium Pump Station**		**Generators**
	Routine Inspection & Preventative Maintenance	**Major Maintenance**	**Routine Inspection & Preventative Maintenance**	**Major Maintenance**	**Routine Preventative Maintenance**
Monthly	Check pump flow Submerged hardware Check valve operation at Rabello Site Inspections: Note total flow readings, electric meter readings, pump hours & any pumps out of service Check screen at Northside and check as needed Degrease wet well, pump down, then wash down normally	Wear rings; inspect clearance	Submerged hardware Note hour meter totals as applicable Degrease wet well, pump down, then wash down normally	Clean wet well	Inspect for leaks Make sure that block heaters are operational Measure fuel levels and refill as necessary Run under load for 1 hour to assure reliability
Quarterly	Amp out all pumps for efficiency	Inspect impellers for wear Replace oil in pumps with new seals Check oil reservoir on pumps and remove rags Inspect flaps or check valve for wear and debris	Amp out all pumps for efficiency Inspect pumps and check valve operation Make sure that all pumps are alternating and working properly	Inspect impellers for wear Inspect wear rings and oil chamber on submersible pumps Check oil reservoir on pumps and remove rags	
Annually	Calibrate flow meters Maintain the Motor Control Center (MCC)		Maintain the Motor Control Center (MCC)		

The Utility also holds a contract with a private company to perform major pump maintenance or repairs due to the expertise and resources needed.

Root Control
As a part of a customer service request, the Utility may treat smaller mains for root control by means of physical removal or a foam product.

The Utility may offer treatment for root controls to private sewer laterals as a courtesy when requested by a resident or when necessary, as pre-treatment to provide inspection services. There is no official program to provide this service, and this service is offered on an as-requested basis only.

The current protocol includes cutting the roots and removing them from the sewer, waiting four (4) to six (6) weeks, foaming, and then going back to double check the affected segment of pipe.

Manhole Inspection and Repairs
Manholes are inspected as mains are jetted. In this way, all manholes are inspected approximately once every eight (8) years during the completion of system-wide CCTV. Any needed repairs are identified and documented in the block book by the Crew Supervisor. Repair needs are transferred to and completed by Sewer Division staff or may be contracted to a private company.

Manhole inspections and cleaning are documented along with other task completion on the daily report form.

Rehabilitation and Replacement Plan
Observations from system-wide CCTV are reviewed by Sewer Division staff and coordinated with the Utility's Engineering Division to prioritize rehabilitation and replacement. Severity of observed defects, location of pipe, proximity to other repair candidates, age, size, and material of pipe are considered and used to advise capital project planning.

Customer Service
The City's website, www.santaclaraca.gov, provides details about how the Utility serves its customers and encourages residents to call the Utility regarding sewer problems.

Sewer Division staff responsible for handling service requests during business hours. After hours service calls are received by the City's Water/Electric Control Operators, which are staffed 24 hours a day, seven days a week. Additional information about after-hours emergency response is contained in the Emergency Response Plan.

Sewer Division staff are also responsible for installing cleanouts on an as-requested basis. Cleanout installations are generally completed as scheduled, but dependent on current workload.

4.3 Training

REQUIREMENTS

In-house external training provided on a regular basis for sanitary sewer system operations and maintenance staff and contractors.

The training must cover the requirements of this General Order; the Enrollee's Spill Emergency Response Plan procedures and practice drills, skilled estimation of spill volume for field operators, and electronic CIWQS reporting procedures for staff submitting data.

Current Training Practices and Requirements
Current training practices focus on hands-on, in-the-field experience. New staff are paired with more experienced crews. The Assistant Sanitary Sewer Superintendent is responsible for scheduling staff to assure that new staff receives the training they need on all required tasks.

Crew Supervisors conduct performance appraisals once every three months for the first year of employment, and once a year in subsequent years, for each employee. The crew supervisor submits appraisal information to upper-level management for review.

All Sewer Division staff must obtain a State Water Resources Control Board Drinking Water Operator Certification Program Grade 1 Water Distribution certification. In order to be promoted from a Maintenance Worker I to a Maintenance Worker II position, staff must advance to at least Grade 2 of the SWRCB Water Distribution certification and must also obtain at least a CWEA Grade 1 collection system certification.

Staff hold daily tailgate safety meetings to review safety concerns and procedures . Staff also hold a monthly safety meeting that is attended by representatives from all staff levels to discuss safety procedures on a departmental level. The Water and Sewer Operations Manager also attends a monthly Utility-wide safety meeting. The Director, Assistant Director and/or Compliance Manager reviews all accidents.

Equipment Operators must be properly licensed according to State laws. The following vehicles require that operators have a class A or B California commercial driver's license:

- Vacuum Excavation Truck
- Jet truck
- Dump truck
- Crane truck
- Service Truck
- Tanker

Staff are required to obtain the appropriate license within one year of employment.

All Department Engineers, the Utility Business Systems Manager, and Sanitary Sewer staff, including Pump Technicians and Utility Crew Supervisors are certified in NASSCO PACP.

Training Opportunities
Sewer Division management and maintenance staff attend appropriate training events offered by CWEA and other organizations as opportunities arise.

Developing Training Materials
The Sewer Division is exploring options for developing more formal training materials. The Division is planning to develop a library of training videos such that each SOP will have a video resource that accompanies it. Resource manuals have been compiled by the Sewer Pump Tech that outline various specifications on our equipment, typical settings, desired operations,

and troubleshooting of stations. Training is ongoing with our CMMS (Lucity) to keep all vital information in the cloud/electronic tablet for instantaneous access to key system, site and procedural information.

4.4 Equipment Inventory

REQUIREMENTS

An inventory of sewer system equipment, including the identification of critical replacement and spare parts.

The City of Santa Clara's Automotive Services Department is responsible for maintaining all the City's vehicles. The Assistant Sanitary Sewer Superintendent is responsible for purchasing other equipment and spare parts to support this equipment. Pipe materials are purchased and stocked by the City's Finance Department's Purchasing Division, according to a minimum quantity list.

A current inventory of vehicles, major equipment, critical spare parts and the minimum quantity list is attached as Appendix E.

ELEMENT 5: DESIGN & PERFORMANCE PROVISIONS

5.1 Updated Design Criteria and Construction Standards

REQUIREMENTS

The Plan must include the following items as appropriate and applicable to the Enrollee's system.

Updated design criteria, and construction standards and specifications, for the construction, installation, repair, and rehabilitation of existing and proposed system infrastructure components, including but not limited to pipelines, pump stations, and other system appurtenances. If existing design criteria and construction standards are deficient to address the necessary component-specific hydraulic capacity as specified in section 8 (System Evaluation, Capacity Assurance and Capital Improvements) of this Attachment, the procedures must include component-specific evaluation of the design criteria.

Maintaining detailed design standards assures that new construction, replacement and rehabilitation work on the Utility's sanitary sewer system maintains the most up to date and relevant engineering standards. Providing these standards to consulting engineers and developers ensures compatibility with the existing system and a long system life with minimum operational cost.

All new sanitary sewer construction projects shall use the City's most recent design standards at a minimum. These standards are to be provided to consulting engineers that are planning a development or providing services for Utility owned sanitary sewer construction projects.

All rehabilitated sanitary sewer construction projects also must use the City's most recent design standards as a minimum. These standards must be provided to consulting engineers that are planning rehabilitation services for the Utility owned sanitary sewer system.
Repairs to the sanitary sewer system shall comply with the most current design standards. Repairs to existing systems shall be made utilizing the most current and acceptable practices.

All major repairs shall be made under the direction of the Director of Water and Sewer Utilities or their designee.

The current construction design standards are maintained by the City Engineer. A copy of the current Standard for Sanitary Sewer Design Criteria is attached as Appendix F. The City is planning on a near-term effort to review and update design criteria in the future.

5.2 Procedures and Standards

REQUIREMENTS

Procedures, and standards for the inspection and testing of newly constructed, newly installed, repaired, and rehabilitated system pipelines, pumps, and other equipment and appurtenances.

There are standards for the inspection and testing of the sanitary sewer system after construction, rehabilitation or repair. The City Public Works Department's City Engineer prepares City Standard Details for the sanitary sewer system. Additionally, new sewer lateral and facilities

are inspected by the City Building Department. Copies of these standards are available for purchase at the City of Santa Clara Inspection counter in City Hall and are attached in Appendix G.

ELEMENT 6: SPILL EMERGENCY RESPONSE PLAN

The Plan must include an up-to-date Spill Emergency Response Plan to ensure prompt detection and response to spills to reduce spill volumes and collect information for prevention of future spills. The Spill Emergency Response Plan must include procedures to meet all the following.

(a) Notify primary responders, appropriate local officials, and appropriate regulatory agencies of a spill in a timely manner.
(b) Notify other potentially affected entities (for example, health agencies, water suppliers, etc.) of all spills that potentially affect public health or reach the waters of the State.
(c) Comply with the notification, monitoring and reporting requirements of this General Order, State law and regulations, and applicable Regional Water Board Orders.
(d) Ensure that appropriate staff and contractors implement the Spill Emergency Response Plan and are appropriately trained.
(e) Address emergency system operations, traffic control and other necessary response activities.
(f) Contain a spill and prevent/minimize discharge to Waters of the State or any drainage conveyance system.
(g)Minimize and remediate public health impacts and adverse impacts on beneficial uses of waters of the State.
(h)Remove sewage from the drainage conveyance system.
(i) Clean the spill area and drainage conveyance system in a manner that does not inadvertently impact beneficial uses in the receiving waters.
(j) Implement technologies, practices, equipment, and interagency coordination to expedite spill containment and recovery.
(k)Implement pre-planned coordination and collaboration with storm drain agencies and other utility agencies/departments prior, during, and after a spill event.
(l) Conduct post-spill assessments of spill response activities.
(m) Document and report spill events as required in this General Order.
(n)Annually review and assess effectiveness of the Spill Emergency Response Plan, and update the Plan as needed.

Spill Emergency Response Procedures

These procedures are described by the following operating procedures, flowcharts and tables and contact lists, which are included as part of this Spill Emergency Response Plan located in Appendix H:

- Receiving a Service Request and Response During Business Hours;
- Receiving a Service Request and Response After Business Hours, Weekends and Holidays;
- Sanitary Sewer Overflow Response SOP;
- Jet Truck Operations SOP
- Vac-Con Operations SOP
- Sanitary Sewer Overflow (Spill Notification, Monitoring, Reporting and Recordkeeping)
- Spill Emergency Response Plan Report:
    - Section 1 - General Information/Background

    - Section 2 - Estimated and Calculated Spill Amounts
    - Section 3 - Spill Cause Source and Destination
    - Section 4 - Incident Response and Notification
    - Section 5 - Additional Spill Calculation and Estimation Information
    - Section 6 - Photograph Checklist
- Additional Support for Emergency Operations;
- Sanitary Sewer Overflow Water Quality Sampling SOP

Receiving and Responding to a Service Request

The City of Santa Clara's website instructs customers to call the Sewer Division staff directly during business hours at 408-615-2000 to report sewer-related problems. Work orders are created to track reported sewer-related issues and a Maintenance Worker is dispatched to investigate the problem and resolve if possible. Additional crew members are called in if necessary.

Customers are instructed to call 408-615-5640 on weekends, holidays and after business hours. These after-hours calls are received by the Water/Electric Control Operators. Sewer Division staff and qualified Water Division staff may choose to be on-call to respond to after-hours service calls. The Water/Electric Control Operators maintain a list of these on-call crew members.

The following procedure has been established for responding to a customer service request for a backup:

- First Responder: The Utility sends out one person to check the public main and the lower lateral (if there is an existing property line cleanout) to determine if there is a stoppage in the Utility-owned system, or if the stoppage is in the customer- owned lateral. The first responder then meets with the customer to discuss the location of the problem.
- If the stoppage is determined to be in the lower lateral of the customer's lateral, Sewer Division staff will run a drain auger into the public main in an attempt to clear the blockage. Staff may also elect to plunge the blockage if it is deemed risky to insert the drain auger. For other types of problems, or items relating to blockages in the upper portion of the lateral, the first responder will advise the customer of appropriate actions to take.
- If the stoppage is determined to be in the main line, the first responder will call in a jet truck and crew to relieve the problem. After clearing the stoppage, the line will be assessed and scheduled for further work if necessary. A CCTV inspection will be completed if the stoppage was particularly problematic, or if the inspection is deemed useful for other reasons.
- If the crew cannot clear the stoppage, the line will be repaired. If a problem is found that requires repairs, the Assistant Sanitary Sewer Superintendent will be notified and will call USA. The Crew Supervisor will mark the work area and will get his crew to saw out, excavate, complete the repair, backfill and clean up.
- In addition, the crew will also perform repairs to manholes that were either damaged during the process of clearing the stoppage or if any prior deficiencies were discovered.

A Sewer/Water Division employee is immediately notified when a spill occurs. After business hours, upon becoming aware of a spill (either through the initial service call or by notification from other sources), the Water/Electric Operators call Sewer and Water Division Maintenance Workers and supervisory staff, working their way up the chain-of-command, until a City employee is reached. Utility workers try to respond to service calls within 30 minutes. The

private contractor will be instructed to contact the Operators immediately upon becoming aware of a spill.

Program to Ensure an Appropriate Response in all Overflows

Responding to a Service Request
During business hours, the first Responder calls the Crew Supervisor or Assistant Sanitary Sewer Superintendent if additional staff or equipment is needed to assist with response. Each Sewer Division truck is equipped with a radio. After business hours, the first Responder calls the Water/Electric control Operators if additional staff or equipment are needed to assist with response. The Operators then call in other staff.

The Sewer Division maintains a spill-response truck/trailer with appropriate equipment and materials. First Responders may call for the truck/trailer to the service request location. Additional equipment is called in as needed for larger spills.

- A binder containing all Sewer Division SOPs, and a packet of additional spill reference and documentation material are included in the truck/trailer. Also, included in the Emergency Response Procedures in Appendix H, is the: Spill Response SOP: Spill Sampling SOP; Jet Truck Operations SOP; and Vac-Con Operations SOP.

Notification of Cal OES, Valley Water, Santa Clara County Health, City of Santa Clara Public Works of spills that potentially affect public health or reach waters of the State

Sewer Division staff has been trained on the updated Spill Emergency Response Plan Report that includes notification information and procedures on when to contact Cal OES. Addition support contact information has been provided for reference to staff for the Valley Water, County Health Officer, City of Santa Clara Public Works.

The Water and Sewer Operations Manager, Water and Sewer Superintendent, Assistant Sanitary Sewer Superintendent and any registered Data Submitters (DS) is responsible for entering reports of spills into the California Integrated Water Quality System (CIWQS), as required by the Monitoring and Reporting Program in the State Water Board Order No. 2022-0103-DWQ. The Water and Sewer Operations Manager and the Water and Sewer Superintendent are responsible for certifying spill reports to CIWQS. Two-hour notifications, as required, may be made by the LRO, and in the event of their absence, notification may be made by the Assistant Water & Sanitary Superintendent, Assistant Director, or Director. The Assistant Director and Director is also responsible for completing the SSMP Audit Report every two years. The updated Spill Notification and Reporting Flow charts are included with updated Appendix H and attached to this document; the Organizational Structure is referenced in Element 2 as Figure 2-1.

Notification, monitoring and reporting requirements of this General Order, State law and regulations, and applicable Regional Water Board Orders

The Utility has updated its Spill Notification, Monitoring, Reporting and Recordkeeping and processes to include requirements of Attachment E1 Notification, Monitoring, Reporting and Recordkeeping Requirements of the new Order. The updated processes are inclusive of the spill categories listed below:

- Category 1- discharges any volume of sewage of any volume that reaches surface water or drainage channel; reaches the Storm drain system not fully captured;
- Category 2 – Discharges of untreated or partially treated wastewater of 1,000 gallons or greater that does not discharge to a surface waters;
- Category 3 – Spill equal to or greater than 50 gallons and less than 1,000 gallons that does not discharge to surface waters;

- Category 4- Spill less than 50 gallons;
- Reporting private lateral discharges is encouraged but not required by the new Order, The Utility will assess the need for reporting private sewer lateral spills to regulatory agencies on a case-by-case basis.

Spill Emergency Response Training

Sewer Division staff has been trained at two training sessions provided by the Utility on the new Spill Emergency Response Plan to address requirements of the State Water Board Order No. 2022-0103-DWQ. The training occurred May 4, 2023, and June 1, 2023, before implementation of the 2022 -0103-DWQ Order that became effective on June 5, 2023. Training on the Spill Response Plan will occur on at least a semi-annual basis. Ongoing coordination meetings between managers and supervisors will occur on an as-needed basis when updates are needs to Element 6 and Appendix H: Emergency Response Procedures. All contractors involved in responding to spills will also be trained on the Spill Emergency Response Plan.

Pre-planned coordination and collaboration with the City's Public Works Department that manages the storm drain system or Municipal Separate Storm Sewer System (MS4) and other utility agencies/departments prior, during, and after a spill event.

The Water and Sewer Utilities meets on an as-needed basis with the Public Works Department to ensure adequate response to various emergencies that occur in the City. The Water and Sewer Utilities and the Public Works Department met on May 11, 2023, to coordinate efforts related to the new Order. Practices and procedures discussed at this meeting were incorporated into the Spill Emergency Response Plan.

Roles and Responsibilities coordinated between the two Departments were designated as follows:

<u>Water & Sewer Utilities</u>

- First responders, implement procedures contained in the Utility's Sewer System Management Plan (SSMP) and Spill Emergency Response Plan to stop/mitigate sewer overflows
- State CalOES Notification when required
- State CIWQS Reporting
- Removing blockage in the sanitary sewer system
- Water Quality Sampling when required
- Clean-up overflowed sewage

<u>Department of Public Works-Stormwater Division</u>

All spill categories have the potential to impact storm conveyance

- Respond to location where overflow enters storm drain system
- Assist with identifying if storm conveyance including catch basins, stormwater green infrastructure BMPs (bioretention, infiltration basins, bioswales) will discharge to surface water (creek/river), pump station/retention basin
- Coordinate shutoff of storm pump/lift station to prevent from discharging to surface water
- Assist with creek access for Water & Sewer Utilities-Compliance staff to complete investigation and take photos at outfall, upstream, downstream, and Water Quality sampling if necessary
- Assist with clean-up effort of storm drain system

The contact list for Stormwater Division staff was updated to the Additional Support for Emergency Operations form.

Conduct post-spill assessments of spill response activities

Management and supervisory staff that could include the Compliance Manager, Water and Sewer Operations Manager, Water and Sewer Superintendent, Assistant Water and Sanitary Sewer Superintendent including the Assistant Director and Director of Water and Sewer Utilities will conduct post-spill assessments to discuss response activities, equipment, and infrastructure deficiencies

Documentation and reporting all spill events categories

Water and Sewer Utilities staff will document and report spills for Categories 1, 2,3,4 as outlined in Attachment E1 of the Statewide Sanitary Sewer Systems General Order 2022-0103-DWQ. Utility staff will document spill responses on the Spill Emergency Response Report forms that are utilized in the field. Pertinent information is documented in the Computer Maintenance Management System (CMMS) utilizing Lucity database software. The Utility will update spill related information in the CIWQS database according to the requirements of the Order.

Annually, review and assess effectiveness of the Spill Emergency Response Plan

On an annual basis the Utility's management and supervisory staff will meet annually and review the Spill Response Plan with a focus on spill response and containment, documentation procedures, training requirements, communication, CIWQS reporting and coordination between agencies including the Public Works stormwater Division. Any outcomes from the annual evaluation will be documented and implemented with modification being made to the Spill Emergency Response Plan.

Lateral Responsibility

Property owners own the entire length of their laterals. Property owners are responsible for dealing with blockages and backups resulting from blockages in their lateral. Utility employees do not work on the customer's upper lateral under any circumstances. If there is a blockage in a lateral and there is not an existing property line cleanout, the property owner is responsible for dealing with the blockage and backup. The Utility is not responsible for damages due to blockages in these laterals. Utility employees will check the lower lateral and will attempt to clear blockages as a courtesy service, provided that there is a property line cleanout.

Sewer Division staff will explain this policy to the customer and offer to schedule a property line cleanout installation so that future backups caused by problems in the lower lateral can be more easily identified and resolved.

In Chapter 13.10 of the Santa Clara Municipal Code under 13.10.020 Definitions (S) (5) sewer lateral is defined included entity that owns the lateral:
"Sewer lateral" (same as "sewer service lateral") means the sewer connection piping used to convey sewage from a building or facility on a parcel (private or public property) to the City-owned sewer main. Each sewer lateral is owned by the entity that owns the property or facility from which that sewer lateral serves to convey sewage."

Under 13.10.040 - Maintenance and inspection of sewer connections defines the requirements:
"Each user shall keep his/her sewer connections and sewer lateral(s) in good order at his/her own expense and shall be liable for all damages resulting from failure to do so. Each owner shall maintain their sewer lateral free from displaced joints, open joints, root intrusions, substantial deterioration of pipe material, cracks, leaks, inflow or infiltration of extraneous water, grease and sediment deposits or other similar conditions, defects, or obstructions likely to cause or increase the chance of blockage. A City inspector shall be admitted at all reasonable hours to any premises connected with the sewer system, for the purpose of checking plumbing fixtures, protecting the rights of the City, and determining facts relevant to the establishment, computation, and billing of the sewer service charges provided for in this chapter, including, in the case of industrial users, examination of the users' books for the purpose of checking the quantities of industrial waste produced. "

The Utility will on a case-by-case basis determine whether to report sewer discharges to California Office of Emergency Services (OES) from Privately-Owned Sewer Laterals and or Private Sanitary Sewer Systems that discharges to waters of the State, or a storm drain conveyance system that discharges to the waters of the State.

Table 6-1: Officials Receiving Immediate Notification of Spill's (Spills resulting from a problem with a main line)

Contact	Circumstances for Immediate Notification
Operations Manager / Assistant Superintendent/ Water and Sewer Compliance Manager	If the spill reaches surface water, indicating if water quality samples need to be taken.
Public Works/ Operations & Maintenance Division/storm drain and street maintenance sub-divisions	If the spill enters the storm system.
Office of Emergency Services	For all spills greater than 1,000 gallons reaching surface waters or spilled in a location where it probably will be discharged to surface water

ELEMENT 7: SEWER PIPE BLOCKAGE CONTROL PROGRAM

REQUIREMENT
The Sewer System Management Plan must include procedures for the evaluation of the Enrollee's service area to determine whether a sewer pipe blockage control program is needed to control fats, oils, grease, rags, and debris. If the Enrollee determines that a program is not needed, the Enrollee shall provide justification in its Plan for why a program is not needed. The procedures must include, at minimum:

(a) An implementation plan and schedule for a public education and outreach program that promotes proper disposal of pipe-blocking substances.
(b) A plan and schedule for the disposal of pipe-blocking substances generated within the sanitary sewer system service area. This may include a list of acceptable disposal facilities and/or additional facilities needed to adequately dispose of substances generated within a sanitary sewer system service area.
(c) The legal authority prohibits discharges to the system and identifies measures to prevent spills and blockages.
(d) Requirements to install grease removal devices (such as traps or interceptors), design standards for the removal devices, maintenance requirements, best management practices requirements, recordkeeping and reporting requirements.
(e) Authority to inspect grease producing facilities, enforcement authorities, and whether the Enrollee has sufficient staff to inspect and enforce the FOG ordinance.
(f) An identification of sanitary sewer system sections subject to fats, oils, and grease blockages and establishment of a cleaning schedule for each section; and
(g) Implementation of source control measures, for all sources of fats, oils, and grease reaching the sanitary sewer system for each section identified above.

Fats, Oils, and Grease (FOG) are common sources for sewer system backups and blockages that could potentially results in spills. The Utility conducts regular inspections to ensure restaurants have the properly sized and maintained grease removal device to keep FOG from entering the collection system. The Utility notifies each facility that an inspector will be conducting a walkthrough of the premises to review business practices and maintenance records regarding the proper cleaning of grease removal devices.

Education/Outreach for Proper Disposal of FOG

As part of the Utility's restaurant FOG inspection program, education and outreach materials, along with fact sheets are distributed to potential FOG producing facilities or operations. They address issues such as:

- Grease Trap Maintenance
- Grease Interceptor Maintenance
- Grease Control Device Maintenance Documentation
- Power-Operated Grease Removal Devices
- Prohibitions of Chemicals, Enzymes and Bacteria in Grease Traps and Interceptors
- Proper Cleaning and Rinse Water Disposal
- How to Clean Your Grease Trap
- Managing Fats, Oils and Grease

The fact sheets mentioned constitute Best Management Practices and are attached in Appendix I. All of the above materials are available to inspectors and plan check staff to distribute to restaurant owners and operators. These materials are also distributed to the food service

establishment upon initial inspection and at any time deemed pertinent. These materials are available on the City's website and are distributed by Utility staff as necessary. In addition, sewer crews may distribute notices in areas that have noted FOG "Hot Spots".

Disposal of Fats, Oils, and Grease

Although no FOG disposal sites are located in the City of Santa Clara, there are ample opportunities for proper disposal in the immediate vicinity of the City. All FOG collected within the city limits are usually handled by commercial grease disposal companies. The Utility provides a list of local grease hauling companies to restaurants and food preparation facilities. A copy of this hand-out is attached in Appendix I.

Legal Authority to Prohibit Discharges

The legal authority of the City rests in the City of Santa Clara's Charter (ref: Section 400, Article IV Powers) and adopted City code. Specific to waste discharge requirements for sanitary sewer system, Code Title 13, Chapter 13.10 "Sewers" codifies all requirements related to sewers. The specific Authority to prohibit discharges can be found in Appendix B.

- Storm and other waters - 13.10.230
- Grease, oils, fats - 13.10.270
- Solid or viscous matter - 13.10.280

Requirements to Install Grease Removal Devices

The following standards can be found in as provided in Appendix B.

- Maintenance Requirements – 13.10.380
- Best Management Practices Requirements – 13.10.380
- Record Keeping - 13.10.520
- Reporting Requirements – 13.10.520

Authority to Inspect

The Utility has sufficient staff to inspect FOG producing facilities or operations, including a Compliance Manager, Code Enforcement Officer and Code Enforcement Technician. The City Code includes sections to address inspection and enforcement issues which can be found in Appendix B.

- Power to Inspect – 13.10.570
- Responsibility – 13.10.530
- Publication of Users in Significant Non-Compliance - 13.10.660

Identification of FOG "Hot Spots"

The Utility has identified "Hot Spots" in the collection system that may be caused by a variety of reasons including FOG. In order to mitigate any potential blockage or spill resulting from these anomalies, these areas are on a more frequent inspection and cleaning regimen. The list of City FOG Hotspots is referenced in Element 4.

Source Control Measures to Prevent Spills/blockages of FOG

The discharger is required to use Best Management Practices (BMP) or have in place a Grease Interceptor or for smaller kitchens at a minimum a Grease Trap on appropriate outlets.

The FOG Control Program is designed for inspections as well as education for the discharger. The inspection includes a tour of the facility, use of BMPs, physical inspection of any/all grease removal devices and review of all records related to the cleaning, pumping and repair of these devices. Discrepancies found during the inspection are duly noted and followed-up after corrective action is scheduled.

The City of Santa Clara adopted a minimum pipe size of eight (8) inches for sanitary sewers in residential areas. There are very limited pipe sizes below six (6) inches. City terrain naturally flows northerly towards the Bay.

The Sewer Division crew completing jet flushing makes note of excessive grease/build-up or blockage in any segment of the collection system. The information is then referred to the FOG Program if it appears that any food service establishment may be contributing to the issue. This may trigger a FOG investigation in the area. The City does not have large commercial processes that produce chronic FOG problems. FOG, when found, is typically localized in nature to onsite customer laterals.

Utility block book maps and customer service requests from upstream discharges can be evaluated to locate areas of concern. The area upstream of the grease build up is evaluated for potential sources, and Grease Removal Device cleaning and maintenance records are reviewed. Enforcement action is taken against establishments determined to be causing grease blockages in the sanitary sewer, and additional requirements for cleaning or installation of Grease removal device (GRD) can be imposed.

ELEMENT 8: SYSTEM EVALUATION, CAPACITY ASSURANCE, CAPITAL IMPROVEMENT

REQUIREMENTS

The Plan must include procedures and activities for

- *Routine evaluation and assessment of system conditions,*
- *Capacity assessment and design criteria.*
- *Prioritization of corrective actions.*
- *Capital improvement plan.*

8.1 System Evaluation and Condition Assessment

REQUIREMENTS

The Plan must include procedures to:

(a) Evaluate the sanitary sewer system assets utilizing the best practices and technologies available.

(b) Identify and justify the amount (percentage) of its system for its condition to be assessed each year.

(c) Prioritize the condition assessment of system areas that:

a. Hold a high level of environmental consequences if vulnerable to collapse, failure, blockage, capacity issues, or other system deficiencies.

b. Are located in or within the vicinity of surface waters, steep terrain, high groundwater elevations, and environmentally sensitive areas.

c. Are within the vicinity of receiving water with a bacterial-related impairment on the most current Clean Water Act section 303(d) List (check with your local Regional Water Quality Control Board for their latest lists).

(d) Assess the system conditions using visual observations, video surveillance and/or other comparable system inspection methods.

(e) Utilize observations/evidence of system conditions that may contribute to exiting of sewage from the system which can reasonably be expected to discharge into a water of the State.

(f) Maintain documents and recordkeeping of system evaluation and condition assessment inspections and activities.

(g) Identify system assets vulnerable to direct and indirect impacts of climate change, including but not limited to sea level rise; flooding and/or erosion due to increased storm volumes, frequency, and/or intensity; wildfires; and increased power disruptions.

The Utility's sewer condition assessment program consists of the following:

- CCTV of all sewer mains and visual inspection of manholes every 8 years
- Inspection of sewer pumps every 6 months
- Inspection of standby generators every 1 year.

After CCTV inspection, sewer mains are assigned a condition rating based on the industry standard NASSCO PACP rating system and methodology. All personnel performing CCTV inspection are required to be certified through NASSCO PACP.

CCTV records and associated observations are documented and recorded using IT Pipes and are uploaded to and

stored in Lucity, the Utility's asset management software.

The largest impact of climate change on the Utility's ability to respond to issues in the sanitary sewer system are anticipated to be related to sea level rise and flood risk. The City is not located in a coastal flood zone, but does feature creeks through City limits, and has potential to experience larger than expected storms. The City currently plans capacity around a 10-year storm event, or 100-year storm event if near a storm drain pump station, consistent with the previous and in-progress Sanitary Sewer Master Plans and capacity studies. In addition, the Utility has continued coordination with SCVWD regarding flood protection and levees to mitigate potential flooding from surface waters within City limits. The Utility plans to continue tracking industry guidance on potential vulnerabilities to direct or indirect effects of climate change and adjust procedures accordingly.

8.2 Capacity Assessment and Design Criteria

REQUIREMENTS
The Plan must include procedures to identify system components that are experiencing or contributing to spills caused by hydraulic deficiency and/or limited capacity, including procedures to identify the appropriate hydraulic capacity of key system elements for:

- *(a) Dry-weather peak flow conditions that cause or contribute to spill events.*
- *(b) The appropriate design storm(s) or wet weather events that causes or contributes to spill events.*
- *(c) The capacity of key system components.*
- *(d) Identify the major sources that contribute to the peak flows associated with sewer spills.*

The capacity assessment must consider:

- *(a) Data from existing system condition assessments, system inspections, system audits, spill history, and other available information.*
- *(b) Capacity of flood-prone systems subject to increased infiltration and inflow, under normal local and regional storm conditions.*
- *(c) Capacity of systems subject to increased infiltration and inflow due to larger and/or higher-intensity storm events as a result of climate change.*
- *(d) Increases of erosive forces in canyons and streams near underground and aboveground system components due to larger and/or higher-intensity storm events.*
- *(e) Capacity of major system elements to accommodate dry weather peak flow conditions, and updated design storm and wet weather events; and*
- *(f) Necessary redundancy in pumping and storage capacities.*

The City of Santa Clara's Design Criteria has been addressed in Element 5: Design & Performance Provisions.

The City of Santa Clara Sewer Capacity Assessment was completed in 2007 and updated in 2016; both reports are attached as Appendix J. The City is currently in the process of developing its Sanitary Sewer Master Plan, which includes the development of an "all-pipes" model, revised system-wide capacity studies, and an updated Capital Improvement Program. The Sanitary Sewer Master Plan is expected to be completed by the end of 2025 and before the next Sewer System Management Plan Update, and revised findings will be described in the next Sewer System Management Plan. For reference, a draft of the in-progress Sanitary Sewer Master Plan is included as Appendix J.

The major flow contributors to the sanitary sewer collection system have been identified. Lists of major dischargers are updated on a monthly basis and are listed in the table on the following page.

Table 8-1 Significant Industrial Users in the City as of 2024

49ERS STADIUM MANAGEMENT
AGILENT TECHNOLOGY #9000081235
AKT AMERICA INC
APCT INC
APPLIED MATERIALS
COLOVORE LLC
CORESITE CORONADO STENDER LLC
CYXTERA DATA CENTERS INC
DIGITAL REALTY TRUST LP TOTALZ
FUJIFILM DIAMATIX INC
INTEL CORPORATION (BOWERS)
INTEL CORPORATION (MCB)
PALO ALTO NETWORKS
QUALITY TECHNOLOGY SERVICES
VANTAGE DATA CENTERS LLC
WONDER ICE CREAM

8.3 Prioritization of Corrective Actions

REQUIREMENTS

The findings of the condition assessments and capacity assessments must be used to prioritize corrective actions. Prioritization must consider the severity of the consequences of potential spills.

Defects identified through condition assessment are reviewed by Utility staff and used to prioritize repairs. Severity of defect, defect type, size of pipe, location of pipe, and previous maintenance history are considered. Point repairs are completed on an as-needed basis by Sewer Division crews, and the Utility implements an annual sewer repair project to be completed by contractors to repair high priority assets where the scope of the repair exceeds that which can be completed by Sewer Division crews (i.e. large diameter trunks, pipelines with defects to large or too frequent to be addressed by point repairs, locations where intensive traffic control is needed). Historically, the annual repair project has addressed severe defects in large diameter (33-inches to 48-inches) sewer trunks with significant tributary sewershed.

8.4 Capital Improvement Plan

REQUIREMENTS

The capital improvement plan must include the following items:

(a) Project schedules include completion dates for all portions of the capital improvement program.
(b) Internal and external project funding sources for each project.
(c) Joint coordination between operation and maintenance staff, and engineering staff/consultants during planning, design, and construction of capital improvement projects; and Interagency coordination with other impacted utility agencies.

The Public Works' Engineering Department is responsible for managing the Public Works' portion of the City's Capital Improvements Program, which includes Sewer capital improvement projects.

If major deficiencies warranting rehabilitation or replacement of sewer system components are identified as a result of routine main-line cleaning or CCTV inspections that require resources

beyond those available to the Sewer Division, the Assistant Sanitary Sewer Superintendent contacts the Principal Engineer – Water and Sewer. Principal Engineer then prioritizes and coordinates with Public Works Design Division for contracting the sewer main repair activities.

The City completed a Sewer System Capacity Assessment in 2007 and a General Plan Update in 2010 for new planned development and redevelopment. An update to the Sewer System Capacity Assessment was completed in 2016. Several capacity-related capital improvement projects were identified as a result of this assessment. The current schedule for these projects is shown in Table 8-2.

Table 8-2: Sanitary Sewer Capacity Improvement Project

Table ES-2: Recommended Capacity Improvement Projects

Project ID	Priority	Project Name	U/S MHID	D/S MHID	Description	Est. Capital Improvement Cost[1]
P1[2]	1	Westside Lift Station Set Point Adjustment	N/A	N/A	Adjust the set points for the pumps to a lower elevation to eliminate unnecessary backups in the influent line.	--
P2[2]	2	Tasman Lift Station Set Point Adjustment	N/A	N/A	Adjust the set points for the pumps to a lower elevation to eliminate unnecessary backups in the influent line.	--
P3	2	Cabrillo Avenue Sewer Improvement	S41-13	S41-20	Upsize 1,600 feet of 8-inch line in Cabrillo Ave. between Lawrence Expressway and Nobili Ave. to a 12-inch line.	$1,097,000
P4	3	Tasman Drive Sewer Improvement	S93-24	S93-35	Upsize 600 feet of 12-inch line in Tasman Dr. between Old Ironsides Dr. and Great America Pkwy. to a 15-inch line.	$327,000
P5	4	Sewer Diversion at Los Prades Boulevard and Saratoga Avenue	S25-85	S25-85	Install a weir in manhole S25-85 located in the intersection of Padres Blvd. and Saratoga Ave. to divert flow northwest to the existing 12-in line in Los Padres Blvd.	$77,000
P6	4	Sewer Diversion at Calabazas Boulevard and Machado Avenue	U/S of S52-93	S52-120	Install a new manhole upstream of S52-93 in the intersection of Calabazas Blvd. and Machado Ave., and install a new 15-inch high-level diversion line (approximately 200 feet) to divert excess flow from the existing 24-inch line in Calabazas Blvd. to the 21-inch line in Machado Ave. The diversion line should be about 6 inches higher than the invert of the 24-inch line.	$166,000
P6-Alt.[3]	4	Calabazas Creek Sewer Improvement	S62-31	S72-20	Upsize 1,800 feet of 24-inch line next to Calabazas Creek between Kifer Rd. and Scott Blvd. to a 27-inch line.	$4,810,850
					Estimated Total Cost for Recommended Projects P1 to P6:	**$1,667,000**
					Estimated Total Cost for Projects P1 to P5 and P6-Alt:	$6,311,850
E1[4]	N/A	Tracy Drive Sewer Improvement	S10-77	S22-51	Upsize approximately 6,600 feet of 10- to 12-inch line in Tracy Dr. and Pomeroy Ave. to a 15-inch line; install a new 15-inch line between manholes S22-55 and S22-46 in Pomeroy Ave. and Homestead Rd. (approximately 50 feet) to divert flow into Homestead Rd., and upsize approximately 1,400 feet of 18-inch line downstream to a 21-inch.	$4,654,000
					Estimated Total Cost (P1 to P6) including Project E1:	**$6,321,000**
					Estimated Total Cost (P1 to P5 and P6-Alt) including Project E1:	**$10,965,850**

1. All costs are presented in 2015 dollars and include 30 percent allowance for contingencies for unknown conditions and 25 percent for engineering, administration, and legal costs.
2. These proposed projects are operational, not capital improvements. Refer to Table 4-4 for recommended set points.
3. Project P6-Alt is presented for the purpose of identifying the solution and associated cost to maintain the current system flow configuration.
4. Project E1 addresses the potential capacity deficiency when parcel APN 316-17-018 begins to discharge its entitled flow of 0.95 mgd into the City's system.

The capacity-related capital improvement projects documented above has not yet been constructed or scheduled into the City's Capital Improvement Program. As previously stated, the City's update to its Sanitary Sewer Master Plan is currently in-progress, and with the inclusion of an all-pipes model and significant changes to the previous studies development assumptions, the City elected to postponed previously identified capacity-related capital improvement projects until the current Sanitary Sewer Master Plan update can be completed. The Sanitary Sewer Master Plan is expected to be completed by the end of 2025 and before the next Sewer System Management Plan Update, and revised Capital Improvement Projects will be described in the next Sewer System Management Plan.

The funding sources for the City's Capital Improvement Plan for the Water and Sewer Utilities are derived from sewer rates, connection fees and bonding proceeds. A copy of the Sewer Utility Budget is attached in Appendix K.

ELEMENT 9: MONITORING, MEASUREMENT, PROGRAM MODIFICATIONS

REQUIREMENTS

The Plan must include an Adaptive Management section that addresses Plan-implementation effectiveness and the steps for necessary Plan improvement, including:
(a) Maintaining relevant information, including audit findings, to establish and prioritize appropriate Plan activities.
(b) Monitoring the implementation and measuring the effectiveness of each Plan element.
(c) Assessing the success of the preventative maintenance activities.
(d) Updating Plan procedures and activities, as appropriate, based on results monitoring and performance evaluations; and
(e) Identifying and illustrating spill trends, including spill frequency, locations, and estimated volumes.

Performance Measures

The Utility will use the following measures to assess the performance of the collection system and the effectiveness of its SSMP:

- total number of spills;
- number of spills by each cause (roots, grease, debris, capacity, pipe failure, pump station failures, and other);
- portion of sewage contained compared to total volume spilled;
- volume of spilled sewage discharged to surface water; and
- planned to actual performance for preventative maintenance.

Implementation and Effectiveness

The Utility implements all elements of the SSMP and has been effective in minimizing spill occurrences.

Preventative Maintenance Program

The Utility's preventative maintenance program has been utilized for many years and has resulted in a low number of spills as indicated by Figure 9-1 below.

Performance Monitoring and Program Changes

The Utility will evaluate the performance of its wastewater collection system at least annually using the identified performance measures. The Utility will update the data and analysis in this section at the time of evaluation. The Utility may use other performance measures in its evaluation. The Utility will prioritize its actions and initiate changes to the SSMP and the related programs based on the results of the evaluation.

Spill Trends: Frequency, Location, and Volume

The Utility maintains records on spills for 5 years. Figure 9-1 shows the frequency and volume of spills by from Calendar Years 2020-2024 Table 9-1 shows spill causes, and Figure 9-2 displays the location of spills within the City of Santa Clara. From this data, it is apparent that the Utility experiences low spill rates.

Figure 9-1: Frequency and Volume of Spills 2020-2024

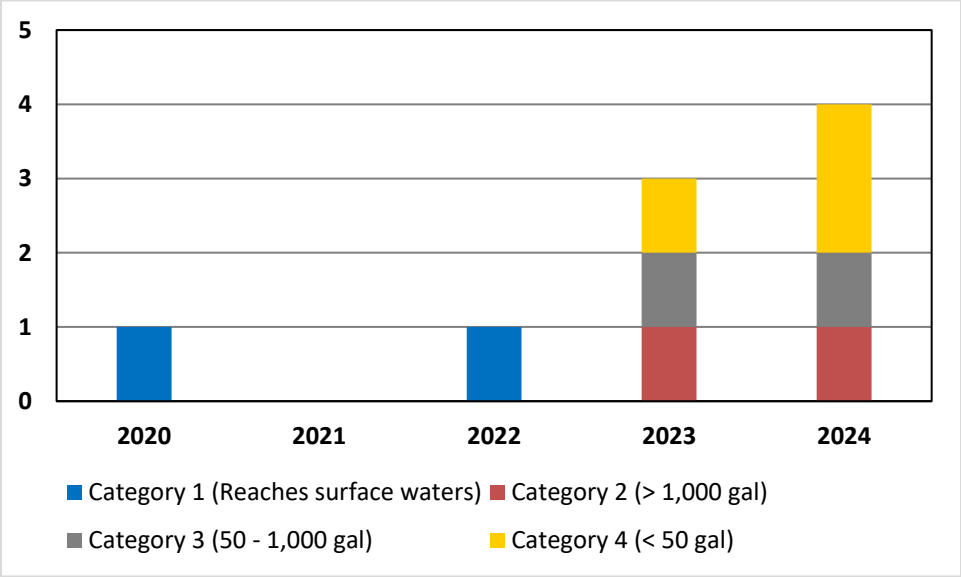
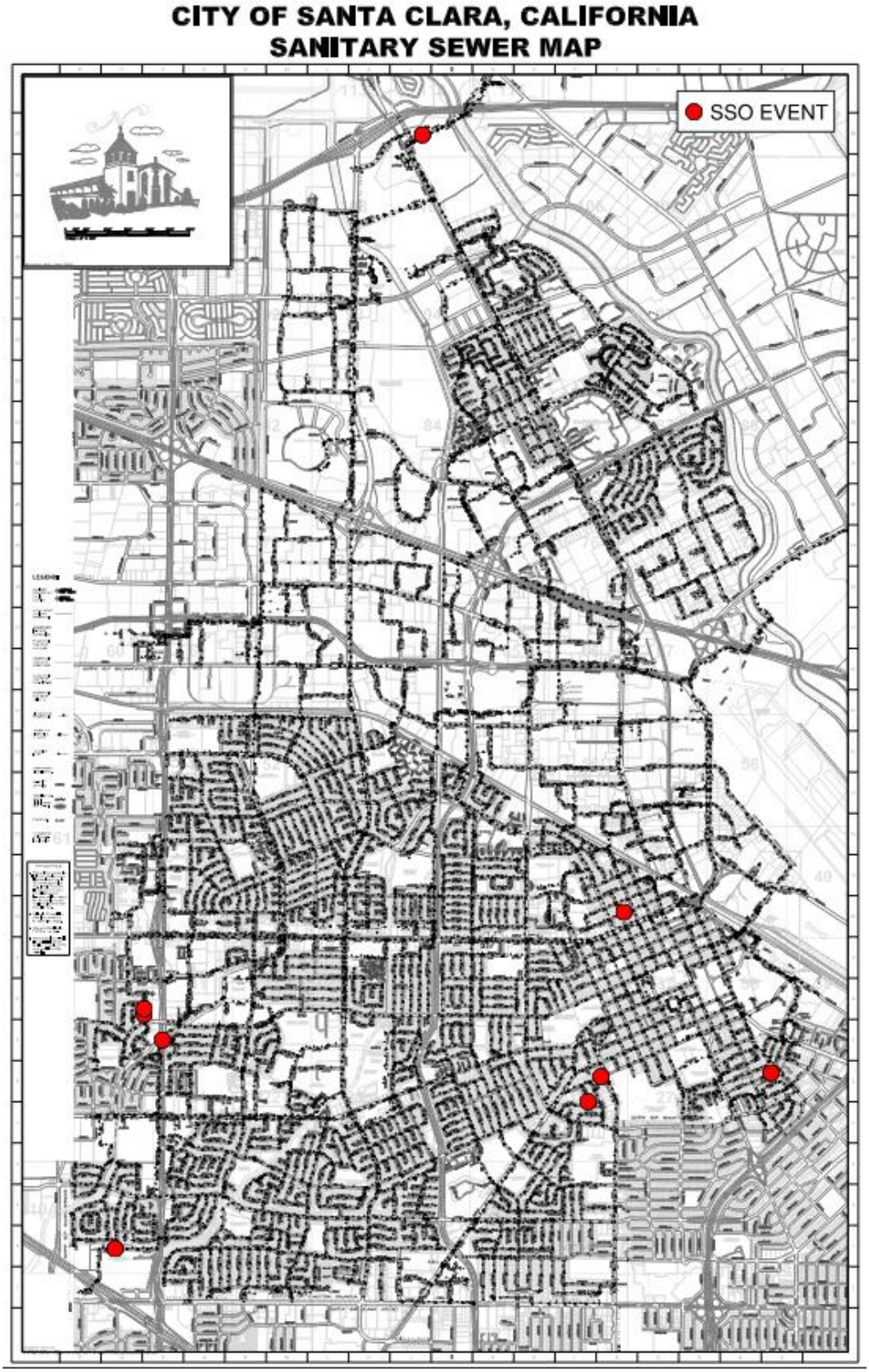


Table 9-1: Spill Causes per Figure 9-1 2020-2024

Cause Category	Number	% of Total
Blockage		
Roots	**2**	**22.22%**
Grease/FOG	**5**	**55.56%**
Debris	**0**	**0.00%**
Other	**0**	**0.00%**
Multiple Causes	**1**	**11.11%**
Subtotal for Blockage	**0**	**0.00%**
Infrastructure	**0**	**0.00%**
Inflow & Infiltration	**0**	**0.00%**
Flow Capacity Deficiency	**0**	**0.00%**
Natural Disaster	**0**	**0.00%**
Bypass	**0**	**0.00%**
Cause Unknown	**0**	**0.00%**
Contractor/Private Party	**1**	**11.11%**
Total	**9**	**100%**

Figure 9-2: Spill Location Map
2020-2024



ELEMENT 10: SSMP PROGRAM AUDITS

REQUIREMENTS
The Plan shall include internal audit procedures, appropriate to the size and performance of the system, for the Enrollee to comply with section 5.4 (Sewer System Management Plan Audits) of this General Order.

Specifications 5.4 (Sewer System Management Plan Audits)
"The Enrollee shall conduct an internal audit of its Sewer System Management Plan, and implementation of its Plan, at a minimum frequency of once every three years. The audit must be conducted for the period after the end of the Enrollee's last required audit period. Within six months after the end of the required 3-year audit period, the Legally Responsible Official shall submit an audit report into the online CIWQS Sanitary Sewer System Database per the requirements in section 3.10 (Sewer System Management Plan Audit Reporting Requirements) of Attachment E1 of this General Order. Audit reports submitted to the CIWQS Sanitary Sewer System Database will be viewable only to Water Boards staff. The internal audit shall be appropriately scaled to the size of the system(s) and the number of spills. The Enrollee's sewer system operations must be involved in completing the audit. At minimum, the Audit must"

- *(a) Evaluate the implementation and effectiveness of the Enrollee's Sewer System Management Plan in preventing spills.*
- *(b) Evaluate the Enrollee's compliance with this General Order.*
- *(c) Identify Sewer System Management Plan deficiencies in addressing ongoing spills and discharges to waters of the State; and*
- *(d) Identify necessary modifications to the Sewer System Management Plan to correct deficiencies.*
- *(e) The Enrollee shall submit a complete audit report that includes:*
    - *a. Audit findings and recommended corrective actions.*
    - *b. A statement that sewer system operators' input on the audit findings has been considered; and*
    - *c. A proposed schedule for the Enrollee to address the identified deficiencies.*

The Audit Process
The Utility will internally audit its implementation and compliance with the provisions of the SSMP every 3 years. The scope of the audit covers each major section of the SSMP. The audit check list will be based on the requirements in the WDR and is included as Appendix M.

The results of the audit, including the identification of any deficiencies and the steps taken or planned to correct them, will be included in an Audit Report. Completed Audit Reports will be kept on file internally and made available for review/inspection.

SSMP Updates
The Utility will determine the need to update its SSMP based on the results of the audit and the performance of its wastewater collection system based on information from the Monitoring and Measurement Program. If the Utility decides that an update is warranted, the process to do so will be identified. The Utility will complete the update within one year of the original audit. The SSMP will be updated/recertified at least once every 6 years.

ELEMENT 11: COMMUNICATION PROGRAM

Requirement:
The Plan must include procedures for the Enrollee to communicate with:

- *(a) The public for spills and discharges resulting in closures of public areas, or that enter a source of drinking water, and the development, implementation, update of its Plan, including opportunities for public input to Plan implementation and updates.*
- *(b) Owners/operators of systems that connect into the Enrollee's system, including satellite systems, for system operation, maintenance, and capital improvement-related activities.*

Communication during SSMP Development and Implementation
Utility Staff began work on an update to the SSMP development in 2017 to reflect current conditions, show updates in staff, and address the Utility's takeover of the fats, oils, and grease (FOG) program from the City of San José. The FOG program update and implementation was approved by the City of Santa Clara Council on December 19, 2017. In addition, minor updates to the SSMP were completed in 2019. Public access to the SSMP will be available on the City of Santa Clara's website, the City's Utility Center and at the Water and Sewer Utilities at City Hall prior to finalization.

The City of Santa Clara is a co-owner of the San José-Santa Clara Regional Wastewater Facility (Facility), and the City of San José is the Operator of the Facility. The City is a member of both Facility Technical Advisory Committee (TAC) and Treatment Plant Advisory Committee (TPAC). Both committees serve as forums for issues related to the Facility; TAC is comprised of staff and TPAC comprised of elected officials. These committees meet regularly and both agendas and minutes are available on the City of San José's website. The content of the meetings deals with updates discussion of issues and soliciting feedback from the Facility's tributary agencies on issues related to influent, effluent, and the operations of the Facility. The seven tributary agencies include: City of Santa Clara, the City of Milpitas, West Valley Sanitation District, Cupertino Sanitary District, Burbank Sanitary District, Sunol Sanitary District and County Sanitation Districts 2 and 3.

Santa Clara staff will conduct a wide variety of outreach, including providing public education pieces which are targeted to reach residential, industrial, and commercial customers, as well as the general public. Informational flyers and other public outreach material are distributed periodically to local businesses and residents and are available on the City's website. Periodically, public education articles may be published on the website or in the City's *Inside Santa Clara* publication.

Summary of Revisions to the Sewer System Management Plan

General

- Minor re-structuring of SSMP to conform to requirements in SWRCB General Order 2022-0103-DWQ.
- Updates to sewer system asset and organizational information as needed throughout SSMP.
- Revised general reference of “City” to “Utility” to avoid confusion with other City Departments.
- Revised general reference of SSO to “spill” to be consistent with references in General Order 2022-0103-DWQ.

Element 1 – Introduction

- Added new section “1.1 Regulatory Context”.
- Included brief narrative on in-progress Sanitary Sewer Master Plan in section “1.1 Regulatory Context”.
- Added new section “1.2 Sewer Management Plan Update Schedule”.
- Added schedule for future SSMP updates, audits, and planned operation and maintenance activities.
- Added new section “1.3 Sewer System Asset Overview”.
- Added discussion on SCADA system.

Element 2 – Organization

- Updated Authorized Representatives, City Key Emergency contacts, and organization chart.

Element 3 – Legal Authority

- Added agency code references for defining lateral ownership and prohibiting vandalism.

Element 4 – Operation & Maintenance Program

- Added new section “4.1 Update Map of Sewer System”.
- Moved sewer system asset information to section “1.3 Sewer System Asset Overview”.
- Added new section “4.2 Preventative Operation and Maintenance Activities”.
- Added discussion on current condition assessment cycle.
- Added discussion on CMMS.
- Revised list of high frequency cleaning segments.
- Revised narrative regarding Root Control to explicitly state that this is offered to residents as a courtesy service to address lateral blockages.
- Revised narrative regarding Rehabilitation and Replacement Plan to describe how CCTV and condition assessment findings are used to advise capital project planning.
- Moved discussion of Capital Improvement Program/Major Repairs to section “8.3 Prioritization of Corrective Actions” and “8.4 Capital Improvement Plan”.
- Removed reference to “Crew A” and “Crew B” for clarity.
- Added new section “4.3 Training”.
- Added new section “4.4 Equipment Inventory”.

Element 5 – Design & Performance Provisions

- Added new section “5.1 Updated Design Criteria and Construction Standards”.
- Added new section “5.2 Procedures and Standards”.

Element 6 – Spill Emergency Response Plan

- Significantly revised section to include updated Element 6 developed as a result of previous audit findings. This effort included a more robust response plan, additional standard operating procedures, and revised process flow charts.

Element 8 – System Evaluation, Capacity Assurance, Capital Improvement Plan

- Added new section “8.1 System Evaluation and Condition Assessment”.
- Added discussion of condition assessment methodology.
- Added discussion of potential impacts of climate change on the sanitary sewer system.
- Added new section “8.2 Capacity Assessment and Design Criteria”.
- Added narrative regarding in-progress Sanitary Sewer Master Plan.
- Revised list of significant industrial users.
- Added new section “8.3 Prioritization of Corrective Actions”.
- Added new section “8.4 Capital Improvement Program”.

Element 9 – Monitoring, Measurement, Program Modifications

- Revised figures and tables documenting spills within past five years.

APPENDICES

Appendix A: State Water Resources Control Board General Order 2022-0103-DWQ
Appendix B: Santa Clara Municipal Code Excerpts
Appendix C: Enforcement Response Plan
Appendix D: Sanitary Sewer System Index Map
Appendix E: Sewer Equipment Inventories
Appendix F: City of Santa Clara Design Criteria
Appendix G: City of Santa Clara Standard Details
Appendix H: Emergency Response Procedures
Appendix I: FOG Program Materials and Handouts
Appendix J: City of Santa Clara Sewer Capacity Assessment
Appendix K: Sewer Utility Budget
Appendix L: Performance Measure Data Sheets (Lucity)
Appendix M: SSMP Audit Checklist

Appendix A
State Water Resources Control Board
General Order 2022-0103-DWQ

STATE WATER RESOURCES CONTROL BOARD
1001 I Street, Sacramento, California 95814
ORDER WQ 2022-0103-DWQ

STATEWIDE WASTE DISCHARGE REQUIREMENTS

GENERAL ORDER FOR SANITARY SEWER SYSTEMS

This Order was adopted by the State Water Resources Control Board on December 6, 2022.
This Order shall become effective **180 days after the Adoption Date of this General Order,** on June 5, 2023. The Enrollee shall comply with the requirements of this Order upon the Effective Date of this General Order.

This General Order does not convey any property rights of any sort or any exclusive privileges. The requirements prescribed herein do not authorize the commission of any act causing injury to persons or property, protect the Enrollee from liability under federal, state, or local laws, nor create a vested right for the Enrollee to continue the discharge of waste.

CERTIFICATION

I, Jeanine Townsend, Clerk to the Board, do hereby certify that this Order with all attachments is a full, true, and correct copy of the Order adopted by the State Water Board on December 6, 2022.

AYE:	Chair E. Joaquin Esquivel Vice Chair Dorene D'Adamo Board Member Sean Maguire Board Member Laurel Firestone Board Member Nichole Morgan
NAY:	None
ABSENT:	None
ABSTAIN:	None

Courtney Tyler for
Jeanine Townsend
Clerk to the Board

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1. INTRODUCTION

This General Order regulates sanitary sewer systems designed to convey sewage. For the purpose of this Order, a sanitary sewer system includes, but is not limited to, pipes, valves, pump stations, manholes, siphons, wet wells, diversion structures and/or other pertinent infrastructure, upstream of a wastewater treatment plant headworks. A sanitary sewer system includes:

- Laterals owned and/or operated by the Enrollee;
- Satellite sewer systems; and/or
- Temporary conveyance and storage facilities, including but not limited to temporary piping, vaults, construction trenches, wet wells, impoundments, tanks and diversion structures.

Sewage is untreated or partially treated domestic, municipal, commercial and/or industrial waste (including sewage sludge), and any mixture of these wastes with inflow or infiltration of stormwater or groundwater, conveyed in a sanitary sewer system. Sewage contains high levels of suspended solids, non-digested organic waste, pathogenic bacteria, viruses, toxic pollutants, nutrients, oxygen-demanding organic compounds, oils, grease, pharmaceuticals, and other harmful pollutants.

For the purpose of this General Order, a spill is a discharge of sewage from any portion of a sanitary sewer system due to a sanitary sewer system overflow, operational failure, and/or infrastructure failure. Sewage and its associated wastewater spilled from a sanitary sewer system may threaten public health, beneficial uses of waters of the State, and the environment.

This General Order serves as statewide waste discharge requirements and supersedes the previous State Water Resources Control Board (State Water Board) Order 2006-0003-DWQ and amendments thereafter. All sections and attachments of this General Order are enforceable by the State Water Board and Regional Water Quality Control Boards (Regional Water Boards). Through this General Order, the State Water Board requires an Enrollee to:

- Comply with federal and state prohibitions of discharge of sewage to waters of the State, including federal waters of the United States;
- Comply with specifications, and notification, monitoring, reporting and recordkeeping requirements in this General Order that implement the federal Clean Water Act, the California Water Code (Water Code), water quality control plans (including Regional Water Board Basin Plans) and policies;
- Proactively operate and maintain resilient sanitary sewer systems to prevent spills;
- Eliminate discharges of sewage to waters of the State through effective implementation of a Sewer System Management Plan;
- Monitor, track, and analyze spills for ongoing system-specific performance improvements; and
- Report noncompliance with this General Order per reporting requirements.

An Enrollee is a public, private, or other non-governmental entity that has obtained approval for regulatory coverage under this General Order, including:

- A state agency, municipality, special district, or other public entity that owns and/or operates one or more sanitary sewer systems:
  - greater than one (1) mile in length (each individual sanitary sewer system);
  - one (1) mile or less in length where the State Water Board or a Regional Water Board requires regulatory coverage under this Order; or
- A federal agency, private company, or other non-governmental entity that owns and/or operates a sanitary sewer system of any size where the State Water Board or a Regional Water Board requires regulatory coverage under this Order in response to a history of spills, proximity to surface water, or other factors supporting regulatory coverage.

For the purpose of this Order, a sanitary sewer system includes only systems owned and/or operated by the Enrollee.

2. REGULATORY COVERAGE AND APPLICATION REQUIREMENTS

2.1. Requirements for Continuation of Existing Regulatory Coverage

To continue regulatory coverage from previous Order 2006-0003-DWQ under this General Order, **within the 60-days-prior-to the Effective Date of this General Order**, the Legally Responsible Official of an existing Enrollee shall electronically certify the Continuation of Existing Regulatory Coverage form in the online California Integrated Water Quality System (CIWQS) Sanitary Sewer System Database. The Legally Responsible Official will receive an automated CIWQS-issued Notice of Applicability email, confirming continuation of regulatory coverage under this General Order. All regulatory coverage under previous Order 2006-0003-DWQ will cease on the Effective Date of this Order.

An Enrollee continuing existing regulatory coverage is not required to submit a new application package or pay an application fee for enrollment under this General Order. The annual fee due date for continued regulatory coverage from previous Order 2006-0003-DWQ to this General Order remains unchanged.

A previous Enrollee of Order 2006-0003-DWQ that fails to certify the Continuation of Existing Regulatory Coverage form in the online CIWQS database by the Effective Date of this Order is considered a New Applicant, and will not have regulatory coverage for its sanitary sewer system(s) until:

- A new application package for system(s) enrollment is submitted per section 2.2 (Requirements for New Regulatory Coverage) below; and
- The new application package is approved per section 2.2.2 (Approval of Application Package (For New Applicants Only)).

2.2. Requirements for New Regulatory Coverage

No later than 60 days prior to commencing and/or assuming operation and maintenance responsibilities of a sanitary sewer system, a duly authorized representative that

maintains legal authority over the public or private sanitary sewer system is required to enroll under this General Order by submitting a complete application package as specified below and as provided in Attachment B (Application for Enrollment Form) of this General Order.

Unless required by a Regional Water Board, a public agency that owns a combined sewer system subject to the Combined Sewer Overflow Control Policy (33 U.S. Code § 1342(q)), is not required to enroll, under this Order, the portions of its sanitary sewer system(s) that collects combined sanitary wastewater and stormwater.

2.2.1. Application Package Requirements

The Application for Enrollment package for new applicants must include the following items:

- **Application for Enrollment Form**. The form in Attachment B of this General Order must be completed, signed, and certified by a Legally Responsible Official, in accordance with section 5.1 (Designation of a Legally Responsible Official) of this General Order. If an electronic Application for Enrollment form is available at the time of application, a new applicant shall submit its application form electronically; and
- **Application Fee**. A fee payable to the "State Water Resources Control Board" in accordance with the Fee Schedule in the California Code of Regulations, Title 23, section 2200, or subsequent fee regulations updates.

  The application fee for this General Order is based on the sanitary sewer system's threat to water quality and complexity designations of category 2C or 3C, which is assigned based on the population served by the system. The current Fee Schedule for sanitary sewer systems is listed under subdivision (a)(2) at the following website: Fee Schedule (https://www.waterboards.ca.gov/resources/fees/water_quality/).

2.2.2. Approval of Application Package (For New Applicants Only)

The Deputy Director of the State Water Board, Division of Water Quality (Deputy Director) will consider approval of each complete Application for Enrollment package. The Deputy Director will issue a Notice of Applicability letter which serves as approved regulatory coverage for the new Enrollee.

If the submitted application package is not complete in accordance with section 2.2.1 (Application Package Requirements) of this General Order, the Deputy Director will send a response letter to the applicant outlining the application deficiencies. The applicant will have 60 days from the date of the response letter to correct the application deficiencies and submit the identified items necessary to complete the application package to the State Water Board.

2.2.3. Electronic Reporting Account for New Enrollee

Within 30 days after the date of the Approval of Complete Application Package for System Enrollment, a duly authorized representative for the Enrollee shall obtain a CIWQS Sanitary Sewer System Database user account by clicking the "User Registration" button and following the directions on the CIWQS Login Page

(https://ciwqs.waterboards.ca.gov). If additional assistance is needed to establish an online CIWQS user account, contact State Water Board staff by email at CIWQS@waterboards.ca.gov. The online user account will provide the Enrollee secure access to the online CIWQS database for electronic reporting.

2.3. Regulatory Coverage Transfer

Regulatory coverage under this General Order is not transferable to any person or party except after an existing Enrollee submits a written request for a regulatory coverage transfer to the Deputy Director, at least 60 days in advance of any proposed system ownership transfer. The written request must include a written agreement between the existing Enrollee and the new Enrollee containing:

- Acknowledgement that the transfer of ownership is solely of an existing system with an existing waste discharge identification (WDID) number;
- The specific ownership transfer date in which the responsibility and regulatory coverage transfer between the existing Enrollee and the new Enrollee becomes effective; and
- Acknowledgement that the existing Enrollee is liable for violations occurring up to the ownership transfer date and that the new Enrollee is liable for violations occurring on and after the ownership transfer date.

The Deputy Director will consider approval of the written request. If approved, the Deputy Director will issue a Notice of Applicability letter which serves as an approved transfer of regulatory coverage to the new Enrollee.

3. FINDINGS

3.1. Legal Authorities

3.1.1. Federal and State Regulatory Authority

The objective of the Clean Water Act is to restore and maintain the chemical, physical, and biological integrity of the waters of the United States (33 U.S.C. 1251). The Water Code authorizes the State Water Board to implement the Clean Water Act in the State and to protect the quality of all waters of the State (Water Code sections 13000 and 13160).

3.1.2. Discharge of Sewage

A discharge of untreated or partially treated sewage is a discharge of waste as defined in Water Code section 13050(d) that could affect the quality of waters of the State and is subject to regulation by waste discharge requirements issued pursuant to Water Code section 13263 and Chapter 9, Division 3, Title 23 of the California Code of Regulations. A discharge of sewage may pollute and alter the quality of the waters of the State to a degree that unreasonably affects the beneficial uses of the receiving water body or facilities that serve those beneficial uses (Water Code section 13050(l)(1)).

3.1.3 Water Boards Authority to Require Technical Reports, Monitoring, and Reporting

Water Code sections 13267 and 13383 authorize the Regional Water Boards and the State Water Board to establish monitoring, inspection, entry, reporting, and recordkeeping requirements. Water Code section 13267(b), authorizes the Regional Water Boards to "require any person who has discharged, discharges, or is suspected of having discharged or discharging, or who proposes to discharge waste within its region… or is suspected of having discharged or discharging, or who proposes to discharge, waste outside of its region that could affect the quality of water within its region shall furnish, under penalty of perjury, technical or monitoring reports which the regional board requires…In requiring those reports, the regional board shall provide the person with a written explanation with regard to the need for the reports and shall identify the evidence that supports requiring that person to provide the reports." Water Code section 13267(f) authorizes the State Water Board to require this information if it consults with the Regional Water Boards and determines that it will not duplicate the efforts of the Regional Water Boards. The State Water Board has consulted with the Regional Water Boards and made this determination.

The technical and monitoring reports required by this General Order and Attachment E (Notification, Monitoring, Reporting and Recordkeeping Requirements) are necessary to evaluate and ensure compliance with this General Order. The effort to develop required technical reports will vary depending on the system size and complexity and the needs of the specific technical report. The burden and cost of these reports are reasonable and consistent with the interest of the state in protecting water quality, which is the primary purpose of requiring the reports.

Water Code section 13383(a) authorizes the Water Boards to "establish monitoring, inspection, entry, reporting, and recordkeeping requirements… for any person who discharges, or proposes to discharge, to navigable waters, any person who introduces pollutants into a publicly owned treatment works, any person who owns or operates, or proposes to own or operate, a publicly owned treatment works or other treatment works treating domestic sewage, or any person who uses or disposes, or proposes to use or dispose, of sewage sludge." Section 13383(b) continues, "the state board or the regional boards may require any person subject to this section to establish and maintain monitoring equipment or methods, including, where appropriate, biological monitoring methods, sample effluent as prescribed, and provide other information as may be reasonably required."

Reporting of spills from privately owned sewer laterals and systems pursuant to section 5.15 (Voluntary Reporting of Spills from Privately-Owned Sewer Laterals and/or Private Sanitary Sewer Systems) of this General Order is authorized by Water Code section 13225(c) and encouraged by the State Water Board, wherein a local agency may investigate and report on any technical factors involved in water quality control provided the burden including costs of such reports bears a reasonable relationship to the need for the report and the benefits to be obtained therefrom. The burden of reporting private spills under section 5.15 (Voluntary Reporting of Spills from Privately-Owned Sewer Laterals and/or Private Sanitary Sewer Systems) is minimal and is outweighed by the benefit of providing Regional Water Boards an opportunity to respond to these spills

when an Enrollee, which in many cases has a contractual relationship with the owner of the private system, has knowledge of the spills.

3.1.4. Water Board Authority to Prescribe General Waste Discharge Requirements

Water Code section 13263(i) provides that the State Water Board may prescribe general waste discharge requirements for a category of discharges if the State Water Board finds or determines that:

- The discharges are produced by the same or similar operations;
- The discharges involve the same or similar types of waste;
- The discharges require the same or similar treatment standards; and
- The discharges are more appropriately regulated under general waste discharge requirements than individual waste discharge requirements.

Since 2006, the State Water Board has been regulating over 1,100 publicly owned sanitary sewer systems (See section 3.1.5 (Previous Statewide General Waste Discharge Requirements) of this General Order). California also has a large unknown number of unregulated privately owned sanitary sewer systems. All waste conveyed in publicly owned and privately owned sanitary sewer systems (as defined in this General Order) is comprised of untreated or partially treated domestic waste and/or industrial waste. Generally, sanitary sewer systems are designed and operated to convey waste by gravity or under pressure; system-specific design elements and system-specific operations do not change the common nature of the waste, the common threat to public health, or the common impacts on water quality. Spills of waste from a sanitary sewer system prior to reaching the ultimate downstream treatment facility are unauthorized and enforceable by the State Water Board and/or a Regional Water Board. Therefore, spills from sanitary sewer systems are more appropriately regulated under general waste discharge requirements.

As specified in Water Code sections 13263(a) and 13241, the implementation of requirements set forth in this Order is for the reasonable protection of past, present, and probable future beneficial uses of water and the prevention of nuisance. The requirements implement the water quality control plans (Basin Plans) for each Regional Water Board and take into account the environmental characteristics of sewer service areas and hydrographic units within the state. Additionally, the State Water Board has considered water quality conditions that could reasonably be achieved through the coordinated control of all factors that affect water quality, costs associated with compliance with these requirements, the need for developing housing within California, and the need to protect sources of drinking water and other water supplies.

3.1.5. Previous Statewide General Waste Discharge Requirements

On May 2, 2006, the State Water Board adopted Order 2006-0003-DWQ serving as Waste Discharge Requirements pursuant to Article 4, Chapter 4, Division 7 of the Water Code (commencing with section 13260) for inadvertent discharges to waters of the State. Order 2006-0003-DWQ prohibited discharges of untreated or partially treated sewage. Order 2006-0003-DWQ also required system-specific management, operation, and maintenance of publicly owned sewer systems greater than one mile in length.

To decrease the impacts on human health and the environment caused by sewage spills, the previous Order required enrollees to develop a rehabilitation and replacement plan that identifies system deficiencies and prioritizes short-term and long-term rehabilitation actions. The previous Order also required enrollees to:

1. Maintain information that can be used to establish and prioritize appropriate Sewer System Management Plan activities; and
2. Implement a proactive approach to reduce spills.

The previous Order required Sewer System Management Plan elements for "the proper and efficient management, operation, and maintenance of sanitary sewer systems, while taking into consideration risk management."

On July 30, 2013, the State Water Board amended General Order 2006-0003-DWQ with Order WQ 2013-0058-EXEC, Amending Monitoring and Reporting Program for Statewide General Waste Discharge Requirements for Sanitary Sewer Systems.

Many enrollees of Order 2006-0003-DWQ have already implemented proactive measures to reduce sewage spills. Other enrollees, however, still need technical assistance and funding to improve sanitary sewer system operation and maintenance for the reduction of sewage spills.

3.1.6. Existing Memorandum of Agreement with California Water Environment Association

The California Water Environment Association is a nonprofit organization dedicated to providing water industry certifications, training, and networking opportunities. The Association's Technical Certification Program provides accredited sanitary sewer system operator certification for collection system operators and maintenance workers.

On February 10, 2016, the State Water Board entered into a collaborative agreement with the Association titled *Memorandum of Agreement Between the California State Water Resources Control Board and the California Water Environment Association - Training Regarding Requirements Set Forth in Statewide General Waste Discharge Requirements for Sanitary Sewer Systems*. The Memorandum sets forth collaborative training necessary for regulated sanitary sewer system personnel to operate and maintain a well operating system and ensure full compliance with statewide sewer system regulations.

On March 15, 2018, the State Water Board and the California Water Environment Association amended the existing Memorandum of Agreement to include collaborative outreach and expand training needs associated with further updates to Water Board regulations for sanitary sewer systems. The State Water Board encourages further Agreement updates as necessary to support improved sewer system operations and the professionalism of collection system operators.

3.2. General

3.2.1. Waters of the State

Waters of the State include any surface water or groundwater, including saline waters, within the boundaries of the state as defined in Water Code section 13050(e), and are inclusive of waters of the United States.

3.2.2. Sanitary Sewer System Spill Threats to Public Health and Beneficial Uses

Sewage contains high levels of suspended solids, pathogenic organisms, toxic pollutants, nutrients, oxygen-demanding organic compounds, oil and grease and other pollutants. Sewage spills may cause a public nuisance, particularly when sewage is discharged to areas with high public exposure such as streets and surface waters used for drinking, irrigation, fishing, recreation, or other public consumption or contact uses.

More specifically, sanitary sewer spills may:

- Adversely affect aquatic life and/or threaten water quality when reaching receiving waters;
- Inadvertently release trash, including plastics;
- Impair the recreational use and aesthetic enjoyment of surface waters by polluting surface water or groundwater;
- Threaten public health through direct public exposure to bacteria, viruses, intestinal parasites, and other microorganisms that can cause serious illness such as gastroenteritis, hepatitis, cryptosporidiosis, and giardiasis;
- Negatively impact ecological receptors and biota within surface waters; and
- Cause nuisance including odors, closure of beaches and recreational areas, and property damage.

Sanitary sewer system spills may pollute receiving waters and threaten beneficial uses of surface water and groundwater. Potentially threatened beneficial uses include, but are not limited to the following (with associated acronym representations as included in statewide water quality control plans and Regional Water Boards' Basin Plans):

- Municipal and Domestic Supply (MUN)
- Water Contact Recreation (REC-1) and Non-Contact Water Recreation (REC-2)
- Cold Freshwater Habitat (COLD)
- Warm Freshwater Habitat (WARM)
- Native American Culture (CUL)
- Wildlife Habitat (WILD)
- Rare, Threatened, or Endangered Species (RARE)
- Spawning, Reproduction, and/or Early Development (SPWN)
- Wetland Habitat (WET)
- Agricultural Supply (AGR)
- Estuarine Habitat (EST)

- Commercial and Sport Fishing (COMM)
- Subsistence Fishing (SUB)
- Tribal Tradition and Culture (CUL)
- Tribal Subsistence Fishing (T-SUB)
- Aquaculture (AQUA)
- Marine Habitat (MAR)
- Preservation of Biological Habitats of Special Significance (BIOL)
- Migration of Aquatic Organisms (MIGR)
- Shellfish Harvesting (SHELL)
- Industrial Process Supply (PROC)
- Industrial Service Supply (IND)
- Hydropower Generation (POW)
- Navigation (NAV)
- Flood Peak Attenuation/Flood Water Storage (FLD)
- Water Quality Enhancement (WQE)
- Fresh Water Replenishment (FRSH)
- Groundwater Recharge (GWR)
- Inland Saline Water Habitat (SAL)

3.2.3. Proactive Sanitary Sewer System Management to Eliminate Spill Causes

Finding 3 of the previous Order, 2006-0003-DWQ, states: “Sanitary sewer systems experience periodic failures resulting in discharges that may affect waters of the state. There are many factors (including factors related to geology, design, construction methods and materials, age of the system, population growth, and system operation and maintenance), which affect the likelihood of an SSO [sanitary sewer overflow]. A proactive approach that requires Enrollees to ensure a system-wide operation, maintenance, and management plan is in place will reduce the number and frequency of SSOs within the state. This approach will in turn decrease the risk to human health and the environment caused by SSOs.”

Many spills are preventable through proactive attention on sanitary sewer system management using the best practices and technologies available to address major causes of spills, including but not limited to:

- Blockages from sources including but not limited to:
  - Fats, oils and grease;
  - Tree roots;
  - Rags, wipes and other paper, cloth and plastic products; and
  - Sediment and debris.
- Sewer system damage and exceedance of sewer system hydraulic capacity from identified system-specific environmental, and climate-change impacts, including but not limited to:

  - Sea level rise impacts including flooding, coastal erosion, seawater intrusion, tidal inundation and submerged lands;
  - Increased surface water flows due to higher intensity rain events;
  - Flooding;
  - Wildfires and wildfire induced impacts;
  - Earthquake induced damage;
  - Landslides; and
  - Subsidence.
- Infrastructure deficiencies and failures, including but not limited to:
  - Pump station mechanical failures;
  - System age;
  - Construction material failures;
  - Manhole cover failures;
  - Structural failures; and
  - Lack of proper operation and maintenance.
- Insufficient system capacity (temporary or sustained), due to factors including but not limited to:
  - Excessive and/or increased storm or groundwater inflow/infiltration;
  - Insufficient capacity due to population increase and/or new connections from industrial, commercial and other system users; and
  - Stormwater capture projects utilizing a sanitary sewer system to convey stormwater to treatment facilities for reuse.
- Community impacts, including but not limited to:
  - Power outages;
  - Vandalism; and
  - Contractor-caused or other third party-caused damages.

3.2.4. Underground Sanitary Sewer System Leakage

Portions of some sanitary sewer systems may leak, causing underground exfiltration (exiting) of sewage from the system. Exfiltrated sewage that remains in the underground infrastructure trench and/or the soil matrix, and that does not discharge into waters of the State (surface water or groundwater) may not threaten beneficial uses.

Underground exfiltrated sewage may threaten beneficial uses if discharged to waters of the State. Exfiltrated sewage that discharges to groundwater may impact beneficial uses of groundwater and pollute groundwater supply. Additionally, if in close proximity, exfiltrated sewage may enter into a compromised underground drainage conveyance system that discharges into a water of the United States, or into groundwater that is hydrologically connected to (feeds into) a water of the United States, thus potentially causing: (1) a Clean Water Act violation, (2) threat and impact to beneficial uses, and/or (3) surface water pollution.

3.2.5. Proactive Sanitary Sewer System Management to Reduce Inflow and Infiltration

Excessive inflow (stormwater entering) and infiltration (groundwater seepage entering) to sanitary sewer systems is preventable through proactive sewer system management using the best practices and technologies available. The efficiency of the downstream wastewater treatment processes is dependent on the performance of the sanitary sewer system. When the structural integrity of a sanitary sewer system deteriorates, high volumes of inflow and infiltration can enter the sewer system. High levels of inflow and infiltration increase the hydraulic load on the downstream treatment plant, which can reduce treatment efficiency, lead to bypassing a portion of the treatment process, cause illegal discharge of partially treated effluent, or in extreme situations make biological treatment facilities inoperable (e.g., wash out the biological organisms that treat the waste).

3.3. Water Quality Control Plans, Policies and Resolutions

The nine Regional Water Boards have adopted region-specific water quality control plans (commonly referred to as Basin Plans) that designate beneficial uses, establish water quality objectives, and contain implementation programs and policies to achieve those objectives. The State Water Board has adopted statewide water quality control plans, policies and resolutions establishing statewide water quality objectives, implementation programs and initiatives.

3.3.1. State Water Board Antidegradation Policy

On October 28, 1968, the State Water Board adopted Resolution 68-16, titled Statement of Policy with Respect to Maintaining High Quality of Waters in California, which incorporates the federal antidegradation policy. Resolution 68-16 requires that existing water quality be maintained unless degradation is justified based on specific findings.

The continued prohibition of sewage discharges from sanitary sewer systems into waters of the State aligns with Resolution 68-16. A sewage discharge from sanitary sewers to waters of the State is prohibited by this Order. Therefore, this Order does not allow degradation of waters of the State. In addition, this Order: (1) further expands the existing prohibition of sewage discharges to include waters of the State, in addition to waters of the United States as provided in previous Order 2006-0003-DWQ, and (2) enhances the ability for Water Board enforcement of violations of the established prohibitions.

3.3.2. State Water Board Sources of Drinking Water Policy

On May 19,1988, the State Water Board adopted Resolution 88-63 (amended on February 1, 2006), titled Sources of Drinking Water, establishing state policy that all waters of the State, with certain exceptions, are suitable or potentially suitable for municipal or domestic supply.

3.3.3. State Water Board Cost of Compliance Resolution

On September 24, 2013, the State Water Board adopted Resolution 2013-0029, titled Directing Actions in Response to Efforts by Stakeholders on Reducing Costs of

Compliance While Maintaining Water Quality Protection. Through this resolution, the State Water Board committed to continued stakeholder engagement in identifying and implementing measures to reduce costs of compliance with regulatory orders while maintaining water quality protection and improving regulatory program outcomes.

3.3.4. State Water Board Human Right to Water Resolution

On February 16, 2016, the State Water Board adopted Resolution 2016-0010, titled Adopting the Human Right to Water as a Core Value and Directing its Implementation in Water Board Programs and Activities, addressing the human right to water as a core value and directing Water Board programs to implement requirements to support safe drinking water for all Californians.

On November 16, 2021, the State Water Board adopted Resolution 2021-0050 titled Condemning Racism, Xenophobia, Bigotry, and Racial Injustice, and Strengthening Commitment to Racial Equity, Diversity, Inclusion, Access, and Anti-racism. Among other actions, through Resolution 2021-0050, the State Water Board, in summary as corresponding to this General Order, reaffirms its commitment to its Human Right to Water resolution, upholding that every human being in California deserves safe, clean, affordable, and accessible water for human consumption, cooking, and sanitation purposes. Resolution 2021-0050 provides the State Water Board commitment to:

- Protect public health and beneficial uses of waterbodies in all communities, including communities disproportionately burdened by wastes discharge of waste to land and surface water;
- Restore impaired surface waterbodies and degraded aquifers; and
- Promote multi-benefit water quality projects.

Through Resolution 2021-0050, the State Water Board also commits to expanding implementation of its Climate Change Resolution to address the disproportionate effects of extreme hydrologic conditions and sea-level rise on Black, Indigenous, and people of color communities, prioritizing:

- The right to safe, clean, affordable, and accessible drinking water and sanitation;
- Sustainable management and protection of local groundwater resources;
- Healthy watersheds; and
- Access to surface waterbodies that support subsistence fishing.

On June 7, 2022, the State Water Board adopted a Resolution, titled Authorizing the Executive Director or Designee to Enter into One or More Multi-Year Contracts Up to a Combined Sum of $4,000,000 for a Statewide Wastewater Needs Assessment, supporting the equitable access to sanitation for all Californians and implementation of Resolutions 2016-0010 and 2021-0050.

This General Order supports the State Water Board priority in collecting a comprehensive set of data for California's wastewater systems, including sanitary sewer systems. Data reported per the requirements of this Order will be used with data from other Water Boards' programs, to further develop criteria and create a statewide risk

framework to prioritize critical funding and infrastructure investments for California's most vulnerable populations, including disadvantaged or severely disadvantaged communities with inadequate or failing sanitation systems and threatened access to healthy drinking water supplies.

3.3.5. State Water Board Open Data Resolution

On July 10, 2018, the State Water Board adopted Resolution 2018-0032, titled Adopting Principles of Open Data as a Core Value and Directing Programs and Activities to Implement Strategic Actions to Improve Data Accessibility and Associated Innovation, directing regulatory programs to assure all monitoring and reporting requirements support the State Water Boards' Open Data Initiative.

3.3.6. State Water Board Response to Climate Change

On March 7, 2017, the State Water Board adopted Resolution 2017-0012, titled Comprehensive Response to Climate Change, requiring a proactive response to climate change in all California Water Board actions, with the intent to embed climate change consideration into all programs and activities.

3.4. California Environmental Quality Act

The adoption of this Order is an action to reissue general waste discharge requirements that is exempt from the California Environmental Quality Act (Public Resources Code section 21000 et seq.) because it is an action taken by a regulatory agency to assure the protection of the environment and the regulatory process involves procedures for protection of the environment (Cal. Code Regs., Title 14, section 15308). In addition, the action to adopt this Order is exempt from CEQA pursuant to Cal. Code Regs., Title 14, section 15301, to the extent that it applies to existing sanitary sewer collection systems that constitute "existing facilities" as that term is used in sections 15301 and 15302, to the extent that it results in the repair or replacement of existing systems involving negligible or no expansion of capacity.

3.5. State Water Board Funding Assistance for Compliance with Water Board Water Quality Orders

The State Water Board, Division of Financial Assistance administers the implementation of the State Water Board financial assistance programs, per Board-adopted funding policies. Among other funding areas, the Division administers loan and grant funding for the planning and construction of wastewater and water recycling facilities per funding program-specific policies and guidelines. Applicants may apply for Clean Water State Revolving Fund low-interest loan, Small Community Wastewater grant funding assistance, and other funding available at the time of application, for some of the costs associated with complying with this General Order.

Funding applicants may obtain further information regarding current funding opportunities, and Division of Financial Assistance staff contact information at the following website: Financial Assistance Funding - Grants and Loans | California State Water Resources Control Board.
(https://www.waterboards.ca.gov/water_issues/programs/grants_loans/)

Section 13477.6 of the Water Code authorizes the Small Community Grant Fund. The Small Community Grant Fund allows the State Water Board to provide grant funding assistance to small, disadvantaged communities and small severely disadvantaged communities that may not otherwise be able to afford a loan or similar financing for projects to comply with requirements of this General Order. The State Water Board also considers loan forgiveness on a disadvantaged community-specific basis.

For disadvantaged communities' wastewater needs, the State Water Board places priority on the funding of projects that address:

- Public health;
- Violations of waste discharge requirements and National Pollutant Discharge Elimination System (NPDES) permits;
- Providing sewer system service to existing septic tank owners; and
- High priority public health and water quality concerns identified by a Regional Water Board.

3.6. Notification to Interested Parties

On January 31, 2022, the State Water Board notified interested parties and persons of its intent to reissue Sanitary Sewer Systems General Order 2006-0003-DWQ by issuing a draft General Order for a 60-day public comment period. State Water Board staff conducted extensive stakeholder outreach and encouraged public participation in the adoption process for this General Order. On March 15, 2022, the State Water Board held a public meeting to hear and consider oral public comments. The State Water Board considered all public comments prior to adopting this General Order.

THEREFORE, IT IS HEREBY ORDERED, that pursuant to Water Code sections 13263, 13267, and 13383 this General Order supersedes Order 2006-0003-DWQ, Order WQ 2013-0058-EXEC, and any amendments made to these Orders thereafter, except for enforcement purposes and to meet the provisions contained in Division 7 of the Water Code (commencing with section 13000) and regulations adopted thereunder, and the provisions of the Clean Water Act and regulations and guidelines adopted thereunder, the Enrollee shall comply with the requirements in this Order.

4. PROHIBITIONS

4.1 Discharge of Sewage from a Sanitary Sewer System

Any discharge from a sanitary sewer system that has the potential to discharge to surface waters of the State is prohibited unless it is promptly cleaned up and reported as required in this General Order.

4.2. Discharge of Sewage to Waters of the State

Any discharge from a sanitary sewer system, discharged directly or indirectly through a drainage conveyance system or other route, to waters of the State is prohibited.

4.3. Discharge of Sewage Creating a Nuisance

Any discharge from a sanitary sewer system that creates a nuisance or condition of pollution as defined in Water Code section 13050(m) is prohibited.

5. SPECIFICATIONS

5.1. Designation of a Legally Responsible Official

The Enrollee shall designate a Legally Responsible Official that has authority to ensure the enrolled sanitary sewer system(s) complies with this Order, and is authorized to serve as a duly authorized representative. The Legally Responsible Official must have responsibility over management of the Enrollee's entire sanitary sewer system, and must be authorized to make managerial decisions that govern the operation of the sanitary sewer system, including having the explicit or implicit duty of making major capital improvement recommendations to ensure long-term environmental compliance. The Legally Responsible Official must have or have direct authority over individuals that:

- Possess a recognized degree or certificate related to operations and maintenance of sanitary sewer systems, and/or
- Have professional training and experience related to the management of sanitary sewer systems, demonstrated through extensive knowledge, training and experience.

For example, a sewer system superintendent or manager, an operations manager, a public utilities manager or director, or a district engineer may be designated as a Legally Responsible Official.

The Legally Responsible Official shall complete the electronic CIWQS "User Registration" form (https://ciwqs.waterboards.ca.gov/ciwqs/newUser.jsp). A Legally Responsible Official that represents multiple enrolled systems shall complete the electronic CIWQS "User Registration" form for each system.

The Enrollee shall submit any change to its Legally Responsible Official, and/or change in contact information, to the State Water Board within 30 calendar days of the change by emailing ciwqs@waterboards.ca.gov and copying the appropriate Regional Water Board as provided in Attachment F (Regional Water Quality Control Board Contact Information) of this General Order.

5.2. Sewer System Management Plan Development and Implementation

To facilitate adequate local funding and management of its sanitary sewer system(s), the Enrollee shall develop and implement an updated Sewer System Management Plan. The scale and complexity of the Sewer System Management Plan, and specific elements of the Plan, must match the size, scale and complexity of the Enrollee's sanitary sewer system(s). The Sewer System Management Plan must address, at minimum, the required Plan elements in Attachment D (Sewer System Management Plan – Required Elements) of this General Order. To be effective, the Sewer System Management Plan must include procedures for the management, operation, and maintenance of the sanitary sewer system(s). The procedures must: (1) incorporate the

prioritization of system repairs and maintenance to proactively prevent spills, and (2) address the implementation of current standard industry practices through available equipment, technologies, and strategies.

For an existing Enrollee under Order 2006-0003-DWQ that has certified its Continuation of Existing Regulatory Coverage, per section 2.1 (Requirements for Continuation of Existing Regulatory Coverage) of this General Order:

Within six (6) months of the Adoption Date of this General Order:

- The Legally Responsible Official shall upload the Enrollee's existing Sewer System Management Plan to the online CIWQS Sanitary Sewer System Database.

For a new Enrollee:

Within twelve (12) months of the Application for Enrollment approval date:

- The governing entity of the new Enrollee shall approve its Sewer System Management Plan; and
- The Legally Responsible Official shall certify and upload its Sewer System Management Plan to the online CIWQS Sanitary Sewer System Database.

5.3. Certification of Sewer System Management Plan and Plan Updates

The Legally Responsible Official shall certify and upload its Sewer System Management Plan and all subsequent updates to the online CIWQS Sanitary Sewer System Database.

5.4. Sewer System Management Plan Audits

The Enrollee shall conduct an internal audit of its Sewer System Management Plan, and implementation of its Plan, at a minimum frequency of once every three years. The audit must be conducted for the period after the end of the Enrollee's last required audit period. **Within six months after the end of the required 3-year audit period**, the Legally Responsible Official shall submit an audit report into the online CIWQS Sanitary Sewer System Database per the requirements in section 3.10 (Sewer System Management Plan Audit Reporting Requirements) of Attachment E1 of this General Order.

Audit reports submitted to the CIWQS Sanitary Sewer System Database will be viewable only to Water Boards staff.

The internal audit shall be appropriately scaled to the size of the system(s) and the number of spills. The Enrollee's sewer system operators must be involved in completing the audit. At minimum, the audit must:

- Evaluate the implementation and effectiveness of the Enrollee's Sewer System Management Plan in preventing spills;
- Evaluate the Enrollee's compliance with this General Order;
- Identify Sewer System Management Plan deficiencies in addressing ongoing spills and discharges to waters of the State; and

- Identify necessary modifications to the Sewer System Management Plan to correct deficiencies.

The Enrollee shall submit a complete audit report that includes:

- Audit findings and recommended corrective actions;
- A statement that sewer system operators' input on the audit findings has been considered; and
- A proposed schedule for the Enrollee to address the identified deficiencies.

A new Enrollee of this General Order (that did not have a sanitary sewer system enrolled in the previous State Water Board Order 2006-0003-DWQ) shall conduct its first internal Sewer System Management Plan audit for the time period between the date of submittal of its certified Sewer System Management Plan and the third subsequent December 31st date. The audit report must be submitted into the online CIWQS Sanitary Sewer System Database **by July 1 of the following calendar year**.

See the following tables for clarification:

Initial Audit Period and Audit Due Date for New Enrollees

	Audit Period	Audit Due Date
New Enrollee	Certified Sewer System Management Plan Submittal Date through the third subsequent December 31st date	July 1st date after audit period
Example	*Certified Sewer System Management Plan Submittal Date of August 2, 2025* *Audit Period of August 2, 2025 through December 31, 2027*	*July 1, 2028*

Initial Audit Period for Transition from 2-Year Audit Required in Previous Order 2006-0003-DWQ to 3-Year Audit Required in this General Order

	Audit Period	Audit Due Date
An Enrollee previously regulated by Order 2006-003-DWQ	A 3-year period starting from the end of last required 2-year Audit Period	Within six months after end of 3-year Audit Period
Example	*Last required Audit Period start date of August 2, 2021;* *Audit Period of August 2, 2021 through August 1, 2024*	*February 1, 2025*

Three-Year Ongoing Audit Period

	Audit Period	Audit Due Date
Each Enrollee	A 3-year period starting from the end of last required Audit Period	Within six months after end of 3-year Audit Period

5.5. Six-Year Sewer System Management Plan Update

At a minimum, the Enrollee shall update its Sewer System Management Plan every six (6) years after the date of its last Plan Update due date. (For an Enrollee previously regulated by Order 2006-0003-DWQ, the six-year period shall commence on the due date identified in section 3.11 of Attachment E1 (Notification, Monitoring, Reporting and Recordkeeping Requirements) of this Order. The Updated Sewer System Management Plan must include:

- Elements required in Attachment D (Sewer System Management Plan – Required Elements) of this Order;
- Summary of revisions included in the Plan update based on internal audit findings; and
- Other sewer system management-related changes.

The Enrollee's governing entity shall approve the updated Plan. The Legally Responsible Official shall upload and certify the approved updated Plan in the online CIWQS Sanitary Sewer System Database in accordance with section 3.11 (Sewer System Management Plan Reporting Requirements) of Attachment E1 (Notification, Monitoring, Reporting and Recordkeeping Requirements) of this General Order. During the time period in between Plan updates, the Enrollee shall continuously document changes to its Sewer System Management Plan in a change log attached to the Plan.

5.6. System Resilience

The Enrollee shall include and implement system-specific procedures in its Sewer System Management Plan to proactively prioritize: (1) operation and maintenance, (2) condition assessments, and (3) repair and rehabilitation, to address ongoing system resilience, as specified in Attachment D (Sewer System Management Plan – Required Elements) of this General Order.

5.7. Allocation of Resources

The Enrollee shall:

- Establish and maintain a means to manage all necessary revenues and expenditures related to the sanitary sewer system; and
- Allocate the necessary resources to its sewer system management program for:
  - Compliance with this General Order,
  - Full implementation of its updated Sewer System Management Plan,
  - System operation, maintenance, and repair, and
  - Spill responses.

5.8. Designation of Data Submitters

The Legally Responsible Official may designate one or more individuals as a Data Submitter for reporting of spill data. The Legally Responsible Official shall authorize the designation of Data Submitter(s) through the online CIWQS database (https://ciwqs.waterboards.ca.gov) prior to the individuals establishing a CIWQS user account (https://ciwqs.waterboards.ca.gov/ciwqs/newUser.jsp) and entering spill data into the online CIWQS Sanitary Sewer System Database.

The Legally Responsible Official shall submit any change to its Data Submitter(s), and/or change in Data Submitter contact information, to the State Water Board within 30 calendar days of the change, by emailing ciwqs@waterboards.ca.gov and copying the appropriate Regional Water Board as provided in Attachment F (Regional Water Quality Control Board Contact Information) of this General Order.

5.9. Reporting Certification

The Legally Responsible Official shall electronically certify, on the Enrollee's behalf, all applications, reports, the Sewer System Management Plan(s) and corresponding updates, and other information submitted electronically into the online CIWQS Sanitary Sewer System Database, as follows:

"I certify under penalty of perjury under the laws of the State of California that the electronically submitted information was prepared under my direction or supervision. Based on my inquiry of the person(s) directly responsible for gathering the information, to the best of my knowledge and belief, the information submitted is true, accurate, and complete, and complies with the Statewide Sanitary Sewer Systems General Order. I am aware that there are significant penalties for submitting false information."

Hardcopy submittals to the State Water Board must be accompanied by the above certification statement.

5.10. System Capacity

The Enrollee shall maintain the system capacity necessary to convey: (1) base flows during dry weather conditions, and (2) wet weather peak flows consistent with designated local historic storms. Design storms must take into account system-specific stormwater contributions via inflow and infiltration, and location-specific depth of groundwater and storm frequencies. The Enrollee shall implement capital improvements to provide adequate hydraulic capacity to:

- Meet or exceed the design criteria as defined in the Enrollee's System Evaluation and Capacity Assurance element of its Sewer System Management Plan; and
- Prevent system capacity-related spills, and adverse impacts to the treatment efficiency of downstream wastewater treatment facilities.

5.11. System Performance Analysis

The Enrollee shall include a running 10-year system performance analysis in its Annual Report. The analysis must include two CIWQS-generated graphs presenting the following information:

Graph 1 – Total Spill Volume per Year:

X axis: A 10-year period which includes the current calendar year and the nine previous calendar years;

Y axis: The total spill volume, per Spill Category, for each calendar year.

Graph 2 – Total Number of Spills per Year:

X axis: A 10-year period which includes the current calendar year and the nine previous calendar years;

Y axis: The total number of spills, per Spill Category, for each calendar year.

The current calendar year is the calendar year covered in the Annual Report.

The Enrollee shall generate the graphs in CIWQS, using the existing data in the online CIWQS Sanitary Sewer System Database at the following graph generation link: (https://ciwqs.waterboards.ca.gov/ciwqs/readOnly/PublicReportSSOServlet?reportAction=criteria&reportId=sso_operation_report).

5.12. Spill Emergency Response Plan and Remedial Actions

For Existing Enrollees (with regulatory coverage under Order 2006-0003-DWQ):

Within six (6) months of the Adoption Date of this General Order, the Enrollee shall update and implement its Spill Emergency Response Plan, per Attachment D, section 6 (Spill Emergency Response Plan) of this General Order.

For New Enrollees:

Within six (6) months of the Application for Enrollment approval date, the Enrollee shall develop and implement a Spill Emergency Response Plan, per Attachment D, section 6 (Spill Emergency Response Plan) of this General Order.

The Enrollee shall certify, in its Annual Report, that its Spill Emergency Response Plan is up to date.

The Spill Emergency Response Plan shall include measures to protect public health and the environment. The Enrollee shall respond to spills from its system(s) in a timely manner that minimizes water quality impacts and nuisance by:

- Immediately stopping the spill and preventing/minimizing a discharge to waters of the State;
- Intercepting sewage flows to prevent/minimize spill volume discharged into waters of the State;
- Thoroughly recovering, cleaning up and disposing of sewage and wash down water; and
- Cleaning publicly accessible areas while preventing toxic discharges to waters of the State.

5.13. Notification, Monitoring, Reporting and Recordkeeping Requirements

The Enrollee shall comply with notification, monitoring, reporting, and recordkeeping requirements in Attachment E1 of this General Order.

5.13.1. Spill Categories

Individual spill notification, monitoring and reporting must be in accordance with the following spill categories:

- **Category 1 Spill**

  A Category 1 spill is a spill of any volume of sewage from or caused by a sanitary sewer system regulated under this General Order that results in a discharge to:

  - A surface water, including a surface water body that contains no flow or volume of water; or
  - A drainage conveyance system that discharges to surface waters when the sewage is not fully captured and returned to the sanitary sewer system or disposed of properly.

    Any spill volume not recovered from a drainage conveyance system is considered a discharge to surface water, unless the drainage conveyance system discharges to a dedicated stormwater infiltration basin or facility.

A spill from an Enrollee-owned and/or operated lateral that discharges to a surface water is a Category 1 spill; the Enrollee shall report all Category 1 spills per section 3.1 of Attachment E1 (Notification, Monitoring, Reporting and Recordkeeping Requirements) of this General Order.

- **Category 2 Spill**

  A Category 2 spill is a spill of 1,000 gallons or greater, from or caused by a sanitary sewer system regulated under this General Order that does not discharge to a surface water.

  A spill of 1,000 gallons or greater that spills out of a lateral and is caused by a failure or blockage in the sanitary sewer system, is a Category 2 spill.

- **Category 3 Spill**

  A Category 3 spill is a spill of equal to or greater than 50 gallons and less than 1,000 gallons, from or caused by a sanitary sewer system regulated under this General Order that does not discharge to a surface water.

  A spill of equal to or greater than 50 gallons and less than 1,000 gallons, that spills out of a lateral and is caused by a failure or blockage in the sanitary sewer system is a Category 3 spill.

- **Category 4 Spill**

  A Category 4 spill is a spill of less than 50 gallons, from or caused by a sanitary sewer system regulated under this General Order that does not discharge to a surface water.

  A spill of less than 50 gallons that spills out of a lateral and is caused by a failure or blockage in the sanitary sewer system is a Category 4 spill.

5.13.2. Annual Report

The Enrollee shall submit an Annual Report (previously termed as Collection System Questionnaire in Order 2006-0003-DWQ) as specified in section 3.9 (Annual Report) of Attachment E1 (Notification, Monitoring, Reporting and Recordkeeping Requirements) of this General Order.

For new Enrollees: Within 30 days of obtaining a CIWQS account, a new Enrollee shall submit its initial Annual Report, as specified in section 3.9 (Annual Report) of Attachment E1 (Notification, Monitoring, Reporting and Recordkeeping Requirements) of this General Order.

5.14. Electronic Sanitary Sewer System Service Area Boundary Map

For continuing enrollees, starting on July 1, 2025, and no later than December 31, 2025:

For new enrollees – no earlier than July 1, 2025, or within 12 months of the Application for Enrollment approval date, whichever date is later:

The Legally Responsible Official shall submit, to the State Water Board, geospatial data detailing the locations of the Enrollee's sanitary sewer system service area boundary, per the required content and specifications in section 3.8 (Electronic Sanitary Sewer System Service Area Boundary Map) of Attachment E1 of this General Order, for each system identified by a WDID number.

An Enrollee of a disadvantaged community that may need assistance developing an electronic map to comply with this requirement, may contact State Water Board staff for assistance at SanitarySewer@waterboards.ca.gov.

5.15. Voluntary Reporting of Spills from Privately-Owned Sewer Laterals and/or Private Sanitary Sewer Systems

Within 24 hours of becoming aware of a spill (as described below) from a private sewer lateral or private sanitary sewer system that is not owned/operated by the Enrollee, the Enrollee is encouraged to report the following observations to the online CIWQS Sanitary Sewer System Database at the following link: https://ciwqs.waterboards.ca.gov:

- A spill equal or greater than 1,000 gallons that discharges (or has a potential to discharge) to a water of the State, or a drainage conveyance system that discharges to waters of the State; **or**
- Any volume of sewage that discharges (or has a potential to discharge) to surface waters.

In the CIWQS module, the Enrollee is encouraged to identify:

- Time of observation;
- Description of general spill location (for example, street name and cross street names);
- Estimated volume of spill;
- If known, general description of spill destination (for example, flowing into drainage channel, flowing directly into a creek, etc.); and
- If known, name of private system owner/operator.

The CIWQS database will make the name and contact information of the entity voluntarily reporting a private spill, accessible to State and Regional Water Board staff only. The CIWQS database will only make information regarding the actual spill, accessible to the public.

5.16. Voluntary Notification of Spills from Privately-Owned Laterals and/or Systems to the California Office of Emergency Services

Upon observing or acquiring knowledge of any of the following from a private sewer lateral or private sanitary sewer system that is not owned/operated by the Enrollee, the Enrollee is encouraged to notify the California Office of Emergency Services (as provided by Health and Safety Code section 5410 et. seq. and Water Code section 13271), or inform the responsible party that State law requires such notification to the Office of Emergency Services by any person that causes or allows a sewage discharge to waters of the State:

- A spill equal to 1,000 gallons or more that discharges (or has a potential to discharge) to waters of the State, or a drainage conveyance system that discharges to waters of the State; or
- A spill of any volume to surface waters.

5.17. Unintended Failure to Report

If an Enrollee becomes aware that they unintentionally failed to submit relevant facts in any report required in this General Order, the Enrollee shall promptly notify Regional Water Board and State Water Board staff. Regional Water Board contact information is included in Attachment F of this Order. State Water Board staff shall be contacted by email at SanitarySewer@waterboards.ca.gov for assistance in formally amending the corresponding report(s) in the online CIWQS Sanitary Sewer System Database.

5.18. Duty to Report to Water Boards

In accordance with Water Code section 13267 and/or section 13383, upon request by the State Water Board Executive Director (or designee) or a Regional Water Board Executive Officer (or designee), the Enrollee shall provide the requested information which the State or Regional Water Board deems necessary to determine compliance with this General Order.

5.19. Operation and Maintenance

To prevent discharges to the environment, the Enrollee shall maintain in good working order, and operate as designed, any facility or treatment and control system designed to contain sewage and convey it to a treatment plant.

6. PROVISIONS

6.1. Enforcement Provisions

The following enforcement provisions are based on existing federal and state regulations, laws and policies, including the federal Clean Water Act, the state Water Code and the State Water Board Enforcement Policy.

6.1.1. Enforceability of Clean Water Act and Water Code Violations

Noncompliance with requirements of this General Order or discharging sewage without enrolling in this General Order constitutes a violation of the Water Code and a potential

violation of the Clean Water Act and is grounds for an enforcement action by the State Water Board or the applicable Regional Water Board. Failure to comply with the notification, monitoring, inspection, entry, reporting, and recordkeeping requirements may subject the Enrollee to administrative civil liabilities of up to $10,000 a day per violation pursuant to Water Code section 13385; up to $1,000 a day per violation pursuant to Water Code section 13268; or referral to the Attorney General for judicial civil enforcement. Discharging waste not in compliance with the requirements of this General Order or the Clean Water Act may subject the Enrollee to administrative civil liabilities up to $10,000 a day per violation and additional liability up to $10 per gallon of discharge not cleaned up after the first 1,000 gallons of discharge; up to $5,000 a day per violation pursuant to Water Code section 13350 or up to $20 per gallon of waste discharged; or referral to the Attorney General for judicial civil enforcement.

6.1.2. Monetary Penalties

The Water Code provides the State and Regional Water Boards the authority to pursue formal enforcement actions, including imposing administrative liability and civil monetary penalties, for non-compliance with the requirements of this General Order and violations of the Clean Water Act.

6.1.3. Falsifying or Failure to Report

The Water Code provides that any person failing or refusing to furnish technical or monitoring program reports, as required under this General Order, or falsifying any information provided in the technical or monitoring reports is subject to administrative liability and civil monetary penalties. Any person who knowingly fails or refuses to furnish technical or monitoring program reports or falsifies any information provided in reports required by this General Order is subject to criminal penalties.

6.1.4. Severability of General Order

The provisions of this General Order are severable; if any provision of this Order, or the application of any provision of this Order to any circumstance, is held invalid, the application of such provision to other circumstances and the remainder of this Order shall not be affected thereby.

6.1.5. Indirect Discharges

In the event that a spill enters into a drainage conveyance system, the Enrollee shall take all feasible steps to prevent discharge of sewage into waters of the State by blocking or redirecting the flow in the drainage conveyance system, removing the sewage from the drainage conveyance system, and cleaning the system in a manner that does not inadvertently impact beneficial uses of the receiving water body.

6.1.6. Water Boards' Considerations for Discretionary Enforcement

Consistent with the State Water Board Enforcement Policy, when considering Water Code section 13327 factors, the State Water Board or a Regional Water Board may consider the Enrollee's efforts to contain, control, clean up, and mitigate spills. In assessing the factors, the State Water Board or the applicable Regional Water Board will consider:

- The Enrollee's compliance with this General Order with a focus on compliance with reporting requirements;
- The Enrollee's provision of adequate funding to implement the requirements of this General Order;
- The Enrollee's compliance with providing a complete and updated Sewer System Management Plan;
- The Enrollee's compliance with implementing its Sewer System Management Plan;
- The overall effectiveness of the Enrollee's Sewer System Management Plan with respect to:
    - System management, operation, and maintenance,
    - Adequate treatment facilities, sanitary sewer system facilities, and/or components with an appropriate design capacity, to reasonably prevent spills (e.g. adequately enlarging treatment or collection facilities to accommodate growth, infiltration and inflow, etc.),
    - Preventive maintenance (including cleaning, root grinding, and fats, oils, and grease control) and source control measures,
    - Implementation of backup equipment,
    - Inflow and infiltration prevention and control,
    - Appropriate sanitary sewer system capacity to prevent spills, and
    - The Enrollee's responsiveness to stop and mitigate the impact of the discharge;
- The Enrollee's compliance with identifying the cause of the spill;
- The Enrollee's use of available information and observations to accurately estimate the spill volume and identify the affected or potentially affected receiving waters;
- The Enrollee's thoroughness of cleaning up sewage in drainage conveyance systems after the spill(s);
- The Enrollee's use of water quality and biological monitoring and assessment to determine the short-term and long-term impacts to beneficial uses and the environment;
- The Enrollee's follow up actions to improve system performance;
- The Enrollee's implementation of feasible alternatives to prevent spills, such as:
    - Use of temporary storage or waste retention,
    - Reduction of system inflow and infiltration,
    - Collection and hauling of waste to a treatment facility,
    - Prevention of and/ or containment of spills due to a design storm event identified in the Enrollee's Sewer System Management Plan,

- Implementation of available equipment, technologies, strategies, and recommended industry practices for maintaining and managing sewer systems to prevent spills, and contain and eliminate discharges to waters of the State; and

- The spill duration and factors beyond the reasonable control of the Enrollee causing the event.

6.1.7. Enforcement Discretion Based on Reporting Compliance

Consistent with the State Water Board Enforcement Policy, the State Water Board or a Regional Water Board may consider the Enrollee's efforts to comply with spill reporting requirements when determining compliance with Water Code section 13267 and section 13383. When assessing Water Code section 13227 factors, the State Water Board or the applicable Regional Water Board will consider:

- The Enrollee's diligence to comply with all reporting requirements in this General Order;
- The use of best available information for the Enrollee's reporting of spill start date and start time in which the release of sewage from the sanitary sewer system initiated;
- The Enrollee's reporting of spill end date, and end time to be the date and time in which the release of sewage from the sanitary sewer system was stopped;
- The Enrollee's diligence to accurately estimate and report spill volumes;
- The Enrollee's subsequent verification and/or updates to initial Draft Spill Reports in accordance with this General Order; and
- The Enrollee's timely certification of required spill reports.

Consistent with Water Code section 13267 and section 13383, the State Water Board or a Regional Water Board may require an Enrollee to report the results of a condition assessment of a specified portion of the Enrollee's sanitary sewer system.

6.2. Other Regional Water Board Orders

It is the intent of the State Water Board that sanitary sewer systems be regulated in a manner consistent with federal and state regulations. This Order will not be interpreted or applied:

- In a manner inconsistent with the federal Clean Water Act;
- To authorize a spill or discharge that is illegal under either the Clean Water Act, the Water Code, and/or an applicable Basin Plan prohibition or water quality standard;
- To prohibit a Regional Water Board from issuing an individual National Pollutant Discharge Elimination System (NPDES) permit or individual waste discharge requirements superseding an Enrollee's regulatory coverage under this General Order for a sanitary sewer system authorized under the Clean Water Act or Water Code;

- To supersede any more specific or more stringent waste discharge requirements or enforcement orders issued by a Regional Water Board; or
- To supersede any more specific or more stringent state or federal requirements in existing regulation, an administrative/judicial order, or Consent Decree.

6.3. Sewer System Management Plan Availability

The Enrollee's updated Sewer System Management Plan must be maintained for public inspection at the Enrollee's offices and facilities and must be available to the public through CIWQS and/or on the Enrollee's website, in accordance with section 3.8 (Sewer System Management Plan Reporting Requirements) of Attachment E1 (Notification, Monitoring, Reporting and Recordkeeping Requirements) of this General Order.

6.4. Entry and Inspection

6.4.1. Entry and Availability of Information

The Enrollee shall allow State and Regional Water Board staff, upon presentation of credentials and other documents as may be required by law, to:

- Enter upon the Enrollee's premises where a regulated facility or activity is located or conducted, or where records are kept under the requirements of this General Order;
- Have access to and reproduce any records required to be maintained by this General Order;
- Inspect any facility and/or equipment (including monitoring and control equipment), practices, or operations required in this General Order; and
- Sample or monitor substances or parameters for assuring compliance with this General Order, or as otherwise authorized by the Water Code.

6.4.2. Pre-Inspection Questionnaire

The Enrollee shall provide pre-inspection information to State and Regional Water Board staff through the completion of a Pre-Inspection Questionnaire provided by Water Board staff.

ATTACHMENT A - DEFINITIONS

Annual Report

An Annual Report (previously termed as Collection System Questionnaire in Order 2006-0003-DWQ) is a mandatory report in which the Enrollee provides a calendar-year update of its efforts to prevent spills.

Basin Plan

A Basin Plan is a water quality control plan specific to a Regional Water Quality Control Board (Regional Water Board), that serves as regulations to: (1) define and designate beneficial uses of surface and groundwaters, (2) establish water quality objectives for protection of beneficial uses, and (3) provide implementation measures.

Beneficial Uses

The term “Beneficial Uses” is a Water Code term, defined as the uses of the waters of the State that may be protected against water quality degradation. Examples of beneficial uses include but are not limited to, municipal, domestic, agricultural and industrial supply; power generation; recreation; aesthetic enjoyment; navigation; and preservation and enhancement of fish, wildlife, and other aquatic resources or preserves.

California Integrated Water Quality System (CIWQS)

CIWQS is the statewide database that provides for mandatory electronic reporting as required in State and Regional Water Board-issued waste discharge requirements.

Data Submitter

A Data Submitter is an individual designated and authorized by the Enrollee’s Legally Responsible Official to enter spill data into the online CIWQS Sanitary Sewer System Database. A Data Submitter does not have the authority of a Legally Responsible Official to certify reporting entered into the online CIWQS Sanitary Sewer System Database.

Disadvantaged Community

A disadvantaged community is a community with a median household income of less than eighty percent (80%) of the statewide annual median household income.

For the purpose of this General Order, there is no differentiation between a small and large disadvantaged community.

Drainage Conveyance System

A drainage conveyance system is a publicly- or privately-owned separate storm sewer system, including but not limited to drainage canals, channels, pipelines, pump stations, detention basins, infiltration basins/facilities, or other facilities constructed to transport stormwater and non-stormwater flows.

Enrollee

An Enrollee is a public, private, or other non-governmental entity that has obtained approval for regulatory coverage under this General Order, including:

- A state agency, municipality, special district, or other public entity that owns and/or operates one or more sanitary sewer systems:
  - greater than one (1) mile in length (each individual sanitary sewer system);
  - one mile or less in length where the State Water Resources Control Board or a Regional Water Quality Control Board requires regulatory coverage under this Order, or
- A federal agency, private company, or other non-governmental entity that owns and/or operates a sanitary sewer system of any size where the State Water Resources Control Board or a Regional Water Quality Control Board requires regulatory coverage under this Order in response to a history of spills, proximity to surface water, or other factors supporting regulatory coverage.

Environmentally Sensitive Area

An environmentally sensitive area is a designated agricultural and/or wildlife area identified to need special natural landscape protection due to its wildlife or historical value.

Exfiltration

Exfiltration is the underground exiting of sewage from a sanitary sewer system through cracks, offset or separated joints, or failed infrastructure due to corrosion or other factors.

Flood Control Channel

A flood control channel is a channel used to convey stormwater and non-stormwater flows through and from areas for flood management purposes.

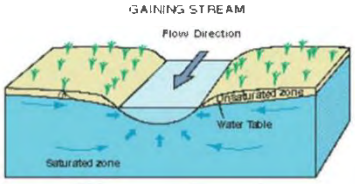
Governing Entity

A governing entity includes but is not limited to the following:

- A publicly elected governing board, council, or commission of a municipal agency;
- A Department or Division director of a federal or state agency that is not governed by a board;
- A governing board or commission of an organization or association; and
- A private system owner/manager that is not governed by a board.

Hydrologically Connected

Two waterbodies are hydrologically connected when one waterbody flows, or has the potential to flow, into the other waterbody. For the purpose of this General Order, groundwater is hydrologically connected to a surface water when the groundwater feeds into the surface water. (The surface waterbody in this example is termed a gaining stream as it gains flow from surrounding groundwater.)



Lateral (including Lower and Upper Lateral)

A lateral is an underground segment of smaller diameter pipe that transports sewage from a customer's building or property (residential, commercial, or industrial) to the Enrollee's main sewer line in a street or easement. Upper and lower lateral boundary definitions are subject to local jurisdictional codes and ordinances, or private system ownership.

A lower lateral is the portion of the lateral located between the sanitary sewer system main, and either the property line, sewer clean out, curb line, established utility easement boundary, or other jurisdictional locations.

An upper lateral is the portion of the lateral from the property line, sewer clean out, curb line, established utility easement boundary, or other jurisdictional locations, to the building or property.

Legally Responsible Official

A Legally Responsible Official is an official representative, designated by the Enrollee, with authority to sign and certify submitted information and documents required by this General Order.

Nuisance

For the purpose of this General Order, a nuisance, as defined in Water Code section 13050(m), is anything that meets all of the following requirements:

- Is injurious to health, or is indecent or offensive to the senses, or an obstruction to the free use of property, so as to interfere with the comfortable enjoyment of life or property;
- Affects at the same time an entire community or neighborhood, or any considerable number of persons, although the extent of the annoyance or damage inflicted upon individuals may be unequal; and
- Occurs during, or as a result of, the treatment or disposal of wastes.

Private Sewer Lateral

A private sewer lateral is the privately-owned lateral that transports sewage from private property(ies) into a sanitary sewer system.

Private Sanitary Sewer System

A private sanitary sewer system is a sanitary sewer system of any size that is owned and/or operated by a private individual, company, corporation, or organization. A private sanitary sewer system may or may not connect into a publicly owned sanitary sewer system.

Potential to Discharge, Potential Discharge

Potential to Discharge, or Potential Discharge, means any exiting of sewage from a sanitary sewer system which can reasonably be expected to discharge into a water of the State based on the size of the sewage spill, proximity to a drainage conveyance system, and the nature of the surrounding environment.

Receiving Water

A receiving water is a water of the State that receives a discharge of waste.

Resilience

Resilience is the ability to recover from or adjust to adversity or change, and grow from disruptions. Resilience can be built through planning, preparing for, mitigating, and adapting to changing conditions.

Sanitary Sewer System

A sanitary sewer system is a system that is designed to convey sewage, including but not limited to, pipes, manholes, pump stations, siphons, wet wells, diversion structures and/or other pertinent infrastructure, upstream of a wastewater treatment plant headworks, including:

- Laterals owned and/or operated by the Enrollee;
- Satellite sewer systems; and/or
- Temporary conveyance and storage facilities, including but not limited to temporary piping, vaults, construction trenches, wet wells, impoundments, tanks and diversion structures.

For purpose of this Order, sanitary sewer systems include only systems owned and/or operated by the Enrollee.

Satellite Sewer System

A satellite sewer system is a portion of a sanitary sewer system owned or operated by a different owner than the owner of the downstream wastewater treatment facility ultimately treating the sewage.

Sewer System Management Plan

A sewer system management plan is a living document an Enrollee develops and implements to effectively manage its sanitary sewer system(s) in accordance with this General Order.

Sewage

Sewage, and its associated wastewater, is untreated or partially treated domestic, municipal, commercial and/or industrial waste (including sewage sludge), and any mixture of these wastes with inflow or infiltration of stormwater or groundwater, conveyed in a sanitary sewer system.

Spill

A spill is a discharge of sewage from any portion of a sanitary sewer system due to a sanitary sewer system overflow, operational failure, and/or infrastructure failure. Exfiltration of sewage is not considered to be a spill under this General Order if the exfiltrated sewage remains in the subsurface and does not reach a surface water of the State.

Training

Training is in-house or external education and guidance needed that provides the knowledge, skills, and abilities to comply with this General Order.

Wash Down Water

Wash down water is water used to clean a spill area.

Waste

Waste, as defined in Water Code section 13050(d), includes sewage and any and all other waste substances, liquid, solid, gaseous, or radioactive, associated with human habitation, or of human or animal origin, or from any producing, manufacturing, or processing operation, including waste placed within containers of whatever nature prior to, and for purposes of, disposal.

Waste Discharge Identification Number (WDID)

A waste discharge identification number (WDID) identifies each individual sanitary sewer system enrolled under this General Order. A WDID number is assigned to each enrolled system upon an Enrollee's approved regulatory coverage.

Waters of the State

Waters of the State are surface waters or groundwater within boundaries of the state as defined in Water Code section 13050(e), in which the State and Regional Water Boards have authority to protect beneficial uses. Waters of the State include, but are not limited to, groundwater aquifers, surface waters, saline waters, natural washes and pools, wetlands, sloughs, and estuaries, regardless of flow or whether water exists during dry conditions. Waters of the State include waters of the United States.

Waters of the United States

Waters of the United States are surface waters or waterbodies that are subject to federal jurisdiction in accordance with the Clean Water Act.

Water Quality Objective

A water quality objective is the limit or maximum amount of pollutant, waste constituent or characteristic, or parameter level established in statewide water quality control plans and Regional Water Boards' Basin Plans, for the reasonable protection of beneficial uses of surface waters and groundwater and the prevention of nuisance.

ATTACHMENT B – APPLICATION FOR ENROLLMENT

1. **Enrollment Status:** (Mark only one item)

   ☐ New Enrollee

   ☐ New Enrollee with previous regulatory coverage under Order 2006-0003-DWQ
   (that failed to certify continuation of coverage in CIWQS per Order 2022-XXXX-DWQ)
   Existing WDID Number: _____

2. **Applicant Information:**

   Legally Responsible Official Submitting Application

   First and Last Name: _____

   Title: _____

   Phone: _____

   Email: _____

   System Owner/Operator Name: _____

   Mailing Address:_____

   City, State, Zip:_____

   County:_____

   Sanitary Sewer System Name: _____

   Regional Water Quality Control Board(s): _____

   Signature and Date: _____

3. **Applicant Type (Check one):**

   ☐ City ☐ County ☐ State ☐ Federal ☐ Special District

   ☐ Government Combination ☐ Private ☐ Other Non-governmental Entity

4. **Wastewater Treatment Plant Receiving Sanitary Sewer System Waste:**

   Wastewater Treatment Plant Permittee:_____

   WDID No.: _____

5. Billing Information

Billing Address: _____

City, State, Zip: _____

Billing Contact Person and Title: _____

Phone and Email Address: _____

6. Application Fee:

The application fee, as required by Water Code section 13260, is based on the daily population served by the sanitary sewer system. See updated Fee Schedule. (https://www.waterboards.ca.gov/resources/fees/water_quality/)

Check one of the following and enter fee amount:

☐ Population Served < 50,000 – Total Fee submitted: $ _____

☐ Population Served ≥ 50,000 – Total Fee submitted: $ _____

Make the fee payment payable to the State Water Resources Control Board and mail the complete application package to:

State Water Resources Control Board, Accounting Office
P. O. Box 1888
Sacramento, CA 95812-1888

Attention: Statewide Sanitary Sewer System Program

7. Application Submittal Certification

I certify under penalty of perjury under the laws of the State of California that to the best of my knowledge and belief, the information in the submitted application package is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment.

Print Name: _____

Title: _____

Signature: _____Date: _____

ATTACHMENT C - NOTICE OF TERMINATION

1. Enrollee Information

Enrollee Name: _____

WDID No:_____

Legally Responsible Official Requesting Termination of Coverage: _____

First and Last Name: _____

Title: _____

Phone: _____

Email: _____

Mailing Address: _____

City, State, Zip: _____

County: _____

Sanitary Sewer System Name(s) or Unique Identifier(s): _____

Regional Water Quality Control Board(s): _____

Signature and Date:_____

2. Basis of Termination

Explanation of termination, including subsequent regulatory coverage and subsequent owner/operator of enrolled sanitary sewer system, as applicable:

_____

_____

_____

_____

_____

_____

_____

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_____

_____

_____

_____

3. Regulatory Coverage Termination Certification

I certify under penalty of perjury under the laws of the State of California that to the best of my knowledge: 1) the sanitary sewer system I officially represent is not required to be regulated under the Statewide Waste Discharge Requirements for Sanitary Sewer Systems Order 2022-XXXX-DWQ, and 2) the information submitted in this Notice of Termination is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine or imprisonment. Additionally, I understand that the submittal of this Notice of Termination does not release sanitary sewer system agencies from liability for any violations of the Clean Water Act.

Print Name: _____

Title: _____

Signature: _____Date: _____

For State Water Board Use Only

☐ Approved for Termination ☐ Denied and Returned to Enrollee

Deputy Director of Water Quality Signature: _____

Date: _____Notice of Termination Effective Date: _____

ATTACHMENT D – SEWER SYSTEM MANAGEMENT PLAN – REQUIRED ELEMENTS

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ATTACHMENT D – SEWER SYSTEM MANAGEMENT PLAN – REQUIRED ELEMENTS

A Sewer System Management Plan (Plan) is a living planning document that documents ongoing local sewer system management program activities, procedures, and decision-making – at the scale necessary to address the size and complexity of the subject sanitary sewer system(s). This Plan may incorporate other programs and other plans by reference, to address short-term and long-term system resilience through:

- Proactive planning and decision-making;
- Local government ordinances;
- Updated operations and maintenance activities and procedures;
- Implementation of capital improvements;
- Sufficient local budget to support staff resources, contractors, equipment, and training; and
- Updated training of staff and contractors.

The Enrollee's development, update, and implementation of a Sewer System Management Plan addressing the requirements of this Attachment is an enforceable component of this General Order. As specified in Provision 6.1 (Enforcement Provisions) of this General Order, consistent with the Water Code and the State Water Board Enforcement Policy, the State Water Board or a Regional Water Board may consider the Enrollee's efforts in implementing an effective Sewer System Management Plan to prevent, contain, control, and mitigate spills when considering Water Code section 13327 factors to determine necessary enforcement of this General Order.

This Attachment includes the following required elements that the Enrollee shall address in its Plan and subsequent updates. The Enrollee shall identify any requirement in this Attachment that is not applicable to the Enrollee's sewer system and shall explain in its Plan why the requirement is not applicable.

1. SEWER SYSTEM MANAGEMENT PLAN GOAL AND INTRODUCTION

The goal of the Sewer System Management Plan (Plan) is to provide a plan and schedule to: (1) properly manage, operate, and maintain all parts of the Enrollee's sanitary sewer system(s), (2) reduce and prevent spills, and (3) contain and mitigate spills that do occur.

The Plan must include a narrative Introduction section that discusses the following items:

1.1. Regulatory Context

The Plan Introduction section must provide a general description of the local sewer system management program and discuss Plan implementation and updates.

1.2. Sewer System Management Plan Update Schedule

The Plan Introduction section must include a schedule for the Enrollee to update the Plan, including the schedule for conducting internal audits. The schedule must include milestones for incorporation of activities addressing prevention of sewer spills.

1.3. Sewer System Asset Overview

The Plan Introduction section must provide a description of the Enrollee-owned assets and service area, including but not limited to:

- Location, including county(ies);
- Service area boundary;
- Population and community served;
- System size, including total length in miles, length of gravity mainlines, length of pressurized (force) mains, and number of pump stations and siphons;
- Structures diverting stormwater to the sewer system;
- Data management systems;
- Sewer system ownership and operation responsibilities between Enrollee and private entities for upper and lower sewer laterals;
- Estimated number or percent of residential, commercial, and industrial service connections; and
- Unique service boundary conditions and challenge(s).

Additionally, the Plan Introduction section must provide reference to the Enrollee's up-to-date map of its sanitary sewer system, as required in section 4.1 (Updated Map of Sanitary Sewer System) of this Attachment.

2. ORGANIZATION

The Plan must identify organizational staffing responsible and integral for implementing the local Sewer System Management Plan through an organization chart or similar narrative documentation that includes:

- The name of the Legally Responsible Official as required in section 5.1 (Designation of a Legally Responsible Official) of this General Order;
- The position titles, telephone numbers, and email addresses for management, administrative, and maintenance positions responsible for implementing specific Sewer System Management Plan elements;
- Organizational lines of authority; and
- Chain of communication for reporting spills from receipt of complaint or other information, including the person responsible for reporting spills to the State and Regional Water Boards and other agencies, as applicable. (For example, county

health officer, county environmental health agency, and State Office of Emergency Services.)

3. LEGAL AUTHORITY

The Plan must include copies or an electronic link to the Enrollee's current sewer system use ordinances, service agreements and/or other legally binding procedures to demonstrate the Enrollee possesses the necessary legal authority to:

- Prevent illicit discharges into its sanitary sewer system from inflow and infiltration (I&I); unauthorized stormwater; chemical dumping; unauthorized debris; roots; fats, oils, and grease; and trash, including rags and other debris that may cause blockages;
- Collaborate with storm sewer agencies to coordinate emergency spill responses, ensure access to storm sewer systems during spill events, and prevent unintentional cross connections of sanitary sewer infrastructure to storm sewer infrastructure;
- Require that sewer system components and connections be properly designed and constructed;
- Ensure access for maintenance, inspection, and/or repairs for portions of the service lateral owned and/or operated by the Enrollee;
- Enforce any violation of its sewer ordinances, service agreements, or other legally binding procedures; and
- Obtain easement accessibility agreements for locations requiring sewer system operations and maintenance, as applicable.

4. OPERATION AND MAINTENANCE PROGRAM

The Plan must include the items listed below that are appropriate and applicable to the Enrollee's system.

4.1. Updated Map of Sanitary Sewer System

An up-to-date map(s) of the sanitary sewer system, and procedures for maintaining and providing State and Regional Water Board staff access to the map(s). The map(s) must show gravity line segments and manholes, pumping facilities, pressure pipes and valves, and applicable stormwater conveyance facilities within the sewer system service area boundaries.

4.2. Preventive Operation and Maintenance Activities

A scheduling system and a data collection system for preventive operation and maintenance activities conducted by staff and contractors.

The scheduling system must include:

- Inspection and maintenance activities;

- Higher-frequency inspections and maintenance of known problem areas, including areas with tree root problems;
- Regular visual and closed-circuit television (CCTV) inspections of manholes and sewer pipes.

The data collection system must document data from system inspection and maintenance activities, including system areas/components prone to root-intrusion potentially resulting in system backup and/or failure.

4.3. Training

In-house and external training provided on a regular basis for sanitary sewer system operations and maintenance staff and contractors. The training must cover:

- The requirements of this General Order;
- The Enrollee's Spill Emergency Response Plan procedures and practice drills;
- Skilled estimation of spill volume for field operators; and
- Electronic CIWQS reporting procedures for staff submitting data.

4.4. Equipment Inventory

An inventory of sewer system equipment, including the identification of critical replacement and spare parts.

5. DESIGN AND PERFORMANCE PROVISIONS

The Plan must include the following items as appropriate and applicable to the Enrollee's system:

5.1. Updated Design Criteria and Construction Standards and Specifications

Updated design criteria, and construction standards and specifications, for the construction, installation, repair, and rehabilitation of existing and proposed system infrastructure components, including but not limited to pipelines, pump stations, and other system appurtenances. If existing design criteria and construction standards are deficient to address the necessary component-specific hydraulic capacity as specified in section 8 (System Evaluation, Capacity Assurance and Capital Improvements) of this Attachment, the procedures must include component-specific evaluation of the design criteria.

5.2. Procedures and Standards

Procedures, and standards for the inspection and testing of newly constructed, newly installed, repaired, and rehabilitated system pipelines, pumps, and other equipment and appurtenances.

6. SPILL EMERGENCY RESPONSE PLAN

The Plan must include an up to date Spill Emergency Response Plan to ensure prompt detection and response to spills to reduce spill volumes and collect information for prevention of future spills. The Spill Emergency Response Plan must include procedures to:

- Notify primary responders, appropriate local officials, and appropriate regulatory agencies of a spill in a timely manner;
- Notify other potentially affected entities (for example, health agencies, water suppliers, etc.) of spills that potentially affect public health or reach waters of the State;
- Comply with the notification, monitoring and reporting requirements of this General Order, State law and regulations, and applicable Regional Water Board Orders;
- Ensure that appropriate staff and contractors implement the Spill Emergency Response Plan and are appropriately trained;
- Address emergency system operations, traffic control and other necessary response activities;
- Contain a spill and prevent/minimize discharge to waters of the State or any drainage conveyance system;
- Minimize and remediate public health impacts and adverse impacts on beneficial uses of waters of the State;
- Remove sewage from the drainage conveyance system;
- Clean the spill area and drainage conveyance system in a manner that does not inadvertently impact beneficial uses in the receiving waters;
- Implement technologies, practices, equipment, and interagency coordination to expedite spill containment and recovery;
- Implement pre-planned coordination and collaboration with storm drain agencies and other utility agencies/departments prior, during, and after a spill event;
- Conduct post-spill assessments of spill response activities;
- Document and report spill events as required in this General Order; and
- Annually, review and assess effectiveness of the Spill Emergency Response Plan, and update the Plan as needed.

7. SEWER PIPE BLOCKAGE CONTROL PROGRAM

The Sewer System Management Plan must include procedures for the evaluation of the Enrollee's service area to determine whether a sewer pipe blockage control program is needed to control fats, oils, grease, rags and debris. If the Enrollee determines that a program is not needed, the Enrollee shall provide justification in its Plan for why a program is not needed.

The procedures must include, at minimum:

- An implementation plan and schedule for a public education and outreach program that promotes proper disposal of pipe-blocking substances;
- A plan and schedule for the disposal of pipe-blocking substances generated within the sanitary sewer system service area. This may include a list of acceptable disposal facilities and/or additional facilities needed to adequately dispose of substances generated within a sanitary sewer system service area;
- The legal authority to prohibit discharges to the system and identify measures to prevent spills and blockages;
- Requirements to install grease removal devices (such as traps or interceptors), design standards for the removal devices, maintenance requirements, best management practices requirements, recordkeeping and reporting requirements;
- Authority to inspect grease producing facilities, enforcement authorities, and whether the Enrollee has sufficient staff to inspect and enforce the fats, oils, and grease ordinance;
- An identification of sanitary sewer system sections subject to fats, oils, and grease blockages and establishment of a cleaning schedule for each section; and
- Implementation of source control measures for all sources of fats, oils, and grease reaching the sanitary sewer system for each section identified above.

8. SYSTEM EVALUATION, CAPACITY ASSURANCE AND CAPITAL IMPROVEMENTS

The Plan must include procedures and activities for:

- Routine evaluation and assessment of system conditions;
- Capacity assessment and design criteria;
- Prioritization of corrective actions; and
- A capital improvement plan.

8.1 System Evaluation and Condition Assessment

The Plan must include procedures to:

- Evaluate the sanitary sewer system assets utilizing the best practices and technologies available;

- Identify and justify the amount (percentage) of its system for its condition to be assessed each year;
- Prioritize the condition assessment of system areas that:
  - Hold a high level of environmental consequences if vulnerable to collapse, failure, blockage, capacity issues, or other system deficiencies;
  - Are located in or within the vicinity of surface waters, steep terrain, high groundwater elevations, and environmentally sensitive areas;
  - Are within the vicinity of a receiving water with a bacterial-related impairment on the most current Clean Water Act section 303(d) List;
- Assess the system conditions using visual observations, video surveillance and/or other comparable system inspection methods;
- Utilize observations/evidence of system conditions that may contribute to exiting of sewage from the system which can reasonably be expected to discharge into a water of the State;
- Maintain documents and recordkeeping of system evaluation and condition assessment inspections and activities; and
- Identify system assets vulnerable to direct and indirect impacts of climate change, including but not limited to: sea level rise; flooding and/or erosion due to increased storm volumes, frequency, and/or intensity; wildfires; and increased power disruptions.

8.2. Capacity Assessment and Design Criteria

The Plan must include procedures to identify system components that are experiencing or contributing to spills caused by hydraulic deficiency and/or limited capacity, including procedures to identify the appropriate hydraulic capacity of key system elements for:

- Dry-weather peak flow conditions that cause or contributes to spill events;
- The appropriate design storm(s) or wet weather events that causes or contributes to spill events;
- The capacity of key system components; and
- Identify the major sources that contribute to the peak flows associated with sewer spills.

The capacity assessment must consider:

- Data from existing system condition assessments, system inspections, system audits, spill history, and other available information;
- Capacity of flood-prone systems subject to increased infiltration and inflow, under normal local and regional storm conditions;

- Capacity of systems subject to increased infiltration and inflow due to larger and/or higher-intensity storm events as a result of climate change;
- Increases of erosive forces in canyons and streams near underground and above-ground system components due to larger and/or higher-intensity storm events;
- Capacity of major system elements to accommodate dry weather peak flow conditions, and updated design storm and wet weather events; and
- Necessary redundancy in pumping and storage capacities.

8.3. Prioritization of Corrective Action

The findings of the condition assessments and capacity assessments must be used to prioritize corrective actions. Prioritization must consider the severity of the consequences of potential spills.

8.4. Capital Improvement Plan

The capital improvement plan must include the following items:

- Project schedules including completion dates for all portions of the capital improvement program;
- Internal and external project funding sources for each project; and
- Joint coordination between operation and maintenance staff, and engineering staff/consultants during planning, design, and construction of capital improvement projects; and Interagency coordination with other impacted utility agencies.

9. MONITORING, MEASUREMENT AND PROGRAM MODIFICATIONS

The Plan must include an Adaptive Management section that addresses Plan-implementation effectiveness and the steps for necessary Plan improvement, including:

- Maintaining relevant information, including audit findings, to establish and prioritize appropriate Plan activities;
- Monitoring the implementation and measuring the effectiveness of each Plan Element;
- Assessing the success of the preventive operation and maintenance activities;
- Updating Plan procedures and activities, as appropriate, based on results of monitoring and performance evaluations; and
- Identifying and illustrating spill trends, including spill frequency, locations and estimated volumes.

10. INTERNAL AUDITS

The Plan shall include internal audit procedures, appropriate to the size and performance of the system, for the Enrollee to comply with section 5.4 (Sewer System Management Plan Audits) of this General Order.

11. COMMUNICATION PROGRAM

The Plan must include procedures for the Enrollee to communicate with:

- The public for:
  - Spills and discharges resulting in closures of public areas, or that enter a source of drinking water, and
  - The development, implementation, and update of its Plan, including opportunities for public input to Plan implementation and updates.
- Owners/operators of systems that connect into the Enrollee's system, including satellite systems, for:
  - System operation, maintenance, and capital improvement-related activities.

ATTACHMENT E1 – NOTIFICATION, MONITORING, REPORTING AND RECORDKEEPING REQUIREMENTS

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ATTACHMENT E1– NOTIFICATION, MONITORING, REPORTING AND RECORDKEEPING REQUIREMENTS

The Notification Requirements (section 1), Spill-specific Monitoring Requirements (section 2), Reporting Requirements (section 3) and Recordkeeping Requirements (section 4) in this Attachment are pursuant to Water Code section 13267 and section 13383, and are an enforceable component of this General Order. For the purpose of this General Order, the term:

- Notification means the notifying of appropriate parties of a spill event or other activity.
- Spill-specific Monitoring means the gathering of information and data for a specific spill event to be reported or kept as records.
- Reporting means the reporting of information and data into the online California Integrated Water Quality System (CIWQS) Sanitary Sewer System Database.
- Recordkeeping means the maintaining of information and data in an official records storage system.

Failure to comply with the notification, monitoring, reporting and recordkeeping requirements in this General Order may subject the Enrollee to civil liabilities of up to $10,000 a day per violation pursuant to Water Code section 13385; up to $1,000 a day per violation pursuant to Water Code section 13268; or referral to the Attorney General for judicial civil enforcement.

Water Code section 13193 et seq. requires the Regional Water Quality Control Boards (Regional Water Boards) and the State Water Resources Control Board (State Water Board) to collect sanitary sewer spill information for each spill event and make this information available to the public. Sanitary sewer spill information for each spill event includes but is not limited to: Enrollee contact information for each spill event, spill cause, estimated spill volume and factors used for estimation, location, date, time, duration, amount discharged to waters of the State, response and corrective action(s) taken.

1. NOTIFICATION REQUIREMENTS

1.1. Notification of Spills of 1,000 Gallons or Greater to the California Office of Emergency Services

Per Water Code section 13271, for a spill that discharges in or on any waters of the State, or discharges or is deposited where it is, or probably will be, discharged in or on any waters of the State, the Enrollee shall notify the California Office of Emergency Services and obtain a California Office of Emergency Services Control Number as soon as possible **but no later than two (2) hours** after:

- The Enrollee has knowledge of the spill; and
- Notification can be provided without substantially impeding cleanup or other emergency measures.

The notification requirements in this section apply to individual spills of 1,000 gallons or greater, from an Enrollee-owned and/or operated laterals, to a water of the State.

1.2. Spill Notification Information

The Enrollee shall provide the following spill information to the California Office of Emergency Services before receiving a Control Number, as applicable:

- Name and phone number of the person notifying the California Office of Emergency Services;
- Estimated spill volume (gallons);
- Estimated spill rate from the system (gallons per minute);
- Estimated discharge rate (gallons per minute) directly into waters of the State or indirectly into a drainage conveyance system;
- Spill incident description:
  - Brief narrative of the spill event, and
  - Spill incident location (address, city, and zip code) and closest cross streets and/or landmarks;
- Name and phone number of contact person on-scene;
- Date and time the Enrollee was informed of the spill event;
- Name of sanitary sewer system causing the spill;
- Spill cause or suspected cause (if known);
- Amount of spill contained;
- Name of receiving water body receiving or potentially receiving discharge; and
- Description of water body impact and/ or potential impact to beneficial uses.

1.3. Notification of Spill Report Updates

Following the initial notification to the California Office of Emergency Services and until such time that the Enrollee certifies the spill report in the online CIWQS Sanitary Sewer System Database, the Enrollee shall provide updates to the California Office of Emergency Services regarding substantial changes to:

- Estimated spill volume (increase or decrease in gallons initially estimated);
- Estimated discharge volume discharged directly into waters of the State or indirectly into a drainage conveyance system (increase or decrease in gallons initially estimated); and
- Additional impact(s) to the receiving water(s) and beneficial uses.

2. SPILL-SPECIFIC MONITORING REQUIREMENTS

2.1 Spill Location and Spread

The Enrollee shall visually assess the spill location(s) and spread using photography, global positioning system (GPS), and other best available tools. The Enrollee shall document the critical spill locations, including:

- Photography and GPS coordinates for:
  - The system location where spill originated.

    For multiple appearance points of a single spill event, the points closest to the spill origin.
- Photography for:
  - Drainage conveyance system entry locations,
  - The location(s) of discharge into surface waters, as applicable,
  - Extent of spill spread, and
  - The location(s) of clean up.

2.2 Spill Volume Estimation

To assess the approximate spill magnitude and spread, the Enrollee shall estimate the total spill volume using updated volume estimation techniques, calculations, and documentation for electronic reporting. The Enrollee shall update its notification and reporting of estimated spill volume (which includes spill volume recovered) as further information is gathered during and after a spill event.

2.3. Receiving Water Monitoring

2.3.1. Receiving Water Visual Observations

Through visual observations and use of best available spill volume-estimating techniques and field calculation techniques, the Enrollee shall gather and document the following information for spills discharging to surface waters:

- Estimated spill travel time to the receiving water;
- For spills entering a drainage conveyance system, estimated spill travel time from the point of entry into the drainage conveyance system to the point of discharge into the receiving water;
- Estimated spill volume entering the receiving water; and
- Photography of:
  - Waterbody bank erosion,
  - Floating matter,
  - Water surface sheen (potentially from oil and grease),

- Discoloration of receiving water, and
- Impact to the receiving water.

2.3.2. Receiving Water – Water Quality Sampling and Analysis

For sewage spills in which an estimated 50,000 gallons or greater are discharged into a surface water, the Enrollee shall conduct the following water quality sampling no later than **18 hours** after the Enrollee's knowledge of a potential discharge to a surface water:

- Collect one water sample, each day of the duration of the spill, at:
  - The DCS-001 location as described in section 2.3.4 (Receiving Water Sampling Locations) of this Attachment, if sewage discharges to a surface water via a drainage conveyance system; and/or
  - Each of the three receiving water sampling locations in section 2.3.4 (Receiving Water Sampling Locations) of this Attachment;

    If the receiving water has no flow during the duration of the spill, the Enrollee must report "No Sampling Due To No Flow" for its receiving water sampling locations.

The Enrollee shall analyze the collected receiving water samples for the following constituents per section 2.3.3 (Water Quality Analysis Specifications) of this Attachment:

- Ammonia, and
- Appropriate bacterial indicator(s) per the applicable Basin Plan water quality objectives, including one or more of the following, unless directed otherwise by the Regional Water Board:
  - Total Coliform Bacteria
  - Fecal Coliform Bacteria
  - *E-coli*
  - Enterococcus

  Dependent on the receiving water(s), sampling of bacterial indicators shall be sufficient to determine post-spill (after the spill) compliance with the water quality objectives and bacterial standards of the California Ocean Plan or the California Inland Surface Water Enclosed Bays, and Estuaries Plan, including the frequency and/or number of post-spill receiving water samples as may be specified in the applicable plans.

The Enrollee shall collect and analyze additional samples as required by the applicable Regional Water Board Executive Officer or designee.

2.3.3. Water Quality Analysis Specifications

Spill monitoring must be representative of the monitored activity (40 Code of Federal Regulations section 122.41(j)(1)).

Sufficiently Sensitive Methods

Sample analysis must be conducted according to sufficiently sensitive test methods approved under 40 Code of Federal Regulations Part 136 for the sample analysis of pollutants. For the purposes of this General Order, a method is sufficiently sensitive when the minimum level of the analytical method approved under 40 Code of Federal Regulations Part 136 is at or below the receiving water pollutant criteria.

Environmental Laboratory Accreditation Program-Accredited Laboratories

The analysis of water quality samples required per this General Order must be performed by a laboratory that has accreditation pursuant to Article 3 (commencing with section 100825) of Chapter 4 of Part 1 of Division 101 of the Health and Safety Code. (Water Code section 13176(a).) The State Water Board accredits laboratories through its Environmental Laboratory Accreditation Program (ELAP).

2.3.4. Receiving Water Sampling Locations

The Enrollee shall collect receiving water samples at the following locations.

Sampling of Flow in Drainage Conveyance System (DCS) Prior to Discharge

Sampling Location	Sampling Location Description
DCS-001	A point in a drainage conveyance system before the drainage conveyance system flow discharges into a receiving water.

Receiving Surface Water Sampling (RSW)[1]

Sampling Location	Sampling Location Description
RSW-001 Point of Discharge	A point in the receiving water where sewage initially enters the receiving water.
RSW-001U: Upstream of Point of Discharge	A point in the receiving water, upstream of the point of sewage discharge, to capture ambient conditions absent of sewage discharge impacts.

Sampling Location	Sampling Location Description
RSW-001D: Downstream of Point of Discharge	A point in the receiving water, downstream of the point of sewage discharge, where the spill material is fully mixed with the receiving water.

[1] The Enrollee must use its best professional judgment to determine the upstream and downstream distances based on receiving water flow, accessibility to upstream/downstream waterbody banks, and size of visible sewage plume.

2.4. Safety and Access Exceptions

If the Enrollee encounters access restrictions or unsafe conditions that prevents its compliance with spill response requirements or monitoring requirements in this General Order, the Enrollee shall provide documentation of access restrictions and/or safety hazards in the corresponding required report.

3. REPORTING REQUIREMENTS

All reporting required in this General Order must be submitted electronically to the online CIWQS Sanitary Sewer System Database (https://ciwqs.waterboards.ca.gov), unless specified otherwise in this General Order. Electronic reporting may solely be conducted by a Legally Responsible Official or Data Submitter(s) previously designated by the Legally Responsible Official, as required in section 5.8 (Designation of Data Submitters) of this General Order.

The Enrollee shall report any information that is protected by the Homeland Security Act, by email to SanitarySewer@waterboards.ca.gov, with a brief explanation of the protection provided by the Homeland Security Act for the subject report to be protected from unauthorized disclosure and/or public access, and for official Water Board regulatory purposes only.

3.1. Reporting Requirements for Individual Category 1 Spill Reporting

3.1.1. Draft Spill Report for Category 1 Spills

Within three (3) business days of the Enrollee's knowledge of a Category 1 spill, the Enrollee shall submit a Draft Spill Report to the online CIWQS Sanitary Sewer System Database.

The Draft Spill Report must, at minimum, include the following items:

1. Contact information: Name and telephone number of Enrollee contact person to respond to spill-specific questions;
2. Spill location name;
3. Date and time the Enrollee was notified of, or self-discovered, the spill;
4. Operator arrival time;

5. Estimated spill start date and time;
6. Date and time the Enrollee notified the California Office of Emergency Services, and the assigned control number;
7. Description, photographs, and GPS coordinates of the system location where the spill originated;
    - If a single spill event results in multiple appearance points, provide GPS coordinates for the appearance point closest to the failure point and describe each additional appearance point in the spill appearance point explanation field;
8. Estimated total spill volume exiting the system;
9. Description and photographs of the extent of the spill and spill boundaries;
10. Did the spill reach a drainage conveyance system? If Yes:
    - Description of the drainage conveyance system transporting the spill;
    - Photographs of the drainage conveyance system entry location(s);
    - Estimated spill volume fully recovered from the drainage conveyance system;
    - Estimated spill volume remaining within the drainage conveyance system;
11. Description and photographs of all discharge point(s) into the surface water;
12. Estimated spill volume that discharged to surface waters; and
13. Estimated total spill volume recovered.

3.1.2. Certified Spill Report for Category 1 Spills

Within 15 calendar days of the spill end date, the Enrollee shall submit a Certified Spill Report for Category 1 spills, to the online CIWQS Sanitary Sewer System Database. Upon completion of the Certified Spill Report, the online CIWQS Sanitary Sewer System Database will issue a final spill event identification number.

The Certified Spill Report must, at minimum, include the following mandatory information in addition to all information in the Draft Spill Report per section 3.1.1 (Draft Spill Report for Category 1 Spills) above:

1. Description of the spill event destination(s), including GPS coordinates if available, that represent the full spread and reach of the spill;
2. Spill end date and time;
3. Description of how the spill volume estimations were calculated, including at a minimum:
    - The methodology, assumptions and type of data relied upon, such as supervisory control and data acquisition (SCADA) records, flow monitoring or other telemetry information used to estimate the volume of the spill discharged, and the volume of the spill recovered (if any volume of the spill was recovered), and
    - The methodology(ies), assumptions and type of data relied upon for estimations of the spill start time and the spill end time;

4. Spill cause(s) (for example, root intrusion, grease deposition, etc.);
5. System failure location (for example, main, lateral, pump station, etc.);
6. Description of the pipe material, and estimated age of the pipe material, at the failure location;
7. Description of the impact of the spill;
8. Whether or not the spill was associated with a storm event;
9. Description of spill response activities including description of immediate spill containment and cleanup efforts;
10. Description of spill corrective action, including steps planned or taken to reduce, eliminate, and prevent reoccurrence of the spill, and a schedule of major milestones for those steps;
11. Spill response completion date;
12. Detailed narrative of investigation and investigation findings of cause of spill;
13. Reasons for an ongoing investigation (as applicable) and the expected date of completion;
14. Name and type of receiving water body(s);
15. Description of the water body(s), including but not limited to:
    - Observed impacts on aquatic life,
    - Public closure, restricted public access, temporary restricted use, and/or posted health warnings due to spill,
    - Responsible entity for closing/restricting use of water body, and
    - Number of days closed/restricted as a result of the spill.
16. Whether or not the spill was located within 1,000 feet of a municipal surface water intake; and
17. If water quality samples were collected, identify sample locations and the parameters the water quality samples were analyzed for. If no samples were taken, Not Applicable shall be selected.

3.1.3. Spill Technical Report for Individual Category 1 Spill in which 50,000 Gallons or Greater Discharged into a Surface Water

For any spill in which 50,000 gallons or greater discharged into a surface water, **within 45 calendar days** of the spill end date, the Enrollee shall submit a Spill Technical Report to the online CIWQS Sanitary Sewer System Database. The Spill Technical Report, at minimum, must include the following information:

1. Spill causes and circumstances, including at minimum:
    - Complete and detailed explanation of how and when the spill was discovered;

- Photographs illustrating the spill origin, the extent and reach of the spill, drainage conveyance system entrance and exit, receiving water, and post-cleanup site conditions;
- Diagram showing the spill failure point, appearance point(s), the spill flow path, and ultimate destinations;
- Detailed description of the methodology employed, and available data used to calculate the discharge volume and, if applicable, the recovered spill volume;
- Detailed description of the spill cause(s);
- Description of the pipe material, and estimated age of the pipe material, at the failure location;
- Description of the impact of the spill;
- Copy of original field crew records used to document the spill; and
- Historical maintenance records for the failure location.

2. Enrollee's response to the spill:
   - Chronological narrative description of all actions taken by the Enrollee to terminate the spill;
   - Explanation of how the Sewer System Management Plan Spill Emergency Response Plan was implemented to respond to and mitigate the spill; and
   - Final corrective action(s) completed and a schedule for planned corrective actions, including:
     - Local regulatory enforcement action taken against an illicit discharge in response to this spill, as applicable,
     - Identifiable system modifications, and operation and maintenance program modifications needed to prevent repeated spill occurrences, and
     - Necessary modifications to the Emergency Spill Response Plan to incorporate lessons learned in responding to and mitigating the spill.
3. Water Quality Monitoring, including at minimum:
   - Description of all water quality sampling activities conducted;
   - List of pollutant and parameters monitored, sampled and analyzed; as required in section 2.3 (Receiving Water Monitoring) of this Attachment;
   - Laboratory results, including laboratory reports;
   - Detailed location map illustrating all water quality sampling points; and
   - Other regulatory agencies receiving sample results (if applicable).
4. Evaluation of spill impact(s), including a description of short-term and long-term impact(s) to beneficial uses of the surface water.

3.1.4. Amended Certified Spill Reports for Individual Category 1 Spills

The Enrollee shall update or add additional information to a Certified Spill Report within **90 calendar days** of the spill end date by amending the report or by adding an attachment to the Spill Report in the online CIWQS Sanitary Sewer System Database. The Enrollee shall certify the amended report.

After **90 calendar days**, the Enrollee shall contact the State Water Board at SanitarySewer@waterboards.ca.gov to request to amend a Spill Report. The Legally Responsible Official shall submit justification for why the additional information was not reported within the Amended Spill Report due date.

3.2. Reporting Requirements for Individual Category 2 Spill Reporting

3.2.1. Draft Spill Report for Category 2 Spills

Within three (3) business days of the Enrollee's knowledge of a Category 2 spill, the Enrollee shall submit a Draft Spill Report to the online CIWQS Sanitary Sewer System Database.

The Draft Spill Report must, at minimum, include the following items:

1. Contact information: Name and telephone number of Enrollee contact person to respond to spill-specific questions;
2. Spill location name;
3. Date and time the Enrollee was notified of, or self-discovered, the spill;
4. Operator arrival time;
5. Estimated spill start date and time;
6. Date and time the Enrollee notified the California Office of Emergency Services, and the assigned control number;
7. Description, photographs, and GPS coordinates of the system location where the spill originated;

   If a single spill event results in multiple appearance points, provide GPS coordinates for the appearance point closest to the failure point and describe each additional appearance point in the spill appearance point explanation field;
8. Estimated total spill volume exiting the system;
9. Description and photographs of the extent of the spill and spill boundaries;
10. Did the spill reach a drainage conveyance system? If Yes:
    - Description of the drainage conveyance system transporting the spill;
    - Photographs of the drainage conveyance system entry location(s);
    - Estimated spill volume fully recovered from the drainage conveyance system;
    - Estimated spill volume remaining within the drainage conveyance system;

- Estimated spill volume discharged to a groundwater infiltration basin or facility, if applicable; and

11. Estimated total spill volume recovered.

3.2.2. Certified Spill Report for Category 2 Spills

Within 15 calendar days of the spill end date, the Enrollee shall submit a Certified Spill Report for the Category 2 spill, to the online CIWQS Sanitary Sewer System Database (https://ciwqs.waterboards.ca.gov). Upon completion of the Certified Spill Report, the online CIWQS Sanitary Sewer System Database will issue a final spill event identification number.

The Certified Spill Report must, at minimum, include the following mandatory information in addition to all information in the Draft Spill Report per section 3.2.1 (Draft Spill Report for Category 2 Spills) above:

1. Description of the spill event destination(s), including GPS coordinates if available, that represent the full spread and reach of the spill;
2. Spill end date and time;
3. Description of how the spill volume estimations were calculated, including at a minimum:
   - The methodology, assumptions and type of data relied upon, such as supervisory control and data acquisition (SCADA) records, flow monitoring or other telemetry information used to estimate the volume of the spill discharged, and the volume of the spill recovered (if any volume of the spill was recovered), and
   - The methodology(ies), assumptions and type of data relied upon for estimations of the spill start time and the spill end time;
4. Spill cause(s) (for example, root intrusion, grease deposition, etc.);
5. System failure location (for example, main, pump station, etc.);
6. Description of the pipe/infrastructure material, and estimated age of the pipe material, at the failure location;
7. Description of the impact of the spill;
8. Whether or not the spill was associated with a storm event;
9. Description of spill response activities including description of immediate spill containment and cleanup efforts;
10. Description of spill corrective action, including steps planned or taken to reduce, eliminate, and prevent reoccurrence of the spill, and a schedule of major milestones for those steps;
11. Spill response completion date;
12. Detailed narrative of investigation and investigation findings of cause of spill;
13. Reasons for an ongoing investigation (as applicable) and the expected date of completion; and

14. Whether or not the spill was located within 1,000 feet of a municipal surface water intake.

3.2.3. Amended Certified Spill Reports for Individual Category 2 Spills

The Enrollee shall update or add additional information to a Certified Spill Report within **90 calendar days** of the spill end date by amending the report or by adding an attachment to the Spill Report in the online CIWQS Sanitary Sewer System Database. The Enrollee shall certify the amended report.

After **90 calendar days**, the Enrollee shall contact the State Water Board at SanitarySewer@waterboards.ca.gov to request to amend a Spill Report. The Legally Responsible Official shall submit justification for why the additional information was not reported within the Amended Spill Report due date.

3.3. Monthly Certified Spill Reporting for Category 3 Spills

The Enrollee shall report and certify all Category 3 spills to the online CIWQS Sanitary Sewer System Database within 30 calendar days after the end of the month in which the spills occurred. (For example, all Category 3 spills occurring in the month of February shall be reported and certified by March 30th). After the Legally Responsible Official certifies the spills, the online CIWQS Sanitary Sewer System Database will issue a spill event identification number for each spill.

The monthly reporting of all Category 3 spills must include the following items for each spill:

1. Contact information: Name and telephone number of Enrollee contact person to respond to spill-specific questions;
2. Spill location name;
3. Date and time the Enrollee was notified of, or self-discovered, the spill;
4. Operator arrival time;
5. Estimated spill start date and time;
6. Description, photographs, and GPS coordinates where the spill originated:
   - If a single spill event results in multiple appearance points, provide GPS coordinates for the appearance point closest to the failure point and describe each additional appearance point in the spill appearance point explanation field;
7. Estimated total spill volume exiting the system;
8. Description and photographs of the extent of the spill and spill boundaries;
9. Did the spill reach a drainage conveyance system? If Yes:
   - Description of the drainage conveyance system transporting the spill;
   - Photographs of the drainage conveyance system entry locations(s);
   - Estimated spill volume fully recovered from the drainage conveyance system; and

- Estimated spill volume discharged to a groundwater infiltration basis or facility, if applicable.

10. Estimated total spill volume recovered;
11. Description of the spill event destination(s), including GPS coordinates, if available, that represent the full spread and reaches of the spill;
12. Spill end date and time;
13. Description of how the spill volume estimations were calculated, including, at minimum:
    - The methodology and type of data relied upon, including supervisory control and data acquisition (SCADA) records, flow monitoring or other telemetry information used to estimate the volume of the spill discharged, and the volume of the spill recovered (if any volume of the spill was recovered), and
    - The methodology and type of data relied upon to estimate the spill start time, on-going spill rate at time of arrival (if applicable), and the spill end time;
14. Spill cause(s) (for example, root intrusion, grease deposition, etc.);
15. System failure location (for example, main, pump station, etc.);
16. Description of the pipe/infrastructure material, and estimated age of the pipe/infrastructure material, at the failure location;
17. Description of the impact of the spill;
18. Whether or not the spill was associated with a storm event;
19. Description of spill response activities including description of immediate spill containment and cleanup efforts;
20. Description of spill corrective actions, including steps planned or taken to reduce, eliminate, and prevent reoccurrence of the spill, and a schedule of the major milestones for those steps; including, at minimum:
    - Local regulatory enforcement action taken against an illicit discharge in response to this spill, as applicable, and
    - Identifiable system modifications, and operation and maintenance program modifications needed to prevent repeated spill occurrences at the same spill event location, including:
      - Adjusted schedule/method of preventive maintenance,
      - Planned rehabilitation or replacement of sanitary sewer asset,
      - Inspected, repaired asset(s), or replaced defective asset(s),
      - Capital improvements,
      - Documentation verifying immediately implemented system modifications and operating/maintenance modifications,
      - Description of spill response activities,

- Spill response completion date, and
- Ongoing investigation efforts, and expected completion date of investigation to determine the full cause of spill;

21. Detailed narrative of investigation and investigation findings of cause of spill.

3.4. Monthly Certified Spill Reporting for Category 4 Spills

The Enrollee shall report and certify the estimated total spill volume exiting the sanitary sewer system, and the total number of all Category 4 spills to the online CIWQS Sanitary Sewer System Database, within 30 calendar days after the end of the month in which the spills occurred.

3.5. Amended Certified Spill Reports for Category 3 Spills

Within 90 calendar days of the certified Spill Report due date, the Enrollee may update or add additional information to a certified Spill Report by amending the report or by adding an attachment to the Spill Report in the online CIWQS Sanitary Sewer System Database. The Enrollee shall certify the amended report.

After 90 calendar days, the Legally Responsible Official shall contact the State Water Board at SanitarySewer@waterboards.ca.gov to request to amend a certified Spill Report. The Legally Responsible Official shall submit justification for why the additional information was not reported within the 90-day timeframe for amending the certified Spill Report, as provided above.

3.6. Annual Certified Spill Reporting of Category 4 and/or Lateral Spills

For all Category 4 spills and spills from its owned and/or operated laterals that are caused by a failure or blockage in the lateral and that do not discharge to a surface water, the Enrollee shall:

- Maintain records per section 4.4. of this Attachment;

  The Enrollee shall provide records upon request by State Water Board or Regional Water Board staff.

- Annually upload and certify a report, in an appropriate digital format, of all recordkeeping of spills to the online CIWQS Sanitary Sewer System Database, by February 1st after the end of the calendar year in which the spills occurred.

A spill from an Enrollee-owned and/or operated lateral that discharges to a surface water is a Category 1 spill; the Enrollee shall report all Category 1 spills per section 3.1 of Attachment E1 (Notification, Monitoring, Reporting and Recordkeeping Requirements) of this General Order.

3.7. Monthly Certification of "No-Spills" or "Category 4 Spills" and/or "Non-Category 1 Lateral Spills"

If either (1) no spills occur during a calendar month or (2) only Category 4, and/or Enrollee-owned and/or operated lateral spills (that do not discharge to a surface water) occur during a calendar month, the Enrollee shall certify, within 30 calendar days after

the end of each calendar month, either a “No-Spill” certification statement, or a “Category 4 Spills” and/or “Non-Category 1 Lateral Spills” certification statement, in the online CIWQS Sanitary Sewer System Database, certifying that there were either no spills, or Category 4 and/or Non-Category 1 Lateral Spills that will be reported annually (per section 3.6 of this Attachment) for the designated month.

If a spill starts in one calendar month and ends in a subsequent calendar month, and the Enrollee has no further spills of any category, in the subsequent calendar month, the Enrollee shall certify “no-spills” for the subsequent calendar month.

If the Enrollee has no spills from its systems during a calendar month, but the Enrollee voluntarily reported a spill from a private lateral or a private system, the Enrollee shall certify “no-spills” for that calendar month.

If the Enrollees has spills from its owned and/or operated laterals during a calendar month, the Enrollee shall not certify “no spills” for that calendar month.

3.8. Electronic Sanitary Sewer System Service Area Boundary Map

The Legally Responsible Official shall submit, to the State Water Board, an up-to-date electronic spatial map of its sewer system service area boundaries. The map must be in accordance with section 5.14 (Electronic Sanitary Sewer System Service Area Boundary Map) of this General Order and the specification provided on the statewide Sanitary Sewer Systems program website. The map must include the location of wastewater treatment facility(ies) that treats the sewer system waste, if in the same sewer service boundary.

By the Effective Date of this General Order, specifications for the electronic sanitary sewer service area boundary map format will be provided on the statewide Sanitary Sewer Systems Order program website.

3.9. Annual Report (Previously termed as Collection System Questionnaire in General Order 2006-0003-DWQ)

A new Enrollee shall complete and submit its first certified Annual Report into the online CIWQS Sanitary Sewer System Database, **within 30 days of obtaining a CIWQS account**; Subsequent Annual Reports are due by April 1 of each year.

All enrollees shall update their previous year’s Annual Report, **by April 1 of each year after the Effective Date of this General Order,** for each calendar year (January 1 through December 31)**.**

The Annual Report must be entered directly into the online CIWQS Sanitary Sewer System Database. The Enrollee’s Legally Responsible Official shall certify the Annual Report as instructed in CIWQS;

The Annual Report must address, and update as applicable, the following items:

- Population served;

- Updated sewer system service area boundary map, if service area boundary has changed from original map submitted per section 5.14 (Electronic Sanitary Sewer System Service Area Boundary Map) of this General Order;
- Number of system operation and maintenance staff:
  - Entry level (less than two years of experience),
  - Journey level (greater than two years of experience),
  - Supervisory level, and
  - Managerial level;
- Number of operation and maintenance staff certified as a certified collection system operator by the California Water Environmental Association (CWEA), with:
  - Corresponding number of certified collection system operator grade levels (Grade I, II, III, IV, and V);
- System information:
  - Miles of system gravity and force mains,
  - Number of upper and lower service laterals connected to system,
  - Estimated number of upper and lower laterals owned and/or operated by the Enrollee,
  - Portion of laterals that is Enrollee's responsibility,
  - Average age the major components of system infrastructure,
  - Number and age of pump stations, and
  - Estimated total miles of the system pipeline not accessible for maintenance;
- Name and location of the treatment plant(s) receiving sanitary sewer system's waste;
- Name of satellite sewer system tributaries;
- Number of system's gravity sewer above or underground crossings of water bodies throughout system;
- Number of force main (pressurized pipe) above or underground crossings of water bodies throughout system;
- Number of siphons used to convey waste throughout the sewer system;
- Miles of sewer system cleaned;
- Miles of sewer system video inspected, or comparable (i.e., video closed-circuit television or alternative inspection methods);
- System Performance Evaluation as specified in section 5.11 (System Performance Analysis) of this General Order;
- Major spill causes (for example, root intrusion, grease deposition);

- System infrastructure failure points (for example, main, pump station, lateral, etc.);
- Ongoing spill investigations; and
- Actions taken to address system deficiencies.

3.10. Sewer System Management Plan Audit Reporting Requirements

The Enrollee shall submit its Sewer System Management Plan Audit and other pertinent audit information, in accordance with section 5.4 (Sewer System Management Plan Audits) of this General Order, to the online CIWQS Sanitary Sewer System Database **by six (6) months after the end of the 3-year audit period**.

If a Sewer System Management Plan Audit is not conducted as required: the Enrollee shall:

- Update the online CIWQS Sanitary Sewer System Database and select the justification for not conducting the Audit; and
- Notify its corresponding Regional Water Board (see Attachment F (Regional Water Quality Control Board Contact Information)) of the justification for the lapsed requirements.

The Enrollee's reporting of a justification for not conducting a timely Audit does not justify non-compliance with this General Order. The Enrollee shall:

- Submit the late Audit as required in this General Order; and
- Comply with subsequent Audit requirements and due dates corresponding with the original audit cycle.

3.11. Sewer System Management Plan Reporting Requirements

For an Existing Enrollee previously regulated by Order 2006-0003-DWQ: **Within every six (6) years after the required due date of its last Plan Update**, the Legally Responsible Official shall upload and certify a local governing entity-approved Sewer System Management Plan Update to the online CIWQS Sanitary Sewer System Database. If the electronic document format or size capacity prevents the electronic upload of the Plan, the Legally Responsible Official shall report an electronic link to its updated Sewer System Management Plan posted on its own website.

Order 2006-0003-DWQ required each enrollee to develop its initial Sewer System Management Plan per the following schedule, with required Plan updates at a frequency of 5-years thereafter:

Systems serving populations: Greater than 100,000: May 2, 2009

Between 100,000 and 10,000: August 2, 2009

Between 10,000 and 2,500: May 2, 2010

Less than 2,500: August 2, 2010

This Order carries forth the previously-required Plan Update schedule per Order 2006-0003-DWQ. Per the six-year Plan Update frequency required in this Order, the Enrollee shall upload and certify its first Plan Update, to the online CIWQS Sanitary Sewer System Database by the following due dates, with subsequent Plan Updates at the frequency of six years thereafter:

Systems serving populations: Greater than 100,000: May 2, 2025

Between 100,000 and 10,000: August 2, 2025

Between 10,000 and 2,500: May 2, 2026

Less than 2,500: August 2, 2026

For a New Enrollee: **Within twelve (12) months of its Application for Enrollment Approval date**, the Legally Responsible Official of a new Enrollee shall upload and certify a local governing entity-approved Sewer System Management Plan to the online CIWQS Sanitary Sewer System Database. If electronic document format or size capacity prevents the electronic upload of the Plan, the Legally Responsible Official shall report an electronic link to its Sewer System Management Plan posted on its own website. The due date for subsequent 6-year Plan updates, is six (6) years from the submittal due date of the new Enrollee's first Sewer System Management Plan.

4. RECORDKEEPING REQUIREMENTS

The Enrollee shall maintain records to document compliance with the provisions of this General Order, and previous General Order 2006-0003-DWQ as applicable, for each sanitary sewer system owned, including any required records generated by an Enrollee's contractor(s).

4.1. Recordkeeping Time Period

The Enrollee shall maintain records of documents required in this Attachment, including records collected for compliance with this General Order, and records collected in accordance with previous General Order 2006-0003-DWQ, for five (5) years.

4.2. Availability of Documents

The Enrollee shall make the records required in this General Order readily available, either electronic or hard copies, for review by Water Board staff during onsite inspections or through an information request.

4.3. Spill Reports

The Enrollee shall maintain records for each of the following spill-related events and activities:

- Spill event complaint, including but not limited to records documenting how the Enrollee responded to notifications of spills. Each complaint record must, at a minimum, include the following information:
    - Date, time, and method of notification,

- Date and time the complainant first noticed the spill, if available,
- Narrative description of the complaint, including any information the caller provided regarding whether the spill has reached surface waters or a drainage conveyance system, if available,
- Complainant's contact information, if available, and
- Final resolution of the complaint;

- Records documenting the steps and/or remedial action(s) undertaken by the Enrollee, using all available information, to comply with this General Order, and previous General Order 2006-0003-DWQ as applicable;
- Records documenting how estimate(s) of volume(s) and, if applicable, volume(s) of spill recovered were calculated;
- All California Office of Emergency Services notification records, as applicable; and
- Records, in accordance with the Monitoring Requirements in this Attachment.

4.4. Recordkeeping of Category 4 Spills and Non-Category 1 Lateral Spills

An Enrollee must maintain the following records for each individual Category 4 spill and for each individual non-Category 1 Enrollee-owned and/or operated lateral spill, and report in accordance to section 3.6 (Annual Certified Spill Reporting of Category 4 and/or Lateral Spills) of this Attachment.

Recordkeeping of Individual Category 4 Spill Information:

1. Contact information: Name and telephone number of Enrollee contact person to respond to spill-specific questions;
2. Spill location name;
3. Description and GPS coordinates for the system location where the spill originated;
4. Did the spill reach a drainage conveyance system? If Yes:
   - Description of drainage conveyance system location,
   - Estimated spill volume fully recovered within the drainage conveyance system, and
   - Estimated spill volume remaining within the drainage conveyance system;
5. Estimated total spill volume exiting the sanitary sewer system;
6. Spill date and start time;
7. Spill cause(s) (for example, root intrusion, grease deposition, etc.);
8. System failure location (for example, main, pump station, etc.);
9. Description of spill response activities including description of immediate spill containment and cleanup efforts;
10. Description of how the volume estimation was calculated, including, at minimum:

- The methodology and type of data relied upon, including supervisory control and data acquisition (SCADA) records, flow monitoring or other telemetry information used to estimate the volume of the spill discharged, and the volume of the spill recovered (if any volume of the spill was recovered), and
- The methodology and type of data relied upon to estimate the spill start time, on-going spill rate at time of arrival (if applicable), and the spill end time;

11. Description of implemented system modifications and operating/maintenance modifications.

Recordkeeping of Individual Lateral Spill Information:

1. Date and time the Enrollee was notified of, or self-discovered, the spill;
2. Location of individual spill;
3. Estimated individual spill volume;
4. Spill cause(s) (for example, root intrusion, grease deposition, etc.); and
5. Description of how the volume estimations were calculated.

Total Annual Spill Information:

1. Estimated total annual spill volume;
2. Description of spill corrective actions, including at minimum:
   - Local regulatory enforcement action taken against the sewer lateral owner in response to a spill, as applicable, and
   - System operation, maintenance and program modifications implemented to prevent repeated spill occurrences at the same spill location.

4.5. Sewer System Telemetry Records

The Enrollee shall maintain the following sewer system telemetry records if used to document compliance with this General Order, and previous General Order 2006-0003-DWQ as applicable, including spill volume estimates:

- Supervisory control and data acquisition (SCADA) system(s);
- Alarm system(s);
- Flow monitoring device(s) or other instrument(s) used to estimate sewage flow rates, and/or volumes;
- Computerized maintenance management system records; and
- Asset management-related records.

4.6. Sewer System Management Plan Implementation Records

The Enrollee shall maintain records documenting the Enrollee's implementation of its Sewer System Management Plan, including documents supporting its Sewer System Management Plan audits, corrections, modifications, and updates to the Sewer System Management Plan.

4.7. Audit Records

The Enrollee shall maintain, at minimum, the following records pertaining to its Sewer System Management Plan audits, and other internal audits:

- Completed audit documents and findings;
- Name and contact information of staff and/or consultants that conducted or involved in the audit; and
- Follow-up actions based on audit findings.

4.8. Equipment Records

The Enrollee shall maintain a log of all owned and leased sewer system cleaning, operational, maintenance, construction, and rehabilitation equipment.

4.9. Work Orders

The Enrollee shall maintain record of work orders for operations and maintenance projects.

ATTACHMENT E2 – SUMMARY OF NOTIFICATION, MONITORING AND REPORTING REQUIREMENTS

This Attachment provides a summary of notification, monitoring and reporting requirements, by spill category, and for Enrollee-owned and/or operated laterals as required in Attachment E1 of this General Order, for quick reference purposes only.

Table E2-1

Spill Category 1: Spills to Surface Waters

Spill Requirement	Due	Method
Notification	**Within two (2) hours** of the Enrollee's knowledge of a Category 1 spill of 1,000 gallons or greater, discharging or threatening to discharge to surface waters: Notify the California Office of Emergency Services and obtain a notification control number.	California Office of Emergency Services at: (800) 852-7550 (Section 1 of Attachment E1)
Monitoring	• Conduct spill-specific monitoring; • Conduct water quality sampling of the receiving water within **18 hours** of initial knowledge of spill of 50,000 gallons or greater to surface waters.	(Section 2 of Attachment E1)
Reporting	• Submit Draft Spill Report **within three (3) business days** of the Enrollee's knowledge of the spill; • Submit Certified Spill Report **within 15 calendar days** of the spill end date; • Submit Technical Report **within 45 calendar days** after the spill end date for a Category 1 spill in which **50,000 gallons or greater** discharged to surface waters; and • Submit Amended Spill Report **within 90 calendar days** after the spill end date.	(Section 3.1 of Attachment E1)

Table E2-2
Spill Category 2: **Spills of 1,000 Gallons or Greater That Do Not Discharge to Surface Waters**

Spill Requirements	Due	Method
Notification	**Within two (2) hours** of the Enrollee's knowledge of a Category 2 spill of 1,000 gallons or greater, discharging or threatening to discharge to waters of the State: Notify California Office of Emergency Services and obtain a notification control number.	California Office of Emergency Services at: (800) 852-7550 (Section 1 of Attachment E1)
Monitoring	Conduct spill-specific monitoring.	(Section 2 of Attachment E1)
Reporting	• Submit Draft Spill Report **within three (3) business days** of the Enrollee's knowledge of the spill; • Submit Certified Spill Report **within 15 calendar days** of the spill end date; and • Submit Amended Spill Report **within 90 calendar days** after the spill end date.	(Section 3.2 of Attachment E1)

Table E2-3
Spill Category 3: Spills of Equal or Greater than 50 Gallons and Less than 1,000 Gallons That Does Not Discharge to Surface Waters

Spill Requirements	Due	Method
Notification	Not Applicable	Not Applicable
Monitoring	Conduct spill-specific monitoring.	(Section 2 of Attachment E1)
Reporting	• Submit monthly Certified Spill Report to the online CIWQS Sanitary Sewer System Database within **30 calendars days** after the end of the month in which the spills occur; and • Submit Amended Spill Reports **within 90 calendar days** after the Certified Spill Report due date.	(Section 3.3 and 3.5 of Attachment E1)

Table E2-4
Spill Category 4: Spills Less Than 50 Gallons That Do Not Discharge to Surface Waters

Spill Requirements	Due	Method
Notification	Not Applicable	Not Applicable
Monitoring	Conduct spill-specific monitoring.	(Section 2 of Attachment E1)
Reporting	• If, during any calendar month, Category 4 spills occur, certify monthly, the estimated total spill volume exiting the sanitary sewer system, and the total number of all Category 4 spills into the online CIWQS Sanitary Sewer System Database, within 30 days after the end of the calendar month in which the spills occurred. • Upload and certify a report, in an acceptable digital format, of all Category 4 spills to the online CIWQS Sanitary Sewer System Database, by February 1st after the end of the calendar year in which the spills occur.	(Section 3.4, 3.6, 3.7 and 4.4 of Attachment E1)

Table E2-5
Enrollee Owned and/or Operated Lateral Spills That Do Not Discharge to Surface Waters

Spill Requirements	Due	Method
Notification	**Within two (2) hours** of the Enrollee's knowledge of a spill of 1,000 gallons or greater, from an enrollee-owned and/or operated lateral, discharging or threatening to discharge to waters of the State: Notify California Office of Emergency Services and obtain a notification control number. Not applicable to a spill of less than 1,000 gallons.	California Office of Emergency Services at: (800) 852-7550 (Section 1 of Attachment E1)
Monitoring	Conduct visual monitoring.	(Section 2 of Attachment E1)
Reporting	• Upload and certify a report, in an acceptable digital format, of all lateral spills (that do not discharge to a surface water) to the online CIWQS Sanitary Sewer System Database, by February 1st after the end of the calendar year in which the spills occur. • Report a lateral spill of any volume that discharges to a surface water as a Category 1 spill.	(Sections 3.6, 3.7 and 4.4 of Attachment E1)

ATTACHMENT F – REGIONAL WATER QUALITY CONTROL BOARD CONTACT INFORMATION

This Attachment provides a map, list of counties, and contact information to assist the Enrollee in identifying the corresponding Regional Water Quality Control Board office, for all Regional Water Board notification requirements in this General Order.

Region 1 -- North Coast Regional Water Quality Control Board:
Del Norte, Glenn, Humboldt, Lake, Marin, Mendocino, Modoc, Siskiyou, Sonoma, and Trinity counties.

RB1SpillReporting@waterboards.ca.gov or (707) 576-2220

Region 2 -- San Francisco Bay Regional Water Quality Control Board:
Alameda, Contra Costa, San Francisco, Santa Clara (Northern most part of Morgan Hill), San Mateo, Marin, Sonoma, Napa, Solano counties.

RB2SpillReports@waterboards.ca.gov or (510) 622-2369

Region 3 -- Central Coast Regional Water Quality Control Board:
Santa Clara (most of Morgan Hill), San Mateo (Southern portion), Santa Cruz, San Benito, Monterey, Kern (small portions), San Luis Obispo, Santa Barbara, Ventura (Northern portion) counties.

CentralCoast@waterboards.ca.gov or (805) 549-3147

Region 4 -- Los Angeles Regional Water Quality Control Board:
Los Angeles, Ventura counties (small portions of Kern and Santa Barbara counties).

rb4-ssswdr@waterboards.ca.gov or (213) 576-6600

Region 5 -- Central Valley Regional Water Quality Control Board:

Rancho Cordova (Sacramento) Office: Colusa, Lake, Sutter, Yuba, Sierra, Nevada, Placer, Yolo, Napa, (North East), Solano (West), Sacramento, El Dorado, Amador, Calaveras, San Joaquin, Contra Costa (East), Stanislaus, Tuolumne counties.

RB5sSpillReporting@waterboards.ca.gov or (916) 464-3291

Fresno Office: Fresno, Kern, Kings, Madera, Mariposa, Merced, and Tulare counties, and small portions of San Benito and San Luis Obispo counties.

RB5fSpillReporting@waterboards.ca.gov or (559) 445-5116

Redding Office: Butte, Glen, Lassen, Modoc, Plumas, Shasta, Siskiyou, and Tehama counties.

RB5rSpillReporting@waterboards.ca.gov or (530) 224-4845

Region 6 -- Lahontan Regional Water Quality Control Board:
Lake Tahoe Office: Alpine, Modoc (East), Lassen (East side and Eagle Lake), Sierra, Nevada, Placer, El Dorado counties.

RB6sSpillReporting@waterboards.ca.gov or (530) 542-5400

Victorville Office: Mono, Inyo, Kern (East), San Bernardino, Los Angeles (North East corner) counties.

RB6vSpillReporting@waterboards.ca.gov or (760) 241-6583

Region 7 -- Colorado River Basin Regional Water Quality Control Board:
Imperial county and portions of San Bernardino, Riverside, San Diego counties.

RB7SpillReporting@waterboards.ca.gov or (760) 346-7491

Region 8 -- Santa Ana Regional Water Quality Control Board:
Orange, Riverside, San Bernardino counties.

RB8SpillReporting@waterboards.ca.gov or (951) 782-4130

Region 9 -- San Diego Regional Water Quality Control Board:
San Diego county and portions of Orange and Riverside counties.

RB9Spill_Report@waterboards.ca.gov or (619) 516-1990

End of Order 2022-0103-DWQ

Appendix B
Santa Clara Municipal Code Excerpts

13.05.100 Violation of this chapter or rules and regulations.

It shall be unlawful for any person to violate the provisions of this chapter or the provisions contained in the Silicon Valley Power rules and regulations, as may be subsequently adopted and amended in the future. (Ord. 1742 § 3, 10-26-99).

13.05.110 Reserved.

(Ord. 1742 § 3, 10-26-99).

13.05.120 Reserved.

(Ord. 1742 § 3, 10-26-99).

13.05.130 Costs of enforcement.

In any civil, criminal, or administrative hearing, appeal or action commenced by the City under this chapter, the City shall be entitled to recover from the defendant of such action reasonable attorney's fees, costs of suit and/or any other costs of enforcement, including, but not limited to, inspection and/or repair costs. (Ord. 1742 § 3, 10-26-99).

Chapter 13.10

SEWERS

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Cross references – Buildings and Construction, SCCC Title 15; Storm Drains and Discharges, Chapter 13.20 SCCC; Water, Chapter 13.15 SCCC.

Article I. General Provisions

13.10.010 Purpose.

(a) Purpose.

(1) To provide for and regulate the disposal of sanitary sewage into the sanitary sewer system of the City in such manner and to such extent as is reasonably necessary to maintain and increase the ability of the sanitary sewer system to handle and dispose of sanitary sewage;

(2) To provide for and regulate the disposal of industrial wastes into the sanitary sewer system of the City in such manner and to such extent as may be reasonably necessary to maintain and increase the ability of such system to handle and dispose of industrial waste without decreasing the ability of said system to handle and dispose of all sanitary sewage;

(3) To prevent the introduction of pollutants into the sanitary sewer system that will pass through the treatment works of the San Jose/Santa Clara Water Pollution Control Plant ("plant") or otherwise be incompatible with such works or interfere with the ability of the plant to treat, discharge, and recycle wastewater, or to use or dispose of plant biosolids;

(4) To improve opportunities to recycle and reclaim treated effluent and wastewater sludge;

(5) To protect the physical structures of the sanitary sewer system and the efficient functioning of its component parts;

(6) To protect the City and its personnel;

(7) To preserve and protect the health, safety, and property of the public;

(8) To enable the City to comply with all applicable and compatible laws, rules, regulations, and orders of the State of California and of the United States;

(9) To provide for the charging and collection of various fees and other charges reasonably necessary for the acquisition, construction, reconstruction, maintenance, and operation of the sanitary sewer system of the City;

(10) To protect the environmental health of San Francisco Bay.

(b) Conflicts with Other Chapters of This Code. In the event of any conflicts or inconsistencies between the provisions of this chapter and the provisions of any other chapter of this Code, the provisions of this chapter shall control.

(c) Responsibility for Enforcement. The primary responsibility for enforcement of the provisions of this chapter shall be vested in the City Manager or his/her designee. (Ord. 1901 § 2, 11-27-12).

13.10.020 Definitions.

The definitions set forth below shall govern the application and interpretation of this chapter.

(a) "A" definitions:

(1) "Amalgam separator" means a device that: employs filtration, settlement, centrifugation, or ion exchange to remove dental amalgam and its metal constituents from a dental office vacuum system before it discharges to the sanitary sewer; has been certified under the International Organization for Standardization's standard for amalgam separators as capable of removing a minimum of ninety-five percent (95%) of dental amalgam at flow rates comparable to the flow rate of the actual vacuum suction system in operation; and does not have any automatic flow bypass.

(2) "Ammonia" means the form of nitrogen that is chemically definable as NH_3.

(3) "Audit protocols" means the procedures to be followed in performing flow and pollutant audit studies.

(4) "Average concentration" means the concentration of a pollutant in an industrial user's discharge that is calculated by adding the concentrations of the particular pollutant in all composite samples taken during a given time period, including, but not limited to, self-monitoring samples, and dividing the total by the number of samples taken.

(b) "B" definitions:

(1) "Batch discharge" means the discharge of wastewater resulting from an intermittent treatment process in which an identified amount of process wastewater is collected, treated to meet discharge standards, and released to the sanitary sewer system.

(2) "Best management practices" means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the introduction of pollutants to the sanitary sewer system that have been determined by the Director to be cost-effective for particular industry groups, business types, or specific industrial processes.

(3) "Biochemical oxygen demand" means the quantity of oxygen expressed in parts per million (ppm) by weight, utilized in the biochemical oxidation of organic matter under standard laboratory conditions for five days at a temperature of twenty degrees centigrade (20º C).

(c) "C" definitions:

(1) "Categorical industrial user" or "CIU" means a source performing any categorical process subject to Federal pretreatment standards, as described in 40 CFR Sections 405 through 471, as amended from time to time, that has any connection to the sanitary sewer system.

(2) "Categorical pretreatment standard" or "categorical standard" means any regulation containing pollutant discharge limits promulgated by EPA that apply to specific categories of users and which appear in 40 CFR Sections 405 through 471, as amended from time to time.

(3) "Code of Federal Regulations" (or "CFR") refers to the Code of Federal Regulations as published by the Office of the Federal Register National Archives and Records Administration. Whenever a reference is made to any portion of the CFR, or to any other Federal regulation, such reference shall apply to all amendments and additions to such portion of said regulations now or hereinafter enacted.

(4) "Composite sample" means a flow-proportional or time-proportional sample, which accurately represents the average pollutant concentration discharged during a continuous time period. A composite sample may be obtained manually or automatically, and it may be taken discretely or continuously. For manual composite sampling, at least six individual samples from each sample point shall be combined and mixed to obtain one composite sample; flow-proportion may be obtained either by varying the time interval between each discrete sample or the volume of each discrete sample.

(5) "Critical user" means a discharger whose wastewater contains priority pollutants, or who discharges any waste which has the potential to cause interference in concentration above those allowed in this chapter and/or who discharges in excess of one hundred thousand (100,000) gallons per day.

(d) "D" definitions:

(1) "Diluting waters" means noncontact cooling water, boiler blowdown, domestic sewage, groundwater, stormwater, surface drainage, reverse osmosis reject, water softener regeneration, potable waters, or any other waters that are not part of an industrial process and that do not contain priority pollutants but are combined with industrial wastewater prior to the monitoring point for industrial wastewater discharge. "Diluting

waters" also includes excess water used in production processes, such as rinse tanks or rinse water running when in production in excess of operational or quality requirements.

(2) "Director," for purposes of this chapter, shall mean the Director of Water and Sewer Utilities or his/her designee.

(3) "Discharger" means any person discharging wastewater into the sanitary sewer system.

(4) "Domestic wastewater" means wastewater from private residences and other premises resulting from the use of water for personal washing, sanitary purposes and/or the elimination of human wastes and related matter.

(e) "E" definitions:

(1) "Existing source" means any source of discharge that is not a new source.

(f) "F" definitions:

(1) "Food service establishment" means a user that prepares and/or sells food for consumption either on or off the premises or washes utensils or dishes on premises that may contribute grease to the sewer system, including, but not limited to, restaurants, sandwich shops, delicatessens, bakeries, cafeterias, markets, bed and breakfast inns, motels, hotels, meeting halls, caterers, retirement and nursing homes or pizzerias. The term, as used in this chapter, does not refer to food stores or establishments that do not prepare food on premises and do not process food in a manner which may contribute grease to the sewer system.

(g) "G" definitions:

(1) "Garbage" means wastes from the preparation, cooking, and dispensing of foods, and from the handling, storage, and sale of produce.

(2) "Grab sample" means a single discrete sample collected at a particular time and place that represents the composition of the waste stream only at that time and place.

(3) "Grease" means liquid or other waste containing floatable and/or dispersed grease, vegetable oil, petroleum oil, nonbiodegradable cutting oil, or fat, oil or grease products of animal, vegetable or mineral origin which is detectable and measurable using analytical test procedures established in the United States Code of Federal Regulations, 40 CFR Section 136.

(4) "Grease control device" means a grease interceptor, grease trap, mechanical grease removal device or other device approved for use by the Director.

(5) "Grease interceptor" means a large tank installed underground and designed to collect and control solid-food wastes and floating grease from wastewater prior to discharge into the sanitary sewer collection system. Grease interceptors are normally installed outside the building and use gravity to separate grease from the wastewater as it moves from one compartment of the interceptor to the next.

(6) "Grease trap" means a device placed under or in close proximity to sinks or other fixtures likely to discharge grease in an attempt to separate, trap and hold oil and grease substances.

(h) Reserved for future use.

(i) "I" definitions:

(1) "Industrial user" means any nonresidential user that discharges industrial wastes to the sanitary sewer system.

(2) "Industrial wastes" means the wastes from producing, manufacturing, and processing operations of every kind and nature.

(3) Interference.

(A) "Interference" means a discharge that, alone or in conjunction with a discharge or discharges from other sources, inhibits or disrupts the processes or operation of the sanitary sewer system, including the plant, or causes or significantly contributes to a violation of any requirement of the National Pollutant Discharge Elimination System (NPDES) permit, which is a permit issued to the City pursuant to Section 402 of the Clean Water Act.

(B) "Interference" also includes prevention of biosolids use or disposal by the plant in accordance with published regulations providing guidelines under Section 405 of the Federal Clean Water Act (33 U.S.C. Sections 1251 through 1387) or in regulations developed pursuant to the Solid Waste Disposal Act (SWDA) (42 U.S.C. Section 6901 et seq.), the Toxic Substances Control Act (15 U.S.C. Sections 2601 through 2654), or more stringent State regulations (including those contained in any State biosolids management plan prepared pursuant to Title IV of SWDA) applicable to the method of disposal or use employed by the plant.

(j) Reserved for future use.

(k) Reserved for future use.

(l) "L" definitions:

(1) "Low flow discharger" means an industrial discharger whose average process flow, as shown on the discharger's application to discharge and as measured as a rolling six-month average, is less than one thousand (1,000) gallons per day.

(m) "M" definitions:

(1) "Maximum allowable concentration" means the highest permissible concentration or other measure of pollutant magnitude taken at a specific point in time.

(2) "Mechanical grease removal device" means a power operated device or combination of devices using electrical equipment to heat, filter, siphon, skim or otherwise separate and retain floating grease and solid food waste prior to the wastewater exiting the trap and entering the sanitary sewer collection system.

(n) "N" definitions:

(1) "New source" means:

(A) Any building, structure, facility or installation from which there is (or may be) a discharge of pollutants, the construction of which commenced after the publication of proposed pretreatment standards under Section 307(c) of the Clean Water Act that will be applicable to such source if such standards are thereafter promulgated in accordance with that section; provided, that:

(i) The building, structure, facility, or installation is constructed at a site at which no other source is located; or

(ii) The building, structure, facility or installation totally replaces the process or production equipment that causes the discharge of pollutants at an existing source; or

(iii) The production or wastewater generating processes of the building, structure, facility or installation are, in the sole judgment of the Director, substantially independent of an existing source at the same site. In determining whether these are substantially independent, factors such as the extent to which the new facility is integrated with the existing plant, and the extent to which the new facility is engaged in the same general type of activity as the existing source, should be considered.

(B) Construction on a site at which an existing source is located results in a modification rather than a new source if the construction does not create a new building, structure, facility, or installation meeting the criteria of subsection (n)(1)(A)(ii) or (iii) of this section but otherwise alters, replaces, or adds to existing process or production equipment.

(C) Construction of a new source as defined under this definition has commenced if the owner or operator has:

(i) Begun, or caused to begin, as part of a continuous on-site construction program:

a. Any placement, assembly or installation of facilities or equipment; or

b. Significant site preparation work, including clearing, excavating, or removal of existing buildings, structures, or facilities, which is necessary for the placement, assembly, or installation of new source facilities or equipment; or

(ii) Entered into a contractual obligation for the purchase of facilities or equipment which are intended to be used in its operation within a reasonable time. Options to purchase or contracts which can be terminated or modified without substantial loss, and contracts for feasibility, engineering, and design studies do not constitute a contractual obligation under this subsection.

(o) "O" definitions:

(1) "Owner" means any person who owns private premises that contain a source as defined in this section.

(2) "Operator" means any person who owns, leases, operates, controls, or supervises a source as defined in this section.

(p) "P" definitions:

(1) "Pass-through" means a discharge which exits the plant into waters of the United States in quantities or concentrations which, alone or in conjunction with a discharge or discharges from other sources, is a cause of a violation of any requirement of the plant's NPDES permit, including an increase in the magnitude or duration of a violation.

(2) "pH" means the logarithm of the reciprocal of the concentration of hydrogen ions in moles per liter of solution.

(3) "Plant" means the San Jose/Santa Clara Water Pollution Control Plant.

(4) "Pretreatment standard" means prohibited discharge standards, categorical pretreatment standards, and local limits.

(5) "Priority pollutants" means all pollutants as defined by the "General Pretreatment Regulations" of the Environmental Protection Agency, found at Title 40, Chapter 1, Subchapter W, Parts 401 and 403 of the Code of Federal Regulations.

(6) "Process flow" means the daily, twenty-four (24)-hour flow of wastewater from any kind or nature of production, manufacturing, or processing operation, including industrial and commercial operations where water is used for the removal of any type of waste other than sanitary sewage. Process flow does not include diluting waters.

(q) Reserved for future use.

(r) "R" definitions:

(1) "Reasonable control measures" means control technologies, best management practices, source control practices, and waste-minimization procedures that prevent or reduce the introduction of pollutants to the sanitary sewer system and are determined by the Director to be cost-effective for particular industry groups, business types, or specific industrial processes.

(s) "S" definitions:

(1) "Sanitary sewage" means water-carried wastes from residences, business buildings, institutions, and industrial establishments, excluding ground, surface, and stormwaters, subsurface drainage, and also excluding industrial waste.

(2) "Sanitary sewer overflow" is any overflow, spill, release, discharge or diversion of untreated or partially treated wastewater from a sanitary sewer system, including overflows or releases that reach waters of the United States, overflows or releases that do not reach waters of the United States, and backups into buildings and/or private property caused by conditions within the publicly owned portion of the sewer system.

(3) "Sanitary sewer system" means all sewers, treatment plants, and other facilities owned or operated by the City for carrying, collecting, pumping, treating, and disposing of sanitary sewage and industrial wastes.

(4) "Sewer" means a pipe or conduit for carrying sewage.

(5) "Sewer lateral" (same as "sewer service lateral") means the sewer connection piping used to convey sewage from a building or facility on a parcel (private or public property) to the City-owned sewer main. Each sewer lateral is owned by the entity that owns the property or facility from which that sewer lateral serves to convey sewage.

(6) "Significant change" means any change in an industrial user's operation that results in any of the following:

(A) A flow that exceeds the expected peak flow as shown in the sewage treatment plant connection allocation for the property on which the industrial user is located.

(B) An increase or decrease in annual average process flow of twenty-five percent (25%) over the standard discharger's average process flow for the discharger's most immediate preceding twelve (12) months.

(C) An increase or decrease in annual average process flow that results in a change from low flow discharger to standard discharger or from standard discharger to low flow discharger.

(D) An increase or decrease in annual average process flow that results in a change from nonsignificant industrial user to significant industrial user or from significant industrial user to nonsignificant industrial user.

(E) An increase or decrease in annual production rate of twenty-five percent (25%) for any industrial user subject to production-based limits over the industrial user's production rate for the most immediate preceding twelve (12) months.

(F) Adding of deleting process discharge or sample points.

(7) "Significant industrial user" means:

(A) An industrial user that has processes subject to categorical pretreatment standards; or

(B) An industrial user that:

(i) Discharges an average of twenty-five thousand (25,000) gpd or more of process wastewater to the sanitary system (excluding sanitary, noncontact cooling and boiler blowdown wastewater); or

(ii) Contributes a process wastestream which makes up five percent or more of the average dry weather hydraulic or organic capacity of the plant; or

(iii) Is designated as such by the Director on the basis that it has a reasonable potential for adversely affecting the plant's operation or for violating any pretreatment standard or requirement.

(8) An industrial user is in "significant noncompliance" if it has a violation or violations meeting one or more of the following criteria:

(A) Chronic violations of wastewater discharge limits defined here as those in which sixty-six percent (66%) or more of all the measurements taken during a six-month period exceed (by any magnitude) a numeric pretreatment standard or requirement, including instantaneous limits, as defined by 40 CFR Section 403.3(l);

(B) Technical review criteria (TRC) violations, defined here as those in which thirty-three percent (33%) or more of all the measurements for each pollutant parameter taken during a six-month period equal or exceed the product of the numeric pretreatment standard or requirement including instantaneous limits, as defined by 40 CFR Section 403.3(l), multiplied by the applicable TRC (TRC equals 1.4 for BOD, TSS, fats, oil and grease, and 1.2 for all other pollutants except pH);

(C) Any other violation of a pretreatment standard or requirement as defined by 40 CFR Sec-

tion 403.3(l) (daily maximum, long-term average, instantaneous limit, or narrative standard) that the Director determines has caused, alone or in combination with other discharges, interference or pass-through (including endangering the health of the Director personnel or the general public);

(D) Any discharge of a pollutant that has caused imminent endangerment to human health, welfare or to the environment or has resulted in the plant's exercise of its emergency authority to halt or prevent such a discharge;

(E) Failure to meet, within ninety (90) days after the scheduled due date, a compliance schedule milestone contained in a discharge permit or enforcement order for starting construction, completing construction, or attaining final compliance;

(F) Failure to provide, within forty-five (45) days after the due date, required reports such as baseline monitoring reports, ninety (90)-day compliance reports, periodic self-monitoring reports, and reports on compliance with compliance schedules;

(G) Failure to accurately report noncompliance; and

(H) Any other violation or group of violations, which may include a violation of reasonable control measures, which the Director determines will adversely affect the operation or implementation of the pretreatment program.

(9) "Slug load" or "slug discharge" means any discharge of a nonroutine, episodic nature, including but not limited to an accidental spill or noncustomary batch discharge, which has a reasonable potential to cause interference or pass-through or in any other way cause a violation of the provisions of this chapter or applicable permit conditions.

(10) "Source" means any building, structure, facility or installation from which there is or may be a potential as determined by the Director to discharge pollutants above the local limits included in this chapter or State or Federal limits or wastewater of such volume or strength that it may cause interference, pass-through or operational problems in the sanitary sewer system or at the San Jose/Santa Clara Water Pollution Control Plant.

(11) "Standard discharger" means any industrial discharger who is not a low flow discharger.

(12) Standard Methods.

(A) "Standard methods" means the procedures set forth in the Code of Federal Regulations, unless the use of another method for the analysis of industrial wastewater has been approved in writing in advance by the Director.

(B) All analyses shall be performed by a laboratory certified by the State for the specific pollutants and matrix to be analyzed, unless otherwise approved in writing, by the Director, prior to performance of a sample analysis.

(13) "Stormwaters" means the flow across any surface or in storm sewers resulting from rainfall.

(14) "Suspended solids" means solids that either float on the surface of, or are in suspension in, water, sewage, or other liquids and that are removable by laboratory filtering.

(t) "T" definitions:

(1) "Total toxic organics (TTOs)" are the sum of the concentrations for each of the regulated toxic organic compounds listed at Title 40, Chapter 1, Subchapter W, Part 401, Section 401.15 CFR and are found in the discharge at a concentration greater than ten micrograms per liter. Some categorical standards (40 CFR Sections 405 through 471) list the specific toxic organic compounds that are to be included in the summation.

(2) "Trucked or hauled waste" means any waste discharged into the sanitary sewer system after being placed in a motorized vehicle for removal from the location where the waste was generated or produced.

(u) "U" definitions:

(1) "User" means any person responsible for payment of sewer service charges.

(v) Reserved for future use.

(w) Reserved for future use.

(x) Reserved for future use.

(y) "Y" definitions:

(1) "Yellow grease" means grease which is associated with food preparation or processing, which has not been contaminated with wash water or chemicals, or by being spilled or otherwise contaminated.

(z) "Z" definitions:

(1) "Zero discharger" or "ZDC" means an industrial facility that performs any categorical process subject to Federal pretreatment standards, as described in 40 CFR 405 through 471, that has any connection to the sanitary sewer system, but does not discharge wastewater from the categorical process to the sanitary sewer. (Ord. 1901 § 2, 11-27-12).

Article II. Sewer Connection Procedures and Service Charges

13.10.030 Duty to connect premises with sewer system.

No person owning any premises within the city, and no user of any premises within the city, where domestic or industrial waste is produced and on which premises the nearest outlet of the plumbing system is located within two hundred (200) feet from the point at which a connection can be made to the sewer system, or having no plumbing system, but in which a plumbing system could be installed with the nearest outlet located within two hundred (200) feet from the point at which a connection could be made to the sewer system, shall use any means of sewage waste disposal other than through the City sewer lines. Every person owning any premises or every use of any premises so located and upon or in which any such sewage waste is produced shall be required to connect such premises to the sewer system within sixty (60) days from the date when a main sewer or lateral sewer located within the distance specified in this section is completed and available for connection to such premises. There shall be a separate connection to the sewer system for each building or structure served. Pursuant to a written permit from the Director, any two or more buildings or structures on the same lot may be served by one sewer connection. (Ord. 1901 § 2, 11-27-12).

13.10.040 Maintenance and inspection of sewer connections.

Each user shall keep his/her sewer connections and sewer lateral(s) in good order at his/her own expense and shall be liable for all damages resulting from failure to do so. Each owner shall maintain their sewer lateral free from displaced joints, open joints, root intrusions, substantial deterioration of pipe material, cracks, leaks, inflow or infiltration of extraneous water, grease and sediment deposits or other similar conditions, defects, or obstructions likely to cause or increase the chance of blockage. A City inspector shall be admitted at all reasonable hours to any premises connected with the sewer system, for the purpose of checking plumbing fixtures, protecting the rights of the City, and determining facts relevant to the establishment, computation, and billing of the sewer service charges provided for in this chapter, including, in the case of industrial users, examination of the users' books for the purpose of checking the quantities of industrial waste produced. (Ord. 1901 § 2, 11-27-12).

13.10.050 Permit required to connect with sanitary sewer system – Generally – Fees.

No person whose premises are not now connected with the sewer system shall connect any premises or cause any premises to be connected with the sewer system without first obtaining a written permit to do so from the City and paying the established connection fees. (Ord. 1901 § 2, 11-27-12).

13.10.060 Purpose and use of funds received.

All revenue collected pursuant to the provisions of this article shall be placed into the utilities fund as established by Section 1320 of the City Charter. Said revenue shall be used in accordance with the provisions of Section 1320 of the City Charter. (Ord. 1901 § 2, 11-27-12).

13.10.070 Connection fee schedule.

Wherever a property is initially connected, or requires an addition of a new connection to the sewer system, a sewage treatment plant expansion calculation fee ("sewer connection fee") shall be charged to and paid for by the property owner in accordance with SCCC 17.15.210. (Ord. 1901 § 2, 11-27-12).

13.10.080 Outlet charge for connection to off-site sewer trunk lines, etc.

In addition to the aforesaid sewer connection fee, each property owner or the developer of real property shall pay to the City an outlet charge as delineated in SCCC 17.15.210. (Ord. 1901 § 2, 11-27-12).

13.10.090 Rates – Users within the city.

(a) There is hereby levied and assessed against and upon all premises having (or required by this chapter or any ordinance of the City to have) any sewer connection with or discharging (or required thereby to discharge) into or through the sanitary sewer system of City, a monthly sewer service charge.

(b) The City Council may, by resolution, establish and amend the monthly sewer service charges. Said resolution(s) shall contain the effective date of any change in the monthly sewer service charge.

(c) The resolution(s) establishing and amending the monthly sewer service charges shall be kept

on file and made available to the public at the City Clerk's office. (Ord. 1901 § 2, 11-27-12).

13.10.100 Rates exclusive of taxes.

The rates herein are exclusive of the monthly utility excise tax prescribed in Chapter 3.30 SCCC and all other prescribed sewer-related fees and charges. (Ord. 1901 § 2, 11-27-12).

13.10.110 Users outside the city.

(a) The City Council may, by resolution, set and fix monthly sewer service charges for various types of users located outside the city that discharge sewage and other wastes into the sanitary sewer system of the City. Such charges will be effective upon adoption of such resolution(s).

(b) Notwithstanding any other provisions of this chapter, the City Council shall have power to establish, by resolution or by agreement with the user, the monthly sewer service charges applicable to any person or any user outside the city limits, at rates different from those set forth in this chapter, as long as the charges so established are fair and equitable under the circumstances. (Ord. 1901 § 2, 11-27-12).

13.10.120 Users obtaining water supply from other than the City to install separate meters.

Where any of the charges enumerated in SCCC 13.10.090 are based upon the consumption of water by any users, and any such water is furnished otherwise than from the City's water system, and no approved meter is installed in the sewer service connection, then such user shall at his/her own expense install a separate water meter for measurement of such water. Said water meter installation shall be made to comply with all requirements of the Director. (Ord. 1901 § 2, 11-27-12).

13.10.130 Purpose and use of funds received.

All revenue collected pursuant to the provisions of this article shall be placed into the utilities fund as established by Section 1320 of the City Charter.

Said revenue shall be used in accordance with the provisions of Section 1320 of the City Charter. (Ord. 1901 § 2, 11-27-12).

13.10.140 Issuance of bills – Information required.

All bills for sewer charges shall be issued by the City's Department of Finance. They shall be combined with bills or statements for water service rendered by the water system in all cases where the premises in question are connected to the water system. The bills shall (a) state their purpose, (b) give the name and last known address of the person responsible for payment as provided in this chapter, and (c) list separately the charge for water service, for sewer service, and the total charge for both services. Neither charge may be paid separately from the other. If premises with sewer service are not connected with the water system, a separate bill shall be rendered. All bills shall be for monthly periods or for such other period as shall be determined by resolution of the City Council. (Ord. 1901 § 2, 11-27-12).

13.10.150 Delinquent accounts.

The City Manager shall ensure enforcement of this chapter by coordinating the actions of the Director of Finance, the Director, and the other City officers or departments concerned. (Ord. 1901 § 2, 11-27-12).

13.10.160 Notice – Disconnection from water system.

In the event of a violation of any provision of this chapter, or any rule or regulation established pursuant thereto, the Director, in writing, shall notify the person causing, allowing, or committing such violation, specifying the violation and, if applicable, the time after which, upon failure of such person to prevent or rectify the violation, the Director will exercise his/her authority to disconnect the premises from the water system or the sewer system. Such time shall not be less than five days after the deposit of such notice in a United States Post Office in the city, addressed to the person upon whom notice is given. In the event such violation results in a public hazard or menace, the Director or other authorized representative may enter upon the premises without notice and do such things and expend such sums as may be necessary to abate such hazard. The reasonable value of the things done and the amounts expended in so doing shall be a charge upon the person in violation. (Ord. 1901 § 2, 11-27-12).

Article III. Sewer Use Regulations

Part 1. Discharge Regulations and General Prohibitions

13.10.170 Limitations on point of discharge.

No person shall discharge any substances directly into a manhole or other opening in a City

sewer, other than through a City-approved sewer connection. (Ord. 1901 § 2, 11-27-12).

13.10.180 Discharge into storm drain prohibited.

It shall be unlawful to discharge any sewage, industrial waste, or other polluted waters into any storm drain or natural outlet or channel without a valid National Pollutant Discharge Elimination System (NPDES) permit. (Ord. 1901 § 2, 11-27-12).

13.10.190 Regulation of trucked or hauled waste.

No person shall discharge, cause, allow, or permit any trucked or hauled waste to be discharged into the sanitary sewer system, except at a site specifically designated in a wastewater discharge permit issued pursuant to this chapter. (Ord. 1901 § 2, 11-27-12).

13.10.200 Protection from accidental discharge.

(a) Each industrial user shall provide protection from accidental discharge of prohibited materials or other wastes regulated by this chapter into either the storm sewer or the sanitary sewer system.

(b) Facilities to prevent accidental discharge of prohibited materials shall be provided and maintained at the industrial user's expense.

(c) All industrial users shall notify the City by telephone or in person within one hour of becoming aware of accidentally discharging wastes of reportable quantities as determined in Title 40, Chapter 1, Subchapter D, Part 117 CFR, or discharge of any substance which, if otherwise disposed to, would be hazardous waste under 40 CFR Part 261, to enable countermeasures to be taken by the City to minimize damage to the sanitary sewer system, the plant, the treatment processes, and/or the receiving waters. If hazardous waste is discharged, the industrial user shall be subject to all requirements in 40 CFR Section 403.12(p).

(d) Within five days of the date of occurrence a detailed written statement describing the causes of the accidental discharge and the measures being taken to prevent future occurrences shall be provided to City.

(e) Notification to the City will not relieve industrial users of notification requirements under any other Federal, State, or local law, nor of liability for any expense, loss, or damage to the sanitary sewer system, plant, or treatment process or receiving waters, or for any fines or penalties imposed on the City on account thereof under applicable provisions of State or Federal law.

(f) All permitted facilities must maintain a spill control plan for protection against accidental discharges, including but not limited to berming of chemicals and waste materials. The review of such plans and procedures shall not relieve the industrial user from the responsibility of modifying the facility as necessary to provide the protection necessary to meet the requirements of this Code or other State or Federal regulations.

(g) This plan must be reviewed and revised as needed within thirty (30) days after an accidental discharge has occurred or as required by the Director. (Ord. 1901 § 2, 11-27-12).

13.10.210 Pretreatment by owner.

Each owner shall, at the owner's expense, provide such treatment or take such other measures, as the Director may require to prevent accidental discharge, reduce objectionable characteristics, contents, or rate of discharge of waters or waste being deposited in the sanitary sewer system, to prevent damage to or interference with the sanitary sewer system. (Ord. 1901 § 2, 11-27-12).

13.10.220 Monitoring facilities.

(a) The Director may require any industrial user of the sanitary sewer system to construct, at the industrial user's own expense and at an approved location, monitoring facilities to allow inspection, sampling and flow measurement of the building sewer or internal drainage systems.

(b) The monitoring facilities, sampling and measurement equipment, and access thereto, shall be maintained at all times in a safe and proper operating condition at the expense of the discharger.

(c) Any required monitoring facilities shall be specified in the wastewater discharge permit issued pursuant to this chapter.

(d) A sample box shall be designed in such a way as to retain sufficient wastewater in the sample box at all times to allow sample collection representative of the last wastewater discharge. (Ord. 1901 § 2, 11-27-12).

Part 2. Prohibited Discharges, Substances

13.10.230 Storm and other waters.

(a) No person shall discharge, cause, allow, or permit any stormwater, surface water, ground water, subsurface drainage or roof runoff to be discharged into the sanitary sewer system or any part thereof without a wastewater discharge permit.

(b) A wastewater discharge permit for the discharge of ground water, subsurface drainage, surface water, roof water or stormwater shall only be issued if there is no reasonable alternative method for disposal of such water.

(c) If permitted, discharge of ground water or subsurface drainage, surface water, roof water or stormwater shall be subject to all applicable requirements of this chapter, including, but not limited to, the payment of applicable permit fees and such terms and conditions as the Director may impose in the wastewater discharge permit. (Ord. 1901 § 2, 11-27-12).

13.10.240 Obstructing or injurious substances.

No person shall discharge, cause, allow, or permit to be discharged, thrown, or deposited into the sanitary sewer system, or any part thereof, or into any plumbing fixture or private sewer or drain connected either directly or indirectly to the sanitary sewer system, any substance of any kind whatsoever tending to obstruct or injure the sanitary sewer system, or to cause a nuisance or hazard, or which will in any manner interfere with the proper operation or maintenance of the sanitary sewer system. (Ord. 1901 § 2, 11-27-12).

13.10.250 Flammable or explosive substances.

No person shall discharge, cause, allow, or permit to be discharged into the sanitary sewer system, or any part thereof, any wastewater containing any flammable liquid, solid, vapor, or gas, or any other substance, including, but not limited to, any substance having a closed cup flashpoint of less than one hundred forty (140) degrees Fahrenheit or sixty (60) degrees Celsius, using the test methods specified in 40 CFR Section 261.21. (Ord. 1901 § 2, 11-27-12).

13.10.260 Hot substances.

No person shall discharge, cause, allow, or permit to be discharged into the sanitary sewer system, or any part thereof, any liquid, solid, vapor, gas, or thing having or developing a temperature of one hundred fifty (150) degrees Fahrenheit or more, or that may cause the temperature at the plant to exceed one hundred four (104) degrees Fahrenheit. (Ord. 1901 § 2, 11-27-12).

13.10.270 Grease, oils, fats.

(a) No person shall discharge, cause, allow, or permit to be discharged into the sanitary sewer system any liquid or other waste containing grease in excess of one hundred fifty (150) parts per million by weight.

(b) No person shall discharge, cause, allow, or permit any grease discharge from a food service establishment into the sanitary sewer system, unless such discharge has first been processed through an approved grease control device.

(c) No person shall discharge, cause, allow, or permit to be discharged any yellow grease, or any waste or material mixed with yellow grease, into the sanitary sewer system from a food service establishment. No yellow grease from a food service establishment shall be mixed with grease trap or grease interceptor waste. (Ord. 1901 § 2, 11-27-12).

13.10.280 Solid or viscous matter.

No person shall discharge, deposit, throw, or cause to be discharged, deposited, or thrown into the sanitary sewer system, or any part thereof, any ashes, cinders, pulp, paper, sand, cement, mud, straw, shavings, metal, glass, rags, feathers, tar, asphalt, resins, plastics, wood, animal hair, paunch manure, or any heavy solid or viscous substance capable of causing obstruction to the flow in the sanitary sewer system, or any part thereof, or that would interfere with the proper operation of the plant or the treatment of sanitary sewage or industrial waste. (Ord. 1901 § 2, 11-27-12).

13.10.290 Corrosive matter.

No person shall discharge, cause, allow, or permit to be discharged into the sanitary sewer system, or any part thereof, any liquid, solid, vapor, gas, or thing having a pH lower than 6.0 or equal to or greater than 12.5, or having any other corrosive property capable of causing damage or hazard to the sanitary sewer system, or any part thereof, or to any personnel operating, maintaining, repairing, or constructing said sanitary sewer system, or any part thereof, or working in or about the sanitary sewer system. (Ord. 1901 § 2, 11-27-12).

13.10.300 Toxic gases, vapors or fumes.

No person shall discharge, cause, allow, or permit to be discharged into the sanitary sewer system, or any part thereof, any substance of any kind whatsoever that results in the presence of toxic gases, vapors, or fumes within the sanitary sewer system in a quantity that may cause acute health and/or safety problems for workers in the sanitary sewer system. (Ord. 1901 § 2, 11-27-12).

13.10.310 Interfering substances.

(a) No person shall discharge, cause, allow, or permit to be discharged into the sanitary sewer system, or any part thereof, any industrial waste containing any of the following toxic substances exceeding the concentrations set forth in Table A.

(b) No person shall discharge, cause, allow, or permit to be discharged into the sanitary sewer system, or any part thereof, any toxic or poisonous substances or any other pollutant, including biochemical oxygen demand, in sufficient quantity to:

(1) Injure or cause an interference with the sewage treatment process;

(2) Constitute a hazard to humans or animals;

(3) Create a hazard for humans or aquatic life in any waters receiving effluent from the sanitary sewer system; or

(4) Create a hazard in the use or disposal of sewage sludge.

(c) All samples, both grab and composite, shall demonstrate compliance with the limits in Table A.

(d) Any industrial user that violates any of the interfering substances limits must resample and submit sample reports for all pollutants in violation of any applicable limits or any other pollutants as required by the Director within thirty (30) days of becoming aware of the violation.

TABLE A

INTERFERING SUBSTANCES

Toxic Substance	Standard Discharger Maximum Allowable Concentration		Low Flow Discharger Maximum Allowable Concentration	
Antimony	5.0	mg/l	5.0	mg/l
Arsenic	1.0	mg/l	1.0	mg/l
Beryllium	0.75	mg/l	0.75	mg/l
Cadmium	0.7	mg/l	0.7	mg/l
Chromium, total	1.0	mg/l	1.0	mg/l
Copper	2.3	mg/l	2.7	mg/l
Cyanides	0.5	mg/l	0.5	mg/l
Lead	0.4	mg/l	0.4	mg/l
Mercury	0.010	mg/l	0.010	mg/l
Nickel	0.5	mg/l	2.6	mg/l
Phenol and derivatives	30.0	mg/l	30.0	mg/l

TABLE A

INTERFERING SUBSTANCES (Continued)

Toxic Substance	Standard Discharger Maximum Allowable Concentration		Low Flow Discharger Maximum Allowable Concentration	
Selenium	1.0	mg/l	1.0	mg/l
Silver	0.7	mg/l	0.7	mg/l
Zinc	2.6	mg/l	2.6	mg/l

(Ord. 1901 § 2, 11-27-12).

13.10.320 Prohibition on use of diluting waters.

No industrial user shall ever increase the use of process water, or in any way use diluting waters as a partial or complete substitute for adequate treatment, or to meet local limits or achieve compliance with a discharge limitation unless expressly authorized by an applicable pretreatment standard or requirement. (Ord. 1901 § 2, 11-27-12).

13.10.330 Suspended solids – Dissolved matter.

No person shall discharge, cause, allow, or permit to be discharged into the sanitary sewer system, or any part thereof, any liquid containing suspended solids or dissolved matter of such character and quantity that unusual attention or expense is required to handle, process, or treat such matter at the plant. (Ord. 1901 § 2, 11-27-12).

13.10.340 Noxious or malodorous matter.

No person shall discharge, cause, allow, or permit to be discharged into the sanitary sewer system, or any part thereof, any solid, liquid, vapor, gas, or thing that is so malodorous or noxious that its discharge into the sanitary sewer system would cause a public nuisance. (Ord. 1901 § 2, 11-27-12).

13.10.350 Radioactive matter.

No person shall discharge, cause, allow, or permit to be discharged any radioactive waste into the sanitary sewer system, except that:

(a) Persons authorized to use radioactive materials by the State Department of Health Services or other governmental agency empowered to regulate the use of radioactive materials may discharge, cause to be discharged, or permit to be discharged such wastes; provided, that such wastes are dis-

charged in strict conformance with the California radiation control regulations (California Code of Regulations, Title 17, Division 1, Chapter 5, Subchapter 4 (entitled "Radiation") et seq.) and Federal regulations and recommendations for safe disposal of such radioactive wastes; and

(b) The person so acting does so in compliance with all applicable rules and regulations of all other regulatory agencies having jurisdiction over such discharges. (Ord. 1901 § 2, 11-27-12).

13.10.360 Colored matter.

No person shall discharge, cause, allow, or permit to be discharged into the sanitary sewer system, or any part thereof, any wastewater with objectionable color not removed in the treatment process, such as, but not limited to, dye wastes and vegetable tanning solutions. (Ord. 1901 § 2, 11-27-12).

13.10.370 Garbage.

(a) No person shall discharge, deposit, throw, cause, allow, or permit to be discharged, deposited, or thrown into the sanitary sewer system, or any part thereof, (1) any garbage, (2) any fruit, vegetable, or animal material, and/or (3) any other solid material from any food-processing plant (or any other industrial plant or retail grocery store), irrespective of whether or not it shall have been first passed through a mechanical grinder.

(b) No person shall install, operate, use, or maintain upon the premises of any food-processing plant (or any other industrial plant or retail grocery store) any mechanical grinder or waste grinder that is connected directly or indirectly to the sanitary sewer system, or any part thereof.

(c) No person shall discharge, deposit, throw, or cause, allow, or permit to be discharged, deposited, or thrown into the sanitary sewer system, or any part thereof, any garbage, or fruit, vegetable, animal, or other solid kitchen waste material resulting from the preparation of any food or drinks in any dwelling, restaurant, or eating establishment, unless the same shall have first been passed through a mechanical garbage or waste grinder in conformance with the provisions of the Plumbing and Electrical Code of the City. (Ord. 1901 § 2, 11-27-12).

13.10.380 Oil and grease removal devices.

(a) Any food service establishment, or other type of business or establishment where grease or other viscous, obstructing, or objectionable materials may be discharged into a public or private sewage main or disposal system, shall have a grease control device and related plumbing of a size and design approved by the Director.

(1) Grease interceptors shall meet the following minimum requirements:

(A) Designed retention time of no less than thirty (30) minutes.

(B) The effluent from the device must flow through an approved sample box.

(C) Installed per manufacturer's specifications.

(D) At least two manholes, situated so all standpipes can be fully observed, and all internal surfaces can be reached, without confined space entry.

(E) Double-sweep cleanouts, on the interceptor inlet, and sample box outlet.

(F) Shall meet the specifications and be constructed in accordance with the applicable provisions of Chapter 15.35 SCCC.

(2) Grease traps shall meet the following minimum requirements:

(A) No injection ports for chemicals or bacteria.

(B) Installed per manufacturer's specifications.

(C) Appropriate flow restrictors, whether integral or external to the device, must be installed.

(D) Shall meet the specifications and be constructed in accordance with the applicable provisions of Chapter 15.35 SCCC.

(3) Mechanical grease removal devices shall be installed in accordance with manufacturers' specifications.

(b) Each grease control device shall be so installed and connected that it shall be at all times easily accessible for visual inspection, sampling, cleaning and removal of grease and other matter from all surfaces.

(c) A grease control device shall be situated on the discharger's premises, except when such a location would be impractical or cause undue hardship on the discharger, the City may issue an encroachment permit to allow the grease control device to be installed in the public street or sidewalk area and located so that it will not be obstructed by landscaping or parked vehicles.

(d) Waste discharged from fixtures and equipment in establishments which may contain grease or other objectionable materials including, but not limited to, scullery sinks, pot and pan sinks, dishwashers, food waste disposals, soup kettles, and floor drains located in areas where such objectionable materials may exist, may be drained into the

sanitary sewer through the grease control device if approved by the Director; provided, however, that toilets, urinals, wash basins, and other fixtures containing fecal material shall not flow through the grease control device.

(e) Grease control devices shall be maintained in efficient operating condition by periodic removal of the accumulated grease. The use of chemicals, bacteria, enzymes, or other additives that have the effect of emulsifying or dissolving grease is prohibited unless specifically authorized by the Director in writing. No accumulated grease shall be introduced into any drainage piping or public or private sewer.

(f) Grease control devices shall be cleaned on a sufficient frequency to prevent objectionable odors, surcharge of the grease control device, or interference with the operation of the sanitary sewer system.

(1) Grease traps shall be cleaned at least once every thirty (30) days.

(2) Grease interceptors shall be cleaned once every ninety (90) days.

(3) Mechanical grease removal devices must be maintained in a manner and frequency consistent with manufacturer specifications and guidance.

(4) Grease control devices shall be cleaned when their last chamber is filled to twenty-five percent (25%) or more of capacity with grease or settled solids. Grease interceptors with a sample box shall be cleaned immediately when grease is evident in the sample box.

(5) Grease control devices shall be cleaned by being pumped dry and all accumulated sludge on all surfaces shall be removed by washing down the sides, baffles and tees. No water removed from the device during cleaning shall be returned to the grease control device.

(g) The Director may grant an exception to the requirements of subsections (f)(1) and (2) of this section where the Director finds, based on evidence presented by the discharger, that a less frequent cleaning schedule will be sufficient to assure that not more than twenty-five percent (25%) of the capacity of the grease control device will be filled with grease or settled solids.

(h) All dischargers shall implement best management practices in their operations to minimize the discharge of grease to the sanitary sewer system.

(i) Dischargers shall maintain records on site for a period of at least three years as follows:

(1) Dischargers with an installed grease control device shall maintain records showing that the grease control device has been properly maintained and cleaned as required by subsections (e) and (f) of this section; and

(2) Food service establishments shall maintain records showing the following related to all grease hauled off site: date and time material removed off site, volume removed, hauler name, truck license number, type of grease removed, and final destination of material collected.

(j) Abandoned grease control devices shall be emptied and filled as required for abandoned septic tanks. (Ord. 1901 § 2, 11-27-12).

13.10.390 Installation and maintenance of amalgam separators.

(a) Except as provided in subsections (b) and (c) of this section, no person shall discharge, cause, allow or permit any discharge to the sanitary sewer system from a dental vacuum system, unless such discharge has first been processed through an amalgam separator.

(b) For each dental vacuum system installed prior to July 1, 2009, an amalgam separator shall be installed on or before December 31, 2010. No dental vacuum system shall be installed on or after January 31, 2009, without an amalgam separator. Proof of certification and installation records shall be submitted to the Director within thirty (30) days of installation.

(c) A dental vacuum system may be operated without an amalgam separator; provided, that the system is not used in connection with the removal or placement of fillings that contain dental amalgam more than three days per calendar year and the system is used exclusively by the following types of dental practices: (1) orthodontics; (2) periodontics; (3) oral and maxillofacial surgery; (4) radiology; (5) oral pathology or oral medicine; and (6) endodontistry and prosthodontistry.

(d) Amalgam separators shall be maintained in accordance with manufacturer recommendations. Installation, certification, and maintenance records shall be maintained for a minimum of five years and available for immediate inspection upon request therefor by the Director or designee during normal business hours. (Ord. 1901 § 2, 11-27-12).

13.10.400 Screened industrial waste.

(a) No person shall discharge, cause, allow, or permit to be discharged into the sanitary sewer system, or any part thereof, any garbage, or any fruit, vegetable, animal, or other solid industrial waste

resulting from the processing, packaging, or canning of fruits, vegetables, or other foods or products, unless such waste has first been passed through screens having openings not exceeding one thirty-second (1/32) of an inch in dimension.

(b) The Director may authorize, in writing, the discharge into the sanitary sewer system of such waste if it is first passed through screens having larger openings, if the Director is satisfied that such larger openings will provide screening efficiency and effectiveness equal to or better than that provided by the above-specified openings of one thirty-second (1/32) of an inch in dimension.

(c) Each person who discharges, causes, allows, or permits to be discharged into the sanitary sewer system, or any part thereof, any such waste shall install and maintain in good operating order, screens as hereinabove specified and appurtenances thereto, including, but not limited to, all necessary conveyors and elevators, all in sufficient quantity and of sufficient size and quality to continuously and effectively screen not less than one hundred percent (100%) of the peak hydraulic and solids loading imposed on such screens and appurtenances during any processing period.

(d) No person shall discharge any such screened waste into the sanitary sewer system, or any part of the system, unless and until he/she has obtained a wastewater discharge permit pursuant to this chapter granting approval to do so. Before a wastewater discharge permit is granted, the Director may require that such person provide to the Director a report prepared by a registered professional engineer verifying, to the satisfaction of the Director, that the provisions of this section have been fully complied with. (Ord. 1901 § 2, 11-27-12).

13.10.410 Use of City's facilities by others.

No person shall enter or remain upon any sanitary sewer manholes, cleanouts, or any appurtenances thereto, or any other property owned or controlled by the Water and Sewer Utilities Department without the consent of the Director. (Ord. 1901 § 2, 11-27-12).

Article IV. Wastewater Discharge Permits – Reports

13.10.420 Mandatory wastewater discharge permits.

No critical user or significant industrial user shall connect, discharge, cause, allow, or permit any discharge into the sanitary sewer system except in accordance with a discharge permit issued by the Director. (Ord. 1901 § 2, 11-27-12).

13.10.430 Permit duration and amendment.

(a) Wastewater discharge permits shall be issued for a specific duration, not to exceed five years.

(b) Permits shall be subject to amendment by the City as limitations or requirements for wastewater discharge are modified and changed.

(c) The holder of a discharge permit shall be informed of any proposed amendment to its permit at least thirty (30) days prior to the effective date of the amendment.

(d) The Director may include a compliance schedule in an amended permit. (Ord. 1901 § 2, 11-27-12).

13.10.440 Permit application.

(a) All persons requiring a discharge permit shall file a complete application, in the form prescribed by the Director, and accompanied by the applicable fees, as established by resolution of the City Council.

(b) For new construction, permit applications shall be filed with the Director at the time that an application for a building permit for a new building or structure is made.

(c) All persons discharging wastewater into the sanitary sewer system for which a wastewater discharge permit has been issued must apply for a new permit prior to making a significant change in the operations affecting their discharge. (Ord. 1901 § 2, 11-27-12).

13.10.450 Delinquent fees.

(a) Permit applications are due ninety (90) days prior to commencing discharge to the sanitary sewer system or expiration of the existing discharge permit. Any person who fails to file an application for a discharge permit prior to discharge shall be assessed a penalty for delinquent filing as follows:

(1) Up to and including a thirty (30) day delinquency, the penalty shall be fifty percent (50%) of the permit fee.

(2) More than a thirty (30) day delinquency, but less than a one-year delinquency, the penalty shall be one hundred percent (100%) of the permit fee.

(3) More than a one-year delinquency, the penalty shall be one thousand percent (1,000%) of the permit fee.

(b) Such penalties shall be in addition to any other penalties or fines that may be levied, and they are in addition to any other remedies that the City may have with respect to the discharge. (Ord. 1901 § 2, 11-27-12).

13.10.460 Signature requirements.

(a) Permit applications, discharge reports, and any other reports required by the Director to be signed shall be signed by an executive officer of the business filing the application.

(b) Such executive officer shall be at least of the level of vice president, general partner, president, or an individual responsible for the overall operation of the facility applying for said permit, or meet Federal requirements for NPDES applications as contained in Title 40 CFR.

(c) Reports subject to the requirements of Title 40 CFR shall include the certifications statement as contained in Title 40 CFR. (Ord. 1901 § 2, 11-27-12).

13.10.470 Additional information.

(a) If the Director is not satisfied that the permit application has sufficient information to determine whether the permit should be issued, the Director may refuse to issue the permit or request that the applicant submit further information.

(b) The applicant shall have thirty (30) working days, or such longer period of time as allowed by the Director, after reviewing a request for information, to complete the application.

(c) If the returned application is not resubmitted within the specified time period, then a new application for a discharge permit must be submitted along with the application fees and any delinquent fees for a new permit. (Ord. 1901 § 2, 11-27-12).

13.10.480 No transfer of permit.

Discharge permits are issued to a specific user for a specific operation at a specific location. No user shall assign, transfer, or sell a discharge permit; nor shall any user attempt to use the permit for premises, facilities, or operations not covered by the permit. (Ord. 1901 § 2, 11-27-12).

13.10.490 Denial of permit.

The Director may deny a wastewater discharge permit if any one or more of the following conditions exist:

(a) The application is not accompanied by the required fee(s).

(b) The application contains false or misleading information.

(c) The issuance of the permit would result in the discharge of industrial wastes of such quantity or strength that the public health or safety, or public or private property are endangered.

(d) The issuance of the permit would cause the plant to violate any permit conditions, laws, or regulations of the State and/or Federal government.

(e) The applicant has not provided adequate information to establish that its discharge will comply with all requirements of this chapter and with such other terms and conditions as the Director may deem necessary to include in the discharger's permit.

(f) The applicant has not provided plans for sufficient protection from accidental discharges to the land, storm sewer system, and sanitary sewer system.

(g) If the Director refuses to issue a permit, the application fees shall not be returned to the applicant unless the Director has ascertained that a permit is not required to discharge the wastewater for which the permit application is made. (Ord. 1901 § 2, 11-27-12).

13.10.500 Permit conditions.

(a) Discharge permits shall be expressly subject to all provisions of this chapter and all other regulations, user charges, discharge limitations, and fees established by the City and all applicable local, State, and Federal law and regulations.

(b) The permit may include such terms and conditions as the Director may deem necessary to implement this chapter, or any other applicable local, State, or Federal law and regulations, including, but not limited to:

(1) Limits on the average and maximum wastewater volume, constituents and characteristics;

(2) Requirements for installation and maintenance of flow monitoring, inspection, and sampling facilities;

(3) Specifications and pretreatment requirements for monitoring programs which may include sampling locations, frequency of sampling, number, types and standards for tests, and reporting schedule;

(4) Compliance schedules;

(5) Requirements for submission of technical reports or discharge reports;

(6) Requirements for maintaining and retaining plant records relating to wastewater discharge as specified by the City and affording the City access thereto;

(7) Requirements for notification to the City of any new introduction of wastewater constituents or any significant change in the volume or character of the wastewater constituents being introduced into the wastewater stream;

(8) Requirements and plans for protection against accidental discharges, including, but not limited to, berming of chemicals and waste materials. The review and approval of such plans and operating procedures shall not relieve the user of the responsibility of modifying the facility as necessary to provide the protection necessary to meet the requirements of this Code or other State or Federal regulations;

(9) Requirements for notification of accidental discharges. (Ord. 1901 § 2, 11-27-12).

13.10.510 Permit appeals.

(a) Any permittee or permit applicant may appeal a notice of revocation of a wastewater discharge permit, notice of denial of a permit, any term or condition of a permit, amendment of a permit, or notice of termination of service to the Director.

(b) A request for hearing on a decision to revoke a permit or terminate service shall be filed, in writing, with the Director within ten calendar days after the date the notice of revocation or termination of service is served on the permittee. A request for hearing on a decision to revoke a permit or terminate service shall, except in the case of immediate permit revocation or suspension of service for the preservation of public health or safety or for the protection of public or private property, stay the effect of the notice of revocation or termination of service during the pendency of the appeal.

(c) A request for hearing on a decision to deny a permit, on the terms or conditions in a permit, or on an amendment to a permit, shall be filed, in writing, with the Director within thirty (30) calendar days after the date the notice of decision is served on the applicant.

(d) Failure of a permittee or applicant to request a hearing within ten calendar days shall be deemed acceptance of the Director's decision, and the Director's decision shall be deemed final.

(e) At the hearing before the Director, the applicant shall be given an opportunity to present witnesses and documentary and other evidence.

(f) The hearing will be conducted informally and technical rules of evidence shall not apply. Any and all evidence that the Director deems reliable, relevant, and not unduly repetitious may be considered.

(g) The applicant may be represented at the hearing by any other person.

(h) The Director shall provide written notice of decision on the appeal to the permittee or applicant. The decision of the Director on the appeal shall be deemed final and effective three calendar days after notice of the decision on appeal is served on the permittee or applicant.

(i) Filing of a request for hearing shall not entitle any person to discharge in violation of any of the provisions of the City Code.

(j) Any permittee or permit applicant may appeal the Director's decision on the appeal to the City Council by the procedure for revocation and permit denials and appeals therefrom as set forth in Chapter 2.115 SCCC. (Ord. 1901 § 2, 11-27-12).

13.10.520 Record keeping.

All industrial users subject to the reporting requirements of this chapter shall retain and make available for inspections and copying all records of information obtained pursuant to any monitoring activities required by this chapter, and additional records of information obtained pursuant to monitoring activities undertaken by the industrial user independent of such requirements. These records shall remain available for a period of at least three years. This period shall be automatically extended for the duration of any enforcement action concerning the industrial user, or where the industrial user has been specifically notified of a longer retention period by the Director. (Ord. 1901 § 2, 11-27-12).

Article V. Enforcement

13.10.530 Responsibility.

The primary responsibility for enforcement of the provisions of this chapter shall be vested in the Director or such agents of the City as he/she shall designate; and provided further, that field inspectors or other employees of the City are hereby authorized to act as agents of the City or of the sewage treatment plant for and on behalf of the Director, with the power to inspect and issue notices for violations of this chapter. (Ord. 1901 § 2, 11-27-12).

13.10.540 Federal pretreatment regulations.

No industrial user shall discharge, cause, allow, or permit a discharge into the sanitary sewer system in violation of any Federal or State regulation

regulating discharges by such users, including, but not limited to, the Federal pretreatment regulations found in Title 40 CFR. (Ord. 1901 § 2, 11-27-12).

13.10.550 Public nuisance.

Waste or wastewater discharge, threatened waste or wastewater discharge, or any condition or act in violation of any provision of this chapter, or any provision of any permit issued pursuant to this chapter, or any directive or order of the Director authorized by this chapter or applicable law is hereby declared to be a public nuisance. Such nuisance may be abated, removed, or enjoined and damages assessed therefor, in any manner provided by law. (Ord. 1901 § 2, 11-27-12).

13.10.560 Falsification of information.

(a) It shall be unlawful to make any false statement, representation, record, report, plan, or other document; to tamper with or render inaccurate any monitoring device or equipment; or to divert flow from any monitoring device or equipment installed or operated to further the purpose of this chapter or the purpose of any permit issued under this chapter.

(b) In addition to any other punishment or remedy provided by law, any such falsification or tampering shall be grounds for revocation of any permit issued under this chapter. (Ord. 1901 § 2, 11-27-12).

13.10.570 Power to inspect.

(a) The Director and other duly authorized employees and agents of the City bearing credentials and identification shall have the right to access upon all properties for the purpose of inspecting any sewer or storm drain connection, including, but not limited to, all discharge connections of roof and surface drains and plumbing fixtures; inspecting, observing, measuring, photographing, sampling, and testing the quality, consistency, and characteristics of sewage and industrial wastewaters being discharged into any public sewer or natural outlet; and inspecting and copying any records relating to quantity and quality of wastewater discharges, including, but not limited to, water usage and effluent discharge, chemical usage, and hazardous waste records.

(b) The Director may terminate service or revoke the permit of any person who has discharged wastewater to the sanitary sewer system and/or has unreasonably refused access to the City. (Ord. 1901 § 2, 11-27-12).

13.10.580 Discharge reports.

(a) Dischargers are subject to the reporting requirements as contained in Title 40 CFR. The Director may require that any person connected to or discharging wastewater into the sanitary sewer system file additional periodic discharge reports or a zero discharge report.

(b) The periodic discharge report may be required to include, but need not be limited to, nature of process, volume, rates of flow, mass emission rate, hours of operation, number of employees, hauling record, potential slug discharge, or other information which relates to the generation of waste, including wastewater constituents and characteristics in the wastewater discharge and the ability of the discharger to meet applicable discharge limits.

(c) The zero discharge report shall certify that the zero discharger user does not discharge any process water to sanitary sewer system, or for a zero discharge categorical user, discharge any categorical process water or ancillary process water to the designated zero discharge categorical sample point or into the sanitary sewer system. This report may be required to include, but need not be limited to, the nature of the process, hours of operation, number of employees, hauling records, or other information that relates to the generation of wastes.

(d) The Director may also require such periodic discharge reports and zero discharge reports to include information concerning the chemical constituents and quantity of chemicals stored on site, including waste hauling records or other information, which relates to the generation of wastes even though they may not normally be discharged.

(e) In addition to discharge reports, the Director may require dischargers to submit such additional reports as may be necessary to allow the City to evaluate the discharger's ability to comply with this chapter, including but not limited to best management practice or self-monitoring reports.

(f) It shall be unlawful for any person who has discharged wastewater to the sanitary sewer system to refuse to file any report requested by the Director.

(g) Sampling and analysis shall be performed in accordance with 40 CFR Section 136 and amendments thereto. Where 40 CFR Section 136 does not contain sampling or analytical methods for the pollutant in question, or where the Director determines that the application of 40 CFR 136 is inappropriate for the pollutant in question, sampling and analysis shall be performed by using ana-

lytical methods validated by the Director. (Ord. 1901 § 2, 11-27-12).

13.10.590 Termination of service.

(a) The Director may revoke any wastewater discharge permit, and/or terminate, or cause to be terminated, wastewater service to any premises:

(1) If a discharge of wastewater from the premises causes or threatens to cause a violation of any provision of this chapter or applicable local, State, or Federal regulations; or

(2) If a discharge of wastewater from the premises causes or threatens to cause a condition of contamination, pollution, or nuisance.

(b) This provision is in addition to other statutes, rules or regulations authorizing termination of service for delinquency in payment. (Ord. 1901 § 2, 11-27-12).

13.10.600 Permit revocation.

Wastewater discharge permits may be revoked for one or more material violations of this chapter, including but not limited to:

(a) Failure to notify the City of changes to the user's operations or systems as described in the wastewater discharge permit application;

(b) Misrepresentation of or failure to fully disclose all relevant facts in the wastewater discharge permit application;

(c) Falsifying self-monitoring reports;

(d) Tampering with monitoring facilities or equipment;

(e) Refusing to allow the City timely access to the facility premises and records;

(f) Failure to meet the prohibitions on discharge according to applicable State, Federal and local law;

(g) Failure to meet compliance time schedules or any wastewater discharge permit conditions or requirements;

(h) Failure to pay fines and/or penalties;

(i) Failure to pay sewer charges;

(j) Failure to complete a wastewater discharge permit application or submit a discharge report;

(k) Violation of any pretreatment standard or requirement. (Ord. 1901 § 2, 11-27-12).

13.10.610 Issuance of cease and desist orders.

When the Director finds that a discharge of wastewater has taken place or is likely to take place in violation of this chapter or the provisions of any wastewater discharge permit, the Director may issue an order to cease and desist such discharge, or practice, or operation likely to cause such discharge and direct those persons not complying with such prohibitions, limits, requirements, or provisions to:

(a) Comply immediately; or

(b) Comply in accordance with a time schedule; and/or

(c) Take appropriate remedial or preventative action. (Ord. 1901 § 2, 11-27-12).

13.10.620 Emergency corrections, remedial or preventative action.

In the event cleanup, repairs, construction, or other work is performed on any premises pursuant to any provision of law relating to an emergency or that authorizes public work on private property to correct, eliminate or abate a condition that threatens to cause, causes, or has caused a violation of any provision of this chapter or the provisions of a wastewater discharge permit, the user or persons responsible for the occurrence or condition giving rise to such work and/or the owner and/or occupant of the premises shall be liable, jointly and severally, to the City for such public expenditures, and subject to all enforcement and administrative penalty provisions of this Code. (Ord. 1901 § 2, 11-27-12).

13.10.630 Notice of termination of service and/or permit revocation.

(a) Written notice of the permit revocation or service termination, and a statement of the grounds therefor, shall be delivered to the discharger. The notice shall be effective ten calendar days after it is served on the discharger unless the Director determines that immediate permit revocation or suspension of service is necessary for the preservation of public health or safety or for the protection of public or private property. If the Director determines that immediate permit revocation or suspension of service is necessary, the Director may act to revoke the permit or suspend service immediately after written notice is delivered to the discharger.

(b) It shall be unlawful for any person to discharge any material into the sanitary sewer system from any premises for which the permit has been revoked or wastewater service has been suspended or terminated. (Ord. 1901 § 2, 11-27-12).

13.10.640 Penalties.

(a) Pursuant to Chapters 1.05 and 1.10 SCCC, the City, in its prosecutorial discretion, may enforce violations of the provisions of this chapter as a criminal, civil, and/or administrative action. All penalties and citations pursuant to applicable

law, including but not limited to Government Code Section 54740.5 and Chapters 1.05 and 1.10 SCCC, shall apply to violations of this chapter.

(b) In addition to the provisions of Chapters 1.05 and 1.10 SCCC, and due to the significant potential harm caused to the environment by violation of provisions of this chapter, any person who intentionally, accidentally, or negligently violates any provisions of this chapter or any provision of any permit issued pursuant to this chapter, or who intentionally, accidentally, or negligently discharges waste or wastewater that causes pollution or violates any effluent limitation, standard of performance, or pretreatment or toxicity standard shall be civilly liable to the City in a sum up to ten thousand dollars ($10,000.00) for the first day in which such violation occurs, up to twenty-five thousand dollars ($25,000.00) for the second day in which such violation occurs, and fifty thousand dollars ($50,000.00) for each additional day. The City may petition a court of appropriate jurisdiction to impose, assess, and recover such sums. Funds collected pursuant to this section shall be paid to City's environmental compliance fee account.

(c) Any assessed penalty shall be paid within ten days from the date of notice of such penalty. Interest shall accrue at the rate of the United States government T-Bills sold at the latest sale prior to the date of the delinquency plus three percent prorated per month or fraction thereof on the amount of penalty from the date of delinquency.

(d) The amount of any penalties imposed under this chapter which have remained delinquent for a period of sixty (60) days shall constitute a lien against the real property of the discharger from which the violation occurred resulting in imposition of the penalty. The Director shall cause the amount of uncollected penalty to be recorded with the County Recorder, in accordance with Government Code Section 54740.5.

(e) Any and all remedies for violations of this chapter are cumulative and not exclusive, and shall be in addition to all other remedies available to the City under State and Federal law and local ordinances. Funds collected pursuant to this section shall be paid to City's environmental compliance fee account. (Ord. 1901 § 2, 11-27-12).

13.10.650 Appeals.

(a) Any user, permittee, applicant or other person aggrieved by any decision, action, finding, determination, order or directive of the Director, made or authorized pursuant to this chapter, or relating to any permit issued pursuant to this chapter, or interpreting or implementing the same, may file a written request with the Director for reconsideration thereof within ten days of such decision, action, finding, determination, order or directive. Such request for reconsideration must set forth in detail all supporting facts. No meeting or hearing shall be convened for such request for reconsideration. The Director shall render a final written decision within ten days of the receipt of such request.

(b) Any user, permittee, applicant or other person aggrieved by any final determination of the Director may appeal such decision to the City Manager within ten days of the Director's final determination. Written notice of such appeal must be filed with the City Clerk within that ten-day period, and shall set forth all supporting facts. The appeal shall be heard by the City Manager within thirty (30) days from the filing of the notice of appeal. The appellant, the Director, and such other persons as the Director and/or the City Manager may deem appropriate shall be heard at the hearing on such appeal. Upon conclusion of the hearing, the City Manager may affirm, reverse or modify the final determination of the Director in furtherance of the provisions of this chapter. The City Manager's determination on the appeal shall be final.

(c) Any decision, action, finding, determination, order or directive of the Director which is subject to a request for reconsideration or appeal shall remain in effect during the pendency of any request for reconsideration and/or appeal.

(d) All monetary penalties shall be due and payable during the pendency of any request for reconsideration or appeal. If a determination is not affirmed and the penalty is modified, the Director shall cause any overpayment of penalty to be reimbursed to the payor within thirty (30) days of the final determination.

(e) Any administrative citation issued for any violation shall be appealed pursuant to Chapters 1.05 and 1.10 SCCC. (Ord. 1901 § 2, 11-27-12).

13.10.660 Publication of user in significant noncompliance.

The Director is authorized to publish annually a list of the significant industrial users which, at any time during the previous twelve (12) months, were in significant noncompliance with applicable pretreatment standards and requirements. The term "significant noncompliance" is defined in 40 CFR Section 403.8. (Ord. 1901 § 2, 11-27-12).

Chapter 13.20

STORM DRAINS AND DISCHARGES

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Article I. Purpose of Chapter and Definitions

13.20.010 Purpose.

This chapter is enacted for the protection of health, life, resources, and property through prevention and control of unauthorized discharges into watercourses, pursuant to a Federal mandate under (i) what is commonly referred to as the Clean Water Act (33 U.S.C. 1251 et seq.) and in accord with (ii) the California Water Code, Division 7 (entitled "Water Quality" – Section 13020 et seq. and commonly referred to as the "Porter-Cologne Water Quality Control Act"), and (iii) the City's National Pollution Discharge Elimination System (NPDES) permit issued by the California Regional Water Quality Control Board, San Francisco Bay Region. The primary goal of this chapter is the cleanup of stormwater pollution from urban runoff that flows to creeks and channels, eventually discharging into the South San Francisco Bay. (Ord. 1655 § 1, 4-26-94. Formerly § 24-1).

13.20.020 Definitions.

For the purposes of this chapter, the following words and phrases shall have the meanings ascribed to them by this section, unless the context or the provision clearly requires otherwise.

(a) Reserved for future use.

(b) "B" definitions:

(1) "Best management practice (BMP)" means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the United States. BMPs also include treatment requirements, operating procedures, and practices to control plant site runoff spillage or leaks, sludge, or waste disposal, or drainage from raw material storage.

(c) "C" definitions:

(1) "City" means and includes all the territory lying within the municipal boundaries of the City of Santa Clara, as presently existing, plus all territory which may be added thereto during the effective term of the ordinance codified herein.

(2) "City Code" means the municipal code of the City of Santa Clara, California.

(3) "City Manager" means the City of Santa Clara's City Manager and his/her duly authorized agents and representatives.

(d) "D" definitions:

(1) "Director of Public Works" means the Director of Public Works and his/her duly authorized agents and representatives.

(2) "Discharger" means any person who discharges, causes, or permits the discharge of industrial waste into a City sewer or storm drain.

(e) "E" definitions:

(1) "Environmental compliance fee" means a program established by the City to assess the fees necessary to cover the costs of the City's federally mandated nonpoint source control and stormwater management program pursuant to City's NPDES permit, such fees shall be paid to the City's storm drain environmental compliance fee account.

(f) Reserved for future use.

(g) Reserved for future use.

(h) Reserved for future use.

(i) "I" definitions:

(1) "Illicit connection" means the unauthorized connection of a wastewater stream to storm drains or storm sewers.

(2) "Illegal discharge" means any discharge to a City storm drain or storm sewer that is not composed entirely of stormwater except discharges authorized by a NPDES permit (other than the NPDES permit for discharges from the City's separate storm drain or storm sewer) and discharges resulting from firefighting emergencies and activities.

(j) Reserved for future use.

(k) Reserved for future use.

(l) Reserved for future use.

(m) Reserved for future use.

(n) "N" definitions:

(1) "Nonpoint source pollution discharge" means any discharge from land that results or likely will result in a discharge into watercourses. Nonpoint source pollution originates from aerial diffuse sources that are mostly related to land use. Nonpoint discharges represent a process whereby pollutants, debris, and chemicals generated from various land uses accumulate on streets, construction sites, parking lots, and other exposed surfaces and are washed off and carried away by stormwater runoff into watercourses. The major pollutants of concern in these discharges are heavy metals, sediments, petroleum hydrocarbons, organochlorine, pesticides, toxins, or any other substance or material deleterious to fish, plant life, or bird life.

(2) "NPDES permit" means a National Pollution Discharge Elimination System permit issued by the Regional Water Quality Control Board, San Francisco Bay Region.

(o) Reserved for future use.

(p) "P" definitions:

(1) "Person" includes any person, firm, association, organization, partnership, business trust, joint venture, corporation, or company, and includes the United States, the State of California, the County of Santa Clara, special purpose districts, and any officer or agency thereof.

(2) "Process wastewater" means wastewater that has been used in one or more industrial processes.

(q) Reserved for future use.

(r) Reserved for future use.

(s) "S" definitions:

(1) "Stormwater" means rainfall runoff, snow melt runoff, surface runoff, and drainage from natural sources, and excludes infiltration.

(2) "Storm drain system," sometimes termed "storm sewer," means any pipe, conduit (including but not limited to streets, curbs, and gutters), or sewer of the City, designed or used for the disposal of stormwaters, surface waters, and natural drainage, including expressly authorized unpolluted water, but excluding any community sanitary sewer system.

(t) Reserved for future use.

(u) "U" definitions:

(1) "Unpolluted water" means water to which no constituent has been added, either intentionally or accidentally, that would render such water unacceptable for disposal to storm systems, natural drainage, or directly to surface waters.

(2) "Urban runoff pollution prevention" means prevention of nonpoint source pollution.

(v) Reserved for future use.

(w) "W" definitions:

(1) "Waste" includes sewage and soil from erosion and any and all other waste substances, liquid, solid, gaseous or radioactive, associated with human habitation, or of human or animal origin, or from any producing, manufacturing, or processing operation of whatever nature, including waste placed within containers of whatever nature prior to, and for purposes of, disposal.

(2) "Watercourse" means a channel in which a flow of water occurs, either continuously or intermittently.

(3) "Wastewater" means water that contains any waste.

(x) Reserved for future use.

(y) Reserved for future use.

(z) Reserved for future use. (Ord. 1655 § 1, 4-26-94; Ord. 1771 § 2, 8-20-02. Formerly § 24-2).

Article II. Storm Drain Discharge, Procedure, Use Regulations, and Prohibited Substances

13.20.030 Discharge into the storm drain prohibited.

(a) It shall be unlawful to discharge, or cause, allow, or permit to be discharged into any storm drain, storm sewer, or natural outlet or channel any waste, including, but not limited to, sewage, industrial wastes, petroleum products, coal tar, or any refuse substance arising from the manufacture of gas from coal or petroleum, chemicals, detergents, solvents, paints, contaminated water, or chlorinated swimming pool water, pesticides, herbicides, fertilizers, or other process wastewater.

(b) No person shall discharge any substance directly into a manhole or other opening in a City

storm drain or storm sewer other than through a City-approved storm drain connection.

(c) Upon permit application and approval by the Director of Streets and Automotive Services, unpolluted water may be discharged into the City's storm drain system or into a natural outlet. No discharge other than rainfall runoff shall be allowed, except for such discharge as is expressly permitted by the City's permit and the National Pollution Discharge Elimination System (NPDES) and will not cause any impairment in the beneficial uses or quality of water of the State as defined in the California Water Code, or any special requirements of the Regional Water Quality Control Board, San Francisco Bay Region, or injure or interfere with the City's storm drain system or the operation of the State's watercourses.

(d) The City may, from time to time, by resolution of the City council, adopt supplementary rules and regulations on discharge into any storm drain or natural outlet or channel that shall have the same force and effect as if set forth herein and for which the remedies herein for violation shall be applicable. (Ord. 1655 § 1, 4-26-94; Ord. 1771 § 3, 8-20-02. Formerly § 24-3).

13.20.040 Suspension of service.

When found necessary by the City Manager or his/her duly authorized agents and representatives to prevent violation of, or nonconformance with, any provision of this chapter or resolution adopted pursuant thereto, he/she shall refuse to allow, and shall suspend service connections with, the storm drain system to any person not complying with allowable storm drain discharges or regulations. (Ord. 1655 § 1, 4-26-94. Formerly § 24-4).

13.20.050 Monitoring of discharge into the storm drain system.

(a) When deemed necessary by the City Manager or his/her duly authorized agents and representatives, he/she shall require any person to monitor their storm drain discharges to ensure compliance with allowable discharges.

(b) Where BMP guidelines or requirements have been adopted by any Federal, State, regional, County, or local agency, for any activity, operation, or facility that may cause or contribute to stormwater pollution or contamination, illicit discharges, discharges of non-stormwater to the stormwater system, every person undertaking such activity or operation, or owning or operating such facility, shall comply with such guidelines or requirements as may be identified by the City Manager or his/her duly authorized agents and representatives. (Ord. 1655 § 1, 4-26-94. Formerly § 24-5).

13.20.060 Public nuisance.

The discharge of unscreened garbage, fruit, vegetable, animal, or other solid industrial wastes into any storm drain or natural outlet or channel, in violation of any provision of this chapter, is hereby declared to be a public nuisance. The City Manager or his/her duly authorized agents and representatives may order cleanup of the waste or abatement of the effects of the waste. In the case of threatened pollution or nuisance as determined by the City Manager or his/her duly authorized agents and representatives, the City may take other remedial action, including, but not limited to, the overseeing of the cleanup and abatement efforts, or the City may seek the issuance of a preliminary or permanent injunction, or both, as may be appropriate, restraining any person from the continued violation of this chapter. Any person who violates the cleanup or abatement may be civilly, criminally, or administratively liable pursuant to SCCC 13.20.090. (Ord. 1655 § 1, 4-26-94. Formerly § 24-6).

13.20.070 Protection from accidental discharge – Accidental discharge notification.

(a) Each person shall provide protection from accidental or negligent discharge of prohibited substances, materials, or other wastes regulated by this chapter into any storm drain, storm sewer, natural outlet, or channel. Liability for any such discharge shall be the responsibility of the person causing or responsible for the discharge, and equipment and facilities used to prevent accidental or negligent discharge of prohibited materials shall be provided and maintained at the user's expense.

(b) All persons shall notify the City of Santa Clara Public Works Department by telephone immediately upon negligent or accidental discharge of nonpermitted substances or wastes to enable mitigation or countermeasures to be taken by the City to minimize damage to storm drains and the receiving waters.

(c) This notification shall be followed, within five days of the date of occurrence, by a detailed written statement describing the cause of the negligent or accidental discharge and the measures being taken to prevent future occurrences. Such notification will not relieve the person of liability for violations of this chapter or for any fines or pen-

alties imposed on the City on account thereof under Section 13350 of the California Water Code, or for violation of Section 5650 of the California Fish and Game Code, or any other applicable provisions of State or Federal laws, or local ordinances. (Ord. 1655 § 1, 4-26-94. Formerly § 24-7).

13.20.080 Discharge pursuant to City and/or NPDES permit.

(a) Subject to review and approval under SCCC 13.20.020, the provisions of this chapter shall not prohibit any discharge in compliance with a valid NPDES permit issued to the discharger.

(b) Any discharge that would result in or contribute to a violation of the City-issued permit and the City's NPDES permit (this permit is available for viewing at the City of Santa Clara, Office of the City Clerk, 1500 Warburton Avenue, Santa Clara, California) and any amendment, revision, or reissuance thereof, either separately considered or when combined with other discharges, is prohibited. Liability for any such discharge shall be the responsibility of the person causing or responsible for the discharge, and such person shall protect, defend, indemnify and hold harmless the City in any administrative or judicial enforcement action relating to such action. (Ord. 1655 § 1, 4-26-94. Formerly § 24-8).

Article III. Enforcement

13.20.090 Criminal or civil penalty for violation, payment of funds to account.

(a) Enforcement. See SCCC 13.25.010.

(b) Citation Authority. The following designated employee positions may enforce the provisions of this chapter by issuance of citations. Persons employed in such positions are authorized to exercise the authority provided in Penal Code Section 836.5 and are authorized to issue citations for violations of this chapter. The designated employee positions are the City Manager, or his/her duly authorized agents and representatives. (Ord. 1655 § 1, 4-26-94; Ord. 1771 § 4, 8-20-02. Formerly § 24-9).

13.20.100 Emergency cleanup or abatement.

In order to enforce the provisions of this chapter, when the City Manager (or his/her duly authorized agents and representatives) finds and determines that the severity of the violation warrants immediate action, he/she shall clean up or abate violation thereof. The cost of such cleanup or abatement shall be recovered by the City in a civil action. Such emergency cleanup or abatement will not relieve the person of further action, which may be taken by the City Manager (or his/her duly authorized agents and representatives), including but not limited to, suspension, revocation, or modification of the discharger's permit, liability for any violations of this chapter, or any other applicable provisions of State or Federal laws, or local ordinances. (Ord. 1655 § 1, 4-26-94. Formerly § 24-10).

13.20.110 Administrative penalties.

Whenever the City Manager (or his/her duly authorized agents and representatives) finds that any person has violated any notice of violation requiring compliance with any provision of this chapter, or has violated any provision of this chapter, he/she may assess an administrative penalty in a sum not to exceed one thousand dollars ($1,000.00) per day, excluding inspection costs, or cleanup or abatement costs. The remedy provided in this section shall be pursuant to administrative procedures and is cumulative and not exclusive, and shall be in addition to all other remedies available to the City under State and Federal law and local ordinances. Funds collected pursuant to this section shall be paid to City's storm drain environmental compliance fee account. (Ord. 1655 § 1, 4-26-94. Formerly § 24-11).

13.20.120 Costs of enforcement.

In any civil, criminal, or administrative appeal, hearing, or action commenced by the City under this chapter, the City shall be entitled to recover from the defendant of such action reasonable attorneys' fees, costs of suit, and any other costs of enforcement, including, but not limited to, inspection costs and cleanup or abatement costs. (Ord. 1655 § 1, 4-26-94. Formerly § 24-12).

Article IV. Storm Drain Environmental Compliance Fee

13.20.130 Definitions.

(a) "Commercial, industrial, or miscellaneous premises" means a premises designed, improved, or used for a commercial or industrial purpose, other than multifamily or single-family residential purpose, and includes, but is not limited to, private schools and churches.

(b) "Multifamily residential premises" means a premises designed, improved, or used as a residence for five or more families, including apartments and condominiums, and that is not designed,

improved, or used for a commercial, industrial, or miscellaneous purpose.

(c) "Premises" means a separate lot or parcel of land, improved or unimproved, which is connected to, or benefits from, directly or indirectly, the storm drain system, or any portion thereof, or from which any water runoff is discharged directly or indirectly into the City's storm drain system.

(d) "Single-family residential premises" means a premises that is designed, improved, or used as a residence for one family only, which includes but is not limited to, individual duplex, triplex, and fourplex residential dwelling units, and that is not designed, improved, or used for a commercial, industrial, multifamily residential, or miscellaneous purpose. (Ord. 1655 § 1, 4-26-94. Formerly § 24-13).

13.20.140 Rates – Users within the city.

There is hereby levied and assessed against and upon all premises having storm drain discharges into or through the storm drain system a monthly storm drain service charge. The City may, by resolution, establish and amend the monthly storm drain charge and define how such charge will be applied to various types of premises within the city. Said resolution shall contain the effective date of any change in the monthly storm drain charge. (Ord. 1655 § 1, 4-26-94. Formerly § 24-14).

13.20.150 Rates – Issuance of bills – Information required.

All bills for storm drain charges shall be issued by the City Department of Finance. Storm drain charge amounts shall be combined with bills or statements for water and sewer service provided by the City. Storm drain charges shall be assessed in all cases where the premises in question is connected to the City's water system, sewer system, or storm drain system.

The bills shall state their purpose and the name and last known address of the person responsible for payment, and list separately each charge for water service, sewer service, and storm drain service. None of these charges shall be paid separately from the other. All bills shall be for monthly periods or for such other period as shall be determined by resolution of the City. (Ord. 1655 § 1, 4-26-94. Formerly § 24-15).

Chapter 13.25

ENFORCEMENT OF TITLE

Sections:

13.25.010 Enforcement of SCCC Title 13.

13.25.010 Enforcement of SCCC Title 13.

Except when more specific provisions contained in this Title 13 [entitled "Public Services"] are intended to supersede the provisions of SCCC 1.05.070, the following shall apply:

(a) Pursuant to SCCC 1.05.070, the City, in its prosecutorial discretion, may enforce violation(s) of the provisions of this Title 13 as a criminal, civil, and/or administrative action. (Added at request of city during 2003 recodification).

collection system as required by Chapter 13.10 SCCC, unless an individual system is permitted thereunder.

(e) Water Supply. Each unit or lot within the subdivision shall be served by an approved domestic water system.

(f) Utilities. Each unit or lot within the subdivision shall be served by gas (if required), electric, telephone and cable television facilities.

(1) Underground Utilities. All existing and proposed utilities within the subdivision and along either side of peripheral streets shall be placed underground except those facilities exempted by the Public Utilities Commission Regulations and as otherwise provided below.

(A) If the subdivision is in the Underground District, as designated in the General Plan, all utility lines along peripheral streets shall be undergrounded or an in lieu of undergrounding fee shall be paid. Undergrounding shall be required for overhead lines on either side of the peripheral street.

(B) If the subdivision is outside the Underground District, undergrounding overhead utilities on peripheral streets shall not be required unless the City Engineer finds that undergrounding of such utilities is likely to occur within the ten-year period following approval of the tentative map. (Ord. 1780 § 3, 4-8-03).

17.05.620 Deferred improvement agreements.

(a) Subdivisions. The frontage improvements along existing peripheral streets may be deferred when deemed necessary by the City Engineer. Deferral will be allowed when the City Engineer finds that construction is impractical due to physical constraints, or the surrounding neighborhood is absent of similar improvements. When improvements are deferred, the subdivider and/or owner of the real property shall enter into an agreement with the City in a form acceptable to the City Attorney for the installation of all frontage improvements at such time in the future as required by the City. The agreement shall provide:

(1) Construction of improvements shall commence within ninety (90) days of the receipt of the notice to proceed from the City;

(2) That in event of default by the subdivider and/or owner, the City is hereby authorized to cause said construction to be done and charge the entire cost and expense to the subdivider and/or owner, including interest from the date of notice of said cost and expense until paid;

(3) That this agreement shall be recorded in the office of the County Recorder of Santa Clara County, California, at the expense of the subdivider and/or owner, and shall constitute notice to all successors and assigns of the title to such real property of the obligation set forth, and also a lien in an amount to fully reimburse the City, including interest as above, subject to foreclosure in event of default in payment;

(4) That in event of litigation occasioned by any default of the subdivider and/or owner, the subdivider and/or owner, agree to pay all costs involved, including reasonable attorney's fees, and that the same shall become a part of the lien against the real property;

(5) That the terms "subdivider" and "owner" shall include, respectively, not only the subdivider and the present owner but also heirs, successors, executors, administrators and assigns, it being the intent of the parties hereto that the obligations undertaken shall run with the real property and constitute a lien against it;

(6) Any other provisions required by the City Engineer as reasonably necessary to effectuate this code and the Subdivision Map Act;

(7) The agreement shall not relieve the owner from any other specific requirements. The construction of deferred improvements shall conform to the provisions of this chapter and all applicable articles of the municipal code in effect at the time of construction.

(b) Remainders. Where a remainder is made part of a final or parcel map, the subdivider may enter into an agreement with the City to construct improvements within the remainder at some future date and prior to the issuance of a permit or other grant of approval for the development of a remainder parcel. The improvements shall be at the subdivider's expense. In the absence of an agreement, the City may require fulfillment of the construction requirements within a reasonable time following approval of the map, upon a finding that fulfillment of the construction requirements is necessary for reasons of:

(1) The public health and safety; or

(2) The required construction is a necessary prerequisite to the orderly development of the surrounding area. (Ord. 1780 § 3, 4-8-03).

17.05.630 Design.

General. The design and layout of all required improvements both on and off site, private and public, shall conform to generally acceptable engineering standards, to the City's Standard Design

provided for in subsection (h) of Table II per front foot of street frontage; where the development is in excess of ten net acres, developer shall pay the amount provided for in subsection (h) of Table II per net acre. For existing street lights served underground, developer shall pay the amount provided for in subsection (h) of Table II per front foot of street frontage.

(e) The character of electric and water service to all classes of property shall conform to the requirements of the rules and regulations for electric and water service, respectively, except as modified from time to time by resolution of the City Council. Three copies of such rules and regulations for electric and water service are on file for use and examination by the public in the office of the City Clerk and are hereby adopted and made a part of this chapter, the same as if fully set forth in this chapter. They are subject to modification from time to time by resolution of the City Council.

(f) The developer shall pay to the City the charges shown in Table II-A. (See also Table II, item (h), which is generally based upon the on-site costs of supplies and materials furnished and installed by the City). (Ord. 1542 §§ 2, 3, 5-27-86; Ord. 1581 § 7, 3-1-88. Formerly § 21A-20).

17.15.220 Sanitary sewer and storm drains.

(a) On-Site Sanitary and Storm Drains. On-site sanitary sewers and storm drains shall be installed by the developer and shall in no event be less than the minimum sizes shown in Table II, unless a lesser size is authorized as hereinafter provided. Whenever engineering studies and investigations of the City indicate that the minimum sizes shown in Table II are larger than required to serve the development and area, the Director of Public Works/City Engineer shall have the power to waive such minimum sizes and approve sizes compatible with aforementioned engineering studies and investigations.

The developer shall, at his/her sole expense, install all public facilities including any oversizing as required by the City. The developer shall be reimbursed by the City in accordance with unit prices established from time to time by resolution of the City Council, which reimbursement shall be set forth in the development agreement, if any, entered into between the developer and the City. There shall be no reimbursement for laterals.

(b) Storm Drainage Outlet Charge. The developer shall pay the City a storm drainage outlet charge. The revenue from the drainage fee shall be used for the purpose of defraying the estimated costs of constructing planned drainage facilities for removal of surface and storm waters from the herein referenced local drainage areas. The base charge for all classes of property shall be as set forth in subsection (o) of Table II.

(1) Reference is hereby made to the drainage plan adopted for the City of Santa Clara, which contains an estimate of twenty million dollars ($20,000,000.00) as the total cost of constructing the local drainage facilities required by the plan, and a map of the drainage area, showing boundaries and the location of major planned drainage facilities, which is on file in the office of the Director of Public Works/City Engineer. The drainage fee which the developer shall pay is based on this drainage plan, using the estimates compiled at current prices.

(2) The drainage plan has been determined by resolution of the Board of Supervisors and Flood Control District of Santa Clara County to be in conformity with the County-wide general drainage plan of said County.

(3) The City Council finds that development of property within the planned local drainage area will require construction of the facilities described in the drainage plan, and that the fees are fairly apportioned within the local drainage area on the basis of the benefits conferred on property available for development and on the need for local drainage facilities created by the proposed development of other property within the local drainage area. The estimated costs are based upon these findings.

(4) The fee as to any property proposed for development within the local drainage area does not exceed the pro rata share of the amount of the total estimated costs of all facilities within the local drainage area which would be assessable on such property if such costs were apportioned uniformly on a per-acre basis paid.

(5) The drainage facilities planned are in addition to existing local drainage facilities serving the area at the time of the adoption of the drainage plan for the area.

(6) The drainage fees required by this section shall be paid into a “planned local drainage facilities fund.” Moneys in this fund shall be expended solely for the construction or reimbursement for construction of local drainage facilities within the planned local drainage area, from which the fees comprising the fund were collected, and to reimburse the City for the cost of engineering and administrative services to form the district and design and construct the facilities.

(c) Sanitary Sewer Outlet Charge. The developer shall pay the City a sanitary sewer outlet charge. The revenue from the sanitary sewer outlet charge shall be used for the acquisition, construction, reconstruction, replacement and debt retirement of off-site sewerage facilities. The City Council shall determine the amounts and rate schedules for the sewer outlet charge authorized hereunder.

(d) Institutional "In Lieu" Sanitary and Storm Outlet Charge. In lieu of the foregoing storm and sanitary sewer outlet charges, provided for in subsections (b) and (c) of this section, at the sole option of the City, developers of institutional property may pay a flat fee of the lesser amounts shown in subsections (m) and (o) of Table II (Institutional fee schedule) per net acre for each item. Said payments shall be treated as the equivalent of the storm drain and sanitary sewer outlet charges, but the developer shall install the required facilities without receiving on-site credits therefor and reimburse the City by payment of the charges set forth in SCCC 17.15.260 for any existing sanitary sewer and storm drain facilities.

(e) Sanitary Sewer Connection Charge (Sewage Treatment Plant Expansion Connection Charge). In addition to the above charges, there shall be a sanitary sewer connection charge whenever property is either (1) initially connected to the sewer system or (2) requires a new connection to the sanitary sewer system or (3) involves a change in land use or development on the real property that results in an increase of sewage to the City sewer system. The purpose of this connection charge is to finance capital and debt retirement costs associated with the sewage treatment facilities which are allocated to unused or future capacity. The charges shall be in accordance with Paragraph A of Table V.

(f) Alternative Method of Collecting a Flow Component of the Sanitary Sewer Outlet Charge (for Sewer Conveyance) and the Sanitary Sewer Connection Charge (Sewage Treatment Plant Expansion Connection Charge).

(1) Applicability.

(A) The Director of Water and Sewer Utilities may periodically review water usage and/or wastewater discharge volume as recorded by the Finance Department for nonresidential or industrial customers. Based on such review, if the actual daily average wastewater discharge volume exceeds the assigned sewer capacity, the payment of an excess use fee will be required.

(B) Only nonresidential sewer users with water use greater than a monthly average of ten thousand (10,000) gallons per day or, by approval of the Director of Water and Sewer Utilities, those sewer users that submit a written request to use this method, will be subject to additional purchased capacity fee, capacity rental fee and/or incremental purchased capacity fee.

(2) Assigned Sewer Capacity (Assigned Capacity).

(A) The amount of assigned capacity shall be either the sewer capacity that is recorded by the City of Santa Clara Engineering Department for sewer capacity purchased since 1983, or shall be calculated based on the building square footage of record that exists on a single parcel of land represented by an assessors parcel number (APN) on the effective date of the ordinance codified in this section. The square footage of record multiplied by the City's estimated discharge factor for the use shall yield a calculated assigned capacity.

(B) Assigned capacity will reside with the parcel and is not transferable other than by conveyance to a new owner through the sale or transfer of the parcel.

(C) In the event that the parcel owner disputes the calculated assigned capacity the parcel owner may appeal the assigned capacity to the Director of Water and Sewer Utilities by written notification to the City of Santa Clara no later than one hundred twenty (120) days after notification of determination of an assigned capacity. If the Director of Water and Sewer Utilities finds that the property owner's appeal has merit based on data and information presented, the Director of Water and Sewer Utilities has authority to adjust the assigned capacity in accordance with the findings.

(D) In instances where multiple sewer uses or users exist on a single parcel (as represented by a single assessors parcel number), the assigned capacity for the parcel will be equal to the sum of the assigned capacities (either per City records or by calculation) for each use.

(3) Capacity Rental Fee. The capacity rental fee shall be calculated based on the amount of average daily wastewater discharge in excess of the assigned capacity for a property using the following formula: Capacity Rental Fee = (0.03/12) x (Average Discharge Volume - Assigned Capacity) x Capacity Fee.

(4) Additional Sewer Capacity Fee. Additional sewer capacity fee shall be calculated based on the amount of the average daily wastewater discharge in excess of the assigned capacity for a par-

cel using the following formula: Additional Sewer Capacity Fee = (Average Discharge Volume - Assigned Capacity) x (Capacity Fee).

(A) In lieu of purchasing the additional sewer capacity, an incremental sewer capacity fee (incremental fee) may be paid to allow for payment of the additional sewer capacity fee over ten years. The incremental fee shall be calculated at one-one hundred twentieth (1/120th) of the additional sewer capacity fee; or using the following formula: Incremental Sewer Capacity Fee = (Average Discharge Volume - Assigned Capacity) x (Capacity Fee/120).

(B) When an additional sewer capacity fee or an incremental fee is paid, the assigned sewer capacity for the parcel will be increased by an amount equal to the additional or incremental purchased capacity.

(C) A sewer user may at any time elect to pay all or part of an additional sewer capacity fee to obtain a desired assigned capacity. However, at a minimum, all who are covered by this section must pay the monthly incremental sewer capacity fee.

(D) Capacity rental fees, additional sewer capacity fees or incremental fees shall not be refunded if the discharge volume decreases to less than the assigned capacity. The assigned capacity for each APN shall remain on record with the City.

(5) Request for Waiver of Excess Use Fee. Upon application of the parcel owner or sewer user, the Director of Water and Sewer Utilities may waive all or part of a capacity rental fee and/or incremental sewer capacity fee if it is found that the excessive usage was the result of a temporary condition that has been eliminated or reduced. The property owner must submit a written request with adequate documentation for a waiver within thirty (30) days of notification that excess use fees have been incurred.

(g) Reimbursement for Off-Site Construction. The developer shall construct all off-site sanitary sewers and storm drains required to properly service his/her lands. The developer shall be reimbursed by the City in accordance with the standard unit prices established from time to time by resolution of the City Council if the construction complies with the plans and specifications and is accepted as a part of the permanent system approved by the City. Reimbursement shall be set forth in the development agreement, if any, and in accordance with SCCC 17.15.090, this section, and SCCC 17.15.250, as applicable. The design of all sanitary sewers and storm drains shall be subject to the approval of the Director of Public Works/City Engineer. (Ord. 1778 § 3, 12-3-02; Ord. 1819 §§ 1, 2, 7-10-07; Ord. 1881 § 2, 5-10-11).

17.15.230 Residual parcels.

The developer shall, concurrently with the development of any lands, construct all required public works facilities and pay all fees and charges set forth in this chapter for any residual parcel created by the development of such lands. For the purposes of this section, a residual parcel is any parcel of land having street frontage of less than one hundred fifty (150) feet along any street within or abutting such development, or comprising an area of less than 18,000 square feet. (Ord. 1312 § 1, 5-6-75. Formerly § 21A-22).

17.15.240 Deferred charges.

Whenever any property or parcel of land not under development is directly benefited by the installation of any of the required facilities, utilities or public works improvements, the City may advance the costs of same and defer the collection of such charges until such time as said property is developed. Said charges shall be satisfied before any parcel map, tract map, building permit or service connection for such property is granted or accepted by the City. Engineering diagrams showing property benefited shall be furnished the building inspection and accounting divisions of the City, showing the amounts of such deferred charges. (Ord. 1312 § 1, 5-6-75. Formerly § 21A-23).

17.15.250 Deferred credits.

If for any reason, the City is not in a position to advance the costs of the required rights-of-way, facilities, utilities or public works improvements for intervening properties or parcels of land, the developer shall advance such costs for which the City will enter a deferred credit upon its books and records in favor of the developer advancing such costs, to be repaid to the developer (less ten percent) for handling, clerical, billing and collection costs), payable upon collection by the City of the charges prescribed by SCCC 17.15.240. In the event that the City is unable to collect such funds within ten years after the date of advancement, the right of reimbursement of the funds not collected shall lapse at the end of such ten-year period. (Ord. 1312 § 1, 5-6-75. Formerly § 21A-24).

Appendix C
Enforcement Response Plan

Appendix C

City of Santa Clara
Fats, Oils & Grease (FOG) and
Sanitary Sewer Inspection Program
Enforcement Response Plan (ERP)

November 2019

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Fats, Oils & Grease (FOG) and Sanitary Sewer Inspection Program Enforcement Response Plan (ERP)

Definitions

Best Management Practice (BMP)
Schedules of activities, prohibitions of practices, maintenance procedures and other management practices to prevent or reduce the introduction of pollutants to the sanitary sewer system which have been determined by the director to be cost effective for particular industry groups, business types, or specific industrial processes.

Citation, Administrative
A civil financial penalty imposed by the City of Santa Clara for a violation of a municipal code. It carries no criminal charges. Fine amounts are set in the schedule of fines by Council resolution.

Compliance Meeting
A meeting with the Site Contact to discuss the causes of violation, the corrective actions required to achieve compliance, and to establish the timeline for the implementation of corrective actions.

Notice of Violation (NOV)
An Inspection Report that lists observed violation(s). It details what remedial actions are required of the Site Contact to correct the violation(s), along with a timeline for completion.

Food Service Establishment (FSE)
A facility that prepares and/or sells food for consumption either on or off the premises or washes utensils or dishes on premises that may contribute grease to the sewer system, including, but not limited to, restaurants, sandwich shops, delicatessens, bakeries, cafeterias, markets, bed and breakfast inns, motels, hotels, meeting halls, caterers, retirement and nursing homes or pizzerias. The term, as used in this chapter, does not refer to food stores or establishments that do not prepare food on premises and do not process food in a manner which may contribute grease to the sewer system.

Grease
Liquid or other waste containing floatable and/or dispersed grease, vegetable oil, petroleum oil, non-biodegradable cutting oil, or fat, oil or grease products of animal, vegetable or mineral origin which is detectable and measurable using analytical test procedures established in the United States Code of Federal Regulations, 40 C.F.R. 136.

Grease Control Device (GCD)
A grease interceptor, grease trap, mechanical grease removal device, or other device approved for use by the director.

Grease Interceptor
A large tank installed underground and designed to collect and control solid- food wastes and floating grease from wastewater prior to discharge into the sanitary sewer collection system. Grease interceptors are normally installed outside the building and use gravity to separate grease from the wastewater as it moves from one compartment of the interceptor to the next.

Grease Trap
A device placed under or in close proximity to sinks or other fixtures likely to discharge grease in an attempt to separate, trap and hold oil and grease substances.

Good Faith Effort
The prompt and vigorous pollution control measures undertaken by the Site Contact which show that extraordinary efforts have been made to achieve compliance. Good faith may also be defined as the person's honest intention to remedy the violation(s) coupled with corrective actions supporting this intention. However, good faith does not eliminate the possibility of enforcement escalation for the Site Contact.

Inspection Warrant
A bench order, issued by a judge, directing a private property owner to provide unimpeded access for conducting investigations inspections. An inspection warrant is needed when an inspector is repeatedly denied access or is otherwise prevented from entering private property.

Pre-Citation
A written notice explaining the municipal code violation and the corresponding corrective measures that needs to be taken by the site contact, or that has been completed notify if same or similar violation is identified in the future, the case may escalate to heavier enforcement to initiate compliance.

Person
Any individual, group of individuals, occupant, property owner, firm, association, organization, partnership, business trust, company, corporation, public agency, school district, any other governmental or public district or entity, or any combination of the forgoing persons.

Regional Water Board
The California Regional Water Quality Control Board, San Francisco Bay Region; the State agency with primary responsibility for the protection and maintenance of water quality.

Site Contact
The person who is managing or responsible for activities associated with the site, affiliated business, property owner, and/or the person who causes the violation.

Background

The FOG and Sewer Investigations Enforcement Response Plan (ERP) was developed to provide staff with guidance on the procedures to identify, document, and respond to violations of municipal and agency codes relating to discharges to the sanitary sewer collection systems. The FOG ERP implements requirements of the Sanitary Sewer Management Plan (SSMP), Element 7: FOG Control Program through education, identification, and controlling sources of FOG that could contribute to sanitary sewer maintenance issues. The City's Water & Sewer Utilities Department is the lead department for conducting inspections to ensure compliance with the Santa Clara City Code (SCCC).

The ERP serves as a reference document for inspection staff to take consistent actions to achieve timely and effective compliance. The specific codes are listed in the Codes/Ordinances section of this ERP.

The Enforcement Timelines section of this ERP incorporate specific criteria to aid City staff in determining the level of enforcement most appropriate to the nature of the violation and the enforcement timelines. The ERP describes the criteria used to determine the level of enforcement action and provides guidance on when and how to use them. The ERP includes guidance on:

- Roles and Responsibilities
- Recordkeeping
- Enforcement Actions
- Timely Correction of Violations
- Referral and Coordination Guidelines

The ERP is periodically reviewed and revised as needed to more efficiently and effectively issue enforcement actions and administrative penalties to prevent sanitary sewer overflows and further protect the sanitary sewer collection system, the Regional Wastewater Facility, and the Bay.

Legal Authority

The Santa Clara City Code (SCCC) Title 13, Section 10 provides the City with the authority to manage and/or prohibit discharges to the sanitary sewer collection system, and grants authority to inspect facilities connected to the sanitary sewer collection system.

SCCC states the Water and Sewer Utilities Director, and other duly authorized employees and agents bearing credentials and identification shall have the right to access upon all properties for the purpose of inspecting any sanitary sewer connection, including all discharge connections of roof and surface drains and plumbing fixtures; inspecting, observing, measuring, photographing, sampling, and testing the quality, consistency, and characteristics of sewage and industrial wastewaters being discharged into any public sewer or natural outlet; and inspecting and copying any records relating to quantity and quality of wastewater discharges, including but not limited to water usage and effluent discharged, chemical usage, and hazardous waste records. Excerpts of pertinent ordinances and associated administrative penalties (if any) are included in Appendix A.

Enforcement Roles and Responsibilities

The FOG Control Program has Water & Sewer Utilities Department staff conduct Food Service Establishment (FSE) inspections, Grease Investigations, and Grease Control Device (GCD) Inspections. Violations that are continuous or severe enough to warrant enforcement remedies may be referred to the City Attorney. The following describes the specific enforcement responsibilities for each:

Code Enforcement Technician

The Code Enforcement Technician position is responsible for the day-to-day implementation and enforcement of the FOG Inspection Program. The Code Enforcement Technician position is authorized to issue up to Administrative Citations for violations of the SCCC. The Code Enforcement Technician(s) duties related to enforcement are to inspect the assigned cases, provide compliance information, recommend and issue the appropriate level of enforcement action based on the type of violation observed using established guidelines, and to process enforcement actions in a timely manner. The following summarizes the duties for all levels of Code Enforcement Technician:

- Reviews inspection history.
- Inspects assigned facilities.
- Documents all work associated with inspecting a site.
- Collects samples as needed.
- Prepares and issues routine enforcement actions.
- Generates and prints out enforcement documents and forms.
- Enters and tracks all inspection and enforcement actions into the Enforcement Database.
- Tracks and reviews the site contact’s response to enforcement actions to ensure compliance issues are adequately addressed.
- Schedules and arranges compliance meetings.
- Prepares for Compliance Meetings, enters record of compliance meeting.
- Coordinates with Code Enforcement Officer when recommending escalating enforcement.

Please refer to relevant Inspection SOPs for guidance and details for each inspection type.

Code Enforcement Officer

The primary roles of the Code Enforcement Officer are to oversee daily enforcement activities of Code Enforcement Technician and to ensure that the ERP is followed in a timely and consistent manner. The Code Enforcement Officer performs the following:

- Reviews inspection reports, sample data, and other relevant case documents.
- Coordinates with Code Enforcement Technician when recommending escalating enforcement.
- Takes Administrative Citations (AC) to Compliance Manager for approval, signs the AC upon approval.
- Audits case files for consistency, accuracy, and adherence to the ERP.
- Performs QC Inspections of Code Enforcement Technicians cases.
- Moderates Compliance Meetings.
- Compiles data for program reports.
- Ensures Code Enforcement Technicians are adequately trained to perform their duties.

Compliance Manager

The primary role of the Compliance Manager is to oversee the City's Enforcement Programs and to ensure that the ERP is followed in a timely and consistent manner. The Compliance Manager performs the following duties:

- Reviews and approves Administrative Citations and Inspection Warrants.
- Coordinates with Code Enforcement Officer on escalated enforcement involving City Attorney, Santa Clara County, District Attorney, or other agency referrals.
- Ensures that compliance actions taken are consistent and timely.
- Approves and signs the ERP, SOPs and other related documentation.
- Approves data for program reports.
- Ensures Code Enforcement Officer is adequately trained to perform their duties.

Director/Assistant Director of Water & Sewer Utilities

The Director and Assistant Director perform the following duties:

- Approves and signs program reports and related policies.
- Delegates enforcement authority from the SCCC and other municipal rules and regulations to designated personnel.

City Attorney

The City Attorney will:

- Become enforcement lead if the responsible party continues to violate Title 13.10 of the SCCC after Administrative Citations or Pre-Citations are issued.
- Advise staff during enforcement matters as required
- Manage civil and criminal litigation on behalf of the City.

Public Works/Public Safety Department
Nonpoint source discharges requiring an emergency response fall under the authority of the Public Works (Streets Division) or Fire Department. If the nonpoint source discharge is a potentially hazardous material or poses a threat to health and safety, the Fire Department is notified by calling 911.

Enforcement Actions

A range of enforcement mechanisms are available. The appropriate enforcement action for FOG control measures can be found in this section.

Enforcement Philosophy
City staff gives the Site Contact every reasonable opportunity to comply with directives issued to them. City staff acknowledges that education plays a vital role in enforcement. The use of verbal education, outreach materials, and recommendations in coordination with more formal enforcement assists City staff in ensuring compliance.

Distribution of Educational Materials
The Code Enforcement Staff has BMPs available to distribute to businesses during inspections. The distribution of applicable BMP's is encouraged to help Site Contacts to control FOG discharges to the sanitary sewer system.

Enforcement Timelines

The Code Enforcement Technician or Code Enforcement Officer gives the Site Contact every reasonable opportunity to comply with directives issued to them. Compliance deadlines issued during inspections and provided on the NOV/Inspection Report, typically give 5 business days to complete most corrective actions. Specific violations may be given more or less time to correct based on site-specific conditions.

The enforcement timelines table included in Appendix B list violations along with applicable compliance deadlines. Unique situations may require a more strict or less strict timeline. Several unique situations include but are not limited to:

- Violations involving the repair of GCD components not associated with the effluent (i.e.: inlet standpipe, baffle plates) may be given a due date that coincides with the next scheduled cleaning (e.g.: up to 30 days for a trap, up to 90 days for an interceptor).
- Violations involving the repair of GCD components associated with the effluent (i.e.: effluent standpipe, outlet shroud) should be given a due date of no more than 5 business days, due to the potential threat of a sanitary sewer overflow or backup.
- Violations involving replacement or installation of equipment, or modifications of plumbing may be given a due date of 30 calendar days. Extensions may be

granted if the Site Contact is making progress on correcting the violations but needs more time (i.e.: going through the Plan Check process, obtaining necessary permits, purchasing a new a grease trap, etc.).

- All other violations should be given a due date of no more than 5 business days.

Enforcement Response Guide

The Enforcement Response Guide (ERG) provides a tiered approach to issuing enforcement actions to violations. All violations and corrective actions from enforcement responses require follow-up by City staff to ensure appropriate compliance. These enforcement actions include Notice of Violations, Pre-Citations, Compliance Meetings, Administrative Citations, and Inspection Warrants. When considering the type of enforcement action to be taken, the ERG serves as a minimum standard. Enforcement action may also be escalated by evaluating the violation based on: magnitude of the violation, timely resolution of violation, compliance history, and/or good faith efforts of the Site Contact. Mitigating factors, such as site-specific conditions, may be used to decide the magnitude of the enforcement and requirements for a timely response to a violation. Any escalation involving a penalty application requires Code Enforcement Officer and Compliance Manager approval. The Code Enforcement Officer ensures that the penalty proposed is consistent and appropriate to the nature of the violation.

The City's general approach is to first educate the Site Contact and provide them an opportunity to comply (Level 1). Where a Site Contact fails or refuses to respond to an educational approach or the circumstances of a violation call for it, enforcement actions are escalated in steps (Levels 2-4).

The tiered enforcement approach used by City staff to reach compliance is set forth in this guide. The guide is intended to ensure consistent application of enforcement actions to parties responsible for violations of applicable codes.

<u>Enforcement Levels</u>

LEVEL 1: Notice of Violation (Inspection Report listing observed violations)

An Inspection Report that lists observed violations serves as a Notice of Violation. NOVs are a Level 1 enforcement action and are generally issued when an FSE has no previous history of the same or similar violation. It details what remedial actions are required of the Site Contact to correct the violation, along with a timeline for completion. Code Enforcement staff will provide relevant educational outreach materials that address the violation. Code Enforcement staff notifies the Site Contact of future enforcement escalation if violations are not addressed.

Code Enforcement staff Action: Provide information on grease control BMPs and issue a NOV. Multiple violations will be consolidated into one NOV.

- Identify violation.
- Determine magnitude of violation.
- Confirm that same or similar violation was not previously documented.
- Issue NOV, listing violations, corrective actions, and enforcement deadlines.
- Provide instruction and educational information on grease control.
- Verbally warn Site Contact of possible escalated enforcement.

Applicable Situations: Level 1 enforcement action is commonly used when a site has no previous history of the same or similar violation. Specific examples include:

- Site lacks maintenance records
- GCD has not been serviced at the required minimum frequency
- No strainers in sinks plumbed to GCDs
- Grease Trap is missing a baffle wall
- Grease Interceptor has a downed standpipe
- A facility is using chemicals, enzymes, or bacteria in their GCD
- Facility did not install GCD as required by Plan Check

LEVEL 2: PRE-CITATION

A Pre-Citation is generally issued when previous violations were not corrected by completion due dates, or when the Site Contact has a history of repeating the same or similar violation. A Pre-Citation is a Level 2 enforcement action that serves as written documentation of the violation that has occurred and directs the Site Contact in writing to take immediate corrective action. Code Enforcement staff also distributes any relevant educational outreach materials that address the violation. Code Enforcement staff notifies the Site Contact of future enforcement escalation if violations are not addressed.

Code Enforcement staff Action: Issuing a Pre-Citation indicates the magnitude of the violation while providing information and an opportunity to remedy the violation. Multiple violations meriting Level 2 enforcement will be documented on one Pre-Citation. A NOV should accompany the Pre-Citation, listing all violations at all levels of enforcement, including those that have been documented on the Pre-Citation.

- Identify violation and document violation, corrective action, and response due date in the Inspection Report.
- Determine the magnitude of the violations.
- Confirm that same or similar violation was previously documented.
- Issue Pre-Citation and NOV.
- Provide instruction and educational information on grease control.
- Verbally warn Site Contact of possible escalated enforcement.

The Level 2 Pre-Citation enforcement action is commonly used to escalate enforcement for the following situations:

- Previous violations at the NOV enforcement level have not been corrected before the due date.
  - Failure to complete the corrective actions may include not completing the corrective actions to the satisfaction of Code Enforcement staff, or failure to take any action by the due date.
- Site Contact has received a NOV enforcement level of the same or similar violation in the last three years.

LEVEL 3: COMPLIANCE MEETING REFERRAL (CMR)

Compliance Meeting Referrals (CMR) are generally issued when previous violations were not corrected by completion due dates, or when the Site Contact has a history of repeating the same or similar violation. A CMR may also be issued for a failure to resolve a violation by the due date in a Pre-Citation, or a similar violation was issued on a Pre-Citation in a previous inspection. A CMR gives the Site Contact notice that they have been referred for a Compliance Meeting. Multiple violations of the same code meriting CMR enforcement will be documented on one CMR. A NOV accompanies the CMR and lists all violations noted during the inspection, including those that have been documented on the CMR.

In the Compliance Meeting, the Site Contact(s) are called in to discuss the violations and agree upon actions needed to resolve the violations. Code Enforcement staff will schedule and sets up the compliance meeting with the Site Contact and any necessary stakeholders. During the meeting, timelines and a schedule for compliance are established. The agreed-upon Compliance Agreement is signed by the Site Contact(s) as a commitment to meet the compliance timelines or future enforcement escalation will be pursued. Progress on the Compliance Agreement is tracked by the Code Enforcement Technician and reported to the Code Enforcement Officer. If the violations are not corrected, Level 4 enforcement should be considered in coordination with the Code Enforcement Officer and Compliance Manager.

Code Enforcement staff Action: Indicate magnitude of violation or discharge by issuing a CMR.

- Identify and document violation, corrective action (including any necessary clean-up activities), and compliance due date in the NOV.
- Confirm that repeat violation(s) and/or serious violation(s) exists.
- Issue CMR as appropriate.

The CMR enforcement action is commonly used to escalate enforcement when:

- Previous violations at the Level 2 enforcement level have not been corrected before e due date,
- Site Contact has a history at the Level 2 enforcement level or higher for the same or similar violation in the last three years.

- Significant capital resources/ construction time required for more permanent solution.
- Multiple responsible parties are involved (e.g.: tenant and property manager)
- Compliance issues are numerous and complex.

Certain situations merit foregoing Level 3 enforcement and going directly to Level 4 enforcement. These include, but are not limited to:

- Site has a history of Level 3 enforcement actions for the same or similar violation in the last three years.
- Site has a history of Level 4 enforcement actions for the same or similar violation in the last three years.

LEVEL 4 ADMINISTRATIVE CITATION (AC)

An Administrative Citation (AC) is generally issued for serious violation or for unresolved repeat violations. An AC is a Level 4 enforcement action issued after a Pre-Citation that notes the type of violation and directs the Site Contact to implement corrective measures to return to compliance. An AC may be issued based on an inspection and/or observation of other City employees, so long as documentation meets the standards set forth in SCCC Section 1.10.030. Additional ACs may be issued to different Site Contacts for the same violation (e.g., the owner, tenant, property manager, etc.). An AC carries a monetary penalty and always requires approval from the Code Enforcement Officer and Compliance Manager.

Code Enforcement staff Action: Indicate magnitude of violation or discharge by issuing an Administrative Citation Referral (ACR).

- Review case with Code Enforcement Officer and/or the Compliance Manager. Case includes Inspection report(s), any photos or other evidence, and pre-inspection report detailing facility's enforcement history.
- Issue Administrative Citation if approved by Code Enforcement Officer and/or the Compliance Manager.
- Pursue Compliance Meeting if appropriate.

The AC enforcement action is commonly used to escalate enforcement when:

- Previous violations at the Level 2 or Level 3 enforcement level have not been corrected before the due date.
- Site Contact has a history at the Level 2 or Level 3 enforcement level or higher for the same or similar violation in the last three years.
    - Significant problems that cannot be addressed promptly or fully using the enforcement tools discussed above will be referred to the City Attorney. A second AC for deliberate or gross negligence should be referred to the City Attorney. Code Enforcement staff will work cooperatively and make available all completed inspection reports and previous enforcement actions so the City Attorney can determine how best to proceed.

ALL REFERRALS TO INTERNAL OR EXTERNAL AGENCIES

Code Enforcement staff Action: Referral to and Coordination with internal or external agencies including not limited to City of Santa Clara Public Works, Community Development or Public Safety Departments, Santa Clara County Department of Environmental Health, etc.

- Significant problems that cannot be addressed promptly or fully using the enforcement tools discussed above will be referred to internal or external agencies for assistance to achieve site compliance. Code Enforcement staff will work cooperatively and make available all completed inspection reports and previous enforcement actions so the assisting agency can determine how best to proceed.

Appendix A: Codes/Ordinances

Santa Clara City Code (SCCC)	City Code Full Text
California Plumbing Code (CPC) 1014.1.3	Food Waste Disposers and Dishwashers. No food waste disposer or dishwasher shall be connected to or discharge into a grease interceptor. Commercial food waste disposers shall be permitted to discharge directly into the building's drainage system. Exception: Food waste disposers shall be permitted to discharge to grease interceptors that are designed to receive the discharge of food waste.
SCCC 13.10.040	Maintenance and inspection of sewer connections. Each user shall keep his/her sewer connections and sewer lateral(s) in good order at his/her own expense and shall be liable for all damages resulting from failure to do so. Each owner shall maintain their sewer lateral free from displaced joints, open joints, root intrusions, substantial deterioration of pipe material, cracks, leaks, inflow or infiltration of extraneous water, grease and sediment deposits or other similar conditions, defects, or obstructions likely to cause or increase the chance of blockage. A City inspector shall be admitted at all reasonable hours to any premises connected with the sewer system, for the purpose of checking plumbing fixtures, protecting the rights of the City, and determining facts relevant to the establishment, computation, and billing of the sewer service charges provided for in this chapter, including, in the case of industrial users, examination of the users' books for the purpose of checking the quantities of industrial waste produced. (Ord. 1901 § 2, 11-27-12).
SCCC 13.10.170	Limitations on point of discharge. No person shall discharge any substances directly into a manhole or other opening in a City sewer, other than through a City-approved sewer connection. (Ord. 1901 § 2, 11-27-12).

SCCC 13.10.200	Protection from accidental discharge. (a) Each industrial user shall provide protection from accidental discharge of prohibited materials or other wastes regulated by this chapter into either the storm sewer or the sanitary sewer system. (b) Facilities to prevent accidental discharge of prohibited materials shall be provided and maintained at the industrial user's expense. (c) All industrial users shall notify the City by telephone or in person within one hour of becoming aware of accidentally discharging wastes of reportable quantities as determined in Title 40, Chapter 1, Subchapter D, Part 117 CFR, or discharge of any substance which, if otherwise disposed to, would be hazardous waste under 40 CFR Part 261, to enable countermeasures to be taken by the City to minimize damage to the sanitary sewer system, the plant, the treatment processes, and/or the receiving waters. If hazardous waste is discharged, the industrial user shall be subject to all requirements in 40 CFR Section 403.12(p). (d) Within five days of the date of occurrence a detailed written statement describing the causes of the accidental discharge and the measures being taken to prevent future occurrences shall be provided to City. (e) Notification to the City will not relieve industrial users of notification requirements under any other Federal, State, or local law, nor of liability for any expense, loss, or damage to the sanitary sewer system, plant, or treatment process or receiving waters, or for any fines or penalties imposed on the City on account thereof under applicable provisions of State or Federal law. (f) All permitted facilities must maintain a spill control plan for protection against accidental discharges, including but not limited to berming of chemicals and waste materials. The review of such plans and procedures shall not relieve the industrial user from the responsibility of modifying the facility as necessary to provide the protection necessary to meet the requirements of this Code or other State or Federal regulations. (g) This plan must be reviewed and revised as needed within thirty (30) days after an accidental discharge has occurred or as required by the Director. (Ord. 1901 § 2, 11-27-12).
SCCC 13.10.210	Pretreatment by owner. Each owner shall, at the owner's expense, provide such treatment or take such other measures, as the Director may require to prevent accidental discharge, reduce objectionable characteristics, contents, or rate of discharge of waters or waste being deposited in the sanitary sewer system, to prevent damage to or interference with the sanitary sewer system. (Ord. 1901 § 2, 11-27-12).
SCCC 13.10.240	Obstructing or injurious substances. No person shall discharge, cause, allow, or permit to be discharged, thrown, or deposited into the sanitary sewer system, or any part thereof, or into any plumbing fixture or private sewer or drain connected either directly or indirectly to the sanitary sewer system, any substance of any kind whatsoever tending to obstruct or injure the sanitary sewer system, or to cause a nuisance or hazard, or which will in any manner interfere with the proper operation or maintenance of the sanitary sewer system. (Ord. 1901 § 2, 11-27-12).

SCCC 13.10.260	Hot substances. No person shall discharge, cause, allow, or permit to be discharged into the sanitary sewer system, or any part thereof, any liquid, solid, vapor, gas, or thing having or developing a temperature of one hundred fifty (150) degrees Fahrenheit or more, or that may cause the temperature at the plant to exceed one hundred four (104) degrees Fahrenheit. (Ord. 1901 § 2, 11-27-12).
SCCC 13.10.270	Grease, oils, fats. (a) No person shall discharge, cause, allow, or permit to be discharged into the sanitary sewer system any liquid or other waste containing grease in excess of one hundred fifty (150) parts per million by weight. (b) No person shall discharge, cause, allow, or permit any grease discharge from a food service establishment into the sanitary sewer system, unless such discharge has first been processed through an approved grease control device. (c) No person shall discharge, cause, allow, or permit to be discharged any yellow grease, or any waste or material mixed with yellow grease, into the sanitary sewer system from a food service establishment. No yellow grease from a food service establishment shall be mixed with grease trap or grease interceptor waste. (Ord. 1901 § 2, 11-27-12).
SCCC 13.10.280	Solid or viscous matter. No person shall discharge, deposit, throw, or cause to be discharged, deposited, or thrown into the sanitary sewer system, or any part thereof, any ashes, cinders, pulp, paper, sand, cement, mud, straw, shavings, metal, glass, rags, feathers, tar, asphalt, resins, plastics, wood, animal hair, paunch manure, or any heavy solid or viscous substance capable of causing obstruction to the flow in the sanitary sewer system, or any part thereof, or that would interfere with the proper operation of the plant or the treatment of sanitary sewage or industrial waste. (Ord. 1901 § 2, 11-27-12).
SCCC 13.10.370	Garbage. (a) No person shall discharge, deposit, throw, cause, allow, or permit to be discharged, deposited, or thrown into the sanitary sewer system, or any part thereof, (1) any garbage, (2) any fruit, vegetable, or animal material, and/or (3) any other solid material from any food-processing plant (or any other industrial plant or retail grocery store), irrespective of whether or not it shall have been first passed through a mechanical grinder. (b) No person shall install, operate, use, or maintain upon the premises of any food-processing plant (or any other industrial plant or retail grocery store) any mechanical grinder or waste grinder that is connected directly or indirectly to the sanitary sewer system, or any part thereof. (c) No person shall discharge, deposit, throw, or cause, allow, or permit to be discharged, deposited, or thrown into the sanitary sewer system, or any part thereof, any garbage, or fruit, vegetable, animal, or other solid kitchen waste material resulting from the preparation of any food or drinks in any dwelling, restaurant, or eating establishment, unless the same shall have first been passed through a mechanical garbage or waste grinder in conformance with the provisions of the Plumbing and Electrical Code of the City. (Ord. 1901 § 2, 11-27-12).

SCCC 13.10.380	Oil and grease removal devices. (a) Any food service establishment, or other type of business or establishment where grease or other viscous, obstructing, or objectionable materials may be discharged into a public or private sewage main or disposal system, shall have a grease control device and related plumbing of a size and design approved by the Director. (1) Grease interceptors shall meet the following minimum requirements: (A) Designed retention time of no less than thirty (30) minutes. (B) The effluent from the device must flow through an approved sample box. (C) Installed per manufacturer's specifications. (D) At least two manholes, situated so all standpipes can be fully observed, and all internal surfaces can be reached, without confined space entry. (E) Double-sweep cleanouts, on the interceptor inlet, and sample box outlet. (F) Shall meet the specifications and be constructed in accordance with the applicable provisions of Chapter 15.35 SCCC. (2) Grease traps shall meet the following minimum requirements: (A) No injection ports for chemicals or bacteria. (B) Installed per manufacturer's specifications. (C) Appropriate flow restrictors, whether integral or external to the device, must be installed. (D) Shall meet the specifications and be constructed in accordance with the applicable provisions of Chapter 15.35 SCCC. (3) Mechanical grease removal devices shall be installed in accordance with manufacturers' specifications. (b) Each grease control device shall be so installed and connected that it shall be at all times easily accessible for visual inspection, sampling, cleaning and removal of grease and other matter from all surfaces. (c) A grease control device shall be situated on the discharger's premises, except when such a location would be impractical or cause undue hardship on the discharger, the City may issue an encroachment permit to allow the grease control device to be installed in the public street or sidewalk area and located so that it will not be obstructed by landscaping or parked vehicles. (d) Waste discharged from fixtures and equipment in establishments which may contain grease or other objectionable materials including, but not limited to, scullery sinks, pot and pan sinks, dishwashers, food waste disposals, soup kettles, and floor drains located in areas where such objectionable materials may exist, may be drained into the sanitary sewer through the grease control device if approved by the Director; provided, however, that toilets, urinals, wash basins, and other fixtures containing fecal material shall not flow through the grease control device. (e) Grease control devices shall be maintained in efficient operating condition by periodic removal of the accumulated grease. The use of chemicals, bacteria, enzymes, or other additives that have the effect of emulsifying or dissolving grease is prohibited unless specifically authorized by the Director in writing. No accumulated grease shall be introduced into any drainage piping or public or private sewer.

	(f) Grease control devices shall be cleaned on a sufficient frequency to prevent objectionable odors, surcharge of the grease control device, or interference with the operation of the sanitary sewer system. (1) Grease traps shall be cleaned at least once every thirty (30) days. (2) Grease interceptors shall be cleaned once every ninety (90) days. (3) Mechanical grease removal devices must be maintained in a manner and frequency consistent with manufacturer specifications and guidance. (4) Grease control devices shall be cleaned when their last chamber is filled to twenty-five percent (25%) or more of capacity with grease or settled solids. Grease interceptors with a sample box shall be cleaned immediately when grease is evident in the sample box. (5) Grease control devices shall be cleaned by being pumped dry and all accumulated sludge on all surfaces shall be removed by washing down the sides, baffles and tees. No water removed from the device during cleaning shall be returned to the grease control device. (g) The Director may grant an exception to the requirements of subsections (f)(1) and (2) of this section where the Director finds, based on evidence presented by the discharger, that a less frequent cleaning schedule will be sufficient to assure that not more than twenty-five percent (25%) of the capacity of the grease control device will be filled with grease or settled solids. (h) All dischargers shall implement best management practices in their operations to minimize the discharge of grease to the sanitary sewer system. (i) Dischargers shall maintain records on site for a period of at least three years as follows: (1) Dischargers with an installed grease control device shall maintain records showing that the grease control device has been properly maintained and cleaned as required by subsections (e) and (f) of this section; and (2) Food service establishments shall maintain records showing the following related to all grease hauled off site: date and time material removed off site, volume removed, hauler name, truck license number, type of grease removed, and final destination of material collected. (j) Abandoned grease control devices shall be emptied and filled as required for abandoned septic tanks. (Ord. 1901 § 2, 11-27-12).

SCCC 13.10.380 (Continued)	(f) Grease control devices shall be cleaned on a sufficient frequency to prevent objectionable odors, surcharge of the grease control device, or interference with the operation of the sanitary sewer system. (1) Grease traps shall be cleaned at least once every thirty (30) days. (2) Grease interceptors shall be cleaned once every ninety (90) days. (3) Mechanical grease removal devices must be maintained in a manner and frequency consistent with manufacturer specifications and guidance. (4) Grease control devices shall be cleaned when their last chamber is filled to twenty-five percent (25%) or more of capacity with grease or settled solids. Grease interceptors with a sample box shall be cleaned immediately when grease is evident in the sample box. (5) Grease control devices shall be cleaned by being pumped dry and all accumulated sludge on all surfaces shall be removed by washing down the sides, baffles and tees. No water removed from the device during cleaning shall be returned to the grease control device. (g) The Director may grant an exception to the requirements of subsections (f)(1) and (2) of this section where the Director finds, based on evidence presented by the discharger, that a less frequent cleaning schedule will be sufficient to assure that not more than twenty-five percent (25%) of the capacity of the grease control device will be filled with grease or settled solids. (h) All dischargers shall implement best management practices in their operations to minimize the discharge of grease to the sanitary sewer system. (i) Dischargers shall maintain records on site for a period of at least three years as follows: (1) Dischargers with an installed grease control device shall maintain records showing that the grease control device has been properly maintained and cleaned as required by subsections (e) and (f) of this section; and (2) Food service establishments shall maintain records showing the following related to all grease hauled off site: date and time material removed off site, volume removed, hauler name, truck license number, type of grease removed, and final destination of material collected.

SCCC 13.10.400	Screened industrial waste. (a) No person shall discharge, cause, allow, or permit to be discharged into the sanitary sewer system, or any part thereof, any garbage, or any fruit, vegetable, animal, or other solid industrial waste resulting from the processing, packaging, or canning of fruits, vegetables, or other foods or products, unless such waste has first been passed through screens having openings not exceeding one thirty-second (1/32) of an inch in dimension. (b) The Director may authorize, in writing, the discharge into the sanitary sewer system of such waste if it is first passed through screens having larger openings, if the Director is satisfied that such larger openings will provide screening efficiency and effectiveness equal to or better than that provided by the above-specified openings of one thirty-second (1/32) of an inch in dimension. (c) Each person who discharges, causes, allows, or permits to be discharged into the sanitary sewer system, or any part thereof, any such waste shall install and maintain in good operating order, screens as hereinabove specified and appurtenances thereto, including, but not limited to, all necessary conveyors and elevators, all in sufficient quantity and of sufficient size and quality to continuously and effectively screen not less than one hundred percent (100%) of the peak hydraulic and solids loading imposed on such screens and appurtenances during any processing period. (d) No person shall discharge any such screened waste into the sanitary sewer system, or any part of the system, unless and until he/she has obtained a wastewater discharge permit pursuant to this chapter granting approval to do so. Before a wastewater discharge permit is granted, the Director may require that such person provide to the Director a report prepared by a registered professional engineer verifying, to the satisfaction of the Director, that the provisions of this section have been fully complied with. (Ord. 1901 § 2, 11-27-12).
SCCC 13.10.520	All industrial users subject to the reporting requirements of this chapter shall retain and make available for inspections and copying all records of information obtained pursuant to any monitoring activities required by this chapter, and additional records of information obtained pursuant to monitoring activities undertaken by the industrial user independent of such requirements. These records shall remain available for a period of at least three years. This period shall be automatically extended for the duration of any enforcement action concerning the industrial user, or where the industrial user has been specifically notified of a longer retention period by the Director. (Ord. 1901 § 2, 11-27-12).
SCCC 13.10.530	Responsibility. The primary responsibility for enforcement of the provisions of this chapter shall be vested in the Director or such agents of the City as he/she shall designate; and provided further, that field inspectors or other employees of the City are hereby authorized to act as agents of the City or of the sewage treatment plant for and on behalf of the Director, with the power to inspect and issue notices for violations of this chapter. (Ord. 1901 § 2, 11-27-12).

SCCC 13.10.540	Federal pretreatment regulations. No industrial user shall discharge, cause, allow, or permit a discharge into the sanitary sewer system in violation of any Federal or State regulation regulating discharges by such users, including, but not limited to, the Federal pretreatment regulations found in Title 40 CFR. (Ord. 1901 § 2, 11-27-12).
SCCC 13.10.550	Public nuisance. Waste or wastewater discharge, threatened waste or wastewater discharge, or any condition or act in violation of any provision of this chapter, or any provision of any permit issued pursuant to this chapter, or any directive or order of the Director authorized by this chapter or applicable law is hereby declared to be a public nuisance. Such nuisance may be abated, removed, or enjoined and damages assessed therefor, in any manner provided by law. (Ord. 1901 § 2, 11-27-12).
SCCC 13.10.560	Falsification of information. (a) It shall be unlawful to make any false statement, representation, record, report, plan, or other document; to tamper with or render inaccurate any monitoring device or equipment; or to divert flow from any monitoring device or equipment installed or operated to further the purpose of this chapter or the purpose of any permit issued under this chapter. (b) In addition to any other punishment or remedy provided by law, any such falsification or tampering shall be grounds for revocation of any permit issued under this chapter. (Ord. 1901 § 2, 11-27-12).
SCCC 13.10.570	Power to Inspect. (a) The Director and other duly authorized employees and agents of the City bearing credentials and identification shall have the right to access upon all properties for the purpose of inspecting any sewer or storm drain connection, including, but not limited to, all discharge connections of roof and surface drains and plumbing fixtures; inspecting, observing, measuring, photographing, sampling, and testing the quality, consistency, and characteristics of sewage and industrial wastewaters being discharged into any public sewer or natural outlet; and inspecting and copying any records relating to quantity and quality of wastewater discharges, including, but not limited to, water usage and effluent discharge, chemical usage, and hazardous waste records. (b) The Director may terminate service or revoke the permit of any person who has discharged wastewater to the sanitary sewer system and/or has unreasonably refused access to the City. (Ord. 1901 § 2, 11-27-12).
SCCC 13.10.610	Issuance of cease and desist orders. When the Director finds that a discharge of wastewater has taken place or is likely to take place in violation of this chapter or the provisions of any wastewater discharge permit, the Director may issue an order to cease and desist such discharge, or practice, or operation likely to cause such discharge and direct those persons not complying with such prohibitions, limits, requirements, or provisions to: (a) Comply immediately; or (b) Comply in accordance with a time schedule; and/or

	(c) Take appropriate remedial or preventative action. (Ord. 1901 § 2, 11-27-12).
SCCC 13.10.620	Emergency corrections, remedial or preventative action. In the event cleanup, repairs, construction, or other work is performed on any premises pursuant to any provision of law relating to an emergency or that authorizes public work on private property to correct, eliminate or abate a condition that threatens to cause, causes, or has caused a violation of any provision of this chapter or the provisions of a wastewater discharge permit, the user or persons responsible for the occurrence or condition giving rise to such work and/or the owner and/or occupant of the premises shall be liable, jointly and severally, to the City for such public expenditures, and subject to all enforcement and administrative penalty provisions of this Code. (Ord. 1901 § 2, 11-27-12).
SCCC 13.10.640	Penalties. (a) Pursuant to Chapters 1.05 and 1.10 SCCC, the City, in its prosecutorial discretion, may enforce violations of the provisions of this chapter as a criminal, civil, and/or administrative action. All penalties and citations pursuant to applicable law, including but not limited to Government Code Section 54740.5 and Chapters 1.05 and 1.10 SCCC, shall apply to violations of this chapter. (b) In addition to the provisions of Chapters 1.05 and 1.10 SCCC, and due to the significant potential harm caused to the environment by violation of provisions of this chapter, any person who intentionally, accidentally, or negligently violates any provisions of this chapter or any provision of any permit issued pursuant to this chapter, or who intentionally, accidentally, or negligently discharges waste or wastewater that causes pollution or violates any effluent limitation, standard of performance, or pretreatment or toxicity standard shall be civilly liable to the City in a sum up to ten thousand dollars ($10,000.00) for the first day in which such violation occurs, up to twenty-five thousand dollars ($25,000.00) for the second day in which such violation occurs, and fifty thousand dollars ($50,000.00) for each additional day. The City may petition a court of appropriate jurisdiction to impose, assess, and recover such sums. Funds collected pursuant to this section shall be paid to City's environmental compliance fee account. (c) Any assessed penalty shall be paid within ten days from the date of notice of such penalty. Interest shall accrue at the rate of the United States government T-Bills sold at the latest sale prior to the date of the delinquency plus three percent prorated per month or fraction thereof on the amount of penalty from the date of delinquency. (d) The amount of any penalties imposed under this chapter which have

	remained delinquent for a period of sixty (60) days shall constitute a lien against the real property of the discharger from which the violation occurred resulting in imposition of the penalty. The Director shall cause the amount of uncollected penalty to be recorded with the County Recorder, in accordance with Government Code Section 54740.5. (e) Any and all remedies for violations of this chapter are cumulative and not exclusive, and shall be in addition to all other remedies available to the City under State and Federal law and local ordinances. Funds collected pursuant to this section shall be paid to City's environmental compliance fee account. (Ord. 1901 § 2, 11-27-12).
SCCC 13.10.650	Appeals. (a) Any user, permittee, applicant or other person aggrieved by any decision, action, finding, determination, order or directive of the Director, made or authorized pursuant to this chapter, or relating to any permit issued pursuant to this chapter, or interpreting or implementing the same, may file a written request with the Director for reconsideration thereof within ten days of such decision, action, finding, determination, order or directive. Such request for reconsideration must set forth in detail all supporting facts. No meeting or hearing shall be convened for such request for reconsideration. The Director shall render a final written decision within ten days of the receipt of such request. (b) Any user, permittee, applicant or other person aggrieved by any final determination of the Director may appeal such decision to the City Manager within ten days of the Director's final determination. Written notice of such appeal must be filed with the City Clerk within that ten-day period, and shall set forth all supporting facts. The appeal shall be heard by the City Manager within thirty (30) days from the filing of the notice of appeal. The appellant, the Director, and such other persons as the Director and/or the City Manager may deem appropriate shall be heard at the hearing on such appeal. Upon conclusion of the hearing, the City Manager may affirm, reverse or modify the final determination of the Director in furtherance of the provisions of this chapter. The City Manager's determination on the appeal shall be final. (c) Any decision, action, finding, determination, order or directive of the Director which is subject to a request for reconsideration or appeal shall remain in effect during the pendency of any request for reconsideration and/or appeal. (d) All monetary penalties shall be due and payable during the pendency of any request for reconsideration or appeal. If a determination is not affirmed and the penalty is modified, the Director shall cause any overpayment of penalty to be reimbursed to the payor within thirty (30) days of the final determination. (e) Any administrative citation issued for any violation shall be appealed pursuant to Chapters 1.05 and 1.10 SCCC. (Ord. 1901 § 2, 11-27-12).

SCCC 15.35.010	Adoption of Plumbing Code. The 2016 California Plumbing Code, published and copyrighted by the International Association of Plumbing and Mechanical Officials and the California Building Standards Commission in Part 5 of Title 24 of the California Code of Regulations, is hereby adopted and referred to, and by this reference expressly incorporated and made a part of this chapter as though fully set forth herein. The adoption includes Appendices A, B, C, D, G, H, I, and J. The 2016 California Plumbing Code shall be designated and referred to as the "Plumbing Code" for the City of Santa Clara. (Ord. 1960 § 5, 11-22-16).
SCCC 8.30.040	Responsibility for property maintenance. The owner, occupant, lessee, or tenant of any property within the city shall be responsible for the maintenance of property and premises in a manner consistent with the provisions of this chapter and this Code. (Ord. 1663 § 1, 11-1-94. Formerly § 22A-4).

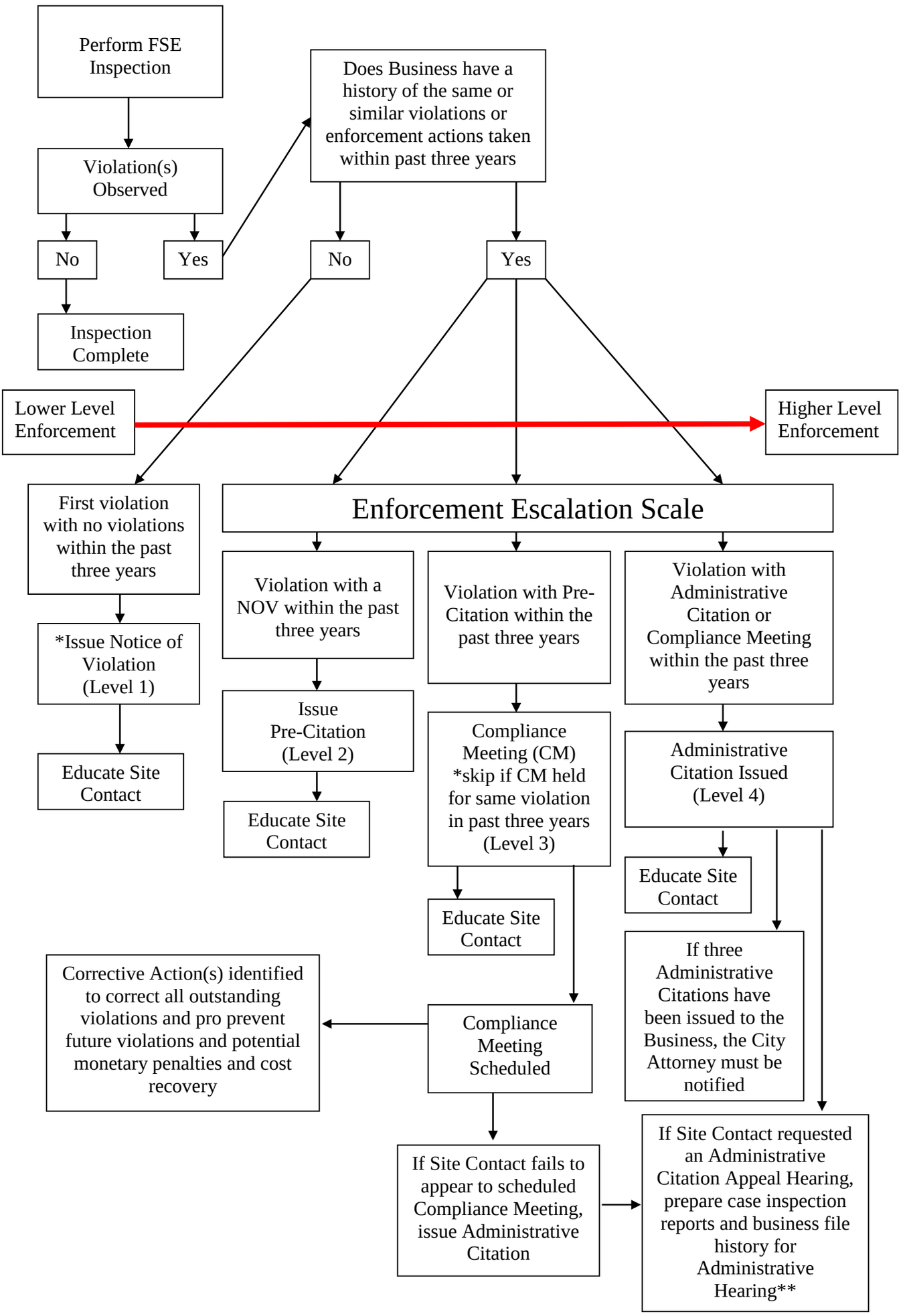
Appendix B: Enforcement Timelines Table

Compliance Deadline (Business Days)	Violation Full Title	Violation Description	Corrective Action	City Code
5	GCD maintenance records.	Partial or no GCD maintenance records were available during inspection.	Obtain GCD maintenance records and keep available onsite for three years.	SCCC 13.10.380(i)
5	GCD exceeded 25% combined solids.	GCD maintenance records noted the combined FOG and bottom solids exceeded 25% at pump out.	Increase GCD pump out frequency within required intervals when the GCD becomes 25% full of FOG and bottom solids.	SCCC 13.10.380(f)(4)
5	Grease trap exceeded 30 day pump out frequency.	The Grease Trap pump out frequency exceeded the required 30 day minimum interval.	Immediately contact a licensed grease hauler to pump out the GCD. Increase Grease Trap pump out frequency within required intervals of a minimum of every 30 days.	SCCC 13.10.380(f)(1)
5	Grease interceptor exceeded 90 day pump out frequency.	The Grease Interceptor pump out frequency exceeded the required 90 day minimum interval.	Immediately contact a licensed grease hauler to pump out the GCD. Increase Grease Interceptor pump out frequency within required intervals of a minimum of every 90 days.	SCCC 13.10.380(f)(2)
5	Powered GCD exceeded required maintenance frequency.	The Power Operated GCD required maintenance specified by the manufacturer has not been maintained.	Immediately contact a licensed grease hauler to pump out the GCD. Increase GCD cleaning frequency within required intervals.	SCCC 13.10.380(f)(3)
5	GCD baffle, standpipes or components damaged, missing or not functioning properly.	GCDs shall be kept in working order according to the manufacturers' specifications.	Repair GCD to the manufacturer's designed specifications, hire a licensed plumber or grease hauler to conduct repairs.	SCCC 13.10.380(a): (1)(C), (2)(B), & (3)
5	GCD not accessible for inspection.	Provide and maintain adequate accessibility to GCD.	Move items away from GCD, maintain access for maintenance and inspections.	SCCC 13.10.380(b)
5	FOG build-up/Excessive build-up/Obstruction identified in the sanitary sewer.	Excessive FOG identified in downstream sanitary sewer or sample box.	Hire a licensed plumber to hydro-flush or hydro-jet and inspect the facility's sanitary sewer from the GCD to the City's main sanitary sewer pipe. Repair any deficiencies immediately if found.	SCCC 13.10.040
5	FOG generating activity not plumbed or discharged to a GCD.	One or more grease generating activities found not plumbed or discharging to a GCD.	Hire a licensed plumber to install an adequately sized GCD, replumb drains or improve activity. Obtain necessary permits for construction. Provide FOG control plan to Water & Sewer Utilities.	SCCC 13.10.270(b)
5	Plumbing of grease generating drain fixtures.	One or more grease generating drain fixtures found not plumbed to a GCD.	Hire a licensed plumber to install an adequately sized GCD, replumb drains or improve activity. Obtain necessary permits for construction. Provide FOG control plan to Water & Sewer Utilities.	SCCC 13.10.380(d)
5	Prohibited drain fixture plumbed to a GCD.	One or more prohibited or non-grease generating drain fixtures found plumbed to a GCD.	Plumb non-grease generating drain fixture to the sanitary sewer to bypass the GCD.	SCCC 15.35.010 & CPC 1014.1.3
5	Best management practices (BMPs).	Facility staff observed conducting poor practices that could lead to excessive FOG buildup.	Implement and train all applicable staff BMPs to reduce FOG discharges to the sanitary sewer and GCD.	SCCC 13.10.380(h)
0	Fats, oils and grease (FOG) disposal.	No person shall dispose of FOG unless it has been discharged through a GCD or to an adequate container for contractor collection.	Implement and train all applicable staff BMPs to reduce FOG discharges to the sanitary sewer and GCD or maintain tallow container.	SCCC 13.10.270
0	Prohibited additive to sewer system.	The use of chemicals, bacteria, enzymes, or other additives that have the effect of emulsifying or dissolving grease is prohibited.	Immediately cease the use of the unauthorized product that emulsify or dissolve FOG.	SCCC 13.10.380(e)
5	Screens missing at drains.	Screens are required to be installed at drains to prevent build-up or obstructions from interfering with the sanitary sewer system.	Immediately install adequate screens not to exceed 1/32 of an inch at necessary drains and train staff to maintain.	SCCC 13.10.400
5	Improper disposal of food or drinks through a grinder, disposer and sanitary sewer.	Food garbage grinders, disposers or disposal of solids to the sanitary sewer are prohibited to prevent build-up or obstructions from interfering with the sanitary sewer system.	Immediately cease improper disposal activity and remove unauthorized equipment. Train staff to proper BMPs.	SCCC 13.10.370(a)
0	Accidental discharge to sewer system.	Facility shall provide protection from accidental discharges of prohibited materials or wastes to the sanitary sewer system.	Immediately provide training to staff or engineering control to protect the sanitary sewer system.	SCCC 13.10.200(a)
30	Abandoned GCD.	Abandoned GCDs shall be emptied and filled as required for septic tanks.	Properly decommission the abandoned GCD, hire a licensed plumber or grease hauler to conduct work.	SCCC 13.10.380(j)

Appendix B: Enforcement Timelines Table

Compliance Deadline (Business Days)	Violation Full Title	Violation Description	Corrective Action	City Code
0	City employee right to inspect.	The Director and other duly authorized employees and agents of the City bearing credentials and identification shall have the right to access upon all properties for the purpose of inspecting any sewer or storm drain connection, including, but not limited to, all discharge connections of roof and surface drains and plumbing fixtures; inspecting, observing, measuring, photographing, sampling, and testing the quality, consistency, and characteristics of sewage and industrial wastewaters being discharged into any public sewer or natural outlet; and inspecting and copying any records relating to quantity and quality of wastewater discharges, including, but not limited to, water usage and effluent discharge, chemical usage, and hazardous waste records.	Please provide authorized City employee access to the facility to complete inspection.	SCCC 13.10.570
0	Solid or viscous matter to the sewer system.	Unauthorized discharge of solid or viscous substance capable of causing obstruction to the flow in the sanitary sewer system or would interfere with the system.	Cease discharge of prohibited solids or viscous substances to the sanitary sewer.	SCCC 13.10.280
5	Pretreatment protection.	Each owner shall, at the owner's expense, provide such treatment or take such other measures, as the Director may require to prevent accidental discharge, reduce objectionable characteristics, contents, or rate of discharge of waters or waste being deposited in the sanitary sewer system, to prevent damage to or interference with the sanitary sewer system.	Hire a licensed plumber to install an adequately sized GCD, replumb drains or improve activity. Obtain necessary permits for construction. Provide FOG control plan to Water & Sewer Utilities.	SCCC 13.10.210
0	Hot substances.	Prohibited materials discharged to the sanitary sewer system having a temperature of one hundred fifty (150) degrees Fahrenheit or more.	Replumb equipment with hot substances to bypass GCD. Cease discharge if unable to reduce to below 150 degrees Fahrenheit.	SCCC 13.10.260
0	Obstructing or injurious substances.	Prohibited materials discharged to the sanitary sewer system that obstruct flow or are injurious substances to the system.	Cease discharge of substances to the sanitary sewer system that obstruct flow or are injurious substances to the system.	SCCC 13.10.240
0	Limitations on point of discharge.	Materials discharged to unauthorized point into the sanitary sewer system.	Cease discharge of materials into unauthorized discharge point. Discharge material to approved sewer connection.	SCCC 13.10.170

Appendix C: ERP Flow Chart



*Code Enforcement Technician or Code Enforcement Officer have discretion to issue NOV during initial or follow up inspections without having to escalate enforcement if situation is reasonable or Site Contact has acted to correct violation although more time was needed.

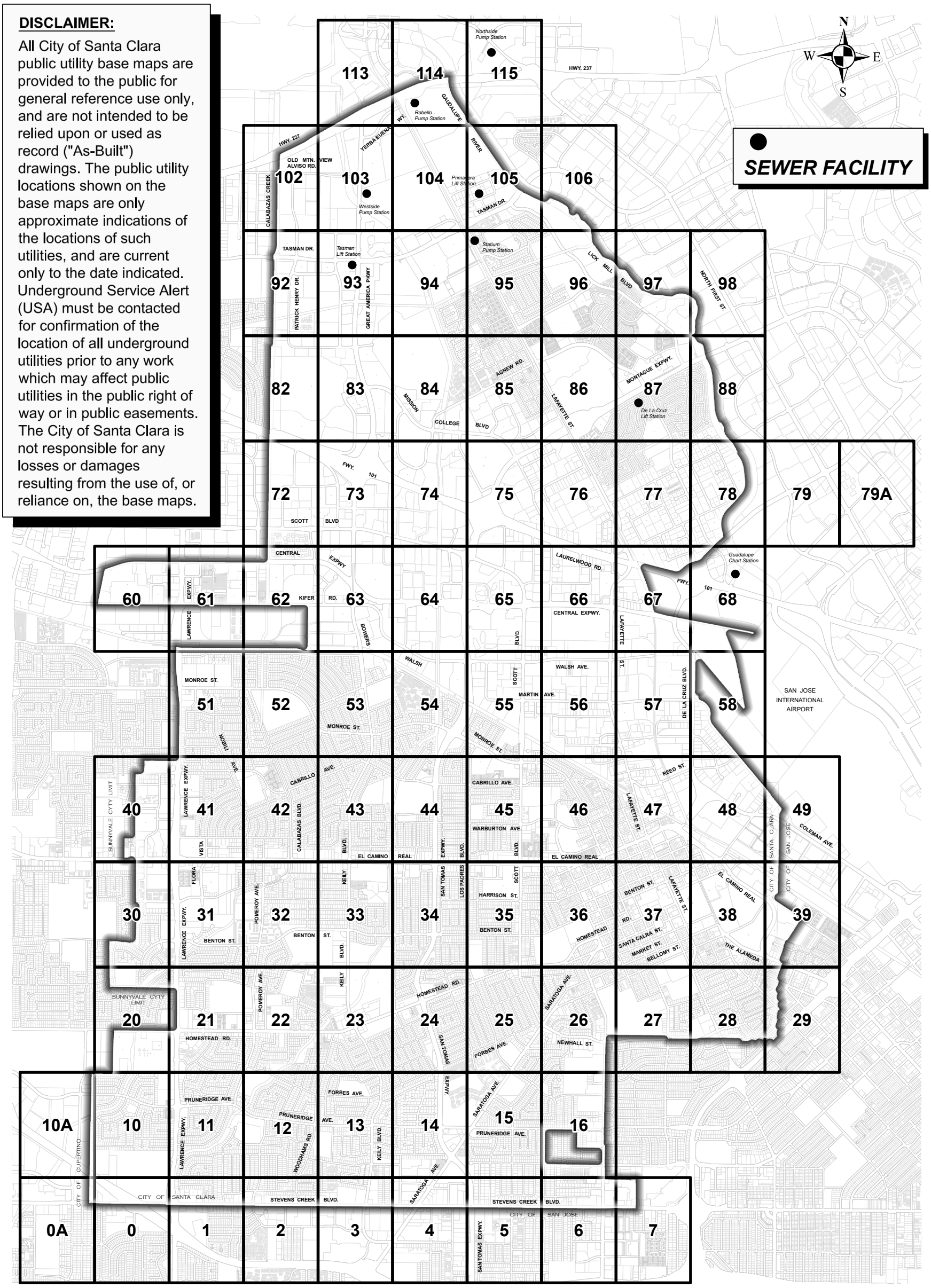
** Administrative Hearing to be processed per SCCC Chapter 1.10

Appendix D
Sanitary Sewer System Index Map

DECEMBER 2023 CITY OF SANTA CLARA SANITARY SEWER SYSTEM - INDEX MAP

DISCLAIMER:

All City of Santa Clara public utility base maps are provided to the public for general reference use only, and are not intended to be relied upon or used as record ("As-Built") drawings. The public utility locations shown on the base maps are only approximate indications of the locations of such utilities, and are current only to the date indicated. Underground Service Alert (USA) must be contacted for confirmation of the location of all underground utilities prior to any work which may affect public utilities in the public right of way or in public easements. The City of Santa Clara is not responsible for any losses or damages resulting from the use of, or reliance on, the base maps.



SANITARY SEWER LEGEND

(FM)	MAIN (FORCE MAIN)	15 20 Sp 30	LATERAL - - - - - - - - - - - - - - - - - The location of each lateral will be shown and dimensioned from the furthest away line of the parcel, a manhole, or end of return, whichever is readily available. Sp indicates Septic.
	PRIVATE MAIN		
	MANHOLE (STANDARD TYPE)	6.5	DEPTH OF MANHOLE - - - - - - - - The depth shown will be from rim of manhole to invert.
	MANHOLE (CAPPED TYPE)		
	FLUSHING INLET	12 - 123	PIPE - DIMENSIONS - - - - - - - - - - The first element of the dimension grouping will express the size of the pipe and the second element will be the distance between each manhole. Note a "P" after the size indicates P.V.C., a "RCP" after the size indicates Reinforced Concrete Pipe, a "PE" after the size indicates Polyethylene Pipe, a "PP" after the size indicates SaniTite HP (High Performance) Pipe, lines where there is no indication are Vitrified Clay Pipe (VCP).
	MANHOLE (N/A TYPE)		
5	MANHOLE NUMBER	9587D - 86	PIPE - DESIGNATION - - - - - - - - - The first element of the pipe designation grouping will be the tract, tracing or job number and the second element will be the year of installation.
	DIRECTION OF FLOW	88'-14" STL CASING	CASING WITH DIMENTIONS - - - The first element of the casing designation grouping will be the casing length, and the second element will diameter of casing and casing material.
	SPOT REPAIR (CLAMP SEAL TYPE)		
	SPOT REPAIR (ALL OTHER TYPES)		CLEANOUT - - - - - - - - - - - - - - - CLEANOUT.

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Appendix E
Sewer Equipment Inventories

Appendix E

SEWER UTILITY INVENTORY

A. VEHICLES:

1. LEAD TRUCKS (3)
2. VAC-CON (2)
3. CCTV TRUCK (1)
4. JET TRUCK (1)
5. CRANE TRUCK (1)
6. DUMP TRUCK (1)
7. PUMP TRUCK (1)
8. UTILITY VAN (1)
9. BACK HOE
   (PAVEMENT BREAKER)
10. TANKER – shared
11. EMERGENCY RESPONSE TRAILER

B. EQUIPMENT:

1. GENERATORS (6)
2. COMPRESSOR (1)
3. JACKHAMMER (1)
4. CHIPPING GUN (1)
5. TAMPER (1)
6. WHACKER (1)
7. SHORING JACKS – shared
8. SHORING PUMPS – shared
9. GAS DETECTION DEVICES (5)
10. BLOWERS (2)
11. TRIPOD+WINCH (2)
12. HARNESS (4)
13. LADDERS (6)
14. VARIOUS EMERGENCY LIGHTS (5)
15. LARGE CONCRETE SAW – shared
16. SMALL CONCRETE SAW (1)
17. CHOP SAW (2)
18. SAWSALL (3)
19. PARTNER SAW
20. SNAP CUTTERS (1 in each truck)
21. ARROWBOARDS – shared 2
22. FLAGSTANDS (8)
23. WARNING SIGNS (8)
24. CONES (125)
25. VACCUUMS (2)
26. ELECTRIC EELS (5)
27. TV CAMERAS
    a. Hand push (2)
    b. Tractor feed (2)
28. METAL DETECTORS (1)
29. METROTECH (1)

30. 6” TRASH PUMPS (1)
31. 2” PUMPS (2)
32. 2” SUBMERSIBLE PUMP (1)
33. 10HP FLYGT SEWER PUMP (SPARE) 240v/3PH (1)

	ON HAND MINIMUM:

C. PARTS:

1. CAST IRON:

A. WYES	25
B. 8 BENDS	50
C. 16 BENDS	50
D. 4” PIPE (100’+)	120 FT.
E. COUPLINGS	50

2. V.C.P.:

A. WYES	50
B. 8 BENDS	25
C. 16 BENDS	25
D. 4” PIPE	120 FT.
E. COUPLINGS	100
F. 8” SADDLE	
G. 6 X6 WYE (2)	
H. 10 X 4 WYE	
I. 4” ANGLE SADDLE	
J. 4’ STRAIGHT SADDLE	
K. 6 X 4 WYE	
L. 8” BEND (2)	
N. 8” 45	

3. PLASTIC:

A. 6” PIPE	100 FT.
B. 8” PIPE	100 FT.
C. 10” PIPE	100 FT.
D. 12” PIPE	100 FT.

4. OTHER:

A. BOX/CLEAN-OUT	50
B. LID for	50
C. STOPPER – ABS 4”	60
D. BUSHING/CI to VCP	50
E. LID, METAL for G-5 BOX	6
F. COUPLING, REDUCING 4”	15

SSO TRAILER INVENTORY

1 – Folding Ladder
1 – Utility Ladder
1 – Tripod
2 – Emergency Lights w/Stands
2 – FM Light
1 – Garden Hose
2 – Flag Stands
Plastic Sheeting
1 – Wheel Walker
1 – Sample Cup w/extension pole
Large paper bags
2 – Barricades
4 – rolls of Fire Hose
1 – Shop Vacuum
1 – 2” Trash Pump
1 – Generator (portable)
1 – Generator (mounted)
1 – Gas Can
5 – Harnesses
1 – Bolt Cutter
2 – Push Brooms
2 – Shovels – round point
2 – Shovels – flat
3 – Large Debris Shovels
2 – Road Signs
1 – multi-drawer Tool Box
1 – SSO Sampling Kit

Appendix F
City of Santa Clara Design Criteria

Appendix F

DESIGN CRITERIA

for Improvements in Public Right-of-Ways and City Easements

City of Santa Clara

Public Works Department

April 2015

City of Santa Clara
Public Works Department

DESIGN CRITERIA

APPROVED BY:

Rajeev Batra

RAJEEV BATRA
DIRECTOR OF PUBLIC WORKS/CITY ENGINEER

DATE: Sept. 17, 2014

Santa Clara
All-America City
2001

Acknowledgement of contributions

Our sincere thanks to the staffs of the
Public Works Department, Water and Sewer Utilities Department, and Electric Department for their contributions.

CITY OF SANTA CLARA
PUBLIC WORKS DEPARTMENT

DESIGN CRITERIA

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1. SCOPE

This Design Criteria has been prepared by the City of Santa Clara (City) to aid Consulting Engineers and/or Developers (referred to herein as Consulting Engineer) in preparing plans for construction of City public improvements in the public right-of-way and City easements. This Design Criteria is not intended to be a textbook nor a substitute for engineering knowledge, experience, or judgment. This Design Criteria sets forth minimum design standards and other requirements of the City. This Design Criteria is not meant to limit the Consulting Engineer in exercising good judgment where higher design standards would be appropriate. It shall be the Consulting Engineer's responsibility to determine the design necessary to fulfill his/her obligation to safeguard the public's health, safety, and welfare.

Deviations, if any, from this Design Criteria, and the reasons for the deviations, shall be noted in writing when plans are submitted. Approval of deviations from this Design Criteria may be applied for and will be reviewed prior to submittal of the plans.

Note: This Design Criteria is to be considered minimum requirements. The City continues to review its design requirements and will make amendments to this Design Criteria from time to time as required. At the discretion of the City, individual projects may be subject to additional requirements.

2. PROCEDURE

Prior to the first plan submittal, the Consulting Engineer shall contact the appropriate Principal Engineer to arrange a "pre-design coordination meeting". The meeting will be with the Consulting Engineer and appropriate City staff from the Land and Property Development Division (LPD), Traffic Division, Street Maintenance Division, Water and Sewer Utilities Department, Electric Department, and Fire Department to review conceptual plans, summarize the project design requirements, and answer questions before actual design begins.

For an established fee, the City will provide the Consulting Engineer with copies of any available prints of existing sanitary sewer and storm drain lines and established street grades (i.e., Block Books and Record Drawings), Bench Marks, Standard Details, and this Design Criteria. Design standards for electric facilities and street lighting, as well as improvement plans of existing electric utilities, street lighting, and City fiber optic systems, may be obtained from the City Electric Department. Design standards, Standard Details, and specifications for water facilities, as well as improvement plans of existing water facilities, may be obtained from the City Water and Sewer Utilities Department. Most of the documents noted above, except for the Record Drawings, may be viewed or downloaded from the City's website. Location of all other utilities may be obtained from the appropriate utility company or facility owner.

The location and elevation of existing utilities shall be verified (potholing may be required) in the field by the Consulting Engineer and shown on the plans.

The on-site drainage, drainage design calculations, and grading plan shall be submitted as part of the storm drain analysis (not as part of the public improvement plans). This plan shall show the overland release of storm water without flooding the buildings. This plan shall also show the building pad elevations on the same datum as the public improvement plans.

The plans and design calculations are subject to the review and approval of various City departments. The Consulting Engineer shall submit the required number of 100% complete plan sets, currently eight (8) sets, and design calculations, currently two (2) sets. The plans submitted for review shall be stamped with the seal of the Engineer-of-Record or Architect-of-Record and the "FOR PLAN CHECK ONLY" notation on each plan sheet. The design calculations submitted for review shall be stamped with the seal of the Engineer-of-Record or Architect-of-Record and the "FOR REVIEW ONLY" notation on the cover sheet. The submittal shall also include the construction cost estimate for the work in the public right-of-way and City easements and a cover letter stating the deviation(s) from this Design Criteria and the City's Standard Details (if any), purpose of the submittal, and the location of the project. Submittal shall be directed to the Principal Engineer of LPD. Incomplete plans or design calculations will be returned to the Consulting Engineer without review. The various City departments will review the plans and design calculations and identify needed changes (if any). The Consulting Engineer shall revise the plans and design calculations accordingly and re-submit the plans and design calculations for further City review.

When the plans and design calculations are completed, reviewed, approved, stamped with the seal, signed, and dated by the Consulting Engineer or Architect-of-Record and the plans are signed by the appropriate City Departments, the required number of plan sets, currently twenty-two (22) full size sets, and the required number of design calculations, currently two (2) sets, shall be submitted to the Principal Engineer of LPD. The reproducible plans shall be printed on bond paper with a minimum bond weight of 20 pounds. These prints shall be used as the construction drawings.

Once the required numbers of plan sets and design calculations have been submitted, the Contractor shall contact the Engineering Department - Field Services Division to schedule the pre-construction meeting.

After the pre-construction meeting, the Contractor must obtain an Encroachment Permit before starting any work. The Encroachment Permit is issued once the following requirements have been met and the plans have been signed by the appropriate City departments.

A. Development fees and Encroachment Permit fees are paid and Bonds are posted.

B. Proper Contractor's Insurance with Endorsements is approved and City Business License is filed.

Upon completion and acceptance of the construction project, the Consulting Engineer shall supply the City with Record Drawings that reflect "as-built" conditions in both hardcopy and electronic PDF format. The hardcopy drawings shall be reproduced on quality 20-pound bond paper with a minimum brightness of 92 and produce good quality prints. The Record Drawings shall become the property of the City.

3. PLANS

Plans shall comply with the following requirements:

3.1 All plans shall be on 24-inch by 36-inch sheets (D-size) with a 1-1/2-inch margin on the left side and a 1/2-inch margin on the top, bottom and right sides. No information shall be placed outside of the border lines, except the drawing's plot stamp along the left border. Plans with a profile shall have only a single profile. The profile shall be placed below the corresponding plan view with matching stations.

3.2 Plans shall be good quality prints produced from the original. At the discretion of the Director of Public Works/City Engineer, plans may be rejected for poor quality. Plans that are illegible or difficult to read will be rejected.

3.3 The scale for improvement plans (plan and profile) shall be in English units and shall generally be a scale of 1" = 20' for the horizontal and 1" = 2' for the vertical. For street improvement plans encompassing more than 500 linear feet of work, a scale of 1" = 40' for the horizontal is allowable if an acceptable plan clarity is maintained. Scales other than 1" = 20' and 1" = 40' may be allowed with prior approval from the Director of Public Works/City Engineer. The Consulting Engineer/Architect and Developer should carefully consider the scale chosen for a plan such that the necessary plan details are not crowded. Plans with crowded notes and details may be rejected by the City and may be required to be redrawn to a larger scale.

3.4 All lettering shall have a minimum height of 0.1 inch. Letter style shall be clear, legible and uniform. Lettering should closely conform to the ANSI Y14.2-1980 standards. Extreme styling of lettering and fonts, such as architectural scripts, are not acceptable. Plans may be rejected for inappropriate lettering.

3.5 In general, new improvements shall be shown with bold unbroken lines and existing improvements be shown with lighter, broken, dashed or screened lines.

3.6 In general, work shown in plan view on sheets shall be oriented so that North is either at the top or left of the sheet.

3.7 Generally, centerline stationing shall increase North to South and West to East (left to right on the sheet).

3.8 The following shall be shown on all sheets:

A. Sheet number and total number of sheets in project (i.e., Sheet 1 of 6);

B. Initials of persons drawing, designing, and checking;

C. Scale (horizontal and vertical);

D. Title Block;

E. Responsible Registered Engineer's stamp with name, license number, signature, and the date of signing. This is required on the final plans before the plans are signed by the various City departments;

F. Date of plan preparation;

G. The City Tracing Number as provided by the Engineering Department for developer projects. This number shall be placed on the lower right hand corner of each sheet, inside the border line, lettered in bold print, and at least 3/10ths of an inch in height; and

H. No information shall be placed outside of the border lines, except the drawing's plot stamp along the left border.

3.9 The first sheet shall be a title sheet and shall contain the following:

A. Location map: a line drawing showing project within a generally larger area of the City. Note: electronic map copies and photocopies of common road maps are not acceptable;

B. Title, descriptive of proposed improvements (both in large print on top center of the sheet and in the title box);

C. Sheet Index;

D. Legend: show only those legend symbols that apply to the plans. See Exhibit "A" for a sample set of "Typical Legend Symbols";

E. Abbreviations: Show only those abbreviations that apply to the plans. Use "Typical Abbreviations" shown on Exhibit "B";

F. Applicable items of the latest revised "General Notes" shown on Exhibit "C" and other appropriate notes;

G. City Bench Mark number, description, elevation, and current datum year. All elevations on plan shall be on the current City bench system. Contact the Engineering Department to obtain the current Bench Mark description, location, and elevation for the Bench Mark(s) near the project site. City Bench Mark information is also available on the City website, http://santaclaraca.gov. Go to "Government", then "Departments", then "Public Works", then "Technical Documents";

H. The City "Site Number" as provided by the Engineering Department for developer projects. This number shall be the same size as and be placed near the City Tracing Number;

I. Certificate of Approval:

APPROVED: Rajeev Batra
Director of Public Works/City Engineer
City of Santa Clara

_____ Date: _____
Public Works Department

REVIEWED:

_____ Date: _____
Land and Property Development Division

_____ Date: _____
Traffic Engineering Division

_____ Date: _____
Street Maintenance Division

_____ Date: _____
Silicon Valley Power

_____ Date: _____
Water and Sewer Utilities Department

The following statement shall appear with the Certificate of Approval:

"This approval does not mean the Director of Public Works/City Engineer nor the City can accept any part or parts of the work done under or in conjunction with these plans that have not been properly indicated."

Note: Signatures of additional Department/Division Heads are required if their respective facilities are being designed within a proposed public works project;

J. A Key Map is required for large projects. The Key Map, large enough in scale (1" = 100' is desirable) to show the entire project area with existing ground contours; general layout of existing and proposed streets; lot lines and numbers; direction of gutter flow; pipe sizes of existing and proposed storm drain and sanitary sewer systems, including manholes and catch basins; electroliers; poles; fire hydrants; indexed sheet numbers; Bench Mark location(s); and any other pertinent features or proposed improvements which can be reasonably shown. The Key Map shall be on a separate sheet or in multiple sheets for very large project areas.

For Assessment Districts the Key Map shall, in addition to the above, show the District Boundary and Parcel Numbers within the District; and

K. The following Developer information:

Contact Person: _____

Company Name: _____

Address: _____

_____

_____

Telephone No.: _____

Fax No.: _____

E-mail: _____

3.10 Cross sections showing both existing and proposed grades, at least within the public right-of-way and City easements, shall be provided if required by the Engineering Department. Some cross sections such as conforms and at driveway centerlines may need to extend beyond the right-of-way lines. The cross sections are to be clear and legible. Cross sections shall be provided for the following locations:

A. At all stations (100 foot intervals);

B. At the beginning and end of the improvements;

C. At existing driveway centerlines;

D. At conform sections; and

E. At other locations necessary for design.

3.11 All new improvements shall be referenced to the centerline stationing. Stationing shall be shown for the following:

A. Beginning and end of improvements;

B. Centerline intersections;

C. Curb returns;

D. Beginning (BC) and end (EC) of horizontal curves;

E. Grade breaks;

F. Manholes, clean-outs, and inlets;

G. Sewer laterals;

H. Beginning and end of curb, gutter and/or sidewalk removal and installation;

I. All water service structures (water valves, hydrants, blow offs, air reliefs, services, etc.);

J. All electrical system structures (street lights, junction boxes, vaults, transformers, poles, etc.);

K. All other utility and private system structures (telephone, cable, gas, communication companies, etc.);

L. Driveway centerlines;

M. Traffic signals and controllers; and

N. Beginning (BVC) and end (EVC) of vertical curves and point of intersection (PI).

This is not meant to be a complete list; other pertinent features shall also be stationed.

For work on existing streets, or for the extension of existing streets, the Consulting Engineer shall use the established centerline stationing. For work on new streets, or work on existing streets without established stationing, the Consulting Engineer shall begin centerline stationing from a City standard monument beyond the limits of the work. Wherever possible, the start of the centerline stationing shall be at a monument at the intersection of the centerlines of two streets.

Stationing of facilities shall require full station identification. For example, a proposed driveway centerline at station 5+32.00 should be noted as "5+32.00" not just "+32.00" nor "5+32".

In general, new facilities and design features shall be stationed to the nearest one-hundredth of a foot. Existing facilities and design features shall be surveyed and stationed to the nearest one-tenth of a foot. Elevations for both new and existing facilities and design features shall be indicated to the nearest one-hundredth of a foot.

3.12 The following shall be shown on the plans where applicable:

A. Names of all proposed and existing streets;

B. Plan and profile of street and underground improvements;

C. Street right-of-way width, curb face to curb face dimension, centerline to curb face dimension, property line to curb face dimension, and easement lines, if any;

D. Street centerline with full station identification. Station identification should stand out on the plan. Lettering should be bold and/or larger than standard plan lettering. Use full station identification (i.e., “5+00" rather than "5");

E. Curve data (delta, tangent, radius, and length);

F. Elevations of existing and proposed top of curbs at all grade breaks, BC, EC, beginning and end of improvements, and every half station (50-foot intervals);

G. Elevation of all inverts at all catch basins, ends of pipes, and manholes on both storm drain and sanitary sewer systems;

H. The slope of street centerlines, top of curbs (where top of curb slope is different than centerline slope), storm drains, and sanitary sewers shall be shown on the profile view. Top of curb slopes and flow lines at curb cuts (i.e., driveways, curb ramps, etc.) shall also be shown on the plan view. All slope indications shall include an arrow denoting the direction of flow. Use of "+" and "-" signs to denote direction is not acceptable;

I. Existing pipe lines (note material type and size), utilities, irrigation systems, poles, trees, pull boxes, manholes, obstacles, edges of existing pavement, monuments, pavement types, etc.;

J. Lot numbers corresponding to the tract map on new subdivision work, Assessor's Parcel Number and owner's name on lots in existing developed areas, and Assessment Number on Assessment District Projects;

K. In general, new improvements shall be shown with bold unbroken lines and existing improvements be shown with lighter broken, dashed or screened lines. See Exhibit "A" for “Typical Legend Symbols”;

L. Trench sections for joint trenches;

M. Detail of material, thicknesses and method of backfill for all trenches within pavement areas (including slurry seal) if different than City Standard Details; and

N. City limits and other jurisdictions' right-of-way lines.

3.13 The following profile information shall be shown on the plans where applicable:

A. Horizontal and vertical scales shall be noted on the profile view;

B. Horizontal stationing above and below profile view, as well as datum elevations on each end of sheet. It must be clear which profile grid line represents which datum elevation. All full stations shall align with major grid lines. Datum elevations (at least every other foot if not every foot) shall align with major grid lines. Stationing of corresponding plan and profile views shall align vertically for straight station line alignments;

C. Size (diameter and length), slope, and material of all pipes, culverts, etc;

D. Label all profiles shown;

E. Slope and direction of fall of all grade lines (use arrow indications);

F. All utilities shall be shown in the profile view with stationing and elevations for catch basin inverts, top of curbs, manhole rims and inverts, and clean-out rims and inverts. Flow lines and top of pipes shall be shown;

G. Stationing and elevation of the following: Beginning (BC) and end (EC) of horizontal curve, beginning of vertical curve (BVC), end of vertical curve (EVC), point of intersection of vertical curve (PIVC), transitional sections, grade breaks, beginning and end of improvements;

H. The slope of street centerlines, top of curbs (where top of curb slope is different from centerline slope), storm drains and sanitary sewers. All slope indications shall include an arrow denoting the direction of flow. Use of "+" and "-" signs to denote direction is not acceptable;

I. Elevations at 25-foot intervals on vertical and horizontal curves; and

J. Extension of profiles 100 feet past each end of improvements.

3.14 A "typical section" shall be shown for each street width and pavement section. Transverse conforms shall be shown in the typical section. The typical section shall show the conform between the back of walk and property line. The design R-value(s) for all materials used to develop the structural pavement section and Traffic Indices (T.I.) shall be placed directly below the typical section. The installation of slurry seal shall be indicated for all trench work, potholes, asphalt concrete repairs, and street widenings.

3.15 In lieu of some details, the Consulting Engineer/Architects or Developer may reference, on the plans, individual City Standard Details. These details should not be included on the plans. City Standard Details are available from the Engineering Department for a nominal fee, or can be accessed on the City website.

3.16 Provide design calculations for storm drain and sanitary sewer systems.

4. STREET DESIGN

4.1 Minimum standard right-of-way and roadway widths (face of curb to face of curb) shall be as follows:

	Residential	Industrial	Commercial
Right-of-Way	60 Feet	68 Feet	84 Feet
Roadway Width	40 Feet	48 Feet	64 Feet

4.2 Property line radii at intersecting streets shall be as follows:

A. If one of the intersecting street right-of-way widths is 70 feet or less in width, the property line radius shall be a minimum of 20 feet.

B. If both intersecting street right-of-way widths are greater than 70 feet, the property line radius shall be a minimum of 40 feet.

C. In special situations, the property line radius shall be subject to individual design contingent on approval by the Director of Public Works/City Engineer.

4.3 Structural pavement sections shall be designed to conform to Topic 633, Engineering Procedures for New and Reconstruction Projects, of Chapter 630, FLEXIBLE PAVEMENT, of the State of California Highway Design Manual. The safety factor needed for gravel equivalent increase shall be 0.07 feet for a base type of Aggregate Base. The asphaltic concrete layer of a structural pavement section shall be designed such that it will accommodate at least 40 percent of the total required Gravel Equivalent. The structural pavement sections shall not be less than 3 inches of asphalt concrete over 12 inches of Class 2 aggregate base or 8 inches of full depth asphalt concrete.

A soils report of the subgrade or basement soil, along with calculations for structural pavement sections, shall be submitted by the Consulting Engineer. In lieu of a soils report, and with the permission of the Engineering Department, the Consulting Engineer may assume an R-value of 5 for native soil (i.e., subgrade or basement soil).

4.4 Traffic Indices (TI) are to be supplied by the Director of Public Works/City Engineer. Minimum typical TI shall be as follows:

Residential cul-de-sacs & loop streets:	4
Residential collector streets:	5

Industrial streets:	6
Major streets:	6-9

Streets with bus traffic or substantial truck traffic will have significantly greater TI values than otherwise similar streets.

The design of the structural pavement section for trenches shall use a TI value that is 0.5 higher than the TI value for the street as supplied by the Director of Public Works/City Engineer (i.e., TI value for trench pavement replacement = TI value for street plus 0.5).

4.5 Minimum allowable street grades:

South of State Highway 101:	0.3%
North of State Highway 101:	0.25%
Around Curb Returns:	0.5%

Undulated street grades shall have a favorable fall to the low point of the drainage basin such that a grade line drawn through the high points of the undulation would not be less than 0.05% grade. The elevation at any low point must not be more than six (6) inches below the lower adjacent high point elevation.

Cul-de-sacs shall drain toward the intersecting street.

4.6 In areas of street widening, the cross slope shall be designed between 2% and 4%. Greater cross slopes may be allowed only with the permission of the Director of Public Works/City Engineer.

4.7 When the vehicle travel way of an existing street is being reduced (i.e., installation of "traffic calming" features) the effect of grade changes to the street must be investigated and clearly indicated on the plans. The cross slope shall be designed between 2% and 4%.

4.8 Vertical curves shall be used whenever a 1.5% grade differential or more occurs. Vertical curves shall be 200 feet minimum.

4.9 Existing street monuments shall not be disturbed and shall be protected during construction. If the plans show an existing street monument is to be disturbed or has the potential of being disturbed, a Corner Record shall be filed with the Santa Clara County Recorder's Office as required by the Subdivision Map Act to preserve the location of said street monument.

4.10 Standard City Monuments shall be placed on the street centerline at every street intersection, angle point, center of cul-de-sac, and beginning and ending of all horizontal curves.

4.11 The centerline profile of the through street shall be continuous through the intersection. The cross street centerline profile shall meet the through street cross slope at the centerline except when the through street pavement width is 60 feet or more. In this case, the cross street centerline profile shall meet the through street cross slope at 10 feet from the face of curb of the through street with the cross street profile sloping away from the through street.

4.12 Medians with landscaping shall require curbing. The top of curbs shall be constructed 8.5 inches above street surface grade, or in areas of median extension, match the existing curbing height as allowed by the Director of Public Works/City Engineer. Depending on the scope of the project root barriers and/or median subdrains may be required by the Director of Public Works/City Engineer.

4.13 Slurry seal shall be required on newly paved streets, trenches, potholes, and street widenings. The slurry seal shall extend 12 inches beyond the limits of pavement reconstruction.

5. SANITARY SEWER DESIGN

5.1 Pipe material shall conform to Section 02062, FURNISHING AND INSTALLING OF PIPE, of the City's Technical Provisions. For pipe sizes 24 inches in diameter or less, use vitrified clay pipe. For pipe sizes greater than 24 inches in diameter, fully lined reinforced concrete pipe may be used. Polyvinyl Chloride (PVC) SDR 26 pipe 12 inches or less may be used. PVC pipe larger than 12 inches in diameter may be used upon approval by the Director of Public Works/City Engineer.

5.2 In general, sanitary sewers shall be placed in every street with a 5-foot offset from street centerline on the side opposite the storm drain.

5.3 Minimum cover over mains shall be 6 feet from finished grade.

5.4 Design:

A. Coefficient of friction "n":

Vitrified Clay Pipe:	0.013
Reinforced Concrete Pipe:	0.013
Polyvinyl Chloride Pipe:	0.011

B. Minimum pipe diameter:

Residential:	8"
Commercial:	10"
Industrial:	12"

C. Sufficient slope shall be used to provide a minimum flow velocity of 2 feet per second when flowing full or half full.

D. Minimum average design flows:

Residential:	245 gallons / unit / day
Commercial:	Based on predicted use. *
Industrial:	Based on predicted use. *
Hospital:	150 gallons / bed / day

* See San Jose – Santa Clara Water Pollution Control Plant Sewage Coefficient List available in the Engineering Department – Land and Property Development Division.

The above flows were used to design the present trunk system. For developments with substantially higher flows (electronics manufacture, data centers, high-rise developments, canning plants, etc.) the anticipated flows shall be used in both the design of the sanitary sewer lateral and in supplementing the existing sanitary sewer system.

E. For design of pipes, the Proposed Development Peak Flow shall not be less than 2.5 times the computed average flow as determined in Subsection 5.4D above. The Design Flow (total peak flow) shall be as determined in Subsection 5.4G below. Sanitary sewers shall be considered full at a d/D (ratio of liquid depth to pipe diameter) value of 0.75 or greater.

F. Sanitary Sewer Hydraulic Model Run:

If required by the City, developer shall submit complete sanitary sewer (SS) information (i.e., building use, square footage, point of connection to the public system, and 24-hour average and peak SS flow graphs for the peak day, showing average daily and peak daily SS flows). Developer shall also provide seasonal peak, if it differs from daily peak. For a fee, the proposed development impact to the modeled trunk sanitary sewer system will be evaluated using the City's Sanitary Sewer Hydraulic Model for the trunk sanitary sewer system. If there is not enough capacity in the existing modeled trunk sanitary sewer system, the developer will be required to upgrade the sanitary sewer system as determined by the City. The required sanitary sewer upgrades will be at developer's expense.

G. Field Monitoring for Non-modeled Sanitary Sewer Lines:

If required by the City, the sanitary sewer mains serving the site not included in the City's Sanitary Sewer Hydraulic Model shall be monitored in the field by the developer at developer's expense to evaluate proposed development impact to said sanitary sewer mains. If there is not enough capacity in the sanitary sewer system, the developer will be required to upgrade the sanitary sewer system as determined by the City. The required sanitary sewer upgrades will be at developer's expense.

Prior to any flow monitoring work, the proposed monitoring location(s) shall be reviewed and approved by the Director of Public Works/City Engineer. Flow monitoring measurements to determine average and peak flows, in existing pipes, shall be done over a period of at least seven (7) consecutive days with continuous mechanical/electronic measurements in a manner acceptable to the Director of Public Works/City Engineer.

An Encroachment Permit (EP) is required to allow developer to monitor the sanitary sewer flows.

. Design flow determination shall be as follows:

$Q_D = Q_M + Q_{WWGWI} + Q_{RDI/I} + Q_{PD}$

Where:

Q	=	Flow
D	=	Design
M	=	Monitored
WWGWI	=	Wet Weather Groundwater Infiltration
RDI/I	=	Rainfall-Dependent Infiltration and Inflow
PD	=	Proposed Development

Q_D	=	Design Flow
Q_M	=	The Monitored Peak Flow or 2.5 times the Monitored Average Flow, whichever is greater.
Q_{WWGWI}	=	The gpd/acre value is obtained by using Figure 3-3 on page 3-5 (see Exhibit "D" of this Design Criteria) and Table 3-2 on page 3-11 (see Exhibit "E" of this Design Criteria) of the Sanitary Sewer Capacity Assessment Report, May 2007. Multiply the factor by the Tributary Area served by the sanitary sewer main being monitored.
$Q_{RDI/I}$	=	Same as Q_{WWGWI} above. For now, use 1,000 gpd/acre.
Q_{PD}	=	Proposed Development Peak Flow.

5.5 At all changes of direction, a drop in flow line shall be installed equal to the velocity head times the ratio of angular change to 90 degrees.

$$\frac{V^2}{2g} \times \frac{A^o}{90^o} = \text{Head Loss} = \text{drop in flow line*}$$

Where:

V = velocity in ft./sec
g = acceleration of gravity (32.17 ft./sec^2)
A^o = the angular change in degrees

*If junction is fully shaped, this value may be reduced by 30%. This value shall not be less than 0.1 foot.

5.6 Where minor mains connect to trunk main, the crown of the minor main shall match the crown of the trunk main.

5.7 A drop in hydraulic grade line (HGL) shall be provided for head losses due to transitions such as bends, pipe size changes, grade changes, and at drainage structures (e.g., manholes).

5.8 The sanitary sewer system shall be designed as a complete grid system.

5.9 In general, sanitary sewer main lines should be designed such that all other parallel facilities have at least an eight-foot clear distance separation. Sanitary sewer main lines that have large diameters or are deeper/shallower in elevation may require greater separation from other facilities as determined by the Director of Public Works/City Engineer.

5.10 Curved sanitary sewer conduit shall not be used except when written permission is obtained from the Director of Public Works/City Engineer.

5.11 Cross connections between the storm drainage system and the sanitary sewer system are prohibited.

5.12 Drainage structures (e.g., manholes) shall be located at the following points:

A. Change in direction;

B. Change in slope;

C. Change in size;

D. Intersection of mains;

E. Changes in pipe material;

F. A nominal spacing of 450 feet with a maximum spacing of 500 feet;

G. Upstream end of lines; and

H. Where laterals are the same size as the main or are 8 inches or larger.

5.13 The Standard Manhole (as shown in the City Standard Details) is applicable in most cases where a drainage structure is required. However, the drainage structure shall be individually designed for any of the following conditions:

A. Through mains larger than 39” with less than a 5 degree change in alignment;

B. 27" or larger through mains with a 5 degree or larger change in alignment;

C. Side mains larger than 24"; and

D. Other special conditions as identified by the Director of Public Works/City Engineer.

5.14 Laterals:

A. Laterals for residential dwellings up to four (4) units shall be at least 4 inches in diameter. All others will be 6 inches or larger;

B. Laterals shall have a minimum slope of 2% and be installed at right angles or radial to street right-of-way;

C. Laterals with clean-outs shall be provided to every lot and known future developments; and

D. Lateral to main connections:

1. Connection to a manhole shall be made wherever possible. Manhole connections shall be as follows:

i. When lateral and main are constructed at the same time, the lateral and main crowns shall have the same elevation.

ii. When connecting to an existing manhole, the outside bottom of lateral pipe shall be at or above the manhole shelf. The maximum height of lateral flow line above the manhole shelf floor shall be one and one half feet (see City Standard Details).

2. When main and lateral are constructed at the same time, and a manhole connection is not possible, a wye connection is to be used as shown in the City Standard Details.

3. A 4” or 6” lateral connection to an existing larger main shall be made by the "Tap-tite" method as shown in the City Standard Details.

4. Lateral cover measured from top of curb shall not be less than 4.5 feet.

5. Siphon connections to main are prohibited;

E. Clean-outs shall be installed on all sanitary sewer laterals at the street right-of-way or easement line as shown in the City Standard Details. If the sanitary sewer lateral is 8 inches or larger, a manhole shall be used in place of a clean-out; and

F. On-site sanitary sewer pump system force mains shall not discharge directly into the City's sanitary sewer system.

5.15 Grit Traps:

A. Grit traps shall be placed just upstream of siphons and at other locations as determined by the Director of Public Works/City Engineer.

B. Grit traps shall be designed with adequate capacity to accommodate the peak flow(s) of the sanitary sewer main(s) discharging into the grit trap.

6. STORM DRAINAGE DESIGN

6.1 The storm drain pipe system shall be designed to convey the 10-year event flow. The storm drain pipe system near storm drain pump stations, as determined by the Director of Public Works/City Engineer, shall be designed to convey the 100-year event flow.

6.2 When a proposed development increases the storm discharge such that it will surcharge the existing storm drain system and/or breach the discharge capacity limit of the existing pump station, the developer shall upgrade/supplement the existing storm drain system and/or existing pump station to accommodate the proposed development.

6.3 For runoff calculations, use the Rational Method of Design (Q = CIA) where:

Q = Runoff in cubic feet per second (CFS)

C = Runoff coefficient or percentage of rainfall running off a given drainage area. In general: Parks 0.3; Residential 0.4 to 0.5; Industrial 0.6 to 0.9; Commercial 0.6 to 0.8. The Consulting Engineer shall determine and submit the backup information used to calculate the C factor(s) along with the storm drain pipe design calculation.

I = Intensity of rainfall in inches per hour as determined by time of concentration (Tc). Use the Intensity-Duration-Frequency (IDF) Graph for a mean annual precipitation of 14 inches (see Exhibit "F" for Graph) as published in the Santa Clara County Drainage Manual 2007 (Figure B-2).

A = Drainage area in acres

Tc = Time required for water to flow from the most remote part of the drainage area to the outlet point under consideration. Use ten minutes start time plus 0.5 ft./sec overland plus 1 ft./sec in gutters plus pipe flow time or formulas found in Santa Clara County Drainage Manual 2007.

6.4 Use County of Santa Clara Standard Form DM-2 (see Exhibit "G") found in the Santa Clara County Drainage Manual 2007 for tabulating design calculation and pipe size selection. Submit completed form DM-2 and tributary area drainage map with improvement plans. Hydrology software providing similar inputs and outputs may be used, if accepted by the Director of Public Works/City Engineer.

6.5 Pipe slope shall generally be parallel with the ground gradient of the drainage basin.

6.6 Roughness coefficient (n) for Reinforced Concrete Pipe shall be 0.013.

6.7 A drop in hydraulic grade line (HGL) shall be provided for head losses due to transitions such as bends, pipe size changes, grade changes, and at drainage structures (e.g., manholes).

6.8 Curved storm drain conduit shall not be used except when written permission is obtained from the Director of Public Works/City Engineer.

6.9 Full flow velocity shall not be less than 2 fps.

6.10 Maximum flow velocity shall be 10 fps.

6.11 Minimum size of conduit shall be 12-inch inside diameter.

6.12 Storm conduit generally shall be located 5 feet from the street centerline on the side opposite the sanitary sewer.

6.13 Pipe material shall be reinforced concrete pipe with minimum strength of Class III (1350-D). Pipe shall be Class V in areas of high electrolysis (e.g., north of Highway 101).

6.14 Minimum cover over pipe shall be 2 feet to street subgrade for mains, and 2 feet to lip of gutter for catch basin laterals.

6.15 In general, storm drain main lines should be designed such that all other parallel facilities have at least an eight-foot clear distance separation. Pipelines that have large diameters or are deeper/shallower in elevation may require greater separation from other facilities as determined by the Director of Public Works/City Engineer.

6.16 Drainage structures (e.g., manholes) shall be located at the following points:

A. Changes in direction;

B. Changes in slope;

C. Changes in size;

D. Intersections of mains and laterals (unless a concrete lug connection is permitted by the Director of Public Works/City Engineer as shown in the City Standard Details);

E. Changes in pipe material; and

F. A nominal spacing of 450 feet with a maximum spacing of 500 feet.

6.17 The Standard Manhole (as shown in the City Standard Details) is applicable in most cases where a drainage structure is required. However, the drainage structure shall be individually designed for any of the following conditions:

A. Through mains larger than 39” with less than a 5 degree change in alignment;

B. 27" or larger through mains with a 5 degree or larger change in alignment;

C. Side mains larger than 24"; and

D. Other special conditions as identified by the Director of Public Works/City Engineer.

6.18 Street pickup points shall not exceed 1,000-foot intervals. Use City standard curb inlet catch basins; or Type "A" catch basins, with approval of the Director of Public Works/City Engineer.

6.19 Maximum depth of City standard catch basins shall be eight feet. Deeper inlet structures require individual designs and approval by the Director of Public Works/City Engineer.

6.20 Backflow protection devices shall be provided whenever the pipe system discharges into a flood control channel in which the 100-year event water surface elevation is higher than the lowest natural ground elevation of the drainage basin. Whenever this occurs, an overflow release protection system, such as culvert, channel, or drainage swale, shall be provided for the ultimate delivery of water to a flood control facility.

6.21 A backflow preventive device shall be provided for on-site storm drain laterals when an on-site elevation of a pick-up point is more than 6 inches below the lowest top of curb on the fronting street(s). The backflow device shall be located in a private structure outside the street right-of-way and maintained by the property owner.

6.22 Private property connections to the City storm system shall be first authorized by proper permits and then connected to the City's storm drain system either directly at an existing or new manhole or to the back of an existing catch basin or, if no storm drain exists, by means of curb face drainage, if permitted by the Director of Public Works/City Engineer.

6.23 Force main delivery from on-site pump systems shall not flow directly through curb face, nor into City storm drain system.

6.24 Cross connections between the sanitary sewer system and the storm drainage system are prohibited.

6.25 Storm drain lines shall be constructed by new development or redevelopment up to the property and include capacity for the upstream watershed area.

6.26 Storm drain lines shall be constructed downstream to a point of adequate discharge.

6.27 Pipe stubs with plugs shall be provided at points of known future extensions.

6.28 Outfalls and work within the Santa Clara Valley Water District (SCVWD) right-of-way are subject to approval and issuance of permits by the SCVWD.

6.29 Hydraulic grade analysis for design of new outfall and pipeline shall take into consideration the 10-year and 100-year storm event water surface elevations of the receiving river or creek. Consulting Engineer may obtain the water surface elevations of the receiving river or creek from the SCVWD.

7. WATER SYSTEM DESIGN (POTABLE AND RECYCLED)

7.1 The Consulting Engineer shall perform the preliminary layout of the Project water system. This preliminary layout shall show the locations of the existing water facilities and the proposed locations for the new facilities. The preliminary design shall be drawn on the street improvement plans and submitted to the City Water and Sewer Utilities Department for review and Final Design.

7.2 The Consulting Engineer shall work with the City Water and Sewer Utilities Department to arrive at a Final Design for the Project water system improvements.

7.3 The Consulting Engineer shall be responsible for reviewing the Final Design and shall note any conflicts with other Project improvements. Working together with the City Water and Sewer Utilities Department, all conflicts shall be eliminated.

7.4 The Consulting Engineer shall draw, on the street improvement plans, the plan and profile of the Final Design of the Project water system as reviewed and approved by the City Water and Sewer Utilities Department.

7.5 The Consulting Engineer shall use the following general design criteria for preparing public improvement plans for the Project water system. For special or complex situations, the City Water and Sewer Utilities Department should be contacted for direction.

A. Depth Requirements:

The typical depth of new potable and recycled water mains from top of near side curb (or finished grade for non-standard or non-street locations) to invert of the pipe is as listed below:

a) 4-inch pipe - 3.50 feet
b) 6-inch pipe - 3.70 feet
c) 8-inch pipe - 4.10 feet
d) 10-inch pipe - 4.50 feet
e) 12-inch pipe - 5.00 feet
f) Pipe over 12 inches - top of pipe at 4.0 feet below finished grade

A minimum cover of 3.0 feet from finished grade to top of pipe.

A minimum cover of 2.0 feet from scarified sub-grade to top of pipe during construction.

For 2 inches and smaller copper tubing - 2.0 feet below scarified sub-grade.

For horizontal alignment, the centerline of the potable/recycled water main shall be located 6 feet from face of curb into the street. Other situations should be reviewed with the Water and Sewer Utilities Department prior to beginning of design.

B. Minimum Horizontal Clearance Requirements:

From potable water mains, services and facilities:

a) To all sanitary sewer mains, manholes, and laterals - 10 feet
b) To all recycled water mains, services, and facilities - 10 feet
c) To all trees - 10 feet*
d) To other utilities and general conflicts - 5 feet

* A note shall be placed on the landscape drawings to indicate that there is a 10’ clearance requirement from trees and public water, recycled water and sewer facilities (i.e., mains, FH’s, WM’s, sewer manholes, C/O’s, etc.) unless City-approved Tree Root Barriers (TRB) are utilized. TRB’s must be 5’ from the public facility. The TRB’s must be shown on the plans and the TRB criteria must be included on the plans.

Provide a minimum of 12 inches of clearance around water meter boxes from any above-ground structures such as mail boxes, or fences.

C. Minimum Vertical Clearance Requirement:

Vertical clearance when crossing typical conflicts shall be 12 inches minimum from outside of pipe to outside of pipe (or conduit). For crossings with less than 12 inches clearance, a concrete saddle shall be installed (see City Standard Details).

D. Improvement Plan Requirements:

Show both plan and profile views, and stationing or other means of locating all water facilities (i.e. water valves, tees, reducers, service taps, fire hydrants, etc.) with the station and item called out. The plans shall include but not be limited to the following:

a) The plan view shall include all existing and proposed utilities and appropriate surface features within or near the street right-of-way as necessary (i.e., curb and gutter, sidewalks, driveways, trees within approximately 15 feet of proposed facilities, utility poles, sanitary sewer laterals, easements, etc.). Where these items may appear to be close or in conflict with the water facility some means of identifying the proper clearance shall be used.

b) The profile view shall include the existing grade above the water main (or top of near-side curb or street centerline with a typical street section). It shall also identify and show all crossings with no conflicts and station and elevation of the water main at each full station and change of slope. Any parallel utility closer than 10 feet to the proposed main shall be shown in profile also.

E. Other Miscellaneous Requirements:

To clear conflicts, the pipe should be gradually deflected up or down sufficiently in advance to cross with the proper clearance without using fittings. In cases where this is not possible standard fittings shall be used.

Use air release valves at locations where the peak of the deflected pipe is more than one pipe diameter above the general elevation of the main. Air release valve cabinets shall be located in landscaped or non-paved areas behind the sidewalk at the nearest most convenient location.

Main line gate valves should be installed at tees for branching mains, large services, and fire hydrants, and at approximately:

a) Every 1,000 feet where few services are installed.

b) After every three major connections to the water system (i.e., water services greater than 3 inches, fire services, and fire hydrants).

c) After every two fire hydrants with no other services.

Fire hydrants are generally placed at 300 to 350 feet intervals on the same side of the street as the main. Typically, hydrant locations are at (or near) the returns of street intersections, 7 feet minimum from driveways, on property lines between properties, etc. The Fire Department requires 3 feet of clearance around all fire hydrants.

Any other utility crossing the public water main is required to cross at or near 90 degrees.

Water meters shall be located in landscaped or non-paved areas with a minimum of 12 inches clearance from above-ground structures such as mailbox posts or fences on all sides of the meter box. They shall be located in front of the property to be served.

Provide minimum 3 feet clearance around all above-grade water utilities. Include bollards as needed to protect the utilities.

Refer to Water Department Standard Drawings and Specifications for additional details.

For any variation from these design criteria the Design Engineer should consult with the Water Department for approval.

8. ELECTRIC UTILITY AND JOINT TRENCH DESIGN

8.1 Electric utility plans shall be drawn on half-tone sheets of the street improvement layout ("base sheets"). These half-tone sheets shall show the major existing and proposed street improvements without the extensive notes and details found on the final street improvement plans. Electric utility plans shall conform to the latest City Electric Department's UG 1000, UG 1250, and SD 1800 standards.

8.2 The Consulting Engineer shall prepare preliminary electric utility plans which shall include locations of existing and proposed electric facilities. The Consulting Engineer shall submit a set of the electric utility design for City review (see PROCEDURE, page 1). These plans shall be reviewed by the City Electric Department.

8.3 The Consulting Engineer shall be responsible for the final design of the elevation and alignment and exact location of the electric utility facilities. Elevations shall be provided for tops of manhole rims, corners of vaults and transformer pads, streetlight foundations, and other electric substructures.

8.4 The Consulting Engineer shall draw the final electric utility plans base sheets, incorporating the City's comments and directions.

8.5 Proposed electric facilities shall be stationed on the same centerline stationing as the civil improvements. All dimensions needed to accurately locate facilities shall be included on the plans.

8.6 The electric utility plans may have a separate legend from the civil plans.

8.7 The Consulting Engineer may reference any of the Standard Details contained in the latest revision of the UG 1000 by note on the plans. The Standard Details do not need to be shown on the plans.

8.8 Any trench section designed for the project, which is not detailed in the latest revision of the UG 1000, must be detailed on the plans.

8.9 At each location of intersections of underground conduits (e.g., street crossings) an installation profile detail shall be required to show exact location of all vaults, manholes, boxes, conduit sweeps, vertical clearances from other facilities, trench locations, etc. Note: conduits of differing diameter may have different minimum sweep radii.

8.10 All potential conflicts with any underground facility shall require a profile view of the conflict area.

9. HORIZONTAL DIRECTIONAL DRILLING (HDD) – MINIMUM REQUIREMENTS.

9.1 General

9.1.1 The use of HDD shall be at the discretion of the Director of Public Works/City Engineer at all times.

9.1.2 Displacement HDD shall not be allowed for reamed diameter of bore hole greater than six inches (6”).

9.2 A Geotechnical Report shall accompany a submittal of HDD plans requiring reamed diameter of bore hole greater than 6”.

A. The Geotechnical Report shall:

1. Be prepared and signed by a State of California Registered Geotechnical Engineer.

2. Be based on information gathered along the proposed layout of the HDD installation at the discretion of the Registered Geotechnical Engineer. Sufficient number of test borings should be included in the geotechnical investigation. Depth of test borings should extend to depth zones of utilities that potentially may be impacted by the HDD.

3. Specifically address the potential impacts (if any) on the surface improvements and existing underground improvements the proposed HDD project may have (based on the existing soil conditions). Alternative layouts and profiles must be considered to minimize the impacts to the existing facilities (surface and underground).

4. Provide drilling fluid recommendations.

5. Provide a general reaming operation recommendations and limitations.

6. Specify the minimum horizontal clearance (from reamed perimeter of the borehole to the outer perimeter of the utility) from the existing utilities when the proposed HDD runs parallel to the existing utilities.

7. Specify the minimum vertical clearance when crossing existing utilities.

8. Specify the minimum depth of cover.

B. A condensed version of the geotechnical report (signed and stamped by Registered Geotechnical Engineer) including conclusions and recommendations to be included in the plans for HDD. A letter from the Registered Geotechnical Engineer certifying that the plans comply with the requirements of the geotechnical report may be submitted with plans in lieu of condensed geotechnical report.

9.3 Civil HDD Plans

A. The Civil HDD Plans shall:

1. Conform to the Geotechnical Report conclusions and recommendations at time of submittal.

2. Be signed and stamped by a State of California Registered Civil Engineer.

3. Specify minimum radius of curvature, taking into accounts the proposed material and equipment to be used.

4. Specify maximum entry angles.

B. HDD shall be located outside the roadway pavement, in the Public Utility Easements (PUE), landscape areas, and sidewalk areas, if possible. If it is not possible to locate the proposed HDD outside the roadway pavement, locate as close to the existing curb and gutter as possible.

C. The drill path alignment should be as straight as possible to minimize the frictional resistance during pull back and maximize the installation length during a single pull.

D. The following minimum clearances (from reamed perimeter of the borehole to the outer perimeter of the utility) shall be used as a guideline. The Geotechnical Report conclusions and recommendations or the City's determination shall be followed, if more restrictive

1. Locate HDD 8 feet clear (horizontally) from the existing storm drain and sanitary sewer mains. Minimum of 5 feet horizontal clearance shall be maintained from water mains, except when at the same elevation as water mains, 8 feet horizontal clearance shall be maintained. Minimum of 5 feet horizontal clearance shall be maintained from electrical conduits, boxes, and vaults.

2. Use the following chart for minimum depth of cover (in the pavement and sidewalk areas) and minimum clearance when crossing utilities (storm drain, sanitary sewer, water, electrical, gas, etc.). Crossing shall be at 90-degree.

Bore Diameter	**Min. Depth of Cover**	**Min. Clearance from Crossing Utilities**
6" or less	4'	3'
14" or less	6'	5'
24" or less	10'	7'
48" or less	25'	15'

9.4 Construction Phase

A. The contractor shall provide a "Letter of Training" from the manufacturer of the HDD equipment to the City Public Works Inspector at the pre-construction meeting or one week prior to starting the work which proves completion of the minimum course in the operations and safety of HDD equipment as contained in the HDD Equipment Manufacturer's Operator's Manual. The training shall be provided by the HDD equipment manufacturer, HDD equipment authorized dealer, or manufacturer's authorized trainer. Operators having Caltrans form TR-0770, "Proof of Training", satisfy this requirement.

B. All crossings with existing utilities with less than 6 feet separation shall be potholed or accurately located by other means.

C. When the depth of the existing utility is unknown, the utility must be potholed.

D. At the pre-construction meeting, or one week prior to starting the work, the Contractor shall provide the following:

1. Specify tracking system used and its capability for both the forward drilling and the backream.

2. A written verification of experience and qualifications of the tracker. Experience shall include a minimum of 5 previous jobs and/or 1,000 feet of tracking experience with references.

3. Specify HDD equipment used and its capability.

4. Names of the HDD operator and the responsible tracker.

5. Proposed methods to control, collect, transport, and dispose of drilling fluids and spoils.

6. Emergency procedures for inadvertently boring into a live electric conduit, natural gas line, water line, sanitary sewer line, storm drain line, fiber optic cables, or any other utility in the ground (private or public). Procedures must comply with all applicable regulations.

E. Geotechnical Engineer shall review the Contractor's submittal and comment on suitability of the proposed equipment with respect to the subsurface conditions described in the geotechnical report and provide a letter of compliance to the City.

F. Contractor shall provide for the tracking and plotting of the HDD operations at all times.

1. Tracker shall check for electrical interference along drill path prior to construction operations for necessary adjustments to a pre-drill plan.

2. Tracker shall provide continuous monitoring and plotting of pilot bore to establish a general running line and pull back operations to establish final location of the installed line.

9.5 As-built Drawings

A. Contractor shall provide the City with As-Built Drawings, meeting the following minimum criteria:

1. As-Built Drawings shall show the layout and profile at a minimum horizontal scale of 1"=40' and vertical scale of 1"=10'.

2. As-Built Drawings shall be based upon the plot information provided by the tracker.

3. As-Built Drawings must show new construction, clearances and existing improvements (sidewalk, curb, gutter, roadway, utilities, etc.).

9.6 References

A. Bueno, Sharon M. (1999), "Directional Crossing Contractor Association (DCCA) Roundtable – What Do Industry Leaders Have to Say About Safety, Contracts and Rollups?" *Directional Drilling* Magazine, Dec., p. 18.

B. California Department of Transportation, "HDD Operator Certification Project (January 18, 2000)".

C. California Department of Transportation, "Guidelines and Specifications for Horizontal Directional Drilling Installations 2000", pp. 12-22."

D. Twohing, M.A., "The Directional Crossing Contractor Association (DCCA) Directional Crossing Survey Standards 1998", p. 5.

E. U.S. Army Corps of Engineers, "Guidelines for Trenchless Technology: Cured-in-Place (CIPP), Fold-and-Formed Pipe (FFP), Mini-Horizontal Directional Drilling (Mini-HDD), and Microtunneling", Construction Productivity Advancement Research (CPAR) Program (Final Report, September 1995).

F. DCM/Joyal Engineering, Review Comments – City of Santa Clara Draft Minimum S.O.P. Requirements for H.D.D. Installation, Marc Gelinas/David Mathy, June 27, 2000.

G. Geotechnical Comments, Proposed City of Santa Clara Draft Requirements – HDD-SOP, Hallenbeck & Associates, Adel Kasim, Ph.D., G.E., June 1, 2000.

EXHIBIT A

Typical Legend Symbols

Note: Include only the "proposed" and "existing" legend symbols that are actually used on the plans. Symbols other than what is shown in this Exhibit may be used subject to approval.

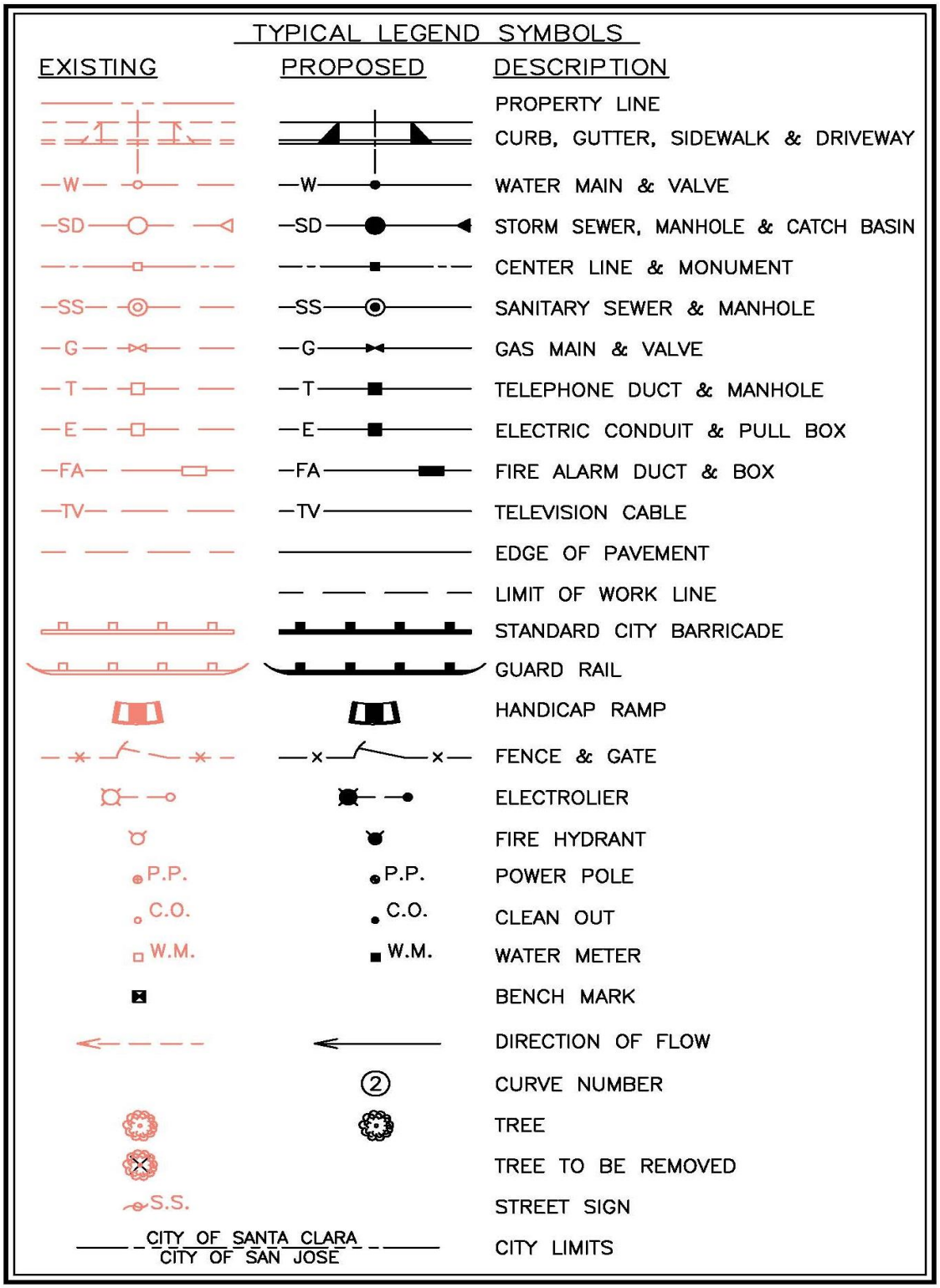

EXHIBIT B

Typical Abbreviations

Note: Show only those abbreviations that are actually used on the plans.

A	
AB	aggregate base
ABBC	asbestos bonded bituminous coated
Abn	abandon
Abut	abutment
AC	asphalt concrete
ACB	asphalt concrete base
ACP	asbestos cement pipe
ADL	added dead load
Adj	adjust
Alt	alternate
Approx	approximate
AS	aggregate subbase
Ave	avenue
Avg	average
@	at

B	
BC	begin horizontal curve
BCR	begin curve return
Beg	begin
Bit Ctd	bituminous coated
Bk	back
Bkf	backfill
Bldg	building
Blvd	boulevard
BM	bench mark
Bot	bottom
Br	bridge
Brg	bearing
BTU	british thermal unit
BVC	begin vertical curve

C	
CAP	corrugated aluminum pipe
C-C	center to center
CG	center of gravity
Chnl	channel
CI	cast iron
CIP	cast iron pipe
CIPCP	cast in place concrete pipe
CL	chain link
Cl	class
Clr	clear, clearance
CM	corrugated metal
CMP	corrugated metal pipe
Co	county
Col	column
Conc	concrete
Cond	conduit
Const	construct, construction
Cont	continuous
Coord	coordinate
Cr	creek
CSP	corrugated steel pipe
CTB	cement treated base
CTPB	cement treated permeable base
CTPM	cement treated permeable material
Ctrs	centers
Culv	culvert
CL	centerline

D	
D	depth
Dbl	double
Deg	degree
Det	detail, detour
DI	drainage inlet, drop inlet
Dia	diameter
Diaph	diaphragm
Dist	distance, district
Dr	drive
Dwy	driveway

E	
E	east
Ease	easement
EB	eastbound
EC	end horizontal curve
ECR	end curb return
Elec	electrolier
Elect	electric
Elev	elevation
Emb	embankment
Engr	engineer
EP	edge of pavement
EVC	end vertical curve
Exc	excavation
Exist, (E)	existing
Exp	expansion, expressway
Exp Jt	expansion joint
Ext	exterior

F	
F & C	frame and cover
F & G	frame and grate
Fdn	foundation
FG	finished grade
FH	fire hydrant
Fig	figure
FL	flow line
FS	finished surface
Ftg	footing
Fwy	freeway

G	
g	acceleration due to gravity
Ga	gage
Galv	galvanized
GR	guard railing
GSP	galvanized steel pipe
Gtr	gutter

H	
H	height
h, hr	hour
hdwl	headwall
HMA	hot mixed asphalt
Horiz	horizontal
HP	high point, horsepower
HW	headwall
Hwy	highway

I	
IB	imported borrow
ID	inside diameter
Int	interior
Inv	invert
Irr	irrigation

J	
Jct	junction
JP	joint pole
JS	junction structure
Jt	joint

K	

L	
L	length
Ln	lane
Loc	location
LS	lump sum
Lt	left

M	
Maint	maintenance
Max	maximum
Med	median
MH	manhole
Min	minimum
Misc	miscellaneous
Mod	modified, modify
Mon	monument
Mtl	material

N	
N	north
NB	northbound
No.	number (must have period)
Nos.	numbers (must have period)
NTS	not to scale

O	
OC	overcrossing
OD	outside diameter
OH	overhead
Opp	opposite

P	
P	page
PAP	perforated aluminum pipe
PB	pull box
PC	point of curvature
PCC	point of compound curve
PCP	perforated concrete pipe
PCVC	point of compound vertical curve
Ped	pedestrian
Ped OC	pedestrian overcrossing
Ped UC	pedestrian undercrossing
PI	point of intersection
PJP	partial joint penetration
P/L	property line
POC	point of horizontal curve
POT	point of tangent
POVC	point of vertical curve
PP	power pole
PPP	perforated plastic pipe
PRC	point of reverse curve
PRF	pavement reinforcing fabric
PRVC	point of reverse vertical curve
PS&E	plans, specifications and estimates
PSP	perforated steel pipe
PT	point of tangency
PVC	polyvinyl chloride
Pvmt	pavement

Q	
Qty	quantity

R	
R	radius
RCP	reinforced concrete pipe
Rd	road
Reinf	reinforced
Ret	retaining
Rev	revised
Rdwy	roadway
RP	radius point
RR	railroad
Rt	right
Rte	route
RW	redwood
R/W	right of way

S	
S	south
SB	southbound
SD	storm drain
Sec	second
Sht	sheet
Sim	similar
Specs	specifications
St	street
Sta	station
Std	standard
Str	structure
Surf	surfacing
SW	sidewalk
Swr	sewer
Sym	symmetrical

T	
Tan	tangent
TC	top of curb
TCB	traffic control box
Tel	telephone
Temp	temporary
TG	top of grade
Tot	total
TP	telephone pole
Trans	transition
TS	traffic signal
Typ	typical

U	
UC	undercrossing
UD	underdrain
UON	unless otherwise noted
UP	underpass

V	
V	valve
Var	variable
VC	vertical curve
VCP	vitrified clay pipe
Vert	vertical
Vol	volume

W	
W	west
WB	westbound
WM	wire mesh
WS	water surface
WSP	welded steel pipe
Wt	weight
WV	water valve
WW	wing wall

X	
X sec	cross section
Xing	crossing

Y	
Yr	year
Yrs	Years

Z

EXHIBIT C

General Notes

1. All materials and workmanship shall conform to the City's Standard Details, Standard Specifications, and General Requirements.

2. Contractor shall secure an Encroachment Permit from the City Engineering Department and pay appropriate fee prior to commencement of work. All work within the public right-of-way shall be done under a single Encroachment Permit.

3. It is the Contractor's responsibility to verify the location of all existing utilities with the appropriate utility agencies prior to the commencement of construction. Contractor shall notify all public and private utility owners 48 hours prior to commencement of work adjacent to the utility. Contact Underground Service Alert (USA) at 811 or 800-227-2600.

4. The Contractor shall notify, by circular, all business establishments and residences located in areas affected by the work at least forty-eight (48) hours prior to start of construction. Circular shall be subject to the approval of the City Engineer.

5. Unless otherwise directed by the City Engineer in the field: at each location where new curb/gutter is to be installed on an existing street (driveway installation, driveway abandonment, curb ramp installation, curb face drainage installation, etc.) pavement reconstruction shall be required. An 18-inch wide band of pavement shall be removed and replaced along the entire length of curb/gutter installation. Removal depth (saw cuts required) shall be to the base material on streets with A.C. or P.C.C. pavement four (4) inches or less in thickness. Removal depth shall be two (2) inches minimum on streets with A.C. (grind) and four (4) inches minimum on streets with P.C.C. (saw cut) pavement thickness greater than four (4) inches. Replace with A.C. or P.C.C. (dowels required) to match existing pavement.

6. All sidewalk, curb, and gutter damaged as a result of the project shall be removed and replaced to the nearest score mark or as directed by the City Engineer. Installation of new sidewalk, curb and gutter against existing improvements shall require a sidewalk contact joint (dowels required).

7. Partial replacement of a driveway is not allowed. A driveway that has been cut or damaged must be replaced in its entirety. The new replacement driveway must meet current City Standards which may affect on-site improvements and/or require a sidewalk easement.

8. Slurry seal shall be required on all new street pavement (e.g., trench work, potholes, and street widenings). Slurry seal shall extend twelve inches beyond the limit of pavement reconstruction.

9. All manholes, valve boxes, monument boxes, and other structures in the pavement area shall be adjusted to finish grade before paving final lift.

10. Grade breaks on curbs on sidewalks are to be rounded off on form work and finished surfacing.

11. The contractor shall be responsible for the preservation and/or perpetuation of existing survey monuments (curb tags, iron pipes, street monuments, etc.) noted on the plans or found during construction per Section 8771of the California Business and Professions Code. If a survey monument has the potential of being disturbed or within 3 feet of the Work, the monument shall be located, referenced, and a corner record shall be filed with the Santa Clara County Surveyor, and a duplicate of the corner record shall be submitted to the City Engineer prior to the start of construction. Should any survey monument be damaged or destroyed during construction, the contractor shall re-establish said monument per City standard, file a corner record with the Santa Clara County Surveyor, and submit a duplicate of the corner record to the City Engineer prior to final project notice of completion issued by the Department of Public Works. The contractor shall, at his/her expense, hire a licensed professional civil engineer authorized to practice land surveying or land surveyor to perform the work.

12. All surplus and unsuitable material shall be removed from public right-of-way.

13. Contractor shall provide adequate dust control and keep mud and debris off the public right-of-way at all times.

14. All trenches and excavations shall be constructed in strict compliance with the applicable sections of California and Federal O.S.H.A. requirements and other applicable safety ordinances. Contractor shall bear full responsibility for trench shoring design and installation.

15. Existing utilities shown are based upon record information and are approximate in location and depth. The Contractor shall pothole all existing utilities that may be affected by new facilities in this contract, verify actual location and depth, and report potential conflicts to the Engineer prior to excavating for new facilities.

16. Contractor shall perform his construction and operation in a manner, which will not allow harmful pollutants to enter the storm drain system. To ensure compliance, the Contractor shall implement the appropriate Best Management Practice (BMP) as outlined in the brochures entitled “Best Management Practice for the Construction Industry” issued by the Santa Clara Valley Nonpoint Source Pollution Control Program, to suit the construction site and job condition.

17. Overnight parking of construction equipment in the public right-of-way shall not be permitted, except at location(s) approved by the City Traffic Engineer.

18. All sanitary sewer and/or storm drain mains to be abandoned shall be filled with sand or control density fill (CDF) and plugged at each end with a 6” thick wall of Class “A” P.C.C.

19. Abandonment of sanitary sewer lateral at the property line shall include the complete removal of the Christy Box, all vertical pipes and the 45º Wye. The remaining lateral ends shall be plugged with 6” thick wall of Class “A” P.C.C., ensuring no concrete enters the main. Abandonment of sanitary sewer lateral at the main will occur when lateral connects at a manhole or as determined by the City. Plug the lateral end with 6” thick wall of Class “A” P.C.C., and fill lateral with sand or control density fill (CDF), making a smooth trowel finish on the inside wall of the manhole for manhole connections.

20. Unless otherwise noted, Class 2 A.B. under curb, gutter, and street sections paved with asphalt concrete shall be compacted to 95% relative compaction (minimum).

21. Near completion of the Project, contractor shall replace damaged curb and gutter along Project frontage as directed by the City Engineer.

EXHIBIT D

Figure 3-3 of Sanitary Sewer Capacity Assessment Report, May 2007

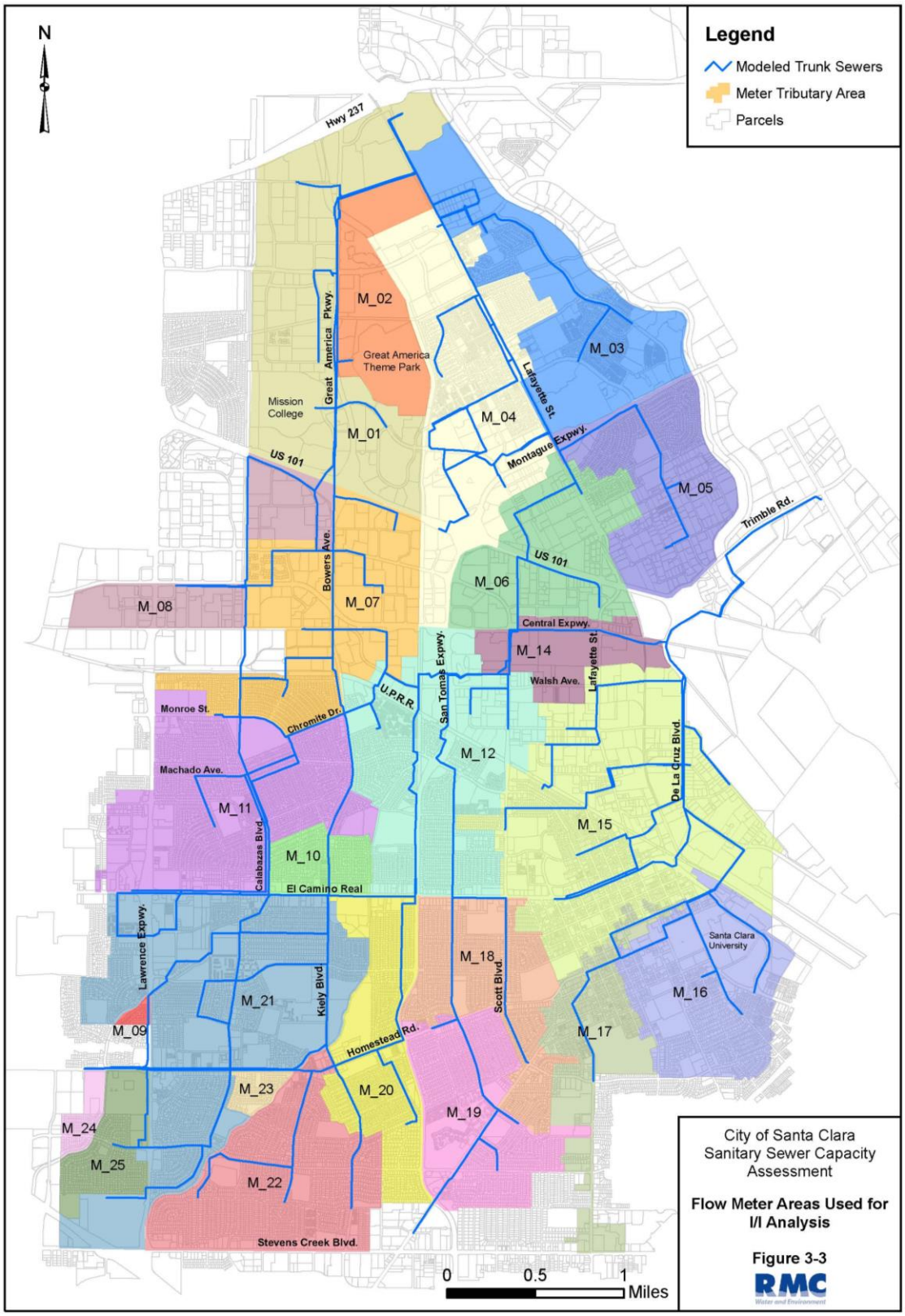

EXHIBIT E

Table 3-2 of Sanitary Sewer Capacity Assessment Report, May 2007

Table 3-2 GWI and RDI/I Parameters by Meter Area

Meter Area[a]	Dry Weather GWI[b] (gpd/acre)	Wet Weather GWI[c] (gpd/acre)	R1 RDI/I Vol. (%) (2 hrs. to peak)	R2 RDI/I Vol. (%) (6 hrs. to peak)	R3 RDI/I Vol. (%) (12 hrs. to peak)
M_01	0	0	0.5	0.8	0.8
M_02	0	0	0.5	0.8	0.8
M_03	0	0	0.6	0.1	0.1
M_04	500	1,300	0.6	0.1	0.1
M_05	700	1,000	0.6	0.1	0.1
M_06	0	0	0.6	0.1	0.1
M_07	1,900	1,900	0.3	0.5	0.5
M_08	0	0	0.3	0.5	0.5
M_09	0	0	0.6	0.1	0.1
M_10	0	0	0.6	0.1	0.1
M_11	1,600	2,300	0.9	1.7	6.0
M_12	0	0	0.9	1.0	0.5
M_14	0	0	0.6	0.1	0.1
M_15	300	700	1.0	0.2	0.2
M_16	900	1,600	1.0	0.2	0.2
M_17	200	200	0.6	0.1	0.1
M_18	0	0	0.8	1.0	0.1
M_19	0	0	0.3	0.1	0.1
M_20	0	0	0.6	0.1	0.1
M_21	0	0	0.6	0.1	0.1
M_22	0	0	0.6	0.1	0.1
M_23	0	0	0.6	0.1	0.1
M_24	0	0	0.6	0.1	0.1
M_25	0	0	0.6	0.1	0.1
CuSD	0	0	0.5	0.2	0.4

(a) See Figure 3-3.
(b) Represents GWI during non-rainfall periods (e.g., early to mid-February) of the 2006 flow monitoring period.
(c) Represents GWI immediately following rainfall events.

EXHIBIT F

Santa Clara County Drainage Manual 2007

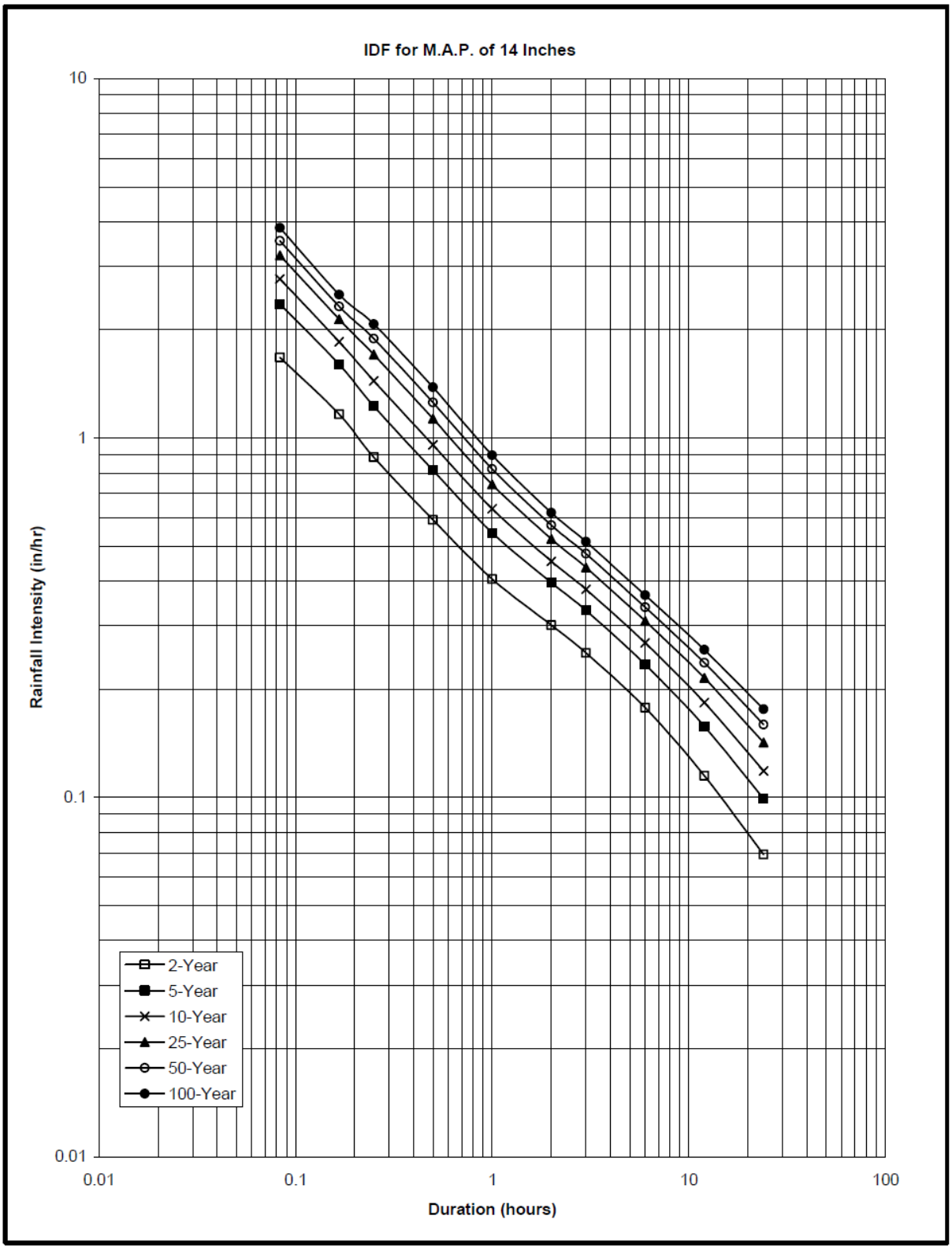

Figure B-2: IDF for M.A.P. of 14 Inches

EXHIBIT G

Standard Form DM-2: Santa Clara County Drainage Manual 2007

Drainage Manual 2007
County of Santa Clara, California

STANDARD FORM DM-2

Drainage Manual

STORM DRAIN DESIGN BY RATIONAL METHOD

county of santa clara

DEPARTMENT OF PUBLIC WORKS

APPROVED: _____ DIRECTOR

Runoff Coefficient (based on Santa Clara County Drainage Manual):
Land Use _____ Weighted C-Value = _____

Rainfall Curves: Source _____
Return Period _____ years (County minimum standard = 10 years)

Time of Concentration (improved): Gutter Time _____ min. Total Inlet Time _____ min.

Pipe (minimum standard size = 12" diameter): Type _____ Manning's "n"
Minimum Velocity at Design Flow, V = _____ fps (min. standard velocity = 2.6 ft/sec.)

Attach map showing boundaries of drainage areas, runoff coefficients, inlet locations, Q's, slope, point of concentration, existing and proposed drainage facilities. If, under normal conditions, pipe will flow full at any point in the system, attach plot of hydraulic grade line.

Project Location _____ Computations by _____ Date

Type of Development _____ Total Area (Acres)

Remarks _____ Signature of Applicant

EXAMPLE

Concentration Point	Discharge (Q) cfs	Ground Slope *	Pipe Slope, S	Vs	Σ Product Area * Coefficient	Duration, min. (Time of Concentration)	Rainfall Intensity, I (inches/hr.)	Runoff, cfs Q = CIA	Length, ft.	Pipe Diameter, in.	Slope, percent	Depth of Flow, D/d	Hydraulic Radius, ft.	Velocity, fps	$V^2/2g$	Flow Time, min.	Fall, ft.	Flow Time, min.	Invert Elevation, ft. In	Invert Elevation, ft. Out	Finished Grade Elevation, ft. In	Finished Grade Elevation, ft. Out	Minimum Cover, ft.	Location of Point of Minimum Contact, ft.	Cut, ft. In	Cut, ft. Out	Remarks
	1	2	3		4	5	6	7	8	9	10	11	12	13	14	15	16											
			1 X 2		3 + 4	5 + 15		4 X 6								8/13	8 X 10											

Appendix G
City of Santa Clara Standard Details

Appendix G

STANDARD DETAILS

CITY OF SANTA CLARA
2015

PREPARED BY
DEPARTMENT OF PUBLIC WORKS

RAJEEV BATRA
DIRECTOR OF PUBLIC WORKS/
CITY ENGINEER

Department of Public Works
City of Santa Clara, CA

Santa Clara
All-America City
2001

STANDARD DETAILS

APPROVED BY:

Rajeev Batra

RAJEEV BATRA
DIRECTOR OF PUBLIC WORKS/
CITY ENGINEER

DATE: Oct. 27, 2013

Acknowledgement of contributions

Our sincere thanks to the staffs of the
Public Works Department,
Electric Utility Department,
and Water & Sewer Department,
for their contributions.

Copies of this book may be purchased from City's Department of Public Works.
Publication Website: http://santaclaraca.gov/gcsearch.aspx?q=Standard%2520Details

CITY OF SANTA CLARA
DEPARTMENT OF PUBLIC WORKS

STANDARD DETAILS

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Appendix A - General Notes ..... AP-A 83

Department of Public Works
City of Santa Clara, CA

STANDARD DETAILS

STREET SECTION

DETAILS ST-1 TO ST-28

1. Definitions:
   a. Driveway - area between lines $\frac{1}{2}$ driveway width plus 2.5 feet each side of driveway centerline (area of thickened section, see driveway details).
   b. Driveway approach - area between back of curb and property line.
   c. Driveway apron - drive area within private property reserved for vehicular ingress and egress.
   d. Curb cut - area of curb and gutter within the driveway limits described in 1.a. (above).
   e. Driveway centerline - a line drawn normal to the street that crosses the depressed area of the curb at its midpoint.
   f. Driveway width - the length of the fully depressed curb.

2. No person, firm, or corporation shall construct or maintain any driveway across any curbing or sidewalk, or connecting with any uncurbed roadway without first securing a City Encroachment Permit. All construction of such driveways shall be done in conformity with City of Santa Clara Standard Details and Standard Specifications, and shall be subject to City inspection.

3. Not more than 50 percent of the street frontage of any parcel of land shall be devoted to driveways, except in cases of narrow frontages (e.g., cul-de-sacs) when approved by the City Engineer.

4. Driveway centerlines on the same property shall be at least their combined half widths plus 29 feet apart.

5. Driveways located adjacent to side property lines or in proximity to utilities obstructions should in general satisfy the Driveway Locations shown in detail ST-2.

6. Driveways located in proximity to street intersections should in general satisfy the Driveway Locations at Curb Returns shown in detail ST-3.

7. Adjustments to utility facilities or other public improvements shall be accomplished without cost to the City.

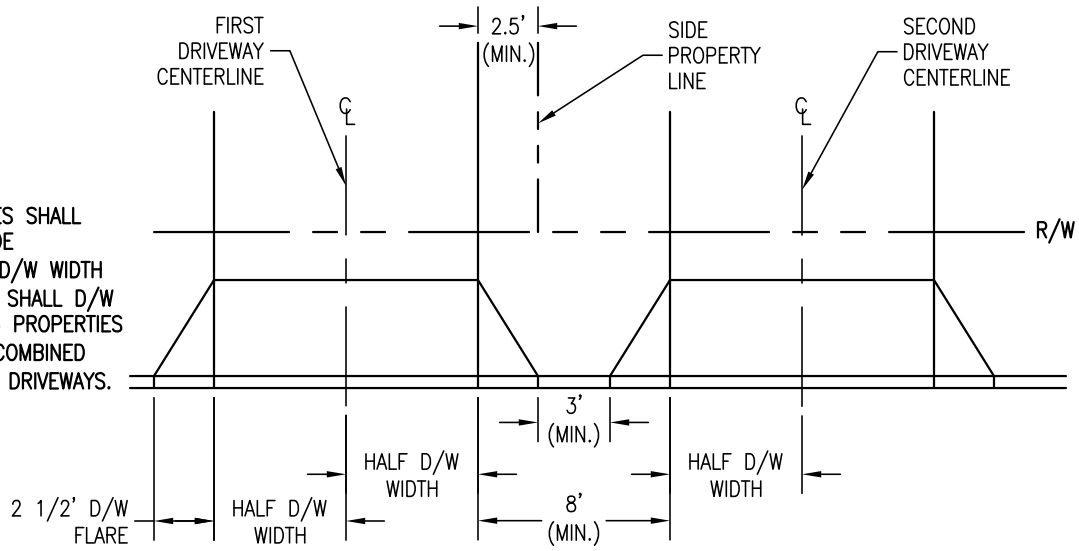
8. Any abandoned driveway shall be reconstructed to City standard sidewalk, curb and gutter requirements, concurrent with the new driveway construction without any cost to the City.

9. Where difficulties, unnecessary hardships and effects inconsistent with the general purpose of these driveway standards may result from the strict application of certain provisions thereof, variances may be granted by the City Engineer.

DRAWN BY: K. TRAN	DRIVEWAY STANDARDS	ST-1
CHECKED BY: F. AMIN		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 1

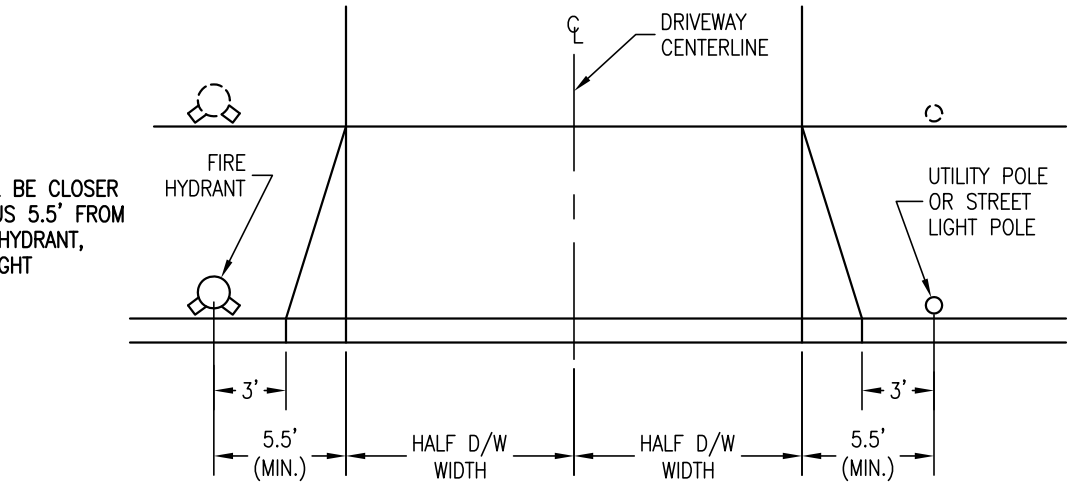
CONDITION 1

DRIVEWAY (D/W) CENTERLINES SHALL NOT BE CLOSER TO THE SIDE PROPERTY LINE THAN HALF D/W WIDTH PLUS 2.5' BUT IN NO CASE SHALL D/W CENTERLINES FOR ADJOINING PROPERTIES BE CLOSER THAN 8' PLUS COMBINED HALF D/W WIDTHS OF BOTH DRIVEWAYS.



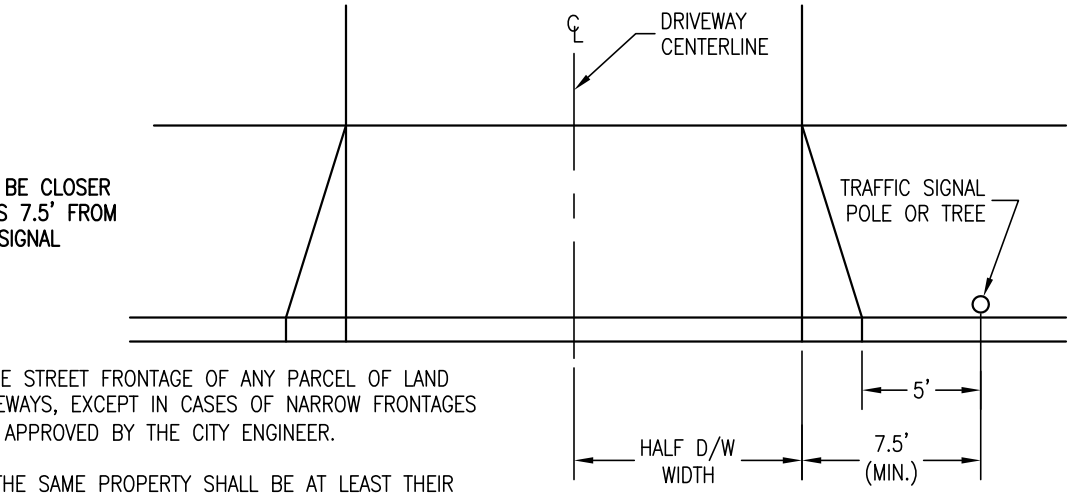
CONDITION 2

NO D/W CENTERLINE SHALL BE CLOSER THAN HALF D/W WIDTH PLUS 5.5' FROM THE CENTER OF ANY FIRE HYDRANT, UTILITY POLE OR STREET LIGHT STANDARD.



CONDITION 3

NO D/W CENTERLINE SHALL BE CLOSER THAN HALF D/W WIDTH PLUS 7.5' FROM THE CENTER OF A TRAFFIC SIGNAL POLE OR TREE.



NOTE:

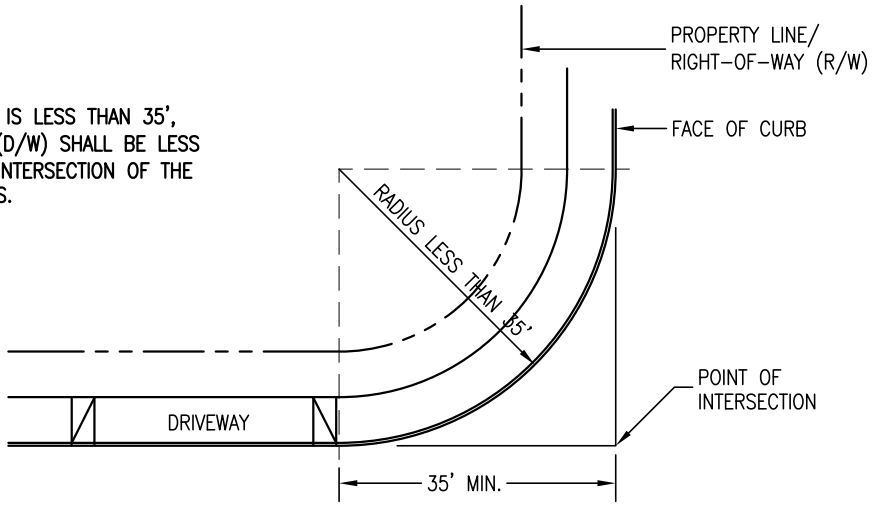
NOT MORE THAN 50% OF THE STREET FRONTAGE OF ANY PARCEL OF LAND SHALL BE DEVOTED TO DRIVEWAYS, EXCEPT IN CASES OF NARROW FRONTAGES (E.G., CUL-DE-SACS) WHEN APPROVED BY THE CITY ENGINEER.

DRIVEWAY CENTERLINES ON THE SAME PROPERTY SHALL BE AT LEAST THEIR COMBINED HALF WIDTHS PLUS 29 FEET APART.

DRAWN BY: K. TRAN	DRIVEWAY LOCATIONS	ST-2
CHECKED BY: F. AMIN		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 2

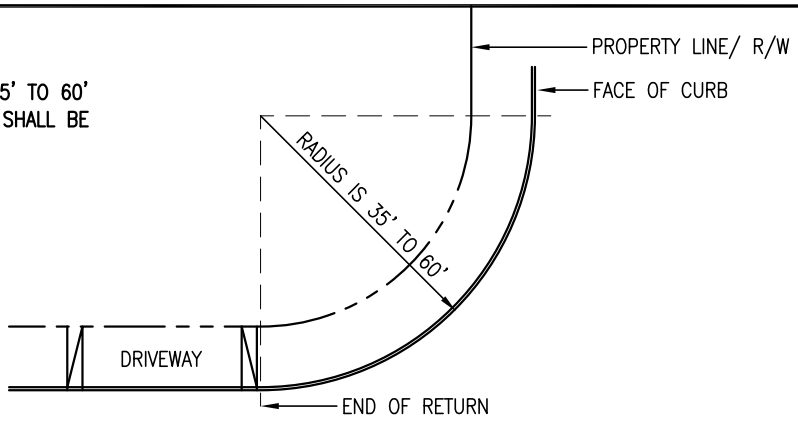
CONDITION 1

WHERE A CURB RETURN RADIUS IS LESS THAN 35', NO PORTION OF ANY DRIVEWAY (D/W) SHALL BE LESS THAN 35' FROM THE POINT OF INTERSECTION OF THE PROJECTED FACE OF CURB LINES.



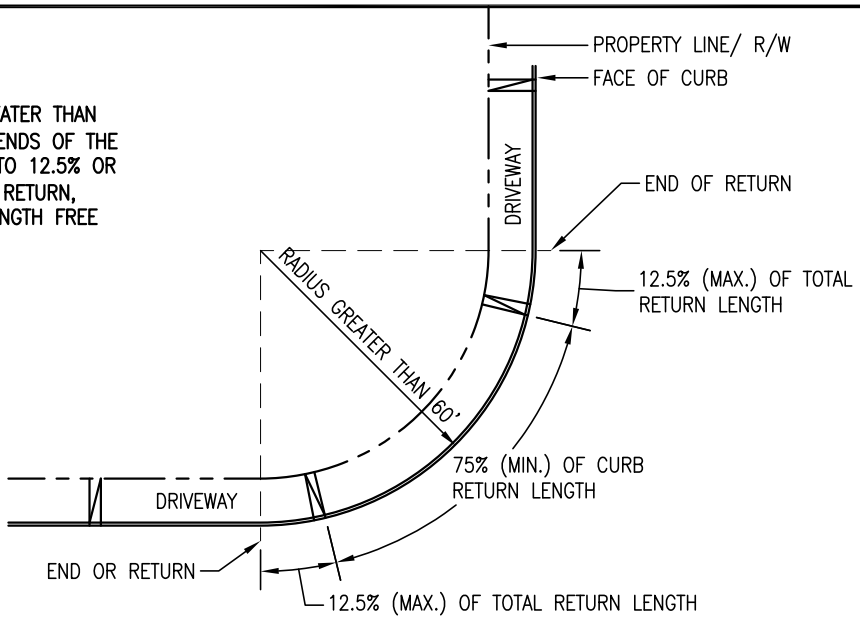
CONDITION 2

WHERE THE CURB RETURN RADIUS IS 35' TO 60' (INCLUSIVE), NO PORTION OF ANY D/W SHALL BE PERMITTED WITHIN THE CURB RETURN.



CONDITION 3

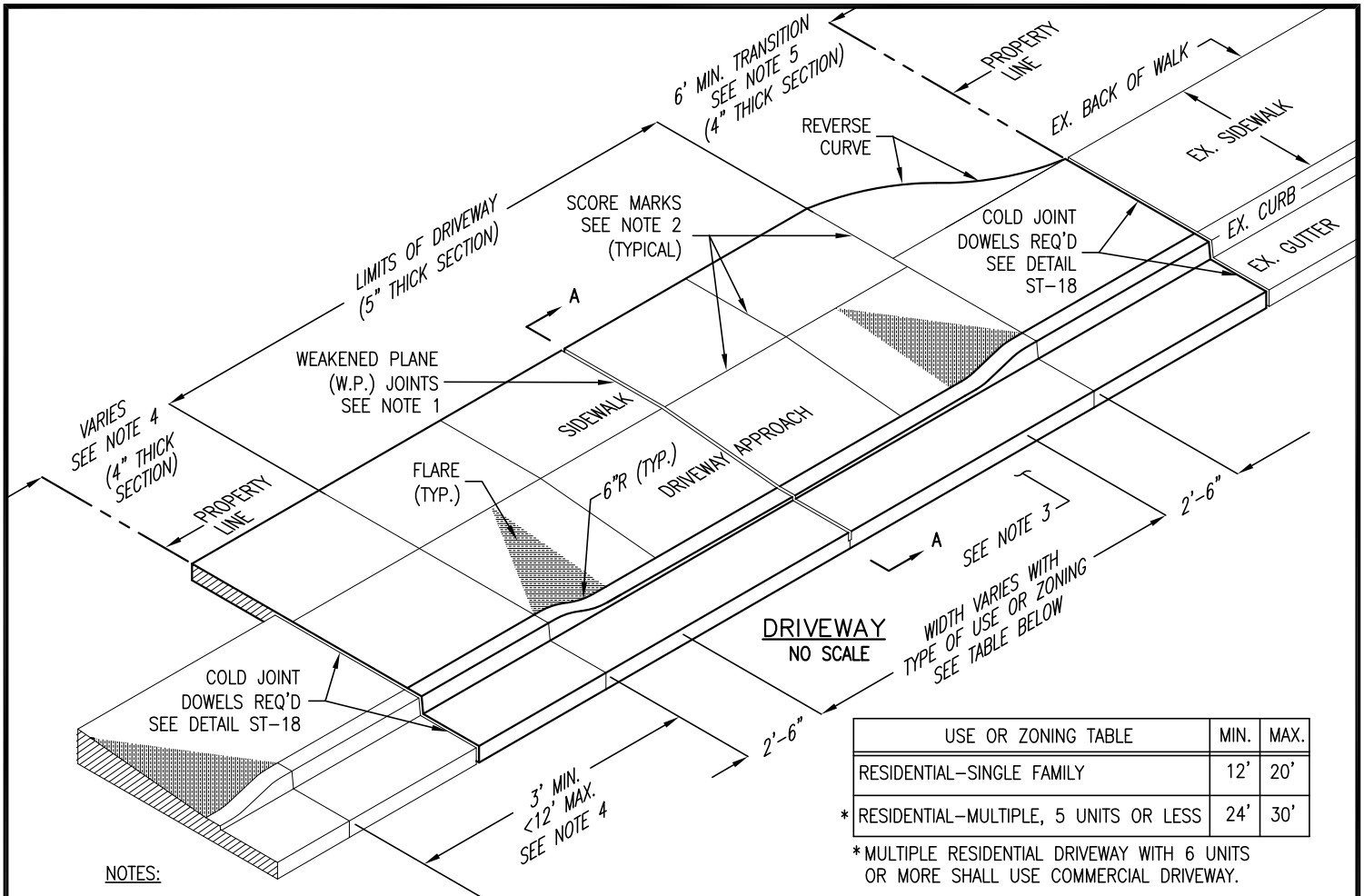
WHERE A CURB RETURN RADIUS IS GREATER THAN 60', D/W MAY ENCROACH UPON EACH ENDS OF THE RETURNS A MAXIMUM DISTANCE EQUAL TO 12.5% OR 1/8TH THE ARC LENGTH OF THE CURB RETURN, LEAVING 75% OF THE CURB RETURN LENGTH FREE FROM D/W ENCROACHMENTS.



CONDITION 4

ON ALL CURB RETURNS WHERE CHANNELIZATION AND/OR COMPOUND CURVES EXIST, D/W LOCATION SHALL BE SUBJECT TO APPROVAL BY THE CITY ENGINEER.

DRAWN BY: K. TRAN	DRIVEWAY LOCATIONS AT CURB RETURNS	ST-3
CHECKED BY: F. AMIN		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 3

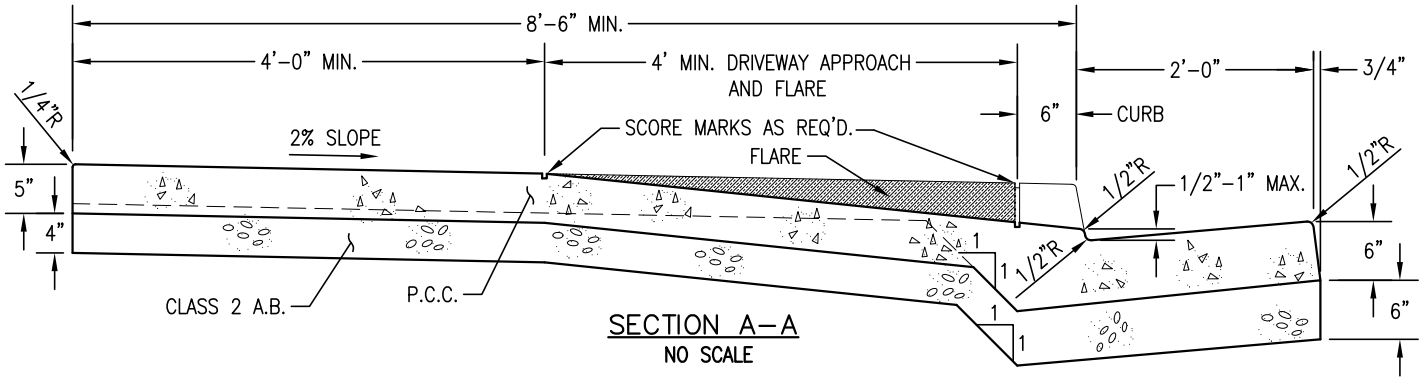


USE OR ZONING TABLE	MIN.	MAX.
RESIDENTIAL–SINGLE FAMILY	12'	20'
* RESIDENTIAL–MULTIPLE, 5 UNITS OR LESS	24'	30'

*MULTIPLE RESIDENTIAL DRIVEWAY WITH 6 UNITS OR MORE SHALL USE COMMERCIAL DRIVEWAY.

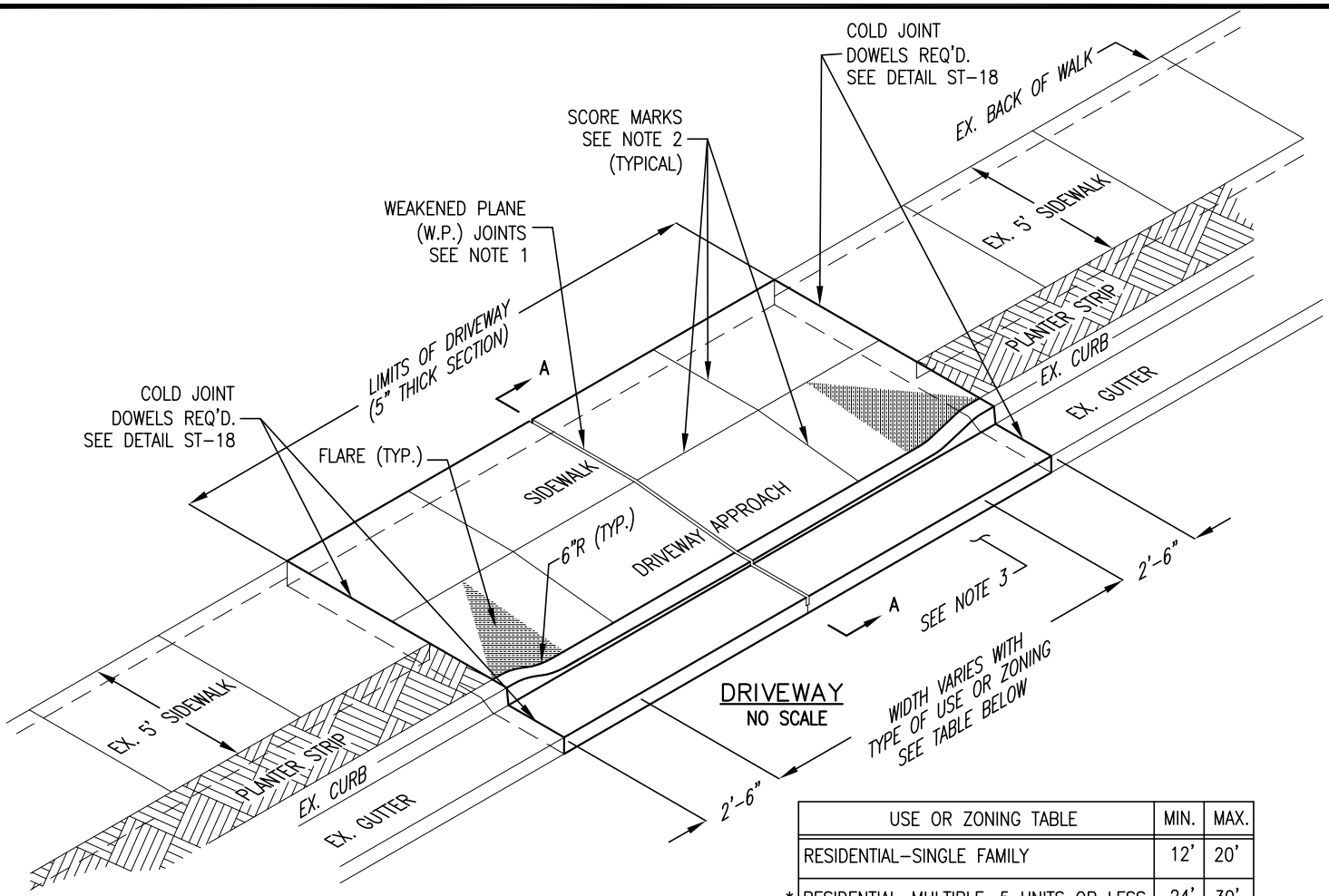
NOTES:

1. W.P. JOINTS REQUIRED ON CENTERLINE FOR DRIVEWAYS 12' TO 20' WIDE. DRIVEWAYS 24' TO 30' WIDE SHALL HAVE 2 W.P. JOINTS EVENLY SPACED (AT 1/3 AND 2/3 POINTS).
2. PLACE SCORE MARKS AT 1/4 POINTS ON DRIVEWAYS 12' TO 20' WIDE AND AT 1/6 POINTS ON DRIVEWAYS 24' TO 30' WIDE. SCORE MARK REQUIRED AT DRIVEWAY SLOPE BREAK PARALLEL TO EXISTING FACE OF CURB.
3. 18" WIDE BAND OF PAVEMENT SHALL BE REMOVED AND REPLACED. SEE NOTE 5 OF GENERAL NOTES (APPENDIX) FOR REQUIREMENTS.
4. WHERE THE DISTANCE BETWEEN NEW DRIVEWAY LIMIT AND PROPERTY LINE IS LESS THAN 6 FEET AT THE BACK OF DRIVEWAY AND THERE IS AN ADJACENT DRIVEWAY LESS THAN 12 FEET DISTANCE AWAY, THE SIDEWALK SHALL NOT TRANSITION. NEW SIDEWALK SHALL TERMINATE AT PROPERTY LINE OR ADJACENT DRIVEWAY TO MAINTAIN ADA PATHWAY.
5. WHERE THE DISTANCE BETWEEN NEW DRIVEWAY LIMIT AND PROPERTY LINE IS EQUAL TO OR GREATER THAN 6 FEET AT THE BACK OF DRIVEWAY AND THERE IS NO ADJACENT DRIVEWAY WITHIN 12 FEET DISTANCE OF NEW DRIVEWAY, THE SIDEWALK SHALL TRANSITION FROM BACK OF DRIVEWAY TO EXISTING SIDEWALK.
6. IF THE EXISTING ON–SITE IMPROVEMENTS DO NOT MATCH THE GRADE OF THE REAR OF THE NEW DRIVEWAY, SUFFICIENT EXISTING IMPROVEMENTS SHALL BE RECONSTRUCTED TO PRODUCE A SMOOTH, USABLE SURFACE WITH A CHANGE IN GRADE NOT EXCEEDING 10%.



SECTION A–A
NO SCALE

DRAWN BY: K. TRAN	RESIDENTIAL DRIVEWAY WITH ATTACHED SIDEWALK	ST-4
CHECKED BY: F. AMIN		
APPROVED BY: G. GOMEZ		
DATE: MAY 2015	CITY OF SANTA CLARA	PAGE: 4



DRIVEWAY
NO SCALE

	USE OR ZONING TABLE	MIN.	MAX.
	RESIDENTIAL–SINGLE FAMILY	12'	20'
*	RESIDENTIAL–MULTIPLE, 5 UNITS OR LESS	24'	30'

* MULTIPLE RESIDENTIAL DRIVEWAY WITH 6 UNITS OR MORE SHALL USE COMMERCIAL DRIVEWAY.

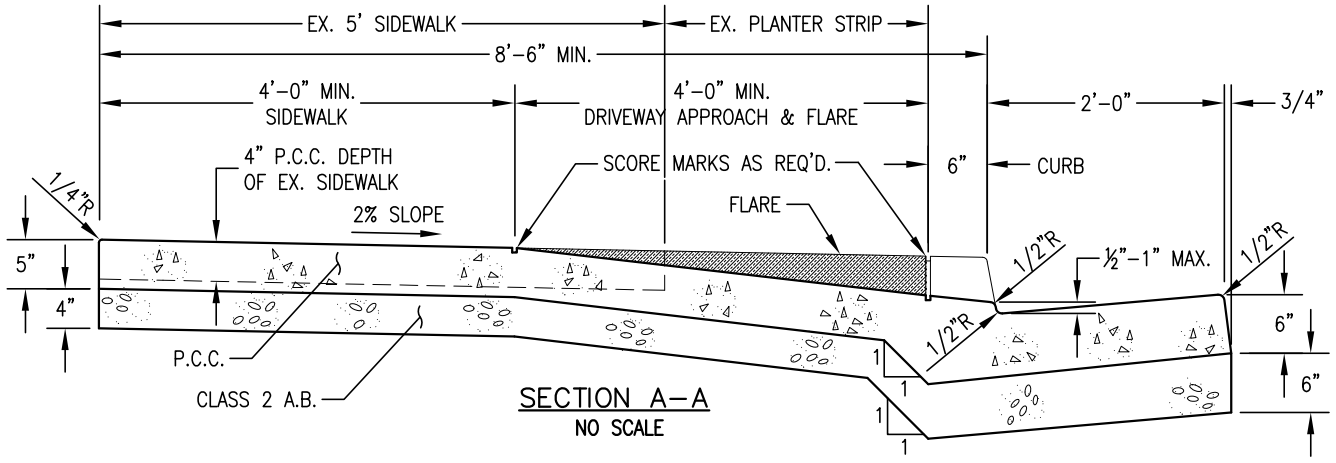
NOTES:

1. W.P. JOINTS REQUIRED ON CENTERLINE FOR DRIVEWAYS 12' TO 20' WIDE. DRIVEWAYS 24' TO 30' WIDE SHALL HAVE 2 W.P. JOINTS EVENLY SPACED (AT 1/3 AND 2/3 POINTS).

2. PLACE SCORE MARKS AT 1/4 POINTS ON DRIVEWAYS 12' TO 20' WIDE AND AT 1/6 POINTS ON DRIVEWAYS 24' TO 30' WIDE. SCORE MARK REQUIRED AT DRIVEWAY SLOPE BREAK PARALLEL TO EXISTING FACE OF CURB.

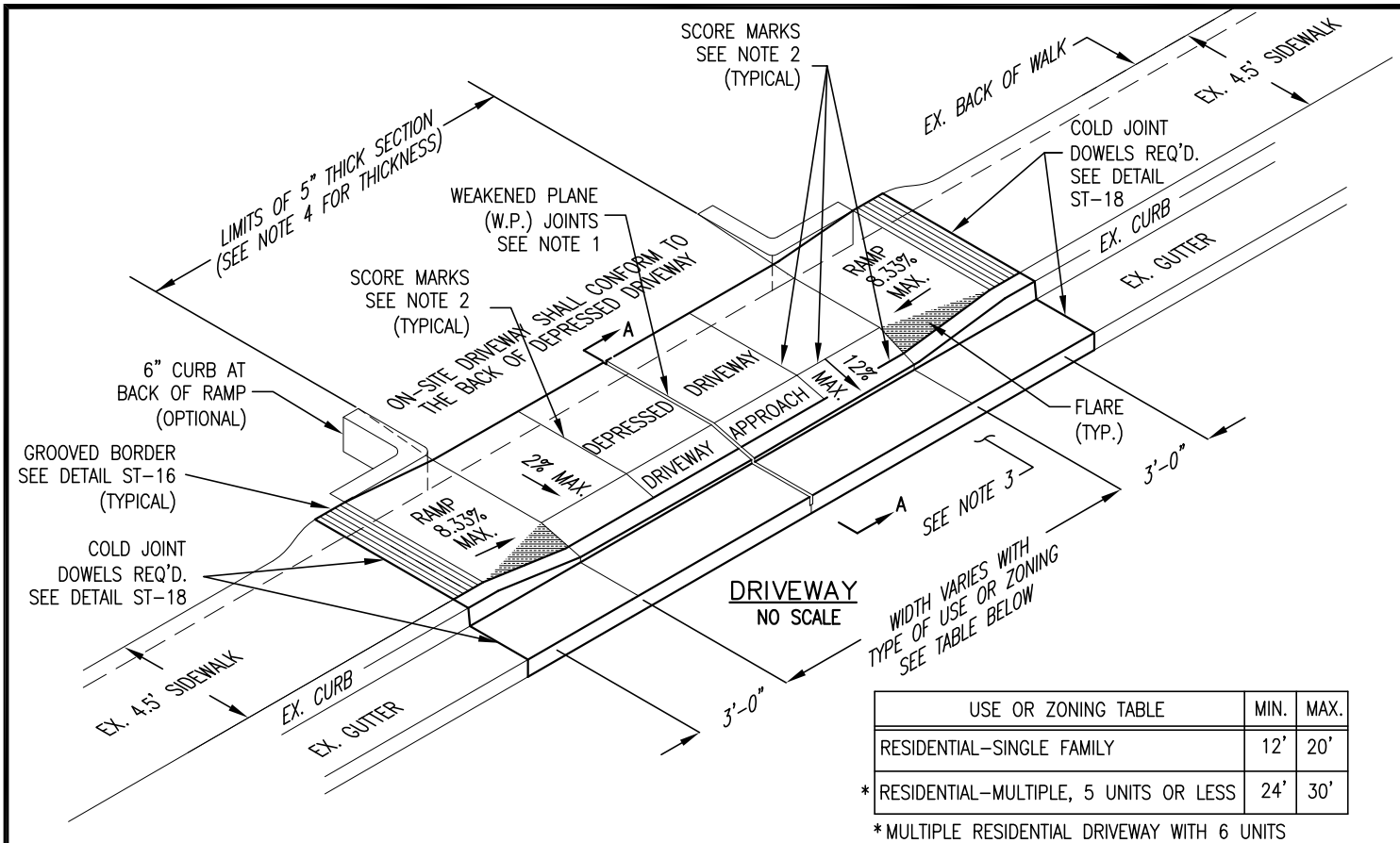
3. 18" WIDE BAND OF PAVEMENT SHALL BE REMOVED AND REPLACED. SEE NOTE 5 OF GENERAL NOTES (APPENDIX) FOR REQUIREMENTS.

4. IF THE EXISTING ON–SITE IMPROVEMENTS DO NOT MATCH THE GRADE OF THE REAR OF THE NEW DRIVEWAY, SUFFICIENT EXISTING IMPROVEMENTS SHALL BE RECONSTRUCTED TO PRODUCE A SMOOTH, USABLE SURFACE WITH A CHANGE IN GRADE NOT EXCEEDING 10%.



SECTION A–A
NO SCALE

CITY OF SANTA CLARA CALIFORNIA The Mission City INCORPORATED 1852	DRAWN BY: K. TRAN	RESIDENTIAL DRIVEWAY WITH SEPARATED SIDEWALK	ST-5
	CHECKED BY: F. AMIN		
	APPROVED BY: G. GOMEZ		
	DATE: MAY 2015	CITY OF SANTA CLARA	PAGE: 5

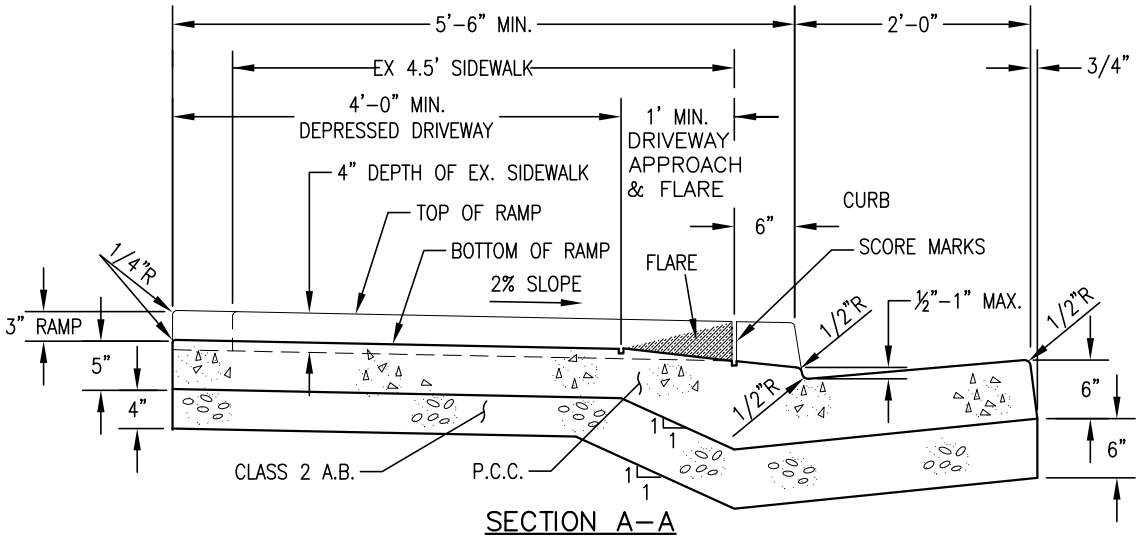


USE OR ZONING TABLE	MIN.	MAX.
RESIDENTIAL–SINGLE FAMILY	12'	20'
* RESIDENTIAL–MULTIPLE, 5 UNITS OR LESS	24'	30'

*MULTIPLE RESIDENTIAL DRIVEWAY WITH 6 UNITS OR MORE SHALL USE COMMERCIAL DRIVEWAY.

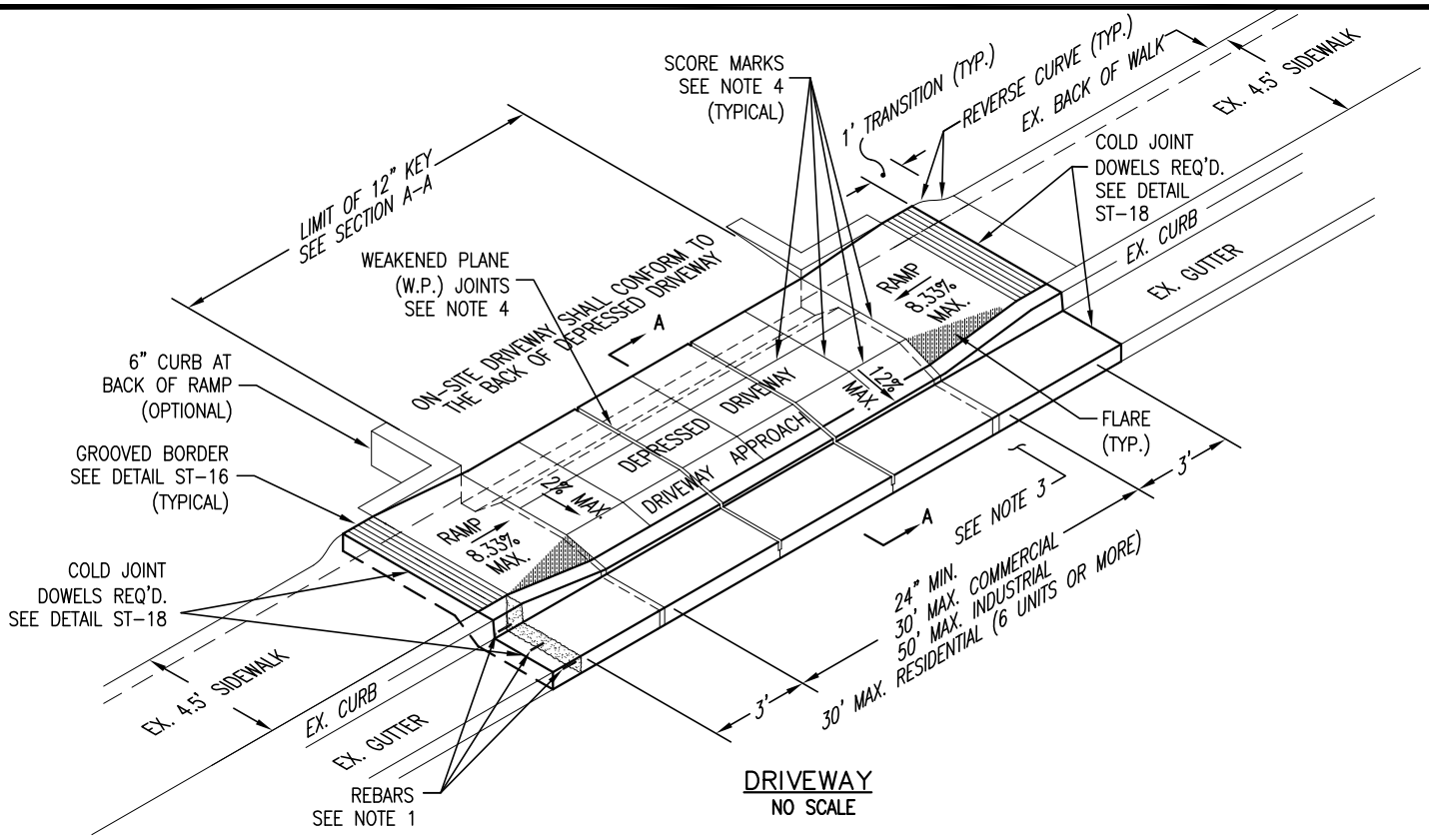
NOTES:

1. W.P. JOINTS REQUIRED ON CENTERLINE FOR DRIVEWAYS 12' TO 20' WIDE. DRIVEWAYS 24' TO 30' WIDE SHALL HAVE 2 W.P. JOINTS EVENLY SPACED (AT 1/3 AND 2/3 POINTS).
2. PLACE SCORE MARKS AT 1/4 POINTS ON DRIVEWAYS 12' TO 20' WIDE AND AT 1/6 POINTS ON DRIVEWAYS 24' TO 30' WIDE.
3. 18" WIDE BAND OF PAVEMENT SHALL BE REMOVED AND REPLACED. SEE NOTE 5 OF GENERAL NOTES (APPENDIX) FOR REQUIREMENTS.
4. DEPRESSED DRIVEWAY, DRIVEWAY APPROACH, GROOVED BORDERS, AND RAMPS SHALL HAVE A THICKNESS OF 5" P.C.C. OVER 4" A.B. GROOVED BORDERS, RAMPS, DEPRESSED DRIVEWAY, DRIVEWAY APPROACH, CURB AND GUTTER SHALL BE MONOLITHIC.
5. IF THE EXISTING ON–SITE IMPROVEMENTS DO NOT MATCH THE GRADE OF THE REAR OF THE NEW DRIVEWAY, SUFFICIENT EXISTING IMPROVEMENTS SHALL BE RECONSTRUCTED TO PRODUCE A SMOOTH, USABLE SURFACE WITH A CHANGE IN GRADE NOT EXCEEDING 10%.

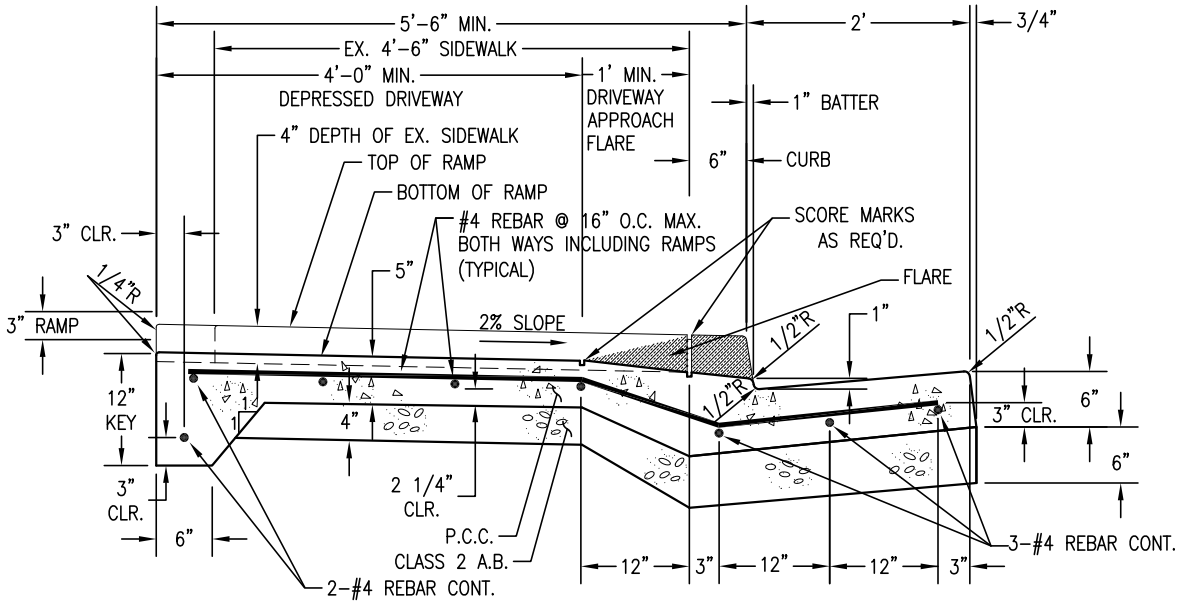


SECTION A–A
NO SCALE

DRAWN BY: K. TRAN	DEPRESSED DRIVEWAY FOR EX. 5' ATTACHED SIDEWALK	ST-6
CHECKED BY: F. AMIN		
APPROVED BY: G. GOMEZ		
DATE: MAY 2015	CITY OF SANTA CLARA	PAGE: 6



DRIVEWAY
NO SCALE

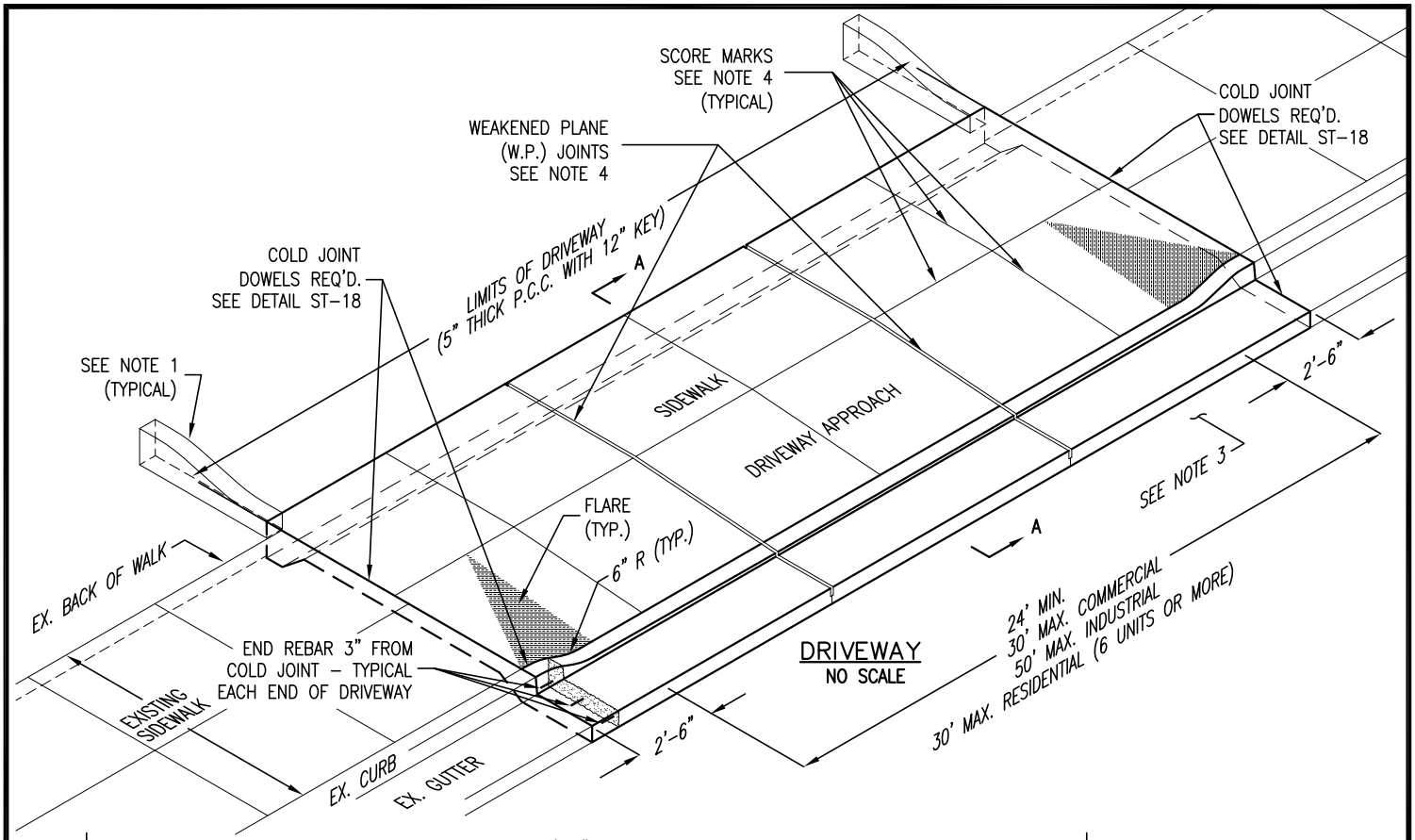


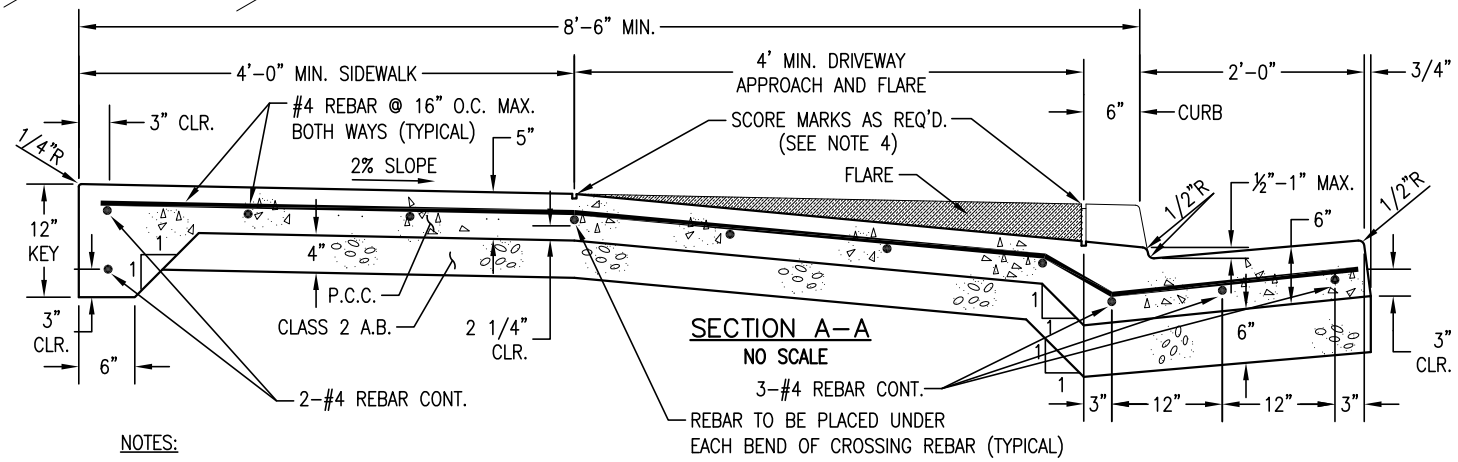
SECTION A-A
NO SCALE

NOTES:

1. END REBAR 3" FROM COLD JOINT FOR GUTTER AND 12" FROM COLD JOINT FOR RAMPS.
2. DEPRESSED DRIVEWAY, DRIVEWAY APPROACH, GROOVED BORDERS, AND RAMPS SHALL HAVE A THICKNESS OF 5" P.C.C. OVER 4" A.B. GROOVED BORDERS, RAMPS, DEPRESSED DRIVEWAY, DRIVEWAY APPROACH, CURB AND GUTTER SHALL BE MONOLITHIC.
3. 18" WIDE BAND OF PAVEMENT SHALL BE REMOVED AND REPLACED. SEE NOTE 5 OF GENERAL NOTES (APPENDIX), FOR REQUIREMENTS.
4. JOINT/SCORE MARK: SEE TABLE ON ST-8.
5. USE OF DETAIL ST-7 IS ALLOWED ONLY WITH WRITTEN APPROVAL OF CITY ENGINEER.
6. IF THE EXISTING ON-SITE IMPROVEMENTS DO NOT MATCH THE GRADE OF THE REAR OF THE NEW DRIVEWAY, SUFFICIENT EXISTING IMPROVEMENTS SHALL BE RECONSTRUCTED TO PRODUCE A SMOOTH, USABLE SURFACE WITH A CHANGE IN GRADE NOT EXCEEDING 10%.

DRAWN BY: K. TRAN	DEPRESSED COMMERCIAL DRIVEWAY FOR EX. 5' ATTACHED SIDEWALK	ST-7
CHECKED BY: F. AMIN		
APPROVED BY: G. GOMEZ		
DATE: MAY 2015	CITY OF SANTA CLARA	PAGE: 7





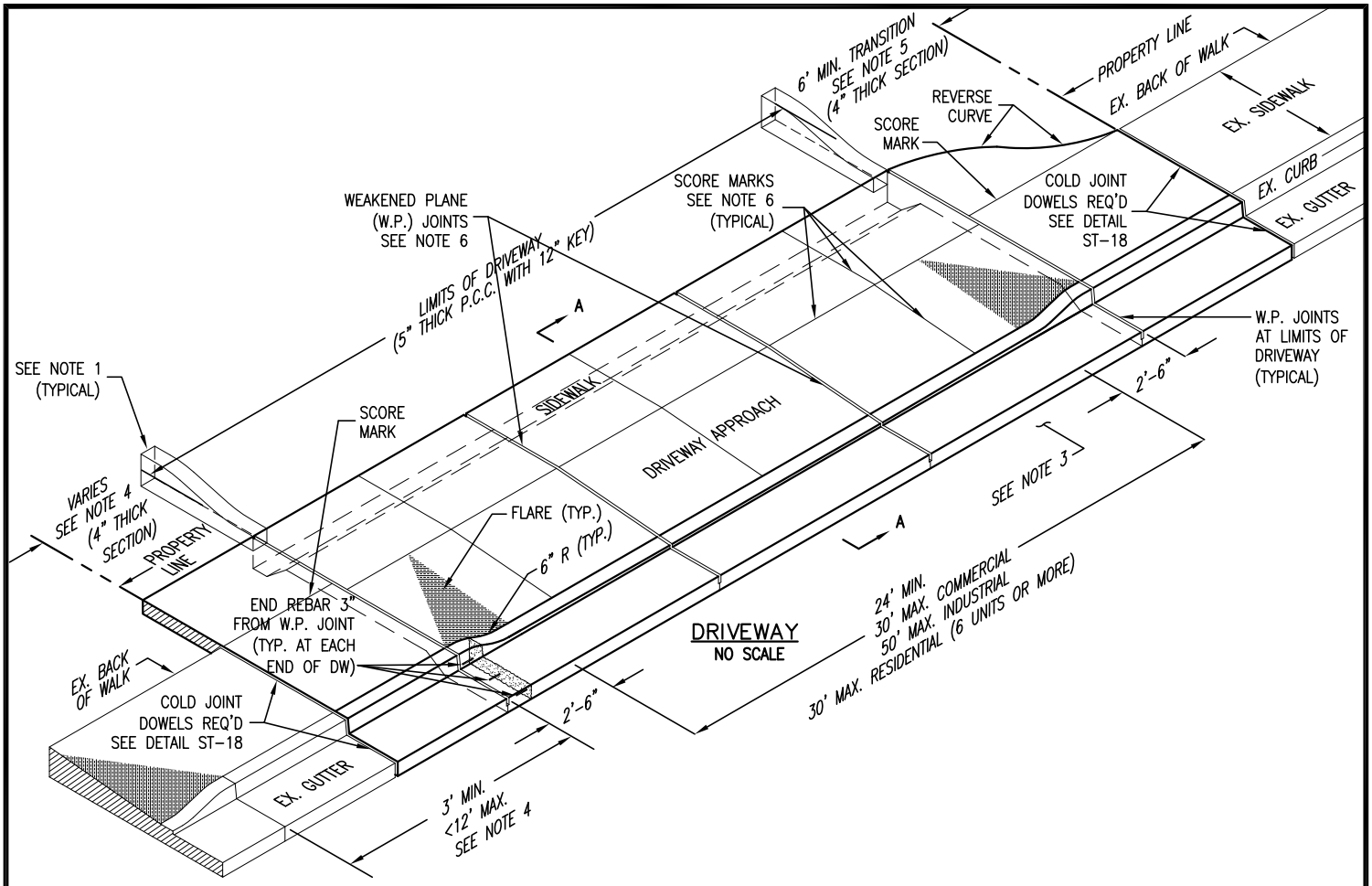
NOTES:

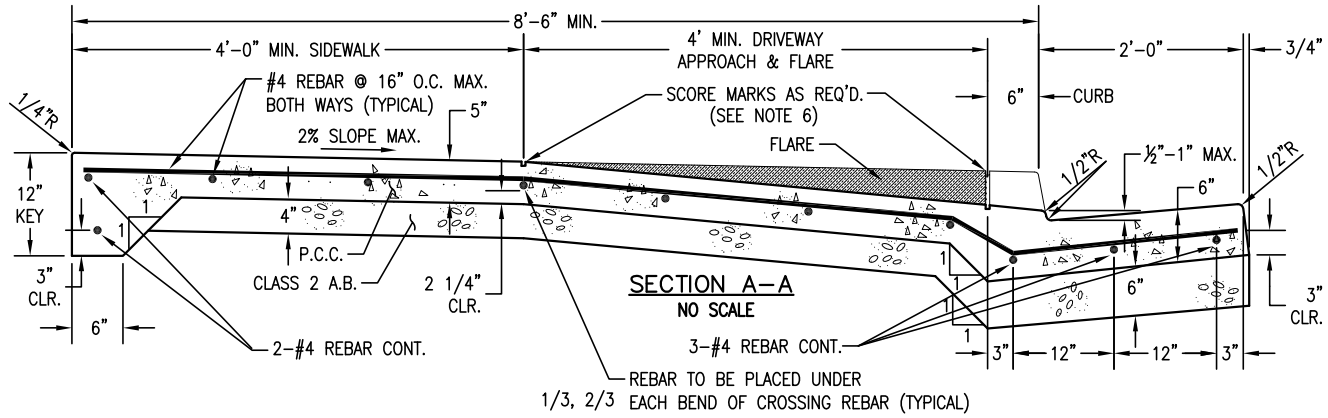
1. CONCRETE CURB SHALL NOT ENCROACH INTO PUBLIC RIGHT–OF–WAY AND SHALL BE FLUSH AT BACK OF WALK.
2. COMMERCIAL DRIVEWAY SHALL BE INSTALLED IN ZONES DESIGNATED COMMERCIAL, INDUSTRIAL, AND RESIDENTIAL WITH 6 UNITS OR MORE.
3. 18" WIDE BAND OF PAVEMENT SHALL BE REMOVED AND REPLACED. SEE NOTE 5 OF GENERAL NOTES (APPENDIX) FOR REQUIREMENTS.
4. JOINT/SCORE MARK TABLE:

DRIVEWAY WIDTH		WEAKENED PLANE JOINT		SCORE MARKS	
MIN.	MAX.	NO. OF JOINTS	LOCATION POINT	NO. OF MARKS	LOCATION POINT
24'	30'	2	1/3, 2/3	3	1/6, 1/2, 5/6
>30'	40'	3	1/4, 1/2, 3/4	4	1/8, 3/8, 5/8, 7/8
>40'	50'	4	1/5, 2/5, 3/5, 4/5	5	1/10, 3/10, 1/2, 7/10, 9/10
		SCORE MARK REQUIRED AT DRIVEWAY SLOPE BREAK PARALLEL TO EXISTING FACE OF CURB			

5. IF THE EXISTING ON–SITE IMPROVEMENTS DO NOT MATCH THE GRADE OF THE REAR OF THE NEW DRIVEWAY, SUFFICIENT EXISTING IMPROVEMENTS SHALL BE RECONSTRUCTED TO PRODUCE A SMOOTH, USABLE SURFACE WITH A CHANGE IN GRADE NOT EXCEEDING 10%.

DRAWN BY: K. TRAN	COMMERCIAL DRIVEWAY WITH/ WITHOUT SEPARATED SIDEWALK	ST-8
CHECKED BY: F. AMIN		
APPROVED BY: G. GOMEZ		
DATE: MAY 2015	CITY OF SANTA CLARA	PAGE: 8

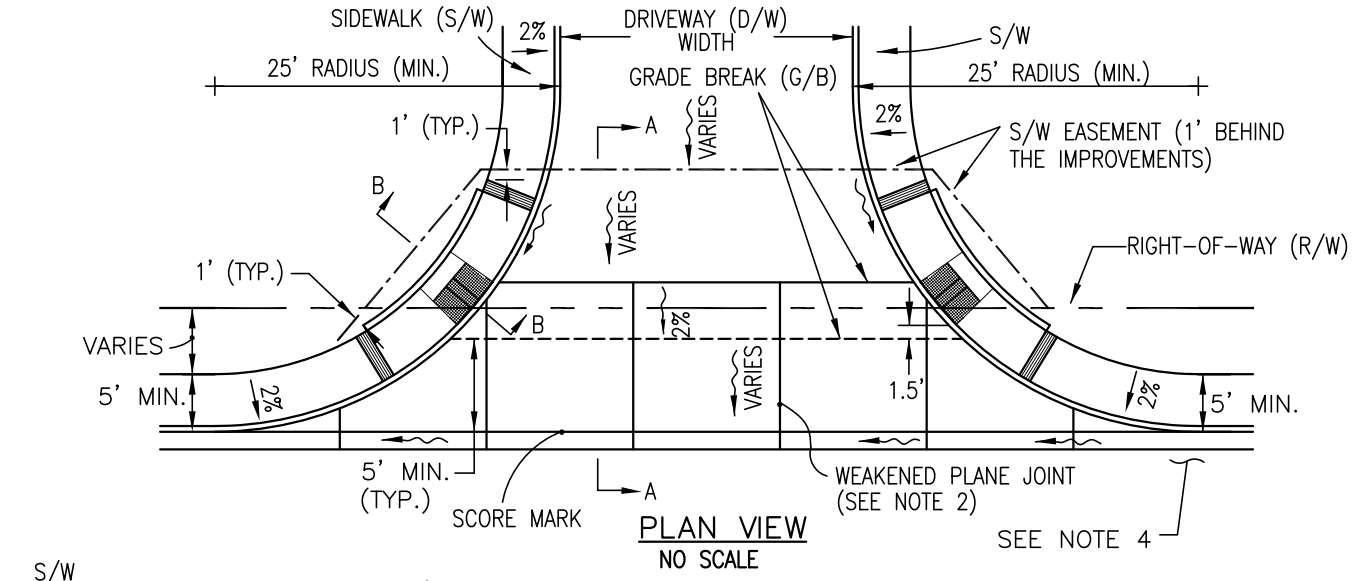




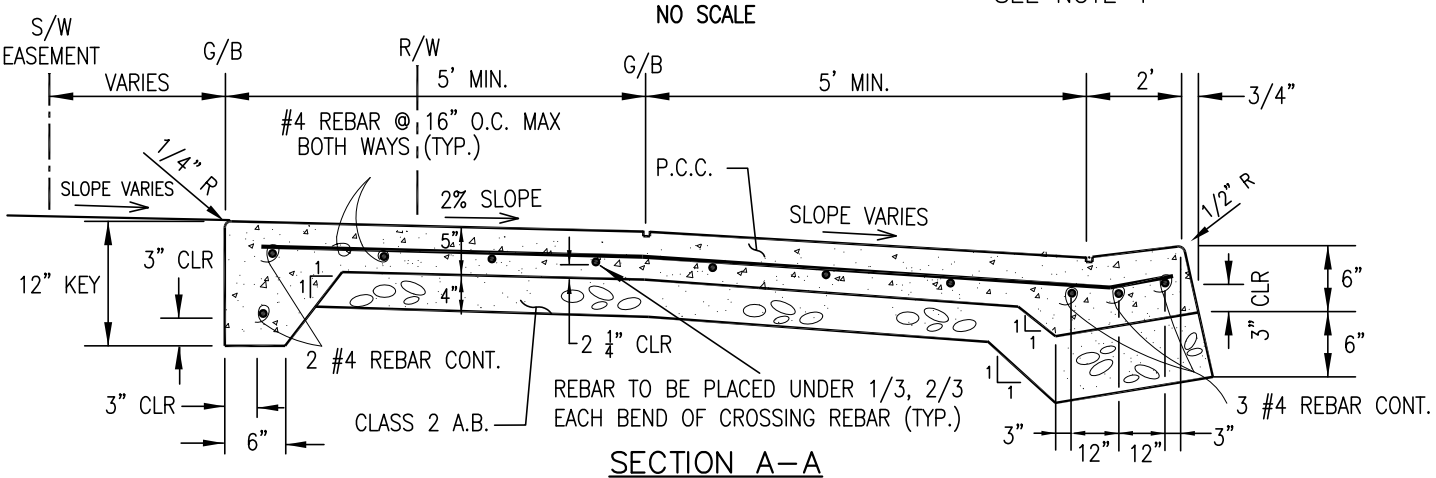
NOTES:

1. CONCRETE CURB SHALL NOT ENCROACH INTO PUBLIC RIGHT-OF-WAY AND SHALL BE FLUSH AT BACK OF WALK.
2. COMMERCIAL DRIVEWAY SHALL BE INSTALLED IN ZONES DESIGNATED COMMERCIAL, INDUSTRIAL, AND RESIDENTIAL WITH 6 UNITS OR MORE.
3. 18" WIDE BAND OF PAVEMENT SHALL BE REMOVED AND REPLACED. SEE NOTE 5 OF GENERAL NOTES (APPENDIX) FOR REQUIREMENTS.
4. WHERE THE DISTANCE BETWEEN NEW DRIVEWAY LIMIT AND PROPERTY LINE IS LESS THAN 6 FEET AT THE BACK OF DRIVEWAY OR LESS THAN 12 FEET FROM AN ADJACENT DRIVEWAY LIMIT AT THE BACK OF DRIVEWAY, THE SIDEWALK SHALL NOT TRANSITION. NEW SIDEWALK SHALL TERMINATE AT PROPERTY LINE OR ADJACENT DRIVEWAY TO MAINTAIN ADA PATHWAY.
5. WHERE THE DISTANCE BETWEEN NEW DRIVEWAY LIMIT AND PROPERTY LINE IS EQUAL TO OR GREATER THAN 6 FEET AT THE BACK OF DRIVEWAY OR EQUAL TO OR GREATER THAN 12 FEET FROM AN ADJACENT DRIVEWAY LIMIT AT THE BACK OF DRIVEWAY, THE SIDEWALK SHALL TRANSITION FROM BACK OF DRIVEWAY TO EXISTING SIDEWALK.
6. JOINT/SCORE MARK: SEE TABLE ON DETAIL ST-8.
7. IF THE EXISTING ON-SITE IMPROVEMENTS DO NOT MATCH THE GRADE OF THE REAR OF THE NEW DRIVEWAY, SUFFICIENT EXISTING IMPROVEMENTS SHALL BE RECONSTRUCTED TO PRODUCE A SMOOTH, USABLE SURFACE WITH A CHANGE IN GRADE NOT EXCEEDING 10%.

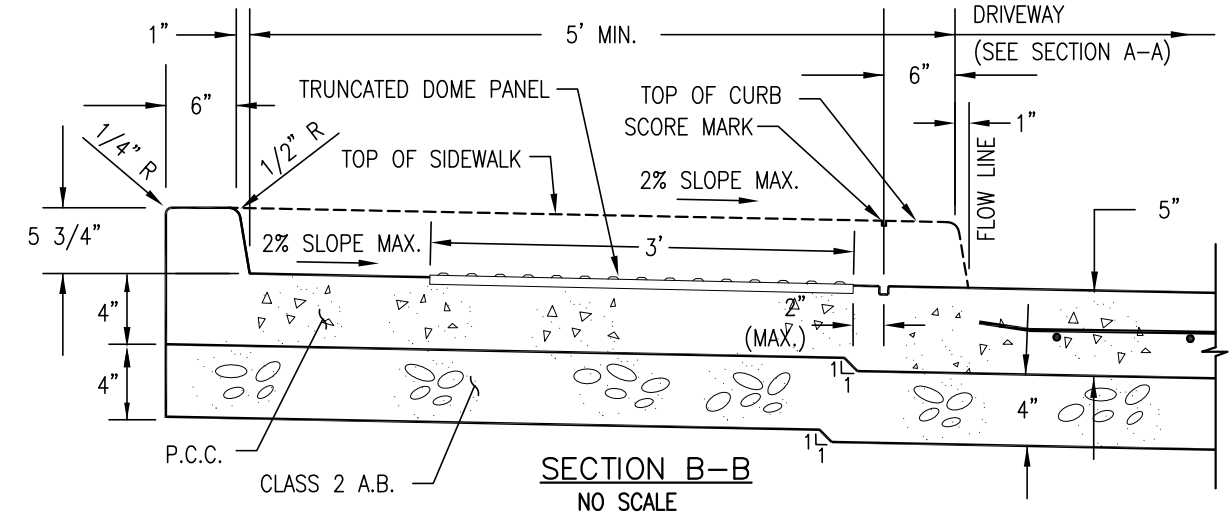
DRAWN BY: K. TRAN	COMMERCIAL DRIVEWAY WITH ATTACHED SIDEWALK	ST-9
CHECKED BY: F. AMIN		
APPROVED BY: G. GOMEZ		
DATE: MAY 2015	CITY OF SANTA CLARA	PAGE: 9



PLAN VIEW
NO SCALE



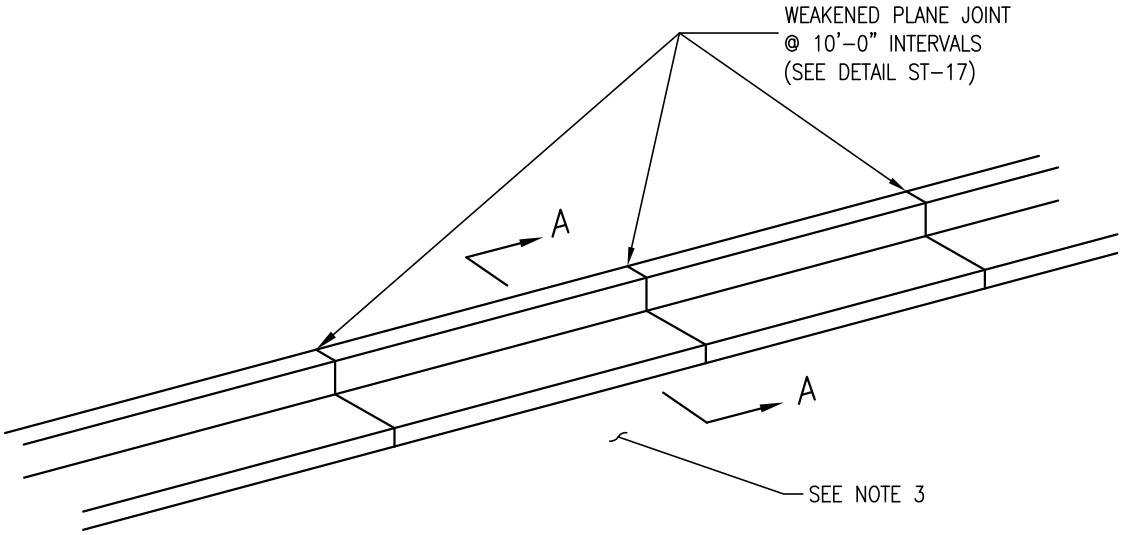
SECTION A–A
NO SCALE



SECTION B–B
NO SCALE

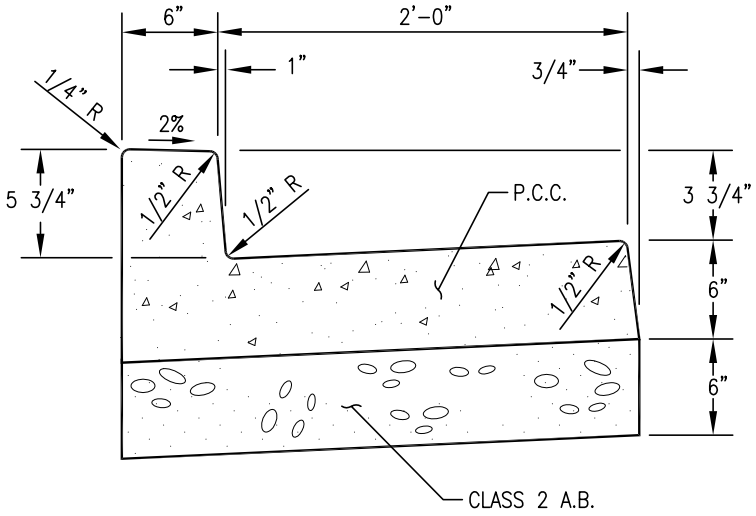
NOTES:
1. USE OF CURB–RETURN DRIVEWAY ALLOWED ONLY WITH WRITTEN APPROVAL OF CITY ENGINEER.
2. SEE DETAIL ST–8 FOR D/W WIDTH, JOINTS, AND SCORE MARKS. JOINTS/SCORE MARKS PATTERNS SHALL CONTINUE TO THE AREA OUTSIDE OF D/W WIDTH.
3. SEE DETAIL ST–14 FOR CURB RAMP CONSTRUCTION AND NOTES.
4. 18" WIDE BAND OF PAVEMENT SHALL BE REMOVED AND REPLACED. SEE NOTE 5 OF GENERAL NOTES (APPENDIX) FOR REQUIREMENTS.

DRAWN BY: K. TRAN	CURB-RETURN DRIVEWAY	ST-10
CHECKED BY: F. AMIN		
APPROVED BY: F. AMIN		
DATE: JANUARY 2016	CITY OF SANTA CLARA	PAGE: 10



CURB GUTTER

NO SCALE



SECTION A-A

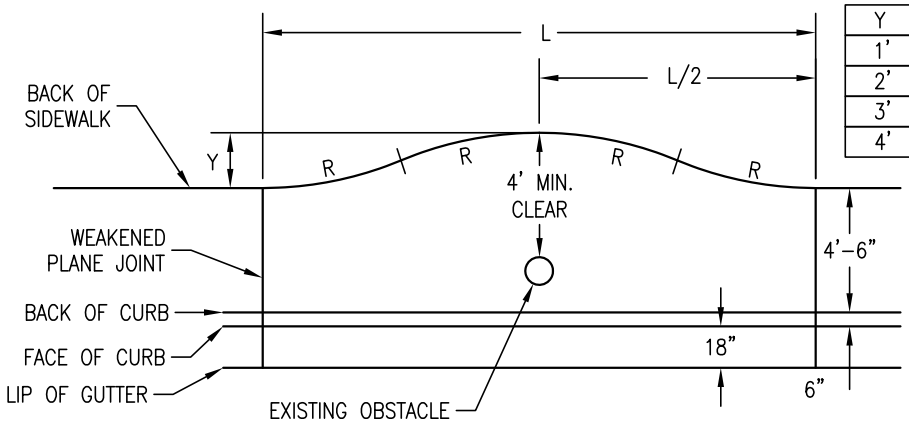
NO SCALE

NOTES:

1. EXPANSION JOINTS (SEE DETAIL ST-17) SHALL BE INSTALLED AT MAJOR STRUCTURES AND CURB RETURNS.
2. TOLERANCE OF THE VERTICAL DIMENSION AT FACE OF CURB AND LIP OF GUTTER SHALL BE 1/4"±.
3. 18" WIDE BAND OF PAVEMENT SHALL BE REMOVED AND REPLACED. SEE NOTE 5 OF GENERAL NOTES (APPENDIX) FOR REQUIREMENTS.

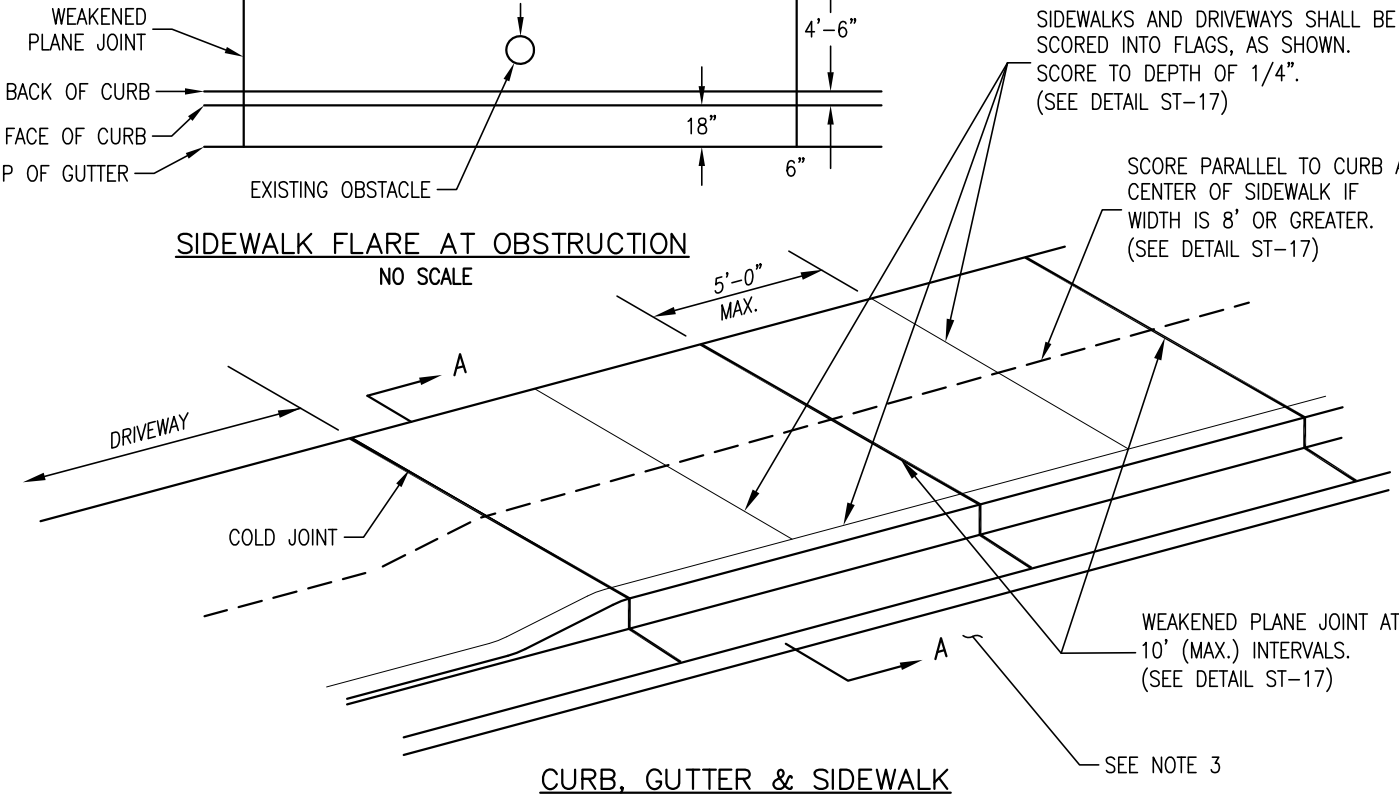
DRAWN BY: K. TRAN	MONOLITHIC CURB AND GUTTER	ST-11
CHECKED BY: F. AMIN		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 11

Y	L	R
1'	20'	25'
2'	20'	13'
3'	20'	9'
4'	25'	11'



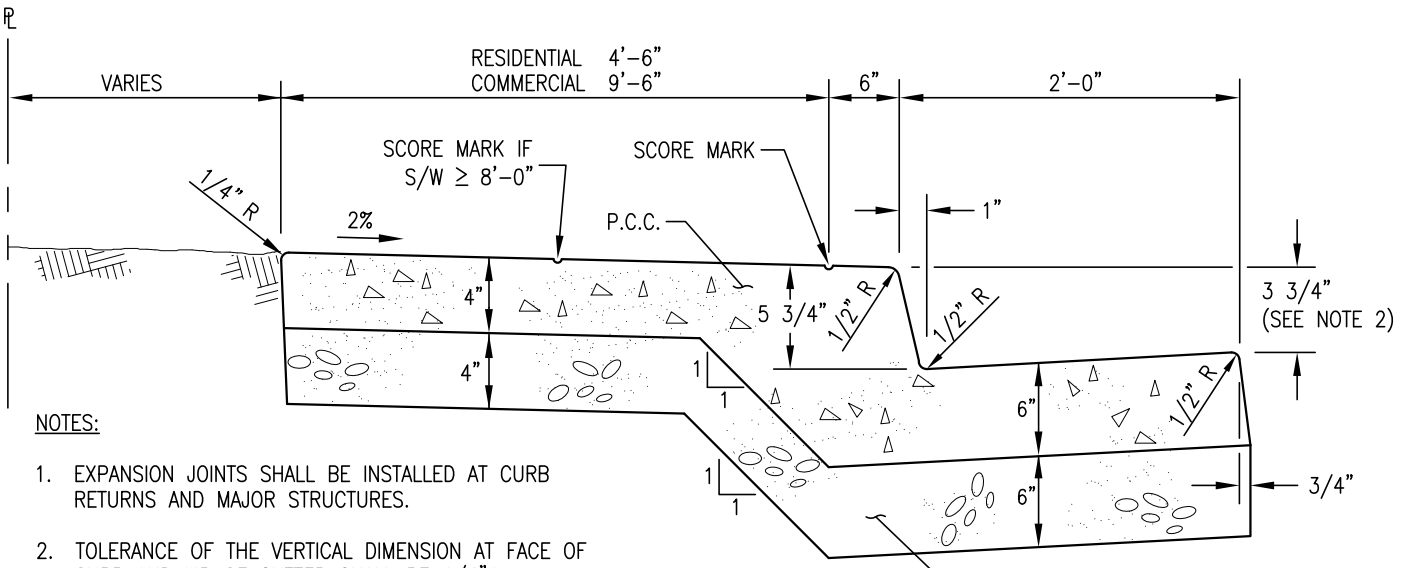
SIDEWALK FLARE AT OBSTRUCTION

NO SCALE



CURB, GUTTER & SIDEWALK

NO SCALE



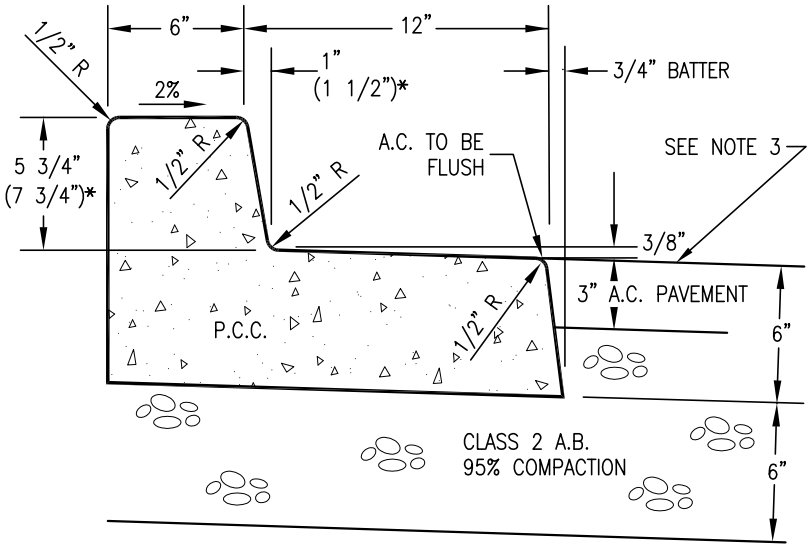
SECTION A–A

NO SCALE

NOTES:

1. EXPANSION JOINTS SHALL BE INSTALLED AT CURB RETURNS AND MAJOR STRUCTURES.
2. TOLERANCE OF THE VERTICAL DIMENSION AT FACE OF CURB AND LIP OF GUTTER SHALL BE 1/4"±.
3. 18" WIDE BAND OF PAVEMENT SHALL BE REMOVED AND REPLACED. SEE NOTE 5 OF GENERAL NOTES (APPENDIX) FOR REQUIREMENTS.

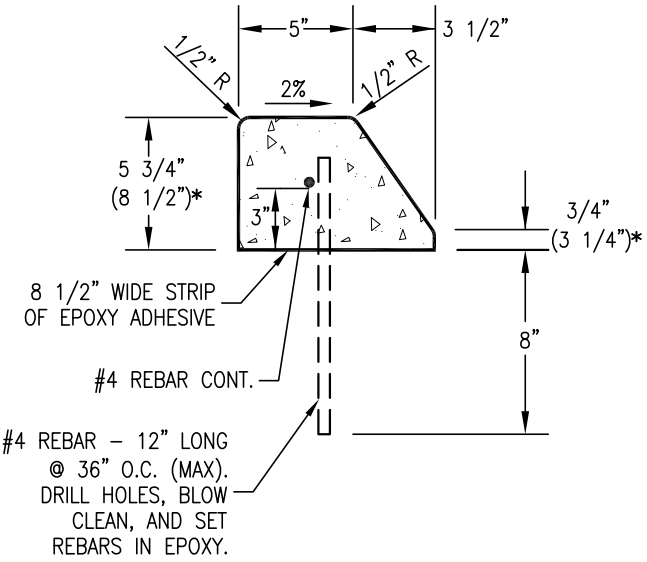
DRAWN BY: K. TRAN	MONOLITHIC CURB, GUTTER AND SIDEWALK	ST-12
CHECKED BY: F. AMIN		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 12



TYPE A–6 & A–8 CURBS

NO SCALE

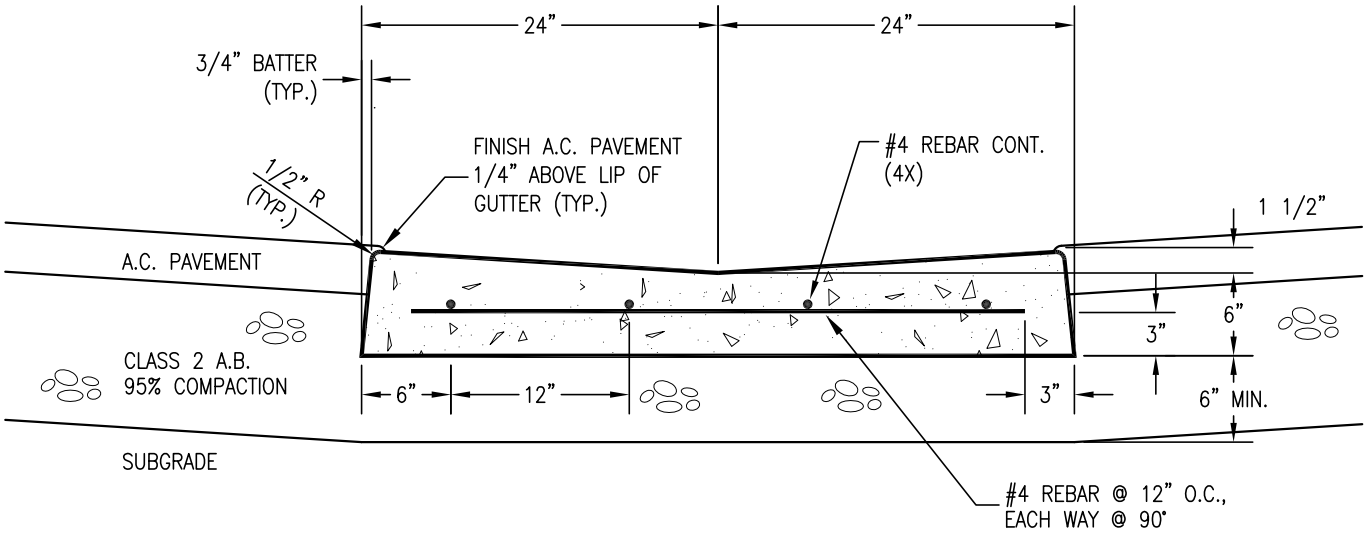
NOTE: *DIMENSIONS SHOWN IN PARENTHESES ABOVE ARE FOR TYPE A–8 CURB ONLY.



TYPE B–6 & B–8 CURBS

NO SCALE

NOTE: *DIMENSIONS SHOWN IN PARENTHESES ABOVE ARE FOR TYPE B–8 CURB ONLY.



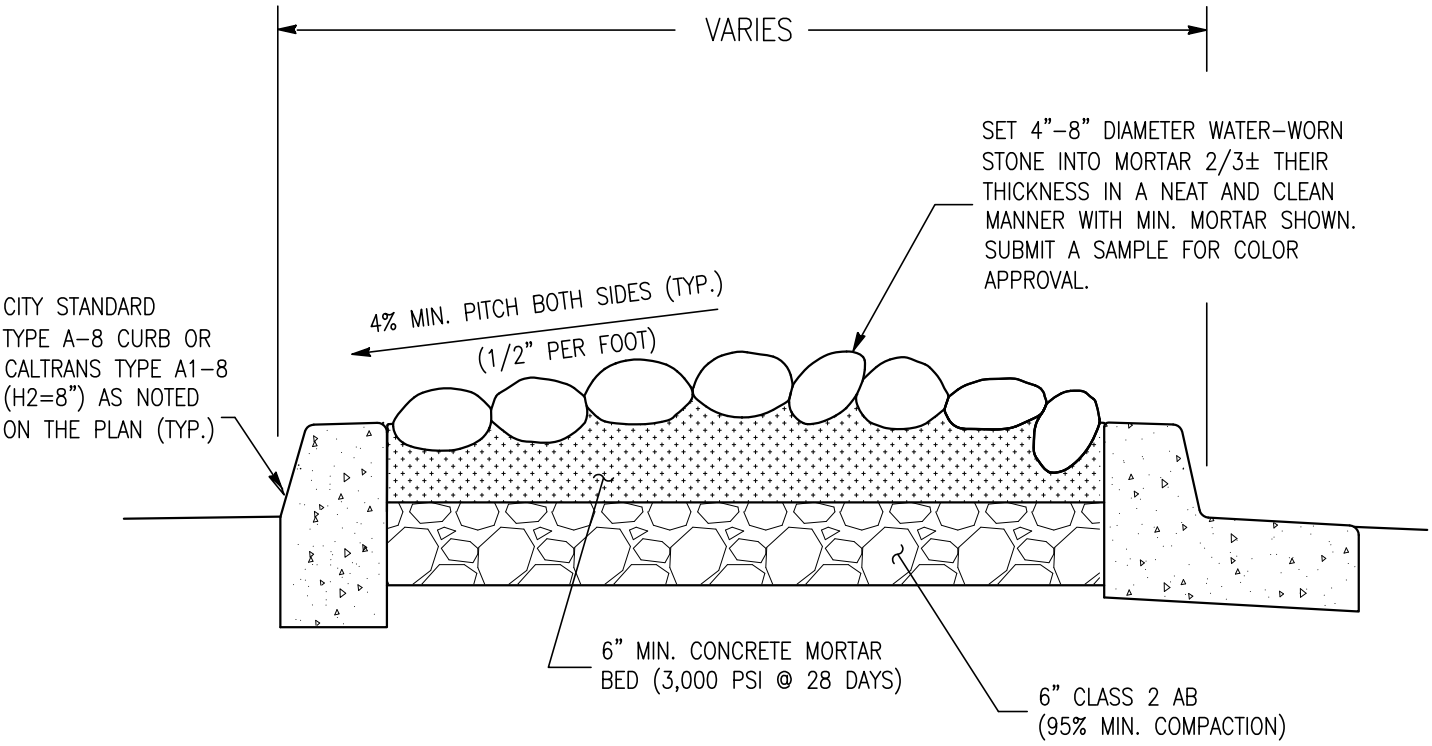
VALLEY GUTTER

NO SCALE

NOTES:

1. CONCRETE VALLEY GUTTER SHALL BE INSTALLED PRIOR TO PAVING.
2. INSTALL WEAKENED PLANE JOINTS AT 10' INTERVALS (MAX).
3. 18" WIDE BANDS OF PAVEMENT ON EACH SIDE OF NEW VALLEY GUTTER SHALL BE REMOVED AND REPLACED. SEE NOTE 5 OF GENERAL NOTES (APPENDIX) FOR REQUIREMENTS.

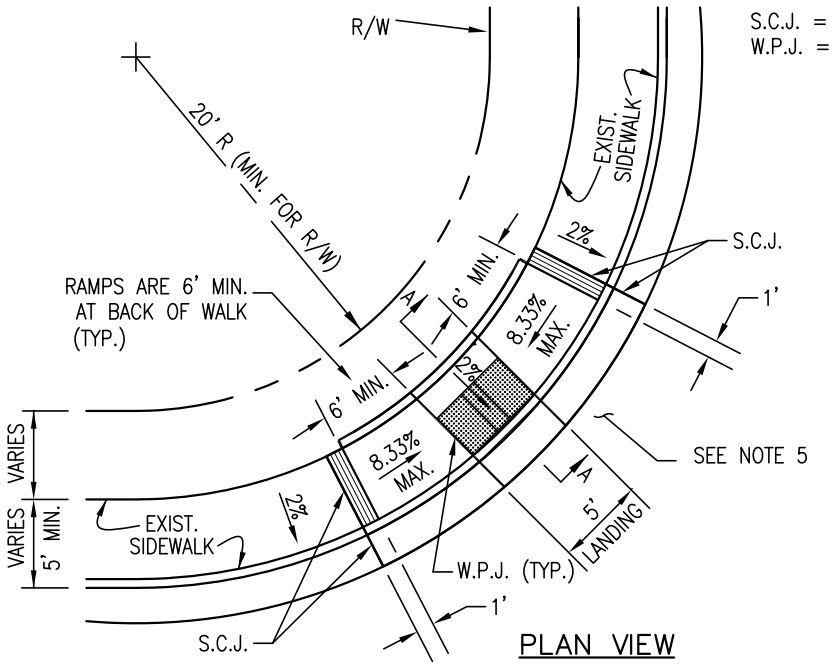
DRAWN BY: K. TRAN	CONCRETE MEDIAN CURBS AND VALLEY GUTTER	ST-13
CHECKED BY: F. AMIN		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 13



NOTES:

1. AFTER THE COBBLESTONE HAS BEEN SET INTO THE MORTAR, THE EXCESSIVE MORTAR IN BETWEEN THE JOINTS OF THE COBBLESTONES SHALL BE CAREFULLY REMOVED AND RAKED IN A SMOOTH JOINT (NO PROTRUSION OF MORTAR WILL BE ALLOWED).
2. CLEAN MORTAR FROM VISIBLE PORTIONS OF COBBLESTONES AFTER INSTALLATION.

DRAWN BY: K. TRAN	MEDIAN COBBLESTONE INSTALLATION	ST-13A
CHECKED BY: F. AMIN		
APPROVED BY: F. AMIN		
DATE: JANUARY 2016	CITY OF SANTA CLARA	PAGE: 13A

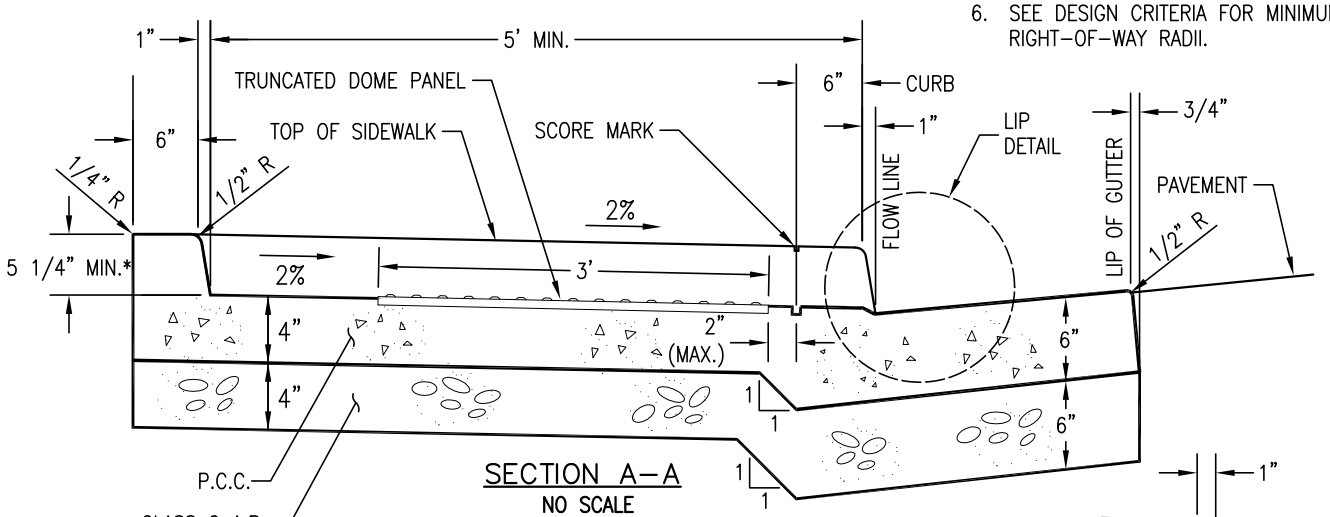


PLAN VIEW
NO SCALE

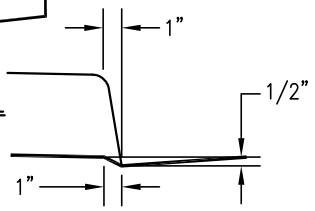
S.C.J. = SIDEWALK CONTACT JOINT
W.P.J. = WEAKENED PLANE JOINT

NOTES:

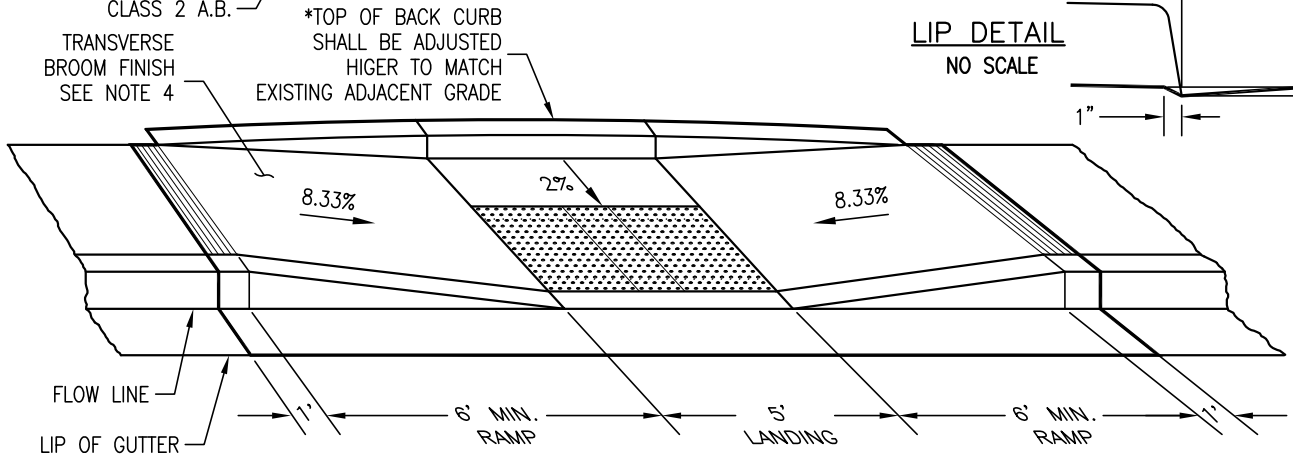
1. CURB RAMPS SHALL HAVE DETECTABLE WARNING SURFACES (GROOVING AND TRUNCATED DOMES). SEE DETAIL ST-16 FOR GROOVING DETAILS AND TRUNCATED DOME DETAILS.
2. AT THE DISCRETION OF CITY ENGINEER, TWO CURB RAMPS SHALL BE REQUIRED WHERE THERE ARE TWO CROSS WALKS AT A CORNER.
3. CURB RAMPS FOR SEPARATED SIDEWALKS SHALL BE DESIGNED ON AN INDIVIDUAL BASIS.
4. THE SURFACE OF RAMP SHALL HAVE A TRANSVERSE BROOMED SURFACE TEXTURE ROUGHER THAN THE SURROUNDING SIDEWALK.
5. 18" WIDE BAND OF PAVEMENT SHALL BE REMOVED AND REPLACED. SEE NOTE 5 OF GENERAL NOTES (APPENDIX) FOR REQUIREMENTS.
6. SEE DESIGN CRITERIA FOR MINIMUM RIGHT-OF-WAY RADII.



SECTION A-A
NO SCALE

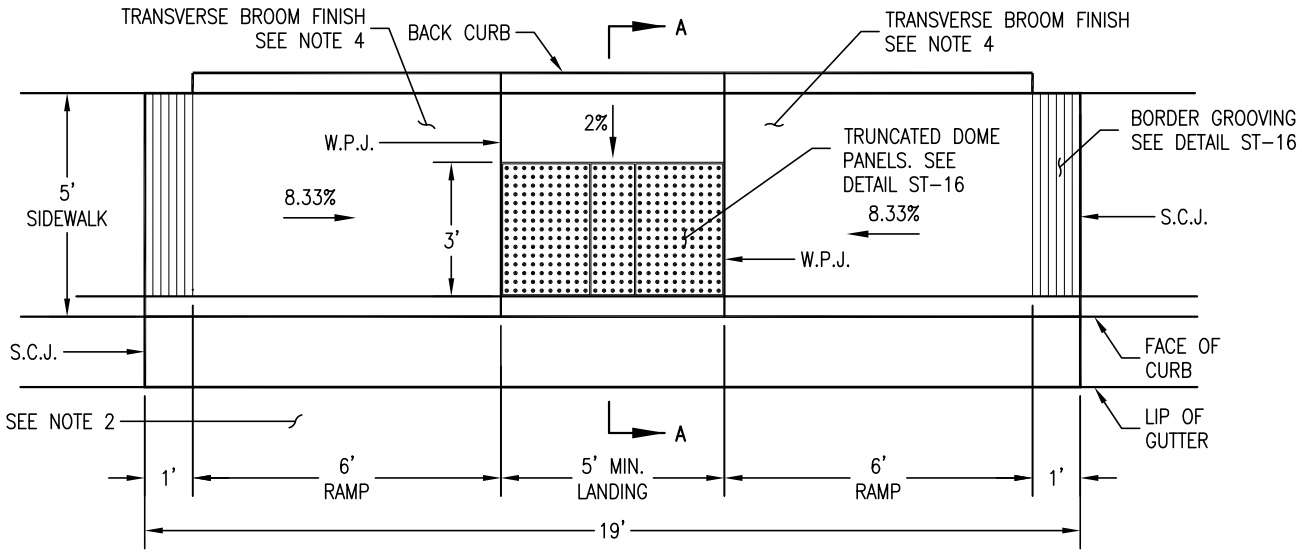


LIP DETAIL
NO SCALE



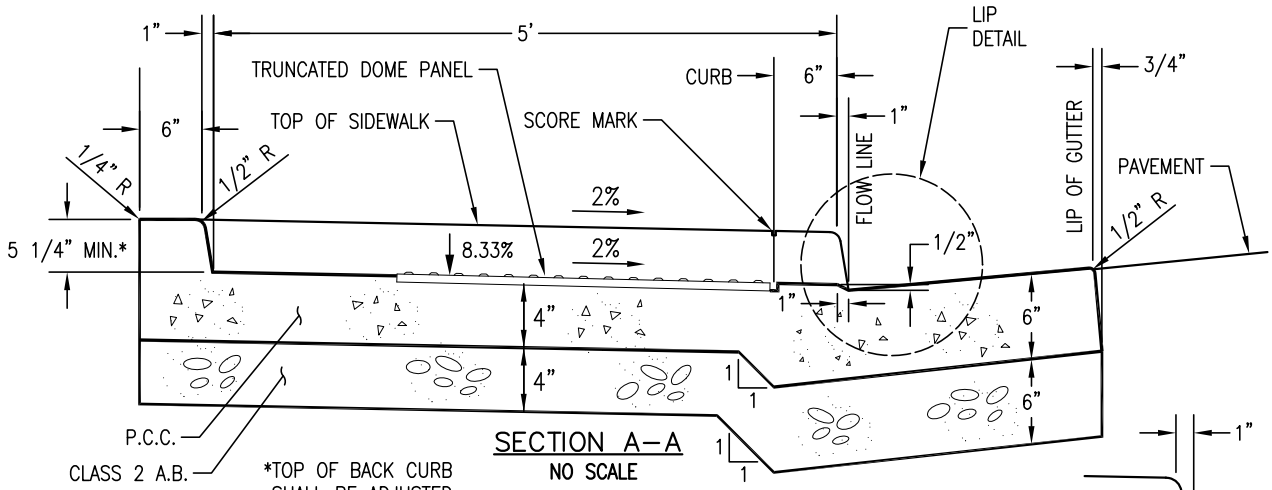
ELEVATION VIEW
NO SCALE

DRAWN BY: K. TRAN	CURVED CURB RAMP	ST-14
CHECKED BY: F. AMIN		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 14

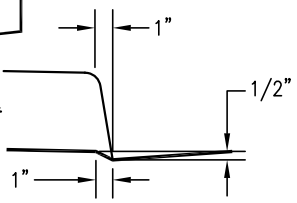


PLAN VIEW
NO SCALE

S.C.J. = SIDEWALK CONTACT JOINT
W.P.J. = WEAKENED PLANE JOINT

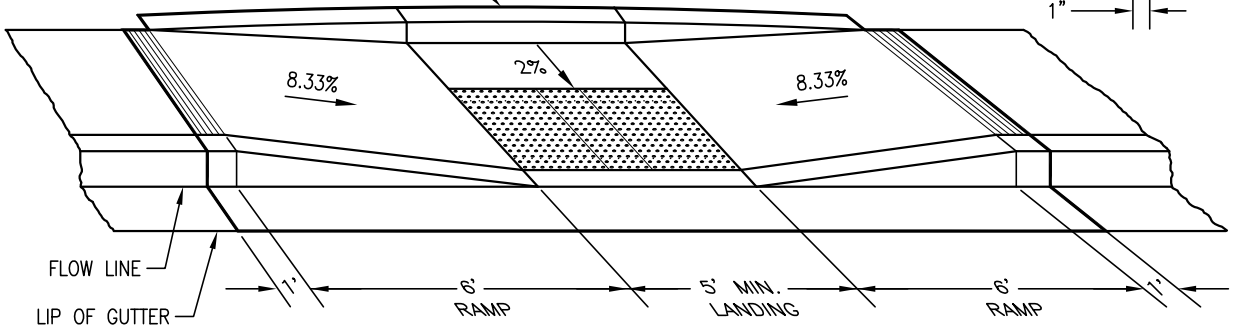


SECTION A–A
NO SCALE



LIP DETAIL
NO SCALE

*TOP OF BACK CURB
SHALL BE ADJUSTED
HIGHER TO MATCH
EXISTING ADJACENT GRADE



ELEVATION VIEW
NO SCALE

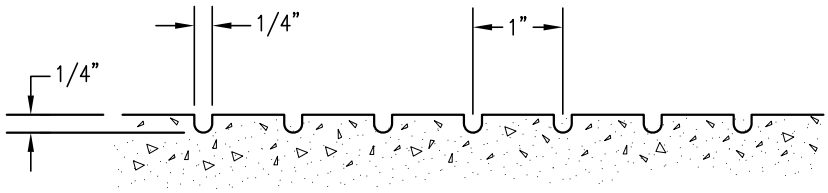
NOTES:

1. CURB RAMPS SHALL HAVE DETECTABLE WARNING SURFACES (GROOVING AND TRUNCATED DOMES). SEE DETAIL ST–16 FOR GROOVING DETAILS AND TRUNCATED DOME DETAILS.
2. 18" WIDE BAND OF PAVEMENT SHALL BE REMOVED AND REPLACED. SEE NOTE 5 OF GENERAL NOTES (APPENDIX) FOR REQUIREMENTS.
3. CURB RAMPS FOR SEPARATED SIDEWALKS SHALL BE DESIGNED ON AN INDIVIDUAL BASIS.
4. THE SURFACE OF RAMP SHALL HAVE A TRANSVERSE BROOMED SURFACE TEXTURE ROUGHER THAN THE SURROUNDING SIDEWALK.

DRAWN BY: K. TRAN			
CHECKED BY: F. AMIN	STRAIGHT CURB RAMP		ST-15
APPROVED BY: G. GOMEZ			
DATE: OCTOBER 2013	CITY OF SANTA CLARA		PAGE: 15

NOTES:

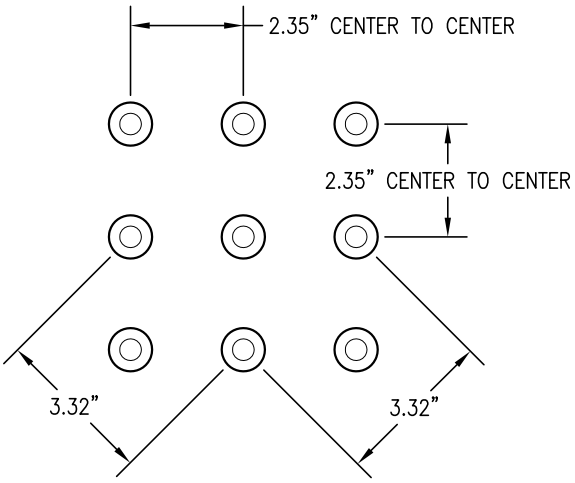
1. THE CURB RAMP SHALL HAVE A 12" WIDE BORDER WITH 1/4" GROOVES APPROXIMATELY 1" O.C. SEE BORDER GROOVING DETAIL.



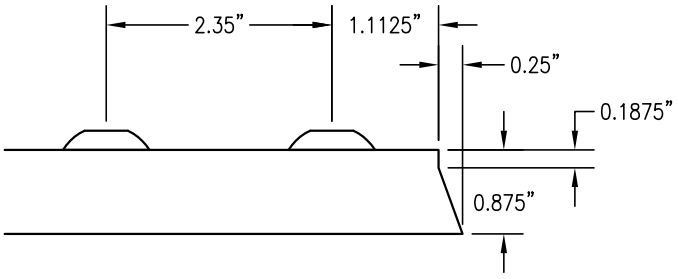
BORDER GROOVING DETAIL

NOTES:

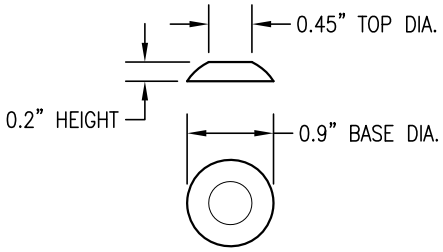
1. THE DETECTABLE WARNING SURFACE SHALL CONSIST OF RAISED TRUNCATED DOMES EXTENDING THE FULL WIDTH OF AND 3'–0" DEPTH OF THE CURB RAMP LANDING.
2. THE RAISED TRUNCATED DOME PANELS SHALL BE CENTERED AND SQUARED ON THE CURB RAMP.
3. THE RAISED TRUNCATED DOME PANELS SHALL BE CONCRETE, CASTinTACT™ MANUFACTURED BY MASCO, TELEPHONE NO. 1–530–878–2440, OR APPROVED EQUAL.
4. THE COLOR OF THE RAISED TRUNCATED DOMES SHALL BE "SAFETY YELLOW".
5. THE EDGE OF THE RAISED TRUNCATED DOME PANEL NEAREST THE STREET SHALL BE BETWEEN 6" AND 8" FROM THE GUTTER FLOWLINE.
6. ALL TRUNCATED DOME DIMENSIONS HEREIN ARE NOMINAL.



RAISED TRUNCATED DOME PATTERN (IN–LINE)

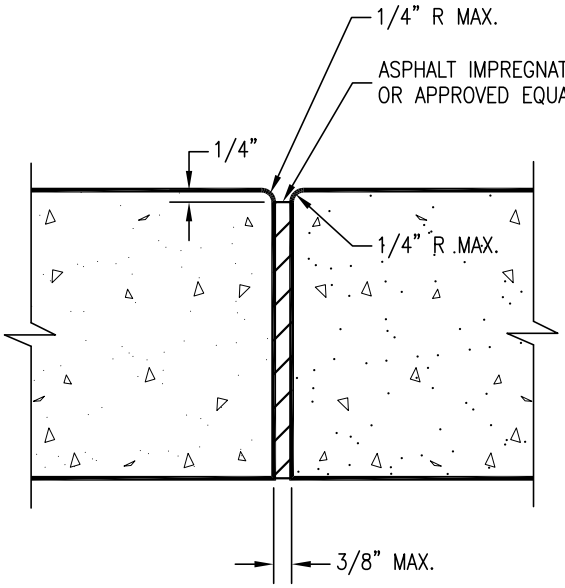


TRUNCATED DOME PANEL WEDGE DETAIL

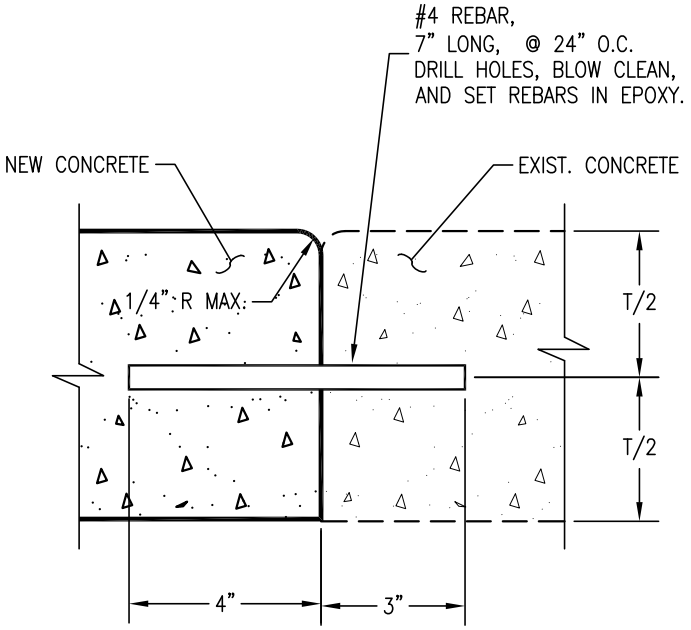


RAISED TRUNCATED DOME

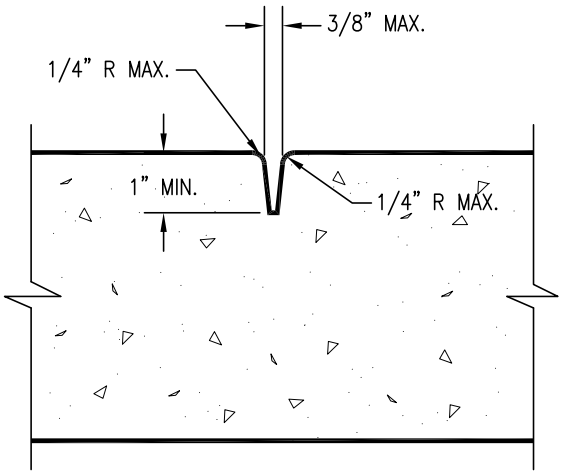
DRAWN BY: K. TRAN	CURB RAMP GROOVING AND TRUNCATED DOME DETAILS	ST-16
CHECKED BY: F. AMIN		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 16



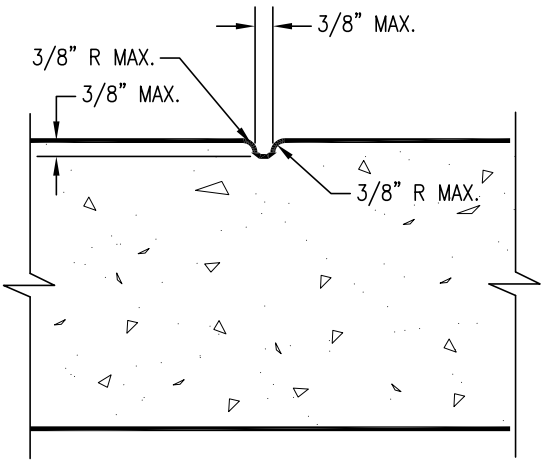
EXPANSION JOINT



SIDEWALK CONTACT JOINT
"COLD JOINT"

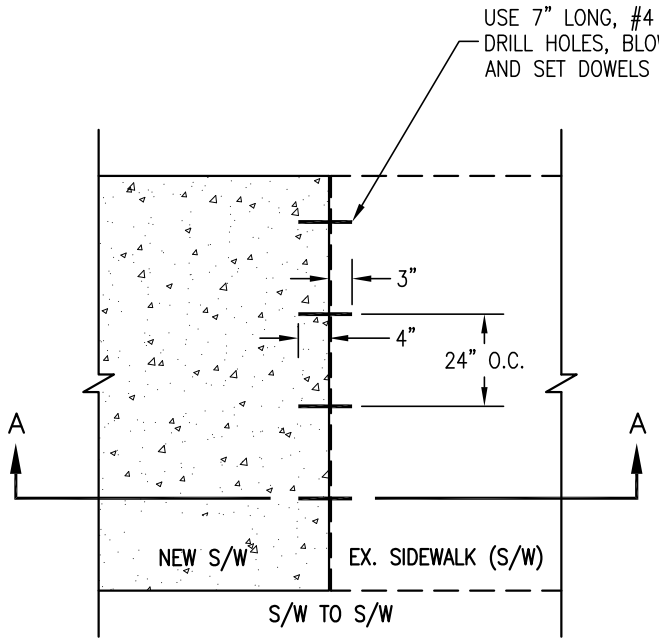


WEAKENED PLANE JOINT
"DEEP JOINT"

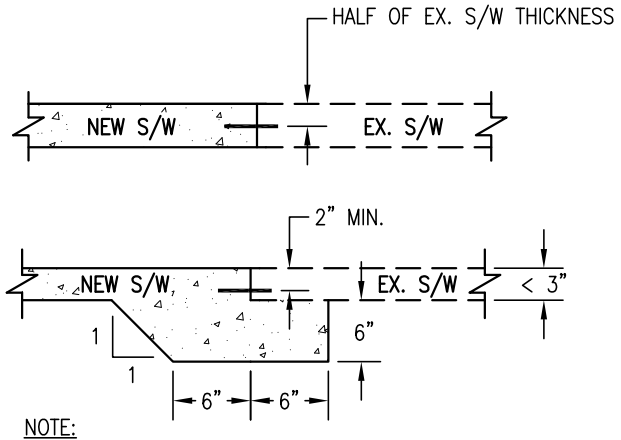


SCORE MARK
"DUMMY JOINT"

DRAWN BY: K. TRAN	CONCRETE JOINTS	ST-17
CHECKED BY: F. AMIN		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 17



PLAN VIEW
NO SCALE

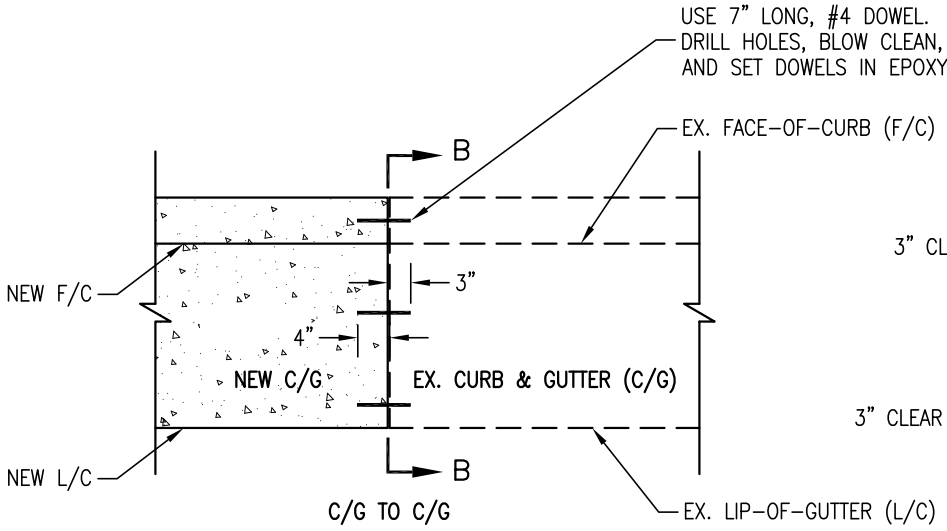


NOTE:

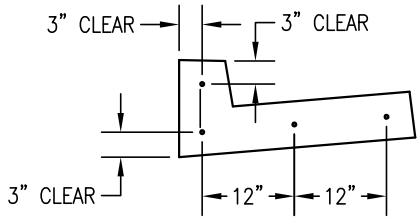
IF EXISTING SIDEWALK IS LESS THAN 3" THICK, USE 6" DEEP X 12" WIDE P.C.C. KEY WITH DOWEL CONNECTION.

SECTION A–A
NO SCALE

SIDEWALK



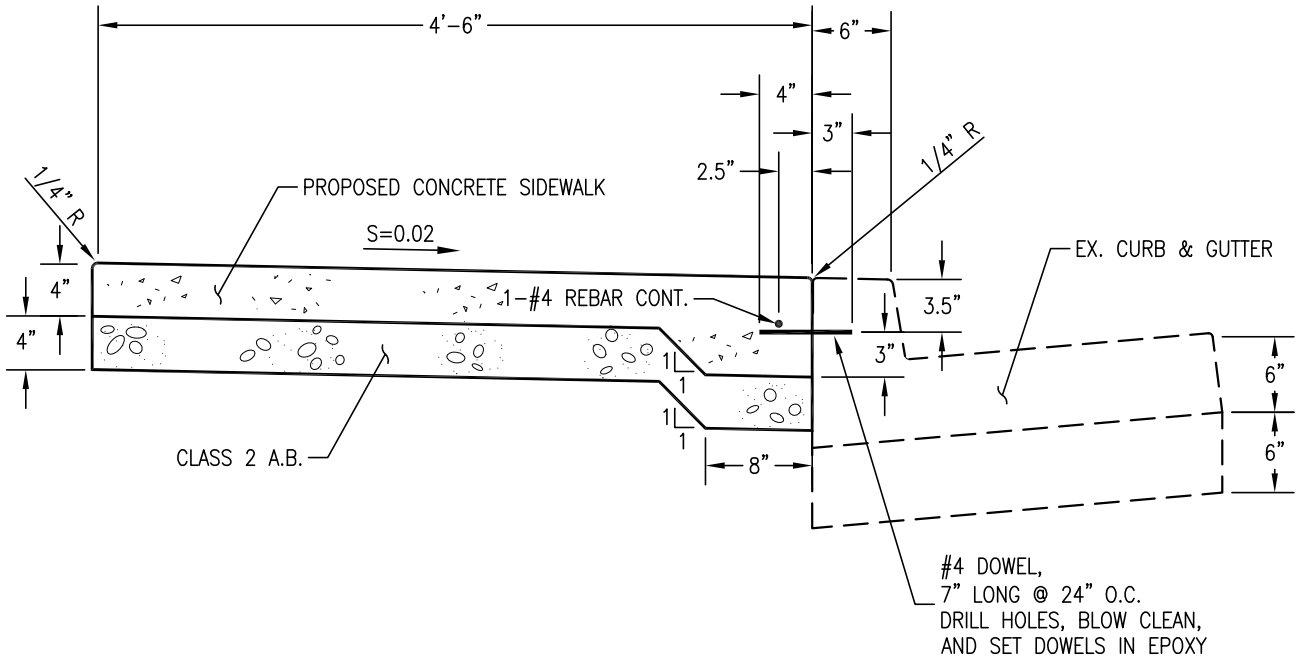
PLAN VIEW
NO SCALE



SECTION B–B
NO SCALE

CURB & GUTTER

DRAWN BY: K. TRAN	DOWEL CONNECTIONS	ST-18
CHECKED BY: F. AMIN		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 18



NOTES:

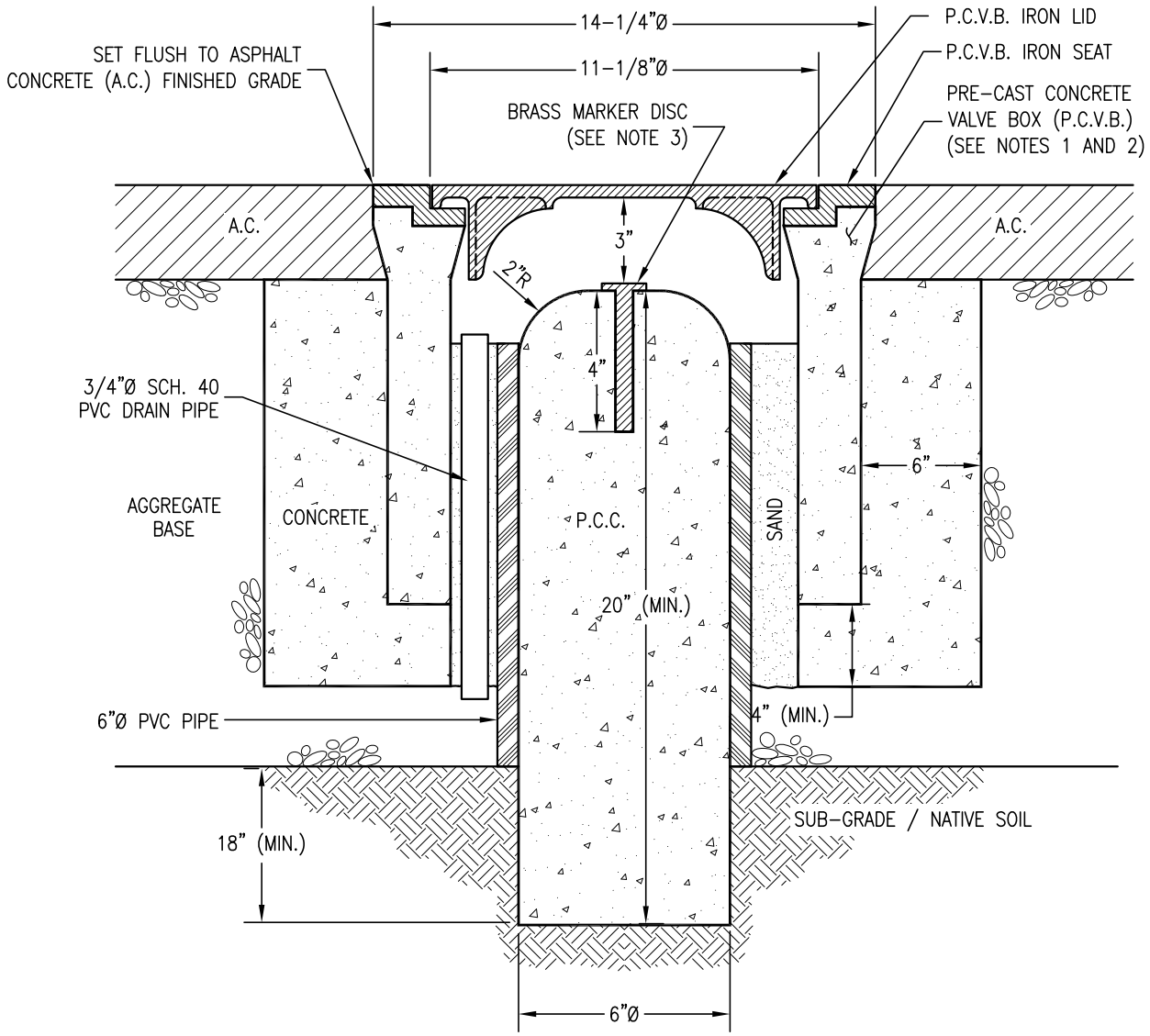
1. WHERE A NEW DRIVEWAY OCCURS, REPLACE EXISTING CURB AND GUTTER BETWEEN THE NEAREST JOINTS AND POUR CURB AND DRIVEWAY MONOLITHICALLY.

2. IF THE REAR FACE OF THE DRIVEWAY CURB DEPRESSION IS NOT AT LEAST 6 INCHES IN DEPTH, REMOVE AND REPLACE THE CURB DEPRESSION WITH A STANDARD MONOLITHIC DRIVEWAY.

3. WHERE IT BECOMES NECESSARY FOR ANY REASON TO REPLACE CURB AND/OR GUTTER, REPLACEMENT MUST BE MONOLITHIC.

4. IF TOP OF EXISTING CURB DOES NOT DRAIN TOWARDS THE STREET, REMOVE CURB AND GUTTER AND REPLACE WITH MONOLITHIC CURB, GUTTER, AND SIDEWALK.

DRAWN BY: K. TRAN	SIDEWALK TO CURB CONNECTION	ST-19
CHECKED BY: F. AMIN		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 19

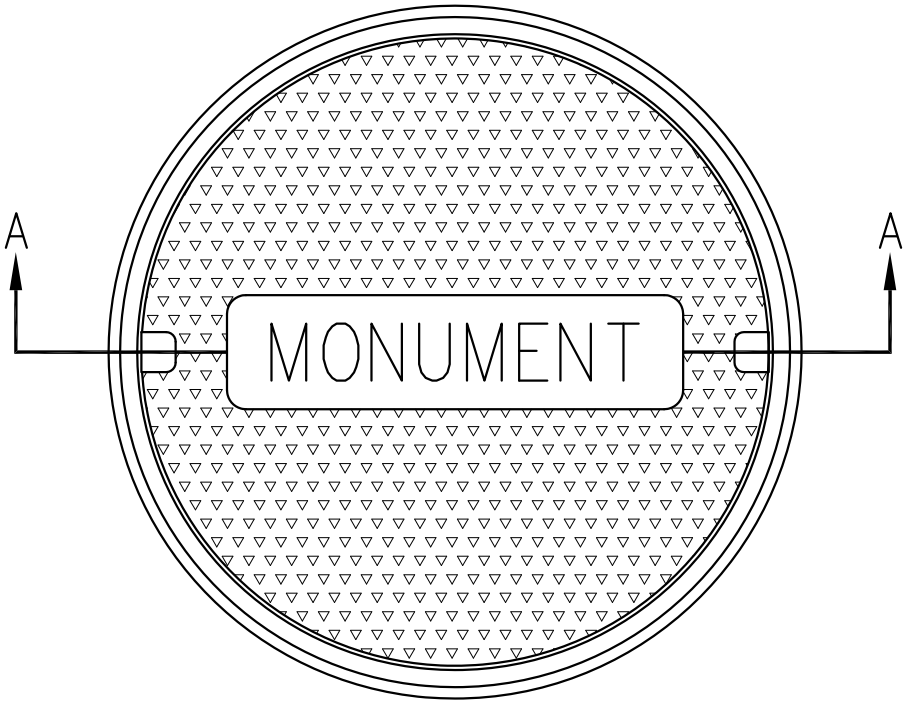


NOTES:

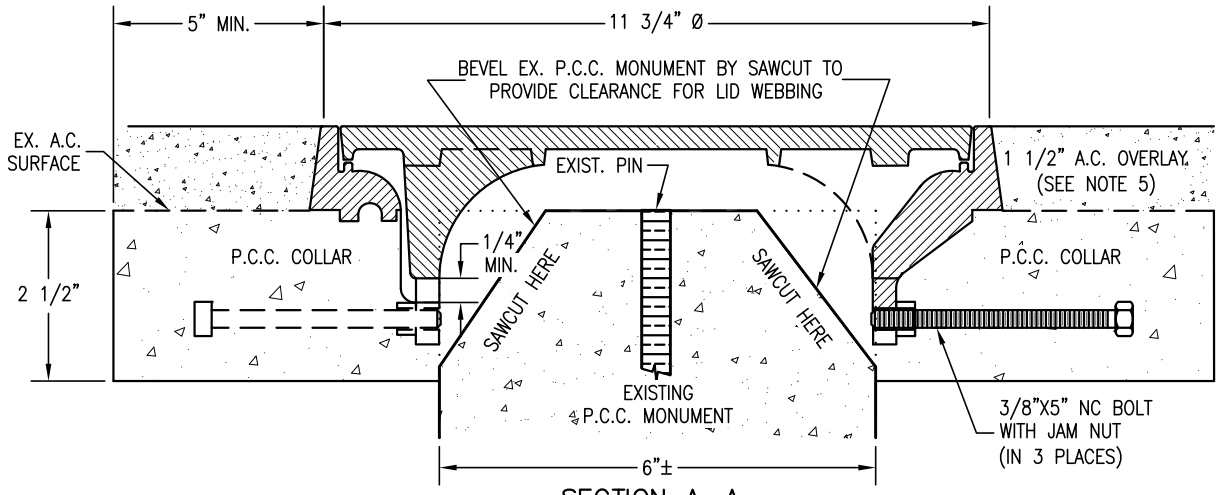
1. PRE-CAST BOX, SEAT, AND LID SHALL BE CHRISTY CONCRETE PRODUCT MODEL G5 TRAFFIC VALVE BOX OR APPROVED EQUAL.
2. SURFACE OF LID SHALL BE LABELED "MONUMENT" ENGRAVED IN 1" HIGH LETTERS.
3. BRASS MARKER DISC SHALL BE ENGRAVED WITH RESPONSIBLE LICENSED SURVEYOR OR CIVIL ENGINEER REGISTRATION NO. AND MONUMENT POINT PUNCHED.
4. CONCRETE SHALL BE CLASS "A".
5. PLACE CONCRETE FOR MONUMENT IN DRILLED HOLE.
6. LOCKING GRADE RINGS (NOT SHOWN) SHALL BE INSTALLED WITH 3/8"X1" NC BOLT AND JAM NUT (IN 3 PLACES) WHEN STREET IS RESURFACED TO BRING MONUMENT LID FLUSH WITH NEW FINISHED GRADE.

LOCKING GRADE RINGS	
CHRISTY NO.	DESCRIPTION
G5GR10 G5GR15 G5GR20	1" HIGH CAST IRON 1-1/2" HIGH CAST IRON 2" HIGH CAST IRON

DRAWN BY: K. TRAN		MONUMENT	ST-20
CHECKED BY: F. AMIN			
APPROVED BY: G. GOMEZ			
DATE: OCTOBER 2013		CITY OF SANTA CLARA	PAGE: 20



TOP VIEW
NO SCALE



SECTION A–A
NO SCALE

NOTES:

1. WHERE AN EXISTING MONUMENT BOX CANNOT BE ADJUSTED TO GRADE WITH IRON EXTENSION RINGS, THE OLD BOX SHALL BE COMPLETELY REMOVED AND A NEW MONUMENT BOX INSTALLED. THIS ADJUSTMENT IS ALSO APPLICABLE TO MONUMENTS WHICH DO NOT HAVE MONUMENT BOXES.

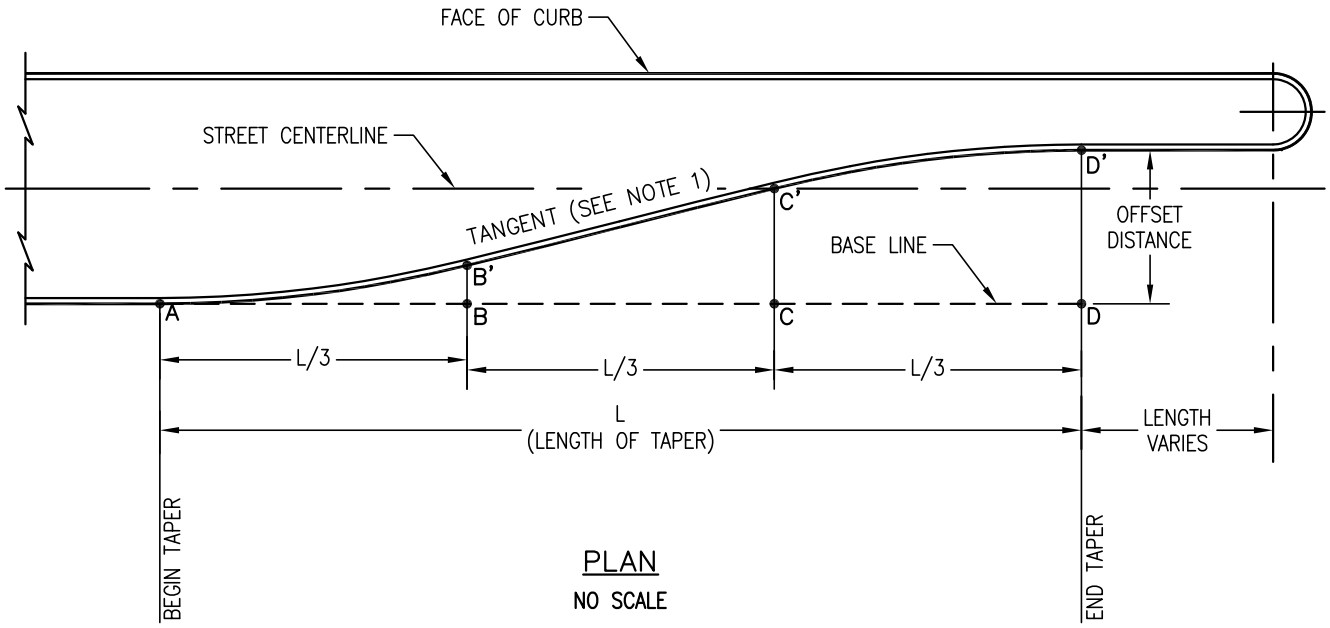
2. MAINTAIN AT LEAST 1/4 INCH CLEARANCE BETWEEN LEGS OF THE NEW COVER AND THE CONCRETE COLLAR.

3. THE BEVELING OF THE EXISTING MONUMENT MUST BE SAW CUT. EXERCISE EXTREME CARE TO AVOID DAMAGE TO PIN.

4. ON STREETS WITH OVERLAY THICKNESS OF 2 1/2" OR 3", PROVIDE ADDITIONAL LOCKING GRADE RINGS COMBINED TO MATCH OVERLAY THICKNESS. ON STREETS WITH 2" OVERLAY, PROVIDE 2" GRADE RING. LOCKING GRADE RINGS AND COVER SHALL BE CHRISTY PRODUCTS FOR G5 TRAFFIC VALVE BOX OR APPROVED EQUAL (SEE DETAIL ST–20).

5. IF THE STABILITY OR LOCATION OF THE EXISTING MONUMENT IS AFFECTED BY THE SAWCUTTING, THE CONTRACTOR SHALL, AT HIS EXPENSE, FILE A CORNER RECORD WITH THE COUNTY SURVEYOR AND INSTALL A REPLACEMENT STANDARD MONUMENT.

DRAWN BY: K. TRAN	SPECIAL MONUMENT BOX ADJUSTMENT	ST-21
CHECKED BY: F. AMIN		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 21



PLAN

NO SCALE

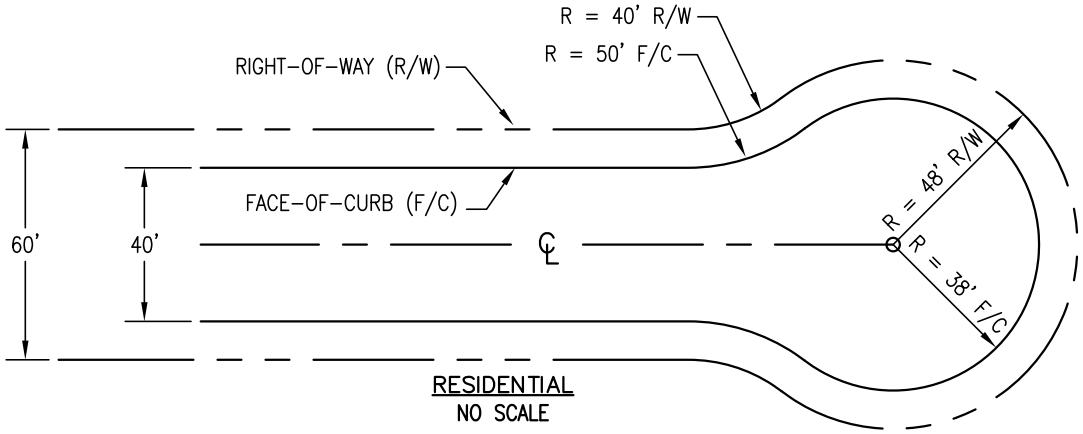
	LENGTH OF TAPER (FEET)			OFFSET DISTANCE (FEET)			
	L=60'	L=90'	L=120'	DD'=10'	DD'=11'	DD'=12'	
	DISTANCE FROM POINT "A"						
	0	0	0	0	0	0	
	5	7.5	10	0.16	0.17	0.19	
	10	15.0	20	0.62	0.69	0.75	
	15	22.5	30	1.41	1.55	1.69	
B'	20	30.0	40	2.50	2.75	3.00	B'
	30	45.0	60	5.00	5.50	6.00	
C'	40	60.0	80	7.50	8.25	9.00	C'
	45	67.5	90	8.59	9.45	10.31	
	50	75.0	100	9.38	10.31	11.25	
	55	82.5	110	9.84	10.83	11.81	
D'	60	90.0	120	10.00	11.00	12.00	D'

NOTES:

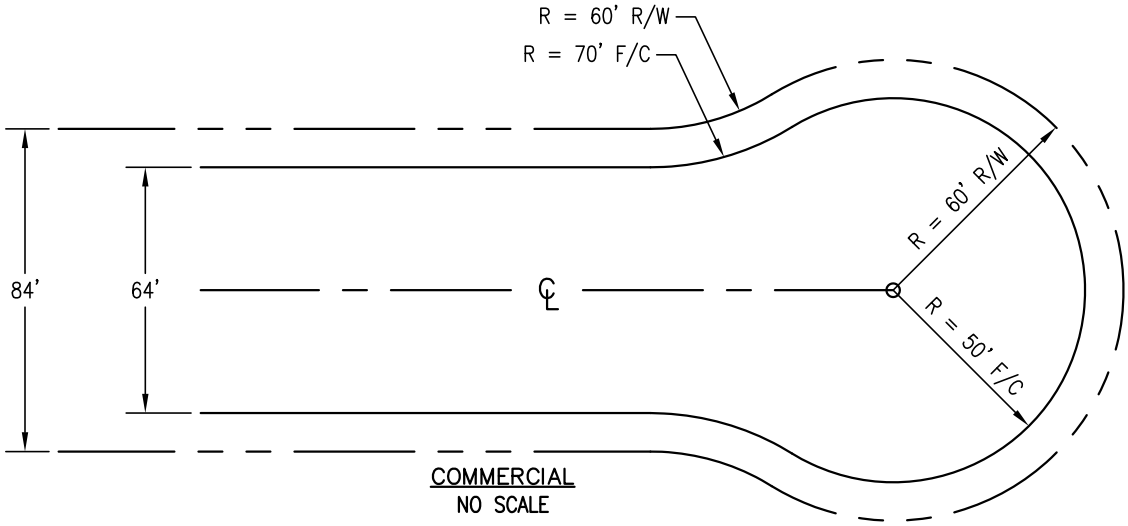
1. WHERE STREET CENTERLINE IS A CURVE, NEITHER BASE LINE NOR TAPER BETWEEN B & C WILL BE A TANGENT. USE PROPORTIONAL OFFSETS FROM B TO C.

2. L = AD = LENGTH OF TAPER
   AB = BC = CD = 1/3 L
   BB' = 1/3 CC' = 1/4 DD'
   AB' & C'D' ARE PARABOLIC CURVES

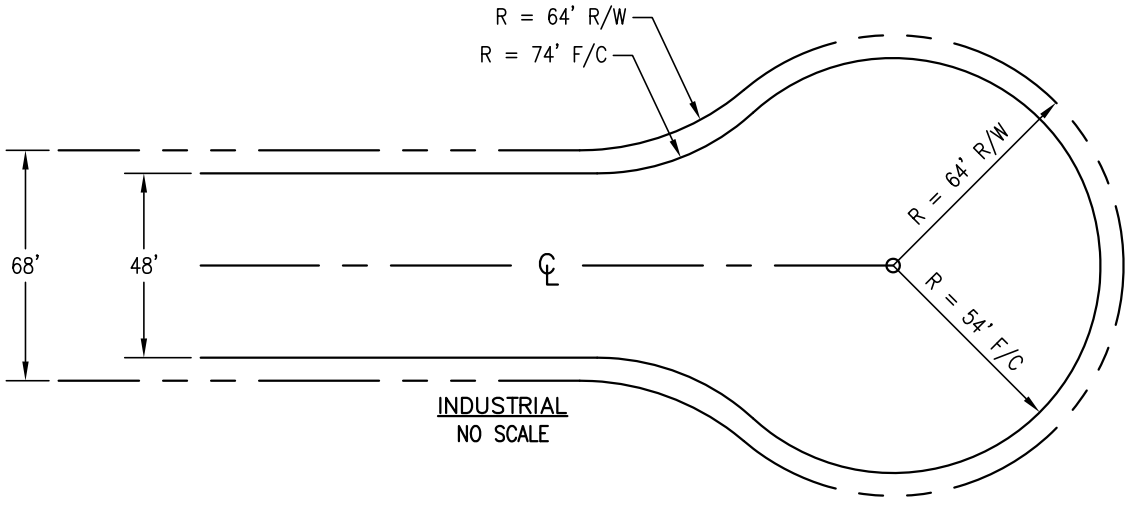
DRAWN BY: K. TRAN	MEDIAN ISLAND TAPER	ST-22	
CHECKED BY: F. AMIN			
APPROVED BY: G. GOMEZ			
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 22	



RESIDENTIAL
NO SCALE



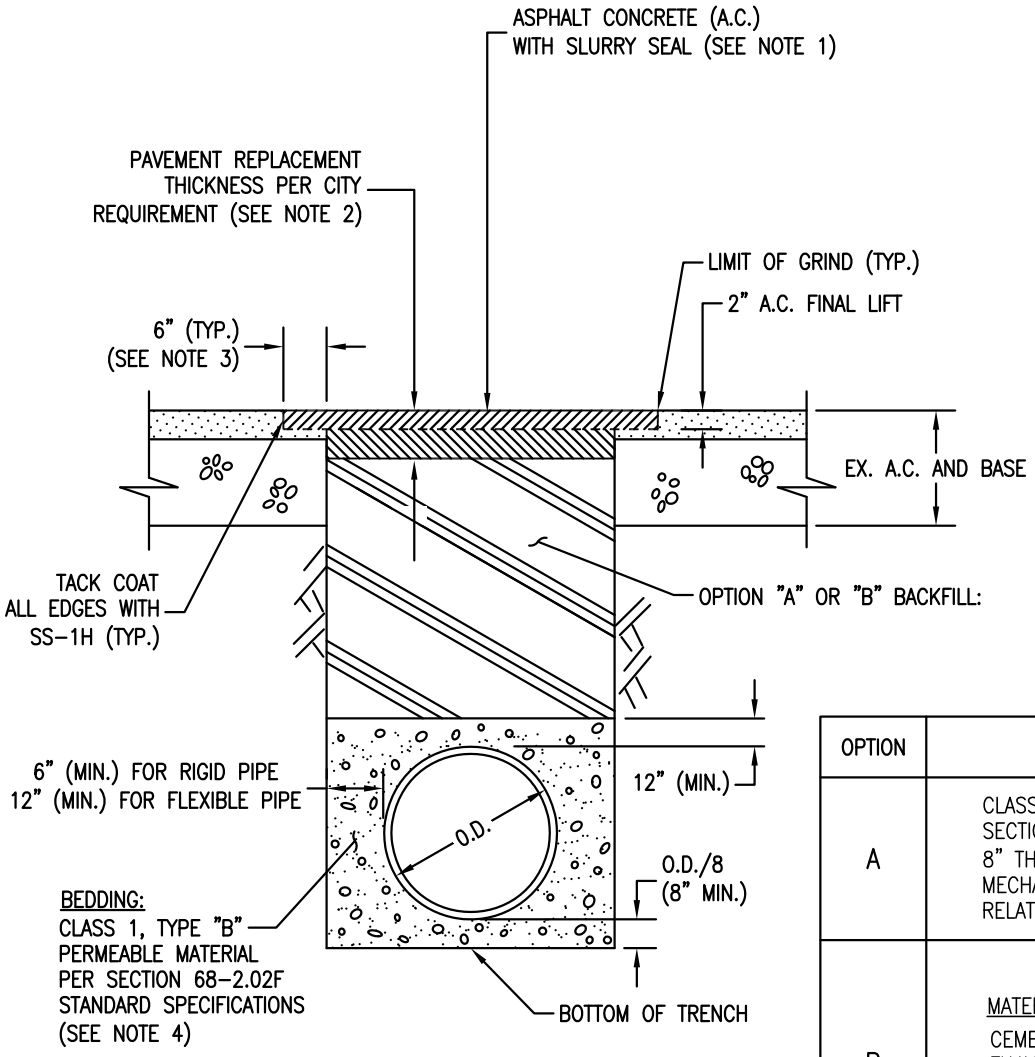
COMMERCIAL
NO SCALE



INDUSTRIAL
NO SCALE

NOTE: MINIMUM FRONTAGE ROAD WIDTH IS 36 FEET BETWEEN CURB FACES.

DRAWN BY: K. TRAN	CUL-DE-SAC	ST-23
CHECKED BY: F. AMIN		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 23



CROSS SECTION VIEW

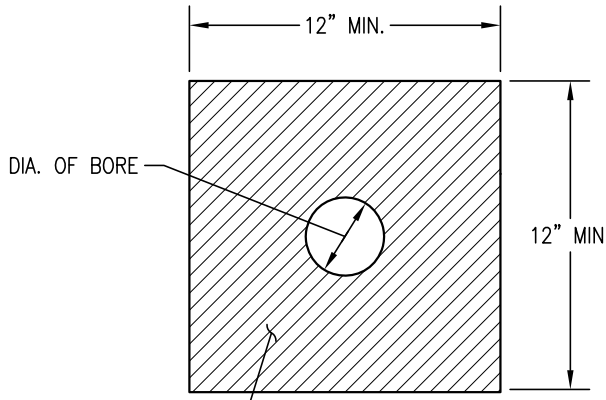
NO SCALE

OPTION	DESCRIPTION
A	CLASS 2 AGGREGATE BASE (3/4") PER SECTION 26 OF CALTRANS SPECIFICATIONS. 8" THICK (MAX.) UNCOMPACTED LIFTS. MECHANICALLY COMPACT TO AT LEAST 95% RELATIVE COMPACTION.
B	CONTROLLED DENSITY FILL (CDF) MATERIAL — ABS. VOL. CEMENT 0.15 FLYASH 1.98 #8 AGGREGATE 8.97 SAND 8.27 WATER 6.02 AIR 1.61 27.00

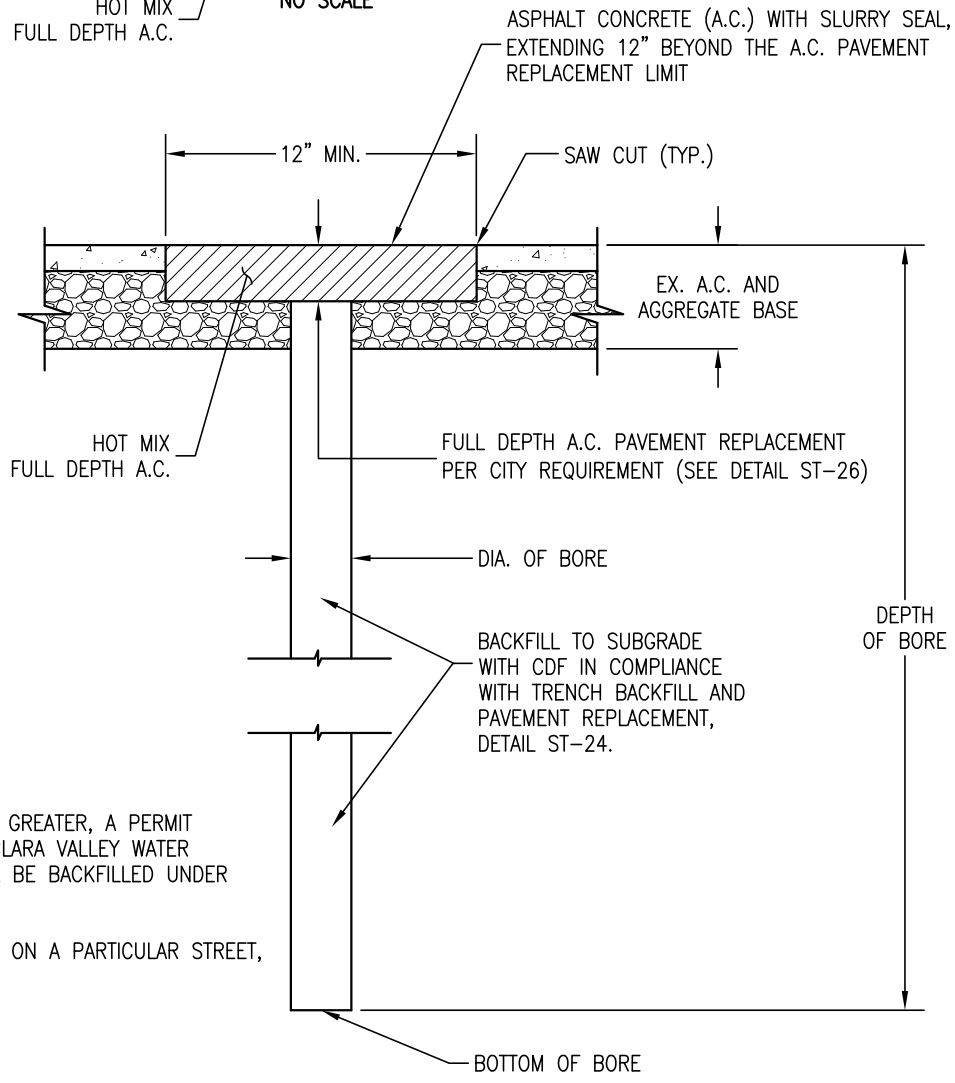
NOTES:

1. SLURRY SEAL SHALL BE EXTENDED 12" BEYOND THE A.C. PAVEMENT REPLACEMENT LIMIT.
2. A.C. PAVEMENT REPLACEMENT SHALL BE FULL DEPTH A.C. WITH THICKNESS PER CITY REQUIREMENT. SEE DETAIL ST-26 FOR TRENCH PAVEMENT THICKNESS REQUIREMENTS OF A PARTICULAR STREET.
3. THE 6" BENCH SECTION FOR A.C. SHALL BE GROUND AND REMOVED IMMEDIATELY PRIOR TO FINISH PAVING OPERATIONS.
4. BEDDING MATERIAL SHALL CONSIST ENTIRELY OF CRUSHED, ANGULAR ROCK (NO ROUNDED PEA GRAVEL ALLOWED) FOR FLEXIBLE PIPE. FOR WATER MAINS AND LATERALS, BEDDING SHALL BE SAND. MATERIAL SHALL BE INSTALLED IN MAX. 8" LIFTS AND COMPACTED WITH VIBRATORY COMPACTOR.

DRAWN BY: K. TRAN	TRENCH BACKFILL AND PAVEMENT REPLACEMENT	ST-24
CHECKED BY: F. AMIN		
APPROVED BY: G. GOMEZ		
DATE: DECEMBER 2014	CITY OF SANTA CLARA	PAGE: 24



TOP VIEW
NO SCALE



ELEVATION VIEW
NO SCALE

NOTES:

1. IF DEPTH OF BORE IS 45 FEET OR GREATER, A PERMIT SHALL BE OBTAINED FROM SANTA CLARA VALLEY WATER DISTRICT (SCVWD) AND BORE SHALL BE BACKFILLED UNDER SCVWD INSPECTION.

2. FOR THE REQUIRED A.C. THICKNESS ON A PARTICULAR STREET, SEE DETAIL ST-26.

DRAWN BY: K. TRAN	SOIL BORING BACKFILL AND PAVEMENT REPLACEMENT	ST-25
CHECKED BY: F. AMIN		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 25

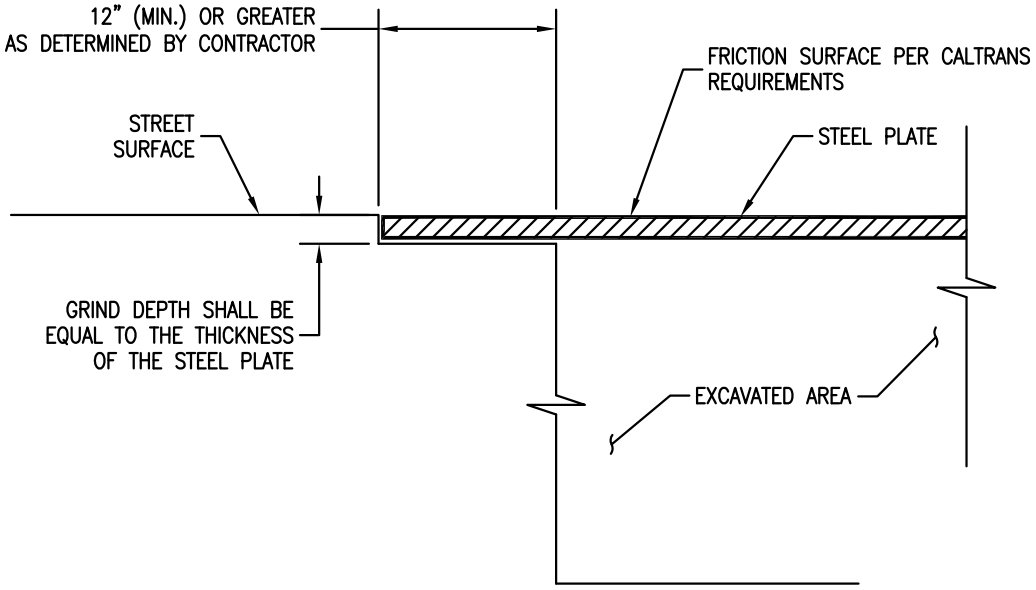
STREETS REQUIRING 10 INCHES OF ASPHALT CONCRETE FOR PAVEMENT RESTORATION

Agnew Road
Bassett Street
Benton Street (Lincoln to West City Limits)
Betsy Ross Drive
Bowers Avenue
Bunker Hill Lane
Calle de Luna
Calle del Mundo
Calle del Sol
De La Cruz Boulevard
Democracy Way
Freedom Circle
Great America Parkway
Great America Way (See note 1)
Homestead Road
Hope Drive
Juliette Lane
Kiely Boulevard
Kifer Road
Lafayette Street
Laurelwood Road
Lick Mill Boulevard
Martin Avenue
Mission College Boulevard
Monroe Street
Norman Avenue
Old Ironsides Drive
Old Mountain View-Alviso Road
Patrick Henry Drive
Pruneridge Avenue
Russell Avenue
Saratoga Avenue
Scott Boulevard
Stevens Creek Boulevard
Tasman Drive
Thomas Road
Walsh Avenue
Washington Street (South of Poplar)
Winchester Boulevard

NOTES: 1. Due to the presence of potentially hazardous materials in the ground under this road, special permission must be obtained prior to any work.

2. All streets, other than the streets listed above, require 8 inches of asphalt concrete for pavement restoration.

DRAWN BY: K. TRAN	ASPHALT CONCRETE PAVEMENT THICKNESS REQUIREMENTS	ST-26
CHECKED BY: F. AMIN		
APPROVED BY: G. GOMEZ		
DATE: DECEMBER 2014	CITY OF SANTA CLARA	PAGE: 26



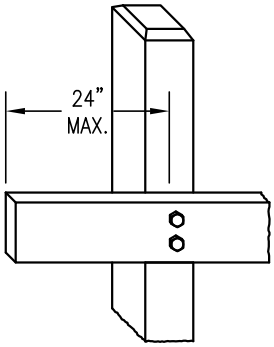
CROSS SECTION VIEW

NO SCALE

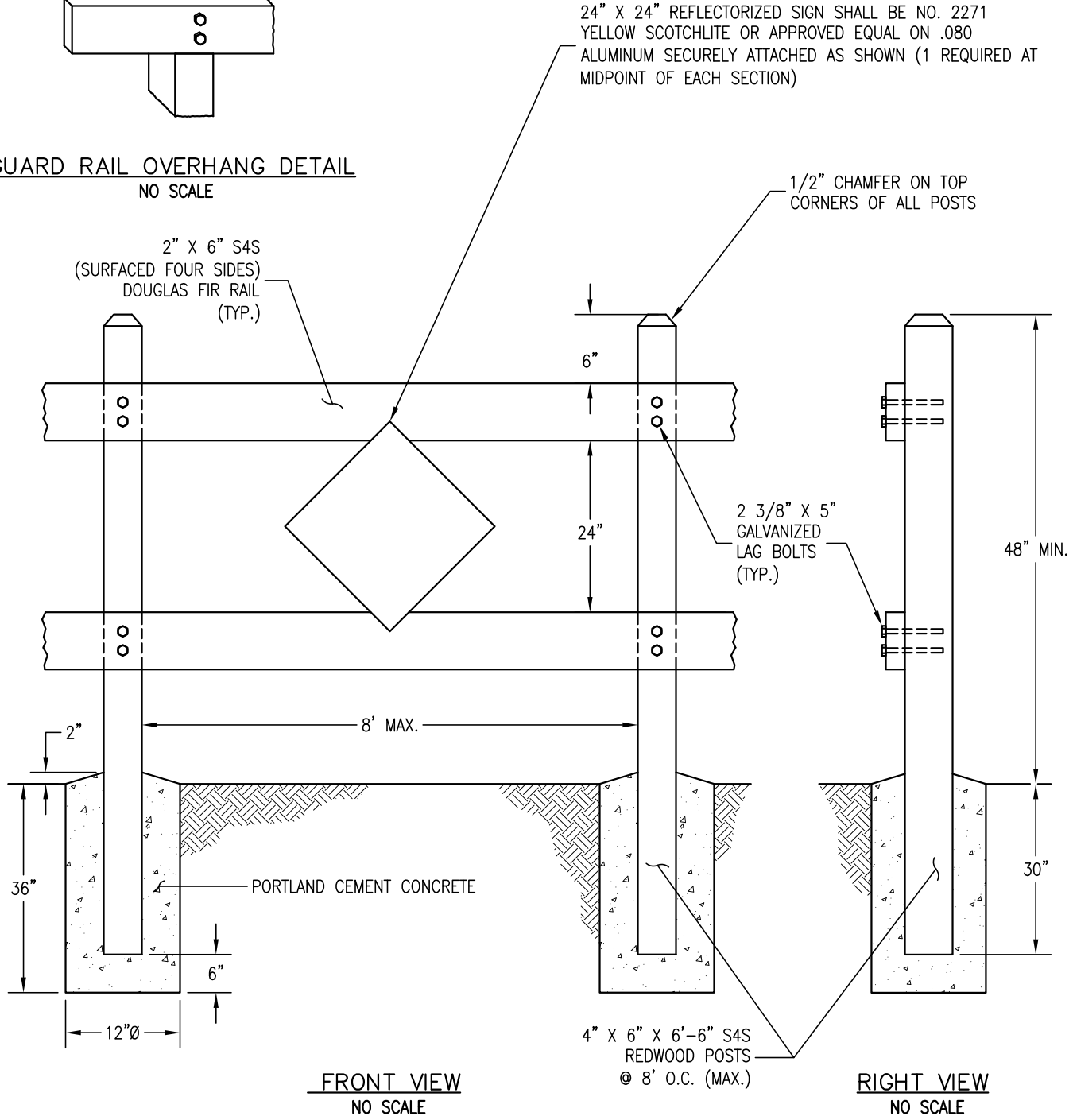
NOTES:

1. THE PLATE BENCHING DETAIL (SHOWN ABOVE) SHALL BE USED ON STREETS WITH A POSTED SPEED LIMIT OF 35 MPH OR HIGHER.
2. NAILS, COLD PATCH ASPHALT, ETC., MAY BE USED TO HOLD THE STEEL PLATE IN PLACE, SUBJECT TO THE APPROVAL OF THE CITY ENGINEER OR DESIGNEE.
3. IF THE GAP BETWEEN THE STREET SURFACE AND THE STEEL PLATE EXCEEDS 1 INCH, THE GAP SHALL BE FILLED WITH COLD PATCH ASPHALT.
4. THE EXCAVATION AREA SHALL BE BACKFILLED, AND THE PAVEMENT SHALL BE RESTORED WITHIN 5 WORKING DAYS OF THE COMPLETION OF THE PERMITTED WORK.

DRAWN BY: K. TRAN	STEEL PLATE BENCHING	ST-27
CHECKED BY: F. AMIN		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 27



GUARD RAIL OVERHANG DETAIL
NO SCALE



FRONT VIEW
NO SCALE

RIGHT VIEW
NO SCALE

NOTES:

1. GUARD RAILS AND POSTS SHALL BE PAINTED WITH TWO (2) COATS OF EXTERIOR WHITE WOOD PAINT.
2. BARRICADE SHALL EXTEND 2' BEYOND FACE OF CURB.

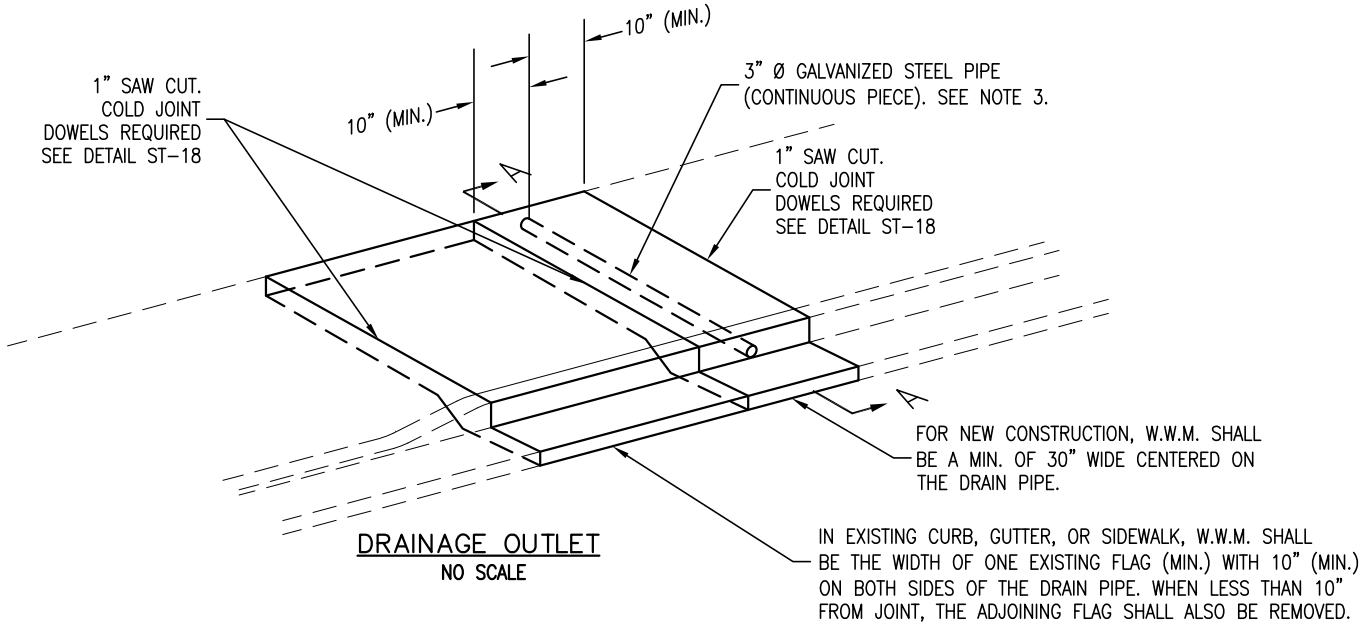
DRAWN BY: K. TRAN	STREET BARRICADE	ST-28
CHECKED BY: F. AMIN		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 28

Department of Public Works
City of Santa Clara, CA

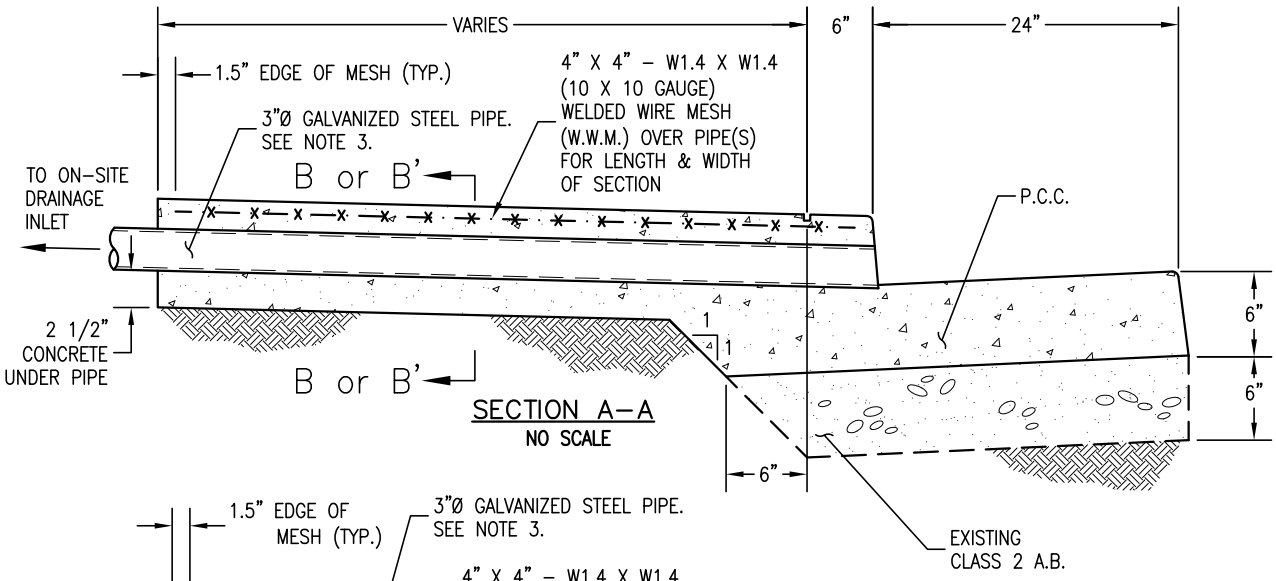
STANDARD DETAILS

STORM DRAIN SECTION

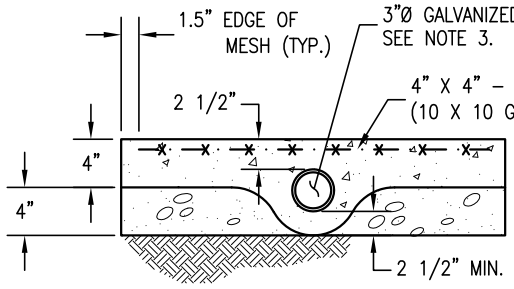
DETAILS SD-1 TO SD-8



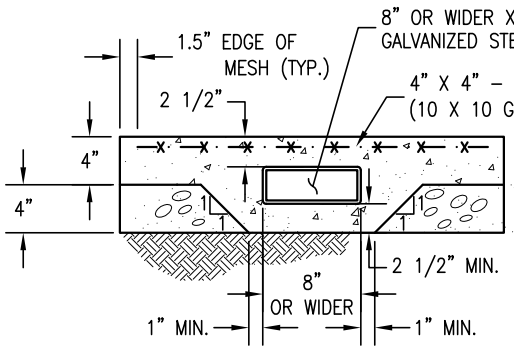
DRAINAGE OUTLET
NO SCALE



SECTION A–A
NO SCALE



SECTION B–B
NO SCALE

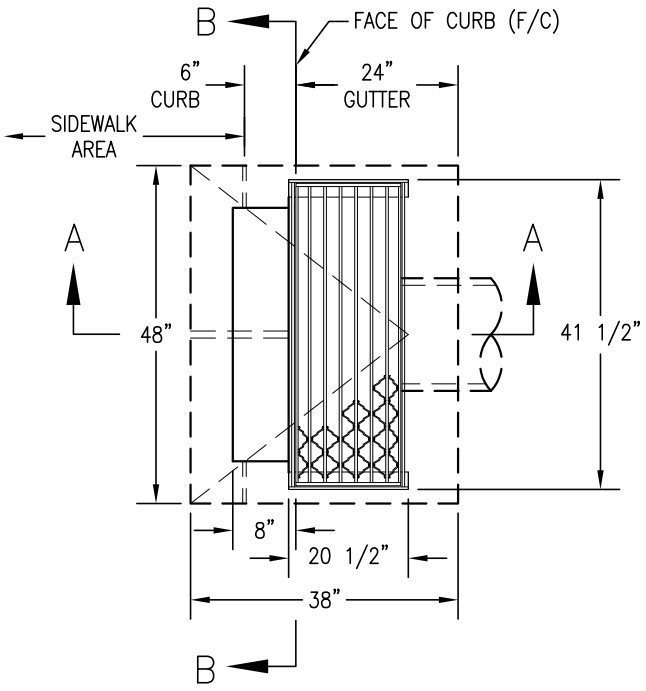


SECTION B'–B'
NO SCALE

NOTES:

1. STEEL PIPE OR CHANNEL SHALL BE ONE CONTINUOUS LENGTH FROM PROPERTY LINE TO CURB FACE.
2. WHERE TWO PIPES ARE ALLOWED, PIPE SPACING SHALL MAINTAIN A MINIMUM CLEAR DISTANCE OF TWO (2) INCHES.
3. WHERE THREE OR MORE PIPES ARE REQUIRED, A RECTANGULAR 8" OR WIDER X 3" GALVANIZED STEEL CHANNEL SHALL BE USED, AND SHALL MAINTAIN THE MINIMUM CLEAR DISTANCES. SEE SECTION B'–B'.
4. CURB FACE DRAIN OUTLET MAY BE USED ONLY AT LOCATIONS APPROVED BY THE CITY ENGINEER.

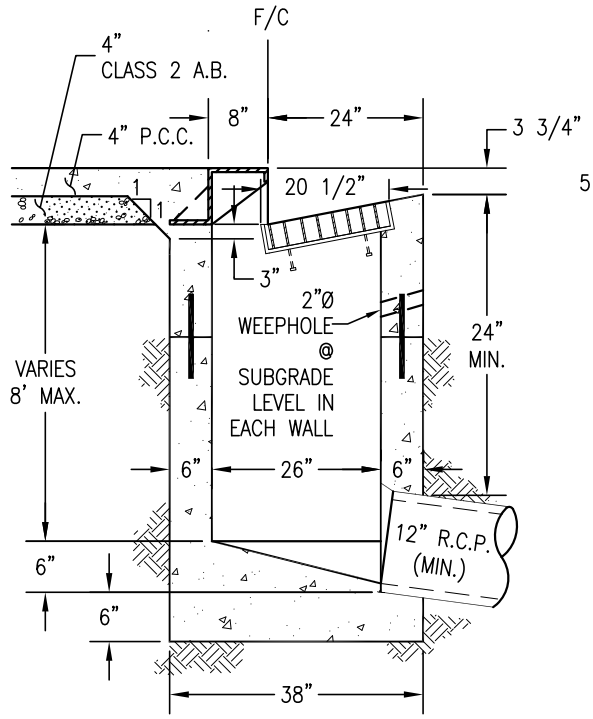
DRAWN BY: K. TRAN	CURB FACE DRAINAGE OUTLET	SD-1
CHECKED BY: F. AMIN		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 29



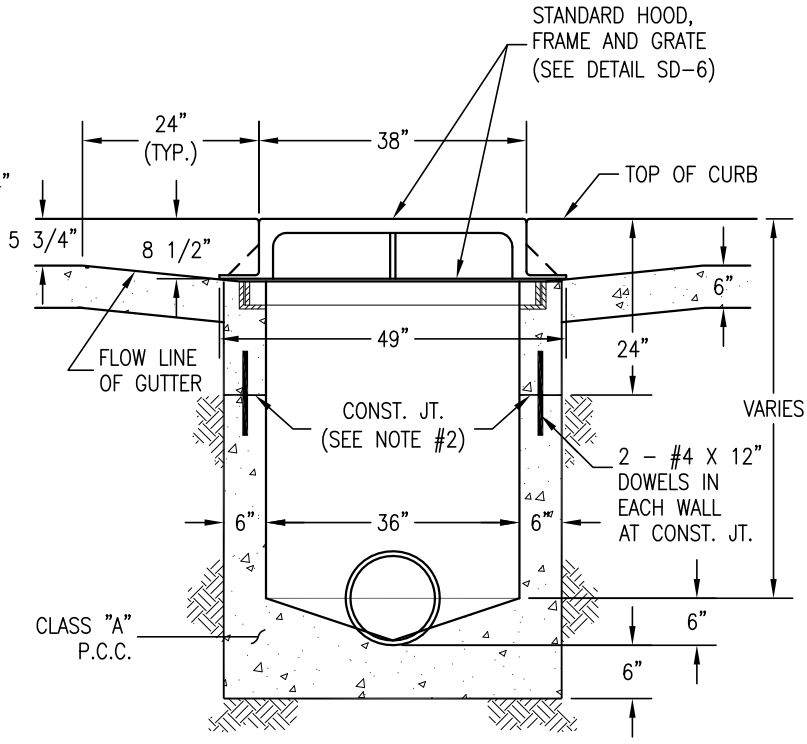
PLAN VIEW
NO SCALE

NOTES:

1. PRECAST CONCRETE CATCH BASIN (C.B.) MAY BE USED SUBJECT TO WRITTEN APPROVAL OF THE CITY ENGINEER.
2. C.B. WALLS MAY BE POURED TO AN ELEVATION NOT LESS THAN 2'–0" BELOW TOP OF CURB. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO FRAME IN AND POUR THE UPPER 2'–0" OF THE C.B. MONOLITHICALLY WITH CURB AND GUTTER.
3. WHEN CURB AND SIDEWALK ARE NOT POURED MONOLITHICALLY, CONCRETE CURB POUR SHALL ALSO ENCASE SIDES AND BACK OF HOOD A MINIMUM OF 12" WIDE AND 12" DEEP. SAID ENCASEMENT SHALL BE POURED IN FORM TO PROVIDE STRAIGHT EDGES.

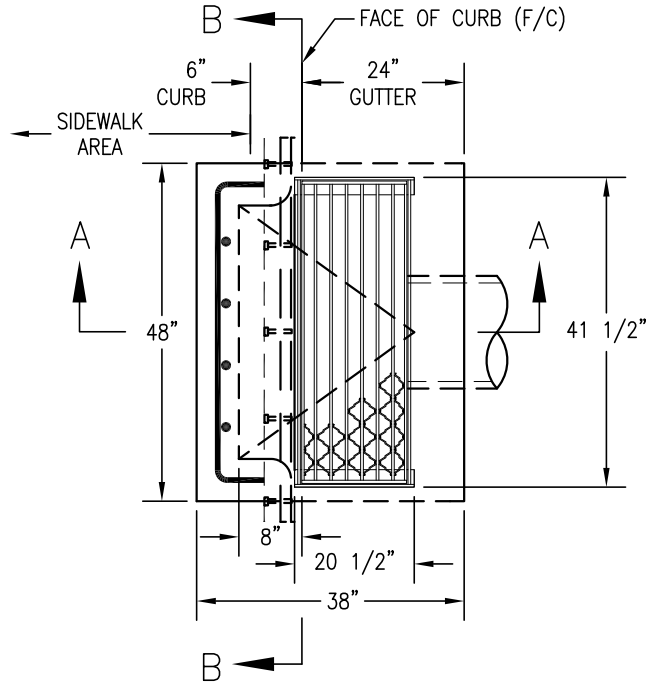


SECTION A–A
NO SCALE

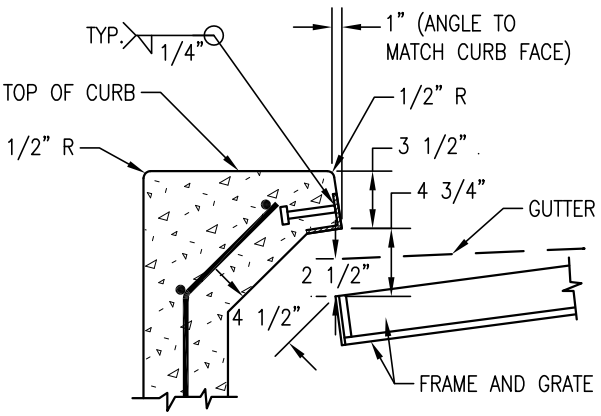


SECTION B–B
NO SCALE

DRAWN BY: K. TRAN	CURB INLET CATCH BASIN	SD-2
CHECKED BY: F. AMIN		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 30



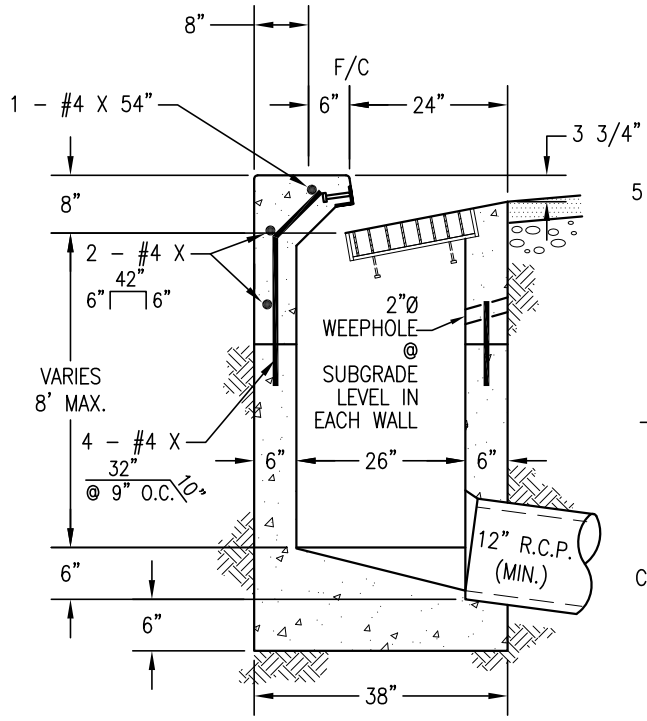
PLAN VIEW
NO SCALE



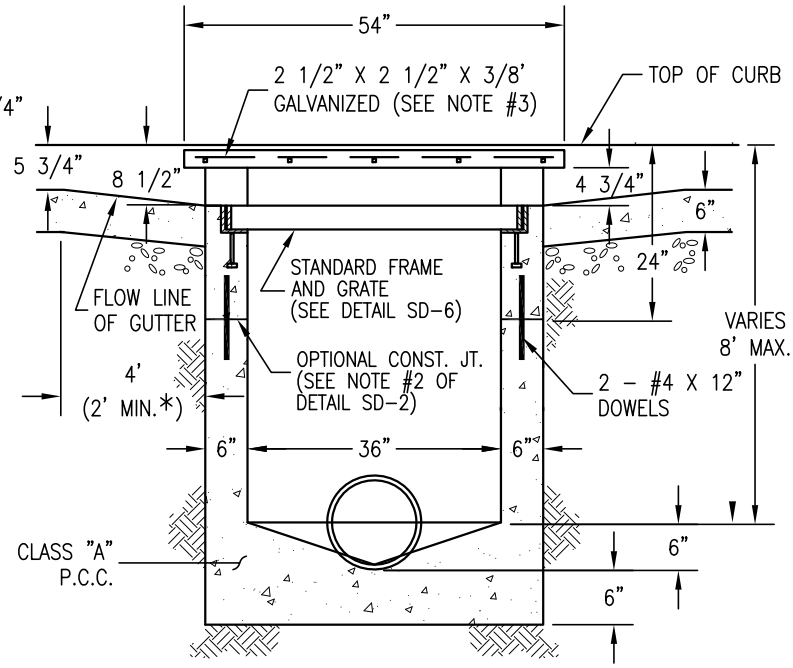
FACE ANGLE ANCHOR DETAIL
NO SCALE

NOTES:

1. FOR APPLICABLE GENERAL NOTES SEE DETAIL SD–2.
2. TYPE "A" CATCH BASIN MAY BE USED ONLY IF WRITTEN APPROVAL IS GRANTED BY THE CITY ENGINEER.
3. WHERE CATCH BASIN IS LOCATED IN CURB RETURN WITH RADIUS < 20', NOTCH AND BEND ANGLE IRON TO MATCH FACE OF CURB.
4. ✳ = DIMENSIONS WITHIN CURB RETURNS.

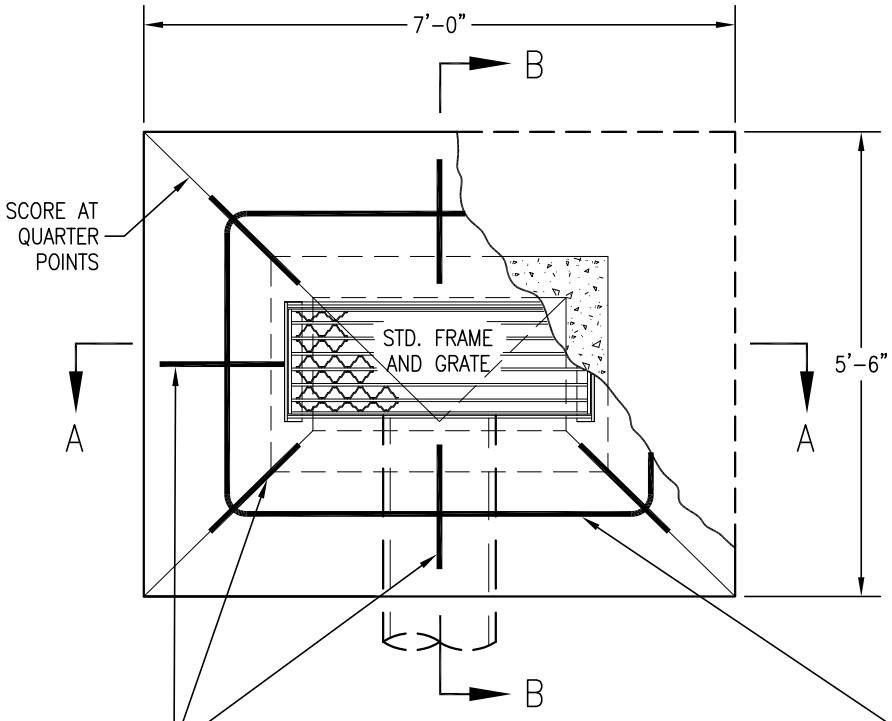


SECTION A–A
NO SCALE



SECTION B–B
NO SCALE

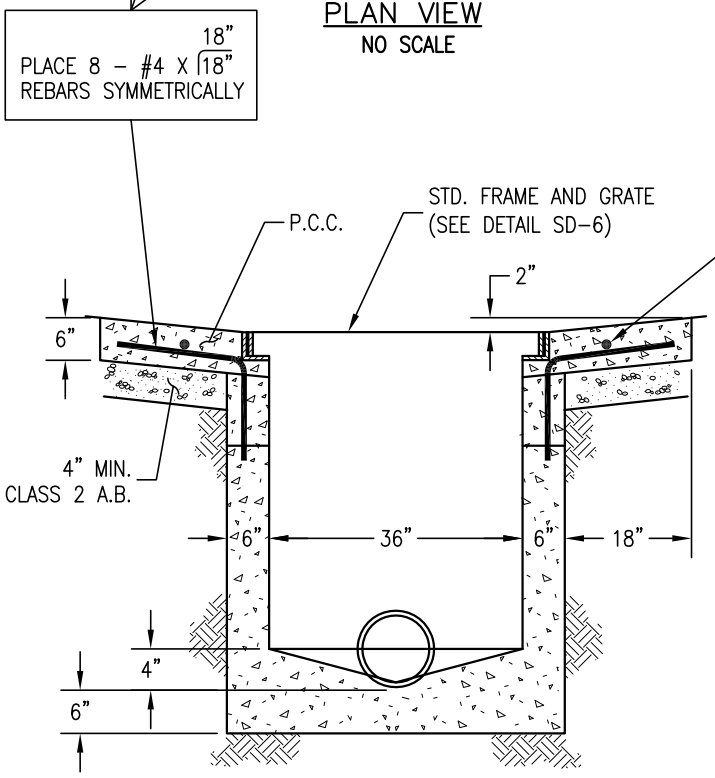
DRAWN BY: K. TRAN	TYPE "A" CURB INLET CATCH BASIN	SD-3
CHECKED BY: F. AMIN		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 31



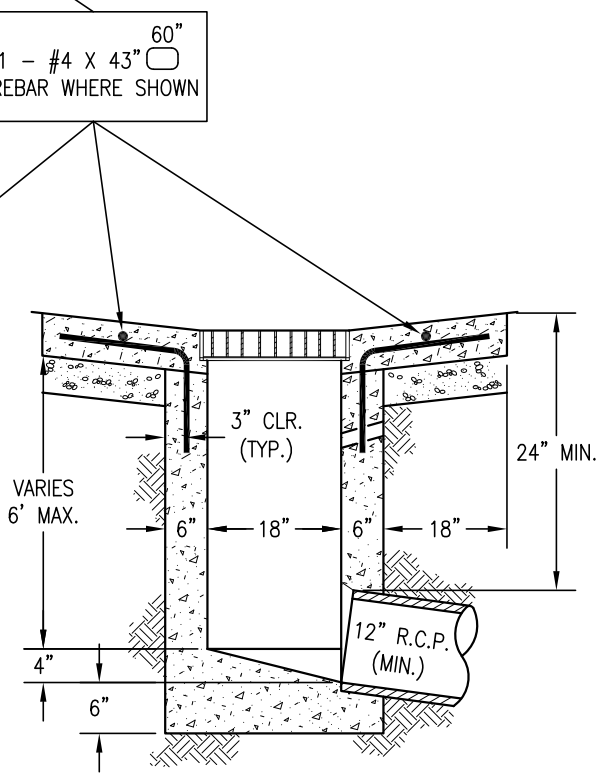
PLAN VIEW
NO SCALE

NOTES:

1. WHERE VALLEY GUTTER MEETS INLET APRON, SHAPE APRON TO CONFORM TO VALLEY GUTTER.
2. PRECAST INLETS MAY BE USED SUBJECT TO WRITTEN APPROVAL OF THE CITY ENGINEER.

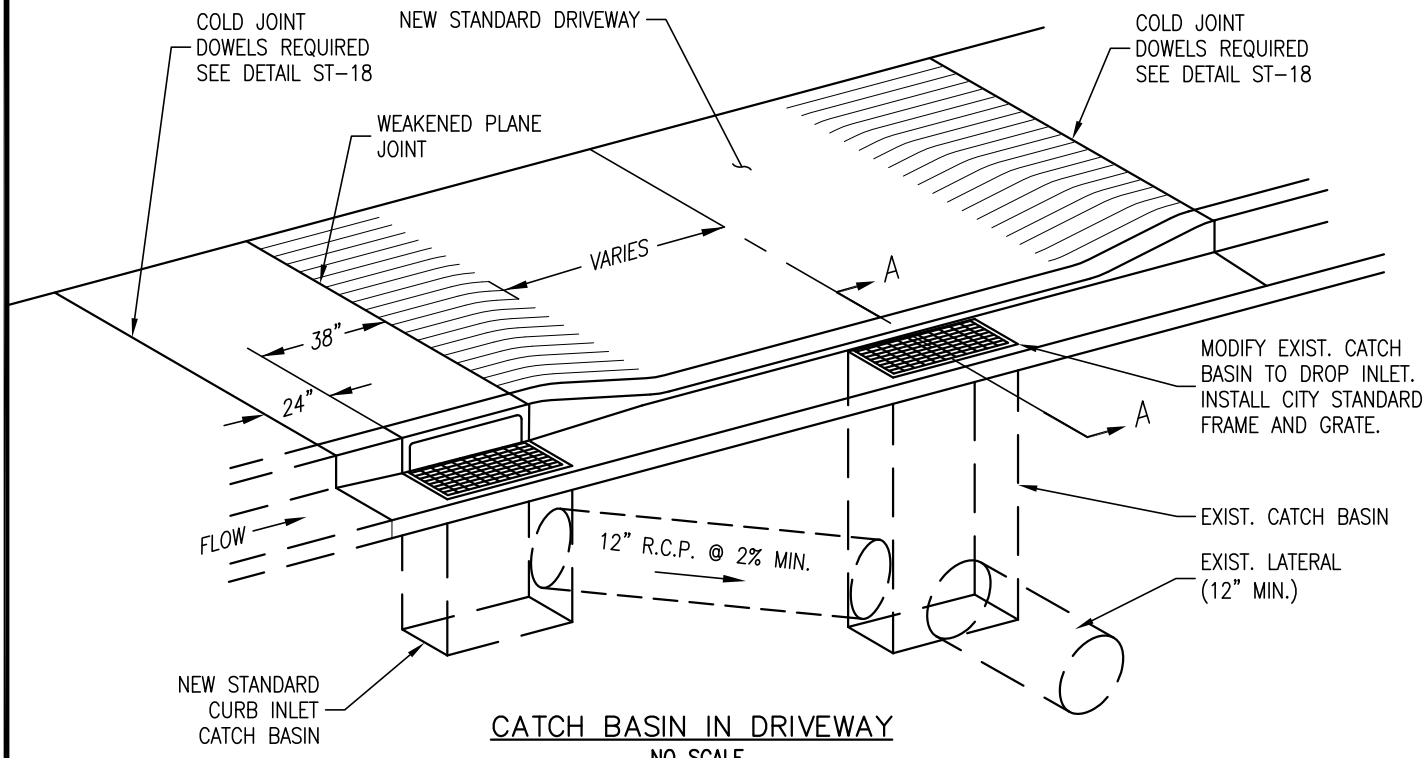


SECTION A–A
NO SCALE

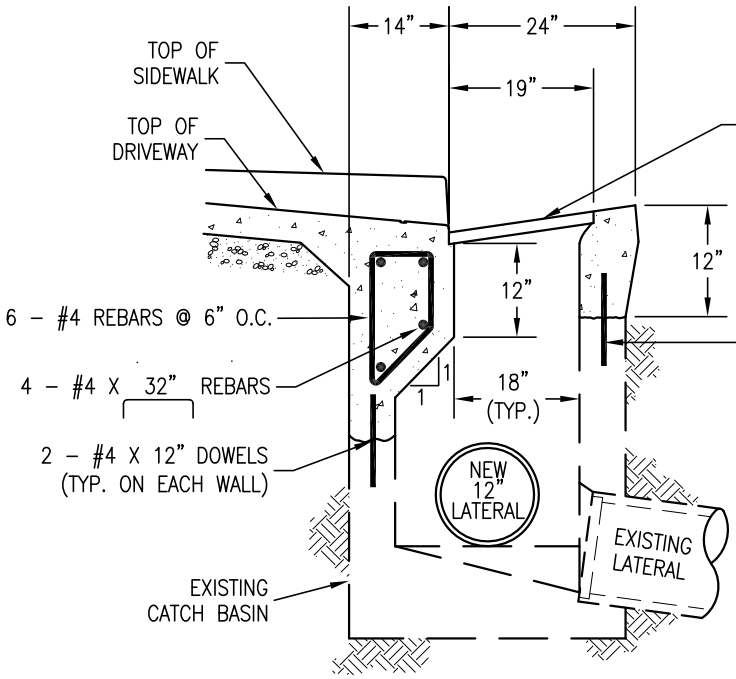


SECTION B–B
NO SCALE

DRAWN BY: K. TRAN	DROP INLET CATCH BASIN	SD-4
CHECKED BY: F. AMIN		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	DATE: 32



CATCH BASIN IN DRIVEWAY
NO SCALE



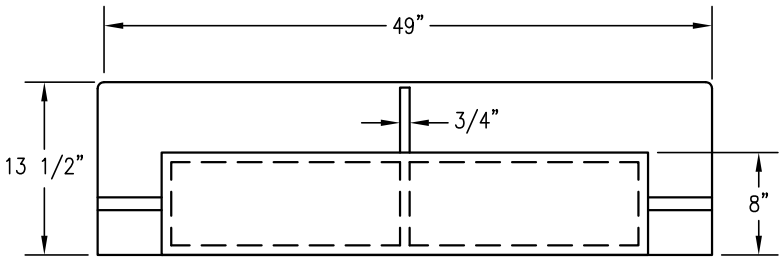
SECTION A-A
NO SCALE

NOTES:

1. THIS METHOD OF CONNECTING A NEW CURB INLET IS TO BE USED ONLY IF THE EXISTING CATCH BASIN AND LATERAL ARE IN GOOD CONDITION AND THE LATERAL IS AT LEAST 12" I.D., OTHERWISE THE EXISTING CATCH BASIN SHALL BE REMOVED OR FILLED IN AND A NEW LATERAL INSTALLED FROM THE NEW CURB INLET TO THE NEAREST MANHOLE.

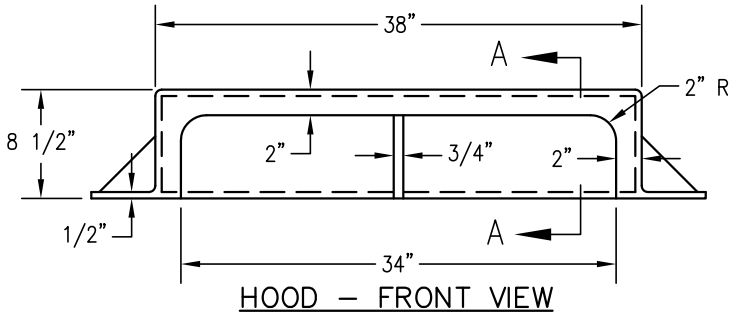
2. CONSTRUCT NEW CURB INLET ON THE UPSTREAM SIDE OF NEW DRIVEWAY OR "LONGER UPSTREAM RUN" SIDE OF DRIVEWAY IF ORIGINAL CATCH BASIN IS CONSTRUCTED AT A LOW POINT.

DRAWN BY: K. TRAN	ADAPTION FOR EXISTING CATCH BASIN IN NEW DRIVEWAY	SD-5
CHECKED BY: F. AMIN		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	DATE: 33

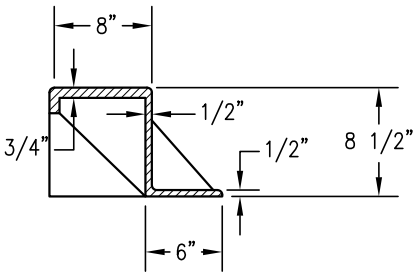


HOOD – PLAN VIEW
NO SCALE

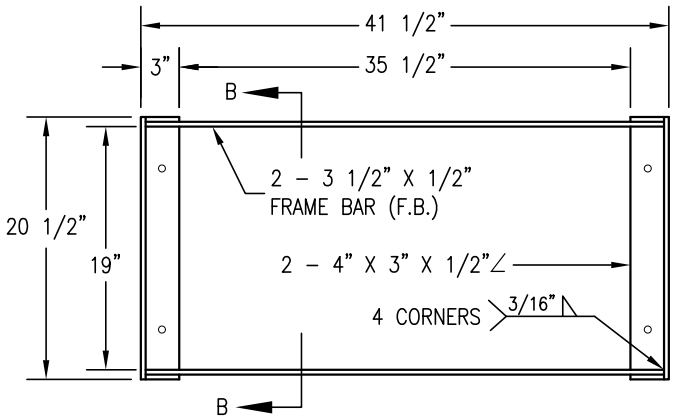
NOTES:
1. HOOD SHALL BE CAST IRON AND BE EQUAL TO SOUTH BAY FOUNDRY SBF 1902. WEIGHT OF HOOD = 175 LBS (APPROX.)
2. CASTING SHALL BE GIVEN A HOT ASPHALT DIP.
3. FRAME & GRATE SHALL BE EQUAL TO METALFAB M–1001.
4. MATERIAL SHALL BE HOT DIP GALVANIZED AFTER FABRICATION.
5. WEIGHT OF FRAME = 80 LBS. (TYP.)
   WEIGHT OF GRAGE = 130 LBS. (TYP.)



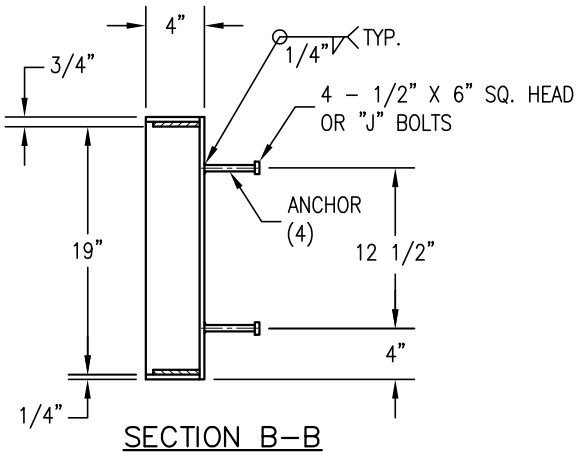
HOOD – FRONT VIEW
NO SCALE



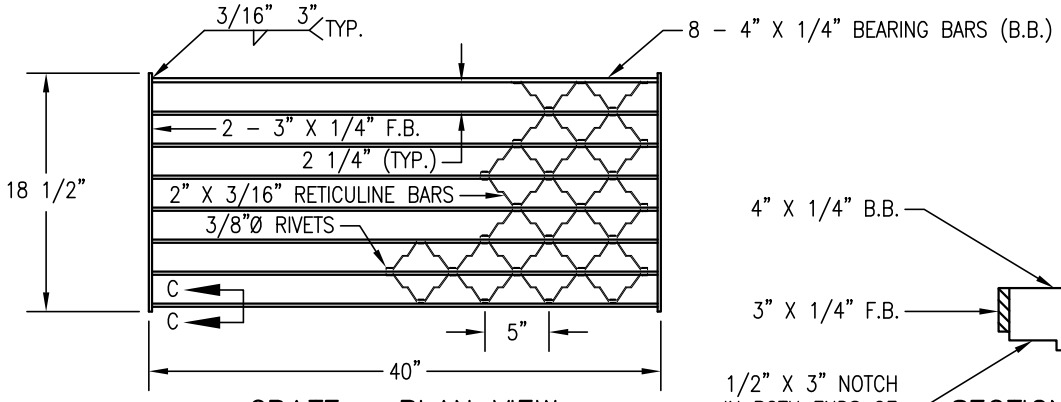
SECTION A–A
NO SCALE



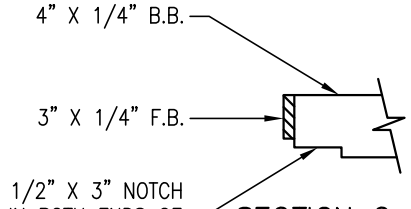
FRAME – PLAN VIEW
NO SCALE



SECTION B–B
NO SCALE

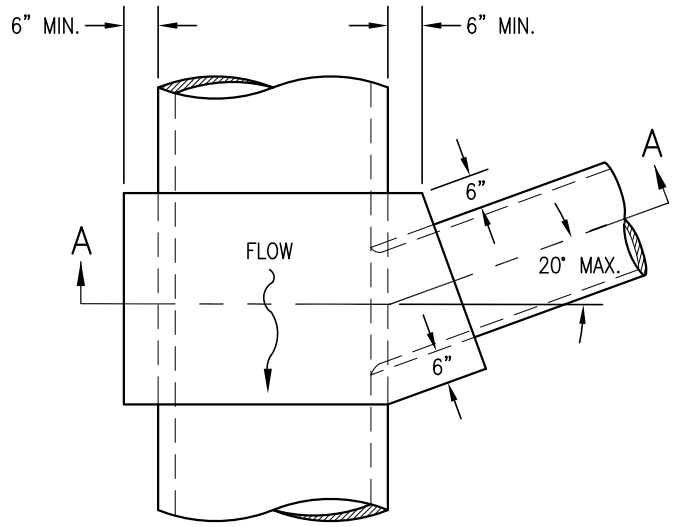


GRATE – PLAN VIEW
NO SCALE

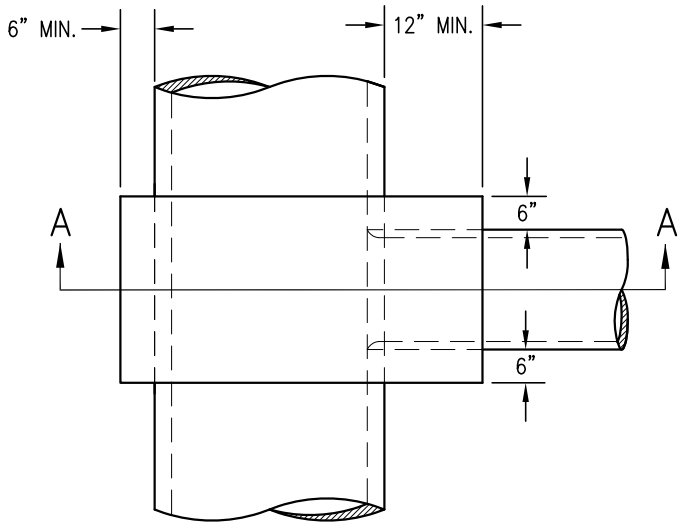


SECTION C–C
NO SCALE

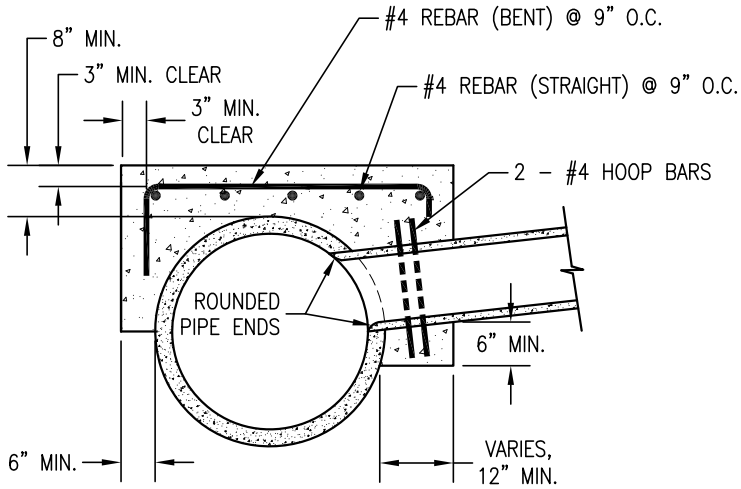
DRAWN BY: K. TRAN	CATCH BASIN HOOD, FRAME AND GRATE	SD-6
CHECKED BY: F. AMIN		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 34



SKEWED CONNECTION
PLAN VIEW
NO SCALE



PERPENDICULAR CONNECTION
PLAN VIEW
NO SCALE



SECTION A–A
NO SCALE

NOTES:

1. CONCRETE LUG CONNECTION MAY BE USED ONLY AT LOCATIONS APPROVED BY THE CITY ENGINEER.
2. THE LARGER PIPE SHALL NOT BE LESS THAN 48" I.D.
3. THE SMALLER PIPE SHALL NOT BE LESS THAN 12" I.D. OR MORE THAN 15" I.D.
4. INVERT OF SMALLER PIPE SHALL NOT BE LOWER THAN MID–HEIGHT OF LARGER PIPE.
5. THE END OF THE CONNECTING PIPE SHALL NOT PROJECT INTO THE WATERWAY OF THE LARGER PIPE.
6. CONCRETE SHALL BE CLASS "A".

DRAWN BY: K. TRAN	CONCRETE LUG	SD-7
CHECKED BY: F. AMIN		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 35

CONNECTION TO PUBLIC STORM DRAIN SYSTEM

CASE A: CONNECTION TO MAINS LESS THAN 48" IN DIAMETER

1. Lateral connection shall require a manhole.
2. Lateral diameter shall be 12" or greater. A lateral diameter greater than 50% of the main diameter or greater than 18" shall require the review and approval of the City Engineer.
3. An accessible cleanout structure at the property line is NOT required.
4. A lateral that connects directly from an on-site collection system to a City manhole, shall be maintained by the owner of the serviced property.

CASE B: CONNECTION TO MAINS 48" IN DIAMETER OR GREATER

1. Lateral connection shall require a junction structure designed by a registered Civil Engineer.
2. Lateral diameter shall be 12" or greater. A lateral diameter greater than 50% of the main diameter or greater than 18" shall require the review and approval of the City Engineer.
3. An accessible cleanout structure at the property line is NOT required.
4. A lateral that connects directly from an on-site collection system to a City junction box, shall be maintained by the owner of the serviced property.

CASE C: CONNECTION OF PRIVATE PIPE SYSTEM TO STREET CATCH BASIN

1. Pipe connection shall be made at the back of the existing catch basin.
2. Pipe diameter shall not be less than 4" nor greater than 12".
3. Cleanout structure at the property line is NOT required.
4. Pipe from site to the catch basin shall be maintained by the owner of the serviced property.

CASE D: CURB FACE DRAINAGE OUTLET

1. A "Curb Face Drainage Outlet" (see Standard Details SD-1) may be used only at locations approved by the City Engineer.
2. The pipe shall be 3"-diameter galvanized steel.
3. The channel shall be 8" or wider by 3" high galvanized steel.
4. A cleanout structure at the property line is NOT required.
5. The "Curb Face Drainage Outlet" shall be maintained by the owner of the serviced property.

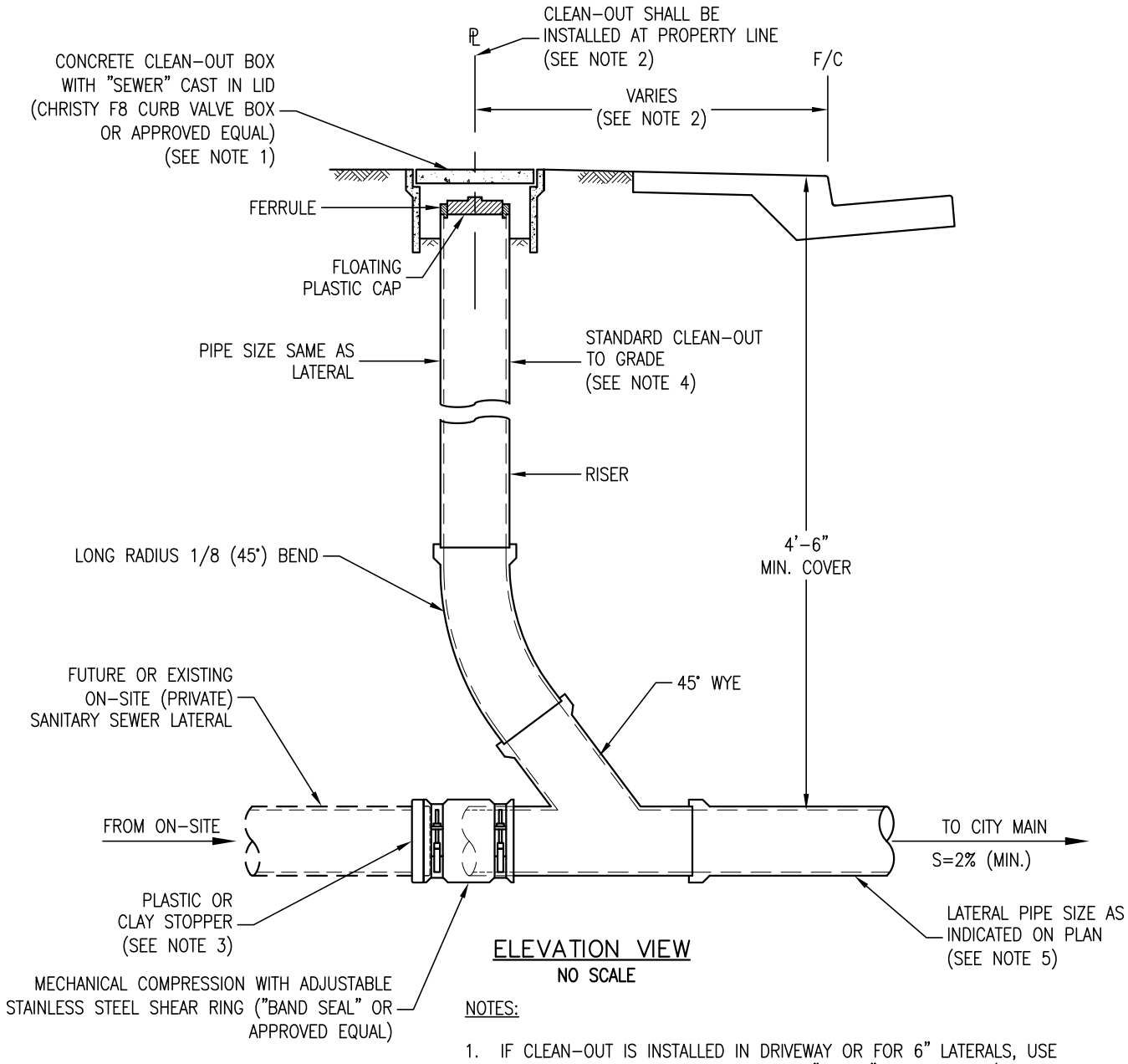
NOTE: Backflow preventive devices may be required by the City Engineer when it is determined that the potential for flooding due to the surcharge of the storm drainage system exists. These devices shall be located within the private property (outside the public right-of-way and City easements) and shall be maintained by the owner of the serviced property (see Design Criteria).

Department of Public Works
City of Santa Clara, CA

STANDARD DETAILS

SANITARY SEWER SECTION

DETAILS SS-1 TO SS-6



ELEVATION VIEW
NO SCALE

NOTES:

1. IF CLEAN–OUT IS INSTALLED IN DRIVEWAY OR FOR 6" LATERALS, USE CHRISTY G5 TRAFFIC VALVE BOX WITH "SEWER" CAST IN LID (OR APPROVED EQUAL). BOX SHALL HAVE A CONCRETE COLLAR. (SEE DETAIL DS–6 FOR DETAILS OF CONCRETE COLLAR)

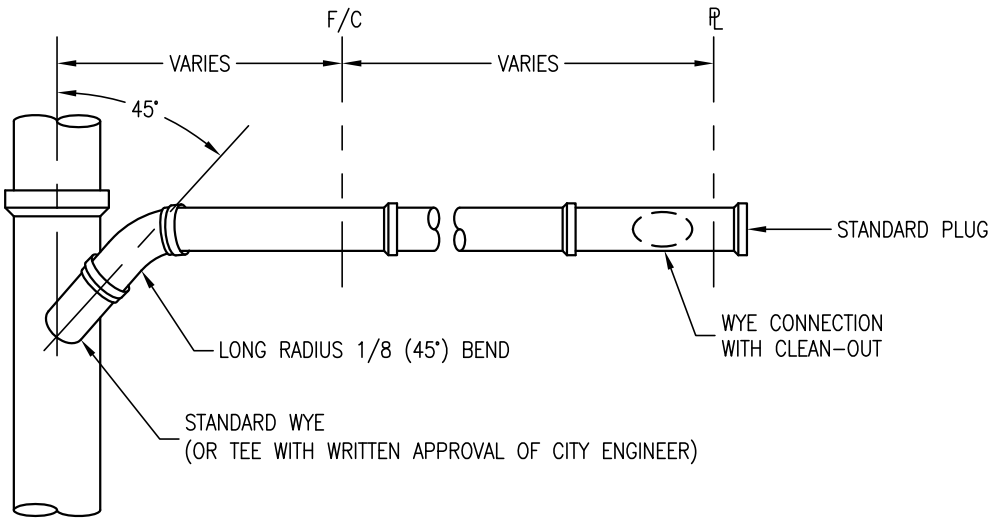
2. WHEN PROPERTY LINE IS AT BACK OF WALK, INSTALL CLEAN–OUT BEHIND BACK OF WALK.

3. PROVIDE STOPPER WHEN THERE IS NO ON–SITE LATERAL CONNECTION.

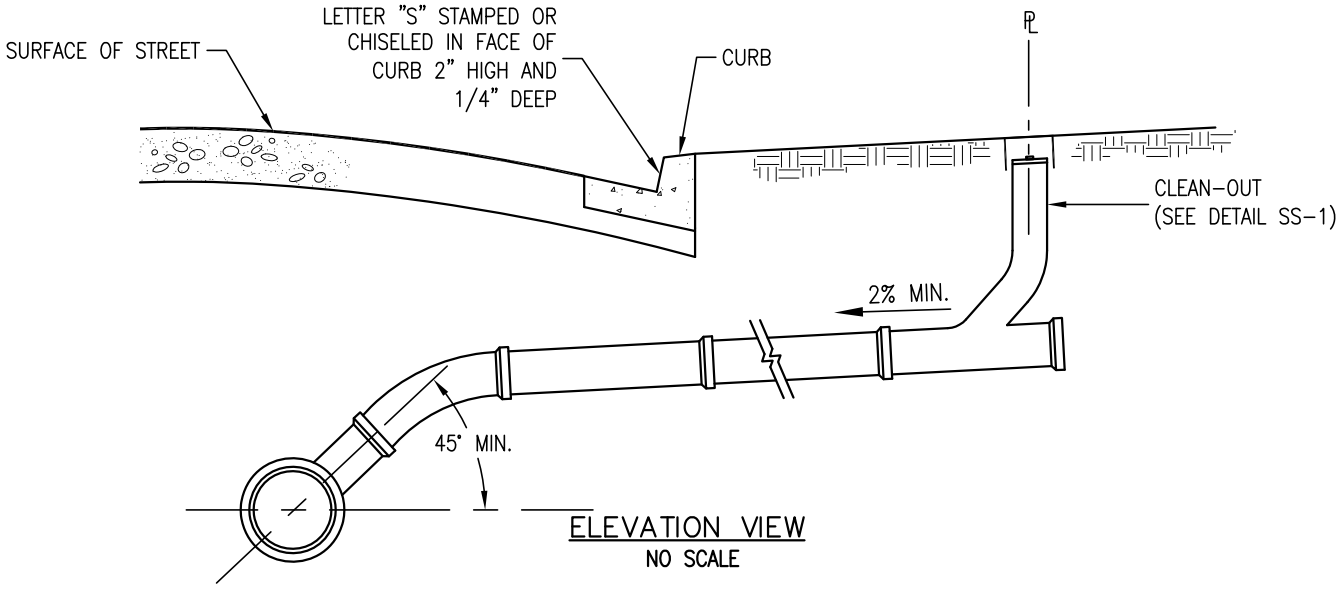
4. FOR NEW LATERALS, THE MATERIAL FOR THE CLEANOUT PIPE SHALL MATCH THE MATERIAL FOR THE LATERAL. SEE CITY'S SPECIFICATIONS FOR MATERIALS. FOR EXISTING LATERALS, THE REPAIR OR REPLACEMENT MATERIAL FOR THE CLEANOUT PIPE SHALL COMPLY WITH STANDARDS FROM THE LATEST EDITION OF THE CALIFORNIA PLUMPING CODE. USE APPROPRIATE COUPLINGS.

5. FOR 8" OR LARGER LATERALS, A STANDARD MANHOLE SHALL BE INSTALLED AT OR NEAR THE PROPERTY LINE.

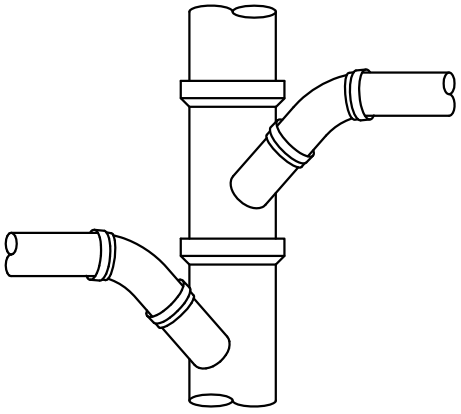
DRAWN BY: K. TRAN	4" & 6" SANITARY SEWER CLEAN-OUT	SS-1
CHECKED BY: F. AMIN		
APPROVED BY: G. GOMEZ		
DATE: DECEMBER 2014	CITY OF SANTA CLARA	PAGE: 37



PLAN VIEW
NO SCALE



ELEVATION VIEW
NO SCALE

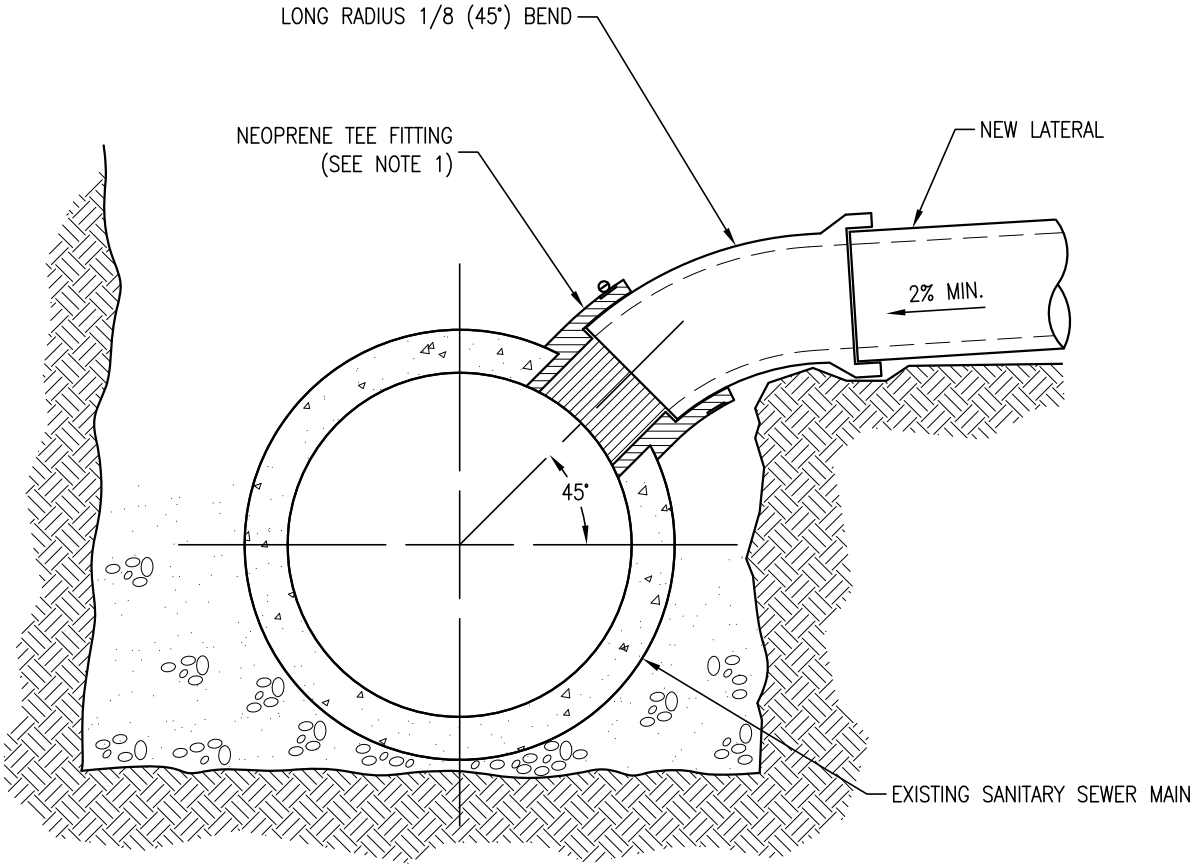


OPPOSITE LATERALS – PLAN VIEW
NO SCALE

NOTES:

1. IN NO CASE SHALL A LATERAL CONNECT TO THE SANITARY SEWER MAIN DIRECTLY ON TOP OF THE PIPE.
2. ONLY ONE CONNECTION MAY BE MADE IN EACH SECTION OF SANITARY SEWER MAIN.
3. SANITARY SEWER LATERALS SHALL HAVE A MINIMUM SLOPE OF 2%.
4. ALL LATERAL PIPE JOINTS SHALL BE COMPRESSION TYPE.
5. LATERAL SHALL EXTEND TO PROPERTY LINE UNLESS OTHERWISE NOTED, AND A CLEANOUT SHALL BE INSTALLED AT THE PROPERTY LINE. (SEE DETAIL SS–1)

DRAWN BY: K. TRAN	4" & 6" SANITARY SEWER LATERAL CONNECTION	SS-2
CHECKED BY: F. AMIN		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 38



NOTES:

1. SYNTHETIC RUBBER CONNECTION FITTING WITH WEDGED INSERT AND MECHANICALLLY TIGHTENED STAINLESS STEEL BAND. HOLE TO BE DRILLED WITH A POWER DRIVEN CUTTER PRODUCING A SMOOTH SURFACE ("TAP–TITE" OR APPROVED EQUAL).

2. THIS LATERAL TAP CONNECTION DETAIL SHALL BE APPLICABLE ONLY TO LATERALS WITH INSIDE PIPE DIAMETER OF 4" OR 6". LATERALS GREATER THAN 6" SHALL CONNECT TO MAINS IN MANHOLES.

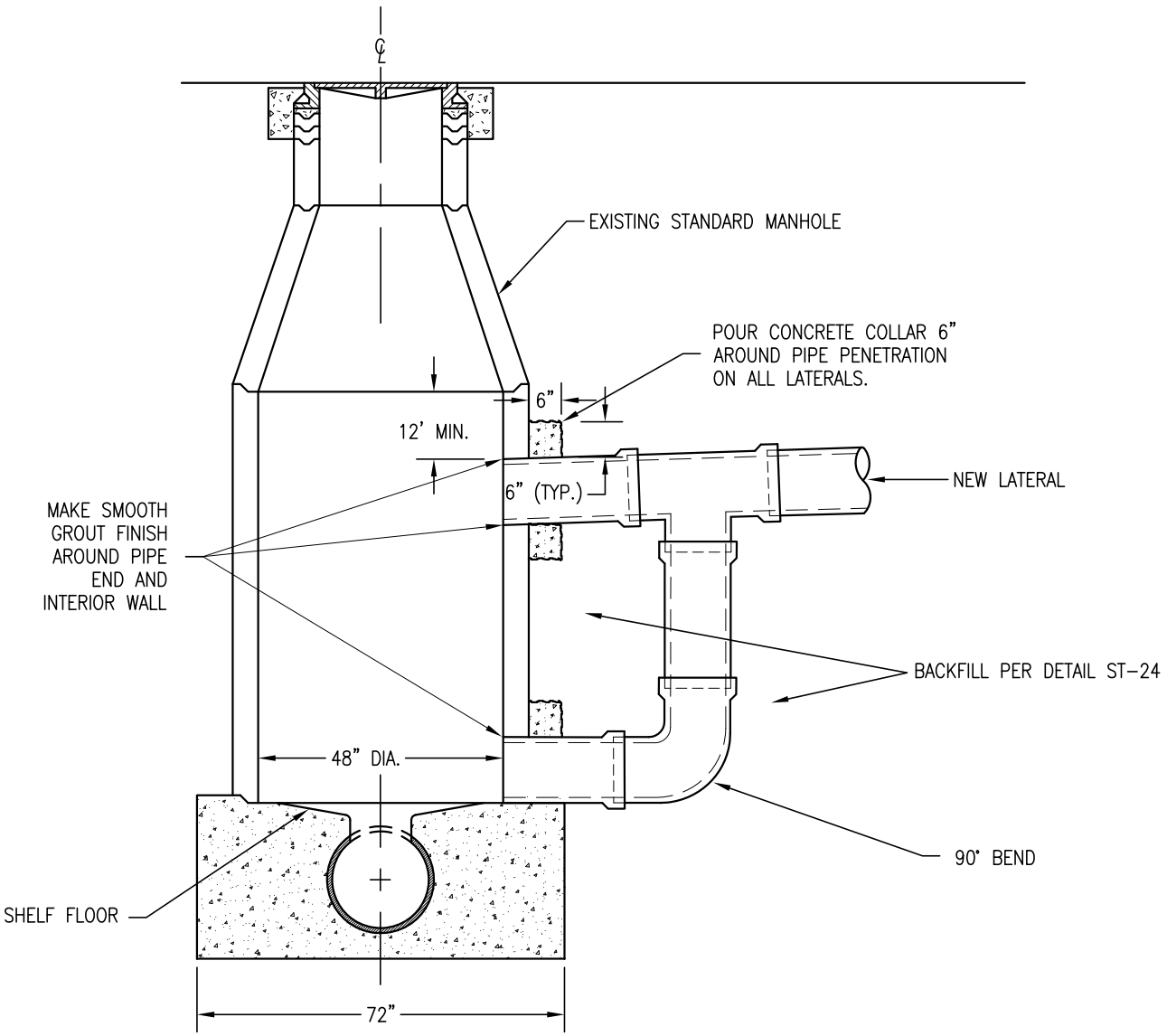
3. MORE THAN ONE LATERAL TAP CONNECTION IN ANY SECTION OF SANITARY SEWER MAIN IS SUBJECT TO THE WRITTEN APPROVAL OF THE CITY ENGINEER.

4. WHERE 6" LATERALS CONNECT TO 8" MAINS, OR 4" LATERALS CONNECT TO 6" MAINS, THE MAIN AND TEE FITTING SHALL BE ENCASED WITH CONCRETE TO A LEVEL OF THREE INCHES ABOVE THE TOP OF THE SANITARY SEWER MAIN.

5. IF THE SANITARY SEWER MAIN IS NOT IN SOUND CONDITION, THE ENTIRE SECTION OF THE MAIN SHALL BE REMOVED AND REPLACED, AND THE LATERAL SHALL BE CONNECTED PER CITY STANDARD "4" & 6" SANITARY SEWER LATERAL CONNECTION" (SEE DETAIL SS–2).

6. FOR 8" OR LARGER LATERALS, A STANDARD MANHOLE SHALL BE INSTALLED AT OR NEAR THE PROPERTY LINE.

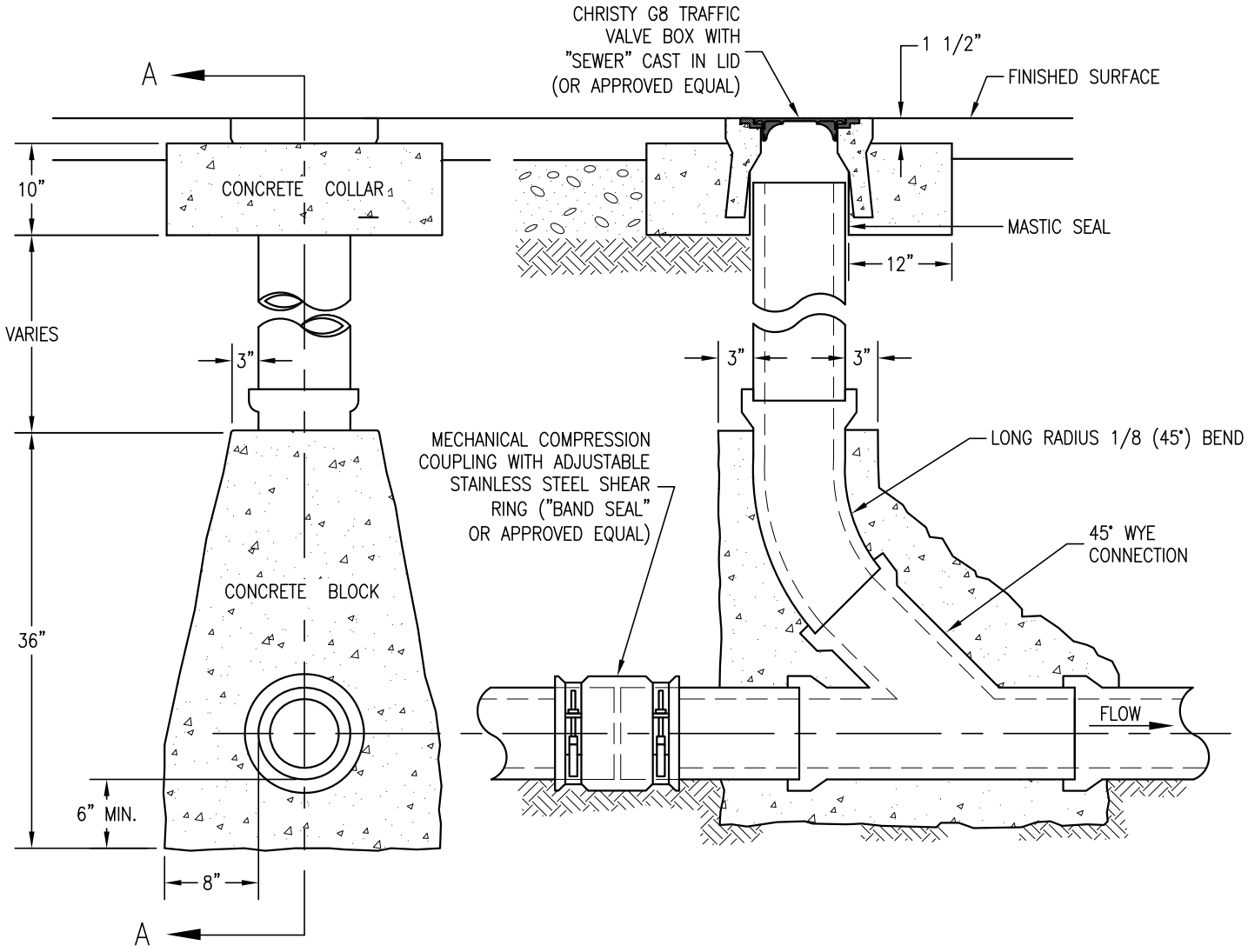
DRAWN BY: K. TRAN	4" & 6" SANITARY SEWER LATERAL CONNECTION TO EXISTING MAIN	SS-3
CHECKED BY: F. AMIN		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 39



ELEVATION VIEW
NO SCALE

NOTES:
1. NEW LATERAL MUST ENTER MANHOLE AT OR ABOVE THE SHELF FLOOR OF THE EXISTING MANHOLE.
2. USE OF DROP MANHOLE ALLOWED ONLY WITH WRITTEN APPROVAL OF CITY ENGINEER.

DRAWN BY: K. TRAN	STANDARD DROP MANHOLE	SS-4
CHECKED BY: F. AMIN		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 40

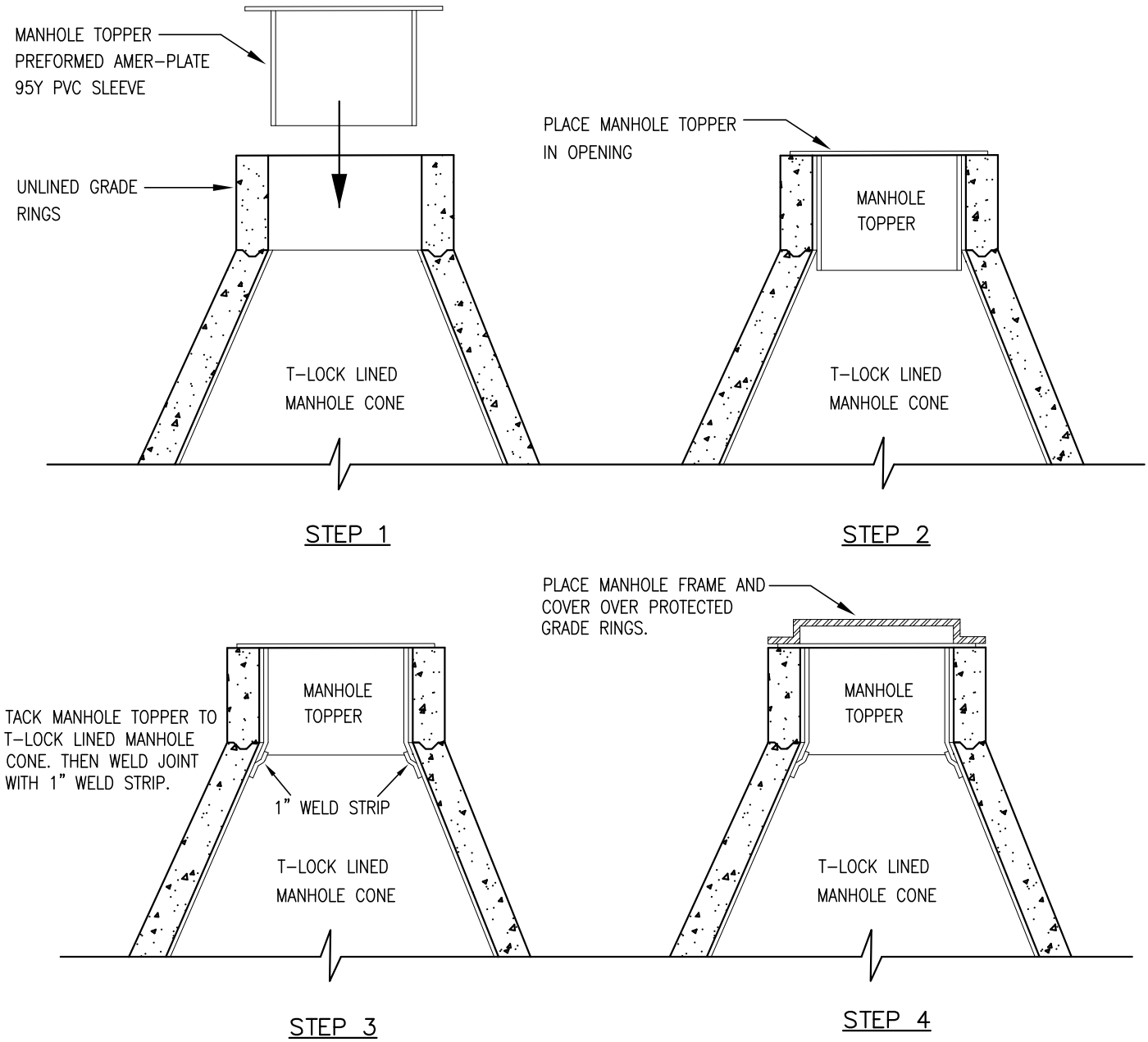


FRONT VIEW
NO SCALE

SECTION A–A
NO SCALE

NOTE: FLUSHING INLETS MAY BE USED ONLY WITH WRITTEN APPROVAL OF THE CITY ENGINEER.

DRAWN BY: K. TRAN	FLUSHING INLET	SS-5
CHECKED BY: F. AMIN		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 41



AMER-PLATE PROTECTION FOR GRADE RINGS

NOTE:

1. FOR LINING PRODUCTS, CONTACT AMERON INTERNATIONAL PROTECTIVE LINING PRODUCTS, 201 NORTH BERRY STREET, P.O. BOX 1629, BREA, CA 92822-1629, PHONE (714) 256-7755, FAX (714) 256-7750, OR APPROVED EQUAL.
2. ALL T-LOCK LINER JOINTS MUST BE WELDED WITH 1" WELD STRIP (TYP.)

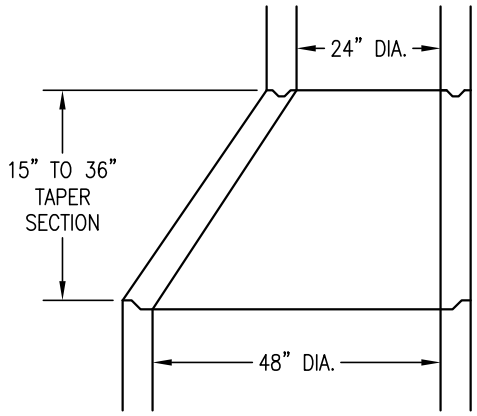
DRAWN BY: K. TRAN	SANITARY SEWER MANHOLE TOPPER	SS-6
CHECKED BY: F. AMIN		
APPROVED BY: G. GOMEZ		
DATE: DECEMBER 2014	CITY OF SANTA CLARA	PAGE: 42

Department of Public Works
City of Santa Clara, CA

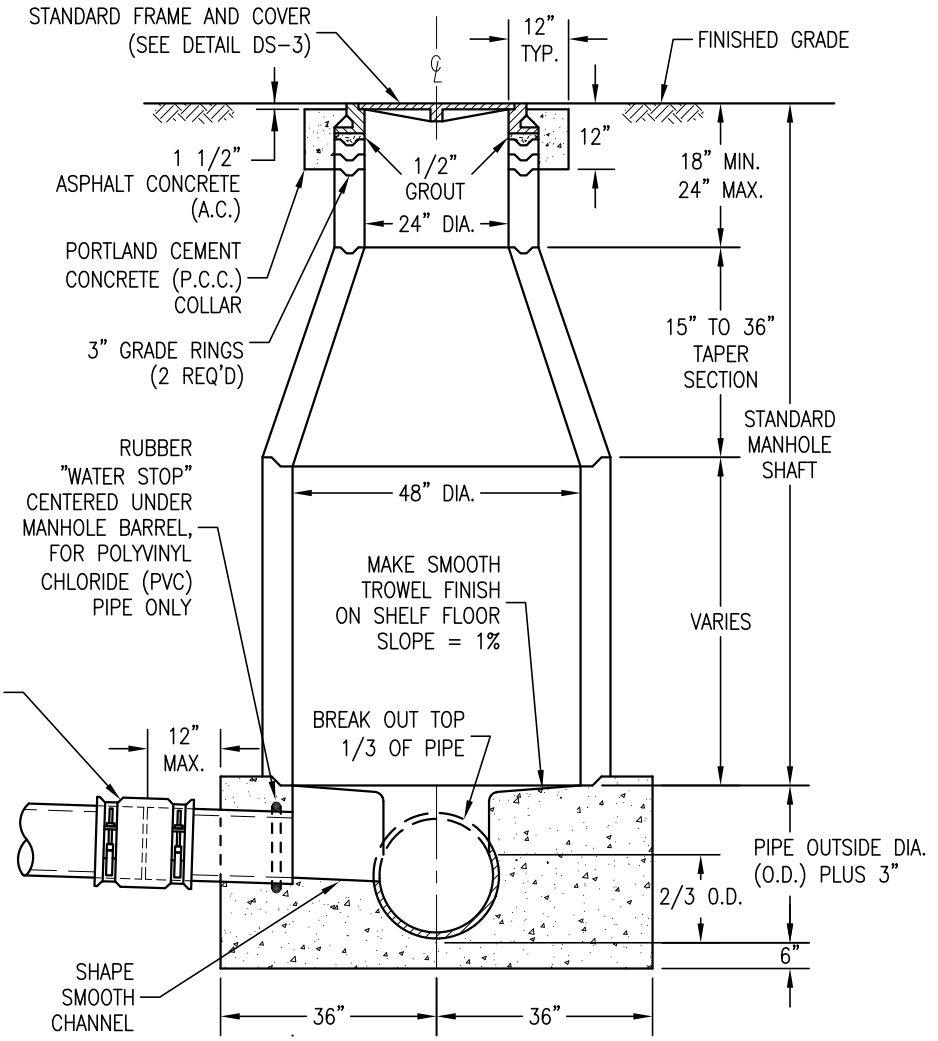
STANDARD DETAILS

DRAINAGE STRUCTURE SECTION

DETAILS DS-1 TO DS-6



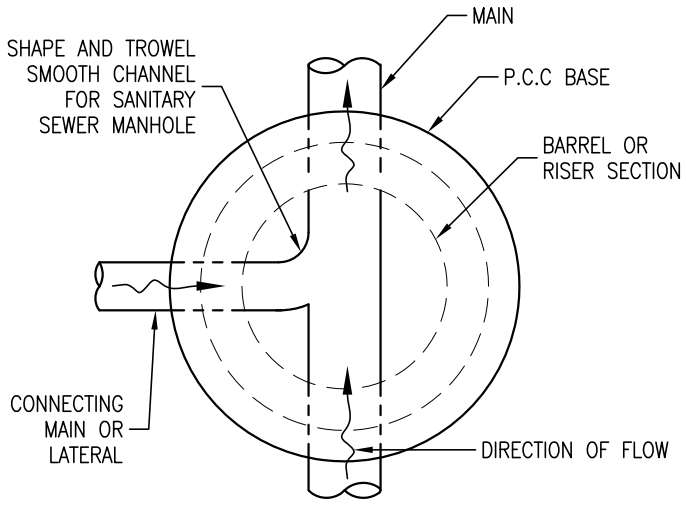
ECCENTRIC MANHOLE
(OPTION FOR STORM DRAIN MANHOLE ONLY)



CONCENTRIC MANHOLE – ELEVATION VIEW
NO SCALE

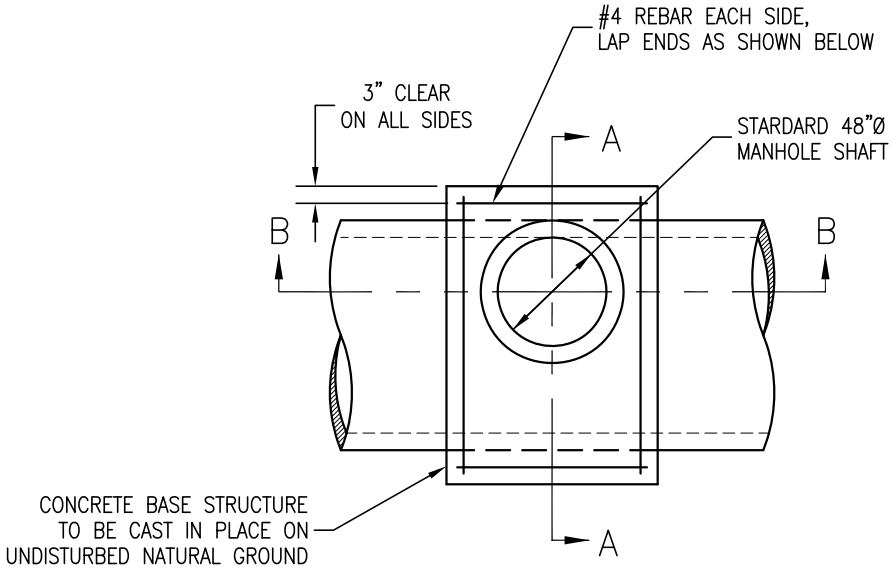
NOTES:

1. MANHOLE BASE SHALL BE POURED ON UNDISTURBED GROUND. IF OVER EXCAVATION OCCURS BELOW MANHOLE BASE, BACKFILL WITH CONCRETE. AN APPROVED 'IMPRESSION RING' MUST BE USED TO FORM KEYWAY FOR MANHOLE BARREL SECTION.
2. INTERSECTING LATERALS' AND MAINS' CROWNS SHALL MATCH.
3. ALL JOINTS SHALL BE SEALED WITH "RAMNEK" OR APPROVED EQUAL.
4. CENTER OF ECCENTRIC MANHOLE COVER SHALL BE LOCATED OVER THE CENTER OF THE MAIN ON THE UPSTREAM SIDE.
5. TYPE V PORTLAND CEMENT FOR SANITARY SEWER STRUCTURES AND TYPE II PORTLAND CEMENT FOR STORM DRAIN STRUCTURES.
6. BELL END OF PIPE SHALL BE 12" MAX. FROM WALL OF MANHOLE
7. THIS DESIGN IS USABLE FOR PIPES UP TO 39" DIA. ONLY.
8. ALL SANITARY SEWER MANHOLES SHALL BE LINED WITH INTEGRALLY LOCKING PVC (T-LOCK) OR APPROVED EQUAL. ALL T-LOCK LINER JOINTS MUST BE WELDED WITH 1" WELD STRIP. GRADE RINGS SHALL BE PVC LINED VIA THE MANHOLE TOPPER BY AMERON OR APPROVED EQUAL. SEE DETAIL SS-6.
9. BACKFILL AROUND THE MANHOLE AND ANY NEW OR EXISTING PIPE CONNECTION(S) SHALL CONFORM TO DETAIL ST-24.

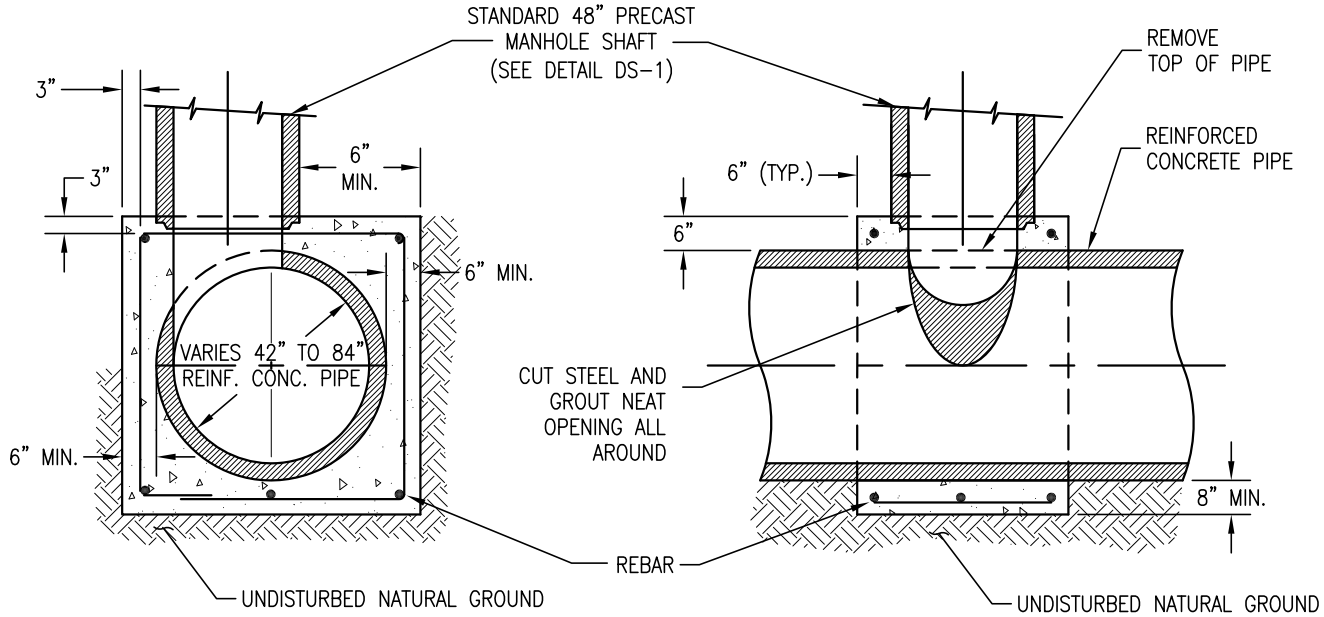


BOTTOM VIEW
NO SCALE

DRAWN BY: K. TRAN			
CHECKED BY: F. AMIN	MANHOLE	DS-1	
APPROVED BY: F. AMIN			
DATE: JANUARY 2016	CITY OF SANTA CLARA	PAGE: 43	



PLAN VIEW
NO SCALE



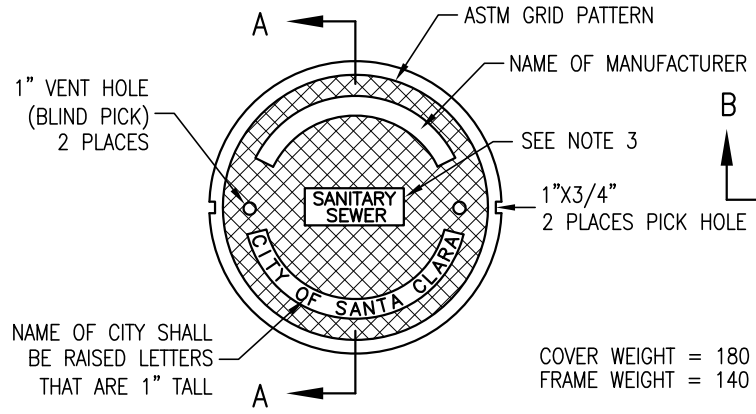
SECTION A–A
NO SCALE

SECTION B–B
NO SCALE

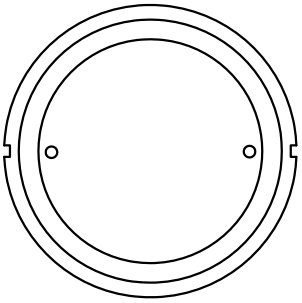
NOTES:

1. MANHOLE SHAFT SHALL BE CENTERED AT MID–LENGTH OF PIPE SECTION.
2. DETAIL NOT APPLICABLE WHERE PIPE DEFLECTION OCCURS AT MANHOLE. SPECIAL MANHOLE BASE DETAIL REQUIRED IF LOCATED AT PIPE JOINT.
3. ALL JOINTS SHALL BE SEALED WITH "RAMNEK" OR APPROVED EQUAL.
4. BACKFILL AROUND THE MANHOLE AND ANY NEW OR EXISTING PIPE CONNECTION(S) SHALL CONFORM TO DETAIL ST–24.

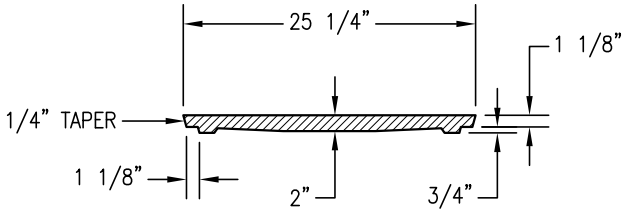
DRAWN BY: K. TRAN	TYPE "A" MANHOLE	DS-2
CHECKED BY: F. AMIN		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 44



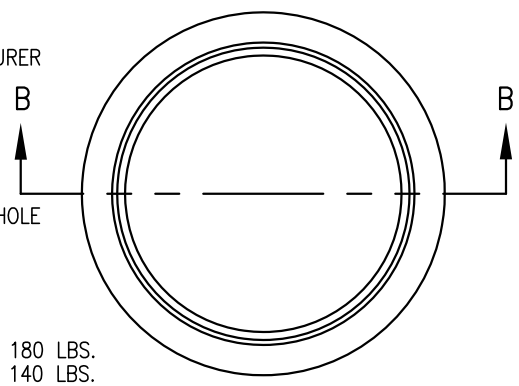
MANHOLE COVER – PLAN VIEW
NO SCALE



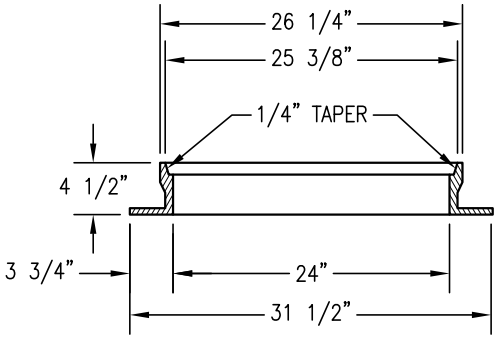
MANHOLE COVER – BOTTOM VIEW
NO SCALE



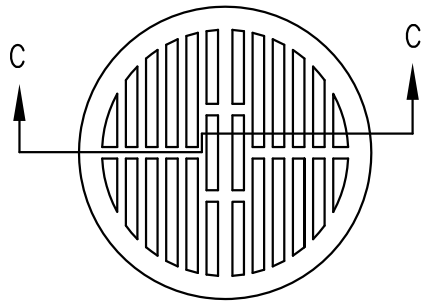
SECTION A–A
NO SCALE



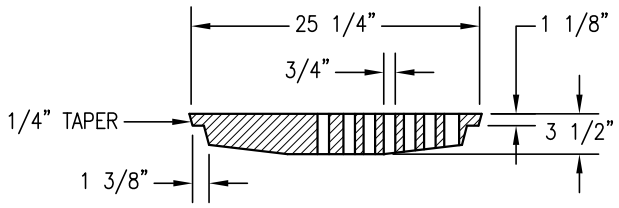
MANHOLE FRAME – PLAN VIEW
NO SCALE



SECTION B–B
NO SCALE



MANHOLE GRATE – PLAN VIEW
NO SCALE

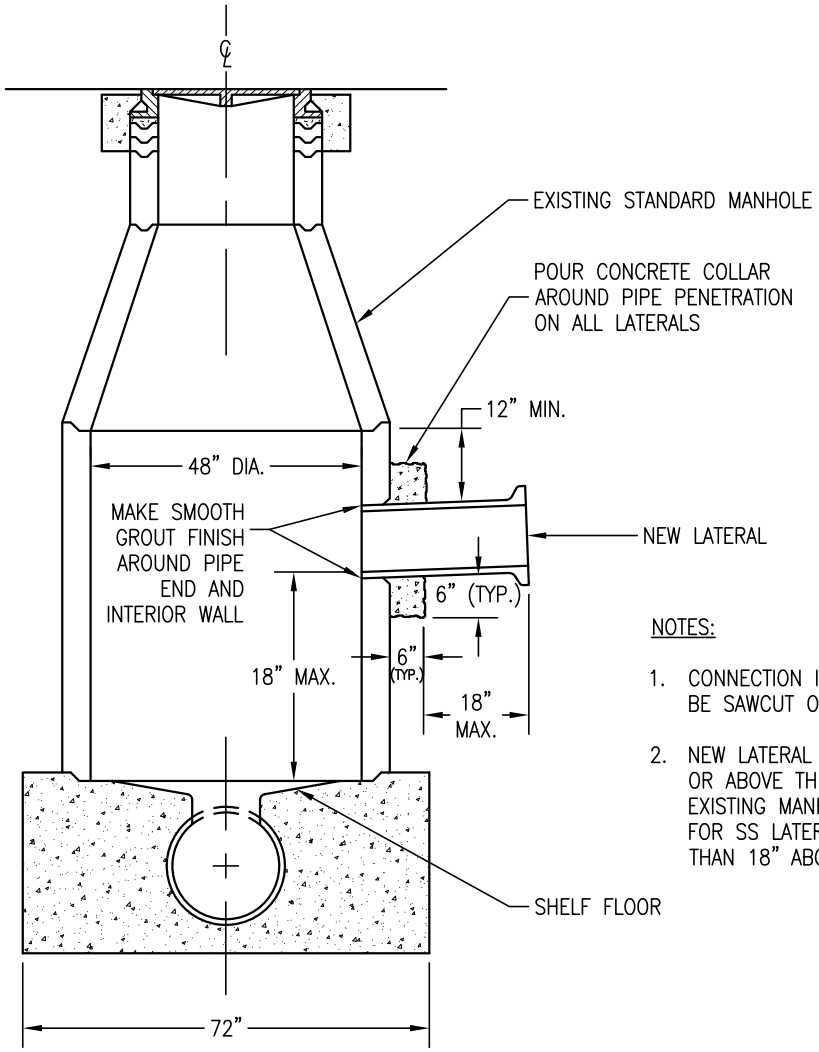


SECTION C–C
NO SCALE

NOTES:

1. ALL MATERIAL TO BE CAST IRON DIPPED IN ASPHALT PAINT.
2. FRAME, GRATE AND COVER SHALL BE SUITABLE FOR H–20 LOADING.
3. COVER SHALL HAVE EITHER "SANITARY SEWER" FOR SANITARY SEWERS OR "STORM DRAIN" FOR STORM DRAINS IN RAISED LETTERS THAT ARE 1–1/2" TALL.

DRAWN BY: K. TRAN	MANHOLE FRAME, COVER AND GRATE	DS-3
CHECKED BY: F. AMIN		
APPROVED BY: G. GOMEZ		
DATE: DECEMBER 2014	CITY OF SANTA CLARA	PAGE: 45

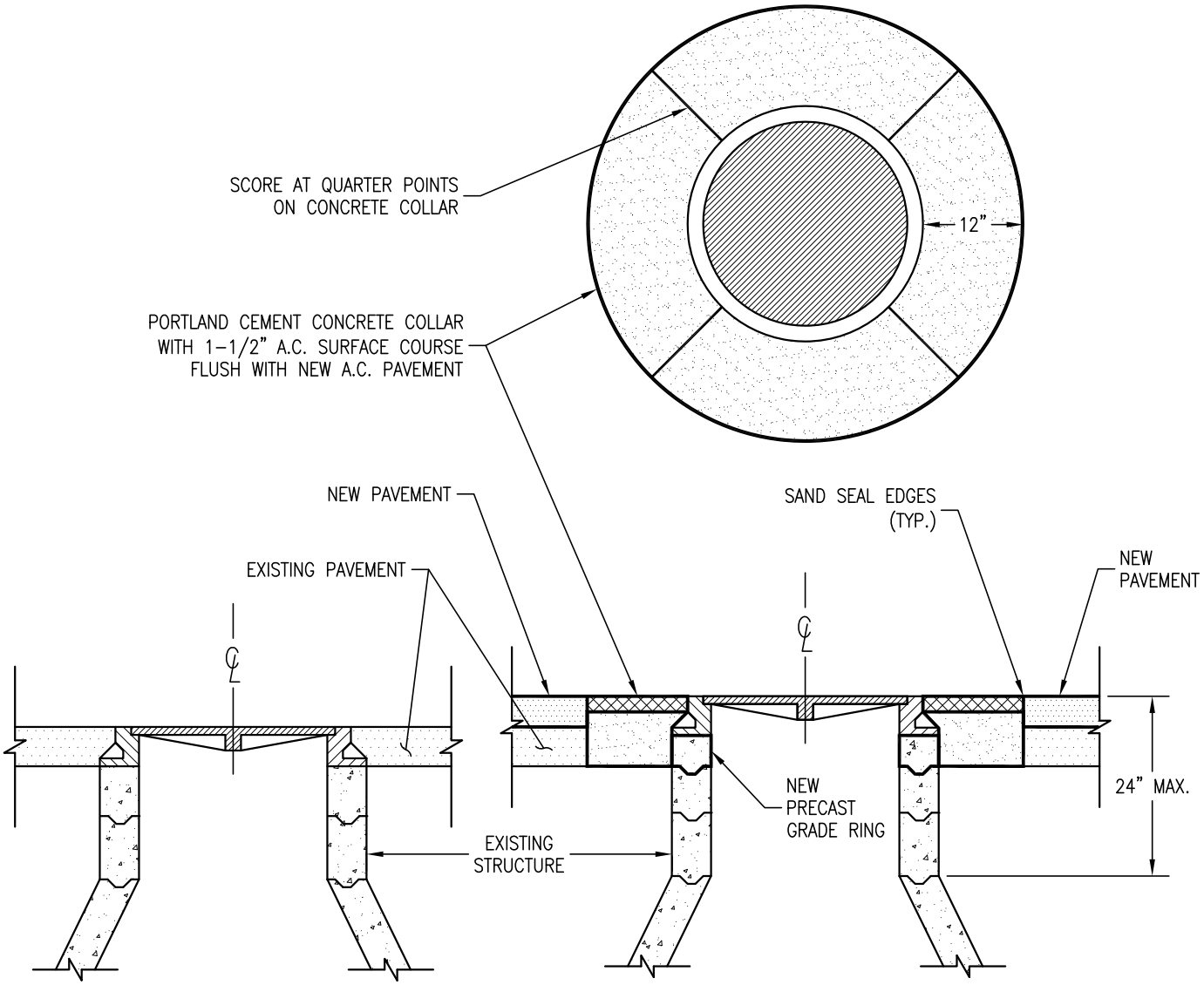


ELEVATION VIEW
NO SCALE

NOTES:

1. CONNECTION INTO MANHOLE BARREL SHALL BE SAWCUT OR CORE DRILLED.
2. NEW LATERAL MUST ENTER MANHOLE AT OR ABOVE THE SHELF FLOOR OF THE EXISTING MANHOLE. SEE DETAIL SS-4 FOR SS LATERAL CONNECTION GREATER THAN 18" ABOVE MANHOLE SHELF FLOOR.

DRAWN BY: K. TRAN	LATERAL CONNECTION TO EXISTING MANHOLE	DS-4
CHECKED BY: F. AMIN		
APPROVED BY: G. GOMEZ		
DATE: DECEMBER 2014	CITY OF SANTA CLARA	PAGE: 46



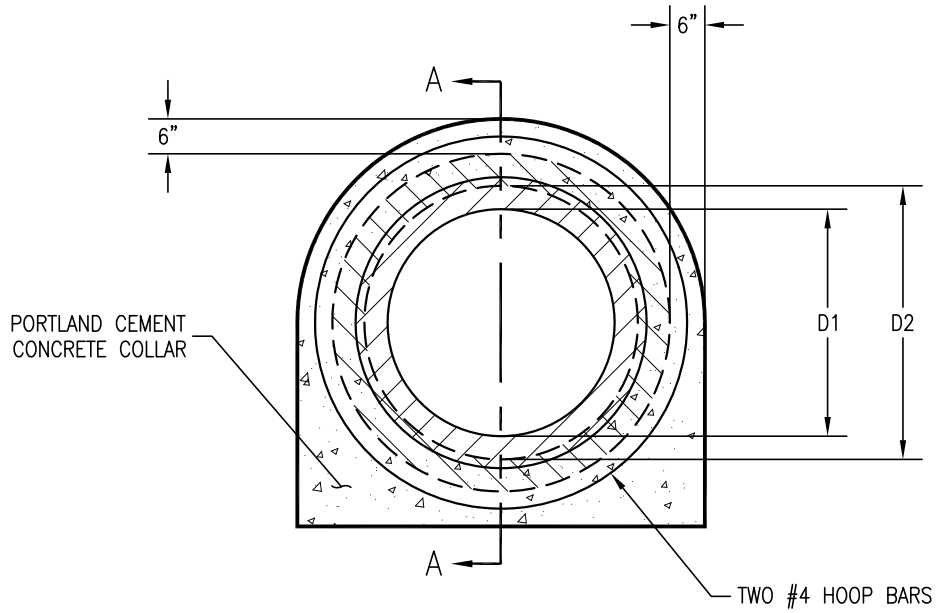
EXISTING MANHOLE
NO SCALE

RAISED MANHOLE
NO SCALE

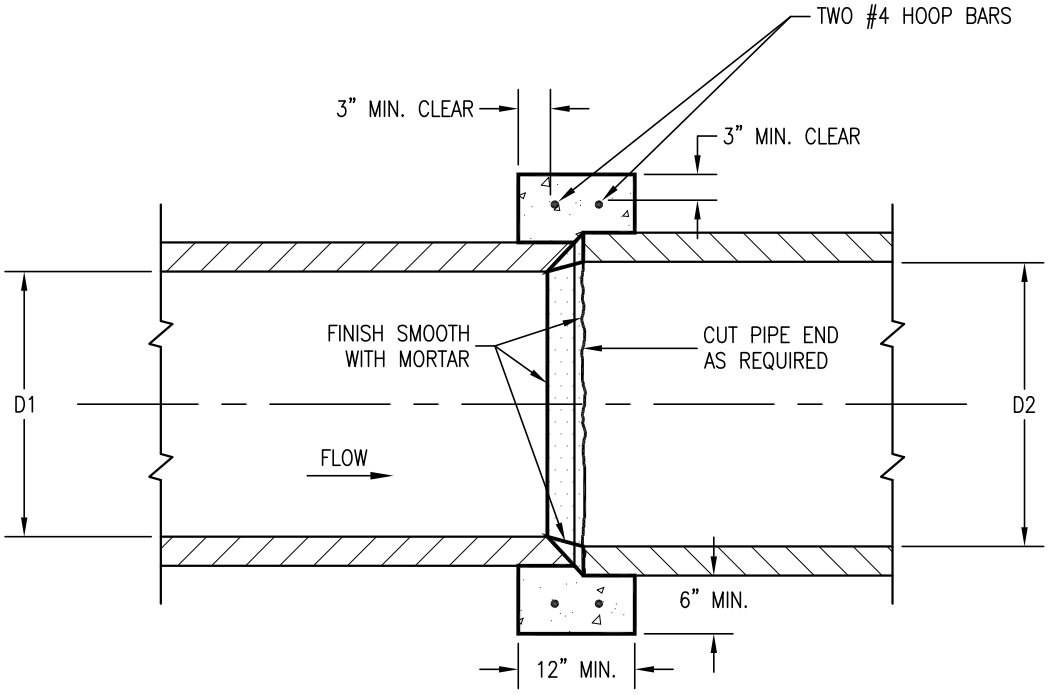
NOTE:

EXISTING FRAME AND COVER TO BE USED
UNLESS OTHERWISE DIRECTED BY THE ENGINEER.

DRAWN BY: K. TRAN	MANHOLE RAISING	DS-5
CHECKED BY: F. AMIN		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 47



ELEVATION VIEW
NO SCALE



SECTION A–A
NO SCALE

NOTES:

1. PIPE COLLAR MAY BE USED ONLY WITH WRITTEN APPROVAL OF THE CITY ENGINEER.
2. PIPE COLLAR MAY BE USED IN JOINING PIPES WITH INCOMPATIBLE (NON–MATING) JOINTS, WHERE: D2 $\geq$ D1 AND D2 $\leq$ (D1 + 3").
3. PIPE COLLAR DOES NOT HAVE TO BE FINISHED IF COVERED, BUT MUST HAVE A MINIMUM OF 6" OF CONCRETE AROUND JOINT.

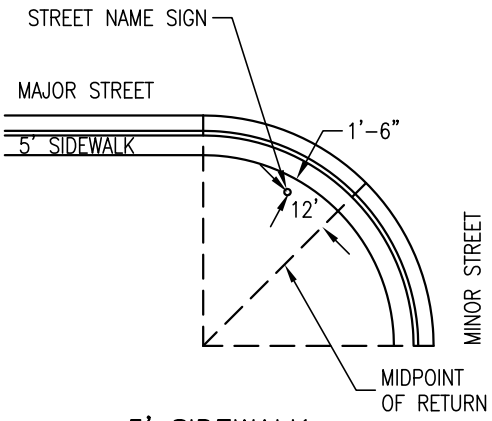
DRAWN BY: K. TRAN	CONCRETE COLLAR	DS-6
CHECKED BY: F. AMIN		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 48

Department of Public Works
City of Santa Clara, CA

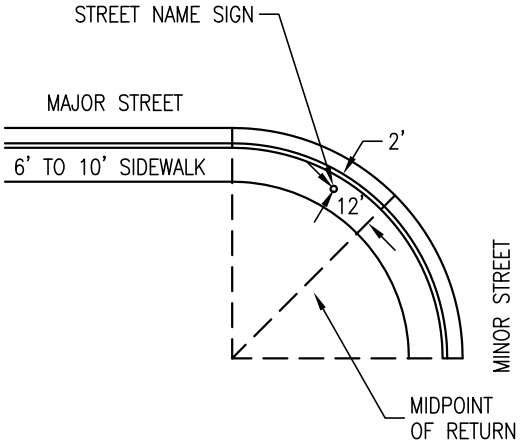
STANDARD DETAILS

TRAFFIC SECTION

DETAILS TR-1 TO TR-8



5' SIDEWALK



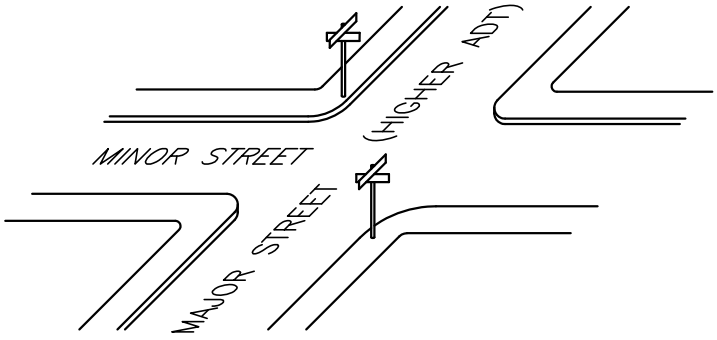
6' TO 10' SIDEWALK

STREET NAME SIGN LOCATION DETAILS

NO SCALE

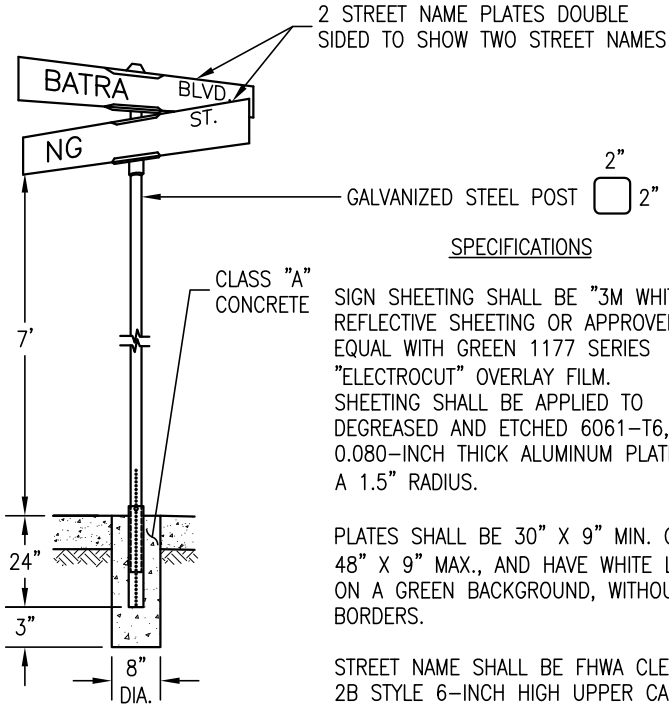
NOTES:

1. TWO STREET NAME SIGNS LOCATED DIAGONALLY ACROSS FROM EACH OTHER ARE REQUIRED WHERE ONE OF THE TWO INTERSECTING STREETS' WIDTH (CURB TO CURB) IS 64' OR MORE.
2. ONLY ONE STREET NAME SIGN IS REQUIRED IF BOTH INTERSECTING STREETS' WIDTHS (CURB TO CURB) ARE LESS THAN 64'.
3. PRIVATE STREET NAME SIGN SHALL BE WHITE LETTERING ON BROWN BACKGROUND AND SHALL BE PLACED OUTSIDE PUBLIC ROW.

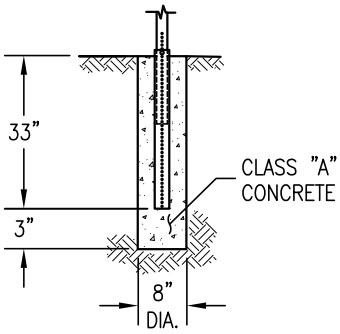


TYPICAL STREET NAME SIGN LOCATIONS

NO SCALE



FOOTING IN SIDEWALK



FOOTING IN DIRT

SPECIFICATIONS

SIGN SHEETING SHALL BE "3M WHITE HIP" REFLECTIVE SHEETING OR APPROVED EQUAL WITH GREEN 1177 SERIES "ELECTROCUT" OVERLAY FILM. SHEETING SHALL BE APPLIED TO DEGREASED AND ETCHED 6061-T6, 0.080-INCH THICK ALUMINUM PLATE WITH A 1.5" RADIUS.

PLATES SHALL BE 30" X 9" MIN. OR 48" X 9" MAX., AND HAVE WHITE LETTERS ON A GREEN BACKGROUND, WITHOUT BORDERS.

STREET NAME SHALL BE FHWA CLEARVIEW 2B STYLE 6-INCH HIGH UPPER CASE LETTERS WITH CORRESPONDING LOWER CASE LETTERS. 2.5-INCH LETTERS SHALL BE USED FOR "AVE., BLVD., CT., DR., PL., RD., ST., LN." "WAY" SHALL NOT BE ABBREVIATED.

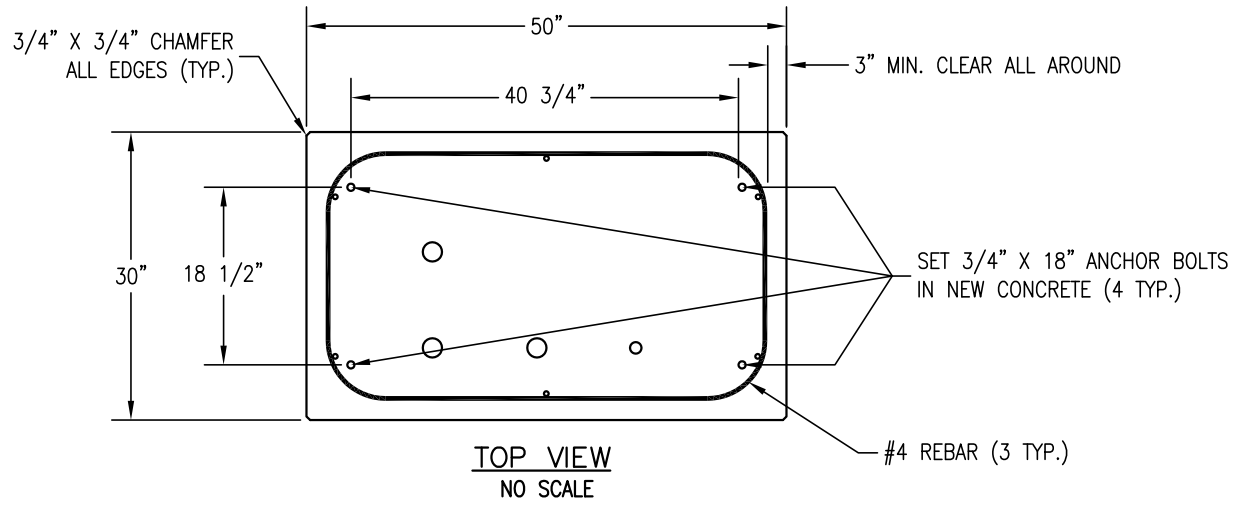
ASSEMBLY HARDWARE SHALL BE "WESTERN HIGHWAY PRODUCTS" (WHP) NO. (812F/12" FOR FLAT BLADES) OR NO. (812F-90% CROSSPIECE FOR FLAT BLADES) OR APPROVED EQUAL.

2" X 2" GALVANIZED STEEL POST SHALL BE INSTALLED WITH WHP "ANCHOR-MATE" SIGN POST SUPPORT ANCHOR OR APPROVED EQUAL.

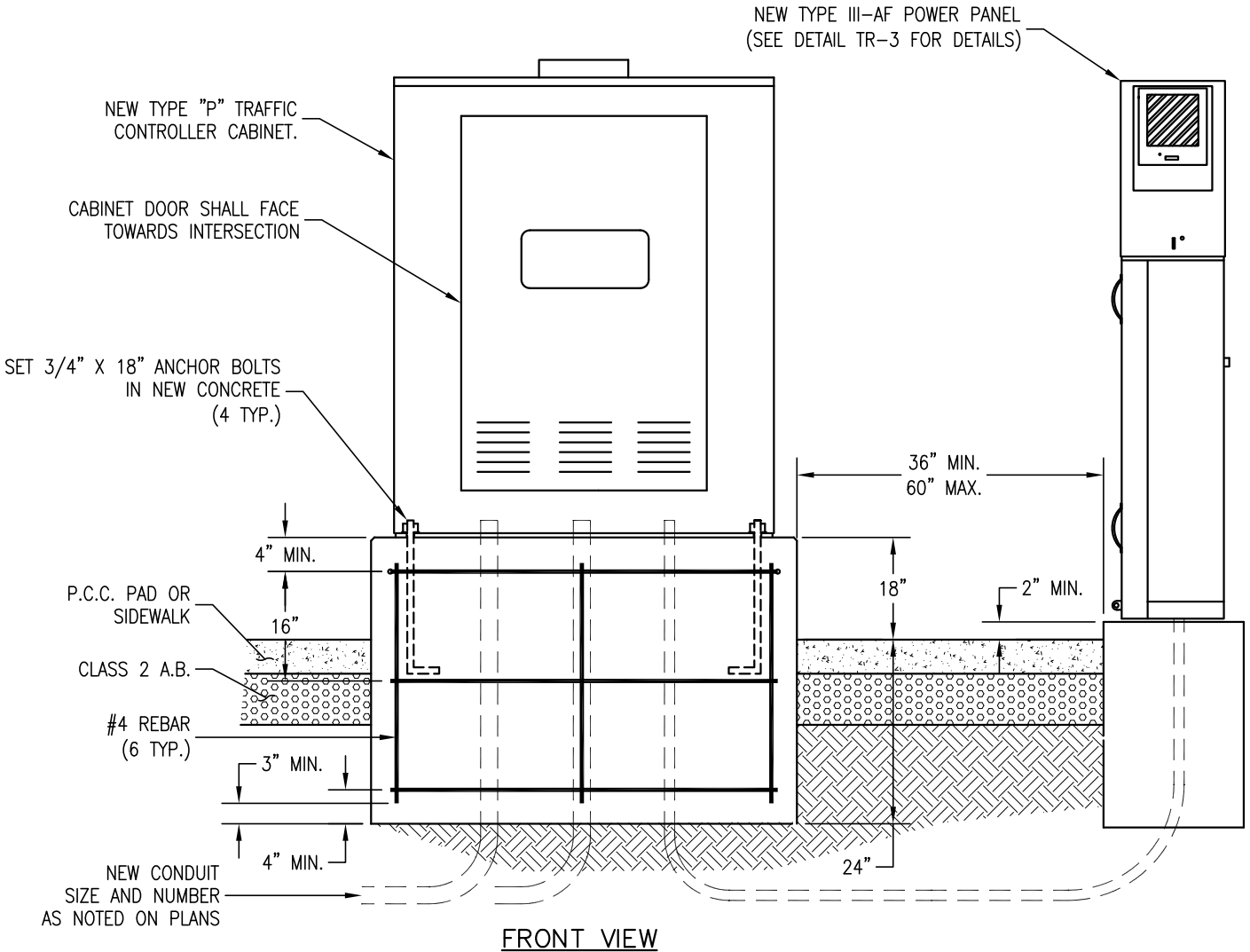
STREET NAME SIGN

NO SCALE

DRAWN BY: K. TRAN	STREET NAME SIGN AND LOCATION	TR-1
CHECKED BY: P. BHATIA		
APPROVED BY: D. NG		
DATE: OCTOBER 2015	CITY OF SANTA CLARA	PAGE: 49



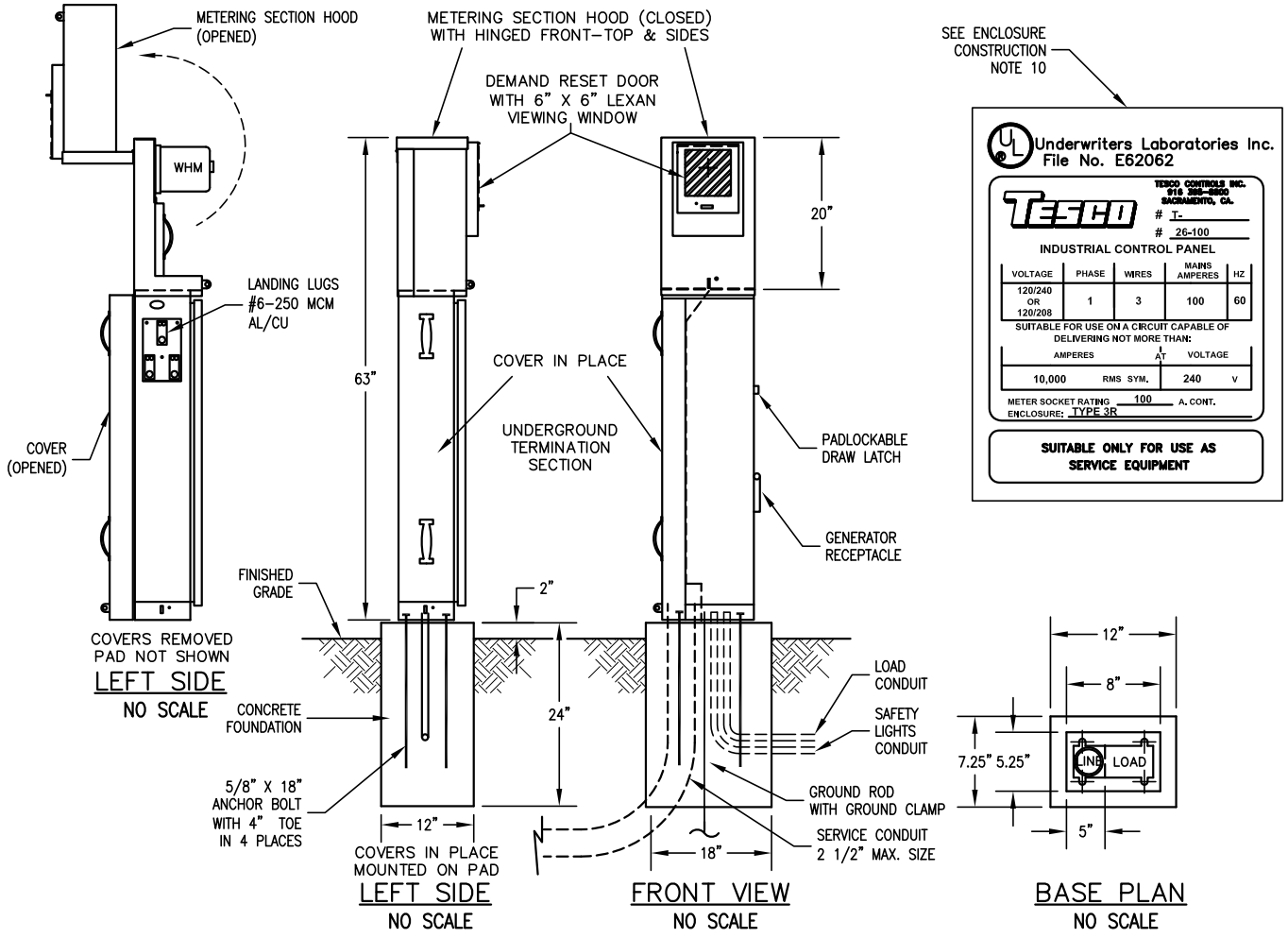
TOP VIEW
NO SCALE

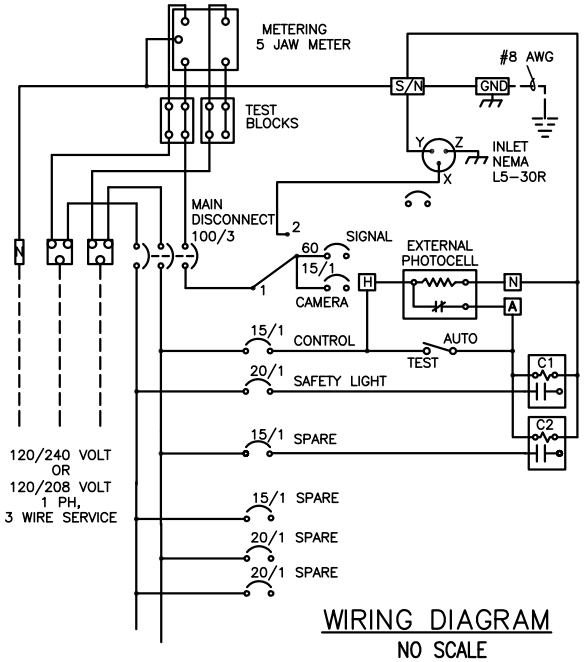


FRONT VIEW
NO SCALE

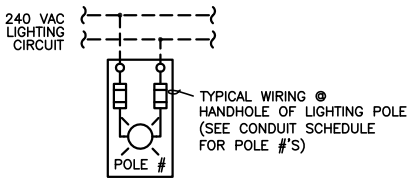
NOTE: GROUND ROD TO BE IN PULL BOX NEXT TO CABINET.

DRAWN BY: K. TRAN	TRAFFIC SIGNAL CONTROLLER CABINET	TR-2
CHECKED BY: B. TRAN		
APPROVED BY: D. NG		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	DATE: 50





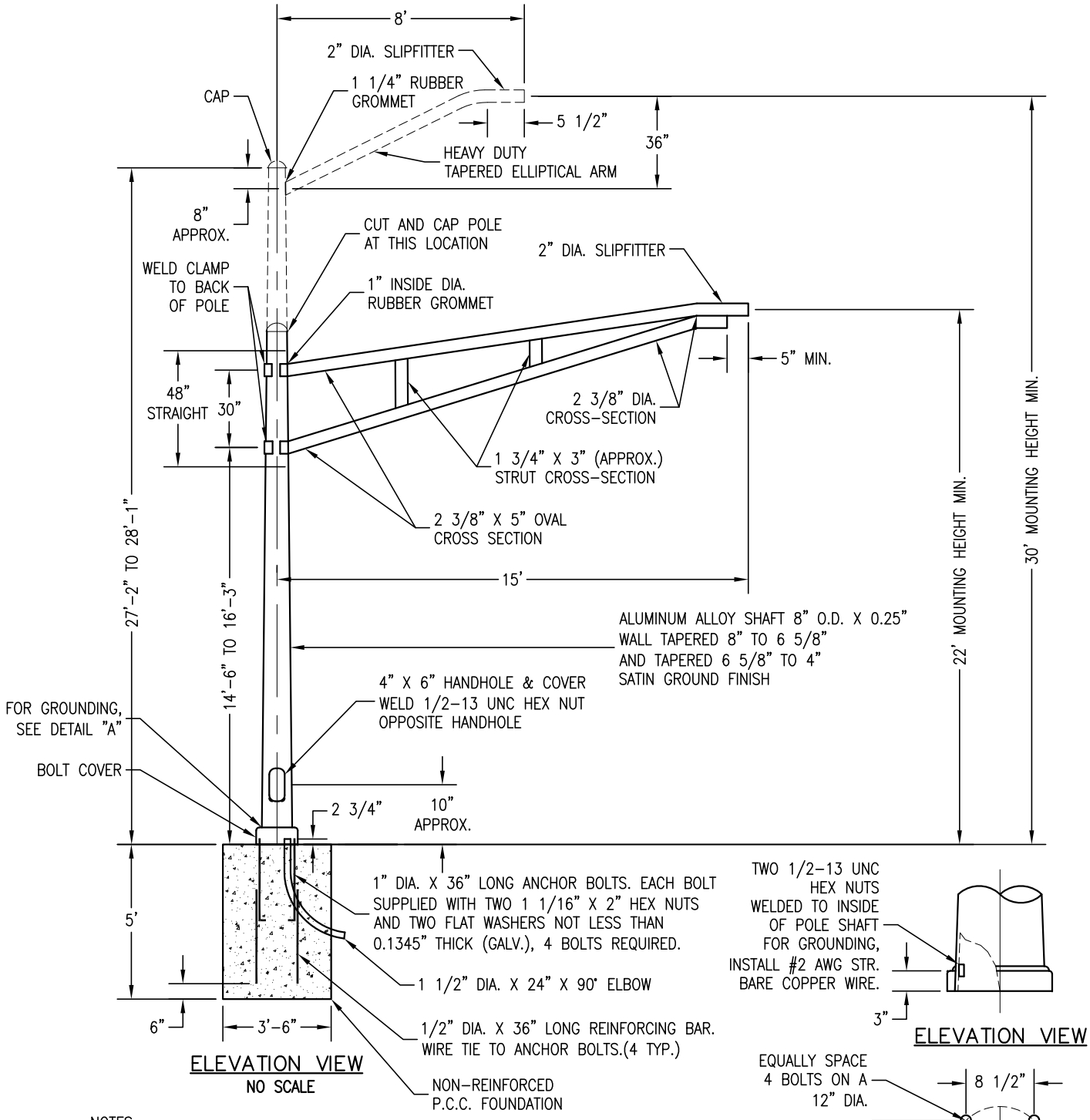
WIRING DIAGRAM
NO SCALE



ENCLOSURE CONSTRUCTION NOTES:

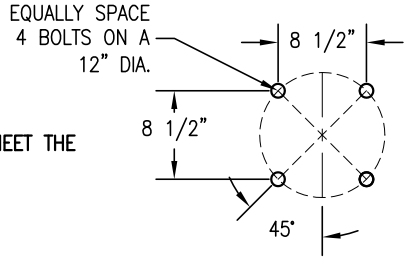
1. FABRICATED FROM 1/8" ALUMINUM SHEET STOCK ELECTRICALLY WELDED AND REINFORCED WHERE REQUIRED.
2. CONSTRUCTION WILL BE NEMA 3R AND 12, RAINTIGHT AND DUST TIGHT.
3. ALL NUTS, BOLTS, SCREWS AND HINGES SHALL BE STAINLESS STEEL.
4. NUTS, BOLTS & SCREWS SHALL NOT BE VISIBLE FROM OUTSIDE OF ENCLOSURE.
5. PHENOLIC NAMEPLATES SHALL BE PROVIDED AS REQUIRED.
6. CONTROL WIRING SHALL BE MARKED AT BOTH ENDS BY PERMANENT WIRE MARKERS.
7. A PLASTIC COVERED WIRING DIAGRAM SHALL BE ATTACHED TO THE INSIDE OF THE FRONT DOOR.
8. ENCLOSURE WILL BE FACTORY WIRED AND CONFORM TO REQUIRED NEMA STANDARD.
9. FINISH: ANODIZED ALUMINUM
10. PANEL SHALL BE TESCO TYPE III AF OR APPROVED EQUAL.

DRAWN BY: K. TRAN	**TRAFFIC SIGNAL POWER PANEL**	TR-3
CHECKED BY: B. TRAN		
APPROVED BY: D. NG		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 51



ELEVATION VIEW
NO SCALE

ELEVATION VIEW



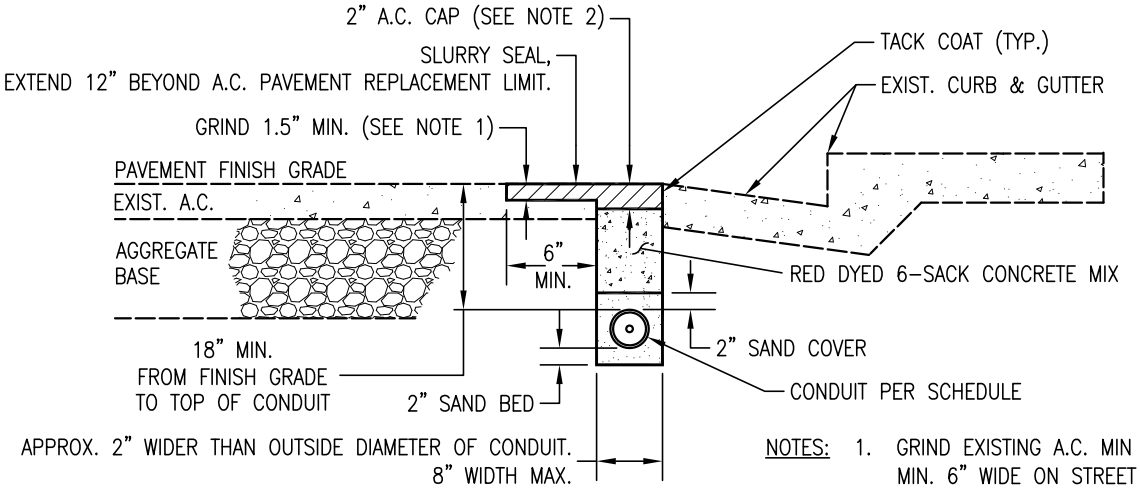
BOTTOM VIEW

DETAIL "A"
NO SCALE

NOTES:

1. **THIS DETAIL IS ONLY FOR MAINTENANCE REFERENCE. NEW TRAFFIC SIGNAL POLES SHALL MEET THE LATEST CALTRANS STANDARDS.**
2. THE POLE SHALL BE FURNISHED WITH GROUNDING CONNECTORS, ANCHOR BOLTS, NUTS, WASHERS, AND BOLT COVER.
3. IF FOUNDATION IS PLACED IN SIDEWALK, PLACE THE FOUNDATION TOP WITHIN 4" OF SIDEWALK SURFACE. REMAINDER OF FOUNDATION SHALL BE PLACED WHEN SIDEWALK IS INSTALLED.
4. IF FOUNDATION IS PLACED AT BACK OF SIDEWALK OR IN DIRT, FINISH TOP 6" TO 42" X 42" SQUARE.

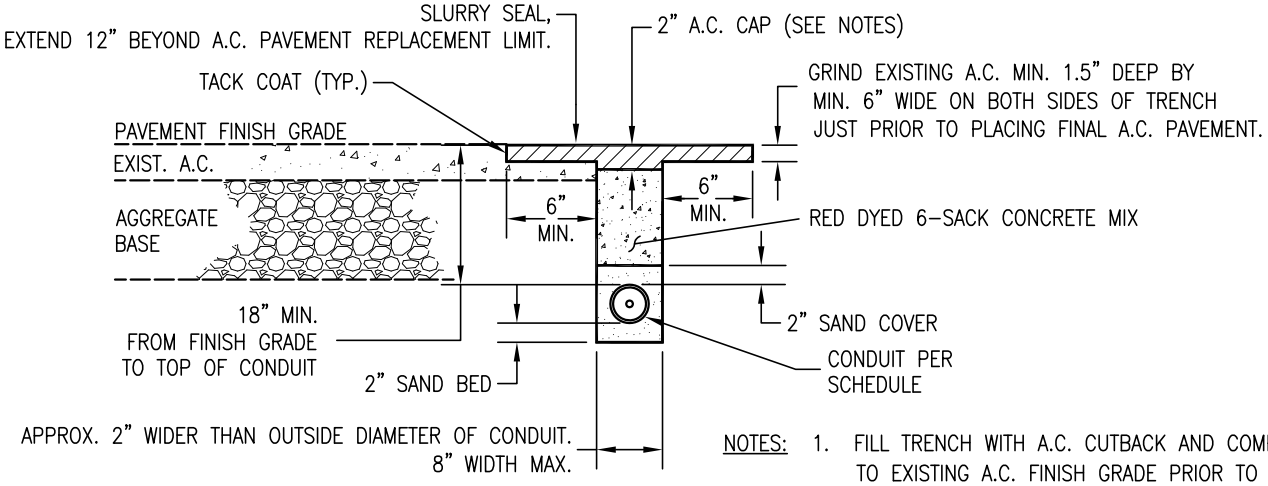
DRAWN BY: K. TRAN			
CHECKED BY: B. TRAN	TYPE III POLE		TR-4
APPROVED BY: D. NG			
DATE: OCTOBER 2013	CITY OF SANTA CLARA		PAGE: 52



TRENCH AT LIP OF GUTTER

NO SCALE

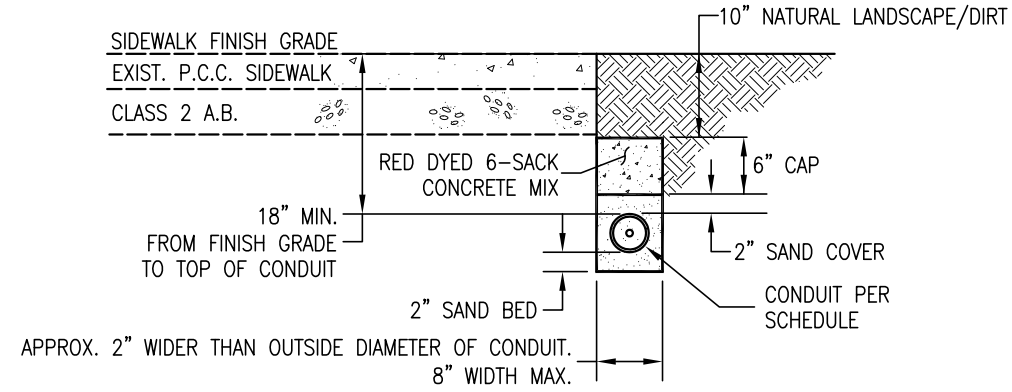
NOTES:
1. GRIND EXISTING A.C. MIN 1.5" DEEP BY MIN. 6" WIDE ON STREET SIDE OF TRENCH JUST PRIOR TO PLACING FINAL A.C. PAVEMENT.
2. FINAL A.C. PAVEMENT SHALL BE PLACED WITHIN 5 WORKING DAYS OF EXCAVATION.



TRENCH IN ROADWAY

NO SCALE

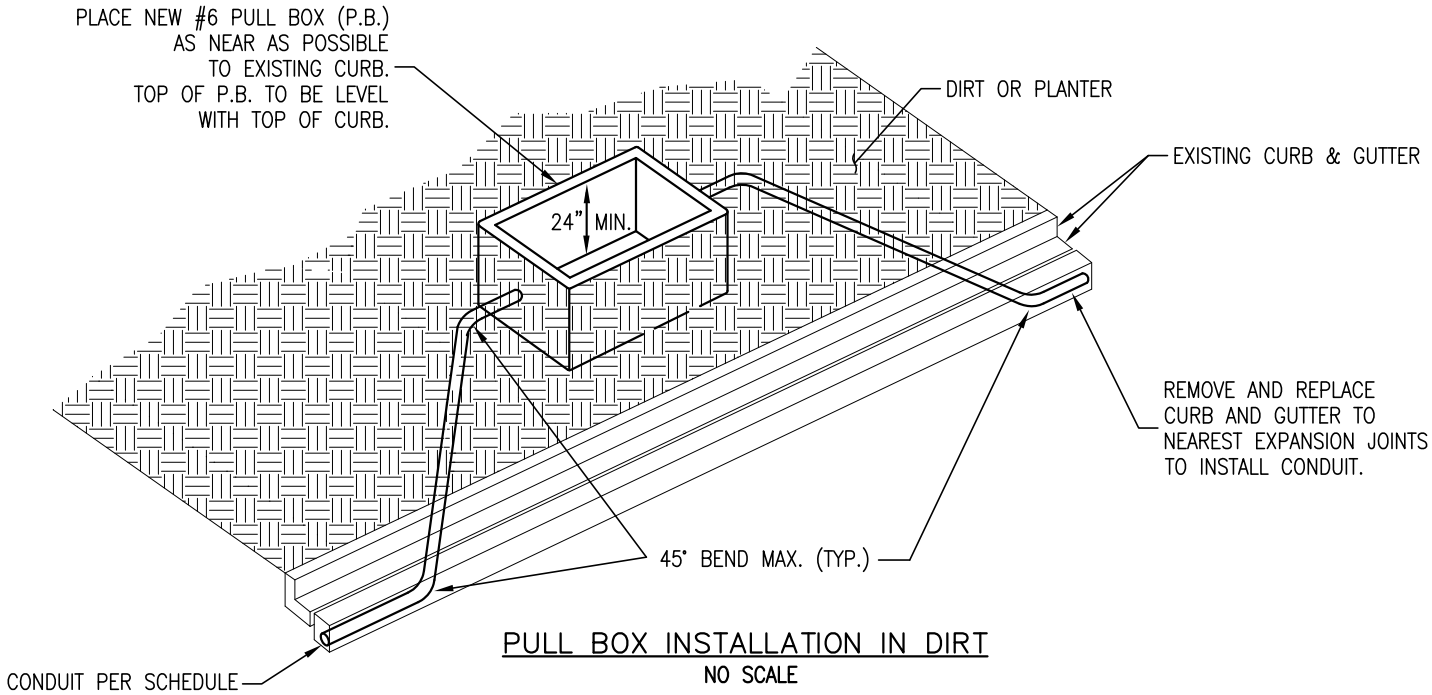
NOTES:
1. FILL TRENCH WITH A.C. CUTBACK AND COMPACTED TO EXISTING A.C. FINISH GRADE PRIOR TO OPENING THE LANE TO TRAFFIC.
2. FINAL A.C. PAVEMENT SHALL BE PLACED WITHIN 48 HOURS OF EXCAVATION.



TRENCH AT BACK OF SIDEWALK

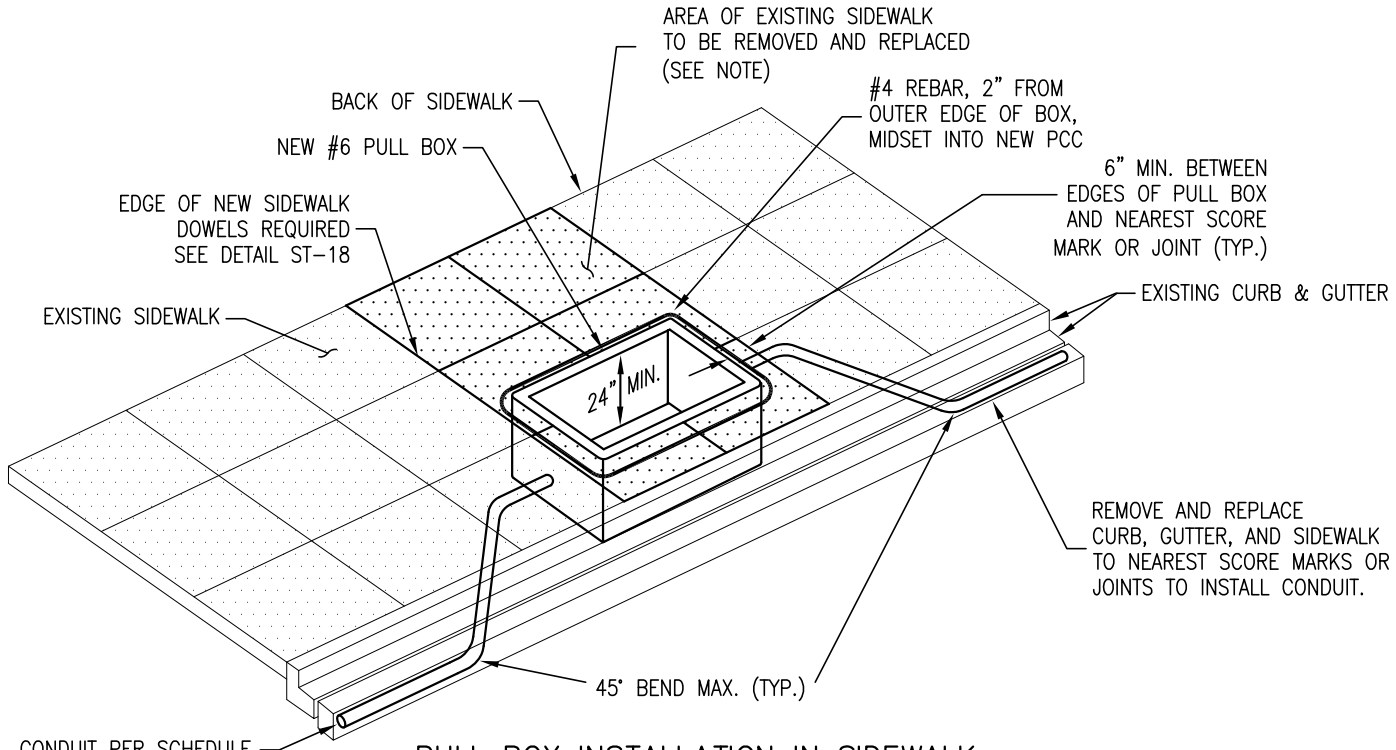
NO SCALE

DRAWN BY: K. TRAN	TRAFFIC SIGNAL TRENCH DETAILS	TR-5
CHECKED BY: B. TRAN		
APPROVED BY: D. NG		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 53



PULL BOX INSTALLATION IN DIRT

NO SCALE

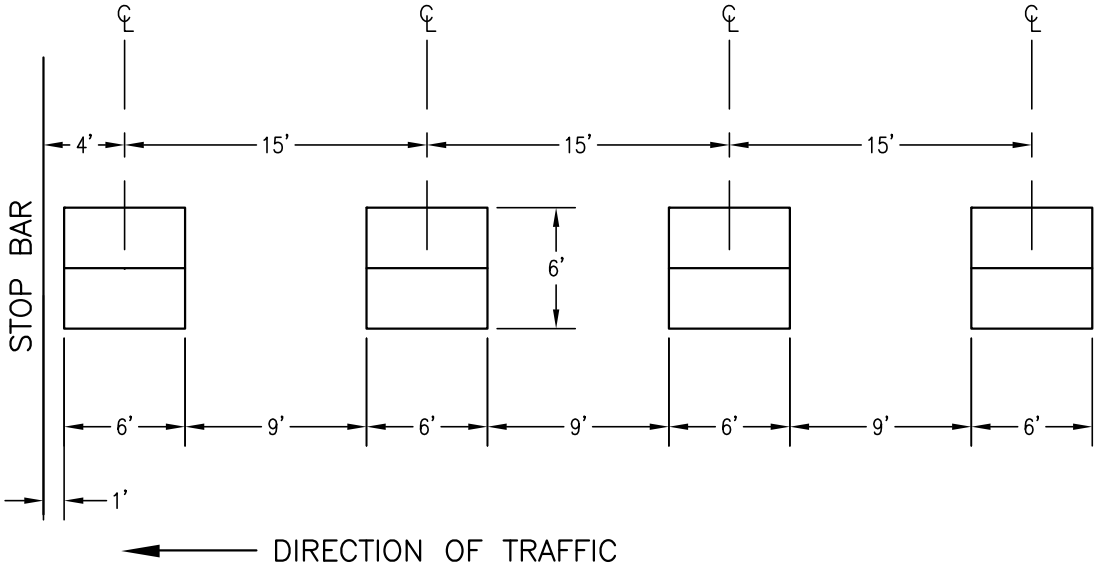


PULL BOX INSTALLATION IN SIDEWALK

NO SCALE

NOTE: IF SIDEWALK IS GREATER THAN 9', REMOVE AND REPLACE TO MIDDLE SCORE MARK.

DRAWN BY: K. TRAN	TRAFFIC SIGNAL PULL BOX	TR-6
CHECKED BY: B. TRAN		
APPROVED BY: D. NG		
DATE: DECEMBER 2014	CITY OF SANTA CLARA	PAGE: 54



NOTES:

1. FOUR (4) LOOPS FOR LEFT AND RIGHT TURN LANES. THREE (3) LOOPS FOR STRAIGHT THROUGH LANES.

2. LOOPS TO BE CUT IN A 6'x6' QUAD CONFIGURATION. LOOP MARKS SHALL BE VERIFIED BY CITY TRAFFIC STAFF (72 HOURS ADVANCE NOTIFICATION REQUIRED) UNLESS OTHERWISE NOTED.

3. DETECTOR LOOPS SHALL BE TYPE "Q". DETECTOR LOOP WIRE SHALL BE TYPE 1. LEAD IN CABLE SHALL CONFORM TO TYPE B. LOOP WIRING IS TO BE WRAPPED IN A 3–6–3 CONFIGURATION.

4. EACH LANE SHALL HAVE ITS INDIVIDUAL LOOP CONNECTED IN SERIES, AND ITS WIRING SHALL BE BROUGHT INTO PROPER PULLBOX FOR CONNECTION TO TYPE B DETECTOR LEAD IN CABLE (DLC). LOOP WIRING IN STREET SHALL ENTER A (G5 BOX) DETECTOR HANDHOLE AT THE LIP OF GUTTER.

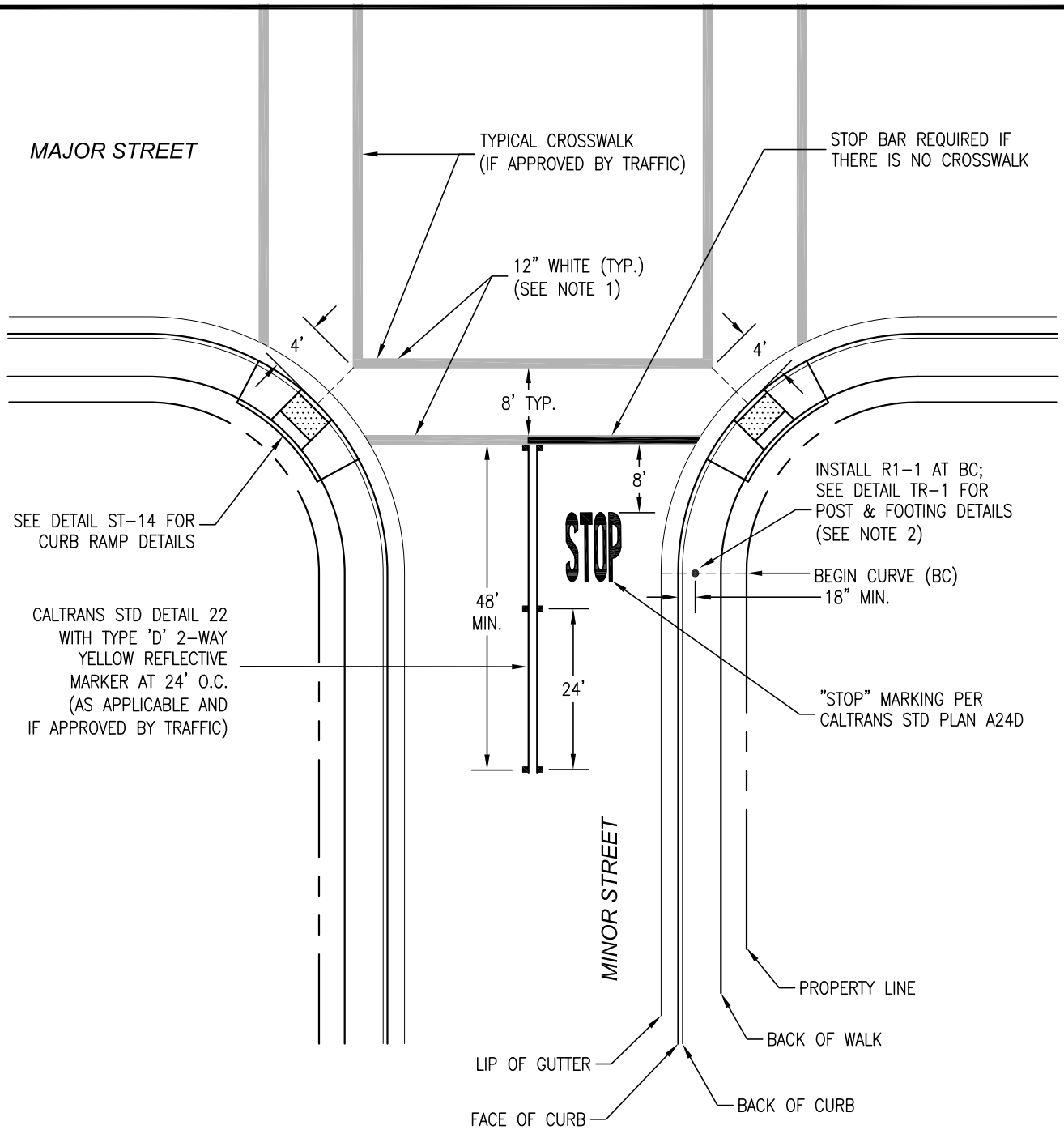
5. SEALANT SHALL BE HOT MELT RUBBERIZED ASPHALT. FINISHED PRODUCT MUST BE AT A MINIMUM STREET LEVEL OR ABOVE.

6. ANY TRAFFIC LOOP WIRE CONNECTION(S) TO BE LAID DOWN IN SIGNAL CABINET SHALL BE SOLDERED. DLC SHIELD CONDUCTORS ARE NOT TO BE BONDED TO THE GROUND, BUT WRAPPED AROUND AND SECURED TO RESPECTIVE OWNER. THEY ARE NOT TO BE SHORTER THAN SIX INCHES (6").

7. ACCEPTABLE TESTING RESULTS FOR EACH INDIVIDUAL LOOP PAIR SHALL BE 126 MICRO–HENRIES INDUCTANCE AND INFINITE MEG–OHMS TO GROUND. NO LOOP WIRING SHALL BE CONNECTED UNTIL TESTED AND APPROVED BY SILICON VALLEY POWER STAFF (72 HOURS ADVANCE NOTIFICATION REQUIRED).

8. SEE STATE OF CALIFORNIA, DEPARTMENT OF TRANSPORTATION (CALTRANS) STANDARD PLANS, PAGES ES–5A AND ES–5B, FOR INSTALLATION DETAILS.

DRAWN BY: K. TRAN	TRAFFIC SIGNAL DETECTOR LOOPS SPACING	TR-7
CHECKED BY: B. TRAN		
APPROVED BY: D. NG		
DATE: DECEMBER 2014	CITY OF SANTA CLARA	PAGE: 55



NOTES:

1. ALL PAVEMENT MARKINGS SHALL BE THERMOPLASTIC OR PRE-FORMED THERMOPLASTIC PER SPECIFICATIONS.

2. INSTALL R1-1 MINIMUM OF 18" FROM FACE OF CURB, 7' FROM GROUND TO BOTTOM OF SIGN. EDGE OF INSTALLED R1-1 SHALL BE 4" BEHIND FACE OF CURB (OFFSET AS NEEDED).

3. NO PERMANENT MARKINGS OR SIGNS SHALL BE PLACED UNTIL THE CITY TRAFFIC ENGINEER OR HIS REPRESENTATIVE APPROVES THE CAT-TRACKING OR PRE-MARKINGS IN THE FIELD.

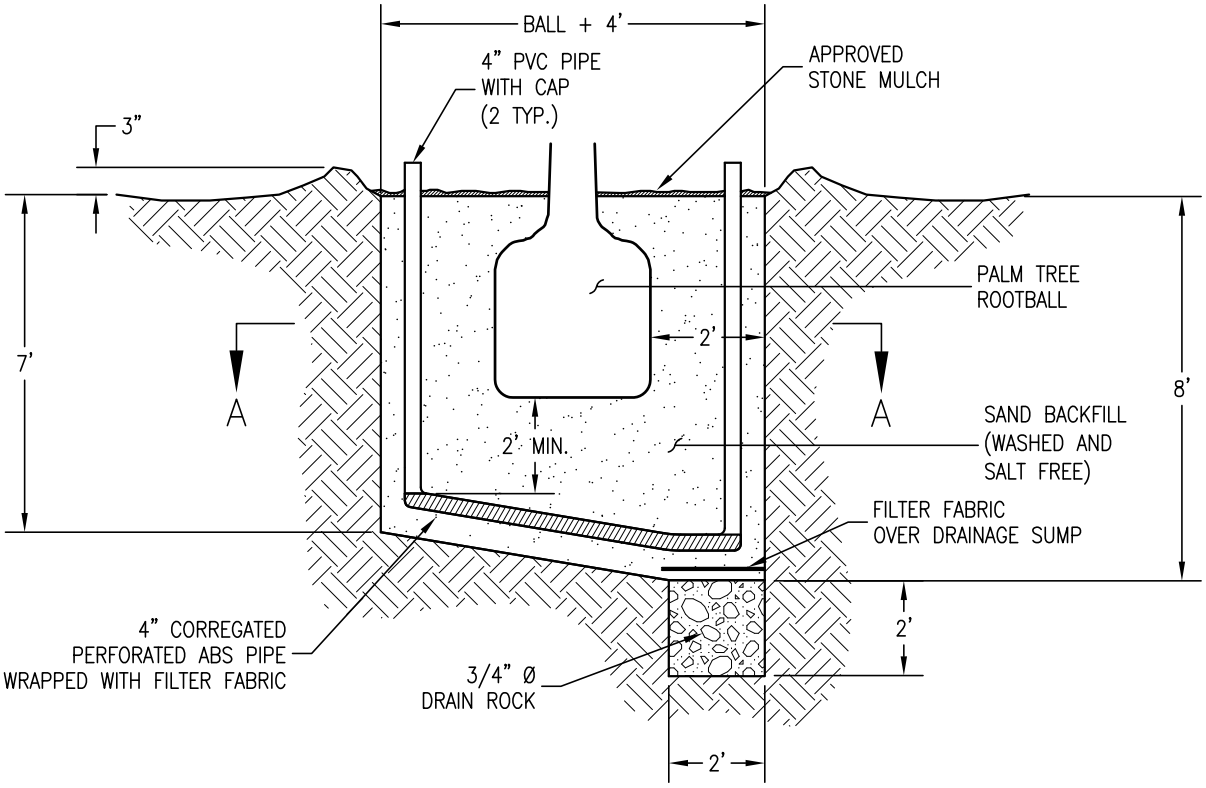
DRAWN BY: K. TRAN	TYPICAL STOP INTERSECTION	TR-8
CHECKED BY: B. TRAN		
APPROVED BY: D. NG		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 56

Department of Public Works
City of Santa Clara, CA

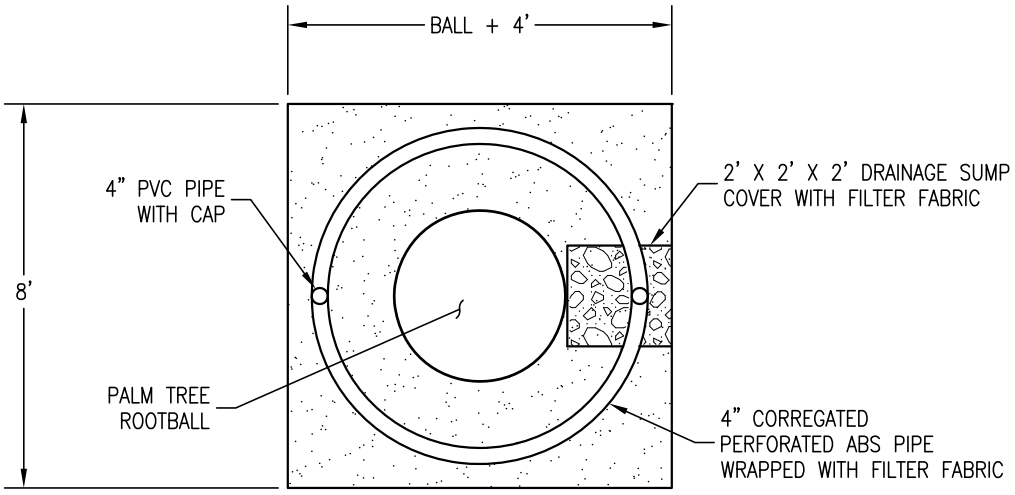
STANDARD DETAILS

LANDSCAPE SECTION

DETAILS LS-1 TO LS-22



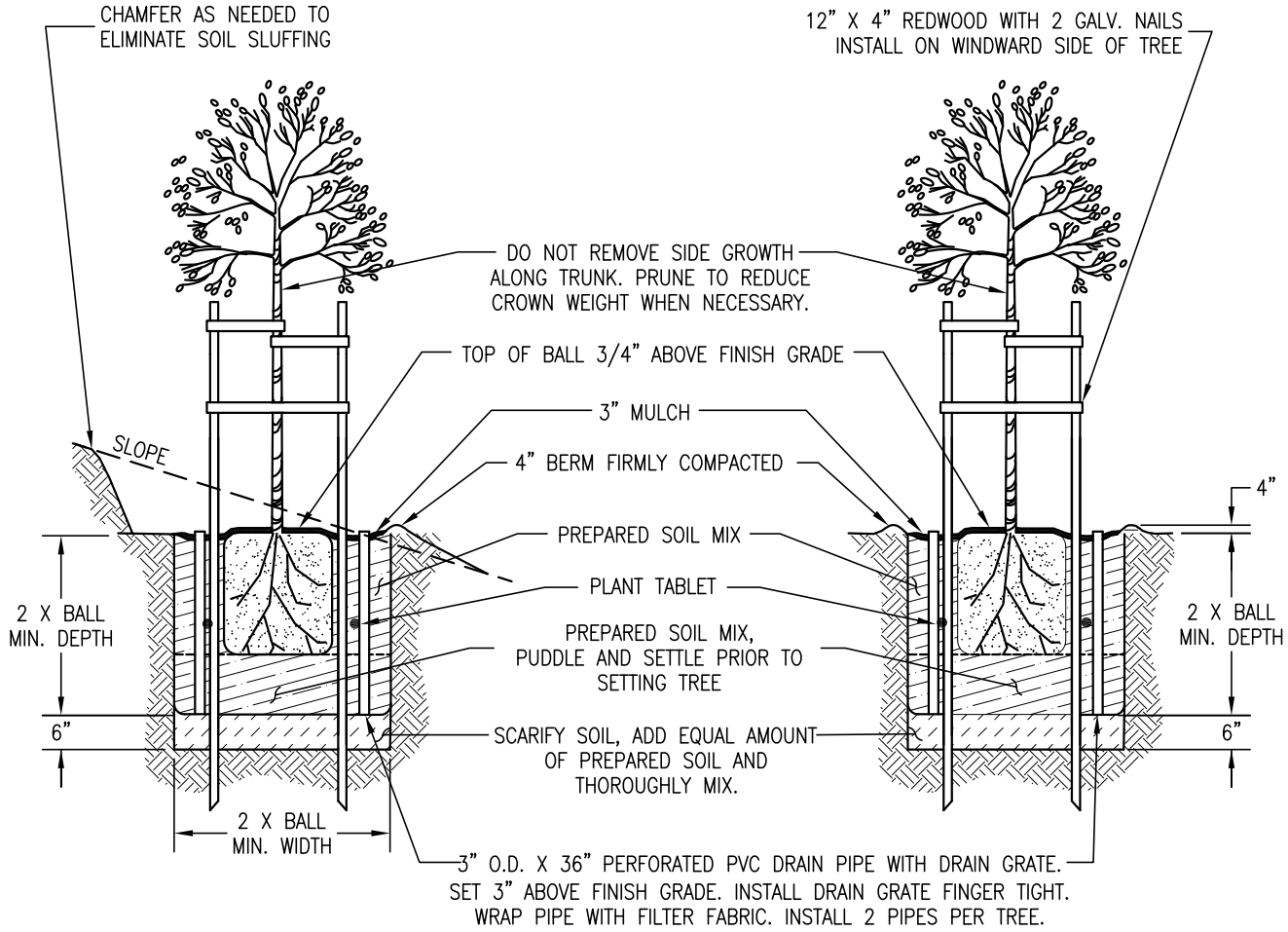
ELEVATION VIEW
NO SCALE



SECTION A–A
NO SCALE

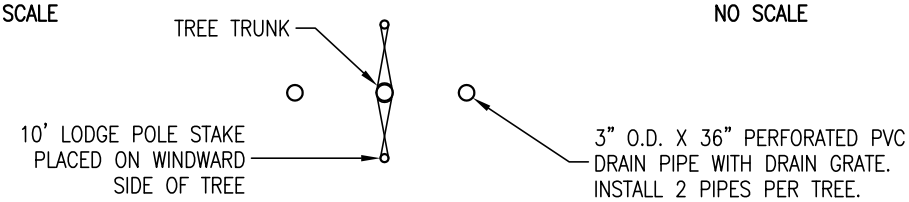
DRAWN BY: K. TRAN	PALM TREE PLANTING	LS-1
CHECKED BY: C. QUANZ		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 57

* ALL TREES EXCEPT PALMS



SLOPE SURFACE ELEVATION VIEW
NO SCALE

LEVEL SURFACE ELEVATION VIEW
NO SCALE

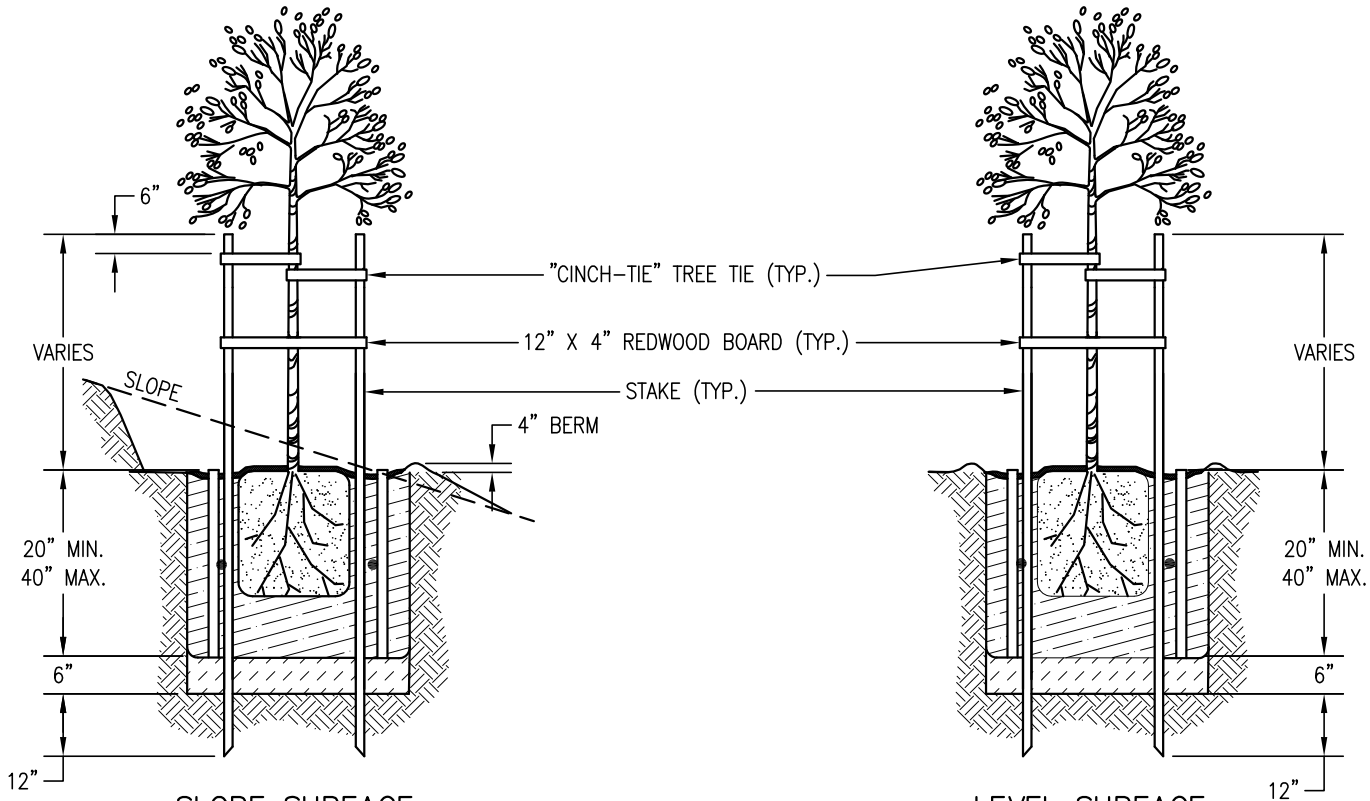


NOTES:

1. CONTACT UNDERGROUND SERVICE ALERT (USA) AT (800) 642–2444 AT LEAST 5 DAYS PRIOR TO BEGINNING EXCAVATION WORK TO LOCATE EXISTING UTILITIES.
2. BUILD SOIL BERM MIN. 4" HIGH AND 3' FROM TREE TRUNK IN PLANTER STRIP. PROVIDE LOAM TOPSOIL NEEDED TO FORM BERM AND FILL HOLES.
3. SOIL, CONCRETE AND OTHER MATERIALS SPILLED ON STREET, SIDEWALK, AND PLANTING AREA SHALL BE CLEANED UP IMMEDIATELY BY CONTRACTOR.
4. IF TREE PLANTING IS DELAYED AFTER TREE WELLS ARE CONSTRUCTED, HOLES WILL BE FILLED IN WITH SOIL UNTIL TREES ARE AVAILABLE.
5. TREE PLANTING PIT DRAINAGE TEST TO BE: AUGER HOLE 18" DEEP 6" DIA., FILL WITH WATER, LET DRAIN, FILL WITH WATER AGAIN AND HAVE CITY ARBORIST ON SITE TO REVIEW DRAINAGE AND MAKE ANY NECESSARY RECOMMENDATIONS AT THAT TIME.

DRAWN BY: K. TRAN	TREE PLANTING		LS-2
CHECKED BY: C. QUANZ			
APPROVED BY: G. GOMEZ			
DATE: OCTOBER 2013	CITY OF SANTA CLARA		PAGE: 58

* ALL TREES EXCEPT PALMS

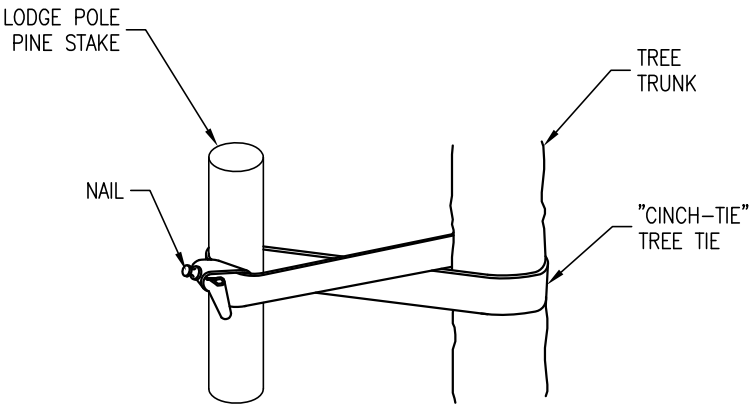


SLOPE SURFACE
ELEVATION VIEW
NO SCALE

LEVEL SURFACE
ELEVATION VIEW
NO SCALE

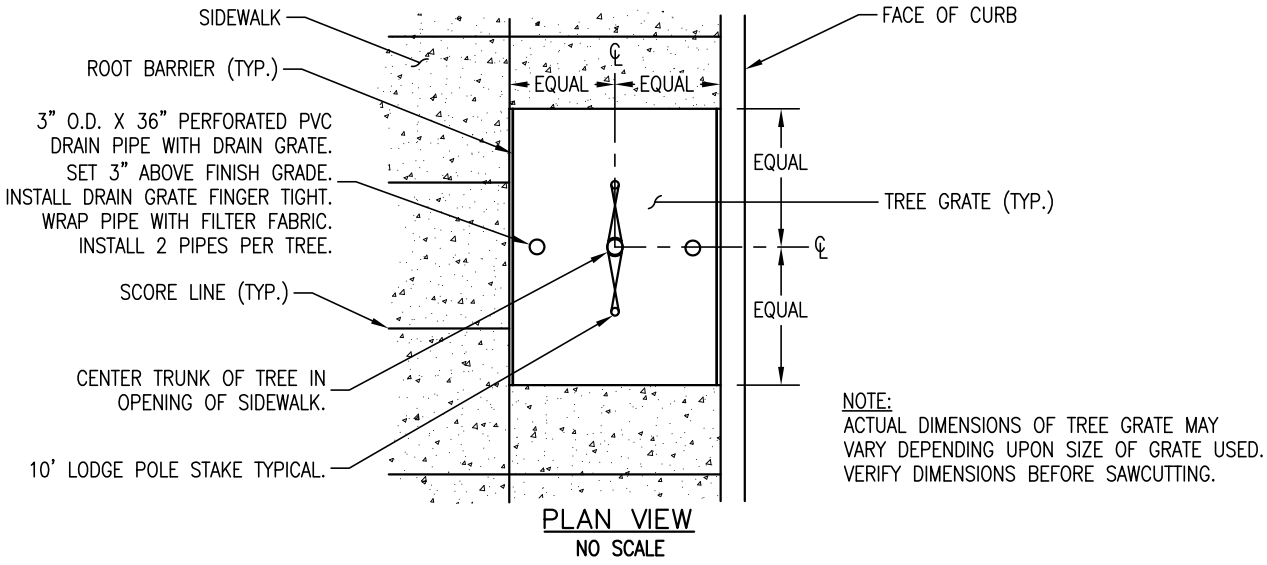
NOTES:

1. USE 2 STAKES AND 2 "CINCH-TIE" TREE TIES.
2. TIE TREE TRUNK 6" ABOVE BENDING MOMENT OF TREE.
3. TIE SHOULD ALLOW TRUNK FLEXIBILITY BUT NOT ALLOW THE STAKE TO RUB AGAINST THE TRUNK.
4. CUT STAKES 6" ABOVE TIES.
5. FOR SINGLE STAKE TREES, PLACE STAKE ON WINDWARD SIDE OF TREE.



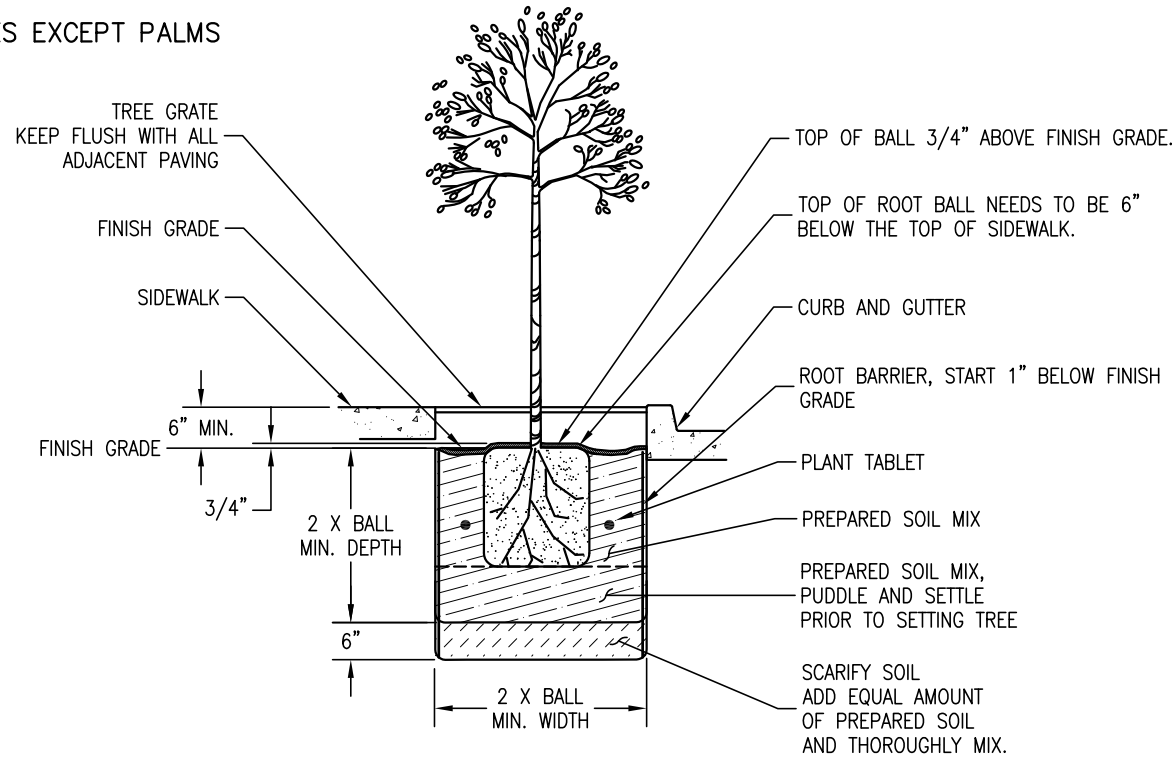
"CINCH-TIE"
TREE TIE DETAIL
NO SCALE

DRAWN BY: K. TRAN	TREE STAKING	LS-3
CHECKED BY: C. QUANZ		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 59



PLAN VIEW
NO SCALE

* ALL TREES EXCEPT PALMS

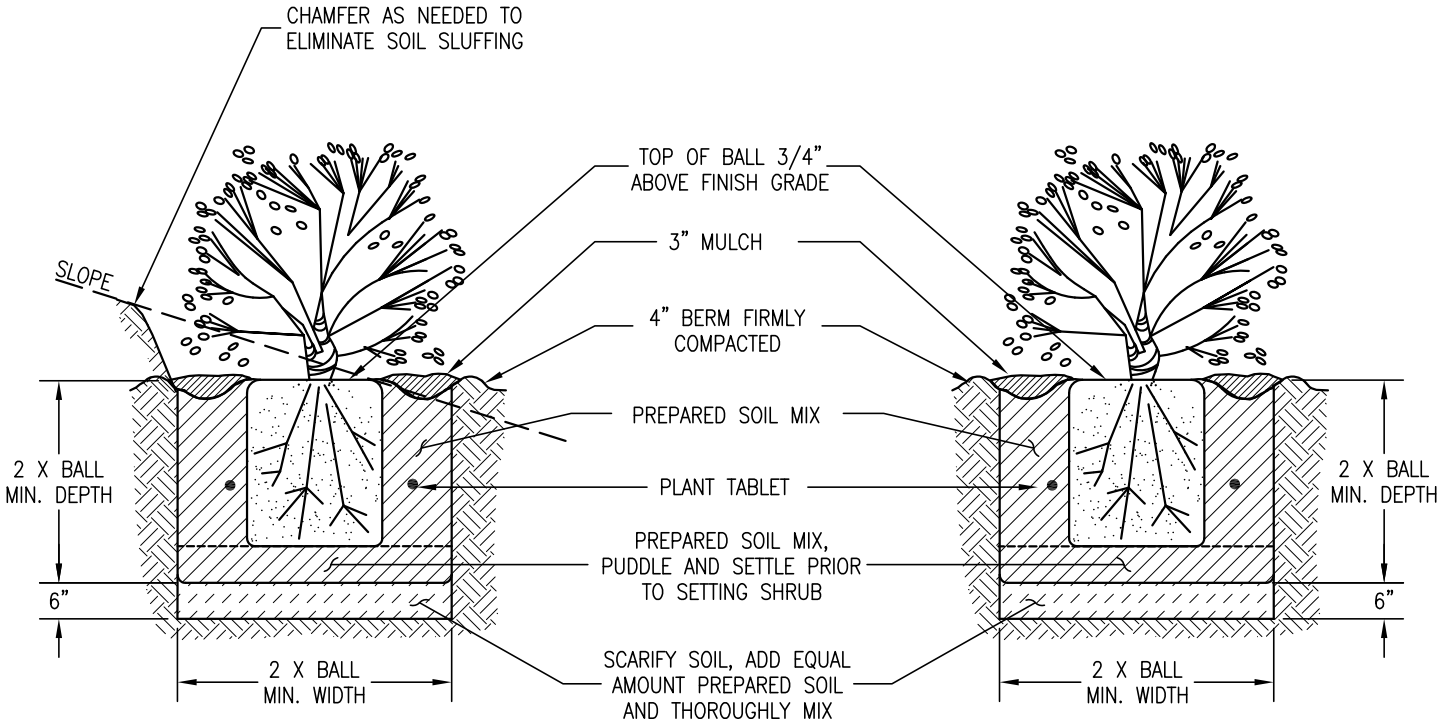


ELEVATION VIEW
NO SCALE

NOTES:

1. CONTACT UNDERGROUND SERVICE ALERT (USA) AT (800) 642–2444 AT LEAST 5 DAYS PRIOR TO BEGINNING EXCAVATION WORK TO LOCATE EXISTING UTILITIES.
2. BUILD SOIL BERM MIN. 4" HIGH AND 3' FROM TREE TRUNK IN PLANTER STRIP. PROVIDE LOAM TOPSOIL NEEDED TO FORM BERM AND FILL HOLES.
3. SOIL, CONCRETE AND OTHER MATERIALS SPILLED ON STREET, SIDEWALK, AND PLANTING AREA SHALL BE CLEANED UP IMMEDIATELY BY CONTRACTOR.
4. IF TREE PLANTING IS DELAYED AFTER TREE WELLS ARE CONSTRUCTED, HOLES WILL BE FILLED IN WITH SOIL UNTIL TREES ARE AVAILABLE.
5. TREE PLANTING PIT DRAINAGE TEST TO BE: AUGER HOLE 18" DEEP 6" DIA., FILL WITH WATER, LET DRAIN, FILL WITH WATER AGAIN AND HAVE CITY ARBORIST ON SITE TO REVIEW DRAINAGE AND MAKE ANY NECESSARY RECOMMENDATIONS AT THAT TIME.

DRAWN BY: K. TRAN			
CHECKED BY: C. QUANZ	TREE WELL		LS-4
APPROVED BY: G. GOMEZ			
DATE: OCTOBER 2013	CITY OF SANTA CLARA		PAGE: 60



SLOPE SURFACE ELEVATION VIEW
NO SCALE

LEVEL SURFACE ELEVATION VIEW
NO SCALE

NOTES:

1. CONTACT UNDERGROUND SERVICE ALERT (USA) AT (800) 642–2444 AT LEAST 5 DAYS PRIOR TO BEGINNING EXCAVATION WORK TO LOCATE EXISTING UTILITIES.

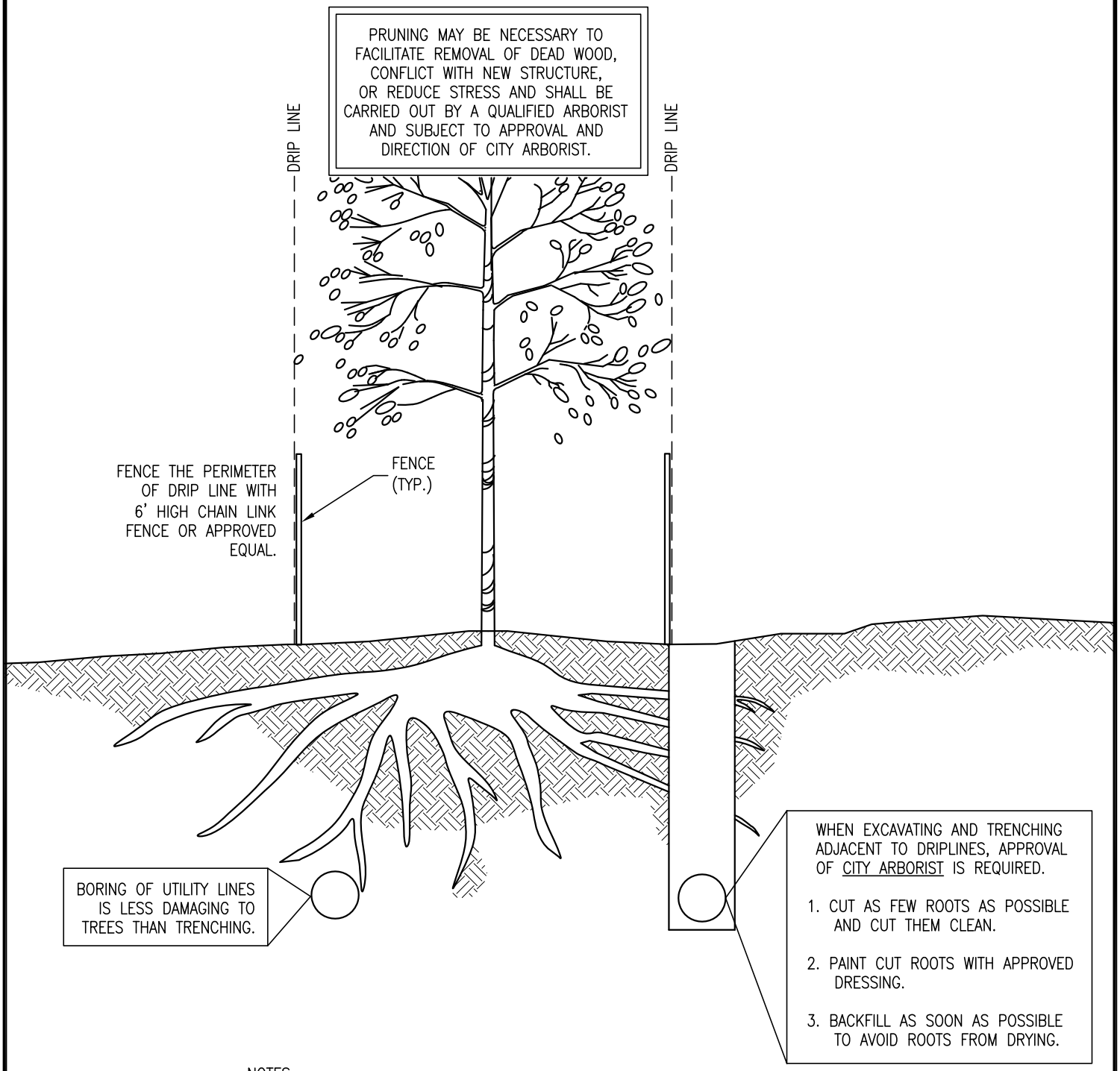
2. BUILD SOIL BERM MIN. 4" HIGH AND 3' FROM SHRUB TRUNK IN PLANTER STRIP. PROVIDE LOAM TOPSOIL NEEDED TO FORM BERM AND FILL HOLES.

3. SOIL, CONCRETE AND OTHER MATERIALS SPILLED ON STREET, SIDEWALK, AND PLANTING AREA SHALL BE CLEANED UP IMMEDIATELY BY CONTRACTOR.

4. IF TREE PLANTING IS DELAYED AFTER TREE WELLS ARE CONSTRUCTED, HOLES WILL BE FILLED IN WITH SOIL UNTIL TREES ARE AVAILABLE.

5. SHRUB PLANTING PIT DRAINAGE TEST TO BE CONDUCTED AT 3 DIFFERENT LOCATIONS ON SITE. TEST TO BE: AUGER HOLE 18" DEEP 6" DIA., FILL WITH WATER, LET DRAIN, FILL WITH WATER AGAIN AND HAVE CITY ARBORIST ON SITE TO REVIEW DRAINAGE AND MAKE ANY NECESSARY RECOMMENDATIONS AT THAT TIME.

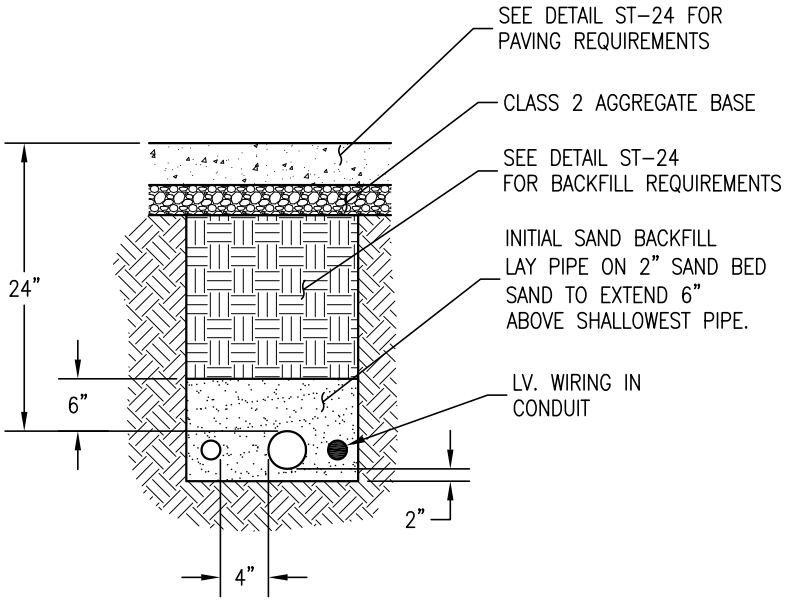
DRAWN BY: K. TRAN	SHRUB PLANTING	LS-5
CHECKED BY: C. QUANZ		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 61

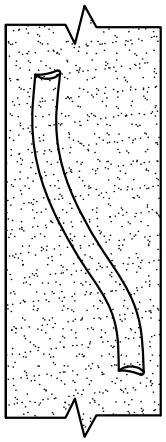


NOTES:

1. PROVIDE ADEQUATE RETAINING WALL – NO CLOSER THAN DRIP LINE. LARGE AMOUNTS OF FILL WILL INHIBIT DELICATE BALANCE BETWEEN ROOTS AND SOIL.
2. AVOID ANY PONDING BY DRAINING LOW POINTS.
3. PRIOR TO GRADING, INSTALL FENCES AND BARRICADES AROUND TREE.
4. FERTILIZE AND WATER TO MINIMIZE SHOCK AS DIRECTED BY QUALIFIED ARBORIST.

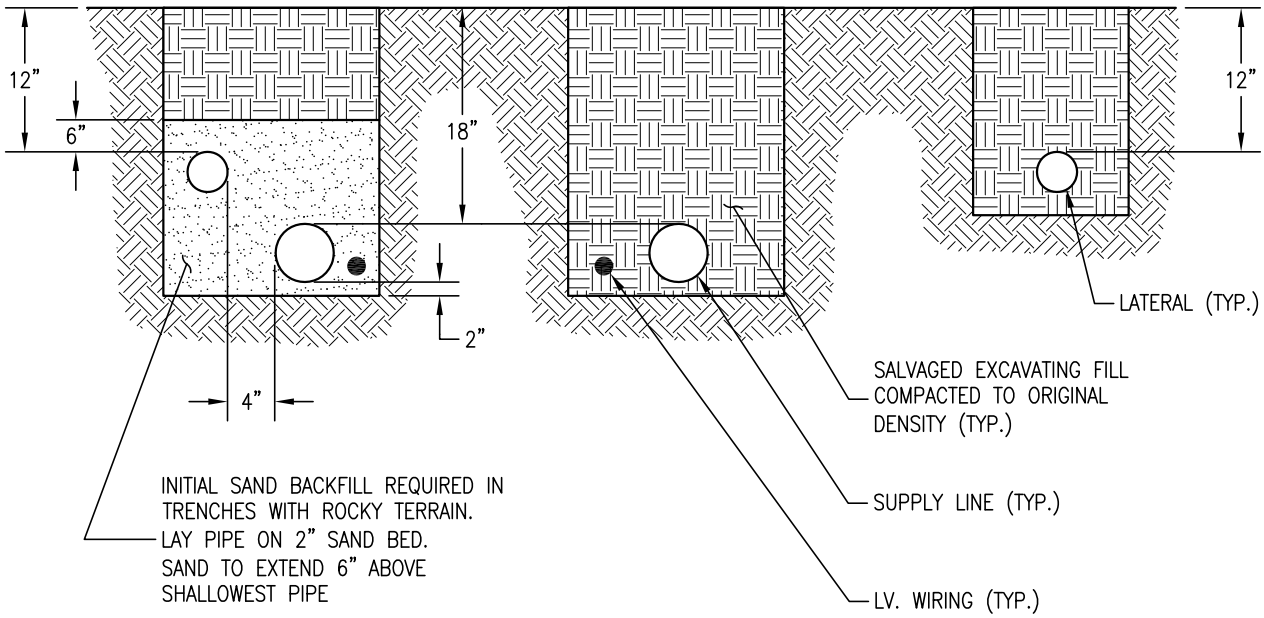
DRAWN BY: K. TRAN	TREE PROTECTION	LS-6
CHECKED BY: C. QUANZ		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 62





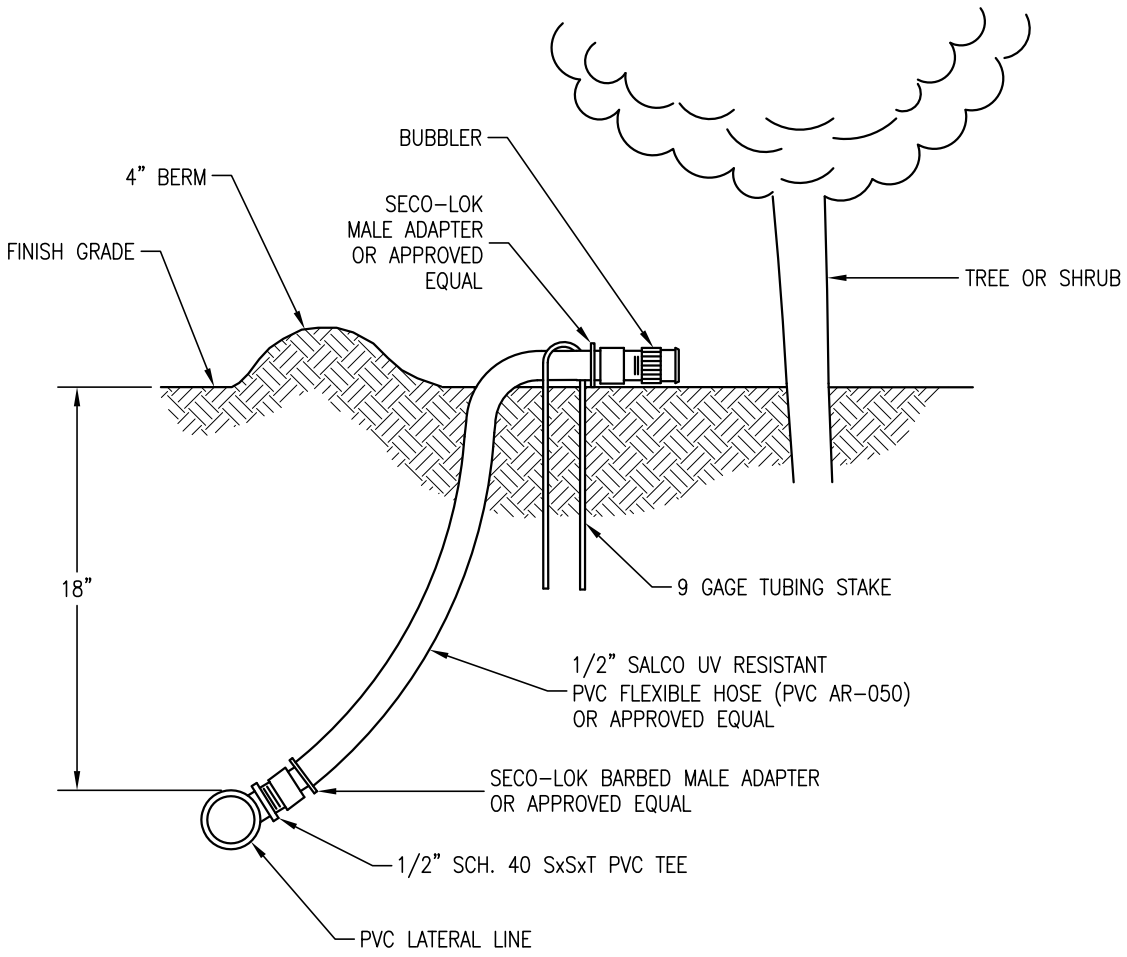
SNAKE ALL PIPE
IN TRENCHES
AS SHOWN

TRENCH IN PAVED AREA
ELEVATION VIEW
NO SCALE



TRENCHES IN PLANTING AREA
ELEVATION VIEW
NO SCALE

DRAWN BY: K. TRAN	LANDSCAPE TRENCHING DETAILS	LS-7
CHECKED BY: C. QUANZ		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 63

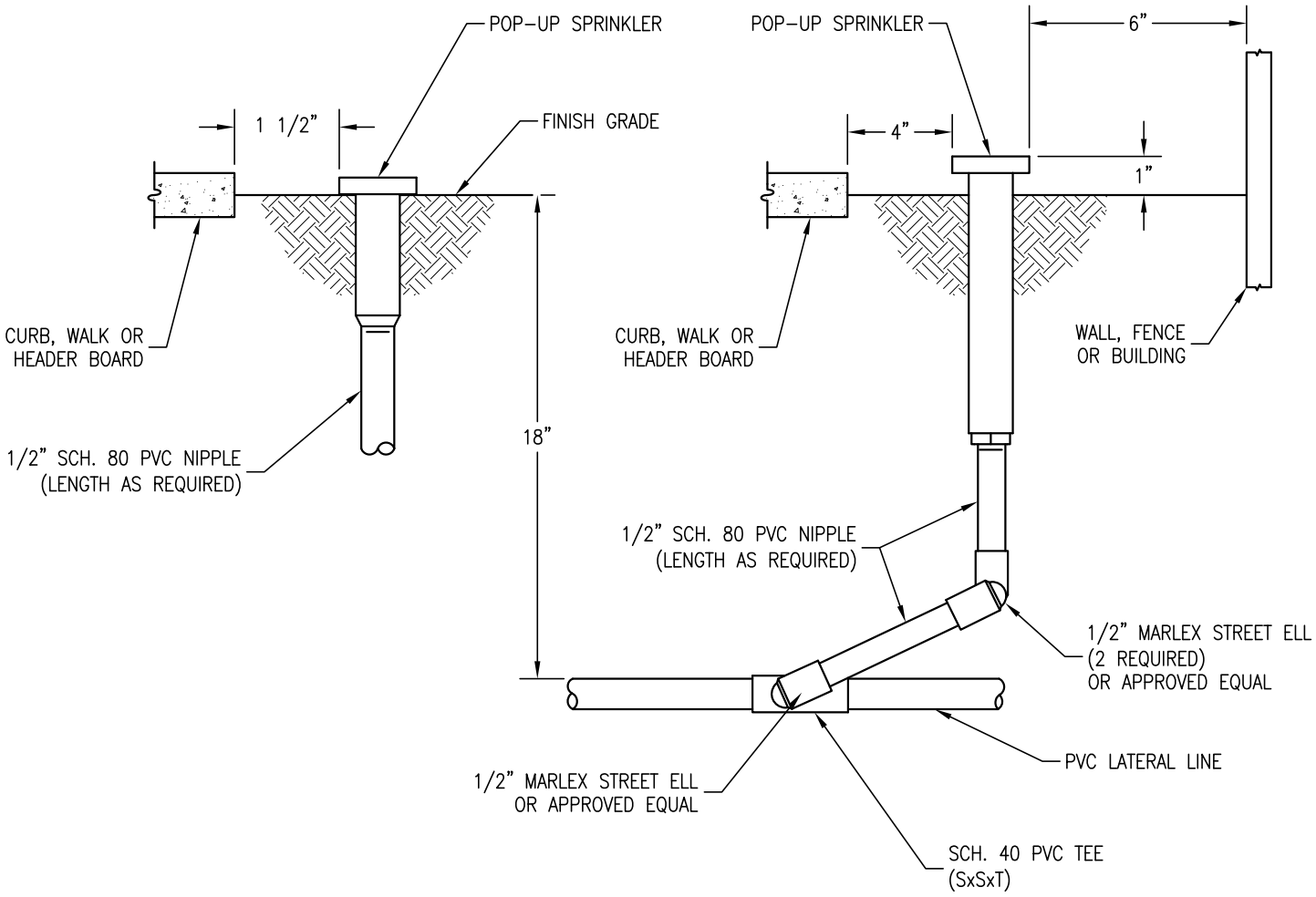


ELEVATION VIEW
NO SCALE

NOTES:

1. ONE BUBBLER PER TREE TO BE PLACED UPHILL SIDE OF ROOTBALL.
2. TREE BUBBLER TO BE A MINIMUM 1' AWAY FROM AERATION TUBE.

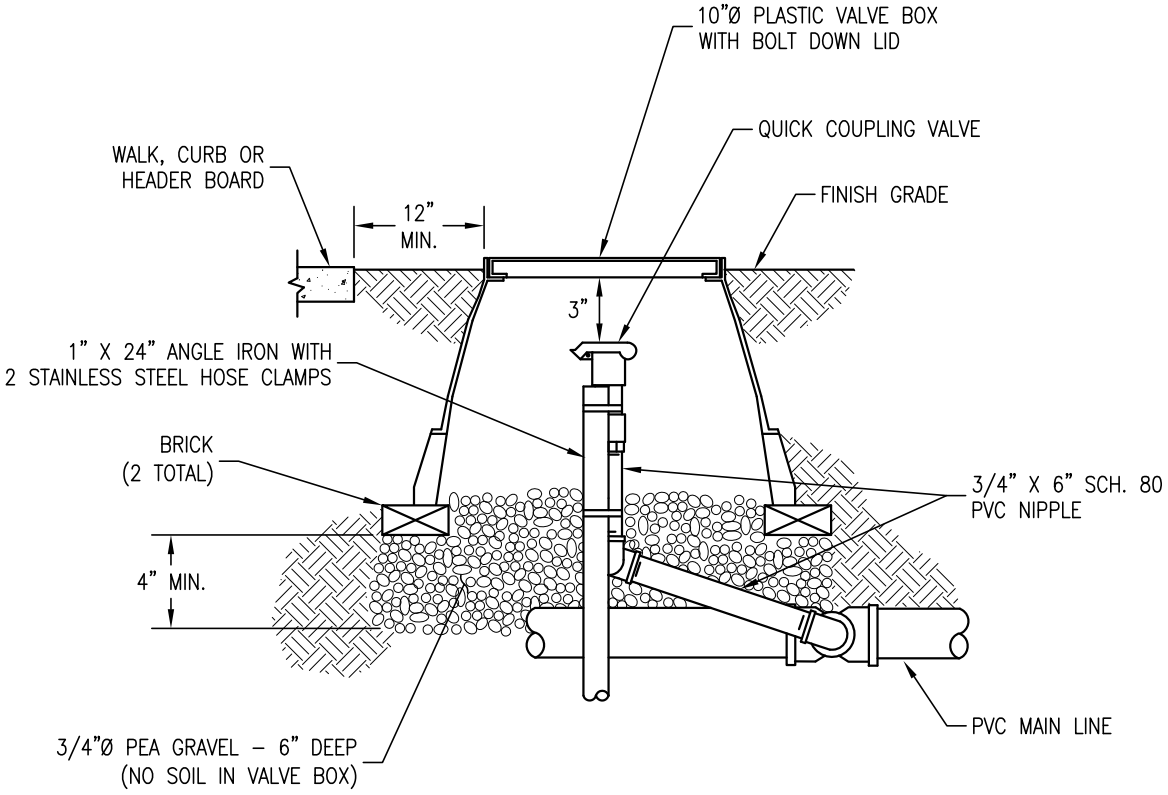
DRAWN BY: K. TRAN	TREE AND SHRUB BUBBLER	LS-8
CHECKED BY: C. QUANZ		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 64



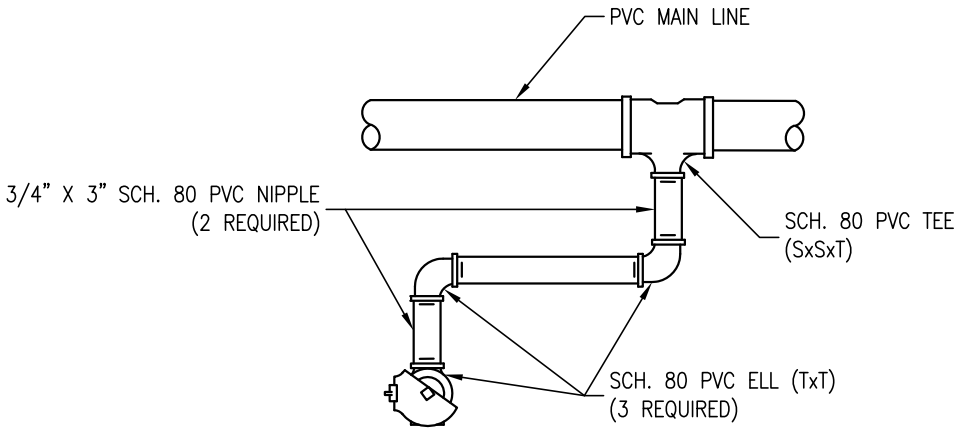
ELEVATION VIEW

NO SCALE

DRAWN BY: K. TRAN	POP-UP SPRINKLER	LS-9
CHECKED BY: C. QUANZ		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 65

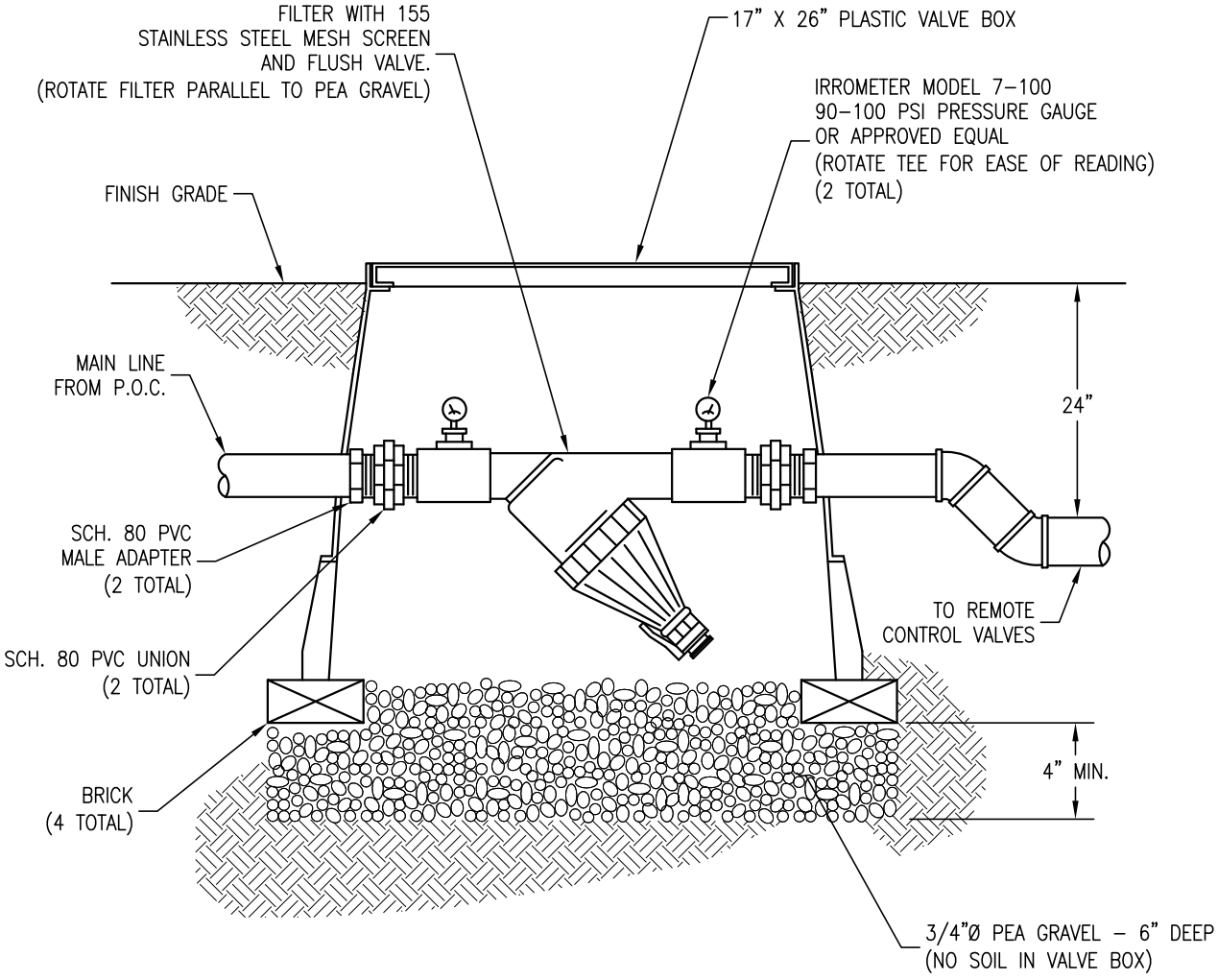


ELEVATION VIEW
NO SCALE



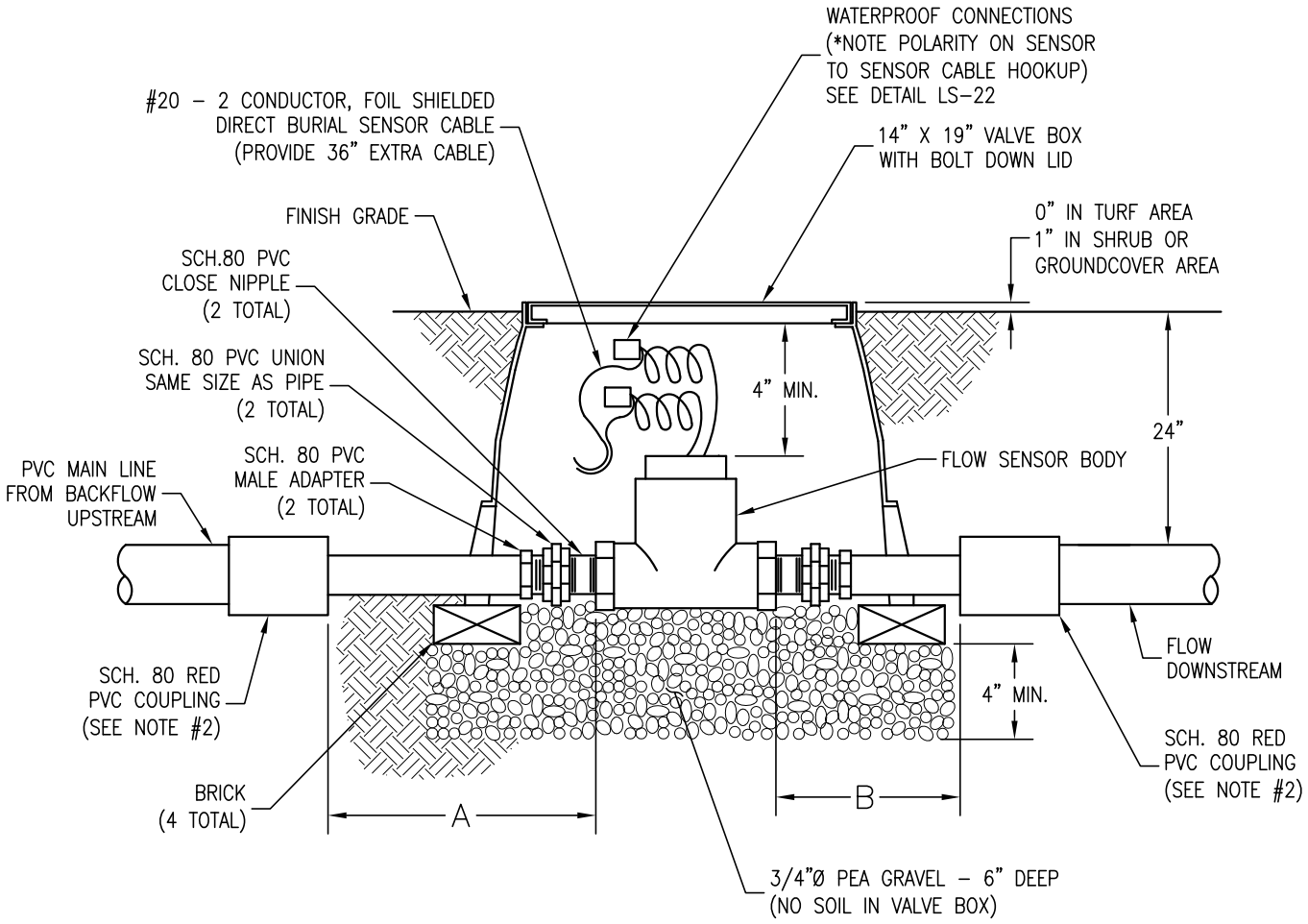
PLAN VIEW
NO SCALE

DRAWN BY: K. TRAN			
CHECKED BY: C. QUANZ	QUICK COUPLER		LS-10
APPROVED BY: G. GOMEZ			
DATE: OCTOBER 2013	CITY OF SANTA CLARA		PAGE: 66



ELEVATION VIEW
NO SCALE

DRAWN BY: K. TRAN	LANDSCAPE FILTER	LS-11
CHECKED BY: C. QUANZ		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 67



ELEVATION VIEW

NO SCALE

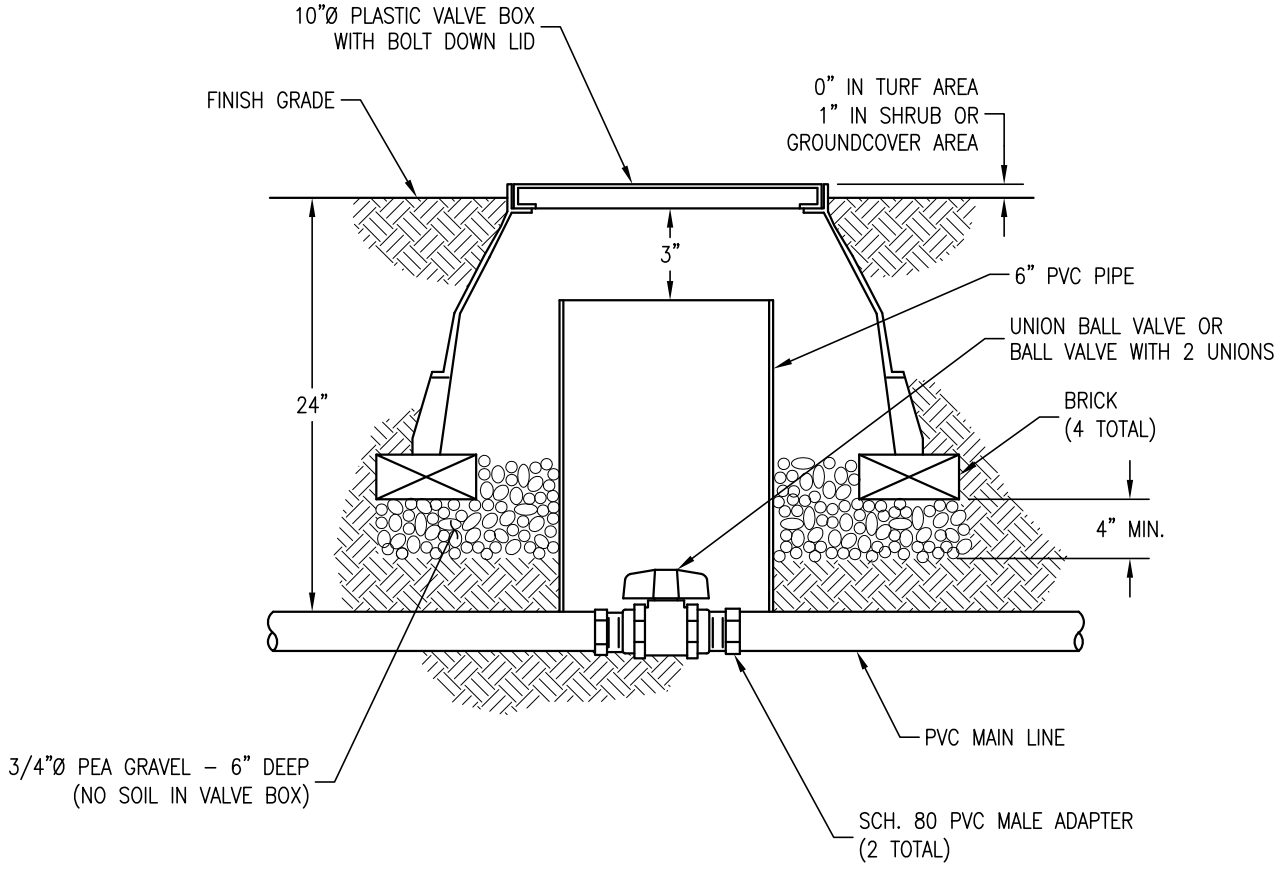
NOTES:

1. FLOW SENSOR MUST BE INSTALLED WITH INSERT (TOP) VERTICAL AND BODY (TEE) POSITIONED HORIZONTALLY.

2. REDUCER COUPLING MUST BE AT A DISTANCE EQUAL TO 10 TIMES THE PIPE DIAMETER ON THE UPSTREAM SIDE (A) AND 5 TIMES THE THE PIPE DIAMETER ON THE DOWNSTREAM (B) SIDE.

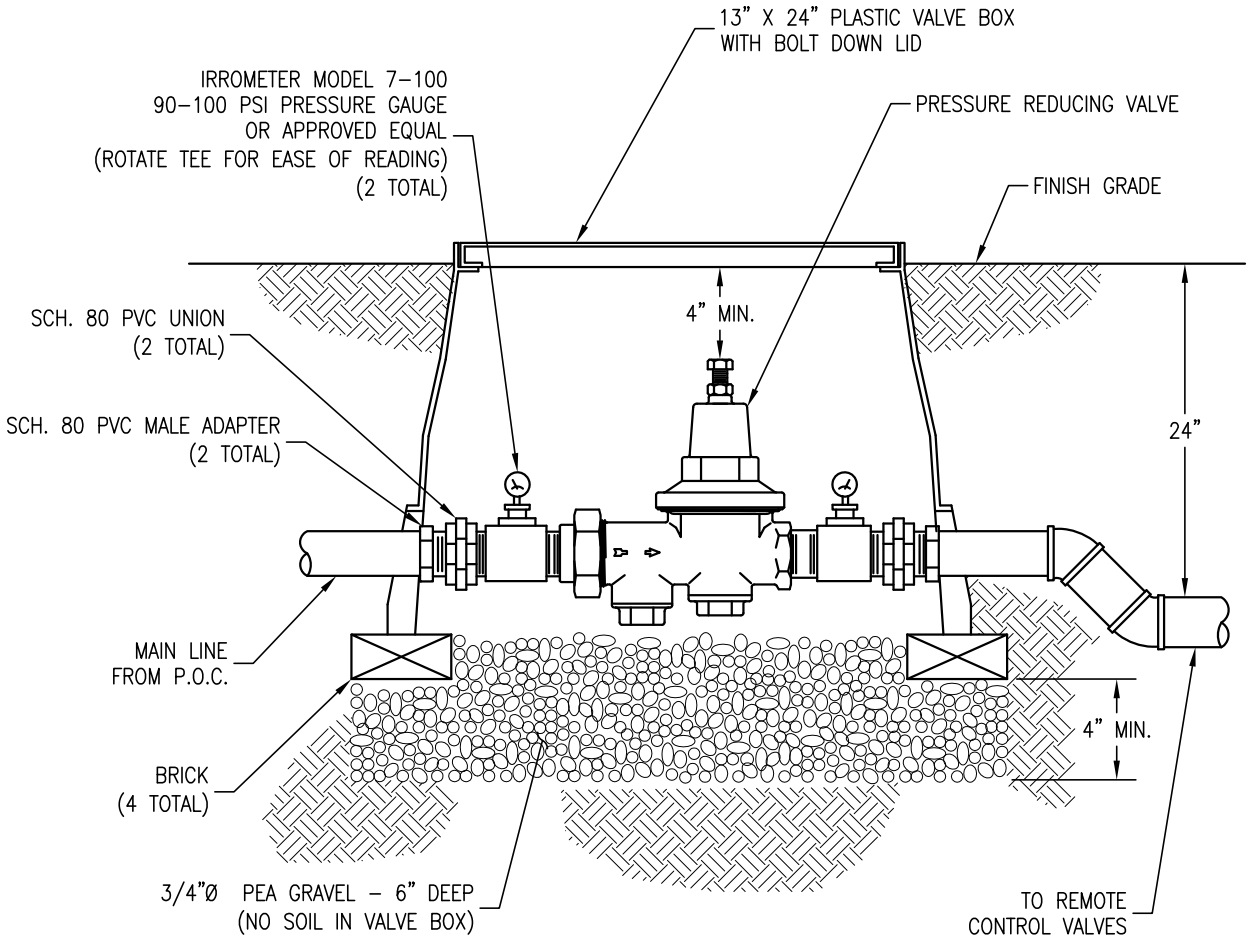
   EXAMPLE: FOR 3" FLOW SENSOR, 30" ON UPSTREAM SIDE AND 15" ON DOWNSTREAM SIDE.

DRAWN BY: K. TRAN	FLOW SENSOR	LS-12
CHECKED BY: C. QUANZ		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 68



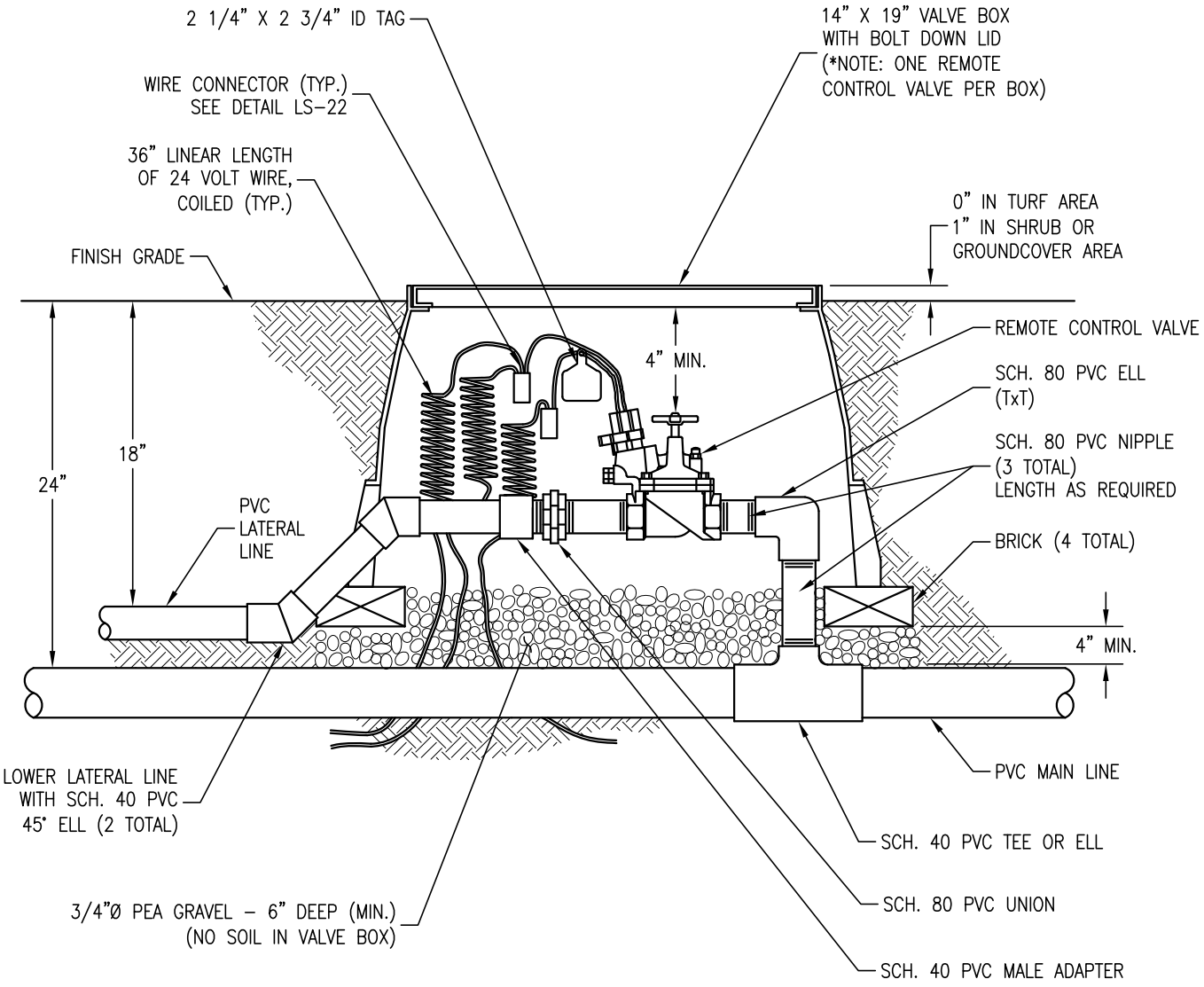
ELEVATION VIEW
NO SCALE

DRAWN BY: K. TRAN	UNION BALL VALVE	LS-13
CHECKED BY: C. QUANZ		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 69



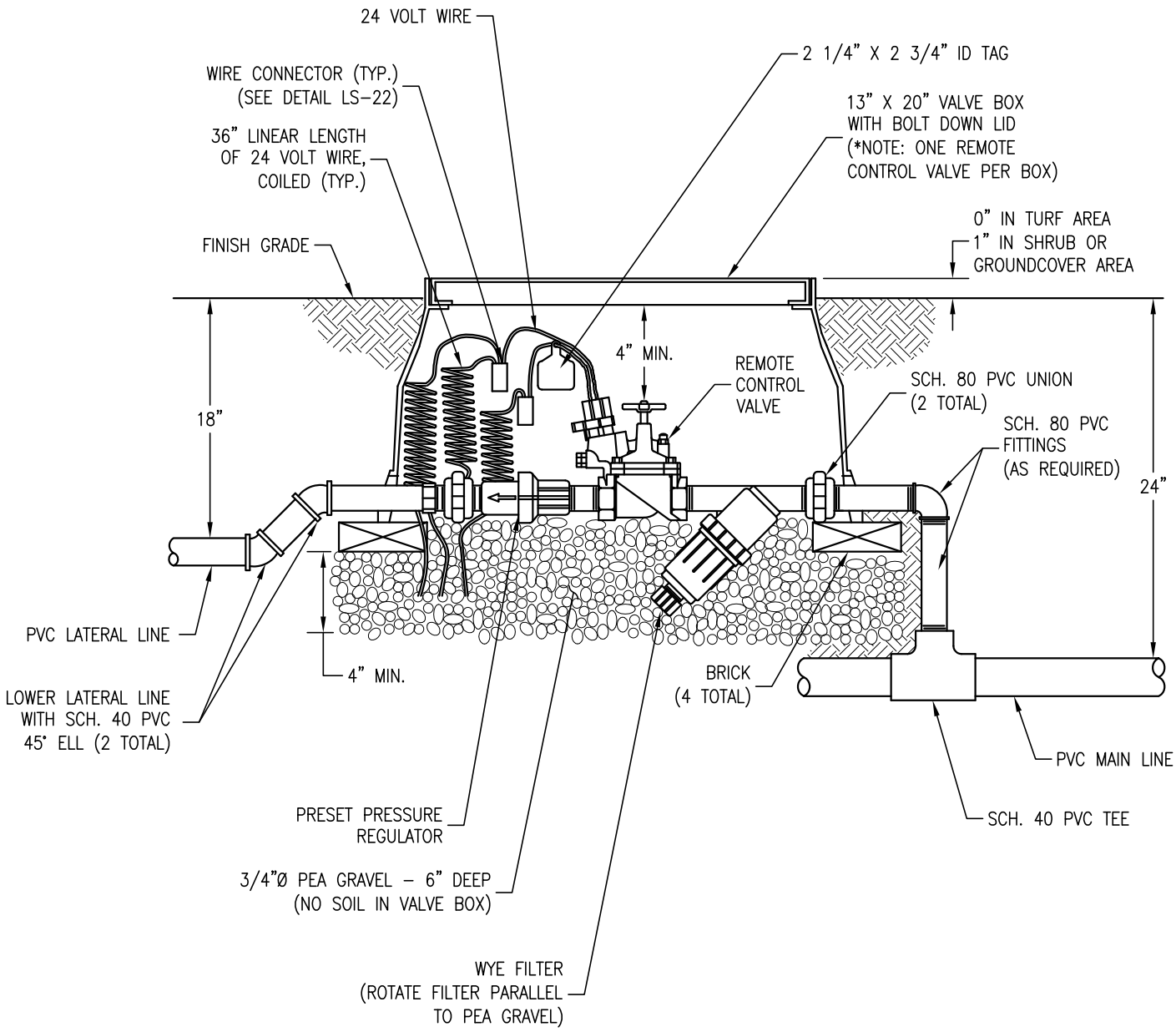
ELEVATION VIEW
NO SCALE

DRAWN BY: K. TRAN	PRESSURE REDUCING VALVE	LS-14
CHECKED BY: C. QUANZ		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 70



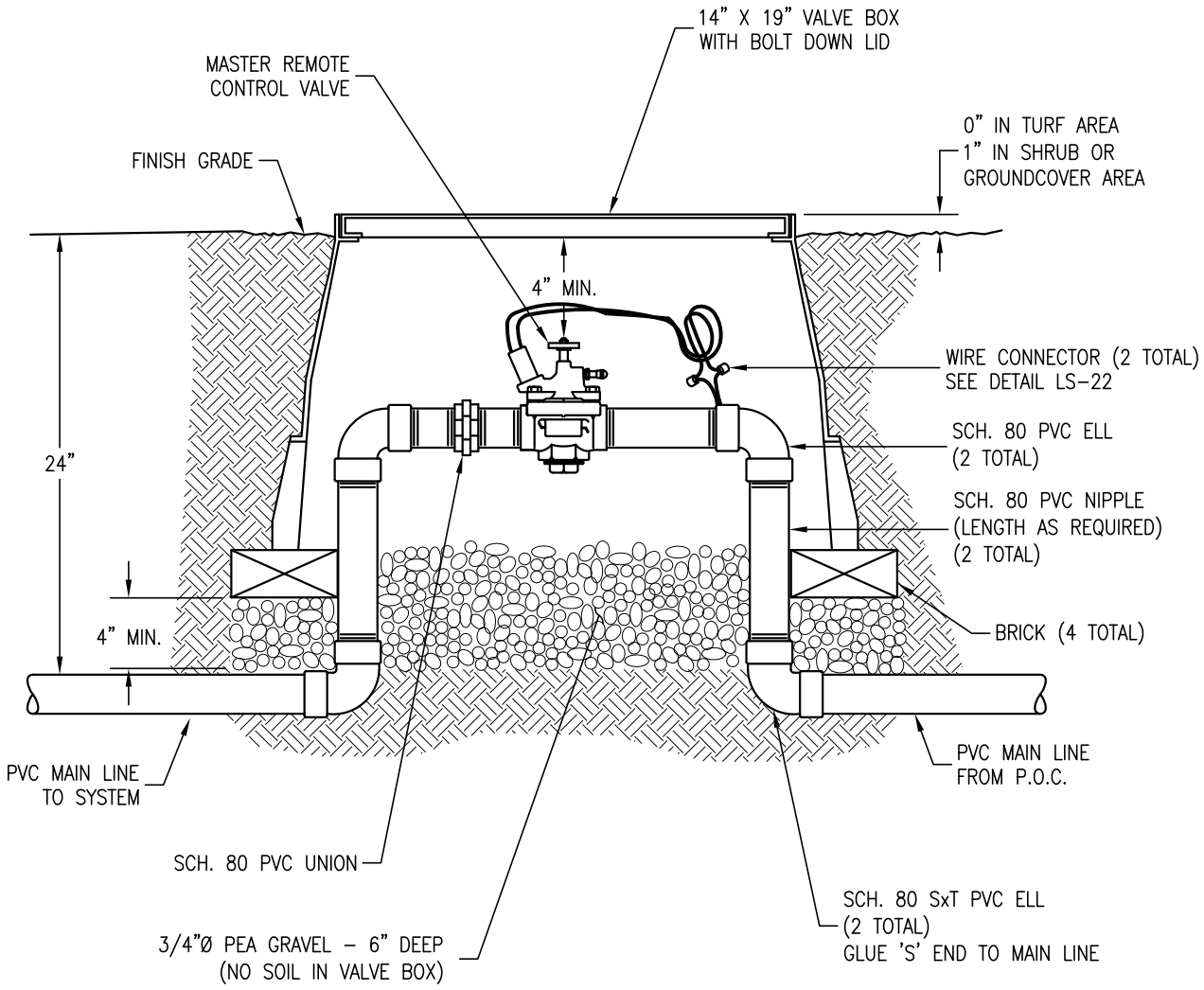
ELEVATION VIEW
NO SCALE

DRAWN BY: K. TRAN	REMOTE CONTROL VALVE	LS-15
CHECKED BY: C. QUANZ		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 71



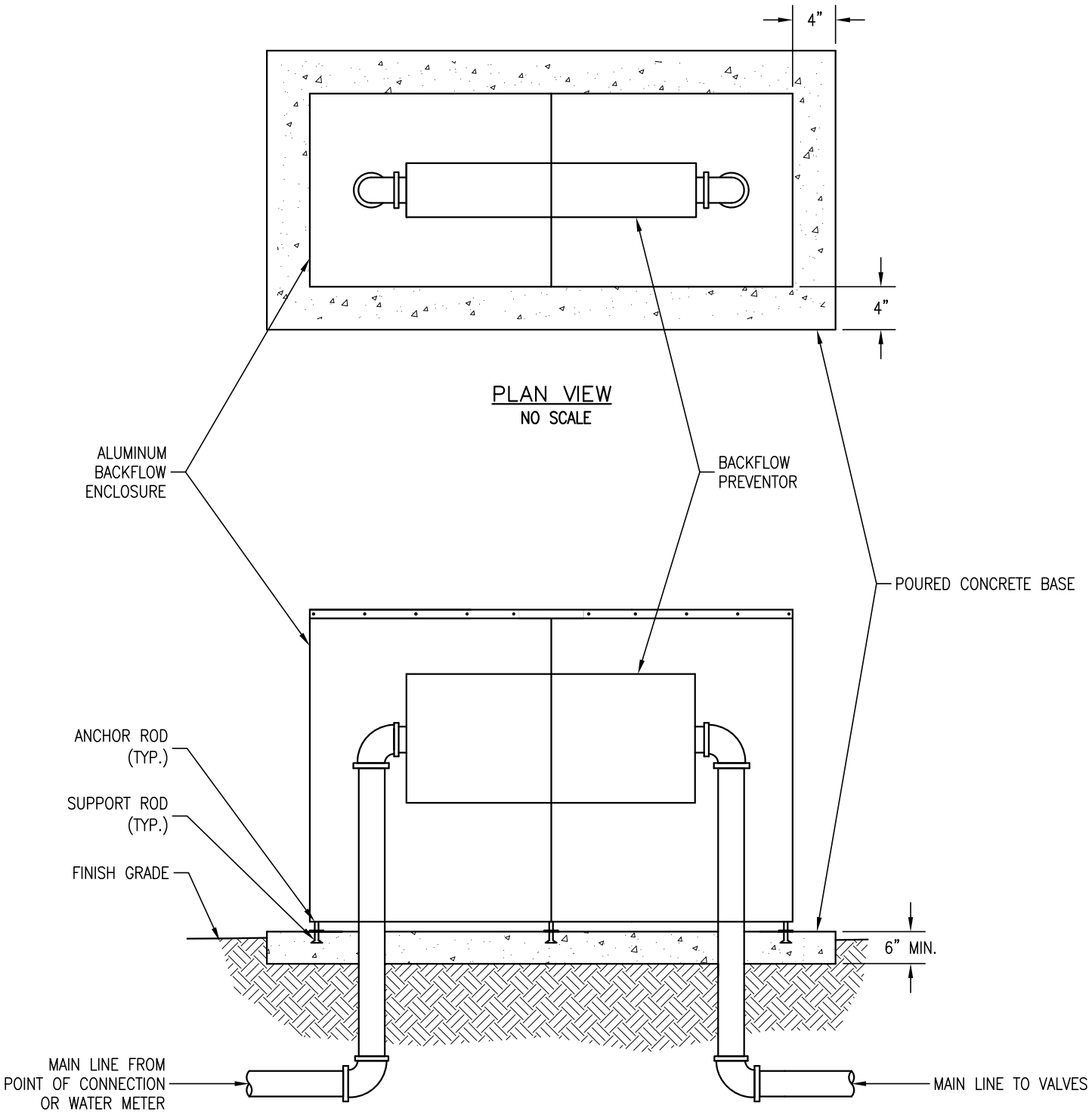
ELEVATION VIEW
NO SCALE

DRAWN BY: K. TRAN	LOW VOLUME REMOTE CONTROL VALVE	LS-16
CHECKED BY: C. QUANZ		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 72

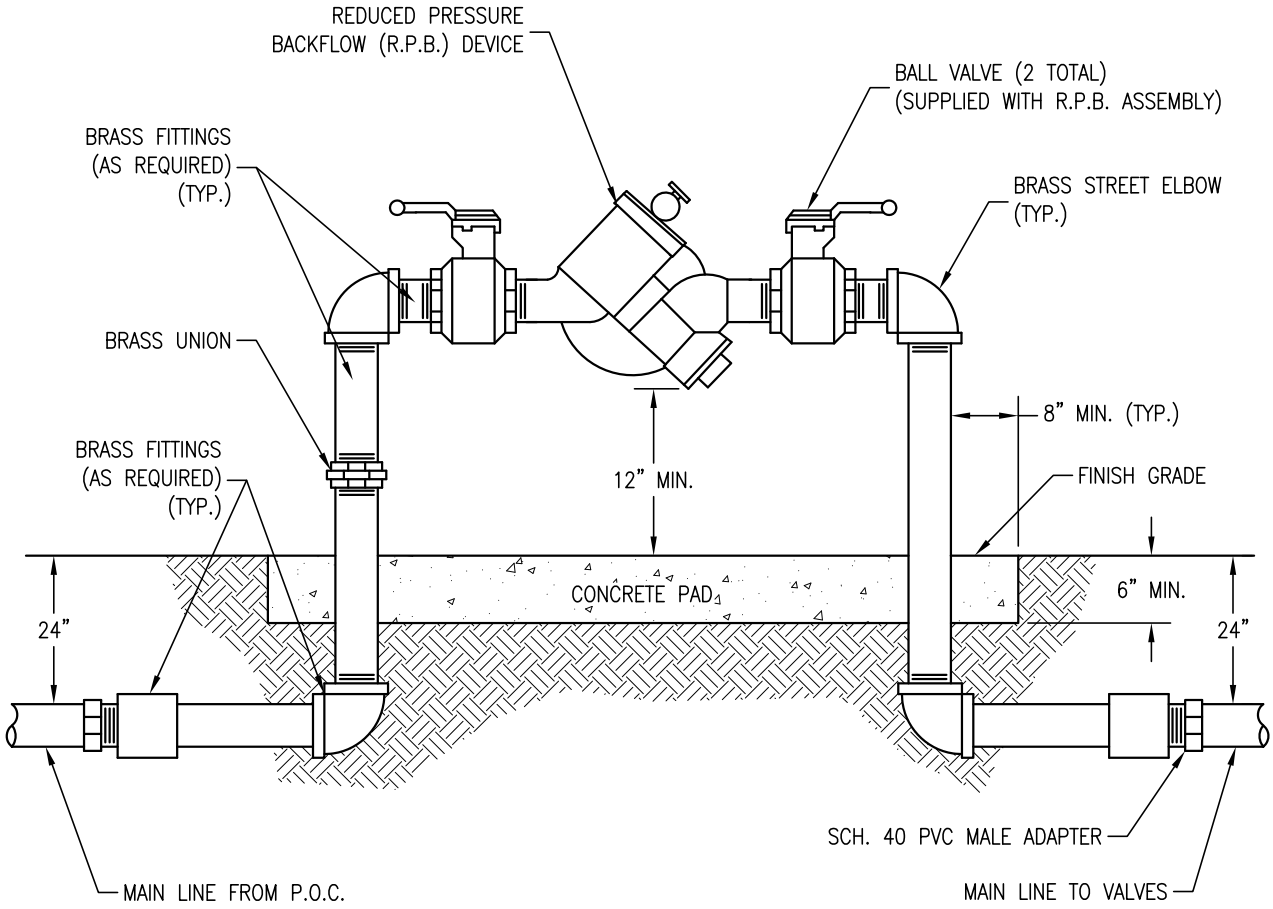


ELEVATION VIEW
NO SCALE

DRAWN BY: K. TRAN	MASTER REMOTE CONTROL VALVE	LS-17
CHECKED BY: C. QUANZ		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 73



DRAWN BY: K. TRAN	BACKFLOW ENCLOSURE	LS-18
CHECKED BY: C. QUANZ		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 74



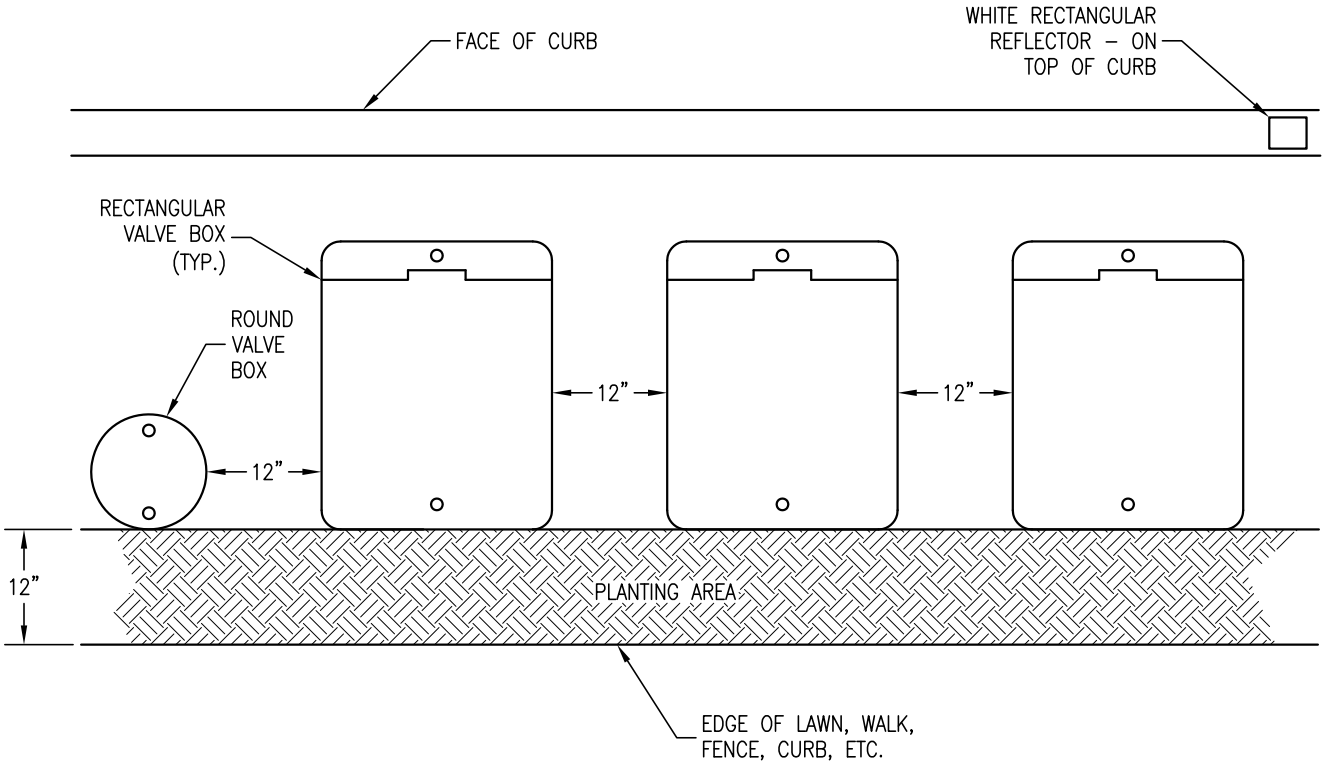
ELEVATION VIEW
NO SCALE

NOTES:

1. EVENLY COAT METAL FITTINGS EXPOSED TO SOIL AND CONCRETE WITH 3M SCOTCHRAP PIPE PRIMER AND THEN WRAP WITH 3M SCOTCHRAP NO. 51 BLACK TAPE (3/4" OVERLAP).

2. FOR SERVICE CONNECTION, REFER TO WATER & SEWER DEPARTMENT STANDARD DETAILS.

DRAWN BY: K. TRAN	REDUCED PRESSURE BACKFLOW ASSEMBLY	LS-19
CHECKED BY: C. QUANZ		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 75

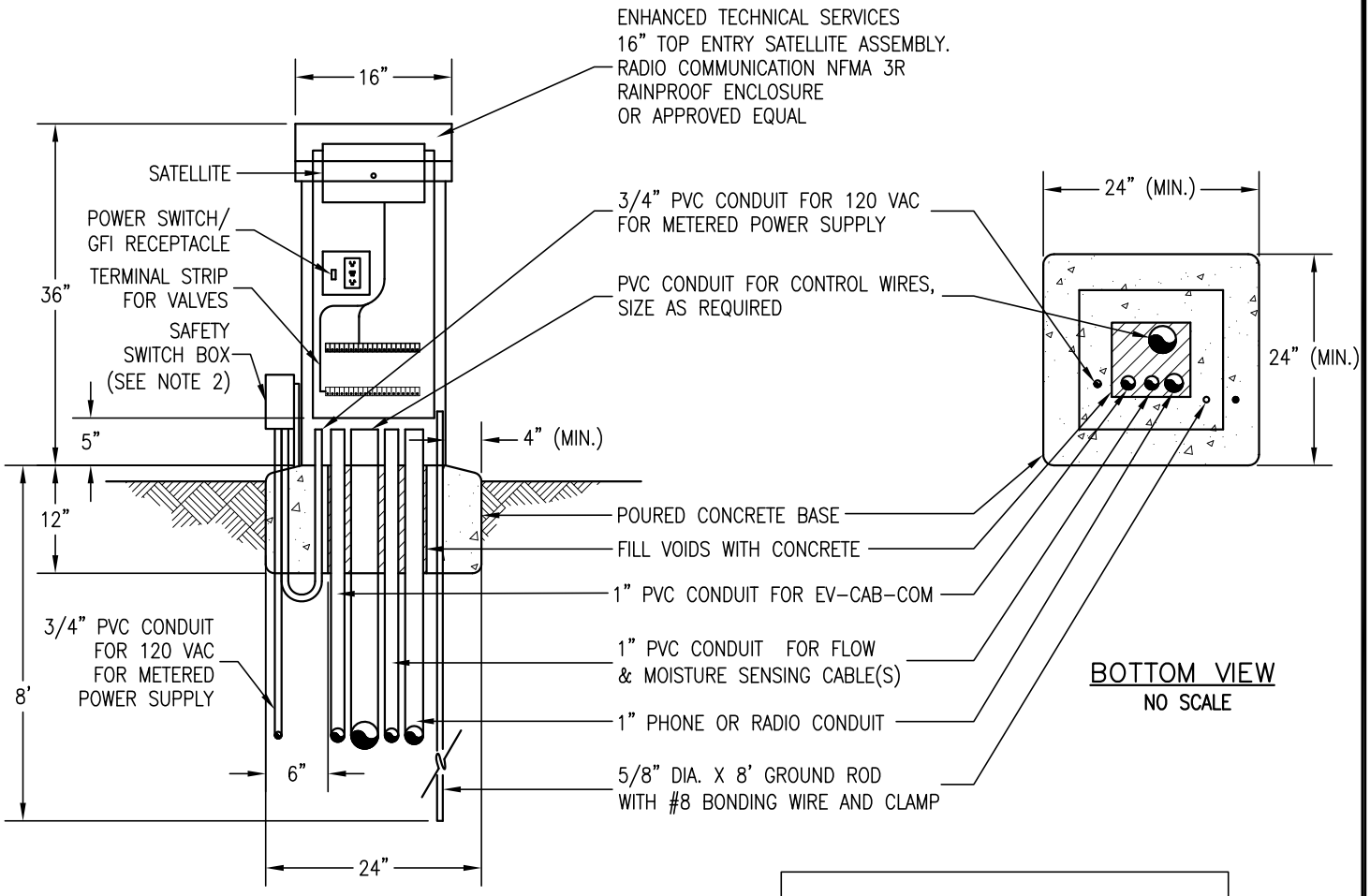


PLAN VIEW
NO SCALE

NOTES:

1. CENTER BOXES OVER VALVES.
2. SET BOXES IN GROUND COVER/SHRUB AREA WHERE POSSIBLE.
3. SET BOXES PARALLEL TO EACH OTHER AND PERPENDICULAR TO EDGE.
4. AVOID HEAVILY COMPACTING SOIL AROUND BOXES TO PREVENT DAMAGING VALVE BOXES

	DRAWN BY: K. TRAN	IRRIGATION VALVE BOX LOCATIONS	LS-20
	CHECKED BY: C. QUANZ		
	APPROVED BY: G. GOMEZ		
	DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 76



BOTTOM VIEW
NO SCALE

16" ENTRY SATELLITE ASSEMBLY (SA6-RM8-(STA#)/DX3) OR APPROVED EQUAL ELEVATION VIEW

NO SCALE

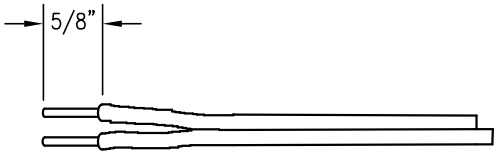
NOTES:

1. ENCLOSURE TYPE MAY VARY PER APPLICATION UPON APPROVAL.
2. SAFETY SWITCH BOX SHALL BE SERIES E3 RAINPROOF 30 AMPS TYPE 3R ENCLOSURE, OR APPROVED EQUAL.
3. SAFETY SWITCH BOX SHALL BE ATTACHED EITHER TO THE ENCLOSURE EXTERIOR OR TO APPROVED POST (1"X1" STEEL OR 4"X4" WOOD).

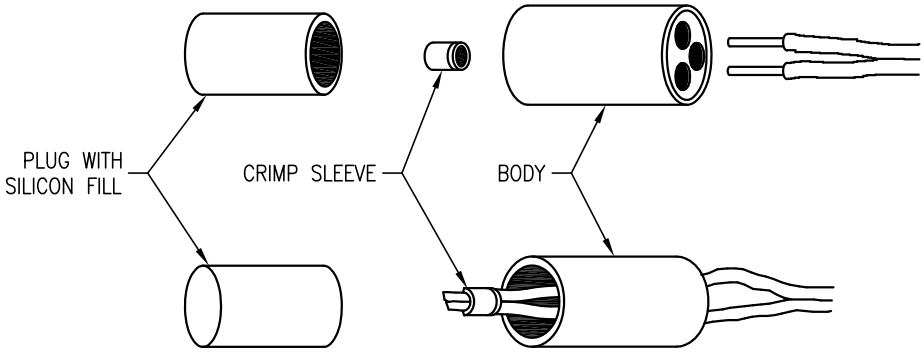
SA ASSEMBLY TO INCLUDE

- CONTROLLER MODEL AS SPECIFIED
- ENCLOSURE MODEL AS SPECIFIED
- OPTIONS AS SPECIFIED
- TERMINAL STRIPS
- TEMPLATE & BOLTS
- 8' COPPER GROUND ROD
- 5 YEAR LIMITED WARRANTY
- CONTACT ENHANCED TECHNICAL SERVICES TO OBTAIN CERTIFICATION

DRAWN BY: K. TRAN	IRRIGATION SATELLITE (RADIO COMMUNICATION)	LS-21
CHECKED BY: C. QUANZ		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 77

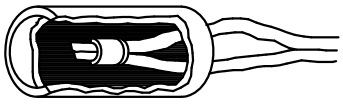


STRIP WIRES TO APPROXIMATELY 5/8" FROM END.



INSERT WIRES THROUGH HOLES IN BASE OF BODY

TWIST STRIPPED WIRES TOGETHER AND APPLY CRIMP SLEEVE WITH AN INDENT TYPE CRIMPING TOOL.



PUSH WIRES BACK INTO BODY. INSERT PLUG INTO BODY UNTIL IT SNAPS TIGHT.

NOTES:

1. ONE CONNECTOR WILL HANDLE #10, #12 AND #14 AWG WIRES.
2. WIRE CONNECTOR WILL ACCEPT TWO OR THREE WIRE CONNECTIONS.
3. MANUFACTURED BY SPEARS, MODEL DS-400, OR APPROVED EQUAL.

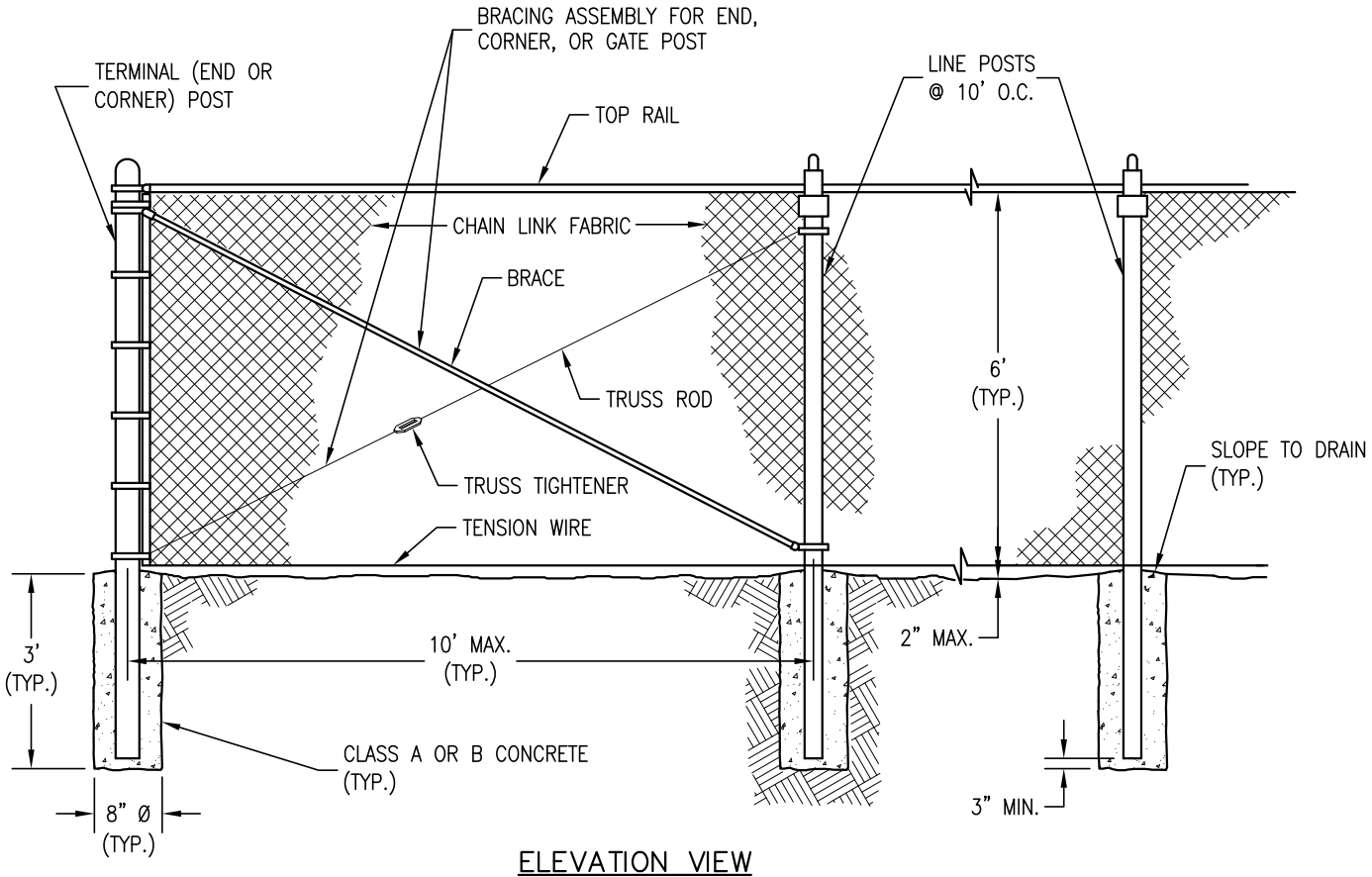
	DRAWN BY: K. TRAN	LOW VOLTAGE IRRIGATION WIRE CONNECTION	LS-22
	CHECKED BY: C. QUANZ		
	APPROVED BY: G. GOMEZ		
	DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 78

Department of Public Works
City of Santa Clara, CA

STANDARD DETAILS

MISCELLANEOUS SECTION

DETAILS MI-1 TO MI-4



ELEVATION VIEW
NO SCALE

NOTES:

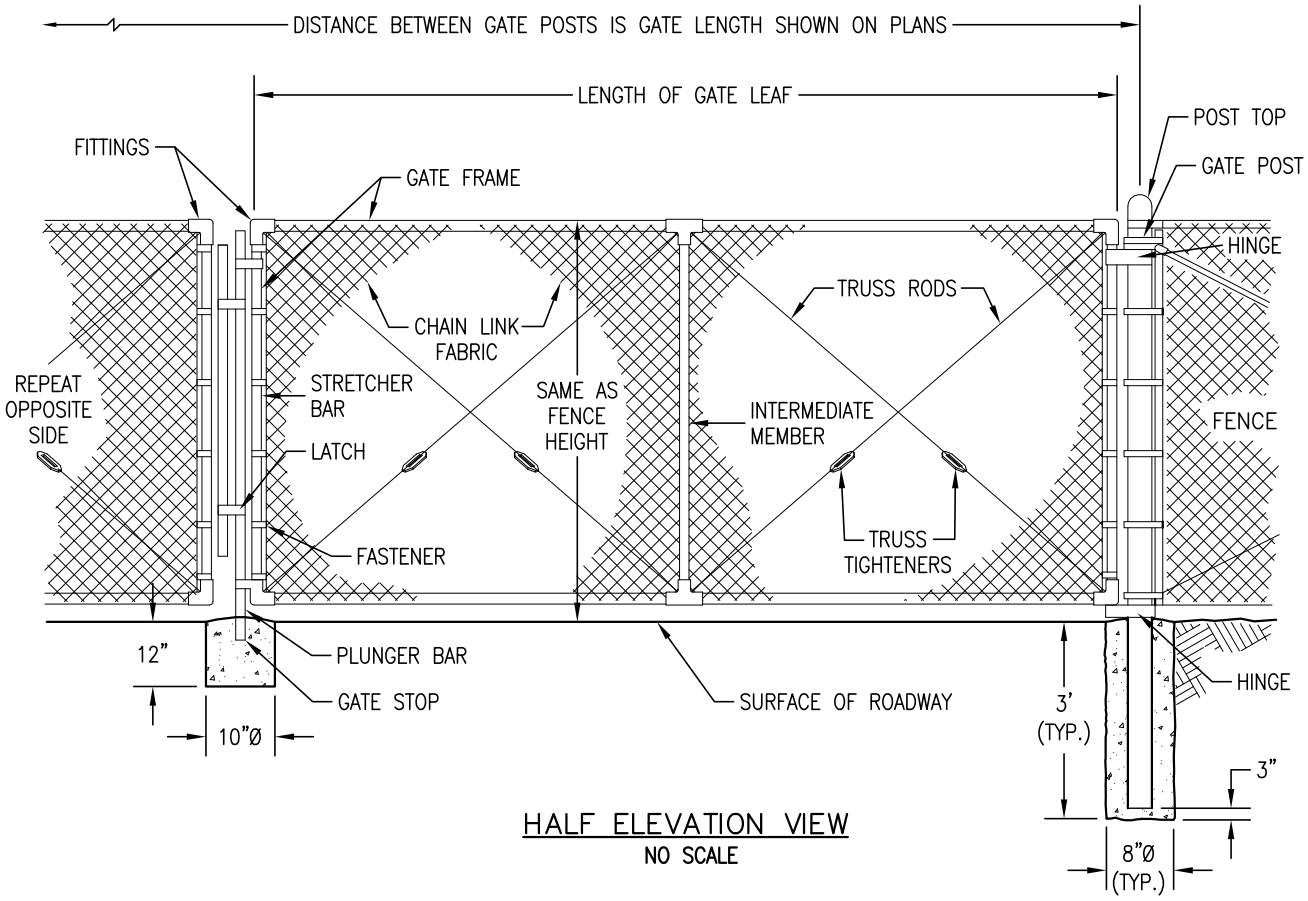
1. ALL MATERIALS AND CONSTRUCTION SHALL CONFORM TO CALTRANS REQUIREMENTS FOR CHAIN LINK FENCE AS SPECIFIED IN SECTION 80-4 OF THE STANDARD SPECIFICATION EXCEPT THAT IN LIEU OF TOP TENSION WIRE, TOP RAIL SHALL BE USED. TOP RAIL SHALL BE GALVANIZED STEEL PIPE NOT LESS THAN 1.63" OUTSIDE DIA. AND WEIGHING NOT LESS THAN 1.93 LBS. PER LINEAL FOOT.

2. CHAIN LINK FABRIC WIRE SHALL BE 11-GAGE MINIMUM. IF SPECIFIED, THE PLASTIC COATED STEEL MESH AND STAINED REDWOOD SLATS SHALL CONFORM TO THE FOLLOWING REQUIREMENTS:

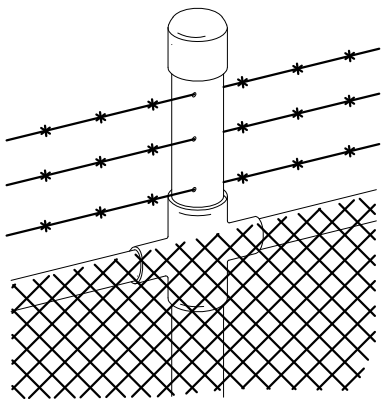
   A) PLASTIC COATED CHAIN LINK FABRIC SHALL BE 11-GAGE PLASTIC COATED COMMERCIAL QUALITY STEEL WIRE WOVEN INTO A 2" MESH CHAIN LINK FABRIC. PLASTIC COATING SHALL BE FIRMLY BONDED TO THE STEEL CORE WIRE AND PROVIDE A DENSE IMPERVIOUS COVERING AT LEAST 0.005" THICK. THE COATING SHALL BE OF A HIGH QUALITY AND SHOW NO DELETERIOUS EFFECTS FROM CHEMICALS SUCH AS AMMONIUM HYDROXIDE, SODIUM CHLORIDE, GASOLINE, PETROLIUM OILS, OR HYDROCHLORIC ACID, NOR SHALL IT SUPPORT COMBUSTION. THE COATING SHALL ALSO HAVE AN ESTHETICALLY PLEASING COLOR THAT WILL NOT FADE, CRACK, OR SPLIT FROM NORMAL AGE AND EXPOSURE.

   B) REDWOOD PICKET CHAIN LINK FABRIC SHALL HAVE 9-GAGE HEAVILY ZINC COATED CHAIN LINK WIRE WOVEN IN A 3 1/2" X 5 1/2" MESH AND STANDARD GRADE "A" 3/8" X 2 1/2" STAINED REDWOOD PICKETS INSERTED VERTICALLY IN EACH MESH OF THE CHAIN LINK FABRIC FOR THE FULL HEIGHT OF THE FABRIC.

DRAWN BY: K. TRAN	CHAIN LINK FENCE	MI-1
CHECKED BY: F. AMIN		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 79



HALF ELEVATION VIEW
NO SCALE

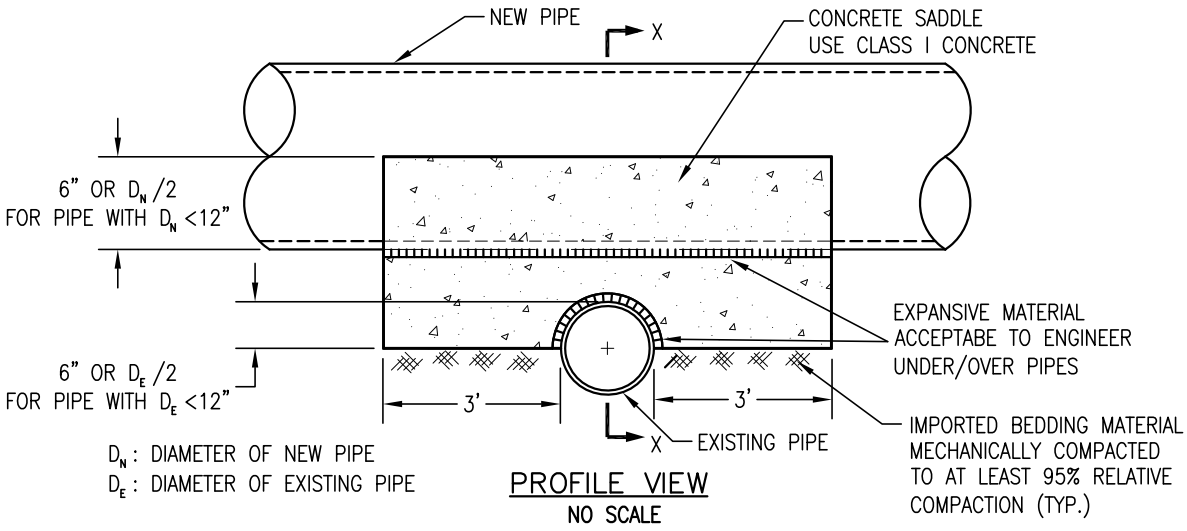


EXTENSION POST AND BARBED WIRE DETAIL
NO SCALE

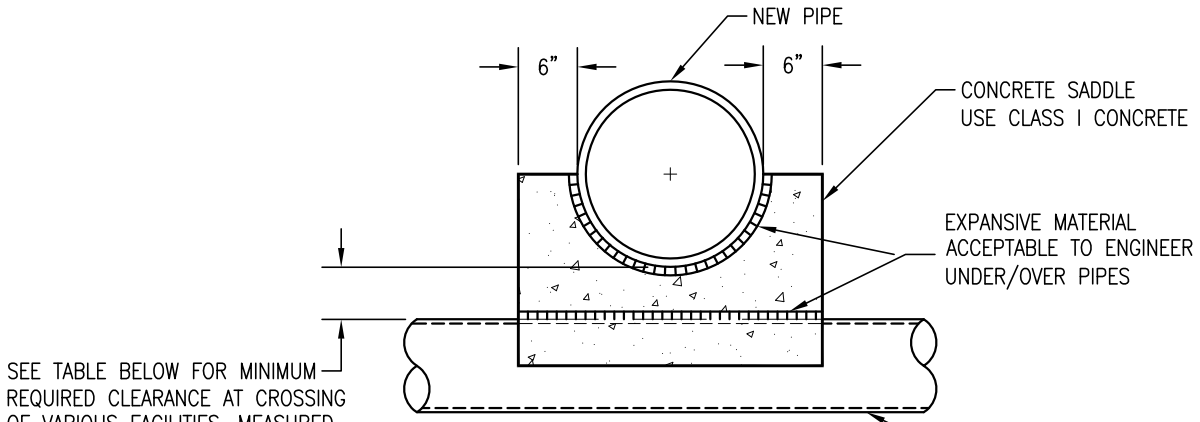
NOTES:

1. ALL FOOTINGS SHALL BE CLASS "A" OR "B" CONCRETE.
2. EXTENSION POST AND BARBED WIRE SHALL BE INSTALLED ONLY WHEN SHOWN ON THE PLANS AND/OR WHEN CALLED FOR IN THE SPECIAL PROVISIONS.
3. CHAIN LINK FABRIC WIRE SHALL BE 11-GAGE MINIMUM. SEE DETAIL MI-1 FOR PLASTIC COATED STEEL MESH AND STAINED REDWOOD SLATS, IF SPECIFIED.

DRAWN BY: K. TRAN	CHAIN LINK DOUBLE SWING GATE	MI-2
CHECKED BY: F. AMIN		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 80



PROFILE VIEW
NO SCALE



X–SECTION VIEW
NO SCALE

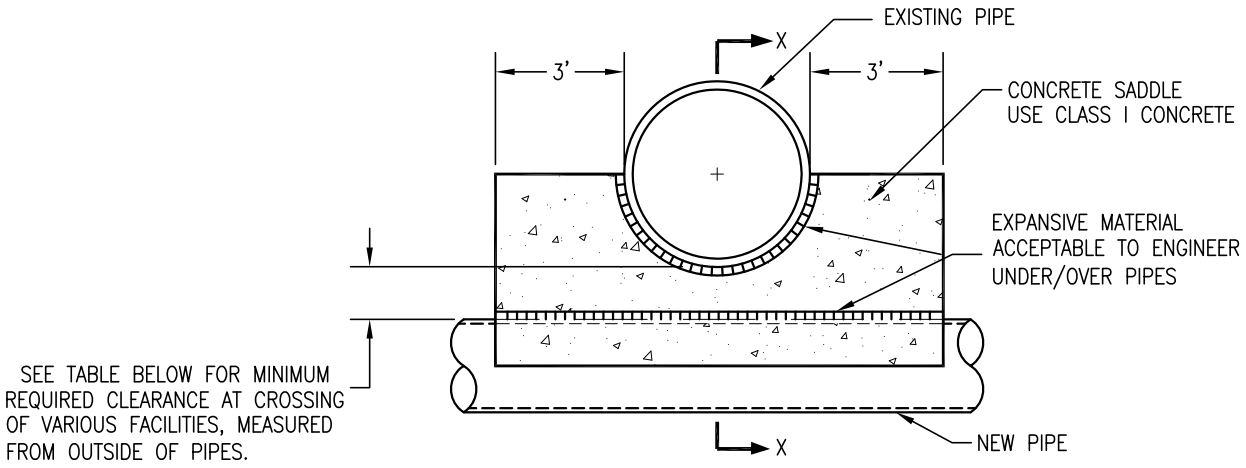
NOTE: INSTALL CONCRETE SADDLE AT EACH LOCATION WHERE A NEW UTILITY CROSSES AN EXISTING UTILITY WITH LESS THAN 12" CLEARANCE.

TABLE: CONCRETE SADDLE MINIMUM REQUIRED CLEARANCE (INCHES)

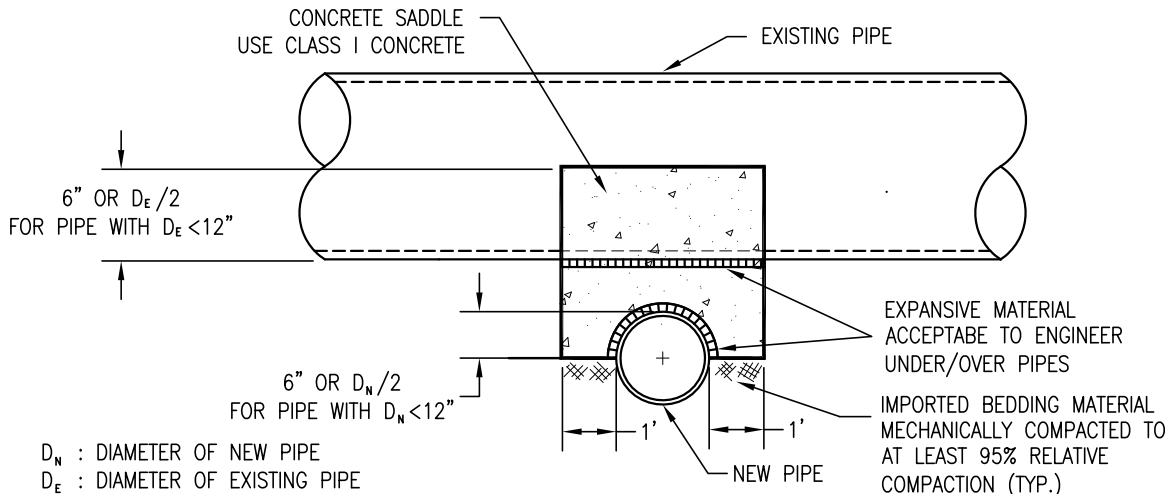
	WATER	RECYCLED WATER	SANITARY SEWER	STORM DRAIN	GAS	ELECTRIC	COMMUNICATIONS	OTHER
WATER	SEE NOTE 1	SEE NOTE 1	SEE NOTE 1	SEE NOTE 1	SEE NOTE 1	SEE NOTE 1	SEE NOTE 1	SEE NOTE 1
RECYCLED WATER	SEE NOTE 1	SEE NOTE 1	SEE NOTE 1	SEE NOTE 1	SEE NOTE 1	SEE NOTE 1	SEE NOTE 1	SEE NOTE 1
SANITARY SEWER	SEE NOTE 1	SEE NOTE 1	3	3	6	SEE NOTE 1	6	SEE NOTE 1
STORM DRAIN	SEE NOTE 1	SEE NOTE 1	3	3	6	SEE NOTE 1	6	SEE NOTE 1
GAS	SEE NOTE 1	SEE NOTE 1	6	6	3	SEE NOTE 1	6	SEE NOTE 1
ELECTRIC	SEE NOTE 1	SEE NOTE 1	SEE NOTE 1	SEE NOTE 1	SEE NOTE 1	SEE NOTE 1	SEE NOTE 1	SEE NOTE 1
COMMUNICATIONS	SEE NOTE 1	SEE NOTE 1	6	6	6	SEE NOTE 1	3	SEE NOTE 1
OTHER	SEE NOTE 1	SEE NOTE 1	SEE NOTE 1	SEE NOTE 1	SEE NOTE 1	SEE NOTE 1	SEE NOTE 1	SEE NOTE 1

NOTE 1: CHECK WITH SPECIFIC UTILITY DEPARTMENT/AGENCY FOR CONCRETE SADDLE MINIMUM REQUIRED CLEARANCE.

DRAWN BY: K. TRAN	CONCRETE SADDLE UPPER PIPE INSTALLATION	MI-3
CHECKED BY: F. AMIN		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 81



PROFILE VIEW
NO SCALE



X–SECTION VIEW
NO SCALE

NOTE: INSTALL CONCRETE SADDLE AT EACH LOCATION WHERE A NEW UTILITY CROSSES AN EXISTING UTILITY WITH LESS THAN 12" CLEARANCE.

TABLE: CONCRETE SADDLE MINIMUM REQUIRED CLEARANCE (INCHES)

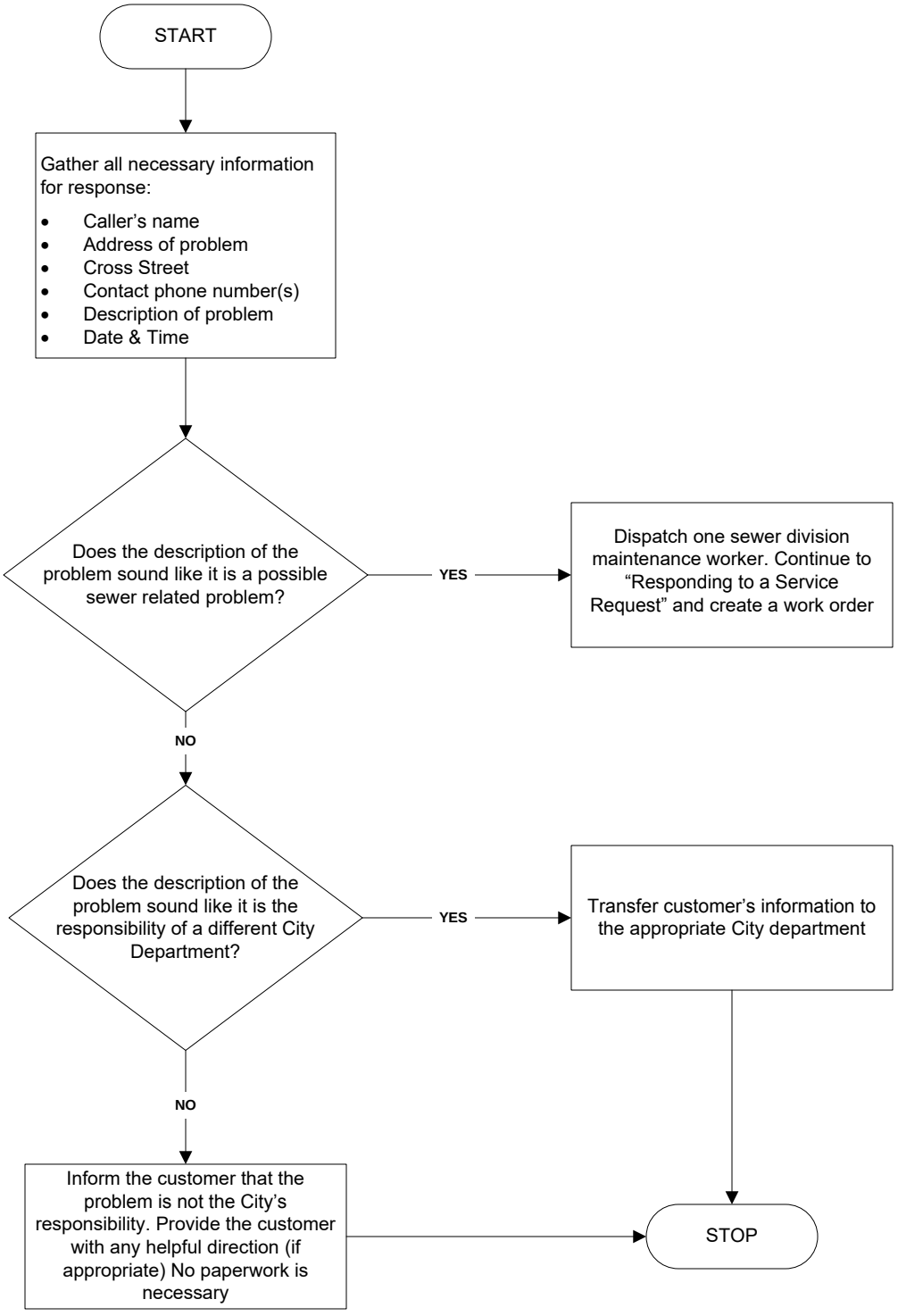
	WATER	RECYCLED WATER	SANITARY SEWER	STORM DRAIN	GAS	ELECTRIC	COMMUNICATIONS	OTHER
WATER	SEE NOTE 1	SEE NOTE 1	SEE NOTE 1	SEE NOTE 1	SEE NOTE 1	SEE NOTE 1	SEE NOTE 1	SEE NOTE 1
RECYCLED WATER	SEE NOTE 1	SEE NOTE 1	SEE NOTE 1	SEE NOTE 1	SEE NOTE 1	SEE NOTE 1	SEE NOTE 1	SEE NOTE 1
SANITARY SEWER	SEE NOTE 1	SEE NOTE 1	3	3	6	SEE NOTE 1	6	SEE NOTE 1
STORM DRAIN	SEE NOTE 1	SEE NOTE 1	3	3	6	SEE NOTE 1	6	SEE NOTE 1
GAS	SEE NOTE 1	SEE NOTE 1	6	6	3	SEE NOTE 1	6	SEE NOTE 1
ELECTRIC	SEE NOTE 1	SEE NOTE 1	SEE NOTE 1	SEE NOTE 1	SEE NOTE 1	SEE NOTE 1	SEE NOTE 1	SEE NOTE 1
COMMUNICATIONS	SEE NOTE 1	SEE NOTE 1	6	6	6	SEE NOTE 1	3	SEE NOTE 1
OTHER	SEE NOTE 1	SEE NOTE 1	SEE NOTE 1	SEE NOTE 1	SEE NOTE 1	SEE NOTE 1	SEE NOTE 1	SEE NOTE 1

NOTE 1: CHECK WITH SPECIFIC UTILITY DEPARTMENT/AGENCY FOR CONCRETE SADDLE MINIMUM REQUIRED CLEARANCE.

DRAWN BY: K. TRAN	CONCRETE SADDLE LOWER PIPE INSTALLATION	MI-4
CHECKED BY: F. AMIN		
APPROVED BY: G. GOMEZ		
DATE: OCTOBER 2013	CITY OF SANTA CLARA	PAGE: 82

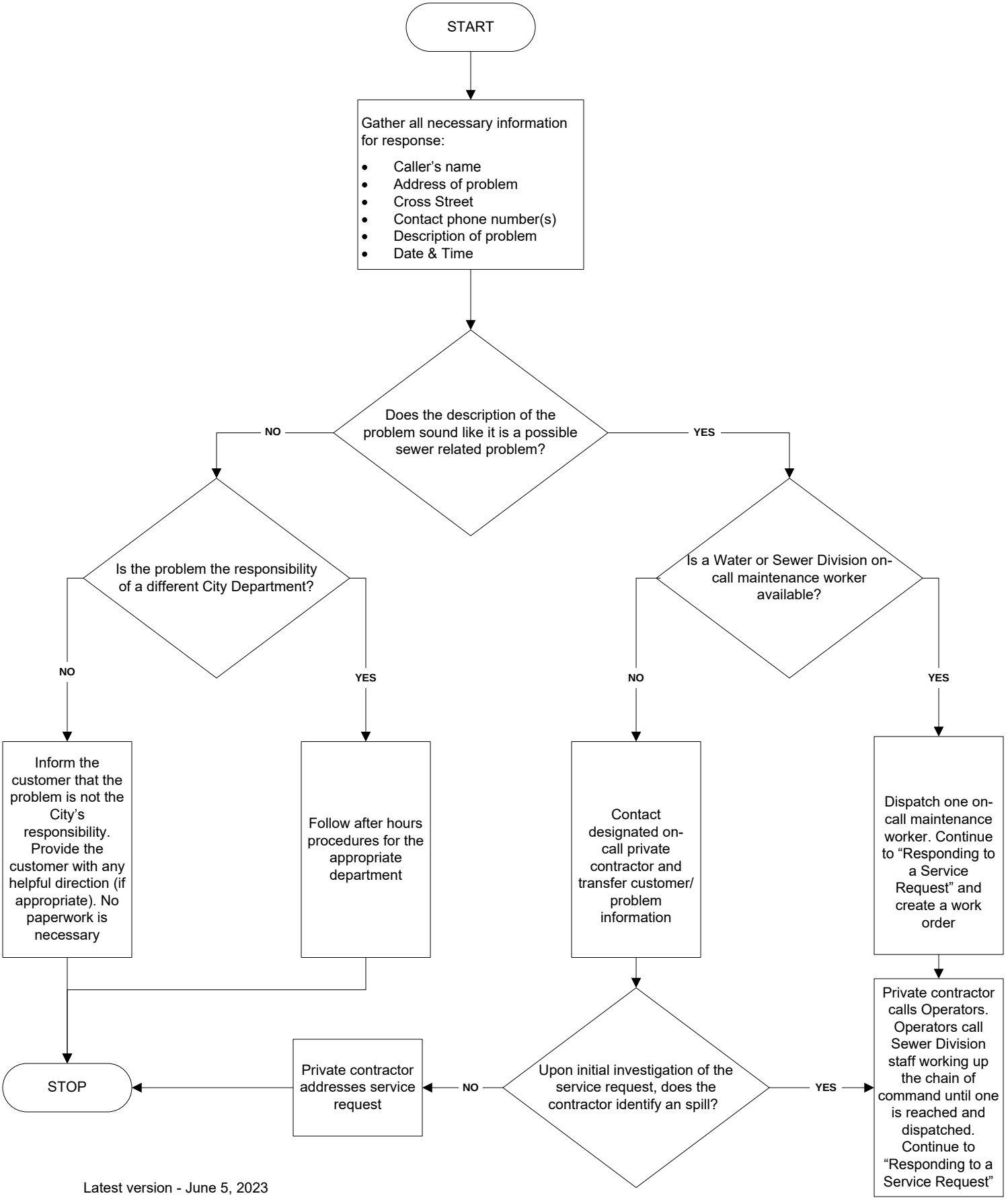
Appendix H
Emergency Response Procedures

RECEIVING A SERVICE REQUEST - DURING BUSINESS HOURS



CITY OF SANTA CLARA SPILL EMERGENCY RESPONSE PLAN

RECEIVING A SERVICE REQUEST – AFTER BUSINESS HOURS, WEEKENDS, AND HOLIDAYS



Latest version - June 5, 2023

SOP TITLE: SPILL RESPONSE

PURPOSE:

1. The goals of the outdoor backup response plan are to:
- a. Stop, contain, and recover spills as quickly and thoroughly as possible.
- b. Protect public health, environment, and property.
- c. Restore affected areas as quickly as possible.

2. Every effort must be made to prevent spills from reaching surface water.

PPE REQUIRED:

1. General
- a. Gloves
- b. Rubber Boots
- c. Eye protection
- d. Safety vest

2. Operating jet truck/ Vac-Con
- a. Hearing protection
- b. Face protection

SPECIFIC HAZARDS:

1. Raw Sewage

2. Traffic Control
- a. Foot
- b. Automotive

SAFETY PRECAUTIONS:

1. Secure the area from the public and control traffic using:
- a. Cones
- b. Arrow board
- c. Warning signs

STANDARD OPERATING PROCEDURE:

OPERATING REQUIREMENTS:

1. Jet Truck
- a. Class A or B California Driver’s License

2. Vac-Con
- a. Training
- b. Class A or B California Driver’s License

SOP TITLE: SPILL RESPONSE - Page 2

PRE-CHECK OF EQUIPMENT:

1. Jet Truck
a. Refer to “JET TRUCK” SOP

2. Vac-Con
a. Refer to “VAC-CON” SOP

OPERATING PROCEDURE:

PRELIMINARY:

1. Secure the area from the public and control traffic using:
a. Cones
b. Arrow board
c. Warning signs

2. Estimate the flow volume
a. Refer to “ESTIMATE THE FLOW” SOP and/or
b. Photograph the spill such that the flow rate can be determined later.

3. Troubleshoot the cause/location of the spill
a. Check the Block Book to identify which manholes need to be checked.

i. Corner lots & properties with sewer easements might have lines on two or more sides.

ii. If there is more than one sewer main in front of or adjacent to the property, all of those mains should be checked.

4. Call for additional support and equipment as needed.

PROCEDURE:

1. Contain the spill
a. Stop and contain the spill prior to storm drain entry.
b. Cover drop inlets (DIs) with plastic sheeting.
c. Sand bag area and gutter.
d. Sand bag downstream storm drain if spill has already entered the storm system.

2. Resolve the problem
a. If the spill is the result of a main line blockage:

i. Refer to “JET TRUCK” and “VAC-CON OPERATION” SOPs to clear the blockage.

ii. If the blockage cannot be cleared quickly, refer to “SETTING UP A BY-PASS” SOP.

SOP TITLE: SPILL RESPONSE - Page 3

iii. After clearing the blockage, check to make sure that all high water subsides. It is possible that the main has plugged again, especially with large chunks of grease and root masses.

b. If the spill is the result of a blockage in the portion of the lateral between the property line cleanout and the main:

i. Refer to the “CUTTERS” SOP to clear the blockage.

ii. After clearing the blockage, flush the lower lateral to ensure that it is clear.

3. Perform final volume estimate

a. Refer to “ESTIMATE THE FLOW” SOP

4. Clean Up

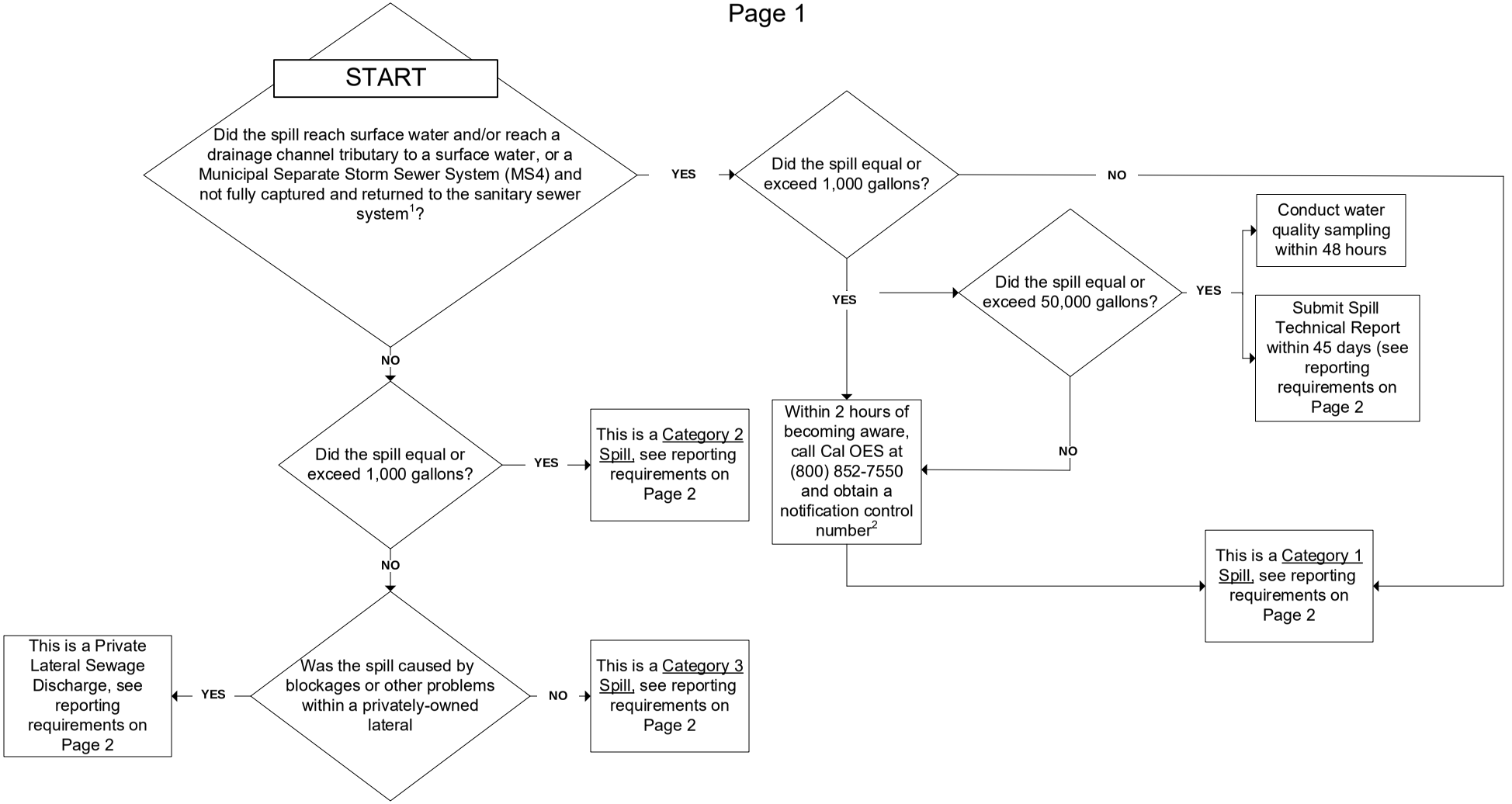
a. Vacuum as much of the spill as possible
b. If the spill is near a clean out: sweep, rake, or wash debris and liquid back into the stand pipe.
c. Wash area as necessary and remove all debris. Refer to “CLEAN UP OF GUTTERS AND MANHOLES” SOP as appropriate.
d. Clean any contaminated storm drains. Contain and reclaim waters generated in the cleaning process.
e. Estimate spill volume reclaimed for reporting purposes.
f. Once the cleanup is complete, remove all sand bags and plastic sheeting and dispose of properly.

5. Documentation and notifications

a. Photograph the affected area.
b. Follow the “NOTIFY THE CUSTOMER” procedure.
c. Follow the “COMPELTE THE PAPERWORK” procedure.
d. Follow the “SPILL NOTIFICATION” procedure.
e. Notify the Assistant Superintendent of the backup immediately.

SIGNATURE BLOCK:

City of Santa Clara
Spill Notification and Reporting
Effective: September 9, 2013
Page 1



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1. Any volume of wastewater not recovered from the MS4 is considered to have reached surface water unless the storm drain system discharges to a dedicated storm water or groundwater infiltration basin) e.g., infiltration pit, percolation pond).

2. Spill information requested may include:
   - Name of person notifying Cal OES/direct return phone number
   - Estimated spill volume discharged (gallons)
   - If ongoing, estimated spill discharge rate (gallons per minute
   - Spill Incident Description
     a. Brief narrative
     b. On-scene point of contact for additional information
     c. Date/time enrollee became aware of the spill
     d. Name of sanitary sewer system agency causing the spill
     e. Spill cause (if known)
   - Indication of whether the spill has been contained
   - Indication of whether surface water is impacted
   - Name of surface water impacted by the spill, if applicable
   - Indication of whether a drinking water supply is or may be impacted by the spill
   - Any other known spill impacts
   - Spill incident location (address, city, state, and zip code).

City of Santa Clara
Spill Notification and Reporting
Effective: September 9, 2013
Page 2

Category 1 and Category 2* Spill Reporting Requirements

Draft Reports – submitted to CIWQS within 3 business days

1. Spill Contact Information: Name & telephone number of enrollee contact person who can answer specific questions about the spill being reported.
2. Spill Location Name
3. Location of the spill event by entering GPS coordinates [1]
4. Whether or not the spill reached surface water, a drainage channel, or entered and was discharged from a drainage structure.
5. Whether or not the spill reached a municipal separate storm drain system.
6. Whether or not the total spill volume that reached a MS4 drain system was fully recovered.
7. Estimate of the spill volume, inclusive of all discharge point(s).
8. Estimate of the spill volume that reached surface water, a drainage channel, or was not recovered from a storm drain.
9. Estimate of the spill volume recovered (if applicable)
10. Number of spill appearance points
11. Description & location of spill appearance point(s). If a single sanitary sewer system failure results in multiple spill appearance points, each appearance point must be described
12. Spill start date and time
13. Date and time the enrollee was notified, or self-discovered, the spill
14. Estimated operator arrival time
15. For spills greater than or equal to 1,000 gallons, the date and time Cal OES was called
16. For spills greater than or equal to 1,000 gallons, the Cal OES control number.

***Draft Category 2**: Items **1-14** from above.

Certified Reports – submitted to CIWQS within 15 calendar days of the end date of the spill

All information in Category 1 Draft Report, and in addition:
1. Description of spill destination(s).
2. Spill end date and time.
3. Spill Causes (mainline blockage, roots, etc).
4. Spill failure point (main, lateral, etc).
5. Whether or not the spill was associated with a storm event.
6. Description of spill corrective action, including steps planned or taken to reduce, eliminate, and prevent reoccurrence of the overflow; and a schedule of major milestones for those steps.
7. Description of spill response activities
8. Spill response completion date.
9. Whether or not there is an ongoing investigation, the reasons for the investigation and the expected date of completion.
10. Whether or not a beach closure occurred or may have occurred as a result of the spill.
11. Whether or not health warnings were posted as a result of the spill.
12. Name of beach(es) closed and/or impacted. If no beach impacted, select NA
13. Name of surface water(s) impacted.
14. If water quality samples were collected, identify parameters the water quality samples were analyzed for. If no samples were taken, select NA
15. If water quality samples were taken, identify which regulatory agencies received sample results. If no samples taken, select NA.
16. Description of methodology(ies) and type of data relied upon for estimations of the spill volume discharged and recovered.
17. Spill Certification: Upon spill certification, the CIWQS Online Spill Database will issue a final spill ID number.

***Certified Category 2**: Items **1-14** in Draft Report, and Items **1-9**, and **17** from above.

Category 3 Spill Reporting Requirements

Certified Report – submitted to CIWQS within 30 calendar days of the end of month in which the spill occurred

Items **1-14** in *Draft Reports*, and Items **1-6**, and **17** in *Certified Reports*

Private Lateral Sewage Discharge Reporting Requirements

May be **voluntarily** reported to CIWQS

Spill Technical Report Requirements

Submitted within 45 calendar days of the Spill end date for spills of 50,000 gallons or greater

1. Causes and Circumstances of the spill:

a. Complete and detailed explanation of how and when the spill was discovered.
b. Diagram showing the spill failure point, appearance point(s), and final destination(s)
c. Detailed description of the methodology employed and available data used to calculate the volume of the spill, and if applicable, the spill volume recovered.
d. Detailed description of the cause(s) of the spill.
e. Copies of original field crew records used to document the spill.
f. Historical maintenance records for the failure location

2. Enrollee's Response to SSO:

a. Chronological narrative description of all actions taken by enrollee
b. Explanation of how the SSMP Overflow Emergency Response plan was implemented to respond to and mitigate the spill
c. Final corrective action(s) completed and/or planned to be completed, including a schedule for actions not yet completed.

3. Water Quality Monitoring:

a. Description of all water quality sampling activities conducted including analytical results and evaluation of the results.
b. Detailed location map illustrating all water quality sampling points.

[1] if one spill event results in multiple appearance points in a sewer system asset, the enrollee shall complete one spill report in the CIWQS Online Spill Database which includes the GPS coordinates for the location of the spill appearance point closest to the failure point, blockage or location of the flow condition that caused the spill, and provide descriptions of the locations of all other discharge points associated with the spill event.

SOP Title: ***Jet Truck***

Purpose:

To clean sewer Lines to prevent grease, sediment build-up and root blockages. To identify areas of excessive Fats, oils and grease discharges and root intrusion.

Specific Hazards:

Traffic Safety, working in and around open manhole, hazardous gases, and possible hazardous materials

Safety Precaution:

1. Traffic Hazards- evaluate traffic and set up safety precautions as needed
2. Gas detection monitor with trained individual
3. Working in manhole requires two people to be present

Standard Operating Procedure

1. **Operating Requirements**
   a. Must have a class A or B license

2. **Pre-Check Equipment**
   a. Preform Pre-Trip Inspection and fill out DOT tag
   b. Check and test truck safety features: Arrow board, beacon and strobes
   c. Make sure fuel tank and DEF tank is adequate for the job
   d. Make sure water tank is full – can be filled from both sides of truck suing the fill hose

3. **Operating Procedure**

Preliminary

1. Park Jet Truck with hose reel positioned over the downstream manhole from stoppage
   a. Use back-up camera to help position truck
   b. Hose reel extends out and pivots left and right

CAUTION: DO NOT RUN WATER PUMP WITHOUT WATER (THERE IS A LOW WATER LEVEL WARNING LIGHT)

Procedure:

1. Truck in Neutral and Brake engaged, Engage PTO (Work Mode ON) inside the truck cab or on the rear Dash Controls
2. Place Tiger tail hose guide on jet hose
3. Select proper skid and jet head for the project
4. Lower hose down into the manhole facing upstream with Payout switch
5. Zero footage counter
6. Suction valve switch to Open
7. Water jet switch to High (pressure) or Low (pressure)
8. Throttle increase switch to raise motor RPM and Water pressure

9. Throttle Water Pressure up to suggested pressure for size of main

DO NOT pressurize more than 2500 psi

10. Jet upstream with Payout switch and Speed control knob
11. Once hose becomes slack the jet head has hit the blockage, allow for the jet head to work through blockage.
12. After blockage is cleared and the main is draining Decrease Throttle, switch to water jet off and suction valve closed
13. Allow for manholes to drain and check downstream manholes for flow
14.. After manhole(s) have drained, follow steps 5-9 to continue upstream jetting to next manhole
15. With Speed control knob and Retrieval hose switch clean main slowly back to starting manhole
16. Black Leader Hose indicates jet head is 20 feet from manhole
17. Throttle Decrease switch to Lower motor RPM and Water pressure
18. Water jet switch OFF
19. Suction valve switch to Closed
20. Retrieve remaining hose
21. Disengage PTO (Work Mode ON) inside the truck cab or on the rear Dash Controls

SOP TITLE: VAC-CON OPERATION

SSMP/SSO REQUIREMENT: If one thousand (1,000) gallons or more of sewage escapes the collection system or sewage reaches the water ways or storm system and is NOT recovered, the Superintendent or Assistant Superintendent must be notified IMMEDIATELY.

PURPOSE: To clean up, remove and properly dispose of any sewage that may have escaped from the collection system

PPE REQUIRED: Hard hat, gloves, safety vest, ear plugs (as needed), face shield (as needed)

SPECIFIC HAZARDS: Traffic safety, possible hazardous materials, working in and near open manhole, overhead lines (moving boom, lifting bed) suction tube

SAFETY PRECAUTIONS:

1. Any work to be done in the manhole must have at least 2 people
2. Evaluate traffic so proper safety can be set up
3. Gas detection monitor and trained operator

STANDARD OPERATING PROCEDURE:

OPERATING REQUIREMENTS:

1. Must have A/B license to operate

PRE-CHECK OF EQUIPMENT:

1. Do a pre-trip inspection and fill out DOT tag
2. Do a safety check: cones, arrow board, beacon, strobe
3. Check tank for water level/fill if needed - (fill hose on passenger side behind cab)

OPERATING PROCEDURE:

PRELIMINARY:

1. Position VAC-CON so that jet hose and vacuum tube are over downstream manhole\
2. Truck in neutral with brake engaged

A. JETTING PROCEDURE:

1. Turn ON secondary motor
2. Control joystick to hose reel control 1%, 25%, 50%, 75% 100% select what is needed
3. Choose proper head and skid to perform tasks
4. Place Tiger tail hose guide on jet hose
5. Lower jet hose into manhole facing upstream using Control Joystick
6. Engage hose reel (hose reel/lever to ON/pump control to ON)
7. Feed out jet hose in upstream direction

8. Throttle water pressure up to required PSI to jet – joystick right side buttons - GREEN Throttle up, RED Throttle down or toggle switch up or down
9. Zero footage counter
10. Throttle water pressure up to suggested pressure for size of main

CAUTION: DO NOT PRESSURIZE MORE THAN 2500 PSI

11. Jet upstream using Control Joystick
12. Once hose becomes slack the jet head has hit the blockage, allow for the jet head to work through blockage.
13. After blockage is cleared and the main is draining (Decrease Throttle, disengage hose reel (pump control to OFF/ hose reel/lever to OFF)
14. After manhole(s) have drained, follow steps 1 to 5 to continue upstream jetting to next manhole
15. Jet Downstream using Control Joystick
16. Black Leader Hose indicates jet head is 20 feet from manhole
17. Decrease Throttle, disengage hose reel (pump control to OFF/ hose reel/lever to OFF)
18. Retrieve remaining hose
19. Turn off Secondary motor if done with Jetting and Vacuuming

VACUUM PROCEDURE:

1. Main truck engine ON Secondary Motor ON
2. Engage Joystick to boom on display screen
3. Unlatch boom from Support Bracket
4. Attach vacuum tubes to vacuum hose using clamps
5. Engage Vacuum with display or have in Work mode/Vacuum breaker ON
6. Control boom Joystick in boom mode, pull trigger to control while jetting
7. Control vacuum with screen controls and Joystick left side buttons GREEN Throttle up, RED Throttle down or toggle switch up or down
   Higher the Throttle stronger the Vacuum
8. Use Joystick to move Vacuum tube to location needed
9. When finished Throttle down
10. Remove Vacuum tubes and clamps
11. Relatch boom to Support Bracket
12.

EXCAVATING:

1. Display control – vacuum - make sure in work mode/vacuum breaker ON
2. Dirt and mud should have water added when sucking to prevent the tubes, hose and boom from getting clogged
3. Low pressure wand– ball valves x2 for low pressure, one valve on the front passenger bumper second near hose reel
4. High pressure hose – large ball valve near reel
5. Pump control to ON

6. Turn off reverse steps – Pump control to OFF, turn all ball valves to original position

DUMPING AND CLEAN UP:

1. VAC-CON should be cleaned after each use
2. VAC-CON should be dumped at Rabello dump site, right hand side
3. VAC-CON should be dewatered in a manhole using the blue dump hose before emptying the tank
    a. To dewater tank, turn on secondary motor and check for overhead obstructions
    b. Back up to manhole and place blue dump hose into open manhole
    c. Open blue dump hose valve
    d. Slowly raise tank to dewater
4. VAC-Con should be backed into the dump stall
5. To Dump debris from the tank check overhead for obstructions
6. The manual door locks for the tank should be released if equipped
7. Automatic door locks for the tank should be released (controls on passenger side)
8. Tank should be raised in order to dump solids and debris (controls on passenger side)
9. Inside of tank, door hatch and Exterior of VAC-CON should be washed well to remove additional solids and debris
10. Wash upper vacuum filters to be sprayed clean
11. Lower tank and engage all door locks for tank
12. Visually inspect all door locks have been engaged
13. Turn off secondary motor

ATTACHMENTS:

1. Low Pressure wand and hose
2. High pressure wand and hose
3. Pendant

SIGNATURE BLOCK:

CITY OF SANTA CLARA - SPILL EMERGENCY RESPONSE PLAN

SPILL REPORT - Page 1

SECTION 1: General Information / Background

Agency Name : City of Santa Clara
Cause Occurred in : Lateral____ Main Line ____ Force Main____
Incident Date : _____ (MM/DD/YY)
Time of call: _____
Time of Arrival At Spill Site: _____
GPS Coordinates/Spill Orientation: _____
Multiple Appearance Points: _____
Blockbook page: _____ Manhole #:_____
Weather Conditions: Wet_____ Dry_____
Street Address/Site : _____ Cross Street._____
City : Santa Clara _____ County : Santa Clara _____ Zip Code :_____
# of Spill Appearance Points: _____ if more than 1, describe each appearance point in section 6

SECTION 2: Estimated and Calculated Spill amounts

Estimated Spill Rate Upon Time Of Arrival[1] : _____ (GPM)
Estimated Spill Start Time And Date[2]: _____
Estimated Spill End Time And Date : _____
Pipe Size:_____ (inches) Pipe Type/Material: _____
Estimated amount Spilled In Gallons[3] : _____ (Numeric Only)
Estimated amount Of Spill Mitigated
And Returned to Sanitary Sewer System
(not including the wash down water): _____ (gallons)

SECTION 3: Spill Cause, Source, Destination

Spill Cause :
____ Blockage →
____ Infrastructure Failure
____ Inflow Infiltration
____ Electrical Power Failure
____ Flow Capacity Deficiency
____ Natural Disaster
____ Bypass
____ Cause Unknown
____ Contractor

If Spill Cause Is Blockage, Please Specify :
____ Grease
____ Debris
____ Roots
____ Debris From Laterals
____ Vandalism
____ Animal Carcass
____ Construction Debris
____ Unknown
____ Multiple Causes
Please List :_____

Source Of Spill :
____ Manhole
____ Pipe
____ Clean Out
____ Pump Station
____ Flushing Inlet
____ Other
If Other, Please Specify :_____

Final Spill Destination:
____ Storm Drain
____ Captured In Storm drain
____ Building Structure
____ Yard/Lawn
____ Street/Curb & Gutter
____ Surface Water Impact; Name: _____ Est. Spill Volume: _____
____ Ground Water Impact
____ Unknown

SECTION 5: Incident Response and Notification

Incident Response:

Were response/ corrective actions taken: ____ Yes ____No if yes, please describe in section 6
Were clean-up actions taken: ____ Yes ____No
Were disinfection actions taking: ____ Yes ____No
Were samples taken: ____ Yes ____No
If yes, for what parameters? _____
Which regulatory agencies received results? _____
Any ongoing investigation: ____ Yes ____No
If yes, expected completion date: _____
Reason for investigation: _____
Any health or safety warnings posted: ____ Yes ____No

Suspected Responsible Party:
Name: _____ Address:_____Phone:_____
City: _____ County: _____Zip Code:_____

Notification: **(Category 1 only when ≥ 1,000 gal. reaching surface waters), contact manager/supervisor)**
OES date called:_____
OES time called:_____
OES contact name:_____
OES Control Number: _____

SECTION 6: Additional Spill Calculation and Estimation information

How Was Spill Start Time Determined?
SSCSC Manhole Overflow Gauge:_____
Math Calculation:_____
Spill Location and Spread (Visually assess using photography and GPS)

1. Draw a sketch
2. Photography for:
   a. Drainage conveyance system entry location
   b. Location(s) if discharge into surface waters
   c. Extent of spill spread
   d. Location(s) of clean up
3. Total Spill Volume Estimation calculation: Rectangle: L x W x D **OR** Circle: 3.14 x r^2 x D
4. Receiving Water Visual Observations:
   a. Estimated spill volume entering the receiving water
   b. Photography of:
      i. Waterbody bank erosion
      ii. Floating matter
      iii. Water surface sheen
      iv. (potentially from oil & grease)
      v. Discoloration of receiving water, and
      vi. Impact of the receiving water, Date of Completion: _____ Time: _____

Description of Multiple Spill Appearance Points, if any:

_____
_____

Description of Spill Response Activities Date of Completion: _____ Time: _____

_____
_____
_____

Description of Spill Corrective Action

_____
_____
_____

Comments / Witnesses / Address / Time

_____
_____
_____

Person Completed _____ Date ____/____/_____

NOTES:

[1] GPM is determined by using “CWEA Manhole Overflow Gauge” Worksheet

[2] Estimated Start Time shall be determined by either of the following: Time of call, arrival time or information contained in section 6

[3] Calculation: Spill Start Time – Spill End Time = Duration of spill (minutes)
Duration of spill (minutes) X Spill rate (gpm) = Spill amount (gallons)

Additional Support for Emergency Operations

For All Emergency Services - Central Dispatch	
Emergency Services	911
Water and Sewer Department	(408) 615-2000
Water and Sewer Emergencies (Electric Control)	(408) 615-5640
Non-Emergency Dispatch	(408) 615-5580
City Police Department - Traffic	(408) 615-4760
County Health Officer	
During Business Hours - Contact Dr. Sara H. Cody, M.D.	(408) 792-3798 (Direct Line) (408) 792-5040 (General Office)
After business hours, contact County Communication and ask for the County Health Office on-call	(408) 998-3438
Regional Water Board - Spill Notification	(510) 622-2369
Regional Water Board - General Office:	(510) 622-2300
Office of Emergency Services	(800) 852-7550
PG&E	(800) 743-5000
AT&T	(800) 310-2355
Comcast XFinity	(800) 945-2288
City Public Works/Engineering	(408) 615-3000
City Fire Department - Emergency Services	(408) 615-4900
City Street Department - Storm Drains	(408) 615-3080

STANDARD

X

CITY OF SANTA CLARA

WATER AND SEWER UTILITIES DEPARTMENT

DIVISION: SEWER UTILITY

STANDARD OPERATION PROCEDURE:

SANITARY SEWER OVERFLOW SAMPLING

City of Santa Clara • 1500 Warburton Ave • Phone 408-615-2000
City of Santa Clara • 1705 Martin Ave • Phone 408-615-2060

Revision History

Rev	Description of Change	Document Owner/Editor	Release Date
001	Initial Release: Sanitary Sewer Overflow Sampling SOP	Diane Foronda	4/30/13

If you have any questions about this program, please contact your immediate Supervisor. This plan is maintained by the Compliance Manager. All Managers and Supervisors are to ensure the policies are carried out and the program is effective.

_____
Assistant Director of Water & Sewer Utilities

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1. Purpose and Scope

1.1. In the event of a sanitary sewer overflow, our utility has developed, implemented and maintains a Standard Operation Procedure to test for various parameters in the event that overflows greater than or equal to 50 gallons reach surface waters.

1.2. The Standard Operation Procedure: Sanitary Sewage Overflow Sampling is developed and implemented for department staff to follow a correct and standardized procedure if an overflow were to occur, and the employer make procedure available to department employees.

1.3. The scope of this procedure applies to the Sanitary Sewer Operations & Maintenance division and Compliance division employees in the City of Santa Clara Water and Sewer Utilities Department.

2. References

2.1. References for this program include the following:

- Thermo Scientific User Guide for:
  - Thermo Scientific Portable pH/RDO/DO Meter
  - RDO Optical Dissolved Oxygen Sensor
  - pH/ATC Triode

3. Acronyms and Definitions

Ammonia: A nutrient that contains nitrogen and hydrogen. Its chemical formula is NH_3 in the un-ionized state and NH_4^+ in the ionized form. Total ammonia is the sum of both NH_3 and NH_4^+. Ammonia can be converted to nitrite and nitrate by bacteria. The neutral, un-ionized form (NH_3) is highly toxic.

CAM 17: A list of heavy metals in the California Administrative Manual, which includes antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc

Corrosive: A substance that causes visible destruction of, or irreversible alteration in, living tissue at the site of contact.

Department: City of Santa Clara Water and Sewer Utilities

Dissolved Oxygen: Oxygen is measured in its dissolved form as dissolved oxygen (DO). If more oxygen is consumed that is produced, dissolved oxygen levels decline and some sensitive animals may move away, weaken, or die. DO levels vary with water temperature and altitude.

Employee: Any regular, full-time, part-time or temporary employee employed by the department at any level in the organization, including Managers and Supervisors.

Fecal Coliform: Bacteria found in the intestinal tracts of mammals. Their presence in water or sludge is an indicator of possible contamination by pathogens

Managers: All unclassified employees in the department, including the Director of Water and Sewer Utilities, Assistant Director of Water and Sewer Utilities, Water and Sewer Superintendent, Assistant Water and Sewer Superintendent, Compliance Manager, Principal Engineer and any employee in an acting role or out of class assignment as a manager within the Water and Sewer Utilities Department.

pH: a measure of the number of hydrogen ions or a solution's acidity. In water, small numbers of water molecules will break apart into hydrogen ions (H^+) and hydroxide ions (OH^-). Other compounds entering the water may react with these, leaving an imbalance in the numbers of hydrogen and hydroxide ions. When more hydrogen ions react, more hydroxide ions are left in solution and the water is basic; when more hydroxide ions react, more hydrogen ions are left and the water is acidic.

POTW: Publicly Owned Treatment Works

Sampling Apparatus: Device used to obtain sample directly from surface water discharge site and transfer to appropriate containers.

Sanitary Sewer Overflow (SSO): A condition whereby untreated sewage is discharged into the environment prior to reaching the wastewater treatment plant.

Qualifying SSO: For purposes of this procedure a qualifying SSO shall mean any Sanitary Sewer Overflow greater than or equal to 50 gallons which reaches surface waters.

4. Responsibilities

4.1. Sanitary Sewer Operations & Maintenance Employees

- Are trained on how to correctly sample and record parameters needed for SSO discharge
- Follow standardized procedures
- Conduct sampling during a qualifying SSO event and notifying the San Mateo Lab upon becoming aware that sampling is necessary
- Request for additional sample kits and sample kit refills from the Compliance staff
- Notify Compliance staff for any equipment meter calibration, replacement, or maintenance which may include, but not limited to:

- Additional AA batteries for pH and DO meter. Battery level is displayed on the meter screen.
- Annual replacement of DO Probe RDO Cap (meter will notify when the cap needs to be replaced)
- For calibration procedures, refer to the Thermo Scientific meter manual on City Drive

- Ensure sample kits are prepared and ready for use at all times.
- Direct any additional questions to the Compliance Manager

4.2. Compliance Manager

- Reviews, implements and maintains this SOP
- Trains and ensures that employees follow the procedures of this SOP

5. Procedure Requirements

5.1. When to take SSO Samples

5.1.1. When an SSO results in an overflow of 50 gallons or greater and reaches surface waters (Qualifying SSO)

5.1.2. When sufficient flow exists to collect a representative, uncontaminated sample and whether weather or other conditions allow City staff to safely obtain a sample

5.1.3. If by March 21, 2015, there are no qualifying SSO event that meets the criteria of 50 gallons or more reaching surface waters, the sample collection for CAM17 analysis will no longer be required.

5.2. Bring Sample Kits to Discharge Location

5.2.1. Two sample kits are available at the Yard. One will be stored in the Sewer Shop and the other will be stored at the Assistant Sewer Superintendent's office.

5.2.2. The responding team shall bring the sample kit from the Sewer Shop.

5.2.3. As needed, the Superintendent(s) will bring the sample kit from the Assistant Sewer Superintendent's Office.

5.3. Where to take SSO Samples

5.3.1. Upstream of the surface water discharge location (within 150 feet if possible)

5.3.2. Surface water discharge location

5.3.3. Downstream of the surface water discharge location (within 150 feet if possible)

5.4. What to sample

5.4.1. Sample at each location identified in 5.3

5.4.2. Field Readings

5.4.2.1. pH

5.4.2.2. Dissolved Oxygen (DO)

5.4.3. Grab Samples

5.4.3.1. Fecal coliform

5.4.3.2. Ammonia

5.4.3.3. CAM17

5.5. How to take SSO Samples

5.5.1. Measuring Equipment Needed

5.5.1.1. Thermo Scientific Portable Reader (for pH and DO)

5.5.1.2. pH probe (Thermo Scientific ROSS Ultra pH/ATC Triode)

5.5.1.3. DO probe (Thermo Scientific RDO Optical Dissolved Oxygen Sensor)

- Calibration sleeve (should already be attached to DO probe) and stainless steel protective guard (used during sampling)

5.5.2. Equipment Checklist

5.5.2.1. Sampling apparatus

5.5.2.2. Distilled water to rinse pH and DO probes

5.5.2.3. Potable water to rinse sampling apparatus

5.5.2.4. Ice packs

5.5.2.5. Permanent pen/marker

5.5.2.6. Nitrile gloves

5.5.2.7. 2 coolers (for Fecal coliform and Ammonia)

5.5.2.8. 1 box (for CAM17)

5.5.2.9. 3 – Site sampling bottle packs, each consisting of:

- 1 – Fecal coliform bottle (100mL)
- 1 – Plastic Ammonia bottle (500mL)
- 1 – Plastic CAM17 bottles (250mL)

5.5.3. Forms

5.5.3.1. SSO Form (Attachment A)

5.5.3.2. 3 - Chain of Custody Report (for each lab and River Watch)

5.5.4. Using sampling apparatus

5.5.4.1. Wear all safety and protective gears

5.5.4.2. Collect all samples using sampling apparatus

5.5.4.3. Transfer surface water collected by sampling apparatus into sample bottles

5.5.4.4. Do not rinse out any of the sample bottles as they all have certain preservatives or reagents inside. As such, do not use sample bottles to collect water from surface water directly.

5.5.5. pH and Dissolved Oxygen (DO) analyses

5.5.5.1. Conduct pH and DO tests within 15 minutes of grabbing samples using sampling apparatus.

5.5.5.2. Perform both readings simultaneously using appropriate probes connected to Thermo Scientific Portable Reader

- Ensure both probes are connected to the top of the Reader (pH→ATC/COND; DO→DO/RDO)

- Turn Reader on, wait for Reader to stabilize
- Loosen storage bottle solution cap to remove pH probe and immediately insert into water collected with sampling apparatus, probe must be immersed in solution at all times
- Unscrew white calibration sleeve from DO probe and attach stainless steel protective guard
- Insert DO probe into the same water sample as the pH probe, being careful to not touch the sensor on the bottom of the probe
- Press “Measure”
- Wait for readings to stabilize and record readings under pH and DO on SSO form (Attachment A)
- Carefully rinse pH probe with distilled water and return to storage bottle solution, ensuring storage bottle cap is screwed on tight
- Carefully rinse DO probe with distilled water

5.5.6. Fecal coliform samples

5.5.6.1. Record date and time on bottle label

5.5.6.2. Remove plastic cap and fill bottle past the 100mL fill line with water from sampling apparatus

5.5.6.3. Take care not to overfill bottle or contaminate container, leave enough head space to allow proper mixing of the sample

5.5.6.4. Replace bottle cap immediately and return to Fecal Coliform cooler

5.5.7. Ammonia samples

5.5.7.1. Record date and time on bottle label

5.5.7.2. Remove cap from plastic bottle

5.5.7.3. Fill bottle up to its shoulder with water collected with sampling apparatus

5.5.7.4. Replace cap and return to Ammonia cooler

5.5.8. CAM17 samples

5.5.8.1. Record date and time on bottle label

5.5.8.2. Remove cap from plastic bottle

5.5.8.3. Fill bottle up to its shoulder with water collected with sampling apparatus

5.5.8.4. Take care not to overfill bottle (contains corrosive material, may cause skin irritation)

5.5.8.5. Replace cap and return to CAM17 box

5.6. Equipment Care between Sample Locations

5.6.1. Rinse sampling apparatus with potable water upon finishing at each site before continuing on to the next sampling site

5.6.2. After the last site, remove stainless steel protective guard from DO probe and replace with white calibration sleeve. Open cap of calibration sleeve and moisten the gray sponge with distilled water before continued storage

5.6.3. Return completed Sanitary Sewer Overflow forms to the Compliance Manager

5.6.4. After the last samples and upon returning to the Yard, rinse sampling equipment with potable water and store sampling kit(s) to their storage location.

5.7. SSO Sample delivery to laboratory

5.7.1. Fecal coliform cooler

5.7.1.1. Place ice packs in cooler to ensure an environment of < 10ºC (50ºF)

5.7.1.2. Make a copy of the Chain of Custody Report (Attachment B) for the Compliance Manager and include original in cooler

5.7.1.3. **Samples need to be delivered to the laboratory within 4 hours of sample collection**

5.7.1.4. Return cooler to Yard and arrange pick up by San Mateo County Lab Courier.

5.7.1.5. Provide location where sample is to be picked up

5.7.1.6. San Mateo County Laboratory Phone Numbers:

- Business Hours – Lab Office: (650)-573-2500; June Wong: (650) 573-2456
- After Hours – June Wong (Cell): (650) 339-2322; (Home): (650) 594-1338
    - Sangeeta Singh – (650) 235-6755
    - Zelda Berrada – (650) 703-3935; (617) 512-9949; or (510) 778-1362

5.7.1.7. In the event that the courier service is not available to deliver samples within the 4-hour time frame, City Staff will deliver the samples to the Public Health Laboratory at:

- 225 West 37th Ave, Room 113. San Mateo, CA 94403

5.7.2. Ammonia cooler

5.7.2.1. Place ice packs in cooler to ensure an environment of < 6ºC (39.2ºF)

5.7.2.2. Make a copy of the Chain of Custody Report (Attachment D) for the Compliance Manager and include original in cooler

5.7.2.3. Sample has up to 28-day holding time.

5.7.2.4. Deliver cooler to Treatment Plant's Environmental Services Department Laboratory at:

- 700 Esteros Rd. San Jose, CA 95134 (see Attachment E for driving directions and lab location)
- Phone Number: (408) 945-3725
- Business Hours: Monday through Friday (7:00AM – 5:00 PM)
- After Hours/Weekends: Store in refrigerator located in Assistant Water & Sewer Superintendent's Office and hold until next available business day.

5.7.3. CAM17 box

5.7.3.1. Make a copy of the Chain of Custody Report (Attachment C) for the Compliance Manager and include original in box

5.7.3.2. Keep samples in ambient temperature. No ice is needed.

5.7.3.3. Sample has 6 months holding time

5.7.3.4. Return box to City Hall or release samples to Assistant Superintendent. Contact Compliance Manager to arrange pick up by River Watch.

5.8. Coordination with Compliance Staff

5.8.1. Notify Compliance Staff regarding the SSO.

5.8.2. Submit Chain of Custody forms (fecal coliform, ammonia and CAM 17) and CAM 17 samples to the Compliance Manager.

5.8.3. Compliance Staff to examine Sewer Overflow Sampling kit(s) and refill any materials including forms. Check pH storage reagent and replenish as necessary. Order more sample bottles as necessary from the respective laboratories.

6. Records

6.1. Standard Operating Procedure: Sanitary Sewer Overflow Sampling

6.1.1. This procedure will be reviewed by the Compliance Manager annually.

6.1.2. All records are to be retained for a minimum of 10 years for compliance purposes.

6.2 Training and Documentation

6.2.1. The Compliance Manager will periodically conduct sampling training for new employees or as a refresher.

7. Annual Inspection

7.1. On an annual basis, Compliance Staff shall inspect the two sample kits and perform the following:

7.1.1. Replace membranes on the DO probes.

7.1.2. Calibrate pH and DO probes.

7.1.3. Check pH and DO meter batteries.

7.1.4. Order more sample bottles as necessary.

Attachment A: Sanitary Sewer Overflow Form

Sanitary Sewer Overflow

(When 50 gallons or greater reach surface water)

Spill Location: _____

Date: _____

Upstream Location

Description: _____

_____

Reading		Time Sample Taken:			Sampler Name:
pH (0.0-14.0)	Dissolved Oxygen (mg/l)	Ammonia	Fecal Coliform	CAM 17	

Surface Water Discharge Location (i.e SD MH#)

Description: _____

_____

Reading		Time Sample Taken:			Sampler Name:
pH (0.0-14.0)	Dissolved Oxygen (mg/l)	Ammonia	Fecal Coliform	CAM 17	

Downstream Location

Description: _____

_____

Reading		Time Sample Taken:			Sampler Name:
pH (0.0-14.0)	Dissolved Oxygen (mg/l)	Ammonia	Fecal Coliform	CAM 17	

Attachment B: Chain of Custody Report (Fecal Coliform San Mateo Lab)

City of Santa Clara
Sanitary Sewer System
CHAIN OF CUSTODY REPORT

Client:	City of Santa Clara				Report Results to: Nina Hawk / Lisa Au		Turnaround Time:			8 hr.		
Address:	1500 Warburton Avenue Santa Clara, CA 95050				Billing to: Same as Client		24 hr.	48 hr.	72 hr.			
							5 day	10 day	15 day			
Telephone:	(408) 615-2018		FAX: (408) 247-0784		Purchase Order No. / Billing Reference:							
Project Name / Site:					ANALYSIS REQUESTED * Send to San Mateo Lab.							
Sampler:			Date:									
Sample Location	Sample Description	No. of Cont.	Type	Sampling Date / Time	Fecal Coliform					Description		
	Wastewater	1	Pl.		X							
	Wastewater	1	Pl.		X							
	Wastewater	1	Pl.		X							
Relinquished by:		Date:		Time:	Received by:		Date: Time:			Laboratory:		
Relinquished by:		Date:		Time:	Received by:		Date: Time:			Laboratory:		

C:\Documents and Settings\dforonda\Desktop\Wastewater-Samples Custody Sht.xls---FecalColiform

Attachment C: Chain of Custody Report (CAM 17 – For Pick Up)

City of Santa Clara
Sanitary Sewer System
CHAIN OF CUSTODY REPORT

From:	City of Santa Clara				Report Results to: Nina Hawk / Lisa Au					Turnaround Time:		
Address:	1500 Warburton Avenue Santa Clara, CA 95050											
Telephone:	(408) 615-2018		FAX: (408) 247-0784									
Project Name / Site:												
					ANALYSIS REQUESTED					* For River Watch Pickup		
Sampler:			Date:									
Sample Location	Sample Description	No. of Cont.	Type	Sampling Date / Time	CAM 17					Description		
	Wastewater	1	Pl.		X							
	Wastewater	1	Pl.		X							
	Wastewater	1	Pl.		X							
Relinquished by:		Date:		Time:	Received by:			Date: Time:		Laboratory:		
Relinquished by:		Date:		Time:	Received by:			Date: Time:		Laboratory:		

C:\Documents and Settings\dforonda\Desktop\Wastewater-Samples Custody Sht.xls----CAM17

Attachment D: San Jose Treatment Plant Lab Form (Ammonia)

CITY OF SAN JOSE
CAPITAL OF SILICON VALLEY

Environmental Services Department
Watershed Protection Division
ESD Laboratory

Lab Supervisor/Designee

LABORATORY WORK/TEST REQUEST

Date Request/Submitted:	Customer/ Section/ Dept: CITY OF SANTA CLARA Water & Sewer Utilities	Send Report To: Nina Hawk. Nhawk@santaclaraca.gov City of Santa Clara Water & Sewer Utilities 1500 Warburton Ave, Santa Clara, CA 95050 (408) 615-2018 FAX (408) 247-0784
Originator:	ProjectName2: CITY OF SANTA CLARA Sanitary Sewer	
Sample Collector:		

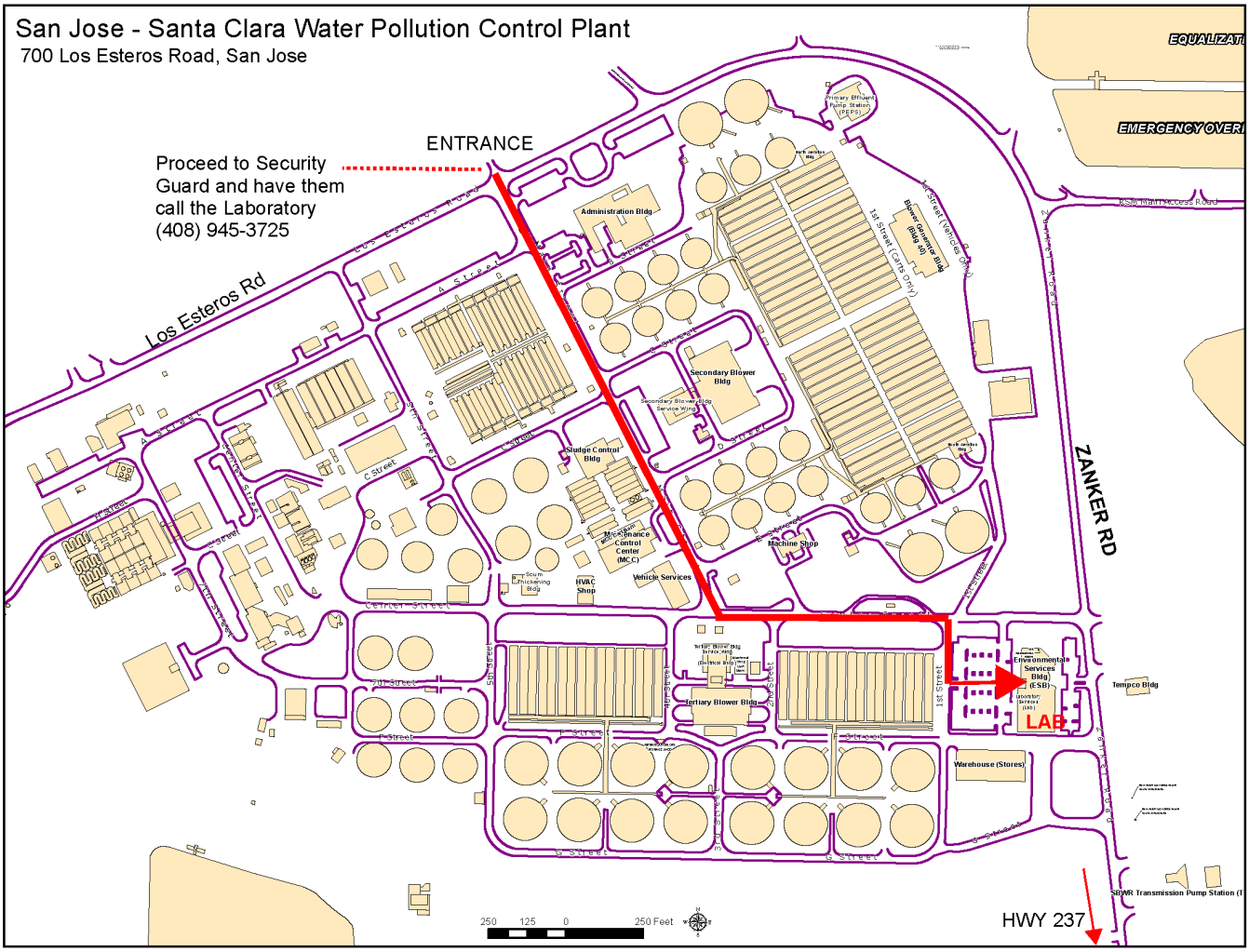
Date&Time Collected	LIMS SampleID	Location Code/ Description (Customer Sample ID)	Containers: No./Type/Vol.	Analysis	Preserved?
	N/A		1	Ammonia Nitrogen	Yes
	N/A		1	Ammonia Nitrogen	Yes
	N/A		1	Ammonia Nitrogen	Yes

Relinquished By: (Print Name) _____ **Received By:** (Print Name) _____

Signature: _____ **Date/Time:** _____ **Signature:** _____ **Date/Time:** _____

Work Request#:	Comments:
Expenditure Code: CITY OF SANTA CLARA	

Attachment E: Driving Directions to Plant Lab

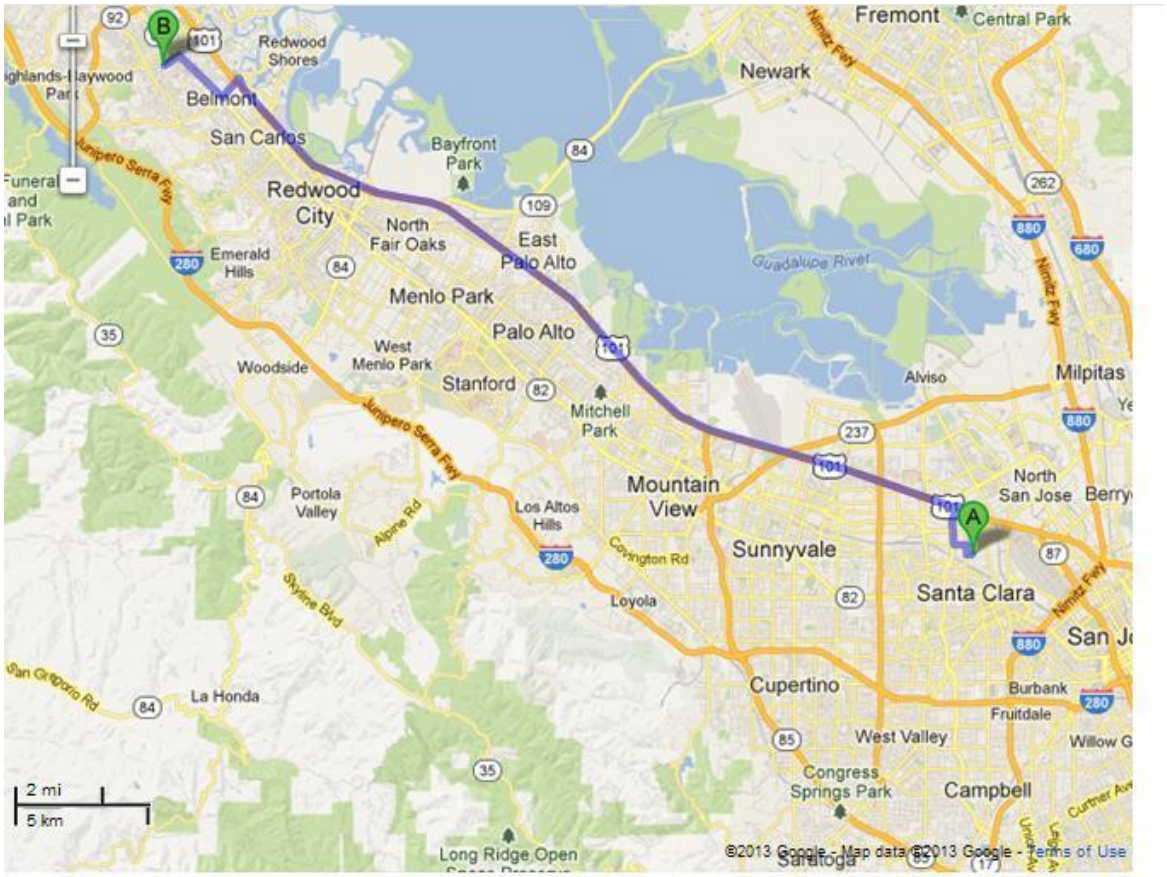


Address: **San Jose/Santa Clara Water Pollution Control Plant**. 700 Los Esteros Road, San Jose

Business Hours: Monday – Friday. 7 AM – 5 PM

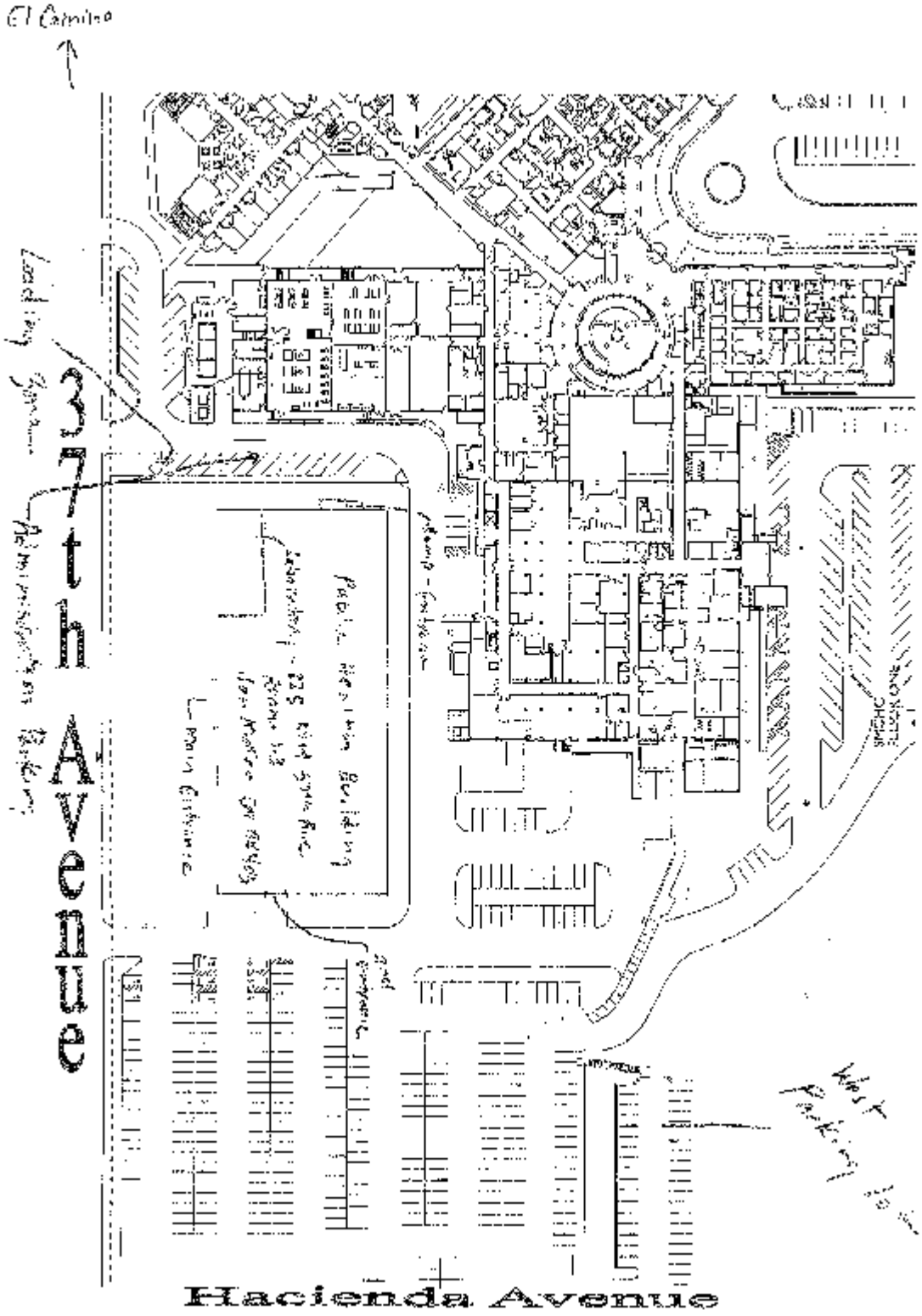
- Stop at Main Gate
- Have Security Guard call Environmental Services Lab to grant access into facility at (408) 945-3725
- Continue into facility and park at the Environmental Services Lab parking lot

Attachment F: Driving Directions to San Mateo Lab



A 1705 Martin Ave, Santa Clara, CA 95050

	1. Head **west** on **Martin Ave** toward **Richard Ave**	go 0.1 mi total 0.1 mi
↱	2. Take the 1st right onto **Scott Blvd** About 53 secs	go 0.2 mi total 0.3 mi
↰	3. Turn left onto **Walsh Ave** About 1 min	go 0.3 mi total 0.6 mi
↱	4. Turn right onto **San Tomas Expy** About 2 mins	go 0.9 mi total 1.5 mi
↗	5. Take the **U.S. 101 N** ramp to **San Francisco**	go 0.2 mi total 1.7 mi
101	6. Keep left at the fork and merge onto **US-101 N** About 19 mins	go 19.8 mi total 21.5 mi
↗	7. Take exit **412** for **Ralston Ave/Marine Pkwy**	go 0.3 mi total 21.8 mi
↰	8. Turn left onto **Ralston Ave** About 2 mins	go 0.6 mi total 22.5 mi
↱	9. Turn right onto **El Camino Real** About 3 mins	go 1.4 mi total 23.9 mi
↰	10. Turn left onto **37th Ave** Destination will be on the left About 2 mins	go 0.4 mi total 24.3 mi


El Camino
Hacienda Avenue

Attachment G: MSDS Sheets

Material Safety Data Sheet

BDH3068-500MLP
BDH3070-2.5LPC
BDH3072-2.5LG
BDH3074-3.8LP
BDH3076-19L
BDH3078-56L
BDH3088-111L
BDH3090-185L
TXBDH307438CPI

Sulfuric Acid

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name: Sulfuric Acid

Synonyms/Generic Names: Oil of Vitriol, Battery Acid, Sulphuric Acid, Dihydrogen Sulfate

Product Use: Industrial, Manufacturing or Laboratory use

Manufacturer: Columbus Chemical Industries, Inc.
N4335 Temkin Rd. Columbus, WI. 53925

For More Information Call: 920-623-2140
(Monday – Friday 8:00-4:30)

IN CASE OF EMERGENCY CALL: CHEMTREC
(24 Hours/Day, 7 Days/Week) 800-424-9300
703-527-3887

2. COMPOSITION/INFORMATION ON INGREDIENTS

Weight %	Component	CAS #	EINECS# / ELINCS#	Classification*
95 – 98%	Sulfuric Acid	7664-93-9	231-639-5	C; R35, **
Balance	Water	7732-18-5	N/A	N/A

*Symbol and R phrase according to EC Annex1
** Subject to the reporting requirements of SARA Title III Section 313

3. HAZARDS IDENTIFICATION

Clear, colorless solution with caustic odor.

R35 – Causes severe burns.

S1/2, S26, S30, S45
Routes of Entry: Skin, eyes, inhalation and ingestion.

Ingredients found on carcinogen lists:

INGREDIENT NAME	NTP STATUS	IARC STATUS	OSHA LIST	ACGIH
Sulfuric Acid	Known	Group 1	Not Listed	A2

4. FIRST AID INFORMATION

Inhalation: Inhalation of mists can cause corrosive action on mucous membranes. Symptoms include burning, choking, coughing, wheezing, laryngitis, shortness of breath, headache or nausea. Move casualty to fresh air and keep at rest. Get medical attention if symptoms persist.

Eyes: Contact rapidly causes severe damage. Symptoms include eye burns, watering eyes. Permanent damage to cornea may result. In case of eye contact, rinse with plenty of water and seek medical attention immediately.

Skin: Severe and rapid corrosion from contact. Extent of damage depends on duration of contact. Symptoms include burning, itching, redness, inflammation and/or swelling of exposed tissues. harmful if absorbed through skin. Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and wash using soap. Get medical attention immediately.

Ingestion: **Do Not Induce Vomiting!** Severe and rapid corrosive burns of the mouth, gullet and gastrointestinal tract will result if swallowed. Symptoms include burning, choking, nausea, vomiting and severe pain. Wash out mouth with water and give a glass of water or milk. Get medical attention immediately.

5. FIRE-FIGHTING MEASURES

FLAMMABLE PROPERTIES:

Flash Point:	Not Flammable
Flash Point method:	Not Applicable
Autoignition Temperature:	Not Applicable
Upper Flame Limit (volume % in air):	Not Applicable
Lower Flame Limit (volume % in air):	Not Applicable

Extinguishing Media: Product is not flammable. Use appropriate media for adjacent fire. Cool containers with water, keep away from common metals.

Special fire-fighting procedures: Wear self-contained, approved breathing apparatus and full protective clothing, including eye protection and boots. Material can react violently with water (spattering and misting) and react with metals to produce flammable hydrogen gas.

Hazardous combustion products: Emits toxic fumes under fire conditions. (See also Stability and Reactivity section).

Unusual fire and explosion hazards: Contact with organic material may cause fire. Material can react with metals to produce flammable hydrogen gas.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions: See section 8 for recommendations on the use of personal protective equipment.

Environmental precautions: Cleanup personnel need personal protection from inhalation and skin/eye contact. Evacuate and ventilate the area. Prevent spillage from entering drains. Cautiously add water to spill, taking care to avoid splashing and spattering. Neutralize diluted spill with soda ash or lime. Absorb neutralized spill with vermiculite or other inert absorbent material, then place in a suitable container for disposal. Clean surfaces thoroughly with water to remove residual contamination. Any release to the environment may be subject to federal/national or local reporting requirements. Dispose of all waste or cleanup materials in accordance with local regulations. Containers, even when empty, will retain residue and vapors.

7. HANDLING AND STORAGE

Normal handling: See section 8 for recommendations on the use of personal protective equipment. Use with adequate ventilation. Wash thoroughly after using. Keep container closed when not in use.

Storage: Store in cool, dry well ventilated area. Keep away from incompatible materials (see section 10 for incompatibilities). Drains for storage or use areas for this material should have retention basins for pH adjustment and dilution of spills.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational exposure controls: (consult local authorities for acceptable exposure limits)

Chemical name	Regulatory List	Value and type
Sulfuric Acid	UK OES	1 mg/m^3 TWA
	USA OSHA PEL	1 mg/m^3 TWA
	STEL	3 mg/m^3 (15 minutes)
	USA ACGIH	1 mg/m^3 TLV
	USA NIOSH	1 mg/m^3 REL
	USA OSHA IDLH	15 mg/m^3
	VME France	1 mg/m^3 TWA 8 hr
	VLE France (STEL)	3 mg/m^3 (15 minutes)

TWA: Time Weighted Average over 8 hours of work.
TLV: Threshold Limit Value over 8 hours of work.
REL: Recommended Exposure Limit
STEL: Short Term Exposure Limit during 15 minutes.
IDLH: Immediately Dangerous to Life or Health

Ventilation: Provide local exhaust, preferably mechanical.

Respiratory protection: If necessary use an approved respirator with acid vapor cartridges.

Eye protection: Wear chemical safety glasses with a face shield for splash protection.

Skin and body protection: Wear neoprene or rubber gloves, apron and other protective clothing appropriate to the risk of exposure.

Other Recommendations: Provide eyewash stations, quick-drench showers and washing facilities accessible to areas of use and handling. Have supplies and equipment for neutralization and running water available.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Clear, colorless to slight yellow liquid
Physical state:	Liquid
Odor:	Caustic
Odor Threshold:	Unknown
Specific Gravity:	1.8427
pH:	1
Melting Point/Freezing Point:	10°C (51°F)
Boiling Point/Range:	330°C (626°F)
Flammability:	Not Flammable (See section 5)
Flash point:	Not Flammable (See section 5)
Evaporation Rate (Butyl Acetate =1):	Not Available
Explosive Limits:	Not Explosive (See section 5)
Vapor Pressure (at 20ºC):	Not Available
Vapor Density (air =1):	3.4
Solubility:	Completely soluble in water
Partition coefficient/n-octanol/water:	Not Available
% Volatile:	Not Available
Autoignition Temperature:	See section 5

10. STABILITY AND REACTIVITY

Stability: Stable

Conditions to avoid: Uncontrolled addition of water.

Incompatibility: Moisture, bases, halides, organic material, metals, carbides, cyanides, chlorates, nitrates, picrates, permanganate, peroxides, zinc iodide, azides, perchlorates, phosphorus, nitrites and finely powdered metals.

Hazardous decomposition products: Oxides of sulfur, Hydrogen sulfide gas.

Hazardous polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

Acute Effects: See section 4 for symptoms of exposure and effects. Likely routes of exposure are skin, eyes and inhalation.
Target organs: Teeth, blood, liver, bone marrow and cardiovascular system.

Acute Toxicity Data:

Sulfuric acid	Oral LD_{50} (rat): 2140 mg/kg LC_{50} (rat): 510 mg/m^3

Chronic Effects: Sulfuric Acid mists are listed as a possible carcinogen.

Teratogenicity: Inhalation (rabbit) 20 mg/m^3/7hrs, 6-18 days pregnant, result-musculoskeletal deformities.
Mutagenicity: Hamster, 4 MMOL/L, ovary.
Embryotoxicity: Not Available
Synergistic Products/Effects: Not Available

12. ECOLOGICAL INFORMATION

Ecotoxicity (aquatic and terrestrial): Data not available

Persistence and Degradability: Data not available

Bioaccumulative Potential: Data not available

Mobility in Soil: Data not available

Other Adverse Effects: Data not available

13. DISPOSAL CONSIDERATIONS

RCRA:

Hazardous waste? Yes RCRA ID number: DOO2

Waste Residues: Carefully dilute with water, neutralize per spill procedures in section 6. Neutralized material may be flushed to sewer (REGULATIONS PERMITTING!) or disposed of through a licensed contractor. Users should review their operations in terms of the applicable federal/nation or local regulations and consult with appropriate regulatory agencies before discharging or disposing of waste material.

Product containers: Containers, if thoroughly cleaned, preferably by rinsing three times and handling the rinse water as waste residues, may be disposed of or recycled as non-hazardous waste. Users should review their operations in terms of the applicable federal/national or local regulations and consult with appropriate regulatory agencies before discharging or disposing of waste material.

The information offered in section 13 is for the product as shipped. Use and/or alterations to the product may significantly change the characteristics of the material and alter the waste classification and proper disposal methods.

14. TRANSPORTATION INFORMATION

DOT: UN1830, Sulfuric Acid, 8, pg II

TDG: UN1830, Sulfuric Acid, 8, pg II

PIN: Not Available

IDMG: UN1830, Sulphuric Acid, 8, pg II
Marine Pollutant: No

IATA/ICAO: UN1830, Sulphuric Acid, 8, pg II

RID/ADR: Class 8, Item 1(b), corrosive, Kemler plate: 80/1830

15. REGULATORY INFORMATION

TSCA Inventory Status: All ingredients are listed on the TSCA inventory.

Federal and State Regulations:
Pennsylvania RTK: Sulfuric Acid
Massachusetts RTK: Sulfuric Acid

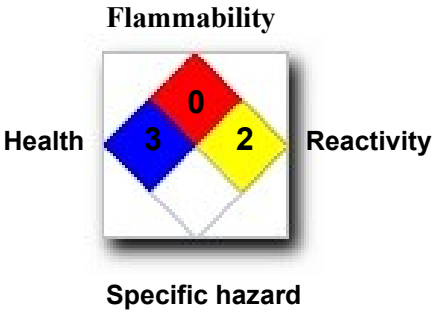
SARA 302/304/311/312 extremely hazardous substances: Sulfuric Acid
SARA 313 toxic chemical notification and release reporting: Sulfuric Acid
CERCLA: Hazardous Substances: Sulfuric Acid

California Proposition 65: Yes - Strong inorganic acid mists containing sulfuric acid.
WHMIS Canada: Class E - corrosive liquid.
DSCL (EEC): R35 – Causes severe burns.

HMIS (U.S.A.)

Health Hazard	3
Fire Hazard	0
Reactivity	3

National Fire Protection Association (U.S.A.)



Protective Equipment:

ADR (Europe):

TDG (Canada):

DSCL (Europe):

16. OTHER INFORMATION

Current Issue Date: December 10, 2010
Prepared by: S. Brock

Disclaimer: Columbus Chemical Industries, Inc. (“Columbus”) believes that the information herein is factual but is not intended to be all inclusive. The information relates only to the specific material designated and does not relate to its use in combination with other materials or its use as to any particular process. Because safety standards and regulations are subject to change and because Columbus has no continuing control over the material, those handling, storing or using the material should satisfy themselves that they have current information regarding the particular way the material is handled, stored or used and that the same is done in accordance with federal, state and local law. COLUMBUS MAKES NO WARRANTY, EXPRESS OR IMPLIED, INCLUDING (WITHOUT LIMITATION) WARRANTIES WITH RESPECT TO THE COMPLETENESS OR CONTINUING ACCURACY OF THE INFORMATION CONTAINED HEREIN OR WITH RESPECT TO FITNESS FOR ANY PARTICULAR USE.

Material Safety Data Sheet
Nitric acid, 20-70%

ACC# 16550

Section 1 - Chemical Product and Company Identification

MSDS Name: Nitric acid, 20-70%
Catalog Numbers: AC124660000, AC124660010, AC124660011, AC124660025, AC124660026, AC124665000, AC124665001, AC133620000, AC133620010, AC133620011, AC133620025, AC133620026, AC424000000, AC424000025, AC424000026, AC424000250, AC424005000, AC424005001, AC613205000, A198C-212, A198C4X-212, A200-212, A200-500, A200-500LC, A200-612GAL, A200212LC, A200C-212, A200C212EA, A200C212LC, A200C4X-212, A200C4X212L, A200S-212, A200S-500, A200S212LC, A200SI-212, A206C-212, A206C4X-212, A467-1, A467-2, A467-250, A467-500, A483-212, A509-212, A509-212LC, A509-500, A509SK-212, A509SK-212LC, MCC-030822, NC9596579, S719721, S71972SC
Synonyms: Azotic acid; Engraver's acid; Aqua fortis.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
7732-18-5	Water	30-80	231-791-2
7697-37-2	Nitric acid	20-70	231-714-2

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: clear to yellow liquid.
Danger! May be fatal if inhaled. Causes severe eye and skin burns. Causes severe respiratory and digestive tract burns. Strong oxidizer. Contact with other material may cause a fire. Acute pulmonary edema or chronic obstructive lung disease may occur from inhalation of the vapors of nitric acid. Corrosive to metal.
Target Organs: Lungs, eyes, skin, mucous membranes.

Potential Health Effects

Eye: Causes severe eye burns. Direct contact with liquid may cause blindness or permanent eye damage.
Skin: Causes skin burns. May cause deep, penetrating ulcers of the skin. Concentrated nitric acid dyes human skin yellow on contact.
Ingestion: May cause severe and permanent damage to the digestive tract. Causes gastrointestinal tract burns. May cause perforation of the digestive tract. May cause systemic effects.
Inhalation: Effects may be delayed. Causes chemical burns to the respiratory tract. Inhalation may be fatal as a result of spasm, inflammation, edema of the larynx and bronchi, chemical pneumonitis and pulmonary edema. Aspiration may lead to pulmonary edema. May cause systemic effects. May cause acute pulmonary edema, asphyxia, chemical pneumonitis, and upper airway obstruction caused by edema. Depending on the conditions, the vapor or fumes of nitric acid may actually be a mixture of nitric acid and various oxides of nitrogen. The

composition may vary with temperature, humidity, and contact with other organic materials.
Chronic: Exposure to high concentrations of nitric acid vapor may cause pneuomonitis and pulmonary edema which may be fatal. Symptoms may or may not be delayed. Continued exposure to the vapor & mist of nitric acid may result in a chronic bronchitis, & more severe exposure results in a chemical pneumonitis. The vapor & mists of nitric acid may erode the teeth, particularly affecting the canines & incisors.

Section 4 - First Aid Measures

Eyes: Get medical aid immediately. Do NOT allow victim to rub eyes or keep eyes closed. Extensive irrigation with water is required (at least 30 minutes).
Skin: Get medical aid immediately. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Destroy contaminated shoes.
Ingestion: Do not induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.
Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Do NOT use mouth-to-mouth resuscitation. If breathing has ceased apply artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Strong oxidizer. Contact with other material may cause fire. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Use water spray to keep fire-exposed containers cool. May react with metal surfaces to form flammable and explosive hydrogen gas. Approach fire from upwind to avoid hazardous vapors and toxic decomposition products.
Extinguishing Media: Use extinguishing media most appropriate for the surrounding fire.
Flash Point: Not applicable.
Autoignition Temperature: Not available.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 4; Flammability: 0; Instability: 0; Special Hazard: OX

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Absorb spill using an absorbent, non-combustible material such as earth, sand, or vermiculite. Do not use combustible materials such as sawdust. Provide ventilation. Evacuate unnecessary personnel. Approach spill from upwind. Use water spray to cool and disperse vapors and protect personnel.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Do not breathe dust, mist, or vapor. Do not get in eyes, on skin, or on clothing. Keep container tightly closed. Avoid contact with clothing and other combustible materials. Discard contaminated shoes. Do not use with metal spatula or other metal items. Use only with adequate ventilation or respiratory protection.

Storage: Do not store near combustible materials. Do not store in direct sunlight. Keep container closed when not in use. Store in a cool, dry, well-ventilated area away from incompatible substances. Keep away from metals. Store away from alkalies. Separate from organic materials. Inspect periodically for damage or evidence of leaks or corrosion.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits. Use a corrosion-resistant ventilation system.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Water	none listed	none listed	none listed
Nitric acid	2 ppm TWA; 4 ppm STEL	2 ppm TWA; 5 mg/m3 TWA 25 ppm IDLH	2 ppm TWA; 5 mg/m3 TWA

OSHA Vacated PELs: Water: No OSHA Vacated PELs are listed for this chemical. Nitric acid: 2 ppm TWA; 5 mg/m3 TWA

Personal Protective Equipment

Eyes: Wear chemical splash goggles and face shield.
Skin: Wear butyl rubber gloves, apron, and/or clothing.
Clothing: Wear appropriate clothing to prevent skin exposure.
Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: clear to yellow
Odor: strong odor - acrid odor - suffocating odor
pH: 1.0 (0.1M soln)
Vapor Pressure: 51 mm Hg @ 25 deg C
Vapor Density: 2.17 (air=1)
Evaporation Rate: Not available.
Viscosity: 0.761 cps @ 25 deg C
Boiling Point: 86 deg C
Freezing/Melting Point:-42 deg C
Decomposition Temperature: Not available.
Solubility: Soluble in water.
Specific Gravity/Density:1.4
Molecular Formula:HNO3
Molecular Weight:63.01

Section 10 - Stability and Reactivity

Chemical Stability: Stable. Decomposes when in contact with air, light, or organic matter. The yellow color is due to release of nitrogen dioxide on exposure to light.
Conditions to Avoid: High temperatures, light, confined spaces.
Incompatibilities with Other Materials: Metals, reducing agents, strong bases, acetic acid, alcohols, acetone, aniline, hydrogen sulfide, metal powders, carbides, aldehydes, organic solvents, combustible materials, chromic acid, flammable liquids, cyanides, sulfides, Incompatible with many substances.

Hazardous Decomposition Products: Nitrogen oxides.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 7732-18-5: ZC0110000
CAS# 7697-37-2: QU5775000; QU5900000
LD50/LC50:
CAS# 7732-18-5:
Oral, rat: LD50 = >90 mL/kg;
.

CAS# 7697-37-2:
Inhalation, rat: LC50 = 260 mg/m3/30M;
Inhalation, rat: LC50 = 130 mg/m3/4H;
Inhalation, rat: LC50 = 67 ppm(NO2)/4H;
.

Carcinogenicity:
CAS# 7732-18-5: Not listed by ACGIH, IARC, NTP, or CA Prop 65.
CAS# 7697-37-2: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No information found
Teratogenicity: No information found
Reproductive Effects: No information found
Mutagenicity: No information found
Neurotoxicity: No information found
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: No data available. No information available.
Environmental: Terrestial: During transport through the soil, nitric acid will dissolve some of the soil material, in particular, the carbonate based materials. The acid will be neutralized to some degree with adsorption of the proton also occurring on clay materials. However, significant amounts of acid are expected to remain for transport down toward the ground water table. Upon reaching the ground water table, the acid will continue to move, now in the direction of the ground water flow.
Physical: No information available.
Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG

Shipping Name:	NITRIC ACID	NITRIC ACID
Hazard Class:	8	8
UN Number:	UN2031	UN2031
Packing Group:	II	II

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 7732-18-5 is listed on the TSCA inventory.
CAS# 7697-37-2 is listed on the TSCA inventory.

Health & Safety Reporting List

None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

CAS# 7697-37-2: 1000 lb final RQ; 454 kg final RQ

SARA Section 302 Extremely Hazardous Substances

CAS# 7697-37-2: 1000 lb TPQ

SARA Codes

CAS # 7697-37-2: immediate, delayed, fire.

Section 313

This material contains Nitric acid (CAS# 7697-37-2, 20-70%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

CAS# 7697-37-2 is listed as a Hazardous Substance under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

CAS# 7697-37-2 is considered highly hazardous by OSHA.

STATE

CAS# 7732-18-5 is not present on state lists from CA, PA, MN, MA, FL, or NJ.
CAS# 7697-37-2 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European / International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

C

Risk Phrases:

R 35 Causes severe burns.

Safety Phrases:

S 23 Do not inhale gas/fumes/vapour/spray.

S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S 36 Wear suitable protective clothing.
S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

WGK (Water Danger/Protection)

CAS# 7732-18-5: No information available.
CAS# 7697-37-2: 1

Canada - DSL/NDSL

CAS# 7732-18-5 is listed on Canada's DSL List.
CAS# 7697-37-2 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of E, C, D1A.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 7697-37-2 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 9/30/1998
Revision #16 Date: 2/11/2008

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

Appendix I
FOG Program Materials and Handouts

Appendix I

Managing FATS, OIL and GREASE

"It's Easier than YOU Think!"

THE WRONG WAY
La Forma Incorrecta

1

Do not pour cooking residue directly into the drain.

No tire residuos de cocinar directamente en el desagüe.

2

Do not dispose of food waste into the garbage disposal.

No ponga desperdicios de comida en el moledor de comida.

3

Do not pour waste oil directly into the drain.

No tire aceite usado directamente en el desagüe.

4

Do not wash floor mats where water will run off directly into the storm drain.

No lave tapetes de piso en un lugar donde el agua corra hacia el desagüe.

THE RIGHT WAY
La Forma Correcta

1

Wipe pots, pans, and work areas prior to washing.

Limpie las ollas, sarténes, y áreas de trabajo con una toalla antes de lavarlos.

2

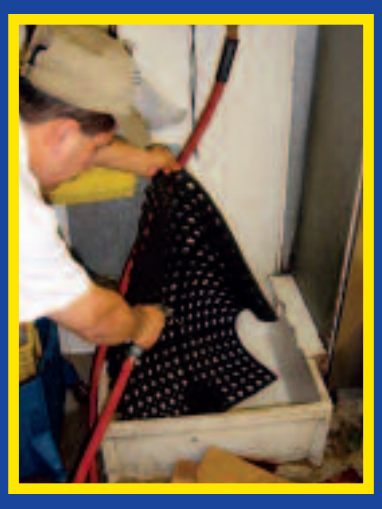
Dispose of food waste directly into the trash.

Deseche los desperdicios de comida en el bote de basura.

3

Collect waste oil and store for recycling.

Junte el aceite usado y guárdelo para que sea reciclado.



4

Clean mats inside over a utility sink.

Limpie los tapetes de piso dentro de una tina o fregador.

Courtesy of Sanitation Districts of Los Angeles County

CALIFORNIA Restaurant ASSOCIATION

City of Santa Clara
The Center of What's Possible

SAN JOSE/SANTA CLARA WATER POLLUTION CONTROL PLANT
(408) 945-3000

PREVENT RAW SEWAGE IN YOUR HOME !

Grease was Removed From Sewer Lines In Your Area!

DON'T

put cooking oil, grease, or greasy food down the drain.

DO

pour cooled grease into disposable containers and place them into the garbage once it has hardened.

Use a paper towel to wipe and absorb grease or oil on dishes and pots before washing them.

If you see a sewer overflow call **408.615.2000** immediately!

City of Santa Clara

PREVENT RAW SEWAGE IN YOUR HOME !

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DON'T

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DO

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Use a paper towel to wipe and absorb grease or oil on dishes and pots before washing them.

If you see a sewer overflow call **408.615.2000** immediately!

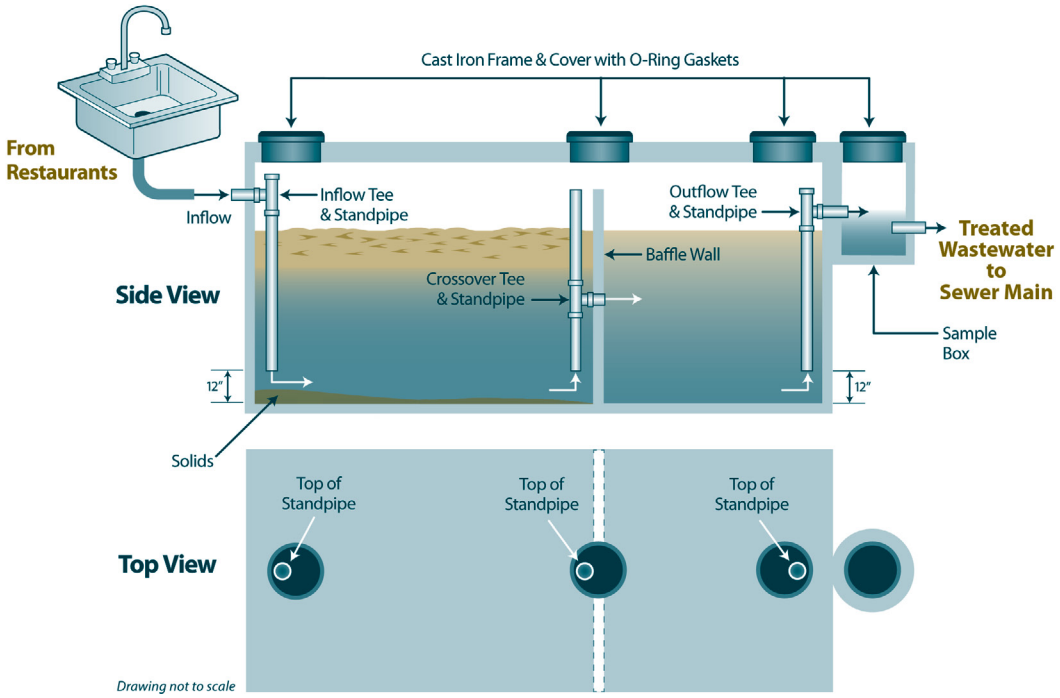
City of Santa Clara

KEEP GREASE OUT OF THE SYSTEM

Acceptable Specifications for Grease Interceptors

All Grease Interceptors (GIs) shall:

- Be approved by the International Association of Plumbing and Mechanical Officials (IAPMO) per the Sanitary Use Ordinance.
- Be installed to manufacturer's specifications and comply with current local, state, and federal requirements.
- Be sized by the City of Santa Clara (CSC)
- Be 500 gallons minimum (California Plumbing Code 1014.3.6) unless authorized by CSC
- Include manholes over the inlet, outlet, and baffle wall(s) standpipes for purposes of access, inspection, and cleaning.
- Include 24-inch diameter round access covers.
- Include a 12-inch gap from bottom floor of Grease Interceptors to bottom of standpipes.
- Include pre-test observation by the CSC prior to backfilling.
- Include connections to all grease generating fixtures.
- Include a sample box (see reverse side for illustration). The preferred type is a minimum 5-gallon capacity circular sample box and is located immediately downstream from the GI. The sample box shall have a hydraulic jump of approximately six (6) inches or a tee on the influent side of the sample box (similar to tee on influent side of GI).

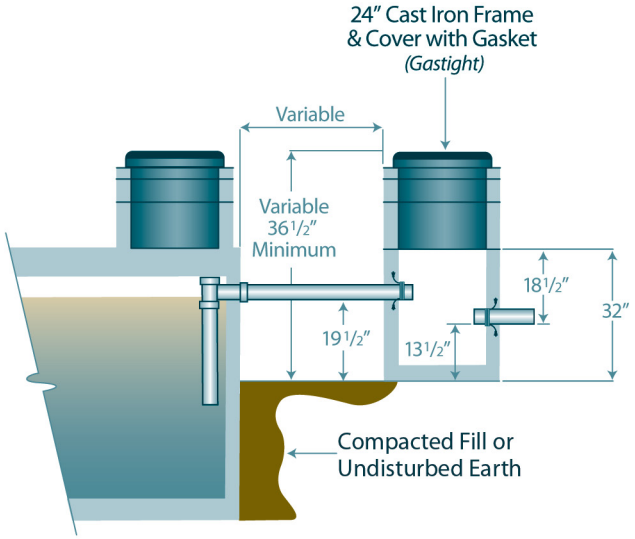


Grease Interceptor

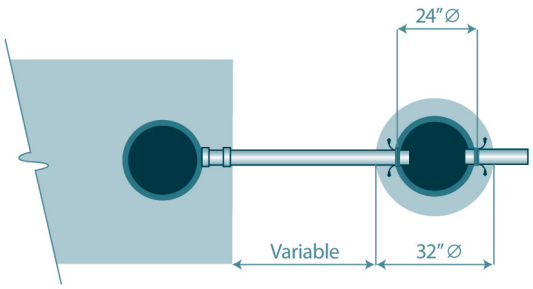
Grease in the system causes problems in storm drains and sanitary sewers — and increases your operating costs.

Sample Box

Side View
Cutaway



Top View
Covers and Risers
Removed



Measurement in inches

List of Grease Interceptor vendors

- **Jensen Precast**
  www.jensenprecast.com
  (707) 429-5500
- **Don Chapin Company**
  www.donchapin.com
  (831) 449-4273
- **US Concrete — Precast Group**
  www.us-concreteprecast.com
  (925) 960-8740
- **Greenturtle — Proceptor**
  www.greenturtletech.com
  (877) 428-8187
- **MC Nottingham**
  www.mcnottingham.com
  (800) 834-9655

It is in no way to be implied or understood that City of Santa Clara - Water and Sewer Utilities Department endorses these companies or their quality of work. This list is provided as a courtesy and is only a partial list of GI vendors in this area. It is the responsibility of the person who is hiring any of these companies to verify their qualifications and references as well as their compliance with regulations on handling and transport of waste. This sheet is intended for use in the City of Santa Clara.

For more information:
City of Santa Clara
Water and Sewer Utilities
1500 Warburton Avenue
Santa Clara, CA 95050
408.615.2000

www.santaclaraca.gov

If you have any questions, please call 408.615.2000 to speak with a Code Enforcement Technician
This and other outreach materials are available at www.santaclaraca.gov

San Jose/
Santa Clara
Water Pollution
Control Plant

Serving the cities of San José, Santa Clara, and Milpitas, Cupertino Sanitary District, West Valley Sanitation District (including the cities of Campbell, Los Gatos, Monte Sereno, and Saratoga), County Sanitation District No. 2-3, and Burbank Sanitary District.

City of
Santa Clara

KEEP GREASE OUT OF THE SYSTEM

Grease Control Device Maintenance Recordkeeping

All food service establishments are required to keep maintenance records for their grease traps, interceptors, and mechanical grease control devices for a minimum of three years. Records must be readily available for review by Environmental Inspectors.

Failure to maintain records on site for a minimum of three years is a violation of the local sewer ordinance and may result in fines.

Device: Grease Interceptor
Cleaning Method: Professional Pumping Company Only

Establish and maintain a log to track maintenance and hold receipts from your professional pumping company. If you have more than one grease interceptor, establish and maintain a separate log for each one.

Receipts must include the following information:

- Pumping company name, address, and phone number.
- Truck IKG number.
- Date and time of pumping service.
- Name and address of your business.
- Location of each grease control device.
- Size and type of your grease control device.
- Approximate quantity of grease and solid food waste recorded in gallons, inches, or percentages.
- Pumping frequency.
- Details on any structural, maintenance, or repair issues.
- Grease disposal location.

Device: Grease Trap
Cleaning Method: Professional Pumping Company or Self-Cleaning

Establish and maintain a log to track maintenance and hold receipts from your professional pumping company if you use one. If you have more than one grease trap, establish and maintain a separate log for each one.

Logs must include the following information:

- Date of cleaning.
- Name of person who cleaned the trap.
- Approximate quantity of grease and solid food waste recorded in gallons, inches, or percentages.
- Location of each grease control device.
- Waste removal and disposal method.
- Grease disposal location.
- Any other relevant notes.
- Keep receipts with your self-cleaning log sheets if you use a professional cleaning service.

Whether you contract a professional pumping service, perform the cleaning yourself, or do both, you are responsible for keeping and maintaining maintenance records.

Example of a Recordkeeping Log for a Grease Control Device

Business: Acme Cafe Grease Control Device Size: 100 lbs Location of Grease Control Device: Underneath 3-pot sink

Example

Date of Cleaning	Name	Waste Volume Observed/Removed	Maintenance Done	Disposal Method	Notes
07-07-11	John Smith	3- 4 gallons FOG & solids removed	Trap emptied, cleaned	Solids dried, double-bagged, put in dumpster.	Patched hole in baffle wall

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San José-Santa Clara Regional Wastewater Facility

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City of Santa Clara

Grease Control Device Maintenance Recordkeeping Log

Business: _____ Grease Control Device Size: _____ Location of Grease Control Device: _____

Date of Cleaning	Name	Waste Volume Observed/Removed	Maintenance Done	Disposal Method	Notes
7-07-11	John Smith	3- 4 gallons FOG & solids removed	Trap emptied, cleaned	Solids dried, double-bagged, put in dumpster.	Patched hole in baffle wall

City of Santa Clara

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San José-Santa Clara Regional Wastewater Facility

Grease Control Device Maintenance Recordkeeping Log

Business: _____ Grease Control Device Size: _____ Location of Grease Control Device: _____

Date of Cleaning	Name	Waste Volume Observed/Removed	Maintenance Done	Disposal Method	Notes

City of Santa Clara

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San José-Santa Clara Regional Wastewater Facility

KEEP GREASE OUT OF THE SYSTEM

Grease Interceptor Maintenance

What is the Purpose of a Grease Interceptor?

- A grease interceptor is designed to separate Fats, Oils, and Grease (FOG) and solid food waste from your kitchen wastewater.
- Buildup of FOG and solid food waste in your plumbing may cause blockages in either your plumbing or the sanitary sewer lines. This can lead to a sanitary sewer overflow into your building, a neighbor's building, streets, or the environment. It is important to clean your grease interceptor regularly.

Cleaning Frequency

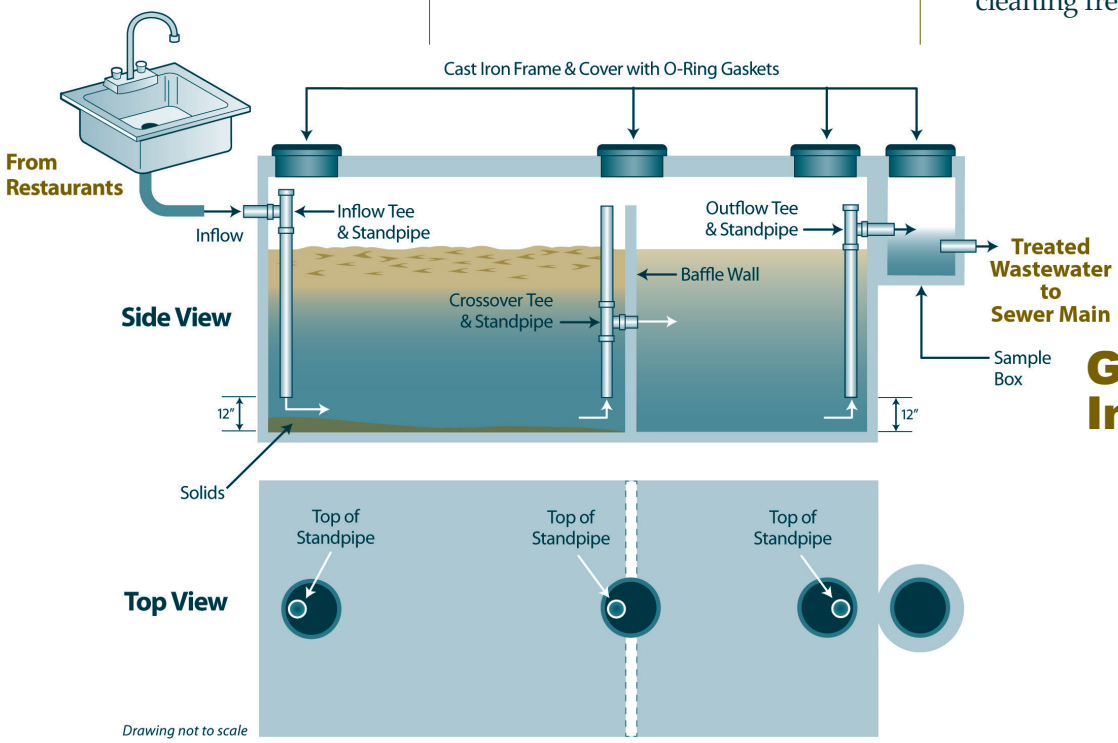
- Grease interceptors shall be cleaned **at least once every 90 days.** More frequent cleaning may be necessary to keep your interceptor operating properly.

Twenty-Five Percent Rule

- **Pump your interceptor when the final chamber is twenty-five percent (25%) full of FOG and solid food waste or within 90 days of the last pumping, whichever comes first**.

Standards for Evaluating Grease Interceptors

- Manhole and sample box lids should be easily removable for cleaning and inspections.
- The baffle wall and all three standpipes must be in place and unbroken, above and below the water and grease levels.
- If any standpipes are under water or grease, they must be raised above the grease level. High water or grease level could result from a blockage in the downstream pipes.
- Downstream blockages could indicate inadequate interceptor cleaning frequency.



Grease Interceptor

Grease in the system causes problems in storm drains and sanitary sewers — and increases your operating costs.

Failure to maintain records on site for a minimum of three years is a violation of your local sewer ordinance and may result in fines. See the "Grease Control Device Maintenance Recordkeeping" factsheet for more information.

Discharging used cooking or deep fryer oil, rotisserie fat, or solid food waste into kitchen sinks, mop sinks, and floor drains in your kitchen that are connected to the **sanitary sewer system** *is a violation of your local sewer use ordinances.*

Discharging anything, including oil, grease waste, wash water, or rinse water to the **storm drain system** *is a violation of the local sewer use ordinance.*

Kitchen Best Management Practices (BMPs)

- Grease and solid food waste can build up inside the interceptor and may cause the interceptor to operate less efficiently.
- Scraping grease and food waste to the garbage before washing dishes will minimize the amount of grease and solids going into the grease interceptor and will improve interceptor performance.

Tips on Routine Grease Interceptor Maintenance

- The pumping service should wash and scrape all sides, standpipes, and surfaces inside the interceptor and completely pump out all contents.
- The pumping service shall not decant (return) wastewater back into the interceptor; the grease concentration in interceptor wastewater is very high.
- Make sure your pumping service cleans the sample box and effluent standpipe of the interceptor. You may need to pump more often if you see fresh grease being discharged into your sample box.
- Require the pumping service to show the disposal destination for your waste on the pumping invoice. Your business may be liable for any illegal dumping or discharge of waste from your facility.
- Do visual inspections after pumping services are performed or when plumbers snake or hydro-jet plumbing or laterals to make sure the interceptor standpipes are not damaged.
- Keep grease interceptor pumping records on site for a minimum of three years. Refer to the Grease Control Device Maintenance Recordkeeping sheet for more information.

For more information:

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City of Santa Clara

KEEP GREASE OUT OF THE SYSTEM

Grease Trap Maintenance

What is the Purpose of a Grease Trap?

- A grease trap is designed to separate Fats, Oils, and Grease (FOG) and solid food waste from your kitchen wastewater.
- Buildup of FOG and solid food waste in your plumbing may cause blockages in either your plumbing or the sanitary sewer lines. This can lead to an overflow into your building, a neighbor's building, streets, or the environment. It is important to clean your grease trap regularly.

Cleaning Frequency

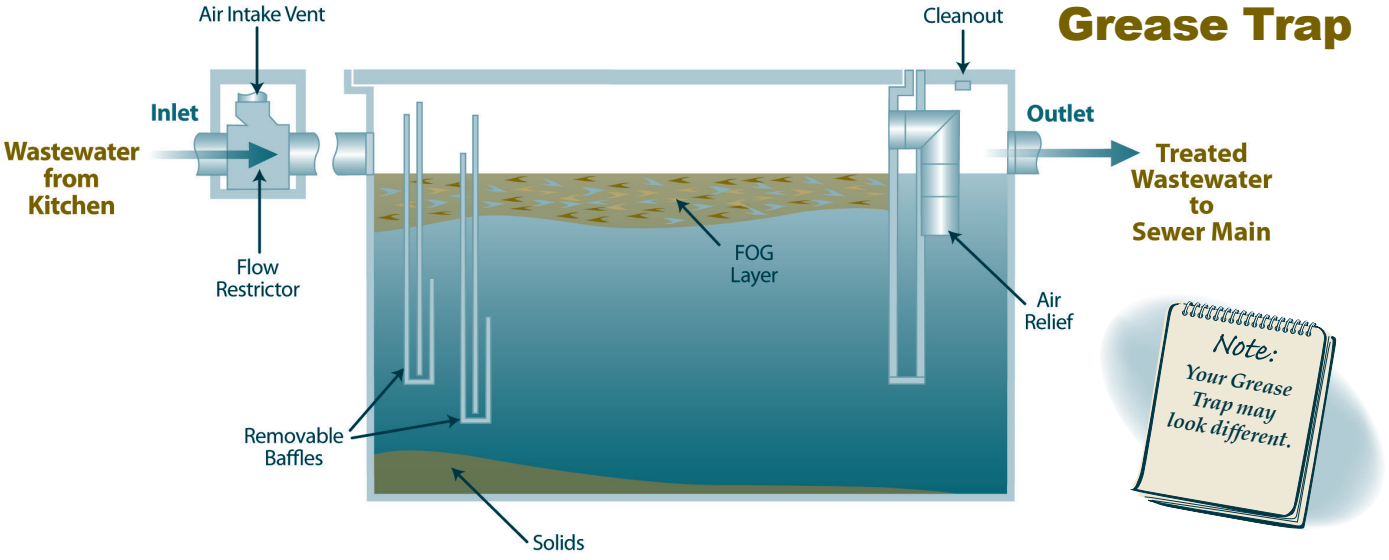
- Grease traps shall be cleaned **at least once every 30 days**. More frequent cleaning may be necessary if:
- Your sinks are draining slowly, possibly due to buildups in the trap.
- Water levels in the trap or floor drains are high, possibly due to grease-related blockages in your plumbing.
- The grease trap smells bad because solids are filling the bottom of the trap quickly.
- Your trap is not sized correctly for your restaurant operations, menu, or number of meals served.

Twenty-Five Percent Rule

- **Clean the trap when it is twenty-five percent (25%) full of FOG and solid food waste or within 30 days of the last pumping, whichever comes first.**

Common Problems Leading to Grease Trap Repair or Replacement

- Grease trap installed backwards, without flow controls, or otherwise in violation of plumbing codes or manufacturer specifications.
- Missing or damaged parts, such as the removable baffle plates.
- Leaks due to rust holes or punctures in the walls or floors.
- Illegal connection to the dishwasher or garbage grinder to the grease trap.



Grease in the system causes problems in storm drains and sanitary sewers — and increases your operating costs.

Failure to maintain records on site for a minimum of three years is a violation of your local sewer ordinance and may result in fines. See the "Grease Control Device Maintenance Recordkeeping" factsheet for more information.

Discharging used cooking or deep fryer oil, rotisserie fat, or solid food waste into kitchen sinks, mop sinks, and floor drains in your kitchen that are connected to the **sanitary sewer system** *is a violation of your local sewer use ordinances.*

Discharging anything, including oil, grease waste, wash water, or rinse water to the **storm drain system** *is a violation of the local sewer use ordinance.*

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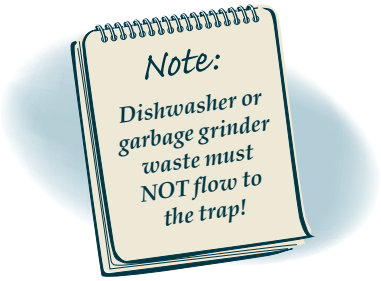
Kitchen Best Management Practices (BMPs)

- Scraping grease and food waste to the garbage before washing dishes will minimize the amount of grease and solids going into the grease trap and will often improve trap performance.



Tips on Routine Grease Trap Maintenance

- To ensure proper maintenance, we recommend using a professional grease hauling company.
- Cleaning consists of emptying the entire trap, including FOG, wastewater, and solid food waste; making sure the removable baffle plates and parts are thoroughly cleaned and replaced properly after each cleaning.
- Keep a maintenance log sheet posted near the grease trap if you self-clean the trap.
- Melt ice in the sink plumbed to the grease trap an hour or two before cleaning. This helps cool and harden the grease in the trap, making cleaning easier and reducing odors.
- Have an extra gasket available for your grease trap lid and use allen screws (which resist stripping) to secure the lid.
- Run your hood fans during cleaning to reduce odors.
- Call a plumber to snake or hydro-flush your sewer lateral (plumbing) pipes to the street periodically to remove any blockages.
- If you choose to self-clean your grease trap, please see the "How to Clean Your Grease Trap" poster for guidance.

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City of Santa Clara

HOW TO CLEAN YOUR GREASE TRAP

Keep grease out of the sanitary sewer by following these simple steps:

CÓMO LIMPIAR LAS TRAMPAS DE GRASA

¡Mantenga la grasa fuera del alcantarillado, y proteja nuestros arroyos y la Bahía siguiendo estos pasos sencillos:

CÁCH THỨC LÀM SẠCH BẪY DẦU MỠ CỦA BẠN

Giữ dầu mỡ ra khỏi cống rãnh bằng cách làm theo các bước đơn giản này:

1 Scoop top grease
Saque la grasa acumulada en la parte superior con una pala / Vớt váng dầu

Let grease trap cool down. Scoop out oil and grease. Place waste in a plastic bag.

Deje que se enfríe la trampa de grasa. Saque el aceite y grasa y pongala en una bolsa de plastico.

Hãy để cho cái bẫy nguội. Vớt ra phần dầu và mỡ nổi trên mặt. Bỏ vào túi nhựa.

2 Remove water
Saque el agua
Đổ nước đi

Scoop out water. Leave solids and sludge behind. Pour water into a sanitary sewer (indoor) drain.

Saque el agua de la trampa. Deje detrás los sólidos y residuos. Tire el agua en un drenaje sanitario.

Múc nước ra. Chừa lại chất rắn và bùn. Đổ nước xuống hệ thống cống thoát nước vệ sinh (trong nhà).

3 Remove solids and sludge
Remueva los sólidos y residuos
Đổ đi chất rắn và bùn

Scrape waste from all sides and bottom of the grease trap. Place in a plastic bag.

Raspe los sólidos y residuos de las superficies de las paredes y del fondo de la grasa y pongala en una bolsa de plastico.

Cạo ra chất thải ở mặt trên, mặt dưới và xung quanh của cái bẫy dầu mỡ. Bỏ hết chất thải vào túi nhựa.

4 Clean all parts
Limpie todas las partes
Làm sạch các bộ phận

Check and clean all removable parts, baffles, and/or screens. Place waste in a plastic bag.

Inspeccione y limpie las partes y/o pantallas y pongala en una bolsa de plastico.

Kiểm tra và làm sạch các bộ phận rời, vách ngăn, và/hoặc màn lưới. Bỏ hết chất thải vào túi nhựa.

5 Make waste solid
Solidifique los desechos
Làm đặc

Pour cat litter into bag(s) of waste and mix until dry. Double-bag the waste.

Vierta arena para gatos en las bolsas con la grasa y residuos, y mezcle hasta que la grasa se solidifique o hasta que la grasa se seque. Después ponga los residuos con la arena de gato en bolsa doble.

Bỏ cát mèo (cat litter) vào trong các túi nhựa chất thải rồi trộn cho đến khi khô. Để túi vào trong một túi nhựa khác.

6 Dispose
Deseche
Vứt bỏ

Securely tie up bags of waste. Dispose in a trash can or dumpster. Close lid over trash.

Ate las bolsas de residuos de manera segura. Deshágase de las bolsas en un basurero o contenedor de basura. Cierre la tapa sobre la basura.

Cột chặt túi lại. Bỏ vào thùng rác. Đậy nắp thùng rác.

7 Reassemble and record
Vuelva a ensamblar, rellene y registre
Lắp ráp lại và ghi chép

Reassemble trap. Tighten lid. Record cleaning on maintenance log sheet.

Vuelva a ensamblar la trampa, apriete la tapa y anote en la hoja de registro de mantenimiento.

Ráp lại cái bẫy. Đậy nắp cho chặt. Ghi vào hồ sơ bảo trì mọi chi tiết làm sạch bẩy dầu mỡ.

COMPLIANCE WARNING: You are required by your sewer use ordinance to keep the grease trap in efficient operating condition. Failure to do so can result in fines or other penalties.

ADVERTENCIA: Usted esta obligado por la ordenanza del uso del alcantarillado sanitario a mantener la trampa de grasa operando en condiciones eficientes. Falta de mantener la trampa de grasa en condición eficiente puede resultar en multas o otros penales.

KHUYẾN CÁO: Về việc phải tuân giữ hợp lê. Luật lệ về việc bảo trì cái bẫy dầu mỡ đòi hỏi bạn luôn luôn giữ gìn cái bẫy dầu mỡ trong điều kiện tốt và điều hành hiệu quả. Mọi khiếm khuyết trong việc tuân hành luật lệ này có thể đem lại việc bị phạt tiền và các hình phạt khác.

PREVENT SEWER OVERFLOWS

KEEP GREASE OUT OF THE SYSTEM

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San José-Santa Clara Regional Wastewater Facility

City of Santa Clara

408.615.2000

www.santaclaraca.gov

KEEP GREASE OUT OF THE SYSTEM

Hello,

I am a Code Enforcement Technician with the City of Santa Clara. I am here to perform an inspection of your business. Santa Clara conducts inspections of restaurants, cafetereias, and other food service operations. We inspect these businesses to ensure that they are:

1. In compliance with environmental laws, and
2. Not releasing excessive grease into the sanitary sewer that can cause sanitary sewer blockages, backups, and overflows.

The inspection will consist of asking you questions about your business activities, walking through your business site, and reviewing certain records. We will also provide you with educational materials and information that can help your business stay in compliance with water pollution laws and protect the environment.

We appreciate the opportunity to work with you to protect the sanitary sewer system and minimize pollution of our local creeks, rivers, and the Bay. For additional information on this inspection and ways you can help us protect our local waterways, please visit our website www.santaclaraca.gov or call our office at 408.615.2000

KEEP GREASE OUT OF THE SYSTEM

Prohibitions on using Chemicals, Enzymes, or Bacteria in Grease Traps and Interceptors

Chemicals: the use of chemicals to clean grease traps or interceptors is strictly prohibited because:

- Local sewer use ordinances prohibit the use of chemicals as a method to remove grease from your grease trap or interceptor.
- Cleaners, solvents, caustics, or other chemicals cannot be used to dissolve accumulated grease from your grease trap or grease interceptor. These chemicals cause grease to flow out of your trap or interceptor in violation of local ordinances. The grease may deposit on sewer pipes downstream of your business, obstructing them and contributing to sewer overflows.

Enzymes: the use of enzymes to clean grease traps or interceptors is strictly prohibited because:

- Whether produced synthetically or from animals, enzymes cannot be used to dissolve grease from your grease trap or interceptor.
- Enzymes can temporarily alter the chemical form of the grease, allowing it to dissolve into the water. However, the altered grease may reform into solid matter downstream from your business, obstructing sewer pipes.

Bacteria: the use of bacteria to clean grease traps or interceptors is strictly prohibited because:

- Bacteria need a reliable environment to grow and are sensitive to changes in temperature, pH, oil and grease loading, water flow changes, etc. It is difficult to maintain the conditions necessary for bacteria to thrive in a kitchen environment. Biological expertise and ongoing sampling are often needed for bacteria to be sustainable.
- Even if bacteria survive and flourish, their effectiveness in removing grease is limited. "Partially eaten" (i.e., not broken down completely) grease may still enter the plumbing and over time reform into solid matter downstream, obstructing the sewer pipes.

Per the sewer use ordinance:

"No person shall discharge...any substance of any kind whatsoever tending to obstruct or injure the sanitary sewer system, or to cause a nuisance or hazard, or which will in any manner interfere with the proper operation or maintenance of the sanitary sewer system."

In general...

- Greasy wastewater may not be discharged to the sanitary sewer system unless it has been treated using a grease trap or interceptor approved by the Environmental Services Department.
- Floating or solid grease matter must be physically removed from your grease removal device by pumping, scraping, scooping, etc.
- Maintain your grease trap and interceptor in efficient operating condition by regular removal of accumulated grease.
- The minimum cleaning frequency required for grease interceptors installed in food service facilities is once every 90 days. However, more frequent cleaning may be necessary.
- The minimum cleaning frequency required for grease traps installed in food service facilities is once every 30 days. However, more frequent cleaning may be necessary.

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City of
Santa Clara

KEEP GREASE OUT OF THE SYSTEM

Proper Cleaning and Rinse Water Disposal for Exhaust Hoods, Filters, Ducting, Roof Fans, and Floor Mats

Cleaning Exhaust Hoods and Exhaust Hood Filters On Site

- Dry-wipe and scrape grease off of all surfaces before washing.
- Empty and clean the grease collection trays located inside of the exhaust hoods regularly.

Cleaning Exhaust Hood Filters Off Site

- The business owner may choose to use professional services to exchange dirty exhaust hood filters for clean ones.

Whether you contract with a professional service, perform the cleaning yourself, or do both, you are liable for any illegal disposal of waste or rinse water resulting from cleaning your exhaust hood, filters, ducting, and roof fans. This includes any cleaning that occurs off site.

Cleaning Frequency

- Check your lease agreements and fire insurance policies to determine the minimum frequency that you must clean your equipment.
- More frequent cleaning may be necessary if grease collects quickly.

Cleaning Exhaust Ducting and Rooftop Exhaust Fans

- Do not allow wash and rinse water to go into downspouts.
- Do not leave pooled wash and rinse water on the roof.
- Collect the wash and rinse water and discharge to the sanitary sewer drains inside your business.

Never clean exhaust hoods or filters outdoors where wash water may flow to a storm drain.

Discharging used cooking or deep fryer oil, rotisserie fat, or solid food waste into kitchen sinks, mop sinks, and floor drains in your kitchen that are connected to the **sanitary sewer system** *is a violation of your local sewer use ordinances.*

Discharging anything, including oil, grease waste, wash water, or rinse water to the **storm drain system** *is a violation of the local sewer use ordinance.*

Proper Disposal of Filter Bath Solution

- Used bath solution from soaking exhaust hood filters (both hazardous and non-hazardous) should be taken to an off-site disposal facility. You and your property manager are liable for any illegal disposal of your waste.

Proper Disposal of Water from Equipment Cleaning

- Do not dispose of the concentrated solution, wash water, or rinse water from cleaning or degreasing equipment or exhaust hood surfaces into sinks leading to a grease trap or mechanical grease removal device.
- Do dispose of the concentrated solution, wash water, or rinse water into a mop-sink, sink, or floor drain connected directly to the sanitary sewer system.
- Do dispose of wastewater from steam cleaning without chemicals to a grease trap or mechanical grease removal device.
- Do not pour concentrated chemicals into sinks, mop sinks, or floor drains plumbed to grease control devices. This may cause liquefied grease to escape the grease control device and could cause a blockage in your drainage system.

Proper Disposal of Water from Cleaning Floor Mats

Wash water from cleaning floor mats must never flow out the back door, onto the parking lots, into a gutter, or into a storm drain. Clean mats:

- In a mop sink or near a floor drain, or
- Outside in a designated area that flows to a sanitary sewer drain, or
- In a garbage can; then dispose of the wash water into a mop sink.

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City of Santa Clara

Do it Right
WASTE STORAGE AREA
Compactors / Dumpsters / Tallow Bins

Hágalo bien
ÁREA DE CONFINAMIENTO DE RESIDUOS
Compactadores / Contenedores / Recipientes de sebo

Làm Cho Đúng
Khu Vực Cất Giữ Rác
Máy Nén Rác / Thùng Lớn Đựng Rác / Thùng Đựng Dầu Mỡ

Maintain and clean waste enclosure area on a regular basis.

Mantenga limpias las áreas de confinamiento de residuos regularmente.

Thường xuyên giữ gìn vệ sinh chung quanh chỗ để rác.

Do not hose down dumpsters, compactors, tallow bins, or the enclosure area to the storm drain.

No lave con manguera los contenedores, los compactadores, recipientes de cebo o el área de residuos al desagüe pluvial.

Không được xịt nước để rửa các thùng đựng rác, các máy nén rác, các thùng đựng dầu mỡ, hoặc khu vực bao quanh xuống cống thoát nước mưa.

When you clean the enclosure, collect all wash water and dispose of it in the sanitary sewer.

Cuando limpie el área de confinamiento de residuos recoja toda el agua sucia y dispóngala en el alcantarillado sanitario.

Khi dọn sạch khu vực đổ rác, thu lại nước rửa và đổ vào ống cống vệ sinh.

Do not put liquid waste in dumpster or compactor.

No ponga residuos líquidos en el contenedor o en el compactador.

Không đổ chất thải ướt vào thùng đựng rác lớn hoặc máy nén rác.

Train employees to keep waste enclosure area clean and prevent all wash water from going to the storm drain.

Entrene a los empleados para mantener limpia el área de residuos y evitar que el agua sucia vaya a los desagües pluviales.

Huấn luyện nhân viên về việc giữ cho khu vực bao quanh chỗ để rác được sạch sẽ, và giữ cho nước rửa không chảy vào cống thoát nước mưa.

Prevent spills and leaks, and have spill kit readily available for clean up.

Prevenga los derrames y fugas y tenga listo un kit de limpieza de derrames.

Phòng ngừa chất phế thải đổ ra, và chuẩn bị sẵn dụng cụ để lau dọn.

Clean up all spills and leaks immediately using spill kit. Sweep up absorbent right away; do not let it sit out overnight or in the rain.

Limpie todos los derrames y fugas inmediatamente usando el kit para derrames. Barra enseguida el absorbente, no lo deje de un día para otro o para cuando llueve.

Lau dọn ngay tất cả các chỗ đổ tháo bằng dụng cụ để lau dọn. Quét dọn ngay chất thấm; không để chất này bên ngoài qua đêm hoặc dưới mưa.

Close lids on all containers after use.

Cierre las tapas de todos los contenedores después de su uso.

Đóng nắp đậy cho tất cả các thùng đựng sau khi dùng.

Double-bag wet waste. Mix dry absorbent in with wet waste, then tie off bags. Use buckets to transfer bagged wet waste to the dumpster.

Ponga los residuos líquidos en doble bolsa. Mézclelos con material absorbente, luego amarre las bolsas. Utilice baldes para pasar la bolsa de residuos líquidos al contenedor.

Dùng hai bao rác lồng vào nhau để đựng rác ướt. Trộn chất thấm nước với rác ướt, và cột bao lại. Dùng sô đựng để chuyển bao rác ướt tới thùng đựng rác.

Call your hauler to replace leaky bins immediately.

Llame a su transportista para reemplazar los contenedores con fugas inmediatamente.

Gọi công ty kéo rác đến thay ngay các thùng đựng rác đã bị thủng.

Keep your waste storage area clean to protect the Bay
Mantenga limpia el área de confinamiento de residuos para proteger la bahía
Giữ cho khu vực đổ rác được sạch sẽ để bảo vệ cho Vùng Vịnh

NO DUMPING! FLOWS TO BAY

408.615.2000
www.santaclaraca.gov

* Failure to be in compliance may subject your business to an Administrative Citation with a fine of $500 or more.

*La falta de cumplimiento puede causarle a su negocio una medida administrativa con multa hasta de $500 ó más.

*Cơ sở kinh doanh không tuân giữ có thể bị phạt tới $500 hoặc hơn

San Jose/ Santa Clara Water Pollution Control Plant

City of Santa Clara

Appendix J
City of Santa Clara Sewer Capacity Assessment

Appendix J

City of Santa Clara Sanitary Sewer Capacity Assessment

May 2007

Prepared by:

RMC Water and Environment

FINAL REPORT

RMC
Water and Environment

Sacramento
San Diego
San Francisco
San Jose
Santa Monica
Walnut Creek

May 31, 2007

Mr. Rajeev Batra
City Engineer
City of Santa Clara Engineering Department
1500 Warburton Avenue
Santa Clara, CA 95050

Subject: Sanitary Sewer Capacity Assessment

Dear Mr. Batra:

RMC Water and Environment is pleased to submit this Final Report on the Sanitary Sewer Capacity Assessment for the City of Santa Clara. The report reflects the collaborative efforts of the RMC team and dedicated staff of the City's Public Works Engineering Department and Water and Sewer Utilities to prepare a comprehensive assessment of the capacity needs of the City's trunk sewer system.

The Capacity Assessment has been based on a detailed study methodology encompassing use of sewer flow monitoring, water use, and land use planning data, coupled with state-of-the-art hydraulic modeling, to identify the future capacity requirements of the City's sanitary sewer system and develop recommended capacity improvement projects. The study also complies with Regional and State regulatory requirements for all collection system agencies to prepare Sewer System Management Plans addressing the operation, maintenance, and management of their systems.

The Capacity Assessment report identifies nine capacity improvement projects in the trunk sewer system, totaling about $20 million in capital costs, that will enable the City to maintain its high level of service to the community and provide adequate capacity to serve proposed future development and redevelopment. The report also includes recommendations and guidelines for implementing the recommended capital improvement program and continuing to track the flows and capacity of the system. The hydraulic model of the trunk sewer system developed for this study will allow the City to update the capacity assessment as changes occur over time.

We appreciate the opportunity to have worked with the City on this very challenging project. We would like to thank you for your oversight and direction of this effort, for the guidance and dedication of the City's Project Manager, Falguni Amin, and for the input and assistance provided by many other City staff members on this Capacity Assessment project.

Sincerely,

Gisa Ju, P.E.
Project Manager

Tammy Qualls, P.E.
Project Engineer

2290 North First Street
Suite 212
San Jose, CA 95131
ph: 408.240.8160
fax: 408.240.8161
www.rmcwater.com

Innovative Solutions for Water and the Environment

City of Santa Clara
Sanitary Sewer Capacity Assessment
Final Report

Prepared by:

RMC
Water and Environment

May 2007

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Appendix B - Project Descriptions and Cost Estimates

Acknowledgements

City of Santa Clara

Rajeev Batra, City Engineer

Tom Supan, Principal Engineer

Falguni Amin, Project Manager

Gustavo Gomez, Principal Engineer

Jim Parissenti, Principal Engineer

Kimchi Tran, Civil Engineer I

Robin Saunders, Director of Water and Sewer Utilities

Alan Kurotori, Assistant Director Sewer Utility

Kevin Riley, Director of Planning and Inspection

Doug Handerson, Associate Planner

RMC Water and Environment

Steve Bui, Principal-in-Charge

Gisa Ju, Project Manager

Tammy Qualls, Project Engineer

Carrie Teng

Catherine Greenman

Glenn Hermanson

E2 Consulting Engineers, Flow Monitoring

List of Abbreviations and Definitions

ADWF	Average dry weather flow: the average flow during dry (non-rainfall) periods
APN	Assessor parcel number
CIP	Capital Improvement Program
City	City of Santa Clara
CSJ	City of San Jose
CuSD	Cupertino Sanitary District
d/D	Ratio of flow depth to pipe diameter
DU	Dwelling unit
DWF	Dry weather flow: the flow during non-rainfall periods, composed of normal sanitary flow contributions from residential, commercial, institutional, and industrial users of a sewer system plus any dry season groundwater infiltration.
E2	E2 Consulting Engineers, Inc.
ECR	El Camino Real
ENR-CCI	Engineering News Record Construction Cost Index: an index published monthly by Engineering News Record magazine and used to reference construction costs (such as those for wastewater system facilities) to a specific date and location.
FAR	Floor-area-ratio: the ratio of building floor space to total parcel area
GIS	Geographic Information System: a computerized system in which geographical features (e.g., sewer facilities, parcels, land use) are linked to an attribute database to facilitate analysis and presentation of information.
gpad or gpd/ac	Gallons per day per acre
gpcd	Gallons per capita per day
gpd	Gallons per day
gpm	Gallons per minute
GWI	Groundwater infiltration: extraneous water that infiltrates a sewer system from the ground through defective pipes and manholes. Groundwater is considered to be a relatively constant daily flow that varies seasonally and depends on location of sewers with respect to the groundwater table.

IDF	Intensity-duration-frequency: rainfall statistics that establish the rainfall intensity over specified durations for various recurrence frequencies
I/I	Infiltration/inflow: extraneous groundwater and/or storm water that enter a sanitary sewer system.
K	Recession coefficient of RDI/I unit hydrograph
lf	Linear feet
mgd	Million gallons per day
PDWF	Peak dry weather flow: the peak flow during non-rainfall periods
PS	Pump Station
PWWF	Peak wet weather flow: the peak flow during a given storm event from dry weather flow plus infiltration and inflow.
R	Ratio of RDI/I volume to rainfall volume
R&D	Research and Development
RDI/I	Rainfall-dependent infiltration/inflow: the infiltration and inflow into a sewer system directly related to a rainfall event. RDI/I may cause rapid, short-term peak flows in the sewer system that recede after the rainfall has ended.
RG	Rain gauge
Regional Board	Regional Water Quality Control Board: a division of the State Water Resources Control Board that administers wastewater discharge permits in a specific region of California. The City of Santa Clara falls under the jurisdiction of the San Francisco Bay Regional Board.
RMC	RMC Water and Environment
SJ/SC WPCP	San Jose/Santa Clara Water Pollution Control Plant
SSMP	Sewer System Management Plan
State Board	State Water Resources Control Board
Surcharge	The hydraulic condition in a sewer pipeline in which the elevation of the hydraulic gradeline (water level) is above the crown (top) of the pipe. Under such a condition, the water in the pipe rises into the manholes and could overflow onto the ground if the hydraulic gradeline exceeds the elevation of the manhole rims.
T	Time to peak of RDI/I unit hydrograph

Executive Summary

Executive Summary

This report summarizes the results and recommendations of the Sanitary Sewer System Capacity Assessment for the City of Santa Clara (City). The Capacity Assessment was prepared by RMC Water and Environment (RMC) in close coordination with City staff. The Capacity Assessment will be used to guide improvements to the City's sanitary sewer system to accommodate current and future development to ensure that the City continues to maintain a high level of service to its customers.

Background and Purpose of Capacity Assessment

The City of Santa Clara is located in central Santa Clara County adjacent to the Cities of San Jose, Cupertino, and Sunnyvale. The City has a population of approximately 110,000 and is served by a wastewater collection system consisting of approximately 270 miles of sewer pipelines and six sewage pump stations. The collection system conveys wastewater flows to the San Jose/Santa Clara Water Pollution Control Plant (SJ/SC WPCP), located north of Highway 237 in San Jose. The City also receives flow from the Cupertino Sanitary District (CuSD) at Homestead Road under an agreement with the City executed in 1985. The City's sewer system and service area are shown in **Figure ES-1**.

The City is experiencing significant growth and redevelopment, necessitating an evaluation of the capacity of the sanitary sewer system to handle future wastewater flows. This evaluation will help identify future capital needs for capacity improvements and associated requirements for financing those improvements through increased connection fees or other sources of funding.

Furthermore, the City is also required to complete a capacity evaluation and capacity assurance plan as part of preparing its Sewer System Management Plan (SSMP). The SSMP addresses the overall management, operation, and maintenance of the sanitary sewer system and is required for all sewer system agencies by the Regional Water Quality Control Board, as well as under the Statewide General Waste Discharge Requirements adopted in 2006 by the State Water Resources Control Board.

The overall objectives of this Capacity Assessment study are to develop wastewater flow projections for the City's collection area using up-to-date water use and land use information; develop a hydraulic model of the trunk sewer system; use the model to identify capacity deficiencies in the existing system and future capacity requirements; and develop a phased Capital Improvement Program, including budget estimates, for implementing the required capacity improvements to the sanitary sewer system.

This Executive Summary is presented in two parts:

- ***How the Capacity Assessment was Prepared*** describes the scope and methodologies of the planning effort, including the key planning and technical assumptions incorporated into the sewer system capacity analysis.

- ***Recommended Capacity Improvement Program*** presents the recommended Capital Improvement Program (CIP), including capacity improvement projects, priorities, and estimated costs. In addition, recommendations are presented for implementing the proposed capacity improvement program.

How the Capacity Assessment Was Prepared

The City's wastewater collection system includes sewer pipelines ranging in size from 4 to 48 inches in diameter. The larger pipes, primarily the 15-inch and larger sewers and a portion of the smaller diameter pipes, comprise the trunk sewer system, which is the primary network for conveying flows generated from the City's service area to the SJ/SC WPCP. The trunk sewer system was the focus of the capacity assessment in this study.

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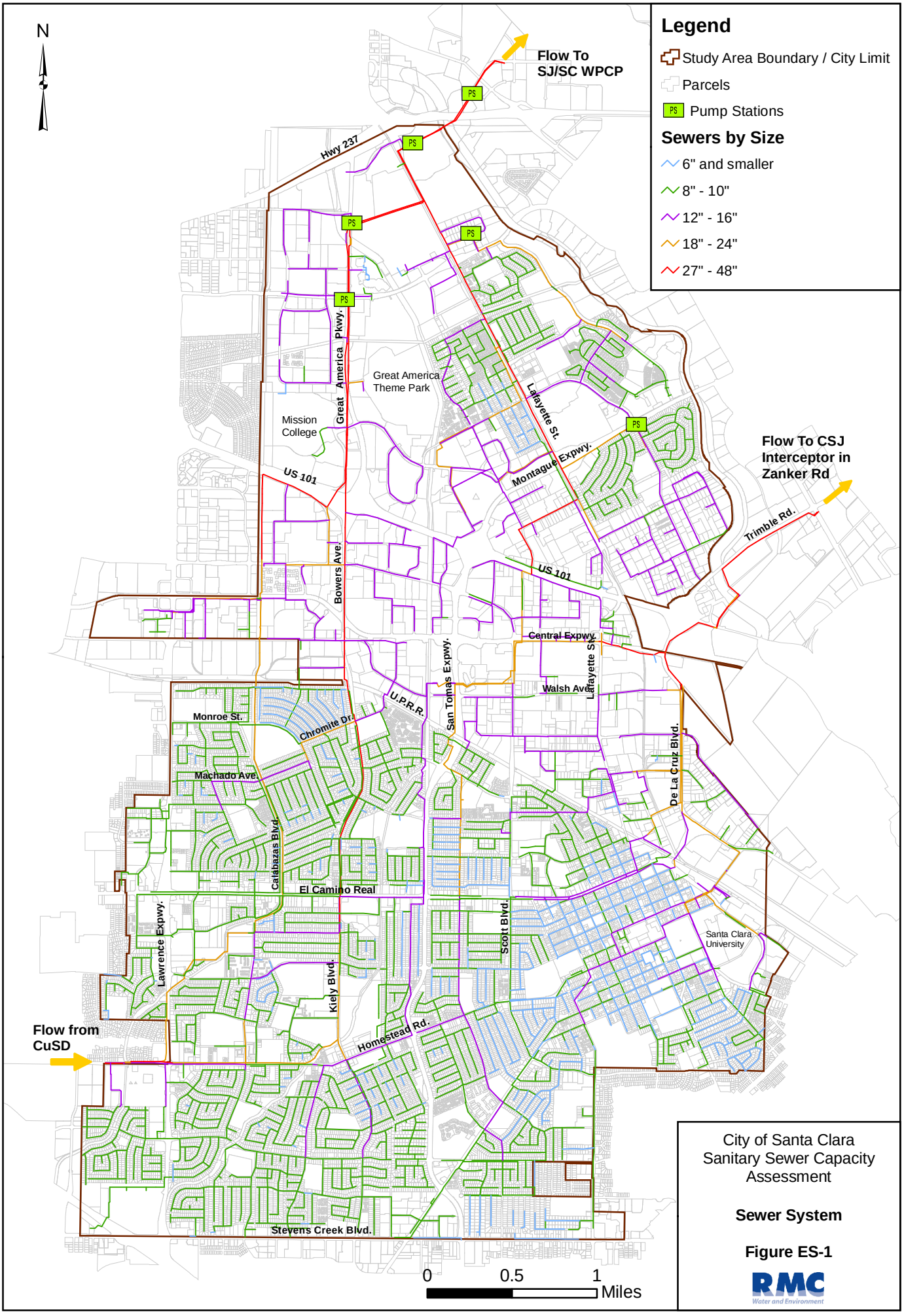
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Study Area Boundary / City Limit
Parcels
Pump Stations
Sewers by Size
6" and smaller
8" - 10"
12" - 16"
18" - 24"
27" - 48"
Flow To SJ/SC WPCP
Flow To CSJ Interceptor in Zanker Rd
Flow from CuSD
PS
Hwy 237
US 101
Great America Pkwy.
Great America Theme Park
Mission College
Lafayette St.
Montague Expwy.
Trimble Rd.
Bowers Ave.
Central Expwy.
San Tomas Expwy.
Walsh Ave.
U.P.R.R.
Monroe St.
Chromite Dr.
Machado Ave.
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Lawrence Expwy.
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Miles
City of Santa Clara
Sanitary Sewer Capacity Assessment
Sewer System
Figure ES-1
RMC
Water and Environment

The project team used a systematic process that incorporated land use planning information, water use and flow monitoring data, and design criteria for estimating wastewater flows into a computer hydraulic model of the trunk sewer system. The modeled system is shown in **Figure ES-2**. The model was used to assess how the system would perform under various planning scenarios and identifies pipes that may not have sufficient capacity to convey the predicted flows under future conditions. Improvement projects were developed to provide the required capacity, the capital costs of the required projects were estimated, and the projects were prioritized based on the model results and anticipated timing of development.

Capacity Assessment Considers Existing and Future Planning Scenarios

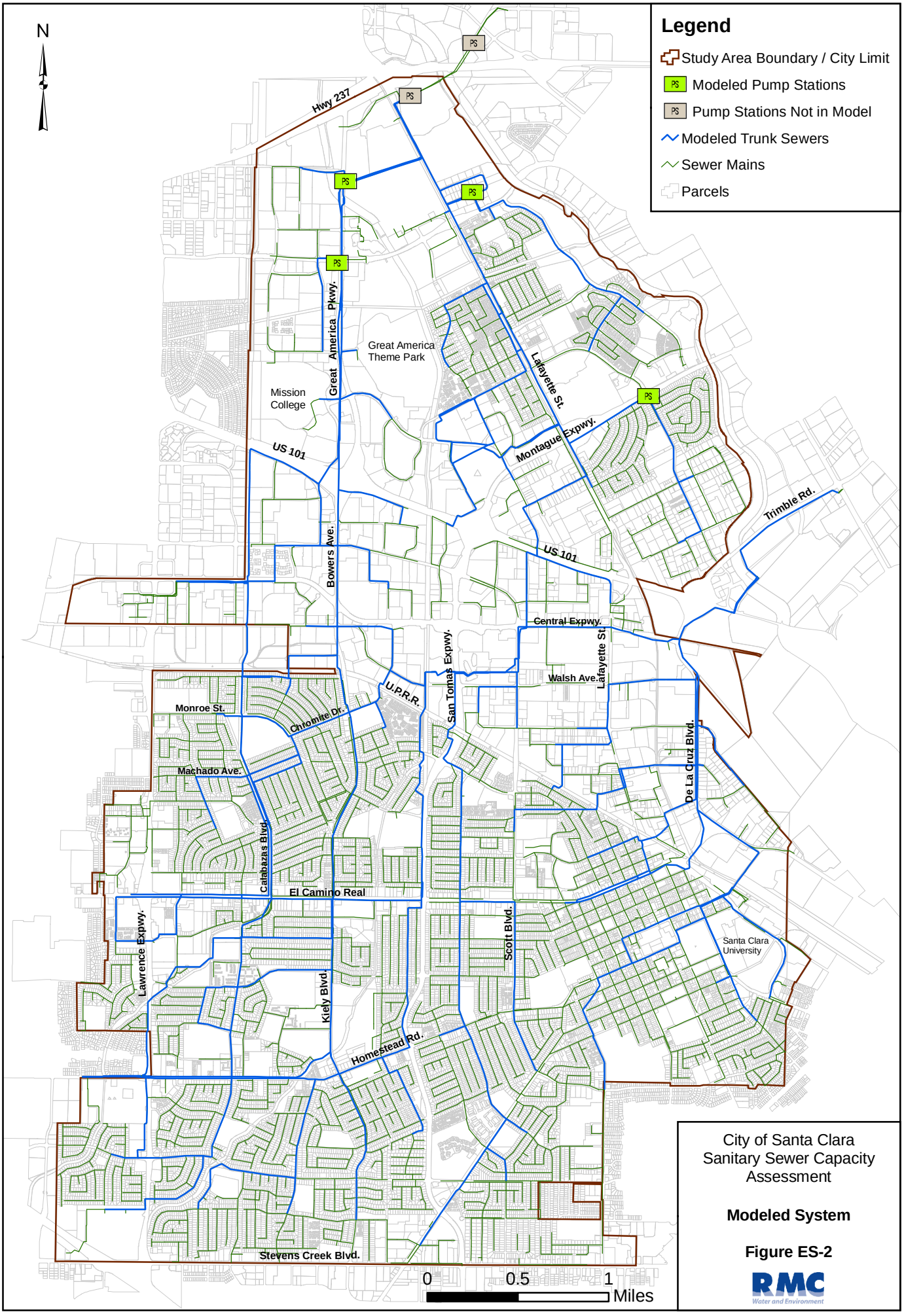
Two planning scenarios, defined based on planning information and discussions with the City's Planning Department staff, were evaluated for this study. The Existing Scenario examined the current capacity of the sewer system based on existing development and flow monitoring data collected in early 2006. The Future Scenario assumed construction of all currently planned major development and redevelopment projects in the City, as well as potential increased densities in mixed use and transit-oriented mixed use and commercial/office areas consistent with the City's 2010 General Plan and General Plan Update. **Figure ES-3** shows the location of these planned and recently constructed developments. Planned development and redevelopment represents over 10,000 new residential dwelling units and over 5 million square feet of new commercial and office space. The Future Scenario was used to examine the impact on the system of future increases in wastewater flows due to new development and redevelopment and determine the required sewer system capacity needed to serve that development.

Potential Capacity Deficiencies Were Identified for Future Flow Conditions

For each of the planning scenarios examined, projected dry and wet weather flows were simulated in the hydraulic model. The model was calibrated to actual flow monitoring data to ensure that it represents an accurate depiction of system conditions. For this study, a wet weather flow monitoring program consisting of 26 temporary flow meters installed in the system for a period of two months was used to calibrate the hydraulic model and verify existing system flows.

The model integrates various dry and wet weather flow parameters to determine system capacity under different flow and planning scenarios. Key flow components incorporated into the model included: base (dry weather) wastewater flow, estimated based on winter water use data; groundwater infiltration, which occurs when water seeps into pipes under the ground through cracks and pipe joints; and rainfall-induced infiltration and inflow (I/I) during storm events. For this Capacity Assessment, a 10-year recurrence frequency rainfall event was selected as the "design storm" to be consistent with the criteria used by the City of San Jose. The flow during a 10-year design storm represents a peak wet weather flow condition that would be expected to occur, on average, no more frequently than once every ten years.

Table ES-1 presents the estimated existing and future average dry weather flow (ADWF) and peak wet weather flow (PWWF) for a 10-year design storm for the City's sewer system developed based on the modeling conducted for this study.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Study Area Boundary / City Limit
Modeled Pump Stations
Pump Stations Not in Model
Modeled Trunk Sewers
Sewer Mains
Parcels
PS
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Great America Pkwy.
Great America Theme Park
Mission College
US 101
Lafayette St.
Montague Expwy.
Trimble Rd.
Bowers Ave.
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San Tomas Expwy.
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Sanitary Sewer Capacity Assessment
Modeled System
Figure ES-2
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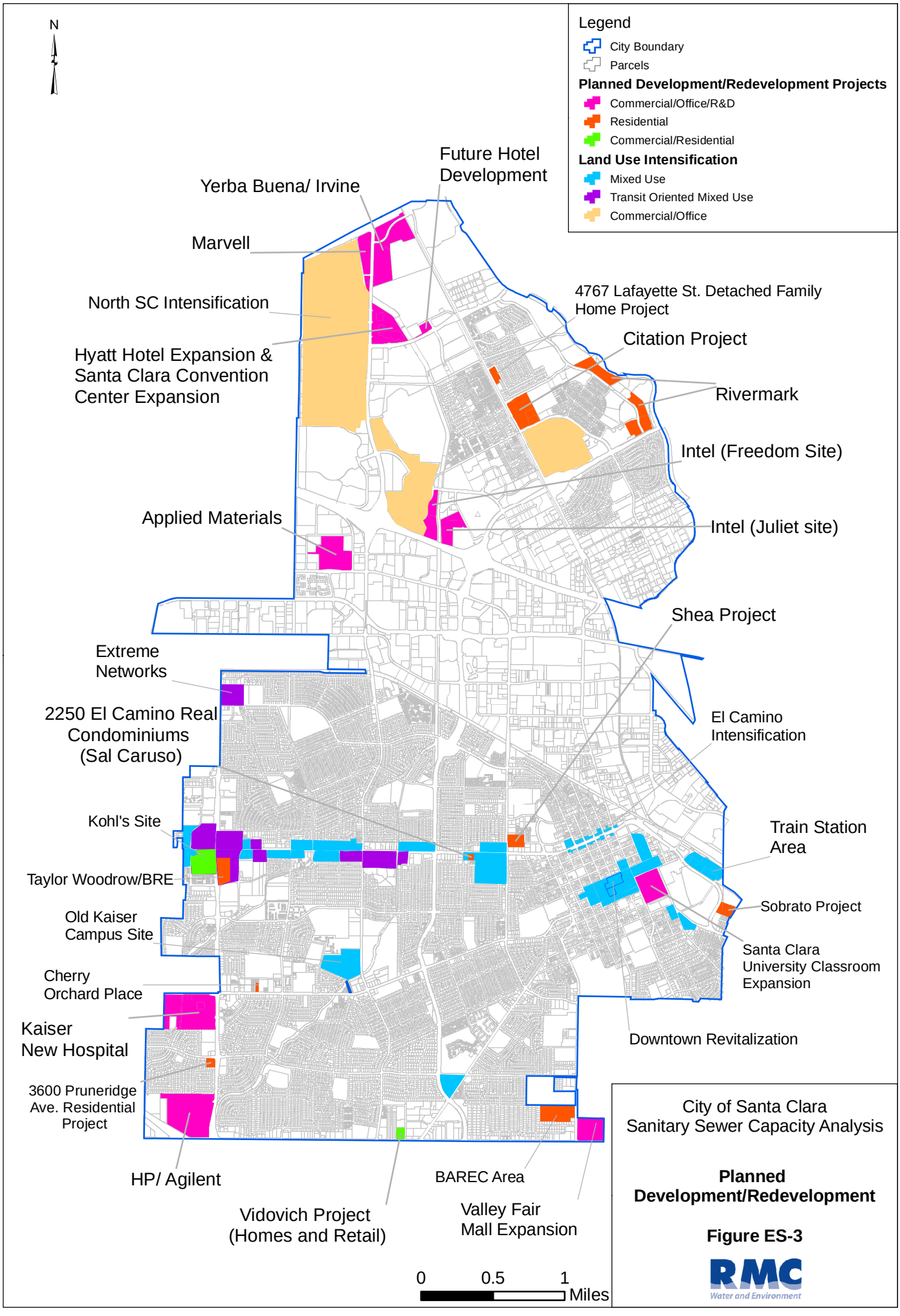
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Planned Development/Redevelopment Projects
Commercial/Office/R&D
Residential
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Land Use Intensification
Mixed Use
Transit Oriented Mixed Use
Commercial/Office
Future Hotel Development
Yerba Buena/ Irvine
Marvell
North SC Intensification
Hyatt Hotel Expansion & Santa Clara Convention Center Expansion
4767 Lafayette St. Detached Family Home Project
Citation Project
Rivermark
Intel (Freedom Site)
Intel (Juliet site)
Applied Materials
Shea Project
Extreme Networks
2250 El Camino Real Condominiums (Sal Caruso)
El Camino Intensification
Kohl's Site
Train Station Area
Taylor Woodrow/BRE
Sobrato Project
Old Kaiser Campus Site
Santa Clara University Classroom Expansion
Cherry Orchard Place
Kaiser New Hospital
Downtown Revitalization
3600 Pruneridge Ave. Residential Project
HP/ Agilent
BAREC Area
Vidovich Project (Homes and Retail)
Valley Fair Mall Expansion
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Miles
City of Santa Clara
Sanitary Sewer Capacity Analysis
Planned Development/Redevelopment
Figure ES-3
RMC
Water and Environment

Table ES-1 Sewer System Flow Estimates

System Outfall	Existing Flow (mgd)		Future Flow (mgd)	
	ADWF	PWWF	ADWF	PWWF
North (to Northside and Rabello Pump Stations)	17.7	40.8	21.2	43.1[a]
East (to San Jose Trimble Road trunk sewer)	6.0	13.2	6.9	14.1
Total	**24**	**54**	**28**	**57**

(a) Assumes peak flow from Cupertino Sanitary District flow does not increase above its contracted maximum capacity of 13.8 mgd.

Model results were examined to determine trunk system capacity needs, as indicated by areas where the flow in the pipes would exceed their capacity and cause surcharge conditions (water levels higher than the tops of the pipes) under peak wet weather flows. **Figure ES-4** shows the existing trunk sewers that were determined by the modeling to have insufficient capacity to handle future flows.

The Proposed Improvement Projects Address the Potential Capacity Deficiencies

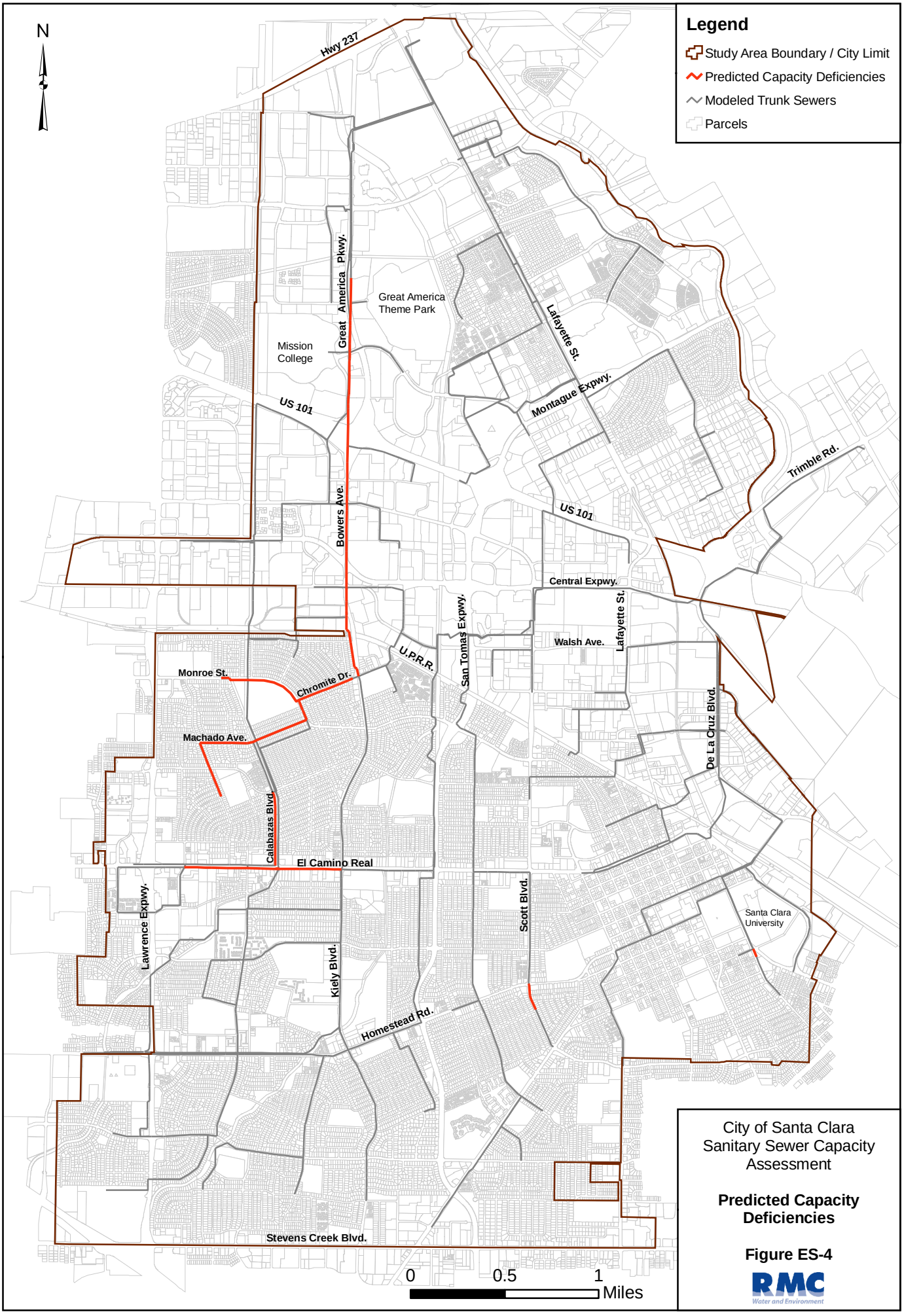
To address the capacity deficiencies identified through the modeling effort, three primary types of capacity relief alternatives were explored:

- Upsizing pipes (i.e., replacing existing pipes with larger ones)
- Construction of parallel pipes
- Flow diversions to other sewers with available capacity or to new sewer pipelines

Potential flow routing and capacity improvement alternatives were developed and tested, and proposed improvements were verified using the hydraulic model. Field visits were conducted to each proposed project site to identify site constraints and assess potential construction conditions, methods, and issues. Based on these analyses, recommended capacity improvement projects were developed.

Figure ES-5 and **Table ES-2** present the recommended capacity improvement projects. Note that the recommended plan reflects the construction of a new siphon crossing Calabazas Creek at El Camino Real, which is currently being designed as part of channel improvements being constructed by the Santa Clara Valley Water District (SCVWD). As part of that project, the City is coordinating with SCVWD to divert flows from the siphon outlet to the existing 24-inch Calabazas trunk sewer, thereby alleviating the predicted capacity deficiencies in El Camino Real east of Calabazas Creek and in the 8-inch sewer in the west side of Calabazas Boulevard north of El Camino Real.

The overall capacity improvement plan also shows a "West-to-East Trunk Alternative," which is an alternative to constructing a major relief trunk sewer in Bowers Avenue and Great America Parkway (Projects 1 and 2), two of the busiest roads in the City that already contain large diameter sewer pipelines. The West-to-East alternative would likely be easier to construct and could provide additional benefits, including greater system flexibility and potential reduction in costs for pumping flows that now are conveyed to the City's Rabello and Northside Pump Stations. However, more detailed alignment studies and constructability evaluations would be needed to reach a final decision on whether the Bowers/Great America Parkway relief sewer or West-to-East Trunk is the most viable alternative.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Great America Theme Park
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Montague Expwy.
Trimble Rd.
Bowers Ave.
US 101
Central Expwy.
San Tomas Expwy.
Walsh Ave.
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Miles
City of Santa Clara
Sanitary Sewer Capacity
Assessment
Predicted Capacity Deficiencies
Figure ES-4
RMC
Water and Environment

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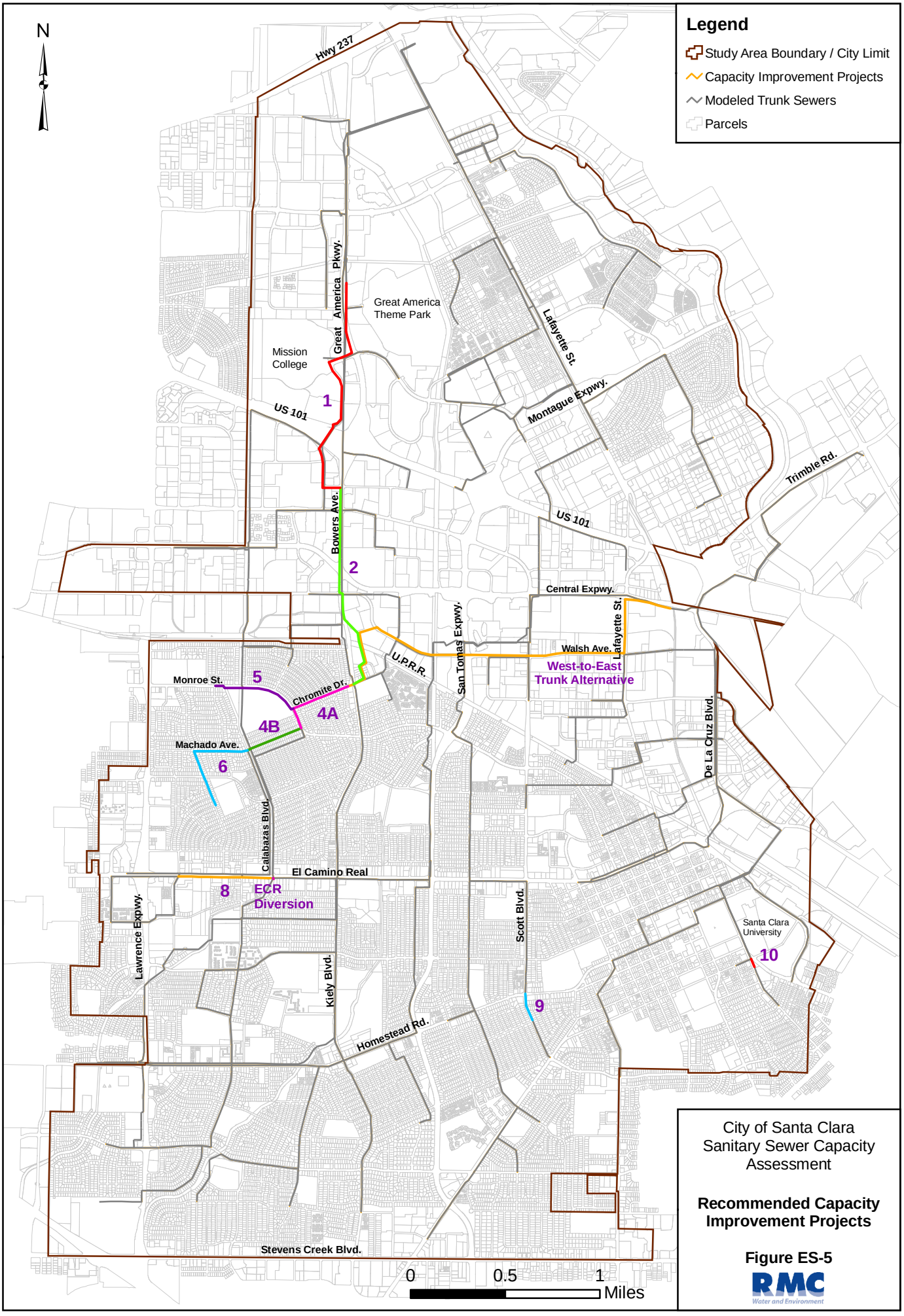
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Legend
Study Area Boundary / City Limit
Capacity Improvement Projects
Modeled Trunk Sewers
Parcels
Hwy 237
Great America Pkwy.
Great America Theme Park
Mission College
US 101
1
Lafayette St.
Montague Expwy.
Trimble Rd.
Bowers Ave.
2
US 101
Central Expwy.
San Tomas Expwy.
U.P.R.R.
Walsh Ave.
Lafayette St.
West-to-East Trunk Alternative
Monroe St.
5
Chromite Dr.
4A
4B
Machado Ave.
6
De La Cruz Blvd.
Calabazas Blvd.
El Camino Real
8
ECR Diversion
Lawrence Expwy.
Kiely Blvd.
Scott Blvd.
Santa Clara University
10
9
Homestead Rd.
Stevens Creek Blvd.
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City of Santa Clara
Sanitary Sewer Capacity Assessment
Recommended Capacity Improvement Projects
Figure ES-5
RMC
Water and Environment

Table ES-2 Recommended Capacity Improvement Projects

Project No.[a]	Location	US MH	DS MH	Length (ft.)	Exist. Dia. (in.)	Req'd. Dia. (in.)[b]
1	Augustine Dr., Lakeside Dr., crossing of U.S. 101, Mission College Boulevard, Great America Pkwy. from Bowers Ave. to south of Hetch Hetchy ROW	S73-20	S93-57	7,200	33-36	21 (P)
2	Chromite Dr., Alhambra Dr., Bracher Park, crossing of UPRR, Bowers Ave. from Bowers Ave. to Augustine Dr.	S53-34	S73-20	6,200	27-33	21 (P)
West-to-East Trunk[c]	Chromite Dr., Alhambra Dr., Bracher Park, crossing of UPRR, Walsh Ave., Lafayette, Lafayette St., Central Expwy. From Bowers Dr. to UPRR	S53-41	S67-18	12,200	NA	24
4A	Monroe St. and Chromite Dr. from Machado Ave. to west of Bowers Ave.	S52-80	S53-41	2,200	18	24-27 (R)
4B	Machado Ave. from Calabazas Blvd. to Monroe St.	S52-103	S52-80	1,500	15	21 (R)
5	Monroe St. from Fordham Dr. to Chromite Dr.	S51-22	S52-65	2,500	10 8(siphon)	12 (R) 8(siphon) (P)
6	Nobili Ave. and Machado Ave. from Flora Vista Ave. to Calabazas Blvd.	S41-53	S52-101	3,100	10-15	15-18 (R)
8	El Camino Real from Flora Vista Ave. to Calabazas Blvd.	S41-113	S32-5	2,600	10	12-15 (R)
9	Scott Blvd. from Serra Ave. to Homestead Rd.	S25-37	S35-98	800	8	10 (R)
10	Park Ave. south of Bellomy St.	S38-75	S38-66	250	10	12 (R)

(a) Note: there are no projects 3 and 7.
(b) P = parallel sewer; R = remove and replace
(c) Alternative to Projects 1 and 2.

Recommended Capacity Improvement Program

The Capital Improvement Program (CIP) recommended in this study is designed to provide for adequate sewer system capacity for the City's existing and anticipated future development. The total estimated capital cost of the CIP is approximately $20 million, as shown in **Table ES-3**. These costs include baseline construction costs for gravity trunk sewers using open-cut and trenchless (e.g., microtunneling) methods, costs for lower lateral replacement for remove-and-replace projects, costs for major sewer junction and siphon structures, and costs allowances for project mobilization/demobilization, traffic control, bypass pumping and delay factors for remove-and-replace projects, extra dewatering requirements in areas of high groundwater, and acquisition of temporary and permanent easements if needed. The total estimated capital costs also include a 30 percent allowance for contingencies for unknown conditions and an allowance of 25 to 35 percent of construction cost (depending on project size) for engineering, administration, and legal costs. The estimated costs are considered planning or conceptual level estimates and are considered to have an estimated accuracy range of -30 to +50 percent.

The recommended projects were divided into the two priority groups based on the relative magnitude of predicted capacity deficiencies, as well as the likely timing of developments that may impact the need for the projects. The priority groups are also shown in Table ES-3.

Table ES-3 Project Costs and Priority Groups

Project No.	Estimated Construction Cost ($)	Estimated Capital Cost ($)
Priority Group 1		
2	5,286,000	7,324,000
4A	1,489,000	1,861,000
8	945,000	1,276,000
Subtotal	***7,720,000***	***10,461,000***
Priority Group 2		
1	4,539,000	5,674,000
4B	1,060,000	1,325,000
5	1,046,000	1,308,000
6	1,139,000	1,424,000
9	256,000	346,000
10	77,000	104,000
Subtotal	***8,117,000***	***10,181,000***
Total	**15,837,000**	**20,642,000**
West-to-East Alternative[a]	9,752,000	12,906,000
Total w/West-to-East Alternative	**15,764,000**	**20,550,000**

(a) Would replace Projects 1 and 2 and be included in Priority Group 1.

A preliminary schedule for completion of the recommended CIP projects over a five-year period was developed based on the project priorities. **Figure ES-6** shows a preliminary schedule for the recommended five-year CIP. Two schedules are provided to reflect the two major alternatives. However, the schedules also provide for a preliminary alignment study of both the Bowers/Great America Parkway and the West-to-East trunk alternatives. Note also that the schedule could be compressed to achieve greater economy of scale and potential cost savings by combining individual projects and/or using alternative bid schedules.

Implementation Recommendations

The City should begin implementation of the Capital Improvement Program recommended in this Sanitary Sewer Capacity Assessment, starting with the highest priority projects. The following items should be considered in project scheduling and design, and in future updates of the Capacity Assessment.

- The alignments and sizes of all recommended projects should be verified with detailed predesign analyses, including topographic surveys, geotechnical investigations, utility research, and constructability reviews.

- The decision to parallel or replace existing sewers should consider the physical condition and remaining useful life of the existing pipelines; the availability of pipeline corridors for new sewer construction; and operation and maintenance concerns.

- The hydraulic model has been developed to assist the City in performing capacity analyses and updating the Capacity Assessment in the future. The model should be kept up-to-date with any changes to existing sewer connections, development plans, and sewer system facilities.

Figure ES-6 Proposed CIP Schedule

With Projects 1 and 2

Project	Year 1	Year 2	Year 3	Year 4	Year 5
Alignment Study					
Project 8					
Project 4A					
Project 2					
Project 1					
Project 4B					
Projects 5&6					
Projects 9&10					

With West-to-East Trunk Alternative

Project	Year 1	Year 2	Year 3	Year 4	Year 5
Alignment Study					
Project 8					
Project 4A					
West-to-East Trunk					
Project 4B					
Projects 5&6					
Projects 9&10					

Planning
Design
Bid and Award
Construction

- The City should periodically calibrate its permanent flow meters at the Northside and Rabello Pump Stations and on the Trimble Road trunk sewer to ensure that accurate flow information is available to track the changes in the flows in the City's system over time.
- The City should conduct additional flow monitoring at key locations in the sewer system, particularly the area tributary to the Chromite/Machado trunk sewers where the 2006 flow monitoring indicated high I/I flows. Flow levels during large storm events should be compared to the peak flows simulated by the hydraulic model to verify the modeling predictions for the 10-year design storm and confirm the need for and sizing of Projects 4A, 4B, 5, and 6.
- The City should consider additional field investigations, including smoke testing, and manhole and pipeline television inspection, in this area to identify potential sources of I/I and possible opportunities for I/I reduction.
- The City should coordinate with the Cupertino Sanitary District on flow and planning assumptions to ensure that adequate capacity exists in the Santa Clara system to handle future flows from CuSD. The City should encourage CuSD to verify the calibration of its flow meter at Homestead Road and confirm its projections of future wastewater flows entering the Santa Clara system.
- The City should coordinate with the City of San Jose to ensure that its flow criteria and planning assumptions are consistent with those used by San Jose in its capacity master planning.
- The City should assess its connection fees and evaluate financial alternatives to fund the recommended capacity assessment CIP.

This Sanitary Sewer Capacity Assessment report is intended to be a working document to be refined and updated as additional data and new planning information becomes available. The Capacity Assessment should be updated whenever there are major changes in planning assumptions or, at a minimum, every five years.

Chapter 1

Introduction

Chapter 1 Introduction

This report presents the results and recommendations of the Sanitary Sewer Capacity Assessment for the City of Santa Clara (City). The report was prepared by RMC Water and Environment (RMC).

1.1 Background and Study Objectives

The City of Santa Clara is located in central Santa Clara County and is bounded by the City of San Jose on the north, east and south, the City of Cupertino on the southwest, and the City of Sunnyvale on the west. As shown in **Figure 1-1**, the capacity assessment study area compromises the area within the Santa Clara city limits.

The City is experiencing significant growth and redevelopment, necessitating an evaluation of the capacity of the sanitary sewer system to handle future wastewater flows. This evaluation will help identify future capital needs for capacity improvements and associated requirements for financing those improvements through increased connection fees or other sources of funding.

Furthermore, the City is also required to complete a capacity evaluation and capacity assurance plan as part of preparing its Sewer System Management Plan (SSMP). The SSMP addresses the overall management, operation, and maintenance of the sanitary sewer system and is required for all sewer system agencies by the Regional Water Quality Control Board (Regional Board), as well as under the Statewide General Waste Discharge Requirements adopted in 2006 by the State Water Resources Control Board (State Board).

The overall objectives of this Capacity Assessment study are to develop wastewater flow projections for the City's collection area using up-to-date water use and land use information; develop a hydraulic model of the trunk sewer system; use the model to identify existing capacity deficiencies and future capacity requirements; and develop a phased Capital Improvement Program, including budget estimates, for implementing the required capacity improvements to the wastewater collection system.

1.2 Wastewater Collection System

The City's wastewater collection system includes approximately 270 miles of sewer pipelines ranging from 4 to 48 inches in diameter, and six sewage pump stations. Flow from Cupertino Sanitary District enters the City's sewer system at Homestead Road. The collection system conveys wastewater to the San Jose/Santa Clara Water Pollution Control Plant (SJ/SC WPCP), located north of Highway 237 in San Jose. The City of Santa Clara collection system is shown in **Figure 1-2**.

1.3 Scope of Study

RMC was authorized by the City to provide engineering consulting services for the Sanitary Sewer Flow Monitoring Program and Sanitary Sewer Capacity Assessment under an Agreement with the City dated December 13, 2005, and amended March 21, 2006.

The scope of the Capacity Assessment, as well as a brief discussion of work conducted under each task, is described below.

- **Task 1 – Project Management and Quality Control.** Periodic progress meetings were held with the City staff to review project status and discuss project issues, and monthly status reports were prepared to document the work completed. Quality control was carried out, including checking of data and calculations, as well as senior review of proposed criteria, recommendations, and project deliverables.

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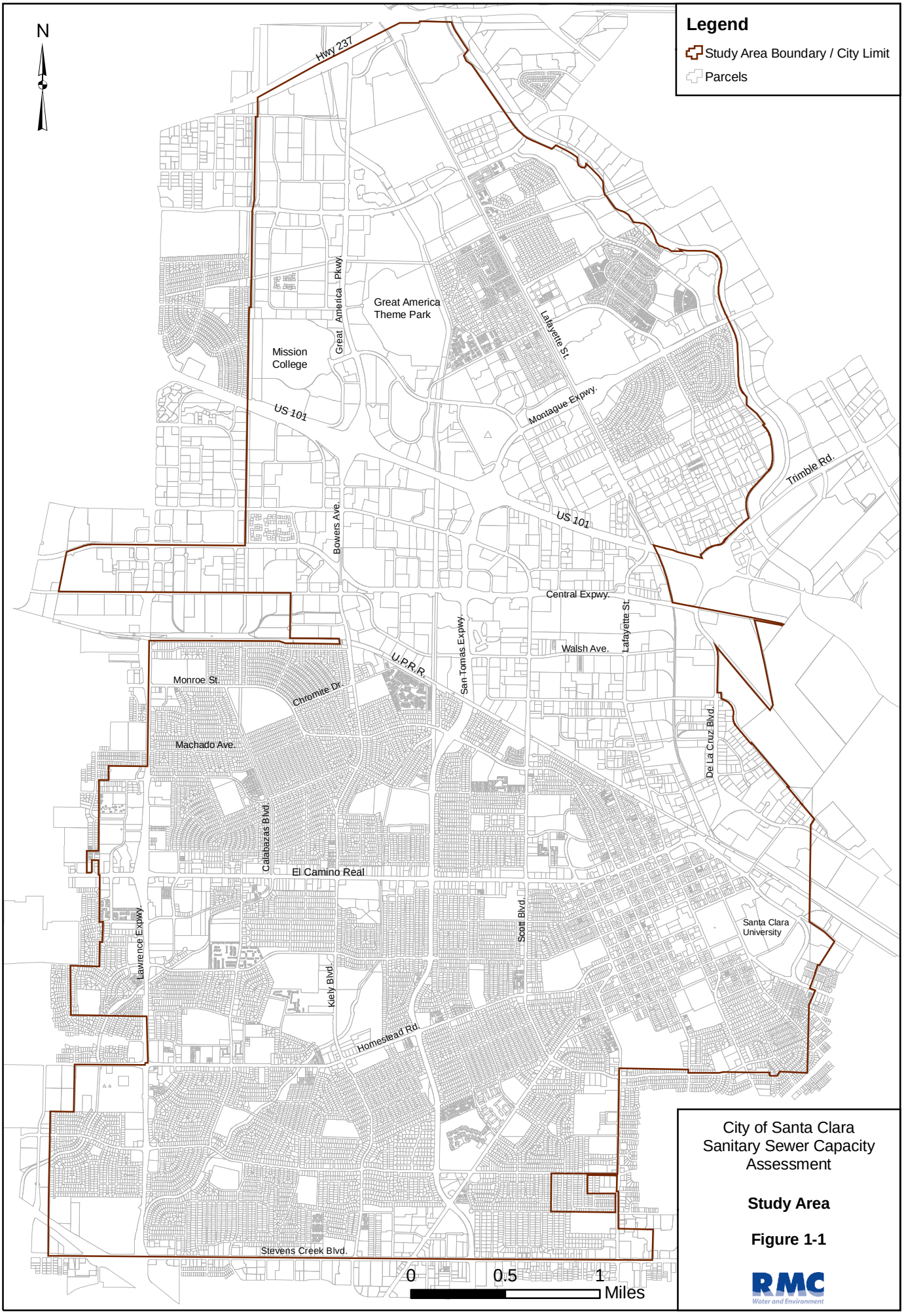
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Study Area Boundary / City Limit
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City of Santa Clara
Sanitary Sewer Capacity Assessment
Study Area
Figure 1-1
RMC
Water and Environment

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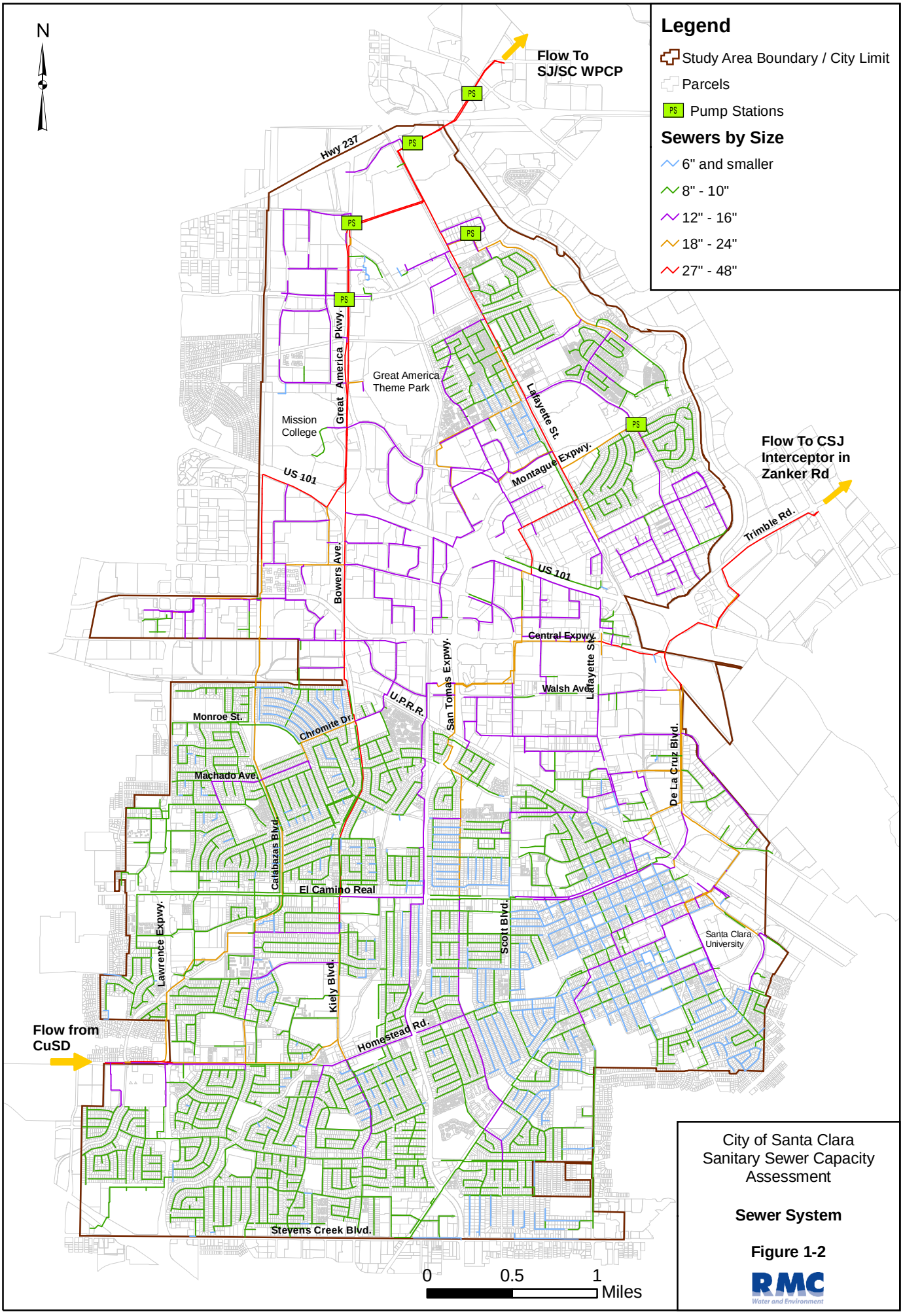
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Study Area Boundary / City Limit
Parcels
Pump Stations
Sewers by Size
6" and smaller
8" - 10"
12" - 16"
18" - 24"
27" - 48"
Flow To SJ/SC WPCP
Flow To CSJ Interceptor in Zanker Rd
Flow from CuSD
PS
Hwy 237
US 101
Great America Pkwy.
Great America Theme Park
Mission College
Lafayette St.
Montague Expwy.
Trimble Rd.
Bowers Ave.
Central Expwy.
San Tomas Expwy.
Walsh Ave.
U.P.R.R.
Monroe St.
Chromite Dr.
Machado Ave.
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Lawrence Expwy.
Kiely Blvd.
Scott Blvd.
De La Cruz Blvd.
Santa Clara University
Homestead Rd.
Stevens Creek Blvd.
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Miles
City of Santa Clara
Sanitary Sewer Capacity Assessment
Sewer System
Figure 1-2
RMC
Water and Environment

- **Task 2 – Flow Monitoring Site Selection.** Sanitary sewer system maps and previous reports were reviewed in order to delineate the trunk sewer network and refine major sewer basins and subbasins. Meter and rain gauge sites were identified, investigated, and finalized. A flow monitoring plan with a listing and map of the final sites, schedule for the field work and site traffic control plans was prepared.
- **Task 3 – Flow Monitoring.** A flow monitoring program, consisting of the 26 meters and 3 rain gauges installed in the collection system for a period of about two months during the 2005-2006 wet weather season, was conducted to obtain data to characterize flows in the system and calibrate the hydraulic model. In addition, two existing City-owned ISCO flow meters were also calibrated and utilized for the study.
- **Task 4 – Flow Monitoring Report.** A flow monitoring report containing copies of monitor site reports, weekly plots of flow and rainfall, and summary tables of average, minimum, and maximum daily flows for each meter was submitted to the City. In addition, all data in electronic format were also submitted.
- **Task 5 - Compile and Review Existing Information.** This task involved assembling, organizing, reviewing maps and documents, and compiling the information in a format that was useful for subsequent tasks.
- **Task 6 – Develop Land Use Planning Information and Parcel Loads.** Meetings were held with the City Planning staff to identify and obtain pertinent land use planning data, vacant land inventory and other information required for the Capacity Assessment, and to discuss specific planning issues and potential growth or redevelopment areas in the City. The City's 2010 General Plan and General Plan Amendment were reviewed. Water use data was compiled for existing customers. The information collected was used to develop estimates of existing and future wastewater flows.
- **Task 7 – Develop Design Flow and Hydraulic Criteria.** This task involved developing criteria used for estimating wastewater generation and wet weather flows in the sanitary sewer system.). Design flow criteria were developed, including base wastewater flow and infiltration/inflow factors, as well as an appropriate design storm to be used for analyzing and determining the required capacity of sewer system facilities. Hydraulic criteria were proposed for evaluating and sizing system facilities for the capacity assessment.
- **Task 8 – Develop Hydraulic Model.** In this task, the model network files were built using the District's mapping and sewer inventory files and additional data developed for this project. A digital sewer subbasin map was developed for the model. Flow input data for the model were compiled using the water use and land use data and design flow criteria developed under previous tasks. The model was verified for system connectivity, calibrated for dry weather conditions, and then calibrated for wet weather conditions using actual storm events from the flow monitoring program.
- **Task 9 – Evaluate System Hydraulic Performance.** Under this task, the model was used to determine collection system capacity requirements for peak dry and wet weather conditions. The model runs identified capacity deficiencies in the existing system and the required system capacity to serve future development. Preliminary solutions to capacity deficiencies were identified and tested in the model.
- **Task 10 – Model Training and Support.** Training of City staff in use of the model was deferred until after completion of the study.
- **Task 11 – Develop Capital Improvement Projects.** Detailed analysis was conducted to refine and further develop the proposed solutions for capacity deficiencies. This work included investigation of alternative alignments and assessment of design and constructability issues.

- **Task 12 – Develop Sewer System Capital Improvement Program.** Unit construction costs for components of sewer construction were developed, and estimated capital costs for the recommended improvement projects were prepared. In conjunction with City staff, the recommended improvement projects were prioritized, and a phased Capital Improvement Program (CIP) was developed.
- **Task 13 – Prepare Capacity Assessment Report.** This report was prepared to summarize and present the results and recommendation of the study.

1.4 Report Organization

This report includes six sections, which are described below.

- **Section 1, Introduction,** presents the background, objectives, and scope of the Sanitary Sewer Capacity Assessment.
- **Section 2, Land Use and Flow Estimates,** discusses the planning area land use projections, the basis for developing estimates for each component of wastewater flows, and the flow projections for the service area.
- **Section 3, Hydraulic Model Development,** describes the modeled sewer system, development of the model network and model loads, and model calibration.
- **Section 4, Capacity Analysis,** describes the capacity analysis and design criteria, model results, and preliminary solutions for identified capacity deficiencies.
- **Section 5, Capacity Improvement Projects,** explains the process for development of capacity improvement projects, and presents the recommended projects.
- **Section 6, Recommended Capital Improvement Program,** presents the recommended CIP, including project costs, prioritization, CIP schedule, and implementation recommendations.

The Appendices to this report include plots of the flow monitoring data and documentation for the recommended CIP, including project descriptions and cost estimates.

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Chapter 2

Land Use and Flow Estimates

Chapter 2 Land Use and Flow Estimates

This chapter presents the land use and design wastewater flow estimates for the City of Santa Clara. The section describes existing and projected future land uses for the City, which form the basis for generating flows in the hydraulic model. Flow monitoring was conducted to verify existing flows in major trunk sewers. Design flow estimates were developed based on criteria developed for each flow component: base wastewater flow, groundwater infiltration, and rainfall-dependent infiltration and inflow.

2.1 Land Use Projections

Land use data form the basis for estimating wastewater flows in the sewer system. Land use data for the City of Santa Clara are based on the City's 2010 General Plan and General Plan Amendment, and information on specific developments provided by the City's Planning Department.

2.1.1 Planning Scenarios

The Sanitary Sewer Capacity Assessment Project includes two modeling scenarios: Existing and Future. For the purposes of this Capacity Assessment, the Existing Scenario was defined as current development as of winter 2005-2006. Actual water use data were used to estimate wastewater flows for the existing scenario, and flow monitoring data collected during this time period were used to calibrate the hydraulic model for existing flows.

The Future Scenario assumes construction of all currently planned major development and redevelopment projects in the City, as well as potential increased densities in mixed use and transit-oriented mixed use and commercial/office areas consistent with the City's current General Plan. The future scenario was used to examine the impact on the system of future increases in wastewater flows due to new development and redevelopment.

RMC met with the City's Planning Department in July 2006 in order to identify planned development and redevelopment for the Future Scenario. **Table 2-1** lists the planned development and redevelopment projects based on information provided by the Planning Department and compiled from the General Plan and General Plan Amendment. It includes the following categories of development/redevelopment:

- Developments under construction or recently constructed
- Planned developments, approved
- Planned developments, not yet approved
- Land use intensification per General Plan and General Plan Amendment, no specific development plan available

Figure 2-1 shows the locations of these planned and recently constructed developments. **Table 2-2** summarizes the quantity of residential and non-residential development represented by the planned developments listed in Table 2-1 and shown in Figure 2-1.

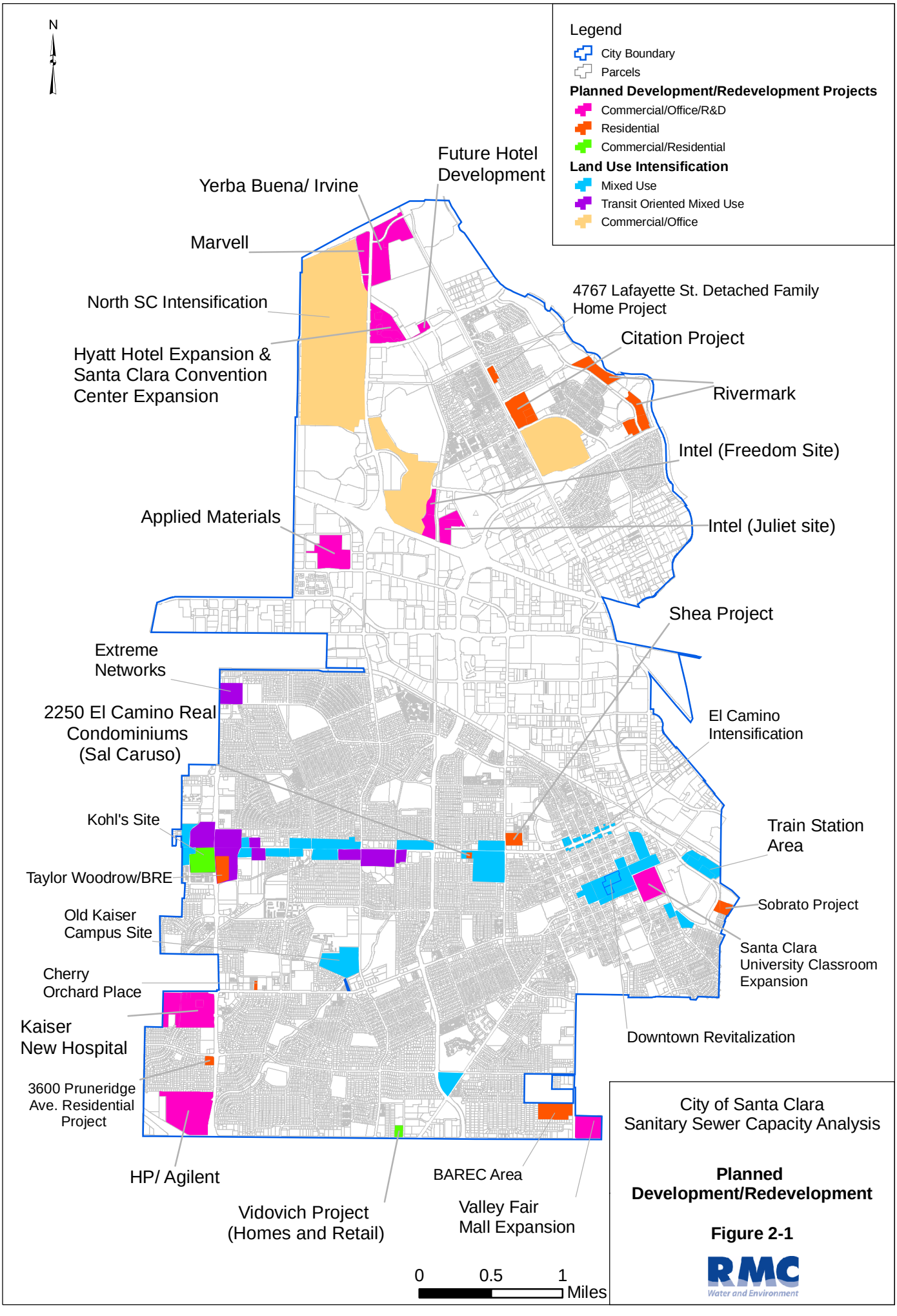
Table 2-1 Planned Development/Redevelopment

Name	Type [a]	Planned Development [b, c]	
Intel (Juliet site)	Commercial	100,000	SF
Intel (Freedom site)	Commercial	400,000	SF
Applied Materials	R&D	840,000	SF
Kaiser -New Hospital	Commercial	675,000	SF
HP/ Agilent	R&D	727,500	SF
Marvell Site (previously 3Com Pal)	R&D	278,000	SF
Yerba Buena/ Irvine	Commercial	910,000	SF
Hotel Development (previously Marriott)	Hotel	225	Rooms
Vidovich Project	Commercial	8,800	SF
	Multi Family	64	DU
Santa Clara University	Commercial	250,000	SF
Citation Project	Single Family	413	DU
Sobrato Project	Apartment	306	DU
3600 Pruneridge	Single Family	31	DU
	Multi Family	2	DU
Shea Project	Multi Family	130	DU
4767 Lafayette St	Single Family	27	DU
Hyatt Regency Hotel Expansion (previously Westin)	Hotel	250	Rooms
2250 El Camino Real (Sal Caruso)	Condominiums	45	DU
Citation Project 2	Multi Family	59	DU
Rivermark	Multi Family	964	DU
Taylor Woodrow/BRE	Single Family	63	DU
	Rental Condominiums	277	DU
Kohl's Site Development	Condominiums	490	DU
	Commercial	52,300	SF
Extreme Networks	TOMU	15	Acres
Santa Clara Convention Center New Ballroom	Commercial	24,000	SF
Valley Fair Mall Expansion	Commercial	22,000	SF
Downtown Revitalization	MU	7	Acres
Train Station Area	MU	17	Acres
BAREC Area	Single Family	110	DU
	Multi Family	165	DU
El Camino Real Intensification	MU	9	Acres
North Santa Clara Intensification	Higher Intensity Office	524	Acres
Cherry Orchard Place	Single Family	14	DU
Old Kaiser Campus	Medium Density Residential	27	Acres
General Plan Developments	MU	142	Acres
General Plan Developments	TOMU	62	Acres

(a) R&D = Research & Development; MU = Mixed Use; TOMU = Transit-Oriented Mixed Use; Multi Family = condominiums/townhouses

(b) DU = dwelling units; SF = square feet

(c) MU and TOMU assumed to be moderate and medium density residential, respectively (added to existing commercial area)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Parcels
Planned Development/Redevelopment Projects
Commercial/Office/R&D
Residential
Commercial/Residential
Land Use Intensification
Mixed Use
Transit Oriented Mixed Use
Commercial/Office
Future Hotel Development
Yerba Buena/ Irvine
Marvell
North SC Intensification
Hyatt Hotel Expansion & Santa Clara Convention Center Expansion
4767 Lafayette St. Detached Family Home Project
Citation Project
Rivermark
Intel (Freedom Site)
Intel (Juliet site)
Applied Materials
Shea Project
Extreme Networks
2250 El Camino Real Condominiums (Sal Caruso)
El Camino Intensification
Kohl's Site
Train Station Area
Taylor Woodrow/BRE
Sobrato Project
Old Kaiser Campus Site
Santa Clara University Classroom Expansion
Cherry Orchard Place
Kaiser New Hospital
Downtown Revitalization
3600 Pruneridge Ave. Residential Project
HP/ Agilent
BAREC Area
Vidovich Project (Homes and Retail)
Valley Fair Mall Expansion
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City of Santa Clara
Sanitary Sewer Capacity Analysis
Planned Development/Redevelopment
Figure 2-1
RMC
Water and Environment

Table 2-2 Planned Development Summary

Type of Development/Redevelopment	Quantity	Units
Single Family	658	DUs
Condominiums/Townhouses	2,196	DUs
Apartments	306	DUs
Hotel	475	Rooms
Commercial	2,442,100	Sq. Ft.
R&D	1,845,500	Sq. Ft.
Commercial/Office Intensification [a]	913,018	Sq. Ft.
Additional Mixed Use per GP [b]	4,444	DUs
Additional Transit-Oriented Mixed Use per GP [c]	2,772	DUs
Total Additional DUs	**10,376**	
Total Additional Sq. Ft. Commercial/Office/R&D	**5,200,618**	

(a) Assumes increase in floor-area-ratio (FAR) on 0.04.
(b) Assumes residential density of 22 DU/acre.
(c) Assumes residential density of 36 DU/acre.

2.2 Flow Monitoring Program

Flow monitoring was conducted by field services staff of E2 Consulting Engineers, subcontractor to RMC, to obtain data to quantify flows in the system and enable analysis of wet weather infiltration/inflow (I/I) and calibration of a hydraulic model. The flow monitoring program consisted of 26 flow meters and three rain gauges operating for a period of approximately ten weeks.

The flow monitoring sites are listed in **Table 2-3** and shown on **Figure 2-2**. The meters were installed from January 19 to 24, 2006, and most were removed on about April 3. Five of the meters were left in place for a few additional weeks to further verify meter calibration parameters. The meter sites utilized Sigma 910 meters with pressure depth transducers and Doppler velocity sensors. Along with the 26 meters, two existing City-owned ISCO flow meters installed on the parallel 33-inch lines at the east side of Santa Clara near Highway 101 were also calibrated per the City's request. In addition, Cupertino Sanitary District has a flow monitor installed at Homestead Road to measure sewer flows that enter Santa Clara at the western city limits; RMC also obtained data from this meter during the flow monitoring period.

Table 2-3 Flow Monitoring Locations

Flow Monitor	Location	Manhole Number	Pipe Size (in.)
1	Easement off of Lafayette St. north of Calle De Mundo	S104-23	33
2	Lafayette St. north of Calle de Mundo	S104-30	42
3	Primavera Lift Station	S105-34	24
4	Lafayette St. south of Calle De Luna	S104-36	36
5	Montague Expwy. east of Lafayette	S86-17	18
6	Lafayette at Montague Expwy.	S86-20	30
7	Mission College Blvd. north of Our Lady's Way	S83-21	33
8	Mission College Blvd. north of Our Lady's Way	S83-22	33
9	Calabazas Creek south of Kifer Rd.	S62-40	24
10	Bowers Ave. at Chromite Dr.	S53-34	30
11	Chromite Dr. at Bowers Ave.	S53-41	18
12	Scott Blvd. south of Central Expwy.	S65-34	24
13	Scott Blvd. south of Central Expwy.	S65-33	18
14	Central Expwy. west of UPRR	S67-16	27
15	De La Cruz Blvd. south of Central Expwy.	S67-26	48
16	Brokaw Rd. north-east of UPRR	S48-36	18
17	Benton St. west of The Alameda	S38-1	12
18	Los Padres Blvd. at Bray Ave.	S45-80	18
19	Los Padres Blvd. at Karen Dr.	S25-1	15
20	San Tomas Expwy. at Warburton	S44-57	15
21	Bowers Ave. south of Warburton	S43-86	27
22	Kiely Blvd. north of Homestead	S23-20	18
23	Saratoga Creek west of Kiely Blvd.	S23-12	21
24	Homestead Rd. east of Bing Dr./Princeton Way	S2147	18
25	Homestead Rd. east of Bing Dr./Princeton Way	S21-54	15
26	Wren Ave. at Lerwick Ct.	S21-23	24

During the flow monitoring period, all of the monitoring sites were visited weekly to check meter operation and site conditions, obtain field calibration measurements, and download collected data. Field calibration involves taking manual depth measurements and flow velocity measurements using a portable velocity meter. These calibration measurements were compared to and used to adjust monitor-recorded depth and velocity if needed. Calibration measurements were taken at different times of day in order to obtain calibration points for the full range of typical diurnal flows.

Three rain gauges were installed to collect representative rainfall over the service area during the monitoring period. The rain gauge locations were:

Rain Gauge 1: Santa Clara Corporation Yard

Rain Gauge 2: Primavera Pump Station

Rain Gauge 3: Santa Clara Tank Site, off of Highway 280 and Lawrence Expressway

Approximately 12 storm events occurred during the flow monitoring period, totally about six inches of rainfall. Most of the events, however, were relatively small. The duration and the total rainfall for each event are summarized in **Table 2-4**.

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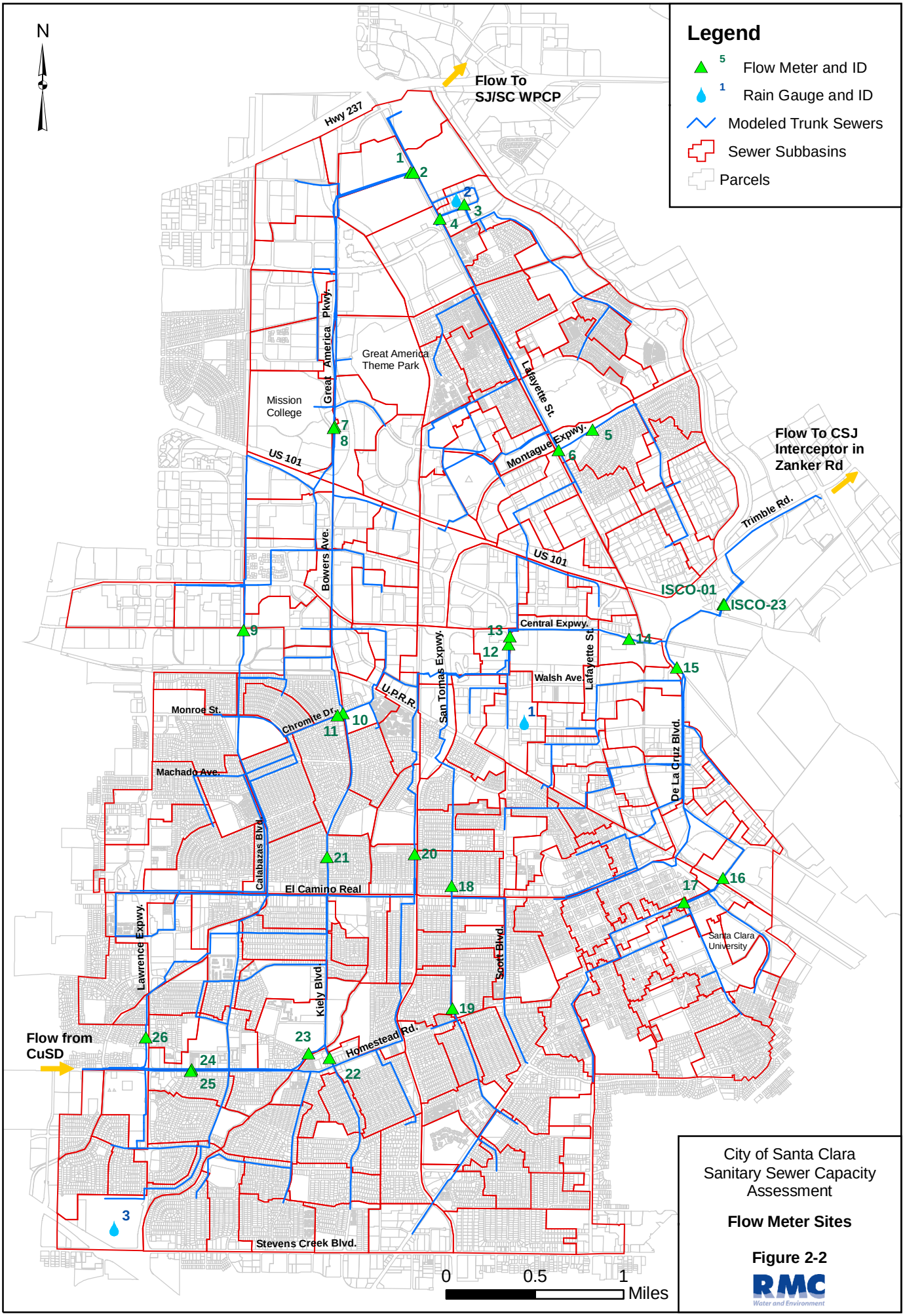
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Legend
Flow Meter and ID
Rain Gauge and ID
Modeled Trunk Sewers
Sewer Subbasins
Parcels
Flow To SJ/SC WPCP
Hwy 237
Great America Pkwy.
Great America Theme Park
Mission College
US 101
Lafayette St.
Montague Expwy.
Flow To CSJ Interceptor in Zanker Rd
Trimble Rd.
Bowers Ave.
ISCO-01
ISCO-23
Central Expwy.
Walsh Ave.
San Tomas Expwy.
U.P.R.R.
Monroe St.
Chromite Dr.
Machado Ave.
De La Cruz Blvd.
Calabazas Blvd.
El Camino Real
Lawrence Expwy.
Kiely Blvd.
Scott Blvd.
Santa Clara University
Homestead Rd.
Flow from CuSD
Stevens Creek Blvd.
0
0.5
1
Miles
City of Santa Clara
Sanitary Sewer Capacity
Assessment
Flow Meter Sites
Figure 2-2
RMC
Water and Environment

Table 2-4 Rain Events during Flow Monitoring Period

Start Date/Time	End Date/Time	Duration	Storm Rainfall (in.)				Max. Hour (in.)		
		(hours)	Avg.	RG1	RG2	RG3	RG1	RG2	RG3
2/17/06 12 PM	2/17/06 8 PM	8	0.23	0.20	0.19	0.31	0.09	0.08	0.15
2/26/06 11 PM	2/28/06 2 AM	27	1.16	1.14	0.99	1.34	0.17	0.16	0.19
3/2/06 12 AM	3/2/06 4 AM	4	0.27	0.25	0.30	0.27	0.10	0.14	0.10
3/3/06 1 AM	3/3/06 5 PM	16	0.26	0.42	0.03	0.32	0.19	0.02	0.13
3/5/06 3 PM	3/6/06 4 AM	13	0.68	0.56	0.66	0.81	0.12	0.13	0.13
3/10/06 6 PM	3/11/06 7 AM	13	0.23	0.28	0.26	0.15	0.08	0.12	0.06
3/13/06 11 PM	3/14/06 7 AM	8	0.38	0.34	0.39	0.42	0.10	0.14	0.12
3/16/06 9 PM	3/17/06 12 AM	3	0.39	0.39	0.37	0.40	0.26	0.26	0.24
3/20/06 10 AM	3/21/06 5 AM	19	0.74	0.71	0.92	0.58	0.22	0.24	0.18
3/24/06 5 PM	3/25/06 6 AM	13	0.61	0.53	0.65	0.66	0.13	0.13	0.19
3/29/06 3 AM	3/29/06 10 AM	7	0.20	0.18	0.13	0.28	0.06	0.05	0.10
4/2/06 4 PM	4/3/06 2 PM	22	0.71	0.74	0.66	0.74	0.11	0.12	0.10

Following the completion of flow monitoring, E2 prepared a summary report containing copies of the meter site reports and photographs; 7-day graphs of the flow and rainfall data; and summary tables of minimum, maximum, and average daily flows and rainfall. In addition, electronic files of all data were provided to the City. The final flow monitoring report has been provided to the City as a separate attachment. Summary plots of the flow and rainfall data are included in **Appendix A** of this report.

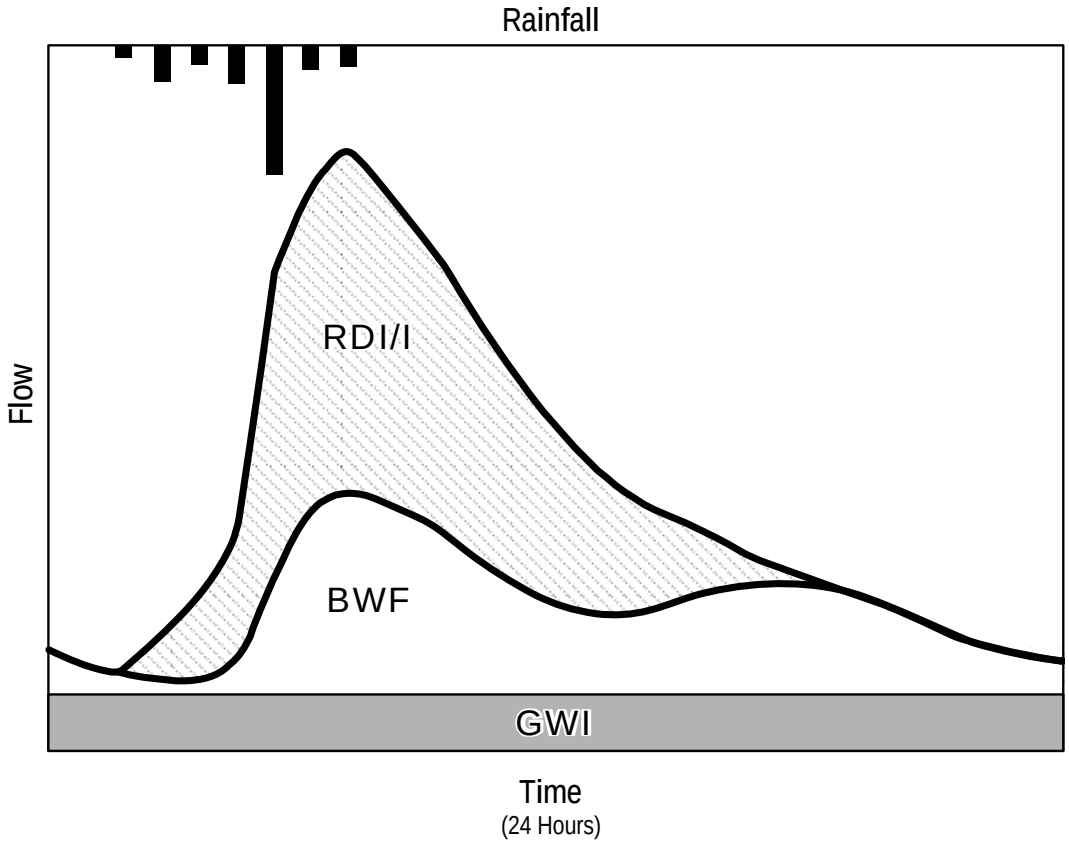
2.3 Wastewater Flows

The components of wastewater flows and methodology for quantifying each flow component are discussed below.

2.3.1 Wastewater Flow Components

Wastewater flows include three components: base wastewater flow (BWF), groundwater infiltration (GWI), and rainfall-dependent infiltration/inflow (RDI/I), as illustrated conceptually in **Figure 2-3**. BWF represents the sanitary and process flow contributions from residential, commercial, institutional, and industrial users of the system. GWI is groundwater that infiltrates into defects in sewer pipes and manholes, particularly in winter and springtime in low-lying areas. GWI is typically seasonal in nature and remains relatively constant during specific periods of the year. RDI/I is storm water inflow and infiltration that enter the system in direct response to rainfall events, typically through direct connections such as holes in manhole covers or illegally connected roof leaders or area drains, or, more commonly, through defects in sewer pipes, manholes, and service laterals. RDI/I typically results in short term peak flows that recede quickly after the rainfall ends.

Figure 2-3 Wastewater Flow Components
(Not to scale)



2.3.2 Methods for Estimating Base Wastewater Flows

Base wastewater flow consists of the normal sanitary flow contribution from residential, commercial, institutional, and industrial users of the sewer system. Base wastewater flows are typically calculated by applying unit BWF factors (in gpd per acre or gpd per DU) to existing and/or future land use quantities. For residential areas, BWF factors depend primarily on residential density and the average number of persons per dwelling unit. For commercial and industrial areas, BWF factors depend primarily on the type and distribution of the commercial and industrial establishments. Since BWF factors would be expected to be similar for communities with similar types of development, BWF factors are often developed based on published values and verified by flow monitoring or analysis of water consumption data for a particular community.

For the City's Sanitary Sewer Capacity Assessment, BWF loads were developed for both existing and future development conditions. Existing loads were developed based on actual winter water use data from the City's customer billing records, and future loads were based on projected development and redevelopment projects anticipated by the City. The unit flow factors used to compute BWF from future development are summarized in **Table 2-5**. The residential factors shown in the table are consistent with the City's standard residential design flow rate of 70 gallons per capita per day (gpcd) and residential densities for various land use classifications. The rates per square foot for commercial/office and office/research & development (R&D) development are based on typical design factors used for other similar areas.

Table 2-5 Base Wastewater Flow Unit Flow Factors

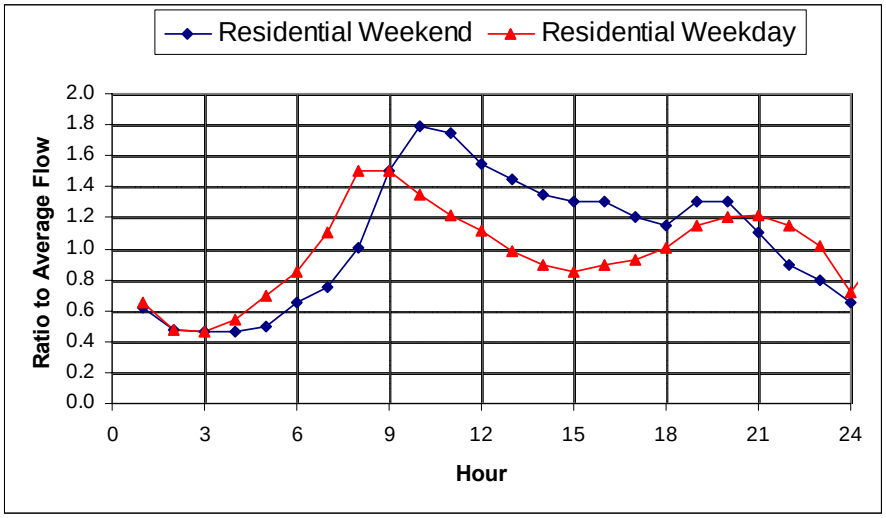
Type of Development	Unit Flow Factor	Basis
Single Family Detached	245 gpd/DU	3.5 people/DU @ 70 gpcd
Townhouses/Condominiums	175 gpd/DU	2.5 people/DU @ 70 gpcd
Apartments	154 gpd/DU	2.2 people/DU @ 70 gpcd
Hotels	100 gpd/room	
Commercial/Office	0.1 gpd/sq. ft.	
Office/R&D	0.15 gpd/sq. ft.	
Moderate Density Residential (Mixed Use)	3,200 gpd/acre	21 DU/acre @154 gpd/DU
Medium Density Residential (Transit-Oriented Mixed Use)	4,600 gpd/acre	30 DU/acre @ 154 gpd/DU
Commercial/Office/R&D Intensification[a]	+ 300 gpd/acre	+ 0.04 FAR @ 0.15 gpd/sq. ft.

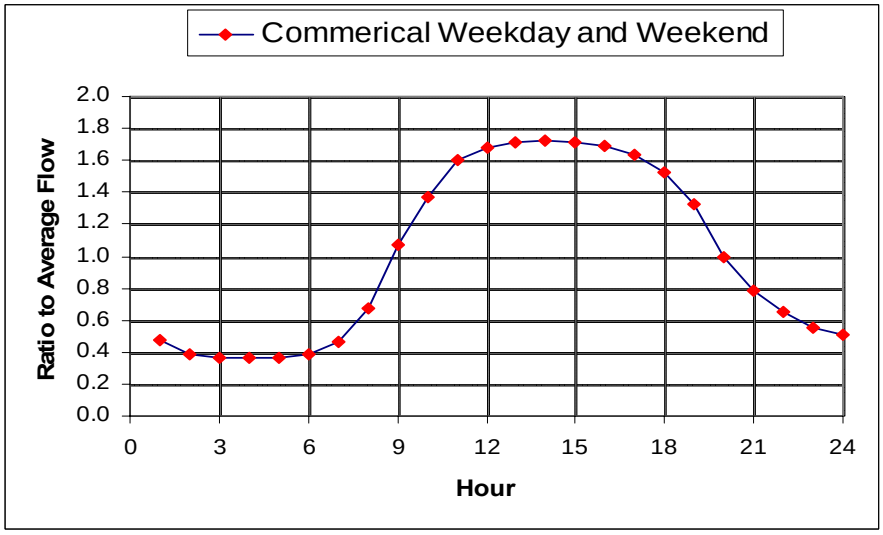
(a) Applied to areas of North Santa Clara where existing development is anticipated to increase in intensity from a current average floor-area-ratio (FAR) of 0.41 to a future average of 0.45.

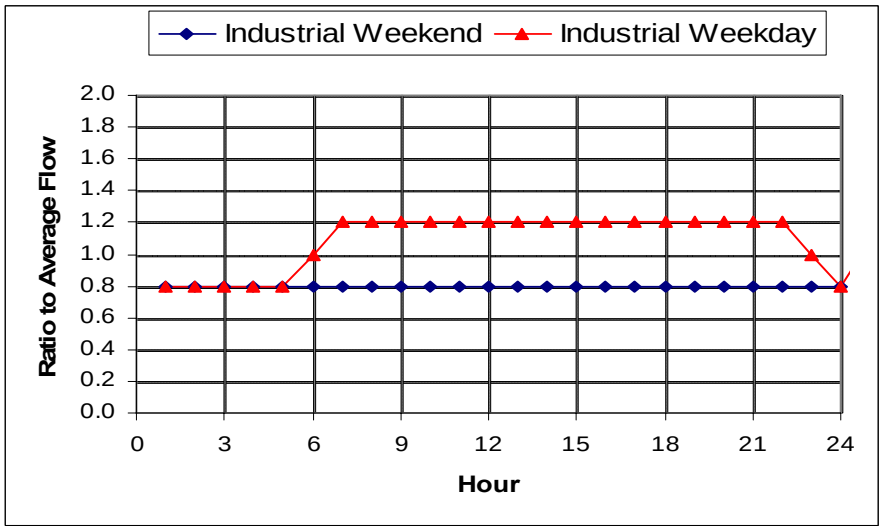
2.3.3 Diurnal Base Wastewater Flow Patterns

In most sewer systems, BWF exhibits typical diurnal patterns depending on the type of land use. For Santa Clara, typical diurnal curves were developed for residential, commercial, and industrial areas, for both weekend and weekday conditions. These curves are shown in **Figure 2-4**. Each area of the system was assigned a diurnal curve according to its predominant land use type.

Figure 2-4 Diurnal Curves







2.3.4 Large Users

For purposes of this study, a "large" discharger was defined as one discharging more than an average of 40,000 gallons per day (gpd) average flow or 50,000 gpd maximum month flow during the winter months. Based on winter 2005-2006 water and recycled water billing records provided by the City, there are eighteen large dischargers that meet the criteria outlined above. Wastewater flows for large users were based on average winter flow.

All dischargers to the sewer system are included in the City's water billing database and are therefore accounted for in the calculation of existing BWF loads. However, some large dischargers do not exhibit typical industrial diurnal wastewater flow patterns and therefore must be accounted for separately. Typically, these are users that discharge wastewater on a relatively constant basis, 24 hours per day and 7 days per week (24/7). These users were given separate constant diurnal profiles in the hydraulic model.

Table 2-6 lists the eighteen large dischargers in the Santa Clara system and those that are considered 24/7 users.

Table 2-6 Large Dischargers

Large Water User	APN	Address	Average Flow [a] (gpd)	Maximum Month Flow [a] (gpd)
KOLL	104-13-090	2151 Mission College Blvd	934,461	1,101,270
CONTAINER CORP OF AMERICA [b,c]	230-03-100	2600 De La Cruz Blvd	381,870	413,739
NEWARK GROUP INDUSTRIES INC [b,c]	230-03-090	525 Mathew St	473,003	561,917
SILICONIX INC [b]	104-39-023	2201 Laurelwood Rd	411,666	422,353
DVR POWER PLANT [d]	224-36-047	850 Duane Ave	103,354	576,000
RENAULT	216-49-019	3320 Scott Blvd	165,222	181,586
OWENS-CORNING FIBERGLAS CORP [b,c]	224-07-099	960 Central Expy	19,715	21,242
ANADITE INC	104-14-047	1440 Norman Ave	142,536	148,429
INTEL CORPORATION	104-48-010	3603 Juliette Ln	118,250	120,743
INTERNATIONAL INTEL	216-46-015	3065 Bowers Ave	91,713	97,439
AGILENT TECHNOLOGIES INC	316-17-018	5301 Stevens Creek Blvd	88,963	131,152
SCP 2001PE LLC	104-13-083	2175 Mission College Blvd	88,922	98,976
APPLIED MATERIALS INC	216-49-024	3070 Bowers Ave	88,129	100,579
DLC ASSOCIATES II	097-31-062	3495 De La Cruz Blvd	67,262	75,719
LEON MARDIROSSIAN	224-06-170	1415 Richard Ave	64,683	66,340
NATIONAL SEMICONDUCTOR CORPORATION	205-39-022	2900 Semiconductor Dr	57,636	72,896
SIGMA CIRCUITS INC	230-47-112	351 Mathew St	54,302	57,047
ADVANCED CARDIOVASCULAR SYSTEMS INC	216-30-040	3200 Lakeside Dr	35,261	51,453

(a) For December 2005 through March 2006 period.
(b) 24/7 discharger.
(c) Derived from water use data adjusted by a factor provided by the City.
(d) Based on DVR Power Plant data provided by the City.

2.3.5 Infiltration/Inflow

Infiltration/inflow is extraneous groundwater and storm water that enter the sewer system through illegal connections or defects in sewer pipelines, manholes, and service laterals. The primary types of I/I are groundwater infiltration and rainfall-dependent I/I.

Groundwater Infiltration

Groundwater infiltration is generally quantified based on actual flow monitoring data, since it is difficult to predict GWI rates based on physical system data alone. In the context of design flow criteria, GWI represents the incremental groundwater infiltration that occurs during the wet weather season above the "baseline" infiltration level during the driest months of the year.

GWI can be estimated based on minimum flows during non-rainfall periods during a wet weather flow monitoring period. Minimum flows typical occur during the nighttime or early morning hours when base wastewater flows are at a low. Alternatively, GWI can be estimated as the difference between average metered flow during non-rainfall periods and computed average BWF. In either case, the resulting GWI, is expressed on a unit basis (gpd/acre or gpad) by dividing by the sewered acreage of the monitored area. Typical GWI rates may range from 100 to over 1,000 gpad.

GWI flows were estimated through the model calibration process (described in the next chapter of this report) by comparing model-simulated BWF to actual flow measurements from the temporary flow monitoring program conducted in January through April 2006. Cases where model-predicted BWF was noticeably lower than monitored flow indicated the possible occurrence of GWI.

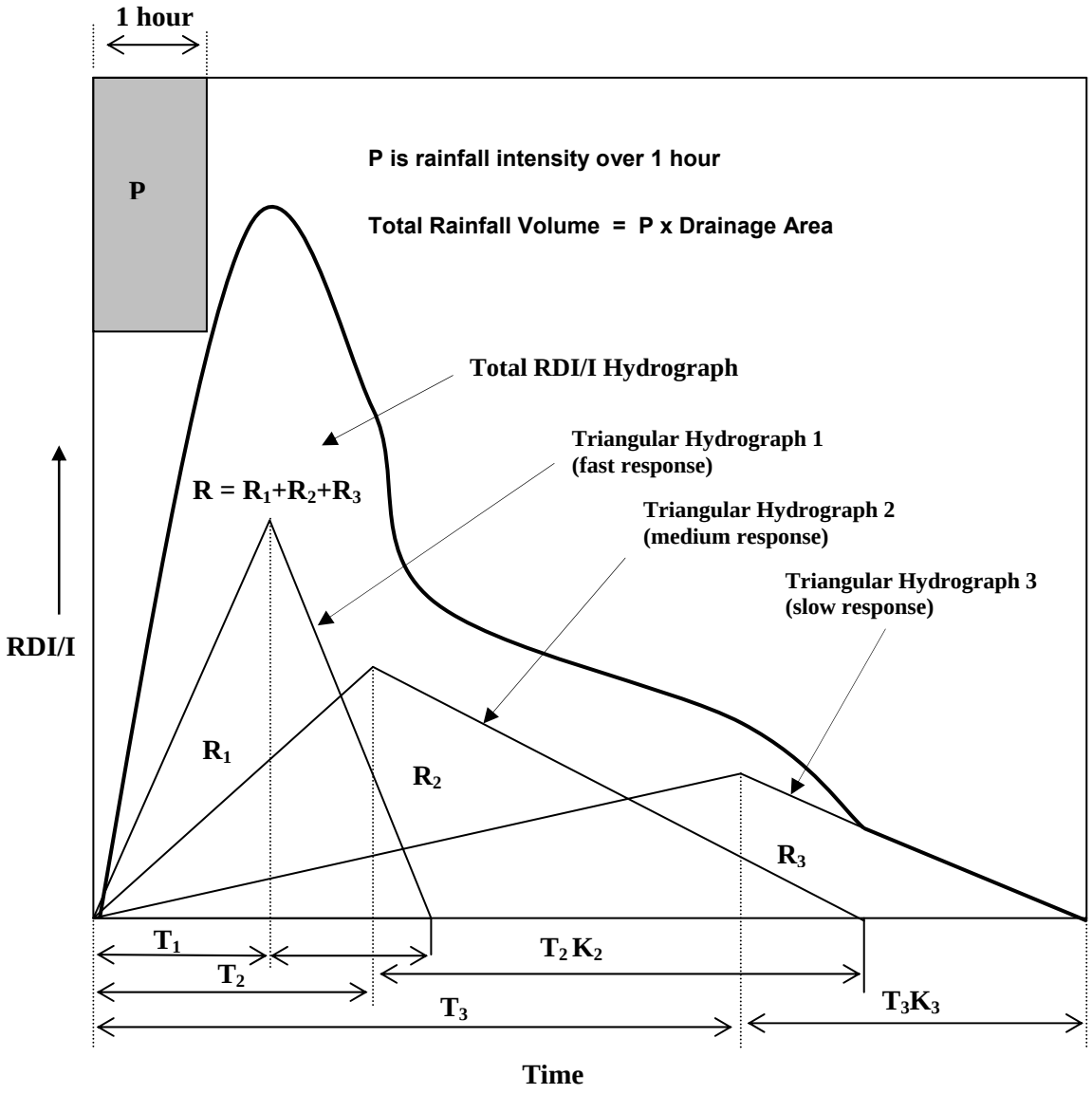
Rainfall-Dependent I/I

RDI/I flows result from rainfall events that produce infiltration and inflow of storm water runoff into the sewer system. RDI/I can be quantified as the difference between the total flow during and immediately following a storm event and the non-rainfall "base flow" (BWF plus GWI) that is estimated to have occurred during the storm period. The magnitude of the resulting RDI/I response is typically described by the percentage of the rainfall volume (called the "R value") represented by the volume of the RDI/I hydrograph. The R value can vary from storm to storm, depending on such factors as the degree of soil saturation (due to antecedent rainfall) prior to the storm event.

The shape of the RDI/I hydrograph is also important in determining the peak RDI/I response. The RDI/I hydrograph shape in often defined by separating the total RDI/I hydrograph volume into components, representing different response times to rainfall (fast, medium, and slow). Each component is identified by a percentage of the total RDI/I volume and specific time to peak (T) and recession coefficient (K), illustrated in **Figure 2-5**. The R component percentages and T and K values can be applied to each hour of rainfall to generate a "synthetic hydrograph" that approximates the volume and shape of the hydrograph from the actual observed event. These parameters, when applied to a different rainfall pattern, can be used to estimate the RDI/I response to that particular rainfall event. This methodology is used to synthesize RDI/I hydrographs for a "design storm" for collection system modeling.

Design criteria for RDI/I include design R values and hydrograph shape parameters and the hourly rainfall for the selected design storm event. As described in the next chapter of this report, R values and hydrograph parameters are determined through the process of model calibration, in which actual observed rainfall events are simulated in the hydraulic model, and the resulting model hydrographs are compared to the measured flows at flow meters locations. The RDI/I parameters are adjusted as needed to achieve the best match of modeled to monitored flows. Once calibrated, the model RDI/I parameters can be applied to a design storm to simulate wet weather flows for a design event.

Figure 2-5 RDI/I Hydrograph Components



2.3.6 Design Event

Wastewater collection systems are typically sized for a specific "design" condition, often represented by a development condition (e.g., "buildout") under a design wet weather event, in combination with a designated system performance criterion.

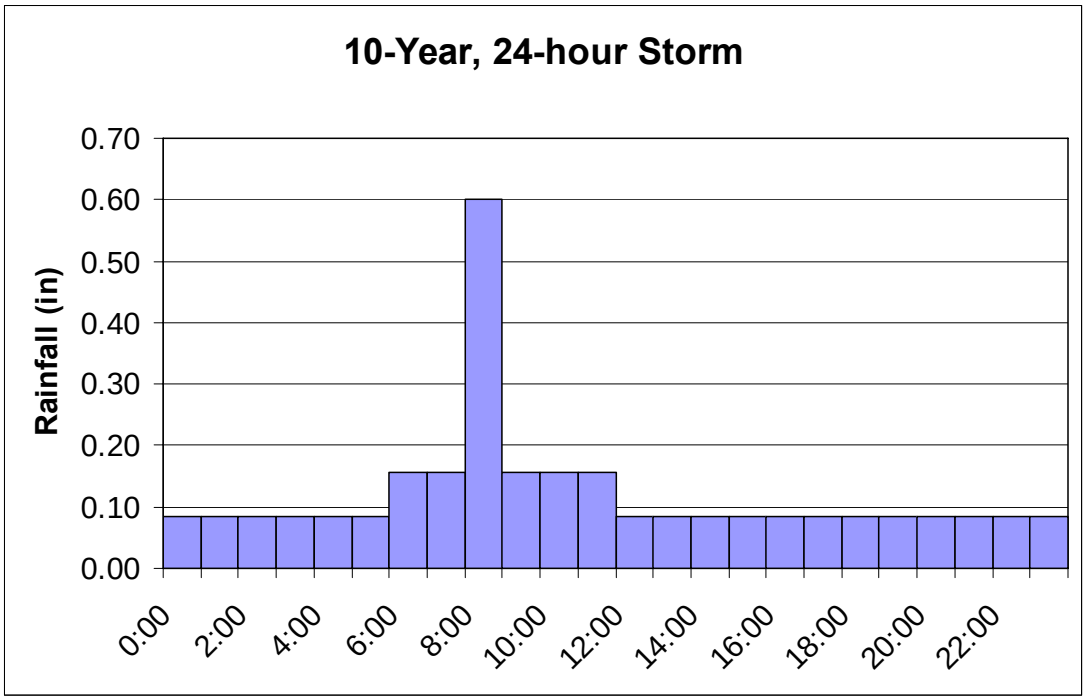
Generally, the performance criterion is defined by the maximum allowable water level in the system, which may be at the ground surface (i.e., "no overflows"), a specified distance below the ground (say 5 feet below the manhole rims), or more conservatively, by a maximum allowable flow depth to pipe diameter (d/D) ratio. The maximum d/D may vary by pipe size. A maximum allowable d/D of 1.0 (i.e., "no surcharge") is commonly used, although a smaller value (e.g., 0.75) may be used for smaller diameter sewers to account for the greater potential for reduced capacity due to obstructions in the pipes, or to add more conservatism to sizing of new pipes.

The "design event" establishes the maximum recurrence frequency under which the design performance criterion can be exceeded. Thus, if the performance criterion is "no surcharge" and the recurrence

frequency is 10 years, then the system must be designed such that pipes would not surcharge any more frequently than once every 10 years.

In practice, the design event is often equated to a specified recurrence frequency *rainfall* event, which can be developed based on historical rainfall intensity-duration-frequency (IDF) statistics. The City of San Jose has adopted a 10-year design storm for its capacity assessment program. Based on IDF data and guidelines from the *County of Santa Clara Storm Design Requirements*, a synthetic 10-year, 24-hour design storm was determined for the San Jose Airport (see **Figure 2-6** below) and applied to other areas of the system in proportion to average annual rainfall. Applying this approach to Santa Clara, the design rainfall would be approximately 1.0 to 1.2 times the San Jose Airport rainfall (varying over the service area from north to south).

Figure 2-6 10-Year Design Storm for San Jose Airport



To develop the projected RDI/I flows for the design event, the RDI/I hydrograph parameters determined from the wet weather calibration would be applied to the design storm rainfall. Note that the design event can be superimposed on an average base wastewater flow condition, based on the assumption that the peak rainfall could potentially occur at any time of the day, or it can be constructed so that the peak RDI/I roughly coincides with the peak BWF for a typical residential diurnal pattern, providing a higher level of conservatism in the design flows. The City of San Jose utilizes the more conservative assumption for sewer system planning. Therefore for Santa Clara, it was recommended that the same design event criteria be used. This is a reasonable assumption given that peak wet weather flows in the Santa Clara sewer system are relatively low.

2.3.7 Flows from Cupertino Sanitary District

Flows from Cupertino Sanitary District (CuSD) enter the City's sewer system on Homestead Road. CuSD maintains a flow meter at the discharge point to the City's system. Initially, data from the District's meter was reviewed in order to estimate CuSD flows discharging into Santa Clara; however, the data was found to be inconsistent, with unexplained changes in average daily flows over the course of the

10-month period (January through October 2006). It is believed that this meter may have been out of calibration and was calibrated at some point during the year.

As part of a separate study conducted for CuSD, RMC estimated existing and future average dry weather flow (ADWF) from CuSD based on data on sewer connections, land use, and population density. The existing flow from the metered area of CuSD (portion tributary to Santa Clara, which represents about 89 percent of the total service area flow) was estimated to be 4.9 mgd, which matches well to the total flows at the temporary meters immediately downstream of the CuSD discharge point. Therefore, for purposes of the Santa Clara model, this value was used as the existing CuSD flow. The RMC study estimates the total future (year 2030) ADWF for CuSD at about 7.2 mgd; therefore, a preliminary estimate of future ADWF from CuSD entering the Santa Clara system at Homestead Road is 6.4 mgd (89 percent of the total future flow).

2.3.8 Wastewater Flow Estimates

The estimated existing and future average dry weather flow (ADWF), peak dry weather flow (PDWF), and design storm PWWF flows for the City's system were developed based on modeling as described in Chapters 3 and 4 of this report. The results are summarized in **Table 2-7**.

Table 2-7 Sewer System Flow Estimates

System Outfall	Existing Flow (mgd)			Future Flow (mgd)		
	ADWF	PDWF	PWWF	ADWF	PDWF	PWWF
North (to Northside and Rabello Pump Stations)	17.7	23.6	40.8	21.2	28.7	43.1[a]
East (to San Jose Trimble Road trunk sewer)	6.0	8.7	13.2	6.9	10.0	14.1
Total	**24**	**32**	**54**	**28**	**38**	**57**

Note: ADWF and PDWF represent a non-rainfall wintertime condition and include groundwater infiltration. PWWF represents a 10-year frequency design storm.

(a) Assumes peak flow from Cupertino Sanitary District does not increase above its contracted maximum capacity of 13.8 mgd.

Chapter 3

Hydraulic Model Development

Chapter 3 Hydraulic Model Development

The City, in conjunction with RMC, selected DHI's MIKE URBAN™ with EPA SWMM 5 as the software to be used for the Sewer System Capacity Assessment. EPA SWMM 5 is the latest version of the U.S. EPA's public domain Storm Water Management Model, which provides a fully dynamic solution for modeling storm water and sanitary sewer systems. MIKE URBAN is an ArcGIS-based model interface that provides the user environment for building and running the model and viewing model results. RMC also utilized another modeling program, InfoWorks™, to help in model construction and validation. The process of developing the model for use in the capacity assessment is described below.

3.1 Modeled System

The hydraulic model developed for the City's Sewer System Capacity Assessment represents the trunk sewer system, the network of larger diameter pipes that comprises the "backbone" of the system. The wastewater is conveyed from the City to the San Jose/Santa Clara Water Pollution Control Plant (SJ/SC WPCP) at two locations: at the northeast corner of the City just east of Lafayette Street, where flow is pumped via the Northside and Rabello Pump Stations and force mains to the WPCP; and on the eastern side of the City east of De La Cruz Boulevard and Highway 101, where flow discharges by gravity into a 48-inch sewer in Trimble Road that conveys the flow to the City of San Jose's interceptor in Zanker Road. The City also receives flows from the Cupertino Sanitary District (CuSD), which discharge into the Santa Clara sewer system on Homestead Road at Swallow Drive.

The City's wastewater collection system includes a total of approximately 270 miles of sewer pipelines, of which approximately 28 percent, or 76 miles, are included in the modeled system. The modeled network includes almost all of the 15-inch and larger pipes, about 40 percent of the 10- and 12-inch pipes, and a few 6- and 8-inch pipes. The modeled system also includes four of the system's six wastewater pump stations: Westside, Primavera, Tasman, and De La Cruz. The Northside and Rabello Pump Stations are not explicitly modeled, as their downstream hydraulic control points are governed by the downstream force mains and hydraulic gradeline at the WPCP. Rather, the northern outlet of the model is located at the junction manhole (S114-19) just upstream of the Rabello Pump Station. The modeled network is shown in **Figure 3-1**.

3.2 Model Network Construction and Validation

Network data for the model were provided by the City in the form of AutoCAD mapping and Excel files with manhole and pipe attribute data (manhole coordinates and rim elevations; pipe diameters, lengths, and invert elevations). Through a multi-step process, the AutoCAD file and attribute data were imported into ArcGIS to create GIS datasets of all of the pipes and manholes in the City's system. The pipes and manholes to be included in the modeled network, described previously, were then extracted out of those datasets. The GIS files of the modeled pipes and manholes formed the basis for model construction and validation; these files were imported into the modeling environment in InfoWorks and subsequently into MIKE URBAN.

The model construction and validation process included the following steps:

- The modeled network was checked for connectivity, i.e., verifying that correct upstream/downstream manholes were identified for each pipe and there were no missing links in the network.
- Profiles were plotted for each series of pipe segments in the modeled network to visually check for missing or suspect data. Examples of missing or suspect data included missing rim or invert elevations, negative pipe slopes, or abrupt steps up or down in pipe inverts. Where appropriate, missing or suspect data were interpolated, or verification in the form of additional survey information or as-built drawings were requested from the City.

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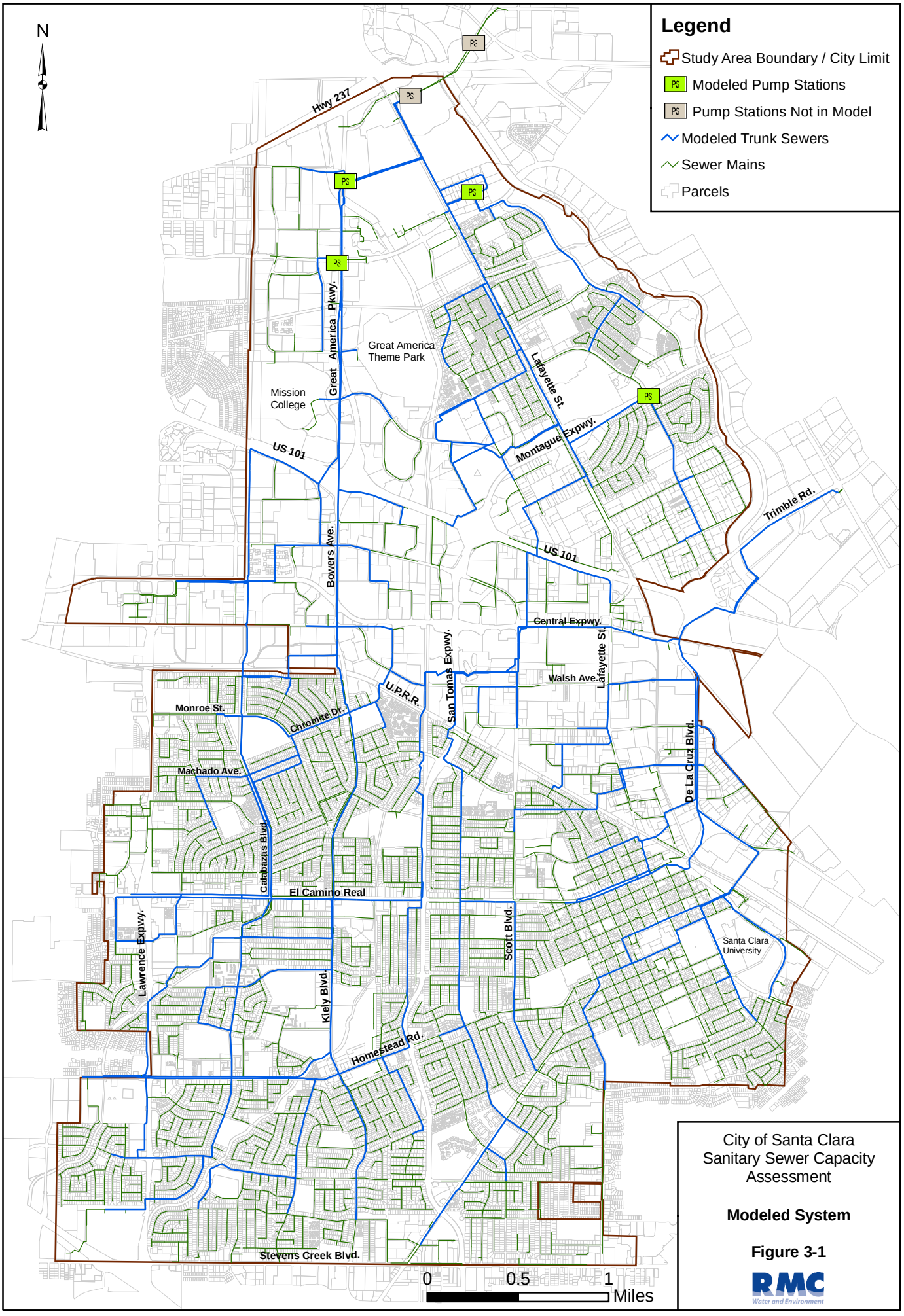
N
Legend
Study Area Boundary / City Limit
Modeled Pump Stations
Pump Stations Not in Model
Modeled Trunk Sewers
Sewer Mains
Parcels
PS
Hwy 237
Great America Pkwy.
Great America Theme Park
Mission College
Lafayette St.
Montague Expwy.
US 101
Trimble Rd.
Bowers Ave.
Central Expwy.
San Tomas Expwy.
Walsh Ave
U.P.R.R.
Monroe St.
Chromite Dr.
Machado Ave.
De La Cruz Blvd.
Calabazas Blvd.
El Camino Real
Lawrence Expwy.
Kiely Blvd.
Scott Blvd.
Santa Clara University
Homestead Rd.
Stevens Creek Blvd.
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Miles
City of Santa Clara
Sanitary Sewer Capacity Assessment
Modeled System
Figure 3-1
RMC
Water and Environment

- As-built information was used to manually input details for each of the 22 inverted siphons in the modeled network. Dummy nodes were created as needed for the siphon angle points so that the three "legs" of the siphon (downward, horizontal, and upward) could be represented explicitly.
- As-built information was used to manually input details on the modeled pump stations. Information required included wet well elevations and dimensions, number of pumps, pump capacities, on/off levels, and discharge curves.
- Flow splits (manholes with more than one outlet pipe) were identified for further verification of outlet pipe elevations and/or the existence of weir overflows or other control structures. Field verification and/or as-built drawings were requested from the City as needed. Two structures in particular, the diversion structure at manhole S20-10 and the "flume" structure at manhole S65-30 required special investigations and model configurations.

3.3 Development of Model Loads

Flows are loaded into the model at "load manholes," each of which represents the point where flows from unmodeled sewers discharge into the modeled network. The unmodeled sewers were grouped into sewer subbasins, each with a unique load manhole in the network. Approximately 175 sewer subbasins were delineated for defining the model loads. The subbasins and load manholes are shown in **Figure 3-2.**

3.3.1 Base Wastewater Loads

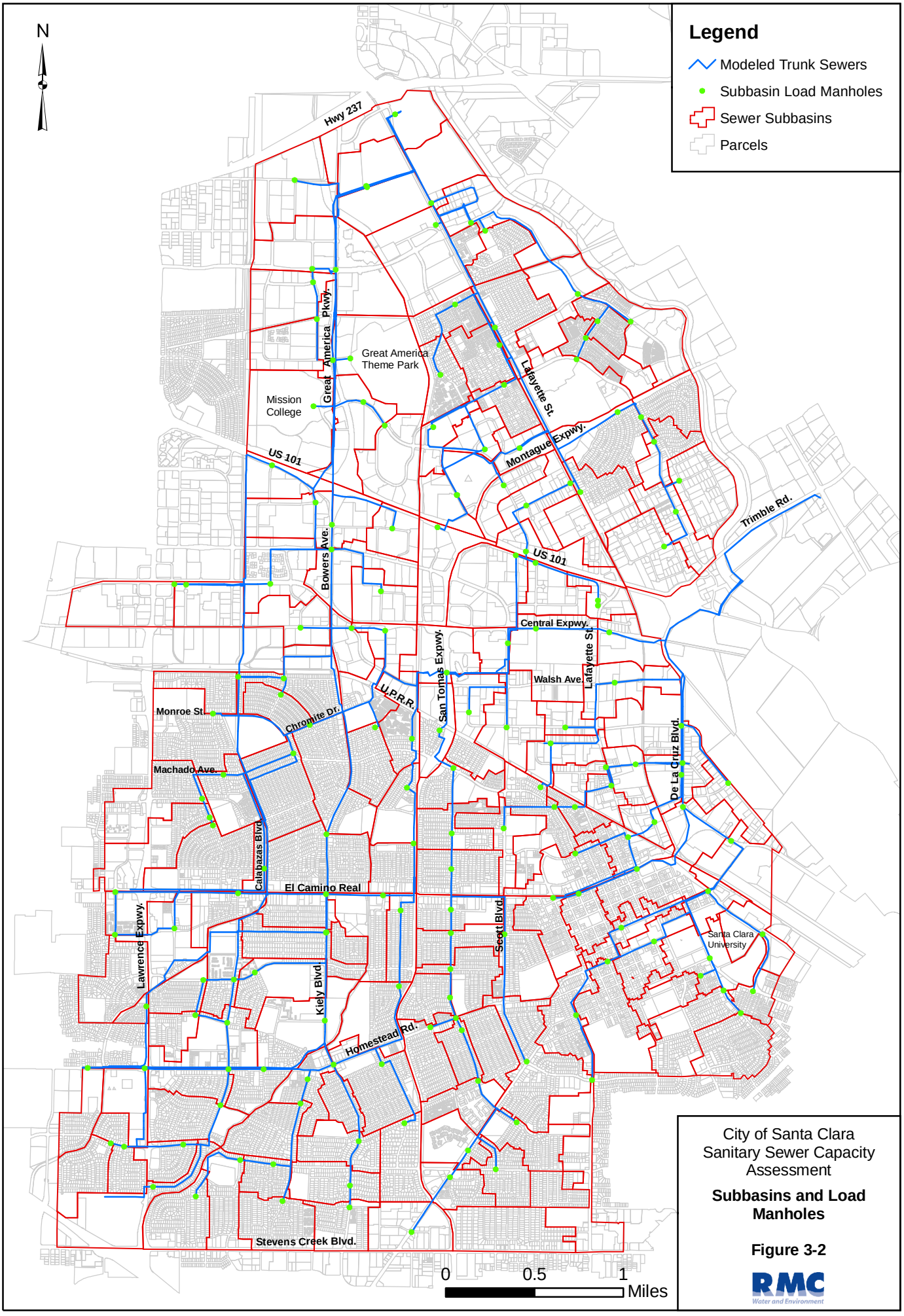
The City's water billing data and recycled water discharge data from December 2005 to March 2006 were used to develop existing loads to the hydraulic model. The billing data provided by the City was compiled into a database, with each billing record (account) associated with its Santa Clara County Assessor's Parcel Number (APN). Since many of the water billing records contained incorrect APNs or no APN at all, an extensive process was used to acquire these APNs from street address cross reference tables and other information supplied by the City. Water usage for multiple water accounts associated with the same parcel were added together. The average water use by parcel was then determined by averaging the monthly use for the four winter months (December through March). Winter water use is considered a reasonable approximation of wastewater flow because outdoor water use (irrigation) during the wintertime is minimal.

The water billing records were then linked to the City's parcel GIS file. Each of the parcels was associated with the appropriate sewer subbasin. Finally, the total average base wastewater flow per sewer subbasin was computed by adding the flows (water use) for all parcels contained with the subbasin. Each subbasin was also characterized based on its predominant land use type (residential, commercial, or industrial) in order to apply an appropriate diurnal wastewater pattern to simulate the flows in the model.

Flows from large dischargers were removed from the cumulative sewer subbasin flow and added to the model as point loads at specific locations in the modeled system. As noted in Chapter 2, model loads for large users were based on average winter flow.

3.3.2 I/I Loads

GWI and RDI/I flows were also loaded to the model by subbasin by associating each subbasin with a flow meter area. The flow meter areas are shown in **Figure 3-3**. For each subbasin, the total sewered area (i.e., area that potentially contributes I/I) was determined by summing the acreage of non-open space land uses in the subbasin. Non-open space land uses include residential, commercial, industrial, and institutional uses, but do not include parks, drainage channels, and large roadways such as freeways. I/I flows for each subbasin were computed in the model by applying the appropriate meter area GWI and RDI/I parameters (determined during the model calibration process described below) to the sewered area of the subbasin.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Modeled Trunk Sewers
Subbasin Load Manholes
Sewer Subbasins
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Hwy 237
Great America Pkwy.
Great America Theme Park
Mission College
US 101
Lafayette St.
Montague Expwy.
Trimble Rd.
Bowers Ave.
Central Expwy.
San Tomas Expwy.
Walsh Ave.
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Monroe St.
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Machado Ave.
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Sanitary Sewer Capacity Assessment
Subbasins and Load Manholes
Figure 3-2
RMC
Water and Environment

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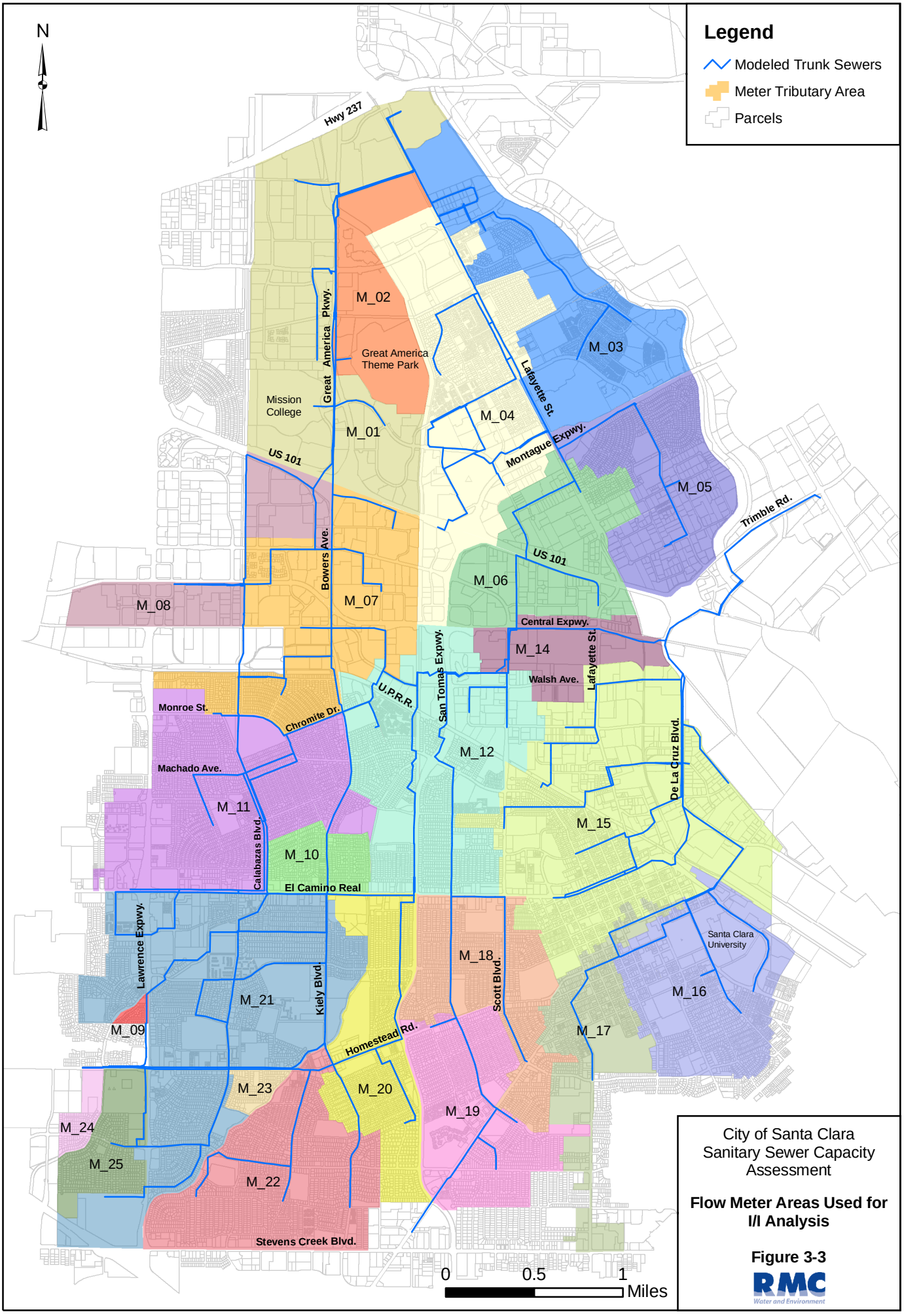
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Monroe St.
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Calabazas Blvd.
M_10
El Camino Real
Santa Clara University
Lawrence Expwy.
M_18
Scott Blvd.
Kiely Blvd.
M_21
M_16
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Homestead Rd.
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M_19
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Stevens Creek Blvd.
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Miles
City of Santa Clara
Sanitary Sewer Capacity Assessment
Flow Meter Areas Used for I/I Analysis
Figure 3-3
RMC
Water and Environment

3.4 Model Calibration

Model calibration is the process of comparing model-computed flows to observed (monitored) flows to verify that the model is accurately simulating flows in the sewer system. The model is calibrated for both dry and wet weather conditions.

As described in Chapter 2, a temporary flow monitoring program consisting of 26 flow meters and 3 rain gauges installed in the Santa Clara system for a period of about two months (late January through early April 2006) provided data for calibration of the hydraulic model. A flow meter schematic is shown in **Figure 3-4.**

3.4.1 Dry Weather Calibration

The 7-day dry period from February 4 to 10, 2006, was used as the dry weather calibration period for the model. The dry weather calibration process was used to verify BWF loads and diurnal curves, and to quantify GWI (as indicated by monitored flows that were higher than estimated BWF). The model calibration resulted in a reasonably good match of modeled to metered flow at most locations, but some significant differences at others. These differences may be due to inaccuracies in the meter data, in water use loadings, or in the configuration of the system (e.g., upstream flow splits). The calibration process did result in further investigation and adjustments to several flow split locations in the model. Every effort was made to resolve as many of the calibration differences as possible. As shown in **Table 3-1**, the total flows in the system, as indicated by the sum of the flows at the most downstream meters (Meters 1, 2, 3, 4, 14, and 15), were within 3 percent of the modeled flows, which provides confidence that the overall flows in the model are reasonably accurate.

Table 3-1 Comparison of Meter and Model Flow

Meter	Meter Avg. Flow (mgd)	Model Avg. Flow (mgd)	Difference (mgd)	Percent Difference
1	5.45	6.06	0.61	11%
2	6.17	6.66	0.49	8%
3	1.06	0.70	-0.36	-34%
4	4.25	4.20	-0.05	-1%
14	2.15	2.23	0.08	4%
15	4.06	3.90	-0.16	-4%
Total	**23.13**	**23.74**	**0.61**	**3%**

Figure 3-5 shows example plots of model vs. metered flow for two locations in the system (Meters 1 and 15).

Figure 3-4 Meter Schematic

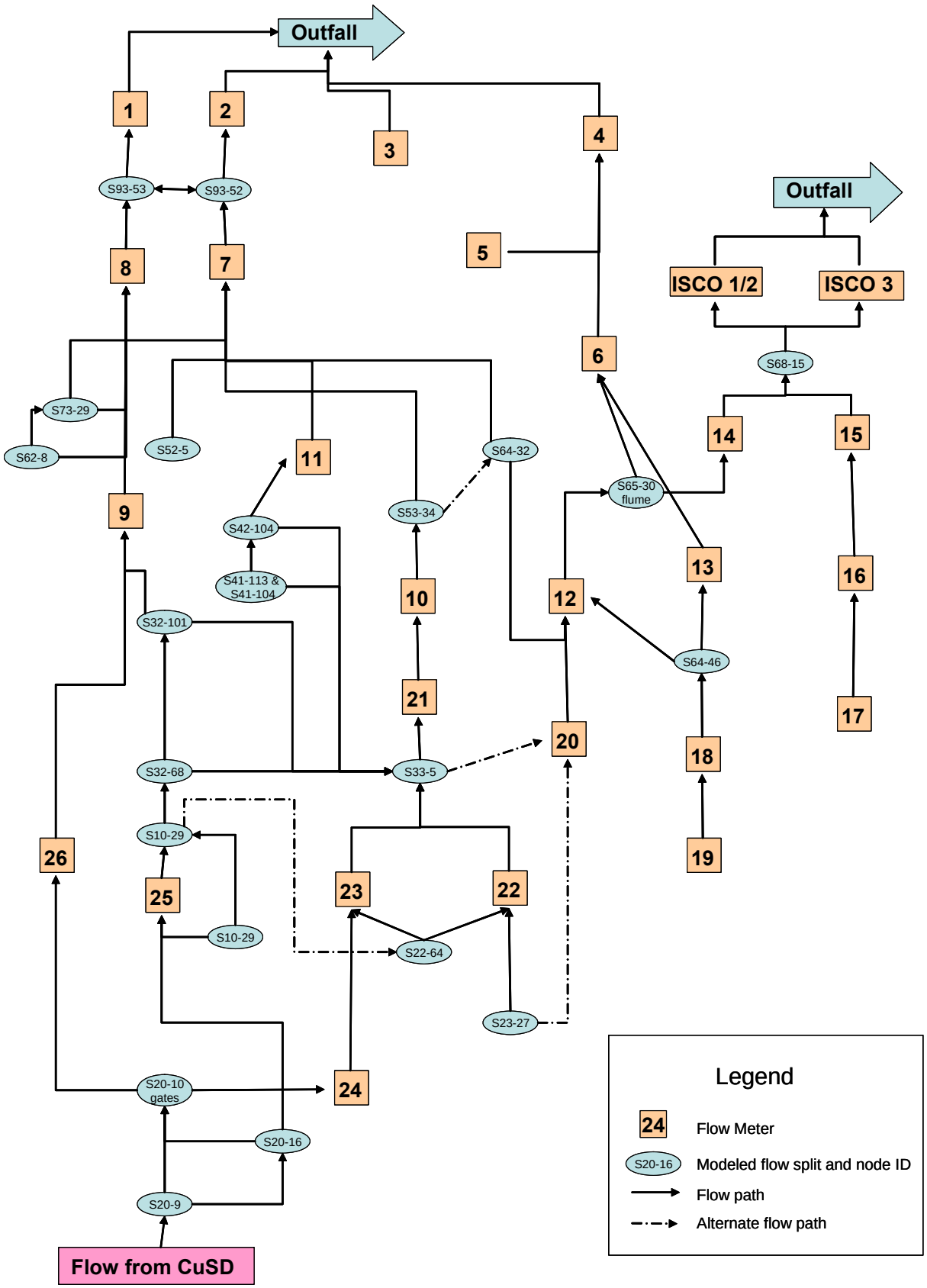
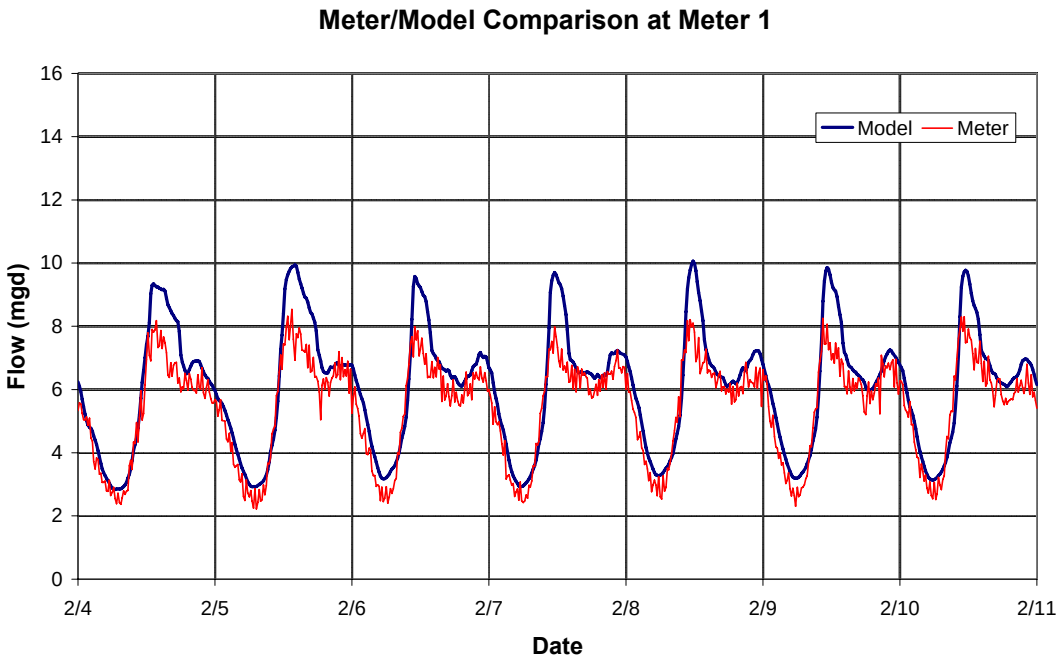
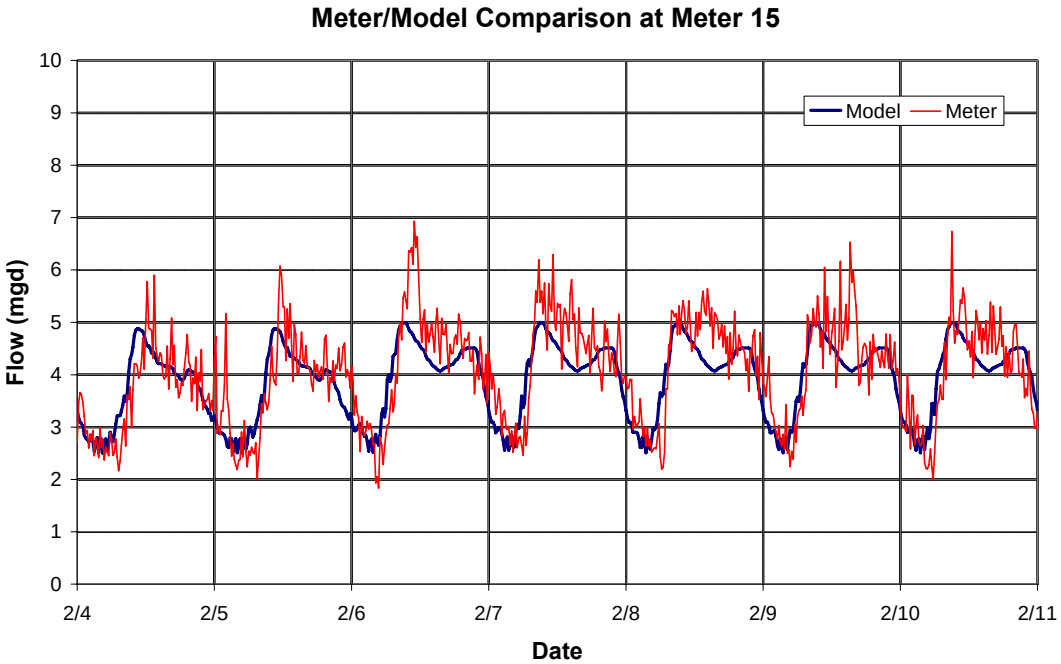


Figure 3-5 Example Dry Weather Calibration Plots



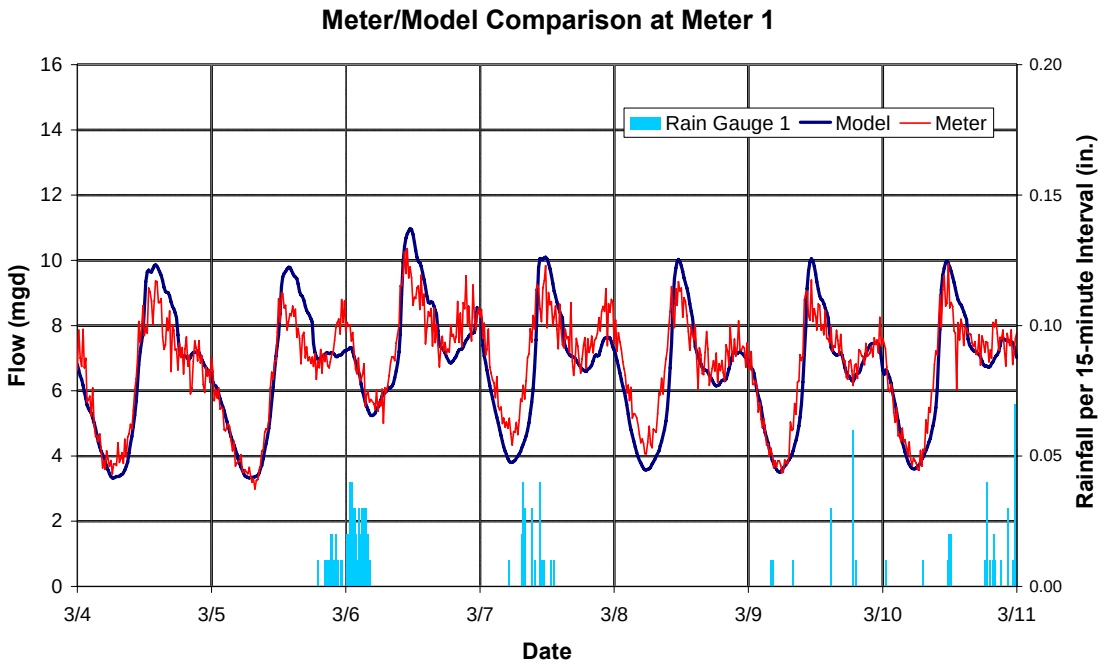


3.4.2 Wet Weather Calibration

Two of the larger storm events from the 2006 monitoring period, February 27 and March 5-6, were used for wet weather calibration. In general, the response to rainfall in the Santa Clara system is relatively small, as evidenced by the relatively low peak flow response to the rainfall events. As described in Chapter 2, RDI/I response to rainfall events was quantified in terms of three sets of triangular unit hydrograph parameters that represent the volume percentage of rainfall that enters the system as RDI/I and the shape of the RDI/I hydrograph as a function of each hour of rainfall. Through the wet weather calibration process, RDI/I hydrograph parameters were developed for each meter area. Additionally, wet weather GWI, as evidenced by elevated flows following the rainfall events, was determined for some areas.

Figure 3-6 presents some wet weather calibration plots for the same meters as shown in Figure 3-5. **Table 3-2** lists the GWI rates that were used for the dry and wet weather calibration by flow meter area and the RDI/I "R values" (percentages of rainfall) for each area.

Figure 3-6 Example Wet Weather Calibration Plots



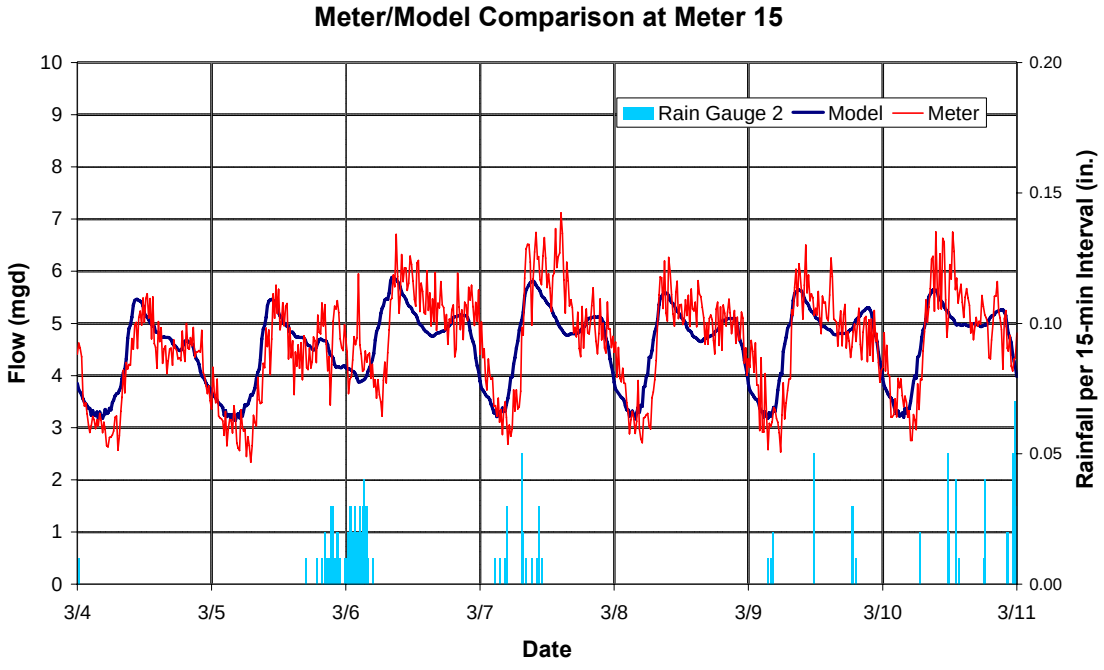


Table 3-2 GWI and RDI/I Parameters by Meter Area

Meter Area[a]	Dry Weather GWI[b] (gpd/acre)	Wet Weather GWI[c] (gpd/acre)	R1 RDI/I Vol. (%) (2 hrs. to peak)	R2 RDI/I Vol. (%) (6 hrs. to peak)	R3 RDI/I Vol. (%) (12 hrs. to peak)
M_01	0	0	0.5	0.8	0.8
M_02	0	0	0.5	0.8	0.8
M_03	0	0	0.6	0.1	0.1
M_04	500	1,300	0.6	0.1	0.1
M_05	700	1,000	0.6	0.1	0.1
M_06	0	0	0.6	0.1	0.1
M_07	1,900	1,900	0.3	0.5	0.5
M_08	0	0	0.3	0.5	0.5
M_09	0	0	0.6	0.1	0.1
M_10	0	0	0.6	0.1	0.1
M_11	1,600	2,300	0.9	1.7	6.0
M_12	0	0	0.9	1.0	0.5
M_14	0	0	0.6	0.1	0.1
M_15	300	700	1.0	0.2	0.2
M_16	900	1,600	1.0	0.2	0.2
M_17	200	200	0.6	0.1	0.1
M_18	0	0	0.8	1.0	0.1
M_19	0	0	0.3	0.1	0.1
M_20	0	0	0.6	0.1	0.1
M_21	0	0	0.6	0.1	0.1
M_22	0	0	0.6	0.1	0.1
M_23	0	0	0.6	0.1	0.1
M_24	0	0	0.6	0.1	0.1
M_25	0	0	0.6	0.1	0.1
CuSD	0	0	0.5	0.2	0.4

(a) See Figure 3-3.
(b) Represents GWI during non-rainfall periods (e.g., early to mid-February) of the 2006 flow monitoring period.
(c) Represents GWI immediately following rainfall events.

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Chapter 4

Capacity Analysis

Chapter 4 Capacity Analysis

This chapter describes the hydraulic analysis and design criteria used to evaluate system performance and size capacity relief projects, the capacity deficiencies based on the results of model runs, and preliminary solutions to identified capacity deficiencies.

4.1 Hydraulic Analysis and Design Criteria

Hydraulic analysis criteria define the conditions under which an existing component of the sewer system is considered to be deficient in capacity. As discussed in Chapter 2, these conditions are based on the design flow and performance criteria established for the system. In the case of Santa Clara, it was recommended that the trunk sewer system be evaluated with respect to its ability to convey peak flows from a 10-year design storm at service area buildout under a peak base wastewater flow condition. Based on discussions with City staff, it was also recommended that a performance criterion of no surcharge (or, more practically, minimal surcharge, e.g., no more than about one foot of surcharge if the sewer is reasonably deep) be used to identify capacity-deficient sewers.

Hydraulic *analysis* criteria may different from the hydraulic *design* criteria used to size new or relief system facilities. Hydraulic design criteria needed for sewer system capacity planning include pipe friction factor, minimum pipe diameter and depth, maximum allowable flow depth to diameter ratio (d/D), and minimum and maximum pipe slopes and velocities. **Table 4-1** presents the recommended hydraulic design criteria for the Santa Clara sewer system capacity assessment. These criteria are consistent with the City's current sanitary sewer design criteria.

Table 4-1 Hydraulic Design Criteria

Criterion	Description	Value
Manning's 'n'	Pipe friction factor	0.013
Pipe Diameter (gravity sewers)	Minimum	8 inches in residential areas, 10 inches in commercial areas, 12 inches in industrial areas
Pipe Depth	Minimum cover over pipe	6 feet
Design Pipe Capacity	Pipe capacity at peak design wet weather flow	0.75 d/D for new or relief sewers
Velocity	Minimum (pipe full or half full)	2 feet/second
	Maximum (at peak design flow)	10 feet/second
Pipe slope	Minimum	Sufficient to obtain minimum velocity
	Maximum	Less than slope that would produce maximum velocity

4.2 Capacity Analysis Results

The results of model runs for future peak dry weather flow (PDWF) and design storm peak wet weather flow (PWWF) scenarios are shown in **Figure 4-1** and **Figure 4-2,** respectively**.** The figures show pipes that are predicted to surcharge due to capacity deficiency or backwater from a downstream capacity deficiency. Note that the results shown reflect an "unrelieved" system, meaning that peak flows are dampened out in pipes that are under heavy surcharge due to backwater from downstream constrictions, and the true peak flows cannot be determined until the downstream capacity deficiencies are relieved. Therefore, the data shown for percent full capacity are only approximations of system performance.

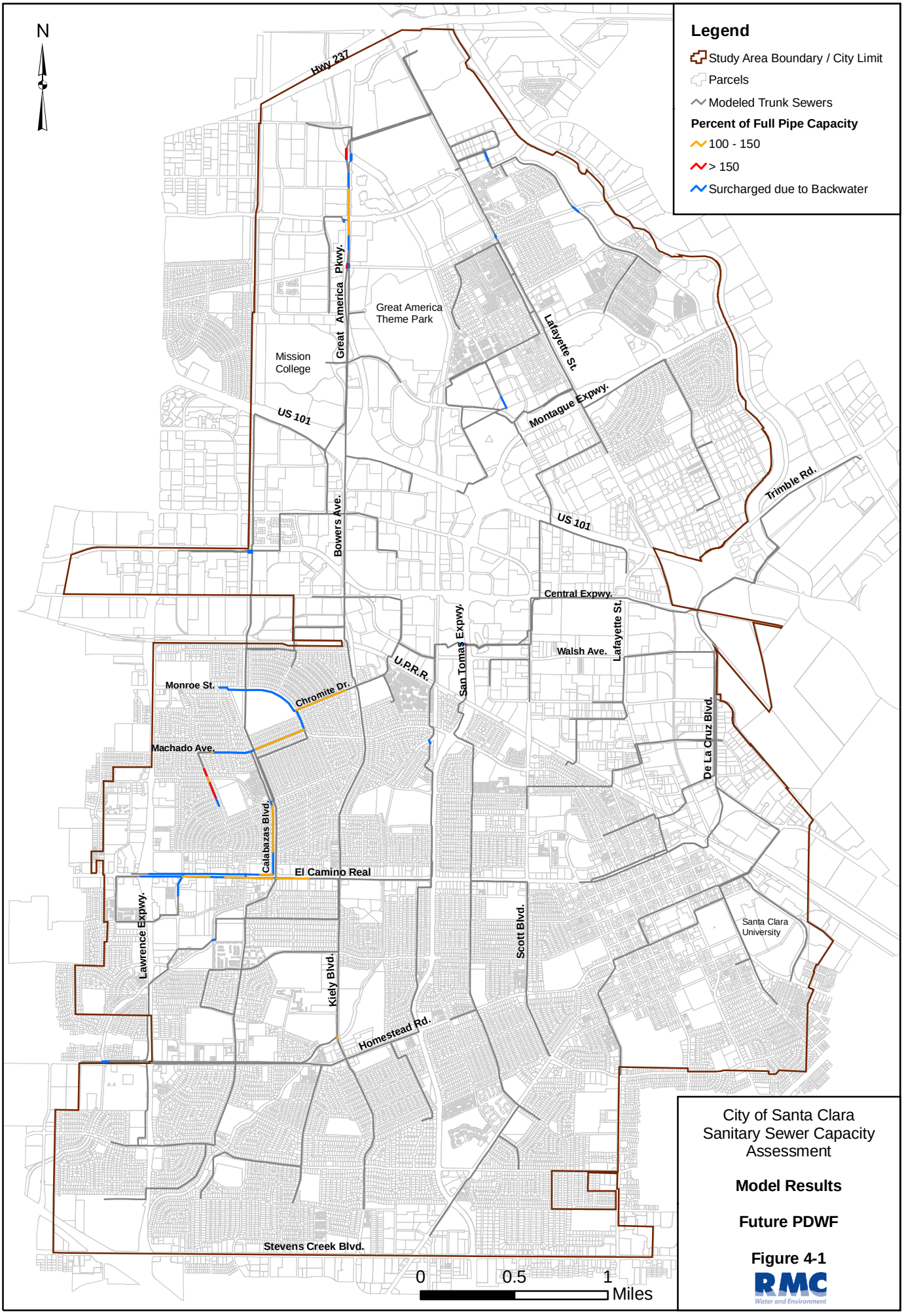
The majority of the predicted future capacity deficiencies in the system are located on the west side of the City along the 27- through 36-inch trunk sewer in Great America Parkway and Bowers Avenue and extending upstream into the smaller trunk sewers in Chromite Drive and Machado Avenue). There are also additional areas of predicted capacity deficiencies in portions of Calabazas Boulevard north of El Camino Real (ECR), ECR east and west of Calabazas Boulevard, Machado Avenue and Nobili Avenue west of Calabazas Boulevard, Monroe Street west of Chromite Drive, Scott Boulevard north of Saratoga Avenue, and Park Avenue south of Bellomy Street.

Using the model software, hydraulic profiles were generated for all areas of the system identified as being surcharged under the future design PWWF scenario. The profiles were reviewed to identify where relief capacity would be required to eliminate surcharged conditions.

It should be noted that a number of capacity deficiencies are identified in the area of the system tributary to the 18-inch trunk sewer in Chromite Drive west of Bowers Avenue (area designated as M_11 in Figure 3-3). This area is roughly bounded by Monroe Avenue and Chromite Drive on the north, ECR on the south, Bowers Avenue on the east, and the city limits on the west. The flow data from Meter 11 showed a very high volume, delayed response to rainfall, as indicated by the high values for R2 and R3 for this meter in Table 3-2. When applied to the 10-year design storm rainfall, these parameters produce a high peak response several hours after the peak of the storm. It is possible that the calibration parameters, which reasonably approximate the observed flow response to the smaller observed rainfall events in the 2006 flow monitoring period, may overestimate the response for a larger, more intense rainfall event like the 10-year design storm. Therefore, the City should consider conducting further wet weather flow monitoring in this area to verify RDI/I response prior to the design of capacity improvements.

4.2.1 Cupertino Sanitary District Flows

Based on preliminary model runs for future conditions, the projected PWWF from CuSD was estimated to be about 16 mgd. This exceeds CuSD's contracted maximum capacity of 13.8 mgd in the Santa Clara system. Model runs were also conducted assuming no future growth in CuSD, which resulted in a peak flow of 13.9 mgd, or approximately equal to the contract capacity. Therefore, for purposes of the capacity assessment presented in this report, the maximum contract flow of 13.8 mgd was assumed for CuSD.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Study Area Boundary / City Limit
Parcels
Modeled Trunk Sewers
Percent of Full Pipe Capacity
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Surcharged due to Backwater
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Great America Pkwy.
Great America Theme Park
Mission College
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Scott Blvd.
Santa Clara University
Homestead Rd.
Stevens Creek Blvd.
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Sanitary Sewer Capacity
Assessment
Model Results
Future PDWF
Figure 4-1
RMC
Water and Environment

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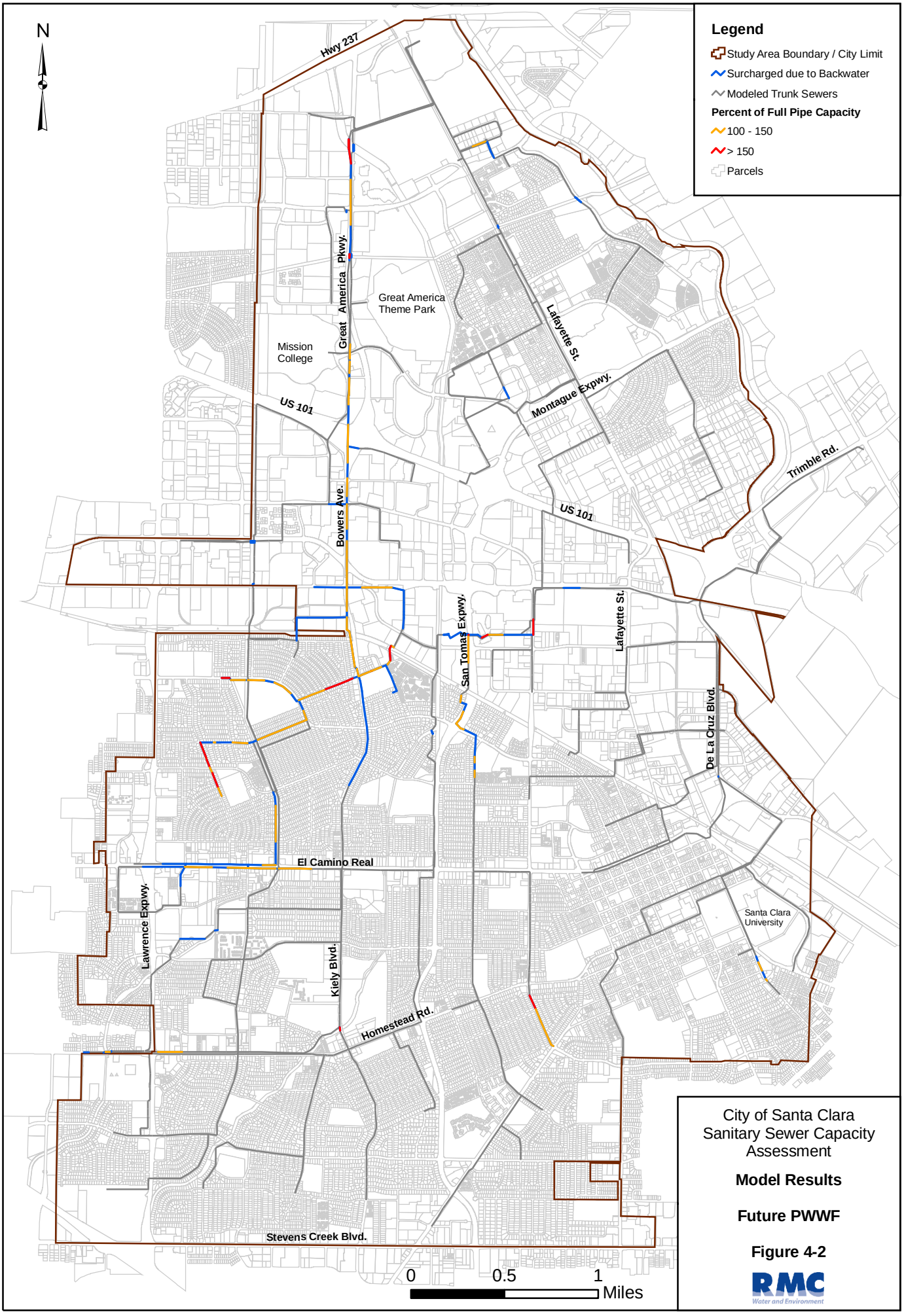
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Study Area Boundary / City Limit
Surcharged due to Backwater
Modeled Trunk Sewers
Percent of Full Pipe Capacity
100 - 150
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City of Santa Clara
Sanitary Sewer Capacity
Assessment
Model Results
Future PWWF
Figure 4-2
RMC
Water and Environment

4.3 Preliminary Solutions to Capacity Deficiencies

Based on the model results and hydraulic profiles, the identified capacity-deficient locations were further reviewed to determine if they should be recommended for capacity improvement. The criterion used to make this determination was that the capacity deficiency results in at least one foot of surcharge above pipe crown, or less than five feet of freeboard under the design storm PWWF condition. This criterion allows for flexibility to eliminate the need to provide potentially expensive capacity relief projects for barely surcharged sewers.

Based on the identified capacity deficiencies, the sizes of required replacement sewers to handle the predicted future PWWF were determined. The model was then re-run with the upsized pipes to confirm that they would resolve the predicted surcharge. The development of relief solutions was an iterative process of gradually upsizing needed pipes to eliminate any significant surcharge in the system under the design peak flow condition.

The required improvements were refined by determining parallel pipe sizes that would be equivalent to pipe replacement for larger diameter sewers requiring capacity relief (the parallel pipe sizes were estimated based on model flows and existing pipe slopes). Parallel pipes were considered an alternative to replacement for trunk sewers with required diameters of 21 inches and larger. Replacement pipes were generally assumed for smaller diameter sewers. During project refinement, other factors such as constructability issues, or the need to rehabilitate or replace a pipe that may be nearing the end of its useful life, would also be taken into consideration in determining whether to parallel or replace a capacity deficient sewer.

The preliminary capacity solutions are listed in **Table 4-2** and shown in **Figure 4-3**. Note that a capacity deficiency (identified as Project 3) was initially identified on the 24-inch Calabazas Trunk Sewer based on the initial estimate of 16 mgd future flow from CuSD. However, if CuSD flows do not exceed the 13.8 mgd contract capacity, the project would not be needed. Therefore, this project was eliminated from consideration and is not shown in Table 4-2 or Figure 4-3.

The identified projects represent preliminary solutions to the identified capacity deficiencies in the Santa Clara trunk sewer system. In the next chapter of the report, other alternatives for addressing these capacity deficiencies, including possible diversions to other trunk sewers with available capacity, or alternative relief sewer alignments that may be more cost effective to construct, are developed and evaluated in order to develop more definitive estimates for the City's long-term Capital Improvement Program for the sanitary sewer system.

Table 4-2 Capacity Deficiencies and Preliminary Solutions

Project No.	Location	US MH	DS MH	Length (ft.)	Design Flow (mgd)	Exist. Dia. (in.)	Req'd. Dia. (in.)	Parallel Dia. (in.)
1A	Great America Pkwy. from Mission College Blvd. to Hetch Hetch crossing	S83-12	S93-57	1,900	23	36	39	21
1B	Great America Pkwy. from north side of US 101 to Mission College Blvd.	S73-1	S83-12	1,800	22	33	39	21
2A	Bowers Ave. from Kifer Rd. to north side of US 101	S63-20	S73-1	5,000	20	30-33	39	21
2B	Bowers Ave. from Chromite Dr. to Kifer Rd.	S53-34	S63-20	2,600	19	27	33	21
4A	Chromite Dr. and Monroe St. from Machado Ave. to west of Bowers Ave.	S52-80	S53-41	2,200	5.0-6.9	18	24-27	18-21
4B	Machado Ave. from Calabazas Blvd. to Monroe St.	S52-103	S52-80	1,500	4.1	15	21	15
5	Monroe St. from Fordham Dr. to Chromite Dr.	S51-22	S52-65	2,500	0.96	10 8(siphon)	12 10(siphon)	--
6	Nobili Ave. and Machado Ave. from Flora Vista Ave. to Calabazas Blvd.	S41-53	S52-101	3,100	2.2-3.5	10-15	15-18	--
7	Calabazas Blvd. from El Camino Real to Cabrillo Ave.	S42-106	S42-30	2,400	0.47	8	10	--
8A	El Camino Real from Pomeroy Ave. to Bowers Ave.	S42-121	S33-5	2,600	1.2	10 6(siphon)	15 8/10(siphon)	--
8B	El Camino Real from Flora Vista Ave. to Pomeroy Ave.	S41-113	S42-121	1,800	1.0	10	12	--
9	Scott Blvd. from Serra Ave. to Homestead Rd.	S25-37	S35-98	800	0.56	8	10	--
10	Park Ave. south of Bellomy St.	S38-75	S38-66	250	0.84	10	12	--

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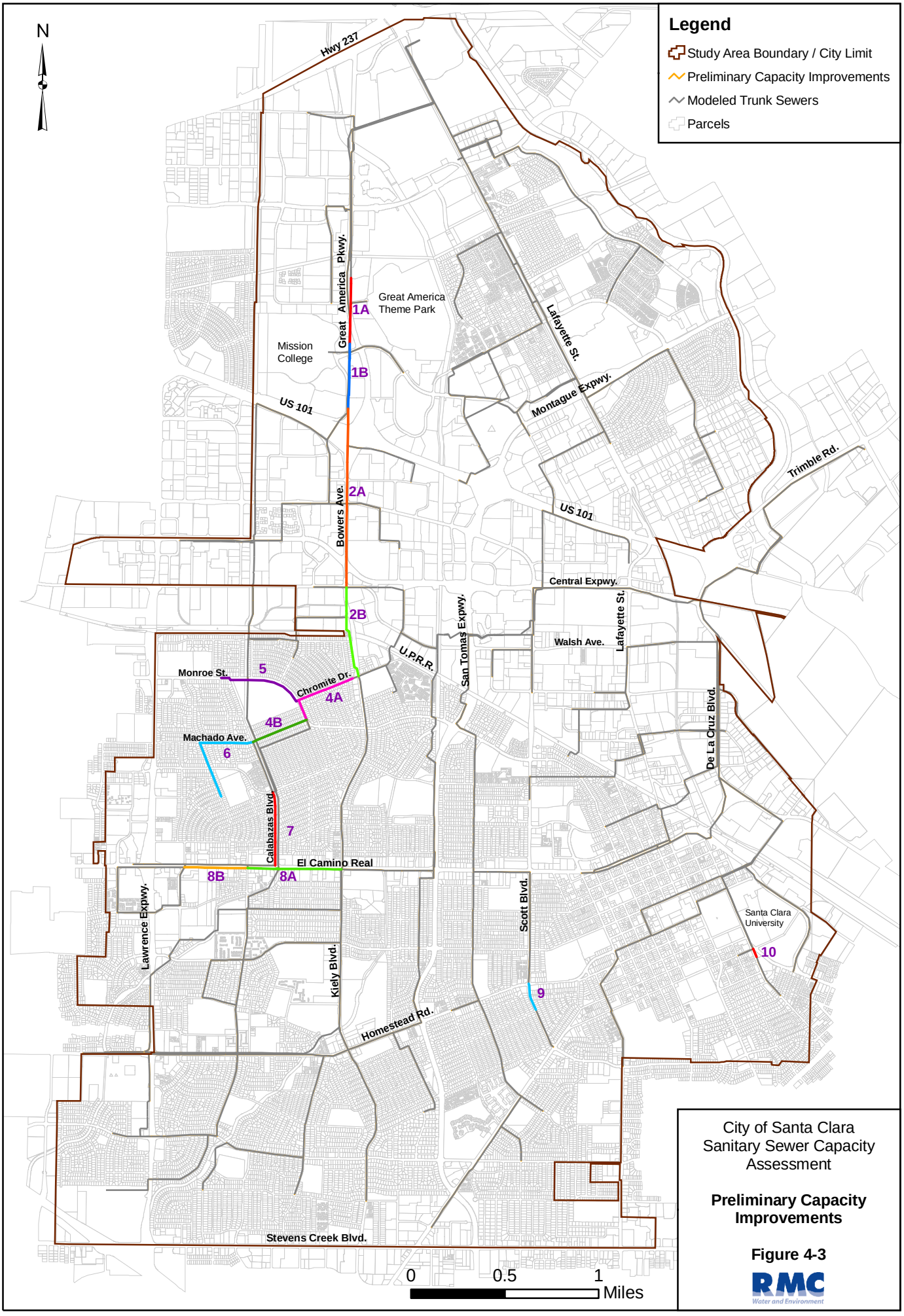
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Study Area Boundary / City Limit
Preliminary Capacity Improvements
Modeled Trunk Sewers
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Great America Pkwy.
Great America Theme Park
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Mission College
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Montague Expwy.
Trimble Rd.
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Calabazas Blvd.
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Santa Clara University
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Stevens Creek Blvd.
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City of Santa Clara
Sanitary Sewer Capacity
Assessment
Preliminary Capacity Improvements
Figure 4-3
RMC
Water and Environment

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Chapter 5

Capacity Improvement Projects

Chapter 5 Capacity Improvement Projects

This section summarizes the improvement projects recommended for Santa Clara's wastewater collection system. Recommended improvements were developed from the results of hydraulic modeling of the trunk sewer system for predicted future flow conditions, as described in Chapter 4. This section discusses the projects, including alternative projects, needed to address potential capacity deficiencies in the existing trunk sewer system.

5.1 Potential Flow Diversion Alternatives

The first step in developing project alternatives was to identify potential flow diversions that could possibly relieve capacity deficiencies without the need for relief sewers, or by significantly reducing the length of needed relief sewers. The following potential flow diversions were identified:

- Divert a portion of the flow from the east trunk sewer to the west trunk sewer in Great America Parkway. This diversion could potentially eliminate the need for Projects 1A and/or 1B.
- Divert flow from the south sewer in El Camino Real (ECR) into the 24-inch trunk sewer that runs along the east side Calabazas Boulevard. This diversion would relieve the capacity deficiency in the south sewer in ECR, which causes flow to back up into the north sewer and then flow north into the 8-inch sewer located on the west side of Calabazas Boulevard. The diversion could be accomplished by diverting flow from the south sewer in ECR into the 24-inch Calabazas trunk sewer just east of Calabazas Creek. This diversion could potentially eliminate the need for Project 7 and Project 8A, and reduce the flow to Projects 4B and 4A.
- Divert flow from the sewer in Machado Avenue west of Calabazas Boulevard into the 24-inch Calabazas trunk sewer. This diversion could potentially eliminate the need for or reduce the required sizes of Projects 4B and 4A.
- Divert flow from the sewer in Monroe Avenue west of Calabazas Creek into the 24-inch Calabazas trunk sewer. This diversion could potentially eliminate the need for the portion of Project 5 east of Calabazas Creek, and reduce the size of Project 4A.

Modeling indicated that diversion of flow from the east to the west trunk sewer in Great America Parkway would not be effective in eliminating the need for capacity relief for that area of the system. A possible connection between manhole S83-18 on the east side of Great America Parkway and S83-17 on the west side of Great America Parkway was evaluated as a potential alternative. However, since the west pipe was higher in elevation than the east pipe a cross connection to relieve the surcharged east pipe is not feasible. The lack of available capacity in both of these pipes further downstream makes the idea of an intertie along Great America Parkway even less feasible.

Modeling of the potential flow diversions to the Calabazas trunk sewer determined that the diversion at ECR and Calabazas Creek could eliminate the need for Project 7 and the portion of Project 8B east of Calabazas Creek. However, the amount of capacity available further downstream in the Calabazas trunk sewer is limited to approximately 1 mgd based on the critical pipe segment between Kifer Road and Scott Boulevard (MHs S62-37 to S72-20). Any additional diversions (e.g., at Machado or Monroe) would result in too much flow in the Calabazas trunk sewer. Furthermore, a diversion at Machado does not appear to be hydraulically feasible because there is insufficient elevation difference between the Machado and Calabazas sewers. Therefore, only the diversion at ECR to the Calabazas trunk sewer was carried forward as a feasible alternative.

5.2 Potential Diversions to New Sewers

The second step in the alternatives analysis process was to identify locations where flows could be diverted to new trunk sewers that could be less difficult or less costly to construct than paralleling or replacing capacity deficient sewers in the same alignment. The following potential diversions to new sewers were identified:

- Divert flow from the Bowers Avenue trunk sewer into a new trunk sewer that would convey flow to the eastern side of the system and ultimately to the system outfall in Trimble Road. This diversion could potentially eliminate the need for Projects 1 and 2.
- Divert flow from the south sewer in ECR into a new sewer in Flora Vista Avenue that would convey flow to Project 6 in Nobili Avenue. This diversion and new sewer would eliminate Project 8B and the need for construction in ECR, but Project 6, 4B and 4A would likely need to be increased in size.

Examination of the model results determined that the eastern portion of the trunk sewer system has excess capacity downstream (east) of Lafayette Street, where the trunk sewer in Central Expressway increases in size to 27 inches and then to 48 inches at De La Cruz Boulevard. Therefore, constructing a new trunk sewer from Bowers Avenue to Central Expressway east of Lafayette to divert flow from the western to the eastern part of the system could potentially reduce the flow in the Bowers Avenue and Great America Parkway trunk sewers sufficiently enough to eliminate the need for capacity relief. In order to ensure adequate grade between the flow diversion point on Bowers Avenue to the connection point to the existing system at Central Expressway, flow would need to be diverted from the existing 18-inch sewer in Chromite Drive just west of Bowers Avenue, which is about 5 feet higher than the Bowers Avenue trunk. Modeling of this alternative indicates that up to 3.5 mgd could be diverted, which would be sufficient to eliminate the need for capacity relief for the Bowers Avenue/Great America Parkway trunk sewer. Therefore, a potential new west-to-east trunk sewer was carried forward as a feasible alternative.

The potential diversion of flow into a new sewer in Flora Vista Avenue is also feasible. However, this alignment would be longer than the project in ECR, would require extensive construction through residential neighborhoods, and would ultimately increase the flow to the sewers in Machado Avenue, Chromite Drive, and Bowers Avenue. Therefore, although this alternative reduces the amount of construction on ECR, it does not offer any significant advantage over the preliminary capacity solution (Project 8B).

5.3 Construction Considerations

To further develop the proposed capacity improvement projects, field visits were conducted to evaluate the proposed project alignments, identify feasible pipeline corridors, and assess potential constructability issues. Utility maps were also obtained to identify potential conflicts with major utilities (e.g., storm drains, large water or recycled water mains) in the proposed project corridors. Based on these investigations, the proposed project alignments and construction methods were refined, as described below. In general, for relief projects to be constructed in the same alignment as existing capacity-deficient trunk sewers, it was assumed that the existing pipeline would be replaced rather than paralleled. This provides a more conservative estimate, appropriate for the planning phase of these projects. For those projects in which the existing sewer is recommended for replacement with a new sewer of one or two pipe diameters larger, however, pipe bursting could also be considered as an alternative to remove and replace.

5.4 Capacity Relief Projects

Table 5-1 summarizes the recommended projects. The locations of the proposed projects are shown in **Figure 5-1** and described in the paragraphs below.

Table 5-1 Recommended Capacity Improvement Projects

Project No.[a]	Location	US MH	DS MH	Length (ft.)	Exist. Dia. (in.)	Req'd. Dia. (in.)[b]
1	Augustine Dr., Lakeside Dr., crossing of U.S. 101, Mission College Boulevard, Great America Pkwy. from Bowers Ave. to south of Hetch Hetchy ROW	S73-20	S93-57	7,200	33-36	21 (P)
2	Chromite Dr., Alhambra Dr., Bracher Park, crossing of UPRR, Bowers Ave. from Bowers Ave. to Augustine Dr.	S53-34	S73-20	6,200	27-33	21 (P)
West-to-East Trunk[c]	Chromite Dr., Alhambra Dr., Bracher Park, crossing of UPRR, Walsh Ave., Lafayette, Lafayette St., Central Expwy. From Bowers Dr. to UPRR	S53-41	S67-18	12,200	NA	24
4A	Monroe St. and Chromite Dr. from Machado Ave. to west of Bowers Ave.	S52-80	S53-41	2,200	18	24-27 (R)
4B	Machado Ave. from Calabazas Blvd. to Monroe St.	S52-103	S52-80	1,500	15	21 (R)
5	Monroe St. from Fordham Dr. to Chromite Dr.	S51-22	S52-65	2,500	10 8(siphon)	12 (R) 8(siphon) (P)
6	Nobili Ave. and Machado Ave. from Flora Vista Ave. to Calabazas Blvd.	S41-53	S52-101	3,100	10-15	15-18 (R)
8	El Camino Real from Flora Vista Ave. to Calabazas Blvd.	S41-113	S32-5	2,600	10	12-15 (R)
9	Scott Blvd. from Serra Ave. to Homestead Rd.	S25-37	S35-98	800	8	10 (R)
10	Park Ave. south of Bellomy St.	S38-75	S38-66	250	10	12 (R)

(a) P = parallel sewer; R = remove and replace
(b) Alternative to Projects 1 and 2.

5.4.1 Projects 1 and 2 – Bowers Ave, Mission College Blvd and Great America Pkwy

These projects would provide capacity relief for the trunk sewer in Bowers Avenue from Chromite Drive to Highway 101 and the east trunk sewer in Great America Parkway from Highway 101 to just south of the Hetch Hetchy right-of-way. Crossing the Union Pacific Railroad (UPRR) and Highway 101 present particular challenges for this alignment, as well as dealing with the heavy traffic along the entire pipeline alignment. Furthermore, there are several large-diameter utilities in the area of Projects 1 and 2.

The proposed project would consist of a parallel 21-inch pipeline to provide capacity relief along this alignment. The majority of the pipeline could be constructed by open trench methods. Because of the need to cross the UPRR (where Bowers Avenue is depressed below grade at the railroad crossing) and Highway 101, and because portions of the existing trunk sewer are located in utility easements that contain other sewer and storm drain pipelines, the new sewer alignment could not exactly parallel the existing trunk sewer. Therefore, a new alignment was developed to facilitate the UPRR and Highway 101 crossings, as well as to keep the pipeline in the public right-of-way as much as possible.

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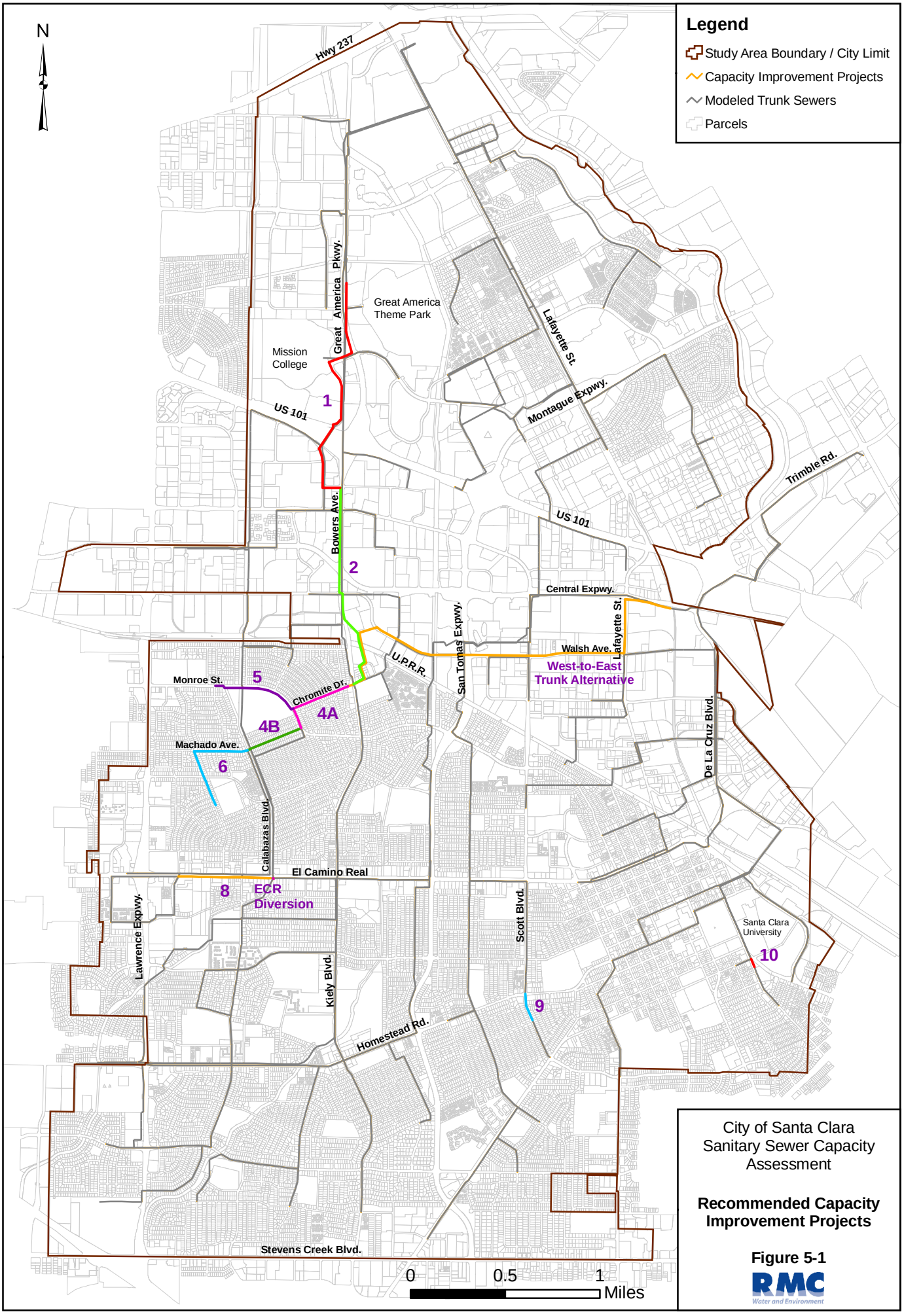

N
Legend
Study Area Boundary / City Limit
Capacity Improvement Projects
Modeled Trunk Sewers
Parcels
Hwy 237
Great America Pkwy.
Great America Theme Park
Mission College
US 101
1
Lafayette St.
Montague Expwy.
Trimble Rd.
Bowers Ave.
2
US 101
Central Expwy.
Lafayette St.
Walsh Ave.
West-to-East Trunk Alternative
San Tomas Expwy.
U.P.R.R.
Monroe St.
5
Chromite Dr.
4A
4B
Machado Ave.
6
De La Cruz Blvd.
Calabazas Blvd.
El Camino Real
8
ECR Diversion
Lawrence Expwy.
Kiely Blvd.
Scott Blvd.
Santa Clara University
10
9
Homestead Rd.
Stevens Creek Blvd.
0
0.5
1
Miles
City of Santa Clara
Sanitary Sewer Capacity Assessment
Recommended Capacity Improvement Projects
Figure 5-1
RMC
Water and Environment

Starting at the intersection of Bowers Avenue and Chromite Drive (manhole S53-34), the pipeline would extend eastward along Chromite Drive to Alhambra Drive and then north to Bracher Park. From the south end of Bracher Park, the pipeline would be tunneled roughly 850 feet underneath the park and the UPRR and underneath a private parking lot, and would then be tunneled approximately 500 feet roughly parallel to the northern edge of the City's power substation property, terminating at approximately the intersection of Bowers Avenue and Mead Avenue. Temporary and permanent easements would be required for construction in the properties adjacent to the City's power substation.

Extending north from Mead Avenue, the pipeline could be aligned along the east side of Bowers Avenue to Central Expressway. Trenchless construction methods would be used to cross Central Expressway. The pipeline would continue north on the west side of Bowers until turning west on Augustine Drive. At Lakeside Drive it would turn north again. Junction structures would be needed where the proposed pipeline crosses the alignment of the existing 21-inch and 30-inch sewers in Lakeside Drive. From near manhole S73-6 on Lakeside Drive, the pipeline would be tunneled approximately 500 feet across Highway 101 to Mission College Boulevard, parallel to the existing 30-inch sewer crossing.

The pipeline would extend north and then east on Mission College Boulevard to Great America Parkway. It is assumed that an inverted siphon would be used to cross under the existing 33- and 36-inch trunk sewers and the 54-inch storm drain located in the utility easement that crosses the east-west segment of Mission College Boulevard. From Mission College Boulevard, the pipeline would follow the east side of Great America Parkway, terminating at manhole S93-57.

5.4.2 New West-to-East Trunk Sewer Alternative

As described above, a new west-to-east trunk sewer would be a possible alternative to Projects 1 and 2. The project would involve intercepting a portion of the flow from the sewer in Chromite Drive just west of Bowers Avenue, which currently discharges to the Bowers Avenue trunk sewer, and diverting it into a new 24-inch sewer that would run in a general west-to-east direction, discharging to the existing 27-inch trunk sewer in Central Parkway east of Lafayette Street. The advantage of this alignment would be avoiding the potentially difficult construction that would be required for Projects 1 and 2 (described above), as well as reducing the flow to the Northside and Rabello Pump Stations, thereby saving in pumping costs. A new west-to-east trunk sewer would also increase the overall flexibility of the system by connecting the west and east basins.

Various alignments for a west-to-east trunk sewer were evaluated using aerial mapping as well as field investigation. The most difficult challenge of the sewer alignment would be the crossing of the UPRR right-of-way. Based on field verification, the preferred alignment would be similar to that proposed for Project 2 from the intersection of Chromite Drive and Bowers Avenue, east to Alhambra Drive, and then north to Bracher Park. As in that project, the pipeline would be tunneled under Bracher Park and across the UPRR to the parking lot behind the buildings on Walsh Avenue. The new sewer would then turn east and be tunneled through the parking lot to Walsh Avenue, then continue east along Walsh Avenue. Twin 15-inch siphons would be installed across San Tomas Aquino Creek. The pipeline would also be tunneled underneath San Tomas Expressway. An inverted siphon would also need to be installed at the Scott Boulevard crossing to avoid a 42-inch storm drain.

On Walsh Avenue between Scott and Lafayette, the existing alignment of utilities makes placing a new 24-inch sewer a challenge. Roughly 1,500 feet of an existing 8-inch water pipeline may need to be moved to provide room for the new sewer pipeline. At Lafayette, the new sewer line would turn north, with a siphon needed to cross Lafayette Street at the south side of Central Expressway to cross under an existing storm drain.

Because the existing 27-inch trunk in Central Expressway at Lafayette Street is located in the center of the road, the proposed new trunk sewer would turn east and follow the southern shoulder of Central Expressway before connecting into the 27-inch line. To alleviate a potential backwater condition due to a

very flat section of pipe that crosses under the UPRR further downstream, the proposed west-to-east trunk pipeline was extended downstream to manhole S67-18.

The west-to-east trunk sewer would increase the peak design flow in the 48-inch Trimble Road trunk sewer from 14.1 to 16.7 mgd. Note that the most downstream parallel 33-inch lines in Trimble Road between North First Street and Zanker Road, where the City's Trimble Road trunk sewer connects into the City of San Jose's interceptors, were not included in the hydraulic model. It is assumed that these lines would have sufficient capacity to handle the increased flows. It is also assumed that the additional flow from the Trimble Road trunk sewer would have minimal impact on the flows in the interceptors in Zanker Road.

5.4.3 Projects 4A and 4B – Machado Avenue and Chromite Drive

This project would provide capacity relief on Machado Avenue, Monroe Street, and Chromite Drive from Calabazas Boulevard to just west of Bowers Avenue (manholes S52-103 to S53-41). (The existing 12-inch siphon across Calabazas Creek would not need to be upsized.) The existing 15- and 18-inch sewers would need to be replaced with 21-, 24-, and 27-inch pipes. A parallel sewer could be an option; however, there is limited room in these streets for another sewer because of other utilities. Approximately 85 lower laterals and cleanouts would also need to be replaced along this alignment, in accordance with the City's policy of replacing lower laterals whenever the main sewer is replaced. Because it is generally considered inadvisable to connect laterals to larger diameter pipelines (e.g., larger than about 18 inches), possibly a parallel 8-inch line could be installed above or adjacent to the new pipe, to which the laterals could be connected.

5.4.4 Project 5 – Monroe Street

Along Monroe Street, from Fordham Drive to Chromite Drive, approximately 2,500 feet of 10-inch sewer would be replaced with 12-inch pipe in order to increase the capacity of this sewer from manholes S51-22 to S52-65. Additionally, a parallel siphon at Calabazas Creek would be installed to increase the capacity of the existing single 8-inch siphon. It is estimated that eight lower laterals would need to be replaced as part of this project.

The portion of the project from MHs S52-51 to S52-65 could possibly be eliminated by a diversion into the 24-inch Calabazas trunk sewer. However, the model indicates that there would be limited capacity available in this pipeline once the El Camino Real Diversion is constructed, so this alternative is not recommended at this time. The diversion, or a potential partial diversion (e.g., with an overflow weir) could be considered in the future if capacity in the Calabazas trunk sewer appears to be adequate.

5.4.5 Project 6 – Nobili Avenue and Machado Avenue

This project would replace 3,100 feet of pipeline along Nobili and Machado Avenues, extending from manholes S41-53 to S52-101. The existing 10-, 12- and 15-inch sewers would be replaced with 15- and 18-inch pipe. Approximately 52 lower laterals would also need to be replaced along this alignment.

5.4.6 ECR Diversion to Calabazas Trunk Sewer

As an alternative to preliminary projects 7 and 8A, a diversion on El Camino Real can be constructed to direct flow into the 24-inch Calabazas trunk sewer. For this diversion, a new pipe would be needed to connect the sewer just downstream of the siphon on the ECR south sewer to divert the flow into the 24-inch Calabazas trunk (at approximately manhole S32-8). This diversion is not listed as a capacity improvement project in Table 5-1 because it is assumed that the connection will be coordinated with the siphon upgrade at Calabazas Creek (replacement of the existing 6-inch siphon with an 8- and 10-inch double siphon) being constructed in conjunction with the channel work being conducted by the Santa Clara Valley Water District. Only a small segment of pipe would be needed to complete this diversion, making it a cost effective alternative to preliminary projects 7 and 8A.

5.4.7 Project 8 – El Camino Real

The existing 10-inch pipeline on the south side of El Camino Real between Flora Visa Avenue and Calabazas Boulevard should be upsized to 12-inch diameter from Flora Visa Avenue to Pomeroy Avenue and to 15-inch diameter from Pomeroy Avenue to Calabazas Creek. This capacity relief project would involve replacing roughly 2,600 feet of pipeline and twelve lower laterals, from manholes S41-113 to S32-5.

5.4.8 Project 9 – Scott Boulevard

This capacity upgrade project is located on Scott Boulevard from Serra Avenue to Homestead Road. It would involve replacing 800 feet of 8-inch sewer with 10-inch pipe and 14 lower laterals, from manholes S25-37 to S35-98.

5.4.9 Project 10 – Park Avenue

The 10-inch pipe on Park Avenue, south of Bellomy Street should be replaced with a 12-inch pipe in order to provide capacity relief. This project would involve 250 feet of pipeline, from manhole S38-75 to manhole S38-66, including two lower laterals.

Chapter 6

Recommended Capital Improvement Program

Chapter 6 Recommended Capital Improvement Program

This chapter presents the recommended Capital Improvement Program (CIP) for capacity improvements to the Santa Clara wastewater collection system, along with estimated project costs and proposed schedule for construction.

6.1 Estimated Cost of Proposed Sewer Improvement Projects

The estimated costs of the proposed projects were refined based on more detailed quantity takeoffs and evaluation of likely construction methods and requirements. Unit cost criteria (updated to current dollars) and cost assumptions developed for the City of San Jose's Phase I Sanitary Sewer Master Plan Capacity Assessment were used in developing the cost estimates. These criteria include baseline construction costs for gravity trunk sewers using open-cut and trenchless (e.g., microtunneling) methods, costs for lower lateral replacement for remove-and-replace projects, costs for major sewer junction structures and siphon inlet and outlet structures, and costs allowances for project mobilization/demobilization, traffic control, bypass pumping and delay factors for remove-and-replace projects, extra dewatering requirements in areas of high groundwater, and acquisition of temporary and permanent easements if needed. A 30 percent allowance for contingencies for unknown conditions was also included, as well as an allowance of 25 to 35 percent of construction cost (depending on project size) for engineering, administration, and legal costs.

Table 6-1 summarizes the cost criteria used for preparing the project cost estimates. These cost estimates are planning or conceptual level estimates, and are considered to have an estimated accuracy range of -30 to +50 percent. This level of accuracy corresponds to an "order of magnitude" or "Class 5" cost estimate as defined by the American Association of Cost Estimators. These estimates are 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 into the design and construction phases.

Table 6-2 presents the estimated construction and capital costs for the proposed projects and major project alternatives. More detailed breakdowns of the costs for each project are included in **Appendix B**.

Table 6-1 Summary of Cost Criteria

Item	Description/ Assumptions	Unit Cost[a]
Baseline Pipeline Construction Costs		
Open-Cut Gravity Trunk Sewers	10" - 27" diameter, 8' - 16' depth	$160 - $240/lf
Microtunneling	36" - 49" casing	$90 - $1,200/lf
	Jacking/Receiving Pits	$70,000/$40,000
Lower Lateral Replacement		$2,000
Special Structures	Junctions, siphon inlet/outlet	$6,000 - $9,000
Site Specific Construction Costs		
High Groundwater (north of Highway 101)	Dewatering plus extra sheeting and shoring	$100/lf
Bypass Pumping/Diversion	% of Baseline Construction Cost for remove and replace projects	10%
Remove/Replace Delay Factor		2%
Construction Cost Allowances		
Mobilization/Demobilization	% of Construction Cost Subtotal	5%
Traffic Control		10%
Contingencies		30%
Easement Acquisition		
Temporary Easement	Easement width = 80 ft	$4/sq. ft.
Permanent Easement	Easement width = 30 ft	$25/sq. ft.
Engineering, Administration, and Legal Costs	% of Construction Cost Total (varies depending on magnitude of Estimated Construction Cost)	25% - 35%

(a) Based on an Engineering News Record (ENR) Construction Cost Index for the San Francisco Bay Area of 9103 (March 2007).

Table 6-2 Estimated Costs of Capacity Improvement Projects

Project No.	Estimated Construction Cost ($)	Estimated Capital Cost ($)
1	4,539,000	5,674,000
2	5,286,000	7,324,000
4A	1,489,000	1,861,000
4B	1,060,000	1,325,000
5	1,046,000	1,308,000
6	1,139,000	1,424,000
8	945,000	1,276,000
9	256,000	346,000
10	77,000	104,000
Total	**15,837,000**	**20,642,000**
West-to-East Alternative	9,752,000	12,906,000
Total w/West-to-East Alternative	**15,764,000**	**20,550,000**

6.2 Comparison of Major Alternatives

As described in Chapter 5, two major alternatives were evaluated for providing capacity relief for the major trunk sewers in Bowers Avenue and Great America Parkway: paralleling or replacement of those sewers, or diverting flow to a new West-to-East trunk sewer. As presented above, the two alternatives are virtually equal in terms of estimated capital cost. Other factors that should be considered in comparing these alternatives are:

- **Constructability.** Bowers Avenue and Great America Parkway are two of the busiest roads in the City. Construction in those corridors would require extensive traffic control and potentially have significant impact on businesses in the area. The sewer alignment also has a number of significant other utilities (e.g., large storm drains). The West-to-East trunk sewer would likely have fewer traffic impacts, but could require the realignment of about 1,500 feet of water main along part of the corridor, siphon crossings under San Tomas Aquino Creek and several large storm drains, and some construction along the shoulder of busy Central Expressway.
- **Permits and Easements.** The Bowers/Great America Parkway project would require a permit from Caltrans for a new sewer crossing under Highway 101. Both projects would require crossing the UPRR west of Bowers, including obtaining a permanent sewer easement across properties adjacent to the City's power substation on the north side of the UPRR. The West-to-East trunk would require coordination with Santa Clara Valley Water District for the crossing of San Tomas Aquino Creek. Both projects would require permits from the County for work in or crossing Central Expressway and, in the case of the West-to-East project, San Tomas Expressway.
- **Project Phasing/Flexibility.** The Bowers/Great America Parkway project could be constructed and put into operation in phases, whereas the West-to-East project could not be used until the entire project was constructed. However, that project would provide greater overall system flexibility by linking the west and east basins by a major trunk.
- **Coordination with Development and Other City Projects:** Current development activity on the west side of the City may provide opportunities for the City to coordinate with developers in construction of some capacity improvement projects. For example, proposed developments in the area of El Camino Real and Lawrence Expressway may construct or fund improvements, such as the El Camino Real relief sewer (Project 8), to allow those developments to move forward more quickly. Other potential projects, either by City or other utilities, may also impact the desirability of one or the other of the major trunk system alternatives.
- **Long-term Cost Savings.** Diverting flow from the west to the east basin could reduce the overall flows to the Rabello and Northside Pump Stations. The amount of such reduction would depend on the configuration of the flow diversion to the West-to-East trunk. A rough estimate of the reduction in average daily flow would indicate a potential annual cost savings of about $10,000 based on City's estimate of $8,000 per mgd cost for power for pumping.

Because the estimated capital costs of the two major alternatives are nearly identical, it is recommended that the City pursue additional predesign level alignment and constructability evaluations of both alternatives before making a decision on which alternative to implement as part of the overall capacity improvement program.

6.3 Prioritization and Schedule for Proposed CIP Projects

A preliminary schedule for completion of the recommended CIP projects over a five-year period has been developed based on assigning relative priorities to the proposed capacity improvements. Priorities have been based on the relative magnitude of the predicted capacity deficiencies, as well as the likely timing of

developments that may impact the need for the projects. Based on these considerations, the projects have been divided into two priority groups, as listed in **Table 6-3**.

Table 6-3 Project Priority Groups

Project No.	Estimated Construction Cost ($)	Estimated Capital Cost ($)
Priority Group 1		
2	5,286,000	7,324,000
4A	1,489,000	1,861,000
8	945,000	1,276,000
Subtotal	***7,720,000***	***10,461,000***
Priority Group 2		
1	4,539,000	5,674,000
4B	1,060,000	1,325,000
5	1,046,000	1,308,000
6	1,139,000	1,424,000
9	256,000	346,000
10	77,000	104,000
Subtotal	***8,117,000***	***10,181,000***
Total	**15,837,000**	**20,642,000**
West-to-East Alternative[a]	9,752,000	12,906,000
Total w/West-to-East Alternative	**15,764,000**	**20,550,000**

(a) Would replace Projects 1 and 2 and be included in Priority Group 1.

For each project, a preliminary estimate of time required to implement the project has been developed, considering time required for design and construction, including obtaining necessary permits and easements. Based on the project schedules and priorities, **Figure 6-1** shows a preliminary schedule for the recommended five-year capacity improvement CIP. The schedule is based on proceeding with the Bowers/Great America Parkway relief sewer, but provides for a preliminary alignment study of both this and the West-to-East trunk alternative, as recommended above. If the City decides to proceed with the West-to-East alternative in lieu of the Bowers/Great America Parkway relief, then the overall CIP schedule would need to be modified.

Figure 6-1 Proposed CIP Schedule

With Projects 1 and 2

Project	Year 1	Year 2	Year 3	Year 4	Year 5
Alignment Study					
Project 8					
Project 4A					
Project 2					
Project 1					
Project 4B					
Projects 5&6					
Projects 9&10					

With West-to-East Trunk Alternative

Project	Year 1	Year 2	Year 3	Year 4	Year 5
Alignment Study					
Project 8					
Project 4A					
West-to-East Trunk					
Project 4B					
Projects 5&6					
Projects 9&10					

Planning
Design
Bid and Award
Construction

6.4 Implementation Recommendations

The City should begin implementation of the Capital Improvement Program recommended in this Sanitary Sewer Capacity Assessment, starting with the highest priority projects. The following items should be considered in project scheduling and design, and in future updates of the Capacity Assessment.

- The alignments and sizes of all recommended projects should be verified with detailed predesign analyses, including topographic surveys, geotechnical investigations, utility research, and constructability reviews.
- The decision to parallel or replace existing sewers should consider the physical condition and remaining useful life of the existing pipelines; the availability of pipeline corridors for new sewer construction; and operation and maintenance concerns.
- The hydraulic model has been developed to assist the City in performing capacity analyses and updating the Capacity Assessment in the future. The model should be kept up-to-date with any changes to existing sewer connections, development plans, and sewer system facilities.
- The City should periodically calibrate its permanent flow meters at the Northside and Rabello Pump Stations and on the Trimble Road trunk sewer to ensure that accurate flow information is available to track the changes in the flows in the City's system over time.
- The City should conduct additional flow monitoring at key locations in the sewer system, particularly the area tributary to the Chromite/Machado trunk sewers (flow meter 11 area). Flow levels during large storm events should be compared to the peak flows simulated by the hydraulic model to verify the modeling predictions for the 10-year design storm and confirm the need for and sizing of Projects 4A, 4B, 5, and 6.

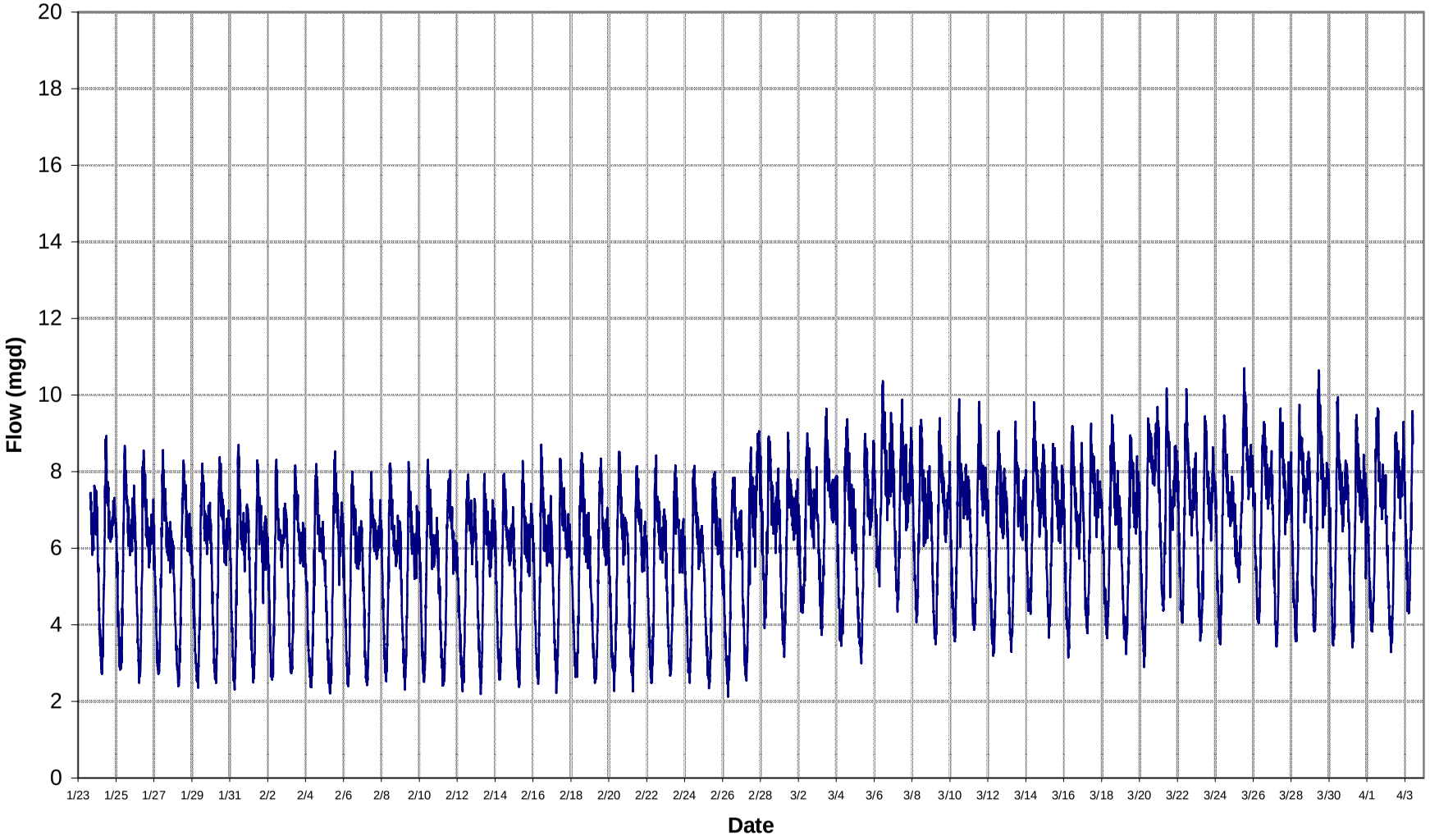
- The City should consider additional field investigations, including smoke testing, and manhole and pipeline television inspection, in the flow meter 11 area to identify potential sources of I/I and possible opportunities for I/I reduction in this area.
- The City should coordinate with the Cupertino Sanitary District on flow and planning assumptions to ensure that adequate capacity exists in the Santa Clara system to handle future flows from CuSD. The City should encourage CuSD to verify the calibration of its flow meter at Homestead Road and confirm its projections of future wastewater flows entering the Santa Clara system.
- The City should coordinate with the City of San Jose to ensure that its flow criteria and planning assumptions are consistent with those used by San Jose in its capacity master planning.
- The City should assess its connection fees and evaluate financial alternatives to fund the recommended capacity assessment CIP.

This Sanitary Sewer Capacity Assessment report is intended to be a working document to be refined and updated as additional data and new planning information becomes available. The Capacity Assessment should be updated whenever there are major changes in planning assumptions or, at a minimum, every five years.

Appendix A

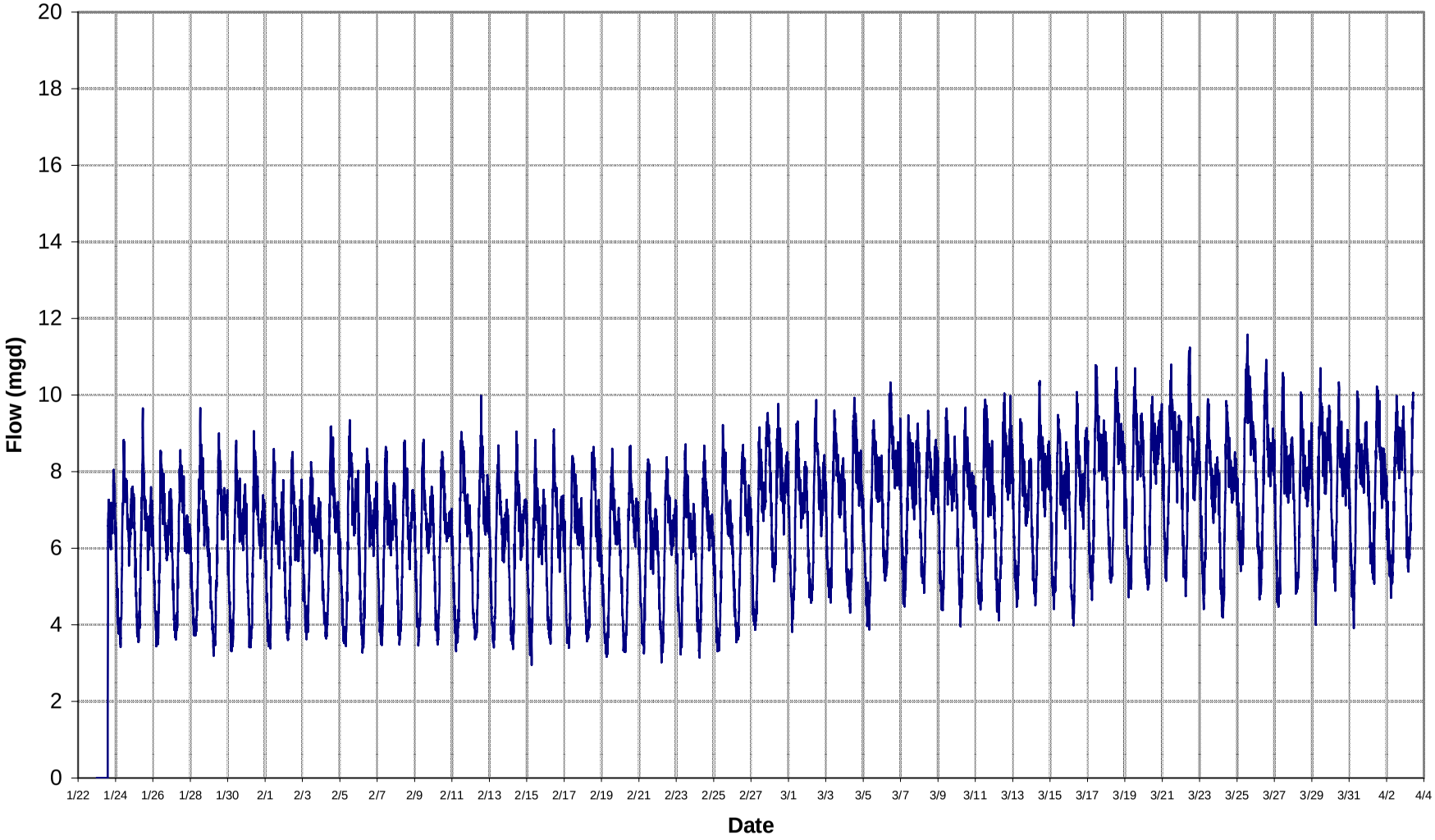
Plots of Flow Monitoring Data

City of Santa Clara
Sanitary Sewer Flow Monitoring, Site 1



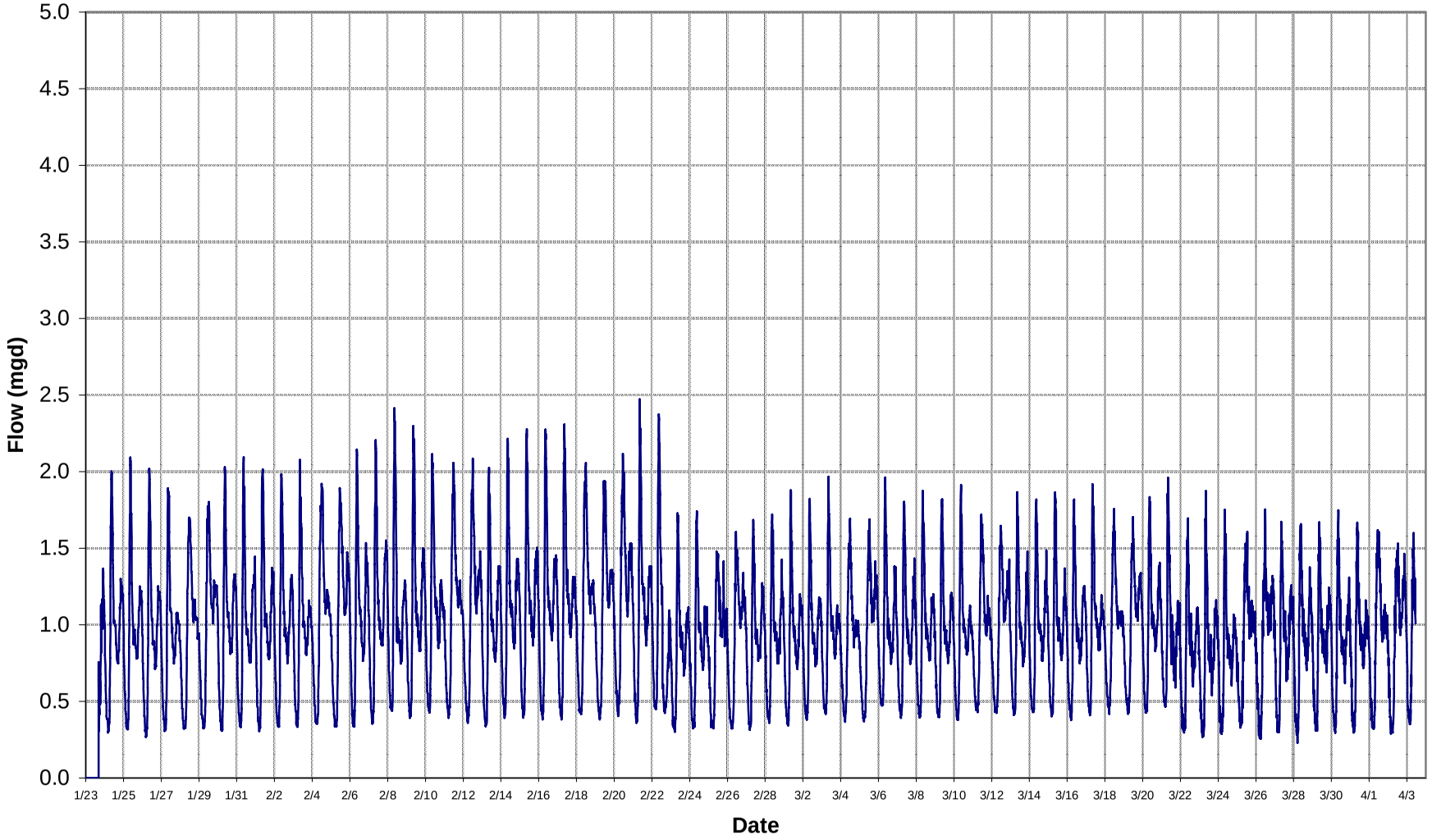
Site 1 061406.xls, Flow

City of Santa Clara
Sanitary Sewer Flow Monitoring, Site 2



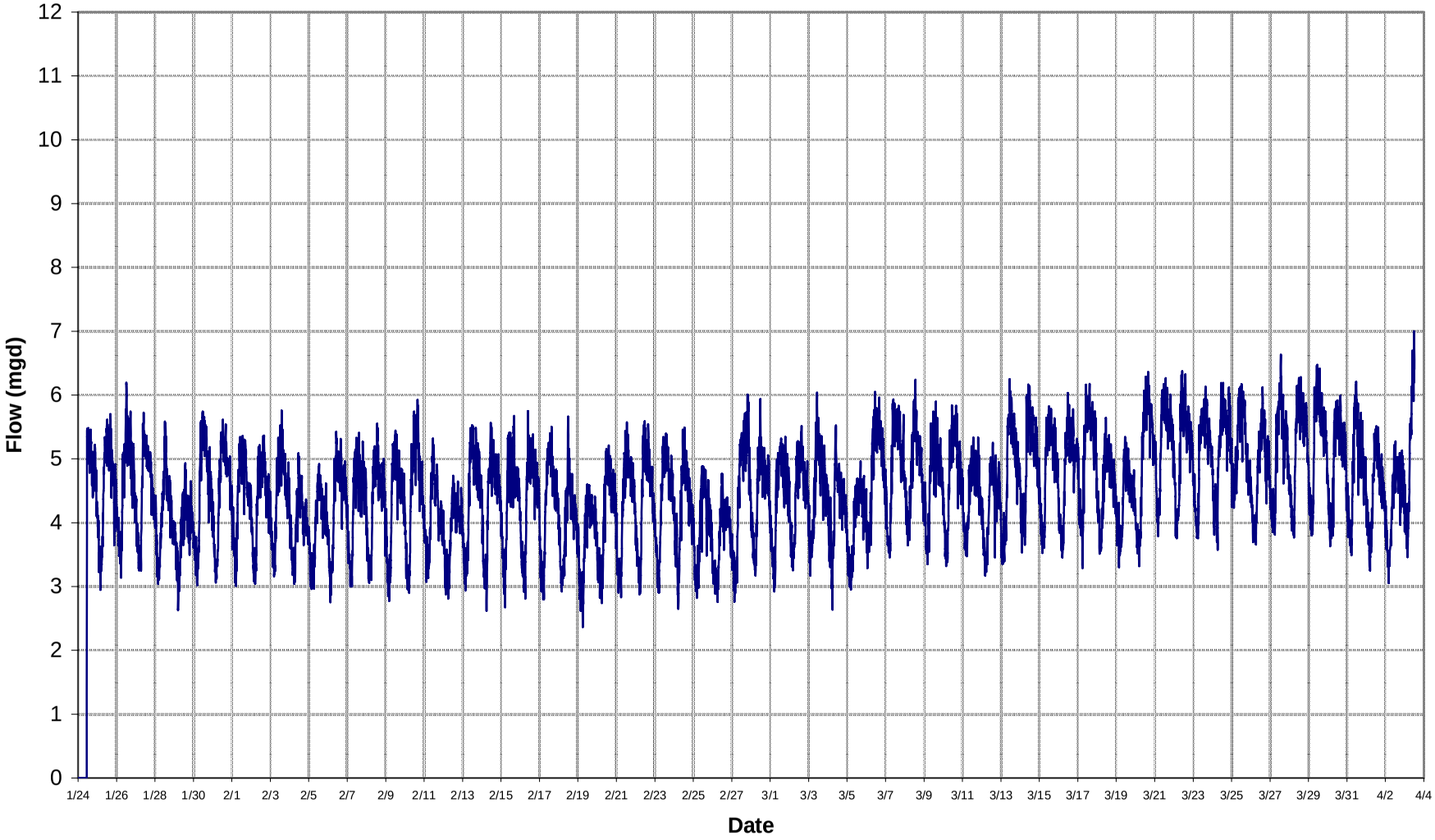
Site 2 072906.xls, Flow

City of Santa Clara
Sanitary Sewer Flow Monitoring, Site 3



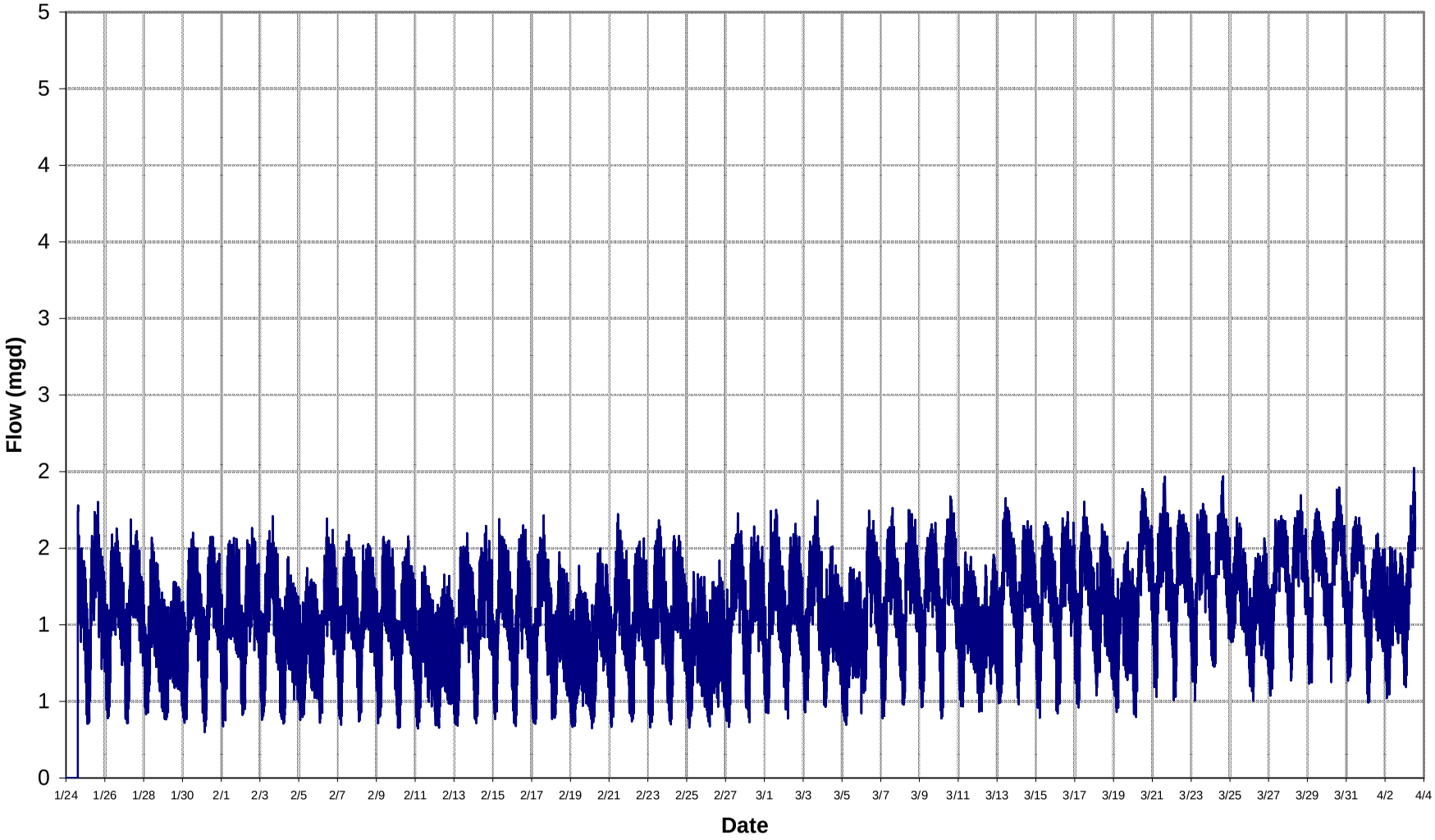
Site 3 072906.xls, Flow

City of Santa Clara
Sanitary Sewer Flow Monitoring, Site 4



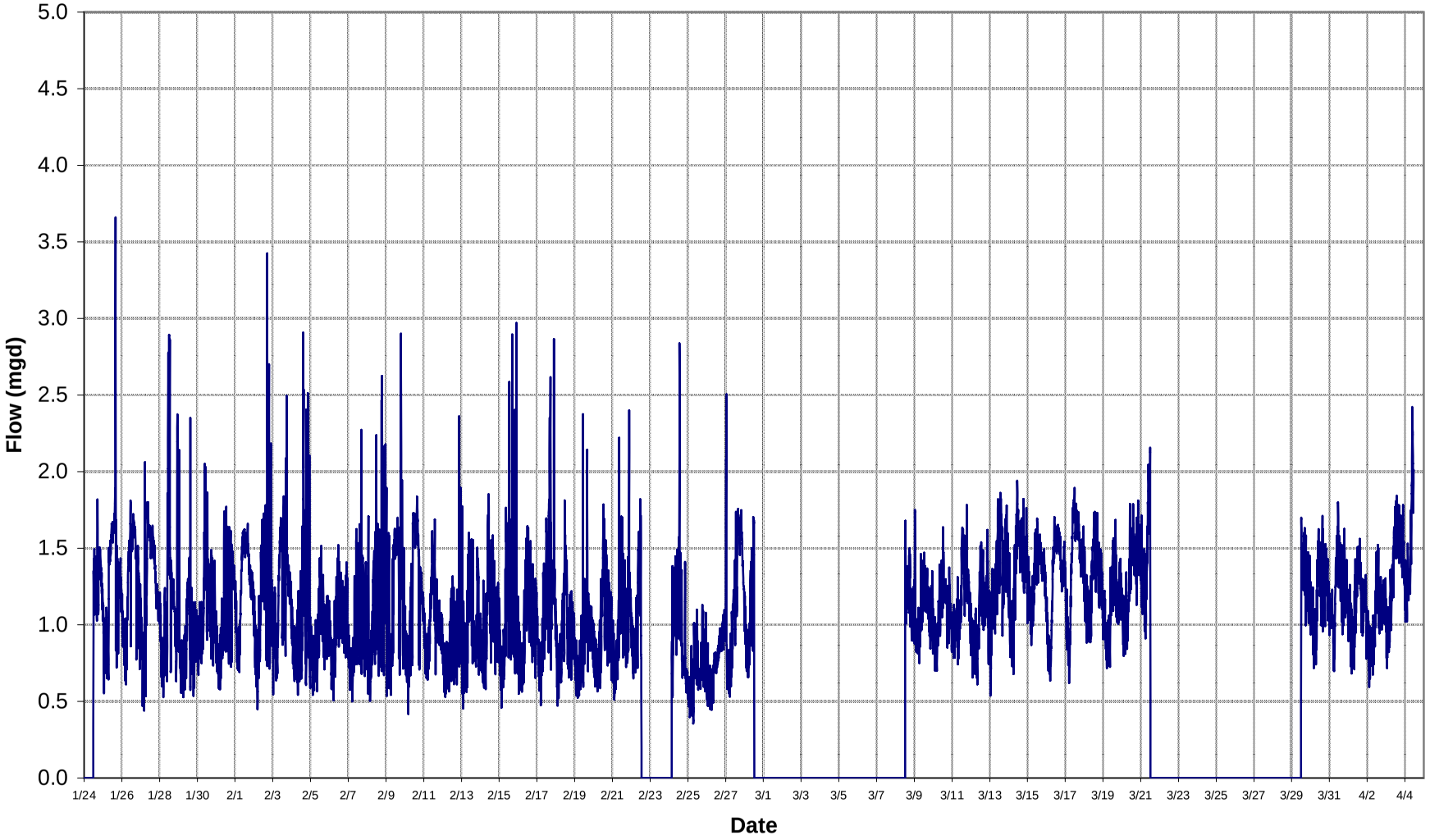
Site 4 061406.xls, Flow

City of Santa Clara
Sanitary Sewer Flow Monitoring, Site 5



Site 5 061406.xls, Flow

City of Santa Clara
Sanitary Sewer Flow Monitoring, Site 6



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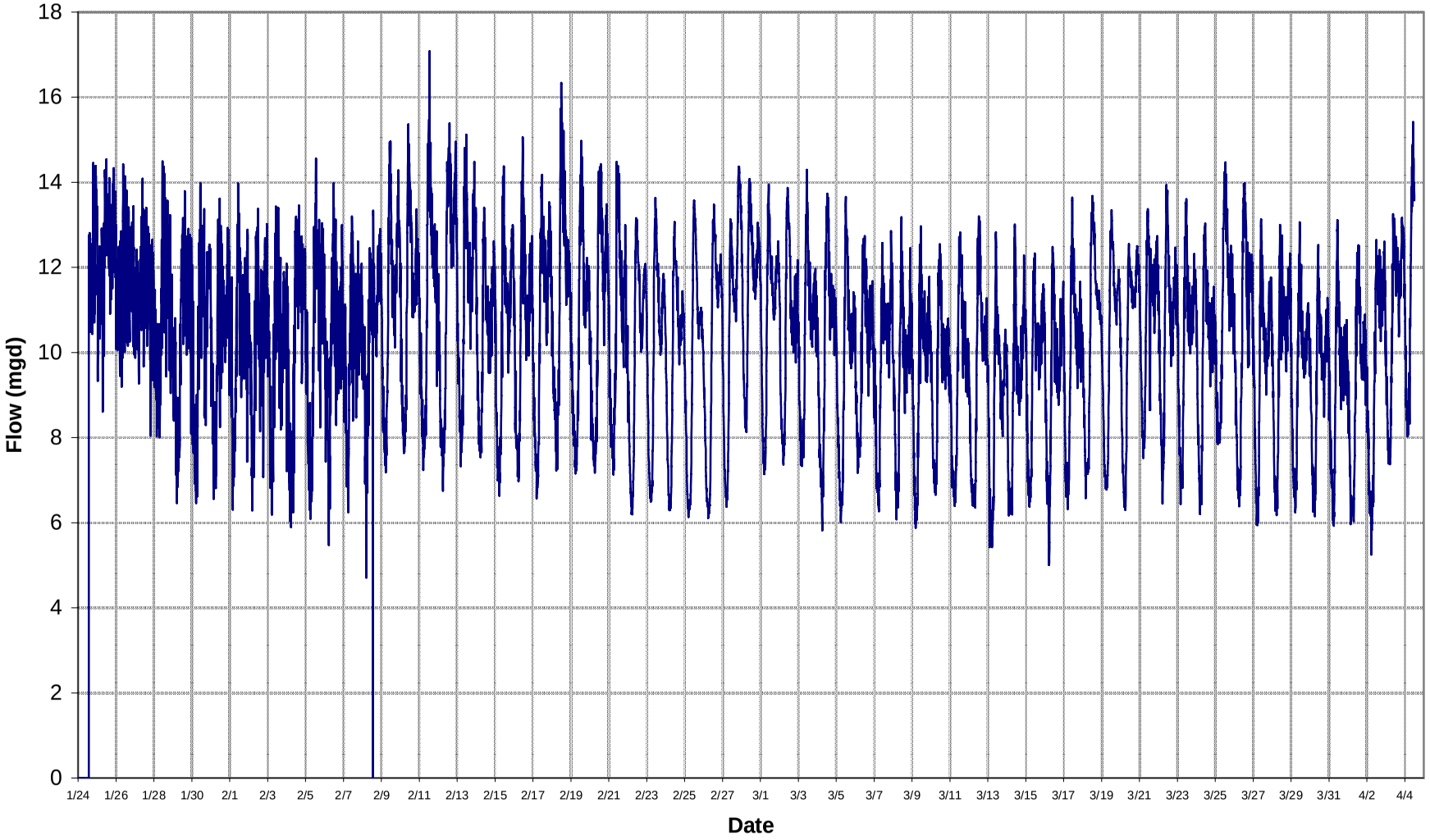
City of Santa Clara
Sanitary Sewer Flow Monitoring, Site 7



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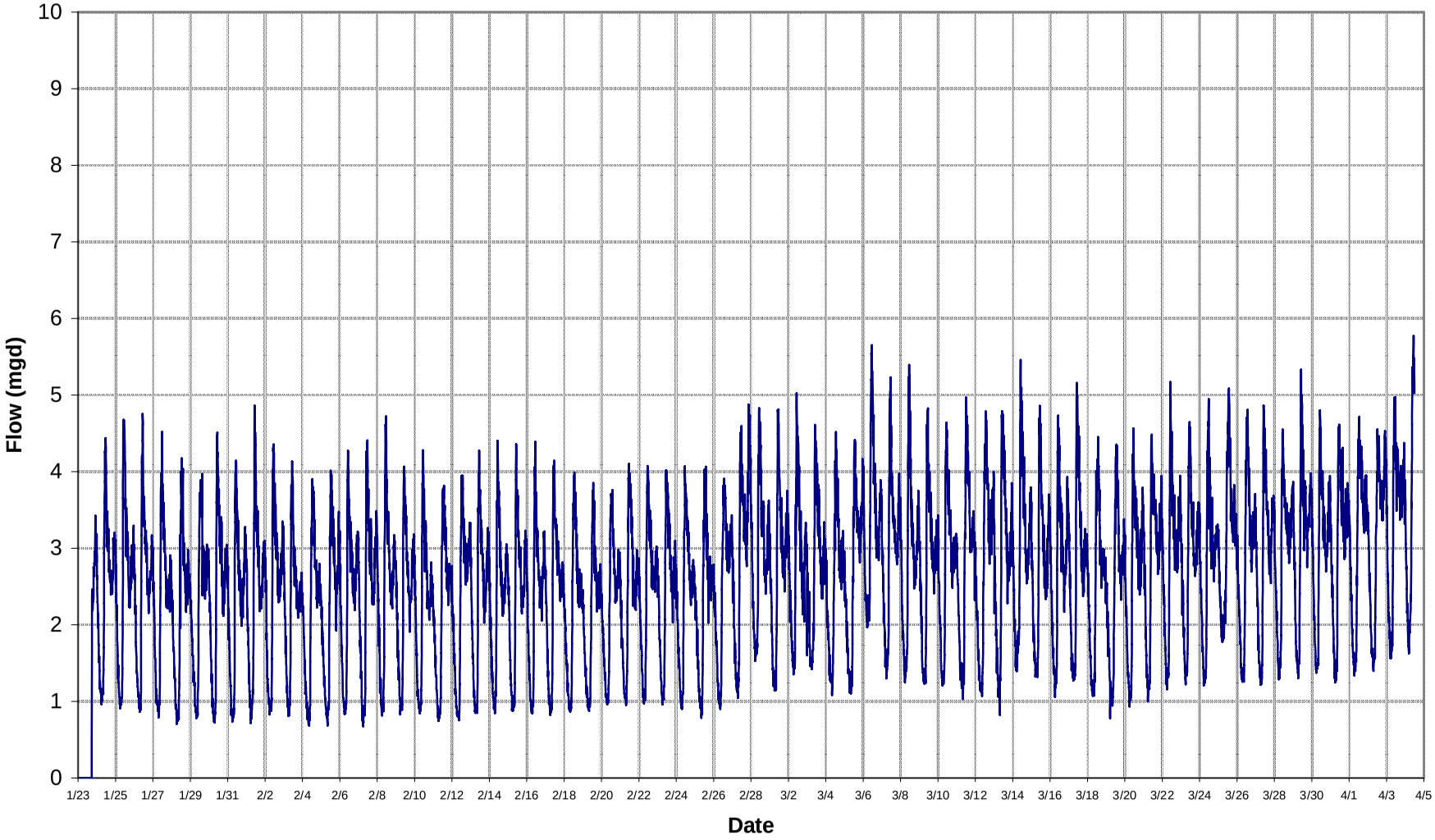
City of Santa Clara
Sanitary Sewer Flow Monitoring, Site 8



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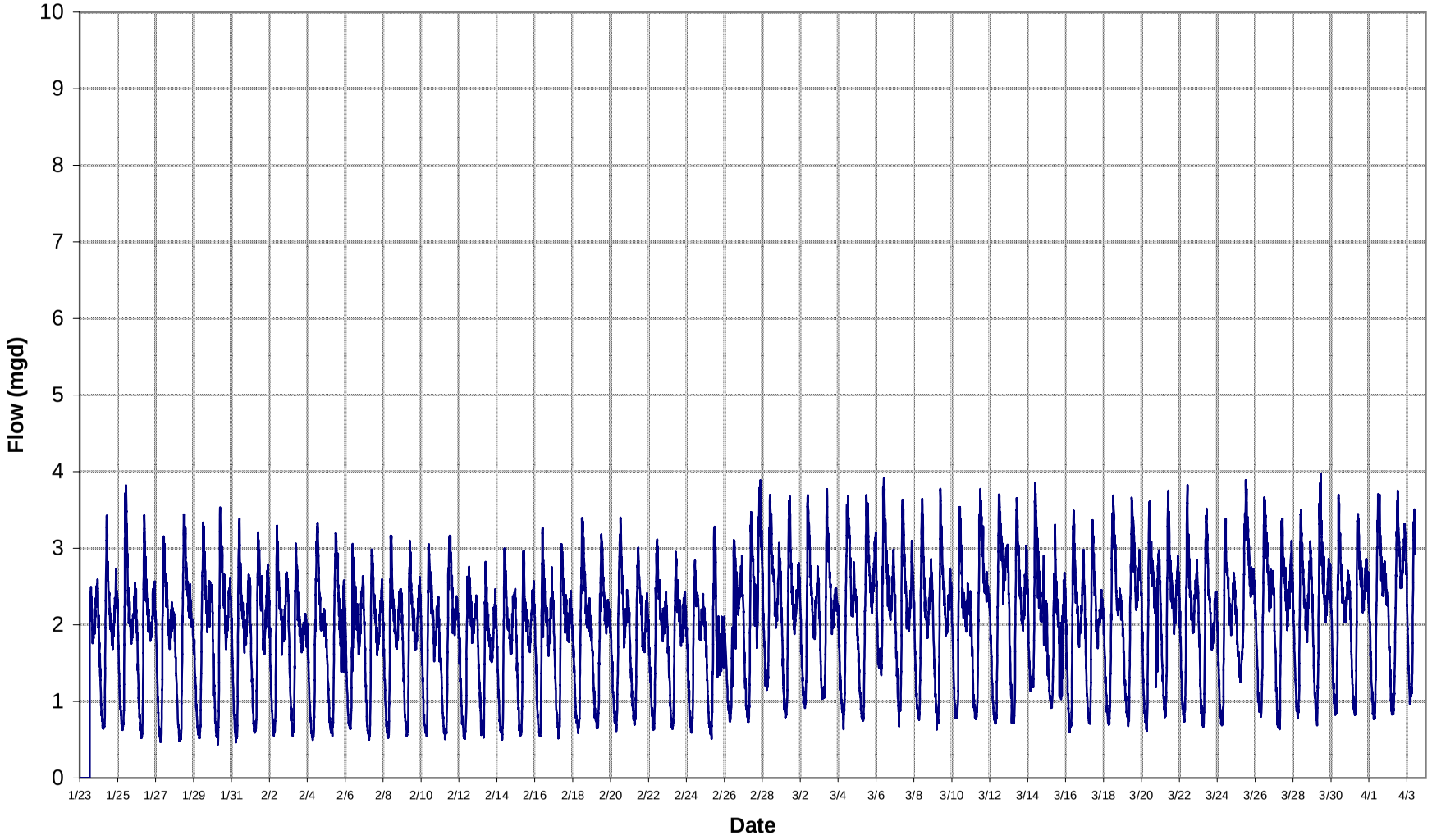
City of Santa Clara
Sanitary Sewer Flow Monitoring, Site 9



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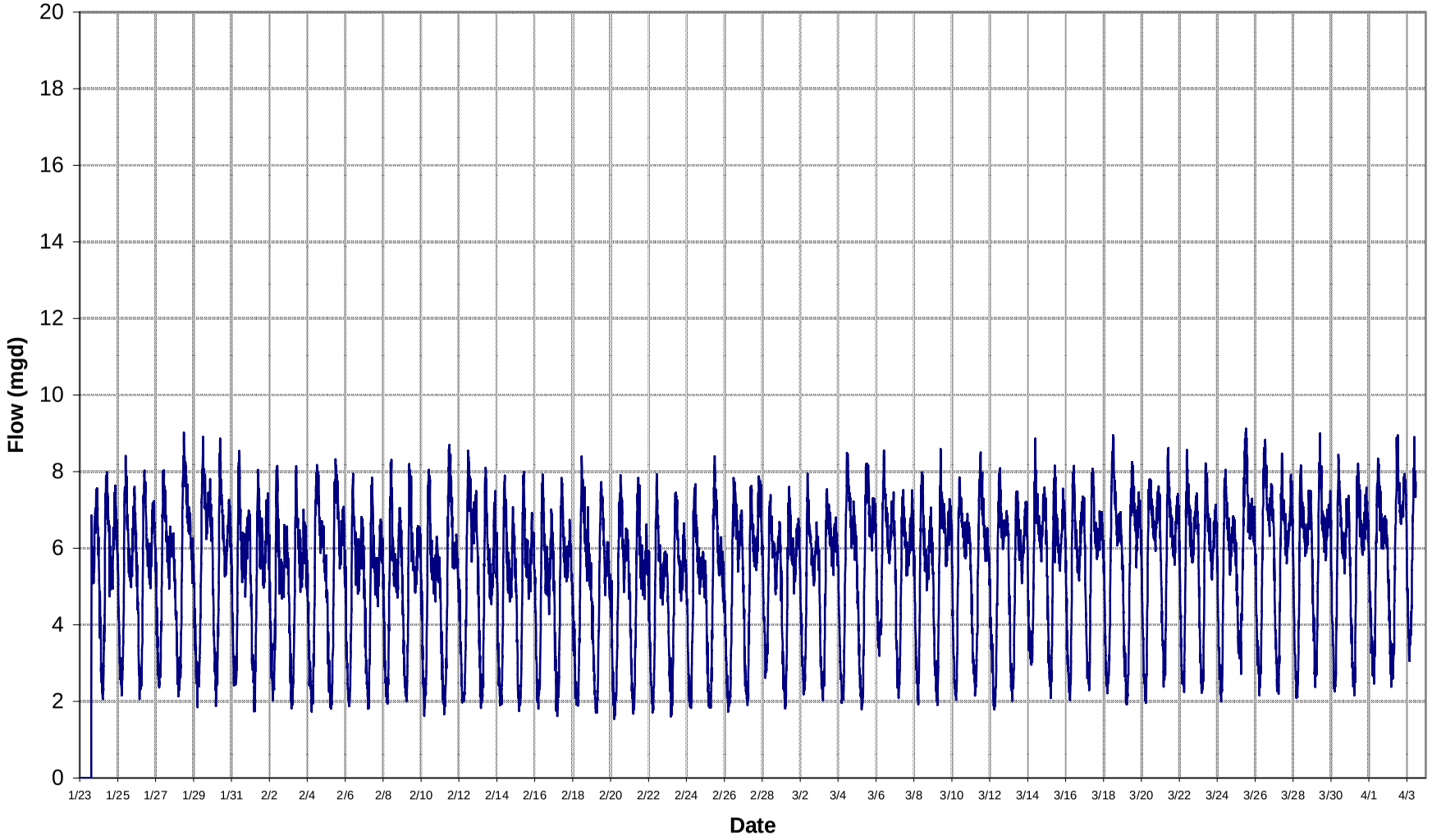
City of Santa Clara
Sanitary Sewer Flow Monitoring, Site 10



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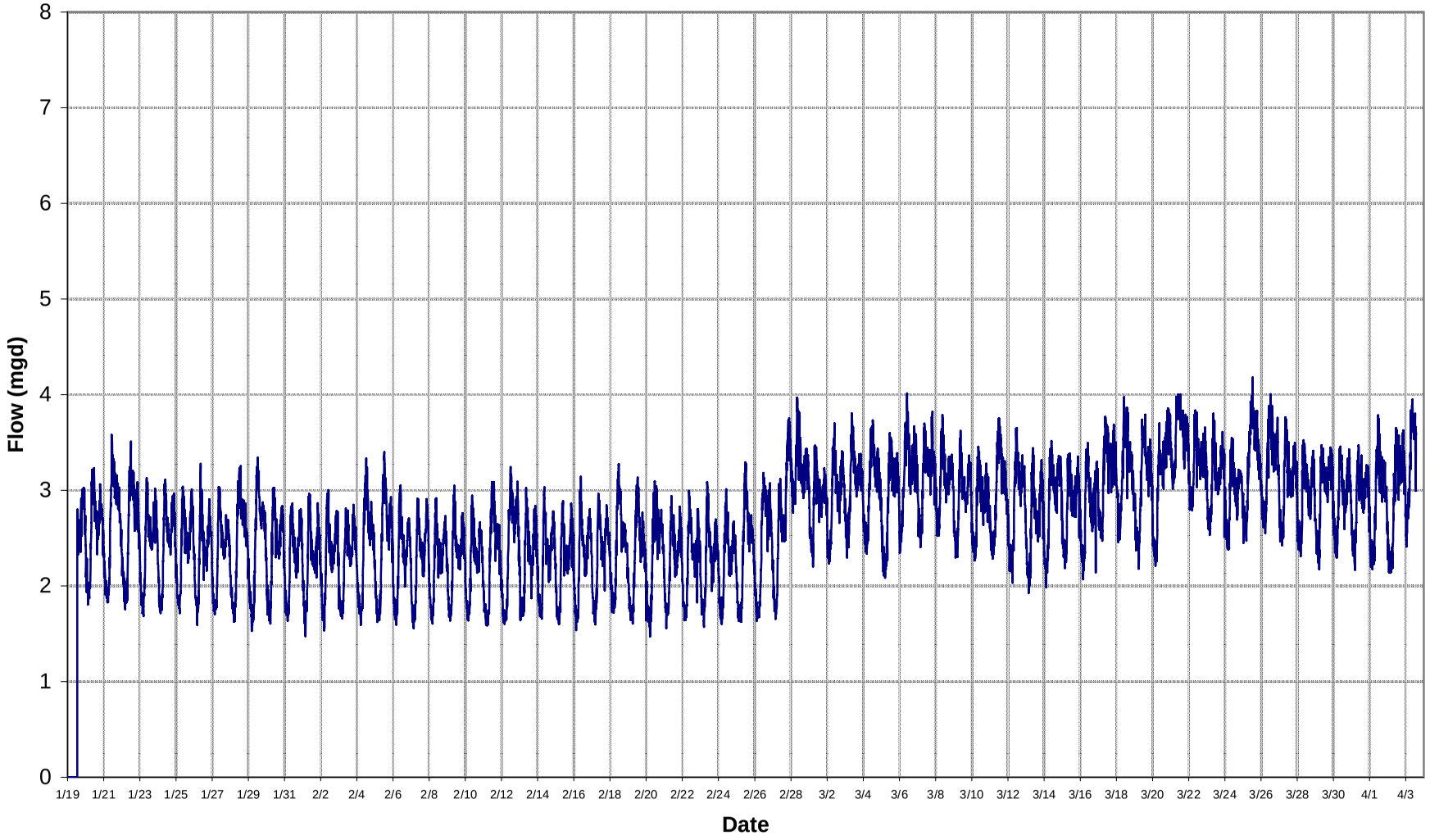
City of Santa Clara
Sanitary Sewer Flow Monitoring, Site 11



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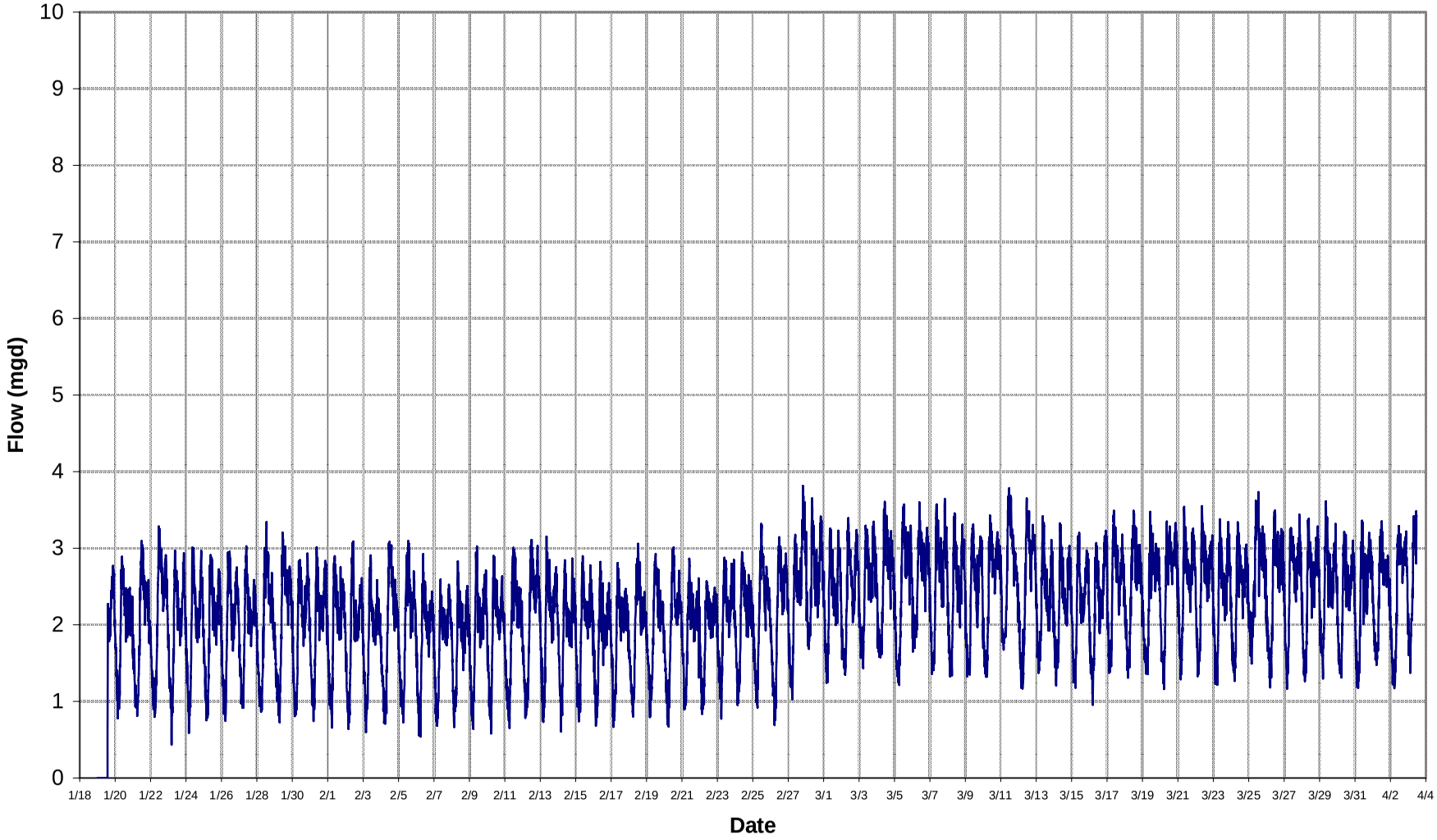
City of Santa Clara
Sanitary Sewer Flow Monitoring, Site 12



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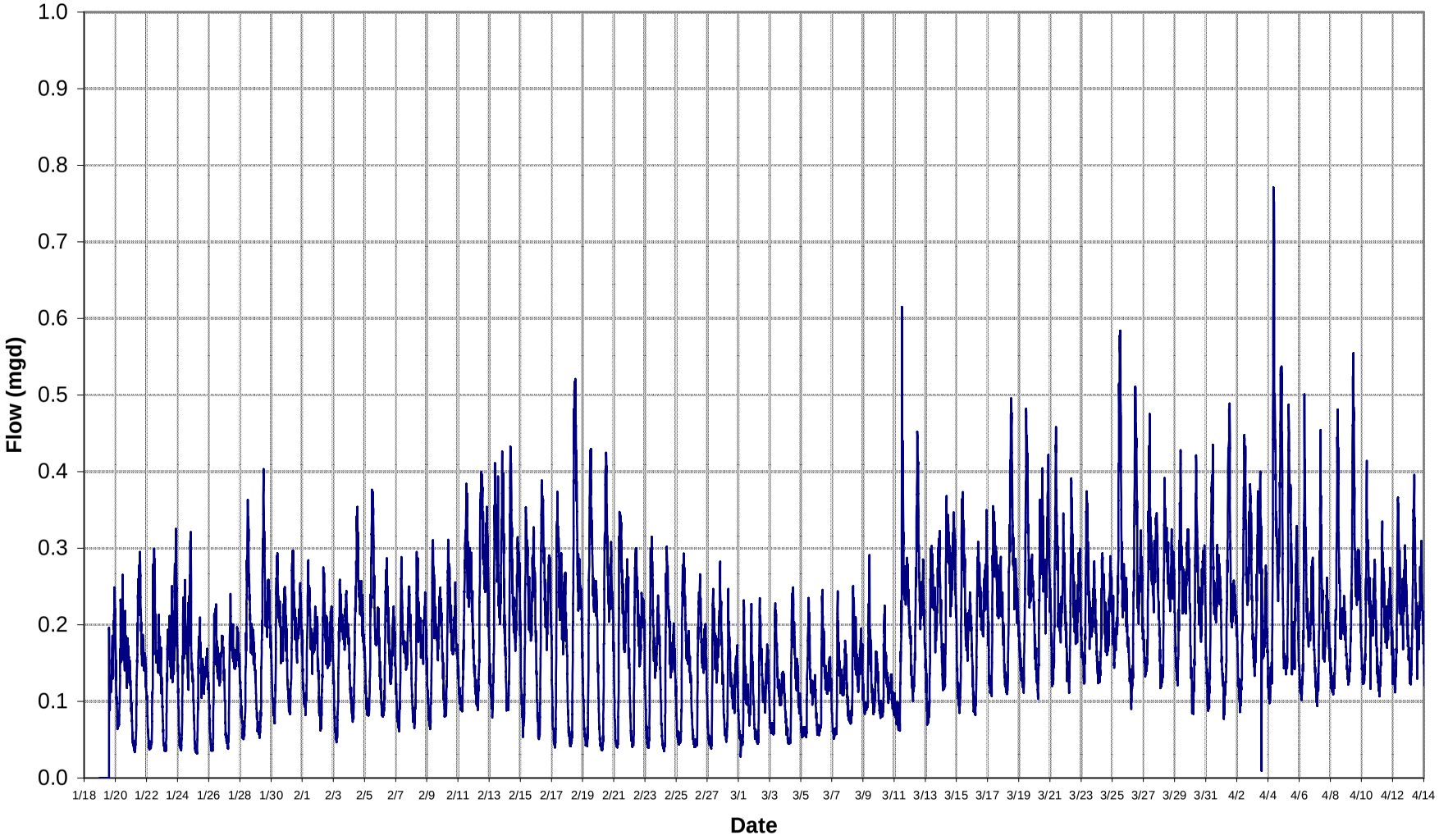
Sanitary Sewer Flow Monitoring, Site 13



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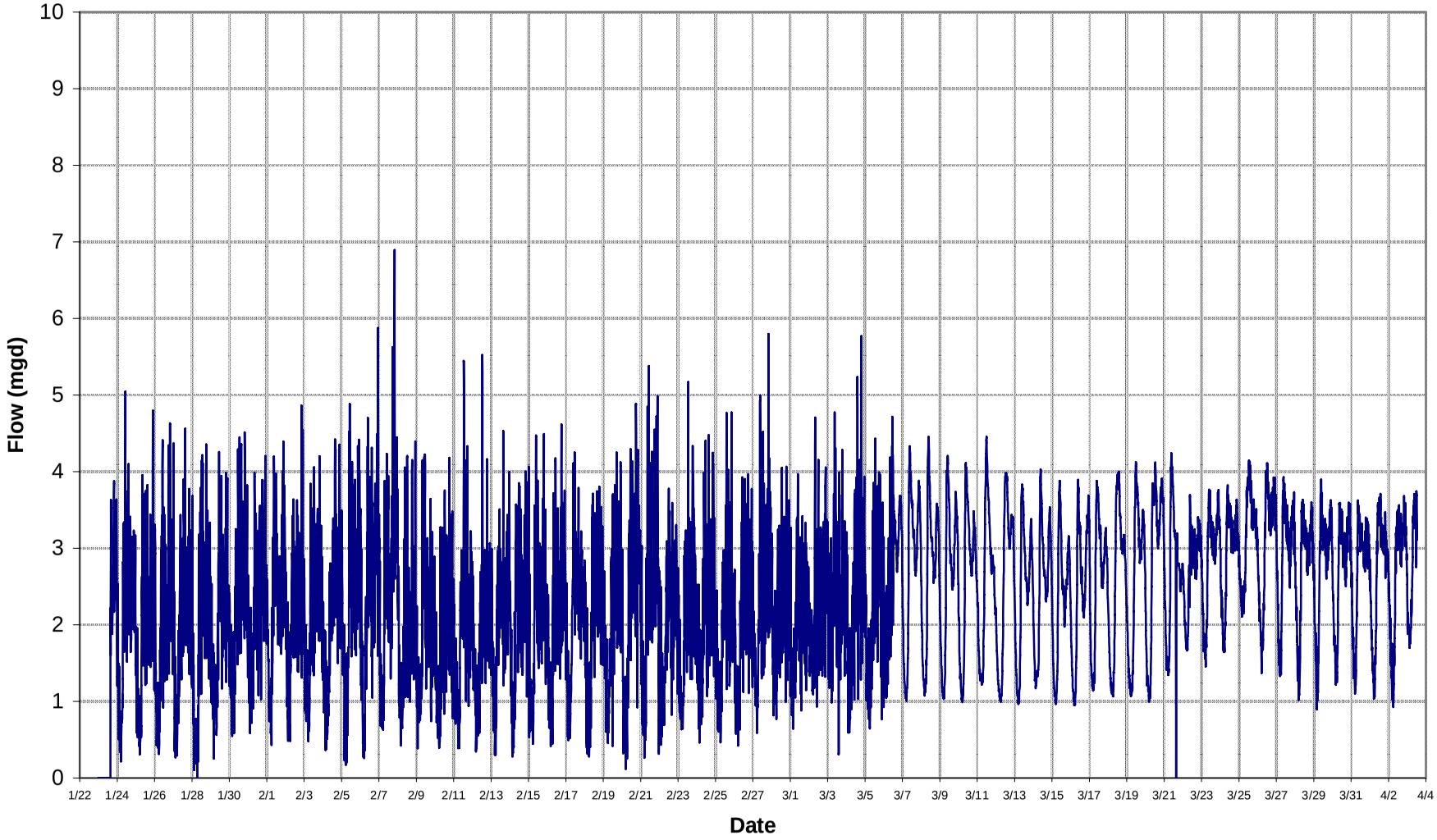
City of Santa Clara
Sanitary Sewer Flow Monitoring, Site 14



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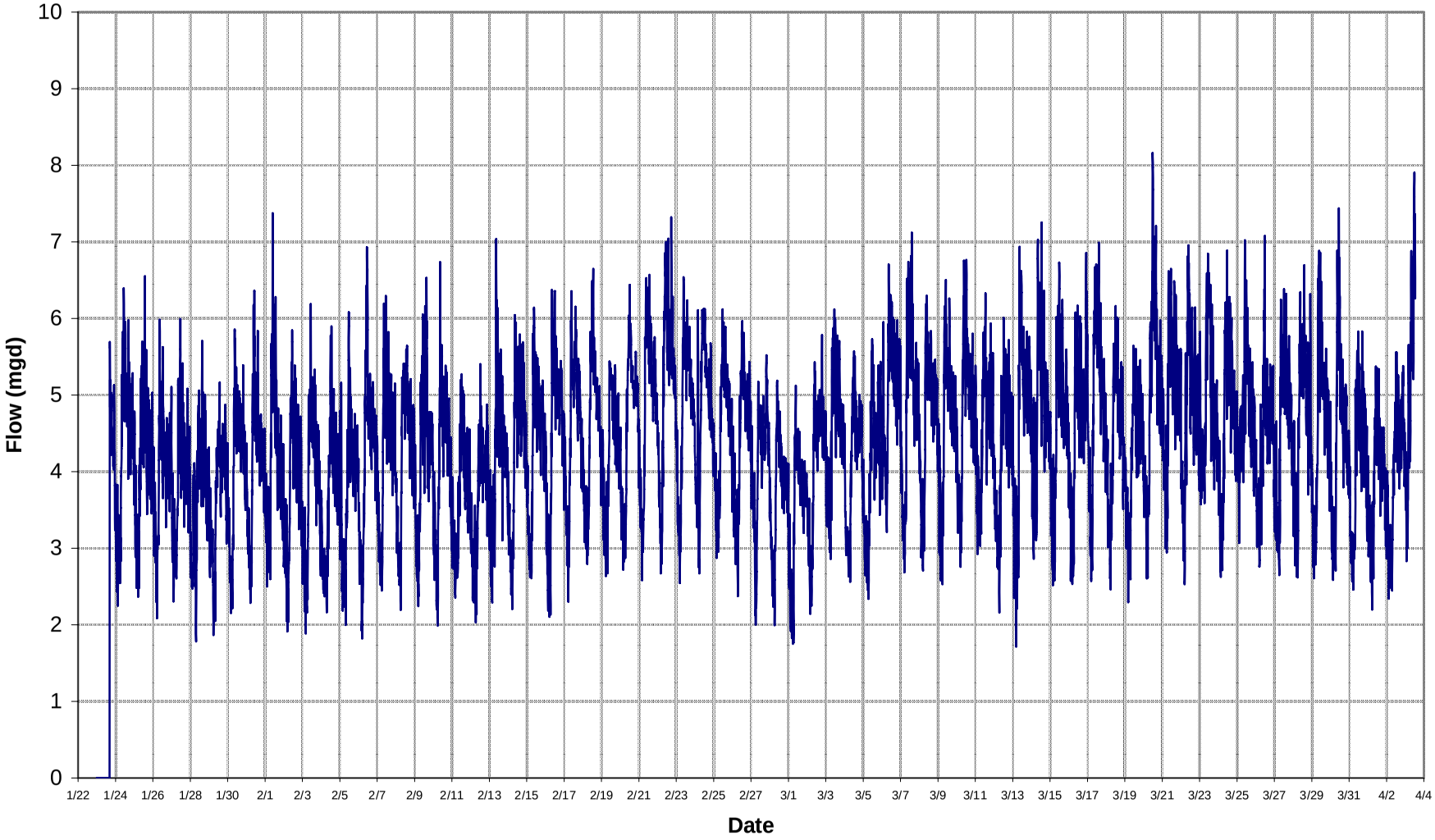
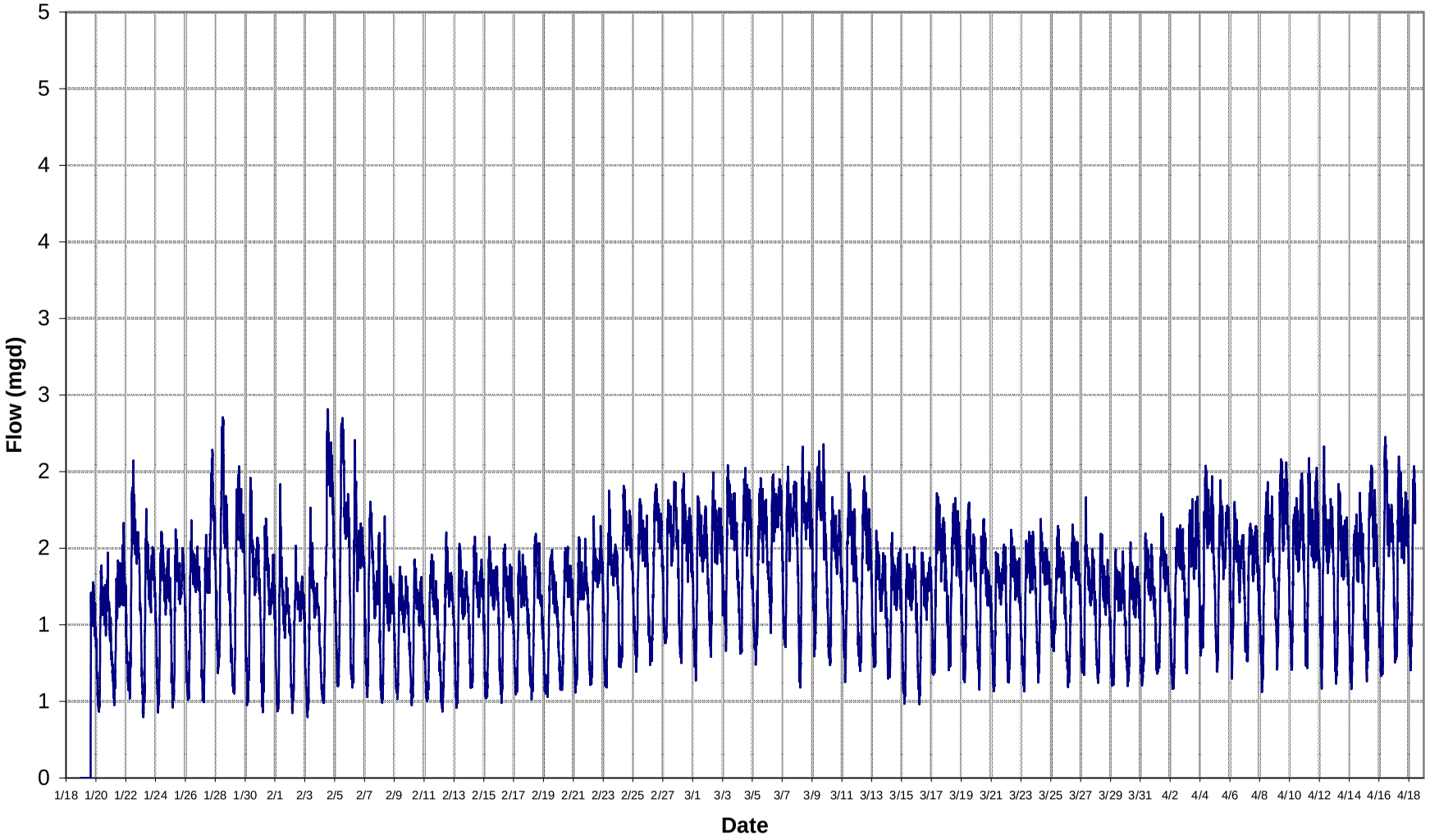
City of Santa Clara
Sanitary Sewer Flow Monitoring, Site 15



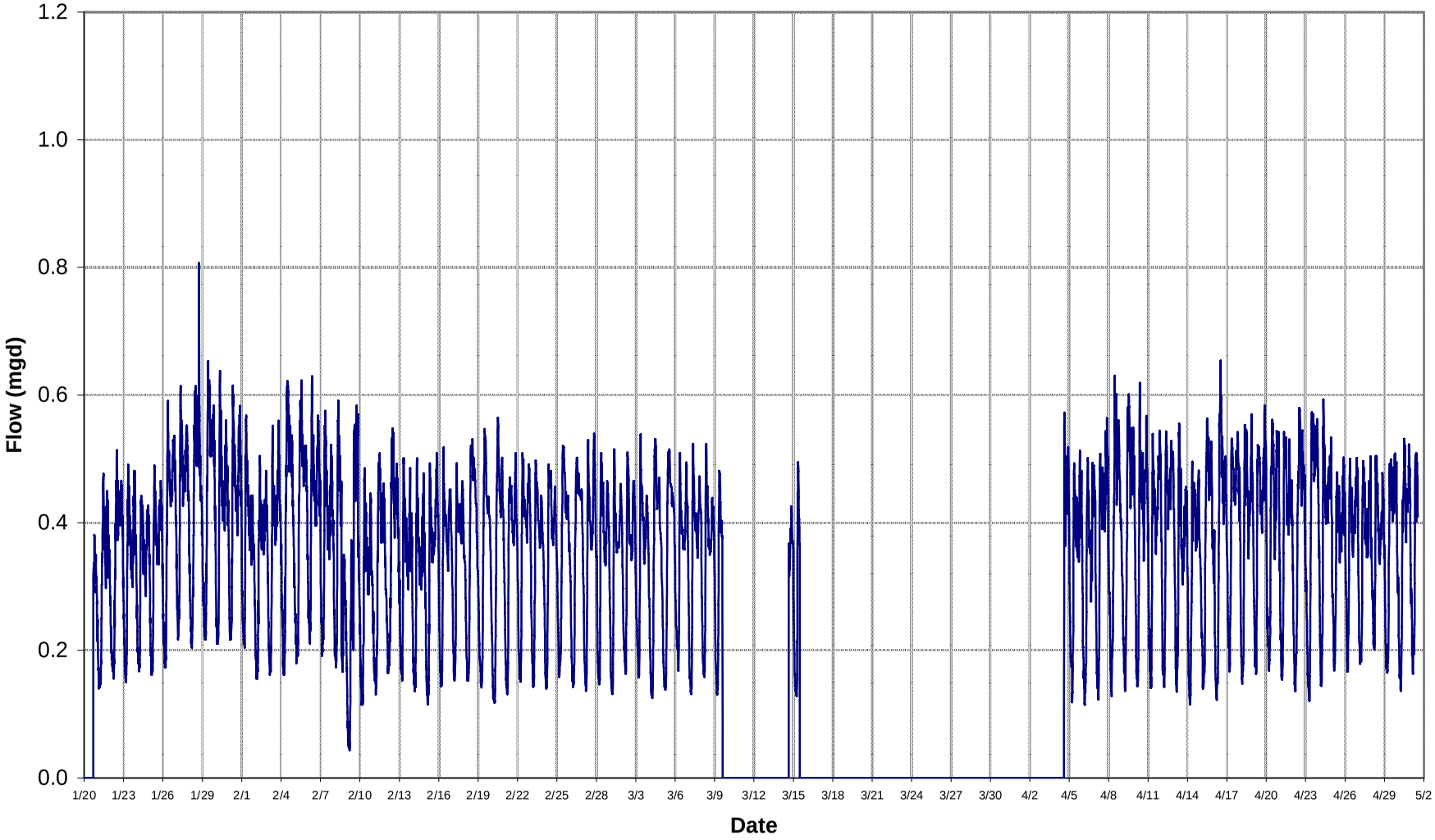
Site 15 072906.xls, Flow

City of Santa Clara
Sanitary Sewer Flow Monitoring, Site 16



Site 16 072906.xls, Flow

City of Santa Clara
Sanitary Sewer Flow Monitoring, Site 17



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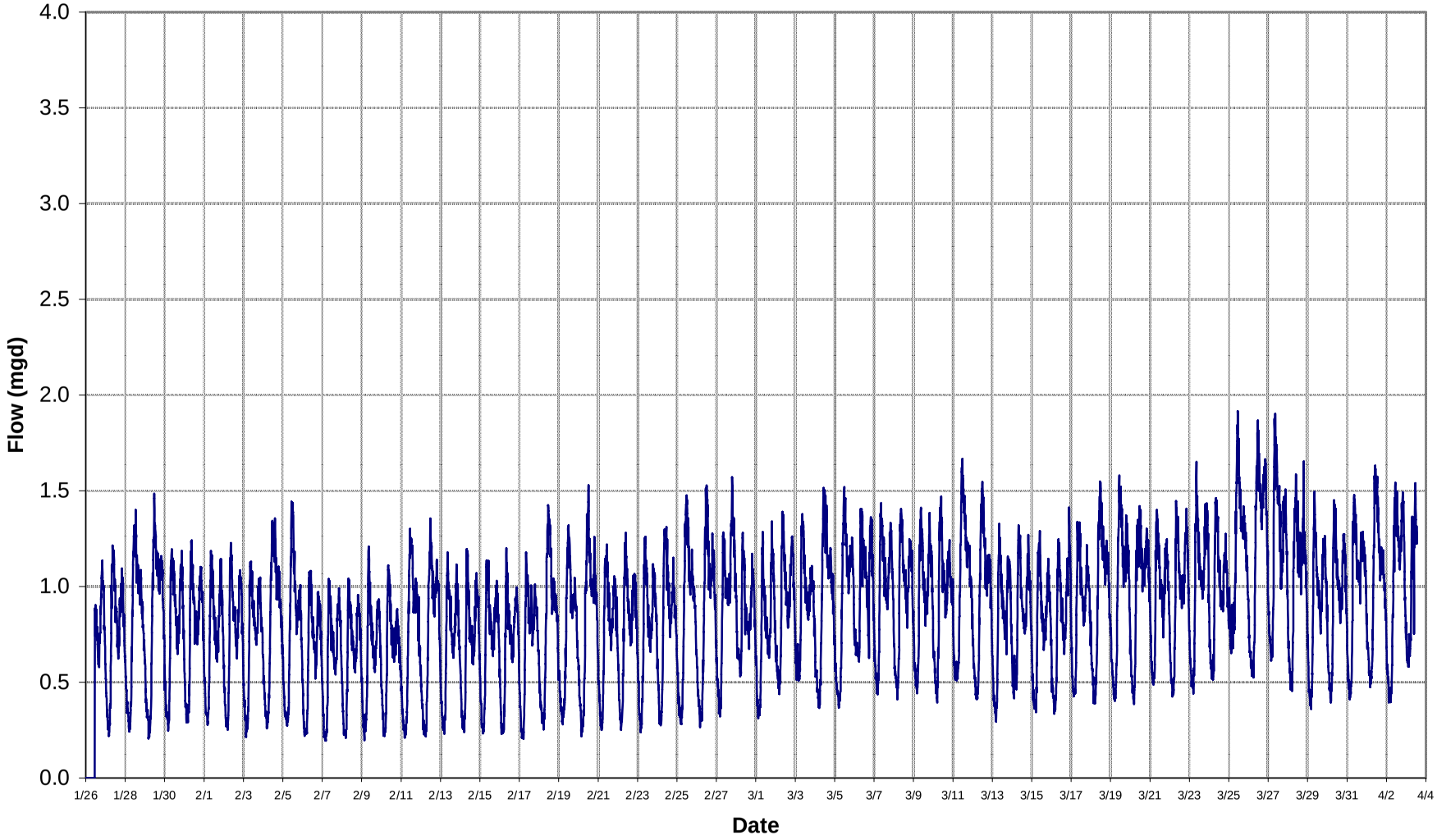
City of Santa Clara
Sanitary Sewer Flow Monitoring, Site 18



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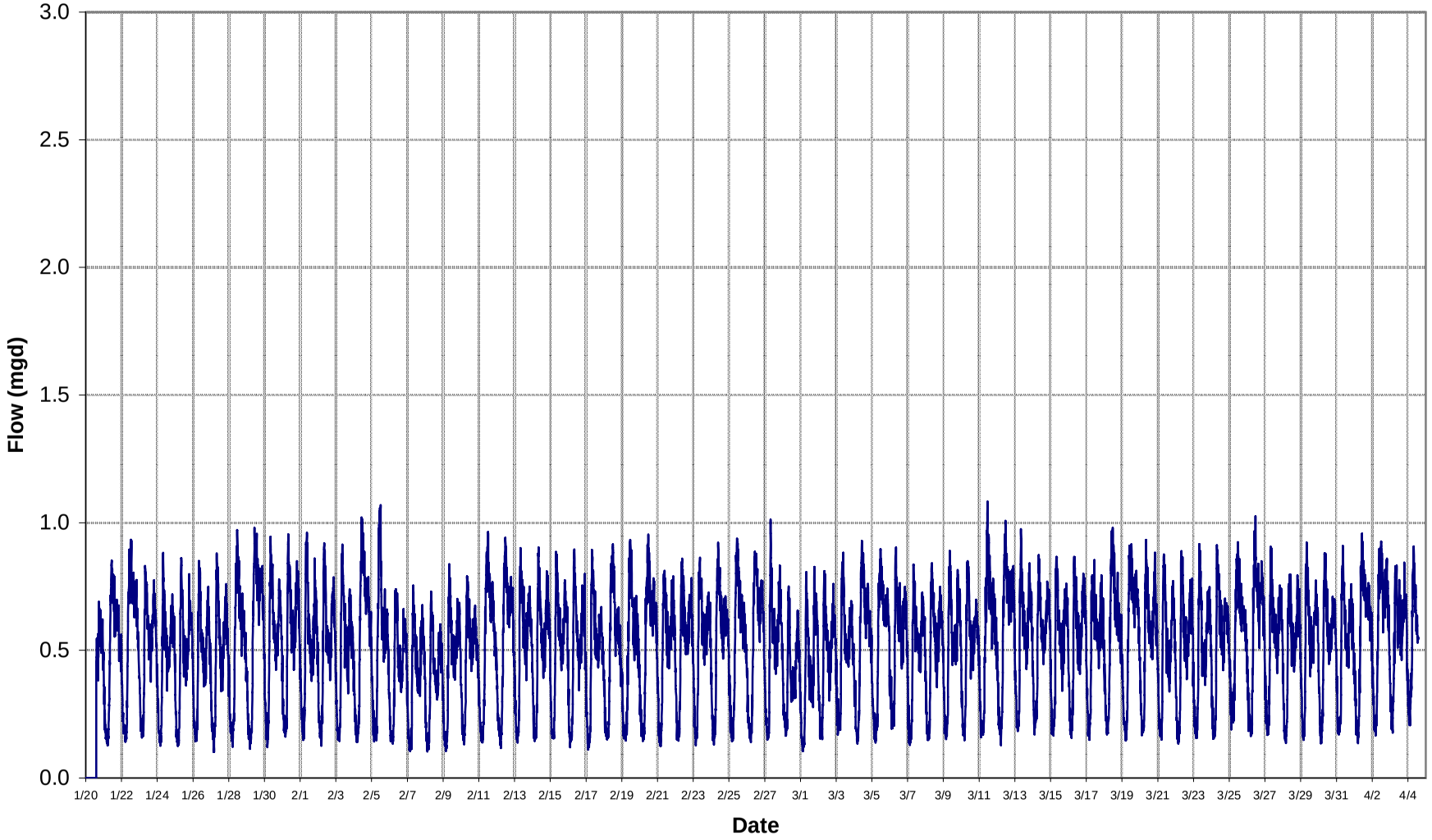
City of Santa Clara
Sanitary Sewer Flow Monitoring, Site 19



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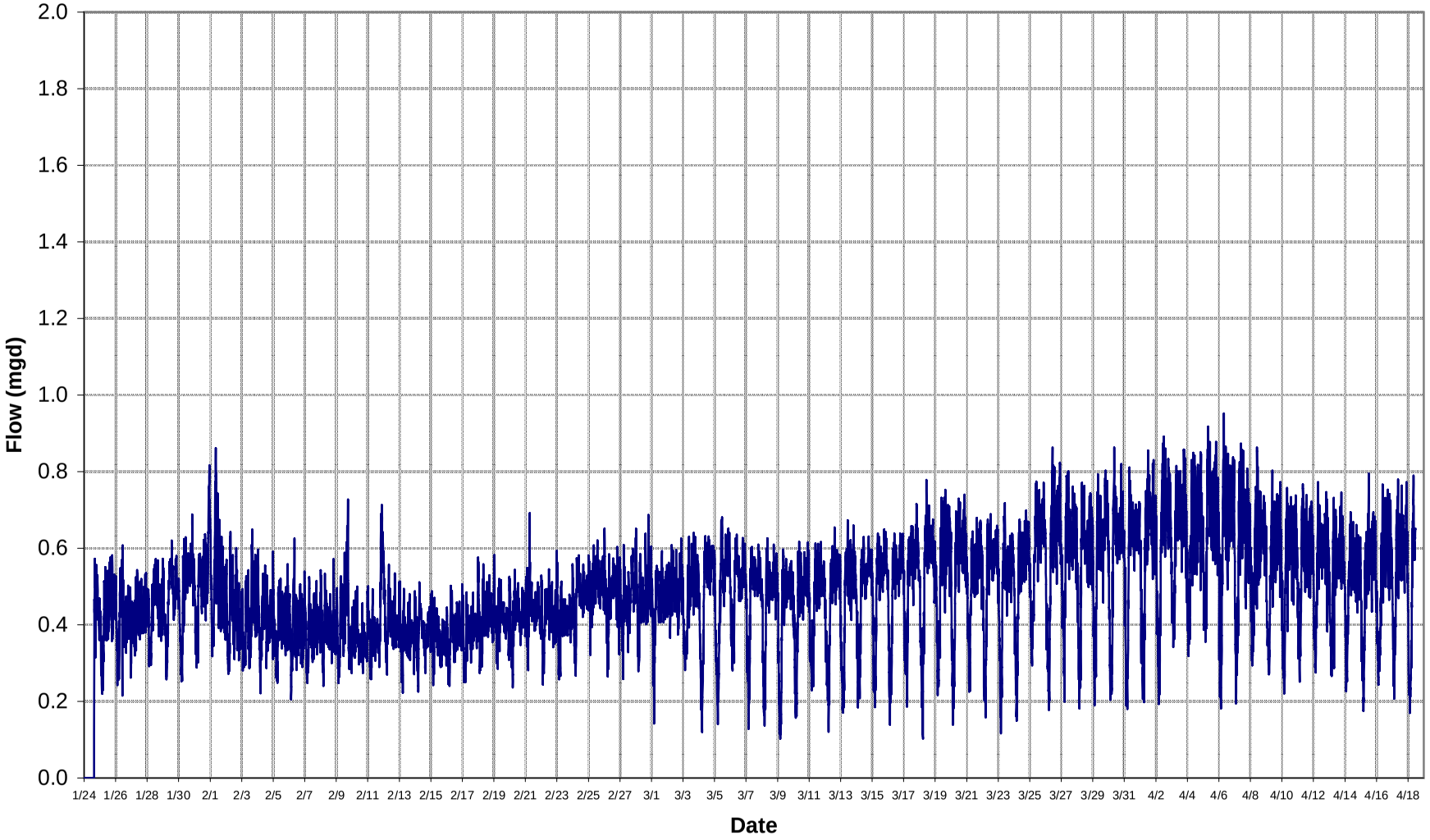
City of Santa Clara
Sanitary Sewer Flow Monitoring, Site 20



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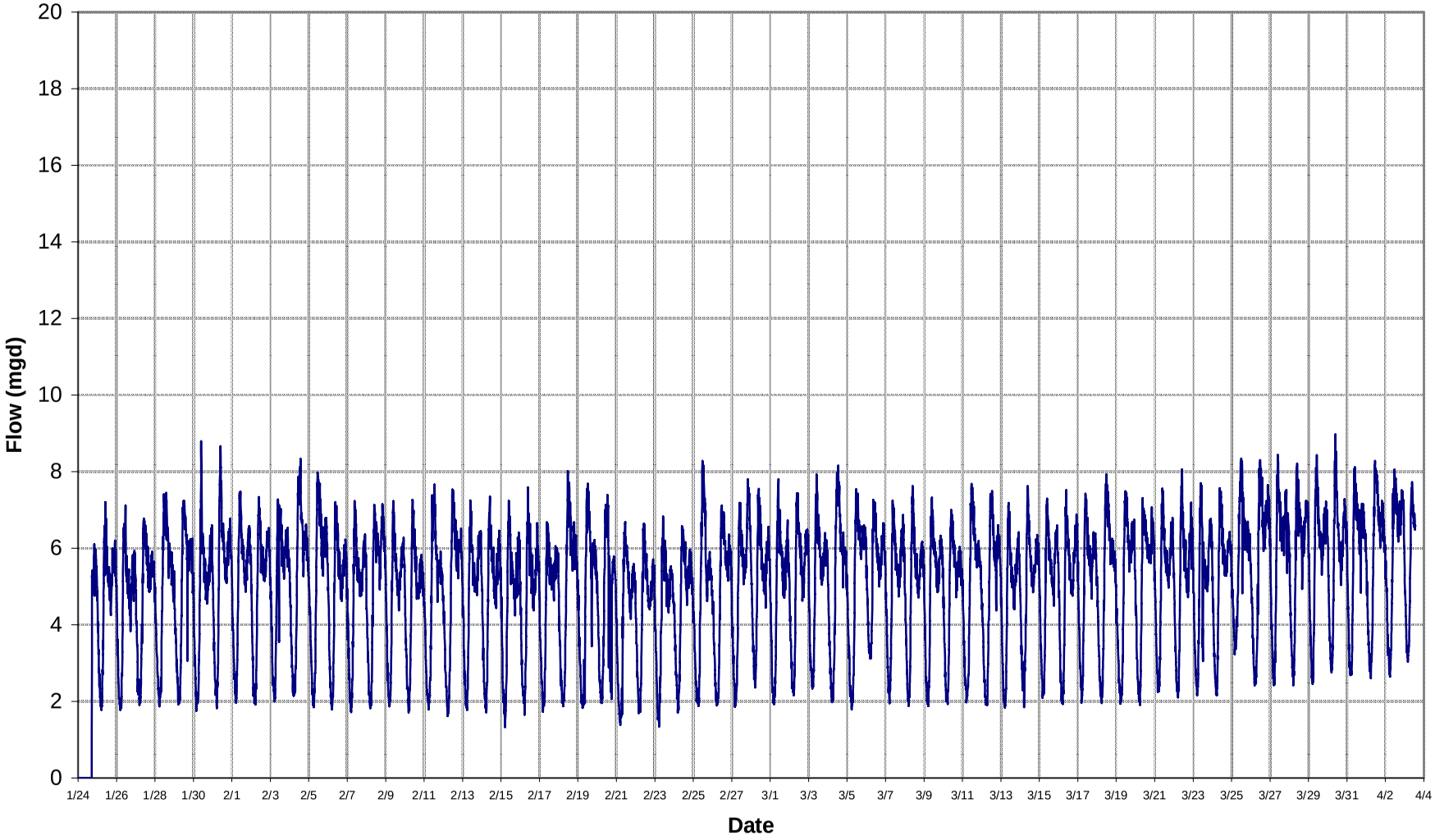

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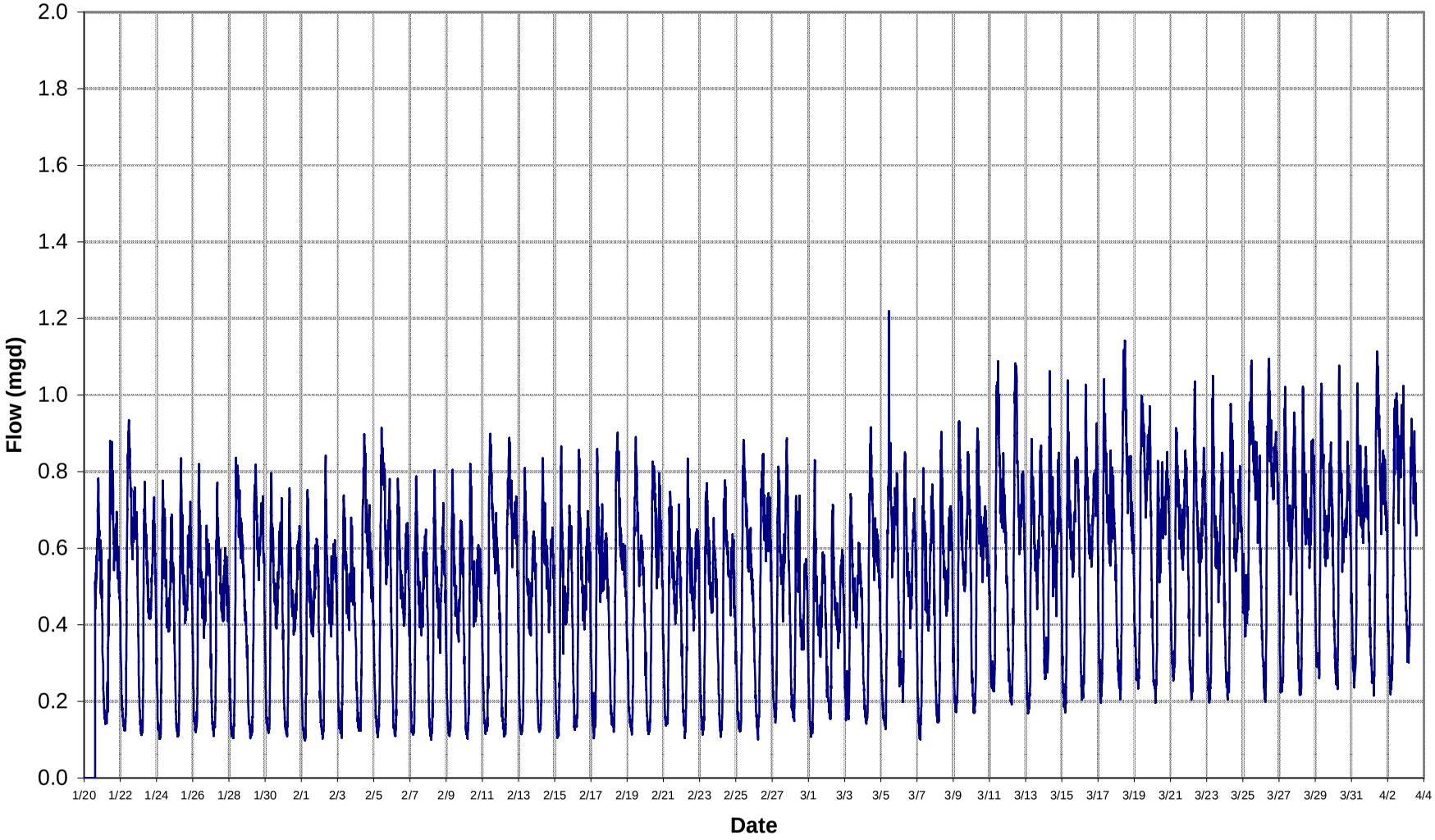
City of Santa Clara
Sanitary Sewer Flow Monitoring, Site 22



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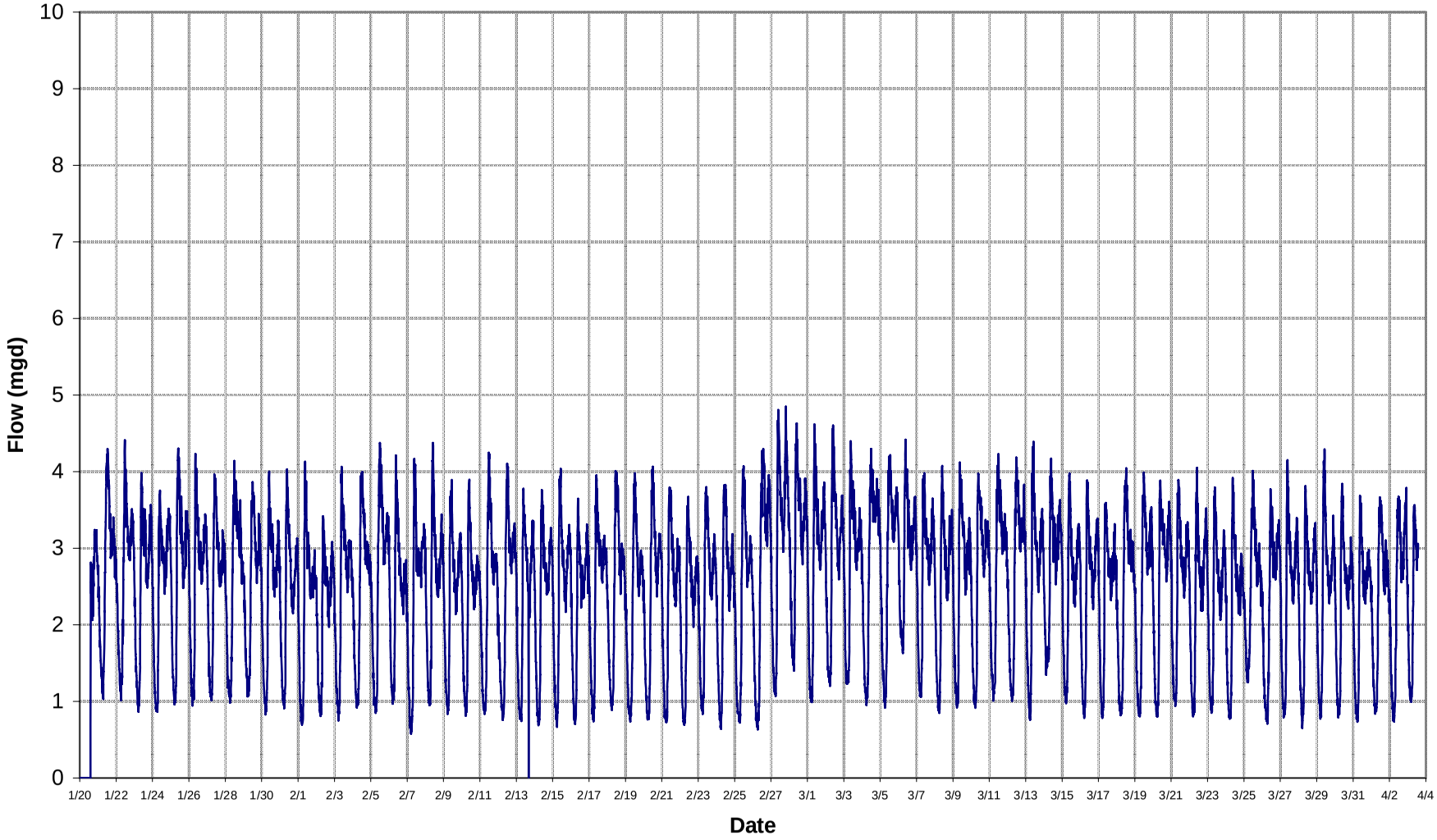
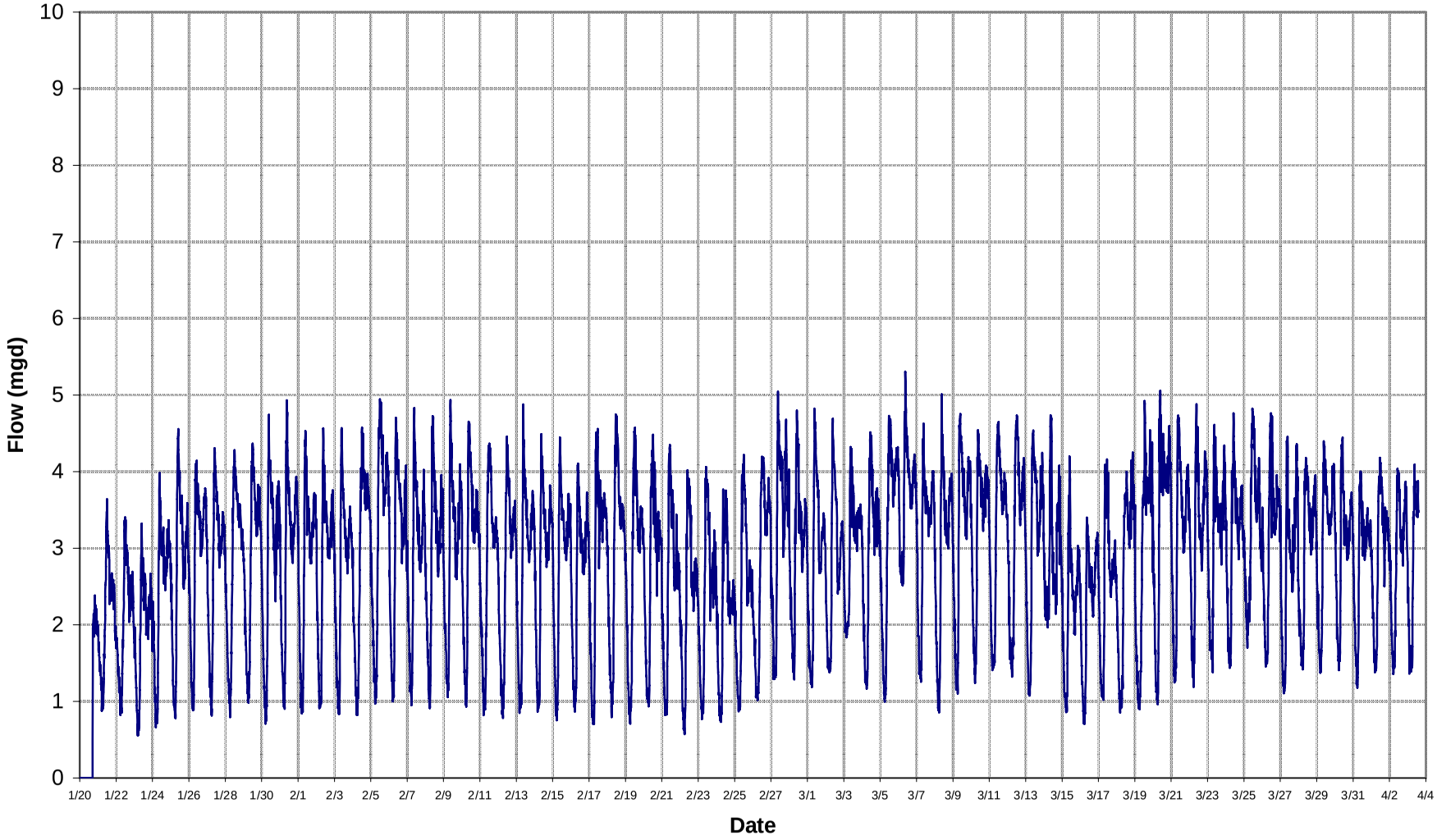
Sanitary Sewer Flow Monitoring, Site 23

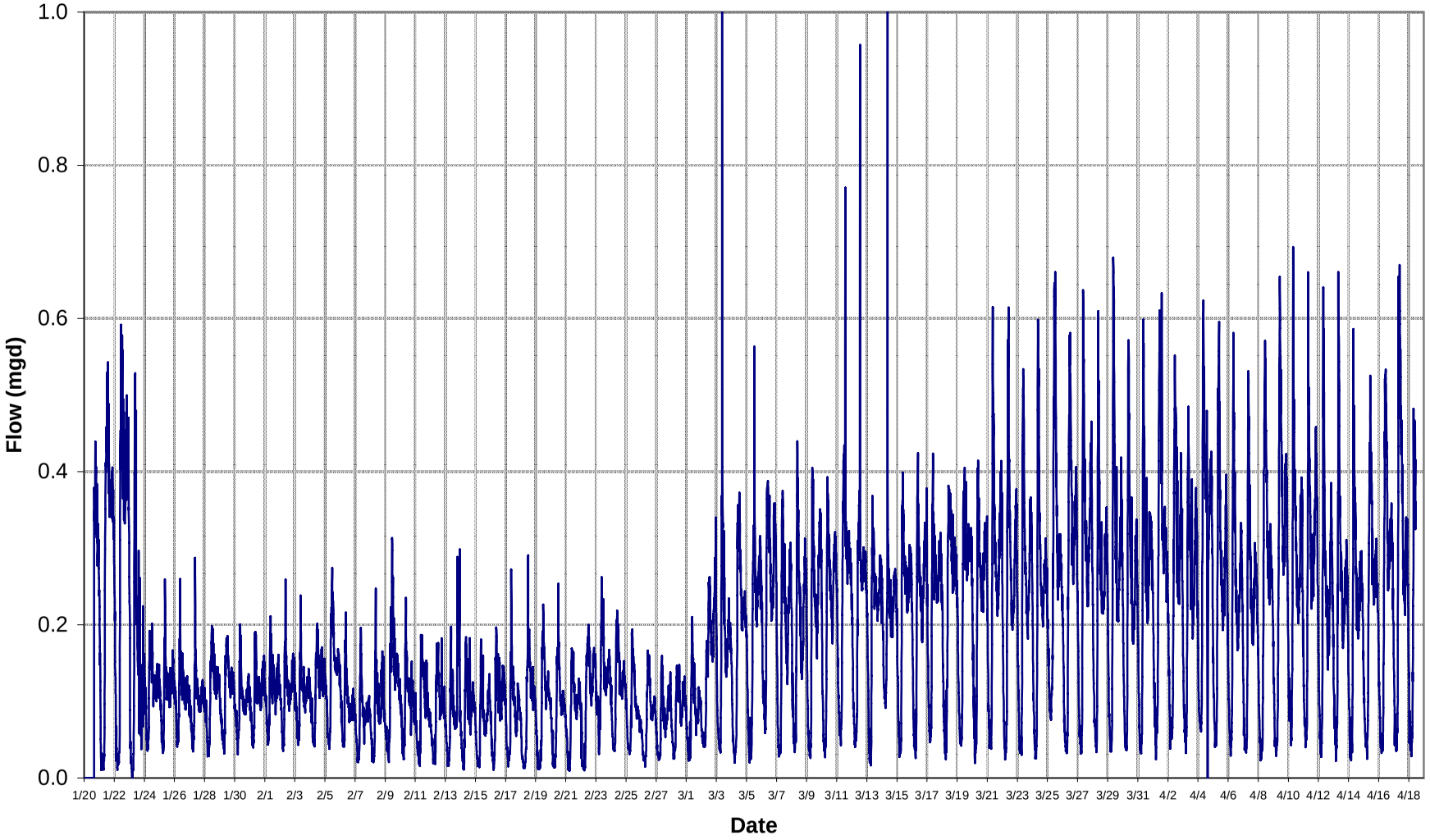


City of Santa Clara
Sanitary Sewer Flow Monitoring, Site 24



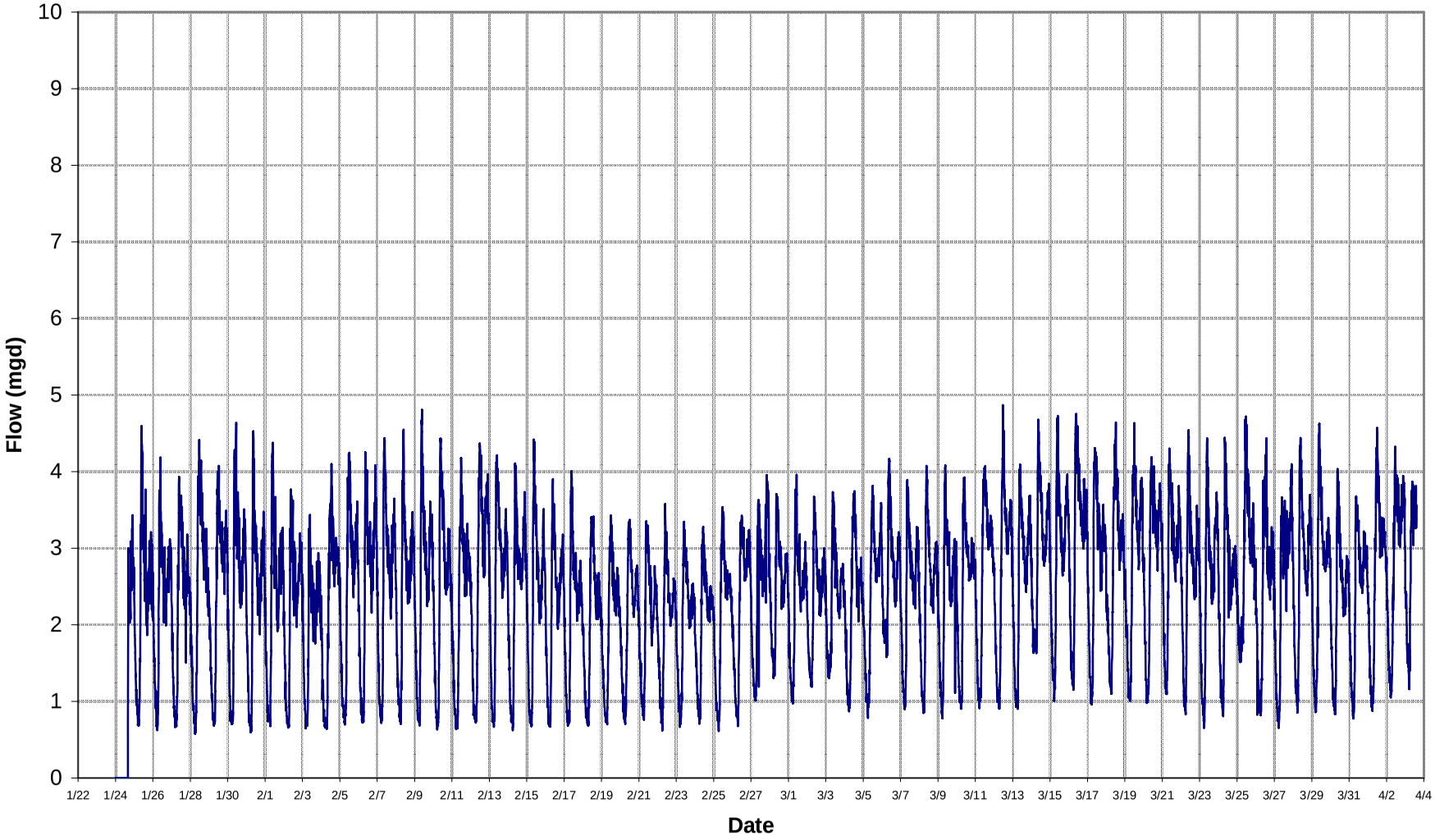
Site 24 061406.xls, Flow

City of Santa Clara
Sanitary Sewer Flow Monitoring, Site 25



Site 25 061406.xls, Flow

City of Santa Clara
Sanitary Sewer Flow Monitoring, Site 26



Site 26 072906.xls, Flow

Appendix B

Project Descriptions and Cost Estimates

TRUNK SEWER SYSTEM PROJECT DESCRIPTION

PROJECT ID:……	1
PROJECT LOCATION:……	Augustine Dr., Lakeside Dr., crossing of U.S. 101, Mission College Boulevard, Great America Pkwy. from Bowers Ave. to south of Hetch Hetchy ROW Near MH S73-20 to MH S93-57
BRIEF PROJECT DESCRIPTION:……	Install 7,200 feet of 21-inch pipeline.
SANITARY SEWER PLAT MAP(S):……	63, 73, 83, 93
LOCATION OF CAPACITY DEFICIENCY: ……	Bowers Ave., Mission College Blvd., and Great America Pkwy. from Augustine Dr. to south of Hetch Hetchy ROW Diameter of existing deficient pipes: 33"-36"
SPECIAL CONSIDERATIONS:……..	Caltrans permit required for crossing Hwy. 101. Best placement of new sewer in Lakeside Dr. is along the west side (to avoid 21" sewer, 12" water, and 24" storm drain). Best placement of new sewer in Mission College Blvd. is along west side (to avoid 18" storm drain and 30" and 33" sewers). Assume siphon under 54" storm drain and 33" and 36" sewers in Mission College Blvd. west of Great America Pkwy. Best placement for new sewer is along east side of Great America Pkwy. (to avoid 66" to 72" storm drain on west side).
ALTERNATIVES:……	New West-to-East pipeline extending from Bowers at Chromite to Central east of Lafayette.

MAJOR ITEMS	DIA. (in.)	DEPTH (feet)	LENGTH* (feet)	UNIT COST	COST
BASELINE CONSTRUCTION COST					
Pipe Construction					
Augustine Dr, Lakeside Dr. and HWY 101 Crossing	21	8-16	2,300'	210 $/ft	$483,000
HWY 101 (casing)	43	Microtunnel	700'	1,000 $/ft	$700,000
Mission College Blvd.	21	8-16	2,900'	210 $/ft	$609,000
Mission College Blvd. double 15" Siphon under utilties	49	Microtunnel	50'	1,200 $/ft	$60,000
Carrier piping for 15-inch double siphon	15	Carrier pipe	100'	180 $/ft	$18,000
Great America Parkway	21	8-16	2,000'	210 $/ft	$420,000
Jacking Pits			2 pits	$70,000	$140,000
Receiving Pits			2 pits	$40,000	$80,000
Structures					
Sewer Junction Structure: Lakeside and Augustine				$6,000	$6,000
Sewer Junction Structure: Lakeside Drive near HWY 101				$6,000	$6,000
Siphon structures at Mission College Blvd			2 structures	$6,000	$12,000
Sewer Junction Structure: Great America Pkwy. near Patrick Henry				$6,000	$6,000
Sewer Junction Structure: connection to S93-57				$6,000	$6,000
SITE SPECIFIC CONSTRUCTION COST					
High Groundwater					
Dewatering (North of HWY 101)			4,900'	50 $/ft	$245,000
Sheeting/Shoring					
Solid Shoring (North of HWY 101)			4,900'	50 $/ft	$245,000
SUBTOTAL					**$3,036,000**
Mobilization and Demobilization				5%	$151,800
Traffic Control				10%	$303,600
CONSTRUCTION COST SUBTOTAL					**$3,491,400**
Contingencies				30%	$1,047,420
CONSTRUCTION COST TOTAL					**$4,538,820**
Engineering and Inspection Costs				25%	$1,134,705
CAPITAL IMPROVEMENT COST TOTAL					**$5,673,525**
ENR = 9103 (S.F. March 2007)				**rounded**	**$5,674,000**

* Pipe lengths include carrier pipe for siphons, double siphons and tunneled sewers.

TRUNK SEWER SYSTEM PROJECT DESCRIPTION

PROJECT ID:……	2
PROJECT LOCATION:……	Chromite Dr., Alhambra Dr., Bracher Park, crossing of UPRR, Bowers Ave. from Bowers Ave. to Augustine Dr. MH S53-34 to near MH S73-20
BRIEF PROJECT DESCRIPTION:……	Install 6,200 feet of 21-inch pipe.
SANITARY SEWER PLAT MAP(S):……	53, 63
LOCATION OF CAPACITY DEFICIENCY: ……	Bowers Ave. from Chromite Dr. to Augustine Dr. Diameter of existing deficient pipes: 27"-33"
SPECIAL CONSIDERATIONS:……..	UPRR permit required for crossing. County permit required for crossing Central Expwy. Permanent easements required through properties on Walsh and Bowers north of UPRR. Best placement for new sewer is along east side of Bowers south of Central Expwy. and along west side of Bowers north of Central Expwy (to avoid 12" water and 42" storm drain). Trenchless crossing assumed under Central Expwy.
ALTERNATIVES:……	New West-to-East pipeline extending from Bowers at Chromite to Central east of Lafayette. Alternative UPRR crossing from Park through City-owned substation not selected due to utility conflicts (this alignment might be feasible, but it is not considered best alternative).

MAJOR ITEMS	DIA. (in.)	DEPTH (feet)	LENGTH* (feet)	UNIT COST	COST
BASELINE CONSTRUCTION COST					
Pipe Construction					
Chromite, Alhambra, Bracher Park, easement to Bowers	21	8-16	2,300'	210 $/ft	$483,000
UPRR Crossing (casing)	43	Microtunnel	1,350'	1,000 $/ft	$1,350,000
Central Expressway (casing)	43	Microtunnel	600'	1,000 $/ft	$600,000
Bowers Ave (Mead to Augustine)	21	8-16	3,900'	210 $/ft	$819,000
Jacking Pits			2 pits	$70,000	$140,000
Receiving Pits**			3 pits	$40,000	$120,000
Structures					
Sewer Junction Structure: Bowers and Chromite				$6,000	$6,000
Sewer Junction Structure: Bowers and Walsh				$6,000	$6,000
Sewer Junction Structure: Bowers and Central				$6,000	$6,000
Sewer Junction Structure: Bowers and Scott				$6,000	$6,000
SUBTOTAL					**$3,536,000**
Mobilization and Demobilization				5%	$176,800
Traffic Control				10%	$353,600
CONSTRUCTION COST SUBTOTAL					**$4,066,400**
Contingencies				30%	$1,219,920
CONSTRUCTION COST TOTAL					**$5,286,320**
Land Acquisition - Temporary Easement Cost (Trenchless staging)		150' wide	150'	4 $/sf	$78,750
Land Acquisition - Permanent Easement Cost (Pipeline Alignment)		30' wide	850'	25 $/sf	$637,500
Engineering and Inspection Costs				25%	$1,321,580
CAPITAL IMPROVEMENT COST TOTAL					**$7,324,150**
ENR = 9103 (S.F. March 2007)				**rounded**	**$7,324,000**

* Pipe lengths include carrier pipe for siphons, double siphons and tunneled sewers.

** For tunneling under UPRR to Bowers, two receiving pits and one jacking pit are needed.

TRUNK SEWER SYSTEM PROJECT DESCRIPTION

PROJECT ID:……	West-to-East Alternative
PROJECT LOCATION:……	Chromite Dr., Alhambra Dr., Bracher Park, crossing of UPRR, Walsh Ave., Lafayette, Lafayette St., Central Expwy. From Bowers Dr. to UPRR MH S53-41 to MH S67-18
BRIEF PROJECT DESCRIPTION:……	Install 12,200 feet of 24-inch pipe.
SANITARY SEWER PLAT MAP(S):……	53, 54, 55, 56, 63, 64, 66, 67
LOCATION OF CAPACITY DEFICIENCY: ……	Bowers Ave., Mission College Blvd., and Great America Pkwy. from Chromite to south of Hetch Hetchy ROW Diameter of existing deficient pipes: 27"-36"
SPECIAL CONSIDERATIONS:……	UPRR Permit required for crossing. Permanent easement needed for crossing into parking lot on north side of UPRR to Walsh. SCVWD permit required for crossing San Tomas Creek. County permit required for crossing San Tomas Expwy. and work in Central Expwy. Best placement for new sewer along Walsh is on north side (to avoid 15" sewer, 12" water, and 15" storm drain. On Walsh between Scott and Lafayette, reolcation of existing water line may be needed. Best placement for new sewer along Lafayette is on west side (to avoid 45" storm drain and 12" water). Siphons (assume twin 15") required to cross San Tomas Aquino Creek and storm drains at Scott and Lafayette.
ALTERNATIVES:……	Projects 1 and 2.

MAJOR ITEMS	DIA. (in.)	DEPTH (feet)	LENGTH* (feet)	UNIT COST	COST
BASELINE CONSTRUCTION COST					
Pipe Construction					
Chromite, Alhambra, Bracher Park, easement to Walsh	24	8-16	2,300'	220 $/ft	$506,000
Walsh, Lafayette, and Central Expwy.	24	8-16	9,900'	220 $/ft	$2,178,000
UPRR Crossing (casing)**	49	Microtunnel	1,350'	1,200 $/ft	$1,620,000
San Tomas Aquino Creek Crossing Siphon (casing)	49	Microtunnel	200'	1,200 $/ft	$240,000
San Tomas Expwy. Crossing (casing)	49	Microtunnel	400'	1,200 $/ft	$480,000
Scott Blvd. siphon under street and strom drain (casing)	49	Microtunnel	300'	1,200 $/ft	$360,000
Lafayette at Central siphon under storm drain (casing)	49	Microtunnel	50'	1,200 $/ft	$60,000
Carrier piping for 15-inch double siphons	15	Carrier Pipe	1,100'	180 $/ft	$198,000
Relocate existing waterline on Walsh due to utility conflicts	8		1,500'	150 $/ft	$225,000
Jacking Pits			5 pits	$70,000	$350,000
Receiving Pits			6 pits	$40,000	$240,000
Structures					
Sewer Junction Structure: Chromite				$6,000	$6,000
Sewer Junction Structure: Walsh and Northwestern Pkwy.				$6,000	$6,000
Siphon structures- San Tomas Aquino Creek			2 structures	$6,000	$12,000
Sewer Junction Structure: Wash and San Tomas Expwy.				$6,000	$6,000
Siphon structures- Scott Blvd			2 structures	$6,000	$12,000
Siphon structures- Lafayette St.			2 structures	$6,000	$12,000
Sewer Junction Structure: Central Expwy. at S67-15				$6,000	$6,000
Sewer Junction Structure: Central Expwy. at S67-18				$6,000	$6,000
SUBTOTAL					$6,523,000
Mobilization and Demobilization				5%	$326,150
Traffic Control				10%	$652,300
CONSTRUCTION COST SUBTOTAL					**$7,501,450**
Contingencies				30%	$2,250,435
CONSTRUCTION COST TOTAL					**$9,751,885**
Land Acquisition - Temporary Easement Cost (Trenchless staging)		150' wide	150'	4 $/sf	$78,750
Land Acquisition - Permanent Easement Cost (Pipeline Alignment)		30' wide	850'	25 $/sf	$637,500
Engineering and Inspection Costs				25%	$2,437,971
CAPITAL IMPROVEMENT COST TOTAL					**$12,906,106**
ENR = 9103 (S.F. March 2007)				**rounded**	**$12,906,000**

* Pipe lengths include carrier pipe for siphons, double siphons and tunneled sewers.

** For tunneling under UPRR to Walsh, two receiving pits and one jacking pit are needed.

TRUNK SEWER SYSTEM PROJECT DESCRIPTION

PROJECT ID:	4A
PROJECT LOCATION:	Monroe St. and Chromite Dr. from Machado Ave. to west of Bowers Ave. MH S52-80 TO S53-41
BRIEF PROJECT DESCRIPTION:	Replace 600 feet of 18-inch pipe with 24-inch pipe. Replace 1,600 feet of 18-inch pipe with 27-inch pipe.
SANITARY SEWER PLAT MAP(S):	52, 53
LOCATION OF CAPACITY DEFICIENCY:	Same as project location Diameter of existing deficient pipes: 18"
SPECIAL CONSIDERATIONS:	Assume parallel 8" collector sewer for lateral connections.
ALTERNATIVES:	Parallel pipe (if space available)

MAJOR ITEMS	DIA. (in.)	DEPTH (feet)	LENGTH (feet)	UNIT COST	COST
BASELINE CONSTRUCTION COST					
Pipe Construction					
Monroe St.	24	8-16	600'	220 $/ft	$132,000
Chromite Dr.	27	8-16	1,600'	240 $/ft	$384,000
Collector line on Monroe St	8	8-16	600'	160 $/ft	$96,000
Collector line of Chromite Dr.	8	8-16	1,600'	160 $/ft	$256,000
Lower Laterals plus Cleanout (Monroe St.)			8	$2,000	$16,000
Lower Laterals plus Cleanout (Chromite Dr.)			22	$2,000	$44,000
Structures					
Sewer Junction Structure: Chromite and Monroe				$6,000	$6,000
SITE SPECIFIC CONSTRUCTION COST					
Bypass Pumping / Flow Diversion Costs		10% of baseline pipe cost		10%	$51,600
Remove and Replace Factor		2% of baseline pipe cost		2%	$10,320
SUBTOTAL					**$995,920**
Mobilization and Demobilization				5%	$49,796
Traffic Control				10%	$99,592
CONSTRUCTION COST SUBTOTAL					**$1,145,308**
Contingencies				30%	$343,592
CONSTRUCTION COST TOTAL					**$1,488,900**
Engineering and Inspection Costs				25%	$372,225
CAPITAL IMPROVEMENT COST TOTAL					**$1,861,126**
ENR = 9103 (S.F. March 2007)				**rounded**	**$1,861,000**

TRUNK SEWER SYSTEM PROJECT DESCRIPTION

PROJECT ID:……	4B
PROJECT LOCATION:……	Machado Ave. from Calabazas Blvd. to Monroe St. MH S52-103 TO S52-80
BRIEF PROJECT DESCRIPTION:……	Replace 1,500 feet of 15-inch pipe with 21-inch pipe.
SANITARY SEWER PLAT MAP(S):……	52
LOCATION OF CAPACITY DEFICIENCY: ……	Same as project location. Diameter of existing deficient pipes: 15"
SPECIAL CONSIDERATIONS:……	Assume parallel 8" collector sewer for lateral connections.
ALTERNATIVES:……	Parallel pipe (if space available)

MAJOR ITEMS	DIA. (in.)	DEPTH (feet)	LENGTH (feet)	UNIT COST	COST
BASELINE CONSTRUCTION COST					
Pipe Construction					
Machado	21	8-16	1,500'	210 $/ft	$315,000
Collector line on Machado	8	8-16	1,500'	160 $/ft	$240,000
Lower Laterals plus Cleanout (Machado)			55	$2,000	$110,000
Structures					
Sewer Junction Structure: Machado and Monroe				$6,000	$6,000
SITE SPECIFIC CONSTRUCTION COST					
Bypass Pumping / Flow Diversion Costs		10% of baseline pipe cost		10%	$31,500
Remove and Replace Factor		2% of baseline pipe cost		2%	$6,300
SUBTOTAL					**$708,800**
Mobilization and Demobilization				5%	$35,440
Traffic Control				10%	$70,880
CONSTRUCTION COST SUBTOTAL					**$815,120**
Contingencies				30%	$244,536
CONSTRUCTION COST TOTAL					**$1,059,656**
Engineering and Inspection Costs				25%	$264,914
CAPITAL IMPROVEMENT COST TOTAL					**$1,324,570**
ENR = 9103 (S.F. March 2007)				**rounded**	**$1,325,000**

TRUNK SEWER SYSTEM PROJECT DESCRIPTION

PROJECT ID:……	5
PROJECT LOCATION:……	Monroe St. from Fordham Dr. to Chromite Dr. MH S51-22 TO S52-65
BRIEF PROJECT DESCRIPTION:……	Replace 2,400 feet of 10-inch pipe with 12-inch pipe. Parallel 6" siphon under Calabazas Creek with 8-inch siphon.
SANITARY SEWER PLAT MAP(S):……	51, 52
LOCATION OF CAPACITY DEFICIENCY: ……	Same as project location Diameter of existing deficient pipes: 10" (6" siphon)
SPECIAL CONSIDERATIONS:……..	
ALTERNATIVES:……	Project extents from S52-51 to S-52-65 could possibly be eliminated by diversion into 24" Calabazas trunk sewer if sufficient capacity is available. Pipe bursting could be an alternative to remove and replace.

MAJOR ITEMS	DIA. (in.)	DEPTH (feet)	LENGTH (feet)	UNIT COST	COST
BASELINE CONSTRUCTION COST					
Pipe Construction					
Monroe	12	8-16	2,400'	170 $/ft	$408,000
Siphon at Calabazas Creek (casing)	36	Microtunnel	100'	900 $/ft	$90,000
Siphon pipe	8	Carrier Pipe	100'	150 $/ft	$15,000
Lower Laterals plus Cleanout (Monroe)			8	$2,000	$16,000
Jacking Pits			1 pits	$70,000	$70,000
Receiving Pits			1 pits	$40,000	$40,000
Structures					
Siphon structure- Calabazas Creek			2 structures	$6,000	$12,000
SITE SPECIFIC CONSTRUCTION COST					
Bypass Pumping / Flow Diversion Costs		10% of baseline pipe cost		10%	$40,800
Remove and Replace Factor		2% of baseline pipe cost		2%	$8,160
SUBTOTAL					**$699,960**
Mobilization and Demobilization				5%	$34,998
Traffic Control				10%	$69,996
CONSTRUCTION COST SUBTOTAL					**$804,954**
Contingencies				30%	$241,486
CONSTRUCTION COST TOTAL					**$1,046,440**
Engineering and Inspection Costs				25%	$261,610
CAPITAL IMPROVEMENT COST TOTAL					**$1,308,050**
ENR = 9103 (S.F. March 2007)				**rounded**	**$1,308,000**

TRUNK SEWER SYSTEM PROJECT DESCRIPTION

PROJECT ID:	6
PROJECT LOCATION:	Nobili Ave. and Machado Ave. from Flora Vista Ave. to Calabazas Blvd. MH S41-53 TO S52-101
BRIEF PROJECT DESCRIPTION:	Replace exisiting 10-inch, 12-inch and 15-inch pipe with 700 feet of 15-inch pipe and 2,400 feet of 18-inch pipe.
SANITARY SEWER PLAT MAP(S):	41, 51, 52
LOCATION OF CAPACITY DEFICIENCY:	Same as project location. Diameter of existing deficient pipes: 10"-15"
SPECIAL CONSIDERATIONS:	
ALTERNATIVES:	Pipe bursting could be an alternative to remove and replace.

MAJOR ITEMS	DIA. (in.)	DEPTH (feet)	LENGTH (feet)	UNIT COST	COST
BASELINE CONSTRUCTION COST					
Pipe Construction					
Nobili Ave	15	8-16	700'	180 $/ft	$126,000
Nobili Ave and Machado Ave	18	8-16	2,400'	190 $/ft	$456,000
Lower Laterals plus Cleanout (Nobili Ave)			31	$2,000	$62,000
Lower Laterals plus Cleanout (Machado Ave)			21	$2,000	$42,000
Structures					
Sewer Junction Structure: Machado and Calabazas				$6,000	$6,000
SITE SPECIFIC CONSTRUCTION COST					
Bypass Pumping / Flow Diversion Costs		10% of baseline pipe cost		10%	$58,200
Remove and Replace Factor		2% of baseline pipe cost		2%	$11,640
SUBTOTAL					**$761,840**
Mobilization and Demobilization				5%	$38,092
Traffic Control				10%	$76,184
CONSTRUCTION COST SUBTOTAL					**$876,116**
Contingencies				30%	$262,835
CONSTRUCTION COST TOTAL					**$1,138,951**
Engineering and Inspection Costs				25%	$284,738
CAPITAL IMPROVEMENT COST TOTAL					**$1,423,689**
ENR = 9103 (S.F. March 2007)				**rounded**	**$1,424,000**

TRUNK SEWER SYSTEM PROJECT DESCRIPTION

PROJECT ID:	8
PROJECT LOCATION:	El Camino Real from Flora Vista Ave. to siphon at Calabazas Creek. MH S41-113 TO S32-5
BRIEF PROJECT DESCRIPTION:	Replace 2,600 feet of 10-inch pipe with 12- and 15-inch pipe.
SANITARY SEWER PLAT MAP(S):	31, 32, 41, 42
LOCATION OF CAPACITY DEFICIENCY:	Same as project location Diameter of existing deficient pipes: 10"
SPECIAL CONSIDERATIONS:	Permits required from Caltrans.
ALTERNATIVES:	Pipe bursting could be an alternative to remove and replace. Possible alternative alignment on Flora Visa Ave, from El Camino Real to Nobili (upstream end of project 6).

MAJOR ITEMS	DIA. (in.)	DEPTH (feet)	LENGTH (feet)	UNIT COST	COST
BASELINE CONSTRUCTION COST					
Pipe Construction					
El Camino Real, Flora Vista to Pomeroy	12	8-16	1,800'	170 $/ft	$306,000
El Camino Real, Pomeroy to Calabazas	15	8-16	800'	180 $/ft	$144,000
Lower Laterals plus Cleanout (El Camino Real)			12	$2,000	$24,000
SITE SPECIFIC CONSTRUCTION COST					
Bypass Pumping / Flow Diversion Costs		10% of baseline pipe cost		10%	$45,000
Remove and Replace Factor		2% of baseline pipe cost		2%	$9,000
Concrete Pavement Replacement Allowance			2,600'	40 $/ft	$104,000
SUBTOTAL					**$632,000**
Mobilization and Demobilization				5%	$31,600
Traffic Control				10%	$63,200
CONSTRUCTION COST SUBTOTAL					**$726,800**
Contingencies				30%	$218,040
CONSTRUCTION COST TOTAL					**$944,840**
Engineering and Inspection Costs				35%	$330,694
CAPITAL IMPROVEMENT COST TOTAL					**$1,275,534**
ENR = 9103 (S.F. March 2007)				**rounded**	**$1,276,000**

TRUNK SEWER SYSTEM PROJECT DESCRIPTION

PROJECT ID:	9
PROJECT LOCATION:	Scott Blvd. from Serra Ave. to Homestead Rd. MH S25-37 TO S35-98
BRIEF PROJECT DESCRIPTION:	Replace 800 feet of 8-inch pipe with 10-inch pipe.
SANITARY SEWER PLAT MAP(S):	25, 35
LOCATION OF CAPACITY DEFICIENCY:	Same as project location. Diameter of existing deficient pipes: 8"
SPECIAL CONSIDERATIONS:	
ALTERNATIVES:	Pipe bursting could be an alternative to remove and replace.

MAJOR ITEMS	DIA. (in.)	DEPTH (feet)	LENGTH (feet)	UNIT COST	COST
BASELINE CONSTRUCTION COST					
Pipe Construction					
Scott Blvd.	10	8-16	800'	160 $/ft	$128,000
Lower Laterals plus Cleanout (Scott Blvd.)			14	$2,000	$28,000
SITE SPECIFIC CONSTRUCTION COST					
Bypass Pumping / Flow Diversion Costs		10% of baseline pipe cost		10%	$12,800
Remove and Replace Factor		2% of baseline pipe cost		2%	$2,560
SUBTOTAL					**$171,360**
Mobilization and Demobilization				5%	$8,568
Traffic Control				10%	$17,136
CONSTRUCTION COST SUBTOTAL					**$197,064**
Contingencies				30%	$59,119
CONSTRUCTION COST TOTAL					**$256,183**
Engineering and Inspection Costs				35%	$89,664
CAPITAL IMPROVEMENT COST TOTAL					**$345,847**
ENR = 9103 (S.F. March 2007)				**rounded**	**$346,000**

TRUNK SEWER SYSTEM PROJECT DESCRIPTION

PROJECT ID:……	10
PROJECT LOCATION:……	Park Ave. south of Bellomy St. MH S38-75 TO S38-66
BRIEF PROJECT DESCRIPTION:……	Replace 250 feet of 10-inch pipe with 12-inch pipe.
SANITARY SEWER PLAT MAP(S):……	38
LOCATION OF CAPACITY DEFICIENCY: ……	Same as project locatin. Diameter of existing deficient pipes: 10"
SPECIAL CONSIDERATIONS:……	
ALTERNATIVES:……	Pipe bursting could be an alternative to remove and replace.

MAJOR ITEMS	DIA. (in.)	DEPTH (feet)	LENGTH (feet)	UNIT COST	COST
BASELINE CONSTRUCTION COST					
Pipe Construction					
Park Ave.	12	8-16	250'	170 $/ft	$42,500
Lower Laterals plus Cleanout (Park Ave.)			2	$2,000	$4,000
SITE SPECIFIC CONSTRUCTION COST					
Bypass Pumping / Flow Diversion Costs		10% of baseline pipe cost		10%	$4,250
Remove and Replace Factor		2% of baseline pipe cost		2%	$850
SUBTOTAL					**$51,600**
Mobilization and Demobilization				5%	$2,580
Traffic Control				10%	$5,160
CONSTRUCTION COST SUBTOTAL					**$59,340**
Contingencies				30%	$17,802
CONSTRUCTION COST TOTAL					**$77,142**
Engineering and Inspection Costs				35%	$27,000
CAPITAL IMPROVEMENT COST TOTAL					**$104,142**
ENR = 9103 (S.F. March 2007)				**rounded**	**$104,000**

2290 North First Street
Suite 212
San Jose, CA 95131
T 408.240.8160
F 408.240.8161

www.rmcwater.com

RMC
Water and Environment

City of Santa Clara

Sanitary Sewer Master Plan Update

Final Report

Prepared by:

RMC water and environment

April 2016

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City of Santa Clara

Rajeev Batra, Director of Public Works/City Engineer

Falguni Amin, Principal Civil Engineer

Evelyn Liang, Senior Civil Engineer (Project Manager)

Kimchi Tran, Civil Engineer

Christopher de Groot, Director of Water and Sewer Utilities

Shilpa Mehta, Principal Engineer

Garrett Brown, Sanitary Sewer Assistant Superintendent

Gloria Sciara, Development Review Officer

Jeff Schwilk, Associate Planner

Debby Fernandez, Project Planner

Payal Bhagat, Associated Planner

RMC Water and Environment

Gisa Ju, Principal-in-Charge/Technical Director

Steve Bui, Project Manager

Winola Cheong, Project Engineer

V&A Consulting Engineers, Flow Monitoring

Schaaf & Wheeler Consulting Civil Engineers, Pump Station Capacity Assessment

Abbreviations and Definitions

ABAG	Association of Bay Area Governments
ABWF	Average base wastewater flow
ADWF	Average dry weather flow
APN	Assessor parcel number
Backwater	A condition in which the hydraulic gradeline (see definition of HGL below) increases upstream of a location in the system due to a downstream hydraulic constriction.
BWF	Base wastewater flow: sanitary and process flow contributions from residential, commercial, institutional, and industrial users.
CIP	Capital Improvement Program
City	City of Santa Clara
CSJ	City of San Jose
CuSD	Cupertino Sanitary District
d/D	Ratio of flow depth to pipe diameter
Design Storm	A rainfall event, defined based on statistical probability of occurrence, which determines the peak wet weather flow conditions for which the capacity of sewer system facilities are evaluated and/or designed.
Diurnal Curve	Change in dry weather flow over a typical 24-hour period on an hourly basis.
DU	Dwelling unit
DWF	Dry weather flow: the flow during non-rainfall periods, composed of normal base wastewater flow plus any dry season groundwater infiltration.
ENR-CCI	Engineering News Record Construction Cost Index; an index published monthly by Engineering News Record magazine and used to reference construction costs (such as those for wastewater system facilities) to a specific date and location.
Firm capacity	The capacity of a pump station with the largest pump out of service.
fps	Feet per second
GIS	Geographic Information System: a computerized system in which geographical features (e.g., sewer facilities, parcels, land use) are linked to an attribute database to facilitate analysis and presentation of information
gpad or gpd/ac	Gallons per day per acre
gpcd	Gallons per capita per day
gpd	Gallons per day
GWDR	General Waste Discharge Requirements for Sanitary Sewer Systems: regulations adopted by the State Water Resources Control Board in 2006 that address the operation, maintenance, and management of publicly-owned sanitary sewer systems in California

GWI	Groundwater infiltration: extraneous water that infiltrations into a sewer system from the ground through defective pipes and manholes. Groundwater infiltration is considered to be a relatively constant daily flow that varies seasonally and depends on location of sewers with respect to the groundwater table.
HGL	Hydraulic Grade Line: in a gravity pipeline system, the water surface elevation in the pipes; or in a system flowing under pressure, the elevation representing the sum of pressure head plus elevation head
Hydrograph	A graph of flow versus time.
IDF	Intensity-duration-frequency: rainfall statistics that establish the rainfall intensity over specified durations for various recurrence frequencies
I/I	Infiltration/inflow (see definitions below)
Infiltration	Extraneous groundwater or storm water that enters sewer pipes, manholes, and service laterals via the soil through breaks, cracks, and defective joints.
Inflow	Storm water that enters the sewer system from the ground surface through direct drainage connections (e.g., directly connected catch basins, area drains, or roof drains) or through manhole or cleanout lids.
Inverted Siphon	A sewer configuration (also called a “siphon”), typically consisting of a downward leg, horizontal section, and upward leg, in which the flow is forced through the pipe by the pressure head created by the elevation difference between the upstream and downstream ends of the siphon**.** An inverted siphon is typically used to cross under a creek, channel, or another pipeline.
Isohyetal	A contour of equal precipitation (typically average annual rainfall)
K	Recession coefficient of RDI/I unit hydrograph (see Figure 2-4)
lf	Linear feet
Loading Manhole	A manhole in the modeled sewer network to which flows from unmodeled sewers discharge into the modeled network (also see definition of subcatchment below).
LS	Lift Station
MAP	Mean annual precipitation
mgd	Million gallons per day
NAICS	North American Industrial Classification System
O&M	Operations and maintenance
PDWF	Peak dry weather flow: the peak flow during non-rainfall periods.
PS	Pump Station
PWWF	Peak wet weather flow: the peak flow during a given storm event from dry weather flow plus infiltration and inflow.
R	Ratio of RDI/I volume to rainfall volume
RDI/I	Rainfall-dependent infiltration/inflow: the infiltration and inflow into a sewer system directly related to a rainfall event. RDI/I may cause rapid, short-term peak flows in the sewer system that recede after the rainfall has ended.
RG	Rain gauge
RMC	RMC Water and Environment

sf or sq. ft.	Square feet
SCVWD	Santa Clara Valley Water District
SECAP	System Evaluation and Capacity Assurance Plan
Siphon	See Inverted Siphon
SJ/SC RWF	San Jose / Santa Clara Regional Wastewater Facility
SSMP	Sewer System Management Plan
SSO	Sanitary sewer overflow
Subcatchment	A small area of the sewer system that contributes flow to the modeled sewer network, in which the unmodeled collection sewers are assumed to discharge to a common point (manhole) in the modeled network
Surcharge	The hydraulic condition in a sewer pipeline in which the elevation of the hydraulic gradeline (water level) is above the crown (top) of the pipe. Under such a condition, the water in the pipe rises into the manholes and could overflow onto the ground if the hydraulic gradeline exceeds the elevation of the manhole rims.
T	Time to peak of RDI/I unit hydrograph (see Figure 2-4)
TM	Technical Memorandum
WWF	Wet weather flow: the flow during rainfall periods, composed on base wastewater flow, wet season groundwater infiltration, and rainfall-dependent I/I.

Executive Summary

This report summarizes the results and recommendations of the Sanitary Sewer Master Plan Update (Master Plan) for the City of Santa Clara (City). The Master Plan was prepared by RMC Water and Environment (RMC) in close coordination with City staff. The Master Plan will be used to guide improvements to the City's sanitary sewer system to accommodate current and future development and ensure that the City continues to provide a high level of service to its customers.

Background and Purpose of Master Plan

The City of Santa Clara is located in central Santa Clara County adjacent to the Cities of San Jose, Cupertino, and Sunnyvale. The City has a population of approximately 120,000 and is served by a wastewater collection system consisting of approximately 270 miles of sewer pipelines and seven sewage pump stations. The system collects wastewater flows generated within the City limits and also flows from the major portion of the Cupertino Sanitary District (CuSD) via a connection at Homestead Road and Swallow Drive. Flow is conveyed eastward to the City of San Jose's interceptor sewer on Zanker Road and also northward to the Northside and Rabello Pump Stations, where the flow is pumped to the San Jose/Santa Clara Regional Wastewater Facility (SJ/SC RWF) for treatment and disposal. The City's sewer system and service area are shown in **Figure ES-1**.

The City's last sanitary sewer master plan was completed in 2007[1]. Since that time, the City has completed a number of sewer improvement projects and is experiencing significant growth and redevelopment in a number of areas, necessitating an evaluation of the capacity of the sanitary sewer system to handle future wastewater flows. This Master Plan will help identify future capital needs for capacity improvements and associated requirements for financing those improvements through increased connection fees or other sources of funding.

The City is also required to comply with the Statewide General Waste Discharge Requirements for Sanitary Sewer Systems (GWDR) adopted in 2006 by the State Water Resources Control Board. The GWDR, which applies to all publicly-owned sewer systems in California, includes the requirement to complete a Sewer System Management Plan (SSMP). The SSMP addresses the overall management, operation, and maintenance of the sanitary sewer system and must include a System Evaluation and Capacity Assurance Plan (SECAP). Therefore, this Master Plan is also intended to satisfy the SECAP requirements of the SSMP.

The overall objectives of this Master Plan are to develop wastewater flow projections for the City's collection area using up-to-date water use and land use information and flow monitoring data; develop an updated hydraulic model of the trunk sewer system; use the model to identify existing capacity deficiencies and future projected capacity requirements; and develop a Capital Improvement Program (CIP), including budget estimates, for implementing the required capacity improvements to the collection system.

This Executive Summary is presented in two parts:

- ***How the Capacity Assessment Was Prepared*** describes the scope and methodologies of the planning effort, including the key planning and technical assumptions incorporated into the sewer system capacity analysis.
- ***Recommended Capacity Improvement Program*** presents the recommended CIP, including capacity improvement projects, priorities, and estimated costs. In addition, recommendations are presented for implementing the proposed capacity improvement program.

[1] City of Santa Clara Sanitary Sewer Capacity Assessment, RMC Water and Environment, May 2007.

How the Capacity Assessment Was Prepared

The City's wastewater collection system includes sewer pipelines ranging in size from 4 to 48 inches in diameter. The larger pipes, primarily the 10-inch and larger sewers and a portion of the smaller diameter pipes, comprise the trunk sewer system, which is the primary network for conveying flows generated from the City's service area and CuSD to the SJ/SC RWF. The trunk sewer system, comprising about 34 percent of the total pipe footage in the system, was the focus of the capacity assessment in this study.

The project team used a systematic process that incorporated land use planning information, water use and flow monitoring data, and design criteria for estimating wastewater flows, applied in a computer hydraulic model of the trunk sewer system. The modeled system is shown in **Figure ES-2**. The model was used to assess how the system would perform under various planning and flow scenarios and identify pipes and/or pump stations that may not have sufficient capacity to convey the predicted flows under existing or future conditions. Improvement projects were developed to provide the required capacity, the capital costs of the required projects were estimated, and the projects were prioritized based on the model results.

Capacity Assessment Considers Existing and Future Planning Scenarios

Two planning scenarios were evaluated for this study: existing (2015) and future (2035) scenarios. The existing scenario examined the current capacity of the sewer system based on existing land use, with flows defined based on winter water use data and calibrated to flow monitoring data collected in the 2014/15 winter season. The future scenario incorporated information on planned development provided by the City. **Figure ES-3** shows the location of the areas of anticipated development. Planned development within the City represents over 15,000 new residential dwelling units and over 20 million square feet of commercial and industrial building floor space. In addition, CuSD has also projected an increase in their base wastewater flow due to anticipated additional development. Together, these projections are estimated to increase current base wastewater flows by over two folds. The future scenario was used to examine the impact on the system of future increases in wastewater flows due to anticipated development and determine the required sewer system capacity needed to serve both existing and future users.

Potential Capacity Deficiencies under Existing and Future Flow Conditions

For each of the planning scenarios, projected dry and wet weather flows were simulated in the hydraulic model. The model was calibrated to flow monitoring data to ensure that it represents a reasonably accurate depiction of system conditions. For this study, a flow monitoring program consisting of 25 temporary flow meters installed in the system during the 2014/15 wet weather season was conducted to provide data to calibrate the hydraulic model and verify existing system flows. The collected data was useful for confirming dry weather flows and characterizing the relative wet weather flow response in different areas of the system.

The model integrates various dry and wet weather flow parameters to determine system capacity under different flow and planning scenarios. Key flow components incorporated into the model included: base (dry weather) wastewater flow (BWF), estimated based on winter water use data; groundwater infiltration (GWI), which occurs when water seeps into pipes under the ground through cracks and pipe joints; and rainfall-dependent infiltration and inflow (RDI/I) during storm events. For this Master Plan, a 10-year return period, 24-hour duration rainfall event was selected as the "design storm" to serve as the basis for computing design peak wet weather flows in the system. A 10-year return period has become a standard design storm criterion for many Bay Area agencies. **Table ES-1** presents the estimated existing and future average dry weather flow (ADWF) and peak wet weather flow (PWWF) for the selected design storm for the City's sewer system, based on the modeling conducted for this study.

Legend

Sewers by Diameter:
- ≤ 6"
- 8" - 10"
- 12" - 16"
- 18" - 24"
- ≥ 27"

- Pump/Lift Station
- Santa Clara Force Mains
- San Jose Interceptors
- City Limit

San Jose / Santa Clara Regional Wastewater Facility

SC Influent Junction Structure

Northside PS

Rabello PS

Westside LS

Primavera LS

Stadium LS

Tasman LS

De La Cruz LS

CSJ Interceptor (not modeled)

CuSD Flow

City of Santa Clara
Sanitary Sewer
Master PlanUpdate

Figure ES-1
Sanitary Sewer Collection System Overview

0 0.5 1 Mile

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Legend

Modeled Trunk Sewers
- ≤ 6"
- 8" - 10"
- 12" - 16"
- 18" - 24"
- ≥ 27"

Modeled Pump/Lift Station
Unmodeled Sewers
San Jose Interceptors
City Limit

San Jose / Santa Clara Regional Wastewater Facility
SC Influent Junction Structure
Northside PS
Rabello PS
Westside LS
Primavera LS
Stadium LS
Tasman LS
De La Cruz LS
CSJ Interceptor (not modeled)
CuSD Flow

City of Santa Clara
Sanitary Sewer
Master Plan Update

Figure ES-2
Modeled Trunk System

0 0.5 1 Mile

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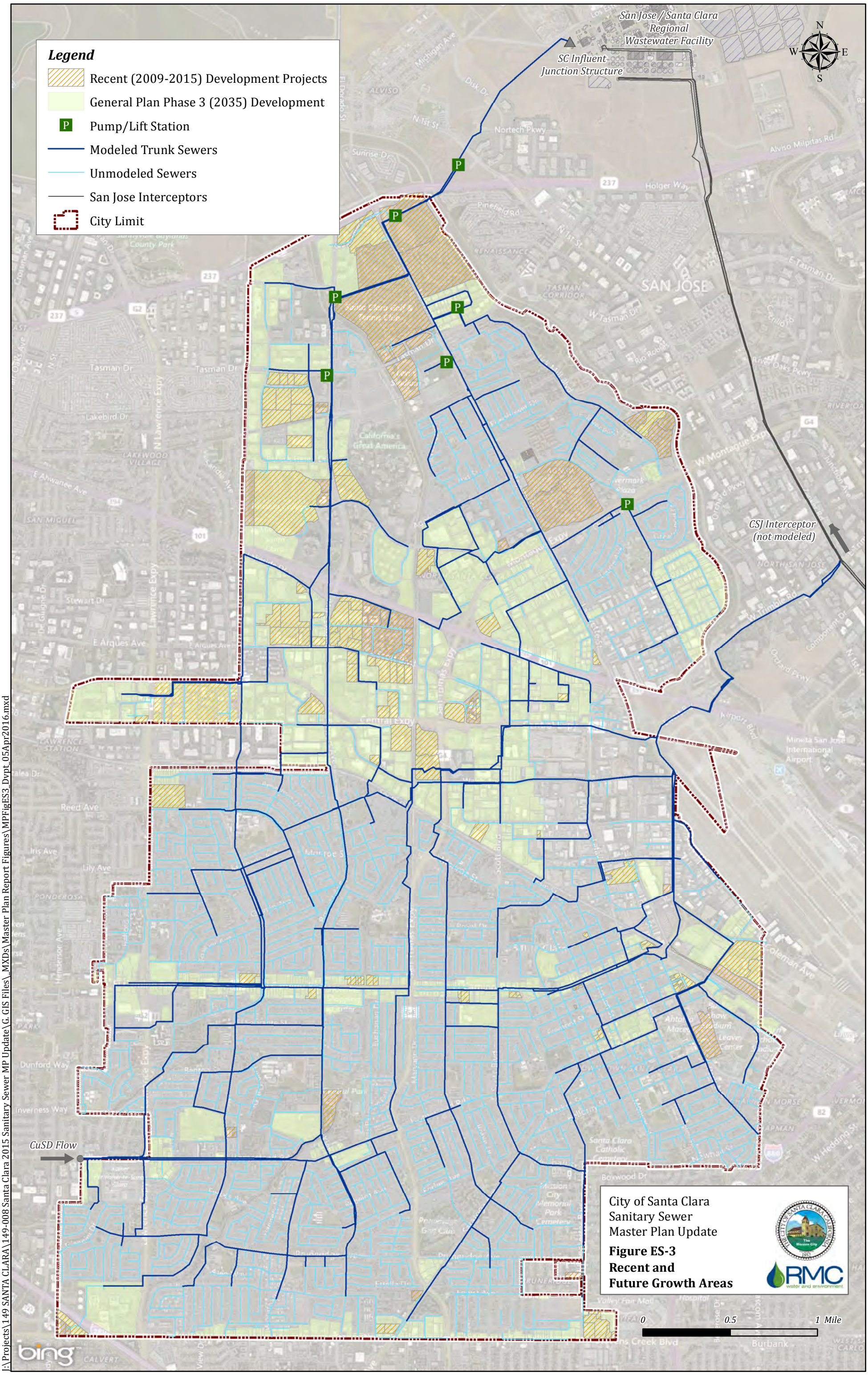

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Table ES-1: Collection System Flow Estimates

	Existing ADWF [2] (mgd)	Existing PDWF [2] (mgd)	Existing PWWF [3] (mgd)	Future ADWF [2] (mgd)	Future PDWF [2] (mgd)	Future PWWF [3,4] (mgd)
Flow Estimates by System Outfall [1]						
North (to Northside and Rabello Pump Stations)	10.2	15.2/16.0	27.9	24.6	33.5/34.4	41.0
East (to San Jose Zanker Road Interceptor)	4.7	6.4	11.7	9.8	13.3	18.3
Total	14.9	21.6/22.4	39.6	34.4	46.8/47.7	59.4
Flow Estimates by Agency [1]						
Santa Clara System	11.3	15.4/16.2	26.8	27.5	34.6/35.5	45.6
Cupertino Sanitary District	3.5	6.2	12.8	6.9	12.2	13.8
Total	14.9	21.6/22.4	39.6	34.4	46.8/47.7	59.4

1. Assuming that trunk sewer capacity deficiencies are relieved with recommended capital improvement projects presented in Table ES-2.
2. Includes groundwater infiltration for a typical wintertime period. ADWF and first value shown for PDWF includes typical non-game day flow from Levi's Stadium; second value shown for PDWF includes a peak game day flow from Levi's Stadium.
3. For 10-year design storm; assumes non-game day flow from Levi's Stadium.
4. Assuming peak wet weather flow from CuSD would not increase above its contractual maximum flow of 13.8 mgd.

Model results were examined to determine trunk system capacity needs, as indicated by areas where the flow in the pipes would exceed their capacity and cause surcharge conditions (water levels higher than the tops of the pipes). **Figure ES-4** shows the capacity assessment results for future PWWF conditions, indicating existing trunk sewers that were predicted by the model to be surcharged due to "throttle" conditions (peak flow exceeding full pipe capacity) or due to backwater from a downstream throttle condition, and locations of where the model predicts a surcharge condition severe enough to violate the City's capacity criteria, defined as water level that exceeds one (1) foot above the top of pipe. Most of these locations were predicted to be capacity issues only under future PWWF. Note that the locations of criteria violations are not necessarily the locations of the actual capacity-deficient pipes, but are typically located further upstream due to backwater from downstream deficiencies.

Note that no overflows are predicted under design storm conditions. Furthermore, all of the modeled pump stations have adequate firm capacity (capacity with largest pumping unit out of service) to convey the predicted PWWF without violating freeboard criteria or resulting in sewer overflows, although for two of the stations (Westside and Tasman), noticeable backwater surcharge was predicted because the switch-on set points for the lead pumps are higher than the influent lines.

Recommended Capacity Improvement Program

The Capital Improvement Program (CIP) recommended in this study is designed to provide for adequate sewer system capacity for the City's existing and anticipated future development. **Figure ES-5** and **Table ES-2** present the recommended capacity improvement projects. Projects have been assigned relative priorities based on the extent of criteria violations or surcharge. Priority 1 and 2 projects are required to address capacity deficiencies that result in criteria violations under current conditions, while Priority 3 projects are those that result in criteria violations under future conditions. In addition to these projects, there was also an additional project (Project E1) that was triggered by an entitlement requirement, discussed in more detail in Chapter 5.

As indicated in **Table ES-2**, the total estimated cost of the recommended capacity improvement program (without Project E1) is about $1.7 million. The total estimated cost, if the City implements Project P6-Alt instead of P6, would be approximately $2.8 million. Note that implementing Project P6-Alt would also increase the peak flow to the Rabello and Northside Pump Stations by about 1 mgd to each pump station, which could require further evaluation of and potential improvements to increase pump station capacity.

Implementation Recommendations

The City should begin implementation of the Capital Improvement Program recommended in this Master Plan, starting with the highest priority projects. The following items should be considered in project scheduling and design, and in future updates of the Master Plan.

- The alignments and sizes of projects should be verified with detailed predesign analyses, including topographic surveys, geotechnical investigations, utility research, and constructability reviews.
- The estimated costs assumed open cut construction, but alternative methods such as trenchless construction or construction of parallel relief pipes could be considered during design. The decision to parallel or replace existing sewers should consider the physical condition and remaining useful life of the existing pipelines; the availability of pipeline corridors for new sewer construction; and operation and maintenance concerns.
- The hydraulic model has been developed to assist the City in performing capacity analyses and updating the Master Plan in the future. The model should be kept up-to-date with changes to existing sewer connections, development plans, and sewer system facilities.
- The City should conduct additional flow monitoring at key locations in the sewer system, particularly the area tributary to the Chromite/Machado trunk sewers where both the 2006 and 2015 flow monitoring programs indicated high I/I. The City should also conduct smoke testing and television inspection to identify potential sources of I/I. Flow levels during large storm events should be compared to the peak flows simulated by the hydraulic model to verify the modeling predictions for the 10-year design storm and confirm the need for and sizing of Project P3 (Cabrillo Avenue Sewer Improvement).
- The City should coordinate with the CuSD on flow and planning assumptions to ensure that adequate capacity exists in the Santa Clara system to handle future flows from the District. The City should encourage CuSD to monitor the flows at the flow meter that it operates and maintains on Homestead Road at Swallow Drive on an on-going basis and periodically confirm meter calibration to verify the wastewater flows entering the Santa Clara system.
- The City should coordinate with the City of San Jose to ensure that its flow criteria and planning assumptions are consistent with those used by San Jose in its capacity master planning.
- The City should verify the need to implement project E1 (Tracy Drive Sewer Improvement). The project is triggered by the large sewer discharge assumed for parcel APN 316-17-018, which holds an entitlement agreement to discharge a potential flow of 0.95 mgd; however, it is currently discharging less than 10 percent of the entitled rate. While the City is obligated to provide capacity for entitlement holders, it is important to note that implementing this project now may result in oversized sewers where the current daily flow is not sufficient to provide the minimum cleaning velocity and thus creating potential debris and odor issues.

Legend

- Surcharge due to Backwater
- Surcharge due to Throttle
- Surcharge Criteria Violation under Existing PWWF
- Surcharge Criteria Violation under Future PWWF
- Modeled Pump/Lift Station
- Modeled Trunk Sewers
- San Jose Interceptors
- City Limit

San Jose / Santa Clara Regional Wastewater Facility

SC Influent Junction Structure

Northside PS

Rabello PS

Westside LS

Primavera LS

Stadium LS

Tasman LS

De La Cruz LS

CSJ Interceptor (not modeled)

CuSD Flow

City of Santa Clara
Sanitary Sewer
Master Plan Update

Figure ES-4
Model Predicted System Surcharge

0 0.5 1 Mile

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Legend

- Modeled Trunk Sewer
- Unmodeled Sewer
- Santa Clara Force Mains
- San Jose Interceptors
- Recommended Capital Improvement Projects
- Project for Entitlement Compliance

San Jose / Santa Clara Regional Wastewater Facility

SC Influent Junction Structure

P1: Westside Lift Station Set Point Adjustment

P4: Tasman Drive Sewer Improvement

P2: Tasman Lift Station Set Point Adjustment

CSJ Interceptor (not modeled)

P6 Alt: Calabazas Creek Sewer Improvement

P6: Sewer Diversion at Calabazas Boulevard and Machado Avenue

P3: Cabrillo Avenue Sewer Improvement

CuSD Flow

E1: Tracy Drive Sewer Improvement

P5: Sewer Diversion at Los Prades Blvd. and Saratoga Ave.

City of Santa Clara
Sanitary Sewer
Master Plan Update

Figure ES-5

Capacity Improvement Projects and Project for Entitlement Compliance

0 0.5 1 Mile

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Table ES-2: Recommended Capacity Improvement Projects

Project ID	Priority	Project Name	U/S MHID	D/S MHID	Description	Est. Capital Improvement Cost[1]
P1[2]	1	Westside Lift Station Set Point Adjustment	N/A	N/A	Adjust the set points for the pumps to a lower elevation to eliminate unnecessary backups in the influent line.	--
P2[2]	2	Tasman Lift Station Set Point Adjustment	N/A	N/A	Adjust the set points for the pumps to a lower elevation to eliminate unnecessary backups in the influent line.	--
P3	2	Cabrillo Avenue Sewer Improvement	S41-13	S41-20	Upsize 1,600 feet of 8-inch line in Cabrillo Ave. between Lawrence Expressway and Nobili Ave. to a 12-inch line.	$1,097,000
P4	3	Tasman Drive Sewer Improvement	S93-24	S93-35	Upsize 600 feet of 12-inch line in Tasman Dr. between Old Ironsides Dr. and Great America Pkwy. to a 15-inch line.	$327,000
P5	4	Sewer Diversion at Los Prades Boulevard and Saratoga Avenue	S25-85	S25-85	Install a weir in manhole S25-85 located in the intersection of Padres Blvd. and Saratoga Ave. to divert flow northwest to the existing 12-in line in Los Padres Blvd.	$77,000
P6	4	Sewer Diversion at Calabazas Boulevard and Machado Avenue	U/S of S52-93	S52-120	Install a new manhole upstream of S52-93 in the intersection of Calabazas Blvd. and Machado Ave., and install a new 15-inch high-level diversion line (approximately 200 feet) to divert excess flow from the existing 24-inch line in Calabazas Blvd. to the 21-inch line in Machado Ave. The diversion line should be about 6 inches higher than the invert of the 24-inch line.	$166,000
P6-Alt.[3]	4	Calabazas Creek Sewer Improvement	S62-31	S72-20	Upsize 1,800 feet of 24-inch line next to Calabazas Creek between Kifer Rd. and Scott Blvd. to a 27-inch line.	$1,334,000
					Estimated Total Cost for Recommended Projects P1 to P6:	$1,667,000
					Estimated Total Cost for Projects P1 to P5 and P6-Alt:	$2,835,000
E1[4]	N/A	Tracy Drive Sewer Improvement	S10-77	S22-51	Upsize approximately 6,600 feet of 10- to 12-inch line in Tracy Dr. and Pomeroy Ave. to a 15-inch line; install a new 15-inch line between manholes S22-55 and S22-46 in Pomeroy Ave. and Homestead Rd. (approximately 50 feet) to divert flow into Homestead Rd., and upsize approximately 1,400 feet of 18-inch line downstream to a 21-inch.	$4,654,000
					Estimated Total Cost (P1 to P6) including Project E1:	$6,321,000
					Estimated Total Cost (P1 to P5 and P6-Alt) including Project E1:	$7,489,000

1. All costs are presented in 2015 dollars and include 30 percent allowance for contingencies for unknown conditions and 25 percent for engineering, administration, and legal costs.
2. These proposed projects are operational, not capital improvements. Refer to Table 4-4 for recommended set points.
3. Project P6-Alt is presented for the purpose of identifying the solution and associated cost to maintain the current system flow configuration. Project P6 is the recommended project.
4. Project E1 addresses the potential capacity deficiency when parcel APN 316-17-018 begins to discharge its entitled flow of 0.95 mgd into the City's system.

Chapter 1 Introduction

This report presents the results and recommendations of the Sanitary Sewer Master Plan Update (Master Plan) for the City of Santa Clara (City). The report was prepared by RMC Water and Environment (RMC).

1.1 Background and Study Objectives

The City of Santa Clara is located in central Santa Clara County adjacent to the Cities of San Jose, Cupertino, and Sunnyvale. The City has a population of approximately 120,000 and is served by a wastewater collection system consisting of approximately 270 miles of sewer pipelines and seven sewage pump stations. The system collects wastewater flows generated within the City's service area and also wastewater flows from the major portion of the Cupertino Sanitary District (CuSD) via a connection at Homestead Road and Swallow Drive. Flow is conveyed eastward to the City of San Jose's interceptor sewer on Zanker Road and also northward to the Northside and Rabello Pump Stations, where the flow is pumped to the San Jose/Santa Clara Regional Wastewater Facility (SJ/SC RWF) for treatment and disposal. The City's sewer system and service area are shown in **Figure 1-1**.

The City's last sanitary sewer master plan was completed in 2007[2]. Since that time, the City has completed a number of sewer improvement projects and is experiencing new development in a number of areas, necessitating an evaluation of the capacity of the sanitary sewer system to handle future wastewater flows. This evaluation will help identify future capital needs for capacity improvements and associated requirements for financing those improvements through increased connection fees or other sources of funding. This Master Plan will confirm flows in the collection system and identify capital needs for capacity improvements.

The City is also required to comply with the Statewide General Waste Discharge Requirements for Sanitary Sewer Systems (GWDR) adopted in 2006 by the State Water Resources Control Board. The GWDR, which applies to all publicly-owned sewer systems in California, includes the requirement to complete a Sewer System Management Plan (SSMP). The SSMP addresses the overall management, operation, and maintenance of the sanitary sewer system and must include a System Evaluation and Capacity Assurance Plan (SECAP). Therefore, this Master Plan is also intended to satisfy the SECAP requirements of the SSMP.

The overall objectives of this Master Plan are to develop wastewater flow projections for the City's collection area using up-to-date water use and land use information and flow monitoring data; develop an updated hydraulic model of the trunk sewer system; use the model to identify existing capacity deficiencies and future anticipated capacity requirements; and develop a phased Capital Improvement Program (CIP), including budget estimates, for implementing the required capacity improvements to the collection system.

[2] City of Santa Clara Sanitary Sewer Capacity Assessment, RMC Water and Environment, May 2007.

1.2 Scope of Study

The scope of the Master Plan, as well as a brief discussion of work conducted under each task, is described below.

- **Task 1 – Project Management and Coordination.** Periodic progress meetings were held with City staff to review project status and discuss project issues, and monthly status reports were prepared to document the work completed. Quality control was carried out, including checking of data and calculations, as well as senior review of proposed criteria, recommendations, and project deliverables.
- **Task 2 – Data Collection and Review.** Data, maps, geographic information system (GIS) files, and previous reports related to the wastewater collection system were reviewed to identify the information available for completing the Master Plan.
- **Task 3 – Flow Monitoring.** A flow monitoring program, consisting of the 23 meters and 4 rain gauges installed in the collection system for a period of about two months during the 2014/15 wet weather season was conducted to obtain data to characterize flows in the system and calibrate the hydraulic model. Two additional FloDar meters were also installed at the Guadalupe Chart Station on the Trimble Road trunk sewer to confirm flows recorded by the City's existing permanent meters at that site. Four of the sites were installed early, including a meter at Levi's Stadium to capture the 2014 Thanksgiving Day football game, and at the three most downstream meters to capture total flows to the Rabello and Northside Pump Stations.
- **Task 4 – Hydraulic Model Update.** An expanded hydraulic model of the City's trunk sewer system was developed using InfoWorks™ CS modeling software. Subcatchments (small areas of unmodeled sewers that contribute flow to the modeled system) were delineated to define areas loading to the model, and flow loads to the model were compiled using water use and land use data and flow factors representing unit base wastewater flow (BWF) rates, diurnal BWF patterns, and infiltration/inflow (I/I). The expanded model also included the Northside and Rabello Pump Stations, the two associated force mains, and a junction structure between the pump stations and the SJ/SC RWF. Meetings were held with City planning staff to identify and obtain pertinent land use data and to discuss specific planning issues and potential growth or development areas in the City. Additional meetings were also held with the City of Cupertino and the CuSD to obtain updated flow projections. The model was verified for system connectivity, calibrated for dry weather conditions, and then calibrated for wet weather conditions using actual storm events from the flow monitoring program under Task 3.
- **Task 5 – Evaluate System Hydraulic Performance and Develop Capital Improvement Projects.** The model was used to determine sewer system capacity requirements and identify capacity deficiencies under peak dry and wet weather flow conditions, defined based on a design storm and system performance criteria. Potential solutions to capacity deficiencies were identified and tested in the model, and capacity improvement projects and associated costs were developed based on these analyses. The model was also used to confirm the results of the City's 2010 Pump Station Evaluation to determine if the City's pump stations are adequate to convey future flows. The recommended capacity improvement projects were prioritized to develop a Capital Improvement Program (CIP).
- **Task 6 – Prepare Sanitary Sewer Master Plan (Update) Report.** This report was prepared to summarize and present the results and recommendation of the study.

Legend

Sewers by Diameter:
- ≤ 6"
- 8" - 10"
- 12" - 16"
- 18" - 24"
- ≥ 27"

- Pump/Lift Station
- Santa Clara Force Mains
- San Jose Interceptors
- City Limit

San Jose / Santa Clara Regional Wastewater Facility

SC Influent Junction Structure

Northside PS

Rabello PS

Westside LS

Primavera LS

Stadium LS

Tasman LS

De La Cruz LS

CSJ Interceptor (not modeled)

CuSD Flow

City of Santa Clara
Sanitary Sewer
Master PlanUpdate

Figure 1-1
Sanitary Sewer Collection System Overview

0 0.5 1 Mile

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1.3 Report Organization

This report includes five Chapters, which are described below.

- **Chapter 1, Introduction,** presents the background, objectives, and scope of the Sanitary Sewer Master Plan Update.
- **Chapter 2, Basis of Flow Estimates,** discusses the planning area land use projections, the basis for developing estimates for each component of wastewater flows, and the base wastewater flow projections for the service area.
- **Chapter 3, Hydraulic Model Development,** describes the modeled sewer system, development of the model network and model loads, flow monitoring program, and model calibration.
- **Chapter 4, Capacity Analysis,** describes the capacity analysis and design criteria, model results, and potential solutions for identified capacity deficiencies.
- **Chapter 5, Recommended Capacity Improvement Program,** presents the recommended capacity improvement CIP, including project costs, prioritization, and implementation recommendations.

The Appendices to this report include plots of the flow monitoring data, model calibration graphs, model hydraulic profiles, and documentation for the recommended CIP, including project descriptions and cost estimates.

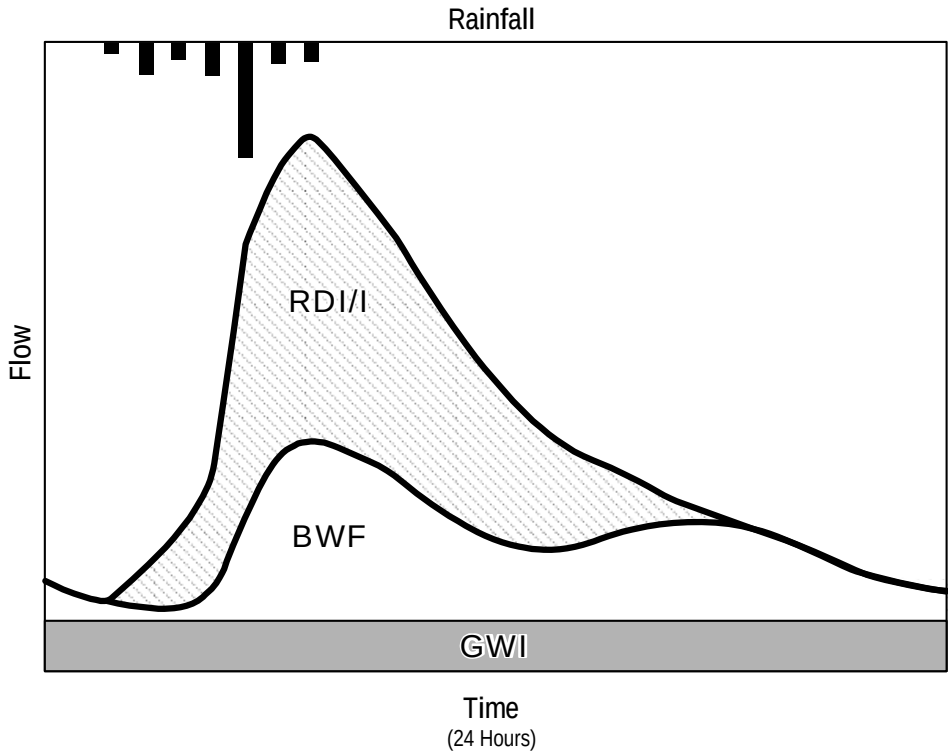
Chapter 2 Basis of Flow Estimates

This chapter presents the basis of wastewater flow estimates for the City's sanitary sewer system. The section describes the wastewater flow components used in the hydraulic model and the existing and projected future land uses for the City, which form the basis for generating base wastewater flows. Design flow estimates were developed based on criteria developed for each flow component: base wastewater flow, groundwater infiltration, and rainfall-dependent infiltration and inflow, and confirmed through model calibration, as described in Chapter 3 of this report.

2.1 Wastewater Flow Components

Wastewater flows include three components: base wastewater flow (BWF), groundwater infiltration (GWI), and rainfall-dependent infiltration/inflow (RDI/I), as illustrated conceptually in **Figure 2-1**. BWF represents the sanitary and process flow contributions from residential, commercial, institutional, and industrial users of the system. GWI is groundwater that infiltrates into defects in sewer pipes and manholes, particularly in winter and springtime in low-lying areas. GWI is typically seasonal in nature and remains relatively constant during specific periods of the year. RDI/I is storm water inflow and infiltration that enter the system in direct response to rainfall events, typically through direct connections such as holes in manhole covers or illegally connected roof leaders or area drains or, more commonly, through defects in sewer pipes, manholes, and service laterals that may have resulted from poor initial construction, settlement of trench backfill, or deterioration due to age. RDI/I typically results in short-term peak flows that recede quickly after the rainfall ends.

Figure 2-1: Wastewater Flow Components



2.2 Base Wastewater Flow

For the City's Master Plan Update, BWF loads were developed for both existing and future development conditions. Existing loads were developed based on average winter water use data from the City's customer billing records, and future loads were based mainly on the General Plan Phase 3 (2035) development forecast and known development and redevelopment projects that had occurred in recent years. The loading methodology for existing conditions and for projecting future BWF are discussed in the following subsections.

2.2.1 Existing Base Wastewater Flow

Existing BWF was estimated based on actual water billing records in the City's customer billing database. Data were first processed to exclude non-wastewater generating accounts such as fire, construction, or irrigation accounts; data for the remaining accounts were converted to average water use (in gallons per day, gpd) using the billing dates and quantities. Each account's BWF was estimated based on the average water use during the four winter periods between December 2010 and February 2014. Each user was also assigned one of three land use types (residential, commercial, or industrial) according to the account's North American Industry Classification System (NAICS) designation.

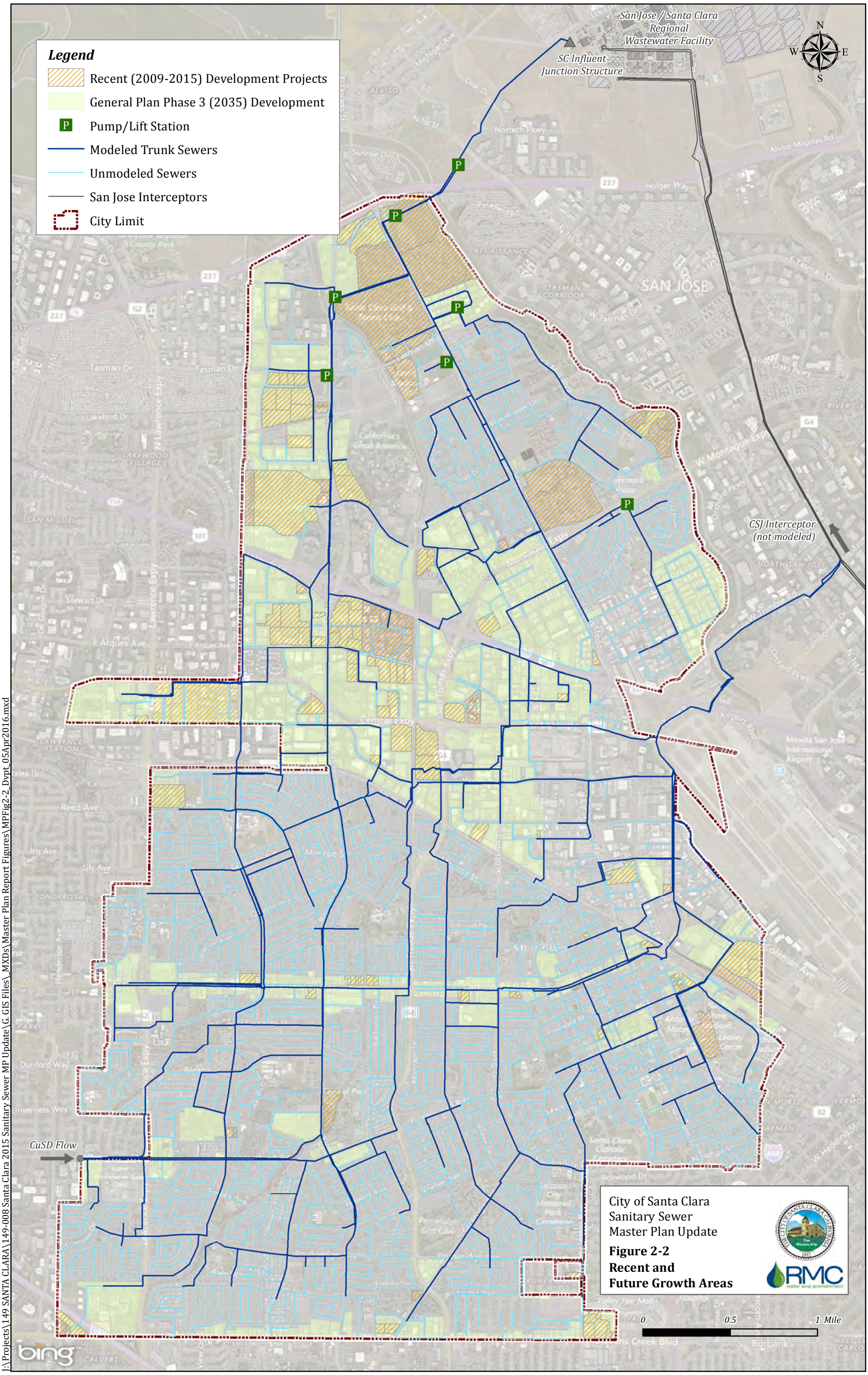
The City also has customers who use domestic wells and/or recycled water. The BWF for these customers were individually estimated based on their winter well usage data and recycled water billing data.

The BWF data (both water use and land use type) were further processed in GIS by geocoding the data to their corresponding parcels using the account's service address. The total BWF for each sewer subcatchment was then estimated by overlaying the subcatchment boundary on the parcels and summing the BWF of all parcels within each subcatchment.

The data were then imported into the hydraulic model to perform a dry weather simulation run, and the results were compared to the flow data collected during the most recent flow monitoring program, in which a total of 25 meters were installed at selected locations throughout the system and collected actual flow data between November 2014 and March 2015 (see further discussion of model calibration in Chapter 3). It was noticed that the modeled flows were consistently about 10 to 20 percent higher than the observed flows. One possible explanation was that there was some level of irrigation activities occurring even in the winter months due to the lack of rainfall in recent years. As such, a wastewater return factor of 10 to 20 percent was applied to the estimated BWF based on the water use data to attain a more reasonable match with actual flows observed in the field. The revised estimated BWF including the wastewater return factor is 6.5 million gallons per day (mgd) for residential accounts and 4.4 mgd for commercial and industrial accounts. These estimates do not include flow from the Levi's Stadium, which varies widely depending on the use of the venue and could potentially generate daily peak flows ranging from less than 0.1 mgd (for local events such as team practice or stadium public tours) to 1.0 mgd or higher (for major events such as the Super Bowl).

2.2.2 Future Base Wastewater Flow

The future scenario for this Master Plan Update refers to the projected flow condition in year 2035, which is the planning horizon for the City's current General Plan. The BWF for this scenario was estimated using multiple data sources, including the original General Plan Phase 3 development forecast that was prepared in 2009 plus various additions and corrections that City staff identified in 2015, development and redevelopment projects that have occurred between 2009 and 2015, and entitlement agreements for specific parcels. These areas are shown in **Figure 2-2**. A more detailed map and tabulation of the recent developments are included in **Appendix G**.



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The original future BWF projection was developed in 2009 as part of the City's overall General Plan Update effort, in which over one thousand parcels with development potential were identified and their developments were quantified in terms of dwelling units (for residential developments) and/or building square footage (for non-residential developments). The development quantities were multiplied by the corresponding unit flow factors depending on land use to convert the information into BWF estimates. These unit flow factors are summarized in **Table 2-1**.

Table 2-1: Base Wastewater Flow Unit Flow Factors

Type of Development	Unit Flow Factor (1)	Basis
Single Family Detached	245 gpd/DU	3.5 people/DU, 70 gpcd
Townhouse or Condominiums	175 gpd/DU	2.5 people/DU, 70 gpcd
Apartments	154 gpd/DU	2.2 people/DU, 70 gpcd
Hotels	100 gpd/room	n/a
Commercial Offices	0.1 gpd/sq. ft.	n/a
R&D Offices	0.15 gpd/sq.ft.	n/a

1. All unit flow factors are consistent with factors used in the 2007 Capacity Assessment.

Parcels that were not identified with development potential were assumed to retain the same land use through 2035 and therefore also maintain approximately the same level of wastewater generation, which was developed based on their 2005-2006 winter water billing data. This version of the future BWF projection has since then been used for various capacity evaluations, and was updated regularly when new development or redevelopment project applications were submitted to the City for capacity evaluation.

In 2015, the City identified a number of additional developments that were not accounted for in the original General Plan Phase 3 development forecast prepared in 2009. The City also identified a list of parcels with entitlement agreements that allow the owners of these parcels to discharge wastewater up to a certain flow rate without applying for permission or notifying the City. Neither set of data was accounted for in the original projection. Furthermore, the revised existing BWF estimates are noticeably lower than those developed based on the 2005-2006 winter water billing data. The decline could be mostly attributed to increased water conservation activities in response to the recent drought. This is also evidenced in the City's potable water sales records, which shows a sharp decline in the past ten years despite continuous population growth in the City. While it is possible that water use could rebound if and when the drought is over (e.g., behavioral changes such as reverting back to longer showers), some of the reduction is likely to remain permanent as a result of installing water-efficient plumbing fixtures and greater awareness of the need to continue conserving water.

In light of the various changes in water use and development information, a focused effort was undertaken to revise the City's future BWF projections. Parcels that were identified to have development potential in the revised General Plan Phase 3 forecast were re-processed using the updated development quantities. Parcels that were not identified with development potential were assumed to maintain their current water use, which is the updated existing BWF described in the previous section, instead of the original BWF based on previous 2005-2006 water use data, plus a 10 percent rebound factor to account for possible increase in water use in the future. For parcels that are on the list of development/redevelopment projects that the City has received between 2009 and 2015, their BWF was estimated according to the development quantities specified in their project applications. For parcels that hold entitlement agreements, BWF was set to their entitled flow rates.

Table 2-2 summarizes the existing (circa 2015) and future (2035) BWF for residential and non-residential sectors. Based on these estimates, BWF is projected to increase by over two fold to 27.1 mgd in 2035.

Table 2-2: Base Wastewater Flow Estimates

Land Use	Existing Flow (mgd)	Future Flow (mgd)
Residential	6.5	10.7
Non-Residential (1)	4.4	16.4
Total (2)	11.0	27.1

1. Does not include flow from the Levi's Stadium, which varies greatly depending on the use of the venue; average flow on a peak game day is approximately 0.19 mgd based on flow monitoring conducted as part of this project.
2. Does not include flow from the Cupertino Sanitary District (CuSD), which is discussed in section 2.5.

2.2.3 Diurnal Curves

In most sewer systems, BWF typically exhibits distinctive diurnal patterns depending on the land use, usually categorized as residential, commercial, and industrial. For Santa Clara, flow monitoring data showed typical responses to commercial and industrial patterns, but also two residential patterns: the northeastern part of the City in the vicinity of Lafayette Street and Montague Expressway appeared to have a more pronounced morning peak flow and a lower evening peak, while the rest of the City had a less peaky morning peak and a somewhat higher evening peak. As such, two residential diurnal curves were created to represent these two patterns.

The diurnal curves are shown in **Figure 2-3**. Each subcatchment was assigned one of the residential curves according to its location (Lafayette Area vs. all other areas); and one of the non-residential curves according to the primary type of non-residential establishments (commercial or industrial).

Figure 2-3: Wastewater Diurnal Curves

Figure 5A: Typical Residential Flow

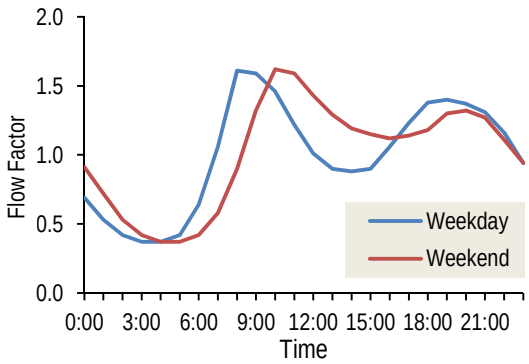


Figure 5B: Lafayette Area Residential Flow

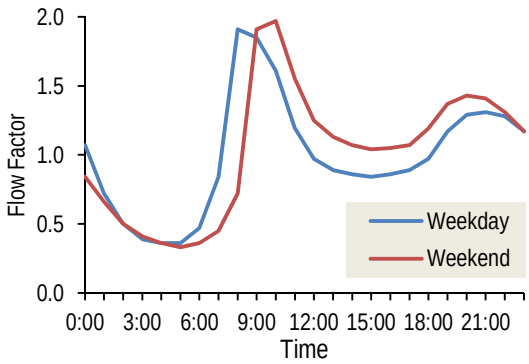


Figure 5C: Commercial Flow

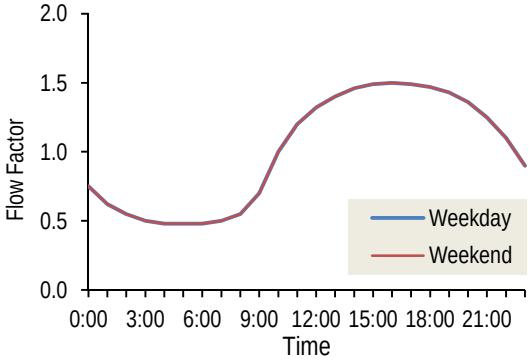
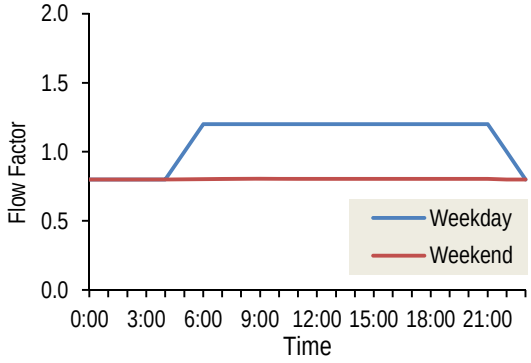


Figure 5D: Industrial Flow



Some of the City's large water users do not exhibit typical diurnal curves. To ensure their flow patterns are accurately reflected in the model, nonresidential accounts with average water use of over 50,000 gpd were identified and individually researched. A total of 18 such large users were identified, and City staff contacted each user to collect operational information regarding their sewer discharge pattern. Individual diurnal curves were created for each based on the operational hours indicated on their wastewater discharge permits or surveys. These large water users are summarized in **Table 2-3**.

Table 2-3: City's Large Water Users

Account Holder	APN	Address	Est. Average Flow (mgd)
Graphic Packaging Intl. Inc.	230-03-100	2600 De La Cruz Blvd.	0.587
Siliconix Inc.	104-39-023	2201 Laurelwood Rd.	0.405
Streamline Circuits Corp.	224-06-170	1415 Richard Ave.	0.308
Intel Corporation	104-48-010	3600 Juliette Ln.	0.191
Intel Corporation	216-46-015	3065 Bowers Ave.	0.099
Marvell Semiconductor Inc.	104-52-024	5488 Marvell Ln.	0.081
APCT Inc.	101-15-033	3495 De La Cruz Blvd.	0.074
Perkin Elmer Optoelectronics	104-13-083	2175 Mission College Blvd.	0.071
Owens Corning Sales LLC	224-07-099	960 Central Exp.	0.069
Applied Materials	216-49-024	3070 Bowers Ave.	0.067
Reaction Technology Inc.	104-51-001	3400 Bassett St.	0.067
City of Santa Clara – Electrical Dept.	230-03-067	524 Robert Ave.	0.065
Abbott Diagnostics Div.	104-50-016	5440 Patrick Henry Dr.	0.063
Diana Fruit Co. Inc.	224-40-001	651 Mathew St.	0.061
Oracle America Inc.	097-08-114	4100 Network Cl.	0.058
Digital 3011 Lafayette LLC	224-36-052	3011 Lafayette St.	0.053
Intel Corporation	104-39-020	2200 Mission College Blvd.	0.053
Agilent Technology	316-17-018	5301 Stevens Creek Blvd.	0.051

2.3 Groundwater Infiltration

Groundwater infiltration is generally quantified based on actual flow monitoring data, since it is difficult to predict GWI rates based on physical system data alone. In the context of design flow criteria, GWI represents the incremental groundwater infiltration that occurs during the wet weather season above the "baseline" infiltration level during the driest months of the year.

GWI can be estimated based on minimum flows during non-rainfall periods during a wet weather flow monitoring period. Minimum flows typical occur during the nighttime or early morning hours when base wastewater flows are at a low. Alternatively, GWI can be estimated as the difference between average metered flow during non-rainfall periods and computed average BWF. In either case, the resulting GWI, is expressed on a unit basis (gpd/acre or gpad) by dividing by the sewered acreage of the monitored area. Typical GWI rates may range from about 100 to 1,000 gpad.

GWI were estimated through the model calibration process (described in Chapter 3) by comparing model-simulated BWF to actual flow measurements from the temporary flow monitoring programs. Cases where model-predicted BWF was noticeably lower than monitored flow indicated the possible occurrence of GWI.

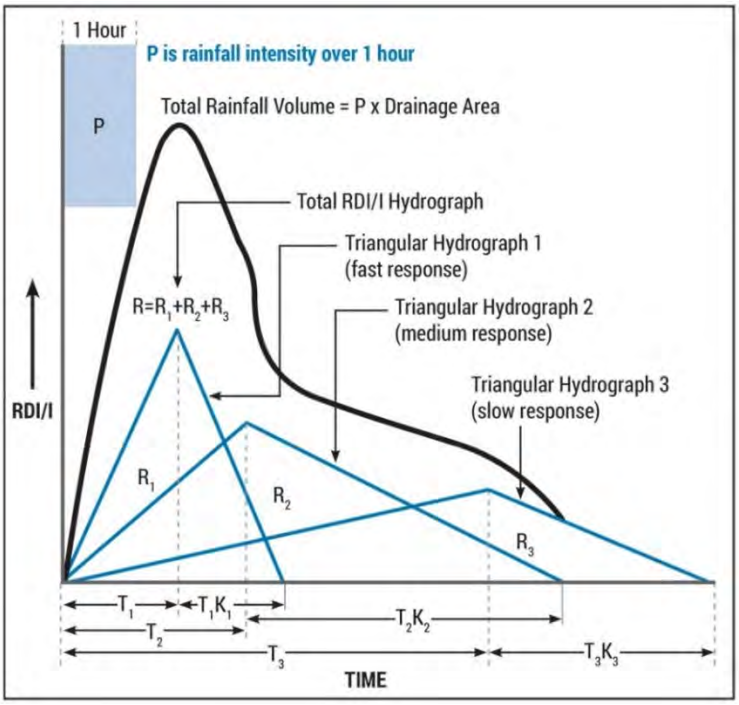
2.4 Rainfall-Dependent I/I

RDI/I flows result from rainfall events that produce infiltration and inflow of storm water into the sewer system. RDI/I can be quantified as the difference between the total flow during and immediately following a storm event and the non-rainfall "base flow" (BWF plus GWI) that is estimated to have occurred during the storm period. The magnitude of the resulting RDI/I response is typically described by the percentage of the rainfall volume (called the "R value") represented by the volume of the RDI/I hydrograph. The R value can vary from storm to storm, depending on such factors as the degree of soil saturation (due to antecedent rainfall) prior to the storm event.

The shape of the RDI/I hydrograph is also important in determining the peak RDI/I response. The RDI/I hydrograph shape is often defined by separating the total RDI/I hydrograph volume into components, representing different response times to rainfall (fast, medium, and slow). Each component is identified by a percentage of the total RDI/I volume and specific time to peak (T) and recession coefficient (K), illustrated in **Figure 2-4**. The R component percentages and T and K values can be applied to each hour of rainfall to generate a "synthetic hydrograph" that approximates the volume and shape of the hydrograph from the actual observed event. These parameters, when applied to a different rainfall pattern, can be used to estimate the RDI/I response to that particular rainfall event. This methodology is used to synthesize RDI/I hydrographs for a "design storm" for collection system modeling (see Chapter 3 for discussion of design storms).

Design criteria for RDI/I include design R values and hydrograph shape parameters and the hourly rainfall for the selected design storm event. As described in the next chapter, R values and hydrograph parameters are determined through the process of model calibration, in which actual observed rainfall events are simulated in the hydraulic model, and the resulting model hydrographs are compared to the measured flows at flow meters locations. The RDI/I parameters are adjusted as needed to achieve the best match of modeled to monitored flows. Once calibrated, the model RDI/I parameters can be applied to a design storm to simulate wet weather flows for a design event.

Figure 2-4: RDI/I Hydrograph Components



2.5 Flow from Cupertino Sanitary District

CuSD provides sewer collection services for the majority of City of Cupertino, portions of the City of Saratoga, and several unincorporated areas within Santa Clara County east of San Jose. Most of the flow is discharged into the Santa Clara system via a 27-inch sewer line in Homestead Road; the rest is discharged into the City of San Jose (CSJ) system at various other connection points.

CuSD maintains a permanent flow meter at its discharge point in Homestead Road. Meter data between November 2014 and March 2015 were reviewed and analyzed; the average dry weather flow (ADWF) was about 3.5 mgd. Similar to the declining trend observed for the City, CuSD's flow has also declined over 28 percent from the 2007 estimates of 4.9 mgd to the current estimates of 3.5 mgd, most likely also due to increased water conservation activities in response to the recent drought.

Multiple meetings were held with City staff and CuSD staff to discuss development projections within the CuSD service areas in an effort to estimate the future BWF for the CuSD system. Information from sources such as the City of Cupertino's General Plan 2020 and General Plan 2040, CuSD-SJ Joint Interceptor Cost Sharing Agreement (which indicates how much flow CuSD would be discharging into the San Jose system), ABAG projections, and CuSD meter data were discussed. Characteristics of the CuSD system, such as system age and I/I, planned sewer improvements, and known large development projects were also considered. Preliminary model simulations were conducted to understand the potential impact of the CuSD flow on the Santa Clara system under future peak design storm condition. For this Master Plan Update, City staff has directed RMC to use 6.90 mgd as CuSD's future ADWF, and cap its future PWWF at 13.8 mgd, which is the maximum flow rate set forth in the agreement[3] between the City and CuSD.

[3] Agreement between the City of Santa Clara and the Cupertino Sanitary District for (a) the purchase of capacity in Cupertino's sanitary interceptor sewer within the City of Santa Clara and (b) continued use by Cupertino Sanitary District of 13.8 MGD Peak Capacity in the City of Santa Clara's interceptor sewer system.

Chapter 3 Hydraulic Model Development

This chapter describes the process of developing and calibrating the hydraulic model for use in the capacity assessment, including the flow monitoring program that was conducted for this study.

3.1 Modeling Terminology

Network refers to the representation of the physical facilities being modeled. The primary components of the modeled network are pipes, manholes, and pump stations.

Nodes are primarily manholes, but also include pump station wet wells, outfalls (discharge points of the modeled system) and breaks (changes in slope or diameter without a structure, such as at the vertical bends in inverted siphons). The primary data associated with nodes are rim and invert elevations. In the case of wet wells, the data also includes the diameter (for a circular well) or cross-sectional area.

Pipes are connections between nodes. The primary data associated with pipes are upstream and downstream node IDs, pipe length, diameter, and upstream and downstream invert elevations. Pipes include both gravity sewers and force mains.

Pumps are represented by links connecting the wet well node(s) and the discharge manhole or upstream end of the force main. Pumps are controlled by a number of user-defined parameters, including the switch-on and switch-off levels, types of pumps, and head discharge curves.

Other model components include **Gates and Weirs**, which are represented by links with zero length. Primary data associated with gates are the opening width and invert; data associated with weirs are the crest width and crest elevation.

Subcatchments are areas that contribute flow to the modeled sewer network and represent the unmodeled sewers in the collection system. Data associated with subcatchments include base wastewater (sanitary) flow (computed based on population, water use, or other available data), type of land use (which defines the diurnal profile associated with the base wastewater flow), infiltration/inflow (I/I) parameters, and the node at which the flow from the subcatchment enters the modeled system.

Loads are the flows assigned to each subcatchment. Components of model loads include residential and commercial base wastewater flow (BWF), groundwater infiltration (GWI), and rainfall-dependent I/I (RDI/I). As a sum, they represent the total wastewater flow applied to the model.

Models are the combination of a modeled network, its associated subcatchments and loads, and other data files (e.g., rainfall, diurnal profiles, etc.) that comprise a specific model scenario.

3.2 Delineation of Modeled System

A hydraulic model is typically developed to represent the *trunk* sewer system, which is the network of larger diameter pipes that comprises the "backbone" of the entire system. The City's original hydraulic model was developed by RMC as part of the 2007 Capacity Assessment project and included approximately 28 percent (about 76 miles) of the total sewer pipelines and four of the pump stations. The model was originally constructed using modeling software MIKE URBAN™ (SWMM version) and was converted to InfoWorks™ CS in 2008. RMC has continuously maintained and updated the model as sewer improvement projects were implemented or when new network data became available.

For this Master Plan Update, the model was expanded to include approximately 34 percent (about 92 miles) of the total pipelines and all seven pump stations. The force mains downstream of the Rabello and Northside pump stations were also added. A summary of the system's pipeline inventory is provided in **Table 3-1**. The modeled network is shown in **Figure 3-1**.

Table 3-1: Sewer Collection System Model Summary

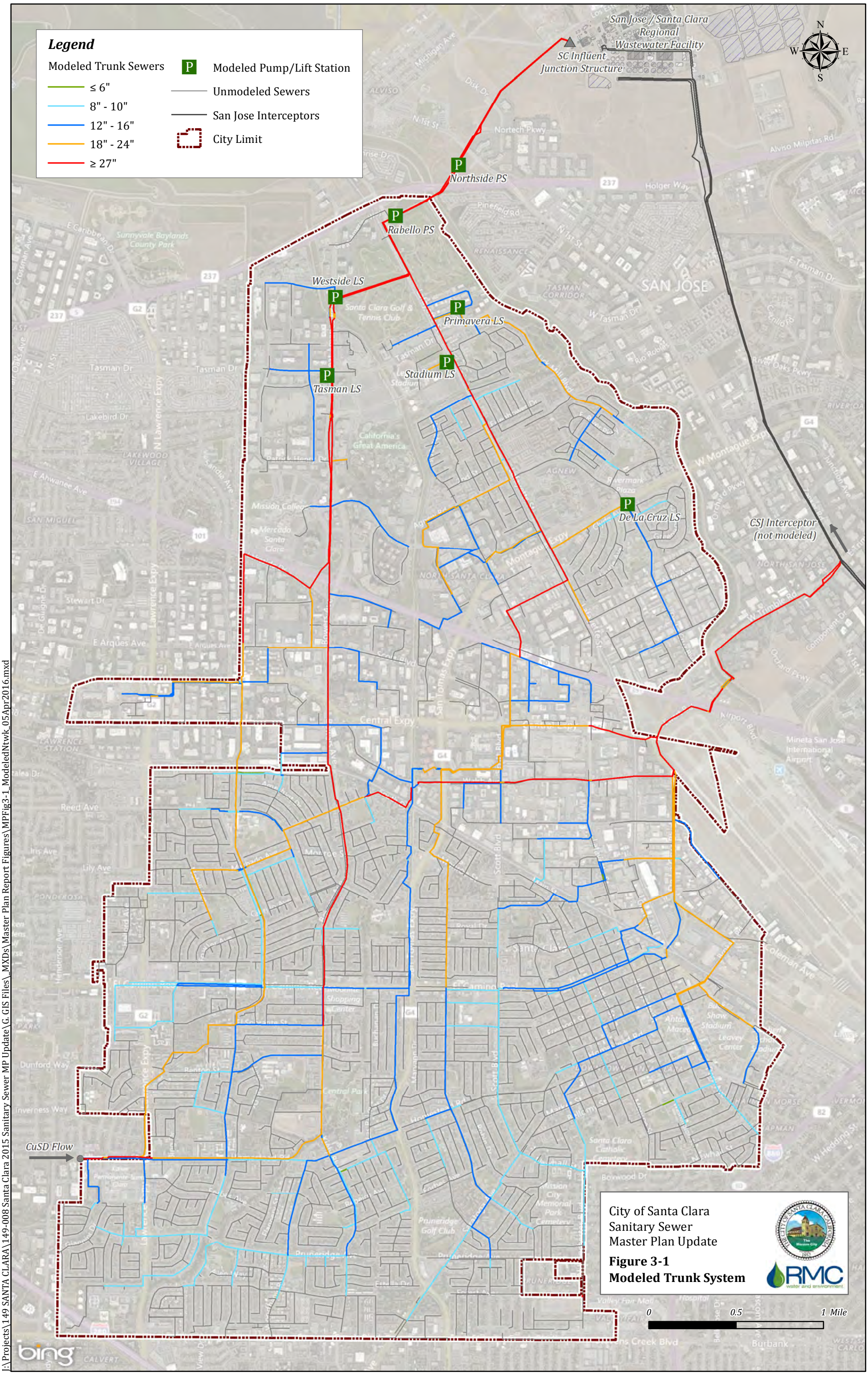
Pipe Diameter (in)	Total Length[1] (ft)	Length Modeled[1] (ft)	Percent Modeled
4-6	197,400	1,800	0.9%
8	619,600	48,300	8%
10	132,300	65,200	49%
12	224,900	120,300	53%
14-16	62,800	59,400	95%
18	43,700	42,000	96%
20-21	15,300	15,300	100%
24	49,600	49,600	100%
27	15,000	15,000	100%
30	25,900	25,900	100%
>30	38,100	38,100	100%
Force Main	13,000	13,000	100%
Total (feet)	1,437,600	493,900	34%
Total (miles)	272.3	93.5	34%
Approx. No. of Manholes	5,260	1,870	36%
No. of Siphons[2]	53	53	100%

1. Rounded to the nearest hundred feet.
2. This refers to the total number of barrels. Some siphons have multiple barrels.

All seven pump stations in the system are included in the model. A survey was conducted to collect information on pump curves and the operational sequences, as summarized in **Table 3-2** below. Pump capacity analysis was conducted for all stations and the results are summarized in Chapter 4 of this report.

Table 3-2: Collection System Pump Station Summary

No.	Station Name	No. of Pumps	Description	Emergency Bypass
1	Westside Lift Station	2	Identical Flygt 3127 pumps.	Yes
2	Tasman Lift Station	2	Identical Flygt 3127 pumps.	Yes
3	De La Cruz Lift Station	2	Identical Flygt 3127 pumps.	Yes
4	Primavera Lift Station	6	Identical Flygt 3127 pumps.	Yes
5	Stadium Lift Station	6	New lift station completed in 2014. Two identical low-flow pumps (Flygt 3127) and four identical high-flow pumps (Flygt 3153).	Yes
6	Rabello Pump Station	8	Identical Flygt 3202 pumps. Four new pumps installed in 2013 and in 2014.	Yes
7	Northside Pump Station	4	Four identical Flygt 3356 pumps.	Yes



City of Santa Clara
Sanitary Sewer
Master Plan Update

Figure 3-1
Modeled Trunk System

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Flows are loaded into the model at "loading manholes," each representing the point where flows from adjacent parcels or parcels connected to unmodeled sewers discharge to the modeled network. The parcels connected to unmodeled sewers were grouped into sewer subcatchments based on the modeled manhole to which the unmodeled sewers drain. Each subcatchment was associated with a unique load manhole in the model network. Approximately 860 sewer subcatchments and associated loading manholes were delineated for defining the model loads. The subcatchments and load manholes are shown in **Figure 3-2**.

3.3 Model Network Construction and Validation

Data of the expanded network were compiled from available as-built drawings, field measurements, and Excel files from previous modeling efforts. The network was also validated using the following steps:

- The entire modeled network (both the original network and the expanded portion) was checked for connectivity, i.e., verifying that correct upstream/downstream manholes were identified for each pipe and there were no missing links in the network.
- Profiles were plotted for each series of pipe segments to visually check for missing or suspect data, such as missing rim or invert elevations, negative pipe slopes, or abrupt steps up or down in pipe inverts. Where appropriate, data were interpolated or verified through field investigation or as-built drawings.
- As-built drawings and field data were used to develop details for the modeled pump stations, such as wet well elevations and dimensions, number of pumps, pump types, on/off levels, and discharge curves.
- Flow splits (manholes with more than one outlet pipe) were identified, and field verification and/or as-built drawings were requested as needed for further verification of outlet pipe elevations and/or the existence of weirs or other flow diversion structures.

3.4 Flow Monitoring Program

Flow monitoring was conducted between November 2014 and March 2015 to measure actual flows in the system for analysis and calibration purposes. The monitoring was conducted by V&A Consulting Engineers (V&A) as subcontractor to RMC. The flow monitoring program originally consisted of 23 flow meters and four rain gauges. Most of the meters were installed and operational from December 10, 2014 to March 4, 2015 (approximately 12 weeks). Four of the meters, Meters 1 through 4, were installed earlier on November 22, 2014 to collect data during scheduled game events at the new Levi's Stadium.

Factors that were considered in selecting the flow meter sites included:

- Location of sites used in 2006 flow monitoring program for the City's previous sewer system capacity assessment study
- Similar sized tributary areas
- Ability to isolate areas to characterize flows for model calibration
- Provides more specific information about flow splits
- Preferred hydraulic conditions (i.e., manholes on a straight line preferred over manholes on bends or with multiple incoming pipes)
- Ease of access and safety considerations

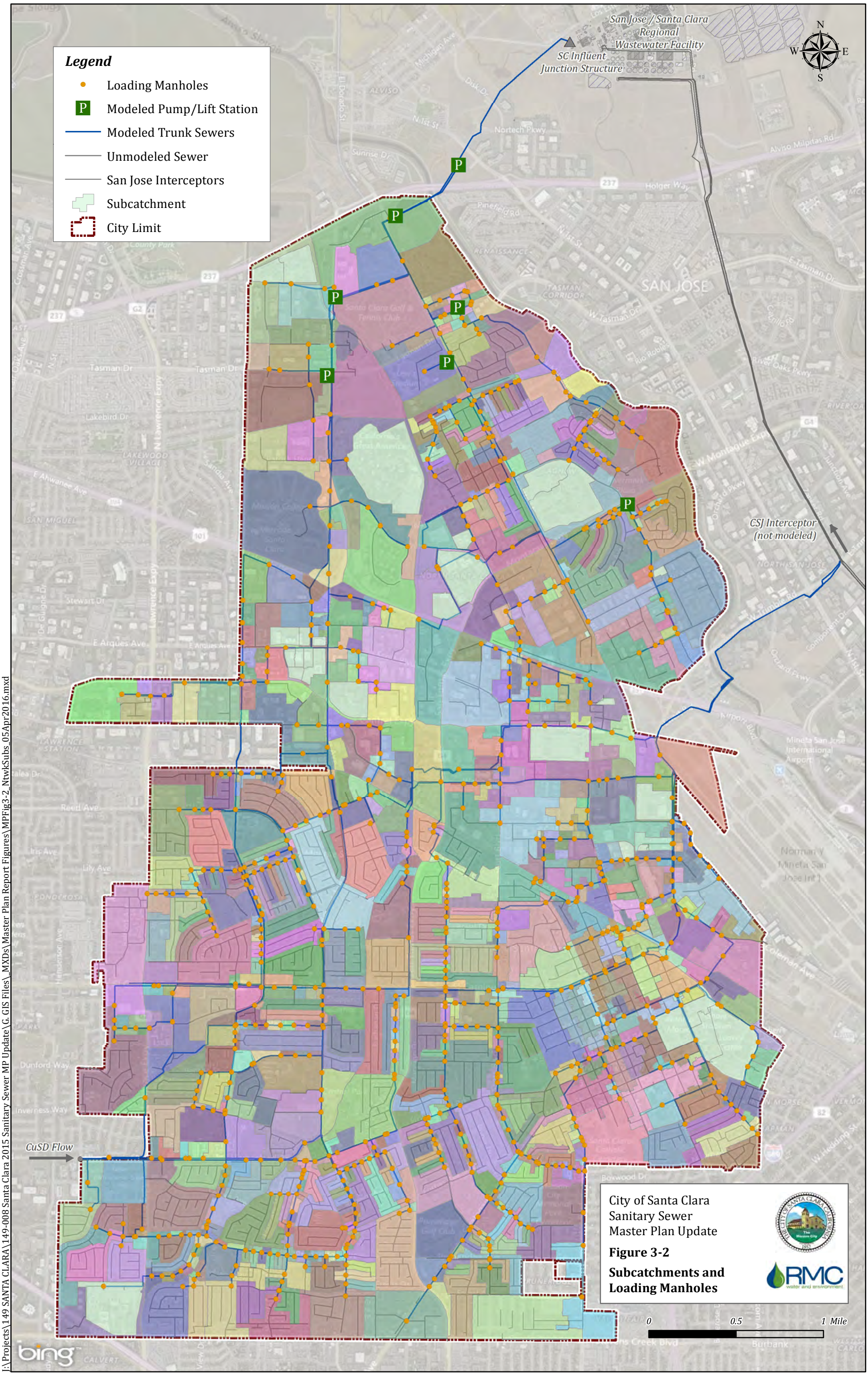
In addition to the 23 sites, the City also owns and maintains two permanent flow meters at the Guadalupe Chart Station just upstream of the connection with the City of San Jose's Interceptors. Upon review of the data collected at these two meters, it was determined that a field calibration was necessary. V&A performed field calibration, and also installed two temporary flow meters at the same site to verify and ensure data quality of the two permanent meters.

The flow monitoring sites are listed in **Table 3-3** and shown on **Figure 3-3**. A flow meter schematic is shown on **Figure 3-4**. Four rain gauges were installed to collect representative rainfall data over the service area during the monitoring period. The rain gauge locations are also shown on Figure 3-3.

Table 3-3: Summary of Flow Monitoring Sites

Meter ID	Location	Manhole ID	Pipe Size (in)	Avg. Flow [1] (mgd)	Peak Flow [2] (mgd)
1 [3]	Lafayette St. north of Calle de Mundo	S104-28	36	3.91	7.95
2 [3]	Golf course private road west of Lafayette St.	S104-26	33	3.97	8.36
3 [3]	Lafayette St. north of Calle de Mundo	S104-30	42	3.05	9.24
4 [3, 4]	Parking lot of the new Levis Stadium	S94-35	24	0.22	0.94
5	Mission College Blvd. north of Our Lady's Wy.	S83-21	33	3.97	10.3
6	Mission College Blvd. north of Our Lady's Wy.	S83-22	30	2.60	6.37
7	Upstream of Primavera Lift Station.	S105-34	24	0.89	1.81
8	Lafayette St. north of Montague Expwy.	S86-12	30	1.79	4.80
9	Calabazas Creek south of Kifer Rd.	S62-40	24	1.98	6.34
10	San Juan Ave. and Monroe St.	S52-79	24	0.80	2.80
11	Chromite Dr. and Pilot Knob Dr.	S53-40	24	1.06	4.76
12	Chromite Dr. and Alhambra	S53-23	24	1.19	4.74
13	Bowers Ave. just north of Bonnie Dr.	S53-54	30	3.50	7.22
14	South Dr. south of Loma Vista Ln.	S54-16	15	0.53	1.12
15	Nvidia Parking lot, west off of Scott Blvd. south of Central Expwy.	S65-50	18	0.45	1.44
16	Central Expwy west of UPRR	S67-13	27	1.43	2.70
17	De La Cruz Blvd. north of Martin Ave.	S58-9	24	0.40	1.48
18	De La Cruz Blvd. north of Martin Ave.	S58-8	24	1.14	
19	North of intersection of Wren Ave. at Kent Avenue	S21-18	24	1.63	3.13
20	Homestead Rd. west of Cherry Orchard Place	S21-47	18	1.74	4.00
21	Kiely Blvd. south of Kaiser Dr.	S23-6	24	2.25	3.68
22	Los Padres Blvd. at Bray Ave.	S45-80	18	0.76	4.60
23	Brokaw Rd. north-east of UPRR	S48-31	18	0.58	1.81
M1 [5]	Guadalupe Chart Station East Line	N/A	33 [6]	3.89	5.80
M2 [5]	Guadalupe Chart Station West Line	N/A	33	1.07	2.64

1. Average flow during non-rainfall period in mid- to late January.
2. Peak 15-minute flow during flow monitoring period (during December 11-12, 2014 storm event for most meters)
3. Meters 1 through 4 were installed on November 22, 2014. All other meters were installed on or around December 10, 2014. All meters were removed on or around March 4, 2015.
4. Average flow represents a typical non-game day flow; peak flow represents a game day flow.
5. Meters M1 and M2 were installed starting January 9, 2015 in addition to the two permanent meters at the Guadalupe Chart Station.
6. Field measurements and observation show this line to be a 36-inch pre-fabricated T-lock lined pipe, while design drawings show its diameter to be 33 inches. A research was done to verify the pipe diameter but did not reach a conclusive result. As such, this pipe remains a 33-inch in the model.



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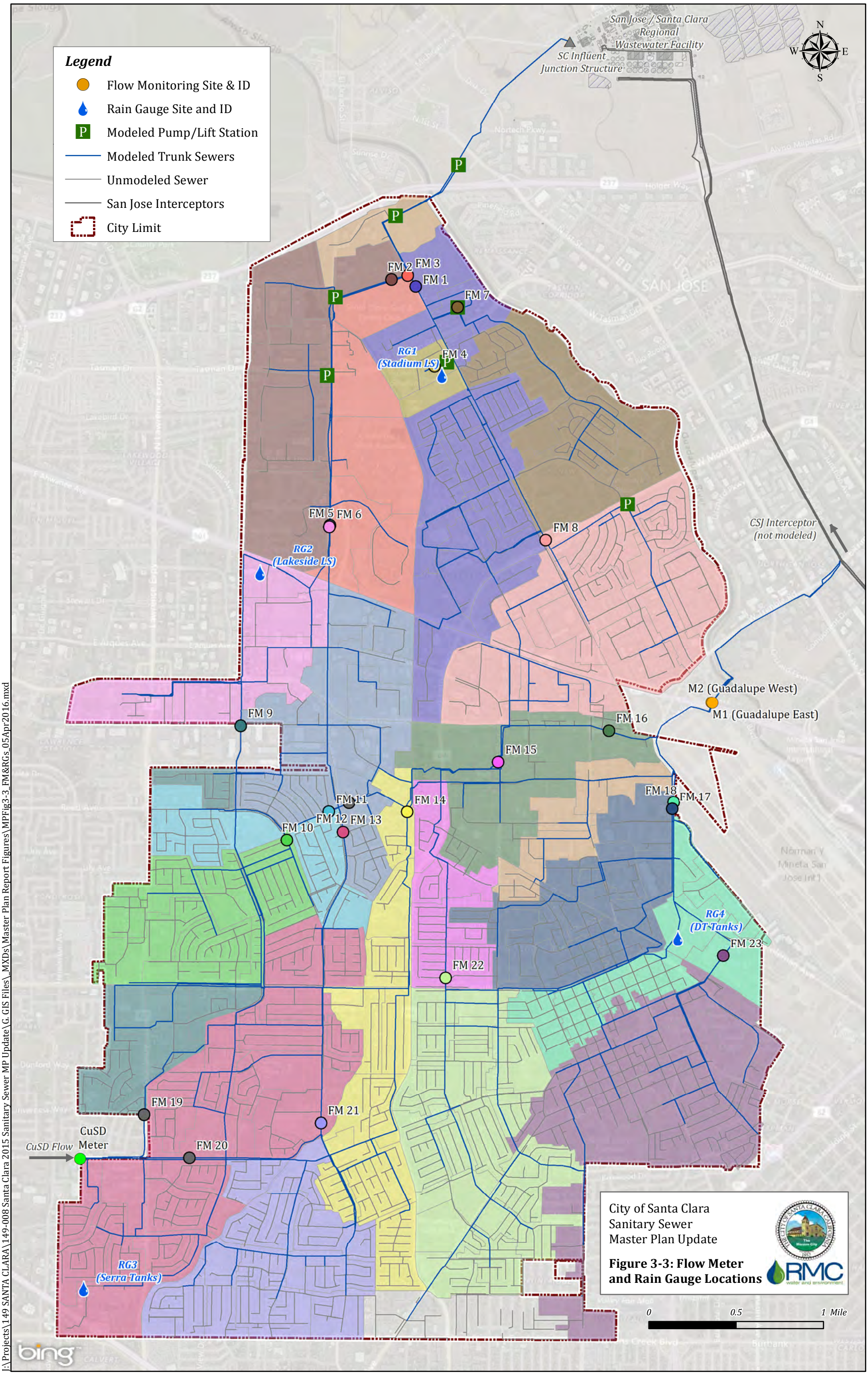

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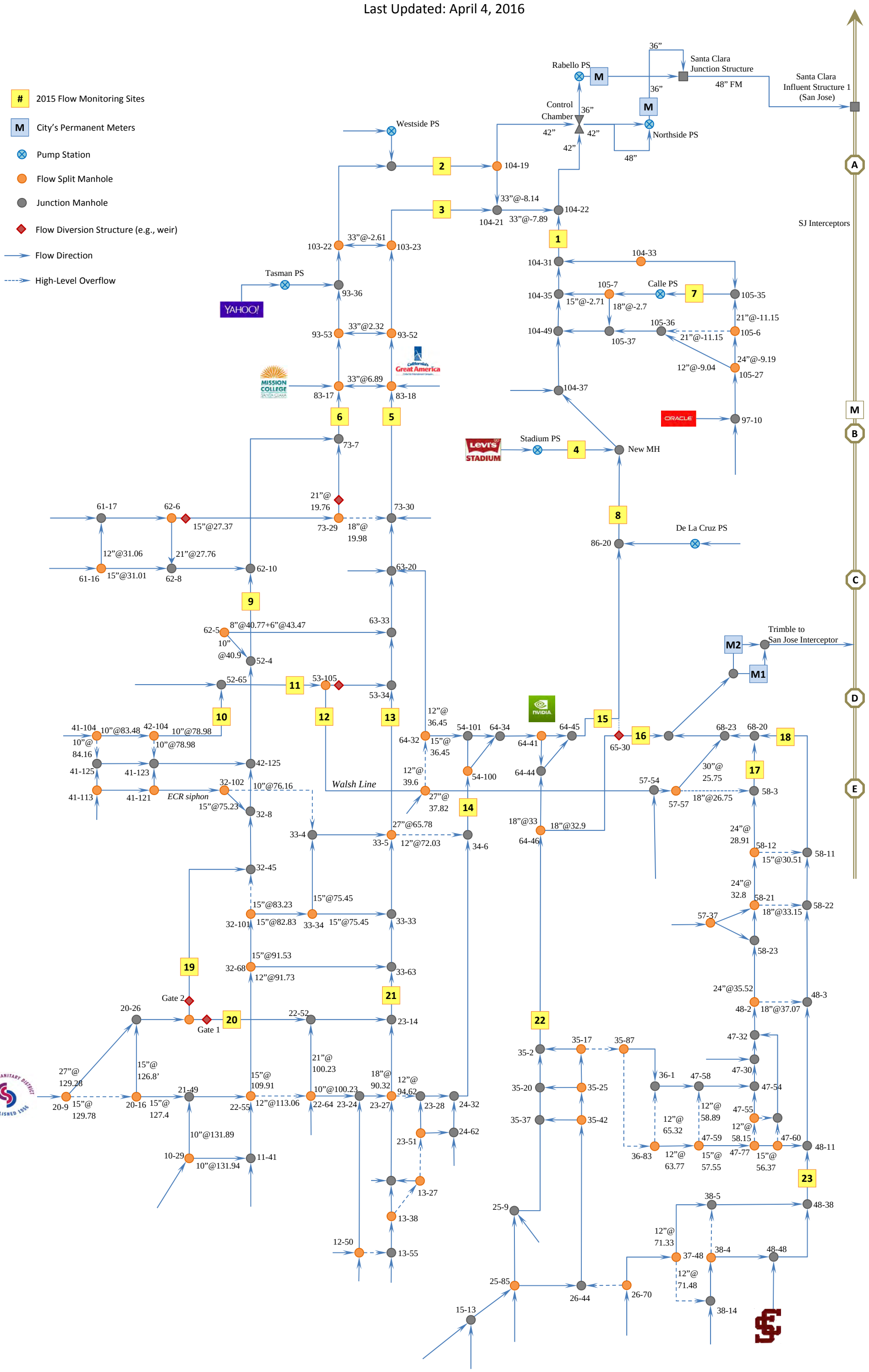
Figure 8: City of Santa Clara Trunk Sewer System Schematic

Last Updated: April 4, 2016



During the flow monitoring period, all of the monitoring sites and the two permanent meter sites at the Guadalupe Chart Station were visited approximately biweekly to check meter operation and site conditions, obtain field calibration measurements, and download collected data. Field calibration involves taking manual depth measurements and flow velocity measurements using a portable velocity meter. These calibration measurements were compared to and used to adjust monitor-recorded depth and velocity if needed. Calibration measurements were taken at different times of day in order to obtain calibration points for the full range of typical diurnal flows.

Approximately four storm events occurred during the flow monitoring period. The biggest event occurred on December 11, 2014, in which over 3 inches of rainfall were recorded within a 24-hour period, with a peak hour rainfall of 0.38 inch between 9 a.m. and 10 a.m. This is the event used for wet weather flow calibration, discussed further in Chapter 3.

Plots of the flow monitoring data and a tabular summary of daily average, minimum, and maximum flows for each meter are included in **Appendix A**.

3.5 Model Calibration

Model calibration is the process of comparing model-computed flows to observed (monitored) flows to verify that the model is accurately simulating flows in the sewer system. As described above, temporary flow monitoring programs consisting of 25 flow meters installed in the Santa Clara system during the 2014/15 winter season as part of the study. The data collected during this flow monitoring program were used for model calibration.

3.5.1 Dry Weather Calibration

The 14-day non-rainfall period from January 17 to January 30, 2015 was used for dry weather calibration. The dry weather calibration process was used to verify BWF loads and diurnal curves, and to quantify GWI (as indicated by monitored flows that were higher than estimated BWF). **Table 3-4** compares the model vs. metered average dry weather flow (ADWF) at each of the meter locations. **Figure 3-5** shows an example plot of model vs. metered flow for one of the flow monitoring locations in the system (Meter 5). Dry weather calibration graphs for all meters are included in **Appendix B**.

Overall, the model calibration resulted in a reasonably good match at most locations, but there were differences at some locations. These differences may be due to inaccuracies in the meter data, water use loadings, or configuration of the system (e.g., upstream flow splits, weir settings, etc.). Extensive effort was made to resolve as many of the calibration differences as possible. As shown in **Table 3-4**, the sum of the observed flows at the most downstream meters (Meters 1, 2, 3, M1 and M2) was within 6 percent of the modeled flows, which provides confidence that the overall flows in the model are reasonably accurate.

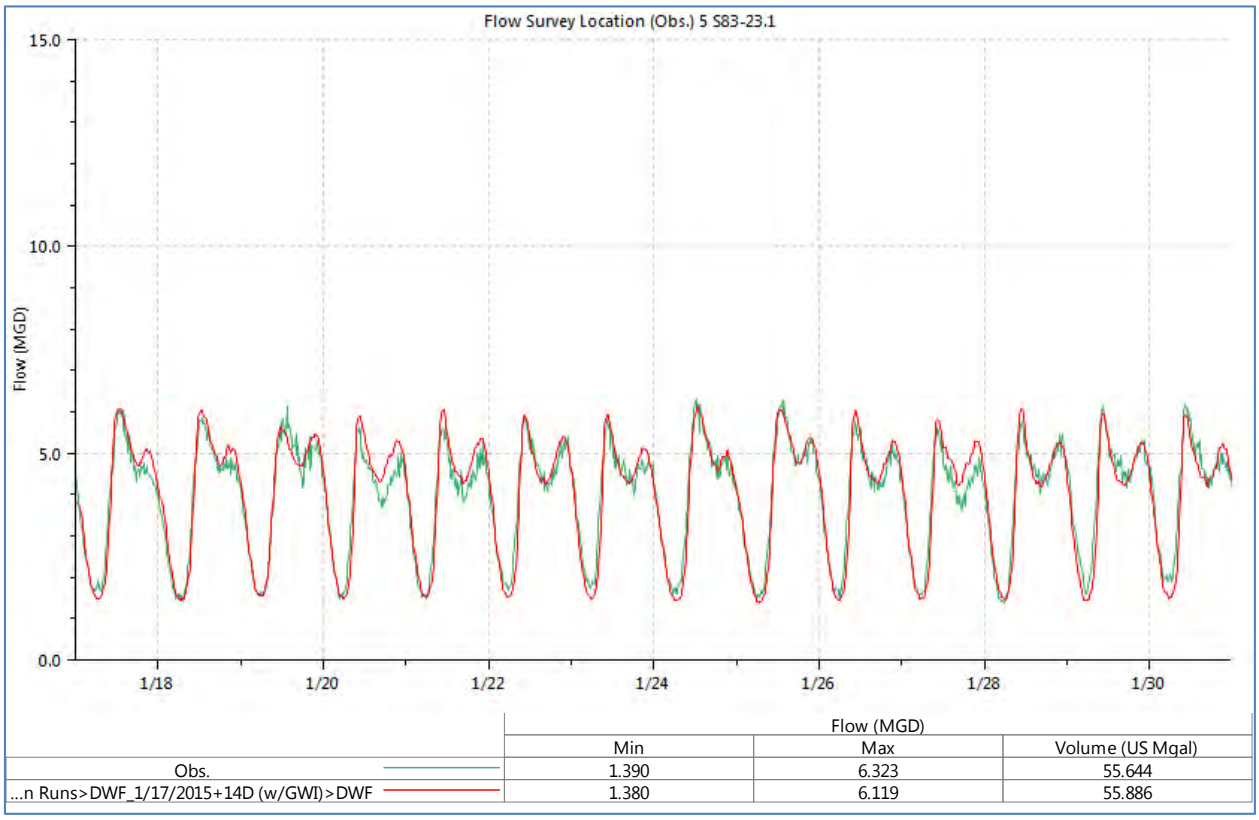
Note that the total model ADWF is higher than the estimated existing BWF shown in Table 2-2 because the model ADWF also accounts for the CuSD flow (observed flow data was used, which was approximately 3.57 mgd for the calibration period) and about 0.35 mgd of GWI that was added to the system during the calibration process, which was applied to the basins tributary to meters 10 and 11, at an estimated rate of 1,000 gpd/acre. As described in Chapter 2, GWI is calculated based on the difference between average flow on non-rainfall days during the flow monitoring period and estimated BWF for meters for which estimated BWF is noticeable lower than monitored flow. Other meter areas may also include some nominal dry weather GWI, which is assumed to be included in the BWF estimates.

Table 3-4: Dry Weather Flow Calibration Results

Meter ID	Meter Avg. Flow (mgd)	Model Avg. Flow (mgd)	Difference (mgd)	Percent Difference
1	3.91	3.42	-0.49	-12%
2	3.97	3.71	-0.26	-7%
3	3.05	3.27	0.21	7%
4 (1)	0.22	0.22	0.00	0%
5	3.97	3.99	0.02	0%
6	2.60	2.54	-0.06	-2%
7	0.89	0.74	-0.16	-17%
8	1.79	1.70	-0.09	-5%
9	1.98	2.25	0.27	13%
10	0.80	0.80	0.00	0%
11	1.06	1.10	0.04	4%
12	1.19	1.14	-0.05	-4%
13	3.50	3.59	0.09	3%
14	0.53	0.51	-0.02	-4%
15 (2)	0.45	0.81	0.36	79%
16 (2)	1.43	1.06	-0.37	-26%
15 & 16 (2)	1.88	1.87	-0.01	-1%
17	0.40	0.54	0.14	34%
18	1.14	0.99	-0.15	-13%
19	1.63	1.56	-0.07	-4%
20	1.74	1.51	-0.23	-13%
21	2.25	2.09	-0.15	-7%
22	0.76	0.91	0.14	19%
23 (3)	0.58	0.69	0.11	18%
M1 (Guadalupe East)	3.89	3.41	-0.48	-12%
M2 (Guadalupe West)	1.07	1.16	0.09	8%
Sum of D/S Meters (4)	15.90	14.97	-0.92	-6%

1. Meter 4 was installed immediately downstream of the Levi's stadium with the intention to collect data to study flow patterns during major game events. The meter did capture good flow data for a number of game events, but also encountered a technical issue in late January that caused data collected between January 20 and February 18 (overlapping with the calibration period) to be unrecoverable. As such, data collected between January 11 and January 18 (a 7-day non-rainfall period when the venue was not used for any games) was used to establish the baseline flow for the stadium.
2. Meters 15 and 16 had an unexpected shift in flow distribution between late December 2014 and early January 2015, possibly caused by a temporary blockage upstream of the two meters. City staff was informed of this shift but could not provide an explanation. Although the meter flows did return to a higher level in late January 2015, they never returned to the pre-shift level. As such, their data was deemed not suitable to be used for calibration for each meter basin individually; instead, their tributary subcatchments were calibrated together as one basin using the combined data of the two meters.
3. Meter 23 was located downstream of the Santa Clara University. The dry weather calibration period coincided with the registration week of the school's winter quarter when student population was not at its maximum. The observed flow for this meter was therefore noticeably lower than the modeled flow (which was developed based normal school period).
4. Downstream (D/S) Meters are meters 1, 2, 3, M1, and M2. See system schematic in Figure 3-4.

Figure 3-5: Example Dry Weather Calibration Graphs



	Flow (MGD)		
	Min	Max	Volume (US Mgal)
Obs.	1.390	6.323	55.644
...n Runs>DWF_1/17/2015+14D (w/GWI)>DWF	1.380	6.119	55.886

3.5.2 Wet Weather Calibration

The storm that occurred on December 11, 2014 was used for wet weather calibration. As described previously, RDI/I response to rainfall events was quantified in terms of three sets of triangular unit hydrograph parameters that represent the volume percentage of rainfall that enters the system as RDI/I and the shape of the RDI/I hydrograph as a function of each hour of rainfall. Through the wet weather calibration process, RDI/I hydrograph parameters were developed for each meter area. In general, the response to rainfall in the Santa Clara system is relatively small, as evidenced by the relatively low peak flow response to the rainfall event, with the exception of areas in the western portion of the City near Monroe Street, which showed both a high peak inflow during the rainfall event and an extended period of infiltration after the event.

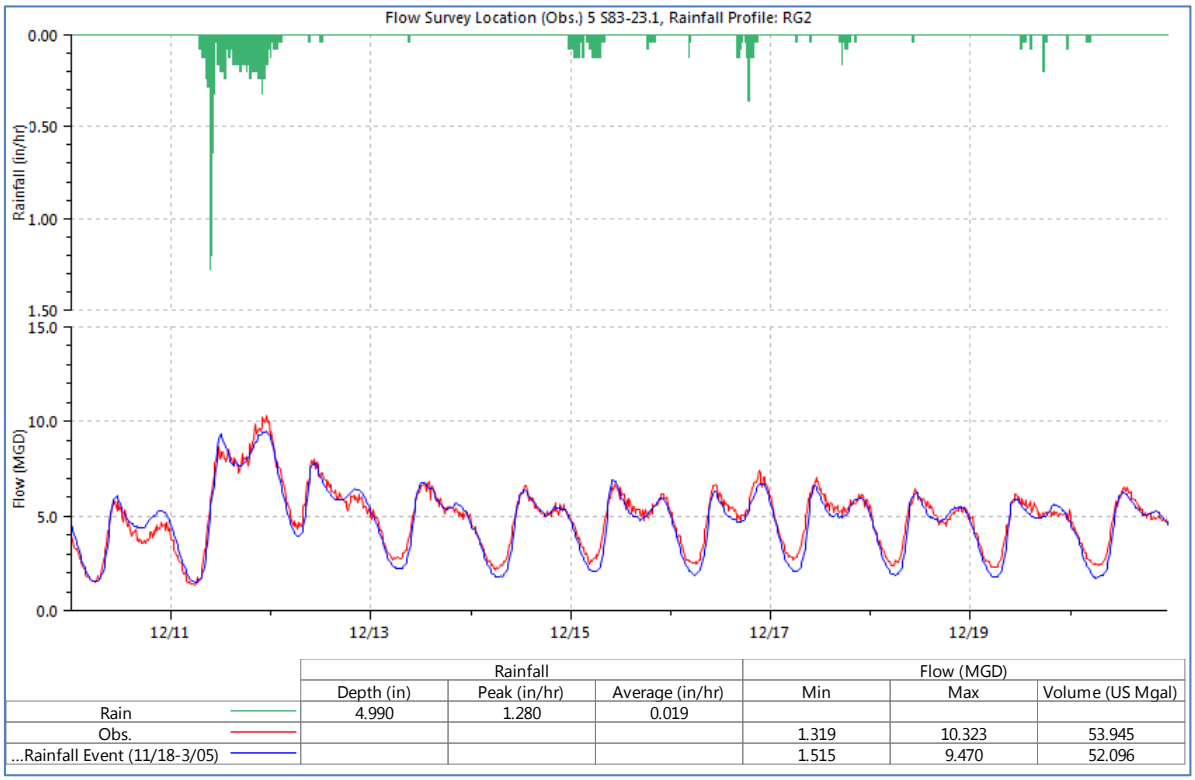
Table 3-5 lists the "R values" (as percentages of rainfall) for each flow meter area. **Figure 3-6** shows an example plot of model vs. metered flow for one of the flow monitoring locations in the system (Meter 5). A complete set of wet weather calibration graphs of modeled vs. metered flow for all meter locations are included in **Appendix C**.

Table 3-5: Wet Weather Flow Calibration Results

Meter ID	R1 RDI/I Vol. (%)	R2 RDI/I Vol. (%)	R3 RDI/I Vol. (%)	Total R (%)
1	0.3%	0.3%	0.8%	1.4%
2	0.1%	0.5%	0.8%	1.4%
3	0.1%	0.1%	0.1%	0.3%
4	1.0%	0.1%	0.1%	1.2%
5	0.1%	1.0%	1.5%	2.6%
6	0.1%	0.5%	1.5%	2.1%
7	0.2%	0.5%	0.8%	1.5%
8	0.3%	0.5%	1.2%	2.0%
9	0.5%	3.5%	8.0%	12.0%
10	1.0%	4.2%	8.0%	13.2%
11	0.1%	2.0%	15.0%	17.1%
12	0.2%	1.0%	20.0%	21.2%
13	0.1%	0.1%	0.8%	1.0%
14	0.4%	0.1%	0.5%	1.0%
15 & 16 (1)	0.1%	0.1%	0.3%	0.5%
17	0.5%	0.5%	0.5%	1.5%
18	0.5%	0.8%	1.0%	2.3%
19	0.3%	0.4%	0.5%	1.2%
20	0.1%	0.1%	0.1%	0.3%
21	0.2%	0.1%	0.1%	0.4%
22	0.1%	0.2%	0.1%	0.4%
23	0.5%	0.2%	0.1%	0.8%
CuSD	0.25%	0.35%	0.5%	1.1%

1. Meters 15 and 16 were calibrated together due to unexpected field conditions. See note 2 under Table 3-4.

Figure 3-6: Example Wet Weather Calibration Graphs for 2014 Storm Period



	Rainfall			Flow (MGD)		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min	Max	Volume (US Mgal)
Rain	4.990	1.280	0.019			
Obs.				1.319	10.323	53.945
...Rainfall Event (11/18-3/05)				1.515	9.470	52.096

Chapter 4 Capacity Analysis

This chapter describes the hydraulic analysis and design criteria used to evaluate system performance and size capacity relief projects, the capacity deficiencies based on the results of model runs, and preliminary solutions to identified capacity deficiencies. The chapter also summarizes the pump station capacity evaluation and analysis.

4.1 Design Event Criteria

Peak design flows for sewer systems consist of dry weather base wastewater flow (BWF), groundwater infiltration (GWI), and rainfall-dependent infiltration/inflow (RDI/I). Criteria for computing existing BWF, GWI, and RDI/I (developed as part of model calibration), and unit flow assumptions for future development were discussed in the previous chapters. However, the peak design flow criteria must also specify the set of conditions (e.g., design storm rainfall and timing with respect to seasonal GWI and diurnal BWF) that will generate the highest peak flows that the sewer system must be capable of hydraulically conveying.

The following subsections discuss design storm criteria, present data from recent storm events, and identify options and recommendations for selection of a design event for use in this Master Plan Update.

4.1.1 Design Storm Condition

The use of wet weather design events as the basis for sewer capacity evaluation is a well-accepted practice. The approach is to first calibrate a hydraulic model of the system to match wet weather flows from observed storms, and then apply the calibrated model to a design rainfall event to identify capacity deficiencies and size improvement projects. The design event may be synthesized from rainfall statistics, or may be an actual historical rainfall event of appropriate duration and intensity.

A design storm is used to simulate a peak wet weather flow condition to identify system deficiencies and develop solutions for them. Design storms are typically classified by their return period and duration. The return period defines the probability that the design rainfall will be exceeded in any given year. For example, a storm with a 10-year return period means there is a 1 in 10 chance, or 10 percent probability, of exceeding the design rainfall in a given year. The chosen return period reflects the degree of risk an agency will tolerate of experiencing sanitary sewer overflows (SSOs) due to future storm events. However, choosing a design storm with a very high return period (reflecting a very low risk tolerance) could lead to the identification of so many system capacity deficiencies that the cost of improvements is prohibitive. Additionally, sizing a system for a very rare event could mean that the system does not function well under typical conditions during much lower flows (due to slow velocities in oversized pipes, or oversized pump stations).

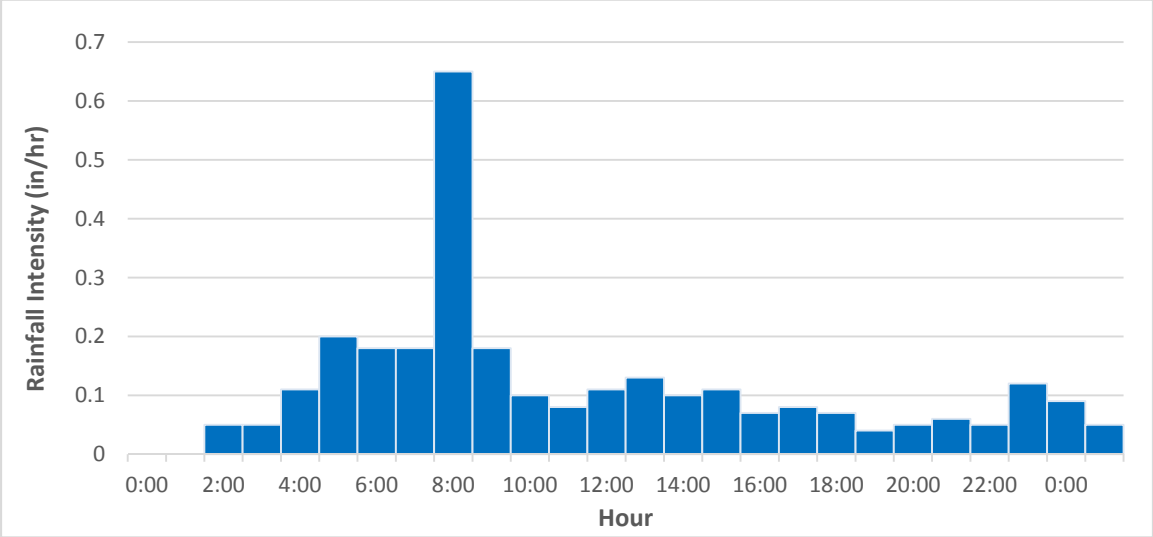
A storm duration must be specified along with the return period. Most Bay Area agencies use a 24-hour storm, though shorter or longer durations may sometimes be appropriate depending on system size and how quickly or slowly the system responds to rainfall. Design storm may be actual historical rainfall events or synthetic events that are designed to represent a certain return period for a specified storm duration or durations.

The City's 2007 Capacity Assessment used a 10-year, 24-hour storm, with one-hour and six-hour 10-year events included within the 24-hour event. This storm was based on the Santa Clara County intensity-duration-frequency (IDF) curve that was current at the time, representing rainfall statistics at the San Jose International Airport. To reflect differences in rainfall characteristics across the service area, the storm was scaled for different areas based on the isohyetal map of average annual rainfall from the Consoer, Townsend & Associates Sanitary Sewer I/I Analysis, dated 1974.

Since the completion of the Capacity Assessment, Santa Clara County released a new County Drainage Manual in October 2007. The Manual includes updated mean annual precipitation isohyetal lines from Santa Clara Valley Water District (SCVWD) and updated, distinct IDF curves for each mean annual

precipitation area. In addition to the IDF curves, Appendix D of the 2007 manual includes a 24-hr design storm pattern. According to the manual, this storm pattern is based on an actual event that occurred in December 1955, but with some adjustments to better reflect IDF statistics for various storm durations. Like the previous design storm, the design storm used for this Master Plan Update is also a 10-year, 24-hour storm that varies across the service area, but the storm pattern and hourly rainfall intensities are based on this updated Santa Clara County Drainage Manual. **Figure 4-1** shows the design storm hourly rainfall as it occurs in the vicinity of the San Jose International Airport. At this location, the total rainfall for the 1, 6-, and 24-hour durations is 0.65, 1.49, and 2.92 inches, respectively.

Figure 4-1: Design Storm Pattern for the San Jose International Airport MAP Area



The design storm represents the "point precipitation" at any single location in the system. The storm is applied in the model at the subcatchment level, with the assumption that the rainfall occurs simultaneously on all subcatchments, which is a conservative assumption.

As noted previously, the timing of the design storm also affects the resulting peak wastewater flows. If the design storm is timed to cause peak RDI/I at the same time as peak base wastewater flow, the total peak wet weather flow will be higher than if the design storm occurs during minimum or average base wastewater flow. Due to variations in the diurnal flow patterns as well as variations in the calibrated I/I response throughout the system, it is not possible to time the rainfall to create a peak-on-peak response everywhere in the system. However, the design storm was timed to achieve a peak-on-peak response in most areas of the system, with the peak hour rainfall occurring at 8:00 a.m. on a weekday.

4.2 Hydraulic Capacity Criteria

The hydraulic capacity criteria determine which sewer pipes should be relieved or replaced due to inadequate capacity to convey existing or future peak flows, and how large the new sewers should be. The criteria adopted by the City should ideally be stringent enough to ensure that sewer overflows caused by capacity limitations (as distinguished from other causes such as obstructions or structural failures) are very rare occurrences, but not so conservative that they cause the City to spend capital improvement funds unnecessarily or result in pipes that are so large that cleaning velocities cannot be achieved under normal flow conditions, causing solids build up and related problems.

The capacity deficiency criteria identify the need to replace an existing facility, while design criteria determine the sizing of new facilities. These criteria are discussed in the paragraphs below.

4.2.1 Capacity Deficiency Criteria

The capacity deficiency criteria are used to determine when the capacity of an existing sewer facility is exceeded to the extent that a relief sewer or larger replacement sewer or potential pump station capacity upgrade is required. Capacity deficiency criteria are sometimes called "trigger" criteria in that they trigger the need for a capacity relief project. These criteria often differ from criteria that are applied to determine the size of a new facility, which are typically more conservative.

It is important that the capacity deficiency criteria be coordinated with the peak design flow criteria. For example, if the peak design flow were to be based on only peak dry weather flow (PDWF), the deficiency criteria would need to be conservative (e.g., require pipes to flow less than full to allow capacity for I/I). On the other hand, if the peak design flow includes I/I from an infrequent storm event, it may be appropriate to allow the sewers to flow surcharged to some extent, since the peak flows will be infrequent and brief in duration.

Gravity Sewers

Since the peak wet weather design flow as recommended in the previous section of this chapter includes RDI/I from a 10-year return period event and is assumed to be concurrent with peak BWF, the City should consider it acceptable to allow gravity sewers to flow surcharged to some extent before a capacity relief project is triggered. For example, significant surcharging may be acceptable in larger, deeper sewers provided the hydraulic gradeline remains a reasonable distance below the ground surface and no surcharging occurs during dry weather flow conditions. For smaller or shallow sewers, a more conservative criteria could be considered to account for the chance that capacity could also be compromised by factors such as offset joints, roots, grease, and debris (which cannot be accounted for in the hydraulic model), or that surcharge could result in flow backing up into connecting laterals.

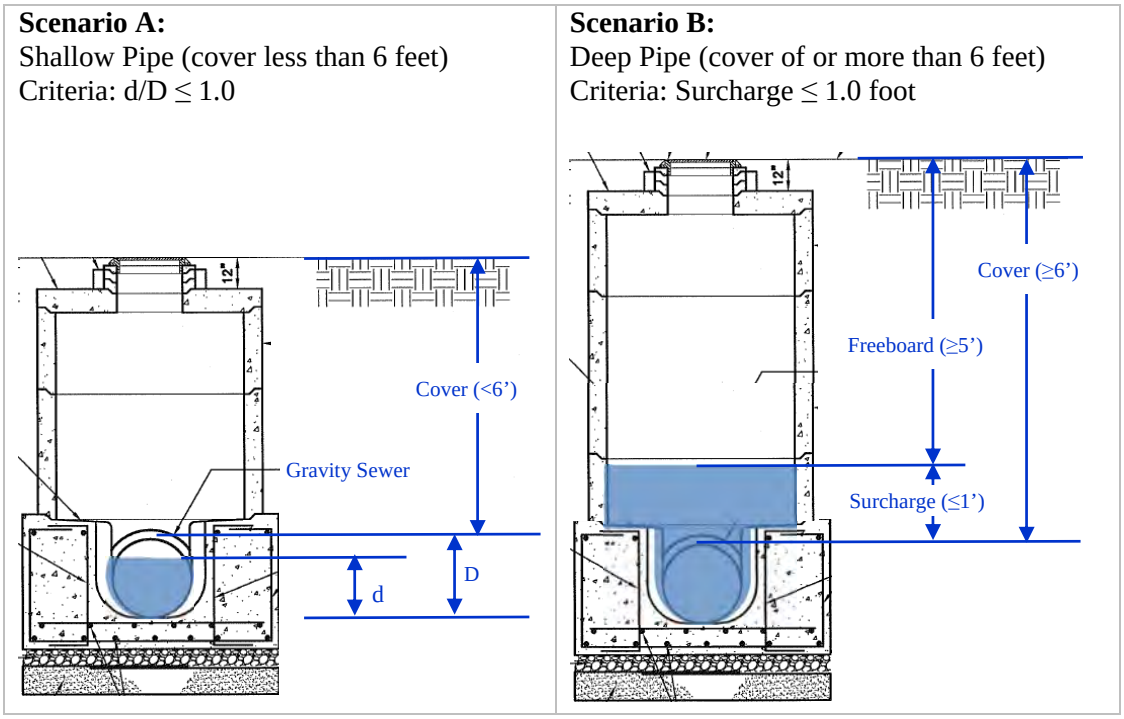
Based on discussion of these considerations, the following criteria are proposed under which gravity sewers would be considered capacity deficient:

- PDWF: No surcharge allowed ($d/D \leq 1.0$)
- PWWF:
    - Gravity sewer with less than 6 feet of cover: no surcharge allowed (i.e., $d/D \leq 1.0$)
    - Gravity sewer with 6 feet or more of cover: surcharge of up to 1 foot under PWWF (see Figure 4-2 for clarification)
- Case-by-case exceptions could be made for isolated short pipe reaches. Conversely, more stringent criteria could be applied for sewers located in areas where the consequences of an overflow would be greater (e.g., adjacent to creeks, schools, or hospitals).
- Note that for evaluating the performance of existing sewers, a Manning's "n" value of 0.013 is assumed for all pipes, regardless of material or age. Although new pipes, particularly plastic materials, would provide a lower initial roughness factor, it is assumed that over time, a "slime layer" formation on the walls of the pipes and/or other obstructions in the sewer, such as roots, debris, or structural defects, may increase pipe roughness. Therefore, an assumption of 0.013 for all pipes is considered to be appropriately conservative for master planning purposes.

Pump Stations and Force Mains

For master planning capacity assessments, the performance of pump stations and force mains are typically evaluated based on pumping capacity and peak force main velocities. Pump stations are considered to be capacity deficient if the station's firm capacity (capacity with largest pumping unit out of service) is insufficient to convey the peak design flow. Force mains are considered to be deficient if velocity under peak design flow exceeds 10 feet per second (fps).

Figure 4-2: PWWF Hydraulic Deficiency Criteria for Gravity Sewers



4.2.2 Sizing Criteria for New Sewer Facilities

The following criteria are proposed for sizing new trunk gravity sewers as part of the Master Plan. They are consistent with the City's current sanitary sewer design criteria. Note that the City may use somewhat different criteria for new developments or actual design, e.g., varying Manning's n for different pipe materials, or a more conservative d/D for smaller diameter sewer mains. These criteria would be based on the modeled design storm peak wet weather flows in the system.

- Maximum allowable flow depth-to-diameter ratio (d/D) of 0.75 under peak design flow
- A Manning's 'n' of 0.013
- Minimum pipe size of 8 inches diameter in residential areas; 10 inches in commercial areas; and 12 inches in industrial areas
- Minimum velocity of 2 feet per second (fps) at half-full pipe
- Maximum velocity of 10 fps at peak design flow
- Downstream pipes at least as large as upstream pipes
- Minimum and maximum pipe slopes determined based on above velocity criteria to the extent feasible (it is recognized that elevation constraints in the existing system may prevent achieving desired minimum slopes for some projects, and terrain may dictate higher maximum slopes in some cases)
- Minimum pipe cover of 6 feet

4.3 Capacity Analysis Results and Proposed Solutions

Based on the criteria described above, the hydraulic model was run for four sets of conditions representing combinations of existing or future development and dry weather flow or design storm wet weather flow. **Figure 4-3** shows the model results for future PWWF conditions. Pipes shown in red are predicted to be surcharged due to "throttle" (peak flow exceeding full pipe capacity), and pipes shown in blue are surcharged due to backwater from a downstream throttle condition. Locations of capacity criteria violations (surcharge of more than 1 foot due to either throttle or backwater conditions) are highlighted in yellow (pipes with criteria violations under both existing and future conditions) or orange (future conditions only).

Note that the locations of criteria violations (i.e., higher than allowable surcharge) are not necessarily the locations of the actual capacity-deficient pipes, but are typically located further upstream due to backwater from downstream throttle conditions. **Appendix D** includes model hydraulic profiles for each of these areas.

Potential solutions for the identified capacity deficiencies were developed in order to assess the potential extent of required capacity improvements and to estimate the resulting peak flow to the SJ/SC RWF once capacity deficiencies are relieved. **Table 4-1** summarizes the predicted flow under each condition. **Table 4-2** describes the solutions. The solutions model results indicate that the combined total estimated design storm future PWWF from the City's system (including flows from CuSD) would be approximately 59 mgd.

Table 4-1: Summary of Capacity Analysis Results

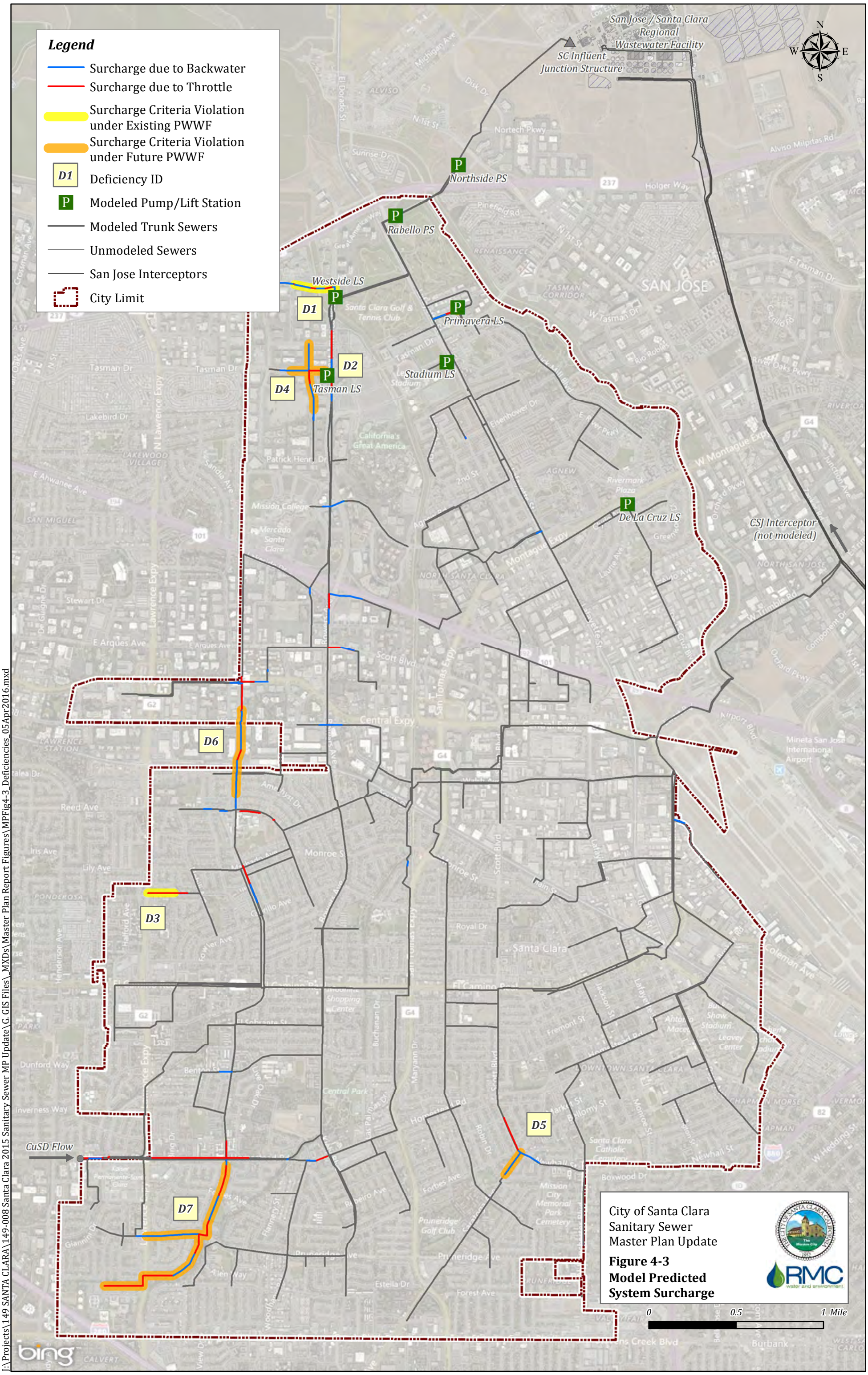
	Existing ADWF [2] (mgd)	Existing PDWF [2] (mgd)	Existing PWWF [3] (mgd)	Future ADWF [2] (mgd)	Future PDWF [2] (mgd)	Future PWWF [3,4] (mgd)
Flow Estimates by System Outfall [1]						
North (to Northside and Rabello Pump Stations)	10.2	15.2/16.0	27.9	24.6	33.5/34.4	41.0
East (to San Jose Zanker Road Interceptor)	4.7	6.4	11.7	9.8	13.3	18.3
Total	14.9	21.6/22.4	39.6	34.4	46.8/47.7	59.4
Flow Estimates by Agency [1]						
Santa Clara System	11.3	15.4/16.2	26.8	27.5	34.6/35.5	45.6
Cupertino Sanitary District	3.5	6.2	12.8	6.9	12.2	13.8
Total	14.9	21.6/22.4	39.6	34.4	46.8/47.7	59.4

1. Assuming that trunk sewer capacity deficiencies are relieved with recommended capital improvement projects presented in Table ES-2.
2. Includes groundwater infiltration for a typical wintertime period. ADWF and first value shown for PDWF includes typical non-game day flow from Levi's Stadium; second value shown for PDWF includes a peak game day flow from Levi's Stadium.
3. For 10-year design storm; assumes non-game day flow from Levi's Stadium.
4. Assuming peak wet weather flow from CuSD would not increase above its contractual maximum flow of 13.8 mgd.

Table 4-2: Capacity Deficiencies and Proposed Solutions

Def. ID	Deficiency Location [1]	Trigger Scenario	Surcharge or Criteria Violation [2]	Proposed Solution
1	Westside Lift Station	2015 PDWF	Current set point of the lead pump is about 5 feet above the invert of the influent line, causing backup issues upstream between MH S102-3 and S103-8 (station wet well).	Adjust the set point of the lead pump to be equal or lower than the invert of the influent gravity line.
2	Tasman Lift Station	2015 PDWF	Current set point of the lead pump is about 2 feet above the invert of the influent line, causing backup issues upstream between MH S93-24 and S93-35 (station wet well).	Adjust the set point of the lead pump to be equal or lower than the invert of the influent gravity line.
3	Cabrillo Avenue	2015 PWWF	Surcharge of up to 5 feet from MH S41-13 to S41-20 under existing PWWF scenario and potential overflow in S41-13, S41-14 and S41-15 under future PWWF scenarios.	Conduct smoke testing and television inspection in the flow tributary area to identify and address high inflow/infiltration sources. If field investigations indicate that I/I reduction is not feasible or cost-effective, then upsize the existing 8-inch line to a 12-inch between S41-13 and S41-20.
4	Tasman Drive and Old Ironsides Drive	2035 PWWF	Surcharge of up to 3 feet upstream of Tasman Lift Station.	Upsize 800 feet of existing 12-inch line between S93-24 and S93-35 to a 15-inch line.
5	Scott Blvd.	2035 PWWF	Surcharge of up to 1 foot between S25-78 and S26-44, and S26-57 and S25-37.	Install a weir in S25-85 to divert flow northwest to Los Padres Blvd.
6	Calabazas Creek Trunk Sewer	2035 PWWF	Surcharge of up to 3 feet in the existing 24-inch line along Calabazas Creek between S52-52 and S62-14.	Install a new 200-ft 15-inch line between S42-12 and S52-93 (Calabazas Blvd. and Machado Ave.) to partially divert flow from the 24-inch to the 21-inch on Machado Ave.
7	Tracy Dr., Pomeroy Ave., and Homestead Rd.	2035 PWWF	Surcharge and potential overflow between S10-77 and S22-55.	Upsize the existing 10- to 12-inch line between S10-77 and S22-55 to a 15-inch line, install a new 15-inch diversion line between S22-55 and S22-46, and upsize the existing 18-inch line between S22-46 and S22-51 to a 21-inch line.

1. Refer to Figure 4-3 for deficiency locations
2. Under PWWF conditions.



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4.3.1 Pump Station Firm Capacity Analysis

All seven lift and pump stations in the system were evaluated to determine if each station had adequate firm capacity to handle the design peak flow. Firm capacity is defined as the capacity of a station with the largest pump out of service. **Table 4-3** below provides a summary of station firm capacity compared with peak inflow for future PWWF conditions.

Table 4-3: Pump Station Firm Capacity Analysis

No.	Station Name	No. of Pumps	Estimated Peak Inflow (mgd) (1)	Estimated Firm Capacity (mgd)	Firm Capacity Status(6)
1	Westside Lift Station	2	0.6	0.6 (3)	Sufficient firm capacity
2	Tasman Lift Station	2	1.5	1.5 (3)	Sufficient firm capacity
3	De La Cruz Lift Station	2	1.2	1.7 (3)	Sufficient firm capacity
4	Primavera Lift Station	6	2.0	5.7 (3)	Sufficient firm capacity
5	Stadium Lift Station	6	1.0	6.0 (4)	Sufficient firm capacity
6	Rabello Pump Station	8	20 (2)	20 (5)	Sufficient firm capacity
7	Northside Pump Station	4	21 (2)	21 (5)	Sufficient firm capacity

1. Peak inflow refers to the maximum flows predicted by the model under future peak wet weather scenario using the solution network. The solution network eliminates flow restrictions upstream of the pump stations.
2. Peak inflow reflects the maximum flows predicted by the solution network in which CIP Project P6 (Sewer Diversion at Calabazas Boulevard and Machado Avenue) is implemented, which would divert excess flow from the 24-inch sewer line along Calabazas Boulevard into the 21-inch sewer line in Machado Ave, ultimately flowing to the City of San Jose's interceptor in Zanker Road. This would reduce the flow conveyed north to the Rabello and Northside Pump Stations to the values shown in the table. Conversely, implementation of Project P6-Alt. would increase the peak flow to the Rabello and Northside Pump Stations by about 1 mgd to each pump station, which could require further evaluation of and potential improvements to increase pump station capacity.
3. Source: Table 1 (Pump Station Firm Capacities and Inflows) of the City of Santa Clara Sanitary Sewer Pump Station Evaluation, Schaaf & Wheeler, December 2010. The firm capacities of Primavera, Tasman, Westside, and De La Cruz lift stations were determined by performing a drawdown test.
4. Based on results from field drawdown tests conducted on September 17, 2015.
5. Source: Rabello and Northside Pump Station Capacity and Forcemain Calibration Technical Memorandum, Schaaf & Wheeler, November 13, 2015. See Appendix E.
6. The lift and pump stations have sufficient firm capacities within the accuracy of the estimated peak flows and capacities.

Although no capacity issues were identified for the pump stations, review of pump station drawings and current on/off set points for the pumps revealed that four of the stations may experience backwater issues in the influent pipes. The current set point of the lead pump at Tasman, Westside, and De La Cruz is above the crown of the influent gravity line. Under this condition, the lead pump will not turn on until the influent line is completely submerged, causing backwater issues upstream. This can be resolved by adjusting the set points to be equal or lower than the invert of the influent line. Primavera Lift Station has a similar condition with the set point of the lag pump. **Table 4-4** summarizes the review findings and presents the suggested set points for each of the four stations. Set point revisions for Westside and Tasman are needed to address capacity criteria violations (Deficiencies 1 and 2 in Table 4-2). These settings should be evaluated by the City's pump operators to determine feasibility and if there are other operational issues that should be considered.

Table 4-4: Recommended Revised Set Levels for Lift Stations

Pump Station	Maximum Starts Per Hour Per Pump w/ Existing Set Levels (1)	Maximum Starts Per Hour Per Pump w/ Recommended Set Levels (1)	Set points	Recommended Revised Set Points (ft from Wet Well Floor) (2)
Westside Lift Station No. of Pumps: 2	7.2	3.7	Level Alarm: High | Low	8.0 | 1.2
			Lead Pump on | off	6.0 | 1.7
			Lag Pump on | off	7.0 | 2.2
Tasman Lift Station No. of Pumps: 2	4.6	6.4	Level Alarm: High | Low	7.0 | 1.2
			Lead Pump on | off	6.0 | 1.7
			Lag Pump on | off	6.5 | 2.2
De La Cruz Lift Station No. of Pumps: 2	4.8	6.2	Level Alarm: High | Low	6.0 | 1.2
			Lead Pump on | off	5.5 | 1.7
			Lag Pump on | off	6.0 | 2.2
Primavera Lift Station No. of Pumps: 6	1.0	2.0	Level Alarm: High | Low	6.0 | 1.2
			Lead Pump on | off	5.5 | 1.7
			Lag Pump 1 on | off	6.0 | 2.2
			Lag Pump 2 on | off	6.0 | 1.2
			Lag Pump 3 on | off	5.5 | 1.7
			Lag Pump 4 on | off	6.0 | 2.2
			Lag Pump 5 on | off	6.0 | 1.2

1. Based on predicted future peak wet weather flow condition.
2. Recommendations provided by Schaaf & Wheeler based on pump information provided by RMC.

Chapter 5 Recommended Capacity Improvement Program

This section summarizes the capacity improvement projects recommended for the City of Santa Clara's sanitary sewer system. Recommended improvements were developed from the results of hydraulic modeling of the trunk sewer system for predicted flow conditions, as described in Chapter 4. This section discusses the projects needed to address potential capacity deficiencies and unnecessary backups in the existing trunk sewer system including estimated capital costs and priorities for construction.

5.1 Development of Capacity Improvement Projects

Based on the proposed solutions described above, each proposed project was reviewed to identify potential design, permitting, environmental, and constructability issues. Feasible construction methods were also identified for each project, and preliminary estimates of probable construction costs were prepared. Estimated costs for capacity improvements were based on cost data compiled by RMC from similar projects. The costs are conceptual level estimates, considered to have an estimated accuracy range of -30 to +50 percent, suitable for use for budget forecasting, capital improvement program 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. All costs are presented in 2015 dollars and include a 30 percent allowance for contingencies for unknown conditions and a 25 percent allowance for engineering, administration, and legal costs.

Figure 5-1 shows the locations of the proposed improvements, and **Table 5-1** presents the recommended capacity improvement projects, including brief project descriptions and estimated capital costs. Relative priorities have been assigned to the projects based on the flow scenario in which deficiency criteria are violated. Priority 1 and Priority 2 projects are required to address deficiencies that result in criteria violations under current flow conditions. Priority 3 projects are required to address deficiencies that result in criteria violations under future (2035) flow conditions.

Note that an alternative for Project P6 is also presented. While substantially more expensive than Project P6, this alternative would maintain the current system flow configuration of conveying all flows in the Calabazas Creek trunk sewer (including flows from CuSD) to the Northside and Rabello Pump Stations and avoid increasing flows in the Machado, Chromite, and Walsh Avenue trunk sewers that may be needed in the future to handle additional new development within the City. Implementation of Project P6-Alt would also increase flow to the Rabello and Northside Pump Stations by about 1 mgd to each pump station, which could require further evaluation of and potential improvements to increase pump station capacity.

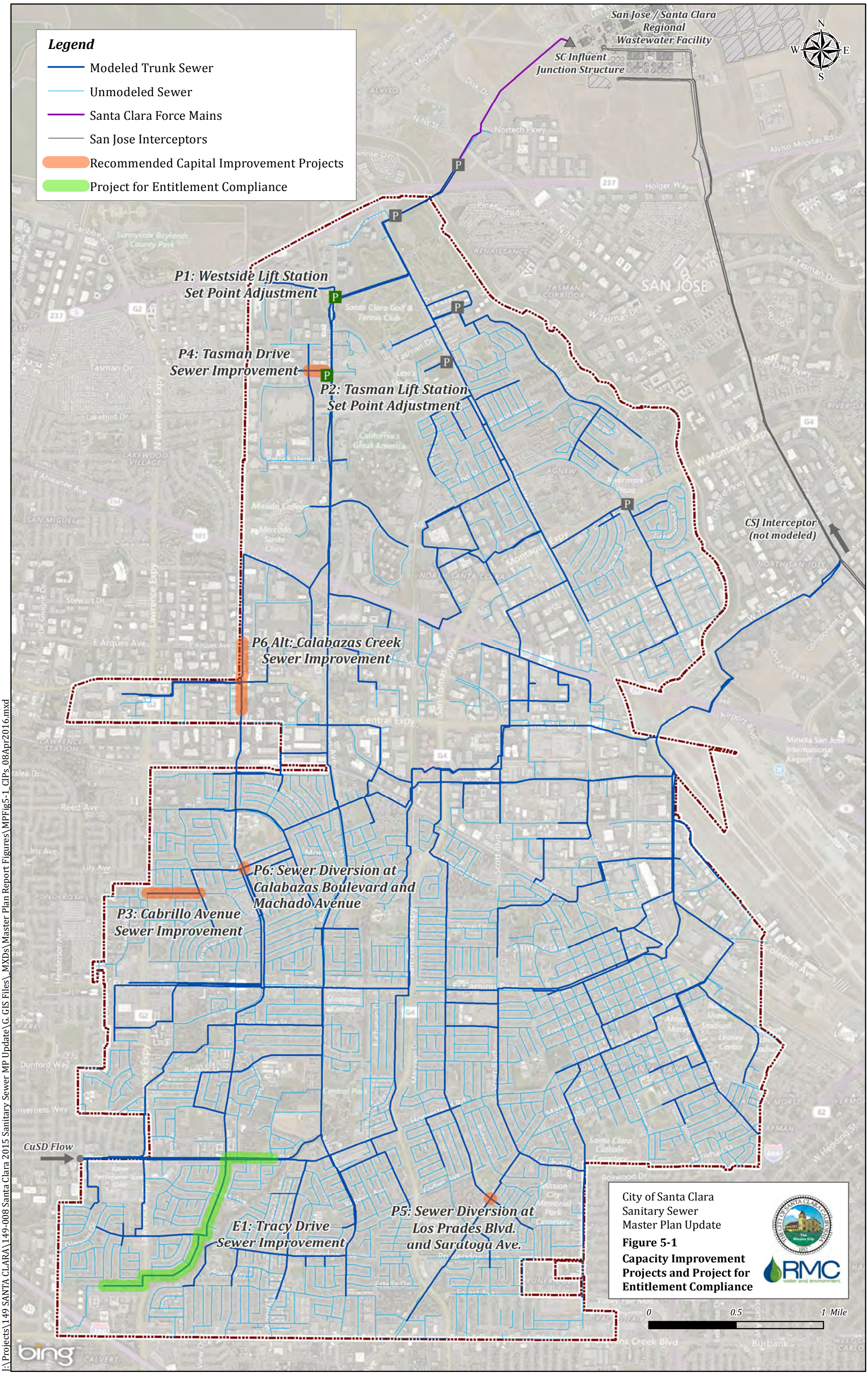
The total estimated cost of the recommended capacity improvement program is approximately $1.7 million. The total estimated cost, if the City were to implement Project P6-Alt instead of P6, would be approximately $2.8 million. More detailed project descriptions and cost estimates and maps of the recommended capacity improvement projects are included in **Appendix F**.

One of the projects was triggered due to the large sewer discharge assumed for parcel APN 316-17-018, which holds an entitlement agreement to discharge a potential flow of 0.95 mgd; however, it is currently discharging less than 10 percent of the entitled rate. While the City is obligated to provide capacity for entitlement holders, it is important to note that implementing this project may result in oversized sewers where the daily flow is not sufficient to provide the minimum cleaning velocity and thus creating potential debris and odor issues. This project is included in the summary table as project E1 (Tracy Drive Sewer Improvement), and is not part of the recommended Capital Improvement Program. It is recommended that the City implement project E1 as part of its Capital Improvement Program before the parcel begins to discharge its entitled flow of 0.95 mgd.

Table 5-1: Recommended Capacity Improvement Projects

Project ID	Priority	Project Name	U/S MHID	D/S MHID	Description	Est. Capital Improvement Cost[1]
P1[2]	1	Westside Lift Station Adjustment	N/A	N/A	Adjust the set points for the pumps to a lower elevation to eliminate unnecessary backups in the influent line.	--
P2[2]	2	Tasman Lift Station Adjustment	N/A	N/A	Adjust the set points for the pumps to a lower elevation to eliminate unnecessary backups in the influent line.	--
P3	2	Cabrillo Avenue Sewer Improvement	S41-13	S41-20	Upsize 1,600 feet of 8-inch line in Cabrillo Ave. between Lawrence Expressway and Nobili Ave. to a 12-inch line.	$1,097,000
P4	3	Tasman Drive Sewer Improvement	S93-24	S93-35	Upsize 600 feet of 12-inch line in Tasman Dr. between Old Ironsides Dr. and Great America Pkwy. to a 15-inch line.	$327,000
P5	4	Sewer Diversion at Los Prades Boulevard and Saratoga Avenue	S25-85	S25-85	Install a weir in manhole S25-85 located in the intersection of Padres Blvd. and Saratoga Ave. to divert flow northwest to the existing 12-in line in Los Padres Blvd.	$77,000
P6	4	Sewer Diversion at Calabazas Boulevard and Machado Avenue	U/S of S52-93	S52-120	Install a new manhole upstream of S52-93 in the intersection of Calabazas Blvd. and Machado Ave., and install a new 15-inch high-level diversion line (approximately 200 feet) to divert excess flow from the existing 24-inch line in Calabazas Blvd. to the 21-inch line in Machado Ave. The diversion line should be about 6 inches higher than the invert of the 24-inch line.	$166,000
P6-Alt.[3]	4	Calabazas Creek Sewer Improvement	S62-31	S72-20	Upsize 1,800 feet of 24-inch line next to Calabazas Creek between Kifer Rd. and Scott Blvd. to a 27-inch line.	$1,334,000
					Estimated Total Cost for Recommended Projects P1 to P6:	$1,667,000
					Estimated Total Cost for Projects P1 to P5 and P6-Alt:	$2,835,000
E1[4]	N/A	Tracy Drive Sewer Improvement	S10-77	S22-51	Upsize approximately 6,600 feet of 10- to 12-inch line in Tracy Dr. and Pomeroy Ave. to a 15-inch line; install a new 15-inch line between manholes S22-55 and S22-46 in Pomeroy Ave. and Homestead Rd. (approximately 50 feet) to divert flow into Homestead Rd., and upsize approximately 1,400 feet of 18-inch line downstream to a 21-inch.	$4,654,000
					Estimated Total Cost (P1 to P6) including Project E1:	$6,321,000
					Estimated Total Cost (P1 to P5 and P6-Alt) including Project E1:	$7,489,000

1. All costs are presented in 2015 dollars and include 30 percent allowance for contingencies for unknown conditions and 25 percent for engineering, administration, and legal costs.
2. These proposed projects are operational, not capital improvements. Refer to Table 4-4 for recommended set points.
3. Project P6-Alt is presented for the purpose of identifying the solution and associated cost to maintain the current system flow configuration. Project P6 is the recommended project.
4. Project E1 addresses the potential capacity deficiency when parcel APN 316-17-018 begins to discharge its entitled flow of 0.95 mgd into the City's system.



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5.2 Implementation Recommendations

The City should begin implementation of the Capital Improvement Program recommended in this Master Plan, starting with the highest priority projects. The following items should be considered in project scheduling and design, and in future updates of the Master Plan.

- The alignments and sizes of all recommended projects should be verified with detailed predesign analyses, including topographic surveys, geotechnical investigations, utility research, and constructability reviews.

- The estimated costs assumed open cut construction, but alternative methods such as trenchless construction or construction of parallel relief pipes could be considered during design. The decision to parallel or replace existing sewers should consider the physical condition and remaining useful life of the existing pipelines; the availability of pipeline corridors for new sewer construction; and operation and maintenance concerns.

- The hydraulic model has been developed to assist the City in performing capacity analyses and updating the Master Plan in the future. The model should be kept up-to-date with any changes to existing sewer connections, development plans, and sewer system facilities.

- The City should conduct additional flow monitoring at key locations in the sewer system, particularly the area tributary to the Chromite/Machado trunk sewers where both the 2006 and 2015 flow monitoring programs indicated high I/I. City should also conduct smoke testing and television inspection to identify potential sources of I/I. Flow levels during large storm events should be compared to the peak flows simulated by the hydraulic model to verify the modeling predictions for the 10-year design storm and confirm the need for and sizing of Project P3 (Cabrillo Avenue Sewer Improvement).

- The City should coordinate with the CuSD on flow and planning assumptions to ensure that adequate capacity exists in the Santa Clara system to handle future flows from the District. The City should encourage CuSD to monitor the flows at the flow meter that it operates and maintains on Homestead Road at Swallow Drive on an on-going basis and periodically confirm meter calibration to verify the wastewater flows entering the Santa Clara system.

- The City should consider adjusting its set points for the four lift stations identified in Table 4-4 to address upstream backwater issues and capacity criteria violations. These settings should be evaluated by the City's pump operators to determine feasibility and if there are other operational issues that should be considered. In addition, the City should continue to conduct regular maintenance as needed to maintain adequate firm pumping capacity at all pump stations, including cleaning the force mains as needed.

- The City should coordinate with the City of San Jose to ensure that its flow criteria and planning assumptions are consistent with those used by San Jose in its capacity master planning.

- Parcel APN 316-17-018 holds an entitlement agreement to discharge up to 0.95 mgd into the City’s system; however, it is currently discharging less than 10 percent of its entitled rate. While the City is obligated to provide capacity for entitlement holders, it is important to note that implementing this project may result in oversized sewers where the daily flow is not sufficient to provide the minimum cleaning velocity and thus creating potential debris and odor issues. However, the City should implement project E1 (Tracy Drive Sewer Improvement) to address the potential capacity deficiency before the parcel begins to discharge its entitled flow of 0.95 mgd.

This Master Plan report is intended to be a working document to be refined and updated as additional data and new planning information becomes available. The capacity assessment should be updated whenever there are major changes in planning assumptions or, at a minimum, every ten years.

Sanitary Sewer Master Plan Update

Draft Report

51 East Campbell Avenue | Suite 128
Campbell, California 95008
800.426.4262

woodardcurran.com

0012307.00

City of Santa Clara

December 2024

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Stephanie Estabrook, Project Engineer
Nery Barrera, Staff Engineer
Cathy Greenman, Technical Reviewer
Gisa Ju, Technical Reviewer

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LIST OF ACRONYMS AND ABBREVIATIONS

ADWF	Average Dry Weather Flow
APN	Assessor Parcel Number
BWF	Base Wastewater Flow
CCTV	Closed-Circuit Television
CIP	Capital Improvement Program or Capital Improvement Plan
CIPP	Cured-in-Place Pipe
City	City of Santa Clara
CMC	Chromite-Machado-Cabrillo
County	Santa Clara County
CSJ	City of San Jose
CuSD	Cupertino Sanitary District
d/D	Depth to Diameter Ratio
DDF	Depth, Duration, Frequency
DIP	Ductile Iron Pipe
DTM	Digital Terrain Model
DU	Dwelling Unit
DWF	Dry Weather Flow
EL	Existing Loads
ENR CCI	Engineering News Record Construction Cost Index
FAR	Floor-area-ratio
FM	Flow Meter
fps	Feet per second

GAP	Great America Parkway
GIS	Geographic Information System
GP	General Plan
gpd	Gallons per day
gpcd	Gallons per capita per day
GWI	Groundwater Infiltration
I/I	Infiltration and Inflow
ICM	InfoWorks ICM™
IDF	Intensity, Duration, Frequency
LiDAR	Light Detection and Ranging
LF	Linear Feet
LMN	Lined Model Network (Future)
LTFL	Long-Term Future Loads
MAP	Mean Annual Precipitation
mgd	Million gallons per day
MH	Sanitary Sewer Manhole
MP	Master Plan
NAICS	North American Industry Classification System
NAVD	North American Vertical Datum of 1988
NGVD	National Geodetic Vertical Datum of 1929
NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resources Conservation Service
NTFL	Near-Term Future Loads
PDWF	Peak Dry Weather Flow
PHD	Patrick Henry Drive
PS	Pump Station
PVC	Polyvinyl Chloride (Pipe)
PWWF	Peak Wet Weather Flow
RCP	Reinforced Concrete Pipe
RDI/I	Rainfall-Dependent Infiltration and Inflow
SCADA	Supervisory Control and Data Acquisition
SCS	Soil Conservation Service
SD	Specific Development
SF	Square Feet
SJ/SC RWF	San Jose / Santa Clara Regional Wastewater Facility
SMH	Sanitary Sewer Manhole
SSO	Sanitary Sewer Overflow
UMN	Unlined Model Network (Current)
USDA	United States Department of Agriculture
V&A	V&A Consulting Engineers, Inc.
VCP	Vitrified Clay Pipe
VFD	Variable Frequency Drive
W&C	Woodard & Curran
WWF	Wet Weather Flow

EXECUTIVE SUMMARY

This report summarizes the results and recommendations of the Sanitary Sewer Master Plan Update (Master Plan Update) for the City of Santa Clara (City or Santa Clara). Woodard & Curran prepared the Master Plan Update in close coordination with City staff. The Master Plan Update will be used to guide improvements to the City's sewer system to accommodate current and future development and to help the City continue to provide a high level of service to its customers.

The overall objectives of this Master Plan Update were to develop wastewater flow projections for the City's sewer service area using up-to-date development and land use information and flow monitoring data; update and expand its existing hydraulic model of the sanitary sewer system; use the model to identify existing capacity deficiencies and future capacity requirements; and develop a phased Capital Improvement Program (CIP), including cost estimates, for implementing the required capacity improvements to the sewer system.

The Master Plan Update included preparation of the following four (4) key technical memoranda (TMs), which were referenced for development of this Master Plan Update report:

- TM #1 – Santa Clara Sewer Model Development and Calibration
- TM #2 – Santa Clara Sewer Performance and Design Criteria
- TM #3 – Santa Clara Sewer Performance Evaluation
- TM #4 – Capital Improvement Plan Report

This Executive Summary provides a concise summary of the Master Plan Update report, highlighting critical information including objectives, findings, conclusions, and recommendations. It is presented in three parts:

1) **Introduction to the City's Existing Sewer System and Service Area** (**Section ES-1**) discusses the City of Santa Clara's existing sewer system infrastructure and service area.
2) **Description of How the Capacity Analysis was Prepared** (**Section 0**) describes the scope and methodologies of the planning effort, including the key planning and technical assumptions incorporated into the sewer system capacity analysis.
3) **Recommended Capital Improvement Program** (**Section ES-3**) presents the recommended CIP, including capacity improvement projects, phasing, and estimated costs. In addition, recommendations are presented for implementing the proposed CIP.

ES-1 Introduction to the City's Existing Sewer System and Service Area

Santa Clara is located in central Santa Clara County adjacent to the cities of San Jose, Cupertino, and Sunnyvale and covers approximately 18 square miles. The City has a population of approximately 130,000 and is served by a wastewater system comprising approximately 288 miles of sewer pipelines generally ranging from 4 to 48 inches in diameter (including 12 miles of private sewer pipelines) and seven (7) sewage pump stations.

The City collects wastewater generated within the City's service area from approximately 25,000 City customers (connections). Based on the City's billing database, roughly 90% of the City's existing customers are residential users and the remaining 10% are non-residential users, including commercial, municipal, and industrial users. In addition to collecting wastewater flows from customers within its service area, the City

also has an agreement to convey wastewater flows from a major portion of the Cupertino Sanitary District (CuSD) via a connection at Homestead Road and Swallow Drive.

Wastewater flows collected are generally conveyed eastward and northward. A portion of the City's flow continues eastward to the Trimble Trunk and conveyed to the City of San Jose's interceptor sewers on Zanker Road. The remainder of the City's flow and all the CuSD flow travels northward to the City's Northside and Rabello Pump Stations, where the flow is pumped to the San Jose/Santa Clara Regional Wastewater Facility (SJ/SC RWF) for treatment and disposal. The City's sewer system and service area are shown in **Figure ES-1**. A summary of the City's sanitary sewer system infrastructure is presented in **Table ES-1**.

TABLE ES-1: SUMMARY OF SANITARY SEWER SYSTEM INFRASTRUCTURE

Infrastructure	Quantity	Unit
Sewer Mains (Pipes)	1,456,400[1] / 276	Feet / Miles
Manholes	5,500	-
Siphons	34 (59 barrels[2])	-
Pump Stations	7	-

[1]Total length is rounded to the nearest one hundred feet.

[2]Some siphons have multiple barrels: Three (3) siphons have three (3) barrels, 19 siphons have two (2) barrels, and the remaining 12 siphons have a single barrel.

San Jose/Santa Clara Regional Wastewater Facility
SC Influent Junction Structure
Northside PS
Rabello PS
Westside LS
Primavera LS
Stadium LS
Tasman LS
De La Cruz LS
CSJ Interceptor (Not Modeled)
CuSD Flow

Figure ES-1
Sanitary Sewer System and Service Area

Sewer Master Plan Update

Legend

- City Boundary
- Pump Station
- Santa Clara Force Mains
- San Jose Interceptors
- CuSD Joint Usage Sewers

Sewers by Diameter

- ≤6"
- 8"-10"
- >10"-16"
- >16"-24"
- ≥27"

0 0.25 0.5 1 Miles

Project #: 0012307.00
Map Created: December 2024

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ES-2 Description of How the Capacity Analysis was Prepared

This study is intended to provide a comprehensive update of the City's Sanitary Sewer Master Plan to reflect the most current and accurate information on wastewater flows, projected growth, and system performance. To accomplish this, the City recognizes the need to update the hydraulic model of its sewer system, which is used to assess system performance and identify system capacity needs for both existing and projected future wastewater flows. This section describes how the capacity analysis was prepared and discusses the wastewater flow assumptions, hydraulic model development and calibration, design and performance criteria, and capacity analysis scenarios and results.

Wastewater Flow Assumptions

Wastewater flow assumptions are required to develop a hydraulic model that is an accurate representation of reality. The Santa Clara model includes both existing and future projected wastewater flow scenarios. Existing base wastewater flow (BWF) was estimated for each parcel within the City's service area based on recent customer water usage records obtained from the City's water billing database.

Future BWF projections were estimated by incorporating the most current development information that was available for the City's service area, which included development projects in review, specific plans, General Plan, and entitlement agreements. Based on the timing and type of development, the future base wastewater flows were assigned to one of two scenarios: near-term future or long-term future. The long-term future scenario included all development assumptions applied to the near-term future scenario plus development assumptions associated with the City's General Plan and entitlement agreements. The City's billing database records show that many entitlement holders have historically discharged less than their flow entitlements; however, considering the City is required to provide capacity to these users should they have the need to increase their discharges, the long-term future BWF scenario conservatively assumes that all entitlement holders would make use of their full discharge allowances.

Table ES-2 summarizes the average BWF assumptions applied to the hydraulic model for the City's service area.

TABLE ES-2: AVERAGE BASE WASTEWATER FLOW ASSUMPTIONS FOR SANTA CLARA[1]

Land Use Flow Scenario	Residential (mgd)	Non-Residential (mgd)	Total (mgd)
Existing	6.72	4.50	11.22
Near-Term Future	10.11	6.09	16.20
Long-Term Future[2]	13.58	15.48	29.06

[1]Does not include sewer flows from the Cupertino Sanitary District (CuSD). Refer to **Table ES-3**.

[2]Includes 5.09 mgd assumed for entitlement agreements, mostly for non-residential land uses.

The Santa Clara hydraulic model includes flow scenarios that represent both dry weather (non-rainfall) and wet weather (rainfall) conditions. In dry weather conditions, the base wastewater flows presented above account for the vast majority of total discharges to the sewer system. During wet weather conditions, total discharges to the sanitary sewer system increase due to the introduction of storm water inflow and infiltration, which enters the sanitary sewer system in direct response to rainfall events through holes in manhole covers, defects in sewer pipelines and service laterals, or illegally connected storm drainage infrastructure. If groundwater levels are high enough, some infiltration can also occur during dry weather conditions as it infiltrates into sewer infrastructure from below through defects. Wet weather flows are generated by simulating a design storm rainfall event in the hydraulic model.

Because CuSD discharges to Santa Clara's sanitary sewer system, the existing and future projected wastewater flow scenarios in the hydraulic model also include wastewater flow assumptions for CuSD for both dry and wet weather conditions. CuSD flows were incorporated into the hydraulic model as inflow hydrographs, which define the rate of wastewater flow entering a specific point (i.e., manhole) in the network during a simulation. CuSD flows for existing dry weather conditions were based on flow monitoring data. CuSD flows for existing wet weather conditions, near-term future dry and wet weather conditions, and long-term future dry and wet weather conditions were based on flows from CuSD's hydraulic model, which was most recently re-calibrated in 2023 by AKEL Engineering. For these flow scenarios, Woodard & Curran created inflow hydrographs based on the results that were exported from CuSD's re-calibrated model; the magnitude of flows was maintained but the timing was slightly shifted to match the diurnal usage pattern observed in the flow monitoring data and to align the peak wet weather response where applicable. For the long-term future wet weather flow scenario only, the peak flow was conservatively scaled up to match the contractual limit (13.8 mgd) defined in Santa Clara's agreement with CuSD.

Table ES-3 summarizes CuSD's average BWF assumptions applied to the hydraulic model for the City's service area.

TABLE ES-3: WASTEWATER FLOW ASSUMPTIONS FOR CUSD[1]

Flow Scenario	Average Dry (mgd)	Peak Dry (mgd)	Average Wet (mgd)	Peak Wet (mgd)
Existing	3.7	5.6	4.1	10.7
Near-Term Future	4.2	6.3	4.6	11.3
Long-Term Future	4.6	6.7	5.9	13.8[2]

[1]Based on CuSD's hydraulic model results for a seven (7) day period.

[2]Assumed to be contractual limit defined in agreement between Santa Clara and CuSD.

Hydraulic Model Network Development

A hydraulic model of the City's sewer system was developed for this study. The model includes all City-owned pipes and manholes within the sanitary sewer system, excluding approximately 12 miles of privately-owned sewer mains. Therefore, the model network consists of about 276 miles of sewers, including 2.7 miles of force mains, or roughly 96% of the total 288 miles of sewer pipeline within the City's system. The model also includes all seven sewage pumping stations. The model is a significant expansion of the model used for the 2016 Master Plan, which was developed to represent the trunk or "backbone" of the sewer system and as such contained approximately 34% (or 94 miles) of the total length of the City's sewers. Since 2016, Woodard & Curran has maintained and updated the City's model as sewer improvement projects were implemented, development reviews were requested, or when new network data became available, and this Master Plan Update builds on that work by significantly expanding the model network to include all City-owned sewer pipelines.

The model was used to assess how the system would perform under various planning and flow scenarios and to identify pipes or pump stations that may not have sufficient capacity to convey the predicted flows under existing or future conditions.

Hydraulic Model Calibration

Before the hydraulic model can be used for the capacity analysis performance evaluation, it must be calibrated to confirm that it is an accurate representation of the flows and hydraulic conditions in the City's sanitary sewer system. Model calibration is the process of comparing model-simulated flows to observed flows and adjusting the model assumptions and parameters as needed until a reasonably good match is

achieved. Generally, the model calibrator attempts to match flow volumes and peak flows between the model-simulated and observed data.

Model calibration is first performed for dry weather flows to achieve an accurate prediction of the base wastewater flows and baseline groundwater infiltration if present during non-rainfall conditions. Wet weather calibration is then performed to achieve an accurate prediction of the storm water inflow and infiltration that discharges to the sanitary sewer system during rainfall events.

A temporary flow monitoring program (shown in **Figure ES-2**) was conducted as part of this study to facilitate model calibration. The program obtained flow depth and velocity data (used to compute flow rate) at 31 strategically identified locations throughout Santa Clara's sanitary sewer system during both dry weather and wet weather conditions and rainfall data at three distinct locations. The observed data were compared to the model-simulated flows during the calibration process to confirm actual flows and system routing and characterize infiltration and inflow into the sewers within each distinct flow meter (FM) basin.

The model calibration process also included reviewing key flow splits in the City's sewer system to confirm flow routing, refining diurnal flow patterns to accurately represent the typical variation of flows throughout the day, and reviewing the City's largest dischargers and their discharge locations.

Table ES-4 summarizes the final model calibration results for the overall system based on discharge location by comparing model-simulated to observed flows during both dry weather and wet weather conditions for the downstream most flow meters. It was determined that a reasonably good match was achieved for the overall system considering the observed average dry weather flows and peak wet weather flows were within 10% of the model-simulated flows at both discharge locations. The period used for the dry weather calibration was the seven (7) day dry period from December 17 through December 23, 2022. Wet weather calibration was performed for the full 2022-2023 season because the flow monitoring program captured several rainfall events. The January 13-16, 2023 rainfall event produced the largest flow response and was used as the primary basis for calibrating the model to match observed peak wet weather flows. Several storms occurred within a short amount of time during the flow monitoring period, so there were likely cumulative impacts that increased the inflow and infiltration response during the subsequent storms. Additionally, the calibration focused on selecting parameters to conservatively match peak flows observed during the mid-January event which occurred later in the season after significant rainfall had already fallen and soils were generally saturated. As a result, the modeled and metered peak flows and volumes typically matched better for the later season rainfall events.

TABLE ES-4: SUMMARY OF HYDRAULIC MODEL CALIBRATION RESULTS[1]

	Average Dry Weather Flows (mgd)			Peak Wet Weather Flows (mgd)		
Discharge Location	**Observed**	**Modeled**	**Difference[2]**	**Observed**	**Modeled**	**Difference[2]**
Santa Clara Northside and Rabello Pump Stations[3]	10.54	10.09	-4.3%	23.03	24.22	+5.2%
Trimble Trunk	4.65	4.46	-4.1%	13.65	13.93	+2.1%

[1]Model results are compared to the 2022-2023 flow monitoring data.

[2]Difference is reported as modeled minus observed flow.

[3]Includes flows from CuSD.

The infiltration and inflow response to rainfall, which is referred to as rainfall-dependent infiltration and inflow (RDI/I), was quantified within each flow meter basin through the wet weather calibration process. **Figure ES-3** presents a visual representation of the wet weather calibration model results in terms of the

total RDI/I rate that was applied to the model for each meter basin to match model-simulated and observed flows. The total RDI/I rate (or "Total R") is a percentage that represents the total amount of rainfall that becomes runoff and eventually enters the sanitary sewer system as RDI/I. As shown in the figure, half of the City's flow meter basins had RDI/I rates of less than 5%. In contrast, flow meter basins concentrated within the central western portion of Santa Clara's system displayed very high RDI/I rates of greater than 80%. These flow meter basins are located within the Chromite-Machado-Cabrillo (CMC) tributary area and the adjacent Agate Drive tributary area. The flow monitoring data showed that the nature of the RDI/I responses to rainfall in these areas were indicative of significant infiltration, as the response was generally slower and took a long time to recede (i.e., several weeks following rainfall). Moreover, because consecutive rainfall events occurred within a short period of time during the flow monitoring period, the infiltration response did not fully recede before another rainfall event occurred. The flow monitoring results were consistent with the findings of other field investigations completed recently in the CMC basin, which concluded that rainfall-dependent infiltration appeared to be the most significant contributor to the wet weather response, possibly from defects in tributary sewer laterals and mains.

During the dry weather calibration process, a total of 0.158 mgd of additional GWI flow was applied to the system uniformly throughout two (2) of the 31 flow meter areas (i.e., FM 26 and FM 31), which were located in the CMC and Agate Drive tributary areas, respectively. GWI represents a seasonal increase in wastewater flows due to infiltration into the sewers during non-rainfall conditions, typically in low-lying areas or areas close to creeks or other water bodies. The need to add GWI to these flow meter basins to calibrate for dry weather conditions further suggests that significant infiltration is occurring, likely through defects in tributary sewer laterals and mains.

Flow Meter Basin

1, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19&20, 2, 2&3, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 3, 30, 31, 4, 5, 6, 7, 8, 9A, 9A&24, 9A&30, 9A&31

San Jose/Santa Clara Regional Wastewater Facility

SC Influent Junction Structure

Northside PS

Rabello PS

FM 3

FM 1

FM 2

Westside LS

Primavera LS

FM 7

FM 4

Stadium LS

Tasman LS

De La Cruz LS

FM 8

FM 5

FM 6

FM 9A

FM 30

FM 24

FM 16

FM 31

FM 15

FM 25

FM 17

FM 18

FM 11

FM 12

FM 14

FM 28

FM 10

FM 13

FM 26

FM 27

FM 23

FM 22

FM 19

FM 21

CuSD Meter

FM 20

FM 29

ALVISO, RENAISSANCE, AGNEW, PLAZA DEL REY, LAKEWOOD, SAN MIGUEL, EAST MURPHY, SCOTT MARTIN, LAWRENCE, CARMICHAEL, BOWERS, CABRILLO, GRAHAM, HOMESTEAD HIGH, PRUNERIDGE TANTAU, MAURICIA KIELY, FORBES BUCHER, WINCHESTER FOREST, BASCOM FOREST, CORY, NEWHALL SHERWOOD, CHAPMAN MORSE, DOWNTOWN SANTA CLARA, EL CAMINO LAS PALMAS, EL CAMINO LOS PADRES, SARATOGA LOS PADRES, LOMA LINDA, NORTHLAKE, CALVERT, BIRDLAND, NORTH SAN JOSE, RIVER OAKS, THE VILLAS

0 0.3 0.6 1.2 Miles

Figure ES-2
Flow Monitoring Program

Sewer Master Plan Update

Legend

- 2014-2015 & 2022-2023 Flow Meter Site
- 2022-2023 Flow Meter Site
- CuSD Flow Meter Site (FM 32)
- City of Santa Clara Boundary
- Pump Station
- San Jose Interceptors

Trunk Mains

- Gravity Main
- Force Main
- Small Diameter Mains

Woodard & Curran

Project #: 0012307.00
Map Created: December 2024

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Figure ES-3
RDI/I Rate by Flow Meter Basin

Sewer Master Plan Update

Legend

- City of Santa Clara Boundary
- 2022-23 Flow Meters
  - 2014-2015 & 2022-2023 Flow Meter Site
  - 2022-2023 Flow Meter Site

RDI/I Rate (Total R)

- 0 - < 5
- 5 - 10
- > 10 - 20
- > 20 - 40
- > 80

N

0 0.25 0.5 1 Miles

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Design and Performance Criteria

The capacity analysis requires selection of design and performance criteria, which are applied so that the hydraulic model can be used to determine if sewer facilities would have adequate capacity under the flow scenarios developed or if the capacity would be exceeded, requiring system improvements. **Table ES-5** presents and describes the design and performance criteria that were selected for this Master Plan Update.

TABLE ES-5: SUMMARY OF DESIGN AND PERFORMANCE CRITERIA

Criterion	Purpose	Selected
Design Storm Rainfall	Single event rainfall assumed to produce peak flows generated from a rainfall event of a desired return period to assess system capacity during wet weather conditions.	• Return Period: 10 years • Duration: 24 hours • Rainfall Depth and Temporal Distribution: Based on Santa Clara County Drainage Manual (developed from historical rainfall event in December 1955) • Storm Timing: Peak-on-peak[1] (weekday) • Antecedent Conditions: Wet, saturated soils • Spatial Distribution: Lowest intensity north and highest intensity southwest
Performance (Capacity Deficiency)	Used to determine if the capacity of an existing sewer facility is inadequate to the extent that a capacity improvement project would be needed.	• Gravity Sewers: Flow depth exceeds full pipe (d/D[2] > 1) during either dry weather or design storm wet weather conditions (i.e., no surcharge is allowed). • Pump Stations: Firm capacity[3] greater than the peak wet weather flow during the design storm. • Force Mains: Velocity exceeds 8 feet per second (fps).
Design	Used for the purpose of sizing new or relief facilities based on the City's desired level of service and are generally more conservative than the performance criteria because new facilities should be designed to a higher standard.	Gravity Sewers: • d/D < 0.75 under future peak wet weather flows • Minimum Velocity = 2 fps for daily dry weather • Maximum Velocity = 10 fps at peak design flow • Minimum Pipe Diameter = 8 inches • Minimum Cover = 6 feet (ground to pipe crown) Pump Stations: Firm capacity greater than the peak wet weather flow during the design storm. Force Mains: • Minimum/Maximum Velocity: 3 fps /8 fps • Minimum Cover = 6 feet (ground to pipe crown)

[1]Peak RDI/I occurs at approximately the same time as peak BWF for most areas of the sewer system.

[2]d/D = Depth-to-Diameter Ratio representing the depth of flow within the pipe.

[3]Capacity of the pump station assuming that the largest pump is out of service.

The design and performance criteria selected for sewer master planning efforts vary by agency and are reflective of the level of risk that is acceptable to each agency. Common criteria for several agencies both inside and outside of California were reviewed during the process of selecting the City's criteria. Ultimately, Santa Clara elected to apply relatively conservative criteria in order to identify all potential projects, recognizing that conditions may change in the future due to variable factors such as sewer condition, additional development, and climate change. However, engineering judgment was used when applying the

performance criteria to avoid identifying capacity deficiencies where gravity sewers showed only minor criteria violations.

Capacity Analysis Scenarios and Results

The capacity analysis is performed using the calibrated hydraulic model to identify sewer facilities that may not have sufficient capacity to convey the predicted flows based on the selected performance criteria. A total of 12 model scenarios were developed to assess system performance and were a combination of the wastewater flow scenario (existing, near-term future, or long-term future), design flow (dry or wet weather), and physical network assumptions (with or without assumed lining of City-identified reinforced concrete sewers likely to be in poor condition) listed in **Table ES-6**.

TABLE ES-6: SUMMARY OF CAPACITY ANALYSIS MODEL SCENARIOS

Wastewater Flow	Design Flow	Physical Network
Existing	Dry Weather	Unlined: Current system with no future lining assumed
Near-Term Future	Wet Weather	Lined: Assumes future lining of City-identified RCP trunks in poor condition
Long-Term Future		

The capacity analysis identified a total of 16 gravity sewer deficiencies, the locations of which are shown in **Figure ES-4**. In the figure, pipes shown in pink are predicted to surcharge due to "throttle" conditions, indicating that the full capacity of the pipe is less than the predicted peak flow. Pipes shown in purple are predicted to surcharge due to backwater from a downstream throttle condition. A total of 15 capacity improvement projects were developed to relieve the gravity sewer capacity deficiencies identified through the capacity analysis. The project locations and extents are shown in **Figure ES-5**. Most projects were developed to either replace the existing, capacity-deficient pipe with a larger pipe or to re-direct a portion of flows to other existing sewers with adequate available capacity. Replacement pipes were sized based on the selected design criteria to convey flow for the most conservative model scenario (i.e., long-term future wastewater flow, wet weather design flow, and lined physical network). The number of projects developed (15) is less than the number of capacity deficiencies identified (16) because model runs showed that the Agate Drive deficiency would be relieved once the Calabazas Trunk project was implemented.

The capacity analysis did not identify any pump station or force main capacity deficiencies. The firm and total capacities of each of the City's seven sewer pump stations were estimated based on basic information, pump settings, pump curves, and system curves provided by the City. Those theoretical capacities were then compared to the model-predicted peak wet weather flows generated from the design storm rainfall event. Because the theoretical firm capacity of each station did not exceed the model-predicted flow into the station, it was assumed that each station had adequate capacity to convey flows during the most conservative condition evaluated based on the City's performance criteria. Model-predicted force main velocities were also within the specified performance criteria (i.e., less than 10 fps) during the most conservative condition evaluated, and similarly, no capacity deficiencies were identified. Although the capacity analysis did not identify any pump station capacity deficiencies, the model-predicted peak design flows to the Rabello and Northside Pump Stations during long-term future wet weather conditions (44.8 mgd) are close to the combined firm capacities of these two stations (45.2 mgd). Based on discussions with the City's Water and Sewer Department, the diversion box upstream of these two pump stations contains a wet well with weir slots that the City has the ability to adjust by dropping in weir boards to control the flow. Under dry weather conditions and normal settings, approximately 80% of flows go to the Rabello PS and the remaining 20% go to the Northside PS. City staff had not observed flows overtopping the weir boards towards Northside PS, but suspects there may be a gap underneath the weir boards considering SCADA

confirms that flows go to both pump stations. The City should continue to monitor influent flows to these two pump stations as future developments come online and adjust the diversion box weir settings as needed to maximize the available capacity.

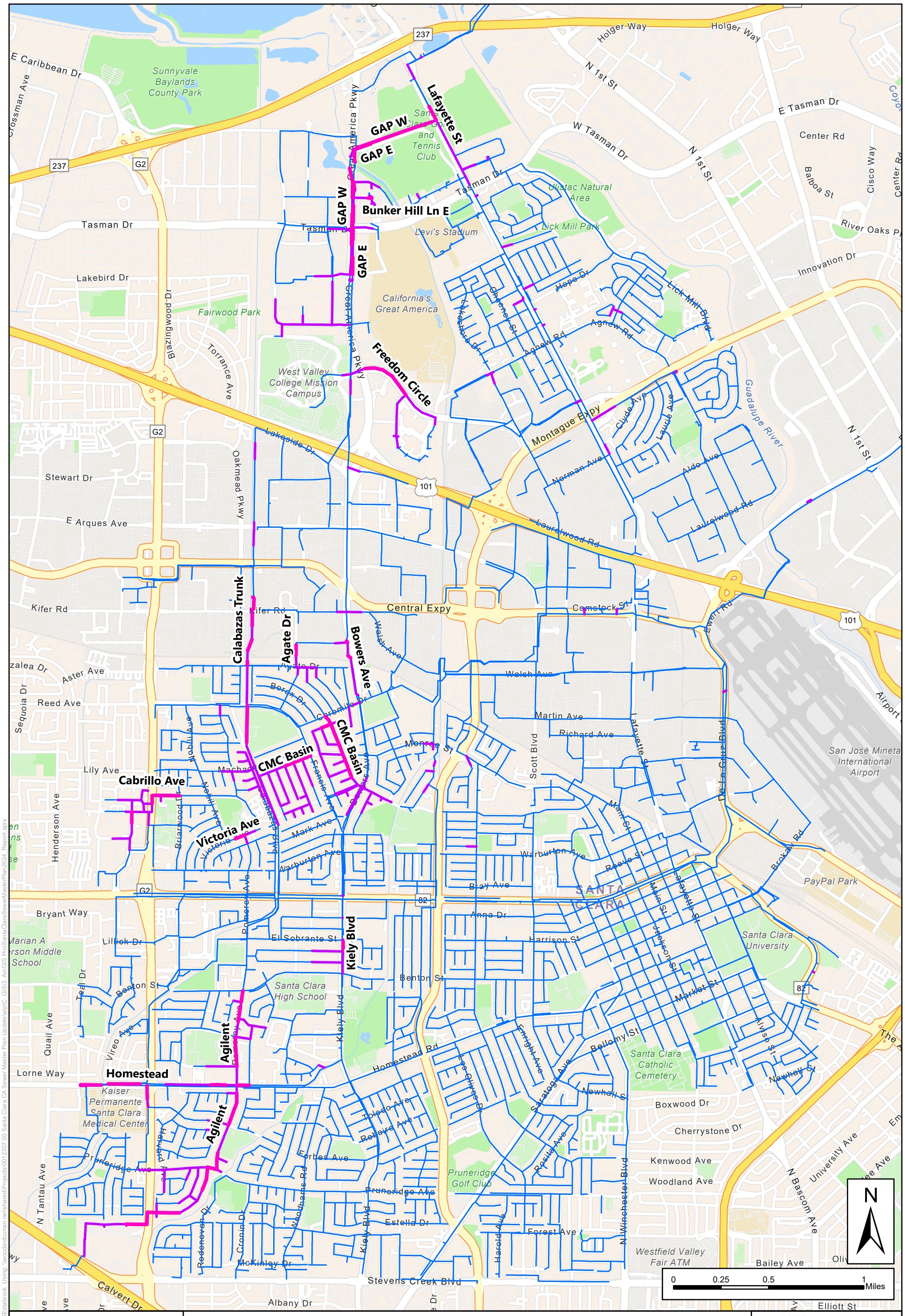

Figure ES-4
Overview of Capacity Deficiencies

Sewer Master Plan Update

Legend

Modeled Sewers

Surcharge State

- <1 (no surcharge)
- 1 (backwater surcharge)
- 2 (throttle surcharge)

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Figure ES-5
Overview of Capacity Improvement Projects

Sewer Master Plan Update

Legend

Modeled Sewers

Capacity Improvement Project

- Bunker Hill Ln E
- Agilent
- Bowers Ave
- CMC Basin
- Calabazas Trunk
- GAP E Trunk
- GAP W Trunk
- Homestead Rd
- Kiely Blvd
- Lafayette St
- Victoria Ave
- Freedom Circle
- Cabrillo Extent (Not Actual Project)

N

0 0.25 0.5 1 Miles

Project #: 0012307.00
Map Created: December 2024

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ES-3 Recommended Sewer Capacity Capital Improvement Plan

The Sewer Capacity CIP recommended in this study is designed as guidance for the City to provide adequate sewer system capacity for the City's existing and anticipated future development. **Table ES-7** and **Table ES-8** provide a summary and detail of the recommended capacity improvement projects, respectively. The wastewater flow, design flow, and physical network triggers listed next to each project in **Table ES-8** represent the least conservative condition (i.e., lowest flow and available capacity) that first caused the deficiency to occur. Relative priorities of "1" (highest priority) to "7" (lowest priority) were assigned to each project based on a combination of factors including the wastewater flow trigger, design flow trigger, and physical network trigger, and assumed structural condition. Therefore, projects that address existing deficiencies without future lining assumptions in place were assigned the highest priority because they pose the greatest risk of a sanitary sewer overflow (SSO). Those projects were subsequently scheduled for earlier implementation, assuming a start date in 2025. The remaining projects, which would be triggered by future loading conditions, were assigned an implementation start date of 2035. Projects were also assigned a flow confidence level from "1" (highest confidence) to "5" (lowest confidence) to reflect the level of confidence in the data that were used to calibrate the hydraulic model, forecast flows, and identify deficiencies. Projects which were assigned a confidence level "4" or "5" had no reliable confirmation of model flows; thus, conducting flow monitoring on these project reaches prior to design would provide a greater level of confidence in modeled flows.

The total estimated capital cost of the Sewer Capacity CIP is approximately $100.6 million in 2024 dollars. These costs include baseline construction costs for new sewer mains and sewer structures using open-cut methods; and cost allowances for project mobilization/demobilization, traffic control, and bypass pumping as needed. The total estimated construction costs also include a 30% allowance for contingencies for unknown conditions, and the total estimated capital cost includes an allowance of 25% of construction cost for engineering, administration, construction management, and legal costs. Costs for lining City-identified RCP trunks are not included in the Sewer Capacity CIP as these are condition-related maintenance costs. The estimated costs are planning or conceptual level estimates to be used for budgeting purposes only and are considered to have an estimated accuracy range of -30% to +50%. Note that the Sewer Capacity CIP does not include costs for two of the specific developer-driven capacity improvement projects, Patrick Henry Drive (PHD) and Mission Point, as the developers will fund those improvements. Additionally, it is assumed that the City's overall sewer system CIP will also include costs for condition-related improvements; however, these projects are not addressed in this Master Plan Update report.

TABLE ES-7: SUMMARY OF RECOMMENDED SEWER CAPACITY CIP

Description	Quantity	Notes
Number of Projects	13	3 to be implemented in 2025; 10 after 2035
Total Length of New Sewers	38,100 LF	Approximately 7.2 miles
Range of New Sewer Diameters	8" – 48"	Standard pipe sizes only (inside diameters)
Number of New Weirs	4	Used to modify flow routing
Total Estimated CIP Cost[1]	$100.6M	Based on August 2024 dollars
Total Other Costs[2]	$75K annually $950K every 7 years $25K annually	Hydraulic Model Maintenance and Support; Future Master Plan updates (next in 2029); Technical Analyses for Model Verification

[1]Designed to reflect costs derived directly from construction of the capacity improvement projects only.

[2]Other costs associated with improvement of flow conveyance in the system.

TABLE ES-8: CAPACITY IMPROVEMENT PROJECT DETAILS

Project No.[1]	Project ID	Project Location	Pre-Project Pipe Diameter(s)[2]	Project Description	Priority[3]	Flow Confidence Level[4]	Wastewater Flow Trigger[5]	Design Flow Trigger[5]	Physical Network Trigger[5]	Project Cost[6]
1	**Agilent**	Tracy Dr, Pomeroy Ave, Homestead Rd (S Trunk), Kiely Blvd	10 to 22.8-inch	12,313 LF of 15 to 27-inch diameter pipe	7	N/A	LTFL (entitlement)	DWF	UMN	**$26,942,000**
2	**Homestead Road**	N Homestead Trunk from Swallow Wy to Saratoga Creek	18 to 30-inch	6,407 LF of 24 to 33-inch diameter pipe	3	3	LTFL	WWF	UMN	**$17,156,000**
3	**Kiely Boulevard**	Orthello Wy to S of El Sobrante St	8-inch	266 LF of 10-inch diameter pipe	6	4	LTFL	WWF	UMN	**$513,000**
4	**Victoria Avenue**	Fowler Ave & Pomeroy Ave to Nobili Ave & Victoria Ave	8-inch	764 LF of 10-inch diameter pipe	6	3	LTFL	WWF	UMN	**$1,337,000**
5	**Cabrillo Avenue**	Halford Ave & Buckley St; St. Lawrence Dr, W of Lawrence Expwy	8-inch	Flow Diversion Weirs only. No pipe replacement.	1	3	EL	WWF	UMN	**$154,000**
6	**CMC Basin**	Santa Maria Ave & Francis Ave; Amethyst Dr	8 to 12-inch	3655 LF of 12 to 15-inch diameter pipe	1	1 & 2	EL	WWF	UMN	**$7,263,000**
7	**Bowers Avenue**	Bowers Ave from Chromite Dr to Walsh Ave	25.7-inch	2605 LF of 30-inch diameter pipe	4	5	LTFL	WWF	LMN	**$8,047,000**
8	**Calabazas Trunk**	Calabazas Creek from S of Agate Dr to Central Expwy	22.8 to 27-inch	2791 LF of 18 to 27-inch diameter pipe	2	5	EL	WWF	LMN	**$8,731,000**
9	**Freedom Circle**	Mission College Blvd from Freedom Cir to west of Great America Pkwy	12 to 15-inch	1886 LF of 15-inch diameter pipe	5	N/A	LTFL (specific development)	DWF	UMN	**$3,830,000**
12	**GAP West Trunk**	S of West Tasman Dr to Lafayette St	28.5 to 35.7-inch	4810 LF of 36 to 42-inch diameter pipe	3	2	LTFL	WWF	UMN	**$17,781,000**
13	**GAP East Trunk**	Old Glory Ln to S of Bunker Hill Ln; Stars and Stripes Dr	31.4-inch	231 LF of 39-inch diameter pipe	4	2	LTFL	WWF	LMN	**$1,002,000**
14	**Bunker Hill Lane East**	E of Great America Pkwy	6-inch	107 LF of 8-inch diameter pipe	7	N/A	LTFL (entitlement)	WWF	UMN	**$301,000**
15	**Lafayette Street**	N of Calle del Mundo to S of Great America Wy	34.2 to 40.3-inch	2290 LF of 42 to 48-inch diameter pipe	3	2	LTFL	WWF	UMN	**$7,515,000**
TOTAL ESTIMATED COST	**$100,572,000**									

[1]Projects are numbered from upstream to downstream. Table does not include Project Nos. 10 (Patrick Henry Drive) and 11 (Mission Point) because project costs will be paid for by the developers.

[2]Pre-project pipe diameters include future lining assumptions.

[3]Projects are prioritized based on wastewater flow, design flow, and physical network triggers as well as assumed structural condition.

[4]Rating assigned to validate the need for the project through review of flow monitoring data and reported surcharging and operational issues, and compatibility between flow meter data and the model. Descriptions of the flow confidence levels are as follows: N/A = Not assigned because project would be triggered by entitlement flow or specific development; 1 = Flow meter on or very near to the project reach surcharged during metered storm; 2 = Flow meter on or very near to the project reach confirms flow, but did not surcharge during metered storm; 3 = Flow meter near the project reach (upstream or downstream) confirms flow; 4 = No flow meter near the project reach to confirm flow; 5 = Conflicting flow between meter and model.

[5]EL = Existing Loads; LTFL = Long-Term Future Loads; DWF = Dry Weather Flow; WWF = Wet Weather Flow; UMN = Unlined Model Network; LMN = Lined Model Network.

[6]Costs are based on August 2024 ENR CCI of 15367.24 for the San Francisco Area and are Class 5 estimates (planning level).

Implementation Recommendations

The City should begin implementation of the Capital Improvement Program recommended in this Master Plan Update, starting with projects needed to address existing system capacity deficiencies. The following items should be considered in project scheduling and design, and in future updates of the Master Plan:

- The City should consider conducting additional flow monitoring or observation to document flow levels during large storm events at locations in the system where the model predicts significant surcharge or where there is a significant difference between previous flow monitoring conducted and the model results. Flow levels during large storm events should be compared to the water levels simulated by the hydraulic model to verify if the modeling predictions for the design storm seem reasonable, and to confirm the need for and, if necessary, refine project sizing.
- The alignments and sizes of all recommended projects should be verified with detailed pre-design analyses, including topographic surveys, geotechnical investigations, utility research, and constructability reviews. Detailed pre-design analyses should consider feasibility of trenchless construction methods including pipe-bursting and Pilot Tube Guided Auger Boring (PTGAB), especially at major roadway, railway, and creek crossings.
- The decision to parallel or replace existing sewers should consider the physical condition and remaining useful life of the existing pipelines and laterals; the availability of pipeline corridors for new sewer construction; and operation and maintenance concerns.
- Capacity improvement projects triggered by long-term future flow assumptions associated with entitlement agreements would not need to be implemented until the entitled parcel(s) begin to discharge their entitled flow(s).
- The hydraulic model has been developed to assist the City in performing capacity analyses and updating the Master Plan in the future. The model should be kept up to date with any changes to existing sewer connections, development plans, and sewer system facilities.

This Master Plan Update report is intended to be a working document to be refined and updated as additional data and new planning information become available. The capacity assessment should be updated whenever there are major changes in planning assumptions or, at a minimum, every five to ten years.

1. INTRODUCTION

This introductory section identifies the background and study objectives for the Master Plan Update, briefly describes the City's sanitary sewer system and service area and presents an overview of the report's organization by summarizing the content discussed within each section.

1.1 Background and Study Objectives

Prior to this study, the City last conducted a comprehensive assessment of its wastewater system in its 2016 Sanitary Sewer Master Plan Update[1] (2016 Master Plan). Of the seven (7) capacity improvement projects recommended in the 2016 Master Plan, three (3) projects were implemented: two (2) of which were operational adjustments to the set points for the Westside and Tasman Pump Stations to eliminate unnecessary backups in the influent gravity sewers, and the third was a capital project to upsize approximately 1,800 feet of 24-inch sewers along the Calabazas Creek trunk between Kifer Road and Scott Boulevard to 27-inch sewers.

Since 2016, in addition to completing a few sewer improvement projects, the City has experienced a significant amount of new development, necessitating an update to the 2016 Master Plan that includes an evaluation of the capacity of the sanitary sewer system to handle existing and future wastewater flows. Several development reviews have also been completed since the 2016 Master Plan. These development reviews are conducted using the City's hydraulic model to assess if the sanitary sewer system has enough available system capacity for the individual development to connect to the system.

Thus, the purpose of this study is to build an updated, comprehensive hydraulic model of the City's sewer system, calibrate the model to current flow monitoring data, and identify needed capacity improvements based on existing and projected future flows. This Master Plan Update summarizes the basis of the sewer flow estimates and the hydraulic model development and calibration process, presents the criteria used for the capacity analysis and the deficiencies identified, and describes the proposed projects to address identified capacity deficiencies. Due to the relatively high rates of I/I in specific areas of the system, this assessment also included identifying areas of higher I/I appropriate for further investigation.

1.2 Sanitary Sewer System and Service Area

Santa Clara is a city of approximately 130,000 people located in central Santa Clara County adjacent to the cities of San Jose, Cupertino, and Sunnyvale and covers approximately 18 square miles. The City's wastewater system serves approximately 25,000 City customers in its service area (primarily residential users) through approximately 288 miles of sewer pipelines generally ranging from 4 to 48 inches in diameter (including 12 miles of private sewer pipelines) and seven (7) sewage pump stations. The City also has an agreement to convey wastewater flows from a major portion of the Cupertino Sanitary District (CuSD) via a connection at Homestead Road and Swallow Drive. Wastewater flows collected are generally conveyed eastward and northward. A portion of the City's flow continues eastward to the Trimble Trunk and is conveyed to the City of San Jose's interceptor sewers on Zanker Road. The remainder of the City's flow and all the CuSD flow travels northward to the City's Northside and Rabello Pump Stations, where the flow is pumped to the San Jose/Santa Clara Regional Wastewater Facility (SJ/SC RWF) for treatment and disposal. A summary of the City's sanitary sewer system infrastructure is presented in **Table ES-1**. The City's sewer system and service area are shown in **Figure ES-1**.

[1] City of Santa Clara, Sanitary Sewer Master Plan Update, RMC Water and Environment, April 2016.

TABLE 1-1: SUMMARY OF SANITARY SEWER SYSTEM INFRASTRUCTURE

Infrastructure	Quantity	Unit
Sewer Mains (Pipes)	1,456,400[1] / 276	Feet / Miles
Manholes	5,500	-
Siphons	34 (59 barrels[2])	-
Pump Stations	7	-

[1]Total length is rounded to the nearest one hundred feet.

[2]Some siphons have multiple barrels: Three (3) siphons have three (3) barrels, 19 siphons have two (2) barrels, and the remaining 12 siphons have a single barrel.

San Jose/Santa Clara Regional Wastewater Facility
SC Influent Junction Structure
Northside PS
Rabello PS
Westside LS
Primavera LS
Stadium LS
Tasman LS
De La Cruz LS
CSJ Interceptor (Not Modeled)
CuSD Flow

Figure 1-1
Sanitary Sewer System and Service Area

Sewer Master Plan Update

Legend

- City Boundary
- Pump Station
- Santa Clara Force Mains
- San Jose Interceptors
- CuSD Joint Usage Sewers

Sewers by Diameter
- ≤6"
- 8"-10"
- >10"-16"
- >16"-24"
- ≥27"

N

0 0.25 0.5 1 Miles

Woodard & Curran

Project #: 0012307.00
Map Created: December 2024

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1.3 Report Organization

The contents of each of the sections and appendices of this Master Plan Update report are described below.

- **Section 1 – Introduction**: This introductory section provides background information on the objectives and scope of the Master Plan Update, the City's sanitary sewer system and service area, and the contents and organization of this report.
- **Section 2 – Wastewater Flow Assumptions**: This section describes the flow monitoring program and basis for estimating model flows for existing conditions and future conditions with projected development.
- **Section 3 – Hydraulic Model Development and Validation**: This section describes the modeled sanitary sewer system, development of the hydraulic model network, and the calibration of the hydraulic model for dry and wet weather flow conditions.
- **Section 4 – System Capacity Analysis**: This section defines the basis for the capacity assessment of the system, including the selected design storm and performance criteria used to identify deficiencies, and presents the capacity deficiencies identified based on the model results. The section also identifies areas of the system with high I/I and recommends additional investigations to isolate potential direct inflow sources in those areas.
- **Section 5 – Recommended Capital Improvement Plan**: This section presents the recommended capacity improvement projects based on the results of the system capacity analysis using the calibrated hydraulic model. Each recommended project is documented with a general description, planning level capital cost estimate, relative priority rating, and flow confidence level.
- **Appendices**: The appendices to the report provide additional detailed information to support the findings and recommendations presented in the report sections, including plots of flow monitoring and rainfall data and model calibrations, future land use assumptions, and detailed project descriptions, cost estimates, and figures for capacity improvement projects.

2. WASTEWATER FLOW ASSUMPTIONS

This section describes the flow monitoring program and basis for estimating model flows for existing conditions and future conditions with projected development.

2.1 Flow Monitoring Program

To support the development of the hydraulic model and Master Plan Update, a temporary flow monitoring program was conducted as part of this study. The purpose of the flow monitoring program was to obtain data to quantify actual flows and characterize infiltration and inflow (I/I) within the sewer system, and to calibrate the hydraulic model for both dry and wet weather conditions.

2.1.1 Flow Monitoring and Rain Gauge Sites

One critical purpose of a flow monitoring program is to aid in the calibration of the model, which is discussed further in **Section 3.3**. Considerations for flow meter (FM) placement to support model calibration generally include:

- Isolate areas to characterize flows for model calibration;
- Select sites on downstream trunks for flow confirmation;
- Align the location with flow meters previously used;
- Further divide tributary areas with suspected high I/I based on previous flow monitoring data to further isolate I/I;
- Prioritize preferred hydraulic conditions (i.e., manholes on a straight line preferred over manholes on bends or with multiple incoming pipes); and
- Consider ease of access and safety.

Santa Clara has conducted citywide flow monitoring programs in 2006 and 2015 as part of the City's sewer system capacity assessment study and sewer master plan, respectively. The City also conducted additional selective flow monitoring in the Chromite-Machado-Cabrillo (CMC) tributary area (an area with suspected high I/I based on previous monitoring programs) as detailed in a September 2020 report[1].

The 2022-2023 flow monitoring program for this Master Plan Update included 31 temporary gravity flow meters. Prioritizing the placement of the flow meters in the same locations used for previous monitoring programs is beneficial because it allows for comparison to the previously monitored flows to identify changes over time (e.g., increase in I/I). Therefore, the 2022-2023 program included placement of flow meters in all the same locations as in 2015 except for FM2, which was moved three manholes upstream due to safety concerns, and FM9, which was moved farther downstream to be north of Scott Blvd. The 2022-2023 program also included installation of 8 additional flow meters that were not part of the 2015 program, including a flow meter along Uranium Drive south of Mead Avenue which the City added onto the initial program. Four (4) rain gauges were also installed during the 2022-2023 program, all in the same locations as the rain gauges installed during 2015 and placed to capture spatial variability of rainfall within the City.

V&A Consulting Engineers (V&A), under sub-contract to Woodard & Curran, installed the flow meters and rain gauges and conducted the monitoring program. The flow meters and rain gauges were installed and

[1] Sewer Flow Monitoring and Inflow/Infiltration Study prepared by V&A in September 2020 included flow monitoring at 20 sites conducted during two phases.

operational from December 13, 2022 to February 13, 2023 (approximately 9 weeks). The flow meters collected flow depth and velocity data which were used to compute flow rate.

In addition to the 31 temporary flow meter sites, CuSD also maintains a permanent flow meter at the CuSD's and City's sewer connection point to monitor CuSD flows discharging to the City's sewer system. CuSD provided V&A with flow data recorded by the permanent meter for the duration of the flow monitoring period.

The location of the flow monitoring sites and rain gauges are shown in **Figure 2-1**. The figure also shows the associated tributary area (basin) for each flow meter. Note that some meters were located downstream of other meters. In those cases, the meter tributary areas are "incremental" (areas between the flow meter and tributary basins of the upstream flow meters). **Table 2-1** lists the flow meter locations and pipe diameters, and notes if the meter is incremental (i.e., has upstream flow meters). A schematic of the City's trunk sewer system including the temporary flow meters, pump stations, flow split manholes, and diversion structures is presented as **Figure 2-2**. Plots of the flow monitoring data, including flow, velocity, and level, are provided as **Appendix A**.

During the flow monitoring period, V&A visited all the temporary flow monitoring sites approximately monthly to check meter operation and site conditions, obtain field calibration measurements, and download collected data. Field calibration involves taking manual depth measurements and flow velocity measurements using a portable velocity meter. These calibration measurements were compared to and used to adjust monitor-recorded depth and velocity, if needed. Calibration measurements were taken at different times of day to obtain calibration points for the full range of typical diurnal flows.

TABLE 2-1: FLOW METER SITES

FM ID	Site Location	MH ID[1]	Upstream Meter ID(s)	Pipe Size (in)[2]
1	Lafayette St. north of Calle de Mundo	S104-28	4, 7-8, 10-12, 14-15, 19-22, 26-29	36
2	Parking Lot east of Great America Pkwy and north of Stars and Stripes Dr	S104-26	6, 9, 19-20, 29-30	33
3	Lafayette St. north of Calle de Mundo	S104-30	5-6, 9-13, 19-21, 24, 26-31	42
4	Parking lot of Levis Stadium	S94-35	--	24
5	Mission College Blvd. north of Our Lady's Wy.	S83-21	10, 11, 12, 13, 20, 21, 24, 26, 27, 28, 29, 30, 31	33
6	Mission College Blvd. north of Our Lady's Wy.	S83-22	9, 19-20, 29-30	30
7	Upstream of Primavera Lift Station.	S105-34	--	24
8	Lafayette St. north of Montague Expwy.	S86-12	11-15, 20-22, 26-29	30
9	Calabazas Creek north of Scott Blvd.	S72-17	19, 20, 29	30
10	San Juan Ave. and Monroe St.	S52-79	26-27	24
11	Chromite Dr. and Pilot Knob Dr.	S53-40	10, 26-28	24
12	Chromite Dr. and Alhambra Dr.	S53-23	10-11, 26-28	24
13	Bowers Ave. just north of Bonnie Dr.	S53-54	20-21, 29	30
14	South Dr. south of Loma Vista Ln.	S54-16	20-21, 29	15

FM ID	Site Location	MH ID[1]	Upstream Meter ID(s)	Pipe Size (in)[2]
15	Nvidia Parking lot, west off of Scott Blvd. south of Central Expwy.	S65-50	22	18
16	Central Expwy west of UPRR	S67-13	10-12, 14, 20-22, 26-29	27
17	De La Cruz Blvd. north of Martin Ave. (western sewer)	S58-9	22	24
18	De La Cruz Blvd. north of Martin Ave. (eastern sewer)	S58-8	22-23	24
19	North of intersection of Wren Ave. at Kent Avenue	S21-18	--	24
20	Homestead Rd. west of Cherry Orchard Place	S21-47	--	18
21	Kiely Blvd. north of Hearth Pl. and south of Kaiser Dr.	S23-6	20, 29	24
22	Los Padres Blvd. at Bray Ave.	S45-80	--	18
23	Brokaw Rd. northeast of UPRR	S48-31	--	18
24	Bowers Ave. (southbound) north of Central Expwy.	S63-1	10-13, 20-21, 26-29, 31	33
25	West of De La Cruz Blvd. (southbound) and east of Walsh Ave.	S57-56	10-12, 26- 28	30
26	Machado Ave. east of Santa Cruz Ave.	S52-87	--	21
27	Francis Ave. north of Cabrillo Ave.	S43-2	--	10
28	Amethyst Dr. south of Chromite Dr. and north of Kearney Ave.	S53-46	--	8
29	Homestead Rd. west of Bond Pl. and east of Cherry Orchard Pl.	S21-55	--	15
30	Parking lot south of Scott Blvd, north of Central Expwy., west of Oakmead Village Dr.	S72-33	--	15
31	Uranium Dr. south of Mead Ave.	S65-50	--	10
32	CuSD FM at Homestead Rd. and Swallow Dr.	S20-9	--	15

[1] Flow meters were placed on the downstream end of the influent pipe.

[2] GIS pipe diameter. Actual diameter as measured by V&A may be slightly different. When manholes have multiple incoming manholes, the largest pipe was monitored.

Flow Meter Basin

1, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19&20, 2, 2&3, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 3, 30, 31, 4, 5, 6, 7, 8, 9A, 9A&24, 9A&30, 9A&31

San Jose/Santa Clara Regional Wastewater Facility

SC Influent Junction Structure

Northside PS

Rabello PS

FM 3

FM 1

FM 2

Westside LS

Primavera LS

FM 7

FM 4

Stadium LS

Tasman LS

De La Cruz LS

FM 8

FM 5

FM 6

FM 9A

FM 30

FM 24

FM 16

FM 31

FM 15

FM 25

FM 17

FM 18

FM 11

FM 12

FM 14

FM 28

FM 10

FM 13

FM 26

FM 27

FM 22

FM 23

FM 19

FM 21

CuSD Meter

FM 20

FM 29

ALVISO

RENAISSANCE

AGNEW

PLAZA DEL REY

LAKEWOOD

SAN MIGUEL

EAST MURPHY

SCOTT MARTIN

LAWRENCE

NORTH SAN JOSE

RIVER OAKS

BIRDLAND

PRUNERIDGE

LOMA LINDA

NORTHLAKE

CORY

BASCOM FOREST

NEWHALL SHERWOOD

Figure 2-1
Flow Monitoring Program

Sewer Master Plan Update

Legend

- 2014-2015 & 2022-2023 Flow Meter Site
- 2022-2023 Flow Meter Site
- CuSD Flow Meter Site (FM 32)
- City of Santa Clara Boundary
- Pump Station
- San Jose Interceptors

Trunk Mains

- Gravity Main
- Force Main
- Small Diameter Mains

N

0 0.3 0.6 1.2 Miles

Woodard & Curran

Project #: 0012307.00
Map Created: December 2024

Figure Exported: 12/31/2024 By: SEstabrook Using: \\woodardcurran.net\shared\Projects\0012307.00 Santa Clara CA Sewer Master Plan Update\wip\C. GIS\3. ArcGIS Pro\SantaClaraSewerMasterPlan2024_Report.aprx

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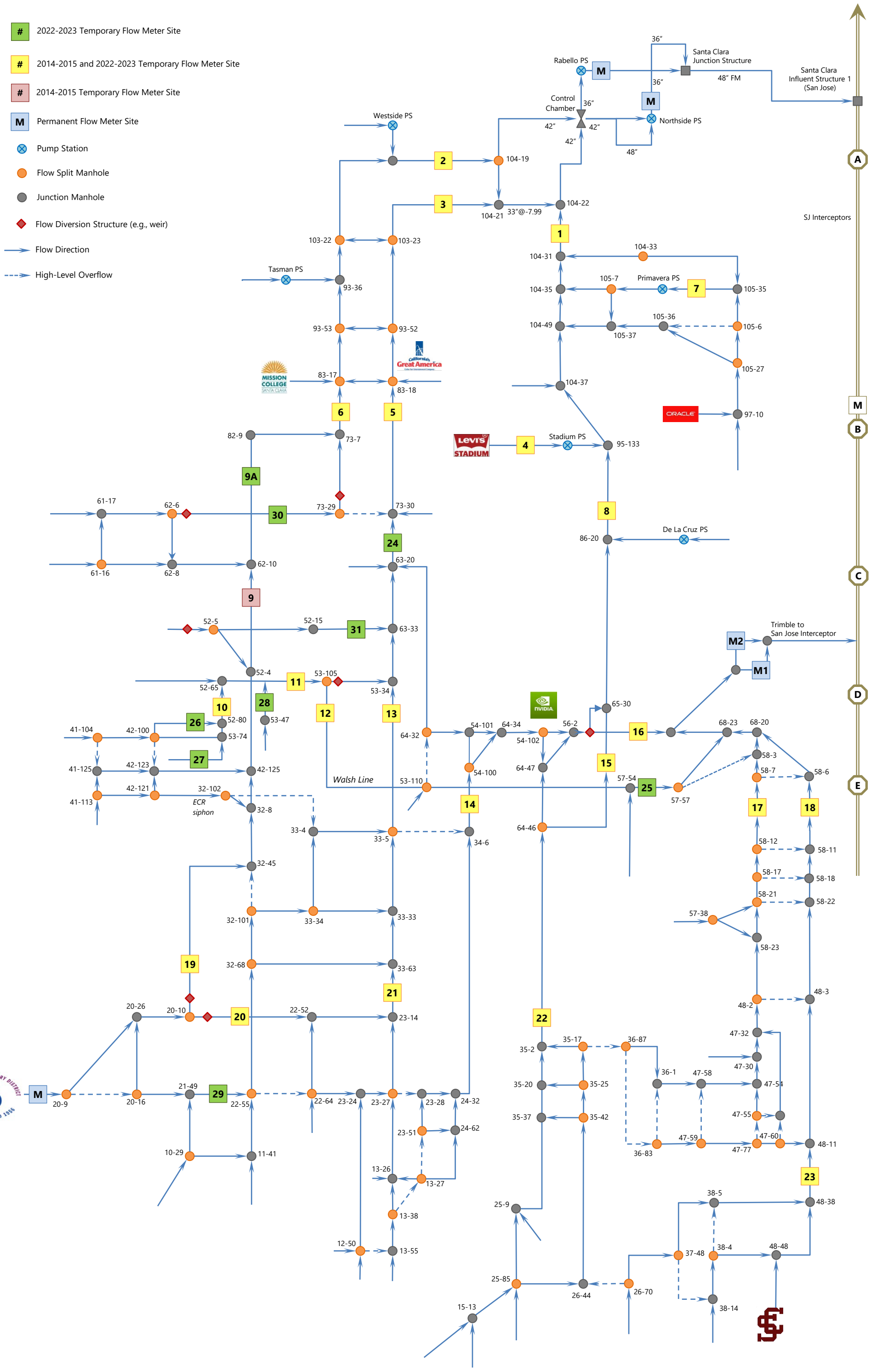
Any reliance upon the map or data contained herein shall be at the users' sole risk.

Figure 2-2: City of Santa Clara Trunk Sewer System Schematic



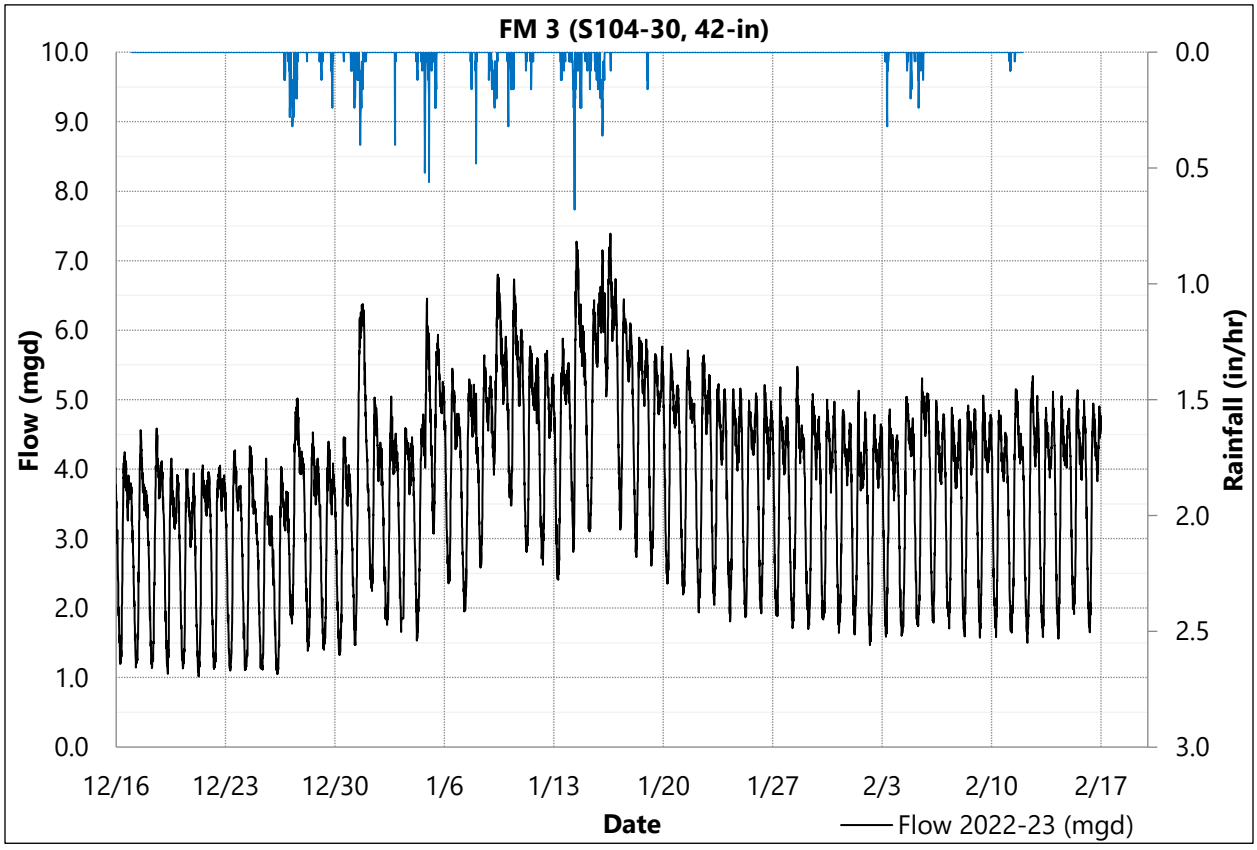
2.1.2 Flow Monitoring Data

During the flow monitoring program, V&A routinely inspected the flow meters as discussed above, and temporary flow meter data was uploaded on a regular basis to an online portal (Claros). Claros generates tabular reports and graphs of recorded level and velocity, as well as scattergraphs of level versus velocity. In addition to V&A's internal data review and quality analysis procedures, Woodard & Curran staff periodically reviewed the preliminary flow meter data over the course of the monitoring program to inspect for changes in flow indicating potential problems with the flow meter (e.g., debris buildup on the sensor), change in system operation, or customer discharges, or response to wet weather events. V&A provided "final" (quality controlled and adjusted data) after the conclusion of the program.

Two (2) of the temporary flow meters in the Chromite Drive and Machado Avenue area (FMs 11 and 28) experienced data loss during the flow monitoring period that coincided with wet weather events. Although the data loss occurred during periods with significant rainfall, there were still data available at these sites from other rainfall events that occurred during the flow monitoring period. V&A used the available data to recreate data for the missing periods.

Figure 2-3 shows typical plots of measured flow and rainfall for one flow meter for the flow monitoring period between December 2022 and February 2023. Plots of the flow monitoring data, including flow, velocity, and level, are provided for all meters as **Appendix A**.

FIGURE 2-3: PLOT OF TYPICAL FLOW DATA FOR 2022-2023 FLOW MONITORING PERIOD



2.1.3 Additional Monitoring for Dry Weather Flow Verification

In addition to the systemwide flow monitoring program conducted during the winter of 2022-2023, V&A also performed selective monitoring per direction from the City and Woodard & Curran as described below.

Review of the flow monitoring data versus model dry weather flows revealed that FM 12 was placed in the incorrect location during the initial winter 2022-2023 flow monitoring program. To remedy this, Woodard & Curran and the City requested that V&A collect one week of dry weather flow data at the correct location over the summer to enable confirmation of model dry weather flows.

Per the City's request, additional dry weather flow monitoring was also performed by V&A at eight (8) FM sites during a 7-day dry period from December 9-15, 2023 (site map included in **Appendix E**). The purpose of the additional flow monitoring was to confirm if the sewer system's routing of dry weather flows was in alignment with the City's normal operating conditions. The City's desire for confirmation was due to discrepancies observed during the winter 2022-2023 flow monitoring program and the previous flow monitoring program conducted during the winter of 2014-2015, which were identified during the model calibration process and are discussed further in **Section 3.3**.

2.2 Basis of Hydraulic Model's Wastewater Flow Estimates

This section presents the basis of wastewater flow estimates for the City's sanitary sewer system. It describes the wastewater flow components used in the hydraulic model and the existing and projected future land uses for the City, which form the basis for generating base wastewater flows that are applied to the model. Design flow estimates are based on criteria developed for three major flow components discussed below and confirmed through model calibration as described in **Section 3.3**.

2.2.1 Wastewater Flow Components

Wastewater flows include three components: base wastewater flow (BWF), groundwater infiltration (GWI), and rainfall-dependent infiltration/inflow (RDI/I), as illustrated conceptually in **Figure 2-4**.

Base Wastewater Flow (BWF)

BWF represents the sanitary and process flow contributions from residential, commercial, institutional, and industrial users of the system. BWF varies throughout the day, but typically follows predictable diurnal patterns depending on the type of land use. (Note: the hydraulic modeling software refers to BWF as "foul flow.")

Groundwater Infiltration (GWI)

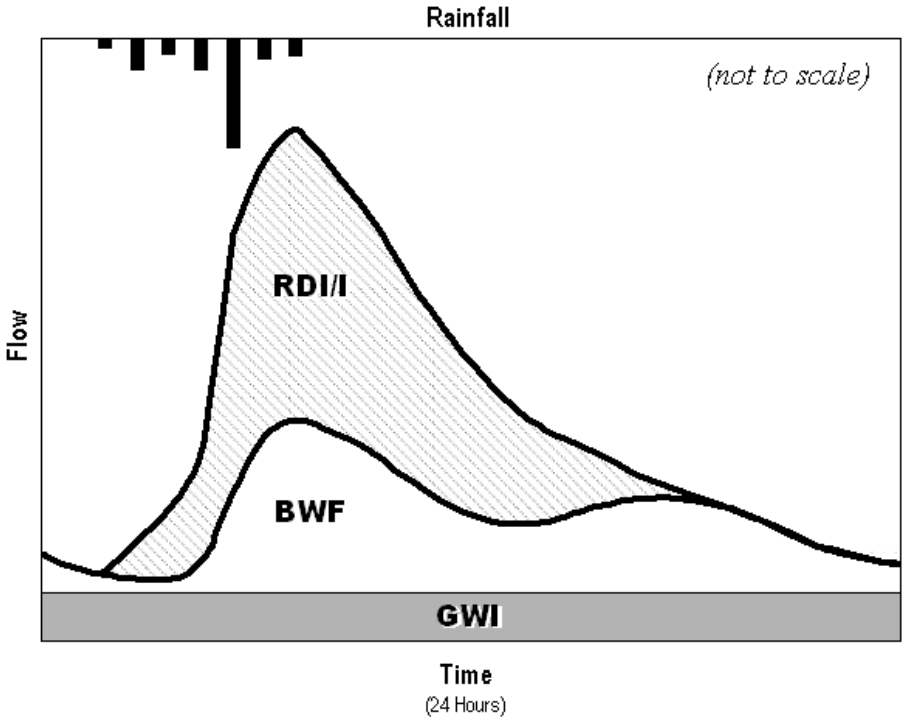
GWI is groundwater that infiltrates into defects in sewer pipes and manholes, particularly in winter and springtime in low-lying areas. GWI is typically seasonal in nature and remains relatively constant during specific periods of the year. However, rainfall typically has long-term impacts on GWI rates, as evidenced by measurable increases in GWI after prolonged periods of rainfall. (Note: the hydraulic modeling software refers to GWI as "baseflow.")

Rainfall-Dependent Infiltration and Inflow (RDI/I)

RDI/I is storm water inflow and infiltration that enter the system in direct response to rainfall events, either through direct connections such as holes in manhole covers or illegally connected roof leaders or area drains, or, more commonly, through defects in sewer pipes, manholes, and service laterals. RDI/I typically result in short term peak flows that recede relatively quickly after the rainfall ends. The magnitude of RDI/I

flows are related to the intensity and duration of the rainfall, the relative soil moisture at the time of the rainfall event, and the condition of the sewers.

FIGURE 2-4: WASTEWATER FLOW COMPONENTS



2.2.2 Base Wastewater Flow Estimates

For the City's Master Plan Update, BWF loads were developed for existing conditions, near-term future development conditions, and long-term future development conditions. Existing loads were developed based on average winter water use data from the City's customer billing records, and future loads were based mainly on specific, known development and redevelopment projects combined with the City's 2035 General Plan (GP) development forecast. The loading methodology for existing conditions and projected near-term and long-term future BWF are discussed further in the following subsections. A summary of the BWF loads associated with both existing and future land use conditions is presented in **Table 2-2**.

TABLE 2-2: SUMMARY OF BWF LOADS FOR EXISTING, NEAR-TERM, AND FUTURE CONDITIONS[1]

	Existing Conditions	Future Conditions	
Flow Component	Existing Load (mgd)[2]	Near-Term Load (mgd)	Long-Term Load (mgd)[3]
Residential BWF	6.72	10.11	13.58
Non-Residential BWF	4.49	6.09	15.48
Total Average BWF	11.21	16.20	29.06

[1]Does not include loads from CuSD, which are discussed in subsequent subsections.
[2]Estimated existing BWF calculated from winter water use data.
[3]Includes 5.09 mgd assumed for entitlement agreements, mostly for non-residential land uses.

2.2.2.1 Existing BWF Loads

Existing BWF was estimated based on actual water billing records exported from the City's customer billing database. The City's Information Technology (IT) group used the Esri ArcGIS software (GIS) to add location identifier fields to the raw billing data, including the assessor parcel number (APN) and service address.

Raw billing data were first processed to exclude non-wastewater generating accounts, which consisted of selecting only the billing data records with field "utility_type" equal to "S" for sewer. By isolating the sewer accounts, the metered potable water and recycled water accounts that do not generate sewer discharges (e.g., meters that serve fire, construction, or irrigation uses) were removed. The City also has customers who use domestic wells and/or recycled water; however, the BWF for these customers were assumed to be included in the sewer billing data per conversations with the City's finance department.

Each account's BWF was estimated based on the average water use for three winter periods (December through March) between December 2019 and March 2022. Metered water use during the winter months most closely approximates wastewater generation because outdoor water use is at a minimum. Each user was also assigned one of two land use types (i.e., residential or non-residential) according to the account's use category designation as shown in **Table 2-3**.

TABLE 2-3: LAND USE CLASSIFICATIONS AND EXISTING BWFS BY USE CATEGORY

Assigned Land Use	Use Category[1]	Use Category Description	Existing BWF (mgd)
Residential	SF	Single-family residential	3.20
	MF	Multi-family residential	3.52[2]
Non-Residential	CI	Commercial industrial	3.78[2]
	MU	Municipal	0.46
	MJ	Major sewer users	0.25
		Total	**11.21**

[1]Based on billing data field "CustomerType_Category".

[2]A portion of the customers assigned to the "CI" use category in the City's billing database were re-assigned to the "MF" use category for the purpose of estimating BWFs because they represented water use from multi-family residential buildings. Detailed land use descriptions based on the North American Industry Classification System (NAICS) were used to identify these customers.

The billing data were further processed in GIS for the purpose of associating each billing data point with its physical service location. Most water billing records were geocoded according to the APN from the City's land parcels dataset. Where parcel APN did not match between the parcel shapefile and the water billing data, billing records were geocoded according to service address. A visual assessment of the City's water meter locations and parcels using GIS confirmed that the data were available for most significantly developed parcels within the City. **Figure 2-5** shows the geocoded water billing data by customer type.

The procedure used to determine the loading point of each parcel is discussed in **Section 3.2.3**.

Existing Flow from Cupertino Sanitary District (CuSD)

CuSD provides sewer services for the majority of City of Cupertino, portions of the City of Saratoga, and several unincorporated areas within Santa Clara County adjacent to San Jose. Most of the flow is discharged into the Santa Clara system via a 27-inch sewer line in Homestead Road; the rest is discharged into the City of San Jose (CSJ) system at various other connection points.

CuSD maintains a permanent flow meter at its discharge point in Homestead Road. Meter data between December 2022 and February 2023 were reviewed and analyzed; based on the raw data, monitored average

dry weather flow (ADWF) and peak dry weather flow (PDWF), based on the period from December 17-23, 2022, were about 3.6 and 5.7 mgd, respectively. Similar to the declining trend observed for the City, CuSD's ADWF has also declined over 20% compared to the 2007 estimate of 4.9 mgd but increased slightly compared to the 2015 estimate of 3.5 mgd. The initial reduction can likely be explained by increased water conservation activities in response to drought and increased efficiency of water fixtures over time as new homes are built or existing homes are remodeled.

For the purposes of model calibration (discussed further in **Section 3.3**), the monitored flows were used as the BWF loads from CuSD in the model and were applied to the model network as inflow hydrographs. However, the raw CuSD flow data were adjusted (i.e., reduced by approximately 5% by volume, resulting in a revised ADWF closer to 3.45 mgd) when applied to the model because it was suspected that the CuSD flow meter was recording higher than actual flows. The CuSD flow meter was not calibrated prior to or during the City's flow monitoring period, whereas the temporary meters installed throughout the City were calibrated by V&A several times. Moreover, the summation of flow data recorded at FMs 19, 20, and 29 (downstream of CuSD) was less than the CuSD recorded flows prior to the adjustment.

Figure 2-5
Water Billing Data

Sewer Master Plan Update

Legend

- City of Santa Clara Boundary
- Billing Data
- Customer Type
  - CI - Non-Residential
  - MF - Residential
  - MJ - Non-Residential
  - MU - Non Residential
  - SF - Residential

0 0.25 0.5 1 Miles

N

Woodard & Curran

Project #: 0012307.00
Map Created: December 2024

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2.2.2.2 Future BWF Loads

Future loads, for both near-term and long-term projected land use conditions, were estimated based on development information tracked by Woodard & Curran, additional development information provided by the City, and unit flow factors developed for the 2016 Master Plan. The development of future load estimates, including the assumed unit flow factors, is discussed further in the following subsections.

Unit Flow Factors for Projected Future Development

Unit flow factors, which are representative of the typical per unit wastewater usage associated with a specific land use type, were referenced for the future load calculations. All unit flow factors used for the calculation are from the 2016 Master Plan and the San José-Santa Clara Regional Wastewater Facility (RWF) sewage coefficient table and are presented in **Table 2-4**, which also shows the associated density and floor-area-ratio (FAR) assumptions where applicable (i.e., for parcels associated with the City's 2035 General Plan). Unit flow factors were also calculated based on the recent billing data that were used to develop existing BWF loads. The multi-family residential unit flow factors calculated using the recent billing data were around 165 gallons per day per dwelling unit (gpd/DU) on average, which is comparable to the 2016 Master Plan unit flow factor values (i.e., 154 gpd/DU for apartments and 175 gpd/DU for condos and townhomes). However, the single-family residential unit flow factor calculated using the recent billing data (i.e., approximately 175 gpd/DU) was significantly lower compared to the 2016 Master Plan unit flow factor of 245 gpd/DU. The reduction observed in per unit water use consumption for single-family dwellings is reasonable considering that outdoor water use is higher for single-family residential customers and several water use restrictions have targeted outdoor water use and irrigation in response to prolonged drought conditions in California. However, for the purpose of this Master Plan Update effort, the City elected to use the single-family residential unit flow factor from the 2016 Master Plan, given that this is a planning exercise, and it is a more conservative assumption.

TABLE 2-4: UNIT FLOW FACTORS USED TO ESTIMATE FUTURE BWF LOADS

Land Use Category Description	Unit Flow Factor[2]	Density/FAR Assumed[3]
Very High Density Residential	121 gpd/DU	-
Apartments	154 gpd/DU	-
Corridor Mixed Use and Community Commercial (Residential)	154 gpd/DU	25 DU/acre
Regional Commercial Mixed (Residential)	154 gpd/DU	40 DU/acre
Condos and Townhomes	175 gpd/DU	-
Corridor Residential	175 gpd/DU	-
Single Family Residential	245 gpd/DU	-
Office (Low Density)	0.1 gpd/SF	-
Agricultural Open Space	0 gpd/SF	-
Retail	0.1 gpd/SF	-
Community	0.1 gpd/SF	-
Amenity	0.1 gpd/SF	-
Research and Development (R&D) Office and High-Density Office	0.15 gpd/SF	-
Daycare	0.183 gpd/SF	-

Land Use Category Description	Unit Flow Factor[2]	Density/FAR Assumed[3]
Police	0.21 gpd/SF	-
Swim center	0.3 gpd/SF	-
Retail Mixed or High-Density Retail	0.3 gpd/SF	-
Corridor Mixed Use (Non-Residential)[1]	0.335 gpd/SF	-
Regional Commercial Mixed (Non-Residential)[1]	0.335 gpd/SF	-
Fitness	0.42 gpd/SF	-
Beauty Parlor	0.47 gpd/SF	-
Hotel	0.48 gpd/SF or 100 gpd/room	-
Medical Office	0.51 gpd/SF	-
Restaurant (Small Food Service)	0.9 gpd/SF	-
Restaurant (Full Service)	1.04 gpd/SF	-
Public (Educational Facilities)	15 gpd/student or 0.21/SF	0.2
Theater	5 gpd/seat	-
Assisted Living Facility	77 gpd/bed	-
University Residences	70 gpd/bed	-
Medium Density Residential	154 gpd/DU	25 DU/acre
High Density Residential	154 gpd/DU	40 DU/acre
Low Density Residential	245 gpd/DU	25 DU/acre
Neighborhood Commercial (Residential)	154 gpd/DU	25 DU/acre
Parks/Recreation	0 gpd/SF	0.2
Neighborhood Commercial (Non-Residential)	0.1 gpd/SF	0.3
Community Commercial (Non-Residential)	0.1 gpd/SF	0.4
Regional Commercial (Non-Residential)	0.1 gpd/SF	0.5
Heavy Industrial	0.15 gpd/SF	1.25
Light Industrial	0.15 gpd/SF	0.85

[1] Unit Flow factor assumes 25% of full-service restaurants and 75% commercial.

[2] gpd = gallons per day. DU = dwelling unit. SF = square foot.

[3] Only used for the GP Phase 3 developments. For specific developments, the square footage was provided by the City or the developer.

BWF Loads for Near-Term Future Projected Development

A list of the near-term future development parcels as well as a figure depicting their locations are provided in **Appendix B**. Near-term future development parcels were identified based on a development tracking spreadsheet that Woodard & Curran created and updated regularly as part of the on-call hydraulic modeling services provided to the City, including near-term future load projections and several development reviews. In January 2023, the City Planning Department reviewed the spreadsheet and

updated the project development assumptions, including project status and timeline, number of units for projects with residential development and development square footage for projects with non-residential development, where applicable. If the City indicated that a specific development was "approved" or "under construction" as of January 2023, it was assumed to be a near-term future development. City Planning indicated a phased approach would be applied to some of the larger development projects associated with specific plans (e.g., Patrick Henry Drive), in which case a portion of the development was included in the near-term future loading scenario and the remainder was applied to the long-term future development scenario. The land use assumptions (e.g., number of units, office square footage) associated with development projects identified as near-term in the updated tracking spreadsheet were multiplied by the appropriate unit flow factors presented in **Table 2-4** to calculate the BWF loads. For near-term specific developments that were also associated with development reviews, the development reviews were referenced to confirm the calculated BWF loads.

When applying the near-term future BWF loads to the model, it was assumed that the existing BWF loads associated with the parcels identified as near-term developments would be replaced.

BWF Loads for Long-Term Future Projected Development

A list of the long-term future development parcels as well as a figure depicting their locations are provided in **Appendix B**. Long-term future development parcels were identified based on Woodard & Curran's development tracking spreadsheet discussed above and the City's 2035 General Plan assumptions. Some of the specific developments in the development tracking spreadsheet were assumed to be long-term future rather than near-term future, mostly in cases where projects were associated with specific plans (e.g., Patrick Henry Drive) and City Planning indicated a phased approach would be applied as discussed in the previous section. Like the near-term BWF loads, the BWF loads associated with the long-term future specific development projects were calculated based on the specific project's development assumptions and the corresponding unit flow factors. Parcels identified as Phase 3 developments in the City's 2035 General Plan were also identified as long-term future developments. Some parcels were removed from the original Phase 3 General Plan development parcels dataset, including parcels that were already associated with specific developments and parcels that had been removed from the General Plan based on feedback provided by City Planning. The General Plan designation field (GPLANCRT) of the General Plan parcels shapefile (*GeneralPlanParcels_Shapefile.shp*) provided by the City was used to assign the appropriate unit flow factors, density, and FAR assumptions to the Phase 3 parcels based on the corresponding land use. The long-term future BWF loads for the Phase 3 parcels were then calculated by applying those assumptions to the square footage (SF) of the parcel. For example, BWF loads for a parcel associated with a GPLANCRT of "Office (High Density)" were calculated by multiplying the area of the parcel by the unit flow factor (0.15 gpd/SF per **Table 2-4**) and the FAR (1.25 per **Table 2-4**).

BWFs for the long-term future development scenario also included flow assumptions for entitlement holders that discharge to the City's sewers. The City is obligated to provide sewer system capacity for entitlement holders up to the flows specified in the entitlement agreements. The City's billing database records show that many entitlement holders have historically discharged less than their flow entitlements; however, considering the City is required to provide capacity to these users should they have the need to increase their discharges, the long-term future BWF scenario conservatively assumes that all entitlement holders would make use of their full discharge allowances. Flow assumptions for entitlement holders were also included in the City's 2016 Master Plan. The City reviewed the entitlement flow assumptions that were included in the 2016 Master Plan and updated those assumptions for this Master Plan Update based on available information. The long-term future BWF scenario includes flow assumptions for entitlement holders totaling approximately 5.09 mgd, the vast majority of which is allocated to non-residential land users. In

limited cases where entitlement flow assumptions were applied to the same parcels with planned future development, the higher flow was applied. Therefore, where entitlement flows were assumed to be less than future flows, the more conservative future flows were used in the model for the long-term future scenario. The entitlement flow assumptions are documented in **Appendix B**.

When applying the long-term future BWF loads to the model, it was assumed that the existing BWF loads associated with the parcels identified as long-term developments would be replaced.

Future Projected Flow from Cupertino Sanitary District

Future projected load assumptions for CuSD were incorporated into Santa Clara's Master Plan Update based on the latest information available from CuSD's hydraulic model, which was most recently re-calibrated in 2023 by AKEL Engineering. CuSD exported the results from its re-calibrated hydraulic model and provided the flow hydrographs to Woodard & Curran for both near-term and long-term future development projections during both dry weather and wet weather flow conditions. Woodard & Curran created inflow hydrographs based on the results that were exported from CuSD's re-calibrated model; the magnitude of flows were maintained but the timing was slightly shifted to match the diurnal usage pattern observed in the flow monitoring data and to align the peak wet weather response where applicable. **Table 4-6** summarizes the wastewater flow assumptions applied to Santa Clara's hydraulic model to represent the future projected inflows from CuSD. Note that for the long-term future wet weather flow scenario only, the peak flow was conservatively scaled up to match the contractual limit defined in Santa Clara's agreement with CuSD which is equal to 13.8 million gallons per day (mgd).

TABLE 2-5: WASTEWATER FLOW ASSUMPTIONS FOR CUSD[1]

Flow Scenario	Average Dry (mgd)	Peak Dry (mgd)	Average Wet (mgd)	Peak Wet (mgd)
Near-Term Future	4.2	6.3	4.6	11.3
Long-Term Future	4.6	6.7	5.9	13.8[2]

[1]Based on CuSD's hydraulic model results for a seven (7) day period.

[2]Assumed to be contractual limit defined in agreement between Santa Clara and CuSD.

2.2.3 Groundwater Infiltration

GWI represents a seasonal increase in wastewater flows due to infiltration into the sewers, typically in low-lying areas or areas close to creeks or other water bodies. In the context of design flow criteria, GWI represents the incremental groundwater infiltration that occurs during the wet weather season which is in addition to the "baseline" groundwater level during the driest months of the year.

GWI is applied in the model as a constant flow in addition to the BWF. The amount of GWI in any particular area of the sewer system is determined during model calibration by comparing the modeled flows to the actual observed dry weather (non-rainfall period) flows at points in the system where flow data are available (e.g., at flow meter sites). Where modeled BWF is noticeably less than monitored dry weather flow by a constant value throughout the day, the difference is assumed to represent GWI. Note that because GWI is seasonal in nature, the modeled GWI is intended to represent a typical GWI rate during the wet weather season (wintertime) rather than a dry season (summertime) GWI. Typical wintertime GWI rates may range from about 100 to 1,000 gallons per acre per day (gpad).

The GWI determined at the monitoring location is then distributed to the upstream meter tributary area on a weighted per-contributing drainage area basis. For Santa Clara, contributing areas for most parcels were set equal to the total area of those parcels. For parcels identified as open space or parks, the contributing

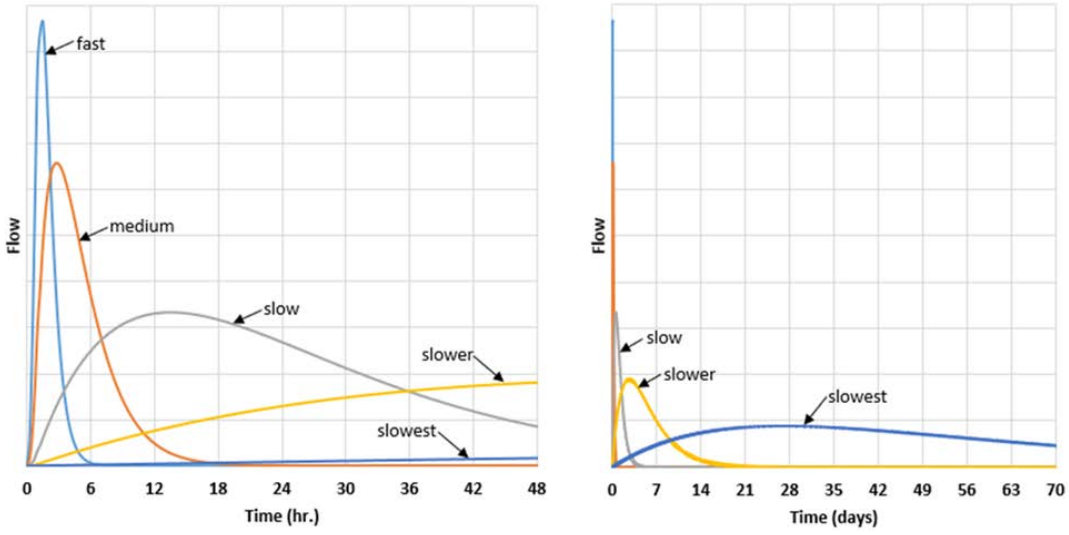
area was set equal to 0. For parcels identified as schools, the contributing area was assumed to be half of the total area to exclude grass sports fields from the contributing area calculation. All parcels with total areas greater than 5 acres were visually inspected, and the contributing area was zeroed out or reduced if it was determined that significant areas within those parcels did not contribute sewer flows.

2.3 Rainfall-Dependent I/I

RDI/I flows result from rainfall events that produce infiltration and inflow of storm water runoff into the sanitary sewer system. RDI/I can be quantified as the difference between the total flow during and immediately following a storm event and the non-rainfall "base flow" (BWF plus GWI) that is estimated to have occurred during the storm period. RDI/I varies depending on many factors including the magnitude and intensity of the storm event, area topography, type of soil and the degree of soil saturation (due to antecedent rainfall) prior to the storm event, and the condition of the sewers, manholes, and service laterals. RDI/I is usually expressed as a volume or a percentage of the rainfall volume (termed the "R value") entering the sewer system from subcatchment contributing areas for each of several flow components representing different response patterns to rainfall events (e.g., fast, medium, slow).

For this modeling effort, five RDI/I response components were used, with each component identified by a percentage of the total RDI/I volume and other parameters that reflect the timing of the flow response, as illustrated conceptually in **Figure 2-6**. The "fast" component of the hydrograph has the largest impact on the magnitude of the peak wet weather flow response, while the slower components can contribute significantly to the total volume of the RDI/I response. The slowest response component can extend out many days or weeks after the rainfall (alternately, this component could be represented as an increase in GWI). Summing all of the component hydrographs for the duration of the rainfall events results in the total RDI/I hydrograph for that area. R values and hydrograph parameters are determined through the process of wet weather model calibration, discussed in **Section 3.5** of this report, in which actual observed rainfall events are simulated in the hydraulic model, and the resulting model hydrographs are compared to the measured flows at the flow meter locations. The RDI/I parameters are adjusted as needed to achieve the best match of modeled to monitored flows. The same calibrated parameters are generally applied to all subcatchments within each meter area. Once calibrated, the model RDI/I parameters can be applied to a design storm to simulate wet weather flows for a design event.

FIGURE 2-6: RDI/I HYDROGRAPH COMPONENTS



3. HYDRAULIC MODEL DEVELOPMENT AND VALIDATION

This section provides an overview of the hydraulic modeling software and modeling terminology and describes the hydraulic model development and validation process, which includes discussion of the modeled sewer network and facilities as well as the methodology and results associated with calibration of the hydraulic model.

3.1 Hydraulic Modeling Software and Modeling Terminology

The modeling software used for development of the Master Plan Update hydraulic model was InfoWorks ICM™ by Autodesk (InfoWorks or ICM), a fully dynamic hydraulic model that was used for Santa Clara's 2016 Master Plan and the development reviews completed since as well as for many other wastewater systems in the Bay Area, including San Jose and Sunnyvale. InfoWorks uses the implicit method to solve fully dynamic equations of motion (St. Venant equations) for all pipe segments simultaneously at each time step. Detailed information regarding the model software and hydraulic theory (i.e., solution model, equation system, solver, and modeling features) can be found on Innovyze's help webpage[1]. Implicit solvers tend to be more stable than explicit solvers with pumping situations and perform better than explicit solvers when dealing with short pipes and loops in the network. Woodard & Curran used its own InfoWorks licenses for this work.

Key hydraulic modeling terms are defined below.

- **Network** refers to the representation of the physical facilities being modeled. Modeled network components include pipes, manholes, pump stations, etc.
- **Nodes** are primarily manholes, but also include pump station wet wells and outfalls (discharge points from the modeled system). Key data associated with nodes include manhole ground elevations and pump station wet well elevations and cross-sectional areas.
- **Pipes** or **conduits** are connections between nodes and include both gravity sewers and force mains. Key data associated with pipes are upstream and downstream node IDs, pipe length, diameter, roughness and headloss factors, and upstream and downstream invert elevations.
- **Pumps** are modeled individually, connecting pump station wet wells with the upstream node of associated force mains. Data associated with pumps include type (e.g., fixed or variable speed), on and off levels, pump capacities, and pump discharge curves.
- **Subcatchments** (also called **sewersheds** or **subbasins**) are areas that contribute flow to the modeled sewer network. Data associated with subcatchments include sanitary flow (computed based on population, water use, or other available data), type of diurnal sanitary flow profile (which is a function of land use), infiltration/inflow (I/I) parameters, and the node at which the flow from the subcatchment enters the modeled system.
- **Model loads** are the flows entering the modeled sewer system from each subcatchment. Model loads include residential and commercial sanitary or BWF, GWI, and RDI/I. As a sum, they represent the total sewer system flow applied to the model. Development of model loads is discussed in **Section 2.2**.

[1] Innovyze Help Menu Documentation on Hydraulic Model Theory, available online at: https://help2.innovyze.com/infoworksicm/Content/HTML/ICM_ILCM/Hydraulic_Theory.htm.

- **Models** are the combination of a modeled network, its associated subcatchments and loads, and other data (e.g., rainfall, diurnal profiles, inflows from other areas, etc.) that comprise a specific model scenario.

3.2 Hydraulic Model Network Development

The hydraulic model network includes the pipes, manholes, and other physical facilities that comprise the modeled sewer system. This section describes the modeled system, including how the sewer facilities are represented in the model, the data attributes that describe the facilities, and the processes for validating those data.

3.2.1 Modeled System

The hydraulic model network developed for this Master Plan Update includes all City-owned pipes within the sanitary sewer system based on the City's GIS data layers. Approximately 12 miles of privately-owned sewer mains were excluded from the model network; therefore, the network consists of about 276 miles of sewers, including 2.7 miles of force mains, or roughly 96% of the total 288 miles of sewer pipeline within the City's system. The hydraulic model also includes all seven sewage pumping stations. The 2016 Master Plan model was developed to represent the trunk or "backbone" of the sewer system and as such contained approximately 34% (or 94 miles) of the total length of the City's sewers. Woodard & Curran has maintained and updated the model as sewer improvement projects were implemented, development reviews were requested, or when new network data became available, and this Master Plan Update built on that work by significantly expanding the model network to include all City-owned sewer pipelines. A summary of the pipes and other facilities included in the hydraulic model network is presented in **Table 3-1**.

TABLE 3-1: SEWER SYSTEM MODEL PIPE SUMMARY

Pipe Diameter (in)	Total Length[1] (ft)
4-6	199,600
8-10	757,800
11-12	222,000
14-16	63,800
17-21	60,100
22-24	48,200
27-29	16,200
30	26,600
>30	47,700
Force Main	14,400
Total Length (feet)	1,456,400
Total Length (miles)	276
Approx. No. of Manholes	5,500
No. of Siphons	34 (59 barrels[2])

[1]Rounded to the nearest hundred feet.

[2]Some siphons have multiple barrels: Three (3) siphons have three (3) barrels, 19 siphons have two (2) barrels, and the remaining 12 siphons have a single barrel.

3.2.2 Model Network Construction and Validation

The updated and expanded model network was constructed using the City's current GIS files of the sewer system, network data from the previous trunk model, 2020 LiDAR ground elevation data, invert data obtained during previous master planning efforts on the small diameter pipes in the system, review of selected record drawings, and limited field investigations.

The GIS shapefiles were used to spatially define the model network, as well as to initially populate asset properties of pipe diameter, pipe length, and pipe material. Invert and rim elevation data were not included in the City's GIS data but are essential for the model. Therefore, elevation data were obtained from a combination of data sources.

For manhole rims, elevations were assigned based on LiDAR ground elevation data as obtained from the County of Santa Clara[1]. Elevations were adjusted from NAVD 88 to NGVD 29 by -2.69 feet based on the National Geodetic Survey Coordinate Conversion and Transformation Tool[2]. The same datum adjustment was used for the 2016 Master Plan and ongoing modeling studies.

For sewer pipe inverts, elevations were populated using the trunk model that was developed for previous master plan efforts (updated on an ongoing basis), small-diameter pipe invert elevations obtained during previous master planning efforts, and depth data from the City's current GIS (invert estimated by subtracting the depth from the inferred manhole rim), in order of priority. For areas with missing data or in areas where more information was needed to construct the model, additional as-built drawings and field investigations were requested and incorporated.

For sewer pipe diameters, diameters of trunk sewer pipes were assigned based on the trunk model that was developed for previous master plan efforts (updated on an ongoing basis). In select cases where as-builts from specific pipeline lining projects were available (e.g., along the Calabazas trunk near Kifer Road), diameters for lined pipes in the trunk system were updated to reflect their internal diameters. Nominal diameters were assumed for all other pipes. Diameters of small-diameter pipes (not included in the trunk model) were populated from the City's current GIS.

Several model construction and validation processes were applied to review the initial data that were imported into the model network. The goal of the review was to resolve potential connectivity and data entry errors associated with the GIS data. The result of the model construction and validation process was a fully connected, all-pipe model network representing the City's physical sewer infrastructure (i.e., pipes, manholes, and special structures) and sewer system inflows from individual parcels throughout the City (i.e., subcatchments).

Model construction and network validation processes included the following:

- The model network was checked for connectivity, i.e., verifying that correct upstream/downstream manholes were identified for each pipe and that there were no missing links in the network.
- Model special structures, such as siphons, sluice gates, weirs, orifices, and pumps were added as described in **Section 3.2.4**. As-built drawings and field data were used to develop details for

[1] Elevation data (2-foot resolution, hydro flattened digital terrain model (DTM) developed based on LiDAR) were published by the County of Santa Clara. The data are available for download here: https://www.arcgis.com/home/item.html?id=44a391b570a14d4687591fa2e89ebb11 (last updated October 2022).
[2] Tool used to determine height adjustments between vertical datums at specific locations of interest. Available online at: https://geodesy.noaa.gov/NCAT/.

the modeled pump stations, such as wet well elevations and dimensions, number of pumps, pump types, on/off levels, and discharge curves.

- Flow splits (manholes with more than one outlet pipe) were identified, and field verification and/or as-built drawings were requested as needed for further verification of outlet pipe elevations and/or the existence of weirs or other flow diversion structures (refer to **Section 3.2.4**).
- Manhole and pipeline network data, including rim and invert elevations and pipeline sizes, were assigned based on the following:
    - In select locations, record drawings for several pipelines were provided by the City and were used to refine elevation, size, and connectivity information. User text fields within the model were used to document the title of the referenced record drawing.
    - Where invert elevation data were missing or inconsistent with nearby elevations, and not determined through as-built information, interpolated values between known values were used as appropriate or pipe slope was used to infer invert elevations at the upstream ends of the system.
    - Elevation data in the as-builts were adjusted as needed to the NGVD 29 datum.
- Based on the data provided by the sources above, SQL scripts were created and run in order to identify missing or suspect data in the modeled network. Profiles were plotted for each series of pipe segments identified by the scripts to visually check for missing rim or invert elevations, negative or reverse pipe slopes, or abrupt steps up or down in pipe inverts. Where data indicated a discrepancy, an approach to resolve the discrepancy was identified and data were either interpolated or verified through field investigations conducted by the City or as-built drawings. Profiles were also plotted for major trunk sewers and a random subset of sewers within the system to check for missing or suspect data.
- The sources of model data (e.g., GIS, as-built/record drawings, survey/field investigation) were documented using "flags" in the model database.
- All gravity pipelines were modeled assuming a Manning's n of 0.013.
- Headloss coefficients for pipelines were inferred using InfoWorks ICM's "Inference Data Editor" tool, which infers the upstream and downstream headloss coefficients for a pipe based on the planar intersection angle at manholes or other model nodes. Larger intersection angles correspond to higher headloss coefficients.
- Model subcatchments were created to represent parcels and their wastewater discharges as discussed in **Section 3.2.3**.

3.2.3 Subcatchments

Model subcatchments define areas tributary to the modeled pipe network. For this new all-pipe model, each subcatchment represents a single assessor parcel within the City and "loads" to a pipe or pipes in the modeled network to define where flow from that parcel enters the sewer system. The model includes approximately 23,300 subcatchments, ranging in size from less than 1 acre to 110 acres.

To assign the load pipes to subcatchments, the laterals shapefile from the City's GIS was used. Load pipes were assigned to subcatchments based on proximity to the closest lateral and were defined as the sewer

pipe intersecting with the closest lateral. This process assigned a loading pipe to each of the parcels. A visual inspection complemented the process where parcels either did not have a lateral nearby or had multiple laterals. The load pipes are then refined as needed as part of the calibration process (discussed in **Section 3.3**). Additional discussion of model load development and allocation is provided in **Section 2.2**.

3.2.4 Special Structures and Flow Splits

Special structures discussed in this section include siphons, gates, weirs, and pumps. Some of these structures were not included in the GIS database of pipes and manholes and therefore were manually added to the model network based on their location. In most cases, the trunk model data were referenced when manually adding these special structures to the model network because most of the special structures were already included in the trunk model used for development reviews. The information specific to each structure that was extracted from the existing trunk network was complemented with information from as-built drawings and/or other information provided by the City where available. Overall, the trunk network included 26 weirs, three (3) gates (at two (2) manholes), and one (1) orifice. The all-pipe model network includes the same number of gates and orifices but two (2) additional weirs, so 28 weirs in total.

3.2.5 Pump Stations

All seven (7) of the City's sewage pumping stations are included in the model network. Pump data summary sheets provided by the City and available record drawings for the lift stations were used to configure the pump stations in the model. Pump on/off levels (converted to elevations) were based on the on/off wet well levels indicated in the pump station summary sheets and as-builts received as part of the 2016 Master Plan and updates received since. Firm capacity (i.e., capacity with the largest pump out of service) and total capacity for each pump station were estimated based on basic information, pump settings, pump curves, and system curves provided by the City. City staff confirmed that none of the pump stations are equipped with variable frequency drives (VFDs). **Table 3-2** presents a summary of modeled pump stations, including their estimated firm and total capacities; the calculations for which are provided in **Appendix C**. The locations of the City's pump stations are shown in **Figure 1-1**.

TABLE 3-2: SEWER SYSTEM MODEL PUMP STATION SUMMARY

No.	Pump Station Name	No. of Pumps	Firm Capacity (mgd)[1]	Total Capacity (mgd)
1	Westside	2	1.55[2]	2.53[2]
2	Tasman	2	1.61[2]	2.34[2]
3	De La Cruz	2	1.61[2]	2.52[2]
4	Primavera	6	5.72[2]	6.39[2]
5	Stadium	6	2.56[2]	2.68[2]
6	Rabello	8	25.4[3]	27.9[4]
7	Northside	4	19.8[3]	21.3[4]

[1] Firm capacity is defined as the capacity with the largest pump out of service.

[2] Theoretical firm and total capacities were estimated for Westside, Tasman, De La Cruz, Primavera, and Stadium Pump Stations based on basic information, pump settings, pump curves, and system curves provided by the City. Refer to **Appendix C** for detailed calculations for each pump station.

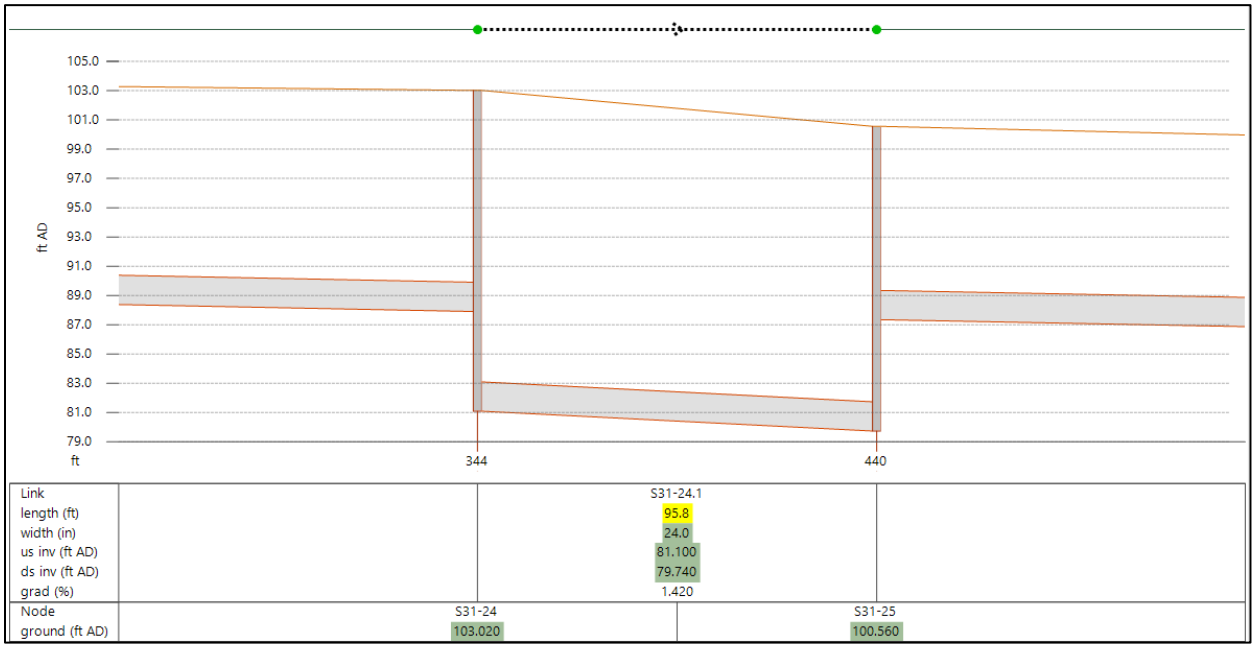
[3] Theoretical firm capacities for Rabello and Northside Pump Stations were estimated by Schaaf & Wheeler Consulting Civil Engineers (S&W) as reported in a memorandum titled "Northside and Rabello Pump Station Firm Capacity Evaluation", dated July 5, 2022.

[4] Theoretical total capacities for Rabello and Northside Pump Stations were estimated using excel spreadsheet tools developed by Schaaf & Wheeler as part of the firm capacity study (refer to footnote 3). System curves for total capacities were estimated based on inferred data because Schaaf & Wheeler did not collect test points with all pumps running.

3.2.5.1 Siphons

The model includes 59 inverted siphons ranging in diameter from 6 to 24 inches; 12 of these are single-barrel siphons, 38 are part of double-barrel siphons (i.e., at 19 locations), and 9 are triple-barrel siphons (i.e., at 3 locations). Siphons were added to the model as pipes with lengths that reflect actual siphon geometry as obtained from record drawings (sum of downslope, horizontal, and upslope portions). A sample siphon profile is shown in **Figure 3-1**.

FIGURE 3-1: SAMPLE SIPHON PROFILE



Siphons include downslope, horizontal, and upslope portions, but can be modeled appropriately without the downslope and upslope segments as shown in **Figure 3-1**. Record drawing information incorporated into the model includes siphon size, invert elevations, segment lengths and locations of the angle points. Where record drawings were not available, GIS data and/or other information provided by the City was referenced. The following rules were applied in the modeling of siphons:

- Siphons with two or more barrels were represented as separate pipes connecting to the same upstream and downstream nodes with diameter and elevations specified for each pipe.
- The friction factor (Manning's "n") was set to the same value (0.013) as those specified for gravity pipes elsewhere in the modeled system.

All siphons were assumed to operate under self-cleansing conditions preventing any major sediment build-up. Therefore, no sediment was included in the model siphons.

A list of the siphons included in the hydraulic model and the corresponding assumptions is provided in **Appendix F**.

3.2.5.2 Flow Splits

Flow splits, or diversions, are nodes in the system with two or more downstream pipes. The City collected survey information at key flow split locations that Woodard & Curran identified to confirm invert elevations, rim elevations, and flow conditions. The field-collected survey information (data sheets included as **Appendix D**) was used to update the model attribute information.

Examples of key connections, flow splits, and diversion structures include the following:

- Connection at Homestead Rd. and Swallow Dr. that sends CuSD's sewer flows to Santa Clara's system via a 27-inch sewer line.
- Diversion structure modeled to divert part of the flow going to Northside PS and to Rabello PS.
- Flume structure modeled to split the flow to the sewer going north on Lawrence Expwy and the sewer going east on Homestead Rd. (refer to **Figure 3-2**).

FIGURE 3-2: FLUME DIVERSION STRUCTURE TO HOMESTEAD RD. OR LAWRENCE EXPWY.

3.3 Model Calibration Process and Results

This section discusses the model calibration methodology and results. Model calibration is the process of comparing model-simulated flows to monitored (observed) flows and adjusting model parameters until a reasonably good match is achieved. It is not expected that the calibration results in an exact match between modeled and observed flows at every meter at all times; however, modeled flows at most meters should reasonably match the flow volumes and peak flows in the observed data. Model calibration was achieved first through comparing modeled versus metered flows during a dry weather (non-rainfall) period to achieve an accurate prediction of BWF and GWI, and then during a wet weather period to estimate the RDI/I response.

3.4 Dry Weather Flow Calibration

This section discusses the methodology and procedures used to calibrate the model for dry weather flow conditions and presents the results of the dry weather calibration.

3.4.1 Dry Weather Flow Calibration Methodology

The goal of dry weather calibration is to confirm that the modeled flows and hydraulic conditions are reasonable compared to the metered flows during non-rainfall periods. Dry weather calibration is an iterative process; if legitimate differences are found between modeled and metered flows, these differences are investigated, and adjustments would be made to the modeled flows as appropriate.

The general approach to dry weather flow calibration was as follows:

1) **Confirm overall model loads match metered flows**. Compare total model flows to metered flows at the most downstream flow meters (FM1, FM2, FM3). If significant discrepancies are identified, review the model loads and billing data for major issues. Investigate and resolve issues.
2) **Compare modeled and metered average flows to identify major discrepancies**. Starting at the upstream ends of the system and continuing downstream until the model outfall, identify any flow meters where the difference between average modeled and metered flows is greater than 30%. If discrepancies are identified at a meter, review the tributary model loads and associated billing for major issues and/or flow routing at flow splits and diversion structures. Investigate and resolve issues.
3) **Compare modeled and metered average flows to identify modest discrepancies**. Starting at the upstream ends of the system and continuing downstream until the model outfall, identify any flow meters where the difference between average modeled and metered flows is between 10% and 30%. If discrepancies are identified at a meter, review parcel loading assignments, major dischargers, or need to use a return factor or discharge cap for selected residential customers. Some modest discrepancies in average flows could be due to the need to add GWI, which are considered in conjunction with review of diurnal patterns. Investigate and resolve issues.
4) **Compare modeled average flows to pump station SCADA**. If hourly pump station SCADA are available, compare the data to modeled flows.
5) **Review diurnal patterns**. Balance adjustment of diurnal patterns with the need to add constant GWI. Adjust patterns as needed or as available information allows for large users (customers with average water use above 50,000 gpd), permitted industrial dischargers (particularly those with batch discharges), and event venues with highly variable use (e.g., Levi Stadium).
6) **Review flow monitoring and model surcharge status**. If the model predicts any surcharge during DWF, those locations should be reviewed for potential network data errors.

For meters that are downstream of multiple other meters, a flow balance was performed to confirm that the total upstream metered flow is less than or equal to the downstream metered flow (e.g., if FM 3 is downstream of FM 1 and FM 2, then FM 1 flows + FM 2 flows should be ≤ FM 3 flows).

3.4.1.1 Review of Largest Water Users

A total of 22 accounts with average winter water use of over 50,000 gpd were identified based on the billing data, which are summarized in **Table 3-3** and shown in **Figure 3-3**. During calibration, average flows from these large users were reviewed. Only base flows from the account located at 444 Saratoga Avenue were adjusted from the initial water consumption value presented below to better match modeled and metered flows; base flows were reduced by approximately 20% because an 80% return factor was applied to the FM 22 tributary area as discussed in **Section 3.4.2**. This adjustment was reasonable given that it is a very large multi-family residential property with a significant amount of irrigated landscape surrounding the 468 units. Several of these large users were assigned distinct diurnal patterns as discussed in **Section 3.4.1.2**.

TABLE 3-3: CITY'S LARGEST WATER USERS (WATER USE GREATER THAN 50,000 GPD)

Account Holder	Account No.	Address	APN	Customer Type[2]	NAICS Class Description[3]	Avg Water Use (gpd)[4]
ELEC DEPT	72271	850 Duane Ave	224-08-153	MU	Other General Government Support (Power Plant)	345,810
CALIFORNIA PAPERBOARD	63199	525 Mathew St	230-03-090	MJ	Paperboard Mills	239,508
INTEL CORPORATION	64334	3065 Bowers Ave	216-46-015	CI	Semiconductor & Related Device Manufacturing	137,542
THE IRVINE COMPANY LLC	82043	3355 Octavius Dr	216-45-058	CI	Lessors of Nonresid. Build. excpt Miniwarehou	125,548
SUMMERHILL LAWRENCE LLC[1]	81664	3494 Toomey Pl	216-60-025	CI	New MF Housing Const Excpt Operative Builders	119,422
CORESITE CORONADO STENDER LLC	62292	3035 Stender Wy	216-29-084	CI	Bare Printed Circuit Board Manufacturing	115,565
ELEC DEPT	64922	524 Robert Ave	230-03-067	MU	Other General Government Support (Power Plant)	115,177
KAISER PERMANENTE	68692	702 Lawrence Expy	316-09-046	CI	General Medical and Surgical Hospitals	109,415
SUMMERWOOD AT SARATOGA CA INC	64126	444 Saratoga Ave	294-04-000	MF	Lessors of Residential Buildings and Dwelling	101,166
APPLIED MATERIALS	64284	3300 Scott Blvd	216-49-024	CI	Semiconductor & Related Device Manufacturing	100,189
INTEL CORPORATION	64352	2150 Mission College Blvd	104-48-010	CI	Semiconductor & Related Device Manufacturing	89,168
3515-3585 MONROE STREET LLC[1]	76100	3555 Monroe St	216-25-008	CI	New MF Housing Const Excpt Operative Builders	83,570
VANTAGE DATA CENTERS LLC	64337	2880 Northwestern Pkwy	216-28-133	CI	Semiconductor & Related Device Manufacturing	83,110
STREAMLINE CIRCUITS CORP	62970	1415 Richard Ave	224-06-170	CI	Bare Printed Circuit Board Manufacturing	73,936

Account Holder	Account No.	Address	APN	Customer Type[2]	NAICS Class Description[3]	Avg Water Use (gpd)[4]
APPLE INC	76270	3250 Scott Blvd	216-29-117	CI	All Other Business Support Services	63,907
CYXTERA DATA CENTERS INC	61293	4650 Old Ironsides Dr	104-04-077	CI	Data Processing, Hosting, & Related Services	61,571
WOODSBOROUGH HOMES ASSOC	64115	950 Kiely Blvd	290-62-000	MF	Othr Orgs (HOA, TOA, Tennant Assoc&Similar)	59,979
DIGITAL REALTY TRUST LP TOTALZ	78636	2220 De La Cruz Blvd	230-03-108	CI	Data Processing, Hosting, & Related Services	59,632
SANTA CLARA UNIVERSITY	64018	500 Lafayette St	269-38-090	CI	Rooming and Boarding Houses	57,109
FUJIFILM DIAMATIX INC	82985	2230 Martin Ave	224-10-126	CI	R&D in Physical, Engineering & Life Sciences	53,903
PROMETHEUS REAL ESTATE MS #2	61640	4101 Lick Mill Blvd	097-08-100	MF	Lessors of Residential Buildings and Dwelling	53,215
APCT INC	61520	3495 De La Cruz Blvd	101-15-033	CI	Radio&TV Broadcast&Wireless Comm Equip Manuf	51,944

[1]Recent new construction.

[2]MU = Municipal; MJ = Major User; CI = Commercial Industrial; MF = Multi-Family Residential.

[3]NAICS = North American Industry Classification System. Federal standard used to classify businesses by type.

[4]Estimated based on winter water use billing data ("utility_type" = sewer records from December 2021 - March 2022). May not correspond directly with the largest sewer dischargers, especially in cases where large volumes of water may be used onsite and therefore not discharge to the sewer system (e.g., data centers). Sewer flows from large users are reviewed and updated as appropriate during the dry weather calibration procedure.

Figure 3-3
Top Water Users

Sewer Master Plan Update

PROMETHEUS REAL ESTATE MS #2
CYXTERA DATA CENTERS INC
INTEL CORPORATION
APCT INC
APPLIED MATERIALS
THE IRVINE COMPANY LLC
APPLE INC
SUMMERHILL LAWRENCE LLC
CORESTIE CORONADO STENDER LLC
INTEL CORPORATION
ELEC DEPT
VANTAGE DATA CENTERS LLC
NVIDIA CORP
3515-3585 MONROE STREET LLC
FUJIFILM DIAMATIX INC
STREAMLINE CIRCUITS CORP
ELEC DEPT
CALIFORNIA PAPERBOARD
DIGITAL REALTY TRUST LP TOTALZ
SANTA CLARA UNIVERSITY
WOODSBOROUGH HOMES ASSOC
KAISER PERMANENTE
SUMMERWOOD AT SARATOGA CA INC

0 0.25 0.5 1 Miles

N

bing

Legend

Largest Water Users (greater than 50,000 gpd)

City Boundary

Trunk Mains

Gravity Main

Force Main

Small Diameter Mains

Woodard & Curran

Project #: 0012307.00
Map Created: December 2024

Third Party GIS Disclaimer: This map is for reference and graphical purposes only and should not be relied upon by third parties for any legal decisions.
Any reliance upon the map or data contained herein shall be at the users' sole risk.

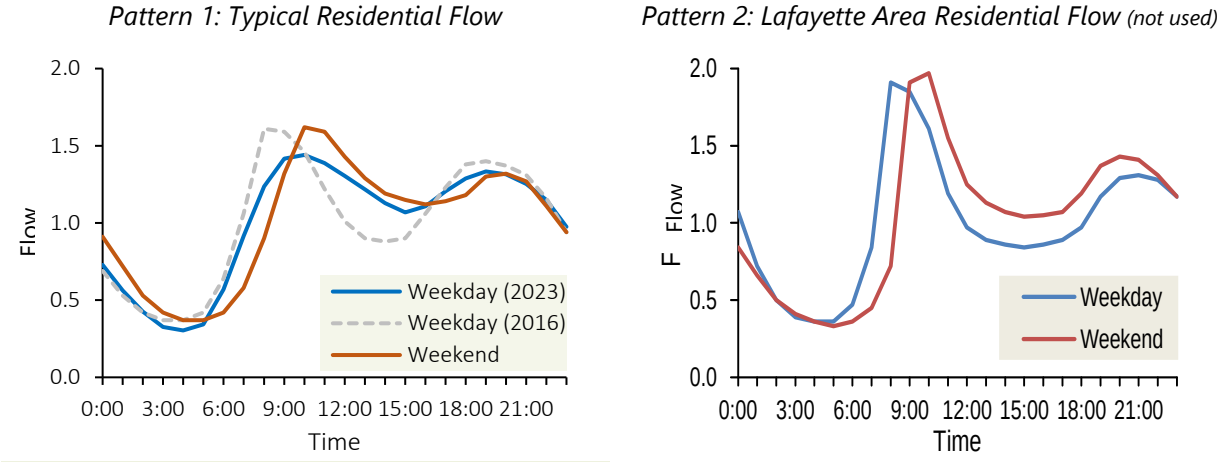
Figure Exported: 12/31/2024 By: SEstabrook Using: \\woodardcurran.net\shared\Projects\0012307.00 Santa Clara CA Sewer Master Plan Update\wip\C. GIS\3. ArcGIS Pro\SantaClaraSewerMasterPlan2024_Report.aprx

3.4.1.2 Diurnal Pattern Development and Refinement

In most sewer systems, BWF typically exhibits distinctive diurnal patterns depending on the land use, usually categorized as residential and non-residential. BWF varies throughout the day in a typical way, generally peaking early in the morning in most predominantly residential areas. Typical hourly peaks from residential areas tend to be about twice the average flow. Higher peaks can occur on atypical days of the year (e.g., on major holidays such as Thanksgiving or at halftime on Super Bowl Sunday). For Santa Clara's sewer model, typical diurnal patterns were developed for residential and commercial/industrial (i.e., non-residential) wastewater flows for both weekend and weekday conditions. Additional non-residential patterns were also developed for specific large users. The patterns were applied to the subcatchment BWF in the model based on the subcatchment's land use and location.

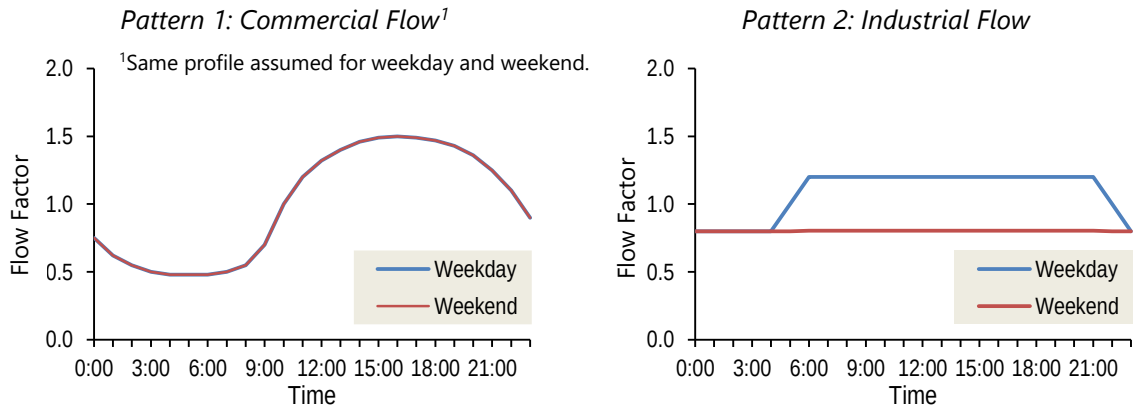
During the dry weather calibration process, the typical residential and non-residential diurnal patterns developed were reviewed and updated accordingly based on a comparison of modeled versus metered flow data. The typical residential diurnal pattern developed for the 2016 Master Plan (shown in **Figure 3-4**) was adjusted to better match the more recent flow meter data, which showed a later and less peaky residential morning peak that can likely be explained by lifestyle changes associated with the COVID-19 pandemic including work-from-home trends. Diurnal patterns exhibited at specific meters that receive predominantly residential flows (e.g., FM 22) were reviewed to refine the residential diurnal curve. The residential diurnal curve that was developed for the Lafayette Area (northeastern part of the City in the vicinity of Lafayette St. and Montague Expwy.) during the 2016 Master Plan (shown in **Figure 3-4**) was also reviewed and compared to the flow monitoring data. Based on the comparison, it was not evident that this distinct, peakier pattern was still an appropriate representation of base flows from this area, so it was removed from the model.

FIGURE 3-4: RESIDENTIAL DIURNAL PATTERNS



Similarly, typical non-residential diurnal patterns developed for the 2016 Master Plan (shown in **Figure 3-5**) were reviewed based on a comparison between modeled versus metered flow data. Specifically, diurnal patterns exhibited at meters that receive predominantly non-residential flows (e.g., FM 17) were reviewed to determine if refinement of existing and/or development of alternate non-residential diurnal curves was warranted. Based on the review, it was determined that the non-residential curves used for the 2016 Master Plan were still an appropriate representation of the typical base flows, so no adjustments were made.

FIGURE 3-5: NON-RESIDENTIAL DIURNAL PROFILES



Operational information regarding sewer discharge patterns for permitted industrial dischargers within the City was obtained during the 2016 Master Plan and was used to create individual non-residential diurnal curves for specific dischargers at that time based on batch discharge information indicated on their wastewater discharge permits or surveys. Individual diurnal patterns developed during the 2016 Master Plan were applied to the following specific non-residential dischargers: Levis Stadium (assuming a 1:00 pm home game), Great America Waterpark, Agilent, Digital LLC, Oracle, City Electric Department (power plants), Applied Material, Owens Corning, APCT Inc., Marvell Semiconductor, Intel, and Streamline Circuits. Woodard & Curran attempted to obtain more recent batch discharge information for permitted industrial dischargers from the City of San Jose but was unsuccessful. However, based on review of the modeled versus metered flow data, the individual patterns obtained for the 2016 Master Plan and applied to specific non-residential dischargers in the model reasonably represented their base flows.

3.4.2 Base Flow Adjustments and Addition of GWI

To better match the modeled and metered flows, some base flow adjustments were applied during the dry weather calibration process. Existing base loads from residential customers, both single-family and multi-family, were capped at a maximum of 300 gpd/dwelling unit. Even though the loads were developed using winter water use billing data (typically the season with the lowest outdoor irrigation), it is likely that some outdoor irrigation is still occurring, so this cap on residential water use was applied to reduce the impacts of excessive outdoor irrigation. Additionally, a return factor, which represents the proportion of water used that is returned to the wastewater system, was considered for the basins where modeled base flows were significantly higher than observed flows. A return factor of 80% was applied to the base flows from upstream basins that primarily collect sewer flows from single-family residential properties (FMs 21, 22, and 23) also to try to remove outdoor irrigation from the water use data to better match modeled and metered flows. A similar return factor was applied to these upstream basins during the 2016 Master Plan effort.

After the base flows adjustments described above were applied, GWI was then added when the observed (metered) dry weather hydrographs were greater than the model-simulated hydrographs by a relatively constant value throughout the day. A total of 0.158 mgd of additional GWI flow was applied to the system uniformly throughout 2 of the 32 flow meter areas at a rate of 250 gpad for FM 26 and 1,800 gpad for FM 31. It should be noted that it may be difficult to assess the actual amount of GWI in any given area, as the relative accuracy of the flow monitoring data, water consumption data, and other model assumptions may affect the amount of flow attributed to GWI. However, this methodology is considered adequate for modeling purposes. It should be noted that this estimate is representative of early-season GWI; however, GWI typically increases throughout the wet weather season as the soil progressively becomes saturated as

more rainfall occurs. Late-season GWI or extended rainfall-dependent infiltration is accounted for during wet weather calibration.

3.4.3 Dry Weather Flow Calibration Results

The seven (7) day dry period from December 17 through December 23, 2022 was used as the primary dry weather calibration period for comparing flow data from the 2022-2023 flow monitoring program to the model results. The primary focus of the dry weather calibration was to confirm that the calculated average BWF based on winter water consumption was consistent with the measured flows at the meter locations. The other objectives of the dry weather calibration were to confirm the flow routing in the system, particularly in areas where flow can be diverted in more than one direction (flow splits), as well as to confirm the diurnal profiles used to represent the hourly variations in BWF. The diurnal curves shown in **Figure 3-4** and **Figure 3-5** were developed and/or confirmed based on the calibration.

Table 3-4 compares the model versus meter average dry weather flows at the downstream most flow meters, **Table 3-5** and **Table 3-6**, respectively, compare the model versus 2022-2023 and 2014-2015 meter average dry weather flow at each meter location, and **Figure 3-6, Figure 3-7**, and **Figure 3-8** show plots of model versus metered dry weather flow for the total flow at the downstream-most meters (FM 1, FM 2, and FM 3, respectively). In these graphs, the green line represents the monitored (observed) flow, and the red line represents the model-simulated flow. Dry weather calibration plots of model-predicted versus metered flows at all flow meter locations for both 2022-2023 and 2014-2015 are provided as **Appendix E**.

As indicated in **Table 3-5**, the dry weather model calibration resulted in a reasonably good match of modeled to metered flow (within 10% at the downstream most flow meters). A comparison of 10% is considered a good match due to fluctuations in flows typically observed over time, as well as potential errors inherent in metering flows in a field environment. At meters with very low flows, small differences between modeled and metered flows can result in a relatively large percent difference; therefore, at these meters (e.g., FM 30), modeled flows within 0.1 mgd of the meter data were also considered a good match.

However, it should also be noted that review of the 2022-2023 flow meter data and comparison to the 2014-2015 data collected for the 2016 Master Plan revealed significant differences that, upon further investigation, were determined to be caused by temporary system conditions that were not representative of typical operations. The initial calibration showed significant, unexpected differences between modeled and metered flows along the Calabazas and Bowers trunks downstream of the Lawrence/Homestead gate structure (pictured in **Figure 3-2**). Through additional review of flow data collected for the 2016 Master Plan; system data and potential flow split locations; and field investigation by City staff, it was determined that the likely cause of the differences was two-fold. First, the Lawrence/Homestead gate structure was likely clogged with rags during the flow monitoring period, causing more flow than expected to be routed to the Calabazas trunk. Second, it was surmised that some issue in the Calabazas trunk (possibly a temporary blockage) caused significant surcharging, enough to reach the level that would route flows away from the Calabazas trunk and into the Bowers trunk through a higher-level split at El Sobrante. Moreover, this second condition seemed to change over time, with significant shifts in metered flows observed at FM 9A, with corresponding shifts at FM 13. These temporary, atypical system conditions that were present during the 2022-2023 flow monitoring period are discussed further in **Section 3.4.3.1**.

The dry weather calibration results presented in **Table 3-5** are based on a model run that attempted to replicate the first difference (clog at the Lawrence/Homestead gate structure), but the second difference (Calabazas trunk backup into Bowers trunk) could not be replicated in the model because although a blockage was suspected based on the data, it was not identified or confirmed at a specific location. Given that the dry weather calibration should be performed assuming normal operating conditions, the 2014-

2015 flow meter data was also compared to the dry weather model calibration results (with the Lawrence/Homestead gate structure settings back to normal) for the locations affected by the two issues discussed above. **Table 3-6** presents the results of that comparison.

TABLE 3-4: DRY WEATHER FLOW CALIBRATION RESULTS SUMMARY[1]

FM IDs	Discharge Location	Meter ADWF (mgd)	Model ADWF (mgd)	Difference (mgd)[2]	Difference (%)[2]
1+2+3	Lafayette and GAP[3] Trunks (FM 1+FM 2+FM3)	10.54	10.09	-0.45	-4.3%
16+17+18+25	Trimble Trunk (FM16+FM17 + FM18 + FM25)	4.65	4.46	-0.19	-4.1%

[1]Model results are compared to the 2022-2023 flow monitoring data.
[2] Difference is reported as model flow minus meter flow.
[3] GAP = Great America Parkway.

TABLE 3-5: DRY WEATHER FLOW CALIBRATION RESULTS VS. 2022-2023 FLOW MONITORING DATA[1]

FM ID	GWI (gpad)	Return Factor Applied (%)[2]	Meter ADWF (mgd)	Model ADWF (mgd)	Difference (mgd)[3]	Difference (%)
1	-	-	2.91	2.91	<-0.01	0.1%
2	-	-	4.71	4.57	-0.14	-3.0%
3	-	-	2.92	2.61	-0.31	-10.6%
4[4]	-	-	0.03	0.04	0.01	33.3%
5	-	-	2.93	3.11	0.18	6.1%
6	-	-	2.75	3.69	0.94	34.2%
7[5]	-	-	1.10	0.83	-0.27	-25%
8	-	-	1.46	1.51	0.05	3.3%
9A	-	-	2.24	3.52	1.28	57.1%
10	-	-	0.65	0.65	<0.01	0.2%
11	-	-	0.77	0.89	0.11	15%
12	-	-	0.83	0.90	0.07	8.3%
13	-	-	2.10	2.05	-0.05	-2.5%
14	-	-	0.41	0.46	0.05	12%
15	-	-	0.23	0.24	0.01	5.8%
16	-	-	1.46	1.35	-0.11	-7.5%
17	-	-	0.77	0.92	0.14	19%
18	-	-	1.18	0.97	-0.21	-18%
19	-	-	2.65	2.78	0.13	4.7%
20	-	-	0.42	0.50	0.08	19%
21	-	80%	0.89	0.95	0.06	6.5%
22	-	80%	0.82	0.87	0.04	5.4%
23	-	80%	0.59	0.66	0.07	12%

FM ID	GWI (gpad)	Return Factor Applied (%)[2]	Meter ADWF (mgd)	Model ADWF (mgd)	Difference (mgd)[3]	Difference (%)
24	-	-	2.39	2.58	0.19	8.2%
25	-	-	1.24	1.22	-0.02	-1.9%
26	250	-	0.55	0.55	<-0.01	0.4%
27	-	-	0.02	0.02	<-0.01	-6.6%
28	-	-	0.08	0.06	-0.02	-22%
29	-	-	0.20	0.23	0.03	15%
30	-	-	0.04	0.05	0.01	25%
31	1,800	-	0.24	0.23	-0.01	-6.3%
32 (CuSD)[6]	-	-	3.63	3.45	-0.18	-5.0%

[1] Model results are compared to the 2022-2023 flow monitoring data and assume a blockage at the Lawrence/Homestead gate structure.
[2] Return factors applied are based on incremental areas (i.e., do not include flows that are upstream of the tributary area).
[3] Difference is reported as model flow minus meter flow. Rounded to nearest 0.01 mgd.
[4] Flow data were highly variable due to impact from Levi's Stadium events.
[5] Flow data were likely impacted by backwater influence from the Primavera Pump Station. Raw data showed frequent spikes in flow.
[6] Raw flow data from CuSD's permanent flow meter were reduced by approximately 5% when applied to the model as discussed in **Section 2.2.2.1**.

TABLE 3-6: DRY WEATHER FLOW CALIBRATION RESULTS VS. SELECT 2014-2015 FLOW MONITORING DATA[1]

FM ID	GWI (gpad)	Return Factor Applied (%)[2]	Meter ADWF (mgd)	Model ADWF (mgd)	Difference (mgd)[3]	Difference (%)
2	-	-	4.05	4.72	0.67	16.5%
3	-	-	2.98	2.79	-0.19	6.4%
5	-	-	3.94	4.13	0.19	4.8%
6	-	-	2.65	3.00	0.35	13.2%
7	-	-	0.88	0.82	-0.06	-6.8%
9[4]	-	-	2.00	2.66	-0.66	33.0%
13	-	-	3.50	3.07	-0.43	-12.3%

[1] Model results are compared to the 2014-2015 flow monitoring data and assume normal settings (no blockages) at the Lawrence/Homestead gate structure.
[2] Model BWF values and return factors applied are based on incremental areas (i.e., do not include flows that are upstream of the tributary area).
[3] Difference is reported as model flow minus meter flow. Rounded to nearest 0.01 mgd.
[4] Located upstream of FM 9A but still along the Calabazas trunk and downstream of El Sobrante overflow connection.

FIGURE 3-6: DRY WEATHER CALIBRATION GRAPH (FM 1)

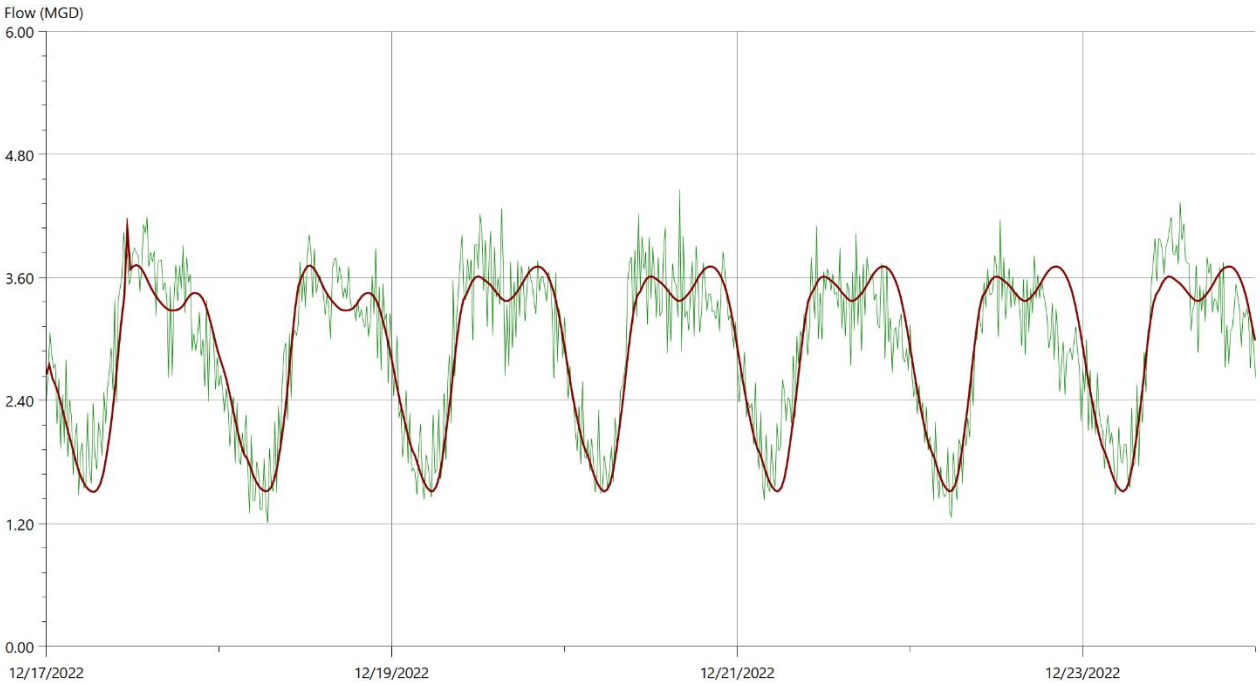


FIGURE 3-7: DRY WEATHER CALIBRATION GRAPH (FM 2)

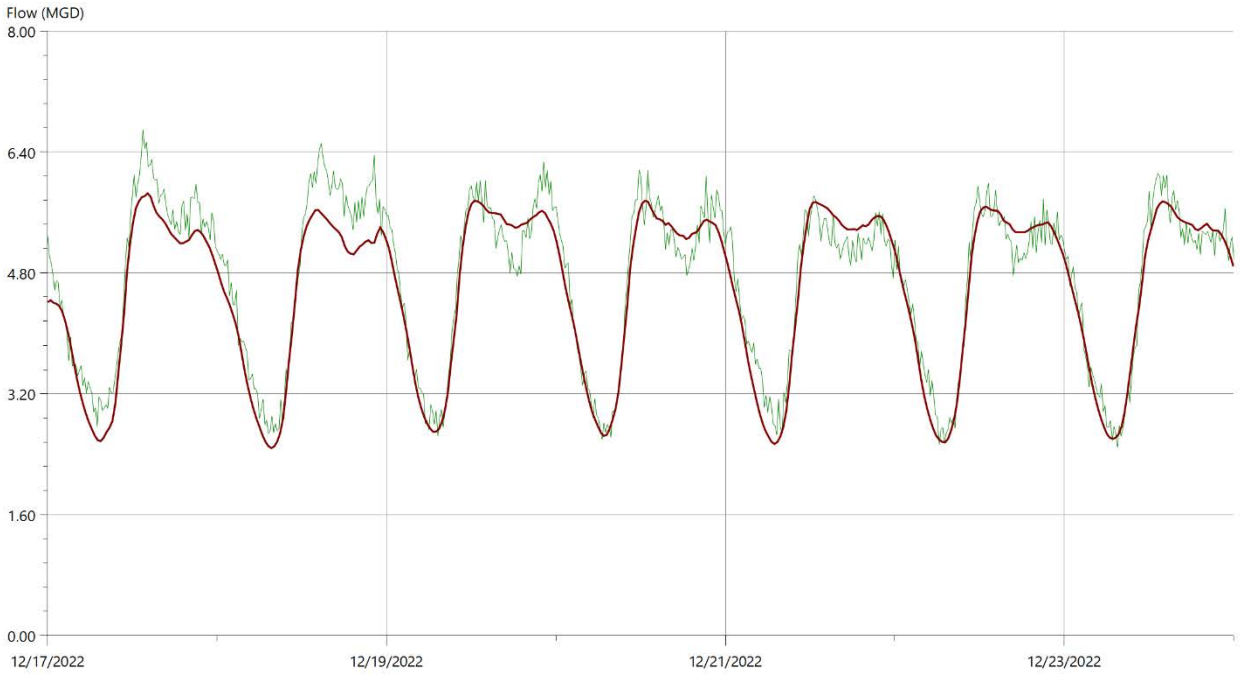


FIGURE 3-8: DRY WEATHER CALIBRATION GRAPH (FM 3)

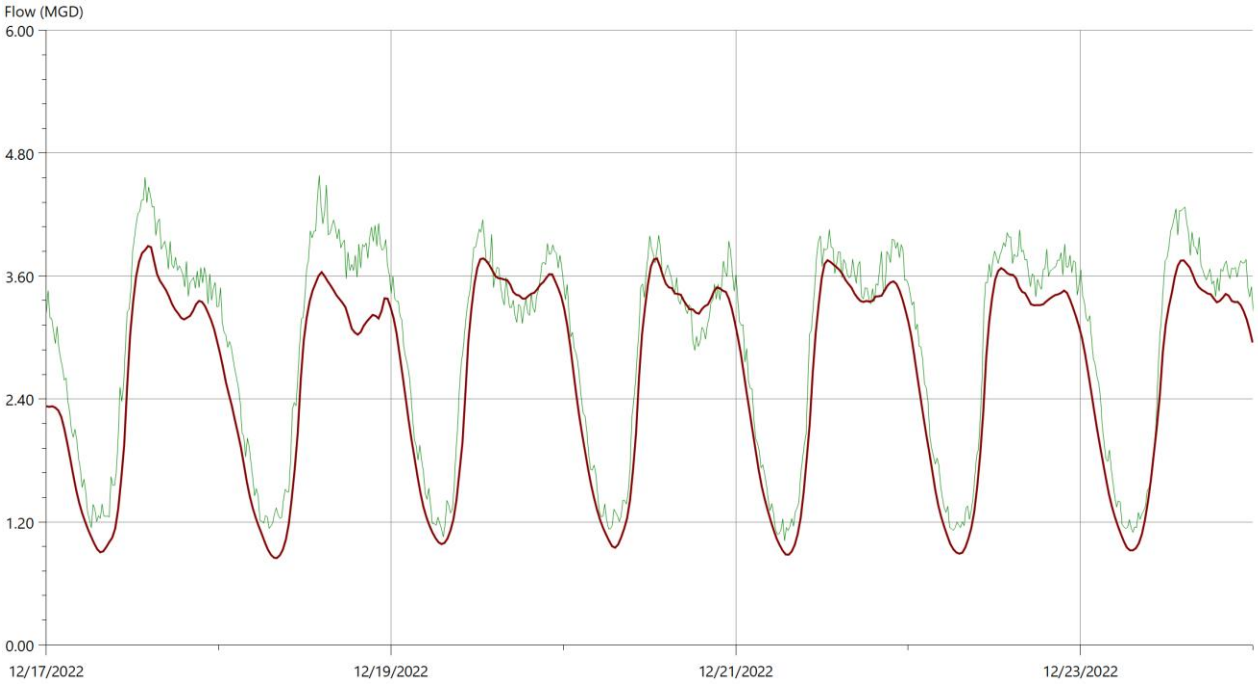


Table 3-7 summarizes the total estimated dry weather flow (DWF) within Santa Clara's sewer system based on the model calibration and the existing loads described previously.

TABLE 3-7: DRY WEATHER FLOW SUMMARY (EXISTING CONDITIONS)

Flow Component	Flow (mgd)
City Residential BWF	5.69
City Non-Residential BWF	5.53
CuSD Total BWF[1]	3.45
Total Average BWF	**14.67**
Estimated GWI[2]	0.16
Total Average DWF	**14.83**

[1]Average modeled daily dry weather flow from CuSD based on dry weather calibration period from **Table 3-5**.
[2]Calculated based on difference between metered non-rainfall period flows and estimated BWF calculated from winter water use data.

3.4.3.1 Differences Between 2022-2023 & 2014-2015 Flow Monitoring Data

During the dry weather calibration and review of the flow monitoring data, Woodard & Curran identified significant differences between the 2022-2023 and 2014-2015 flow monitoring data at the following meters:

- **FMs 19 & 20**: Based on the 2014-2015 flow monitoring data and field inspections recorded by the City, the diversion structure located at Homestead Road and Lawrence Expressway (shown in **Figure 3-2**) splits flows roughly evenly, routing approximately 50% of the flow to the trunk on Homestead and the remaining 50% to the trunk on Lawrence. The model replicated this expected split based on field measurements of gate openings at that time. However, the 2022-2023 flow monitoring data showed that approximately 80% of flow was being routed to the trunk on Lawrence and the remaining 20% was being routed to the trunk on Homestead. The City's Water and Sewer Department staff performed a field inspection to investigate the discrepancy in August 2023 and discovered that rags had built up on the center divider and were impacting the distribution of flow. After City staff removed the rags, they reported that both gates were fully open, and flows appeared to be evenly split. Staff also confirmed that gate settings had not been changed since 2015.
- **FMs 9A & 13**: The 2022-2023 flow monitoring data showed that flows in the Calabazas trunk at FM 9A were significantly lower than flows recorded at FM 9 in 2014-2015, which is located upstream of FM 9A. Additionally, the 2022-2023 flows at FM 19, which is located considerably upstream of FMs 9A and 9, were higher than the flows recorded at FM 9A. These data suggested that flows were being diverted away from the Calabazas trunk somewhere between FM 19 and FM 9A, which was not evident in the 2014-2015 flow monitoring data. Further investigation by Woodard & Curran and additional field surveys conducted by the City revealed that surcharged conditions were observed in the Calabazas line at manhole S32-101 located at the Pomeroy Avenue and El Sobrante Street intersection in March 2023 during dry weather conditions. The invert of the overflow pipeline on El Sobrante is significantly higher compared to that of the Calabazas line (+2.9 ft per the survey data), so it would take a substantial increase in hydraulic grade line for flows to back up into El Sobrante (away from FM 9A and into FM 13). When the same location was surveyed in August 2023, no surcharging was discovered, and flows appeared to have returned to normal. Woodard & Curran was unable to replicate the surcharging observed in March 2023 dry weather conditions in the model. Therefore, in addition to flows in the Calabazas trunk being higher than normal due to rag build up at the Homestead/Lawrence diversion structure (discussed above), it is suspected that there was a temporary downstream blockage in the Calabazas trunk somewhere downstream of the El Sobrante connection that forced flows to backup into the overflow pipe. Flows to El Sobrante are routed to FM 13. Other downstream flow meters affected by the atypical flow routing include FMs 2, 3, 5, 6, and 24. The reported flow differences are greater at FMs 5 and 6 compared to FMs 2 and 3 because there are interconnectors between the two GAP trunks downstream of FMs 5 and 6 but upstream of FMs 2 and 3.
- **FM 7**: The 2022-2023 flow monitoring data were likely affected by backwater influence from the pump station. Numerous spikes were observed in the raw flow data, which were not present in the 2014-2015 flow data. As shown in **Table 3-6**, the modeled dry weather flows were only 6.8% lower by volume than the 2014-2015 recorded flows; moreover, V&A installed the 2022-2023 flow meter one manhole upstream of the 2014-2015 flow meter due to the pump station backwater influence observed at the original location during the site investigations.

Per the City's request, additional dry weather flow monitoring was performed for a week in early December 2023 as described in **Section 2.1.3** to further investigate the major discrepancies which are summarized below.

Summary of Major Discrepancies Identified

It was determined that the likely cause of the differences between the 2022-2023 and 2014-2015 flow monitoring data was two-fold:

1) *Lawrence/Homestead Gate Structure Flow Split*: The Lawrence/Homestead gate structure was likely clogged with rags during the initial flow monitoring period, causing more flow than expected to be routed to the Calabazas trunk.

2) *Calabazas Trunk Line Temporary Blockage*: It was surmised that some issue in the Calabazas trunk (possibly a temporary blockage) caused significant surcharging, enough to reach the level that would route flows away from the Calabazas trunk and into the Bowers trunk through a higher-level split at El Sobrante. Moreover, this second condition seemed to change over time, with significant shifts in metered flows observed at FM 9A (located on the Calabazas trunk), with corresponding shifts at FM 13 (located on the Bowers trunk).

Conclusions from Additional DWF Monitoring Investigations

Metered ADWFs for the 7-day dry period between December 9-15, 2023 were compared to the winter 2022-2023 and winter 2014-2015 metered ADWFs at the same locations as well as model-predicted ADWFs. Graphs of metered versus modeled ADWFs are included in **Appendix E**. Based on a comparison of the results, Woodard & Curran suspects that the two major differences identified above (1. Lawrence/Homestead Gate Structure Flow Split; 2. Calabazas Trunk Line Temporary Blockage) had been resolved as of the December 2023 flow monitoring period and that the City's Calabazas and Bowers trunk lines were operating closer to normal and as intended. To prevent future clogs that could affect sewer flow routing, it is recommended that the City periodically inspect and clean the Lawrence/Homestead gate structure as well as other structures or locations prone to rags or blockages.

Key findings based on the flow monitoring data were as follows:

- During the December 2023 flow monitoring period, the flow split at the Lawrence/Homestead gate structure (FM 19 along Lawrence Expwy, and FM 20 along Homestead Rd) was operating much closer to the approximately 50/50 flow split that the City considers to be "normal" conditions. Based on the flow monitoring data, metered flows at the split were as follows:
    - *December 9-15, 2023 ADWFs*: ~39% to Lawrence Expwy / Calabazas trunk line (FM 19) vs. ~61% to Homestead Rd / Bowers trunk line (FM 20). It should be noted that this split was used in the model and is reflected in the Model Flow results shown on the attached graphs.
    - *December 17-23, 2022 ADWFs*: ~86% to Lawrence Expwy / Calabazas trunk line (FM 19) vs. ~14% to Homestead Rd / Bowers trunk line (FM 20).

- The December 2023 flow monitoring results at FM 21 (along Kifer Rd downstream of FM 20) also confirmed that flows along Homestead Rd continued through to the Bowers trunk line. The December 2023 ADWFs were similar to the winter 2014-2015 metered ADWFs.

- New flow meter sites (FM 33 along El Sobrante St and FM 34 along El Camino Real) were added to check if flows were leaving the Calabazas trunk line at these locations. The December 2023 flow monitoring results confirmed that during the monitoring period flows were retained within the

Calabazas trunk line and did not discharge to the sewers along El Sobrante St or El Camino Real. Additionally, FM 30 (east of Calabazas trunk line between E Arques Ave and Central Expwy) was repeated to confirm flows from the Calabazas trunk line were not discharging to Central Expwy. The December 2023 flow monitoring results were consistent with the 2022 data at this site, showing very low flows through FM 30.

- Shifts in ADWFs that were apparent in the winter 2022-2023 flow monitoring data at FM 9A (along the Calabazas trunk line north of E Arques Ave) and FM 13 (along Bowers Ave on the Bowers trunk line between Chromite Dr and Monroe St) were not present during the one week of December 2023 flow monitoring.

- As evident on the graphs included in **Appendix E**, the model overpredicts flows at both FM 9A and FM 13. In reviewing the collected data, however, no changes to the model flows were incorporated. Total metered flows at FM 19 and FM 20 were very similar between the 2015, 2022, and 2023 flow monitoring periods. Likewise, total metered flows at the downstream meters FM 2 and FM 3 were very similar between 2015 and 2022. The model matches overall flows at these locations well. Conversely, the total metered flows between FM 9A and FM 13 in 2023 and 2022 were 24% and 27% lower than the 2015 metered flows (at FM 9 and FM 13). However, attempting to adjust the model to replicate these lower flows would adversely affect the calibration of downstream meters.

3.5 Wet Weather Flow Calibration

This section discusses the methodology and procedures used to calibrate the model for wet weather flow conditions and presents the results of the wet weather calibration.

3.5.1 Wet Weather Flow Calibration Methodology

Wet weather calibration builds on the dry weather calibration procedure. The goal of wet weather calibration is to match modeled and metered flows during the rainfall events observed during the flow monitoring period. Specifically, the model calibrator strives to achieve a reasonably good match between the modeled and metered peak flows and volumes observed during and before and after the rainfall event. Like dry weather calibration, wet weather calibration is also an iterative process during which adjustments are made to GWI (if needed to match pre-rainfall conditions) and to model parameters governing the volume and response time of RDI/I.

To define the RDI/I parameters, actual rainfall events observed during the flow monitoring period were simulated in the hydraulic model, and the resulting model hydrographs were compared to the measured flows at the flow meter locations. The RDI/I parameters were adjusted as needed to achieve a reasonable match of modeled to monitored flows. The same calibrated parameters were applied to all subcatchments within each meter basin.

3.5.2 Wet Weather Flow Calibration Results

During wet weather calibration, the percentage volume of each of five RDI/I components representing a range of response times (pictured conceptually in **Figure 2-6**) were adjusted to simulate the volume and timing of RDI/I for monitored storm events in order to best match the overall wet weather hydrograph shape and magnitude of peak flows. To simulate a rainfall event in the model, the rainfall was assigned to subcatchments using observed data from the closest available rain gauge. The model-predicted wet weather response, which is based on the assigned rainfall intensity and RDI/I components, was then compared to the observed flow monitoring data.

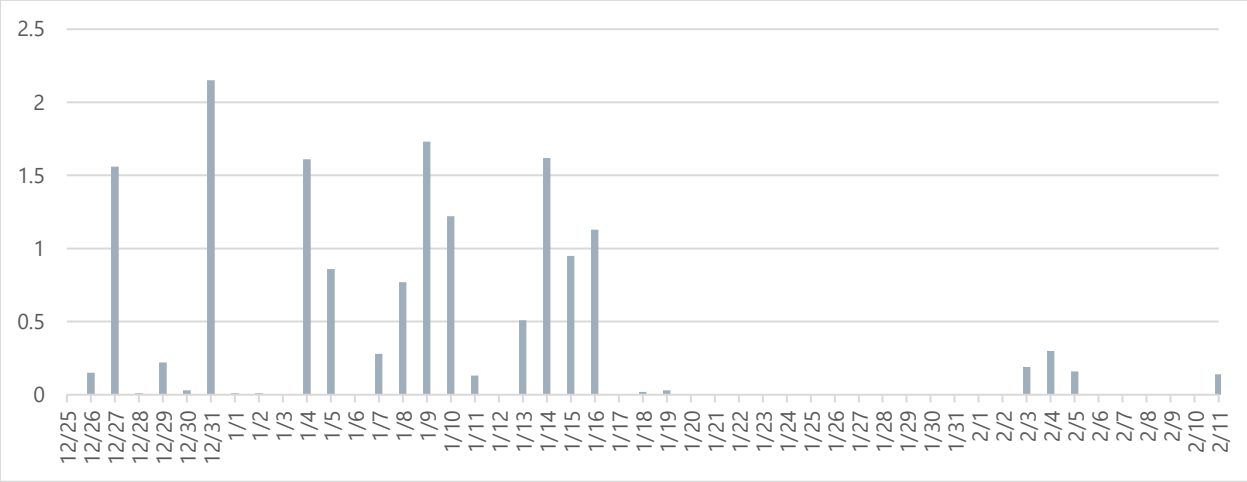
The flow monitoring program conducted in winter of 2022-2023 as part of this Master Plan Update (refer to **Section 2.1**) captured several rainfall events for the wet weather calibration effort. Rainfall for key events referenced for the wet weather calibration is summarized in **Table 3-8**. For comparison (based on the County Drainage Manual and an assumed MAP of 14.5 inches), the 10-year, 24-hour rainfall volume for central Santa Clara is approximately 2.92 inches with a peak hour intensity of 0.65 in/hr and the 5-year, 24-hour rainfall volume for central Santa Clara is approximately 2.45 inches with a peak hour intensity of 0.54 in/hr. Therefore, based on the statistics reported in **Table 3-8**, all the rainfall events observed during the flow monitoring period were individually less than a 10-year return period for the 24-hour duration and the January 4-5, 2023 storm was close to a 5-year return period. However, several of the storms occurred within a short amount of time so there were likely cumulative impacts that increased the inflow and infiltration response during subsequent storms. For example, the January 13-16, 2023 storm event was close to a 10-year storm based on NOAA statistics for the 2-day and 4-day durations. **Figure 3-9** graphically depicts the daily rainfall recorded during the temporary flow monitoring period, in inches.

TABLE 3-8: RAINFALL EVENTS REFERENCED FOR WET WEATHER CALIBRATION[1]

Date of Event	Min 24-Hour Rainfall (in)	Max 24-Hour Rainfall (in)	Min Peak 1-Hour Intensity (in/hr)[2]	Max Peak 1-Hour Intensity (in/hr)[2]
Dec 27, 2022	1.52	1.89	0.28	0.37
Dec 31, 2022	1.55	2.15	0.28	0.36
Jan 4-5, 2023	1.29	2.34	0.36	0.59
Jan 8-10, 2023	1.11	2.08	0.23	0.39
Jan 13-16, 2023	1.62	2.06	0.29	0.42

[1]Rainfall totals based on temporary rain gauge data from gauges 1-4. Minimum rainfall totals are generally from rain gauge 1 located in the northern portion of the City and maximum rainfall totals are generally from rain gauge 3 located in the southern portion of the City. [2]Intensity is reported as an hourly average of 15-minute rainfall data.

FIGURE 3-9: DAILY RAINFALL OBSERVED DURING 2022-2023 FLOW MONITORING PERIOD (IN)[1]



[1]Rainfall totals are from rain gauge 3 located in the southern portion of the City.

Table 3-9 compares the model versus meter peak wet weather flows discharged to the City's GAP and Trimble trunks, **Table 3-10** and **Table 3-11**, respectively, compare the model versus 2022-2023 and 2014-2015 meter wet weather flows at each meter location, and **Figure 3-10**, **Figure 3-11**, and **Figure 3-12**, show plots of model versus metered wet weather flow at the downstream-most meters (FM 1, FM 2, and FM 3,

respectively). In these graphs, the green line represents the monitored (observed) flow, and the red line represents the model-simulated flow. Wet weather calibration plots of model-predicted versus metered flows at all flow meter locations for both 2022-2023 and 2014-2015 are provided as **Appendix E**.

As indicated in **Table 3-10**, the wet weather model calibration resulted in a reasonably good match of modeled to metered volumes and peak flows (within 15% at most locations). However, because it was determined that temporary system conditions that were not representative of typical operations were present during the 2022-2023 flow monitoring period (discussed in **Section 3.4.3.1**), the 2014-2015 flow monitoring data were also compared to the model results at select, affected locations as shown in **Table 3-11**. As part of the wet weather calibration process, Woodard & Curran still reviewed data from both the 2014/2015 and 2022/2023 seasons to confirm that the model was at least reasonable for both conditions at all flow meter locations. The 2014/2015 wet weather season had one very large early season rainfall event, which differed from the 2022/2023 wet weather season in which several, smaller individual storms occurred in a short amount of time.

As evident in the wet weather calibration plots included in **Appendix E**, the modeled and metered peak flows and volumes typically matched better for the later season rainfall events. This is because the full 2022-2023 season was reviewed as the wet weather calibration period; the volume and peak flows associated with the early-season rainfall events are typically overestimated because the same RDI/I parameters were applied across all rainfall events. The RDI/I response typically increases throughout the wet weather season as the soil progressively becomes saturated as more rainfall occurs. Therefore, the wet weather calibration was performed to conservatively match the observed volume and peak flows resulting from higher RDI/I responses during late-season wet weather events.

FIGURE 3-10: WET WEATHER CALIBRATION RESULTS AT FM 1

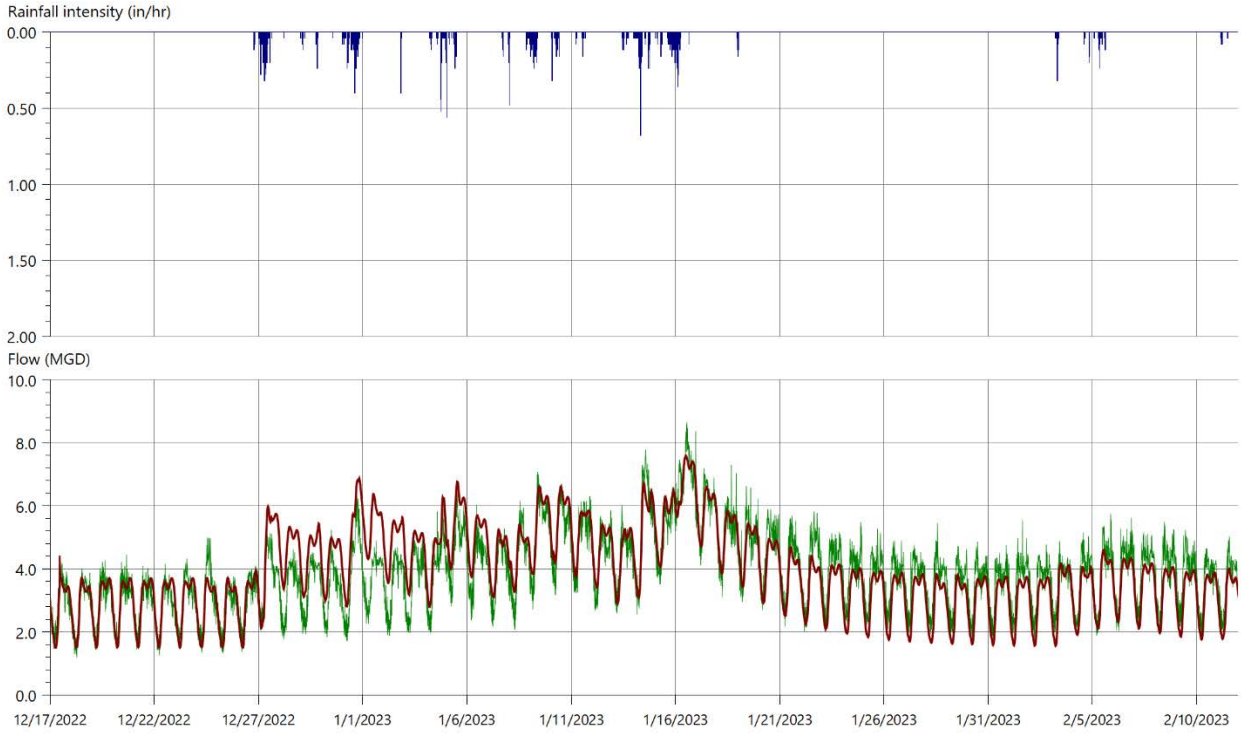


FIGURE 3-11: WET WEATHER CALIBRATION RESULTS AT FM 2

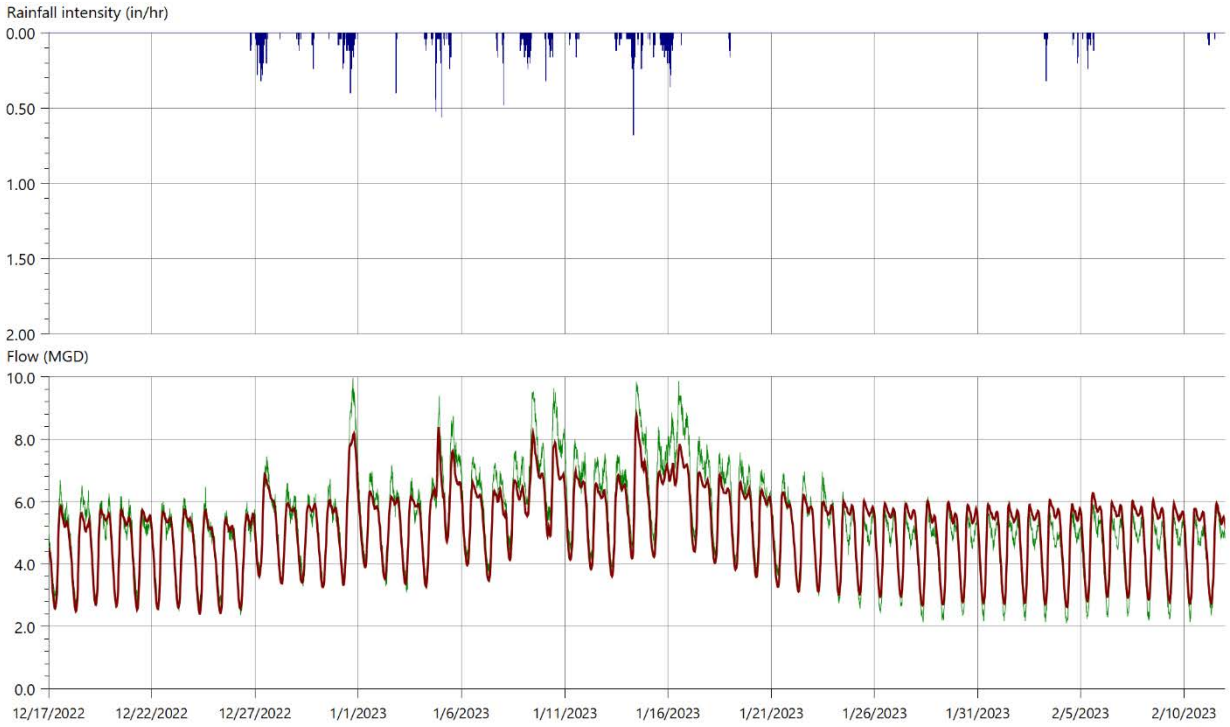
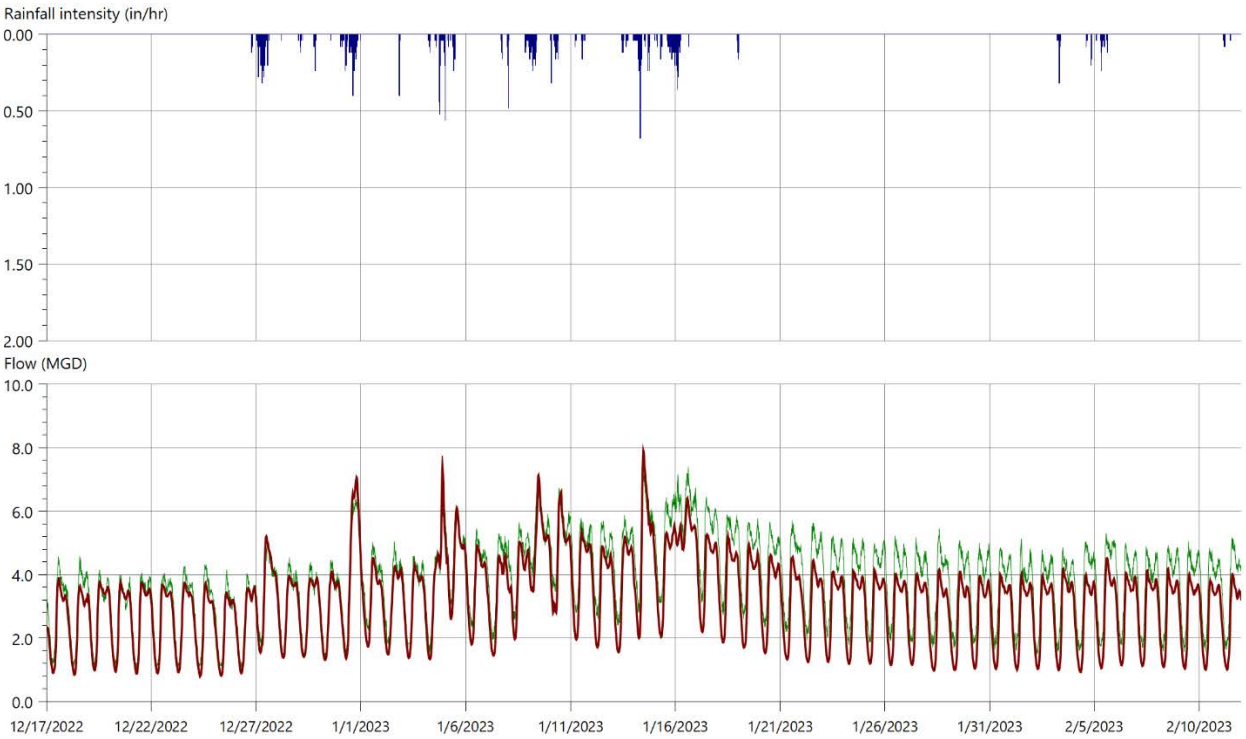


FIGURE 3-12: WET WEATHER CALIBRATION RESULTS AT FM 3



The results of the wet weather calibration are shown in **Table 3-10**. Wet weather peaking factors were calculated for each flow meter based on the ratio of peak flow to average flow.

TABLE 3-9: WET WEATHER FLOW CALIBRATION RESULTS SUMMARY[1]

FM IDs	Discharge Location	Meter PWWF (mgd)	Model PWWF (mgd)	Difference (mgd)[2]	Difference (%)[2]
1+2+3	Lafayette and GAP Trunks	23.03	24.22	1.19	5.2%
16+17+18+25	Trimble Trunk	13.65	13.93	0.28	2.1%

[1] Model results are compared to the 2022-2023 flow monitoring data.
[2] Difference is reported as model flow minus meter flow.

TABLE 3-10: WET WEATHER FLOW CALIBRATION RESULTS VS. 2022-2023 FLOW MONITORING DATA[1]

FM ID	Meter PWWF (mgd)[2]	Model PWWF (mgd)	Difference (mgd, %)	Avg Flow (mgd)[3]	Peaking Factor[4]
1	8.67	7.59	-1.07, -12.4%	2.91	3.0
2	9.97	8.75	-1.22, -12.2%	4.71	2.1
3	7.39	7.88	0.49, 6.6%	2.92	2.5
4[5]	1.25	0.44	-0.81, -64.8%	0.04	31.3
5	8.96	7.78	-1.18, -13.2%	2.93	3.1
6	4.88	7.90	3.02, 61.8%	2.75	1.8
7	2.27	1.80	-0.47, -20.5%	1.10	2.1
8	3.12	2.77	-0.36, -11.5%	1.46	2.1
9	3.85	7.59	3.74, 97.1%	2.24	1.7
10	3.41	3.28	-0.13, -3.7%	0.65	5.2
11	4.94	4.57	-0.37, -7.4%	0.77	6.4
12	-[6]	5.28	-[6]	0.83	-[6]
13	8.56	5.75	-2.81, -32.8%	2.10	4.1
14	1.14	1.05	-0.10, -8.5%	0.41	2.8
15	0.84	0.95	0.11, 12.6%	0.23	3.6
16	2.77	3.03	0.26, 9.2%	1.46	1.9
17	1.68	1.62	-0.06, -3.3%	0.77	2.2
18	2.53	2.81	0.28, 11.1%	1.18	2.1
19	5.98	5.94	-0.05, -0.7%	2.65	2.3
20	1.94	2.26	0.32, 16.6%	0.42	4.6
21	2.90	3.30	0.39, 13.6%	0.89	3.3
22	1.95	2.07	0.11, 5.8%	0.82	2.4
23	1.22	1.49	0.27, 2.2%	0.59	2.1
24	8.30	7.14	-1.16, -13.9%	2.39	3.5
25	6.67	6.47	-0.197, -3.0%	1.24	5.4

FM ID	Meter PWWF (mgd)[2]	Model PWWF (mgd)	Difference (mgd, %)	Avg Flow (mgd)[3]	Peaking Factor[4]
26	1.70	1.70	0.004, 0.2%	0.55	3.1
27	0.47	0.46	-0.001, -0.2%	0.02	23.5
28	1.36	0.88	-0.48, -3.5%	0.08	17.0
29	1.16	1.04	-0.12, -10.4%	0.20	5.8
30	0.14	0.11	-0.02, -17.0%	0.04	3.5
31	1.23	1.28	0.06, 4.6%	0.24	5.1
32[7]	9.51	8.95	-0.56, -5.9%	3.45	6.0

[1] Model results are compared to the 2022-2023 flow monitoring data and assume a blockage at the Lawrence/ Homestead gate structure.
[2] Based on meter response during January 15-16, 2023 rainfall event.
[3] Average metered dry weather flow from **Table 3-5**.
[4] Ratio of metered peak flow to metered average flow.
[5] FM 4 base flows were highly variable because of sporting events held at Levi's Stadium. FM was calibrated to match the wet weather response from rainfall on non-gamedays, resulting in an underestimation of total gameday flows.
[6] Meter was not installed in the correct location during the wet weather flow monitoring period, so data are not available.
[7] Permanent CuSD flow meter.

TABLE 3-11: WET WEATHER FLOW CALIBRATION RESULTS VS. SELECT 2014-2015 FLOW MONITORING DATA[1]

FM ID	Meter PWWF (mgd)[2]	Model PWWF (mgd)	Difference (mgd, %)
2+3	17.59	17.72	0.13, 0.7%
5+6	16.69	16.30	-0.39, -2.3%
9[3]	6.34	6.43	0.09, 1.4%
13	7.22	7.65	0.43, 6.0%

[1] Model results are compared to the 2014-2015 flow monitoring data and assume normal settings (no blockages) at the Lawrence/Homestead gate structure.
[2] Based on meter response during December 11, 2014 rainfall event.
[3] FM 9 is located along the Calabazas trunk but upstream of FM 9A (south of Central Expressway).

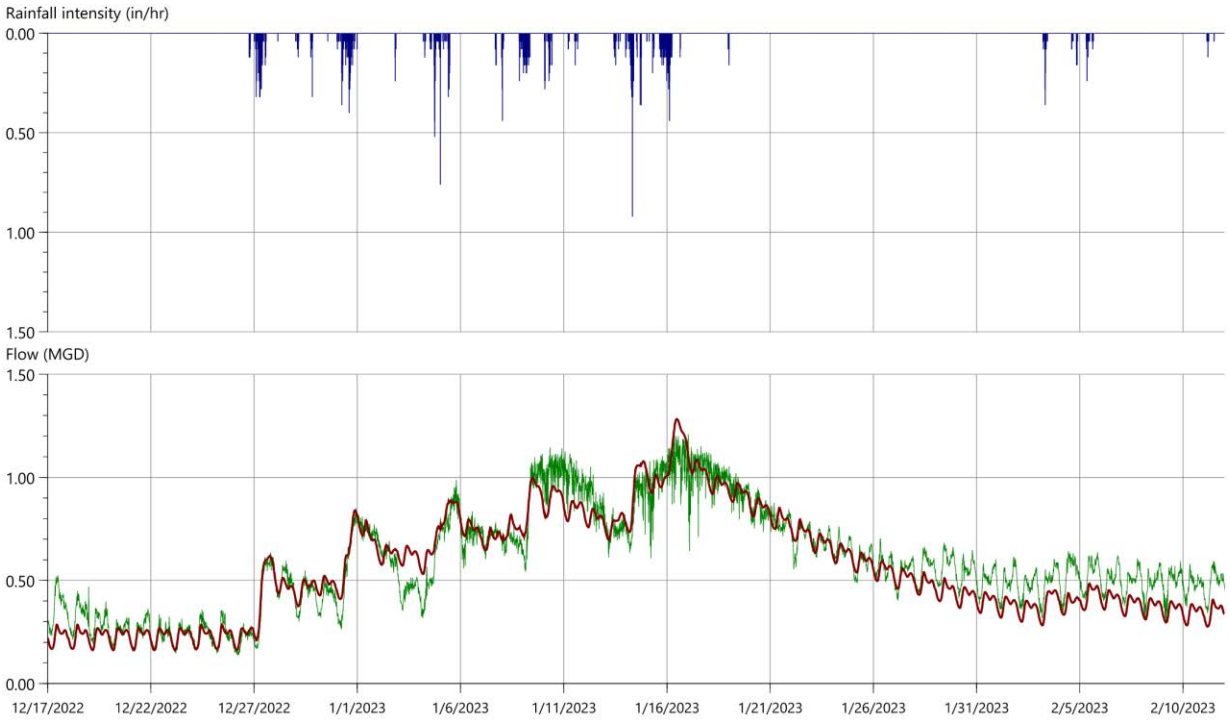
3.5.2.1 RDI/I Response

As discussed in **Section 2.3** and shown in **Figure 2-6**, RDI/I is estimated in the model using five runoff components that reflect a range of response times from fast to slow. The total RDI/I hydrograph for each flow meter basin is the summation of all the component hydrographs for the duration of the rainfall events.

As expected, a very high RDI/I response was observed within the meter basins that collect flows from the CMC tributary area which is upstream of FMs 11 and 12 (discussed in **Section 2.1**) and at FM 31 which is a basin that is adjacent to the CMC tributary area but upstream of FM 24. Examples of the very high RDI/I responses observed at a few of these meters (FM 31 and FM 27) are presented in **Figure 3-13** and **Figure 3-14**. In both examples, the nature of the response is indicative of significant infiltration as the response is generally slower and takes a long time to recede (i.e., several weeks after the January 15-16, 2023 storm as shown in the figures). Moreover, because several consecutive rainfall events occurred within a short period of time, the infiltration response did not fully recede before another rainfall event occurred.

These flow monitoring results are consistent with the findings of other field investigations that were completed recently in the CMC basin. The City retained V&A to perform I/I investigations within the CMC tributary area with the objective of identifying specific areas of high I/I to a sub-basin or micro-basin level. Investigation methods included targeted night-time I/I reconnaissance and CCTV inspections, which occurred during the 2022-2023 winter wet weather season. V&A's report[1], which details the scope and findings of these investigations, concluded that rainfall-dependent infiltration appeared to be the most severe component in the CMC basin, as opposed to the rainfall-dependent inflow. V&A observed a rapid response but also long-term, sustained rainfall-dependent infiltration, which are presumably due to increased groundwater elevations that take a long time to recede. V&A suspected that the rainfall-dependent infiltration was entering the sewer system from defects in sewer laterals and mains, rather than from defects within the sewer manhole structures. City staff suspect that laterals in some areas within the CMC basin were constructed using Orangeburg pipe material, which is known to have high rates of defects and may be a significant source of RDI/I. V&A's report recommended that the City consider smoke testing in the CMC basin, which may better identify lateral defects. Options to identify and reduce RDI/I in the CMC basin were identified and are suggested as part of the system capacity assessment (refer to **Section 4.6.3**).

FIGURE 3-13: WET WEATHER CALIBRATION RESULTS – RDI/I RESPONSE AT FM 31



[1] Sewer Flow Monitoring and Inflow/Infiltration Study prepared by V&A for City of Santa Clara dated August 2023.

FIGURE 3-14: WET WEATHER CALIBRATION RESULTS – RDI/I RESPONSE AT FM 27

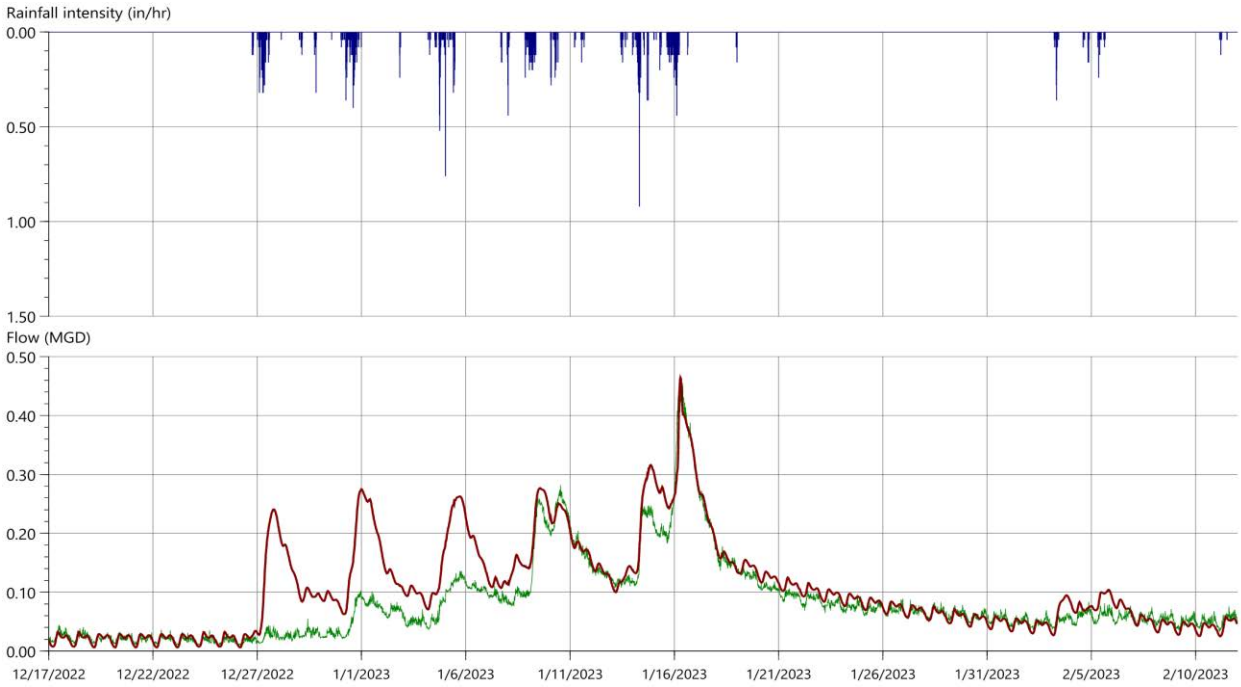


Figure 3-15 on the next page presents a visual representation of the wet weather calibration results in terms of the total RDI/I rate that was applied to the model for each meter basin to try to match modeled and metered flows.

Figure 3-15
RDI/I Rate by Flow Meter Basin

Sewer Master Plan Update

Legend

- City of Santa Clara Boundary
- 2022-23 Flow Meters
  - 2014-2015 & 2022-2023 Flow Meter Site
  - 2022-2023 Flow Meter Site

RDI/I Rate (Total R)

- 0 - < 5
- 5 - 10
- > 10 - 20
- > 20 - 40
- > 80

N

0 0.25 0.5 1 Miles

The City of Santa Clara California — The Mission City — 1852

Woodard & Curran

Project #: 0012307.00
Map Created: December 2024

Third Party GIS Disclaimer: This map is for reference and graphical purposes only and should not be relied upon by third parties for any legal decisions.
Any reliance upon the map or data contained herein shall be at the users' sole risk.

Figure Exported: 12/27/2024 By: SEstabrook Using: \\woodardcurran.net\shared\Projects\0012307.00 Santa Clara CA Sewer Master Plan Update\wip\C. GIS\3. ArcGIS Pro\SantaClaraSewerMasterPlan2024_Report.aprx

4. SYSTEM CAPACITY ANALYSIS

This section defines the basis for the capacity assessment of the system, including the selected design storm and performance criteria used to identify deficiencies, and presents the capacity deficiencies identified based on the model results. The section also identifies areas of the system with high I/I and recommends additional investigations to isolate potential direct inflow sources in those areas.

4.1 Hydraulic Assumptions Used for the Capacity Analysis

This section summarizes the hydraulic assumptions used for the capacity evaluation, including the dry weather flow scenarios (i.e., existing, near-term future, long-term future), wet weather design flows, performance (or capacity deficiency) criteria, and physical model network.

Section 2 discusses the various flow components and the development of existing, near-term future, and long-term future wastewater flows (referred to as model "loads"). It also discusses the application of a design storm in conjunction with calibrated model parameters that represent rainfall-dependent infiltration and inflow (RDI/I) into the sewer system to generate wet weather design flows.

Section 4.1.1 presents the characteristics of the City's design storm event that is used to generate wet weather design flows and summarizes the performance criteria that are applied to identify system capacity deficiencies and the design criteria that are applied to develop project solutions for the identified capacity deficiencies.

The physical model network assumptions, including development of a new "Lined Model Network" as requested by the City, is described in more detail in **Section 4.1.2**.

4.1.1 Summary of Design Storm, Performance Criteria, and Design Criteria

Criteria used by other agencies both inside and outside of California were referenced when selecting the criteria that was used for the City's sewer system capacity analysis. These references are further discussed in TM #2 (Santa Clara Sewer Performance and Design Criteria), which was submitted to the City.

Design Storm

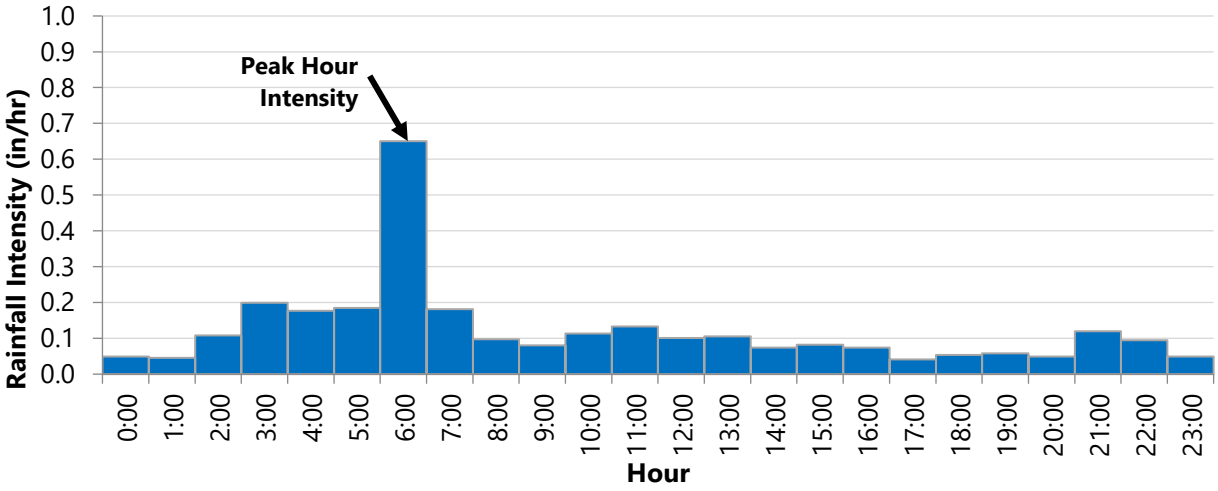
Key factors needed to define a design storm event for the purpose of sewer modeling and master planning include return period, rainfall depth, storm duration, temporal and spatial distribution of rainfall, storm timing, and antecedent conditions. Characteristics of the selected design storm related to these key factors are presented in **Table 4-1** and discussed further below.

The City elected to continue to use the same 10-year, 24-hour design storm event that was used for its 2016 Master Plan for this Master Plan Update. The design storm used for the 2016 Master Plan Update is a 10-year, 24-hour storm that varies across the service area. The storm pattern and hourly rainfall intensities are based on the Santa Clara County's Drainage Manual (October 2007)[1]. The manual includes mean annual precipitation (MAP) isohyetal lines from Santa Clara Valley Water District (SCVWD) and distinct intensity, depth, frequency (IDF) curves for each MAP area in Appendix B. In addition to the IDF curves, Appendix D of the manual includes a 24-hour design storm pattern. According to the manual, this storm pattern is based on an actual three-day rainfall event that occurred in December 1955, but with some adjustments to better reflect IDF statistics for various storm durations.

[1] Santa Clara County's Drainage Manual is available online at: https://stgenpln.blob.core.windows.net/document/DrainageManual_Final.pdf.

Figure 4-1 shows the design storm hourly rainfall as it occurs in the vicinity of central Santa Clara, including the San Jose International Airport area. At this location, the total rainfall for the 1-, 6-, and 24-hour durations is 0.65, 1.49, and 2.92 inches, respectively. For this graph, the storm timing has been adjusted so that the peak intensity coincides with the weekday morning peak of the diurnal wastewater pattern.

FIGURE 4-1: DESIGN STORM EVENT FOR CENTRAL SANTA CLARA (MAP ~14.5 INCHES)



Santa Clara selected its design storm event based on the key considerations presented in **Table 4-1** with respect to its desired level of service to reflect the level of risk that is acceptable to the City. For future modeling efforts, the City may consider applying a more conservative design storm event with a higher return period and/or perform a sensitivity analysis to evaluate potential impacts of climate change. The analysis could either be performed prior to, or concurrent with, the next update.

TABLE 4-1: RAINFALL DESIGN EVENT CRITERIA USED FOR SANTA CLARA MASTER PLAN UPDATE

Design Event Criterion	Santa Clara Selection
Return Period	10 years
Rainfall Depth	Based on County Drainage Manual IDF curves
Storm Duration	24 hours
Rainfall Temporal Distribution	Based on County Drainage Manual (developed from historical rainfall event in December 1955)
Storm Timing	Peak-on-Peak (weekday)
Spatial Rainfall Distribution	Lowest intensity: North Highest intensity: Southwest
Antecedent Conditions	Wet, saturated soils

The key factors used to define Santa Clara's selected design storm event are further described below:

- *Return Period*: The return period defines the probability that the design rainfall will be exceeded in any given year. For example, a storm with a 5-year return period means that there is a 1 in 5 chance, or 20 percent probability, that the design rainfall will be exceeded in any given year. For sewer modeling and master planning applications, the chosen return period reflects the degree of risk that an agency is willing to accept regarding the potential of experiencing sanitary sewer overflows

(SSOs) due to future storm events. However, selecting a design storm with a very high return period (reflecting a very low risk tolerance) could lead to identification of a significant number of system capacity deficiencies that would make the cost of improvements prohibitive. Additionally, sizing a system for a very infrequent event could mean that the system does not function well under typical conditions during much lower flows (due to slow velocities in oversized pipes, or oversized pump stations).

- *Rainfall Depth*: Synthetic design storms are typically based on rainfall IDF or depth, duration, frequency (DDF) statistics that have been compiled for a local area. These statistics give the rainfall depths or intensities for various return periods (e.g., 2-year, 5-year, etc.) and durations of rainfall (e.g., 1-hour, 2-hour, etc.). Rainfall IDF statistics are available through the National Oceanic and Atmospheric Administration (NOAA), which provides the IDF statistics for any location in the U.S. based on latitude/longitude coordinates. IDF curves specific to Santa Clara County (one for each MAP area) for various return periods and durations are provided in Appendix B of the 2007 County Drainage Manual. These IDF curves were used to define the selected design storm event. MAP varies spatially throughout Santa Clara, with the highest average annual rainfall typically occurring in the southern portion of the City. In central Santa Clara, according to the County Drainage Manual, the MAP is approximately 14.5 inches, and the 10-year, 24-hour rainfall depth is approximately 2.92 inches (versus 2.63 inches according to NOAA Atlas 14).

- *Storm Duration*: A storm duration must be specified for the design storm along with the return period. Most Bay Area agencies use a 24-hour storm, although shorter or longer durations may sometimes be appropriate (e.g., a shorter duration in a very small system with fast response to rainfall or in an area where storm events are typically very brief; a longer duration in a very large system or one with a very slow response to rainfall). Typically, the 24-hour duration storms are constructed such that the more intense rainfall occurs during a shorter (e.g., 4- to 6-hour) period. Santa Clara's selected design storm uses a 24-hour duration.

  Rainfall Temporal Distribution: The temporal rainfall distribution of a design storm may be based on a synthetic storm or an actual historical event. Commonly used synthetic storm distributions include nested storms (which incorporate design rainfall intensities for a given return period for several durations within the total storm duration), or a "SCS" storm distribution, a dimensionless 24-hour rainfall distribution developed by the SCS (Soil Conservation Service), now known as the NRCS (Natural Resources Conservation Service). The SCS developed four 24-hour distributions, with each distribution representative of a specific region of the U.S., as presented in the USDA guidance document Urban Hydrology for Small Watersheds TR-55 (June 1986). The City's service area generally falls within the area covered by the "Type I" distribution, but it is close to the boundary between the "Type I" and "Type IA" distributions. It is sometimes preferable to use historical rainfall patterns to depict the design storm temporal rainfall distribution of the design event. As described above and shown in **Figure 4-3**, Santa Clara County's Drainage Manual defines a temporal rainfall distribution based on a historical event that occurred during December of 1955. The rainfall for a historical storm could be scaled to match the desired rainfall depth and return period of the design storm. **Table 4-2** compares the peak hour intensity of the County Drainage Manual design storm distribution to the peak hour intensities of the synthetic distributions (SCS-I and SCS-IA, and nested) based on the County Drainage Manual IDF statistics for a 10-year, 24-hour rainfall event. As shown in the table, in central Santa Clara, peak hour rainfall intensity of the County Drainage Manual distribution is very similar to that of the synthetic SCS Type I distribution, moderately lower than that of the synthetic nested distribution, and significantly higher than that of the SCS Type IA

distribution. The temporal distribution of Santa Clara's selected design storm is based on an actual historical event (i.e., December 1955).

TABLE 4-2: CHARACTERISTICS OF DESIGN STORM DISTRIBUTIONS CONSIDERED[1]

Frequency	Duration	IDF Statistics Source	Temporal Distribution	Volume (in)	Peak Hour Intensity (in/hr)
10-yr	24-hr	Historical, County Drainage Manual	Historical, County Drainage Manual	2.92	0.65
10-yr	24-hr	NOAA	Synthetic, Nested	2.92	0.64
10-yr	24-hr	NOAA	Synthetic, SCS-I	2.92	0.76
10-yr	24-hr	NOAA	Synthetic, SCS-IA	2.92	0.46

[1]Based on County Drainage Manual and assumed MAP of 14.5 inches for central Santa Clara.

- *Storm Timing*: The selected event is based on the Santa Clara County Drainage Manual design storm with peak-on-peak BWF timing. Generally, peak-on-peak timing is achieved by adjusting the timing of the peak intensity of the rainfall event so that it occurs one to two hours prior to the peak BWF to account for the typical delay between the rainfall occurring and observation of the RDI/I response. For the 2016 Master Plan, the design storm rainfall was timed such that the peak rainfall occurred around 8 a.m., resulting in a peak RDI/I flow at approximately the same time as the typical weekend day peak BWF in most areas of the system (graphically depicted in **Figure 4-2**). Given that the peak BWF typically occurs earlier on a weekday compared to a weekend day, Santa Clara's selected design storm for this Master Plan Update was evaluated assuming an earlier peak rainfall intensity (around 6 a.m.) so as to align the peak intensity with the typical weekday peak BWF (graphically depicted in **Figure 4-3**).

FIGURE 4-2: DESIGN STORM EVENT FOR CENTRAL SANTA CLARA (WEEKEND)

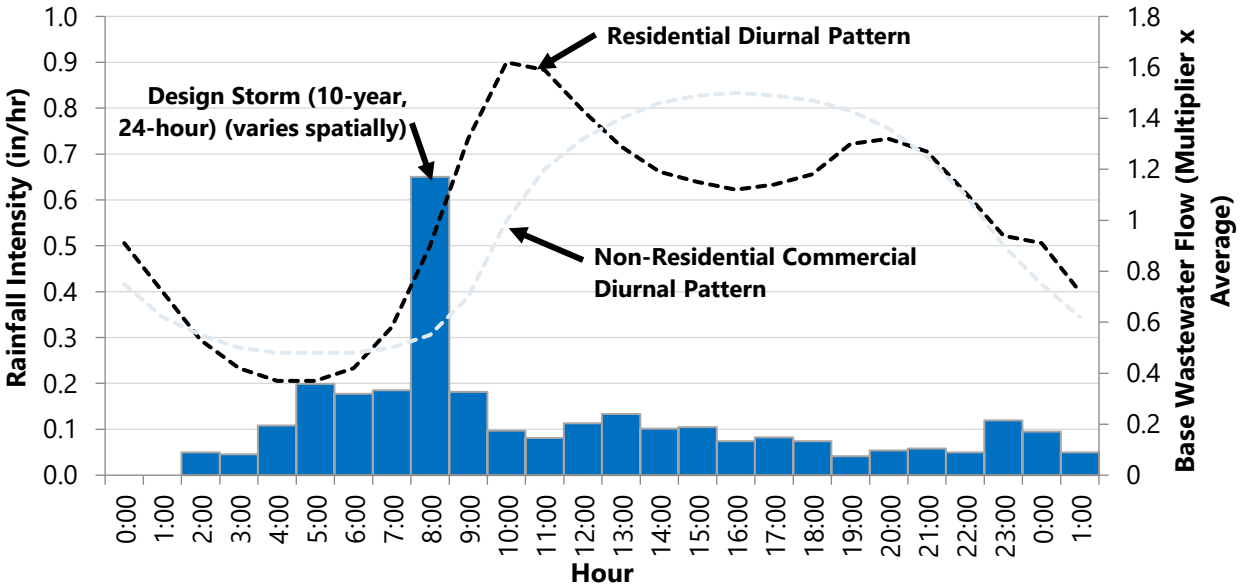
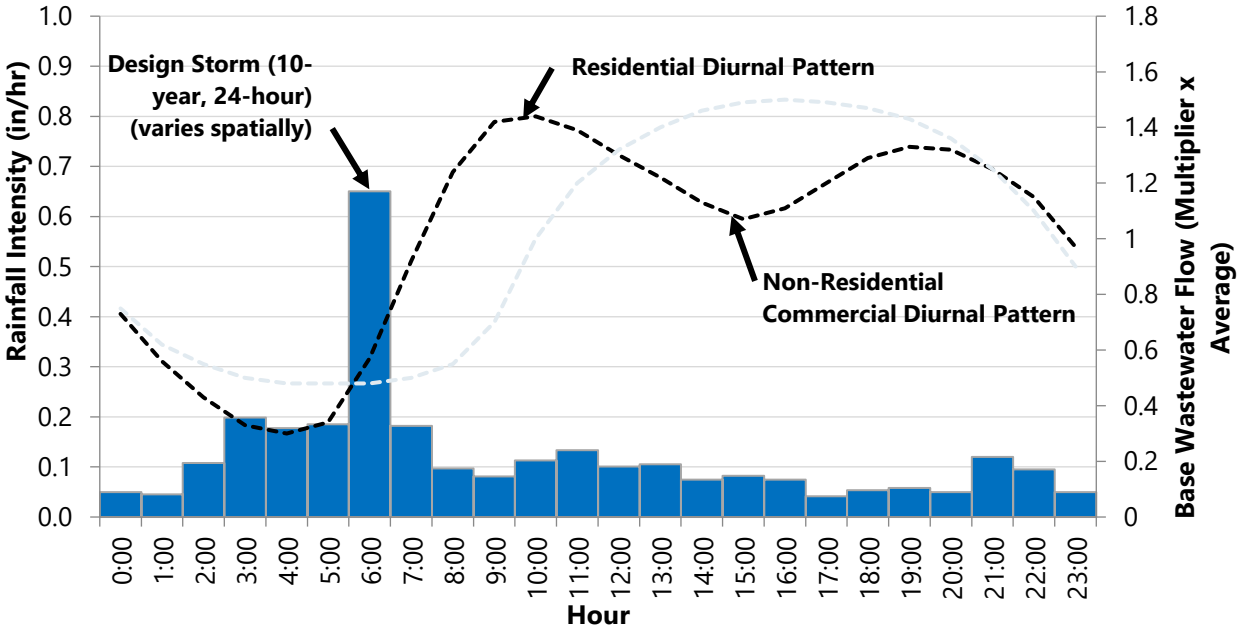
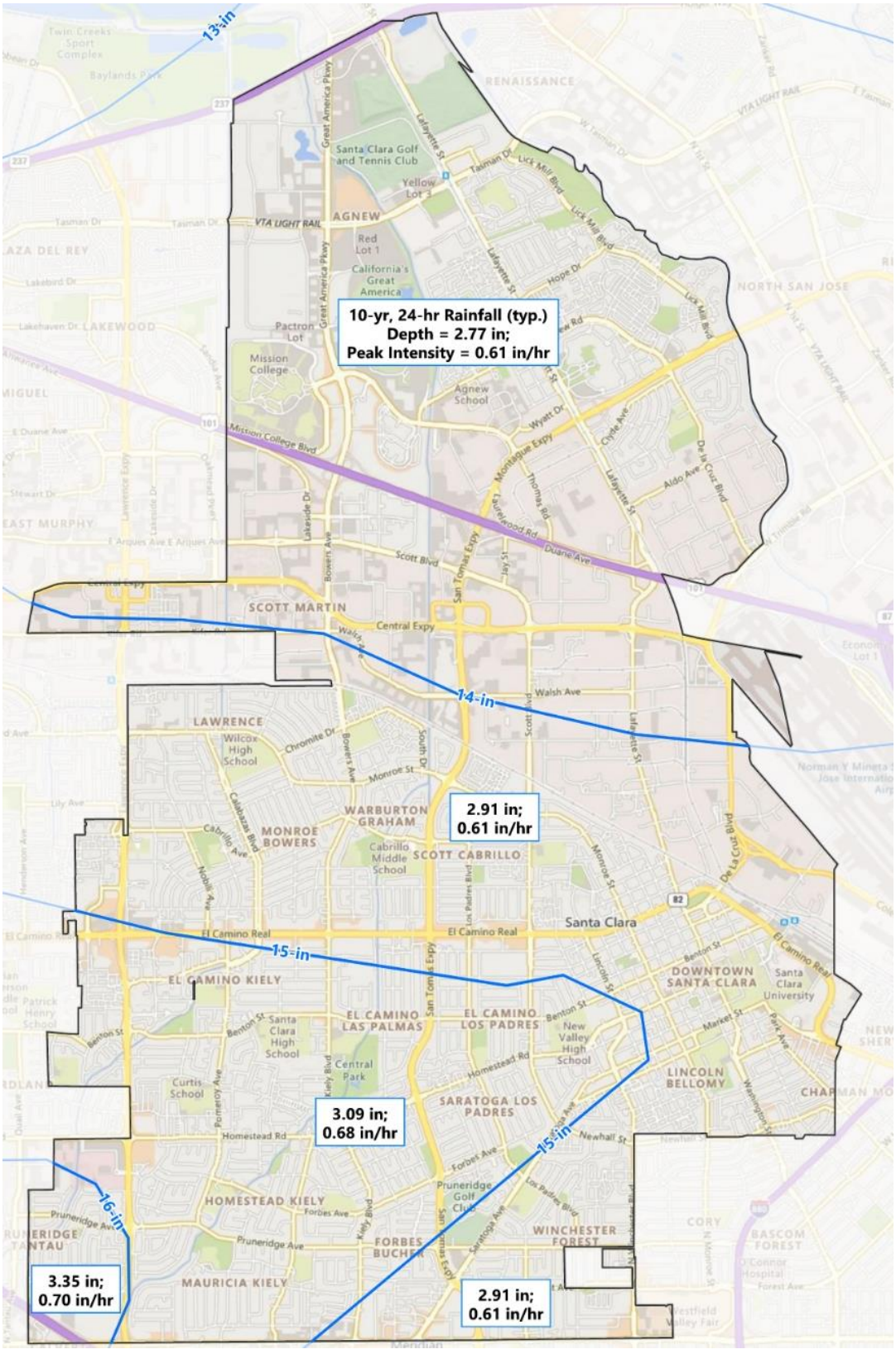


FIGURE 4-3: DESIGN STORM EVENT FOR CENTRAL SANTA CLARA (WEEKDAY)



- *Spatial Rainfall Distribution*: The magnitude of rainfall may vary spatially, generally based on topography and the typical movement of storms over the service area. Based on the County Drainage Manual, MAP in the City's service area varies from about 13 to 16 inches in a north to southwest direction. While this pattern may not hold true for every storm event, it is common practice to apply the spatial variation of average annual rainfall to the design storm. As such, the IDF curves (one for each MAP) provided in Appendix B of the County Drainage Manual were referenced to obtain IDF statistics (rainfall depth, duration, and peak intensity) for subareas within the City. **Figure 4-4** presents the spatial variation of rainfall depth and peak intensity throughout the City's service area for a 10-year, 24-hour event that the selected design storm is based upon; it illustrates that the highest and most intense rainfall typically occurs within the southwest portion of the City.
- *Antecedent Conditions*: Based on flow monitoring data from the 2022-2023 winter season, flow response to rainfall in portions of the City's service area (e.g., CMC tributary area) is characterized by prolonged elevated flows extending for several days and in some cases weeks after storm events. Thus, a storm happening later in the season after several storm events have occurred may produce higher peak flows because the ground is saturated (meaning less rainfall can be "absorbed" by the soil) and flows are already elevated due to the preceding events. This "wet" antecedent condition can be modeled as a prolonged RDI/I response (when the model simulation includes multiple events) or as an elevated, antecedent GWI condition (when modeling a single event such as a design storm). Because it is not unusual for large storm events to occur after periods of preceding rainfall, it is common to define a design storm as occurring under "saturated soil" or "wet" antecedent conditions; this approach was applied when defining Santa Clara's selected design storm. Assuming dry or moderately dry soil conditions would be a less conservative approach.

FIGURE 4-4: SPATIAL VARIATION OF RAINFALL THROUGHOUT SANTA CLARA'S SERVICE AREA



Capacity Deficiency Criteria

Capacity deficiency criteria are used to determine if the capacity of an existing sewer facility is exceeded to the extent that a capacity improvement project is needed. These criteria are sometimes called "trigger" criteria, in that they trigger the need for a capacity improvement project. An agency defines its capacity deficiency criteria based on its desired level of service. As such, the criteria vary by agency and are reflective of the level of risk that is acceptable to each agency.

The capacity deficiency criteria differ from the design criteria that are applied to determine the size of a new facility; the latter typically being more conservative. The difference between capacity deficiency criteria and design criteria reflect the concept that some existing facilities can continue to provide adequate, if not optimal, conveyance capacity without undue risk, but new facilities should be designed to a higher standard.

The capacity deficiency criteria utilized for the Master Plan Update to identify capacity deficiencies under both Peak Dry Weather Flow (PDWF) and Peak Wet Weather Flow (PWWF) design flow conditions are summarized in **Table 4-3**. The City's selected criteria were conservative in order to identify all potential projects, recognizing that conditions may change in the future due to variable risk factors (e.g., sewer condition, additional development, climate change). Evaluating system capacity based on conservative criteria provides an "advance warning" of more vulnerable areas of the system that could require deficiencies to be corrected as these future potential risks materialize. All projects identified were prioritized based on the cause and extent of the model-predicted capacity deficiency as discussed in **Section 5**.

TABLE 4-3: CAPACITY DEFICIENCY CRITERIA USED FOR SANTA CLARA MASTER PLAN UPDATE

Facility	Design Flow Condition(s)	Capacity Deficiency Criteria
Gravity Sewer	PDWF or PWWF	No surcharge allowed (d/D[1] ≤ 1.0)
Force Main	PDWF or PWWF	Velocities less than 10 feet per second
Pump Station	PDWF or PWWF	Flows less than firm capacity[2]

[1] Ratio of depth (d) of water to pipe diameter (D), which represents the approximate percent full within a pipe.
[2] Firm capacity is defined as the capacity of the pump station with the largest pump out of service.

For evaluating the performance of existing sewers, a Manning's "n" value of 0.013 was assumed for all pipes, regardless of material or age. Although new pipes, particularly plastic materials, would provide a lower initial roughness factor, it was assumed that over time, a "slime layer" formation on the walls of the pipes and/or other obstructions in the sewer, such as roots, debris, or structural defects, may increase pipe roughness. Therefore, an assumption of 0.013 for all pipes was considered appropriately conservative for master planning purposes.

Note that engineering judgment was used in conjunction with applying the capacity deficiency criteria presented above to identify model-predicted capacity deficiencies in gravity sewers. Gravity sewers that showed only minor criteria violations were not considered deficient if one or more of the following conditions applied:

- Surcharged on one end only (i.e., downstream end caused by backwater);
- Isolated flat pipe segments;
- Invert differences (i.e., offsets) between adjacent pipes;
- Smaller diameter sewers connected to larger diameter pipes at equal inverts; or
- Sewers protected from overflows by a high-level flow diversion or parallel pipe.

Design Criteria

The key design criteria that were applied for the Master Plan Update when developing project solutions to relieve the identified capacity deficiencies are summarized in **Table 4-4**. The City's "Design Criteria" (April 2015)[1], which specify criteria for hydraulic design of sanitary sewer facilities (e.g., pipe material and diameter and roughness for gravity sewers), were referenced to develop the design criteria used for this Master Plan Update.

TABLE 4-4: DESIGN CRITERIA USED FOR SANTA CLARA MASTER PLAN UPDATE

Facility	Component	Design Criteria
Gravity Sewer	d/D Ratio	Less than or equal to 0.75 unless minimum velocities are a concern.
Gravity Sewer	Velocity	Minimum 2 fps during existing peak dry weather flow; maximum 10 fps during design peak wet weather flow.
Gravity Sewer	Diameter	Minimum 8-inch, 10-inch, and 12-inch for residential, commercial, and industrial land uses, respectively; downstream pipes at least as large as upstream pipes where feasible.
Gravity Sewer	Roughness	Manning's n friction coefficient of 0.013.
Gravity Sewer	Inverts	Match crowns at junctions of side sewers and trunk sewers.
Gravity Sewer	Slope	Determined based on velocity criteria to the extent feasible.
Gravity Sewer	Cover	6 feet from finished grade to sewer crown if feasible.
Gravity Sewer	Material[1]	RCP for 24-inch and larger; VCP for greater than 12- to 24-inch or PVC if approval given by Director of Public Works / City Engineer; VCP or PVC SDR 26 for 12-inch and smaller.
Gravity Sewer	Alignment[2]	Generally, 5-foot offset from street centerline on side opposite the storm drain and 8-foot clear distance separation from all other parallel facilities.
Gravity Sewer	Manhole Placement and Spacing[2]	Located at sewer main or street intersections, at upstream terminal ends of sewer lines, at any change in pipe direction, slope, diameter, or material, and where laterals have the same diameter as the sewer main or are 8 inches or larger. Nominal and maximum manhole spacing shall be 450 and 500 feet, respectively.
Force Main	Velocity	Minimum 3 fps to prevent solids from settling out and maximum 8 fps to prevent excessive head losses in the force main.
Force Main	Cover	6 feet from finished grade to sewer crown if feasible.
Pump Station	Roughness	Hazen-Williams C-value of 100 but must have proper operation at C-value of 120.

[1] Note that material is tracked in the hydraulic model, but roughness values are what impact the hydraulic analysis.
[2] Note that these details were considered for the hydraulic modeling analysis but are generally more applicable to project development during the pre-design stage.

[1] City of Santa Clara's Sanitary Sewer Design Criteria (Section 5) are available online at: https://www.santaclaraca.gov/home/showpublisheddocument/61878/636766631787130000.

4.1.2 Physical Model Network

Two physical model networks were used to evaluate the capacity of the City's sanitary sewer system. One of these networks included future lining assumptions applied to City-identified RCP trunks and VCP siphons within the City's sewer system based on information provided by the City ("Lined Model Network"); the other did not ("Unlined Model Network"). **Section 4.1.2.1** discusses the assumptions applied to the Lined Model Network in more detail.

The following assumptions were applied to the physical model network (both the Lined Model Network and Unlined Model Network):

- A Manning's n of 0.013 was assumed for all pipes in the model, including lined pipes. Lined pipes can initially reduce the friction factor. However, over time, with sedimentation and fouling, the friction factor may increase. Assuming a friction factor of 0.013 for lined pipes therefore represents a conservative assumption.
- The flume diversion structure located at Homestead Road and Lawrence Expressway (Lawrence/Homestead gate structure), which splits the flow to either the eastern sewer on Homestead or the northern sewer on Lawrence Expressway, was modeled assuming a 50% flow split for the capacity evaluation. Therefore, half of the influent sewer flows are sent east to the Homestead sewer and the other half are sent north to the Lawrence sewer. This even flow split assumption was applied for the capacity evaluation because it is the City's normal and desired flow setting at that structure. It should be noted that the model calibration (described in **Section 3.3**) considered both normal settings and a temporary blockage condition which existed during the flow monitoring period but was investigated and cleared by City staff thereafter.
- Pump stations were set up in the model using Archimedean screw pumps, meaning that all the influent sewer flows from the upstream sewer system would be pumped out through the force main at the same flow rate they reach the pump station (i.e., influent flow rate = effluent flow rate). Pump station firm capacities were estimated based on information provided by the City and compared to the model PWWF as described further in **Section 4.4**.
- Non-free-fall (submerged) conditions were assumed at the downstream most discharge structure where the Rabello and Northside force mains outfall to a discharge box structure. Based on information provided by the City, the water level in the structure was set to be eight (8) feet above the crown of the force mains which was the approximate water level during a City field inspection completed on June 19, 2024. At the time of the field inspection, the City noted that the high-water level within the structure appeared to be approximately 13 feet above the crown of the force mains; however, considering it is not known when or how often that condition occurs, it was not used as the design condition.
- Project solutions for the following specific development projects that were already identified and modeled during previous development reviews were included in the appropriate future loading model scenario(s) based on timing:
    - *Patrick Henry Drive (PHD)*: Included in both the near-term future and long-term future model load scenarios. The sanitary sewer improvements within the PHD plan area and the upsize of the Great America Parkway (GAP) West Trunk (from PHD to the Bay Division pipelines crossing) are both to be paid by the developers; therefore, the previously modeled improvements for PHD will not be further discussed in this Master Plan Update or included in the City's Sewer Capacity CIP.

- o *Mission Point*: Included in the long-term future model load scenario only. The City is allowing either of two developer-proposed alternatives, one of which (Revised Option 2A) is included in the model. Both alternatives are assumed to be completely at the developer's cost and therefore will not be further discussed in this Master Plan Update or included in the City's Sewer Capacity CIP.
- o *Freedom Circle*: Included in the long-term future model load scenario only. No separate infrastructure fee area has been established for the Freedom Circle Focus Area; therefore, the previously modeled improvements are presented in this Master Plan Update and will be included in the City's Sewer Capacity CIP.

4.1.2.1 Lined Model Network Assumptions

The Lined Model Network assumes RCP trunks identified by the City to be in poor condition would be lined in future as shown in **Table 4-6** and **Figure 4-5**). The Lined Model Network also assumes that select unlined siphons constructed of either vitrified clay pipe (VCP), cast iron pipe (CIP), or ductile iron pipe (DIP) material would be lined as identified in the table provided as **Appendix F**. The table also includes condition assessment information (i.e., structural quick rating score) from recent CCTV inspections that the City conducted on select siphons between January 2024 and May 2024. The four siphons with the highest severity grade of 4 were part of the group of siphons identified for future lining.

Future lining assumptions were only incorporated into the Lined Model Network, while sewers and siphons already lined were incorporated into both the lined and unlined networks. Gravity sewers and siphons assumed to be lined in the future were assigned a reduced diameter based on an assumed liner thickness and the "FLIN" (future lining) model flag was then applied to the diameter field.

Liner thicknesses, and the corresponding diameter reductions, were calculated based on conservative assumptions. Woodard & Curran referenced information provided by the City from recent lining projects and expertise from condition assessment experts to develop conservative lining assumptions based on the original diameter as shown in **Table 4-5**.

TABLE 4-5: FUTURE LINER THICKNESS ASSUMPTIONS FOR RCP TRUNKS AND SIPHONS (LINED MODEL NETWORK ONLY)[1]

Original Diameter (in)	Assumed Liner Thickness (in)	Assumed Diameter Reduction (in)
12	0.297	0.594
18	0.446	0.892
19	0.471	0.942
20	0.496	0.992
21	0.521	1.042
24	0.596	1.192
27	0.671	1.342
30	0.745	1.49
33	0.82	1.64
36	0.895	1.79
39	0.97	1.94
42	1.046	2.092
53	1.324	2.648

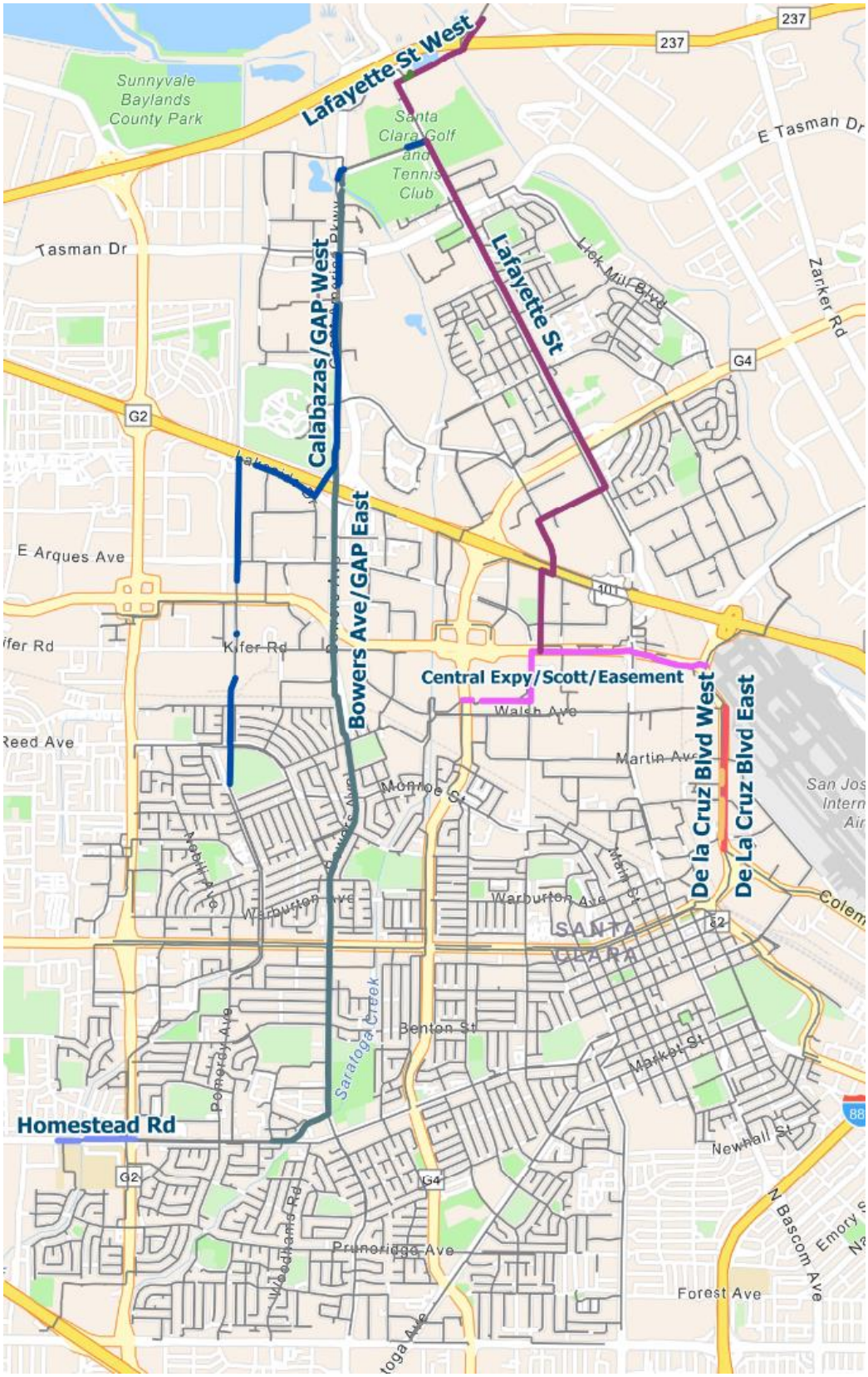
[1] Assumed future liner thicknesses were conservatively calculated based on key assumptions such as host pipe condition, groundwater table, soil properties, etc.

TABLE 4-6: RCP TRUNKS IDENTIFIED FOR FUTURE LINING (LINED MODEL NETWORK ONLY)

Trunk	Lined Section[1]	Original Diameter (in)	Lined Diameter (in)[2]	Capacity Reduction[3]
Homestead	S20-9 to S21-43	27-30	25.7-28.5	12.8%
Calabazas	S52-113 to S83-17	24-33	22.8-31.4	12.8%
Bowers	S22-51 to S83-18	21-33	20-31.4	12.8%
Lafayette	S65-30 to S115-8	24-53	22.8-50.4	12.8%
Central Expressway	S64-44 to S67-21	24-27	22.8-25.7	12.9%
De La Cruz East	S48-11 to S58-2	24	22.8	12.8%
De la Cuz West	S48-2 to S58-14	24	22.8	12.7%
Lafayette West	S114-23 to S114-18	42	39.9	12.8%
GAP E Trunk	S83-18 to S104-30	33-42	31.4-39.9	12.8%
GAP W Trunk	S83-17 to S104-51	30-33	28.5-31.4	12.8%

[1] Upstream to downstream manhole. [2] Rounded to the nearest 0.01-in. [3] Capacity Reduction was calculated as the maximum percent difference of the full capacities of the unlined and lined scenarios.

FIGURE 4-5: RCP TRUNKS IDENTIFIED FOR FUTURE LINING (LINED MODEL NETWORK ONLY)



4.2 Capacity Evaluation Results

The calibrated model was run for existing, near-term future, and long-term future load conditions using both the Unlined Model Network and Lined Model Network to identify areas of the system that fail to meet the specified performance criteria described in **Section 4.1.1**. Areas that fail to meet the specified performance criteria were identified as capacity deficiencies.

This section presents the results of the system capacity evaluation as it relates to the City's gravity sewers (**Section 4.3**) and pump stations and force mains (**Section 4.4**).

4.3 Gravity Sewer System Capacity Deficiencies

All the capacity deficiencies identified in the model for the City's gravity sewer pipes are summarized in **Table 4-7**, including the load scenario, design flow, and physical network conditions that would trigger each deficiency. An overview map showing the locations of all the model-identified capacity deficiencies is provided as **Figure 4-6**. In the figure, pipes shown in pink are predicted to surcharge due to "throttle" conditions, indicating that the full capacity of the pipe is less than the predicted peak flow. Pipes shown in purple are predicted to surcharge due to backwater from a downstream throttle condition. The deficiencies listed in **Table 4-7** are the gravity sewer pipes that would fail to meet the City's specified performance criteria and would therefore need some type of capacity relief, either by increasing their capacity (e.g., upsize to larger diameter) or reducing the flow (e.g., divert flow away from pipe, reducing RDI/I). Project solutions modeled to relieve the identified capacity deficiencies are discussed in **Section 4.5**.

Profiles of the capacity deficient sewers, both before and after project implementation, are provided in **Appendix G**. Profiles are not provided for the specific development projects identified in **Section 4.1.2** that have been previously modeled as part of the development review process (i.e., PHD, Mission Point, Freedom Circle). Note that model-predicted surcharging or overflows (depicted in the before profiles) do not necessarily mean that pipes would be capacity deficient at that location, as flows can back up due to downstream capacity limitations and cause surcharging or potential overflows at upstream locations due to backwater. Additionally, although the profiles indicate where modeled surcharging would occur due to backwater versus due to a capacity limitation ("throttle" condition), the results reflect an "unrelieved" system, meaning that peak flows are dampened out in the pipes that are under heavy surcharge or reduced due to overflows. This means that, as upstream deficiencies are relieved through capacity projects, the peak flows reaching downstream pipes would increase, potentially causing additional surcharging or overflows and triggering additional deficiencies and projects. Therefore, it would be necessary to model the project solutions starting upstream and then proceed to review the deficiencies downstream to confirm that any additional downstream deficiencies are addressed, as the system starts to be relieved.

TABLE 4-7: SUMMARY OF MODEL-PREDICTED GRAVITY SEWER CAPACITY DEFICIENCIES

Deficiency Name	Wastewater Flow Trigger[1]			Design Flow Trigger		Network Trigger	
	Existing (EL)	Near-Term Future (NTFL)	Long-Term Future (LTFL)	Dry Weather (DWF)	Wet Weather (WWF)	Unlined (UMN)	Future Lined (LMN)
Agilent			✓ (E)	✓		✓	N/A
Homestead Road			✓		✓	✓	N/A
Kiely Boulevard			✓ (GP)		✓	✓	N/A
Victoria Avenue			✓ (SD, GP)		✓	✓	N/A
Cabrillo Avenue	✓				✓	✓	N/A

Deficiency Name	Wastewater Flow Trigger[1]			Design Flow Trigger		Network Trigger	
	Existing (EL)	Near-Term Future (NTFL)	Long-Term Future (LTFL)	Dry Weather (DWF)	Wet Weather (WWF)	Unlined (UMN)	Future Lined (LMN)
CMC Basin	✓				✓	✓	N/A
Bowers Avenue			✓		✓		✓
Calabazas Trunk	✓				✓		✓
Agate Drive			✓ (O[2])		✓	✓	N/A
Freedom Circle			✓ (SD)	✓		✓	N/A
PHD		✓ (SD)		✓		✓	N/A
Mission Point			✓ (SD)	✓		✓	N/A
GAP West Trunk			✓		✓	✓	N/A
GAP East Trunk			✓		✓		✓
Bunker Hill Lane East			✓ (E)		✓	✓	N/A
Lafayette Street			✓		✓	✓	N/A

[1] Deficiency cause: SD = Specific Development Project; GP = General Plan; E = Entitlement Flow. O = Other (see notes). If no specific cause is listed, deficiency would be caused by future lining assumption and/or cumulative impacts from upstream due to development and/or relieving upstream capacity constraints.

[2] During wet weather design flows only, Agate Drive deficiency would be triggered because the Calabazas Trunk has insufficient capacity. Flows from Calabazas would backup and overflow to the Agate Drive sewers in the model through manhole S52-4, which is located just upstream of the Agate Drive siphon crossing. However, once the Calabazas Trunk deficiency is relieved, the model runs show that the Agate Drive deficiency would go away. Therefore, **Section 4.5** does not include a capacity improvement project specific to Agate Drive, but **Section 4.6** discusses this area in more detail due to the prolonged RDI/I observed during the flow monitoring program.

Figure 4-6
Overview of Capacity Deficiencies

Sewer Master Plan Update

Legend

Modeled Sewers

Surcharge State

- <1 (no surcharge)
- 1 (backwater surcharge)
- 2 (throttle surcharge)

Woodard & Curran

Project #: 0012307.00

Map Created: December 2024

0 0.25 0.5 1 Miles

N

Third Party GIS Disclaimer: This map is for reference and graphical purposes only and should not be relied upon by third parties for any legal decisions.
Any reliance upon the map or data contained herein shall be at the users' sole risk.

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4.4 Pump Station and Force Main Capacity Deficiencies

Table 4-8 compares the estimated (theoretical) firm and total capacity of each modeled pump station to the modeled flows under buildout PWWF conditions. The table indicates that all pump stations would have sufficient capacity to convey model-predicted buildout PWWF. The table also indicates that model-predicted force main velocities under buildout PWWF for Westside, Tasman, De La Cruz, Primavera, and Stadium Pump Stations would all be less than the capacity deficiency criteria threshold of 10 fps. Velocities are not reported for the Rabello and Northside Pump Station force mains because sufficient information was not available to reasonably represent the operation of these pump stations and force mains in the model (i.e., City could not confirm settings at the flow split gate structure upstream of the pump stations located at S114-19; City reported that the force main discharge pipes are normally submerged but could not provide monitored level data; actual typical pump operations / pump sequencing is unknown).

It should be noted that the model-predicted PWWFs and force main velocities presented may be slightly underpredicted compared to actual measured flows because of the way that the pumps are modeled; all pump stations are represented in the model network using Archimedean screw pumps, meaning that all the influent sewer flows from the upstream sewer system would be pumped through the force main at the same flow rate they reach the pump station (i.e., influent flow rate = effluent flow rate). Therefore, modeled Archimedean screw pumps mimic the smoother trunk flows coming into the pump station rather than the "peakier" downstream flows created by nature of the pumps turning on and off. However, considering SCADA flow data were not available to compare observed flows to model-predicted flows, this approach was considered to be a reasonable representation of flows and velocities.

TABLE 4-8: SUMMARY OF MODEL-PREDICTED PUMP STATION AND FORCE MAIN CAPACITY DEFICIENCIES

Pump Station (Number of Pumps)	Model-Predicted Buildout PWWF (mgd)[1]	Firm Capacity (mgd)	Total Capacity (mgd)	Force Main Velocity at Buildout PWWF (mgd)[1]	Capacity Deficiency[4]
Westside (2)	0.99	1.55[2]	2.53[2]	4.41	No
Tasman (2)	0.52	1.61[2]	2.34[2]	3.20	No
De La Cruz (2)	0.64	1.61[2]	2.52[2]	2.92	No
Primavera (6)	2.65	5.72[2]	6.39[2]	7.9	No
Stadium (6)	0.66	2.56[2]	2.68[2]	4.78	No
Rabello (8)	44.8	25.4[3]	27.9[5]	-	No
Northside (4)		19.8[3]	21.3[5]	-	No

[1] Model Buildout PWWF values and force main velocities reported are from the long-term future load scenario using the Lined Model Network and the relieved system (assuming project solutions have been implemented). mgd = million gallons per day.

[2] Theoretical firm and total capacities were estimated for Westside, Tasman, De La Cruz, Primavera, and Stadium Pump Stations based on basic information, pump settings, pump curves, and system curves provided by the City. Refer to **Appendix C** for detailed calculations for each pump station.

[3] Theoretical firm capacities for Rabello and Northside Pump Stations were estimated by Schaaf & Wheeler Consulting Civil Engineers (S&W) as reported in a memorandum titled "Northside and Rabello Pump Station Firm Capacity Evaluation", dated July 5, 2022.

[4] A capacity deficiency would be identified for cases where model-predicted PWWF exceeds the theoretical firm capacity or where force main velocity during PWWF exceeds 10 fps (refer to **Table 4-3** for the capacity deficiency criteria).

[5] Theoretical total capacities for Rabello and Northside Pump Stations were estimated using excel spreadsheet tools developed by Schaaf & Wheeler as part of the firm capacity study (refer to footnote 3). System curves for total capacities were estimated based on inferred data because Schaaf & Wheeler did not collect test points with all pumps running.

4.5 Capacity Improvement Projects

This section presents the capacity improvement projects that were identified for the City's sanitary sewer system based on the results of the performance evaluation described in **Sections 4.3** and **4.4**. An overview map showing the locations of all the model-identified capacity improvement projects is provided as **Figure 4-7**.

For most of the gravity sewer capacity deficiencies identified in **Table 4-7**, a project was developed to either replace the existing pipe with a larger pipe or redirect flows to other existing sewers with adequate available capacity. The PHD and Mission Point projects were already modeled during the development review process and will be paid for by the developers (as discussed in **Sections 4.1.2** and **5.6**); these projects will not be included in the Master Plan Update's Sewer Capacity CIP but are still included in **Table 4-9** for reference. The Freedom Circle project is also included in **Table 4-9** and discussed below; no separate infrastructure fee area has been established for the Freedom Circle Focus Area, so the previously modeled improvements are included in the City's Sewer Capacity CIP. Additionally, a specific project was not identified to address the Agate Drive deficiency because model runs showed that this deficiency would be relieved once the Calabazas Trunk project was implemented to relieve existing capacity constraints within the Calabazas Trunk. The assumptions used to define the capacity improvement projects, including the design criteria applied (refer to **Section 4.1.1** for more detail), are discussed briefly below.

Replacement pipes were sized to convey the buildout PWWF using the Lined Model Network with a maximum d/D ratio of 0.75; some exceptions were made to allow a slightly higher d/D ratio (always less than 1) to avoid oversizing isolated, flat segments just to meet this criterion. Existing pipe slopes and depths were preserved when upsizing sewers in-place. Projects that included re-sloping (i.e., replacing the existing pipe at a different slope) are identified as such in the project descriptions. Diameters were increased as minimally as possible to prevent oversizing and subsequent low velocities during dry weather conditions, while also considering standard pipe sizes.

Iterative model runs with all capacity improvement projects in place were performed to verify that no additional sewer system capacity deficiencies would occur after upstream capacity improvements were implemented and to review the flow and capacity of the pump stations in the sewer system. These model runs assessed the cumulative impact of increased capacity from upstream projects on peak flows in pipes downstream. Therefore, project solutions for the GAP West and GAP East Trunks were modeled last.

The recommended capacity improvement projects are all listed in **Table 4-9** and discussed in more detail in the following subsections. In total, the table presents fifteen (15) capacity improvement projects which were identified as part of this Master Plan Update. Each project is documented in further detail in **Appendix G** with an individual plan view map and profile views of the impacted sewers before and after project implementation. Project prioritization and planning-level capital cost estimates were prepared for each of the thirteen (13) recommended projects to be funded by the City and included in its Sewer Capacity CIP; these are presented in **Section 5** of this report.

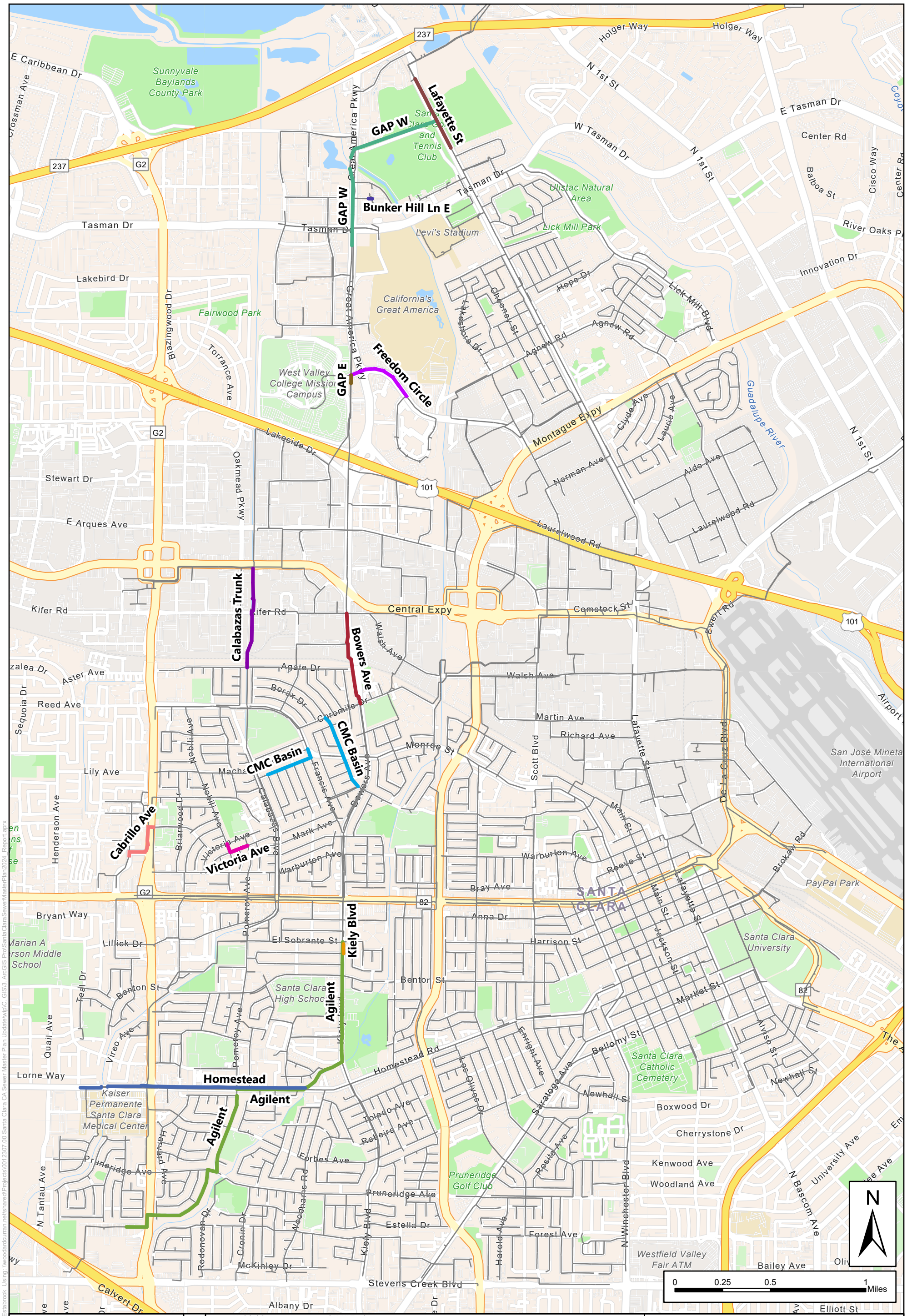


Figure 4-7
Overview of Capacity Improvement Projects

Sewer Master Plan Update

Legend

- Modeled Sewers
- Capacity Improvement Project
- Bunker Hill Ln E
- Agilent
- Bowers Ave
- CMC Basin
- Calabazas Trunk
- GAP E Trunk
- GAP W Trunk
- Homestead Rd
- Kiely Blvd
- Lafayette St
- Victoria Ave
- Freedom Circle
- Cabrillo Extent (Not Actual Project)

THE CITY OF SANTA CLARA CALIFORNIA — The Mission City — 1852

Woodard & Curran

Figure Exported: 12/27/2024 By: SEstabrook Using: \\woodardcurran.net\shared\Projects\0012307.00 Santa Clara CA Sewer Master Plan Update\wip\C. GIS\3. ArcGIS Pro\Santa Clara Sewer Master Plan2024_Report.aprx

TABLE 4-9: SUMMARY OF CAPACITY IMPROVEMENT PROJECTS

Project	Triggers[1]	Project Details					
		MH IDs (US - DS)	Length (LF)[2]	Pre-Project Diameters (in)[3]	Post-Project Diameters (in)[3]	New Weirs	Location & Description
1. Agilent (*Section 4.5.1*)	LTFL DWF UMN	S10-77 - S33-33	12,313	10, 21, 24	15, 24, 27	S22-55	Tracy Dr, Pomeroy Ave, Homestead Rd (S Trunk), Kiely Blvd
2. Homestead Road (*Section 4.5.2*)	LTFL WWF UMN	S20-9 - S23-18 (excluding siphon)	6,407	18, 27, 30	24, 30, 33	S20-16	N Homestead Trunk from Swallow Wy to Saratoga Creek
3. Kiely Boulevard (*Section 4.5.3*)	LTFL WWF UMN	S33-42 - S33-35	270	8	10	-	Orthello Wy to S of El Sobrante St
4. Victoria Avenue (*Section 4.5.4*)	LTFL WWF UMN	S42-113 - S42-36	765	8	10	-	Fowler Ave & Pomeroy Ave to Nobili Ave & Victoria Ave
5. Cabrillo Avenue (*Section 4.5.5*)	EL WWF UMN	-	-	-	-	S40-16, S41-38	Halford Ave & Buckley St; St. Lawrence Dr, W of Lawrence Expwy
6. CMC Basin (*Section 4.5.6*)	EL WWF UMN	S52-104 - S52-80 S43-14 - S53-103	3,655	8	12, 15	-	Santa Maria Ave & Francis Ave; Amethyst Dr
7. Bowers Avenue (*Section 4.5.7*)	LTFL WWF LMN	S53-34 - S63-20	2,605	25.7	30	-	Chromite Dr to Walsh Ave
8. Calabazas Trunk (*Section 4.5.8*)	EL WWF LMN	S52-4 - S62-31 S62-31 - S62-10 S62-37 - S62-38	2,760[4]	22.8, 24, 27	18, 27	-	Calabazas Creek from S of Agate Dr to Central Expwy
9. Freedom Circle (*Section 4.5.9*)	LTFL DWF UMN	S84-12 - S83-18	1,885[5]	12	15	-	Mission College Blvd from Freedom Cir to west of Great America Pkwy

Project	Triggers[1]	Project Details					
		MH IDs (US - DS)	Length (LF)[2]	Pre-Project Diameters (in)[3]	Post-Project Diameters (in)[3]	New Weirs	Location & Description
10. Patrick Henry Drive (PHD)[6]	LTFL DWF UMN	S92-16 – S93-50	6,185	-	6-39	-	Patrick Henry Drive and Great America Parkway.
11. Mission Point[6]	LTFL DWF UMN	S92-15 – PHD-11	6,560	-	12-15	-	West Tasman Drive and Great America Parkway.
12. GAP West Trunk (*Section 4.5.10)*	LTFL WWF UMN	S93-42 - S104-19 (excluding siphon)	4,810	28.5-35.7	36, 42	-	S of West Tasman Dr to Lafayette St
13. GAP East Trunk (*Section 4.5.11)*	LTFL WWF LMN	S83-20 to S83-18	231	31.4	39	-	Old Glory Ln to S of Bunker Hill Ln; Stars and Stripes Dr
14. Bunker Hill Lane East (*Section 4.5.12)*	LTFL WWF UMN	S93-10 - S93-7	110	6	8	-	E of Great America Pkwy
15. Lafayette Street (*Section 4.5.13)*	LTFL WWF UMN	S104-29 - S104-8	2,290[5]	34.2, 40.3, 42	42, 48	-	N of Calle del Mundo to S of Great America Wy

[1] Triggers include: EL = Existing Loads; NTFL = Near-Term Future Loads; LTFL = Long-Term Future Loads; DWF = Dry Weather Flows; WWF = Wet Weather Flows; UMN = Unlined Model Network; LMN = Lined Model Network.

[2] Length of sewers included in upsizing project, rounded up to the nearest 5 linear feet (LF).

[3] Range of pipe diameters included in the project. If the project sewers were identified for future lining, the pre-project diameters represent the future lined diameter assumption that was applied to the Lined Model Network which may be different from the existing diameters that exist in the field.

[4] Includes length of sewers to be re-sloped and new parallel sewer segment. [5] Includes length of sewers to be re-sloped.

[6] Proposed project to be paid for by the developer.

4.5.1 Agilent

The Agilent capacity improvement project would relieve the surcharge capacity deficiency first triggered in the model under long-term future sewer loads, during dry weather conditions, in the Unlined Model Network (as indicated in **Table 4-7**).

The recommended project includes replacement of 12,557 LF of 10-, 21-, and 24-inch pipe with 15-, 24-, and 27-inch pipe along Tracy Drive, Pruneridge Avenue, Pomeroy Avenue, Homestead Road (South Homestead Trunk), Saratoga Creek, and Kiely Boulevard (from manhole S10-79 to S33-33). The recommended project also includes installation of a weir at manhole S22-55 to divert the influent flows from Homestead Road South Trunk and Pomeroy Avenue sewers to the Homestead Road South Trunk, which would be upsized as part of the project. The recommended project would maximize capacity in the Homestead Road South Trunk and send as much flow as possible to an upsized Bowers Avenue Trunk.

An alternative involving diverting flows to the larger diameter Homestead Road North Trunk instead of the South Trunk was also preliminarily considered and investigated. However, pipe condition data provided by the City showed that the Homestead Road South Trunk was known to be in worse condition; this pipe had defect scores of 4 or 5 (assigned based on the severity of the worst defect detected) along the stretch of pipe that would be upsized. Therefore, the recommended alternative includes upsizing of the Homestead Road South Trunk. Moreover, it should be noted that a capacity improvement project was also identified for the Homestead Road North Trunk and is discussed in **Section 4.5.2**.

The primary reason for this capacity deficiency is a historic entitlement flow of 0.95 mgd associated with Parcel APN 316-17-018 located at 5301 Stevens Creek Boulevard (current owner Agilent Technologies). This entitlement flow is significantly greater than the company's recent historical water usage of approximately 0.02 mgd (based on winter season water billing data from 2019-2022). Implementing this project in the near term would result in oversized sewers where the daily flow is not sufficient to provide the minimum cleaning velocity and thus could create potential debris and odor issues. However, the City should implement the Agilent capacity improvement project to address the potential capacity deficiency before the parcel begins to discharge its entitled flow of 0.95 mgd. Based on model runs, the maximum flow that Agilent could discharge before the capacity project would be needed is approximately 0.23 mgd; the deficiency would first occur in the sewers along Pomeroy Avenue, south of Homestead Road.

4.5.2 Homestead Road

The Homestead Road capacity improvement project would relieve the surcharge capacity deficiency first triggered in the model under long-term future sewer loads, during wet weather conditions, in the Unlined Model Network. The long-term future loads scenario assumes that the Cupertino Sanitary District (CuSD) discharges a future flow to the City's sanitary sewer system up to its current contractual limit (13.8 mgd), which contributes to the deficiency identified in the Homestead Road sewers.

The recommended project includes replacement of 6,565 LF of 18-inch, 27-inch, and 30-inch pipe with 24-inch, 30-inch, and 33-inch pipe along Homestead Road from Swallow Way to Saratoga Creek (from manhole S20-9 to S23-18). The proposed upsizing project that was modeled maintains the existing pipe slopes; however, if feasible, the City may wish to evaluate alternatives during preliminary design that would re-slope and steepen the flatter pipe segments (i.e., proposed 33-inch pipes between manholes S20-18 and S21-43). It should be noted that the proposed project does not include improvements to the siphon between manhole S20-26 and S20-18 because the siphon would not be capacity deficient. Per the City's records, that siphon is not currently lined and is made of polyethylene with an internal diameter of 20.2

inches; therefore, it was not assumed for future lining in the Lined Model Network based on the material classification.

The recommended project also includes installation of a weir at manhole S20-16 to divert as much flow as possible to maximize the available capacity within the upsized Homestead Road South Trunk (refer to description of the Agilent project in **Section 4.5.1**). The Homestead Road and Agilent capacity improvement projects would work together to maximize capacity within both trunks along Homestead Road to send as much flow as possible to an upsized Bowers Avenue Trunk. This approach targets replacement efforts to older pipelines assumed to be in worse condition and diverts flow away from the Calabazas Trunk, which is relatively shallow in some locations (i.e., at higher risk of sewer overflows) and also had capacity issues during wet weather flows which were first identified under existing loading conditions using the Lined Model Network and under near-term loading conditions in the Unlined Model Network (refer to **Section 4.5.8** for discussion of the Calabazas Trunk project).

4.5.3 Kiely Boulevard

The Kiely Boulevard capacity improvement project would relieve the surcharge capacity deficiency first triggered in the model under long-term future sewer loads, during wet weather conditions, in the Unlined Model Network. Simulation results show that the capacity deficiency is caused by cumulative impacts of increased discharges from General Plan parcels (discussed in **Section 2.2.2.2**), specifically parcels draining to the Homestead Road North Trunk and the sewer along Brookdale Drive.

The recommended project includes upsizing of one 270 LF segment of 8-inch pipe to 10-inch pipe on Kiely Boulevard from Orthello Way to south of El Sobrante Street (from manhole S32-42 to S33-35).

4.5.4 Victoria Avenue

The Victoria Avenue capacity improvement project would relieve the surcharge capacity deficiency first triggered in the model under long-term future sewer loads, during wet weather conditions, in the Unlined Model Network. According to the simulation results, the capacity deficiency is caused by cumulative impacts of increased discharges from the El Camino Real Specific Plan and General Plan parcels, specifically parcels draining to the sewers on the north side of El Camino Real and along Warburton Avenue.

The recommended project includes upsizing and re-sloping of 515 LF of 8-inch pipe to 10-inch pipe on Fowler Avenue from Pomeroy Avenue to Nobili Avenue and installation of 250 LF of new 10-inch pipe on Nobili Avenue from Fowler Avenue to Victoria Avenue (from manhole S42-113 to S42-36). The project also would include abandoning 255 LF of existing 8-inch sewer between Fowler Avenue and Victoria Avenue (from manhole S42-48 to S42-36), which crosses through an easement underneath single-family residential parcels.

The recommended project is an alternative solution to the project that was preliminarily modeled, which included upsizing of only two pipe segments along Victoria Avenue from Pomeroy Avenue to Nobili Avenue (from manhole S42-36 to S42-113). However, upon further review and based on discussions with the City, the alternative was expanded so that the pipe located within the existing easement could be abandoned.

This project solution does not include two pipe segments between manholes S42-113 and S41-53, because they would have adequate capacity based on the City's capacity criteria (no surcharge), thus they were not included in the proposed project. However, considering these pipe segments are located between the Victoria Avenue proposed project and the recently upsized section downstream of manhole S41-53, the City may wish to consider expanding the project to include these pipes during preliminary design.

4.5.5 Cabrillo Avenue

The Cabrillo Avenue capacity improvement project would relieve the surcharge capacity deficiency first triggered in the Unlined Model Network under existing sewer loads during wet weather conditions. Note that the capacity deficiency is also triggered during dry weather conditions but only under long-term future loads.

The recommended project includes installation of two weirs (at manhole S40-16 and S41-38) to divert as much flow as possible away from the capacity deficient sewers along Cabrillo Avenue and maximize use of available capacity within adjacent existing sewers. The first weir would be installed in manhole S40-16 at the intersection of Halford Avenue and Buckley Street and would divert flow east through the sewers along Buckley Street and away from the sewers to the north along Halford Avenue that eventually drain to Cabrillo Avenue. The second weir, which would be located downstream of the first weir, would be installed in manhole S41-38 at the intersection of Lawrence Expressway and Saint Lawrence Drive and would continue to divert flow east through the sewers along Saint Lawrence Drive and away from the sewers to the north that eventually drain to Cabrillo Avenue. Model simulation results suggest a maximum change in d/D of 28% (from 37% to 65% full) in the sections downstream of the weirs. However, with flows diverted away from Cabrillo Avenue through these two new weirs, the capacity deficiency along Cabrillo Avenue would be eliminated.

An alternative solution was preliminarily modeled to upsize existing 8-inch pipes to 12-inch along Cabrillo Avenue (from manhole S41-13 to S41-20) and one pipe segment on Lawrence Expressway from 8-inch to 10-inch; however, the City preferred the recommended solution which avoids the need for pipe replacement. Additionally, any pipe replacement along Lawrence Expressway would require obtaining a permit from Santa Clara County, which would add cost and complexity to the project.

4.5.6 CMC Basin

The CMC Basin capacity improvement project would relieve the surcharge capacity deficiency first triggered in the model under existing sewer loads, during wet weather conditions, in the Unlined Model Network.

The recommended upsizing project includes replacement of approximately 3,655 LF of 8-inch pipe with 12-inch pipe along Amethyst Drive (from manhole S43-14 to S53-103) and 15-inch pipe along Santa Maria Avenue and Francis Avenue (from manhole S52-104 to S52-80).

Although the model runs show that the recommended upsizing project would meet the City's d/D design criteria under PWWF as shown in the project solution profile presented in **Appendix G**, it would not meet the City's velocity design criteria under PDWF (i.e., minimum of 2 fps) within the upsized 12-inch pipe segments between S43-14 and S53-103 on Amethyst Drive and the upsized 15-inch pipe segments between S52-104 and S53-74 on Santa Maria Avenue. These criteria often come into conflict with one another because increasing the size of the pipe to meet the required maximum d/D criterion under a relatively short-duration PWWF condition means that the pipe will experience lower velocities during normal dry weather conditions which occur much more often.

Flow meters within the CMC Basin tributary area exhibited a very high RDI/I response during the monitoring program. Therefore, it is recommended that the City conduct I/I investigations prior to project implementation to attempt to pinpoint and eliminate significant sources of excessive I/I within the CMC Basin, if possible. However, model runs show that the RDI/I would need to be reduced by at least 50% to 60% to eliminate the capacity deficiency. Refer to **Section 4.6** for a more detailed discussion on I/I, including source detection and control methods and previous investigations and recommendations for Santa Clara.

4.5.7 Bowers Avenue

The Bowers Avenue capacity improvement project would relieve the surcharge capacity deficiency first triggered in the model under long-term future sewer loads, during wet weather conditions, in the Lined Model Network only. The capacity deficiency would be caused by the assumed future lining of the Bowers Trunk, which the City identified as a RCP sewer.

The recommended upsizing project includes replacement of approximately 2,605 LF of existing 27-inch pipe (25.7-inch with assumed future lining) with 30-inch pipe along Bowers Avenue (from manhole S53-34 to S63-20) from Chromite Drive to Walsh Avenue. The project profile in **Appendix G** shows that the downstream end of the downstream-most pipe segment included in the proposed project (from manhole S63-26 to S63-20) would exceed the City's 0.75 maximum d/D design criterion under PWWF; however, the pipe was not upsized because the resulting d/D ratio was still less than 1 and the City preferred to keep diameters consistent rather than upsize one isolated pipe segment just to meet the d/D design criterion.

4.5.8 Calabazas Trunk

The Calabazas Trunk capacity improvement project would relieve the surcharge capacity deficiency first triggered in the model under existing sewer loads, during wet weather conditions, in the Lined Model Network. The capacity deficiency also appears in the Unlined Model Network under near-term and long-term future loads during wet weather flow conditions.

The recommended project includes upsizing of approximately 2,000 LF of existing 22.8 – 27-inch pipes along Calabazas Creek (from manhole S52-4 to S62-10) from south of Agate Drive to Central Expressway. It should be noted that the recommended project includes pipe segments that are already lined between manhole S62-51 and S62-32. The Lined Model Network assumes existing, unlined 27-inch RCP pipes would be lined resulting in a diameter of 25.7-inch. Roughly 750 LF of pipe between manhole S62-31 and S62-10 of the 2,000 LF that would be upsized to 27-inch would also be re-sloped. In addition to upsizing and re-sloping, the project includes installation of a new 18-inch pipe between manhole S62-37 and S62-38 that runs parallel to the existing sewer to relieve the capacity restriction at that location due to a storm drain crossing north of Kifer Road.

The model runs show that the Calabazas Trunk project would eliminate the overflow diversion from the Calabazas Trunk into the Agate Drive sewers at manhole S52-4, which is located just upstream of the Agate Drive siphon crossing. Therefore, the Calabazas Trunk project solution would eliminate the Agate Drive capacity deficiency so that no additional project would be required for Agate Drive.

4.5.9 Freedom Circle

The Freedom Circle capacity improvement project would relieve the surcharge capacity deficiency first triggered in the model under long-term future sewer loads, during dry weather conditions, in the Unlined Model Network. The capacity deficiency would be caused by increased flows from the Freedom Circle Focus Area specific development project that would discharge into the City's sewers along Freedom Circle Drive and Mission College Boulevard. This project was previously modeled during the development review process but is still identified as a Master Plan Update project to be included in the City's Sewer Capacity CIP. The recommended project is a slight modification of the project identified during the development review and includes re-sloping to meet the City's design criteria d/D (maximum of 0.75 during PWWF).

The recommended upsizing project includes replacement and re-sloping of 1,885 LF of 12-inch pipe and 15-inch pipe with 15-inch pipe along Mission College Boulevard (from manhole S84-12 - S83-18) from Freedom Circle Drive to west of Great America Parkway. The downstream most segment of the project (from

manhole S83-13 to S83-18) was assumed to connect to the GAP East trunk at equal crown elevations to minimize impacts from the GAP East trunk hydraulics.

4.5.10 GAP West Trunk

The GAP West Trunk capacity improvement project would relieve the surcharge capacity deficiency first triggered in the model under long-term future sewer loads, during wet weather conditions, in the Unlined Model Network. The GAP West Trunk sits lower than the GAP East Trunk, to which it is interconnected, and therefore reaches capacity first. However, a capacity deficiency project was also identified for the GAP East Trunk (triggered by the Lined Model Network only) and is discussed further in **Section 4.5.11**. Considering that the capacity deficient sewers are located towards the downstream end of the City's sewer system, the capacity deficiency would likely be caused by the cumulative impacts of long-term future loads on the system combined with wet weather conditions. The deficiency would be slightly exacerbated with assumed future lining of the GAP West Trunk, which the City identified as a RCP sewer.

The recommended upsizing project includes replacement of approximately 4,810 LF of existing 28.8-31.7-inch pipe (already lined), 30-inch pipe, and 33-inch pipe with 36-inch and 42-inch pipe along Great America and the easement north of Stars and Stripes Drive (from manhole S93-42 to S104-19) from south of West Tasman Drive to Lafayette Street. The recommended project does not include improvements to the existing siphon between manhole S103-19 and S103-16, because the simulation results do not predict this siphon to be deficient. It should be noted that this siphon was assumed to be lined in the future as part of the Lined Model Network, but it is not currently lined. Even with the reduced diameter assumed based on future lining, the siphon would not be capacity deficient. However, the City may wish to consider evaluating alternatives during preliminary design that would replace or remove this siphon that crosses under the San Tomas Aquino Creek, if feasible.

It should also be noted that the project does not include the GAP West Trunk improvements associated with the PHD development. The cost to upsize the GAP West Trunk from the PHD specific development project's discharge point to the Bay Division pipelines crossing (from manhole S83-5 to S93-53) is to be paid by the developers as discussed in **Section 4.1.2**; therefore, this portion of the project is not included in the Master Plan Update and will not be reflected in the City's Sewer Capacity CIP. The Master Plan Update and Sewer Capacity CIP will only include the GAP West Trunk capacity improvements located downstream (north of Old Glory Lane) and which are not part of the PHD agreement. There are, however, two pipe segments between manholes S93-48 and S93-42 that are downstream of the PHD project and the GAP West project that would still have capacity based on the City's capacity criteria of no surcharge. They are not included in the proposed project, but the City may wish to consider expanding the project to include them during preliminary design.

4.5.11 GAP East Trunk

The GAP East Trunk capacity improvement project would relieve the surcharge capacity deficiency first triggered in the model under long-term future sewer loads, during wet weather conditions, in the Lined Model Network only because the City identified the GAP East Trunk as a RCP sewer. Therefore, the capacity deficiency would not be triggered in the Unlined Model Network. Considering the capacity deficient sewers are located at the downstream end of the City's sewer system, the deficiency is due to the combined effects of the assumed future lining plus long-term future loads plus wet weather conditions.

The recommended upsizing project includes replacement of approximately 230 LF of existing 33-inch (assumed lined inside diameter of 31.4-inches) to 39-inch pipe from manhole S83-20 to S83-18 (at the manhole connecting the Freedom Circle trunk with the GAP East Trunk). The scope of the recommended

improvement project is minimal because simulation results show that the recommended improvements to the GAP West Trunk (discussed in **Section 4.5.10**) would relieve most of the deficiencies in the GAP East Trunk.

4.5.12 Bunker Hill Lane East

The Bunker Hill Lane East capacity improvement project would relieve the surcharge capacity deficiency first triggered in the model under long-term future sewer loads, during wet weather conditions, in the Unlined Model Network. The primary cause of the capacity deficiency is due to historic entitlements held by parcel APNs 104-55-012 and 104-55-013 (located near Bunker Hill Lane and east of Great America Parkway by the Santa Clara Convention Center). Combined, these two parcels are entitled to discharge up to 0.27 mgd into the City's sewer system.

Assuming that the entitlement flow would be loaded to the City's sewer system, the existing 6-inch sewers between manhole S93-13 and S93-7 would be surcharged during PWWF conditions (as shown in the profile provided in **Appendix G**); specifically, the sewer between manhole S93-10 and S93-7 would be capacity deficient and would need to be upsized to convey the flow. Therefore, the recommended project includes replacement of the existing 6-inch pipe that would experience the throttle surcharge (between manhole S93-10 and S93-7) with approximately 110 LF of 8-inch pipe. The project solution profile in **Appendix G** shows that the pipe segment immediately downstream of the pipe to be upsized would still be surcharged at the downstream end. However, this model-predicted surcharge is a backwater surcharge on one end only that is caused by the hydraulic grade line from the connection to the larger diameter GAP East Trunk. Prior to project implementation, the City should verify the inverts of sewers along the project alignment and at the downstream connection to the GAP East trunk sewer.

This project should not be implemented until these parcels begin to discharge their entitled flow.

4.5.13 Lafayette Street

The Lafayette Street capacity improvement project would relieve the surcharge capacity deficiency first triggered in the model under long-term future sewer loads, during wet weather conditions, in the Unlined Model Network. Considering the capacity deficient sewers are located towards the downstream end of the City's sewer system, the capacity deficiency would likely be caused by the cumulative impacts of long-term future loads on the system combined with wet weather conditions. The deficiency would be slightly exacerbated with assumed future lining of the Lafayette Trunk, which the City identified as a RCP sewer.

The recommended upsizing project includes replacement of approximately 2,290 LF of existing 36-inch (34.2-inch with assumed future lining), 40.3-inch pipe (already lined), and 42-inch pipe with 42-inch and 48-inch pipe along Lafayette Street (from manhole S104-29 to S104-8) from north of Calle del Mundo to south of Great America Way. The project also includes some re-sloping of the existing pipe segments from manhole S104-22 to S104-14; per record information, the existing slope is minimal at approximately 0.02%.

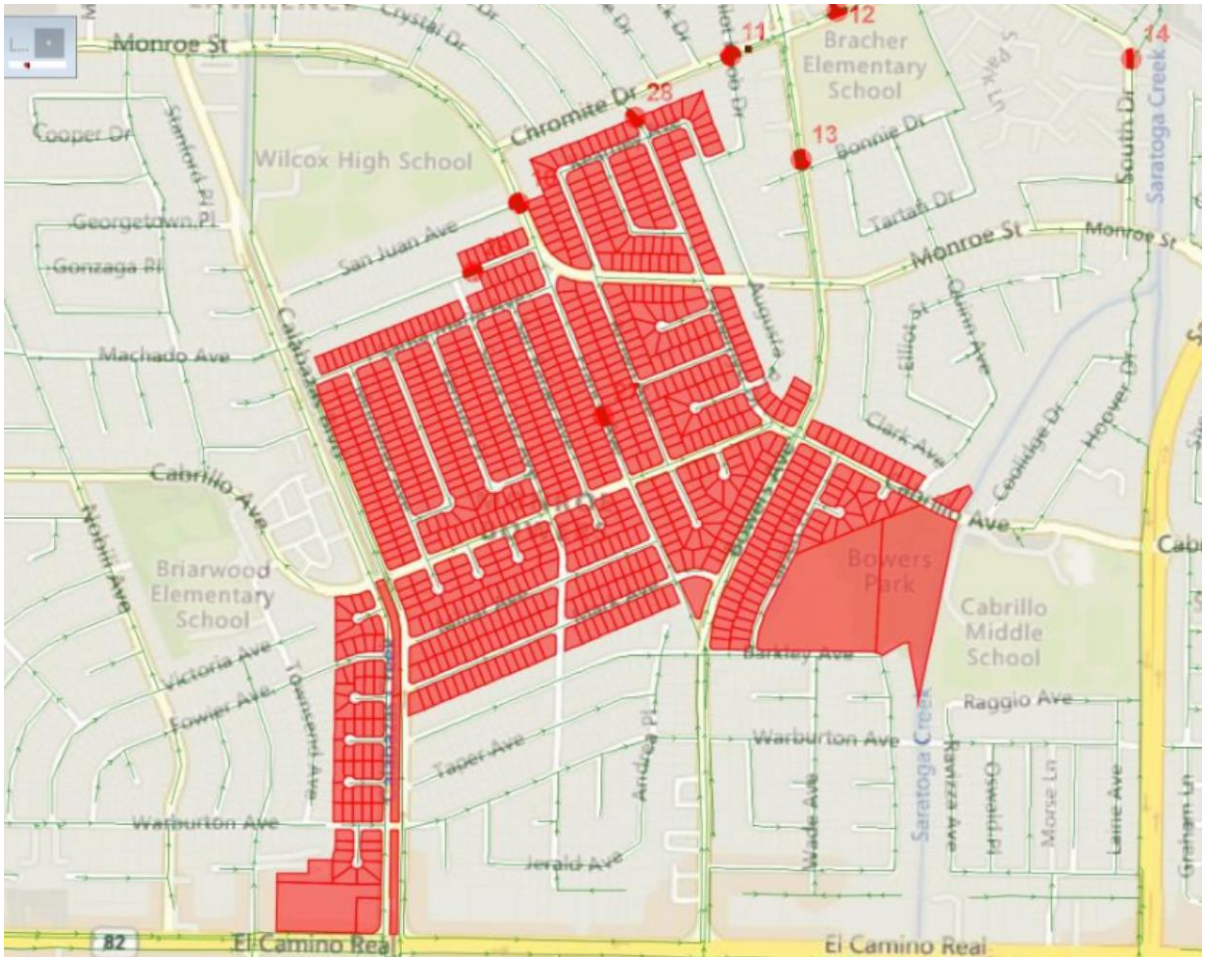
4.6 Infiltration and Inflow Discussion

There are various methods for characterizing the relative contributions of RDI/I from different areas of the sewer system. Because the critical issue with respect to RDI/I is the impact that peak flows have on the system, the focus is on characterizing peak RDI/I in particular. Potential approaches to quantify peak RDI/I include: the ratio of PWWF to average dry weather flow (ADWF), referred to as the wet weather peaking factor; peak RDI/I per acre of contributing area; and peak RDI/I per foot of pipe; where PWWF and peak RDI/I are based on design storm flows. The RDI/I response can be characterized for each metered basin based on these parameters.

4.6.1 Completed Infiltration and Inflow Investigations

Based on the flow monitoring data collected during the winter 2022-2023 season and as discussed in **Sections 2.1** and **3.5.2.1**, a very high RDI/I response was observed within the flow meter (FM) basins in the CMC tributary area, the extent of which is shown in **Figure 4-8**.

FIGURE 4-8: CMC BASIN TRIBUTARY AREA



During the flow monitoring period, wet weather peaking factors of 23.5 and 17.0 were observed in the FM 27 and FM 28 basins, respectively; these peaking factors (presented in **Section 3.5.2**) were much higher than the peaking factors observed in other FM basins throughout the City which, when averaged together not including FM 27, FM 28, and FM 4 (Levis stadium flows), were approximately 3.4. The adjacent Agate Drive tributary area (FM 31) also showed a significant and sustained response to rainfall. The nature of the responses at FM 27 and FM 31 were indicative of significant infiltration, as the response was generally slower and took a long time to recede (i.e., several weeks following rainfall). Moreover, because several consecutive rainfall events occurred within a short period of time during the flow monitoring period, the infiltration response did not fully recede before another rainfall event occurred. For example, the FM 31 data indicate that depth of flow did not return to baseline levels in between rainfall events from December 27, 2023, and January 19, 2024, as shown in **Figure 4-9**. Based on NOAA rainfall statistics (refer to **Figure 4-10**), actual rainfall observed during the wet weather monitoring season was greater than a 10-yr event for longer durations (10+ days).

FIGURE 4-9: OBSERVED FLOW MONITORING DATA AT FM 31 (S62-50, 10")

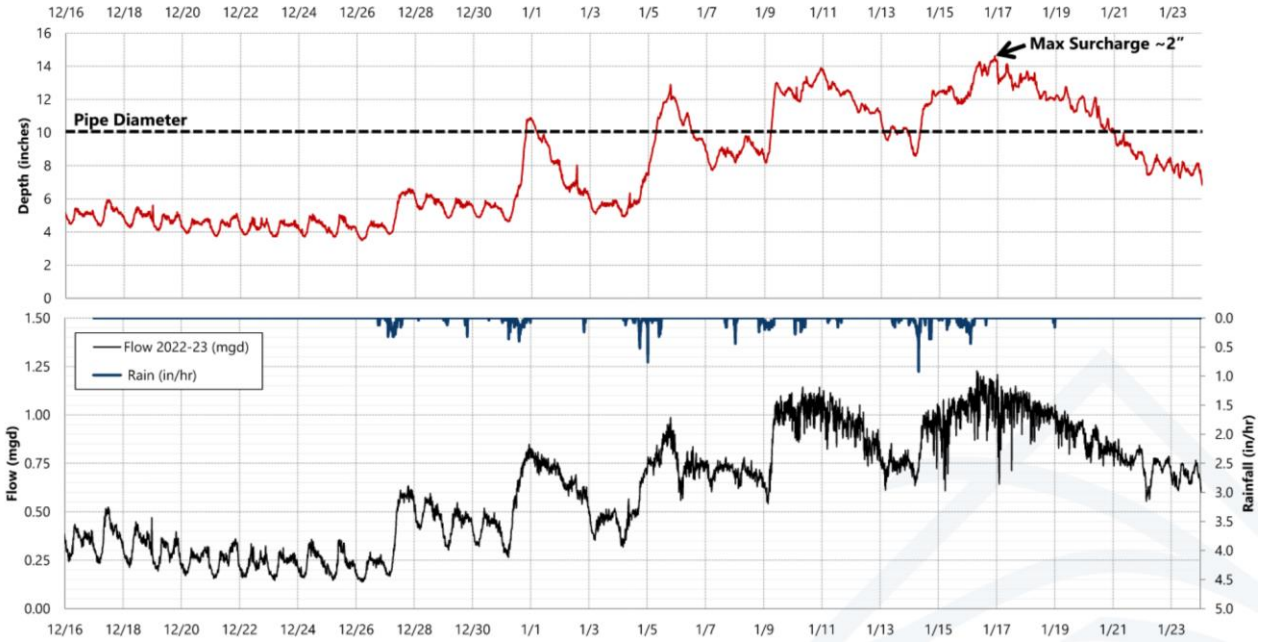
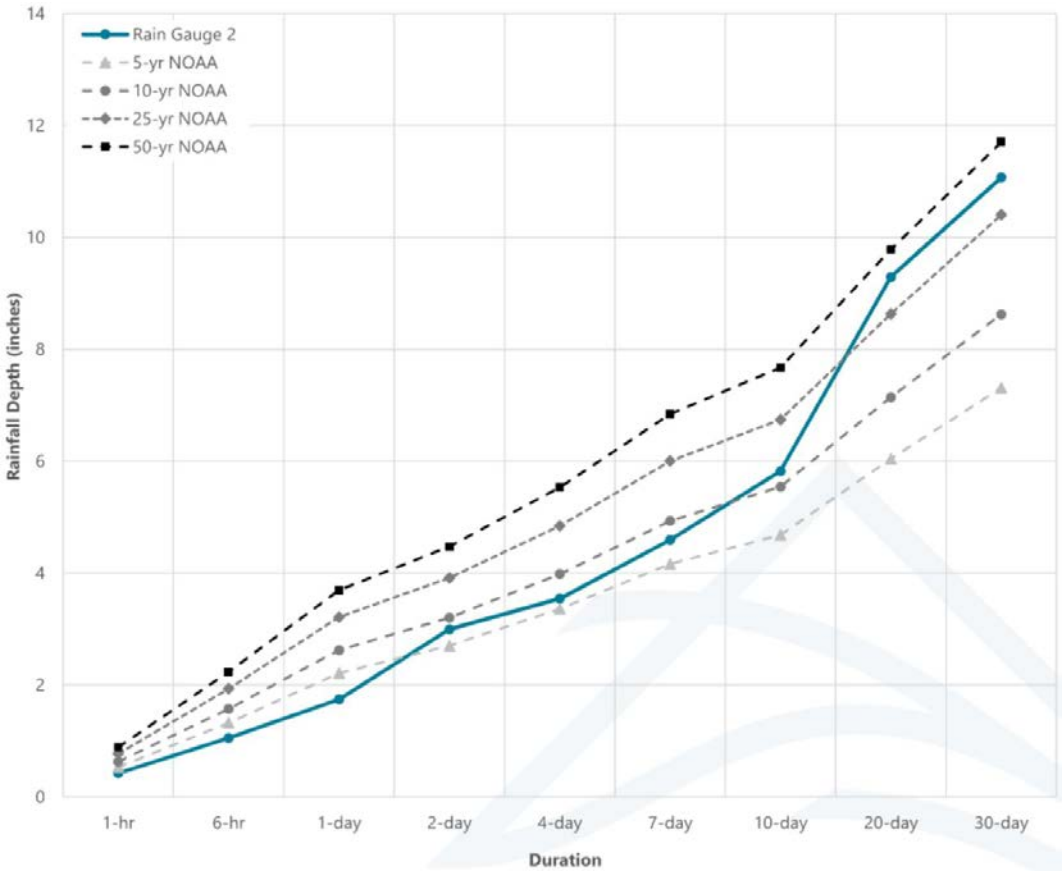


FIGURE 4-10: NOAA RAINFALL STATISTICS COMPARED TO OBSERVED JANUARY 2023 RAINFALL IN SANTA CLARA, CA



The flow monitoring results are consistent with the findings of other field investigations that V&A recently completed in the CMC basin as discussed in **Section 3.5.2.1**. V&A's associated report recommended that the City consider smoke testing in the CMC basin, which may better identify lateral defects.

4.6.2 I/I Source Detection and Control Methods

A necessary step in identifying potential I/I control measures is a realistic assessment of the actual sources of I/I in the sewer system. Based on the pattern and magnitude of flows in the City's sewer system, the likely sources of RDI/I flows are defects in sewers and service laterals, and possibly some direct connections (e.g., illegally connected roof and area drains, direct connections from the storm drain system, etc.). Appropriate I/I control methods depend on the type and sources of I/I. Control methods must include detection as well as correction.

Direct Inflow Sources

Direct inflow sources can contribute significantly to both volume and peak rates of I/I and have the greatest probability of being cost effective to eliminate. The main methods used to detect and locate direct inflow sources are smoke and dye testing (dye testing is used primarily as a confirmatory test). Smoke testing is considered to be a relatively easy and inexpensive method (cost is approximately $1.00 to $1.25 per foot if a substantial length of pipe is tested), and discovery of just a few direct storm drain cross-connections, for example, can make the effort worthwhile. However, unless there is some indication or knowledge of the existence of direct connections in the system, finding them may require an extensive smoke testing program, which requires public notification measures and access to private property to document the smoke returns. For this reason, smoke testing is generally targeted at specific areas with high peak RDI/I rates.

Generally, the most numerous types of sources found during smoke testing are not direct inflow connections but defects in shallow pipes, primarily laterals. Rehabilitation of laterals may be a challenging institutional issue (see discussion below on correction of private property I/I sources).

Manholes subject to ponding or located in drainage courses may also be sources of direct inflow. The amount of I/I depends on the manhole location, type of manhole cover (number and size of holes), and the condition of the cover and frame. Physical inspection of manholes is the most effective way to identify such conditions, and correction is relatively straightforward (replace cover, realign frame, raise manhole to grade, remove or relocate manhole in watercourse, etc.). Physical inspection can be conducted in conjunction with sewer inspection or routine cleaning work, or as a separate activity.

Elimination of direct inflow connections requires disconnection of the source and re-direction of the drainage to an appropriate location. This may simply be to the ground surface (as in the case of roof drains), or connection to a nearby storm drain or street gutter. In general, each identified source needs to be evaluated on a case-by-case basis to identify the appropriate corrective measure.

Infiltration Sources in Sewer Mains and Manholes

Infiltration sources are defects in sewer pipes or manholes caused by defective materials or construction, general deterioration, or damage caused by physical conditions such as ground movement or settlement, traffic loads, or root intrusion. Infiltration sources (defects) are detected by inspection: visual inspection in the case of manholes and CCTV inspection for sewer mains. However, visual observation of active I/I is generally not feasible because the RDI/I generally occurs for only short periods during rainfall events, and the pipes may fill up during those periods, making CCTV inspection difficult or impossible.

Infiltration correction methods involve rehabilitation or replacement of entire pipe segments or manholes or spot repair of localized defects. There are numerous materials and methods used for this type of rehabilitation. In general, however, the cost per unit amount of I/I removed is relatively high, because the defects individually contribute relatively small amounts of flow. It is recognized that infiltration in the sewer system will "migrate" to other nearby defects that are left un-repaired. Therefore, a fairly extensive area of the system may need to be included in the rehabilitation effort in order to achieve substantial flow reduction. Furthermore, reductions greater than about 30% can rarely be achieved without also addressing the infiltration from private laterals. Generally, rehabilitation to reduce infiltration is cost effective only if a significant amount of infiltration can be isolated to a relatively small area, or there are extremely costly improvements required downstream to convey, treat, and dispose of the excess flow.

I/I Sources on Private Property

I/I sources on private property are primarily defective laterals, but may also include broken cleanouts or cleanout caps, or directly connected roof and area drains. Smoke testing is the primary method for detecting private property I/I sources.

It should be noted that low lying areas and any buildings with basements are likely to have sump pumps. It is possible that some sump pumps may be directly connected to the sewer system, rather than the storm system, or may be discharging to the street, in which case those flows would likely enter the storm system but could also enter the sewer system through manhole cover openings. Connected sump pumps would not be identified by any of the source detection methods described here, but building inspectors may have more information about whether these types of connections exist in the area. Therefore, for more aggressive programs, building or property inspections can be conducted, and/or laterals can be CCTV inspected or tested for leaks using air or water pressure tests. These types of inspections and tests generally require that the lateral have cleanout access, ideally at both the connection to the building plumbing and at or near the property line. However, new technologies are now available, such as cameras that can be "launched" up the lateral during CCTV inspection of the mainline, that make it easier to inspect private laterals.

4.6.3 I/I Investigation Recommendations for Santa Clara

Reducing I/I through locating defects and sewer main replacement programs could be an effective alternative to capacity improvement projects; specifically, the capacity improvement project recommended for the CMC Basin. However, it can be difficult to predict the extent of I/I reduction that could be achieved through any individual I/I reduction project. In the CMC Basin tributary area, for example, model runs show that RDI/I would need to be reduced by at least 50% to 60% to eliminate the CMC Basin capacity deficiency (i.e., surcharge along Amethyst Drive and Santa Maria Avenue and Francis Avenue) and the need for a capacity improvement project that includes upsizing the existing sewers.

Even if the required I/I reduction is achievable, the cost of the significant sewer main (and sewer lateral) replacement needed to achieve meaningful reductions of I/I is often more expensive than adding additional conveyance capacity. Moreover, the time needed to implement I/I reduction projects and assess their impacts on system through pre-and-post-implementation flow monitoring programs could be significant. Therefore, I/I reduction may not be a cost-effective approach.

Still, it is recommended that the City's Sewer Capacity CIP include some budget for I/I source detection methods to attempt to further characterize and pinpoint significant sources of I/I to the sanitary sewer system. The V&A report (discussed in **Section 4.6.1**) recommended CIPP lining of pipe segments that were investigated via CCTV during the study because all showed condition defects; however, it is recommended that further basin wide investigations be completed prior to implementing targeted rehabilitation projects.

At minimum, smoke testing and CCTV investigations should be conducted within the CMC Basin prior to implementation of the capacity improvement project discussed in **Section 4.5.1**, which consists of upsizing the capacity deficient sewers. Additionally, the City should consider conducting smoke testing and CCTV investigations within the FM 31 basin area that is tributary to the Agate Drive sewers. An allowance for these recommended I/I investigations is included in the Sewer Capacity CIP in the form of other additional costs (refer to **Section 5.5**).

5. RECOMMENDED SEWER CAPACITY CAPITAL IMPROVEMENT PROGRAM

This section presents the specific sewer projects that are recommended for inclusion in the City's Sewer Capacity CIP based on the findings of the sewer system capacity analysis discussed in **Section 4**.

The sections below give an overview of the process, information and assumptions used, specifically:

- Project development process
- The methodology used to prioritize projects and estimate their costs
- Indirect cost resulting from implementing the capacity improvement projects
- Level of confidence in the projects
- Projects that will not be financed by the City
- An overall summary of all recommended projects, along with a brief discussion for each project focusing on the rationale and validation to justify the need for the project (refer to **Sections 4.5.1-4.5.13** for more detailed descriptions of the model-predicted capacity deficiencies and the solutions modeled)
- Project schedule

Details for each project are included in **Appendix G**.

5.1 Project Development Process

Capital improvement projects were developed to address potential deficiencies identified in the capacity analysis. One project was developed from up to three alternatives analyzed for each of the capacity deficiencies presented in **Section 4**.

The capacity deficiencies were relieved by a) increasing the capacity of deficient segments by upsizing sewers, adding additional parallel pipes, and/or re-slopping segments b) decreasing the flow through deficient pipe segments by diverting flow towards pipe segments with more capacity, or c) a combination of both a and b. All new pipes were sized according to the City's Design Criteria (refer to **Table 4-4**), except when the City decided not to do so, which is stated in the project descriptions included in **Section 4.5**.

Each project solution was tested in the hydraulic model to confirm that it would provide system capacity relief and to determine the pipe size required for any new sewers. Finally, the proposed pipe alignment was reviewed using GIS maps and aerial imagery to identify potential constructability issues. Complicating factors such as highway crossings, railroad crossings, creek proximity and crossings, and projects on sewers with many laterals (thereby impacting flow control during construction) were noted. Although this constructability review was done at a high level for planning rather than a detailed design level, the issues identified provide a reasonable starting point for further project development during the pre-design phase. The goal of the constructability review was to flag key areas where trenchless construction may be required. Pipe-bursting may be feasible but was not evaluated during this Master Plan Update; detailed utility separation and geotechnical investigations would be required to fully evaluate feasibility.

5.2 Project Prioritization Methodology

Each project was prioritized from "1" (highest priority) to "7" (lowest priority) based on a combination of factors including the wastewater flow trigger (existing load or EL vs. near-term future load or NTFL vs. long-term future load or LTFL), design flow trigger (dry weather flow or DWF vs. wet weather flow or WWF), physical network trigger (future lined network or LMN vs. no future lining network or UMN), and assumed

structural condition trigger (RCP segments present vs. not present). Projects that address existing deficiencies with future lining assumptions not in place should have the highest priority because they pose the greatest risk of a sanitary sewer overflow (SSO). **Table 5-1** shows the ranking classifications used to assign priorities to each of the projects.

TABLE 5-1: PROJECT PRIORITIZATION RANKING[1]

Priority Ranking	Wastewater Flow Trigger(s)	Design Flow Trigger(s)	Physical Network Trigger	Structural Condition Trigger	Notes
1	EL	WWF	UMN	-	
2	EL	WWF	LMN	-	
3	LTFL	WWF	UMN	RCP trunk	Not Priority 1 or 2 but alignment includes RCP trunk identified for future lining.
4	LTFL	WWF	LMN	RCP trunk	Not Priority 1 or 2 but alignment includes RCP trunk identified for future lining.
5	LTFL	DWF	UMN	-	
6	LTFL	WWF	UMN	-	
7	LTFL (entitlement)	DWF or WWF	UMN	-	

[1]Note: Triggers include: EL = Existing Loads; NTFL = Near-Term Future Loads; LTFL = Long-Term Future Loads; DWF = Dry Weather Flows; WWF = Wet Weather Flows; UMN = Unlined Model Network; LMN = Lined Model Network.

5.3 Project Level of Confidence

The capacity improvement projects developed to resolve the hydraulic deficiencies are primarily based on forecasted flows predicted from the calibrated model. As discussed in **Section 4.1**, the hydraulic model utilizes a design rainfall event along with other modeling assumptions to identify hydraulic deficiencies and resulting capacity improvement projects. Because these assumptions impact the recommended capacity improvement projects, it becomes necessary to independently validate the need for these projects by reviewing local flow monitoring data, review of reported surcharging and operational issues, and compatibility between flow meter data and the model. The project validation process, often referred to as a 'level of confidence' evaluation, was conducted for each recommended project with the results discussed by project in **Section 5.7**. The confirmation levels used in the validation process are shown in **Table 5-2**.

TABLE 5-2: PROJECT FLOW CONFIRMATION LEVELS

Flow Confirmation Level	Description
1	Flow meter on or very near to the project reach surcharged during metered storm.
2	Flow meter on or very near to the project reach confirms flow, but did not surcharge during metered storm.
3	Flow meter near the project reach (upstream or downstream) confirms flow.
4	No flow meter near the project reach to confirm flow.
5	Conflicting flow between meter and model.

For projects with a Level 1 rating, the need for the project has effectively already been confirmed by previous flow monitoring data. Level 2 projects were confirmed to have reasonably accurate model flows based on

model comparison to flow meter data but have no confirmed surcharging during the monitoring period (calibration events may have been too small to cause surcharging at these locations). Level 3 projects were confirmed to have reasonably accurate model flows based on model comparison to flow meter data. Level 4 and 5 projects have no reliable confirmation of model flows; conducting flow monitoring on these project reaches prior to design would provide a greater level of confidence in modeled flows.

It should be noted that projects triggered by projected flows from historic entitlement agreements or specific future development flow estimates were not assigned a confidence level as it relates to monitored flows.

5.4 Project Cost Estimates

Planning level cost estimates were developed for each recommended project. This level of cost estimate corresponds to the Planning-Level "Class-5" cost as defined by the American Association of Cost Engineers, International (AACE 2005). The AACE provides guidelines on accuracy ranges defined as percentages +/- of the expected average bid cost of the work. The Planning Level cost is expected to range from a high of: +30% to+100% and from a low of: -20% to -50% of the eventual cost of the project.

The cost index used for escalation of past bid prices was the Engineering News Records Construction Cost Index (ENR 2024) for the San Francisco area as of August 2024 (CCI of 15367.24).

Cost criteria include baseline construction costs for gravity trunk sewers using open-cut construction[1]. Unit costs for gravity trunk sewers vary with pipe diameter and depth. Baseline costs include all standard materials, equipment, possible weir installation or adjustment, potential lateral reconnection, potential manhole modifications, and labor to construct a pipeline project, except for site-specific items (e.g., possible dewatering and shoring needs or bypass pumping). The unit cost for open-cut construction ranged from $654 per linear-foot (LF) for a shallow (pipe depth less than 16 feet), 8-inch sewer to $1,579 per LF for a deep (from 25 to 30 ft of depth), 60-inch sewer.

An allowance of 10% of baseline construction costs was provided for traffic control, or 20% for high traffic areas. Additional allowances were provided for dewatering, bypass pumping, remove and replace activities, and pavement restoration. Subtotal construction costs reflect these allowances plus the baseline construction cost. The estimated construction subtotal cost for each project also includes an allowance for mobilization/demobilization (5% of subtotal construction costs), plus an additional allowance for contingencies and unknown conditions (30% of construction cost subtotal, and an allowance for engineering and inspection costs (25% of construction cost). Costs for lining City-identified RCP trunks are not included in the Sewer Capacity CIP as these are condition-related maintenance costs.

The itemized cost estimate for each project is detailed in the individual project information sheets included in **Appendix G**. Note that all costs presented in this Master Plan Update report represent August 2024 costs for the San Francisco Area and are not escalated for future years.

5.5 Other Costs

The project cost estimates developed would reflect costs derived directly from construction of the projects only. However, there would be other additional costs associated with improvement of flow conveyance in the City's sanitary sewer system. For this Master Plan Update, these costs were categorized as three-fold:

[1] Pipe-bursting may be feasible but was not evaluated during this Master Plan Update. Detailed utility separation and geotechnical investigations would be required to fully evaluate feasibility.

1) **Hydraulic Model Maintenance & Support Costs**, which include continuous updates to the hydraulic model to reflect improvements to the system, updates to base flow scenarios based on specific development project status or General Plan updates, and maintenance of consistent documentation in model files;

2) **Future Master Plan Update Costs**, which include updates to the master plan to incorporate updates to the hydraulic model, compare model results to flow monitoring data, update model calibration, perform system capacity evaluations, develop capacity improvement projects to resolve deficiencies, and produce accompanying memoranda and reports; and

3) **Technical Analyses to Support System Verification and Hydraulic Model Accuracy**, which includes performing I/I studies, conducting flow monitoring to verify system hydraulic conditions (in addition to flow monitoring mentioned above), analyzing water usage and sewer generation rates, performing pump station evaluations, evaluating proposed improvements for system performance, and conducting other studies and analyses.

Table 5-3 shows the additional anticipated other costs by category, which were provided by the City. Note that these costs reflect 2024 US Dollars and should be escalated for future years.

TABLE 5-3: OTHER COSTS IN ADDITION TO SEWER CAPACITY CIP PROJECT COSTS

Category	Frequency	Cost[1]
Hydraulic Model Maintenance & Support	Annual	$75,000
Future Master Plan Updates	Every 7 years (next funding need in 2029)	$950,000
Technical Analyses to Support System Verification and Hydraulic Model Accuracy	Annual	$25,000

[1]Cost is estimated in 2024 Dollars. Use an escalation factor of 3% to 5% per year for subsequent years.

5.6 Project Costs Financed by Developers

As discussed in **Section 4.5**, two capacity improvement projects were developed to address the model-predicted deficiencies resulting from the PHD and Mission Point developments. These improvement projects will be paid for by the developers and not by the City. For this reason, they are not included in the Sewer Capacity CIP project list and are not addressed further in this section. Any changes to their respective design and/or elimination may impact the sizing and timing of the capacity improvement projects identified in this study, specifically those proposed downstream along the GAP and Lafayette trunks.

5.7 Summary of Recommended Capacity Improvement Projects

Based on results of the capacity evaluation discussed in **Section 4**, there are thirteen (13) recommended capacity improvement projects with a total length of approximately 38,100 LF of new pipelines. The total estimated cost of the capacity improvement projects is approximately $100.6 million.

Table 5-4 shows a summary of the capacity improvement projects, including their priority, flow confidence level, wastewater flow trigger, design flow trigger, physical network trigger, and the estimated planning-level cost. Refer to **Figure 4-7** provides a system overview map and shows the locations of all thirteen (13) projects. **Appendix G** includes a plan view figure for and a detailed description of each project as well as an associated cost estimate. The projects are listed in upstream-to-downstream order. The project descriptions on the cost estimate page follow a standard format, consisting of a summary project description, project triggers, estimated cost, priority, and any associated comments, assumptions, or project alternatives. Each cost estimate page also includes an itemized cost estimate, as well as the estimated existing and future flows and dry weather velocities. Note the comments listed on each project description

page. In some cases, the need for additional verification is noted. A brief discussion for each project focusing on the rationale and validation justifying the project need is included in the **Sections 5.7.1-5.7.13**.

TABLE 5-4: CAPACITY IMPROVEMENT PROJECTS

Project No.[1]	Project ID	Project Location	Pre-Project Pipe Diameter(s)[2]	Project Description	Priority[3]	Flow Confidence Level[4]	Wastewater Flow Trigger[5]	Design Flow Trigger[5]	Physical Network Trigger[5]	Project Cost[6]
1	**Agilent**	Tracy Dr, Pomeroy Ave, Homestead Rd (S Trunk), Kiely Blvd	10 to 22.8-inch	12,313 LF of 15 to 27-inch diameter pipe	7	N/A	LTFL (entitlement)	DWF	UMN	**$26,942,000**
2	**Homestead Road**	N Homestead Trunk from Swallow Wy to Saratoga Creek	18 to 30-inch	6,407 LF of 24 to 33-inch diameter pipe	3	3	LTFL	WWF	UMN	**$17,156,000**
3	**Kiely Boulevard**	Orthello Wy to S of El Sobrante St	8-inch	266 LF of 10-inch diameter pipe	6	4	LTFL	WWF	UMN	**$513,000**
4	**Victoria Avenue**	Fowler Ave & Pomeroy Ave to Nobili Ave & Victoria Ave	8-inch	764 LF of 10-inch diameter pipe	6	3	LTFL	WWF	UMN	**$1,337,000**
5	**Cabrillo Avenue**	Halford Ave & Buckley St; St. Lawrence Dr, W of Lawrence Expwy	8-inch	Flow Diversion Weirs only. No pipe replacement.	1	3	EL	WWF	UMN	**$154,000**
6	**CMC Basin**	Santa Maria Ave & Francis Ave; Amethyst Dr	8 to 12-inch	3655 LF of 12 to 15-inch diameter pipe	1	1 & 2	EL	WWF	UMN	**$7,263,000**
7	**Bowers Avenue**	Bowers Ave from Chromite Dr to Walsh Ave	25.7-inch	2605 LF of 30-inch diameter pipe	4	5	LTFL	WWF	LMN	**$8,047,000**
8	**Calabazas Trunk**	Calabazas Creek from S of Agate Dr to Central Expwy	22.8 to 27-inch	2791 LF of 18 to 27-inch diameter pipe	2	5	EL	WWF	LMN	**$8,731,000**
9	**Freedom Circle**	Mission College Blvd from Freedom Cir to west of Great America Pkwy	12 to 15-inch	1886 LF of 15-inch diameter pipe	5	N/A	LTFL (specific development)	DWF	UMN	**$3,830,000**
12	**GAP West Trunk**	S of West Tasman Dr to Lafayette St	28.5 to 35.7-inch	4810 LF of 36 to 42-inch diameter pipe	3	2	LTFL	WWF	UMN	**$17,781,000**
13	**GAP East Trunk**	Old Glory Ln to S of Bunker Hill Ln; Stars and Stripes Dr	31.4-inch	231 LF of 39-inch diameter pipe	4	2	LTFL	WWF	LMN	**$1,002,000**
14	**Bunker Hill Lane East**	E of Great America Pkwy	6-inch	107 LF of 8-inch diameter pipe	7	N/A	LTFL (entitlement)	WWF	UMN	**$301,000**
15	**Lafayette Street**	N of Calle del Mundo to S of Great America Wy	34.2 to 40.3-inch	2290 LF of 42 to 48-inch diameter pipe	3	2	LTFL	WWF	UMN	**$7,515,000**
TOTAL ESTIMATED COST	**$100,572,000**									

[1]Projects are numbered from upstream to downstream. Table does not include Project Nos. 10 (Patrick Henry Drive) and 11 (Mission Point) because project costs will be paid for by the developers.

[2]Pre-project pipe diameters include future lining assumptions.

[3]Projects are prioritized based on wastewater flow, design flow, and physical network triggers as well as assumed structural condition.

[4]Rating assigned to validate the need for the project through review of flow monitoring data and reported surcharging and operational issues, and compatibility between flow meter data and the model. Descriptions of the flow confidence levels are as follows: N/A = Not assigned because project would be triggered by entitlement flow or specific development; 1 = Flow meter on or very near to the project reach surcharged during metered storm; 2 = Flow meter on or very near to the project reach confirms flow, but did not surcharge during metered storm; 3 = Flow meter near the project reach (upstream or downstream) confirms flow; 4 = No flow meter near the project reach to confirm flow; 5 = Conflicting flow between meter and model.

[5]EL = Existing Loads; LTFL = Long-Term Future Loads; DWF = Dry Weather Flow; WWF = Wet Weather Flow; UMN = Unlined Model Network; LMN = Lined Model Network.

[6]Costs are based on August 2024 ENR CCI of 15367.24 for the San Francisco Area and are Class 5 estimates (planning level).

5.7.1 Agilent

This project was assigned priority 7 (least priority) as it was created to accommodate mainly the historic entitlement flow from Agilent Technologies (average dry weather flow of 0.95 million gallons per day or mgd).

Because the project is driven by the projected flows from the Agilent historic entitlement agreement, it was not assigned a confidence level as it relates to monitored flows. This project should not be implemented until the City has more certainty on the parcel's plan to discharge its entitled flow.

It should also be noted that a trenchless crossing would be required to cross under Lawrence Expressway (from manhole S11-77 to S11-80) so the cost estimate assumes that the PTGAB construction method would be used for these segments.

5.7.2 Homestead Road

This project was assigned priority 3 as it is triggered under the long-term future peak wet weather flows in the unlined model network. The deficiency in the north Homestead trunk is just upstream of FMs 19 and 20. Neither flow meter surcharged during monitored wet weather flow events. As a result, the project has a confidence Level 3 because the downstream flow meters confirmed the flow but did not surcharge during the monitored events. This project is also highly dependent on the projected future incoming peak wet weather flows (13.8 mgd) from CuSD, which were based on the current contractual agreement. Any change to the contractual agreement affecting the maximum flow would affect the resulting deficiency and project.

It should also be noted that a trenchless crossing would be required to cross under Lawrence Expressway (from manhole S20-10 to S21-43) so the cost estimate assumes that the PTGAB construction method would be used for this segment. Special considerations should be given to the construction set up upstream of this crossing as manhole S20-10 houses the Lawrence/Homestead gate structure.

5.7.3 Kiely Boulevard

This project was assigned priority 6 as it is triggered under the long-term future peak wet weather flows in the unlined model network. Although its wastewater flow, design flow, and physical network triggers are the same as those assigned to the Homestead Road project, it is much lower priority because it is not located on an alignment that includes RCP trunks identified for future lining by the City.

The Kiely Boulevard trunk flowed into FM 13, which was located on the Bowers Avenue trunk a considerable distance downstream of the deficient segment. As a result, this project has a confidence Level 4 and conducting flow monitoring on the project reach prior to design would provide a greater level of confidence.

5.7.4 Victoria Avenue

This project was assigned priority 6 as it is triggered under the long-term future peak wet weather flows in the unlined model network. Although its wastewater flow, design flow, and physical network triggers are the same as those assigned to the Homestead Road project, it is much lower priority because it is not located on an alignment that includes RCP trunks identified for future lining by the City.

The Victoria Avenue trunk flowed into FM 26 which did not surcharge during the monitored rainfall events. FM 26 was downstream of the project (i.e., not on the Victoria Avenue trunk itself). The project therefore has confidence Level 3 as the model was confirmed to have reasonably accurate model flows based on model comparison to flow meter data, but there was no confirmed surcharging during the wet weather calibration events.

5.7.5 Cabrillo Avenue

This project was assigned priority 1 as it is triggered under the existing peak wet weather flows in the unlined model network. As discussed in **Section 4.5.5**, this project consists of the installation of two weirs to divert flow to segments with more capacity, which are reflected in the costs for the Cabrillo Avenue project.

The Cabrillo Avenue trunk flowed into FM 26 which did not surcharge during the monitored rainfall events. FM 26 was downstream of the project (i.e., not on the Cabrillo trunk itself). The project therefore has confidence Level 3 as the model was confirmed to have reasonably accurate model flows based on model comparison to flow meter data, but there was no confirmed surcharging during the wet weather calibration events.

5.7.6 CMC Basin

The segments in Santa Maria Ave and Amethyst Drive become deficient under existing loads and wet weather flow due to high rainfall-derived infiltration and inflow (RDI/I) that occur in the CMC basin. As a result, they have a priority ranking of 1.

The Amethyst Drive trunk flowed into FM 28 which surcharged during the monitored rainfall event on January 1st, 5th, and 9th, 2023. As a result, the project was assigned a high level of confidence (i.e., Level 1) because the need has been confirmed by previous flow monitoring data.

The Santa Maria Ave project flowed into FM 10. FM 10 showed a high RDI/I response during the monitored rainfall events but did not surcharge. This project was assigned a Level 2 confidence rating as the model was confirmed to have reasonably accurate model flows based on model comparison to flow meter data, but there was no confirmed surcharging during the wet weather calibration events.

The recommended capacity improvement upsizing project was developed to accommodate the flow during wet weather; however, the City also has the option to reduce the RDI/I in the basin. The cost of reducing the RDI/I would include smoke testing to identify specific sources of infiltration and additional flow monitoring in the basin. An annual allowance for these other non-construction costs is shown in **Section 5.5**.

5.7.7 Bowers Avenue

This project was assigned priority 4 as it is triggered under long-term future peak wet weather flows in the lined model network and is located on an alignment that includes RCP trunks identified for future lining by the City.

The Bowers Avenue deficiency was just downstream of flow meter 13 which did not surcharge during the monitored wet weather events. However, as described in **Section 3.4.3.1**, the 2022-2023 flow monitoring data at FM 13 showed that observed flows in the Bowers trunk at this location were significantly lower than the model-predicted flows based on the assumed system flow routing under normal conditions. Further investigation by Woodard & Curran and additional field surveys conducted by the City revealed that the system was not operating under normal conditions during the 2022-2023 flow monitoring program; the Lawrence/Homestead gate structure was routing significantly more flow to the trunk on Lawrence Expressway (80%) and only 20% to the trunk on Homestead Road, compared to the approximate 50/50 split that is observed during normal conditions. Additionally, City staff observed surcharge conditions farther downstream during dry weather, suggesting that some of the increased flows to the trunk on Lawrence Expressway were backing up through the El Sobrante overflow pipe towards FM 13 and away from FM 9A. Because of these atypical and temporary issues, a flow balance between FMs 13 and 9A was impossible to

achieve. Model-predicted flows assuming normal system flow routing were compared to the 2014-2015 flow monitoring data and matched more closely, but due to the inconsistencies discussed above with the 2022-2023 flow monitoring data, this project was assigned a confidence Level 5 (flow meter shows significantly different flow than model). Therefore, it is recommended that additional flow monitoring be conducted prior to design to provide a greater level of confidence in modeled flows.

It should be noted that the proposed alignment would require a trenchless crossing under the Caltrain railroad tracks (between manhole S53-7 and S63-36). Additionally, the alignment between manholes S63-36 and S63-27 has many bends and does not follow the Bowers Avenue public right-of-way (ROW). The design of the new project may want to consider realigning the sewer to be closer to Bowers Avenue.

5.7.8 Calabazas Trunk

The Calabazas Trunk project is triggered by existing wet weather flows in the lined model network and therefore was assigned a priority ranking of 2. The Calabazas Trunk Improvements assume that all deficiencies upstream have been relieved. Because this project is a higher priority than the projects upstream (i.e., Agilent and Homestead Road), this assumption should be considered during the design phase.

The deficient segments of the Calabazas trunk flowed into FM 9A located somewhat downstream. FM 9A did not surcharge during the monitored wet weather events. However, as described in **Section 3.4.3.1** and in **Section 5.7.7** above, inconsistencies with the 2022-2023 flow monitoring data made it impossible to achieve a flow balance at FMs 9A and 13. Due to the atypical flow routing, the model comparison to FM 9A is inconclusive. As a result, this project has confidence Level 5 (flow meter shows significantly different flow than model), and it is recommended that additional flow monitoring be conducted prior to design to provide a greater level of confidence in modeled flows.

It should be noted that the alignment would require a trenchless crossing under the Caltrain and private railroad tracks to the north (between manhole S52-4 and S62-52).

5.7.9 Freedom Circle

The proposed project was assigned priority ranking 5 as it is triggered by long-term future dry weather flows as a result of the proposed Freedom Circle Focus Area development project. It is therefore highly dependent on the final loads generated by the proposed development and should be reviewed should those flows change.

This project is driven by the projected flows from the Freedom Circle Focus Area specific development. As a result, it was not assigned a confidence level as it relates to monitored flows.

5.7.10 GAP West Trunk

The proposed project was assigned priority ranking 3 as it is triggered by long-term future loads combined with wet weather flow conditions in the unlined model network and is located on an alignment that includes RCP trunks identified for future lining by the City.

The GAP West trunk had a flow meter on the deficient sewer segment (FM 2). Flow monitoring data showed the sewer did not surcharge during the monitored wet weather events although the d/D ratio reached 75%. As a result, the project has a confidence Level 2 (flow meter on capacity deficient pipe reach confirms model flow, but did not surcharge).

It should be noted that the alignment would require a trenchless crossing under the Valley Transportation Authority (VTA) light rail tracks on West Tasman Drive.

Because of their interconnections, the GAP West and East trunks should be evaluated together during the pre-design and design phases.

5.7.11 GAP East Trunk

The proposed project was assigned priority ranking 4 as it is triggered under long-term future peak wet weather flows in the lined model network and is located on an alignment that includes RCP trunks identified for future lining by the City.

The GAP East trunk had FM 5 just upstream of the deficient sewer segment. However, the flow meter data did not show a surcharge condition under the monitored wet weather events. As a result, this project was assigned a confidence Level 2.

Because of their interconnections, the GAP West and East trunks should be evaluated together during the pre-design and design phases.

5.7.12 Bunker Hill East Lane

This project was assigned priority 7 (least priority) because it is triggered by long-term future loads as a result of a historic entitlement flow assumption from parcels with APNs 104-55-012 and 104-55-013 (site of the current Santa Clara Convention Center) under wet weather flows. During the pre-design phase, the City should verify the inverts along the alignment and at the downstream connection with the GAP East Trunk at manhole S93-7.

This project is driven by the projected flows from the historic entitlement agreement from the two parcels identified above. As a result, it was not assigned a confidence level as it relates to monitored flows.

5.7.13 Lafayette Street

This project was assigned priority 3 as it is triggered under long-term future peak wet weather flows in the unlined model network and is located on an alignment that includes RCP trunks identified for future lining by the City. As discussed in **Section 4.5.13**, the project would include re-sloping of some minimally sloped (approximately 0.02%) existing pipe segments according to record information. Due to lack of data, it was not possible to confirm if there are other utilities near the deficient segment in Lafayette Street. Therefore, the project alignment was developed assuming that there are no obstacles in upsizing and re-sloping the segments to relieve the deficiency. However, this assumption should be confirmed during the pre-design phase.

The Lafayette trunk had FM 1 on one of the deficient sewer segments. Flow monitoring data showed the sewer did not surcharge during the monitored wet weather events and the d/D ratio reached a maximum of 50%. As a result, the project has a confidence Level 2 (flow meter on capacity deficient pipe reach confirms model flow, but did not surcharge).

5.8 Schedule

A preliminary Sewer Capacity CIP schedule was developed and is presented in **Table 5-5**. Because none of the projects have a near-term future loads wastewater flow trigger, the projects are scheduled for either implementation within the next five years (2025-2030), if triggered by existing loads, or implementation within the next 10 years (or beyond 2035), if triggered by long-term future loads. Projects triggered by

entitlement flows (i.e., Agilent and Bunker Hill Lane East) are still listed for implementation beyond 2035; however, if the entitlement holders do not exercise their rights, then implementation of these projects would not be necessary. Preliminary design, including condition assessments (e.g., smoke testing, CCTV, etc.), final design, and permitting activities should commence two (2) to three (3) years prior to project trigger. It is worth noting that all costs are calculated in August 2024 dollars; thus, if a project is scheduled to be constructed in 2035, the cost should be scaled to 2035 using an escalation factor of 3% to 5% per year.

TABLE 5-5: CAPACITY IMPROVEMENT PROJECTS SCHEDULE

Project No.	Project ID	Schedule
1	Agilent	2035
2	Homestead Road	2035
3	Kiely Boulevard	2035
4	Victoria Avenue	2035
5	Cabrillo Avenue	2025
6	CMC Basin	2025
7	Bowers Avenue	2035
8	Calabazas Trunk	2025
9	Freedom Circle	2035
12	GAP West Trunk	2035
13	GAP East Trunk	2035
14	Bunker Hill Lane East	2035
15	Lafayette Street	2035

5.9 Implementation Recommendations

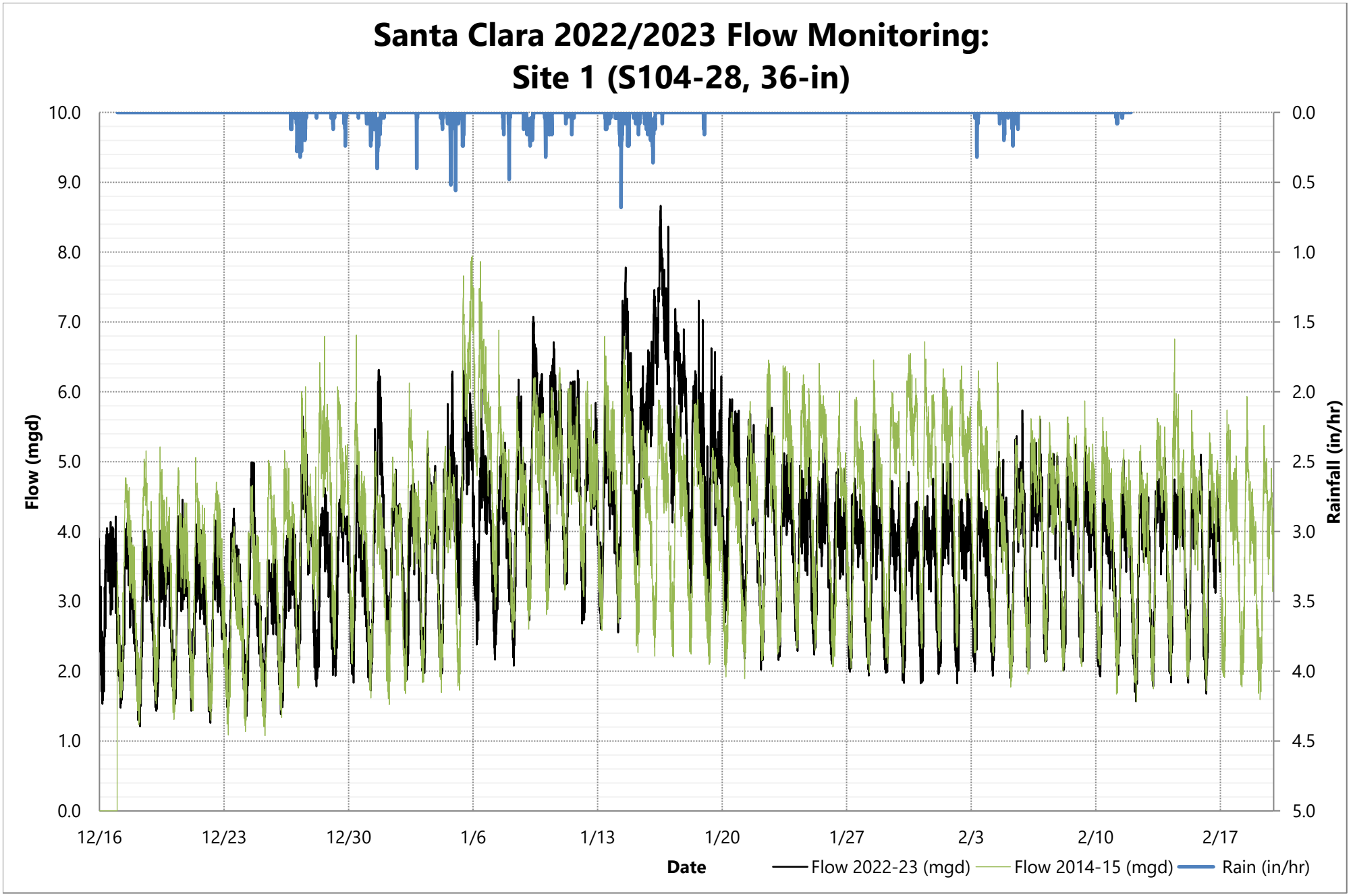
The City should begin implementation of the Sewer Capacity CIP recommended in this Master Plan Update, starting with the highest priority projects needed to address existing system capacity deficiencies. The following items should be considered in project scheduling and design, and in future updates of the Master Plan:

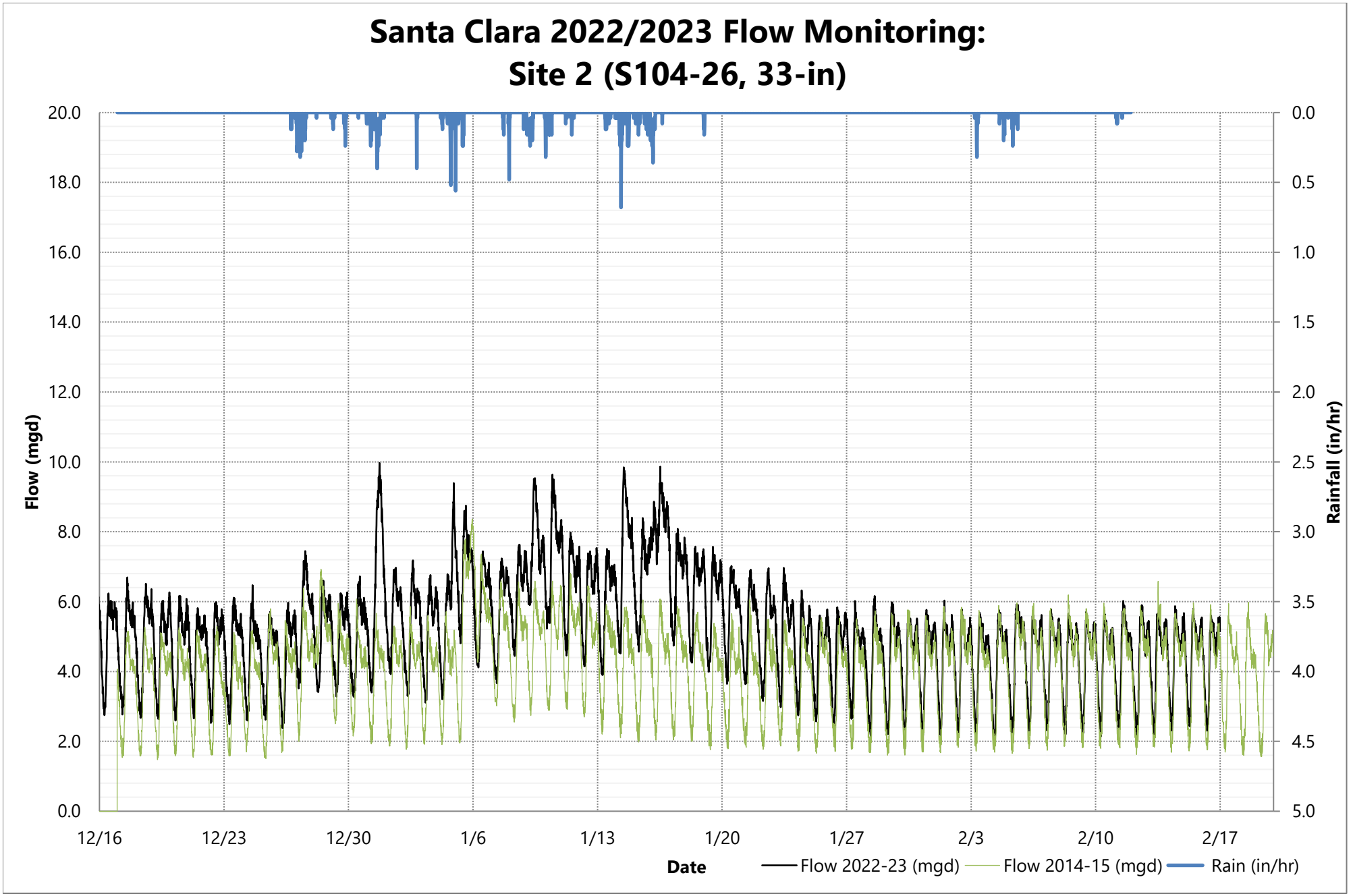
- The City should consider conducting additional flow monitoring or observation to document flow levels during large storm events at locations in the system where the model predicts significant surcharge or where there is a significant difference between previous flow monitoring conducted and the model results. Flow levels during large storm events should be compared to the water levels simulated by the hydraulic model to verify if the modeling predictions for the design storm seem reasonable, and to confirm the need for and, if necessary, refine project sizing.
- The alignments and sizes of all recommended projects should be verified with detailed pre-design analyses, including topographic surveys, geotechnical investigations, utility research, and constructability reviews. Detailed pre-design analyses should consider feasibility of trenchless construction methods including pipe-bursting and Pilot Tube Guided Auger Boring (PTGAB), especially at major roadway, railway, and creek crossings.
- The decision to parallel or replace existing sewers should consider the physical condition and remaining useful life of the existing pipelines and laterals; the availability of pipeline corridors for new sewer construction; and operation and maintenance concerns.

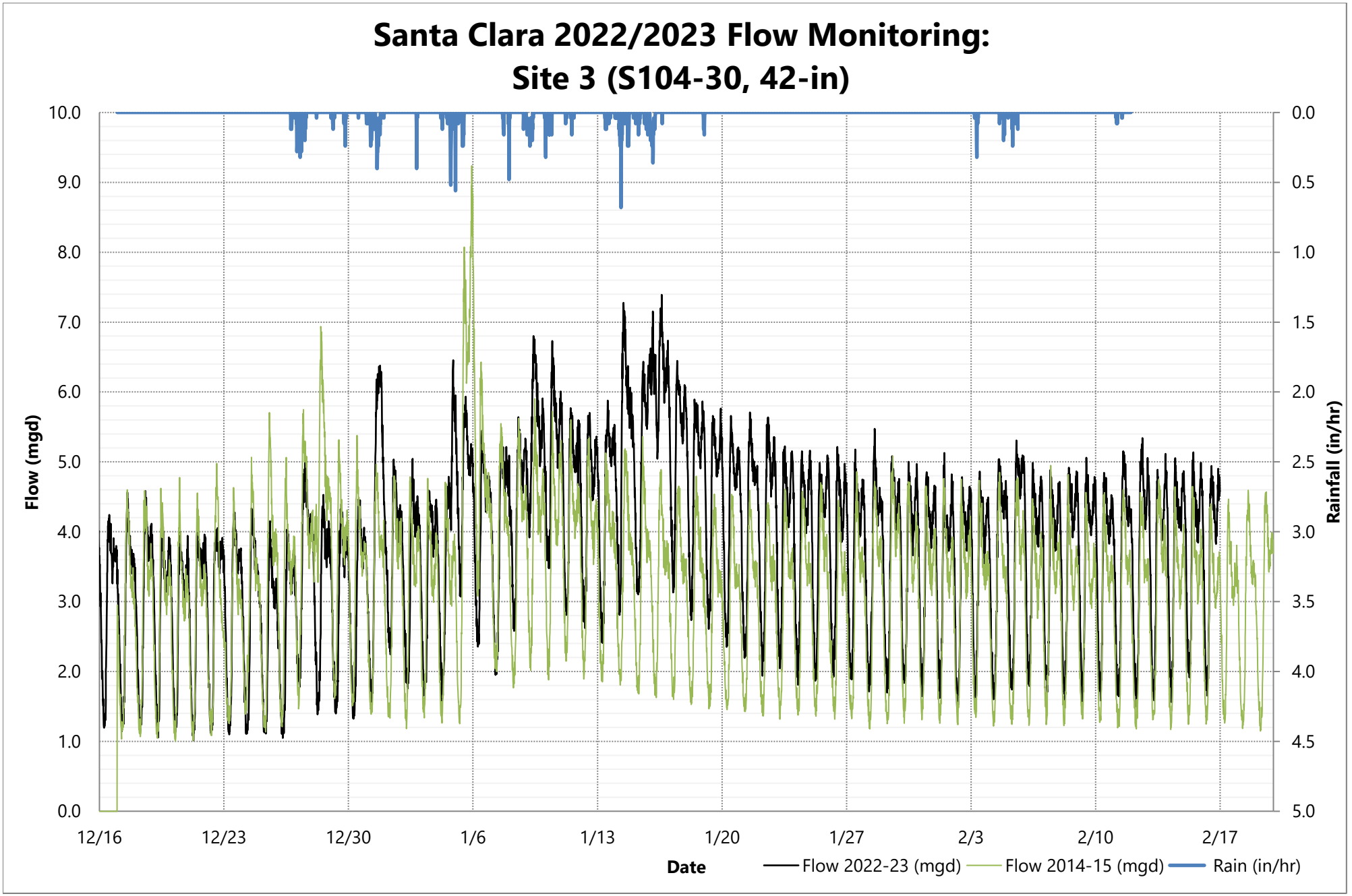
- Capacity improvement projects triggered by long-term future flow assumptions associated with entitlement agreements would not need to be implemented until the entitled parcel(s) begin to discharge their entitled flow(s).
- The hydraulic model has been developed to assist the City in performing capacity analyses and updating the Master Plan in the future. The model should be kept up to date with any changes to existing sewer connections, development plans, and sewer system facilities.

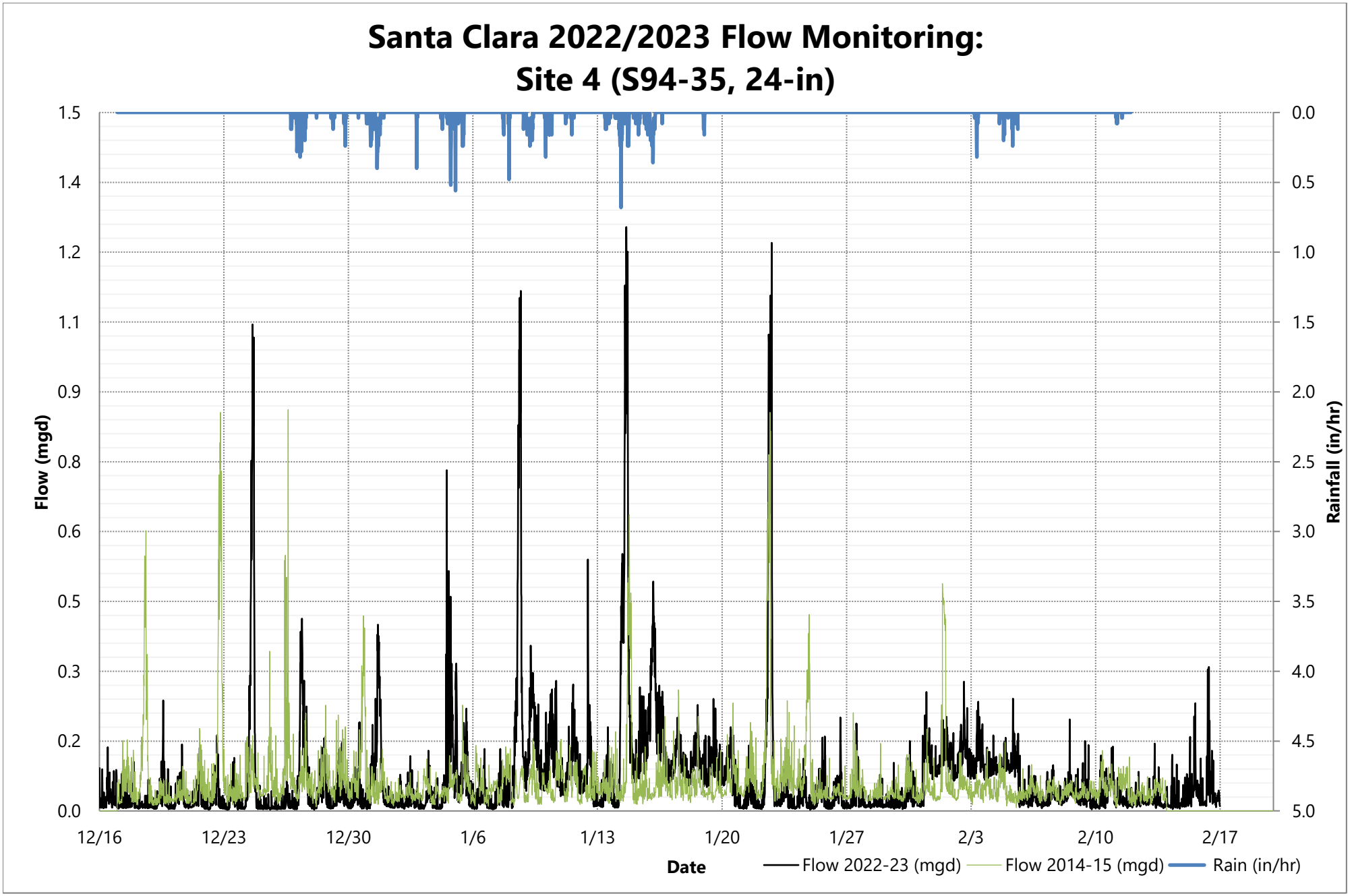
This Master Plan Update report is intended to be a working document to be refined and updated as additional data and new planning information become available. The capacity assessment should be updated whenever there are major changes in planning assumptions or, at a minimum, every five to ten years.

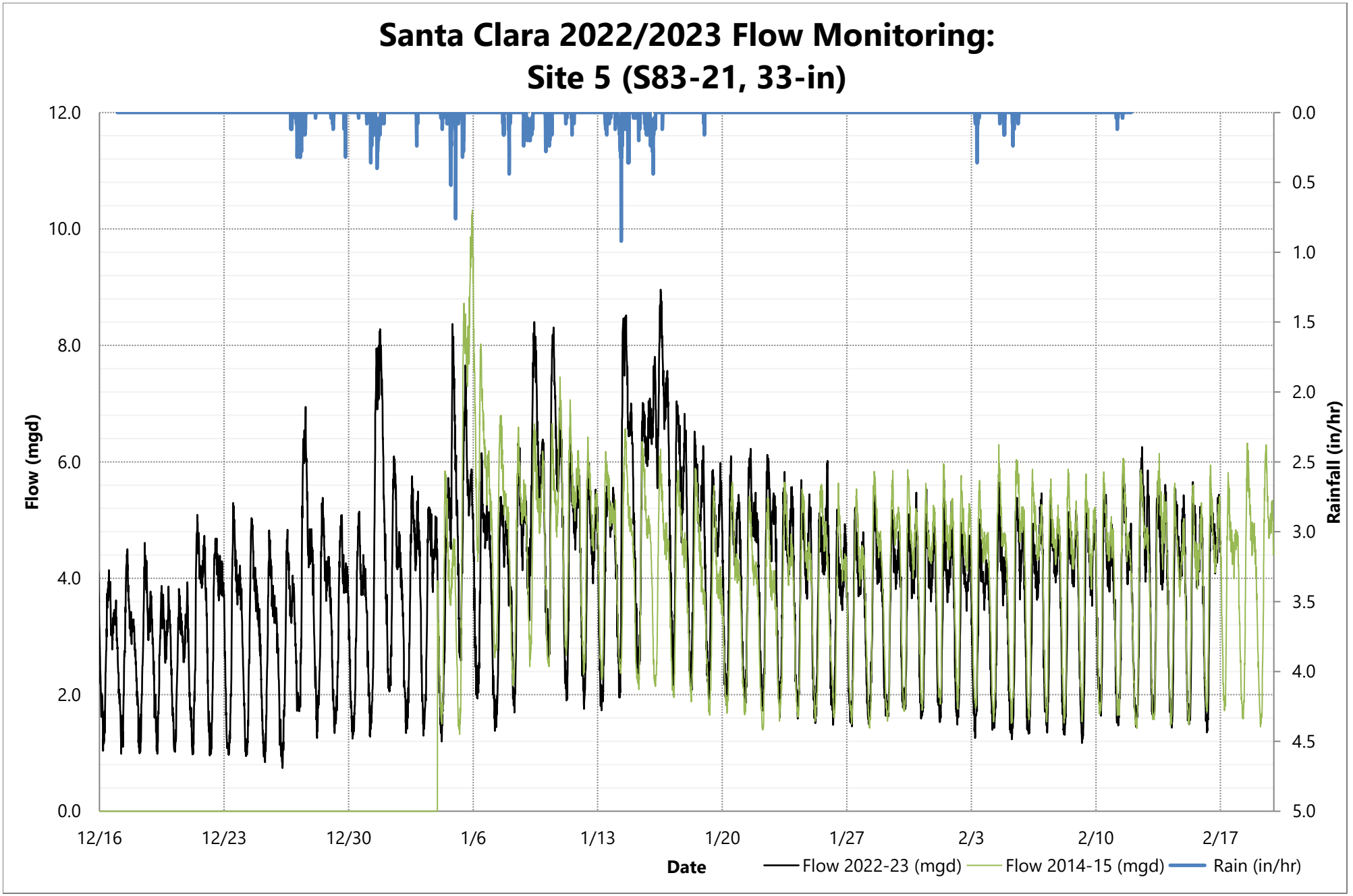
APPENDIX A: FLOW MONITORING DATA PLOTS

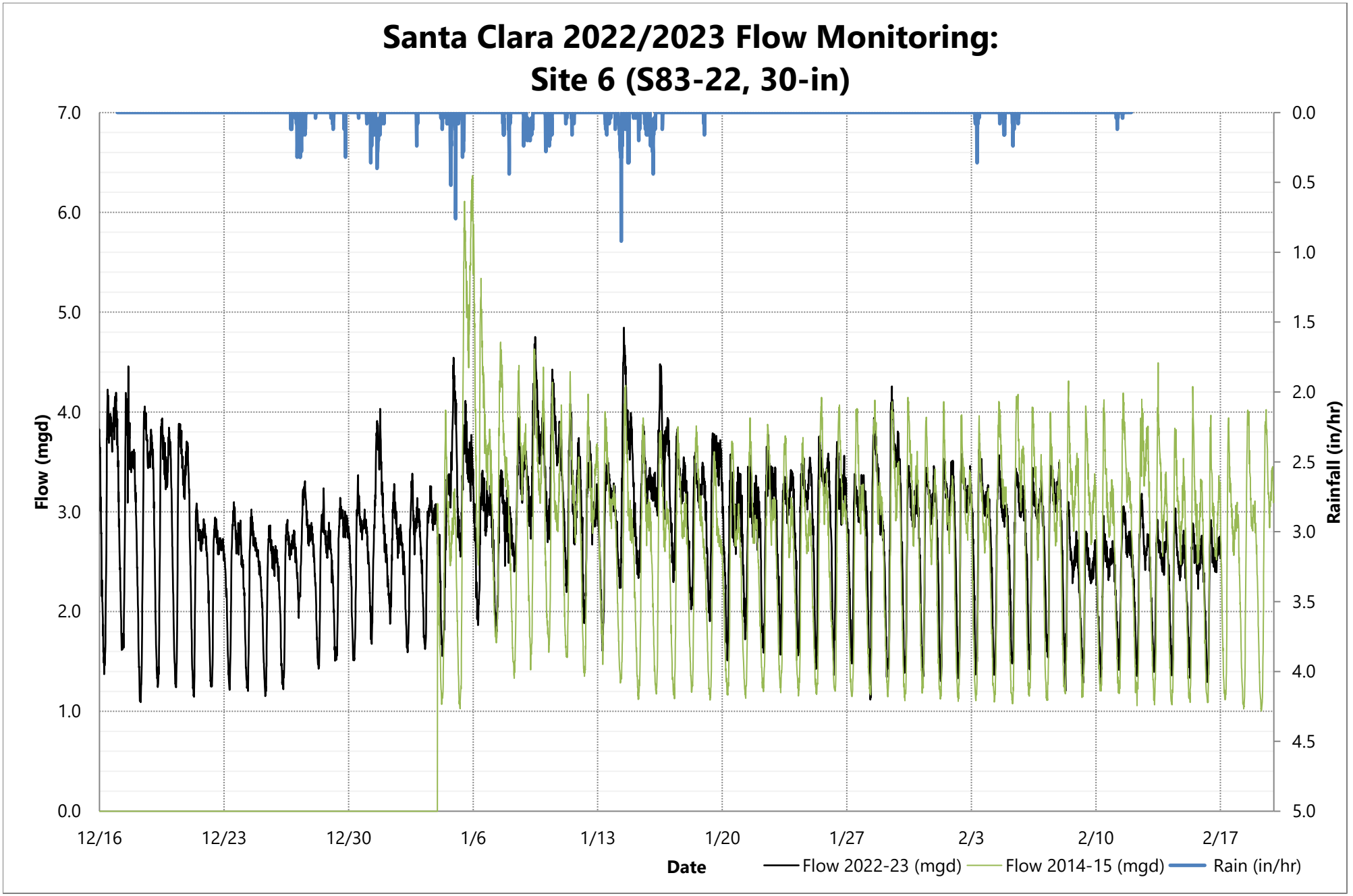

Santa Clara 2022/2023 Flow Monitoring:
Site 1 (S104-28, 36-in)
Flow (mgd)
Rainfall (in/hr)
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
12/16
12/23
12/30
1/6
1/13
1/20
1/27
2/3
2/10
2/17
Date
Flow 2022-23 (mgd)
Flow 2014-15 (mgd)
Rain (in/hr)

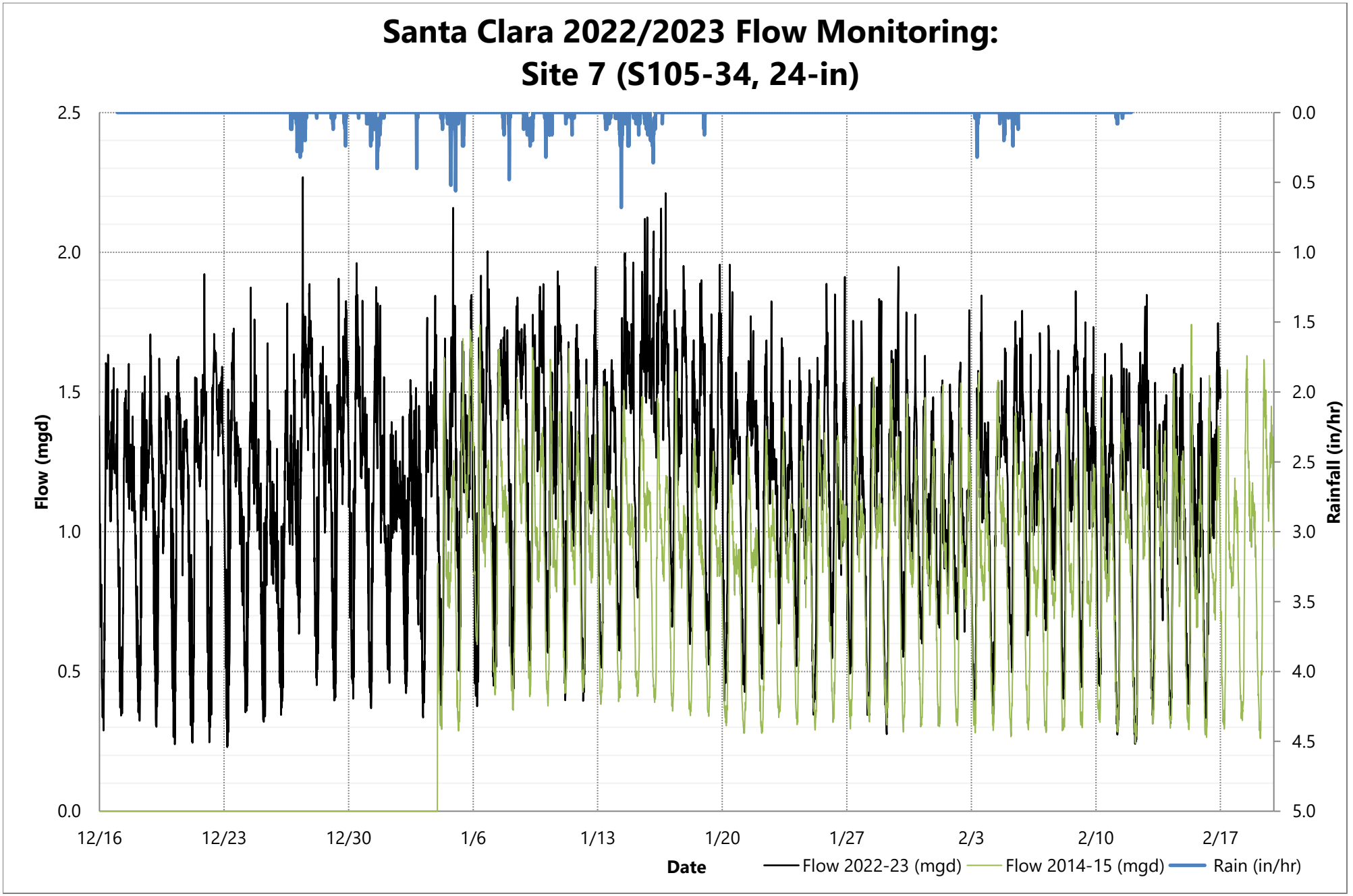

Santa Clara 2022/2023 Flow Monitoring:
Site 2 (S104-26, 33-in)
Flow (mgd)
Rainfall (in/hr)
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
12/16
12/23
12/30
1/6
1/13
1/20
1/27
2/3
2/10
2/17
Date
Flow 2022-23 (mgd)
Flow 2014-15 (mgd)
Rain (in/hr)


Santa Clara 2022/2023 Flow Monitoring:
Site 3 (S104-30, 42-in)
Flow (mgd)
Rainfall (in/hr)
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
12/16
12/23
12/30
1/6
1/13
1/20
1/27
2/3
2/10
2/17
Date
Flow 2022-23 (mgd)
Flow 2014-15 (mgd)
Rain (in/hr)

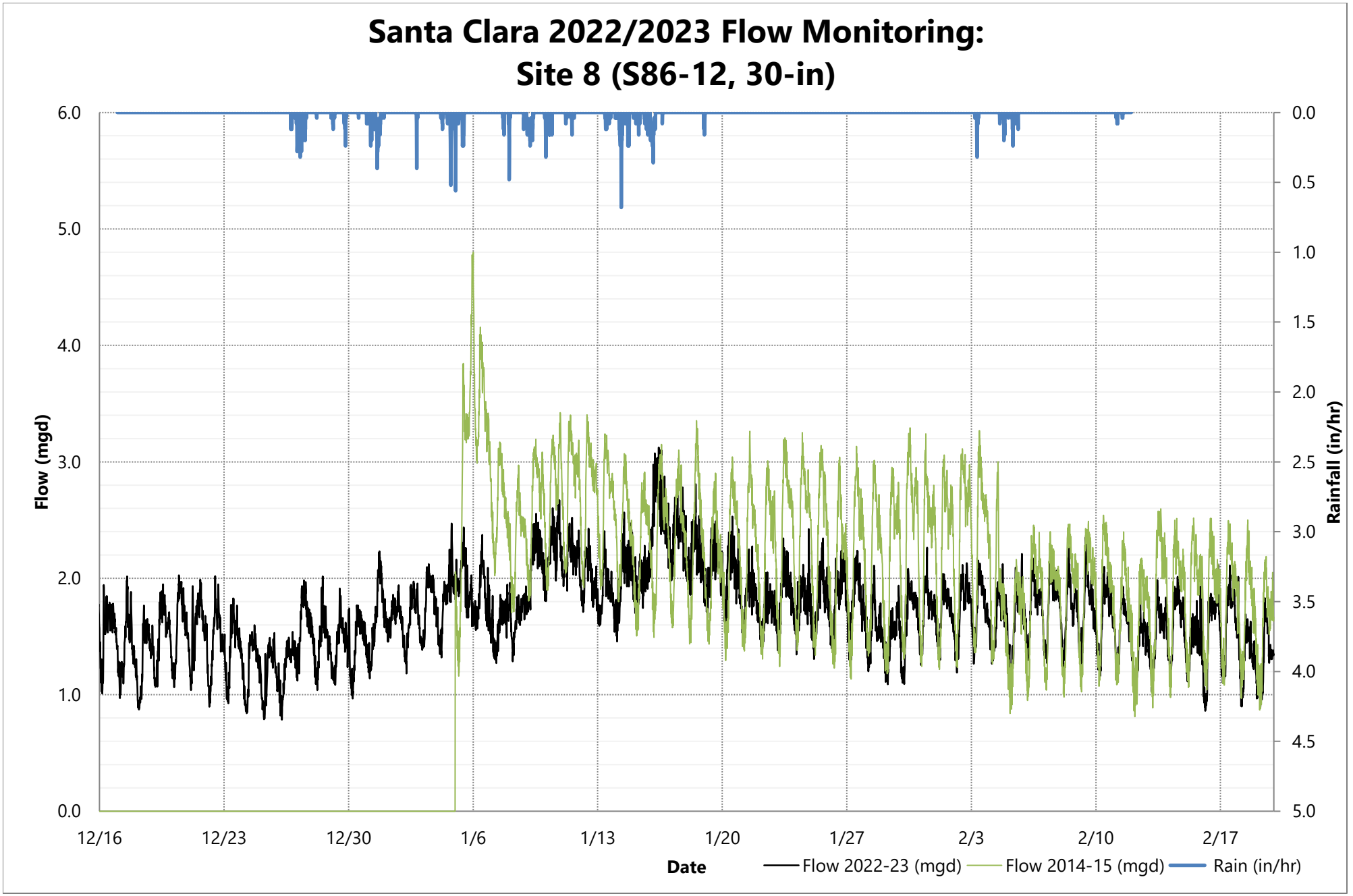

Santa Clara 2022/2023 Flow Monitoring:
Site 4 (S94-35, 24-in)
Flow (mgd)
Rainfall (in/hr)
1.5
1.4
1.2
1.1
0.9
0.8
0.6
0.5
0.3
0.2
0.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
12/16
12/23
12/30
1/6
1/13
1/20
1/27
2/3
2/10
2/17
Date
Flow 2022-23 (mgd)
Flow 2014-15 (mgd)
Rain (in/hr)

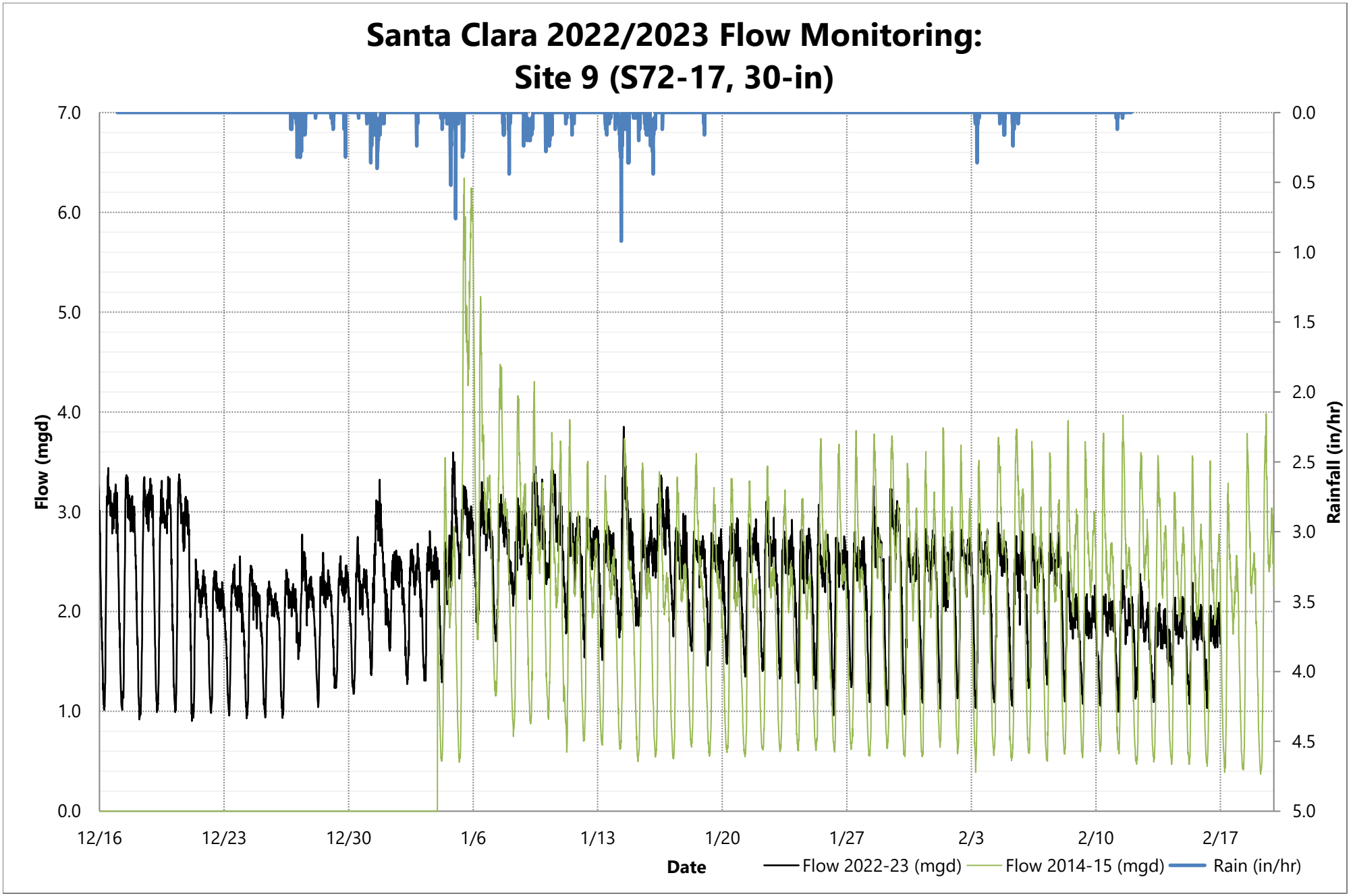

Santa Clara 2022/2023 Flow Monitoring:
Site 5 (S83-21, 33-in)
Flow (mgd)
Rainfall (in/hr)
12.0
10.0
8.0
6.0
4.0
2.0
0.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
12/16
12/23
12/30
1/6
1/13
1/20
1/27
2/3
2/10
2/17
Date
Flow 2022-23 (mgd)
Flow 2014-15 (mgd)
Rain (in/hr)

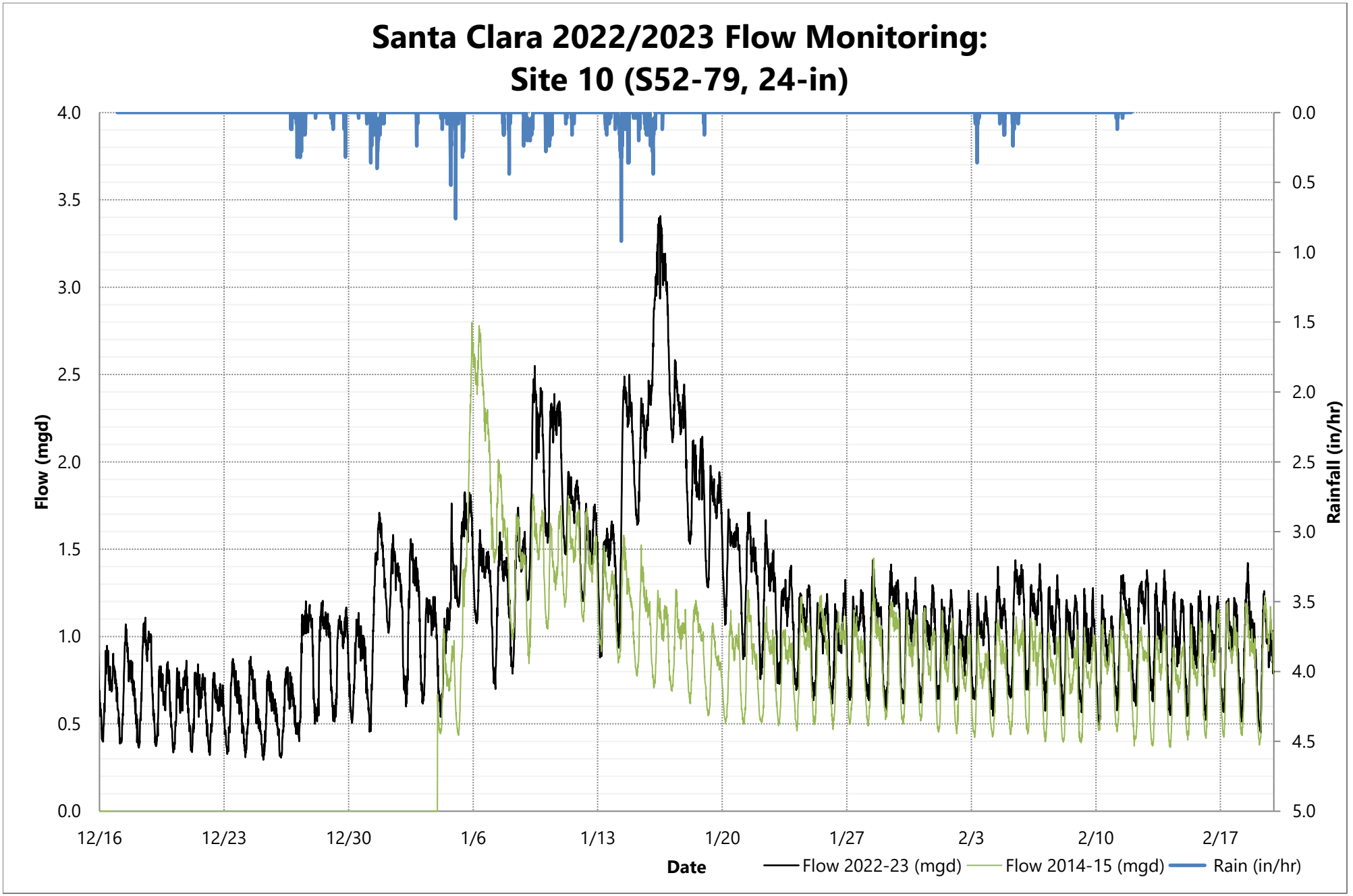

Santa Clara 2022/2023 Flow Monitoring:
Site 6 (S83-22, 30-in)
Flow (mgd)
Rainfall (in/hr)
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
12/16
12/23
12/30
1/6
1/13
1/20
1/27
2/3
2/10
2/17
Date
Flow 2022-23 (mgd)
Flow 2014-15 (mgd)
Rain (in/hr)

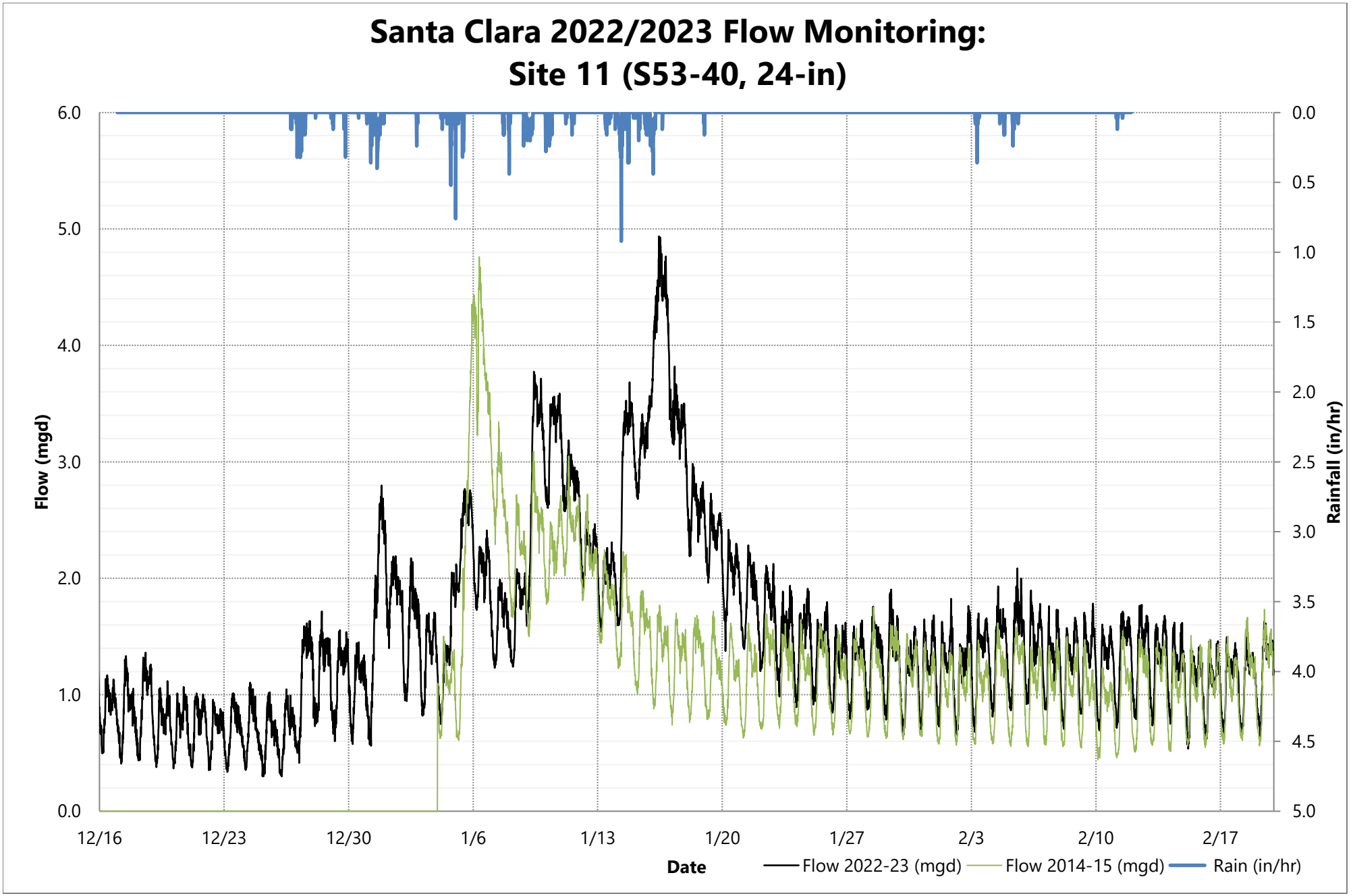

Santa Clara 2022/2023 Flow Monitoring:
Site 7 (S105-34, 24-in)
Flow (mgd)
Rainfall (in/hr)
2.5
2.0
1.5
1.0
0.5
0.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
12/16
12/23
12/30
1/6
1/13
1/20
1/27
2/3
2/10
2/17
Date
Flow 2022-23 (mgd)
Flow 2014-15 (mgd)
Rain (in/hr)

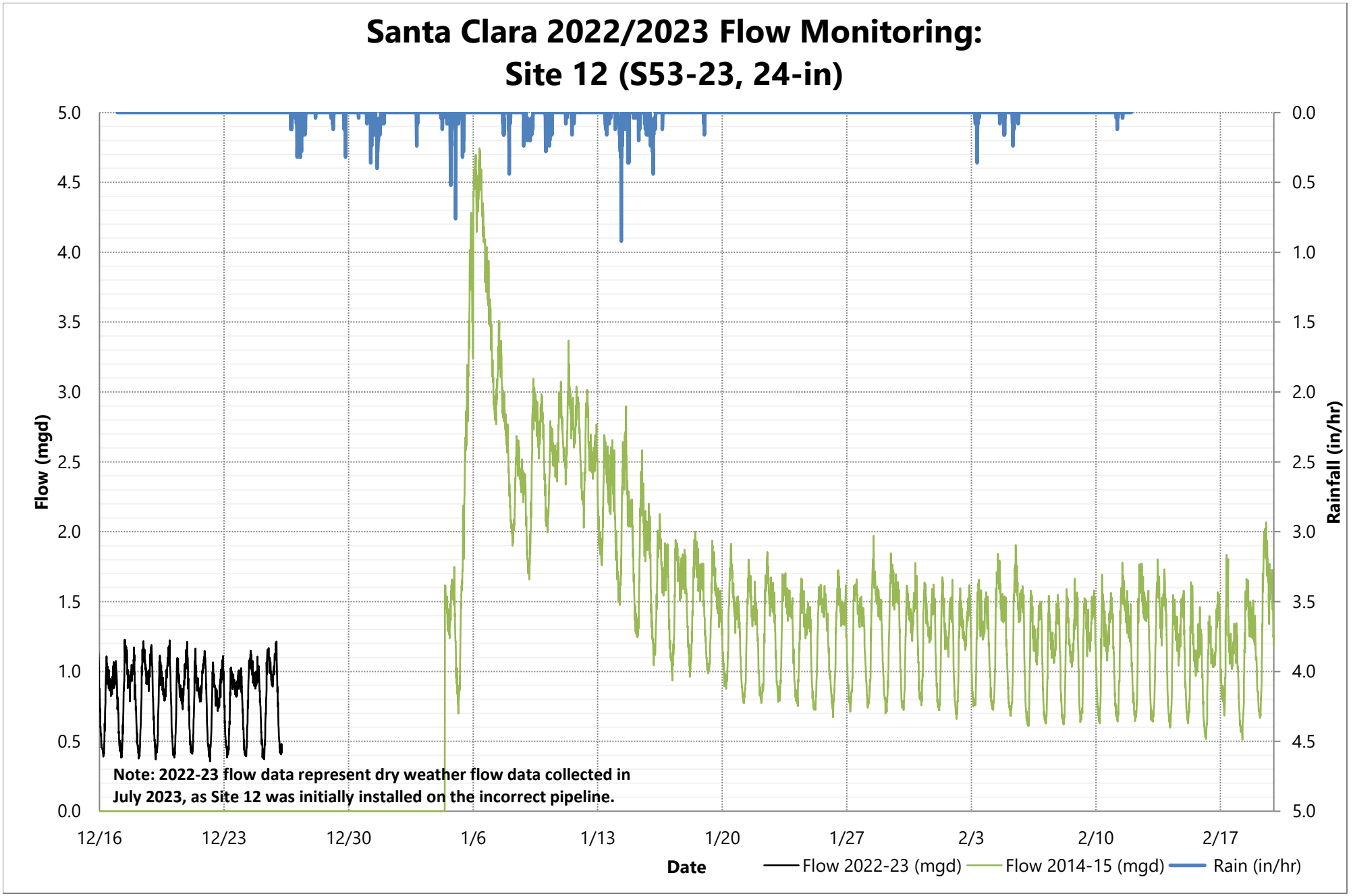
Santa Clara 2022/2023 Flow Monitoring: Site 8 (S86-12, 30-in)

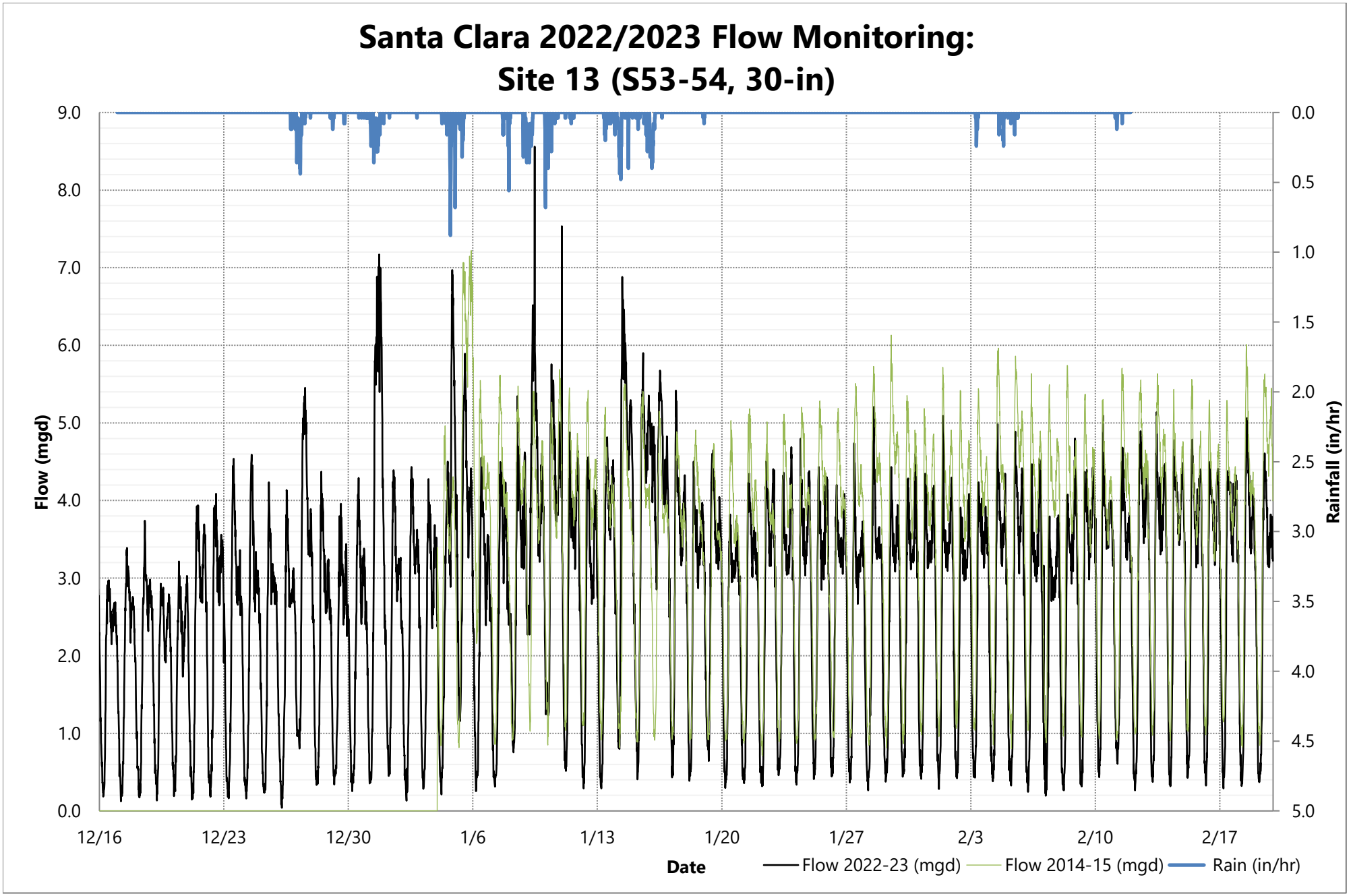


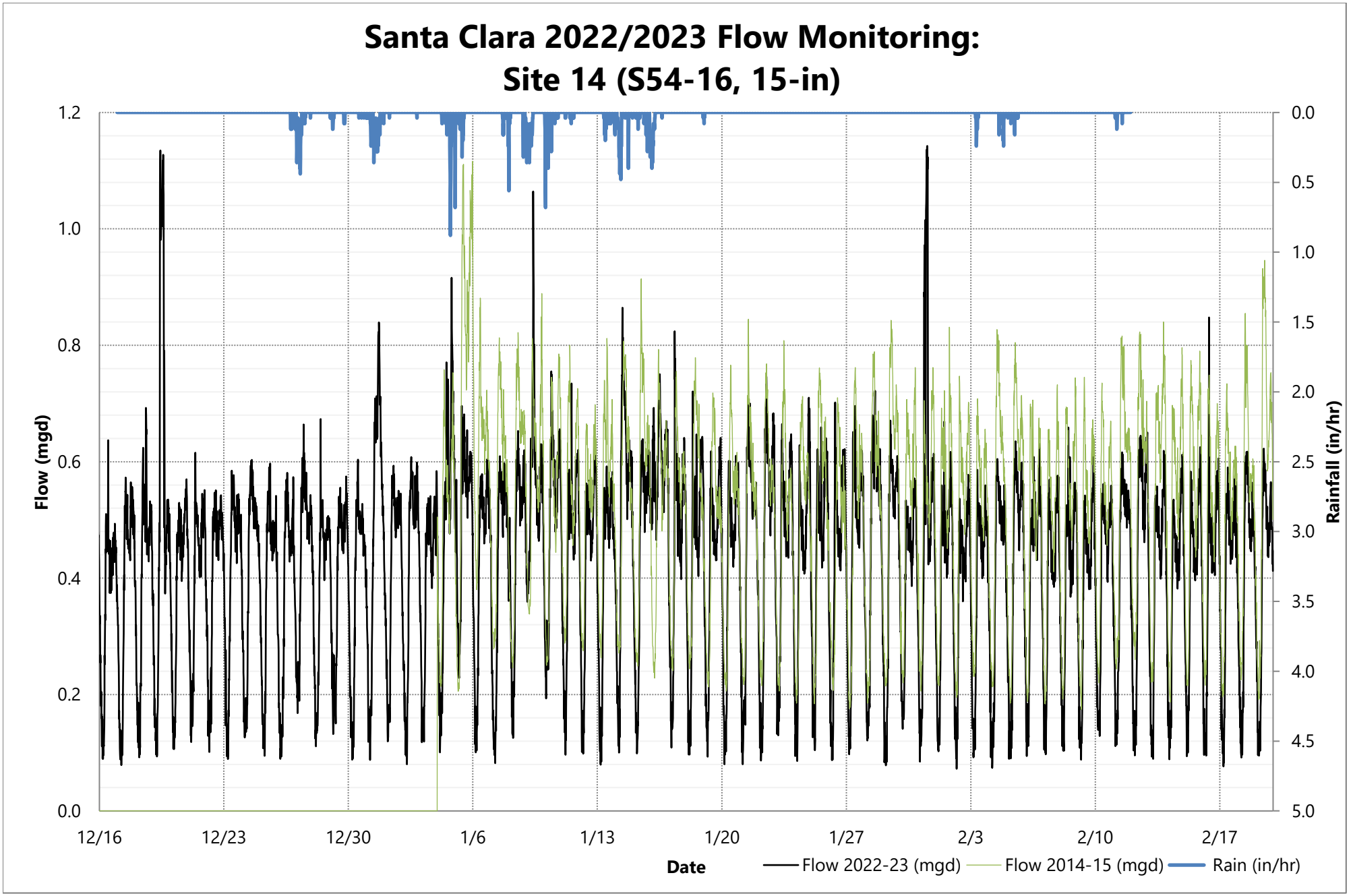

Santa Clara 2022/2023 Flow Monitoring:
Site 9 (S72-17, 30-in)
Flow (mgd)
Rainfall (in/hr)
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
12/16
12/23
12/30
1/6
1/13
1/20
1/27
2/3
2/10
2/17
Date
Flow 2022-23 (mgd)
Flow 2014-15 (mgd)
Rain (in/hr)

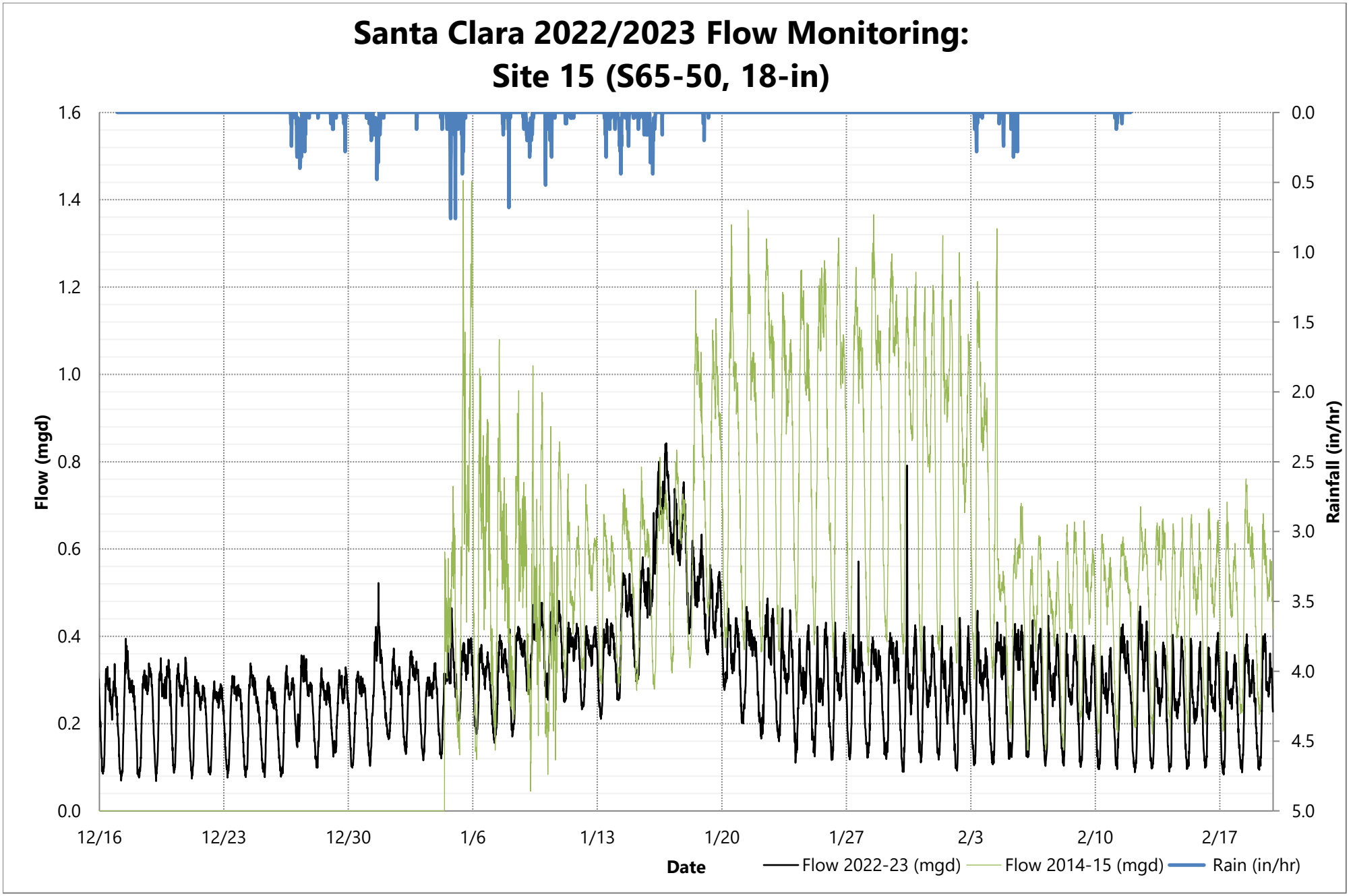

Santa Clara 2022/2023 Flow Monitoring:
Site 10 (S52-79, 24-in)
Flow (mgd)
Rainfall (in/hr)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
12/16
12/23
12/30
1/6
1/13
1/20
1/27
2/3
2/10
2/17
Date
Flow 2022-23 (mgd)
Flow 2014-15 (mgd)
Rain (in/hr)

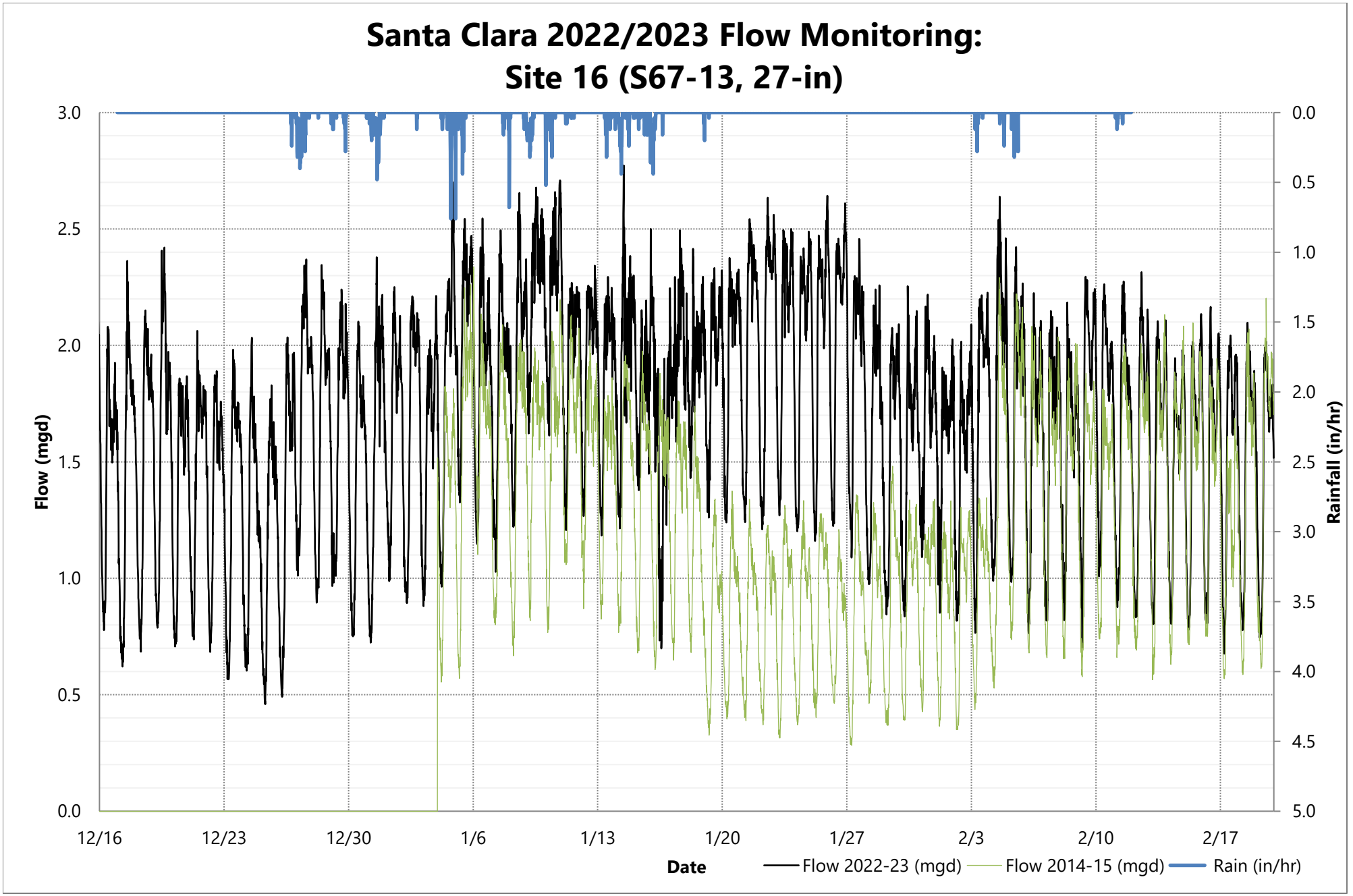

Santa Clara 2022/2023 Flow Monitoring:
Site 11 (S53-40, 24-in)
Flow (mgd)
Rainfall (in/hr)
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
12/16
12/23
12/30
1/6
1/13
1/20
1/27
2/3
2/10
2/17
Date
Flow 2022-23 (mgd)
Flow 2014-15 (mgd)
Rain (in/hr)

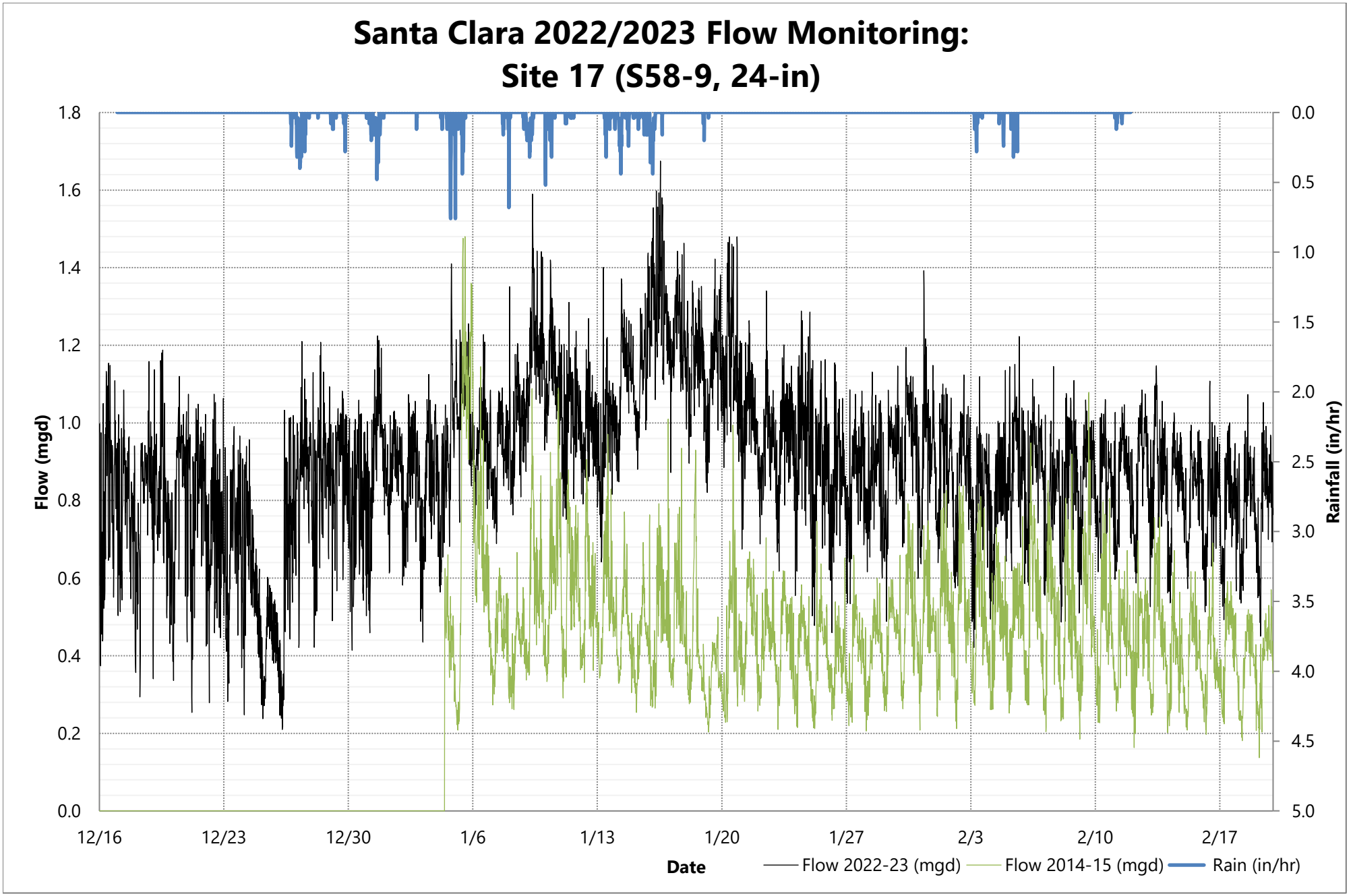

Santa Clara 2022/2023 Flow Monitoring:
Site 12 (S53-23, 24-in)
Flow (mgd)
Rainfall (in/hr)
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
12/16
12/23
12/30
1/6
1/13
1/20
1/27
2/3
2/10
2/17
Date
Note: 2022-23 flow data represent dry weather flow data collected in July 2023, as Site 12 was initially installed on the incorrect pipeline.
Flow 2022-23 (mgd)
Flow 2014-15 (mgd)
Rain (in/hr)

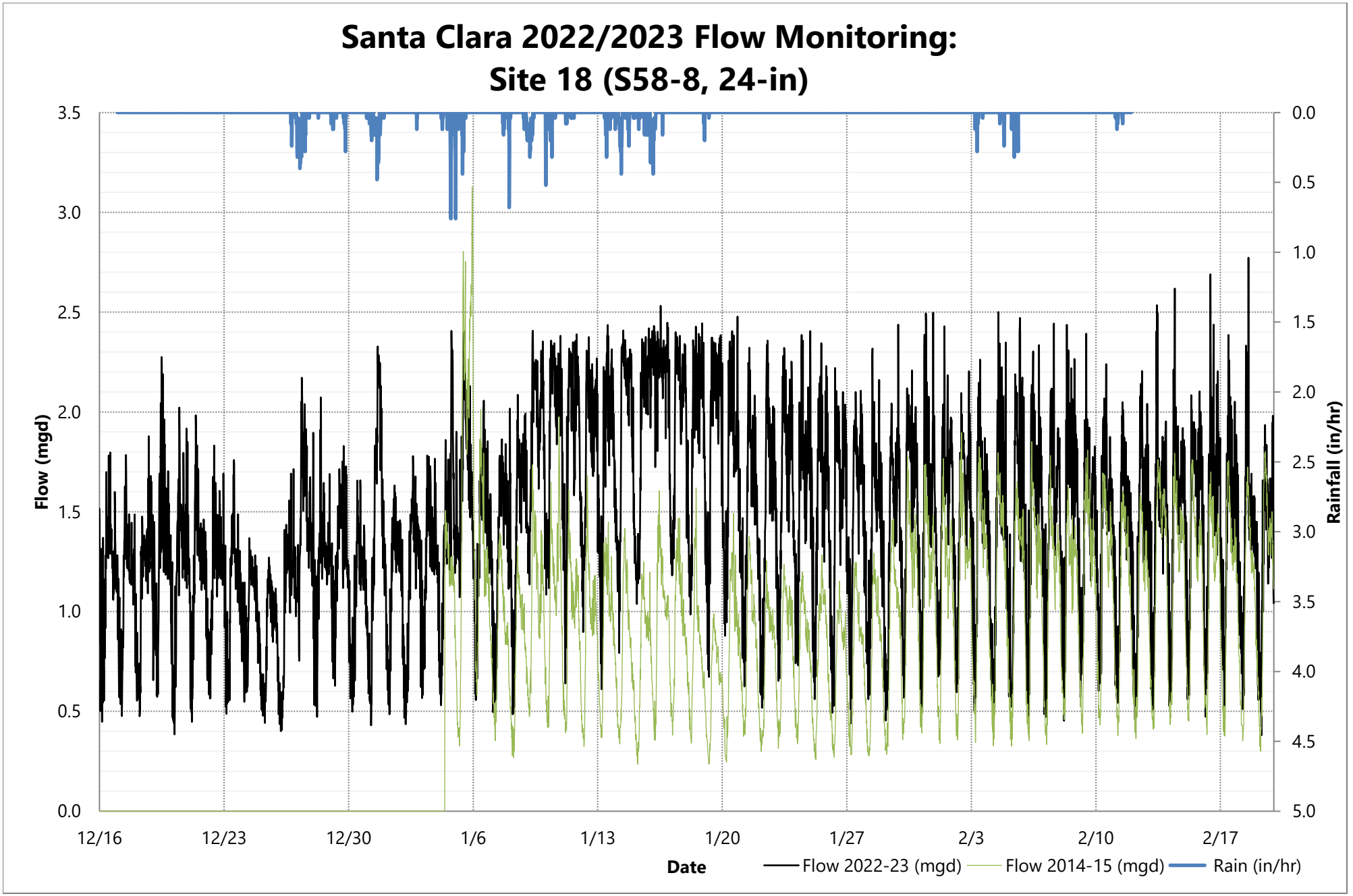

Santa Clara 2022/2023 Flow Monitoring:
Site 13 (S53-54, 30-in)
Flow (mgd)
Rainfall (in/hr)
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
12/16
12/23
12/30
1/6
1/13
1/20
1/27
2/3
2/10
2/17
Date
Flow 2022-23 (mgd)
Flow 2014-15 (mgd)
Rain (in/hr)

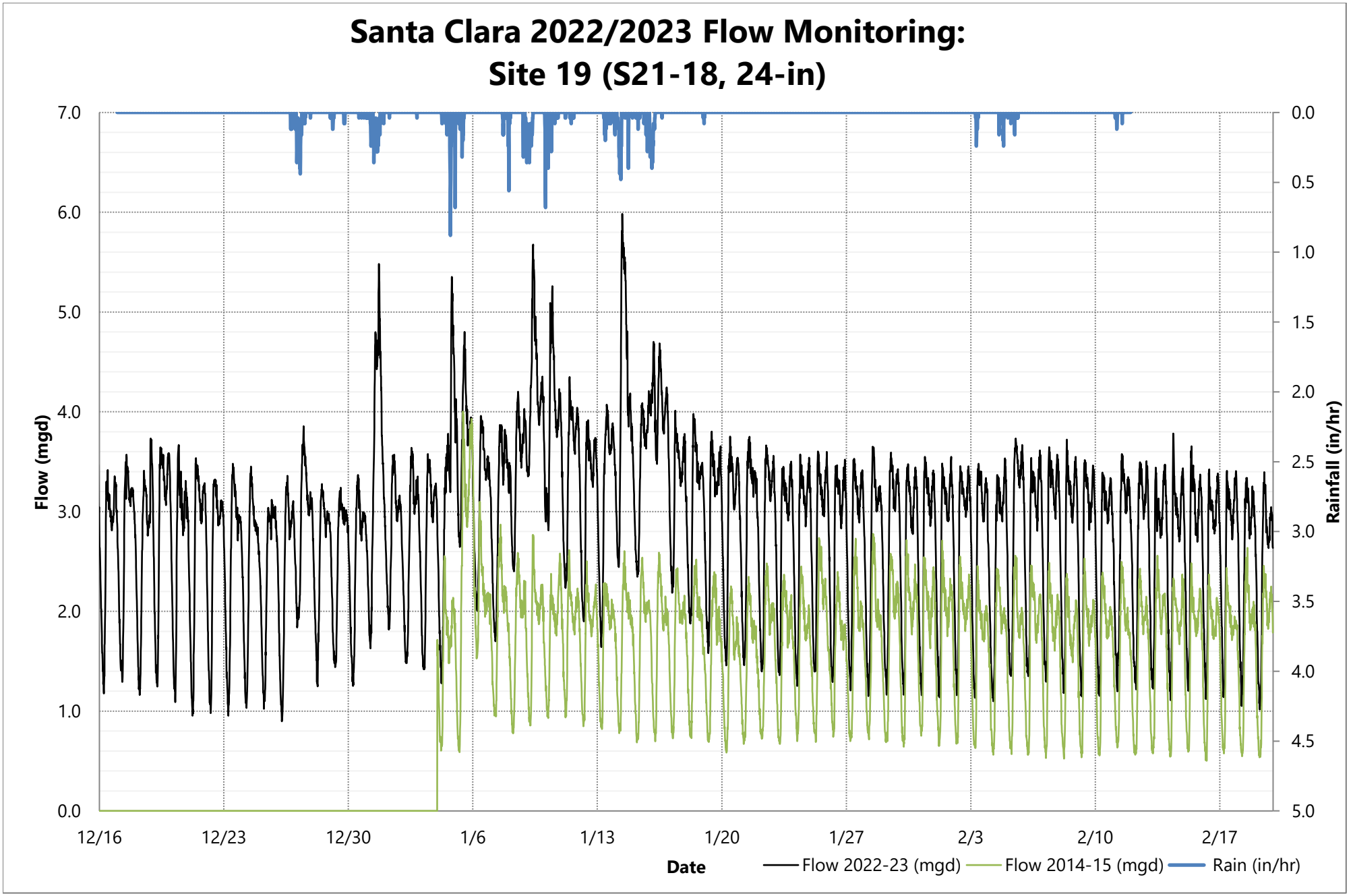

Santa Clara 2022/2023 Flow Monitoring:
Site 14 (S54-16, 15-in)
Flow (mgd)
Rainfall (in/hr)
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
12/16
12/23
12/30
1/6
1/13
1/20
1/27
2/3
2/10
2/17
Date
Flow 2022-23 (mgd)
Flow 2014-15 (mgd)
Rain (in/hr)

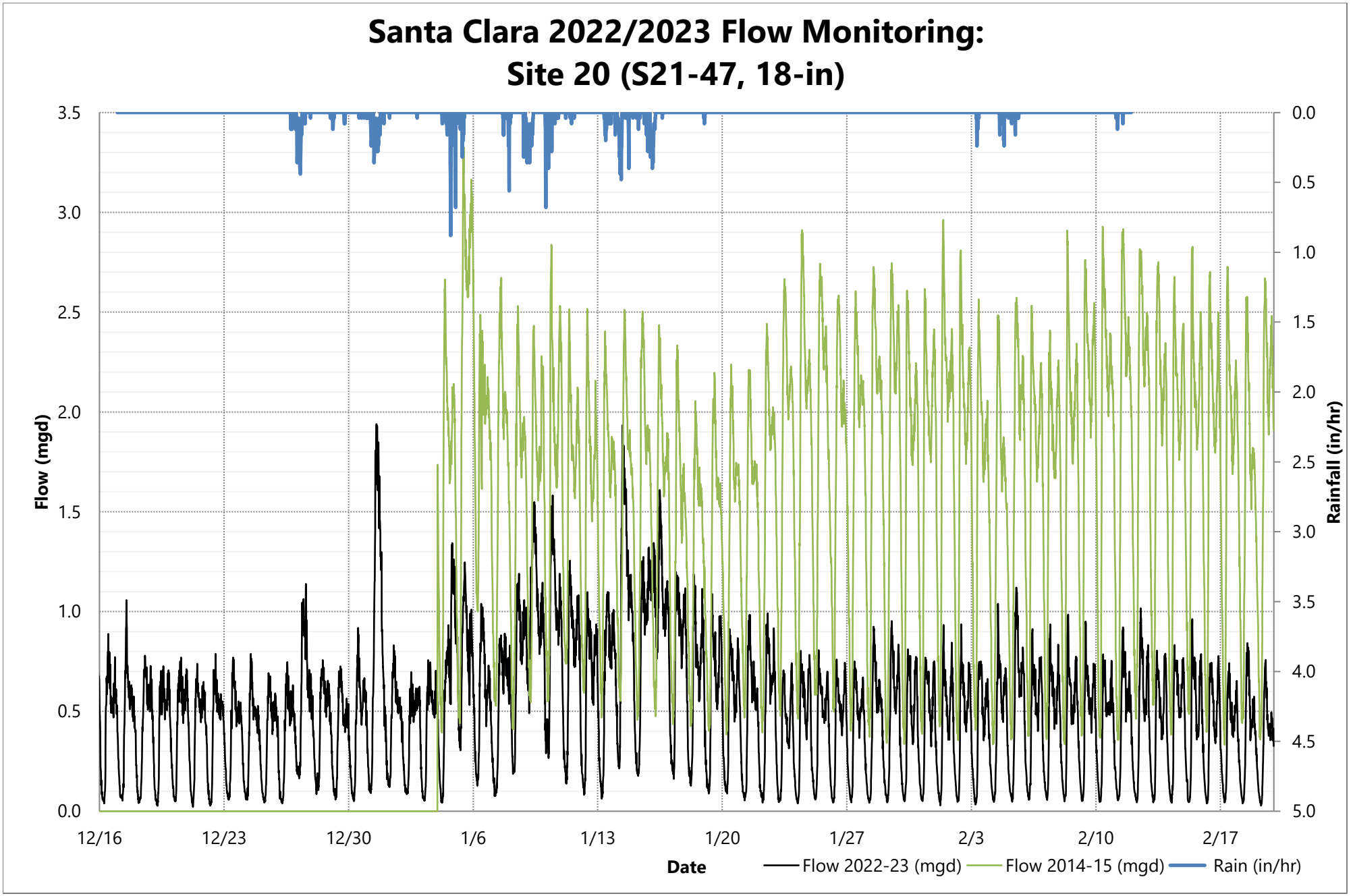

Santa Clara 2022/2023 Flow Monitoring:
Site 15 (S65-50, 18-in)
Flow (mgd)
Rainfall (in/hr)
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
12/16
12/23
12/30
1/6
1/13
1/20
1/27
2/3
2/10
2/17
Date
Flow 2022-23 (mgd)
Flow 2014-15 (mgd)
Rain (in/hr)

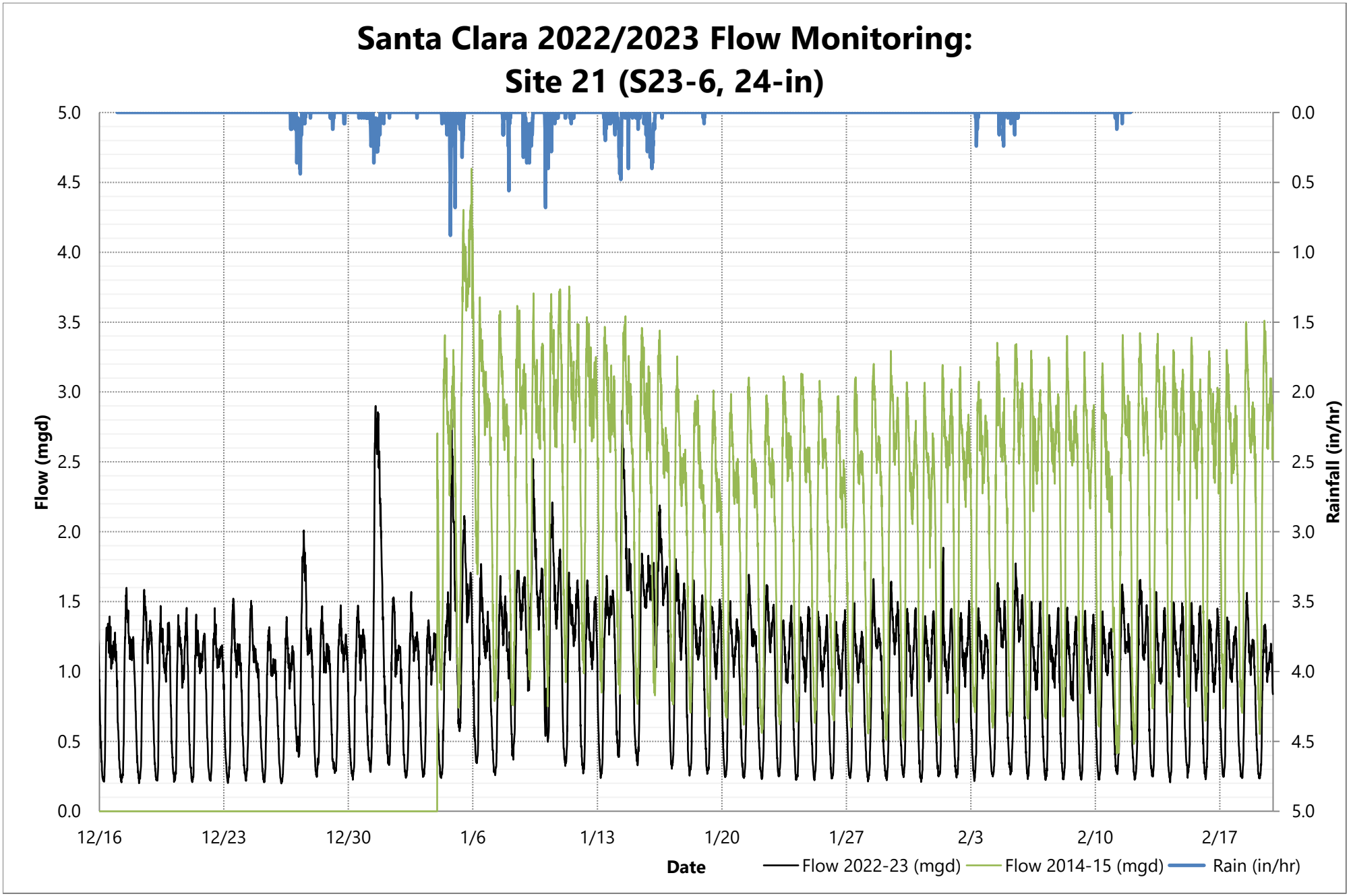

Santa Clara 2022/2023 Flow Monitoring:
Site 16 (S67-13, 27-in)
Flow (mgd)
Rainfall (in/hr)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
12/16
12/23
12/30
1/6
1/13
1/20
1/27
2/3
2/10
2/17
Date
Flow 2022-23 (mgd)
Flow 2014-15 (mgd)
Rain (in/hr)

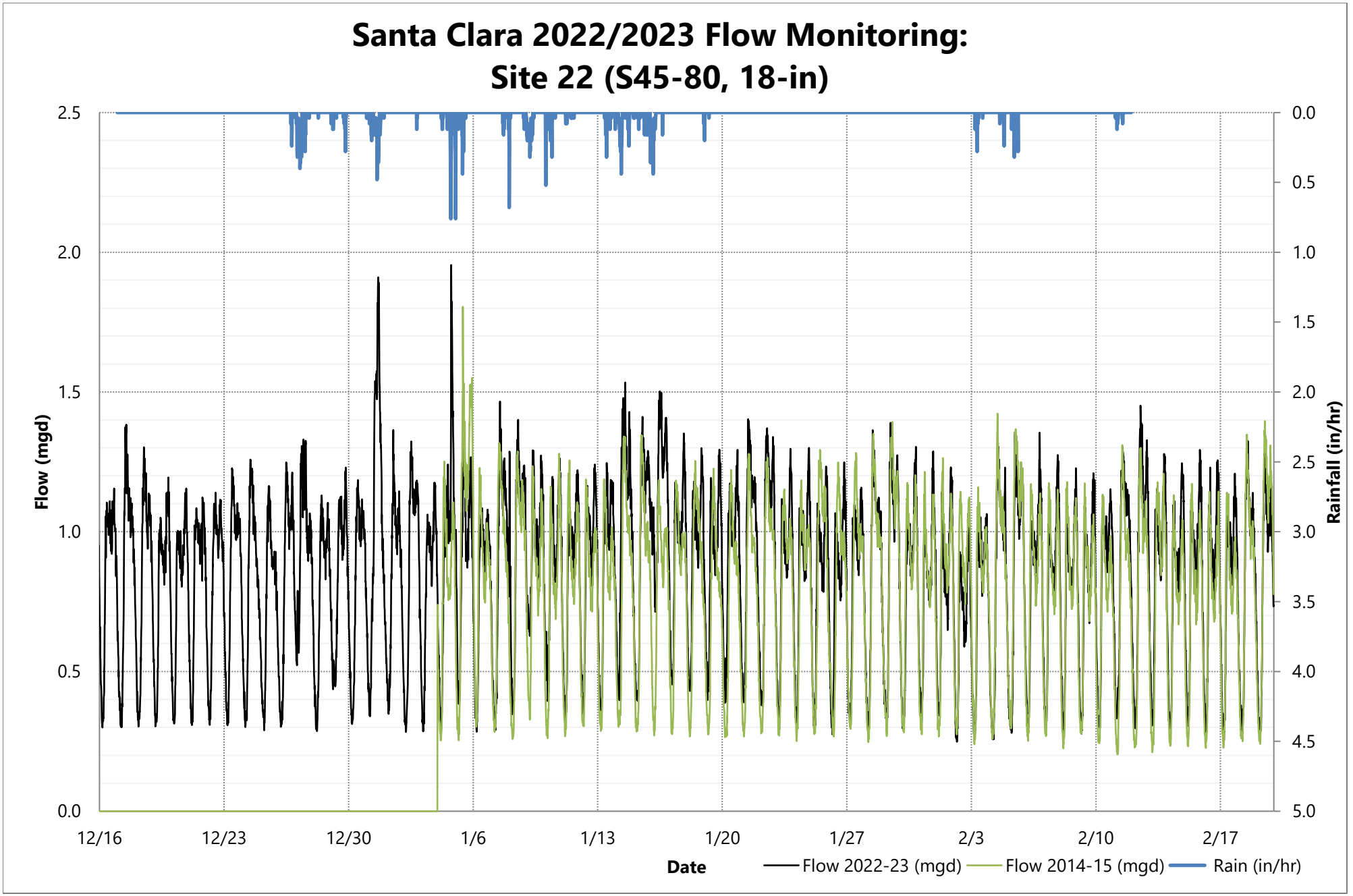

Santa Clara 2022/2023 Flow Monitoring:
Site 17 (S58-9, 24-in)
Flow (mgd)
Rainfall (in/hr)
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
12/16
12/23
12/30
1/6
1/13
1/20
1/27
2/3
2/10
2/17
Date
Flow 2022-23 (mgd)
Flow 2014-15 (mgd)
Rain (in/hr)

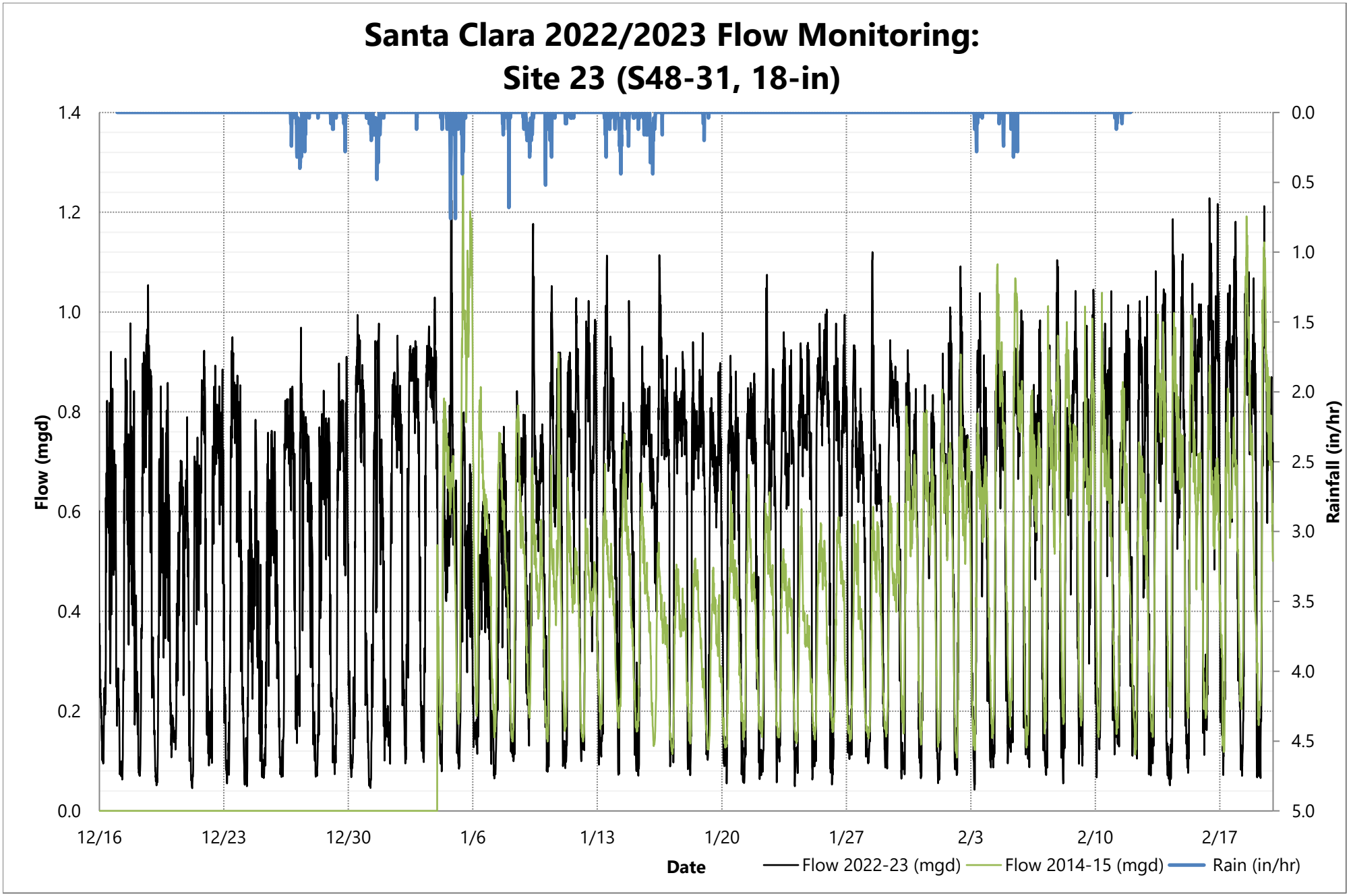

Santa Clara 2022/2023 Flow Monitoring:
Site 18 (S58-8, 24-in)
Flow (mgd)
Rainfall (in/hr)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
12/16
12/23
12/30
1/6
1/13
1/20
1/27
2/3
2/10
2/17
Date
Flow 2022-23 (mgd)
Flow 2014-15 (mgd)
Rain (in/hr)

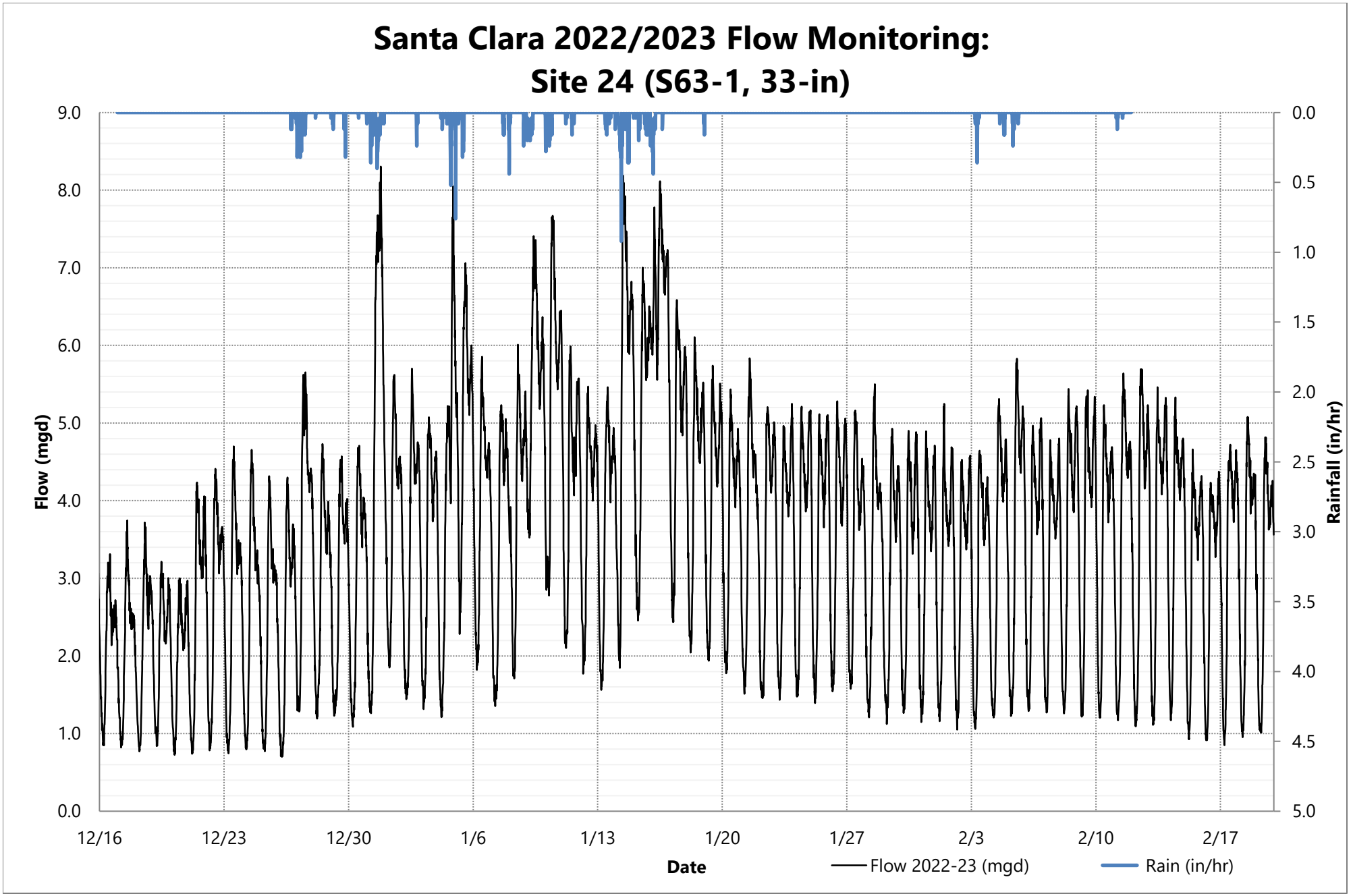

Santa Clara 2022/2023 Flow Monitoring:
Site 19 (S21-18, 24-in)
Flow (mgd)
Rainfall (in/hr)
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
12/16
12/23
12/30
1/6
1/13
1/20
1/27
2/3
2/10
2/17
Date
Flow 2022-23 (mgd)
Flow 2014-15 (mgd)
Rain (in/hr)

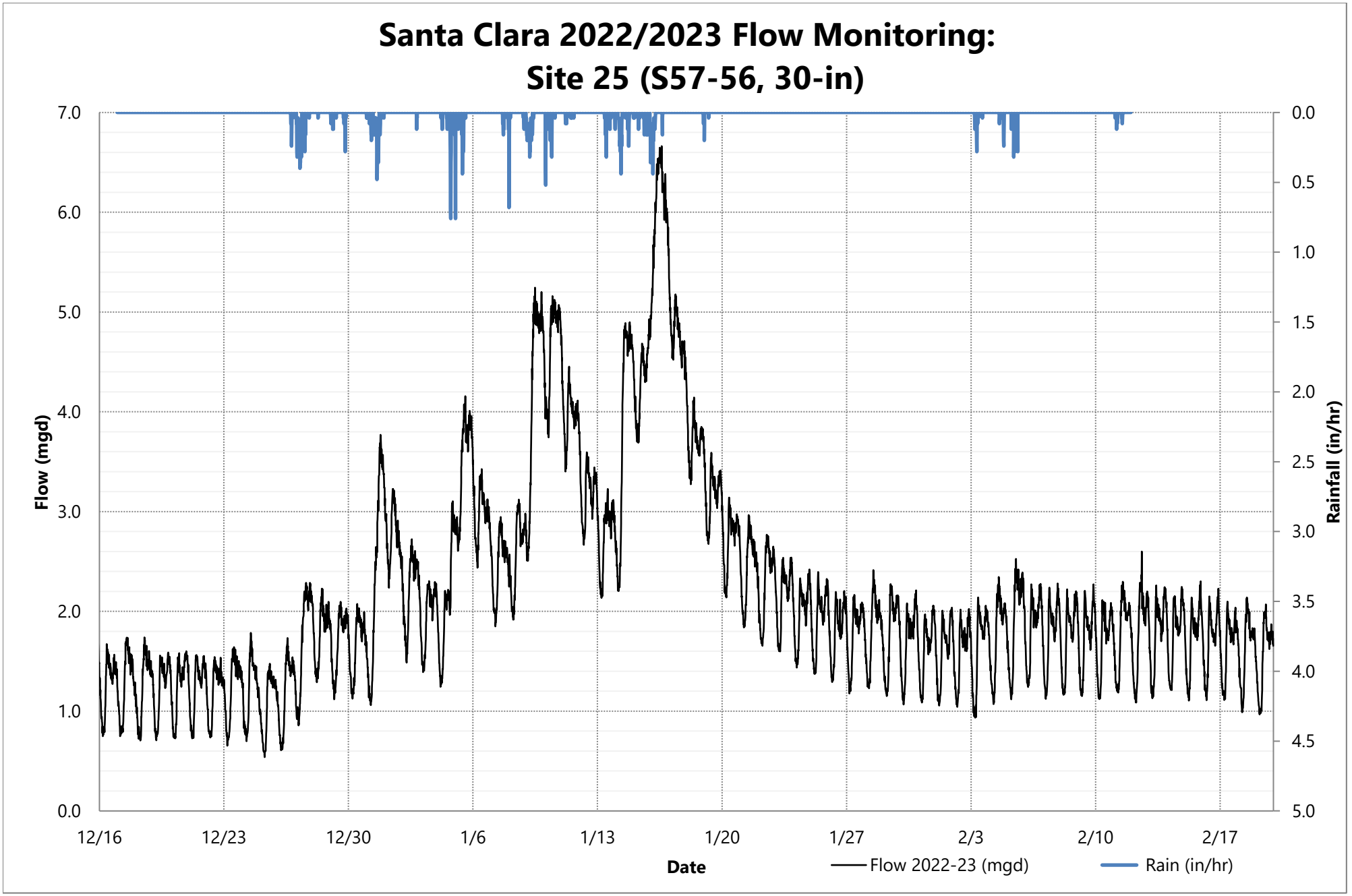

Santa Clara 2022/2023 Flow Monitoring:
Site 20 (S21-47, 18-in)
Flow (mgd)
Rainfall (in/hr)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
12/16
12/23
12/30
1/6
1/13
1/20
1/27
2/3
2/10
2/17
Date
Flow 2022-23 (mgd)
Flow 2014-15 (mgd)
Rain (in/hr)

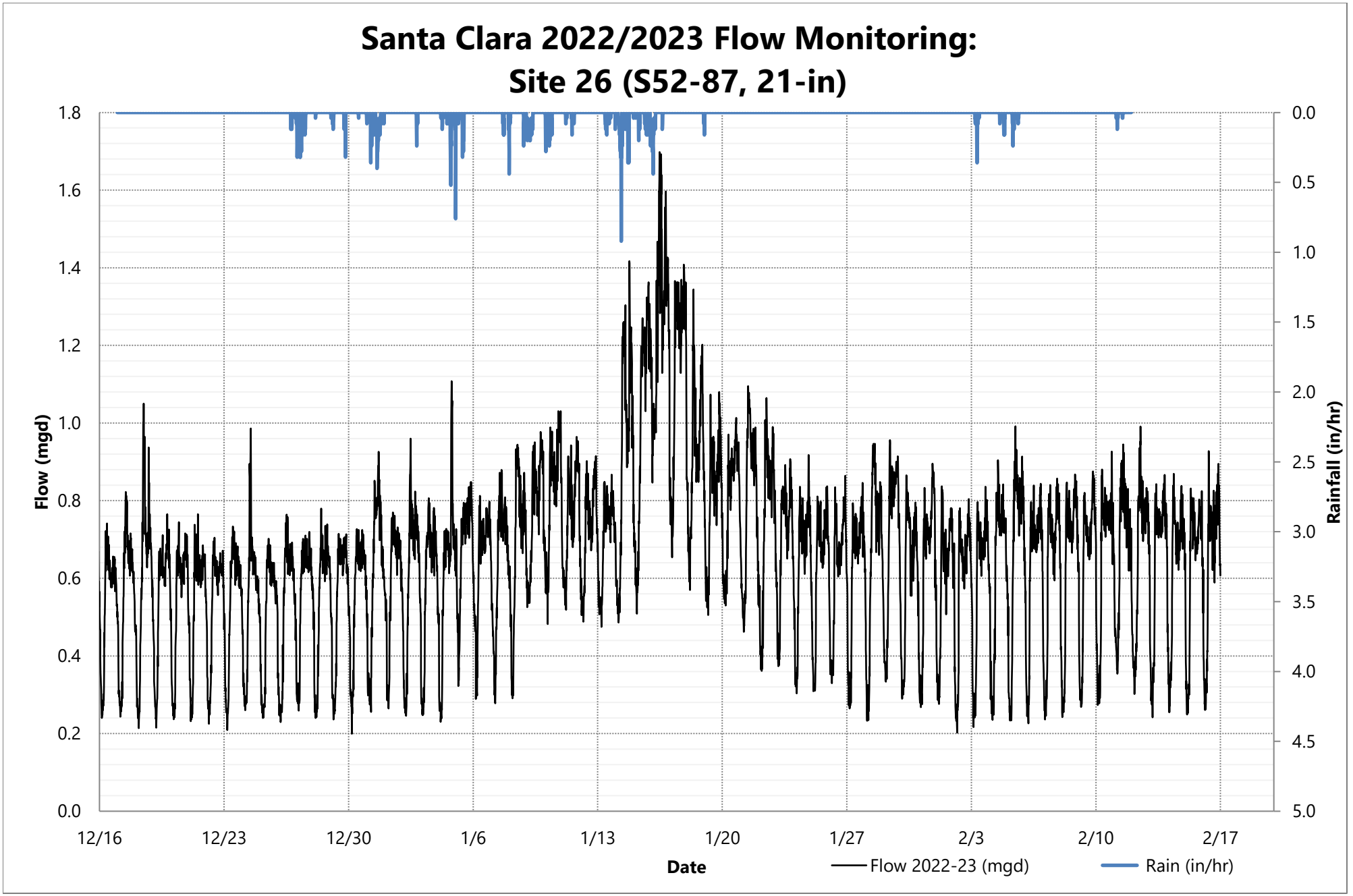

Santa Clara 2022/2023 Flow Monitoring:
Site 21 (S23-6, 24-in)
Flow (mgd)
Rainfall (in/hr)
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
12/16
12/23
12/30
1/6
1/13
1/20
1/27
2/3
2/10
2/17
Date
Flow 2022-23 (mgd)
Flow 2014-15 (mgd)
Rain (in/hr)

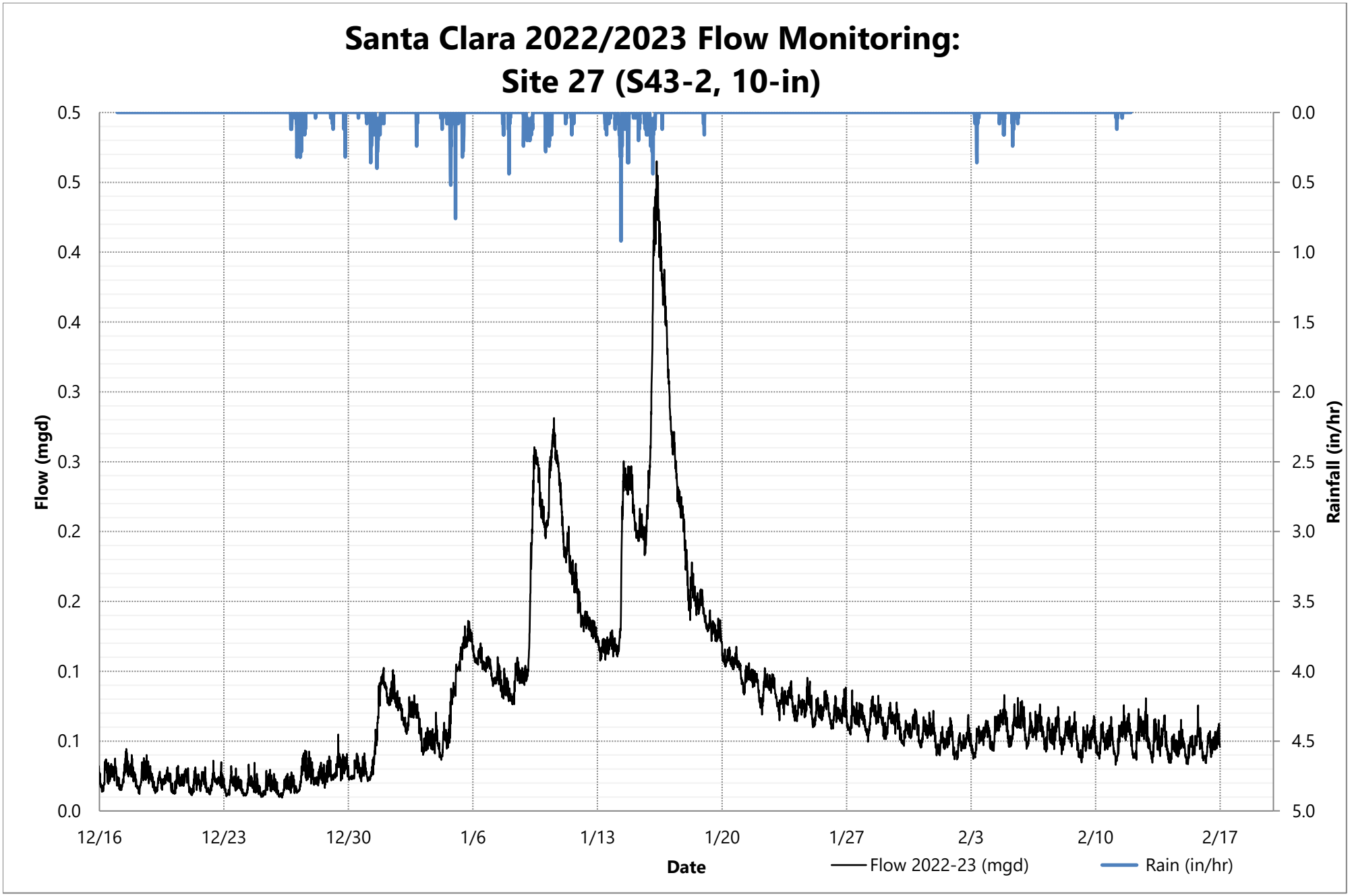

Santa Clara 2022/2023 Flow Monitoring:
Site 22 (S45-80, 18-in)
Flow (mgd)
Rainfall (in/hr)
2.5
2.0
1.5
1.0
0.5
0.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
12/16
12/23
12/30
1/6
1/13
1/20
1/27
2/3
2/10
2/17
Date
Flow 2022-23 (mgd)
Flow 2014-15 (mgd)
Rain (in/hr)

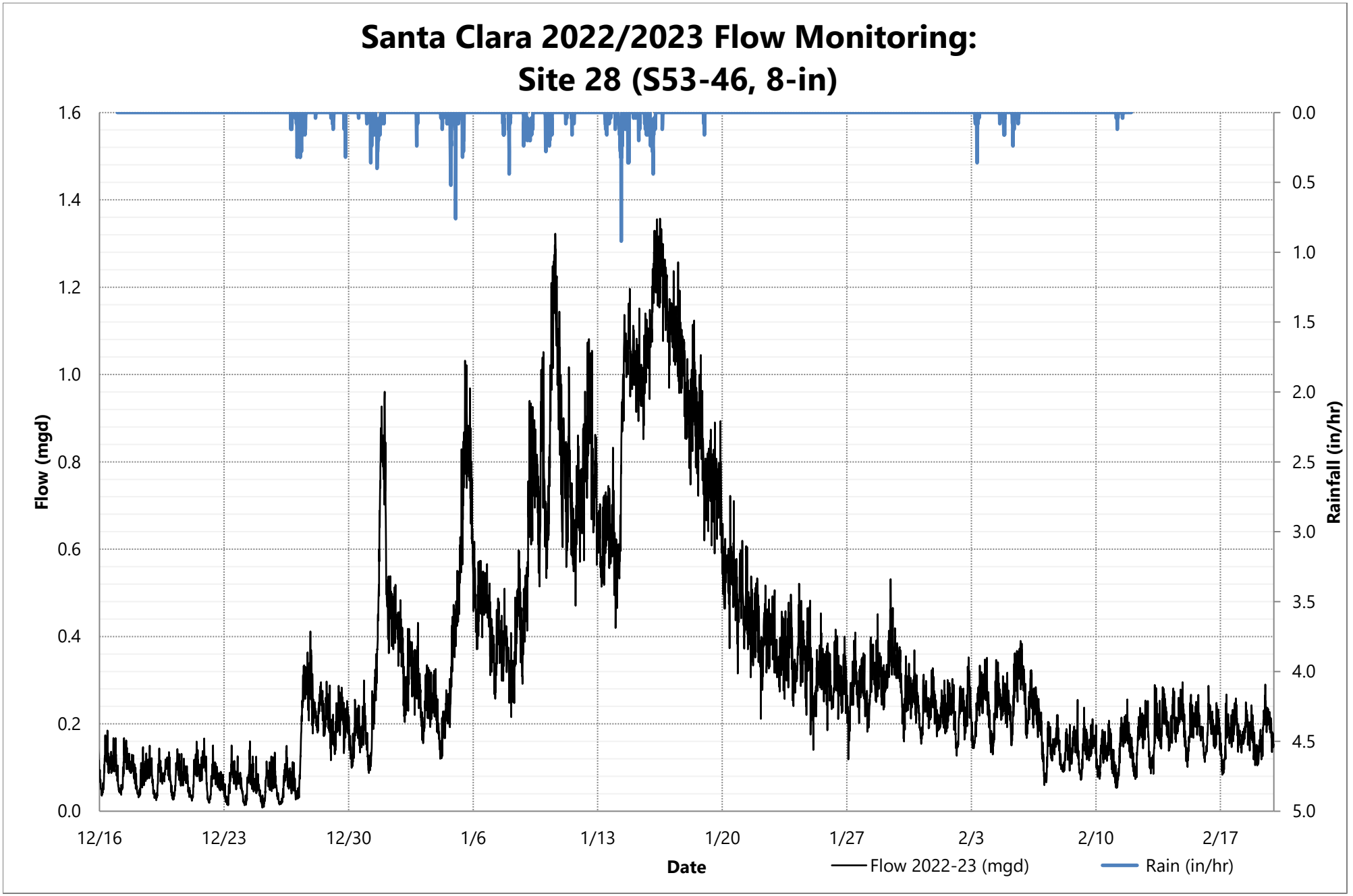

Santa Clara 2022/2023 Flow Monitoring:
Site 23 (S48-31, 18-in)
Flow (mgd)
Rainfall (in/hr)
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
12/16
12/23
12/30
1/6
1/13
1/20
1/27
2/3
2/10
2/17
Date
Flow 2022-23 (mgd)
Flow 2014-15 (mgd)
Rain (in/hr)

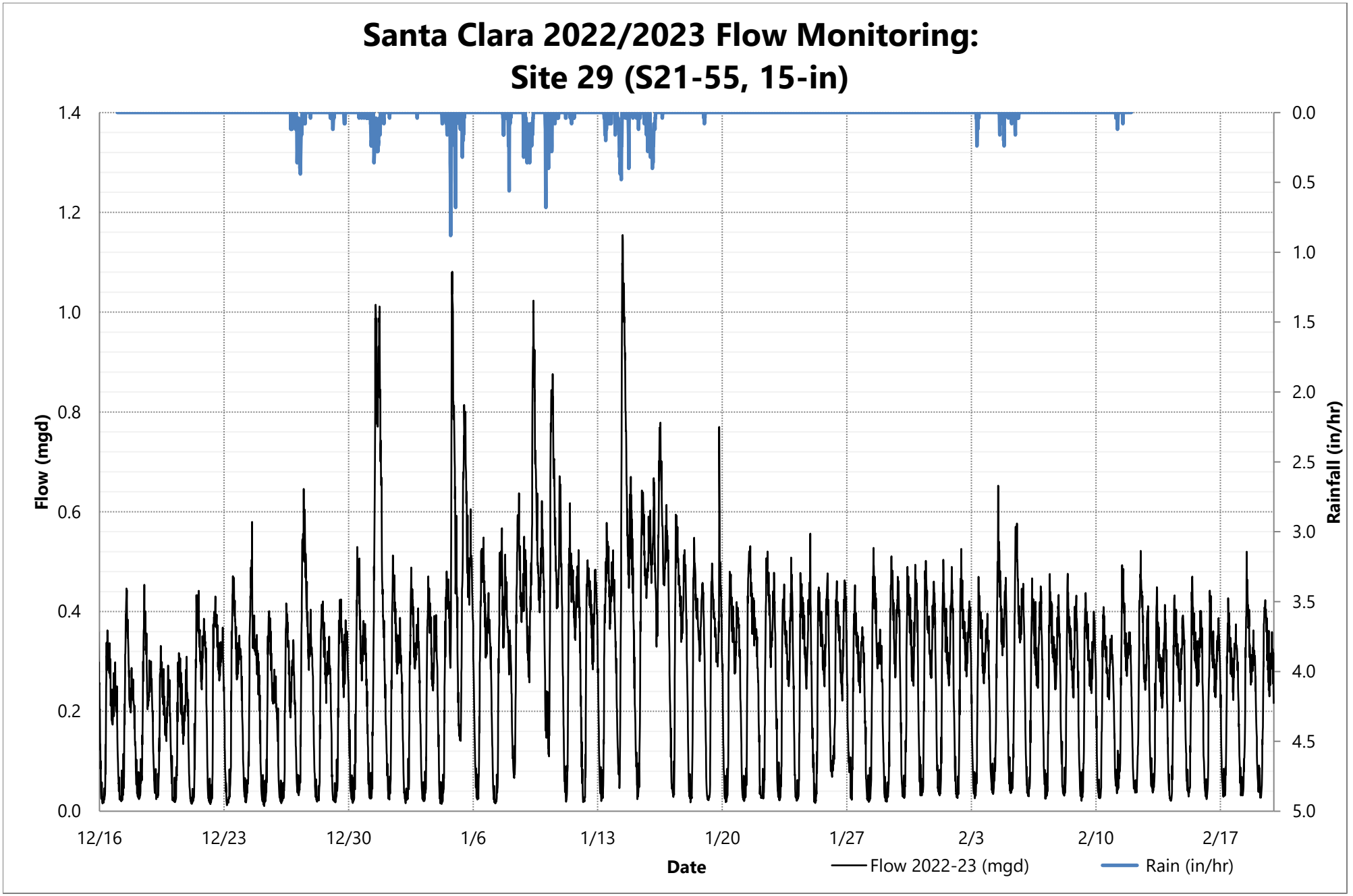

Santa Clara 2022/2023 Flow Monitoring:
Site 24 (S63-1, 33-in)
Flow (mgd)
Rainfall (in/hr)
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
12/16
12/23
12/30
1/6
1/13
1/20
1/27
2/3
2/10
2/17
Date
Flow 2022-23 (mgd)
Rain (in/hr)

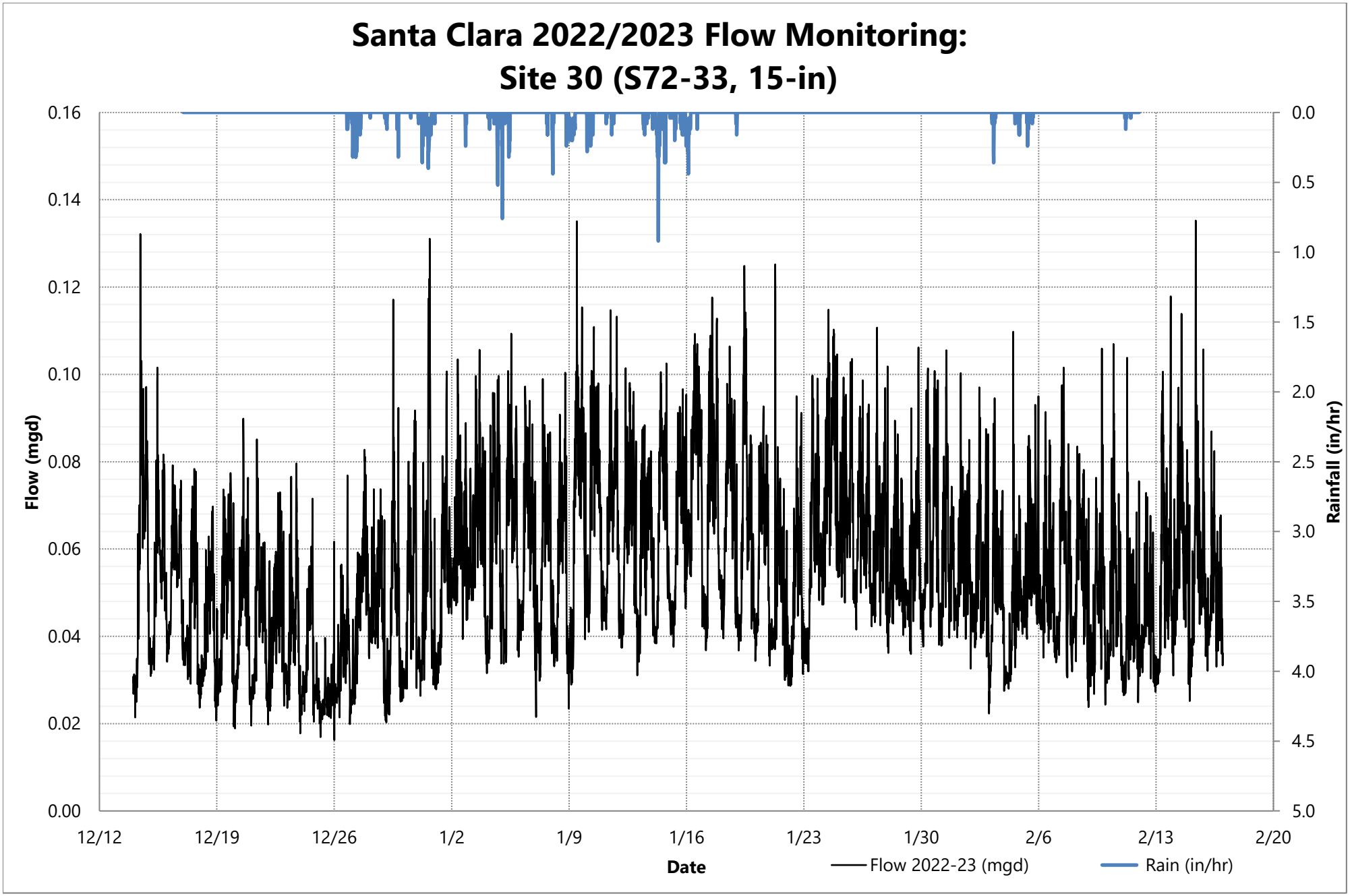

Santa Clara 2022/2023 Flow Monitoring:
Site 25 (S57-56, 30-in)
Flow (mgd)
Rainfall (in/hr)
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
12/16
12/23
12/30
1/6
1/13
1/20
1/27
2/3
2/10
2/17
Date
Flow 2022-23 (mgd)
Rain (in/hr)

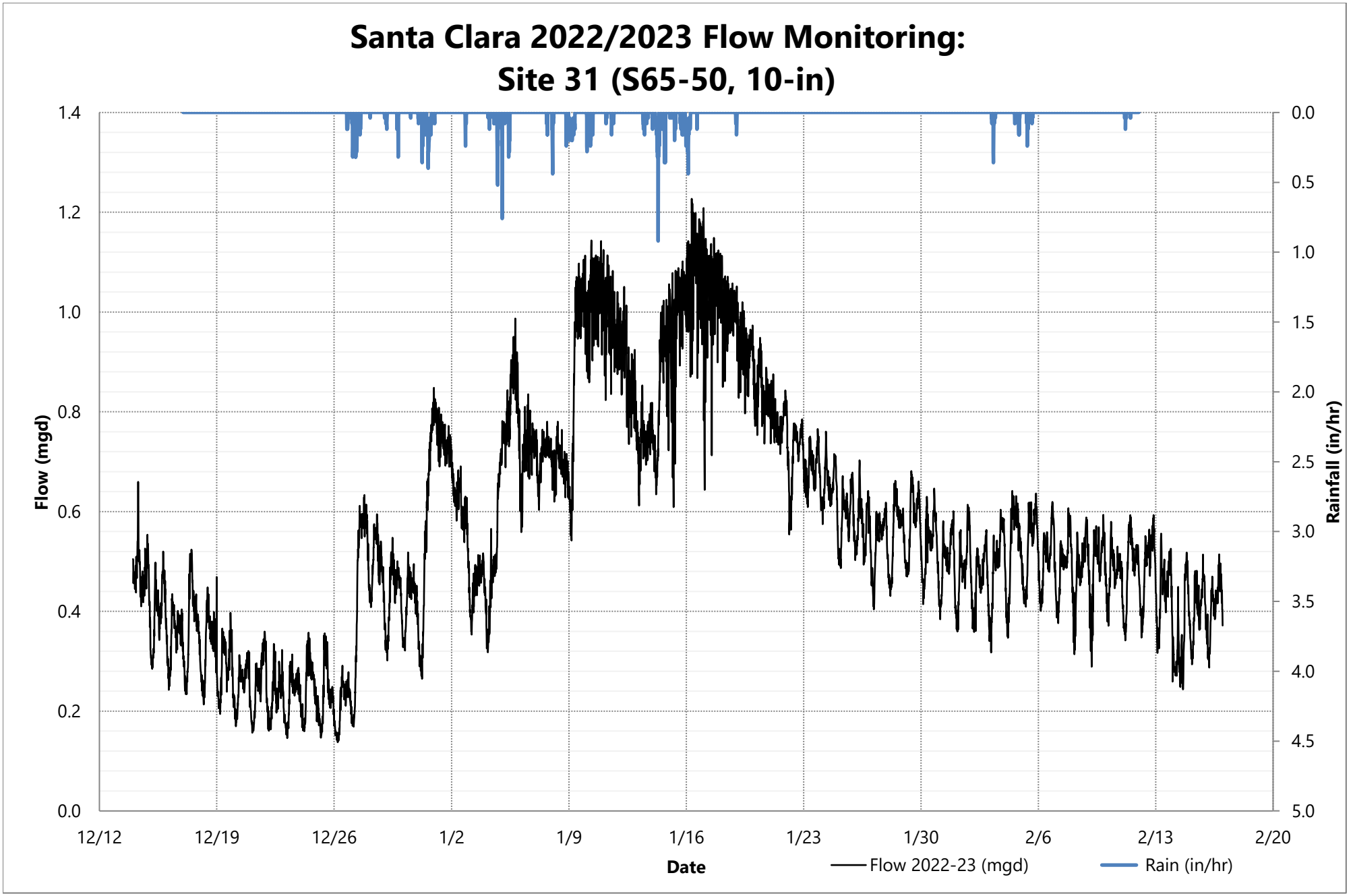

Santa Clara 2022/2023 Flow Monitoring:
Site 26 (S52-87, 21-in)
Flow (mgd)
Rainfall (in/hr)
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
12/16
12/23
12/30
1/6
1/13
1/20
1/27
2/3
2/10
2/17
Date
Flow 2022-23 (mgd)
Rain (in/hr)

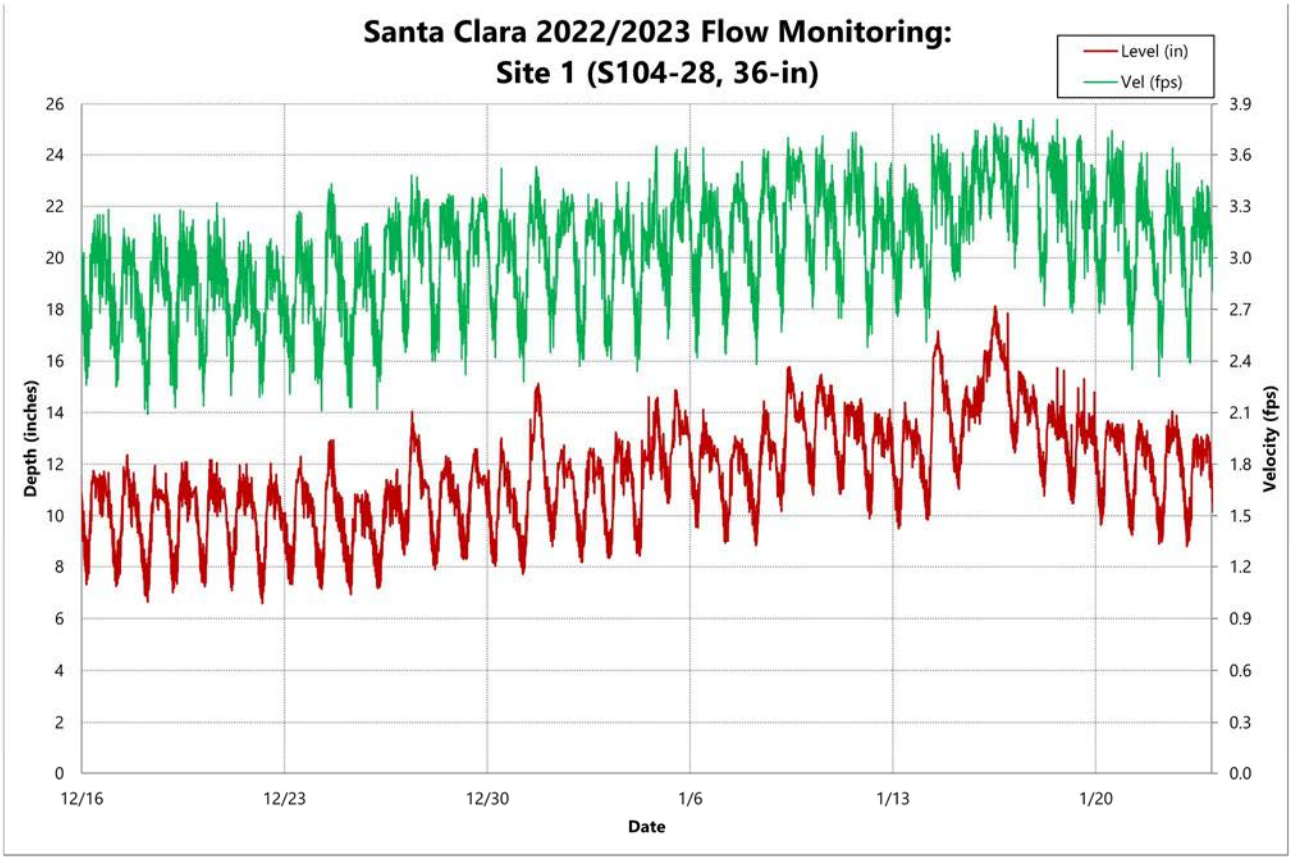

Santa Clara 2022/2023 Flow Monitoring:
Site 27 (S43-2, 10-in)
Flow (mgd)
Rainfall (in/hr)
0.5
0.4
0.3
0.2
0.1
0.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
12/16
12/23
12/30
1/6
1/13
1/20
1/27
2/3
2/10
2/17
Date
Flow 2022-23 (mgd)
Rain (in/hr)

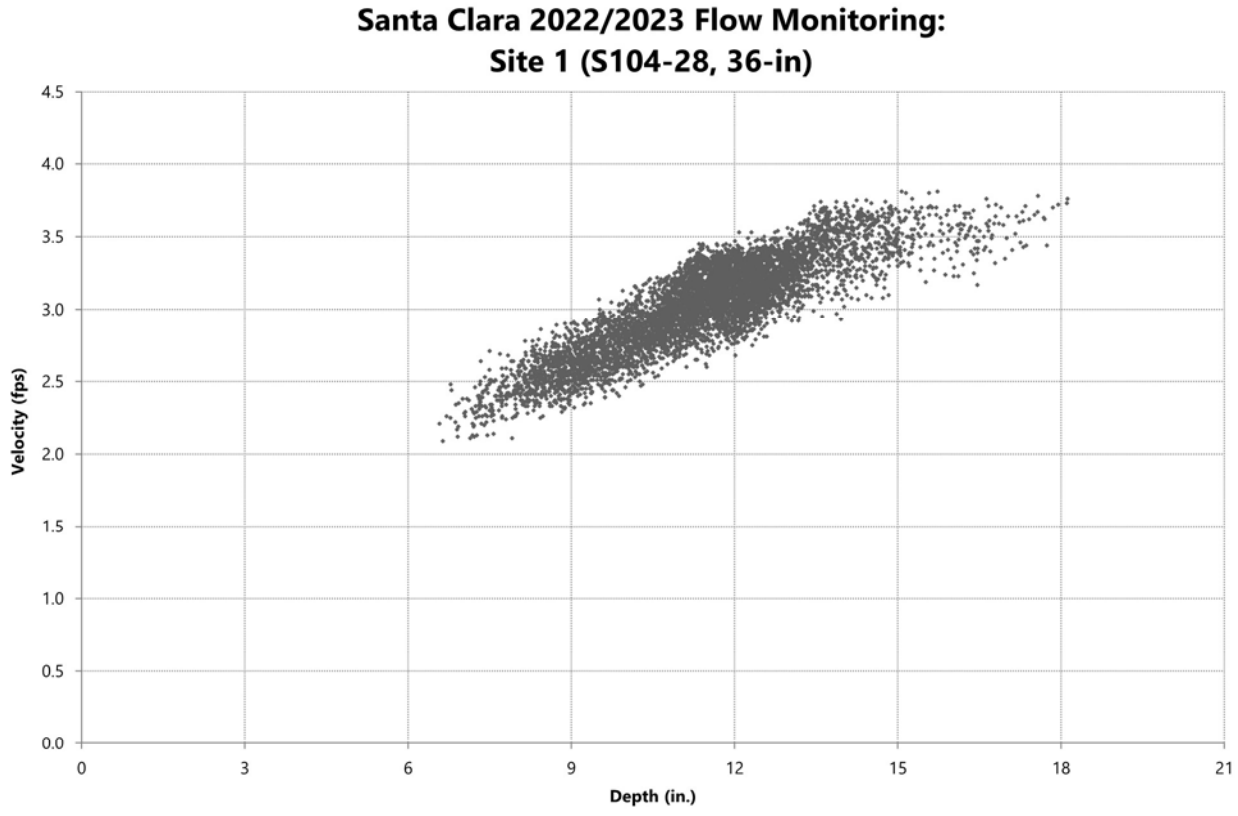

Santa Clara 2022/2023 Flow Monitoring:
Site 28 (S53-46, 8-in)
Flow (mgd)
Rainfall (in/hr)
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
12/16
12/23
12/30
1/6
1/13
1/20
1/27
2/3
2/10
2/17
Date
Flow 2022-23 (mgd)
Rain (in/hr)

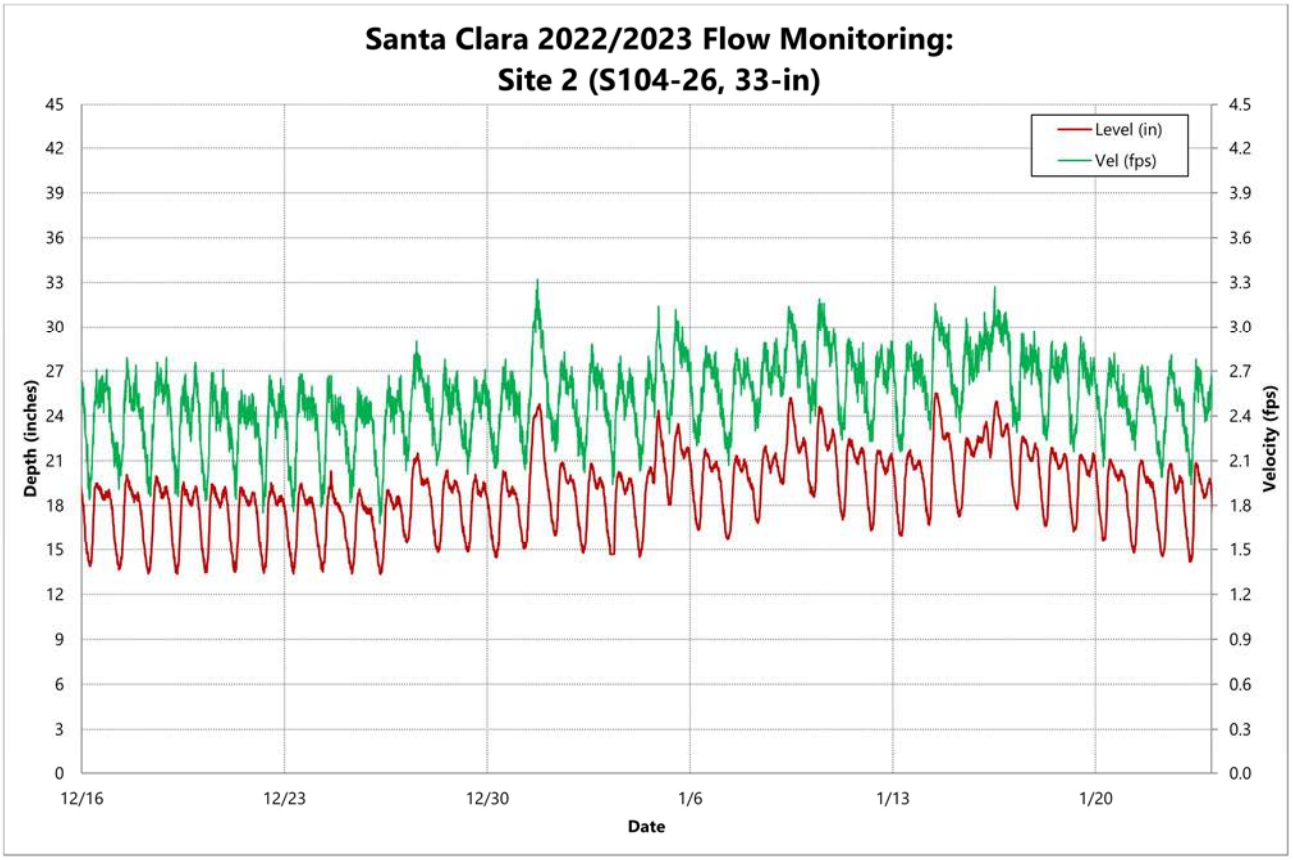

Santa Clara 2022/2023 Flow Monitoring:
Site 29 (S21-55, 15-in)
Flow (mgd)
Rainfall (in/hr)
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
12/16
12/23
12/30
1/6
1/13
1/20
1/27
2/3
2/10
2/17
Date
Flow 2022-23 (mgd)
Rain (in/hr)

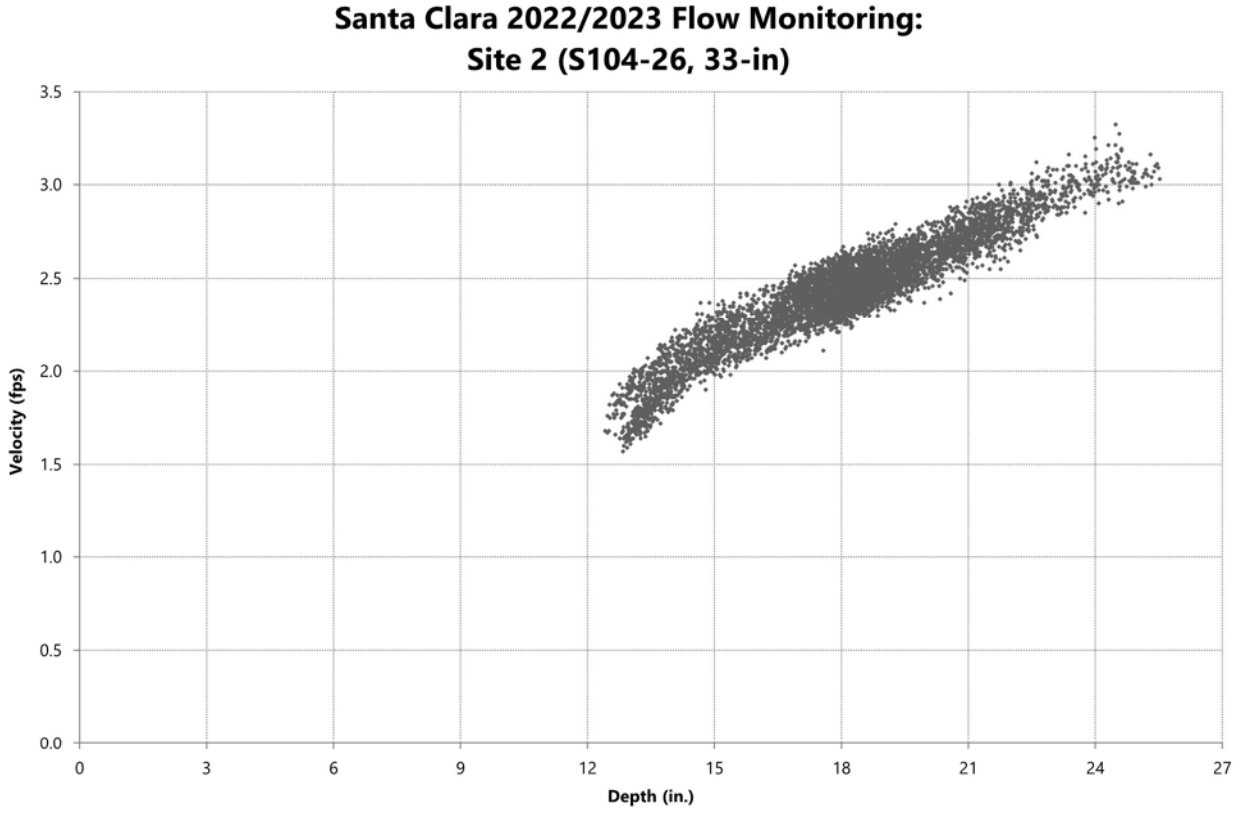

Santa Clara 2022/2023 Flow Monitoring:
Site 30 (S72-33, 15-in)
Flow (mgd)
Rainfall (in/hr)
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
12/12
12/19
12/26
1/2
1/9
1/16
1/23
1/30
2/6
2/13
2/20
Date
Flow 2022-23 (mgd)
Rain (in/hr)

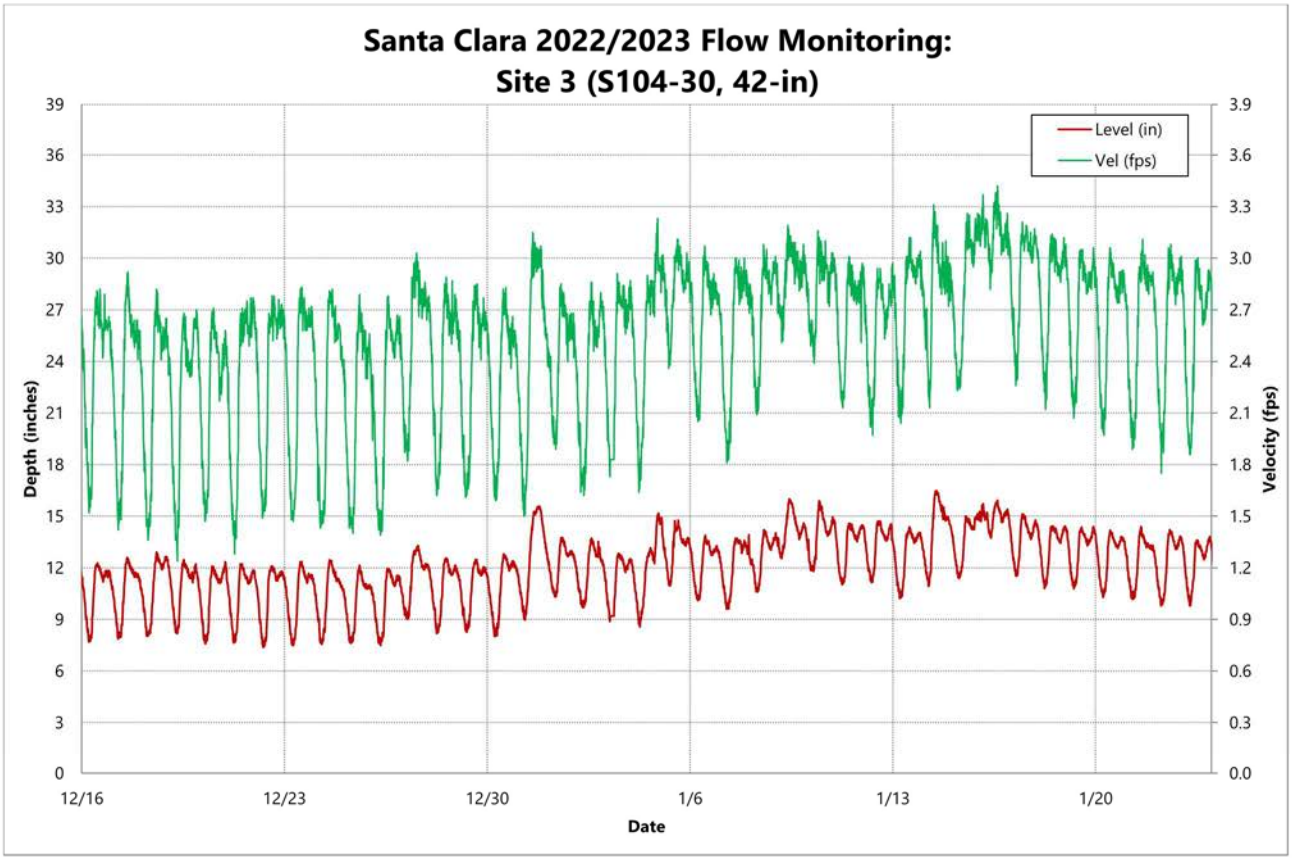

Santa Clara 2022/2023 Flow Monitoring:
Site 31 (S65-50, 10-in)
Flow (mgd)
Rainfall (in/hr)
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
12/12
12/19
12/26
1/2
1/9
1/16
1/23
1/30
2/6
2/13
2/20
Date
Flow 2022-23 (mgd)
Rain (in/hr)

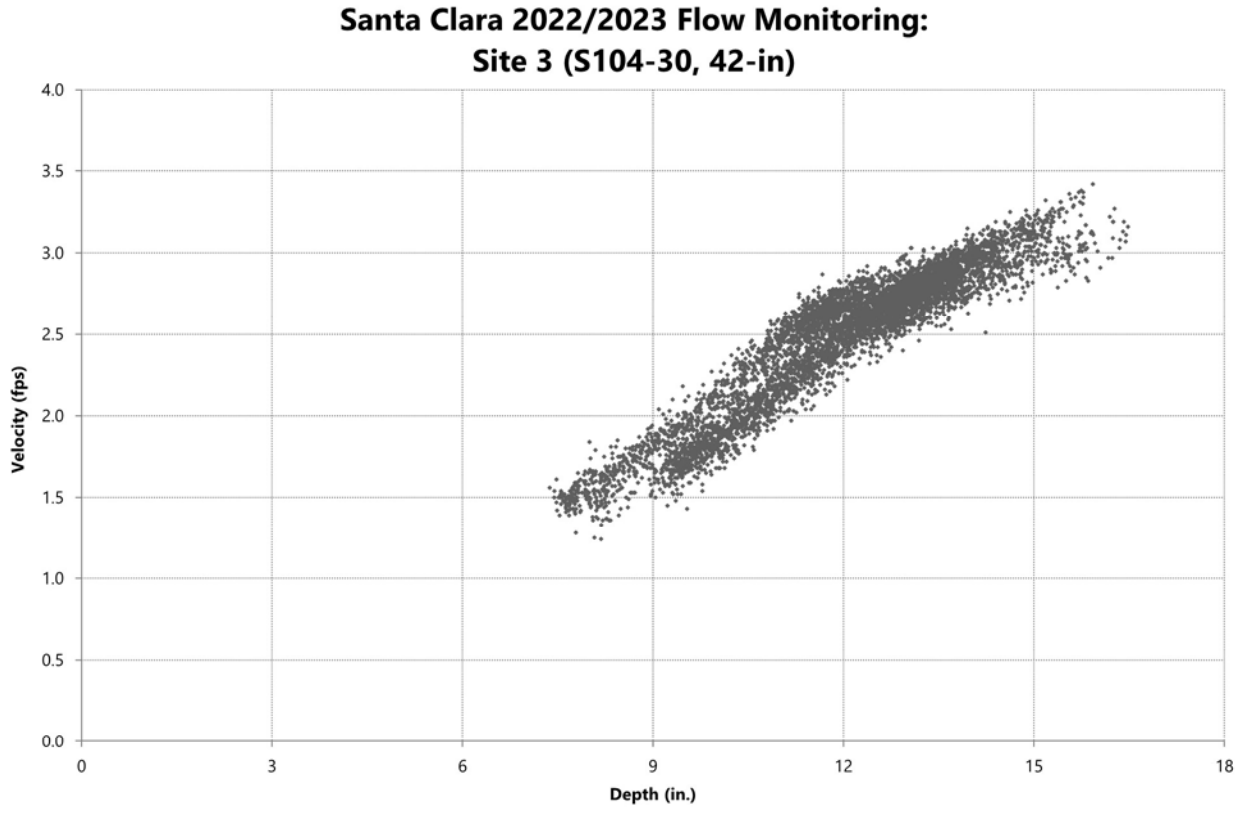

Santa Clara 2022/2023 Flow Monitoring:
Site 1 (S104-28, 36-in)
Level (in)
Vel (fps)
Depth (inches)
Velocity (fps)
Date
12/16
12/23
12/30
1/6
1/13
1/20

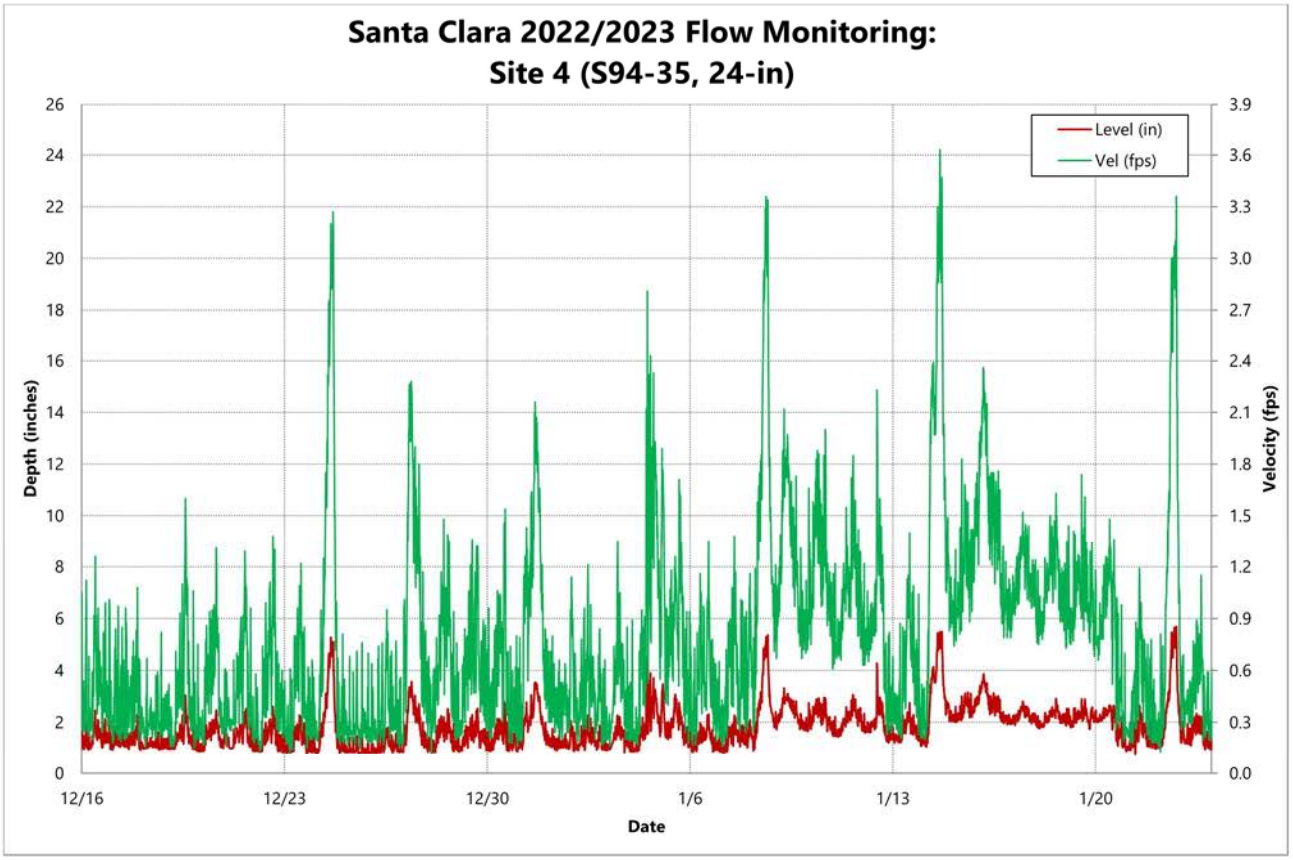

Santa Clara 2022/2023 Flow Monitoring:
Site 1 (S104-28, 36-in)
Velocity (fps)
Depth (in.)

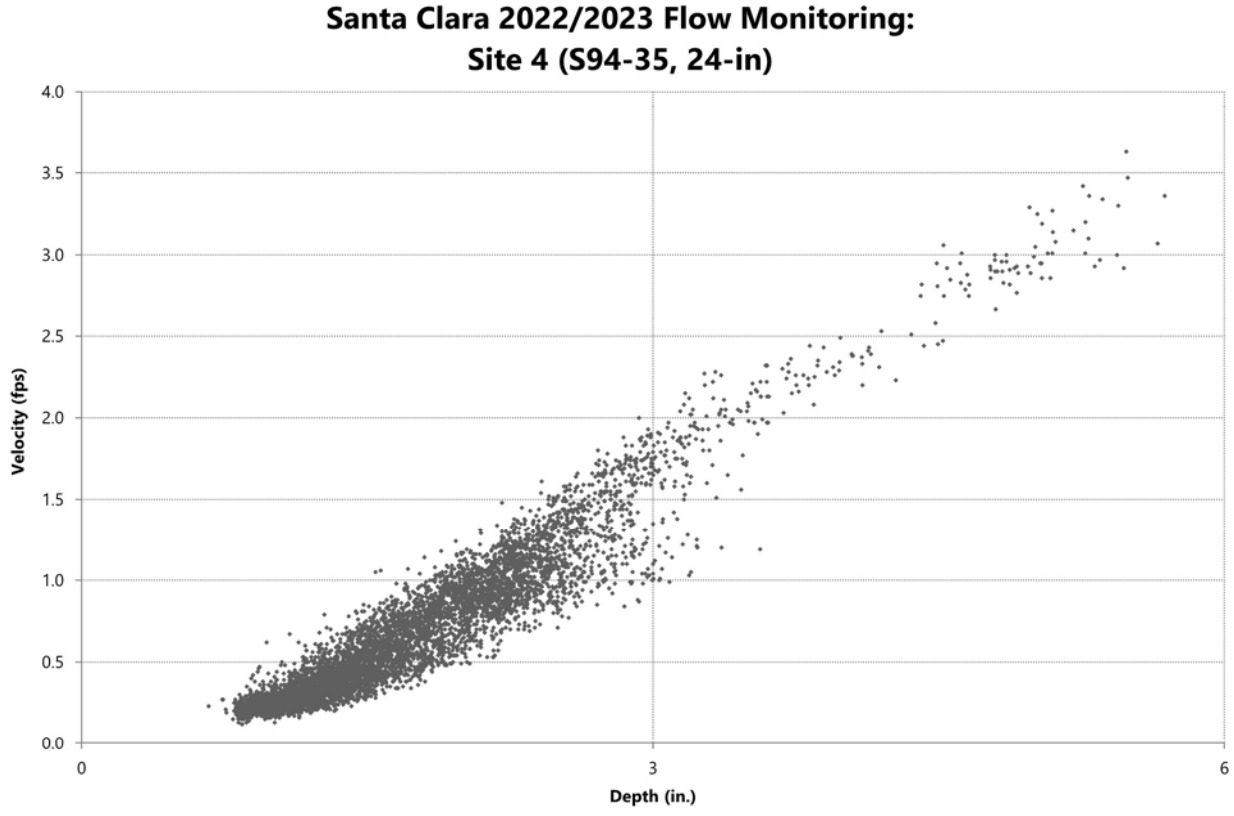

Santa Clara 2022/2023 Flow Monitoring:
Site 2 (S104-26, 33-in)
Level (in)
Vel (fps)
Depth (inches)
Velocity (fps)
Date
12/16
12/23
12/30
1/6
1/13
1/20

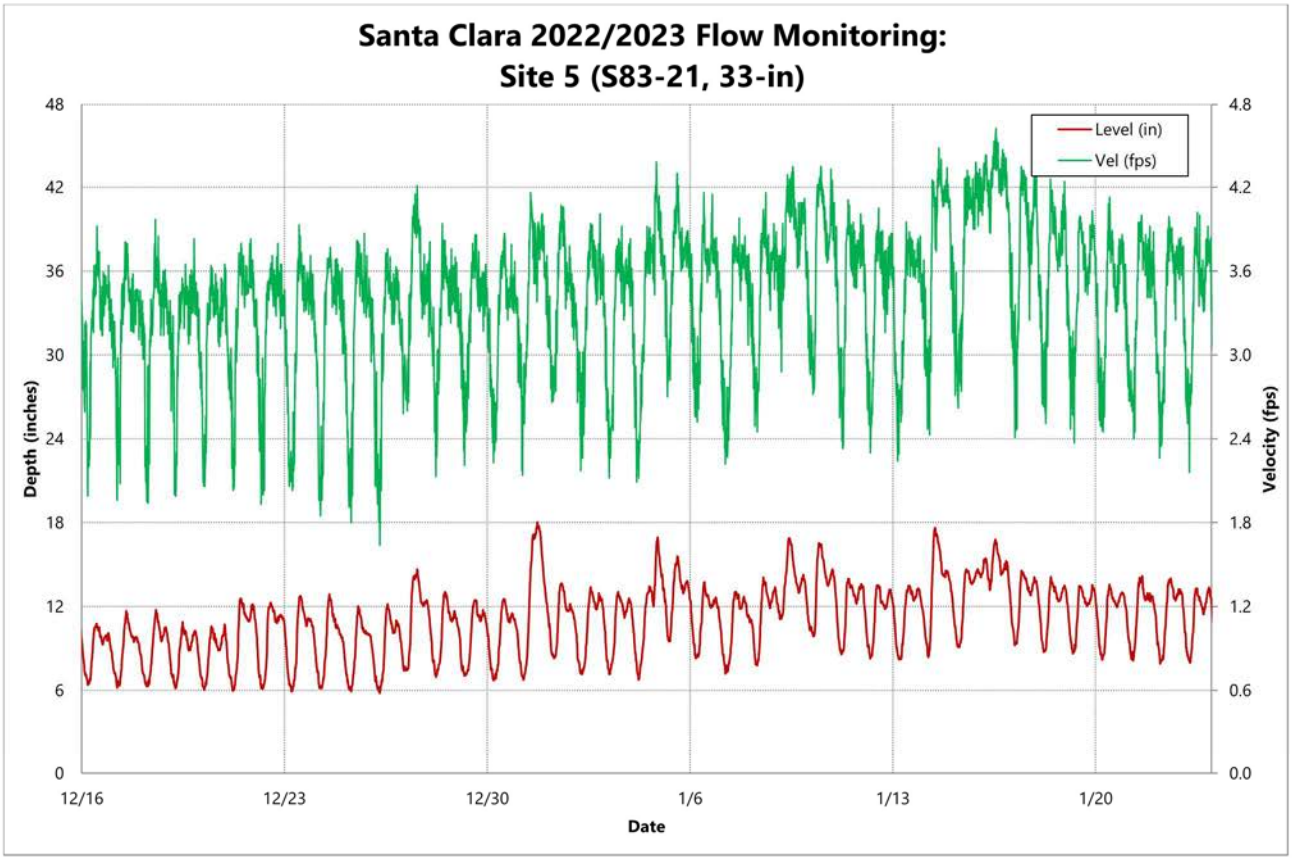

Santa Clara 2022/2023 Flow Monitoring:
Site 2 (S104-26, 33-in)
Velocity (fps)
Depth (in.)

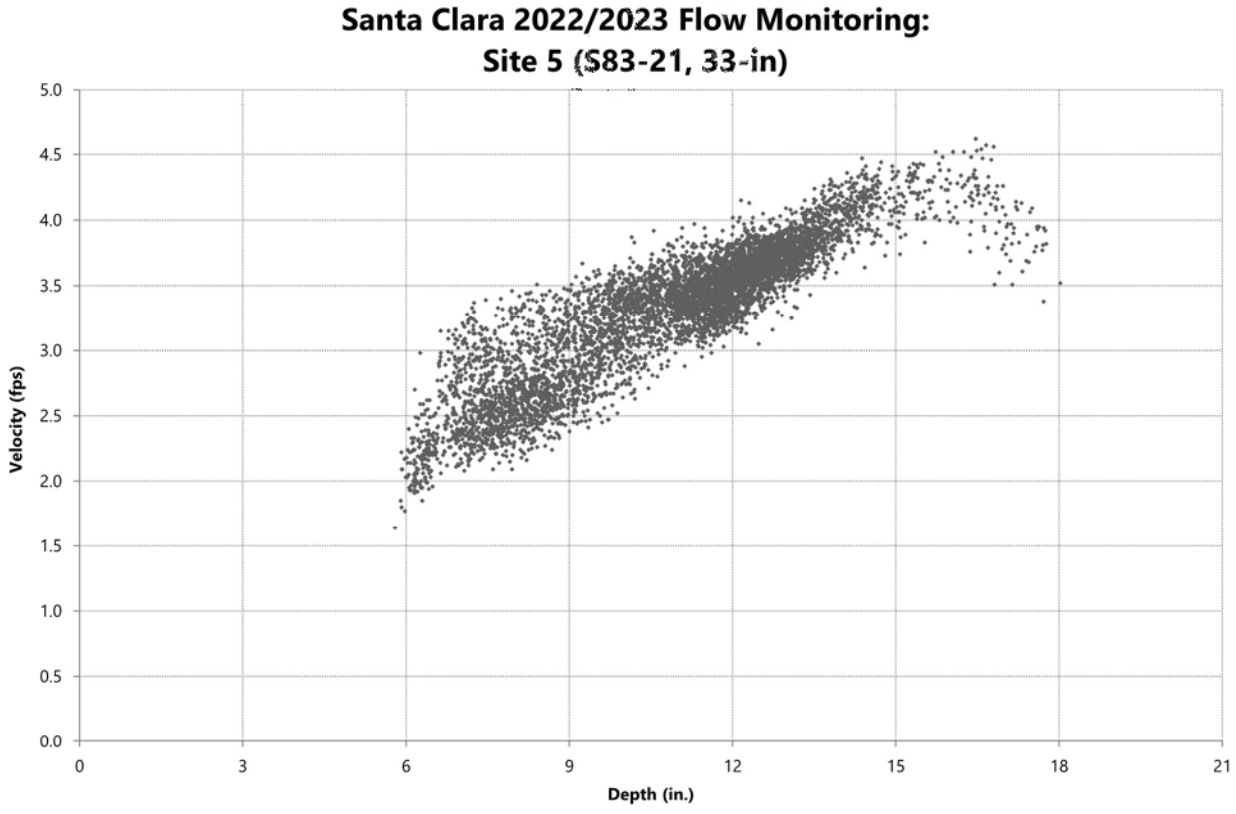

Santa Clara 2022/2023 Flow Monitoring:
Site 3 (S104-30, 42-in)
Level (in)
Vel (fps)
Depth (inches)
Velocity (fps)
Date
12/16
12/23
12/30
1/6
1/13
1/20

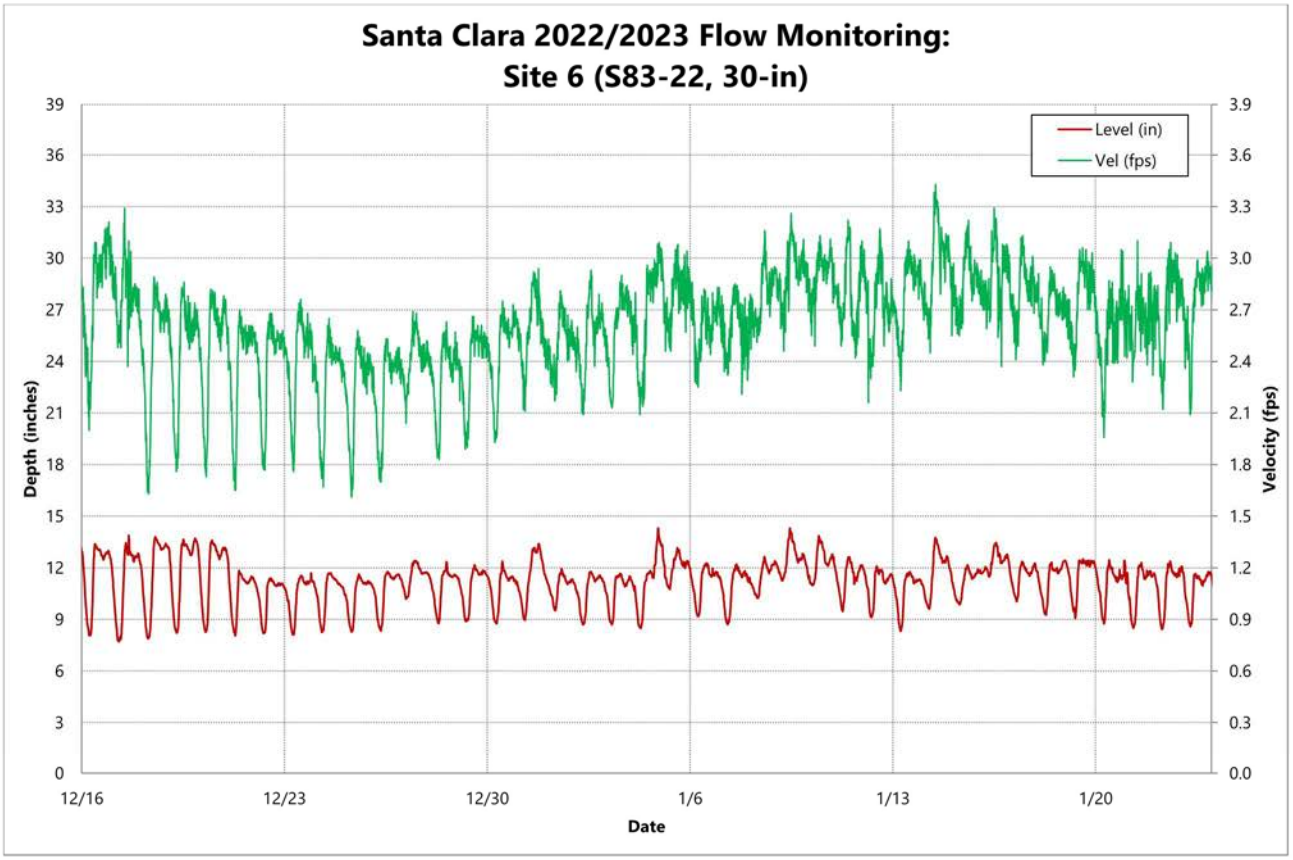

Santa Clara 2022/2023 Flow Monitoring:
Site 3 (S104-30, 42-in)
Velocity (fps)
Depth (in.)

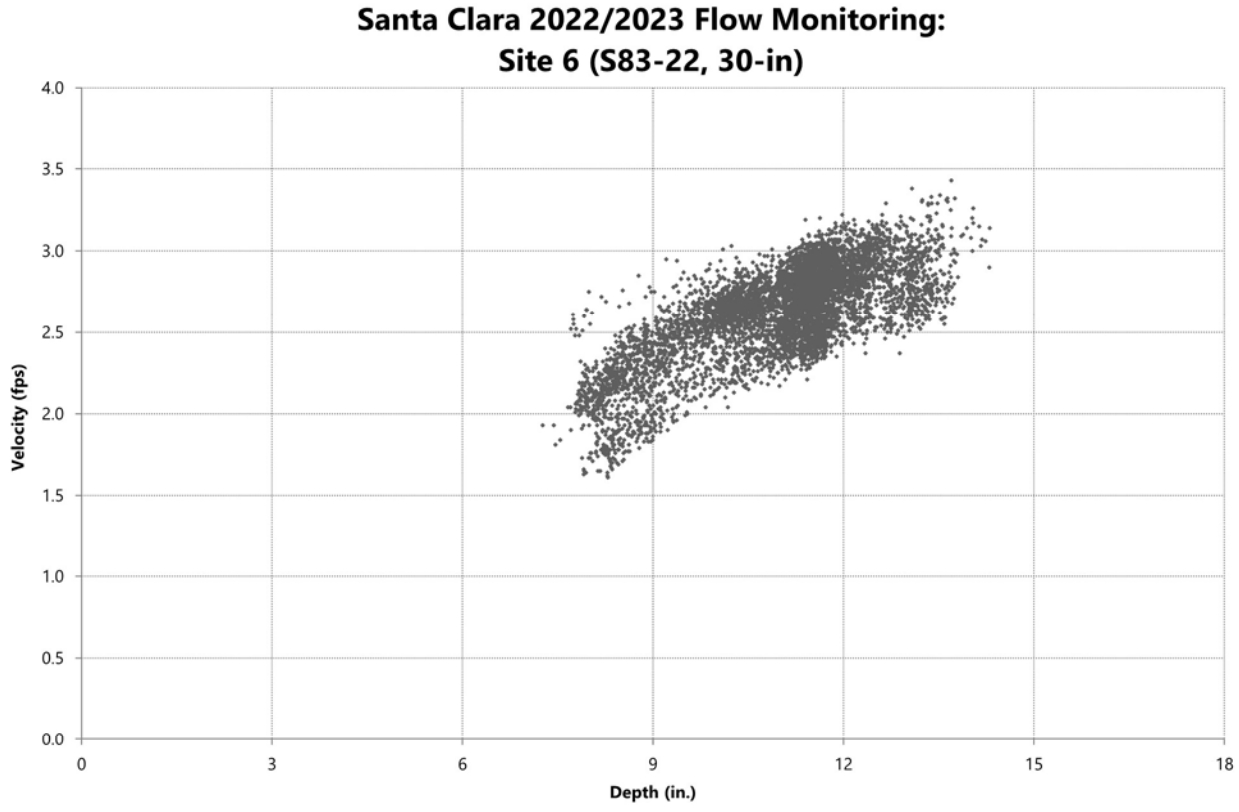

Santa Clara 2022/2023 Flow Monitoring:
Site 4 (S94-35, 24-in)
Level (in)
Vel (fps)
Depth (inches)
Velocity (fps)
Date
12/16
12/23
12/30
1/6
1/13
1/20

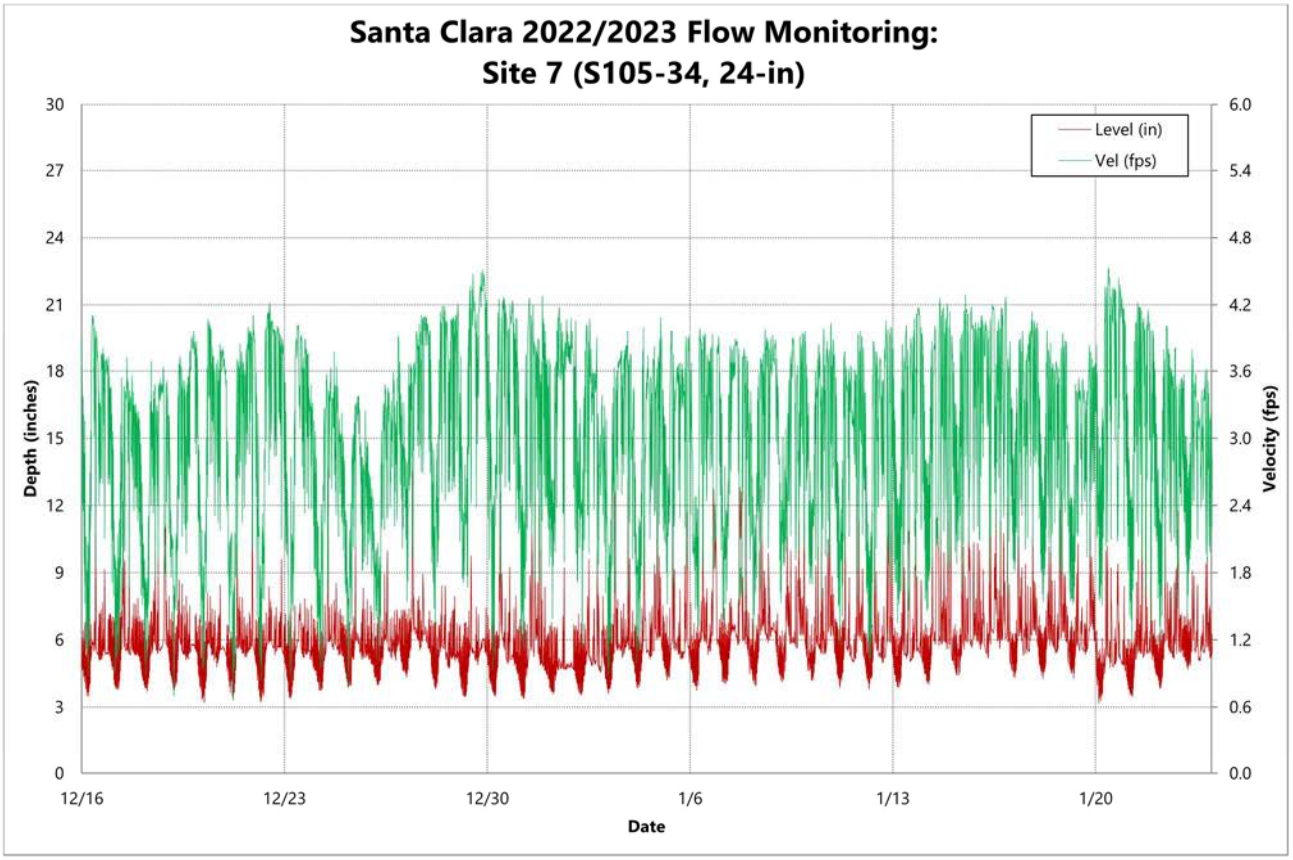

Santa Clara 2022/2023 Flow Monitoring:
Site 4 (S94-35, 24-in)
Velocity (fps)
Depth (in.)

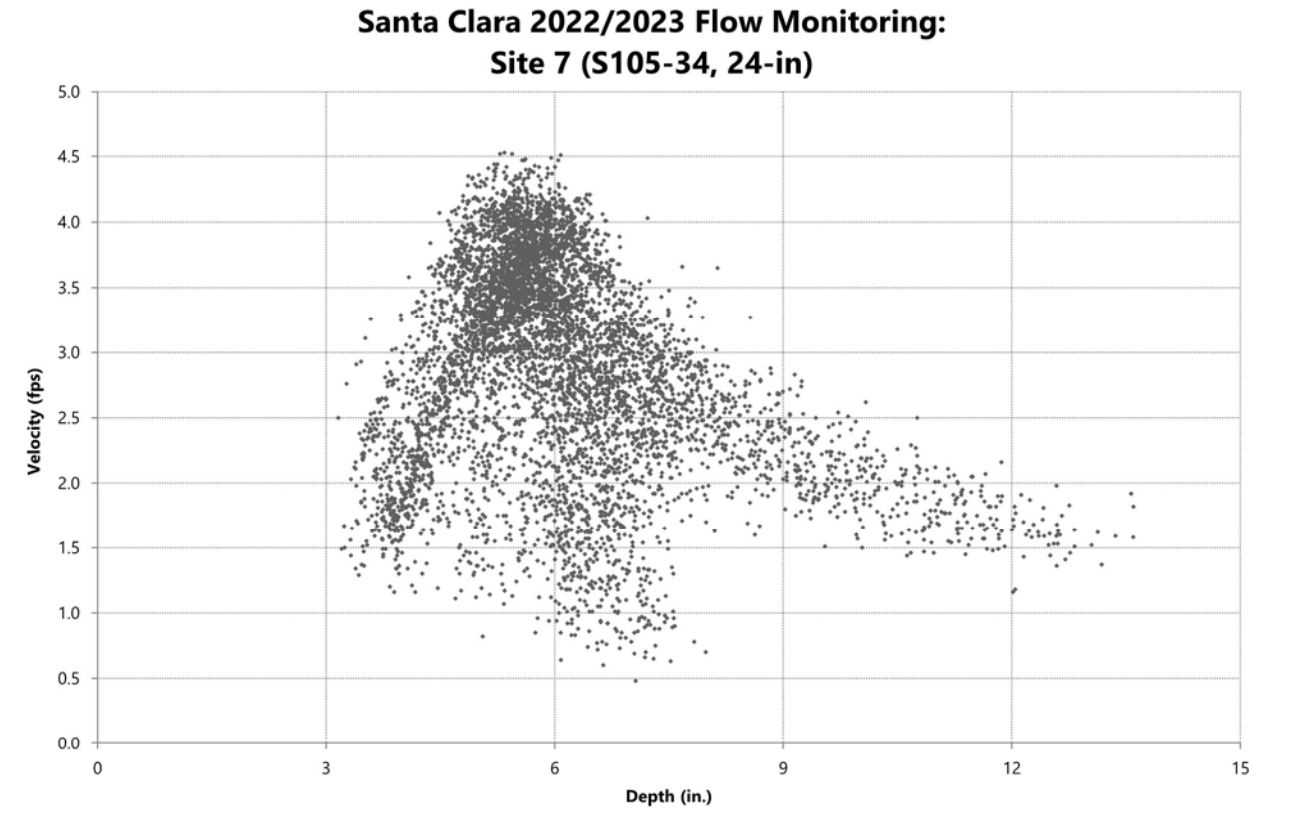

Santa Clara 2022/2023 Flow Monitoring:
Site 5 (S83-21, 33-in)
Level (in)
Vel (fps)
Depth (inches)
Velocity (fps)
Date
48
42
36
30
24
18
12
6
0
4.8
4.2
3.6
3.0
2.4
1.8
1.2
0.6
0.0
12/16
12/23
12/30
1/6
1/13
1/20

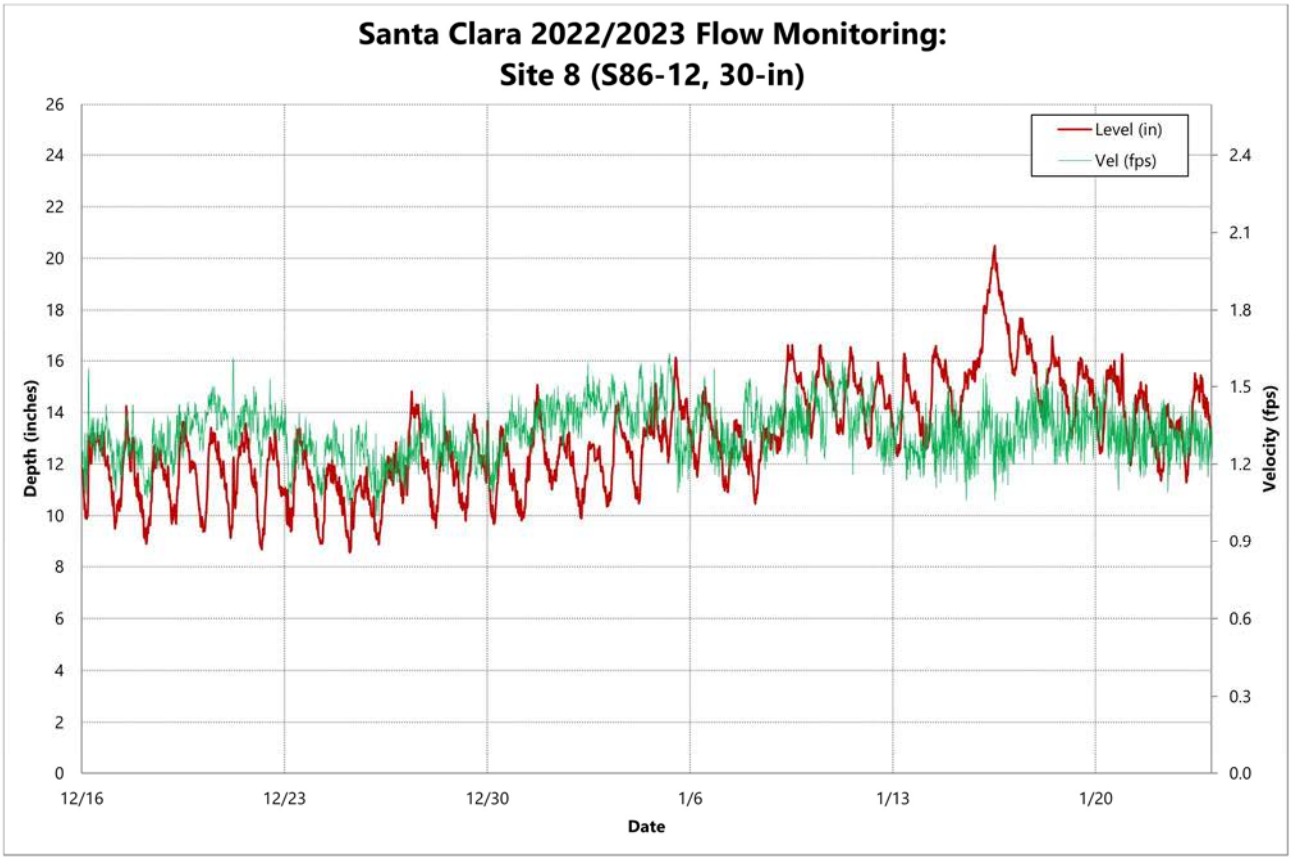

Santa Clara 2022/2023 Flow Monitoring:
Site 5 (S83-21, 33-in)
Velocity (fps)
Depth (in.)
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0
3
6
9
12
15
18
21

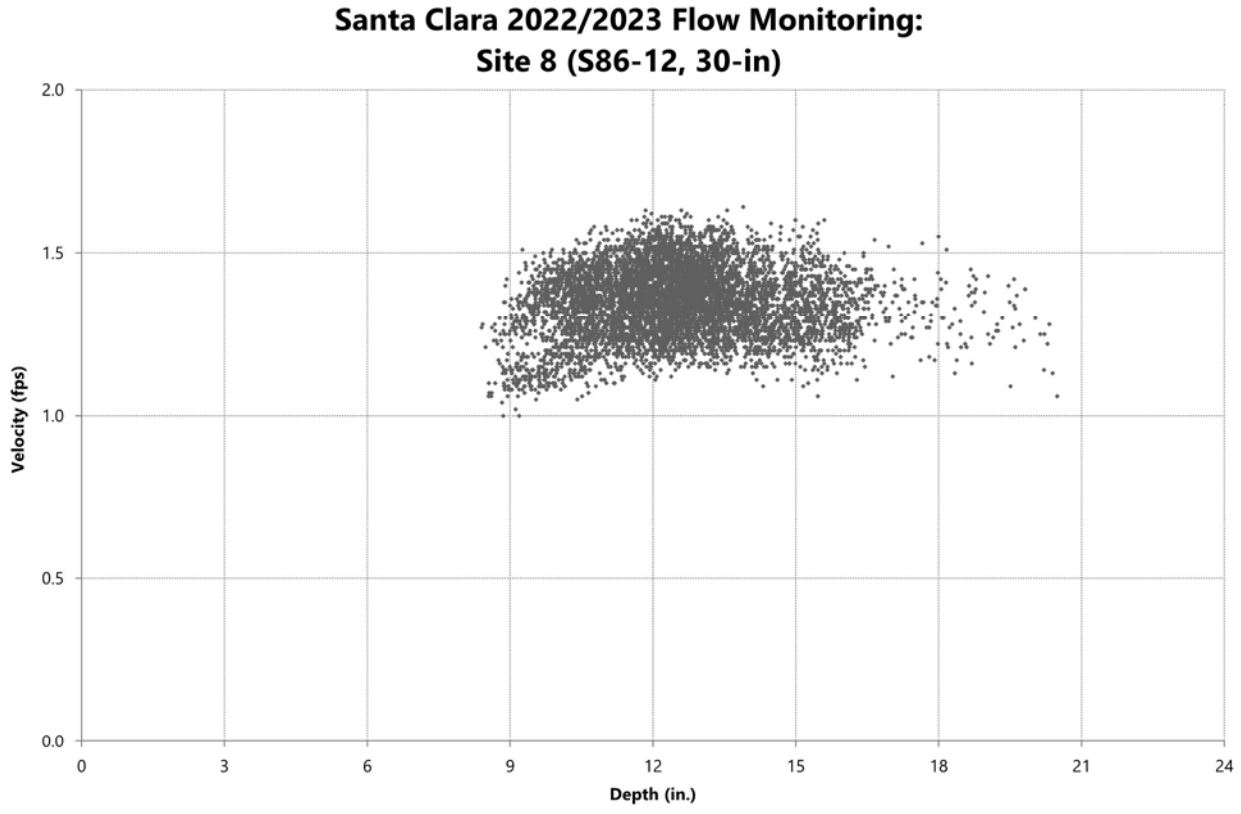

Santa Clara 2022/2023 Flow Monitoring:
Site 6 (S83-22, 30-in)
Level (in)
Vel (fps)
Depth (inches)
Velocity (fps)
Date
12/16
12/23
12/30
1/6
1/13
1/20

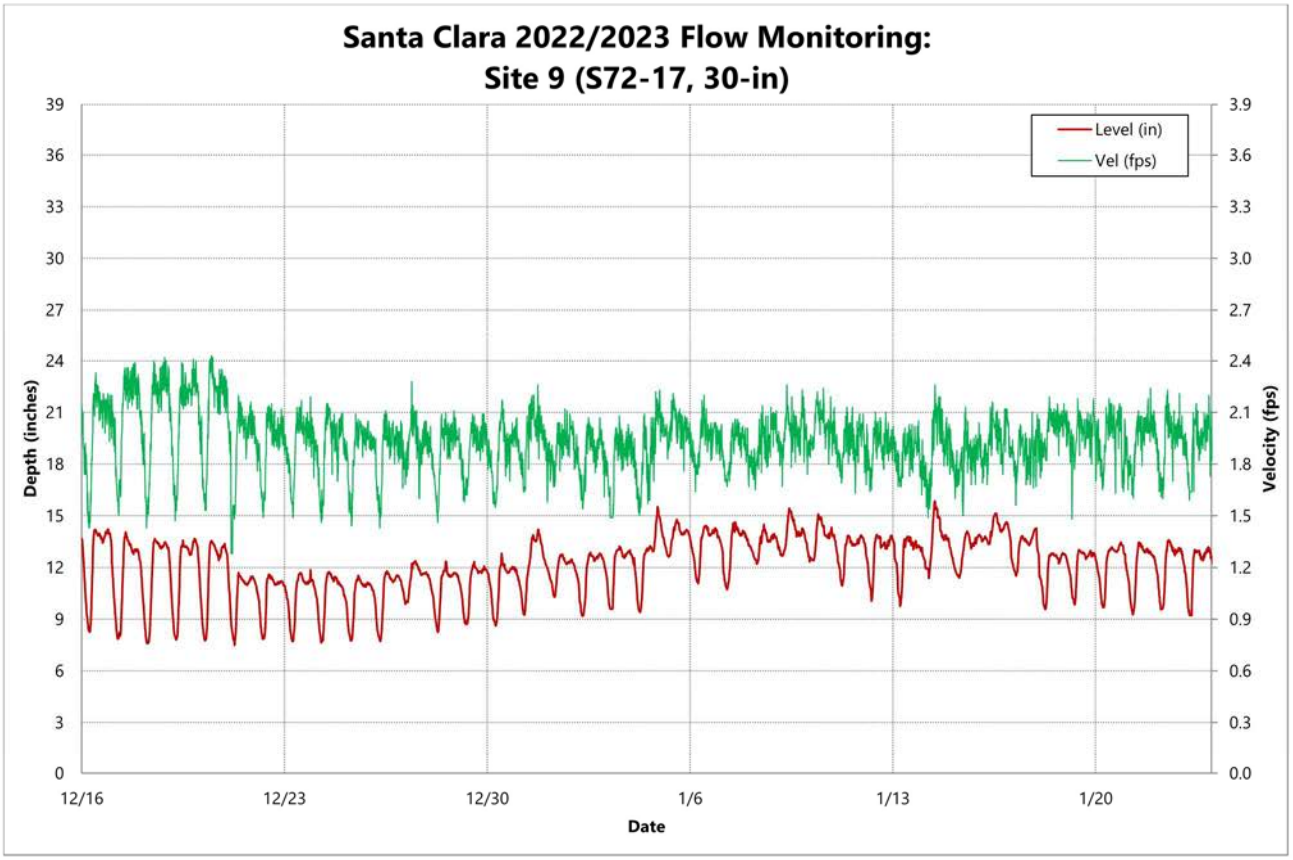

Santa Clara 2022/2023 Flow Monitoring:
Site 6 (S83-22, 30-in)
Velocity (fps)
Depth (in.)

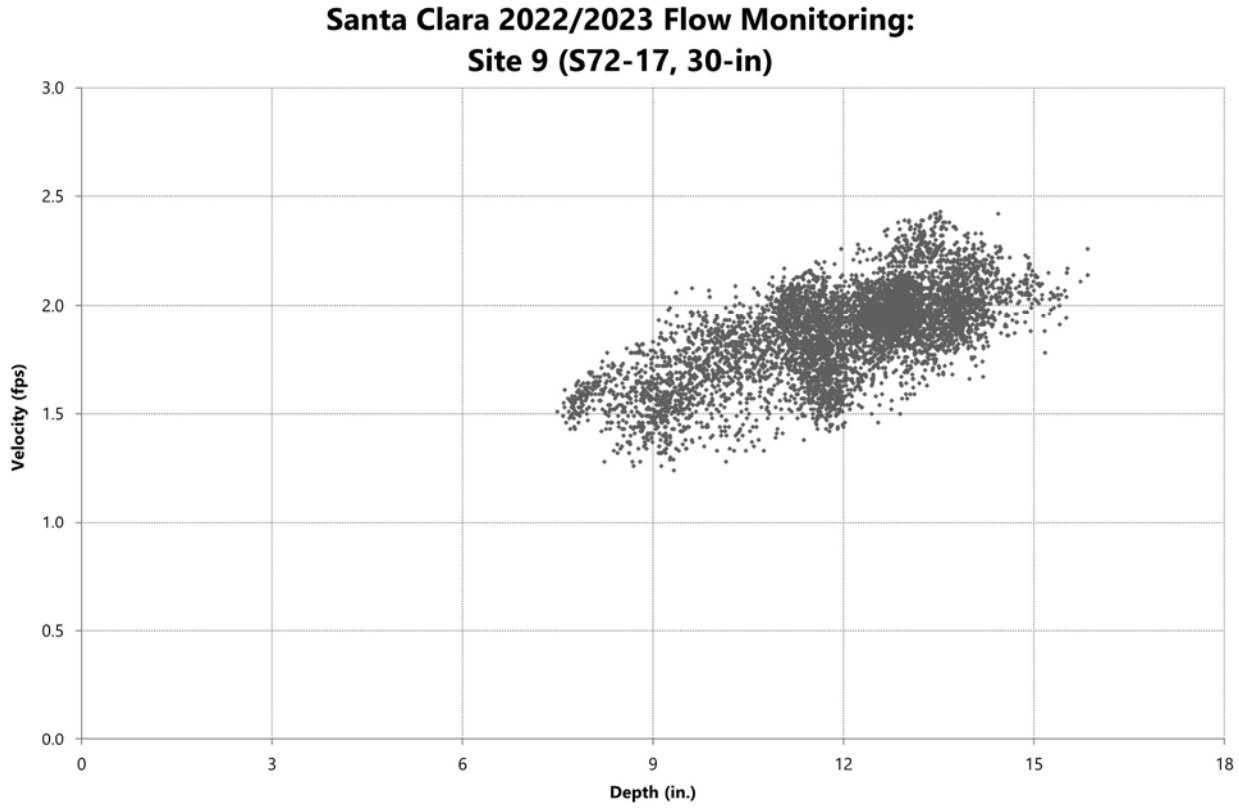

Santa Clara 2022/2023 Flow Monitoring:
Site 7 (S105-34, 24-in)
Level (in)
Vel (fps)
Depth (inches)
Velocity (fps)
Date
12/16
12/23
12/30
1/6
1/13
1/20
0
3
6
9
12
15
18
21
24
27
30
0.0
0.6
1.2
1.8
2.4
3.0
3.6
4.2
4.8
5.4
6.0

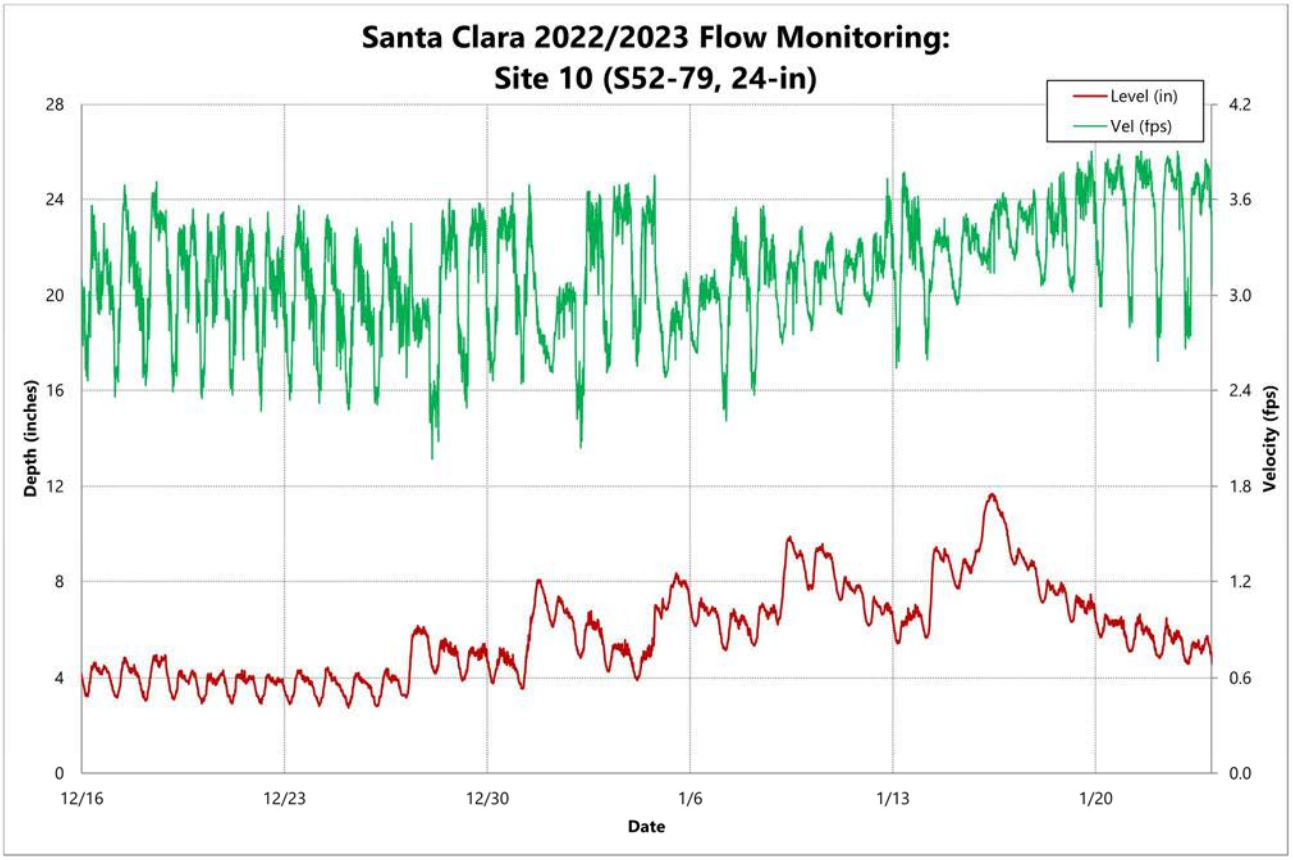

Santa Clara 2022/2023 Flow Monitoring:
Site 7 (S105-34, 24-in)
Velocity (fps)
Depth (in.)
0
3
6
9
12
15
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0

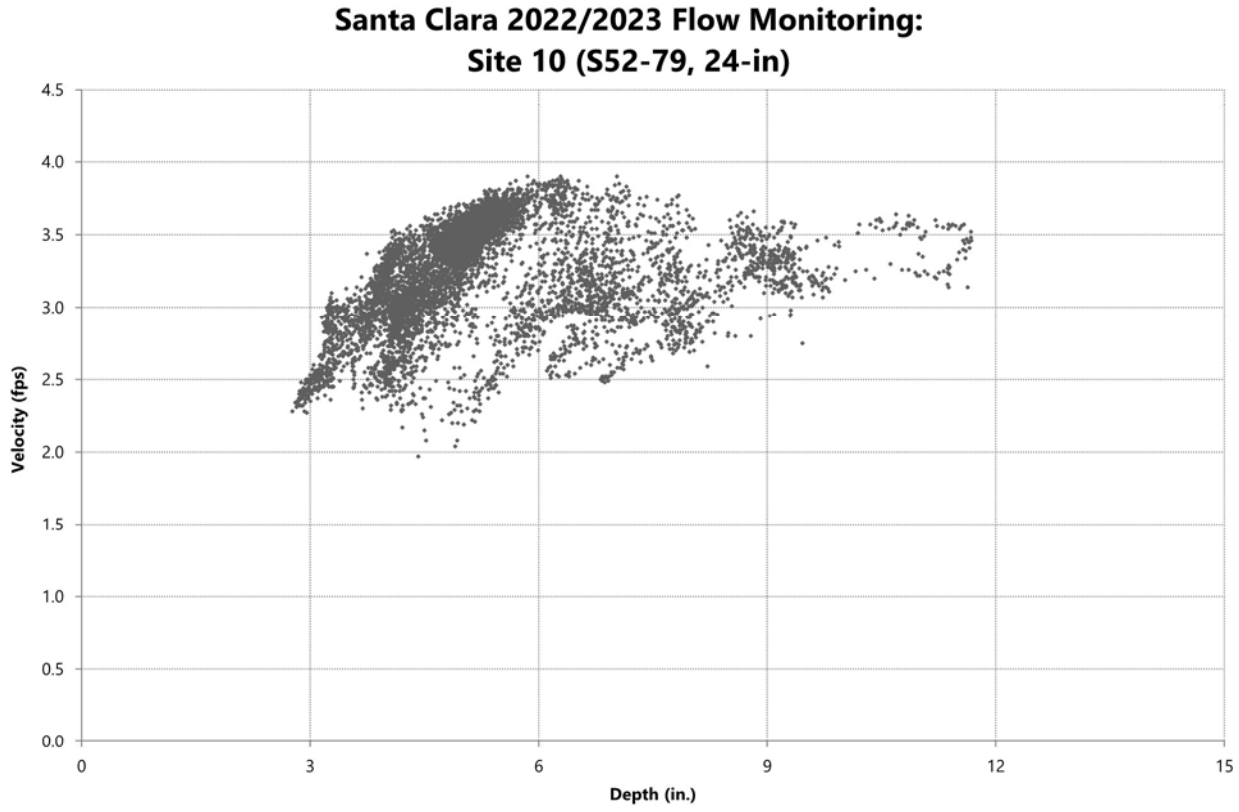

Santa Clara 2022/2023 Flow Monitoring:
Site 8 (S86-12, 30-in)
Level (in)
Vel (fps)
Depth (inches)
Velocity (fps)
Date
12/16
12/23
12/30
1/6
1/13
1/20

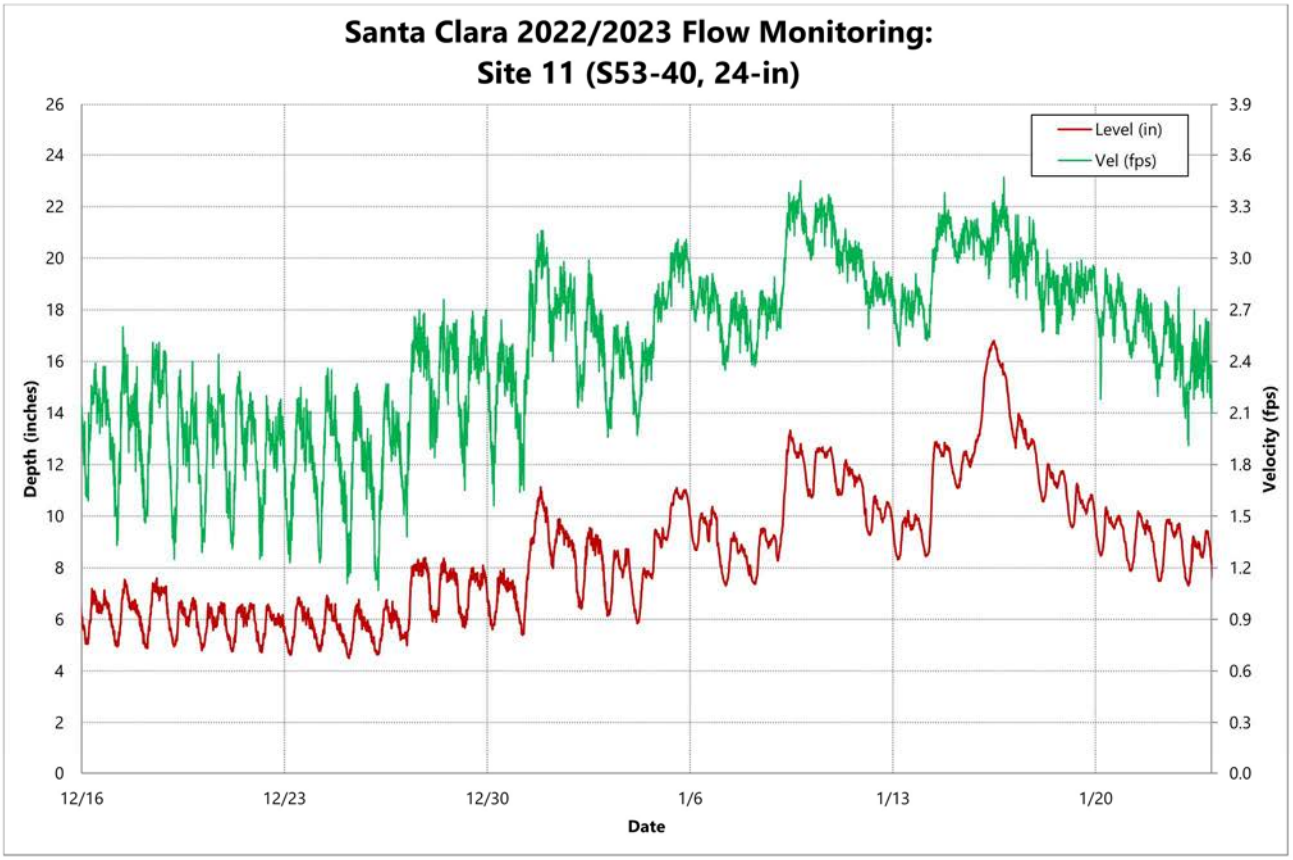

Santa Clara 2022/2023 Flow Monitoring:
Site 8 (S86-12, 30-in)
Velocity (fps)
Depth (in.)

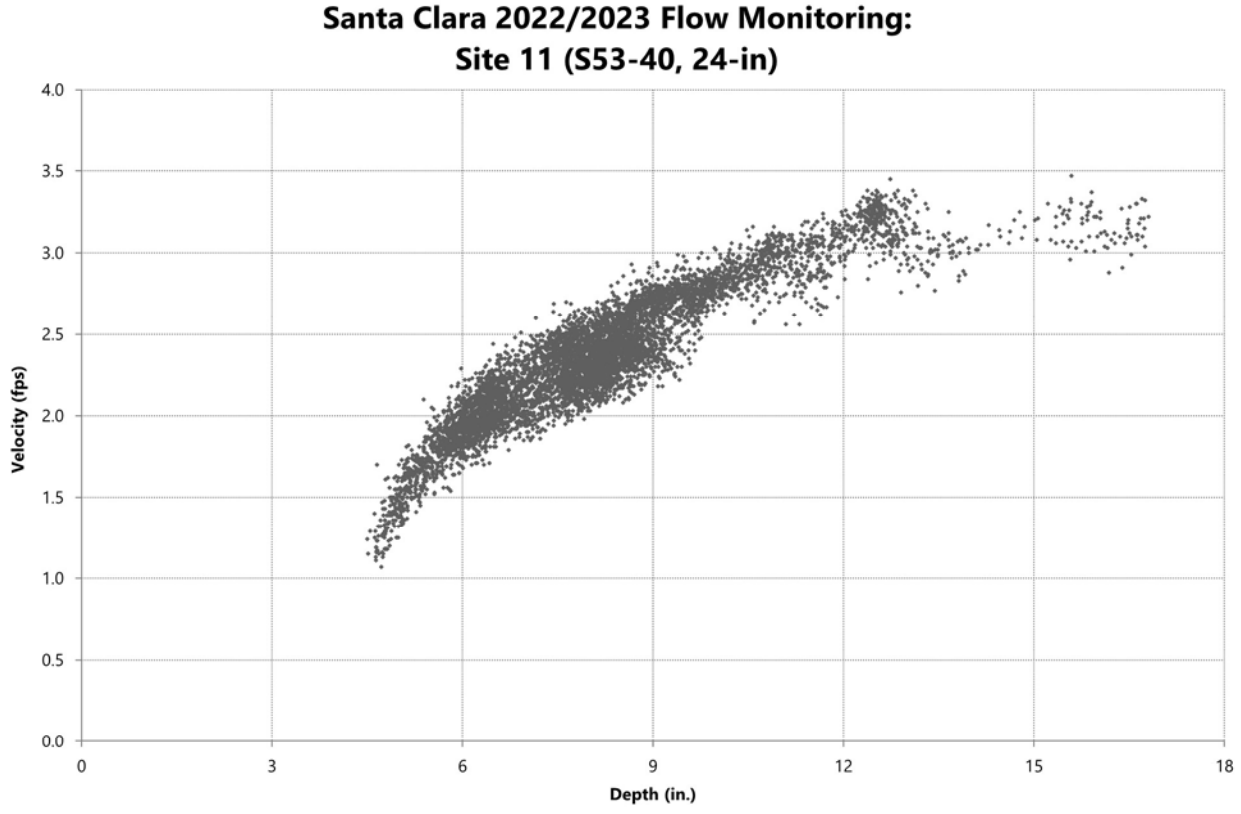

Santa Clara 2022/2023 Flow Monitoring:
Site 9 (S72-17, 30-in)
Level (in)
Vel (fps)
Depth (inches)
Velocity (fps)
Date
12/16
12/23
12/30
1/6
1/13
1/20

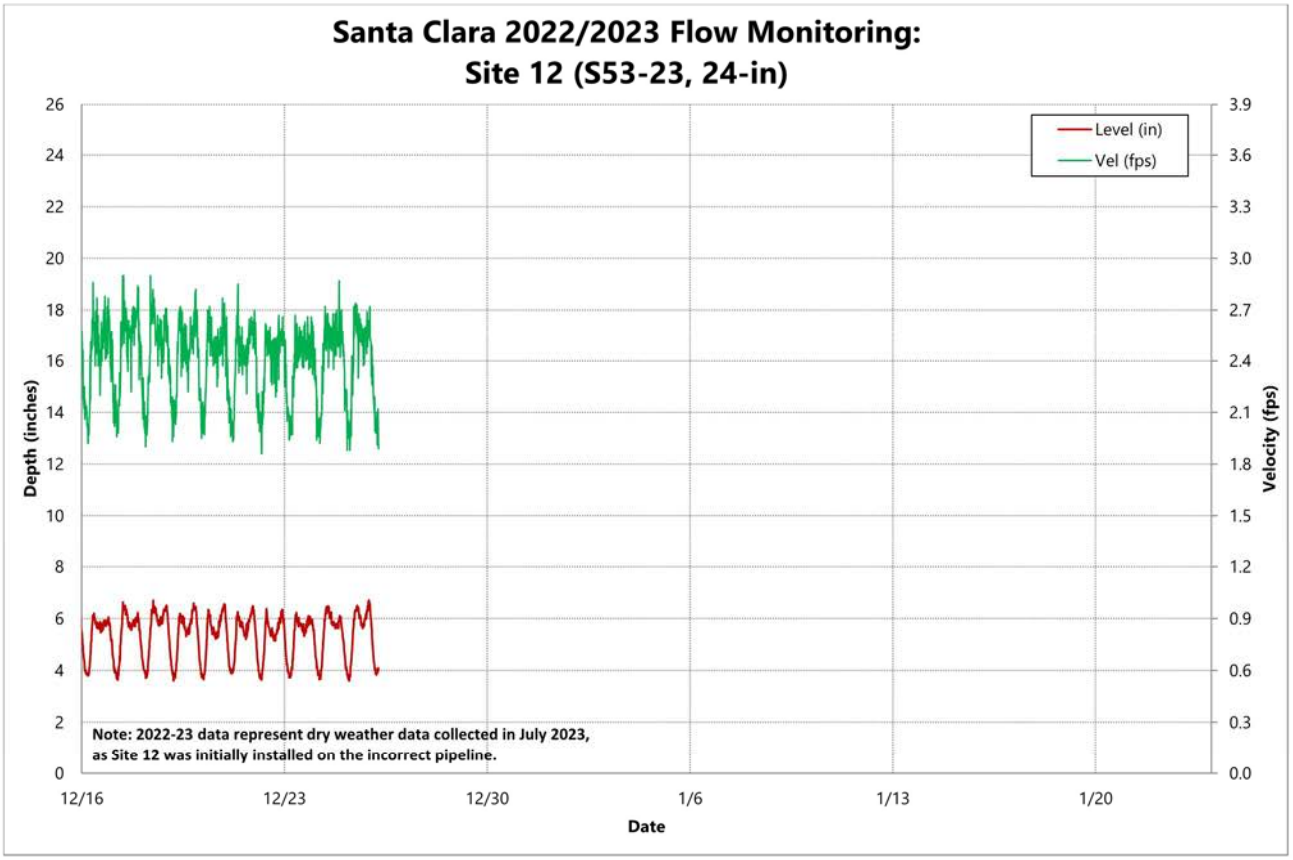

Santa Clara 2022/2023 Flow Monitoring:
Site 9 (S72-17, 30-in)
Velocity (fps)
Depth (in.)

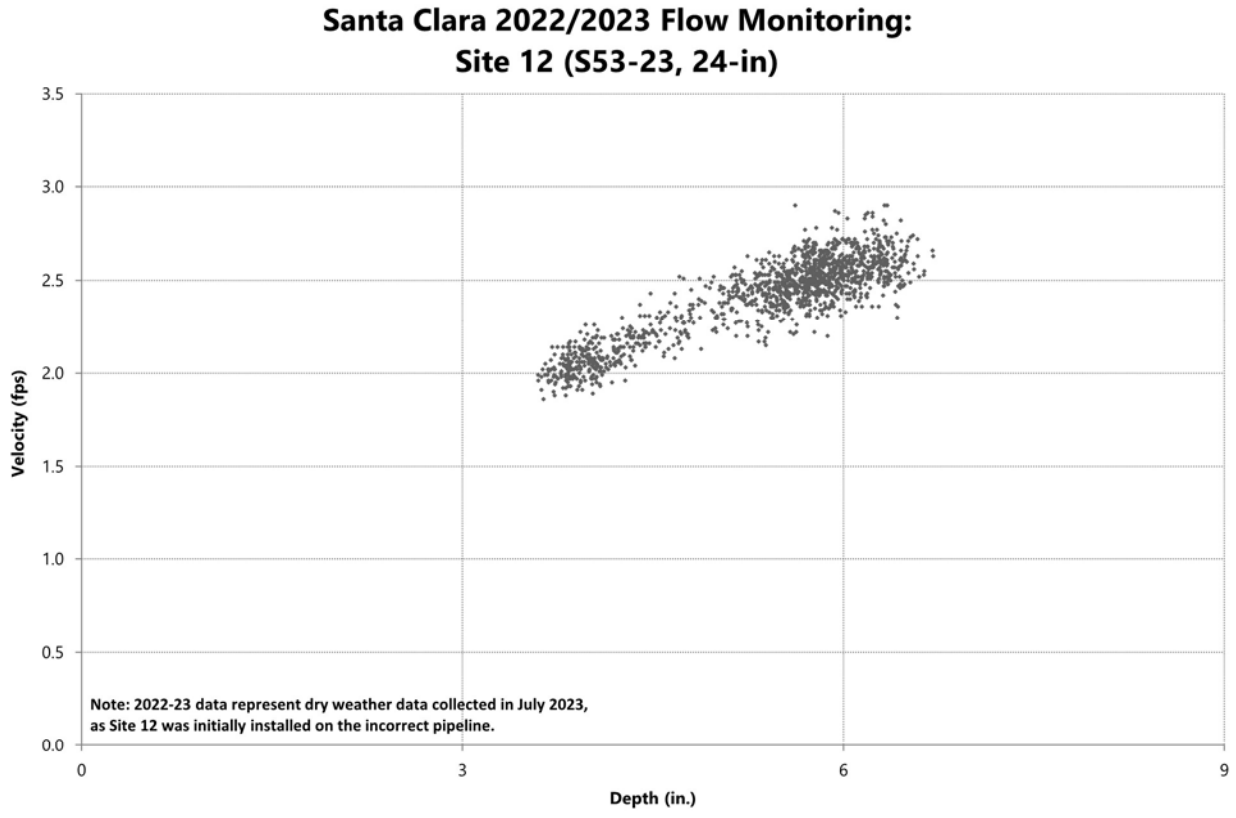

Santa Clara 2022/2023 Flow Monitoring:
Site 10 (S52-79, 24-in)
Level (in)
Vel (fps)
Depth (inches)
Velocity (fps)
Date
28
24
20
16
12
8
4
0
4.2
3.6
3.0
2.4
1.8
1.2
0.6
0.0
12/16
12/23
12/30
1/6
1/13
1/20

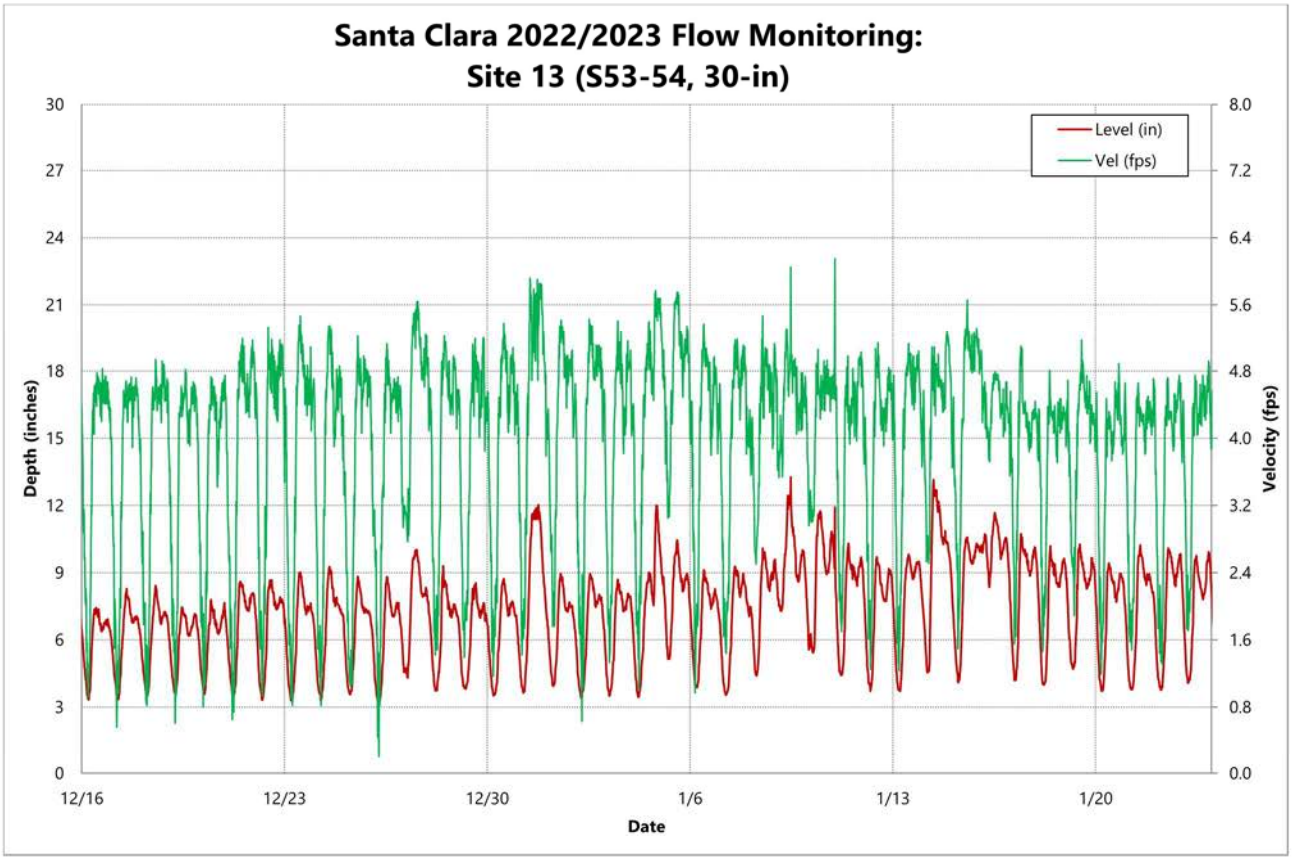

Santa Clara 2022/2023 Flow Monitoring:
Site 10 (S52-79, 24-in)
Velocity (fps)
Depth (in.)
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0
3
6
9
12
15

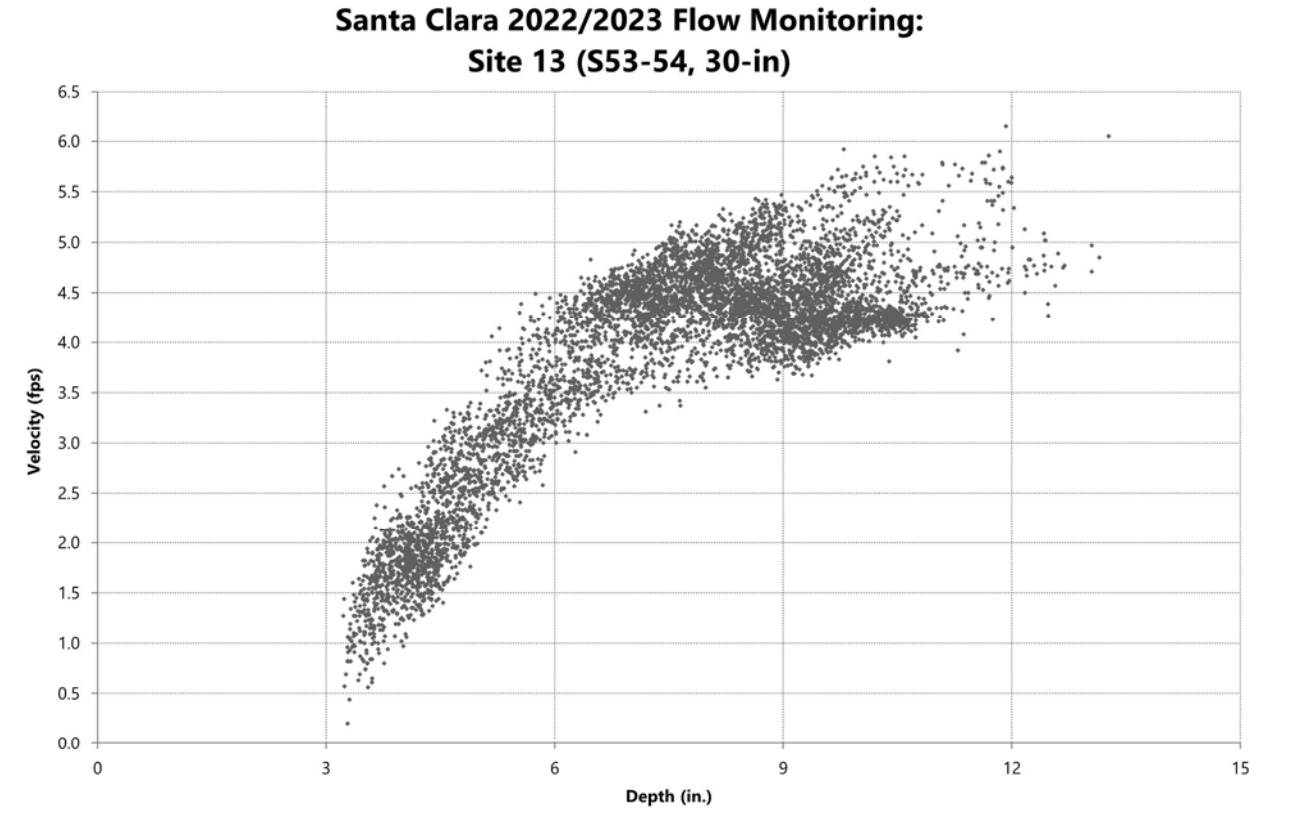

Santa Clara 2022/2023 Flow Monitoring:
Site 11 (S53-40, 24-in)
Level (in)
Vel (fps)
Depth (inches)
Velocity (fps)
Date
12/16
12/23
12/30
1/6
1/13
1/20

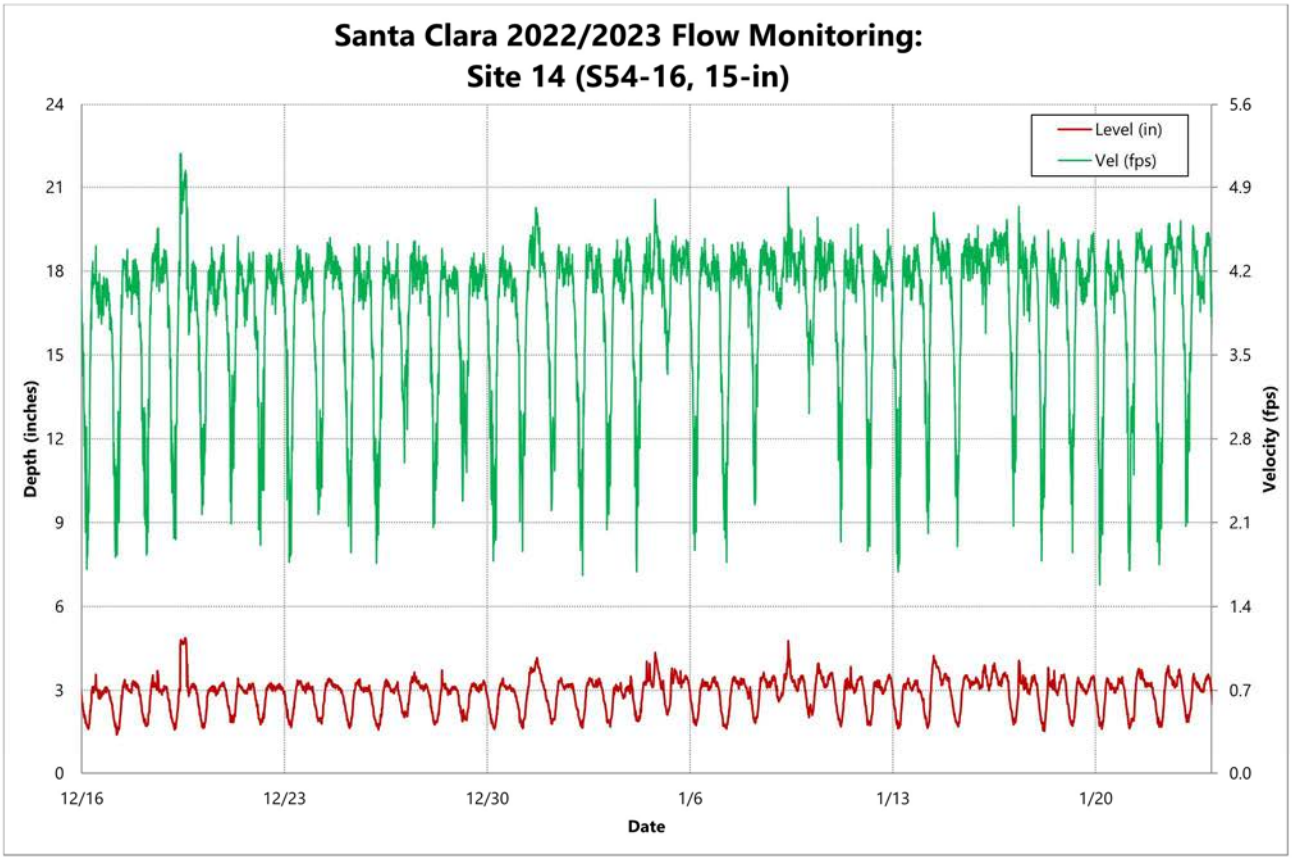

Santa Clara 2022/2023 Flow Monitoring:
Site 11 (S53-40, 24-in)
Velocity (fps)
Depth (in.)

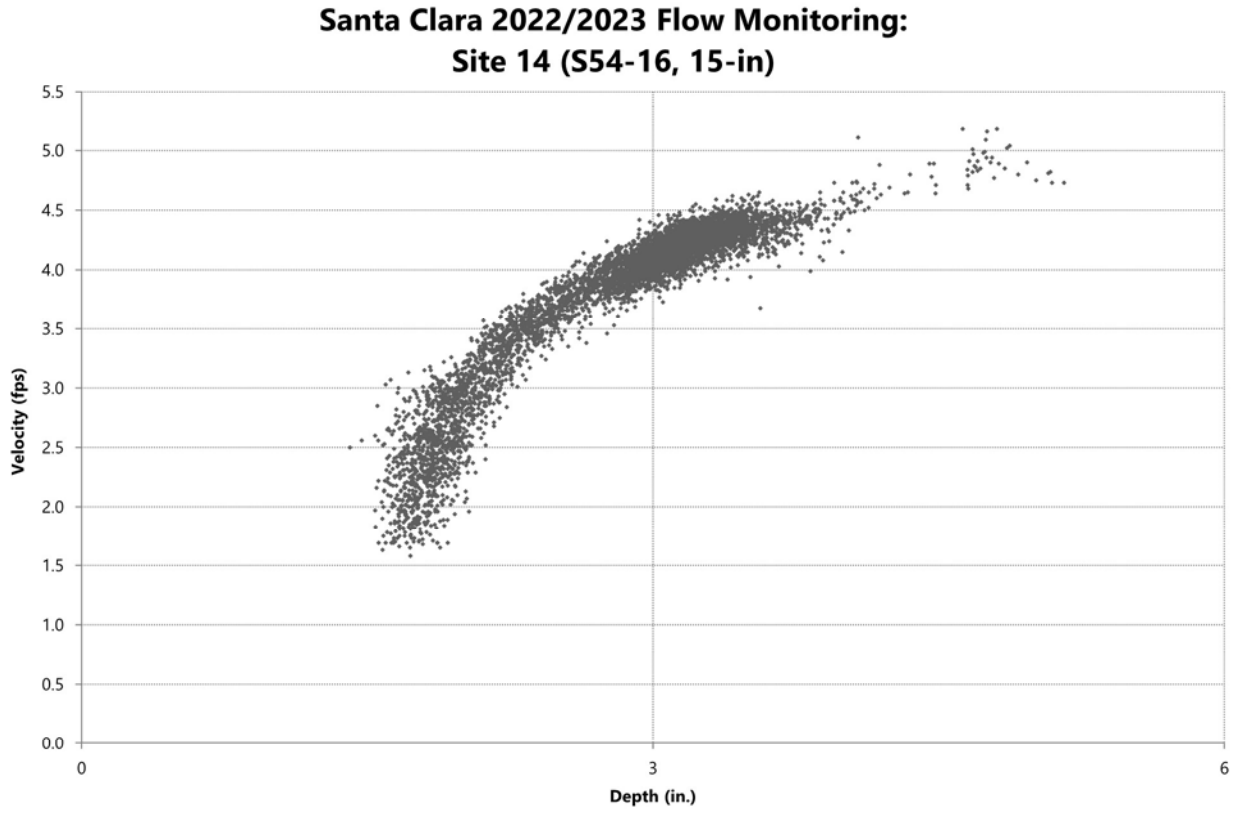

Santa Clara 2022/2023 Flow Monitoring:
Site 12 (S53-23, 24-in)
Level (in)
Vel (fps)
Depth (inches)
Velocity (fps)
Date
12/16
12/23
12/30
1/6
1/13
1/20
Note: 2022-23 data represent dry weather data collected in July 2023,
as Site 12 was initially installed on the incorrect pipeline.

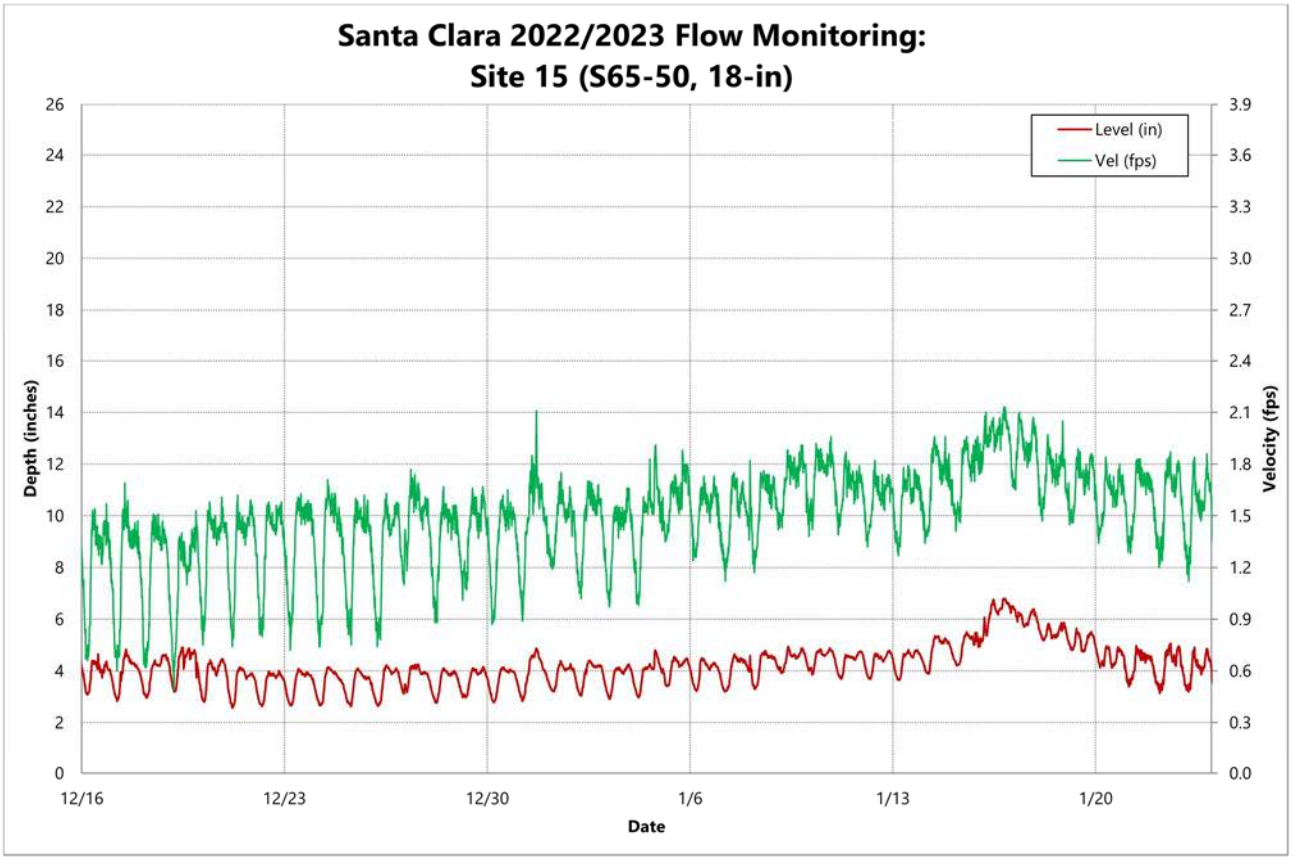

Santa Clara 2022/2023 Flow Monitoring:
Site 12 (S53-23, 24-in)
Velocity (fps)
Depth (in.)
Note: 2022-23 data represent dry weather data collected in July 2023,
as Site 12 was initially installed on the incorrect pipeline.

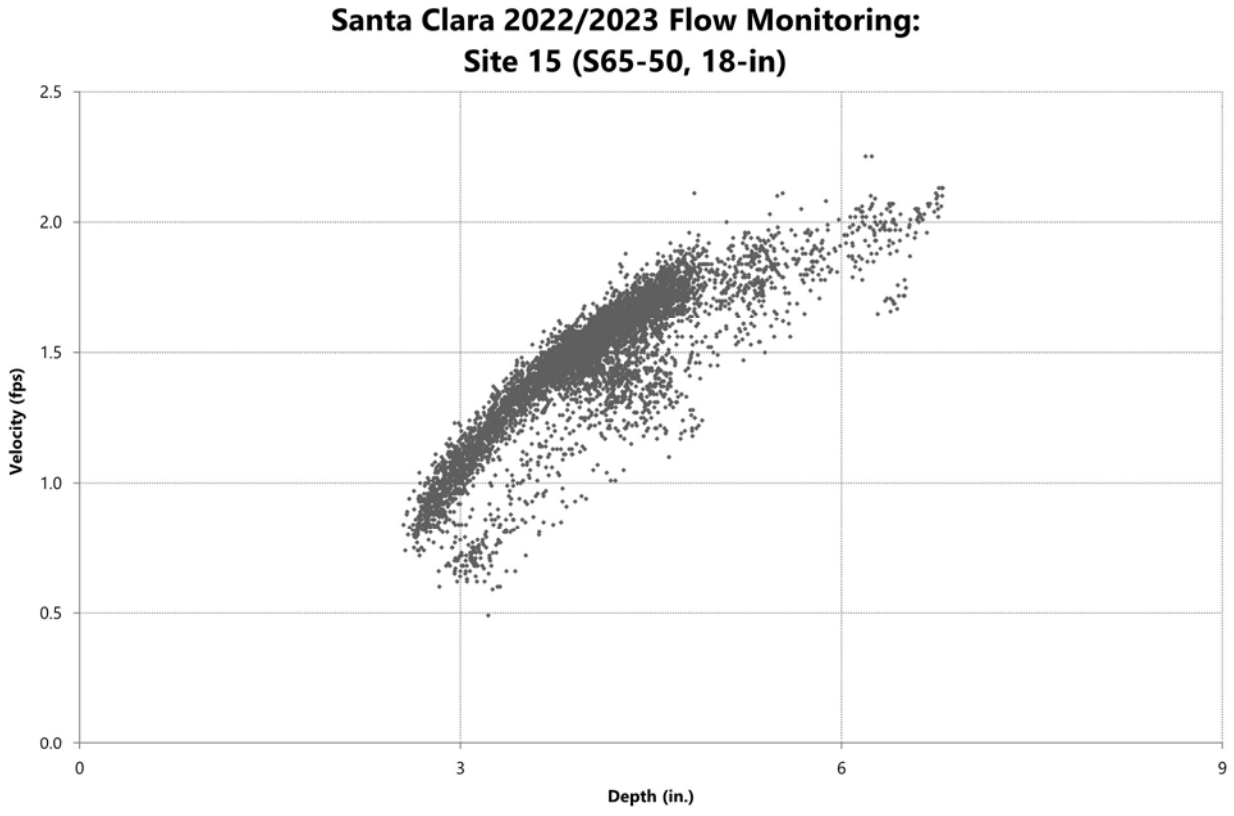

Santa Clara 2022/2023 Flow Monitoring:
Site 13 (S53-54, 30-in)
Level (in)
Vel (fps)
Depth (inches)
Velocity (fps)
Date
12/16
12/23
12/30
1/6
1/13
1/20
0
3
6
9
12
15
18
21
24
27
30
0.0
0.8
1.6
2.4
3.2
4.0
4.8
5.6
6.4
7.2
8.0

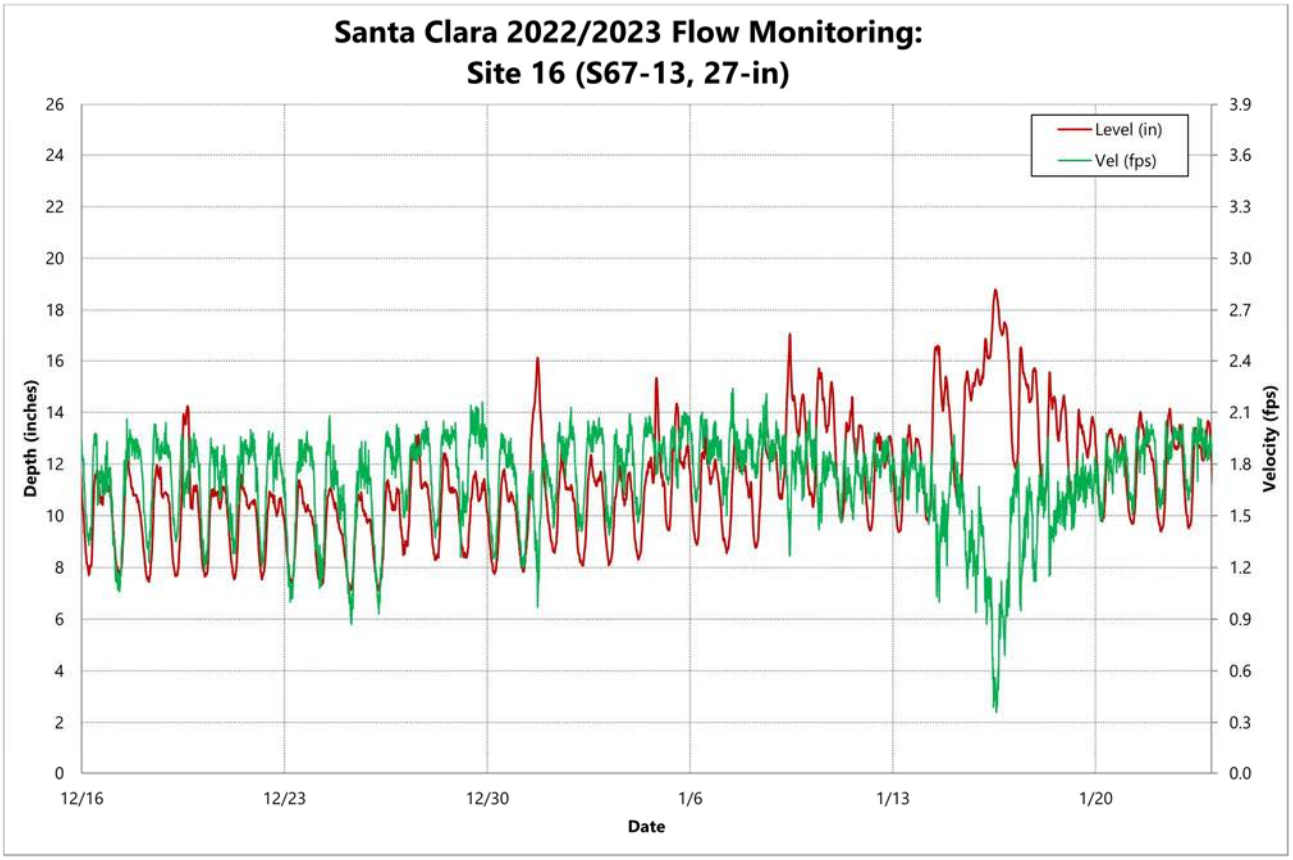

Santa Clara 2022/2023 Flow Monitoring:
Site 13 (S53-54, 30-in)
Velocity (fps)
Depth (in.)
0
3
6
9
12
15
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
6.0
6.5

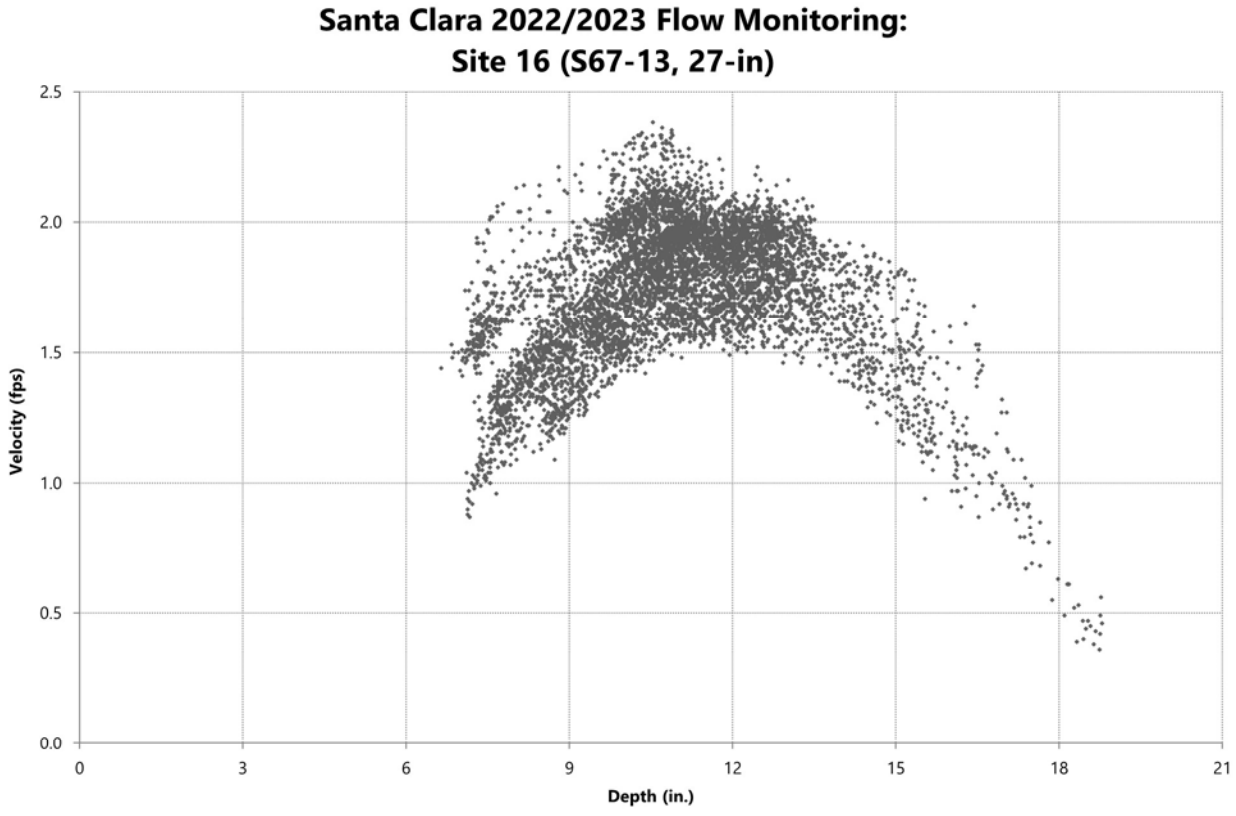

Santa Clara 2022/2023 Flow Monitoring:
Site 14 (S54-16, 15-in)
Level (in)
Vel (fps)
Depth (inches)
Velocity (fps)
Date
24
21
18
15
12
9
6
3
0
5.6
4.9
4.2
3.5
2.8
2.1
1.4
0.7
0.0
12/16
12/23
12/30
1/6
1/13
1/20

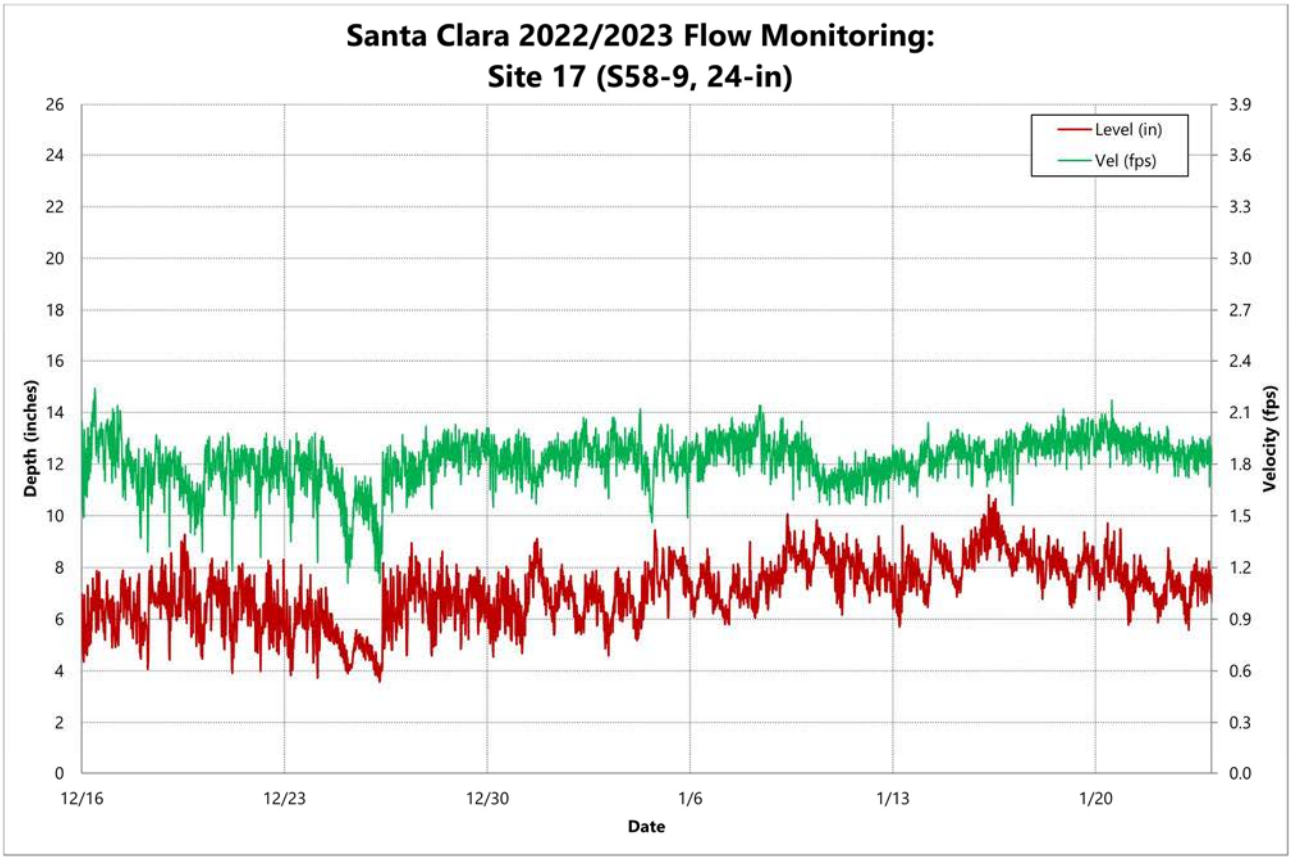

Santa Clara 2022/2023 Flow Monitoring:
Site 14 (S54-16, 15-in)
Velocity (fps)
Depth (in.)
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0
3
6

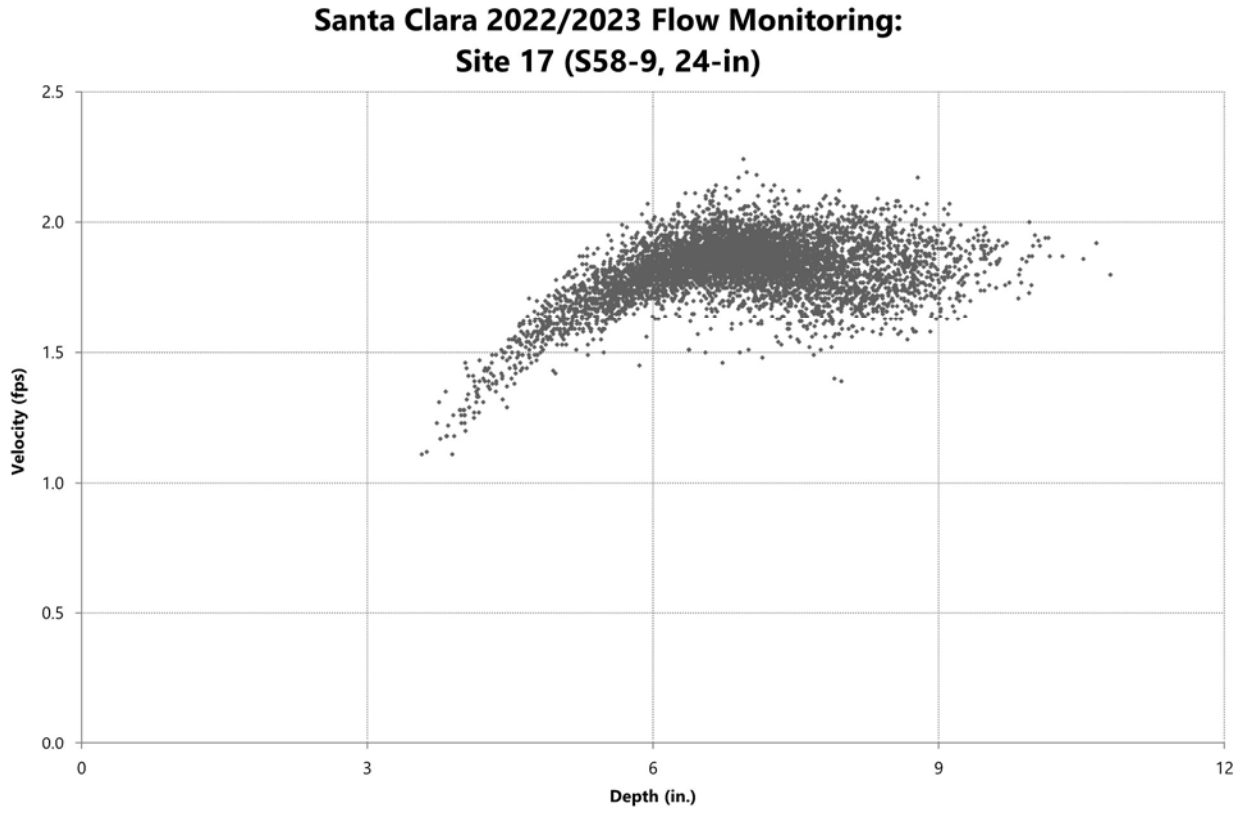

Santa Clara 2022/2023 Flow Monitoring:
Site 15 (S65-50, 18-in)
Level (in)
Vel (fps)
Depth (inches)
Velocity (fps)
Date
12/16
12/23
12/30
1/6
1/13
1/20

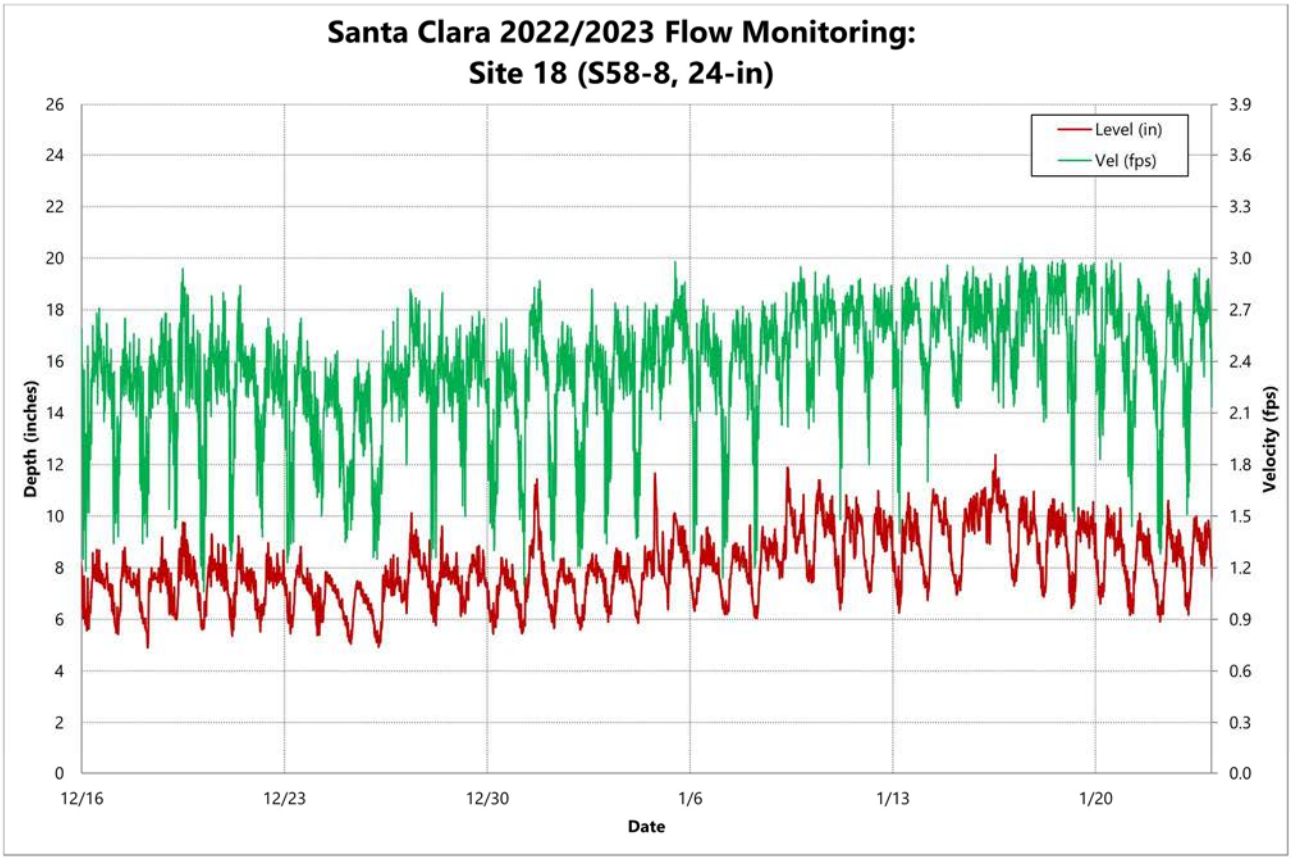

Santa Clara 2022/2023 Flow Monitoring:
Site 15 (S65-50, 18-in)
Velocity (fps)
Depth (in.)

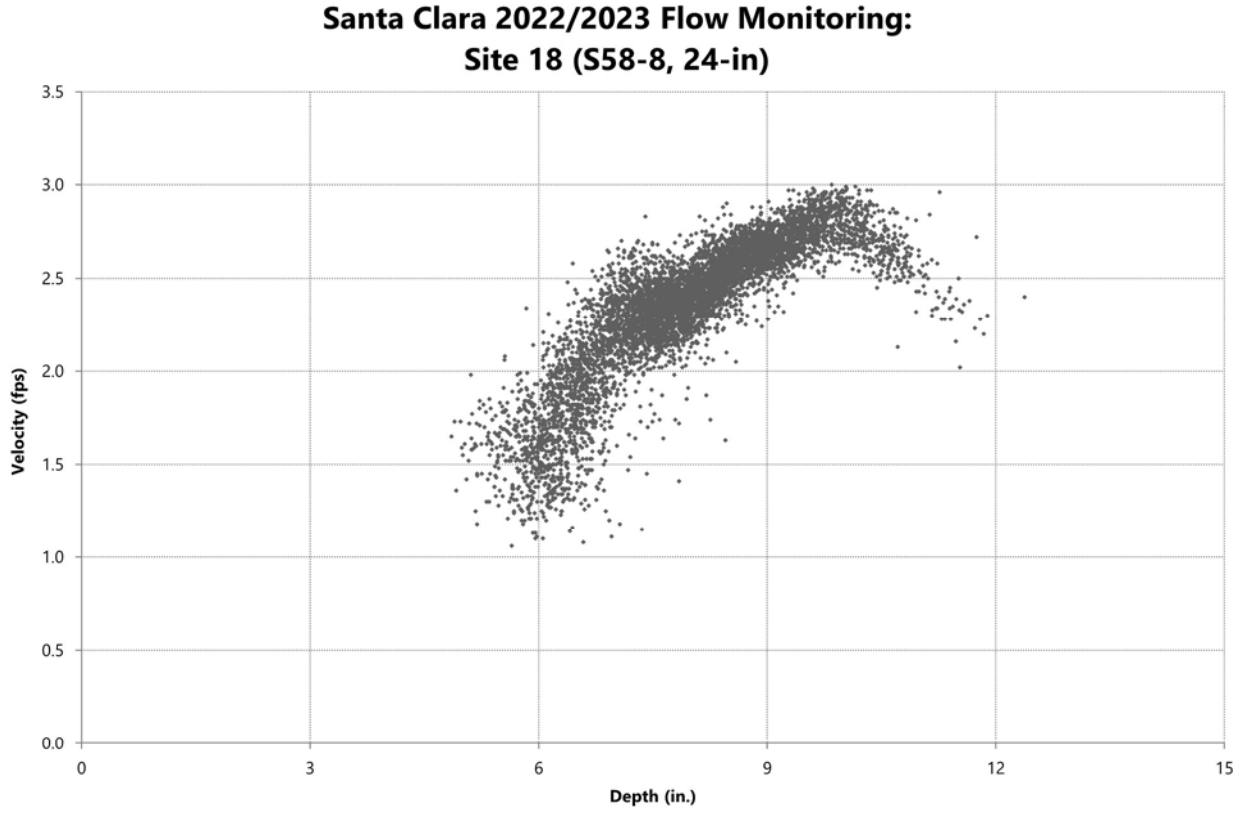

Santa Clara 2022/2023 Flow Monitoring:
Site 16 (S67-13, 27-in)
Level (in)
Vel (fps)
Depth (inches)
Velocity (fps)
Date
12/16
12/23
12/30
1/6
1/13
1/20

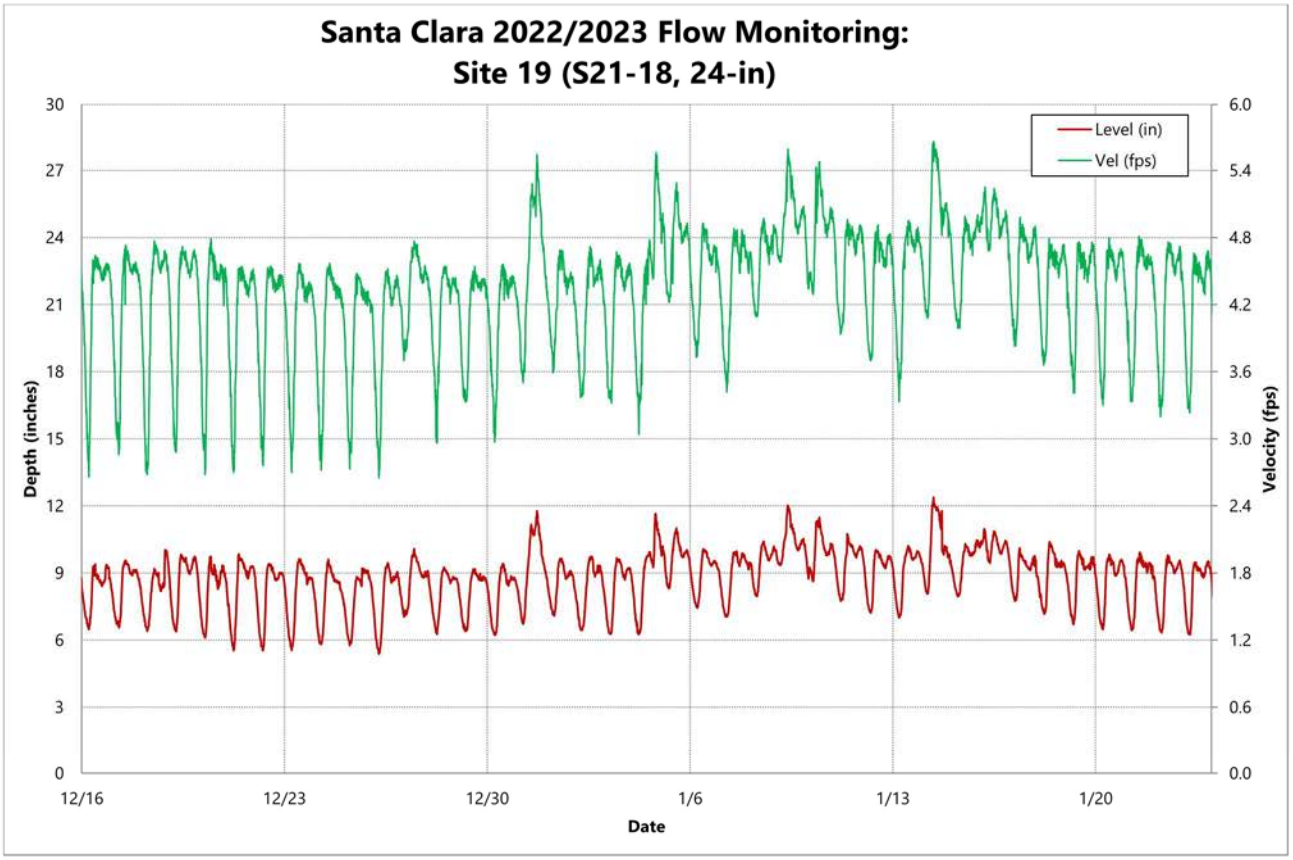

Santa Clara 2022/2023 Flow Monitoring:
Site 16 (S67-13, 27-in)
Velocity (fps)
Depth (in.)

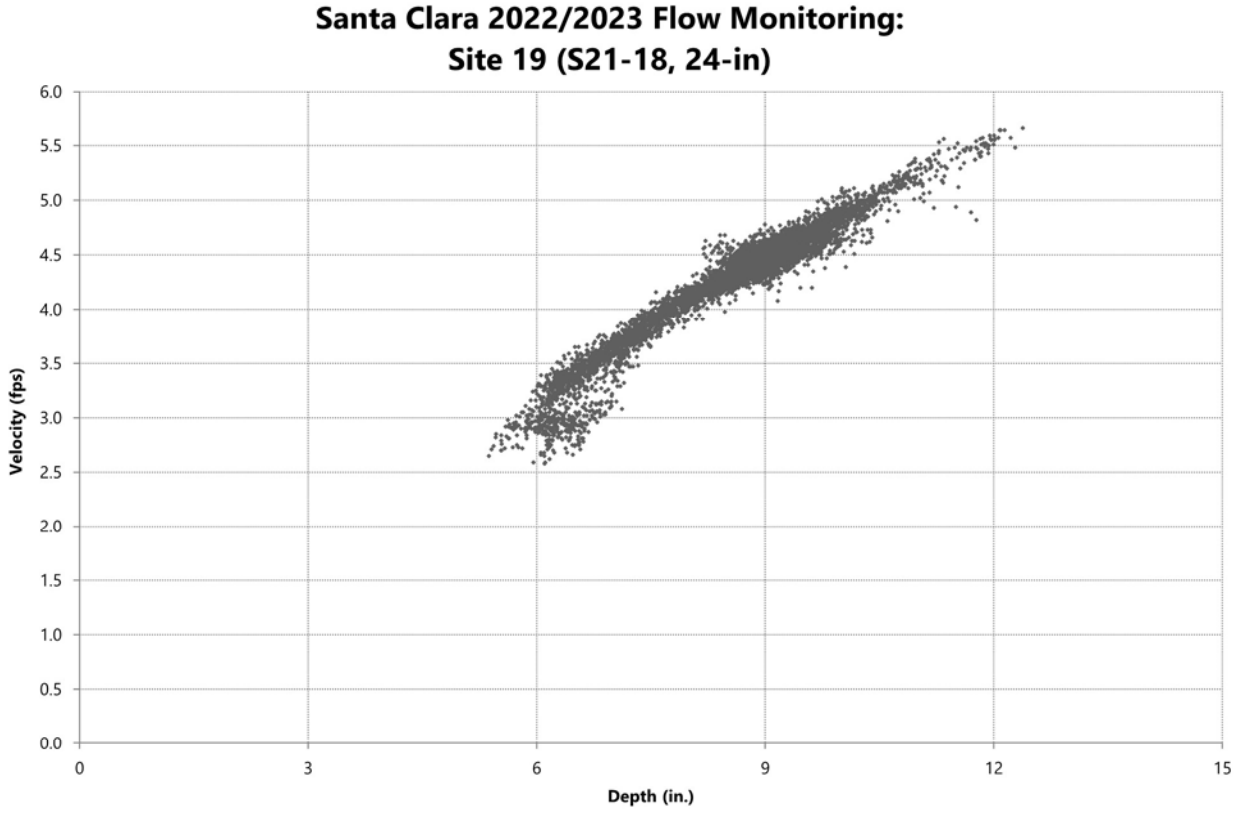

Santa Clara 2022/2023 Flow Monitoring:
Site 17 (S58-9, 24-in)
Level (in)
Vel (fps)
Depth (inches)
Velocity (fps)
Date
12/16
12/23
12/30
1/6
1/13
1/20

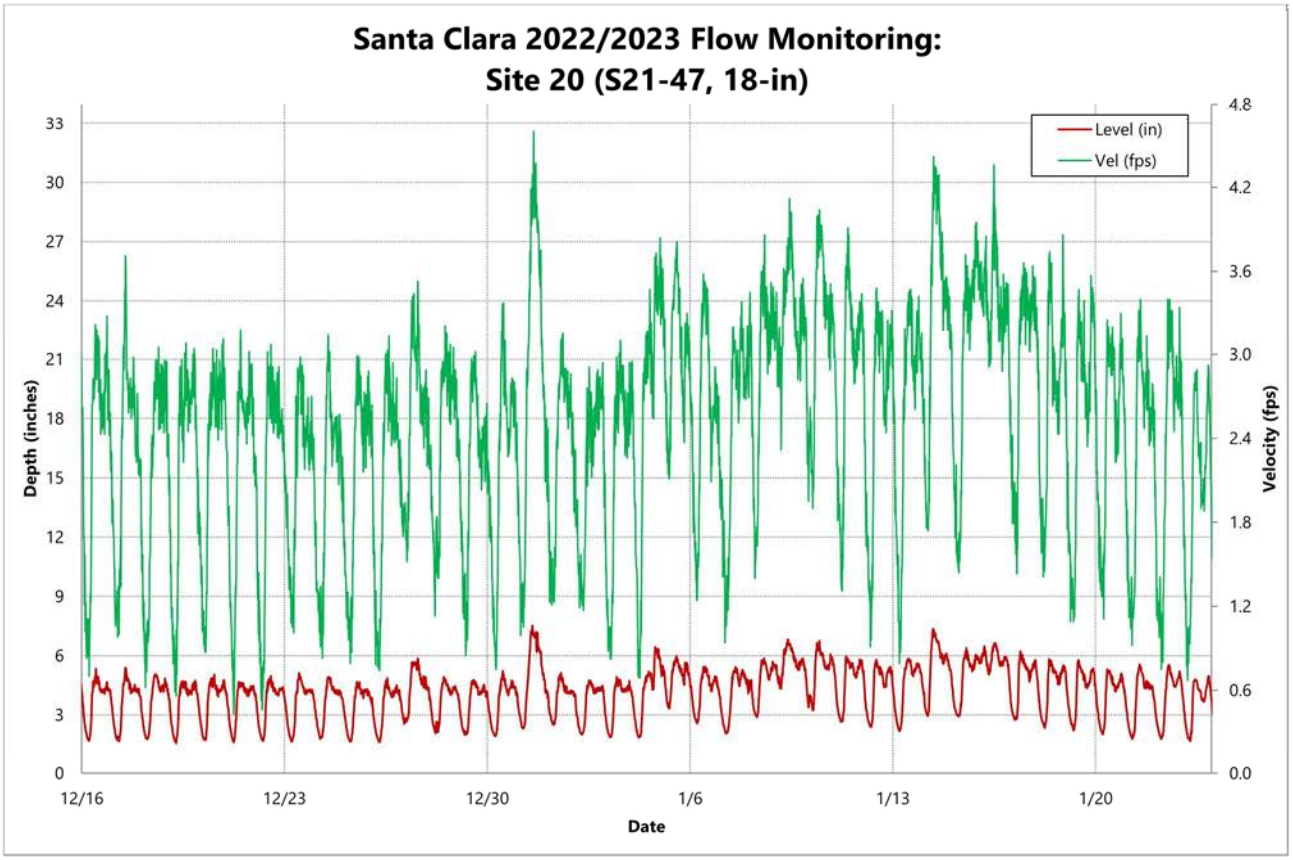

Santa Clara 2022/2023 Flow Monitoring:
Site 17 (S58-9, 24-in)
Velocity (fps)
Depth (in.)

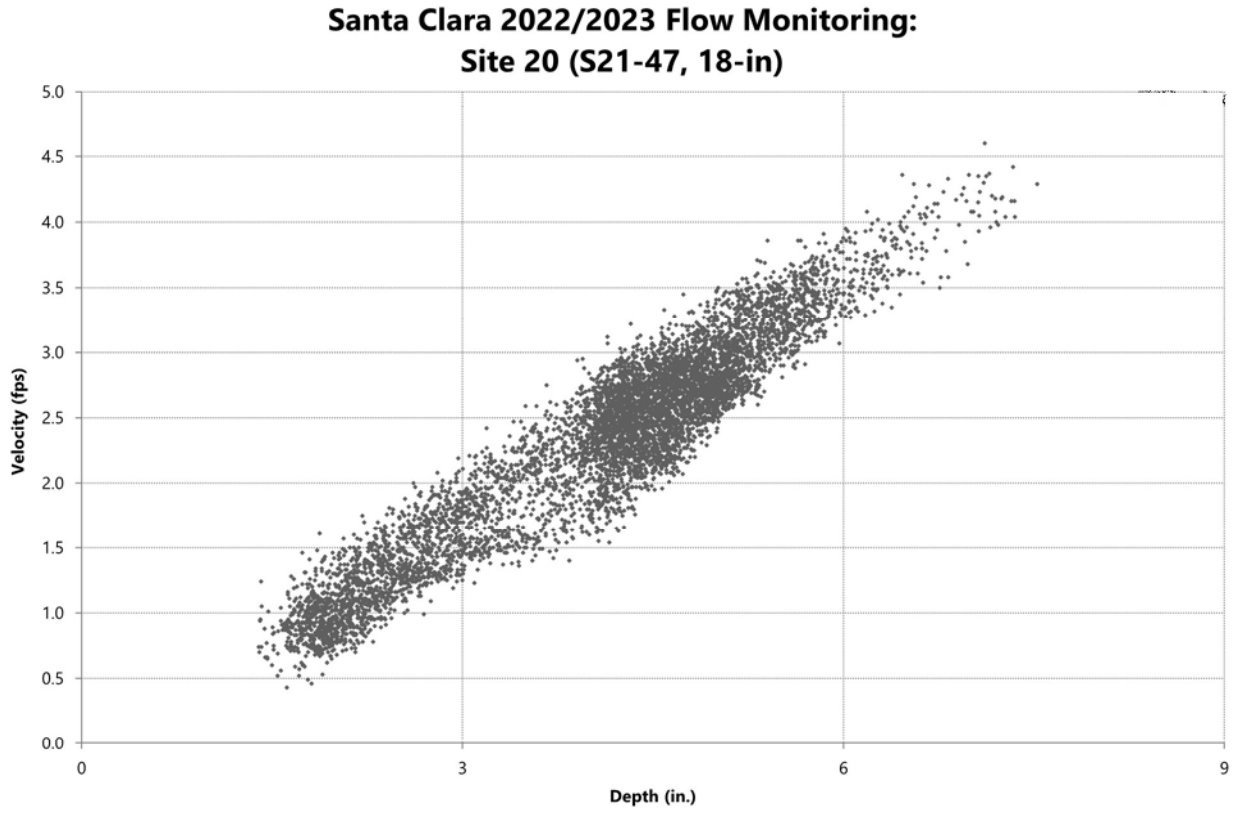

Santa Clara 2022/2023 Flow Monitoring:
Site 18 (S58-8, 24-in)
Level (in)
Vel (fps)
Depth (inches)
Velocity (fps)
Date
12/16
12/23
12/30
1/6
1/13
1/20

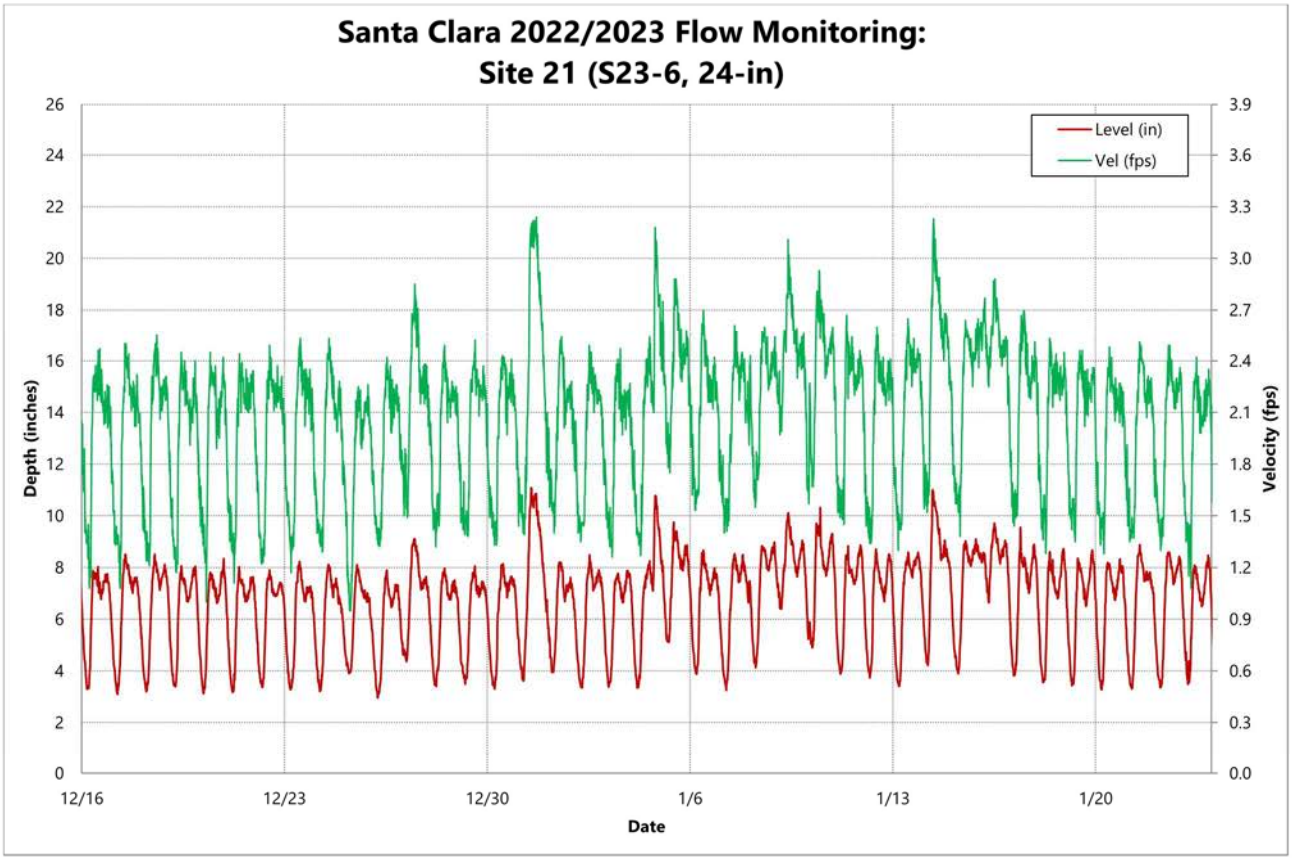

Santa Clara 2022/2023 Flow Monitoring:
Site 18 (S58-8, 24-in)
Velocity (fps)
Depth (in.)

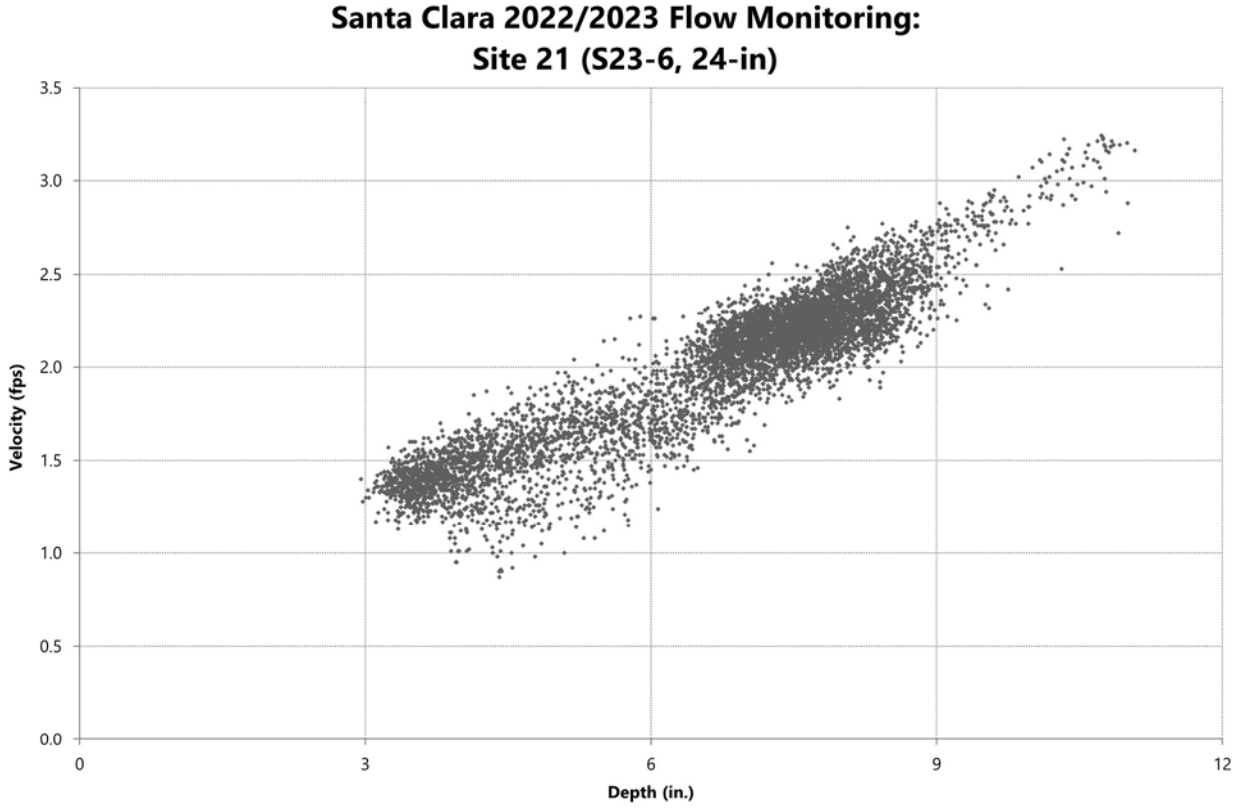

Santa Clara 2022/2023 Flow Monitoring:
Site 19 (S21-18, 24-in)
Level (in)
Vel (fps)
Depth (inches)
Velocity (fps)
Date
12/16
12/23
12/30
1/6
1/13
1/20
0
3
6
9
12
15
18
21
24
27
30
0.0
0.6
1.2
1.8
2.4
3.0
3.6
4.2
4.8
5.4
6.0

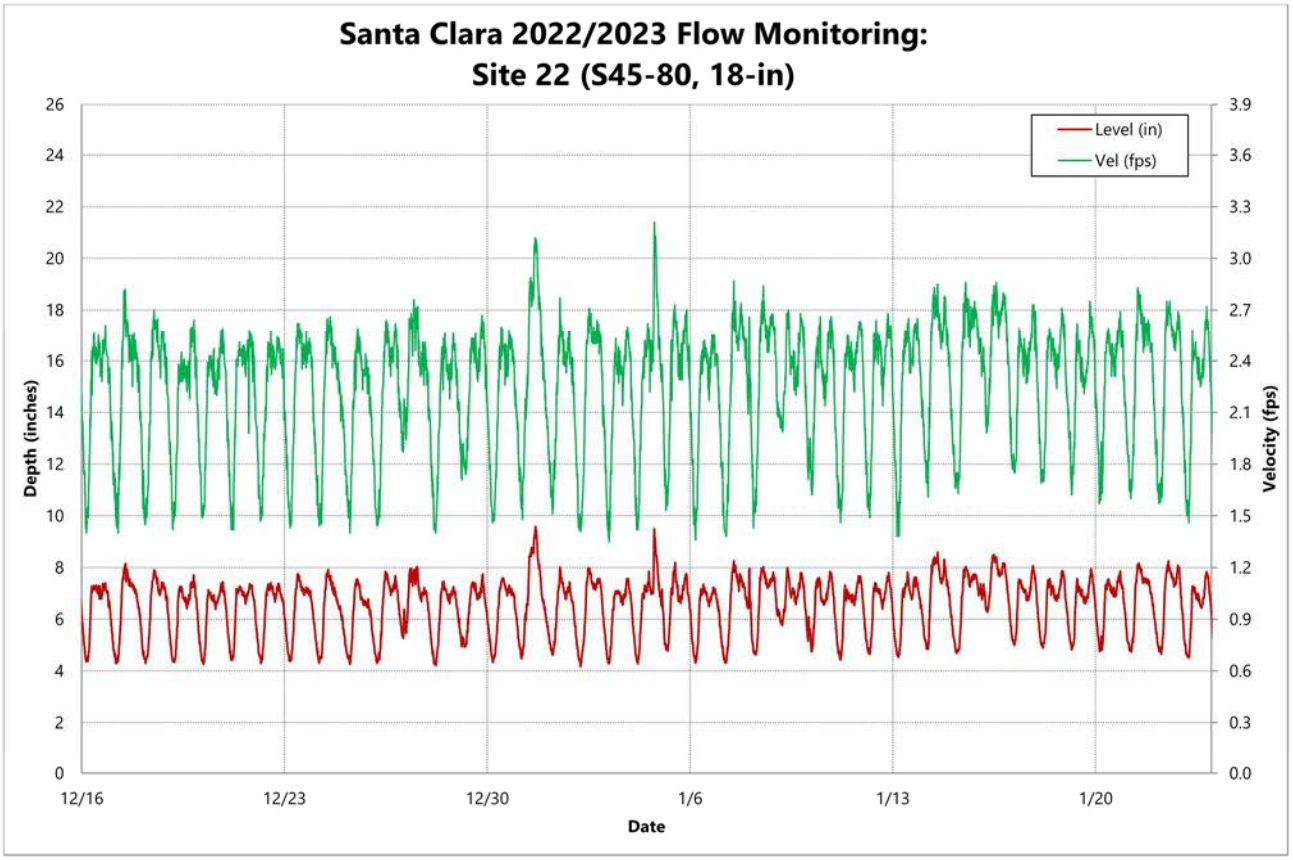

Santa Clara 2022/2023 Flow Monitoring:
Site 19 (S21-18, 24-in)
Velocity (fps)
Depth (in.)
0
3
6
9
12
15
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
6.0

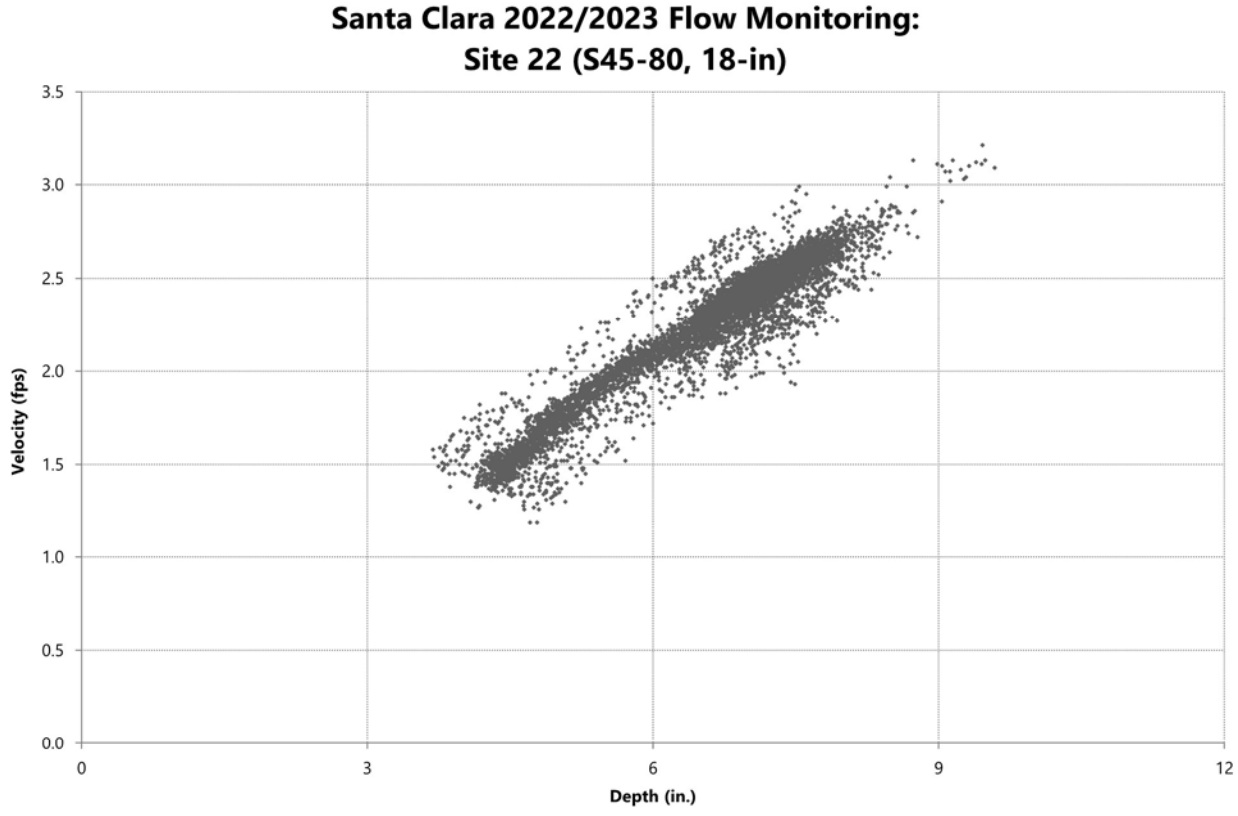

Santa Clara 2022/2023 Flow Monitoring:
Site 20 (S21-47, 18-in)
Level (in)
Vel (fps)
Depth (inches)
Velocity (fps)
Date
0
3
6
9
12
15
18
21
24
27
30
33
0.0
0.6
1.2
1.8
2.4
3.0
3.6
4.2
4.8
12/16
12/23
12/30
1/6
1/13
1/20

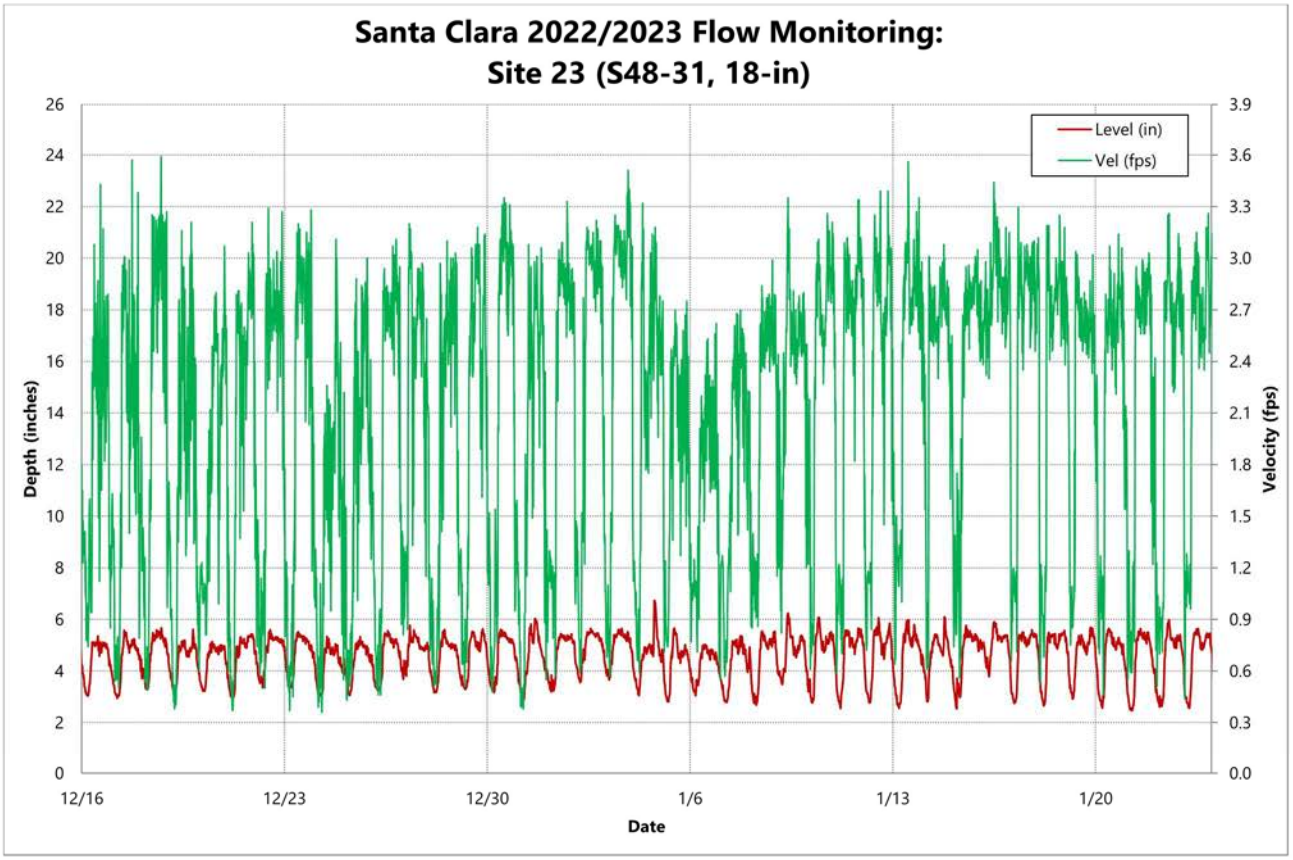

Santa Clara 2022/2023 Flow Monitoring:
Site 20 (S21-47, 18-in)
Velocity (fps)
Depth (in.)
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
0
3
6
9

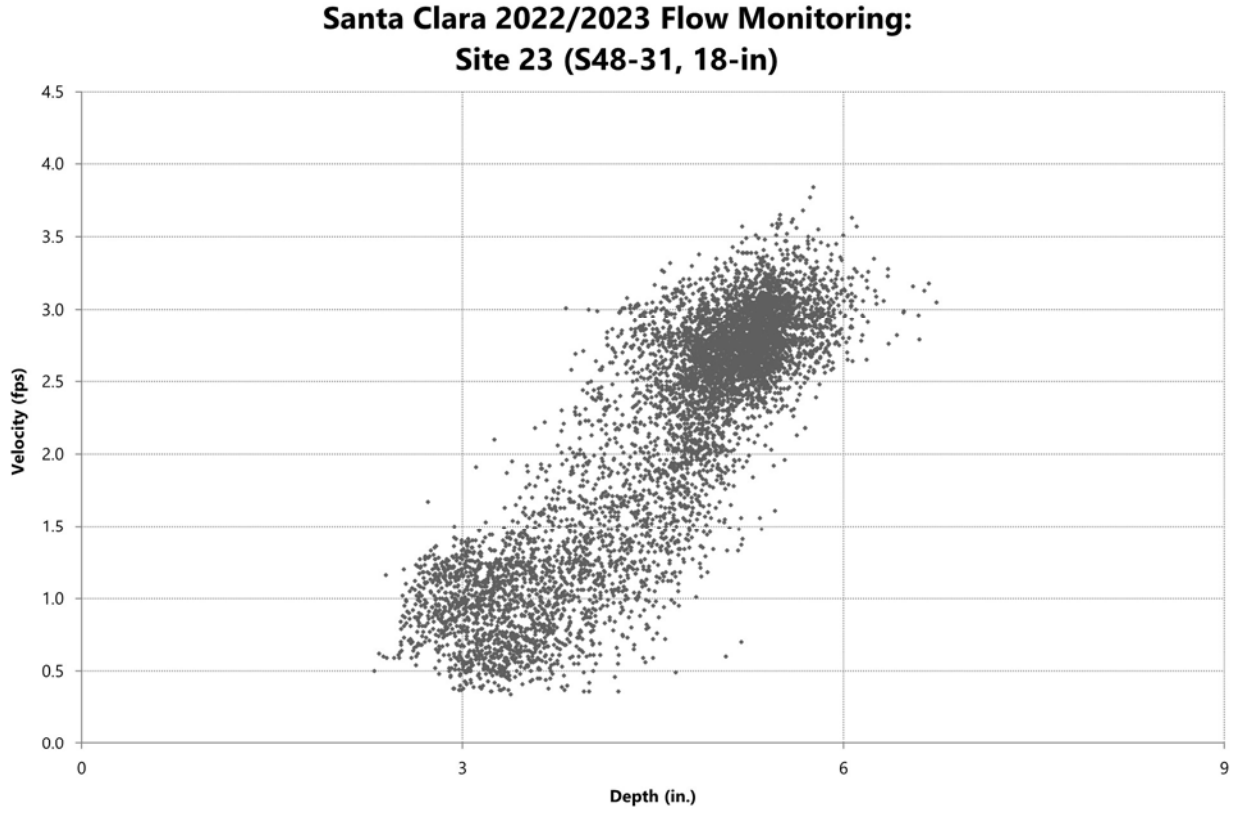

Santa Clara 2022/2023 Flow Monitoring:
Site 21 (S23-6, 24-in)
Level (in)
Vel (fps)
Depth (inches)
Velocity (fps)
Date
12/16
12/23
12/30
1/6
1/13
1/20

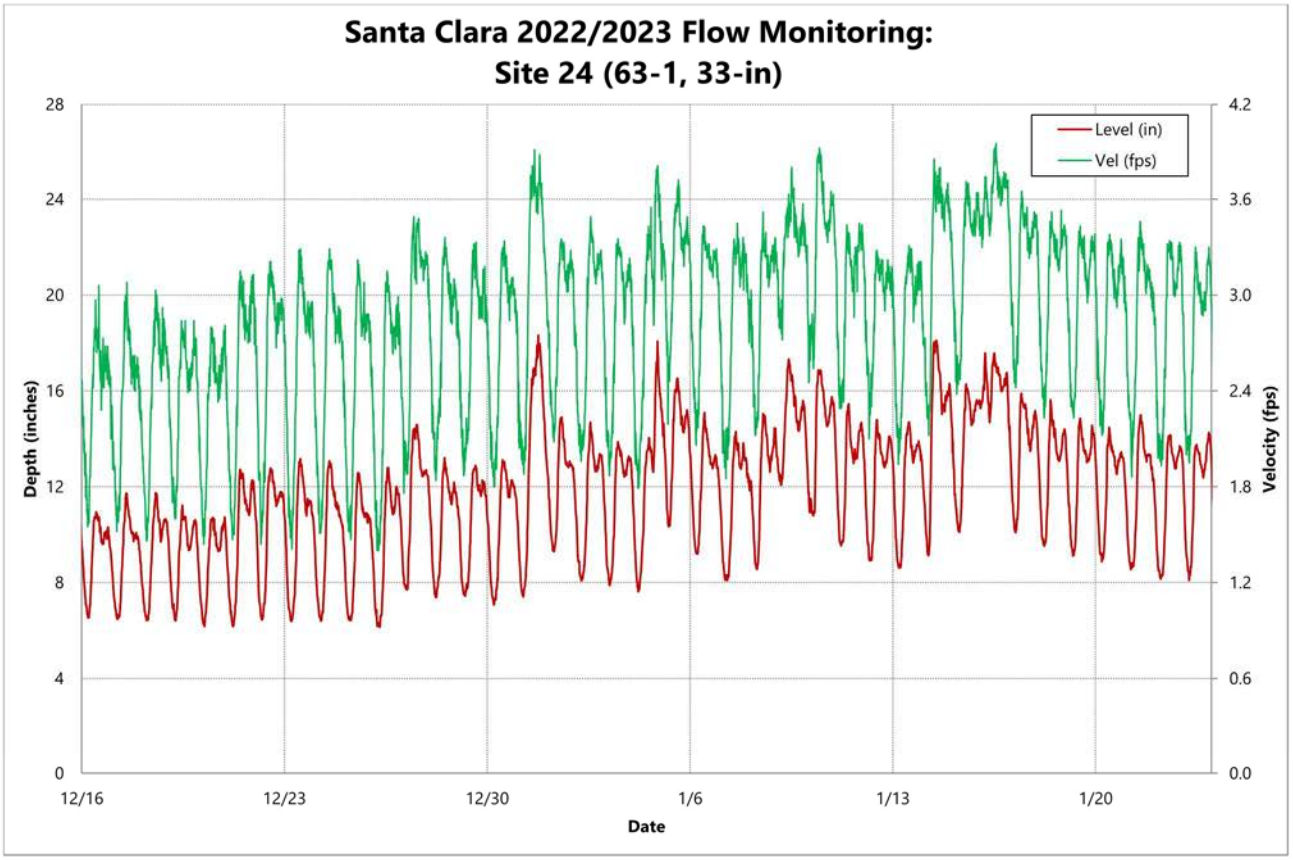

Santa Clara 2022/2023 Flow Monitoring:
Site 21 (S23-6, 24-in)
Velocity (fps)
Depth (in.)

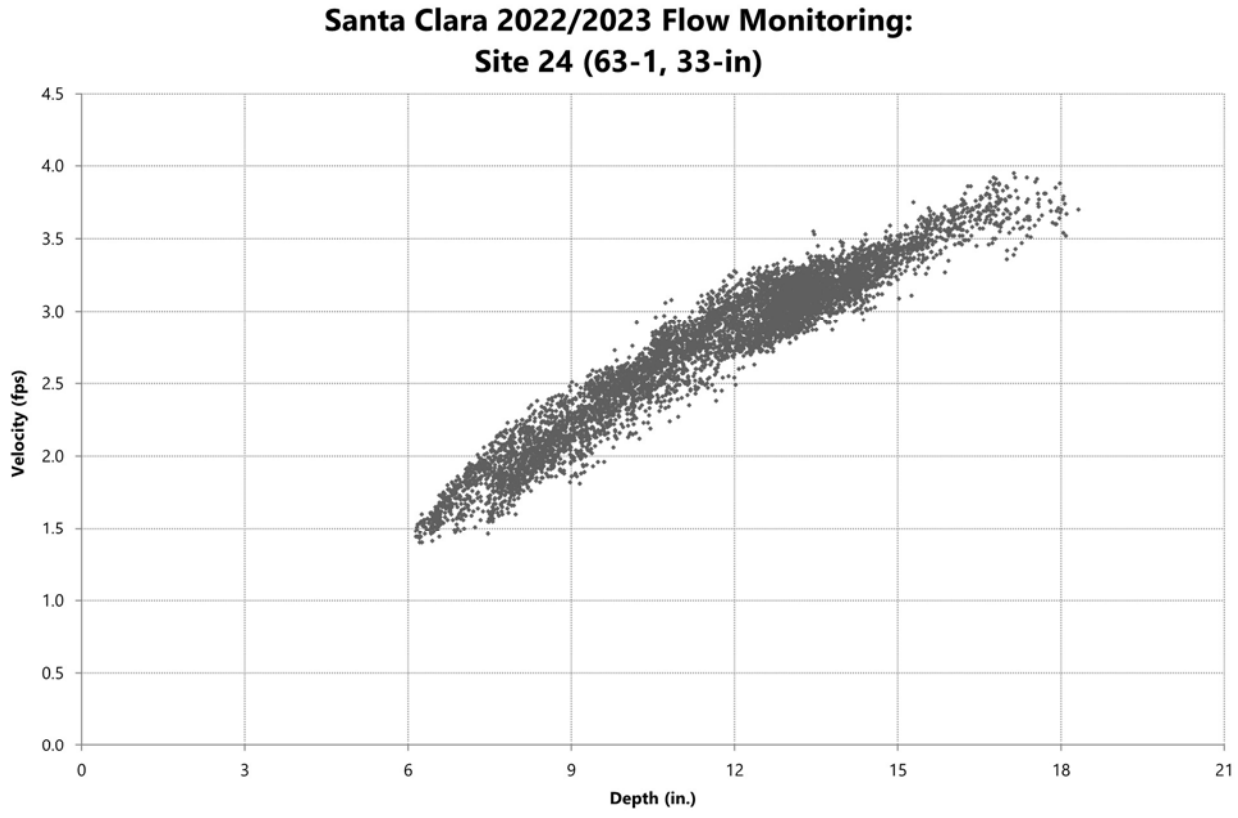

Santa Clara 2022/2023 Flow Monitoring:
Site 22 (S45-80, 18-in)
Level (in)
Vel (fps)
Depth (inches)
Velocity (fps)
Date
12/16
12/23
12/30
1/6
1/13
1/20


Santa Clara 2022/2023 Flow Monitoring:
Site 22 (S45-80, 18-in)
Velocity (fps)
Depth (in.)

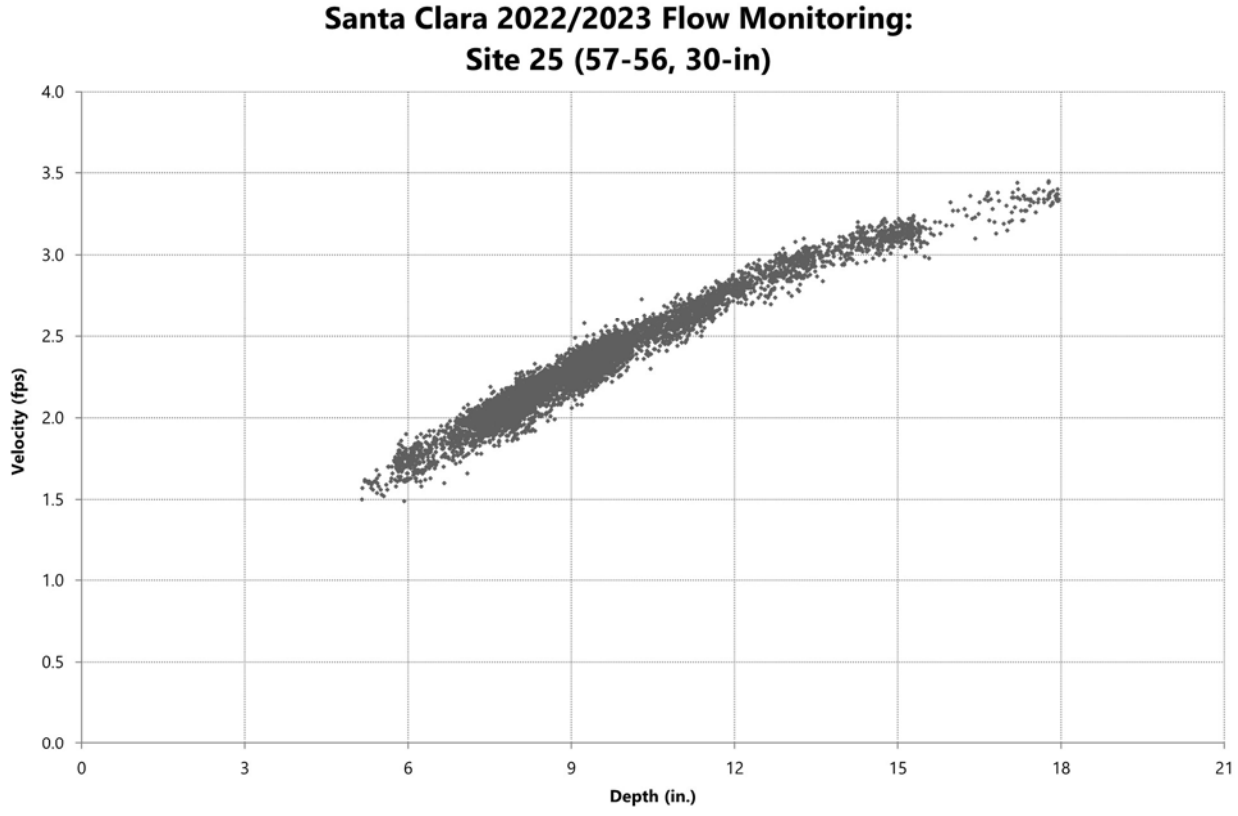

Santa Clara 2022/2023 Flow Monitoring:
Site 23 (S48-31, 18-in)
Level (in)
Vel (fps)
Depth (inches)
Velocity (fps)
Date
12/16
12/23
12/30
1/6
1/13
1/20

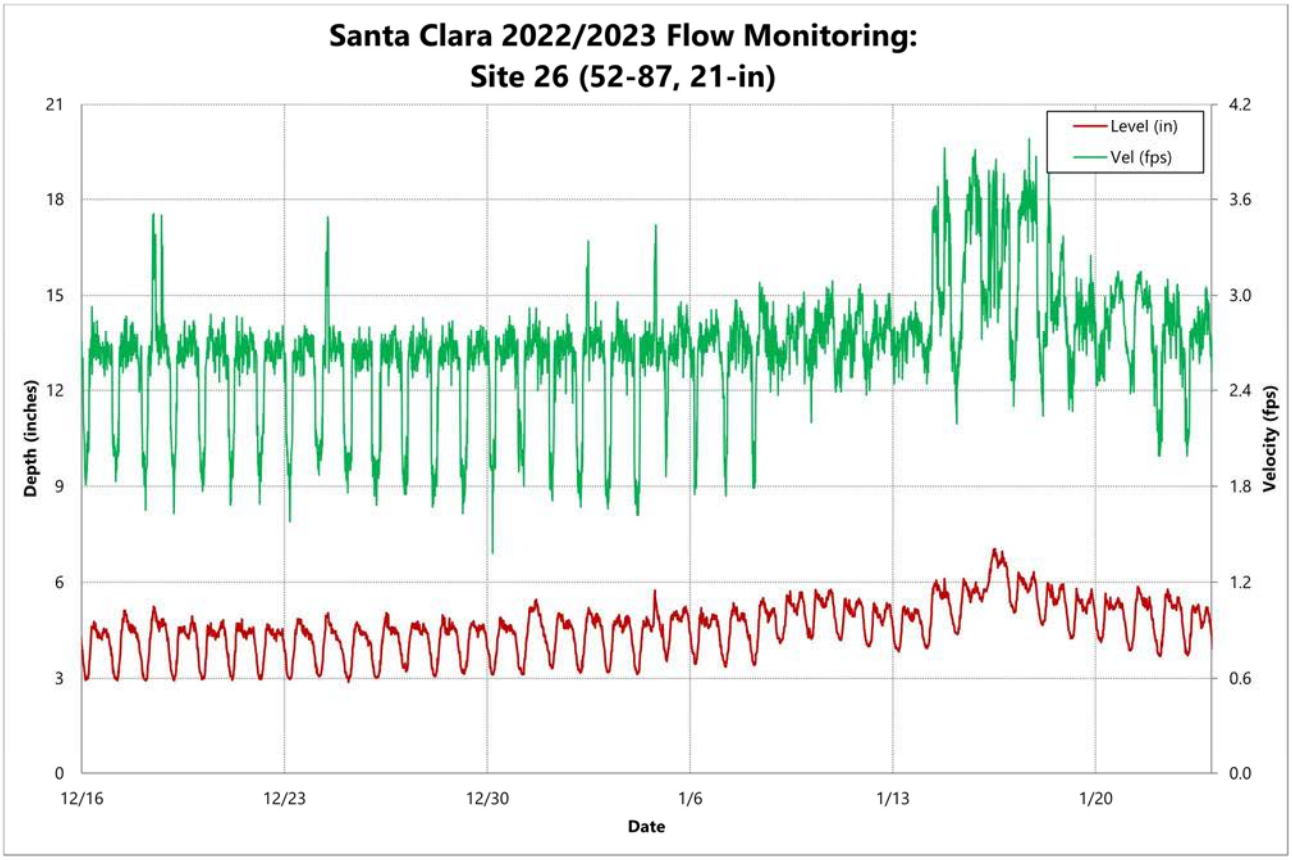

Santa Clara 2022/2023 Flow Monitoring:
Site 23 (S48-31, 18-in)
Velocity (fps)
Depth (in.)

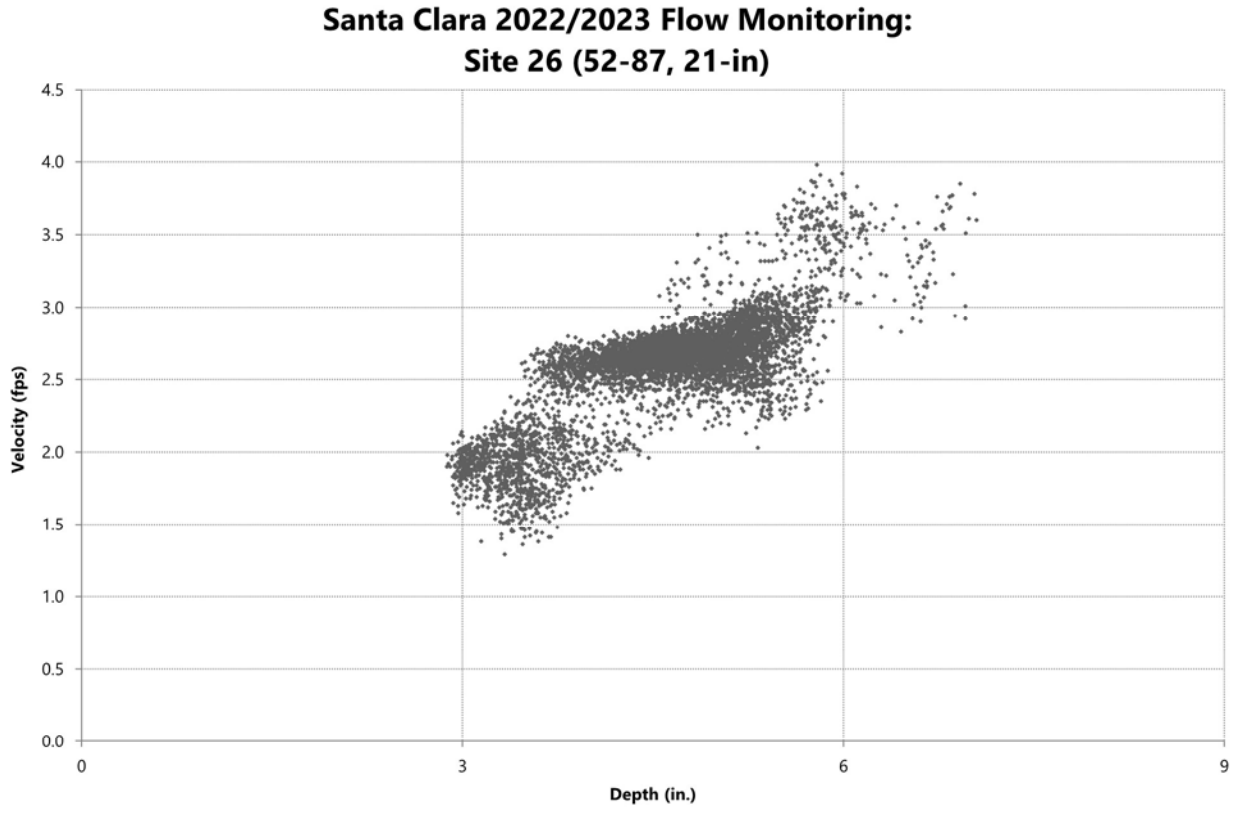

Santa Clara 2022/2023 Flow Monitoring:
Site 24 (63-1, 33-in)
Level (in)
Vel (fps)
Depth (inches)
Velocity (fps)
Date
28
24
20
16
12
8
4
0
4.2
3.6
3.0
2.4
1.8
1.2
0.6
0.0
12/16
12/23
12/30
1/6
1/13
1/20

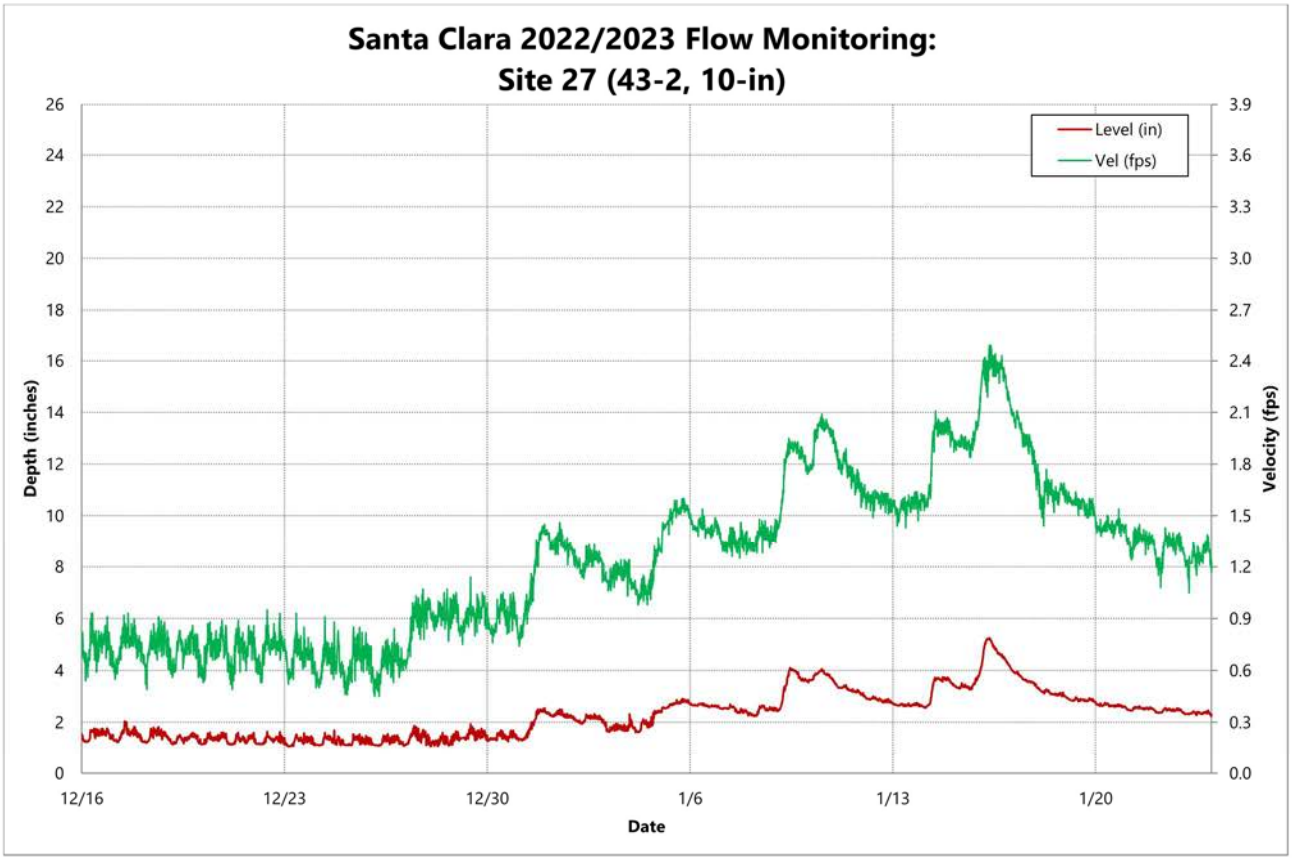

Santa Clara 2022/2023 Flow Monitoring:
Site 24 (63-1, 33-in)
Velocity (fps)
Depth (in.)
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0
3
6
9
12
15
18
21

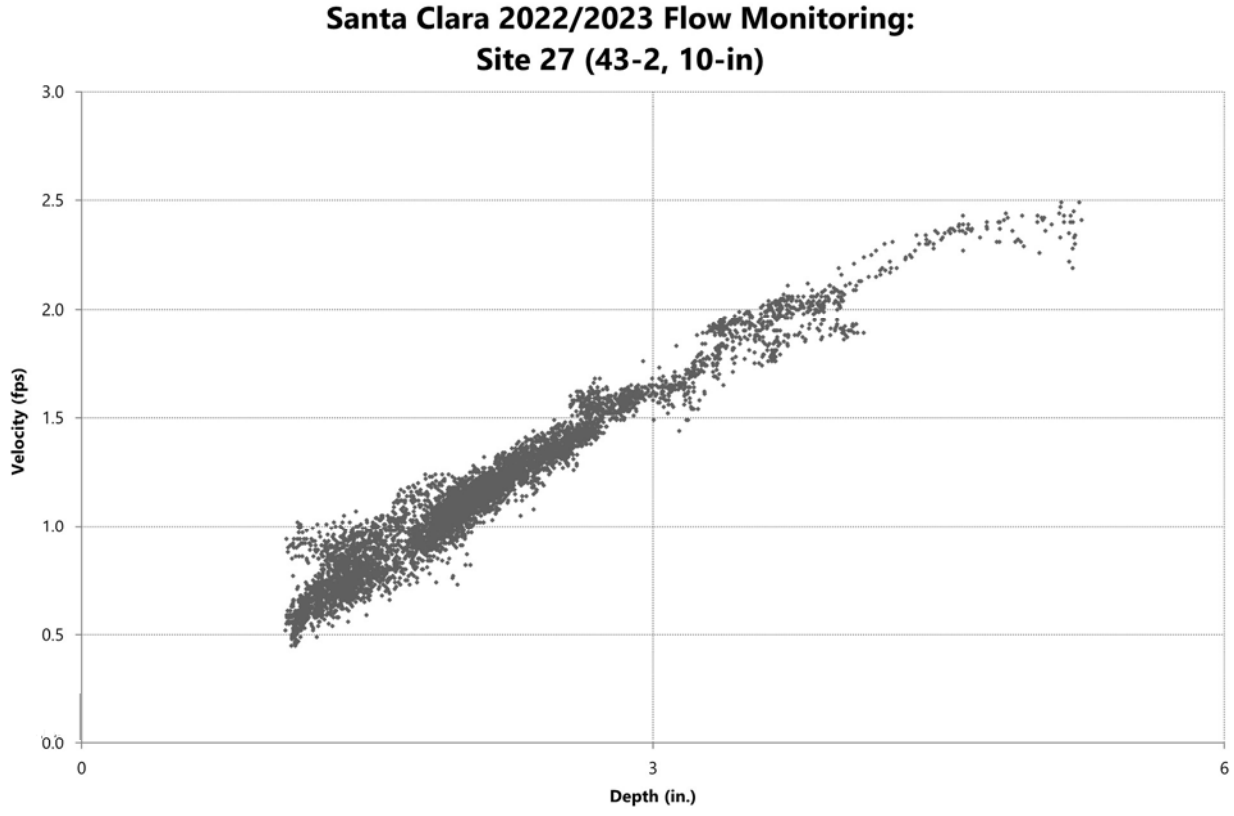
Santa Clara 2022/2023 Flow Monitoring:
Site 25 (57-56, 30-in)
Level (in)
Vel (fps)
Depth (inches)
Velocity (fps)
Date
12/16
12/23
12/30
1/6
1/13
1/20

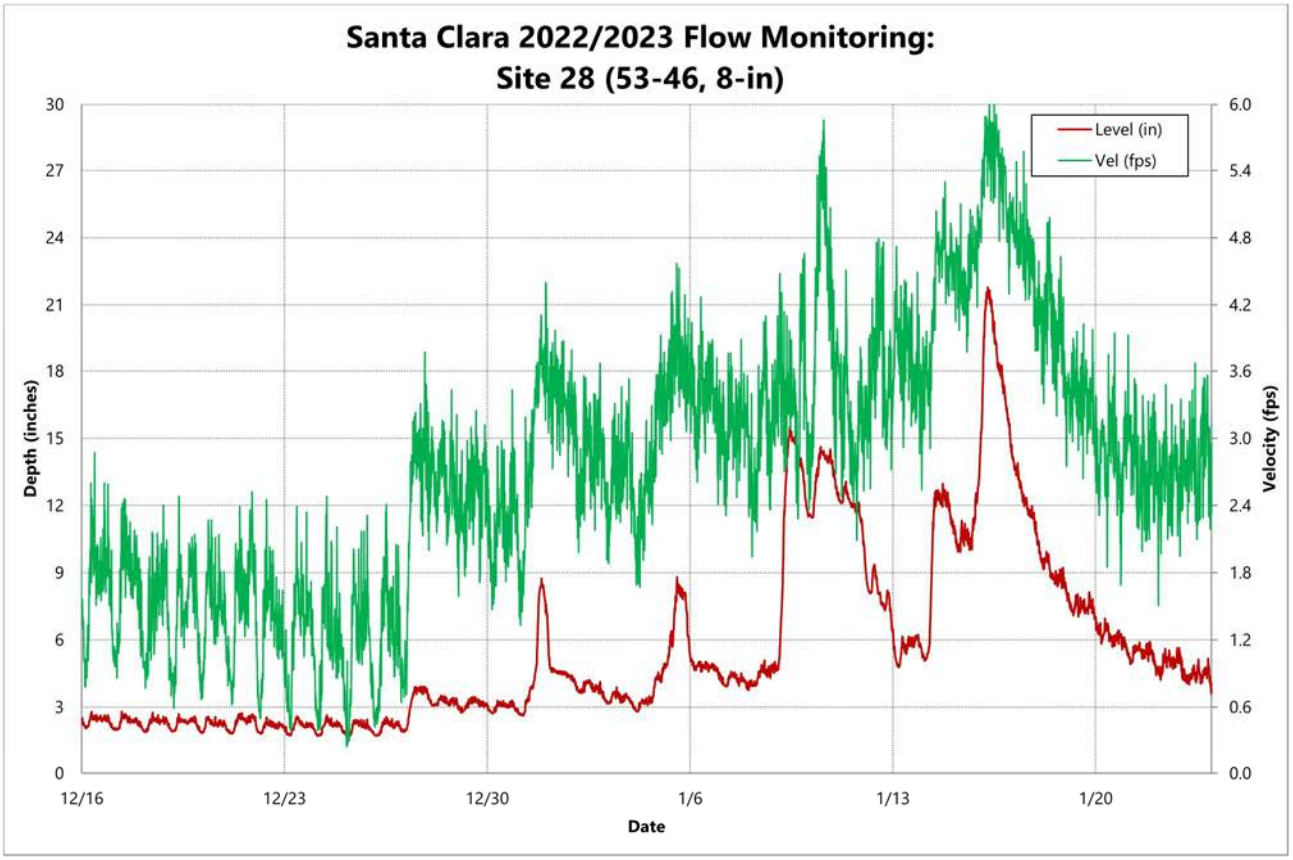

Santa Clara 2022/2023 Flow Monitoring:
Site 25 (57-56, 30-in)
Velocity (fps)
Depth (in.)

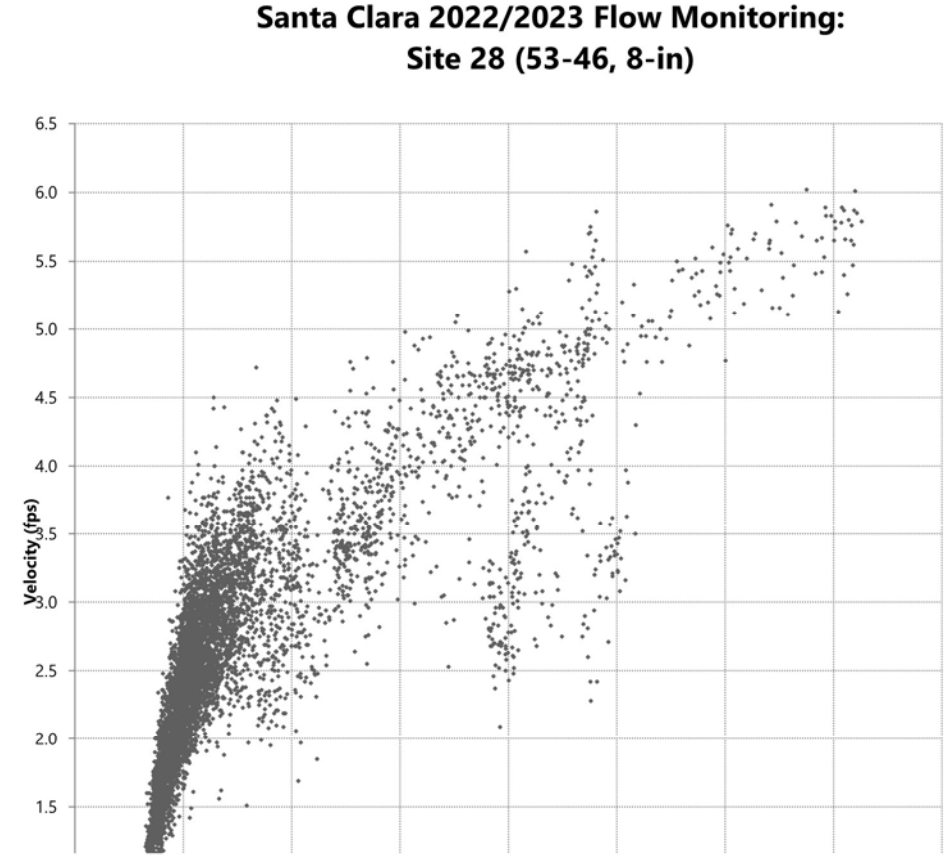

Santa Clara 2022/2023 Flow Monitoring:
Site 26 (52-87, 21-in)
Level (in)
Vel (fps)
Depth (inches)
Velocity (fps)
Date
12/16
12/23
12/30
1/6
1/13
1/20
0
3
6
9
12
15
18
21
0.0
0.6
1.2
1.8
2.4
3.0
3.6
4.2


Santa Clara 2022/2023 Flow Monitoring:
Site 26 (52-87, 21-in)
Velocity (fps)
Depth (in.)
0
3
6
9
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5


Santa Clara 2022/2023 Flow Monitoring:
Site 27 (43-2, 10-in)
Level (in)
Vel (fps)
Depth (inches)
Velocity (fps)
Date
12/16
12/23
12/30
1/6
1/13
1/20


Santa Clara 2022/2023 Flow Monitoring:
Site 27 (43-2, 10-in)
Velocity (fps)
Depth (in.)


Santa Clara 2022/2023 Flow Monitoring:
Site 28 (53-46, 8-in)
Level (in)
Vel (fps)
Depth (inches)
Velocity (fps)
Date
12/16
12/23
12/30
1/6
1/13
1/20
0
3
6
9
12
15
18
21
24
27
30
0.0
0.6
1.2
1.8
2.4
3.0
3.6
4.2
4.8
5.4
6.0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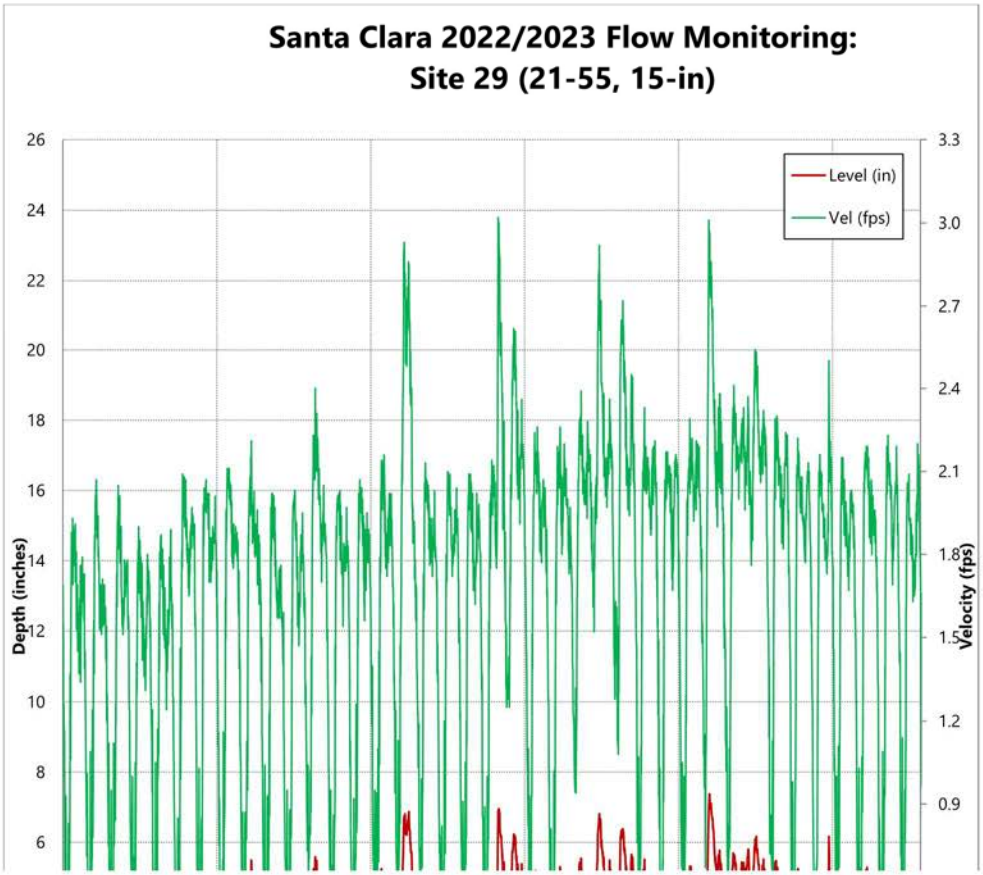
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Vel (fps)
Depth (inches)
Velocity (fps)
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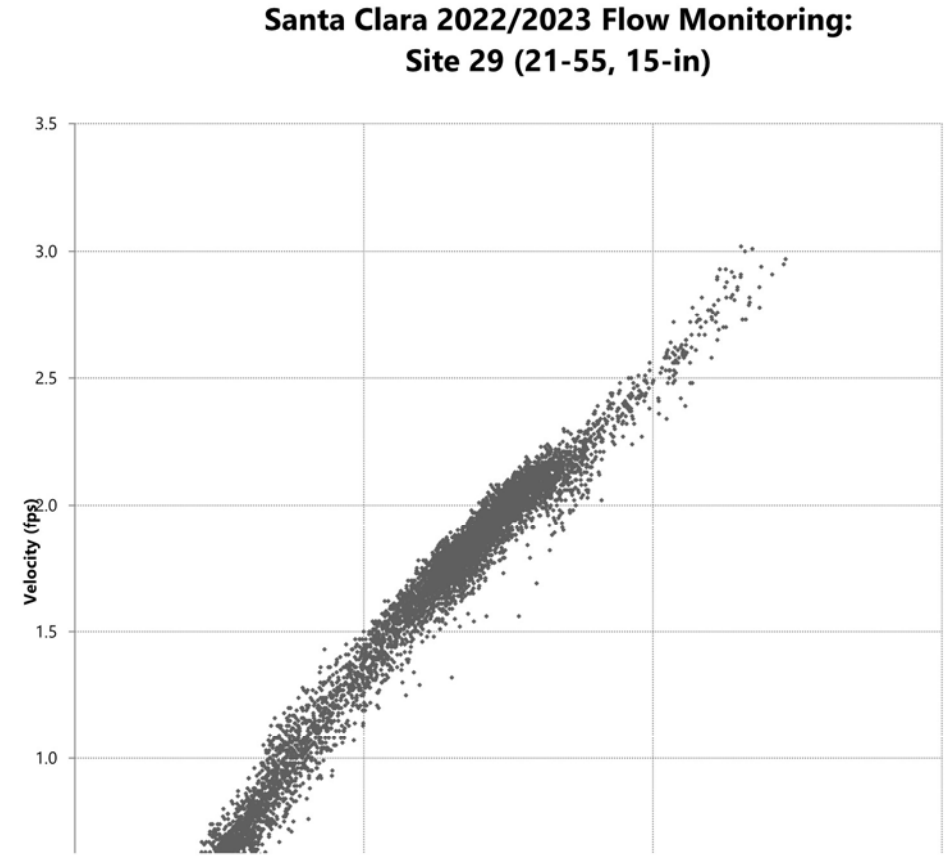
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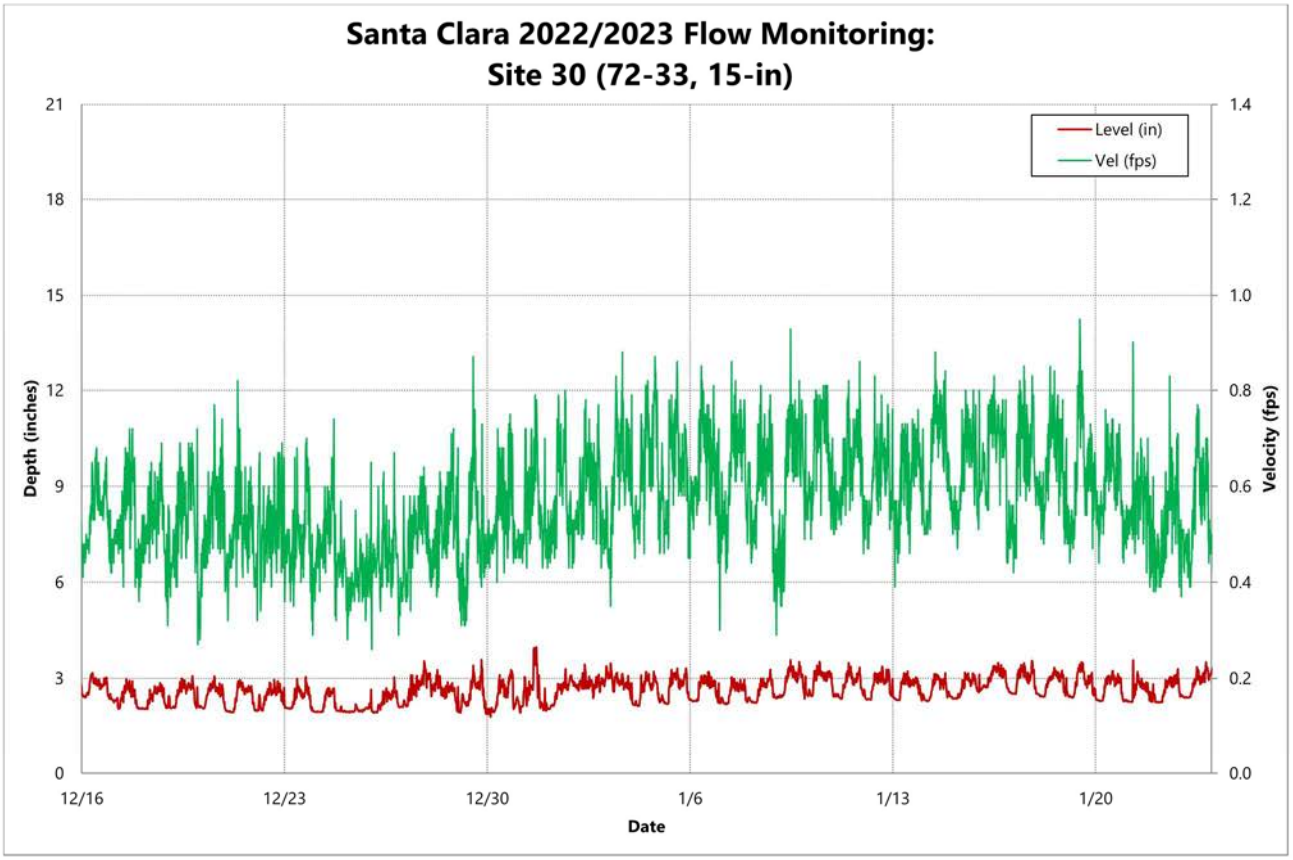
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Depth (inches)
Velocity (fps)
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15
12
9
6
3
0
1.4
1.2
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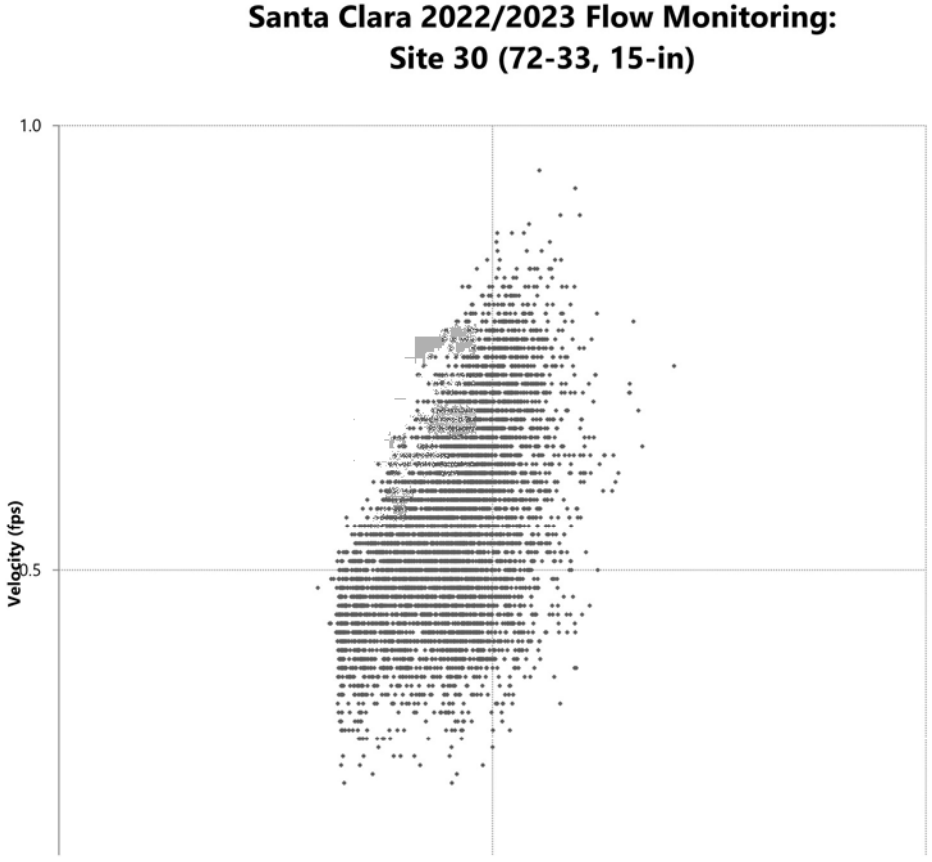
12/16
12/23
12/30
1/6
1/13
1/20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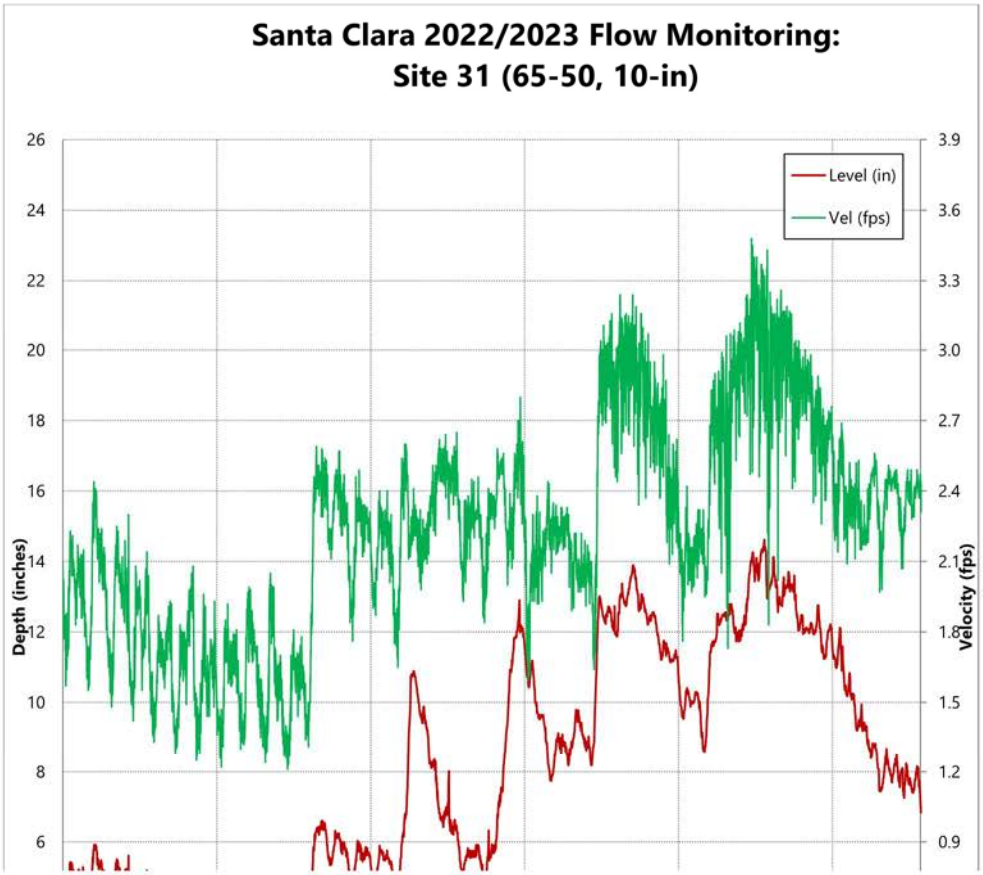
Santa Clara 2022/2023 Flow Monitoring:
Site 31 (65-50, 10-in)
Level (in)
Vel (fps)
Depth (inches)
Velocity (fps)
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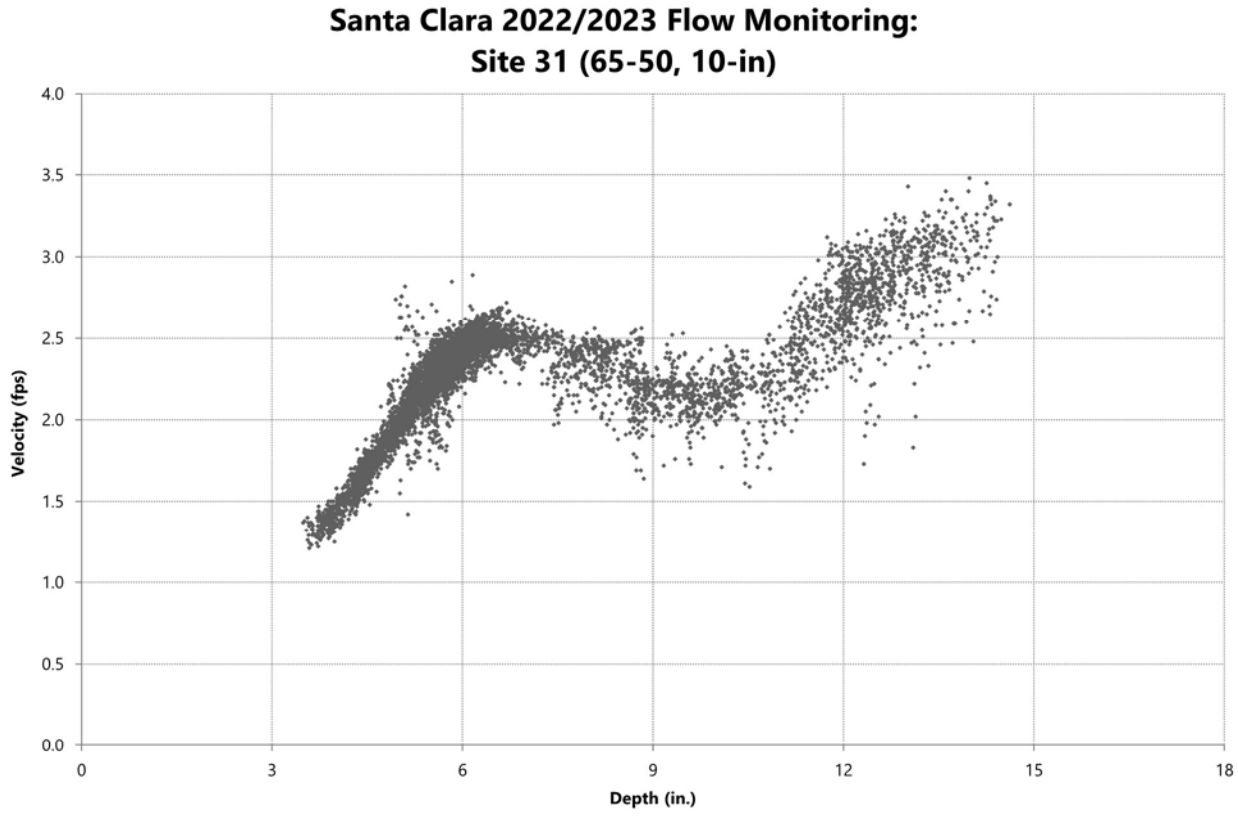
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APPENDIX B: FUTURE DEVELOPMENT ASSUMPTIONS

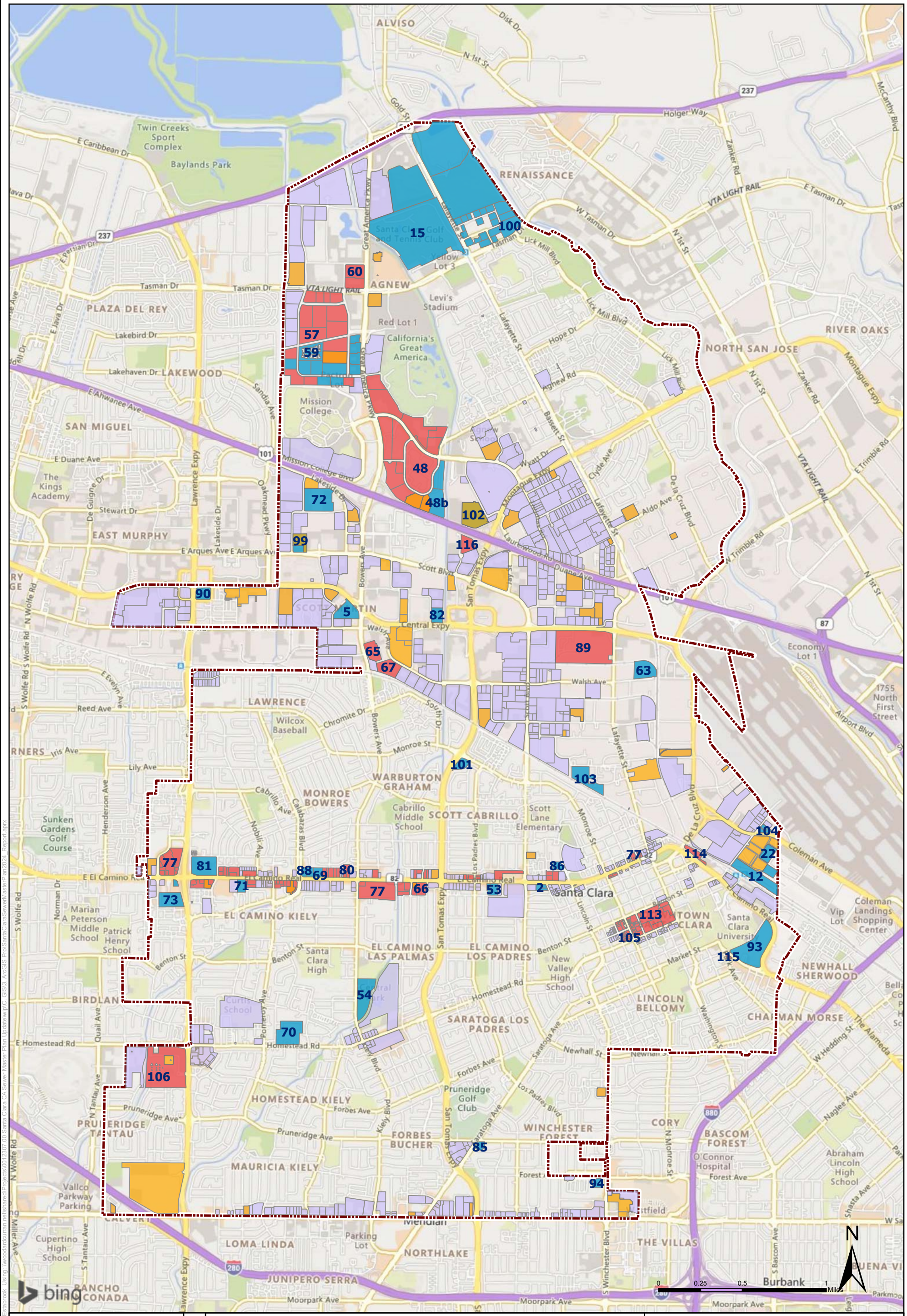

Figure B-1: Map of Future Development & Entitlement Parcels

Sewer Master Plan Update

Legend

- City Limit
- Parcel with Future Flow Assumption
  - Near-Term Specific Development (2025-2030)
  - Long-Term Specific Development (2030-2035)
  - Long-Term General Plan Phase 3 (2030-2035)
  - Entitlements

Woodard & Curran

Figure Exported: 12/27/2024 By: SEstabrook Using: \\woodardcurran.net\shared\Projects\001230\7.00 Santa Clara CA Sewer Master Plan Update\wip\C. GIS\3. ArcGIS Pro\Santa Clara Sewer Master Plan2024_Report.aprx

Name of Development	PLN #	BLD #	Address #	Street Name	APN	Block Book Page	W&C Notes	Ref_ID	January 2023 Status (per City Planning)	Residential Units	Residential Type	Non-Residential SF	Non-Residential Type	Non-Residential Type 2 SF/Units	Non-Residential Type 2	Future Model Scenario	Residential Flow (mgd)	Non-Residential Flow (mgd)
1890 El Camino Real	PLN2015-11361	BLD2017-47840	1890	El Camino Real	269-01-081, 269-63-000	35, 36	Still under construction, May 2023	2	Under construction	56	Condos					Near-Term	0.0098	0
Bowers Ave	PLN2012-09162	BLD2016 41725 & BLD2016-41470	3000	Bowers Ave.	216-48-033	63	Empty lots as of 9/2021. No billing point associated with this parcel. No longer a development Update (5/19/23): two 165,000 square foot five-story office buildings totaling 330,000 square feet; a five-level parking garage and surface lots providing a total of 980 parking spaces; and site and public right-of-way improvements.	5	Approved			330,000	Office			Near-Term	0	0.033
VTA BART station and yard			480	Brokaw Road	230-06-054		Billing database does not account for development.	12				351,512	Community (yard, BART station, and parking garage)			Near-Term	0	0.032339104
Related (land use changed in parcels 4 & 5)	PLN2014-10554		2351, 5155	2351, 5155 Stars and Stripes Dr	104-03-036	94, 103, 104, 105, 114	Some parcels within development constructed and accounted for in billing database. Others not.	15	Approved	1,680	Apts	4,080,000 2,889,640	Office Mixed Use	4,128	Hotel	Near-Term	0.32872	0.98910174
Coleman Highline (old FMC site) - Gateway Crossing project added	PLN2016-12318		1205	Coleman Ave	230-46-069, 230-59-001	48	No billing point here. Development proposal in review (see folder T001).	22	Phase 1 Under Construction	230 760 610	Studio 1-b Units (SF) 2-d Units (SF)	15,000	Retail	700 (rooms)	Hotel	Near-Term	0.28171	0.114
Freedom Circle Focus Area					104-40-019, 104-40-020, 104-40-030, 104-40-031, 104-40-034, 104-40-035, 104-40-038, 104-41-031, 104-41-032, 104-41-043, 104-41-044, 104-42-020, 104-42-021		Focus Area approved - Specific Plan still required. Development timing for residential should be considered near-term. (6/1/2023)	48	Approved	2,500	Apts	4,229,000	Retail/Office			Near-Term	0.385	0.5085
Greystar	PLN2017-12516		3905	Freedom Circle	104-40-021, 104-40-036		Development permit approved. Could be moving forward in the next couple of years.	48	Approved	1,100	Apts	2,000	Retail			Near-Term	0.1694	0.0002
South Bay Development	PLN2007-06433 & PLN2013-09743	BLD2015-40394	2350	Mission College Bl.			Site under construction until summer 2018 therefore not confident billing database accounts for full building being occupied. The proposed project consists of the construction of two 6-story office buildings each supporting 150,000 square fet of space (300,000 square feet total), a 6,000 square foot retail building and a 6-level parking garage. The site currently contains the 13-story Regency Plaza Interational building (251,000 square feet).	49	Constructed			306,000	Office/Retail (6,000 SF)				0	0.0306
Summer Hill Apartments	PLN2017-12723		2230 (?), 2232 & 2240 El Camino Real	El Camino Real	290-10-090, 290-10-091	35	Development not constructed yet (not even under construction). Billing database only accounts for the existing non-residential use.	53	Approved	151	Apts	5,000 5,000	Retail Restaurant			Near-Term	0.023254	0.0057
Santa Clara CRC, ISC & ISHOF (International Swim Center)	PLN2015-10939	BLD1974-42418	Central Park	Kiely Boulevard	290-26-029	23, 33	Development not even under construction. Recreation/swim center (275,369 SF) and a theater (400 seats)	54	Approved			275,369	Swim center (UFF = 0.3 GPD/SF)	400	Seats (UFF = 5 gpd/seat)	Near-Term	0.002	0.0826107
(Now called Kylli) Yahoo! at Tasman (In addition to the previously modeled Yahoo! development)	PLN2002-07218, PLN2017-12724		5010 Old Ironsides	Surrounded by Patrick Henry, Hetch Hetchy ROW, Old Ironsides Dr., and Tasman Dr.	104-04-064, 104-04-065, 104-04-111, 104-04-112, 104-04-113, 104-04-142, 104-04-143, 104-04-150, 104-04-151		General Plan amendment for a nine-parcel property to amend the designation from High-Intensity Office/Research to a newly-established mixed-use designation allowing a high-intensity mix of office, commercial, and residential uses. The Project proposes a PD rezone for the development of 3,000,000 +/- square feet of commercial office/lab space, 100,000 +/- square feet of neighborhood retail, 1,800 +/- new multi-family residential, a childcare facility, and indoor and outdoor community spaces.	57	Under Review	1,800		3,000,000 100,000 5,000 800 10,000	Office Retail Community Police Daycare			Future	0.2772	0.303048

Name of Development	PLN #	BLD #	Address #	Street Name	APN	Block Book Page	W&C Notes	Ref_ID	January 2023 Status (per City Planning)	Residential Units	Residential Type	Non-Residential SF	Non-Residential Type	Non-Residential Type 2 SF/Units	Non-Residential Type 2	Future Model Scenario	Residential Flow (mgd)	Non-Residential Flow (mgd)
Patrick Henry Specific Plans Phase 1					104-04-078, 104-04-093, 104-04-094, 104-04-123, 104-04-131, 104-04-136, 104-04-138, 104-04-139, 104-04-140, 104-04-141, 104-53-000			59	Approved	1,200	Condos	200,000 110,000	Retail Public (Commercial facilities)			Near-Term	2.1	0.04796
2901 Tasman Dr	PLN2020-14361		2901	Tasman Dr	104-49-025, 104-49-026	S93		60	Under Review			1,070,344	R&D			Future	0	0.1605516
651 Walsh Ave	PLN2018-13303 (Debby)		651	Walsh Ave	224-04-059	57, 67	Approved. To be accounted for as future data center.	63	Under construction			435,050	Data Center			Near-Term	0	0.059173
2805 Bowers Avenue	PLN2021-15069		2805	Bowers Avenue	216-28-063		Accounted for in model as future data center.	65	Under Review			244,068	Data Center			Future	0	0.012816
2500 El Camino Real (Mariani)	PLN2016-11686	BLD1968-33480	2500	El Camino Real	290-46-001, 290-46-002, 290-46-003, 290-46-015, 290-46-016, 290-46-017	34	Last submittal - 2018	66	Under Review	392	Condos	8,000	Restaurant	311 (rooms)	Hotel	Future	0.0686	0.03942
2590 Walsh Ave Vantage Data Center CA3			2590	Walsh Ave	216-28-112	63	Will be modeled as future data center.	67				450,800	Data Center			Future	0	0.01692
3035 El Camino Real	PLN2018-13265		3035	El Camino Real	220-32-059	42		69	Under construction	42	Condos					Near-Term	0.00735	0
3131 Homestead Rd	PLN2019-13869 PLN2018-13339 (Debby)		3131	Homestead Rd	290-24-071	22		70	Under construction	225	Apts					Near-Term	0.070991976	0
3402/3410 El Camino Real	PLN2017-12578	BLD2019-57108 (3406 ECR, same APN)	3402/3410	El Camino Real	290-01-136			71	Under construction	69	Apts	10,000 3,458	Restaurant Commercial			Near-Term	0.010626	0.0110578
3625 Peterson Way	PLN2018-13144		3625	Peterson Way	216-30-049	72, 73	Two 8-story office buildings totaling 632,216 SF; a 13,370 SF 1-story ammenity building, 4 level parking structure.	72	Approved			658630	Office	13,370	Ammenity	Near-Term	0	0.1008
ECR (Gateway Village) - See line 116	PLN2012-09540	BLD2016-41881 (for apartment BLD)	3610, 3700	3610, 3640, 3650, & 3700 ECR	313-06-002, 313-06-008	30, 40	Development under construction 2017 through 2018. Billing database would not have accounted for development.	73	Residencies constructed	476	Condos	23,010 15,340 14,750 9,357 15,257 9,386	Restaurant (small food Service) Restaurant (full Service) Retail Fitness Beauty Parlor Medical Office			Near-Term	0.0833	0.05402519
El Camino Real Specific Plans EIR				El Camino Real	220-31-079, 220-31-080, 220-02-049, 220-31-075, 220-32-056, 220-32-054, 220-02-020, 220-02-048, 220-02-045, 220-02-040, 220-02-046, 220-02-022, 290-03-084, 290-03-083, 290-03-081, 290-03-085, 290-03-059, 290-03-088, 290-03-087, 290-03-064, 290-63-008, 290-02-102, 290-02-095, 290-02-094, 290-01-012, 290-01-114, 290-01-113, 290-01-117, 290-01-116, 290-01-115, 224-15-037, 216-01-053, 216-01-047, 216-01-043, 216-01-050, 224-28-051, 269-03-086, 269-03-130, 213-34-008, 213-34-011, 213-34-005, 213-34-013, 213-34-012, 213-34-010, 213-34-004, 224-49-009, 224-49-008, 269-03-079, 269-03-131, 224-28-069, 216-01-040, 290-06-020, 290-06-021, 224-15-034, 224-49-012, 224-14-111, 224-14-089, 224-14-090, 224-15-017, 224-28-067, 224-28-048, 224-28-035, 224-28-050			77	Re-do Under Review	1,920 401 2,580	Corridor Mixed Use Corridor Residential Regional Commercial Mixed	182,646 224,658	Corridor Mixed Use Regional Commercial Mixed			Future	0.763175	0.13644684

Name of Development	PLN #	BLD #	Address #	Street Name	APN	Block Book Page	W&C Notes	Ref_ID	January 2023 Status (per City Planning)	Residential Units	Residential Type	Non-Residential SF	Non-Residential Type	Non-Residential Type 2 SF/Units	Non-Residential Type 2	Future Model Scenario	Residential Flow (mgd)	Non-Residential Flow (mgd)
Warmington Residential	PLN22-00151 PLN22-00160		2855	El Camino Real	220-31-082, 220-31-083		Pending review. 23 new townhomes and 65 affordable senior apartment units and 3,912 square feet of ground floor commercial in a five-story building. Total residential load = 0.014 MGD, non-residential load = 0.00039 MGD. Model has a total residential load of 0.0082 mgd. Model corrected.	80	Under Review	47	Condos & townhomes					Future	0.008225	0
Prometheus	PLN2015-11478		3501	El Camino Real	220-03-010		Part of ECR Specific Plan. three-, four- and five-story development would sit on 10.6 acres and comprise 701 apartments above 84,000 square feet of retail space. Model loads match proposed development description.	81	Not a File	700	Apts	86,000	Retail				0.1078	0.0086
2905 Stender Way Data Center	PLN2019-14118		2905	Stender Way	216-29-108		Parcel accounted for in model as future data center.	82	Under construction							Near-Term	0	0
275 Saratoga Ave	PLN2021-15005		275	Saratoga Avenue	303-46-051		4 Story Assisted Living Facility – 61,287 SF including 146 bed spaces	85	Under Review					146	Beds	Near-Term	0.011242	0
1601 Civic Center Dr	PLN202-14401		1601	Civic Center Dr	224-49-006	S46	106 DU affordable apartments	86	Approved	106	Apts					Near-Term	0.016324	0
3155 El Camino Real	PLN2020-14674		3155	El Camino Real	220-32-057, 220-32-058		60-unit, three-story townhome development	88	Approved	60	Townhomes					Near-Term	0.0105	0
960 Central Expressway	PLN21-15299		960	Central Expressway	224-07-099		Architectural review of three development scenarios for redevelopment of an existing Heavy Industrial (MH) zoned parcel occupied by 747,424 square feet of industrial warehouse buildings and 130,00 square feet of covered truck loading docks and surface parking. The proposal is to demolish the existing structures and site improvements to construct three Class "A" speculative buildings totaling up to 890,000 square feet for warehousing and/or data center uses, associated parking, on- and off-site improvements and landscaping. The proposal includes subdivision of the parcel into three separate parcels and the addition of new ingress and egress driveways along the project frontages. Development replaces Large User 9 (trade flow = 0.0994 MGD). Actual usage (based on billing database) is 0.01713 MGD. For the development load, assumed data center (Scenario 1) usage. Note data center survey received. Parcel will be counted as a future data center.	89	Under Review			388,482	Data Center			Future	0	0.1136448
3517 Ryder St			3517	Ryder St	216-34-052		Part of Lawrence Station development. 5-story 328-unit residential complex. Building Permit Under Review	90	Approved	328	Apts					Near-Term	0.050512	0

Name of Development	PLN #	BLD #	Address #	Street Name	APN	Block Book Page	W&C Notes	Ref_ID	January 2023 Status (per City Planning)	Residential Units	Residential Type	Non-Residential SF	Non-Residential Type	Non-Residential Type 2 SF/Units	Non-Residential Type 2	Future Model Scenario	Residential Flow (mgd)	Non-Residential Flow (mgd)
Santa Clara University Master Plan (5-years plan)	PLN2014-10779	BLD2016-42681 (Charney Hall of Law_UC), BLD2017-48533 (South Residence Hall)_UC), BLD2018-49473 (Benson Hall_UC)	500	El Camino Real	230-13-023	38, 39	Finn Residence Hall - construction begun February 2018. Constructed by October 2019. Billing database likely does not account for discharge. Approximately 30 residents live on each of the twelve wings, with one Community Facilitator on each wing. Total number of residents = 360. Phase 2 involves the construction of a four-story, 250 bed residence hall with a gross floor area of 55,800 sf on the site of the existing 19,000 square foot Fine Arts Building to be demolished. Construction has not begun. Benson Hall - This project involves one and two-story additions to the north and west building elevations totaling 21 ,363 sf and includes partial renovations of the building interior to accommodate the new additions and create meeting and common space. Residence hall loads accounted for in new subcatchment 23013023.	93	Under construction							Near-Term	0.0427	0
Worthington Circle (Former BAREC site/Summerhill and Charity Housing at 90 N. Winchester Blvd)	PLN2016-12389		1834	Worthington Circle	303-17-053		Agrihood Mixed-Use Development Project. Construction initiated September 2021. Development not accounted for in billing database. Parcel does not have a billing point. residential mixed-use development consisting of up to 160 mixed-income apartments,165 affordable senior apartments, 36 townhomes and approximately 1.5 acres of agricultural open space. Development accounted for in model in subcatchment 30317053 which replaced original development subcatchment DVPT_NWinchester.	94	Under construction	36 325	SF Apt	65,340		Agricultural Open Space		Near-Term	0.05635	0
3375 Scott Blvd.	PLN2016-12232		3375	Scott Blvd.	216-31-059, 216-31-060	72	Project would demolish the existing office buildings and construct a six-story, 237,107 SF office building, and a four-level parking structure with an attached two-story amenity building. Remove existing billing point loads. Model reflects development flow in new sub ID 21631059 and 21631060.	99	Approved			237,107	Office			Near-Term	0	0.0237107
Tasman East Specific Plan (+1,500 units)	PLN2016-12400			Surrounded by TasmanDr, Lafayette St, Calle Del Mundo, and Guadalupe River	097-05-062, 097-05-063, 097-05-110, 097-05-060, 097-05-061, 097-05-059, 097-05-058, 097-05-056, 097-05-057, 097-46-019, 097-46-029, 097-46-016, 097-46-017, 097-46-018, 097-46-033, 097-46-011, 097-46-024, 097-46-002, 097-46-020, 097-46-027	104, 105	Project website (link below) lists 5 approved projects (2343 Calle del Mundo, 5123 Calle del Sol, 2200 Calle de Luna, 2300 Calle de Luna, and 2302/2310 Calle del Mundo) and 6 proposed projects. These projects have not been subject to individual development reviews and are therefore not specifically reflected in the model. Instead, the model reflects the original (June 2018) review of the overall Tasman East Specific Plan. Modeling the specific approved or proposed projects within this Specific Plan is not in the scope of work for the near-term network development.	100	Under construction	5,998	Transit Neighborhood	93,600 10,000 35,147	Retail Daycare School			Near-Term	0.725758	0.046664575

Name of Development	PLN #	BLD #	Address #	Street Name	APN	Block Book Page	W&C Notes	Ref_ID	January 2023 Status (per City Planning)	Residential Units	Residential Type	Non-Residential SF	Non-Residential Type	Non-Residential Type 2 SF/Units	Non-Residential Type 2	Future Model Scenario	Residential Flow (mgd)	Non-Residential Flow (mgd)
2330 Monroe St	PLN2019-13723		2330	Monroe Steet	224-37-068	54	Architectural Review for an approved 2-3 story building containing 65 affordable residential units in a mix of studios and one-, two-, and threebedroom units, including 25 percent of the units set aside for people with developmental disabilities. Currently vacant lot with no billing point. Model accounts for development flow in new sub ID 22437068.	101	Under construction	65	Apt					Near-Term	0.01001	0
2201 Laurelwood	PLN2019-13742	BLD2021-61850	2201	Laurelwood	104-39-023	75	Proposed future data center (data center Ref ID = 13). Will be included in the model as a future data center. Development replaces large user LU02 (Siliconix) with modeled trade flow = 1.2327 mgd. Actual flow (based on billing data) = 0.00711 mgd. Construction begun June 2019. Model updated with development parcel. Future data center flows to be modeled as inflow file. LU02 subcatchment deleted from model.	102	Under construction			536,730	Data Center			Near-Term	0	0.091020833
1200 Memorex Drive data center	PLN2019-14055		1200	Memorex Drive	224-66-006		Development will be modeled as a future data center (data center Ref ID = 80). New sub ID 22466006 added to model to represent data center parcel. Remove existing billing point.	103	Under construction							Near-Term	0	0
1290, 1240 Coleman Ave and 312 Brokaw Rd - Santa Clara Dual-Branded Hotel	PLN2019-14051; CEQ2020-01073		1290, 1240, 312	1290 and 1240 Coleman Ave and 312 Brokaw Rd	230-05-045, 230-05-049, 230-05-050	48, 49	Model accounts for development with new subs IDs 23005045, 049, and 050. Development consists of 396 room, 6-story hotel, totaling 204,444 square feet. Old sub ID 23005045, Parcel_23005049, Parcel_23005050, Parcel_23005049!, and Parcel_23005050! replaced.	104	Approved			7,480	Restaurant	630.3447	Hotel	Near-Term	0.0351	0.0077792
906, 930, 940, 950 Monroe St	PLN2020-14457		906, 930, 940, 950	Monroe St	269-20-086, 269-20-087, 269-20-095		Residential mix-use redevelopment. Construct a five story building with 61 condo rental units, 3,844 sf general retail, a 6,224 sf restaurant on the ground floor, 116 residential parking spaces, and 71 retail parking spaces. The project also includes relocation of two existing historic houses located at 906 and 930 Monroe. Development accounted for in model with new sub IDs 26920086, 26920095, and 26920087.	105	Under Review	64	condos	3,844	Retail	6,224	Restaurant	Future	0.0112	0.00685736
Kaiser Entitlement					316-09-046		Entitlement flow.	106								Future	0	0
Downtown Precise Plan			Various	Various	269-22-088, 269-22-089, 269-22-072, 269-22-096, 269-22-084, 269-22-079, 269-22-094, 269-22-093, 269-22-095, 269-22-108, 269-22-109, 269-22-110, 269-22-111, 269-22-112, 269-22-097, 269-22-098, 269-22-099, 269-22-100, 269-22-101, 269-22-102, 269-22-103, 269-22-104, 269-22-105, 269-22-106, 269-22-107, 269-22-113, 269-22-114, 269-22-115, 269-20-082, 269-20-083, 269-20-084, 269-20-085, 269-20-089, 269-20-090, 269-20-091, 269-20-078, 269-20-075, 269-20-081, 269-20-080, 269-62-000, 269-20-079, 269-20-074, 269-20-077		Development review dated 3/20/2023. Note that 5 parcels are on top of other recent developments (Ref_ID 23 and 105).	113		386 578	Condos Apts	637,440 197,900	Commercial Retail	74,160 SF	Hotel	Future	0.156562	0.1191308
611 El Camino Real			611	El Camino Real	230-06-053		70 affordable apartment units to replace existing women's facility. The zone is ML-Light Industrial but the general plan use has it as Public/Quasi Public as the parcel is owned by the City of Santa Clara.	114		70	Apt					Future	0.01078	0
2655 The Alameda	PLN2022-00448		2655	The Alameda	230-12-012		4-story mixed use development with 1,500 SF ground floor commercial & 39 residential units	115		39	Apt	1,500	Commercial			Future	0.006006	0.00015

Name of Development	PLN #	BLD #	Address #	Street Name	APN	Block Book Page	W&C Notes	Ref_ID	January 2023 Status (per City Planning)	Residential Units	Residential Type	Non-Residential SF	Non-Residential Type	Non-Residential Type 2 SF/Units	Non-Residential Type 2	Future Model Scenario	Residential Flow (mgd)	Non-Residential Flow (mgd)
3301 Olcott Street	PLN22-00560		3301	Olcott Street	224-47-019		189,153 SF (Building 1 discharging to MH S74-28) 151,384 SF (Building 2 discharging to MH S74-43) commercial R&D office.	116				340,537	Office R&D			Future	0	0.025540275
Santa Clara Station Area Plan							Plan is in the early stages of development--no project description yet--for now, use GP estimates from Table 5.2.1, footnote 1.											
4701 Great America Parkway			4701	Great America Parkway	104-42-014, 104-42-014-019	83	Amusement park lease may be up in the next couple of years, but no details are available. Assume will operate as is into the future.	NA										

APN	GPLANCRT	Area (SF)	Area (Acres)	Assumed Land Use	Flow Factor	FAR	DUA	Residential Flow (mgd)	Non-Residential Flow (mgd)	Future Model Scenario
230-03-090	HYIN	211,963.46	4.87	Heavy Industrial	0.15	1.25	0	0.0000	0.0397	Future
294-18-037	NHMX	18,696.46	0.43	Neighborhood Commercial	0.1	0.3	25	0.0017	0.0006	Future
290-23-059	NHMX	23,162.02	0.53	Neighborhood Commercial	0.1	0.3	25	0.0020	0.0007	Future
104-51-015	LDRD	27,934.37	0.64	Office: 100%	0.1	0.85	0	0.0000	0.0024	Future
104-51-016	LDRD	28,860.54	0.66	Office: 100%	0.1	0.85	0	0.0000	0.0025	Future
104-51-017	LDRD	28,221.53	0.65	Office: 100%	0.1	0.85	0	0.0000	0.0024	Future
104-51-008	LDRD	21,568.32	0.50	Office: 100%	0.1	0.85	0	0.0000	0.0018	Future
104-51-007	LDRD	23,675.58	0.54	Office: 100%	0.1	0.85	0	0.0000	0.0020	Future
104-15-025	LDRD	8,849.96	0.20	Office: 100%	0.1	0.85	0	0.0000	0.0008	Future
104-51-006	LDRD	27,949.92	0.64	Office: 100%	0.1	0.85	0	0.0000	0.0024	Future
104-51-009	LDRD	19,521.75	0.45	Office: 100%	0.1	0.85	0	0.0000	0.0017	Future
104-51-014	LDRD	23,350.55	0.54	Office: 100%	0.1	0.85	0	0.0000	0.0020	Future
104-51-005	LDRD	31,103.49	0.71	Office: 100%	0.1	0.85	0	0.0000	0.0026	Future
104-15-092	LDRD	54,693.70	1.26	Office: 100%	0.1	0.85	0	0.0000	0.0046	Future
104-15-141	LDRD	46,524.15	1.07	Office: 100%	0.1	0.85	0	0.0000	0.0040	Future
104-15-140	LDRD	32,608.15	0.75	Office: 100%	0.1	0.85	0	0.0000	0.0028	Future
104-51-010	LDRD	33,028.98	0.76	Office: 100%	0.1	0.85	0	0.0000	0.0028	Future
104-15-029	LDRD	16,356.77	0.38	Office: 100%	0.1	0.85	0	0.0000	0.0014	Future
104-51-013	LDRD	24,912.63	0.57	Office: 100%	0.1	0.85	0	0.0000	0.0021	Future
290-29-009	PKOS	1,357,204.52	31.16	Parks/Recreation	0	0.2	0	0.0000	0.0000	Future
101-11-042	LHIN	34,719.96	0.80	Light Industrial	0.15	0.85	0	0.0000	0.0044	Future
220-02-047	CMXU	14,277.06	0.33	Community Commercial	0.1	0.4	25	0.0013	0.0006	Future
220-01-059	CMXU	26,194.76	0.60	Community Commercial	0.1	0.4	25	0.0023	0.0010	Future
220-01-055	CMXU	29,422.83	0.68	Community Commercial	0.1	0.4	25	0.0026	0.0012	Future
220-01-053	CMXU	13,950.79	0.32	Community Commercial	0.1	0.4	25	0.0012	0.0006	Future
220-31-077	CMXU	14,566.71	0.33	Community Commercial	0.1	0.4	25	0.0013	0.0006	Future
220-31-078	CMXU	15,046.30	0.35	Community Commercial	0.1	0.4	25	0.0013	0.0006	Future
220-01-054	CMXU	30,351.56	0.70	Community Commercial	0.1	0.4	25	0.0027	0.0012	Future

APN	GPLANCRT	Area (SF)	Area (Acres)	Assumed Land Use	Flow Factor	FAR	DUA	Residential Flow (mgd)	Non-Residential Flow (mgd)	Future Model Scenario
220-02-015	VLDR	9,665.35	0.22	Low Density Residential	245	0	25	0.0014	0.0000	Future
220-02-014	VLDR	9,376.27	0.22	Low Density Residential	245	0	25	0.0013	0.0000	Future
220-02-013	VLDR	9,375.20	0.22	Low Density Residential	245	0	25	0.0013	0.0000	Future
220-02-012	VLDR	9,376.26	0.22	Low Density Residential	245	0	25	0.0013	0.0000	Future
220-02-011	VLDR	9,376.20	0.22	Low Density Residential	245	0	25	0.0013	0.0000	Future
220-02-010	VLDR	9,375.63	0.22	Low Density Residential	245	0	25	0.0013	0.0000	Future
220-02-009	VLDR	9,291.32	0.21	Low Density Residential	245	0	25	0.0013	0.0000	Future
230-05-005	RGCO	6,564.42	0.15	Regional Commercial	0.1	0.5	0	0.0000	0.0003	Future
230-05-020	RGCO	27,964.10	0.64	Regional Commercial	0.1	0.5	0	0.0000	0.0014	Future
230-05-037	RGCO	53,420.53	1.23	Regional Commercial	0.1	0.5	0	0.0000	0.0027	Future
230-05-017	RGCO	25,013.75	0.57	Regional Commercial	0.1	0.5	0	0.0000	0.0013	Future
230-05-016	RGCO	25,005.08	0.57	Regional Commercial	0.1	0.5	0	0.0000	0.0013	Future
230-05-015	RGCO	23,825.51	0.55	Regional Commercial	0.1	0.5	0	0.0000	0.0012	Future
230-05-084	RGCO	20,980.12	0.48	Regional Commercial	0.1	0.5	0	0.0000	0.0010	Future
230-05-021	RGCO	166,493.71	3.82	Regional Commercial	0.1	0.5	0	0.0000	0.0083	Future
230-05-083	RGCO	22,351.24	0.51	Regional Commercial	0.1	0.5	0	0.0000	0.0011	Future
230-05-054	RGCO	83,262.85	1.91	Regional Commercial	0.1	0.5	0	0.0000	0.0042	Future
104-14-052	LDRD	41,745.26	0.96	Office: 100%	0.1	0.85	0	0.0000	0.0035	Future
104-14-090	LDRD	33,524.38	0.77	Office: 100%	0.1	0.85	0	0.0000	0.0028	Future
104-14-141	LDRD	23,021.12	0.53	Office: 100%	0.1	0.85	0	0.0000	0.0020	Future
104-14-071	LDRD	30,847.01	0.71	Office: 100%	0.1	0.85	0	0.0000	0.0026	Future
104-14-053	LDRD	23,417.60	0.54	Office: 100%	0.1	0.85	0	0.0000	0.0020	Future
104-14-047	LDRD	30,846.99	0.71	Office: 100%	0.1	0.85	0	0.0000	0.0026	Future
104-14-124	LDRD	131,211.66	3.01	Office: 100%	0.1	0.85	0	0.0000	0.0112	Future
104-14-036	LDRD	19,855.46	0.46	Office: 100%	0.1	0.85	0	0.0000	0.0017	Future
104-14-048	LDRD	30,847.01	0.71	Office: 100%	0.1	0.85	0	0.0000	0.0026	Future
104-15-131	LDRD	444,843.84	10.21	Office: 100%	0.1	0.85	0	0.0000	0.0378	Future
104-14-023	LDRD	19,842.58	0.46	Office: 100%	0.1	0.85	0	0.0000	0.0017	Future

APN	GPLANCRT	Area (SF)	Area (Acres)	Assumed Land Use	Flow Factor	FAR	DUA	Residential Flow (mgd)	Non-Residential Flow (mgd)	Future Model Scenario
104-14-038	LDRD	30,846.99	0.71	Office: 100%	0.1	0.85	0	0.0000	0.0026	Future
101-09-023	LDRD	170,155.51	3.91	Office: 100%	0.1	0.85	0	0.0000	0.0145	Future
290-05-060	CMXU	18,140.31	0.42	Community Commercial	0.1	0.4	25	0.0016	0.0007	Future
220-01-018	CMXU	12,754.24	0.29	Community Commercial	0.1	0.4	25	0.0011	0.0005	Future
220-01-044	CMXU	18,789.19	0.43	Community Commercial	0.1	0.4	25	0.0017	0.0008	Future
220-31-114	CMXU	44,562.59	1.02	Community Commercial	0.1	0.4	25	0.0039	0.0018	Future
230-05-116	LHIN	449,148.01	10.31	Light Industrial	0.15	0.85	0	0.0000	0.0573	Future
230-47-068	LHIN	23,098.35	0.53	Light Industrial	0.15	0.85	0	0.0000	0.0029	Future
230-03-108	HYIN	821,203.99	18.85	Heavy Industrial	0.15	1.25	0	0.0000	0.1540	Future
230-03-047	HYIN	14,575.93	0.33	Heavy Industrial	0.15	1.25	0	0.0000	0.0027	Future
290-55-012	NHMX	1,549.42	0.04	Neighborhood Commercial	0.1	0.3	25	0.0001	0.0000	Future
290-02-092	CMXU	13,792.24	0.32	Community Commercial	0.1	0.4	25	0.0012	0.0006	Future
290-05-076	CMXU	29,128.38	0.67	Community Commercial	0.1	0.4	25	0.0026	0.0012	Future
290-05-074	CMXU	22,490.01	0.52	Community Commercial	0.1	0.4	25	0.0020	0.0009	Future
290-05-055	CMXU	45,529.94	1.05	Community Commercial	0.1	0.4	25	0.0040	0.0018	Future
290-05-054	CMXU	22,055.98	0.51	Community Commercial	0.1	0.4	25	0.0019	0.0009	Future
290-04-007	CMXU	98,212.43	2.25	Community Commercial	0.1	0.4	25	0.0087	0.0039	Future
290-04-006	CMXU	48,009.37	1.10	Community Commercial	0.1	0.4	25	0.0042	0.0019	Future
290-04-005	CMXU	23,809.87	0.55	Community Commercial	0.1	0.4	25	0.0021	0.0010	Future
290-04-004	CMXU	32,223.14	0.74	Community Commercial	0.1	0.4	25	0.0028	0.0013	Future
290-04-003	CMXU	28,816.85	0.66	Community Commercial	0.1	0.4	25	0.0025	0.0012	Future
290-04-002	CMXU	24,001.59	0.55	Community Commercial	0.1	0.4	25	0.0021	0.0010	Future
290-04-045	CMXU	25,858.00	0.59	Community Commercial	0.1	0.4	25	0.0023	0.0010	Future
290-02-099	CMXU	6,669.50	0.15	Community Commercial	0.1	0.4	25	0.0006	0.0003	Future
290-02-098	CMXU	6,540.84	0.15	Community Commercial	0.1	0.4	25	0.0006	0.0003	Future
290-02-087	CMXU	3,637.06	0.08	Community Commercial	0.1	0.4	25	0.0003	0.0001	Future
290-02-105	CMXU	12,089.50	0.28	Community Commercial	0.1	0.4	25	0.0011	0.0005	Future
290-02-104	CMXU	13,782.03	0.32	Community Commercial	0.1	0.4	25	0.0012	0.0006	Future

APN	GPLANCRT	Area (SF)	Area (Acres)	Assumed Land Use	Flow Factor	FAR	DUA	Residential Flow (mgd)	Non-Residential Flow (mgd)	Future Model Scenario
290-02-101	CMXU	6,483.39	0.15	Community Commercial	0.1	0.4	25	0.0006	0.0003	Future
290-02-100	CMXU	9,650.45	0.22	Community Commercial	0.1	0.4	25	0.0009	0.0004	Future
290-02-103	CMXU	41,169.09	0.95	Community Commercial	0.1	0.4	25	0.0036	0.0016	Future
101-13-003	LHIN	311,364.82	7.15	Light Industrial	0.15	0.85	0	0.0000	0.0397	Future
101-09-024	RGCO	92,430.01	2.12	Regional Commercial	0.1	0.5	0	0.0000	0.0046	Future
303-02-013	PUQP	74,316.43	1.71	Public/Institutional	0.21	0.2	0	0.0000	0.0031	Future
290-23-088	PUQP	1,173,909.65	26.95	Public/Institutional	0.21	0.2	0	0.0000	0.0493	Future
303-21-071	RGCO	48,269.26	1.11	Regional Commercial	0.1	0.5	0	0.0000	0.0024	Future
303-21-072	RGCO	21,356.10	0.49	Regional Commercial	0.1	0.5	0	0.0000	0.0011	Future
303-19-072	RGCO	18,582.19	0.43	Regional Commercial	0.1	0.5	0	0.0000	0.0009	Future
303-22-014	RGCO	10,447.18	0.24	Regional Commercial	0.1	0.5	0	0.0000	0.0005	Future
303-23-036	RGCO	159,016.92	3.65	Regional Commercial	0.1	0.5	0	0.0000	0.0080	Future
303-23-002	RGCO	21,753.41	0.50	Regional Commercial	0.1	0.5	0	0.0000	0.0011	Future
303-23-032	CMXU	59,698.08	1.37	Community Commercial	0.1	0.4	25	0.0053	0.0024	Future
303-22-015	RGCO	11,663.35	0.27	Regional Commercial	0.1	0.5	0	0.0000	0.0006	Future
303-22-039	RGCO	22,016.42	0.51	Regional Commercial	0.1	0.5	0	0.0000	0.0011	Future
303-21-068	RGCO	24,215.83	0.56	Regional Commercial	0.1	0.5	0	0.0000	0.0012	Future
303-22-037	RGCO	22,012.72	0.51	Regional Commercial	0.1	0.5	0	0.0000	0.0011	Future
303-18-046	RGCO	48,506.89	1.11	Regional Commercial	0.1	0.5	0	0.0000	0.0024	Future
303-18-023	RGCO	19,000.00	0.44	Regional Commercial	0.1	0.5	0	0.0000	0.0009	Future
303-18-022	RGCO	28,265.76	0.65	Regional Commercial	0.1	0.5	0	0.0000	0.0014	Future
303-18-037	RGCO	9,191.61	0.21	Regional Commercial	0.1	0.5	0	0.0000	0.0005	Future
303-23-044	CMXU	35,632.59	0.82	Community Commercial	0.1	0.4	25	0.0031	0.0014	Future
303-19-078	RGCO	31,754.11	0.73	Regional Commercial	0.1	0.5	0	0.0000	0.0016	Future
303-18-050	RGCO	48,396.21	1.11	Regional Commercial	0.1	0.5	0	0.0000	0.0024	Future
303-18-049	RGCO	120,162.09	2.76	Regional Commercial	0.1	0.5	0	0.0000	0.0060	Future
303-23-043	CMXU	40,282.23	0.92	Community Commercial	0.1	0.4	25	0.0036	0.0016	Future
303-23-029	CMXU	45,256.12	1.04	Community Commercial	0.1	0.4	25	0.0040	0.0018	Future

APN	GPLANCRT	Area (SF)	Area (Acres)	Assumed Land Use	Flow Factor	FAR	DUA	Residential Flow (mgd)	Non-Residential Flow (mgd)	Future Model Scenario
303-23-026	CMXU	14,329.30	0.33	Community Commercial	0.1	0.4	25	0.0013	0.0006	Future
303-23-030	RGCO	79,488.65	1.82	Regional Commercial	0.1	0.5	0	0.0000	0.0040	Future
303-18-048	RGCO	63,348.69	1.45	Regional Commercial	0.1	0.5	0	0.0000	0.0032	Future
303-23-037	RGCO	66,753.62	1.53	Regional Commercial	0.1	0.5	0	0.0000	0.0033	Future
303-23-034	RGCO	99,561.24	2.29	Regional Commercial	0.1	0.5	0	0.0000	0.0050	Future
303-23-035	CMXU	45,156.65	1.04	Community Commercial	0.1	0.4	25	0.0040	0.0018	Future
303-23-022	CMXU	13,600.82	0.31	Community Commercial	0.1	0.4	25	0.0012	0.0005	Future
290-01-125	CMXU	98,936.97	2.27	Community Commercial	0.1	0.4	25	0.0087	0.0040	Future
303-20-073	RGCO	720.06	0.02	Regional Commercial	0.1	0.5	0	0.0000	0.0000	Future
303-18-042	RGCO	8,656.02	0.20	Regional Commercial	0.1	0.5	0	0.0000	0.0004	Future
303-18-036	RGCO	9,198.41	0.21	Regional Commercial	0.1	0.5	0	0.0000	0.0005	Future
303-19-077	RGCO	18,664.05	0.43	Regional Commercial	0.1	0.5	0	0.0000	0.0009	Future
303-19-075	RGCO	9,375.00	0.22	Regional Commercial	0.1	0.5	0	0.0000	0.0005	Future
303-20-068	RGCO	8,879.83	0.20	Regional Commercial	0.1	0.5	0	0.0000	0.0004	Future
303-20-069	RGCO	2,310.91	0.05	Regional Commercial	0.1	0.5	0	0.0000	0.0001	Future
303-20-070	RGCO	3,080.93	0.07	Regional Commercial	0.1	0.5	0	0.0000	0.0002	Future
303-20-071	RGCO	10,741.45	0.25	Regional Commercial	0.1	0.5	0	0.0000	0.0005	Future
303-20-072	RGCO	4,061.67	0.09	Regional Commercial	0.1	0.5	0	0.0000	0.0002	Future
303-20-074	RGCO	11,981.14	0.28	Regional Commercial	0.1	0.5	0	0.0000	0.0006	Future
303-18-035	RGCO	11,513.82	0.26	Regional Commercial	0.1	0.5	0	0.0000	0.0006	Future
296-20-006	RGCO	21,323.88	0.49	Regional Commercial	0.1	0.5	0	0.0000	0.0011	Future
290-02-096	CMXU	9,078.63	0.21	Community Commercial	0.1	0.4	25	0.0008	0.0004	Future
290-05-053	CMXU	28,774.74	0.66	Community Commercial	0.1	0.4	25	0.0025	0.0012	Future
290-01-123	CMXU	138,195.80	3.17	Community Commercial	0.1	0.4	25	0.0122	0.0055	Future
290-23-048	MDRE	49,544.21	1.14	Medium Density Residential	154	0	25	0.0044	0.0000	Future
290-39-037	NHMX	48,028.13	1.10	Neighborhood Commercial	0.1	0.3	25	0.0042	0.0014	Future
290-39-083	NHMX	16,996.75	0.39	Neighborhood Commercial	0.1	0.3	25	0.0015	0.0005	Future
290-23-092	NHMX	61,504.56	1.41	Neighborhood Commercial	0.1	0.3	25	0.0054	0.0018	Future

APN	GPLANCRT	Area (SF)	Area (Acres)	Assumed Land Use	Flow Factor	FAR	DUA	Residential Flow (mgd)	Non-Residential Flow (mgd)	Future Model Scenario
290-39-053	NHMX	40,305.12	0.93	Neighborhood Commercial	0.1	0.3	25	0.0036	0.0012	Future
290-39-081	NHMX	16,798.50	0.39	Neighborhood Commercial	0.1	0.3	25	0.0015	0.0005	Future
290-39-012	NHMX	15,174.41	0.35	Neighborhood Commercial	0.1	0.3	25	0.0013	0.0005	Future
290-39-035	NHMX	19,585.89	0.45	Neighborhood Commercial	0.1	0.3	25	0.0017	0.0006	Future
293-02-028	NHMX	208,966.89	4.80	Neighborhood Commercial	0.1	0.3	25	0.0185	0.0063	Future
290-39-065	NHMX	23,534.53	0.54	Neighborhood Commercial	0.1	0.3	25	0.0021	0.0007	Future
290-23-053	NHMX	159,663.43	3.67	Neighborhood Commercial	0.1	0.3	25	0.0141	0.0048	Future
290-23-049	NHMX	84,194.27	1.93	Neighborhood Commercial	0.1	0.3	25	0.0074	0.0025	Future
290-23-071	NHMX	46,444.96	1.07	Neighborhood Commercial	0.1	0.3	25	0.0041	0.0014	Future
293-02-036	NHMX	61,913.63	1.42	Neighborhood Commercial	0.1	0.3	25	0.0055	0.0019	Future
269-20-020	CMXU	5,784.49	0.13	Community Commercial	0.1	0.4	25	0.0005	0.0002	Future
269-28-061	CMXU	25,783.00	0.59	Community Commercial	0.1	0.4	25	0.0023	0.0010	Future
269-20-099	CMXU	3,996.19	0.09	Community Commercial	0.1	0.4	25	0.0004	0.0002	Future
269-28-075	CMXU	3,608.44	0.08	Community Commercial	0.1	0.4	25	0.0003	0.0001	Future
269-28-024	CMXU	9,180.95	0.21	Community Commercial	0.1	0.4	25	0.0008	0.0004	Future
269-20-101	CMXU	3,758.41	0.09	Community Commercial	0.1	0.4	25	0.0003	0.0002	Future
224-26-050	CMXU	10,726.43	0.25	Community Commercial	0.1	0.4	25	0.0009	0.0004	Future
293-02-025	NHMX	17,597.17	0.40	Neighborhood Commercial	0.1	0.3	25	0.0016	0.0005	Future
293-02-029	NHMX	15,975.24	0.37	Neighborhood Commercial	0.1	0.3	25	0.0014	0.0005	Future
293-02-021	NHMX	29,723.03	0.68	Neighborhood Commercial	0.1	0.3	25	0.0026	0.0009	Future
293-25-037	NHMX	22,463.73	0.52	Neighborhood Commercial	0.1	0.3	25	0.0020	0.0007	Future
104-14-095	LDRD	46,270.51	1.06	Office: 100%	0.1	0.85	0	0.0000	0.0039	Future
104-14-024	LDRD	31,233.37	0.72	Office: 100%	0.1	0.85	0	0.0000	0.0027	Future
104-14-096	LDRD	21,592.89	0.50	Office: 100%	0.1	0.85	0	0.0000	0.0018	Future
104-16-112	RGCO	910,541.85	20.90	Regional Commercial	0.1	0.5	0	0.0000	0.0455	Future
104-16-111	RGCO	131,271.33	3.01	Regional Commercial	0.1	0.5	0	0.0000	0.0066	Future
104-50-025	LDRD	359,669.04	8.26	Office: 100%	0.1	0.85	0	0.0000	0.0306	Future
296-20-003	RGCO	28,882.37	0.66	Regional Commercial	0.1	0.5	0	0.0000	0.0014	Future

APN	GPLANCRT	Area (SF)	Area (Acres)	Assumed Land Use	Flow Factor	FAR	DUA	Residential Flow (mgd)	Non-Residential Flow (mgd)	Future Model Scenario
296-20-011	RGCO	111,910.33	2.57	Regional Commercial	0.1	0.5	0	0.0000	0.0056	Future
104-52-024	LDRD	523,726.09	12.02	Office: 100%	0.1	0.85	0	0.0000	0.0445	Future
104-52-023	HDRD	942,817.65	21.64	Office	0.15	1.25	0	0.0000	0.1768	Future
290-39-050	PUQP	16,357.67	0.38	Public/Institutional	0.21	0.2	0	0.0000	0.0007	Future
296-21-010	RGCO	100,277.78	2.30	Regional Commercial	0.1	0.5	0	0.0000	0.0050	Future
296-21-009	RGCO	28,038.05	0.64	Regional Commercial	0.1	0.5	0	0.0000	0.0014	Future
296-21-008	RGCO	28,053.03	0.64	Regional Commercial	0.1	0.5	0	0.0000	0.0014	Future
296-21-007	RGCO	25,832.30	0.59	Regional Commercial	0.1	0.5	0	0.0000	0.0013	Future
296-21-005	RGCO	19,411.04	0.45	Regional Commercial	0.1	0.5	0	0.0000	0.0010	Future
296-21-006	RGCO	19,507.52	0.45	Regional Commercial	0.1	0.5	0	0.0000	0.0010	Future
296-20-004	RGCO	45,412.92	1.04	Regional Commercial	0.1	0.5	0	0.0000	0.0023	Future
296-34-017	RGCO	82,216.67	1.89	Regional Commercial	0.1	0.5	0	0.0000	0.0041	Future
296-34-018	RGCO	39,059.89	0.90	Regional Commercial	0.1	0.5	0	0.0000	0.0020	Future
224-29-017	CMXU	7,496.67	0.17	Community Commercial	0.1	0.4	25	0.0007	0.0003	Future
216-28-113	LHIN	143,382.91	3.29	Light Industrial	0.15	0.85	0	0.0000	0.0183	Future
216-28-126	LHIN	191,506.23	4.40	Light Industrial	0.15	0.85	0	0.0000	0.0244	Future
294-18-034	NHMX	22,695.80	0.52	Neighborhood Commercial	0.1	0.3	25	0.0020	0.0007	Future
296-17-036	RGCO	11,138.36	0.26	Regional Commercial	0.1	0.5	0	0.0000	0.0006	Future
296-17-001	RGCO	16,631.96	0.38	Regional Commercial	0.1	0.5	0	0.0000	0.0008	Future
296-17-037	RGCO	9,679.83	0.22	Regional Commercial	0.1	0.5	0	0.0000	0.0005	Future
296-20-005	RGCO	17,441.64	0.40	Regional Commercial	0.1	0.5	0	0.0000	0.0009	Future
296-21-030	RGCO	33,437.98	0.77	Regional Commercial	0.1	0.5	0	0.0000	0.0017	Future
296-21-011	RGCO	17,214.11	0.40	Regional Commercial	0.1	0.5	0	0.0000	0.0009	Future
296-21-012	RGCO	49,573.01	1.14	Regional Commercial	0.1	0.5	0	0.0000	0.0025	Future
296-37-030	RGCO	71,651.08	1.64	Regional Commercial	0.1	0.5	0	0.0000	0.0036	Future
296-37-031	RGCO	47,537.77	1.09	Regional Commercial	0.1	0.5	0	0.0000	0.0024	Future
296-34-015	RGCO	135,803.85	3.12	Regional Commercial	0.1	0.5	0	0.0000	0.0068	Future
296-34-016	RGCO	300,944.07	6.91	Regional Commercial	0.1	0.5	0	0.0000	0.0150	Future

APN	GPLANCRT	Area (SF)	Area (Acres)	Assumed Land Use	Flow Factor	FAR	DUA	Residential Flow (mgd)	Non-Residential Flow (mgd)	Future Model Scenario
104-50-001	LDRD	161,596.64	3.71	Office: 100%	0.1	0.85	0	0.0000	0.0137	Future
230-05-057	RGCO	37,460.68	0.86	Regional Commercial	0.1	0.5	0	0.0000	0.0019	Future
104-01-100	HDRD	896,389.01	20.58	Office	0.15	1.25	0	0.0000	0.1681	Future
104-04-117	LDRD	187,293.35	4.30	Office: 100%	0.1	0.85	0	0.0000	0.0159	Future
104-04-147	LDRD	38,029.74	0.87	Office: 100%	0.1	0.85	0	0.0000	0.0032	Future
104-15-101	LDRD	1,585.42	0.04	Office: 100%	0.1	0.85	0	0.0000	0.0001	Future
104-50-011	LDRD	245,423.15	5.63	Office: 100%	0.1	0.85	0	0.0000	0.0209	Future
104-50-018	LDRD	299,221.75	6.87	Office: 100%	0.1	0.85	0	0.0000	0.0254	Future
104-50-007	LDRD	163,238.01	3.75	Office: 100%	0.1	0.85	0	0.0000	0.0139	Future
104-50-016	LDRD	472,755.41	10.85	Office: 100%	0.1	0.85	0	0.0000	0.0402	Future
104-01-107	HDRD	3,590.42	0.08	Office	0.15	1.25	0	0.0000	0.0007	Future
104-52-026	HDRD	374,809.37	8.60	Office	0.15	1.25	0	0.0000	0.0703	Future
104-04-119	LDRD	159,816.73	3.67	Office: 100%	0.1	0.85	0	0.0000	0.0136	Future
104-04-118	LDRD	175,792.09	4.04	Office: 100%	0.1	0.85	0	0.0000	0.0149	Future
104-43-054	RGCO	170,051.74	3.90	Regional Commercial	0.1	0.5	0	0.0000	0.0085	Future
104-42-017	HDRD	280,398.58	6.44	Office	0.15	1.25	0	0.0000	0.0526	Future
104-04-120	LDRD	166,248.03	3.82	Office: 100%	0.1	0.85	0	0.0000	0.0141	Future
104-16-091	RGCO	162,086.73	3.72	Regional Commercial	0.1	0.5	0	0.0000	0.0081	Future
104-14-120	LDRD	24,376.36	0.56	Office: 100%	0.1	0.85	0	0.0000	0.0021	Future
104-14-121	LDRD	19,520.29	0.45	Office: 100%	0.1	0.85	0	0.0000	0.0017	Future
104-14-131	LDRD	19,544.67	0.45	Office: 100%	0.1	0.85	0	0.0000	0.0017	Future
104-14-154	LDRD	42,839.05	0.98	Office: 100%	0.1	0.85	0	0.0000	0.0036	Future
104-14-159	LDRD	124,601.55	2.86	Office: 100%	0.1	0.85	0	0.0000	0.0106	Future
104-14-160	LDRD	238,912.02	5.48	Office: 100%	0.1	0.85	0	0.0000	0.0203	Future
104-48-010	HDRD	1,695,829.23	38.93	Office	0.15	1.25	0	0.0000	0.3180	Future
104-38-011	LDRD	157,141.89	3.61	Office: 100%	0.1	0.85	0	0.0000	0.0134	Future
104-16-113	HDRD	609,770.70	14.00	Office	0.15	1.25	0	0.0000	0.1143	Future
104-13-090	LDRD	208,242.04	4.78	Office: 100%	0.1	0.85	0	0.0000	0.0177	Future

APN	GPLANCRT	Area (SF)	Area (Acres)	Assumed Land Use	Flow Factor	FAR	DUA	Residential Flow (mgd)	Non-Residential Flow (mgd)	Future Model Scenario
104-13-091	LDRD	56,780.67	1.30	Office: 100%	0.1	0.85	0	0.0000	0.0048	Future
104-13-094	LDRD	215,698.87	4.95	Office: 100%	0.1	0.85	0	0.0000	0.0183	Future
104-13-095	LDRD	215,831.58	4.95	Office: 100%	0.1	0.85	0	0.0000	0.0183	Future
216-29-116	LHIN	277,119.40	6.36	Light Industrial	0.15	0.85	0	0.0000	0.0353	Future
104-12-180	NHMX	10,379.13	0.24	Neighborhood Commercial	0.1	0.3	25	0.0009	0.0003	Future
104-15-087	LDRD	81,123.41	1.86	Office: 100%	0.1	0.85	0	0.0000	0.0069	Future
104-15-061	LDRD	56,001.87	1.29	Office: 100%	0.1	0.85	0	0.0000	0.0048	Future
104-15-047	LDRD	40,392.68	0.93	Office: 100%	0.1	0.85	0	0.0000	0.0034	Future
104-51-004	LDRD	35,579.63	0.82	Office: 100%	0.1	0.85	0	0.0000	0.0030	Future
104-15-127	LDRD	30,658.22	0.70	Office: 100%	0.1	0.85	0	0.0000	0.0026	Future
104-15-089	LDRD	58,355.47	1.34	Office: 100%	0.1	0.85	0	0.0000	0.0050	Future
104-51-011	LDRD	27,074.40	0.62	Office: 100%	0.1	0.85	0	0.0000	0.0023	Future
104-15-096	LDRD	54,801.05	1.26	Office: 100%	0.1	0.85	0	0.0000	0.0047	Future
104-51-012	LDRD	27,699.23	0.64	Office: 100%	0.1	0.85	0	0.0000	0.0024	Future
104-15-114	LDRD	10,746.71	0.25	Office: 100%	0.1	0.85	0	0.0000	0.0009	Future
104-51-003	LDRD	32,105.77	0.74	Office: 100%	0.1	0.85	0	0.0000	0.0027	Future
104-51-002	LDRD	28,444.71	0.65	Office: 100%	0.1	0.85	0	0.0000	0.0024	Future
104-51-001	LDRD	23,285.21	0.53	Office: 100%	0.1	0.85	0	0.0000	0.0020	Future
104-15-105	LDRD	5,951.68	0.14	Office: 100%	0.1	0.85	0	0.0000	0.0005	Future
104-15-109	LDRD	235,123.60	5.40	Office: 100%	0.1	0.85	0	0.0000	0.0200	Future
104-15-113	LDRD	125,741.82	2.89	Office: 100%	0.1	0.85	0	0.0000	0.0107	Future
104-15-135	LDRD	48,996.33	1.12	Office: 100%	0.1	0.85	0	0.0000	0.0042	Future
104-15-128	LDRD	102,258.97	2.35	Office: 100%	0.1	0.85	0	0.0000	0.0087	Future
104-15-123	LDRD	177,907.28	4.08	Office: 100%	0.1	0.85	0	0.0000	0.0151	Future
104-15-097	LDRD	239,795.76	5.50	Office: 100%	0.1	0.85	0	0.0000	0.0204	Future
104-15-122	LDRD	185,710.26	4.26	Office: 100%	0.1	0.85	0	0.0000	0.0158	Future
104-15-124	LDRD	52,383.65	1.20	Office: 100%	0.1	0.85	0	0.0000	0.0045	Future
104-15-130	LDRD	268,248.12	6.16	Office: 100%	0.1	0.85	0	0.0000	0.0228	Future

APN	GPLANCRT	Area (SF)	Area (Acres)	Assumed Land Use	Flow Factor	FAR	DUA	Residential Flow (mgd)	Non-Residential Flow (mgd)	Future Model Scenario
104-15-134	LDRD	124,677.01	2.86	Office: 100%	0.1	0.85	0	0.0000	0.0106	Future
104-14-091	LDRD	95,797.97	2.20	Office: 100%	0.1	0.85	0	0.0000	0.0081	Future
104-15-133	LDRD	136,626.87	3.14	Office: 100%	0.1	0.85	0	0.0000	0.0116	Future
104-39-012	LDRD	46,027.35	1.06	Office: 100%	0.1	0.85	0	0.0000	0.0039	Future
104-15-132	LDRD	35,477.40	0.81	Office: 100%	0.1	0.85	0	0.0000	0.0030	Future
104-15-125	LDRD	110,690.62	2.54	Office: 100%	0.1	0.85	0	0.0000	0.0094	Future
104-14-125	LDRD	248,197.72	5.70	Office: 100%	0.1	0.85	0	0.0000	0.0211	Future
104-14-158	LDRD	66,441.61	1.53	Office: 100%	0.1	0.85	0	0.0000	0.0056	Future
104-14-068	LDRD	18,508.21	0.42	Office: 100%	0.1	0.85	0	0.0000	0.0016	Future
104-14-089	LDRD	201,639.86	4.63	Office: 100%	0.1	0.85	0	0.0000	0.0171	Future
104-14-142	LDRD	37,016.40	0.85	Office: 100%	0.1	0.85	0	0.0000	0.0031	Future
104-14-111	LDRD	27,695.18	0.64	Office: 100%	0.1	0.85	0	0.0000	0.0024	Future
104-14-110	LDRD	40,106.86	0.92	Office: 100%	0.1	0.85	0	0.0000	0.0034	Future
104-14-143	LDRD	16,149.72	0.37	Office: 100%	0.1	0.85	0	0.0000	0.0014	Future
104-14-144	LDRD	17,509.25	0.40	Office: 100%	0.1	0.85	0	0.0000	0.0015	Future
104-14-171	LDRD	289,159.69	6.64	Office: 100%	0.1	0.85	0	0.0000	0.0246	Future
104-14-140	LDRD	36,975.96	0.85	Office: 100%	0.1	0.85	0	0.0000	0.0031	Future
104-14-139	LDRD	52,502.92	1.21	Office: 100%	0.1	0.85	0	0.0000	0.0045	Future
104-14-168	LDRD	284,381.69	6.53	Office: 100%	0.1	0.85	0	0.0000	0.0242	Future
104-14-166	LDRD	43,576.87	1.00	Office: 100%	0.1	0.85	0	0.0000	0.0037	Future
104-14-170	LDRD	29,087.38	0.67	Office: 100%	0.1	0.85	0	0.0000	0.0025	Future
104-14-133	LDRD	15,395.68	0.35	Office: 100%	0.1	0.85	0	0.0000	0.0013	Future
104-14-114	LDRD	49,019.67	1.13	Office: 100%	0.1	0.85	0	0.0000	0.0042	Future
104-14-161	LDRD	43,451.86	1.00	Office: 100%	0.1	0.85	0	0.0000	0.0037	Future
104-14-132	LDRD	32,756.94	0.75	Office: 100%	0.1	0.85	0	0.0000	0.0028	Future
104-14-146	LDRD	43,629.84	1.00	Office: 100%	0.1	0.85	0	0.0000	0.0037	Future
104-14-169	LDRD	169,127.91	3.88	Office: 100%	0.1	0.85	0	0.0000	0.0144	Future
104-14-106	LDRD	66,746.62	1.53	Office: 100%	0.1	0.85	0	0.0000	0.0057	Future

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104-14-118	LDRD	39,669.06	0.91	Office: 100%	0.1	0.85	0	0.0000	0.0034	Future
104-14-156	LDRD	76,619.12	1.76	Office: 100%	0.1	0.85	0	0.0000	0.0065	Future
104-14-107	LDRD	50,125.41	1.15	Office: 100%	0.1	0.85	0	0.0000	0.0043	Future
104-14-164	LDRD	46,277.09	1.06	Office: 100%	0.1	0.85	0	0.0000	0.0039	Future
104-14-108	LDRD	19,513.18	0.45	Office: 100%	0.1	0.85	0	0.0000	0.0017	Future
104-13-097	HDRD	42,636.40	0.98	Office	0.15	1.25	0	0.0000	0.0080	Future
104-14-113	LDRD	24,349.67	0.56	Office: 100%	0.1	0.85	0	0.0000	0.0021	Future
216-48-030	LDRD	78,112.76	1.79	Office: 100%	0.1	0.85	0	0.0000	0.0066	Future
216-32-030	LDRD	90,656.42	2.08	Office: 100%	0.1	0.85	0	0.0000	0.0077	Future
216-48-026	LDRD	53,536.77	1.23	Office: 100%	0.1	0.85	0	0.0000	0.0046	Future
216-46-019	LHIN	73,951.07	1.70	Light Industrial	0.15	0.85	0	0.0000	0.0094	Future
216-48-005	LDRD	97,626.99	2.24	Office: 100%	0.1	0.85	0	0.0000	0.0083	Future
216-48-004	LDRD	94,115.77	2.16	Office: 100%	0.1	0.85	0	0.0000	0.0080	Future
216-48-035	LDRD	111,197.42	2.55	Office: 100%	0.1	0.85	0	0.0000	0.0095	Future
216-32-040	LDRD	361,825.88	8.31	Office: 100%	0.1	0.85	0	0.0000	0.0308	Future
216-32-041	LDRD	74,070.56	1.70	Office: 100%	0.1	0.85	0	0.0000	0.0063	Future
216-48-003	LDRD	131,522.42	3.02	Office: 100%	0.1	0.85	0	0.0000	0.0112	Future
216-29-107	LHIN	147,528.17	3.39	Light Industrial	0.15	0.85	0	0.0000	0.0188	Future
216-29-083	LHIN	43,868.28	1.01	Light Industrial	0.15	0.85	0	0.0000	0.0056	Future
216-49-023	LDRD	151,178.71	3.47	Office: 100%	0.1	0.85	0	0.0000	0.0129	Future
216-01-041	CMXU	27,647.14	0.63	Community Commercial	0.1	0.4	25	0.0024	0.0011	Future
216-01-060	CMXU	63,809.87	1.46	Community Commercial	0.1	0.4	25	0.0056	0.0026	Future
216-01-059	RGMX	38,518.76	0.88	Regional Commercial	0.1	0.5	40	0.0054	0.0019	Future
216-01-051	CMXU	28,186.25	0.65	Community Commercial	0.1	0.4	25	0.0025	0.0011	Future
290-39-034	NHMX	19,585.27	0.45	Neighborhood Commercial	0.1	0.3	25	0.0017	0.0006	Future
290-39-033	NHMX	19,583.68	0.45	Neighborhood Commercial	0.1	0.3	25	0.0017	0.0006	Future
290-08-010	CMXU	15,857.59	0.36	Community Commercial	0.1	0.4	25	0.0014	0.0006	Future
290-08-141	CMXU	17,637.41	0.40	Community Commercial	0.1	0.4	25	0.0016	0.0007	Future

APN	GPLANCRT	Area (SF)	Area (Acres)	Assumed Land Use	Flow Factor	FAR	DUA	Residential Flow (mgd)	Non-Residential Flow (mgd)	Future Model Scenario
290-08-135	CMXU	21,723.07	0.50	Community Commercial	0.1	0.4	25	0.0019	0.0009	Future
216-26-027	MDRE	12,224.97	0.28	Medium Density Residential	154	0	25	0.0011	0.0000	Future
216-26-028	MDRE	13,090.94	0.30	Medium Density Residential	154	0	25	0.0012	0.0000	Future
216-26-029	MDRE	14,020.44	0.32	Medium Density Residential	154	0	25	0.0012	0.0000	Future
216-26-030	MDRE	13,942.08	0.32	Medium Density Residential	154	0	25	0.0012	0.0000	Future
216-26-031	MDRE	13,941.47	0.32	Medium Density Residential	154	0	25	0.0012	0.0000	Future
216-26-032	MDRE	13,927.52	0.32	Medium Density Residential	154	0	25	0.0012	0.0000	Future
216-26-033	MDRE	13,913.87	0.32	Medium Density Residential	154	0	25	0.0012	0.0000	Future
216-26-034	MDRE	13,899.89	0.32	Medium Density Residential	154	0	25	0.0012	0.0000	Future
216-26-035	MDRE	13,896.39	0.32	Medium Density Residential	154	0	25	0.0012	0.0000	Future
216-26-036	MDRE	27,978.65	0.64	Medium Density Residential	154	0	25	0.0025	0.0000	Future
216-48-025	LDRD	71,026.36	1.63	Office: 100%	0.1	0.85	0	0.0000	0.0060	Future
216-29-106	LHIN	93,596.65	2.15	Light Industrial	0.15	0.85	0	0.0000	0.0119	Future
213-37-015	RGMX	43,810.63	1.01	Regional Commercial	0.1	0.5	40	0.0062	0.0022	Future
313-05-012	RGMX	51,476.79	1.18	Regional Commercial	0.1	0.5	40	0.0073	0.0026	Future
224-09-173	LHIN	20,081.82	0.46	Light Industrial	0.15	0.85	0	0.0000	0.0026	Future
224-09-178	HDRD	320,161.58	7.35	Office	0.15	1.25	0	0.0000	0.0600	Future
224-47-011	HDRD	147,038.83	3.38	Office	0.15	1.25	0	0.0000	0.0276	Future
269-28-029	CMXU	12,611.17	0.29	Community Commercial	0.1	0.4	25	0.0011	0.0005	Future
269-20-000	CMXU	13,257.80	0.30	Community Commercial	0.1	0.4	25	0.0012	0.0005	Future
269-16-081	LDRE	40,665.93	0.93	Low Density Residential	245	25	25	0.0057	0.0000	Future
269-05-058	CMXU	5,066.77	0.12	Community Commercial	0.1	0.4	25	0.0004	0.0002	Future
224-08-146	LDRD	242,279.02	5.56	Office: 100%	0.1	0.85	0	0.0000	0.0206	Future
224-42-001	LDRD	56,303.38	1.29	Office: 100%	0.1	0.85	0	0.0000	0.0048	Future
224-42-011	LDRD	27,425.81	0.63	Office: 100%	0.1	0.85	0	0.0000	0.0023	Future
224-42-010	LDRD	29,601.66	0.68	Office: 100%	0.1	0.85	0	0.0000	0.0025	Future
224-47-010	HDRD	90,447.13	2.08	Office	0.15	1.25	0	0.0000	0.0170	Future
224-09-168	LDRD	141,873.70	3.26	Office: 100%	0.1	0.85	0	0.0000	0.0121	Future

APN	GPLANCRT	Area (SF)	Area (Acres)	Assumed Land Use	Flow Factor	FAR	DUA	Residential Flow (mgd)	Non-Residential Flow (mgd)	Future Model Scenario
224-09-176	LDRD	37,256.71	0.86	Office: 100%	0.1	0.85	0	0.0000	0.0032	Future
224-09-175	LDRD	51,330.24	1.18	Office: 100%	0.1	0.85	0	0.0000	0.0044	Future
224-47-009	HDRD	88,616.97	2.03	Office	0.15	1.25	0	0.0000	0.0166	Future
224-47-018	HDRD	187,994.16	4.32	Office	0.15	1.25	0	0.0000	0.0352	Future
269-26-092	CMXU	5,045.57	0.12	Community Commercial	0.1	0.4	25	0.0004	0.0002	Future
269-28-065	CMXU	26,816.67	0.62	Community Commercial	0.1	0.4	25	0.0024	0.0011	Future
269-28-028	CMXU	6,806.80	0.16	Community Commercial	0.1	0.4	25	0.0006	0.0003	Future
269-26-079	CMXU	5,538.36	0.13	Community Commercial	0.1	0.4	25	0.0005	0.0002	Future
269-26-120	CMXU	5,411.85	0.12	Community Commercial	0.1	0.4	25	0.0005	0.0002	Future
269-26-084	CMXU	9,310.59	0.21	Community Commercial	0.1	0.4	25	0.0008	0.0004	Future
269-26-081	CMXU	7,925.53	0.18	Community Commercial	0.1	0.4	25	0.0007	0.0003	Future
269-20-065	CMXU	11,043.91	0.25	Community Commercial	0.1	0.4	25	0.0010	0.0004	Future
269-26-082	CMXU	5,078.92	0.12	Community Commercial	0.1	0.4	25	0.0004	0.0002	Future
269-28-011	CMXU	3,873.44	0.09	Community Commercial	0.1	0.4	25	0.0003	0.0002	Future
269-20-053	CMXU	10,883.87	0.25	Community Commercial	0.1	0.4	25	0.0010	0.0004	Future
269-26-121	CMXU	8,170.95	0.19	Community Commercial	0.1	0.4	25	0.0007	0.0003	Future
269-20-037	CMXU	10,487.24	0.24	Community Commercial	0.1	0.4	25	0.0009	0.0004	Future
294-01-003	CMXU	19,029.93	0.44	Community Commercial	0.1	0.4	25	0.0017	0.0008	Future
294-01-006	CMXU	18,958.54	0.44	Community Commercial	0.1	0.4	25	0.0017	0.0008	Future
269-28-012	CMXU	4,638.02	0.11	Community Commercial	0.1	0.4	25	0.0004	0.0002	Future
269-20-038	CMXU	6,308.92	0.14	Community Commercial	0.1	0.4	25	0.0006	0.0003	Future
269-20-039	CMXU	6,131.89	0.14	Community Commercial	0.1	0.4	25	0.0005	0.0002	Future
269-28-067	CMXU	4,940.43	0.11	Community Commercial	0.1	0.4	25	0.0004	0.0002	Future
269-28-066	CMXU	4,782.93	0.11	Community Commercial	0.1	0.4	25	0.0004	0.0002	Future
269-20-098	CMXU	3,747.28	0.09	Community Commercial	0.1	0.4	25	0.0003	0.0001	Future
269-20-021	CMXU	5,648.19	0.13	Community Commercial	0.1	0.4	25	0.0005	0.0002	Future
269-20-100	CMXU	3,521.06	0.08	Community Commercial	0.1	0.4	25	0.0003	0.0001	Future
269-28-018	CMXU	6,061.11	0.14	Community Commercial	0.1	0.4	25	0.0005	0.0002	Future

APN	GPLANCRT	Area (SF)	Area (Acres)	Assumed Land Use	Flow Factor	FAR	DUA	Residential Flow (mgd)	Non-Residential Flow (mgd)	Future Model Scenario
269-28-025	CMXU	4,653.62	0.11	Community Commercial	0.1	0.4	25	0.0004	0.0002	Future
269-28-074	CMXU	4,009.02	0.09	Community Commercial	0.1	0.4	25	0.0004	0.0002	Future
269-28-015	CMXU	7,590.17	0.17	Community Commercial	0.1	0.4	25	0.0007	0.0003	Future
269-28-054	CMXU	3,855.92	0.09	Community Commercial	0.1	0.4	25	0.0003	0.0002	Future
269-28-073	CMXU	8,234.43	0.19	Community Commercial	0.1	0.4	25	0.0007	0.0003	Future
269-16-034	CMXU	40,806.52	0.94	Community Commercial	0.1	0.4	25	0.0036	0.0016	Future
294-36-001	RGCO	9,162.97	0.21	Regional Commercial	0.1	0.5	0	0.0000	0.0005	Future
294-35-021	RGCO	8,695.67	0.20	Regional Commercial	0.1	0.5	0	0.0000	0.0004	Future
294-36-002	MDRE	9,312.85	0.21	Medium Density Residential	154	0	25	0.0008	0.0000	Future
294-35-020	MDRE	8,936.77	0.21	Medium Density Residential	154	0	25	0.0008	0.0000	Future
294-39-010	CMXU	25,661.70	0.59	Community Commercial	0.1	0.4	25	0.0023	0.0010	Future
294-39-004	CMXU	6,113.49	0.14	Community Commercial	0.1	0.4	25	0.0005	0.0002	Future
294-39-009	CMXU	25,319.39	0.58	Community Commercial	0.1	0.4	25	0.0022	0.0010	Future
294-35-023	RGCO	108,335.81	2.49	Regional Commercial	0.1	0.5	0	0.0000	0.0054	Future
294-39-002	CMXU	44,529.78	1.02	Community Commercial	0.1	0.4	25	0.0039	0.0018	Future
294-39-001	CMXU	127,776.81	2.93	Community Commercial	0.1	0.4	25	0.0113	0.0051	Future
294-35-025	RGCO	78,581.26	1.80	Regional Commercial	0.1	0.5	0	0.0000	0.0039	Future
294-01-015	CMXU	132,726.89	3.05	Community Commercial	0.1	0.4	25	0.0117	0.0053	Future
294-01-004	CMXU	22,443.42	0.52	Community Commercial	0.1	0.4	25	0.0020	0.0009	Future
294-01-011	CMXU	23,291.59	0.53	Community Commercial	0.1	0.4	25	0.0021	0.0009	Future
294-18-035	NHMX	395,927.79	9.09	Neighborhood Commercial	0.1	0.3	25	0.0350	0.0119	Future
216-29-059	LHIN	80,632.00	1.85	Light Industrial	0.15	0.85	0	0.0000	0.0103	Future
216-46-002	HDRD	183,201.72	4.21	Office	0.15	1.25	0	0.0000	0.0344	Future
216-49-017	LDRD	155,505.49	3.57	Office: 100%	0.1	0.85	0	0.0000	0.0132	Future
216-49-019	LDRD	166,629.95	3.83	Office: 100%	0.1	0.85	0	0.0000	0.0142	Future
216-49-018	LDRD	149,900.69	3.44	Office: 100%	0.1	0.85	0	0.0000	0.0127	Future
216-31-063	LDRD	89,829.40	2.06	Office: 100%	0.1	0.85	0	0.0000	0.0076	Future
224-28-064	CMXU	25,154.69	0.58	Community Commercial	0.1	0.4	25	0.0022	0.0010	Future

APN	GPLANCRT	Area (SF)	Area (Acres)	Assumed Land Use	Flow Factor	FAR	DUA	Residential Flow (mgd)	Non-Residential Flow (mgd)	Future Model Scenario
294-01-010	CMXU	114,948.89	2.64	Community Commercial	0.1	0.4	25	0.0102	0.0046	Future
294-18-031	NHMX	13,733.57	0.32	Neighborhood Commercial	0.1	0.3	25	0.0012	0.0004	Future
269-16-083	LDRE	21,969.79	0.50	Low Density Residential	245	25	25	0.0031	0.0000	Future
269-16-082	LDRE	6,750.64	0.15	Low Density Residential	245	25	25	0.0009	0.0000	Future
316-19-032	RGCO	39,604.73	0.91	Regional Commercial	0.1	0.5	0	0.0000	0.0020	Future
313-06-003	RGMX	29,253.05	0.67	Regional Commercial	0.1	0.5	40	0.0041	0.0015	Future
313-05-010	RGMX	29,601.59	0.68	Regional Commercial	0.1	0.5	40	0.0042	0.0015	Future
313-05-011	RGMX	56,183.00	1.29	Regional Commercial	0.1	0.5	40	0.0079	0.0028	Future
205-38-023	DHRE	87,447.39	2.01	High Density Residential	154	40	40	0.0124	0.0000	Future
205-38-021	DHRE	194,466.58	4.46	High Density Residential	154	40	40	0.0275	0.0000	Future
205-38-024	DHRE	82,952.93	1.90	High Density Residential	154	40	40	0.0117	0.0000	Future
205-38-001	DHRE	35,017.13	0.80	High Density Residential	154	40	40	0.0050	0.0000	Future
205-38-007	DHRE	39,416.06	0.90	High Density Residential	154	40	40	0.0056	0.0000	Future
205-38-008	DHRE	39,857.56	0.92	High Density Residential	154	40	40	0.0056	0.0000	Future
205-38-022	DHRE	76,671.09	1.76	High Density Residential	154	40	40	0.0108	0.0000	Future
205-38-020	DHRE	24,243.28	0.56	High Density Residential	154	40	40	0.0034	0.0000	Future
230-08-021	LDRE	10,700.73	0.25	Low Density Residential	245	25	25	0.0015	0.0000	Future
216-28-094	LDRD	152,700.83	3.51	Office: 100%	0.1	0.85	0	0.0000	0.0130	Future
230-06-049	RGMX	131,470.74	3.02	Regional Commercial	0.1	0.5	40	0.0186	0.0066	Future
230-06-048	RGMX	33,651.84	0.77	Regional Commercial	0.1	0.5	40	0.0048	0.0017	Future
205-39-002	DHRE	109,402.55	2.51	High Density Residential	154	40	40	0.0155	0.0000	Future
205-39-024	MDRE	29,086.65	0.67	Medium Density Residential	154	0	25	0.0026	0.0000	Future
269-01-085	CMXU	53,012.27	1.22	Community Commercial	0.1	0.4	25	0.0047	0.0021	Future
269-02-077	CMXU	30,191.78	0.69	Community Commercial	0.1	0.4	25	0.0027	0.0012	Future
269-02-078	CMXU	13,026.73	0.30	Community Commercial	0.1	0.4	25	0.0012	0.0005	Future
269-02-080	CMXU	10,578.66	0.24	Community Commercial	0.1	0.4	25	0.0009	0.0004	Future
230-06-033	RGMX	548,274.30	12.59	Regional Commercial	0.1	0.5	40	0.0775	0.0274	Future
213-35-032	RGMX	50,554.93	1.16	Regional Commercial	0.1	0.5	40	0.0071	0.0025	Future

APN	GPLANCRT	Area (SF)	Area (Acres)	Assumed Land Use	Flow Factor	FAR	DUA	Residential Flow (mgd)	Non-Residential Flow (mgd)	Future Model Scenario
213-35-035	RGMX	95,178.19	2.18	Regional Commercial	0.1	0.5	40	0.0135	0.0048	Future
274-43-059	RGCO	19,161.77	0.44	Regional Commercial	0.1	0.5	0	0.0000	0.0010	Future
224-49-010	CMXU	60,265.32	1.38	Community Commercial	0.1	0.4	25	0.0053	0.0024	Future
230-08-018	LDRE	21,973.57	0.50	Low Density Residential	245	25	25	0.0031	0.0000	Future
230-08-019	LDRE	9,003.59	0.21	Low Density Residential	245	25	25	0.0013	0.0000	Future
230-08-020	LDRE	6,561.48	0.15	Low Density Residential	245	25	25	0.0009	0.0000	Future
216-28-083	LDRD	214,833.40	4.93	Office: 100%	0.1	0.85	0	0.0000	0.0183	Future
216-48-032	LDRD	55,403.94	1.27	Office: 100%	0.1	0.85	0	0.0000	0.0047	Future
216-48-029	LDRD	85,689.32	1.97	Office: 100%	0.1	0.85	0	0.0000	0.0073	Future
224-04-071	HYIN	322,762.73	7.41	Heavy Industrial	0.15	1.25	0	0.0000	0.0605	Future
224-10-119	LDRD	180,002.68	4.13	Office: 100%	0.1	0.85	0	0.0000	0.0153	Future
224-10-069	LDRD	94,509.08	2.17	Office: 100%	0.1	0.85	0	0.0000	0.0080	Future
224-10-130	LDRD	58,158.84	1.34	Office: 100%	0.1	0.85	0	0.0000	0.0049	Future
224-10-107	LDRD	30,686.39	0.70	Office: 100%	0.1	0.85	0	0.0000	0.0026	Future
224-10-106	LDRD	19,213.62	0.44	Office: 100%	0.1	0.85	0	0.0000	0.0016	Future
224-10-105	LDRD	148,684.73	3.41	Office: 100%	0.1	0.85	0	0.0000	0.0126	Future
224-10-080	LDRD	61,246.48	1.41	Office: 100%	0.1	0.85	0	0.0000	0.0052	Future
224-10-118	LDRD	77,019.71	1.77	Office: 100%	0.1	0.85	0	0.0000	0.0065	Future
224-10-066	LDRD	32,927.93	0.76	Office: 100%	0.1	0.85	0	0.0000	0.0028	Future
224-10-068	LDRD	37,041.51	0.85	Office: 100%	0.1	0.85	0	0.0000	0.0031	Future
224-10-067	LDRD	36,958.61	0.85	Office: 100%	0.1	0.85	0	0.0000	0.0031	Future
224-11-064	LDRD	411,756.58	9.45	Office: 100%	0.1	0.85	0	0.0000	0.0350	Future
224-11-063	LDRD	280,884.22	6.45	Office: 100%	0.1	0.85	0	0.0000	0.0239	Future
224-58-001	PUQP	414,248.77	9.51	Public/Institutional	0.21	0.2	0	0.0000	0.0174	Future
224-57-008	LDRD	35,388.10	0.81	Office: 100%	0.1	0.85	0	0.0000	0.0030	Future
224-45-009	LDRD	35,765.74	0.82	Office: 100%	0.1	0.85	0	0.0000	0.0030	Future
230-07-014	LDRE	5,533.35	0.13	Low Density Residential	245	25	25	0.0008	0.0000	Future
230-07-047	LDRE	22,778.52	0.52	Low Density Residential	245	25	25	0.0032	0.0000	Future

APN	GPLANCRT	Area (SF)	Area (Acres)	Assumed Land Use	Flow Factor	FAR	DUA	Residential Flow (mgd)	Non-Residential Flow (mgd)	Future Model Scenario
230-07-048	LDRE	7,214.30	0.17	Low Density Residential	245	25	25	0.0010	0.0000	Future
230-07-045	LDRE	8,284.00	0.19	Low Density Residential	245	25	25	0.0012	0.0000	Future
230-07-046	LDRE	4,658.13	0.11	Low Density Residential	245	25	25	0.0007	0.0000	Future
230-06-042	PUQP	520,830.24	11.96	Public/Institutional	0.21	0.2	0	0.0000	0.0219	Future
269-05-011	CMXU	5,249.97	0.12	Community Commercial	0.1	0.4	25	0.0005	0.0002	Future
269-05-056	CMXU	5,223.89	0.12	Community Commercial	0.1	0.4	25	0.0005	0.0002	Future
269-05-003	CMXU	5,049.62	0.12	Community Commercial	0.1	0.4	25	0.0004	0.0002	Future
269-05-091	MDRE	8,193.12	0.19	Medium Density Residential	154	0	25	0.0007	0.0000	Future
269-05-093	CMXU	16,596.41	0.38	Community Commercial	0.1	0.4	25	0.0015	0.0007	Future
230-09-017	RGMX	52,635.73	1.21	Regional Commercial	0.1	0.5	40	0.0074	0.0026	Future
230-09-020	RGMX	481,376.41	11.05	Regional Commercial	0.1	0.5	40	0.0681	0.0241	Future
230-08-061	RGMX	31,261.22	0.72	Regional Commercial	0.1	0.5	40	0.0044	0.0016	Future
230-08-078	RGMX	89,580.36	2.06	Regional Commercial	0.1	0.5	40	0.0127	0.0045	Future
269-02-039	CMXU	5,529.70	0.13	Community Commercial	0.1	0.4	25	0.0005	0.0002	Future
269-02-006	CMXU	5,458.81	0.13	Community Commercial	0.1	0.4	25	0.0005	0.0002	Future
269-02-008	CMXU	5,100.25	0.12	Community Commercial	0.1	0.4	25	0.0005	0.0002	Future
269-02-082	CMXU	6,828.27	0.16	Community Commercial	0.1	0.4	25	0.0006	0.0003	Future
269-03-003	CMXU	7,875.27	0.18	Community Commercial	0.1	0.4	25	0.0007	0.0003	Future
269-02-005	CMXU	7,968.31	0.18	Community Commercial	0.1	0.4	25	0.0007	0.0003	Future
269-02-004	CMXU	7,979.70	0.18	Community Commercial	0.1	0.4	25	0.0007	0.0003	Future
269-03-004	CMXU	11,000.36	0.25	Community Commercial	0.1	0.4	25	0.0010	0.0004	Future
269-03-006	CMXU	4,000.14	0.09	Community Commercial	0.1	0.4	25	0.0004	0.0002	Future
269-02-079	CMXU	8,975.61	0.21	Community Commercial	0.1	0.4	25	0.0008	0.0004	Future
269-03-132	CMXU	1,564.90	0.04	Community Commercial	0.1	0.4	25	0.0001	0.0001	Future
269-03-051	CMXU	23,569.95	0.54	Community Commercial	0.1	0.4	25	0.0021	0.0009	Future
269-02-083	CMXU	34,085.10	0.78	Community Commercial	0.1	0.4	25	0.0030	0.0014	Future
216-28-062	LHIN	85,429.32	1.96	Light Industrial	0.15	0.85	0	0.0000	0.0109	Future
216-28-091	LDRD	84,980.10	1.95	Office: 100%	0.1	0.85	0	0.0000	0.0072	Future

APN	GPLANCRT	Area (SF)	Area (Acres)	Assumed Land Use	Flow Factor	FAR	DUA	Residential Flow (mgd)	Non-Residential Flow (mgd)	Future Model Scenario
216-28-092	LDRD	11,676.99	0.27	Office: 100%	0.1	0.85	0	0.0000	0.0010	Future
216-28-093	LDRD	5,193.89	0.12	Office: 100%	0.1	0.85	0	0.0000	0.0004	Future
216-28-103	LDRD	125,080.84	2.87	Office: 100%	0.1	0.85	0	0.0000	0.0106	Future
216-28-102	LDRD	265,103.47	6.09	Office: 100%	0.1	0.85	0	0.0000	0.0225	Future
216-28-127	LHIN	223,792.30	5.14	Light Industrial	0.15	0.85	0	0.0000	0.0285	Future
216-28-044	LHIN	108,141.49	2.48	Light Industrial	0.15	0.85	0	0.0000	0.0138	Future
216-28-089	LDRD	256,220.27	5.88	Office: 100%	0.1	0.85	0	0.0000	0.0218	Future
216-28-090	LDRD	7,325.70	0.17	Office: 100%	0.1	0.85	0	0.0000	0.0006	Future
216-28-084	LDRD	7,511.17	0.17	Office: 100%	0.1	0.85	0	0.0000	0.0006	Future
216-28-055	LHIN	82,516.42	1.89	Light Industrial	0.15	0.85	0	0.0000	0.0105	Future
216-28-047	LHIN	53,122.75	1.22	Light Industrial	0.15	0.85	0	0.0000	0.0068	Future
224-06-169	LDRD	20,348.77	0.47	Office: 100%	0.1	0.85	0	0.0000	0.0017	Future
224-06-149	LDRD	56,242.08	1.29	Office: 100%	0.1	0.85	0	0.0000	0.0048	Future
224-06-142	LDRD	35,499.06	0.81	Office: 100%	0.1	0.85	0	0.0000	0.0030	Future
216-26-070	MDRE	36,540.64	0.84	Medium Density Residential	154	0	25	0.0032	0.0000	Future
216-28-115	LHIN	137,562.20	3.16	Light Industrial	0.15	0.85	0	0.0000	0.0175	Future
216-31-069	LDRD	125,038.39	2.87	Office: 100%	0.1	0.85	0	0.0000	0.0106	Future
216-30-053	HDRD	128,918.91	2.96	Office	0.15	1.25	0	0.0000	0.0242	Future
216-30-042	HDRD	23,650.32	0.54	Office	0.15	1.25	0	0.0000	0.0044	Future
216-31-068	LDRD	236,103.75	5.42	Office: 100%	0.1	0.85	0	0.0000	0.0201	Future
216-30-044	HDRD	61,150.67	1.40	Office	0.15	1.25	0	0.0000	0.0115	Future
216-30-043	HDRD	19,180.76	0.44	Office	0.15	1.25	0	0.0000	0.0036	Future
224-65-010	LDRD	546,769.64	12.55	Office: 100%	0.1	0.85	0	0.0000	0.0465	Future
216-26-042	MDRE	12,284.17	0.28	Medium Density Residential	154	0	25	0.0011	0.0000	Future
216-26-041	MDRE	14,342.90	0.33	Medium Density Residential	154	0	25	0.0013	0.0000	Future
216-26-040	MDRE	14,354.33	0.33	Medium Density Residential	154	0	25	0.0013	0.0000	Future
216-26-043	MDRE	14,269.73	0.33	Medium Density Residential	154	0	25	0.0013	0.0000	Future
216-26-039	MDRE	28,745.58	0.66	Medium Density Residential	154	0	25	0.0025	0.0000	Future

APN	GPLANCRT	Area (SF)	Area (Acres)	Assumed Land Use	Flow Factor	FAR	DUA	Residential Flow (mgd)	Non-Residential Flow (mgd)	Future Model Scenario
216-26-038	MDRE	14,391.60	0.33	Medium Density Residential	154	0	25	0.0013	0.0000	Future
216-26-037	MDRE	16,815.24	0.39	Medium Density Residential	154	0	25	0.0015	0.0000	Future
224-71-006	LDRD	3,156.19	0.07	Office: 100%	0.1	0.85	0	0.0000	0.0003	Future
269-20-062	CMXU	1,790.65	0.04	Community Commercial	0.1	0.4	25	0.0002	0.0001	Future
269-20-061	CMXU	1,732.17	0.04	Community Commercial	0.1	0.4	25	0.0002	0.0001	Future
269-20-060	CMXU	1,722.60	0.04	Community Commercial	0.1	0.4	25	0.0002	0.0001	Future
269-20-059	CMXU	1,722.33	0.04	Community Commercial	0.1	0.4	25	0.0002	0.0001	Future
269-20-058	CMXU	1,732.82	0.04	Community Commercial	0.1	0.4	25	0.0002	0.0001	Future
269-20-057	CMXU	1,790.54	0.04	Community Commercial	0.1	0.4	25	0.0002	0.0001	Future
216-50-005	LDRD	7,974.91	0.18	Office: 100%	0.1	0.85	0	0.0000	0.0007	Future
269-05-104	CMXU	659.00	0.02	Community Commercial	0.1	0.4	25	0.0001	0.0000	Future
216-28-114	LHIN	138,163.27	3.17	Light Industrial	0.15	0.85	0	0.0000	0.0176	Future
216-48-031	LDRD	795,820.37	18.27	Office: 100%	0.1	0.85	0	0.0000	0.0676	Future
216-48-006	LDRD	75,580.15	1.74	Office: 100%	0.1	0.85	0	0.0000	0.0064	Future
216-31-032	RGCO	44,669.28	1.03	Regional Commercial	0.1	0.5	0	0.0000	0.0022	Future
216-31-072	HDRD	21,880.32	0.50	Office	0.15	1.25	0	0.0000	0.0041	Future
216-31-071	HDRD	57,595.21	1.32	Office	0.15	1.25	0	0.0000	0.0108	Future
216-26-073	MDRE	30,638.70	0.70	Medium Density Residential	154	0	25	0.0027	0.0000	Future
224-06-146	LDRD	6,350.31	0.15	Office: 100%	0.1	0.85	0	0.0000	0.0005	Future
224-06-175	LDRD	5,020.27	0.12	Office: 100%	0.1	0.85	0	0.0000	0.0004	Future
224-06-085	LDRD	36,326.27	0.83	Office: 100%	0.1	0.85	0	0.0000	0.0031	Future
224-06-119	LDRD	18,751.84	0.43	Office: 100%	0.1	0.85	0	0.0000	0.0016	Future
224-06-120	LDRD	2,271.83	0.05	Office: 100%	0.1	0.85	0	0.0000	0.0002	Future
224-28-039	CMXU	9,300.57	0.21	Community Commercial	0.1	0.4	25	0.0008	0.0004	Future
224-29-008	CMXU	7,826.61	0.18	Community Commercial	0.1	0.4	25	0.0007	0.0003	Future
224-29-023	CMXU	6,795.49	0.16	Community Commercial	0.1	0.4	25	0.0006	0.0003	Future
224-29-009	CMXU	8,474.60	0.19	Community Commercial	0.1	0.4	25	0.0007	0.0003	Future
224-29-010	CMXU	11,433.43	0.26	Community Commercial	0.1	0.4	25	0.0010	0.0005	Future

APN	GPLANCRT	Area (SF)	Area (Acres)	Assumed Land Use	Flow Factor	FAR	DUA	Residential Flow (mgd)	Non-Residential Flow (mgd)	Future Model Scenario
224-29-016	CMXU	7,496.72	0.17	Community Commercial	0.1	0.4	25	0.0007	0.0003	Future
216-31-062	LDRD	113,507.12	2.61	Office: 100%	0.1	0.85	0	0.0000	0.0096	Future
216-30-050	HDRD	43,557.94	1.00	Office	0.15	1.25	0	0.0000	0.0082	Future
216-30-057	HDRD	38,594.54	0.89	Office	0.15	1.25	0	0.0000	0.0072	Future
216-31-070	LDRD	105,255.55	2.42	Office: 100%	0.1	0.85	0	0.0000	0.0089	Future
216-30-045	HDRD	5,236.77	0.12	Office	0.15	1.25	0	0.0000	0.0010	Future
216-30-040	LDRD	653,406.10	15.00	Office: 100%	0.1	0.85	0	0.0000	0.0555	Future
216-28-081	LHIN	186,276.94	4.28	Light Industrial	0.15	0.85	0	0.0000	0.0238	Future
216-28-109	LHIN	88,943.87	2.04	Light Industrial	0.15	0.85	0	0.0000	0.0113	Future
224-47-020	HDRD	23,418.70	0.54	Office	0.15	1.25	0	0.0000	0.0044	Future
224-28-068	CMXU	5,239.94	0.12	Community Commercial	0.1	0.4	25	0.0005	0.0002	Future
224-26-055	CMXU	9,006.06	0.21	Community Commercial	0.1	0.4	25	0.0008	0.0004	Future
224-28-037	CMXU	4,034.10	0.09	Community Commercial	0.1	0.4	25	0.0004	0.0002	Future
224-28-036	CMXU	4,034.77	0.09	Community Commercial	0.1	0.4	25	0.0004	0.0002	Future
216-01-056	RGMX	15,712.15	0.36	Regional Commercial	0.1	0.5	40	0.0022	0.0008	Future
216-01-044	CMXU	21,689.08	0.50	Community Commercial	0.1	0.4	25	0.0019	0.0009	Future
216-01-042	RGMX	14,775.77	0.34	Regional Commercial	0.1	0.5	40	0.0021	0.0007	Future
216-01-058	RGMX	54,219.09	1.24	Regional Commercial	0.1	0.5	40	0.0077	0.0027	Future
104-42-018	HDRD	325,210.13	7.47	Office	0.15	1.25	0	0.0000	0.0610	Future
104-13-083	LDRD	249,231.13	5.72	Office: 100%	0.1	0.85	0	0.0000	0.0212	Future
104-13-085	LDRD	130,494.37	3.00	Office: 100%	0.1	0.85	0	0.0000	0.0111	Future
290-10-068	CMXU	17,341.17	0.40	Community Commercial	0.1	0.4	25	0.0015	0.0007	Future
224-08-049	HDRD	98,542.70	2.26	Office	0.15	1.25	0	0.0000	0.0185	Future
224-08-119	LDRD	68,705.01	1.58	Office: 100%	0.1	0.85	0	0.0000	0.0058	Future
224-08-120	LDRD	64,431.51	1.48	Office: 100%	0.1	0.85	0	0.0000	0.0055	Future
224-08-151	HDRD	89,600.68	2.06	Office	0.15	1.25	0	0.0000	0.0168	Future
290-10-031	CMXU	15,120.32	0.35	Community Commercial	0.1	0.4	25	0.0013	0.0006	Future
290-10-096	RGMX	920,253.35	21.13	Regional Commercial	0.1	0.5	40	0.1301	0.0460	Future

APN	GPLANCRT	Area (SF)	Area (Acres)	Assumed Land Use	Flow Factor	FAR	DUA	Residential Flow (mgd)	Non-Residential Flow (mgd)	Future Model Scenario
290-10-028	RGMX	42,075.24	0.97	Regional Commercial	0.1	0.5	40	0.0060	0.0021	Future
290-10-078	RGMX	41,167.15	0.95	Regional Commercial	0.1	0.5	40	0.0058	0.0021	Future
290-08-136	CMXU	21,499.91	0.49	Community Commercial	0.1	0.4	25	0.0019	0.0009	Future
290-08-109	CMXU	21,499.92	0.49	Community Commercial	0.1	0.4	25	0.0019	0.0009	Future
290-08-116	CMXU	21,499.74	0.49	Community Commercial	0.1	0.4	25	0.0019	0.0009	Future
290-08-137	CMXU	21,154.45	0.49	Community Commercial	0.1	0.4	25	0.0019	0.0008	Future
290-08-153	CMXU	28,068.52	0.64	Community Commercial	0.1	0.4	25	0.0025	0.0011	Future
290-08-152	CMXU	33,051.55	0.76	Community Commercial	0.1	0.4	25	0.0029	0.0013	Future
290-07-138	CMXU	52,654.99	1.21	Community Commercial	0.1	0.4	25	0.0047	0.0021	Future
224-06-130	LDRD	40,600.66	0.93	Office: 100%	0.1	0.85	0	0.0000	0.0035	Future
224-06-166	LDRD	86,532.24	1.99	Office: 100%	0.1	0.85	0	0.0000	0.0074	Future
224-06-165	LDRD	66,796.10	1.53	Office: 100%	0.1	0.85	0	0.0000	0.0057	Future
224-06-127	LDRD	39,269.31	0.90	Office: 100%	0.1	0.85	0	0.0000	0.0033	Future
224-06-150	LDRD	19,193.90	0.44	Office: 100%	0.1	0.85	0	0.0000	0.0016	Future
224-06-176	LDRD	36,651.21	0.84	Office: 100%	0.1	0.85	0	0.0000	0.0031	Future
224-10-117	LDRD	288,521.71	6.62	Office: 100%	0.1	0.85	0	0.0000	0.0245	Future
224-10-098	LDRD	83,754.38	1.92	Office: 100%	0.1	0.85	0	0.0000	0.0071	Future
224-35-017	HYIN	207,087.34	4.75	Heavy Industrial	0.15	1.25	0	0.0000	0.0388	Future
224-10-097	LDRD	87,984.01	2.02	Office: 100%	0.1	0.85	0	0.0000	0.0075	Future
224-61-002	LDRD	44,428.12	1.02	Office: 100%	0.1	0.85	0	0.0000	0.0038	Future
224-61-007	LDRD	26,414.71	0.61	Office: 100%	0.1	0.85	0	0.0000	0.0022	Future
224-61-008	LDRD	25,675.79	0.59	Office: 100%	0.1	0.85	0	0.0000	0.0022	Future
224-10-115	LDRD	73,391.17	1.68	Office: 100%	0.1	0.85	0	0.0000	0.0062	Future
224-61-001	LDRD	16,149.31	0.37	Office: 100%	0.1	0.85	0	0.0000	0.0014	Future
224-61-003	LDRD	8,601.44	0.20	Office: 100%	0.1	0.85	0	0.0000	0.0007	Future
224-61-004	LDRD	64,004.31	1.47	Office: 100%	0.1	0.85	0	0.0000	0.0054	Future
224-10-121	LDRD	204,760.26	4.70	Office: 100%	0.1	0.85	0	0.0000	0.0174	Future
224-60-013	HYIN	118,217.10	2.71	Heavy Industrial	0.15	1.25	0	0.0000	0.0222	Future

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224-10-126	LDRD	188,685.04	4.33	Office: 100%	0.1	0.85	0	0.0000	0.0160	Future
224-10-057	LDRD	72,205.64	1.66	Office: 100%	0.1	0.85	0	0.0000	0.0061	Future
224-61-009	LDRD	62,780.64	1.44	Office: 100%	0.1	0.85	0	0.0000	0.0053	Future
224-10-122	LDRD	137,809.08	3.16	Office: 100%	0.1	0.85	0	0.0000	0.0117	Future
224-10-123	LDRD	27,813.12	0.64	Office: 100%	0.1	0.85	0	0.0000	0.0024	Future
224-10-125	LDRD	96,709.30	2.22	Office: 100%	0.1	0.85	0	0.0000	0.0082	Future
224-60-014	HYIN	189,025.30	4.34	Heavy Industrial	0.15	1.25	0	0.0000	0.0354	Future
224-61-005	PUQP	147,332.98	3.38	Public/Institutional	0.21	0.2	0	0.0000	0.0062	Future
224-61-006	PUQP	438,706.55	10.07	Public/Institutional	0.21	0.2	0	0.0000	0.0184	Future
224-61-010	LDRD	62,783.57	1.44	Office: 100%	0.1	0.85	0	0.0000	0.0053	Future
224-10-131	LDRD	68,534.53	1.57	Office: 100%	0.1	0.85	0	0.0000	0.0058	Future
224-45-008	LDRD	17,716.99	0.41	Office: 100%	0.1	0.85	0	0.0000	0.0015	Future
224-45-027	LDRD	199,140.76	4.57	Office: 100%	0.1	0.85	0	0.0000	0.0169	Future
224-57-003	LDRD	106,948.39	2.46	Office: 100%	0.1	0.85	0	0.0000	0.0091	Future
224-57-013	LDRD	56,556.82	1.30	Office: 100%	0.1	0.85	0	0.0000	0.0048	Future
224-57-006	LDRD	43,541.19	1.00	Office: 100%	0.1	0.85	0	0.0000	0.0037	Future
224-57-007	LDRD	45,835.48	1.05	Office: 100%	0.1	0.85	0	0.0000	0.0039	Future
224-45-006	LDRD	13,852.82	0.32	Office: 100%	0.1	0.85	0	0.0000	0.0012	Future
224-45-028	LDRD	94,706.79	2.17	Office: 100%	0.1	0.85	0	0.0000	0.0081	Future
224-57-011	LDRD	155,439.63	3.57	Office: 100%	0.1	0.85	0	0.0000	0.0132	Future
224-45-029	LDRD	189,474.75	4.35	Office: 100%	0.1	0.85	0	0.0000	0.0161	Future
224-45-030	LDRD	630,206.01	14.47	Office: 100%	0.1	0.85	0	0.0000	0.0536	Future
224-45-031	LDRD	133,774.51	3.07	Office: 100%	0.1	0.85	0	0.0000	0.0114	Future
224-07-123	LDRD	223,031.31	5.12	Office: 100%	0.1	0.85	0	0.0000	0.0190	Future
224-07-121	LDRD	592,999.10	13.61	Office: 100%	0.1	0.85	0	0.0000	0.0504	Future
224-08-109	LDRD	45,669.11	1.05	Office: 100%	0.1	0.85	0	0.0000	0.0039	Future
224-08-101	LDRD	28,681.23	0.66	Office: 100%	0.1	0.85	0	0.0000	0.0024	Future
224-08-102	LDRD	29,091.31	0.67	Office: 100%	0.1	0.85	0	0.0000	0.0025	Future

APN	GPLANCRT	Area (SF)	Area (Acres)	Assumed Land Use	Flow Factor	FAR	DUA	Residential Flow (mgd)	Non-Residential Flow (mgd)	Future Model Scenario
224-08-058	LDRD	29,720.80	0.68	Office: 100%	0.1	0.85	0	0.0000	0.0025	Future
224-08-092	LDRD	66,219.60	1.52	Office: 100%	0.1	0.85	0	0.0000	0.0056	Future
224-43-003	LDRD	85,296.50	1.96	Office: 100%	0.1	0.85	0	0.0000	0.0073	Future
224-08-147	LDRD	133,093.62	3.06	Office: 100%	0.1	0.85	0	0.0000	0.0113	Future
224-43-002	LDRD	197,082.09	4.52	Office: 100%	0.1	0.85	0	0.0000	0.0168	Future
224-08-085	LDRD	118,687.70	2.72	Office: 100%	0.1	0.85	0	0.0000	0.0101	Future
224-08-132	LDRD	19,701.48	0.45	Office: 100%	0.1	0.85	0	0.0000	0.0017	Future
224-08-133	LDRD	20,721.64	0.48	Office: 100%	0.1	0.85	0	0.0000	0.0018	Future
224-08-153	LHIN	336,272.79	7.72	Light Industrial	0.15	0.85	0	0.0000	0.0429	Future
224-08-134	LDRD	59,221.47	1.36	Office: 100%	0.1	0.85	0	0.0000	0.0050	Future
224-42-007	LDRD	36,961.31	0.85	Office: 100%	0.1	0.85	0	0.0000	0.0031	Future
224-08-144	LDRD	79,841.88	1.83	Office: 100%	0.1	0.85	0	0.0000	0.0068	Future
224-08-099	LDRD	57,516.22	1.32	Office: 100%	0.1	0.85	0	0.0000	0.0049	Future
224-08-135	LDRD	25,991.68	0.60	Office: 100%	0.1	0.85	0	0.0000	0.0022	Future
224-08-143	LDRD	16,209.74	0.37	Office: 100%	0.1	0.85	0	0.0000	0.0014	Future
224-08-082	LHIN	264,753.16	6.08	Light Industrial	0.15	0.85	0	0.0000	0.0338	Future
224-08-136	LDRD	20,109.40	0.46	Office: 100%	0.1	0.85	0	0.0000	0.0017	Future
224-08-006	LDRD	43,564.96	1.00	Office: 100%	0.1	0.85	0	0.0000	0.0037	Future
224-42-008	LDRD	42,463.43	0.97	Office: 100%	0.1	0.85	0	0.0000	0.0036	Future
224-08-145	LDRD	58,919.34	1.35	Office: 100%	0.1	0.85	0	0.0000	0.0050	Future
224-09-113	LDRD	320,572.47	7.36	Office: 100%	0.1	0.85	0	0.0000	0.0272	Future
224-08-142	LDRD	33,502.96	0.77	Office: 100%	0.1	0.85	0	0.0000	0.0028	Future
224-08-137	LDRD	20,714.89	0.48	Office: 100%	0.1	0.85	0	0.0000	0.0018	Future
224-08-138	LDRD	25,545.20	0.59	Office: 100%	0.1	0.85	0	0.0000	0.0022	Future
224-08-141	LDRD	31,949.48	0.73	Office: 100%	0.1	0.85	0	0.0000	0.0027	Future
224-08-123	LDRD	22,059.18	0.51	Office: 100%	0.1	0.85	0	0.0000	0.0019	Future
224-42-003	LDRD	84,435.13	1.94	Office: 100%	0.1	0.85	0	0.0000	0.0072	Future
224-08-122	LDRD	24,633.00	0.57	Office: 100%	0.1	0.85	0	0.0000	0.0021	Future

APN	GPLANCRT	Area (SF)	Area (Acres)	Assumed Land Use	Flow Factor	FAR	DUA	Residential Flow (mgd)	Non-Residential Flow (mgd)	Future Model Scenario
224-08-127	LDRD	28,216.48	0.65	Office: 100%	0.1	0.85	0	0.0000	0.0024	Future
224-08-089	LDRD	53,116.36	1.22	Office: 100%	0.1	0.85	0	0.0000	0.0045	Future
224-09-140	LDRD	89,912.39	2.06	Office: 100%	0.1	0.85	0	0.0000	0.0076	Future
224-42-002	LDRD	41,805.84	0.96	Office: 100%	0.1	0.85	0	0.0000	0.0036	Future
224-65-009	LDRD	228,010.35	5.23	Office: 100%	0.1	0.85	0	0.0000	0.0194	Future
224-15-030	CMXU	5,401.82	0.12	Community Commercial	0.1	0.4	25	0.0005	0.0002	Future
224-20-094	CMXU	18,193.10	0.42	Community Commercial	0.1	0.4	25	0.0016	0.0007	Future
224-20-095	CMXU	22,728.81	0.52	Community Commercial	0.1	0.4	25	0.0020	0.0009	Future
224-20-096	CMXU	29,526.30	0.68	Community Commercial	0.1	0.4	25	0.0026	0.0012	Future
224-20-081	CMXU	32,679.25	0.75	Community Commercial	0.1	0.4	25	0.0029	0.0013	Future
224-14-114	CMXU	17,491.07	0.40	Community Commercial	0.1	0.4	25	0.0015	0.0007	Future
224-14-094	CMXU	21,945.47	0.50	Community Commercial	0.1	0.4	25	0.0019	0.0009	Future
224-14-109	CMXU	12,329.51	0.28	Community Commercial	0.1	0.4	25	0.0011	0.0005	Future
224-14-110	CMXU	9,560.58	0.22	Community Commercial	0.1	0.4	25	0.0008	0.0004	Future
224-14-106	CMXU	15,079.50	0.35	Community Commercial	0.1	0.4	25	0.0013	0.0006	Future
224-15-031	CMXU	9,926.16	0.23	Community Commercial	0.1	0.4	25	0.0009	0.0004	Future
224-14-086	CMXU	14,645.77	0.34	Community Commercial	0.1	0.4	25	0.0013	0.0006	Future
224-15-022	CMXU	15,656.29	0.36	Community Commercial	0.1	0.4	25	0.0014	0.0006	Future
224-15-029	RGMX	53,635.66	1.23	Regional Commercial	0.1	0.5	40	0.0076	0.0027	Future
224-48-009	CMXU	9,239.30	0.21	Community Commercial	0.1	0.4	25	0.0008	0.0004	Future
224-48-011	CMXU	22,092.35	0.51	Community Commercial	0.1	0.4	25	0.0020	0.0009	Future
224-26-073	CMXU	20,776.62	0.48	Community Commercial	0.1	0.4	25	0.0018	0.0008	Future
224-26-060	CMXU	11,107.62	0.25	Community Commercial	0.1	0.4	25	0.0010	0.0004	Future
224-26-065	CMXU	7,439.28	0.17	Community Commercial	0.1	0.4	25	0.0007	0.0003	Future
224-26-012	CMXU	7,575.30	0.17	Community Commercial	0.1	0.4	25	0.0007	0.0003	Future
224-26-066	CMXU	8,788.94	0.20	Community Commercial	0.1	0.4	25	0.0008	0.0004	Future
224-26-058	CMXU	13,547.21	0.31	Community Commercial	0.1	0.4	25	0.0012	0.0005	Future
224-20-080	MDRE	58,008.42	1.33	Medium Density Residential	154	0	25	0.0051	0.0000	Future

APN	GPLANCRT	Area (SF)	Area (Acres)	Assumed Land Use	Flow Factor	FAR	DUA	Residential Flow (mgd)	Non-Residential Flow (mgd)	Future Model Scenario
224-29-038	CMXU	13,664.26	0.31	Community Commercial	0.1	0.4	25	0.0012	0.0005	Future
224-28-058	CMXU	11,846.08	0.27	Community Commercial	0.1	0.4	25	0.0010	0.0005	Future
224-29-030	CMXU	8,121.91	0.19	Community Commercial	0.1	0.4	25	0.0007	0.0003	Future
224-25-074	PUQP	451,036.23	10.35	Public/Institutional	0.21	0.2	0	0.0000	0.0189	Future
224-29-007	CMXU	16,145.09	0.37	Community Commercial	0.1	0.4	25	0.0014	0.0006	Future
224-29-041	CMXU	31,918.48	0.73	Community Commercial	0.1	0.4	25	0.0028	0.0013	Future
224-29-018	CMXU	7,426.58	0.17	Community Commercial	0.1	0.4	25	0.0007	0.0003	Future
224-29-033	CMXU	146,637.38	3.37	Community Commercial	0.1	0.4	25	0.0130	0.0059	Future
293-02-034	NHMX	7,757.23	0.18	Neighborhood Commercial	0.1	0.3	25	0.0007	0.0002	Future
293-02-033	NHMX	21,414.98	0.49	Neighborhood Commercial	0.1	0.3	25	0.0019	0.0006	Future
293-02-032	NHMX	33,739.12	0.77	Neighborhood Commercial	0.1	0.3	25	0.0030	0.0010	Future
293-02-030	NHMX	1,803.92	0.04	Neighborhood Commercial	0.1	0.3	25	0.0002	0.0001	Future
293-02-031	NHMX	1,748.95	0.04	Neighborhood Commercial	0.1	0.3	25	0.0002	0.0001	Future
104-55-013	RGCO	69,034.46	1.58	Regional Commercial	0.1	0.5	0	0.0000	0.0035	Future
104-39-024	LDRD	360.55	0.01	Office: 100%	0.1	0.85	0	0.0000	0.0000	Future
224-75-023	LHIN	1,538.63	0.04	Light Industrial	0.15	0.85	0	0.0000	0.0002	Future
097-37-112	NHMX	1,413.10	0.03	Neighborhood Commercial	0.1	0.3	25	0.0001	0.0000	Future
269-05-089	CMXU	18,382.06	0.42	Community Commercial	0.1	0.4	25	0.0016	0.0007	Future
316-09-044	PUQP	603,655.61	13.86	Public/Institutional	0.21	0.2	0	0.0000	0.0254	Future
097-11-000	DHRE	197,344.59	4.53	High Density Residential	154	40	40	0.0279	0.0000	Future
290-21-059	MDRE	1,181.34	0.03	Medium Density Residential	154	0	25	0.0001	0.0000	Future
290-53-025	MDRE	2,499.33	0.06	Medium Density Residential	154	0	25	0.0002	0.0000	Future
316-51-008	MDRE	1,142.09	0.03	Medium Density Residential	154	0	25	0.0001	0.0000	Future
104-59-039	MDRE	2,415.77	0.06	Medium Density Residential	154	0	25	0.0002	0.0000	Future
224-76-061	MDRE	843.21	0.02	Medium Density Residential	154	0	25	0.0001	0.0000	Future
290-71-058	CMXU	2,141.60	0.05	Community Commercial	0.1	0.4	25	0.0002	0.0001	Future
104-15-142	LDRD	55,510.68	1.27	Office: 100%	0.1	0.85	0	0.0000	0.0047	Future
104-15-143	LDRD	80,861.26	1.86	Office: 100%	0.1	0.85	0	0.0000	0.0069	Future

APN	GPLANCRT	Area (SF)	Area (Acres)	Assumed Land Use	Flow Factor	FAR	DUA	Residential Flow (mgd)	Non-Residential Flow (mgd)	Future Model Scenario
269-05-094	CMXU	13,850.43	0.32	Community Commercial	0.1	0.4	25	0.0012	0.0006	Future
104-12-215	MDRE	4,110.43	0.09	Medium Density Residential	154	0	25	0.0004	0.0000	Future
269-05-106	CMXU	561.94	0.01	Community Commercial	0.1	0.4	25	0.0000	0.0000	Future
216-28-129	LHIN	59,722.21	1.37	Light Industrial	0.15	0.85	0	0.0000	0.0076	Future
290-44-143	MDRE	5,236.45	0.12	Medium Density Residential	154	0	25	0.0005	0.0000	Future
269-33-051	MDRE	3,016.20	0.07	Medium Density Residential	154	0	25	0.0003	0.0000	Future
269-05-090	CMXU	293.06	0.01	Community Commercial	0.1	0.4	25	0.0000	0.0000	Future
294-01-014	CMXU	20,318.83	0.47	Community Commercial	0.1	0.4	25	0.0018	0.0008	Future
303-17-051	MDRE	41,241.29	0.95	Medium Density Residential	154	0	25	0.0036	0.0000	Future
316-09-052	PUQP	495.30	0.01	Public/Institutional	0.21	0.2	0	0.0000	0.0000	Future
097-22-00G	NHMX	5,537.12	0.13	Neighborhood Commercial	0.1	0.3	25	0.0005	0.0002	Future
216-31-067	LDRD	179,532.35	4.12	Office: 100%	0.1	0.85	0	0.0000	0.0153	Future
216-01-054	CMXU	19,102.84	0.44	Community Commercial	0.1	0.4	25	0.0017	0.0008	Future
224-49-011	CMXU	5,195.08	0.12	Community Commercial	0.1	0.4	25	0.0005	0.0002	Future
104-48-009	HDRD	495.30	0.01	Office	0.15	1.25	0	0.0000	0.0001	Future
104-52-027	HDRD	174,604.01	4.01	Office	0.15	1.25	0	0.0000	0.0327	Future
224-06-177	LDRD	1,351.59	0.03	Office: 100%	0.1	0.85	0	0.0000	0.0001	Future
216-31-093	LDRD	247,968.38	5.69	Office: 100%	0.1	0.85	0	0.0000	0.0211	Future
293-02-035	NHMX	26,099.53	0.60	Neighborhood Commercial	0.1	0.3	25	0.0023	0.0008	Future
104-38-016	LDRD	109,021.33	2.50	Office: 100%	0.1	0.85	0	0.0000	0.0093	Future
104-38-014	LDRD	301,191.72	6.91	Office: 100%	0.1	0.85	0	0.0000	0.0256	Future
220-35-001	MDRE	2,769.02	0.06	Medium Density Residential	154	0	25	0.0002	0.0000	Future
220-35-002	MDRE	2,227.07	0.05	Medium Density Residential	154	0	25	0.0002	0.0000	Future
220-35-003	MDRE	3,074.10	0.07	Medium Density Residential	154	0	25	0.0003	0.0000	Future
220-35-004	MDRE	2,326.29	0.05	Medium Density Residential	154	0	25	0.0002	0.0000	Future
220-35-005	MDRE	2,086.74	0.05	Medium Density Residential	154	0	25	0.0002	0.0000	Future
220-35-006	MDRE	2,140.26	0.05	Medium Density Residential	154	0	25	0.0002	0.0000	Future
220-35-009	MDRE	2,738.91	0.06	Medium Density Residential	154	0	25	0.0002	0.0000	Future

APN	GPLANCRT	Area (SF)	Area (Acres)	Assumed Land Use	Flow Factor	FAR	DUA	Residential Flow (mgd)	Non-Residential Flow (mgd)	Future Model Scenario
220-35-007	MDRE	3,277.50	0.08	Medium Density Residential	154	0	25	0.0003	0.0000	Future
220-35-008	MDRE	3,148.35	0.07	Medium Density Residential	154	0	25	0.0003	0.0000	Future
205-39-026	MDRE	122,629.84	2.82	Medium Density Residential	154	0	25	0.0108	0.0000	Future
224-42-013	LDRD	84,412.03	1.94	Office: 100%	0.1	0.85	0	0.0000	0.0072	Future
224-42-014	LDRD	98,739.54	2.27	Office: 100%	0.1	0.85	0	0.0000	0.0084	Future
230-06-055	PUQP	68,335.37	1.57	Public/Institutional	0.21	0.2	0	0.0000	0.0029	Future
274-43-099	RGCO	264,044.93	6.06	Regional Commercial	0.1	0.5	0	0.0000	0.0132	Future
097-08-109	DHRE	233,446.43	5.36	High Density Residential	154	40	40	0.0330	0.0000	Future
303-18-051	RGCO	70,063.84	1.61	Regional Commercial	0.1	0.5	0	0.0000	0.0035	Future
296-37-035	RGCO	89,133.81	2.05	Regional Commercial	0.1	0.5	0	0.0000	0.0045	Future
224-57-016	LDRD	57,961.86	1.33	Office: 100%	0.1	0.85	0	0.0000	0.0049	Future
224-59-031	HYIN	224,958.92	5.16	Heavy Industrial	0.15	1.25	0	0.0000	0.0422	Future
104-14-172	LDRD	73,656.43	1.69	Office: 100%	0.1	0.85	0	0.0000	0.0063	Future
205-39-029	MDRE	1,204,315.75	27.65	Medium Density Residential	154	0	25	0.1064	0.0000	Future
205-39-028	MDRE	559,453.44	12.84	Medium Density Residential	154	0	25	0.0494	0.0000	Future

Flow Assumptions for Parcels with Entitlements
(Provided by the City)

LABELID	APN	OWNERNAM	Entitled Flow (gpd) 2016	Entitled Flow (gpd) 2024	Flow Difference (gpd) 2023-2016	Entitled Flow (mgd) 2024
1	230-03-090	Newark Group Industries Inc.	267,189	267,189	0	0.2671890
2	101-11-042	Dorothy Nutto Trustee	11,656	11,657	1	0.0116570
4	104-15-131	M West Prop Co. LLC	49,672	28,686	-20,986	0.0286860
5	104-39-023	Siliconix Inc	1,232,651	1,232,651	0	1.2326510
6	101-09-023	Dick Lee Corp	30,700	30,700	0	0.0307000
8	230-03-079	Xeres Ventures LLC	5,890	5,538	-352	0.0055380
9	230-47-068	Robert Jung Et. Al.	14,655	14,655	0	0.0146550
10	290-03-087	G6 Hospitality Property LLC	14,408	14,345	-63	0.0143450
11	101-13-003	AMB Property Corporation LP	8,132	8,106	-26	0.0081060
12	303-02-013	Annine Untiedt Trustee & Et. Al.	29,000	29,000	0	0.0290000
13	303-23-029	Machado Children's Trust	49,300	49,300	0	0.0493000
14	290-01-113	Shri Jai Ranchhodrai Inc	39,078	19,045	-20,033	0.0190450
15	104-50-025	Coherent	220,414	220,414	0	0.2204140
17	296-20-004	LJS LLC	9,780	9,777	-3	0.0097770
18	104-49-026	Marriott Plaza Associates L.P.	14,694	14,630	-64	0.0146300
19	104-50-018	Abbott Laboratories	9,998	9,998	0	0.0099980
20	104-43-054	City of Santa Clara	58,719	58,719	0	0.0587190
21	104-14-154	Cemex	6,911	5,689	-1,222	0.0056890
23	104-16-113	West Valley-Mission Community College Dist	54,000	54,000	0	0.0540000
24	104-51-001	Ixys Corporation	15,837	18,006	2,169	0.0180060
25	104-14-089	Kang Family Partners LP	58,282	58,282	0	0.0582820
26	104-40-020	Intel Corporation	17,608	17,608	0	0.0176080
27	104-40-031	Santa Clara Towers LP	29,540	29,540	0	0.0295400
28	216-48-035	James Lindsey Trustee & Et. Al.	32,303	32,303	0	0.0323030
29	216-34-076	Si 34 LLC	22,499	22,751	252	0.0227510
30	216-34-079	Si 34 LLC	12,591	12,464	-127	0.0124640
31	216-32-040	Ksl Capital Partners	40,384	40,384	0	0.0403840
32	216-01-060	Sunita Kumar Et. Al.	13,572	13,572	0	0.0135720
34	216-34-005	Erik Naslund Trustee	40,069	40,069	0	0.0400690
35	224-46-007	Act Ponderosa LLC Et. Al.	7,351	6,006	-1,345	0.0060060
36	224-08-146	Digital 1350 Duane LLC	79,530	79,530	0	0.0795300
37	224-09-165	Akt America Inc	62,052	61,209	-843	0.0612090
38	294-39-010	Donna Bonasera Trustee & Et. Al.	8,091	8,118	27	0.0081180
39	216-46-003	Chawla Ventures LLC	38,218	38,218	0	0.0382180
40	316-19-032	Yangs Brother Intl Corp	14,326	14,326	0	0.0143260
41	316-17-018	Agilent Technologies Inc	949,151	949,151	0	0.9491510
42	274-43-071	Federated Western Properties, Inc.	19,348	19,348	0	0.0193480
43	213-35-035	K D W Santa Clara	21,798	21,798	0	0.0217980
44	224-04-071	Gahrahmat Fam LP II	20,189	20,189	0	0.0201890
45	224-59-029	Hertz Investors Inc	41,582	20,791	-20,791	0.0207910
46	224-06-170	Leon and Colette Mardirossian Trustee	68,135	73,268	5,133	0.0732680
48	216-30-053	Ashford Santa Claraparts LP	86,122	86,122	0	0.0861220
49	216-28-101	Vantage Data Centers	121,199	95,370	-25,829	0.0652462
49	216-28-118	Vantage Data Centers		95,370	95,370	0.0301238
50	216-46-020	Latham & Watkins, LLP	32,114	31,841	-273	0.0318410
51	216-31-060	Cooperage-Rose Investments	26,309	26,309	0	0.0263090
52	216-30-054	Sierra-Santa Clara Inc	65,520	65,520	0	0.0655200
53	104-04-077	Digital-Pr Old Ironsides 1 LLC	24,091	29,240	5,149	0.0292400
54	104-13-083	SCP 2001 PE LLC	88,636	89,422	786	0.0894220
56	290-46-016	Dennis Mariani Trustee & Et. Al.	19,000	19,000	0	0.0190000
57	290-06-020	Moonlite Associates LLC	40,188	40,188	0	0.0401880
58	224-35-017	Sunset Properties Inc	8,767	8,767	0	0.0087670
59	224-60-013	1065 Martin Ave LLC	18,125	22,667	4,542	0.0226670
60	224-10-126	San Tomas Income Partners LLC	58,788	58,788	0	0.0587880
61	224-60-014	Martin Investment Properties LLC	11,239	11,218	-21	0.0112180
62	224-08-101	Renault & Handley Employee's Investment Co	11,139	11,139	0	0.0111390
63	224-08-147	1100 Space Park LLC	41,036	41,015	-21	0.0410150
64	224-08-085	Pacific Bell Lease	17,921	20,083	2,162	0.0200830
65	224-08-134	Harbor Electronics Inc	44,586	44,586	0	0.0445860
66	224-20-080	Masonic Hall Corp of Santa Clara	35,934	35,934	0	0.0359340
67	104-55-005	City of Santa Clara	117,735	117,735	0	0.1177350
68	104-55-013	City of Santa Clara	148,087	148,087	0	0.1480870
69	224-03-085	2045-2055 Lafayette Street	42,000	42,000	0	0.0420000
70	316-09-035	Kaiser Foundation Hospital	374,350	374,350	0	0.3743500
71	230-46-061	BFV LLC	13,111	13,111	0	0.0131110

Owner	APN	Subcatchment ID	WC Address	Additional foul flow (MGD)	Trade flow (MGD)	Customer Type	NAICS Description	DC Num/ RefID	DC/NTD/LTD Name
CALIFORNIA PAPERBOARD	230-03-090	311	525 Mathew Street	0	0.2672	MJ	Paperboard Mills	GP_Ph3	
BAB FACILITIES GROUP	101-11-042	1574	3295 Woodward Avenue	0	0.0117	CI	General Warehousing and Storage	GP_Ph3	
SILICONIX INC	104-39-023	2593	2201 Laurelwood Road	0	1.2327	CI	Semiconductor & Related Device Manufacturing	102	2201 Laurelwood Data Center
SST INVESTMENTS LLC	101-09-023	2978	805 Aldo Avenue	0	0.0307	CI	Lessors of Nonresid. Build. excpt Miniwarehou	GP_Ph3	
ALTAFLEX	230-47-068	4586	336 Martin Avenue	0	0.0147	CI	Bare Printed Circuit Board Manufacturing	GP_Ph3	
MOTEL SIX # 263	290-03-087	5628	3208 El Camino Real	0.0099	0.0045	CI	Hotels (except Casino Hotels) and Motels	77	ECR_CMU
MISSION HOSPITAL INC	303-02-013	6122	410 North Winchester Boulevard	0	0.029	CI	Homes for the Elderly	GP_Ph3	
SCCW LLC	303-23-029	6850	3655 Stevens Creek Boulevard	0.0339	0.0154	CI	Car Washes	GP_Ph3	
SHRI JAI RANCHHODRAI INC	290-01-113	7089	3550 El Camino Real	0.0141	0.005	CI	Hotels (except Casino Hotels) and Motels	77	ECR_CMU
COHERENT INC	104-50-025	9416	5100 Patrick Henry Drive	0	0.2204	CI	Semiconductor & Related Device Manufacturing	GP_Ph3	
BRIGHT HORIZONS CHILDREN CTR	296-20-004	10028	4945 Stevens Creek Boulevard	0	0.0098	CI	Child Day Care Services	GP_Ph3	
ONTARIO AIRPORT HOTEL CORP	104-43-054	11327	4949 Great America Parkway	0.0404	0.0183	CI	Hotels (except Casino Hotels) and Motels	GP_Ph3	
CEMEX INC	104-14-154	11740	1555 Russell Avenue	0	0.0057	CI	Ready-Mix Concrete Manufacturing	GP_Ph3	
VIVID INC	104-51-001	11892	3400 Bassett Street	0	0.018	CI	Household Appliance Stores	GP_Ph3	
BILTMORE HOTEL & SUITES	104-14-089	11910	2151 Laurelwood Road	0	0.0583	CI	Hotels (except Casino Hotels) and Motels	GP_Ph3	
GOLDEN STATE RESTAURANTS	104-40-020	11915	3935 Freedom Circle	0	0.0176	CI	Full-Service Restaurants	48	Freedom Circle
SCT OWNER LLC	104-40-031	11917	3945 Freedom Circle	0	0.0295	CI	Lessors of Nonresid. Build. excpt Miniwarehou	48	Freedom Circle
PROMEX INC	216-48-035	12068	3075 Oakmead Village Drive	0	0.0323	CI	Radio&TV Broadcast&Wireless Comm Equip Manuf	GP_Ph3	
AFFYMETRIX INC	216-34-079	12070	3450 Central Expressway	0	0.0125	CI	R&D in Physical, Engineering & Life Sciences		
WESTERN ATHLETIC CLUBS	216-32-040	12071	3250 Central Expressway	0	0.0404	CI	Fitness and Recreational Sports Centers	GP_Ph3	
HAWTHORN SUITES LTD	216-01-060	12109	2455 El Camino Real	0.0093	0.0042	CI	Hotels (except Casino Hotels) and Motels	GP_Ph3	
PONDEROSA OFFICE CENTER	224-46-007	14397	3080 Olcott Street	0	0.006	CI	Lessors of Nonresid. Build. excpt Miniwarehou		
EQUINIX INC	224-08-146	14398	1350 Duane Avenue	0	0.0795	CI	Data Processing, Hosting, & Related Services	GP_Ph3	
AKT AMERICA INC	224-09-165	14400	3101 Scott Boulevard	0	0.0612	CI	Semiconductor & Related Device Manufacturing		
M.B. EXCLUSIVELY PROPERTIES LL	294-39-010	15281	3941 Stevens Creek Boulevard	0.0056	0.0025	CI	Lessors of Nonresid. Build. excpt Miniwarehou	GP_Ph3	
DUARTE COMMUNICATIONS INC	216-46-003	15637	3200 Coronado Drive	0	0.0382	CI	Lessors of Nonresid. Build. excpt Miniwarehou		
WOODCREST HOTEL	316-19-032	16763	5415 Stevens Creek Boulevard	0	0.0143	CI	Hotels (except Casino Hotels) and Motels	GP_Ph3	
AGILENT TECHNOLOGY #9000089889	316-17-018	16766	5301 Stevens Creek Boulevard	0	0.9492	CI	Semiconductor & Related Device Manufacturing		
KDW CORP	213-35-035	17444	1550 Halford Avenue	0.0161	0.0057	CI	Lessors of Nonresid. Build. excpt Miniwarehou	GP_Ph3	
STREAMLINE CIRCUITS CORP	224-06-170	18371	1415 Richard Avenue	0	0.0733	CI	Bare Printed Circuit Board Manufacturing		
SANTA CLARA TENANT CORP	216-30-053	18456	2885 Lakeside Drive	0	0.0861	CI	Hotels (except Casino Hotels) and Motels	GP_Ph3	
CORESITE CORONADO STENDER LLC	216-46-021	18967	3020 Coronado Drive	0	0.0209	CI	Data Processing, Hosting, & Related Services	DC_47	Coresite / Telecom SV7
PENINSULAR INVESTMENTS INC	216-30-054	19335	3100 Lakeside Drive	0	0.0655	CI	Hotels (except Casino Hotels) and Motels		
CYXTERA DATA CENTERS INC	104-04-077	20154	4650 Old Ironsides Drive	0	0.0292	CI	Data Processing, Hosting, & Related Services	59	Patrick Henry Drive
VAREX IMAGING WEST HLDNGS INC	104-13-083	20170	2175 Mission College Boulevard	0	0.0894	CI	Semiconductor & Related Device Manufacturing	GP_Ph3	
LOMBARDI AUTO	290-46-016	20411	2540 El Camino Real	0.0131	0.0059	CI	Gasoline Stations with Convenience Stores	66	2570 ECR
D&T FOODS CO	224-60-013	20508	1061 Martin Avenue	0	0.0227	CI	Ice Cream and Frozen Dessert Manufacturing	GP_Ph3	
FUJIFILM DIAMATIX INC	224-10-126	20509	2210 Martin Avenue	0	0.0588	CI	R&D in Physical, Engineering & Life Sciences	GP_Ph3	
ONSPEC TECHNOLOGY PARTNERS INC	224-08-101	20554	975 Comstock Street	0	0.0111	CI	Semiconductor & Related Device Manufacturing	GP_Ph3	
DIGITAL REALTY TRUST LP	224-08-147	20568	1100 Space Park Drive	0	0.041	CI	Semiconductor & Related Device Manufacturing	GP_Ph3	
ELEC DEPT	224-08-085	20575	3025 Raymond Street	0	0.0201	MU	Other General Government Support	GP_Ph3	
HARBOR ELECTRONICS INC	224-08-134	20582	3021 Kenneth Street	0	0.0446	CI	Othr Electronic Parts and Equip Wholesalers	GP_Ph3	
NIC 13 THE WESTMONT OWNER LLC	224-20-080	21015	1675 Scott Boulevard	0.0359	0	CI	Residential Mental Retardation Facilities	GP_Ph3	
HUDSON TECHMART COMM CTR LLC	104-55-013	21654	5201 Great America Parkway	0	0.1481	CI	Lessors of Residential Buildings and Dwelling	GP_Ph3	
MICROSOFT CORPORATION	224-03-085	21746	2045 Lafayette Street	0	0.042	CI	Data Processing, Hosting, & Related Services		
ELEC DEPT SUBSTATION	216-46-022	22799	2920 Coronado Drive	0	0.0109	MU	Other General Government Support		
MACYS WEST INC # 17012B	274-43-071	23069	3051 Stevens Creek Boulevard	0	0.003	CI	Department Stores (except Discount Stores)		
	104-55-012	25819		0	0				
	316-09-035	26155		0	0.372				
	230-46-069	26350		0	0.0017				

Hydraulic Model Input Data for Parcels with Entitlements
(Based on Information Provided by the City)

Owner	APN	Subcatchment ID	WC Address	Additional foul flow (MGD)	Trade flow (MGD)	Customer Type	NAICS Description	DC Num/ RefID	DC/NTD/LTD Name
	216-31-060	26372		0	0.0263			99	3375 Scott Blvd
	316-09-054	26708		0	0.0024				
AFFYMETRIX INC	216-34-076	26820	3380 Central Expressway	0	0.0221	CI	R&D in Physical, Engineering & Life Sciences		
AFFYMETRIX INC	216-34-076	26821	3380 Central Expressway	0	0.0007	CI	R&D in Physical, Engineering & Life Sciences		
VANTAGE DATA CENTERS LLC	216-28-118	26847	2820 Northwestern Parkway	0	0.0301	CI	Semiconductor & Related Device Manufacturing		
456200 HERTZ MAIL STOP 2	224-59-029	26853	1000 Walsh Avenue	0	0.0005	CI	Passenger Car Rental		
VANTAGE DATA CENTERS LLC	216-28-131	26913	2565 Walsh Avenue	0	0.0038	CI	Data Processing, Hosting, & Related Services		
VANTAGE DATA CENTERS LLC	216-28-131	26914	2565 Walsh Avenue	0	0.0614	CI	Data Processing, Hosting, & Related Services	DC_28	Vantage SC I (1/6) CA11 / V1
	104-55-005	26993		0	0.1177				
	230-46-069	27003		0	0.0017				
	230-46-069	27005		0	0.0009				
	230-46-069	27006		0	0.0003				
	230-46-069	27007		0	0.0024				
	230-46-069	27008		0	0.0012				
	230-46-069	27010		0	0.0023				
	216-59-038	27288		0	0.0023				
	216-59-038	27289		0	0.0023				
	216-59-038	27290		0	0.002				
	216-59-038	27291		0	0.0017				
	216-59-037	27293		0	0.0023				
	216-59-037	27294		0	0.002				
	216-59-037	27295		0	0.0019				
	216-59-037	27296		0	0.0017				
	216-59-037	27297		0	0.0023				
	216-59-037	27298		0	0.0023				
	216-59-037	27299		0	0.0019				
	216-59-037	27300		0	0.0176				
MACYS WEST INC # 17012B	274-43-092	27337	3051 Stevens Creek Boulevard	0	0.0161	CI	Department Stores (except Discount Stores)		
MACYS WEST INC # 17012B	274-43-071	27355	3051 Stevens Creek Boulevard	0	0.0003	CI	Department Stores (except Discount Stores)		

Flow Assumptions for Parcels with Entitlements and Planned Future Development
(Based on Information Provided by the City)

Entitlement Information from City				Assumptions Used for Future Flow Calculations[3]									
Entitlement APN	Entitlement ID	Entitled Flow (gpd)	Future Flow (gpd)[1]	Phase[2]	Land Use	Parcel Area (SF)	Non-Res Dev. Area (SF)	FAR	No. of Res Units	No. of Hotel Rooms	Non-Res UFF (gpd/SF)	Res UFF (gpd/unit)	Hotel UFF (gpd/room)
104-15-131	4	28,686	37,812	GP Phase 3	Office: 100%	444,844	-	0.85	-	-	0.1	-	-
101-13-003	11	8,106	39,699	GP Phase 3	Light Industrial	311,365	-	0.85	-	-	0.15	-	-
104-50-018	19	9,998	25,434	GP Phase 3	Office: 100%	299,222	-	0.85	-	-	0.1	-	-
104-16-113	23	54,000	114,332	GP Phase 3	Office	609,771	-	1.25	-	-	0.15	-	-
224-04-071	44	20,189	60,518	GP Phase 3	Heavy Industrial	322,763	-	1.25	-	-	0.15	-	-
224-59-029	45	20,791	42,180	GP Phase 3	Heavy Industrial	224,959	-	1.25	-	-	0.15	-	-
224-35-017	58	8,767	38,829	GP Phase 3	Heavy Industrial	207,087	-	1.25	-	-	0.15	-	-
224-60-014	61	11,218	35,442	GP Phase 3	Heavy Industrial	189,025	-	1.25	-	-	0.15	-	-
230-46-061	71	13,111	395,710	NTD	Mixed Use	-	1,140,000[4]	-	1,600	225	0.1	154 or 175	100

[1]Where entitlement flows were less than future flows, the more conservative future flows were used in the model for the long-term future scenario.

[2]GP = General Plan. NTD = Near-Term Development. The one NTD is the Gateway Crossing project (Reference ID = 22).

[3]UFF = Unit Flow Factor. FAR = Floor-Area Ratio. SF = Square Feet. Parcel Area, FAR, and UFF were used to calculate GP Phase 3 future flows. No. of Units/Rooms, UFFs, and dev. area were used to calculate NTD future flows.

[4]Includes 15,000 SF of retail/commercial for the Gateway Crossing Project, plus 1,125,000 SF of office/R&D space associated with the adjacent Coleman Highline development that still needs to connect to the sewer system.

APPENDIX C: PUMP STATION CAPACITY CALCULATIONS

Westside Lift Station Capacity Analysis

Cell Legend

Input Cell	*(and try to add as much explanatory text as you can)*
Calculation Cell	*(do not overwrite the formulas!)*
Output Cell	*(this is your results - i.e., firm & total capacity)*

Table 1: Basic Information

FM length (feet)	49	*Total length from bottom of wetwell to discharge elevation (17.4') to the discharge manhole (32')*
FM diameter (inches)	8	*Two 8" discharge lines.*
FM area (ft^2)	0.35	*Calculated*
Material	C.I.	*Cast Iron*
Approx Year Built	1977	*Approx. pump age: 2 years (source: pump station survey)*
number of pumps	2	*Source: Lift Station Level Summary, received from City on 2/23/2015*
wet well floor elevation	-17.4	*Source: Dwg 77054-16, Sheet C-13. 1977*
approx discharge elevation	0.0	*Source: Dwg 77054-16, Sheet C-13. 1977*
f	0.020	*Default value for Darcy-Weisbach*
C	120	*Default value for Hazen-Williams*
K - force main	1.48	*Calculated*
K - allowance for minor losse	5	

Table 2: Pump Settings

Source: data provided by City on PS Info Sheet/Questionnaire

	On Set Pt	On Elev.	Lift	Off	Off Level	Lift
Pump #1 (IW ID: S103-8.1)	7.5	-9.9	9.9	5.33	-12.07	12.07
Pump #2 (IW ID: S103-8.2)	8	-9.4	9.4	5.33	-12.07	12.07

Table 3: Pump Curves

Sources: Pump curves provided by City. Two pumps are identical.

Pump Model: Flygt NP 3127 MT 3~ Adaptive 438 Pump Serial Number: 3127.090-1780054

	Pump #1 & #2	
HEAD (ft)	Flow (gpm)	Flow (mgd)
15	1215	1.75
20	1100	1.58
25	980	1.41
30	865	1.25
35	745	1.07
40	620	0.89
45	505	0.73
50	390	0.56
55	265	0.38
60	190	0.27
65	80	0.12
70	0	0.00

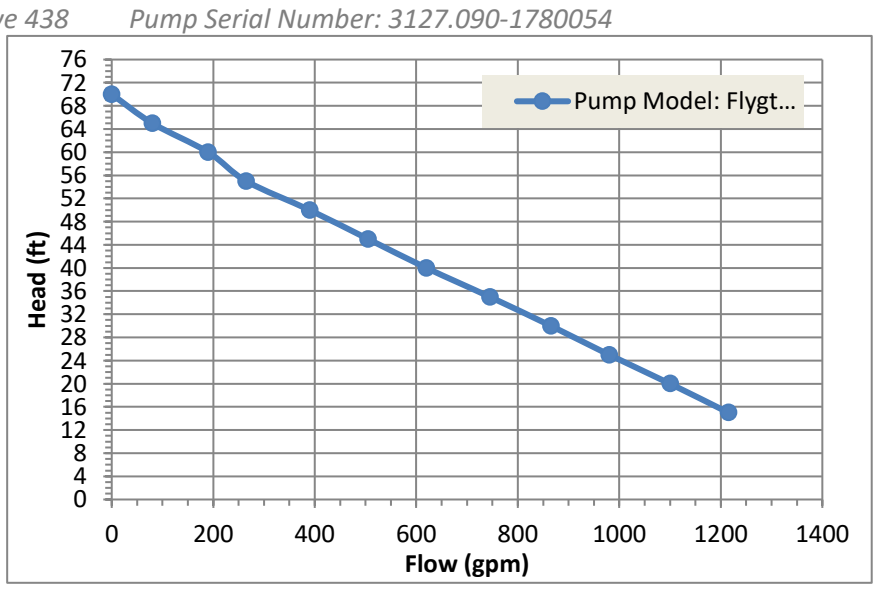


Table 4: Operation Scenarios

	Firm Pump Curve		Total Pump Curve	
HEAD (ft)	Flow (gpm)	Flow (mgd)	Flow (gpm)	Flow (mgd)
15	1215	1.75	2430	3.50
20	1100	1.58	2200	3.17
25	980	1.41	1960	2.82
30	865	1.25	1730	2.49
35	745	1.07	1490	2.15
40	620	0.89	1240	1.79
45	505	0.73	1010	1.45
50	390	0.56	780	1.12
55	265	0.38	530	0.76
60	190	0.27	380	0.55
65	80	0.12	160	0.23
70	0	0.00	0	0.00

Table 5: Total Dynamic Head (TDH) Calculations

Scenario:	Firm TDH	Total TDH	Other (use as-needed)
Lift:	9.9	9.4	

Flow			Velocity (ft/s)	Minor Headloss (ft)	Friction Headloss (ft)		Total Dynamic Head (ft)					
					Darcy-Weisbach	Hazen-Williams	Darcy-Weisbach	Hazen-Williams	Darcy-Weisbach	Hazen-Williams	Darcy-Weisbach	Hazen-Williams
mgd	gpm	cfs										
0.00	0	0.0	0.0	0.0	0.0	0.0	9.9	9.9	9.4	9.4	0.0	0.0
0.23	162	0.4	1.0	0.1	0.0	0.0	10.0	10.0	9.5	9.5	0.1	0.1
0.47	324	0.7	2.1	0.3	0.1	0.1	10.3	10.4	9.8	9.9	0.4	0.5
0.70	486	1.1	3.1	0.7	0.2	0.3	10.9	10.9	10.4	10.4	1.0	1.0
0.93	648	1.4	4.1	1.3	0.4	0.5	11.6	11.7	11.1	11.2	1.7	1.8
1.17	810	1.8	5.2	2.1	0.6	0.7	12.6	12.7	12.1	12.2	2.7	2.8
1.40	972	2.2	6.2	3.0	0.9	1.0	13.8	13.9	13.3	13.4	3.9	4.0
1.63	1134	2.5	7.2	4.1	1.2	1.3	15.2	15.3	14.7	14.8	5.3	5.4
1.87	1296	2.9	8.3	5.3	1.6	1.7	16.8	16.9	16.3	16.4	6.9	7.0
2.10	1458	3.2	9.3	6.7	2.0	2.1	18.6	18.8	18.1	18.3	8.7	8.9
2.33	1620	3.6	10.3	8.3	2.5	2.6	20.7	20.8	20.2	20.3	10.8	10.9
2.57	1782	4.0	11.4	10.1	3.0	3.1	22.9	23.1	22.4	22.6	13.0	13.2
2.80	1944	4.3	12.4	12.0	3.5	3.7	25.4	25.5	24.9	25.0	15.5	15.6
3.03	2106	4.7	13.5	14.0	4.2	4.2	28.1	28.2	27.6	27.7	18.2	18.3
3.27	2269	5.1	14.5	16.3	4.8	4.9	31.0	31.1	30.5	30.6	21.1	21.2
3.50	2431	5.4	15.5	18.7	5.5	5.5	34.1	34.1	33.6	33.6	24.2	24.2

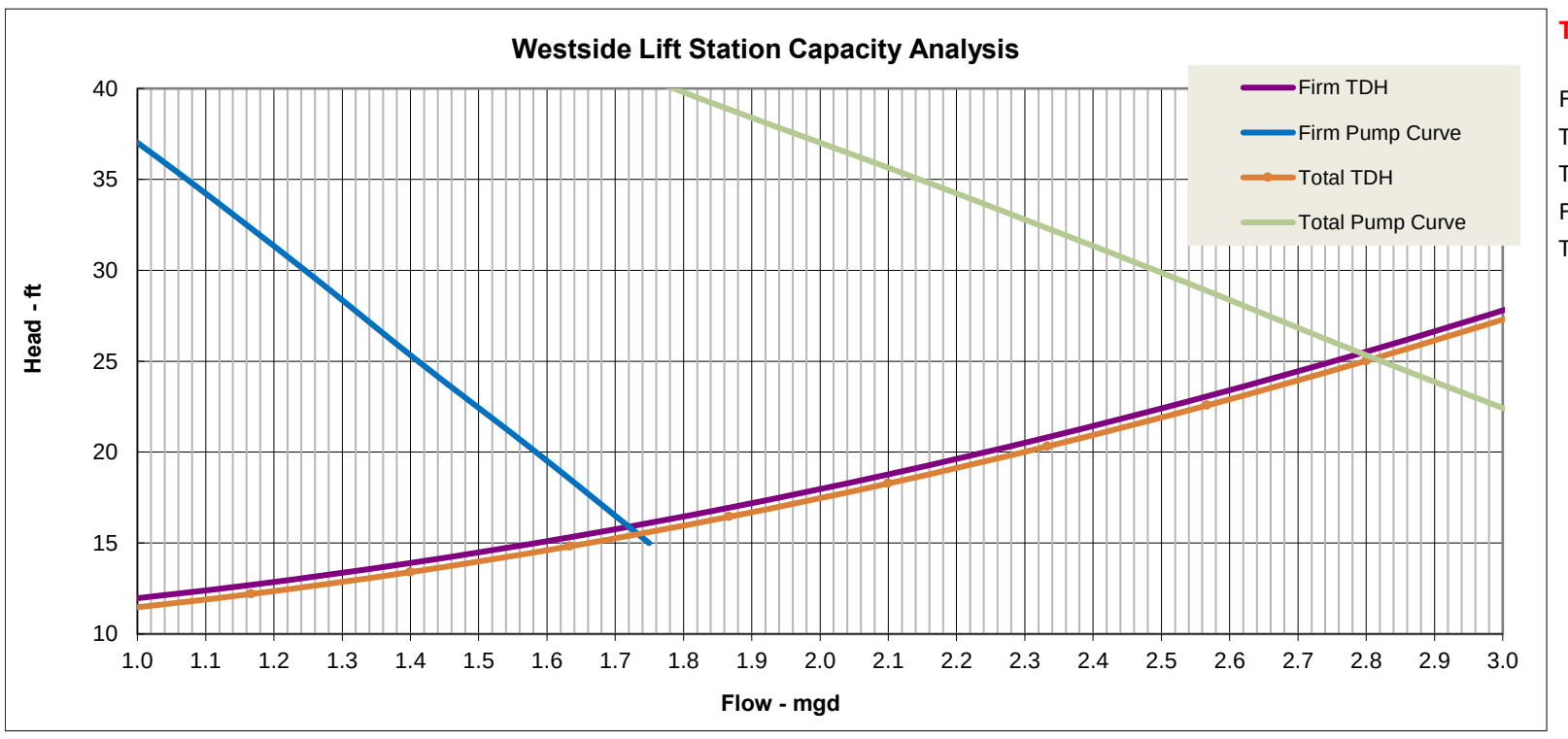


Table 6: Estimated Capacity

Firm Capacity:	1.72	mgd
Total Capacity:	2.81	mgd
Tear & Wear factor:	10%	
Firm Capacity:	**1.55**	mgd
Total Capacity:	**2.53**	mgd

Tasman Lift Station Capacity Analysis

Cell Legend

Input Cell	*(and try to add as much explanatory text as you can)*
Calculation Cell	*(do not overwrite the formulas!)*
Output Cell	*(this is your results - i.e., firm & total capacity)*

Table 1: Basic Information

FM length (feet)	47	*Total length from bottom of wetwell to discharge elevation (-12.5' to 4.3') to the discharge manhole (~30')*
FM diameter (inches)	8	*Two discharge lines.*
FM area (ft^2)	0.35	*Calculated*
Material	D.I.	*Ductile Iron*
Approx Year Built		
number of pumps	2	*Source: Lift Station Level Summary, received from City on 2/23/2015*
wet well floor elevation	-12.50	*Source: Dwg 9542-D, Sheet 29. 1986*
approx discharge elevation	4.30	*Source: Dwg 9542-D, Sheet 29. 1986*
f	0.0	*Default value for Darcy-Weisbach*
C	120	*Default value for Hazen-Williams*
K - force main	1.40	*Calculated*
K - allowance for minor losse	10	

Table 2: Pump Settings

Source: data provided by City on PS Info Sheet/Questionnaire

	On Set Pt	On Elev.	Lift	Off	Off Level	Lift
Pump #1 (IW ID: S103-8.1)	7.3	-5.20	9.50	2.7	-9.8	14.1
Pump #2 (IW ID: S103-8.2)	9.8	-2.70	7.00	2.7	-9.8	14.1

Table 3: Pump Curves

Sources: Pump curves provided by City. Two pumps are identical.

Pump Model: Flygt NP 3127 LT3~ Adaptive 425 *Pump Serial Number: 3127.070-1780057*

	Pump #1 & #2	
HEAD (ft)	Flow (gpm)	Flow (mgd)
7	1730	2.49
10	1630	2.35
15	1470	2.12
20	1280	1.84
25	1090	1.57
30	930	1.34
33	830	1.20
35	740	1.07
38	570	0.82
40	420	0.60
45	240	0.35
50	80	0.12
52	0	0.00

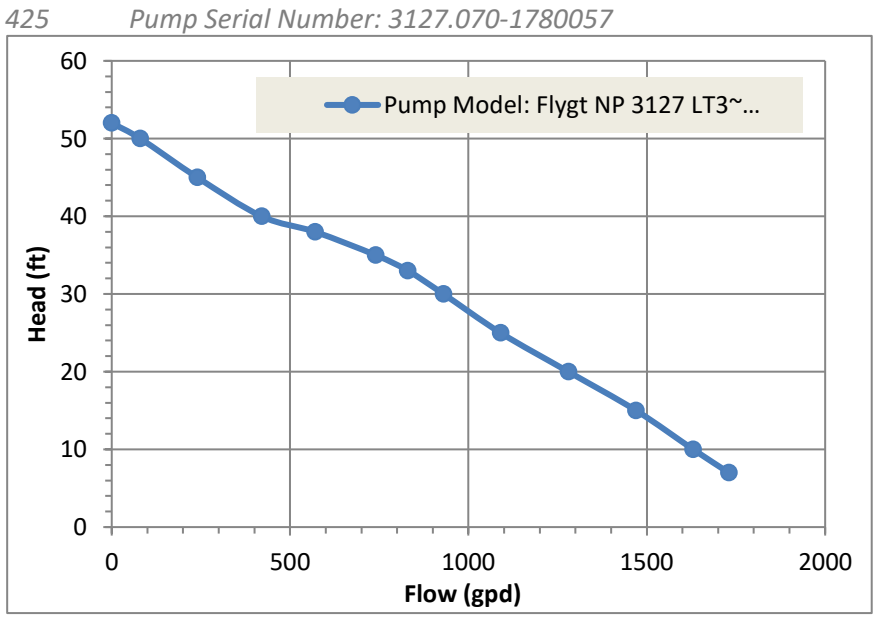


Table 4: Operation Scenarios

	Firm Pump Curve		Total Pump Curve	
HEAD (ft)	Flow (gpm)	Flow (mgd)	Flow (gpm)	Flow (mgd)
7	1730	2.49	3460	4.98
10	1630	2.35	3260	4.69
15	1470	2.12	2940	4.23
20	1280	1.84	2560	3.69
25	1090	1.57	2180	3.14
30	930	1.34	1860	2.68
33	830	1.20	1660	2.39
35	740	1.07	1480	2.13
38	570	0.82	1140	1.64
40	420	0.60	840	1.21
45	240	0.35	480	0.69
50	80	0.12	160	0.23
52	0	0.00	0	0.00

Table 5: Total Dynamic Head (TDH) Calculations

Scenario:	Firm TDH	Total TDH	Other (use as-needed)
Lift:	9.5	7	

					Friction Headloss (ft)		Total Dynamic Head (ft)					
Flow			Velocity (ft/s)	Minor Headloss (ft)	Darcy-Weisbach	Hazen-Williams	Darcy-Weisbach	Hazen-Williams	Darcy-Weisbach	Hazen-Williams	Darcy-Weisbach	Hazen-Williams
mgd	gpm	cfs										
0.00	0	0.0	0.0	0.0	0.0	0.0	9.5	9.5	7.0	7.0	0.0	0.0
0.25	171	0.4	1.1	0.2	0.0	0.0	9.7	9.7	7.2	7.2	0.2	0.2
0.49	343	0.8	2.2	0.7	0.1	0.1	10.3	10.4	7.8	7.9	0.8	0.9
0.74	514	1.1	3.3	1.7	0.2	0.3	11.4	11.5	8.9	9.0	1.9	2.0
0.99	685	1.5	4.4	3.0	0.4	0.5	12.9	13.0	10.4	10.5	3.4	3.5
1.23	856	1.9	5.5	4.6	0.7	0.8	14.8	14.9	12.3	12.4	5.3	5.4
1.48	1028	2.3	6.6	6.7	0.9	1.1	17.1	17.3	14.6	14.8	7.6	7.8
1.73	1199	2.7	7.7	9.1	1.3	1.4	19.9	20.0	17.4	17.5	10.4	10.5
1.97	1370	3.1	8.8	11.9	1.7	1.8	23.1	23.2	20.6	20.7	13.6	13.7
2.22	1542	3.4	9.8	15.1	2.1	2.3	26.7	26.8	24.2	24.3	17.2	17.3
2.47	1713	3.8	10.9	18.6	2.6	2.7	30.7	30.8	28.2	28.3	21.2	21.3
2.71	1884	4.2	12.0	22.5	3.2	3.3	35.1	35.2	32.6	32.7	25.6	25.7
2.96	2056	4.6	13.1	26.8	3.8	3.8	40.0	40.1	37.5	37.6	30.5	30.6
3.21	2227	5.0	14.2	31.4	4.4	4.4	45.3	45.4	42.8	42.9	35.8	35.9
3.45	2398	5.3	15.3	36.4	5.1	5.1	51.0	51.0	48.5	48.5	41.5	41.5
3.70	2569	5.7	16.4	41.8	5.9	5.8	57.2	57.1	54.7	54.6	47.7	47.6

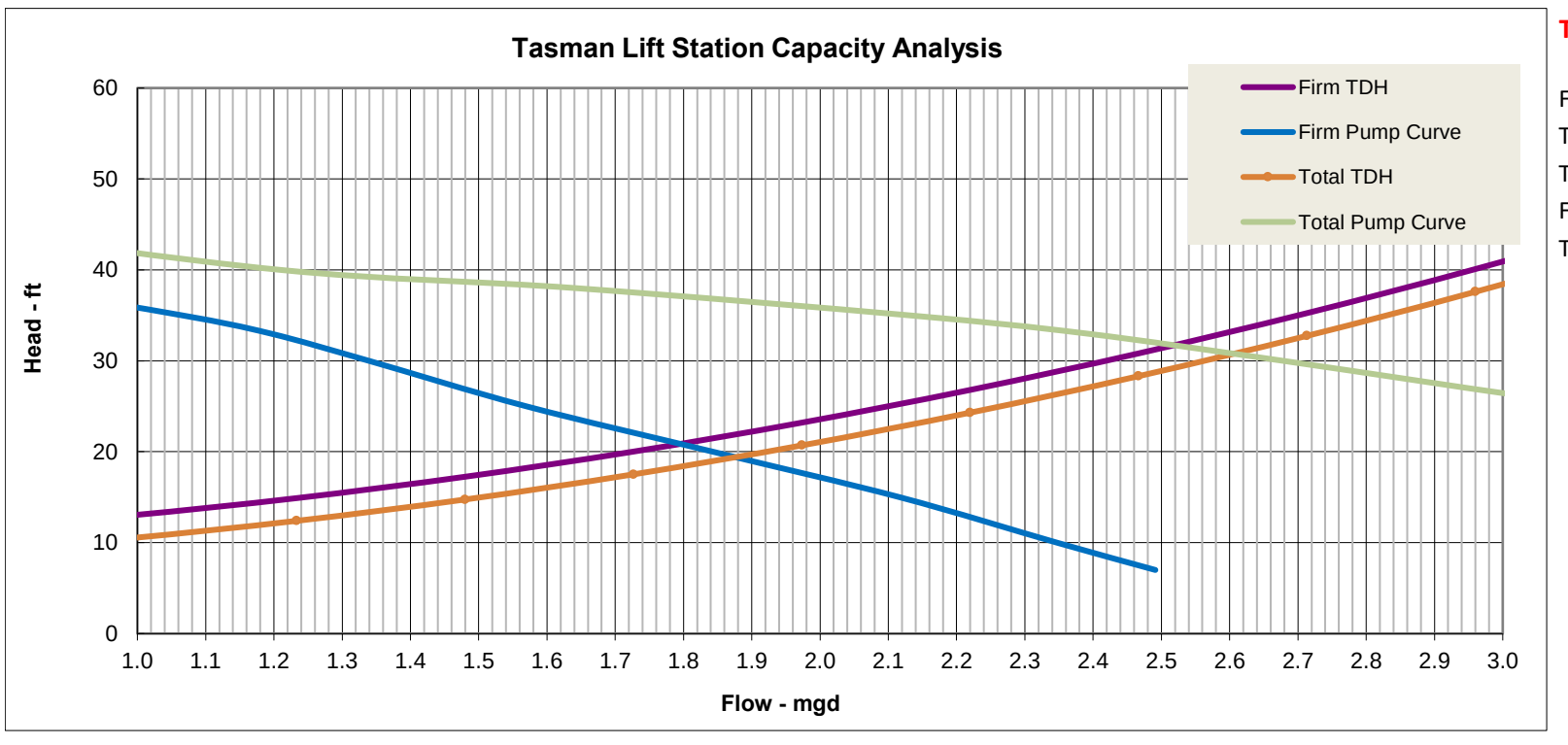


Table 6: Estimated Capacity

Firm Capacity:	1.79	mgd
Total Capacity:	2.60	mgd
Tear & Wear factor:	10%	
Firm Capacity:	**1.61**	mgd
Total Capacity:	**2.34**	mgd

De La Cruz Lift Station Capacity Analysis

Cell Legend

Input Cell	*(and try to add as much explanatory text as you can)*
Calculation Cell	*(do not overwrite the formulas!)*
Output Cell	*(this is your results - i.e., firm & total capacity)*

Table 1: Basic Information

FM length (feet)	23	*Total length from bottom of wetwell to discharge elevation (-6.74' to 12.05') to the discharge manhole (~4')*
FM diameter (inches)	8	*Two discharge lines.*
FM area (ft^2)	0.35	*Calculated*
Material	DIP	*Source: Dwg 10016-D, Sheet 2. 1992*
Approx Year Built	1992	*FYI: approx. pump age: 5 years (source: pump station survey)*
number of pumps	2	*Source: Lift Station Level Summary, received from City on 2/23/2015*
wet well floor elevation	-6.74	*Source: Dwg 10016-D, Sheet 2. 1992*
approx discharge elevation	12.05	*Source: Dwg 10016-D, Sheet 2. 1992*
f	0.0	*Default value for Darcy-Weisbach*
C	120	*Default value for Hazen-Williams*
K - force main	0.68	*Calculated*
K - allowance for minor losses	5	

Table 2: Pump Settings

Source: data provided by City on PS Info Sheet/Questionnaire

	On Set Pt	On Elev.	Lift	Off	Off Level	Lift
Pump #1 (IW ID: S103-8.1)	3.5	-3.24	15.29	1	-5.74	17.79
Pump #2 (IW ID: S103-8.2)	4	-2.74	14.79	1	-5.74	17.79

Table 3: Pump Curves

Sources: Pump curves provided by City. Two pumps are identical.

Pump Model: Flygt NP 3127 LT3~ Adaptive 425 *Pump Serial Number: 3127.090-1780054*

	Pump #1 & #2	
HEAD (ft)	Flow (gpm)	Flow (mgd)
15	1470	2.12
20	1280	1.84
25	1080	1.56
30	930	1.34
33	830	1.20
35	740	1.07
37	570	0.82
40	420	0.60
45	240	0.35
50	80	0.12
51	0	0.00
		0.00
		0.00
		0.00

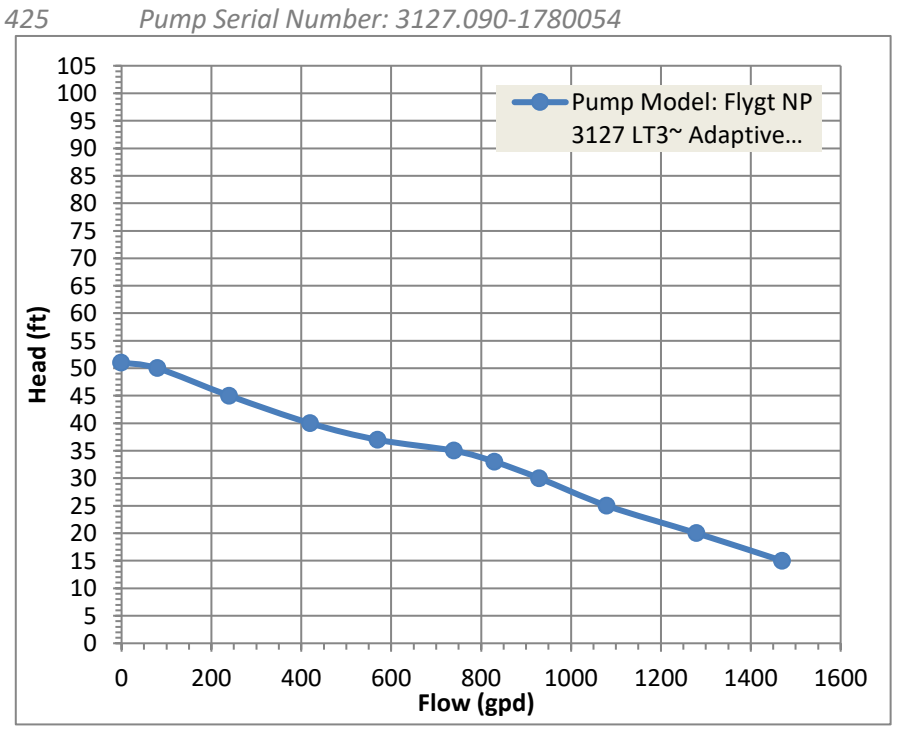


Table 4: Operation Scenarios

	Firm Pump Curve		Total Pump Curve	
HEAD (ft)	Flow (gpm)	Flow (mgd)	Flow (gpm)	Flow (mgd)
15	1470	2.12	2940	4.23
20	1280	1.84	2560	3.69
25	1080	1.56	2160	3.11
30	930	1.34	1860	2.68
33	830	1.20	1660	2.39
35	740	1.07	1480	2.13
37	570	0.82	1140	1.64
40	420	0.60	840	1.21
45	240	0.35	480	0.69
50	80	0.12	160	0.23
51	0	0.00	0	0.00

Table 5: Total Dynamic Head (TDH) Calculations

Scenario:	Firm TDH	Total TDH	Other (use as-needed)
Lift:	15.29	14.79	

Flow			Velocity (ft/s)	Minor Headloss (ft)	Friction Headloss (ft)		Total Dynamic Head (ft)					
					Darcy-Weisbach	Hazen-Williams	Darcy-Weisbach	Hazen-Williams	Darcy-Weisbach	Hazen-Williams	Darcy-Weisbach	Hazen-Williams
mgd	gpm	cfs										
0.00	0	0.0	0.0	0.0	0.0	0.0	15.3	15.3	14.8	14.8	0.0	0.0
0.29	199	0.4	1.3	0.1	0.0	0.0	15.4	15.4	14.9	14.9	0.1	0.2
0.57	398	0.9	2.5	0.5	0.1	0.1	15.9	15.9	15.4	15.4	0.6	0.6
0.86	597	1.3	3.8	1.1	0.2	0.2	16.6	16.6	16.1	16.1	1.3	1.3
1.15	796	1.8	5.1	2.0	0.3	0.3	17.6	17.6	17.1	17.1	2.3	2.3
1.43	995	2.2	6.4	3.1	0.4	0.5	18.9	18.9	18.4	18.4	3.6	3.6
1.72	1194	2.7	7.6	4.5	0.6	0.7	20.4	20.5	19.9	20.0	5.1	5.2
2.01	1394	3.1	8.9	6.1	0.8	0.9	22.3	22.3	21.8	21.8	7.0	7.1
2.29	1593	3.5	10.2	8.0	1.1	1.2	24.4	24.5	23.9	24.0	9.1	9.2
2.58	1792	4.0	11.4	10.2	1.4	1.4	26.8	26.9	26.3	26.4	11.6	11.6
2.87	1991	4.4	12.7	12.5	1.7	1.8	29.6	29.6	29.1	29.1	14.3	14.3
3.15	2190	4.9	14.0	15.2	2.1	2.1	32.5	32.6	32.0	32.1	17.3	17.3
3.44	2389	5.3	15.3	18.1	2.5	2.5	35.8	35.8	35.3	35.3	20.5	20.5
3.73	2588	5.8	16.5	21.2	2.9	2.9	39.4	39.4	38.9	38.9	24.1	24.1
4.01	2787	6.2	17.8	24.6	3.4	3.3	43.2	43.2	42.7	42.7	28.0	27.9
4.30	2986	6.7	19.1	28.2	3.9	3.7	47.4	47.3	46.9	46.8	32.1	32.0

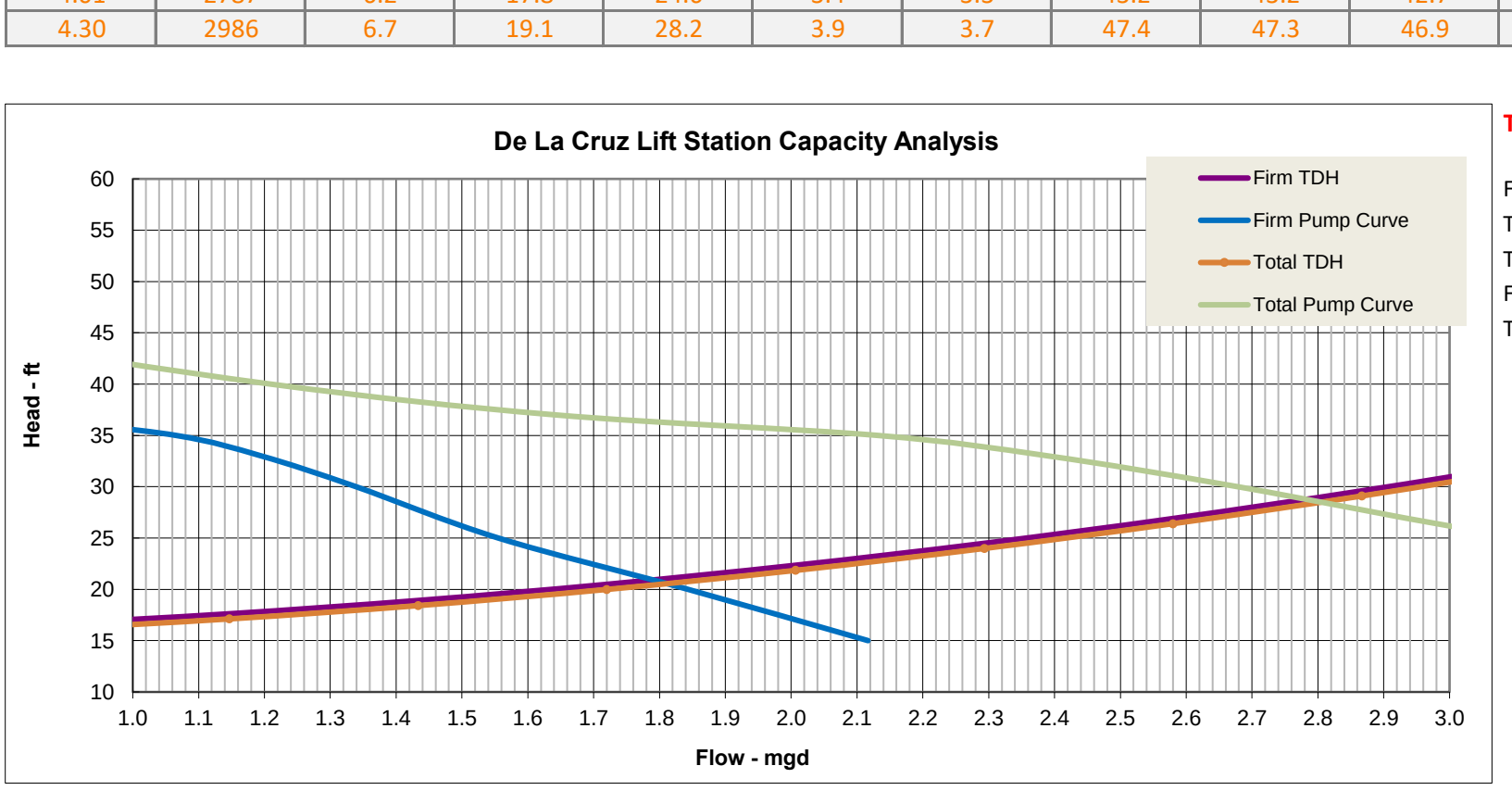


Table 6: Estimated Capacity

Firm Capacity:	1.79	mgd
Total Capacity:	2.8	mgd
Tear & Wear factor:	10%	
Firm Capacity:	**1.61**	mgd
Total Capacity:	**2.52**	mgd

Primavera Pump Station Capacity Analysis

Cell Legend

Input Cell	*(and try to add as much explanatory text as you can)*
Calculation Cell	*(do not overwrite the formulas!)*
Output Cell	*(this is your results - i.e., firm & total capacity)*

Table 1: Basic Information

FM length (feet)	68	*Source; Sanitary Sewer Pump Station Evaluation, Schaaf & Wheeler, 2010.*
FM diameter (inches)	16	*1 discharge line*
FM area (ft^2)	1.40	*Calculated*
Material	C.I.	*Cast Iron*
Approx Year Built	unknown	
number of pumps	6	*Source: Lift Station Level Summary, received from City on 2/23/2015*
wet well floor elevation	-22.00	*Source: Dwg 9518, Sheet 57, 1988*
approx discharge elevation	-0.35	*Source: Dwg 9518, Sheet 57, 1988*
f	0.02	*Default value for Darcy-Weisbach*
C	120	*Default value for Hazen-Williams*
K - force main	1.02	*Calculated*
K - allowance for minor losses	20	

Table 2: Pump Settings

Source: data provided by City on PS Info Sheet/Questionnaire

	On	On Level	Lift	Off	Off Level	Lift
Pump #1	9	-13.00	12.65	4.8	-17.20	16.85
Pump #2	9.3	-12.70	12.35	4.8	-17.20	16.85
Pump #3	9.7	-12.30	11.95	5.2	-16.80	16.45
Pump #4	9.8	-12.20	11.85	5.2	-16.80	16.45
Pump #5	9.9	-12.10	11.75	5.3	-16.70	16.35
Pump #6	10.2	-11.80	11.45	7.5	-14.50	14.15

Table 3: Pump Curves

Sources: Pump curves provided by City

Pump Model: Flygt NP 3127 MT 3~ Adaptive 438 *Pump Serial Number: 3127.090-1260005*

	Pump #1-#6	
HEAD (ft)	Flow (gpm)	Flow (mgd)
15	1210	1.74
20	1090	1.57
25	980	1.41
30	860	1.24
35	735	1.06
40	615	0.89
45	500	0.72
50	380	0.55
55	260	0.37
58	190	0.27
60	145	0.21
65	60	0.09
69	0	0.00

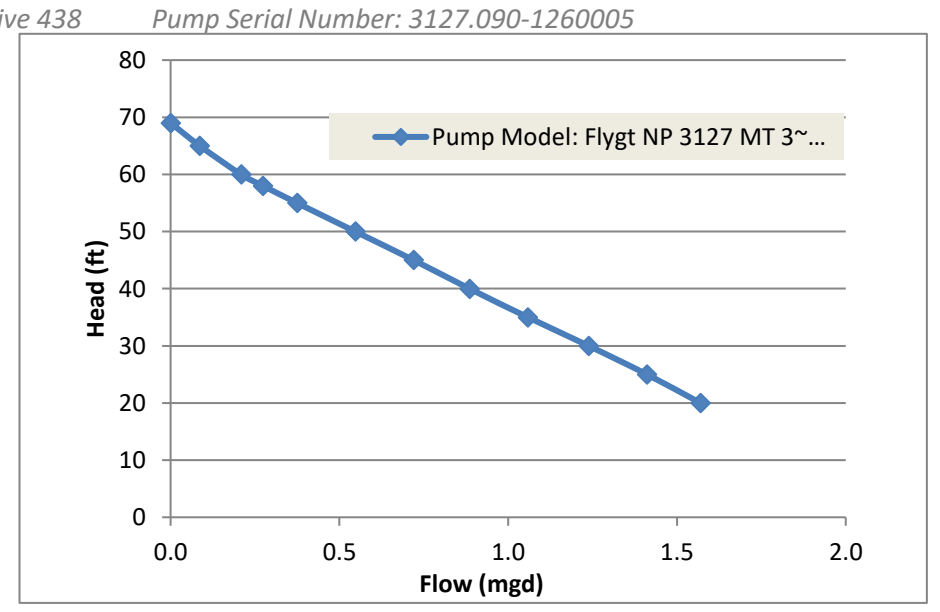


Table 4: Operation Scenarios

	Firm Pump Curve		Total Pump Curve	
HEAD (ft)	Flow (gpm)	Flow (mgd)	Flow (gpm)	Flow (mgd)
15	6050	8.71	7260	10.45
20	5450	7.85	6540	9.42
25	4900	7.06	5880	8.47
30	4300	6.19	5160	7.43
35	3675	5.29	4410	6.35
40	3075	4.43	3690	5.31
45	2500	3.60	3000	4.32
50	1900	2.74	2280	3.28
55	1300	1.87	1560	2.25
58	950	1.37	1140	1.64
60	725	1.04	870	1.25
65	300	0.43	360	0.52
69	0	0.00	0	0.00

Table 5: Total Dynamic Head (TDH) Calculations

Scenario:	Pump #1 only (Firm)			All On (High Level)			Other (use as-needed)		
Lift:	12.65			11.45					

Flow			Velocity (ft/s)	Minor Headloss (ft)	Friction Headloss (ft)		Total Dynamic Head (ft)					
					Darcy-Weisbach	Hazen-Williams	Darcy-Weisbach	Hazen-Williams	Darcy-Weisbach	Hazen-Williams	Darcy-Weisbach	Hazen-Williams
mgd	gpm	cfs										
0.00	0	0.0	0.0	0.0	0.0	0.0	12.7	12.7	11.5	11.5	0.0	0.0
0.70	486	1.1	0.8	0.2	0.0	0.0	12.8	12.9	11.6	11.7	0.2	0.2
1.40	972	2.2	1.6	0.7	0.0	0.0	13.4	13.4	12.2	12.2	0.8	0.8
2.10	1458	3.2	2.3	1.7	0.1	0.1	14.4	14.4	13.2	13.2	1.8	1.8
2.80	1944	4.3	3.1	3.0	0.2	0.2	15.8	15.8	14.6	14.6	3.1	3.2
3.50	2431	5.4	3.9	4.7	0.2	0.3	17.6	17.6	16.4	16.4	4.9	4.9
4.20	2917	6.5	4.7	6.7	0.3	0.4	19.7	19.7	18.5	18.5	7.1	7.1
4.90	3403	7.6	5.4	9.2	0.5	0.5	22.3	22.3	21.1	21.1	9.6	9.7
5.60	3889	8.7	6.2	12.0	0.6	0.6	25.2	25.2	24.0	24.0	12.6	12.6
6.30	4375	9.7	7.0	15.2	0.8	0.8	28.6	28.6	27.4	27.4	15.9	15.9
7.00	4861	10.8	7.8	18.7	1.0	0.9	32.3	32.3	31.1	31.1	19.7	19.6
7.70	5347	11.9	8.5	22.6	1.2	1.1	36.4	36.4	35.2	35.2	23.8	23.8
8.40	5833	13.0	9.3	26.9	1.4	1.3	41.0	40.9	39.8	39.7	28.3	28.3
9.10	6319	14.1	10.1	31.6	1.6	1.5	45.9	45.8	44.7	44.6	33.2	33.1
9.80	6806	15.2	10.9	36.7	1.9	1.8	51.2	51.1	50.0	49.9	38.5	38.4
10.50	7292	16.2	11.6	42.1	2.1	2.0	56.9	56.7	55.7	55.5	44.2	44.1

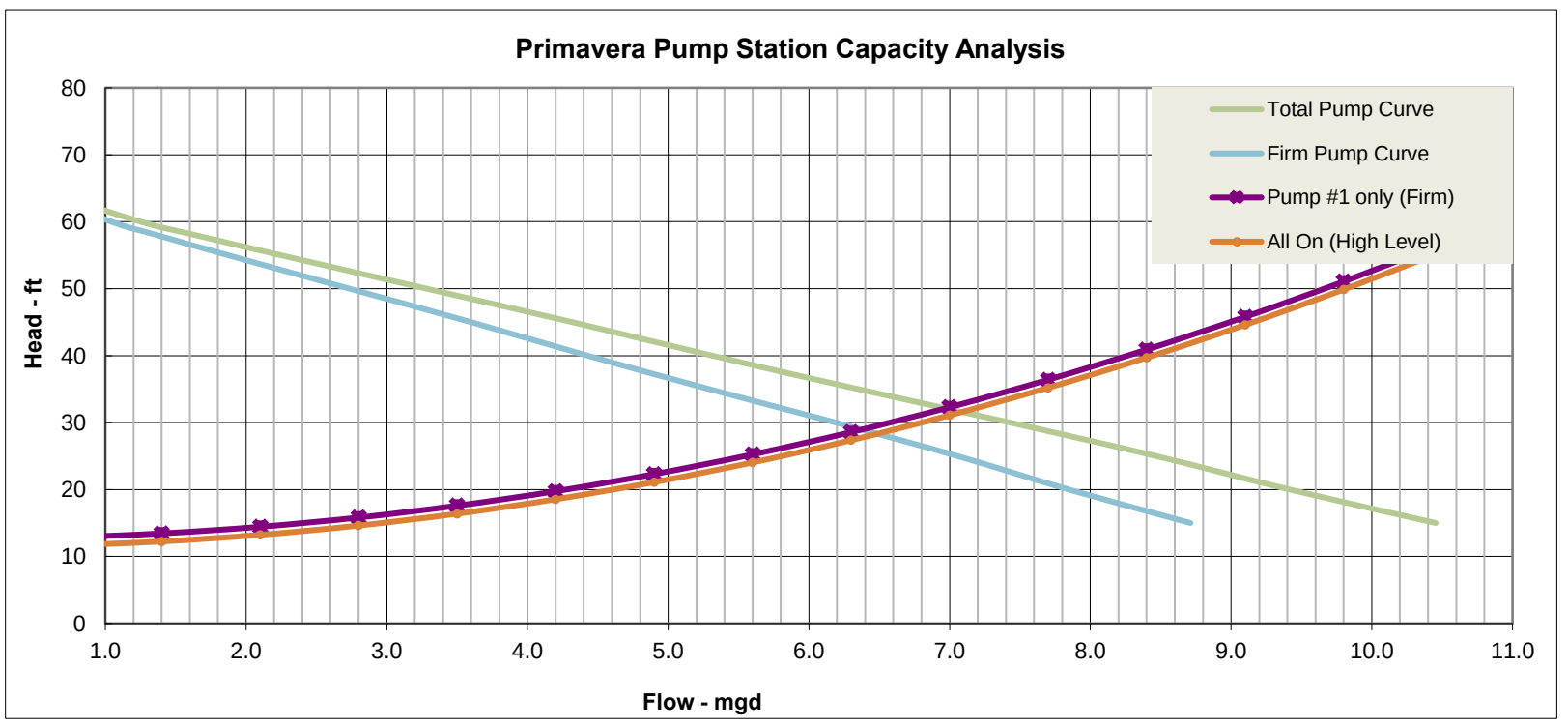


Table 6: Estimated Capacity

Firm Capacity:	6.35	mgd
Total Capacity:	7.1	mgd
Tear & Wear factor:	10%	
Firm Capacity:	**5.72**	mgd
Total Capacity:	**6.39**	mgd

Levis Stadium Pump Station Capacity Analysis

Cell Legend

Input Cell	*(and try to add as much explanatory text as you can)*
Calculation Cell	*(do not overwrite the formulas!)*
Output Cell	*(this is your results - i.e., firm & total capacity)*

Table 1: Basic Information

FM length (feet)	220	*Source: As-Built Drawings*
FM diameter (inches)	10	*Note: Two 6-inch and four 8-inch turn into 10 inch FM.*
FM area (ft^2)	0.55	*Calculated*
Material	N/A	
Approx Year Built	2014	*Approx. pump age: 1 year (source: pump station survey)*
number of pumps	6	*Source: Lift Station Level Summary, received from City on 2/23/2015*
wet well floor elevation	-16.63	*Source: Dwg M101, Sheet 11, 2013*
approx discharge elevation	-2	*Source: Dwg C-102, Sheet 5, 2012*
f	0.02	*Default value for Darcy-Weisbach*
C	120	*Default value for Hazen-Williams*
K - force main	5.28	*Calculated*
K - allowance for minor losse	20	

Table 2: Pump Settings

Source: data provided by City on PS Info Sheet/Questionnaire

	On	On Level	Lift	Off	Off Level	Lift
Pump #1	11.75	-12.9	10.9	11.25	-15.4	13.4
Pump #2	12.75	-11.9	9.9	12.25	-12.4	10.4
Pump #3	8.55	-8.1	6.1	8.05	-10.6	8.6
Pump #4	9.55	-7.1	5.1	9.05	-9.3	7.3
Pump #5	10.55	-6.1	4.1	10.05	-8.3	6.3
Pump #6	11.55	-5.6	3.6	11.1	-7.6	5.6

Table 3: Pump Curves

Sources: Pump curves provided by City

	Lower Flow		Higher Flow	
	Pump #1-#2		Pump #3-#6	
HEAD (ft)	Flow (gpm)	Flow (mgd)	Flow (gpm)	Flow (mgd)
0				
5				
10			1470	2.12
15	760	1.09	1300	1.87
20	670	0.96	1105	1.59
25	575	0.83	910	1.31
30	480	0.69	740	1.07
35	390	0.56	590	0.85
40	300	0.43	345	0.50
45	210	0.30	130	0.19
50	130	0.19	20	0.03
55	45	0.06		
60				
65				
70				
75				
80				
85				
90				
95				
100				

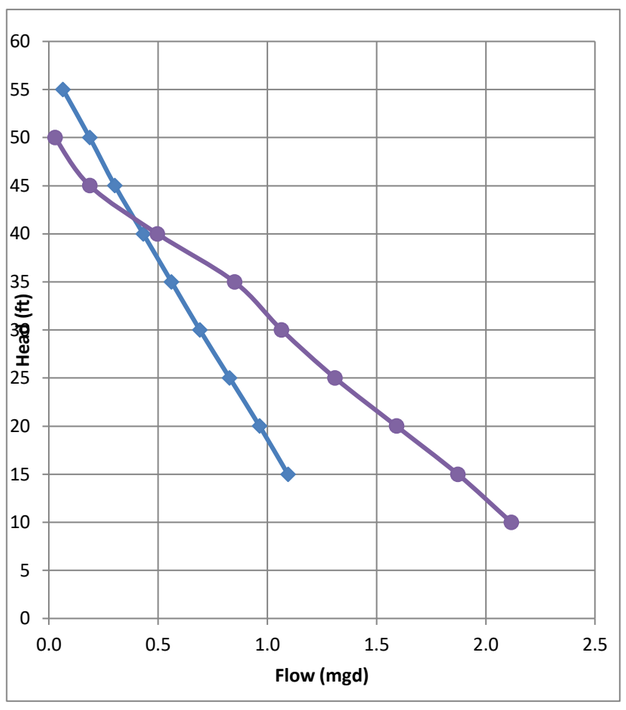


Table 4: Operation Scenarios

	Pump #1-#5 On		All Pumps On	
HEAD (ft)	Flow (gpm)	Flow (mgd)	Flow (gpm)	Flow (mgd)
0				
5				
10				
15			6,720	9.68
20	4,655	6.70	5,760	8.29
25	3,880	5.59	4,790	6.90
30	3,180	4.58	3,920	5.64
35	2,550	3.67	3,140	4.52
40	1,635	2.35	1,980	2.85
45	810	1.17	940	1.35
50	320	0.46	340	0.49
55	90	0.13	90	0.13
60				
65				
70				
75				
80				

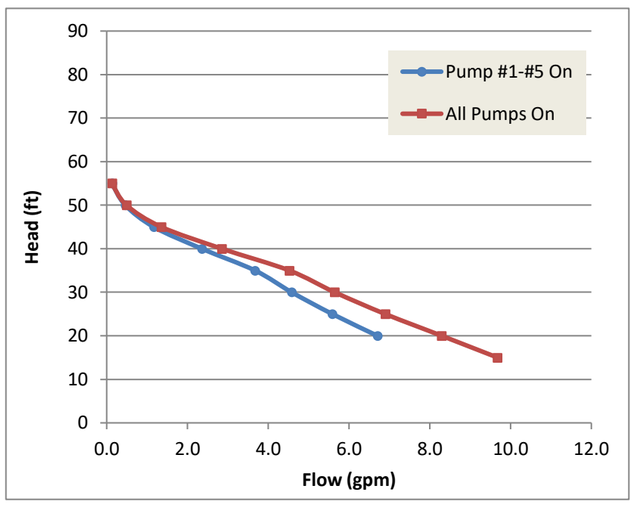


Table 5: Total Dynamic Head (TDH) Calculations

Scenario:	Pump #1-5 (Firm)	All On (High Level)	
Lift:	4.1	3.6	

Flow			Velocity (ft/s)	Minor Headloss (ft)	Friction Headloss (ft)		Total Dynamic Head (ft)					
mgd	gpm	cfs			Darcy-Weisbach	Hazen-Williams	Darcy-Weisbach	Hazen-Williams	Darcy-Weisbach	Hazen-Williams	Darcy-Weisbach	Hazen-Williams
0	0	0.0	0.0	0.0	0.0	0.0	4.1	4.1	3.6	3.6	0.0	0.0
5	3472	7.7	14.2	62.5	16.5	16.1	83.1	82.7	82.7	82.2	79.1	78.6
10	6944	15.5	28.4	250.2	66.0	58.0	320.3	312.3	319.8	311.8	316.2	308.2
15	10417	23.2	42.6	562.9	148.6	123.0	715.6	689.9	715.1	689.5	711.5	685.9
20	13889	30.9	56.8	1000.7	264.2	209.5	1269.0	1214.3	1268.5	1213.8	1264.9	1210.2
25	17361	38.7	71.0	1563.6	412.8	316.7	1980.4	1884.4	1980.0	1883.9	1976.4	1880.3
30	20833	46.4	85.1	2251.6	594.4	443.9	2850.0	2699.6	2849.6	2699.1	2846.0	2695.5
35	24306	54.2	99.3	3064.6	809.1	590.6	3877.7	3659.3	3877.3	3658.8	3873.7	3655.2
40	27778	61.9	113.5	4002.8	1056.7	756.3	5063.6	4763.1	5063.1	4762.7	5059.5	4759.1
45	31250	69.6	127.7	5066.0	1337.4	940.7	6407.5	6010.7	6407.0	6010.3	6403.4	6006.6
50	34722	77.4	141.9	6254.3	1651.1	1143.3	7909.5	7401.7	7909.1	7401.3	7905.4	7397.6
55	38194	85.1	156.1	7567.7	1997.9	1364.1	9569.7	8935.8	9569.2	8935.4	9565.6	8931.8
60	41667	92.8	170.3	9006.2	2377.6	1602.6	11387.9	10612.9	11387.5	10612.4	11383.8	10608.8
65	45139	100.6	184.5	10569.8	2790.4	1858.6	13364.3	12432.5	13363.8	12432.1	13360.2	12428.4
75	48611	108.3	198.7	12258.4	3236.2	2132.1	15498.7	14394.6	15498.3	14394.1	15494.7	14390.5
70	52083	116.0	212.9	14072.2	3715.1	2422.7	17791.3	16498.9	17790.9	16498.5	17787.2	16494.9

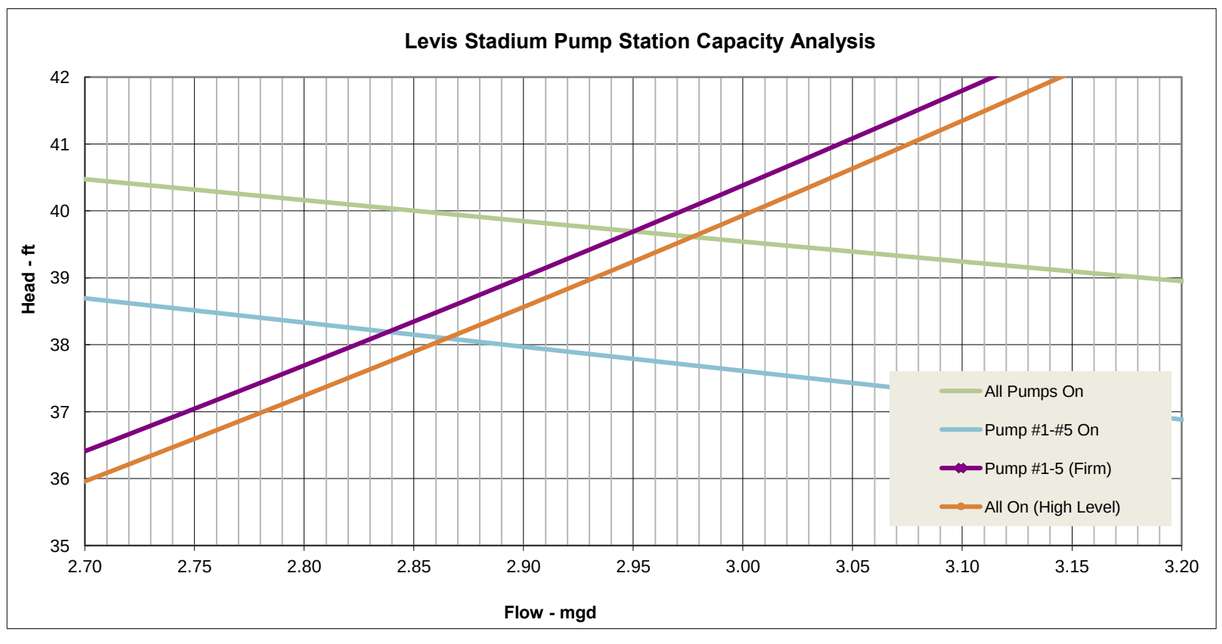


Table 6: Estimated Capacity

Firm Capacity:	2.84	mgd
Total Capacity:	2.98	mgd
Tear & Wear factor:	10%	
Firm Capacity:	**2.56**	mgd
Total Capacity:	**2.68**	mgd

(manual input base on info from the graph. This is the total pump capacity with the largest pump out of service)
(manual input base on info from the graph)
(per recommendations from Dennis G)

APPENDIX D: FIELD-COLLECTED SURVEY INFORMATION DATA SHEETS

Field Verification

Date: 3/20/23 Time: 10:30 am Weather: (Dry)/Rain

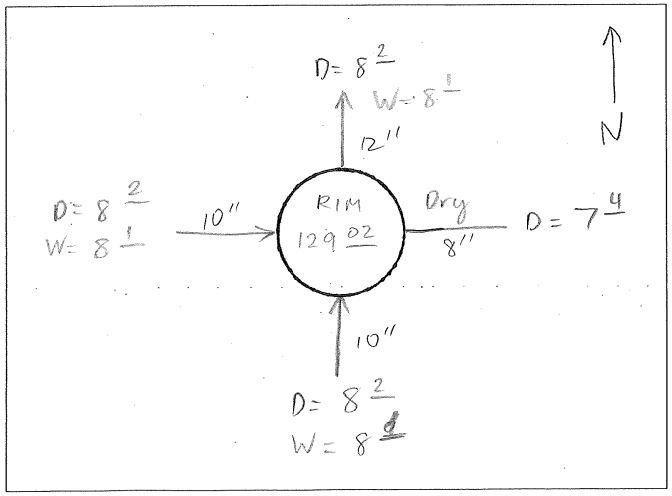
Name of Field Observer(s): CL & KT

MH Number: S12-50

Street/Intersection: Pruneridge @ Woodhams

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:
All VCP

Field Verification

Date: 3/20/23 Time: 10:10 am Weather: (Dry)/Rain

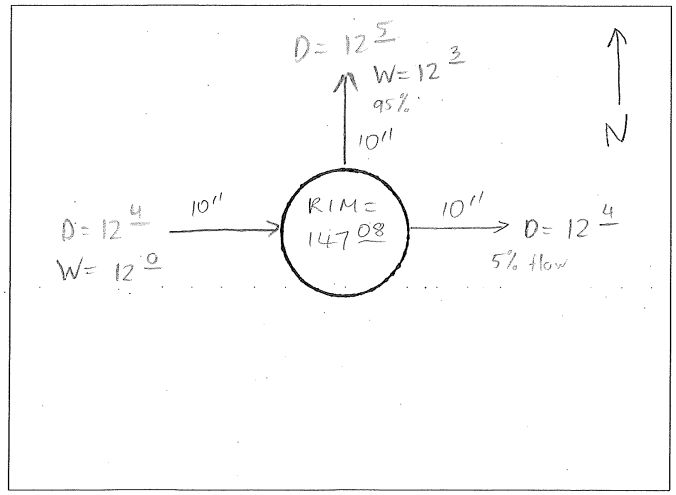
Name of Field Observer(s): CL & KT

MH Number: S10-29

Street/Intersection: Pruneridge @ Norwood Cir

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?
most flow goes north. East pipe blocked by debris.

Other Observations:
All VCP

Field Verification

Date: 3/20/23 Time: 10:45 am Weather: (Dry)/Rain

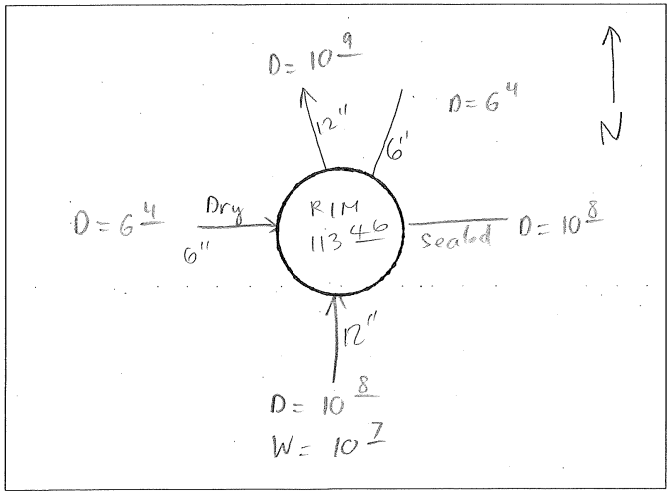
Name of Field Observer(s): CL & KT

MH Number: S13-38

Street/Intersection: Kiely @ S. of Forbes

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

flow goes north

Other Observations:

All VCP

Field Verification

Date: 3/20/23 Time: 10:45 am Weather: (Dry)/Rain

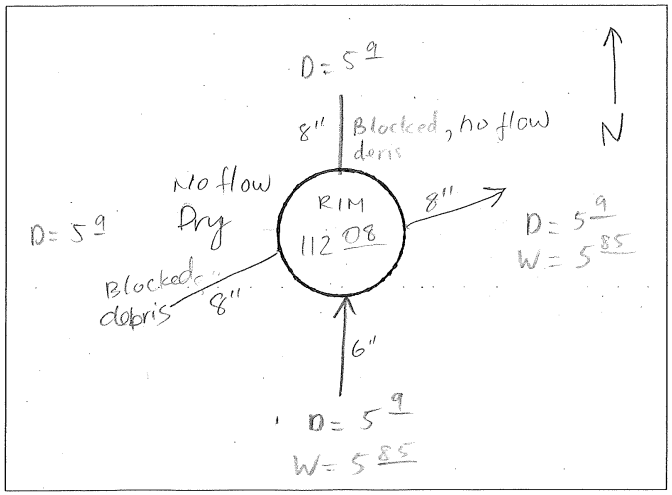
Name of Field Observer(s): CL & KT

MH Number: S13-27

Street/Intersection: Kiely @ Forbes

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

All from south into east.

Other Observations:

All VCP

K:\Engineering\Draft\AutoCAD\Surveys\Field Photos\Field Data Verification Form.doc

Field Verification

Date: 3/2/23 Time: 2:30 pm Weather: (Dry)/Rain

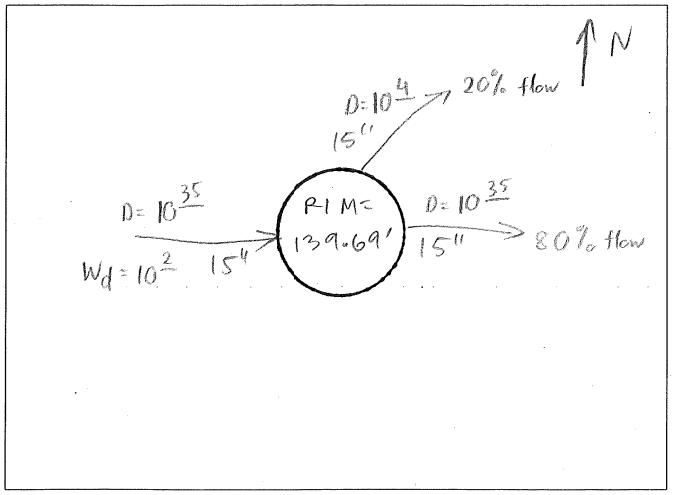
Name of Field Observer(s): CL & KT (CHANH LE EKHOI TRAN)

MH Number: S20-16 West of

Street/Intersection: Homestead Rd @ Kaiser Entrance

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



ELEVATION IS BASED ON NAVD88.
D = INVERT DEPTH
W OR Wd = DEPTH OF WATER LEVEL

Where is most of the flow going out to? Or is the flow evenly split?

80% going W to E
20% to NE

Other Observations:

Wd = 10 2 VCP
Fast flow

Field Verification

Date: 4/5/23 Time: 2:45 pm Weather: (Dry)/Rain

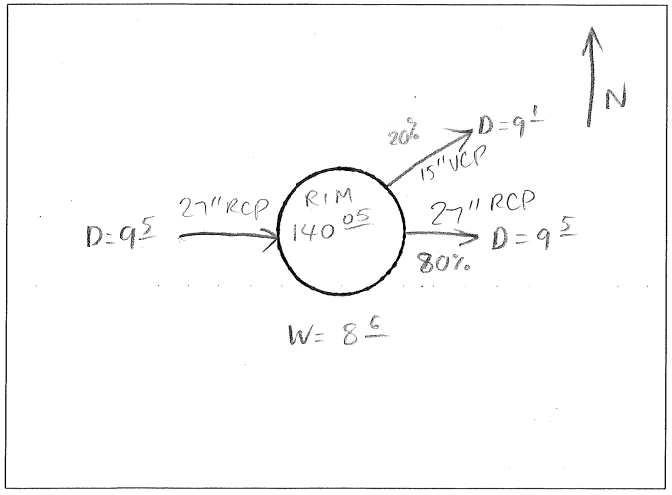
Name of Field Observer(s): CL & KT

MH Number: S 20-9

Street/Intersection: Homestead @ Swallow

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:

Field Verification

Date: 4/5/23 Time: 2:30 pm Weather: (Dry)/Rain

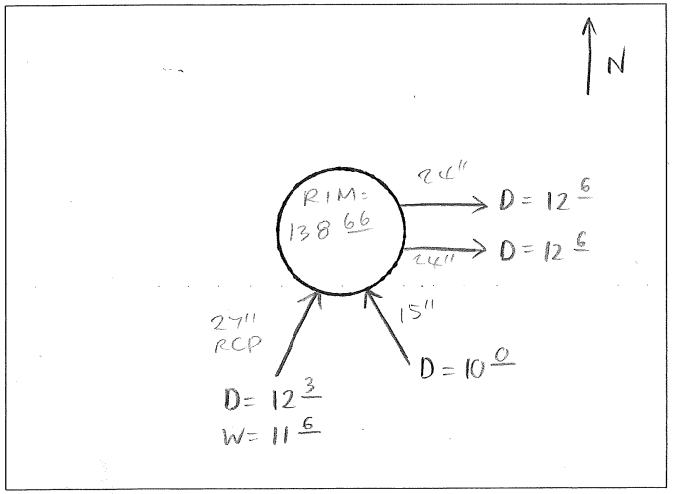
Name of Field Observer(s): CL & KT

MH Number: S 20-26

Street/Intersection: Homestead @ West of Kaiser Entrance

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:

Field Verification

Date: 3/2/23 Time: 2:45 pm Weather: (Dry)/Rain

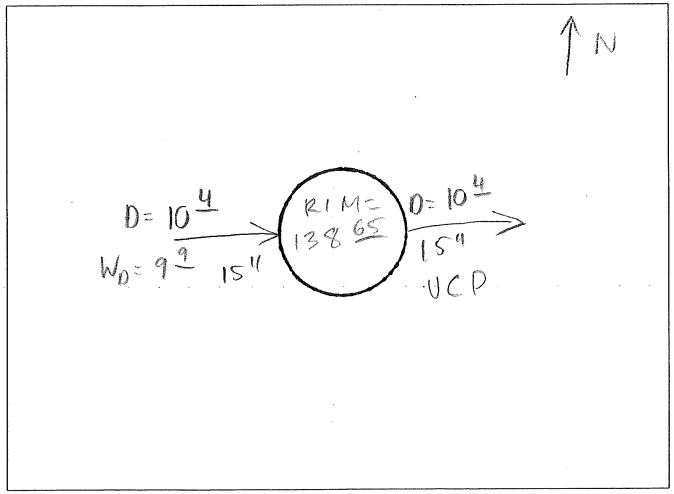
Name of Field Observer(s): CL & KT

MH Number: S 20-17

Street/Intersection: Homestead @ Kaiser Entrance

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:
VCP

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Field Verification

Date: 3/20/23 Time: 11:15 am Weather: Dry/Rain

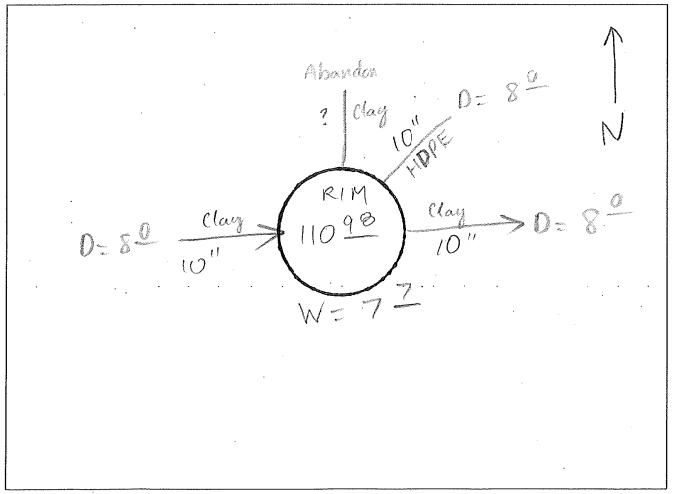
Name of Field Observer(s): CL & KT

MH Number: S22-64

Street/Intersection: Homestead @ Saratoga Creek

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:

Field Verification

Date: 4/5/23 Time: 3 pm Weather: Dry/Rain

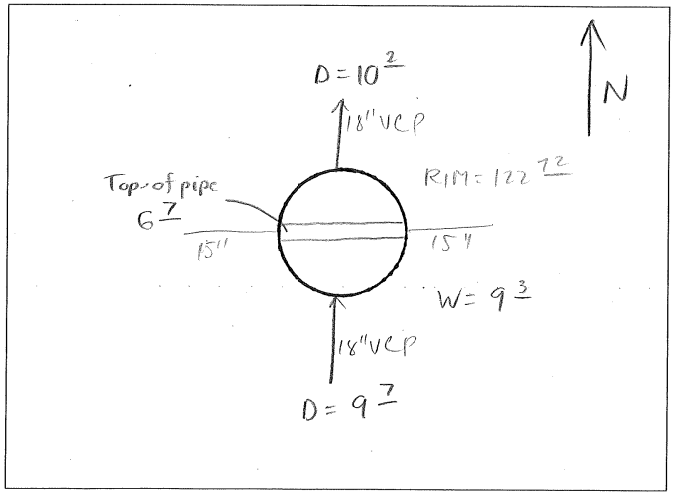
Name of Field Observer(s): CL & KT

MH Number: S22-55

Street/Intersection: Homestead @ Pomeroy

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:

All VCP

Field Verification

Date: 3/20/23 Time: 11:30 am Weather: (Dry)/Rain

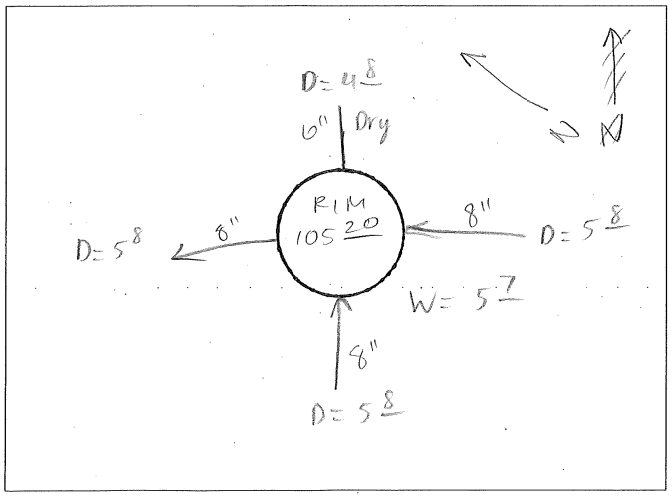
Name of Field Observer(s): CL & KT

MH Number: S23-51

Street/Intersection: Kiely @ Barcell

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

flow all goes west

Other Observations:

All VCP

Field Verification

Date: 3/27/23 Time: 10 am Weather: (Dry)/Rain

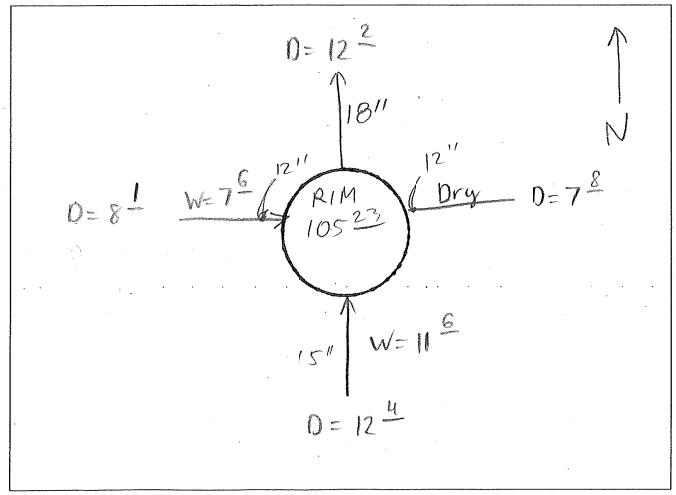
Name of Field Observer(s): CL & KT

MH Number: S23-27

Street/Intersection: Homestead @ Kiely

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Can't tell how flow is split.

Other Observations:

Field Verification

Date: 3/20/23 Time: 1:45 pm Weather: (Dry)/Rain

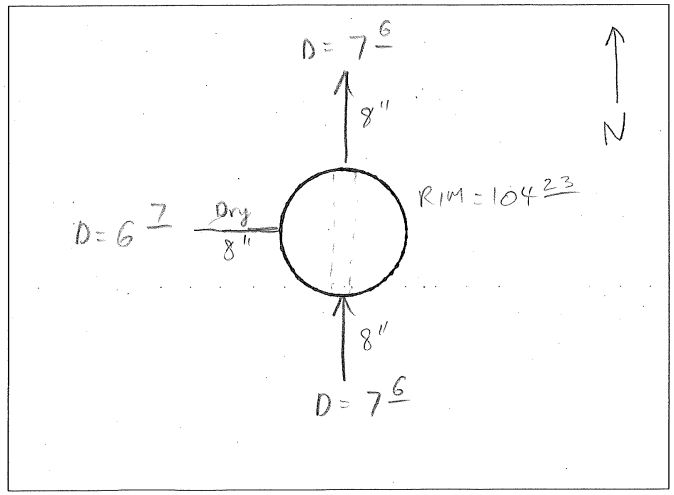
Name of Field Observer(s): CL & KT

MH Number: S26 - 70

Street/Intersection: Newhall @ N. Winchester

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:
W = 7 4
All VCP

Field Verification

Date: 4/6/23 Time: 9:15 am Weather: (Dry)/Rain

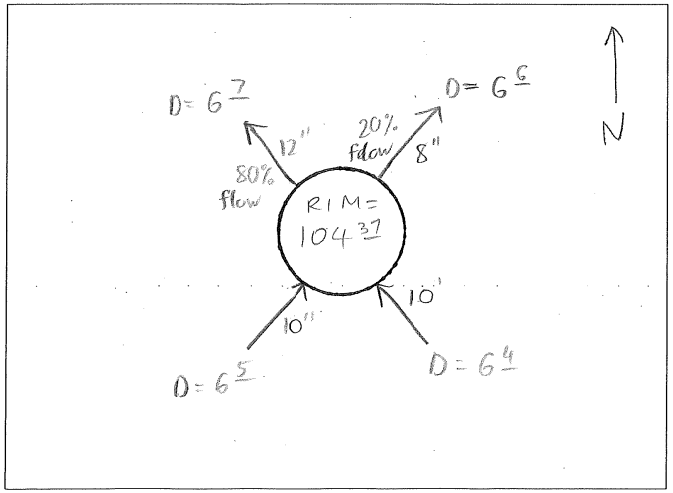
Name of Field Observer(s): CL & KT

MH Number: S25-85

Street/Intersection: Los Padres @ Saratoga

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:
W = 6 2
All VCP

Field Verification

Date: 3/20/23 Time: 11:45 am Weather: (Dry)/Rain

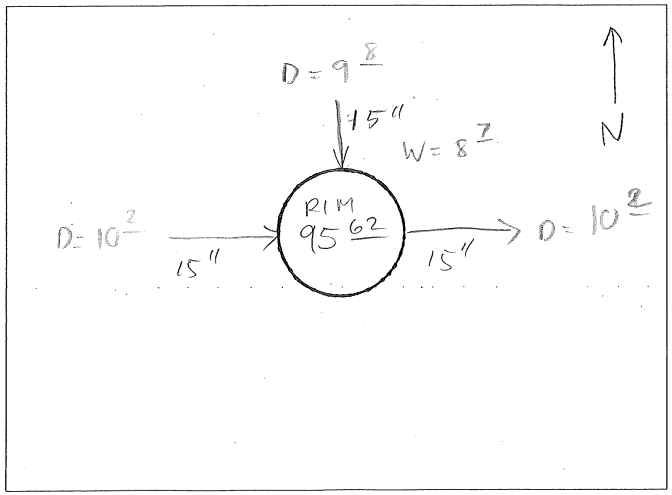
Name of Field Observer(s): CL & KT

MH Number: S32 - 101

Street/Intersection: Pomeroy @ El Sobrante

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

most flow goes to the east

Other Observations:

All VCP

Field Verification

Date: 4/5/23 Time: 3:15 pm Weather: (Dry)/Rain

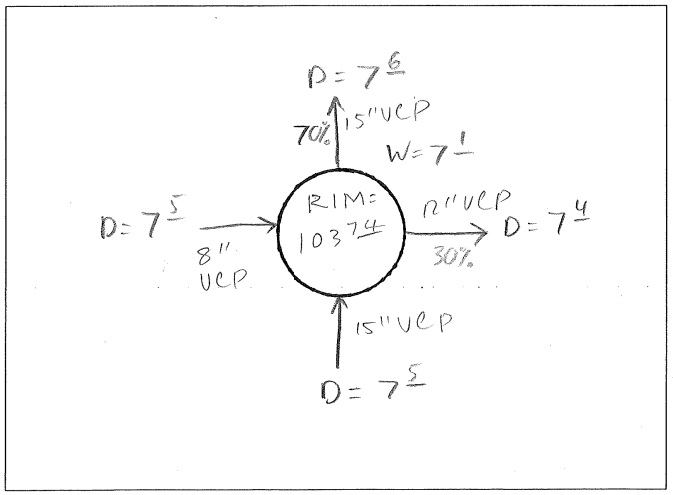
Name of Field Observer(s): CL & KT

MH Number: S 32 - 68

Street/Intersection: Benton @ Pomeroy

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:

K:\Engineering\Draft\AutoCAD\Surveys\Field Photos\Field Data Verification Form.doc

Field Verification

Date: 3/17/23 Time: 11:15 am Weather: Dry/Rain

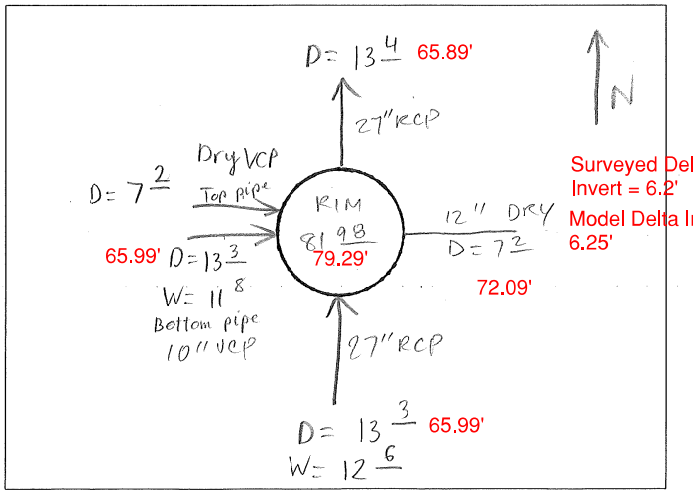
Name of Field Observer(s): CL & KT

MH Number: S33-5

Street/Intersection: ECR @ Kiely

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:

Field Verification

Date: 3/20/23 Time: 11:50 am Weather: Dry/Rain

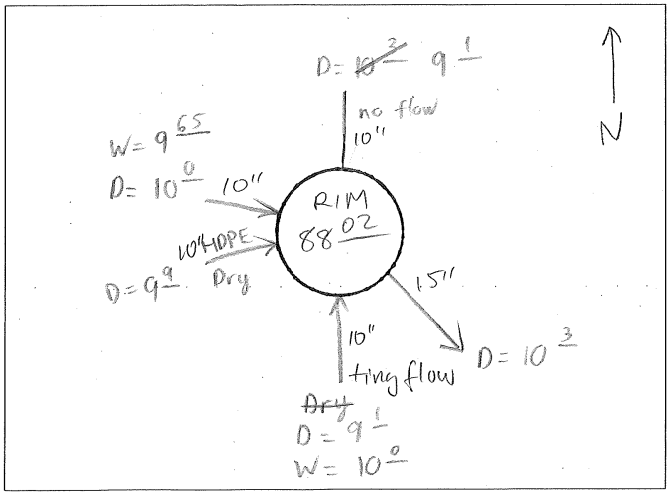
Name of Field Observer(s): CL & KT

MH Number: S32-102

Street/Intersection: Calabazas @ ECR

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:
All 100% flow from north western pipe to south eastern pipe

Field Verification

Date: 3/20/23 Time: 9:45 am Weather: (Dry)/Rain

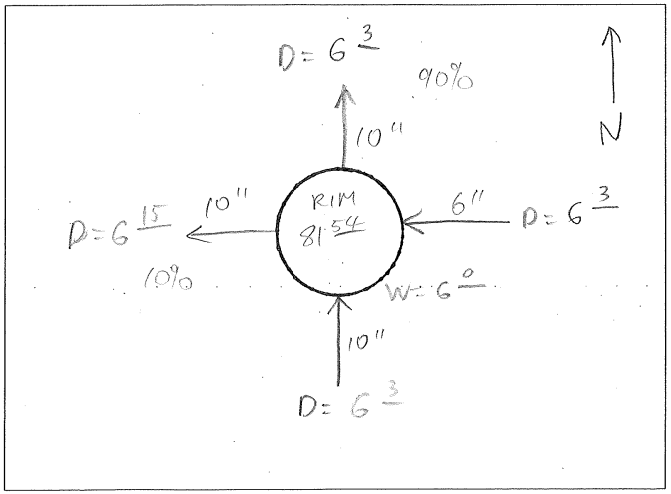
Name of Field Observer(s): CL & KT

MH Number: S35-25

Street/Intersection: Scott @ Clay

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?
most flows to north (90%).

Other Observations:
All VCP

Field Verification

Date: 3/17/23 Time: 11:30 am Weather: (Dry)/Rain

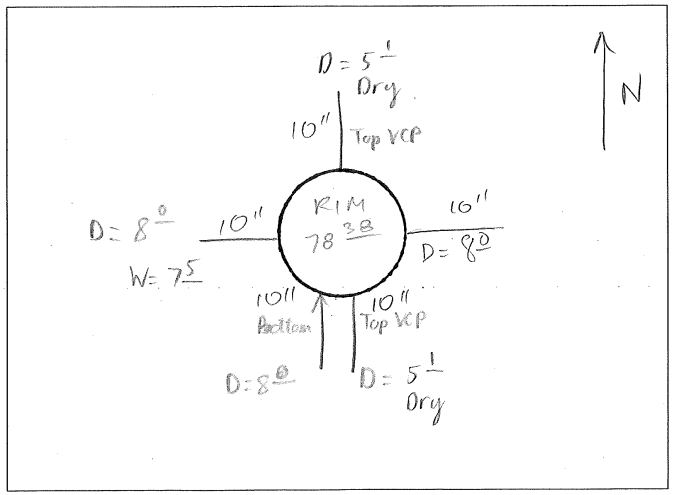
Name of Field Observer(s): CL & KT

MH Number: S35-17

Street/Intersection: ECR @ Scott

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:

Field Verification

Date: 4/6/23 Time: 9:30 am Weather: (Dry)/Rain

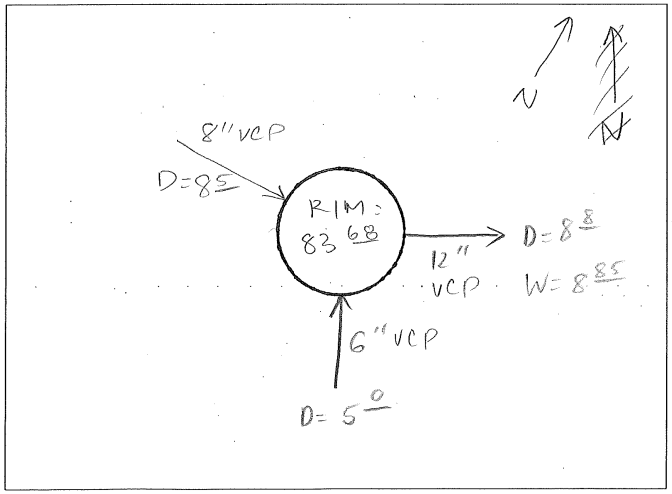
Name of Field Observer(s): CL & KT

MH Number: S 37-49

Street/Intersection: Monroe @ Homestead

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:
All VCP

Field Verification

Date: 3/20/23 Time: 9:30 am Weather: (Dry)/Rain

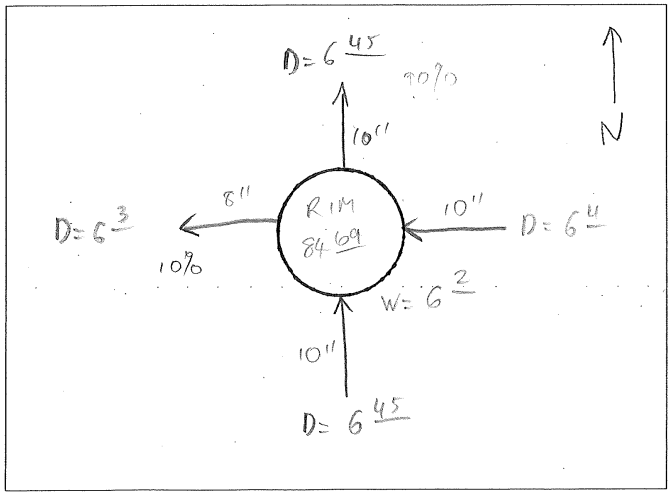
Name of Field Observer(s): CL & KT

MH Number: S 35-42

Street/Intersection: Scott @ Harrison

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?
most flow goes north (90%).

Other Observations:
All VCP

Field Verification

Date: 3/17/23 Time: 10:45 am Weather: (Dry)/Rain

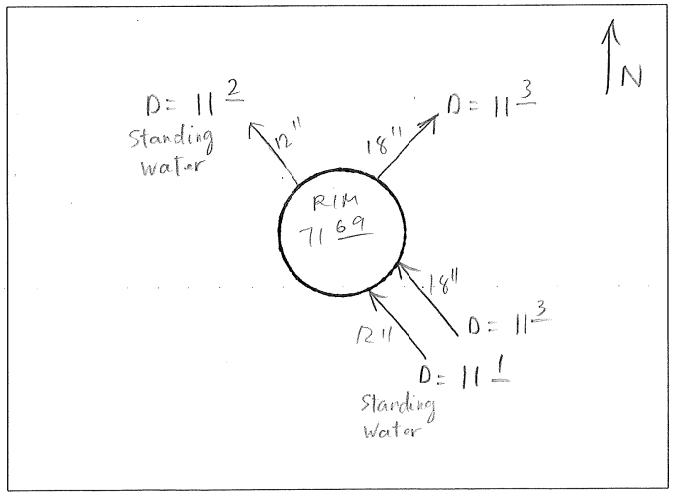
Name of Field Observer(s): CL & KT

MH Number: S38 - 4

Street/Intersection: The Alameda @ Benton

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Most flow from 18" SE to 18" NE.
12" SE to 12" NW seems to have standing water or slow moving

Other Observations:

All VCP
W = 10 95

Field Verification

Date: 3/20/23 Time: 9:15 am Weather: (Dry)/Rain

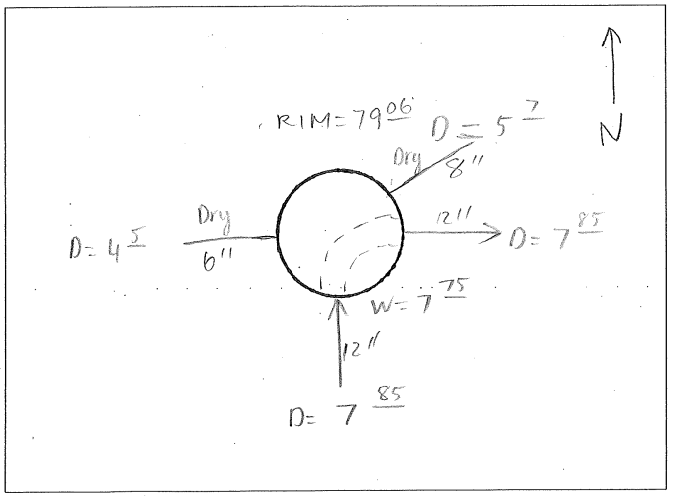
Name of Field Observer(s): CL & KT

MH Number: S37 - 90

Street/Intersection: Monroe @ Benton

Manhole sketch:

Draw all inlet and cutlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:

All VCP

Field Verification

Date: 3/17/23 Time: 11 am Weather: (Dry)/Rain

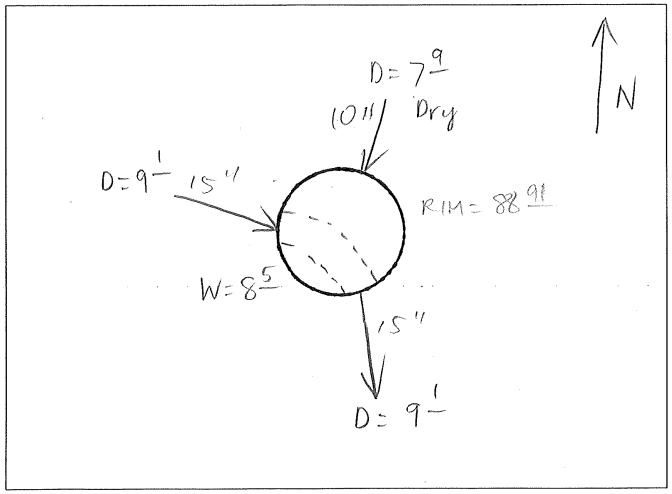
Name of Field Observer(s): CL & KT

MH Number: S 42 - 125

Street/Intersection: ECR @ Calabazas

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:
All VCP

Field Verification

Date: 4/5/23 Time: 3:20 pm Weather: (Dry)/Rain

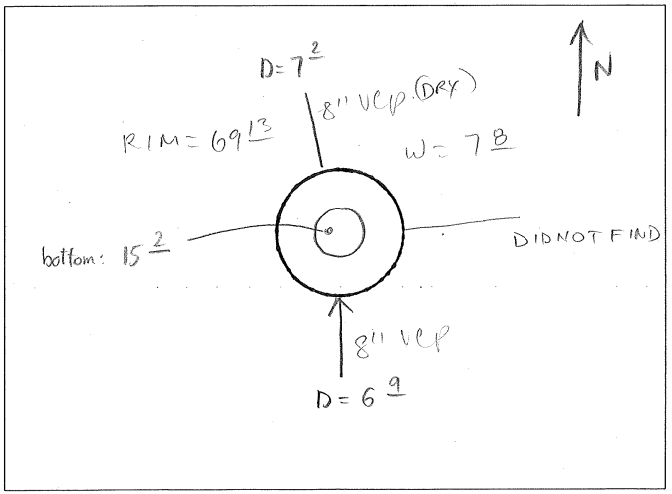
Name of Field Observer(s): CL & KT

MH Number: S 42 - 30

Street/Intersection: Calabazas @ Cabrillo

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:

Field Verification

Date: 3/17/23 Time: 10 am Weather: (Dry)/Rain

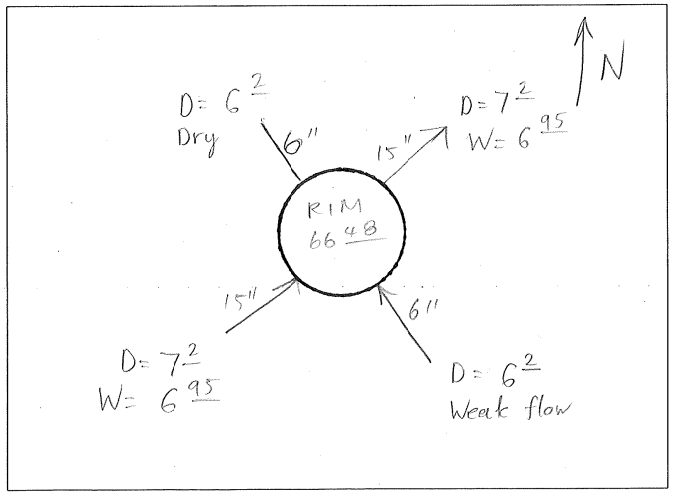
Name of Field Observer(s): CL & KT

MH Number: S47-77

Street/Intersection: Lafayette @ ECR

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:
All VCP

Field Verification

Date: 3/17/23. Time: 10:20 am Weather: (Dry)/Rain

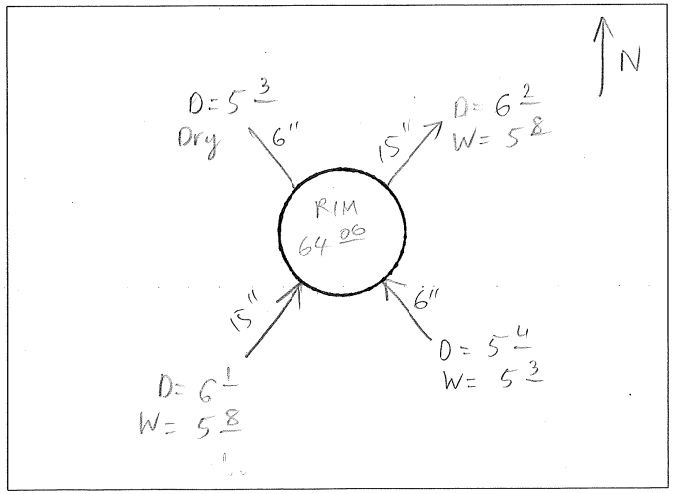
Name of Field Observer(s): CL & KT

MH Number: S47-60

Street/Intersection: ECR @ Alviso St

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:
All VCP

Field Verification

Date: 3/20/23 Time: 2 pm Weather: (Dry)/Rain

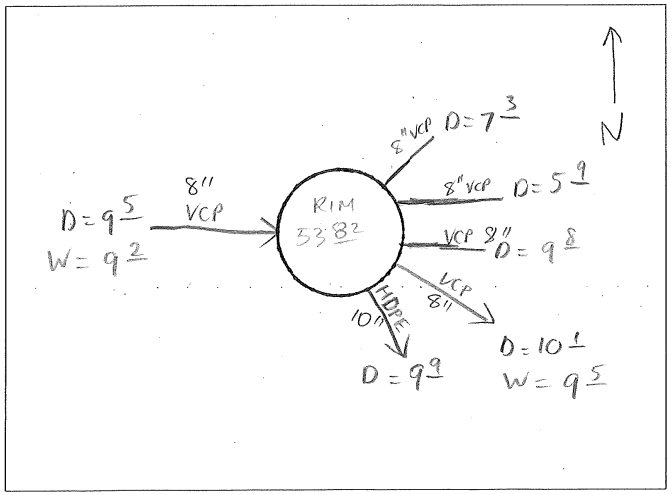
Name of Field Observer(s): CL & KT

MH Number: S52-05

Street/Intersection: Agate @ Calabazas Creek

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Most flow goes out to the VCP pipe

Other Observations:

Field Verification

Date: 3/17/23 Time: 9:45 am Weather: (Dry)/Rain

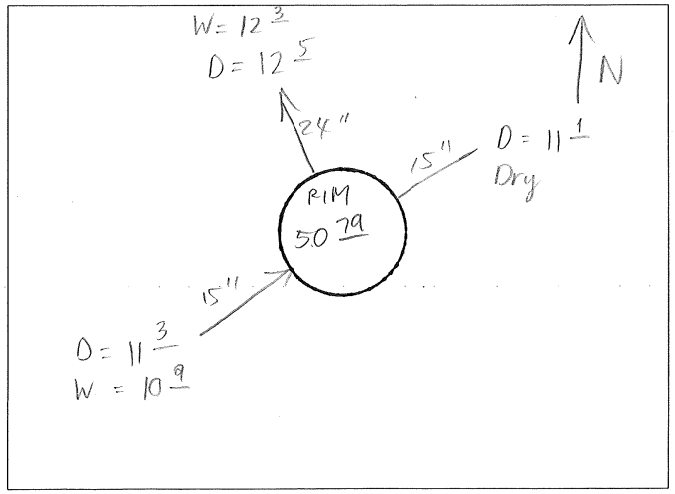
Name of Field Observer(s): CL & KT

MH Number: S48 - 2

Street/Intersection: De La Cruz @ Reed

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

All flow S/E to N/W.

Other Observations:

Field Verification

Date: 3/20/23 Time: 2:35 pm Weather: (Dry)/Rain

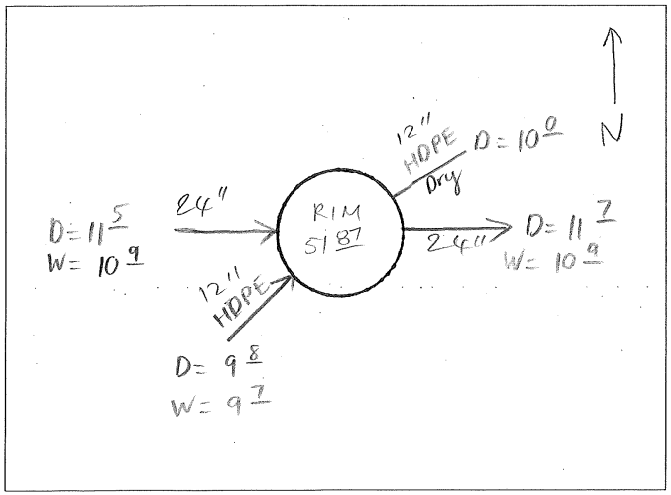
Name of Field Observer(s): CL & KT

MH Number: S53-110

Street/Intersection: Chromite @ East of Cortez

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:

Field Verification

Date: 3/2/23 Time: 3:15 pm Weather: (Dry)/Rain

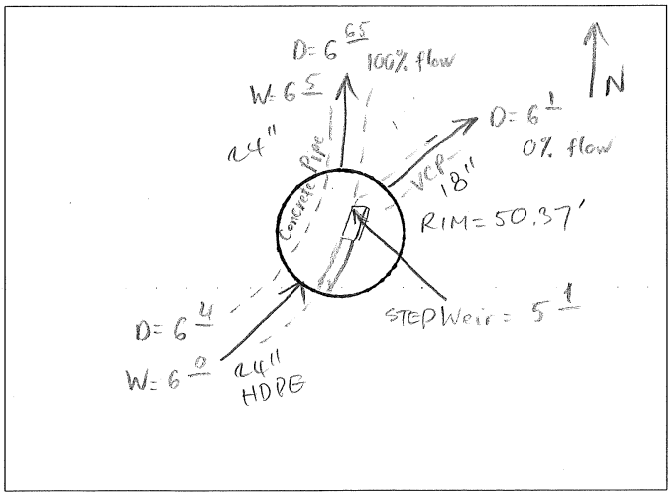
Name of Field Observer(s): CL & KT

MH Number: S53-105

Street/Intersection: Chromite @ East Pilot Knob

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

flow goes from SW to N

No flow goes into VCP

Other Observations:

K:\Engineering\Draft\AutoCAD\Surveys\Field Photos\Field Data Verification Form.doc

Field Verification

Date: 4/6/23 Time: 10:15 am Weather: (Dry)/Rain

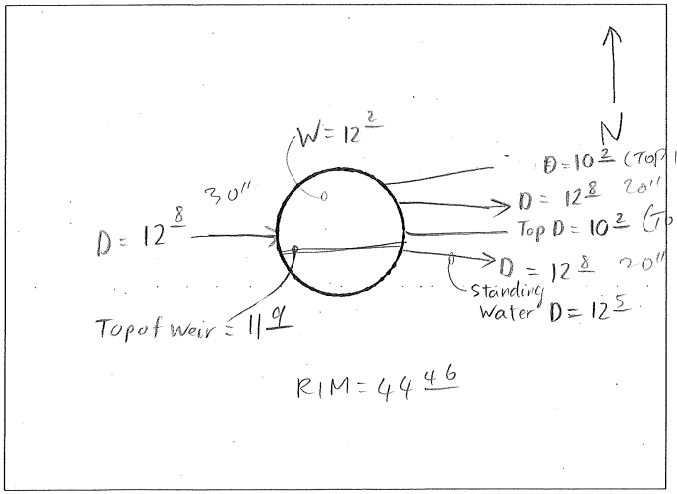
Name of Field Observer(s): CL & KT

MH Number: S55-51

Street/Intersection: Walsh @ Scott

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:

Field Verification

Date: 4/5/23 Time: 4:15 pm Weather: (Dry)/Rain

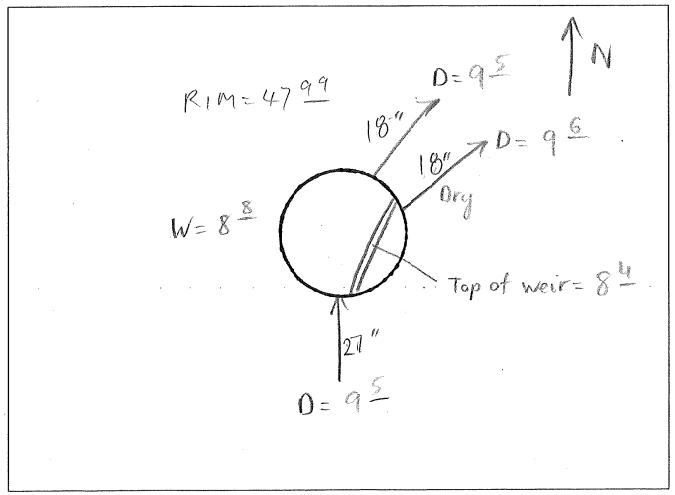
Name of Field Observer(s): CL & KT

MH Number: S54-94

Street/Intersection: Parking lot South of Walsh

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:

Field Verification

Date: 4/6/23 Time: 9:45 am Weather: (Dry)/Rain

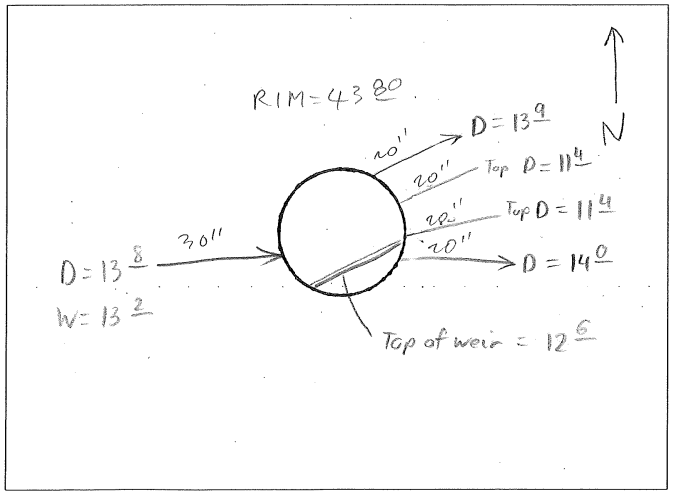
Name of Field Observer(s): CL & KT

MH Number: S56-58

Street/Intersection: Walsh @ Lafayette

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:
ALL PIPES = HPPE

Field Verification

Date: 4/6/23 Time: 10 am Weather: (Dry)/Rain

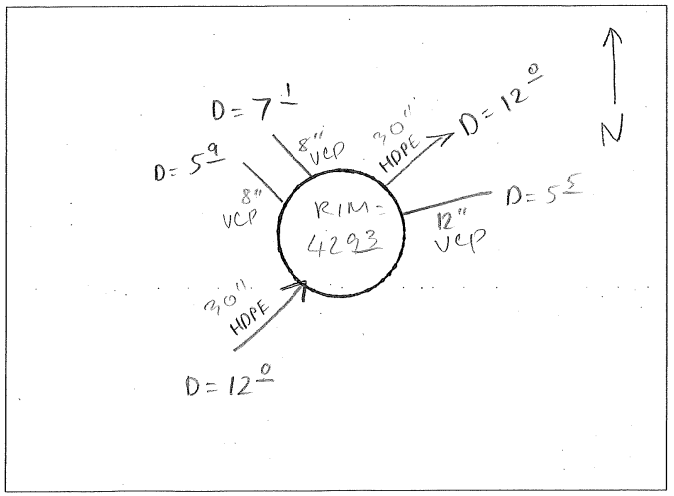
Name of Field Observer(s): CL & KT

MH Number: S56-02

Street/Intersection: Walsh in front of sub-station

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:
W = 11 1

Field Verification

Date: 3/17/23 Time: 9:30 am Weather: (Dry)/Rain

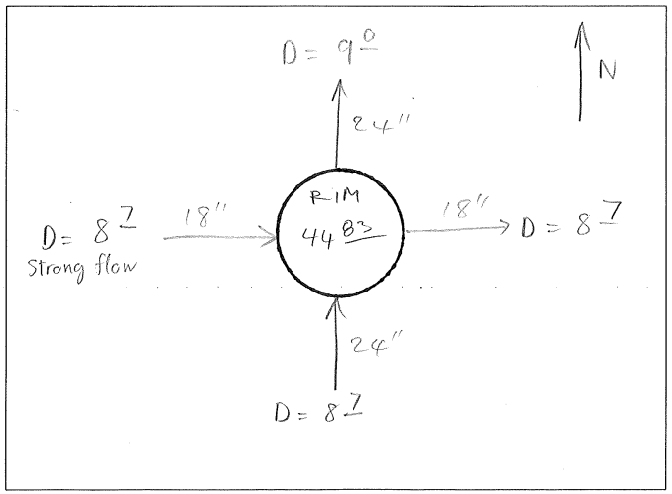
Name of Field Observer(s): CL & KT

MH Number: 558-21

Street/Intersection: De la Cruz @ Mathew

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?
Mostly going out to north pipe

Other Observations:
W_D = 8 1

Field Verification

Date: 3/17/23 Time: 9 am Weather: (Dry)/Rain

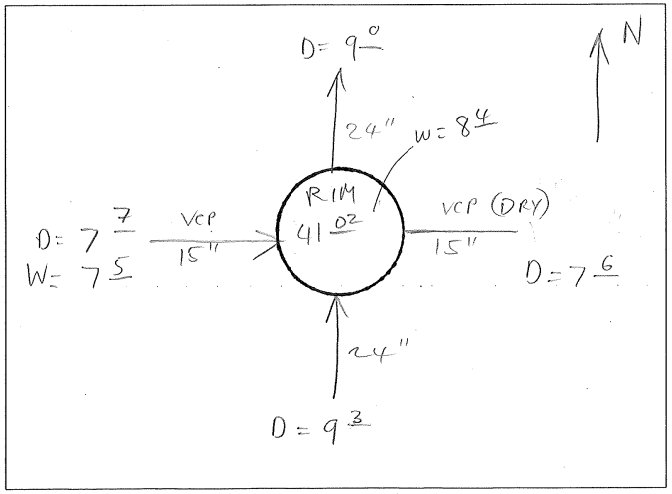
Name of Field Observer(s): CL & KT

MH Number: 558-12

Street/Intersection: De la Cruz @ Martin

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:

Field Verification

Date: 3/17/23 Time: 2 pm Weather: (Dry)/Rain

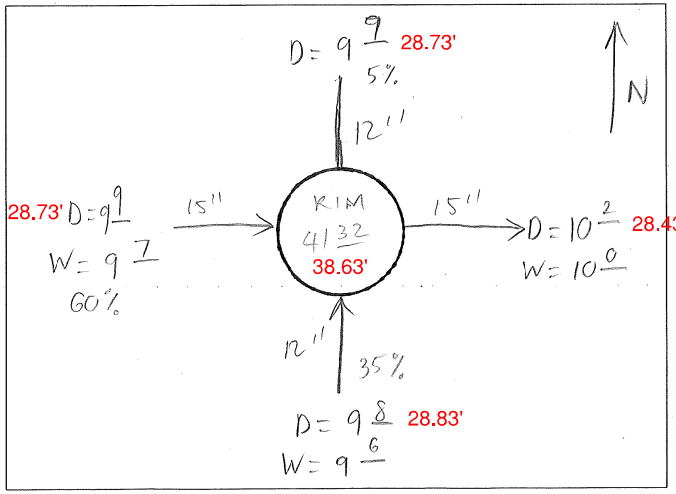
Name of Field Observer(s): CL & KT

MH Number: SG2-11

Street/Intersection: Corrin @ Central

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:
All VCP

Field Verification

Date: 3/17/23 Time: 2:15 pm Weather: (Dry)/Rain

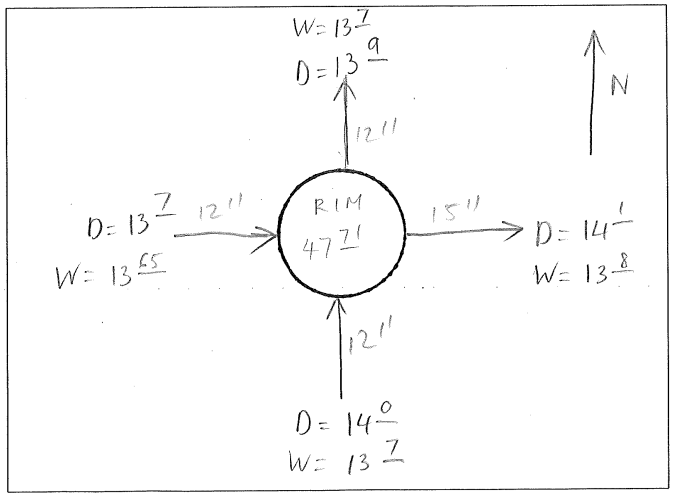
Name of Field Observer(s): CL & KT

MH Number: SG1 - 16

Street/Intersection: Central Expy

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?
strong flow: west to east.
weak flow from south.

Other Observations:
All VCP

Field Verification

Date: 3/6/23 Time: 3:00 pm Weather: (Dry)/Rain

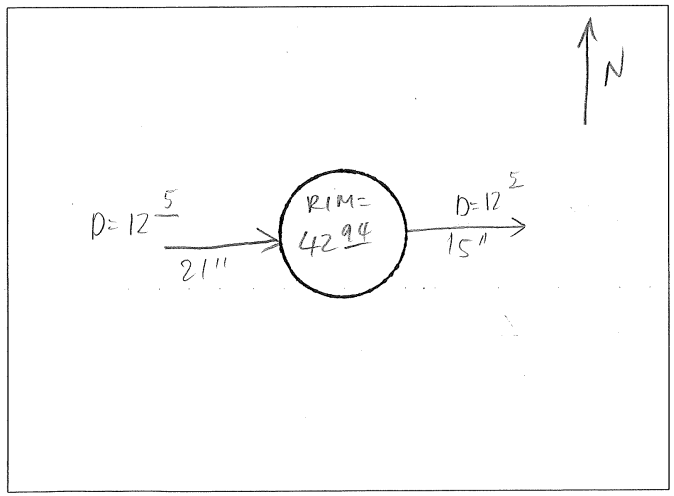
Name of Field Observer(s): CL & KT

MH Number: S62 - 7

Street/Intersection: Central Expwy @ Calabazas Creek

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:

All VCP
W_D = 12 6/8

Field Verification

Date: 3/6/23 Time: 2:45 pm Weather: (Dry)/Rain

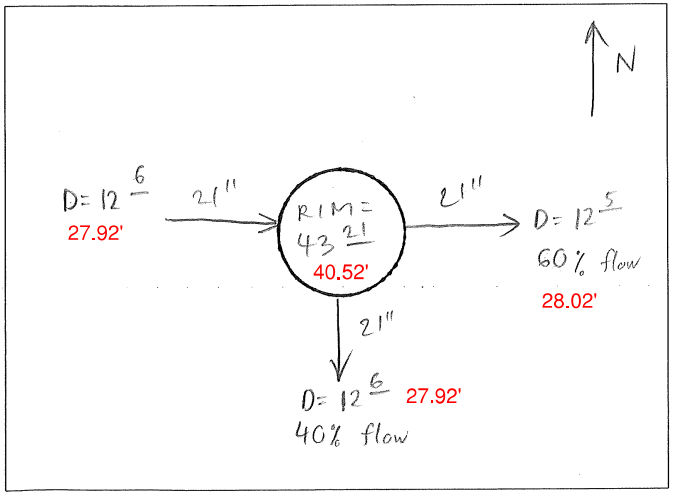
Name of Field Observer(s): CL & KT

MH Number: S62 - 6

Street/Intersection: Central Expwy @ Calabazas Creek

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Most flow goes east

Other Observations:

W_D = 12 4/8 28.12'

All VCP

Field Verification

Date: 3/17/23 Time: 1:45 pm Weather: (Dry)/Rain

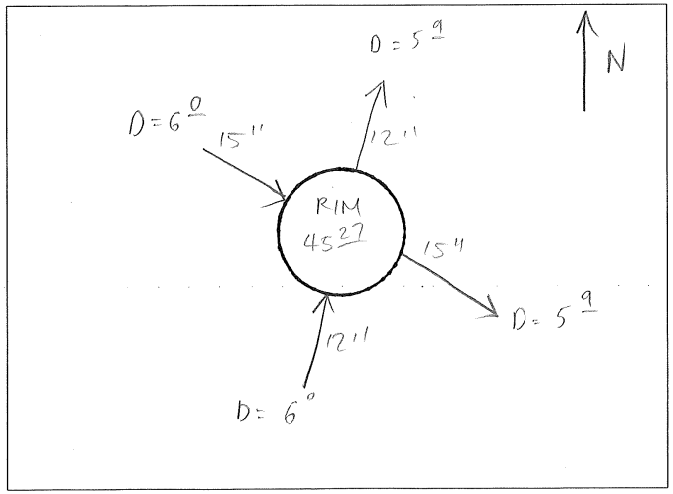
Name of Field Observer(s): CL & KT

MH Number: SG4 - 32

Street/Intersection: Walsh @ Northwestern

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:

All VCP
W = 5 85

Field Verification

Date: 3/6/23 Time: 3:15 pm Weather: Dry/Rain

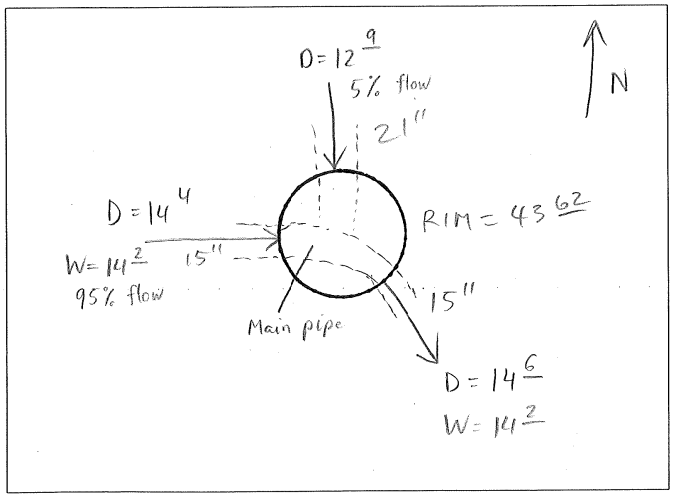
Name of Field Observer(s): CL & KT

MH Number: SG2 - 8

Street/Intersection: Central Expwy @ Calabazas Creek

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:

All VCP

Field Verification

Date: 4/5/23 Time: 3:45 pm Weather: (Dry)/Rain

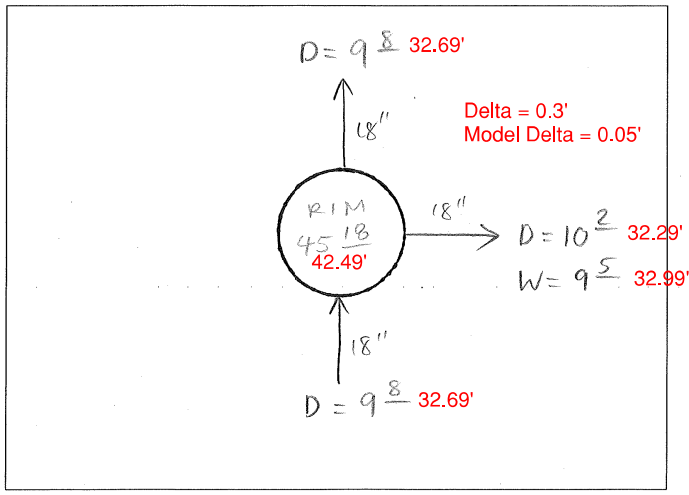
Name of Field Observer(s): CL & KT

MH Number: S64-46

Street/Intersection: San Tomas Expy

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

70% North

30% East

Other Observations:

All VCP

Field Verification

Date: 4/5/23 Time: 4 pm Weather: (Dry)/Rain

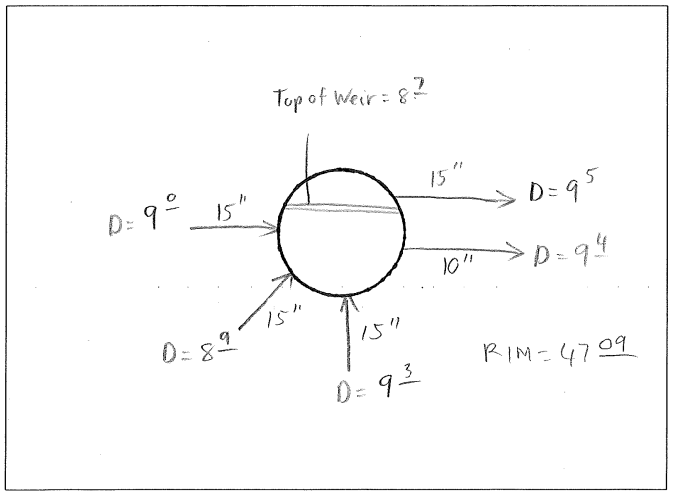
Name of Field Observer(s): CL & KT

MH Number: S64-34

Street/Intersection: San Tomas Creek trail North of Walsh

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:

W_D = 8 9/9

All VCP

Field Verification

Date: _____ Time: _____ Weather: Dry/Rain

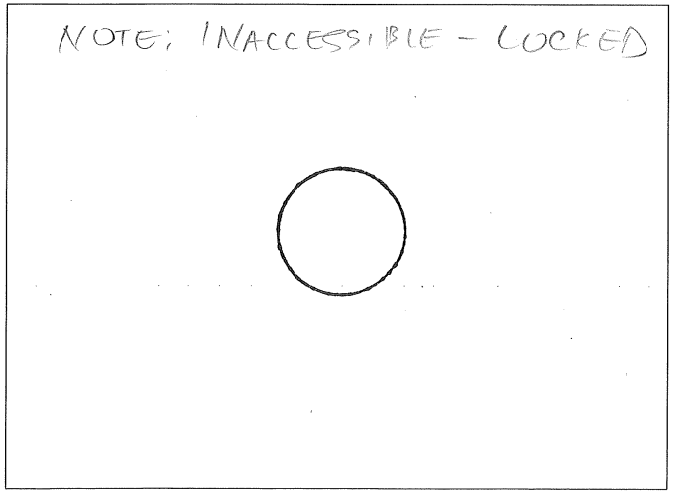
Name of Field Observer(s): _____

MH Number: S68-9

Street/Intersection: _____

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:

Field Verification

Date: 3/3/23 Time: 11:15 am Weather: (Dry)/Rain

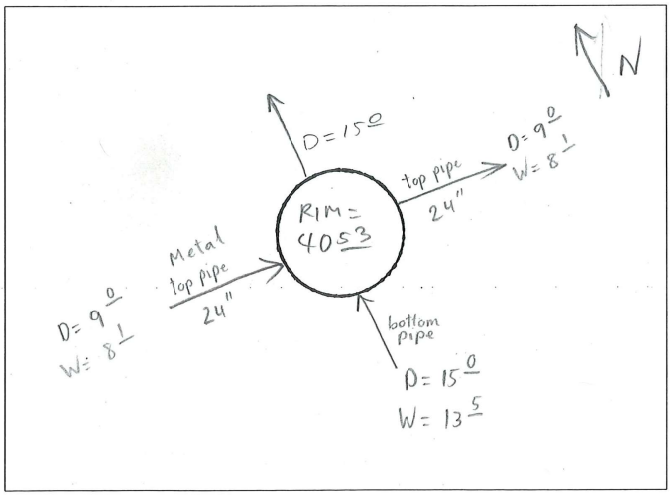
Name of Field Observer(s): CL & KT

MH Number: S65-30

Street/Intersection: Central Expwy @ ~~North~~ East of Scott Blvd

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:
top pipe obstructs the view of the bottom pipe

Field Verification

Date: 3/17/23 Time: 3:30 pm Weather: (Dry)/Rain

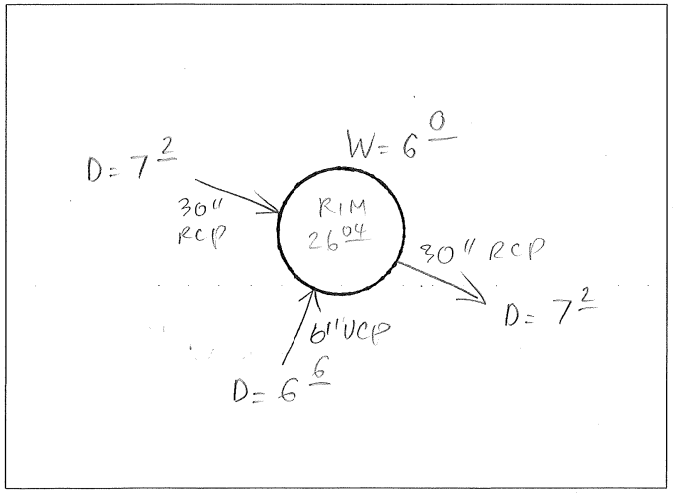
Name of Field Observer(s): CL & KT

MH Number: S72-3

Street/Intersection: Lakeside

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:

Field Verification

Date: _____ Time: _____ Weather: Dry/Rain

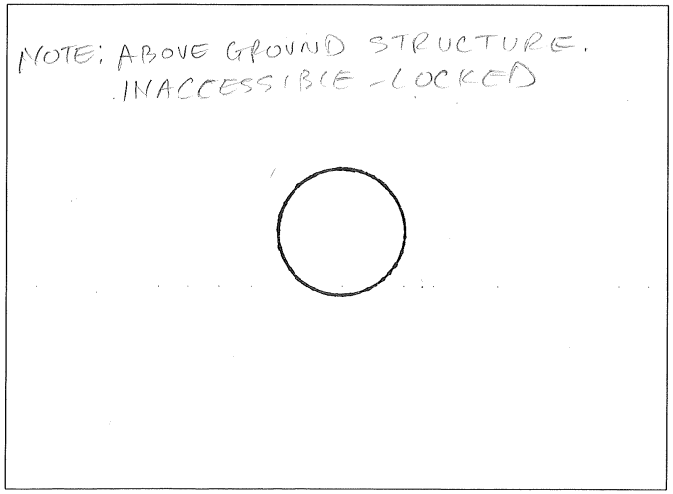
Name of Field Observer(s): _____

MH Number: S68-10

Street/Intersection: _____

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:

Field Verification

Date: 3/17/23 Time: 3:15 pm Weather: (Dry)/Rain

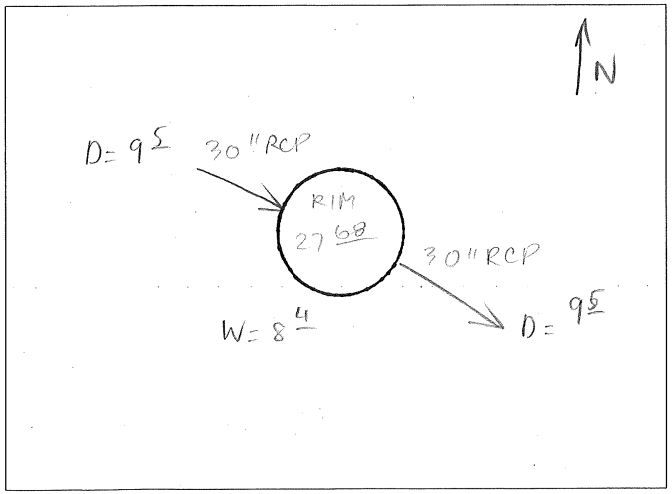
Name of Field Observer(s): CL & KT

MH Number: S72-5

Street/Intersection: Lakeside @ E of Peterson

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:

Field Verification

Date: 3/17/23 Time: 3:20 pm Weather: (Dry)/Rain

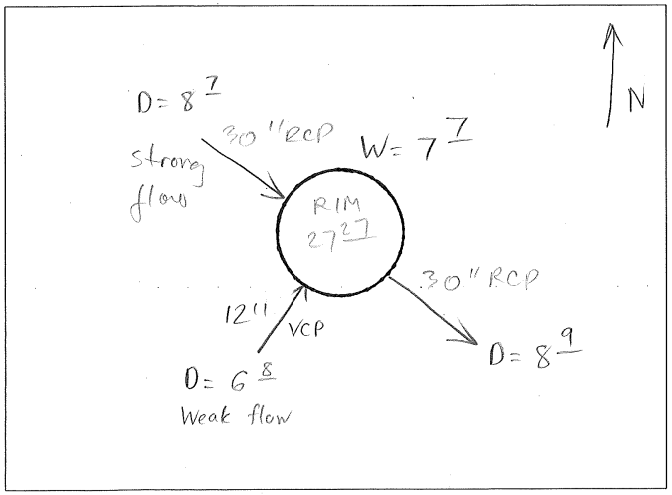
Name of Field Observer(s): CL & KT

MH Number: S72-4

Street/Intersection: Lakeside @ Peterson

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:

Field Verification

Date: 3/17/23 Time: 3:50 pm Weather: (Dry)/Rain

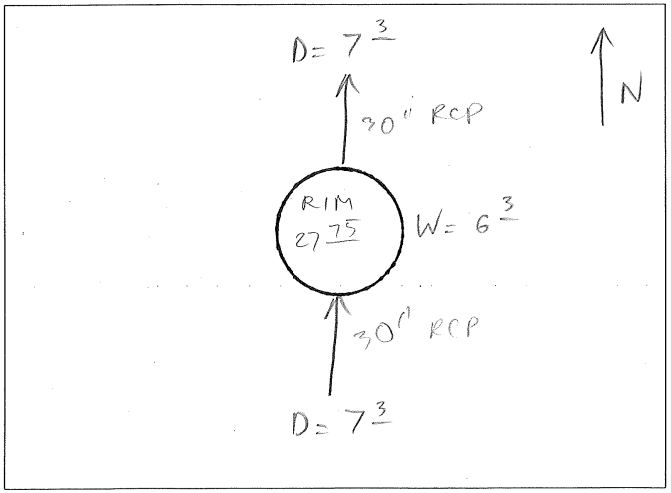
Name of Field Observer(s): CL & KT

MH Number: S72-7

Street/Intersection: Calabazas Creek

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:

Field Verification

Date: 3/17/23 Time: 3:45 pm Weather: (Dry)/Rain

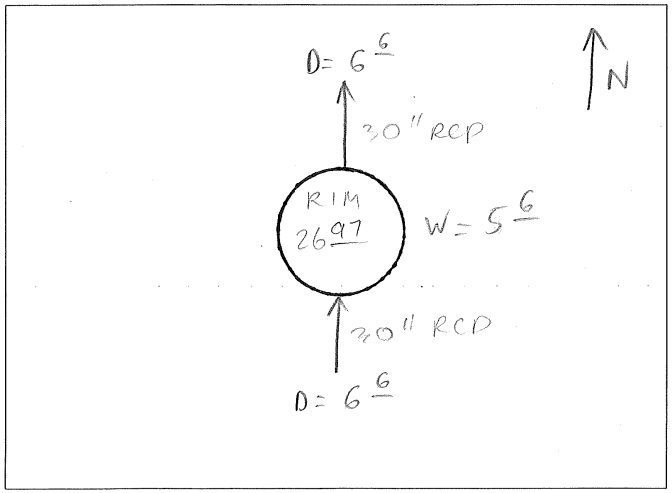
Name of Field Observer(s): CL & KT

MH Number: S72-6

Street/Intersection: Calabazas Creek

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:

Field Verification

Date: 3/17/23 Time: 3:55 pm Weather: (Dry)/Rain

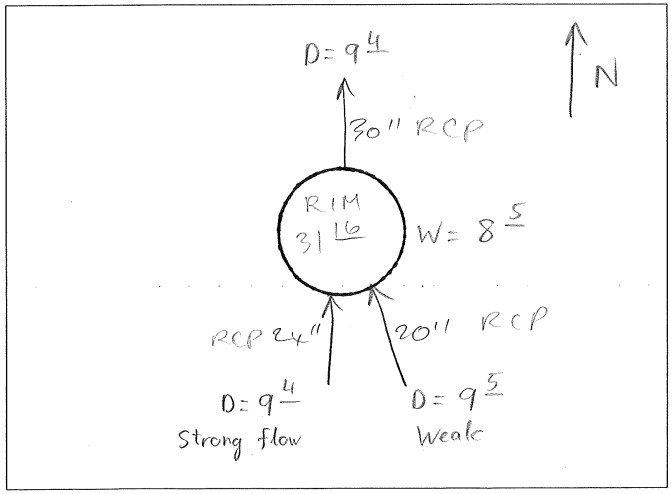
Name of Field Observer(s): CL & KT

MH Number: S72-11

Street/Intersection: Calabazas Creek

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:

Field Verification

Date: 3/17/23 Time: 3:50 pm Weather: (Dry)/Rain

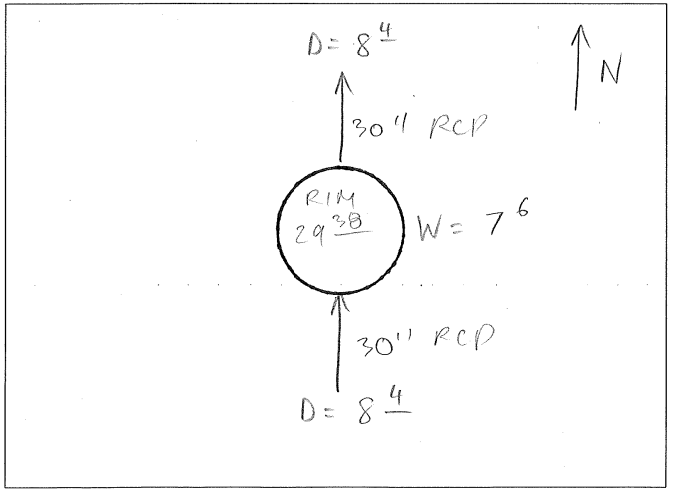
Name of Field Observer(s): CL & KT

MH Number: S72-8

Street/Intersection: Calabazas Creek

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:

Field Verification

Date: 3/17/23 Time: 2:50 pm Weather: (Dry)/Rain

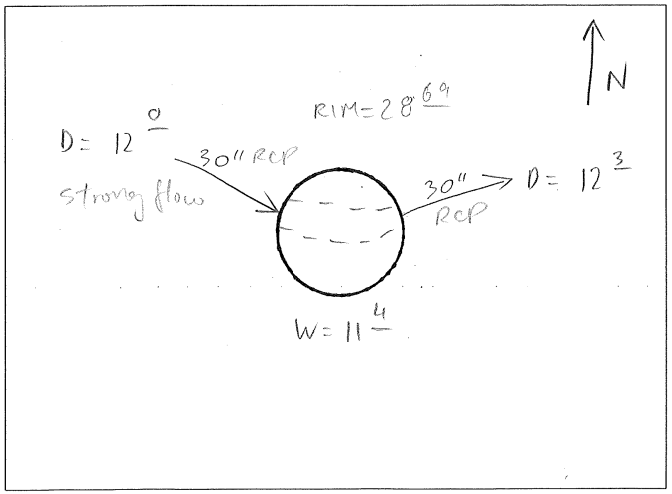
Name of Field Observer(s): CL & KT

MH Number: S73-6

Street/Intersection: Lakeside Dr

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:

Field Verification

Date: 3/17/23 Time: 3 pm Weather: (Dry)/Rain

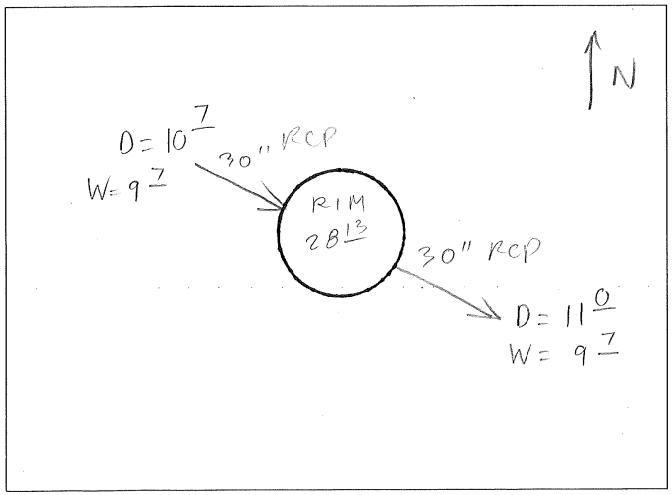
Name of Field Observer(s): CL & KT

MH Number: S73-5

Street/Intersection: Lakeside Rd

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:

K:\Engineering\Draft\AutoCAD\Surveys\Field Photos\Field Data Verification Form.doc

Field Verification

Date: 4/5/23 Time: 2:10 pm Weather: (Dry)/Rain

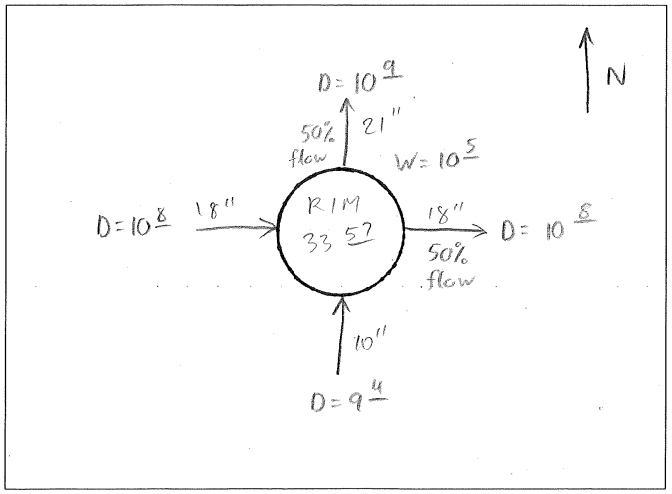
Name of Field Observer(s): CL & KT

MH Number: S 73 - 29

Street/Intersection: Scott @ Lakeside

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow (evenly split)?

Other Observations:
All VCP

Field Verification

Date: 3/17/23 Time: 2:40 pm Weather: (Dry)/Rain

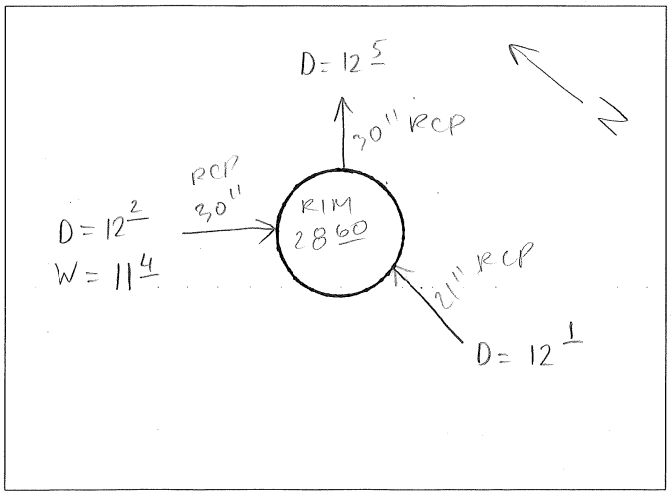
Name of Field Observer(s): CL & KT

MH Number: S73 - 7

Street/Intersection: Lakeside Dr

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?
Most flow goes from NW to NE.

Other Observations:
W = 11 4

K:\Engineering\Draft\AutoCAD\Surveys\Field Photos\Field Data Verification Form.doc

Field Verification

Date: 3/17/23 Time: 3:40 pm Weather: (Dry)/Rain

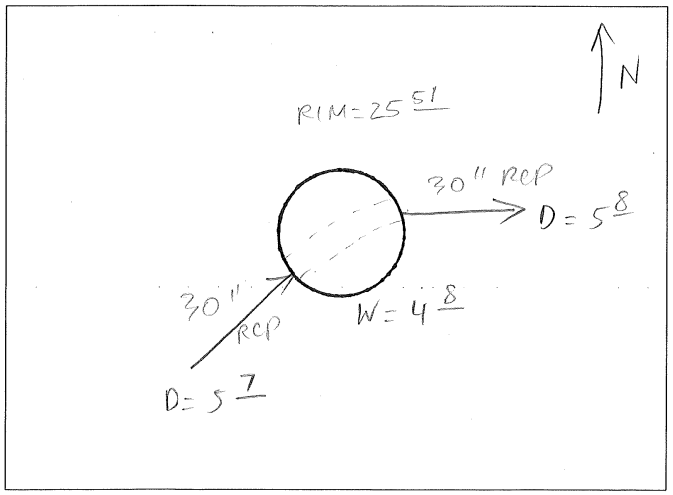
Name of Field Observer(s): CL & KT

MH Number: S82-9

Street/Intersection: Lakeside @ Calabazas Creek

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:

Field Verification

Date: 4/5/23 Time: 2 pm Weather: (Dry)/Rain

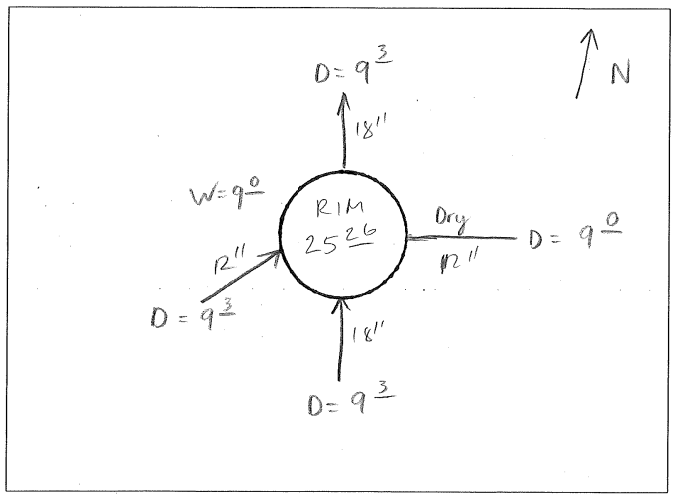
Name of Field Observer(s): CL & KT

MH Number: S 74 - 46

Street/Intersection: Juliette Ln

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:
All VCP

Field Verification

Date: 3/20/23 Time: 3pm Weather: (Dry)/Rain

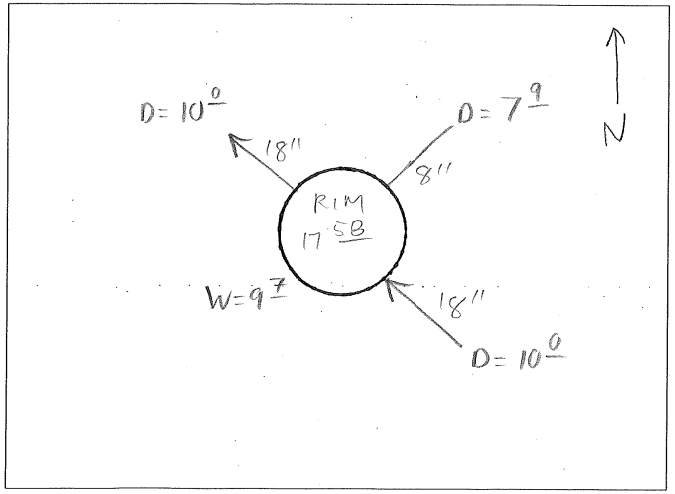
Name of Field Observer(s): CL & KT

MH Number: S 85-9

Street/Intersection: Bassett @ Second St

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:

All VCP

Field Verification

Date: 3/17/23 Time: 3:35 pm Weather: (Dry)/Rain

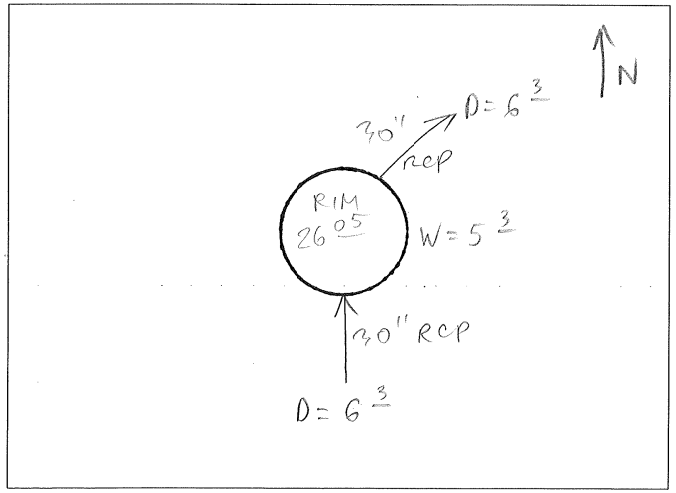
Name of Field Observer(s): CL & KT

MH Number: S 82-10

Street/Intersection: Lakeside @ Calabazas Creek

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:

Field Verification

Date: 3/8/23 Time: 11:10 am Weather: (Dry)/Rain

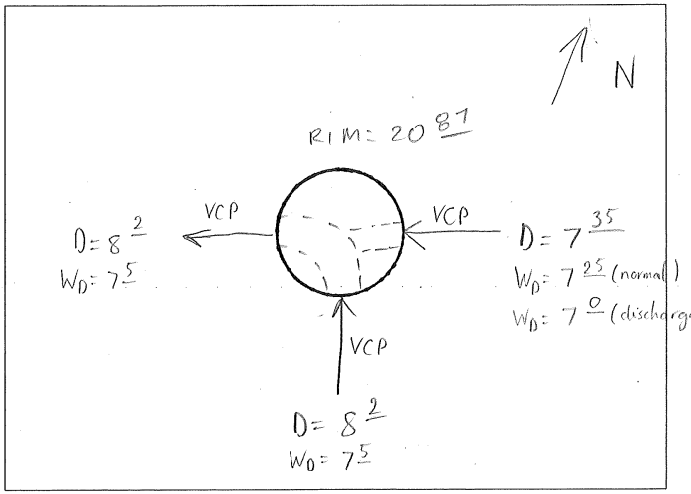
Name of Field Observer(s): CL & KT

MH Number: S87 - 1

Street/Intersection: Della Cruz @ Montague Expwy

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:

Field Verification

Date: 3/20/23 Time: 2:50 pm Weather: (Dry)/Rain

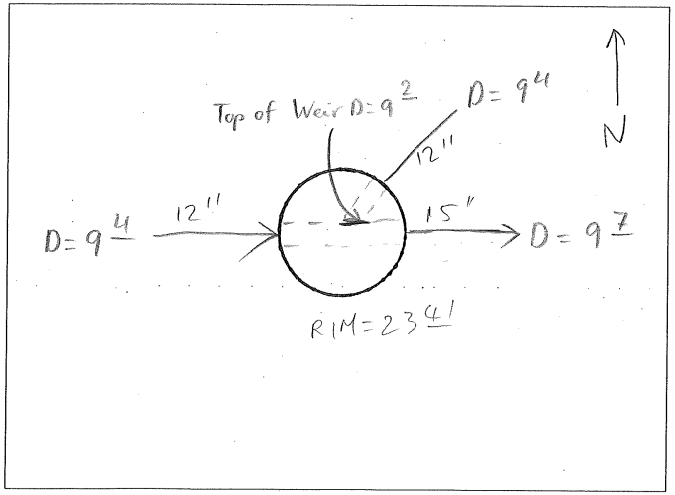
Name of Field Observer(s): CL & KT

MH Number: S85-76

Street/Intersection: MCB @ Burton

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:
W: 9 3

Field Verification

Date: 3/20/23 Time: 3:15 pm Weather: (Dry)/Rain

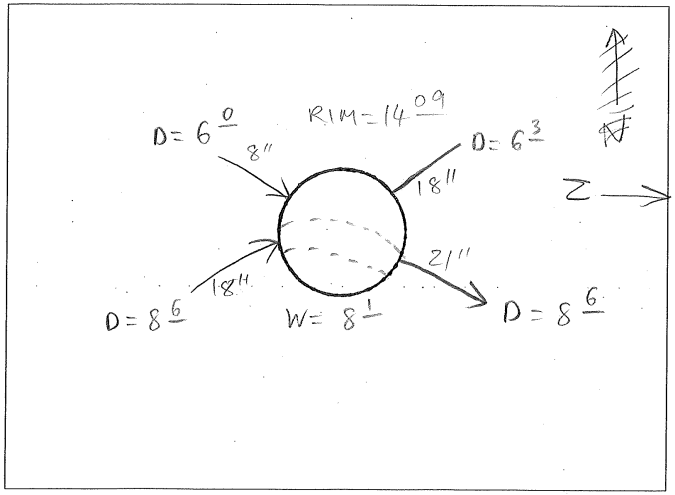
Name of Field Observer(s): CL & KT

MH Number: S95-74

Street/Intersection: Wilcox @ E of Esperanza

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:
All VCP

Field Verification

Date: 3/3/23 Time: 11:45 am Weather: (Dry)/Rain

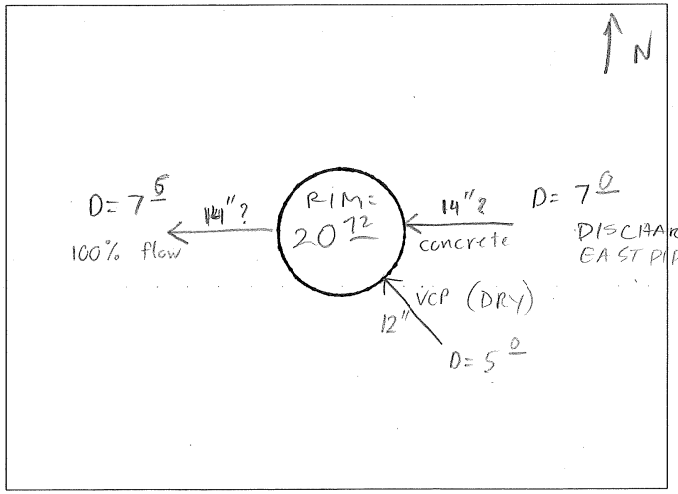
Name of Field Observer(s): CL & KT

MH Number: S87-02

Street/Intersection: De la Cruz Lift Station

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?
Most flow goes from East to West on the concrete pipe

Other Observations:
Water level when discharging is 5 7 and 6 5 when water is standing still

Field Verification

Date: 3/6/23 Time: 2:15 pm Weather: (Dry)/Rain

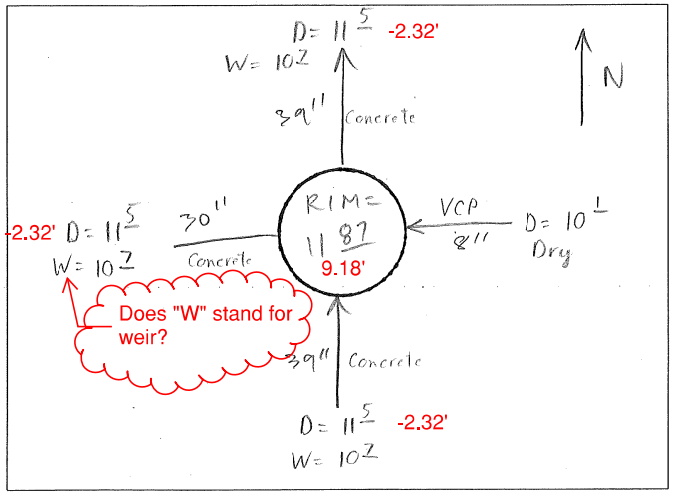
Name of Field Observer(s): CL & KT

MH Number: S103 - 23

Street/Intersection: Great America Pkwy @ Convention Center

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?
flow mostly goes north

Other Observations:

Field Verification

Date: 3/6/23 Time: 2:30 pm Weather: (Dry)/Rain

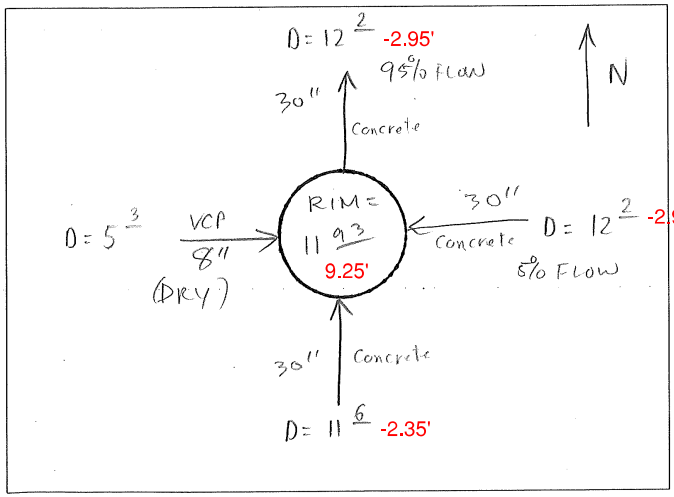
Name of Field Observer(s): CL & KT

MH Number: S103 - 22

Street/Intersection: Great America Pkwy @ 5200 block

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?
flow most goes north

Other Observations:
W_D = 10 8/8

Field Verification

Date: 4/5/23 Time: 11:40 pm Weather: (Dry)/Rain

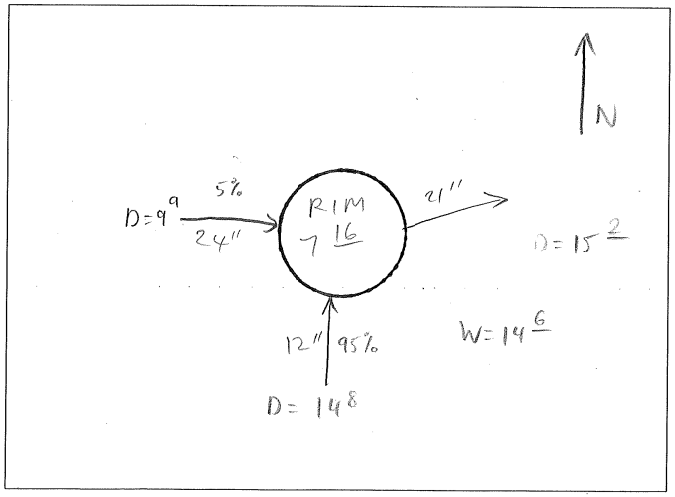
Name of Field Observer(s): CL & KT

MH Number: S105-36

Street/Intersection: Calle De Sol @ Calle De Luna

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:
All VCP

Field Verification

Date: 3/6/23 Time: 2:00 pm Weather: (Dry)/Rain

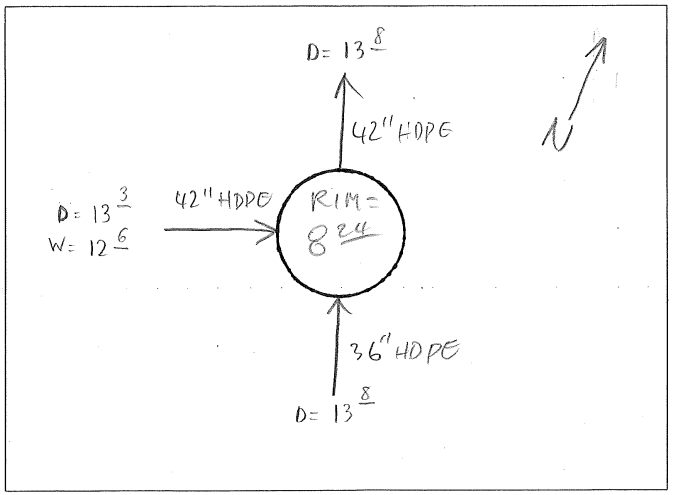
Name of Field Observer(s): CL & KT

MH Number: S104-19

Street/Intersection: Lafayette St

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:

Field Verification

Date: 4/5/23 Time: 1:30 pm Weather: (Dry)/Rain

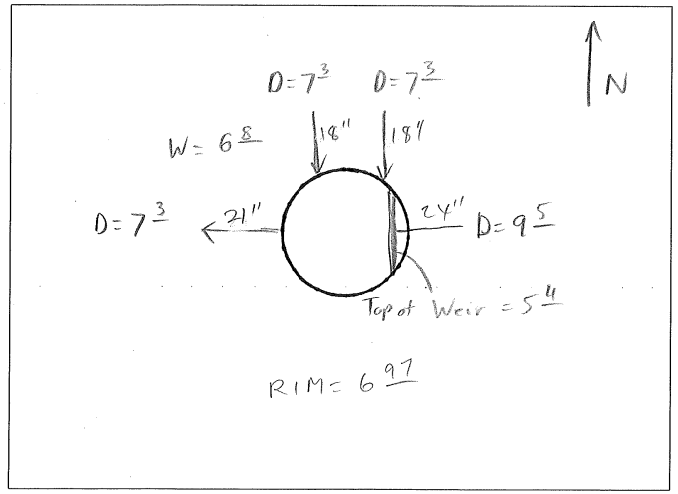
Name of Field Observer(s): CL & KT

MH Number: S105-37

Street/Intersection: Calle De Sol @ Calle De Luna

Manhole sketch:

Draw all inlet and outlet pipes.
Note all pipe sizes and materials. If pipe is lined, note on drawing.
Measure depth to each invert for all pipes.
Provide rim and invert elevations, if possible (note datum)
If there is channelization, note on drawing.
Draw all weirs and gates and measure depth to top of weir.
Always take pictures.



Where is most of the flow going out to? Or is the flow evenly split?

Other Observations:
All VCP

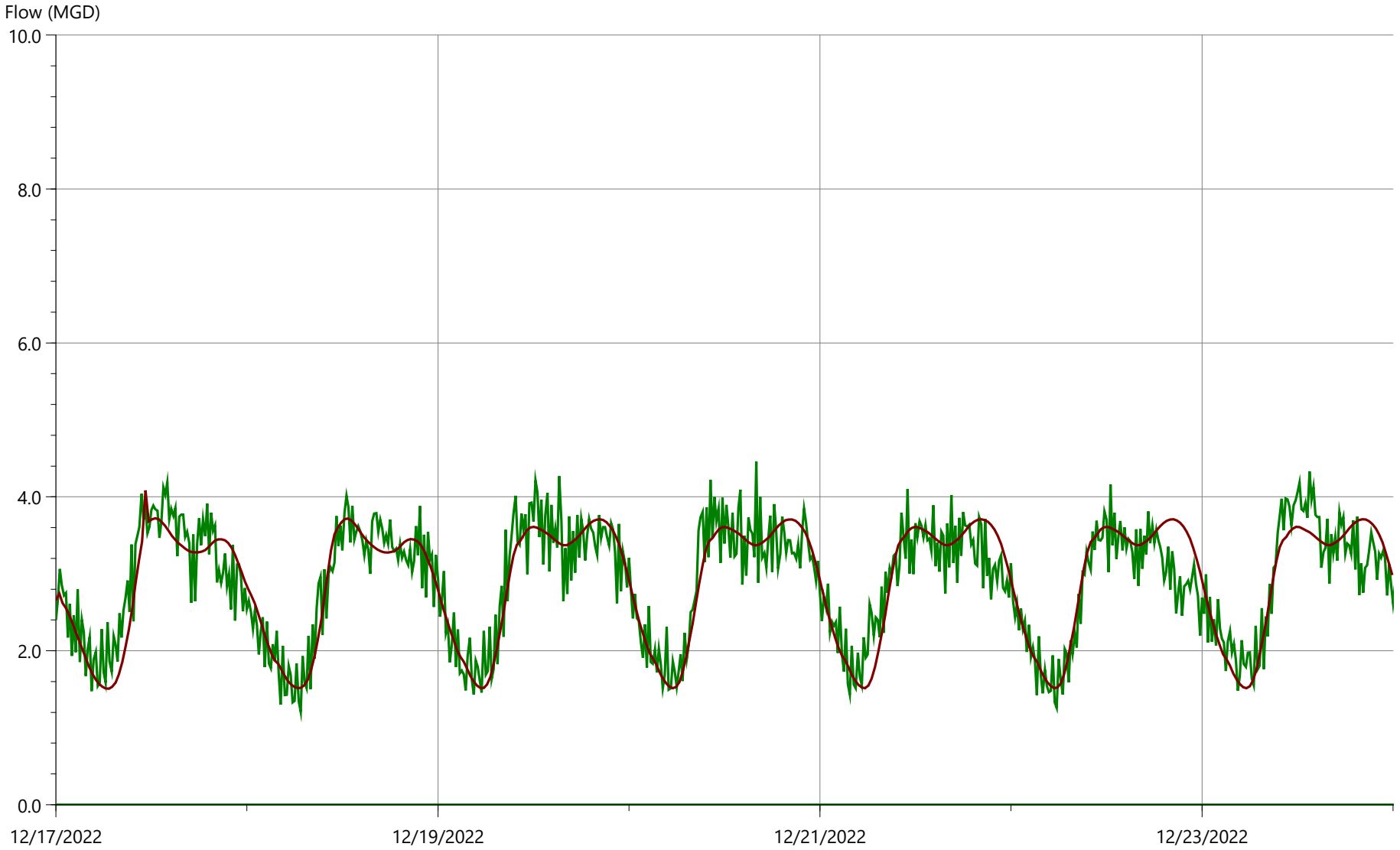
APPENDIX E: CALIBRATION RESULTS

Dry Weather Flow Calibration Plots
Modeled vs. 2022-2023 Metered Flows

(*assumes clog at Homestead/Lawrence gate structure*)

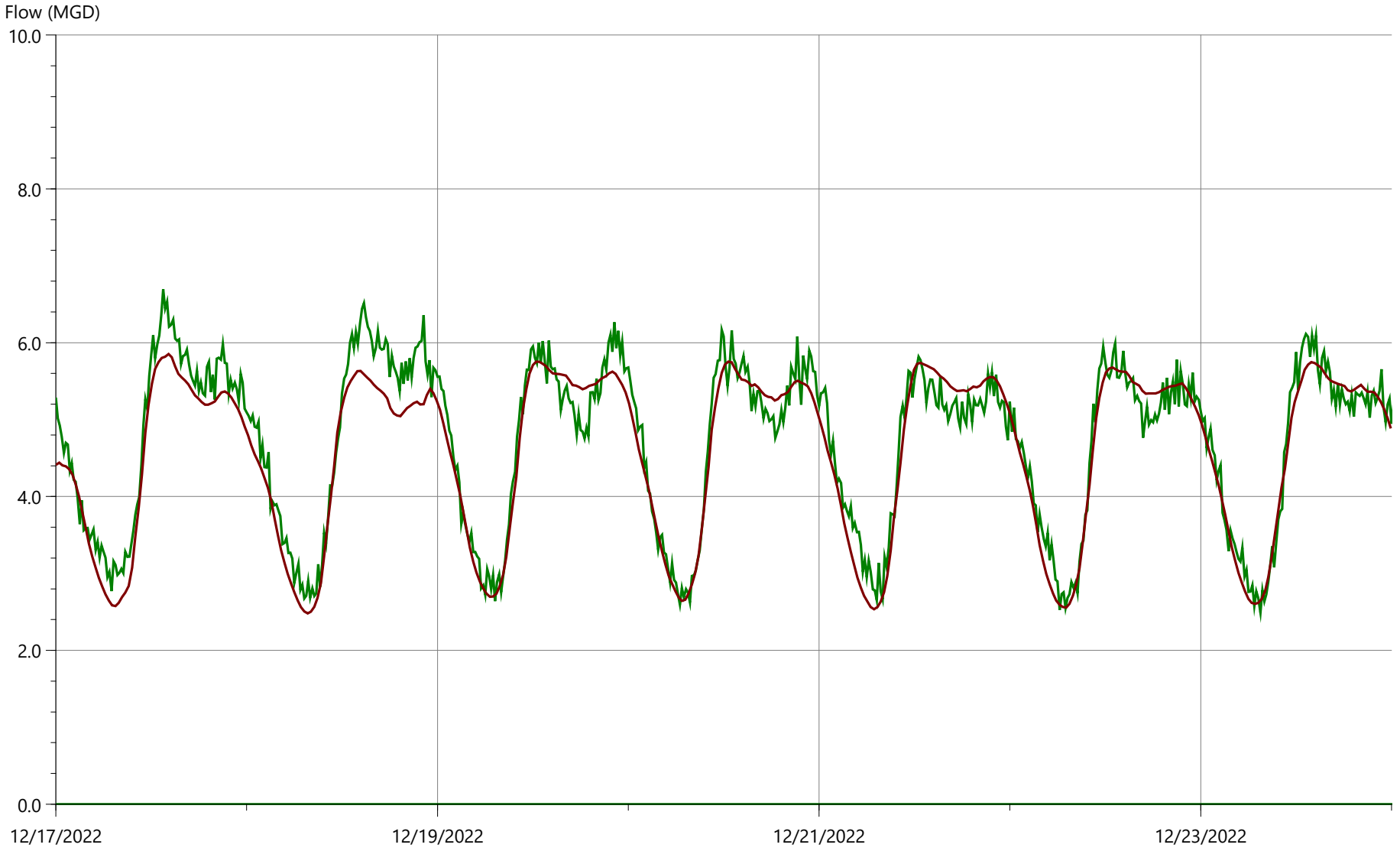
Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>Existing_DWF_2022.12.17_7d_WithBlock...

Flow Survey Location (Obs.) 1, Model Location (Pred.) D/S S104-29.1



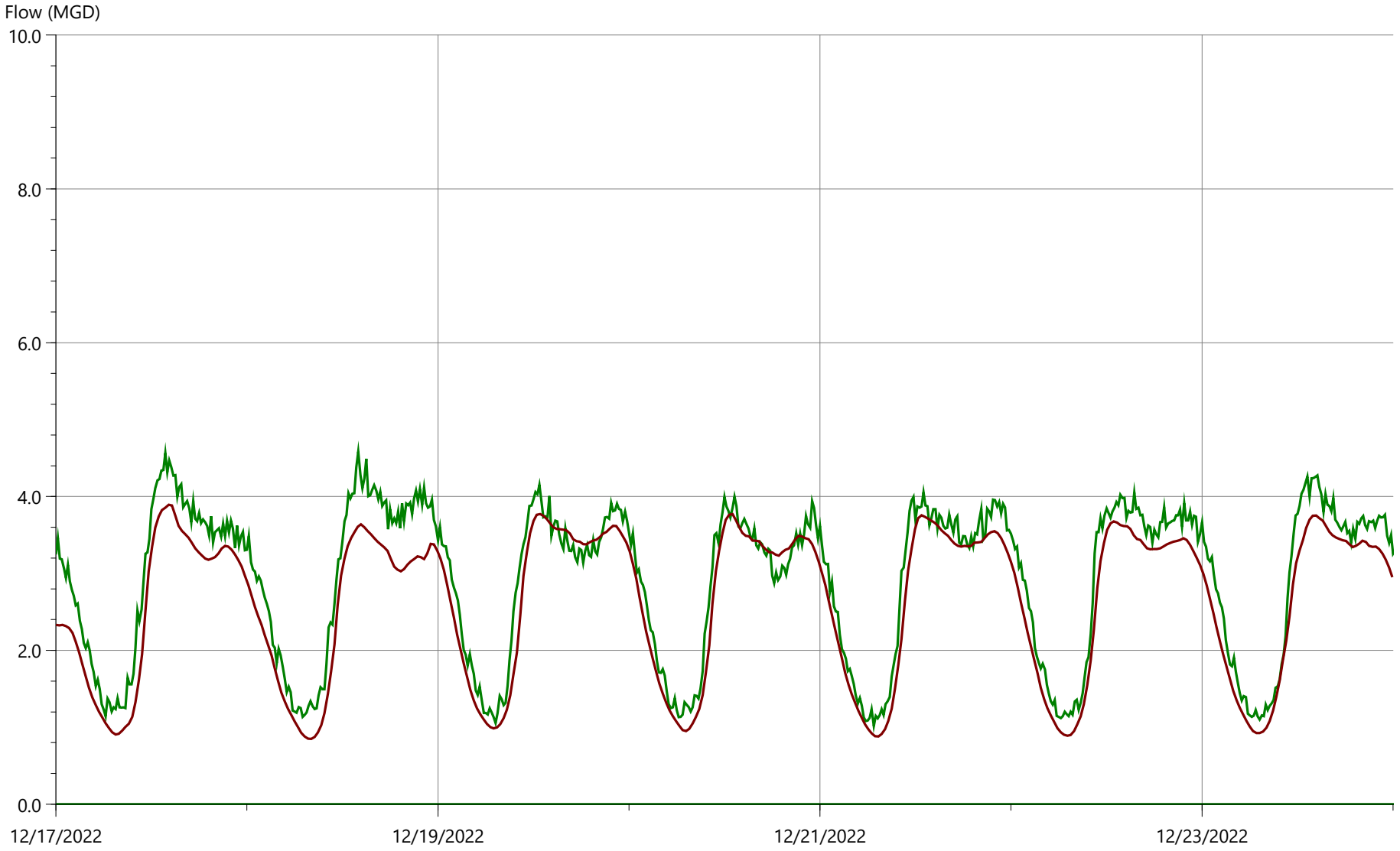
	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	1.210	4.456	20.361
...ation (Homestead Blockage) DWF	1.509	4.082	20.343

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>Existing_DWF_2022.12.17_7d_WithBlock...
Flow Survey Location (Obs.) 2, Model Location (Pred.) D/S S103-9.1



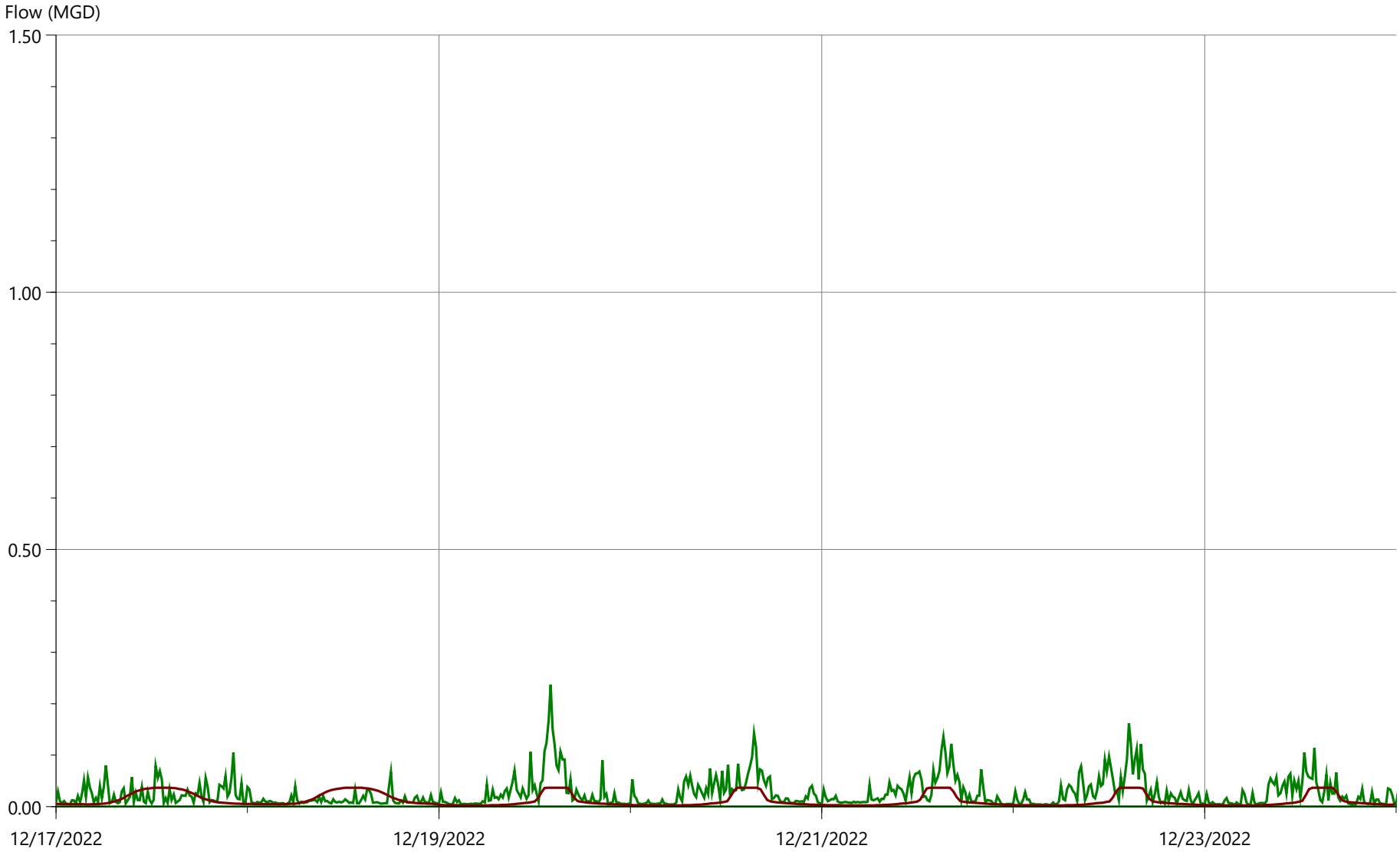
	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	2.491	6.695	33.003
...ation (Homestead Blockage) DWF	2.482	5.853	31.993

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>Existing_DWF_2022.12.17_7d_WithBlock...
Flow Survey Location (Obs.) 3, Model Location (Pred.) D/S S104-27.1



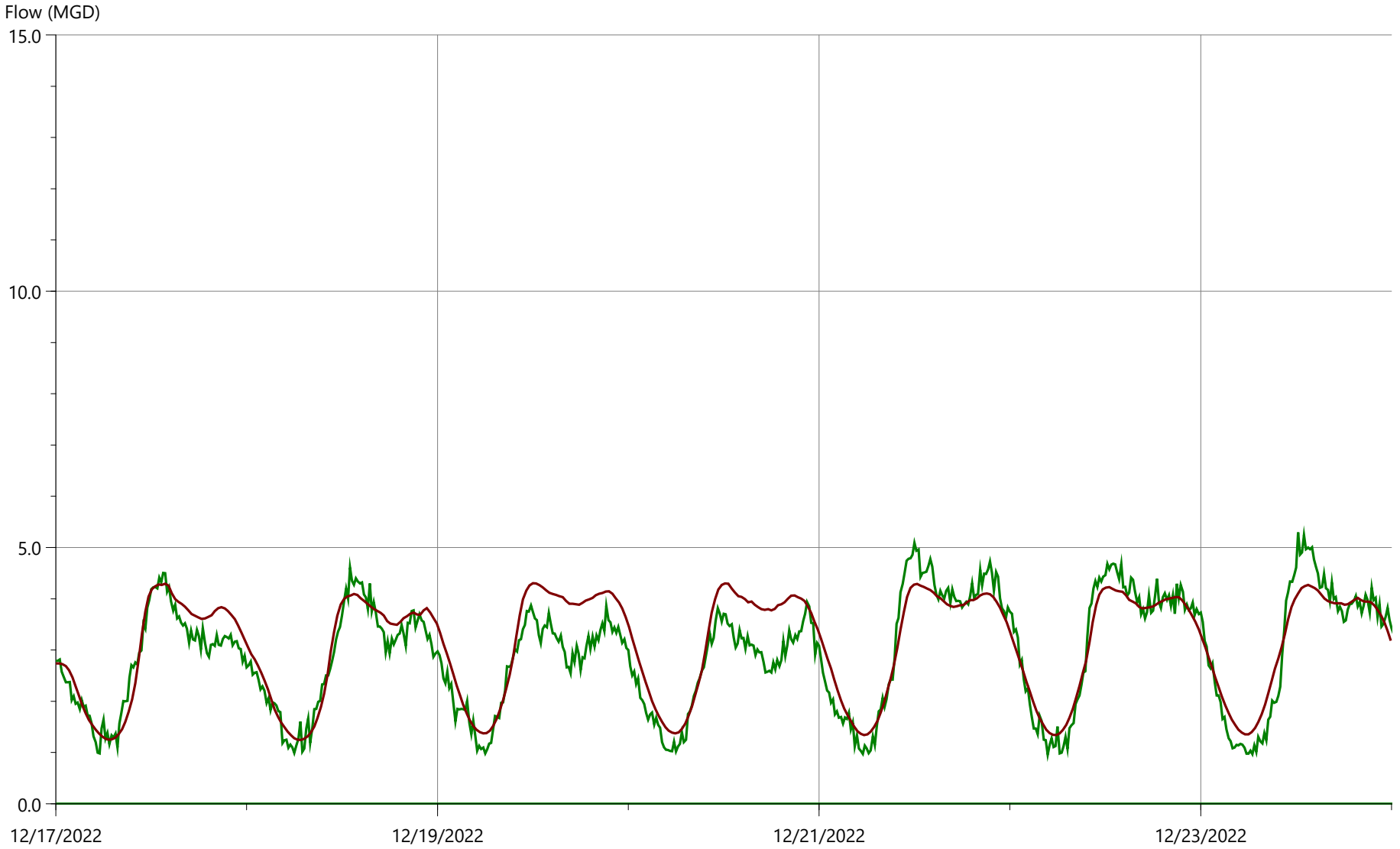
	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	1.016	4.583	20.466
...ation (Homestead Blockage) DWF	0.850	3.894	18.244

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>Existing_DWF_2022.12.17_7d_WithBlock...
Flow Survey Location (Obs.) 4, Model Location (Pred.) D/S S94-36.1



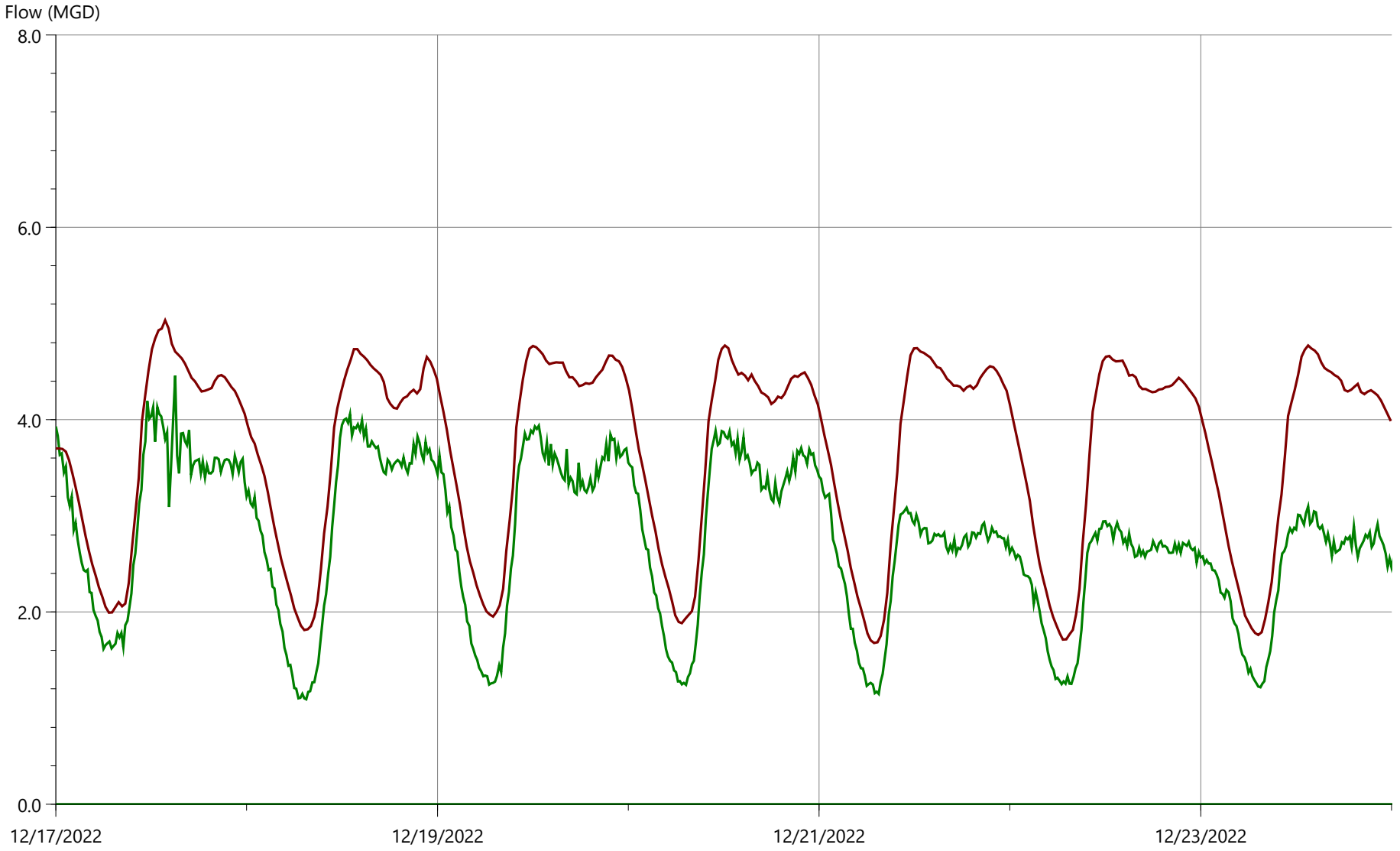
	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.003	0.237	0.181
...ation (Homestead Blockage) DWF	0.003	0.037	0.085

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>Existing_DWF_2022.12.17_7d_WithBlock...
Flow Survey Location (Obs.) 5, Model Location (Pred.) D/S S83-23.1



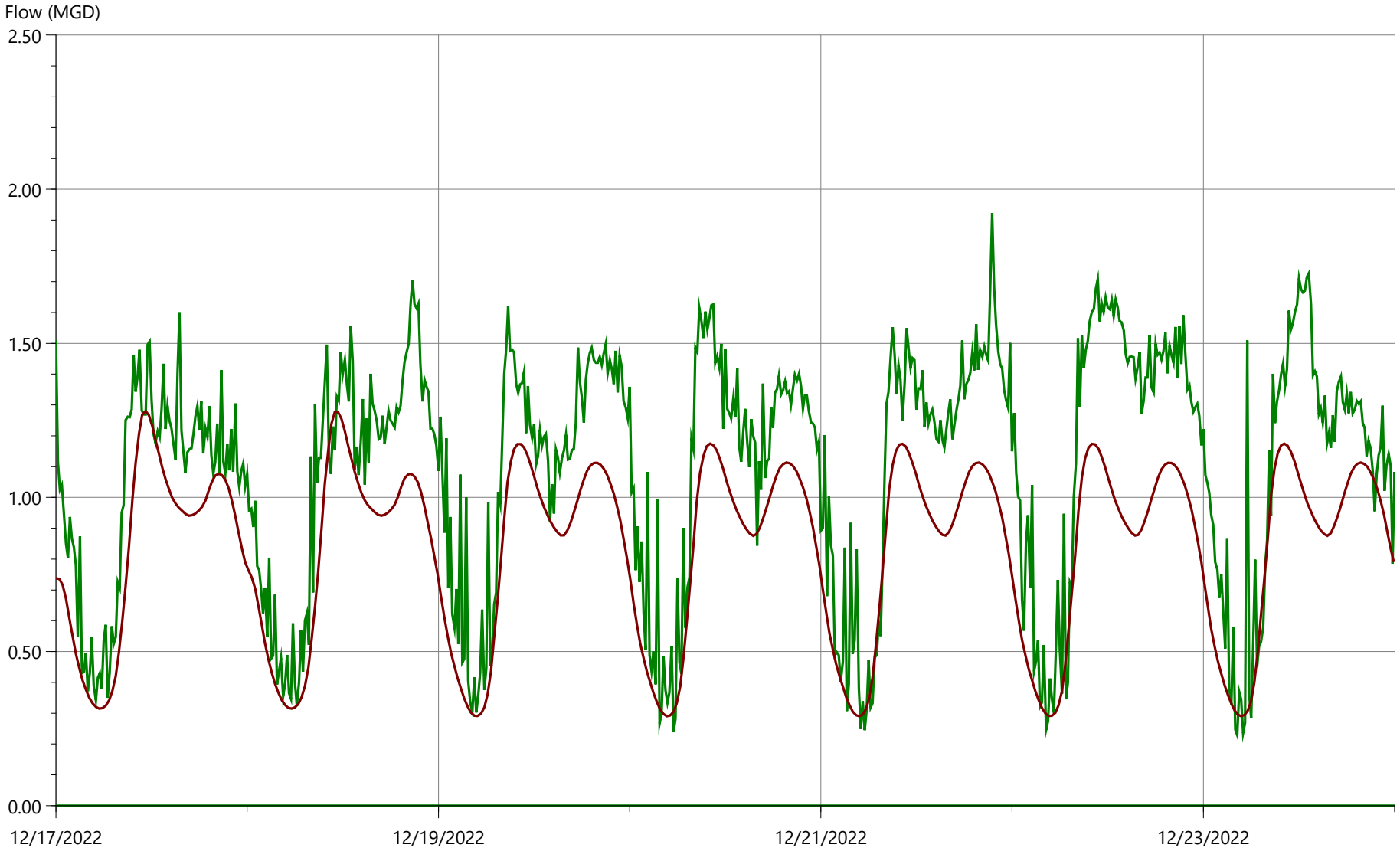
	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.957	5.296	20.493
...ation (Homestead Blockage) DWF	1.247	4.301	21.735

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>Existing_DWF_2022.12.17_7d_WithBlock...
Flow Survey Location (Obs.) 6, Model Location (Pred.) D/S S83-25.1



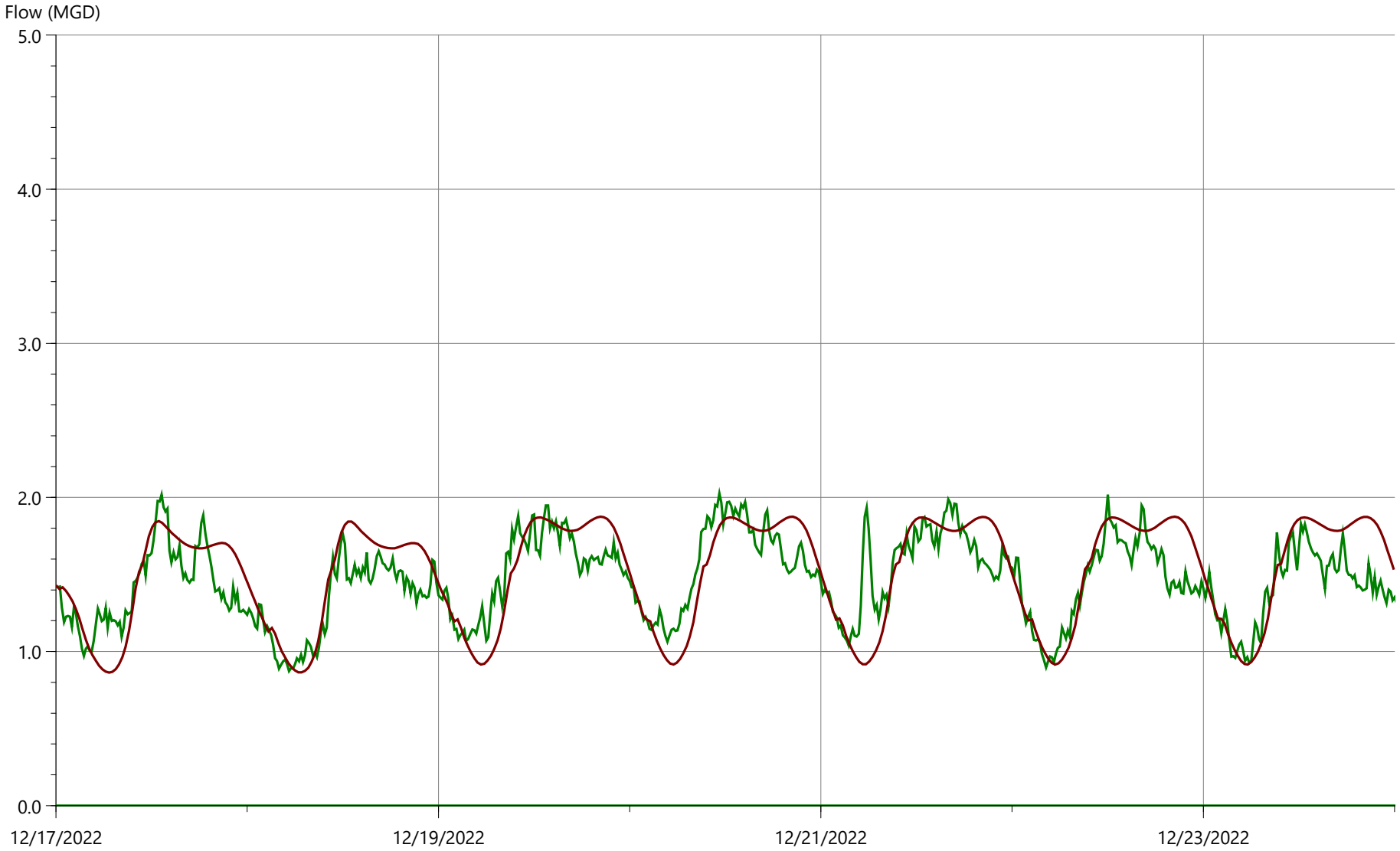
	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	1.092	4.457	19.238
...ation (Homestead Blockage) DWF	1.676	5.034	25.837

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>Existing_DWF_2022.12.17_7d_WithBlock...
Flow Survey Location (Obs.) 7, Model Location (Pred.) D/S S105-6.1



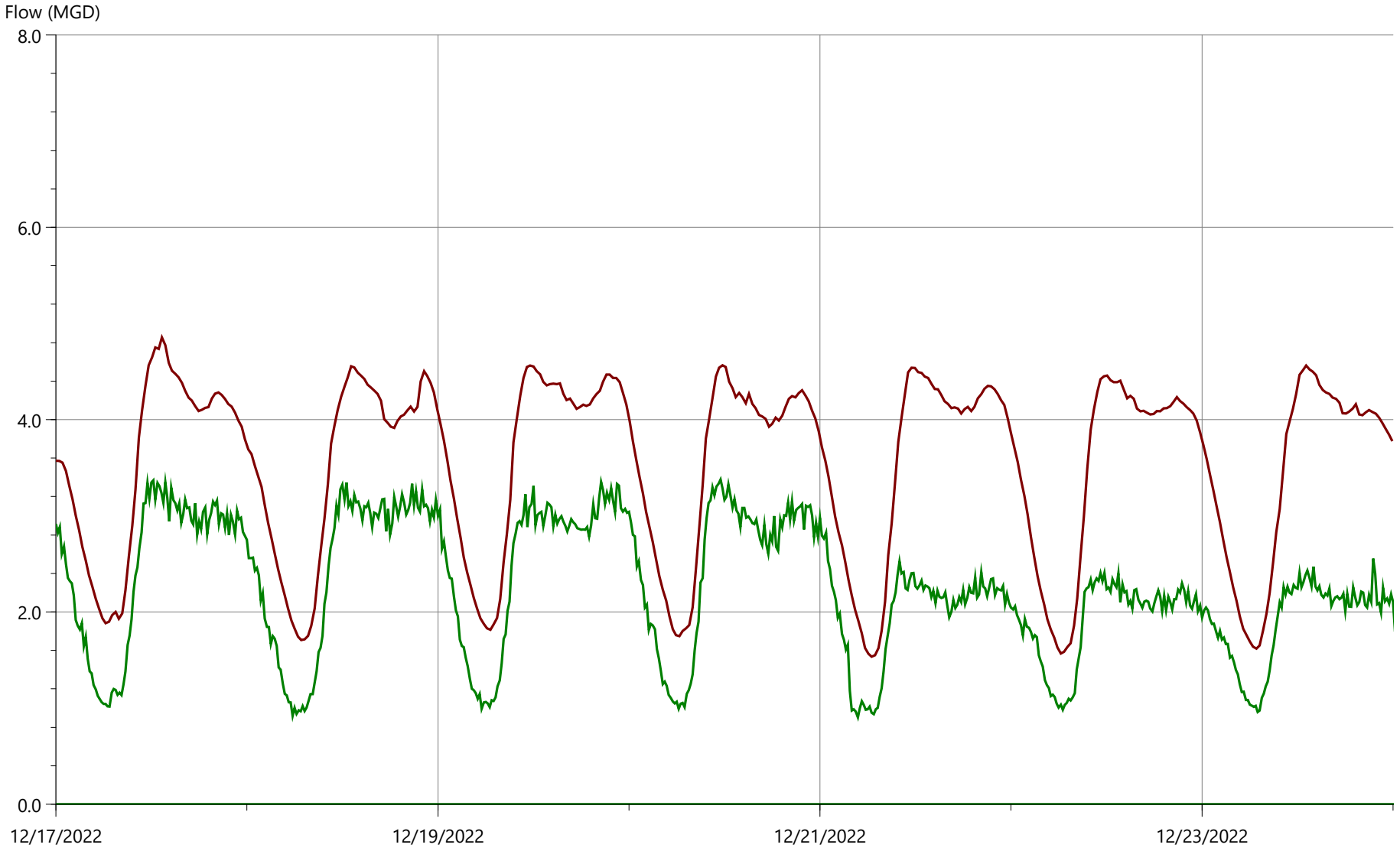
	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.229	1.922	7.675
...ation (Homestead Blockage) DWF	0.290	1.280	5.781

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>Existing_DWF_2022.12.17_7d_WithBlock...
Flow Survey Location (Obs.) 8, Model Location (Pred.) D/S S86-13.1



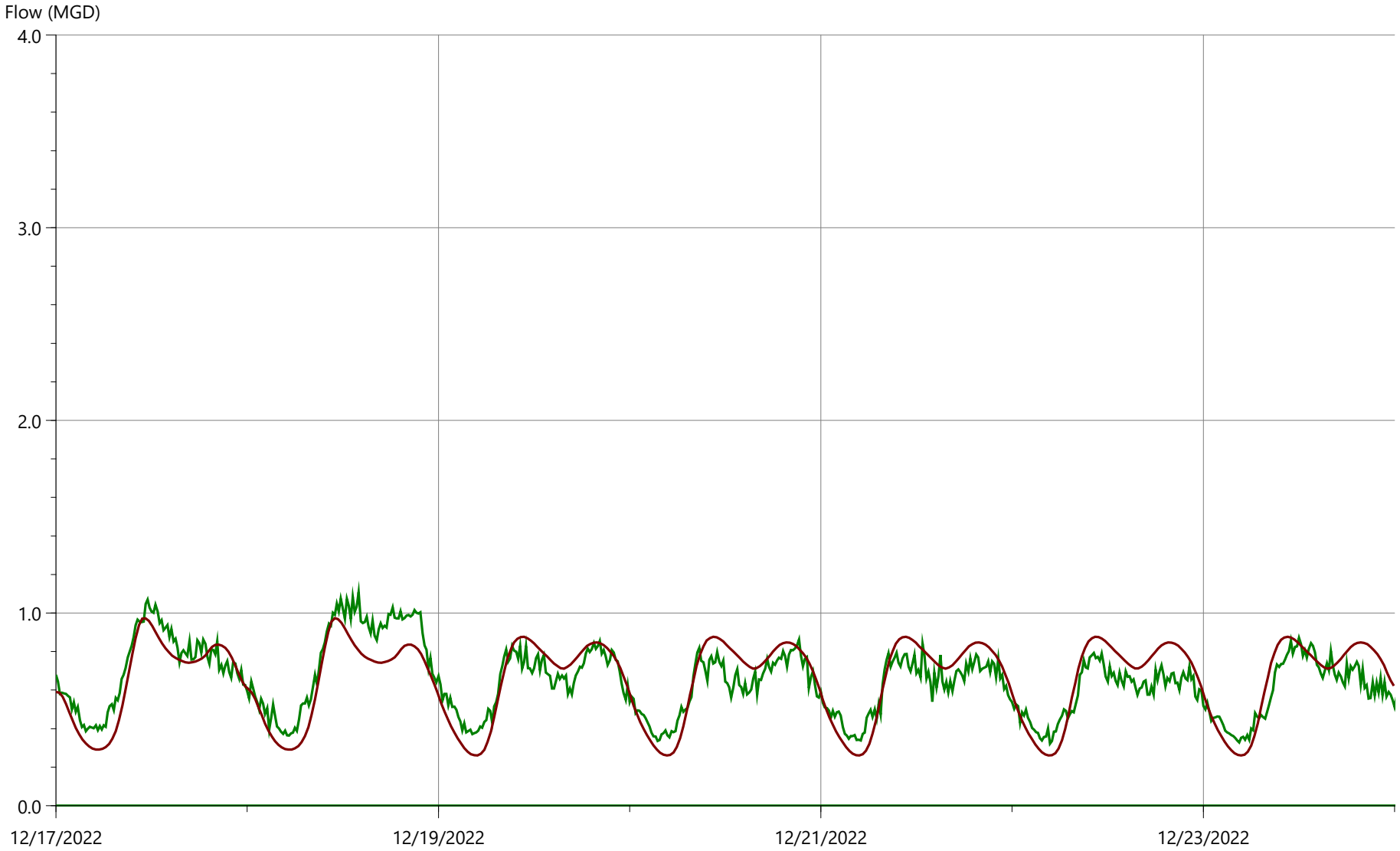
	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.873	2.026	10.240
...ation (Homestead Blockage) DWF	0.864	1.875	10.578

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>Existing_DWF_2022.12.17_7d_WithBlock...
Flow Survey Location (Obs.) 9, Model Location (Pred.) D/S S72-20.1



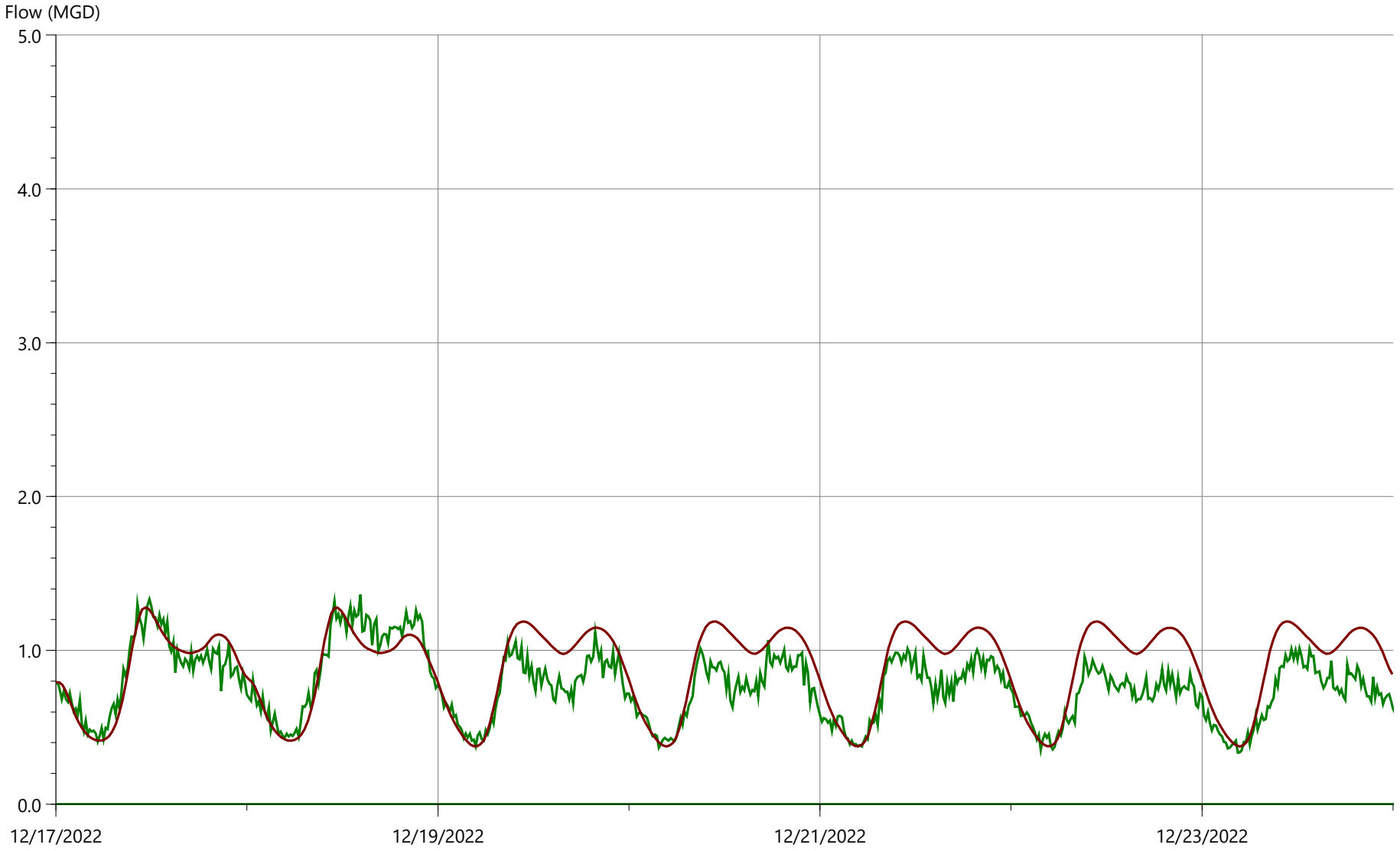
	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.904	3.377	15.707
...ation (Homestead Blockage) DWF	1.535	4.856	24.662

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>Existing_DWF_2022.12.17_7d_WithBlock...
Flow Survey Location (Obs.) 10, Model Location (Pred.) D/S S52-80.1



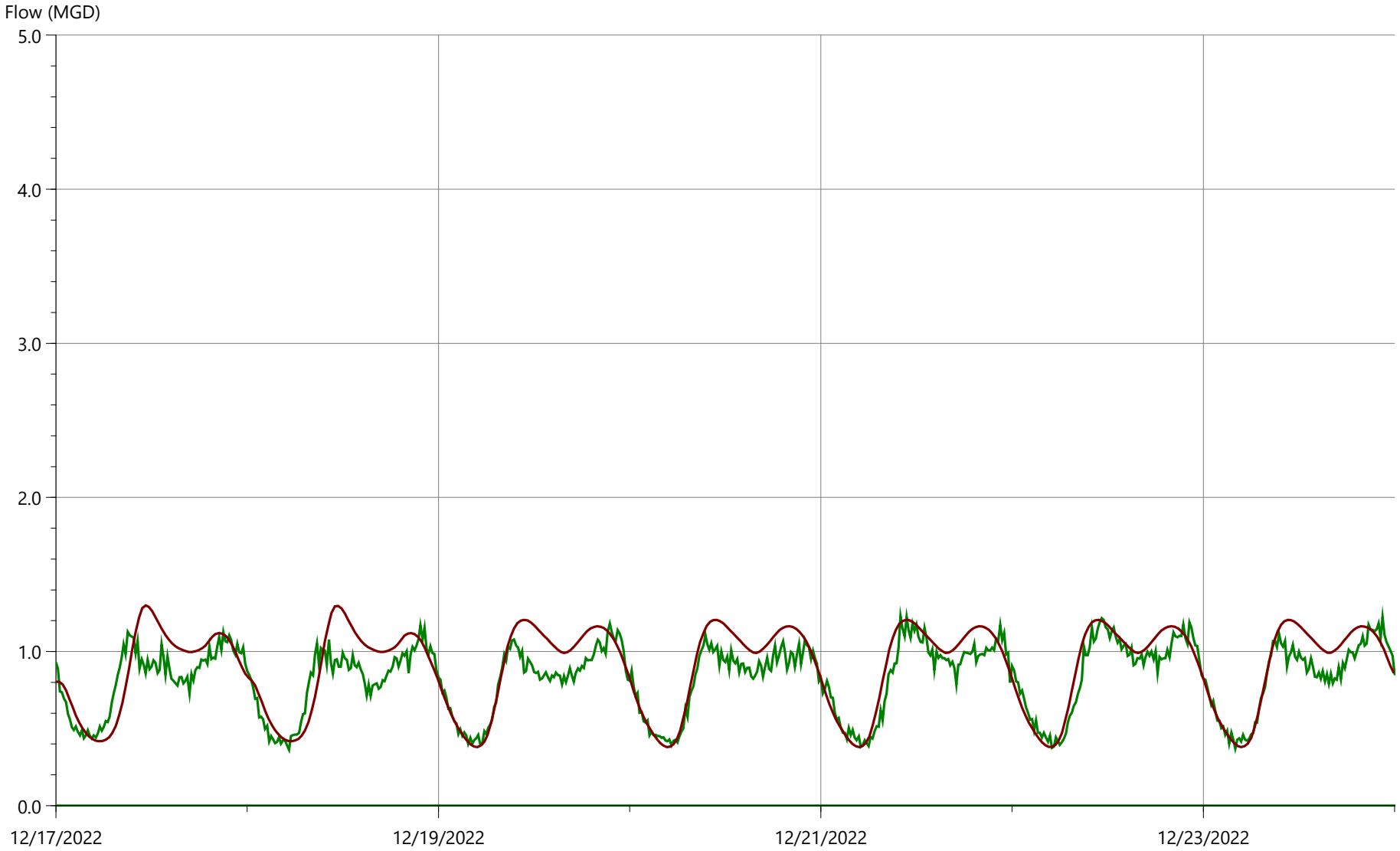
	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.321	1.108	4.553
...ation (Homestead Blockage) DWF	0.261	0.973	4.560

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>Existing_DWF_2022.12.17_7d_WithBlock...
Flow Survey Location (Obs.) 11, Model Location (Pred.) D/S S53-9.1



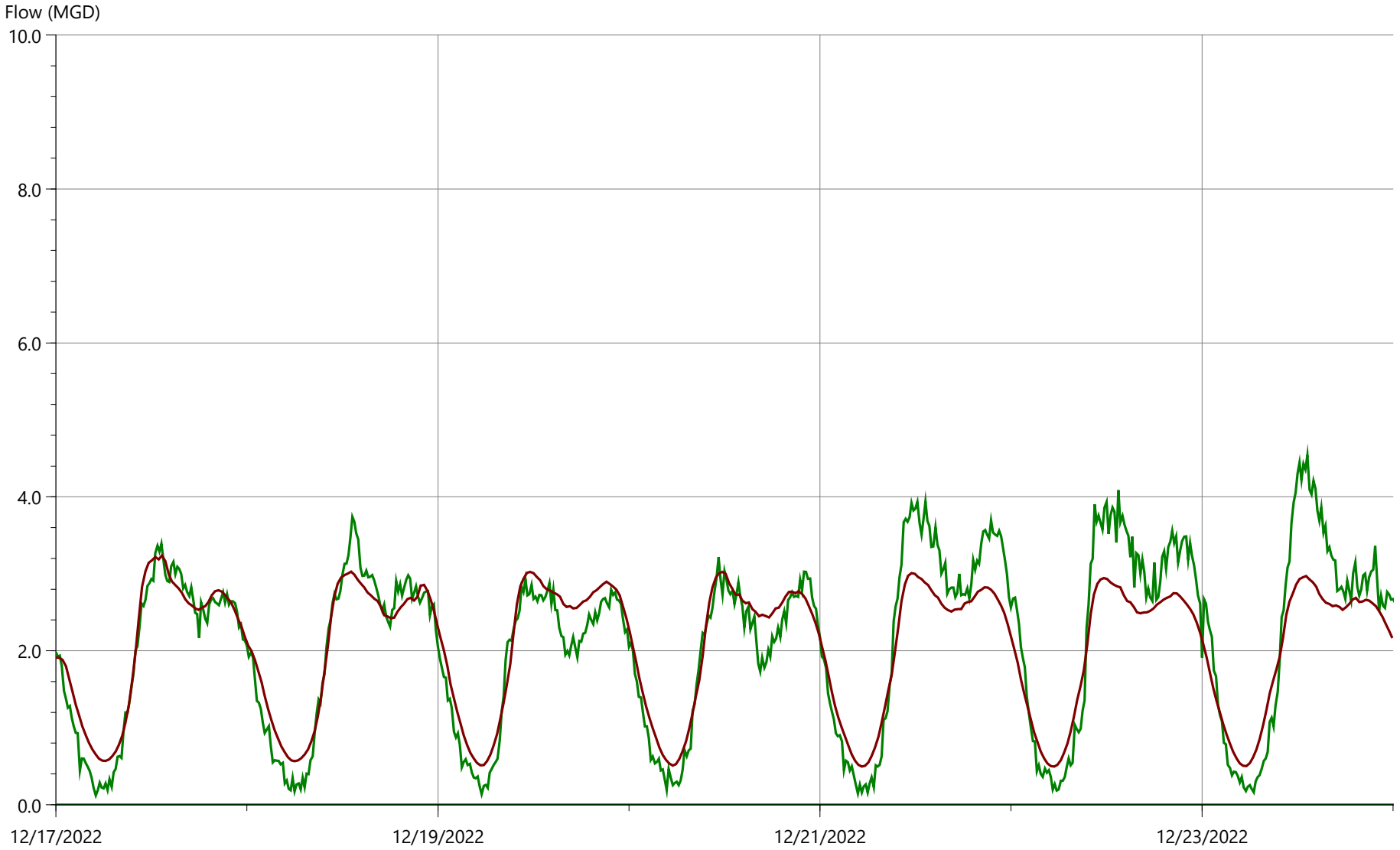
	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.336	1.363	5.402
...ation (Homestead Blockage) DWF	0.376	1.279	6.198

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>Existing_DWF_2022.12.17_7d_WithBlock...
Flow Survey Location (Obs.) 12, Model Location (Pred.) D/S S53-109.1



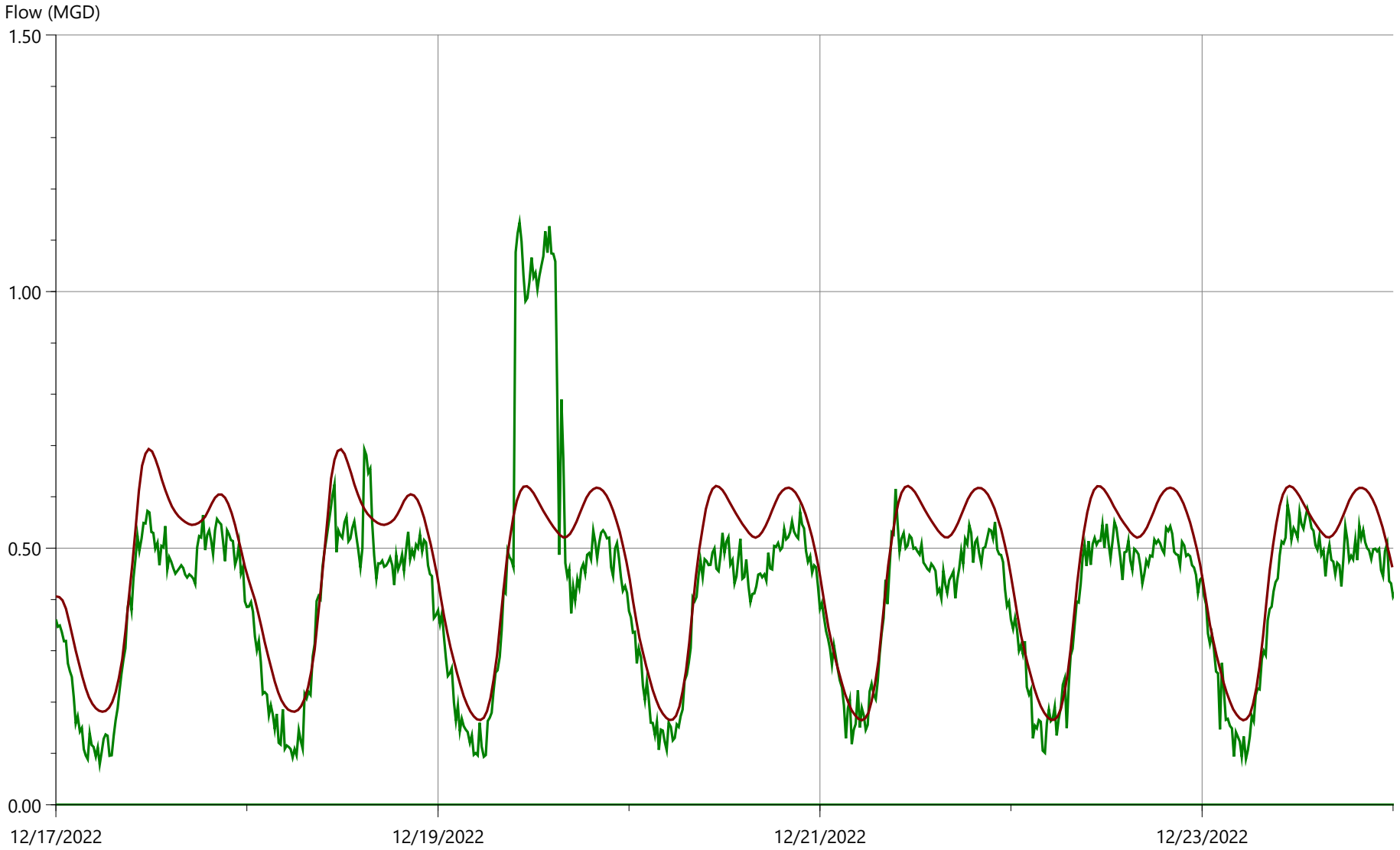
	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.363	1.229	5.803
...ation (Homestead Blockage) DWF	0.380	1.299	6.286

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>Existing_DWF_2022.12.17_7d_WithBlock...
Flow Survey Location (Obs.) 13, Model Location (Pred.) D/S S53-73.1



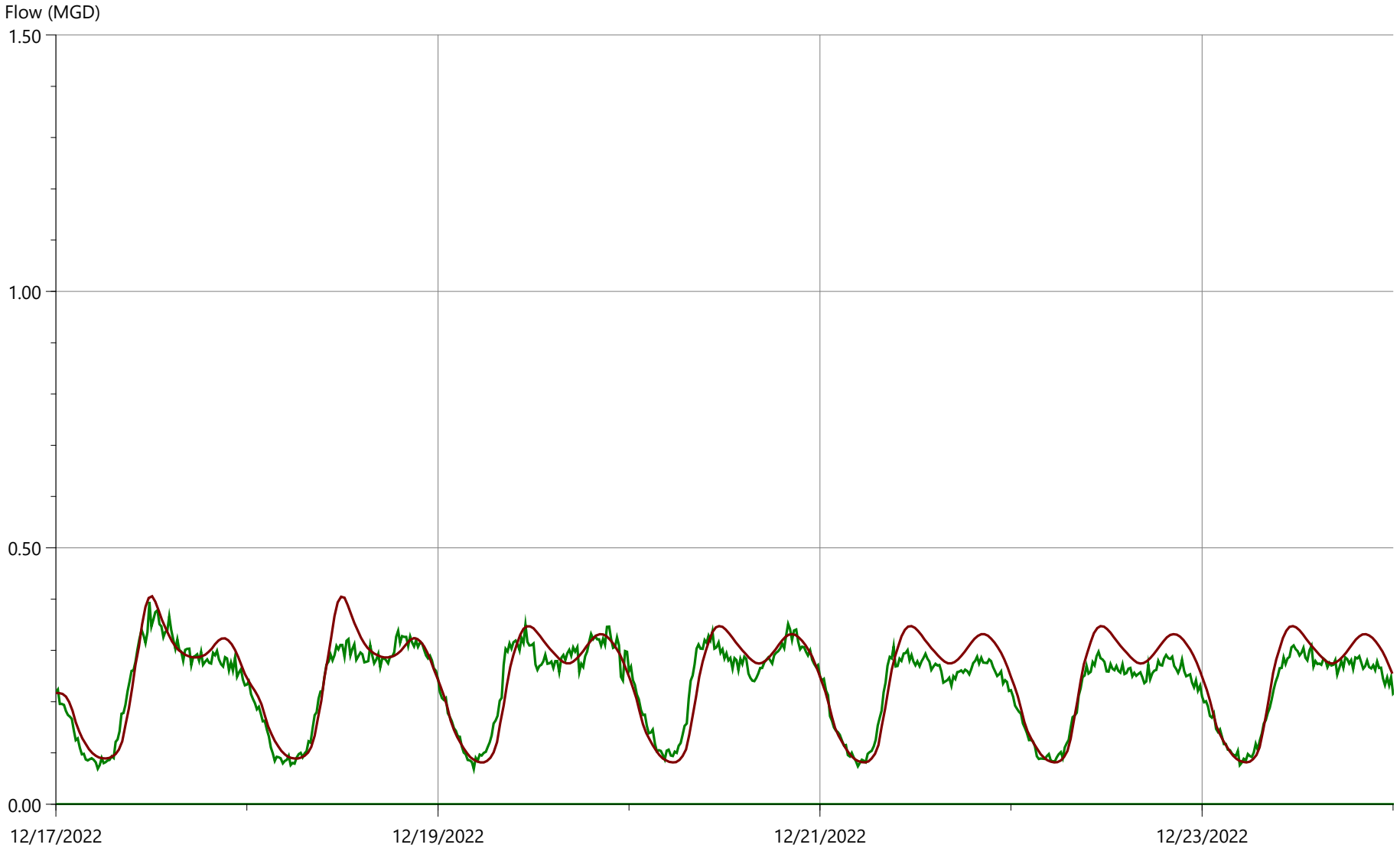
	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.122	4.539	14.702
...ation (Homestead Blockage) DWF	0.496	3.237	14.336

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>Existing_DWF_2022.12.17_7d_WithBlock...
Flow Survey Location (Obs.) 14, Model Location (Pred.) D/S S54-17.1



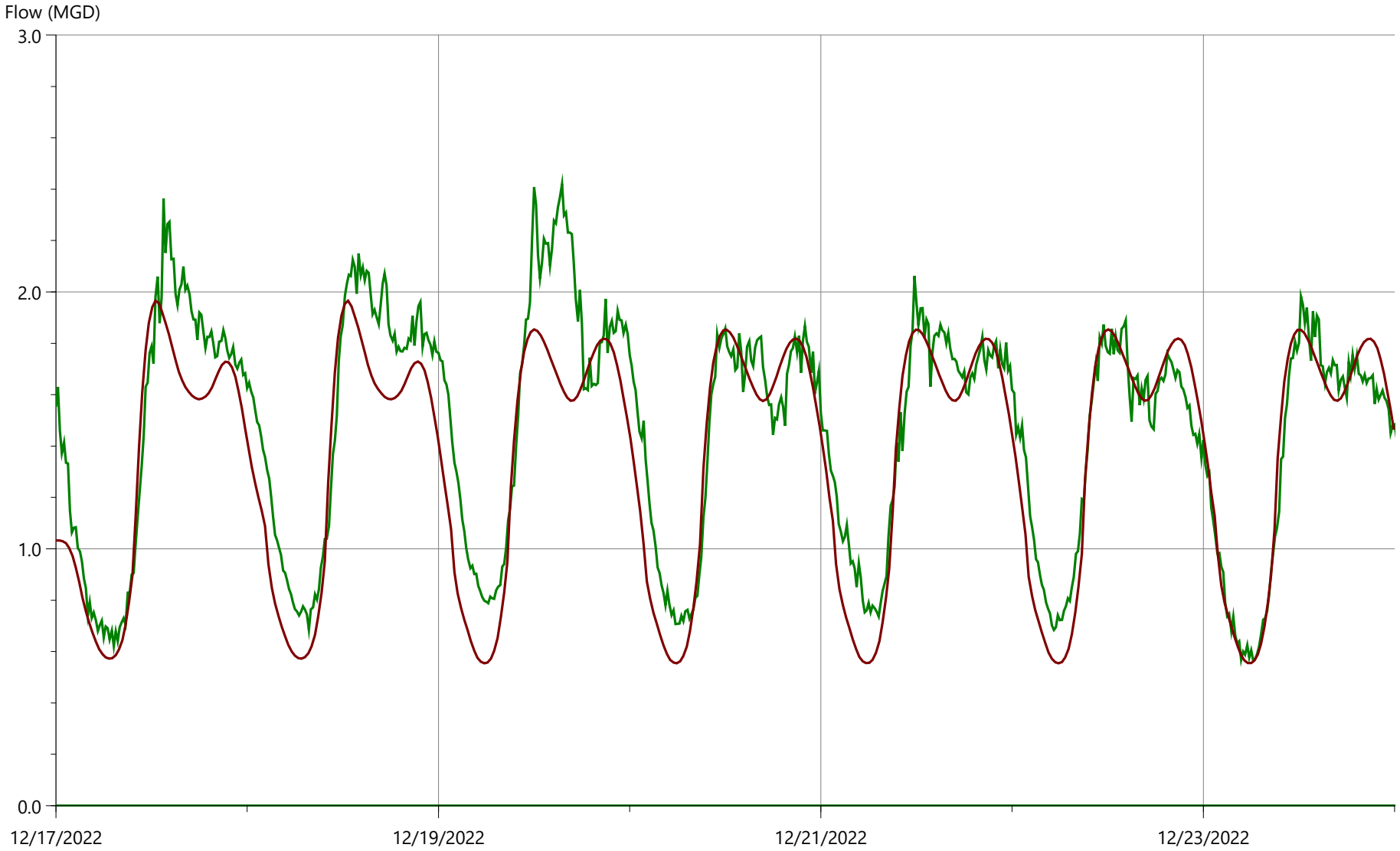
	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.079	1.135	2.874
...ation (Homestead Blockage) DWF	0.165	0.693	3.216

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>Existing_DWF_2022.12.17_7d_WithBlock...
Flow Survey Location (Obs.) 15, Model Location (Pred.) D/S S65-48.1



	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.068	0.395	1.615
...ation (Homestead Blockage) DWF	0.081	0.406	1.709

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>Existing_DWF_2022.12.17_7d_WithBlock...
Flow Survey Location (Obs.) 16, Model Location (Pred.) D/S S67-12.1

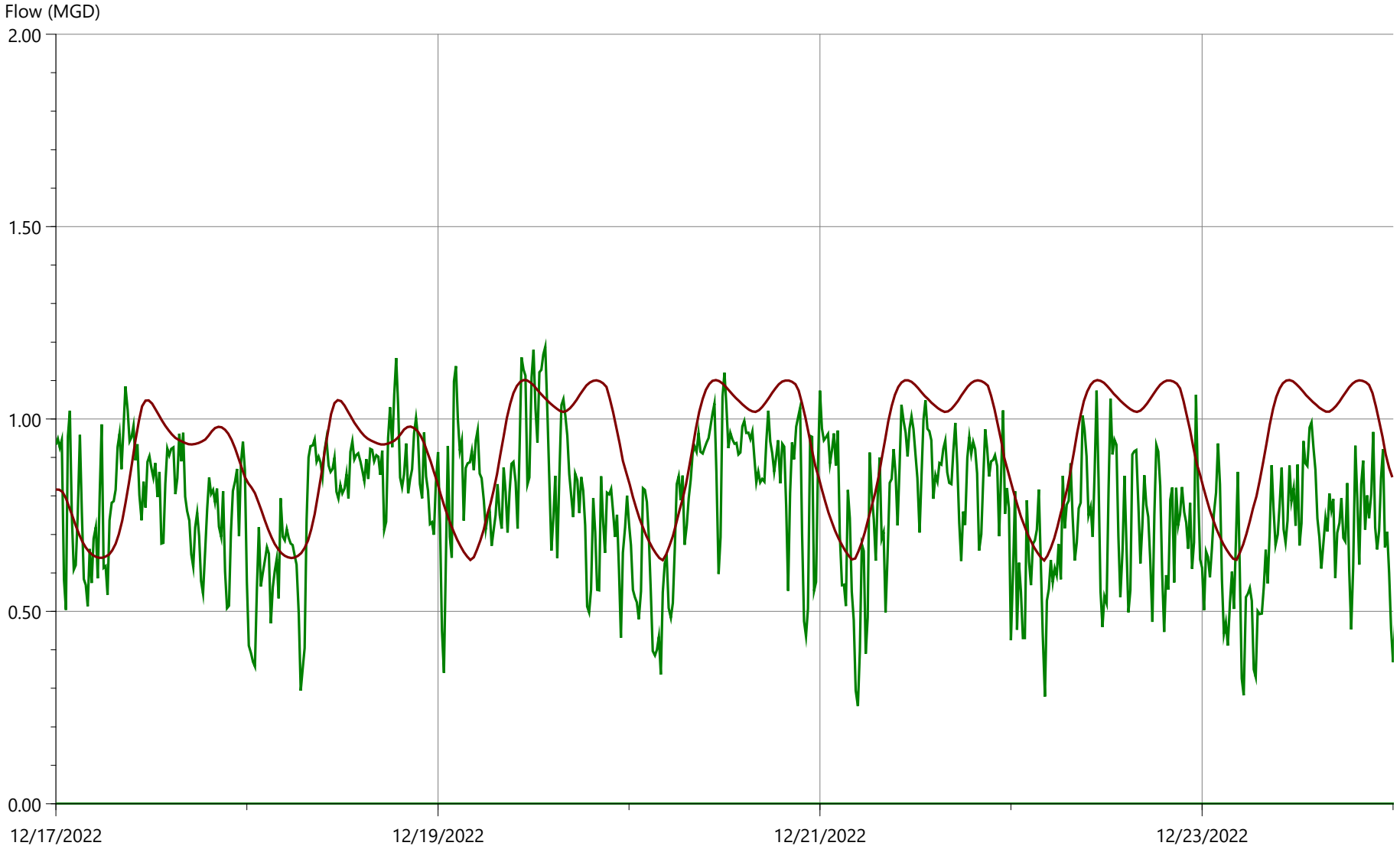


	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.566	2.420	10.213
...ation (Homestead Blockage) DWF	0.555	1.966	9.440

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)

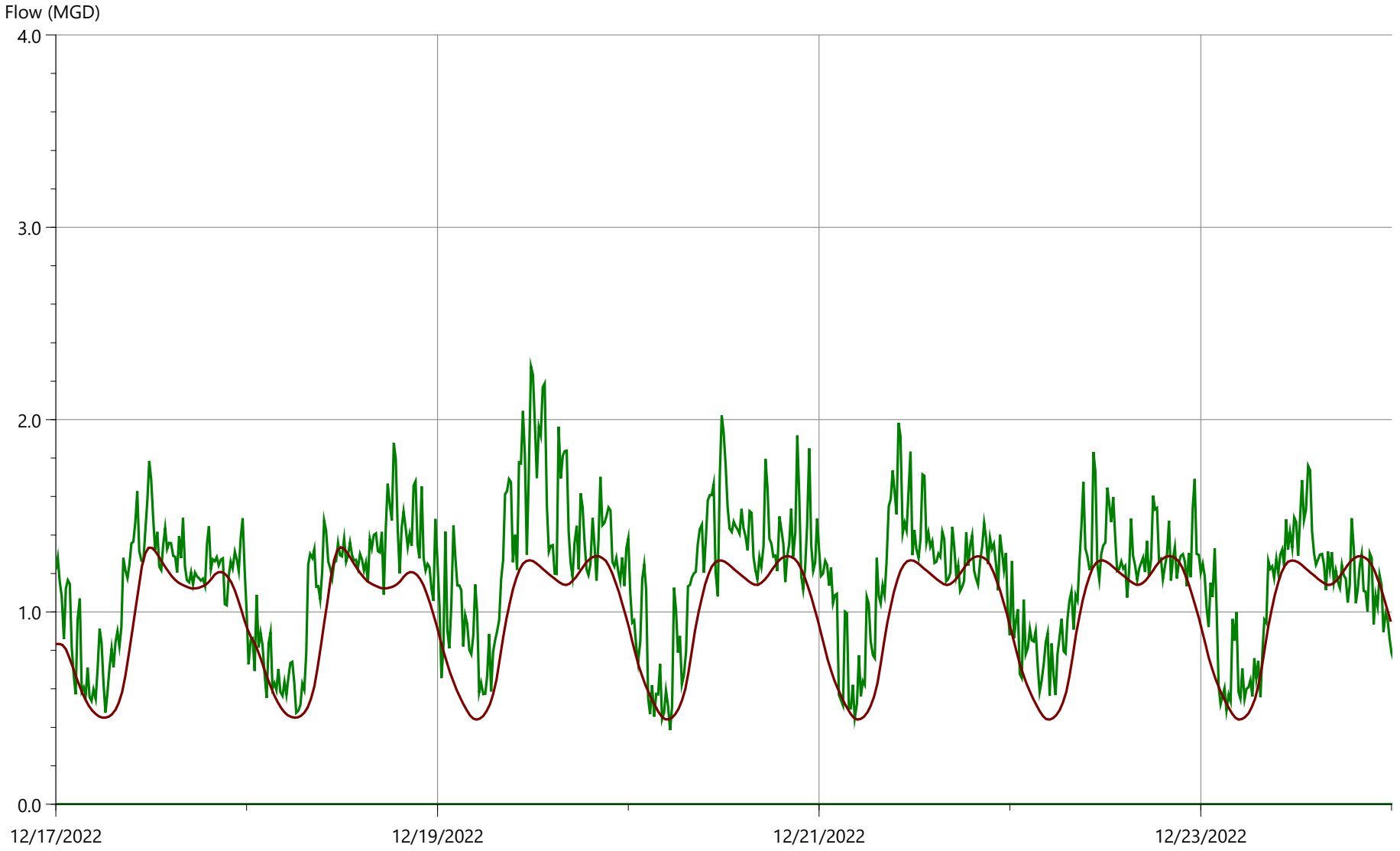
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>Existing_DWF_2022.12.17_7d_WithBlock...

Flow Survey Location (Obs.) 17, Model Location (Pred.) D/S S58-12.2



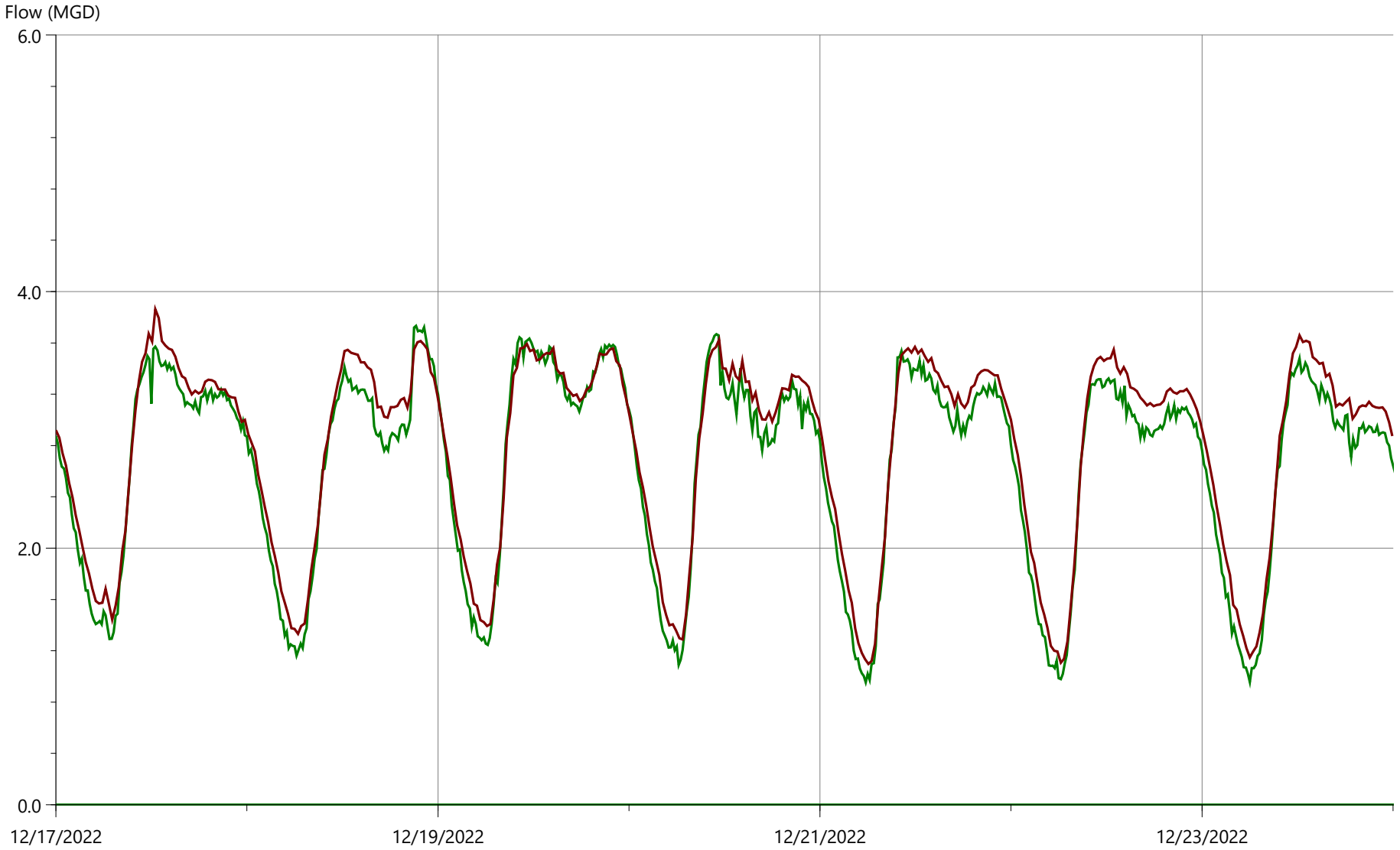
	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.254	1.188	5.406
...ation (Homestead Blockage) DWF	0.632	1.101	6.417

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>Existing_DWF_2022.12.17_7d_WithBlock...
Flow Survey Location (Obs.) 18, Model Location (Pred.) D/S S58-11.1



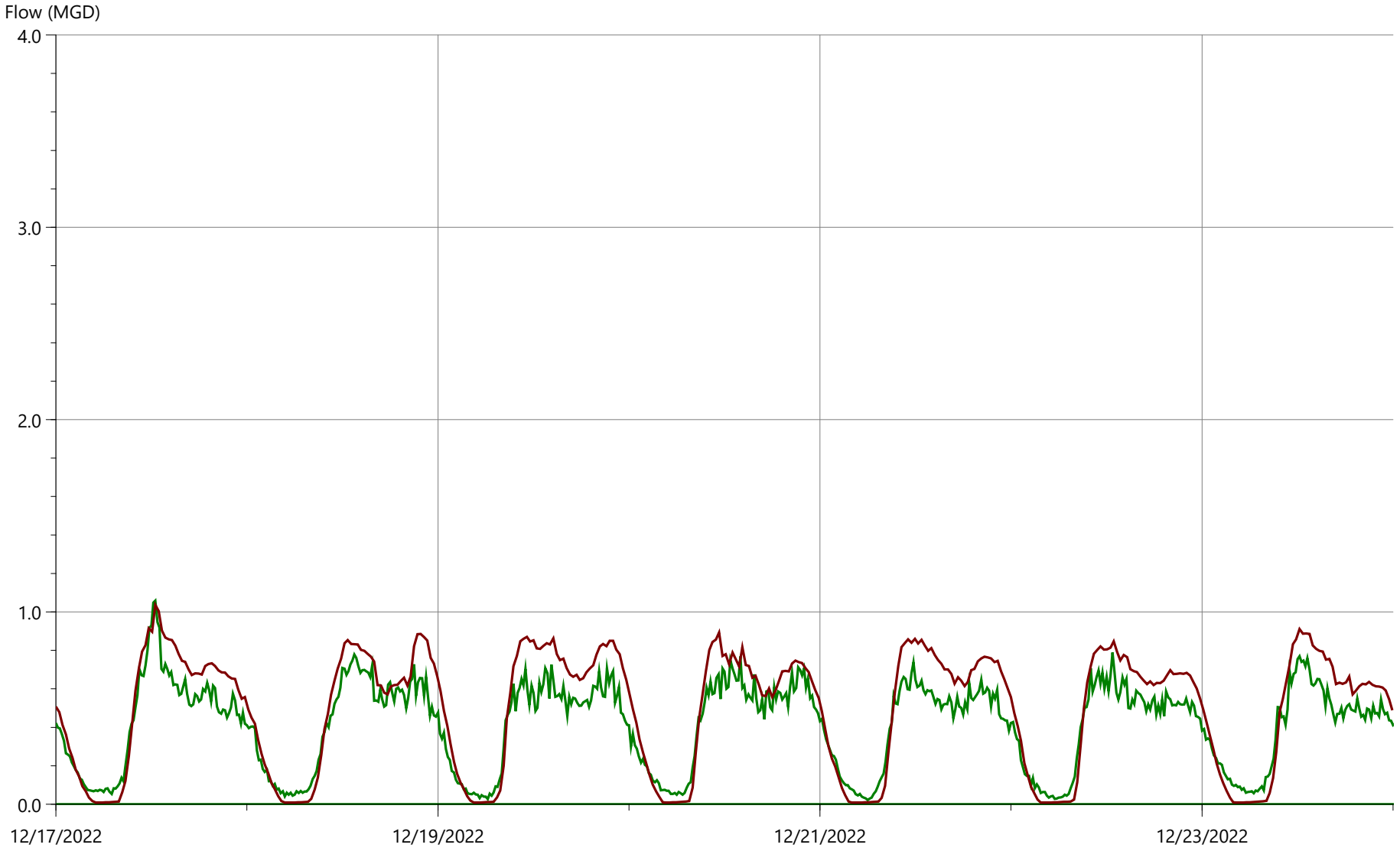
	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.385	2.276	8.249
...ation (Homestead Blockage) DWF	0.440	1.336	6.799

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>Existing_DWF_2022.12.17_7d_WithBlock...
Flow Survey Location (Obs.) 19, Model Location (Pred.) D/S S21-23.1



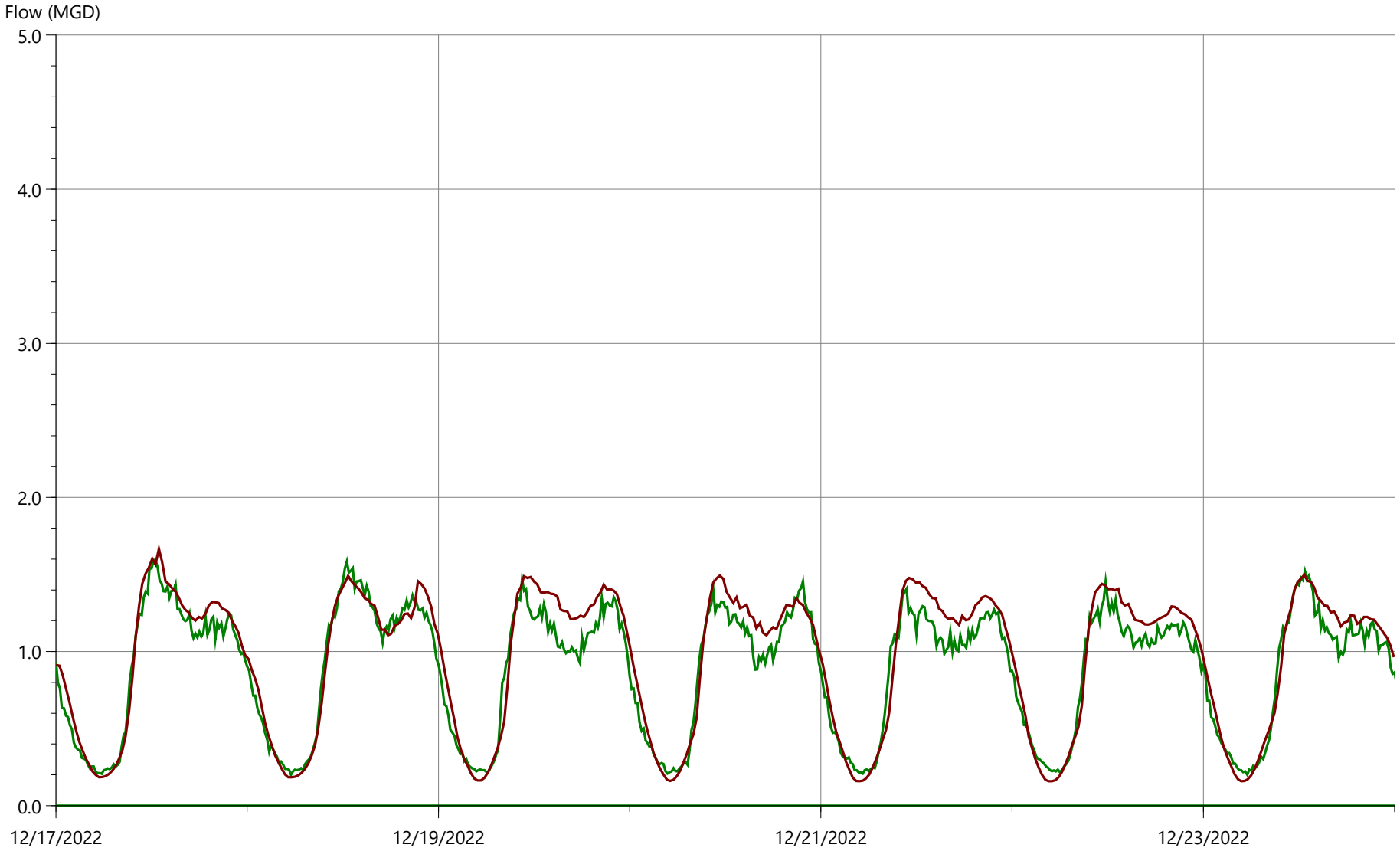
	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.955	3.733	18.569
...ation (Homestead Blockage) DWF	1.098	3.862	19.445

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>Existing_DWF_2022.12.17_7d_WithBlock...
Flow Survey Location (Obs.) 20, Model Location (Pred.) D/S S21-46.1



	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.022	1.058	2.906
...ation (Homestead Blockage) DWF	0.009	1.037	3.464

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>Existing_DWF_2022.12.17_7d_WithBlock...
Flow Survey Location (Obs.) 21, Model Location (Pred.) D/S S23-14.1

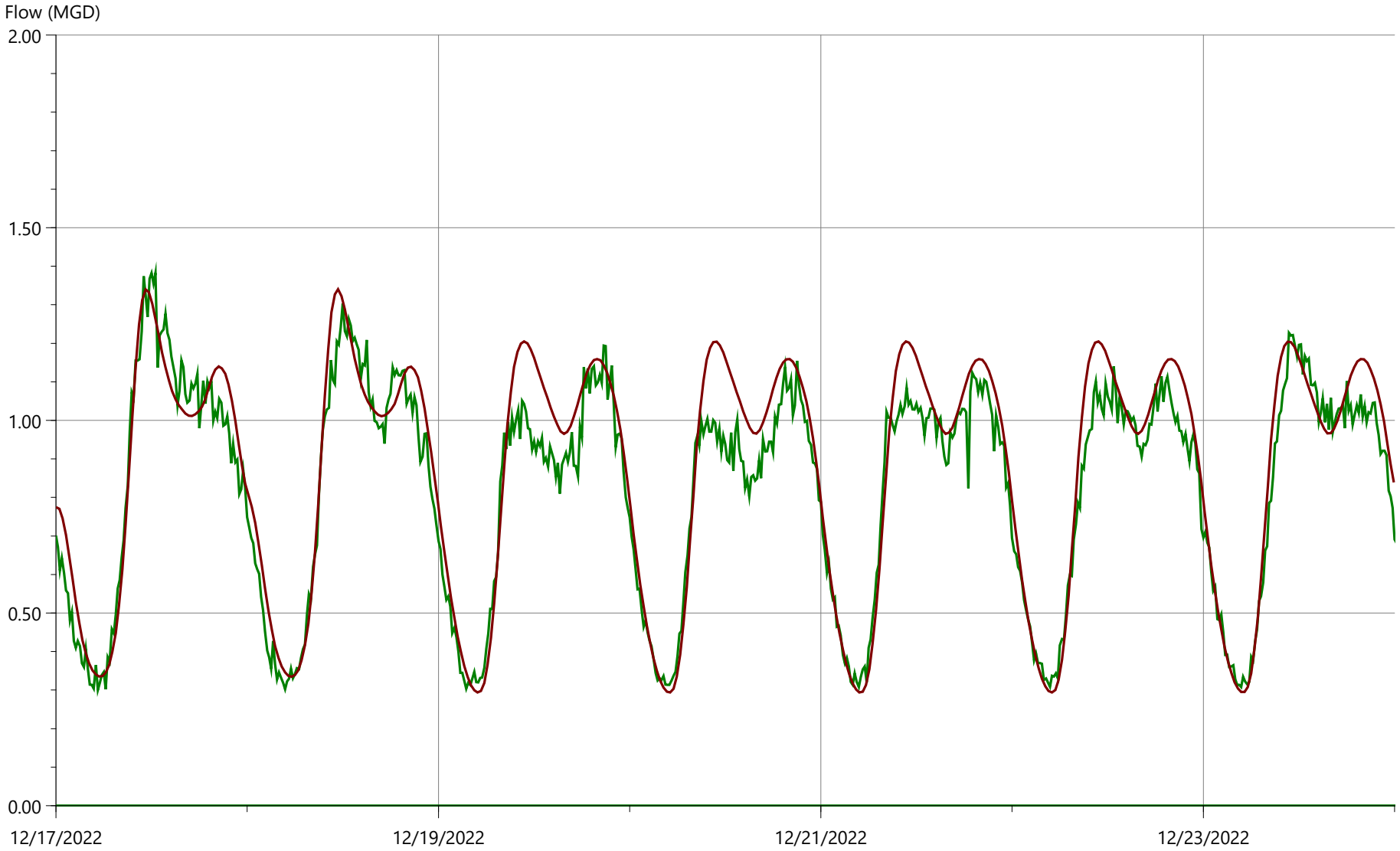


	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.200	1.598	6.243
...ation (Homestead Blockage) DWF	0.158	1.667	6.646

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)

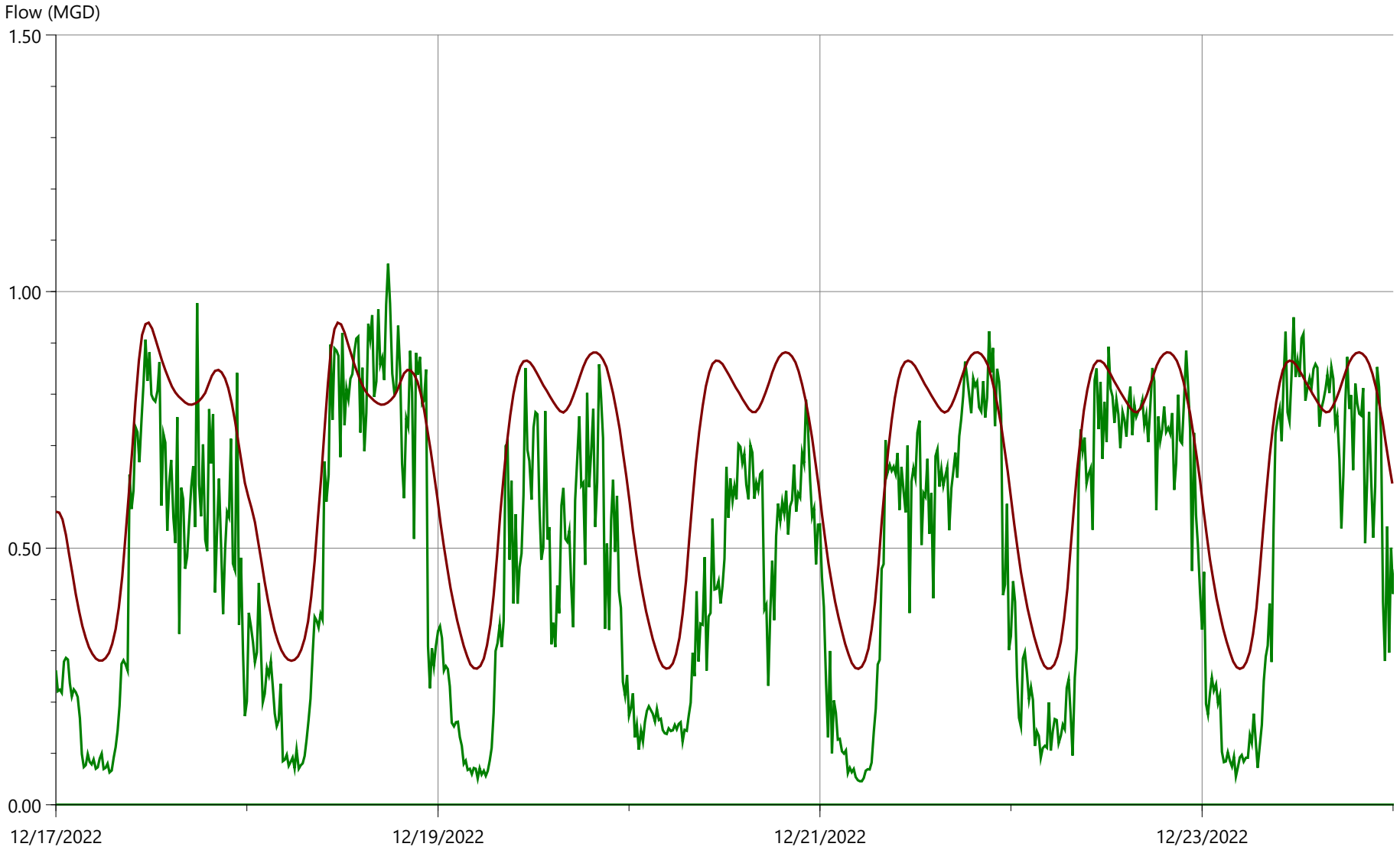
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>Existing_DWF_2022.12.17_7d_WithBlock...

Flow Survey Location (Obs.) 22, Model Location (Pred.) D/S S45-88.1



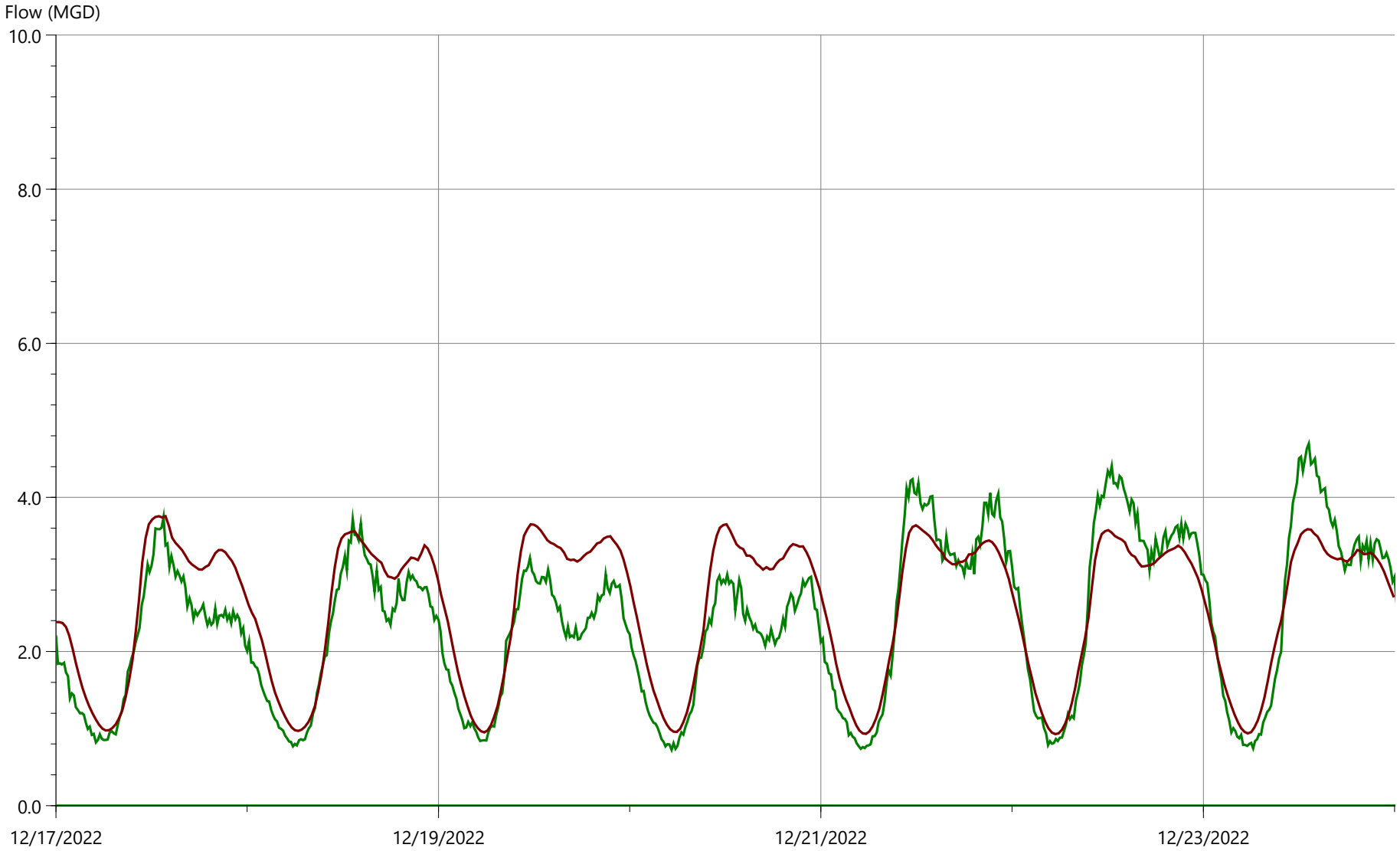
	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.300	1.382	5.769
...ation (Homestead Blockage) DWF	0.294	1.340	6.078

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>Existing_DWF_2022.12.17_7d_WithBlock...
Flow Survey Location (Obs.) 23, Model Location (Pred.) D/S S48-32.1



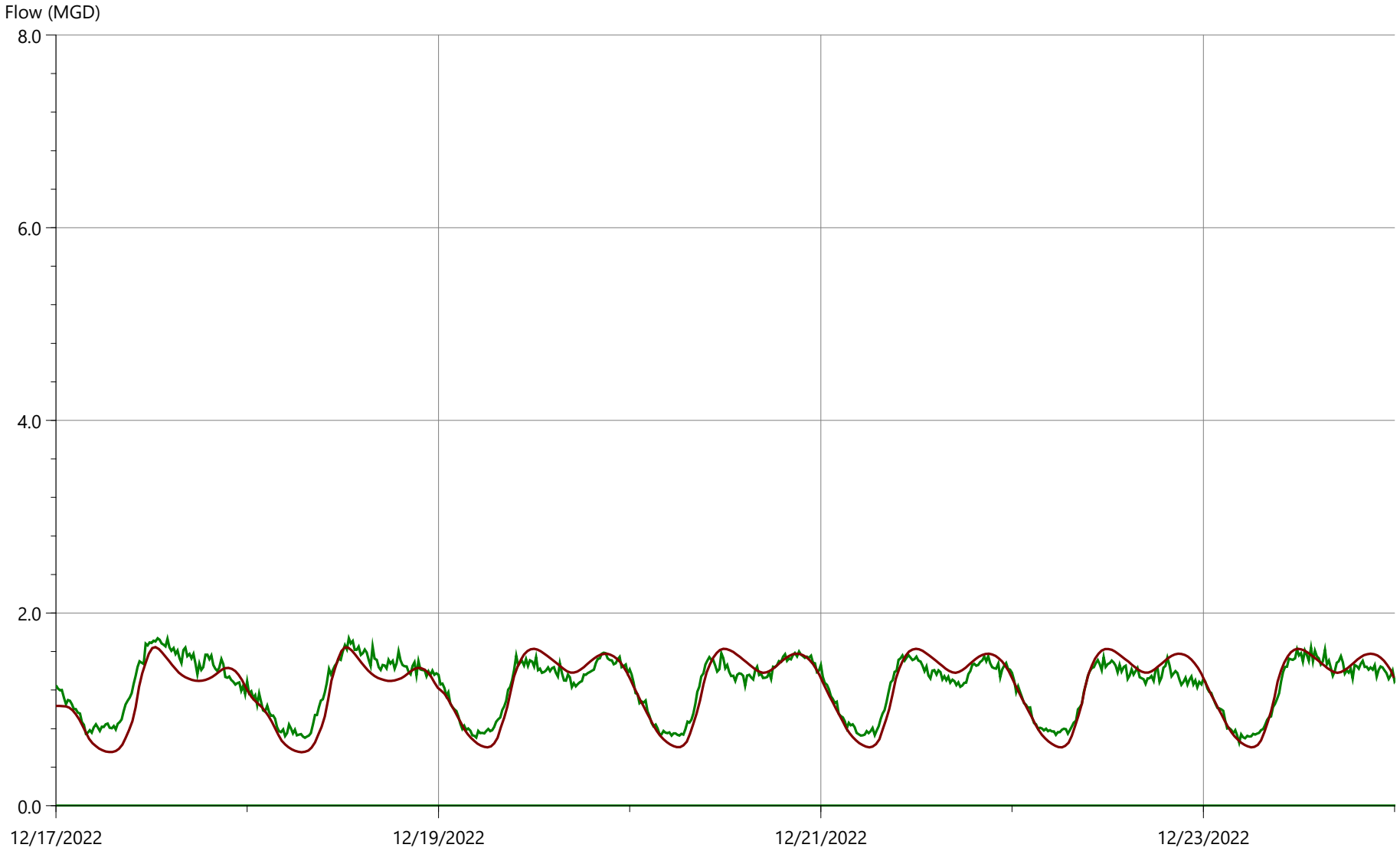
	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.046	1.054	3.386
...ation (Homestead Blockage) DWF	0.265	0.939	4.607

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>Existing_DWF_2022.12.17_7d_WithBlock...
Flow Survey Location (Obs.) 24, Model Location (Pred.) D/S S63-2.1



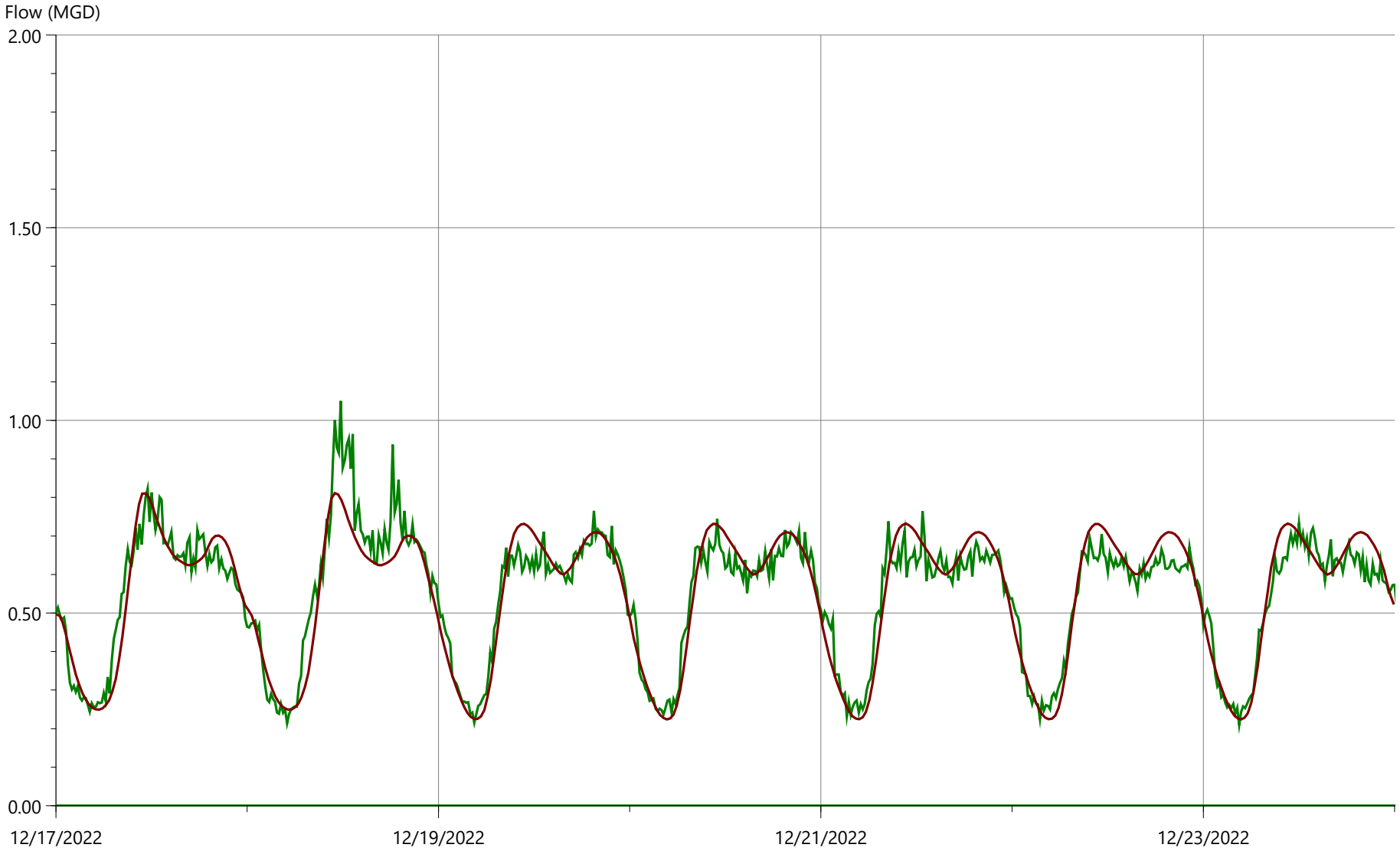
	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.725	4.699	16.699
...ation (Homestead Blockage) DWF	0.928	3.757	18.065

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>Existing_DWF_2022.12.17_7d_WithBlock...
Flow Survey Location (Obs.) 25, Model Location (Pred.) D/S S57-6.1



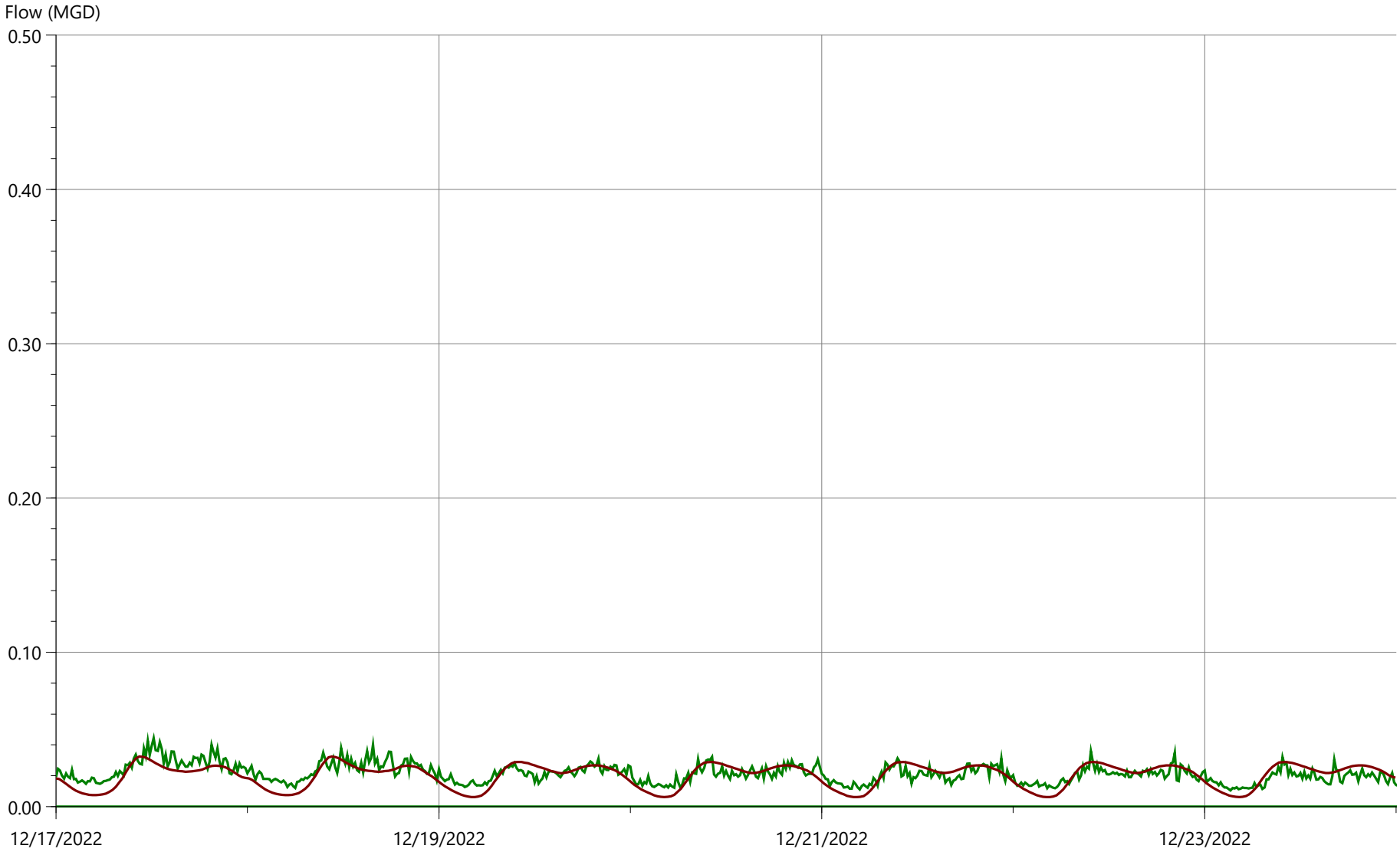
	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.653	1.739	8.697
...ation (Homestead Blockage) DWF	0.555	1.646	8.531

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>Existing_DWF_2022.12.17_7d_WithBlock...
Flow Survey Location (Obs.) 26, Model Location (Pred.) D/S S52-86.1



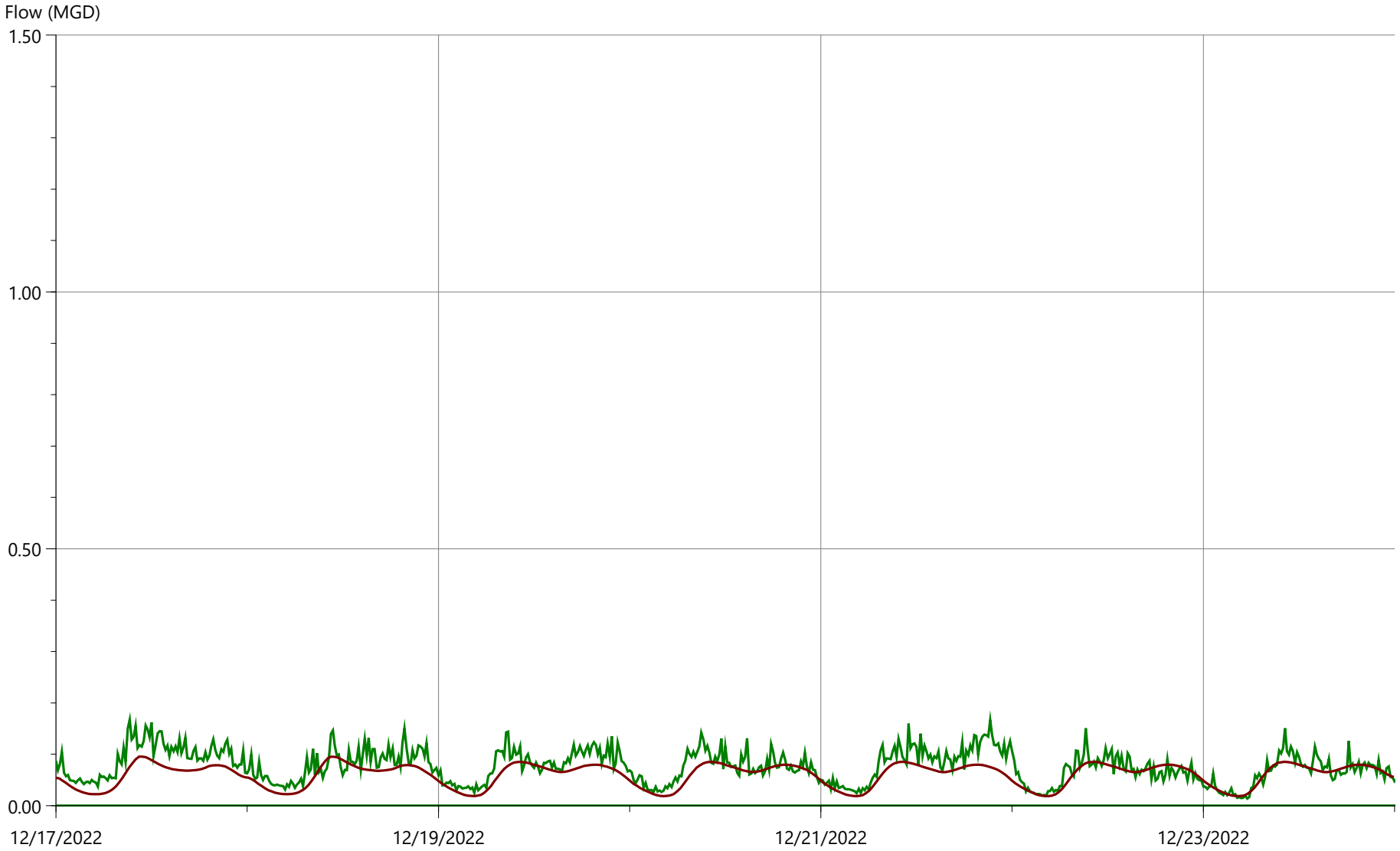
	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.209	1.050	3.846
...ation (Homestead Blockage) DWF	0.224	0.811	3.832

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>Existing_DWF_2022.12.17_7d_WithBlock...
Flow Survey Location (Obs.) 27, Model Location (Pred.) D/S S43-8.1



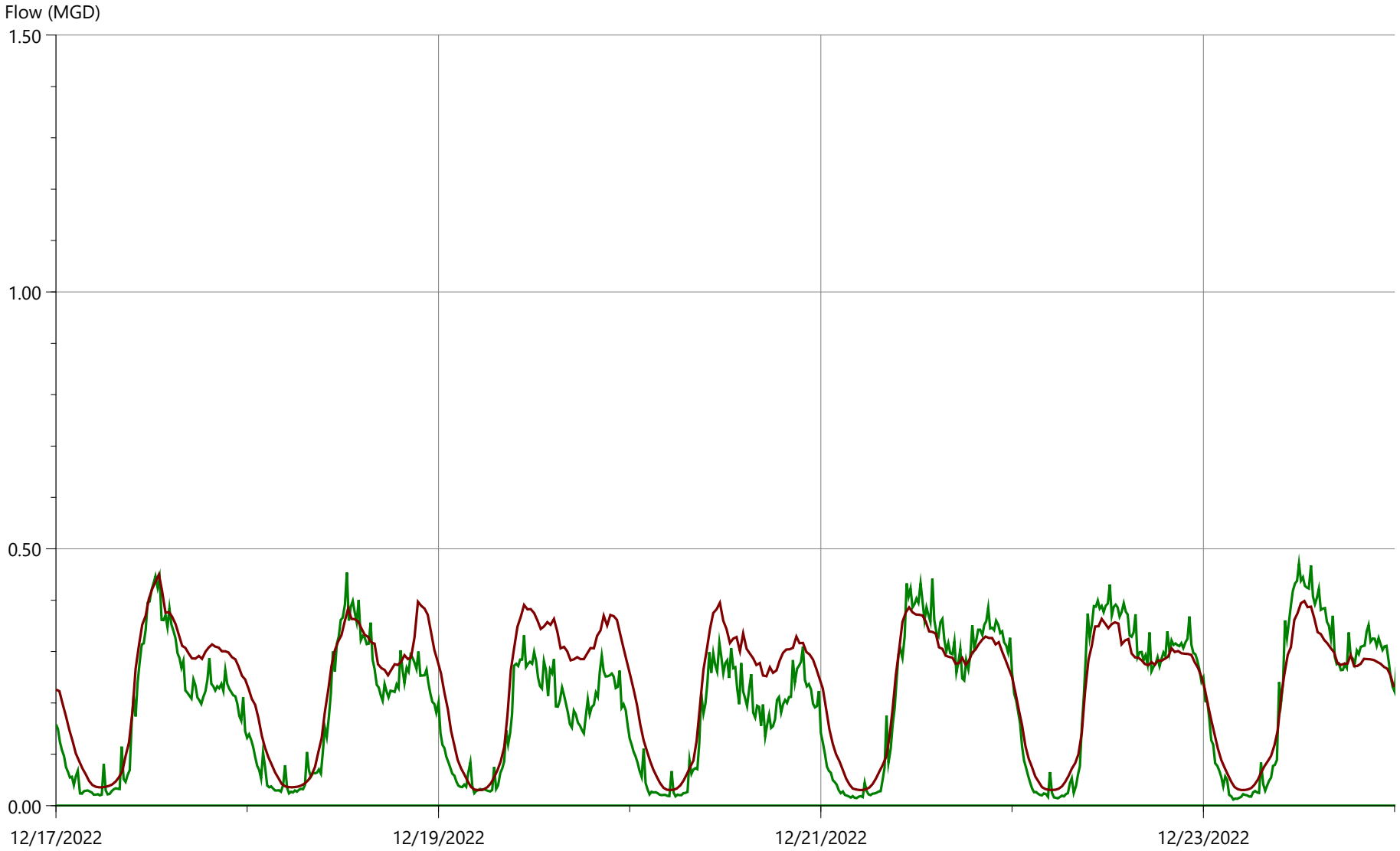
	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.010	0.044	0.151
...ation (Homestead Blockage) DWF	0.006	0.032	0.141

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>Existing_DWF_2022.12.17_7d_WithBlock...
Flow Survey Location (Obs.) 28, Model Location (Pred.) D/S S53-47.1



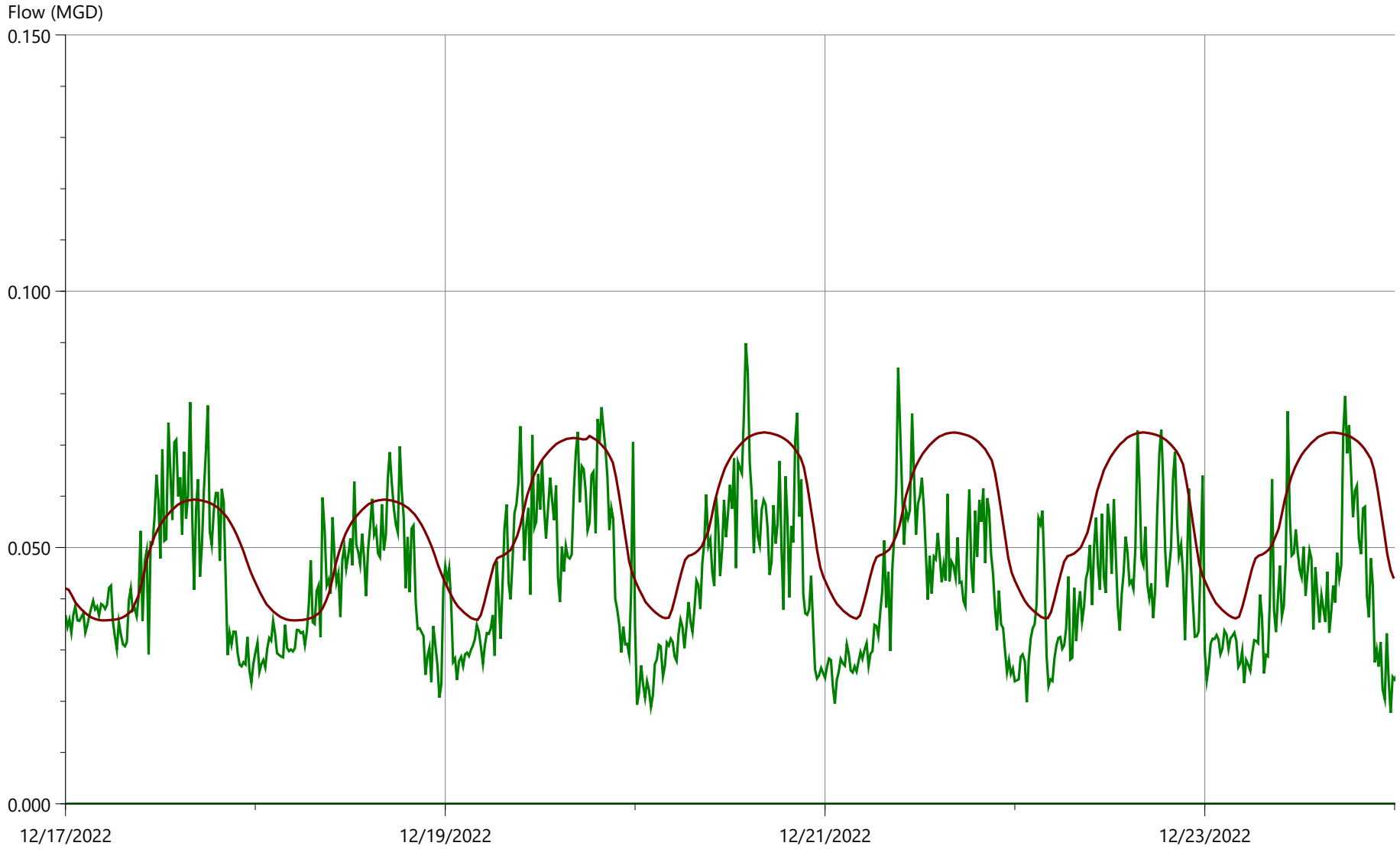
	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.014	0.167	0.542
...ation (Homestead Blockage) DWF	0.019	0.096	0.421

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>Existing_DWF_2022.12.17_7d_WithBlock...
Flow Survey Location (Obs.) 29, Model Location (Pred.) D/S S21-54.1



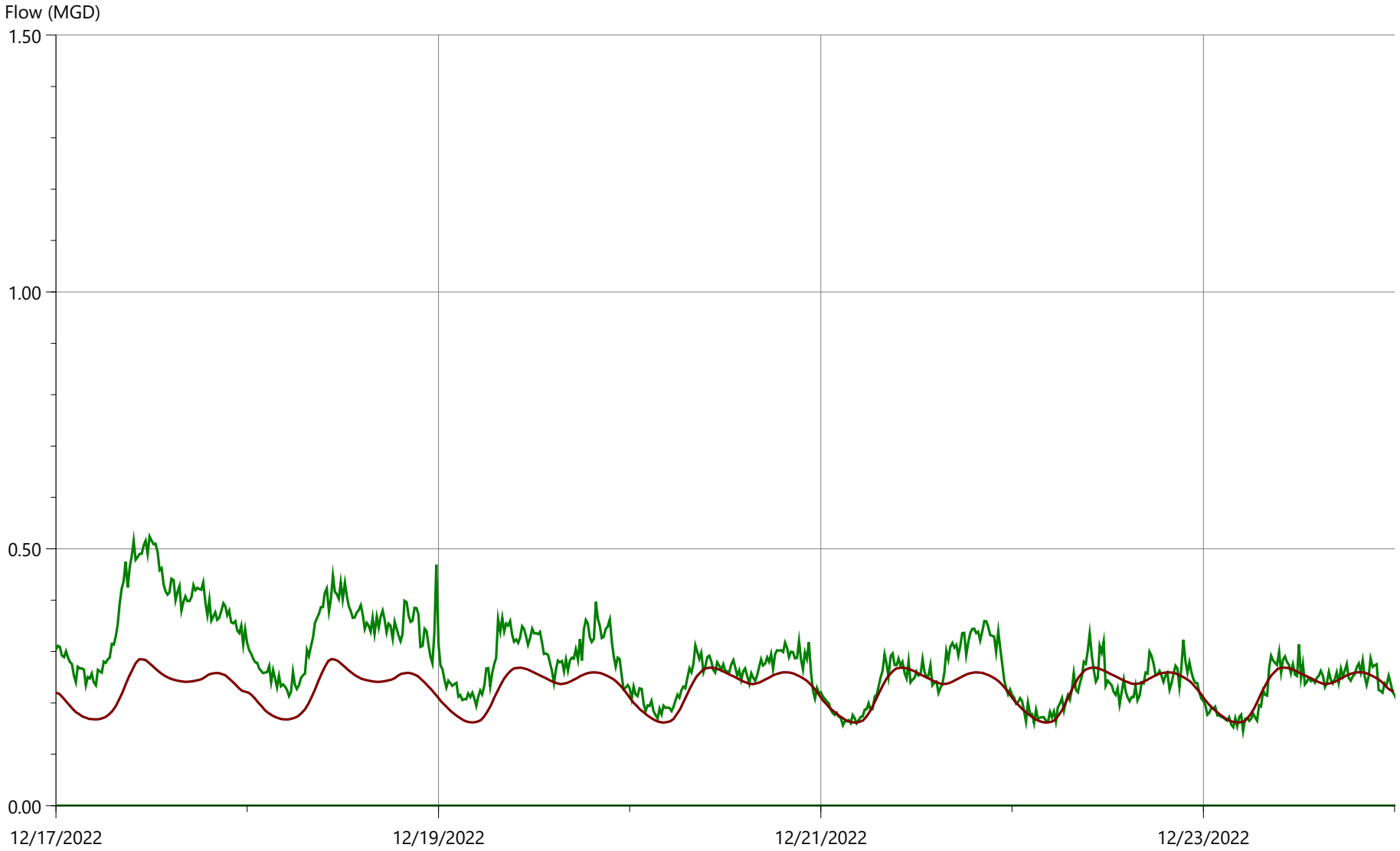
	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.012	0.471	1.385
...ation (Homestead Blockage) DWF	0.030	0.450	1.589

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>Existing_DWF_2022.12.17_7d_WithBlock...
Flow Survey Location (Obs.) 30, Model Location (Pred.) D/S S62-24.1



	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.018	0.090	0.305
...ation (Homestead Blockage) DWF	0.036	0.072	0.380

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>Existing_DWF_2022.12.17_7d_WithBlock...
Flow Survey Location (Obs.) 31, Model Location (Pred.) D/S S62-23.1



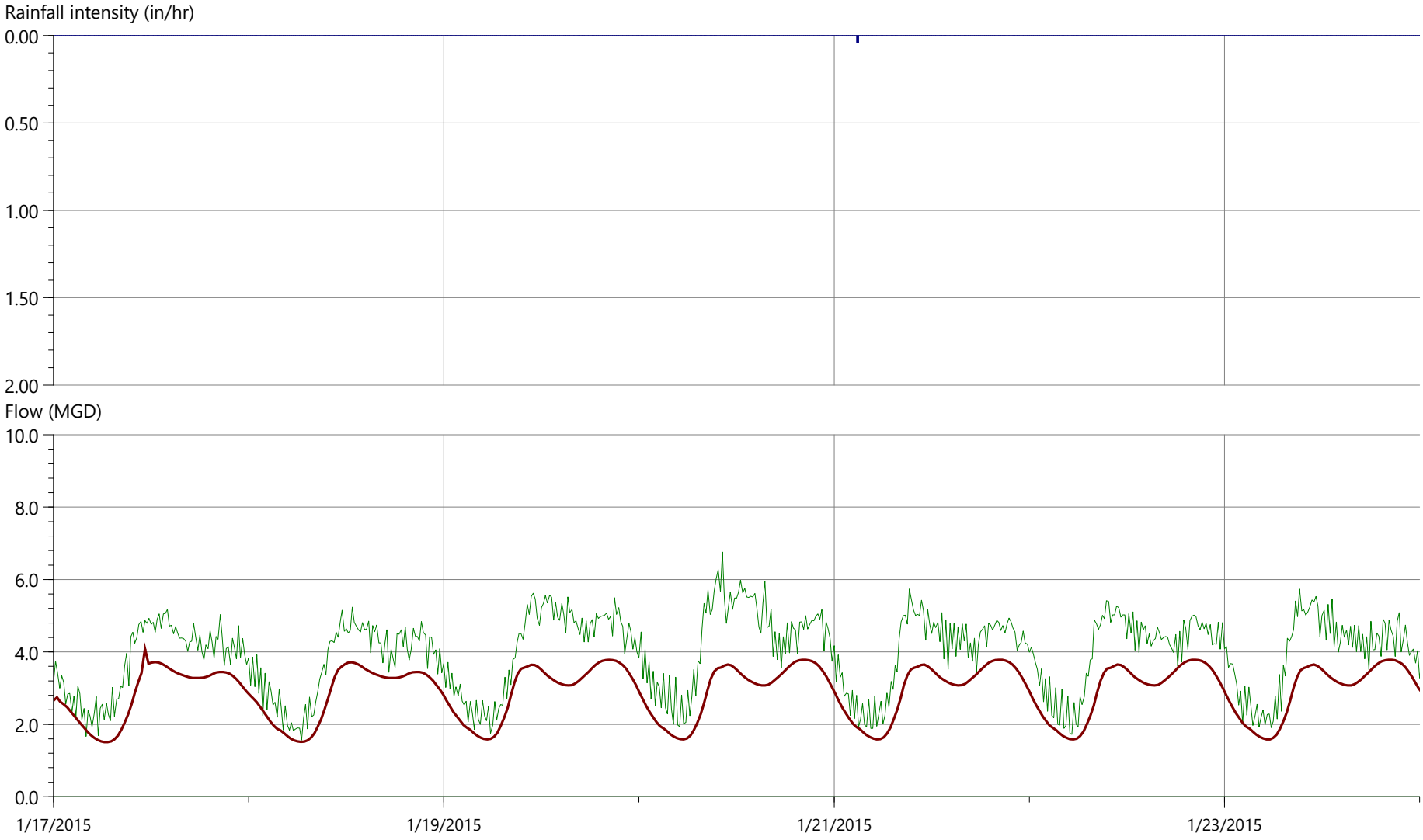
	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.146	0.524	1.961
...ation (Homestead Blockage) DWF	0.162	0.285	1.599

Dry Weather Flow Calibration Plots
Modeled vs. 2014-2015 Metered Flows

(*assumes normal settings at Homestead/Lawrence gate structure*)

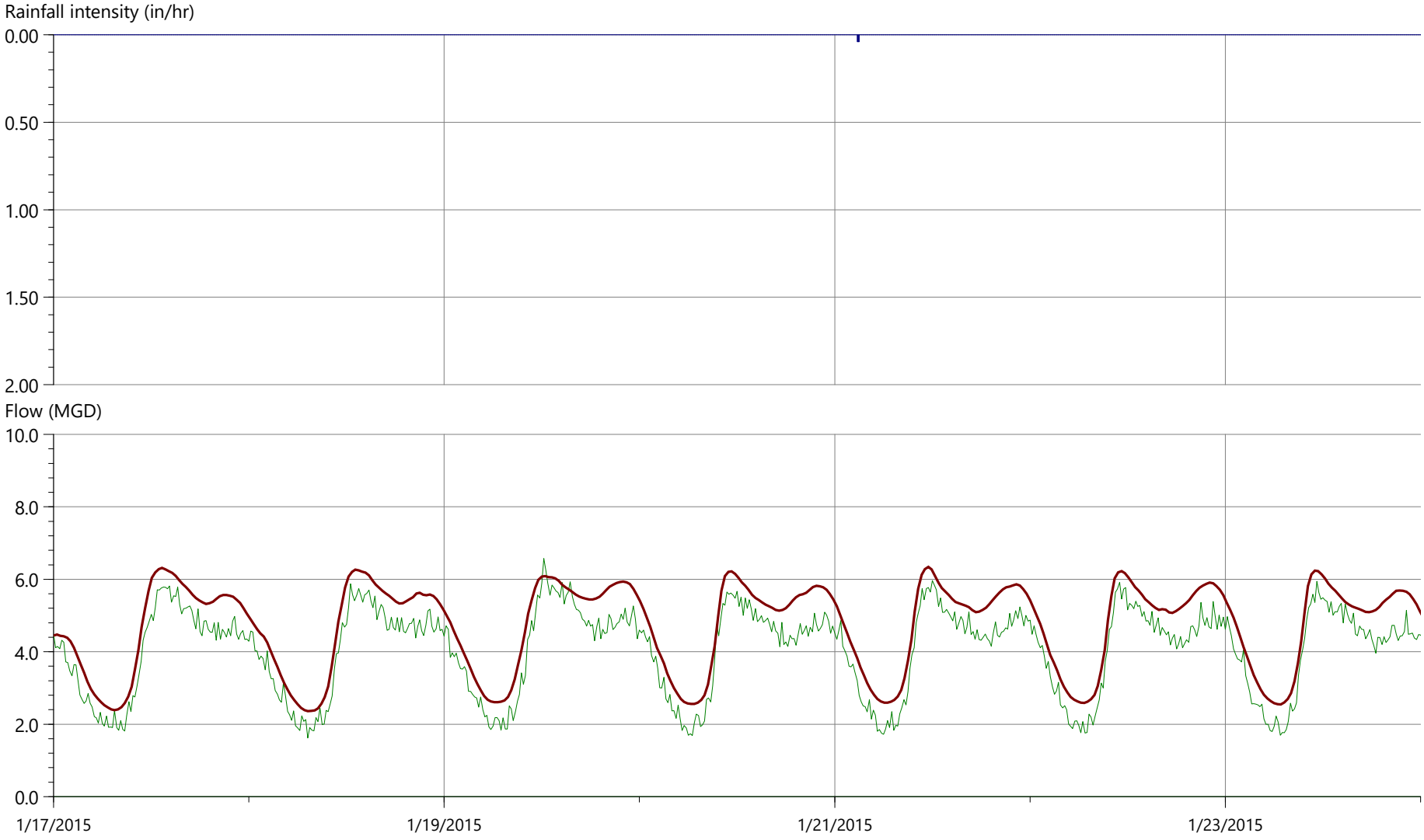
Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>2015_DWF_2015.01.17_14d_10232023>...

Flow Survey Location (Obs.) 1, Model Location (Pred.) D/S S104-29.1, Rainfall Profile: 1



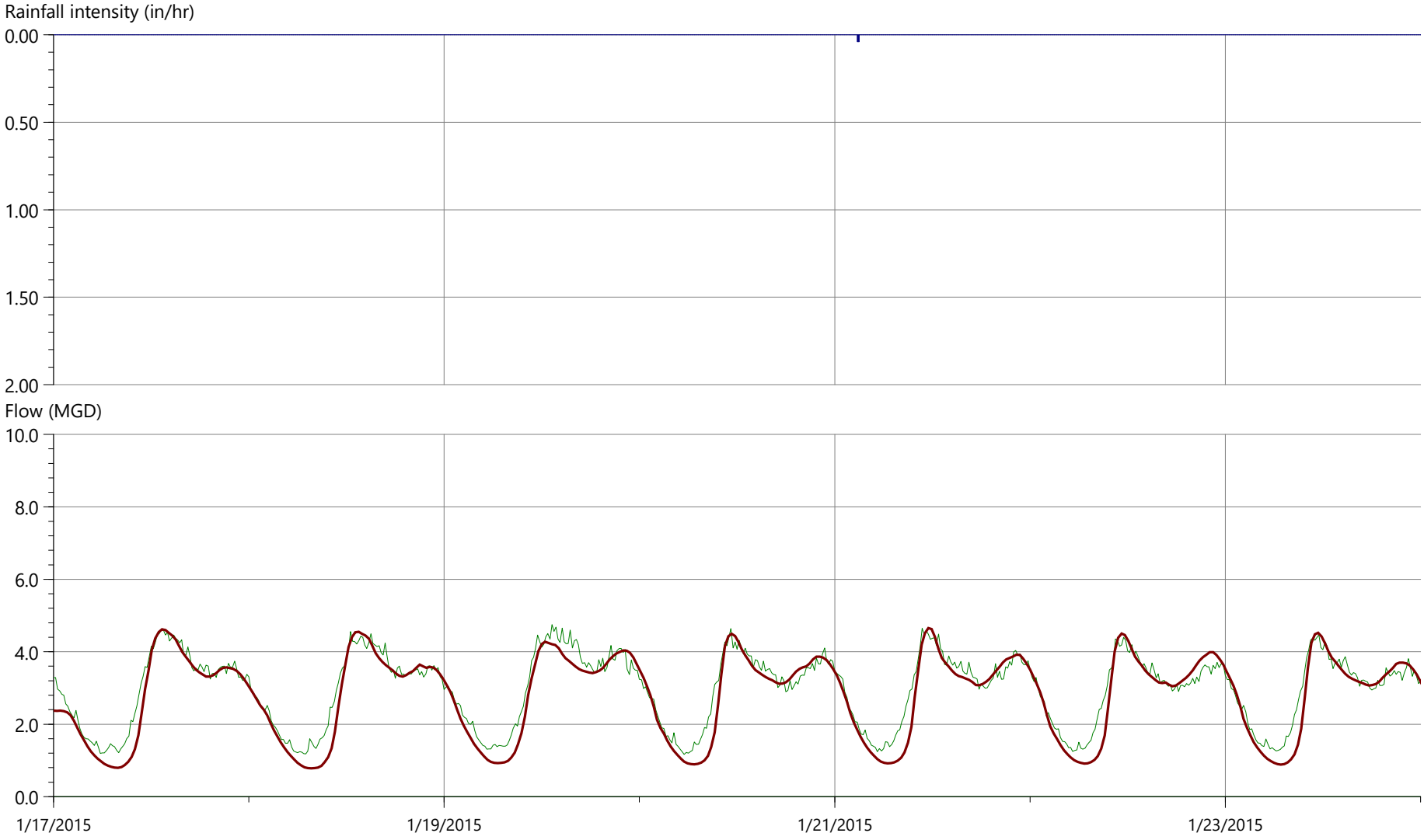
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.010	0.040	0.000			
Observed				1.565	6.760	27.798
...4d_10232023>DWF				1.509	4.083	20.338

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>2015_DWF_2015.01.17_14d_10232023>...
Flow Survey Location (Obs.) 2, Model Location (Pred.) D/S S103-9.1, Rainfall Profile: 1



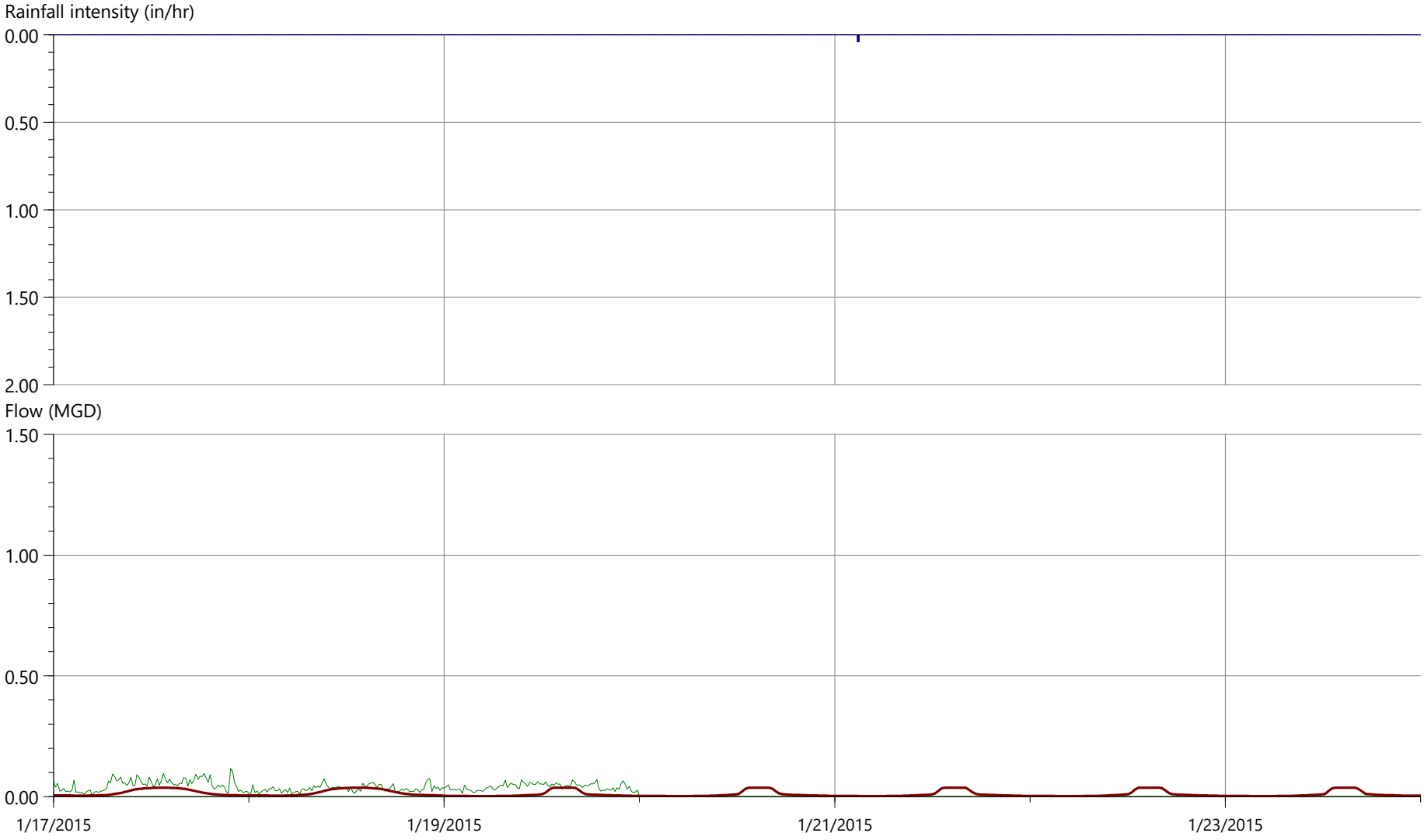
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.010	0.040	0.000			
Observed				1.622	6.578	28.333
...4d_10232023>DWF				2.363	6.345	33.008

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>2015_DWF_2015.01.17_14d_10232023>...
Flow Survey Location (Obs.) 3, Model Location (Pred.) D/S S104-27.1, Rainfall Profile: 1



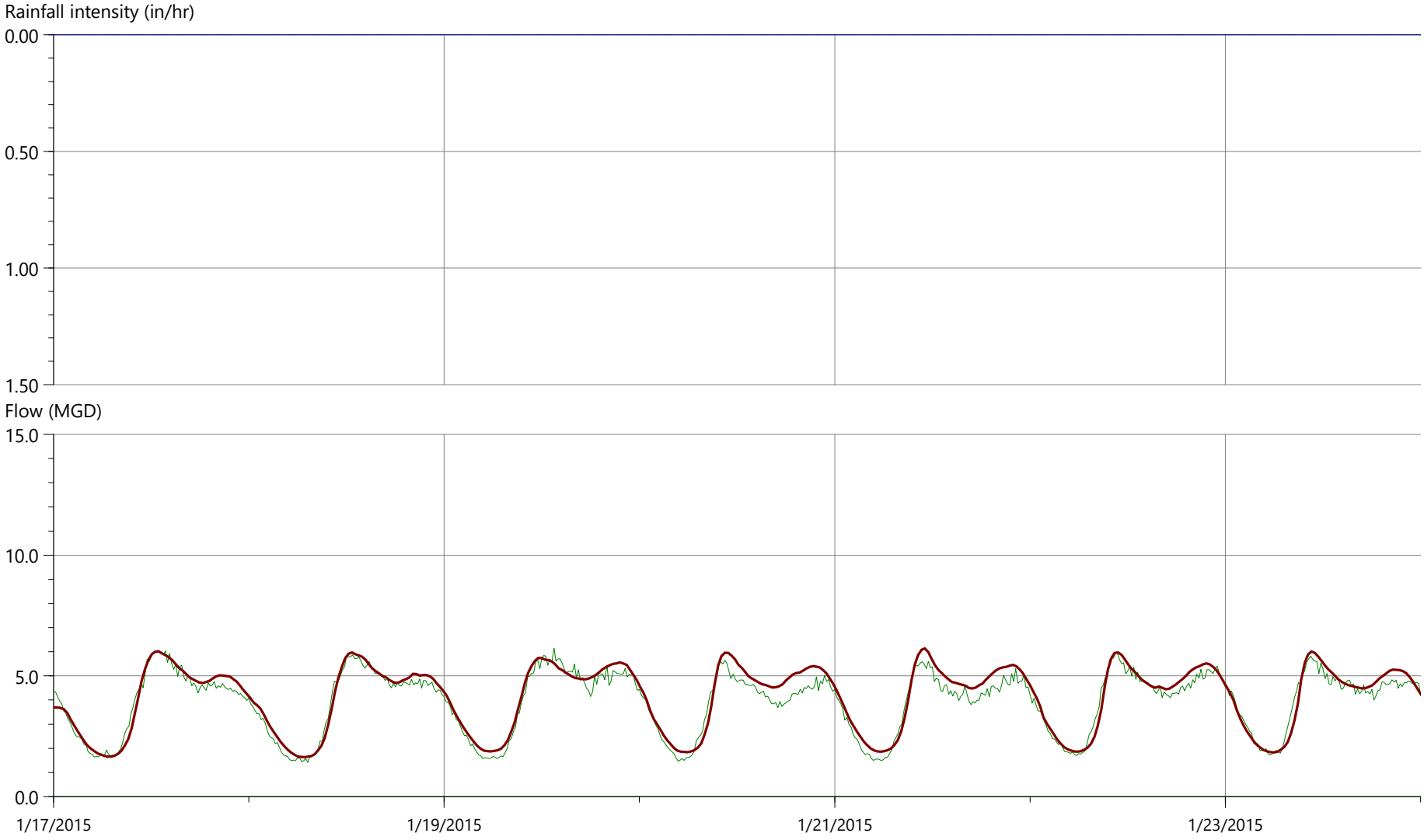
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.010	0.040	0.000			
Observed				1.168	4.748	20.854
...4d_10232023>DWF				0.780	4.654	19.551

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>2015_DWF_2015.01.17_14d_10232023>...
Flow Survey Location (Obs.) 4, Model Location (Pred.) D/S S94-36.1, Rainfall Profile: 1



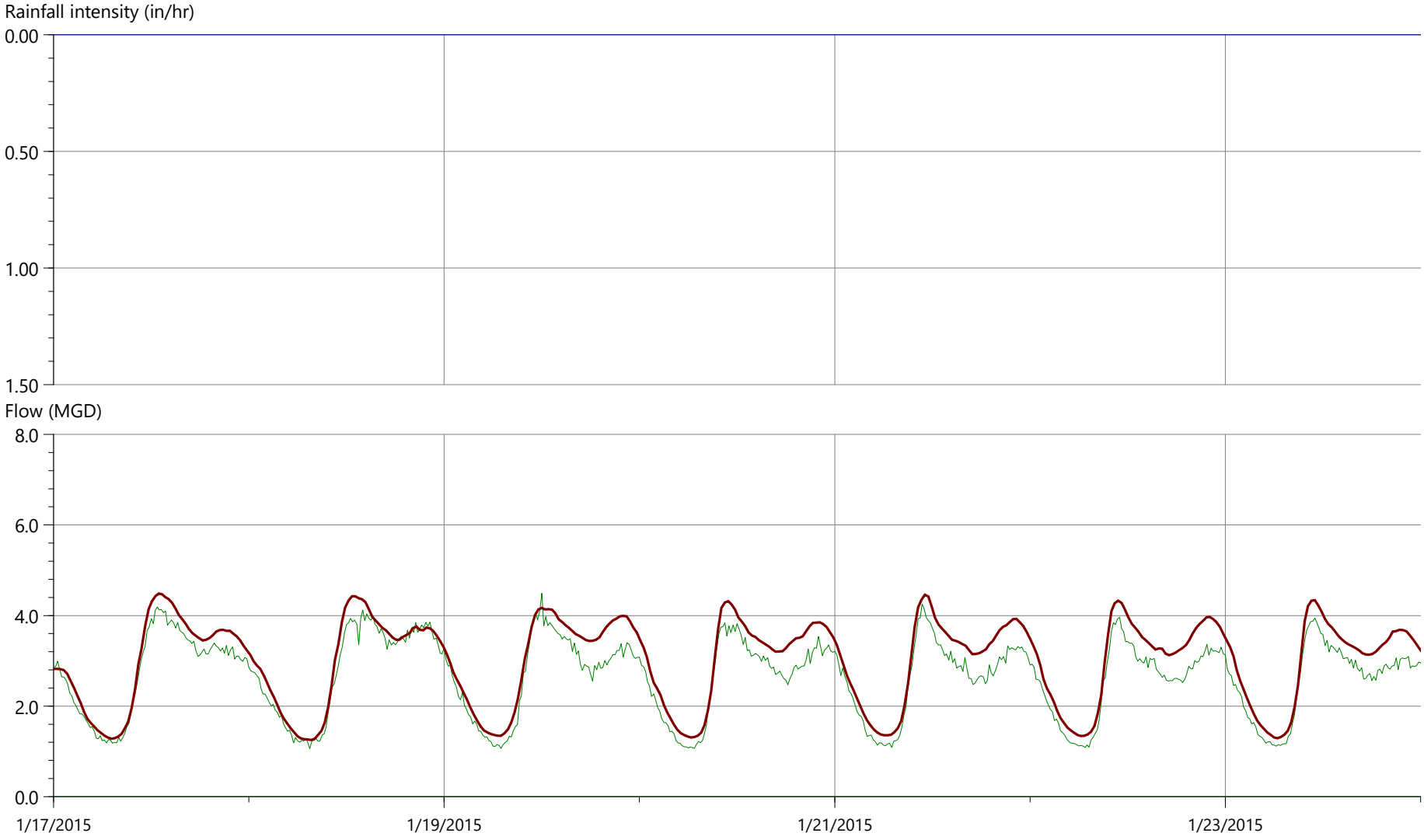
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.010	0.040	0.000			
Observed				0.000	0.116	0.125
...4d_10232023>DWF				0.003	0.037	0.085

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>2015_DWF_2015.01.17_14d_10232023>...
Flow Survey Location (Obs.) 5, Model Location (Pred.) D/S S83-23.1, Rainfall Profile: 2



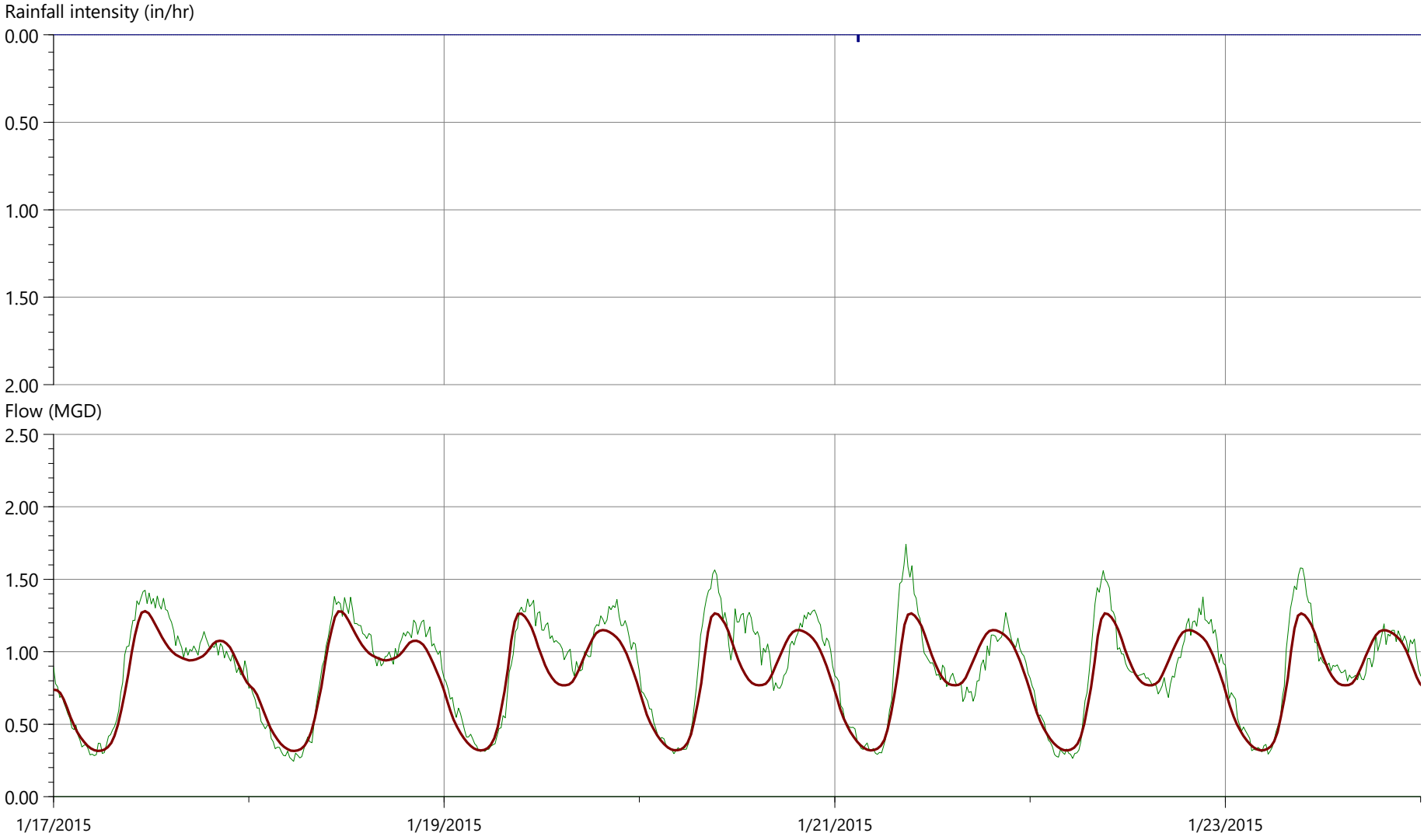
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.000	0.000	0.000			
Observed				1.422	6.144	27.553
...4d_10232023>DWF				1.638	6.131	28.906

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>2015_DWF_2015.01.17_14d_10232023>...
Flow Survey Location (Obs.) 6, Model Location (Pred.) D/S S83-25.1, Rainfall Profile: 2



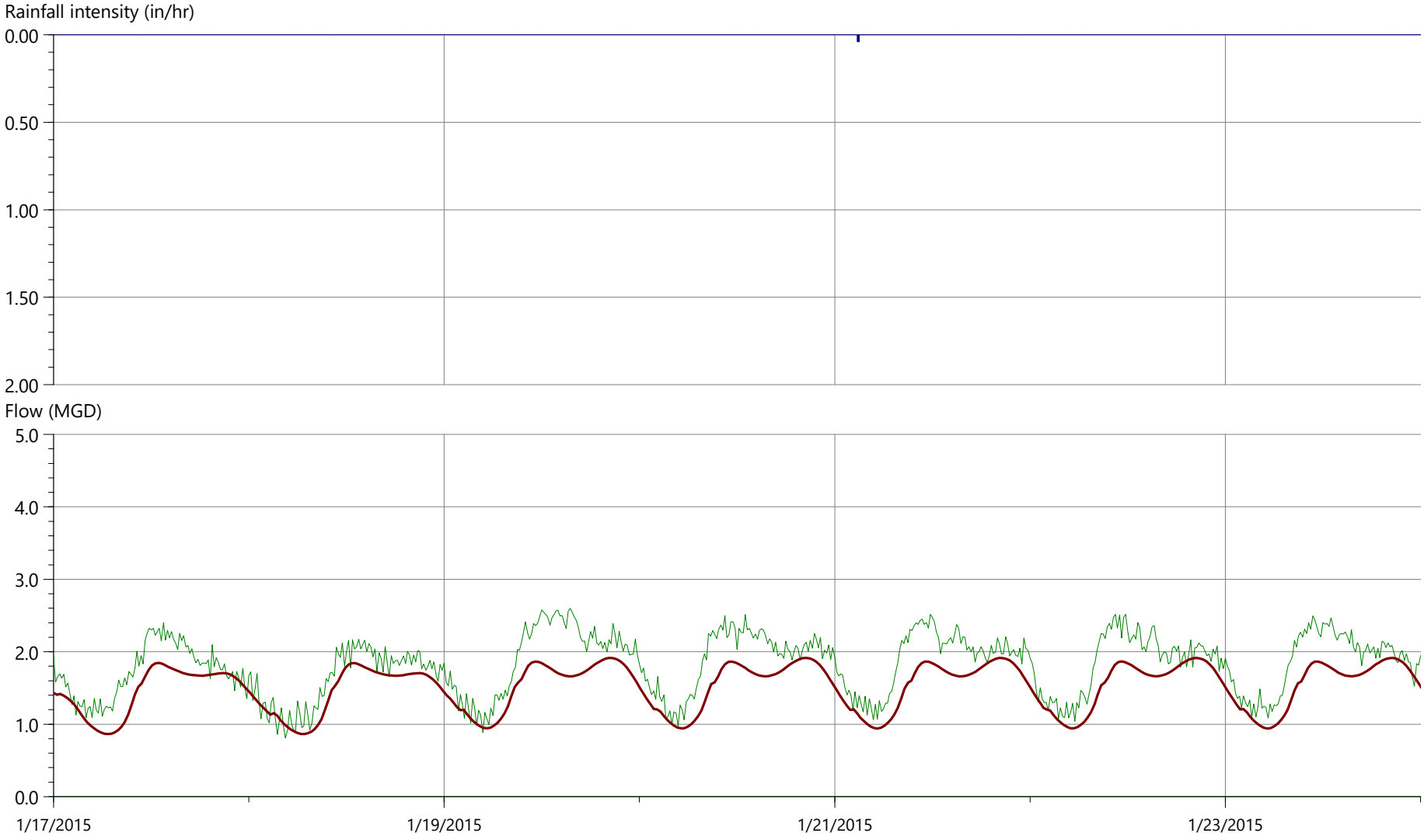
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.000	0.000	0.000			
Observed				1.058	4.493	18.522
...4d_10232023>DWF				1.253	4.485	20.993

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>2015_DWF_2015.01.17_14d_10232023>...
Flow Survey Location (Obs.) 7, Model Location (Pred.) D/S S105-6.1, Rainfall Profile: 1



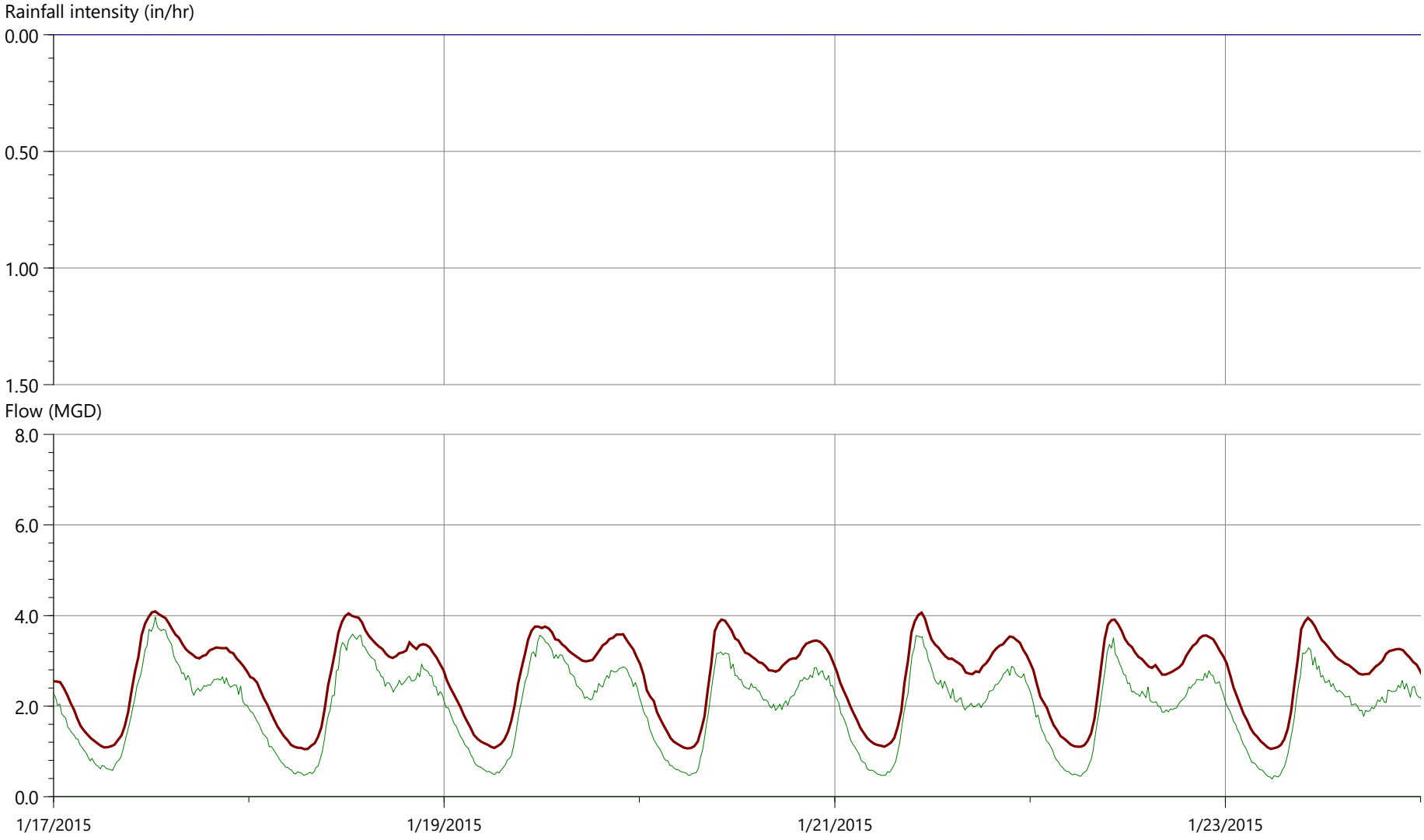
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.010	0.040	0.000			
Observed				0.243	1.742	6.178
...4d_10232023>DWF				0.315	1.280	5.774

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>2015_DWF_2015.01.17_14d_10232023>...
Flow Survey Location (Obs.) 8, Model Location (Pred.) D/S S86-13.1, Rainfall Profile: 1



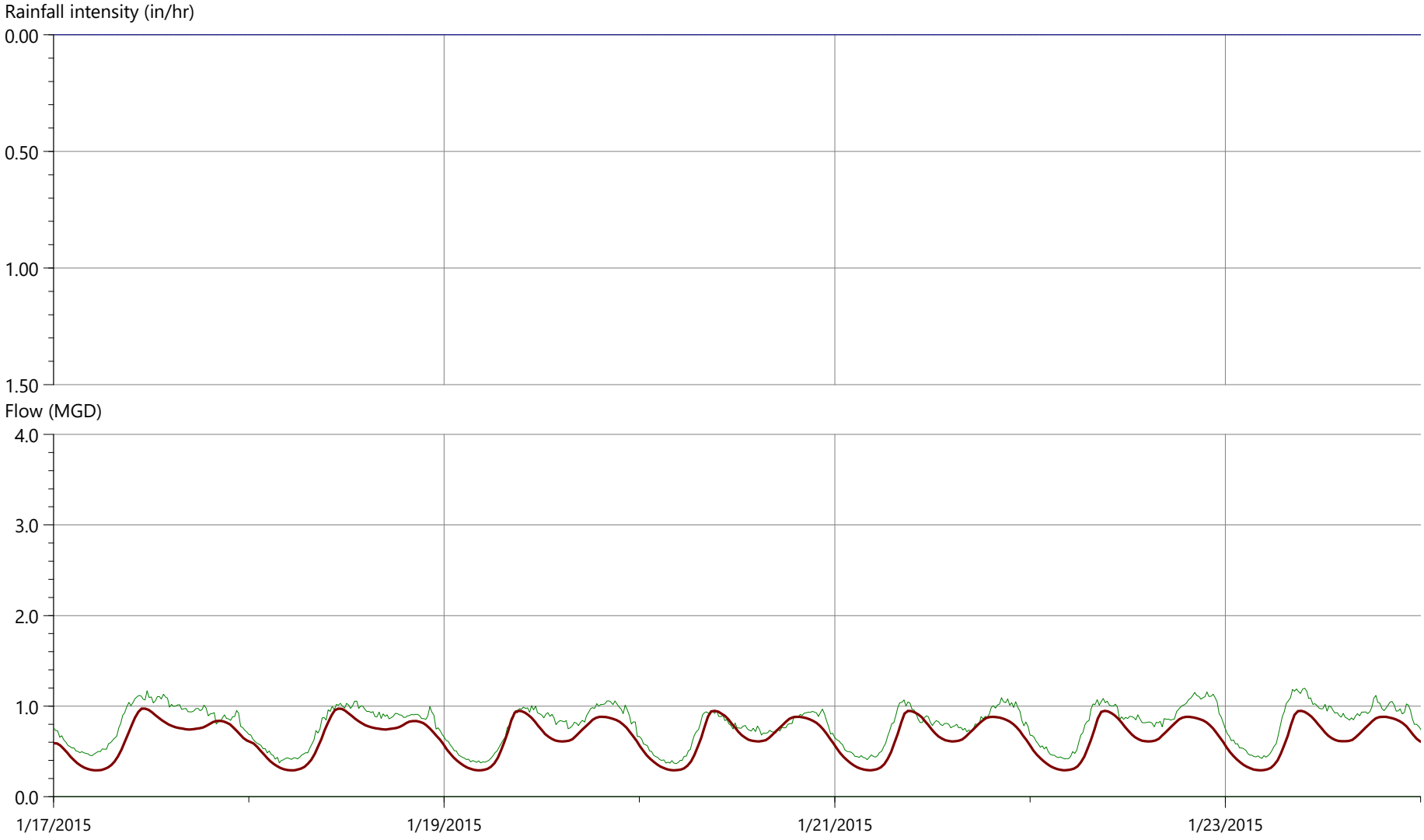
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.010	0.040	0.000			
Observed				0.811	2.598	12.782
...4d_10232023>DWF				0.864	1.915	10.581

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>2015_DWF_2015.01.17_14d_10232023>...
Flow Survey Location (Obs.) 9, Model Location (Pred.) D/S S62-48.1, Rainfall Profile: 2



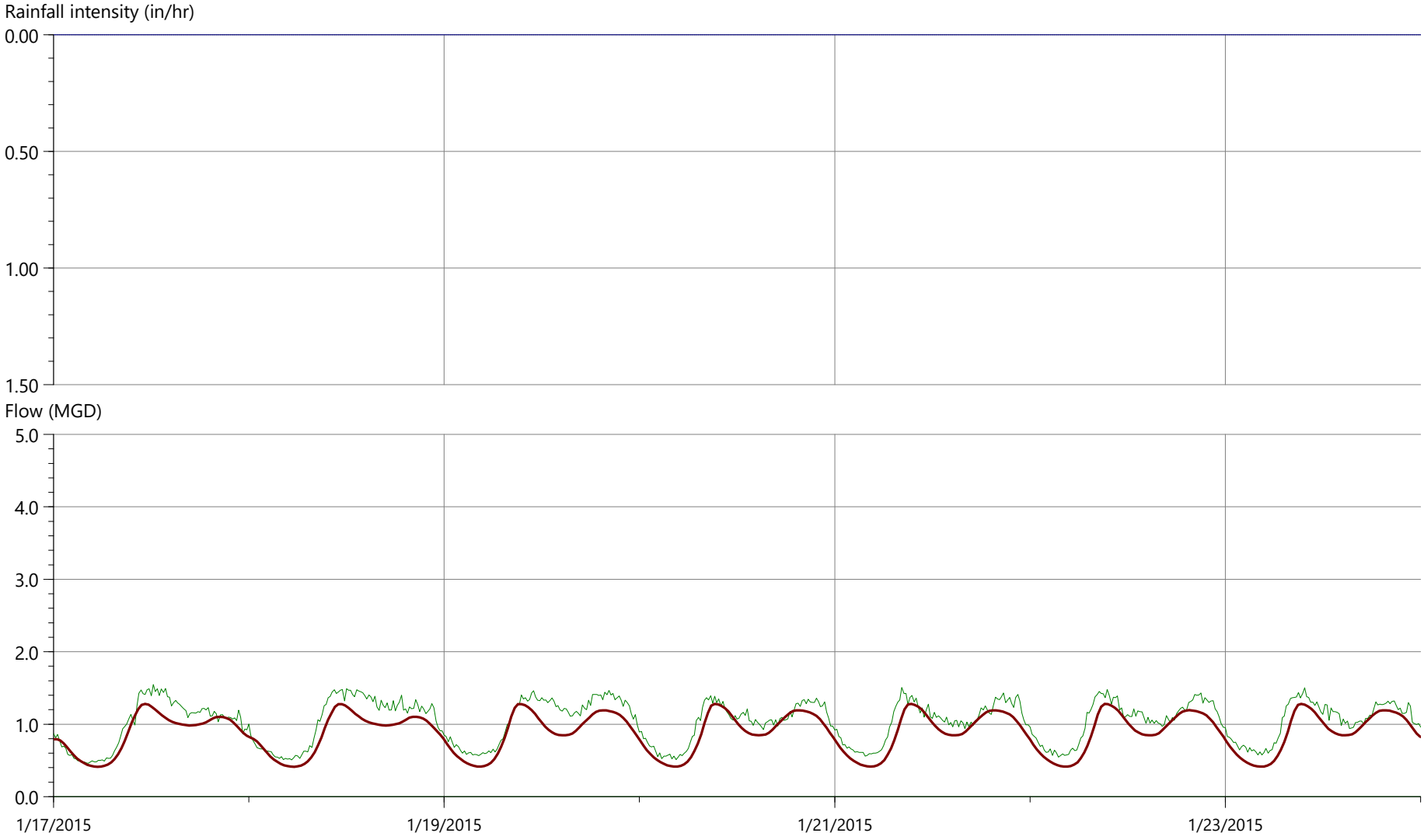
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.000	0.000	0.000			
Observed				0.389	3.968	13.993
...4d_10232023>DWF				1.048	4.093	18.629

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>2015_DWF_2015.01.17_14d_10232023>...
Flow Survey Location (Obs.) 10, Model Location (Pred.) D/S S52-80.1, Rainfall Profile: 2



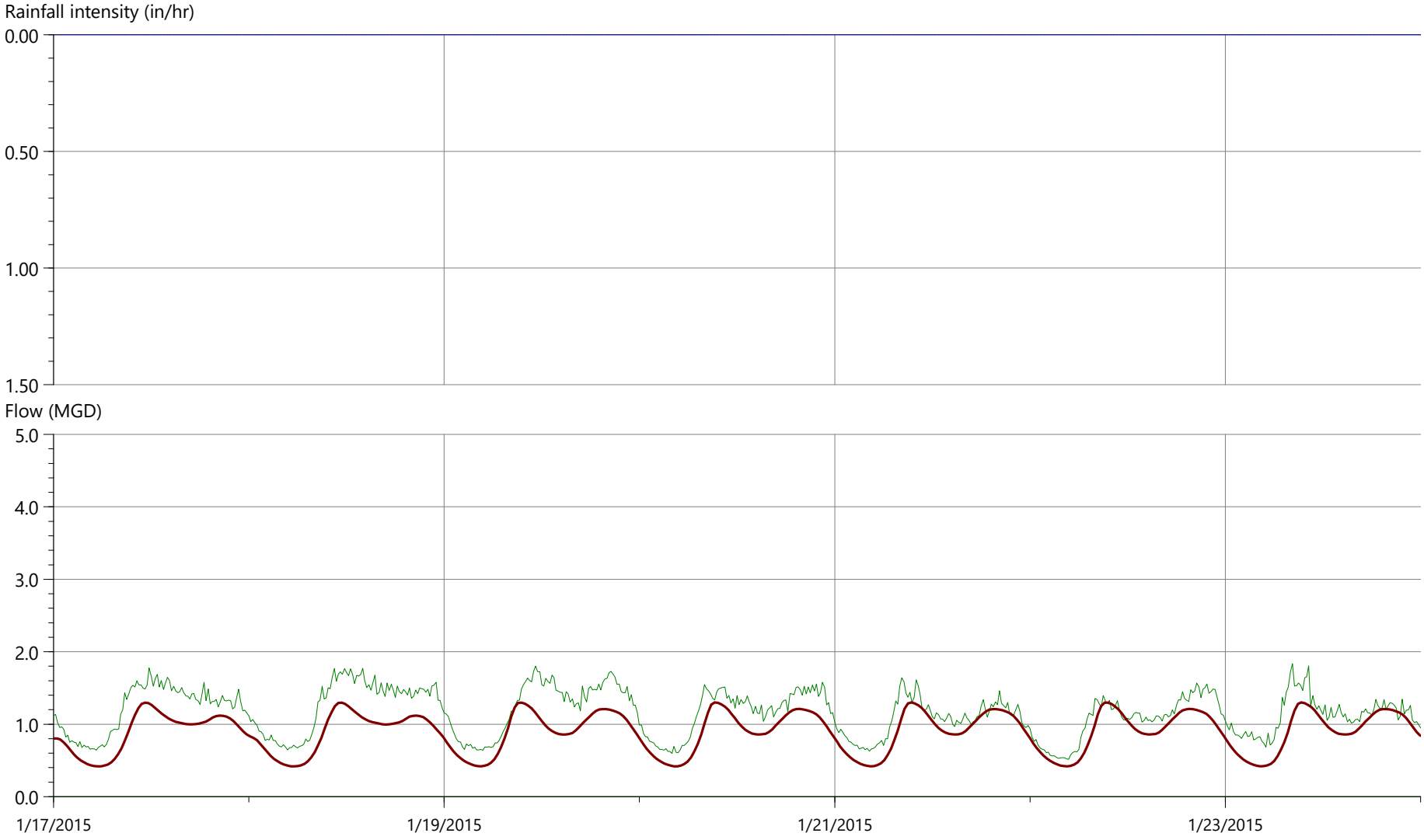
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.000	0.000	0.000			
Observed				0.365	1.198	5.546
...4d_10232023>DWF				0.291	0.973	4.553

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>2015_DWF_2015.01.17_14d_10232023>...
Flow Survey Location (Obs.) 11, Model Location (Pred.) D/S S53-9.1, Rainfall Profile: 2



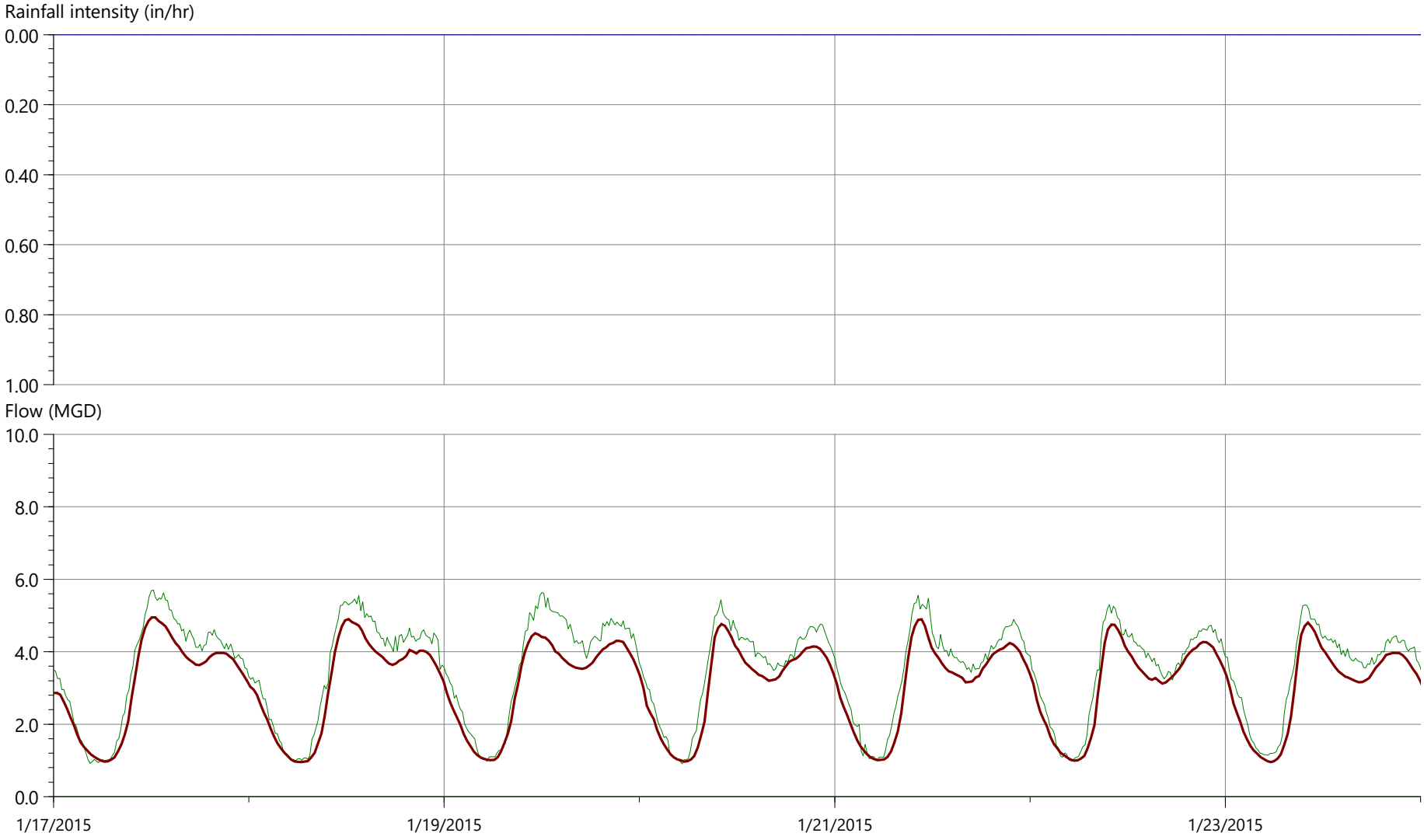
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.000	0.000	0.000			
Observed				0.459	1.547	7.290
...4d_10232023>DWF				0.413	1.280	6.190

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>2015_DWF_2015.01.17_14d_10232023>...
Flow Survey Location (Obs.) 12, Model Location (Pred.) D/S S53-109.1, Rainfall Profile: 2



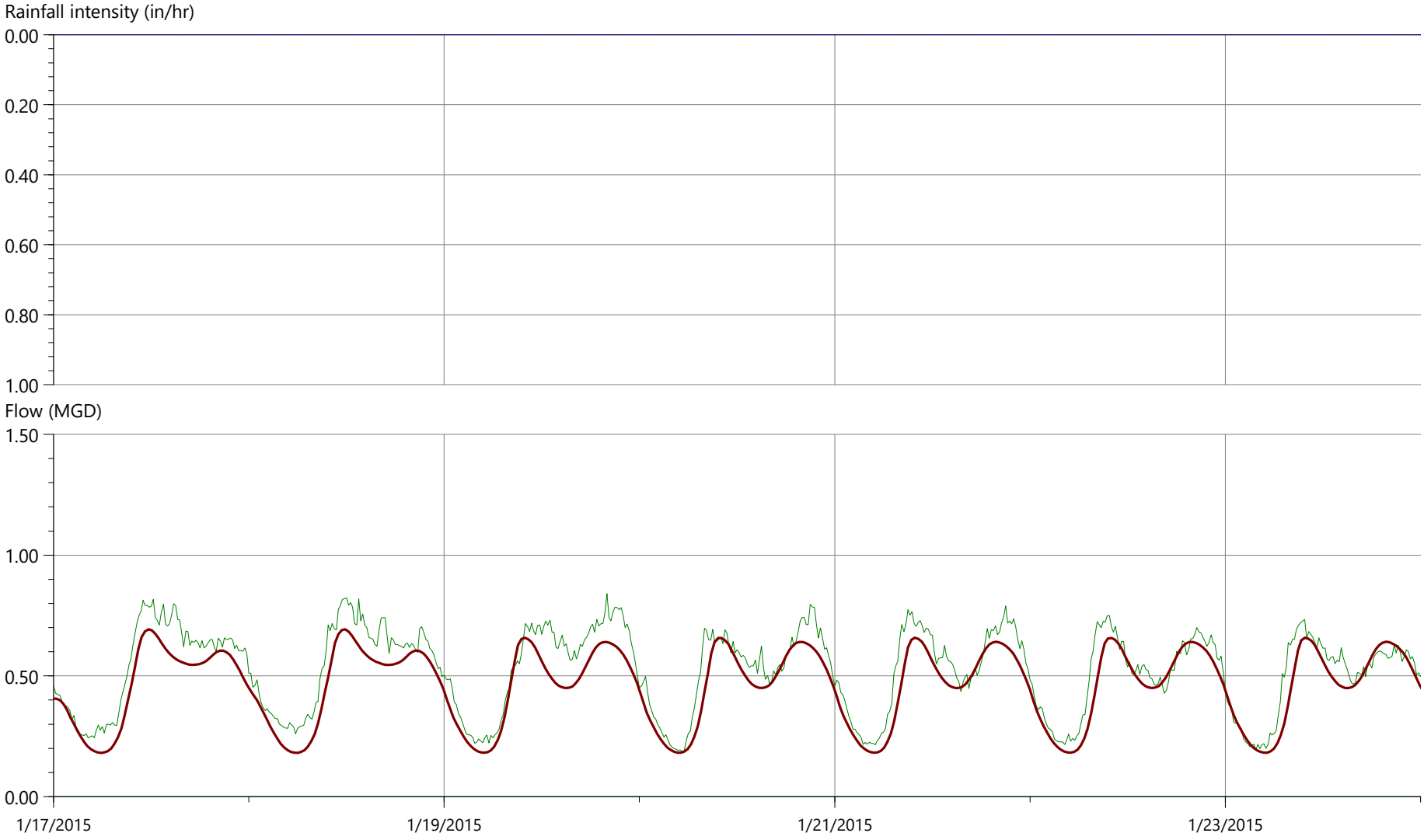
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.000	0.000	0.000			
Observed				0.516	1.835	8.168
...4d_10232023>DWF				0.418	1.300	6.278

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>2015_DWF_2015.01.17_14d_10232023>...
Flow Survey Location (Obs.) 13, Model Location (Pred.) D/S S53-73.1, Rainfall Profile: 3



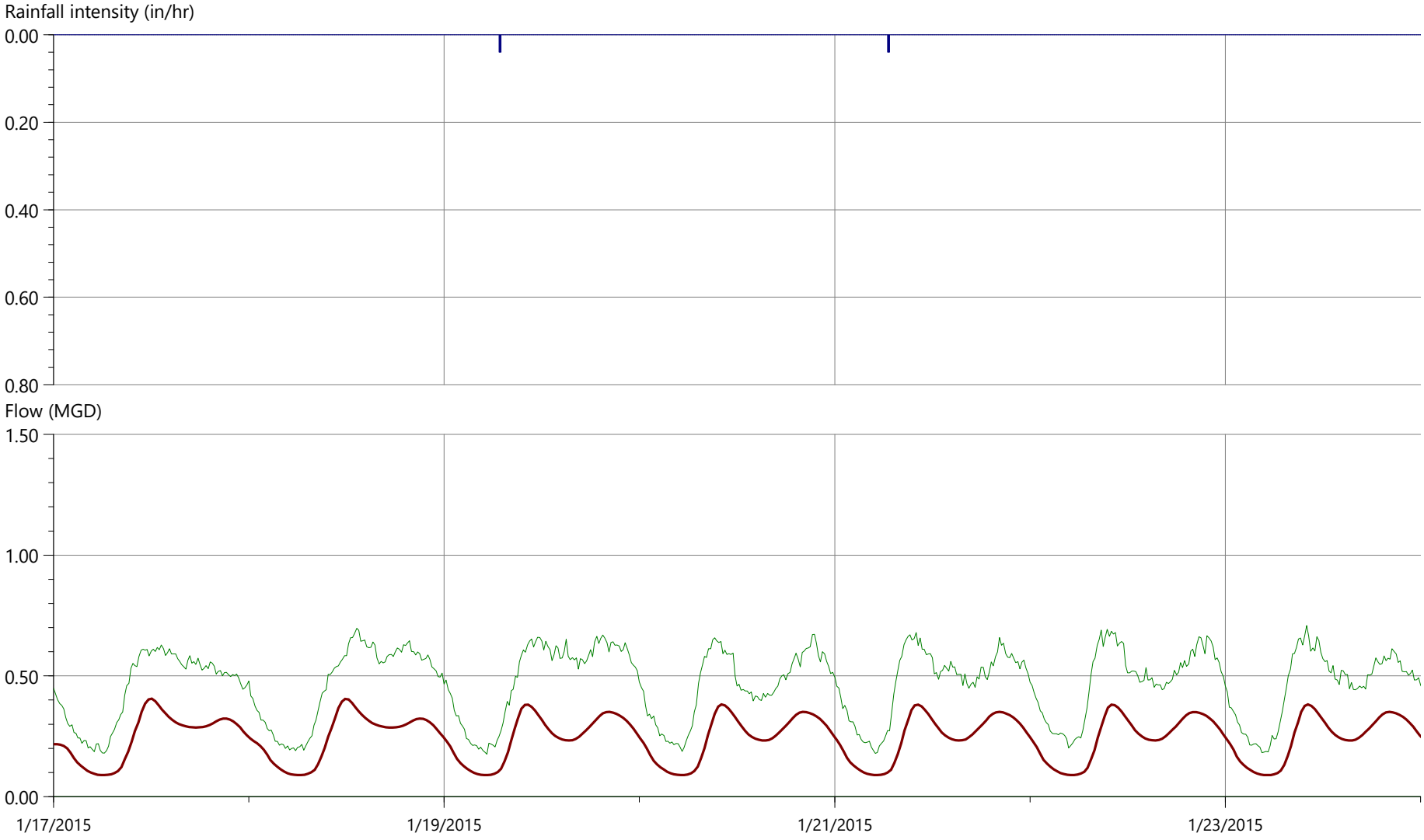
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.000	0.000	0.000			
Observed				0.904	5.704	24.523
...4d_10232023>DWF				0.954	4.945	21.504

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>2015_DWF_2015.01.17_14d_10232023>...
Flow Survey Location (Obs.) 14, Model Location (Pred.) D/S S54-17.1, Rainfall Profile: 3



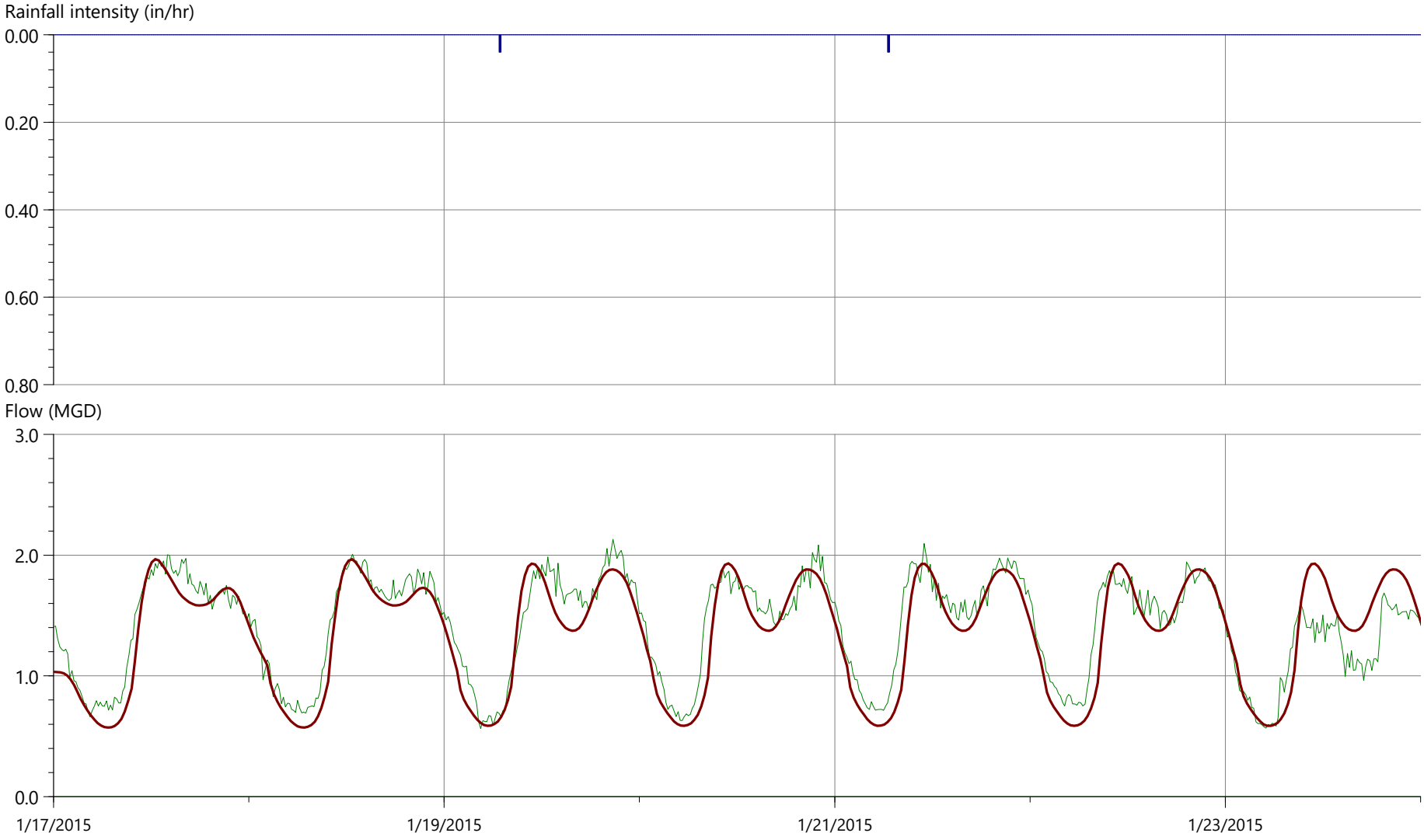
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.000	0.000	0.000			
Observed				0.187	0.840	3.691
...4d_10232023>DWF				0.181	0.693	3.212

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>2015_DWF_2015.01.17_14d_10232023>...
Flow Survey Location (Obs.) 15, Model Location (Pred.) D/S S65-48.1, Rainfall Profile: 4



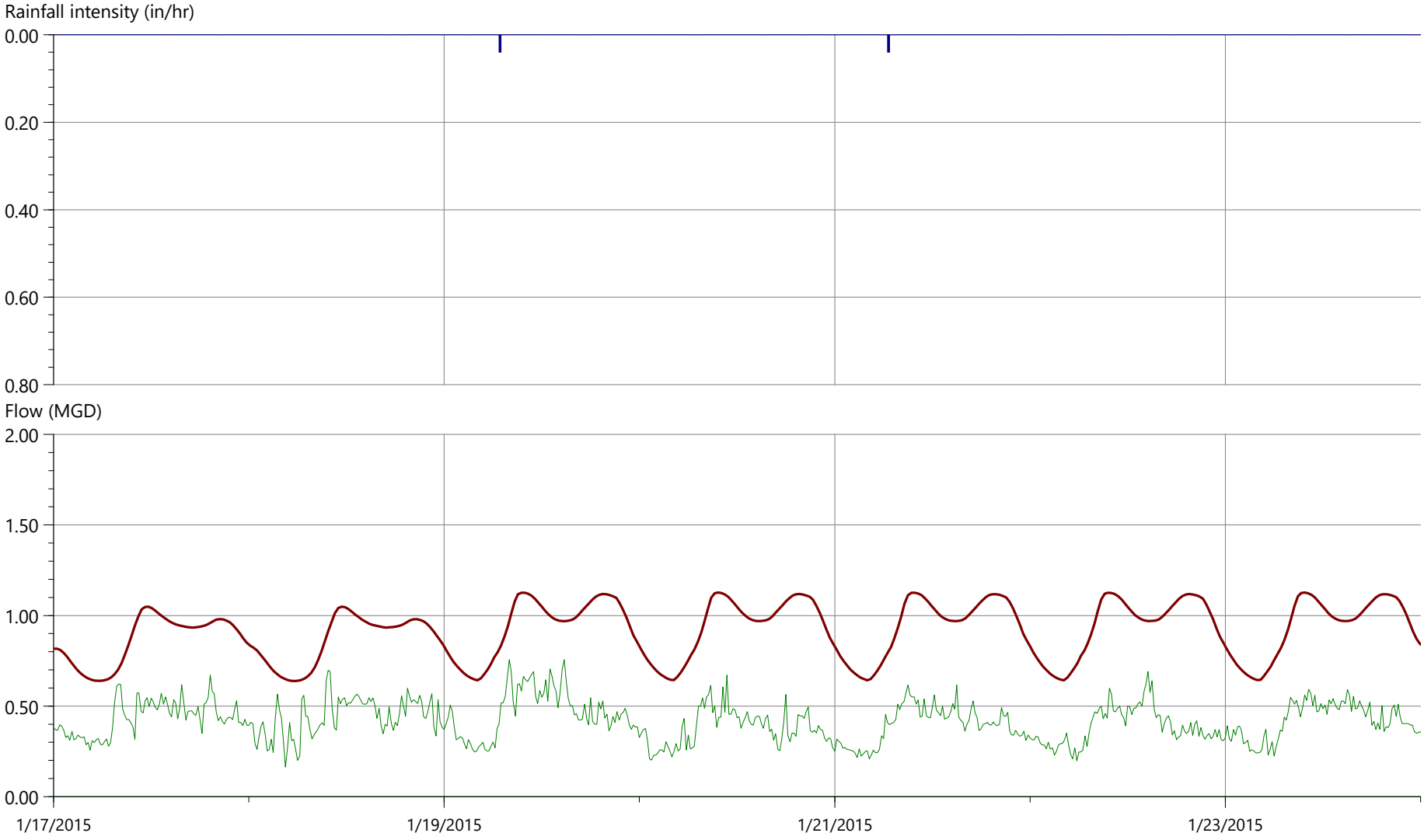
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.020	0.040	0.000			
Observed				0.176	0.708	3.273
...4d_10232023>DWF				0.089	0.406	1.711

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>2015_DWF_2015.01.17_14d_10232023>...
Flow Survey Location (Obs.) 16, Model Location (Pred.) D/S S67-12.1, Rainfall Profile: 4



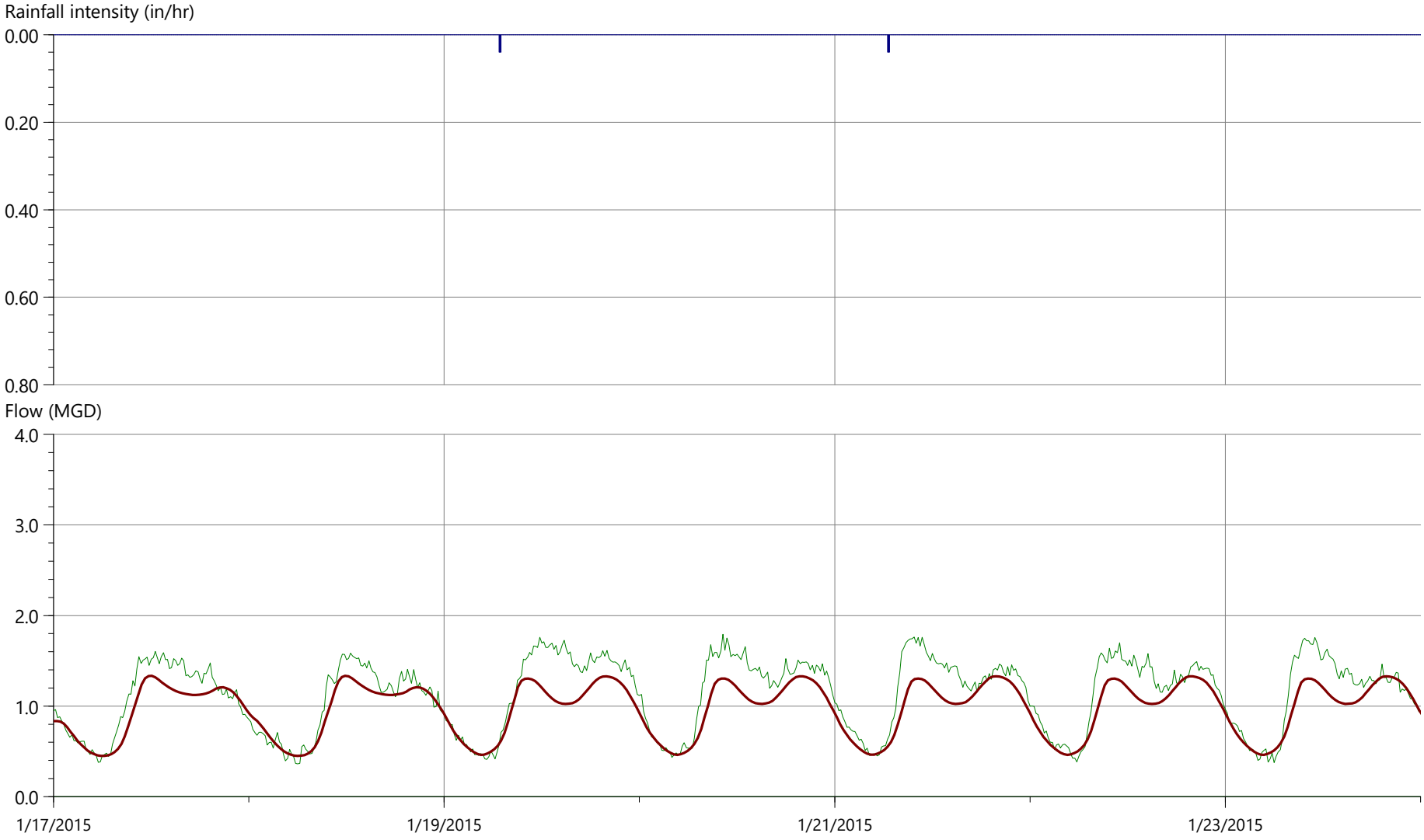
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.020	0.040	0.000			
Observed				0.564	2.132	9.871
...4d_10232023>DWF				0.572	1.966	9.424

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>2015_DWF_2015.01.17_14d_10232023>...
Flow Survey Location (Obs.) 17, Model Location (Pred.) D/S S58-12.2, Rainfall Profile: 4



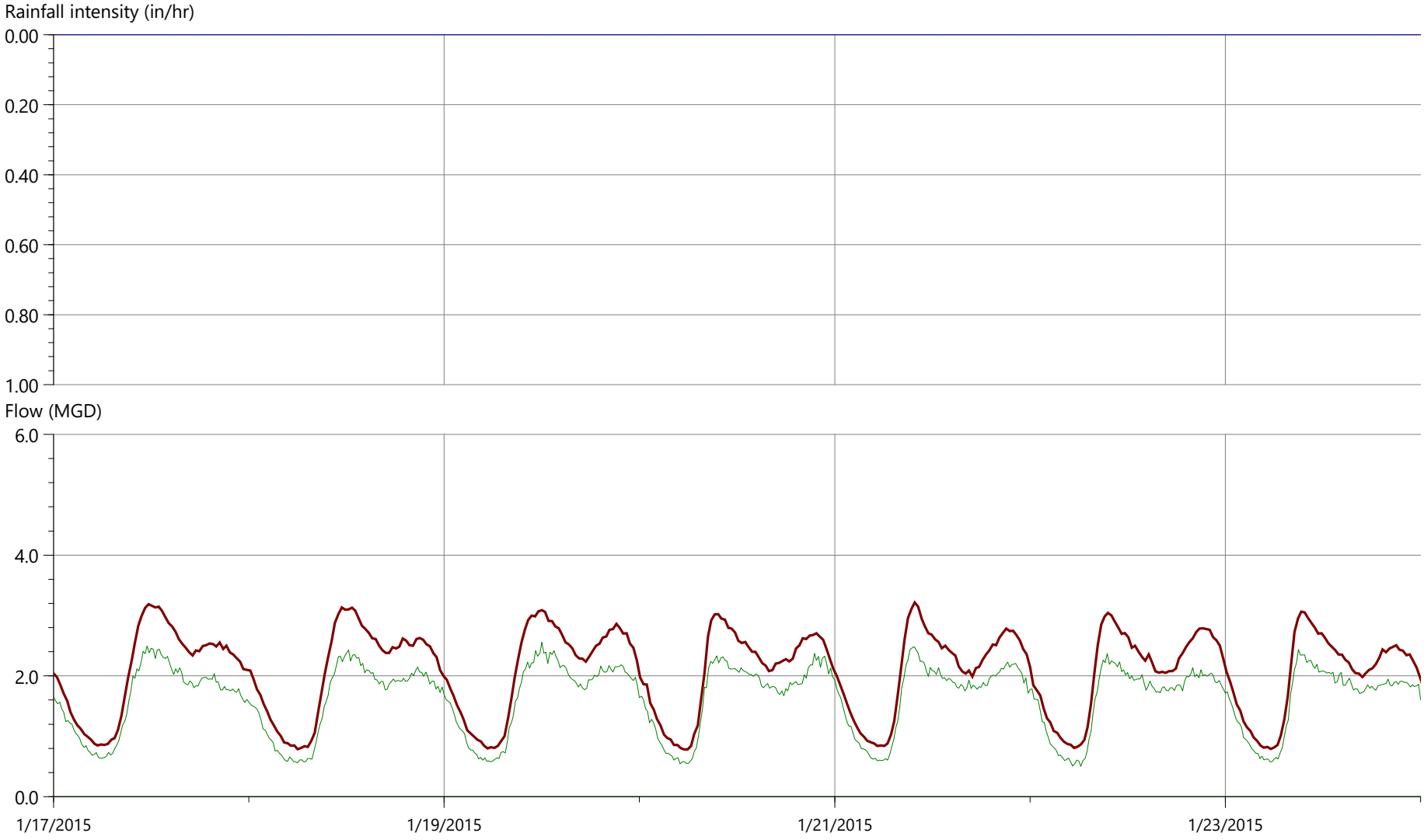
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.020	0.040	0.000			
Observed				0.163	0.757	2.925
...4d_10232023>DWF				0.639	1.126	6.419

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>2015_DWF_2015.01.17_14d_10232023>...
Flow Survey Location (Obs.) 18, Model Location (Pred.) D/S S58-11.1, Rainfall Profile: 4



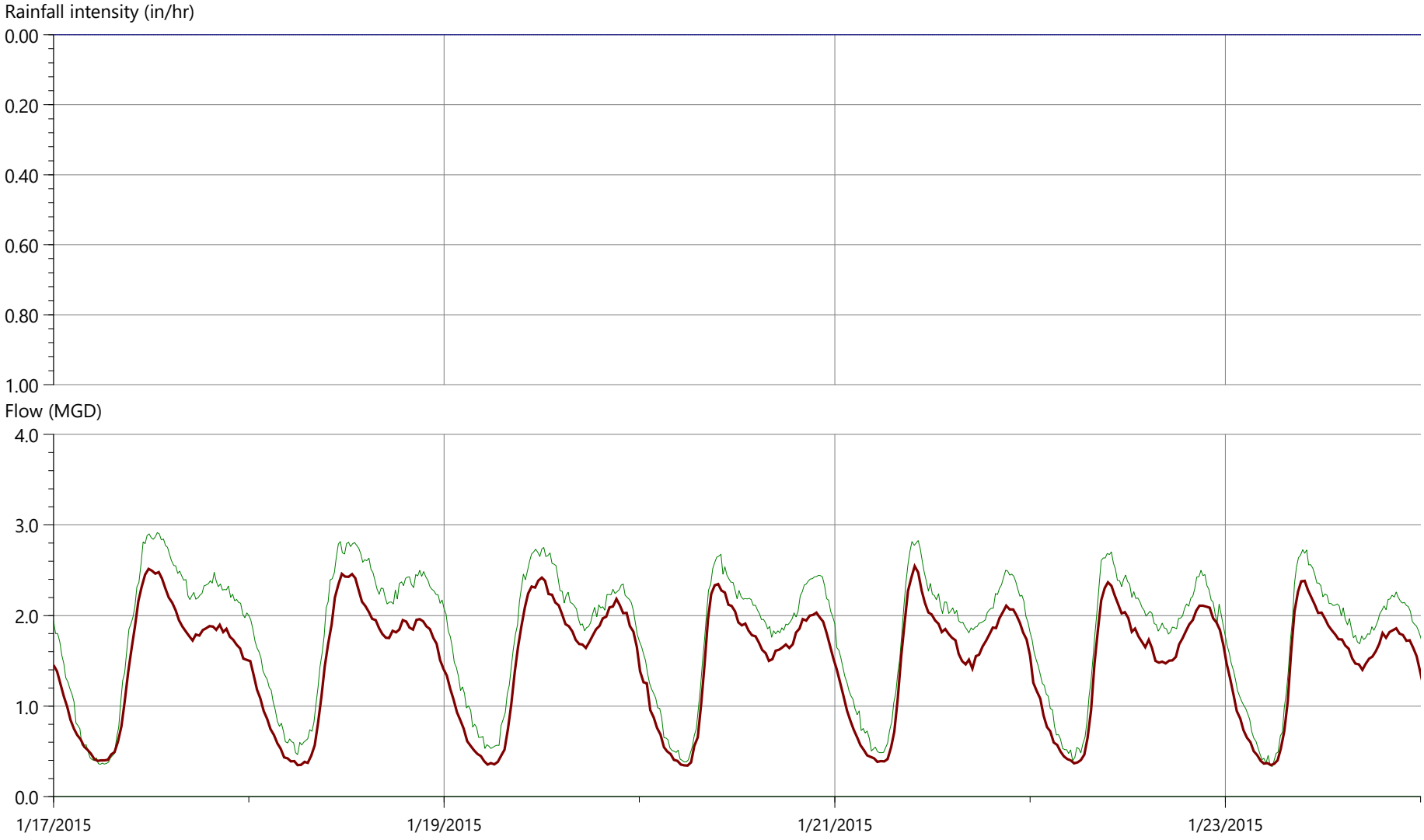
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.020	0.040	0.000			
Observed				0.363	1.793	7.940
...4d_10232023>DWF				0.450	1.336	6.796

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>2015_DWF_2015.01.17_14d_10232023>...
Flow Survey Location (Obs.) 19, Model Location (Pred.) D/S S21-23.1, Rainfall Profile: 3



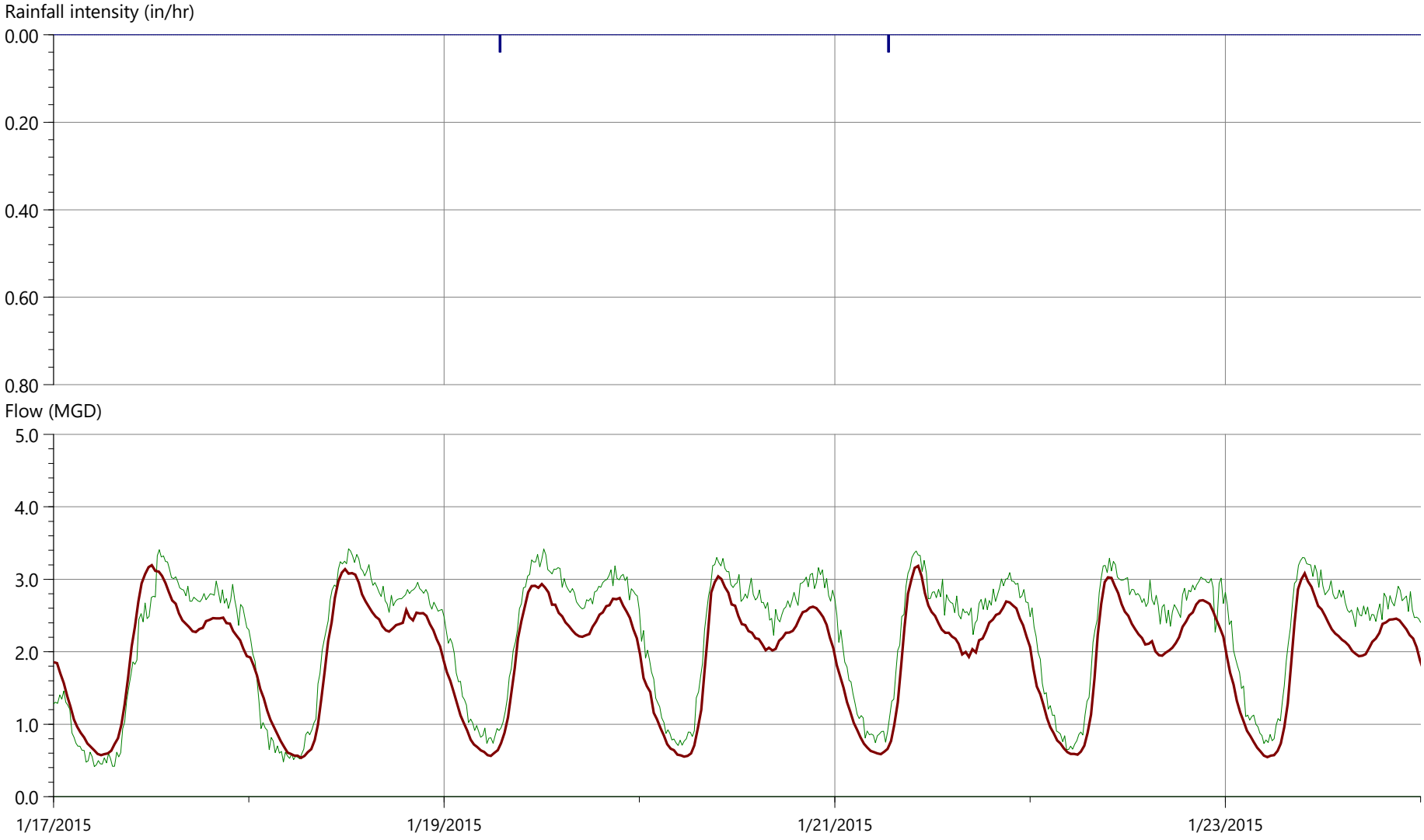
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.000	0.000	0.000			
Observed				0.503	2.559	11.445
...4d_10232023>DWF				0.782	3.218	14.555

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>2015_DWF_2015.01.17_14d_10232023>...
Flow Survey Location (Obs.) 20, Model Location (Pred.) D/S S21-46.1, Rainfall Profile: 3



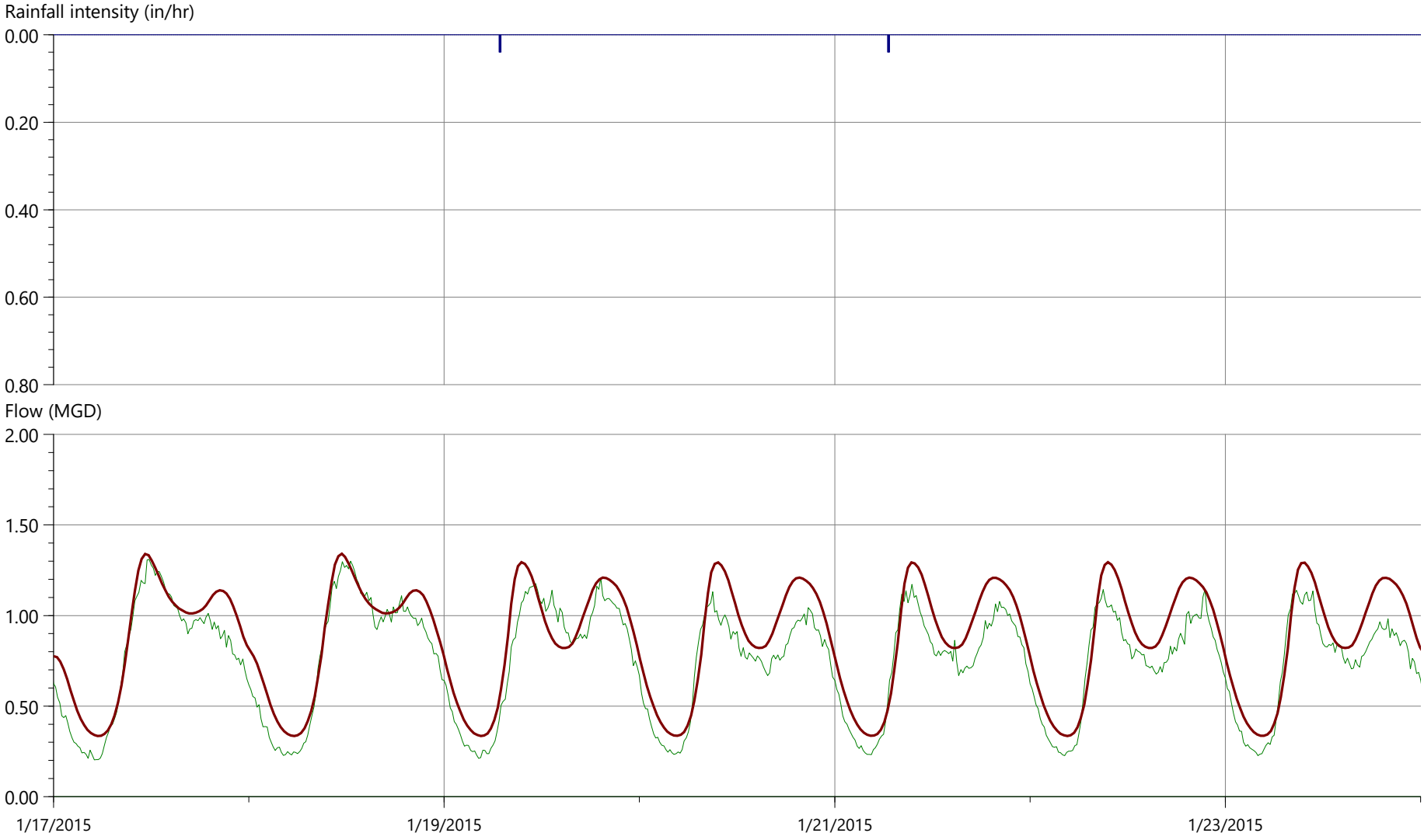
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.000	0.000	0.000			
Observed				0.333	2.916	12.509
...4d_10232023>DWF				0.342	2.544	10.374

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>2015_DWF_2015.01.17_14d_10232023>...
Flow Survey Location (Obs.) 21, Model Location (Pred.) D/S S23-14.1, Rainfall Profile: 4



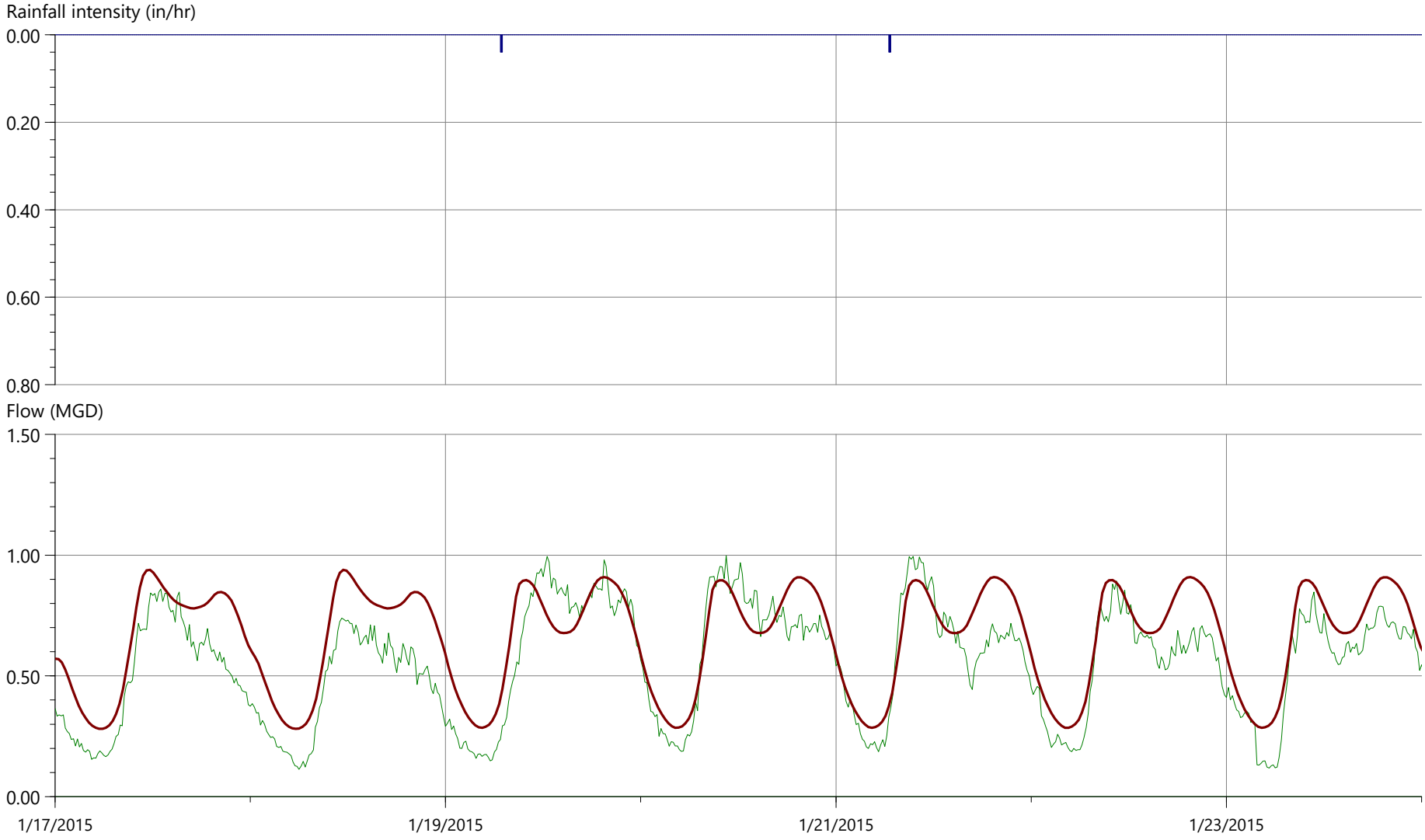
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.020	0.040	0.000			
Observed				0.415	3.422	15.707
...4d_10232023>DWF				0.535	3.196	13.548

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>2015_DWF_2015.01.17_14d_10232023>...
Flow Survey Location (Obs.) 22, Model Location (Pred.) D/S S45-88.1, Rainfall Profile: 4



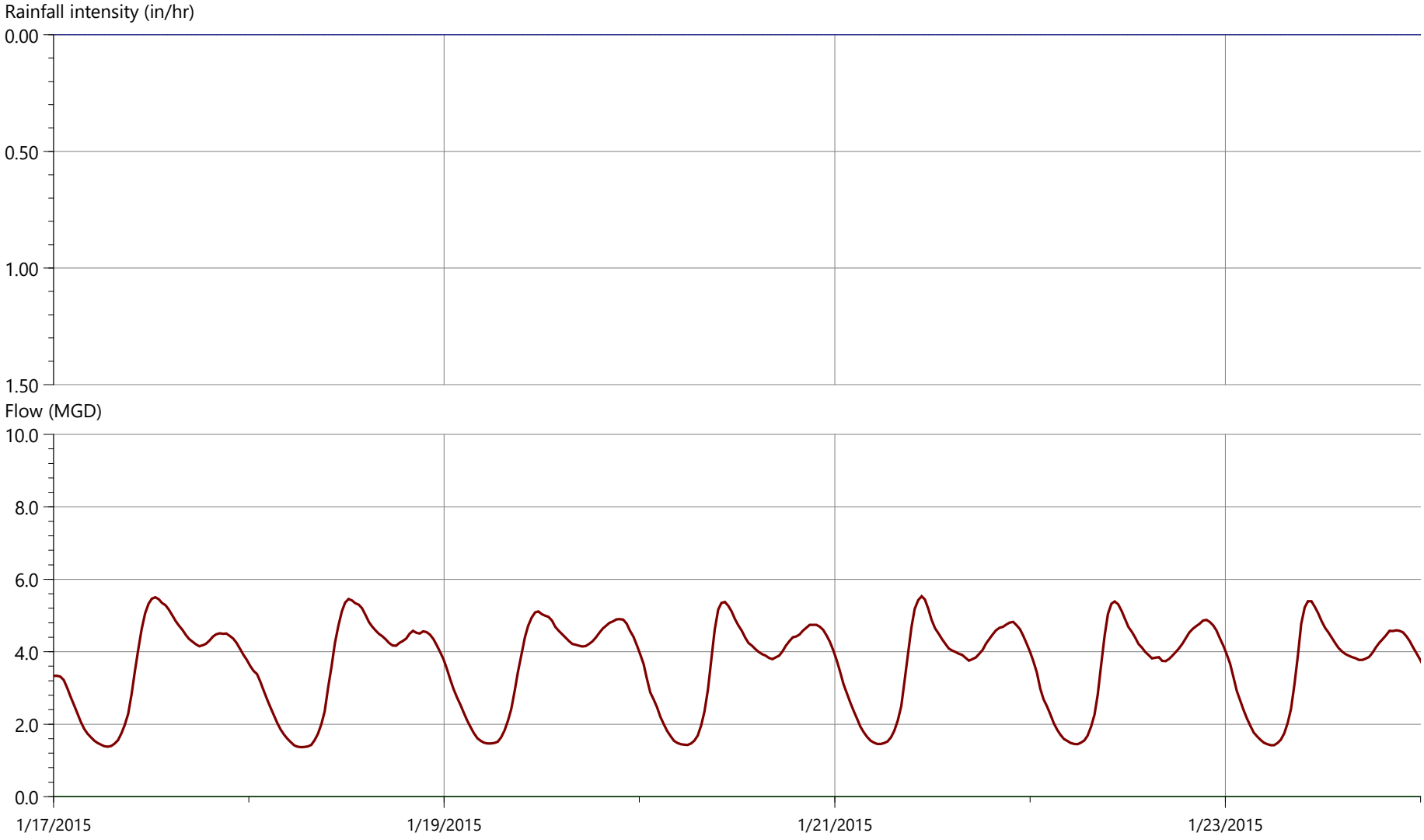
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.020	0.040	0.000			
Observed				0.203	1.310	5.264
...4d_10232023>DWF				0.335	1.340	6.068

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>2015_DWF_2015.01.17_14d_10232023>...
Flow Survey Location (Obs.) 23, Model Location (Pred.) D/S S48-32.1, Rainfall Profile: 4



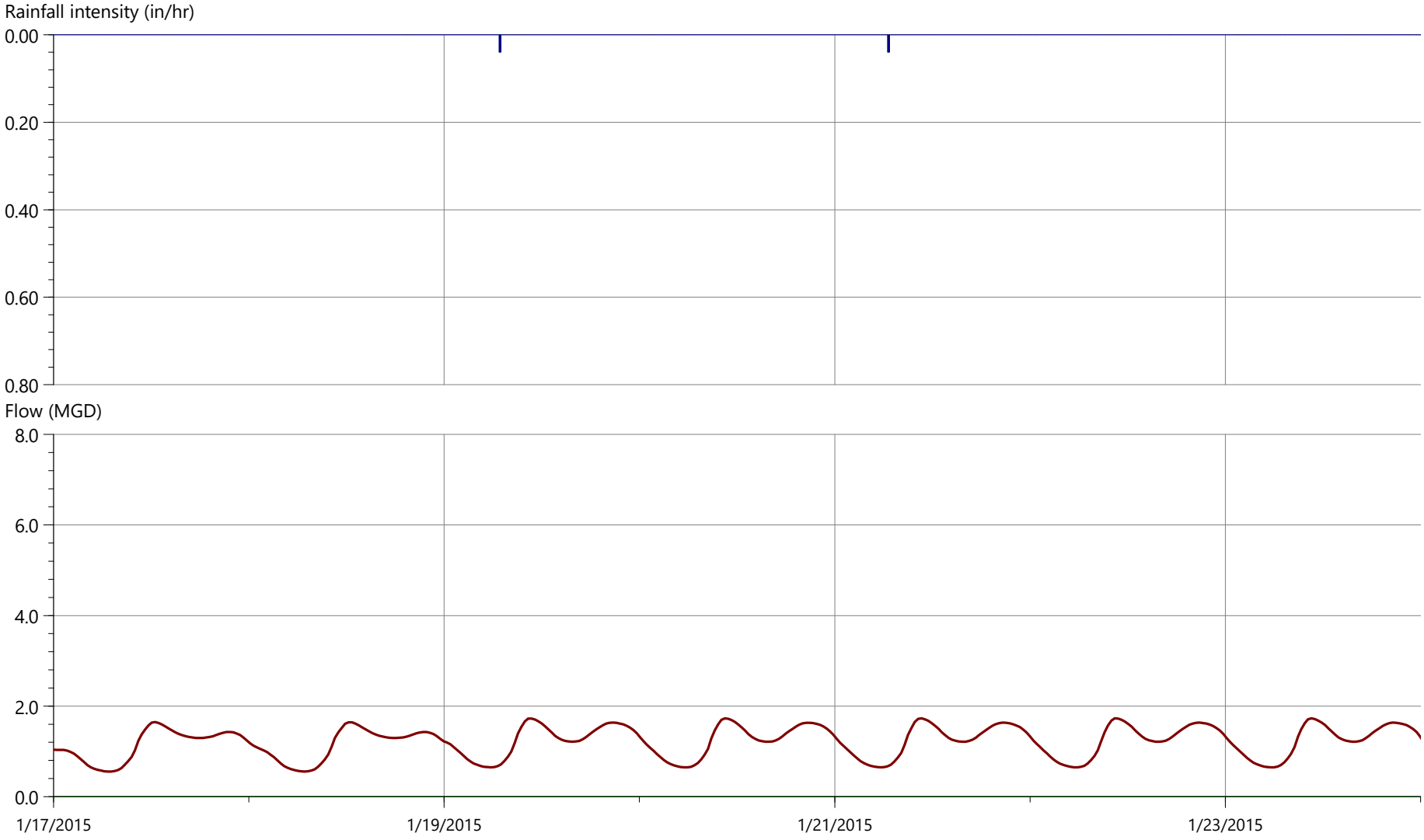
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.020	0.040	0.000			
Observed				0.113	0.998	3.870
...4d_10232023>DWF				0.281	0.939	4.601

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>2015_DWF_2015.01.17_14d_10232023>...
Flow Survey Location (Obs.) 24, Model Location (Pred.) D/S S63-2.1, Rainfall Profile: 2



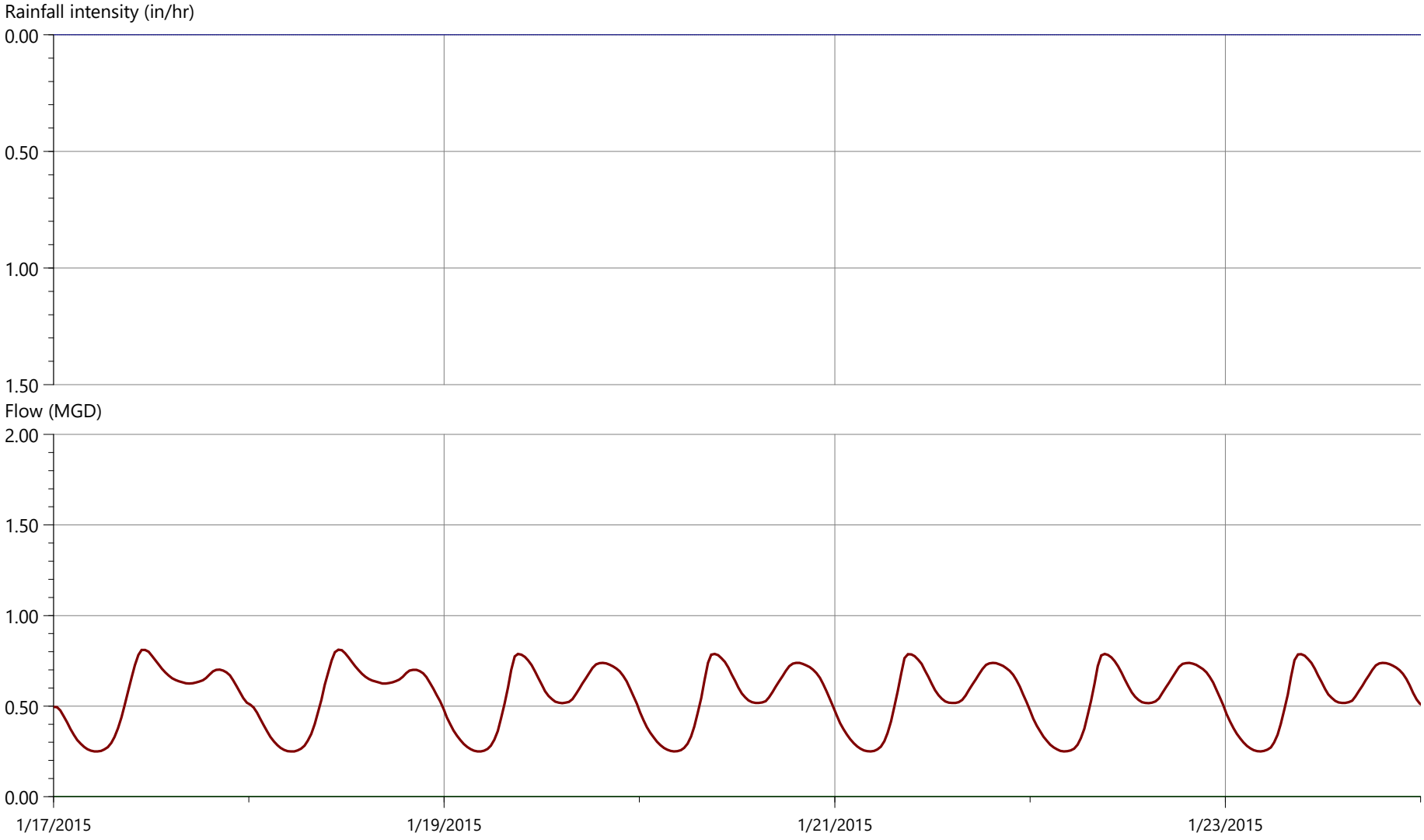
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.000	0.000	0.000			
Observed				0.000	0.000	0.000
...4d_10232023>DWF				1.364	5.533	25.234

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>2015_DWF_2015.01.17_14d_10232023>...
Flow Survey Location (Obs.) 25, Model Location (Pred.) D/S S57-6.1, Rainfall Profile: 4



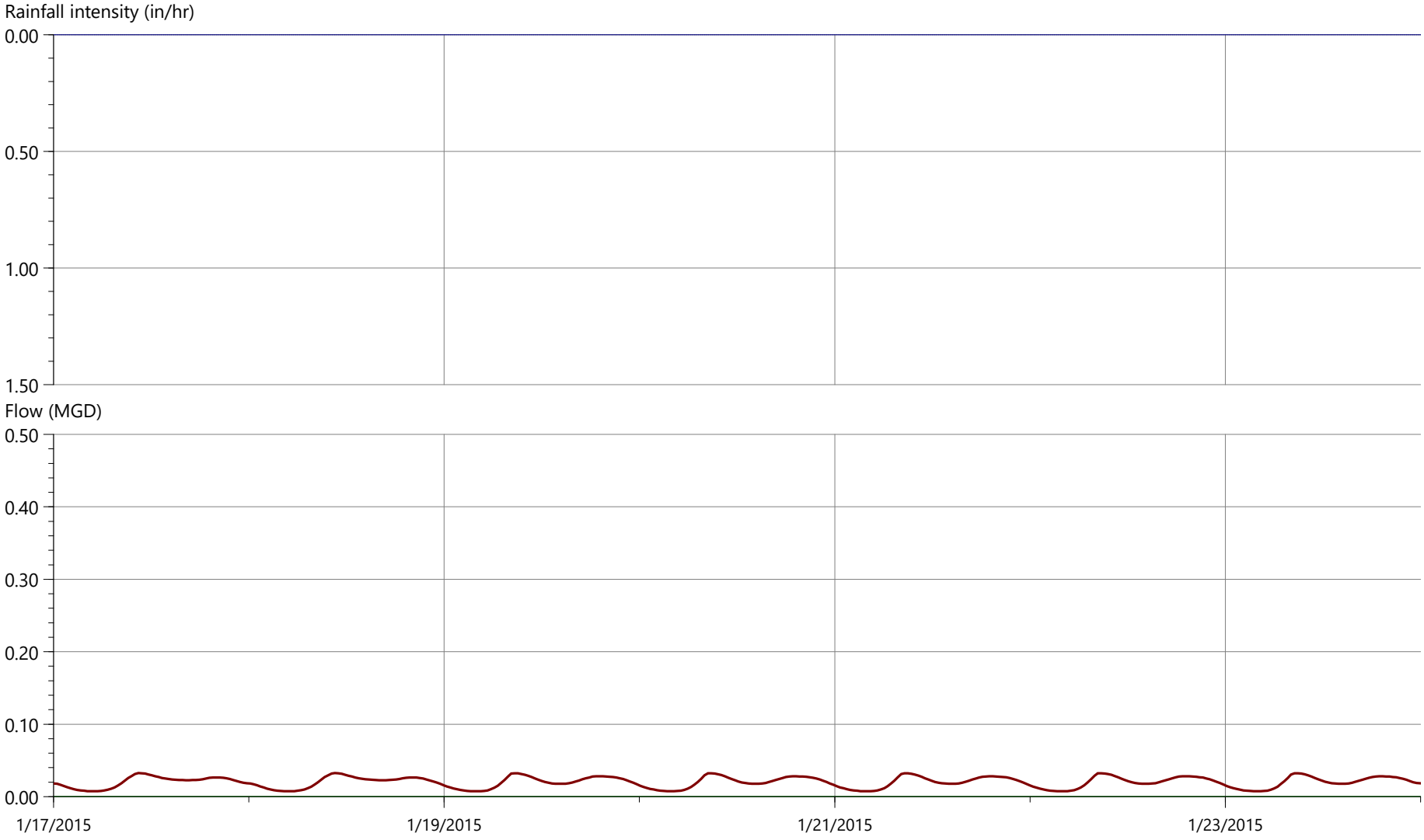
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.020	0.040	0.000			
Observed				0.000	0.000	0.000
...4d_10232023>DWF				0.555	1.729	8.523

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>2015_DWF_2015.01.17_14d_10232023>...
Flow Survey Location (Obs.) 26, Model Location (Pred.) D/S S52-86.1, Rainfall Profile: 2



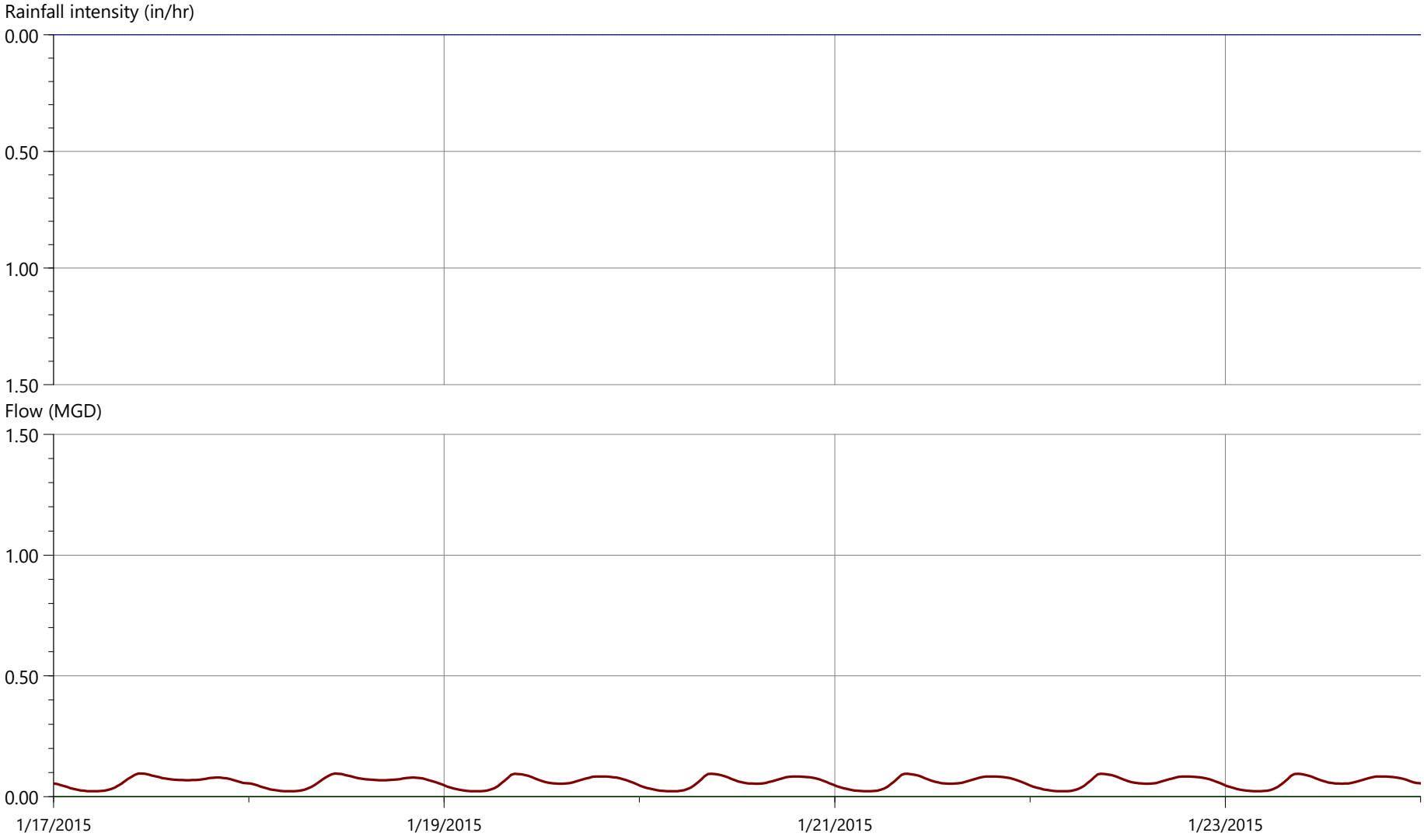
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.000	0.000	0.000			
Observed				0.000	0.000	0.000
...4d_10232023>DWF				0.249	0.811	3.826

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>2015_DWF_2015.01.17_14d_10232023>...
Flow Survey Location (Obs.) 27, Model Location (Pred.) D/S S43-8.1, Rainfall Profile: 2



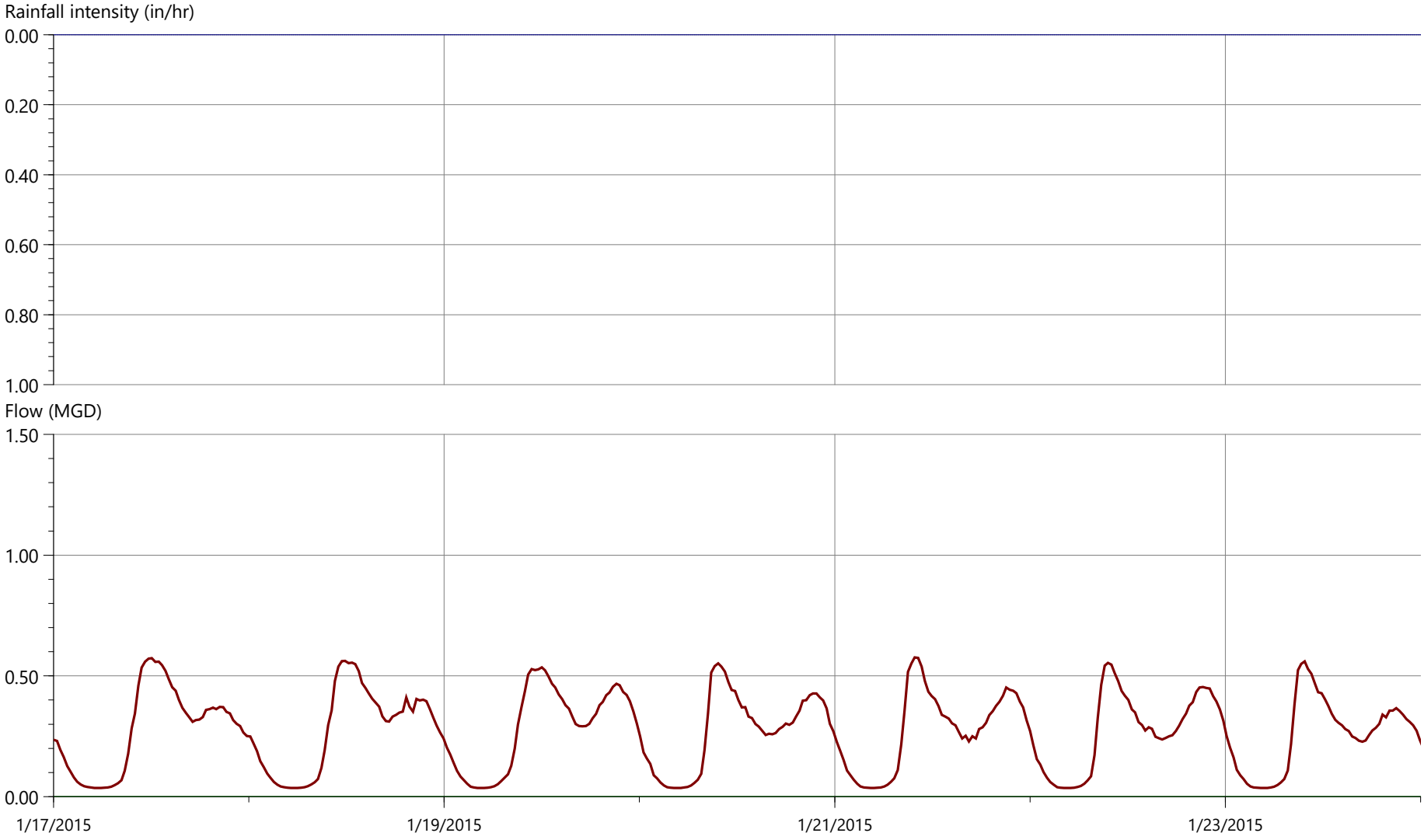
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.000	0.000	0.000			
Observed				0.000	0.000	0.000
...4d_10232023>DWF				0.007	0.032	0.141

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>2015_DWF_2015.01.17_14d_10232023>...
Flow Survey Location (Obs.) 28, Model Location (Pred.) D/S S53-47.1, Rainfall Profile: 2



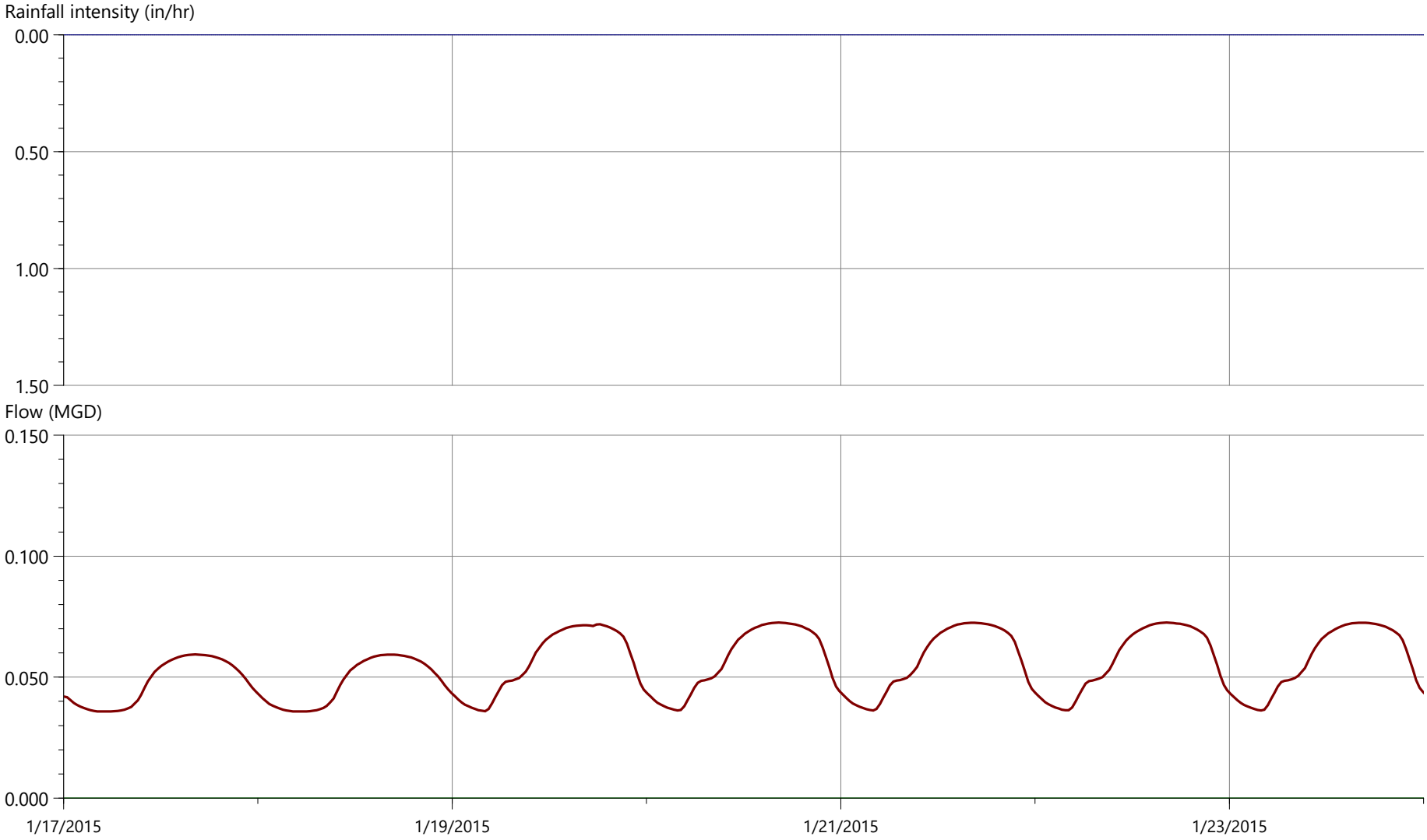
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.000	0.000	0.000			
Observed				0.000	0.000	0.000
...4d_10232023>DWF				0.022	0.096	0.420

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>2015_DWF_2015.01.17_14d_10232023>...
Flow Survey Location (Obs.) 29, Model Location (Pred.) D/S S21-54.1, Rainfall Profile: 3



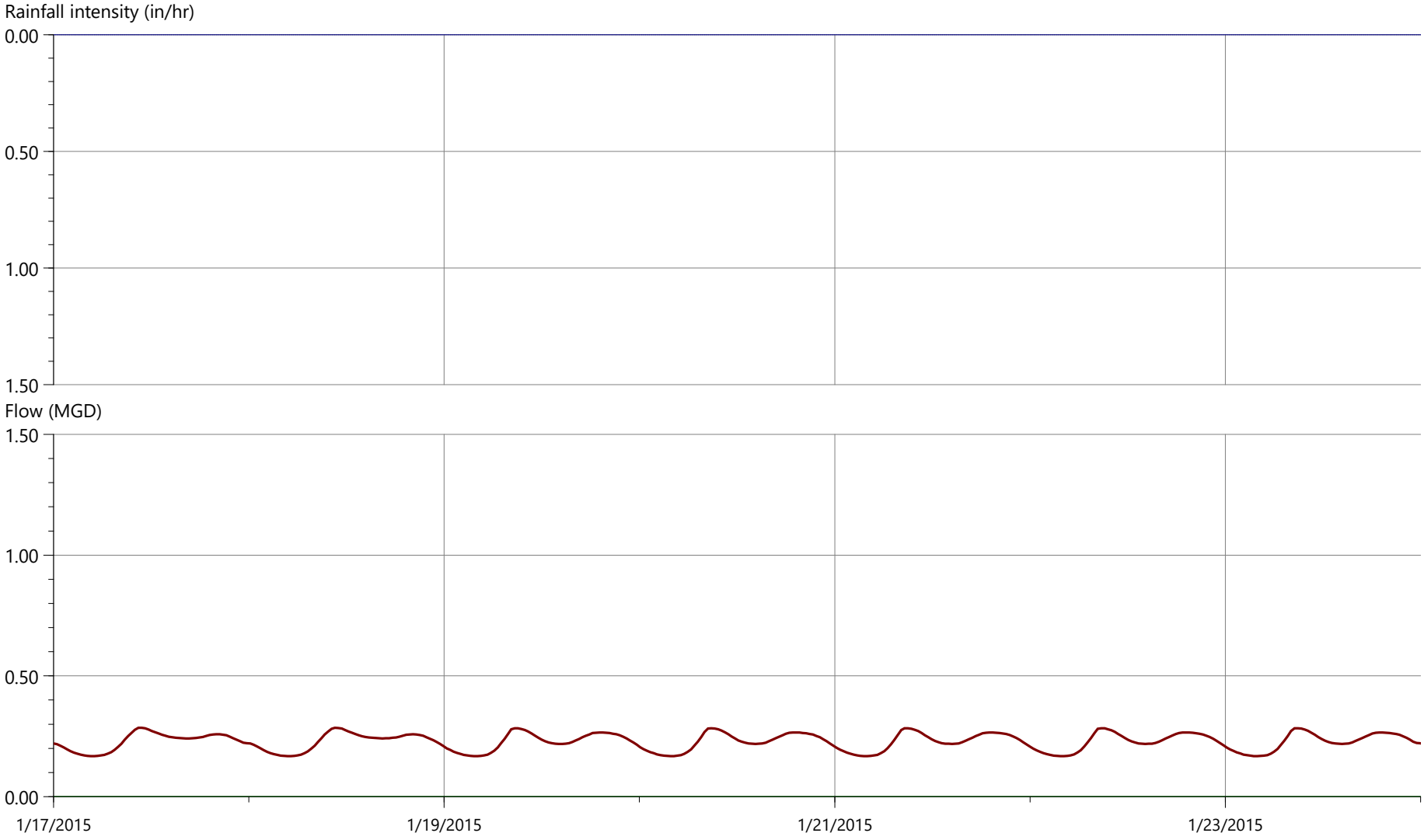
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.000	0.000	0.000			
Observed				0.000	0.000	0.000
...4d_10232023>DWF				0.036	0.576	1.915

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>2015_DWF_2015.01.17_14d_10232023>...
Flow Survey Location (Obs.) 30, Model Location (Pred.) D/S S62-24.1, Rainfall Profile: 2



	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.000	0.000	0.000			
Observed				0.000	0.000	0.000
...4d_10232023>DWF				0.036	0.073	0.381

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Dry Weather>2023.10.07 SAH DWF MODS (WORKING)>2015_DWF_2015.01.17_14d_10232023>...
Flow Survey Location (Obs.) 31, Model Location (Pred.) D/S S62-23.1, Rainfall Profile: 2



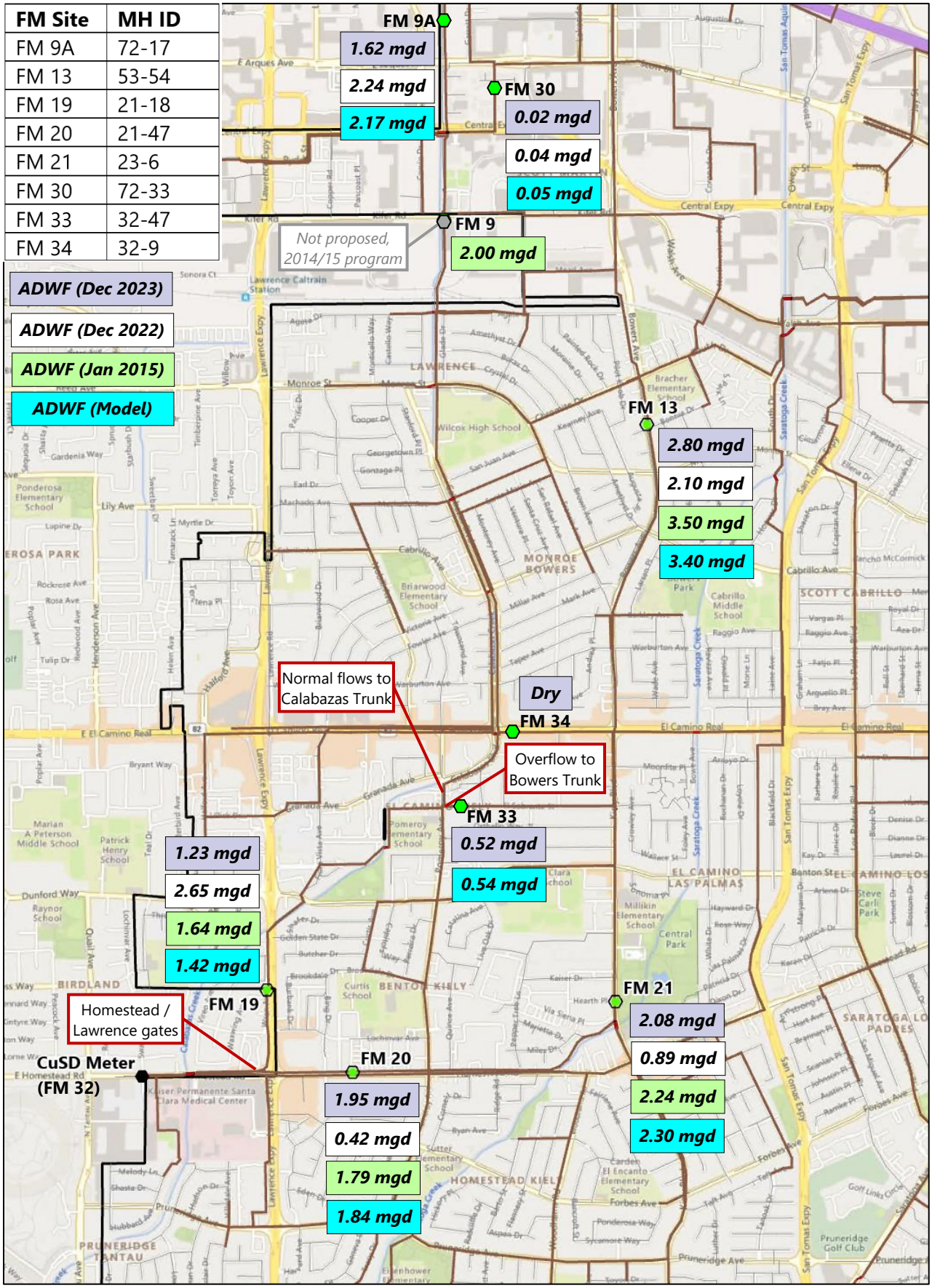
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.000	0.000	0.000			
Observed				0.000	0.000	0.000
...4d_10232023>DWF				0.168	0.285	1.598

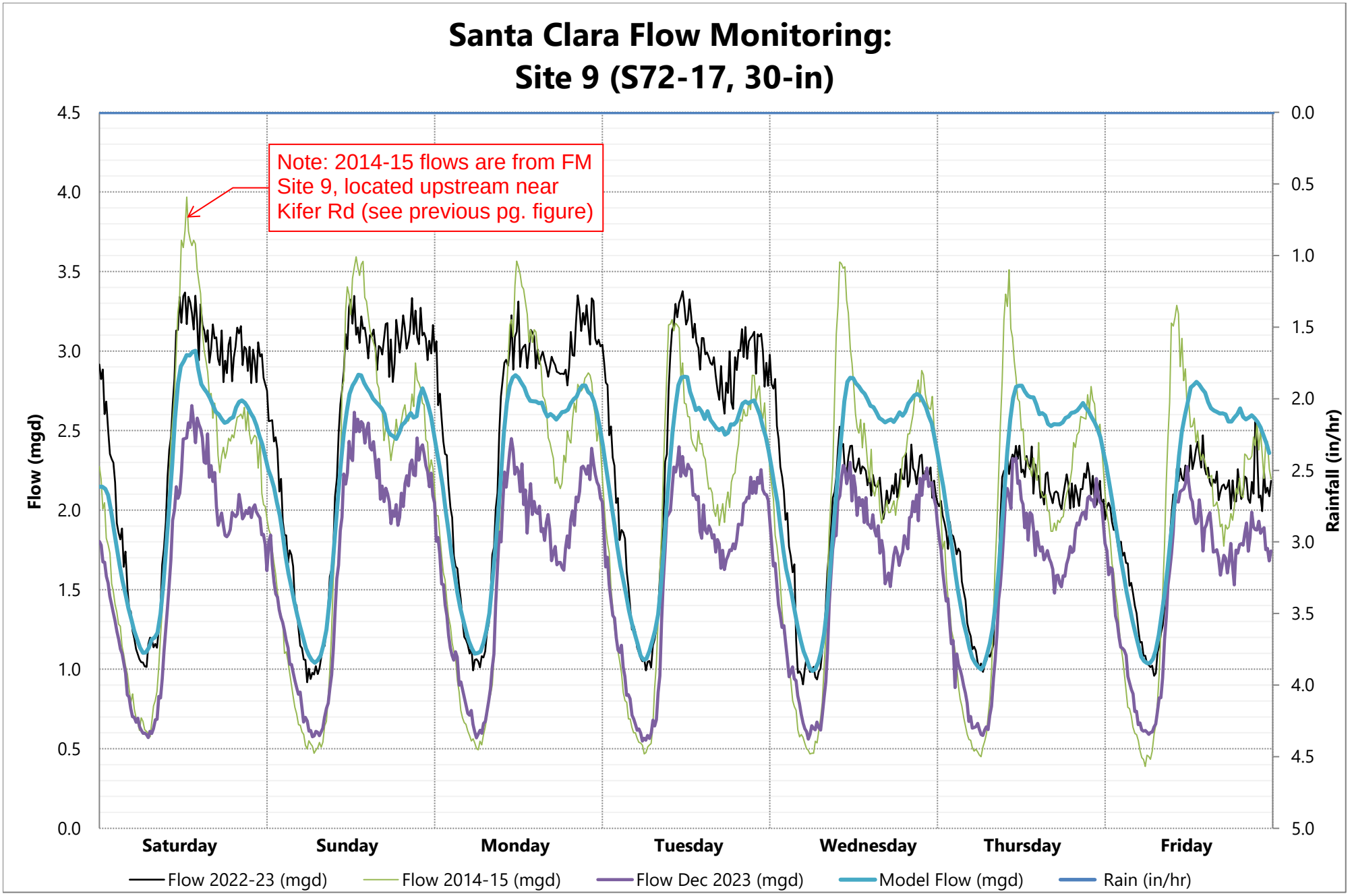
Dry Weather Flow Calibration Plots
Modeled vs. Metered Flows (Dec 2024, Dec 2022, Jan 2015)

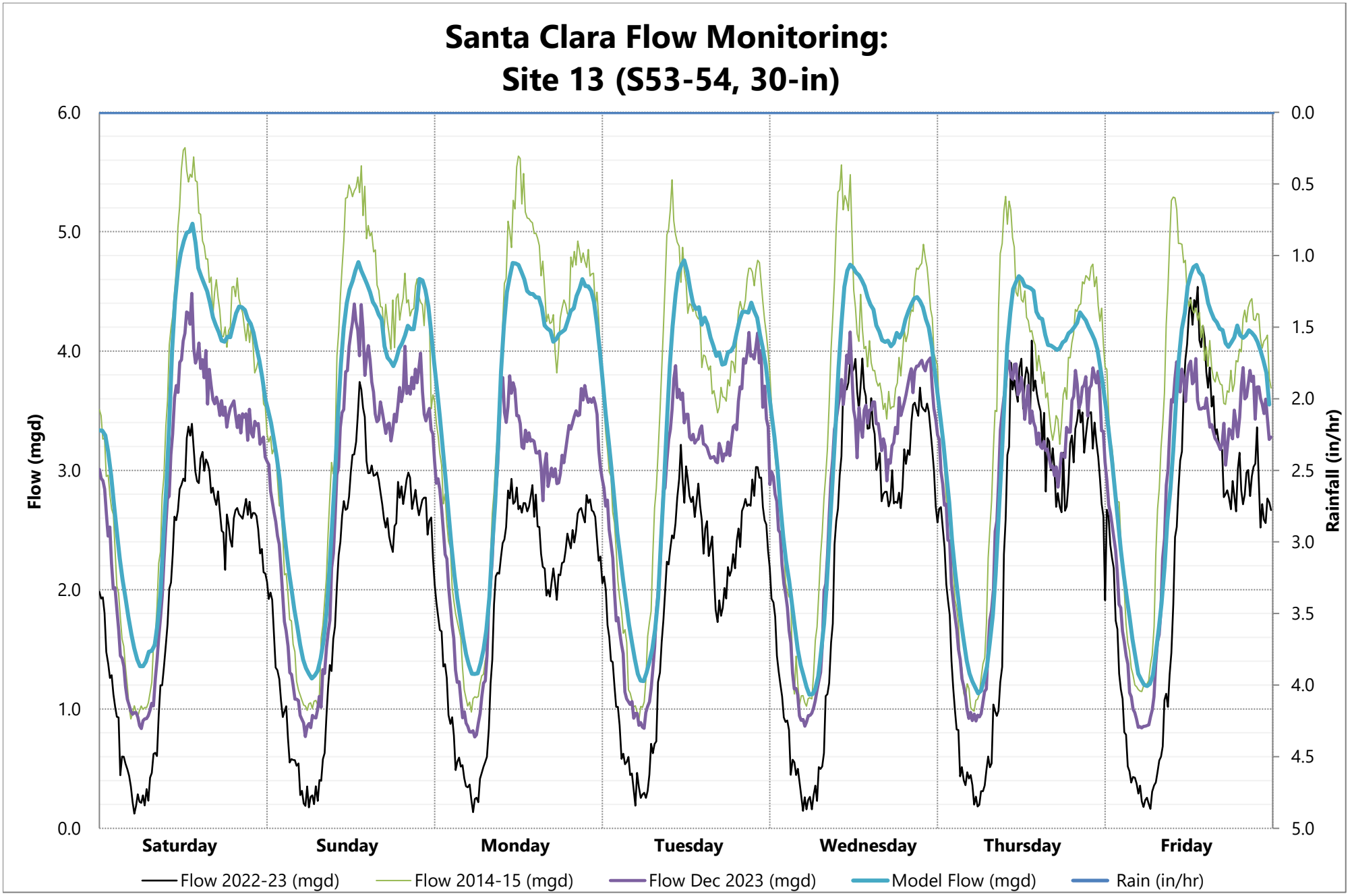
(*assumes normal settings at Homestead/Lawrence gate structure*)

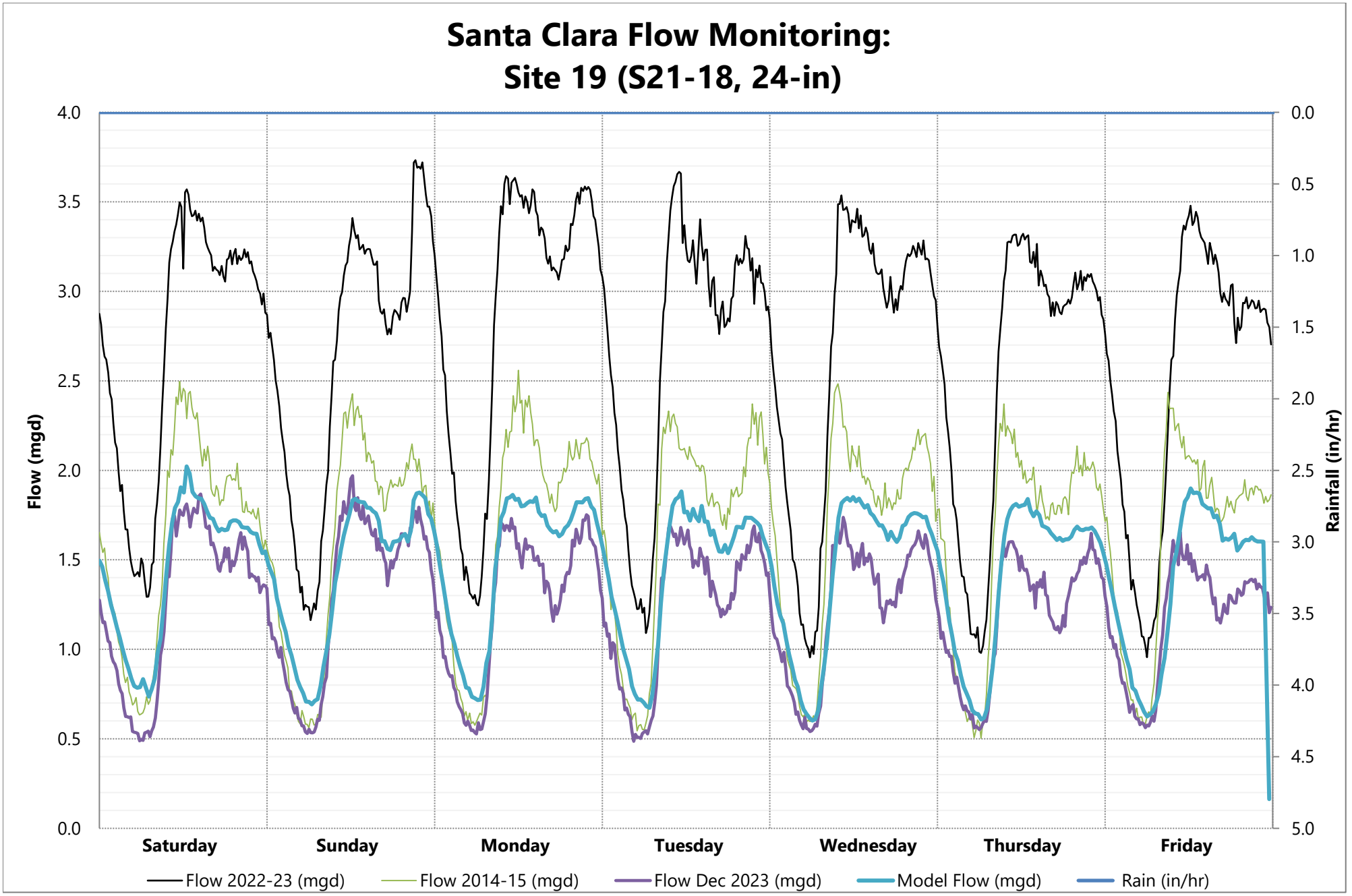
City of Santa Clara
Sanitary Sewer Master Plan Update
Site Locations for Additional Dry Weather Flow Monitoring

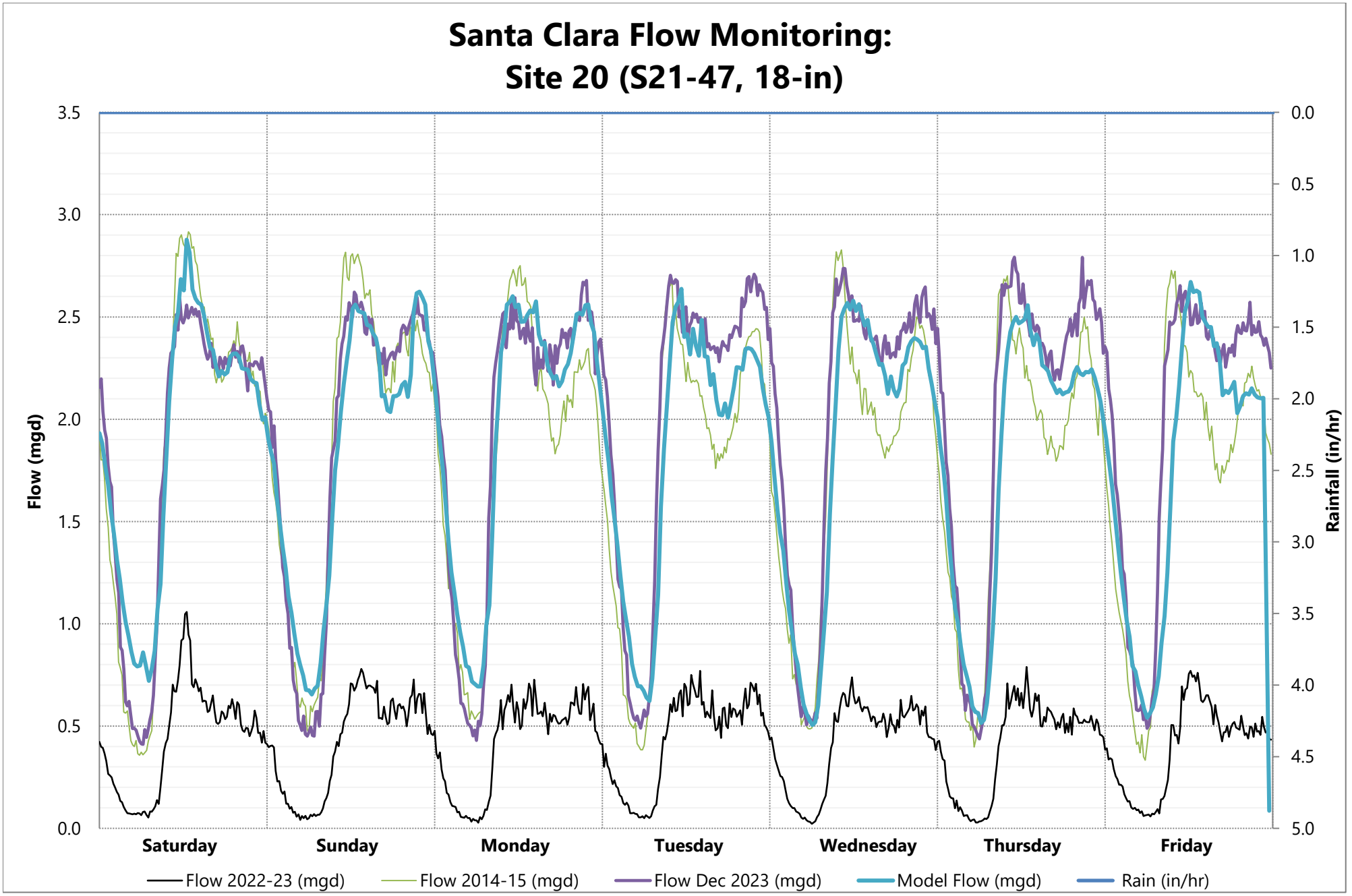
FM Site	MH ID
FM 9A	72-17
FM 13	53-54
FM 19	21-18
FM 20	21-47
FM 21	23-6
FM 30	72-33
FM 33	32-47
FM 34	32-9

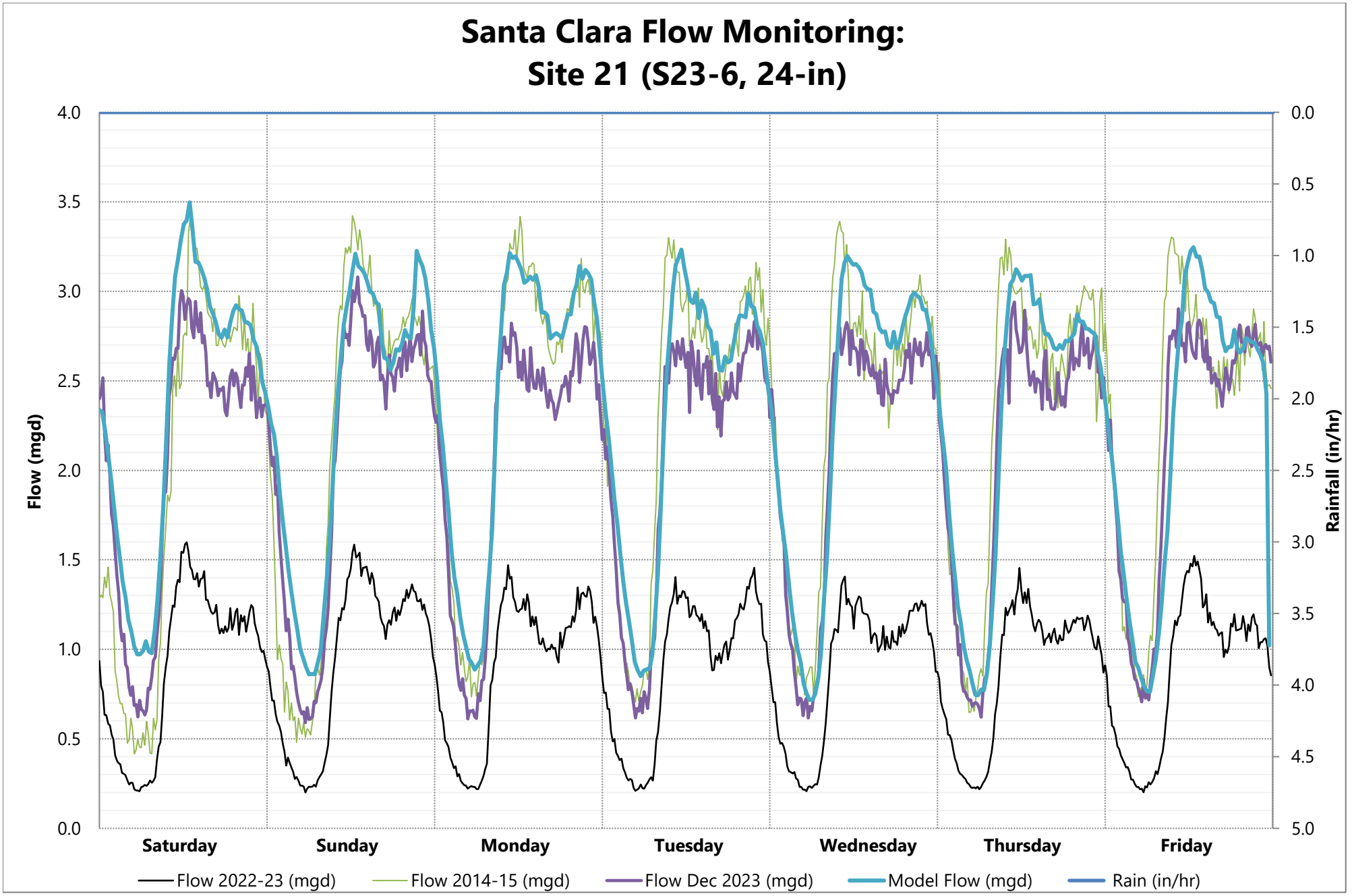


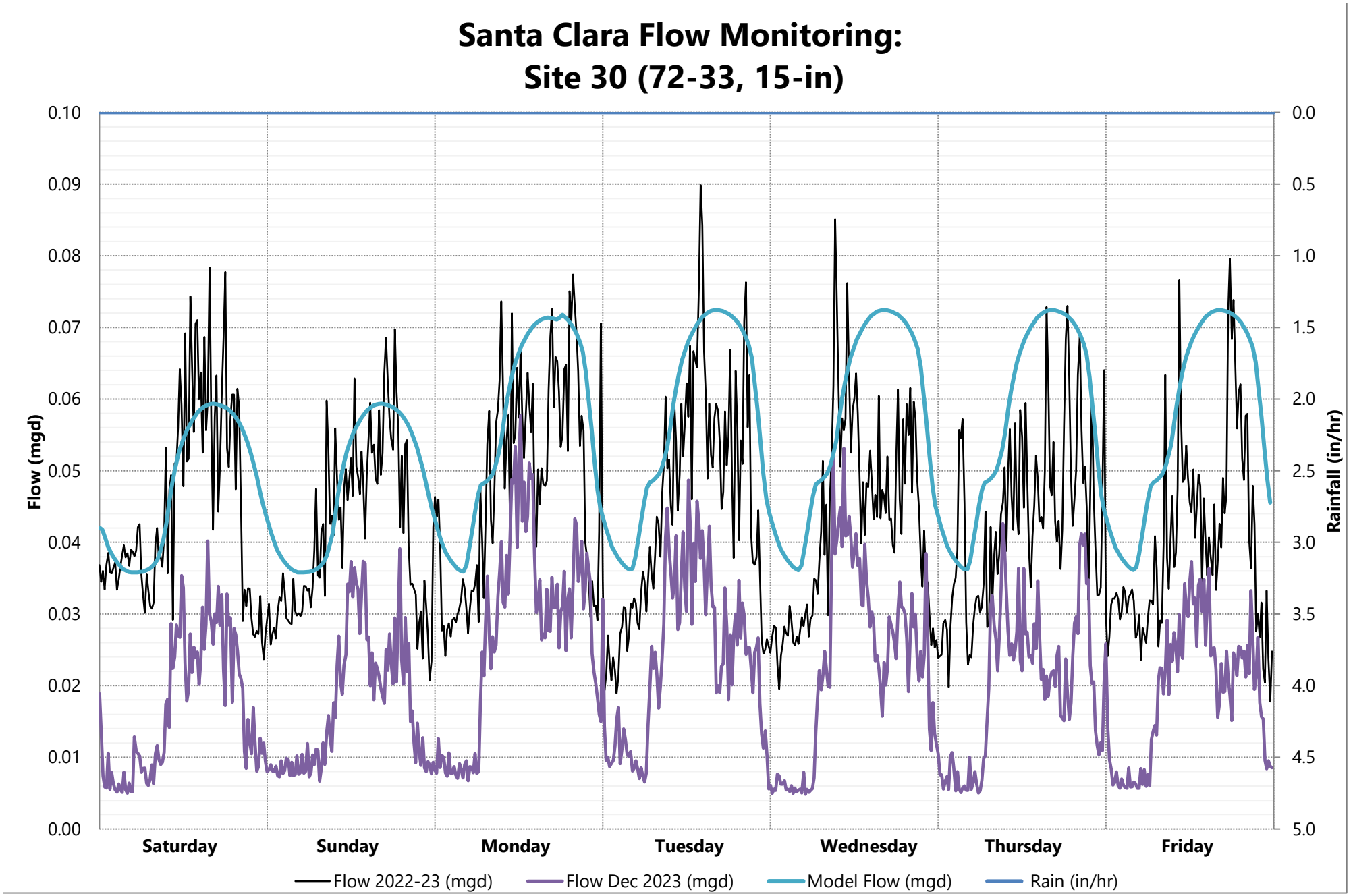

Santa Clara Flow Monitoring:
Site 9 (S72-17, 30-in)
Note: 2014-15 flows are from FM Site 9, located upstream near Kifer Rd (see previous pg. figure)
Flow (mgd)
Rainfall (in/hr)
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
Saturday
Sunday
Monday
Tuesday
Wednesday
Thursday
Friday
Flow 2022-23 (mgd)
Flow 2014-15 (mgd)
Flow Dec 2023 (mgd)
Model Flow (mgd)
Rain (in/hr)

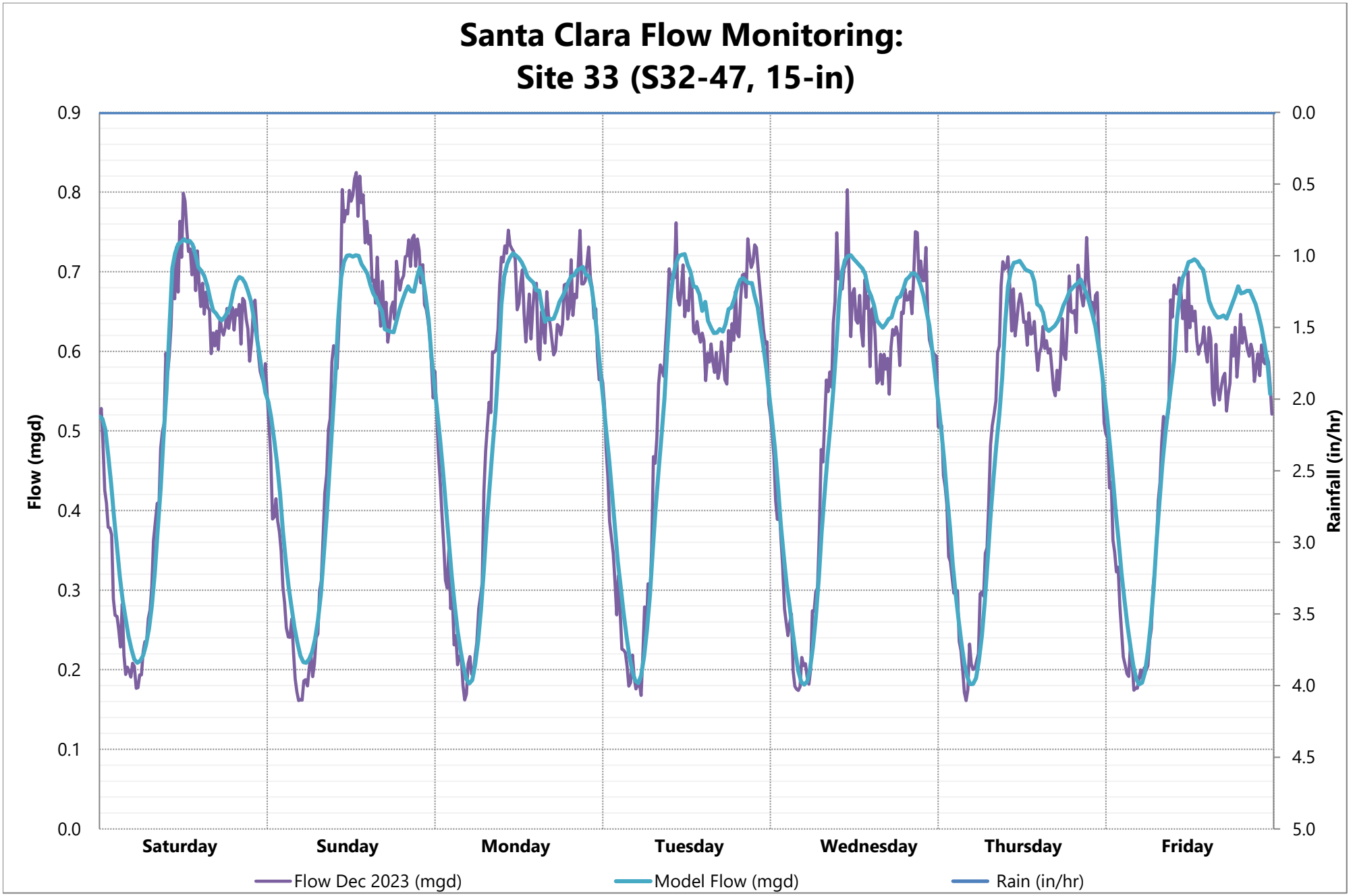

Santa Clara Flow Monitoring:
Site 13 (S53-54, 30-in)
Flow (mgd)
Rainfall (in/hr)
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
Saturday
Sunday
Monday
Tuesday
Wednesday
Thursday
Friday
Flow 2022-23 (mgd)
Flow 2014-15 (mgd)
Flow Dec 2023 (mgd)
Model Flow (mgd)
Rain (in/hr)


Santa Clara Flow Monitoring:
Site 19 (S21-18, 24-in)
Flow (mgd)
Rainfall (in/hr)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
Saturday
Sunday
Monday
Tuesday
Wednesday
Thursday
Friday
Flow 2022-23 (mgd)
Flow 2014-15 (mgd)
Flow Dec 2023 (mgd)
Model Flow (mgd)
Rain (in/hr)


Santa Clara Flow Monitoring:
Site 20 (S21-47, 18-in)
Flow (mgd)
Rainfall (in/hr)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
Saturday
Sunday
Monday
Tuesday
Wednesday
Thursday
Friday
Flow 2022-23 (mgd)
Flow 2014-15 (mgd)
Flow Dec 2023 (mgd)
Model Flow (mgd)
Rain (in/hr)


Santa Clara Flow Monitoring:
Site 21 (S23-6, 24-in)
Flow (mgd)
Rainfall (in/hr)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
Saturday
Sunday
Monday
Tuesday
Wednesday
Thursday
Friday
Flow 2022-23 (mgd)
Flow 2014-15 (mgd)
Flow Dec 2023 (mgd)
Model Flow (mgd)
Rain (in/hr)


Santa Clara Flow Monitoring:
Site 30 (72-33, 15-in)
Flow (mgd)
Rainfall (in/hr)
0.10
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
Saturday
Sunday
Monday
Tuesday
Wednesday
Thursday
Friday
Flow 2022-23 (mgd)
Flow Dec 2023 (mgd)
Model Flow (mgd)
Rain (in/hr)

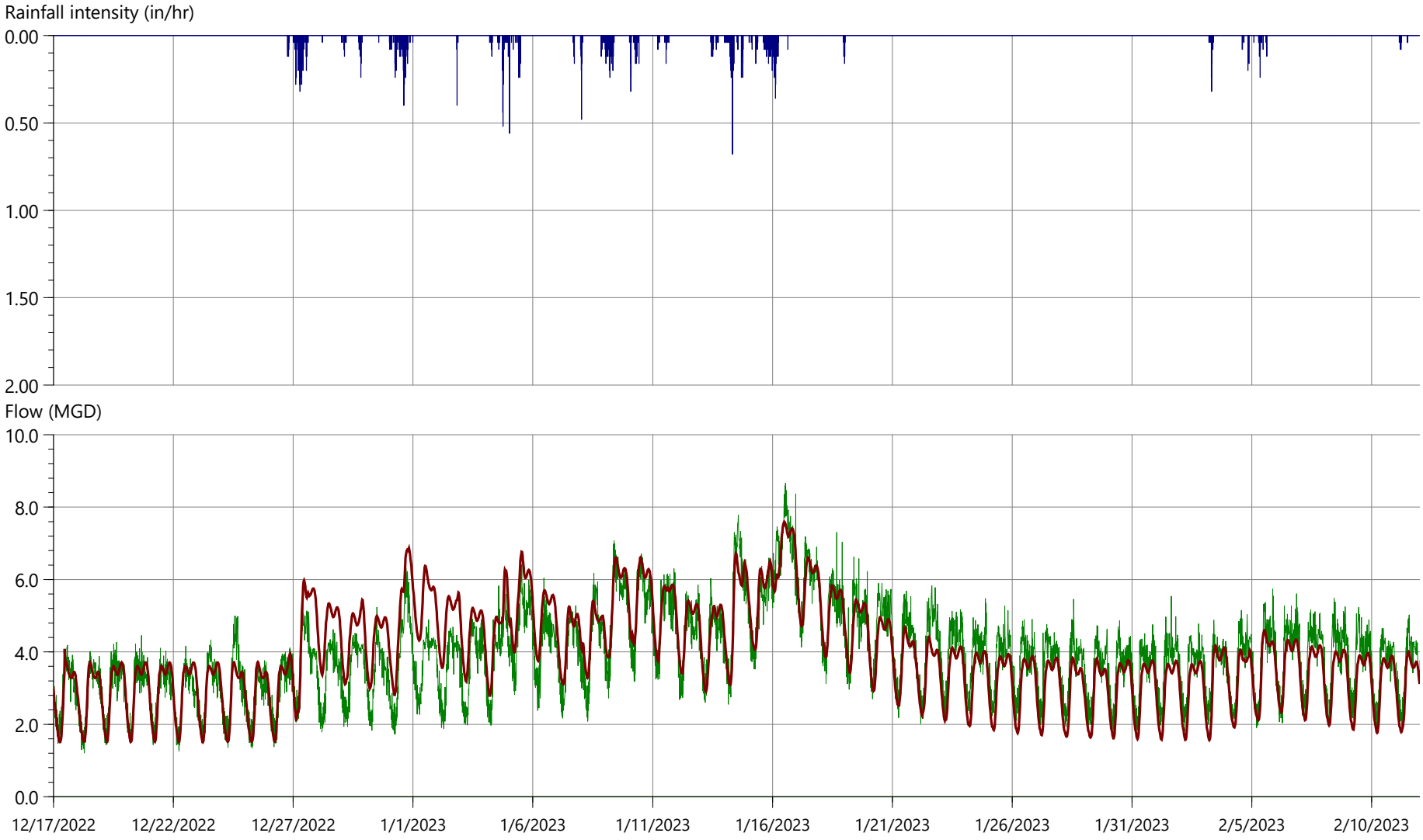

Santa Clara Flow Monitoring:
Site 33 (S32-47, 15-in)
Flow (mgd)
Rainfall (in/hr)
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
Saturday
Sunday
Monday
Tuesday
Wednesday
Thursday
Friday
Flow Dec 2023 (mgd)
Model Flow (mgd)
Rain (in/hr)

Wet Weather Flow Calibration Plots
Modeled vs. 2022-2023 Metered Flows

(*assumes clog at Homestead/Lawrence gate structure*)

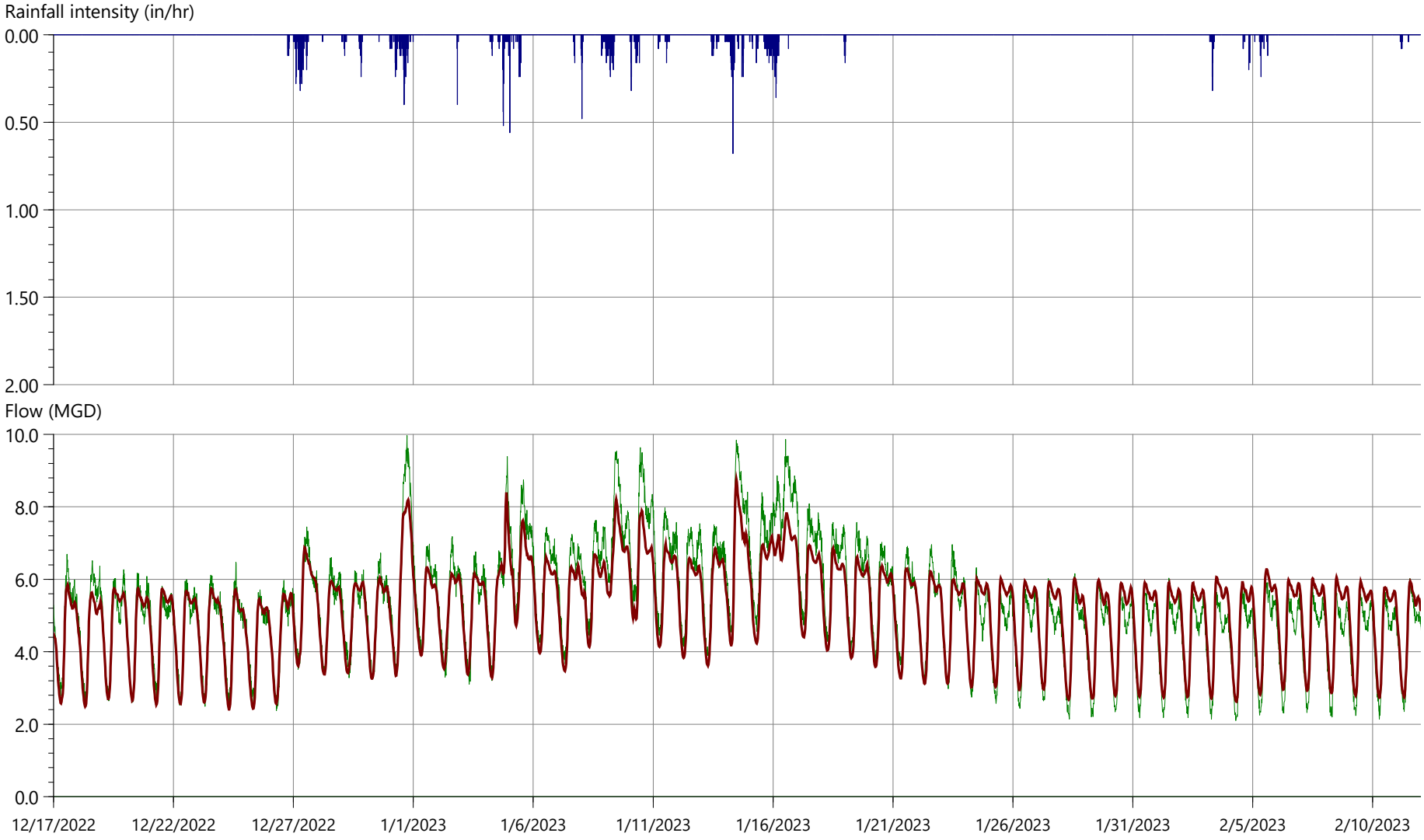
Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2023 WWF Existing_WithBlockage_10232023>Calibration (Homestead Blockage) ...

Flow Survey Location (Obs.) 1, Model Location (Pred.) D/S S104-29.1, Rainfall Profile: 1



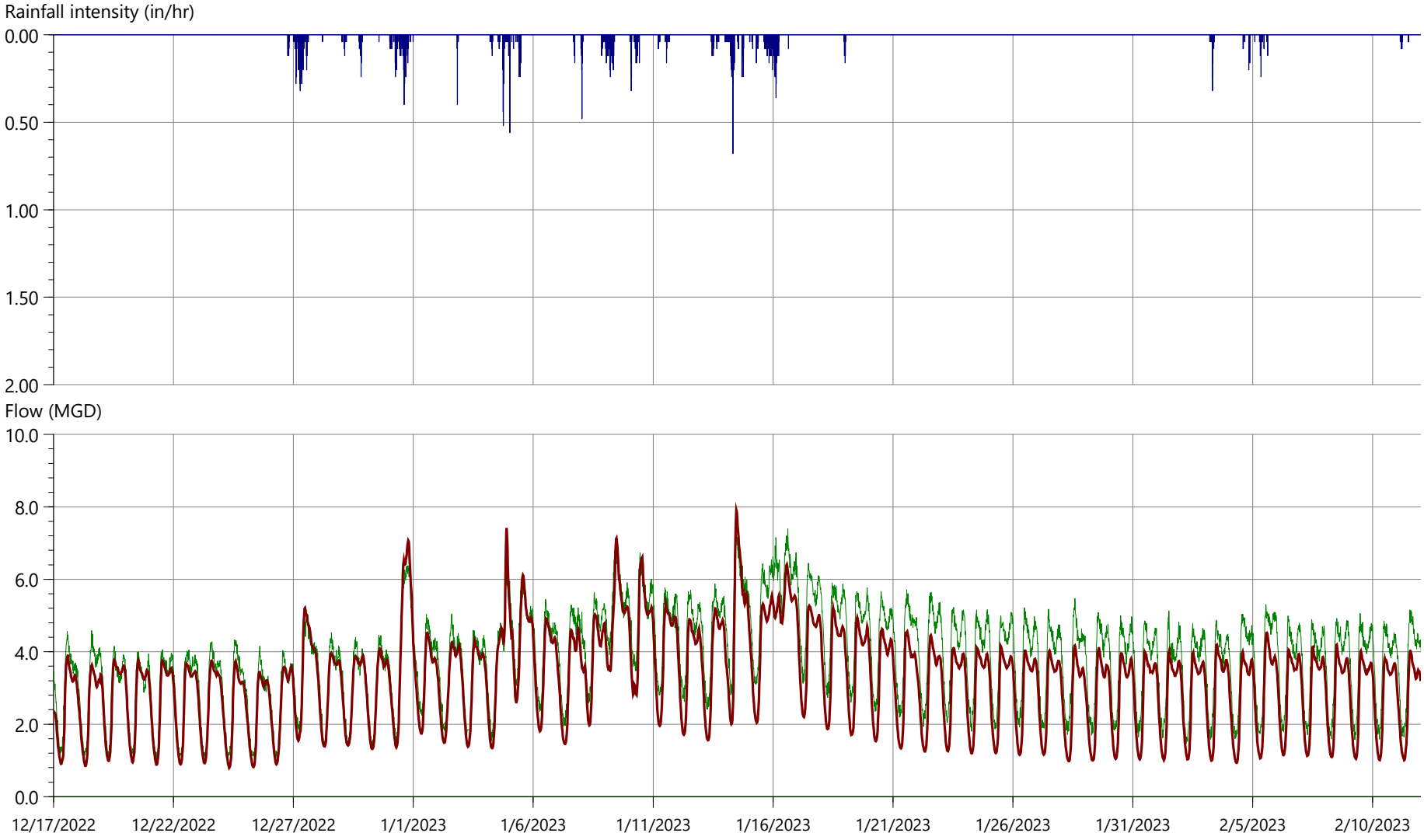
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	11.270	0.680	0.008			
Observed				1.210	8.665	223.590
... Data 2023 and 2015				1.509	7.594	225.159

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2023 WWF Existing_WithBlockage_10232023>Calibration (Homestead Blockage) ...
Flow Survey Location (Obs.) 2, Model Location (Pred.) D/S S103-9.1, Rainfall Profile: 1



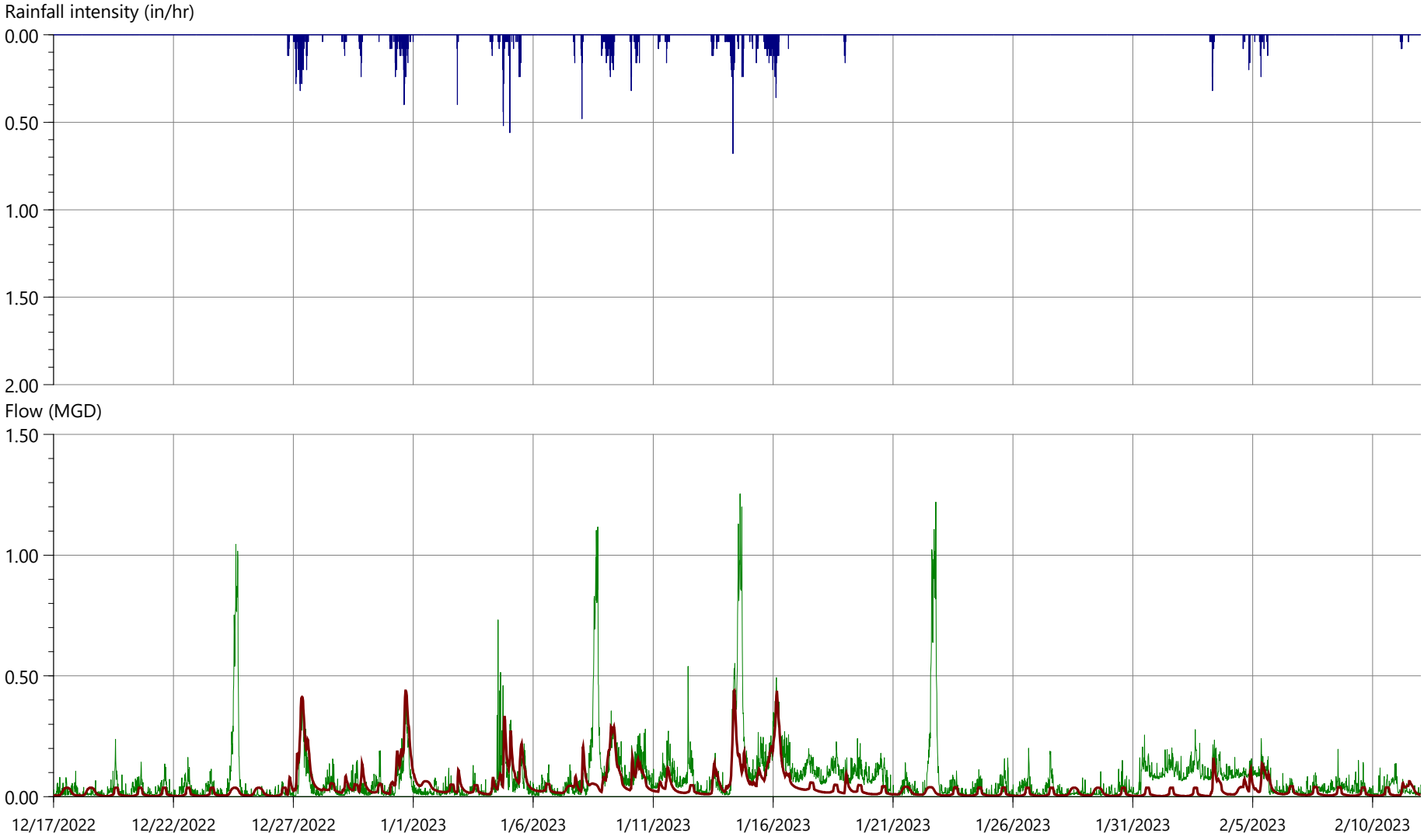
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	11.270	0.680	0.008			
Observed				2.099	9.967	301.286
... Data 2023 and 2015				2.407	8.766	295.289

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2023 WWF Existing_WithBlockage_10232023>Calibration (Homestead Blockage) ...
Flow Survey Location (Obs.) 3, Model Location (Pred.) D/S S104-27.1, Rainfall Profile: 1



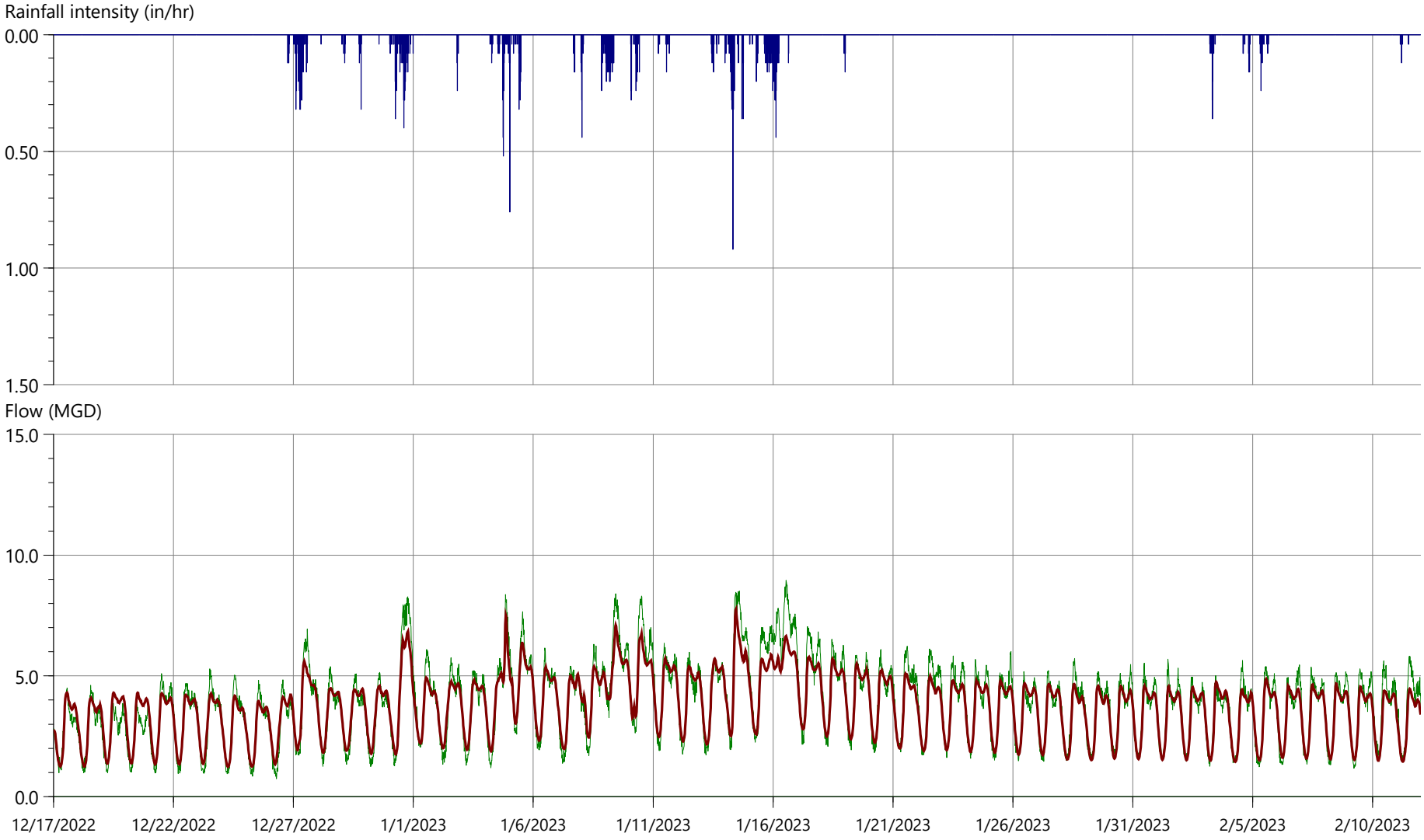
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	11.270	0.680	0.008			
Observed				1.016	7.391	219.358
... Data 2023 and 2015				0.799	7.906	184.787

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2023 WWF Existing_WithBlockage_10232023>Calibration (Homestead Blockage) ...
Flow Survey Location (Obs.) 4, Model Location (Pred.) D/S S94-36.1, Rainfall Profile: 1



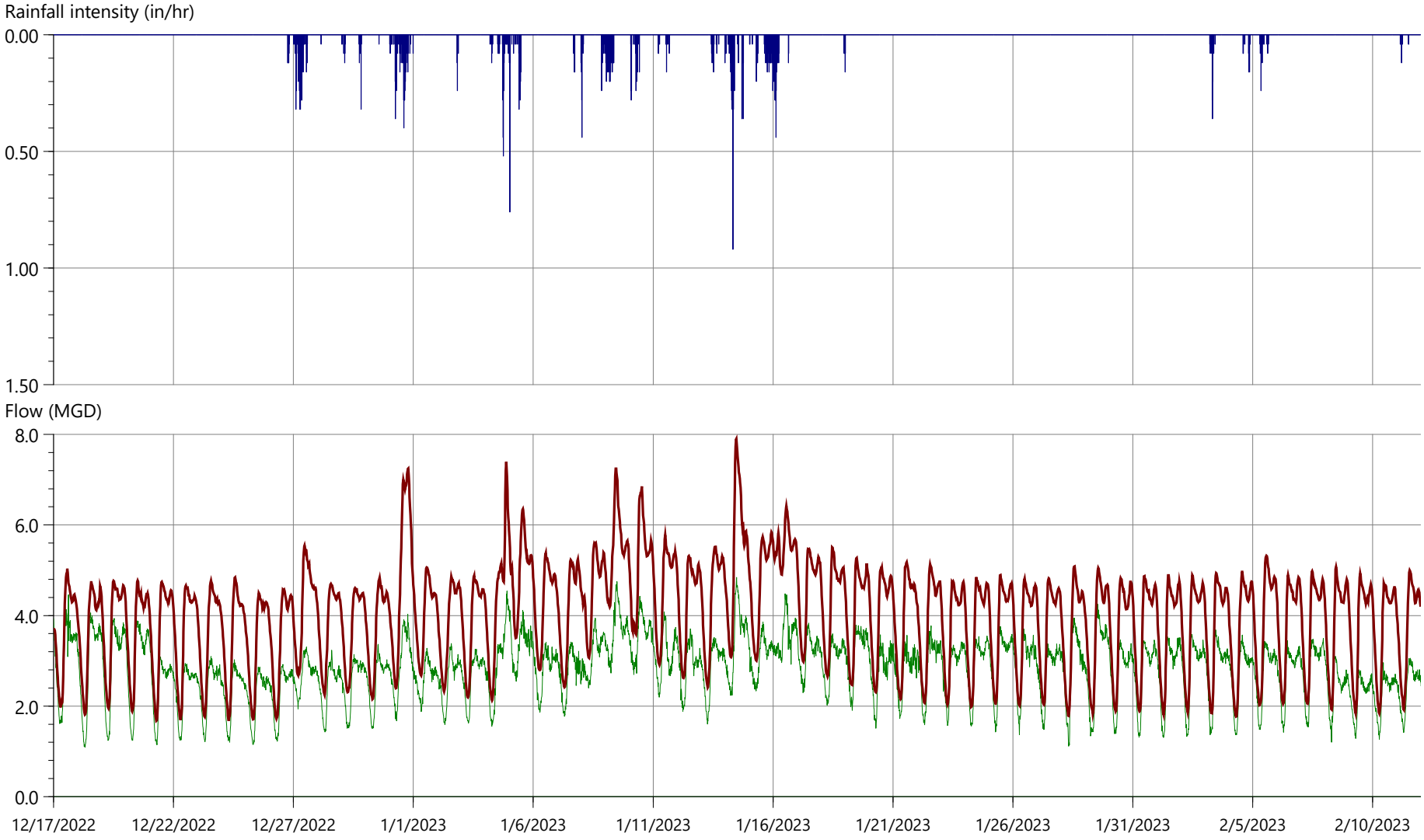
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	11.270	0.680	0.008			
Observed				0.003	1.254	4.199
... Data 2023 and 2015				0.003	0.440	2.251

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2023 WWF Existing_WithBlockage_10232023>Calibration (Homestead Blockage) ...
Flow Survey Location (Obs.) 5, Model Location (Pred.) D/S S83-23.1, Rainfall Profile: 2



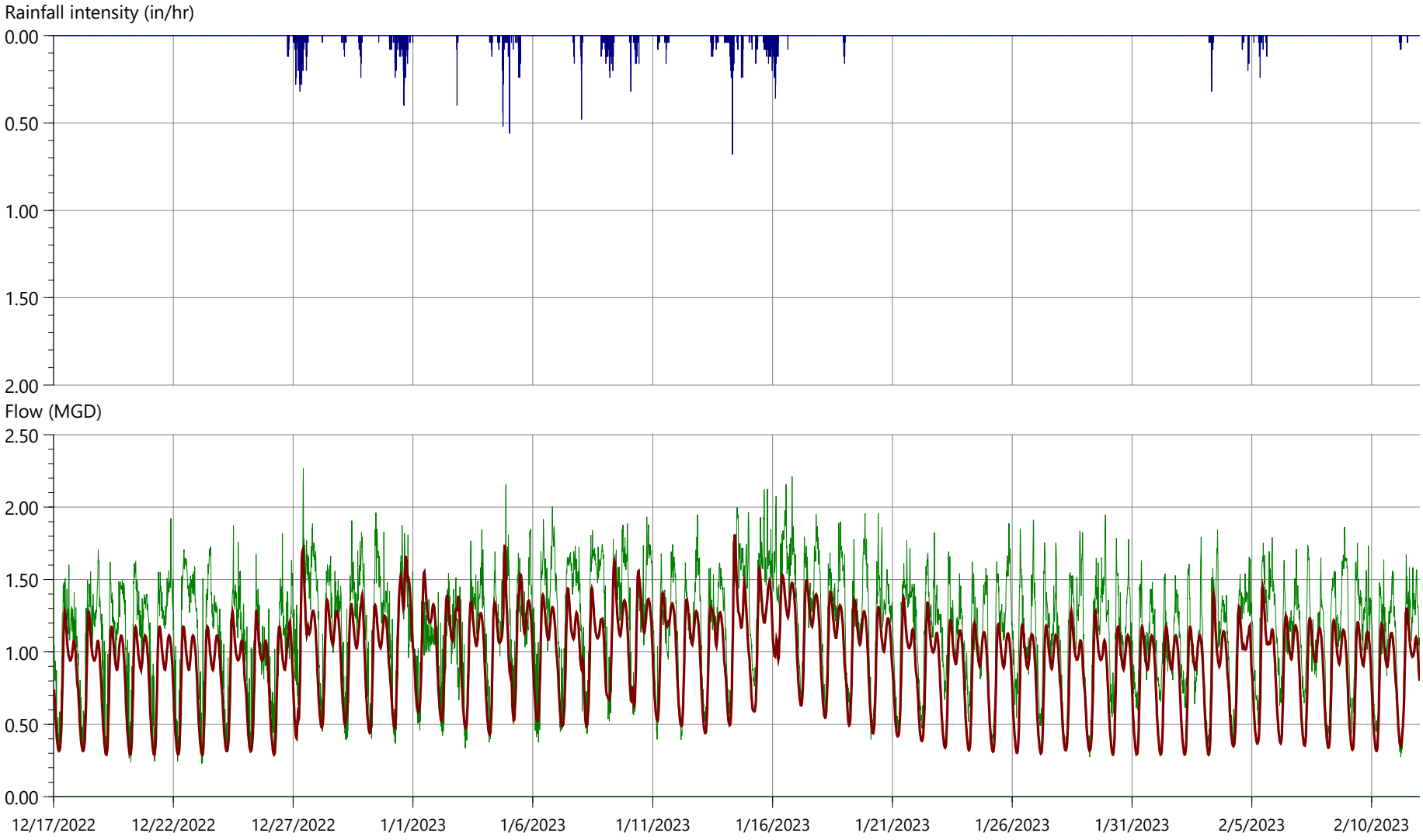
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	11.920	0.920	0.009			
Observed				0.742	8.959	222.725
... Data 2023 and 2015				1.239	7.776	214.979

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2023 WWF Existing_WithBlockage_10232023>Calibration (Homestead Blockage) ...
Flow Survey Location (Obs.) 6, Model Location (Pred.) D/S S83-25.1, Rainfall Profile: 2



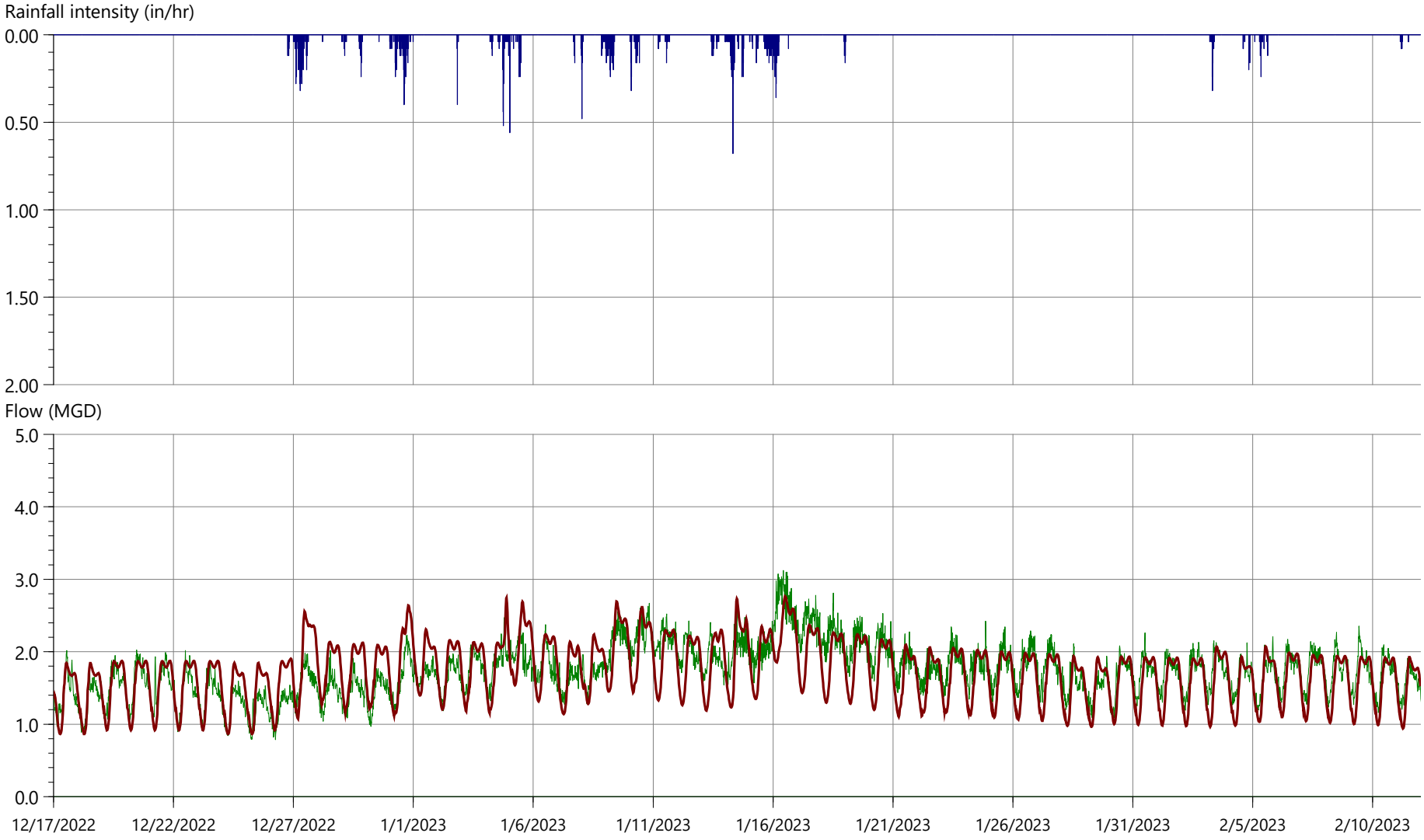
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	11.920	0.920	0.009			
Observed				1.092	4.844	161.024
... Data 2023 and 2015				1.676	7.903	232.228

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2023 WWF Existing_WithBlockage_10232023>Calibration (Homestead Blockage) ...
Flow Survey Location (Obs.) 7, Model Location (Pred.) D/S S105-6.1, Rainfall Profile: 1



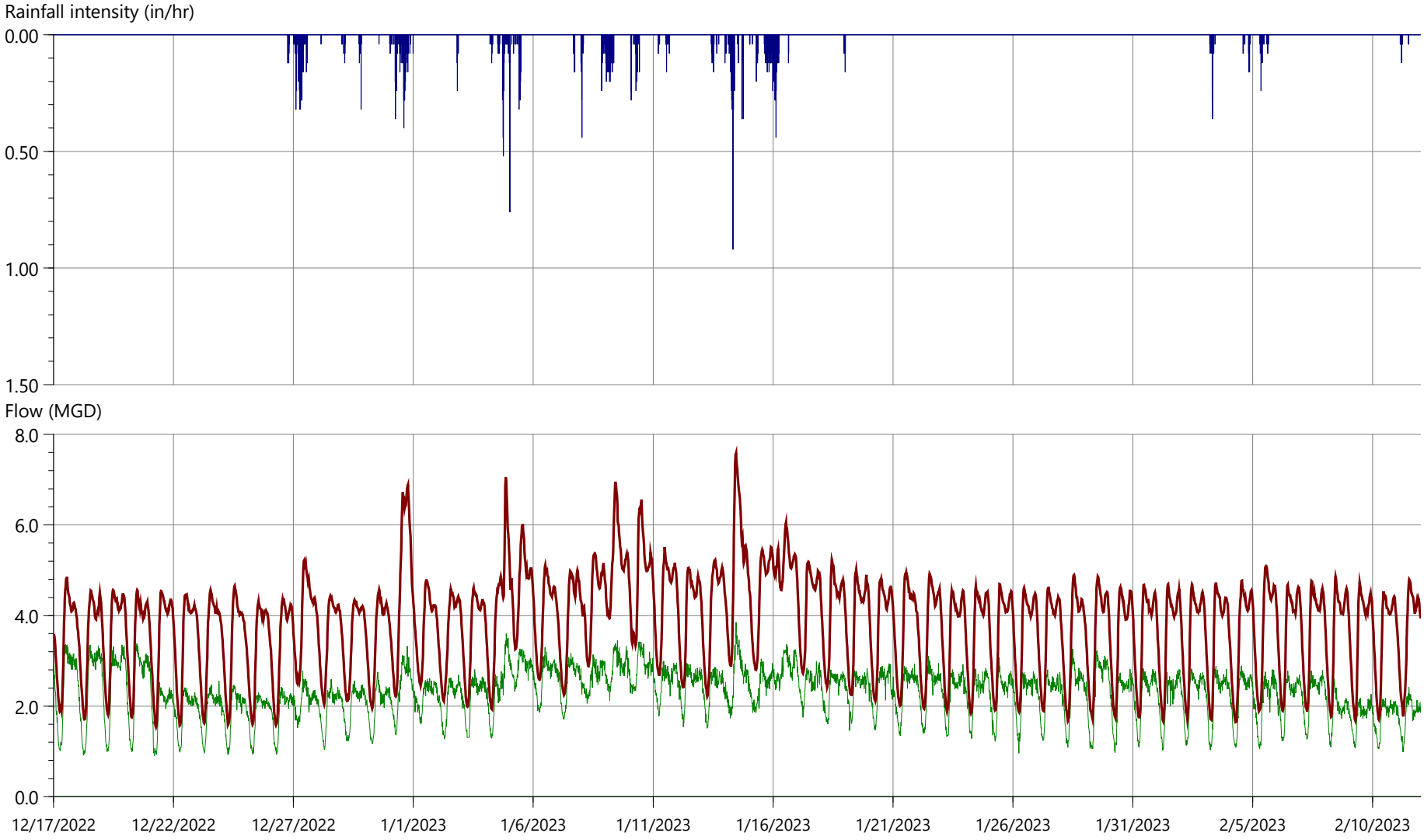
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	11.270	0.680	0.008			
Observed				0.229	2.269	66.613
... Data 2023 and 2015				0.290	1.804	53.713

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2023 WWF Existing_WithBlockage_10232023>Calibration (Homestead Blockage) ...
Flow Survey Location (Obs.) 8, Model Location (Pred.) D/S S86-13.1, Rainfall Profile: 1



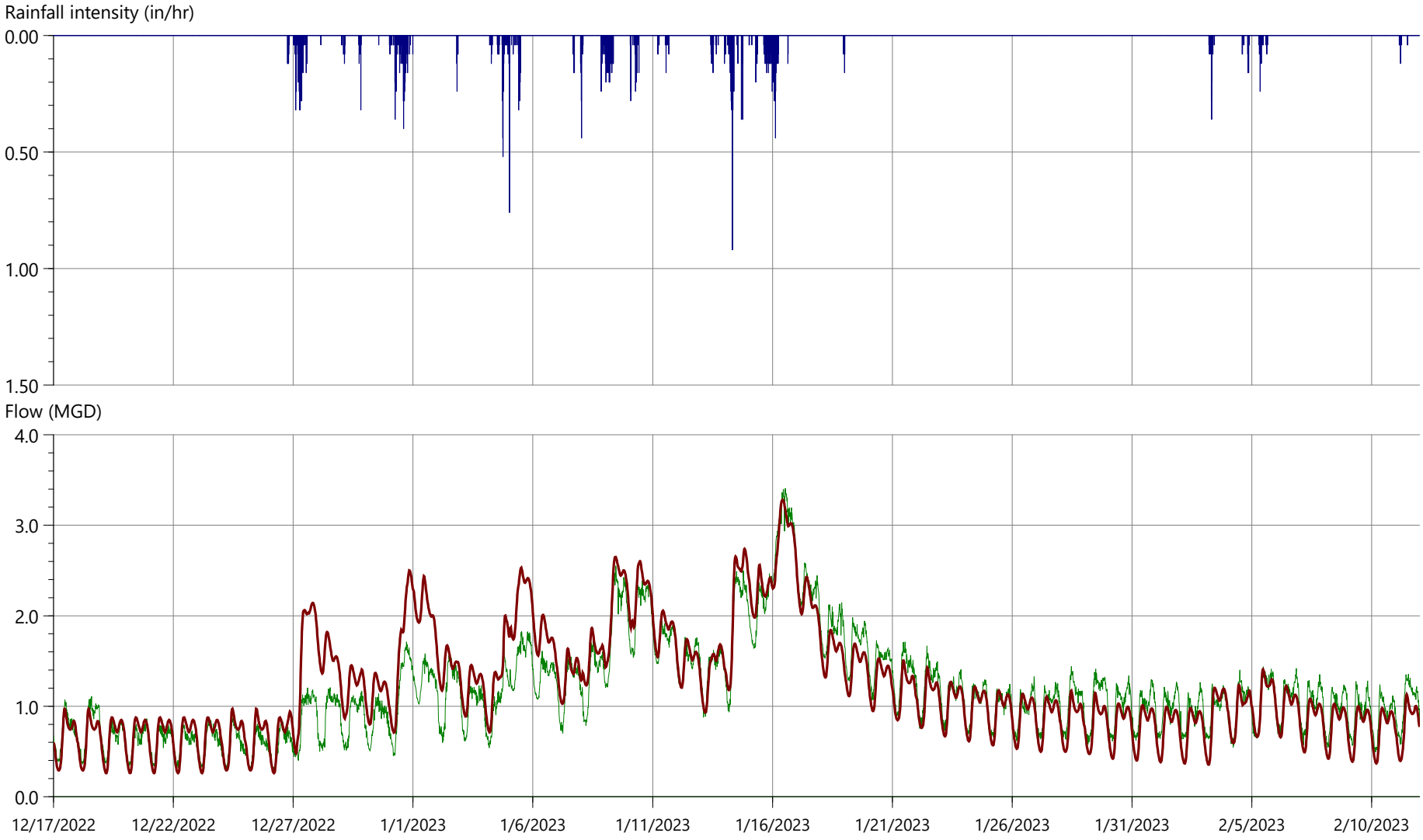
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	11.270	0.680	0.008			
Observed				0.785	3.123	99.151
... Data 2023 and 2015				0.864	2.765	98.422

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2023 WWF Existing_WithBlockage_10232023>Calibration (Homestead Blockage) ...
Flow Survey Location (Obs.) 9, Model Location (Pred.) D/S S72-20.1, Rainfall Profile: 2



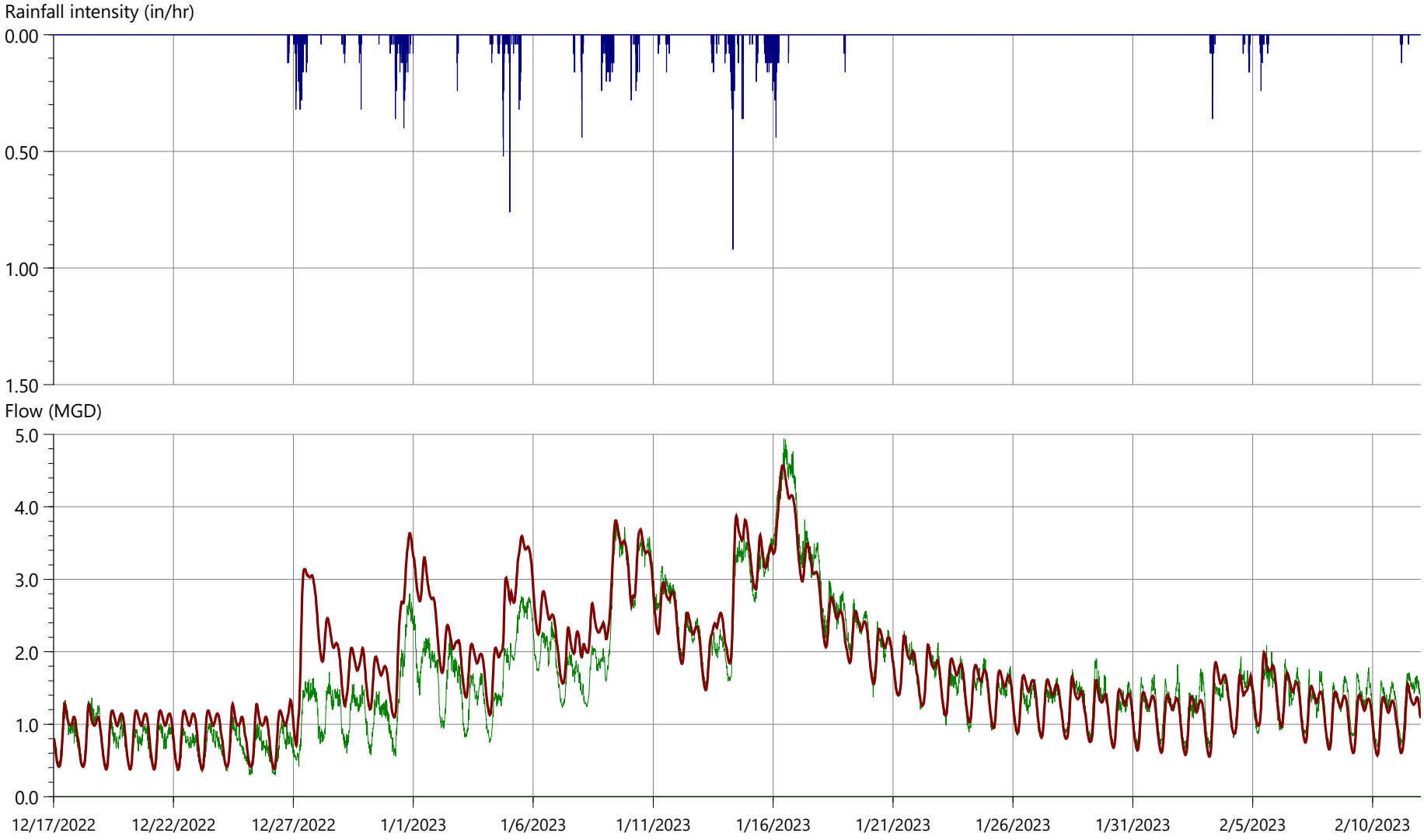
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	11.920	0.920	0.009			
Observed				0.904	3.852	130.258
... Data 2023 and 2015				1.535	7.588	220.094

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2023 WWF Existing_WithBlockage_10232023>Calibration (Homestead Blockage) ...
Flow Survey Location (Obs.) 10, Model Location (Pred.) D/S S52-80.1, Rainfall Profile: 2



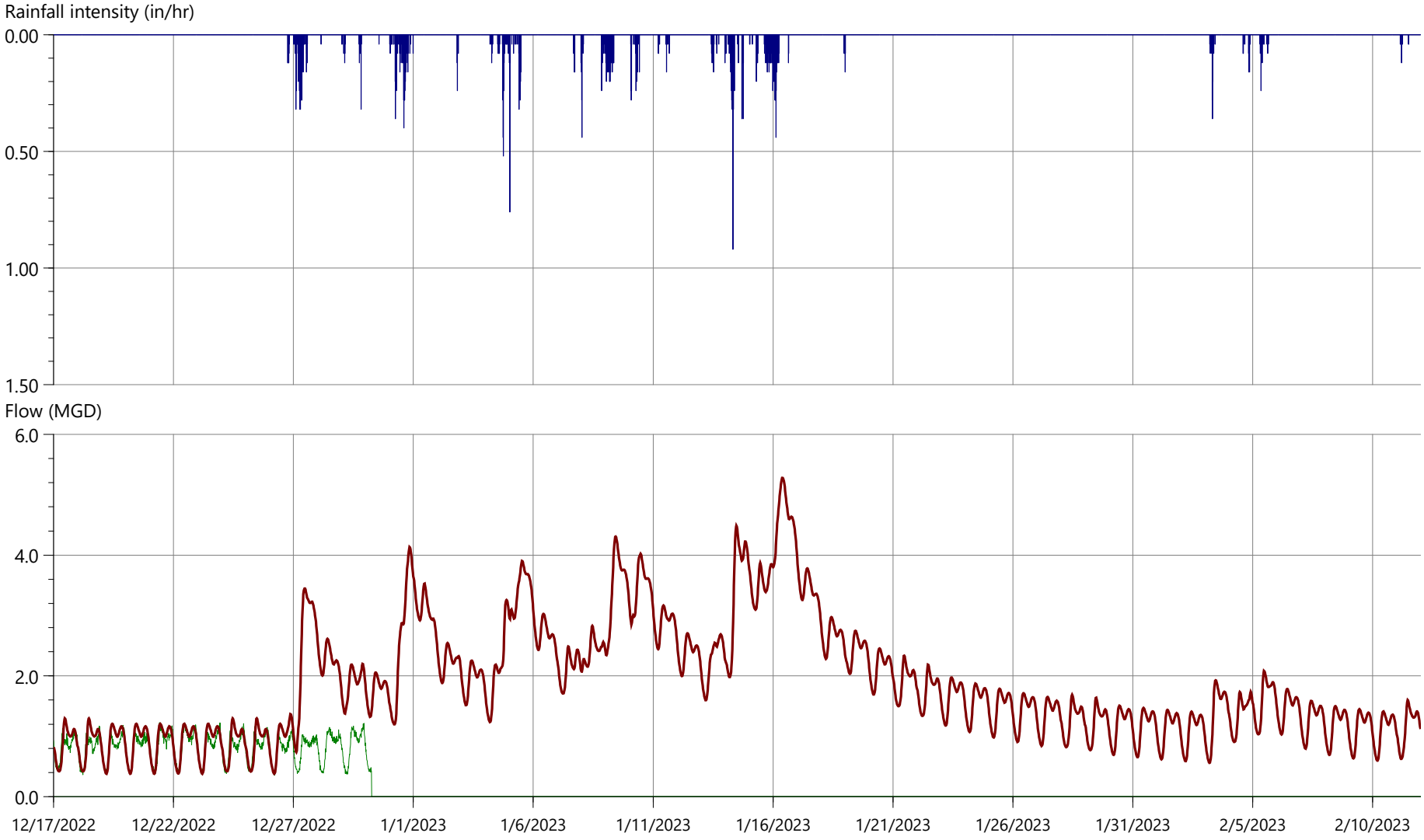
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	11.920	0.920	0.009			
Observed				0.293	3.408	66.545
... Data 2023 and 2015				0.261	3.281	69.344

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2023 WWF Existing_WithBlockage_10232023>Calibration (Homestead Blockage) ...
Flow Survey Location (Obs.) 11, Model Location (Pred.) D/S S53-9.1, Rainfall Profile: 2



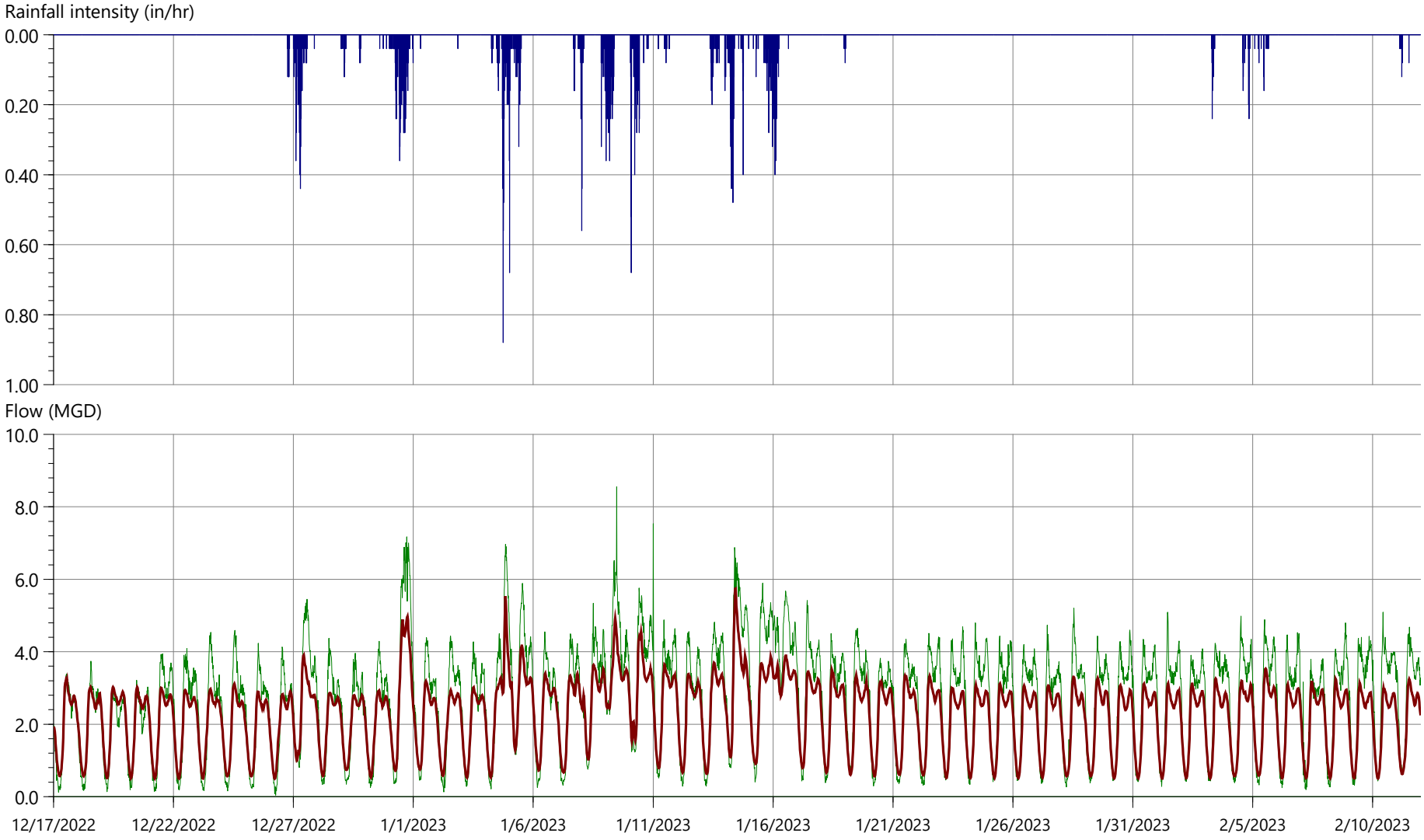
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	11.920	0.920	0.009			
Observed				0.299	4.937	91.451
... Data 2023 and 2015				0.376	4.572	100.543

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2023 WWF Existing_WithBlockage_10232023>Calibration (Homestead Blockage) ...
Flow Survey Location (Obs.) 12, Model Location (Pred.) D/S S53-109.1, Rainfall Profile: 2



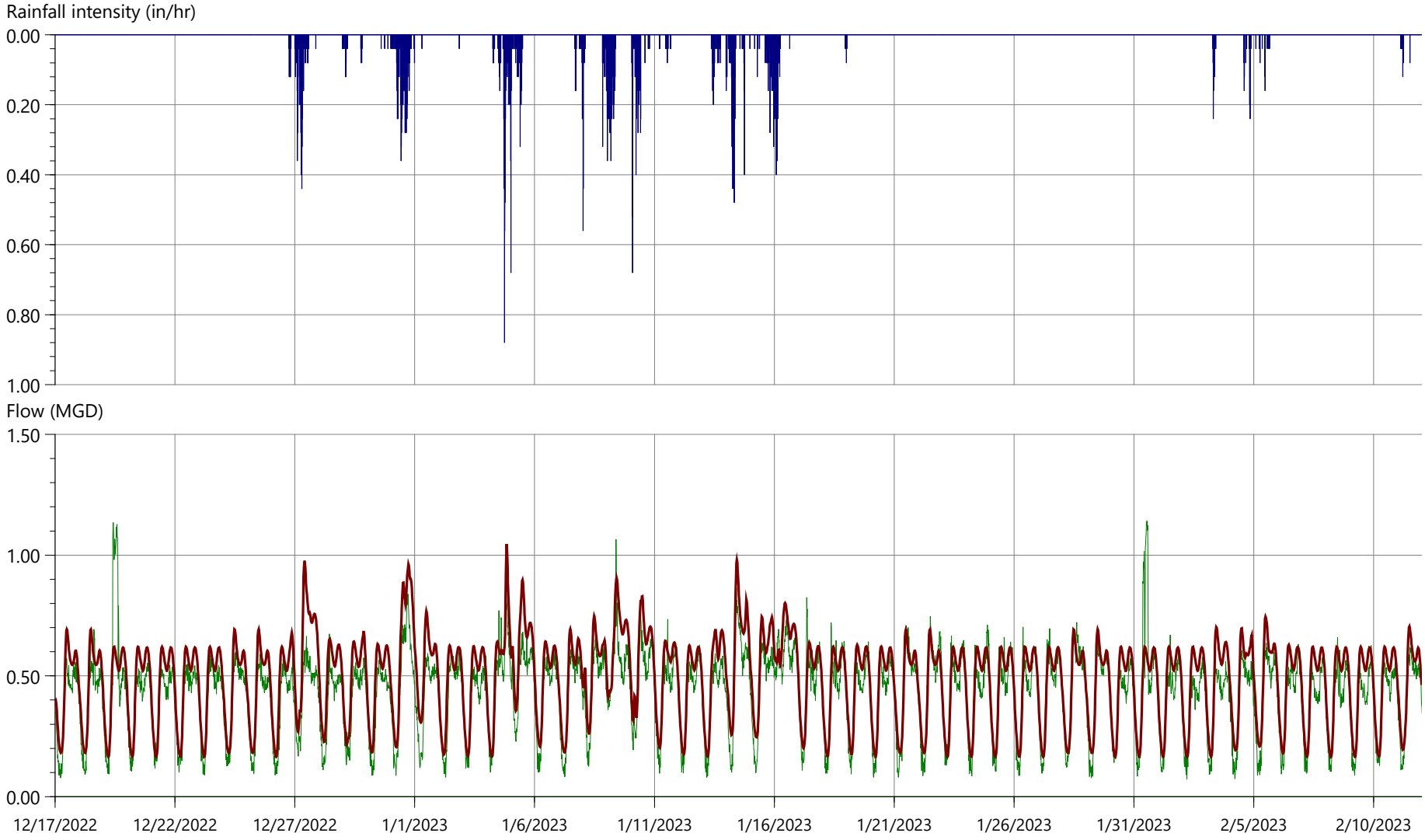
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	11.920	0.920	0.009			
Observed				0.000	1.229	10.854
... Data 2023 and 2015				0.380	5.281	106.907

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2023 WWF Existing_WithBlockage_10232023>Calibration (Homestead Blockage) ...
Flow Survey Location (Obs.) 13, Model Location (Pred.) D/S S53-73.1, Rainfall Profile: 3



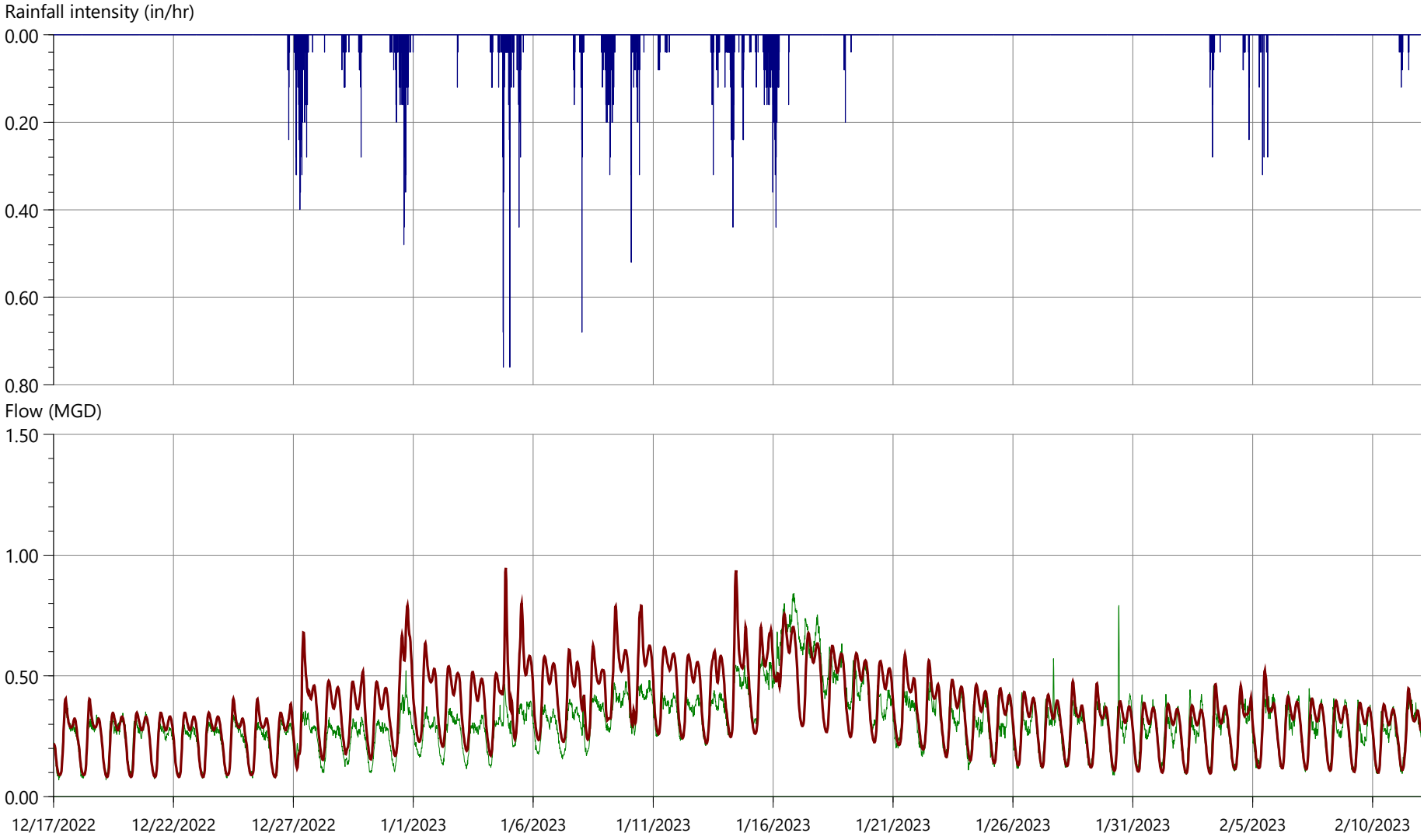
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	15.790	0.880	0.012			
Observed				0.039	8.561	156.493
... Data 2023 and 2015				0.496	5.745	130.152

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2023 WWF Existing_WithBlockage_10232023>Calibration (Homestead Blockage) ...
Flow Survey Location (Obs.) 14, Model Location (Pred.) D/S S54-17.1, Rainfall Profile: 3



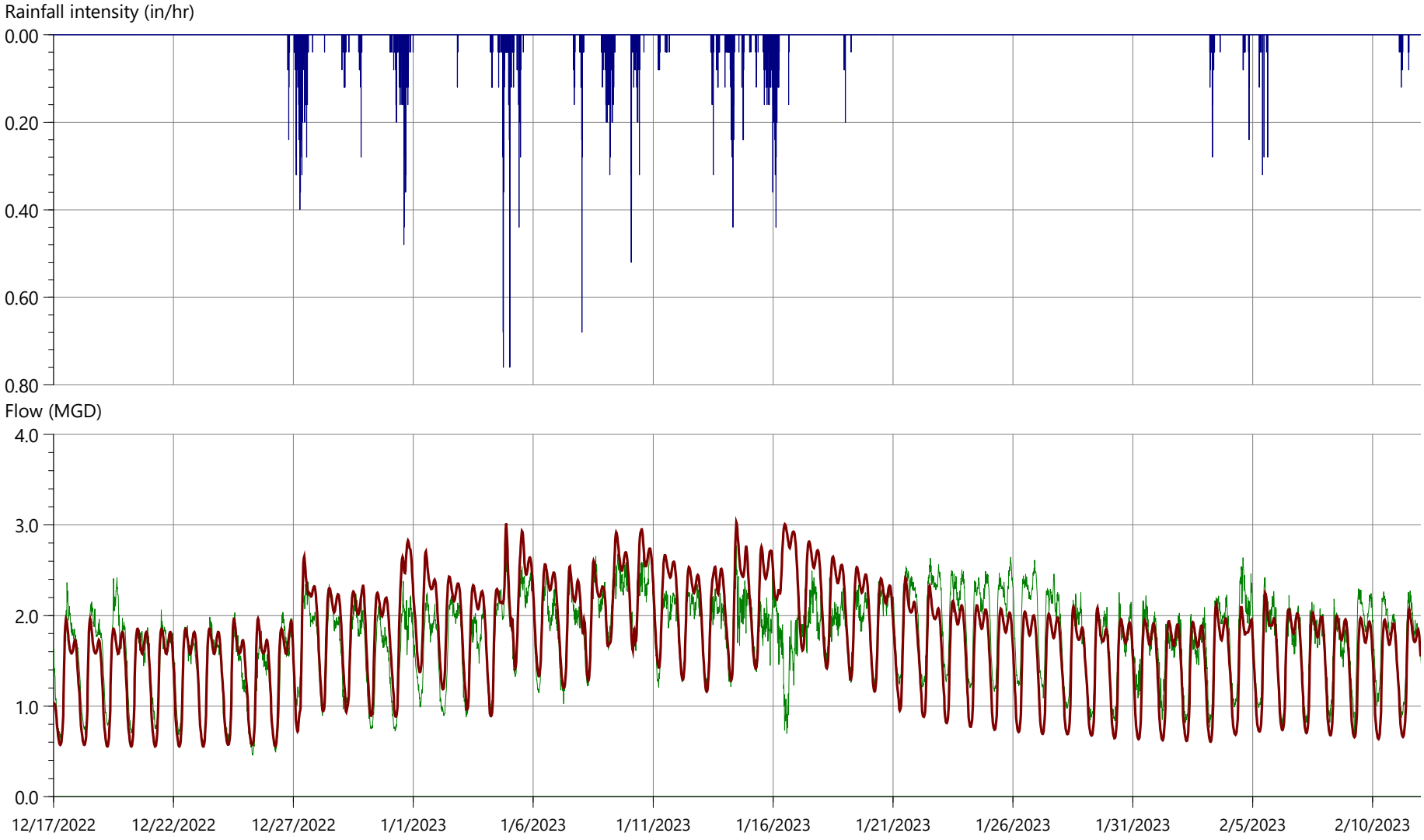
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	15.790	0.880	0.012			
Observed				0.072	1.143	24.509
... Data 2023 and 2015				0.165	1.046	28.116

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2023 WWF Existing_WithBlockage_10232023>Calibration (Homestead Blockage) ...
Flow Survey Location (Obs.) 15, Model Location (Pred.) D/S S65-48.1, Rainfall Profile: 4



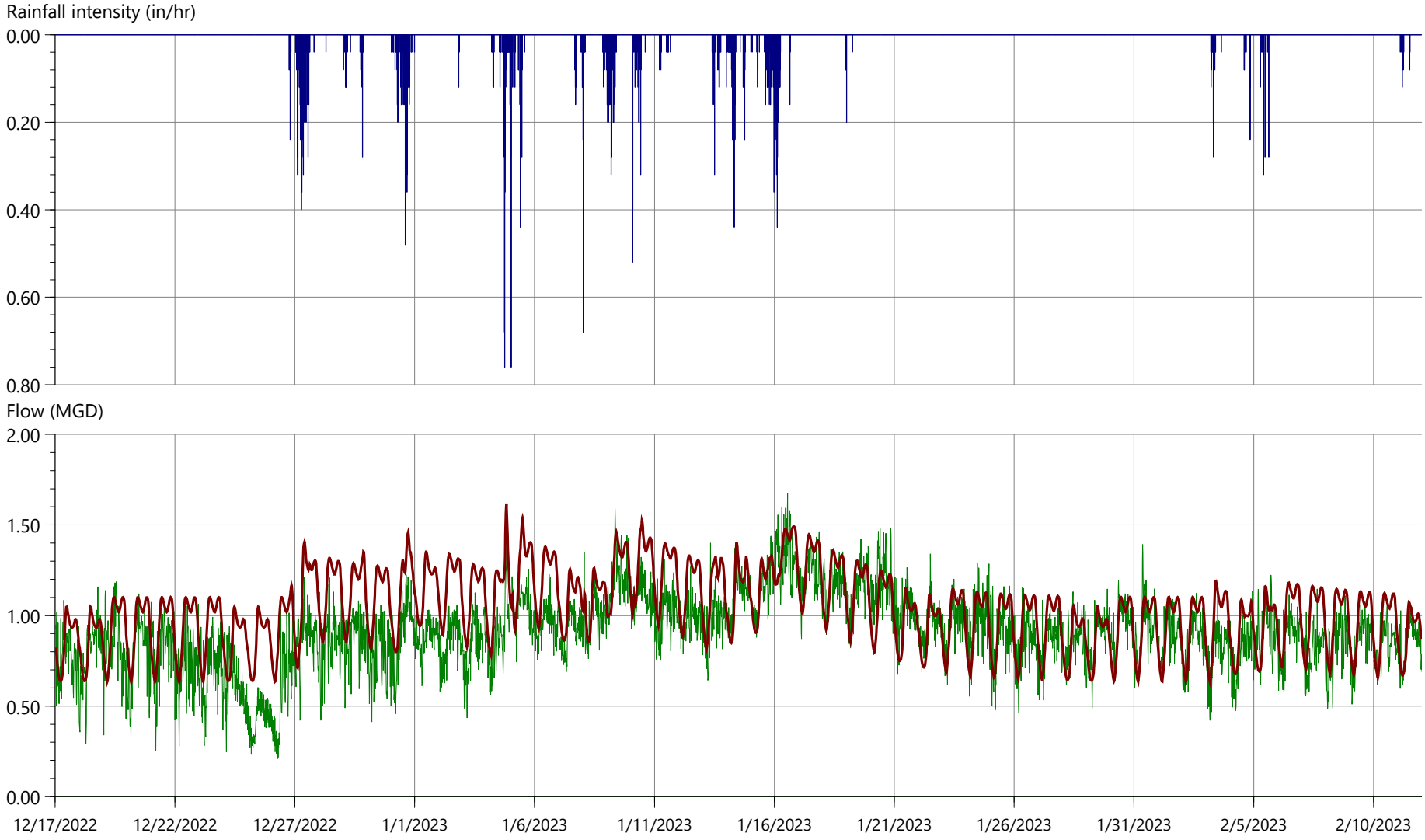
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	13.810	0.760	0.010			
Observed				0.068	0.842	17.364
... Data 2023 and 2015				0.081	0.947	20.260

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2023 WWF Existing_WithBlockage_10232023>Calibration (Homestead Blockage) ...
Flow Survey Location (Obs.) 16, Model Location (Pred.) D/S S67-12.1, Rainfall Profile: 4



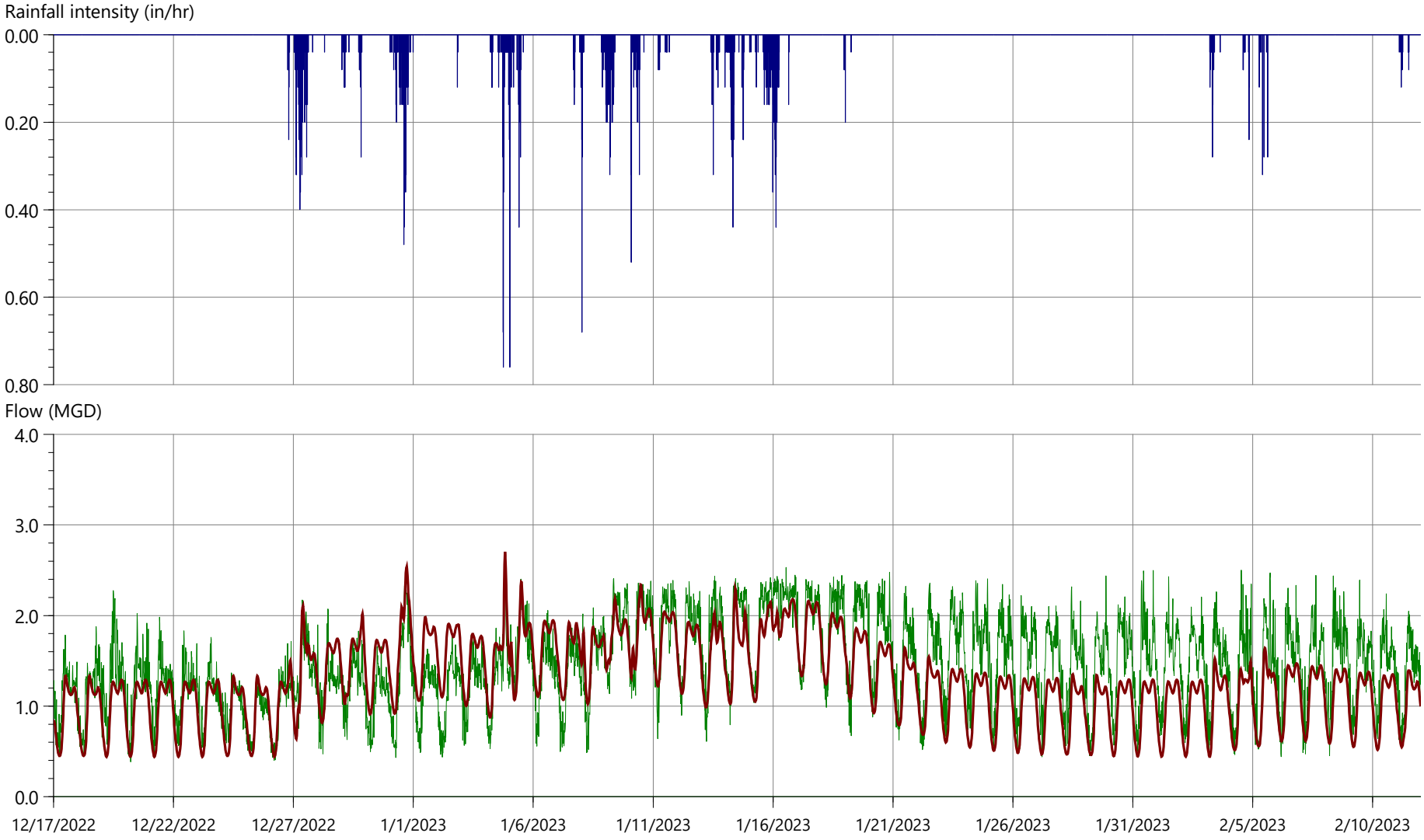
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	13.810	0.760	0.010			
Observed				0.459	2.773	98.978
... Data 2023 and 2015				0.555	3.028	99.594

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2023 WWF Existing_WithBlockage_10232023>Calibration (Homestead Blockage) ...
Flow Survey Location (Obs.) 17, Model Location (Pred.) D/S S58-12.2, Rainfall Profile: 4



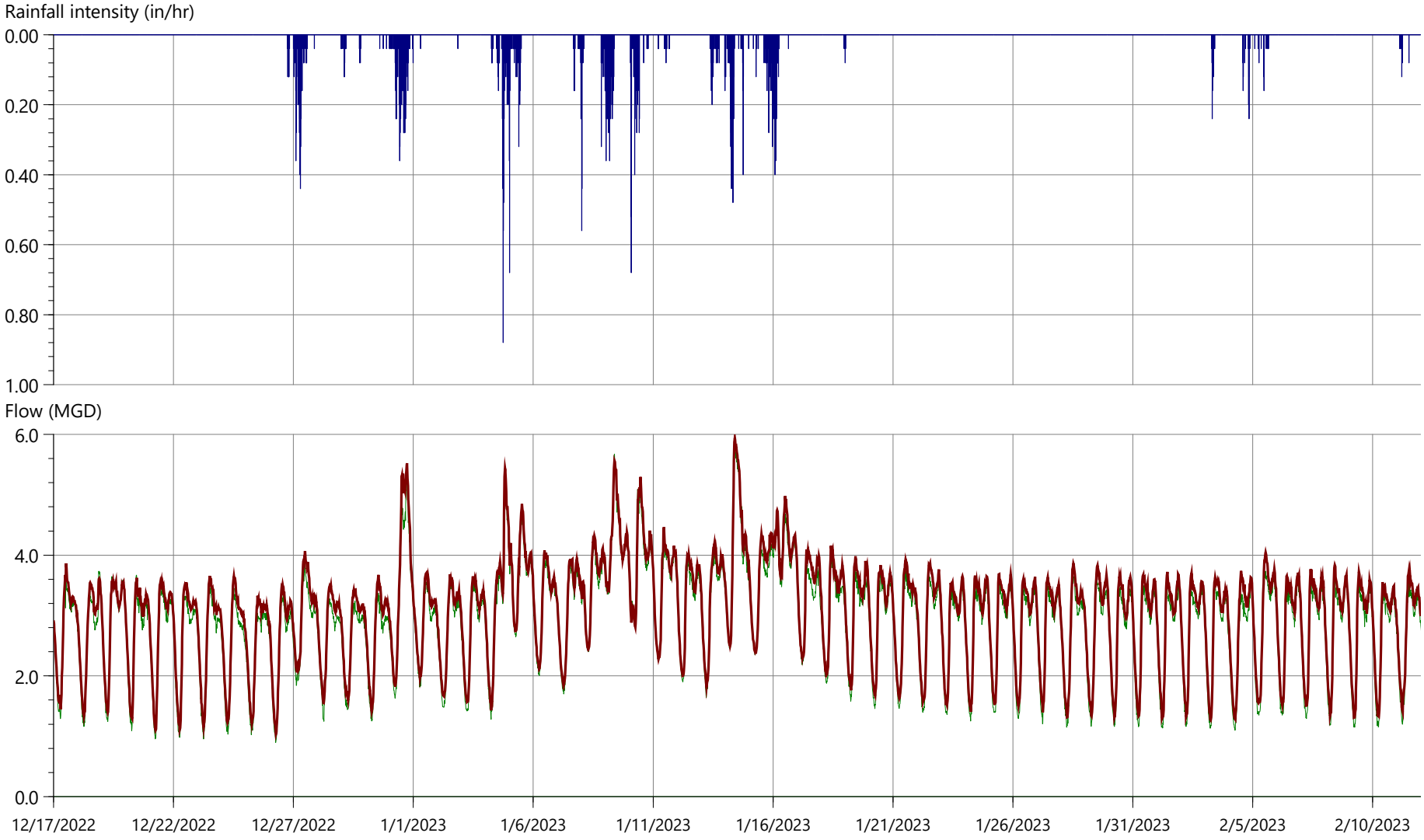
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	13.810	0.760	0.010			
Observed				0.210	1.675	51.663
... Data 2023 and 2015				0.632	1.619	59.316

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2023 WWF Existing_WithBlockage_10232023>Calibration (Homestead Blockage) ...
Flow Survey Location (Obs.) 18, Model Location (Pred.) D/S S58-11.1, Rainfall Profile: 4



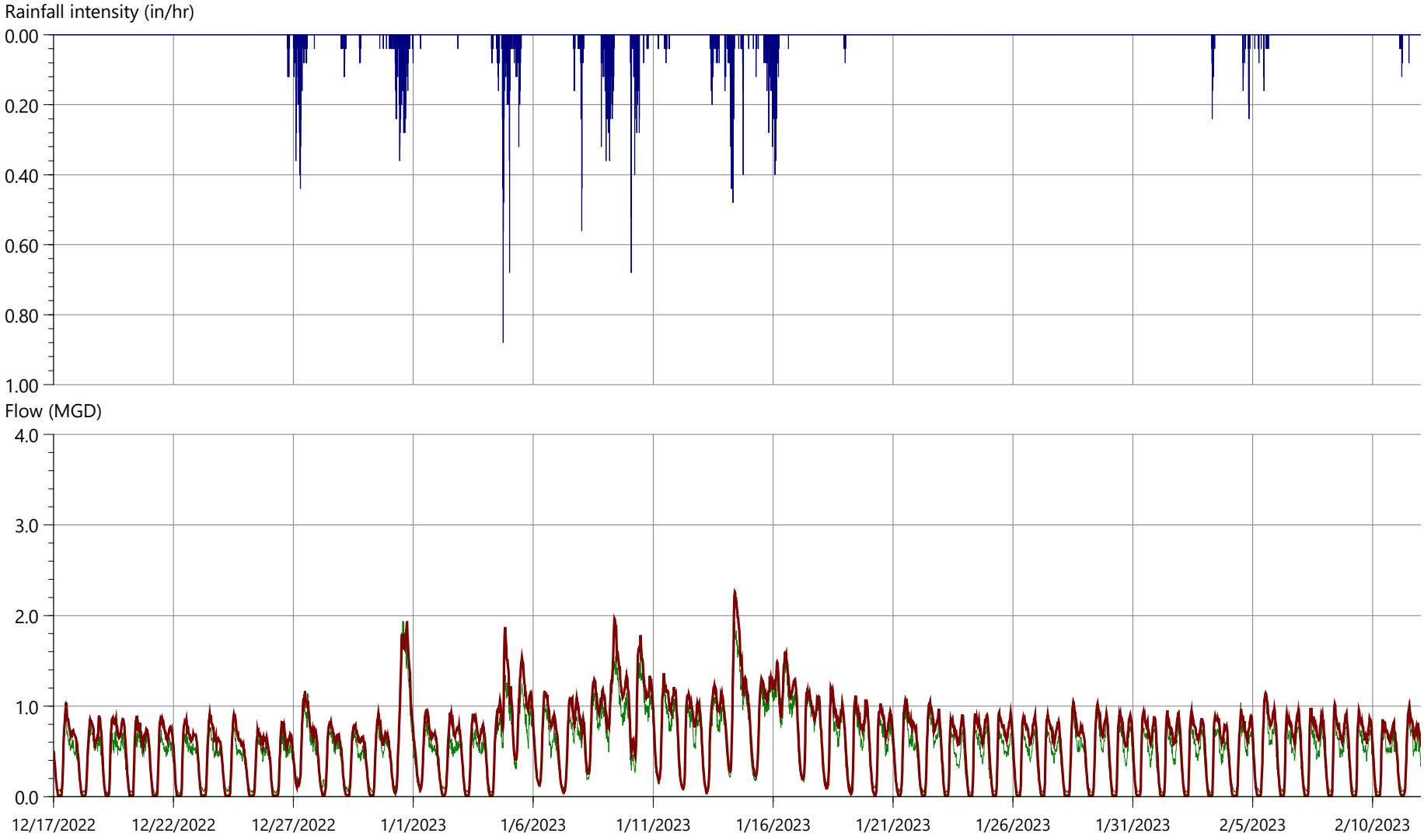
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	13.810	0.760	0.010			
Observed				0.385	2.531	82.942
... Data 2023 and 2015				0.440	2.704	73.747

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2023 WWF Existing_WithBlockage_10232023>Calibration (Homestead Blockage) ...
Flow Survey Location (Obs.) 19, Model Location (Pred.) D/S S21-23.1, Rainfall Profile: 3



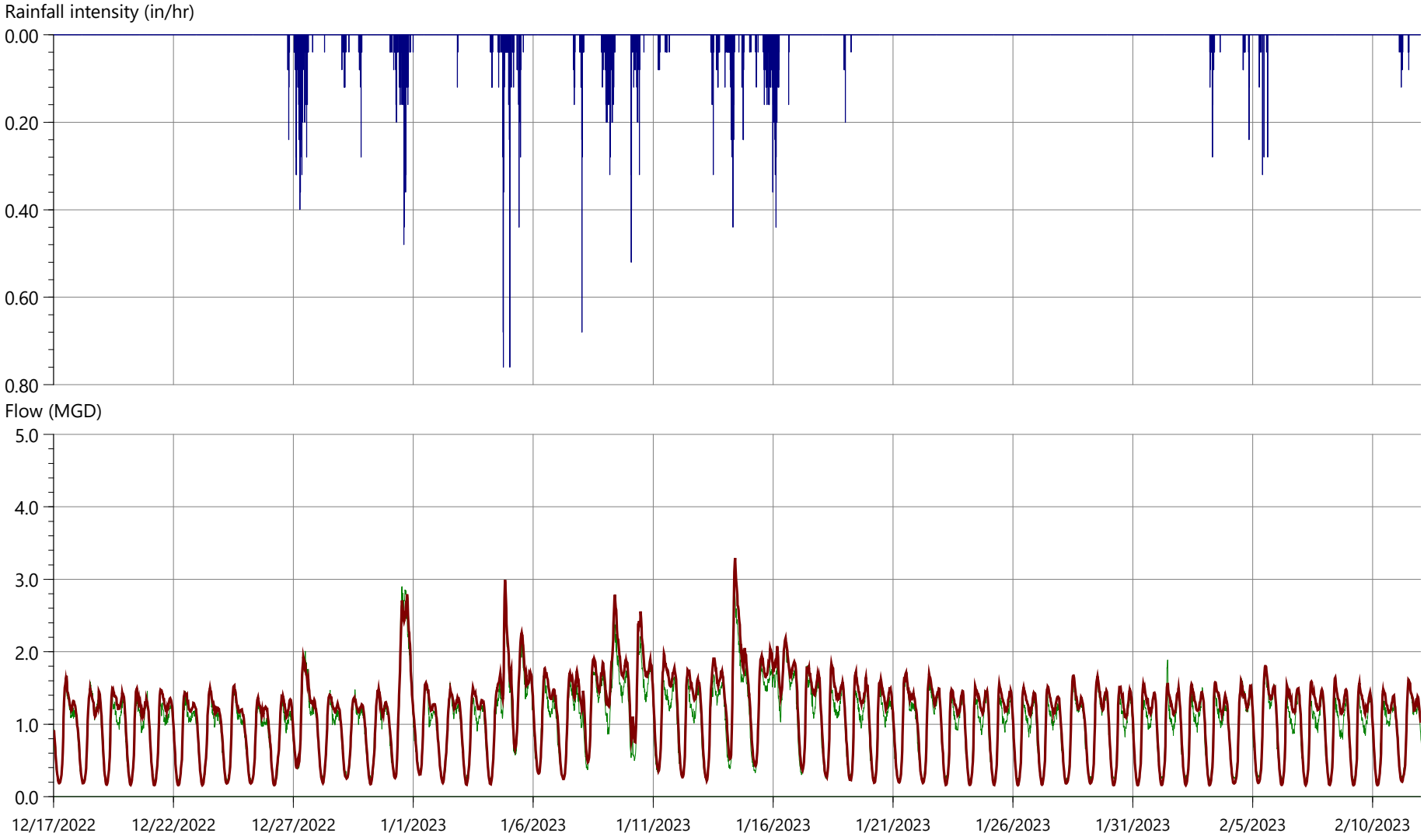
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	15.790	0.880	0.012			
Observed				0.899	5.983	166.563
... Data 2023 and 2015				1.039	5.938	175.023

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2023 WWF Existing_WithBlockage_10232023>Calibration (Homestead Blockage) ...
Flow Survey Location (Obs.) 20, Model Location (Pred.) D/S S21-46.1, Rainfall Profile: 3



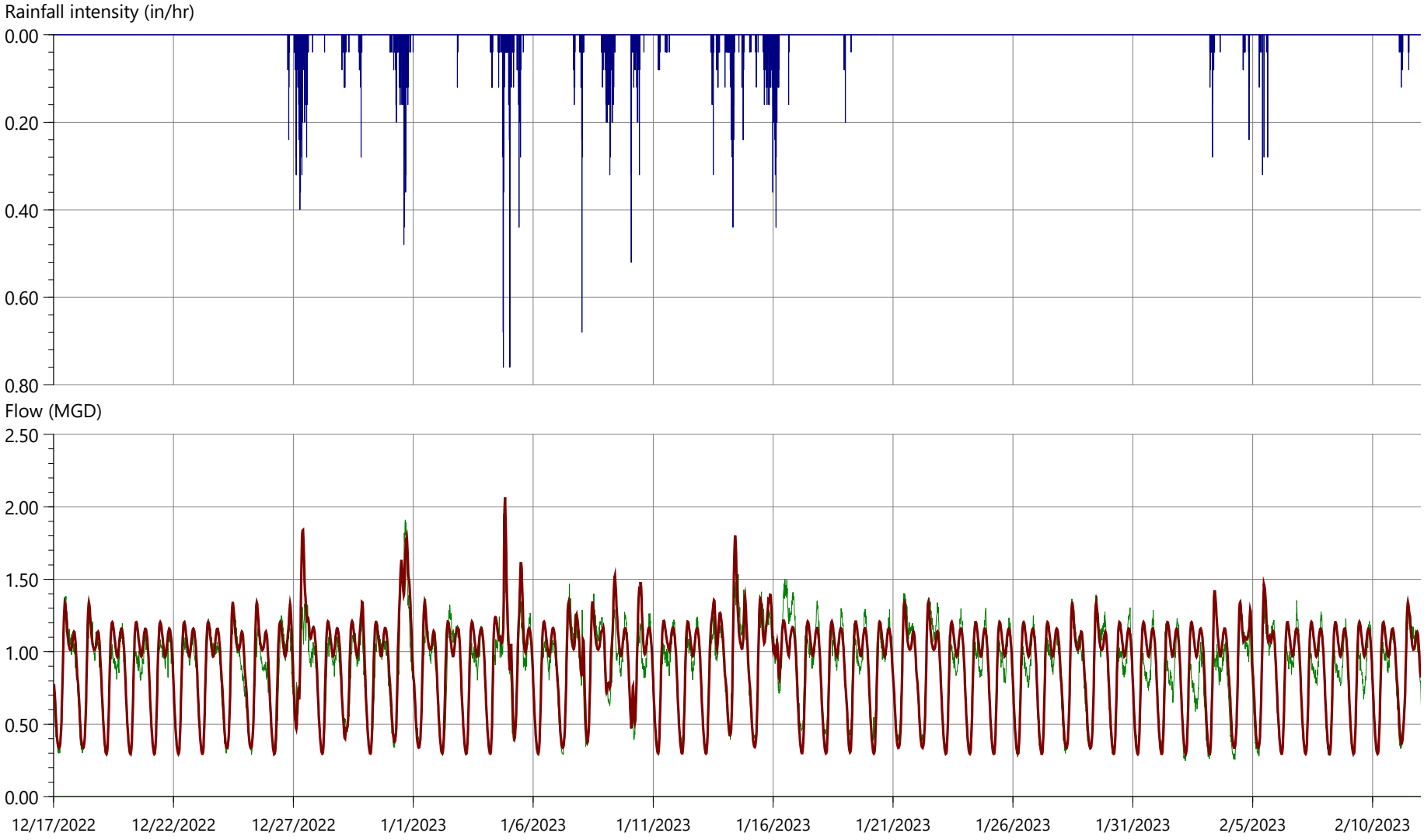
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	15.790	0.880	0.012			
Observed				0.022	1.939	30.414
... Data 2023 and 2015				0.009	2.260	35.967

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2023 WWF Existing_WithBlockage_10232023>Calibration (Homestead Blockage) ...
Flow Survey Location (Obs.) 21, Model Location (Pred.) D/S S23-14.1, Rainfall Profile: 4



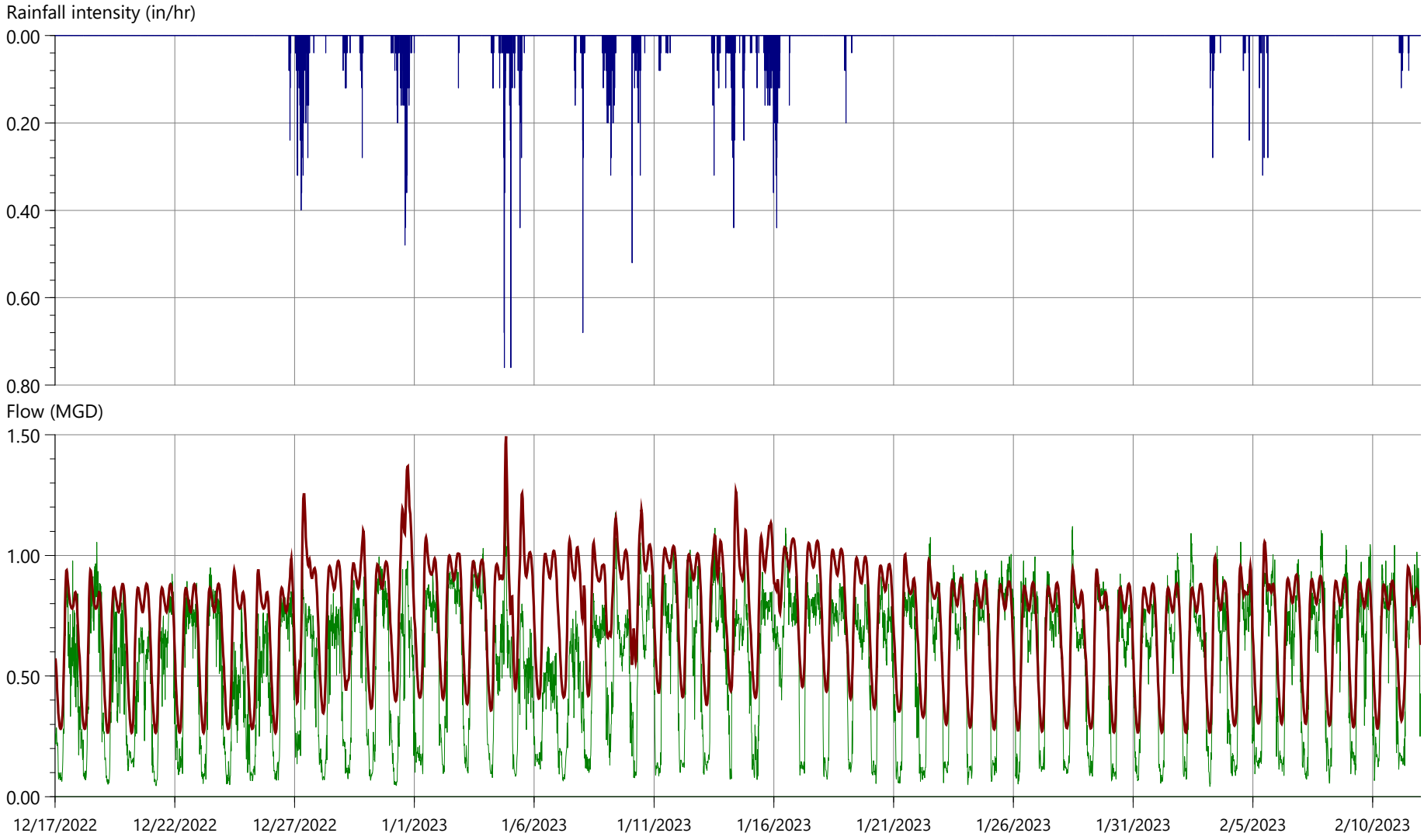
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	13.810	0.760	0.010			
Observed				0.199	2.901	57.470
... Data 2023 and 2015				0.158	3.295	62.917

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2023 WWF Existing_WithBlockage_10232023>Calibration (Homestead Blockage) ...
Flow Survey Location (Obs.) 22, Model Location (Pred.) D/S S45-88.1, Rainfall Profile: 4



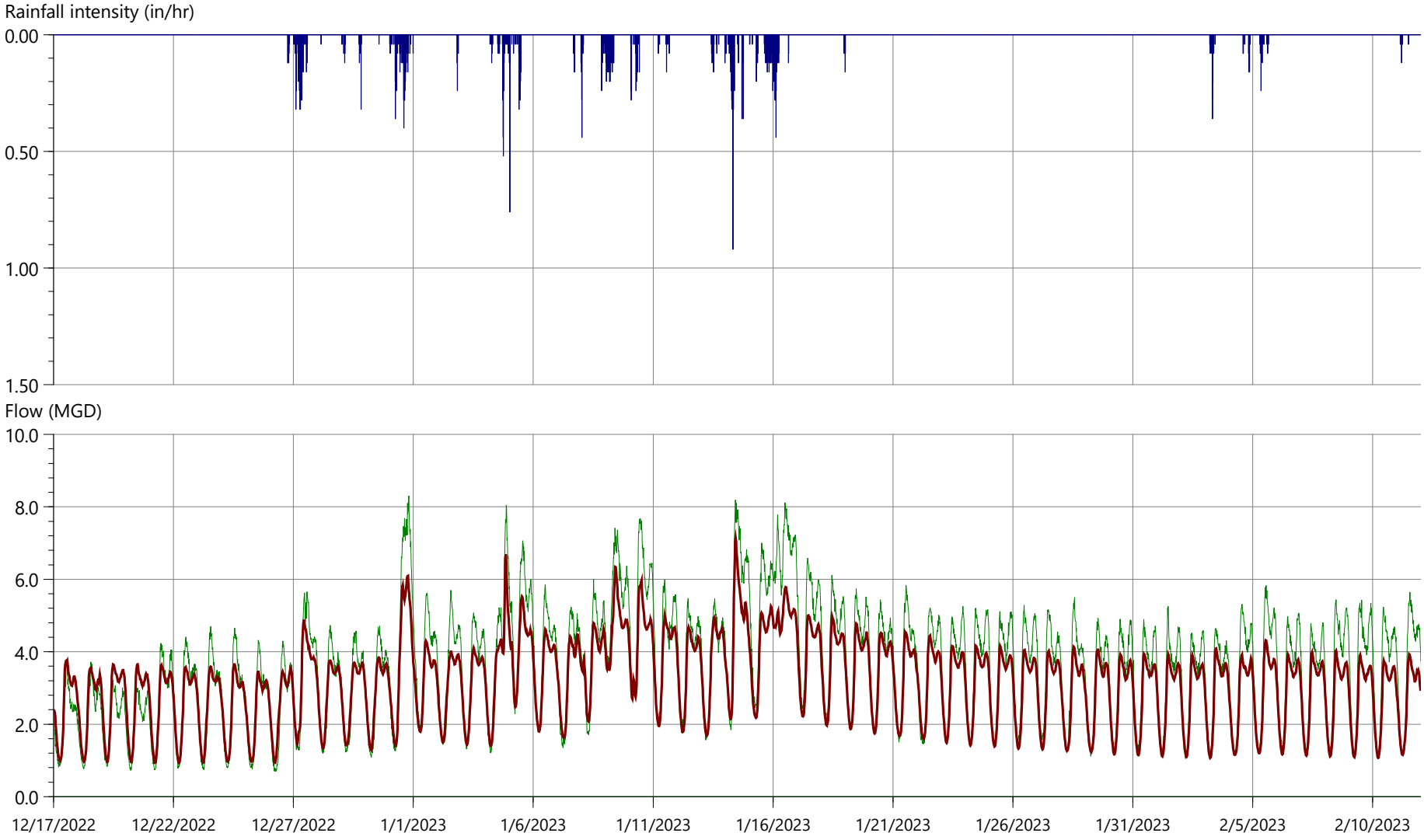
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	13.810	0.760	0.010			
Observed				0.249	1.954	48.806
... Data 2023 and 2015				0.294	2.067	51.449

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2023 WWF Existing_WithBlockage_10232023>Calibration (Homestead Blockage) ...
Flow Survey Location (Obs.) 23, Model Location (Pred.) D/S S48-32.1, Rainfall Profile: 4



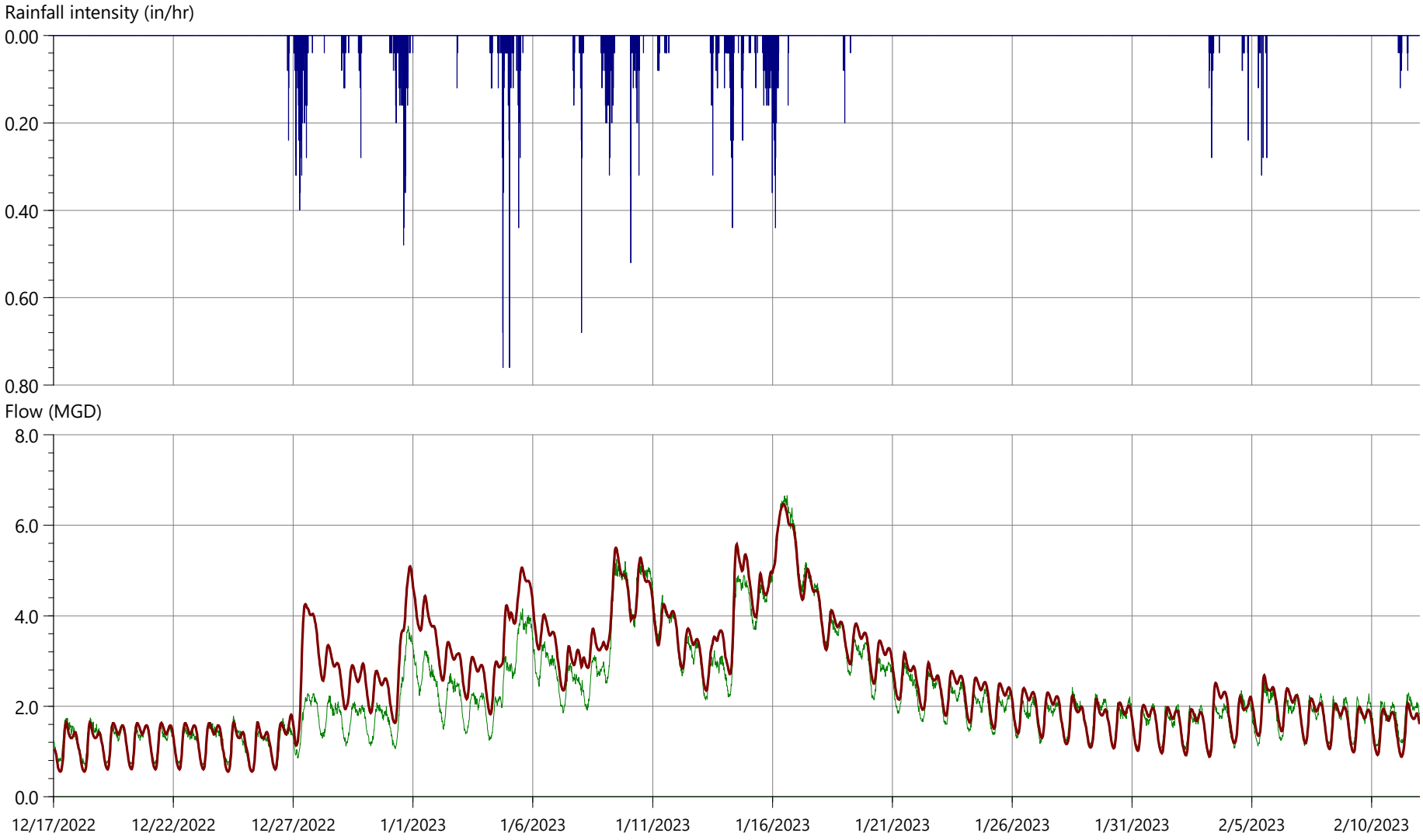
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	13.810	0.760	0.010			
Observed				0.043	1.224	31.114
... Data 2023 and 2015				0.265	1.494	42.122

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2023 WWF Existing_WithBlockage_10232023>Calibration (Homestead Blockage) ...
Flow Survey Location (Obs.) 24, Model Location (Pred.) D/S S63-2.1, Rainfall Profile: 2



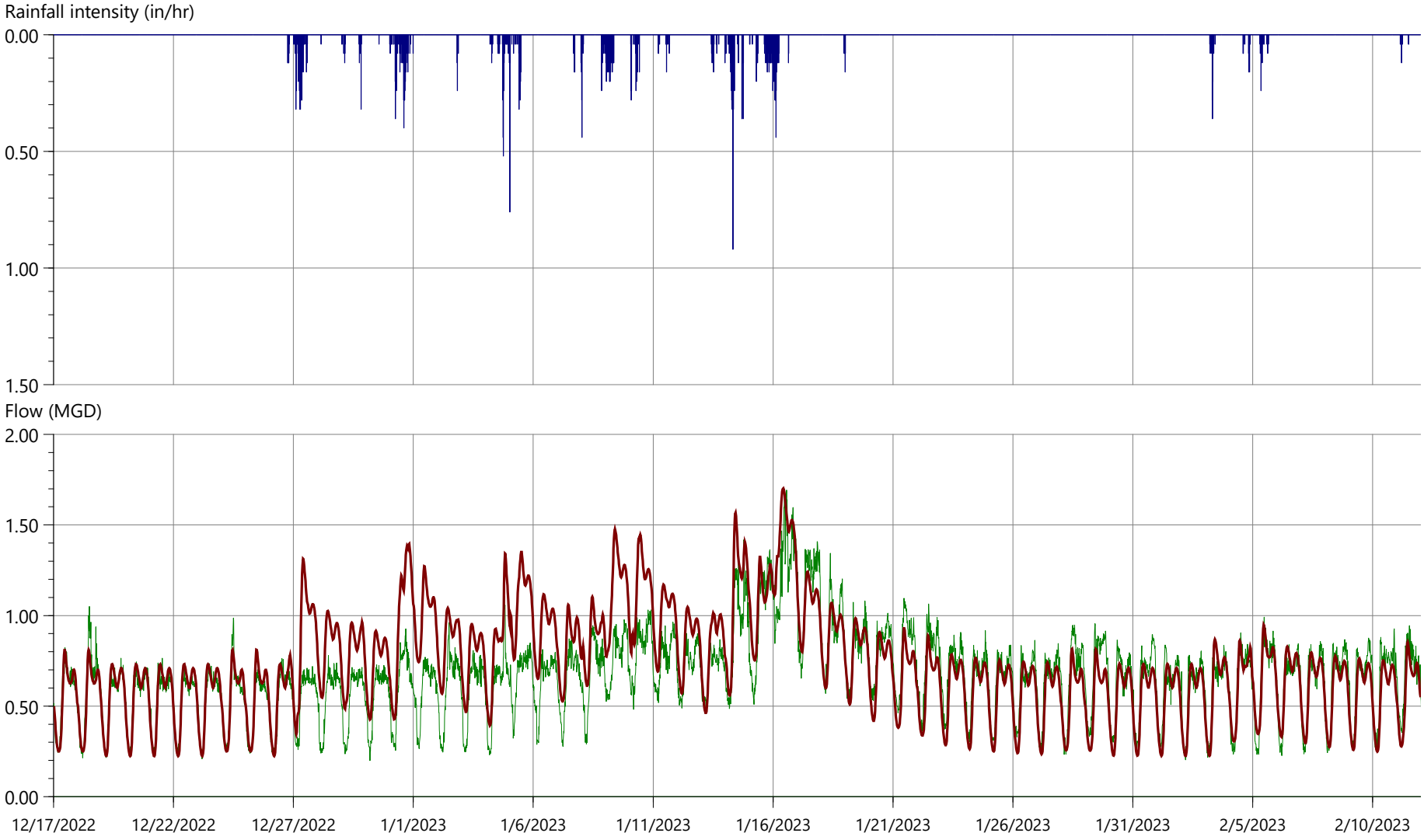
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	11.920	0.920	0.009			
Observed				0.701	8.304	207.686
... Data 2023 and 2015				0.928	7.143	182.287

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2023 WWF Existing_WithBlockage_10232023>Calibration (Homestead Blockage) ...
Flow Survey Location (Obs.) 25, Model Location (Pred.) D/S S57-6.1, Rainfall Profile: 4



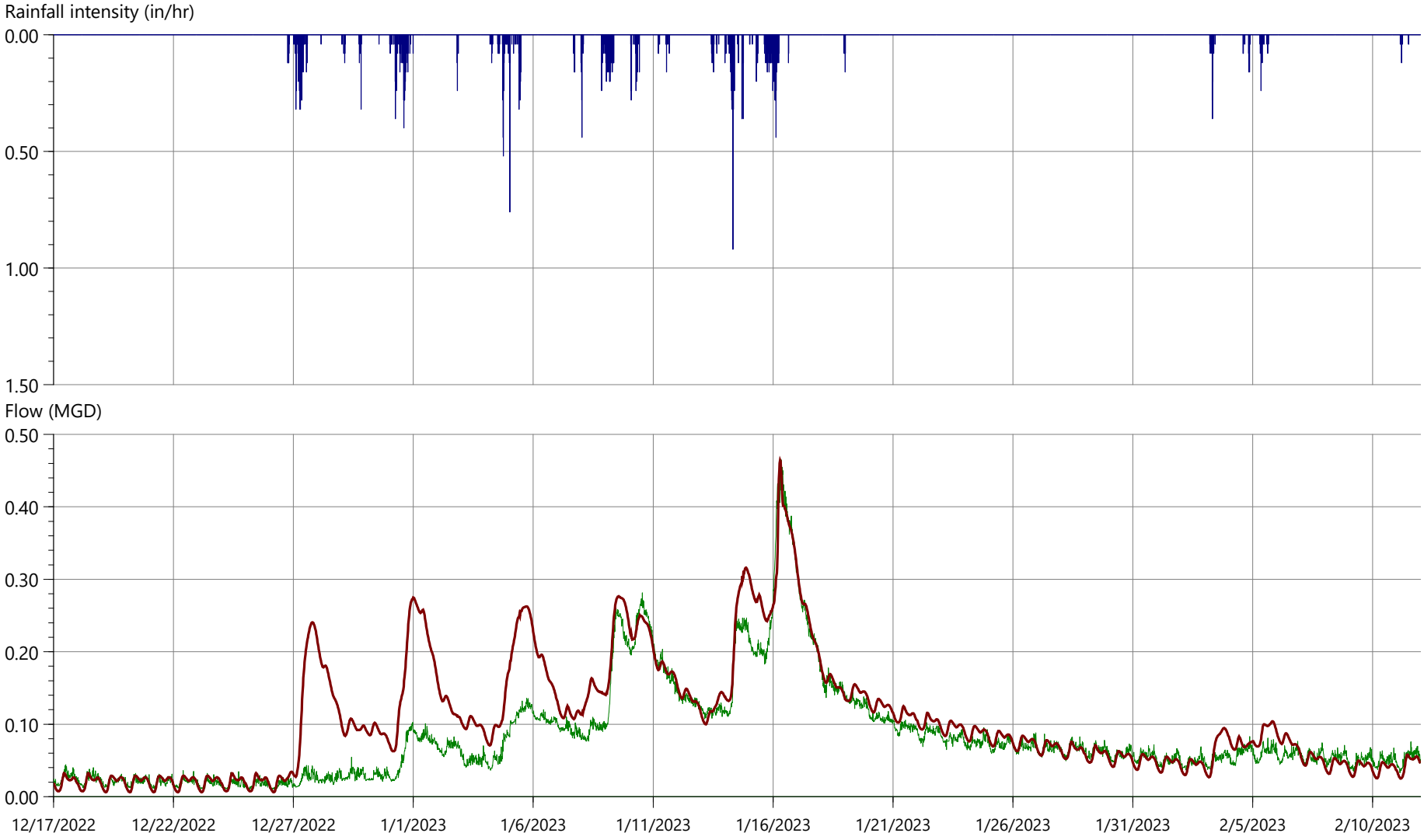
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	13.810	0.760	0.010			
Observed				0.540	6.661	130.153
... Data 2023 and 2015				0.555	6.470	144.336

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2023 WWF Existing_WithBlockage_10232023>Calibration (Homestead Blockage) ...
Flow Survey Location (Obs.) 26, Model Location (Pred.) D/S S52-86.1, Rainfall Profile: 2



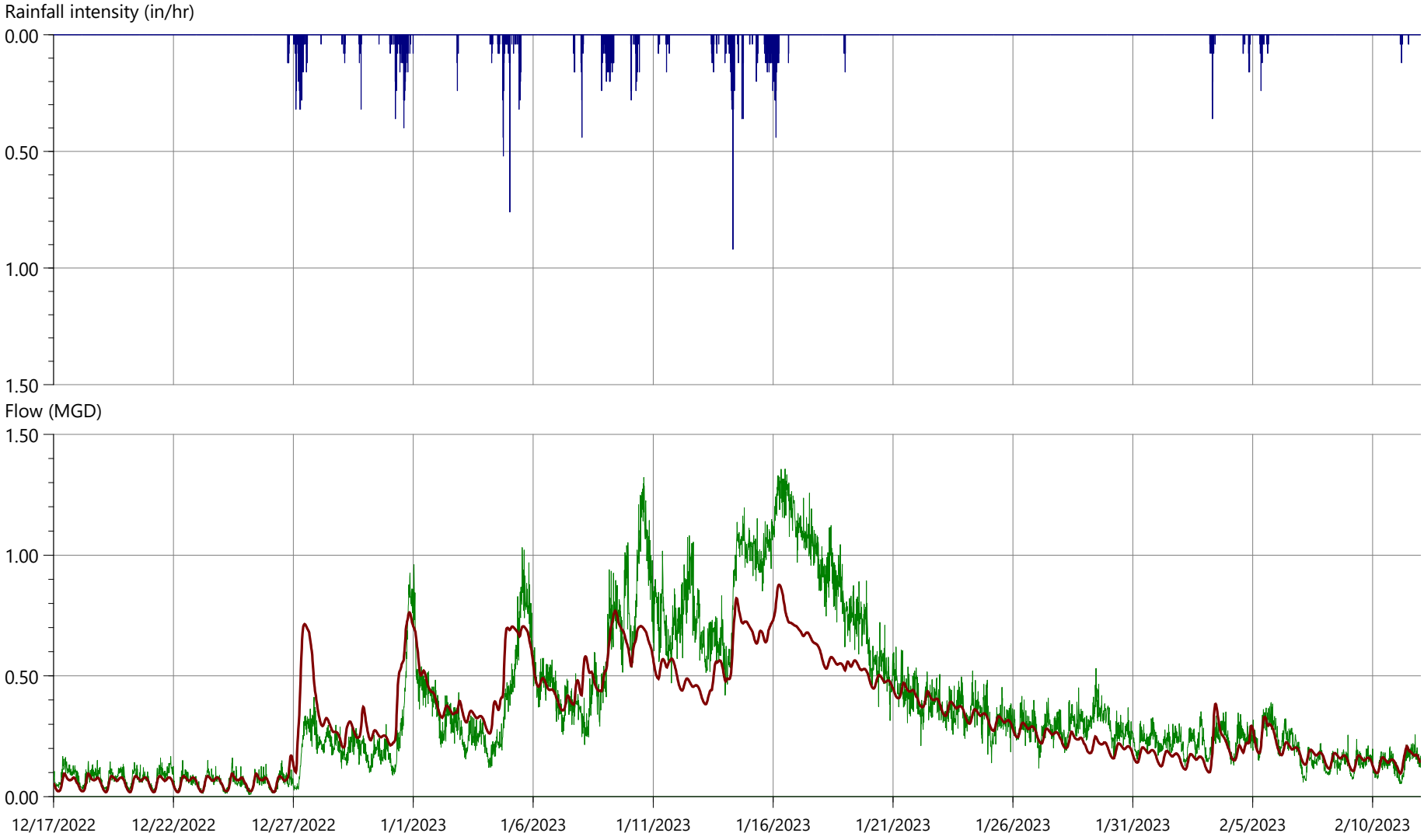
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	11.920	0.920	0.009			
Observed				0.200	1.698	38.187
... Data 2023 and 2015				0.224	1.702	41.875

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2023 WWF Existing_WithBlockage_10232023>Calibration (Homestead Blockage) ...
Flow Survey Location (Obs.) 27, Model Location (Pred.) D/S S43-8.1, Rainfall Profile: 2



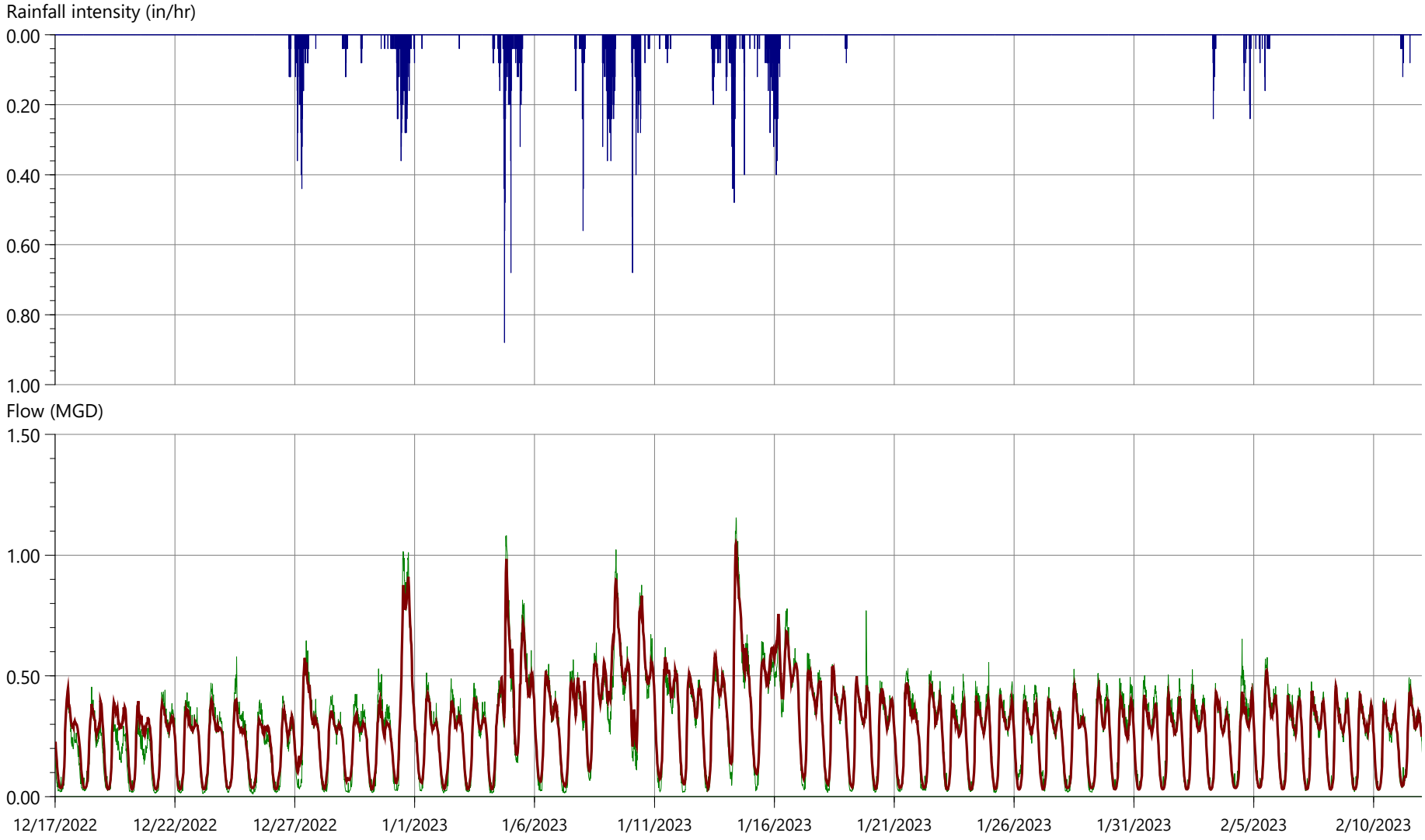
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	11.920	0.920	0.009			
Observed				0.009	0.465	4.696
... Data 2023 and 2015				0.006	0.464	5.989

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2023 WWF Existing_WithBlockage_10232023>Calibration (Homestead Blockage) ...
Flow Survey Location (Obs.) 28, Model Location (Pred.) D/S S53-47.1, Rainfall Profile: 2



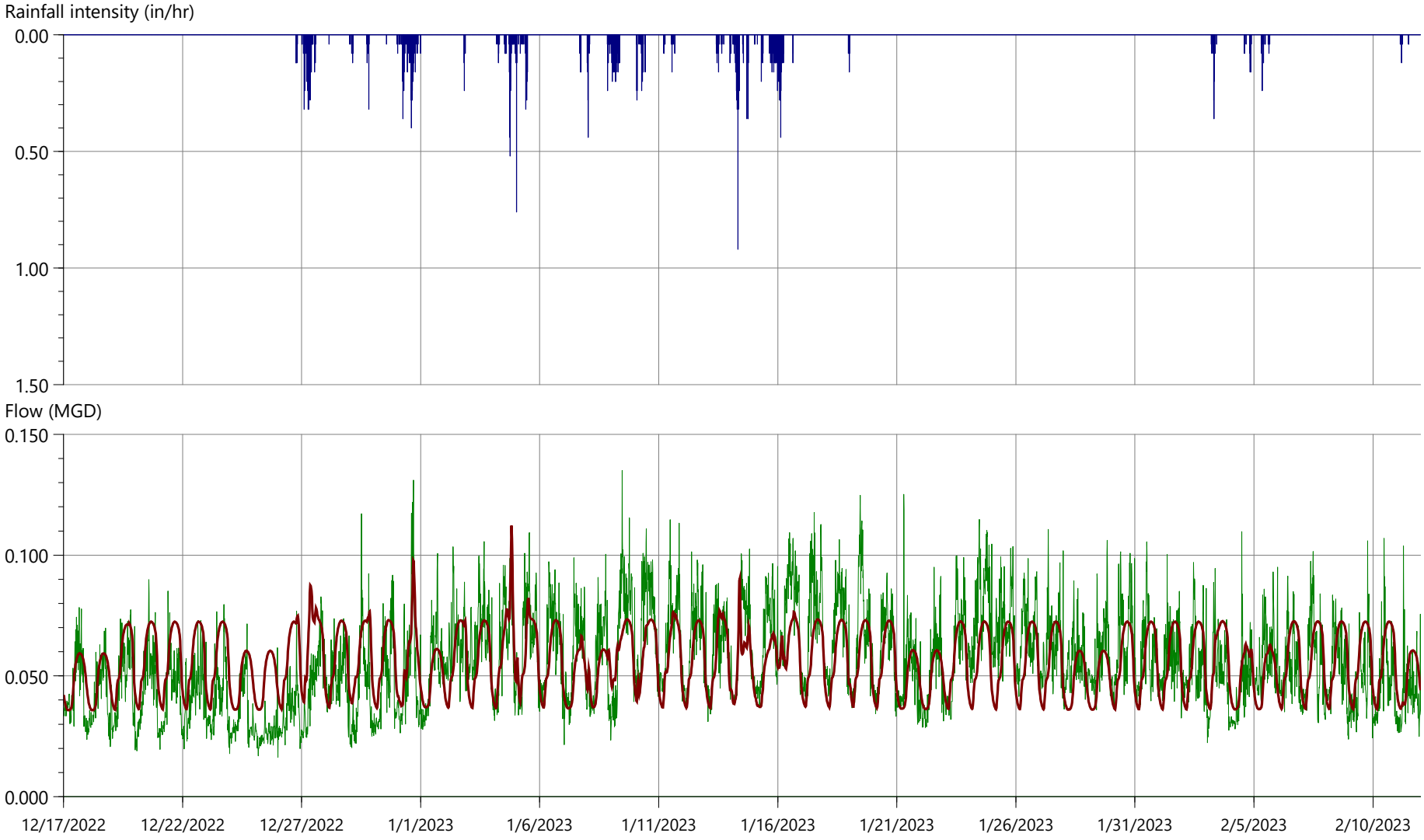
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	11.920	0.920	0.009			
Observed				0.009	1.357	21.009
... Data 2023 and 2015				0.019	0.877	18.369

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2023 WWF Existing_WithBlockage_10232023>Calibration (Homestead Blockage) ...
Flow Survey Location (Obs.) 29, Model Location (Pred.) D/S S21-54.1, Rainfall Profile: 3



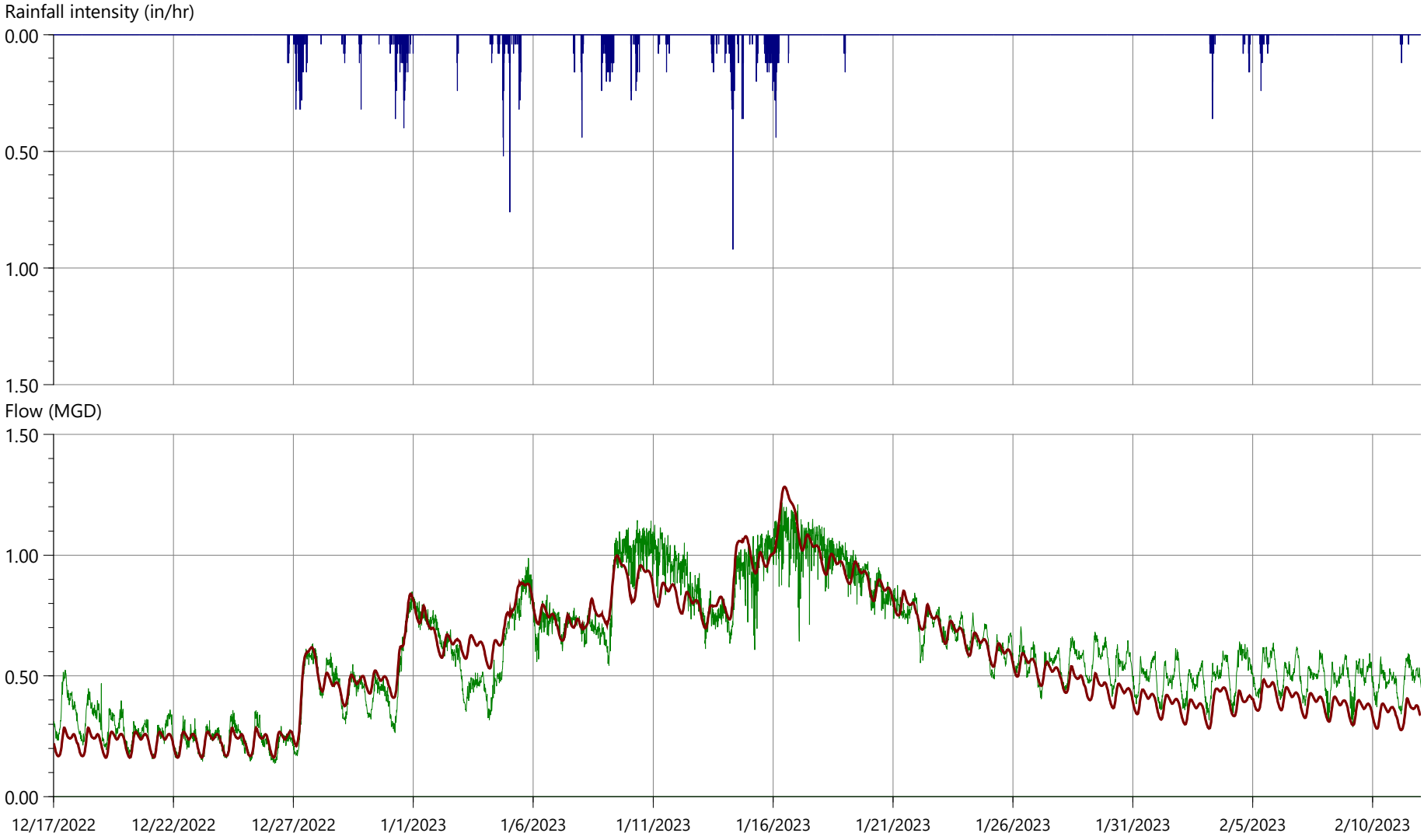
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	15.790	0.880	0.012			
Observed				0.010	1.155	16.332
... Data 2023 and 2015				0.030	1.052	16.361

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2023 WWF Existing_WithBlockage_10232023>Calibration (Homestead Blockage) ...
Flow Survey Location (Obs.) 30, Model Location (Pred.) D/S S62-24.1, Rainfall Profile: 2



	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	11.920	0.920	0.009			
Observed				0.016	0.135	3.157
... Data 2023 and 2015				0.036	0.112	3.179

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2023 WWF Existing_WithBlockage_10232023>Calibration (Homestead Blockage) ...
Flow Survey Location (Obs.) 31, Model Location (Pred.) D/S S62-23.1, Rainfall Profile: 2



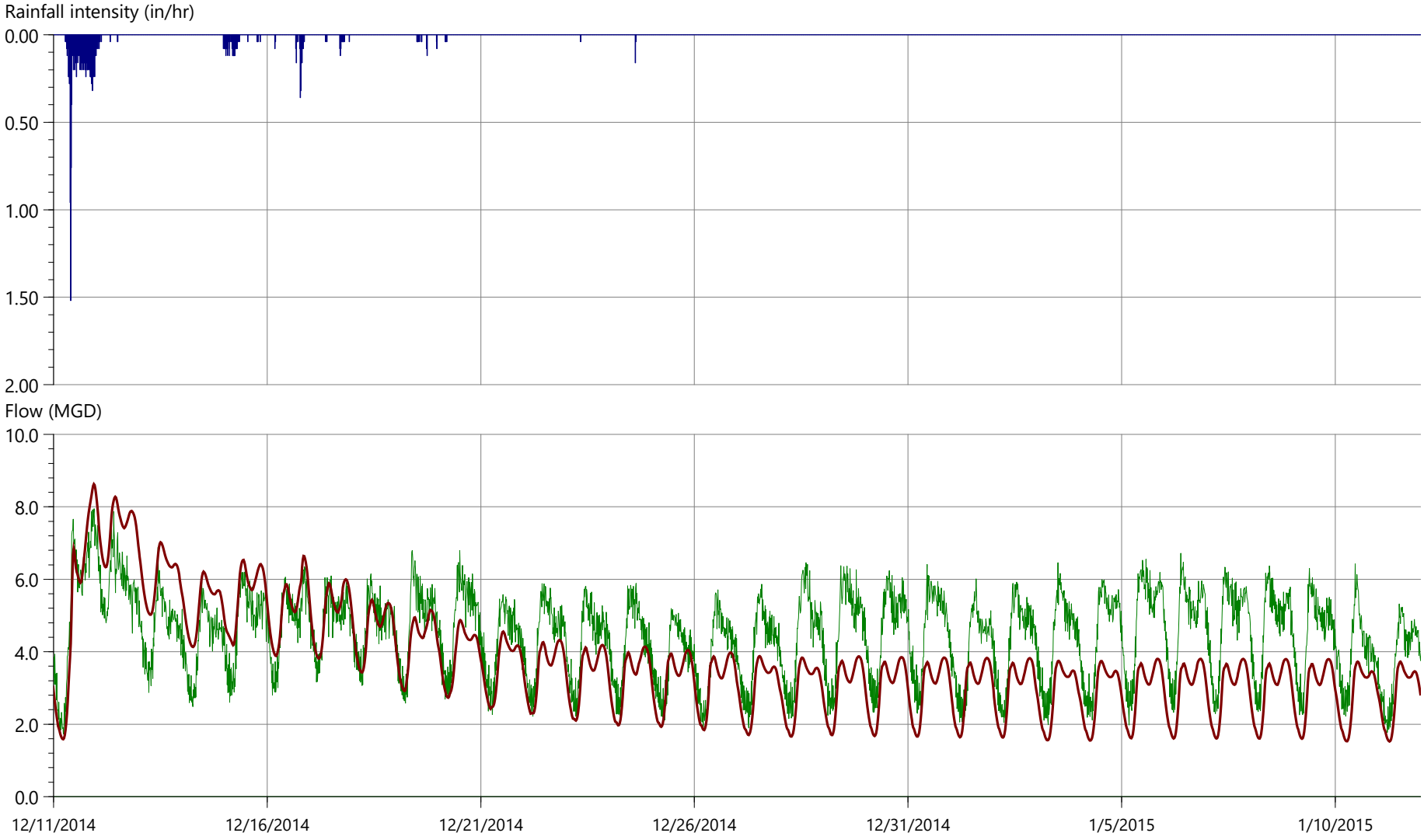
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	11.920	0.920	0.009			
Observed				0.138	1.227	33.687
... Data 2023 and 2015				0.162	1.283	31.984

Wet Weather Flow Calibration Plots
Modeled vs. 2014-2015 Metered Flows

(*assumes normal settings at Homestead/Lawrence gate structure*)

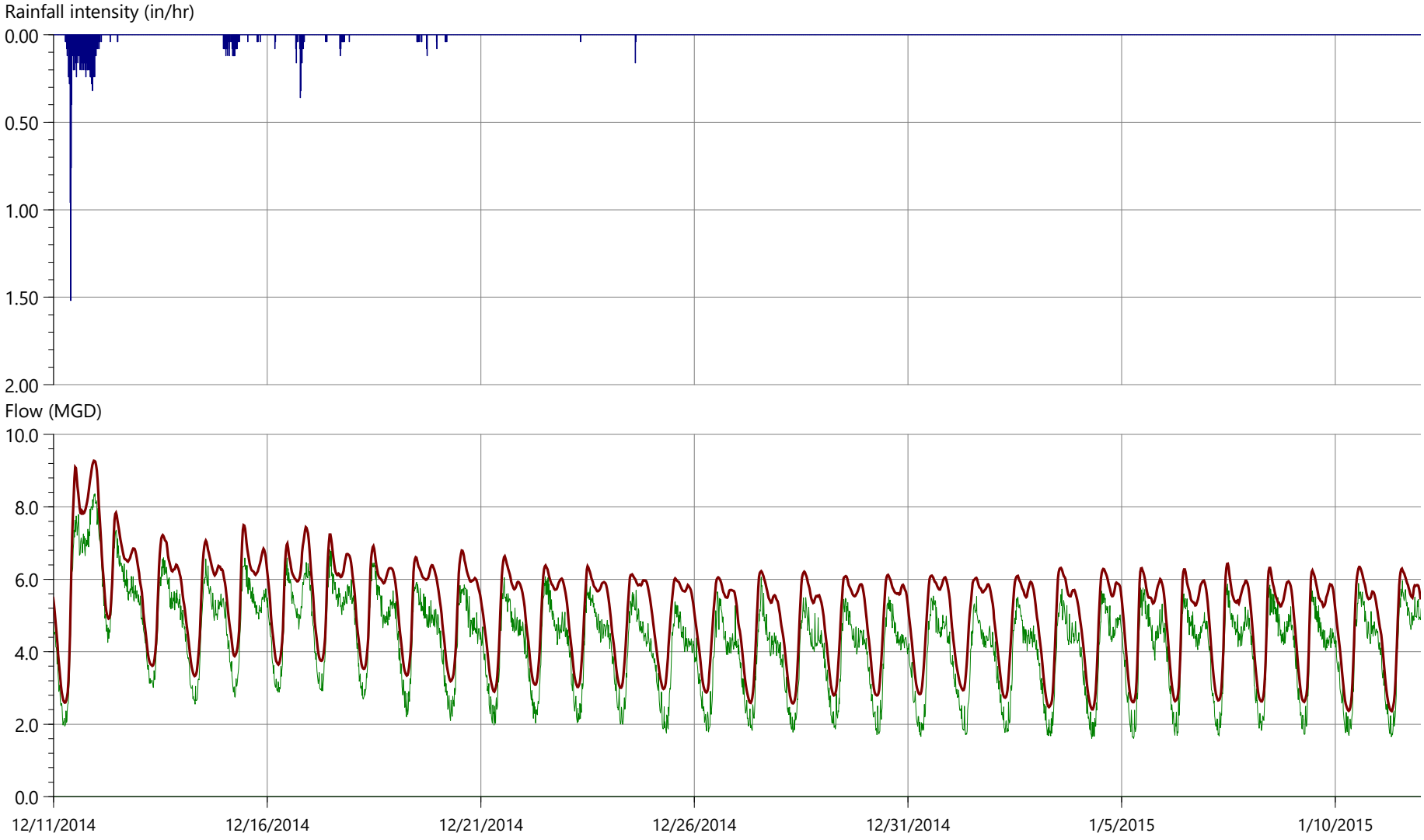
Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2015 WWF Existing_WithBlockage_10192023>Rainfall Data 2023 and 2015 (10/19/...

Flow Survey Location (Obs.) 1, Model Location (Pred.) D/S S104-29.1, Rainfall Profile: 1



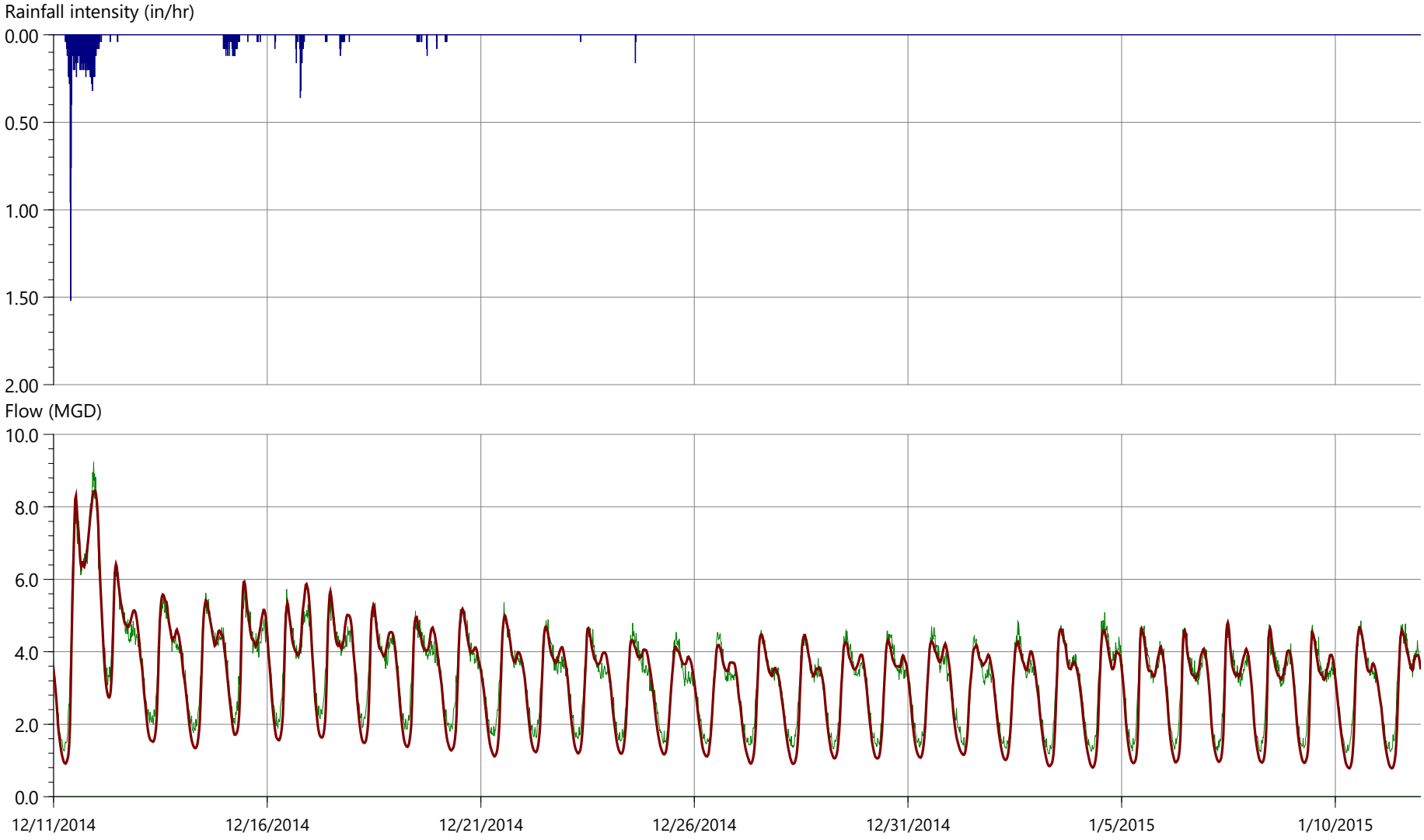
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	5.280	1.520	0.007			
Observed				1.726	7.950	144.336
... Data 2023 and 2015				1.525	8.628	119.999

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2015 WWF Existing_WithBlockage_10192023>Rainfall Data 2023 and 2015 (10/19/...
Flow Survey Location (Obs.) 2, Model Location (Pred.) D/S S103-9.1, Rainfall Profile: 1



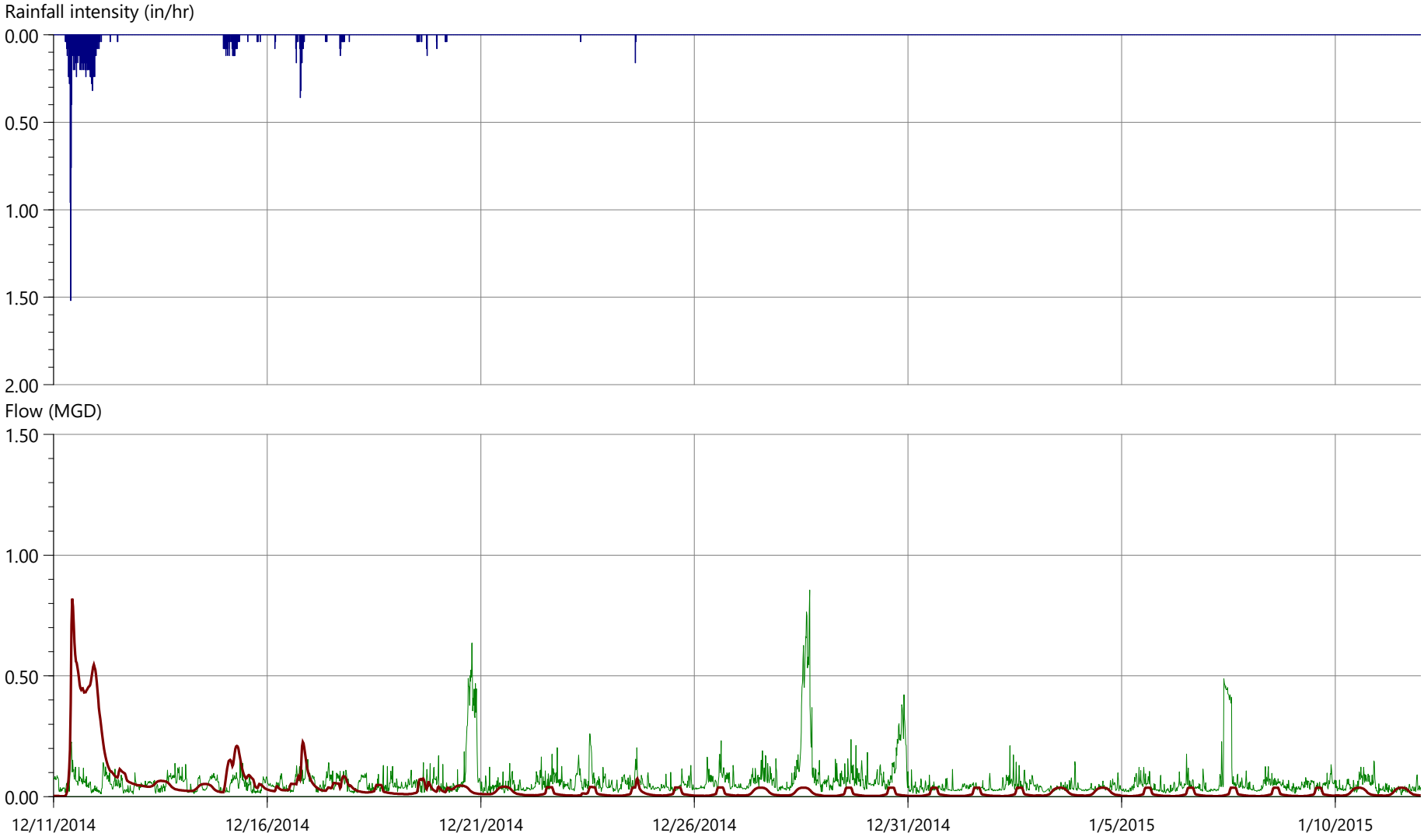
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	5.280	1.520	0.007			
Observed				1.605	8.363	135.825
... Data 2023 and 2015				2.362	9.269	164.340

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2015 WWF Existing_WithBlockage_10192023>Rainfall Data 2023 and 2015 (10/19/...
Flow Survey Location (Obs.) 3, Model Location (Pred.) D/S S104-27.1, Rainfall Profile: 1



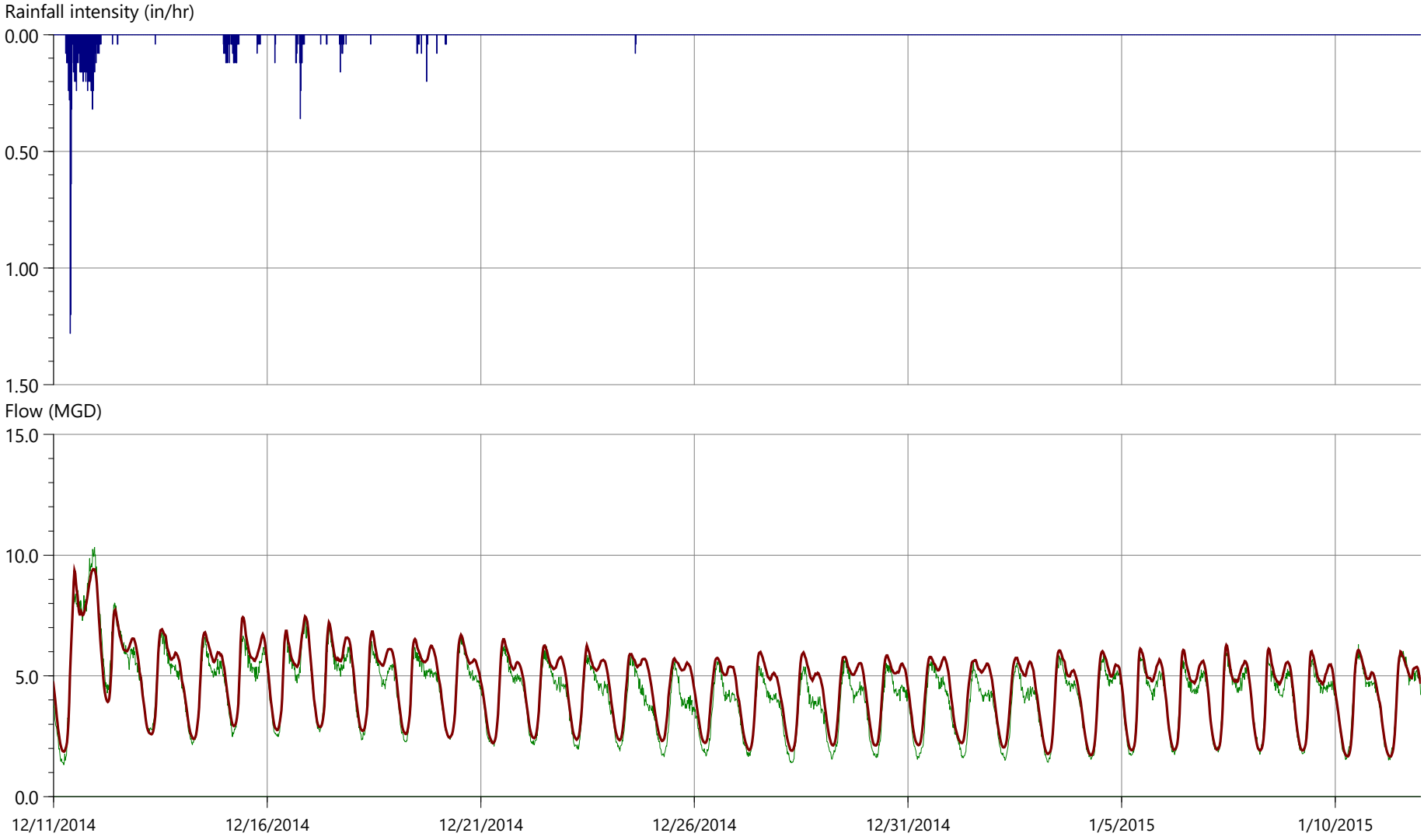
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	5.280	1.520	0.007			
Observed				1.179	9.236	108.117
... Data 2023 and 2015				0.782	8.445	103.228

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2015 WWF Existing_WithBlockage_10192023>Rainfall Data 2023 and 2015 (10/19/...
Flow Survey Location (Obs.) 4, Model Location (Pred.) D/S S94-36.1, Rainfall Profile: 1



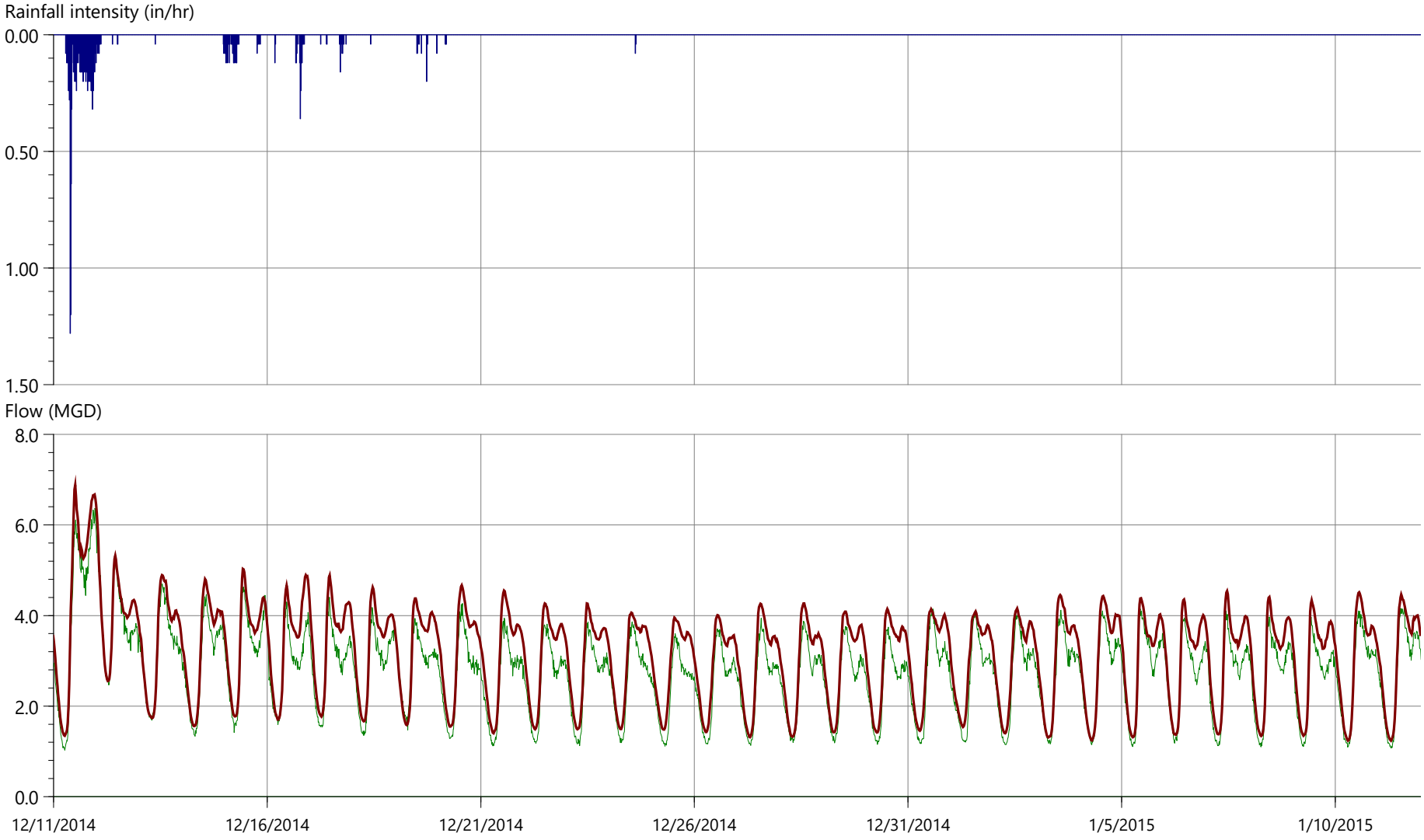
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	5.280	1.520	0.007			
Observed				0.007	0.856	2.021
... Data 2023 and 2015				0.003	0.819	1.125

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2015 WWF Existing_WithBlockage_10192023>Rainfall Data 2023 and 2015 (10/19/...
Flow Survey Location (Obs.) 5, Model Location (Pred.) D/S S83-23.1, Rainfall Profile: 2



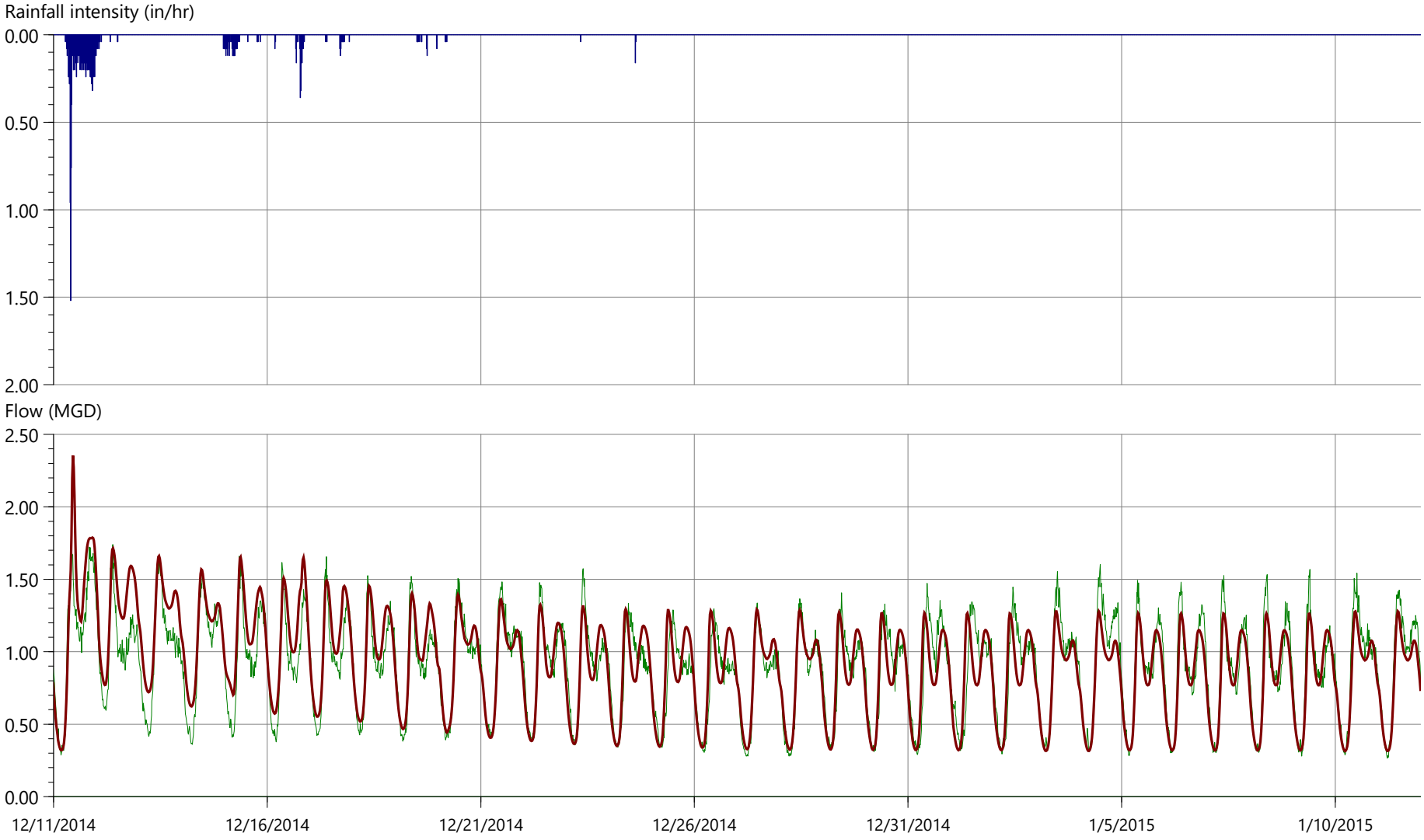
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	5.020	1.280	0.007			
Observed				1.319	10.323	135.549
... Data 2023 and 2015				1.658	9.423	148.110

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2015 WWF Existing_WithBlockage_10192023>Rainfall Data 2023 and 2015 (10/19/...
Flow Survey Location (Obs.) 6, Model Location (Pred.) D/S S83-25.1, Rainfall Profile: 2



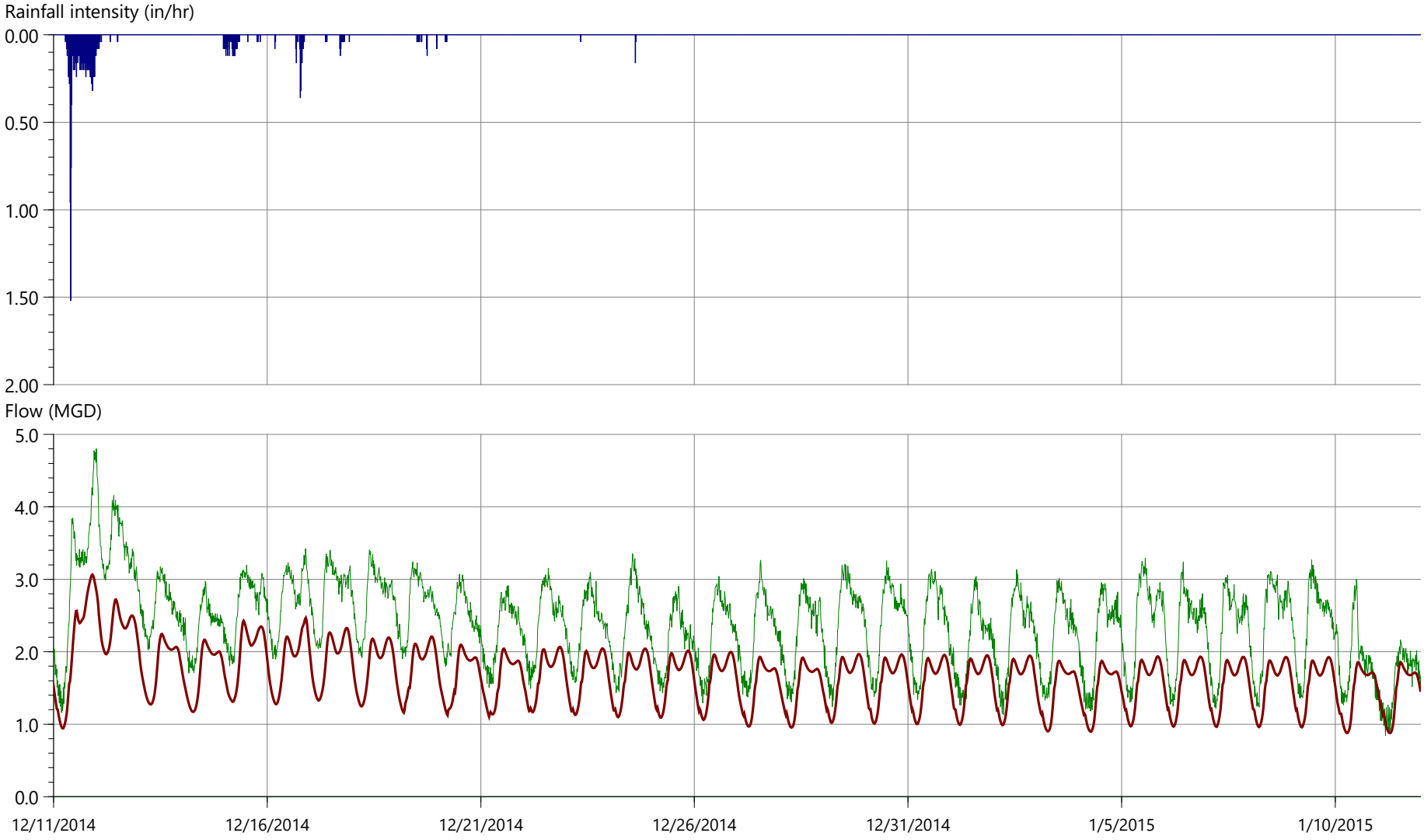
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	5.020	1.280	0.007			
Observed				1.026	6.367	88.800
... Data 2023 and 2015				1.234	6.879	102.203

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2015 WWF Existing_WithBlockage_10192023>Rainfall Data 2023 and 2015 (10/19/...
Flow Survey Location (Obs.) 7, Model Location (Pred.) D/S S105-6.1, Rainfall Profile: 1



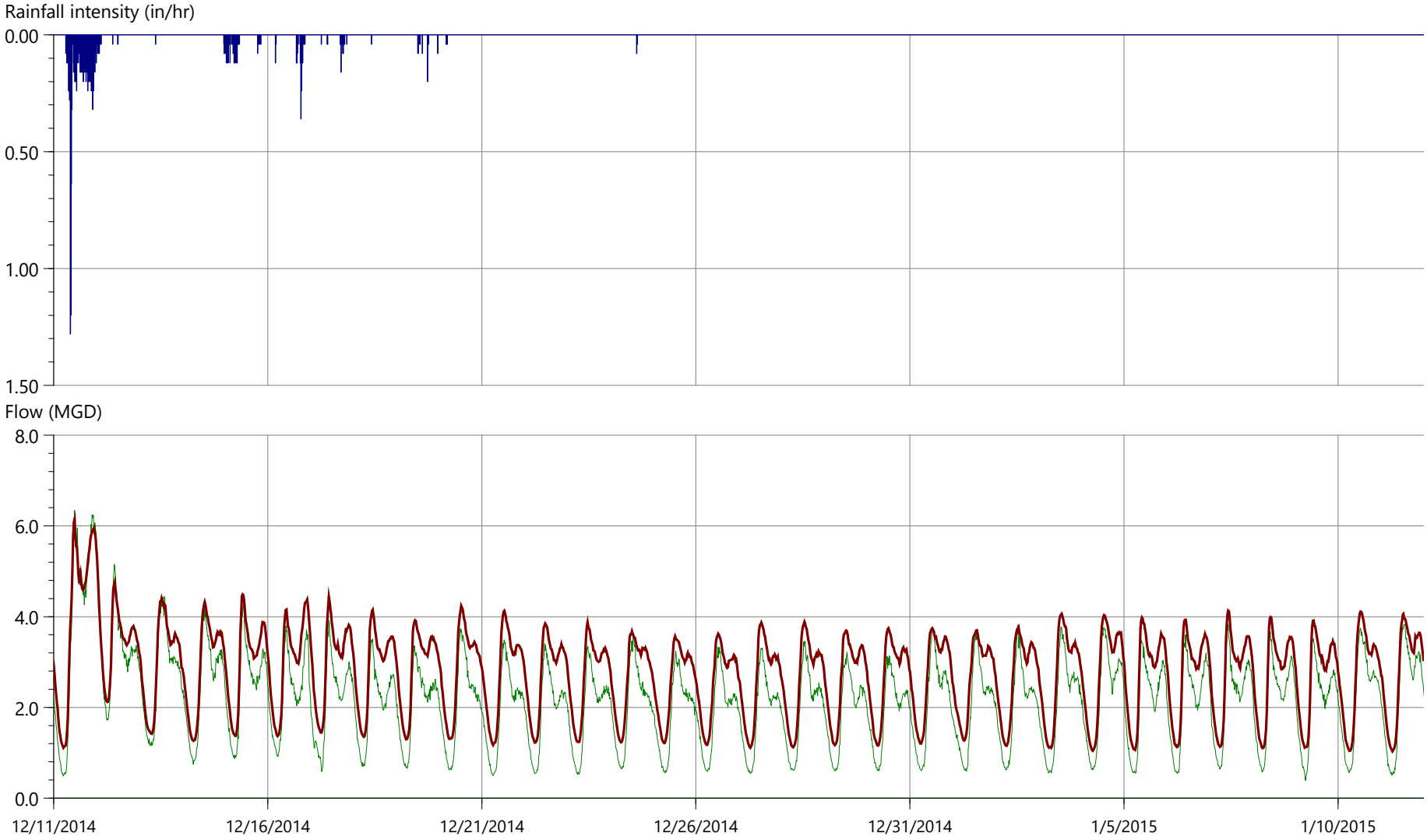
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	5.280	1.520	0.007			
Observed				0.266	1.740	29.016
... Data 2023 and 2015				0.315	2.354	29.534

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2015 WWF Existing_WithBlockage_10192023>Rainfall Data 2023 and 2015 (10/19/...
Flow Survey Location (Obs.) 8, Model Location (Pred.) D/S S86-13.1, Rainfall Profile: 1



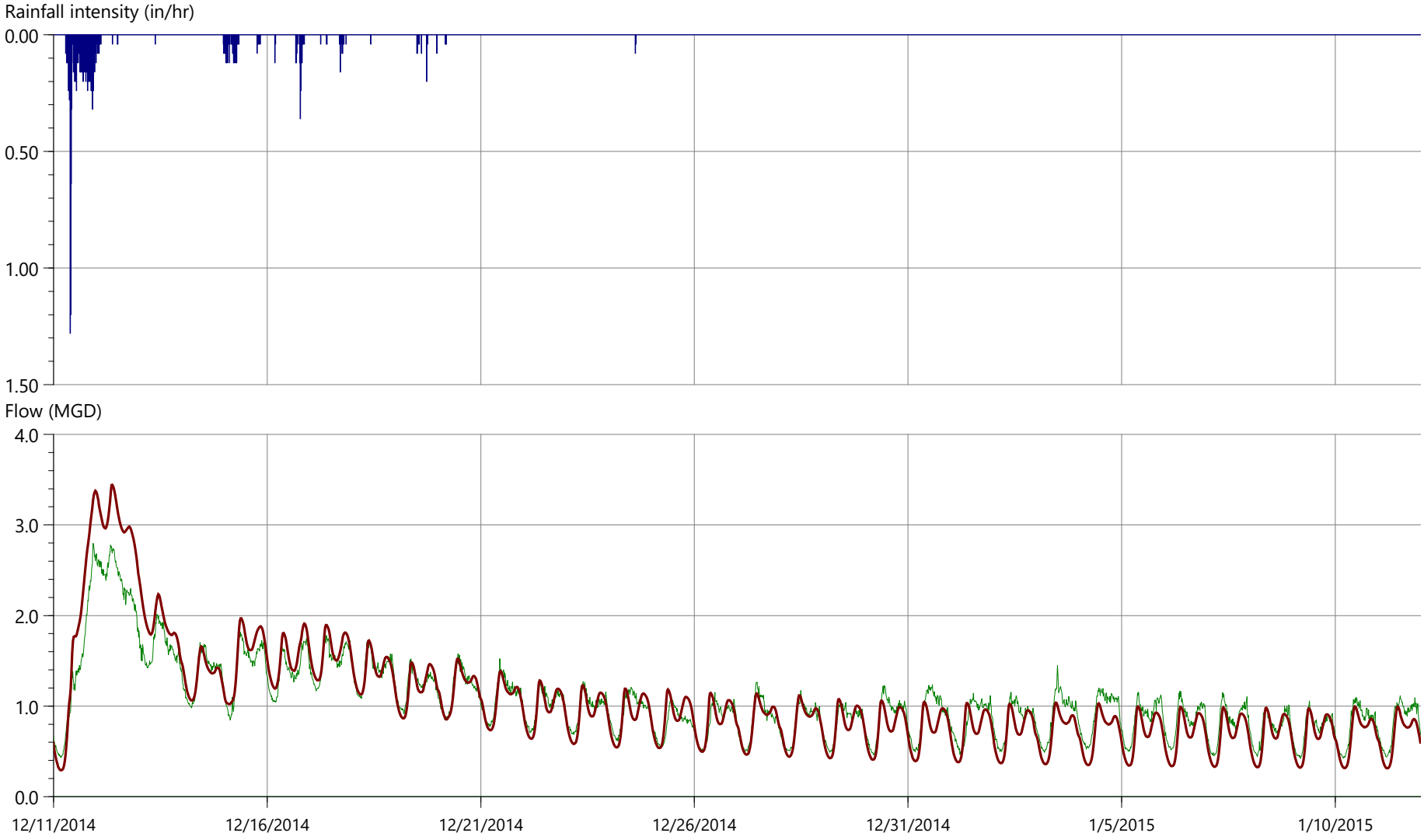
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	5.280	1.520	0.007			
Observed				0.840	4.800	76.804
... Data 2023 and 2015				0.877	3.064	53.414

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2015 WWF Existing_WithBlockage_10192023>Rainfall Data 2023 and 2015 (10/19/...
Flow Survey Location (Obs.) 9, Model Location (Pred.) D/S S62-48.1, Rainfall Profile: 2



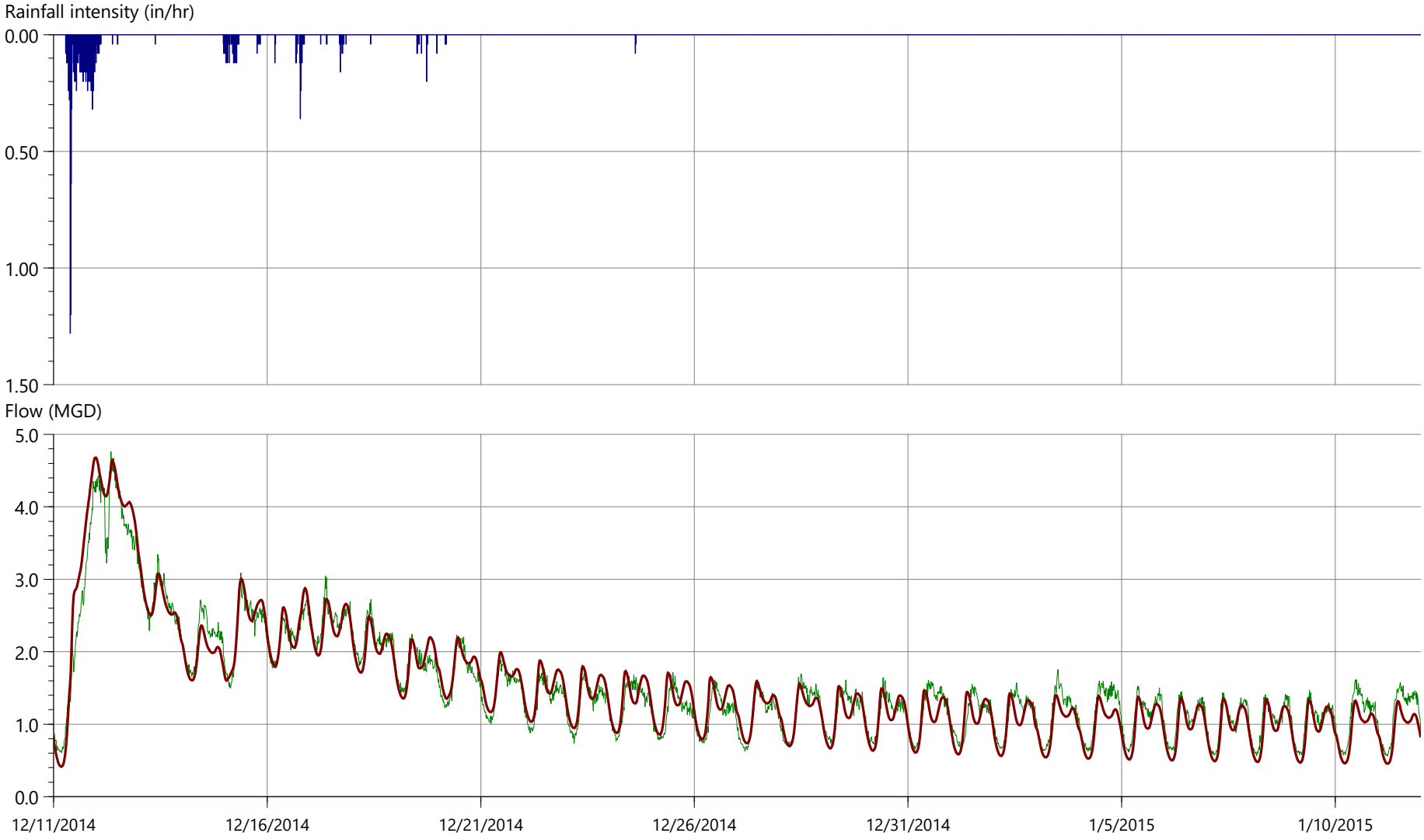
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	5.020	1.280	0.007			
Observed				0.388	6.343	70.300
... Data 2023 and 2015				1.034	6.151	90.221

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2015 WWF Existing_WithBlockage_10192023>Rainfall Data 2023 and 2015 (10/19/...
Flow Survey Location (Obs.) 10, Model Location (Pred.) D/S S52-80.1, Rainfall Profile: 2



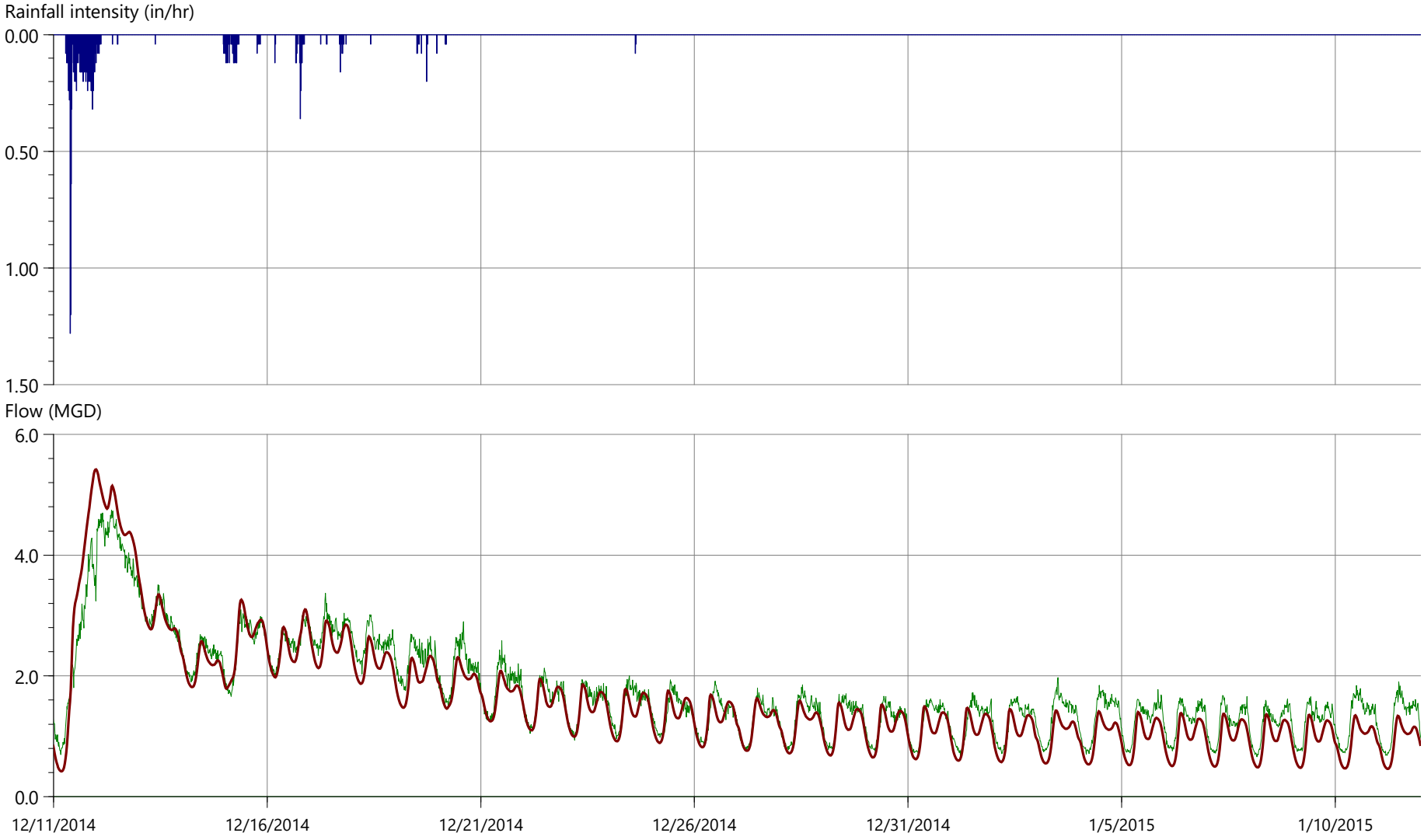
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	5.020	1.280	0.007			
Observed				0.423	2.798	33.900
... Data 2023 and 2015				0.292	3.444	33.611

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2015 WWF Existing_WithBlockage_10192023>Rainfall Data 2023 and 2015 (10/19/...
Flow Survey Location (Obs.) 11, Model Location (Pred.) D/S S53-9.1, Rainfall Profile: 2



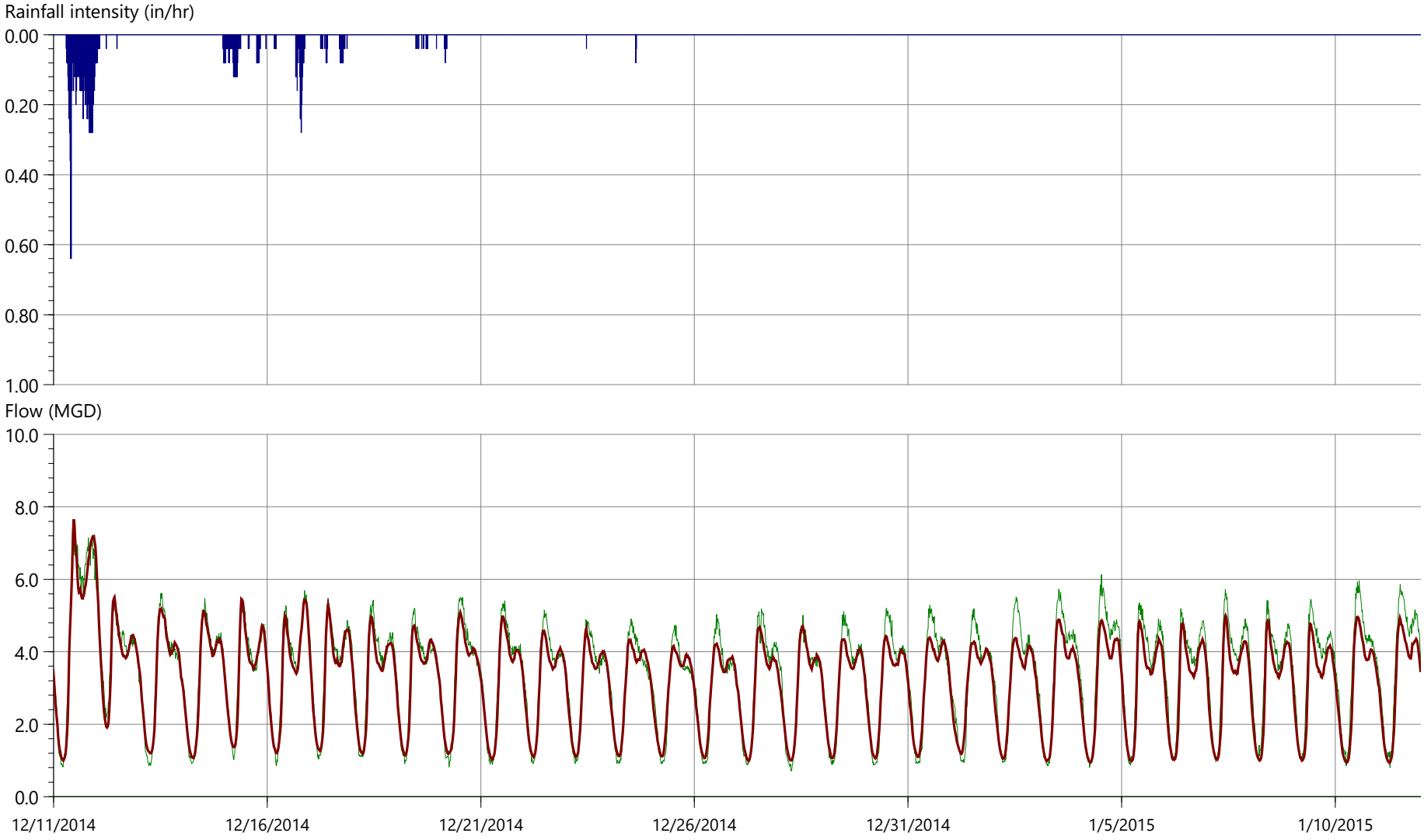
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	5.020	1.280	0.007			
Observed				0.558	4.760	49.282
... Data 2023 and 2015				0.415	4.679	48.633

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2015 WWF Existing_WithBlockage_10192023>Rainfall Data 2023 and 2015 (10/19/...
Flow Survey Location (Obs.) 12, Model Location (Pred.) D/S S53-109.1, Rainfall Profile: 2



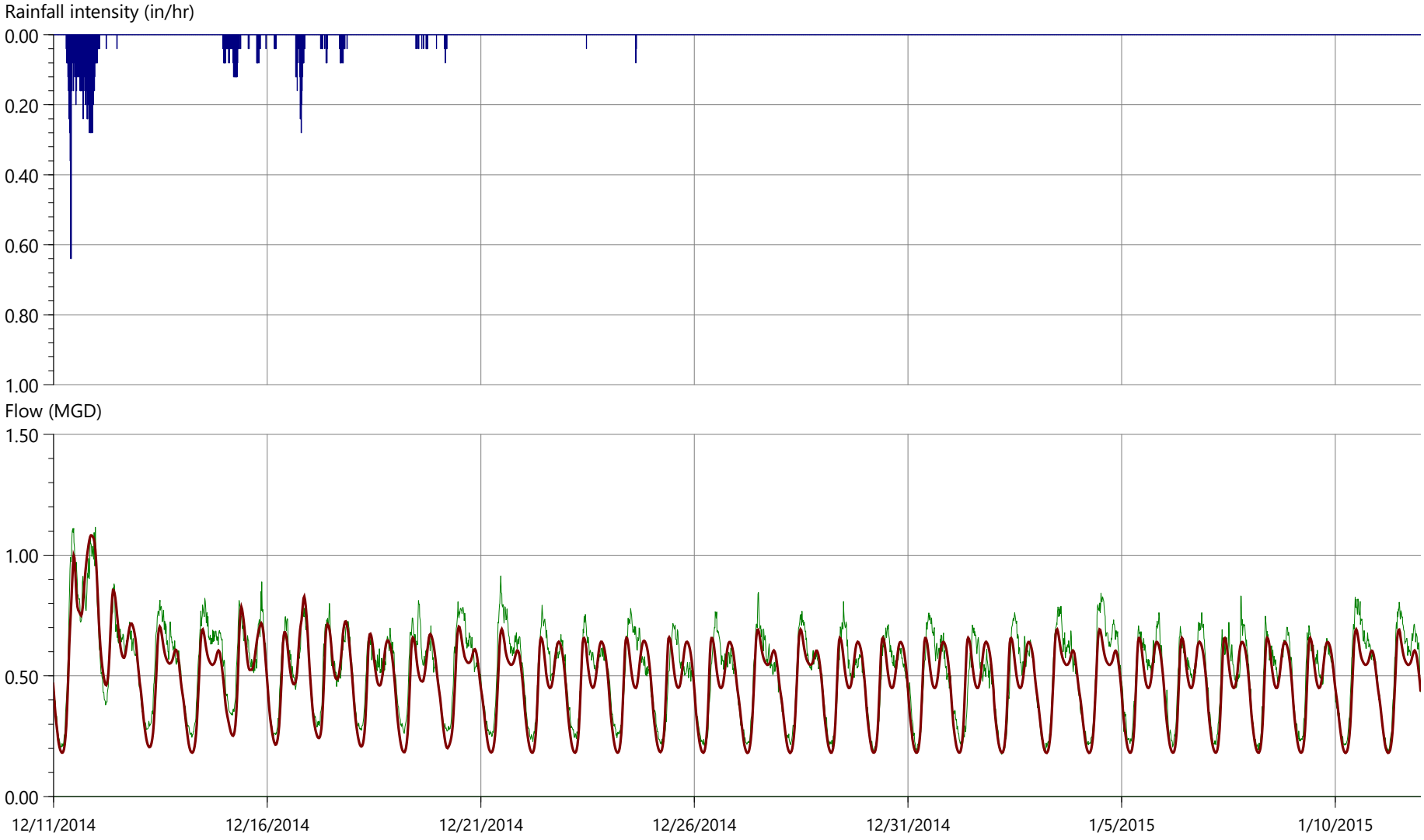
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	5.020	1.280	0.007			
Observed				0.660	4.744	55.973
... Data 2023 and 2015				0.420	5.417	51.478

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2015 WWF Existing_WithBlockage_10192023>Rainfall Data 2023 and 2015 (10/19/...
Flow Survey Location (Obs.) 13, Model Location (Pred.) D/S S53-73.1, Rainfall Profile: 3



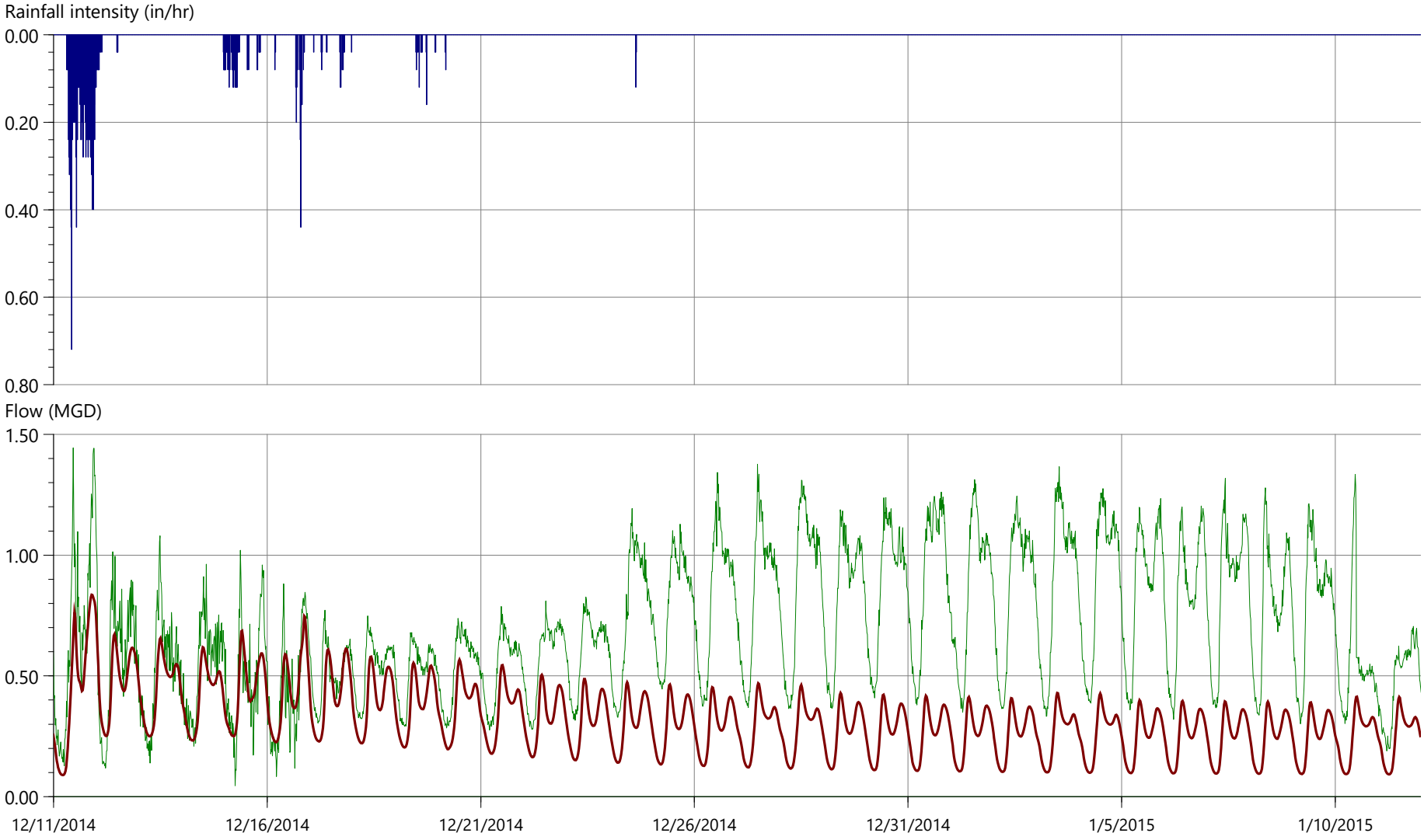
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	4.950	0.640	0.006			
Observed				0.709	7.220	110.750
... Data 2023 and 2015				0.932	7.651	103.773

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2015 WWF Existing_WithBlockage_10192023>Rainfall Data 2023 and 2015 (10/19/...
Flow Survey Location (Obs.) 14, Model Location (Pred.) D/S S54-17.1, Rainfall Profile: 3



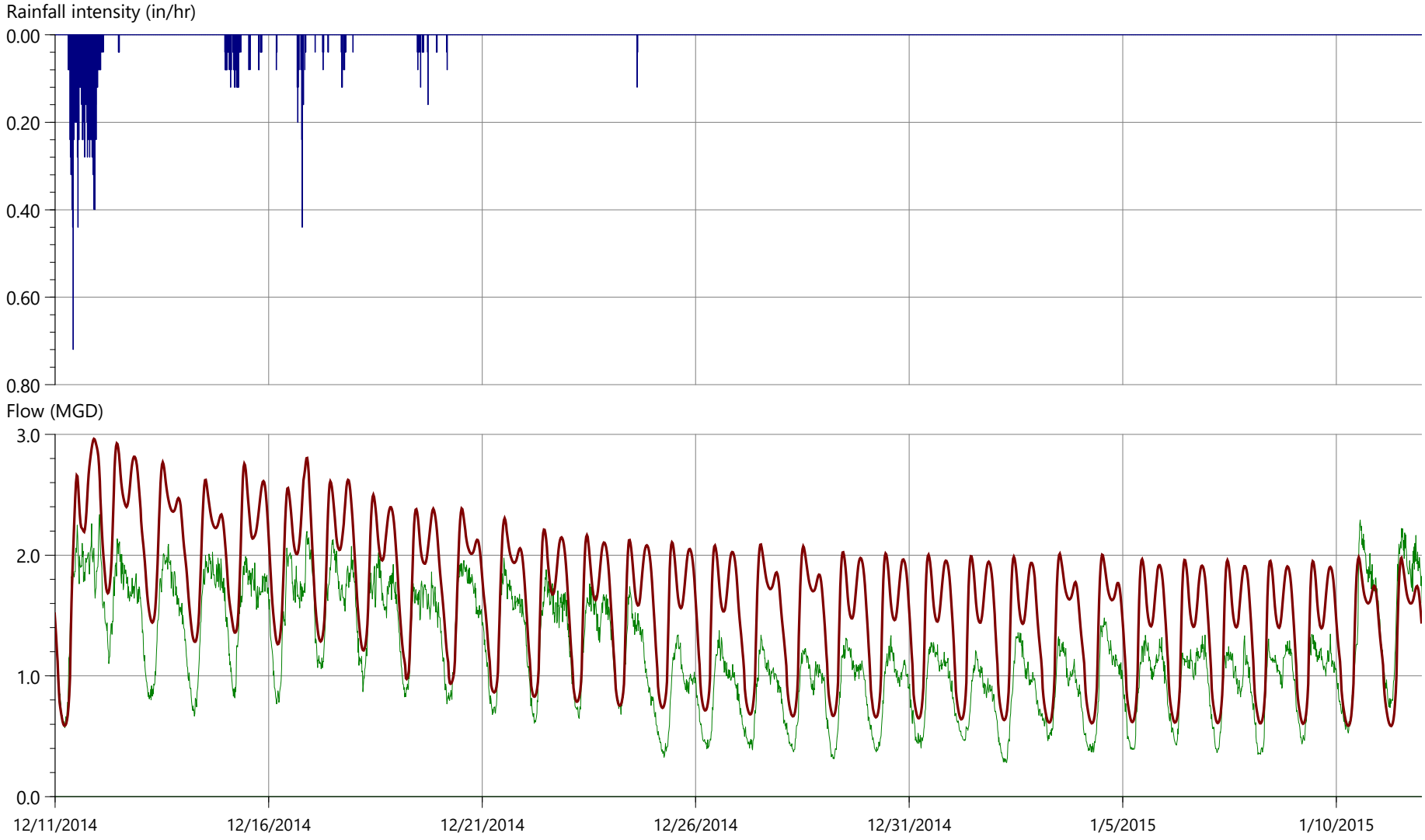
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	4.950	0.640	0.006			
Observed				0.176	1.116	16.638
... Data 2023 and 2015				0.181	1.082	15.366

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2015 WWF Existing_WithBlockage_10192023>Rainfall Data 2023 and 2015 (10/19/...
Flow Survey Location (Obs.) 15, Model Location (Pred.) D/S S65-48.1, Rainfall Profile: 4



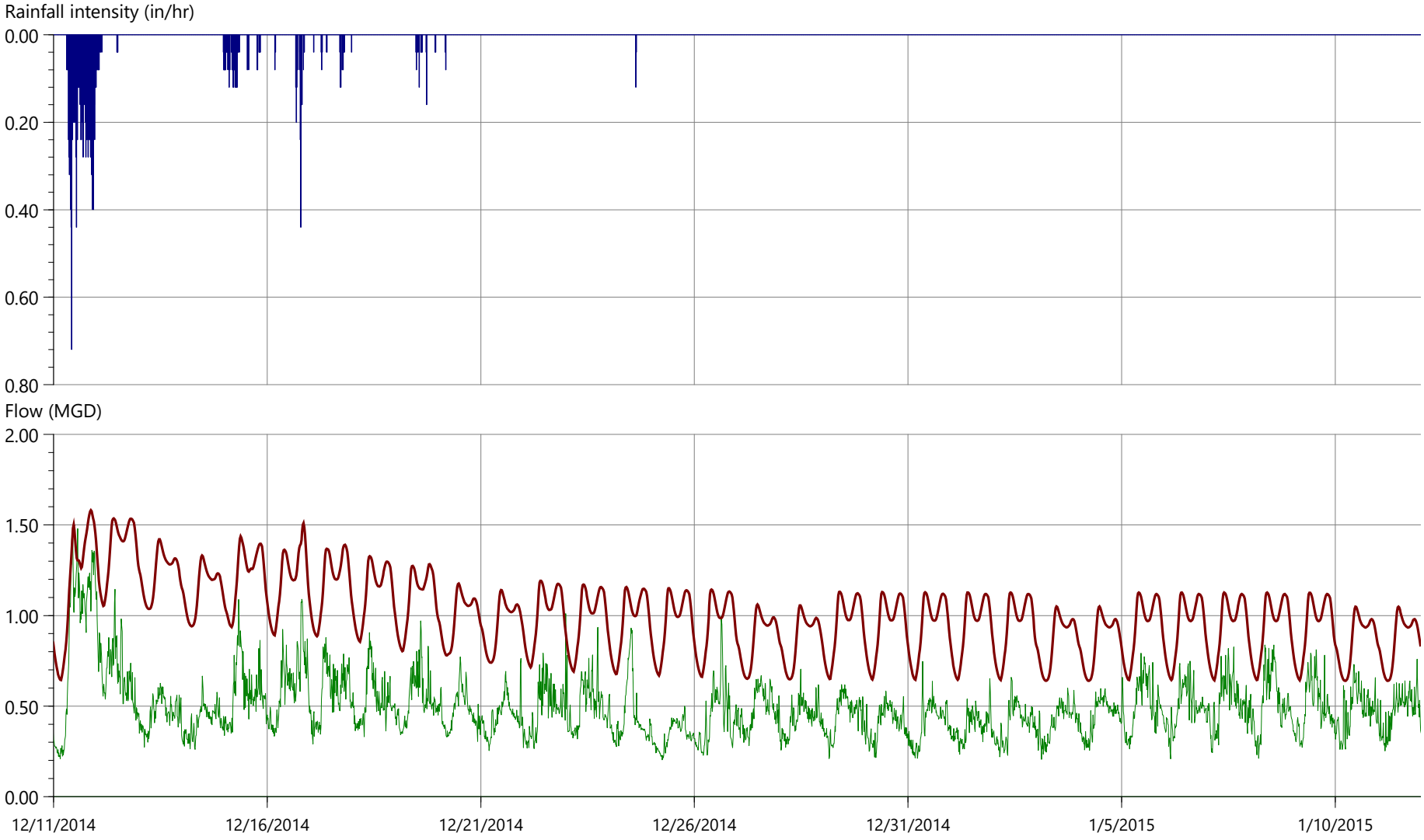
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	5.550	0.720	0.007			
Observed				0.045	1.444	22.418
... Data 2023 and 2015				0.089	0.836	10.376

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2015 WWF Existing_WithBlockage_10192023>Rainfall Data 2023 and 2015 (10/19/...
Flow Survey Location (Obs.) 16, Model Location (Pred.) D/S S67-12.1, Rainfall Profile: 4



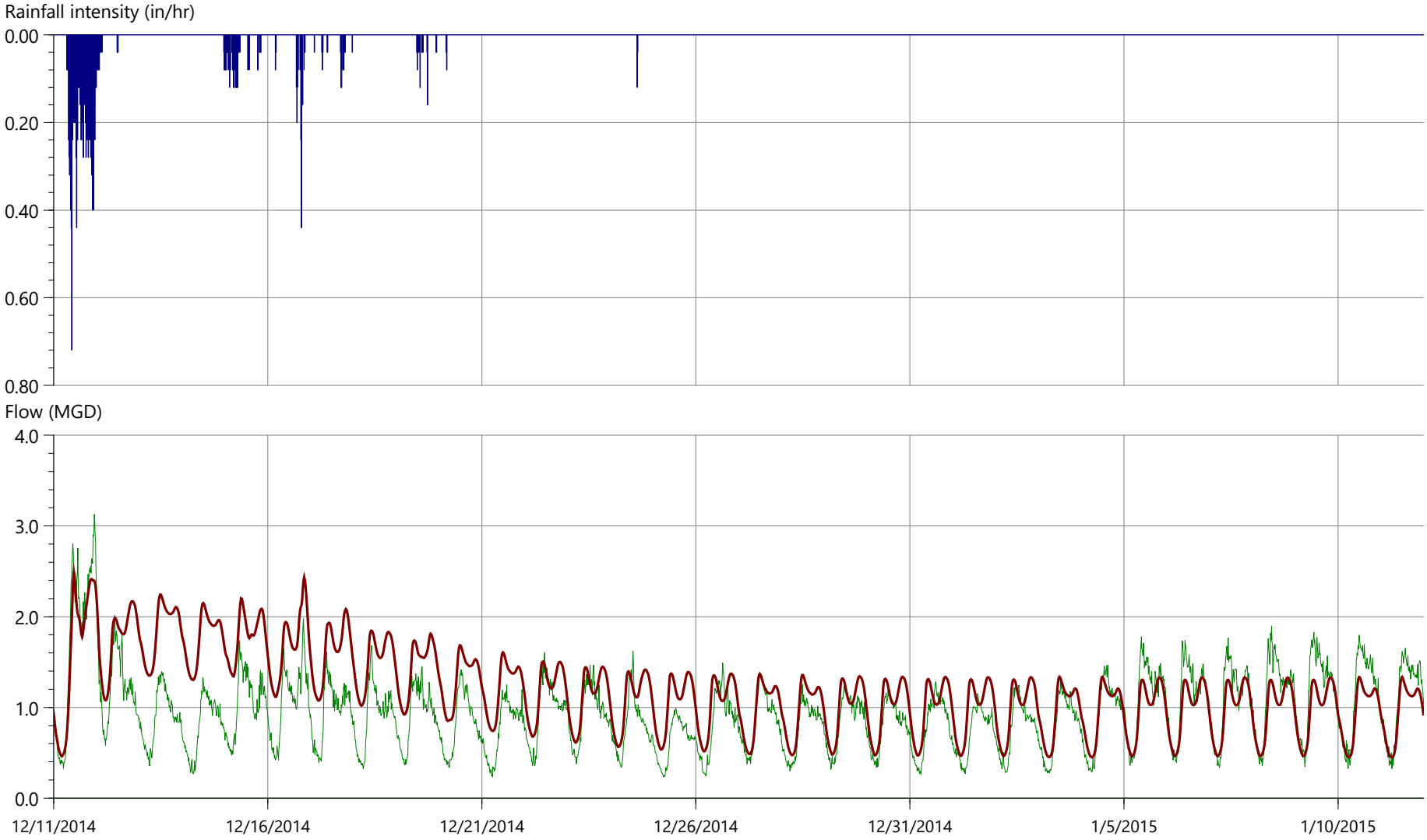
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	5.550	0.720	0.007			
Observed				0.283	2.337	37.855
... Data 2023 and 2015				0.586	2.963	52.355

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2015 WWF Existing_WithBlockage_10192023>Rainfall Data 2023 and 2015 (10/19/...
Flow Survey Location (Obs.) 17, Model Location (Pred.) D/S S58-12.2, Rainfall Profile: 4



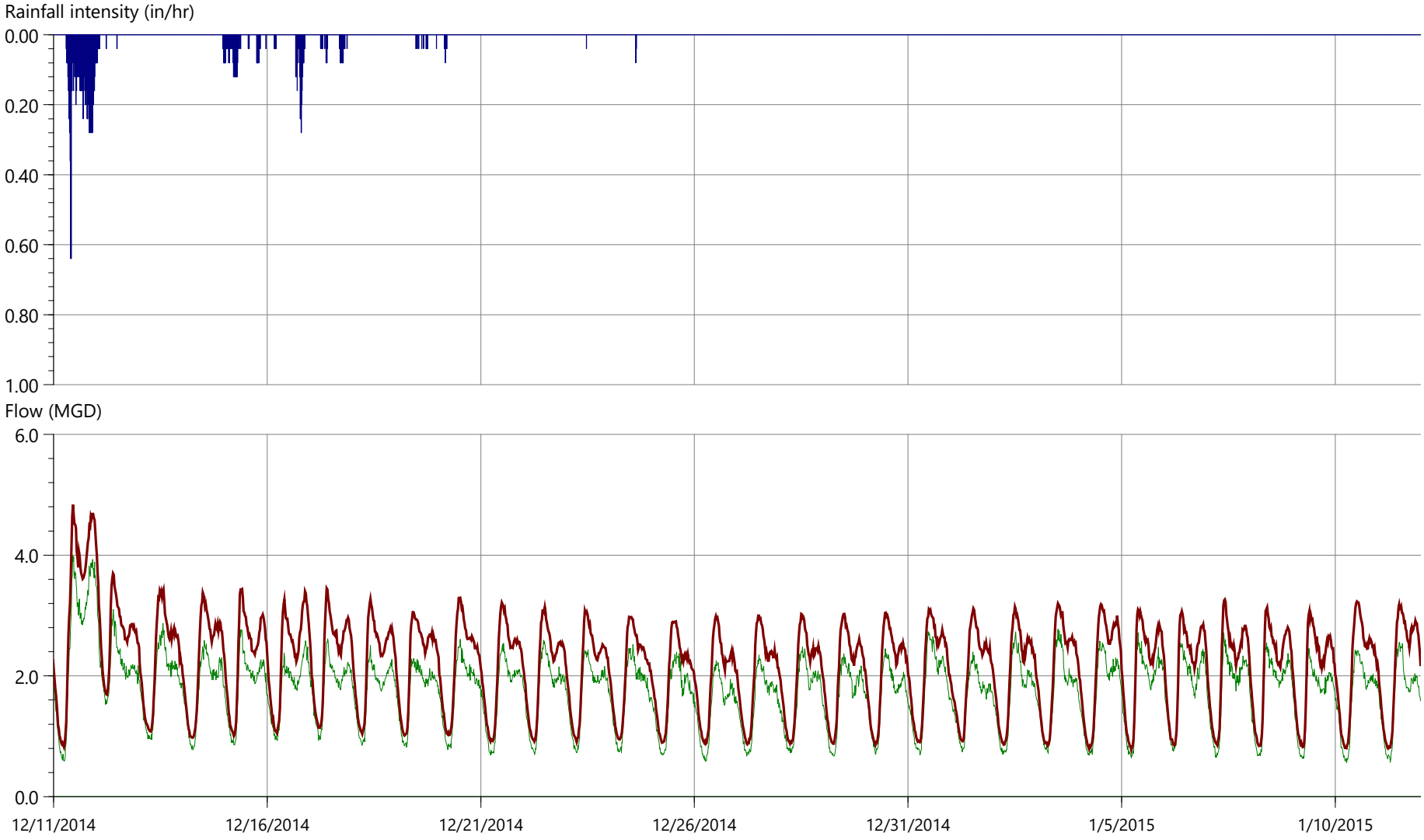
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	5.550	0.720	0.007			
Observed				0.203	1.480	15.720
... Data 2023 and 2015				0.639	1.581	32.173

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2015 WWF Existing_WithBlockage_10192023>Rainfall Data 2023 and 2015 (10/19/...
Flow Survey Location (Obs.) 18, Model Location (Pred.) D/S S58-11.1, Rainfall Profile: 4



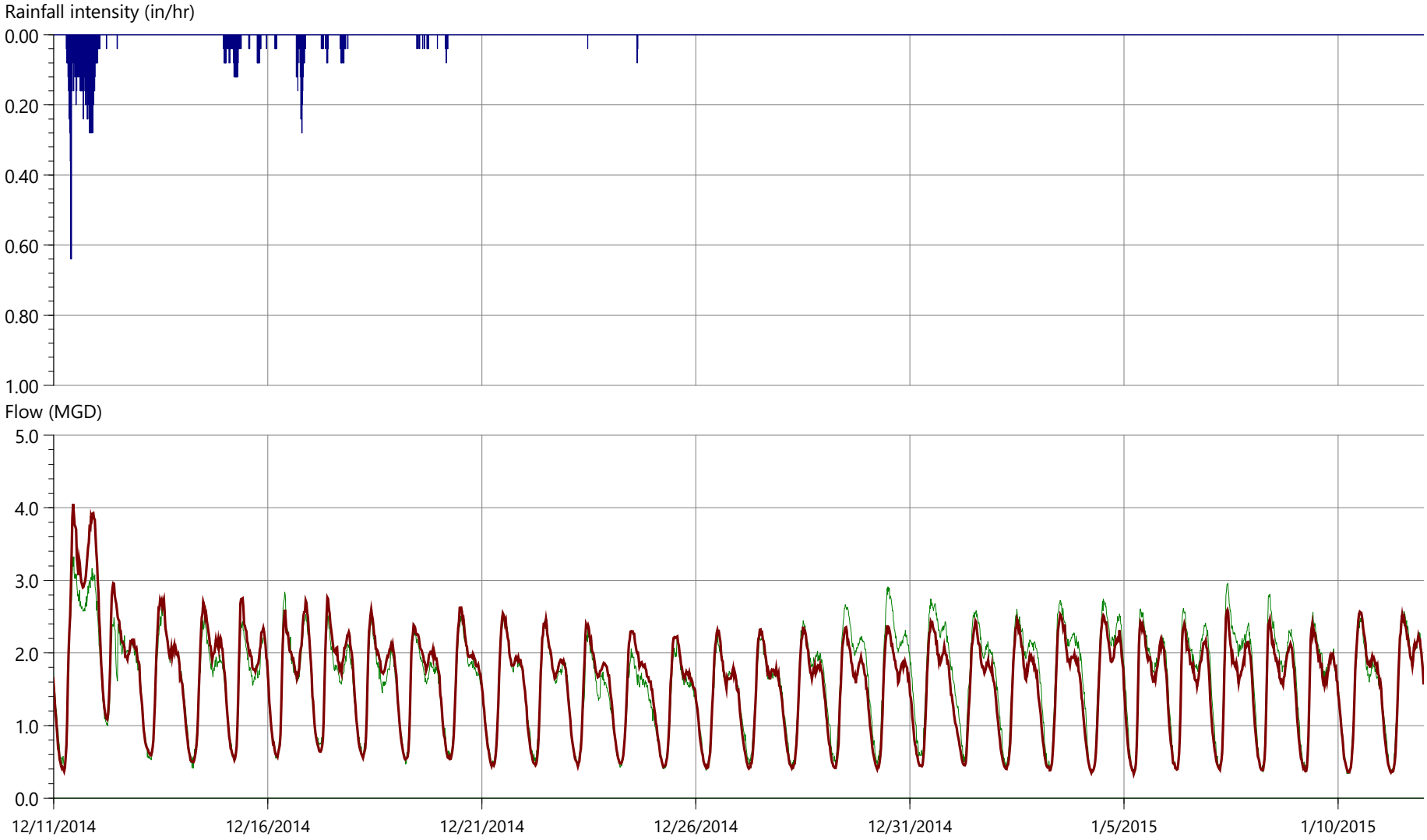
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	5.550	0.720	0.007			
Observed				0.236	3.126	30.382
... Data 2023 and 2015				0.450	2.489	38.534

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2015 WWF Existing_WithBlockage_10192023>Rainfall Data 2023 and 2015 (10/19/...
Flow Survey Location (Obs.) 19, Model Location (Pred.) D/S S21-23.1, Rainfall Profile: 3



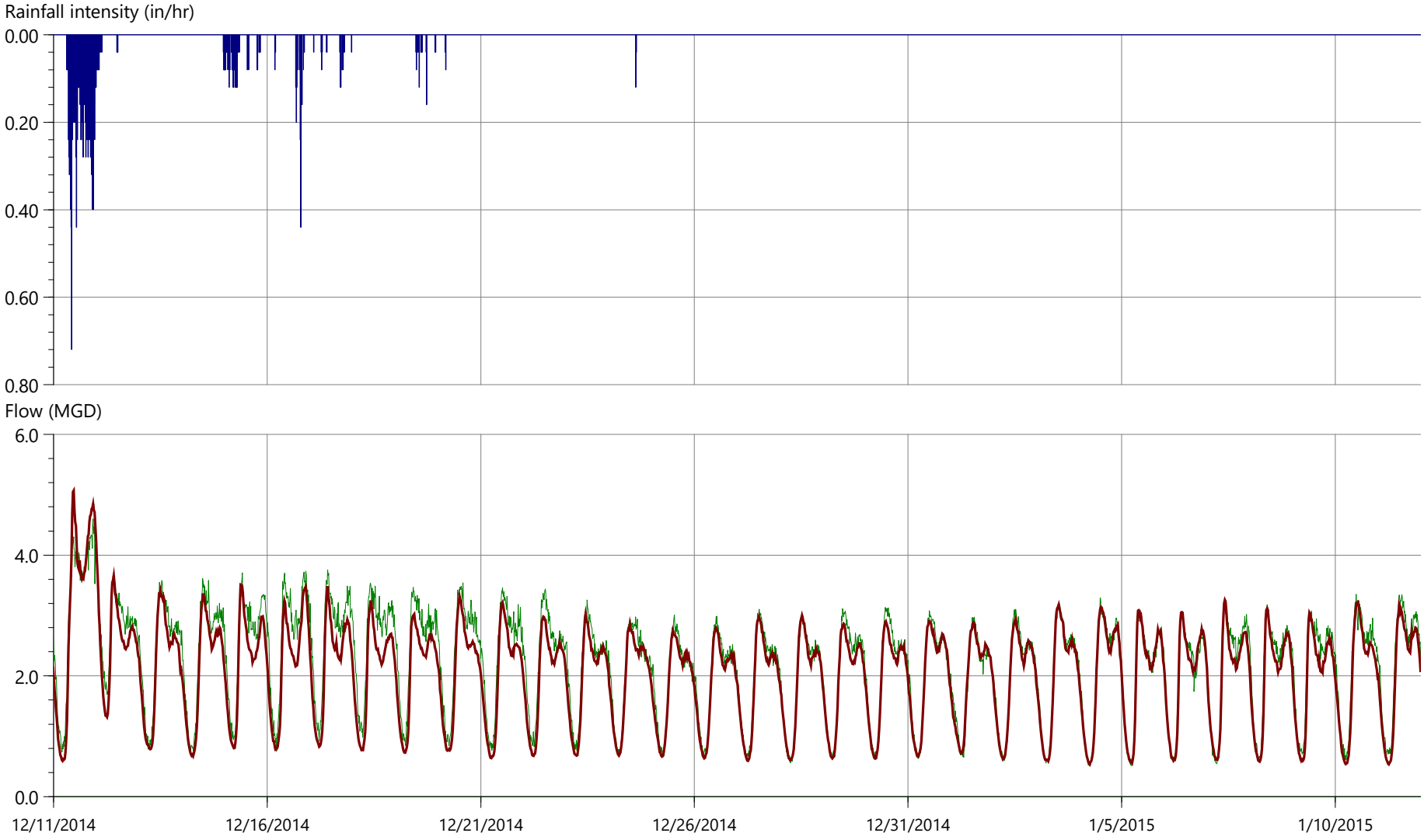
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	4.950	0.640	0.006			
Observed				0.564	4.003	56.266
... Data 2023 and 2015				0.772	4.835	70.665

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2015 WWF Existing_WithBlockage_10192023>Rainfall Data 2023 and 2015 (10/19/...
Flow Survey Location (Obs.) 20, Model Location (Pred.) D/S S21-46.1, Rainfall Profile: 3



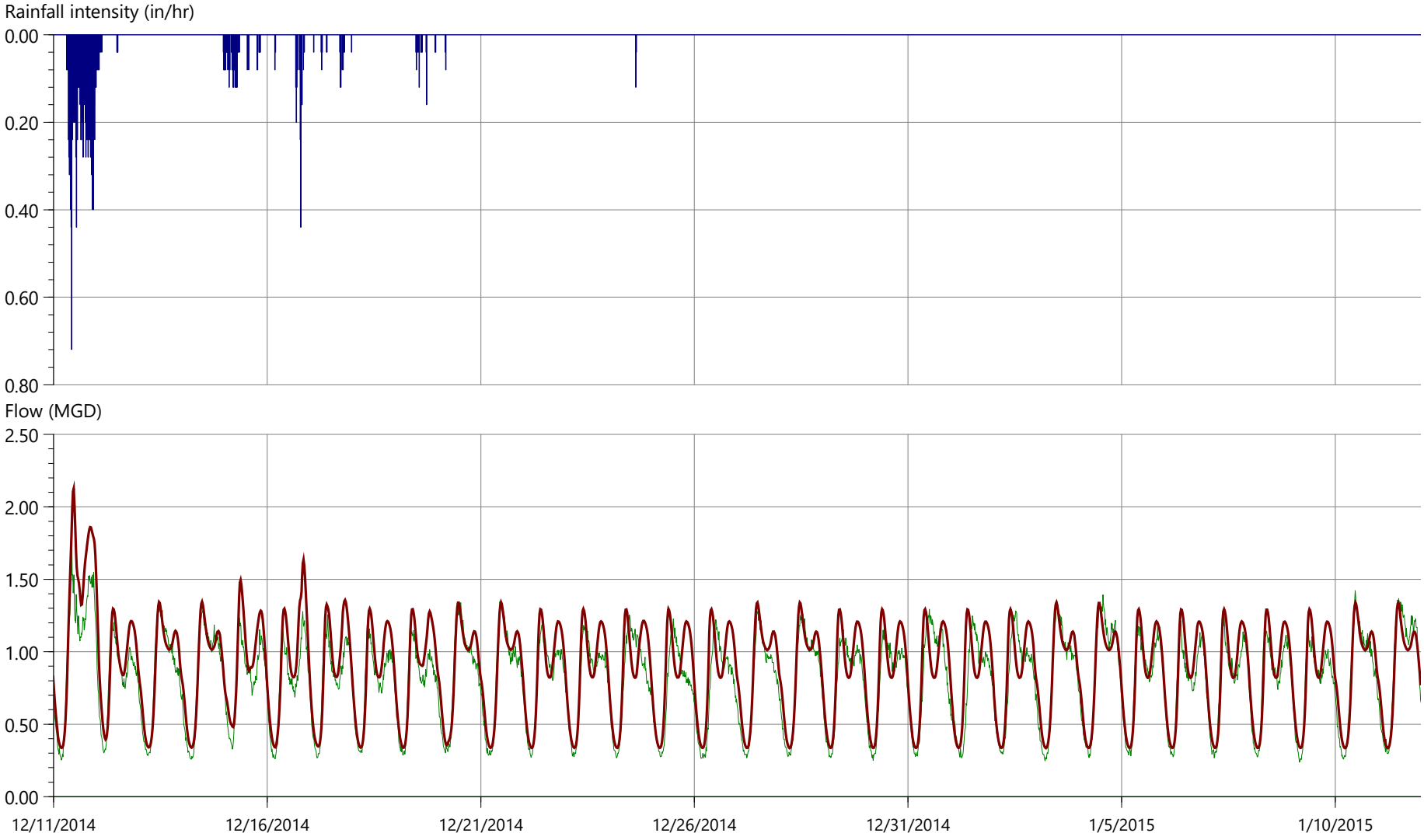
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	4.950	0.640	0.006			
Observed				0.335	3.327	52.396
... Data 2023 and 2015				0.334	4.053	51.122

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2015 WWF Existing_WithBlockage_10192023>Rainfall Data 2023 and 2015 (10/19/...
Flow Survey Location (Obs.) 21, Model Location (Pred.) D/S S23-14.1, Rainfall Profile: 4



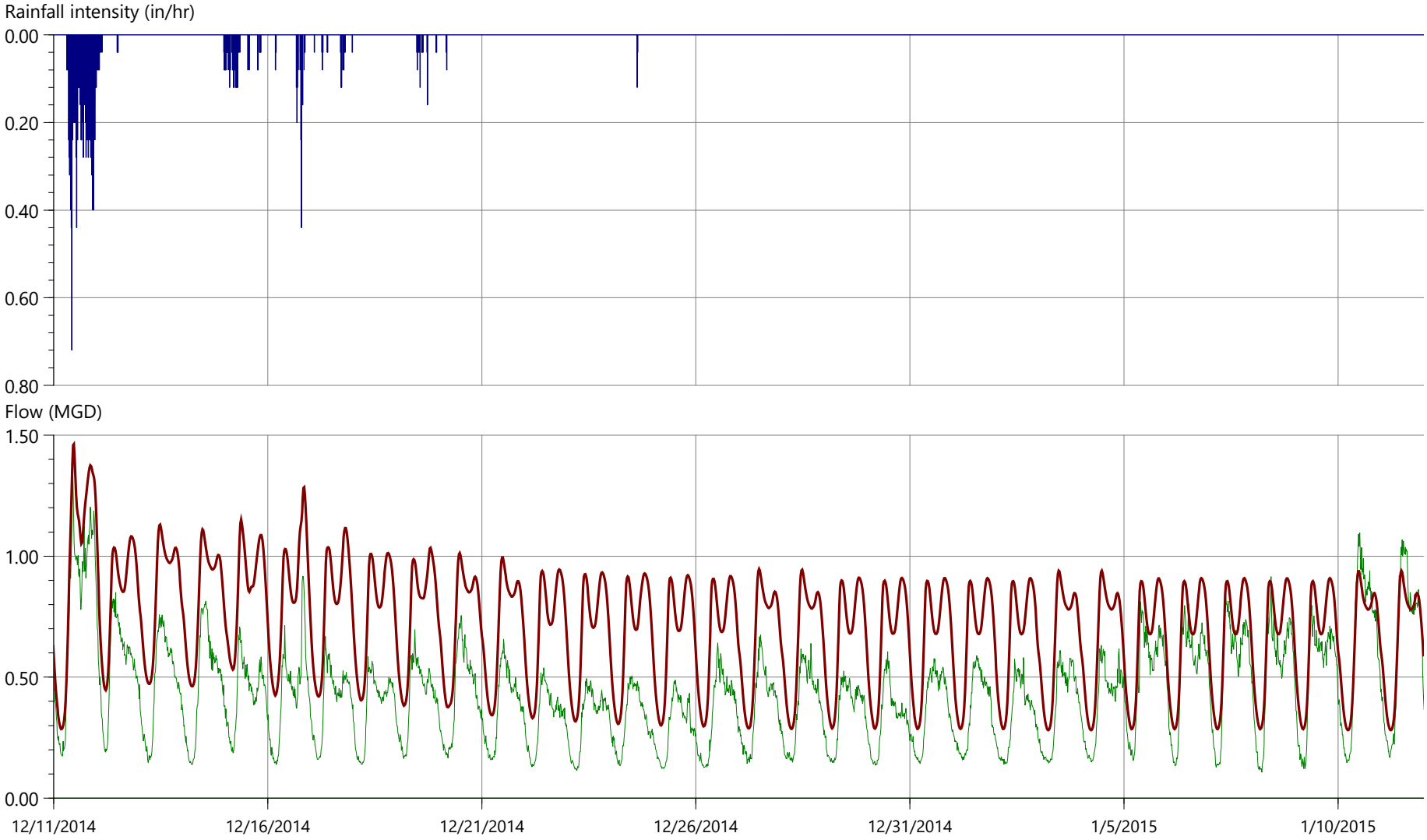
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	5.550	0.720	0.007			
Observed				0.511	4.598	72.002
... Data 2023 and 2015				0.535	5.069	65.968

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2015 WWF Existing_WithBlockage_10192023>Rainfall Data 2023 and 2015 (10/19/...
Flow Survey Location (Obs.) 22, Model Location (Pred.) D/S S45-88.1, Rainfall Profile: 4



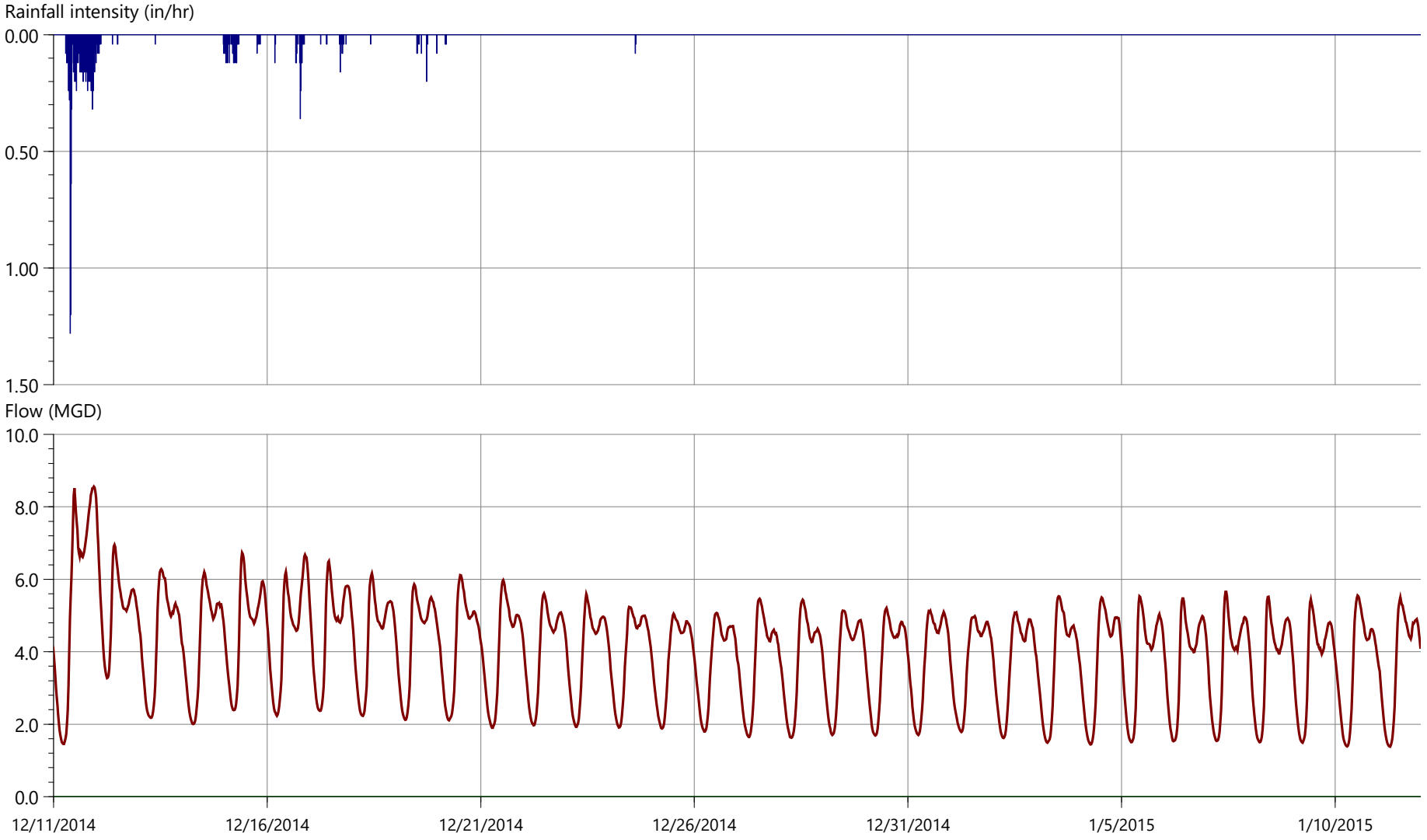
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	5.550	0.720	0.007			
Observed				0.239	1.805	26.012
... Data 2023 and 2015				0.335	2.125	28.494

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2015 WWF Existing_WithBlockage_10192023>Rainfall Data 2023 and 2015 (10/19/...
Flow Survey Location (Obs.) 23, Model Location (Pred.) D/S S48-32.1, Rainfall Profile: 4



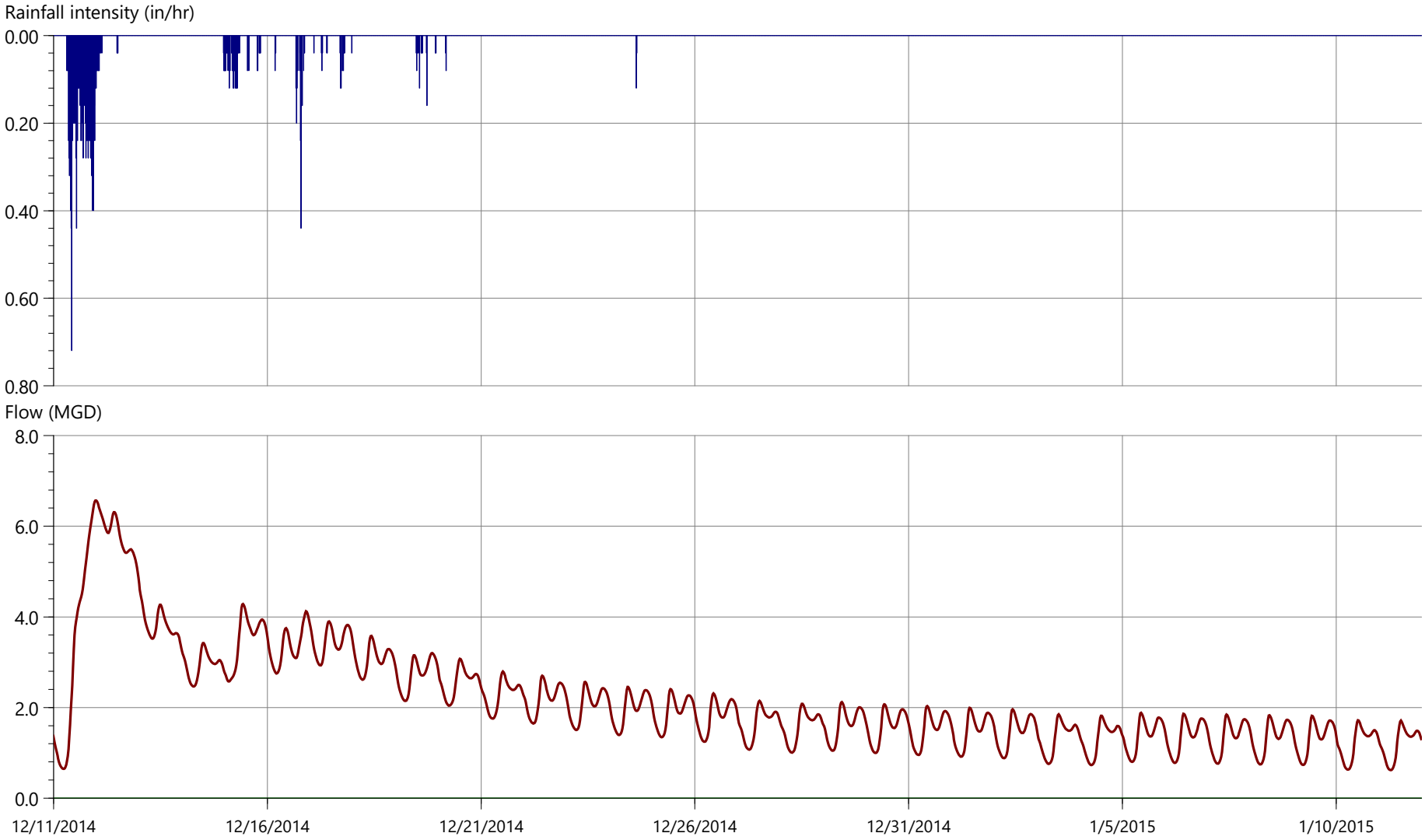
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	5.550	0.720	0.007			
Observed				0.107	1.328	13.863
... Data 2023 and 2015				0.281	1.463	22.889

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2015 WWF Existing_WithBlockage_10192023>Rainfall Data 2023 and 2015 (10/19/...
Flow Survey Location (Obs.) 24, Model Location (Pred.) D/S S63-2.1, Rainfall Profile: 2



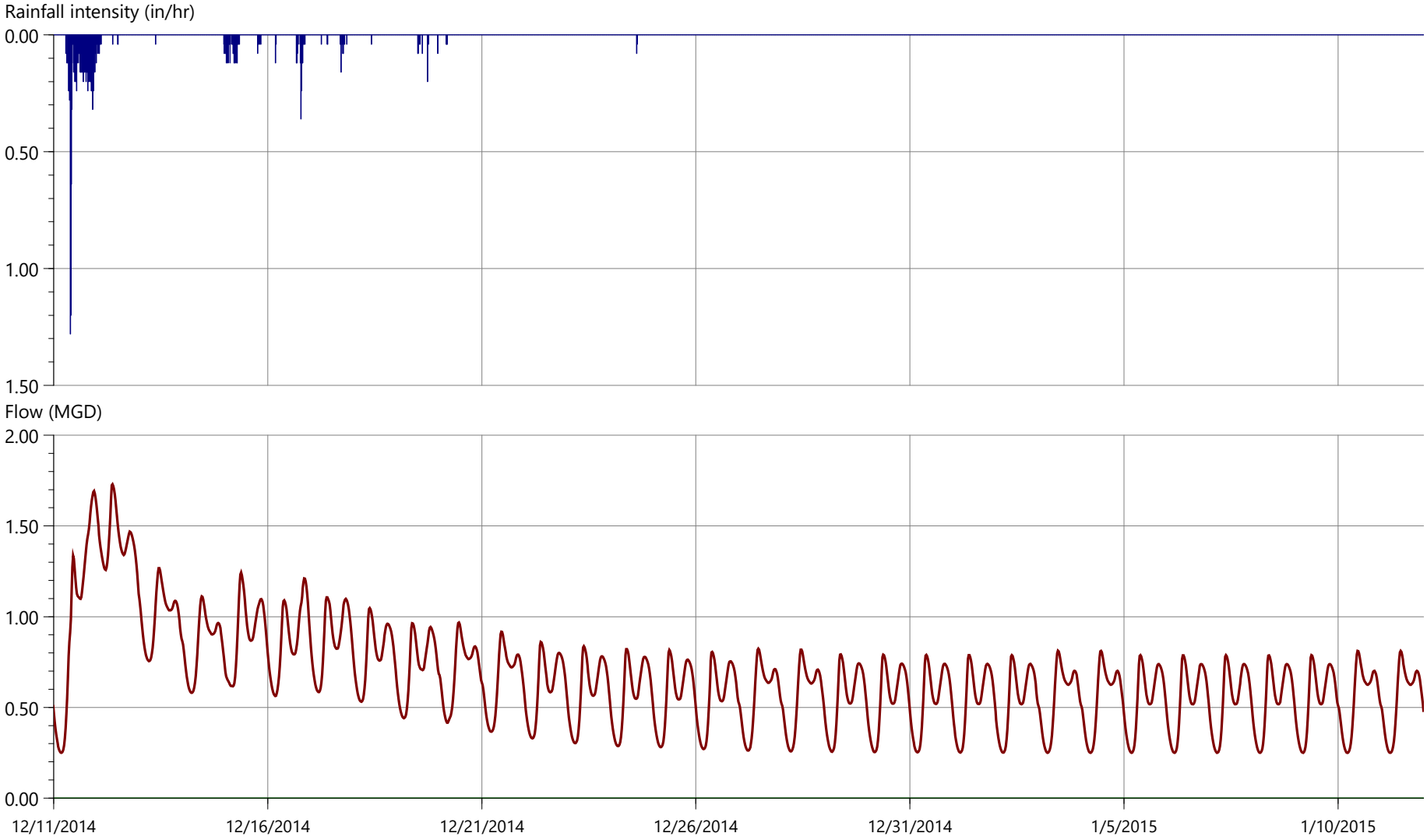
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	5.020	1.280	0.007			
Observed				0.000	0.000	0.000
... Data 2023 and 2015				1.379	8.556	130.203

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2015 WWF Existing_WithBlockage_10192023>Rainfall Data 2023 and 2015 (10/19/...
Flow Survey Location (Obs.) 25, Model Location (Pred.) D/S S57-6.1, Rainfall Profile: 4



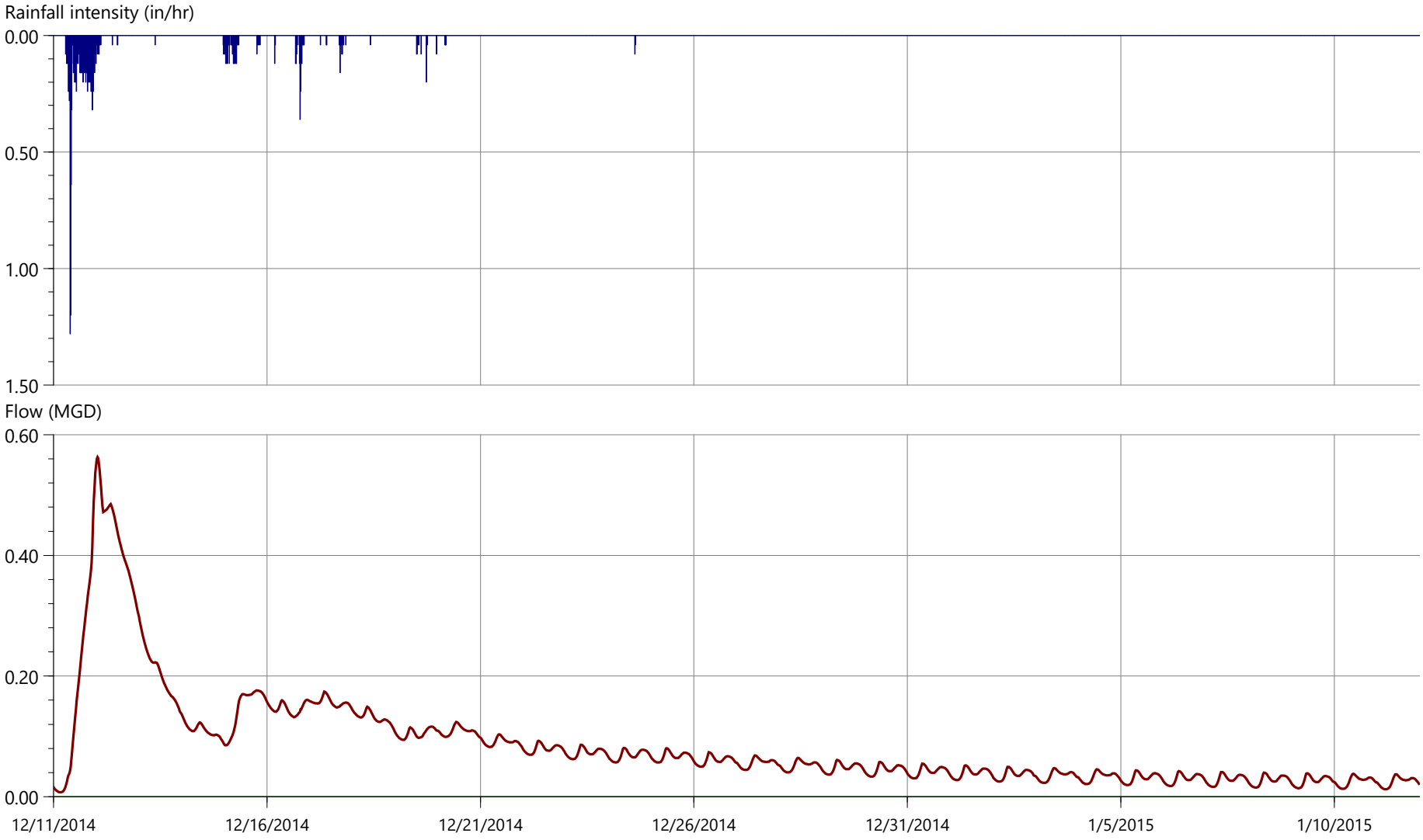
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	5.550	0.720	0.007			
Observed				0.000	0.000	0.000
... Data 2023 and 2015				0.620	6.569	69.782

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2015 WWF Existing_WithBlockage_10192023>Rainfall Data 2023 and 2015 (10/19/...
Flow Survey Location (Obs.) 26, Model Location (Pred.) D/S S52-86.1, Rainfall Profile: 2



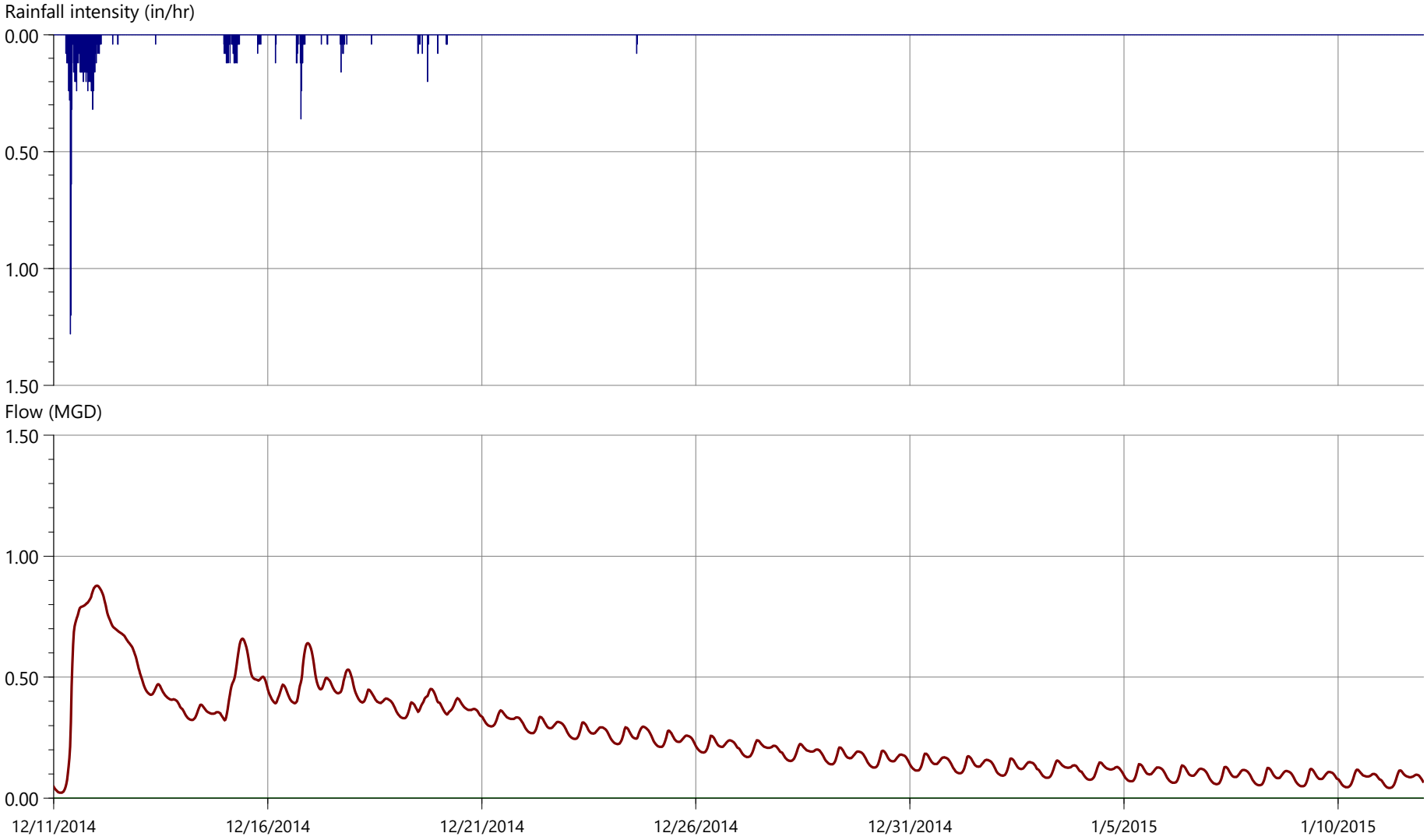
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	5.020	1.280	0.007			
Observed				0.000	0.000	0.000
... Data 2023 and 2015				0.249	1.729	21.528

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2015 WWF Existing_WithBlockage_10192023>Rainfall Data 2023 and 2015 (10/19/...
Flow Survey Location (Obs.) 27, Model Location (Pred.) D/S S43-8.1, Rainfall Profile: 2



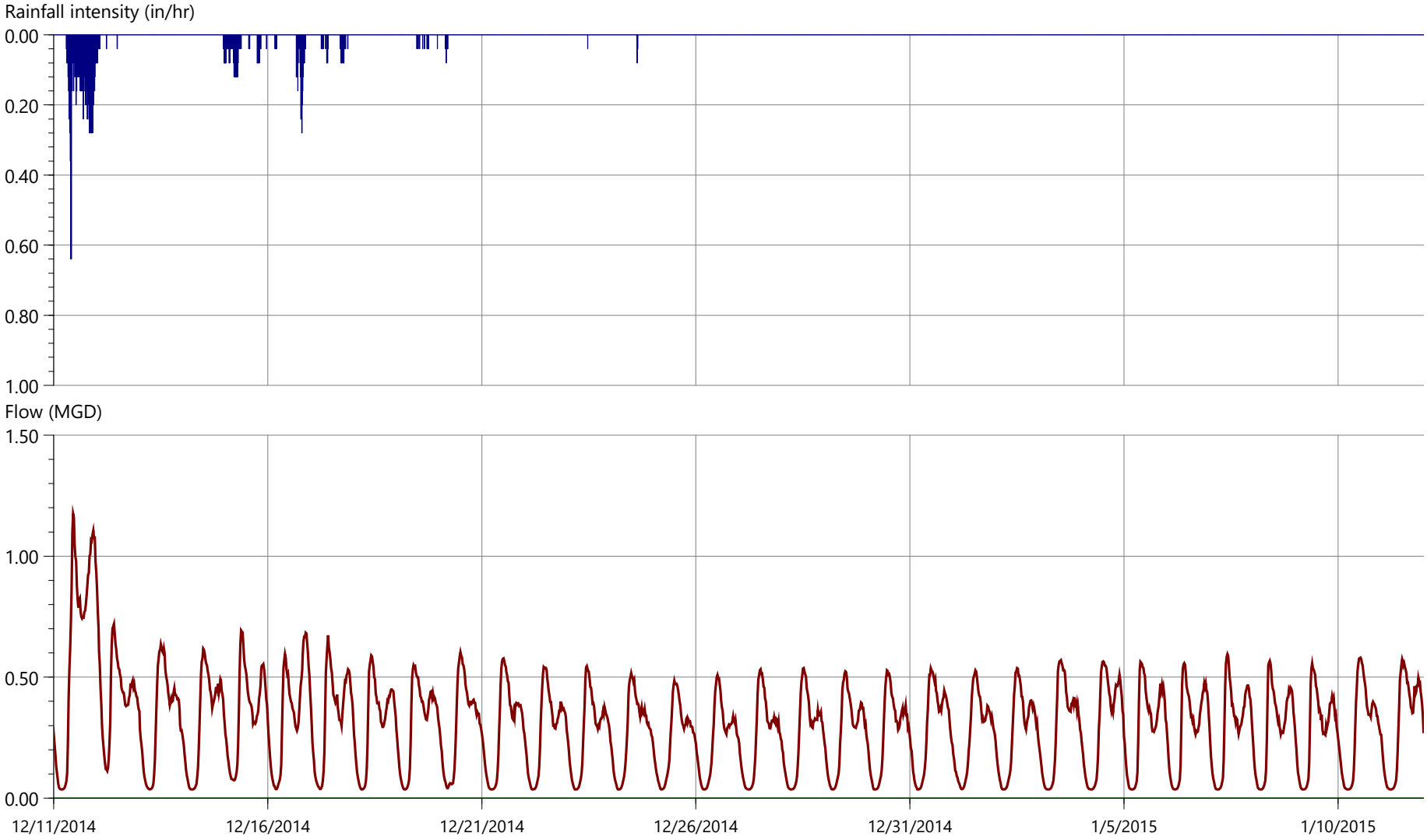
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	5.020	1.280	0.007			
Observed				0.000	0.000	0.000
... Data 2023 and 2015				0.007	0.563	2.735

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2015 WWF Existing_WithBlockage_10192023>Rainfall Data 2023 and 2015 (10/19/...
Flow Survey Location (Obs.) 28, Model Location (Pred.) D/S S53-47.1, Rainfall Profile: 2



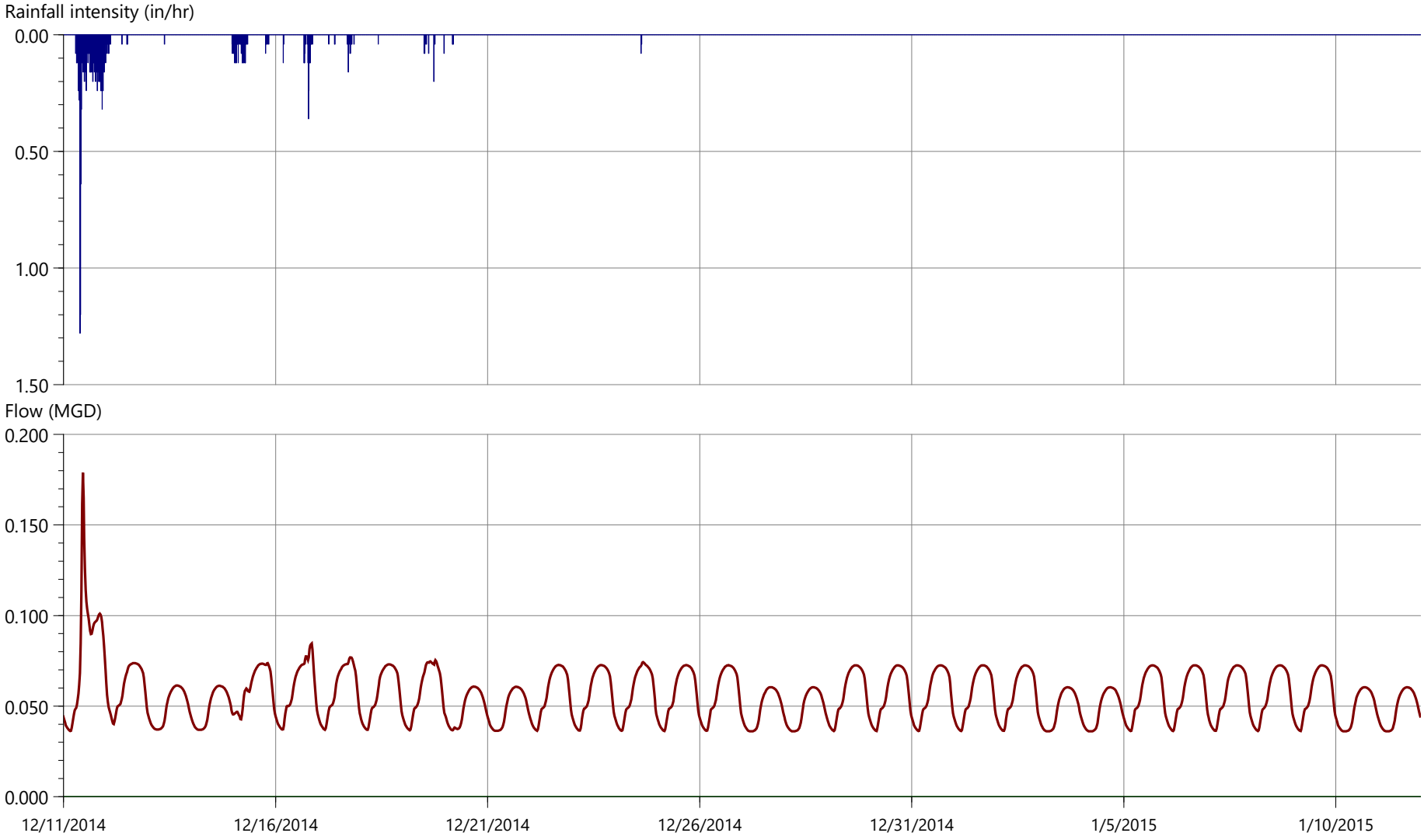
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	5.020	1.280	0.007			
Observed				0.000	0.000	0.000
... Data 2023 and 2015				0.022	0.878	8.229

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2015 WWF Existing_WithBlockage_10192023>Rainfall Data 2023 and 2015 (10/19/...
Flow Survey Location (Obs.) 29, Model Location (Pred.) D/S S21-54.1, Rainfall Profile: 3



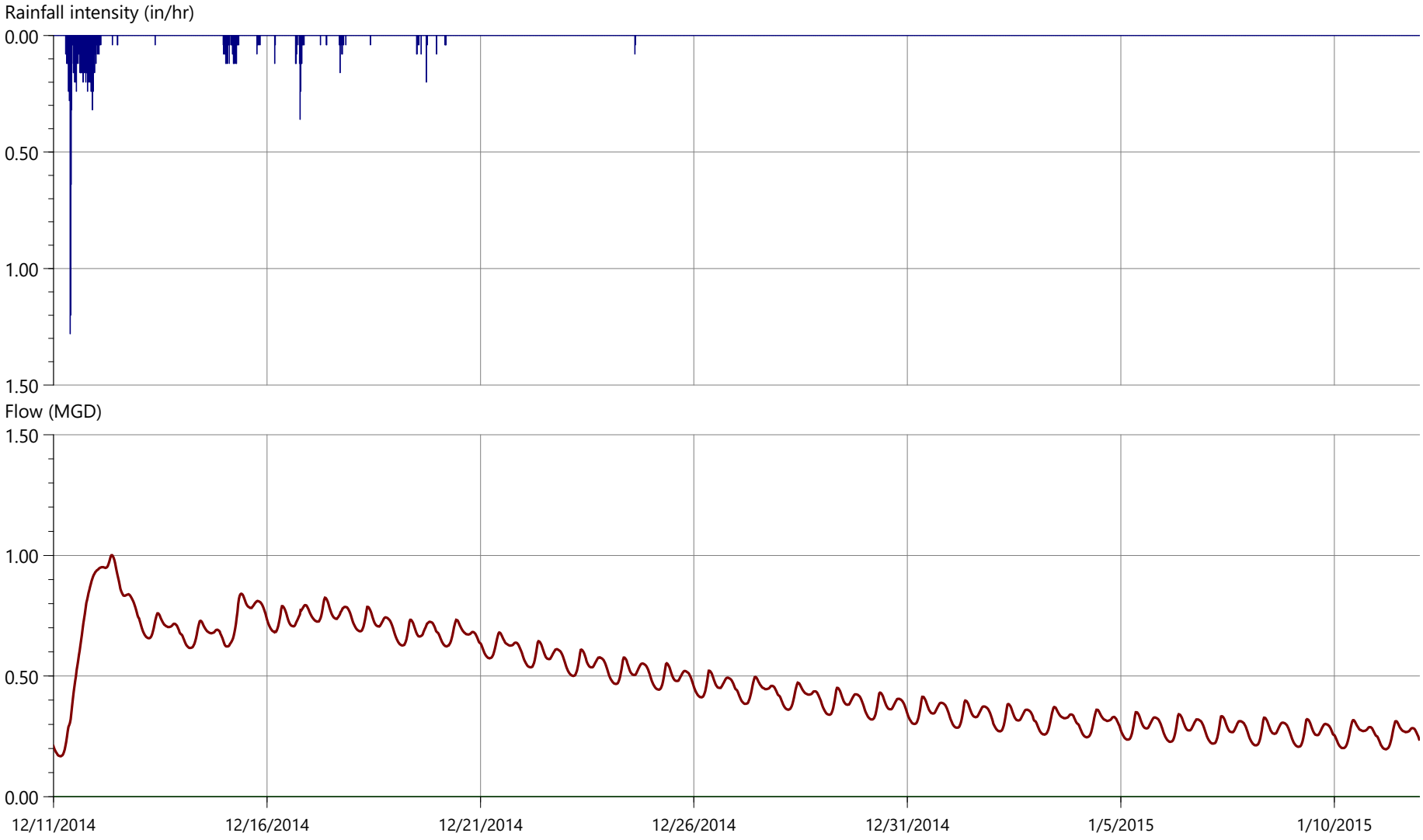
	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	4.950	0.640	0.006			
Observed				0.000	0.000	0.000
... Data 2023 and 2015				0.036	1.175	9.810

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2015 WWF Existing_WithBlockage_10192023>Rainfall Data 2023 and 2015 (10/19/...
Flow Survey Location (Obs.) 30, Model Location (Pred.) D/S S62-24.1, Rainfall Profile: 2



	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	5.020	1.280	0.007			
Observed				0.000	0.000	0.000
... Data 2023 and 2015				0.036	0.179	1.780

Flow survey: >2022/2023 Sewer Master Plan (0012307.00)>03 DATA>A FLOW DATA>Flow Meter Data>2022/2023 Flow Meters Updated FM12_with2015 (4/11/2023 8:49:09 PM)
Sim: >2022/2023 Sewer Master Plan (0012307.00)>04 RUNS>A CALIBRATION>Wet Weather>2015 WWF Existing_WithBlockage_10192023>Rainfall Data 2023 and 2015 (10/19/...
Flow Survey Location (Obs.) 31, Model Location (Pred.) D/S S62-23.1, Rainfall Profile: 2



	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	5.020	1.280	0.007			
Observed				0.000	0.000	0.000
... Data 2023 and 2015				0.168	1.001	15.500

APPENDIX F: SIPHON LINING ASSUMPTIONS

Appendix A: City of Santa Clara Sanitary Sewer Siphons and Lining Assumptions

USNODE	USNODE_FLAG	SUFFIX	DSNODE	DSNODE_FLAG	ASSETID	ASSETID_FLAG	MATERIAL	MATERIAL_FLAG	FUTURE LINING?	WIDTH_EXISTING	WIDTH_FLAG_EXISTING	WIDTH_LINED	WIDTH_FLAG_LINED	2024 CCTV_Structural Quick Rating
S103-19	SPH2	1	S103-16		103-00008	SPH2	VCP	GIS	Yes	24	RD	22.808	RN	
S103-19	SPH2	2	S103-16		103-00049	SPH2	VCP	GIS	Yes	12	RD	11.406	RN	
S103-20	SPH3	1	S103-18		103-00007	SPH3	VCP	GIS	No	17.3	RE24	17.3	RE24	
S103-20	SPH3	2	S103-18		103-00047	SPH3	VCP	GIS	No	23.2	RE24	23.2	RE24	
S103-20	SPH3	3	S103-18		103-00048	SPH3	VCP	GIS	No	22.4	RE24	22.4	RE24	
S14-61	SPH1	1	S14-62		14-00027	GIS	VCP	GIS	Yes	8	RD	7.406	RN	4132
S14-65	SPH1	1	S15-62		15-00061	GIS	CIP	RN	Yes	8	RN	7.406	RN	4331
S20-16(2)	SPH1	2	S20-17(2)		20-00032	GIS	PE	GIS	No	13.49	RN	13.49	RN	
S20-26D1	SPH2	1	S20-26D3		20-00059	GIS	PE	GIS	No	20.23	RN	20.23	RN	
S20-26D2	SPH2	2	S20-26D4		20-00058	GIS	PE	GIS	No	20.23	RN	20.23	RN	
S22-64	SPH1	2	S22-102		22-00114	GIS	CIP	RN	Yes	8	RN	7.406	RN	
S23-15	SPH2	1	S23-14		23-00023	GIS	VCP	GIS	Yes	8	RN	7.406	RN	
S23-15	SPH2	2	S23-14		23-00094	GIS	VCP	GIS	Yes	12	MU	11.406	RN	
S31-24	SPH1	1	S31-25		31-00029	SPH1	DIP	RN	Yes	24	MU	22.808	RN	
S32-2	SPH2	1	S32-102		32-00118	GIS	PVC	RN	No	10	RD	10	RD	0000
S32-2	SPH2	2	S32-102		32-00120	GIS	PVC	RN	No	8	RN	8	RN	0000
S33-9	SPH1	1	S33-10		33-00059	SPH1	CIP	RN	Yes	8	MU	7.406	RN	
S42-30	SPH1	2	S42-31		42-00051	GIS	CIP	RN	Yes	6	M2	5.406	RN	
S46-114	SPH2	1	S46-115	SPH2	46-00132	GIS	HDPE	RD	No	5.35	RN	5.35	RN	0000
S46-114W	SPH2	1	S46-115	SPH2			HDPE	RD	No	5.35	RN	5.35	RN	0000
S52-116	SPH2	1	S52-119		52-00146	GIS	HDPE	RN	No	10.29	RN	10.29	RN	
S52-116	SPH2	2	S52-119		52-00147	GIS	HDPE	RN	No	10.29	RN	10.29	RN	
S52-123	SPH2	1	S52-124		52-00136	GIS	HDPE	RN	No	6.96	RN	6.96	RN	2700
S52-123	SPH2	2	S52-124		52-00137	GIS	HDPE	RN	No	6.96	RN	6.96	RN	2700
S52-3	SPH1	1	S52-5 (SiphonOutlet)		52-00028	GIS	VCP	GIS	Yes	8	GIS	7.406	RN	
S54-79	SPH2	1	S54-78		54-00044	SPH2	VCP	GIS	Yes	10	MU	9.406	RN	4231
S54-79	SPH2	2	S54-78		54-00094	SPH2	VCP	GIS	Yes	10	MU	9.406	RN	4231
S54-94	SPH2	1	S54-95		54-00092	GIS	HDPE	RN	No	15.17	RN	15.17	RN	
S54-94	SPH2	2	S54-95		54-00093	GIS	HDPE	RN	No	15.17	RN	15.17	RN	
S55-51	SPH2	2	S55-52		55-00056	GIS	HDPE	RN	No	17.5	RN	17.5	RN	2B00
S55-51	SPH2	1	S55-52		55-00055	GIS	HDPE	RN	No	17.5	RN	17.5	RN	2B00
S56-58	SPH2	2	S56-59		56-00062	GIS	HDPE	RN	No	17.51	RN	17.51	RN	2500
S56-58	SPH2	1	S56-59		56-00061	GIS	HDPE	RN	No	17.51	RN	17.51	RN	2500
S62-7D	SPH2	2	S62-12		62-00063	GIS	VCP	GIS	Yes	8	GIS	7.406	RN	
S62-7D!	SPH2	1	S62-12		62-00027	GIS	VCP	GIS	Yes	10	GIS	9.406	RN	
S62-9	SPH1	1	S62-11	RD	62-00025	GIS	DIP	RN	Yes	16	RD	15.108	RN	
S64-34	SPH2	2	S64-36		64-00045	GIS	VCP	GIS	Yes	15	RD	14.108	RN	2900
S64-34	SPH2	1	S64-36		64-00015	SPH1	VCP	GIS	Yes	8	RD	7.406	RN	2900
S67-21	SPH2	1	S67-29	SPH2	67-00015	SPH2	DIP	RD	No	23.17	RN	23.17	RN	3600
S67-21	SPH2	2	S67-29	SPH2	67-00035	SPH2	DIP	RD	No	23.17	RN	23.17	RN	3600
S68-10	SPH2	1	D_S68-7		68-00002	GIS	VCP	GIS	No	23.3	GIS	23.3	GIS	
S68-10	SPH2	2	S68-7		68-00025	GIS	VCP	GIS	No	14.4	GIS	14.4	GIS	
S68-15	SPH1	1	S68-12		68-00012	SPH1	VCP	GIS	No	23.6	RD	23.6	RD	3C00
S68-15	SPH1	2	S68-16		68-00013	SPH1	VCP	GIS	No	23.5	RD	23.5	RD	3C00
S68-9	SPH2	1	D_S68-6		68-00018	GIS	VCP	GIS	No	23.3	GIS	23.3	GIS	
S68-9	SPH2	2	S68-6		68-00026	GIS	VCP	GIS	No	14.5	GIS	14.5	GIS	
S72-12	SPH2	1	S72-11		72-00018	SPH2	CIP	GIS	Yes	20	RD	19.008	RN	
S72-12	SPH2	2	S72-11		72-00051	SPH2	CIP	GIS	Yes	20	SV	19.008	RN	
S85-86	SPH1	1	S85-85		85-00068	GIS	HDPE	RN	No	15.17	RN	15.17	RN	0000
S93-50	SPH2	1	S93-48		93-00014	GIS	VCP	GIS	Yes	12	RD	11.406	RN	3124
S93-50	SPH2	2	S93-48		93-00070	GIS	VCP	GIS	Yes	24	RD	22.808	RN	3124

Appendix A: City of Santa Clara Sanitary Sewer Siphons and Lining Assumptions

USNODE	USNODE_FLAG	SUFFIX	DSNODE	DSNODE_FLAG	ASSETID	ASSETID_FLAG	MATERIAL	MATERIAL_FLAG	FUTURE LINING?	WIDTH_EXISTING	WIDTH_FLAG_EXISTING	WIDTH_LINED	WIDTH_FLAG_LINED	2024 CCTV_Structural Quick Rating
S93-51	SPH3	1	S93-49	SPH3	93-00061	GIS	RCP	RE24	No	22.8	RE24	22.8	RE24	
S93-51	SPH3	2	S93-49	SPH3	93-00069	GIS	VCP	GIS	No	16.8	RE24	16.8	RE24	
S93-51	SPH3	3	S93-49	SPH3	93-00071	GIS	RCP	RE24	No	22.8	RE24	22.8	RE24	
S95-45	SPH3	1	S95-44		95-00067	GIS	VCP	GIS	No	17	RE24	17	RE24	3C22
S95-45	SPH3	2	S95-44		95-00150	GIS	VCP	GIS	No	14.3	RE24	14.3	RE24	3C22
S95-45	SPH3	3	S95-44		95-00151	GIS	VCP	GIS	No	17	RE24	17	RE24	3C22
S96-14	SPH2	1	S96-13		96-00014	SPH2	HDPE	RN	No	12.3	RN	12.3	RN	2300
S96-14	SPH2	2	S96-13		96-00090	SPH2	HDPE	RN	No	8.68	RN	8.68	RN	2300

FLAG	Description
SPH1	Single barrel siphon.
SPH2	Twin barrel siphon.
SPH3	Triple barrel siphon.
GIS	Data originated from City's GIS (2023).
RN	Refer to note.
RD	Data originated from record drawing.
RE24	Data originated from Condition Assessment Repairs [CIPP Liners] (data sent by Craig).
MU	Data originated from original Mike Urban model.
SV	Data was surveyed.
M2	Data originated from 2007 Mike Urban model.

Legend for "2024 CCTV_Structural Quick Rating"

Severity grade goes from 1 to 5 with 5 being most severe.

5 – Most significant defect grade. Needs immediate attention. Possible failure within 5 years.

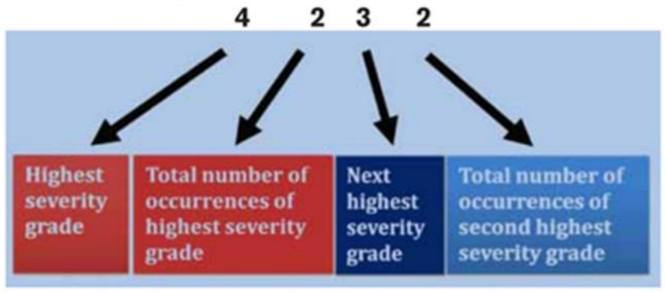
4 – Significant defect grade. Possible failure within 5 to 10 years. Will likely progress to 5 if not addressed.

3 – Moderate defect

2 – Minor to moderate defect

1 – Minor defect grade

PACP Quick Rating



APPENDIX G: SEWER CAPACITY CIP PROJECT COST ESTIMATES, MAPS, AND PROFILES

Appendix G: Sewer Capacity CIP Cost Estimates, Maps, and Profiles

Capital Improvement Project Summary Table

Project No.[1]	Project ID	Project Location	Pre-Project Pipe Diameter(s)[2]	Project Description	Priority[3]	Flow Confidence Level[4]	Loads Trigger[5]	Design Flow Trigger[5]	Physical Network Trigger[5]	Project Cost[6]
1	**Agilent**	Tracy Dr, Pomeroy Ave, Homestead Rd (S Trunk), Kiely Blvd	10 to 22.8-inch	12313 LF of 15 to 27-inch diameter pipe	7	N/A	LTFL (entitlement)	DWF	UMN	**$26,942,000**
2	**Homestead Road**	N Homestead Trunk from Swallow Wy to Saratoga Creek	18 to 30-inch	6407 LF of 24 to 33-inch diameter pipe	3	3	LTFL	WWF	UMN	**$17,156,000**
3	**Kiely Boulevard**	Orthello Wy to S of El Sobrante St	8-inch	266 LF of 10-inch diameter pipe	6	4	LTFL	WWF	UMN	**$513,000**
4	**Victoria Avenue**	Fowler Ave & Pomeroy Ave to Nobili Ave & Victoria Ave	8-inch	764 LF of 10-inch diameter pipe	6	3	LTFL	WWF	UMN	**$1,337,000**
5	**Cabrillo Avenue**	Halford Ave & Buckley St; St. Lawrence Dr, W of Lawrence Expwy	8-inch	Flow Diversion Weirs only. No pipe	1	3	EL	WWF	UMN	**$154,000**
6	**CMC Basin**	Santa Maria Ave & Francis Ave; Amethyst Dr	8 to 12-inch	3655 LF of 12 to 15-inch diameter pipe	1	1 & 2	EL	WWF	UMN	**$7,263,000**
7	**Bowers Avenue**	Bowers Ave from Chromite Dr to Walsh Ave	25.7-inch	2605 LF of 30-inch diameter pipe	4	5	LTFL	WWF	LMN	**$8,047,000**
8	**Calabazas Trunk**	Calabazas Creek from S of Agate Dr to Central Expwy	22.8 to 27-inch	2791 LF of 18 to 27-inch diameter pipe	2	5	EL	WWF	LMN	**$8,731,000**
9	**Freedom Circle**	Mission College Blvd from Freedom Cir to west of Great America Pkwy	12 to 15-inch	1886 LF of 15-inch diameter pipe	5	N/A	LTFL (specific development)	DWF	UMN	**$3,830,000**
12	**GAP West Trunk**	S of West Tasman Dr to Lafayette St	28.5 to 35.7-inch	4810 LF of 36 to 42-inch diameter pipe	3	2	LTFL	WWF	UMN	**$17,781,000**
13	**GAP East Trunk**	Old Glory Ln to S of Bunker Hill Ln; Stars and Stripes Dr	31.4-inch	231 LF of 39-inch diameter pipe	4	2	LTFL	WWF	LMN	**$1,002,000**
14	**Bunker Hill Lane East**	E of Great America Pkwy	6-inch	107 LF of 8-inch diameter pipe	7	N/A	LTFL (entitlement)	WWF	UMN	**$301,000**
15	**Lafayette Street**	N of Calle del Mundo to S of Great America Wy	34.2 to 40.3-inch	2290 LF of 42 to 48-inch diameter pipe	3	2	LTFL	WWF	UMN	**$7,515,000**
									CIP Total:	**$100,572,000**

[1]Projects are numbered from upstream to downstream. Table does not include Project Nos. 10 (Patrick Henry Drive) and 11 (Mission Point) because project costs will be paid for by the developers.

[2]Pre-project pipe diameters include future lining assumptions.

[3]Projects are prioritized based on wastewater flow, design flow, and physical network triggers as well as assumed structural condition.

[4]Rating assigned to validate the need for the project through review of flow monitoring data and reported surcharging and operational issues, and compatibility between flow meter data and the model. Descriptions of the flow confidence levels are as follows: N/A = Not assigned because project would be triggered by entitlement flow or specific development; 1 = Flow meter on or very near to the project reach surcharged during metered storm; 2 = Flow meter on or very near to the project reach confirms flow, but did not surcharge during metered storm; 3 = Flow meter near the project reach (upstream or downstream) confirms flow; 4 = No flow meter near the project reach to confirm flow; 5 = Conflicting flow between meter and model.

[5]EL = Existing Loads; LTFL = Long-Term Future Loads; DWF = Dry Weather Flow; WWF = Wet Weather Flow; UMN = Unlined Model Network; LMN = Lined Model Network.

[6]Costs are based on August 2024 ENR CCI of 15367.24 for the San Francisco Area and are Class 5 estimates (planning level).

Total Cost by Priority Category

Priority	# of Projects	Estimated Capital Cost	%
1	2	$ 7,417,000	7%
2	1	$ 8,731,000	9%
3	3	$ 42,452,000	42%
4	2	$ 9,049,000	9%
5	1	$ 3,830,000	4%
6	2	$ 1,850,000	2%
7	2	$ 27,243,000	27%
Total	13	**$ 100,572,000**	

Project 1: Agilent

PROJECT DESCRIPTION

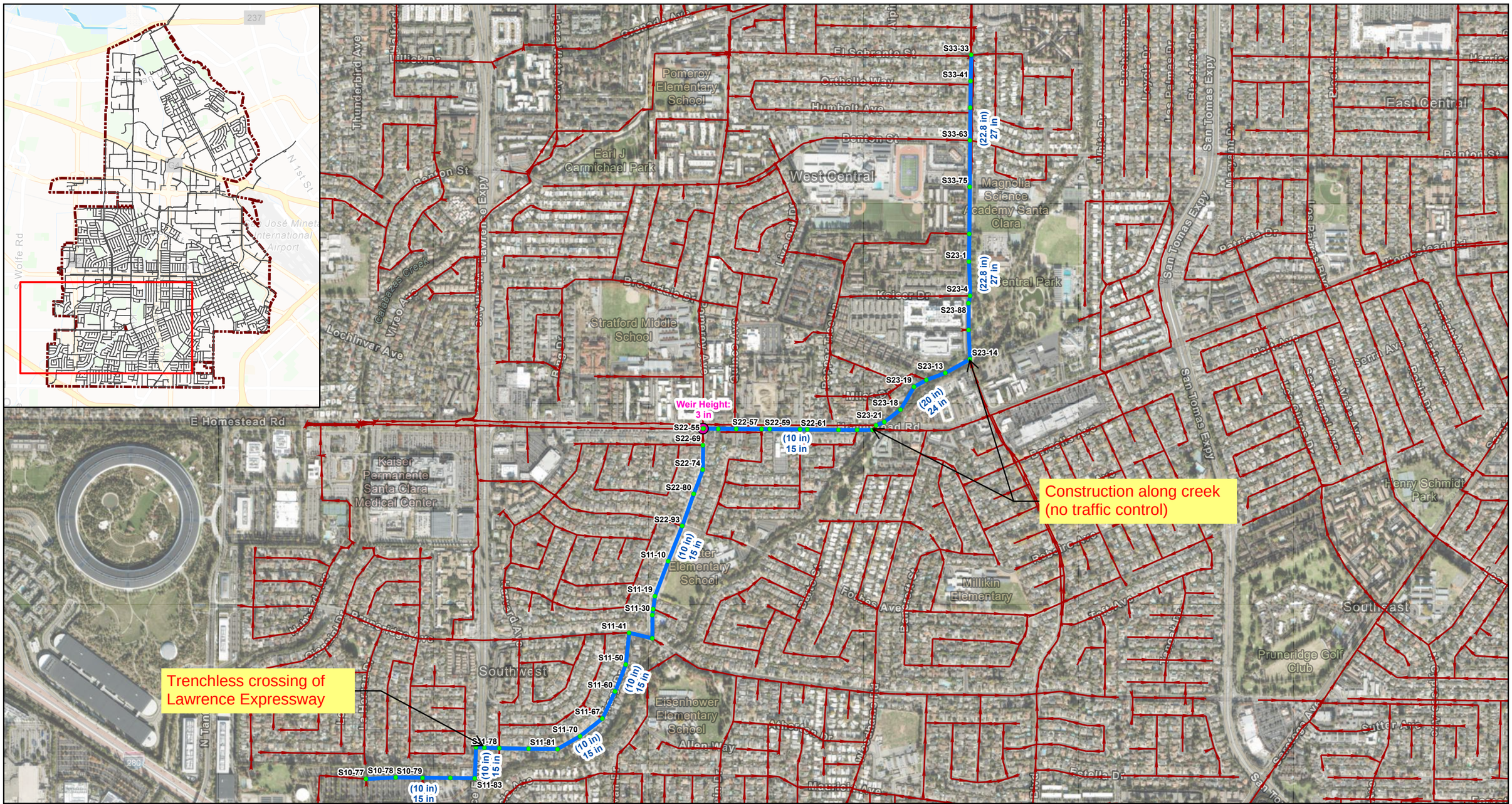
Project No.	1
Project ID	Agilent
Project Location	Tracy Dr, Pomeroy Ave, Homestead Rd (S Trunk), Kiely Blvd
Description	12313 LF of 15 to 27-inch diameter pipe
Priority	7
Flow Confidence Level	N/A
Loads Trigger	Long-Term Future Loads (LTFL)
Design Flow Trigger	Dry Weather Flow (DWF)
Physical Network Trigger	Unlined Model Network (UMN)
Estimated Capital Improvement Cost	$26,942,000
Comments	(i) Pipes are listed in order from upstream to downstream.
	(ii) A 50/50 flow split was assumed at the Lawrence/Homestead gate structure which splits flow between the eastern sewer on Homestead Rd or the northern sewer on Lawrence Expwy.
	(iii) Project also includes installation of a weir at manhole S22-55 to divert the influent flows from Homestead Rd (S Trunk) and Pomeroy Ave sewers to Homestead Rd (S Trunk).
	(iv) Deficiency would be caused by Agilent Technologies historic entitlement flow (0.95 mgd). Project should be implemented before parcel begins to discharge its entitled flow.
	(v)
	(vi)
Assumptions	(i) New diameter based on pipe replacement.
	(ii) Cost estimates are based on CCI of 15367.24 from the August 2024 ENR.
Alternatives	N.A.

PROJECT COST DETAIL

U/S MH ID	D/S MH ID	Existing Diameter (inches)	New Diameter (inches)	Length (feet)	Slope (%)	Pipe Depth (feet BGL)	Existing Pipe Capacity (mgd)	Future Pipe Capacity (mgd)	Long-Term Future PDWF (mgd)	Long-Term Future PWWF (mgd)	Long-Term Future DWF Velocity (ft/sec)	Open Cut Cost	Trenchless Installation	Trenchless Casing Size	Unit Cost ($/LF)	Total Cost ($)
S10-79	S10-80	10	15	305	0.16	11	0.56	1.66	1.46	1.49	3.06	$804			$804	$ 244,898
S10-80	S11-83	10	15	264	0.31	9	0.78	2.31	1.46	1.49	3.55	$804			$804	$ 212,497
S11-83	S11-76	10	15	337	0.47	9	0.97	2.85	1.46	1.49	3.45	$804			$804	$ 270,787
S11-76	S11-77	10	15	93	0.51	10	1.01	2.97	1.46	1.49	3.52	$804			$804	$ 74,450
S11-77	S11-78	10	15	164	0.44	9	0.94	2.77	1.46	1.49	3.85	$804	PTGAB	30.00	$1,922	$ 314,514
S11-78	S11-80	10	15	319	0.48	7	0.98	2.88	1.47	1.49	3.80	$804	PTGAB	30.00	$1,922	$ 612,687
S11-80	S11-81	10	15	316	0.55	7	1.05	3.08	1.47	1.49	3.85	$804			$804	$ 253,903
S11-81	S11-70	10	15	283	0.87	8	1.32	3.89	1.47	1.49	4.51	$804			$804	$ 227,532
S11-70	S11-67	10	15	311	1.21	8	1.56	4.59	1.47	1.50	4.15	$804			$804	$ 249,883
S11-67	S11-60	10	15	325	0.70	8	1.18	3.49	1.48	1.51	3.08	$804			$804	$ 261,139
S11-60	S11-50	10	15	319	0.31	8	0.79	2.34	1.48	1.51	3.44	$804			$804	$ 256,315
S11-50	S11-41	10	15	346	0.42	8	0.92	2.70	1.48	1.51	3.87	$804			$804	$ 278,104
S11-41	S11-42	10	15	260	0.27	9	0.73	2.17	1.53	1.59	3.91	$804			$804	$ 209,281
S11-42	S11-30	10	15	257	0.50	9	1.00	2.96	1.53	1.59	3.10	$804			$804	$ 206,950
S11-30	S11-29	10	15	65	0.48	8	0.98	2.88	1.53	1.59	3.91	$804			$804	$ 52,421
S11-29	S11-19	10	15	142	0.64	9	1.13	3.34	1.53	1.59	3.48	$804			$804	$ 114,168
S11-19	S11-10	10	15	405	1.00	9	1.41	4.16	1.54	1.60	4.80	$804			$804	$ 325,700
S11-10	S22-93	10	15	414	1.09	10	1.48	4.35	1.54	1.60	4.81	$804			$804	$ 332,534
S22-93	S22-80	10	15	372	0.51	11	1.01	2.97	1.62	1.69	3.82	$804			$804	$ 299,249
S22-80	S22-74	10	15	284	0.52	10	1.02	3.02	1.62	1.69	2.71	$804			$804	$ 227,934
S22-74	S22-69	10	15	269	0.21	10	0.65	1.92	1.62	1.70	3.42	$804			$804	$ 216,115
S22-55	S22-53	15	15	9	0.95	11	8.92	4.07	2.20	2.28	5.14	$804			$804	$ 7,075
S22-53	S22-56	10	15	159	0.95	11	1.93	4.07	2.20	2.28	4.37	$804			$804	$ 127,595
S22-56	S22-57	10	15	195	0.62	11	1.12	3.30	2.20	2.28	4.41	$804			$804	$ 157,102
S22-57	S22-58	10	15	278	0.64	11	1.13	3.33	2.20	2.28	4.02	$804			$804	$ 223,190
S22-58	S22-59	10	15	89	0.55	11	1.05	3.10	2.21	2.29	3.74	$804			$804	$ 71,556
S22-59	S22-60	10	15	332	0.42	10	0.92	2.71	2.21	2.29	3.33	$804			$804	$ 266,526
S22-60	S22-61	10	15	79	0.16	10	0.57	1.69	2.22	2.31	4.48	$804			$804	$ 63,757
S22-61	S22-62	10	15	339	0.47	9	0.97	2.85	2.22	2.31	3.91	$804			$804	$ 272,315
S22-62	S22-63	10	15	205	0.47	9	0.97	2.86	2.22	2.31	3.86	$804			$804	$ 164,820
S22-63	S22-64	10	15	168	0.45	9	0.95	2.79	2.23	2.32	4.47	$804			$804	$ 135,152
S22-52	S23-21	20	24	96	0.68	15	7.36	12.03	7.62	7.83	5.16	$1,039			$1,039	$ 99,744
S23-21	S23-18	20	24	223	0.45	15	6.02	9.84	7.62	7.83	5.40	$1,039			$1,039	$ 231,801
S23-18	S23-19	20	24	289	0.52	15	6.42	10.50	7.62	7.83	5.77	$1,039			$1,039	$ 300,375
S23-19	S23-12	20	24	154	0.68	15	7.36	12.03	7.62	7.83	5.38	$1,039			$1,039	$ 159,590
S23-12	S23-13	20	24	221	0.49	15	6.25	10.22	7.63	7.85	5.78	$1,039			$1,039	$ 229,619
S23-13	S23-14	20	24	307	0.63	15	7.07	11.56	7.63	7.85	4.93	$1,039			$1,039	$ 319,181
S23-14	S23-6	23	27	322	0.33	15	7.36	11.55	8.40	8.95	4.40	$1,089			$1,089	$ 350,222
S23-6	S23-88	23	27	290	0.25	15	6.44	10.09	8.43	9.00	4.90	$1,089			$1,089	$ 316,028
S23-88	S23-4	23	27	84	0.25	15	6.43	10.09	8.48	9.04	5.64	$1,089			$1,089	$ 91,040
S23-4	S23-1	23	27	371	0.51	15	9.09	14.25	8.56	9.14	5.76	$1,089			$1,089	$ 404,019
S23-1	S33-79	23	27	305	0.62	14	10.02	15.71	8.56	9.14	5.66	$1,089			$1,089	$ 332,363
S33-79	S33-75	23	27	511	0.51	14	9.07	14.23	8.67	9.26	5.46	$1,089			$1,089	$ 556,370
S33-75	S33-63	23	27	507	0.45	14	8.54	13.39	8.67	9.26	5.04	$1,089			$1,089	$ 552,341
S33-63	S33-50	23	27	359	0.40	14	8.12	12.73	9.12	9.85	5.42	$1,089			$1,089	$ 390,624
S33-50	S33-41	23	27	289	0.42	14	8.30	13.01	9.12	9.85	5.76	$1,089			$1,089	$ 314,394
S33-41	S33-33	23	27	286	0.52	14	9.21	14.44	9.12	9.85	4.98	$1,089			$1,089	$ 311,890

Total Baseline Pipe Construction Cost	$	10,762,552
Total Trenchless Installation Cost	$	927,201
No Jacking Pit	$	-
No Receiving Pit	$	-
Installation or Adjustment of Weir in Existing Manhole Structure (1)	$	45,000
Lateral Reconnection Cost (Approx. 130)	$	65,000
Modify Existing Manholes Cost (Approx. 22)	$	385,000
Baseline Construction Cost:	**$**	**12,184,753**
Dewatering	$	415,215
Bypass Pumping	$	1,168,975
Remove & Replace Factor	$	584,488
Traffic Control (10%)	$	1,168,975
Pavement Restoration (T-trench)	$	267,617
Subtotal:	**$**	**15,790,023**
Mobilization/Demobilization (5% of subtotal)	$	789,501.14
Estimated Construction Cost Subtotal:	**$**	**16,579,524**
Contingencies (30% of construction subtotal)	$	4,973,857.21
Estimated Construction Cost:	**$**	**21,553,381**
Engineering and Inspection (25% of construction cost)	$	5,388,345
Estimated Capital Improvement Cost:	**$**	**26,942,000**

(Note: Cost estimates are based on August 2024 ENR CCI of 15367.24 for the San Francisco Area)



Project 1
Agilent

Santa Clara Sewer Master Plan Update

Legend

Capacity Improvement Project

- Manholes
- Proposed Weir
- Project Sewers
- Other Modeled Sewers

(8-in) (Existing Diameter)
10-in Proposed Diameter

0 0.13 0.25 0.5 Miles

N

Woodard & Curran

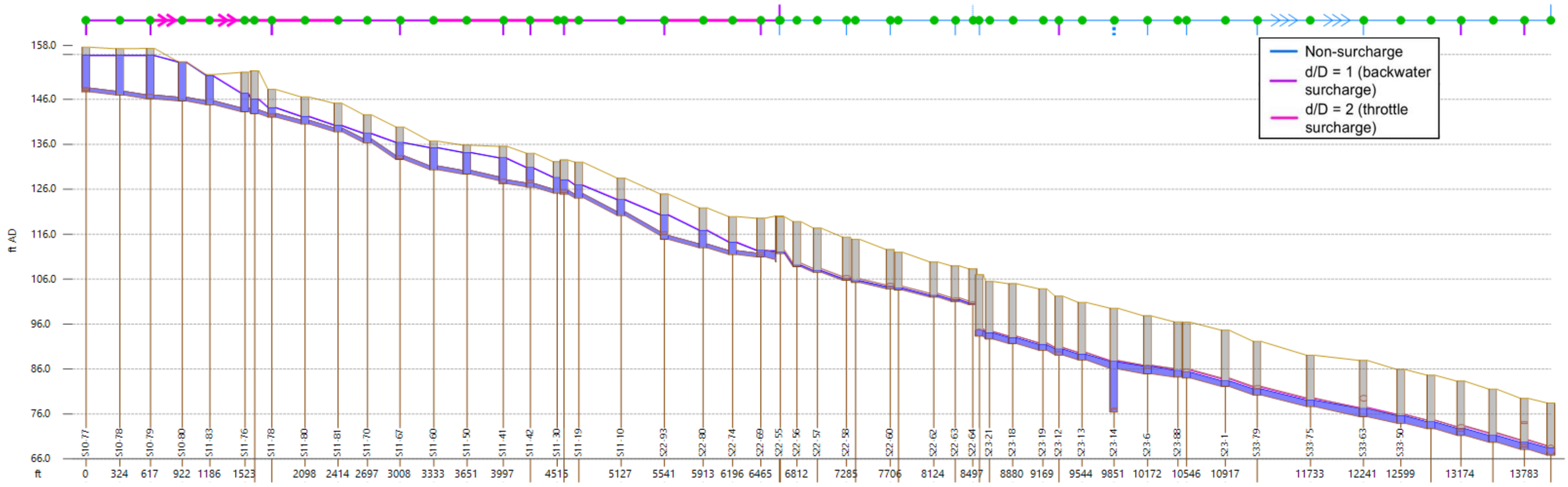
Project #: 0012307.00
Map Created: July 2024

Figure Exported: 7/17/2024 By: nbarreralopez Using: \\woodardcurran.net\shared\Projects\0012307.00 Santa Clara CA Sewer Master Plan Update\wip\C. GIS\3. ArcGIS Pro\SantaClaraSewerMasterPlan2023_TMFigures.aprx

Project 1: Agilent

Capacity Deficiency Profile View

Model Run Scenario: Wet Weather, Long-Term Future Loads, and Lined Model Network



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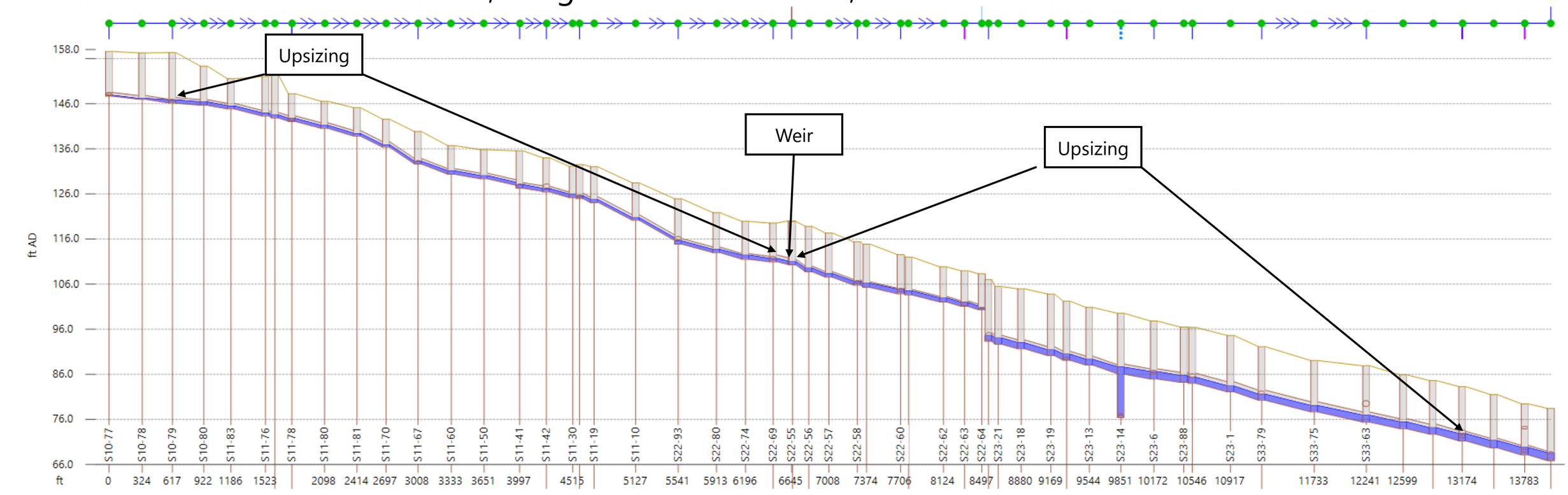
Project 1: Agilent

Project Solution Profile View

Model Run Scenario: Wet Weather, Long-Term Future Loads, and Lined Model Network



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Project 2: Homestead Road

PROJECT DESCRIPTION

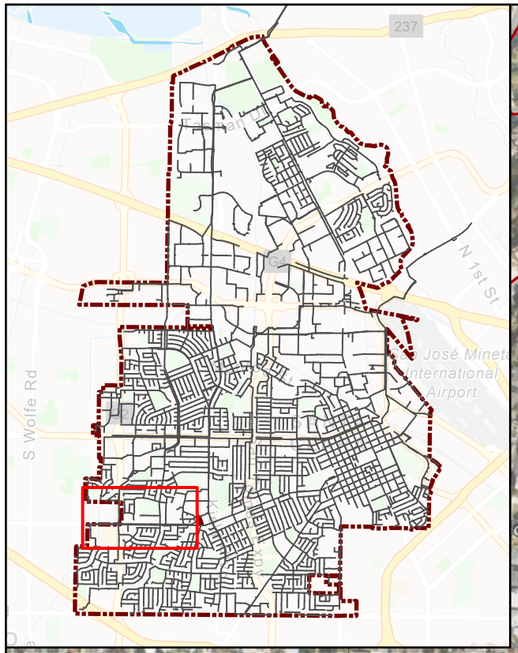
Project No.	2
Project ID	Homestead Road
Project Location	N Homestead Trunk from Swallow Wy to Saratoga Creek
Description	6407 LF of 24 to 33-inch diameter pipe
Priority	3
Flow Confidence Level	3
Loads Trigger	Long-Term Future Loads (LTFL)
Design Flow Trigger	Wet Weather Flow (WWF)
Physical Network Trigger	Unlined Model Network (UMN)
Estimated Capital Improvement Cost	$17,156,000
Comments	(i) Pipes are listed in order from upstream to downstream.
	(ii) A 50/50 flow split was assumed at the Lawrence/Homestead gate structure which splits flow between the eastern sewer on Homestead Rd or the northern sewer on Lawrence Expwy.
	(iii) Project also includes installation of a weir at manhole S20-16 to divert as much flow as possible to maximize capacity within upsized Homestead Rd (S Trunk). See Agilent project.
	(iv) Project would not include improvements to siphon between manholes S20-26 and S20-18. Per City records, siphon is unlined and made of polyethylene (internal diameter 20.2-inch).
	(v)
	(vi)
Assumptions	(i) New diameter based on pipe replacement.
	(ii) Cost estimates are based on CCI of 15367.24 from the August 2024 ENR.
Alternatives	N.A.

PROJECT COST DETAIL

U/S MH ID	D/S MH ID	Existing Diameter (inches)	New Diameter (inches)	Length (feet)	Slope (%)	Pipe Depth (feet BGL)	Existing Pipe Capacity (mgd)	Future Pipe Capacity (mgd)	Long-Term Future PDWF (mgd)	Long-Term Future PWWF (mgd)	Long-Term Future DWF Velocity (ft/sec)	Open Cut Cost	Trenchless Installation	Trenchless Casing Size	Unit Cost ($/LF)	Total Cost ($)
S20-9	S20-13	26	30	111	0.40	12	11.06	16.79	11.65	11.65	5.91	$1,139			$1,139	$ 126,315
S20-13	S20-37	26	30	49	0.40	12	11.07	16.79	11.65	11.65	6.14	$1,139			$1,139	$ 55,469
S20-37	S20-15	26	30	409	0.58	13	13.25	20.10	11.69	11.72	6.48	$1,139			$1,139	$ 465,851
S20-15	S20-26	27	30	33	0.51	14	-23.81	18.96	11.69	11.72	6.03	$1,139		16.00	$1,139	$ 37,815
S20-18	S20-19	30	33	22	0.23	16	12.56	16.20	11.96	11.99	4.17	$1,189		16.00	$1,189	$ 26,515
S20-19	S20-12	29	33	25	0.20	19	10.35	15.29	11.96	11.99	4.10	$1,219		16.00	$1,219	$ 30,475
S20-12	S20-21	29	33	386	0.20	19	10.41	15.37	11.96	11.99	3.72	$1,219			$1,219	$ 470,412
S20-21	S20-23	29	33	473	0.08	14	6.65	9.82	11.96	11.99	5.28	$1,189			$1,189	$ 562,040
S20-23	S20-10	29	33	45	0.11	13	7.71	11.39	11.96	11.99	5.99	$1,189			$1,189	$ 53,505
00_Gate_2	S21-43	29	33	372	0.30	13	12.58	18.59	5.74	5.75	4.61	$1,189	PTGAB	42.00	$2,531	$ 941,840
S21-43	S21-44	18	24	291	0.65	13	5.49	11.82	5.77	5.79	5.74	$1,039			$1,039	$ 302,765
S21-44	S21-45	18	24	399	0.69	14	5.65	12.17	5.79	5.81	5.87	$1,039			$1,039	$ 414,873
S21-45	S21-46	18	24	315	0.73	15	5.80	12.49	5.80	5.82	5.79	$1,039			$1,039	$ 327,701
S21-46	S21-47	18	24	113	0.67	16	5.55	11.95	5.80	5.82	5.80	$1,039			$1,039	$ 117,511
S21-47	S21-48	18	24	427	0.68	16	5.58	12.01	5.80	5.82	5.49	$1,039			$1,039	$ 443,861
S21-48	S21-9	18	24	189	0.59	15	5.19	11.19	5.80	5.82	5.37	$1,039			$1,039	$ 196,059
S21-9	S22-45	18	24	237	0.55	15	5.05	10.86	5.81	5.84	5.40	$1,039			$1,039	$ 246,035
S22-45	S22-46	18	24	312	0.73	16	5.79	12.47	5.82	5.84	5.66	$1,039			$1,039	$ 323,649
S22-46	S22-47	18	24	337	0.63	16	5.38	11.59	5.82	5.85	5.67	$1,039			$1,039	$ 350,039
S22-47	S22-48	18	24	31	0.66	15	5.51	11.87	5.82	5.85	5.78	$1,039			$1,039	$ 31,897
S22-48	S22-49	18	24	315	0.69	15	5.62	12.10	5.92	5.95	5.85	$1,039			$1,039	$ 327,701
S22-49	S22-50	18	24	367	0.68	15	5.58	12.02	5.92	5.95	5.77	$1,039			$1,039	$ 380,897
S22-50	S22-51	18	24	361	0.65	15	5.48	11.80	5.92	5.96	5.73	$1,039			$1,039	$ 375,495
S22-51	S22-52	20	24	469	0.64	16	7.17	11.72	5.92	5.96	4.37	$1,039			$1,039	$ 487,187
S22-52	S23-21	20	24	96	0.68	15	7.36	12.03	7.62	7.83	5.16	$1,039			$1,039	$ 99,744
S23-21	S23-18	20	24	223	0.45	15	6.02	9.84	7.62	7.83	5.40	$1,039			$1,039	$ 231,801

Total Baseline Pipe Construction Cost	$	6,485,611
Total Trenchless Installation Cost	$	941,840
No Jacking Pit	$	-
No Receiving Pit	$	-
Installation or Adjustment of Weir in Existing Manhole Structure (1)	$	45,000
Lateral Reconnection Cost (Approx. 21)	$	10,500
Modify Existing Manholes Cost (Approx. 26)	$	455,000
Baseline Construction Cost:	**$**	**7,937,951**
Dewatering	$	103,446
Bypass Pumping	$	742,745
Remove & Replace Factor	$	371,373
Traffic Control (10%)	$	742,745
Pavement Restoration (T-trench)	$	156,576
Subtotal:	**$**	**10,054,836**
Mobilization/Demobilization (5% of subtotal)	$	502,741.80
Estimated Construction Cost Subtotal:	**$**	**10,557,578**
Contingencies (30% of construction subtotal)	$	3,167,273.35
Estimated Construction Cost:	**$**	**13,724,851**
Engineering and Inspection (25% of construction cost)	$	3,431,213
Estimated Capital Improvement Cost:	**$**	**17,156,000**

(Note: Cost estimates are based on August 2024 ENR CCI of 15367.24 for the San Francisco Area)



Golden State Dr
Butcher Dr
Brockdale Dr
Curtis Ave
Bonetta Dr
Live Oak Dr
Lawrence Expy
Lawrence Expy
Burbank Dr
Ring Dr
Stratford Middle School
Pomeroy Ave
Quince Ave
Pepper Tree Ln
Apollo Pl
Miles Dr
Lochinvar Ave
Lorne Way
Homestead Rd
Princeton Way
Yale Ln
Ridge Rd
Alexander Ave
Ryan Ave
Homeridge Park
Kenyon Dr
Forbes Ave
Kaiser Permanente Santa Clara Medical Center

S20-9 S20-37 S20-13 S20-15 S20-16 S20-26 S20-18 S20-19 S20-21 S20-23 S20-10 S21-43 S21-44 S21-45 S21-46 S21-48 S21-9 S22-45 S22-46 S22-48 S22-49 S22-50 S22-51 S22-52

(25.7 in) 30 in

Weir Height: 6 in

(28.5 in) 33 in

(18 in) 24 in

Trenchless crossing of Lawrence Expressway

(20 in) 24 in

Project 2
Homestead Rd

Santa Clara Sewer Master Plan Update

Legend

Capacity Improvement Project

- Manholes
- Project Sewers
- **(8-in)** (Existing Diameter)
- **10-in** Proposed Diameter
- Proposed Weir
- Other Modeled Sewers

0 0.03 0.05 0.1 Miles

N

Project #: 0012307.00
Map Created: July 2024

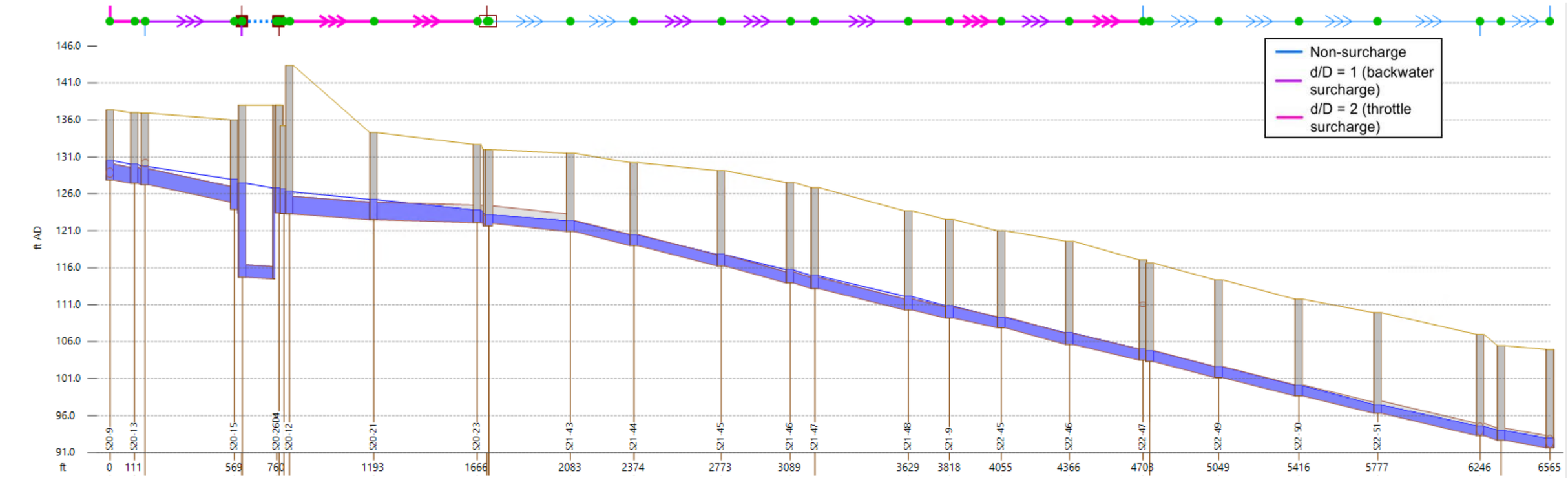
Woodard & Curran

Figure Exported: 7/17/2024 By: nbarreralopez Using: \\woodardcurran.net\shared\Projects\0012307.00 Santa Clara CA Sewer Master Plan Update\wip\C. GIS\3. ArcGIS Pro\SantaClaraSewerMasterPlan2023_TMFigures.aprx

Project 2: Homestead Rd

Capacity Deficiency Profile View

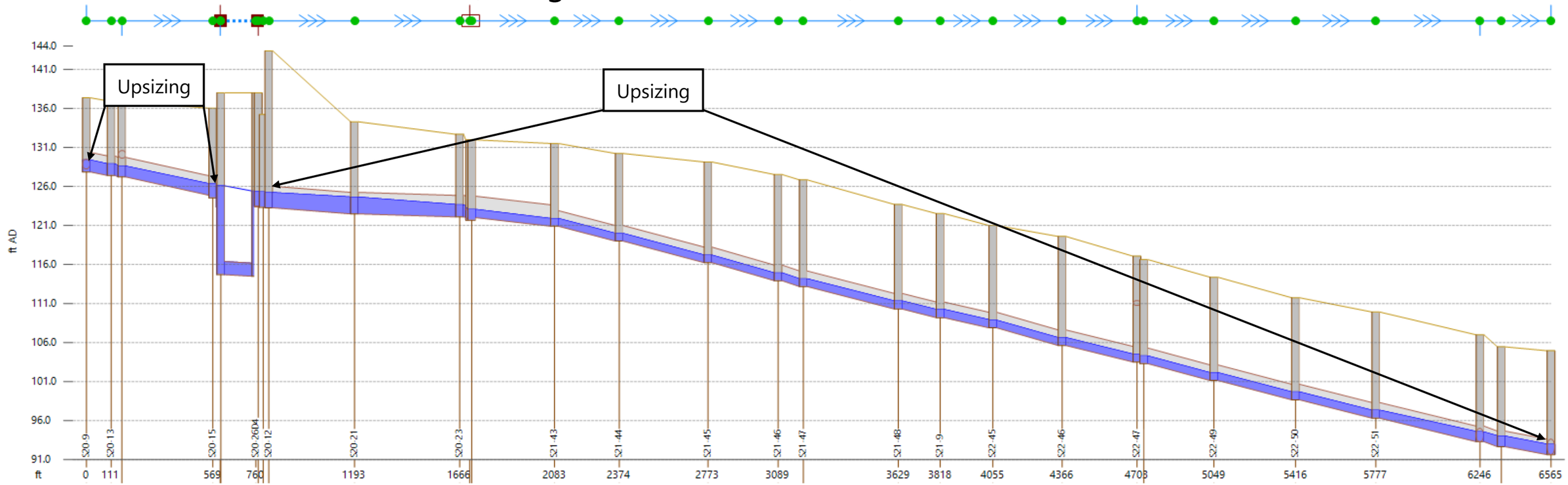
Model Run Scenario: Wet Weather, Long-Term Future Loads, and Lined Model Network



Link	-	-	S20-37.1	-	S20-12.1	S20-21.1	00_Gate_2.1	S21-43.1	S21-44.1	S21-45.1	-	S21-47.1	-	S21-9.1	S22-45.1	S22-46.1	S22-48.1	S22-49.1	S22-50.1	S22-51.1	-	S23-21.1
Conduit mate	RCP	-	RCP	PE	RCP	RCP	RCP	VCP	VCP	VCP	VCP	VCP	VCP	VCP	VCP	VCP	VCP	VCP	VCP	RCP	-	RCP
width (in)	25.7	-	25.7	20.2	28.5	28.5	28.5	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	20.0	-	20.0
length (ft)	-	-	409.0	158.0	385.9	472.7	372.1	291.4	399.3	315.4	-	427.2	188.7	236.8	311.5	336.9	315.4	366.6	361.4	468.9	-	223.1
pfc (MGD)	-	-	13.25	3.38	10.41	6.65	12.58	5.49	5.65	5.80	5.55	5.58	5.19	5.05	5.79	5.38	5.62	5.58	5.48	7.17	-	6.02
us inv (ft AD)	-	-	127.220	-	123.270	122.490	122.000	120.900	118.996	116.233	-	113.175	110.293	109.189	107.882	105.617	103.299	101.140	98.663	96.310	-	92.650
ds inv (ft AD)	-	-	124.870	-	122.490	122.100	120.900	118.996	116.233	113.931	-	110.293	109.189	107.882	105.617	103.502	101.140	98.663	96.310	93.300	-	91.640
surc	2.00	-	1.00	2.00	2.00	2.00	0.60	0.94	1.00	1.00	1.00	1.00	2.00	2.00	1.00	2.00	0.97	0.95	0.90	0.77	-	0.78
DS flow (MGD)	-	-	11.1434	5.8906	11.7801	11.7800	5.4006	5.4260	5.4089	5.4081	-	5.4073	5.4083	5.4184	5.4201	5.4208	5.5272	5.5265	5.5283	5.5273	-	5.7408
DS velocity (ft/s)	-	-	6.025	4.083	3.957	5.362	3.646	5.450	5.558	5.324	-	4.975	4.911	5.516	5.210	5.253	5.388	5.312	5.961	5.043	-	4.885

Node	S20-37	S20-15	-	S20-12	S20-21	S20-23	-	S21-43	S21-44	S21-45	S21-46	S21-47	S21-48	S21-9	S22-45	S22-46	-	-	S22-49	S22-50	S22-51	S22-52	-	-
ground (ft AD)	136.920	136.020	-	-	134.280	132.680	-	131.500	130.220	129.130	-	126.840	123.690	-	121.000	119.590	-	-	114.370	111.750	109.910	106.990	-	-
flood dep (ft)	-7.194	-8.084	-	-	-9.040	-8.884	-8.860	-9.163	-9.817	-11.337	-11.797	-11.895	-11.539	-11.668	-11.731	-12.398	-	-	-11.774	-11.703	-12.480	-12.416	-	-

Project 2: Homestead Rd
Project Solution Profile View
Model Run Scenario: Wet Weather, Long-Term Future Loads, and Lined Model Network



Link	-	-	S20-37.1	-	S20-12.1	S20-21.1	00_Gate_2.1	S21-43.1	S21-44.1	S21-45.1	-	S21-47.1	-	S21-9.1	S22-45.1	S22-46.1	S22-48.1	S22-49.1	S22-50.1	S22-51.1	-	S23-21.1
Conduit mate	RCP	-	RCP	PE	RCP	RCP	RCP	VCP	VCP	VCP	VCP	VCP	VCP	VCP	VCP	VCP	VCP	VCP	VCP	RCP	-	RCP
width (in)	30.0	-	30.0	20.2	33.0	33.0	33.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	-	24.0
length (ft)	-	-	409.0	158.0	385.9	472.7	372.1	291.4	399.3	315.4	-	427.2	188.7	236.8	311.5	336.9	315.4	366.6	361.4	468.9	-	223.1
pfc (MGD)	-	-	20.10	3.38	15.37	9.82	18.59	11.82	12.17	12.49	-	12.01	11.19	10.86	12.47	11.59	12.10	12.02	11.80	11.72	-	9.84
us inv (ft AD)	-	-	127.220	-	123.270	122.490	122.000	120.900	118.996	116.233	-	113.175	110.293	109.189	107.882	105.617	103.299	101.140	98.663	96.310	-	92.650
ds inv (ft AD)	-	-	124.870	-	122.490	122.100	120.900	118.996	116.233	113.931	-	110.293	109.189	107.882	105.617	103.502	101.140	98.663	96.310	93.300	-	91.640
surc	0.61	-	0.59	2.00	0.78	0.78	0.38	0.50	0.49	0.50	0.50	0.52	0.53	0.52	0.51	0.51	0.50	0.51	0.51	0.65	-	0.68
DS flow (MGD)	-	-	11.7184	5.9957	11.9855	11.9851	5.7539	5.7937	5.8074	5.8194	-	5.8206	5.8226	5.8367	5.8431	5.8455	5.9542	5.9539	5.9554	5.9556	-	7.8279
DS velocity (ft/s)	-	-	6.470	4.156	3.721	5.286	4.613	5.749	5.877	5.799	-	5.495	5.373	5.409	5.668	5.677	5.857	5.772	5.739	4.251	-	5.417

Node			S20-37	S20-15		-	S20-12	S20-21	S20-23	-	S21-43	S21-44	S21-45	S21-46	S21-47	S21-48	S21-9	S22-45	S22-46	-	-	S22-49	S22-50	S22-51	S22-52	-	-
ground (ft AD)			136.920	136.020		-	-	134.280	132.680	-	131.500	130.220	129.130	-	126.840	123.690	-	121.000	119.590	-	-	114.370	111.750	109.910	106.990	-	-
flood dep (ft)			-8.311	-9.674		-	-	-9.640	-9.011	-8.912	-9.608	-10.245	-11.932	-12.608	-12.677	-12.363	-12.288	-12.149	-12.961	-	-	-12.229	-12.075	-12.583	-12.389	-	-

Project 3: Kiely Boulevard

PROJECT DESCRIPTION

Project No.	3
Project ID	Kiely Boulevard
Project Location	Orthello Wy to S of El Sobrante St
Description	266 LF of 10-inch diameter pipe
Priority	6
Flow Confidence Level	4
Loads Trigger	Long-Term Future Loads (LTFL)
Design Flow Trigger	Wet Weather Flow (WWF)
Physical Network Trigger	Unlined Model Network (UMN)
Estimated Capital Improvement Cost	$513,000
Comments	(i) Pipes are listed in order from upstream to downstream.
	(ii) A 50/50 flow split was assumed at the Lawrence/Homestead gate structure which splits flow between the eastern sewer on Homestead Rd or the northern sewer on Lawrence Expwy.
	(iii)
	(iv)
	(v)
	(vi)
Assumptions	(i) New diameter based on pipe replacement.
	(ii) Cost estimates are based on CCI of 15367.24 from the August 2024 ENR.
Alternatives	N.A.

PROJECT COST DETAIL

U/S MH ID	D/S MH ID	Existing Diameter (inches)	New Diameter (inches)	Length (feet)	Slope (%)	Pipe Depth (feet BGL)	Existing Pipe Capacity (mgd)	Future Pipe Capacity (mgd)	Long-Term Future PDWF (mgd)	Long-Term Future PWWF (mgd)	Long-Term Future DWF Velocity (ft/sec)	Open Cut Cost	Trenchless Installation	Trenchless Casing Size	Unit Cost ($/LF)	Total Cost ($)
S33-42	S33-35	8	10	266	0.32	8	0.44	0.80	0.31	0.36	2.63	$704			$704	$ 187,053

Total Baseline Pipe Construction Cost	$	187,053
Total Trenchless Installation Cost	$	-
No Jacking Pit	$	-
No Receiving Pit	$	-
Installation or Adjustment of Weir in Existing Manhole Structure	$	-
Lateral Reconnection Cost (Approx. 6)	$	3,000
Modify Existing Manholes Cost (Approx. 2)	$	35,000
Baseline Construction Cost:	**$**	**225,053**
Dewatering	$	23,913
Bypass Pumping	$	18,705
Remove & Replace Factor	$	9,353
Traffic Control (10%)	$	18,705
Pavement Restoration (T-trench)	$	5,021
Subtotal:	**$**	**300,750**
Mobilization/Demobilization (5% of subtotal)	$	15,037.51
Estimated Construction Cost Subtotal:	**$**	**315,788**
Contingencies (30% of construction subtotal)	$	94,736.34
Estimated Construction Cost:	**$**	**410,524**
Engineering and Inspection(25% ofconstruction cost)	$	102,631
Estimated Capital Improvement Cost:	**$**	**513,000**

(Note: Cost estimates are based on August 2024 ENR CCI of 15367.24 for the San Francisco Area)

Project 3
Kiely Blvd

Santa Clara Sewer Master Plan Update

Legend

Capacity Improvement Project

- Manholes
- Other Modeled Sewers
- Project Sewers
- **(8-in)** (Existing Diameter)
- **10-in** Proposed Diameter

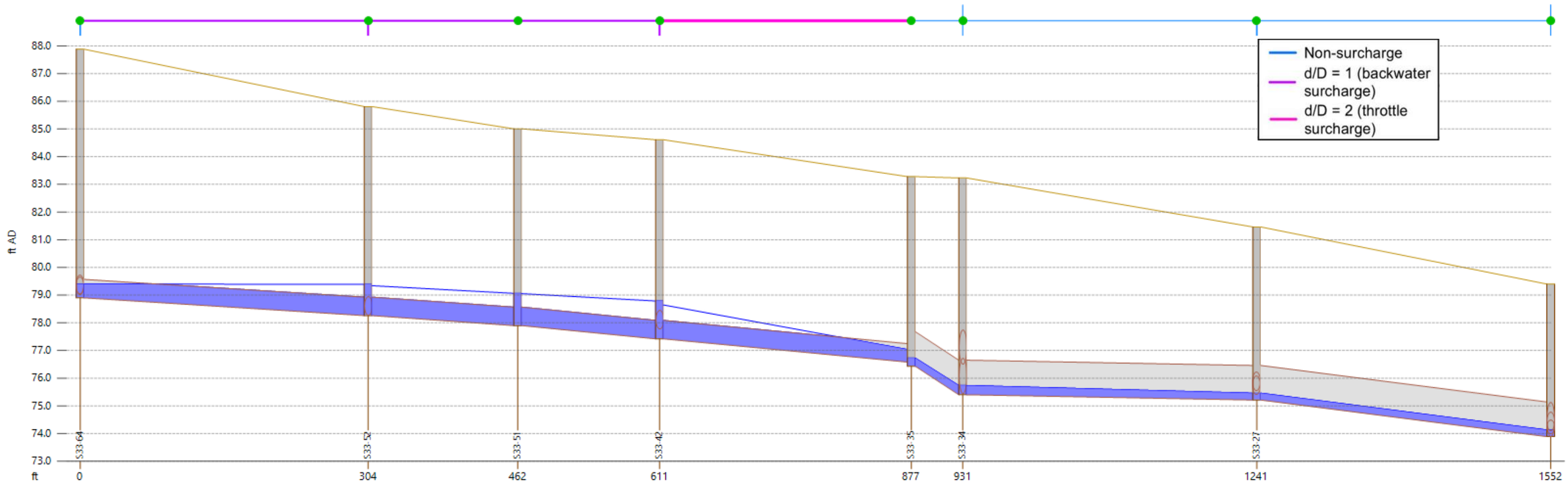
0 0.03 0.05 0.1 Miles

N

Project #: 0012307.00
Map Created: July 2024

Figure Exported: 7/17/2024 By: nbarreralopez Using: \\woodardcurran.net\shared\Projects\0012307.00 Santa Clara CA Sewer Master Plan Update\wip\C. GIS\3. ArcGIS Pro\SantaClaraSewerMasterPlan2023_TMFigures.aprx

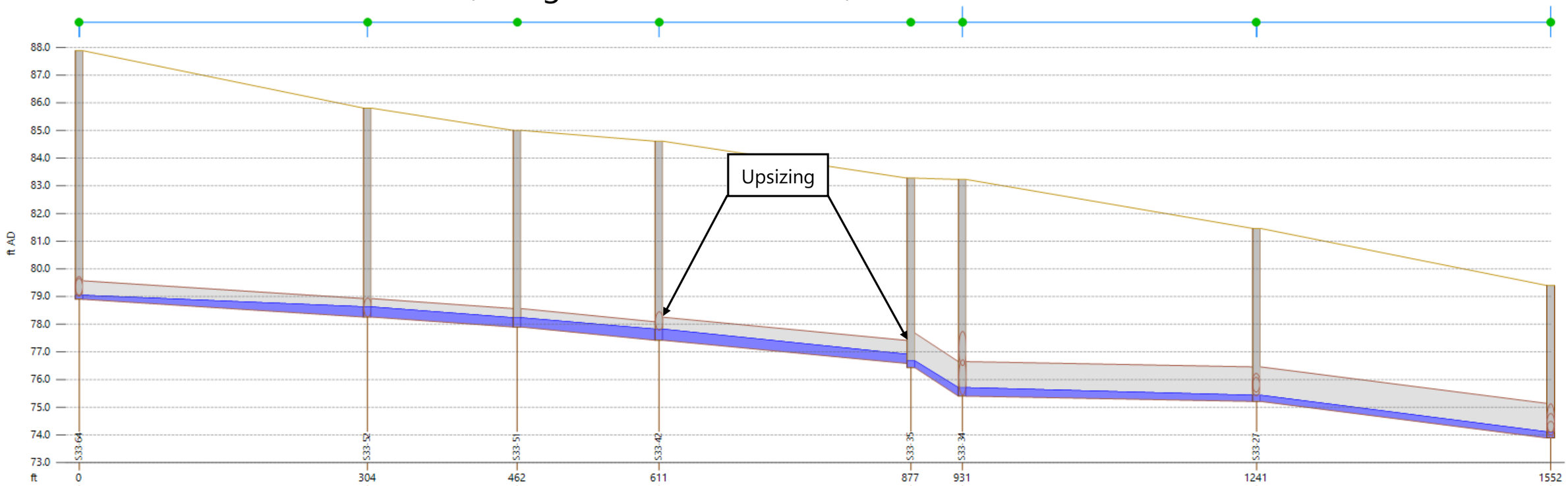
Project 3: Kiely Blvd
Capacity Deficiency Profile View
Model Run Scenario: Wet Weather, Long-Term Future Loads, and Lined Model Network



Link	S33-64.1	S33-52.1	S33-51.1	S33-42.1	S33-35.1	S33-34.2	S33-27.1
Conduit mate	VCP	VCP	VCP	VCP	VCP	VCP	VCP
width (in)	8.0	8.0	8.0	8.0	15.0	15.0	15.0
length (ft)	303.8	157.9	149.6	265.7	54.2	310.3	310.1
pfc (MGD)	0.36	0.37	0.44	0.44	5.76	1.03	2.72
us inv (ft AD)	78.900	78.260	77.900	77.420	76.430	75.400	75.210
ds inv (ft AD)	78.260	77.900	77.420	76.580	75.400	75.210	73.890
surc	1.00	1.00	1.00	2.00	0.27	0.27	0.20
DS flow (MGD)	0.0293	0.3206	0.3212	0.5881	0.5881	0.1644	0.2187
DS velocity (ft/s)	0.238	1.897	1.341	3.578	3.412	1.488	2.059

Node	S33-64	S33-52	S33-51	S33-42	S33-35	S33-34	S33-27	S33-17
ground (ft AD)	87.881	85.808	85.004	84.610	83.280	83.230	81.460	79.400
flood dep (ft)	-8.483	-6.414	-5.942	-5.823	-6.553	-7.493	-6.003	-5.270

Project 3: Kiely Blvd
Project Solution Profile View
Model Run Scenario: Wet Weather, Long-Term Future Loads, and Lined Model Network



Link	S33-64.1	S33-52.1	S33-51.1	S33-42.1	S33-35.1	S33-34.2	S33-27.1
Conduit mate	VCP	VCP	VCP	VCP	VCP	VCP	VCP
width (in)	8.0	8.0	8.0	10.0	15.0	15.0	15.0
length (ft)	303.8	157.9	149.6	265.7	54.2	310.3	310.1
pfc (MGD)	0.36	0.37	0.44	0.80	5.76	1.03	2.72
us inv (ft AD)	78.900	78.260	77.900	77.420	76.430	75.400	75.210
ds inv (ft AD)	78.260	77.900	77.420	76.580	75.400	75.210	73.890
surc	0.55	0.54	0.60	0.48	0.24	0.24	0.18
DS flow (MGD)	0.0299	0.2076	0.2081	0.3562	0.3562	0.1334	0.1687
DS velocity (ft/s)	0.337	1.864	1.487	2.740	2.373	1.426	1.828

Node	S33-64	S33-52	S33-51	S33-42	S33-35	S33-34	S33-27	S33-17
ground (ft AD)	87.881	85.808	85.004	84.610	83.280	83.230	81.460	79.400
flood dep (ft)	-8.838	-7.182	-6.774	-6.793	-6.606	-7.525	-6.030	-5.293

Project 4: Victoria Avenue

PROJECT DESCRIPTION

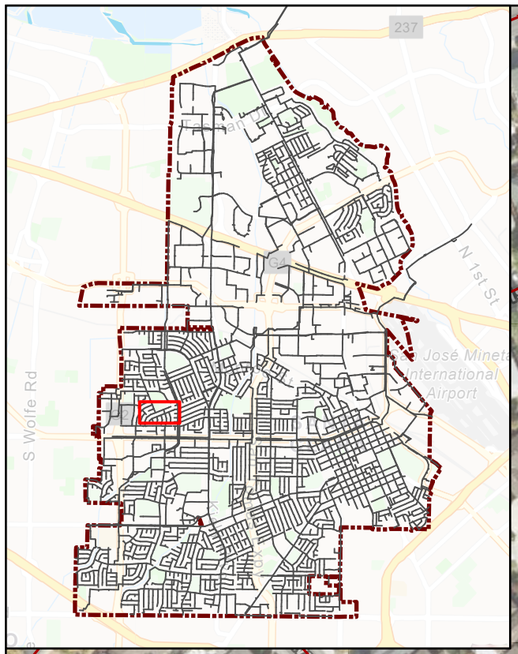
Project No.	4
Project ID	Victoria Avenue
Project Location	Fowler Ave & Pomeroy Ave to Nobili Ave & Victoria Ave
Description	764 LF of 10-inch diameter pipe
Priority	6
Flow Confidence Level	3
Loads Trigger	Long-Term Future Loads (LTFL)
Design Flow Trigger	Wet Weather Flow (WWF)
Physical Network Trigger	Unlined Model Network (UMN)
Estimated Capital Improvement Cost	$1,337,000
Comments	(i) Pipes are listed in order from upstream to downstream.
	(ii) A 50/50 flow split was assumed at the Lawrence/Homestead gate structure which splits flow between the eastern sewer on Homestead Rd or the northern sewer on Lawrence Expwy.
	(iii) Project would also would include abandonment 255 LF of existing 8-inch sewer between Fowler Avenue and Victoria Avenue (from manhole S42-48 to S42-36), which crosses through an easement underneath single-family residential parcels
	(iv) Two pipe segments between manholes S42-113 and S41-53 would have sufficient capacity and therefore were not included in the proposed project. However, considering these pipe segments are located between the proposed project and the recently upsized section downstream of manhole S41-53, the City may wish to consider expanding the project to include these pipes during preliminary design.
	(v)
	(vi)
Assumptions	(i) New diameter based on pipe replacement.
	(ii) Cost estimates are based on CCI of 15367.24 from the August 2024 ENR.
Alternatives	N.A.

PROJECT COST DETAIL

U/S MH ID	D/S MH ID	Existing Diameter (inches)	New Diameter (inches)	Length (feet)	Slope (%)	Pipe Depth (feet BGL)	Existing Pipe Capacity (mgd)	Future Pipe Capacity (mgd)	Long-Term Future PDWF (mgd)	Long-Term Future PWWF (mgd)	Long-Term Future DWF Velocity (ft/sec)	Open Cut Cost	Trenchless Installation	Trenchless Casing Size	Unit Cost ($/LF)	Total Cost ($)
S42-48	S42-47	8	10	253	0.36	8	0.48	0.84	0.31	0.38	2.13	$704			$704	$ 178,042
S42-47	S42-46	8	10	261	0.36	11	0.66	0.84	0.32	0.40	2.11	$704			$704	$ 183,814
S42-46	S42-113	N/A	10	250	0.36	12	N/A	0.85	0.33	0.43	2.21	$704			$704	$ 176,211

Total Baseline Pipe Construction Cost	$	538,067
Total Trenchless Installation Cost	$	-
No Jacking Pit	$	-
No Receiving Pit	$	-
Installation or Adjustment of Weir in Existing Manhole Structure	$	-
Lateral Reconnection Cost (Approx. 14)	$	7,000
Modify Existing Manholes Cost (Approx. 4)	$	70,000
Baseline Construction Cost:	**$**	**615,067**
Dewatering	$	46,026
Bypass Pumping	$	36,186
Remove & Replace Factor	$	18,093
Traffic Control (10%)	$	53,807
Pavement Restoration (T-trench)	$	14,444
Subtotal:	**$**	**783,622**
Mobilization/Demobilization (5% of subtotal)	$	39,181.12
Estimated Construction Cost Subtotal:	**$**	**822,803**
Contingencies (30% of construction subtotal)	$	246,841.03
Estimated Construction Cost:	**$**	**1,069,644**
Engineering and Inspection(25% ofconstruction cost)	$	267,411
Estimated Capital Improvement Cost:	**$**	**1,337,000**

(Note: Cost estimates are based on August 2024 ENR CCI of 15367.24 for the San Francisco Area)



Project 4
Victoria Ave

Santa Clara Sewer Master Plan Update

Legend

Capacity Improvement Project

- Manholes
- Modeled Sewers Included in the Project
- Other Modeled Sewers
- Pipe to be Abandoned

(8-in) (Existing Diameter)
10-in Proposed Diameter

0 0.03 0.05 0.1 Miles

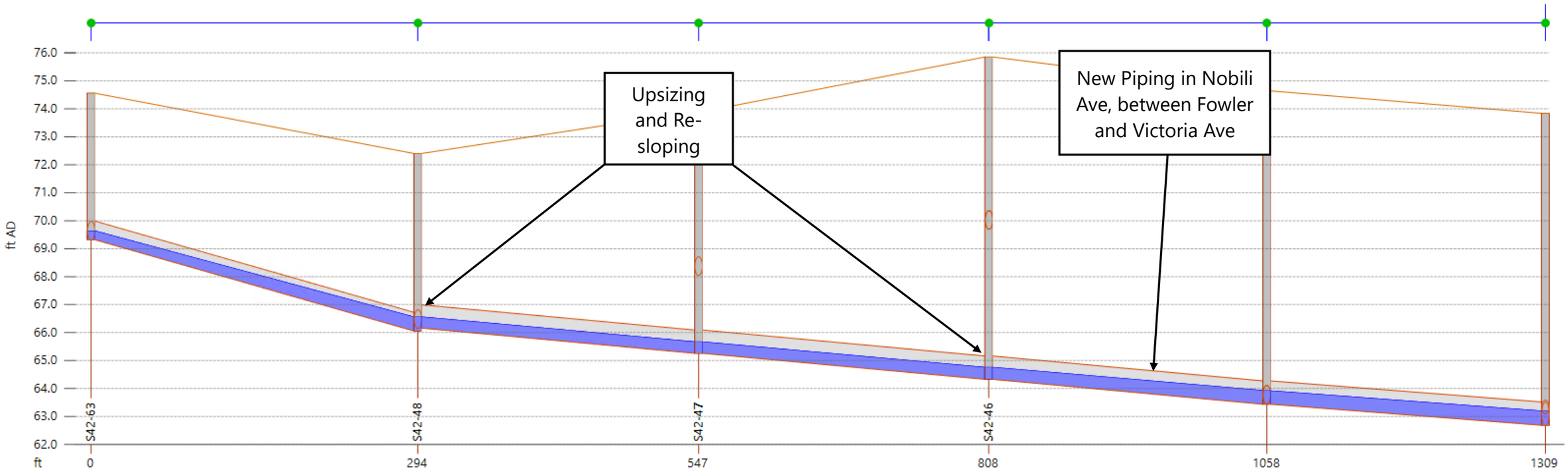
N

Woodard & Curran

Project #: 0012307.00
Map Created: July 2024

Figure Exported: 8/29/2024 By: nbarreralopez Using: \\woodardcurran.net\shared\Projects\0012307.00 Santa Clara CA Sewer Master Plan Update\wip\C. GIS\3. ArcGIS Pro\SantaClaraSewerMasterPlan2023.aprx

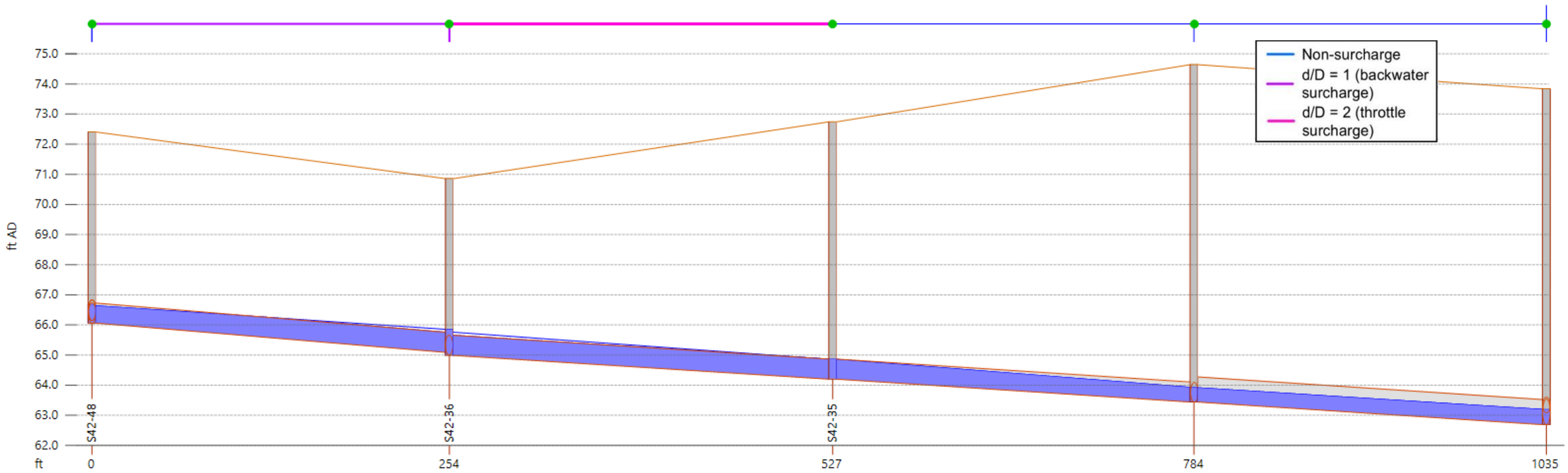
Project 4: Victoria Ave
Project Solution Profile View
Model Run Scenario: Wet Weather, Long-Term Future Loads, and Lined Model Network



Link	S42-63.1	S42-48.1	S42-47.1	S42-46.2	S42-113.1
Conduit mate	VCP	VCP	VCP	UNKN	VCP
width (in)	8.0	10.0	10.0	10.0	10.0
length (ft)	294.1	252.9	261.1	250.3	250.8
pfc (MGD)	0.82	0.84	0.84	0.85	0.77
us inv (ft AD)	69.320	66.160	65.260	64.331	63.440
ds inv (ft AD)	66.060	65.260	64.331	63.440	62.690
surc	0.75	0.49	0.51	0.58	0.61
DS flow (MGD)	0.3530	0.3807	0.3958	0.4253	0.4726
DS velocity (ft/s)	1.954	2.231	2.194	1.997	2.111

Node	S42-63	S42-48	S42-47	S42-46	S42-113	S41-55
ground (ft AD)	74.557	72.405	73.900	75.851	74.640	73.840
flood dep (ft)	-4.926	-5.848	-8.234	-11.096	-10.713	-10.644

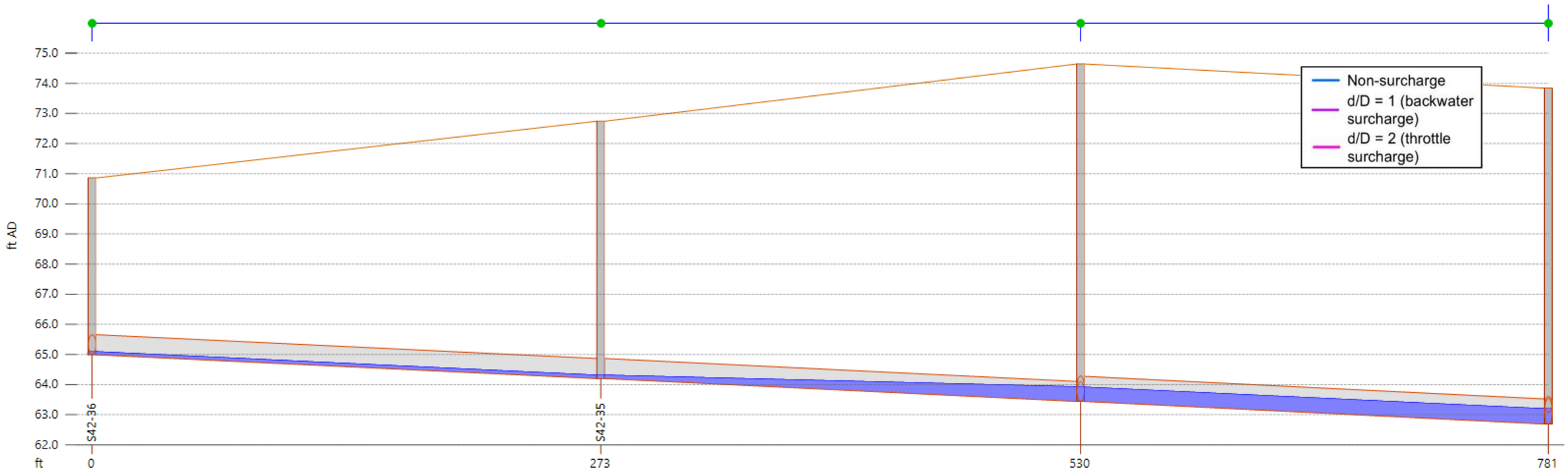
Project 4: Victoria Ave
Capacity Deficiency Profile View
Model Run Scenario: Wet Weather, Long-Term Future Loads, and Lined Model Network



Link	S42-48.1	S42-36.1	S42-35.1	S42-113.1
Conduit mate	VCP	VCP	VCP	VCP
width (in)	8.0	8.0	8.0	10.0
length (ft)	254.4	272.7	257.1	250.8
pfc (MGD)	0.48	0.42	0.42	0.77
us inv (ft AD)	66.060	64.990	64.200	63.440
ds inv (ft AD)	65.090	64.200	63.440	62.690
surc	1.00	2.00	0.99	0.60
DS flow (MGD)	0.4240	0.4403	0.4452	0.4695
DS velocity (ft/s)	2.636	2.081	2.517	2.109

Node	S42-48	S42-36	S42-35	S42-113	S41-55
ground (ft AD)	72.405	70.858	72.742	74.640	73.840
flood dep (ft)	-5.724	-5.010	-7.879	-10.715	-10.647

Project 4: Victoria Ave
Project Solution Profile View
Model Run Scenario: Wet Weather, Long-Term Future Loads, and Lined Model Network



Link	S42-36.1	S42-35.1	S42-113.1
Conduit mate	VCP	VCP	VCP
width (in)	8.0	8.0	10.0
length (ft)	272.7	257.1	250.8
pfc (MGD)	0.42	0.42	0.77
us inv (ft AD)	64.990	64.200	63.440
ds inv (ft AD)	64.200	63.440	62.690
surc	0.17	0.73	0.61
DS flow (MGD)	0.0178	0.0227	0.4726
DS velocity (ft/s)	0.698	0.138	2.111

Node	S42-36	S42-35	S42-113	S41-55
ground (ft AD)	70.858	72.742	74.640	73.840
flood dep (ft)	-5.767	-8.429	-10.713	-10.644

Project 5: Cabrillo Avenue

PROJECT DESCRIPTION

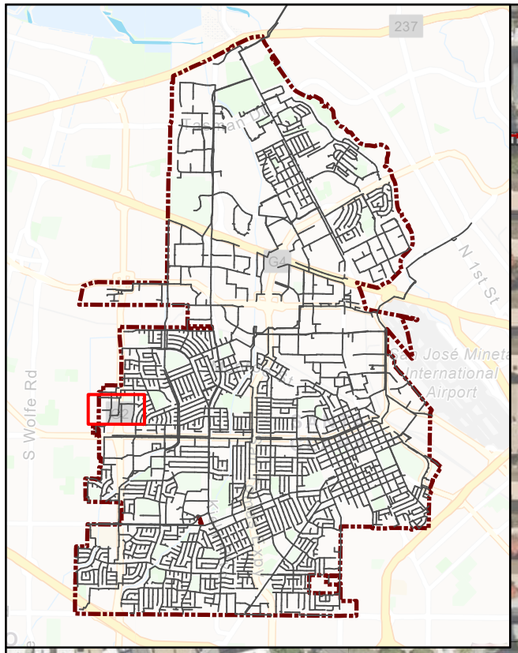
Project No.	5
Project ID	Cabrillo Avenue
Project Location	Halford Ave & Buckley St; St. Lawrence Dr, W of Lawrence Expwy
Description	Flow Diversion Weirs only. No pipe replacement.
Priority	1
Flow Confidence Level	3
Loads Trigger	Existing Loads (EL)
Design Flow Trigger	Wet Weather Flow (WWF)
Physical Network Trigger	Unlined Model Network (UMN)
Estimated Capital Improvement Cost	$154,000
Comments	(i) Pipes are listed in order from upstream to downstream. (ii) A 50/50 flow split was assumed at the Lawrence/Homestead gate structure which splits flow between the eastern sewer on Homestead Rd or the northern sewer on Lawrence Expwy. (iii) Project would include installation of two weirs at manholes S40-16 and S41-38 to divert flow away from capacity deficient sewers along Cabrillo Ave and maximize use of available capacity within existing adjacent sewers. Weirs would be installed at the intersection of Halford Ave and Buckley St and Lawrence Expwy and Saint Lawrence Dr. (iv) Two pipe segments between manholes S42-113 and S41-53 would have sufficient capacity and therefore were not included in the proposed project. However, considering these pipe segments are located between the proposed project and the recently upsized section downstream of manhole S41-53, the City may wish to consider expanding the project to include these pipes during preliminary design. (v) (vi)
Assumptions	(i) Cost estimates are based on CCI of 15367.24 from the August 2024 ENR. (ii)
Alternatives	Upsize existing 8-inch pipes to 12-inch along Cabrillo Avenue from manhole S41-13 to S41-20.

PROJECT COST DETAIL

U/S MH ID	D/S MH ID	Existing Diameter (inches)	New Diameter (inches)	Length (feet)	Slope (%)	Pipe Depth (feet BGL)	Existing Pipe Capacity (mgd)	Future Pipe Capacity (mgd)	Long-Term Future PDWF (mgd)	Long-Term Future PWWF (mgd)	Long-Term Future DWF Velocity (ft/sec)	Open Cut Cost	Trenchless Installation	Trenchless Casing Size	Unit Cost ($/LF)	Total Cost ($)
															$0	$ -

Total Baseline Pipe Construction Cost	$	-
Total Trenchless Installation Cost	$	-
No Jacking Pit	$	-
No Receiving Pit	$	-
Installation or Adjustment of Weir in Existing Manhole Structure (2)	$	90,000
Lateral Reconnection Cost (Approx. 0)	$	-
Modify Existing Manholes Cost (Approx. 0)	$	-
Baseline Construction Cost:	**$**	**90,000**
Dewatering	$	-
Bypass Pumping	$	-
Remove & Replace Factor	$	-
Traffic Control (N/A)	$	-
Pavement Restoration	$	-
Subtotal:	**$**	**90,000**
Mobilization/Demobilization (5% of subtotal)	$	4,500.00
Estimated Construction Cost Subtotal:	**$**	**94,500**
Contingencies (30% of construction subtotal)	$	28,350.00
Estimated Construction Cost:	**$**	**122,850**
Engineering and Inspection(25% ofconstruction cost)	$	30,713
Estimated Capital Improvement Cost:	**$**	**154,000**

(Note: Cost estimates are based on August 2024 ENR CCI of 15367.24 for the San Francisco Area)



Project 5
Cabrillo Ave

Santa Clara Sewer Master Plan Update

Legend

Capacity Improvement Project

- Proposed Weir
- Manholes Within the Project Area
- Pipes within the Project Area (not Part of the Project)
- Other Modeled Sewers

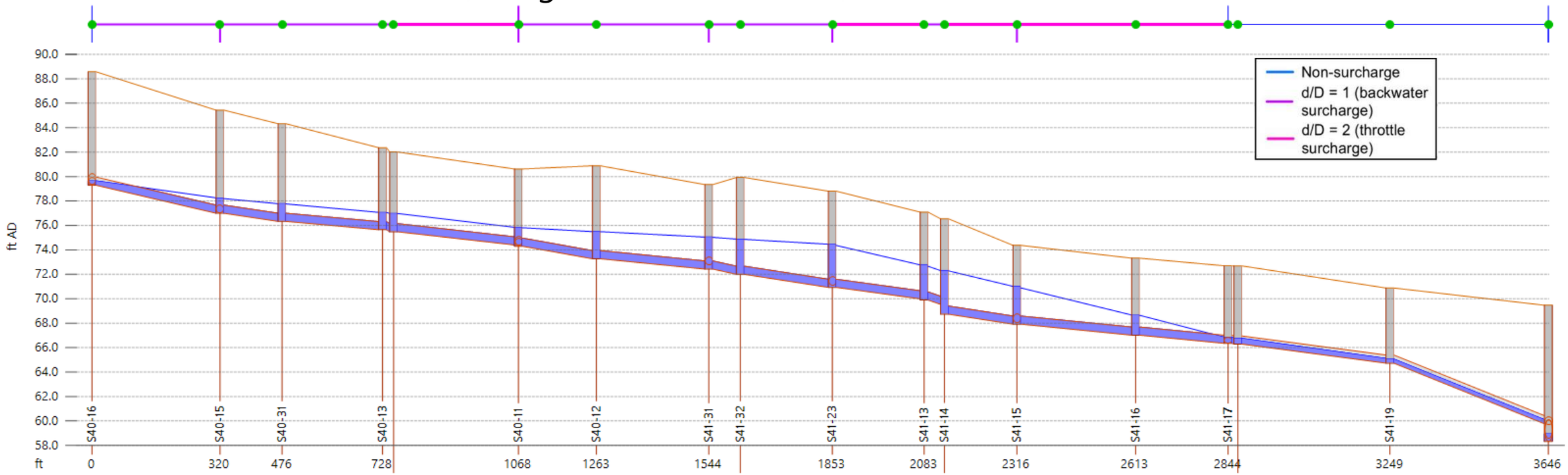
0 0.03 0.05 0.1 Miles

N

Project #: 0012307.00
Map Created: July 2024

Figure Exported: 10/20/2024 By: nbarreralopez Using: \\woodardcurran.net\shared\Projects\0012307.00 Santa Clara CA Sewer Master Plan Update\wipC. GIS\3. ArcGIS Pro\SantaClaraSewerMasterPlan2023_TMFigures.aprx

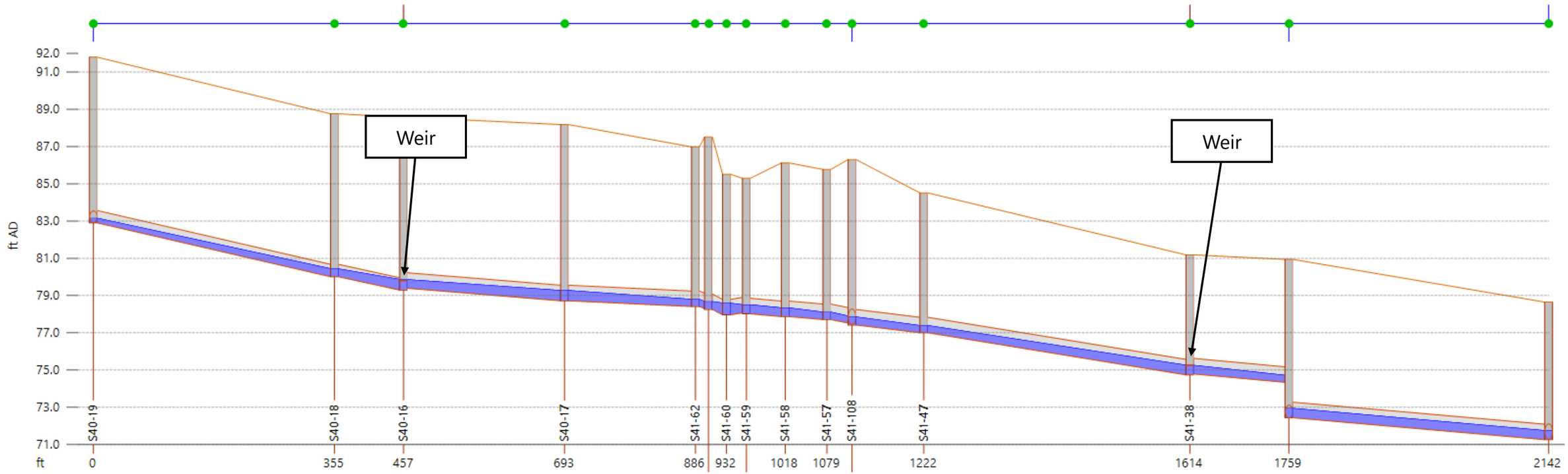
Project 5: Cabrillo Ave
Capacity Deficiency Profile View
Model Run Scenario: Wet Weather, Long-Term Future Loads, and Lined Model Network



Link	S40-16.1	S40-15.1	S40-31.1	S40-30.1	S40-11.2	S40-12.1	-	S41-32.1	S41-23.1	-	S41-14.1	S41-15.1	S41-16.1	S41-18.1	S41-19.1
Conduit mate	VCP	VCP	VCP	VCP	VCP	VCP	VCP	VCP	VCP	-	VCP	VCP	VCP	VCP	VCP
width (in)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
length (ft)	320.4	155.4	251.7	312.6	195.2	281.4	79.0	230.0	230.1	-	181.3	297.3	231.3	380.7	396.5
pfc (MGD)	0.66	0.51	0.41	0.46	0.57	0.43	0.58	0.53	0.50	-	0.53	0.43	0.42	0.50	0.87
us inv (ft AD)	79.290	77.000	76.330	75.480	74.300	73.270	-	72.000	70.930	-	68.740	67.920	67.020	66.290	64.730
ds inv (ft AD)	77.000	76.330	75.650	74.400	73.270	72.430	-	70.930	69.990	-	67.920	67.020	66.350	64.730	59.770
surc	1.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	2.00	-	2.00	2.00	2.00	0.70	0.50
DS flow (MGD)	0.3525	0.4006	0.4006	0.4989	0.3167	0.3134	-	0.4026	0.6401	-	0.6429	0.6674	0.6720	0.4138	0.4214
DS velocity (ft/s)	2.110	1.984	2.468	3.272	2.006	2.006	-	1.649	3.368	-	2.527	2.759	3.687	3.099	3.717

Node	S40-16	S40-15	S40-31	S40-13	S40-30	S40-11	S40-12	S41-31	S41-32	S41-23	S41-13	-	S41-15	S41-16	-	S41-18	S41-19	S41-20
ground (ft AD)	88.574	85.436	84.320	82.361	82.009	80.620	80.880	79.342	79.921	78.804	77.090	-	74.370	73.320	72.700	72.690	70.880	69.470
flood dep (ft)	-8.928	-7.182	-6.543	-5.291	-5.025	-4.784	-5.385	-4.293	-5.037	-4.342	-4.331	-	-3.355	-4.656	-5.842	-5.930	-5.818	-10.524

Project 5: Cabrillo Ave
Project Solution Profile View
Model Run Scenario: Wet Weather, Long-Term Future Loads, and Lined Model Network



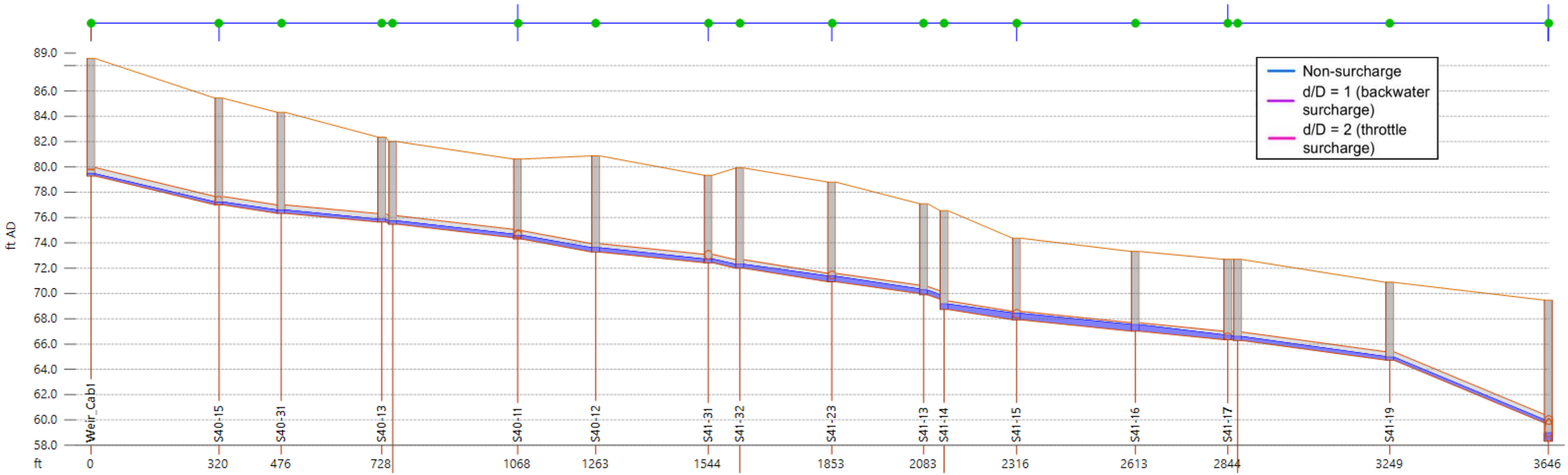
Link	S40-19.1	S40-18.1	S40-16.2	S40-17.1	-	-	-	-	-	-	S41-108.1	S41-47.1	S41-38.2	S41-39.1
Conduit mate	VCP	VCP	VCP	VCP	-	-	-	VCP	VCP	-	VCP	VCP	VCP	VCP
width (in)	8.0	8.0	10.0	10.0	-	-	-	10.0	10.0	-	10.0	10.0	10.0	10.0
length (ft)	354.9	101.8	236.8	192.7	-	-	-	57.1	61.3	-	105.7	391.5	145.6	382.2
pfc (MGD)	0.70	0.66	0.75	0.57	-	-	-	0.72	0.73	-	0.89	1.08	0.79	0.79
us inv (ft AD)	82.900	80.010	79.390	78.720	-	-	-	-	77.870	-	77.420	77.000	74.790	72.440
ds inv (ft AD)	80.010	79.290	78.720	78.410	-	-	-	-	77.710	-	77.000	74.740	74.340	71.260
surc	0.64	0.85	0.65	0.65	-	-	-	0.57	0.55	-	0.51	0.62	0.55	0.60
DS flow (MGD)	0.4327	0.4954	0.4377	0.4526	-	-	-	-	0.4525	-	0.4525	0.4525	0.4516	0.5192
DS velocity (ft/s)	2.841	2.427	1.792	2.879	-	-	-	2.257	2.778	-	2.854	1.984	2.962	2.439

Node	S40-19	S40-18	S40-16	S40-17	S41-62			-	-	-	-	S41-47	S41-38	S41-39	S41-40
ground (ft AD)	91.798	88.761	88.574	88.180	86.984			-	-	-	-	84.510	81.184	80.945	78.649
flood dep (ft)	-8.652	-8.326	-8.723	-8.914	-8.193			-	-	-	-	-7.127	-5.932	-8.007	-6.904

Project 5: Cabrillo Ave

Project Solution Profile View 1 of 2 (*Sewers Along Cabrillo Avenue*)

Model Run Scenario: Wet Weather, Long-Term Future Loads, and Lined Model Network



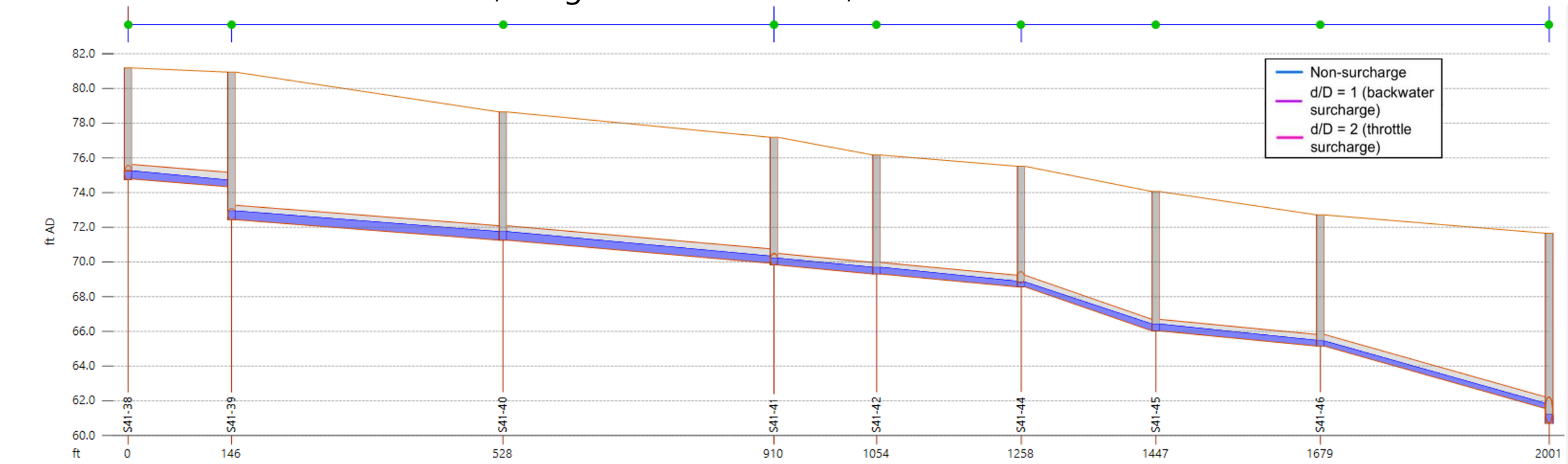
Link	Weir_Cab1.1	S40-15.1	S40-31.1	S40-30.1	S40-11.2	S40-12.1	-	S41-32.1	S41-23.1	-	S41-14.1	S41-15.1	S41-16.1	S41-18.1	S41-19.1
Conduit mate	VCP	VCP	VCP	VCP	VCP	VCP	VCP	VCP	VCP	-	VCP	VCP	VCP	VCP	VCP
width (in)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
length (ft)	320.4	155.4	251.7	312.6	195.2	281.4	79.0	230.0	230.1	-	181.3	297.3	231.3	380.7	396.5
pfc (MGD)	0.66	0.51	0.41	0.46	0.57	0.43	0.58	0.53	0.50	-	0.53	0.43	0.42	0.50	0.87
us inv (ft AD)	79.290	77.000	76.330	75.480	74.300	73.270	-	72.000	70.930	-	68.740	67.920	67.020	66.290	64.730
ds inv (ft AD)	77.000	76.330	75.650	74.400	73.270	72.430	-	70.930	69.990	-	67.920	67.020	66.350	64.730	59.770
surc	0.33	0.39	0.39	0.42	0.50	0.50	0.44	0.66	0.63	-	0.78	0.76	0.76	0.45	0.35
DS flow (MGD)	0.0733	0.1219	0.1219	0.2209	0.2021	0.2021	-	0.2029	0.3520	-	0.3548	0.3797	0.3844	0.2067	0.2145
DS velocity (ft/s)	1.138	1.500	1.921	2.488	1.808	2.225	-	1.316	2.919	-	1.894	2.056	3.023	2.427	3.019

Node	-	S40-15	S40-31	S40-13	S40-30	S40-11	S40-12	S41-31	S41-32	S41-23	S41-13	-	S41-15	S41-16	-	S41-18	S41-19	S41-20
ground (ft AD)	88.574	85.436	84.320	82.361	82.009	80.620	80.880	79.342	79.921	78.804	77.090	-	74.370	73.320	72.700	72.690	70.880	69.470
flood dep (ft)	-9.121	-8.215	-7.730	-6.495	-6.273	-6.036	-7.279	-6.629	-7.627	-7.435	-6.833	-	-5.927	-5.792	-6.022	-6.098	-5.919	-10.503

Project 5: Cabrillo Ave

Project Solution Profile View 2 of 2 (*Sewers Downstream of Proposed Diversions*)

Model Run Scenario: Wet Weather, Long-Term Future Load, and Lined Model Network



Link	S41-38.2	S41-39.1	S41-40.1	S41-41.2	S41-42.1	S41-44.1	S41-45.1	S41-46.1
Conduit mate	VCP	VCP	VCP	VCP	VCP	VCP	VCP	VCP
width (in)	10.0	10.0	10.0	8.0	8.0	8.0	8.0	8.0
length (ft)	145.6	382.2	381.7	144.6	203.5	189.7	231.6	322.2
pfc (MGD)	0.79	0.79	0.84	0.47	0.47	0.90	0.48	0.83
us inv (ft AD)	74.790	72.440	71.260	69.830	69.310	68.570	66.030	65.160
ds inv (ft AD)	74.340	71.260	69.930	69.310	68.570	66.030	65.160	61.560
surc	0.55	0.60	0.58	0.57	0.57	0.58	0.57	0.43
DS flow (MGD)	0.4516	0.5192	0.5302	0.2798	0.2809	0.2893	0.2937	0.3008
DS velocity (ft/s)	2.962	2.439	3.123	2.101	2.699	2.146	2.740	3.236

Node	-	S41-39	S41-40	S41-41	S41-42	S41-44	S41-45	S41-46	S41-37
ground (ft AD)	81.184	80.945	78.649	77.188	76.168	75.517	74.060	72.718	71.660
flood dep (ft)	-5.932	-8.007	-6.904	-6.978	-6.478	-6.679	-7.645	-7.274	-10.461

Project 6: CMC Basin

PROJECT DESCRIPTION

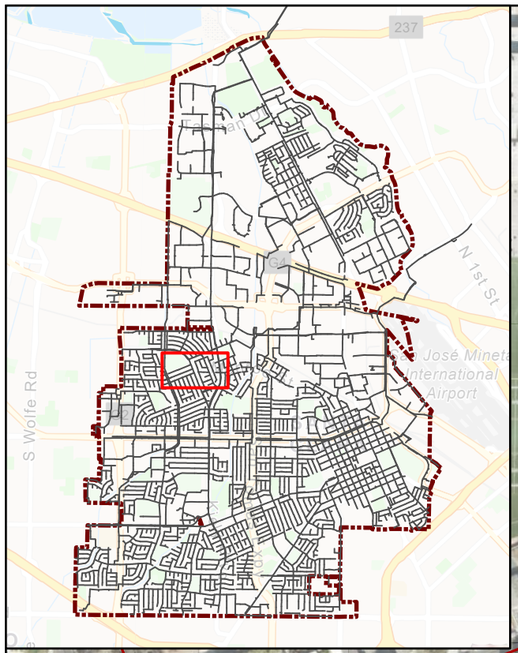
Project No.	6
Project ID	CMC Basin
Project Location	Santa Maria Ave & Francis Ave; Amethyst Dr
Description	3655 LF of 12 to 15-inch diameter pipe
Priority	1
Flow Confidence Level	1 & 2
Loads Trigger	Existing Loads (EL)
Design Flow Trigger	Wet Weather Flow (WWF)
Physical Network Trigger	Unlined Model Network (UMN)
Estimated Capital Improvement Cost	$7,263,000
Comments	(i) Pipes are listed in order from upstream to downstream. (ii) A 50/50 flow split was assumed at the Lawrence/Homestead gate structure which splits flow between the eastern sewer on Homestead Rd or the northern sewer on Lawrence Expwy. (iii) It is recommended that the City conduct infiltration and inflow (I/I) investigations prior to project implementation to attempt to pinpoint and eliminate significant sources of excessive I/I within the CMC Basin, if possible. (iv) Model runs show that the proposed upsizing project would be needed to meet the City's depth to diameter (d/D) ratio criteria. However, it would not meet the City's velocity design criteria under PDWF (i.e., minimum of 2 feet per second) within the upsized 12-inch pipe segments between manholes S43-14 and S53-103 on Amethyst Dr and within the upsized 15-inch pipe segments between manholes S52-104 and S53-74 on Santa Maria Ave. (v) (vi)
Assumptions	(i) New diameter based on pipe replacement. (ii) Cost estimates are based on CCI of 15367.24 from the August 2024 ENR.
Alternatives	Eliminate significant sources of excessive I/I. However, model runs show that the rainfall dependent I/I would need to be reduced by at least 50-60% to eliminate the capacity deficiency.

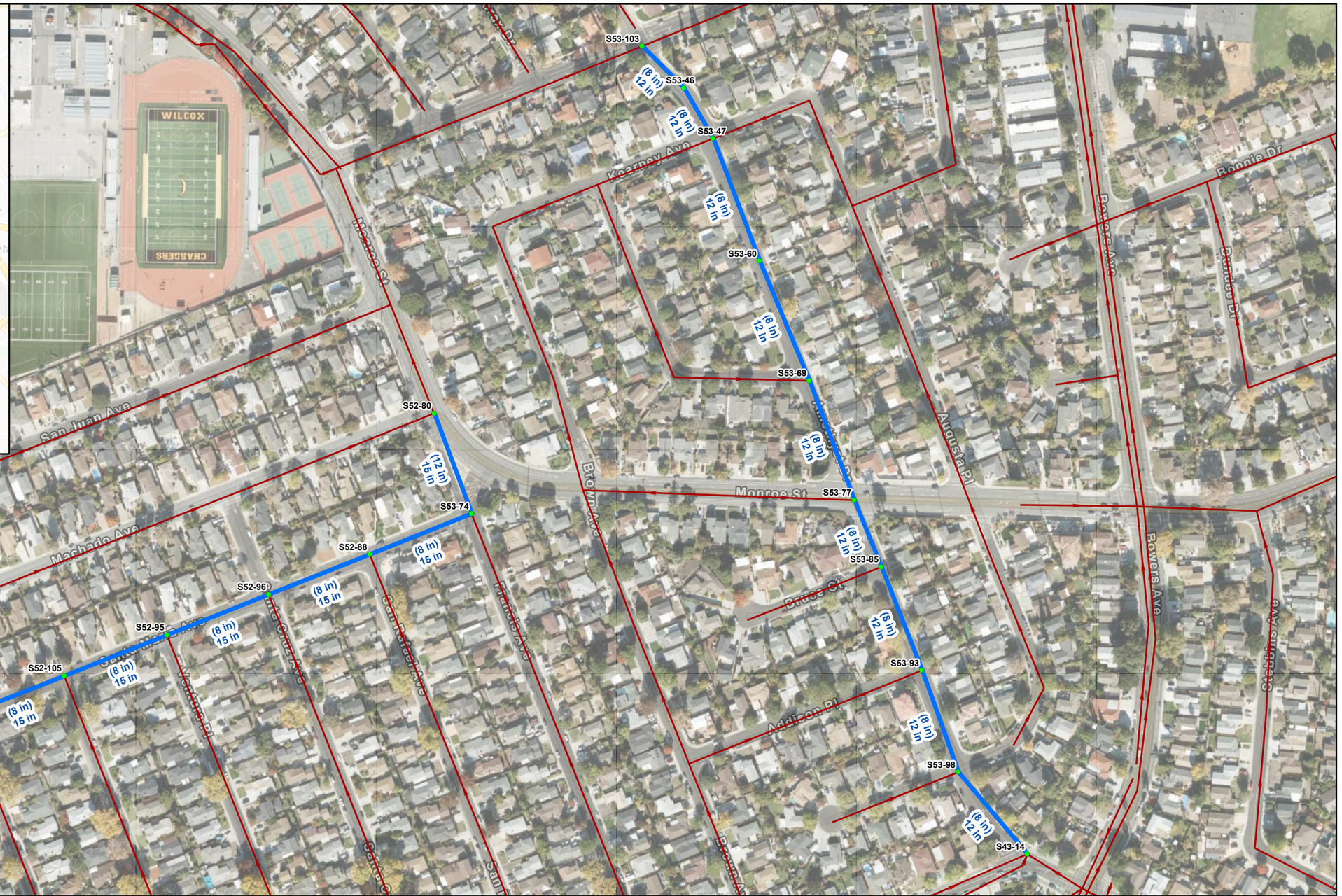
PROJECT COST DETAIL

U/S MH ID	D/S MH ID	Existing Diameter (inches)	New Diameter (inches)	Length (feet)	Slope (%)	Pipe Depth (feet BGL)	Existing Pipe Capacity (mgd)	Future Pipe Capacity (mgd)	Long-Term Future PDWF (mgd)	Long-Term Future PWWF (mgd)	Long-Term Future DWF Velocity (ft/sec)	Open Cut Cost	Trenchless Installation	Trenchless Casing Size	Unit Cost ($/LF)	Total Cost ($)
S52-104	S52-105	8	15	252	0.38	9	0.48	2.57	0.09	0.44	1.30	$804			$804	$ 202,447
S52-105	S52-95	8	15	260	0.42	9	0.50	2.69	0.10	0.57	1.30	$804			$804	$ 208,638
S52-95	S52-96	8	15	257	0.35	9	0.46	2.46	0.11	0.68	1.25	$804			$804	$ 206,628
S52-96	S52-88	8	15	256	0.33	9	0.45	2.38	0.13	0.95	0.74	$804			$804	$ 205,422
S52-88	S53-74	8	15	257	0.53	10	0.57	3.03	0.15	1.10	0.56	$804			$804	$ 206,708
S53-74	S52-80	12	15	252	0.75	11	1.99	3.61	0.19	1.57	2.23	$804			$804	$ 202,206
S43-14	S53-98	8	12	251	0.35	8	0.46	1.36	0.04	0.55	1.00	$754			$754	$ 189,556
S53-98	S53-93	8	12	254	0.35	8	0.46	1.36	0.05	0.61	0.97	$754			$754	$ 191,214
S53-93	S53-85	8	12	261	0.31	8	0.43	1.28	0.06	0.70	1.43	$754			$754	$ 196,643
S53-85	S53-77	8	12	169	0.37	8	0.47	1.39	0.06	0.76	1.45	$754			$754	$ 127,652
S53-77	S53-69	8	12	300	0.33	9	0.45	1.32	0.06	0.80	1.22	$754			$754	$ 225,898
S53-69	S53-60	8	12	304	0.37	8	0.47	1.39	0.07	0.84	1.21	$754			$754	$ 229,291
S53-60	S53-47	8	12	308	0.32	8	0.44	1.30	0.07	0.88	1.05	$754			$754	$ 232,157
S53-47	S53-46	8	12	137	0.35	7	0.46	1.36	0.10	1.14	1.72	$754			$754	$ 103,223
S53-46	S53-103	8	12	139	0.35	7	0.46	1.36	0.10	1.14	1.72	$754			$754	$ 104,655

Total Baseline Pipe Construction Cost	$	2,832,339
Total Trenchless Installation Cost	$	-
No Jacking Pit	$	-
No Receiving Pit	$	-
Installation or Adjustment of Weir in Existing Manhole Structure	$	-
Lateral Reconnection Cost (Approx. 69)	$	34,500
Modify Existing Manholes Cost (Approx. 16)	$	280,000
Baseline Construction Cost:	**$**	**3,146,839**
Dewatering	$	328,932
Bypass Pumping	$	283,234
Remove & Replace Factor	$	141,617
Traffic Control (10%)	$	283,234
Pavement Restoration (T-trench)	$	72,880
Subtotal:	**$**	**4,256,736**
Mobilization/Demobilization (5% of subtotal)	$	212,836.82
Estimated Construction Cost Subtotal:	**$**	**4,469,573**
Contingencies (30% of construction subtotal)	$	1,340,871.96
Estimated Construction Cost:	**$**	**5,810,445**
Engineering and Inspection (25% of construction cost)	$	1,452,611
Estimated Capital Improvement Cost:	**$**	**7,263,000**

(Note: Cost estimates are based on August 2024 ENR CCI of 15367.24 for the San Francisco Area)





Project 6
CMC Basin

Santa Clara Sewer Master Plan Update

Legend

Capacity Improvement Project

- Manholes
- Other Modeled Sewers
- Project Sewers
- **(8-in)** (Existing Diameter)
- **10-in** Proposed Diameter

0 0.03 0.05 0.1 Miles

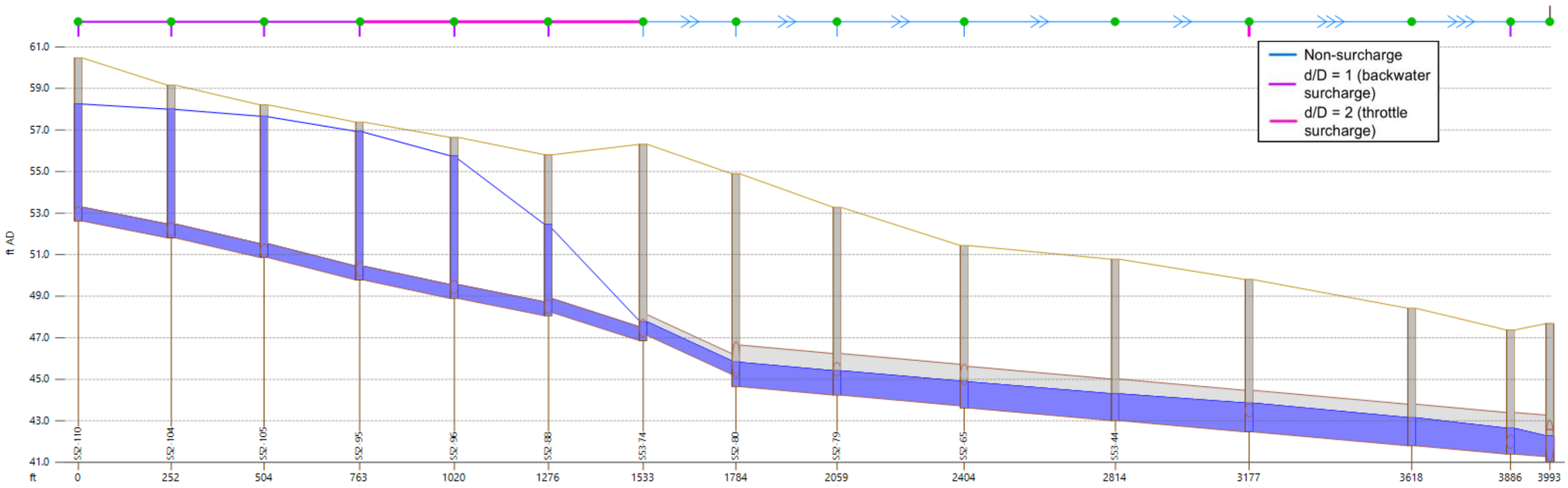
N

Project #: 0012307.00
Map Created: July 2024

Woodard & Curran

Figure Exported: 7/16/2024 By: nbarreralopez Using: \\woodardcurran.net\shared\Projects\0012307.00 Santa Clara CA Sewer Master Plan Update\wip\C. GIS\3. ArcGIS Pro\SantaClaraSewerMasterPlan2023.aprx

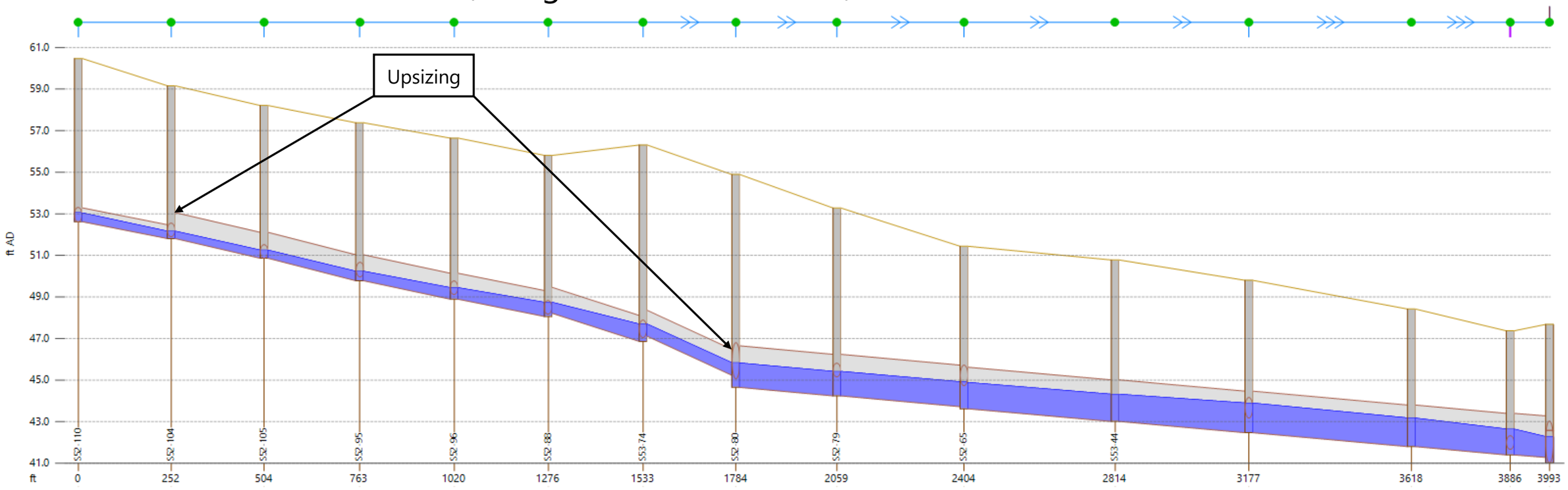
Project 6: CMC Basin - Santa Maria Avenue
Capacity Deficiency Profile View
Model Run Scenario: Wet Weather, Long-Term Future Loads, and Lined Model Network



Link	S52-110.1	S52-104.1	S52-105.1	S52-95.1	S52-96.1	S52-88.1	S53-74.1	S52-80.1	S52-79.1	S52-65.1	S53-44.1	S53-103.1	S53-9.1	-
Conduit mate	VCP	VCP	VCP	VCP	VCP	VCP	VCP	PE	PE	PE	PE	PE	PE	PE
width (in)	8.0	8.0	8.0	8.0	8.0	8.0	12.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
length (ft)	252.0	251.8	259.5	257.0	255.5	257.1	251.5	274.5	344.7	410.4	362.7	441.5	267.9	106.9
pfc (MGD)	0.44	0.48	0.50	0.46	0.45	0.57	1.99	5.65	5.68	5.64	5.64	5.70	5.65	4.90
us inv (ft AD)	52.620	51.810	50.860	49.780	48.890	48.210	47.110	44.650	44.240	43.620	43.010	42.470	41.800	41.400
ds inv (ft AD)	51.810	50.860	49.780	48.890	48.060	46.860	45.230	44.240	43.720	43.010	42.470	41.800	41.400	41.280
surc	1.00	1.00	1.00	2.00	2.00	2.00	0.65	0.58	0.59	0.65	0.69	0.69	0.67	0.62
DS flow (MGD)	0.2889	0.3774	0.4747	0.5709	0.8616	1.0161	1.4822	3.5628	3.5951	3.9762	3.9797	4.6972	4.7003	5.0382
DS velocity (ft/s)	1.704	1.872	1.809	2.081	3.244	4.307	4.259	2.891	2.882	2.871	2.675	3.222	3.553	4.990

Node	-	S52-104	S52-105	S52-95	S52-96	S52-88	S53-74	S52-80	S52-79	S52-65	S53-44	S53-103	S53-9	S53-40	-
ground (ft AD)	60.470	59.160	58.210	57.380	56.640	55.810	56.310	54.890	53.280	51.440	50.780	49.800	48.420	47.370	-
flood dep (ft)	-2.210	-1.154	-0.547	-0.441	-0.883	-3.359	-8.542	-9.064	-7.872	-6.534	-6.480	-5.943	-5.271	-4.730	-

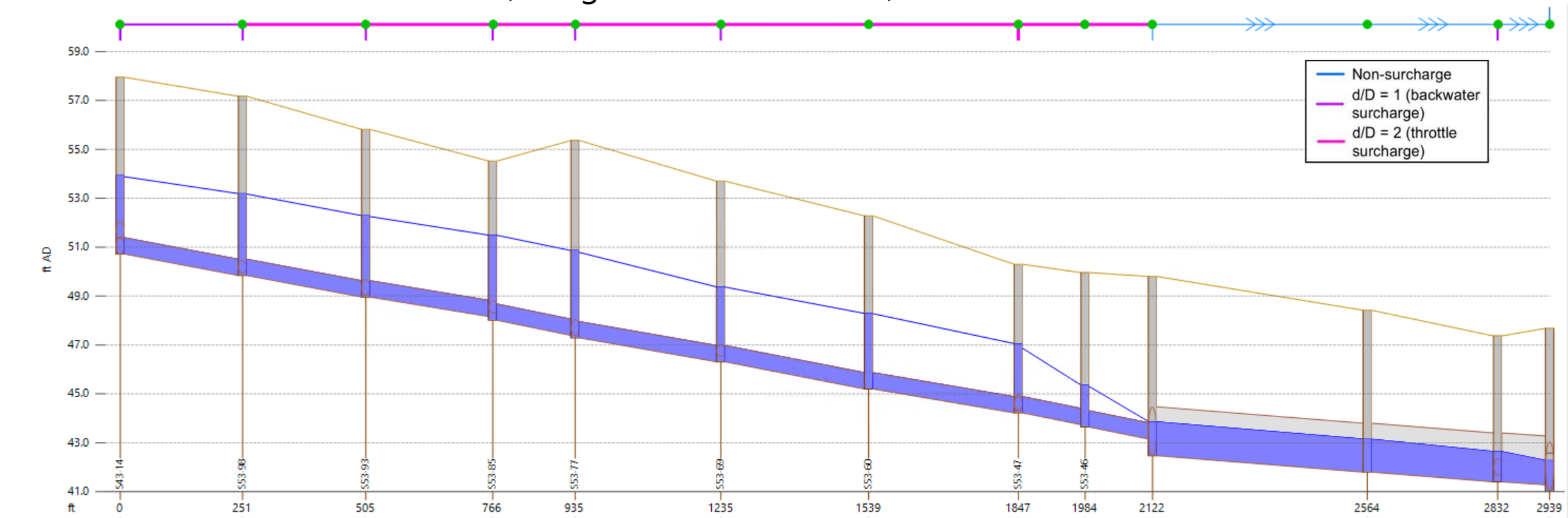
Project 6: CMC Basin - Santa Maria Avenue
Project Solution Profile View
Model Run Scenario: Wet Weather, Long-Term Future Loads, and Lined Model Network



Link	S52-110.1	S52-104.1	S52-105.1	S52-95.1	S52-96.1	S52-88.1	S53-74.1	S52-80.1	S52-79.1	S52-65.1	S53-44.1	S53-103.1	S53-9.1	-
Conduit mate	VCP	VCP	VCP	VCP	VCP	VCP	VCP	PE	PE	PE	PE	PE	PE	PE
width (in)	8.0	15.0	15.0	15.0	15.0	15.0	15.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
length (ft)	252.0	251.8	259.5	257.0	255.5	257.1	251.5	274.5	344.7	410.4	362.7	441.5	267.9	106.9
pfc (MGD)	0.44	2.57	2.69	2.46	2.38	3.03	3.61	5.65	5.68	5.64	5.64	5.70	5.65	4.90
us inv (ft AD)	52.620	51.810	50.860	49.780	48.890	48.210	47.110	44.650	44.240	43.620	43.010	42.470	41.800	41.400
ds inv (ft AD)	51.810	50.860	49.780	48.890	48.060	46.860	45.230	44.240	43.720	43.010	42.470	41.800	41.400	41.280
surc	0.63	0.31	0.36	0.44	0.54	0.67	0.48	0.59	0.60	0.65	0.71	0.71	0.68	0.62
DS flow (MGD)	0.3220	0.4411	0.5672	0.6812	0.9465	1.1017	1.5691	3.5805	3.6129	3.9946	3.9983	4.8694	4.8723	5.0473
DS velocity (ft/s)	2.668	2.098	2.201	2.026	2.171	1.965	4.357	2.892	2.873	2.876	2.683	3.272	3.677	4.993

Node	-	S52-104	S52-105	S52-95	S52-96	S52-88	S53-74	S52-80	S52-79	S52-65	S53-44	S53-103	S53-9	S53-40	-
ground (ft AD)	60.470	59.160	58.210	57.380	56.640	55.810	56.310	54.890	53.280	51.440	50.780	49.800	48.420	47.370	-
flood dep (ft)	-7.419	-6.998	-6.961	-7.149	-7.200	-7.076	-8.619	-9.059	-7.867	-6.527	-6.464	-5.907	-5.246	-4.728	-

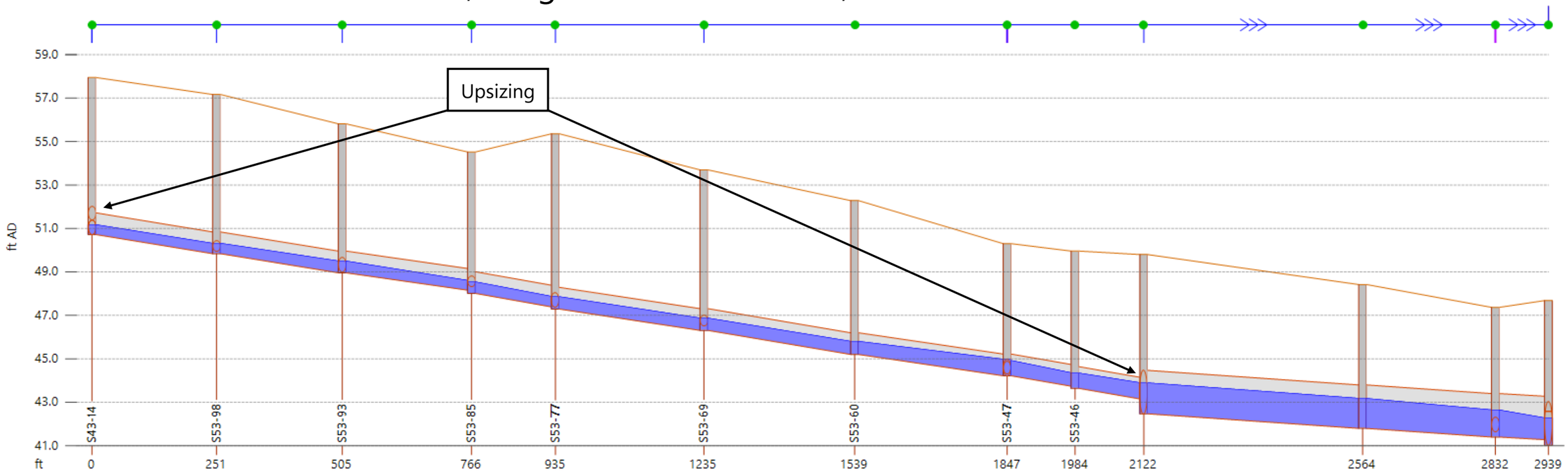
Project 6: CMC Basin - Amethyst Drive
Capacity Deficiency Profile View
Model Run Scenario: Wet Weather, Long-Term Future Loads, and Lined Model Network



Link	S43-14.1	S53-98.1	S53-93.1	S53-85.1	S53-77.1	S53-69.1	S53-60.1	S53-47.1	S53-46.1	S53-103.1	S53-9.1	S53-40.1
Conduit mate	VCP	VCP	VCP	VCP	VCP	VCP	VCP	VCP	VCP	PE	PE	PE
width (in)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	24.0	24.0	24.0
length (ft)	251.4	253.6	260.8	169.3	299.6	304.1	307.9	136.9	138.8	441.5	267.9	106.9
pfc (MGD)	0.46	0.46	0.43	0.47	0.45	0.47	0.44	0.46	0.46	5.70	5.65	4.90
us inv (ft AD)	50.720	49.840	48.960	48.010	47.290	46.310	45.200	44.220	43.640	42.470	41.800	41.400
ds inv (ft AD)	49.840	48.960	48.160	47.390	46.310	45.200	44.220	43.740	43.153	41.800	41.400	41.280
surc	1.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	0.69	0.67	0.62
DS flow (MGD)	0.4121	0.4642	0.5388	0.5911	0.5330	0.4722	0.4964	0.8055	0.8055	4.6970	4.7001	5.0379
DS velocity (ft/s)	1.997	1.823	3.057	2.709	2.211	2.095	2.033	3.333	4.069	3.222	3.553	4.990

Node	S43-14	S53-98	S53-93	S53-85	S53-77	S53-69	S53-60	S53-47	S53-46	S53-103	S53-9	S53-40	-
ground (ft AD)	57.950	57.169	55.816	54.522	55.360	53.697	52.281	50.300	49.960	49.800	48.420	47.370	-
flood dep (ft)	-4.024	-3.980	-3.527	-3.029	-4.498	-4.324	-3.991	-3.246	-4.604	-5.943	-5.271	-4.730	-

Project 6: CMC Basin - Amethyst Drive
Project Solution Profile View
Model Run Scenario: Wet Weather, Long-Term Future Loads, and Lined Model Network



Link	S43-14.1	S53-98.1	S53-93.1	S53-85.1	S53-77.1	S53-69.1	S53-60.1	S53-47.1	S53-46.1	S53-103.1	S53-9.1	-
Conduit mate	VCP	VCP	VCP	VCP	VCP	VCP	VCP	VCP	VCP	PE	PE	PE
width (in)	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	24.0	24.0	24.0
length (ft)	251.4	253.6	260.8	169.3	299.6	304.1	307.9	136.9	138.8	441.5	267.9	106.9
pfc (MGD)	1.36	1.36	1.28	1.39	1.32	1.39	1.30	1.36	1.36	5.70	5.65	4.90
us inv (ft AD)	50.720	49.840	48.960	48.010	47.290	46.310	45.200	44.220	43.640	42.470	41.800	41.400
ds inv (ft AD)	49.840	48.960	48.160	47.390	46.310	45.200	44.220	43.740	43.153	41.800	41.400	41.280
surc	0.47	0.54	0.53	0.53	0.56	0.60	0.75	0.70	0.74	0.71	0.68	0.62
DS flow (MGD)	0.5531	0.6086	0.7036	0.7568	0.7994	0.8433	0.8759	1.1428	1.1424	4.8693	4.8723	5.0473
DS velocity (ft/s)	2.351	2.192	3.246	3.218	2.729	2.650	2.133	3.570	3.738	3.272	3.677	4.993

Node	S43-14	S53-98	S53-93	S53-85	S53-77	S53-69	S53-60	S53-47	S53-46	S53-103	S53-9	S53-40	-
ground (ft AD)	57.950	57.169	55.816	54.522	55.360	53.697	52.281	50.300	49.960	49.800	48.420	47.370	-
flood dep (ft)	-6.782	-6.858	-6.319	-5.984	-7.494	-6.826	-6.481	-5.327	-5.608	-5.907	-5.246	-4.728	-

Project 7: Bowers Avenue

PROJECT DESCRIPTION

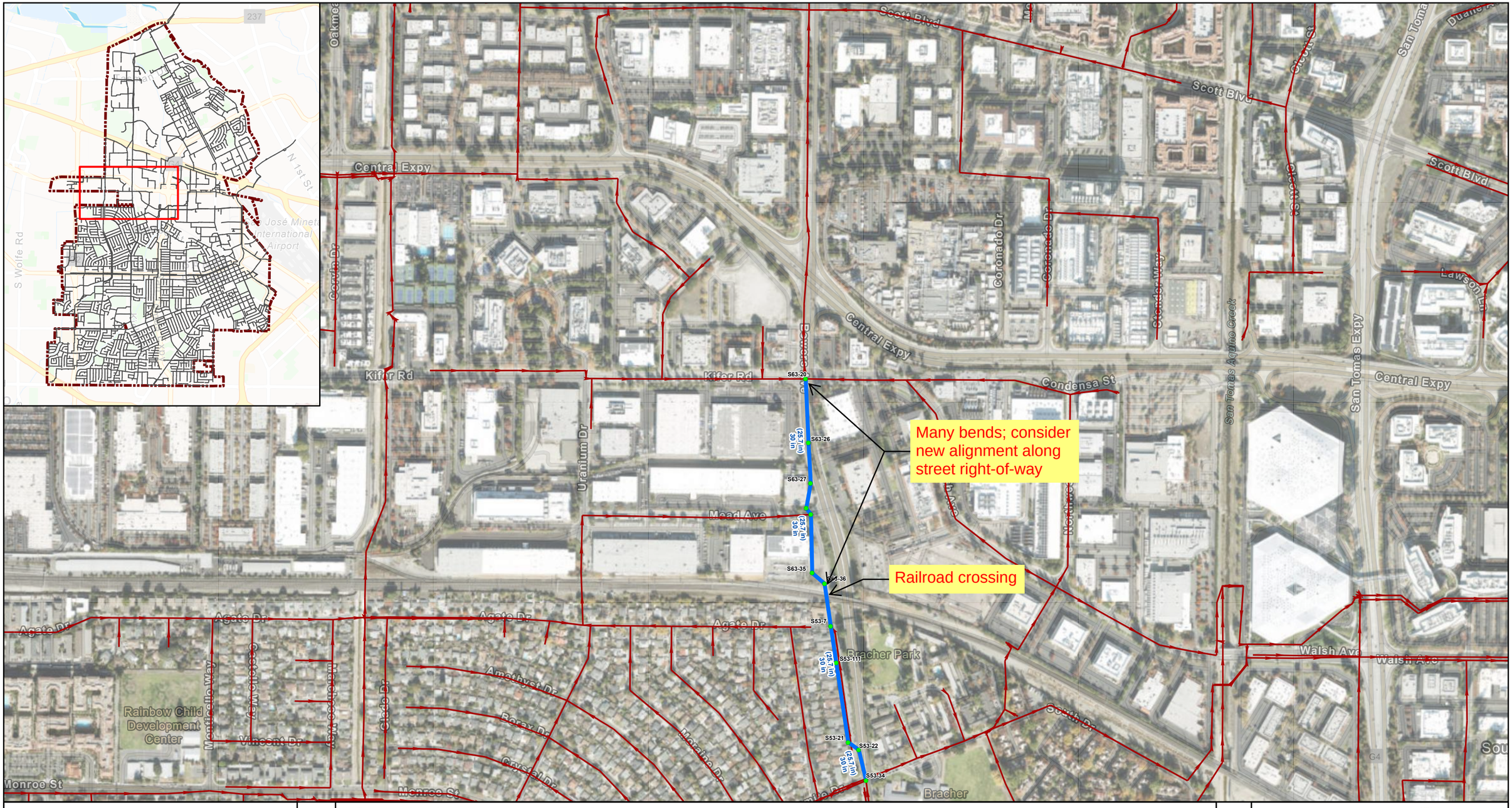
Project No.	7
Project ID	Bowers Avenue
Project Location	Bowers Ave from Chromite Dr to Walsh Ave
Description	2605 LF of 30-inch diameter pipe
Priority	4
Flow Confidence Level	5
Loads Trigger	Long-Term Future Loads (LTFL)
Design Flow Trigger	Wet Weather Flow (WWF)
Physical Network Trigger	Lined Model Network (LMN)
Estimated Capital Improvement Cost	$8,047,000
Comments	(i) Pipes are listed in order from upstream to downstream. (ii) A 50/50 flow split was assumed at the Lawrence/Homestead gate structure which splits flow between the eastern sewer on Homestead Rd or the northern sewer on Lawrence Expwy. (iii) Project would be required due to assumed future lining of Bowers Ave trunk sewer. (iv) Downstream-most pipe segment included in the proposed project (from manhole S63-26 to S63-20) would exceed the City's 0.75 maximum d/D design criterion under PWWF; however, the pipe was not upsized because the resulting d/D ratio was still less than 1 and the City preferred to keep diameters consistent rather than upsize one isolated pipe segment just to meet the d/D design criterion. (v) (vi)
Assumptions	(i) New diameter based on pipe replacement. (ii) Cost estimates are based on CCI of 15367.24 from the August 2024 ENR.
Alternatives	N.A.

PROJECT COST DETAIL

U/S MH ID	D/S MH ID	Existing Diameter (inches)	New Diameter (inches)	Length (feet)	Slope (%)	Pipe Depth (feet BGL)	Existing Pipe Capacity (mgd)	Future Pipe Capacity (mgd)	Long-Term Future PDWF (mgd)	Long-Term Future PWWF (mgd)	Long-Term Future DWF Velocity (ft/sec)	Open Cut Cost	Trenchless Installation	Trenchless Casing Size	Unit Cost ($/LF)	Total Cost ($)
S53-34	S53-22	26	30	197	0.38	14	10.71	16.24	10.68	11.68	5.95	$1,139			$1,139	$ 224,611
S53-22	S53-21	26	30	80	0.65	15	14.09	21.38	10.68	11.68	5.63	$1,139			$1,139	$ 91,120
S53-21	S53-111	26	30	501	0.41	15	11.16	16.93	10.68	11.68	5.24	$1,139			$1,139	$ 570,753
S53-111	S53-7	26	30	231	0.41	15	11.16	16.93	10.68	11.68	5.95	$1,139			$1,139	$ 263,109
S53-7	S63-36	26	30	269	0.45	16	11.72	17.78	10.69	11.70	5.06	$1,169	PTGAB	42.00	$2,511	$ 676,001
S63-36	S63-35	26	30	102	0.26	17	8.84	13.42	10.69	11.70	5.95	$1,169			$1,169	$ 118,654
S63-35	S63-33	26	30	366	0.53	16	12.69	19.26	10.69	11.70	4.92	$1,139			$1,139	$ 416,532
S63-33	S63-32	26	30	48	0.31	16	9.79	14.86	11.03	12.38	5.35	$1,139			$1,139	$ 54,444
S63-32	S63-27	26	30	158	0.39	17	10.87	16.50	11.03	12.38	5.83	$1,169			$1,169	$ 184,118
S63-27	S63-26	26	30	253	0.46	18	11.84	17.97	11.04	12.39	6.02	$1,169			$1,169	$ 295,173
S63-26	S63-20	26	30	401	0.55	18	12.91	19.59	11.04	12.36	4.45	$1,169			$1,169	$ 468,886

Total Baseline Pipe Construction Cost	$	2,687,399
Total Trenchless Installation Cost	$	676,001
No Jacking Pit	$	-
No Receiving Pit	$	-
Installation or Adjustment of Weir in Existing Manhole Structure	$	-
Lateral Reconnection Cost (Approx. 3)	$	1,500
Modify Existing Manholes Cost (Approx. 12)	$	210,000
Baseline Construction Cost:	**$**	**3,574,900**
Dewatering	$	234,414
Bypass Pumping	$	336,340
Remove & Replace Factor	$	168,170
Traffic Control (10%)	$	336,340
Pavement Restoration (T-trench)	$	66,196
Subtotal:	**$**	**4,716,360**
Mobilization/Demobilization (5% of subtotal)	$	235,817.98
Estimated Construction Cost Subtotal:	**$**	**4,952,178**
Contingencies (30% of construction subtotal)	$	1,485,653.28
Estimated Construction Cost:	**$**	**6,437,831**
Engineering and Inspection (25% of construction cost)	$	1,609,458
Estimated Capital Improvement Cost:	**$**	**8,047,000**

(Note: Cost estimates are based on August 2024 ENR CCI of 15367.24 for the San Francisco Area)



Project 7
Bowers Ave

Santa Clara Sewer Master Plan Update

Legend

Capacity Improvement Project

- Manholes
- Project Sewers
- **(8-in)** (Existing Diameter)
- **10-in** Proposed Diameter
- Other Modeled Sewers
- Manholes

0 0.05 0.1 0.2 Miles

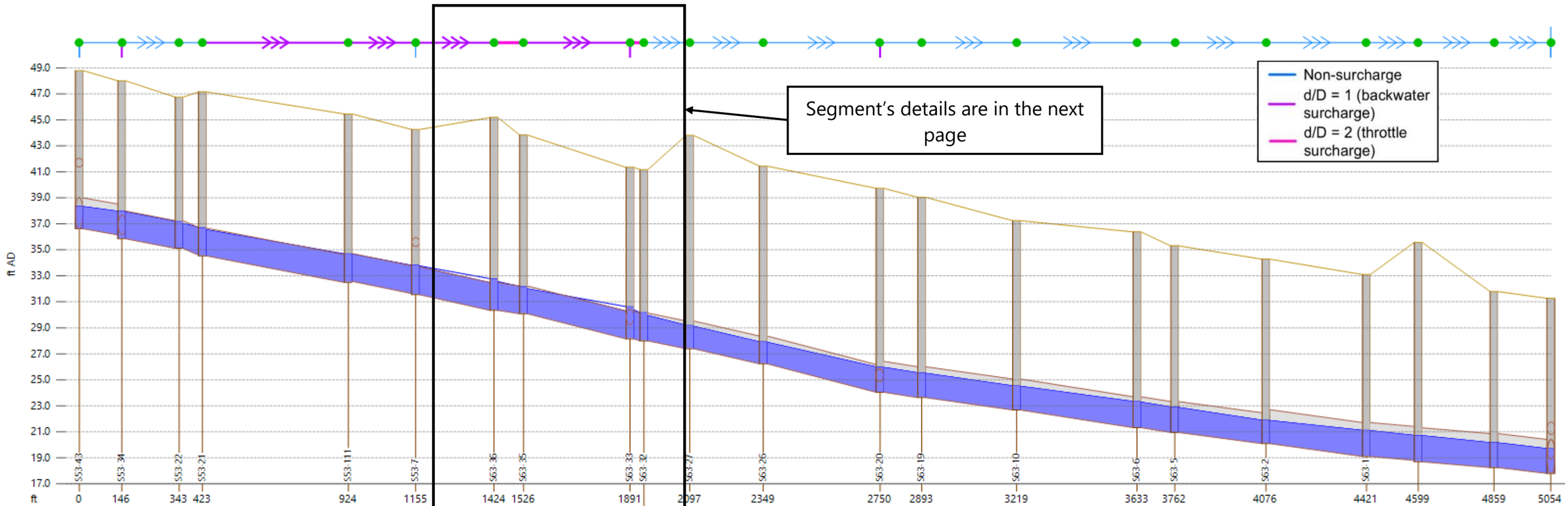
N

Woodard & Curran

Project #: 0012307.00
Map Created: July 2024

Figure Exported: 9/10/2024 By: nbarreralopez Using: \\woodardcurran.net\shared\Projects\0012307.00 Santa Clara CA Sewer Master Plan Update\wip\C. GIS\3. ArcGIS Pro\SantaClaraSewerMasterPlan2023_TMFigures.aprx

Project 7: Bowers Ave
Capacity Deficiency Profile View
Model Run Scenario: Wet Weather, Long-Term Future Loads, and Lined Model Network



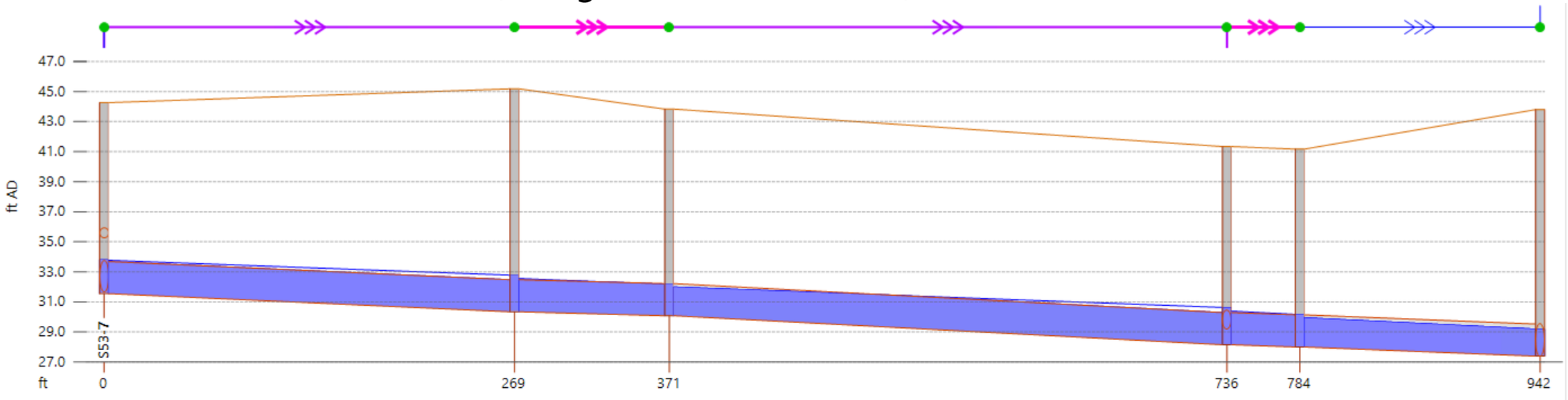
Link	-	S53-34.1	-	S53-21.1	S53-111.1	S53-7.1	-	S63-35.1	-	S63-32.1	S63-27.1	S63-26.1	-	S63-19.1	S63-10.1	-	S63-5.1	S63-2.1	S63-1.1	S63-1A.1	S73-35.1
Conduit mate	RCP	RCP	RCP	RCP	RCP	RCP	RCP	RCP	-	RCP	RCP	RCP	RCP	RCP	RCP	RCP	RCP	RCP	RCP	RCP	RCP
width (in)	28.5	25.7	25.7	25.7	25.7	25.7	25.7	25.7	-	25.7	25.7	25.7	28.5	28.5	28.5	28.5	28.5	31.4	31.4	31.4	31.4
length (ft)	145.7	197.2	80.0	501.1	231.0	269.2	101.5	365.7	-	157.5	252.5	401.1	142.8	326.2	413.3	129.9	313.0	345.4	177.8	260.4	194.8
pfc (MGD)	13.14	10.71	-	11.16	11.16	11.72	8.84	12.69	-	10.87	11.84	12.91	12.40	12.49	13.28	12.35	12.13	15.98	12.34	12.34	14.34
us inv (ft AD)	36.620	35.850	-	34.534	32.577	31.550	-	30.080	-	28.000	27.390	26.230	24.040	23.630	22.680	21.320	20.950	20.090	19.100	18.695	18.250
ds inv (ft AD)	36.150	35.110	-	32.491	31.635	30.340	-	28.150	-	27.390	26.230	24.040	23.630	22.680	21.320	20.950	20.090	19.100	18.796	18.250	17.800
surc	0.76	0.97	1.00	1.00	1.00	1.00	2.00	1.00	-	0.91	0.81	0.91	0.80	0.79	0.84	0.82	0.80	0.77	0.76	0.77	0.73
DS flow (MGD)	10.6088	10.5883	-	10.5524	10.5416	10.5511	-	10.5422	-	11.5446	11.5584	11.5548	11.9672	11.9660	11.9633	-	12.1433	12.1470	12.1464	12.1453	12.3499
DS velocity (ft/s)	5.890	5.583	-	5.069	5.678	4.604	5.396	4.380	-	5.596	5.997	5.249	4.871	5.045	4.700	4.767	5.246	4.260	4.456	4.477	4.585

Node	-	S53-34	-	S53-21	S53-111	S53-7	S63-36	S63-35	S63-33	-	S63-27	S63-26	S63-20	S63-19	S63-10	S63-6	S63-5	S63-2	S63-1	S63-1A	S73-35	-
ground (ft AD)	-	48.000	-	47.150	45.451	44.260	45.180	43.830	41.340	-	43.800	41.440	39.730	39.040	37.240	36.380	35.300	34.280	33.100	35.572	31.790	-
flood dep (ft)	-	-10.042	-	-10.444	-10.763	-10.451	-12.418	-11.671	-10.726	-	-14.617	-13.527	-13.755	-13.510	-12.712	-13.061	-12.402	-12.403	-11.998	-14.859	-11.629	-

Project 7: Bowers Ave

Capacity Deficiency Profile View (*Zoomed-in section*)

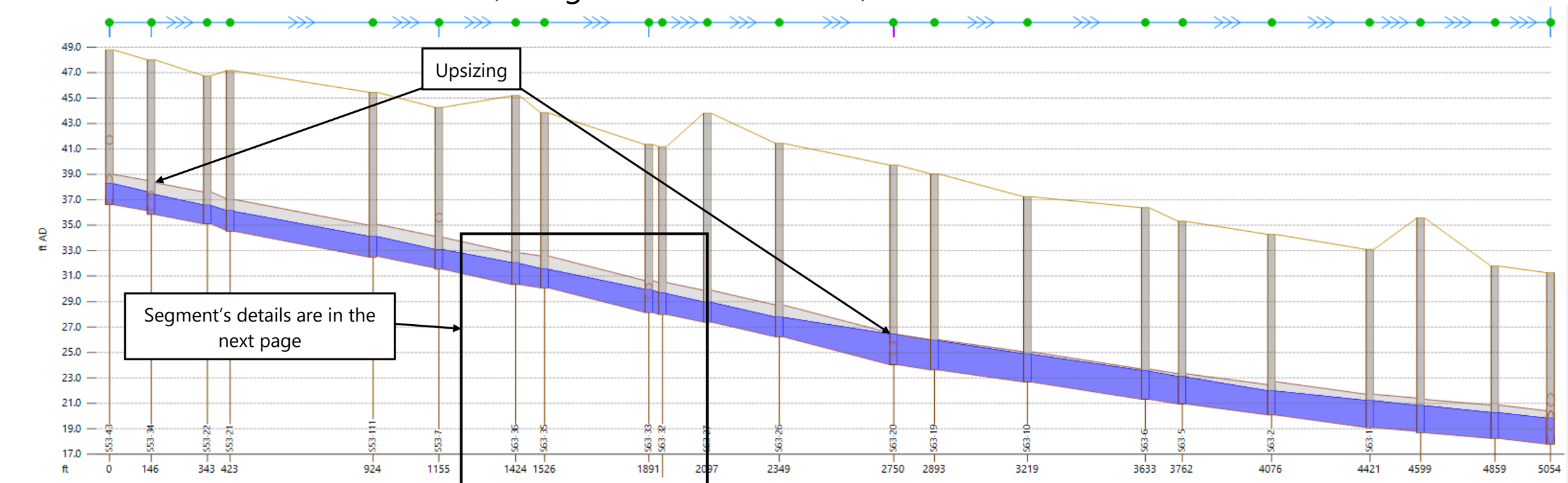
Model Run Scenario: Wet Weather, Long-Term Future Loads, and Lined Model Network



Link	S53-7.1	S63-36.1	S63-35.1	S63-33.1	S63-32.1
Conduit mate	RCP	RCP	RCP	RCP	RCP
width (in)	25.7	25.7	25.7	25.7	25.7
length (ft)	269.2	101.5	365.7	47.8	157.5
pfc (MGD)	11.72	8.84	12.69	9.79	10.87
us inv (ft AD)	31.550	30.340	30.080	28.150	28.000
ds inv (ft AD)	30.340	30.080	28.150	28.000	27.390
surc	1.00	2.00	1.00	2.00	0.91
DS flow (MGD)	10.5511	10.5484	10.5422	11.5444	11.5446
DS velocity (ft/s)	4.604	5.396	4.380	4.960	5.596

Node	S53-7	S63-36	S63-35	S63-33	S63-32	S63-27
ground (ft AD)	44.260	45.180	43.830	41.340	41.170	43.800
flood dep (ft)	-10.451	-12.418	-11.671	-10.726	-11.018	-14.617

Project 7: Bowers Ave
Project Solution Profile View
Model Run Scenario: Wet Weather, Long-Term Future Loads, and Lined Model Network



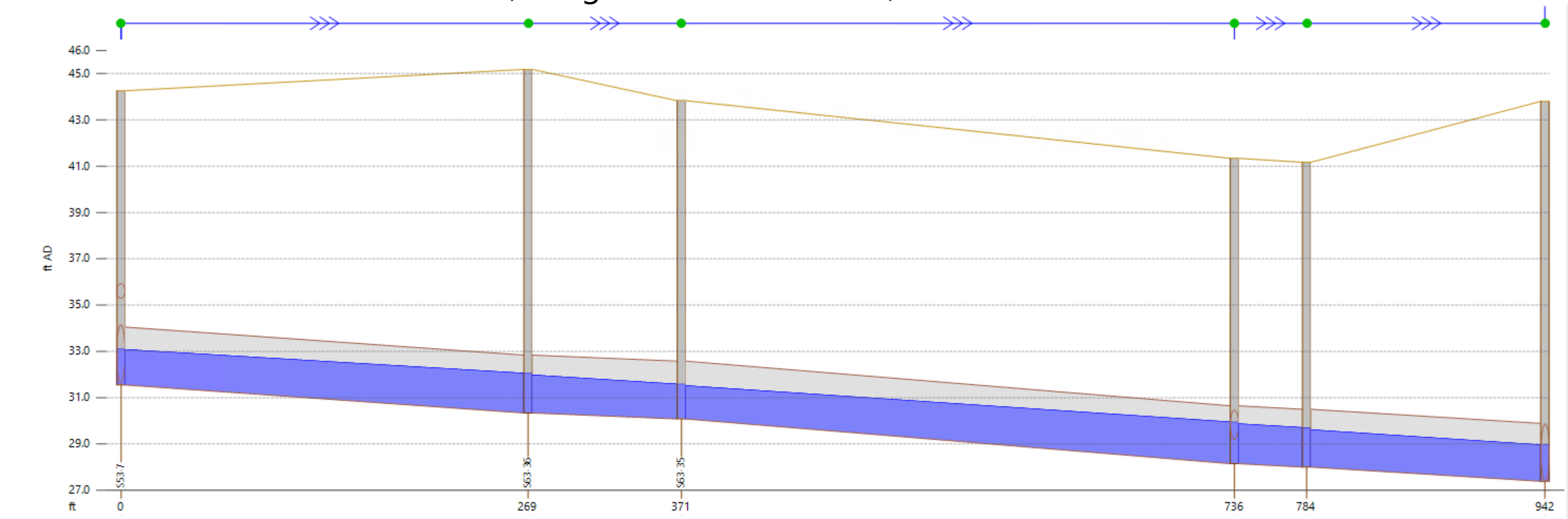
Link	-	S53-34.1	-	S53-21.1	S53-111.1	S53-7.1	-	S63-35.1	-	S63-32.1	S63-27.1	S63-26.1	-	S63-19.1	S63-10.1	-	S63-5.1	S63-2.1	S63-1.1	S63-1A.1	S73-35.1
Conduit mate	RCP	RCP	RCP	RCP	RCP	RCP	RCP	RCP	-	RCP	RCP	RCP	RCP	RCP	RCP	RCP	RCP	RCP	RCP	RCP	RCP
width (in)	28.5	30.0	30.0	30.0	30.0	30.0	30.0	30.0	-	30.0	30.0	30.0	28.5	28.5	28.5	28.5	28.5	31.4	31.4	31.4	31.4
length (ft)	145.7	197.2	80.0	501.1	231.0	269.2	101.5	365.7	-	157.5	252.5	401.1	142.8	326.2	413.3	129.9	313.0	345.4	177.8	260.4	194.8
pfc (MGD)	13.14	16.24	-	16.93	16.93	17.78	13.42	19.26	-	16.50	17.97	19.59	12.39	12.48	13.26	12.34	12.12	15.98	12.34	12.34	14.34
us inv (ft AD)	36.620	35.850	-	34.534	32.577	31.550	-	30.080	-	28.000	27.390	26.230	24.040	23.630	22.680	21.320	20.950	20.090	19.100	18.695	18.250
ds inv (ft AD)	36.150	35.110	-	32.491	31.635	30.340	-	28.150	-	27.390	26.230	24.040	23.630	22.680	21.320	20.950	20.090	19.100	18.796	18.250	17.800
surc	0.69	0.62	0.62	0.65	0.61	0.68	0.65	0.72	-	0.64	0.61	0.95	0.99	0.95	0.94	0.92	0.88	0.81	0.80	0.81	0.77
DS flow (MGD)	11.6816	11.6813	-	11.6839	11.6842	1.6968	-	11.6961	-	12.3812	12.3896	12.3625	12.6729	12.6664	12.6614	-	12.8125	12.8131	12.8101	12.8045	12.9957
DS velocity (ft/s)	6.292	6.073	-	5.375	6.128	5.066	5.935	4.816	-	5.941	6.239	4.503	4.887	5.062	4.720	4.792	5.282	4.293	4.484	4.525	4.651

Node	-	S53-34	-	S53-21	S53-111	S53-7	S63-36	S63-35	S63-33	-	S63-27	S63-26	S63-20	S63-19	S63-10	S63-6	S63-5	S63-2	S63-1	S63-1A	S73-35	-
ground (ft AD)	-	48.000	-	47.150	45.451	44.260	45.180	43.830	41.340	-	43.800	41.440	39.730	39.040	37.240	36.380	35.300	34.280	33.100	35.572	31.790	-
flood dep (ft)	-	-10.580	-	-11.011	-11.342	-11.175	-13.137	-12.258	-11.402	-	-14.348	-13.676	-13.311	-13.100	-12.365	-12.821	-12.212	-12.312	-11.888	-14.751	-11.526	-

Project 7: Bowers Ave

Project Solution Profile View (*Zoomed-in section*)

Model Run Scenario: Wet Weather, Long-Term Future Loads, and Lined Model Network



Link	S53-7.1	S63-36.1	S63-35.1	S63-33.1	S63-32.1
Conduit mate	RCP	RCP	RCP	RCP	RCP
width (in)	30.0	30.0	30.0	30.0	30.0
length (ft)	269.2	101.5	365.7	47.8	157.5
pfc (MGD)	17.78	13.42	19.26	14.86	16.50
us inv (ft AD)	31.550	30.340	30.080	28.150	28.000
ds inv (ft AD)	30.340	30.080	28.150	28.000	27.390
surc	0.68	0.65	0.72	0.69	0.64
DS flow (MGD)	11.6968	11.6968	11.6961	12.3807	12.3812
DS velocity (ft/s)	5.066	5.935	4.816	5.386	5.941

Node	S53-7	S63-36	S63-35	S63-33	S63-32	S63-27
ground (ft AD)	44.260	45.180	43.830	41.340	41.170	43.800
flood dep (ft)	-11.175	-13.137	-12.258	-11.402	-11.476	-14.848

Project 8: Calabazas Trunk

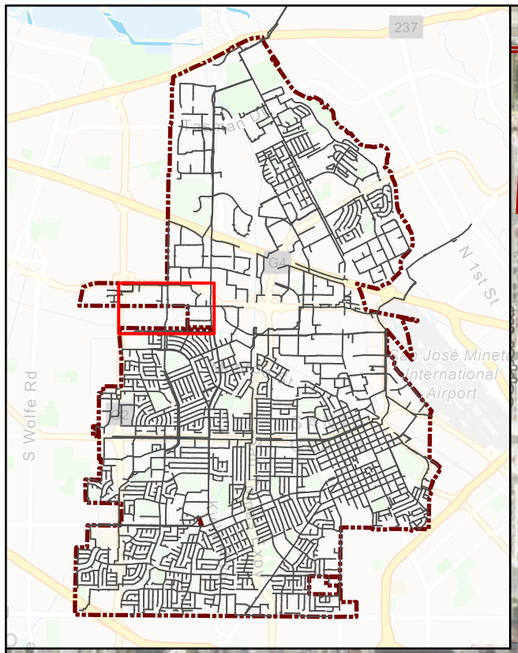
PROJECT DESCRIPTION	
Project No.	8
Project ID	Calabazas Trunk
Project Location	Calabazas Creek from S of Agate Dr to Central Expwy
Description	2791 LF of 18 to 27-inch diameter pipe
Priority	2
Flow Confidence Level	5
Loads Trigger	Existing Loads (EL)
Design Flow Trigger	Wet Weather Flow (WWF)
Physical Network Trigger	Lined Model Network (LMN)
Estimated Capital Improvement Cost	$8,731,000
Comments	(i) Pipes are listed in order from upstream to downstream. (ii) A 50/50 flow split was assumed at the Lawrence/Homestead gate structure which splits flow between the eastern sewer on Homestead Rd or the northern sewer on Lawrence Expwy. (iii) Recommended project includes pipe segments that are already lined between manhole S62-51 and S62-32. (iv) The Lined Model Network assumes existing, unlined 27-inch pipes would be lined in the future resulting in a diameter of 25.7-inch. (v) Roughly 750 LF of pipe between manhole S62-31 and S62-10 of the 2,000 LF that would be upsized to 27-inch would also be re-sloped. In addition to upsizing and re-sloping, the project includes installation of a new 18-inch pipe between manhole S62-37 and S62-38 that runs parallel to the existing sewer to relieve the capacity restriction at that location due to a storm drain crossing north of Kifer Road. (vi) Calabazas Trunk project solution would eliminate the Agate Drive capacity deficiency by eliminating the overflow diversion from the Calabazas Trunk into the Agate Drive sewers at manhole S52-4, which is located just upstream of Agate Drive siphon crossing.
Assumptions	(i) New diameter based on pipe replacement. (ii) Cost estimates are based on CCI of 15367.24 from the August 2024 ENR.
Alternatives	N.A.

PROJECT COST DETAIL

U/S MH ID	D/S MH ID	Existing Diameter (inches)	New Diameter (inches)	Length (feet)	Slope (%)	Pipe Depth (feet BGL)	Existing Pipe Capacity (mgd)	Future Pipe Capacity (mgd)	Long-Term Future PDWF (mgd)	Long-Term Future PWWF (mgd)	Long-Term Future DWF Velocity (ft/sec)	Open Cut Cost	Trenchless Installation	Trenchless Casing Size	Unit Cost ($/LF)	Total Cost ($)
S52-4	S62-53	23	27	136	0.17	15	5.25	8.24	7.52	7.85	5.09	$1,089	PTGAB	42.00	$2,431	$ 329,907
S62-53	S62-52	23	27	282	0.41	14	8.15	12.78	7.52	7.85	4.85	$1,089	PTGAB	42.00	$2,431	$ 685,584
S62-52	S62-51	23	27	240	0.26	13	6.54	10.26	7.52	7.85	5.48	$1,089			$1,089	$ 261,360
S62-51	S62-48	23	27	503	0.72	13	10.96	16.94	7.52	7.85	4.74	$1,089			$1,089	$ 547,767
S62-48	S62-40	23	27	307	0.33	13	7.40	11.43	7.52	7.85	5.48	$1,089			$1,089	$ 334,323
S62-40	S62-39	23	27	55	0.69	15	10.63	16.64	7.52	7.85	6.26	$1,089			$1,089	$ 59,895
S62-39	S62-37	23	27	66	0.68	16	10.55	16.53	7.52	7.85	5.69	$1,089			$1,089	$ 71,874
S62-37	S62-38	N/A	18	60	0.12	16	N/A	2.33	2.59	2.70	2.48	$854			$854	$ 50,813
S62-38	S62-34	23	27	343	0.32	17	7.24	11.34	7.52	7.85	5.31	$1,119			$1,119	$ 383,817
S62-34	S62-33	23	27	14	0.50	17	9.04	14.16	7.52	7.85	5.39	$1,119			$1,119	$ 15,666
S62-33	S62-32	23	27	40	0.33	17	7.29	11.41	7.52	7.85	5.42	$1,119			$1,119	$ 44,760
S62-32	S62-31	23	27	14	0.71	18	10.80	16.92	7.52	7.85	5.20	$1,119			$1,119	$ 15,666
S62-31	S62-29	27	27	386	0.33	18	4.32	11.44	7.52	7.85	4.72	$1,119			$1,119	$ 431,934
S62-29	S62-10	27	27	346	0.33	18	16.00	11.44	7.52	7.85	5.44	$1,119			$1,119	$ 387,174

Total Baseline Pipe Construction Cost	$	2,605,049
Total Trenchless Installation Cost	$	1,015,491
No Jacking Pit	$	-
No Receiving Pit	$	-
Installation or Adjustment of Weir in Existing Manhole Structure	$	-
Lateral Reconnection Cost (Approx. 0)	$	-
Modify Existing Manholes Cost (Approx. 16)	$	280,000
Baseline Construction Cost:	**$**	**3,900,540**
Dewatering	$	251,208
Bypass Pumping	$	356,973
Remove & Replace Factor	$	178,486
Traffic Control (10%)	$	362,054
Pavement Restoration (T-trench)	$	67,625
Subtotal:	**$**	**5,116,886**
Mobilization/Demobilization (5% of subtotal)	$	255,844.30
Estimated Construction Cost Subtotal:	**$**	**5,372,730**
Contingencies (30% of construction subtotal)	$	1,611,819.09
Estimated Construction Cost:	**$**	**6,984,549**
Engineering and Inspection (25% of construction cost)	$	1,746,137
Estimated Capital Improvement Cost:	**$**	**8,731,000**

(Note: Cost estimates are based on August 2024 ENR CCI of 15367.24 for the San Francisco Area)



S62-10
S62-29
(27 in) 27 in
Pipes will be re-sloped
S62-31
S62-33
S62-34
Consider eliminating bend with new alignment, if possible.
(22.8 in) 27 in
S62-38
New Pipe 18 in
S62-39
S62-40
S62-48
(22.9 in) 27 in
S62-51
S62-52
(22.8 in) 27 in
Railroad crossings
S62-53
S52-4

Central Expy
Oakmead Village Dr
Oakmead Village Ct
Bowers Ave
Millikin Pl
Eichers Pl
Pancoast Pl
Corvin Dr
Calabazas Creek
Noyce Pl
Feliz Rd
Sanor Pl
Kifer Rd
Lawrence Expy
Lawrence Station Rd
Uranium Dr
Mead Ave
Agate Dr

Project 8
Calabazas Trunk

Santa Clara Sewer Master Plan Update

Legend

Capacity Improvement Project

- Manholes
- Other Modeled Sewers
- Project Sewers
- **(8-in)** (Existing Diameter)
- **10-in** Proposed Diameter

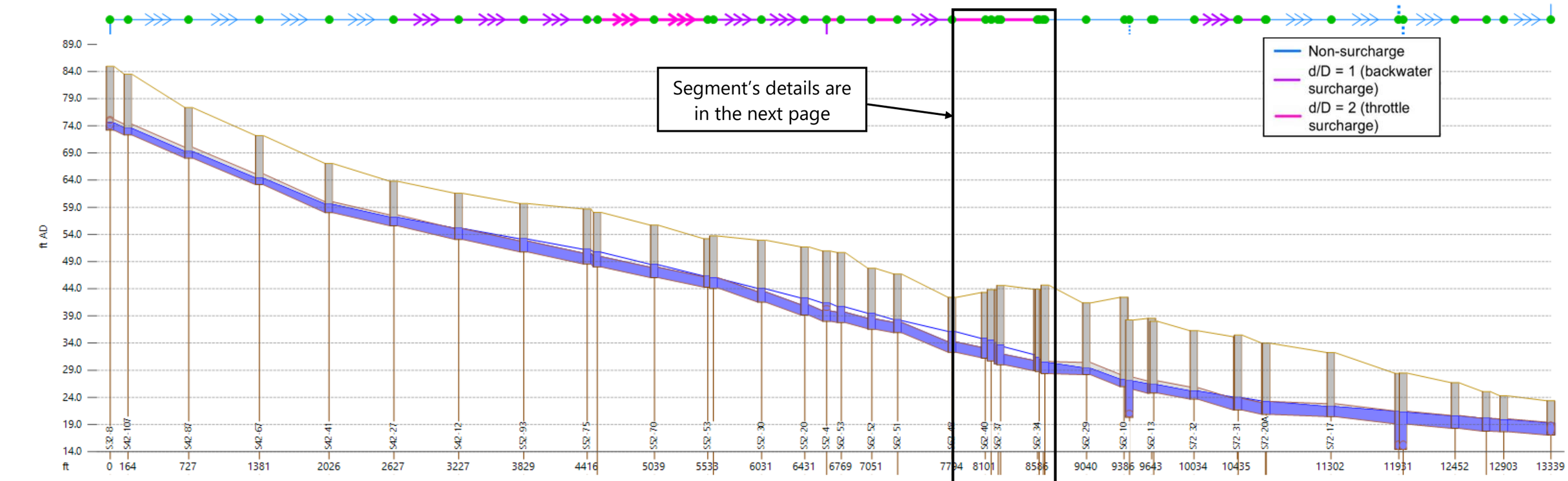
0 0.04 0.07 0.15 Miles

N

Project #: 0012307.00
Map Created: July 2024

Figure Exported: 9/10/2024 By: nbarreralopez Using: \\woodardcurran.net\shared\Projects\0012307.00 Santa Clara CA Sewer Master Plan Update\wip\C. GIS\3. ArcGIS Pro\SantaClaraSewerMasterPlan2023_TMFigures.aprx

Project 8: Calabazas Trunk
Capacity Deficiency Profile View
Model Run Scenario: Wet Weather, Long-Term Future Loads, and Lined Model Network



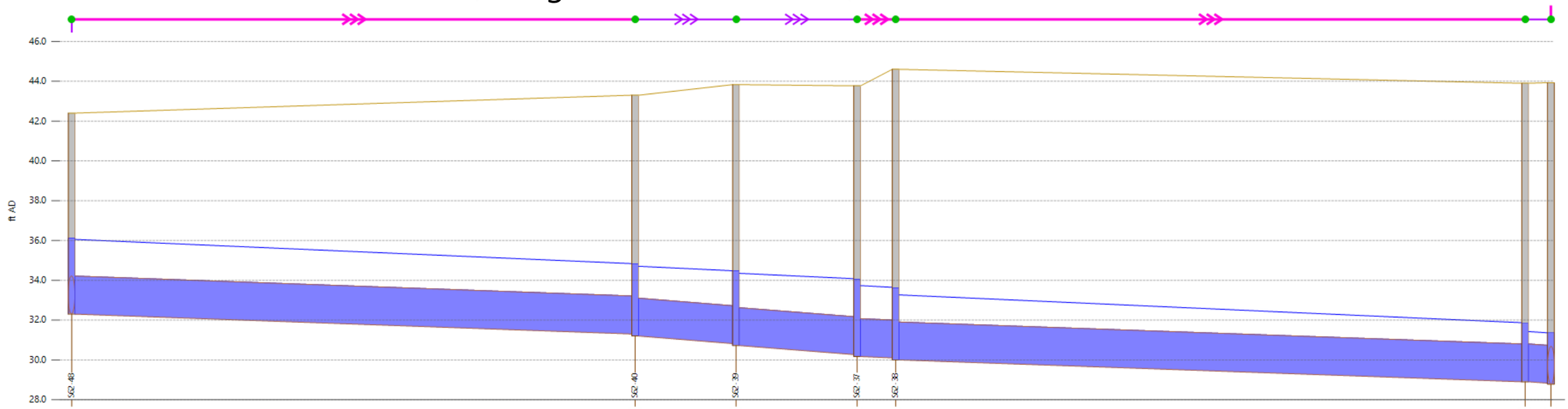
Link	-	S42-107.1	S42-87.1	S42-67.1	S42-41.1	S42-27.1	S42-12.1	S52-93.1	-	S52-113.1	S52-70.1	S52-52.1	-	-	-	-	-	S62-51.1	-	-	-	-	-	-	-	-	S72-20.1	S72-17.1	S72-11.1	-	-	S72-6.1
Conduit mate	-	VCP	VCP	VCP	VCP	VCP	VCP	VCP	-	RCP	RCP	RCP	RCP	RCP	-	RCP	RCP	RCP	RCP	RCP	HDPE	HDPE	PVC	HDPE	RCP	RCP	RCP	RCP	RCP	RCP	-	RCP
width (in)	-	24.0	24.0	24.0	24.0	24.0	24.0	24.0	-	22.8	22.8	22.8	22.8	-	-	22.8	22.8	22.9	22.9	22.8	27.0	27.0	-	27.0	25.7	25.7	28.5	28.5	28.5	28.5	-	28.5
length (ft)	-	563.0	654.0	645.0	601.0	600.0	602.0	587.0	-	530.0	494.0	446.2	399.9	-	-	282.0	-	503.0	307.0	343.0	386.0	346.0	-	373.0	401.0	-	598.0	629.0	481.0	288.8	-	436.0
pfc (MGD)	-	12.74	12.64	13.08	9.28	9.46	9.02	9.03	-	7.78	7.62	9.86	9.85	-	-	8.15	6.54	10.96	7.40	7.24	4.32	16.00	-	11.02	12.34	9.81	6.02	10.68	9.32	9.91	-	8.73
us inv (ft AD)	-	72.325	68.055	63.165	58.005	55.585	53.075	50.785	-	48.015	46.045	44.190	41.530	-	-	-	-	35.900	-	30.000	28.365	28.185	-	24.795	23.665	-	20.865	20.460	19.070	-	-	17.680
ds inv (ft AD)	-	68.055	63.165	58.005	55.585	53.075	50.785	48.545	-	46.045	44.285	41.530	39.150	-	-	-	-	32.300	-	28.900	28.185	25.975	-	23.665	21.665	-	20.460	19.120	18.290	-	-	17.060
surc	-	0.61	0.60	0.78	0.78	1.00	1.00	1.00	-	2.00	2.00	1.00	1.00	-	-	1.00	2.00	1.00	2.00	2.00	0.89	0.59	-	0.67	1.00	1.00	0.98	0.96	0.95	1.00	-	0.93
DS flow (MGD)	-	8.4056	8.4053	8.4048	8.4032	8.3582	8.2538	8.2362	-	8.2542	8.2534	8.2523	8.2522	-	-	-	-	8.1322	-	8.1322	8.1321	8.1322	-	8.5649	8.5571	-	8.5410	8.5256	8.5208	-	-	8.5156
DS velocity (ft/s)	-	6.506	6.624	4.939	5.145	4.935	4.917	5.015	-	4.668	4.988	5.752	5.148	-	-	4.578	-	4.574	5.650	4.222	5.644	5.562	-	5.203	3.805	-	3.987	3.385	3.439	3.136	-	3.352

| Node | - | S42-87 | S42-67 | S42-41 | S42-27 | S42-12 | S52-93 | - | - | S52-70 | - | - | S52-30 | - | - | - | - | - | - | - | -

Project 8: Calabazas Trunk

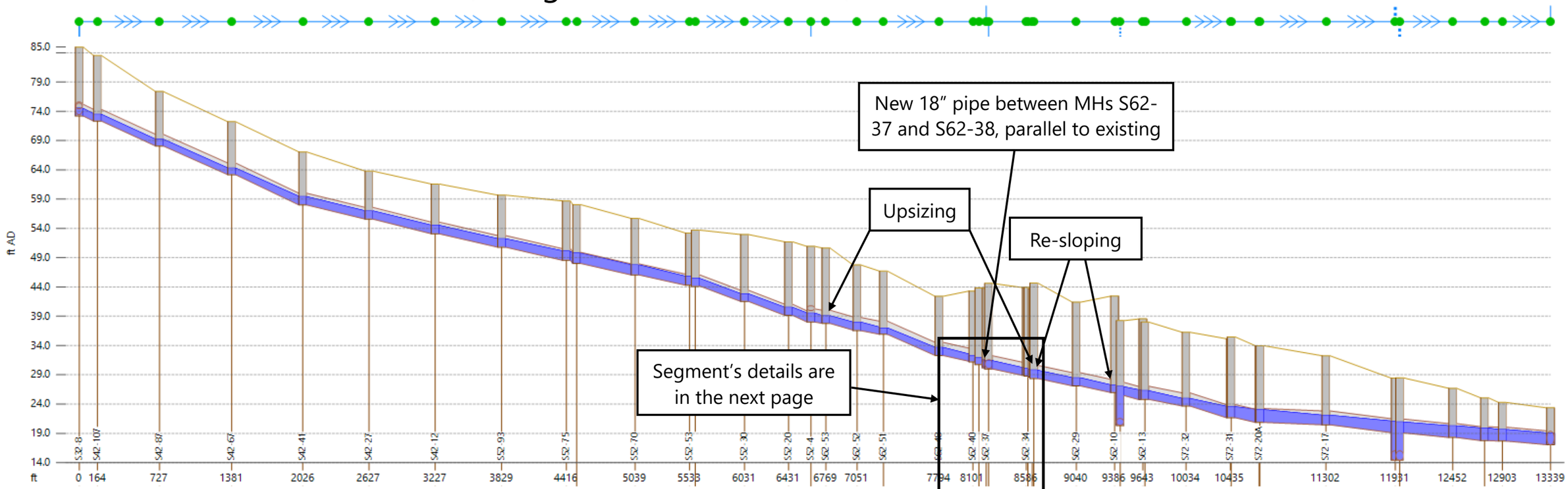
Capacity Deficiency Profile View (*Zoomed-in section*)

Model Run Scenario: Wet Weather, Long-Term Future Loads, and Lined Model Network



| ft | 0 | | |

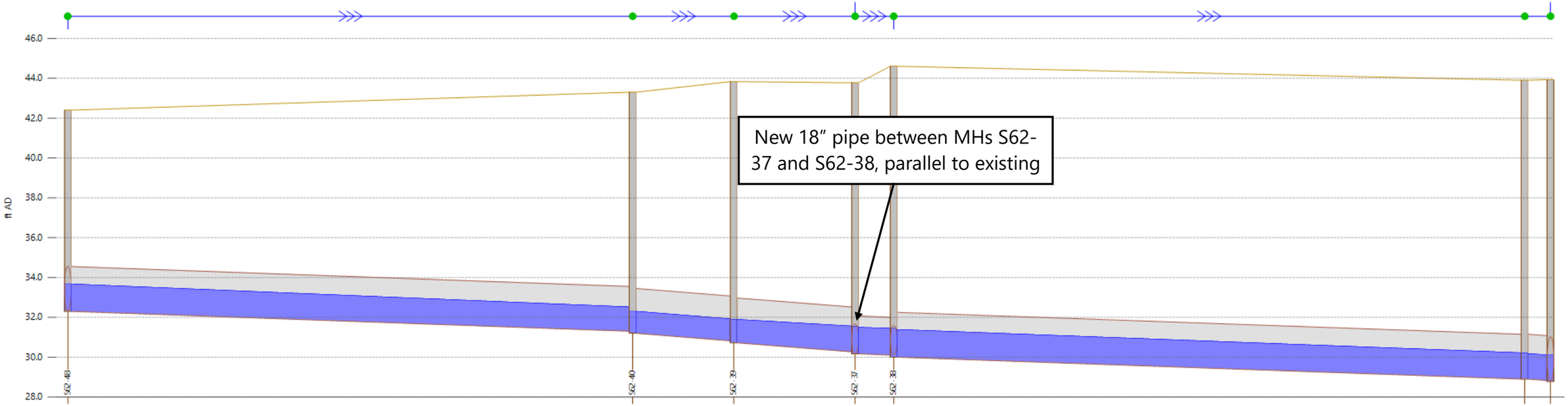
Project 8: Calabazas Trunk
Project Solution Profile View
Model Run Scenario: Wet Weather, Long-Term Future Loads, and Lined Model Network



Link	-	S42-107.1	S42-87.1	S42-67.1	S42-41.1	S42-27.1	S42-12.1	S52-93.1	-	S52-113.1	S52-70.1	S52-52.1	-	-	-	-	-	S62-51.1	-	-	-	-	-	-	-	S72-20.1	S72-17.1	S72-11.1	-	-	S72-6.1
Conduit mate	-	VCP	VCP	VCP	VCP	VCP	VCP	VCP	-	RCP	RCP	RCP	RCP	RCP	-	RCP	RCP	RCP	RCP	RCP	HDPE	HDPE	PVC	HDPE	RCP	RCP	RCP	RCP	RCP	RCP	-	RCP
width (in)	-	24.0	24.0	24.0	24.0	24.0	24.0	24.0	-	22.8	22.8	22.8	22.8	-	-	27.0	27.0	27.0	27.0	27.0	27.0	27.0	-	27.0	27.0	27.0	28.5	28.5	28.5	28.5	-	28.5
length (ft)	-	563.0	654.0	645.0	601.0	600.0	602.0	587.0	-	530.0	494.0	446.2	399.9	-	-	282.0	-	503.0	307.0	343.0	386.0	346.0	-	373.0	401.0	-	598.0	629.0	481.0	288.8	-	436.0
pfc (MGD)	-	12.74	12.64	13.08	9.28	9.46	9.02	9.03	-	7.78	7.62	9.86	9.85	-	-	12.78	-	16.94	11.43	11.34	11.44	11.44	-	11.02	14.14	-	6.02	10.68	9.32	9.91	-	8.73
us inv (ft AD)	-	72.325	68.055	63.165	58.005	55.585	53.075	50.785	-	48.015	46.045	44.190	41.530	-	-	-	-	35.900	-	30.000	28.365	27.105	-	24.795	23.665	-	20.865	20.460	19.070	-	-	17.680
ds inv (ft AD)	-	68.055	63.165	58.005	55.585	53.075	50.785	48.545	-	46.045	44.285	41.530	39.150	-	-	-	-	32.300	-	28.900	27.105	25.975	-	23.665	21.665	-	20.460	19.120	18.290	-	-	17.060
surc	-	0.57	0.57	0.72	0.70	0.72	0.72	0.80	-	0.92	0.89	0.68	0.71	-	-	0.60	0.63	0.61	0.61	0.61	0.61	0.61	-	0.64	0.86	0.99	0.91	0.83	0.83	0.90	-	0.84
DS flow (MGD)	-	7.6901	7.6902	7.6895	7.6893	7.6884	7.6878	7.6785	-	7.6866	7.6845	7.6843	7.6837	-	-	-	-	7.8481	-	7.8470	7.8468	7.8460	-	8.2851	8.2807	-	8.2735	8.2572	8.2358	-	-	8.2116
DS velocity (ft/s)	-	6.407	6.489	4.895	5.087	4.894	4.894	5.016	-	4.658	4.952	5.782	5.477	-	-	4.884	-	4.787	5.558	5.334	4.754	5.427	-	5.501	3.808	-	3.978	3.392	3.450	3.131	-	3.361

| Node | - | S42-87 | S42-67 | S42-41 | S42-27 | S42-12 | S52-93 | - | - | S52-70 | - | - | S52-30 | - | - | - | - | - | - | -

Project 8: Calabazas Trunk
Project Solution Profile View (*Zoomed-in section*)
Model Run Scenario: Wet Weather, Long-Term Future Loads, and Lined Model Network



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Project 9: Freedom Circle

PROJECT DESCRIPTION

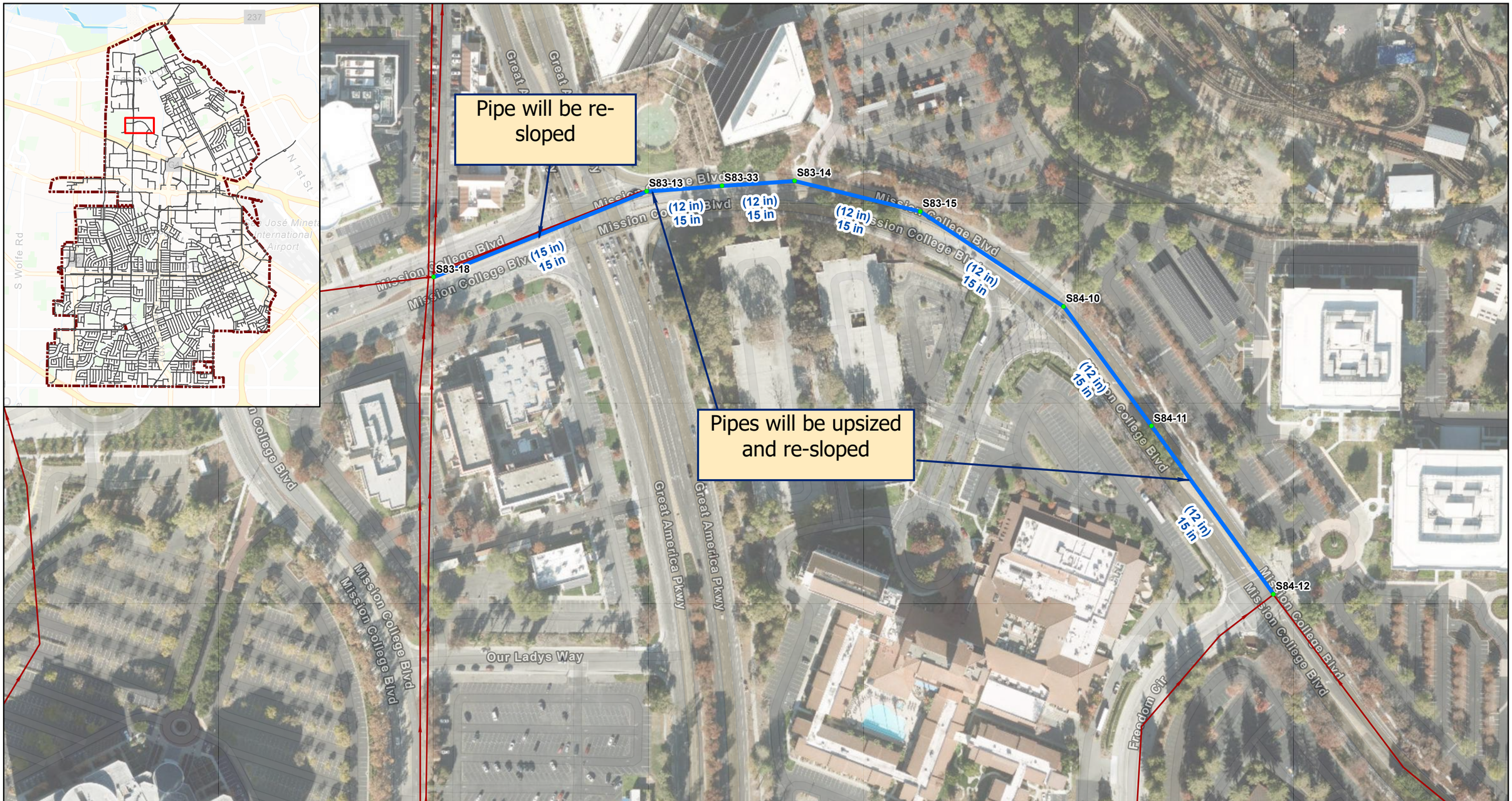
Project No.	9
Project ID	Freedom Circle
Project Location	Mission College Blvd from Freedom Cir to west of Great America Pkwy
Description	1886 LF of 15-inch diameter pipe
Priority	5
Flow Confidence Level	N/A
Loads Trigger	Long-Term Future Loads (LTFL)
Design Flow Trigger	Dry Weather Flow (DWF)
Physical Network Trigger	Unlined Model Network (UMN)
Estimated Capital Improvement Cost	$3,830,000
Comments	(i) Pipes are listed in order from upstream to downstream. (ii) A 50/50 flow split was assumed at the Lawrence/Homestead gate structure which splits flow between the eastern sewer on Homestead Rd or the northern sewer on Lawrence Expwy. (iii) Project would be required due to increased flows from the Freedom Circle Focus Area specific development project that would discharge into the City's sewers along Freedom Circle Drive and Mission College Boulevard. The recommended project is a slight modification of the project identified during the development review process and includes re-sloping to meet the City's design criteria d/D (maximum of 0.75 during PWWF). (iv) Downstream-most pipe segment included in the proposed project (from manhole S63-26 to S63-20) would exceed the City's 0.75 maximum d/D design criterion under PWWF; however, the pipe was not upsized because the resulting d/D ratio was still less than 1 and the City preferred to keep diameters consistent rather than upsize one isolated pipe segment just to meet the d/D design criterion. (v) (vi)
Assumptions	(i) New diameter based on pipe replacement. (ii) Cost estimates are based on CCI of 15367.24 from the August 2024 ENR.
Alternatives	N.A.

PROJECT COST DETAIL

U/S MH ID	D/S MH ID	Existing Diameter (inches)	New Diameter (inches)	Length (feet)	Slope (%)	Pipe Depth (feet BGL)	Existing Pipe Capacity (mgd)	Future Pipe Capacity (mgd)	Long-Term Future PDWF (mgd)	Long-Term Future PWWF (mgd)	Long-Term Future DWF Velocity (ft/sec)	Open Cut Cost	Trenchless Installation	Trenchless Casing Size	Unit Cost ($/LF)	Total Cost ($)
S84-12	S84-11	12	15	378	0.18	7	1.98	1.77	1.21	1.24	2.28	$804			$804	$ 303,832
S84-11	S84-10	12	15	270	0.18	7	2.00	1.77	1.28	1.31	2.21	$804			$804	$ 217,402
S84-10	S83-15	12	15	313	0.18	7	1.87	1.77	1.48	1.57	2.44	$804			$804	$ 251,572
S83-15	S83-14	12	15	236	0.18	7	1.80	1.77	1.48	1.57	2.44	$804			$804	$ 189,583
S83-14	S83-33	12	15	132	0.18	7	2.18	1.77	1.48	1.57	2.47	$804			$804	$ 106,369
S83-33	S83-13	12	15	138	0.18	7	2.33	1.77	1.47	1.57	2.48	$804			$804	$ 110,872
S83-13	S83-18	15	15	418	0.18	8	1.87	1.77	1.47	1.57	3.87	$804			$804	$ 336,313

Total Baseline Pipe Construction Cost	$	1,515,942
Total Trenchless Installation Cost	$	-
No Jacking Pit	$	-
No Receiving Pit	$	-
Installation or Adjustment of Weir in Existing Manhole Structure	$	-
Lateral Reconnection Cost (Approx. 3)	$	1,500
Modify Existing Manholes Cost (Approx. 8)	$	140,000
Baseline Construction Cost:	**$**	**1,657,442**
Dewatering	$	169,695
Bypass Pumping	$	151,594
Remove & Replace Factor	$	75,797
Traffic Control (10%)	$	151,594
Pavement Restoration (T-trench)	$	38,705
Subtotal:	**$**	**2,244,827**
Mobilization/Demobilization (5% of subtotal)	$	112,241.36
Estimated Construction Cost Subtotal:	**$**	**2,357,068**
Contingencies (30% of construction subtotal)	$	707,120.54
Estimated Construction Cost:	**$**	**3,064,189**
Engineering and Inspection (25% of construction cost)	$	766,047
Estimated Capital Improvement Cost:	**$**	**3,830,000**

(Note: Cost estimates are based on August 2024 ENR CCI of 15367.24 for the San Francisco Area)



Project 9
Freedom Circle

Santa Clara Sewer Master Plan Update

Legend

Capacity Improvement Project

- Manholes
- Other Modeled Sewers
- Project Sewers
- **(8-in)** (Existing Diameter)
- **10-in** Proposed Diameter

0 0.01 0.03 0.05 Miles

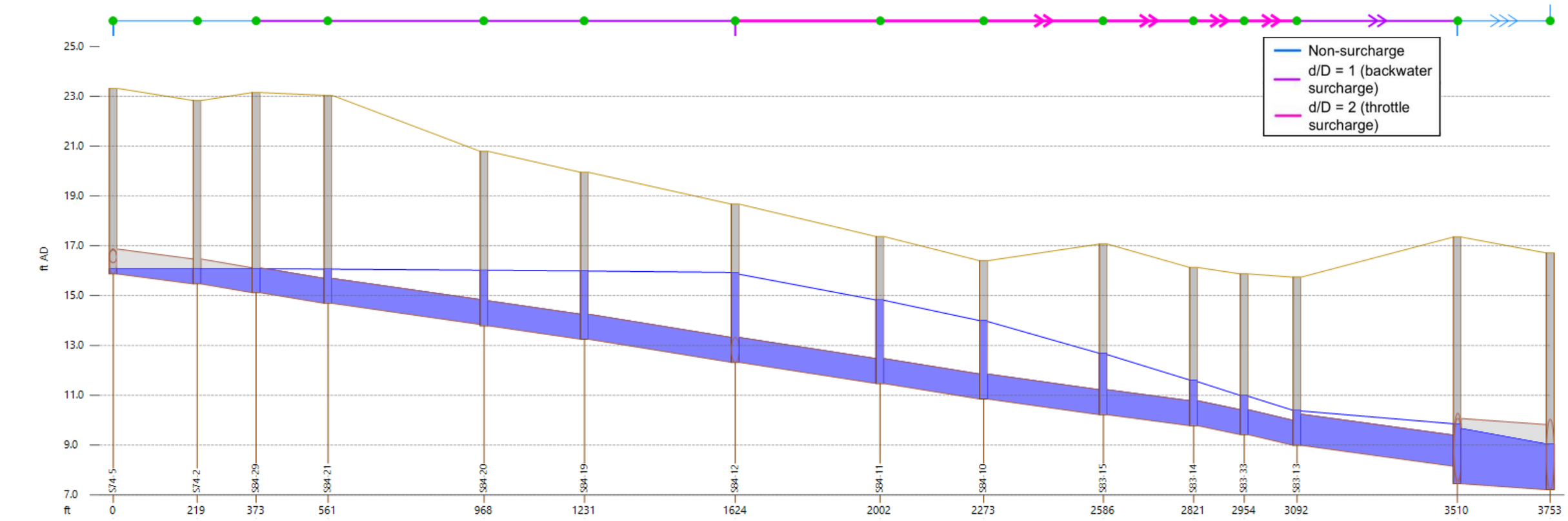
N

Project #: 0012307.00
Map Created: July 2024

Woodard & Curran

Figure Exported: 9/10/2024 By: nbarreralopez Using: \\woodardcurran.net\shared\Projects\0012307.00 Santa Clara CA Sewer Master Plan Update\wip\C. GIS\3. ArcGIS Pro\SantaClaraSewerMasterPlan2023_TMFigures.aprx

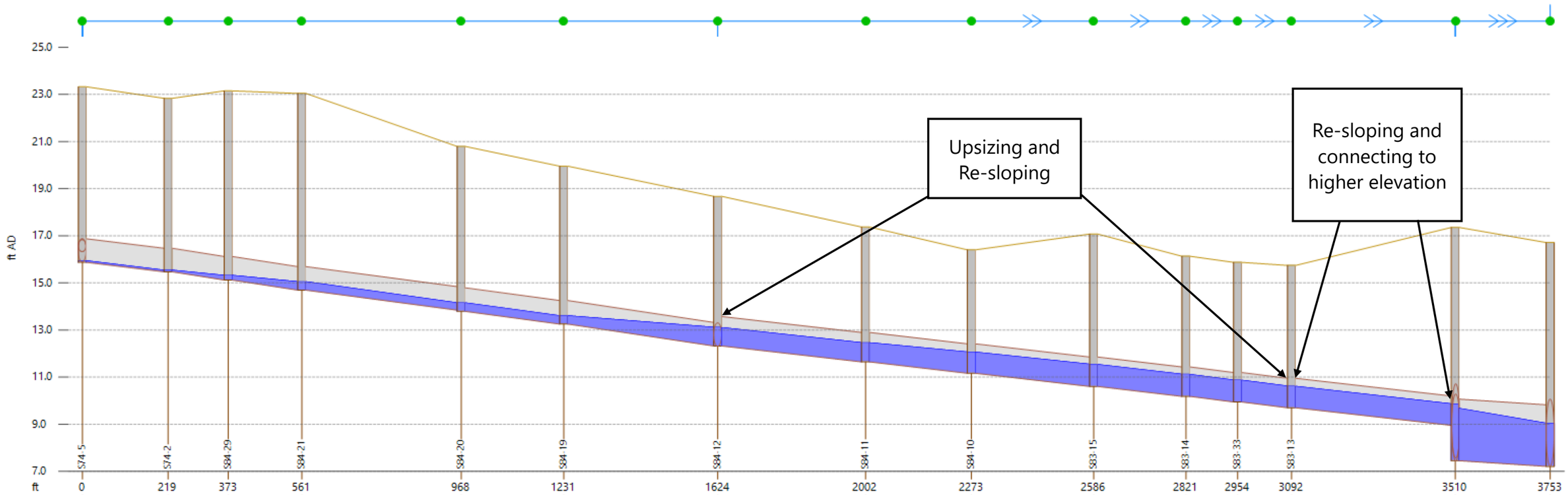
Project 9: Freedom Circle
Capacity Deficiency Profile View
Model Run Scenario: Wet Weather, Long-Term Future Loads, and Lined Model Network



Link	S74-5.1	S74-2.1	S84-29.1	S84-21.1	S84-20.1	S84-19.1	S84-12.1	S84-11.1	S84-10.1	S83-15.1	S83-14.1	S83-33.1	S83-13.1	S83-18.1
Conduit mate	VCP	VCP	VCP	VCP	VCP	VCP	VCP	VCP	VCP	VCP	VCP	VCP	VCP	RCP
width (in)	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	15.0	31.4
length (ft)	218.9	154.0	188.0	407.5	262.3	393.7	377.9	270.4	312.9	235.8	132.3	137.9	418.3	243.0
pfc (MGD)	0.98	1.10	1.10	1.05	1.05	1.12	1.09	1.10	1.03	0.99	1.20	1.29	1.87	9.38
us inv (ft AD)	15.870	15.470	15.118	14.690	13.790	13.250	12.320	11.470	10.850	10.220	9.780	9.420	8.990	7.450
ds inv (ft AD)	15.470	15.118	14.690	13.840	13.250	12.320	11.470	10.850	10.220	9.780	9.420	8.990	8.150	7.210
surc	0.61	0.96	1.00	1.00	1.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00	1.00	0.85
DS flow (MGD)	0.0101	0.0210	0.2770	0.2766	0.2584	0.3163	1.1959	1.2819	1.5473	1.5473	1.5472	1.5472	1.5467	13.2916
DS velocity (ft/s)	0.065	0.068	1.705	2.077	1.680	0.628	2.307	2.318	2.844	2.891	2.914	3.044	3.020	5.148

Node	S74-5	S74-2	S84-29	S84-21	S84-20	S84-19	S84-12	S84-11	S84-10	S83-15	S83-14	S83-33	S83-13	S83-18	S83-12
ground (ft AD)	-	22.832	23.148	23.040	20.790	19.950	18.670	17.370	16.400	17.070	16.130	15.870	15.740	17.350	16.710
flood dep (ft)	-	-6.752	-7.068	-6.974	-4.772	-3.962	-2.743	-2.548	-2.408	-4.392	-4.526	-4.881	-5.353	-7.503	-7.675

Project 9: Freedom Circle
Project Solution Profile View
Model Run Scenario: Wet Weather, Long-Term Future Loads, and Lined Model Network

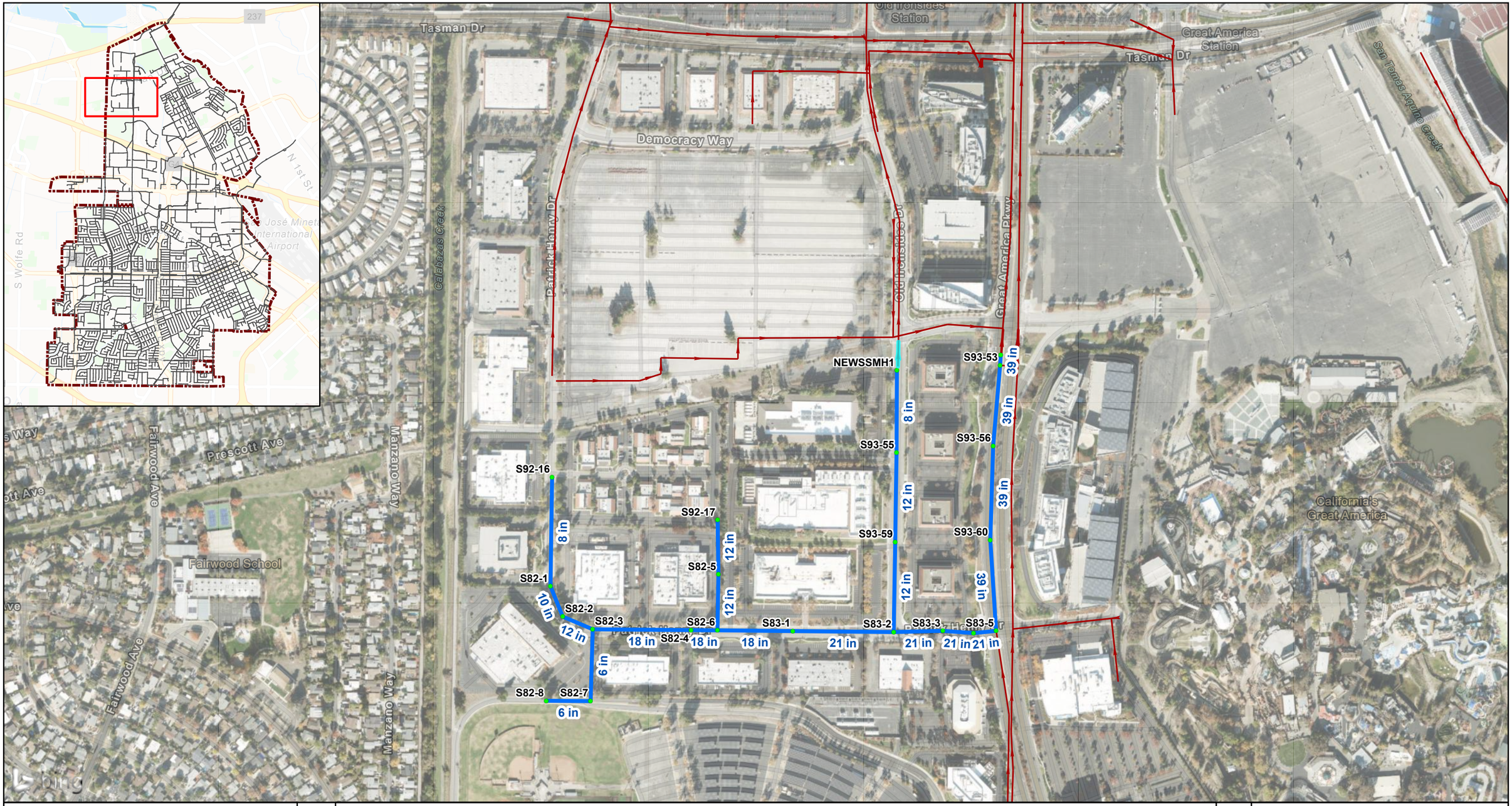


Link	S74-5.1	S74-2.1	S84-29.1	S84-21.1	S84-20.1	S84-19.1	S84-12.1	S84-11.1	S84-10.1	S83-15.1	S83-14.1	S83-33.1	S83-13.1	S83-18.1
Conduit mate	VCP	VCP	VCP	VCP	VCP	VCP	VCP	VCP	VCP	VCP	VCP	VCP	VCP	RCP
width (in)	12.0	12.0	12.0	12.0	12.0	12.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	31.4
length (ft)	218.9	154.0	188.0	407.5	262.3	393.7	377.9	270.4	312.9	235.8	132.3	137.9	418.3	243.0
pfc (MGD)	0.98	1.10	1.10	1.05	1.05	1.12	1.77	1.77	1.77	1.77	1.77	1.77	1.77	9.38
us inv (ft AD)	15.870	15.470	15.118	14.690	13.790	13.250	12.320	11.645	11.161	10.602	10.181	9.944	9.698	7.450
ds inv (ft AD)	15.470	15.118	14.690	13.840	13.250	12.320	11.645	11.161	10.602	10.181	9.944	9.698	8.950	7.210
surc	0.07	0.20	0.36	0.36	0.36	0.79	0.65	0.72	0.75	0.75	0.74	0.74	0.73	0.85
DS flow (MGD)	-0.0000	-0.0002	0.2770	0.2779	0.2778	0.3288	1.2383	1.3075	1.5729	1.5729	1.5729	1.5728	1.5725	13.3632
DS velocity (ft/s)	-0.000	-0.004	1.705	2.091	1.744	0.767	2.280	2.210	2.454	2.463	2.493	2.515	3.915	5.161

Node	S74-5	S74-2	S84-29	S84-21	S84-20	S84-19	S84-12	S84-11	S84-10	S83-15	S83-14	S83-33	S83-13	S83-18	S83-12
ground (ft AD)	-	22.832	23.148	23.040	20.790	19.950	18.670	17.370	16.400	17.070	16.130	15.870	15.740	17.350	16.710
flood dep (ft)	-	-7.296	-7.832	-7.993	-6.642	-6.348	-5.556	-4.913	-4.339	-5.527	-5.012	-4.999	-5.124	-7.493	-7.674

Project 10: Patrick Henry Drive

Cost estimate not included because project will be paid for by the developer.



Project 10
Patrick Henry Drive

Santa Clara Sewer Master Plan Update

Legend

Capacity Improvement Project

- PHD Manholes
- Other Modeled Sewers
- PHD Sewers
- **(8-in)** (Existing Diameter)
- **10-in** Proposed Diameter

0 0.05 0.1 0.2 Miles

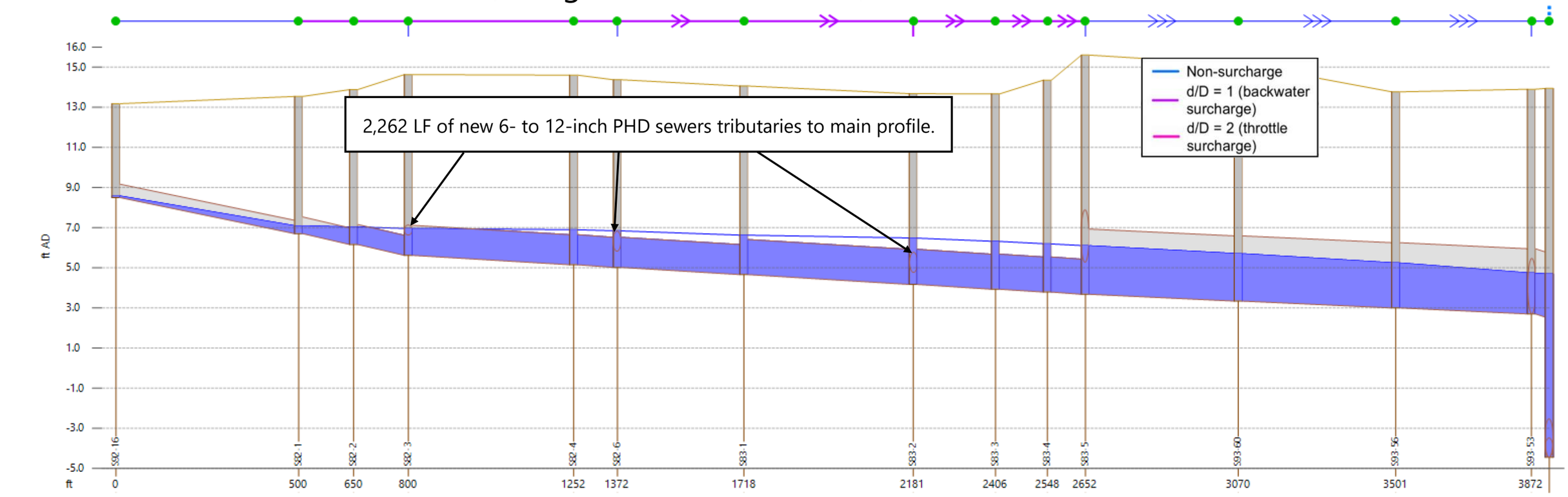
N

Woodard & Curran

Project #: 0012307.00
Map Created: July 2024

Figure Exported: 9/2/2024 By: nbarreralopez Using: \\woodardcurran.net\shared\Projects\0012307.00 Santa Clara CA Sewer Master Plan Update\wip\C. GIS\3. ArcGIS Pro\SantaClaraSewerMasterPlan2023_TMFigures.aprx

Project 10: Patrick Henry Drive
Project Solution Profile View
Model Run Scenario: Wet Weather, Long-Term Future Loads, and Lined Model Network



Link	S92-16.1	S82-1.1	S82-2.1	S82-3.1	S82-4.1	S82-6.1	S83-1.1	S83-2.2	S83-3.1	-	S83-5.1	S93-60.1	S93-56.1	-
Conduit mate	UNKN	UNKN	UNKN	UNKN	UNKN	UNKN	UNKN	UNKN	UNKN	UNKN	UNKN	UNKN	UNKN	-
width (in)	8.0	10.0	12.0	18.0	18.0	18.0	21.0	21.0	21.0	21.0	39.0	39.0	39.0	-
length (ft)	500.0	150.0	150.0	452.0	120.0	346.0	463.0	225.3	142.0	104.0	418.0	431.0	371.0	-
pfc (MGD)	0.47	0.85	1.38	2.19	2.23	2.19	3.33	3.34	3.22	3.33	15.22	14.99	15.18	-
us inv (ft AD)	8.500	6.700	6.160	5.620	5.150	5.020	4.660	4.170	3.930	3.790	3.680	3.340	3.000	-
ds inv (ft AD)	6.700	6.160	5.620	5.150	5.020	4.660	4.170	3.930	3.790	3.680	3.340	3.000	2.700	-
surc	0.59	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.74	0.73	0.69	-
DS flow (MGD)	0.1486	0.2963	0.5975	0.9243	1.3644	1.8146	1.9345	2.8987	3.0675	3.0664	14.3167	14.4272	14.5425	-
DS velocity (ft/s)	1.661	1.694	1.526	1.105	1.522	1.953	1.345	1.882	1.943	1.932	3.417	3.660	4.367	-

Node	S92-16	S82-1	S82-2	S82-3	S82-4	S82-6	S83-1	S83-2	S83-3	S83-4	S83-5	S93-60	S93-56	S93-53
ground (ft AD)	13.180	13.540	13.880	14.630	14.600	14.370	14.060	13.680	13.667	14.354	15.600	15.150	13.770	13.900
flood dep (ft)	-4.600	-6.446	-6.847	-7.670	-7.703	-7.523	-7.432	-7.194	-7.344	-8.154	-9.491	-9.438	-8.519	-9.152

Project 11: Mission Point

Cost estimate not included because project will be paid for by the developer.

Project 11
Mission Point
(Revised Option 2A)

Santa Clara Sewer Master Plan Update

Legend

Capacity Improvement Project

- Mission Point Manholes
- Other Modeled Sewers
- Mission Point Sewers
- **(8-in)** (Existing Diameter)
- **10-in** Proposed Diameter

0 0.05 0.1 0.2 Miles

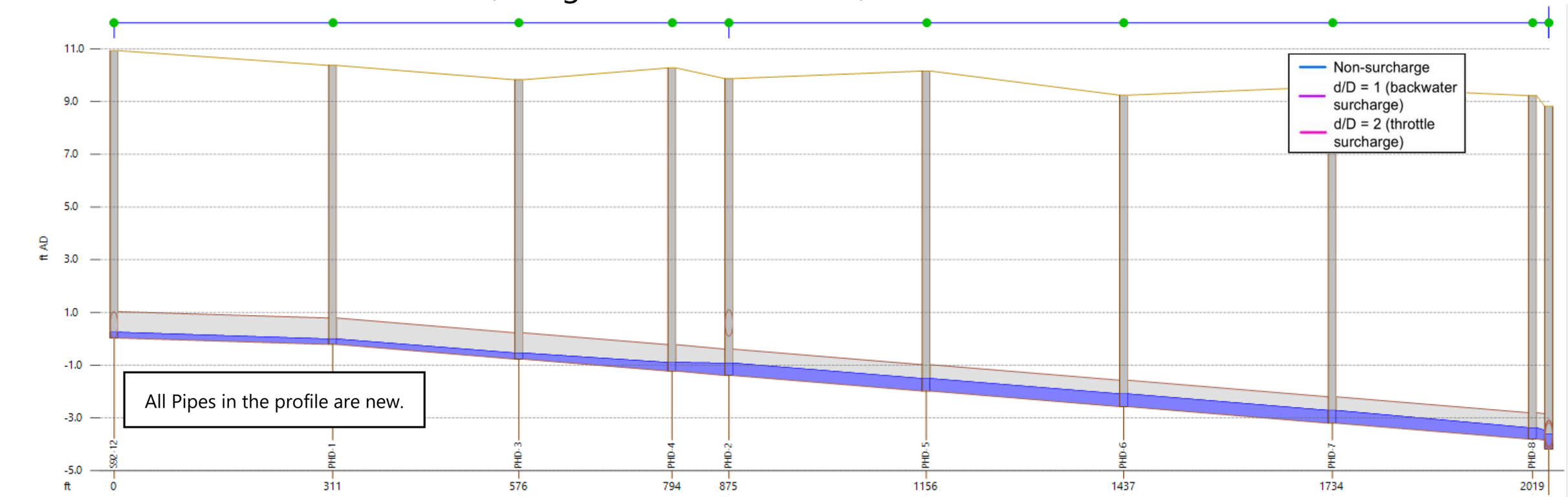
N

Project #: 0012307.00
Map Created: July 2024

Woodard & Curran

Figure Exported: 9/10/2024 By: nbarreralopez Using: \\woodardcurran.net\shared\Projects\0012307.00 Santa Clara CA Sewer Master Plan Update\wip\C. GIS\3. ArcGIS Pro\SantaClaraSewerMasterPlan2023_TMFigures.aprx

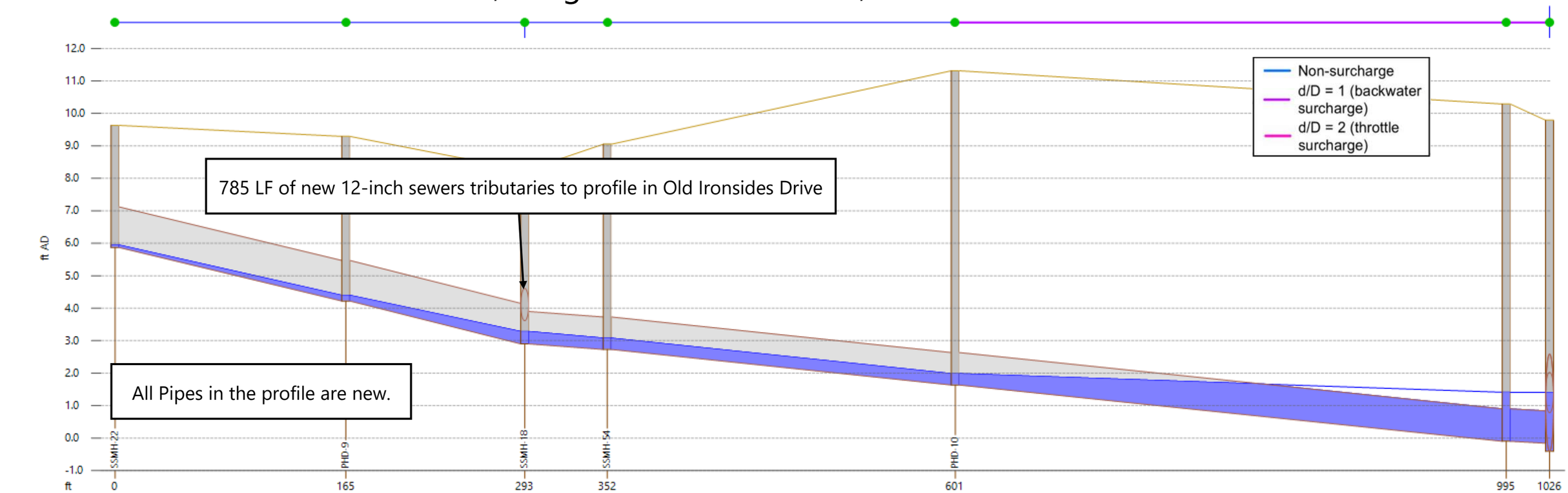
Project 11: Mission Point
Project Solution Profile View 1 of 3
Model Run Scenario: Wet Weather, Long-Term Future Loads, and Lined Model Network



Link	S92-12.1	PHD-1.1	PHD-3.1	PHD-4.1	PHD-2.1	PHD-5.1	PHD-6.1	PHD-7.1	-
Conduit mate	UNKN	UNKN	UNKN	UNKN	UNKN	UNKN	UNKN	UNKN	-
width (in)	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	-
length (ft)	311.0	265.0	218.0	81.0	281.0	281.0	297.0	285.0	-
pfc (MGD)	0.64	1.06	1.05	1.06	1.06	1.06	1.06	1.06	-
us inv (ft AD)	0.030	-0.210	-0.770	-1.220	-1.390	-1.980	-2.570	-3.200	-
ds inv (ft AD)	-0.210	-0.770	-1.220	-1.390	-1.980	-2.570	-3.200	-3.800	-
surc	0.21	0.23	0.32	0.46	0.47	0.48	0.48	0.48	-
DS flow (MGD)	0.0775	0.1064	0.1122	0.1123	0.4524	0.4787	0.4787	0.4786	-
DS velocity (ft/s)	1.082	1.239	0.894	0.489	1.940	2.007	2.004	2.362	-

Node	S92-12	PHD-1	PHD-3	PHD-4	PHD-2	PHD-5	PHD-6	PHD-7	PHD-8
ground (ft AD)	10.930	10.370	9.826	10.274	9.869	10.156	9.241	9.556	9.225
flood dep (ft)	-10.686	-10.381	-10.370	-11.178	-10.796	-11.668	-11.334	-12.279	-12.604

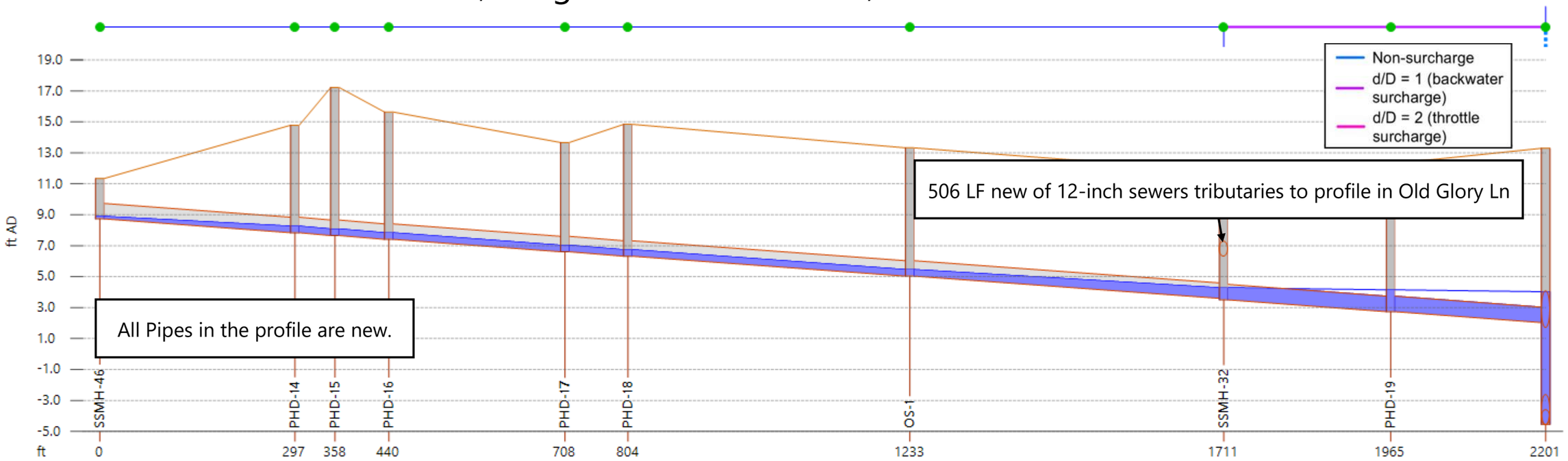
Project 11: Mission Point
Project Solution Profile View 2 of 3
Model Run Scenario: Wet Weather, Long-Term Future Loads, and Lined Model Network



Link	SSMH-22.1	PHD-9.1	SSMH-18.1	SSMH-54.1	PHD-10.1	-
Conduit mate	UNKN	UNKN	UNKN	UNKN	UNKN	UNKN
width (in)	15.0	15.0	12.0	12.0	12.0	12.0
length (ft)	165.0	128.0	59.0	249.0	394.0	31.0
pfc (MGD)	4.18	4.24	1.24	1.53	1.53	1.02
us inv (ft AD)	5.870	4.220	2.900	2.730	1.634	-0.099
ds inv (ft AD)	4.220	2.900	2.730	1.634	-0.099	-0.160
surc	0.14	0.31	0.38	0.35	1.00	1.00
DS flow (MGD)	0.0908	0.0908	0.3863	0.3863	0.3867	0.3867
DS velocity (ft/s)	1.342	0.441	2.449	2.443	0.728	0.727

Node	SSMH-22	PHD-9	SSMH-18	SSMH-54	PHD-10	PHD-11	-
ground (ft AD)	9.630	9.291	8.270	9.050	11.313	10.288	-
flood dep (ft)	-3.684	-4.896	-4.987	-5.971	-9.329	-8.877	-

Project 11: Mission Point
Project Solution Profile View 3 of 3
Model Run Scenario: Wet Weather, Long-Term Future Loads, and Lined Model Network



Link	SSMH-46.1	-	-	PHD-16.1	-	PHD-18.1	OS-1.1	SSMH-32.1	PHD-19.1
Conduit mate	UNKN	-	UNKN	UNKN	UNKN	UNKN	UNKN	UNKN	UNKN
width (in)	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
length (ft)	297.0	61.0	82.0	268.0	96.0	429.0	478.0	254.0	236.0
pfc (MGD)	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26
us inv (ft AD)	8.730	7.839	7.656	7.410	6.606	6.318	5.031	3.500	2.738
ds inv (ft AD)	7.839	7.656	7.410	6.606	6.318	5.031	3.597	2.738	2.030
surc	0.42	0.42	0.42	0.42	0.42	0.42	0.68	1.00	1.00
DS flow (MGD)	0.4552	-	0.4550	0.4549	0.4549	0.4548	0.4992	0.5503	0.5499
DS velocity (ft/s)	2.244	2.244	2.244	2.244	2.243	2.222	2.863	1.744	1.031

Node	SSMH-46	PHD-14	-	PHD-16	PHD-17	PHD-18	OS-1	SSMH-32	PHD-19	S93-48
ground (ft AD)	11.340	14.785	-	15.636	13.668	14.842	13.320	11.810	12.312	13.290
flood dep (ft)	-2.449	-6.525	-	-7.805	-6.641	-8.103	-7.865	-7.532	-8.160	-9.263

Project 12: GAP West Trunk

PROJECT DESCRIPTION

Project No.	12
Project ID	GAP West Trunk
Project Location	S of West Tasman Dr to Lafayette St
Description	4810 LF of 36 to 42-inch diameter pipe
Priority	3
Flow Confidence Level	2
Loads Trigger	Long-Term Future Loads (LTFL)
Design Flow Trigger	Wet Weather Flow (WWF)
Physical Network Trigger	Unlined Model Network (UMN)
Estimated Capital Improvement Cost	$17,781,000
Comments	(i) Pipes are listed in order from upstream to downstream. (ii) A 50/50 flow split was assumed at the Lawrence/Homestead gate structure which splits flow between the eastern sewer on Homestead Rd or the northern sewer on Lawrence Expwy. (iii) Project would not include improvements to siphon between manholes S103-19 and S103-16. Siphon is unlined but was assumed to be lined in the future in the Lined Model Network. (iv) Project does not include the GAP West Trunk improvements associated with the PHD development. The cost to upsize the GAP West Trunk from the PHD specific development project's discharge point to the Bay Division pipelines crossing (from manhole S83-5 to S93-53) is to be paid by the developers as discussed in Section 2.2; therefore, this portion of the project is not included the City's CIP. (v) Two pipe segments between manholes S93-48 and S93-42 that are downstream of the PHD project and the GAP West project are not included in the proposed project because they would still have capacity based on the City's capacity criteria of no surcharge; however, the City may wish to consider expanding the project to include them during preliminary design. (vi)
Assumptions	(i) New diameter based on pipe replacement. (ii) Cost estimates are based on CCI of 15367.24 from the August 2024 ENR.
Alternatives	City may wish to consider evaluating alternatives during preliminary design that would replace or remove this siphon that crosses under the San Tomas Aquino Creek, if feasible.

PROJECT COST DETAIL

U/S MH ID	D/S MH ID	Existing Diameter (inches)	New Diameter (inches)	Length (feet)	Slope (%)	Pipe Depth (feet BGL)	Existing Pipe Capacity (mgd)	Future Pipe Capacity (mgd)	Long-Term Future PDWF (mgd)	Long-Term Future PWWF (mgd)	Long-Term Future DWF Velocity (ft/sec)	Open Cut Cost	Trenchless Installation	Trenchless Casing Size	Unit Cost ($/LF)	Total Cost ($)
S93-42	S93-36	29	36	401	0.13	14	8.41	15.67	10.16	10.57	3.71	$1,239			$1,239	$ 496,839
S93-36	S93-21	29	36	452	0.16	13	9.51	17.09	10.79	11.33	3.91	$1,239	PTGAB	48.00	$2,805	$ 1,267,788
S93-21	S93-4	29	36	451	0.18	13	10.17	18.27	10.88	11.43	3.47	$1,239			$1,239	$ 558,789
S93-4	S103-22	29	36	447	0.09	14	7.36	13.22	11.00	11.55	5.28	$1,239			$1,239	$ 553,337
S103-22	S103-19	29	42	388	0.05	20	5.55	15.14	12.48	12.85	5.21	$1,399			$1,399	$ 542,113
S103-16	S103-14	31	42	245	0.12	23	10.45	22.77	12.48	12.85	3.37	$1,399			$1,399	$ 342,335
S103-14	S103-9	31	42	101	0.20	20	13.28	28.95	12.48	12.85	3.25	$1,399			$1,399	$ 141,159
S103-9	S103-10	32	42	375	0.09	19	9.38	19.87	13.21	13.70	3.46	$1,369			$1,369	$ 513,375
S103-10	S103-12	32	42	468	0.10	17	9.53	20.17	13.20	13.70	3.49	$1,369			$1,369	$ 640,281
S103-12	S104-24	32	42	468	0.10	16	9.53	20.17	13.20	13.70	3.58	$1,369			$1,369	$ 640,144
S104-24	S104-26	32	42	477	0.09	19	9.43	19.98	13.20	13.70	3.91	$1,369			$1,369	$ 652,739
S104-26	S104-23	31	42	423	0.10	17	9.18	20.00	13.20	13.69	5.68	$1,369			$1,369	$ 579,087
S104-23	S104-51	31	42	62	0.71	16	25.20	54.92	13.20	13.69	5.68	$1,369			$1,369	$ 84,467
S104-51	S104-19	36	42	54	0.80	17	37.62	58.03	13.20	13.69	4.46	$1,369			$1,369	$ 73,926

Total Baseline Pipe Construction Cost	$	5,818,593
Total Trenchless Installation Cost	$	1,267,788
No Jacking Pit	$	-
No Receiving Pit	$	-
Installation or Adjustment of Weir in Existing Manhole Structure	$	-
Lateral Reconnection Cost (Approx. 6)	$	3,000
Modify Existing Manholes Cost (Approx. 16)	$	280,000
Baseline Construction Cost:	**$**	**7,369,380**
Dewatering	$	432,855
Bypass Pumping	$	708,638
Remove & Replace Factor	$	354,319
Traffic Control (20%)	$	1,417,276
Pavement Restoration (T-trench)	$	138,352
Subtotal:	**$**	**10,420,820**
Mobilization/Demobilization (5% of subtotal)	$	521,041.02
Estimated Construction Cost Subtotal:	**$**	**10,941,861**
Contingencies (30% of construction subtotal)	$	3,282,558.41
Estimated Construction Cost:	**$**	**14,224,420**
Engineering and Inspection (25% of construction cost)	$	3,556,105
Estimated Capital Improvement Cost:	**$**	**17,781,000**

(Note: Cost estimates are based on August 2024 ENR CCI of 15367.24 for the San Francisco Area)

Project 12
GAP West Trunk

Santa Clara Sewer Master Plan Update

Legend

Capacity Improvement Project

- Manholes
- Other Modeled Sewers
- Project Sewers
- **(8-in)** (Existing Diameter)
- **10-in** Proposed Diameter

0 0.05 0.1 0.2 Miles

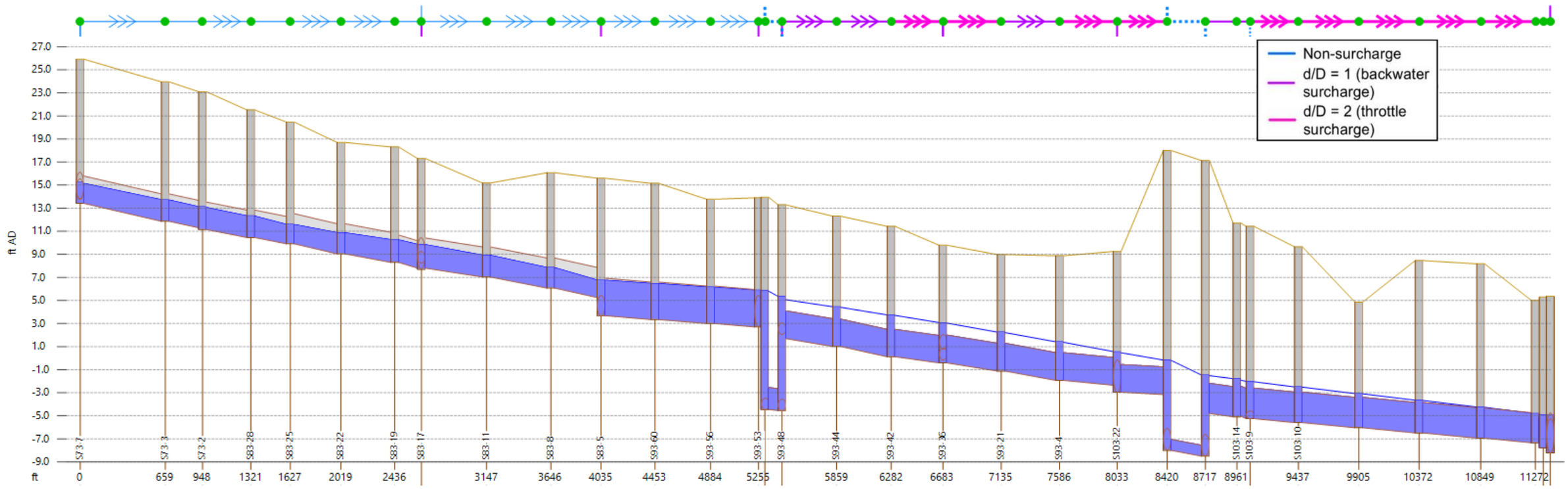
N

Woodard & Curran

Project #: 0012307.00
Map Created: July 2024

Figure Exported: 9/3/2024 By: nbarreralopez Using: \\woodardcurran.net\shared\Projects\0012307.00 Santa Clara CA Sewer Master Plan Update\wipIC: GIS\3. ArcGIS Pro\SantaClaraSewerMasterPlan2023_TMFigures.aprx

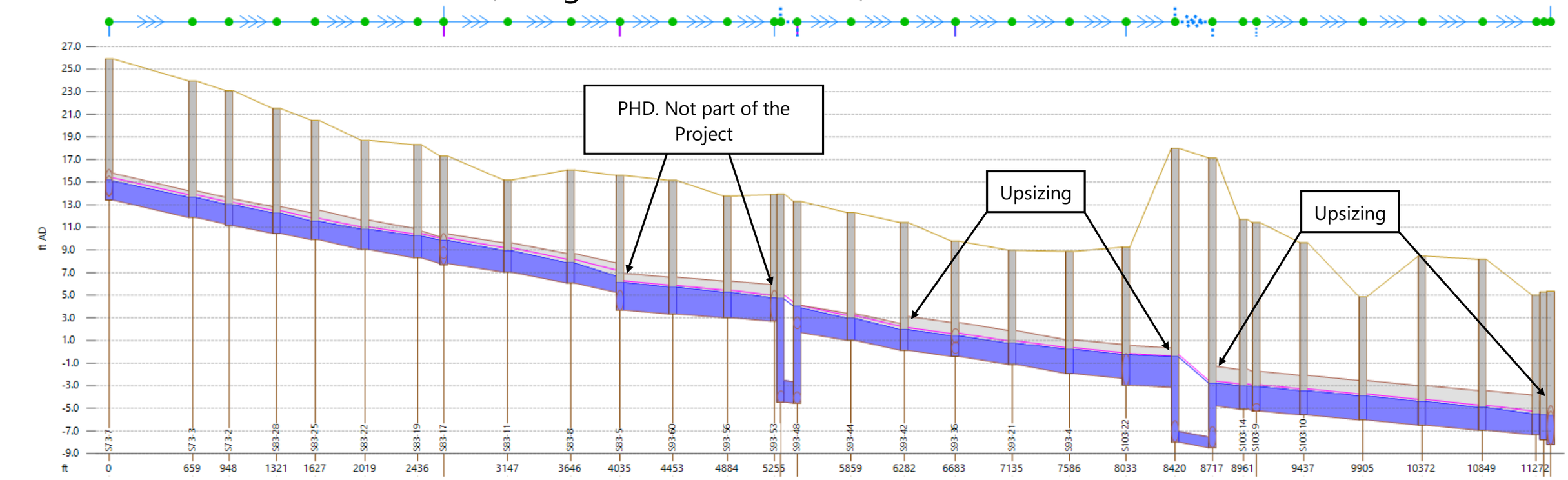
Project 12: GAP West Trunk
Capacity Deficiency Profile View
Model Run Scenario: Wet Weather, Long-Term Future Loads, and Lined Model Network



Link	S73-7.1	-	S73-2.1	-	S83-25.1	S83-22.1	-	S83-17.1	S83-11.1	S83-8.1	S83-5.1	S93-60.1	S93-56.1	-	S93-48.1	S93-44.1	S93-42.1	S93-36.1	S93-21.1	S93-4.1	-	-	-	-	S103-9.1	S103-10.1	S103-12.1	S104-24.1	S104-26.1
Conduit mate	RCP	RCP	RCP	RCP	RCP	RCP	RCP	RCP	RCP	RCP	UNKN	UNKN	UNKN	-	RCP	RCP	RCP	RCP	RCP	RCP	RCP	VCP	RCP	-	RCP	RCP	RCP	RCP	RCP
width (in)	28.5	28.5	28.5	28.5	31.4	31.4	28.5	31.4	31.4	31.4	39.0	39.0	39.0	-	28.9	28.5	28.5	28.9	28.9	28.9	28.8	11.4	31.4	-	31.7	31.7	31.7	31.7	31.4
length (ft)	658.7	288.9	373.8	305.7	392.1	416.7	-	503.0	499.0	389.0	418.0	431.0	371.0	-	423.0	423.0	401.0	452.0	451.0	446.6	387.5	296.2	244.7	-	375.0	467.7	467.6	476.8	423.0
pfc (MGD)	11.23	10.19	9.94	9.82	14.06	12.58	-	11.68	13.09	13.70	15.22	14.99	15.18	-	9.62	10.62	8.41	9.51	10.17	7.36	5.55	0.83	10.45	-	9.38	9.53	9.53	9.43	9.18
us inv (ft AD)	13.410	11.860	11.150	10.460	9.910	9.040	-	7.800	7.030	6.070	3.680	3.340	3.000	-	1.690	1.010	0.120	-0.410	-1.120	-1.930	-2.950	-8.000	-	-	-5.240	-5.590	-6.040	-6.490	-6.940
ds inv (ft AD)	11.860	11.300	10.460	9.910	9.040	8.300	-	7.030	6.070	5.250	3.340	3.000	2.700	-	1.010	0.120	-0.410	-1.120	-1.930	-2.350	-3.160	-8.500	-	-	-5.590	-6.040	-6.490	-6.940	-7.340
surc	0.79	0.78	0.80	0.78	0.70	0.75	0.87	0.78	0.72	0.67	0.96	0.97	0.98	-	1.00	1.00	2.00	2.00	1.00	2.00	2.00	2.00	1.00	-	2.00	2.00	2.00	2.00	2.00
DS flow (MGD)	9.7231	9.7229	9.7228	9.8966	9.8990	9.9069	-	11.4763	11.4885	11.4882	14.0521	14.1030	14.1700	-	9.2138	9.2112	9.2087	9.9604	10.0619	10.1861	9.6615	1.3291	-	-	10.5776	10.5764	10.5734	10.5684	10.5626
DS velocity (ft/s)	4.037	4.198	4.018	4.568	3.862	3.675	-	4.261	4.563	6.010	3.291	3.503	4.242	-	3.821	3.416	3.531	3.718	3.505	5.518	5.567	2.898	2.978	-	3.210	3.175	3.288	3.581	5.569

Node	S73-7	S73-3	S73-2	-	S83-25	S83-22	-	S83-17	S83-11	S83-8	S83-5	S93-60	S93-56	-	-	S93-44	S93-42	S93-36	S93-21	S93-4	S103-22	-	-	-	-	S103-10	S103-12	S104-24	S104-26	-
ground (ft AD)	-	23.950	-	21.520	20.470	18.700	-	17.300	15.180	16.070	15.600	15.150	13.770	-	-	12.310	11.420	9.790	8.980	8.870	9.250	18.000	-	-	-	9.650	4.860	8.460	8.170	-
flood dep (ft)	-	-10.225	-9.985	-9.192	-8.879	-7.827	-	-7.449	-6.255	-8.216	-8.835	-8.683	-7.612	-	-	-7.860	-7.677	-6.712	-6.727	-7.455	-8.703	-	-	-	-	-12.148	-7.938	-12.116	-12.413	-

Project 12: GAP West Trunk
Project Solution Profile View
Model Run Scenario: Wet Weather, Long-Term Future Loads, and Lined Model Network



Link	S73-7.1	-	S73-2.1	-	S83-25.1	S83-22.1	-	S83-17.1	S83-11.1	S83-8.1	S83-5.1	S93-60.1	S93-56.1	-	S93-48.1	S93-44.1	S93-42.1	S93-36.1	S93-21.1	S93-4.1	-	-	-	-	S103-9.1	S103-10.1	S103-12.1	S104-24.1	S104-26.1
Conduit mate	RCP	RCP	RCP	RCP	RCP	RCP	RCP	RCP	RCP	RCP	UNKN	UNKN	UNKN	-	RCP	RCP	RCP	RCP	RCP	RCP	RCP	VCP	RCP	-	RCP	RCP	RCP	RCP	RCP
width (in)	28.5	28.5	28.5	28.5	31.4	31.4	28.5	31.4	31.4	31.4	39.0	39.0	39.0	-	28.9	28.5	36.0	36.0	36.0	36.0	42.0	11.4	42.0	-	42.0	42.0	42.0	42.0	42.0
length (ft)	658.7	288.9	373.8	305.7	392.1	416.7	-	503.0	499.0	389.0	418.0	431.0	371.0	-	423.0	423.0	401.0	452.0	451.0	446.6	387.5	296.2	244.7	-	375.0	467.7	467.6	476.8	423.0
pfc (MGD)	11.23	10.19	9.94	9.82	14.06	12.58	-	11.68	13.09	13.70	15.22	14.99	15.18	-	9.62	10.62	15.67	17.09	18.27	13.22	15.14	0.83	22.77	-	19.87	20.17	20.17	19.98	20.00
us inv (ft AD)	13.410	11.860	11.150	10.460	9.910	9.040	-	7.800	7.030	6.070	3.680	3.340	3.000	-	1.690	1.010	0.120	-0.410	-1.120	-1.930	-2.950	-8.000	-	-	-5.240	-5.590	-6.040	-6.490	-6.940
ds inv (ft AD)	11.860	11.300	10.460	9.910	9.040	8.300	-	7.030	6.070	5.250	3.340	3.000	2.700	-	1.010	0.120	-0.410	-1.120	-1.930	-2.350	-3.160	-8.500	-	-	-5.590	-6.040	-6.490	-6.940	-7.340
surc	0.75	0.74	0.77	0.75	0.68	0.74	0.87	0.78	0.72	0.67	0.74	0.73	0.69	-	0.90	0.81	0.60	0.62	0.71	0.71	0.77	2.00	0.59	-	0.61	0.61	0.60	0.59	0.57
DS flow (MGD)	9.2880	9.2876	9.2868	9.4393	9.4382	9.4361	-	11.5037	11.5150	11.5148	14.3152	14.4257	14.5411	-	10.5705	10.5699	10.5684	11.3273	11.4285	11.5526	12.8451	1.7651	-	-	13.7047	13.7036	13.7017	13.6982	13.6922
DS velocity (ft/s)	4.027	4.203	3.985	4.519	3.792	3.508	-	4.263	4.566	6.014	3.417	3.660	4.367	-	4.173	4.494	3.704	3.912	3.474	5.296	5.190	3.853	3.366	-	3.476	3.505	3.578	3.866	5.626

Node	S73-7	S73-3	S73-2	-	S83-25	S83-22	-	S83-17	S83-11	S83-8	S83-5	S93-60	S93-56	-	-	S93-44	S93-42	S93-36	S93-21	S93-4	S103-22	-	-	-	-	S103-10	S103-12	S104-24	S104-26	-
ground (ft AD)	-	23.950	-	21.520	20.470	18.700	-	17.300	15.180	16.070	15.600	15.150	13.770	-	-	12.310	11.420	9.790	8.980	8.870	9.250	18.000	-	-	-	9.650	4.860	8.460	8.170	-
flood dep (ft)	-	-10.308	-	-9.261	-8.936	-7.883	-	-7.445	-6.252	-8.218	-9.491	-9.438	-8.520	-	-	-9.360	-9.483	-8.387	-8.251	-8.664	-9.519	-	-	-	-	-13.118	-8.790	-12.866	-13.102	-

Project 13: GAP East Trunk

PROJECT DESCRIPTION

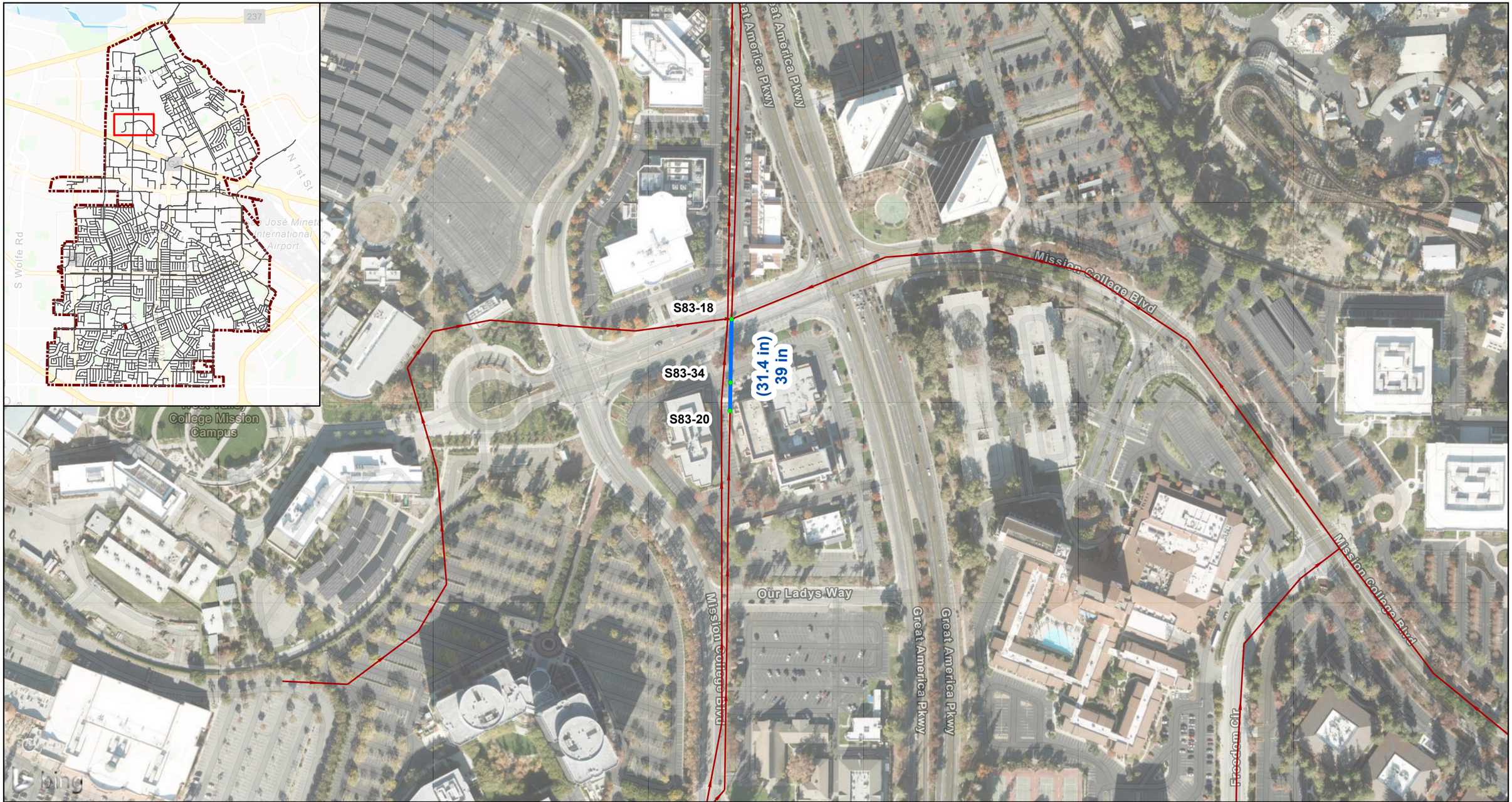
Project No.	13
Project ID	GAP East Trunk
Project Location	Old Glory Ln to S of Bunker Hill Ln; Stars and Stripes Dr
Description	231 LF of 39-inch diameter pipe
Priority	4
Flow Confidence Level	2
Loads Trigger	Long-Term Future Loads (LTFL)
Design Flow Trigger	Wet Weather Flow (WWF)
Physical Network Trigger	Lined Model Network (LMN)
Estimated Capital Improvement Cost	$1,002,000
Comments	(i) Pipes are listed in order from upstream to downstream.
	(ii) A 50/50 flow split was assumed at the Lawrence/Homestead gate structure which splits flow between the eastern sewer on Homestead Rd or the northern sewer on Lawrence Expwy.
	(iii) Project would not include improvements to the two siphons along the GAP E Trunk that cross Hetch Hetchy and San Tomas Aquino Creeks because the upstream sewers are not deficient based on the City's no surcharge capacity deficiency criteria. Both of these siphons have already been lined by the City; therefore, the lining is reflected in both the Unlined Model Network and Lined Model Network.
	(iv) Project would be required due to assumed future lining of GAP E Trunk sewer and other trunk sewers upstream.
	(v)
	(vi)
Assumptions	(i) New diameter based on pipe replacement.
	(ii) Cost estimates are based on CCI of 15367.24 from the August 2024 ENR.
Alternatives	City may wish to consider evaluating alternatives during preliminary design that would replace or remove the siphons crossing under Hetch Hetchy and San Tomas Aquino Creek, if feasible.

PROJECT COST DETAIL

U/S MH ID	D/S MH ID	Existing Diameter (inches)	New Diameter (inches)	Length (feet)	Slope (%)	Pipe Depth (feet BGL)	Existing Pipe Capacity (mgd)	Future Pipe Capacity (mgd)	Long-Term Future PDWF (mgd)	Long-Term Future PWWF (mgd)	Long-Term Future DWF Velocity (ft/sec)	Open Cut Cost	Trenchless Installation	Trenchless Casing Size	Unit Cost ($/LF)	Total Cost ($)
S83-20	S83-34	31	39	71	0.21	14	13.68	24.47	12.45	13.84	3.20	$1,289			$1,289	$ 91,906
S83-34	S83-18	31	39	160	0.09	14	9.14	16.35	12.45	13.83	3.19	$1,289			$1,289	$ 205,982

Total Baseline Pipe Construction Cost	$	297,888
Total Trenchless Installation Cost	$	-
No Jacking Pit	$	-
No Receiving Pit	$	-
Installation or Adjustment of Weir in Existing Manhole Structure	$	-
Lateral Reconnection Cost (Approx. 1)	$	500
Modify Existing Manholes Cost (Approx. 9)	$	157,500
Baseline Construction Cost:	**$**	**455,888**
Dewatering	$	20,799
Bypass Pumping	$	29,789
Remove & Replace Factor	$	14,894
Traffic Control (20%)	$	59,578
Pavement Restoration (T-trench)	$	6,551
Subtotal:	**$**	**587,499**
Mobilization/Demobilization (5% of subtotal)	$	29,374.94
Estimated Construction Cost Subtotal:	**$**	**616,874**
Contingencies (30% of construction subtotal)	$	185,062.11
Estimated Construction Cost:	**$**	**801,936**
Engineering and Inspection(25% ofconstruction cost)	$	200,484
Estimated Capital Improvement Cost:	**$**	**1,002,000**

(Note: Cost estimates are based on August 2024 ENR CCI of 15367.24 for the San Francisco Area)



Project 13
GAP East Trunk

Santa Clara Sewer Master Plan Update

Legend

Capacity Improvement Project

- Manholes
- Project Sewers
- **(8-in)** (Existing Diameter)
- **10-in** Proposed Diameter
- Other Modeled Sewers

0 0.04 0.07 0.14 Miles

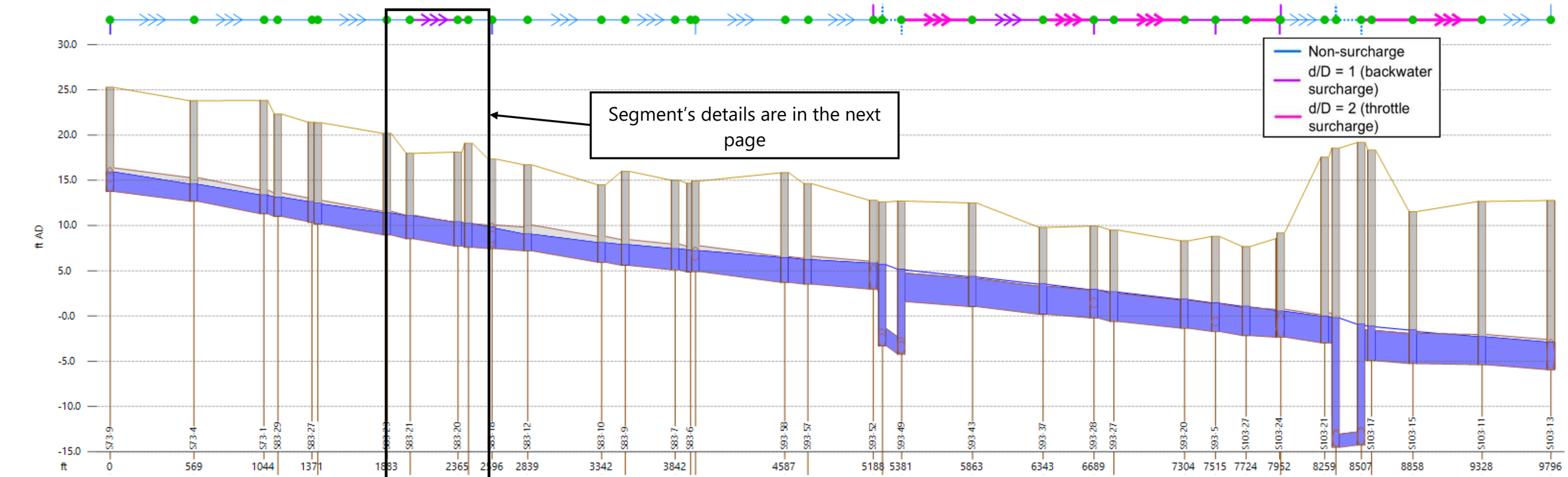
N

Project #: 0012307.00
Map Created: July 2024

Woodard & Curran

Figure Exported: 10/15/2024 By: nbarreralopez Using: \\woodardcurran.net\shared\Projects\0012307.00 Santa Clara CA Sewer Master Plan Update\wipC. GIS\3. ArcGIS Pro\SantaClaraSewerMasterPlan2023_TMFigures.aprx

Project 13: GAP East Trunk
Capacity Deficiency Profile View
Model Run Scenario: Wet Weather, Long-Term Future Loads, and Lined Model Network



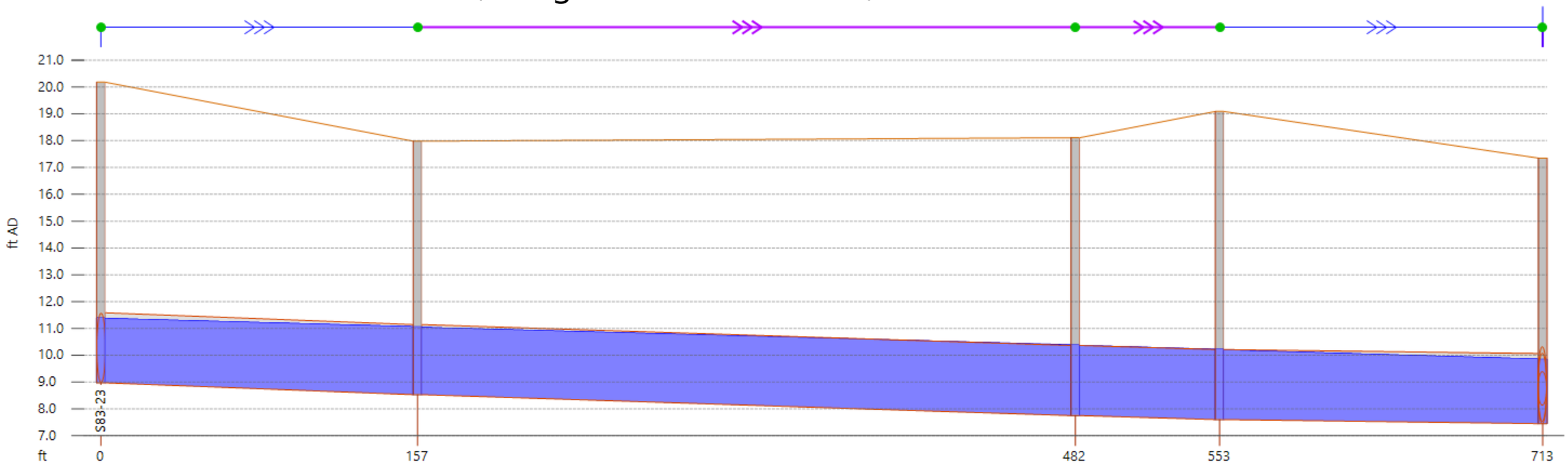
Link	S73-9.1	S73-4.1	-	-	S83-26.1	-	S83-21.1	-	-	-	S83-12.1	-	S83-9.1	-	S83-30.1	-	S93-57.1	-	S93-49.1	S93-43.1	S93-37.1	-	S93-27.1	-	-	-	-	-	-	-	S103-15.1	S103-11.1
Conduit mate	RCP	RCP	-	RCP	RCP	RCP	RCP	-	RCP	RCP	RCP	RCP	RCP	-	RCP	RCP	RCP	-	RCP	RCP	RCP	-	RCP	RCP	RCP	RCP	RCP	-	VCP	-	RCP	RCP	RCP
width (in)	31.4	31.4	-	31.4	31.4	31.4	31.4	-	31.4	31.4	34.2	34.2	34.2	-	34.2	34.2	37.1	-	37.6	37.1	37.1	-	37.1	37.1	37.1	37.1	37.1	-	17.3	-	39.9	40.1	40.1
length (ft)	569.4	474.9	-	230.4	471.3	-	325.4	-	-	243.0	503.0	-	339.0	-	607.0	-	444.0	-	482.0	480.0	346.0	-	480.0	211.0	208.9	227.6	299.4	-	-	-	281.3	469.9	468.2
pfc (MGD)	13.00	16.03	-	14.71	15.06	-	14.61	-	9.14	9.38	18.83	-	14.16	-	16.66	-	16.39	-	16.35	19.72	15.84	-	18.41	19.24	21.86	13.10	21.37	-	-	-	19.14	9.56	19.52
us inv (ft AD)	13.760	12.680	-	-	10.170	-	8.530	-	-	7.450	7.210	-	5.590	-	4.920	-	3.530	-	1.600	1.050	0.190	-	-0.590	-	-	-2.160	-2.320	-	-	-	-4.930	-5.250	-5.380
ds inv (ft AD)	12.680	11.310	-	-	8.970	-	7.750	-	-	7.210	5.950	-	5.110	-	3.730	-	2.980	-	1.050	0.190	-0.210	-	-1.340	-	-	-2.340	-2.950	-	-	-	-5.250	-5.380	-5.920
surc	0.82	0.79	-	0.84	0.93	0.97	1.00	-	0.99	0.85	0.76	0.81	0.82	-	0.95	0.94	0.92	-	2.00	1.00	2.00	-	2.00	1.00	1.00	2.00	0.94	-	1.00	-	2.00	2.00	0.92
DS flow (MGD)	13.3174	13.3081	-	-	13.2931	-	13.3136	-	-	-	13.3034	-	13.2770	-	13.4917	-	13.3924	-	18.9698	18.9485	18.9299	-	18.9708	-	-	-	19.8493	-	-	-	19.8406	19.8297	19.8143
DS velocity (ft/s)	5.006	4.843	-	5.118	4.520	-	3.796	-	-	5.149	4.171	-	4.091	-	4.008	-	5.604	-	4.344	4.221	4.636	-	4.392	4.388	4.254	4.868	5.807	-	-	-	3.416	3.909	3.938

Node	S73-9	S73-4	S73-1	-	-	-	S83-23	-	-	-	-	S83-12	S83-10	-	-	S83-30	S93-58	S93-57	-	S93-49	S93-43	S93-37	-	S93-27	S93-20	-	-	-	-	-	-	-	S103-15	S103-11	-
ground (ft AD)	-	23.790	-	-	-	-	20.180	-	-	-	-	16.710	14.500	-	-	14.920	15.830	14.630	-	12.700	12.500	9.790	-	9.510	8.310	-	-	-	-	-	-	-	11.540	12.660	-
flood dep (ft)	-9.338	-9.227	-	-	-	-	-8.788	-	-	-	-	-7.671	-6.398	-	-	-7.694	-9.389	-8.413	-	-7.531	-8.158	-6.269	-	-6.843	-6.472	-	-	-	-	-	-	-	-13.100	-14.964	-

Project 13: GAP East Trunk

Capacity Deficiency Profile View (*Zoomed-in section*)

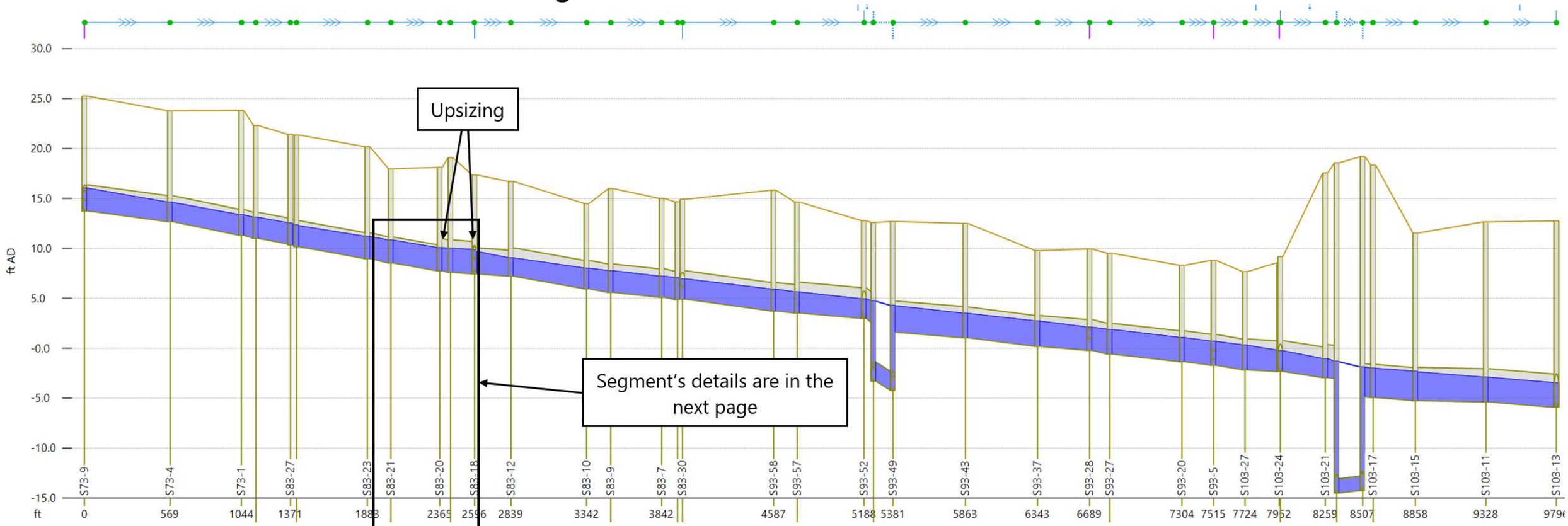
Model Run Scenario: Wet Weather, Long-Term Future Loads, and Lined Model Network



Link	S83-23.1	S83-21.1	S83-20.1	S83-34.1
Conduit mate	RCP	RCP	RCP	RCP
width (in)	31.4	31.4	31.4	31.4
length (ft)	156.6	325.4	71.3	159.8
pfc (MGD)	15.82	14.61	13.68	9.14
us inv (ft AD)	8.970	8.530	7.750	7.600
ds inv (ft AD)	8.530	7.750	7.600	7.450
surc	0.97	1.00	1.00	0.99
DS flow (MGD)	13.2986	13.3136	13.3133	13.3125
DS velocity (ft/s)	4.195	3.796	3.807	3.993

Node	S83-23	S83-21	S83-20	S83-34	S83-18
ground (ft AD)	20.180	17.980	18.110	19.090	17.350
flood dep (ft)	-8.788	-6.921	-7.723	-8.872	-7.498

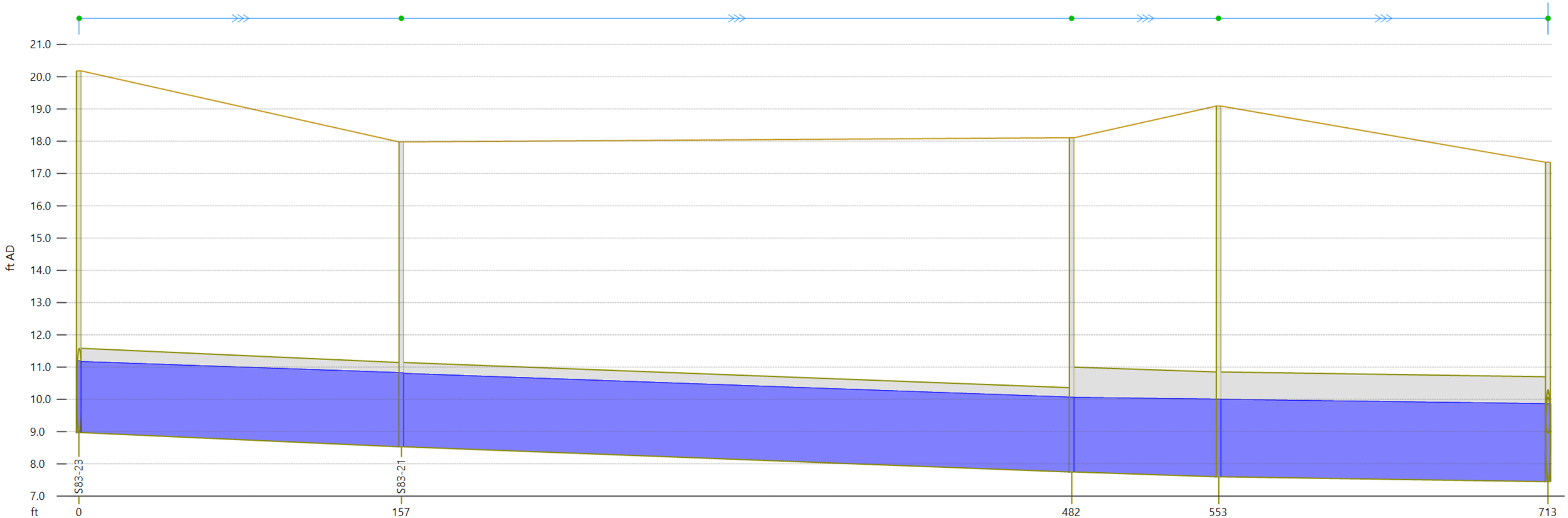
Project 13: GAP East Trunk
Project Solution Profile View
Model Run Scenario: Wet Weather, Long-Term Future Loads, and Lined Model Network



Link	S73-9.1	S73-4.1	-	-	S83-26.1	-	S83-21.1	-	-	S83-12.1	-	S83-9.1	-	S83-30.1	-	S93-57.1	-	S93-49.1	S93-43.1	S93-37.1	-	S93-27.1	-	-	-	-	-	-	-	S103-15.1	S103-11.1
Conduit mate	RCP	RCP	-	RCP	RCP	RCP	RCP	RCP	RCP	RCP	RCP	RCP	-	RCP	RCP	RCP	-	RCP	RCP	RCP	-	RCP	RCP	RCP	RCP	RCP	-	VCP	RCP	RCP	RCP
width (in)	31.4	31.4	-	31.4	31.4	-	31.4	-	31.4	34.2	34.2	34.2	-	34.2	-	37.1	-	37.6	37.1	37.1	-	37.1	37.1	37.1	37.1	37.1	-	17.3	39.9	40.1	40.1
length (ft)	569.4	474.9	-	230.4	471.3	-	325.4	-	243.0	503.0	-	339.0	-	607.0	-	444.0	-	482.0	480.0	346.0	-	480.0	211.0	208.9	227.6	299.4	-	-	281.3	469.9	468.2
pfc (MGD)	13.00	16.03	-	14.71	15.06	-	14.61	-	9.38	18.83	-	14.16	-	16.66	-	16.39	-	21.97	27.53	22.11	-	25.71	19.24	21.86	13.10	21.37	-	-	31.31	15.44	19.52
us inv (ft AD)	13.760	12.680	-	-	10.170	-	8.530	-	7.450	7.210	-	5.590	-	4.920	-	3.530	-	1.600	1.050	0.190	-	-0.590	-	-	-	-2.320	-	-	-4.930	-5.250	-5.380
ds inv (ft AD)	12.680	11.310	-	-	8.970	-	7.750	-	7.210	5.950	-	5.110	-	3.730	-	2.980	-	1.050	0.190	-0.210	-	-1.340	-	-	-	-2.950	-	-	-5.250	-5.380	-5.920
surc	0.86	0.79	-	0.81	0.85	-	0.88	-	0.85	0.72	0.76	0.75	-	0.76	-	0.67	-	0.84	0.82	0.81	-	0.79	0.77	0.80	0.79	0.66	-	1.00	0.89	0.85	0.74
DS flow (MGD)	13.8302	13.8255	-	-	13.8155	-	13.8355	-	-	13.3619	-	13.3605	-	13.6553	-	13.6550	-	17.9248	17.9215	17.9195	-	18.0107	-	-	-	17.3783	-	-	-	17.3735	17.3714
DS velocity (ft/s)	5.034	4.867	-	5.121	4.712	-	4.285	-	5.159	4.183	-	4.120	-	4.079	-	5.673	-	4.346	4.225	4.652	-	4.460	4.494	4.425	5.227	5.799	-	-	3.304	3.871	3.905

Node	S73-9	S73-4	S73-1	-	-	-	-	S83-23	-	-	-	-	S83-12	S83-10	-	-	S83-30	S93-58	-	-	-	S93-43	S93-37	-	-	S93-20	-	-	-	-	-	-	S103-15	S103-11	-
ground (ft AD)	-	23.790	-	-	-	-	-	20.180	-	-	-	-	16.710	14.500	-	-	14.920	15.830	14.630	-	-	12.700	12.500	9.790	-	9.510	8.310	-	-	-	-	-	-	11.540	12.660	-
flood dep (ft)	-	-9.175	-	-	-	-	-	-8.993	-	-	-	-	-7.674	-6.487	-	-	-7.976	-9.929	-9.010	-	-	-8.422	-9.012	-7.070	-	-7.635	-7.246	-	-	-	-	-	-	-13.851	-15.571	-

Project 13: GAP East Trunk
Project Solution Profile View (*Zoomed-in section*)
Model Run Scenario: Wet Weather, Long-Term Future Loads, and Lined Model Network



Link	S83-23.1	S83-21.1	S83-20.1	S83-34.1
Conduit mate	RCP	RCP	RCP	RCP
width (in)	31.4	31.4	39.0	39.0
length (ft)	156.6	325.4	71.3	159.8
pfc (MGD)	15.82	14.61	24.47	16.35
us inv (ft AD)	8.970	8.530	7.750	7.600
ds inv (ft AD)	8.530	7.750	7.600	7.450
surc	0.88	0.88	0.74	0.74
DS flow (MGD)	13.8205	13.8355	13.8351	13.8341
DS velocity (ft/s)	4.508	4.285	3.322	3.318

Node	S83-23	S83-21	S83-20	S83-34	S83-18
ground (ft AD)	20.180	17.980	18.110	19.090	17.350
flood dep (ft)	-8.993	-7.160	-8.049	-9.090	-7.492

Project 14: Bunker Hill Lane East

PROJECT DESCRIPTION

Project No.	14
Project ID	Bunker Hill Lane East
Project Location	E of Great America Pkwy
Description	107 LF of 8-inch diameter pipe
Priority	7
Flow Confidence Level	N/A
Loads Trigger	Long-Term Future Loads (LTFL)
Design Flow Trigger	Wet Weather Flow (WWF)
Physical Network Trigger	Unlined Model Network
Estimated Capital Improvement Cost	$301,000
Comments	(i) Pipes are listed in order from upstream to downstream.
	(ii) A 50/50 flow split was assumed at the Lawrence/Homestead gate structure which splits flow between the eastern sewer on Homestead Rd or the northern sewer on Lawrence Expwy.
	(iii) Deficiency would be caused by historic entitlement flows held by parcel APNs 104-55-012 and 104-55-013 . Project should be implemented before parcels begin to discharge entitled flows.
	(iv) Prior to project implementation, the City should verify the inverts of sewers along the project alignment and at the downstream connection to the GAP East trunk sewer.
	(v)
	(vi)
Assumptions	(i) New diameter based on pipe replacement.
	(ii) Cost estimates are based on CCI of 15367.24 from the August 2024 ENR.
Alternatives	N.A.

PROJECT COST DETAIL

U/S MH ID	D/S MH ID	Existing Diameter (inches)	New Diameter (inches)	Length (feet)	Slope (%)	Pipe Depth (feet BGL)	Existing Pipe Capacity (mgd)	Future Pipe Capacity (mgd)	Long-Term Future PDWF (mgd)	Long-Term Future PWWF (mgd)	Long-Term Future DWF Velocity (ft/sec)	Open Cut Cost	Trenchless Installation	Trenchless Casing Size	Unit Cost ($/LF)	Total Cost ($)
S93-10	S93-7	6	8	107	0.71	10	0.31	0.66	0.40	0.40	3.04	$654			$654	$ 69,651

Total Baseline Pipe Construction Cost	$	69,651
Total Trenchless Installation Cost	$	-
No Jacking Pit	$	-
No Receiving Pit	$	-
Installation or Adjustment of Weir in Existing Manhole Structure (1)	$	45,000
Lateral Reconnection Cost (Approx. 10)	$	5,000
Modify Existing Manholes Cost (Approx. 2)	$	35,000
Baseline Construction Cost:	**$**	**154,651**
Dewatering	$	9,585
Bypass Pumping	$	-
Remove & Replace Factor	$	3,483
Traffic Control (10%)	$	6,965
Pavement Restoration (T-trench)	$	1,943
Subtotal:	**$**	**176,627**
Mobilization/Demobilization (5% of subtotal)	$	8,831.35
Estimated Construction Cost Subtotal:	**$**	**185,458**
Contingencies (30% of construction subtotal)	$	55,637.48
Estimated Construction Cost:	**$**	**241,096**
Engineering and Inspection(25% ofconstruction cost)	$	60,274
Estimated Capital Improvement Cost:	**$**	**301,000**

(Note: Cost estimates are based on August 2024 ENR CCI of 15367.24 for the San Francisco Area)

Project 14
Bunker Hill Lane East

Santa Clara Sewer Master Plan Update

Legend

Capacity Improvement Project

- Manholes
- Other Modeled Sewers
- Project Sewers
- **(8-in)** (Existing Diameter)
- **10-in** Proposed Diameter

0 0.01 0.02 0.04 Miles

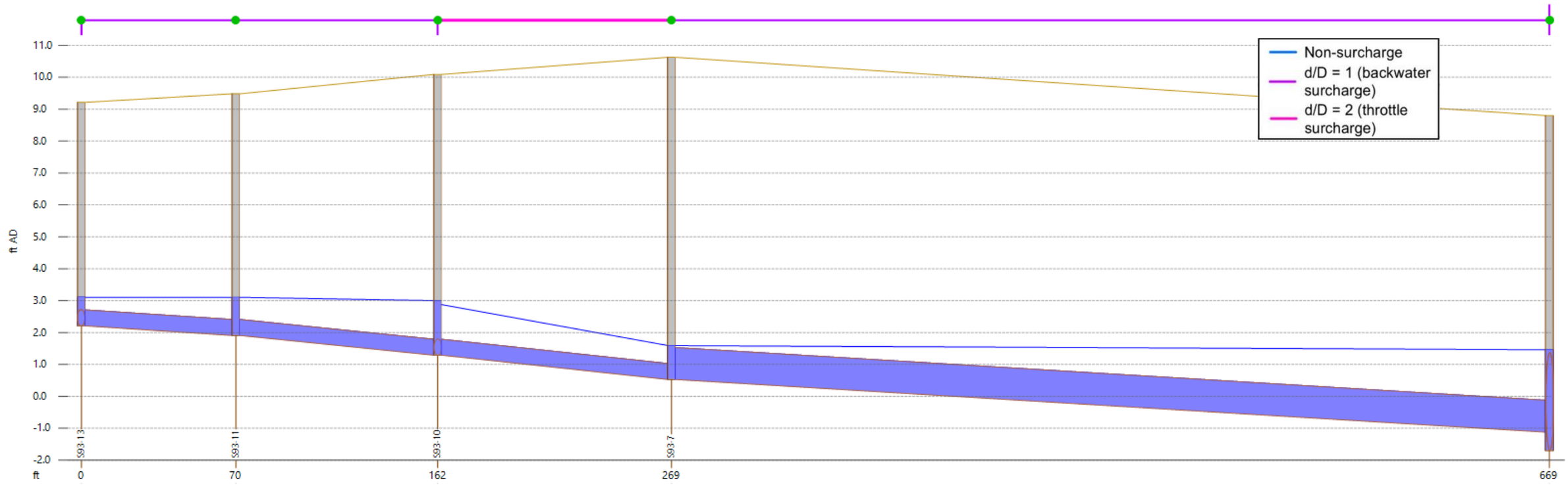
N

Project #: 0012307.00
Map Created: July 2024

Woodard & Curran

Figure Exported: 9/3/2024 By: nbarreralopez Using: \\woodardcurran.net\shared\Projects\0012307.00 Santa Clara CA Sewer Master Plan Update\wip\C. GIS\3. ArcGIS Pro\SantaClaraSewerMasterPlan2023_TM\Figures.aprx

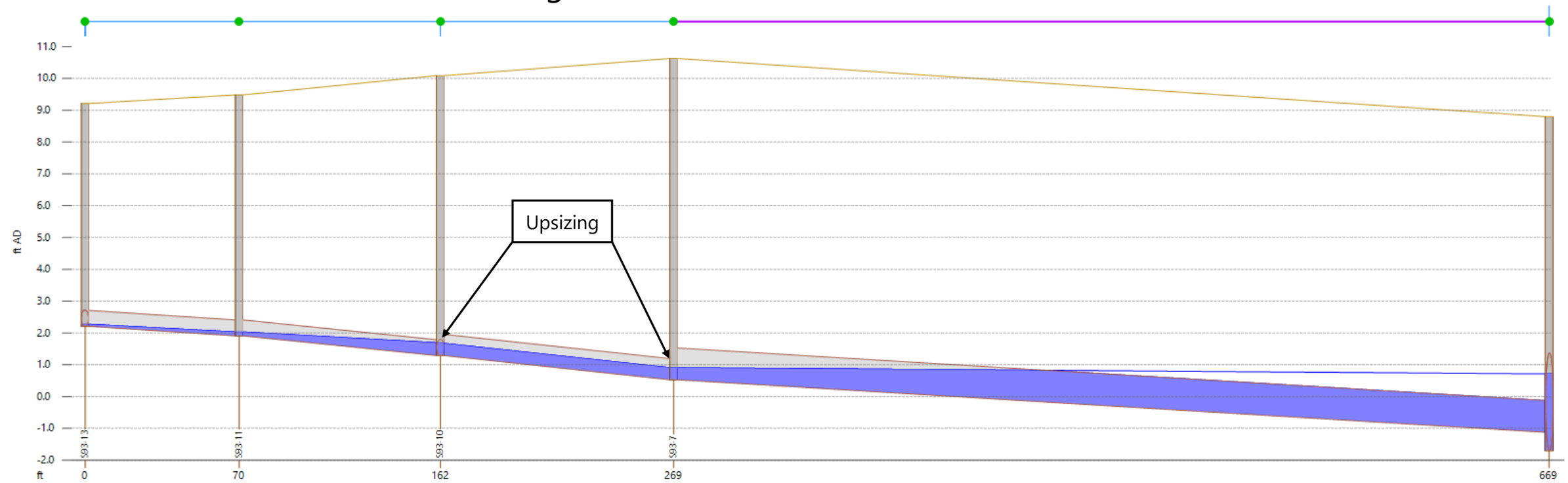
Project 14: Bunker Hill Lane East
Capacity Deficiency Profile View
Model Run Scenario: Wet Weather, Long-Term Future Loads, and Lined Model Network



Link	S93-13.1	S93-11.1	S93-10.1	S93-7.1
Conduit mate	VCP	VCP	VCP	VCP
width (in)	6.0	6.0	6.0	12.0
length (ft)	70.4	91.8	106.5	399.8
pfc (MGD)	0.24	0.30	0.31	1.48
us inv (ft AD)	2.210	1.910	1.290	0.530
ds inv (ft AD)	1.910	1.290	0.530	-1.120
surc	1.00	1.00	2.00	1.00
DS flow (MGD)	-0.0063	0.1826	0.4080	0.4641
DS velocity (ft/s)	-0.047	1.335	3.654	1.822

Node	S93-13	S93-11	S93-10	S93-7	S93-5
ground (ft AD)	9.213	9.481	10.089	10.627	8.800
flood dep (ft)	-6.108	-6.377	-7.090	-9.035	-7.341

Project 14: Bunker Hill Lane East
Project Solution Profile View
Model Run Scenario: Wet Weather, Long-Term Future Loads, and Lined Model Network



Link	S93-13.1	S93-11.1	S93-10.1	S93-7.1
Conduit mate	VCP	VCP	VCP	VCP
width (in)	6.0	6.0	8.0	12.0
length (ft)	70.4	91.8	106.5	399.8
pfc (MGD)	0.24	0.30	0.66	1.48
us inv (ft AD)	2.210	1.910	1.290	0.530
ds inv (ft AD)	1.910	1.290	0.530	-1.120
surc	0.24	0.81	0.58	1.00
DS flow (MGD)	-0.0000	0.1784	0.4023	0.4496
DS velocity (ft/s)	-0.000	1.619	3.051	1.870

Node	S93-13	S93-11	S93-10	S93-7	S93-5
ground (ft AD)	9.213	9.481	10.089	10.627	8.800
flood dep (ft)	-6.938	-7.450	-8.396	-9.717	-8.084

Project 15: Lafayette Street

PROJECT DESCRIPTION

Project No.	15
Project ID	Lafayette Street
Project Location	N of Calle del Mundo to S of Great America Wy
Description	2290 LF of 42 to 48-inch diameter pipe
Priority	3
Flow Confidence Level	2
Loads Trigger	Long-Term Future Loads (LTFL)
Design Flow Trigger	Wet Weather Flow (WWF)
Physical Network Trigger	Unlined Model Network (UMN)
Estimated Capital Improvement Cost	$7,515,000
Comments	(i) Pipes are listed in order from upstream to downstream.
	(ii) A 50/50 flow split was assumed at the Lawrence/Homestead gate structure which splits flow between the eastern sewer on Homestead Rd or the northern sewer on Lawrence Expwy.
	(iii) Project would also include some re-sloping of the existing pipe segments from manhole S104-22 to S104-14; per record information, the existing slope is minimal at approximately 0.02 percent.
	(iv) Lined model network includes assumed future lining of Lafayette Trunk.
	(v)
	(vi)
Assumptions	(i) New diameter based on pipe replacement.
	(ii) Cost estimates are based on CCI of 15367.24 from the August 2024 ENR.
Alternatives	N.A.

PROJECT COST DETAIL

U/S MH ID	D/S MH ID	Existing Diameter (inches)	New Diameter (inches)	Length (feet)	Slope (%)	Pipe Depth (feet BGL)	Existing Pipe Capacity (mgd)	Future Pipe Capacity (mgd)	Long-Term Future PDWF (mgd)	Long-Term Future PWWF (mgd)	Long-Term Future DWF Velocity (ft/sec)	Open Cut Cost	Trenchless Installation	Trenchless Casing Size	Unit Cost ($/LF)	Total Cost ($)
S104-29	S104-28	34	42	416	0.19	16	16.51	28.53	10.57	14.33	3.11	$1,369			$1,369	$ 568,956
S104-28	S104-22	34	48	436	0.15	16	14.53	35.86	10.56	14.33	2.12	$1,419			$1,419	$ 618,400
S104-22	S104-17	40	48	426	0.09	16	8.18	27.69	21.18	25.41	3.82	$1,389			$1,389	$ 591,714
S104-17	S104-16	40	48	435	0.09	15	8.18	27.69	21.17	25.40	3.91	$1,389			$1,389	$ 604,215
S104-16	S104-14	40	48	428	0.09	17	22.17	27.69	21.17	25.40	4.16	$1,419			$1,419	$ 607,332
S104-14	S104-8	40	48	150	0.09	17	22.70	27.69	21.17	25.40	4.72	$1,419			$1,419	$ 212,850

Total Baseline Pipe Construction Cost	$	3,203,468
Total Trenchless Installation Cost	$	-
No Jacking Pit	$	-
No Receiving Pit	$	-
Installation or Adjustment of Weir in Existing Manhole Structure	$	-
Lateral Reconnection Cost (Approx. 1)	$	500
Modify Existing Manholes Cost (Approx. 7)	$	122,500
Baseline Construction Cost:	**$**	**3,326,468**
Dewatering	$	206,136
Bypass Pumping	$	320,347
Remove & Replace Factor	$	160,173
Traffic Control (10%)	$	320,347
Pavement Restoration (T-trench)	$	70,897
Subtotal:	**$**	**4,404,368**
Mobilization/Demobilization (5% of subtotal)	$	220,218.40
Estimated Construction Cost Subtotal:	**$**	**4,624,586**
Contingencies (30% of construction subtotal)	$	1,387,375.90
Estimated Construction Cost:	**$**	**6,011,962**
Engineering and Inspection (25% of construction cost)	$	1,502,991
Estimated Capital Improvement Cost:	**$**	**7,515,000**

(Note: Cost estimates are based on August 2024 ENR CCI of 15367.24 for the San Francisco Area)

Project 15
Lafayette St

Santa Clara Sewer Master Plan Update

Legend

Capacity Improvement Project

- Manholes
- Other Modeled Sewers
- Project Sewers
- **(8-in)** (Existing Diameter)
- **10-in** Proposed Diameter

0 0.04 0.07 0.15 Miles

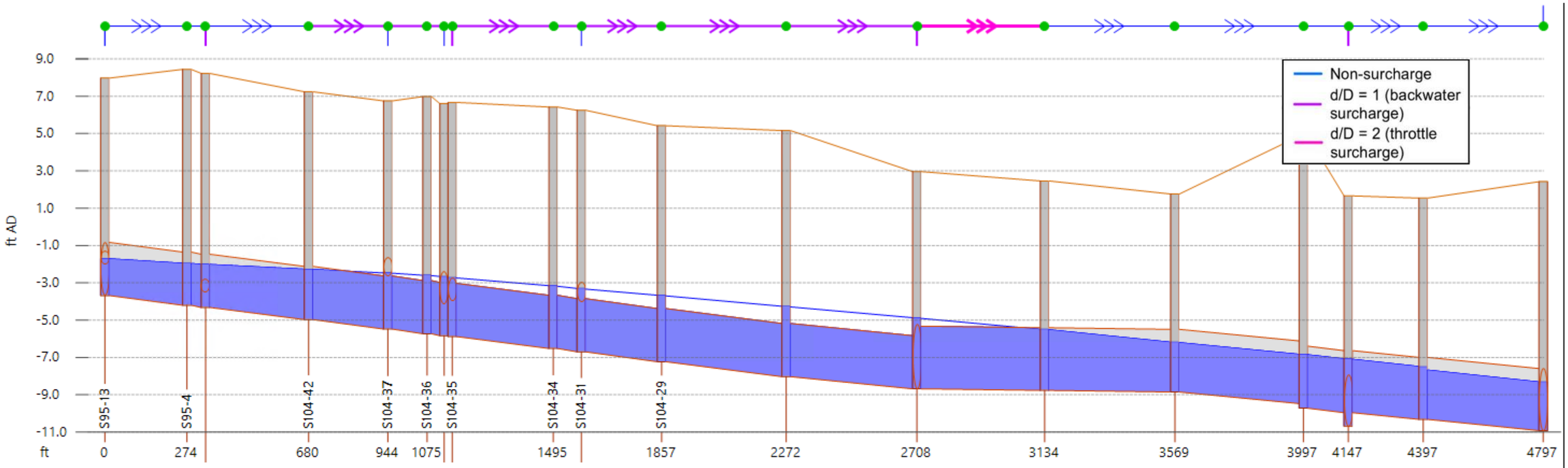
N

Project #: 0012307.00
Map Created: July 2024

Woodard & Curran

Figure Exported: 9/10/2024 By: nbarreralopez Using: \\woodardcurran.net\shared\Projects\0012307.00 Santa Clara CA Sewer Master Plan Update\wip\C. GIS\3. ArcGIS Pro\SantaClaraSewerMasterPlan2023_TMFigures.aprx

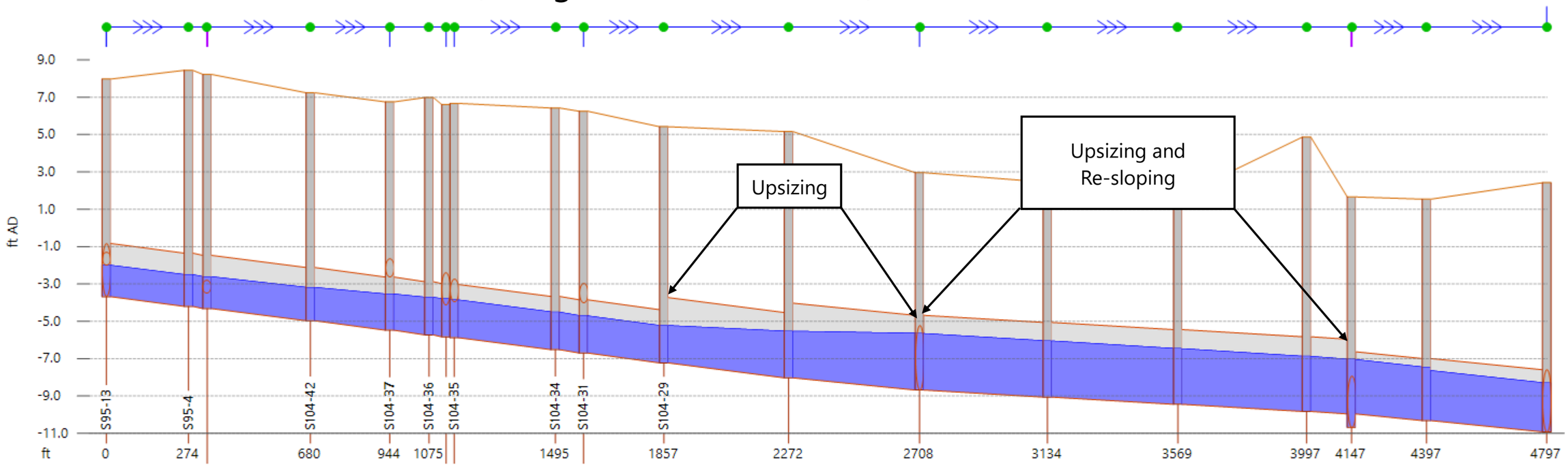
Project 15: Lafayette Street
Capacity Deficiency Profile View
Model Run Scenario: Wet Weather, Long-Term Future Loads, and Lined Model Network



Link	S95-13.1	-	S95-1.1	S104-42.1	-	-	S104-35.1	-	S104-31.1	S104-29.1	S104-28.1	S104-22.1	S104-17.1	S104-16.1	-	S104-8.1	S114-13.1
Conduit mate	RCP	-	RCP	RCP	RCP	-	RCP	-	RCP	RCP	RCP	RCP	RCP	RCP	RCP	RCP	RCP
width (in)	34.2	-	34.2	34.2	34.2	-	34.2	-	34.2	34.2	34.2	40.3	40.3	40.3	39.9	39.9	39.9
length (ft)	273.5	-	343.7	263.9	131.1	-	336.8	-	267.7	415.6	435.8	426.0	435.0	428.0	150.0	250.0	400.0
pfc (MGD)	16.39	-	16.36	16.53	16.47	-	16.38	-	16.75	16.51	14.53	8.18	8.18	22.17	22.70	21.53	21.98
us inv (ft AD)	-3.681	-	-4.320	-4.970	-	-	-5.882	-	-6.700	-7.230	-8.030	-8.680	-8.764	-8.850	-9.720	-9.960	-10.320
ds inv (ft AD)	-4.200	-	-4.970	-5.479	-	-	-6.520	-	-7.230	-8.030	-8.680	-8.764	-8.850	-9.470	-9.960	-10.320	-10.920
surc	0.79	-	0.95	1.00	1.00	-	1.00	-	1.00	1.00	1.00	2.00	0.97	0.79	0.87	0.86	0.79
DS flow (MGD)	10.3970	-	10.4451	10.4600	-	-	13.7705	-	13.8106	14.3059	14.3057	21.2761	21.2757	21.2754	-	21.5626	21.5625
DS velocity (ft/s)	3.969	-	3.805	3.466	3.501	-	4.007	-	3.715	3.329	3.330	3.733	4.422	5.133	4.223	4.234	4.570

Node	-	-	S95-1	S104-42	-	-	-	-	-	S104-29	S104-28	S104-22	S104-17	S104-16	S104-14	S104-8	S114-13	-
ground (ft AD)	-	8.440	8.220	7.240	6.750	-	6.670	6.420	6.250	5.420	5.160	2.960	2.460	1.760	4.860	1.660	1.540	2.420
flood dep (ft)	-	-	-	-9.510	-9.219	-	-9.386	-9.577	-9.554	-9.089	-9.418	-7.832	-7.952	-7.946	-11.693	-8.737	-9.042	-

Project 15: Lafayette Street
Project Solution Profile View
Model Run Scenario: Wet Weather, Long-Term Future Loads, and Lined Model Network



Link	S95-13.1	-	S95-1.1	S104-42.1	-	-	S104-35.1	-	S104-31.1	S104-29.1	S104-28.1	S104-22.1	S104-17.1	S104-16.1	-	S104-8.1	S114-13.1
Conduit mate	RCP	-	RCP	RCP	RCP	-	RCP	-	RCP	RCP	RCP	RCP	RCP	RCP	RCP	RCP	RCP
width (in)	34.2	-	34.2	34.2	34.2	-	34.2	-	34.2	42.0	48.0	48.0	48.0	48.0	48.0	39.9	39.9
length (ft)	273.5	-	343.7	263.9	131.1	-	336.8	-	267.7	415.6	435.8	426.0	435.0	428.0	150.0	250.0	400.0
pfc (MGD)	16.39	-	16.36	16.53	16.47	-	16.38	-	16.75	28.53	35.86	27.69	27.69	27.69	27.69	21.53	21.98
us inv (ft AD)	-3.681	-	-4.320	-4.970	-	-	-5.882	-	-6.700	-7.230	-8.030	-8.680	-9.059	-9.446	-9.827	-9.960	-10.320
ds inv (ft AD)	-4.200	-	-4.970	-5.479	-	-	-6.520	-	-7.230	-8.030	-8.680	-9.059	-9.446	-9.827	-9.960	-10.320	-10.920
surc	0.60	-	0.62	0.68	0.71	-	0.71	-	0.70	0.71	0.76	0.75	0.75	0.74	0.73	0.87	0.80
DS flow (MGD)	10.4065	-	10.4578	10.4735	-	-	13.7963	-	13.8367	14.3339	14.3304	25.4071	25.4049	25.4030	-	21.7524	21.7518
DS velocity (ft/s)	4.062	-	3.879	3.548	3.671	-	4.443	-	4.705	3.424	2.448	3.882	3.947	4.168	4.742	4.237	4.579

Node	-	-	S95-1	S104-42	-	-	-	-	-	S104-29	S104-28	S104-22	S104-17	S104-16	S104-14	S104-8	S114-13	-
ground (ft AD)	-	8.440	8.220	7.240	6.750	-	6.670	6.420	6.250	5.420	5.160	2.960	2.460	1.760	4.860	1.660	1.540	2.420
flood dep (ft)	-	-	-	-10.431	-	-	-	-10.926	-	-10.655	-10.695	-8.611	-8.508	-8.222	-11.740	-8.699	-9.011	-

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Appendix K
Sewer Utility Budget

Water and Sewer Utilities Department Description

The Water and Sewer Utilities Department provides planning, design, construction, maintenance, and operation of the City's water distribution system, sewer collection system, and recycled water system. The three utilities, water, sewer, and recycled water, operate independently and charge rates to recover the costs of providing these services to Santa Clara residents and businesses, including capital investment in City infrastructure and funding of needed reserves.

In 2024, the Water Utility produced and distributed 6.9 billion gallons of water to approximately 26,000 service connections, delivered through approximately 335 miles of water main. Of the total water supply, 50% is obtained from the City's wells and 30% is treated water purchased from two wholesale potable water agencies. Approximately 20% of the City's water supply is met with recycled water delivered through the South Bay Water Recycling system. The Department oversees:

- Design, construction, distribution, metering, quality monitoring, and system operation and system maintenance for both potable and recycled water.
- Collection and conveyance of wastewater for approximately 26,000 accounts and assessment, maintenance, or repair for more than 288 miles of sewer mains as required.
- Construction, operation, and maintenance of the recycled water system within the Santa Clara city limits. This recycled water system distributes highly treated wastewater for non-potable use.
- Review and conditioning of planning applications, building permits, and encroachment permits for new development projects to mitigate impacts on the existing water, recycled water and sewer systems and to provide safe and reliable services to the new developments.

Other activities include:

- Long-term planning for the replacement and/or upsizing of existing and future water and recycled water systems.
- Maintain high water quality through routine and special bacteriological sampling and testing.
- Annual replacement of existing water mains using internal City forces.
- Promote water conservation and environmental sustainability through outreach to the community.
- Manage contracts for the construction of new South Bay Recycled Water pipelines.
- Coordinate planning efforts for the future expansions of recycled water systems in Santa Clara County (County).
- Maintain compliance with State regulations through development plan reviews and site inspections.
- Annual testing of all backflows and maintenance of meters.
- Respond to customer inquiries, service leaks and main breaks 24 hours a day.

The Sewer Utility operates and maintains a sanitary sewage collection system that collects and conveys wastewater to the jointly owned San José-Santa Clara Regional Wastewater Facility (RWF) for treatment and disposal. The Sewer Utility maintains seven sewer pump stations and the sewer collection pipelines and manholes, and assists the Department of Public Works in the operation and maintenance of 21 stormwater pump stations to ensure reliable service. Additional services include: installing property line clean-outs for access to maintain residential sewer laterals; assisting the industrial waste inspectors from the RWF with investigations of City industries; processing the City of San José wastewater discharge permits and implementing the Sanitary Sewer Management Plan as submitted to the State and Regional Water Quality Control Board.

Bonds are issued to mitigate rate increases while allowing for the repair and replacement of critical infrastructure. Proceeds from debt were used to pay for repairs and rehabilitation of the Trimble Road Sanitary Sewer main trunk line and capital improvements for the RWF, with these being repaid over the next six years and the next 23 years respectively.

Divisions and Services

The Water and Sewer Utilities Department is organized into five Divisions: Solar Utility; Water Construction, Maintenance, Operations; Water Engineering; Recycled Water Program; and Sewer.

The overall Mission of the Department is to provide the City's community with high-quality, reliable, economical, and environmentally sustainable water, wastewater and recycled water services in a manner that protects these resources for future generations. The Department's vision is to ensure clean water and a sustainable future for generations to come through innovation and environmental management of resources while providing an exceptional level of customer and community service.

Solar Utility Division Mission	Provide installation and maintenance of solar heating systems for commercial, residential, and pool water heating.
Division Objectives	Maintain more than 119 swimming pool systems.
	Maintain seven domestic solar hot water systems.

Water Construction, Maintenance, Operations Division Mission	Operate and maintain the Water Utility in a sustainable, cost effective, efficient manner and ensure that the approved levels of service are met.
Division Objectives	Increase reliability of the water system through the replacement of mains and appurtenances at the end of their useful life.
	Complete the construction, and installation of approximately 10,000 linear feet of water main.
	Construct, repair, and/or rehabilitate at least two groundwater wells each budget cycle to continue to provide reliable water service.

Water Engineering, Compliance, Conservation Division Mission	Provide Engineering services that improve and protect the water supply and distribution system while planning for future expansion and upgrades to infrastructure to ensure future reliability.
Division Objectives	Continue to improve the seismic safety of the water utility system.
	Continue the use of innovative technology to optimize the management of City water assets and appurtenances.
	Support citywide development through plan check review and inspection.
	Undertake engineering studies of the condition and reliability of water system assets.

Recycled Water Program Division Mission	Provide for the safe, efficient, cost effective, and reliable distribution of sustainable and high-quality recycled water which meets all requirements of State regulations and local codes. Deliver services in a cost effective and efficient manner with a focus on outstanding customer service.
Division Objectives	Increase connection of recycled water services for landscape irrigation of commercial and industrial sites, City parks, and school fields.
	Increase the use of recycled water for approved uses.
	Coordinate planning efforts with South Bay Water Recycling (SBWR) for the future expansions of recycled water systems in the County, and coordinate and compile annual site inspections as required by the State.
	Maintain compliance with State regulations through development plan reviews and site inspections.
	Design, construct, and maintain recycled water pipelines.

Sewer Division Mission	Collect, treat, and dispose of wastewater in an efficient, cost-effective, and environmentally safe manner. Provide for maintenance of stormwater pump stations. Deliver services at approved levels in a cost effective and efficient manner with a focus on outstanding customer service.
Division Objectives	Install property line clean-outs for access for the provision of a courtesy service of maintaining lower laterals for residential sewer customers.
	Maintain seven sanitary sewer and twenty-one stormwater pump stations to ensure reliable service.
	Assist the pre-treatment program staff from the RWF with investigations of City industries.
	Implement Sewer System Management Plan (SSMP) as submitted to the State and Regional Water Quality Control Board.
	Clean, conduct condition assessment, and repair or rehabilitate sanitary sewer collection system.

Significant Accomplishments

- Substantially completed the One Water/Sustainable Water Master Plan and Asset Management Plan.
- Updated Mission and Vision Statements utilizing a workshop that involved staff from throughout the Department.
- Finalized the update to the Water Use Rules and Regulations, including revisions to the potable and recycled water use regulations, adoption of State Model Water Efficient Landscape Ordinance (MWELO) goals as they relate to State regulations, and adoption of portions of Valley Water's Water Conservation Ordinances.
- Completed sewer condition assessment projects via closed-circuit television (CCTV), which is used to rate infrastructure and inform the capital improvement program (CIP). Notably, began CCTV of the City's force mains that deliver wastewater to the Regional Wastewater Facility. Approximately 184,000 linear feet of CCTV assessments were completed.
- Completed and coordinated major CIP projects for both the Water ($7 million) and Sewer ($7.7 million) Utilities as well as RWF projects that amounted to approximately $10 million.
- Continued to work and negotiate with Valley Water and the City of San José regarding the Purified Water Project Expansion to be located at the RWF and continued to work with San José and San Francisco on a proposed design for the South Bay Purified Water Project.
- Continued to meet monthly and work with the Bay Area Water Supply and Conservation Agency (BAWSCA), City of San José and San Francisco regarding securing permanent status with San Francisco Public Utilities Commission (SFPUC) for water supply by 2028.
- Finalized work and negotiations on the Tier 2 Allocation Plan, which is being updated by BAWSCA for use during a drought when potable water cutbacks are required per the amended City of San Francisco Water Supply Agreement (WSA). As a result of negotiations, Santa Clara is now being treated equally with drought cutbacks as compared to other permanent SFPUC customers. Santa Clara will now have reduced cutbacks during a drought as a result of the new negotiated allocations.
- Initiated a joint project with Valley Water to switch the City's 21 well sites to Advance Meter Infrastructure (AMI). This project with Valley Water was initiated to improve billing accuracies and reduce manual meter reading by Santa Clara and Valley Water staff.
- Initiated an AMI pilot program and leak detection pilot to test water meter technologies for residential and commercial properties. The Department will setup 30 site locations to test the technology and will work with the Finance Department and Silicon Valley Power (SVP) to leverage existing technology and infrastructure installed by SVP and explore current capabilities of the billing system in order to accept the remote reads. Once the proof of concept is complete, a phased full-scale project will be planned. The pilot project will be completed in 2025.
- Completed Phase 2 of the Supervisory Control and Data Acquisition (SCADA) CIP implementation and fiber connectivity for Water and Sewer Utilities at remote water and sewer sites. This past year, 10 sites received Remote Terminal Unit (RTU) hardware upgrades for a total of 34 sites now with the upgrade. In partnership with SVP, five new sites received fiber optic connectivity, bringing the total number of sites with fiber to 30. Only four fiber sites remain for installation in 2025.
- Completed the Water, Sewer and Recycled Water Rate Study with Council approval in FY 2024/25.
- Continued to maintain full compliance with all water quality regulations, protect public health and water quality, and enhance potable water quality in the distribution system. Completed additional public outreach on water quality.
- Met the goal of rehabilitating two groundwater wells per year. Well 34 and Well 18 were rehabilitated and will be back online. In addition, an assessment of Well 32 was completed.
- Completed installation of 17,500 linear feet of replacement water main, exceeding the annual goal of 10,000 linear feet of water main replacement.
- Completed recertification of sewer operations staff for sewer pipeline, manhole and lateral condition assessment (PACP, MACP, LACP).

- Completed annual testing of approximately 3,900 backflow preventors within the City.
- Completed the Federal and State Lead and Copper Rule customer service line inventory survey by October 16, 2024, including reporting the results to the State Department of Drinking Water. No customer lead service lines were identified during the survey.
- Continued to implement State water use efficiency requirements to keep Santa Clara's residential gallon per capita per day (gpcd) below 55 gpcd. Santa Clara met the requirement with a 51.8 gpcd for 2024. Conservation rebate programs, increased outreach and partnering with Valley Water and BAWSCA continue to assist the City in lowering its gpcd.
- Finalized negotiations on Approval/Acceptance Letter from the Division of Drinking Water (DDW) for Related Santa Clara Development Operations and Maintenance Plan for Phase 1. DDW has approved the Operations and Maintenance Program, and the City has received the Acceptance Letter from DDW. The City may now proceed with the final design of the water system infrastructure.
- Completed design of Phase 3 of the Citywide Generator Replacement project consisting of two water sites and one sewer site.
- Received the California Water Environment Association's (CWEA) Collection System of the Year 2024 award for a medium-sized utility in the field of wastewater.
- Continued work to increase the use of recycled water in Santa Clara by promoting use in new developments. Recycled water usage is now over 3.5 million gallons per day.
- Expanded use of recycled water infrastructure through new development, by constructing 268 linear feet (lf) and connecting 1,900 lf of recycled water main in Tasman East and conditioning the use of recycled water on 19 projects/facilities.
- Completed 1,236 plan reviews that included 738 building permits and 498 encroachment permits with 92.7% of the reviews completed on time.
- Completed Environmental Protection Agency (EPA) Risk and Resilience Assessment (RRA) and Emergency Response Plan (ERP) updates.
- Department staff were awarded the Merit Award and the Customer Service Award from the American Public Works Association (APWA).
- Received Project of the Year Award from the APWA for the Bassett Street Emergency Recycled Water Repair and Installation of Curbside Recycled Water Fill Station.

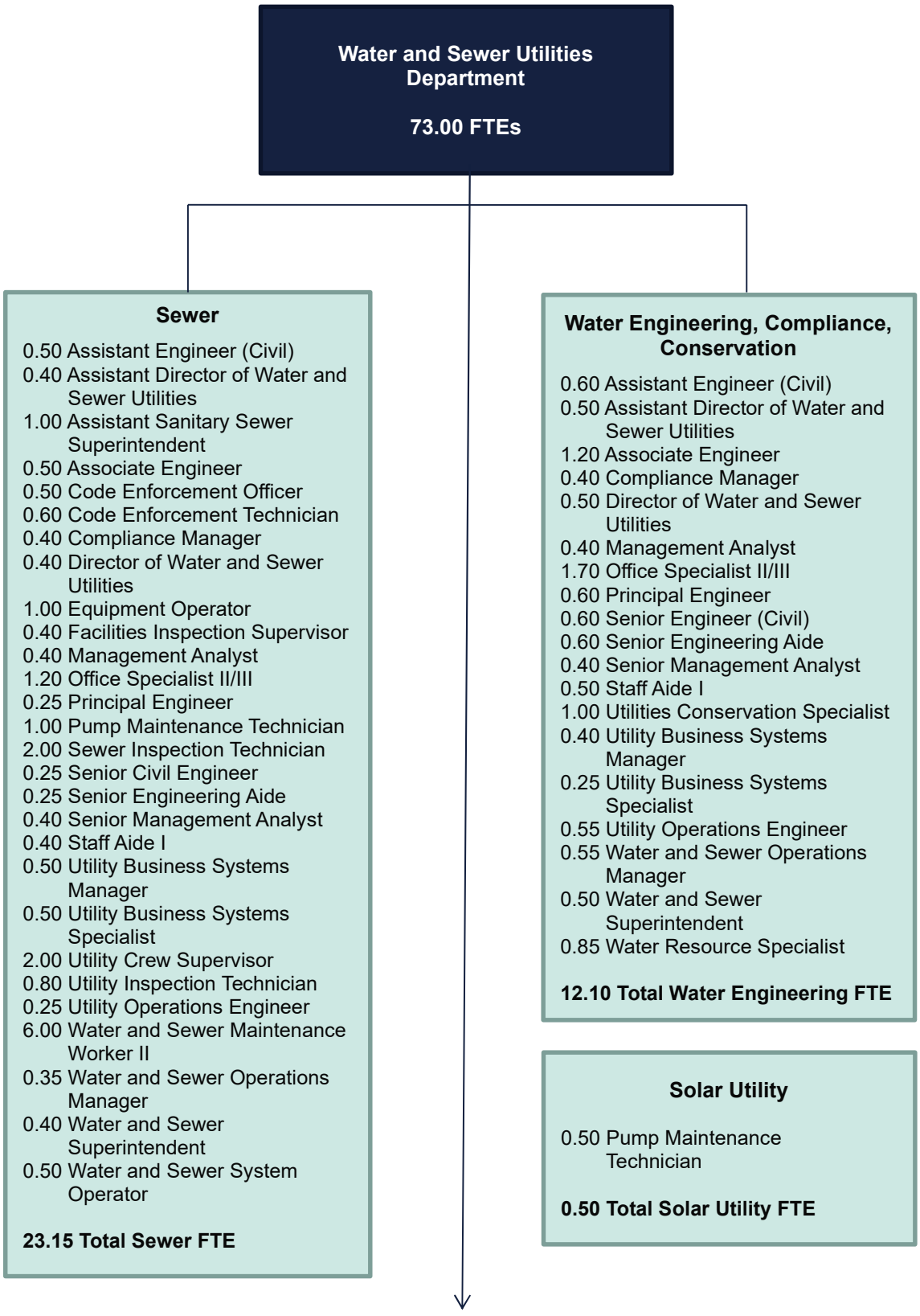
Significant Objectives

- Implement updated State water use efficiency requirements to bring Santa Clara's residential gpcd below 47 gpcd (previously 55 gpcd) for 2025 through December 31, 2029.
- Continue to work and negotiate with Valley Water and the City of San José regarding the Purified Water Project Expansion to be located at the RWF and continue to work with San José and San Francisco on a proposed design for the South Bay Purified Water Project.
- Continue to meet monthly and work with the BAWSCA, City of San José and San Francisco regarding securing permanent status with SFPUC for water supply.
- Coordinate negotiations for amendments to the SFPUC water supply agreement regarding SFPUC decisions regarding permanent customer status.
- Initiate the Accela Module upgrade from TruePoint to enable specific development project information related to recycled water, portable hydrant meters, development impact analyses, water supply agreements, and the Cross Connection Control Program to be tracked.
- Complete rehabilitation of three groundwater wells per year.

- Complete at least 10,000 linear feet of water main replacement per year.
- Complete jetting and CCTV condition assessment of 300,000 linear feet of sewer collection pipe per year.
- Complete and coordinate major CIP City projects for both water and sewer infrastructure improvements including RWF CIP projects.
- Complete the pilot project to field test the upgrade of 30 existing water meters to AMI and plan for a full-scale AMI program.
- Comply with water use efficiency regulations regarding indoor residential water use to support Making Conservation a California Way of Life.
- Finalize the One Water/Sustainability Water Supply Master Plan including the Asset Management Plan and implement recommended CIP projects to manage risks in the utilities.
- Continue Phase 3 SCADA system improvements that include: testing of and training with the Remote Terminal Unit (RTU) module, SCADA Cybersecurity and password protection program, and generator monitoring.
- Develop and implement the Cross Connection Control Policy Handbook (Standards and Principles for California's Public Water Systems) State regulations.
- Complete the update to the Sanitary Sewer Management Plan (SSMP) in 2025 and present to City Council for final approval.
- Substantially complete the State required 2025 Urban Water Management Plan that needs to be approved by Council by July 1, 2026.
- Complete the Report on Water Relative to Public Health Goals as required every three years by the State water quality regulations. Council will need to approve the report in 2025.
- Complete outreach to properties for new development and existing commercial, industrial, institutional (CII) and homeowners' associations properties regarding the State Urban Water Use Efficiency Guidelines, Valley Water Ordinances, and City's Rules and Regulations. New requirements include future prohibitions using drinking water for ornamental grass at all CII sites.
- Continue expansion of recycled water infrastructure and demand to supplant potable water use.
- Complete preliminary evaluation of a new recycled water storage tank.
- Coordinate with the City of San José on a new master meter project for recycled water lines.

Budget Highlights

- The budget reflects updates to the City of Santa Clara's contribution to the Regional Wastewater Facility, co-owned with the City of San José, as well as revised revenues and costs to continue to effectively deliver water, recycled water, and sewer services.
- This budget also reflects the resources necessary to comply with regulations that affect all three utilities and changing climate conditions as well as the commitment of the Department and the City to long term sustainability, both environmental and fiscal.


Water and Sewer Utilities Department
73.00 FTEs
Sewer
0.50 Assistant Engineer (Civil)
0.40 Assistant Director of Water and Sewer Utilities
1.00 Assistant Sanitary Sewer Superintendent
0.50 Associate Engineer
0.50 Code Enforcement Officer
0.60 Code Enforcement Technician
0.40 Compliance Manager
0.40 Director of Water and Sewer Utilities
1.00 Equipment Operator
0.40 Facilities Inspection Supervisor
0.40 Management Analyst
1.20 Office Specialist II/III
0.25 Principal Engineer
1.00 Pump Maintenance Technician
2.00 Sewer Inspection Technician
0.25 Senior Civil Engineer
0.25 Senior Engineering Aide
0.40 Senior Management Analyst
0.40 Staff Aide I
0.50 Utility Business Systems Manager
0.50 Utility Business Systems Specialist
2.00 Utility Crew Supervisor
0.80 Utility Inspection Technician
0.25 Utility Operations Engineer
6.00 Water and Sewer Maintenance Worker II
0.35 Water and Sewer Operations Manager
0.40 Water and Sewer Superintendent
0.50 Water and Sewer System Operator
23.15 Total Sewer FTE
Water Engineering, Compliance, Conservation
0.60 Assistant Engineer (Civil)
0.50 Assistant Director of Water and Sewer Utilities
1.20 Associate Engineer
0.40 Compliance Manager
0.50 Director of Water and Sewer Utilities
0.40 Management Analyst
1.70 Office Specialist II/III
0.60 Principal Engineer
0.60 Senior Engineer (Civil)
0.60 Senior Engineering Aide
0.40 Senior Management Analyst
0.50 Staff Aide I
1.00 Utilities Conservation Specialist
0.40 Utility Business Systems Manager
0.25 Utility Business Systems Specialist
0.55 Utility Operations Engineer
0.55 Water and Sewer Operations Manager
0.50 Water and Sewer Superintendent
0.85 Water Resource Specialist
12.10 Total Water Engineering FTE
Solar Utility
0.50 Pump Maintenance Technician
0.50 Total Solar Utility FTE

Recycled Water Program

0.10 Assistant Director of Water and Sewer Utilities
0.30 Assistant Engineer (Civil)
0.50 Assistant Water Superintendent
0.30 Associate Engineer
0.20 Code Enforcement Officer
0.30 Code Enforcement Technician
0.20 Compliance Manager
0.10 Director of Water and Sewer Utilities
0.20 Facilities Inspection Supervisor
0.20 Management Analyst
0.10 Office Specialist III
0.15 Principal Engineer
0.15 Senior Civil Engineer
0.15 Senior Engineering Aide
0.20 Senior Management Analyst
0.10 Staff Aide I
0.10 Utility Business Systems Manager
0.25 Utility Crew Supervisor
0.40 Utility Inspection Technician
0.20 Utility Operations Engineer
0.10 Water and Sewer Operations Manager
0.10 Water and Sewer Superintendent
0.15 Water Resource Specialist
0.50 Water Service Technician II

5.05 Total Recycled Water Program FTE

Water Construction, Maintenance, Operations

0.60 Assistant Engineer (Civil)
1.50 Assistant Water Superintendent
0.30 Code Enforcement Officer
0.10 Code Enforcement Technician
4.00 Equipment Operator
0.40 Facilities Inspection Supervisor
1.50 Pump Maintenance Technician
0.25 Utility Business Systems Specialist
4.75 Utility Crew Supervisor
0.80 Utility Inspection Technician
13.00 Water and Sewer Maintenance Worker II
0.50 Water and Sewer System Operator
4.50 Water Service Technician II

32.20 Total Water Construction, Maintenance, Operations FTE

Budget Summary

		FY 2023/24 Actual	FY 2024/25 Adopted	FY 2025/26 Proposed	FY 2025/26 Change %	FY 2026/27 Proposed	FY 2026/27 Change %
Dollars by Division / Program							
Solar Utility Division							
1532	Solar – System Maintenance	185,662	273,552	122,921	(55.1%)	130,213	5.9%
Total Solar Utility Division		**185,662**	**273,552**	**122,921**	**(55.1%)**	**130,213**	**5.9%**
Water Construction, Maintenance, Operations Division							
1422	Water System Maintenance	2,971,255	2,058,038	2,701,366	31.3%	2,772,084	2.6%
1423	Water Construction	2,278,191	4,095,260	4,579,001	11.8%	4,761,219	4.0%
1424	Water System Operations	12,652,759	11,126,551	12,747,078	14.6%	13,372,723	4.9%
Total Water Construction, Maintenance, Operations Division		**17,902,205**	**17,279,849**	**20,027,445**	**15.9%**	**20,906,026**	**4.4%**
Water Engineering, Compliance, Conservation Division							
1411	Administration Design	3,397,701	8,172,951	9,620,000	17.7%	9,021,197	(6.2%)
1412	Water Quality	382,400	584,784	618,710	5.8%	633,395	2.4%
1413	Water Resources	33,123,300	35,410,351	41,931,264	18.4%	46,476,993	10.8%
Total Water Engineering, Compliance, Conservation Division		**36,903,401**	**44,168,086**	**52,169,974**	**18.1%**	**56,131,585**	**7.6%**
Recycled Water Program Division							
1522	System Maintenance	6,191,951	8,449,995	9,917,568	17.4%	11,017,949	11.1%
1523	System Construction	920	251	50,000	19820.3%	50,000	0.0%
1525	South Bay Water Recycling Maintenance	1,151,513	896,008	972,487	8.5%	1,010,522	3.9%
Total Recycled Water Program Division		**7,344,384**	**9,346,254**	**10,940,055**	**17.1%**	**12,078,471**	**10.4%**
Sewer Division							
1511	System Administration	5,041,158	5,435,865	5,792,229	6.6%	6,101,216	5.3%
1512	System Maintenance	2,339,525	2,386,389	2,700,010	13.1%	2,818,448	4.4%
1514	Operations	5,815,682	14,507,373	17,444,576	20.2%	11,077,465	(36.5%)
1515	San José-Santa Clara Water Pollution Control Plant	23,121,078	25,756,931	29,273,912	13.7%	33,439,696	14.2%
1516	Storm Pump Maintenance	113,613	164,571	171,794	4.4%	178,323	3.8%
Total Sewer Division		**36,431,056**	**48,251,129**	**55,382,521**	**14.8%**	**53,615,148**	**(3.2%)**
Total by Division / Program		**98,766,708**	**119,318,870**	**138,642,916**	**16.2%**	**142,861,443**	**3.0%**

Budget Summary

	FY 2023/24 Actual	FY 2024/25 Adopted	FY 2025/26 Proposed	FY 2025/26 Change %	FY 2026/27 Proposed	FY 2026/27 Change %
Dollars by Fund						
Water Utility Fund	54,983,063	61,955,133	72,320,343	16.7%	77,167,824	6.7%
Water Recycling Program Fund	7,348,020	9,307,540	10,940,055	17.5%	12,078,471	10.4%
Sewer Utility Fund	36,435,625	48,056,197	55,382,521	15.2%	53,615,148	(3.2%)
Total by Fund	**98,766,708**	**119,318,870**	**138,642,919**	**16.2%**	**142,861,443**	**3.0%**
Dollars by Category						
Salary and Benefits						
Salary	6,234,536	9,204,413	9,764,922	6.1%	10,386,581	6.4%
As-Needed	144,372	254,929	260,954	2.4%	267,189	2.4%
Overtime	373,789	289,174	299,295	3.5%	309,770	3.5%
Retirement	2,767,036	3,232,890	3,431,195	6.1%	3,336,106	(2.8%)
Health Allocation	871,677	1,325,631	1,551,183	17.0%	1,670,176	7.7%
Medicare	112,287	137,647	149,254	8.4%	157,567	5.6%
Social Security	451,180	584,237	605,261	3.6%	631,777	4.4%
Other Benefits	469,331	446,348	588,466	31.8%	631,320	7.3%
Total Salary and Benefits	**11,424,208**	**15,475,269**	**16,650,530**	**7.6%**	**17,390,486**	**4.4%**
Non-Personnel						
Materials/Services/Supplies	11,259,965	10,074,008	11,218,269	11.4%	11,786,215	5.1%
Resource/Production	62,977,271	68,582,130	79,722,346	16.2%	86,239,900	8.2%
Interfund Services	7,961,055	8,098,380	10,098,183	24.7%	10,310,557	2.1%
Capital Outlay	769,323	150,000	153,000	2.0%	156,060	2.0%
Transfers to Other Funds	4,374,886	16,939,083	20,800,591	22.8%	16,978,225	(18.4%)
Total Non-Personnel	**87,342,500**	**103,843,601**	**121,992,389**	**17.5%**	**125,470,957**	**2.9%**
Total by Category	**98,766,708**	**119,318,870**	**138,642,919**	**16.2%**	**142,861,443**	**3.0%**

Position Summary

	FY 2023/24 Adopted	FY 2024/25 Adopted	FY 2025/26 Proposed	FY 2025/26 Change	FY 2026/27 Proposed
Positions by Division / Program					
Solar Utility Division					
1532 Solar – System Maintenance	1.50	1.50	0.50	(1.00)	0.50
Total Solar Utility Division	**1.50**	**1.50**	**0.50**	**(1.00)**	**0.50**
Water Construction, Maintenance, Operations Division					
1422 Water System Maintenance	7.00	7.00	5.60	(1.40)	5.60
1423 Water Construction	13.45	13.45	13.95	0.50	13.95
1424 Water System Operations	11.85	11.85	12.65	0.80	12.65
Total Water Construction, Maintenance, Operations Division	**32.30**	**32.30**	**32.20**	**(0.10)**	**32.20**
Water Engineering, Compliance, Conservation Division					
1411 Administration Design	11.75	11.75	10.85	(0.90)	10.85
1412 Water Quality	0.85	0.85	0.85	0.00	0.85
1413 Water Resources	0.25	0.25	0.40	0.15	0.40
Total Water Engineering, Compliance, Conservation Division	**12.85**	**12.85**	**12.10**	**(0.75)**	**12.10**
Recycled Water Program Division					
1522 System Maintenance	1.45	1.45	1.40	(0.05)	1.40
1525 South Bay Water Recycling Maintenance	2.65	2.65	3.65	1.00	3.65
Total Recycled Water Program Division	**4.10**	**4.10**	**5.05**	**0.95**	**5.05**
Sewer Division					
1511 System Administration	6.25	6.25	6.60	0.35	6.60
1512 System Maintenance	10.15	10.15	9.85	(0.30)	9.85
1514 Operations	4.85	4.85	5.65	0.80	5.65
1515 SJSC Water Pollution Control Plant	0.10	0.10	0.20	0.10	0.20
1516 Storm Pump Maintenance	0.90	0.90	0.85	(0.05)	0.85
Total Sewer Division	**22.25**	**22.25**	**23.15**	**0.90**	**23.15**
Total by Division / Program	**73.00**	**73.00**	**73.00**	**0.00**	**73.00**

Position Summary

	FY 2023/24 Adopted	FY 2024/25 Adopted	FY 2025/26 Proposed	FY 2025/26 Change	FY 2026/27 Proposed
Positions by Fund					
Water Utility Fund	46.65	46.65	44.80	(1.85)	44.80
Water Recycling Program Fund	4.10	4.10	5.05	0.95	5.05
Sewer Utility Fund	22.25	22.25	23.15	0.90	23.15
Total by Fund	**73.00**	**73.00**	**73.00**	**0.00**	**73.00**
Position Classification					
Assistant Director of Water & Sewer Utility	1.00	1.00	1.00	0.00	1.00
Assistant Engineer (Civil)	2.00	2.00	2.00	0.00	2.00
Assistant Sanitary Sewer Superintendent	1.00	1.00	1.00	0.00	1.00
Assistant Water Superintendent	2.00	2.00	2.00	0.00	2.00
Associate Engineer	2.00	2.00	2.00	0.00	2.00
Code Enforcement Officer	1.00	1.00	1.00	0.00	1.00
Code Enforcement Technician	1.00	1.00	1.00	0.00	1.00
Compliance Manager	1.00	1.00	1.00	0.00	1.00
Director of Water & Sewer Utility	1.00	1.00	1.00	0.00	1.00
Equipment Operator	5.00	5.00	5.00	0.00	5.00
Facilities Inspection Supervisor	1.00	1.00	1.00	0.00	1.00
Facilities Technician	2.00	2.00	0.00	(2.00)	0.00
Management Analyst	2.00	2.00	1.00	(1.00)	1.00
Office Specialist II/III	3.00	3.00	3.00	0.00	3.00
Principal Engineer	1.00	1.00	1.00	0.00	1.00
Pump Maintenance Technician	3.00	3.00	3.00	0.00	3.00
Senior Civil Engineer	1.00	1.00	1.00	0.00	1.00
Senior Engineering Aide	1.00	1.00	1.00	0.00	1.00
Senior Management Analyst	0.00	0.00	1.00	1.00	1.00
Sewer Inspection Technician	2.00	2.00	2.00	0.00	2.00
Staff Aide I	1.00	1.00	1.00	0.00	1.00
Utilities Conservation Specialist	1.00	1.00	1.00	0.00	1.00
Utility Business Systems Manager	1.00	1.00	1.00	0.00	1.00
Utility Business Systems Specialist	1.00	1.00	1.00	0.00	1.00
Utility Crew Supervisor	7.00	7.00	7.00	0.00	7.00
Utility Inspection Technician	0.00	0.00	2.00	2.00	2.00
Utility Operations Engineer	1.00	1.00	1.00	0.00	1.00

Position Summary

	FY 2023/24 Adopted	FY 2024/25 Adopted	FY 2025/26 Proposed	FY 2025/26 Change	FY 2026/27 Proposed
Position Classification					
Water & Sewer Maintenance Worker II	19.00	19.00	19.00	0.00	19.00
Water & Sewer Operations Manager	0.00	0.00	1.00	1.00	1.00
Water & Sewer Superintendent	2.00	2.00	1.00	(1.00)	1.00
Water & Sewer System Operator	1.00	1.00	1.00	0.00	1.00
Water Resource Specialist	1.00	1.00	1.00	0.00	1.00
Water Service Technician II	5.00	5.00	5.00	0.00	5.00
Total Positions	**73.00**	**73.00**	**73.00**	**0.00**	**73.00**

Budget Reconciliation

	Positions	Expenditures (All Funds)
Prior Year Budget	73.00	119,318,870
FY 2025/26 Base Budget Adjustments		
One-Time Cost Adjustments		
Net increase in transfers to the capital improvement program		3,861,508
Ongoing Cost Adjustments		
Salary and benefits adjustments		1,175,261
Reclassifications of the following positions:		
2.0 Facilities Technicians to 2.0 Utility Inspection Technicians	0.00	
1.0 Management Analyst to 1.0 Senior Management Analyst	0.00	
1.0 Water and Sewer Superintendent to 1.0 Water and Sewer Operations Manager	0.00	
Adjustments to resource and production costs		
Water Utility		6,604,900
Sewer Utility		3,209,416
Water Recycling		1,325,900
Net increase in various internal service fund allocations		1,999,803
Non-personnel adjustments		585,776
Adjustments to right of way		561,485
Total FY 2025/26 Base Budget Adjustments	**0.00**	**19,324,049**
Total FY 2025/26 Base Budget	**73.00**	**138,642,919**
Total FY 2025/26 Proposed Budget	**73.00**	**138,642,919**

Budget Reconciliation

	Positions	Expenditures (All Funds)
FY 2026/27 Base Budget Adjustments		
One-Time Cost Adjustments		
Net decrease in transfers to the capital improvement program		(3,822,366)
Ongoing Cost Adjustments		
Salary and benefit adjustments		739,956
Adjustments to resource and production costs		
Water Utility		4,654,800
Water Recycling		1,025,900
Sewer Utility		836,854
Adjustments to right of way		481,940
Net increase in various internal service fund allocations		212,374
Non-personnel adjustments		89,066
Total FY 2026/27 Base Budget Adjustments	**0.00**	**4,218,524**
Total FY 2026/27 Base Budget	**73.00**	**142,861,443**
Total FY 2026/27 Proposed Budget	**73.00**	**142,861,443**

Performance and Workload Measures

Solar Utility Division

Workload Measures

	Strategic Pillar	2022/23 Actual	2023/24 Actual	2024/25 Target	2024/25 Estimate	2025/26 Target	2026/27 Target
Number of systems provided with semi-annual winterization service		38	36	40	40	40	40
Number of requests for solar system repairs		87	55	80	60	60	60

Water Construction, Maintenance, Operations Division

Performance Measures

	Strategic Pillar	2022/23 Actual	2023/24 Actual	2024/25 Target	2024/25 Estimate	2025/26 Target	2026/27 Target
Maintain an industry standard for unaccounted water of 8% or less		6.3%	9%	8% or less	8%	8% or less	8% or less

Workload Measures

Number of responses to water customer service requests		1,903	1,688	1,600	1,500	1,500	1,500
Number of backflow prevention devices tested		2,083	3,900	3,900	3,900	3,900	3,900
Number of linear feet of water mains installed		10,430	17,500	10,000	12,000	10,000	10,000
Number of underground utility locates performed		13,869	8,625	10,000	7,000	10,000	10,000
Number of mainline water valves tested and exercised		552	535	2,500	1,500	2,000	2,500
Water Line Flushing for Water Quality		N/A	55	50	90	120	150

Performance and Workload Measures

Water Engineering, Compliance, Conservation Division

Performance Measures

	Strategic Pillar	2022/23 Actual	2023/24 Actual	2024/25 Target	2024/25 Estimate	2025/26 Target	2026/27 Target
Complete review of plans by the required due dates		80%	92.7%	90%	90%	90%	90%
Residential water use measured in Gallons per Capita per Day		53	51.8	55	46.4	47	47
Overall City water use measured in Gallons per Capita per Day		110	114.7	117	118	117	117

Workload Measures

Number of plans reviewed		788	1,236	900	1,000	1,000	1,000
Number of water quality samples processed		2,933	1,236	3,000	3,100	3,000	3,000
Promote water conservation at public events		9	12	10	12	12	12

Recycled Water Program Division

Performance Measures

	Strategic Pillar	2022/23 Actual	2023/24 Actual	2024/25 Target	2024/25 Estimate	2025/26 Target	2026/27 Target
Citywide use of recycled water (measured in million gallons per day)		3.1	3.5	3.5	3.5	3.7	3.9

Workload Measures

Number of recycled water plans reviewed		N/A	186	250	120	250	250

Performance and Workload Measures

Sewer Division							
Performance Measures							
	Strategic Pillar	**2022/23 Actual**	**2023/24 Actual**	**2024/25 Target**	**2024/25 Estimate**	**2025/26 Target**	**2026/27 Target**
Percentage of food service establishments found to be in compliance with Fats, Oil and Grease regulations		N/A	97%	100%	97%	100%	100%
Workload Measures							
Number of linear feet of mainlined jetted		310,000	372,238	300,000	400,000	300,000	300,000
Number of reportable Sanitary Sewer Overflows		1	4	0	2	2	2
Number of responses to Sewer customer services requests		1,328	1,040	1,500	1,000	1,000	1,000
Number of linear feet of sewer mains inspected using CCTV		62,670	184,676	300,000	200,000	300,000	300,000
Number of inspections of food serving establishments for compliance with Fats, Oils and Grease regulations		N/A	78	150	33	150	150

Appendix L
Performance Measure Data Sheets (Lucity)

Work Order Number: 2025-05-01-017

5/29/2025 8:39 AM

Category: Mains **Status:** New Work Order

Problem: **Supervisor:** Felipe Carrillo

Main Task: Inspection **Related:** swHotspot Siphon Inspect - Monthly

Work Order Start Date: 5/1/2025 **Work Order End Date:**

Comments To / From Crew

Siphon Inspection

Employee Number	Employee Name	Date	Hours

Equipment Code	Equipment Description	Units

Asset List (Sewer Pipes)

US / DS	Address / General Location		Diameter	Length	Material	Comment / Completion Date
14-61	165 SARATOGA AV	165 SARATOGA AV	10	113.6	Vitrified Clay Pipe	
14-62	165 SARATOGA AV	165 SARATOGA AV				
Special instructions -						
14-65	273 SARATOGA AV	273 SARATOGA AV	10	91.9	Vitrified Clay Pipe	
15-62	273 SARATOGA AV	273 SARATOGA AV				
Special instructions -						
20-16		HOMESTEAD RD	15	164.3	Vitrified Clay Pipe	
20-17		HOMESTEAD RD				
Special instructions -						
20-26			24	168.7	Polyethylene	
20-18						
Special instructions -						
20-26		HOMSTEAD RD	24	170.9	Polyethylene	
20-18		HOMESTEAD ROAD				
Special instructions -						
22-64			12	120.5	Vitrified Clay Pipe	
22-102						
Special instructions -						
23-15	830 KIELY BL	830 KIELY BL	12	85.7	Vitrified Clay Pipe	
23-14	830 KIELY BL	830 KIELY BL				
Special instructions -						

23-15 23-14			8	84.8	Vitrified Clay Pipe
Special instructions -					
31-24	3405 BENTON ST	3405 BENTON ST	24	115.2	Cast Iron
31-25	1144 POMEROY AV	1144 POMEROY AV			
Special instructions -					
32-2	3180 EL CAMINO REAL	3180 EL CAMINO REAL	10	71.1	PolyVinyl Chloride
32-102	3180 EL CAMINO REAL	3180 EL CAMINO REAL			
Special instructions -					
32-2	3180 EL CAMINO REAL	3180 EL CAMINO REAL	8	72.9	PolyVinyl Chloride
32-102	3180 EL CAMINO REAL	3180 EL CAMINO REAL			
Special instructions -					
33-9	2632 EL CAMINO REAL	2632 EL CAMINO REAL	8	102.8	Vitrified Clay Pipe
33-10	2570 EL CAMINO REAL	2570 EL CAMINO REAL			
Special instructions -					
42-30	3155 COLFAX CT	3155 COLFAX CT	6	93.0	Vitrified Clay Pipe
42-31	1947 CALABAZAS BL	1947 CALABAZAS BL			
Special instructions -					
46-113 46-114			12	15.0	Vitrified Clay Pipe
Special instructions -					
52-3	2637 MARCHESE WY	2637 MARCHESE WY	8	67.2	Cast Iron
52-5	3289 AGATE DR	3289 AGATE DR			
Special instructions -					
52-123 52-124			8	334.8	Polyethylene
Special instructions -					
52-123 52-124			8	340.7	Polyethylene
Special instructions -					
52-116 52-119			12	304.0	Polyethylene
Special instructions -					
54-79	2195 HOOVER DR	2195 HOOVER DR	10	134.2	Vitrified Clay Pipe
54-78	2414 MARMON CT	2414 MARMON CT			
Special instructions -					
54-79 54-78			10	133.1	Vitrified Clay Pipe
Special instructions -					
54-94	2400 WALSH AV	2400 WALSH AV	18	270.0	Vitrified Clay Pipe
54-95	2398 WALSH AV	2398 WALSH AV			
Special instructions -					
54-94	2400 WALSH AV	2400 WALSH AV	18	271.8	Vitrified Clay Pipe
54-95	2398 WALSH AV	2398 WALSH AV			
Special instructions -					
55-51	2746 SCOTT BL	2746 SCOTT BL	20	176.8	Vitrified Clay Pipe
55-52	2735 SCOTT BL	2735 SCOTT BL			
Special instructions -					

55-51	2746 SCOTT BL	2746 SCOTT BL	20	180.3	Vitrified Clay Pipe
55-52	2735 SCOTT BL	2735 SCOTT BL			
Special instructions -					
56-58	901 WALSH AV	901 WALSH AV	20	120.6	Vitrified Clay Pipe
56-59	2710 LAFAYETTE ST	2710 LAFAYETTE ST			
Special instructions -					
56-58	901 WALSH AV	901 WALSH AV	20	121.6	Vitrified Clay Pipe
56-59	2710 LAFAYETTE ST	2710 LAFAYETTE ST			
Special instructions -					
62-7	3300 CENTRAL EX	3300 CENTRAL EX	10	145.5	Vitrified Clay Pipe
62-12	3300 CENTRAL EX	3300 CENTRAL EX			
Special instructions -					
62-7			8	144.6	Vitrified Clay Pipe
62-12					
Special instructions -					
62-9	3300 CENTRAL EX	3300 CENTRAL EX	15	112.2	Vitrified Clay Pipe
62-11	3300 CENTRAL EX	3300 CENTRAL EX			
Special instructions -					
64-34		WALSH AVE	15	130.6	Vitrified Clay Pipe
64-36		EASEMENT THROUGH SAN TOMA			
Special instructions -					
64-34		WALSH AVE	8	130.4	Vitrified Clay Pipe
64-36		EASEMENT THROUGH SAN TOMA			
Special instructions -					
67-21		DE LA CRUZ BL	24	23.0	Ductile Iron Pipe
67-29		DE LA CRUZ BL			
Special instructions -					
67-21			24	22.8	Ductile Iron Pipe
67-29					
Special instructions -					
68-15		DE LA CRUZ BL	24	61.8	Vitrified Clay Pipe
68-12	460 GIANNI ST	460 GIANNI ST			
Special instructions -					
68-15		DE LA CRUZ BL	24	67.4	Vitrified Clay Pipe
68-16	460 GIANNI ST	460 GIANNI ST			
Special instructions -					
68-9			15	354.8	Vitrified Clay Pipe
68-6					
Special instructions -					
68-9	3165 DE LA CRUZ BL	3165 DE LA CRUZ BL	24	350.7	Vitrified Clay Pipe
68-6	3165 DE LA CRUZ BL	3165 DE LA CRUZ BL			
Special instructions -					
68-10	3165 DE LA CRUZ BL	3165 DE LA CRUZ BL	24	491.2	Vitrified Clay Pipe
68-7	3165 DE LA CRUZ BL	3165 DE LA CRUZ BL			
Special instructions -					
68-10			15	477.3	Vitrified Clay Pipe
68-7					
Special instructions -					

72-12	3500	GARRETT DR	3500 GARRETT DR		20	38.7	Reinforced Concrete
72-11			CALABAZAS CREEK NEAR TANNE				
Special instructions -							
72-12					20	38.3	Reinforced Concrete
72-11							
Special instructions -							
85-86	2320	FALLING WATER CT	2320 FALLING WATER CT		18	97.4	PolyVinyl Chloride
85-85	2270	RIVER BED CT	2270 RIVER BED CT				
Special instructions -							
93-50	4699	OLD IRONSIDES DR	4699 OLD IRONSIDES DR		12	124.1	Vitrified Clay Pipe
93-48	4880	GREAT AMERICA PY	4880 GREAT AMERICA PY				
Special instructions -							
93-50	4699	OLD IRONSIDES DR	4699 OLD IRONSIDES DR		24	122.2	Vitrified Clay Pipe
93-48	4880	GREAT AMERICA PY	4880 GREAT AMERICA PY				
Special instructions -							
93-51	4699	OLD IRONSIDES DR	4699 OLD IRONSIDES DR		24	106.5	Vitrified Clay Pipe
93-49	4880	GREAT AMERICA PY	4880 GREAT AMERICA PY				
Special instructions -							
93-51	4699	OLD IRONSIDES DR	4699 OLD IRONSIDES DR		18	107.6	Vitrified Clay Pipe
93-49	4880	GREAT AMERICA PY	4880 GREAT AMERICA PY				
Special instructions -							
93-51	4699	OLD IRONSIDES DR	4699 OLD IRONSIDES DR		24	107.5	Vitrified Clay Pipe
93-49	4880	GREAT AMERICA PY	4880 GREAT AMERICA PY				
Special instructions -							
95-45	2196	FAIRWAY GLEN DR	2196 FAIRWAY GLEN DR		15	88.8	Vitrified Clay Pipe
95-44	2198	AVE DE LAS FLORES	2198 AVE DE LAS FLORES				
Special instructions -							
95-45					18	88.4	Vitrified Clay Pipe
95-44							
Special instructions -							
95-45					18	87.3	Vitrified Clay Pipe
95-44							
Special instructions -							
96-14	4751	LICK MILL BL	4751 LICK MILL BL		10	205.5	Polyethylene
96-13	4751	LICK MILL BL	4751 LICK MILL BL				
Special instructions -							
96-14	4751	LICK MILL BL	4751 LICK MILL BL		15	203.2	Polyethylene
96-13	4751	LICK MILL BL	4751 LICK MILL BL				
Special instructions -							
103-19	5251	GREAT AMERICA PY	5251 GREAT AMERICA PY		24	306.4	Vitrified Clay Pipe
103-16	5350	GREAT AMERICA PY	5350 GREAT AMERICA PY				
Special instructions -							
103-19					12	305.0	Vitrified Clay Pipe
103-16							
Special instructions -							
103-20	5251	GREAT AMERICA PY	5251 GREAT AMERICA PY		24	181.6	Vitrified Clay Pipe
103-18	5353	GREAT AMERICA PY	5353 GREAT AMERICA PY				
Special instructions -							

103-20	5251	GREAT AMERICA PY	5251	GREAT AMERICA PY	24	181.3	Vitrified Clay Pipe
103-18	5353	GREAT AMERICA PY	5353	GREAT AMERICA PY			
Special instructions -							
103-20	5251	GREAT AMERICA PY	5251	GREAT AMERICA PY	18	180.0	Vitrified Clay Pipe
103-18	5353	GREAT AMERICA PY	5353	GREAT AMERICA PY			
Special instructions -							
57 Pipes				9,007.6 Total Length			

Work Order Number: 2025-05-01-016

5/29/2025
8:40 AM

Category: Mains
Status: New Work Order
Problem:
Supervisor: Felipe Carrillo
Main Task: Jet
Related: swHotspot Main Jetting - Monthly

Work Order Start Date: 5/1/2025
Work Order End Date:

Comments To / From Crew

Employee Number	Employee Name	Date	Hours

Equipment Code	Equipment Description	Units

Asset List (Sewer Pipes)

US / DS	Address / General Location		Diameter	Length	Material	Comment / Completion Date
2-30	3038 MCKINLEY DR	3038 MCKINLEY DR	8	230.4	Vitrified Clay Pipe	
2-27	3080 MCKINLEY DR	3080 MCKINLEY DR				
Special instructions -						
2-32	4477 STEVENS CREEK BL	4477 STEVENS CREEK BL	8	351.9	Vitrified Clay Pipe	
2-30	3038 MCKINLEY DR	3038 MCKINLEY DR				
Special instructions -						
25-82	566 LOS OLIVOS DR	566 LOS OLIVOS DR	8	259.6	Vitrified Clay Pipe	
25-74	596 LOS OLIVOS DR	596 LOS OLIVOS DR				
Special instructions -						
28-1	281 WASHINGTON ST	281 WASHINGTON ST	8	361.2	Vitrified Clay Pipe	
28-92	910 POPLAR ST	910 POPLAR ST				
Special instructions -						
30-20	1068 WOOD DUCK AV	1068 WOOD DUCK AV	8	295.8	Vitrified Clay Pipe	
30-17	3701 SWALLOW WY	3701 SWALLOW WY				
Special instructions -						
30-21	1048 WOOD DUCK AV	1048 WOOD DUCK AV	8	68.1	Vitrified Clay Pipe	
30-20	1068 WOOD DUCK AV	1068 WOOD DUCK AV				
Special instructions -						
30-36	3700 BENTON ST	3700 BENTON ST	8	184.5	Vitrified Clay Pipe	
30-21	1048 WOOD DUCK AV	1048 WOOD DUCK AV				
Special instructions -						

32-34	1353 CALABAZAS CT	1353 CALABAZAS CT	6	119.7	Vitrified Clay Pipe	
32-39	1373 CALABAZAS BL	1373 CALABAZAS BL				
Special instructions -						
32-35	1370 VIA DONDERA	1370 VIA DONDERA	6	52.1	Vitrified Clay Pipe	
32-36	1360 VIA DONDERA	1360 VIA DONDERA				
Special instructions -						
32-36	1360 VIA DONDERA	1360 VIA DONDERA	6	315.3	Vitrified Clay Pipe	
32-48	3216 EL SOBRANTE ST	3216 EL SOBRANTE ST				
Special instructions -						
32-39	1373 CALABAZAS BL	1373 CALABAZAS BL	6	202.9	Vitrified Clay Pipe	
32-35	1370 VIA DONDERA	1370 VIA DONDERA				
Special instructions -						
32-4	3180 EL CAMINO REAL	3180 EL CAMINO REAL	10	34.5	Vitrified Clay Pipe	
32-5	3180 EL CAMINO REAL	3180 EL CAMINO REAL				
Special instructions -						
46-2	2119 MAIN ST	2119 MAIN ST	10	106.4	Vitrified Clay Pipe	
56-47	2119 MAIN ST	2119 MAIN ST				
Special instructions -						
46-87	1597 JACKSON ST	1597 JACKSON ST	6	253.6	Vitrified Clay Pipe	
47-44	1596 MAIN ST	1596 MAIN ST				
Special instructions -						
52-15	2632 MEADOWBROOK DR	2632 MEADOWBROOK DR	10	333.5	Vitrified Clay Pipe	
62-23	3069 AGATE DR	3069 AGATE DR				
Special instructions -						
52-17	2999 AGATE DR	2999 AGATE DR	8	249.2	Vitrified Clay Pipe	
52-16	3049 AGATE DR	3049 AGATE DR				
Special instructions -						
53-2	2949 AGATE DR	2949 AGATE DR	8	255.9	Vitrified Clay Pipe	
52-17	2999 AGATE DR	2999 AGATE DR				
Special instructions -						
53-3	2899 AGATE DR	2899 AGATE DR	8	256.3	Vitrified Clay Pipe	
53-2	2949 AGATE DR	2949 AGATE DR				
Special instructions -						
53-4	2859 AGATE DR	2859 AGATE DR	8	258.7	Vitrified Clay Pipe	
53-3	2899 AGATE DR	2899 AGATE DR				
Special instructions -						
56-32	1160 RICHARD AV	1160 RICHARD AV	10	237.4	Vitrified Clay Pipe	
56-26	1161 RICHARD AV	1161 RICHARD AV				
Special instructions -						
56-34	1255 MEMOREX DR	1255 MEMOREX DR	10	390.4	Vitrified Clay Pipe	
56-32	1160 RICHARD AV	1160 RICHARD AV				
Special instructions -						
56-35	1255 MEMOREX DR	1255 MEMOREX DR	10	40.3	Vitrified Clay Pipe	
56-34	1255 MEMOREX DR	1255 MEMOREX DR				
Special instructions -						
56-39	1330 MEMOREX DR	1330 MEMOREX DR	10	227.1	Vitrified Clay Pipe	
56-35	1255 MEMOREX DR	1255 MEMOREX DR				
Special instructions -						

56-47	2119 MAIN ST	2119 MAIN ST	10	318.2	Vitrified Clay Pipe
56-39	1330 MEMOREX DR	1330 MEMOREX DR			
Special instructions -					
57-21	518 ROBERT AV	518 ROBERT AV	6	106.4	Vitrified Clay Pipe
57-17	527 ROBERT AV	527 ROBERT AV			
Special instructions -					
57-16	585 ROBERT AV	585 ROBERT AV	10	203.9	Vitrified Clay Pipe
57-17	527 ROBERT AV	527 ROBERT AV			
Special instructions -					
57-17	527 ROBERT AV	527 ROBERT AV	10	113.9	Vitrified Clay Pipe
57-18	508 ROBERT AV	508 ROBERT AV			
Special instructions -					
57-18	508 ROBERT AV	508 ROBERT AV	10	356.4	Vitrified Clay Pipe
57-19	426 ROBERT AV	426 ROBERT AV			
Special instructions -					
57-19	426 ROBERT AV	426 ROBERT AV	10	247.3	Vitrified Clay Pipe
58-17	2362 DE LA CRUZ BL	2362 DE LA CRUZ BL			
Special instructions -					
62-23	3069 AGATE DR	3069 AGATE DR	10	290.4	Vitrified Clay Pipe
62-50		AGATE DR			
Special instructions -					
85-30	4316 FILLMORE ST	4316 FILLMORE ST	6	434.9	Vitrified Clay Pipe
85-17	2169 2ND ST	2169 2ND ST			
Special instructions -					
86-18	930 CLYDE AV	930 CLYDE AV	8	65.5	Vitrified Clay Pipe
86-36	941 CLYDE AV	941 CLYDE AV			
Special instructions -					
86-23	1030 CLYDE AV	1030 CLYDE AV	8	134.0	Vitrified Clay Pipe
86-21	1010 CLYDE AV	1010 CLYDE AV			
Special instructions -					
87-25	791 CLYDE AV	791 CLYDE AV	10	184.1	Vitrified Clay Pipe
87-13	791 CLYDE AV	791 CLYDE AV			
Special instructions -					
95-14	4993 STARS AND STRIPES	4993 STARS AND STRIPES DR	8	42.0	Vitrified Clay Pipe
95-13	4993 STARS AND STRIPES	4993 STARS AND STRIPES DR			
Special instructions -					
95-3	5095 LAFAYETTE ST	5095 LAFAYETTE ST	8	43.7	Vitrified Clay Pipe
95-1	5095 LAFAYETTE ST	5095 LAFAYETTE ST			
Special instructions -					
36 Pipes			7,625.7 Total Length		

Work Order Number: 2025-05-01-015

5/29/2025 8:42 AM

Category: Mains **Status:** New Work Order

Problem: **Supervisor:** Felipe Carrillo

Main Task: Flush **Related:** swHotspot Main Flush - Monthly

Work Order Start Date: 5/1/2025 **Work Order End Date:**

Comments To / From Crew

Employee Number	Employee Name	Date	Hours

Equipment Code	Equipment Description	Units

Asset List (Sewer Pipes)

US / DS	Address / General Location		Diameter	Length	Material	Comment / Completion Date
5-12	3565 STEVENS CREEK BL	3565 STEVENS CREEK BL	6	482.3	Vitrified Clay Pipe	
5-14	265 CYPRESS AV	265 CYPRESS AV				
Special instructions -						
5-16	265 TYLER AV	265 TYLER AV	6	409.0	Vitrified Clay Pipe	
5-14	265 CYPRESS AV	265 CYPRESS AV				
Special instructions -	DO NOT JET - ISSUE AT 15' - USE SMALL HEAD - NO SKID					
21-80	3555 LEHIGH DR	3555 LEHIGH DR	8	205.2	Vitrified Clay Pipe	
21-75	681 HARVARD AV	681 HARVARD AV				
Special instructions -						
23-7	2620 PATRICIA DR	2620 PATRICIA DR	8	180.8	Vitrified Clay Pipe	
24-17	906 LAS PALMAS DR	906 LAS PALMAS DR				
Special instructions -						
27-19	1295 MANCHESTER DR	1295 MANCHESTER DR	6	552.7	Vitrified Clay Pipe	
27-10	1301 JONATHAN ST	1301 JONATHAN ST				
Special instructions -						
28-28	720 HILMAR ST	720 HILMAR ST	6	187.2	Vitrified Clay Pipe	
28-20	2407 PARK AV	2407 PARK AV				
Special instructions -						
39-17	1224 SHERWOOD AV	1224 SHERWOOD AV	8	124.5	Vitrified Clay Pipe	
39-27	1227 SHERWOOD AV	1227 SHERWOOD AV				
Special instructions -						

39-23	1224 SHERWOOD AV	1224 SHERWOOD AV	8	224.8	Vitrified Clay Pipe	
39-17		1202 SHERWOOD AV				
Special instructions -						
39-24	2222 THE ALAMEDA	2222 THE ALAMEDA		212.1	Vitrified Clay Pipe	
39-23						
Special instructions -						
45-86	1610 LONG ST	1610 LONG ST	6	309.5	Vitrified Clay Pipe	
45-85	2125 BRAY AV	2125 BRAY AV				
Special instructions -						
45-85	2125 BRAY AV	2125 BRAY AV	6	240.4	Vitrified Clay Pipe	
45-84	2165 BRAY AV	2165 BRAY AV				
Special instructions -						
45-84	2165 BRAY AV	2165 BRAY AV	6	239.6	Vitrified Clay Pipe	
45-83	2228 BRAY AV	2228 BRAY AV				
Special instructions -						
45-83	2228 BRAY AV	2228 BRAY AV	6	234.8	Vitrified Clay Pipe	
45-82	2268 BRAY AV	2268 BRAY AV				
Special instructions -						
45-82	2268 BRAY AV	2268 BRAY AV	6	121.4	Vitrified Clay Pipe	
45-81	2278 BRAY AV	2278 BRAY AV				
Special instructions -						
45-81	2278 BRAY AV	2278 BRAY AV	6	161.4	Vitrified Clay Pipe	
45-80	1648 LOS PADRES BL	1648 LOS PADRES BL				
Special instructions -						
46-86	1590 JACKSON ST	1590 JACKSON ST	6	348.5	Vitrified Clay Pipe	
46-85	1708 JACKSON ST	1708 JACKSON ST				
Special instructions -						
48-22	1450 COLEMAN AV	1450 COLEMAN AV	8	406.6	Vitrified Clay Pipe	
48-21	1601 COLEMAN AV	1601 COLEMAN AV				
Special instructions -						
88-23	3575 VICTOR ST	3575 VICTOR ST	12	364.3	Vitrified Clay Pipe	
78-27	431 NELO ST	431 NELO ST				
Special instructions -						
103-33	5490 GREAT AMERICA PY	5490 GREAT AMERICA PY	12	260.1	Vitrified Clay Pipe	
103-34		GREAT AMERICA WAY				
Special instructions -						
103-34		GREAT AMERICA WAY	12	361.8	Vitrified Clay Pipe	
103-35	2900 OLD MOUNTAIN VIEW	2900 OLD MOUNTAIN VIEW				
Special instructions -						
103-35	2900 OLD MOUNTAIN VIEW	2900 OLD MOUNTAIN VIEW	12	428.8	Vitrified Clay Pipe	
113-2	2600 GREAT AMERICA WY	2600 GREAT AMERICA WY				
Special instructions -						
113-2	2600 GREAT AMERICA WY	2600 GREAT AMERICA WY	12	344.8	Vitrified Clay Pipe	
113-3	2600 GREAT AMERICA WY	2600 GREAT AMERICA WY				
Special instructions -						
114-20		GREAT AMERICA WAY	12	147.9	Polyethylene	
114-21	5599 LAFAYETTE ST	5599 LAFAYETTE ST				
Special instructions -						

114-21	5599 LAFAYETTE ST	5599 LAFAYETTE ST	12	216.2	Vitrified Clay Pipe	
114-22	5599 LAFAYETTE ST	5599 LAFAYETTE ST				
Special instructions -						
113-3	2600 GREAT AMERICA WY	2600 GREAT AMERICA WY	12	271.7	Vitrified Clay Pipe	
114-20		GREAT AMERICA WAY				
Special instructions -						
25 Pipes		7,036.4 Total Length				

Work Order Number: 2025-05-01-014

5/29/2025
8:43 AM

Category: Mains
Status: New Work Order
Problem:
Supervisor: Felipe Carrillo
Main Task: Inspection
Related: swHotspot Main Inspection - Monthly

Work Order Start Date: 5/1/2025
Work Order End Date:

Comments To / From Crew

MAINS

Employee Number	Employee Name	Date	Hours

Equipment Code	Equipment Description	Units

Asset List (Sewer Pipes)

US / DS	Address / General Location		Diameter	Length	Material	Comment / Completion Date
10-75	3818 HANCOCK DR	3818 HANCOCK DR	8	233.5	Vitrified Clay Pipe	
10-76	3798 HANCOCK DR	3798 HANCOCK DR				
Special instructions -						
10-76	3798 HANCOCK DR	3798 HANCOCK DR	8	277.2	Vitrified Clay Pipe	
10-77	259 LA HERRAN DR	259 LA HERRAN DR				
Special instructions -						
10-77	259 LA HERRAN DR	259 LA HERRAN DR	8	323.8	Vitrified Clay Pipe	
10-78	300 MONTCLAIR DR	300 MONTCLAIR DR				
Special instructions -						
10-78	300 MONTCLAIR DR	300 MONTCLAIR DR	8	293.6	Vitrified Clay Pipe	
10-79	3678 MAGELLAN AV	3678 MAGELLAN AV				
Special instructions -						
10-79	3678 MAGELLAN AV	3678 MAGELLAN AV	8	304.6	Vitrified Clay Pipe	
10-80	3638 MAGELLAN AV	3638 MAGELLAN AV				
Special instructions -						
11-76	283 LA SALLE AV	283 LA SALLE AV	10	92.6	Vitrified Clay Pipe	
11-77	250 CALVERT DR	250 CALVERT DR				
Special instructions -						
11-77	250 CALVERT DR	250 CALVERT DR	10	163.6	Vitrified Clay Pipe	
11-78	241 CALVERT CT	241 CALVERT CT				
Special instructions -						

13-98	100 SERENA WY	100 SERENA WY		8	133.5	Vitrified Clay Pipe
13-97	100 SERENA WY	100 SERENA WY				
Special instructions -						
13-99	2753 MAURICIA AV	2753 MAURICIA AV		8	123.1	Vitrified Clay Pipe
13-98	100 SERENA WY	100 SERENA WY				
Special instructions -						
23-89				12	124.8	Vitrified Clay Pipe
23-5						
Special instructions -						
23-11	2900 MILES DR	2900 MILES DR		8	177.7	Vitrified Clay Pipe
23-12	2900 MILES DR	2900 MILES DR				
Special instructions -						
26-39	400 CALIFORNIA ST	400 CALIFORNIA ST		6	250.2	Vitrified Clay Pipe
26-35	469 CALIFORNIA ST	469 CALIFORNIA ST				
Special instructions -						
26-35	469 CALIFORNIA ST	469 CALIFORNIA ST		6	257.5	Vitrified Clay Pipe
26-28	1945 BELLOMY ST	1945 BELLOMY ST				
Special instructions -						
26-89	1803 HENNING PL	1803 HENNING PL		10	220.0	Vitrified Clay Pipe
26-32	575 WINCHESTER BL	575 WINCHESTER BL				
Special instructions -						
26-38	1802 HENNING PL	1802 HENNING PL		10	38.5	Vitrified Clay Pipe
26-89	1803 HENNING PL	1803 HENNING PL				
Special instructions -						
33-35	1293 KIELY BL	1293 KIELY BL		15	54.2	Vitrified Clay Pipe
33-34	1270 KIELY BL	1270 KIELY BL				
Special instructions -						
33-22	2644 EL CAMINO REAL	2644 EL CAMINO REAL		8	210.3	Vitrified Clay Pipe
33-23	2620 EL CAMINO REAL	2620 EL CAMINO REAL				
Special instructions -						
33-23	2620 EL CAMINO REAL	2620 EL CAMINO REAL		8	111.2	Vitrified Clay Pipe
33-24	1400 WHITE DR	1400 WHITE DR				
Special instructions -						
33-24	1400 WHITE DR	1400 WHITE DR		8	260.2	Vitrified Clay Pipe
33-14	2610 EL CAMINO REAL	2610 EL CAMINO REAL				
Special instructions -						
33-14	2610 EL CAMINO REAL	2610 EL CAMINO REAL		8	266.4	Vitrified Clay Pipe
33-9	2632 EL CAMINO REAL	2632 EL CAMINO REAL				
Special instructions -						
39-1	518 CHAPMAN CT	518 CHAPMAN CT		8	95.3	Vitrified Clay Pipe
39-19	2221 THE ALAMEDA	2221 THE ALAMEDA				
Special instructions -						
41-14		LAWRENCE EX & 3584 CABRILLO A\		8	181.3	Vitrified Clay Pipe
41-15	3573 CABRILLO AV	3573 CABRILLO AV				
Special instructions -						
41-15	3573 CABRILLO AV	3573 CABRILLO AV		8	297.3	Vitrified Clay Pipe
41-16	3513 CABRILLO AV	3513 CABRILLO AV				
Special instructions -						

46-1	2124 MAIN ST	2124 MAIN ST	10	142.4	Vitrified Clay Pipe
56-46	2125 MAIN ST	2125 MAIN ST			
Special instructions -					
41-16	3513 CABRILLO AV	3513 CABRILLO AV	8	231.3	Vitrified Clay Pipe
41-17	3502 CABRILLO AV	3502 CABRILLO AV			
Special instructions -					
41-17	3502 CABRILLO AV	3502 CABRILLO AV	8	24.5	Vitrified Clay Pipe
41-18	3499 CABRILLO AV	3499 CABRILLO AV			
Special instructions -					
46-85	1708 JACKSON ST	1708 JACKSON ST	8	394.2	Vitrified Clay Pipe
47-38	1100 REEVE ST	1100 REEVE ST			
Special instructions -					
46-93	1205 EL CAMINO REAL	1205 EL CAMINO REAL	8	335.8	Vitrified Clay Pipe
46-86	1590 JACKSON ST	1590 JACKSON ST			
Special instructions -					
55-22	2299 PASETTA DR	2299 PASETTA DR	12	332.0	Vitrified Clay Pipe
55-15	2230 MARTIN AV	2230 MARTIN AV			
Special instructions -					
55-15	2230 MARTIN AV	2230 MARTIN AV	12	219.2	Vitrified Clay Pipe
55-11	2250 MARTIN AV	2250 MARTIN AV			
Special instructions -					
57-2	785 WALSH AV	785 WALSH AV	15	342.9	Vitrified Clay Pipe
57-3	672 WALSH AV	672 WALSH AV			
Special instructions -					
57-38		MATHEW ST	18	207.9	Vitrified Clay Pipe
57-35	525 MATHEW ST	525 MATHEW ST			
Special instructions -					
57-38			24	344.4	Vitrified Clay Pipe
57-58					
Special instructions -					
65-14	3023 SCOTT BL	3023 SCOTT BL	12	335.7	Vitrified Clay Pipe
65-11	3033 SCOTT BL	3033 SCOTT BL			
Special instructions -					
66-41	1451 WALSH AV	1451 WALSH AV	10	207.6	Vitrified Clay Pipe
66-40		WALSH			
Special instructions -					
66-40		WALSH	12	338.5	Vitrified Clay Pipe
66-38	2841 SCOTT BL	2841 SCOTT BL			
Special instructions -					
36 Pipes			7,946.7 Total Length		

Appendix M
SSMP Audit Checklist

City of Santa Clara
Sewer System Management Plan (SSMP)
Audit Report

The purpose of the Annual SSMP Audit is to evaluate the effectiveness of the City of Santa Clara's SSMP and to identify deficiencies, if any, and steps to correct them. The audit is submitted pursuant to the San Francisco Bay Regional Water Quality Control Board's Sewer System Management Plan Development Guide, July 2005.

Directions: Please check **YES** or **NO** for each question. If **NO** is answered for any question, describe the updates/changes needed and the timeline to complete those changes in the "*Description of Scheduled Updates/Changes to the SSMP"* section on Page 5 of this form.

		YES	NO
ELEMENT 1 – GOAL AND INTRODUCTION			
A.	Are the goals stated in the SSMP still appropriate and accurate?	☐	☐
ELEMENT 2 -- ORGANIZATION			
A.	Is the Utilities Key Staff Telephone List current?	☐	☐
B.	Is the Sanitary Sewer Overflow Responder Telephone List current?	☐	☐
C.	Is the "City Organization Chart," in the SSMP current?	☐	☐
D.	Are the position descriptions an accurate portrayal of staff responsibilities?	☐	☐
E.	Is the "Chain of Communication for Reporting and Responding to SSOs," table accurate and up-to-date?	☐	☐
ELEMENT 3 – LEGAL AUTHORITY			
Does the SSMP contain excerpts from the current City of Santa Clara Municipal Code documenting the City's legal authority to:			
A.	Prevent illicit discharges?	☐	☐
B.	Require proper design and construction of sewers and connections?	☐	☐
C.	Ensure access for maintenance, inspection, or repairs for portions of the lateral owned or maintained by the City?	☐	☐
D.	Limit discharges of fats, oil and grease?	☐	☐
E.	Enforce any violation of its sewer ordinances?	☐	☐

		YES	NO
ELEMENT 4 – OPERATION & MAINT**ENANCE PROGRAM**			
	Collection System Maps		
A.	Does the SSMP reference the current process and procedures for maintaining the City's wastewater collection system maps?	☐	☐
B.	Are the City's wastewater collection system maps complete, current, and sufficiently detailed?	☐	☐
	Resources and Budget		
C.	Does the City allocate sufficient funds for the effective operation, maintenance and repair of the wastewater collection system and is the current budget structure documented in the SSMP?	☐	☐
	Prioritized Preventive Maintenance		
D.	Does the SSMP describe current preventive maintenance activities and the system for prioritizing the cleaning of sewer lines?	☐	☐
E.	Based upon information in the Annual SSO Report, are the City's preventive maintenance activities sufficient and effective in minimizing SSOs and blockages?	☐	☐
	Scheduled Inspections and Condition Assessments		
F.	Is there an ongoing condition assessment program sufficient to develop a capital improvement plan addressing the proper management and protection of infrastructure assets? Are the current components of this program documented in the SSMP?	☐	☐
	Contingency Equipment and Replacement Inventory		
G.	Does the SSMP list the major equipment currently used in the operation and maintenance of the collection system and document the procedures of inventory management?	☐	☐
H.	Are contingency equipment and replacement parts sufficient to respond to emergencies and properly conduct regular maintenance?	☐	☐
	Training		
I.	Is the training calendar current?	☐	☐
J.	Does the SSMP document current training expectations and programs within the City's Sewer Division?	☐	☐
	Outreach to Plumbers and Building Contractors		
K.	Does the SSMP document current outreach efforts to plumbers and building contractors?	☐	☐

		YES	NO
ELEMENT 5 – DESIGN AND PERFORMANCE PROVISIONS			
A.	Does the SSMP contain current design and construction standards for the installation of new sanitary sewer systems, pump stations and other appurtenances and for the rehabilitation and repair of existing sanitary sewer systems?	☐	☐
B.	Does the SSMP document current procedures and standards for inspecting and testing the installation of new sewers, pumps, and other appurtenances and the rehabilitation and repair of existing sewer lines?	☐	☐
ELEMENT 6 – SPILL EMERGENCY RESPONSE PLAN			
A.	Does the City's Sanitary Sewer Overflow and Backup Response Plan establish procedures for the emergency response, notification, and reporting of sanitary sewer overflows (SSOs)?	☐	☐
B.	Are Wastewater Division staff and contractor personnel appropriately trained on the procedures of the Sanitary Sewer Overflow and Backup Response Plan?	☐	☐
C.	Considering performance indicator data in the Annual SSO Report, is the Sanitary Sewer Overflow and Backup Response Plan effective in handling SSOs in order to safeguard public health and the environment?	☐	☐
ELEMENT 7 – SEWER PIPE BLOCKAGE CONTROL PROGRAM			
A.	Does the Fats, Oils, and Grease (FOG) Control Program include efforts to educate the public on the proper handling and disposal of FOG?	☐	☐
B.	Does the City's FOG Control Program identify sections of the collection system subject to FOG blockages, establish a cleaning schedule and address source control measures to minimize these blockages?	☐	☐
C.	Are requirements for grease removal devices, best management practices (BMP), record keeping and reporting established in the City's FOG Control Program?	☐	☐
D.	Does the City have sufficient legal authority to implement and enforce the FOG Control Program?	☐	☐
E.	Is the current FOG program effective in minimizing blockages of sewer lines resulting from discharges of FOG to the system	☐	☐
ELEMENT 8 – SYSTEM EVALUATION, CAPACITY ASSURANCE, CAPITAL IMPROVEMENT			
A.	Does the City's Sanitary Sewer Master Plan evaluate hydraulic deficiencies in the system, establish sufficient design criteria and recommend both short and long term capacity enhancement and improvement projects?	☐	☐
B.	Does the City's Capital Improvement Plan (CIP) establish a schedule of approximate completion dates for both short and long-term improvements and is the schedule reviewed and updated to reflect current budgetary capabilities and activity accomplishment?	☐	☐

		YES	NO
ELEMENT 9 – MONITORING, MEASUREMENT, PROGRAM MODIFICATIONS			
A.	Does the SSMP accurately portray the methods of tracking and reporting selected performance indicators?	☐	☐
B.	Is the City able to sufficiently evaluate the effectiveness of SSMP elements based on relevant information?	☐	☐
ELEMENT 10 – SSMP PROGRAM AUDITS			
A.	Will the SSMP Audit be submitted to the Regional Water Board by May 2, 2014?	☐	☐
ELEMENT 11 – COMMUNICATION PROGRAM			
A.	Does the City effectively communicate with the public and other agencies about the development and implementation of the SSMP and continue to address any feedback?	☐	☐

Description of Scheduled Updates/Changes to the SSMP

Directions: For each NO answer, please describe the planned revision and indicate the date the revision will be completed. Reference the SSMP element and question number with each explanation.