











City of Milpitas Sewer Master Plan

January 2021 | FINAL

HydroScience

City of Milpitas

Sewer Master Plan

Prepared by HydroScience Engineers, Inc.





January 2021

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ABBREVIATIONS

A	Amperes
ABS	Acrylonitrile-Butadiene-Styrene
AIC	Ampere Interrupting Capacity
BRE	Business Risk Exposure
BSF	Base sanitary flow
CCTV	Closed caption television
CEQA	California Environmental Quality Act
CIP	Capital Improvement Plan/Capital Improvement Program, Cast Iron Pipe
CIPP	Cured-in-Place Pipe
City	City of Milpitas
CoF	Consequence of failure
d	Wastewater depth
D	Pipe diameter
DEM	Digital elevation model
DIP	Ductile Iron Pipe
DU	Dwelling unit
DWF	Dry weather flow
ESDC	Engineering services during construction
FM	Flow meter
ft, ‘	Foot, feet, linear feet
ft/s	Feet per second
FY	Fiscal year
GIS	Geographic Information Systems/ArcGIS geodatabase
GP	General Plan
gpd	Gallons per day
GWI	Groundwater infiltration
HDPE	High-Density Polyethylene
HGL	Hydraulic grade line
Hp	Horsepower
IAP	InfoAsset Planner by Innovyze®
in, “	Inch, inches
InfoWorks	InfoWorks ICM by Innovyze®
kV	Kilovolt
kVA	Kilovolt-ampere
LAFCO	Local Agency Formation Commission
LoF	Likelihood of failure
Main LS	Milpitas Main Lift Station
MGD	Millions of gallons per day
MH	Manhole
NASSCO	National Association of Sewer Service Companies

NAVD 88	North American Vertical Datum of 1988
NEMA	National Electrical Manufacturers Association
NGVD 29	National Geodetic Vertical Datum of 1929
NOAA	National Oceanic and Atmospheric Administration
O&M	Operations & Maintenance
P	Pole
PACP	Pipeline Assessment Certification Program
ph	phase
PVC	Polyvinyl Chloride
QC	Quality control
RCP	Reinforced Concrete Pipe
RDI/I	Rainfall dependent inflow and infiltration
RG	Rain gauge
ROW	Right-of-way
RWF	San Jose-Santa Clara Regional Wastewater Facility
RWQCB	Regional Water Quality Control Board
SBWR	South Bay Water Recycling
SFPUC	San Francisco Public Utility Commission
SMP	Sewer Master Plan
SOI	Sphere of Influence
SSMP	Sanitary Sewer Management Plan
SSO	Sanitary sewer overflow
TASP	Transit Area Specific Plan
UF	Unit flow
UGB	Urban Growth Boundary
USA	Urban Service Area
USGS	United States Geological Survey
V	Volts
VCP	Vitrified Clay Pipe
Venus Way LS	Venus Way Lift Station
VFD	Variable frequency drive
W	Watts
WDR	RWQCB General Waste Discharge Requirements
WWF	Wet weather flow

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EXECUTIVE SUMMARY

HydroScience Engineers, Inc. (HydroScience) was retained by the City of Milpitas (City), to prepare the City Sewer Master Plan (SMP) and develop a Capital Improvement Plan (CIP) based on the current (2020) and future (2040) planning horizons. This executive summary provides a concise discussion of the project elements including background information, analyses conducted, and recommendations.

Services and Service Area

The City is in Santa Clara County and is bounded by the cities of Fremont to the north, San Jose to the south and west, and unincorporated Santa Clara County to the east. The City encompasses 14 square miles and is approximately 45 miles southeast of San Francisco (see **Figure ES-1**). The City provides wastewater collection services to a population of 77,961 according to the Department of Finance.

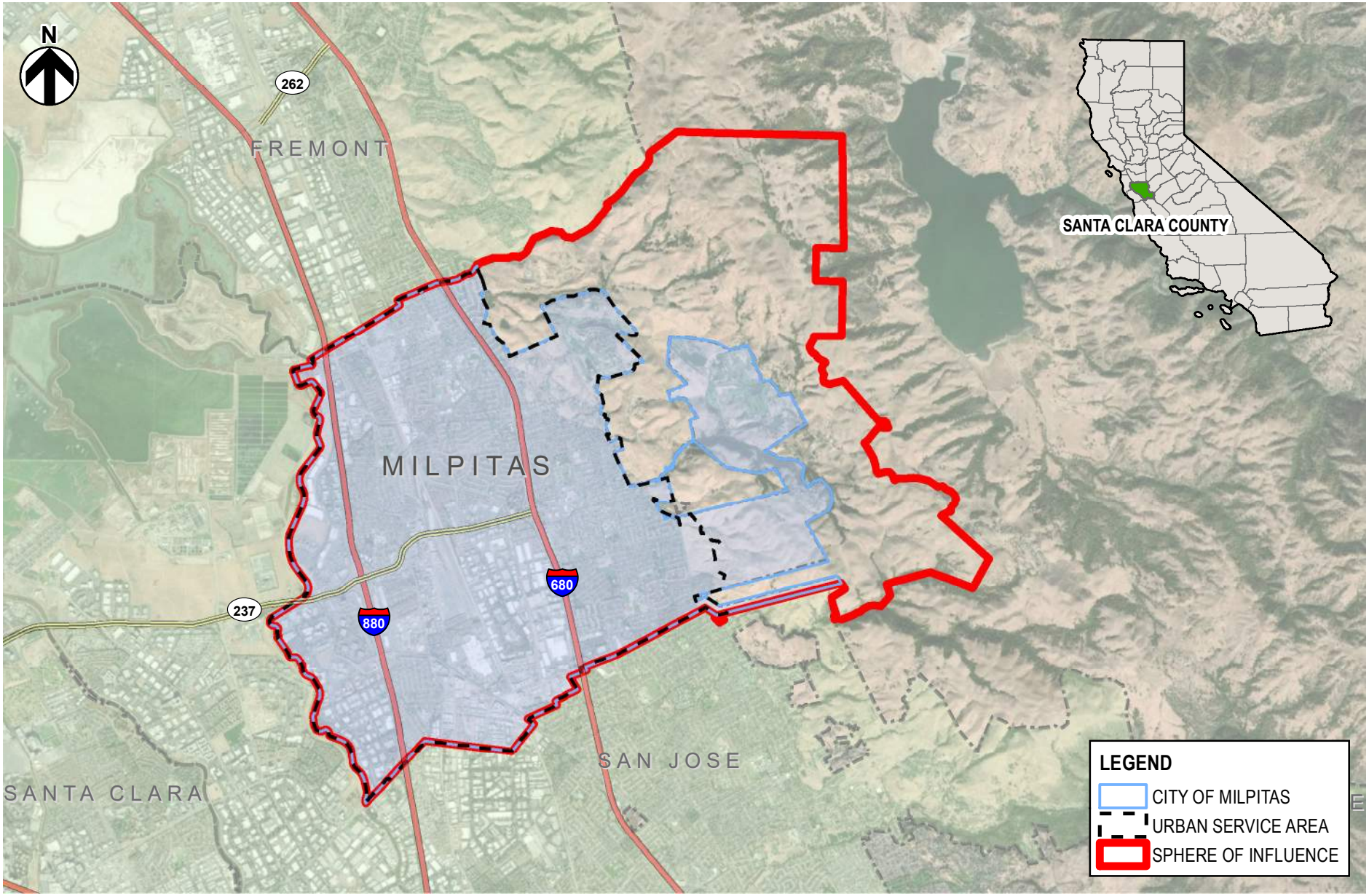
The wastewater collection system consists of approximately 160 miles of gravity sewers, with pipe diameters ranging from 4- to 66-inches. The collection system generally flows from east to west and south to north towards the San Francisco Bay. Most of the collection system flows by gravity to the Milpitas Main Lift Station (Main LS) then is pumped to the San Jose-Santa Clara Regional Wastewater Facility (RWF) through dual force mains. The Venus Way Lift Station (Venus Way LS) pumps sewage from a small portion of the City that is at a lower elevation up to a higher elevation where it then flows by gravity to the Main LS. **Figure ES-2** provides an overview of the wastewater collection system.

The City's wastewater collection system includes pipelines and structures of varying age, size, and material. According to the City's ArcGIS geodatabase (GIS), most the City's wastewater collection system pipelines are vitrified clay pipe (VCP) and 4- to 12-inches in diameter, and approximately 70% of all pipelines were built before 1990. The collection system also includes almost 3,000 manholes, of which approximately 60% were built before 1990. Of these manholes, 177 were identified as flow splits – manholes that allow outflow via two or more pipes.

Condition Assessment

As part of the City's Master Plan project, a *Sewer Utility Asset Renewal and Replacement Study* (R&R Study) was conducted. The study documents the City's Business Risk Exposure (BRE) based on the physical condition and desktop assessment of the City's collection system applying a set of factors developed to determine the relative risk of failure for each pipeline segment.

The first element of the study involved performing a field investigation using closed-circuit television (CCTV) to assess the condition of key pipeline segments in the collection system. National Plant Services Inc. (NPS) successfully inspected 105,211 ft (approximately 20 miles) of pipeline. For each pipeline segment inspected, structural and operations and maintenance (O&M) related defects were identified and graded on a scale of one (least severe) to five (most severe) based on the type and severity of the defect in accordance with the National Association of Sewer Service Companies (NASSCO) Pipeline Assessment Certification Program (PACP).



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FIGURE ES-1
CITY OF MILPITAS
SEWER MASTER PLAN
PROJECT LOCATION MAP

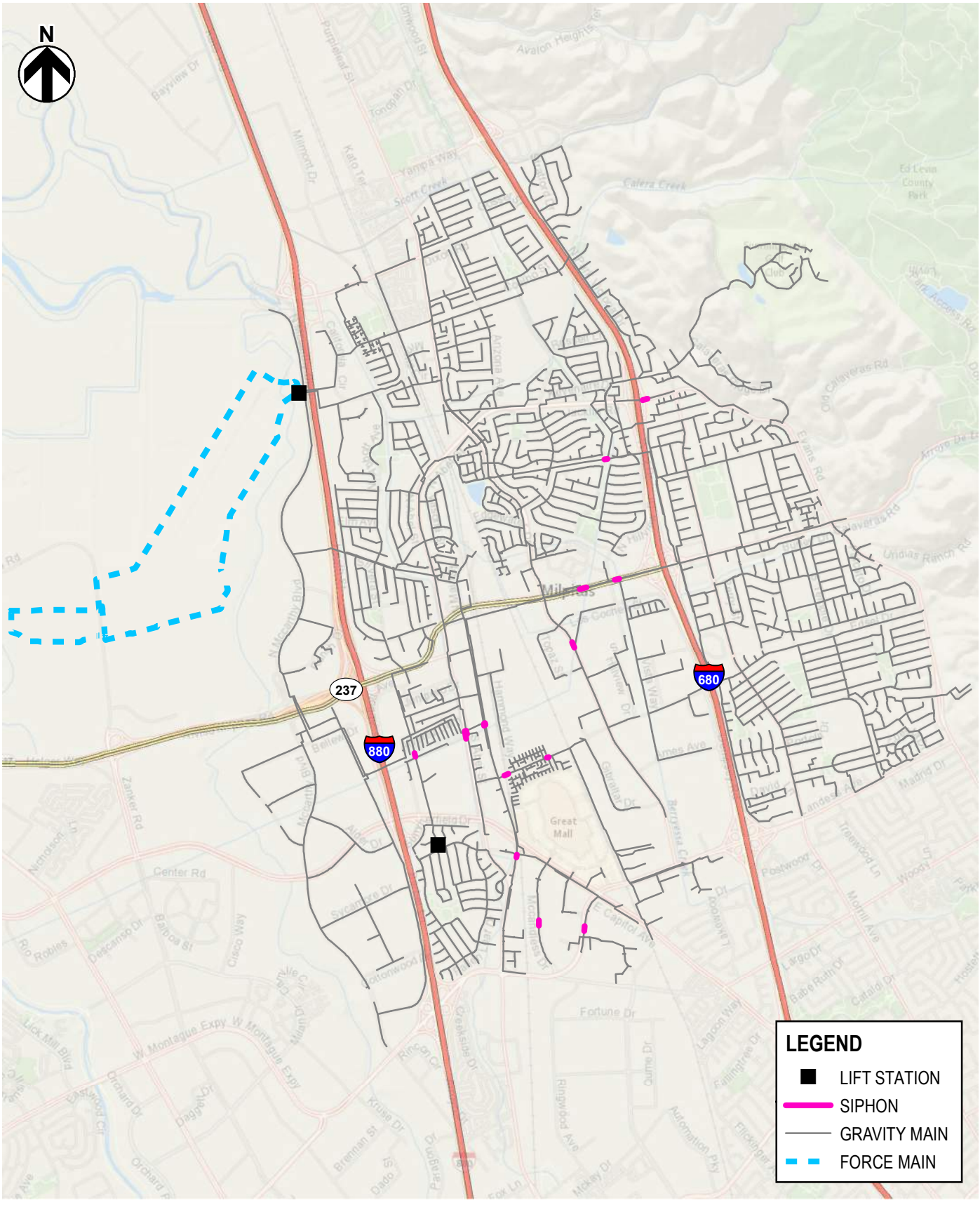


FIGURE ES-2
CITY OF MILPITAS
SEWER MASTER PLAN
WASTEWATER COLLECTION SYSTEM OVERVIEW

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The second element of the study involved a desktop assessment of the entire collection system based on relative risk of failure of each pipeline segment. A pipeline's risk of failure is determined by a combination of the *likelihood* and the *consequence* of the failure of the segment.

Likelihood of failure (LoF) and consequence of failure (CoF) scores were assigned to each pipeline segment by considering various factor ratings with assigned factor weightings. Factor ratings were given on a scale of one (least likely to fail/least consequential) to five (most likely to fail/most consequential). The weighting of each factor was assigned based on the relative criticality of that factor, with higher weighting factors assigned to the most critical factors. The following factors, typical for sewer renewal/replacement, were selected for this Study:

LoF Factors:

- Pipe age
- Pipe material
- Structural condition
- Presence of pipe obstructions
- Required pipe cleaning
- Proximity to landslide zones
- Proximity to earthquake faults

Local geology (liquefaction)

CoF Factors:

- Sewer size (pipe diameter)
- Proximity to critical facilities
- Road type (impact to transit/traffic)
- Railroad proximity
- Easement (access restriction)
- Pipeline depth
- Proximity to waterway or waterbody

The following equations were used to calculate a risk score for each pipeline segment:

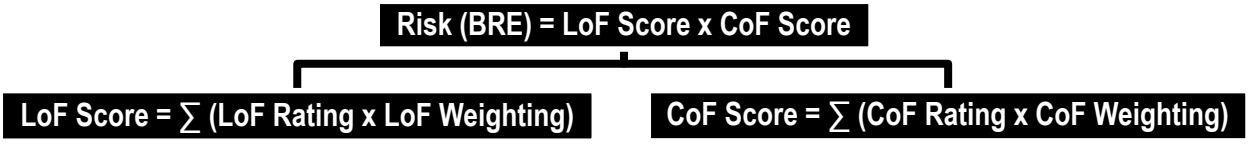


Figure ES-3 presents the resulting BRE scores for all pipelines in the entire city.

Hydraulic Model Land Use and Network Development

To develop base sanitary flows (BSF) – the flow directly contributed by the customer – wastewater flows were assigned to every contributing parcel in the City. For planning level analysis, parcels of similar land use types are estimated to have similar wastewater flow rates either on a per parcel basis (gpd/parcel) or per acre basis (gpd/acre) and similar diurnal patterns. City General Plan (GP) land use designations were reviewed for each parcel in the City. For modeling purposes, some modifications to the land uses were warranted to ensure relevance to the sewer analysis. Land use types expected to generate similar wastewater flows were consolidated into model-based land use designations to facilitate unit flow (UF) analysis (listed in **Table 5-1**). Land uses that have little to no contribution to the sewer system were excluded from further analysis. **Figure ES-4** presents the City according to the model-based land designations.

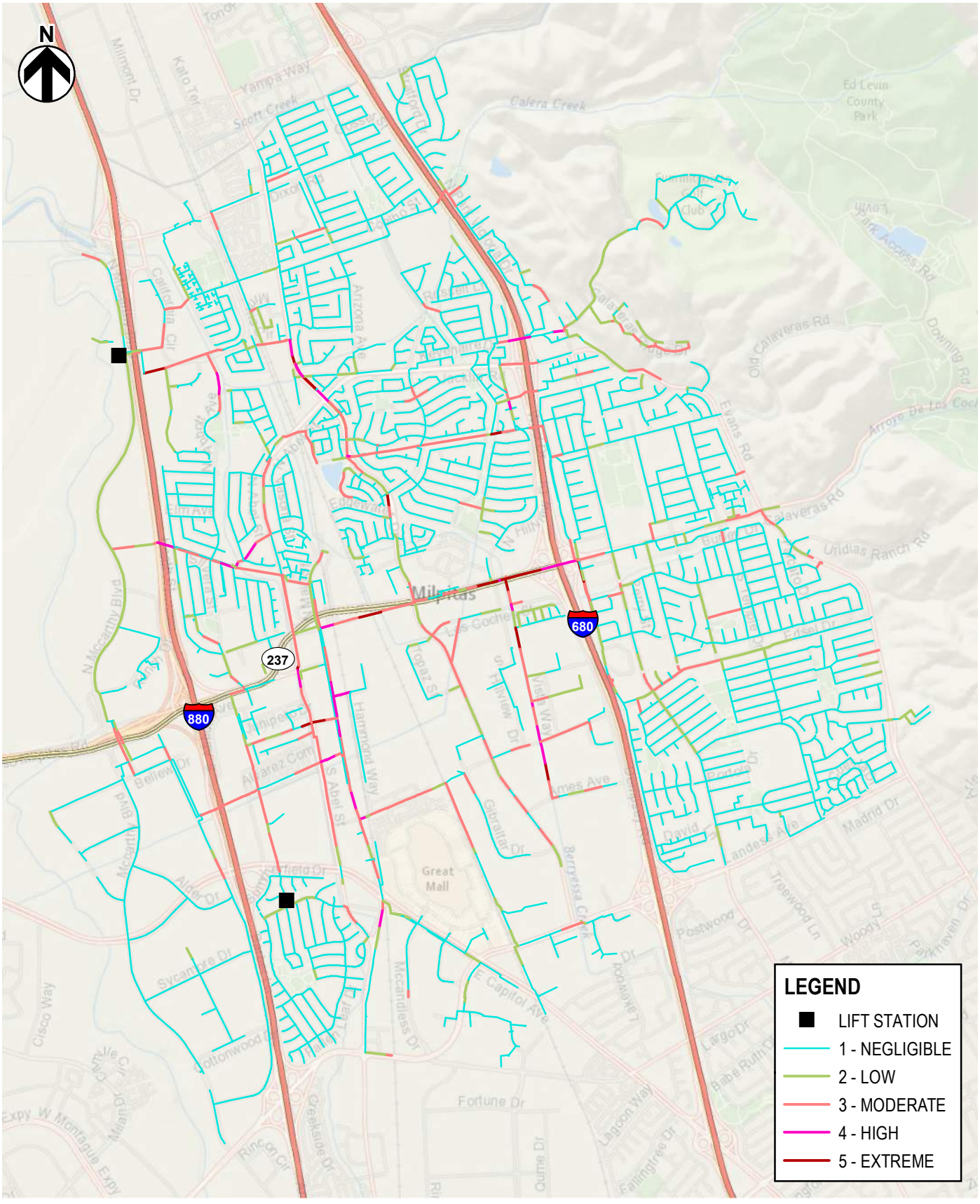


FIGURE ES-3
CITY OF MILPITAS
SEWER MASTER PLAN
BUSINESS RISK EXPOSURE SCORE MAP

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The City has identified "Opportunity Areas" which refers to parcels identified within the City that may be considered for future redevelopment. The future land uses identified in the "Opportunity Areas" were reviewed and assigned the model-based land use designations listed in **Table ES-1** according to the anticipated use, density, and wastewater flow rates.

Table ES-1: Model-Based Land Use Designations for Existing Conditions

GP Land Use	Code	Model-Based Land Use	Code
Hillside Very Low Density	HVL	Hillside Single-Family Low Density	HSFL
Hillside Low Density	HLD		
Hillside Medium Density	HMD	Hillside Single Family Medium Density	HSFM
Valley Floor Single-Family Low Density	SFL	Valley Floor Single-Family Low Density	SFL
Valley Floor Single-Family Medium Density	SMD	Valley Floor Single-Family Medium Density	SFM
Multi-Family Medium Density	MFM		
Multi-Family High Density	MFH	Valley Floor Multi-Family High Density	MFH
Multi-Family Very High Density	VHD	Valley Floor Multi-Family Very High Density	MFVH
Mobile Home Park	MHP	Mobile Home Park	MHP
Mixed Use	MXD	Mixed Use	MXD
Boulevard Very High-Density Mixed Use	BVMU	High Density Mixed Use	HDMU
Residential-Retail Mixed Use	RRMU		
Professional & Administrative Offices	PAO	Professional & Administrative Offices	PAO
General Commercial	GNC	Commercial	COM
Retail Sub-Center	RSC		
Industrial Park	INP	Industrial Park	INP
Manufacturing	MFG	Manufacturing	MFG
Public Facilities	PF	Public Facilities[1]	PF
		Elmwood Correctional Facility[2]	COR
TWC, MXD, GNC, INP, HWS, RSC		Hotels[3]	HOTEL
Park Open Space	POS	NF	
Waterways	WATERWAYS	NF	
Highway Services	HWS	Parcels reviewed and model-based land use designation assigned, as appropriate.	
Town Center	TWC		
Urban Residential	URR		
Parcels with no land use designation	-		

Notes:
1. Includes schools, churches, health facilities, libraries, and fire stations.
2. The correctional facility is categorized as PF in the GP. For modeling purposes, it was given a distinct code.
3. Hotels are categorized under various land uses in the GP. They were identified and assigned a distinct code.

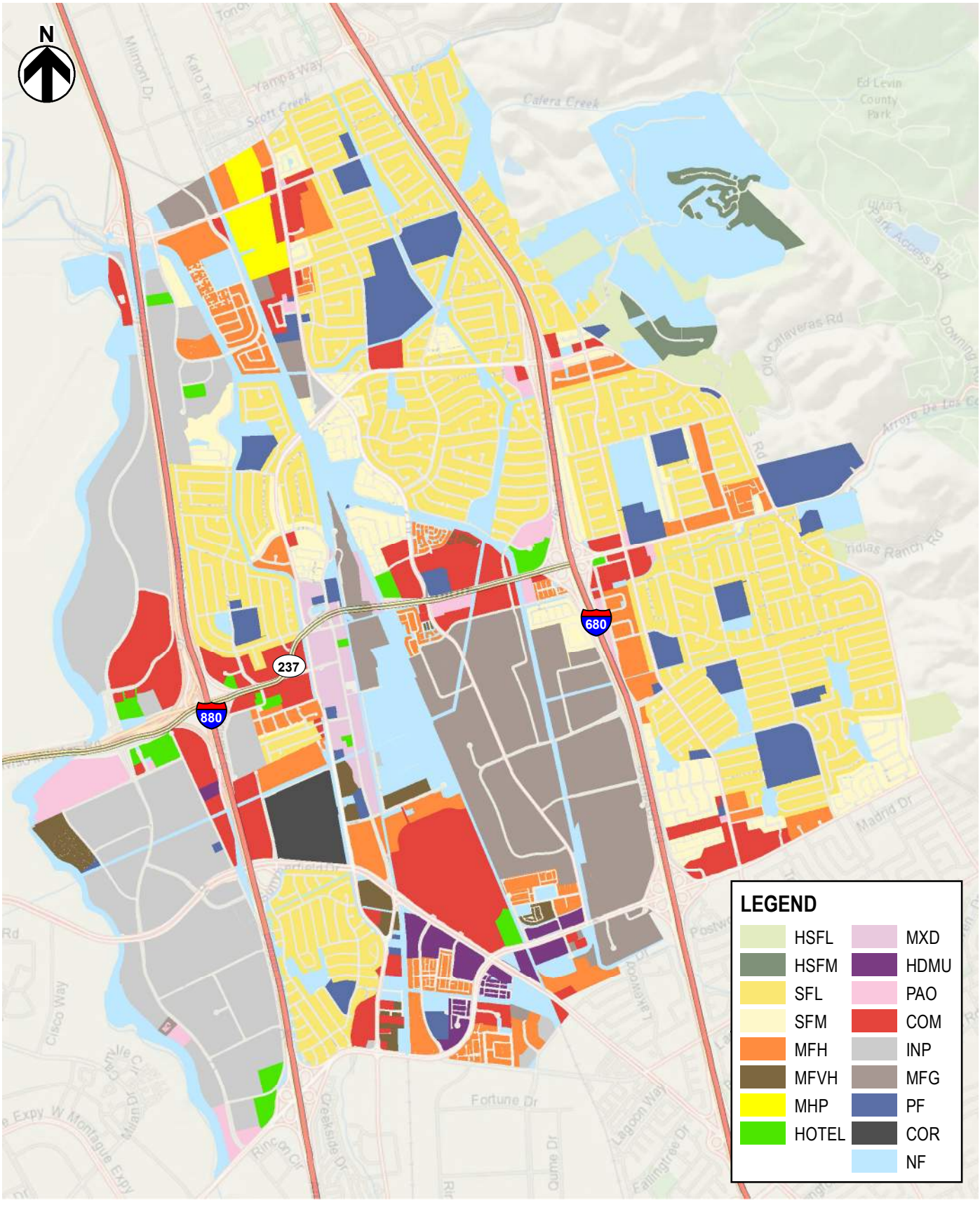


FIGURE ES-4
CITY OF MILPITAS
SEWER MASTER PLAN
MODEL-BASED LAND USE DESIGNATIONS - EXISTING

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Wastewater Flow Analysis

The City contracted with ADS Environmental Services (ADS) to perform dry and wet weather flow monitoring within the City collection system. ADS installed 23 FlowShark Triton flow meters throughout the City and monitored flow between November 16, 2019 and March 9, 2020. The collection system was divided into 21 sub-basins based on the location of the flow meters, and the data from the flow monitoring program was used to calibrate the hydraulic model. Dry weather flow data from the flow monitoring program was used to develop dry weather groundwater infiltration (GWI) for each sub-basin and BSF. For modeling purposes, this document defines GWI as any, and all sources of constant flow. GWI is comprised both of groundwater infiltration and any other constant flow that is generally detected during low flow periods. BSF is represented by a combination of UF factors and diurnal patterns for a given land use. The dry weather calibration involved comparing modeled flows to observed flows and iteratively adjusting GWI values, UF factors, and diurnal patterns until modeled flows were reflective of observed flows. **Table ES-2** summarizes the UF factors developed for each land use type and the total modeled dry weather flows for both existing and future conditions.

Table ES-2: UF Factor Summary by Land Use

Land Use Designation	UF Factor (gpd)	Existing Quantity	Future Quantity	Quantity Units	Existing Model BSF (MGD)	Future Model BSF (MGD)
HSFL	400	56	56	Parcel	0.022	0.022
HSFM	465	107	107	Parcel	0.050	0.050
SFL	200	9619	9677	Parcel	1.924	1.935
SFM	1200	266	264	Acre	0.319	0.316
MFH	1500	292	449	Acre	0.438	0.674
MFVH	2000	56	187	Acre	0.113	0.373
MHP[1]	-	-	-	Acre	-	-
HOTEL	4000	60	24	Acre	0.244	0.095
MXD	1000	67	71	Acre	0.067	0.071
HDMU	2200	64	175	Acre	0.141	0.385
PAO	500	65	520	Acre	0.031	0.260
COM	900	467	367	Acre	0.420	0.330
INP	450	727	236	Acre	0.327	0.106
MFG	1500	550	499	Acre	0.825	0.748
PF	190	310	305	Acre	0.059	0.058
COR[1]	-	-	-	-	-	-
Large Dischargers[2]		38	32	Discharger	1.176	1.006
Total	**-**	**-**	**-**	**-**	**6.157[3]**	**6.249[3]**

Notes:
1. Mobile home parks (3) and the correctional facility were considered large dischargers and assigned flows based on water use data.
2. Large dischargers are defined as those customers that discharge a disproportionately large volume of wastewater for the parcel size and use type. They were assigned a diurnal pattern based on the original parcel land use codes.
3. Represents the total BSF. The total BSF plus the total GWI is the total DWF.

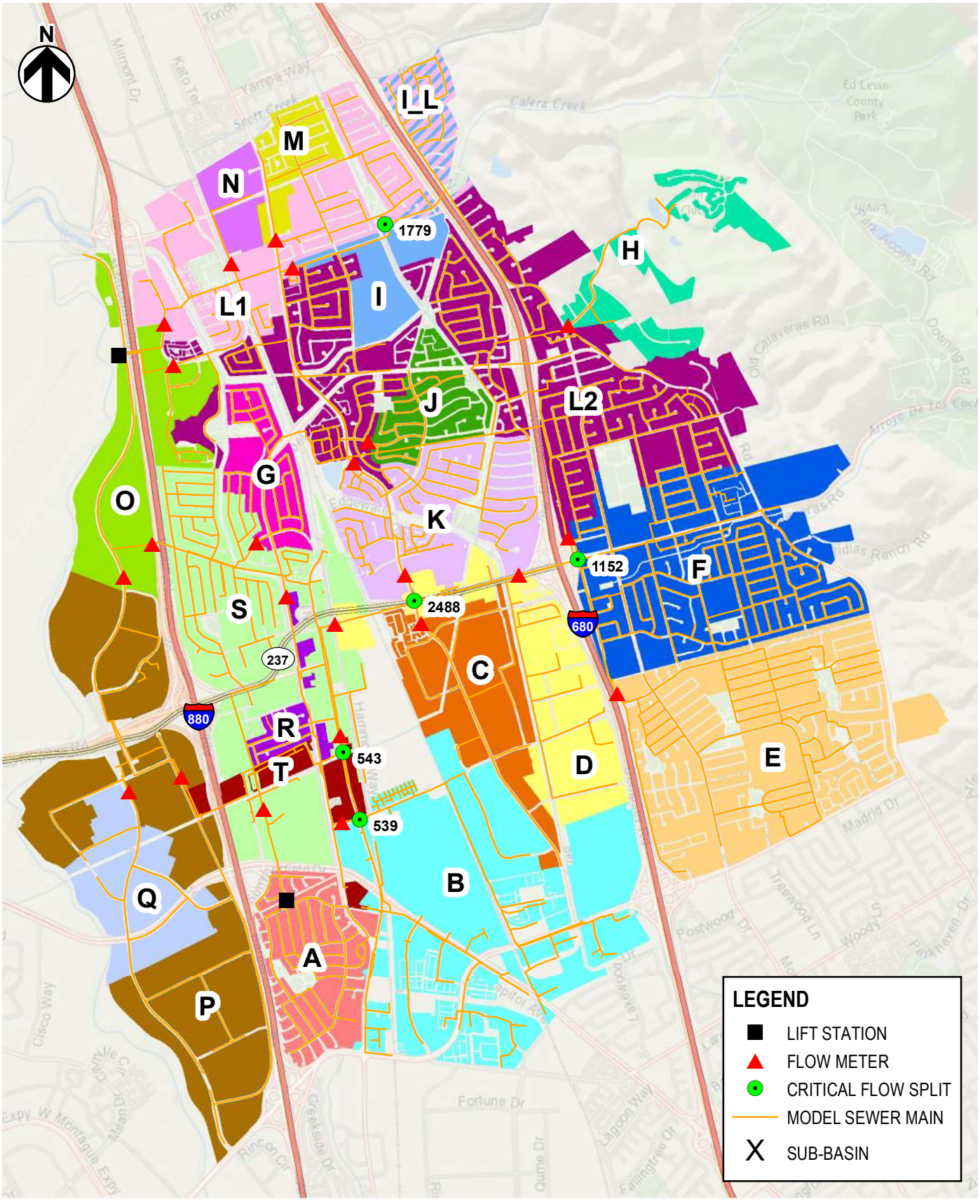


FIGURE ES-5
CITY OF MILPITAS
SEWER MASTER PLAN
SUB-BASIN DELINEATION

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The largest storm identified during the flow monitoring period occurred on December 7, 2019 (Storm event 1); this was used to estimate the extent of rainfall-dependent inflow and infiltration (RDI/I) in each sub-basin. RDI/I is characterized by an R-factor, which represents the percentage of rainfall volume that enters the sewer system. GWI also tends to fluctuate throughout the wet season as the groundwater table rises and falls. Modeled flows were compared to observed flows for Storm event 1, and wet weather GWI values and R-factors were iteratively adjusted until modeled flows were reflective of observed flows. **Table ES-3** summarizes the calibrated R-Factors for each of the 21 sub-basins.

Table ES-3: R-Factor Summary by Sub-Basin

Sub-Basin	Total R-Factor
A	1.48%
B	1.59%
C	0.30%
D	1.90%
E	0.60%
F	0.86%
G	3.40%
H	0.24%
I	0.42%
J	2.17%
K	0.81%
L1	0.40%
L2	0.31%
M	1.39%
N	2.06%
O[1]	1.50%
P	1.26%
Q	0.60%
R	3.71%
S	1.64%
T	0.64%

Notes:
1. There is no flow meter at the outfall for sub-basin O. Values were estimated based on surrounding sub-basins.

Capacity Analysis

To estimate wet weather wastewater flows, a design storm is applied to the model and wet weather flows are represented based on the calibrated R-factors for each sub-basin. Under this condition, the existing and future performance of the wastewater collection system can be evaluated. For this Study, the collection system performance was evaluated using the typical 10-year 24-hour storm with a peak hour coinciding with the peak of the typical diurnal curve.

The initial deficiency criteria used to evaluate the capacity of the modeled pipes under design flow conditions was the ratio of wastewater flow depth (d) to pipe diameter (D), or d/D. In InfoWorks, if d/D is greater than one, this means the pipe is flowing full under pressure and the hydraulic grade line (HGL) is higher than the crown of the pipe. InfoWorks reports a "surcharge state" for each pipe, which is defined in **Table ES-4**.

Table ES-4: InfoWorks Surcharge States

Surcharge State	Definition	Deficiency if:
< 1 [1]	When depth of flow is less than the diameter of the pipe	Not considered hydraulically deficient
= 1	Pipe is surcharged due to backwater from a downstream deficiency.	Not considered hydraulically deficient
= 2	Pipe is hydraulically under capacity and needs to be upsized.	Freeboard < 5 feet

Notes:
1. Surcharge State = d/D

In the hydraulic model, the HGL reaching the ground surface indicates a potential SSO. Even for a pipe flowing under capacity or surcharged, if the freeboard – the distance between the ground surface and the HGL – is five feet or greater, the risk of SSO is minimal. Where pipes were shown as surcharged due to inadequate hydraulic capacity (surcharge state of "2"), a pipe was identified as deficient if the freeboard in these locations is also less than five feet.

There is a 6% increase from existing to future conditions, from 7.5 MGD to 7.9 MGD, in average dry weather flow at the outfall. **Table ES-5** presents the total system flows for all modeled conditions.

Table ES-5: Model Flow Summary

Scenario	Average Dry Weather Flow (MGD)	Peak Dry Weather Flow (MGD)	Peak Wet Weather Flow (MGD)
Existing	7.5	10.4	14.9
Future	7.9	11.0	18.5

There were no major capacity deficiencies identified as part of this analysis. There were six pipeline segments with a recorded surcharge state of "2" indicating that they are under capacity. Of these six segments, five of them have freeboard values greater than five feet, so they do not fulfill the criteria for a deficiency, and thus are not considered hydraulically deficient. There were no additional capacity deficiencies identified under future conditions that were not seen under existing conditions.

There is a single pipeline segment that has a freeboard of 4.7 ft., slightly less than the freeboard criteria; however, for a single pipe reach that is considered marginally deficient, replacement is not recommended without further cause. It is recommended that the City monitor this location for potential surcharging. This location (MH GID 1392) is a good candidate for installing a SmartCover to monitor the wastewater level to prevent SSOs.

Capital Improvement Plan

The City's capital improvement program (CIP) is intended to serve as a comprehensive planning tool for budgeting and carrying out capital projects. Capital projects are designed to adhere to the City Council goals and priorities; among them is to maintain a superior level of service to the community. To that end, a compilation of improvement projects was identified as part of the detailed risk and condition assessment. The PACP peak scores from the CCTV inspection and the risk scores calculated from the LoF/CoF desktop condition assessment drive the pipeline rehabilitation selection process. Using the defect coding assigned by NPS and the desktop assessment software, the pipe segments with defects were assigned a defect-level rehabilitation method.

With the rehabilitation method established for each defect code, a decision tree was established to determine the final overall rehabilitation method for the pipeline. This decision tree was prepared based on the following factors:

- CCTV structural peak score and overall peak score;
- Number of point repairs and lining recommendations by the defect-level rehabilitation methods module;
- Number of defects;
- Length of major (score of 4 or 5) and/or minor (score of 3) defects; and
- Presence of specific defects such as infiltration drippers (ID) or Reinforcement Corroded Chemical (SRCC).

Of the approximately 105,000 ft (449 segments) of sewer pipeline inspected, approximately 50,000 ft (178 segments) requires improvement. Recommended improvements include:

- Pipe Replacement
- Full Cured-In-Place Pipe (CIPP)
- Point Repair(s) by Excavation
- Sectional Liner(s)

It is noted that some pipeline segments include more than one recommended rehabilitation method.

For segments without CCTV inspection data, risk scores and diameter were used to develop a prioritized set of segments that are recommended for CCTV inspection and further analysis.

Projects are prioritized based on risk of failure along with consideration for type of proposed rehabilitation and project location. The general strategy is to address the highest risk/highest priority projects in the near-term (Years 1-5) with lower risk projects deferred to the medium- (Years 6-10) and long-term (Years 11-20).

Costs were developed to represent capital construction costs along with soft costs. Soft costs consisting of engineering design and consulting; permitting and obtaining right-of-way; and ESDC, construction management and inspection services are included in the capital project costs.

Provided below in **Table ES-6** is a proposed budget and schedule for the CIP and recommended projects over 20-years in 5-year increments. The most critical projects are scheduled for earlier implementation. It is noted that the timing of projects can be adjusted based on results of CCTV and future operating conditions. **Figure ES-6** presents the proposed improvement projects in 5-year increments.

Table ES-6: Proposed CIP Schedule and Budget

Projects	5-Year (2022-2026)	10-Year (2027-2031)	15-Year (2032-2036)	20-Year (2037-2041)
Existing Projects				
6124 Pump Station Rehabilitation Program	$200,000[1]	--	--	--
6126 Minor Sewer Projects	$200,000[2]	--	--	--
6130 Main Lift Station Odor Emissions Control	$200,000	--	--	--
6131 Sanitary Sewer Cathodic Protection Improvements	$500,000	--	--	--
6134 On-Call Sewer Maintenance & Repair Services	$98,000	--	--	--
Total Existing Projects	**$1,198,000**	**--**	**--**	**--**
Proposed Projects				
CCTV large diameter and high-risk assets	$400,000	--	--	--
Highest Priority Improvements	$1,562,000	--	--	--
Medium- to High- Priority Improvements	$5,266,000	$6,424,000	--	--
Low Priority Improvements	--	--	$6,888,000	$1,240000
Allocation for improvements identified from ongoing CCTV	$1,250,000	$1,250,000	$1,250,000	$1,250,000
Total Proposed Projects	**$8,478,000**	**$7,674,000**	**$8,138,000**	**$2,490,000**
Existing and Proposed Projects	**$9,676,000**	**$7,674,000**	**$8,138,000**	**$2,490,000**

Notes:
1. Original allocation is $200,000 through 2023 with $148,000 in prior year funding from Sewer Infrastructure Fund to be allocated for other projects in FY2020-21.
2. Original allocation is $200,000 with $37,000 in prior year funding from Sewer Infrastructure Fund to be allocated for other projects in FY2020-21.

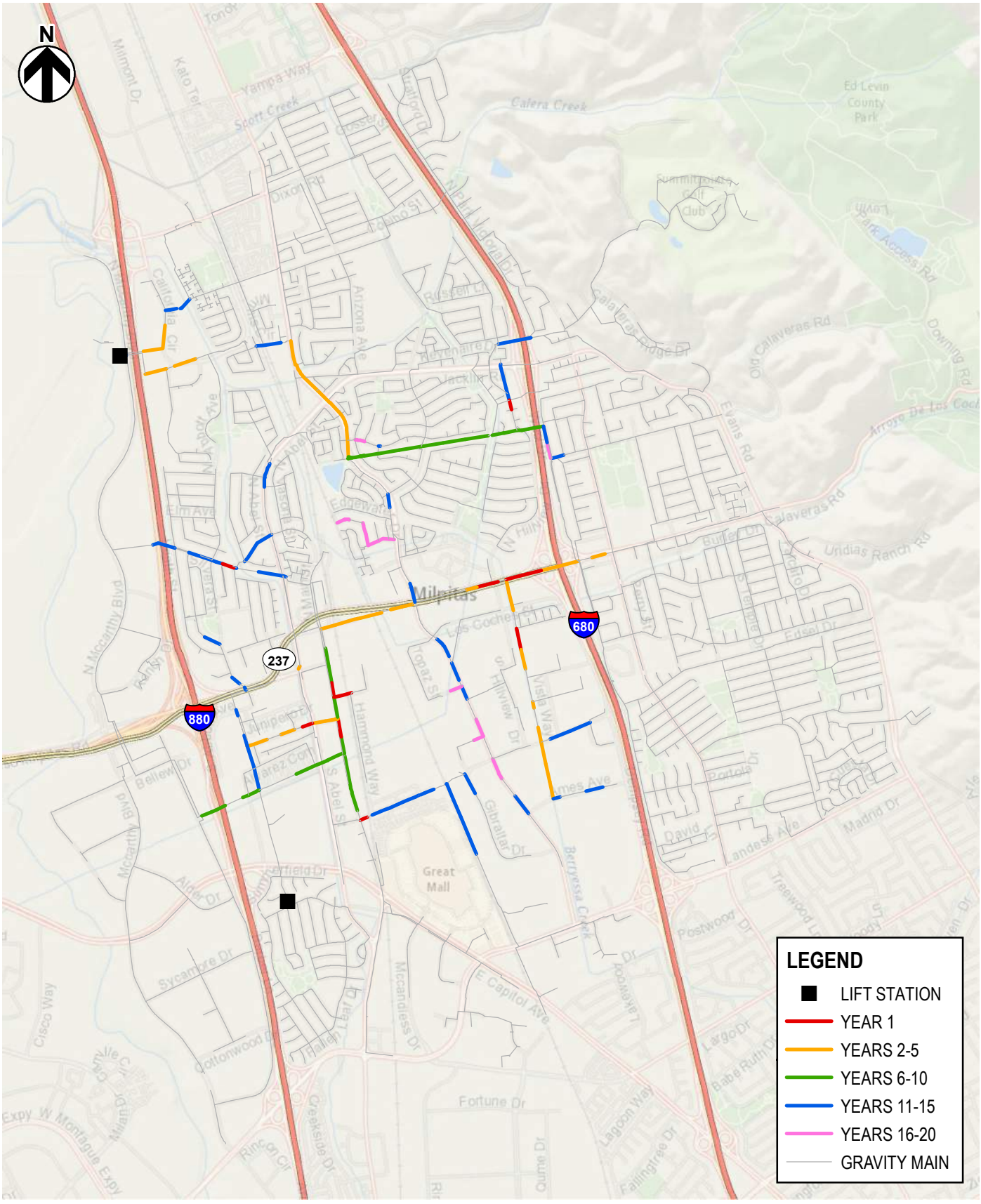


FIGURE ES-6
CITY OF MILPITAS
SEWER MASTER PLAN
CAPITAL IMPROVEMENT PROJECTS

HydroScience

SECTION 1 – INTRODUCTION AND PURPOSE

HydroScience Engineers (HydroScience) was retained by the City of Milpitas (City), to prepare the City Sewer Master Plan (SMP), which includes development of a Capital Improvement Plan (CIP) based on the current (2020) and future (2040) planning horizons. This section outlines the background and SMP objectives.

1.1 Background

The City's wastewater system infrastructure was constructed in the 1950s when the City was established, and it was expanded with the growth of the City. Today, the City is essentially built out. The most recent SMP was completed in 2002 with a revision completed in 2004 and an update completed in 2009.

1.1.1 Previous Studies/Existing Documents

The following is a brief description of previous studies and documents reviewed and used in the preparation of this SMP.

- **City of Milpitas Capital Improvement Program 2020-2025 Final Report, July 2020:** Every year the City prepares a five-year Capital Improvement Program (CIP) that provides the City Council, staff, and the public with a comprehensive planning tool for budgeting and carrying out a range of capital projects. Also known as a Capital Budget, this document enables the City to identify estimated costs, priorities and schedules, funding sources and financing methods necessary for delivering critical services to meet community demands. The CIP is a necessary first step for planning the implementation and construction of new capital assets including public facilities such as water, sewer, and storm, and for repairs and replacements of aging infrastructure. The CIP reflects Council's priorities and policies to ensure that the needs of the community are met. The CIP documents the existing planned sewer related projects and the allocated funding for each project.
- **City of Milpitas Sewer Master Plan Revision, RMC, August 2004:** This study assessed the capacity of the wastewater collection system as well as investigated the conditions of the system. The SMP Revision updated the 2002 SMP, also completed by RMC. It provided information required for the City planning and financial efforts and defined the sanitary sewer system improvements necessary to accommodate the City's future land use development plans to the year 2018. During this study, the hydraulic model built using Hydra for the 2002 SMP was updated based on a wet weather flow monitoring program.
- **City of Milpitas Sewer Master Plan Update, RMC, December 2009:** This study was an update to the 2004 SMP Revision to reevaluate the City's sewer system capacity needs as a result of several development projects that were not considered for the 2004 SMP Revision. The Hydra hydraulic model was updated using updated large discharger information as well as updated future land use conditions. A CIP was developed to address any projected capacity deficiencies based on this updated modeling analysis.
- **Sewer System Management Plan 2016 Update, City of Milpitas, December 2016:** In accordance with the requirements of the Regional Water Quality Control Board (RWQCB), public wastewater collection system agencies are required to develop a sanitary sewer management plan (SSMP) that designates sewer system management practice to minimize

sanitary sewer overflows (SSOs) and provide reliable sewer service to the public. The 2016 SSMP describes the City's specific maintenance protocols to meet and exceed all requirements and documentation of the requirements set forth by the RWQCB General Waste Discharge Requirements (WDR).

- **Milpitas General Plan Update – Land Use Alternatives Report, De Novo Planning Group, September 2018:** State law requires that every city and county in California prepare and maintain a general planning document. As part of the General Plan (GP) update process, the City must update its GP Land Use Map. This Land Use Alternatives Report was developed as a tool to identify and evaluate a range of geographic locations ("Opportunity Areas") within the City where some changes to existing land uses may be appropriate.

The following studies were completed in conjunction with the Master Plan Study and are incorporated as appendices to the Master Plan. Where appropriate, details and summaries of findings have been included in the body of the Master Plan Study. For additional detail, the reader is directed to the appendices.

- **Sewer Utility Asset Renewal and Replacement Study, Brown and Caldwell, August 2020 (R&R Study):** This study was conducted as part of this Master Plan Study to assess the current condition of the City's wastewater collection system. This includes CCTV inspection results, an assessment of the relative risk of failure of all pipe segments in the City, as well as lift station inspection results. The purpose of this study is to provide the City with a set of priorities for asset renewal and replacement. This study is included as **Appendix A**.
- **Main and Venus Way Lift Station Inspections Report, Brown and Caldwell, May 2020 (LS Report):** This study was conducted as part of the Master Plan Study to assess the current operations and condition of the Main Lift Station (Main LS) and Venus Way Lift Station (Venus Way LS). This study presents the results of the on-site inspection performed for these two facilities. It is included as part of **Appendix A** (R&R Study App. K [App. K]).
- **Milpitas Sewer Flow Monitoring Report 2019-2020, ADS Environmental Services, April 2020:** This program was completed for the months of November 2019 – March 2020 for the purposes of measuring wastewater flows in the City's collection system. Both wet weather and dry weather flows were captured, and the resulting data was used for the calibration of the hydraulic model for this Study. This report is included as **Appendix B**.

1.2 Objectives

The objectives of this Master Plan project are:

- To perform a condition assessment on the current state of the collection system;
- To evaluate the hydraulic performance of the system under current conditions and under projected future conditions;
- To identify any hydraulic capacity deficiencies or pipes in poor condition, and
- To develop a CIP to address physical and hydraulic deficiencies.

These objectives were developed in collaboration with City Staff through technical review of available asset data and development of a hydraulic model. Through these analyses, projects were identified to help maintain the City's collection system level of service standards..

1.3 Report Organization

This Master Plan consists of ten sections followed by appendices that provide supporting documentation for the analyses present in the body of the SMP. The sections are as follows:

- **SECTION 1 – Introduction and Purpose**: This section presents the background leading to the development of this SMP, a description of previous work, and objectives and organization of the SMP.
- **SECTION 2 – Service Area and Wastewater Services**: This section describes the City as well as the related wastewater services.
- **SECTION 3 – Existing Wastewater Collection System**: This section describes the existing wastewater collection system and the overall system operation within the service area.
- **SECTION 4 – Condition Assessment**: This section presents the results of the condition assessment performed as part of the SMP, including the results of the closed-circuit television (CCTV) inspections.
- **SECTION 5 – Analysis of Land Uses for Hydraulic Modeling**: This section outlines the land use categories identified by the GP and details the methodology for using these land use categories for the development and calibration of the hydraulic model.
- **SECTION 6 – Hydraulic Model Development**: This section presents the process and assumptions associated with building the hydraulic model infrastructure and filling in any existing data gaps.
- **SECTION 7 – Wastewater Flow Analysis**: This section presents the results of the flow monitoring program and analysis of that data. This section also presents the development of the wastewater flows used to develop and calibrate the hydraulic model and the results of the model calibration.
- **SECTION 8 – Capacity Analysis**: This section presents identified hydraulic capacity-related deficiencies under existing and future modeled conditions.
- **SECTION 9 – Project Development**: This section presents the recommended improvements resulting from the condition assessment and the basis for cost development.
- **SECTION 10 – Capital Improvement Plan**: This section presents the recommended capital improvement projects, costs, and timeline for implementation.

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SECTION 2 – SERVICE AREA AND WASTEWATER SERVICES

The City provides wastewater collection services to all customers within the City boundary. This section describes the service area and related wastewater services.

2.1 Service Area

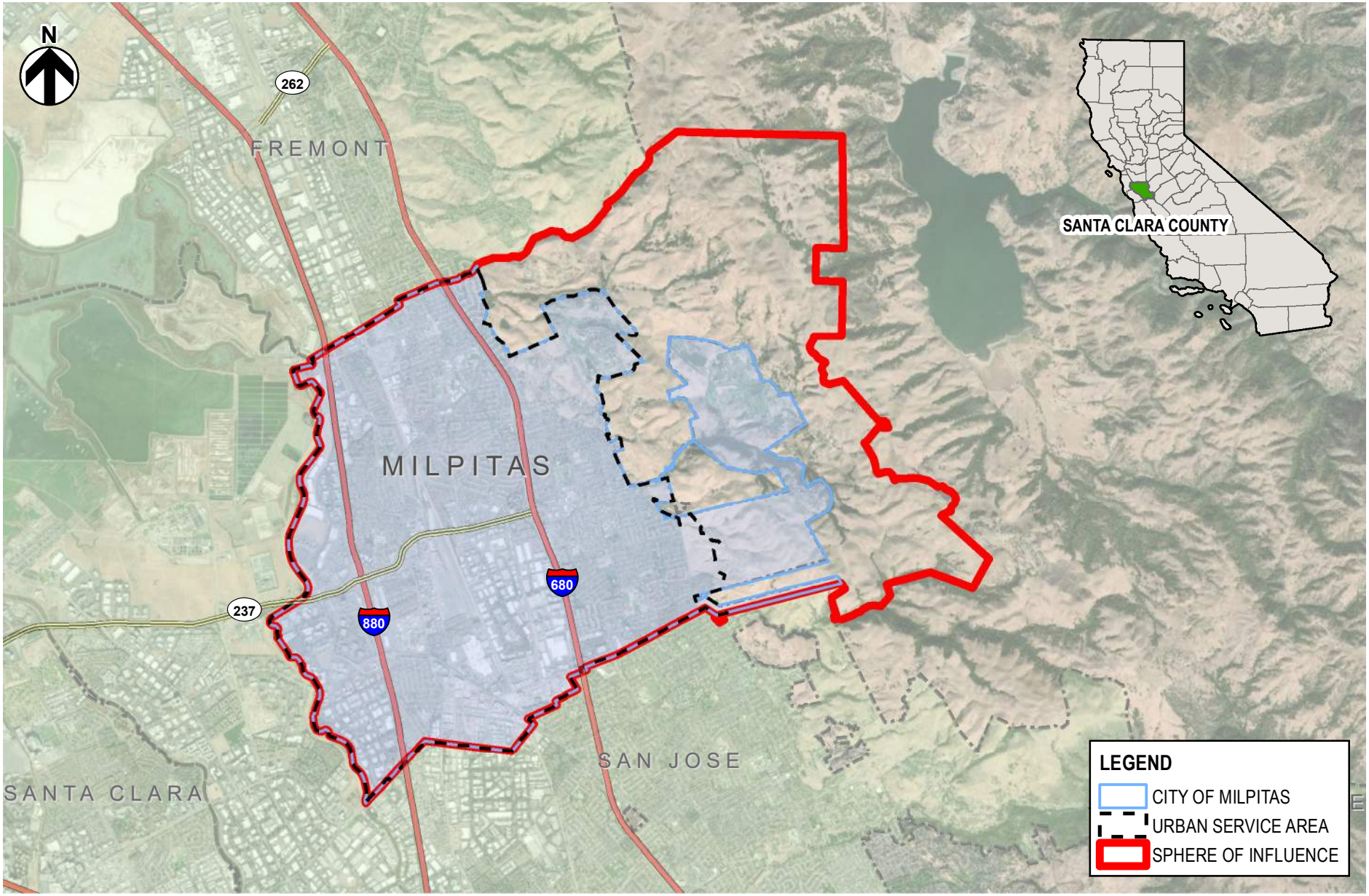
The City is located along the northern boundary of Santa Clara County at the southern tip of the San Francisco Bay, approximately 45 miles southeast of San Francisco. It is bounded by the Cities of Fremont to the north, San Jose to the south and west, and unincorporated Santa Clara County to the east (see **Figure 2-1**).

Incorporated in 1954, the City encompassed 2.9 square miles and housed a population of 825. The Ford Motor Company assembly plant was built in 1955 and this brought the start of the City's rapid growth period; this growth was maintained by the high technology industry in the 1970s. By 1992, the City encompassed 13.6 square miles, which is approximately its current area. Today, the City is almost completely built out, so any future increases in wastewater flows would come from increases in density or changes in land use through redevelopment.

Today, the City encompasses 14 square miles and provides wastewater collection services to a population of 77,961 according to the Department of Finance. There are two distinct areas of the City referred to as the "valley floor," which is relatively flat, and the "hillside" on the eastern edge of the City limits. Elevations gently slope from west to east along the valley floor from approximately 10 ft to 120 ft and up to approximately 700 ft in the hillside area. The valley floor includes a mixture of industrial, manufacturing, commercial, and residential land uses, while the hillside is reserved solely for residential use. Parks and open spaces are scattered throughout the residential areas.

The following boundaries are identified on **Figure 2-1**:

- **City Limits:** The City Limits includes the area within the City's corporate boundary, over which the City exercises land use authority and provides public services.
- **Urban Service Area (USA):** In 1998, voters in the City established an Urban Growth Boundary (UGB) limiting development in its eastern hill areas. The initiative was set to expire in 2018 but was extended through the recent passage of Measure I by Milpitas voters in November 2016. Contiguous with the UGB the USA restricts the extension of public service and infrastructure to new development in eastern areas of the City Limits.
- **Sphere of Influence (SOI):** An SOI is the probable physical boundary and service area of a local agency, as adopted by a Local Agency Formation Commission (LAFCO). An SOI includes both incorporated and unincorporated areas within which a city or special district will have primary responsibility for the provision of public facilities and services. The SOI also coincides with the Planning Area – the area included in the analysis and planning for the 20-year horizon of the City's proposed GP.



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FIGURE 2-1
CITY OF MILPITAS
SEWER MASTER PLAN
PROJECT LOCATION MAP

2.1.1 Land Use

The City's current land uses, according to the GP, are listed in **Table 2-1** and displayed in **Figure 2-2**. These land uses served as the basis for the model-based land use designations and analysis, which are described in **SECTION 5**.

Table 2-1: General Plan Land Use Categories

GP Land Use Categories	Land Use Code
Hillside Very Low Density	HVL
Hillside Low Density	HLD
Hillside Medium Density	HMD
Single-Family Low Density	SFL
Single-Family Medium Density	SMD
Multi-Family Medium Density	MFM
Multi-Family High Density	MFH
Multi-Family Very High Density	VHD
Mobile Home Park	MHP
Urban Residential	URR
Mixed Use	MXD
Boulevard Very High-Density Mixed Use	BVMU
Residential-Retail Mixed Use	RRMU
General Commercial	GNC
Retail Sub-Center	RSC
Highway Services	HWS
Town Center	TWC
Industrial Park	INP
Manufacturing	MFG
Professional & Administrative Offices	PAO
Public Facilities	PF
Park Open Space	POS
Waterways	WATERWAYS

Source: Milpitas General Plan Update – Land Use Alternatives Report, September 2018

There are several "Opportunity Areas" identified throughout the City as areas of potential growth and/or redevelopment; these "Opportunity Areas" are identified on **Figure 2-2**. The Midtown Specific Plan and Metro Specific Plan are detailed below:

- **Midtown Specific Plan**: This plan, updated in 2010, provides a new vision for approximately 589 acres of land which is currently undergoing changes related to its growing role as a housing and employment center in Silicon Valley. This plan presents an opportunity to reinvigorate the "historic" commercial and industrial core of Milpitas and bring it into the life of the City. The overall strategy of the Midtown Specific Plan is to create a mixed-use community

that includes high-density, transit-oriented housing and a central community "gathering place," while maintaining needed industrial, service, and commercial uses. This plan provides for up to 2,328 new dwelling units and supporting retail development, new office developments at key locations; bicycle and pedestrian trails linking the areas together and new parks to serve residential development.

- **Metro Specific Plan**: Of the 443 acres of the Metro Specific Plan, approximately 403 acres were previously included as part of the Midtown Specific Plan but have since been broken off into a new standalone specific plan. The goal of the Metro Specific Plan is to bring about an attractive and livable neighborhood that takes advantage of public investment in light rail and BART, and to transform an older light industrial district to meet high demand for housing, offices, and shopping in the Bay Area. The plan creates a structure for a walkable, transit-oriented area with a mix of land uses, which encourages walking, biking, and transit trips and minimizes vehicle trips. This type of development can accommodate substantial growth, minimize impacts on local roadways, and reduce urban sprawl at the periphery of the region.

2.2 Wastewater Treatment and Disposal

Wastewater from the City's collection system is conveyed to and treated by the San Jose-Santa Clara Regional Wastewater Facility (RWF). Eight tributary agencies contribute flow to the RWF including the City of Santa Clara, Cupertino Sanitary District, West Valley Sanitation District, the City of San Jose, County Sanitation District 2-3, Burbank Sanitary District, and the City of Milpitas.

The City of Milpitas pays a share of the capital cost of the RWF, based on the City's capacity rights in proportion to the 167 MGD total capacity of the RWF. The City also pays a share of the operating cost, based on the volume of wastewater discharged to RWF. The City has rights to discharge 14.25 MGD to the RWF under its current allotment.

To calculate dry weather flows from each agency, the RWF identifies the peak week – five-day period during June through October with the highest flows based on the plant's influent data – and each tributary agency is asked to provide an estimate of their average flow for the peak week.

2.3 Recycled Water

The City purchases recycled water from the South Bay Water Recycling (SBWR) Program. The SBWR Program is an on-going, multi-year effort to use high quality recycled water produced at the RWF and distribute for irrigation, industrial, and other purposes. The SBWR Program is administered through the City of San José's Environmental Services Division.

The City uses recycled water for irrigating public and private areas such as parks, medians, and industrial uses to supplement potable water use. The City's existing recycled water pipeline system connects to the SBWR system near Technology Drive and Coyote Creek, southeast of the State Route 237/Interstate-880 interchange. Recycled water provided by the SBWR Program is delivered through an existing transmission line. It is then distributed through a series of mains that provide landscape irrigation to business/retail areas surrounding McCarthy Ranch and Oak Creek Industrial Park, and to central Milpitas. The City maintains and operates approximately 22.4 miles of SBWR-owned recycled water lines that serve approximately 224 service connections. The City has an agreement with SBWR to be reimbursed for its costs to operate and maintain the SBWR-owned system within the City.

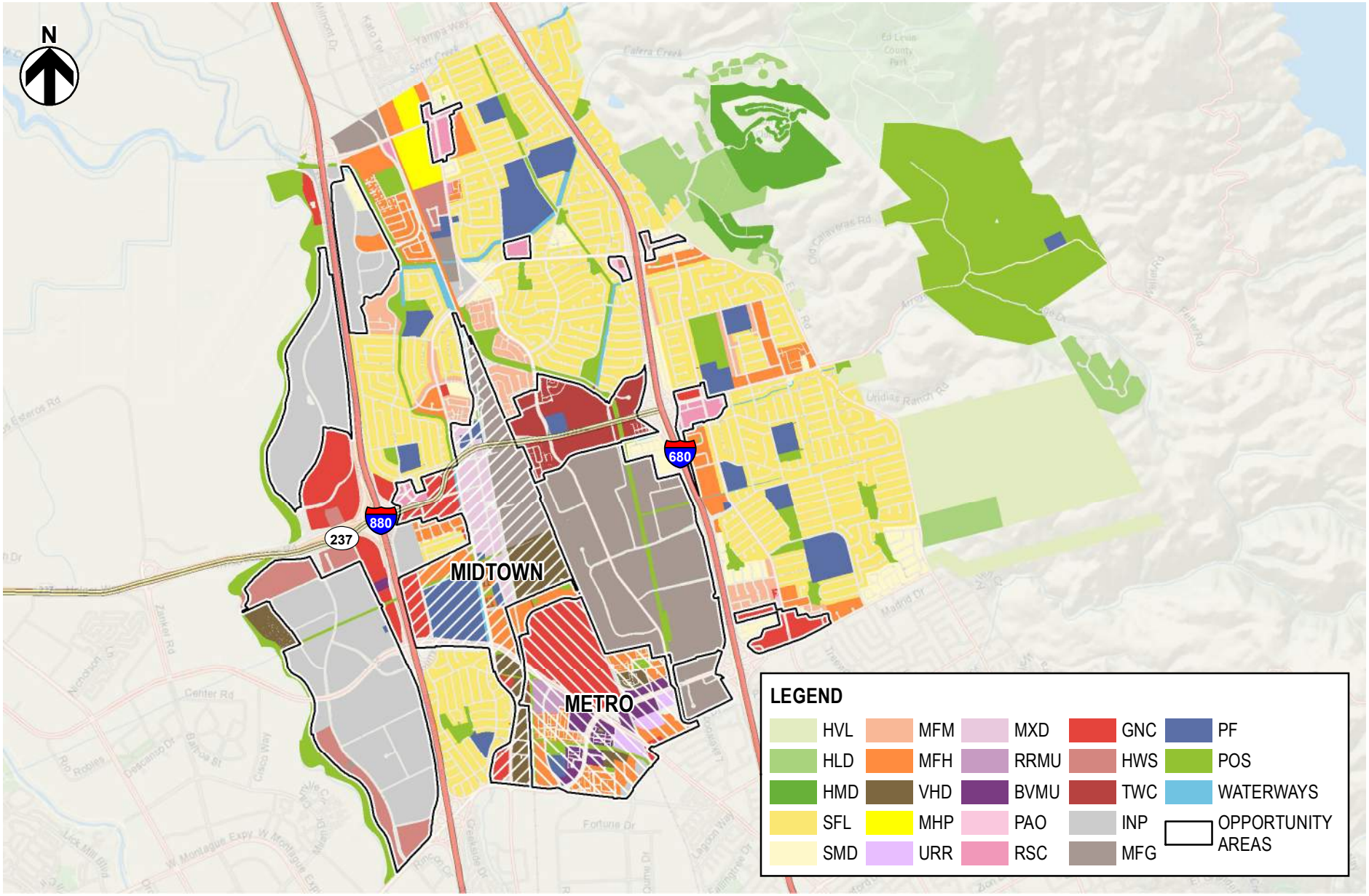


FIGURE 2-2
CITY OF MILPITAS
SEWER MASTER PLAN
CITY GENERAL PLAN LAND USE

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SECTION 3 – EXISTING WASTEWATER COLLECTION SYSTEM

This section describes the City's existing wastewater collection and conveyance system. Information from previous studies, regulatory documentation, field investigation, and discussions with the City Planning Department Staff were compiled herein. A wholesale review and update of the City's ArcGIS geodatabase (GIS) was conducted using an extensive database of record drawings. A summary of the updates made to the GIS is included in **Appendix C**.

3.1 Wastewater Collection System

According to the updated GIS, the wastewater collection system consists of 844,114 feet (ft) (approximately 160 miles) of gravity sewers ranging from pipe diameters of 4- to 66-inches. The eastern side of the City has predominantly residential customers, with the western side of the City on the valley floor dominated by industrial and manufacturing. Commercial and mixed use are scattered throughout the valley floor as well. The topography is generally flat on the valley floor, with gradual elevation drops from the southeast to the northwest. The entire system flows to the Milpitas Main Lift Station (Main LS) in the northwestern corner of the City where it is pumped to the RWF through two force mains. An additional lift station, located on Venus Way, connects a small portion of low-elevation flow to the higher-elevation gravity system. **Figure 3-1** contains an overview of the City's wastewater collection system.

3.1.1 Pipelines and Manholes

The City's wastewater collection system includes pipelines and structures of varying age, size, and material. According to the City's GIS, the majority of the City's wastewater collection system pipelines are vitrified clay pipe (VCP) and 4- to 12-inches in diameter. Approximately 70% of the system was built before 1990. **Table 3-1**, **Table 3-2**, and **Table 3-3** provide breakdowns of the distribution of existing pipe material, size, and age according to the City's GIS, and are reflected in **Figure 3-2**, **Figure 3-3**, and **Figure 3-4**.

As part of the preventative maintenance program, City Staff schedule weekly cleaning for high problem areas of the system. Areas with a moderate frequency of problems receive cleaning on a monthly or biannual basis, and low problem areas including the remainder of the system are cleaned on a recurring 18-month basis.

Based on review of record drawings and existing GIS, 15 siphons were identified throughout the collection system that divert flow under the San Francisco Public Utility Commission (SFPUC) water supply pipeline, creeks, and highways. The siphons are shown in **Figure 3-1**. As part of the preventative maintenance schedule, one problem siphon is cleaned weekly, and the others are cleaned quarterly.

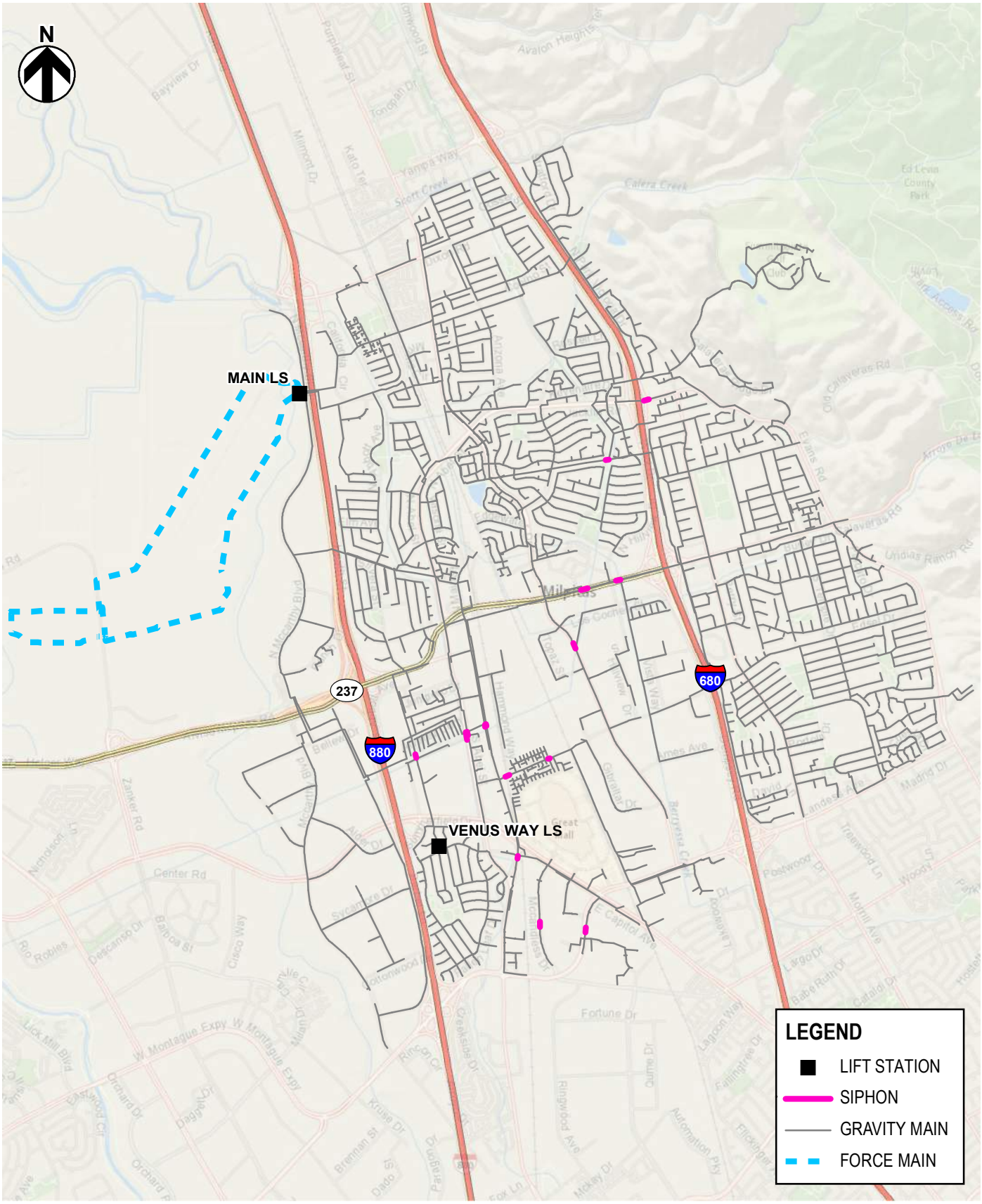


FIGURE 3-1
CITY OF MILPITAS
SEWER MASTER PLAN
WASTEWATER COLLECTION SYSTEM OVERVIEW

HydroScience

Table 3-1: Collection System Pipeline Material

Pipe Material	Total Length (ft)	Length as Percentage
Acrylonitrile-Butadiene-Styrene (ABS)	13,812	1.64%
Cast Iron Pipe (CIP)	2,027	0.24%
Ductile Iron Pipe (DIP)	2,017	0.24%
High-Density Polyethylene (HDPE)	15,898	1.88%
Polyvinyl Chloride (PVC)	59,188	7.01%
Reinforced Concrete Pipe (RCP)	36,414	4.32%
Vitrified Clay Pipe (VCP)	650,411	77.05%
VCP/ABS	14,337	1.70%
Unspecified	50,011	5.92%
Total	**844,114**	**100.00%**

Table 3-2: Collection System Pipeline Diameter

Pipe Diameter (in)	Total Length (ft)	Length as Percentage
< 8	392,365	46.48%
8-12	300,557	35.61%
15-18	49,886	5.91%
21-24	20,400	2.42%
27-30	24,421	2.89%
33-37	36,479	4.32%
39-42	5,756	0.68%
48-66	5,970	0.71%
Unspecified	8,280	0.98%
Total	**844,114**	**100.00%**

Table 3-3: Collection System Pipeline Age

Installation Date	Total Length (ft)	Length as Percentage
1951-1959	82,527	9.78%
1960-1969	173,537	20.56%
1970-1979	146,186	17.32%
1980-1989	196,192	23.24%
1990-1999	63,195	7.49%
2000-2009	58,136	6.89%
2010-2019	23,611	2.80%
Unspecified	100,729	11.93%
Total	**844,114**	**100.00%**

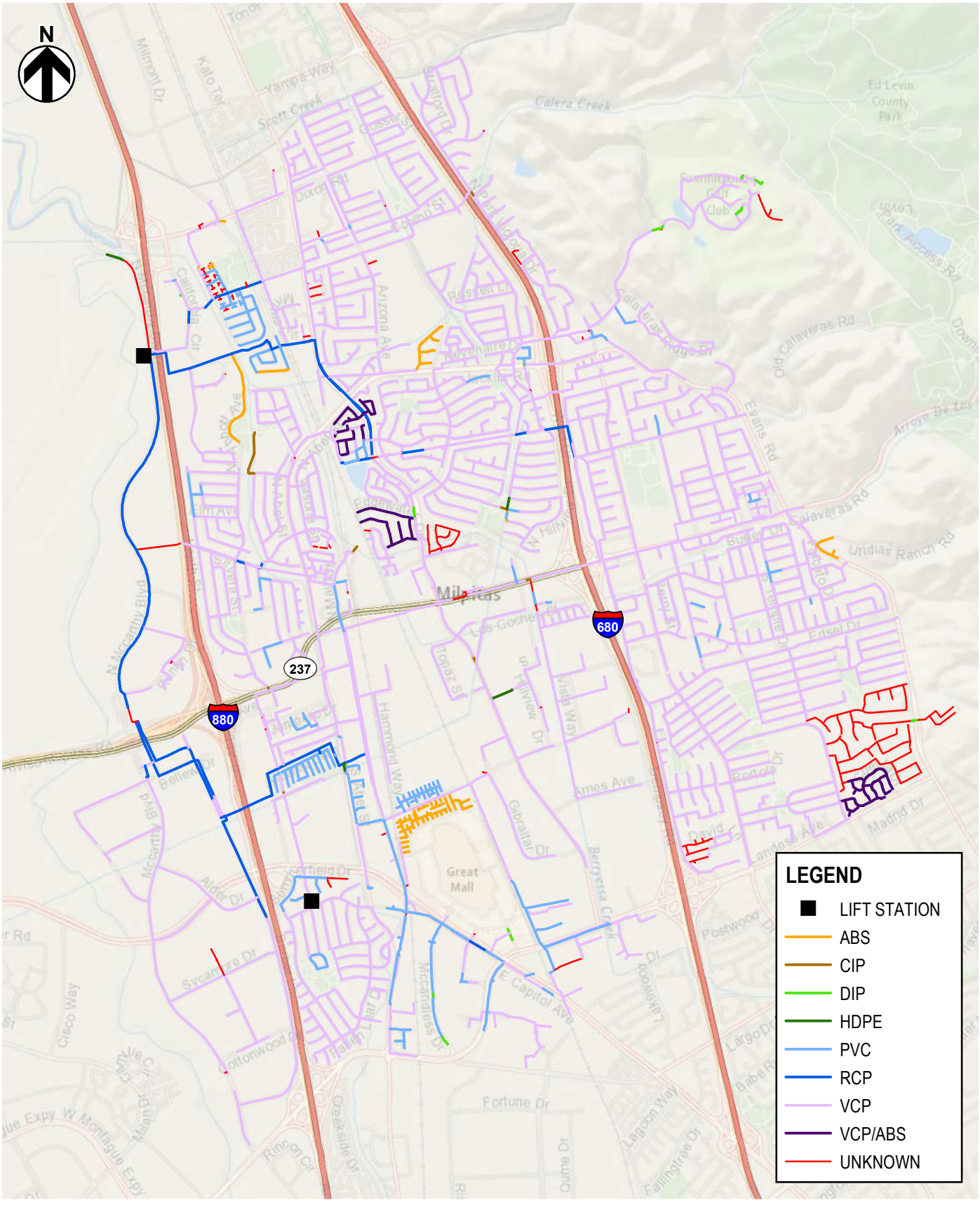


FIGURE 3-2
CITY OF MILPITAS
SEWER MASTER PLAN
COLLECTION SYSTEM PIPELINE MATERIAL

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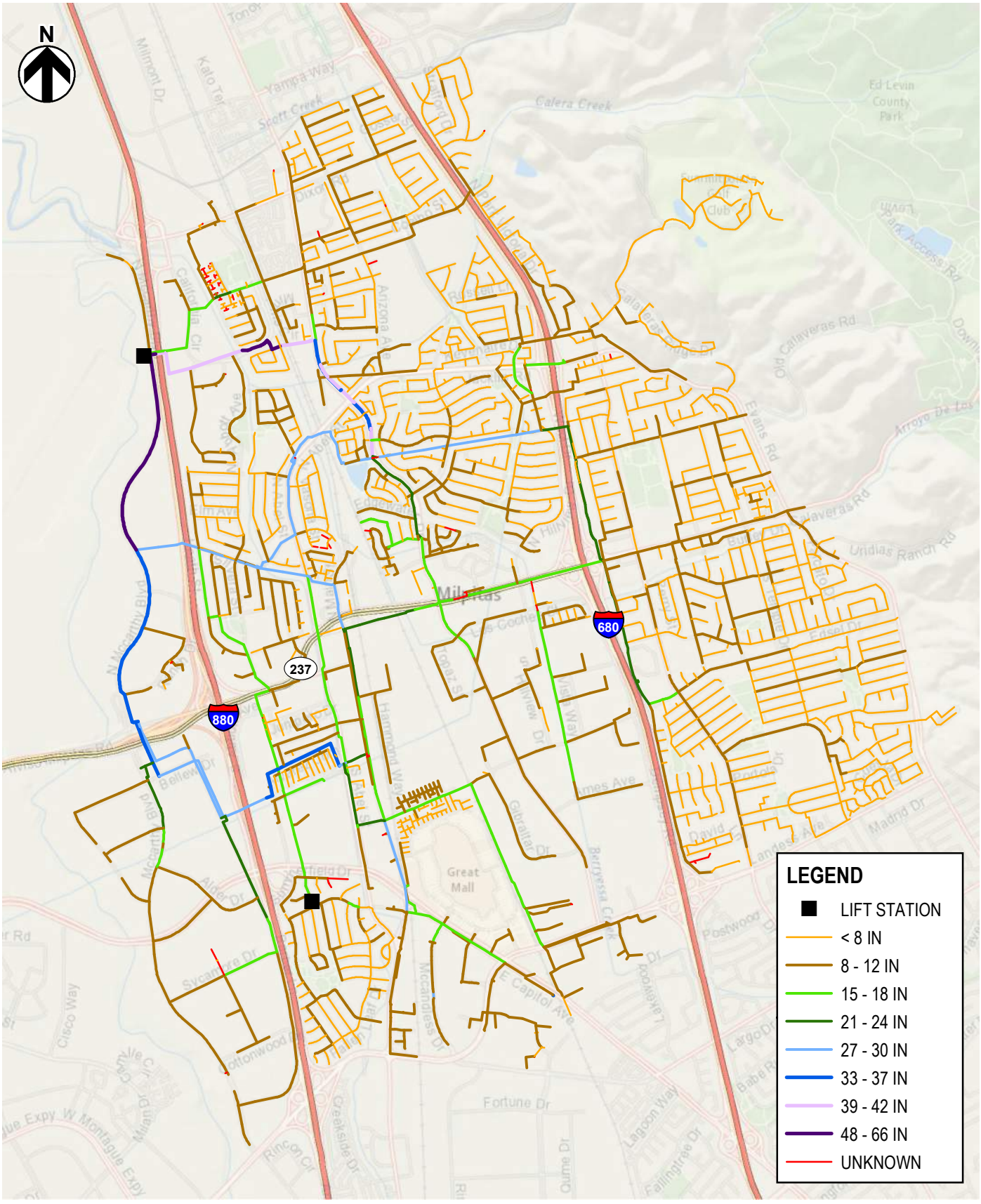


FIGURE 3-3
CITY OF MILPITAS
SEWER MASTER PLAN
COLLECTION SYSTEM PIPELINE DIAMETER

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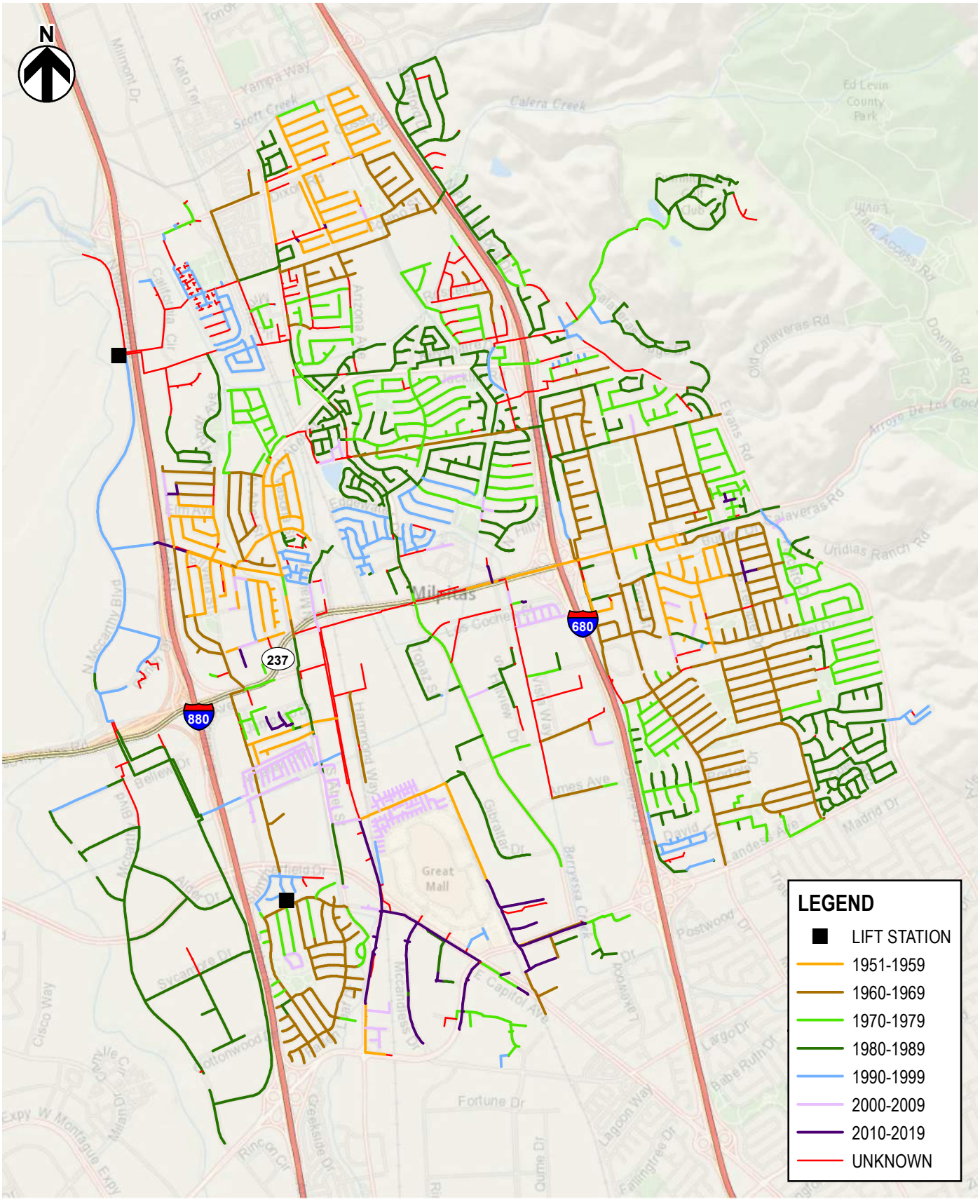


FIGURE 3-4
CITY OF MILPITAS
SEWER MASTER PLAN
COLLECTION SYSTEM PIPELINE AGE

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Based on the City's GIS, the collection system includes almost 3,000 manholes. Of these manholes, approximately 60% were built before 1990. **Table 3-4** provides a breakdown of the age distribution of the existing manholes based on the City's GIS.

Table 3-4: Collection System Manhole Age

Installation Date	Total Count	Count as Percentage (%)
1951-1959	229	7.69%
1960-1969	440	14.77%
1970-1979	415	13.93%
1980-1989	631	21.18%
1990-1999	286	9.60%
2000-2009	204	6.85%
2010-2019	125	4.20%
Unspecified	649	21.78%
Total	**2,979**	**100.00%**

To facilitate operations and maintenance and prevent SSOs, the City has implemented SmartCover technology to monitor the wastewater collection system. They have installed 33 SmartLevel™ Monitoring Systems in sewer manholes throughout the City to provide real-time remote level monitoring to operations staff. SmartCovers can be installed under any manhole lid and can be moved to monitor areas of concern, as needed.

Flow Splits

There are 177 identified flow splits throughout the City's collection system. Flow splits are manholes that allow outflow via two or more pipes. There are three types of flow splits within the City's collection system, including:

- **High point flow splits** – high points from which sewage flows in opposing directions (see **Figure 3-5**);
- **Even flow splits** – manholes where incoming flow is split proportionally in two (or more) directions where downstream pipes have matching inverts (see **Figure 3-6**); and
- **Overflow flow splits** – manhole flow splits with overflow. At an overflow split during normal flow conditions, the flow takes one path and during high flow conditions, if the manhole begins to surcharge and flow reaches a certain depth, there is an "overflow" pipeline that is activated and will carry flow (see **Figure 3-7**).

As part of the network review and hydraulic model calibration processes, three flow diversion structures (MH 1053, MH 2578, and MH 1152) were identified for inclusion in the hydraulic model. These were identified by reviewing record drawings and available CCTV information. They are described as follows:

- **Flow diversion structure** – alters an existing even flow split to mimic an overflow flow split. A typical flow diversion structure is depicted in **Figure 3-8**. As can be seen in the figure, during normal dry weather operating conditions, all inflow is directed to one outflow pipe by the diversion structure. During higher flow conditions as the manhole begins to surcharge, the diversion structure is overtopped, and some flow is diverted to an overflow pipe. To represent these structures in the model, the height of the overflow pipe invert was adjusted to match the height of the diversion structure.

All identified flow splits and flow diversion structures are displayed on **Figure 3-9**.

Figure 3-5: Example High Point Flow Split

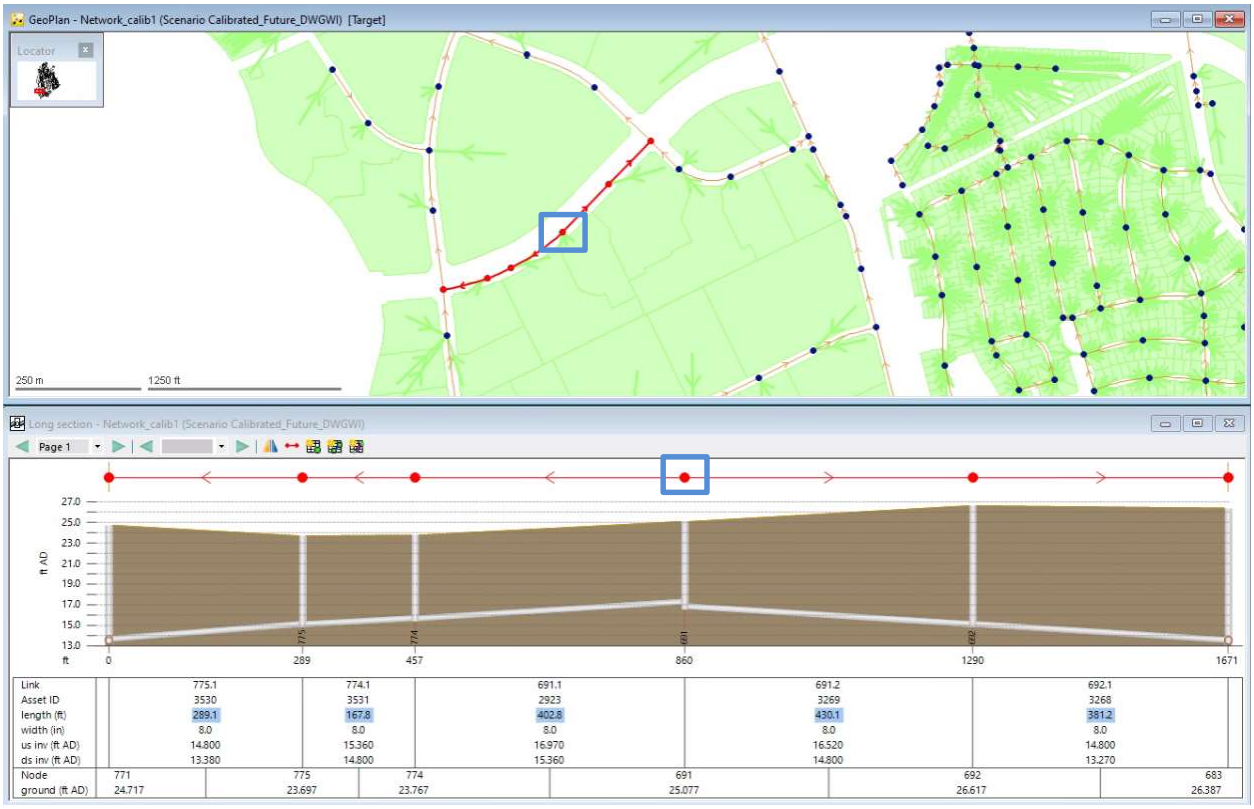


Figure 3-6: Example Even Flow Split

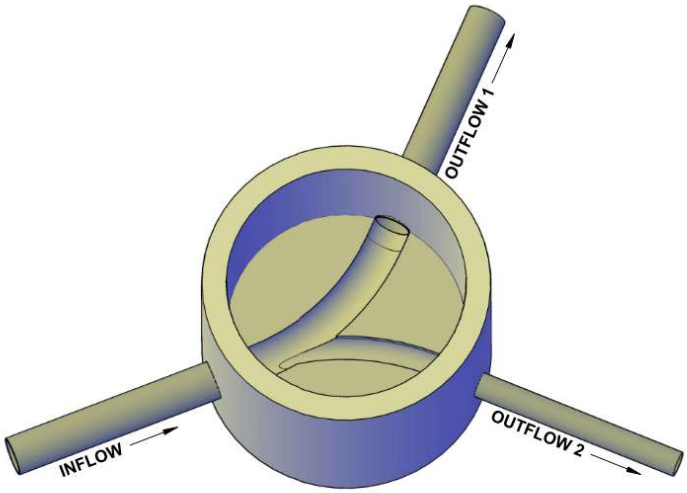


Figure 3-7: Example Overflow Flow Split

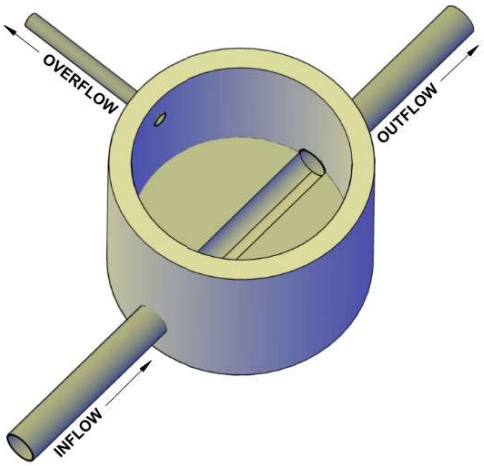
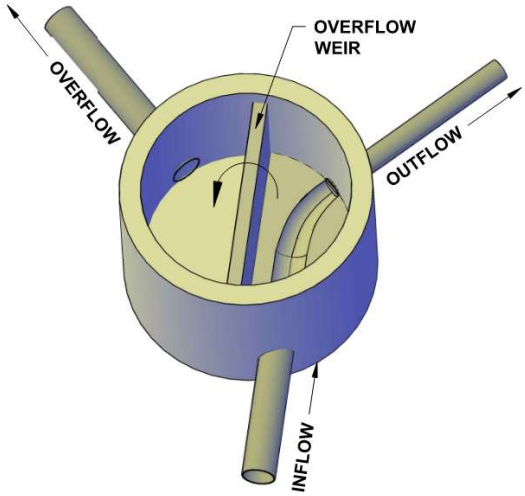


Figure 3-8: Example Flow Diversion Structure



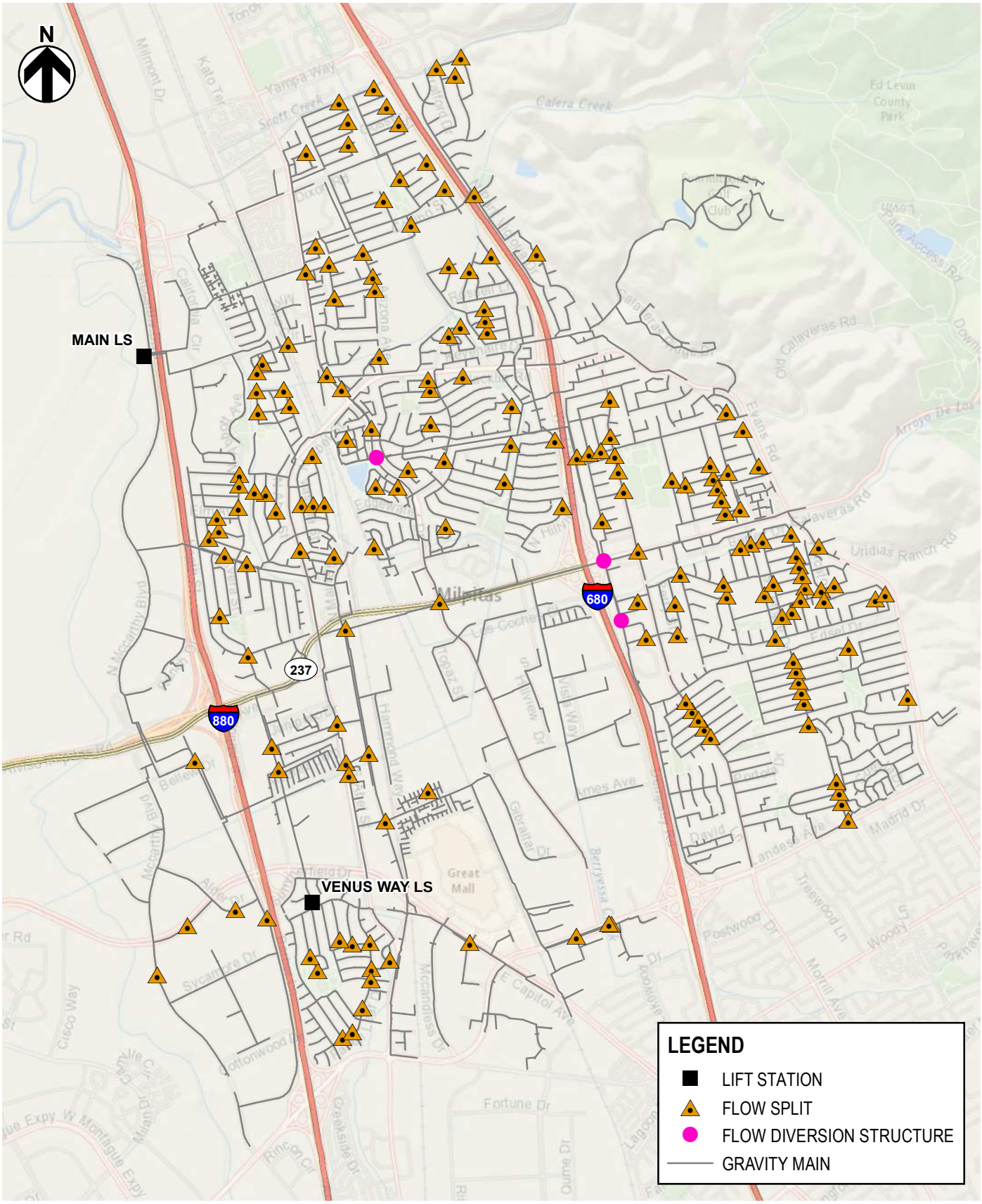


FIGURE 3-9
CITY OF MILPITAS
SEWER MASTER PLAN
FLOW SPLITS AND DIVERSION STRUCTURES

HydroScience

3.1.2 Lift Stations

In February and March 2020, a condition assessment of the two lift stations was conducted as part of the Master Plan effort. An inspection report detailing the assessment and a full asset inventory list of the lift stations are included as part of **Appendix A** (R&R Study App. K, LS Report).

The Venus Way Lift Station (Venus Way LS) serves approximately 1,200 single-family homes surrounding Pinewood Park in the southwestern corner of the City. It is designed to lift wastewater collected from the lower elevations and transmit it the collector main parallel to, and to the east of, Interstate 880. It is a single pump (with stand-by pump) lift station, equipped with two 5 hp 3-phase 540 gpm non-clog sewage pumps in a packaged dry-well plus wet-well configuration. The wet well is a 72-inch diameter RCP wet well equipped with an aluminum hatch and safety grate. The City rehabilitated this lift station during 2008. As part of the preventative maintenance program, the Venus Way LS is inspected annually. **Table 3-5** provides a summary of the asset inventory list for the Venus Way LS; a detailed asset inventory is provided in **Appendix A** (R&R Study App. K, LS Report Sections 2.2 and 4.1).

Table 3-5: Venus Way LS Asset Inventory List

Asset Name	Asset Description	Asset Type	Year Installed
Mechanical			
Pumps (2) #1 & #2	FLYGT CP3102-441, 5 hp 3-PH 230 V Submersible Pump	Pump	2008
Pump Guide Rails	Reinstalled in 2008		2008
8” Gate Valves (3), Pumps 1 & 2	8” Gate Valve, Pump 1 & 2	Valve	2008
8” Check Valves (2), Pump 1 & 2	8” Check Valve, Pump 1 & 2	Valve	2008
4” Flap Gate	4’ Flap Gate in Wet Well	Valve	2008
2” Combo Air/Vacuum Valve	2” Combo Air/Vacuum Valve	Valve	2008
Electrical			
Utility Transformer	240/120 V, 3-Ph, 3 W	Transformer	2000
Service Pedestal	Service Disconnect and Metering		2008
Pump Control Panel	Starter Panel for Pumps 1 & 2 (each 5 hp)	Panel	2008
Instrumentation			
Level Instrument	Wet Well Level Sensor	Level Switch	2008
Structural			
Wet Well	72” Diameter RCP	Tank	1964
Valve Vault		Vault	1964
Aluminum Hatch-Vault	Aluminum Hatch, slide-in	Vault	2008
Aluminum Hatch-Wet Well	Aluminum Hatch w/ safety grate	Vault	2008

All wastewater is collected at the Main LS, the terminal point in the gravity collection system, where it is pumped to the RWF. The Main LS is located to the west of Interstate 880 between North McCarthy Blvd and Coyote Creek Trail. Flow enters the lift station site through a single 54-inch diameter RCP pipe.

The site consists of three buildings that house the lift station components. The Main LS consists of four grinders and four large submersible 170 hp 3 phase 705 rpm pumps with variable frequency drives (VFDs). Pumps #1 and #6 are slated for future installation though the base assembly, piping, and rail system were installed under Project 6103/2-1066. Grinders #5-8 are also slated for future installation. According to the City's 2016 SSMP, the Main LS has a wet weather capacity of 45 MGD. **Table 3-6** provides a summary of the asset inventory list for the Main LS; a detailed asset inventory is provided in **Appendix A** (R&R Study App. K, LS Report Sections 2.2 and 3.1).

Table 3-6: Main LS Asset Inventory Summary

Asset Name	Asset Description	Asset Type	Year Installed
Mechanical			
Pig Launchers (2) A & B	36" Pig Launcher	Pig Launcher	2002
Pinch Valves (3) 1-3	36" Pinch Valve	Valve	2002
Mag Meter (Flow Meter A)	24" Magnetic Meter	Flow Meter	2002
Venturi Meter – Removed in 2008	36" Venturi Meter (taken out)	Flow Meter	1975
Butterfly Valve	36" Butterfly Valve, FM interconnect	Valve	1970
Manifold Piping Butterfly Valve	36" diameter BFV, middle of manifold	Valve	2008
Manifold Piping Plug Valve #1	36" diameter PV, pumps 1, 2, 3	Valve	2008
Manifold PV #1 & #2 Actuators (2)	plug valve electric actuator	Actuator	2008
Manifold Piping Plug Valve #2	36" diameter PV, pumps 4, 5, 6	Valve	2008
Pumps (3) #2-4	FLYGT CP3531-775, 170 hp Submersible Pump	Pump	2008
Pumps (4) #2-5 Piping	20" Ductile Iron Vertical Discharge Pipe, 20" Ductile Iron 90 Elbow, 20" Flanged Coupling Adapter	Piping	2008
Pumps (4) #2-5 Check Valves	20" Diameter Spring Loaded Check Valve	Valve	2008
Pumps (4) #2-5 Plug Valves	20" Diameter Plug Valve	Valve	2008
Pump #5 (not installed yet)	FLYGT CP3531-775, 170 hp Submersible Pump	Pump	
Main Head Gate	54" sluice gate with manual actuator	Gate	2008
Head Gate (4) #1-4	48" sluice gate with electric actuator	Gate	2008
Grinder (2) #1 & #4	5-hp electric driven	Grinder	2008
Grinder (2) #2 & #3	10-hp electric driven	Grinder	2008
2" combo air/vac valve			
Force Main A B Flow Recorder			
Flow Meter B	This is for force main B		
Main Transformer	1000 kVA, 12 kV-480 V, 3-ph (PG&E)	Transformer	2000
Outdoor Utility Disconnect and Metering Panel	Outdoor NEMA 3R Enclosure	Panel	2000
Main Switchgear	Located in Existing Generator Building	Switchgear	2000

Asset Name	Asset Description	Asset Type	Year Installed
Variable Frequency Drives (4) P2-P5	VFD for Pump (170 hp)	VFD	2008
Local Disconnect for Engine Jacket Water Heater	30A/3P	Switch	2000
Motor Control Center (2) 2 & 2A	600 A, 480 V, 3-ph, 3W, 65000 AIC	MCC	2000
Dry Type Transformers (2)	30 kVA, 480-208/120 V, Dry Type	Transformer	2000 & 2008
Lighting panel (LP-1)		Panel	2008
Lighting panel (LA)	100 A, 1-ph, 3 Wire	Panel	2000
Motor Control Center (2) A &B	400 A, 480 V, 3-ph, 3W, 65000 AIC	MCC	2008
Dry Type Transformer	10 kVA, 480-240/120 V, Dry Type	Transformer	2008
Distribution panels (2) (DP-1 & DP-2)	125 A, NEMA Type 1	Panel	2008
Dry Type Transformer	75 kVA, 480-208/120 V, Dry Type	Transformer	2008
Local Control Panels (4) for Grinders #1-4	LCP grinder 1	Panel	2008
Local Disconnects (4) for CU-1 (for FC-1), EF-1 (for Control Room), HP-1 (for FC-2) & FC-1 (for Control Room)	30A/3P	Switch	2008
Local Disconnects (2) for EF-5 & SF-1 (for Wet Well)	60A/3P	Switch	2008
Generator	1000 kVA, 480 V Diesel Driven Engine Generator	Generator	2000
Automatic Transfer Switch	ATS, 1600 A	Switch	2000
Instrumentation			
Level Switch	Level High High	Level Switch	2008
Level Switches (2)	Ultrasonic level	Level Switch	2008
Structural			
Pinch Valve Vaults (3) 1-3	Pinch Valve Vault	Vault	2002
Mag Meter Vault	24" Magnetic Meter Vault	Vault	2002
Venturi Meter Vault	36" Venturi Meter Vault	Vault	1975
Butterfly Valve Vault	36" Butterfly Valve Vault	Vault	1997
Fuel Tank (bulk)	2,000-gal UL-2085 above ground vault tank	Tank	2008
Fuel Tank (day)		Tank	2000
Grit Chamber/Inflow Structure		Tank	2008
Wet Well		Tank	2008

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SECTION 4 – CONDITION ASSESSMENT

As mentioned in **Section 1.1.1**, as part of the City's Master Plan project, a *Sewer Utility Asset Renewal and Replacement Study* (R&R Study) was conducted. Included in this study is a condition assessment of the City's current collection system based on a set of factors developed to determine the relative risk of failure for each pipeline segment. This section describes the development of the factors established for the Business Risk Exposure (BRE) analysis and the results of the collection system condition assessment. The R&R Study is attached as **Appendix A**.

4.1 CCTV Condition Assessment

Part of evaluating the condition of the City's collection system is understanding the pipe condition based on the level of structural and/or operations and maintenance (O&M) related defects. For this part of the condition assessment, key segments of the system were selected for closed-circuit television (CCTV) investigation based on the following criteria:

- Diameter greater than 8-inches;
- Older pipe (pre-1990) and pipe materials susceptible to corrosion/failure (RCP, VCP);
- Located within high traffic areas; and
- Located within commercial/industrial areas.

Figure 4-1 presents the segments selected for CCTV inspection based on these criteria. The pipelines indicated as "Contract" were the priority for inspection while the "Misc" were completed as time and budget permitted.

National Plant Services Inc. (NPS) was contracted to complete the CCTV assessment (168,180 ft, 31 miles, approximately 20% of the entire system) and performed this inspection between March and May 2020. Additional details regarding the planned scope of the assessment can be found in the **Appendix A** (R&R Study Section 2.1). It is expected that additional CCTV assessment will be performed by City forces in the future as part of a City-wide CCTV program.

4.1.1 CCTV Inspection Results

As part of the assessment work performed by NPS, NPS inspected 105,221 ft. (approximately 20 miles) of pipeline. This constitutes approximately 12% of the entire system. **Figure 4-1** shows the pipelines fully inspected by NPS in green.

There were some pipe segments where NPS attempted inspection but was unable to conduct or complete inspection. NPS reported various reasons for not completing inspection of pipe segments including the presence of siphons; manholes that were paved over or did not exist; and obstructions such as root balls, grease, and rocks. These pipe segments are shown in **Figure 4-2** in red; this includes segments for which inspection was only partially completed. Where there were obstructions observed, the survey was attempted from the next manhole in the opposite direction.

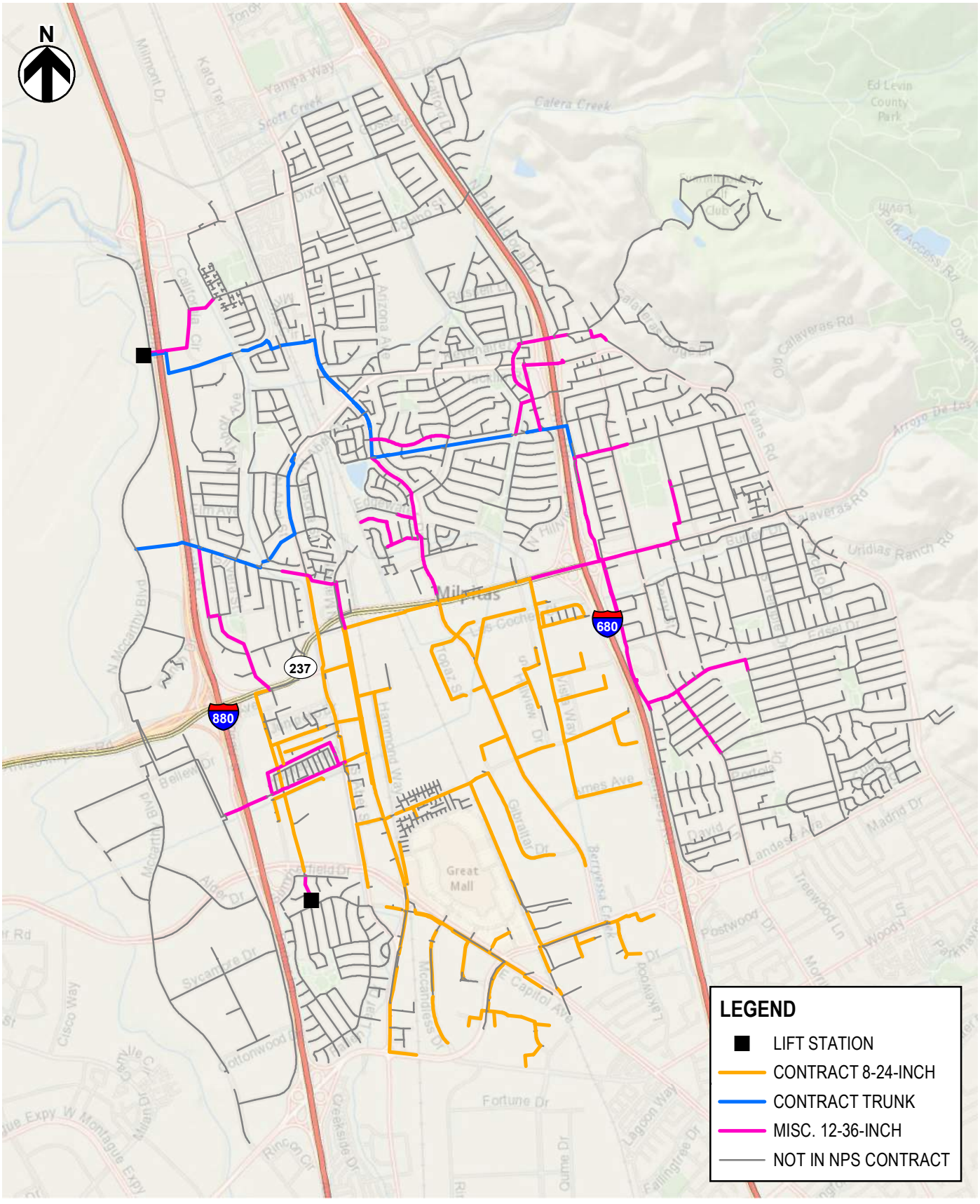


FIGURE 4-1
CITY OF MILPITAS
SEWER MASTER PLAN
NPS CCTV INSPECTION PLAN

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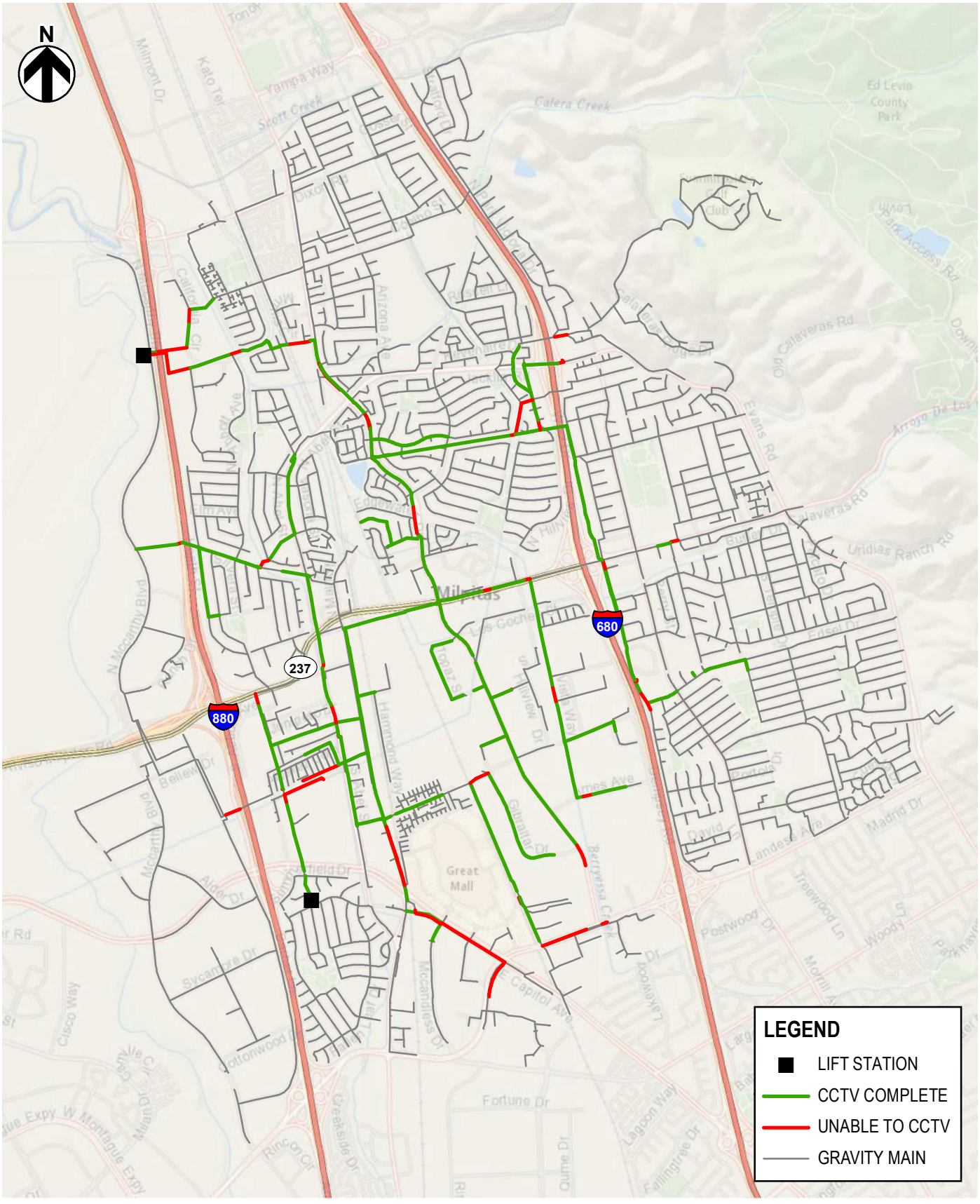


FIGURE 4-2
CITY OF MILPITAS
SEWER MASTER PLAN
COMPLETED CCTV INSPECTION

HydroScience

A breakdown of the completed segments by pipe diameter is presented in **Table 4-1**.

Table 4-1: Completed CCTV Inspection by Pipe Diameter

Pipe Diameter (in)	Length Inspected (ft)
8	8,221
10	3,540
12	19,003
15	25,552
16	195
18	15,292
21	10,268
24	1,995
27	5,337
30	7,393
33	574
39	2,487
42	2,547
66	1,037
Unspecified	1,788
Total	**105,221**

Defect Coding

Defects were identified and sewer pipeline conditions were assessed according to the National Association of Sewer Service Companies (NASSCO) Pipeline Assessment Certification Program (PACP). PACP-certified NPS staff coded all inspected pipelines. As part of the quality control (QC) process, approximately 20% (89 out of 449 pipe segments) of inspection CCTV and PACP reports were additionally reviewed by PACP-certified staff. A detailed description of the QC process can be found in **Appendix A** (R&R Study Section 2.3).

For the condition assessment, the following steps were taken for each pipeline segment, which is defined from manhole to manhole:

1. Defects identified through review of CCTV footage.
2. Individual grade assigned based on the type and severity of defect(s).
3. Overall condition grade developed by assessing the type and number of defects along the segment.
4. Final condition rating assigned based on the condition grades and the potential for further deterioration and/or failure.

Per NASSCO PACP, each defect is categorized as either structural or O&M-related. Structural defects directly impair the structural condition of the pipe and are typically addressed through repairs, rehabilitation, or replacement. O&M-related conditions are those that directly affect the performance of the sewer or are indicative of potential future structural defects and are typically

addressed through maintenance, though some (such as infiltration) may require additional rehabilitation.

Both structural and O&M-related condition grades range from one to five. **Table 4-2** provides a description of each rating as well as some examples of structural and O&M-related defects at each rating.

Table 4-2: Condition Grade Definitions

Condition Grade	Condition Rating	Structural Examples	O&M Examples
1	Minor defect grade	Circumferential crack; roughness increased due to surface damage; spalling of coating	Fine roots at lateral, connection, or joint; infiltration stains on barrel, lateral, connection, or joint; vermin cockroach
2	Minor to moderate defect grade	Spiral or longitudinal crack; circumferential fracture; aggregate visible due to surface damage	Factory tap intruding <10%; infiltration weeper on barrel, lateral, connection, or joint; vermin rat
3	Moderate defect grade	spiral or longitudinal fracture, lining feature blistered; medium joint offset	Deposits (grease, rags, gravel, etc.) attached 10-20%; medium roots at lateral, connection, or joint
4	Significant defect grade	Broken pipe; surface damage with aggregate missing; large joint offset	Deposits attached 20-30%; medium roots at barrel; infiltration runner at barrel, lateral, connection, or joint
5	Most significant defect grade	Broken pipe with visible void; flexible pipe deformed >10%; collapsed pipe	Deposits attached >30%; root ball at barrel; infiltration gusher at barrel, lateral, connection, or joint

Each defect identified along a pipeline segment is categorized and rated according to **Table 4-2**. The condition of each pipeline segment is ultimately given the following three scores:

- **Structural Peak Score** – The most severe condition grade for structural defects present in a pipeline segment.
- **O&M Peak Score** – The most severe condition grade for O&M-related defects present in a pipeline segment.
- **Overall Peak Score** – The greater of the two peak scores, either the structural or O&M peak score.

The structural and O&M peak scores are used in the BRE analysis. The structural and overall peak scores developed from this CCTV condition assessment are used to develop project recommendations for the City's CIP (see **Section 9.1.1**).

Figure 4-3 presents the overall peak scores resulting from this PACP condition assessment. Additional detail including breakdown by pipe diameter of the structural and O&M peak scores and maps of the structural and O&M peak scores can be found in **Appendix A** (R&R Study Section 2.2.1 and Appendices D and E).

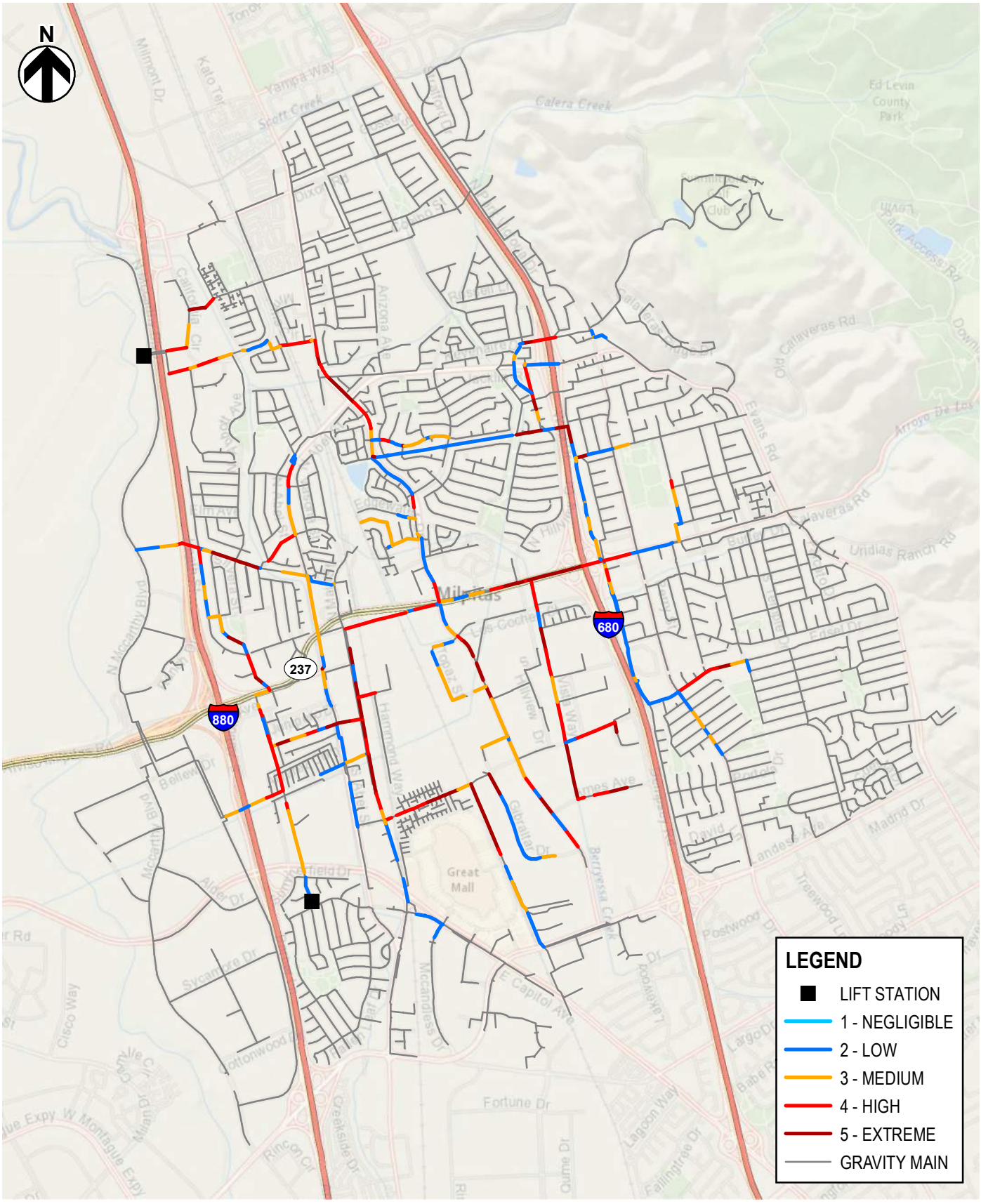


FIGURE 4-3
CITY OF MILPITAS
SEWER MASTER PLAN
PACP OVERALL PEAK SCORES

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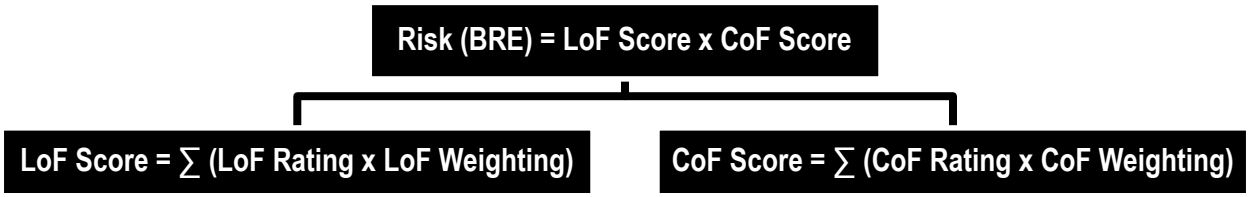
4.2 Desktop Condition Assessment

In addition to the PACP condition assessment performed using the CCTV footage, a desktop condition assessment was performed to determine the relative risk of failure of each pipeline segment. A pipeline's risk of failure is determined by a combination of the *likelihood* and the *consequence* of the failure of the pipe segment. The results of this assessment represent the City's BRE.

Likelihood of failure (LoF) and consequence of failure (CoF) scores were assigned to each pipeline segment by considering various factor ratings with assigned factor weightings. LoF and CoF ratings were given on a scale of one (least likely to fail/least consequential) to five (most likely to fail/most consequential). The weighting of each factor was assigned based on the relative criticality of that factor, with higher weighting factors assigned to the most critical LoF/CoF factors.

Both the factors and the weightings were established by industry standard along with input from the City Staff through a workshop between BC, HydroScience, and City Staff in April 2020. A summary of the discussion at this workshop can be found in **Appendix A** (R&R Study Section 3.4).

The following equations were used to calculate a risk score for each pipeline segment:



4.2.1 Likelihood of Failure (LoF)

The first factor in determining the relative risk of failure of a pipeline was the *likelihood* that the segment is unable to provide the function for which it was installed. This was determined by assigning LoF criteria and ratings based on characteristics, condition, and location of each pipeline. In cases where pipeline characteristics (age and material) were missing or unavailable, medium risk was assigned as this is the equivalent to "neutral." The following criteria were selected for this analysis and are typical for sewer renewal/replacement projects:

- **Pipe age** – In general, as a pipe ages, it has a higher likelihood to fail.
- **Pipe material** – Different pipe materials have different life expectancies and failure modes.
- **Structural condition** – Known structural defects based on 2020 CCTV inspection by NPS.
- **Presence of pipe obstructions** – Known O&M-related defects based on 2020 CCTV inspection by NPS.
- **Required pipe cleaning** – Pipe requiring more frequent cleaning are typically subject to chronic O&M issues (i.e., oil, grease, and roots) when not maintained. However, the act of cleaning with high pressure water jets can contribute to premature failure of older or compromised pipe and inadvertently remove the top layer of corroded concrete or metal pipe.

- **Proximity to landslide zones** – Landslides can pose a threat to pipe segments that are buried at a depth of three feet or less. This factor also accounts for the impact of smaller seismic events on pipe structural integrity.
- **Proximity to earthquake faults** – Pipes located in the Hayward Fault Zone are given a higher LoF rating. This factor also accounts for the impact of smaller seismic events on pipe structural integrity.
- **Local geology (liquefaction)** – A liquefaction layer from County GIS provides soil resiliency ratings to seismic events. This factor also accounts for the impact of smaller seismic events on pipe structural integrity.

Sources include the City's GIS; the City's collection system maintenance schedule; and landslide, fault, and liquefaction zoning provided by the County of Santa Clara Department of Planning and Development. The basis of scoring and weighting of each criteria is detailed in **Table 4-3**.

Table 4-3: LoF Criteria and Ratings

Broad Category	Criteria	LoF Rating (← Least likely to fail 1	2	3	4	Most likely to fail → 5)	Criteria Weighting
Asset Characteristics	**Installation Year**	After 2000	1985 -1999	1970 – 1984[1]	1955 – 1969	Before 1954	2
	Pipe Material	Force Main, HDPE, PVC	VCP[1]	RCP, STL, DIP, ABS, PPR	-	ACP, CIP	2
Asset Condition	**Structural PACP Grade/ Defect Type**	Grade 2 defect(s) or lower	Grade 3 defect(s) (except hinge defects)	One Grade 4 defect (except hinge defects) OR Grade 3 hinge defect	One Grade 5 defect (except soil/void/collapse deformation >10%) OR multiple Grade 4 defects OR Grade 4 hinge defect	Multiple Grade 5 defects OR one Grade 5 defect (soil/void/ collapse deformation >10%)	5
	O&M PACP Grade	Grade 2 defect(s) or lower	Grade 3 defect(s)	One Grade 4 defect	One Grade 5 defect or multiple Grade 4 defects	Multiple Grade 5 defects	5
	Required Pipe Cleaning	-	Require annual cleaning	Requires quarterly cleaning	Requires monthly cleaning	Requires weekly cleaning	5
Asset Location	**Proximity to Landslide Zone**	Not within landslide zone	-	-	-	Within landslide zone	3
	Proximity to Earthquake Faults	Not within fault area	-	-	-	Crossing or within fault area	3
	Likelihood of Liquefaction	-	-	Prone to liquefaction	High likelihood of liquefaction	Very high likelihood of liquefaction	3

Notes:
1. Unknown or unspecified characteristics were classified at this rating.

4.2.2 Consequence of Failure (CoF)

The second factor in calculating the relative risk of failure of a pipeline is the CoF, or the predicted impacts resulting from the failure of the segment. Similar to the LoF analysis, CoF criteria and ratings were assigned based on the following groups: service interruption potential, repair/overflow potential, impact to transportation/transit, response time to potential failure, cost of potential failure, and environmental impacts. The criteria were selected to align with City Council core values and priorities and are typical for sewer renewal/replacement projects.

The CoF criteria and the relationship to City Council core values and priorities are summarized in **Table 4-4**.

Table 4-4: Council Core Values/Priorities and Related CoF Criteria

Council Core Value/Priority Area	Organization Category	Measure of Failure	CoF Criteria
Superior Customer Service	Community	Sewer service interruptions to large areas	Pipe diameter
Integrity and Accountability		Sewer service interruptions to critical and educational facilities	Critical facilities (proximity)
Trust and Respect		Magnitude and method of public response (sewer size)	Pipe diameter
Transportation and Transit		Public transit service and traffic interruptions	Road type
		Railroad interruptions	Railroad proximity
Governance and Administration	Finance	Response time to restore an asset	Easement (access restriction), road type
		Restoration costs or impact on utility rates	Pipe diameter and depth
Environment	Environment	State and Federal regulatory violations or public response (discharge to surface water)	Waterway/waterbody (proximity)

Below is a more detailed description of the selected CoF criteria outlined in **Table 4-4**:

- **Sewer size (pipe diameter)** – Larger diameter pipes are more expensive to replace and provide service to a larger service area than smaller diameter pipes.
- **Proximity to critical facilities** – Pipe proximity to an educational, police, fire, or health facility was calculated and rated for CoF. Pipelines servicing critical facilities were approximated by using a buffer of 500 feet. For context, the facility addresses were plotted as a point, so the buffer of 500 feet accounts for building size and nearby critical pipes.
- **Road type** – Different road types such as arterial or highway will impact more people than a neighborhood street. Therefore, locations where pipe intersects with major traffic conveyance routes such as freeways, state routes, arterial streets, or major roads were identified.
- **Railroad proximity** – Impacts to railroad operations and repairs on railroad property have significant cost and permitting impacts.
- **Easement (access restriction)** – Access restrictions were determined by overlaying the City GIS over an aerial basemap and manually assigning pipes which appeared to be within easements through private property or restricted areas. For example, the parking lot of a shopping mall would be assigned private but not restricted. However, if a pipe is near a swale between a park and a neighborhood, or between two properties, it was assigned "restricted access." In a further analysis, parcels with easement information could provide a more refined outcome.
- **Pipeline depth** – Pipes that are buried deeper require more time and effort to excavate and as a result can be more costly to repair or replace.
- **Proximity to waterway or waterbody** – There are significant permitting impacts for repair or cleanup of failed pipes that discharge into a waterway or waterbody.

Data sources include the City's GIS, Google Maps, major road locations provided by the County of Santa Clara Department of Planning and Development, and railroad and waterbody locations provided by the United States Geological Survey (USGS).

For a more detailed explanation of the City Council core values and how each criterion was rated, see Appendix A (R&R Study Section 3.2). The basis of scoring and weighting of each criteria is summarized in **Table 4-5**.

Table 4-5: CoF Criteria and Ratings

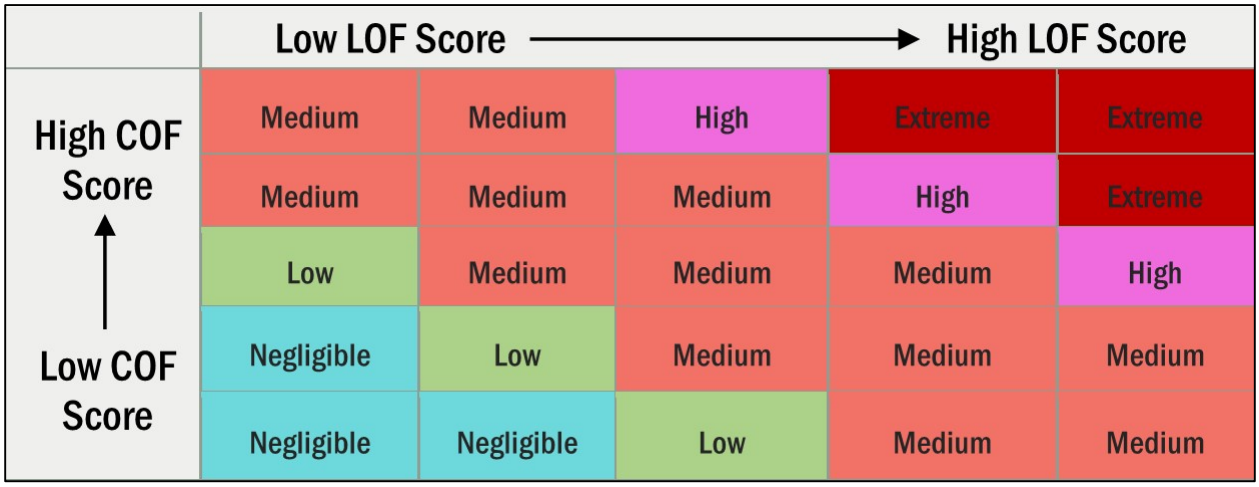
Organization Category	Group	Criteria	CoF Rating (← Negligible consequence 1	2	3	4	Critical consequence → 5)	Criteria Weighting
Community	Service Interruptions and Overflow Potential	**Pipeline Diameter[1,2]**	< 6 in	8 – 12 in[4]	14 – 18 in	18 – 24 in	> 24 in	1
		Critical Facilities	-	-	School	Fire/Police	Hospital	1
	Transportation/ Transit	**Road Type[1,3]**	Neighborhood streets	Collector streets	Arterial streets	Expressway and state routes	Freeways	1
		Railroad Proximity	Not crossing or within 50' of railroad	-	-	-	Crossing or within 50' of railroad	1
Financial	Response Time	**Access Restriction**	Public right-of-way	-	Private property	-	Limited access	2
		Road Type[1,3]	Neighborhood streets	Collector streets	Arterial streets	Expressway and state routes	Freeways	2
	Pipeline Cost	**Pipeline Diameter[1,2]**	< 6 in	8 – 12 in[4]	14 – 18 in	18 – 24 in	> 24 in	1
		Pipeline Depth	All others	-	-	-	Greater than 10' (or special configuration requiring substantial excavation)	1
Environment	Environment	**Waterway or Waterbody**	-	Within 250' of waterway or waterbody	Within 100' of waterway or waterbody	Within 50' of waterway or waterbody	Crossing waterway or waterbody	3

Notes:
1. Pipe diameter and road type affect the CoF in both the broad community and financial categories.
2. Pipe Diameter weighting = 1+1 = 2; 1 (Service Interruptions and Overflow Potential) + 1 (Pipeline Cost) = 2 (overall Pipe Diameter weighting).
3. Road Type weighting = 1+2 = 3; 1 (Transportation/Transit) + 2 (Response Time) = 3 (overall Road Type weighting).
4. Unknown or unspecified characteristics were classified at this rating.

4.2.3 Business Risk Exposure (BRE, Risk of Failure)

The LoF and CoF scores, as described above, were automatically calculated based on the criteria and weightings laid out in **Table 4-3** and **Table 4-5** using the InfoAsset Planner (IAP) software by Innovyze, a GIS extension risk assessment tool. As described at the beginning of **Section 4.2**, the relative risk was given by the product of the LoF and CoF scores calculated by IAP. **Figure 4-4** illustrates the risk assignment for each LoF and CoF pairing.

Figure 4-4: Risk of Failure Assessment Matrix



Total risk scores were normalized within the dataset from one (negligible risk) to five (extreme risk). **Table 4-6** provides a breakdown of the distribution of risk scores as a portion of the total length of pipe; for a more detailed breakdown of the risk scores, see **Appendix A** (R&R Study Section 3.6). **Figure 4-5** presents a map of the resulting risk scores for the entire city, and these were used to provide CCTV recommendations (see **Section 9.1.2**).

Table 4-6: Business Risk Exposure Score Distribution by Length

Risk Score	Length of Pipe (ft)	% of Total
1 – Negligible	610,497	77
2 – Low	77,844	10
3 – Medium	80,247	10
4 – High	9,674	1
5 – Extreme	5,922	1
Blank (no facility ID)	4,935	< 1
Total	**789,119**	**100**

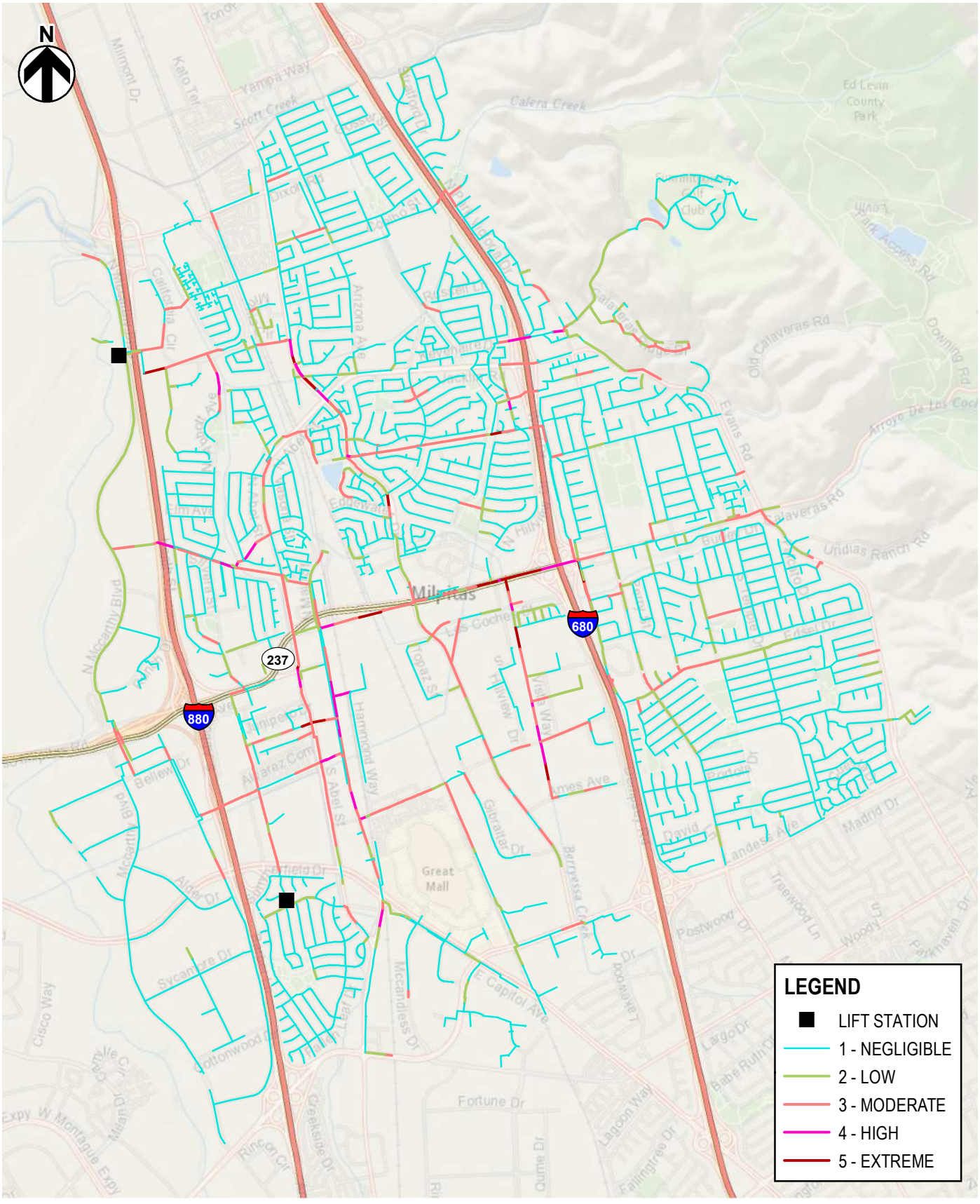


FIGURE 4-5
CITY OF MILPITAS
SEWER MASTER PLAN
BUSINESS RISK EXPOSURE SCORE MAP

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4.3 Lift Station Condition Assessment

As part of the R&R Study, BC also performed an on-site inspection of the collection system's two lift stations – the Main LS and Venus Way LS – described in **Section 3.1**. The results of this inspection are presented in the *Main and Venus Way Lift Station Inspections Report* (LS Report) which is included in **Appendix A** (R&R Study App. K). Assets in the following categories were evaluated during the inspection of these lift stations:

- Mechanical;
- Electrical;
- Instrumentation;
- Civil; and
- Structural.

Further breakdown of these categories and the specific assets evaluated are detailed in the LS Report.

Field inspections were completed on February 11 and March 11, 2020. Each asset inspected was reported with a condition score and a performance score from one to five; the breakdown of each score is summarized in **Table 4-7**.

Table 4-7: Condition and Performance Score Definitions

Score	Description	Condition Score Meaning	Performance Score Meaning
1	Excellent/Good	No defects observed.	Functioning as intended.
2	Fair	Only minor defects observed.	In service, but higher than expected O&M.
3	Neutral		
4	Poor	Major defects observed. Asset integrity may be compromised.	In service, but function is highly impaired.
5	Failing or Failed	Asset integrity is compromised. Asset may be out of service.	Not functioning as intended or out of service.

4.3.1 Main LS Inspection

Table 4-8 presents the major deficiencies identified at the Main LS that require timely attention. A summary asset inventory list is provided in **Table 3-6**. A comprehensive list of the inspection notes and scoring for all Main LS components are included in **Appendix A** (R&R Study App. K, LS Report Section 3).

Table 4-8: Main LS Deficiencies

Asset Name	Field Assessment/Comments	Condition Score	Performance Score
Mag Meter (Flow Meter A)[1]	Not in operation	4	4
Manifold PV #2 Actuator	Does not work	5	5
Pump #3	Has exceeded useful life[2]	4	4
Grinder #1	Excessive vibration and inadequate supports	5	5
2" Combination Air/Vacuum Valve	None	4	4
Flow Meter B[1]	Operable, but not accurate	4	4
Air Vacuum 1 to 15	Cavitation, coating failure, and inadequate supports	5	5
Variable Frequency Drive P2	No corrosion identified, arc flash labels missing	4	2
Variable Frequency Drive P3	No corrosion identified, confirmed by City that IGBT was replaced in 2019, arc flash labels missing	4	2
Variable Frequency Drive P4	No corrosion identified, arc flash labels missing	4	2
Variable Frequency Drive P5	No corrosion identified, confirmed by City that cooling fans were replaced in 2019, arc flash labels missing	4	2

Notes:
1. The City is replacing these meters as part of CIP Project 6131: Sanitary Sewer Cathodic Protection Improvements.
2. This pump has logged over 50,000 hours.

4.3.2 Venus Way LS Inspection

Condition and performance scores for all assets inspected were rated as 1 – no defects and functioning as intended. A summary asset inventory list is provided in **Table 3-5**. A comprehensive list of the inspection notes and scoring for the Venus Way LS can be found in **Appendix A** (R&R Study App. K, LS Report Section 4).

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SECTION 5 – ANALYSIS OF LAND USES FOR HYDRAULIC MODELING

To develop base sanitary flows (BSF) – the flow directly contributed by the customer – wastewater flows were assigned to every contributing parcel in the City. For planning level analysis, parcels of similar land use types are estimated to have similar wastewater flow rates either on a per parcel basis (gpd/parcel) or per acre basis (gpd/acre) and similar diurnal patterns. Thus, common land use types were consolidated, where appropriate. This section discusses the land use data used for planning level wastewater modeling.

5.1 Land Use Designations for Model Analysis – Existing Condition

City land use designations were available as a parcel GIS shapefile containing GP land use information for each parcel in the City. For modeling purposes, some modifications to the land uses are warranted to ensure relevance to the sewer analysis. Land use types expected to generate similar wastewater flows were consolidated into general categories to facilitate unit flow (UF) analysis. Land uses that have little to no contribution to the sewer system were excluded from further analysis.

It is noted that the consolidations made for the purpose of this Study might not correspond directly to the land use categories used for the Water Master Plan Study because these categories were established based on expected similar wastewater flow generation, which do not always directly correspond to water use.

Data cleaning was necessary to assure an accurate representation of wastewater flow from individual parcels/customers. Below is a description of the GP land use categories that required further review in order to assign the appropriate model-based land use designation (see **Table 2-1**):

- The following GP Land Use categories and parcel types were assigned as “NF” (no flow) and excluded from this analysis;
    - POS, WATERWAYS, parcels consisting of train tracks, streets, parking lots, or other open space; and parcels located in the City of San Jose or unincorporated areas not serviced by the City’s sewer system.
- All parcels with location specific land use codes (HWS, TWC, and URR) were reviewed using Google Earth Satellite and Street Views and assigned a model-based land use according to facilities present on each parcel as listed in **Table 5-1**.
- Some parcels with GP land use of BVMU were assigned to COM if commercial facilities appeared to be present;
- All hotels in the City were identified and parcels assigned to a new model-based land use code: HOTEL;
- Elmwood Correctional Facility was assigned to its own model-based land use code: COR; and
- All residential GP land use categories with parcels greater than one acre were reviewed to ensure the model-based land use designations were representative according to expected wastewater generation rates. Updated model-based land use designations were assigned, as appropriate.

Table 5-1 summarizes the GP land uses and associated codes included in the data set, and the model-based land uses developed for use in the model for this Study. **Figure 5-1** presents the City according to the model-based land use designations.

Table 5-1: Model-Based Land Use Designations for Existing Conditions

GP Land Use	Code	Model-Based Land Use	Code
Hillside Very Low Density	HVL	Hillside Single-Family Low Density	HSFL
Hillside Low Density	HLD		
Hillside Medium Density	HMD	Hillside Single Family Medium Density	HSFM
Valley Floor Single-Family Low Density	SFL	Valley Floor Single-Family Low Density	SFL
Valley Floor Single-Family Medium Density	SMD	Valley Floor Single-Family Medium Density	SFM
Multi-Family Medium Density	MFM		
Multi-Family High Density	MFH	Valley Floor Multi-Family High Density	MFH
Multi-Family Very High Density	VHD	Valley Floor Multi-Family Very High Density	MFVH
Mobile Home Park	MHP	Mobile Home Park	MHP
Mixed Use	MXD	Mixed Use	MXD
Boulevard Very High-Density Mixed Use	BVMU	High Density Mixed Use	HDMU
Residential-Retail Mixed Use	RRMU		
Professional & Administrative Offices	PAO	Professional & Administrative Offices	PAO
General Commercial	GNC	Commercial	COM
Retail Sub-Center	RSC		
Industrial Park	INP	Industrial Park	INP
Manufacturing	MFG	Manufacturing	MFG
Public Facilities	PF	Public Facilities[1]	PF
		Elmwood Correctional Facility[2]	COR
TWC, MXD, GNC, INP, HWS, RSC		Hotels[3]	HOTEL
Park Open Space	POS	NF	
Waterways	WATERWAYS	NF	
Highway Services	HWS	Parcels reviewed and model-based land use designation assigned, as appropriate.	
Town Center	TWC		
Urban Residential	URR		
Parcels with no land use designation	-		

Notes:
1. Includes schools, churches, health facilities, libraries, and fire stations.
2. The correctional facility is categorized as PF in the GP. For modeling purposes, it was given a distinct code.
3. Hotels are categorized under various land uses in the GP. They were identified and assigned a distinct code.

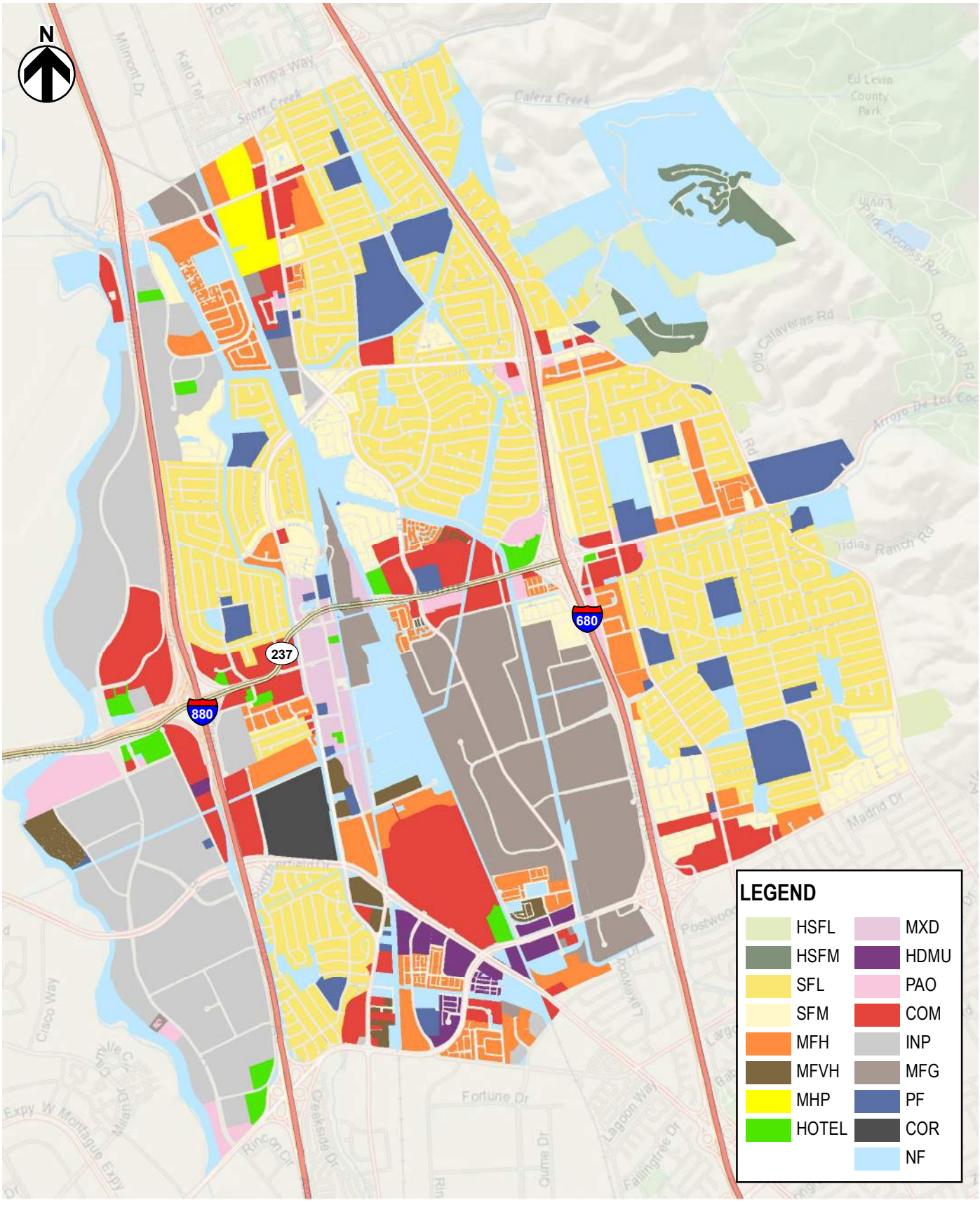


FIGURE 5-1
CITY OF MILPITAS
SEWER MASTER PLAN
MODEL-BASED LAND USE DESIGNATIONS - EXISTING

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5.2 Land Use Designations for Model Analysis – Future Condition

The City has identified "Opportunity Areas" (see **Section 2.1.1**) which refers to parcels identified within the City that may be considered for future redevelopment (see **Figure 2-2**). For modeling and planning purposes, it is important to understand the potential impact redevelopment can have on the wastewater collection system. Not all "Opportunity Areas" had proposed changes in land use.

Similar to the existing condition described in **Section 5.1**, the objective is to assign the model-based land use designation to the parcel according to the type of redeveloped land uses planned/anticipated within the "Opportunity Areas". The future land uses identified in the "Opportunity Areas" were reviewed and assigned the model-based land use designations listed in **Table 5-1** according to the anticipated use, density, and wastewater flow rates.

Table 5-2 summarizes the changes in land uses from the existing condition within "Opportunity Areas" that are proposed for redevelopment. The table identifies the redeveloped future land use, the assigned model-based land use designation, and the corresponding area. Areas listed represent the acreage within each opportunity area that is changing and does not include areas within "Opportunity Areas" where land use remains the same. **Figure 5-2** displays the identified "Opportunity Areas" where land use has changed, and the corresponding model-based land use designation within those areas.

Table 5-2: Summary of Future Land Use Updates

"Opportunity Areas"	Proposed Future LU	Model-Based LU	Area (acres)
Sunny Hills Neighborhood/Commercial Center	NCMU	HDMU	19.9
California Circle	NCMU	HDMU	54.1
	HDR	MFH	18.3
Landess Neighborhood/Commercial Center	NCMU	HDMU	38.0
Calaveras & North Park Neighborhood/Commercial Center	NCMU	HDMU	28.3
Milpitas Town Center	HDR	MFH	38.1
Southwestern Employment Area	BPR&D	PAO	488.3
Jacklin & 680 Neighborhood/Commercial Center East	NC	COM	8.0
Jacklin & 680 Neighborhood/Commercial Center West	NC	COM	6.4
Jacklin Neighborhood/Commercial Center	NC	COM	9.8
Midtown Specific Plan	Various	Various	484.3
Metro Specific Plan (aka TASP)	HDR	MFH	212.5
	NC	COM	85.4

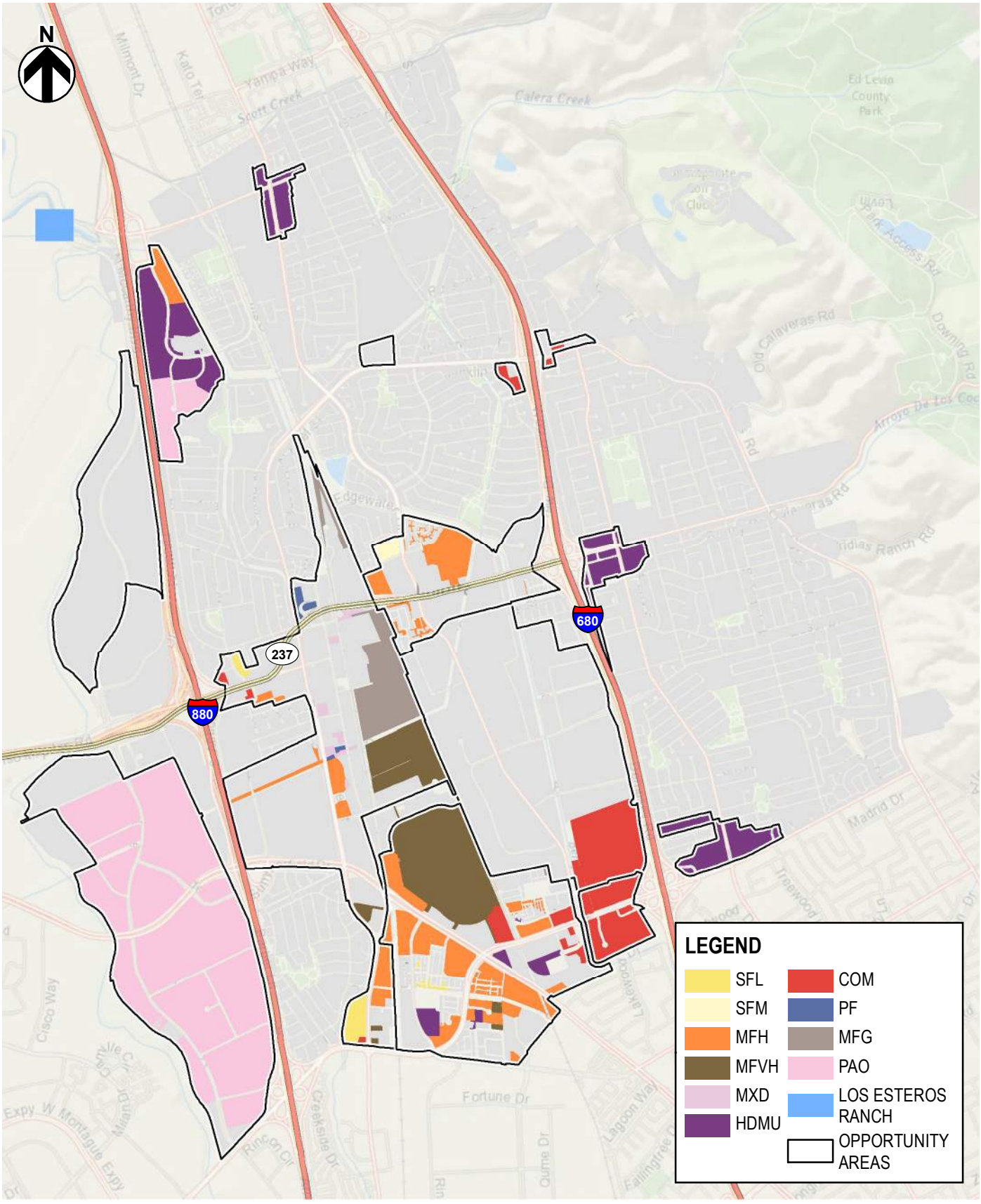


FIGURE 5-2
CITY OF MILPITAS
SEWER MASTER PLAN
MODEL-BASED LAND USE DESIGNATIONS - FUTURE

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SECTION 6 – HYDRAULIC MODEL DEVELOPMENT

This section summarizes the history of the City's hydraulic model and describes the process of developing and building the most up-to-date version of the hydraulic model.

6.1 Model System Development

The City's original hydraulic model was built using SANSYS as part of the 1994 master planning effort. As part of the 2002 master planning effort, the hydraulic model was converted to Hydra® software version 6.0 by Pizer, Inc. The Hydra® model was subsequently reviewed, updated, and calibrated as part of the 2004 and 2009 Master Plan Updates.

For this Master Plan, HydroScience recommended InfoWorks ICM by Innovyze® (InfoWorks) to model the City's collection system because it is a fully dynamic software that uses the full set of St. Venant equations to model and evaluate complicated hydraulic systems. This recommendation was based on the knowledge that the City's collection system includes 177 flow splits, which significantly increases the complexity of the system and model.

As part of the model build, a review and update of the City's GIS was conducted using an extensive database of record drawings. A summary of the updates made to the GIS is included in **Appendix C**.

The updated GIS sewer system consists of 160 miles of gravity sewer main comprised of approximately 3,500 pipe segments and 3,000 manholes. For model development, the network was pared down to approximately 2,600 pipe segments and 2,400 manholes. All pipes 8-inches and larger were included, as well as all smaller pipes that included flow splits as they can affect the direction and quantity of flow downstream. The purpose of trimming the system is to reduce complexity of the system while maintaining all critical infrastructure. Smaller diameter pipes are generally less critical to the system operation. Including all pipe segments increases the complexity of the model but does not necessarily increase the value of the model and its analysis.

6.1.1 Model Network Development

The first step in developing the model network was to identify all pipelines for inclusion in the model. Using GIS, the pipe database was queried to select all pipes 8-inches and larger. To ensure the accuracy of flow representation, smaller pipelines downstream of flow splits were hand-selected where those flow splits would affect the direction and volume of downstream flow. Where there were unselected pipe segments between selected pipes, presenting potential gaps, those pipes were also hand selected for inclusion in the model to ensure network continuity. Pipes that had a listed diameter of "0" inch or an unknown diameter were the most common reason for unselected pipe segments.

The second step in developing the model network was to identify all manholes for inclusion in the model. Using GIS, all manholes that coincided with the selected pipelines were also selected. There were some instances where there was no manhole at the end of a terminal pipe segment

or at the junction between two pipe segments. These instances were most commonly one of the following two conditions:

1. Where a terminal pipe segment has a cleanout or flushing invert at its upstream end that was not represented in GIS; or
2. Where two pipe segments were built at different times and were directly connected without a manhole at the junction.

To remedy this, manhole placeholders were inserted at these locations for inclusion in the model network to prevent errors during the import into InfoWorks. These placeholders were given unique identification numbers to differentiate them from existing manholes.

The Venus Way LS was also included in the model network and the Main LS was modeled as the outfall. **Figure 6-1** shows the final model network that was imported into InfoWorks.

Approximately 63% of the manholes did not have rim elevations documented in the GIS. To reconcile this data gap, regional digital elevation model (DEM) data was downloaded from the USGS web database to obtain surface elevations at each manhole. Two separate DEM files were needed for coverage of the entire modeled collection system. The DEM resolution for most of the collection system (over 99% of manholes) was 1/9 arc-second (approximately 10 feet). For the remaining (~25) manholes, rim elevations were supplemented by a 1/3 arc-second (approximately 30 feet) resolution DEM. **Figure 6-2** shows the coverage for the 1/9 arc-second DEM data set.

DEM surface elevations were given in reference to the North American Vertical Datum of 1988 (NAVD 88). Most of the data in the City's existing GIS is based on the National Geodetic Vertical Datum of 1929 (NGVD 29) due to the age of the system. For consistency, NGVD 29 was established as the reference datum in the hydraulic model. To adjust from NAVD 88 to NGVD 29, the following conversion, referenced from City record drawing #2-1228, was applied:

$$\text{NGVD 29} = \text{NAVD 88} - 2.743 \text{ ft}$$

This equation is a simplified representation of conversion between the two datums but is generally representative within the bounds of the City. Small differences are not expected to affect the hydraulic model results as the relative elevation differences that affect inverts and slopes would be unchanged.

Generally, rim elevations contained in the GIS were used and supplemented by DEM where no rim elevation was documented. Existing rim elevations were compared to DEM elevations for confirmation. The average discrepancy between those listed in GIS and those calculated using the DEM data was approximately 0.8 ft. The cases that had the largest discrepancies were reviewed against record drawings and adjusted, as necessary.

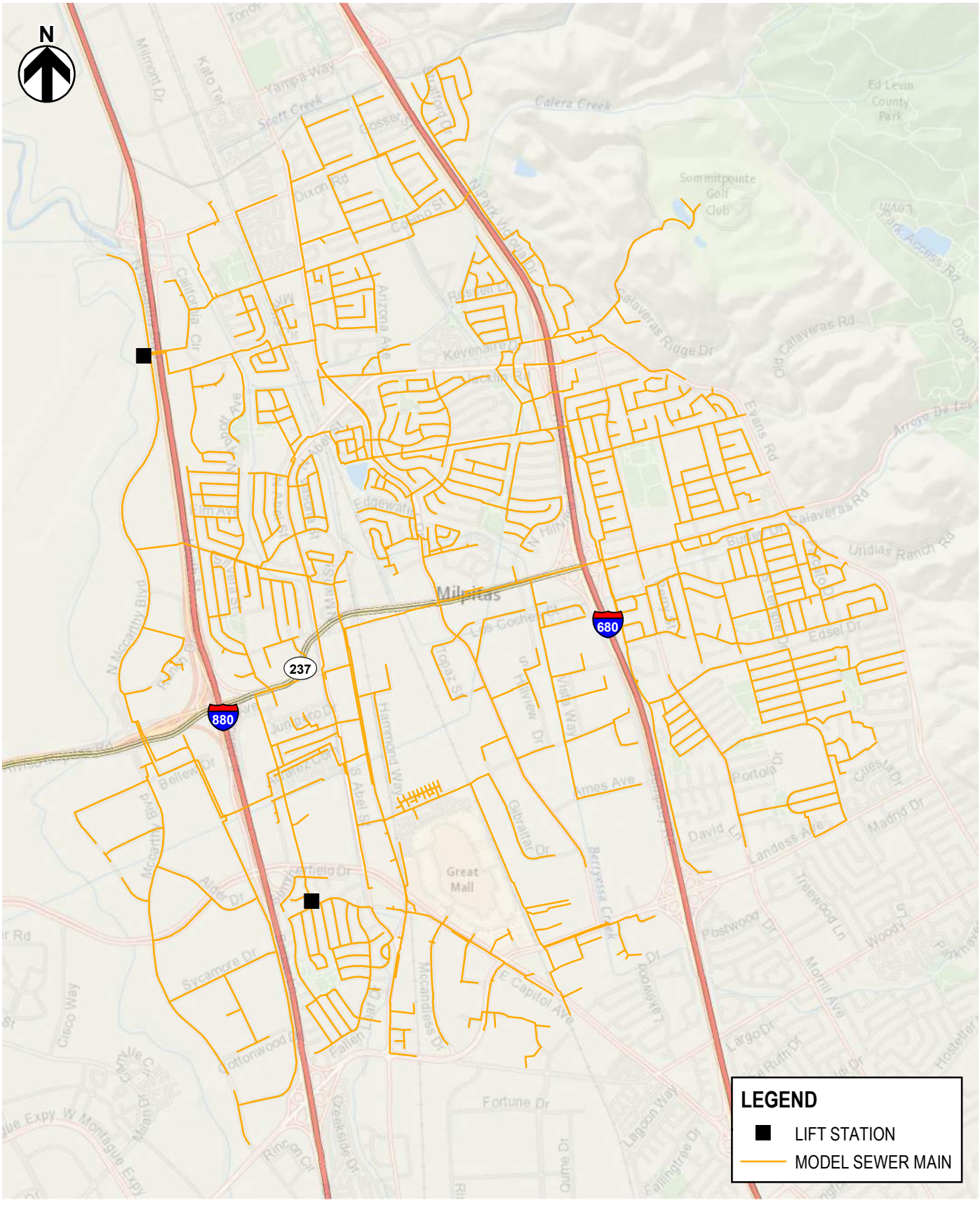


FIGURE 6-1
CITY OF MILPITAS
SEWER MASTER PLAN
MODEL NETWORK

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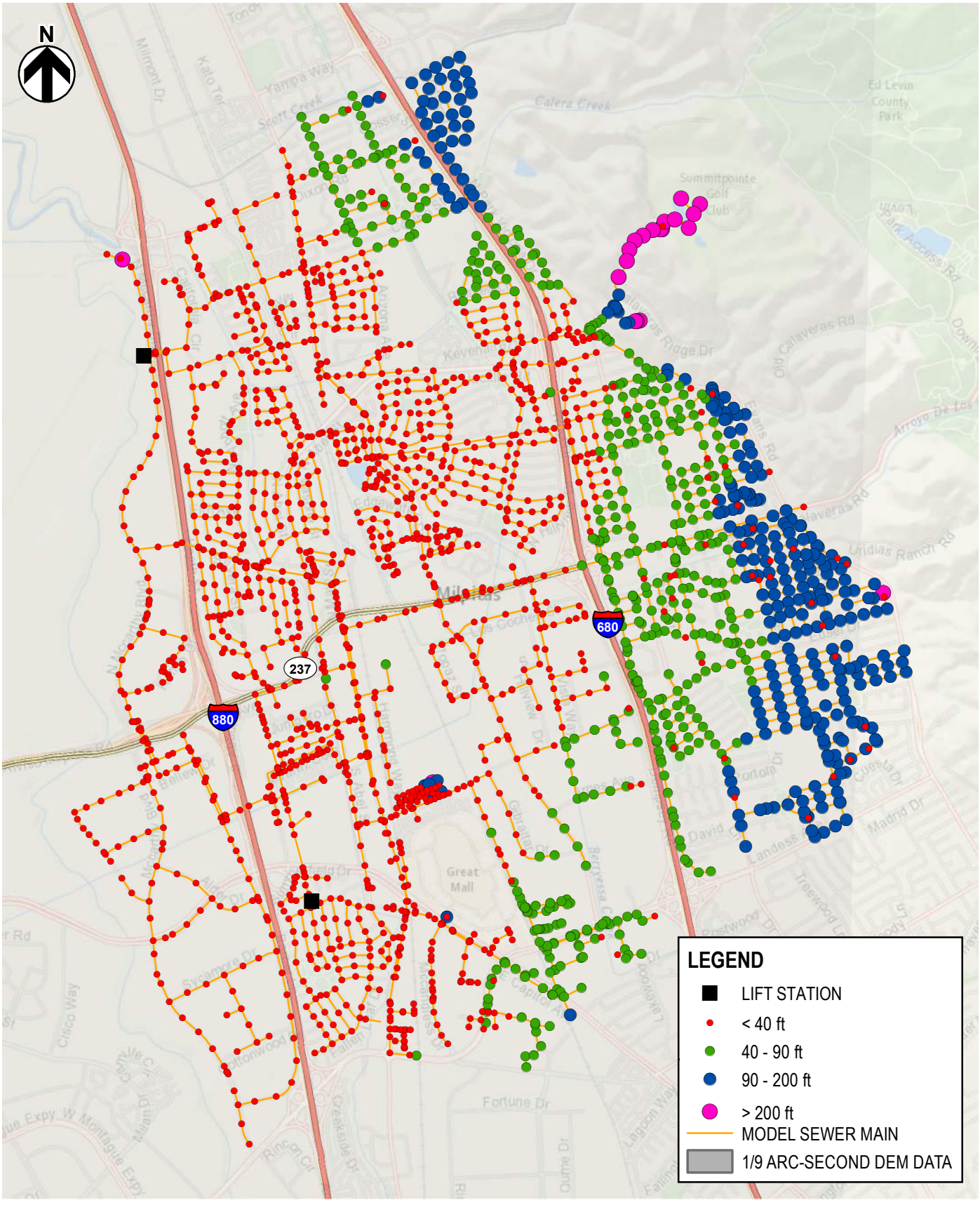
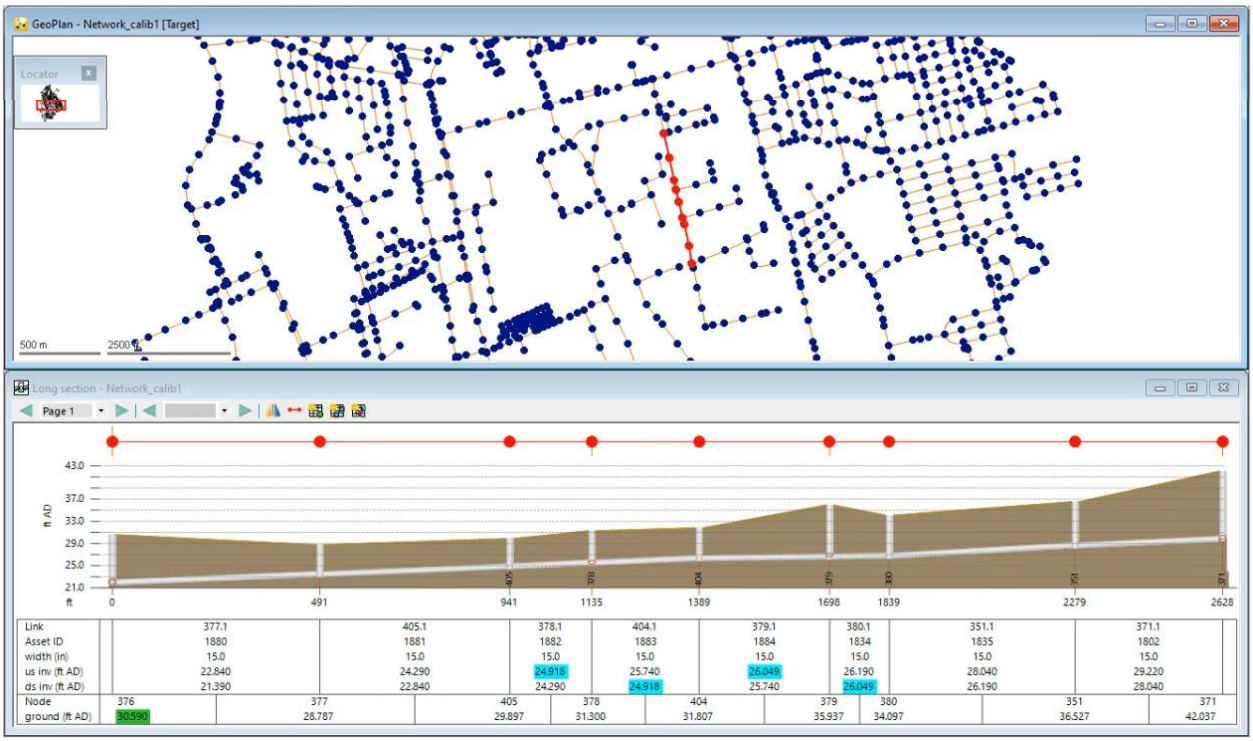


FIGURE 6-2
CITY OF MILPITAS
SEWER MASTER PLAN
MANHOLE RIM ELEVATIONS

HydroScience

Figure 6-3: InfoWorks Profile View



Network Review

Selected elements were imported into InfoWorks to build the hydraulic model. It is noted that the element selection and import process was iterative as errors in network continuity were identified and resolved. Upon import, InfoWorks will detect any errors when validating the network. Most validation errors encountered were related to network discontinuity and elements with missing data. Where possible, missing data, such as invert elevations or pipe diameters, were interpolated using surrounding data and the *Inference Tool* in InfoWorks.

Once all validation errors were reconciled, the system was analyzed using the pipeline *Profile View* (see **Figure 6-3**). If additional analysis was required, record drawings or CCTV were reviewed, where available. Significant adjustments were made based on differing datums referenced in the record drawings. Each update to the model data was marked with a data flag and different flags were created to represent the varying reasons for the updates. **Figure 6-4** shows the various data flags that were developed and used during the model network review process.

6.1.2 Load Allocation

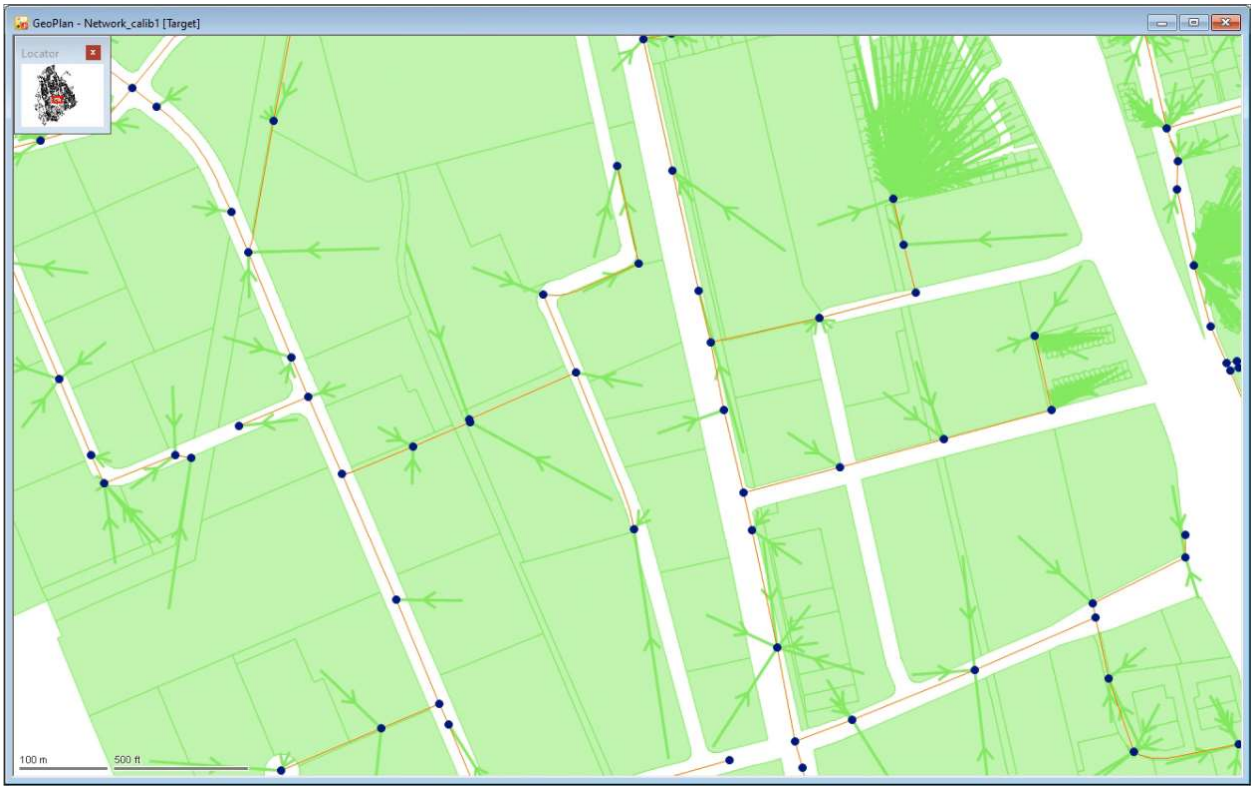
Parcel loads were initially assigned to the nearest manhole. Quality control was performed alongside the map of the sub-basins to verify that the load allocations matched the actual flow path; adjustments were made as necessary. **Figure 6-5** is a sample showing the load allocation from the parcel centroid to the corresponding receiving manhole.

Figure 6-4: InfoWorks Data Flags

Name	Display Colour	Obsolete	Description
#A		☐	Asset Data
#D		☐	System Default
#G		☐	Data From GeoPlan
#I		☐	Model Import
#S		☐	System Calculated
#V		☐	CSV Import
CCTV		☐	Estimated from CCTV footage
DEM		☐	DEM elevation source
DTM		☐	Datum adjustment
DWG		☐	Drawing elevation source
INT		☐	Interpolated elevation
NRBY		☐	Rim based on near-by rims
RLV		☐	Relative adjustment based on drawing
SIPH		☐	Siphon
SLP		☐	Calculated from slope
UPD		☐	Updated during calibration

Notes:
1. Descriptions that are highlighted gray are system defaults.

Figure 6-5: Sample Load Allocation



6.2 Scenario Development

InfoWorks can create many different scenarios within the same model. The following scenarios were developed and analyzed:

1. **Existing Dry Weather:** Used to calibrate the hydraulic model to dry weather conditions and to evaluate hydraulic deficiencies under existing dry weather conditions. Two alternatives were evaluated under this scenario:
    - With obstructions: includes adjustments made to account for flow obstructions as described in **Section 7.3.4**. This scenario was used for dry weather calibration.
    - Design conditions: inverts at flow splits with obstructions returned to the elevations they are designed to operate at. This scenario assumes the flow obstructions have been removed/cleaned and the flow splits are operating as intended. This scenario was used to evaluate hydraulic deficiencies under existing dry weather conditions.
2. **Existing Wet Weather:** Used for calibration of wet weather conditions. This scenario accounts for an elevated water table and R-factors to model wet weather conditions and to evaluate hydraulic deficiencies under existing wet weather conditions. Two alternatives were evaluated under this scenario:
    - With obstructions: includes adjustments made to account for flow obstructions as described in **Section 7.3.4**. This scenario was used for wet weather calibration.
    - Design conditions: inverts at flow splits with obstructions returned to the elevations they are designed to operate at. This scenario assumes the flow obstructions have been removed/cleaned and the flow splits are operating as intended. This scenario was used to evaluate hydraulic deficiencies under existing wet weather conditions.
3. **Future Dry Weather:** Land use categories updated based on future planned land use changes in “Opportunity Areas” (see **Sections 2.1.1** and **5.2**) and dry weather GWI included. This scenario was used to evaluate hydraulic deficiencies under future dry weather conditions assuming flow obstructions are addressed and no longer present.
4. **Future Wet Weather:** Land use categories updated based on future planned land use changes in “Opportunity Areas” and GWI adjusted to match wet weather calibration. This scenario was used to evaluate hydraulic deficiencies under future design storm/wet weather conditions assuming flow obstructions are addressed and no longer present.

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SECTION 7 – WASTEWATER FLOW ANALYSIS

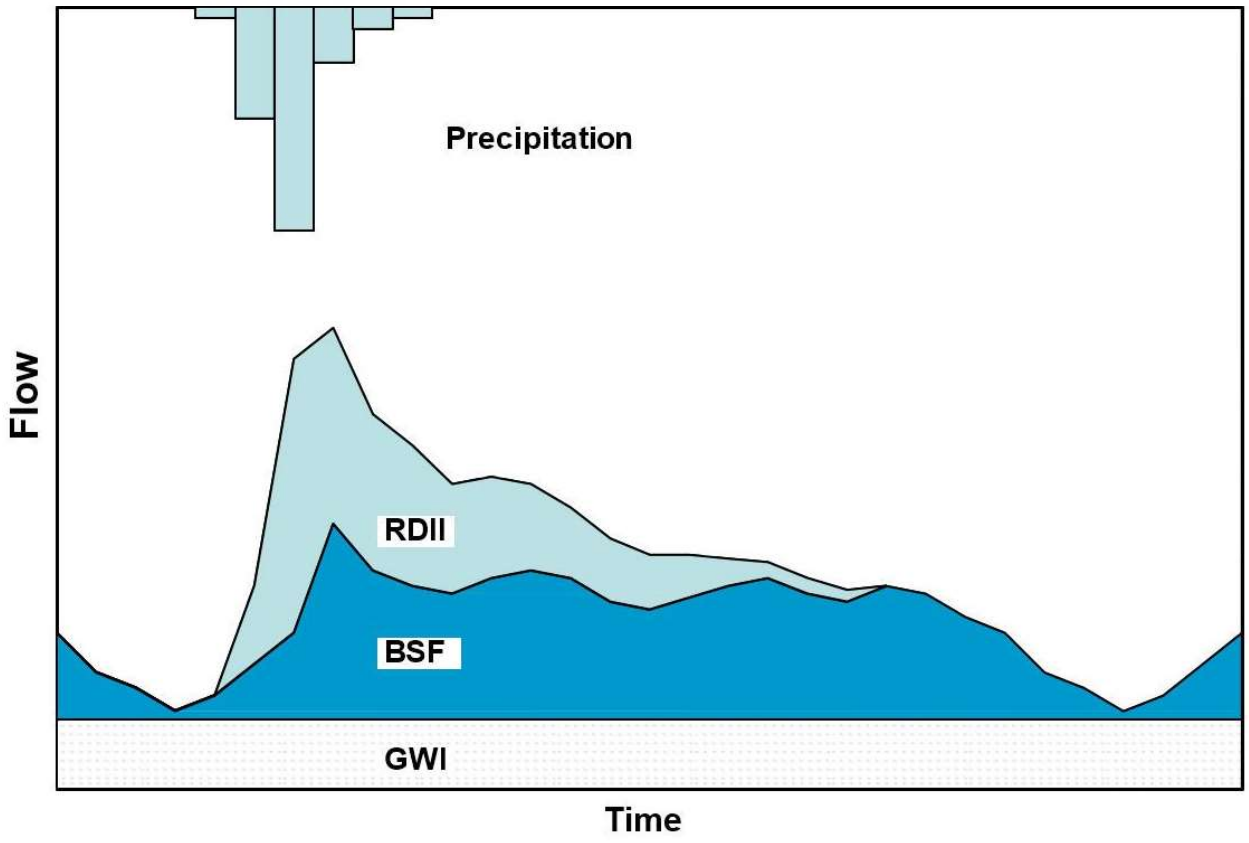
For this study, the flow monitoring data collected by the City was used for model calibration. This section summarizes typical wastewater flow components, summarizes the City's flow monitoring program, describes the basis for developing design wastewater flows used to model the City's collection system, and presents the results of the model calibration.

7.1 Typical Wastewater Flow Components

Wastewater flows consist of three primary flow components: groundwater infiltration (GWI), base sanitary flow (BSF), and rainfall dependent inflow and infiltration (RDI/I) as illustrated in **Figure 7-1**.

- **GWI** – For modeling purposes, this document defines GWI as any, and all sources of constant flow. GWI is comprised both of groundwater infiltration and any other constant flow that is generally detected during low flow periods. Constant flows can be associated with leaking faucets, running toilets, and/or manufacturing or industrial processes, etc. This can also capture any meter reading variance at extremely low flows. GWI is seasonal where dry

Figure 7-1: Typical Wastewater Flow Components



Source: Rainfall Dependent Inflow and Infiltration from the EPA SWMM 5 Hydrology Manual

weather GWI (summer) is typically less than wet weather GWI (winter) due to the elevated water table that occurs during the rainy season.

- **BSF** – This represents the direct diurnal flow contributions from customers. This is represented by a combination of unit flows and diurnal patterns, which is further detailed in **Section 7.3** below.
- **RDI/I** – This is the volume of rainfall that enters the wastewater collection system through various avenues (holes in manhole covers, elevated water table, etc.).

To understand hydraulic capacity of a wastewater collection system, both dry weather flow (DWF) and wet weather flow (WWF) conditions are evaluated. DWF includes both dry weather GWI and BSF while WWF includes wet weather GWI, BSF, and RDI/I.

The flow monitoring and rainfall data collected by the City was evaluated for each of the components, and this process is described in the following sections.

7.2 Flow Monitoring Program

The City contracted with ADS Environmental Services (ADS) to perform dry and wet weather flow monitoring within the City collection system. ADS installed 23 ADS FlowShark Triton flow meters throughout the City and monitored flow between November 16, 2019 and March 9, 2020. This type of meter is a velocity flow meter installed in collection system manholes to measure both depth and velocity at either a 5- or 15-minute intervals for the duration of the flow monitoring period. Depth, velocity, and flow (calculated using the Continuity Equation) were presented in the *Milpitas Sewer Flow Monitoring Report 2019-2020* (ADS Report) in the form of daily averages, and additional data was provided separately in the form of hourly averages. The ADS Report is included as **Appendix B**.

Rain gauges were also installed in two distinct locations for the duration of the monitoring period – one was placed on the valley floor at the Gibraltar Reservoir (RG01) and the other was placed on the hillside near the Summitpointe Golf Club (RG02). Depth of precipitation was presented in the ADS Report in the form of hourly averages to the nearest hundredth of an inch. The raw data was recorded in 5-minute increments to the nearest hundredth of an inch.

The locations of all flow meters and rain gauges are shown in **Figure 7-2**. Flow meters are identified according to the GID of the manhole in which they were installed.

Table 7-1 summarizes the recorded depths, velocities, and flows for each flow meter.

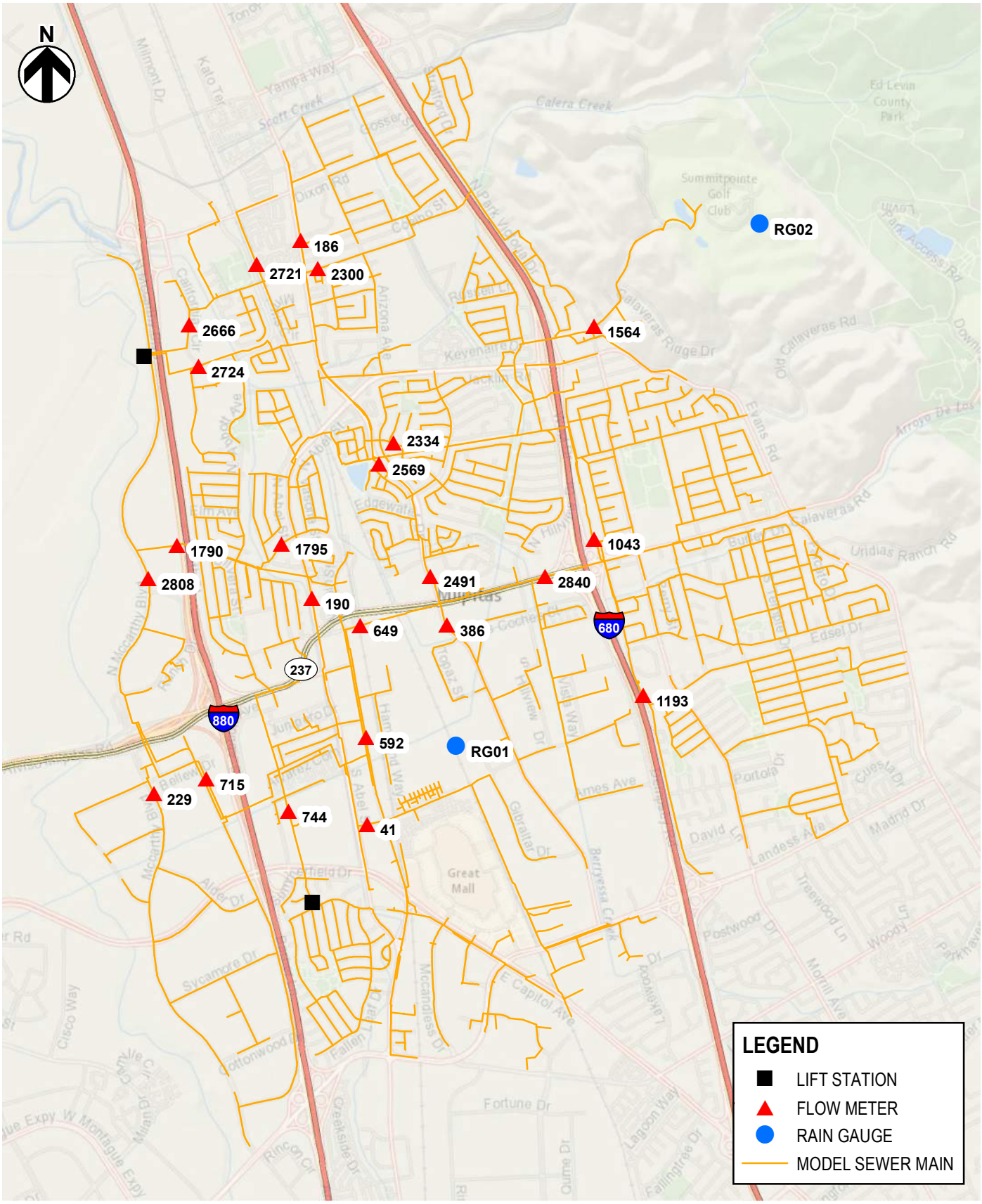


FIGURE 7-2
CITY OF MILPITAS
SEWER MASTER PLAN
FLOW MONITORS AND RAIN GAUGES

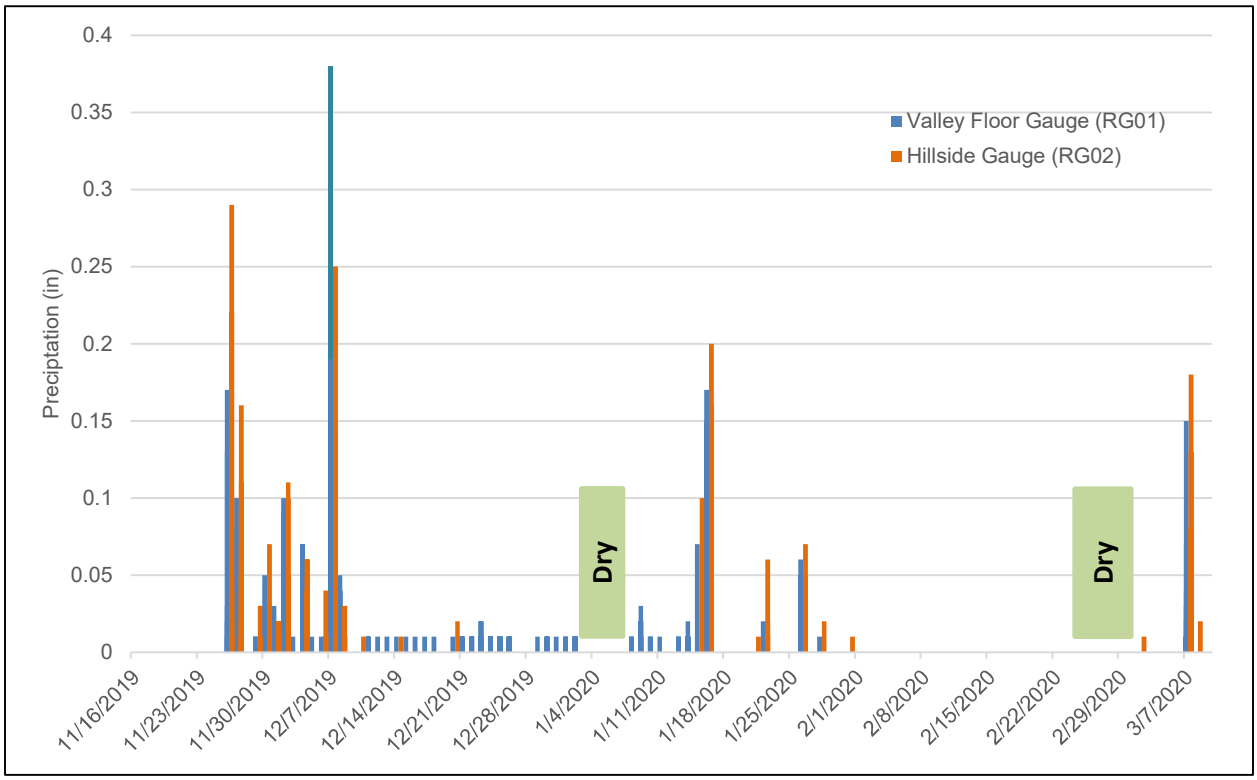
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Table 7-1: Flow Monitoring Data Summary

Flow Meter	Nominal Pipe Dia. (in)[1]	Depth (in)[2]			Velocity (ft/s)[2]			Flow (MGD)[2]		
		Average	Minimum	Maximum	Average	Minimum	Maximum	Average	Minimum	Maximum
41	24	6.515	4.000	9.340	1.543	0.780	2.060	0.708	0.189	1.310
186	8	1.540	0.780	2.060	1.540	0.780	2.060	1.540	0.780	2.060
190	18	2.465	1.820	3.200	0.959	0.500	1.320	0.093	0.031	0.160
226	21	3.466	1.810	5.100	0.591	0.240	0.840	0.103	0.021	0.232
386	16	6.427	5.190	9.000	1.375	1.060	1.880	0.511	0.291	1.071
592[3]	18	3.682	1.280	5.620	1.534	0.430	2.130	0.276	0.016	0.644
649	21	8.655	6.660	11.190	1.236	0.860	1.600	0.776	0.406	1.361
715	30	0.959	0.500	1.320	0.959	0.500	1.320	0.959	0.500	1.320
744	15	0.094	0.032	0.160	0.094	0.032	0.160	0.094	0.032	0.160
1043	21	5.252	3.420	7.270	3.999	2.220	4.800	1.263	0.378	2.277
1193	21	0.590	0.240	0.840	0.590	0.240	0.840	0.590	0.240	0.840
1564	8	0.590	0.240	0.840	0.590	0.240	0.840	0.590	0.240	0.840
1790	30	0.590	0.240	0.840	0.590	0.240	0.840	0.590	0.240	0.840
1795	27	9.483	6.360	12.140	0.399	0.220	0.510	0.300	0.091	0.460
2300	10	1.647	1.020	2.350	1.402	0.450	2.690	0.056	0.009	0.154
2334	12	2.123	1.620	2.580	2.770	1.460	3.460	0.175	0.063	0.263
2491	15	2.345	1.110	3.850	2.356	0.510	3.700	0.216	0.014	0.592
2569	21	6.434	4.390	8.470	1.051	0.540	1.600	0.441	0.148	0.828
2666	18	8.746	5.850	20.960	1.741	0.880	2.160	0.949	0.385	1.371
2721	8	6.229	3.950	7.900	1.053	0.590	1.420	0.198	0.091	0.312
2724	42	18.342	13.520	22.120	0.779	0.510	1.000	2.041	0.876	3.205
2808	36	8.737	5.860	11.120	2.257	1.320	2.920	2.007	0.643	3.438
2840[4]	15	1.995	1.810	2.250	1.384	1.080	1.660	0.087	0.060	0.120

Notes:
1. Pipe diameter listed in GIS. ADS measured internal pipe diameters in the field which are recorded in the ADS Report. Nominal pipe diameters listed in GIS were used in the hydraulic model.
2. These values are calculated using hourly averages. These may differ slightly from the ADS Report since those values are based on all field data collected.
3. Initially identified as FM 602 in the ADS Report, was placed further downstream in manhole GID 592.
4. FM 2840 was directly downstream of a flow diversion structure which diverts wastewater flows away from the flow meter, resulting in extremely low recorded flows at this site.

Figure 7-3: Rainfall during Monitoring Period



Rainfall measured by both rain gauges for the duration of the monitoring period is shown in **Figure 7-3**. The flow monitoring program was designed to capture both WWF and DWF, thus, the flow meters and rain gauges provided the data necessary to estimate both dry weather and wet weather GWI and RDI/I.

The following dry weather and wet weather periods, as shown on **Figure 7-3**, were identified and used for the model calibration and analysis. Dry weather period 1 and Storm event 1 were used primarily, unless there was insufficient data for the flow meter, then Dry weather period 2 or Storm event 2 was used:

- Dry weather period 1: February 24 – March 3, 2020
- Dry weather period 2: January 4 – 8, 2020
- Storm event 1: December 7, 2019
- Storm event 2: November 26, 2019

The maximum rainfall from either of these days are listed in **Table 7-2**, along with the National Oceanic and Atmospheric Administration (NOAA) precipitation frequency estimates for Milpitas, CA. The largest storms were between a 1- and 2-year storm or smaller than a 1-year storm frequency.

Table 7-2: NOAA Rainfall Frequency vs. Rain Gauge Data

NOAA Frequency Estimates[1]					Rain Gauge Data[2]	
Duration	1-year	2-year	5-year	10-year	RG01	RG02
1-hr:	0.34	0.43	0.56	0.66	0.38	0.29
2-hr:	0.50	0.63	0.80	0.95	0.57	0.51
6-hr:	0.85	1.06	1.36	1.62	0.64	0.76
12-hr:	1.10	1.40	1.82	2.18	0.66	0.92
24-hr:	1.37	1.79	2.36	2.83	0.95	1.30

Notes:
1. NOAA Atlas 14 Volume 6 Version 2 precipitation frequency estimates for Milpitas, CA
2. Maximum Rain by Rain Gauge (Total Inches by Duration)

7.2.1 Flow Meter Sewer Sub-Basins

The flow meters served as the basis for the delineation of tributary sewer sub-basins in the City for calibration purposes. Generally, for sub-basins located at the most upstream ends of the collection system, all flow from the sub-basin is captured by a single flow meter which in turn flows to downstream sub-basins. Where there are flow splits, flow can be directed to more than one downstream sub-basin so it is important to understand the flow behavior at each flow split in order to properly delineate sub-basin boundaries.

The identification of all flow splits (see **Section 3.1.1**) was imperative to track the flow through the system. They were each reviewed and identified as either a “non-critical” or “critical” flow split, as follows:

- **Non-Critical Flow Split:** In these cases, the flow is split then returns to the same sub-basin or flow path before it reaches the downstream flow meter. These flows splits and flow are fully contained within a single subbasin.
- **Critical Flow Split:** These are flow splits that divert flow to two different downstream sub-basins (or flow meters). All critical flow splits were evaluated using the City’s most current GIS geodatabase and the City’s extensive library of as-built record drawings.

There are 177 identified flow splits, of which five are considered critical, as shown in **Figure 7-4**. For critical flow splits, the ratio of flow was estimated based on the slopes and diameters of the outgoing pipes.

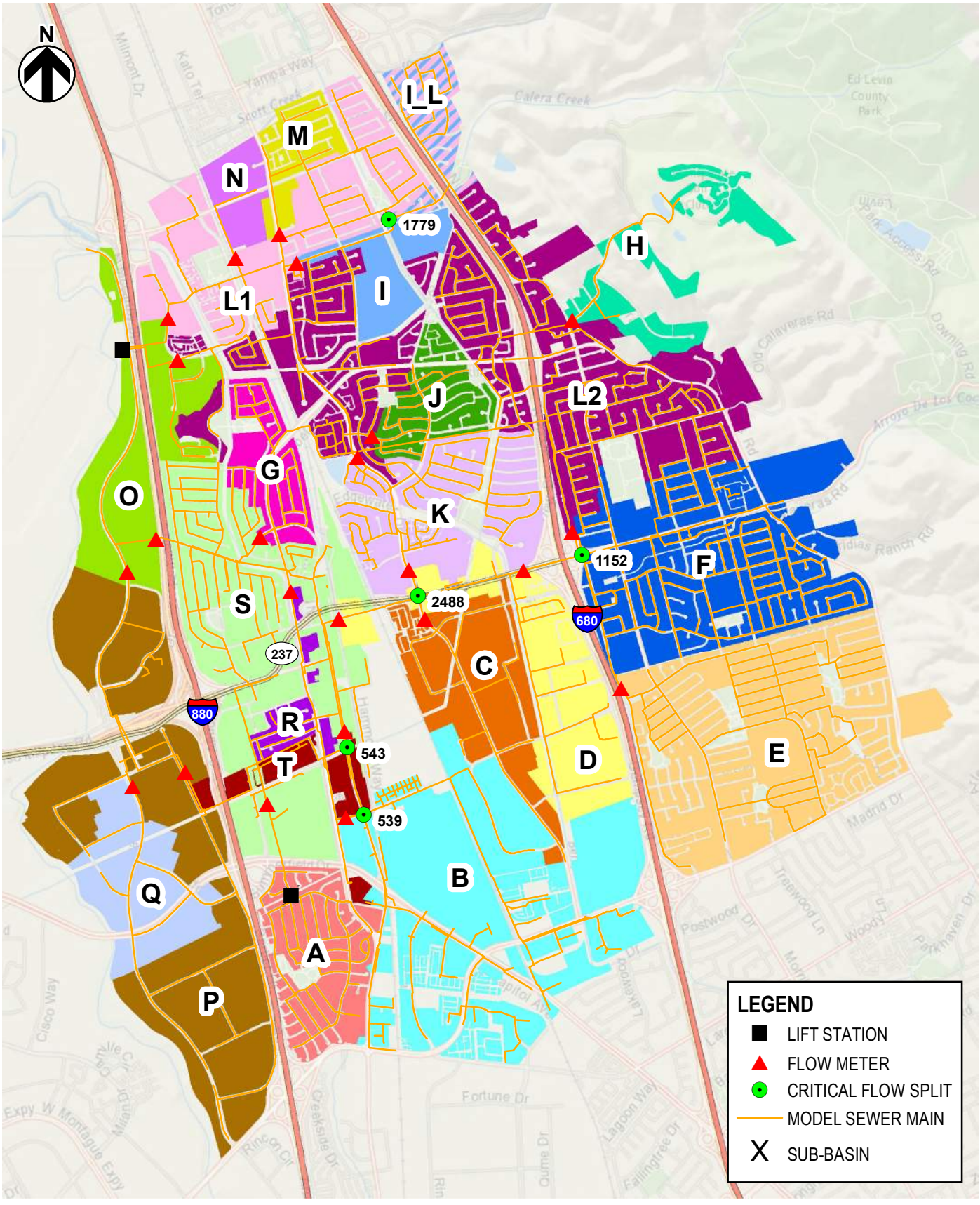


FIGURE 7-4
CITY OF MILPITAS
SEWER MASTER PLAN
SUB-BASIN DELINEATION

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The results of the sub-basin delineation are displayed on **Figure 7-4**. The flow meters immediately upstream of each sub-basin and those that are capturing the flow of each sub-basin are listed in **Table 7-3**. **Figure 7-5** is a diagram summarizing flow through the sub-basins and the flow meters in the entire system, including all critical flow splits.

Table 7-3: Sub-Basins and Corresponding Flow Meters

Sub-Basin	Upstream Flow Meters	Capturing Flow Meters
A	N/A	744
B[1]	N/A	41
C	N/A	386
D	386 & 2840	649 & 2491
E	N/A	1193
F	1193	1043 & 2840
G	N/A	1795
H	N/A	1564
I[2]	N/A	2300
J	N/A	2334
K	2491	2569
L1[2]	186, 2721	2666
L2	1043, 1564, 2300, 2334, & 2569	2724
M	N/A	186
N	N/A	2721
O	1790, 2666, 2724, & 2808	OUTFALL
P	229 & 715	2808
Q	N/A	229
R	N/A	190
S	190, 592, 649, 744, & 1795	1790
T	41	592 & 715

Notes:
1. Flow from sub-basin B splits at MH 539. FM 41 captures a portion of the flow from sub-basin B and the remainder continues downstream to sub-basin T.
2. Flow from parcels upstream of MH 1776 splits and flows to sub-basins I and L1 downstream.

A summary of the various contributing land uses within each sub-basin is shown in **Table 7-4**. The area of each parcel was calculated using the geometry calculator tool in GIS.

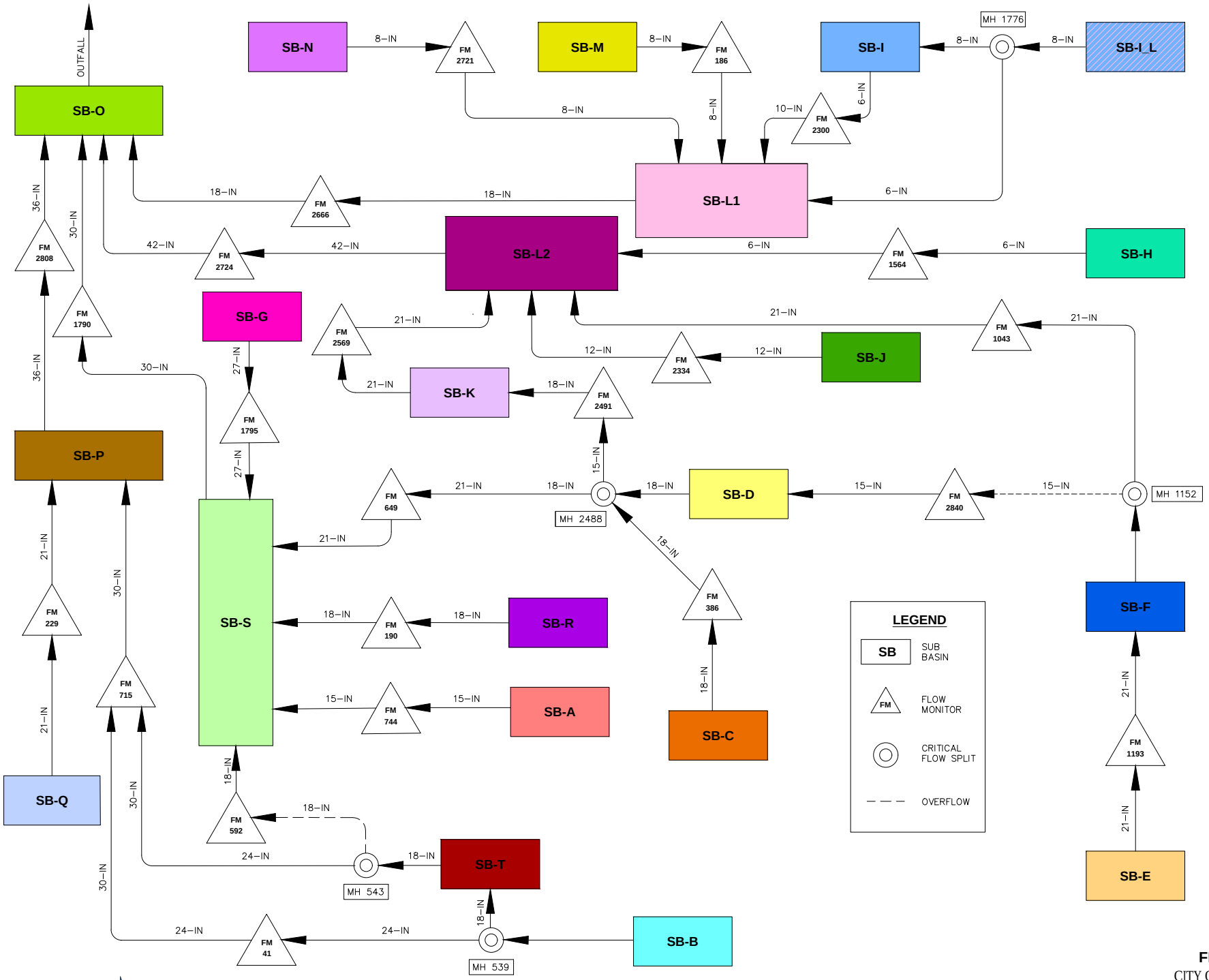


FIGURE 7-5
CITY OF MILPITAS
SEWER MASTER PLAN
SCHEMATIC FLOW DIAGRAM

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Table 7-4: Total Acreage of Each Land Use by Sub-Basin

LU Code	A	B[1]	C	D	E	F	G	H	I[2]	J	K	L1[2]	L2	M	N	O	P	Q	R	S	T[1]	Total
HSFL (DU)[3]	-	-	-	-	22 (17)	9 (4)	-	39 (8)	3 (3)	-	-	2 (2)	71 (22)	-	-	-	-	-	-	-	-	146 (56)
HSFM (DU)[3]	-	-	-	-	-	-	-	67 (107)	-	-	-	-	-	-	-	-	-	-	-	-	-	67 (107)
SFL (DU)[3]	115 (982)	-	-	-	227 (1,586)	228 (1,500)	50 (331)	4 (9)	42 (208)	72 (490)	86 (571)	108 (716)	320 (2,028)	32 (229)	-	-	-	-	12 (101)	131 (868)	-	1,427 (9,619)
SFM	-	-	-	17	87	8	13	-	-	7	32	11	67	6	-	7	-	-	1	10	-	266
MFH	-	93	8	3	25	52	1	-	-	-	6	57	46	-	12	-	-	-	7	15	48	373
MFVH	3	20	1	-	-	-	-	-	-	-	2	-	-	-	-	-	19	2	-	-	27	72
MHP	-	-	-	-	-	-	-	-	-	-	-	13	-	-	39	-	-	-	-	-	-	52
HOTEL	-	5	-	-	-	1	-	-	-	-	14	3	-	-	-	3	28	-	-	7	2	62
MXD	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	12	45	10	67
HDMU	-	46	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18	64
PAO	-	-	-	10	1	6	-	-	-	-	9	2	6	-	-	-	54	-	-	-	-	87
COM	13	108	12	17	39	21	2	-	-	-	38	15	18	16	4	9	86	-	1	59	45	502
INP	-	5	-	-	-	-	-	-	-	-	-	21	5	-	-	188	347	148	-	22	2	738
MFG	-	150	171	154	-	-	-	-	-	-	-	24	12	-	-	-	2	-	-	25	50	588
PF	7	6	-	7	54	89	12	-	36	-	<1	10	62	3	-	-	1	1	1	17	5	311
COR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	62	-	62
Total	**138**	**432**	**192**	**210**	**454**	**414**	**78**	**110**	**81**	**79**	**187**	**266**	**606**	**57**	**55**	**207**	**537**	**151**	**34**	**393**	**207**	**4,889**

Notes:
1. Flow from sub-basin B splits at MH 539. Areas are based on the estimate that 75% of flow from sub-basin B parcels flow to meter 41, and 25% flow from these parcels downstream to sub-basin T.
2. Areas are based on the estimate that 60% of parcels upstream of flow split at MH 1776 flows to sub-basin I, and 40% flows to sub-basin L1.
3. HSFL, HSFM, and SFL are analyzed based on number of dwelling units in UF factor analysis with the assumption that there is one dwelling unit per parcel.
4. The City encompasses 8,680 acres. The area contributing sanitary flows is 4,884 acres. Non-contributing areas include park, streets, railroads, waterways, and other open spaces. Only parcels contributing sanitary flows are included in this table.

7.3 Dry Weather Flow (DWF)

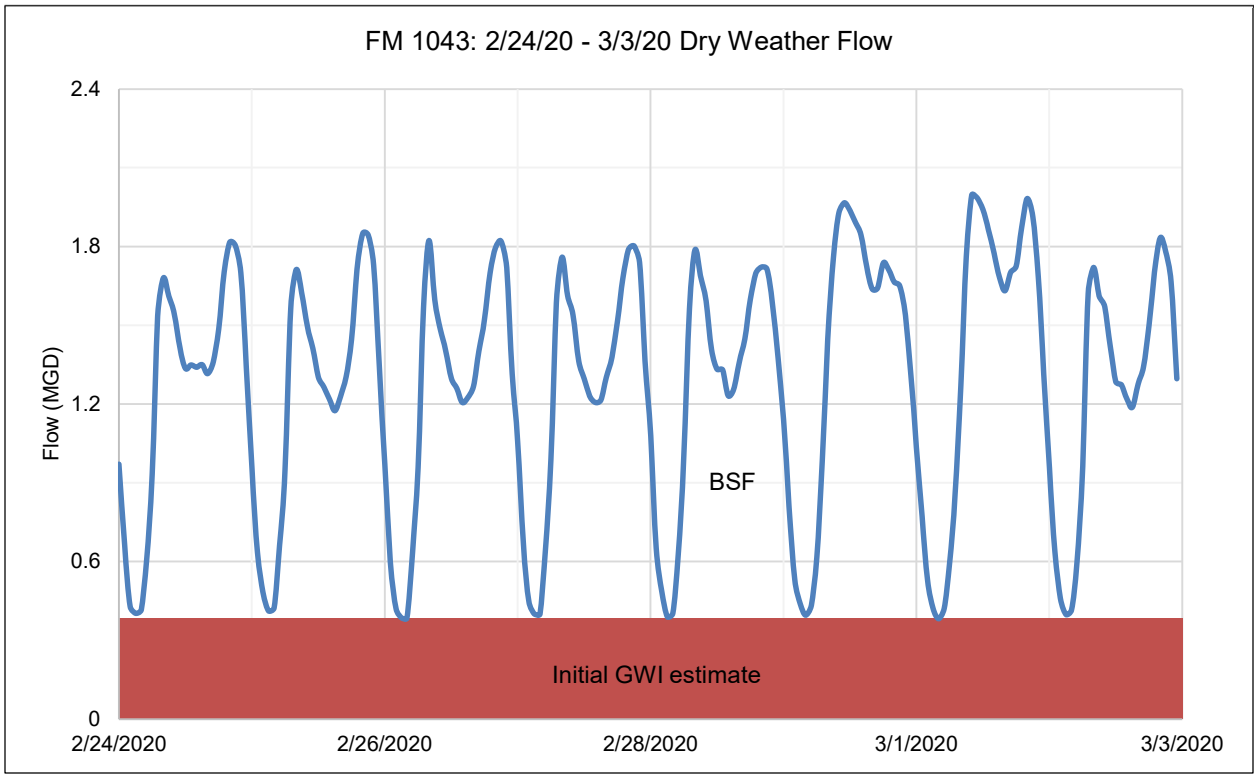
The dry weather periods were analyzed to establish dry weather GWI and BSF inclusive of the diurnal patterns for groups of land uses. The process for developing each of the components and the results are discussed below.

7.3.1 Dry Weather GWI

To isolate BSF, an estimate of GWI was developed. The daily minimum flow was calculated to serve as the initial basis for the GWI estimate. **Figure 7-6** presents an example of the DWF and corresponding estimated GWI for FM 1043. Once GWI estimates were developed for each flow meter, upstream contributing flow meters, outlined in **Table 7-3**, were subtracted to develop an estimate of dry weather GWI by sub-basin. Because GWI is not affected by human activity, and therefore should be the same for weekdays and weekend, there is only one value for GWI.

Using these initial values, a unique unit GWI (gpd/acre) was calculated for each sub-basin by dividing the total estimated GWI by the total contributing sub-basin acreage. This unit GWI was then applied to each parcel by multiplying the parcel area by the unit GWI for the respective sub-basin. These initial GWI estimates served as a starting point for model calibration and were further refined during the calibration using an iterative process, as described in **Section 7.3.4** below.

Figure 7-6: Dry Weather Flow



7.3.2 Base Sanitary Flow (BSF)

The GWI estimates developed for each sub-basin and estimated wastewater flows of identified large dischargers were subtracted from the total weekday DWF for the corresponding sub-basin. The remaining BSF was then used to estimate the UF factors for each land use category. These UF factors represent the average daily contribution to BSF by each parcel according to land use. The analysis was initiated in the most terminal/upstream sub-basins with the fewest land use types, and UF factors were iteratively adjusted until the calculated BSF matched the observed BSF at the corresponding flow meter. UF factors were calibrated to weekday flows; diurnal patterns were then adjusted to account for differences between weekday and weekend discharge patterns.

Large Dischargers

For this analysis, large dischargers are defined as those customers that discharge a disproportionately large volume of wastewater for the parcel size and use type. Large dischargers are typically treated as point sources for hydraulic modeling purposes. The City provided wintertime water use data for January thru March 2019 for non-single family residential, commercial, and industrial customers to estimate wastewater flows. It is preferable to use water data from the winter period to estimate wastewater flows as it is a closer representation of indoor water use, since less water is consumed for irrigation.

Wastewater flows were estimated at approximately 85% of winter water use. Estimated flows greater than 10,000 gpd were linked to a respective parcel, and a unit flow (gpd/acre) was calculated by dividing the total estimated wastewater flow by the total area of the contributing parcel(s). The gpd/acre for each flagged large discharger was compared to the respective land use based UF factor. Each flagged discharger was ultimately classified as a large discharger if the gpd/acre was at least twice the UF factor or more for its respective land use.

Table 7-5 lists the identified large dischargers and **Figure 7-7** shows the location of the associated parcels.

Table 7-5: Large Dischargers

Rank	Location[1]	Estimated Wastewater Flows (gpd) [1]	Model-Based Land Use	Sub-Basin
1	Abel St.	157,678	COR	S
2	Hillview Dr	148,562	MFG	C
3	Ames Ave	74,079	MFG	D
4	Hillview Dr	63,137	MFG	C
5	Abel St	49,821	MFVH	T
6	Main St	39,341	MFH	B
7	Milmont Dr	38,377	MFH	L
8	Dixon Landing Rd	35,426	MFH	L
9[2]	McCandless Dr	32,594	MFH	B
10[2]	Poppylane Townhouses	31,158	MFH	F
11	Murphy Ranch Rd	30,694	MFVH	P

Rank	Location[1]	Estimated Wastewater Flows (gpd) [1]	Model-Based Land Use	Sub-Basin
12	Dixon Landing Rd	30,134	MHP	N
13	Main St	28,747	COM	B
14	Technology Dr	27,964	PAO	P
15	McCarthy Blvd	26,312	INP	P
16	Landess Ave	24,423	COM	E
17	Wilson Way	23,433	MHP	N
18	Milpitas Blvd	23,142	MFG	L
19	Milpitas Blvd	20,737	MFG	C
20	McCarthy Blvd	20,566	INP	P
21	Park Victoria Dr	19,454	MFH	E
22	Main St	16,927	MFVH	A
23	McCarthy Blvd	16,610	INP	P
24	Technology Dr	16,467	PAO	P
25	N Milpitas Blvd	16,315	MFH	N
26	Calaveras Blvd	16,229	COM	F
27	Barber Ln	15,806	COM	T
28	Amalfi Loop	15,335	MFH	B
29[2]	Trento Loop	15,036	MFH	B
30	Turquoise St	13,357	MFG	C
31	Yosemite Rd	11,858	MFG	C
32	Trade Zone Blvd	11,696	MFH	B
33	Ames Ave	11,181	MFG	D
34	Milpitas Blvd	11,044	MHP	L
35	Cypress Dr	10,928	HOTEL	P
36	Park Victoria Dr	10,795	COM	F
37	Calaveras Blvd	10,616	COM	D
38	Milmont Dr	9,664	COM	L
Total	**-**	**1,175,643**	**-**	**-**

Notes:
1. Source: January-March 2019 water meter customer billing data provided by the City multiplied by 85% - assumed portion of water use that contributes to wastewater flows.
2. One meter (or multiple meters) provides water to multiple parcels.

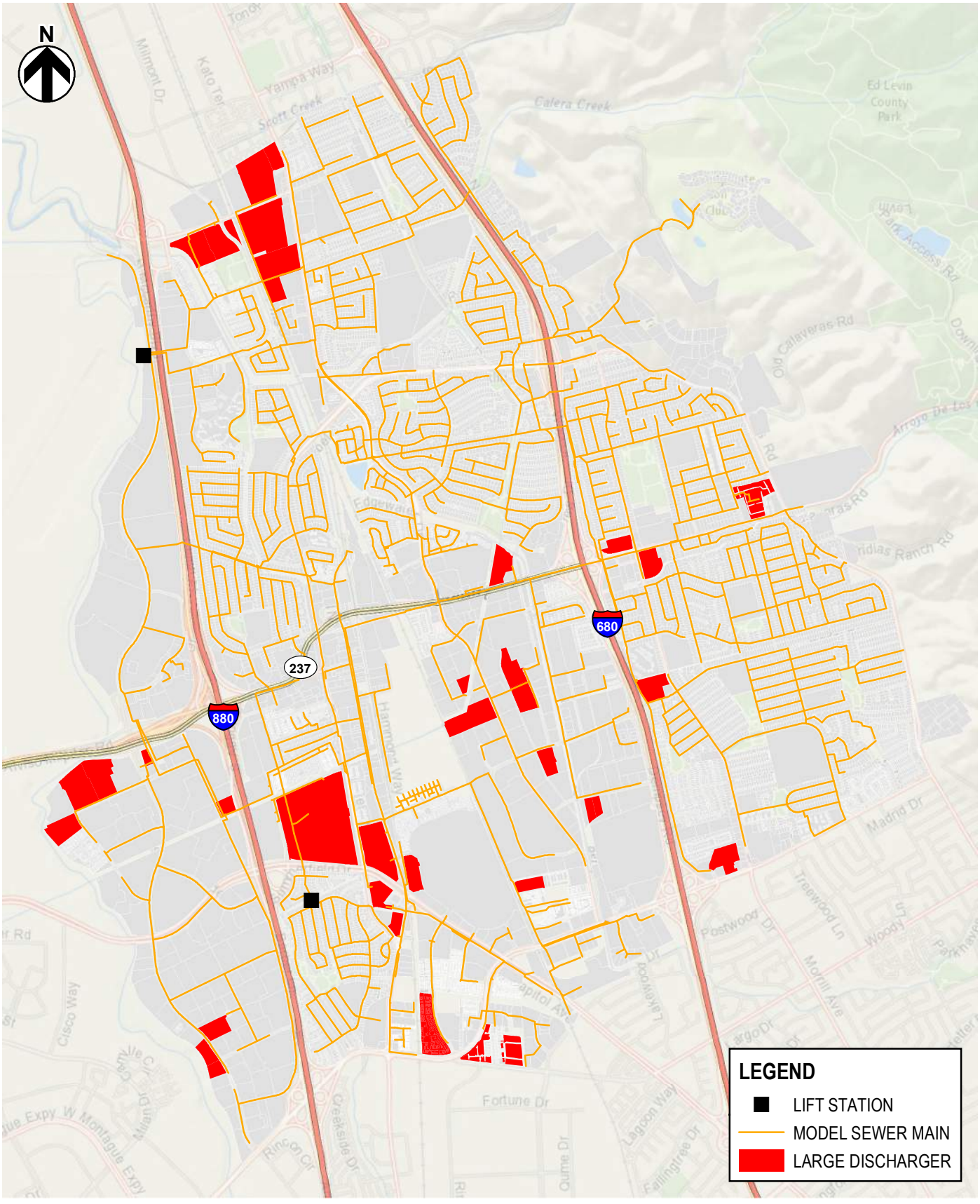


FIGURE 7-7
CITY OF MILPITAS
SEWER MASTER PLAN
LARGE DISCHARGERS

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7.3.3 Diurnal Patterns

To account for hourly flow fluctuations, a set of diurnal flow patterns were established for different land use categories for both weekday and weekend conditions. To estimate these patterns, sub-basins with predominately residential, industrial, manufacturing, and commercial land uses were identified.

- **Residential:** Sub-basins H (valley floor) and J (hillside) are comprised of only residential land uses, so the average of these two sub-basins was used to develop the weekday residential diurnal pattern. Two separate weekend diurnal patterns were developed for valley floor and hillside residential land uses. No significant variation was observed during the weekday.
- **Industrial:** Flow in sub-basin Q is 95% industrial. This sub-basin was used to develop industrial diurnal patterns.
- **Manufacturing:** Sub-basin C is comprised of 95% manufacturing land use and was used to develop manufacturing diurnal patterns.
- **Commercial:** Sub-basin B has the highest portion of flow from commercial land uses, which is comprised of 32% commercial flow. It is noted that sub-basin B flow is comprised of approximately 1/3 commercial, 1/3 residential, and 1/3 manufacturing. Residential and manufacturing land use diurnal patterns were established using other sub-basins providing the basis for 2/3 of the flow contribution to the sub-basin. The remaining flow and pattern was used to develop the third diurnal pattern (commercial), accordingly.
- **Correctional Facility:** A diurnal pattern was developed for the correctional facility. The pattern is similar to the residential diurnal pattern but is slightly flattened and roughly based on FM 1790, which is downstream of the correctional facility. There is no variation in weekday and weekend patterns for the correctional facility.

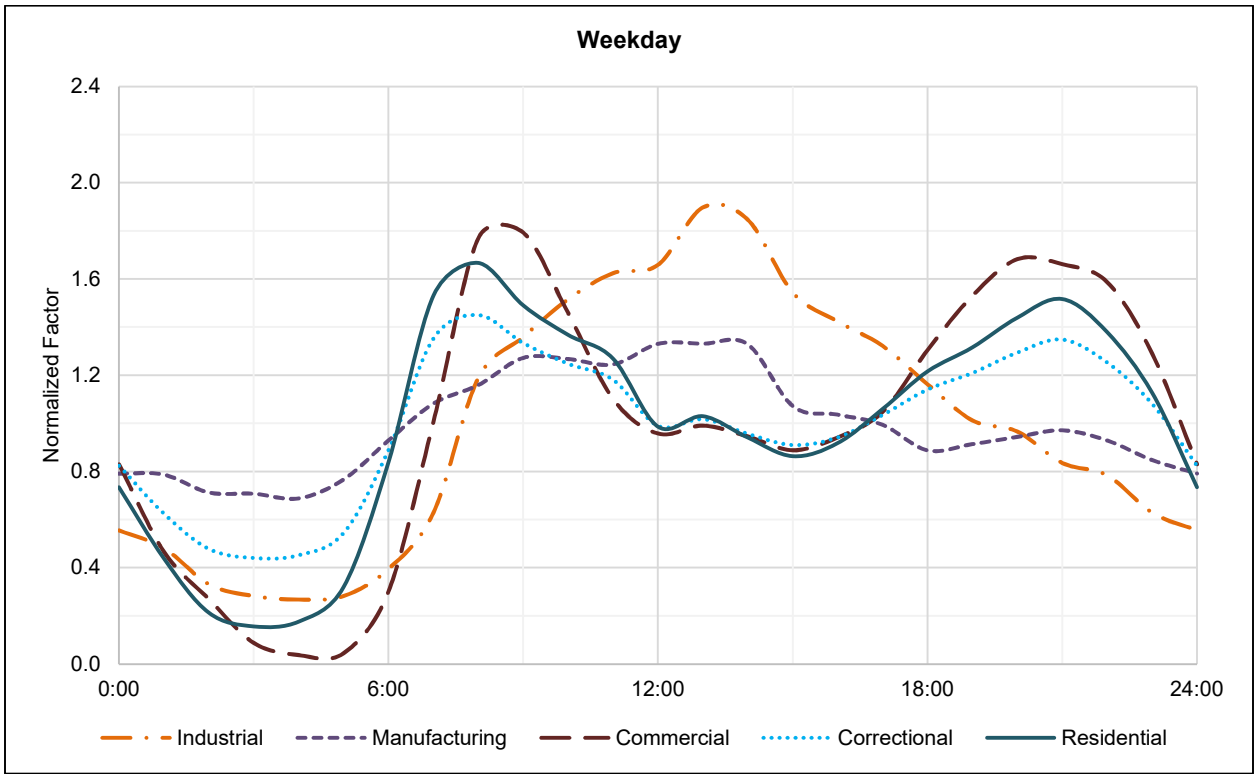
Diurnal patterns were adjusted iteratively for weekday and weekend to match measured flows during the calibration process discussed below.

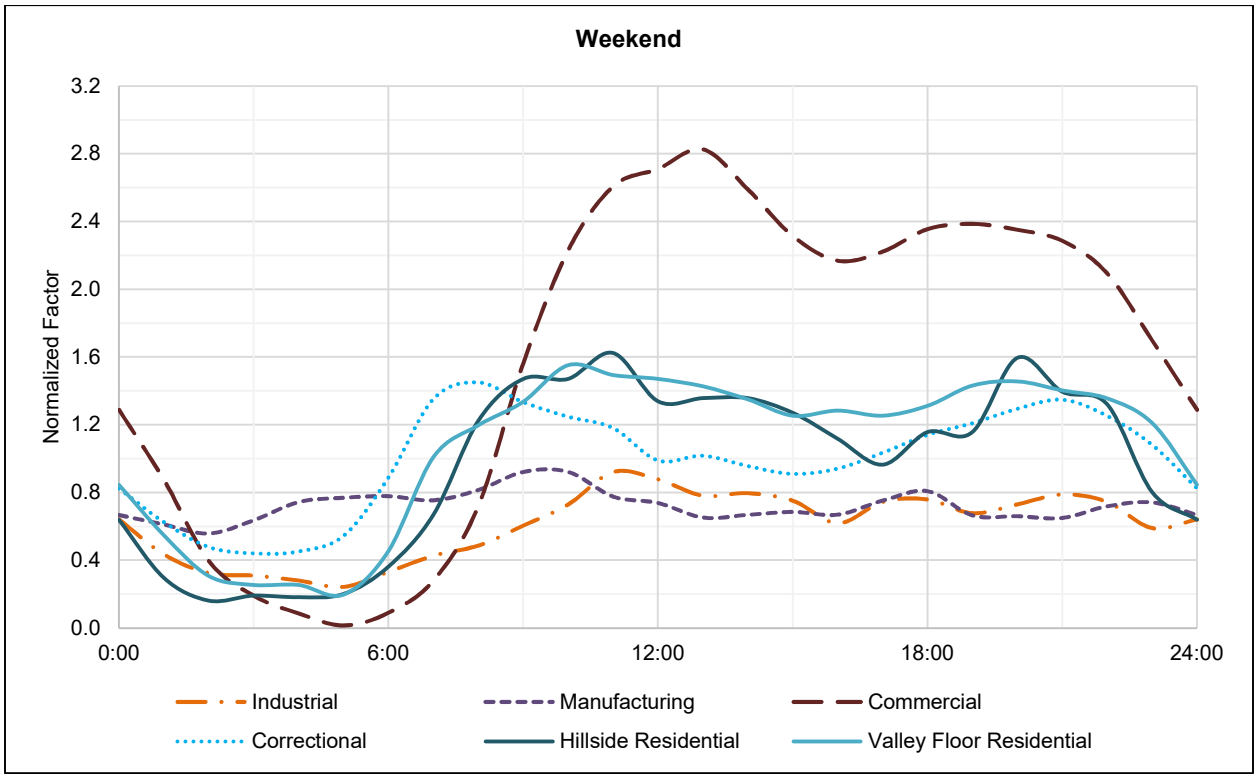
Figure 7-8 displays the calibrated set of weekday and weekend diurnal patterns developed.

7.3.4 Dry Weather Calibration

Initial GWI and base flow estimates, along with diurnal patterns, were added to the model. Large dischargers were assigned the diurnal pattern that corresponds to the original land use listed in **Table 7-5**. After each model run, iterative adjustments were made while comparing the modeled versus the observed flow at each flow meter (see **Figure 7-10**). Adjustments were made to GWI for each sub-basin, UF factors, and diurnal patterns. The process is iteration intensive as one change to a sub-basin affects everything downstream. Thus, the focus was to start with the terminal sub-basins that are in the most upstream areas with the fewest land use types and unknowns, followed by downstream sub-basins.

Figure 7-8: Diurnal Patterns





Flow Obstructions

Where there were consistent discrepancies between modeled and observed flows, CCTV was reviewed to analyze upstream critical flow splits. It was discovered that four of the five critical flow splits were not operating as intended. The key findings and changes that were made in the model to represent these findings are described below and identified on **Figure 7-9**. These adjustments for obstructions were removed for the capacity analysis as detailed in **Section 8.3**.

1. MH 539 is a critical flow split at the intersection of Curtis Avenue and Main Street. There are two pipes flowing into the manhole from the south and the east. During dry weather conditions, all flow should exit the manhole to the west to FM 41 as part of sub-basin B. The outlet to the north is slightly elevated and serves as an overflow flow split flowing to sub-basin T. During CCTV review, a large grease buildup was identified at the manhole. The grease buildup diverts a large portion of the flow entering the manhole from the east to the north to sub-basin T instead of west to FM 41 as part of sub-basin B. To account for this in the model, the upstream pipe invert flowing to the north was adjusted until, as visually estimated using CCTV, approximately two-thirds of the peak flow entering the manhole from the east was flowing north.
2. MH 543 is a critical flow split located where Tom Evatt Park intersects Main Street just downstream of the critical flow split at MH 539. During review of the CCTV for MH 543, it was discovered that there is also a large obstruction here. Based on what was observed in the CCTV, under normal conditions, the flow entering this manhole from the south should flow exclusively to the west during dry weather and the pipe exiting to the north would function as an overflow flow split. Due to a large obstruction at this manhole, some of the flow is being diverted to the north, activating the flow split. To account for this obstruction in the model, the upstream pipe invert of the segment flowing to the north was adjusted to simulate the flow diversion by the obstruction. This invert was adjusted until the modeled flows at FM 592 and FM 715, which are capturing the flow of sub-basin T, approximately matched the observed flows.
3. MH 2488 is a critical flow split located in sub-basin D. After reviewing CCTV, a large obstruction was also observed at this manhole. Under normal conditions, based on the pipe inverts observed in the CCTV, all flow entering this manhole from the south and the east should flow to the north. However, due to the large buildup, a large proportion of the flow is diverted to the west. To account for this obstruction, the upstream pipe invert of the segment exiting this manhole to the north was adjusted until the modeled flows matched the observed flows at FM 649 and FM 2491, which are located just downstream of this flow split to the west and north, respectively.
4. MHs 1053, 1152, and 2578, as discussed in **Section 3.1.1**, are flow diversion structures, and MH 1152 is a critical flow split. As part of the calibration process, the inverts of the overflow segments exiting each of these manholes was adjusted to reflect the operation of the flow diversion structures in the field.

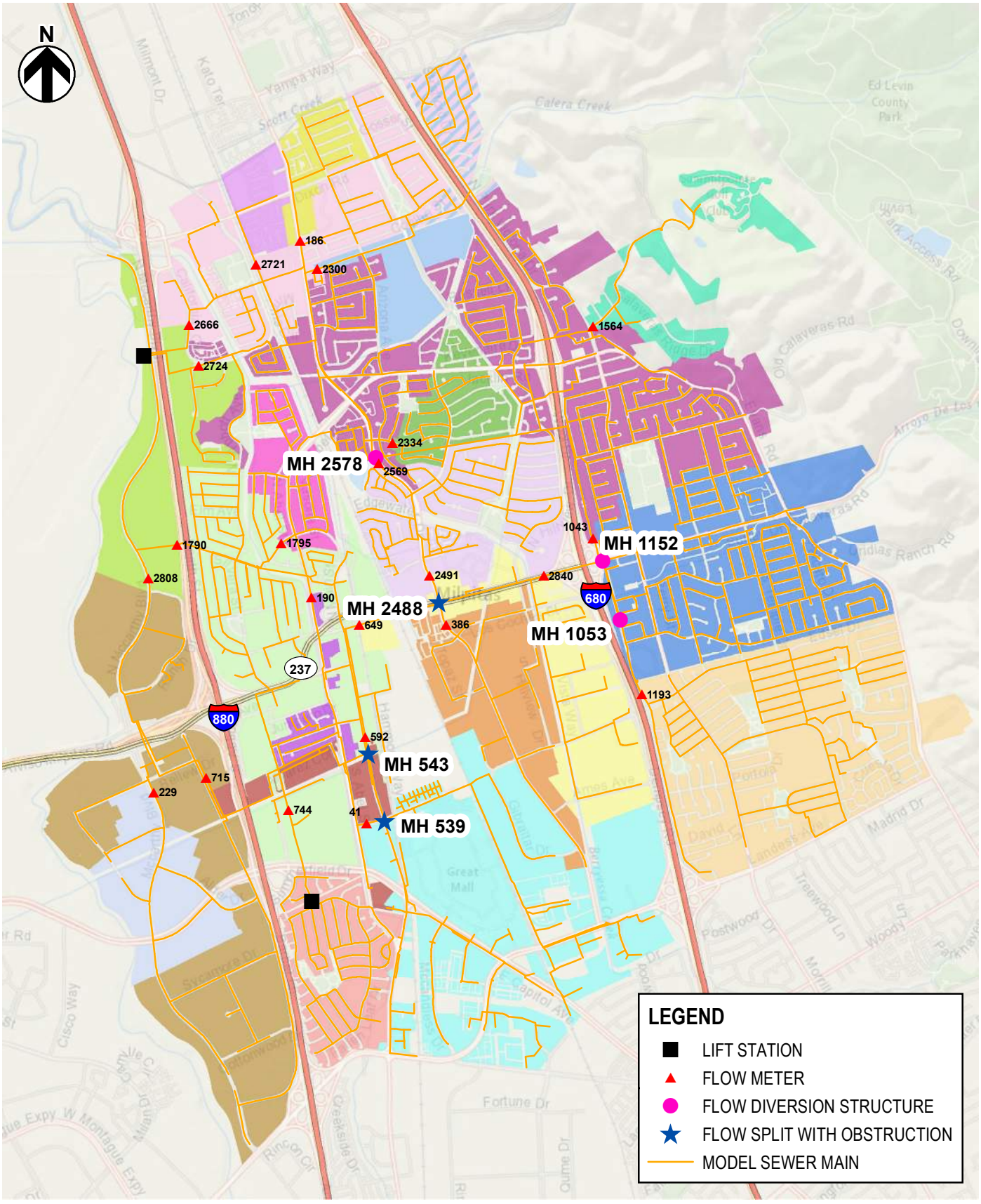


FIGURE 7-9
CITY OF MILPITAS
SEWER MASTER PLAN
FLOW DIVERSION AND OBSTRUCTION

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After completing all UF factor and GWI adjustments, and adjusting inverts at flow splits/diversion structures, the modeled flows were determined to align as close to the observed flows as reasonably possible. **Table 7-6** presents the final calibrated UF factors.

The final modeled average DWF at the outfall is 7.55 MGD. The total modeled GWI, which represents both GWI and other continuous flow contributions, is 1.40 MGD. There is no reliable flow data for the outfall at the Main LS; thus, GWI values in sub-basin O were estimated based on the GWI of the nearby sub-basins.

Figure 7-10 presents a sample of the final modeled versus observed flows for dry weather. This chart includes Sunday and Monday, so both weekend and weekday dry weather calibration are represented. Calibration charts for all flow meters are included as **Appendix D**.

Table 7-6: Calibrated UF Factors

Land Use Designation	UF Factor	Units	Quantity	Flow (MGD)	Diurnal Pattern
HSFL	400	gpd/parcel	56	0.022	Hillside Residential
HSFM	465	gpd/parcel	107	0.050	Hillside Residential
SFL	200	gpd/parcel	9619	1.924	Valley Floor Residential
SFM	1200	gpd/acre	266	0.319	Valley Floor Residential
MFH	1500	gpd/acre	292	0.438	Valley Floor Residential
MFVH	2000	gpd/acre	56	0.113	Valley Floor Residential
MHP[1]	-	-	-	-	Valley Floor Residential
HOTEL	4000	gpd/acre	60	0.244	Valley Floor Residential
MXD	1000	gpd/acre	67	0.067	Commercial
HDMU	2200	gpd/acre	64	0.141	Commercial
PAO	500	gpd/acre	65	0.031	Industrial
COM	900	gpd/acre	467	0.420	Commercial
INP	450	gpd/acre	727	0.327	Industrial
MFG	1500	gpd/acre	550	0.825	Manufacturing
PF	190	gpd/acre	310	0.059	Commercial
COR[1]	-	-	-	-	Correctional
Large Dischargers[2]	Various	-	-	1.176	Various
Total	**-**	**-**	**-**	**6.157** [3]	**-**

Notes:
1. All three mobile home parks and the correctional facility were identified as large dischargers and assigned flows based on water use data as described in **Section 7.3.2**.
2. Large dischargers were assigned a diurnal pattern based on their original land use codes, which are listed in **Table 7-5**.
3. Represents the total BSF. The total BSF plus the total GWI is the total DWF.

Figure 7-10: Example of Dry Weather Model Calibration Charts

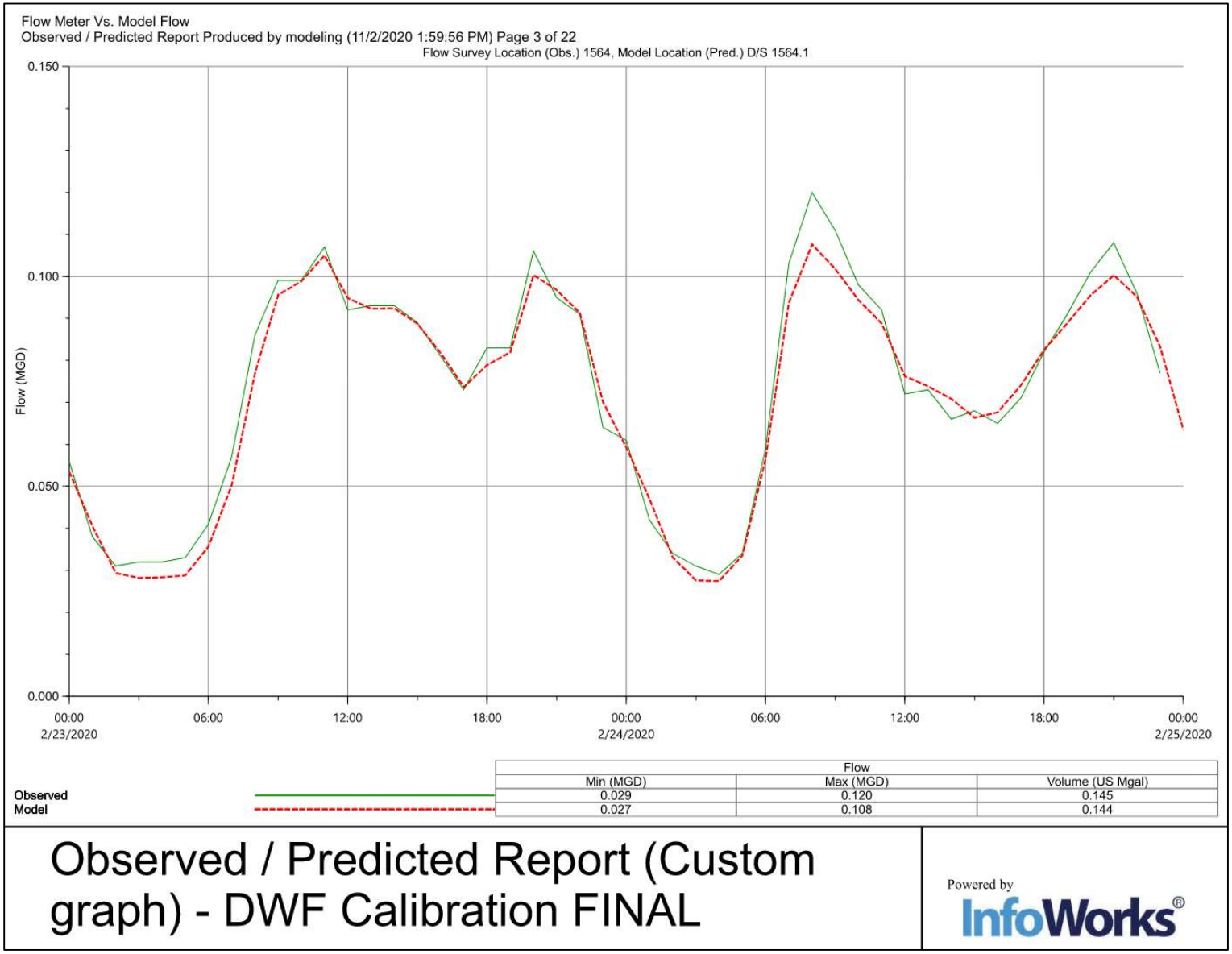


Figure 7-10 presents a comparison between modeled and observed dry weather weekday flows. For the overall system, modeled flows are 3.4% higher than the observed flows on an average dry weekday and are within 10% (higher) of the measured flows on the average dry weekend. A calibration within 5% is considered a good representation of actual conditions and having modeled flows higher than measured flows assures that the model is conservative in its representation of the collection system.

Table 7-7: Calibrated Model vs. Observed Weekday Dry Weather Flow Comparison

Flow Meter	Sub-Basin	Model Avg Flow (MGD)	Observed Avg Flow (MGD)	% Difference
744	A	0.273	0.270	1.2%
41[1]	B	0.540	0.565	-4.4%
386	C	0.566	0.576	-1.8%
649[2]	*D*	*0.892*	*0.862*	*3.5%*
2491[2]	*D*	*0.103*	*0.133*	*-22.9%*
	D Total	**0.995**	**0.995**	**-0.1%**
1193	E	0.588	0.580	1.3%
1043	F	1.219	1.248	-2.4%
1795	G	0.258	0.271	-4.6%
1564	H	0.073	0.074	-2.3%
2300	I	0.059	0.056	5.3%
2334	J	0.163	0.167	-2.2%
2569	K	0.383	0.357	7.5%
2666	L1	0.867	0.889	-2.5%
2724	L2	2.442	2.036	19.9%
186	M	0.113	0.123	-7.5%
2721	N	0.198	0.199	-0.7%
2808	P	1.755	1.837	-4.5%
229	Q	0.091	0.086	6.2%
190	R	0.081	0.087	-7.1%
1790	S	2.267	1.934	17.2%
592[1,3]	*T*	*0.194*	*0.191*	*1.5%*
715[1,3]	*T*	*0.990*	*1.027*	*-3.6%*
	T Total	**1.184**	**1.219**	**-2.8%**
OUTFALL[4]	O	7.492	-	-

Notes:
1. Flows are affected by the obstruction in MH 539 - a critical flow split.
2. Flows are affected by the obstruction in MH 2488 - a critical flow split.
3. Flows are affected by the obstruction in MH 543 - a critical flow split.
4. The flows of sub-basin O capture the entire system. There are not any measured flows at this location, so there is nothing to compare the modeled flows to.

7.4 Wet Weather Flow (WWF)

The remaining components of wastewater flow are additional wet weather GWI related to an elevated groundwater table and the RDI/I as illustrated in **Figure 7-1**. GWI levels typically fluctuate as the water table rises during the wet season and falls during the dry season; GWI values were adjusted to account for the seasonal variation. RDI/I is the flow that enters the system through manhole covers and through temporarily increased groundwater infiltration driven by rainfall.

7.4.1 RDI/I Volume

The volume of RDI/I is calculated by subtracting the volume of DWF in the system from the volume of total wet weather flow, as shown in **Figure 7-11**. For this study, the volume of RDI/I and corresponding R-factor was calculated for the 24-hour period following the start of Storm event 1. Because GWI tends to fluctuate over the course of the wet season as the water table rises and falls, dry weather data from just prior to the storm was used for RDI/I calculations. DWF prior to the storm was subtracted from the storm flow for RDI/I calculations.

Figure 7-11 is an example of the flows at FM 2724 during the storm period.

Figure 7-11: Wet Weather Flow

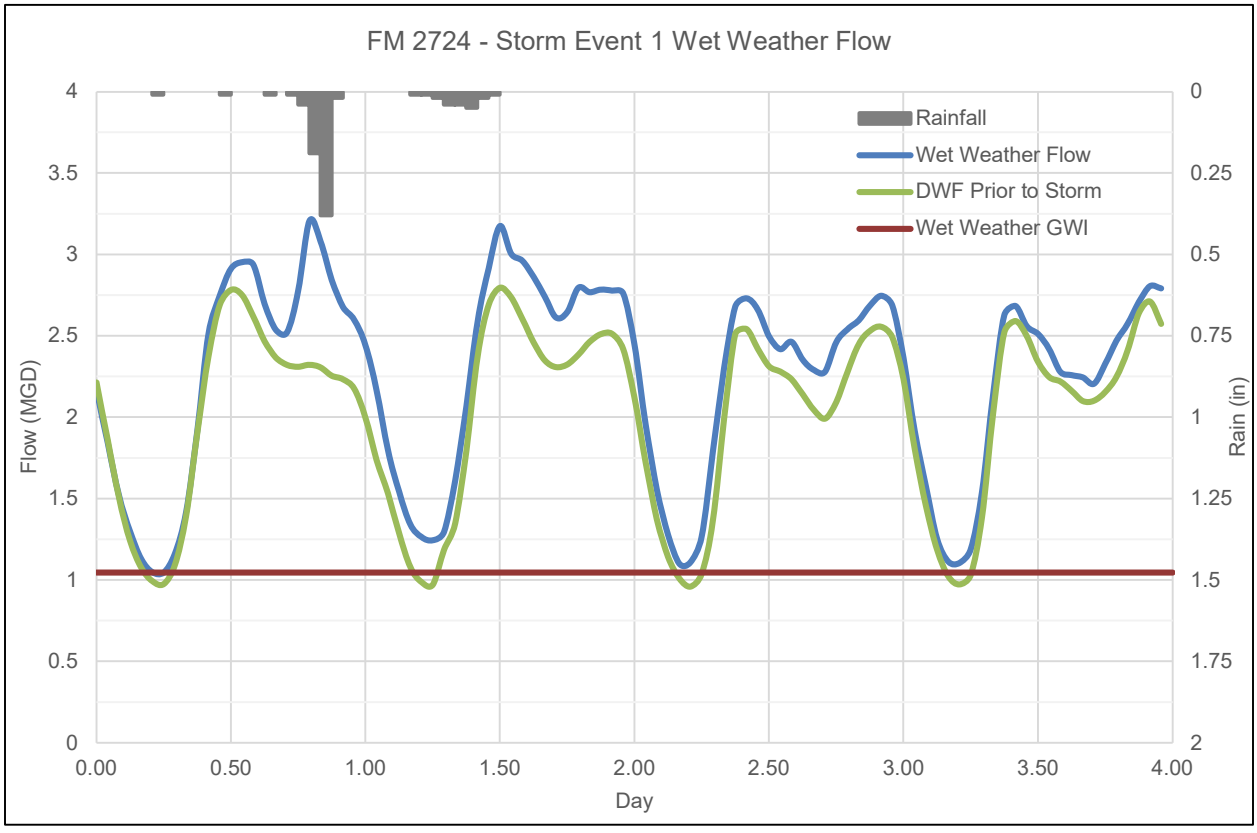
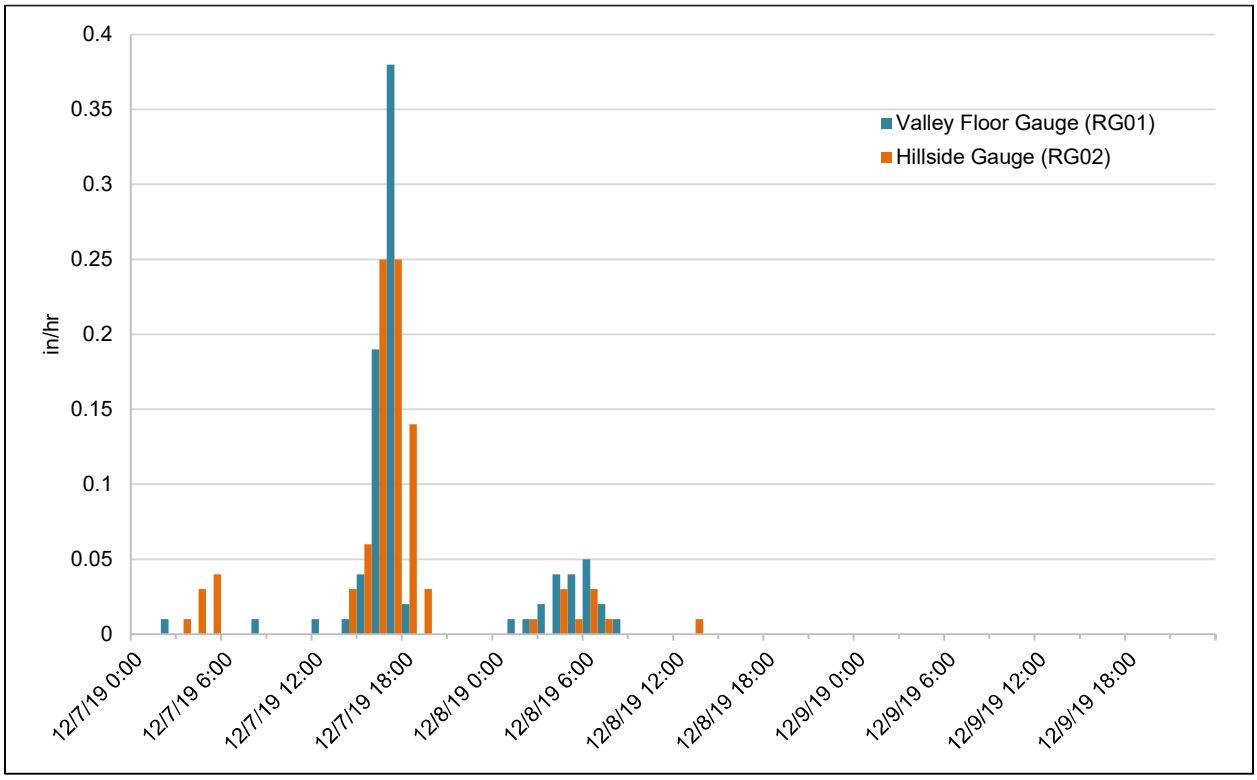


Figure 7-12: Storm Rainfall



7.4.2 Total Rainfall

The volume of rain that fell on each sub-basin is calculated by multiplying the depth of rain by the total area contributing sanitary flows in each respective sub-basin. The areas of each sub-basin are listed in **Table 7-4**. This acreage excludes parcels with no wastewater flows (NF designation – see **Figure 5-1**) such as streets and areas of open space. To calculate the rainfall volume for this initial analysis, each sub-basin was matched to a corresponding rain gauge (RG01 or RG02) based on proximity and elevation. Sub-basin H is the only sub-basin located on the hillside, so this was matched to RG02. The remainder of the sub-basins were matched with RG01 on the valley floor. **Figure 7-12** presents the rainfall for Storm event 1 for both rain gauges.

7.4.3 R-Factor Development

The R-factor represents the percentage of rainfall that enters the City's sewer system by volume: the ratio of RDI/I to total volume of rain. An initial R-factor was calculated for each sub-basin based on the flow data and was iteratively adjusted for the wet weather model calibration process.

There is no separate estimation of antecedent moisture conditions in the soil. It is best to use at least a 2-year storm to estimate R-factors, as it will more likely represent conditions similar to a large representative design storm. For this analysis, the storm selected for the R-factor calculation and calibration was Storm event 1, which was the largest storm available during the flow monitoring period. Storm event 1 was less than a 1-year 24-hour storm, but between a 1- and 2-year 2-hour storm.

Once the RDI/I and total volume of rainfall are calculated, the R-factor is a simple calculation of RDI/I volume divided by rainfall volume, resulting in the estimated portion of rainfall that enters the wastewater collection system. These values were also iteratively adjusted during the model calibration process.

7.4.4 Wet Weather Calibration

To initiate the wet weather calibration process, the observed rainfall collected at both rain gauges for Storm event 1 was added to the model (see **Figure 7-12**). During the calibration process, it was noted that the peak flows for all valley floor sub-basin meters occurred approximately three hours prior to the peak rainfall, which was clearly elevated related to rainfall as compared to dry weather flow. It appears that there may have been an error in the timestamps of RG01, so the rainfall was shifted three hours earlier.

Wet Weather GWI

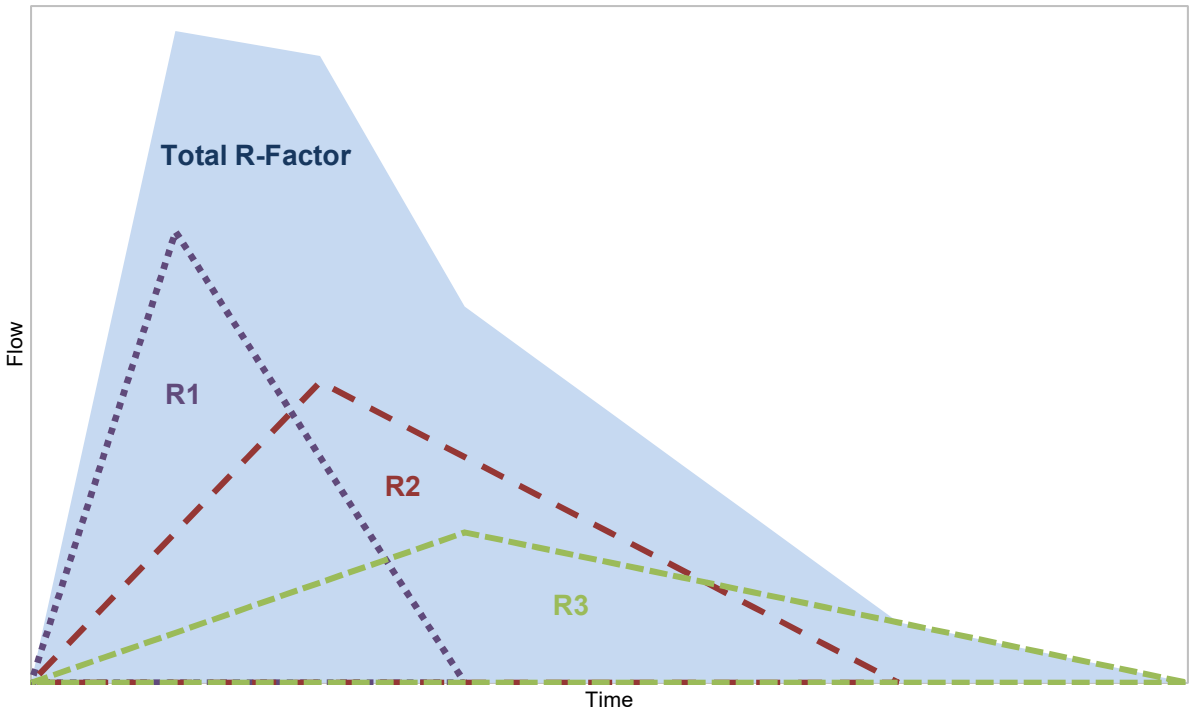
GWI fluctuates over the course of the year, increasing during the wet season as the water table rises. The extent that the water table rises and falls is site specific and can be affected by geology, surface water features, and tides. By extension, wet weather GWI changes are also site specific and can also depend on the condition of the pipelines. In the wet weather calibration scenarios of the model, GWI values established during the dry weather calibration process were iteratively increased to reflect the elevated water table more accurately during the wet season as displayed by an increase in the minimum flows.

RDI/I R-Factor

The RDI/I is estimated using the R-factor, or the percentage of rainfall that enters a sewer system as described in **Section 7.4.1**, and the Tri-Triangular Method. The Tri-Triangular Method, which is the industry standard for representing wet weather flows, involves summing three separate hydrographs to derive a single unit hydrograph. The total R-factor is divided into three separate values, represented as triangles (see **Figure 7-13**), based on the speed at which rainfall enters the sewer system, as described below:

- **Rapid (R1)** – Stormwater inflow that enters the sewer system most rapidly, typically through entry points such as holes in manhole covers. The peak of this triangle occurs one to three hours after the start of the rainfall.
- **Intermediate (R2)** – A combination of rapid stormwater inflow and slow rainfall-dependent infiltration.
- **Slow (R3)** – Long term delayed rainfall-dependent infiltration. The peak of this triangle occurs the longest time after the start of the rainfall, and the effects of this infiltration can continue long after the end of the rainfall.

Figure 7-13: Tri-Triangular R-Factor Method



The initial estimated R-factors (R1, R2, and R3) for each sub-basin were input into the model, which generated the total R-factors. Total R-factors are simply the sum of the individual R-factors (R1 + R2 + R3). The entered R-factors were iteratively adjusted for each sub-basin by comparing modeled flows to observed flows at each flow meter during the day of, and the two days following, the storm. During this part of the calibration process, it is critical to capture the peak flows as accurately as possible to avoid underestimating capacity deficiencies.

The final calibrated R-factors for each sub-basin are presented in **Table 7-8**.

For wet weather calibration of the system, average modeled flows representing Storm event 1 and one day following the storm are 3.3% higher than measured flows. Modeled peak WWF for Storm event 1 are 2.3% higher than measured peak flows. A calibration within 5% is considered a good representation of actual conditions and having modeled flows higher than measured flows assures that the model is conservative in its representation of the collection system.

A sample wet weather calibration chart is displayed in **Figure 7-14**. Wet weather calibration charts for all flow meters are attached as **Appendix E**.

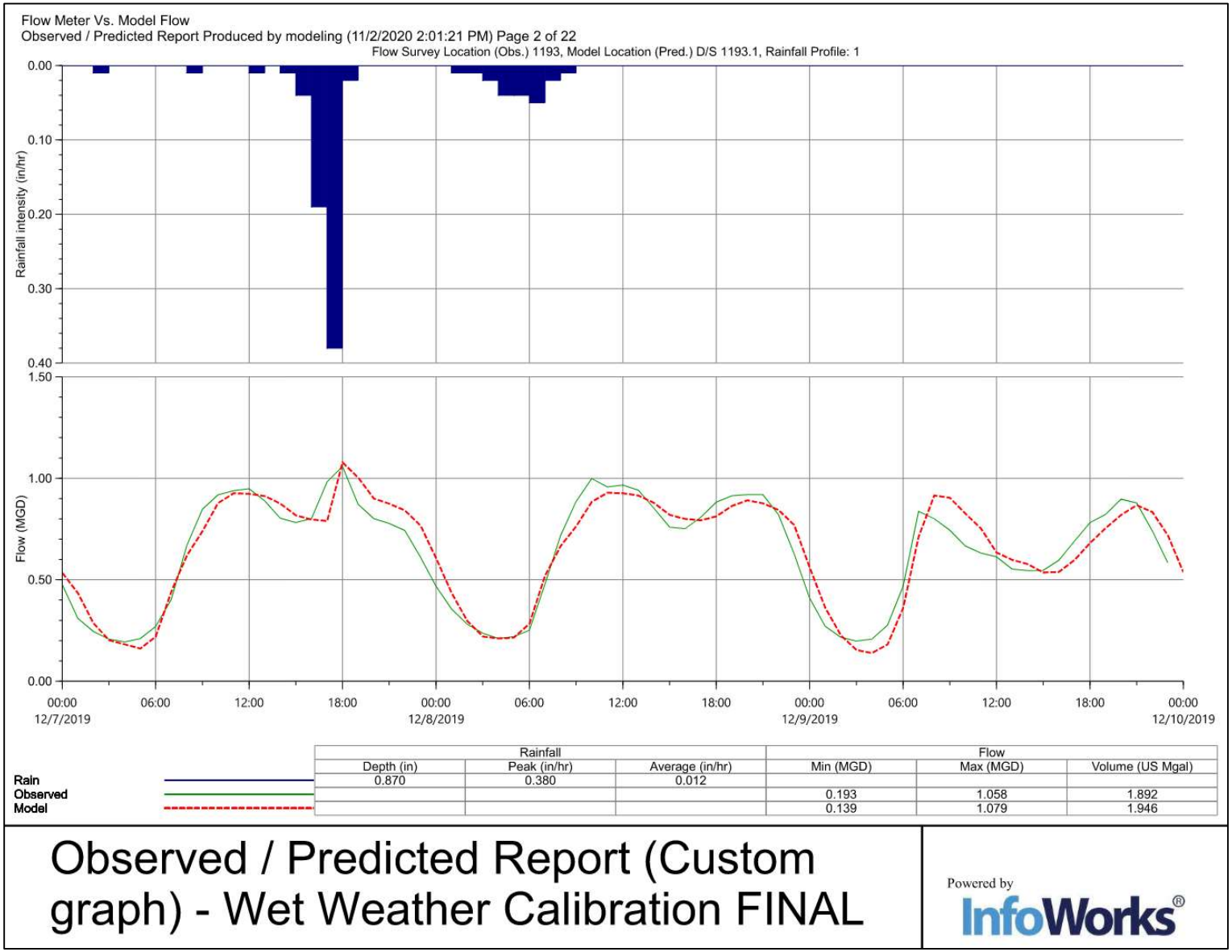
Table 7-8: Final Calibrated R-Factors

Sub-Basin	Acreage	R1	R2	R3	Total R-Factor
A	138	0.40%	0.85%	0.23%	1.48%
B	433	0.80%	0.66%	0.13%	1.59%
C	192	0.27%	0.00%	0.02%	0.30%
D	208	0.26%	1.64%	0.00%	1.90%
E	455	0.53%	0.00%	0.07%	0.60%
F	414	0.67%	0.00%	0.19%	0.86%
G	78	1.27%	2.14%	0.00%	3.40%
H	110	0.24%	0.00%	0.00%	0.24%
I	81	0.08%	0.35%	0.00%	0.42%
J	79	0.00%	0.67%	1.50%	2.17%
K	187	0.10%	0.56%	0.15%	0.81%
L1	266	0.09%	0.17%	0.14%	0.40%
L2	607	0.09%	0.17%	0.05%	0.31%
M	57	1.07%	0.26%	0.07%	1.39%
N	55	0.55%	1.17%	0.34%	2.06%
O[1]	207	0.70%	0.40%	0.40%	1.50%
P	537	0.59%	0.30%	0.37%	1.26%
Q	151	0.45%	0.00%	0.15%	0.60%
R	34	1.30%	2.41%	0.00%	3.71%
S	393	0.00%	1.30%	0.34%	1.64%
T	207	0.25%	0.12%	0.26%	0.64%
Average[2]	**4,889**	**0.40%**	**0.45%**	**0.19%**	**1.04%**

Notes:
1. There is no flow meter at the outfall for sub-basin O. Values were estimated based on surrounding sub-basins.
2. The average represents the weighted average by sub-basin area.

In summary, total R-factors for each subbasin ranges from 0.24% up to 3.71%, which represents the percentage of rainfall entering the collection system. A low R-factor would be less than 3% and 10% is considered high. The weighted average for the entire system is 1.04%; this is considered a relatively watertight system with limited rainfall entering the collection system.

Figure 7-14: Example of Wet Weather Model Calibration Charts



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SECTION 8 – CAPACITY ANALYSIS

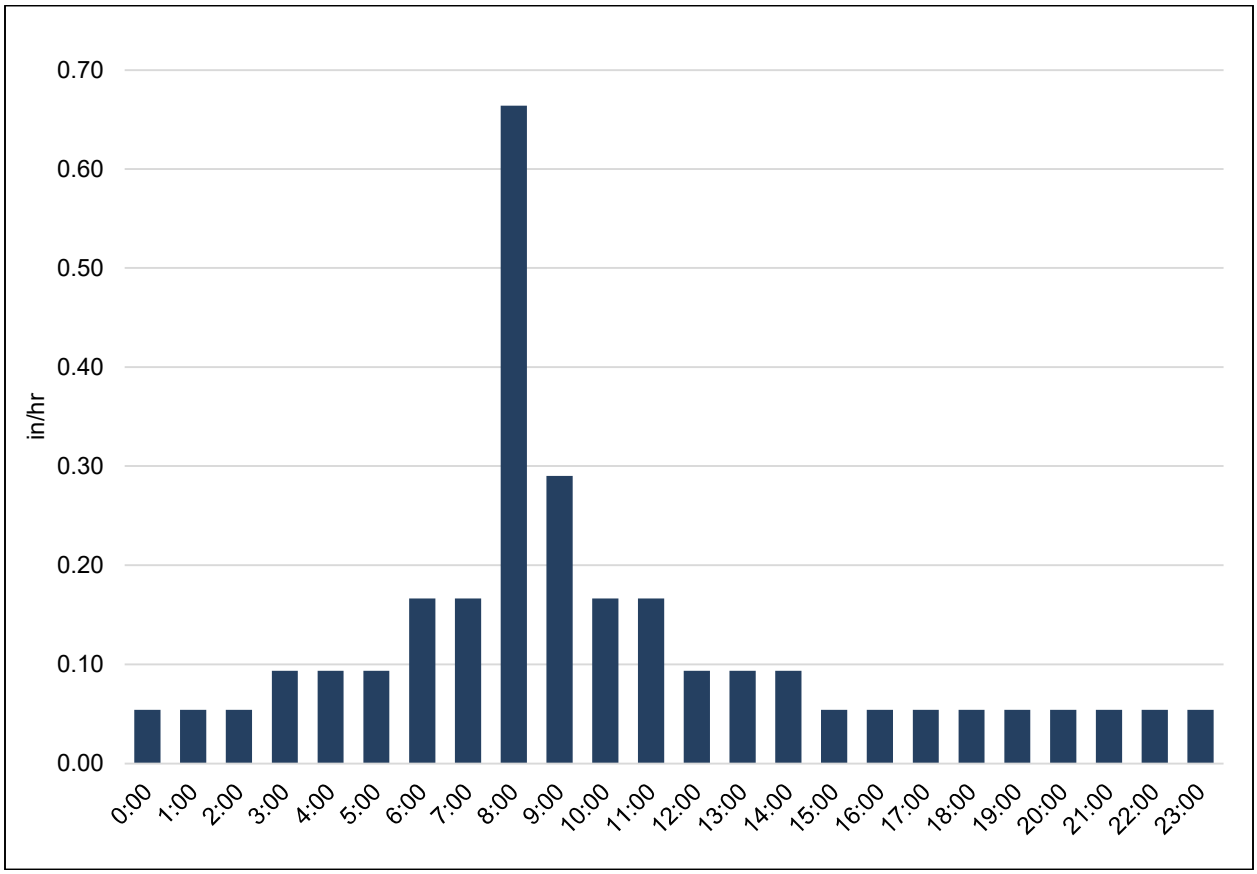
The hydraulic analysis for the collection system was evaluated under design storm for existing and future land use conditions. This section describes the analysis and the resulting deficiencies.

8.1 Design Storm

To estimate WWF, a design storm is applied to the model and wet weather flows are represented based on the calibrated R-factors for each sub-basin. A range of storms was considered for the design condition of this study. Both the 2002 and 2009 Master Plans used a 10-year, 4-hour constant distribution storm. Often, a 10-year 24-hour storm is used with a peak hour coinciding with the peak of the typical diurnal curve. A 5-year 24-hour storm was also available in the event that a 10-year 24-hour storm caused exceedingly large flows due to high rates of RDI/I.

For this study, the typical 10-year 24-hour storm with a peak hour coinciding with the peak of the typical diurnal curve was deemed appropriate.

Figure 8-1: 10-Year 24-Hour Design Storm



Source: NOAA Atlas 14 Volume 6 Version 2 precipitation frequency estimates in inches for Milpitas, California (https://hdsc.nws.noaa.gov/hdsc/pfds).

8.2 Deficiency Criteria

The initial deficiency criteria used to evaluate the capacity of the modeled pipes under design flow conditions was the ratio of wastewater flow depth (d) to pipe diameter (D), or d/D. In InfoWorks, if d/D is greater than one, this means the pipe is flowing full under pressure and the hydraulic grade line (HGL) is higher than the crown of the pipe. InfoWorks also reports a "surcharge state" for each pipe, and **Table 8-1** summarizes the definition of each surcharge state.

In the hydraulic model, the HGL reaching the ground surface indicates a potential SSO. Even for a pipe flowing under capacity or surcharged, if the freeboard – the distance between the ground surface and the HGL – is five feet or greater, the risk of SSO is minimal. Where pipes were shown as surcharged due to inadequate hydraulic capacity (surcharge state of "2"), a pipe was identified as deficient if the freeboard in these locations is also less than five feet.

Table 8-1: InfoWorks Surcharge States

Surcharge State	Definition	Deficiency if:
< 1 [1]	When depth of flow is less than the diameter of the pipe	Not considered hydraulically deficient
= 1	Pipe is surcharged due to backwater from a downstream deficiency.	Not considered hydraulically deficient
= 2	Pipe is hydraulically under capacity and needs to be upsized.	Freeboard < 5 feet

Notes:
1. Surcharge State = d/D

8.3 Assumed Condition

As detailed in **Section 7.3.4**, there were three critical flow splits identified in the system as having major flow obstructions that drastically changed the flow path of wastewater – likely from grease buildup at MH 539, MH 543, and MH 2488. During the dry weather calibration process, these flow splits were modified in the model to match the wastewater flows observed in the system. For the hydraulic analysis, system performance was evaluated based on the assumption that these obstructions have been cleared and the system is operating as intended.

8.4 Future Condition

Section 5.2 presents the process used to update the land use for potential future redevelopment areas in the City to estimate future wastewater flows. For the hydraulic analysis of the system under future conditions, calibrated GWI, UF factors, and R-factors developed above were applied to the updated land uses for projected future buildout conditions. The same design storm was used for both existing and future conditions.

8.4.1 Large Dischargers

If parcels were identified as large dischargers under existing conditions and located within "Opportunity Areas" (see **Figure 2-2** and **Figure 5-2**), the existing land use was compared to the future land use; where the land uses differed, the future land use UF factor was applied. If there

was no change to the land use, then the large discharger wastewater flow (see **Table 7-5**) under existing conditions was maintained for the future scenario.

Table 8-2 lists the large dischargers that were removed from the future condition and replaced with the future land use UF factors.

Table 8-2: Summary of Large Discharger Sites Planned for Redevelopment

Rank	Location[1]	Existing Land Use	Future Land Use
13	Main St	COM	MFH
15	McCarthy Blvd	INP	PAO
16	Landess Ave	COM	HDMU
20	McCarthy Blvd	INP	PAO
23	McCarthy Blvd	INP	PAO
26	Calaveras Blvd	COM	HDMU
36	Park Victoria Dr	COM	HDMU

Notes:
1. Source: January-March 2019 water meter customer billing data provided by the City multiplied by 85% - assumed portion of water use that contributes to wastewater flows.

Los Esteros Ranch, which is located at the intersection of McCarthy Blvd and Dixon Landing Road, is connected to the City collection system. This land use was added to the modeled system in accordance with the City's agreement with Los Esteros Ranch. The agreement between the City and Los Esteros Ranch, attached as **Appendix F**, states that they have a maximum allowable water usage of 50,000 gpd among the three parcels included in the agreement. Applying the same method identified for other large dischargers (see **Section 7.3.2**), it was assumed that wastewater flows constitute approximately 85% of water usage. Los Esteros Ranch was assigned a wastewater flow of 42,500 gpd and was added as a large discharger for the future condition. The area of the three contributing parcels was measured using the Measure tool in Bluebeam Revu 2016 and calibrated using the scale bar displayed on Exhibit "A" of the Los Esteros Ranch Agreement.

8.5 Hydraulic Capacity Deficiencies

Under dry weather conditions, **Table 8-3** shows a 6% increase to 7.9 MGD in average flow for future conditions at the outfall.

Table 8-3: Model Flow Summary

Scenario	Average DWF (MGD)	Peak DWF (MGD)	Peak WWF (MGD)
Existing	7.5	10.4	14.9
Future	7.9	11.0	18.5

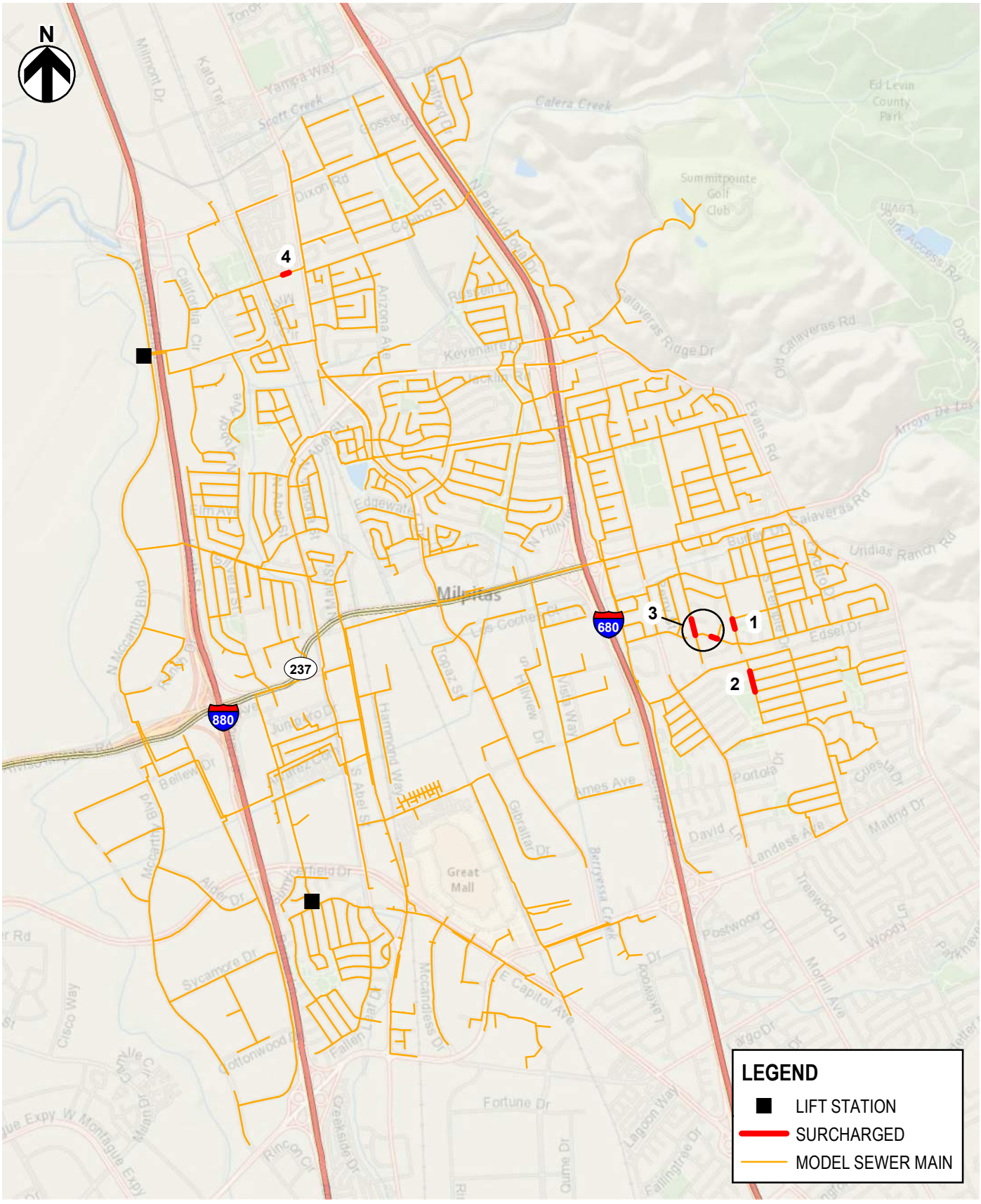


FIGURE 8-2
CITY OF MILPITAS
SEWER MASTER PLAN
SURCHARGED PIPELINE SEGMENTS

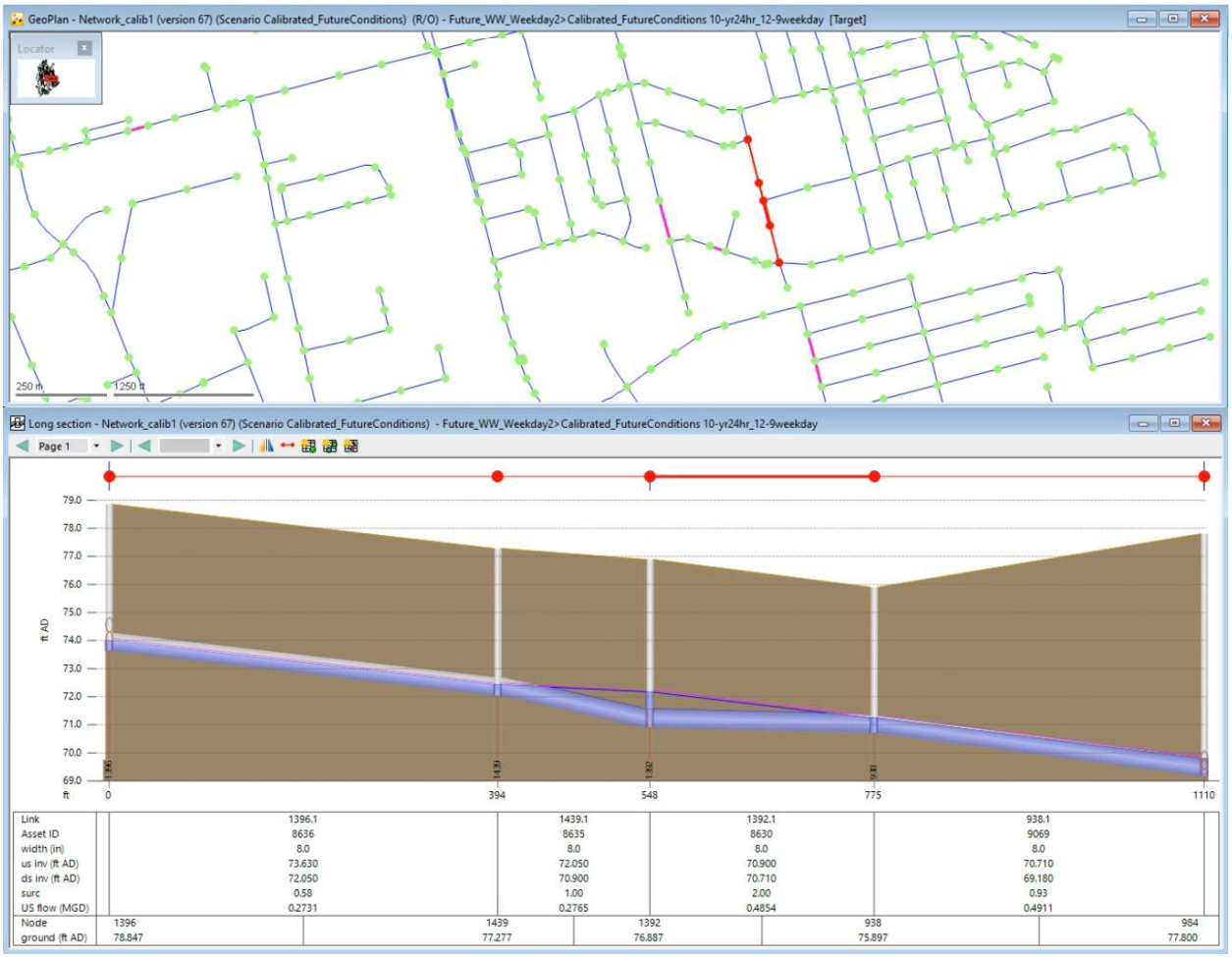
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Under all scenarios, there were no additional surcharged segments identified under future conditions that were not seen under existing conditions. It is expected that this is because the City is largely built out and system improvements implemented with development have addressed potential deficiencies.

There were six pipe segments with a recorded surcharge state of "2" (see **Section 8.2**) under both existing and future conditions indicating that they are under capacity. These segments are displayed on **Figure 8-2**. Provided below is a description of each of these pipelines:

- **Surcharged Location 1:** This pipe segment drops below the minimum freeboard deficiency criteria (see **Table 8-1**) with a freeboard of 4.7 ft, shown in **Figure 8-3**. For a single pipe reach, replacement is not recommended without further cause. It is recommended that the City monitor this location for surcharging. This location (MH GID 1392) is a good candidate for installing a SmartCover to monitor the wastewater level and prevent SSOs.
- **Surcharged Location 2:** These two surcharged segments are 6-inch mains. Freeboard at these locations is greater than five feet, so they do not exceed the criteria for a capacity deficiency and therefore are not considered deficient. In general, it is recommended that all future sewer mains in the collection system are constructed with minimum diameters of 8-inches.

Figure 8-3: Surcharged Location 1 with 4.7 feet of Freeboard



- **Surcharged Location 3:** These two surcharged segments are 10-inch pipes. Freeboard at these locations is greater than five feet, so they do not exceed the criteria for a capacity deficiency and therefore are not considered deficient.
- **Surcharged Location 4:** This pipe, identified as under capacity (GID 17506), is located to the west of the intersection between N. Milpitas Blvd. and Washington Dr. In GIS, this segment was identified as an 8-inch pipe; however, both upstream and downstream pipes were identified as 12-inch pipes. During the review of record drawings, it was unclear if this pipe has been upsized to match the neighboring pipes. In the model, this segment experiences surcharging during wet weather as an 8-inch pipe, however, when this segment is upsized to 12-inches to match the neighboring pipe diameters, there is no longer surcharging. An improvement project is not recommended at this location as the freeboard is over ten feet and does not meet the threshold for deficiency identified in **Table 8-1**.

SECTION 9 – PROJECT DEVELOPMENT

Based on the condition assessment described in **SECTION 4**, projects were recommended to address prioritized defects identified in the collection system. This section describes the prioritization process and a summary of the project cost development. Results of this project development and selection translate into a prioritized CIP for the wastewater collection system.

9.1 Rehabilitation Selection Methodology

The PACP peak scores from the CCTV inspection and the risk scores calculated from the LoF/CoF desktop condition assessment drive the pipeline rehabilitation selection process. Below is a summary of the methodology implemented for both inspected and non-inspected pipe.

9.1.1 CCTV Inspected Segments

For segments with CCTV inspection data, a two-step process was used to determine the final rehabilitation recommendation. Using the defect coding assigned by NPS and the IAP software, the pipe segments with defects were assigned one of the following defect-level rehabilitation methods:

- Replace;
- Cured-in-place pipeline (CIPP);
- Point repair by excavation; or
- Sectional liner.

When the user assigns a rehabilitation method for each defect code, IAP assigns the respective rehabilitation method to each segment based on the associated defect coding.

Table 9-1 presents a sample of the assigned rehabilitation methods for all structural defects with a score of 5. A full list of all defect codes and associated rehabilitation methods can be found in **Appendix A** (R&R Study App. H).

With the rehabilitation method established for each defect code, a decision tree was established to determine the final overall rehabilitation method for the pipeline. This decision tree was prepared based on the following factors:

- CCTV structural peak score and overall peak score;
- Number of point repairs and lining recommendations by the defect-level rehabilitation methods module;
- Number of defects;
- Length of major (score of 4 or 5) and/or minor (score of 3) defects; and
- Presence of specific defects such as infiltration drippers (ID) or Reinforcement Corroded Chemical (SRCC).

Figure 9-1 presents a schematic of the established decision tree. Pipeline segments with CCTV inspection data are filtered by their PACP peak scores. Then, they are analyzed based on the number of point repairs and lining recommendations established by the defect-level rehabilitation methods module as well as the number of defects, length of defects, and presence of specified minor, but not negligible, defects. When multiple rehabilitation options were recommended, a cost analysis was performed to determine the best action. For example, if a segment was recommended to receive ten sectional liners, a full liner would be more cost-effective.

Table 9-1: Sample of Defect Codes with Associated Rehabilitation Methods

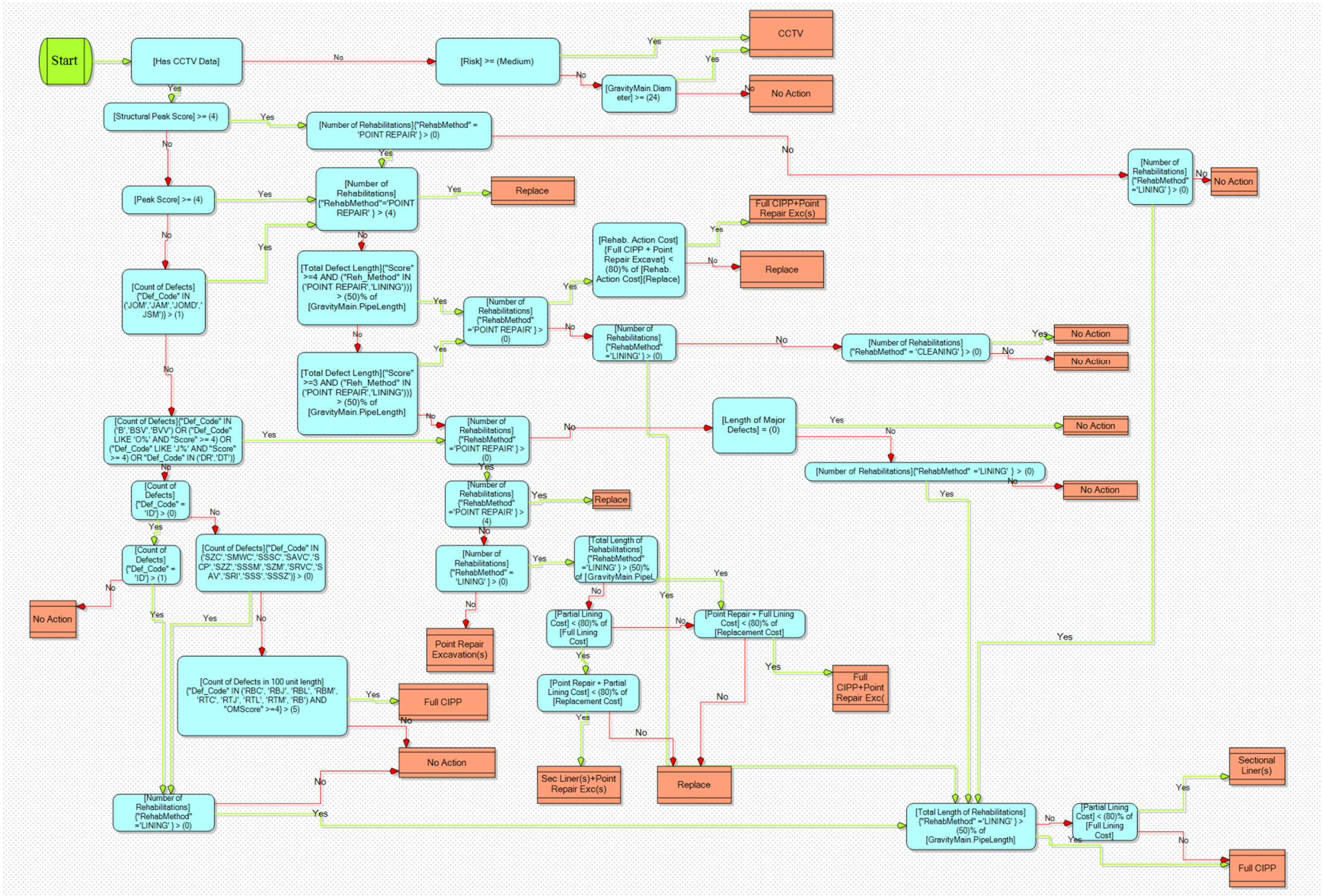
Defect Code	Score	Defect Type	Description	Rehabilitation Method
BSV	5	Structural	Broken Soil Visible	Point repair
BVV	5	Structural	Broken Void Visible	Point repair
DI	5	Structural	Dropped Invert	Point repair
DV	5	Structural	Deformed Vertical Brick	Point repair
HSV	5	Structural	Hole Soil Visible	Point repair
HVV	5	Structural	Hole Void Visible	Point repair
SMW	5	Structural	Missing Wall	Point repair
SMWC	5	Structural	Missing Wall Chemical	Point repair
SMWM	5	Structural	Missing Wall Chemical	Point repair
SMWZ	5	Structural	Missing Wall Unknown	Point repair
SRC	5	Structural	Reinforcement Corroded	Point repair
SRCC	5	Structural	Reinforcement Corroded Chemical	Point repair
SRCM	5	Structural	Reinforcement Corroded Mechanical	Point repair
SRCZ	5	Structural	Reinforcement Corroded Unknown	Point repair
SRP	5	Structural	Reinforcement Projecting	Lining
SRVM	5	Structural	Reinforcement Visible Mechanical	Lining
SRVZ	5	Structural	Reinforcement Visible Unknown	Lining
XB	5	Structural	Collapse Brick Sewer	Point repair
XP	5	Structural	Collapse Pipe Sewer	Point repair

Figure 9-2 displays the final rehabilitation methods recommended for each segment based on the decision tree. For a table of the recommended rehabilitation method for each segment, see **Appendix A** (R&R Study App. A).

9.1.2 Segments without CCTV Inspection

For segments without CCTV inspection data, risk scores and diameter were used to develop a prioritized set of segments that are recommended for CCTV inspection and further analysis. Pipeline segments with a risk score of medium or higher (greater than or equal to three) – see **Section 4.2.3** – were included as part of this CCTV recommendation. Additionally, all pipelines with a diameter of 24-inches or greater are recommended for prioritized CCTV regardless of the associated risk rating. **Figure 9-3** presents the segments recommended to prioritize for CCTV.

Figure 9-1: Rehabilitation Decision Tree



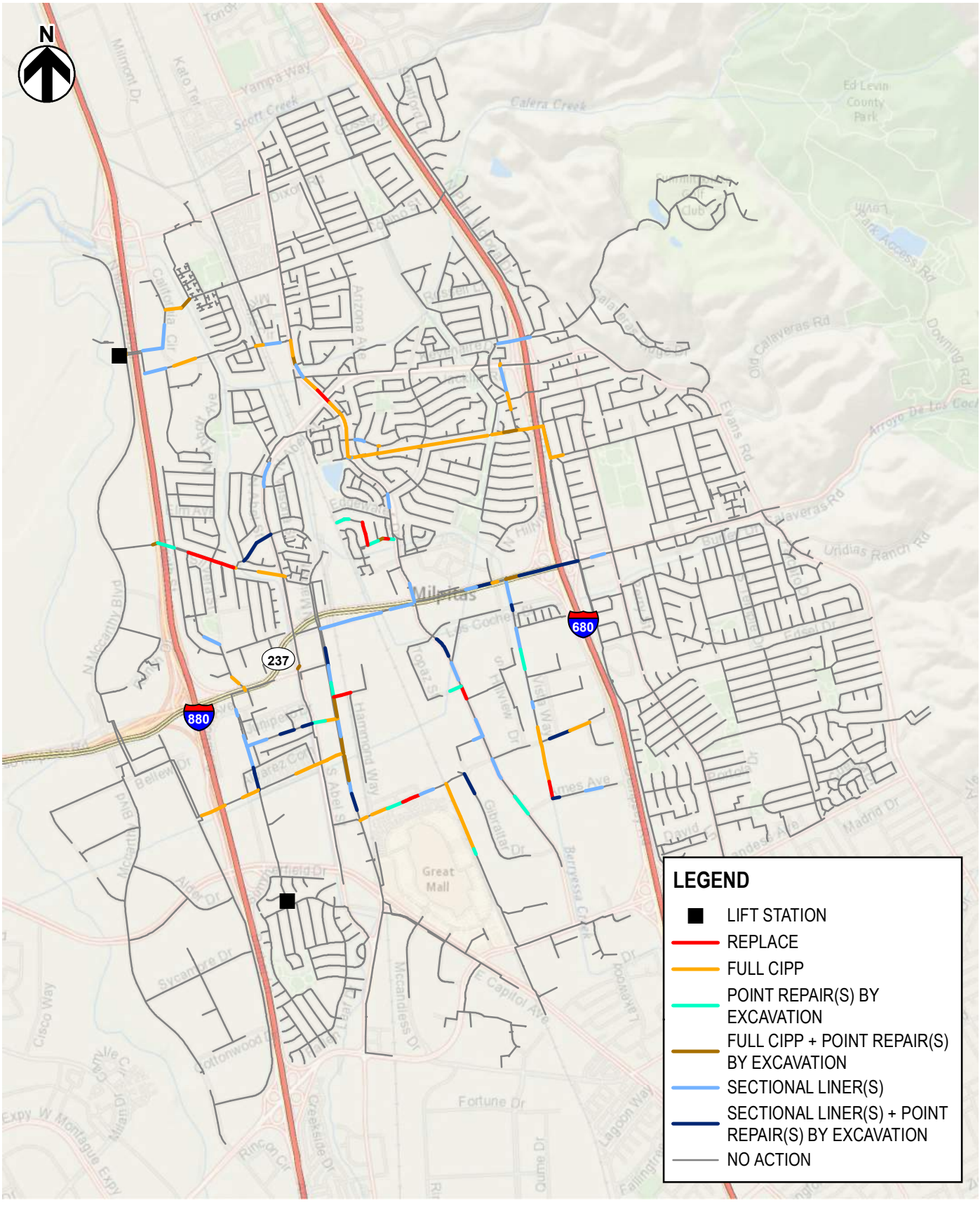


FIGURE 9-2
CITY OF MILPITAS
SEWER MASTER PLAN
RECOMMENDED REHABILITATION METHOD

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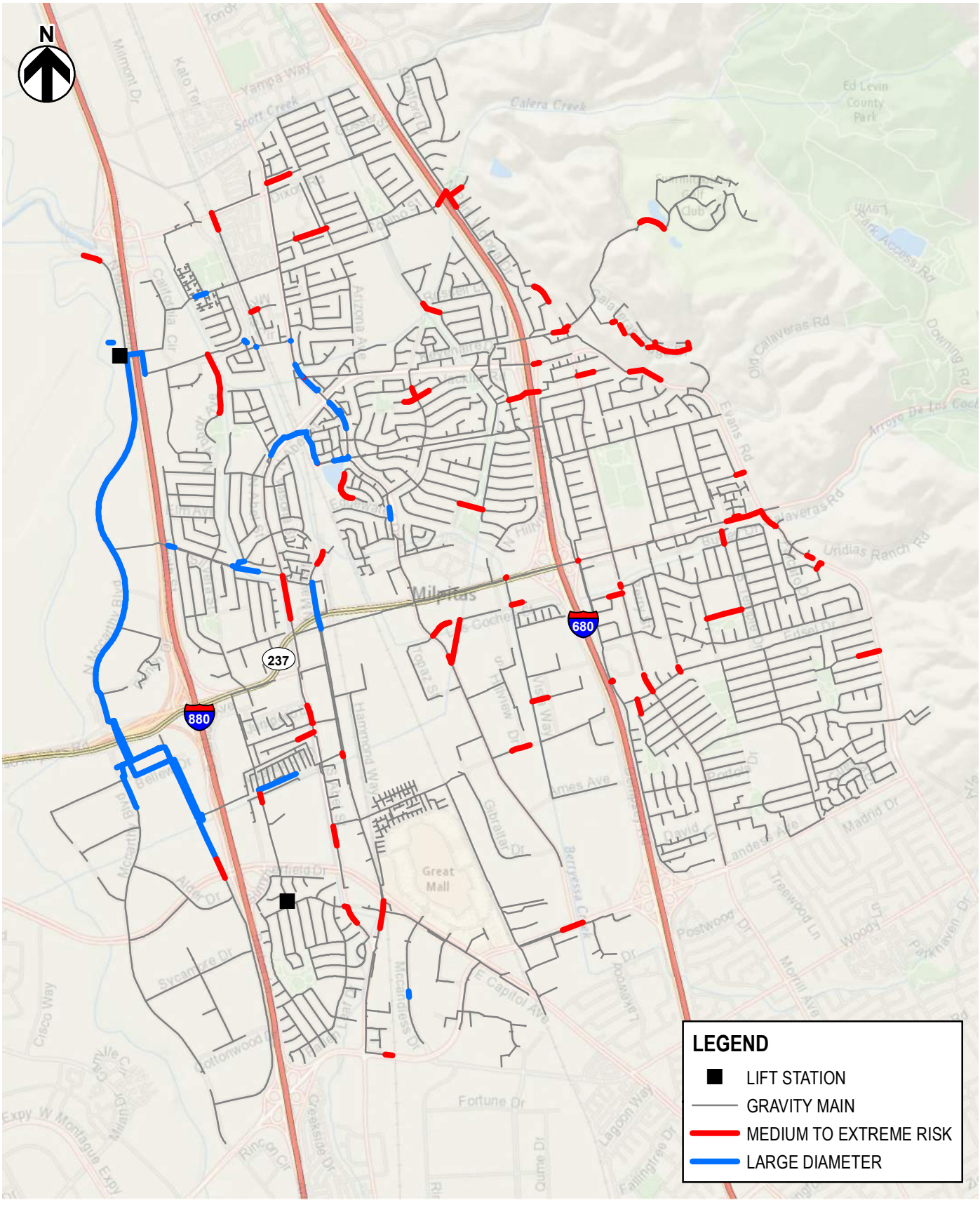


FIGURE 9-3
CITY OF MILPITAS
SEWER MASTER PLAN
RECOMMENDED CCTV PRIORITY

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9.2 Basis of Cost Assumptions

A cost estimate was developed for each type of rehabilitation method. Provided is a description of the basis for unit cost development and associated project-specific costs for pipelines, resurfacing, manholes, pumping systems, structural rehabilitation, protective coatings, bypass and redundancy, and electrical equipment. The purpose of approximating construction costs is to appropriate a conservative level of funding for each identified rehabilitation project included within the proposed scope of the City's upcoming CIP. **Appendix A** (R&R Study App. J) contains details of the preliminary cost estimates for all projects analyzed as part of this SMP.

9.2.1 CCTV Costs

CCTV costs were estimated based on diameter and length. Unit costs are conservative to account for the added cost for specialized techniques, such as laser profiling for large diameter pipe, and general quality control review. Unit costs are provided in **Table 9-2**.

Table 9-2: CCTV Unit Costs

Pipe Diameter (in)	Unit Cost ($/ft)
Up to 18	$4
19 to 24	$5
25 to 36	$6
37 to 66	$8

9.2.2 Pipeline Costs

Pipeline construction costs were developed in coordination with the City according to the City's cost criteria.

9.2.3 Soft Costs

Soft costs are additional project costs that are not considered to be contractor construction costs. These costs include engineering design, permitting, construction administration, and construction management. Typical soft costs include the following:

- Engineering design and consulting is expected to also address California Environmental Quality Act (CEQA) requirements to identify significant environmental impacts, if any.
- Permitting, land acquisition and obtaining right-of-way (ROW) are dependent on the project. For existing City facilities, the cost is expected to be less than if an easement is needed to be obtained through a property. The cost is also expected to be a function of the total cost. A range of percentages were applied to each project.
- Engineering services during construction (ESDC) and construction management costs are those costs associated with the administration of the contract and management of the project, ensuring the project is constructed as designed.
- The annual inflation of cost that would occur over time for a future project.

Table 9-3 provides a summary of the parameters used for estimating the soft costs. Soft costs were applied to all projects.

Table 9-3: Soft Cost Estimating Parameters

Cost Parameter	Cost	Applied to:
Engineering Design and Consulting Services	15%	Construction Subtotal
Permitting, land acquisition, and obtaining ROW	7%	Construction Subtotal
ESDC, Construction Management, & Inspection Services	12%	Construction Subtotal
Annual Inflation	3%	Project Total

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SECTION 10 – CAPITAL IMPROVEMENT PLAN

This section presents a summary of the prioritized set of CIP projects developed as a culmination of the condition assessment (CCTV inspection, desktop inspection, and lift station inspection) presented in **SECTION 4** and the project development summarized in **SECTION 9**. Recommendations include budget estimates and targeted timelines for project implementation based on the prioritization laid out in **SECTION 9**.

10.1 Existing CIP Projects

Every year, the City prepares a five-year CIP that provides the City Council, staff, and public with a comprehensive planning tool for budgeting and carrying out a range of capital projects. To ensure that the recommendations provided as part of this Master Plan Study align with recent, ongoing, and planned projects, a review of the City's 2020-2025 CIP was conducted. **Table 10-1** presents recent and ongoing wastewater collection system and lift station improvement projects per the 2020-2025 CIP.

Table 10-1: Recent Sewer Improvement Projects

Project ID	Project	Description	Status
6119	Sanitary Sewer Condition Assessment Program	Citywide sanitary sewer condition assessment program to determine the condition of the City's sanitary sewer system.	This phase to be completed during FY 2020/21.
6124	Pump Station Rehabilitation Program	Rehabilitation or replacement of wastewater pumps at Main LS and Venus LS to safely discharge sewage.	Replacement of pump no. 3 and purchase of portable backup generator at the Main LS planned for FY 2020-21.
6126	Minor Sewer Projects	Ongoing analysis, engineering, and implementation of various minor modifications and improvements to existing sewer systems.	Transfer switch at Venus and pavement restoration at the Main LS are planned for FY 2020-21.
6130	Main LS Odor Emissions Control	Installation of odor emission controls at the Main LS to address concerns regarding elevated levels of hydrogen sulfide and other odorous compounds at the facility.	Design started in FY2018-19 and construction started during spring 2020.
6131	Sanitary Sewer Cathodic Protection Improvements	Assessment, design, and installation of cathodic protection system along City's steel sewer force main from the Main LS to the RWF. Includes replacement of two existing magnetic flow meters at the Main LS with proper isolation to prevent reading interference.	Assessment and design started in FY 2019-20.
6134	On-Call Sewer Maintenance & Repair Services	On-call repair and maintenance services at all City sewer infrastructure, assets, and appurtenances.	Ongoing
Plan	Sewer Line Replacement at E. Curtis	Design and construction of sanitary sewer main replacement/upgrade on E. Curtis Avenue from S. Main Street to the E. Curtis cul-de-sac. This project will be financed through TASP Impact Fees.	2023-2024

Table 10-2 provides a summary of the 2020-2025 allocation for each of the projects and the sources of funding for each per the City's Capital Improvement Program 2020-2025 Final Report.

Table 10-2: Existing CIP Financing for 2020-2025

Projects	Sewer Infrastructure Fund	Sewer Fund	Sewer Treatment Fund	Total
6119 Sanitary Sewer Condition Assessment Prgm[1]	($50,000)	($74,000)	$0	$ 0
6124 Pump Station Rehabilitation Program[2]	$52,000	$0	$0	$52,000
6126 Minor Sewer Projects[3]	$163,000	$0	$0	$163,000
6130 Main Lift Station Odor Emissions Control	$0	$0	$200,000	$200,000
6131 Sanitary Sewer Cathodic Protection Improvements	$500,000	$0	$0	$500,000
6134 On-Call Sewer Maintenance & Repair Services	$24,000	$74,000	$0	$98,000
Total Existing Projects	$689,000	$0	$200,000	$889,000

Notes:
1. The total $124,000 in prior year funding from Sewer Fund and Sewer Infrastructure Fund to be allocated for other projects in FY2020-21. There is no further allocation for this program according to the Capital Improvement Program 2020-2025 Final Report
2. This is the net allocation. Original allocation is $200,000 with $148,000 in prior year funding from Sewer Infrastructure Fund to be allocated for other projects in FY2020-21.
3. This is the net allocation. Original allocation is $200,000 with $37,000 in prior year funding from Sewer Infrastructure Fund to be allocated for other projects in FY2020-21.

Sewer CIP are largely funded by the Sewer Infrastructure Fund. Other funding sources include the Sewer Fund (user rate structure) and the Sewer Treatment Fund (sewer connection fees). The funds are described in the CIP 2020-2025 Final Report as follows:

- **Sewer Infrastructure Fund:** Monies set aside to replace aging infrastructure for sewer related projects.
- **Sewer Fund:** Enterprise fund which receives revenue from sewer rates for sewer related improvements.
- **Sewer Treatment Fund:** Funded from fees collected from developers connecting to the Sewer System. Funds restricted for sewer related projects.

10.2 Proposed CIP Projects

Three alternatives to project phasing were evaluated in developing the proposed CIP phases. The first alternative addresses CIP projects based on BRE grades without consideration of project location, prioritizing the highest risk projects. The second alternative approach groups projects geographically within the sewer basin. The third alternative, which was selected for implementation, was a hybrid approach where pipelines with significant defects were prioritized in the first year and each subsequent year considered risk, type of rehabilitation, and geographic location. The general strategy is to address the highest risk/highest priority projects in the near-term (Years 1-5) with lower risk projects deferred to the medium- (Years 6-10) and long-term (Years 11-20). The objective was to budget for approximately $1.5M-$2M annually. Depending on funding availability, projects can slide up or down CIP phases while maintaining project priority.

The detailed risk assessment, basis for selecting rehabilitation methods, prioritization of improvements, and the related construction costs (construction and contingency) are provided in **Appendix A** (R&R Study).

Soft costs, as described in **Section 9.2.3**, consisting of engineering design and consulting; permitting and ROW; and ESDC, construction management and inspection services are included in the capital project costs provided. The following sections present the recommended projects for implementation and the proposed timeframe.

10.2.1 CCTV Inspection

Approximately 105,000 ft (449 segments) of sewer main was inspected as part of the condition assessment. The remaining 685,000 ft was analyzed using the desktop assessment. Medium- to extreme-risk pipes and large diameter pipes are recommended for CCTV inspection. Large diameter pipe is defined as 24-inch diameter or greater. **Figure 9-3** presents the recommended CCTV inspection map of these highest priority areas. These inspections total 55,000 ft, with an estimated cost totaling approximately $400,000 based on the unit costs provided in **Section 9.2.1**.

It is noted that the CCTV inspection work may generate additional improvement projects that may augment the proposed CIP. There is an existing CIP project (6126) that is intended to address minor sewer projects that currently allocates $50,000 annually. It is recommended that the City increase the annual allowance to $250,000 ($1.25M every five years) to budget for improvements needed to address defects as they are discovered during new CCTV inspections.

10.2.2 Pipeline Improvements

Of the approximately 105,000 ft (449 segments) of sewer pipeline inspected, approximately 50,000 ft (178 segments, see **Figure 9-2**) requires improvement. Recommended improvements include:

- Pipe Replacement
- Full Cured-In-Place Pipe (CIPP)
- Point Repair(s) by Excavation
- Sectional Liner(s)

It is noted that some pipeline segments include more than one recommended rehabilitation method.

The highest priority improvements are those segments identified to have significant defects during the condition assessment and thus rated as highest risk of failure. These projects are proposed for immediate improvement (Year 1) to reduce the likelihood of a catastrophic failure and are summarized in **Table 10-3**. The proposed method of rehabilitation is provided along with the capital cost for the collective improvements.

Table 10-3: Highest Priority Pipe with Significant Defects (Year 1: 2022)

Average Risk Grade	Street Name	Diameter (in)	Length (ft)	Material	Recommended Rehabilitation Method	Construction Cost
5.0	Coming Ave	8	234	VCP	Sectional Liner(s), Point Repair(s)	$61,000
5.0	E Calaveras Blvd	15	1305	VCP	Sectional Liner(s), Point Repair(s), Full CIPP	$273,000
5.0	Just East of S Hillview Dr	15	491	VCP	Sectional Liner(s), Full CIPP	$103,000
4.0	Curtis Ave	18	172	VCP	Sectional Liner(s)	$39,000
4.0	Marylinn Dr	27	292	VCP, RCP	Pipe Replacement, Full CIPP, Point Repair(s)	$131,000
4.0	N Hillview Dr	12	218	VCP	Sectional Liner(s)	$44,000
4.0	S Main St	18, 21	733	VCP	Sectional Liner(s), Point Repair(s)	$147,000
4.0	Sinnot Ln	12	398	VCP	Full CIPP, Point Repair(s)	$139,000
Construction Subtotal						**$936,000**
Construction Contingency					30%	$281,000
Engineering Design and Consulting Services					15%	$140,000
Permitting and Right of Way (ROW)					7%	$66,000
ESDC, Construction Management, & Inspection Services					12%	$112,000
Total Year 1 Project Costs						**$1,536,000**

Additional high- and some medium-priority improvements are recommended for implementation in the first five years after addressing the highest risk improvements shown in **Table 10-3**. These improvements are listed in **Table 10-4** and include the next priority projects, which also combine pipes with rehabilitation needs (of any risk grading) along the same street for efficiency.

Table 10-4: Medium- to High-Priority Improvements (Years 2-5: 2023-2026)

Average Risk Grade	Street Name	Diameter (in)	Length (ft)	Material	Recommended Rehabilitation Method	Construction Cost
5.0	S Abel St	18	66	VCP	Point Repair(s), Sectional Liner(s)	$32,000
3.9	Just East of S Hillview Dr[1]	12, 15	2,947	VCP	Full CIPP, Point Repair(s), Sectional Liner(s)	$503,000
3.7	N Milpitas Blvd	33, 39	3,062	RCP	Full CIPP, Sectional Liner(s)	$1,776,000
3.5	Nimitz Fwy and California Cir	18, 42	1,974	VCP, RCP	Full CIPP, Sectional Liner(s)	$474,000
3.3	E Calaveras Blvd[1]	12, 15, 18, 21	3,336	VCP	Full CIPP, Point Repair(s), Sectional Liner(s)	$1,168,000
3.2	Coming Ave[1]	8	1,374	VCP	Full CIPP	$358,000
Construction Subtotal						**$4,311,000**
Contingency					30%	$1,293,000
Engineering Design and Consulting Services					15%	$647,000
Permitting and Right of Way (ROW)					7%	$302,000
ESDC, Construction Management, & Inspection Services					12%	$517,000
Total Year 2-5 Project Costs						**$7,070,000**

Notes:
1. This street had some rehabilitation addressed in Year 1.

After addressing all high-priority, and some medium-priority, improvements in the first five years, the remaining medium-priority improvements are proposed for the next five-year period (Years 6-10). These improvements are listed in **Table 10-5**.

Table 10-5: Medium-Priority Improvements (Years 6-10: 2027-2031)

Average Risk Grade	Street Name	Diameter (in)	Length (ft)	Material	Recommended Rehabilitation Method	Construction Cost
3.3	S Main St[1]	18, 21	2,882	VCP	Point Repair(s) and Sectional Liner(s)	$576,000
2.9	Machado Ave	24, 30	2,939	RCP, VCP	Full CIPP, Sectional Liner(s)	$1,006,000
2.8	B/w Tramway Dr & Los Pinos Ave	24, 30	4,473	VCP, RCP	Full CIPP, Sectional Liner(s)	$2,484,000
Construction Subtotal						**$4,066,000**
Contingency					30%	$1,220,000
Engineering Design and Consulting Services					15%	$610,000
Permitting and Right of Way (ROW)					7%	$285,000
ESDC, Construction Management, & Inspection Services					12%	$488,000
Total Year 6-10 Project Costs						**$6,669,000**

Notes:
1. This street had some rehabilitation addressed in Year 1.

Low- and very low-priority improvements are proposed in the longer-term CIP (Years 11-20). The next two five-year increments are proposed in **Table 10-6** and **Table 10-7**. While these pipelines pose a small risk of failure, it is expected that they can continue to operate without significant likelihood of immediate failure.

Table 10-6: Low-Priority Improvements (Years 11-15: 2032-2036)

Average Risk Grade	Street Name	Diameter (in)	Length (ft)	Material	Recommended Rehabilitation Method	Construction Cost
3.1	Marylinn Dr	27, 30	2,841	RCP, VCP, SS	Full CIPP, Pipe Replacement, Point Repair(s), Sectional Liner(s)	$1,472,000
3.0	Ames Ave	12	533	VCP	Point Repair(s), Sectional Liner(s)	$107,000
3.0	Connection b/w N Milpitas Blvd & Summerwind Way	42	563	RCP	Full CIPP, Sectional Liner(s)	$176,000
3.0	Curtis Ave	15, 18	1,457	VCP	Full CIPP, Pipe Replacement, Point Repair(s), Sectional Liner(s)	$572,000
3.0	Gibraltar Dr	12	502	VCP	Point Repair(s), Sectional Liner(s)	$100,000
3.0	Kennedy Dr	12	276	VCP	Full CIPP	$82,000
3.0	N Abel St	27	543	VCP	Sectional Liner(s)	$103,000
3.0	N McCarthy Blvd	18	44	VCP	Sectional Liner(s)	$31,000
3.0	N Milpitas Blvd	15	423	VCP	Sectional Liner(s)	$122,000
3.0	River Rock Rd	18	561	VCP, RCP	Full CIPP	$238,000
3.0	S Abbott Ave	15, 16	285	VCP, CIP	Sectional Liner(s), Full CIPP	$103,000
3.0	S Milpitas Blvd	8, 12, 18	1,695	VCP	Point Repair(s), Sectional Liner(s)	$339,000
3.0	Fwy Crossing near Fox Hollow Ct	12	748	VCP	Sectional Liner(s)	$150,000
3.0	Smithwood St	15	388	VCP	Sectional Liner(s)	$78,000
3.0	Tramway Dr	12	38	VCP	Full CIPP	$19,000
3.0	Venus Way	8	46	VCP	Point Repair(s)	$12,000
3.0	Wool Dr	24	368	VCP	Full CIPP	$168,000
3.0	Yosemite Dr	8	970	VCP	Full CIPP, Pt Repair(s), Sectional Liner(s)	$194,000
2.8	Great Mall Dr	15	1,724	VCP	Full CIPP, Pt Repair(s), Sectional Liner(s)	$448,000
2.7	Connection to SW Community Starting from W Calaveras Blvd	15	1,419	VCP	Full CIPP, Pt Repair(s), Sectional Liner(s)	$369,000
2.3	N Hillview Dr	12	833	VCP, DIP	Full CIPP, Sectional Liner(s)	$208,000
Construction Subtotal						**$5,090,000**
Contingency					30%	$1,527,000
Engineering Design and Consulting Services					15%	$764,000
Permitting and Right of Way (ROW)					7%	$356,000
ESDC, Construction Management, & Inspection Services					12%	$611,000
Total Year 11-15 Project Costs						**$8,348,000**

Table 10-7: Very Low-Priority Improvements (Years 16-20: 2037-2041)

Average Risk Grade	Street Name	Diameter (in)	Length (ft)	Material	Recommended Rehabilitation Method	Construction Cost
2.0	S Milpitas Blvd	8, 12	893	VCP	Sectional Liner(s)	$179,000
2.0	Turquoise St	10	275	VCP	Point Repair(s)	$55,000
2.0	Tramway Dr	12	220	VCP	Sectional Liner(s)	$44,000
1.0	Connection b/w S Milpitas Blvd and Gibraltar Ct	12	231	VCP	Sectional Liner(s)	$46,000
1.0	Meadowland Dr	15	816	Unknown	Pipe Replacement and Point Repair(s)	$354,000
1.0	Silverlake Dr	15	621	Unknown	Full CIPP and Point Repair(s)	$161,000
1.0	Wool Dr	24	368	RCP	Full CIPP	$169,000
Construction Subtotal						**$1,008,000**
Contingency					30%	$302,000
Engineering Design and Consulting Services					15%	$151,000
Permitting and Right of Way (ROW)					7%	$71,000
ESDC, Construction Management, & Inspection Services					12%	$121,000
Total Year 16-20 Project Costs						**$1,653,000**

10.2.3 Lift Station

The Main LS and Venus Way LS were inspected, and major deficiencies were catalogued in the LS Report, as summarized in **Section 4.3** and detailed in **Appendix A** (R&R Study App. K). There are no immediate needs for the Venus Way LS. For the Main LS, the highest scoring deficiencies are identified **Table 10-8** and presented in order of priority according to both the condition and performance scores for the specific asset. Per City's 2019-24 CIP, project 6124, an allowance of $100,000 annual investment from FY 2019-20 through FY 2022-23 is planned to address these rehabilitation needs.

Table 10-8: Main LS Deficiencies

Asset Name	Field Assessment/Comments	Condition Score	Performance Score
Manifold PV #2 Actuator	Does not work	5	5
Grinder #1	Excessive vibration and inadequate supports	5	5
Air Vacuum 1 to 15	Cavitation, coating failure, and inadequate supports	5	5
Mag Meter (Flow Meter A)[1]	Not in operation	4	4
Pump #3	Has exceeded useful life[2]	4	4
2" Combination Air/Vacuum Valve	None	4	4
Flow Meter B[1]	Operable, but not accurate	4	4
Variable Frequency Drive P2	No corrosion identified, arc flash labels missing	4	2
Variable Frequency Drive P3	No corrosion identified, confirmed by City that IGBT was replaced in 2019, arc flash labels missing	4	2
Variable Frequency Drive P4	No corrosion identified, arc flash labels missing	4	2
Variable Frequency Drive P5	No corrosion identified, confirmed by City that cooling fans were replaced in 2019, arc flash labels missing	4	2

Notes:
1. The City is replacing these meters as part of CIP Project 6131: Sanitary Sewer Cathodic Protection Improvements.
2. This pump has logged over 50,000 hours.

10.3 CIP Budget and Schedule

The sewer CIP is funded by the sewer enterprise fund which includes the user rate structure and sewer connection fees. Provided below in **Table 10-9** is a proposed budget and schedule for the CIP and recommended projects over 20-years in 5-year increments. The most critical projects are scheduled for earlier implementation. It is noted that the timing of projects can be adjusted based on results of CCTV and future operating conditions. **Figure 10-1** presents the proposed improvement projects in 5-year increments.

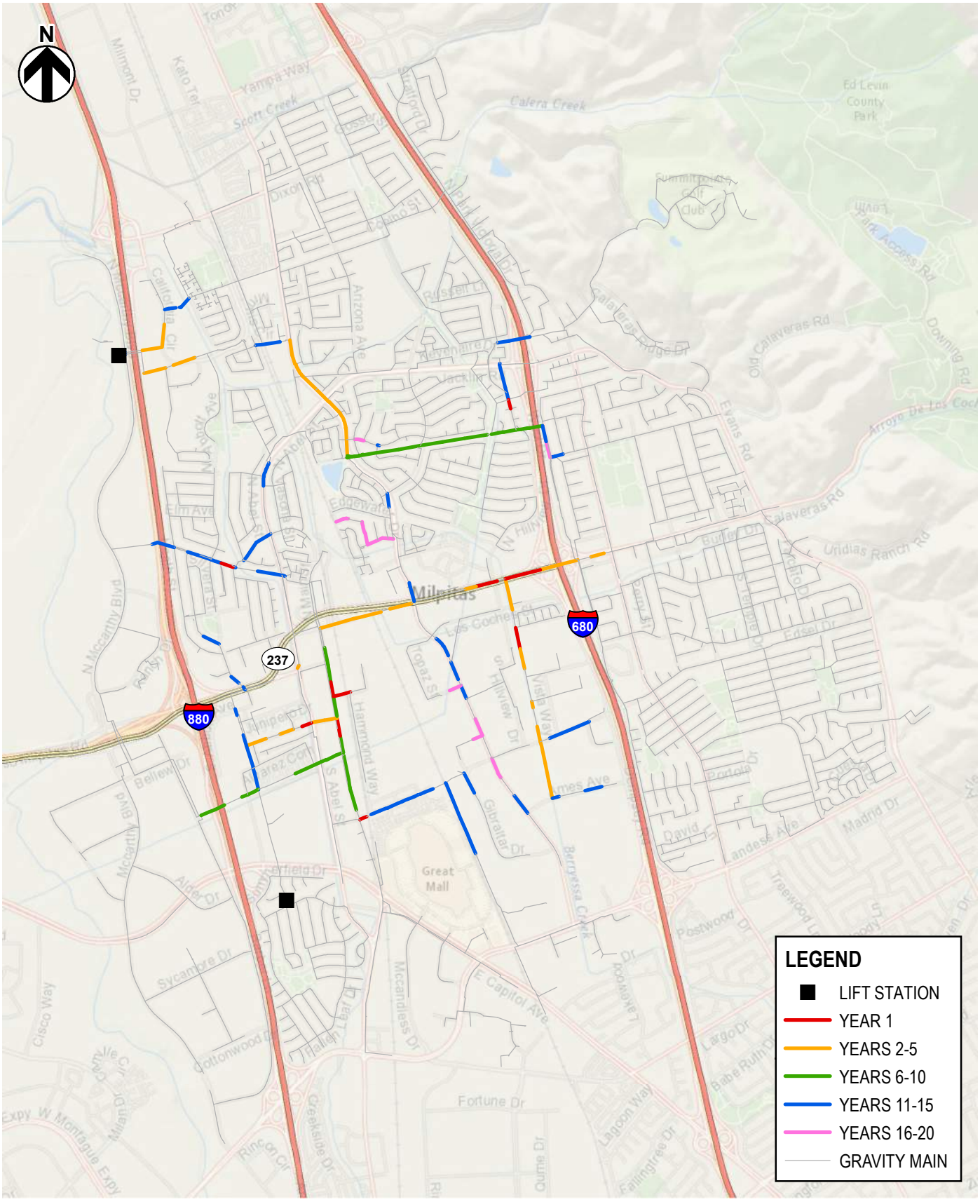


FIGURE 10-1
CITY OF MILPITAS
SEWER MASTER PLAN
CAPITAL IMPROVEMENT PROJECTS

HydroScience

Table 10-9: Proposed CIP Schedule and Budget

Projects	5-Year (2022-2026)	10-Year (2027-2031)	15-Year (2032-2036)	20-Year (2037-2041)
Existing Projects				
6124 Pump Station Rehabilitation Program	$200,000[1]	--	--	--
6126 Minor Sewer Projects	$200,000[2]	--	--	--
6130 Main Lift Station Odor Emissions Control	$200,000	--	--	--
6131 Sanitary Sewer Cathodic Protection Improvements	$500,000	--	--	--
6134 On-Call Sewer Maintenance & Repair Services	$98,000	--	--	--
Total Existing Projects	**$1,198,000**	**--**	**--**	**--**
Proposed Projects				
CCTV large diameter and high-risk assets	$400,000	--	--	--
Highest Priority Improvements	$1,536,000	--	--	--
Medium- to High- Priority Improvements	$7,070,000	$6,669,000	--	--
Low Priority Improvements	--	--	$8,348,000	$1,653,000
Allocation for improvements identified from ongoing CCTV	$1,250,000	$1,250,000	$1,250,000	$1,250,000
Total Proposed Projects	**$10,256,000**	**$7,919,000**	**$9,598,000**	**$2,903,000**
Existing and Proposed Projects	**$11,454,000**	**$7,919,000**	**$9,598,000**	**$2,903,000**

Notes:
1. Original allocation is $200,000 through 2023 with $148,000 in prior year funding from Sewer Infrastructure Fund to be allocated for other projects in FY2020-21.
2. Original allocation is $200,000 with $37,000 in prior year funding from Sewer Infrastructure Fund to be allocated for other projects in FY2020-21.
3. It is noted that costs were reviewed and updated during 2022 to reflect recent cost increases associated with sewer infrastructure projects.

After the projects above were developed, the City contracted with the financial consulting firm Raftelis to develop fiscal impact models and to assess the financial feasibility of the Master Plan projects, beginning FY 2024 through FY 2040. The financial models are intended to evaluate the sewer utility fund revenues and expenses and analyze the impacts of the Master Plan projects on City funds. The Wastewater Financial Plan Options Report is attached as **Appendix G**.

10.4 Other Recommendations

During the CCTV inspection performed by NPS, there were instances of large grease buildup in various locations throughout the wastewater collection system. As explained previously, the presence of grease buildup and other blockages, particularly at, or near, critical flow splits, can significantly impact collection system operations, particularly at flow splits, which are generally intended to mitigate high flows and provide redundancy. This redundancy aids the system's ability to handle higher flows during wet weather events and as the water table rises during the wet season. When flow splits are not operating properly, this can drastically impact the system operation, particularly during wet weather events.

It is recommended that the City cleans the locations identified as having grease buildup. Locations should also be vacuumed to remove blockages from moving further downstream. In addition, stricter FOG Control Program guidelines and increased inspections may be necessary to prevent FOG discharges to the wastewater collection system.

It is expected that there will be additional O&M costs related to the following:

- In-house CCTV inspection;
- Additional cleaning related to the act of inspection and as a result of discovering blockages; and
- Implementing a stricter FOG Control Program/increased inspections of grease traps.

In addition to the projects summarized herein, the City is evaluating the need to rehabilitate or replace Force Main A (FM-A), which conveys wastewater from the Main LS to the RWF (see **Figure 3-1**). Built in 1974, FM-A was identified as requiring inspection because the soils surrounding the pipeline are very corrosive. The City contracted with a third party to perform cleaning and CCTV inspection of FM-A to determine the internal condition. The inspection was not fully completed due to unforeseen obstacles.

It is recommended that the City perform a complete condition assessment of FM-A to verify the internal condition of the pipeline and determine the best options for rehabilitation or replacement. The City's report generated by the engineering department is included as **Appendix H**.

Initial City estimates to rehabilitate or replace FM-A are approximately $1M to complete the force main assessment and maintenance of the appurtenances and an additional $25M to replace the force main. Both of these costs were included as capital projects requiring consideration for an upcoming CIP, in addition to the amounts specified in **Section 10.3**.

APPENDIX A

City of Milpitas
Sewer Master Plan Study
Sewer Utility Asset Renewal and Replacement Study

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Final Report

11020 White Rock Road, Suite 200
Rancho Cordova, CA 95670

T: 916.444.0123

Prepared for: HydroScience Engineers and City of Milpitas

Project Title: Milpitas Sewer Master Plan

Project No.: 154251

Final Report

Subject: Sewer Utility Asset Renewal and Replacement Study

Date: November 23, 2020

From: Brown and Caldwell

Prepared by: Elton DeSouza, PE (Non-CA)
Timothy Lee, EIT

Reviewed by: Lawrence Catalano, PE (Non-CA)
Sean Kilpatrick, PE (Non-CA)

Approved by: Manjit Saini, PE, C-61948, Exp 09-30-21

Limitations:

This document was prepared solely for HydroScience Engineers/City of Milpitas in accordance with professional standards at the time the services were performed and in accordance with the contract between HydroScience Engineers/City of Milpitas and Brown and Caldwell dated October 16, 2019. This document is governed by the specific scope of work authorized by HydroScience Engineers/City of Milpitas; it is not intended to be relied upon by any other party except for regulatory authorities contemplated by the scope of work. We have relied on information or instructions provided by HydroScience Engineers/City of Milpitas and other parties and, unless otherwise expressly indicated, have made no independent investigation as to the validity, completeness, or accuracy of such information.

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Executive Summary

As a part of the City of Milpitas' (City) Sewer Master Plan, Brown and Caldwell (BC) has been retained to develop a Sewer Utility Asset Renewal and Replacement (R&R) Study. The intent of the R&R Study is to provide the City with priorities for upcoming asset renewal and replacement projects given a fixed yearly budget.

Closed-circuit television (CCTV) was utilized to visually assess the sewer's condition. Resulting CCTV review was summarized and cataloged according to National Association of Sewer Service Company's (NASSCO) Pipeline Assessment and Certification Program (PACP) structural and operations and maintenance (O&M) grades in Section 2. Additionally, a desktop condition assessment was performed for all pipe segments using likelihood of failure (LOF) and consequence of failure (COF) criteria described in Section 3. This collective analysis revealed that of the approximately 105,000 linear feet (LF) (449 sewer segments) of sewer gravity pipeline inspected, approximately 50,000 LF (178 sewer segments) require system improvements totaling approximately $17 million of construction costs. Of the remaining 685,000 LF segments with no inspection data, desktop risk assessment determined that 55,000 LF of medium to extreme risk pipes and/or large diameter pipes (24-inch diameter pipe or larger) require CCTV or sonar inspection totaling approximately $400,000. System improvements and CCTV inspection recommendations total to $17.4 million. These proposed improvements are illustrated on Figure ES-1.

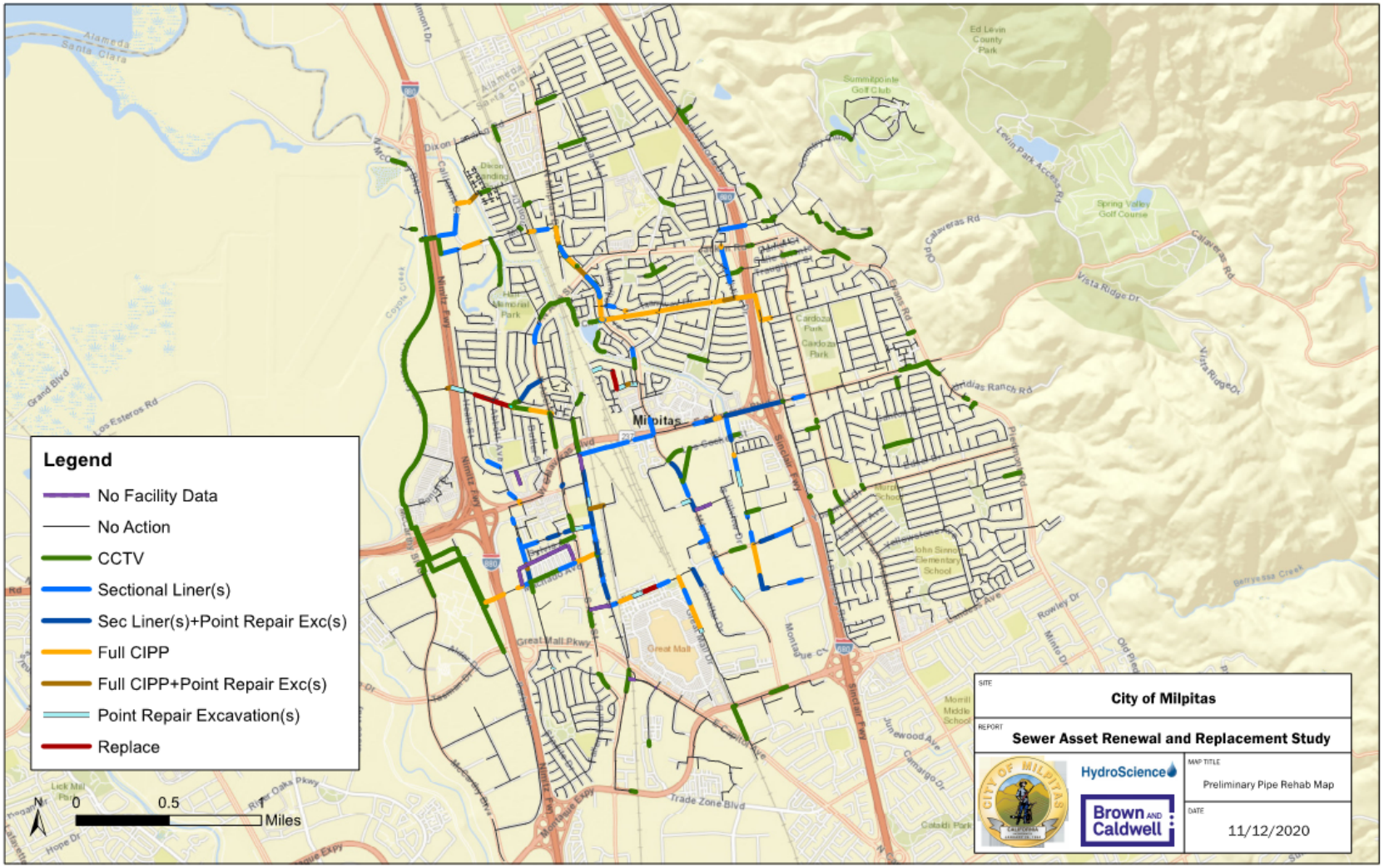


Figure ES-1: Preliminary Pipe Rehabilitation Recommendations Map

Table ES-1 presents a summary of the overall CCTV and rehabilitation recommendations with associated Association for the Advancement of Cost Engineering (AACE) Class 5 cost estimate. Note that the presented costs are budgetary construction costs and do not include engineering, permitting, legal, administrative, or other planning costs typical of budgetary capital improvement planning.

Table ES-1. Detailed Rehabilitation Recommendations for Sewer Improvement

Rehabilitation Action	Construction Cost
CCTV	$400,000
Full Cured-In-Place Pipe (CIPP)	$8,900,000
Full CIPP+Point Repair Exc(s)	$1,400,000
No Action	$0
Point Repair Excavation(s)	$300,000
Pipe Replacement[1]	$2,400,000
Sec Liner(s)+Point Repair Exc(s)	$1,400,000
Sectional Liner(s)	$2,600,000
Total Construction Cost[2] (Class 5 Estimate)	**$17,400,000**

[1]Loaded cost including costs associated with earthwork, demolition, sheeting, shoring & bracing, paving, and testing and commissioning. Pavement repair assumes minimum four-foot-wide trench per running foot.
[2]Contingencies amounting to 45% are included in the estimate (5% Mobilization/Demobilization, 10% Sewer Bypassing, 30% Construction Cost and Market Contingency). Additionally, traffic control during construction amounting to $10,000 to $30,000 depending on roadway traffic rating was also assumed. Administrative, engineering, or other planning costs typical of CIP planning are not included.

These rehabilitation recommendations are divided into capital improvement program (CIP) phases below in Table ES-2 in correspondence with the City's $2,000,000 annual rehabilitation budget when feasible. Although years 2 and 3 propose rehabilitations exceeding the budget, crucial rehabilitation of extreme and select high risk pipes help to minimize costly pipe failures. In addition, years 4 through 8 feature a rehabilitation plan requiring less budget to offset the previous expenditures.

Table ES-2. Preliminary Sewer Pipeline Capital Improvement Plan

Year	Description	Construction Cost[1]	Construction Cost Per Year
1	Rehabilitate Extreme and High Risk Pipes with Significant Defects	$1,300,000	$3,000,000
	CCTV Large Diameter and Medium to Extreme Risk Pipes	$400,000	
1-3	Rehabilitate Extreme Risk Pipes and Pipes Along the Same Street Requiring Rehabilitation	$7,400,000	
4	Rehabilitate High Risk Pipes and Pipes Along the Same Street	$1,900,000	-
5-7	Rehabilitate Medium Risk Pipes and Pipes Along the Same Street	$5,400,000	$1,800,000
8	Rehabilitate Low Risk Streets	$1,000,000	-

[1]Assets are rated from 1 (negligible) to 5 (extreme) based on available survey data and desktop condition assessment results.
[2]Contingencies amounting to 45% are included in the cost estimate (5% Mobilization/Demobilization, 10% Sewer Bypassing, 30% Construction Cost and Market Contingency). Additionally, traffic control during construction amounting to $10,000 to $30,000 depending on roadway traffic rating was also assumed. Administrative, engineering, or other planning costs typical of CIP planning are not included.

The CIP phases are described in more detail in Section 4.5. Additionally, the rehabilitation recommendations for each asset is included in graphic information system (GIS) and tabular format in Appendix A. Recommendations are subject to change depending on future discussions with operational staff to determine rehabilitation preferences of the various levels and types of defects. The methodology and rehabilitation selection process is detailed in Section 4.1. The cost assumptions and sources are listed in Section 4.2 and Appendix J; detailed cost estimates are recommended when further CIP budgeting and planning takes place.

Section 1: Introduction

The intent of this Sewer Utility Asset Renewal and Replacement (R&R) Study is to provide the City of Milpitas (City) with priorities for asset renewal and replacement. A part of the evaluation included developing an understanding of the relative risk of failure for the City's sewer gravity pipeline segments by performing a likelihood and consequence of failure analysis. Understanding the relative risk of failure for various sewer pipeline sections is critical to effectively plan sewer capital improvement projects by prioritizing the highest risk projects. Brown and Caldwell (BC) worked closely with City staff and HydroScience Engineers (HSE) to develop an appropriate failure ranking and weighting system to predict risk of failure. In general, overall risk of failure was determined by considering both pipe characteristics (age, material, depth, location, presence of obstructions, etc.) and internal pipe video inspection findings.

1.1 Background

The City of Milpitas is located within the San Francisco Bay Area, north of San Jose, California. All wastewater produced in the City is treated at the San Jose–Santa Clara Regional Wastewater Facility (RWF), the largest advanced wastewater treatment facility in the western United States. The City's sewer system serves over 77,000 customers and consists of 0.95 million linear feet (LF) of underground pipeline, including 26,400 LF of force main pipeline (Milpitas Wastewater Fact Sheet, Water and Sewer System Information). Wastewater is conveyed to RWF through two large pump stations, the Venus station and the Main Sewer pump station (Milpitas Wastewater Fact Sheet). A map of RWF's tributary agencies, provided by the City of San Jose, can be found in Figure 1-1 (City of San Jose). Recycled water, which is produced at RWF, is returned to the City for use in non-drinking water applications, such as irrigation of golf courses and agricultural land. Recycled water pipelines, shown as purple pipes in Figure 1-1, are not included in this analysis.

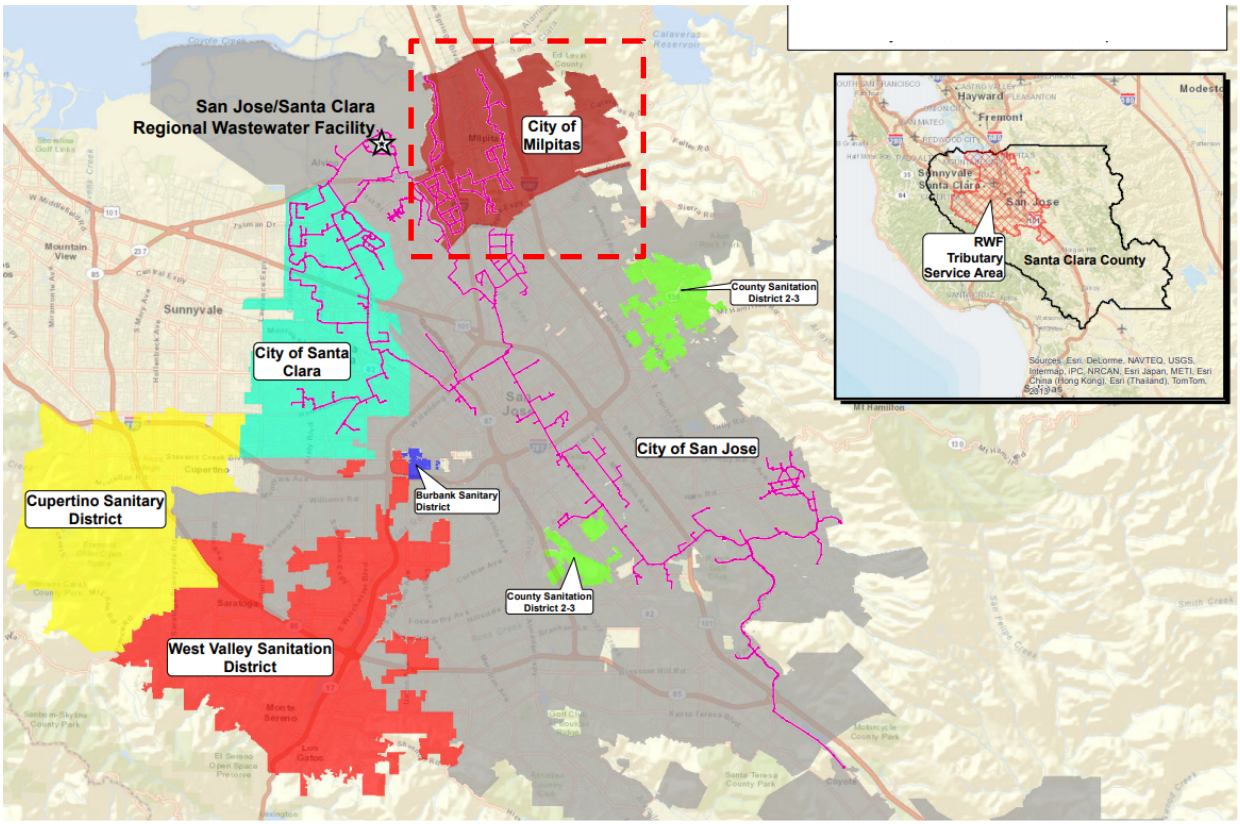


Figure 1-1: San Jose-Santa Clara Regional Wastewater Facility Tributary Service Area

1.2 Objectives

The objective of the Sewer Utility Asset R&R Study is to provide the City with applicable sewer condition and risk information to support prioritization of asset renewal and replacement. Core values and priority areas, established by City Council, guide the evaluation of risk and consequence in order to meet the City's mission and performance levels.

Objectives associated with this report are presented below.



Section 2: Inspection Condition Assessment

Understanding the internal pipe condition (presence of structural and operational & maintenance (O&M) defects) is critical to understanding asset condition and likelihood of failure. Closed-circuit television (CCTV) inspection was utilized to assess the internal condition of the key pipeline segments. Key pipeline segments were defined as follows:

- Diameters greater than 8 inches
- Located within traffic impacted areas
- Located within commercial/industrial areas.

Due to budget limitations, the CCTV efforts were divided between a subcontractor, National Plant Services, Inc (NPS), and the City. NPS completed their portion of CCTV inspections between March and May of 2020. The City was unable to complete its portion of the CCTV inspection due to Coronavirus restrictions, therefore that portion of the information was not available for this analysis. Approximately 105,000 LF of CCTV inspection data was collected by NPS.

2.1 Planned Segments and Scope

NPS' work was subdivided into six planned inspection contracts shown in Table 2-1. Figure 2-1 details the division of the contracts, as well as the sewer segments scheduled to be inspected by the City. The detailed planned CCTV inspection scope can be found in Appendix B.

Table 2-1. CCTV Inspection Scope

Inspection Responsibility	Inspection Contract	Pipe Material	Pipe Diameter	Number of Segments	Total Length
NPS	Contract Trunk 1	RCP	33-inch, 36-inch, 39-inch, 42-inch, 54-inch and 66-inch	37	8,830 LF
	Contract Trunk 2	RCP and VCP	27-inch and 33-inch	24	5,760 LF
	Contract Trunk 3	RCP and VCP	24-inch and 30-inch	15	4,850 LF
	Contract 16-24 Inch	Mostly VCP	16-inch, 18-inch, 21-inch and 24-inch	62	16,610 LF
	Contract 10-15 Inch	Mostly VCP	10-inch, 12-inch and 15-inch	119	34,930 LF
	Contract 8-Inch	Mostly VCP	8-inch	184	51,350 LF
	Subcontractor Total			441	122,330 LF
City	N/A	VCP	Primarily 6-inch and 8-inch	389	98,750 LF

*RCP = reinforced concrete pipe
*VCP = vitrified clay pipe

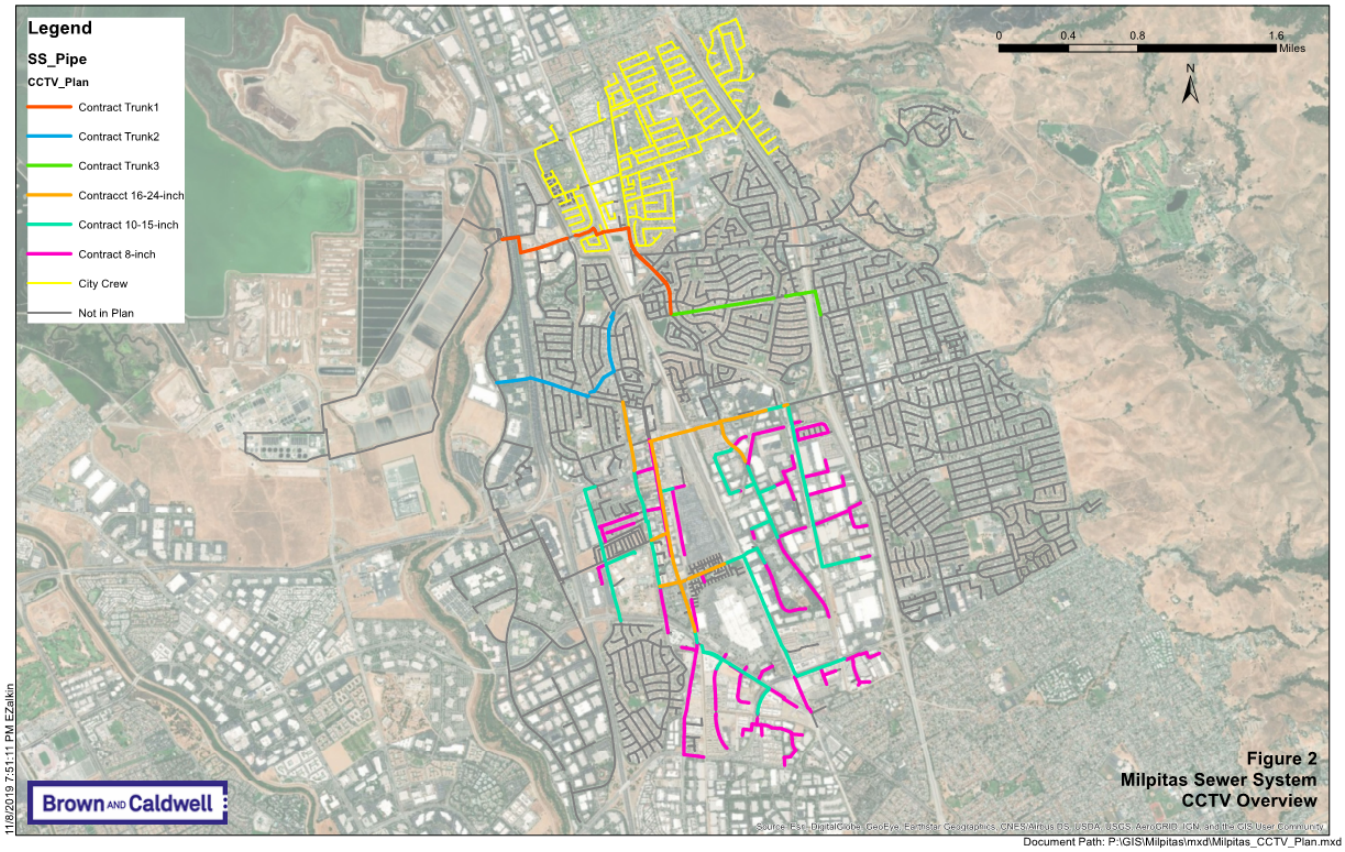


Figure 2-1: CCTV Inspection Map by Contract

In addition to CCTV, a two-dimensional laser and sonar inspection was to be performed as part of Contract Trunk 1. Due to scheduling conflicts, this work was not completed.

2.2 Inspection Results (NPS)

NPS successfully inspected 105,221 LF of their contracted 122,330 LF of sewer pipeline. NPS reported that pipes were unable to be completely inspected for multiple reasons, including presence of siphons (requiring extra equipment), root balls, grease, rocks, and other debris preventing complete inspection. The inspected segments are shown in green on Figure 2-2.

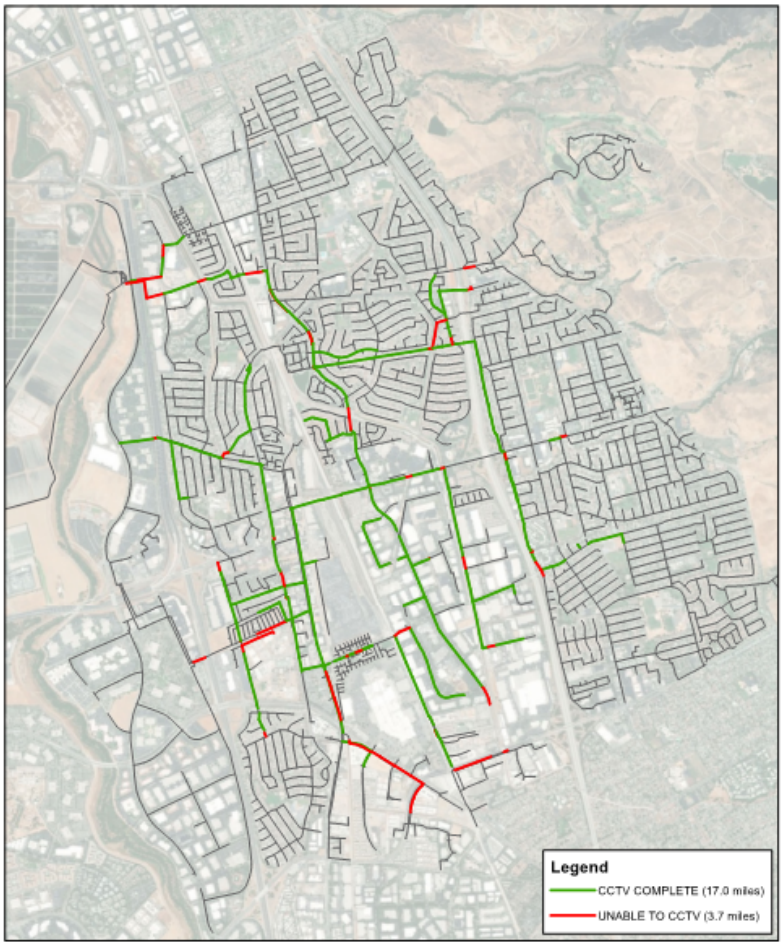


FIGURE 2
CITY OF MILPITAS SEWER SYSTEM
PIPELINES RECEIVING CCTV
MAY 28, 2020

HydroScience

Figure 2-2: NPS Completed CCTV Inspection

Details of the NPS CCTV inspection performed by pipe diameter are presented in Table 2-2.

Table 2-2. NPS CCTV Inspection Results

Pipe Diameter	Distance of Inspection Performed
6-Inch	N/A
8-Inch	8,211 LF
10-Inch	3,540 LF
12-Inch	19,003 LF
15-Inch	25,552 LF
16-Inch	195 LF
18-Inch	15,292 LF
21-Inch	10,268 LF

Table 2-2. NPS CCTV Inspection Results	
Pipe Diameter	Distance of Inspection Performed
24-Inch	1,995 LF
27-Inch	5,337 LF
30-Inch	7,393 LF
33-Inch	574 LF
36-Inch	0 LF
39-Inch	2,487 LF
42-Inch	2,547 LF
48-Inch	0 LF
54-Inch	0 LF
66-Inch	1,037 LF
Size Unknown	1,788 LF
Total Pipe Inspected	105,221 LF

2.2.1 Defect Coding

The National Association of Sewer Service Company's (NASSCO) Pipeline Assessment Certification Program (PACP) was utilized to assess sewer pipeline condition and identify defects. All pipeline segments were coded by NPS staff who had been PACP-certified. Additionally, approximately 20 percent of the pipe (89 out of 449 pipe segments) CCTV and PACP reports were reviewed by PACP-certified BC personnel, as part of BC's quality control (QC) process. BC noted minor issues with the condition assessment data collection or data review and forwarded summary of this review to HSE. Further details regarding the QC process can be found in Section 2.3.

The condition assessment of pipelines consists of:

- Identifying defects along each pipeline segment through visual inspection
- Assigning individual grades to each defect based on the type and severity
- Developing an overall Condition Grade for each pipeline segment by assessing type and number of defects along the pipeline segment
- Assigning a final Condition Rating to each pipeline segment based on the condition grades and the potential for further deterioration and/or failure

Under PACP, defects are categorized as either structural or O&M related. Structural defects are those that directly impair the structural condition of the pipeline, such as joint separation, joint deflections, cracks, fractures, broken and collapsed pipe or wall, corrosion, worn inverts, and sag conditions. Structural defects are those that are typically addressed through repairs, rehabilitation, or replacement. O&M defects include a range of conditions that can either directly affect the performance of the sewer or are indicators of potential future structural defects. O&M conditions include debris, grease, infiltration, intrusions (root or service laterals), and hydraulic problems. O&M defects are typically addressed through maintenance, although some (such as infiltration) may require additional rehabilitation.

In general, PACP grades range from 1 to 5, with 1 being a minor defect grade and 5 being the most significant defect grade. Table 2-3 provides a description of the defect related to the condition grade it receives.

Table 2-3. Structural Condition Grade Implications		
Condition Grade	Condition Rating	Defect Description
1	Mild	Minor defects
2		Defects that have not begun to deteriorate
3	Moderate	Moderate defects that will continue to deteriorate
4	Severe	Severe defects that will become Grade 5 defects within the foreseeable future
5		Defects requiring attention soon

When rating the condition of a pipe, three factors best characterize the inspection results.

- Structural Peak Score - The highest rated condition grade for structural defects present in a pipe
- O&M Peak Score - The highest rated condition grade for O&M defects present in a pipe
- Peak Score - The greater of structural peak score and O&M peak score

Table 2-4 presents the peak structural and O&M scores by pipe diameter.

Table 2-4. Peak Structural and O&M Scores by Pipe Diameter (NPS CCTV)									
Pipe Diameter	Structural Peak Score	Total Pipe Length (LF)	O&M Peak Score	Total Pipe Length (LF)	Pipe Diameter, Continued	Structural Peak Score	Total Pipe Length (LF)	O&M Peak Score	Total Pipe Length (LF)
8-Inch	0	514	0	0	27-Inch	0	149	0	40
	1	0	1	340		1	0	1	486
	2	5,177	2	3,541		2	3,010	2	1,167
	3	1,915	3	860		3	1,087	3	1,834
	4	46	4	2,415		4	0	4	1,808
	5	560	5	1,055		5	1,090	5	0
10-Inch	0	117	0	511	30-Inch	0	598	0	1,226
	1	0	1	0		1	24	1	622
	2	1,769	2	2,095		2	4,738	2	3,627
	3	1,654	3	934		3	2,034	3	832
	4	0	4	0		4	0	4	522
	5	0	5	0		5	0	5	564
12-Inch	0	2,047	0	367	33-Inch	0	0	0	0
	1	0	1	347		1	0	1	0
	2	11,782	2	7,766		2	574	2	0
	3	2,956	3	3,339		3	0	3	0
	4	1,692	4	4,262		4	0	4	374
	5	526	5	2,922		5	0	5	201

Table 2-4. Peak Structural and O&M Scores by Pipe Diameter (NPS CCTV)									
Pipe Diameter	Structural Peak Score	Total Pipe Length (LF)	O&M Peak Score	Total Pipe Length (LF)	Pipe Diameter, Continued	Structural Peak Score	Total Pipe Length (LF)	O&M Peak Score	Total Pipe Length (LF)
15-Inch	0	2,269	0	800	39-Inch	0	0	0	0
	1	0	1	0		1	0	1	0
	2	11,898	2	11,980		2	1,073	2	0
	3	5,680	3	3,450		3	1,415	3	634
	4	1,409	4	6,909		4	0	4	1,049
	5	4,296	5	2,413		5	0	5	805
16-Inch	0	127	0	0	42-Inch	0	399	0	268
	1	0	1	0		1	0	1	0
	2	0	2	0		2	977	2	0
	3	69	3	0		3	1,171	3	569
	4	0	4	69		4	0	4	1,709
	5	0	5	127		5	0	5	0
18-Inch	0	1,368	0	716	66-Inch	0	609	0	0
	1	66	1	826		1	0	1	0
	2	7,774	2	4,616		2	0	2	917
	3	3,996	3	3,610		3	428	3	120
	4	996	4	3,124		4	0	4	0
	5	1,093	5	2,399		5	0	5	0
21-Inch	0	852	0	0	Unknown Diameter	0	169	0	106
	1	0	1	0		1	0	1	124
	2	7,113	2	6,136		2	1,274	2	672
	3	1,977	3	1,682		3	346	3	7
	4	326	4	1,721		4	0	4	824
	5	0	5	728		5	0	5	55
24-Inch	0	0	0	305	Total	0	9,218	0	4,339
	1	85	1	368		1	175	1	3,113
	2	1,543	2	35		2	58,702	2	42,552
	3	368	3	537		3	25,096	3	18,408
	4	0	4	0		4	4,469	4	24,786
	5	0	5	750		5	7,565	5	12,019

A map of the overall peak score by pipe segment can be found in Figure 2-3. Appendices D and E provide Structural and O&M score maps, respectively.

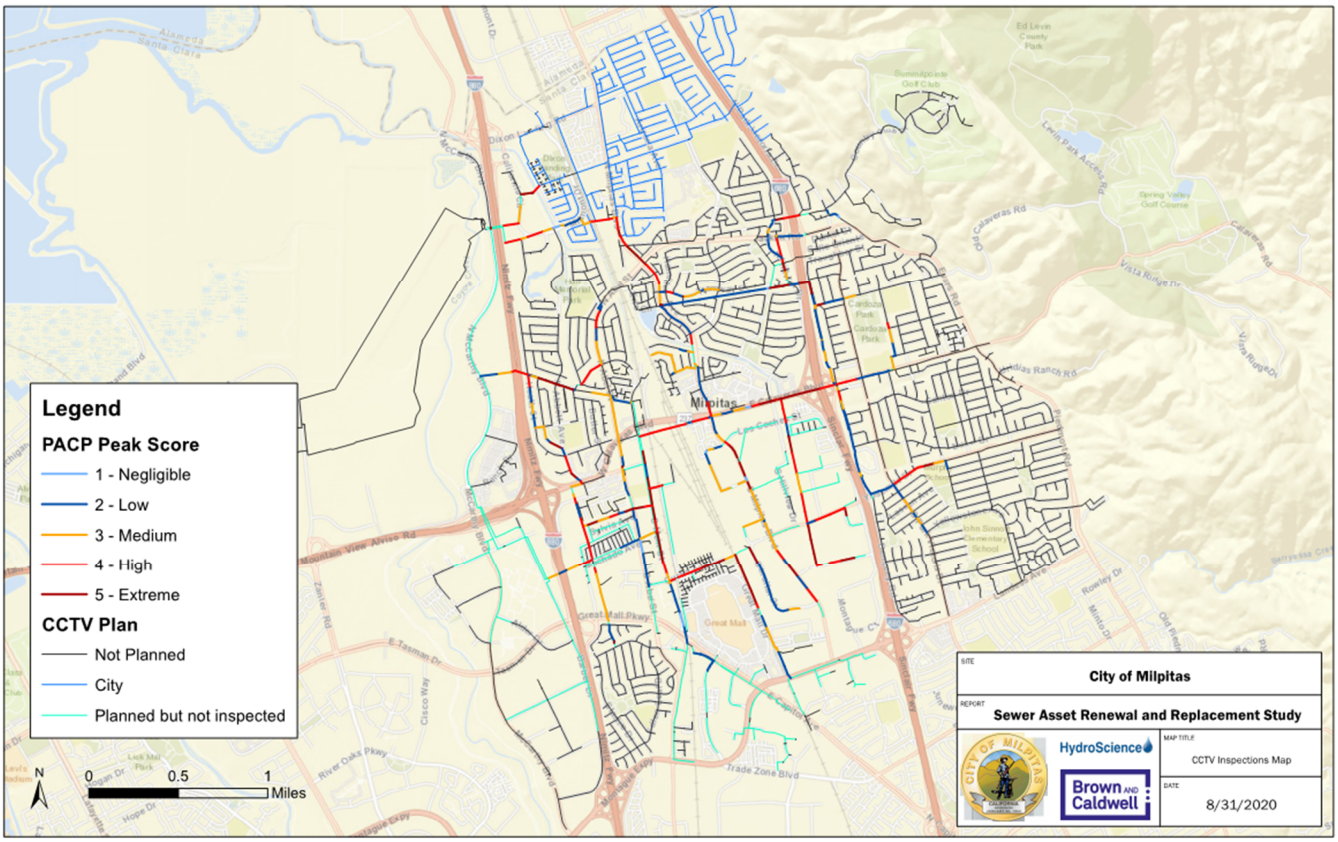


Figure 2-3: Overall PACP Peak Score

2.3 Quality Control Review

Following CCTV inspection, the CCTV database was imported into InfoAsset Manager (IAM) to compare CCTV data to existing geographic information system (GIS) data. After the import, several QC queries were performed to confirm that CCTV data was appropriately matched with existing GIS data. For example, a conflict between CCTV data and GIS data can occur when a new structure is found in the field, or when a structure in the GIS is verified to not to exist on CCTV. Once QC in IAM was completed, the data with updated manhole and pipe connectivity (as confirmed by CCTV) was exported for use in InfoAsset Planner (IAP). Updated GIS data was made available for HSE to update their model and maps.

The QC review of CCTV and PACP reports was performed on approximately 20 percent of the pipe segments. In general, several videos were found to be blurry or unfocused. These were noted in the QC Comment Log, included as Appendix C. Primary QC efforts targeted pipe segments with structural peak grades of four or five because of the high likelihood of these segments requiring repair or improvements. Pipe wall loss due to corrosion, of varying severities, was found throughout the collection system, which is not unexpected in sanitary systems comprised of concrete pipes. Infiltration was observed in some locations, and a few pipe breaks and holes with visible voids were identified. Specific QC comments can be found in the QC Comment Log (Appendix C).

Section 3: Desktop Condition Assessment Task

For all pipe segments, a desktop condition assessment analysis was performed to assess asset risk. The overall risk of pipeline failure is determined by considering both the *likelihood* that an asset is unable to provide the function for which it was installed, as well as the *consequence* or impacts resulting from failure of the asset.

Overall likelihood of failure (LOF) and consequence of failure (COF) scores were determined by considering both **factor ratings** and **factor weightings**. The LOF factor rating predicts how likely an asset is to fail and the consequence factor rating predicts how consequential an asset failure would be. Assigned factor ratings range between one and five, with one being the least likely to fail/least consequential and five being the most likely to fail/most consequential.

The likelihood/consequence factor weighting is an assigned value which reflects the relative importance of a specific factor category compared to other factor categories. Critical factors are assigned greater weighting values than less critical factors.

The following equations provide basis for determining risk scores.

$$\text{Risk} = \text{LOF Score} \times \text{COF Score}$$

$$\text{LOF Score} = \sum (\text{LOF Rating} \times \text{LOF Weighting})$$

$$\text{COF Score} = \sum (\text{COF Rating} \times \text{COF Weighting})$$

3.1 Likelihood of Failure

The LOF analysis predicts the likelihood that an asset is unable to provide the function for which it was installed determined by assigned ratings and weightings. The factors selected for analysis are typical for sewer renewal/replacement projects.

Asset characteristics, asset condition and asset location were all considered during the LOF analysis. In all cases, unknown data was assigned medium risk. Specifically, the following factors were used (data sources included in parentheses):

- **Pipe Age** - In general, as a pipe ages, it has a higher likelihood to fail (pipe age provided by City GIS).
- **Pipe Material** – Different pipe material has different life expectancy and failure modes (pipe material provided by City GIS).
- **Structural Condition, if available** – Known structural defects based on 2020 CCTV survey performed by NPS.
- **Presence of Pipe Obstructions (roots, grease, debris, infiltration, etc.), if available** - Known O&M related defects based on 2020 CCTV survey performed by NPS.
- **Required Pipe Cleaning** – Pipes requiring higher cleaning frequency oftentimes experience problems when not maintained. However, the act of cleaning (with high pressure jets of water at a minimum) can cause premature failure and inadvertently remove the top layer of potentially corroded concrete or metal pipe (cleaning frequency provided by City).

- **Proximity to Landslide Zones** - Landslides can pose a threat to pipe segments which are surface pipelines or buried at a depth of three feet or less (Baum, 2008). This factor also accounts for the impact of smaller seismic events on pipe structural integrity ((Landslide Zone) County of Santa Clara Department of Planning and Development).
- **Proximity to Earthquake Faults** – Pipes located in the Hayward Fault zone are rated higher likelihood to fail. This factor also accounts for the impact of smaller seismic events on pipe structural integrity ((Fault Zone) County of Santa Clara Department of Planning and Development).
- **Local Geology (Liquefaction)** – A liquefaction layer from County GIS provides soil resiliency ratings to seismic events. This factor accounts for the impact of smaller seismic events on pipe structural integrity ((Liquefaction Rating) County of Santa Clara Department of Planning and Development).

Details and scoring basis for each factor are elaborated in Table 3-1.

Table 3-1. LOF Factors and Ratings

Broad Category	LOF Factor	LOF Rating					Factor Weighting
		1 (Least Likely to Fail)	2	3	4	5 (Most Likely to Fail)	
Asset Characteristics	Age (Installation Year)	Installed after 2000	Installed between 1985 and 1999	Installed between 1970 and 1984[1]	Installed between 1955 and 1969	Installed before 1954	2
	Pipe Material	Force main, HDPE, PVC	VCP[1]	RCP, STL, DIP, ABS, PPR	-	ACP, CIP	2
Asset Condition	Structural PACP Grade/Defect Type	Grade 2 defect(s) or lower	Grade 3 defect(s) (except hinge defects)	One Grade 4 defect (except hinge defects) or Grade 3 hinge defect	One Grade 5 defect (except soil/void/collapse deformation greater than 10%) or multiple Grade 4 defects or Grade 4 hinge defect	Multiple Grade 5 defects or one Grade 5 defects (soil/void/collapse deformation greater than 10%)	5
	O&M PACP Grade	Grade 2 defect(s) or lower	Grade 3 defect(s)	One Grade 4 defect	One Grade 5 defect or multiple Grade 4 defects	Multiple Grade 5 defects	5
	Required Pipe Cleaning	-	Requires annual cleaning	Requires quarterly cleaning	Requires monthly cleaning	Requires weekly cleaning	5
Asset Location	Proximity to Landslide Zone	Not within landslide zone	-	-	-	Within landslide zone	3
	Proximity to Earthquake Faults	Not within fault area	-	-	-	Crossing or within fault area	3
	Likelihood of Liquefaction	-	-	Prone to liquefaction	High likelihood of liquefaction	Very high likelihood of liquefaction	3

[1]If characteristic is unknown, classify as this rating.

ABS = Acrylonitrile Butadiene Styrene
ACP = Asbestos Cement Pipe
CIP = Cast Iron Pipe
DIP = Ductile Iron Pipe
HDPE = High-Density Polyethylene
PPR = Polypropylene Pipe
PVC = Polyvinyl Chloride
RCP = Reinforced Concrete Pipe
STL = Steel Pipe
VCP = Vitrified Clay Pipe

Figures 3-1 and 3-2 display the LOF Factors in relation with the sewer main pipelines. CCTV inspection data was previously shown in Section 2.2.

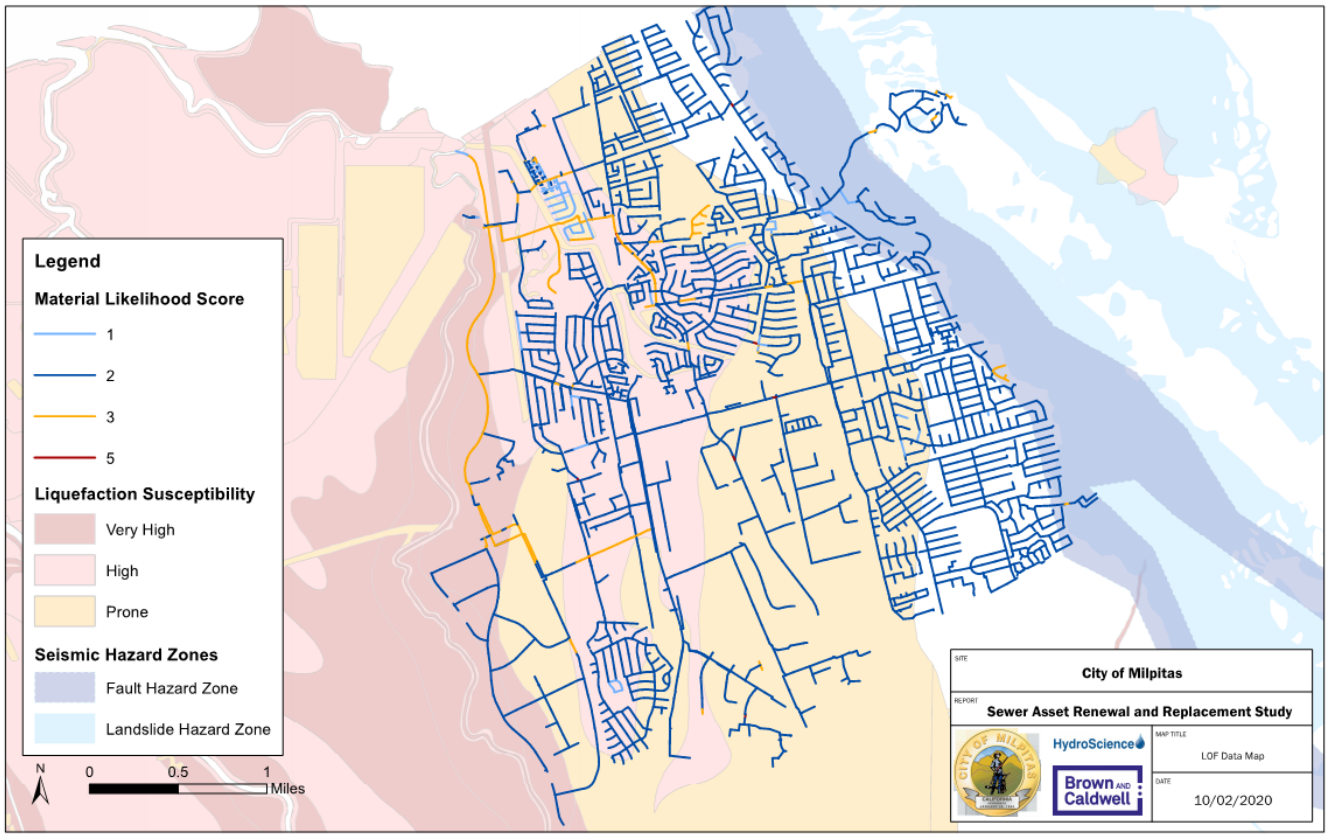


Figure 3-1: LOF Data Map – Material, Liquefaction, Seismic Hazard Zones

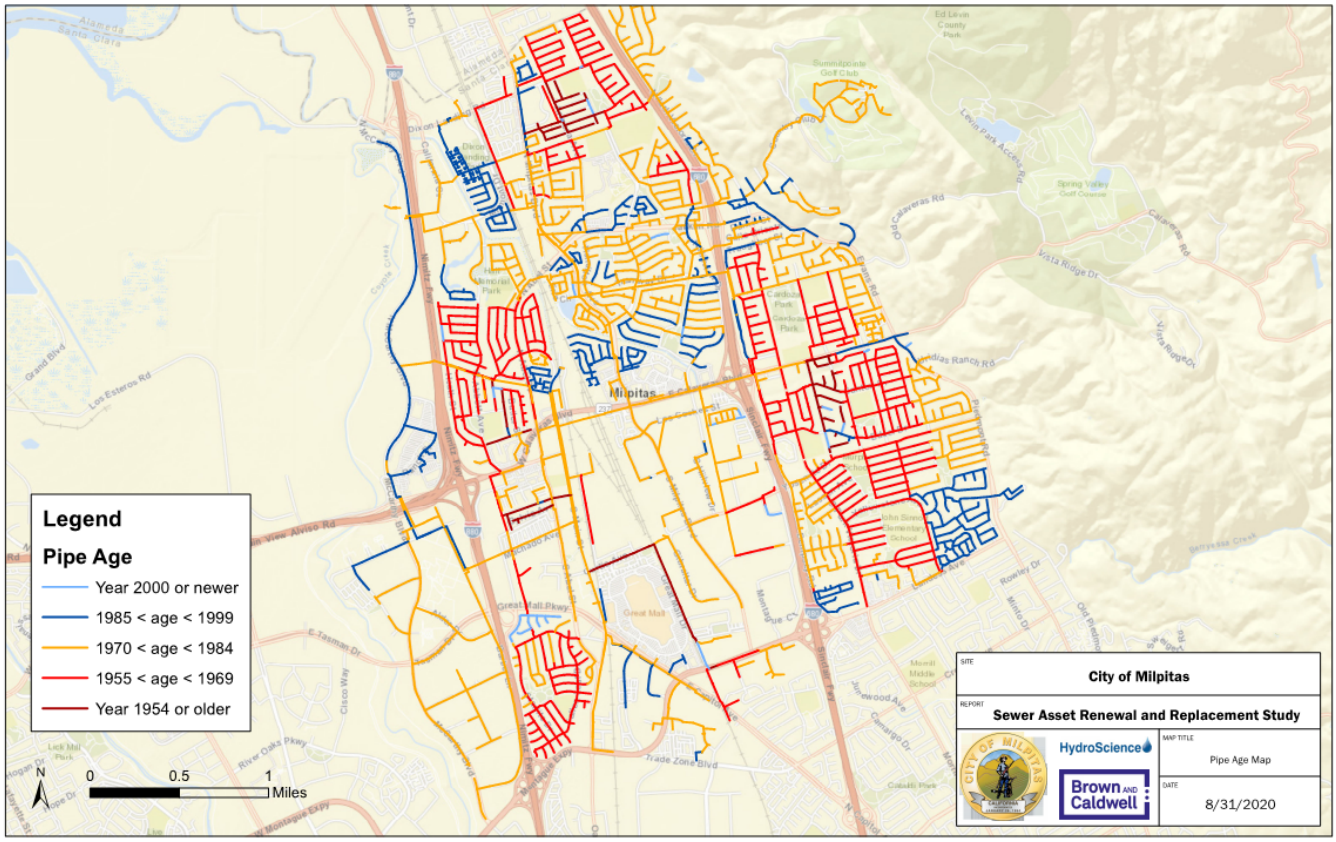


Figure 3-2: LOF Data Map – Pipe Age

Figure 3-3 provides the LOF scores.

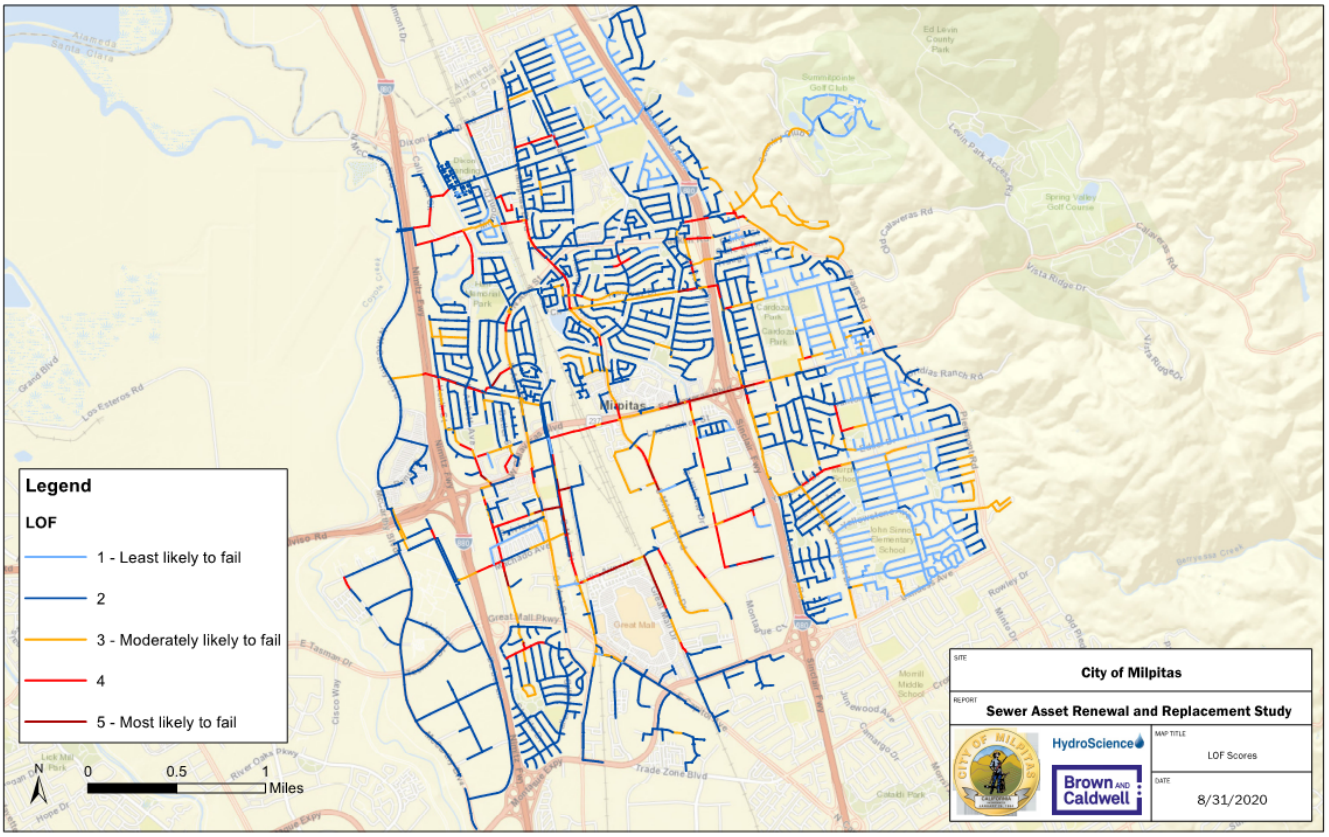


Figure 3-3: LOF Scores Map

3.2 Consequence of Failure

The COF analysis predicts the impact resulting from the failure of an asset by assigned ratings and weightings. Service interruptions, repair/overflow potential, transportation/transit, response time of potential failure, cost of potential failure, and environmental impacts were all considered during the COF analysis.

In a similar fashion to the LOF analysis, the factors selected for analysis are typical for sewer renewal/replacement projects and were selected to ensure the pipe rehabilitation prioritization aligned with City Council core values and priorities. The COF and City Council core values and priorities are shown in Table 3-2. Certain consequence factors, such as pipe diameter or road type, quantify multiple council core values. As a result, these factors received a higher factor weighting value.

Table 3-2. COF and Council Core Value/Priorities

Council Core Value/ Priority Area	Organization Category	Measure of Failure	Consequence Factor
Superior Customer Service	Community	(1) Sewer service interruptions to large areas	Pipe diameter
Integrity and Accountability		(2) Sewer service interruptions to critical and educational facilities	Critical facilities (proximity)
Trust and Respect		(3) Magnitude and method of public response (sewer size)	Pipe diameter
Transportation and Transit		(4) Public transit service and traffic interruptions	Road type

Table 3-2. COF and Council Core Value/Priorities			
Council Core Value/ Priority Area	Organization Category	Measure of Failure	Consequence Factor
		(5) Railroad interruptions	Railroad proximity
Governance and Administration	Financial	(6) Response time to restore an asset	Easement (access restriction), road type
		(7) Restoration costs or impact on utility rates	Pipe diameter and depth
Environment	Environment	(8) State and Federal regulatory violations or public response (discharge to surface water)	Waterway/waterbody (proximity)

Due to public health and environmental concerns, the potential for waterway/waterbody leaks and road type were weighted most heavily followed by pipe diameter and access restriction. Additional COF factor descriptions and data sources are provided below:

- Sewer Size (Pipe Diameter) – Larger diameter pipes are more expensive to replace and provide a greater service area than smaller diameter pipes (pipe diameter provided by City GIS).
- Proximity to Critical Facilities – Pipe proximity to an educational, police, fire, or health facility was calculated and rated for COF. Facilities were searched from Google Maps and geocoded onto the ArcGIS platform. Pipelines servicing critical facilities were approximated by using a buffer of 500 feet. For context, the facility addresses were plotted as a point, so the buffer of 500 feet accounts for building size and nearby critical pipes.
- Road Type – Different road types such as arterial or highway will impact more people than a neighborhood street. Therefore, pipe intersections with major traffic conveyance routes such as the Bay Area Rapid Transit Milpitas station, freeways, state routes, arterial streets, or major roads were determined. The GIS used for major roads was downloaded from County of Santa Clara ((Major Roads) County of Santa Clara Department of Planning and Development). The BART GIS was downloaded from BART website and a buffer of 800 feet was applied to the geocoded coordinate point to capture the frontage and segments adjacent to the frontage. A buffer of 35 feet was applied to the major roads layer to capture potential overflow impact and GIS alignment differences between the road type and pipe layers.
- Railroad Proximity – Impacts to railroad operations and repairs on railroad property have significant cost and permitting impacts (railroad GIS provided by United States Geological Survey (USGS) (USGS National Transportation Dataset for California)).
- Easement (Access Restriction) – Access restrictions were determined by overlaying the city GIS over an aerial base map and manually assigning pipes which appeared to be in private property or restricted areas. For example, the parking lot of a shopping mall would be assigned private but not restricted. However, if a pipe is near a swale between a park and a neighborhood, or between two properties, it was assigned “restricted access”. In a further analysis, parcels with easement information could provide a more refined outcome.
- Pipeline Depth – Calculated by subtracting pipe inverts from manhole rim elevations from City GIS.
- Proximity to Waterway or Waterbody – Significant permitting impacts for repair or cleanup of failed pipe (waterway/waterbody GIS provided by USGS (National Hydrography Dataset, 2019)).

Details and scoring basis for each factor are elaborated in Table 3-3.

Table 3-3. COF Factors and Ratings

Broad Category	Group	COF Factor	COF Rating					Factor Weighting
			1 (Negligible Consequence)	2 (Minimal Consequence)	3 (Moderate Consequence)	4 (Severe Consequence)	5 (Critical Consequence)	
Community	Service Interruptions and Over-flow Potential	Pipeline Diameter[1,3]	Less than 6-inches	8- to 12-inches[4]	14- to 18-inches	18- to 24-inches	Greater than 24-inches	1
		Critical Facilities	-	-	School	Fire/Police	Hospital	1
	Transportation/ Transit	Road Type[1,2]	Neighborhood streets	Collector streets	Arterial streets	Expressway and state routes	Freeway or BART	1
		Railroad Proximity	Not crossing or within 50 feet of railroad	-	-	-	Crossing or withing 50 feet of railroad	1
Financial	Response Time	Access Restriction	Public ROW	-	Private property	-	Limited access	2
		Road Type[1,2]	Neighborhood streets	Collector streets	Arterial streets	Expressway and state routes	Freeways	2
	Pipeline Cost	Pipeline Diameter[1,3]	Less than 6-inches	8- to 12-inches[4]	14- to 18-inches	18- to 24-inches	Greater than 24-inches	1
		Pipeline Depth	All others	-	-	-	Greater than 10 feet (or special configuration requiring substantial excavation)	1
Environ-ment	Environment	Waterway or waterbody	-	Within 250' of waterway or waterbody	Within 100' of waterway or waterbody	Within 50' of waterway or waterbody	Crossing waterway or waterbody	3

[1]Pipe diameter and road type affect the consequence of a pipe failure in both the community and financial broad categories
[2]Road type weighting = 1+2 = 3; 1 (Transportation/transit) + 2 (Response Time) = 3 (Overall Road Type weighting).
[3]Pipe diameter weighting=1+1=2; 1 (Service Interruptions and Overflow Potential) + 1 (Pipeline Cost) = 2 (Overall Pipe Diameter weighting).
[4]If characteristic is unknown, classify as this rating.
ROW = right-of-way

Figure 3-4 shows COF factors on a map and Figure 3-5 provides COF Scores.

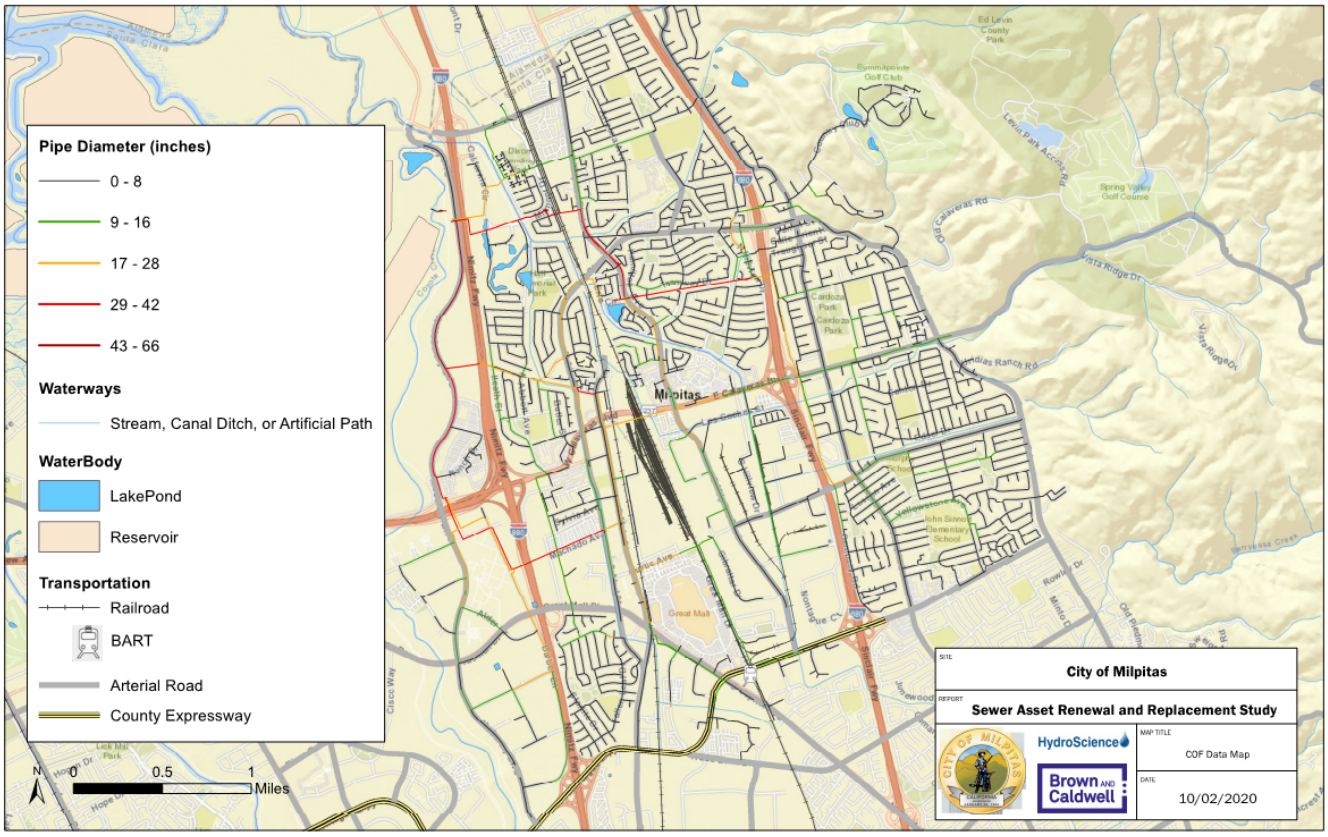


Figure 3-4: COF Data Map

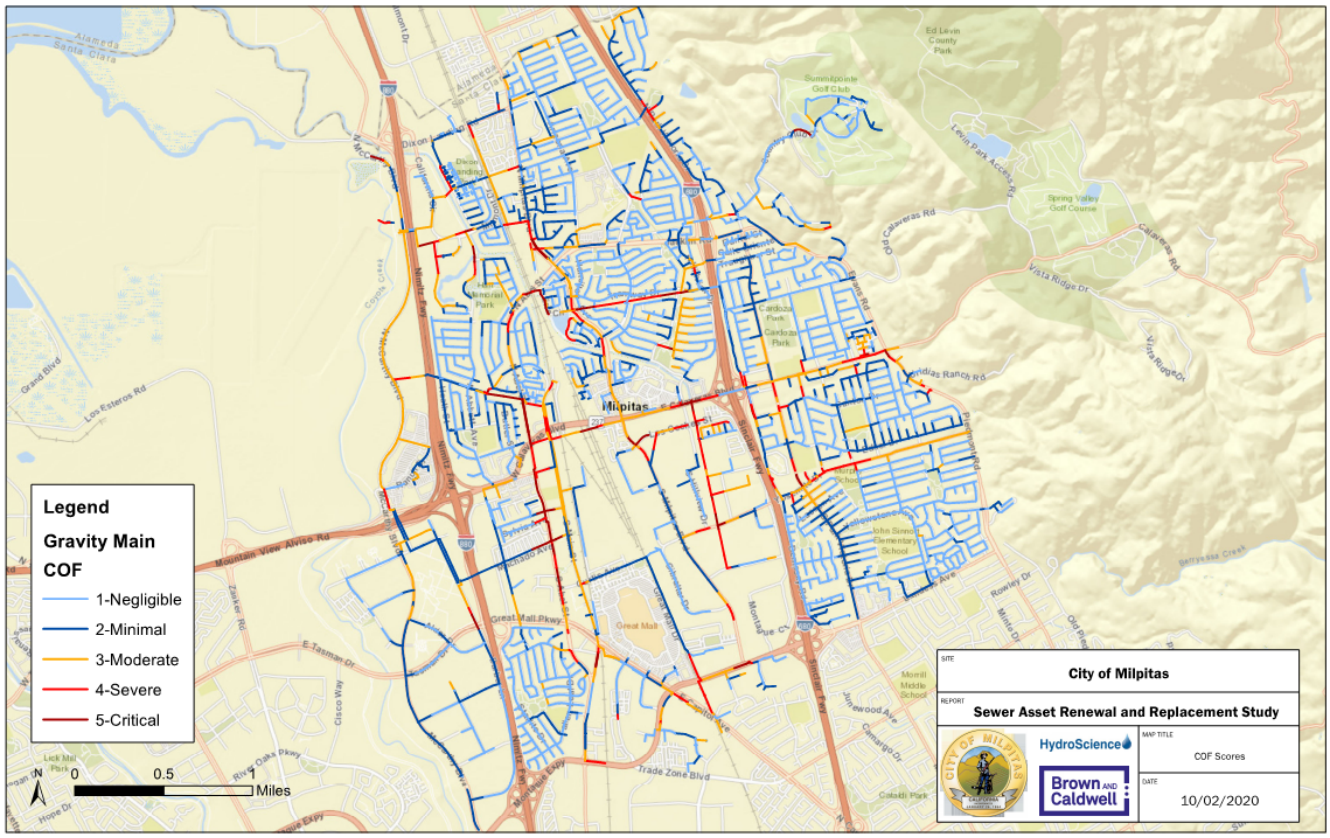


Figure 3-5: COF Scores

3.3 Asset Risk

Once the LOF and COF rating and weighting have been determined for individual factors, an overall LOF score and overall COF score can be determined by summing the factor scores. Multiplying the two overall scores determines the overall asset risk (Risk = LOF x COF). Asset risk is considered negligible, low, medium, high or extreme based on the paired LOF and COF data. The matrix below illustrates the risk assignments for varying LOF and COF pairings.

	Low LOF Score → High LOF Score				
High COF Score ↑	Medium	Medium	High	Extreme	Extreme
	Medium	Medium	Medium	High	Extreme
	Low	Medium	Medium	Medium	High
	Negligible	Low	Medium	Medium	Medium
Low COF Score	Negligible	Negligible	Low	Medium	Medium

3.4 Staff Input

A risk assessment workshop between HSE, BC and City staff was conducted on April 24, 2020. The purpose of this workshop was to provide an overview of the risk assessment approach and to receive City input regarding specific risk assessment criteria and weighting. At this workshop the final LOF and COF criteria and weighting were reviewed. Following the workshop, BC sent a proposed criteria and weighting document, to which the City agreed on. Key comments were summarized below:

- Seismic events are fairly unlikely; use caution to weigh the proximity to earthquake faults factor too highly.
    - Noted. City to confirm draft LOF and COF weighting shown in this draft report.
- Bay Area Rapid Transit (BART) is very critical. This is regarding discussion of "road type/transit" COF factor.
    - Draft report #1 comment - the addition of BART will be investigated in between draft and final report.
    - Final report - BART was added to the road type/transit COF factor and report content was revised accordingly.
- City confirmed that repairs to pipe on freeway/highway is challenging.
    - Action - Incorporated in criteria. Pipes within 35 feet of freeways are assigned the highest COF factor for the road type.
- Sewer pipelines are relatively new, so it may be hard to provide much input on historical data.
    - Noted. CCTV survey and other desktop condition assessment factors will drive pipe rehabilitation and inspection recommendations.
- City decided to rate pipes that would go directly to a waterway/waterbody higher.
    - Action - Incorporated in rating and weighting. Pipelines near waterway/waterbodies are rated by proximity. The factor measuring waterway/waterbody proximity was most highly weighted.

3.5 InfoAsset Planner (IAP)

A desktop risk assessment was performed using Innovyze's IAP program, a GIS extension tool. Using the criteria described in Sections 3.1 and 3.2, LOF analysis predicts the probability that each asset could fail based on its GIS data and spatial interaction with other GIS layers. All assets, with or without CCTV data, were evaluated in detail using:

1) GIS data, such as age, material, and diameter
2) County or USGS GIS layers such as seismic hazards, soil stability, waterways, and other factors
3) Maintenance data - required pipe cleaning factor
4) CCTV data when available

For example, for the structural condition and presence of pipe obstruction LOF factors, CCTV data was analyzed to mass compute LOF for each of the approximate 3,200 pipes based on structural and O&M defects. Likewise, COF analysis determines the severity of each asset if it were to fail. The tool scores each pipe for COF based on asset data such as diameter and proximity to other GIS layers such as waterways or hospitals. Each LOF and COF factor is first set up in individual modules by choosing to use asset data, CCTV survey results, or spatial analysis with other GIS layers. Then, buffers and score criteria are defined. Once this is setup, the risk analysis takes user input for weighting of these factors relative to one another and

produces a holistic risk score for each pipe GIS asset. Screenshots of IAP modules can be found in Figures 3-6 to 3-8.

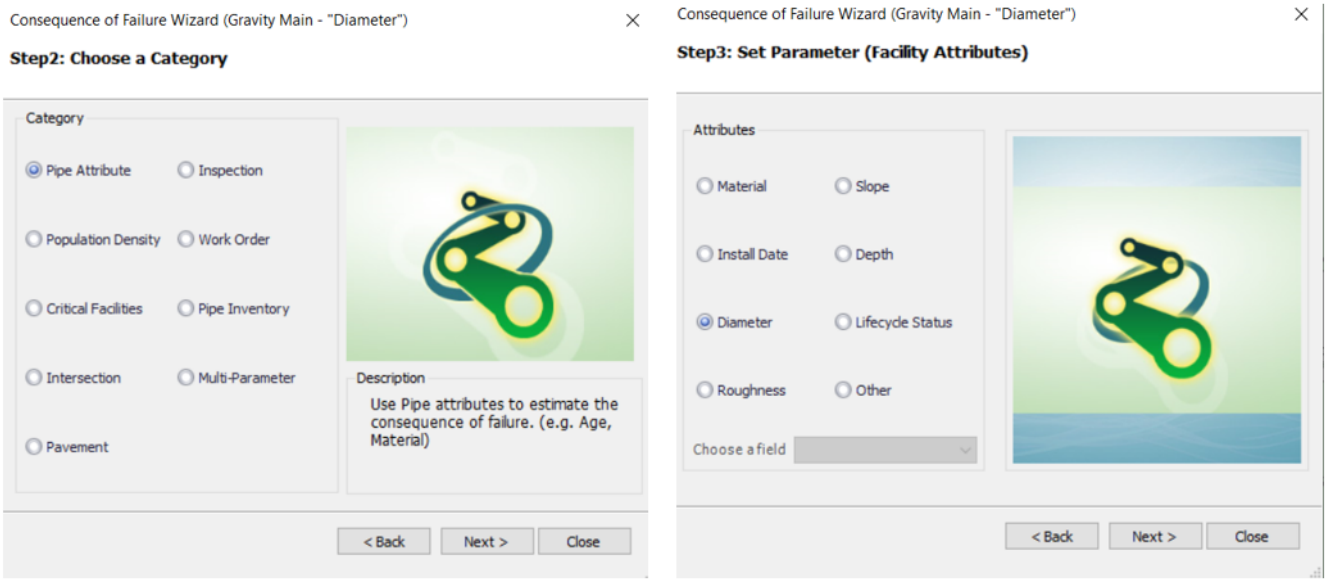


Figure 3-6: IAP LOF/COF Setup Example - Diameter (1 of 2)

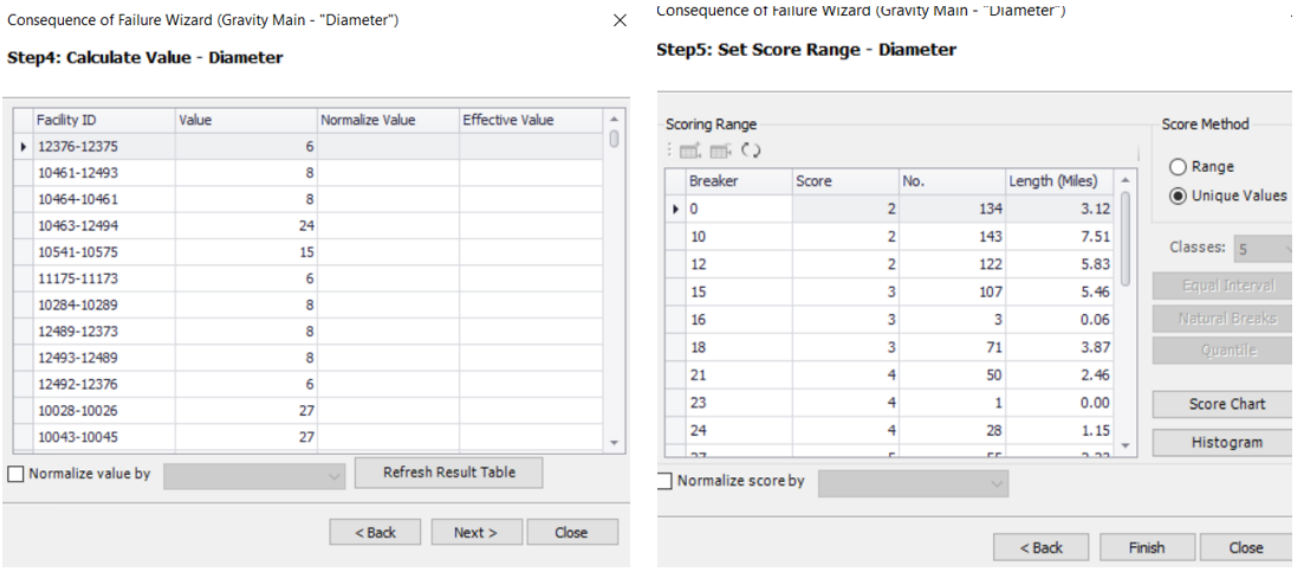


Figure 3-7: IAP LOF/COF Setup Example - Diameter (2 of 2)

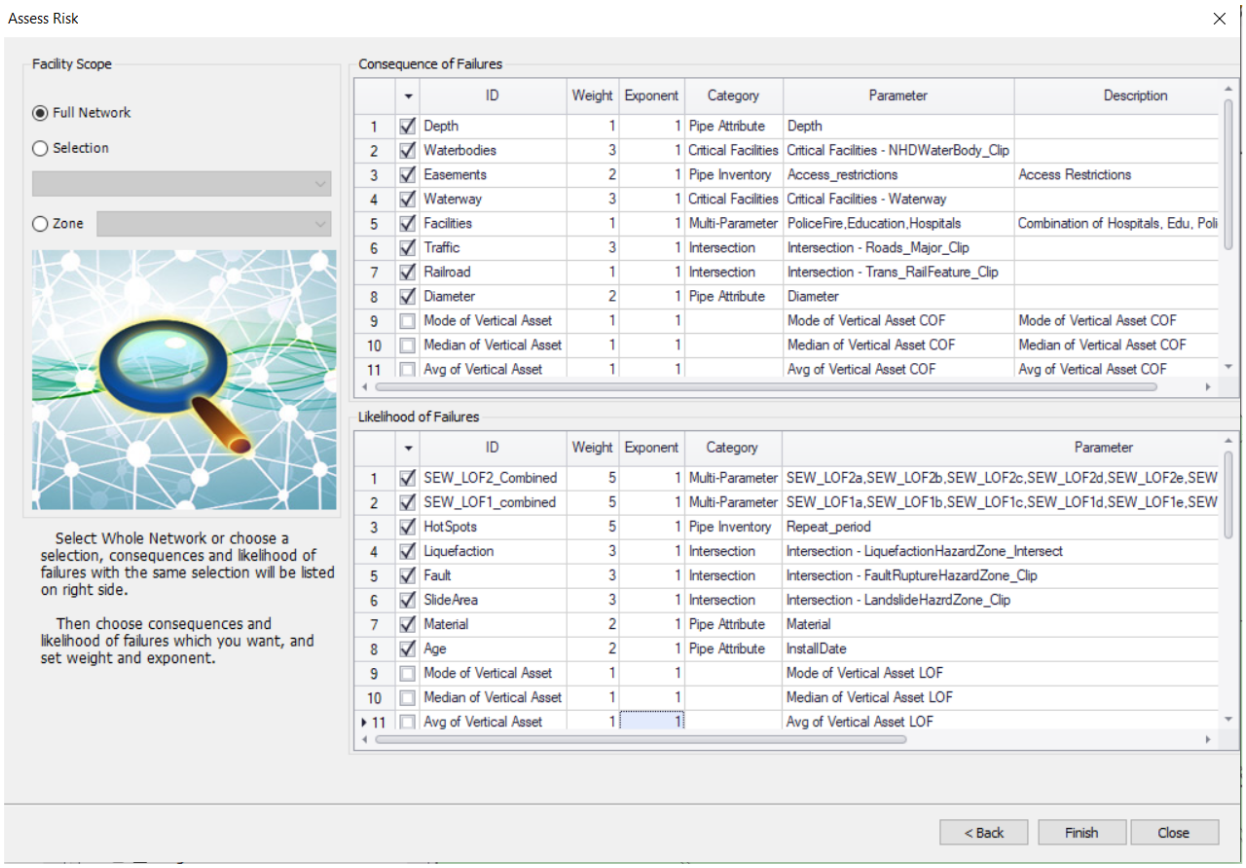


Figure 3-8: IAP LOF/COF Weighting and Risk Setup Example

3.6 Risk Assessment Results

Overall LOF and COF score assignments were determined for all pipe segments, based on the criteria outlined in Tables 3-1 and 3-3. A total risk score was then determined from the product of the overall LOF and COF scores, which was then normalized within the dataset from one (negligible risk) to five (extreme risk).

Figure 3-9 presents the risk scores for all gravity main pipelines.

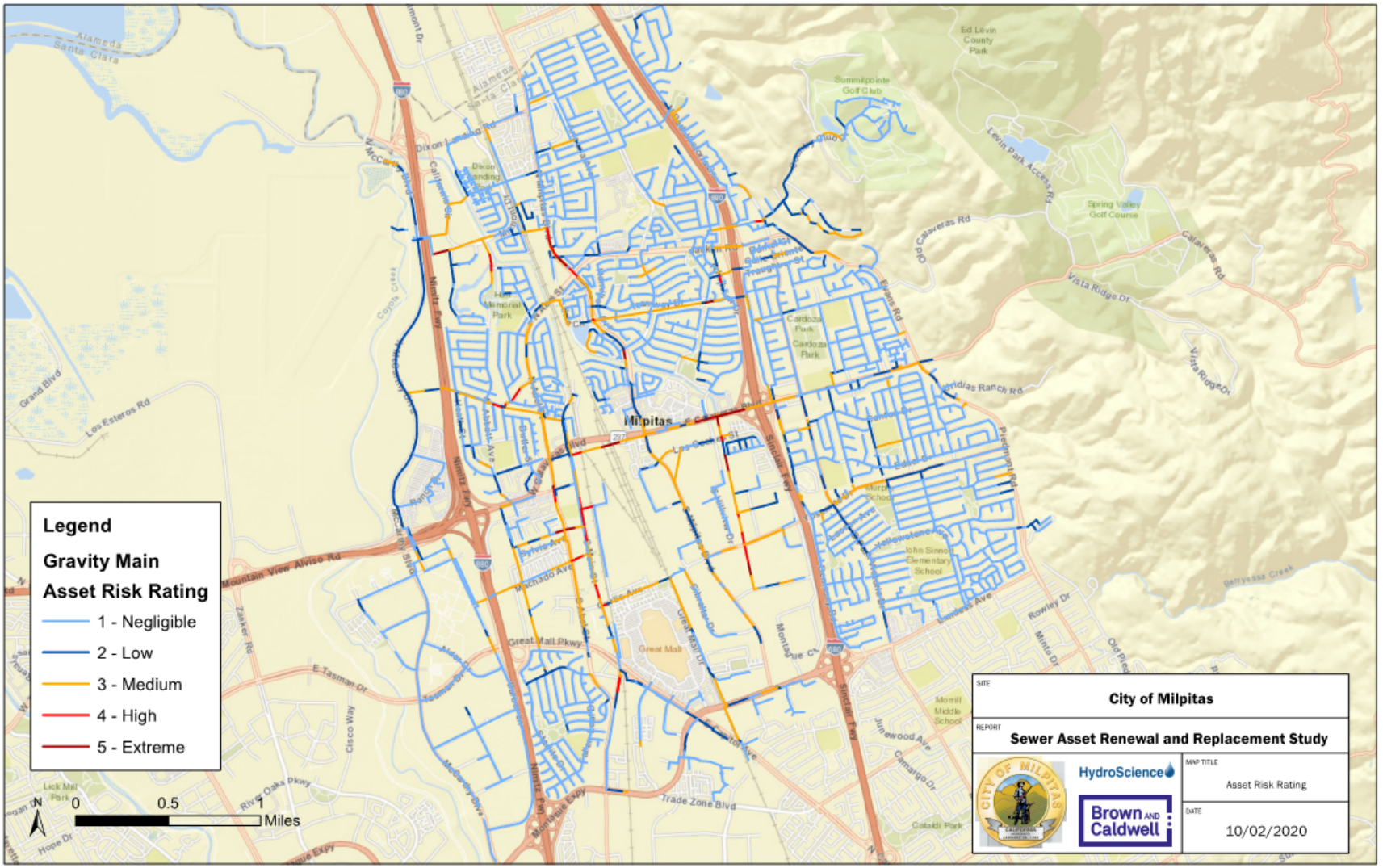


Figure 3-9: Asset Risk Rating

A risk matrix for the pipe segments is presented in Figure 3-10. The bottom left tile represents the subset of pipes with the least risk while the top right tile represents the subset of pipes with the most risk. Risk is colorized as follows:

- **Blue** – Negligible risk
- **Green** – Low risk
- **Peach** – Medium risk
- **Magenta** – High risk
- **Dark Red** – Extreme risk

	LOF - Low	LOF - M. Low	LOF - Medium	LOF - M. High	LOF - High
COF - High	32 Gravity Mains, ...	19 Gravity Mains,...	12 Gravity Mains,...	6 Gravity Mains, ...	7 Gravity Mains, ...
COF - M. High	40 Gravity Mains, ...	18 Gravity Mains,...	16 Gravity Mains,...	6 Gravity Mains, ...	6 Gravity Mains, ...
COF - Medium	165 Gravity Mains,...	29 Gravity Mains,...	28 Gravity Mains,...	13 Gravity Mains,...	15 Gravity Mains,...
COF - M. Low	473 Gravity Mains,...	73 Gravity Mains,...	40 Gravity Mains,...	10 Gravity Mains,...	17 Gravity Mains,...
COF - Low	1962 Gravity Main...	96 Gravity Mains,...	70 Gravity Mains,...	13 Gravity Mains,...	16 Gravity Mains,...

Figure 3-10: Pipeline Risk LOF COF Matrix

Figure 3-11 provides the risk distribution for the pipe segments. The majority of the pipe segments are classified as negligible or low risk; twelve percent are medium to extreme risk pipe segments.

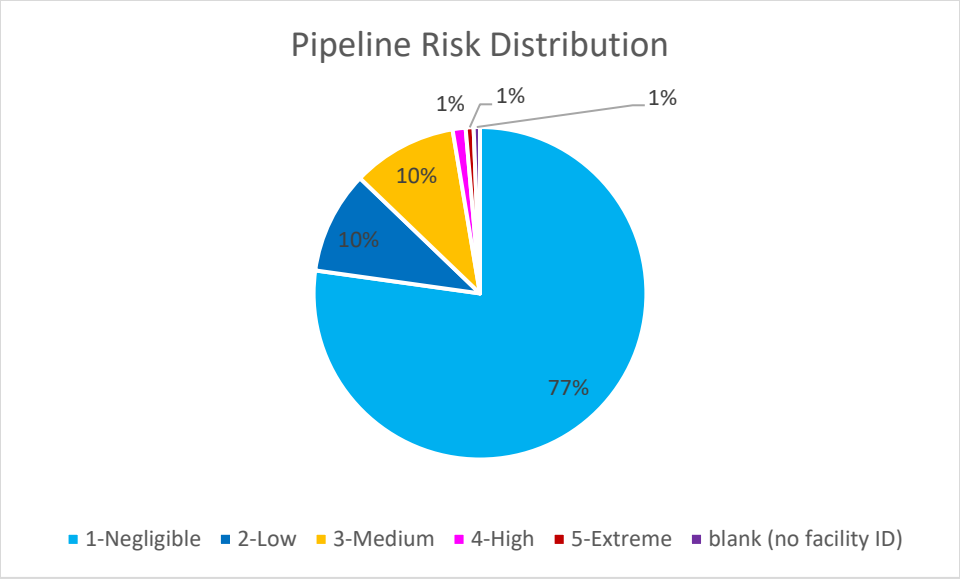


Figure 3-11: Pipeline Risk Distribution by Length

For the pipeline risk distribution figure, the "blank" category is attributed to 22 pipes whose GIS segments had blank facility ID, diameter, installation date, and material fields. Table 3-4 below shows the pipe segments with the highest risk scores. This includes all pipes with risk scores of 4 or 5. Appendix F provides the risk scores for all pipe segments. LOF and COF scores are calculated based on the equation figure at the beginning of Section 3 and the rating and weighting criteria described in Table 3-1 and 3-3 in previous sections. The risk score column is calculated by multiplying the LOF score and COF score, which is then normalized from 1 through 5 in the last column (1- negligible, 2-low, 3- medium, 4- high or 5- extreme). The table is sorted by descending risk score.

Table 3-4. At-Risk Pipes									
Segment ID	Street Name	Install Year	Pipe Diameter	Pipe Material	Segment Length (LF)	LOF Score	COF Score	Risk Score (LOF x COF)	Asset Risk (Normalized from 1 to 5)
10395-10396	Coming Ave	1954	8	VCP	284	76	39	2964	5 - Extreme
12717-12718	E Calaveras Blvd	-	15	VCP	312	59	43	2537	5 - Extreme
12719-12720	E Calaveras Blvd	-	16	CIP	127	50	46	2300	5 - Extreme
10012-10394	Coming Ave	1954	8	VCP	234	61	36	2196	5 - Extreme
12721-12722	E Calaveras Blvd	-	15	VCP	116	59	37	2183	5 - Extreme
12721-12722*	E Calaveras Blvd	-	15	VCP	16	59	37	2183	5 - Extreme
12043-12021	Between Tramway & Los Pinos Ave	-	30	RCP	258	56	36	2016	5 - Extreme
12716-12719	Slightly East of S Hillview Dr	-	0	UNK	302	49	41	2009	5 - Extreme
12232-12251	N Milpitas Blvd	-	39	RCP	434	54	36	1944	5 - Extreme
12589-12601	Cadillac Ct / Nimitz Fwy Crossing	-	42	RCP	494	52	37	1924	5 - Extreme
10395-10394	Coming Ave	1954	8	VCP	15	51	36	1836	5 - Extreme
12722-12711	E Calaveras Blvd	-	15	VCP	362	59	31	1829	5 - Extreme
12729-12717	E Calaveras Blvd	-	15	VCP	500	59	31	1829	5 - Extreme
10176-10177	Slightly East of S Hillview Dr	-	15	VCP	408	54	33	1782	5 - Extreme
12218-12522	N Milpitas Blvd	-	33	RCP	201	54	33	1782	5 - Extreme
10185-10184	Slightly East of S Hillview Dr	-	15	VCP	448	54	33	1782	5 - Extreme
10185-10184*	Slightly East of S Hillview Dr	-	15	VCP	43	54	33	1782	5 - Extreme
10883-10972	Sinclair Fwy	1965	21	VCP	495	56	31	1736	5 - Extreme
10480-10481	S Abel Ave	1982	18	VCP	66	47	35	1645	5 - Extreme
12488-12496	E Calaveras Blvd	-	21	VCP	501	47	35	1645	5 - Extreme
12457-12154	N Milpitas Blvd	1981	21	VCP	310	47	34	1598	5 - Extreme
10968-12729	E Calaveras Blvd	-	15	VCP	388	69	29	2001	4 - High
11647-11695	Marylinn Dr	1959	27	VCP	500	74	27	1998	4 - High
11781-12608	Hall Memorial Park Connection	1980	8	ABS	329	44	43	1892	4 - High

Table 3-4. At-Risk Pipes									
11786-11781	Hall Memorial Park Connection	1980	8	ABS	144	44	43	1892	4 - High
10972-10968	E Calaveras Blvd	-	15	VCP	482	64	29	1856	4 - High
12251-12219	N Milpitas Blvd	-	39	RCP	319	44	42	1848	4 - High
10404-10398	S Main St	-	18	VCP	407	67	26	1742	4 - High
10179-10159	Slightly East of S Hillview Dr	-	15	VCP	349	44	39	1716	4 - High
10178-10179	Slightly East of S Hillview Dr	-	15	VCP	100	44	39	1716	4 - High
11661-11656	Marylinn Dr	1959	27	RCP	133	46	36	1656	4 - High
12088-12081	N Hillview Dr	-	12	VCP	218	54	30	1620	4 - High
12218-12219	N Milpitas Blvd	-	33	RCP	25	49	33	1617	4 - High
10177-10178	Slightly East of S Hillview Dr	-	15	VCP	397	49	33	1617	4 - High
10472-10467	Sinnot Ln	-	12	VCP	219	57	28	1596	4 - High
10467-10474	S Main St	-	21	VCP	326	57	28	1596	4 - High
10478-10480	S Abel Ave	1982	15	VCP	420	42	38	1596	4 - High
10472-10467*	Sinnot Ln	-	12	VCP	179	57	28	1596	4 - High
10333-10347	Curtis Ave	1954	18	VCP	172	51	31	1581	4 - High
12720-12721	E Calaveras Blvd	-	15	VCP	60	39	40	1560	4 - High
11525-20134	Marylinn Dr	1981	27	VCP	393	47	33	1551	4 - High
12706-12733	Slightly East of S Hillview Dr	-	0	UNK	118	44	35	1540	4 - High
11389-11377	Sinclair Crossing to Country Club Dr	1988	8	VCP	250	53	29	1537	4 - High
12522-12526	N Milpitas Blvd	-	33	RCP	349	49	31	1519	4 - High
10462-10463	E Calaveras Blvd	-	21	VCP	334	52	29	1508	4 - High
11657-11678	Marylinn Dr	-	27	RCP	19	54	27	1458	4 - High
11936-11935	Sinclair Crossing to Country Club Dr	1983	12	VCP	489	54	27	1458	4 - High
12248-12233	N Milpitas Blvd	-	39	RCP	370	54	27	1458	4 - High
12439-12446	N Milpitas Blvd	-	24	VCP	42	47	31	1457	4 - High
12439-12446*	N Milpitas Blvd	-	24	VCP	42	47	31	1457	4 - High

Table 3-4. At-Risk Pipes									
10403-10418	Machado Ave	-	24	RCP	260	39	37	1443	4 - High
10403-10418*	Machado Ave	-	24	RCP	138	39	37	1443	4 - High
10284-10289	S Main St	-	8	VCP	438	39	36	1404	4 - High
10188-10187	Slightly East of S Hillview Dr	-	15	VCP	141	39	36	1404	4 - High
10331-10350	S Main St	-	18	VCP	398	52	27	1404	4 - High
10284-10289*	S Main St	-	8	VCP	438	39	36	1404	4 - High
11678-11680	Marylinn Dr	-	27	VCP	273	52	27	1404	4 - High
10399-10467	S Main St	-	18	VCP	451	52	26	1352	4 - High

*Same facility ID, different GIS pipe segment.

Figure 3-12 provides the high and extreme risk pipelines shown in Table 3-4 in map format.

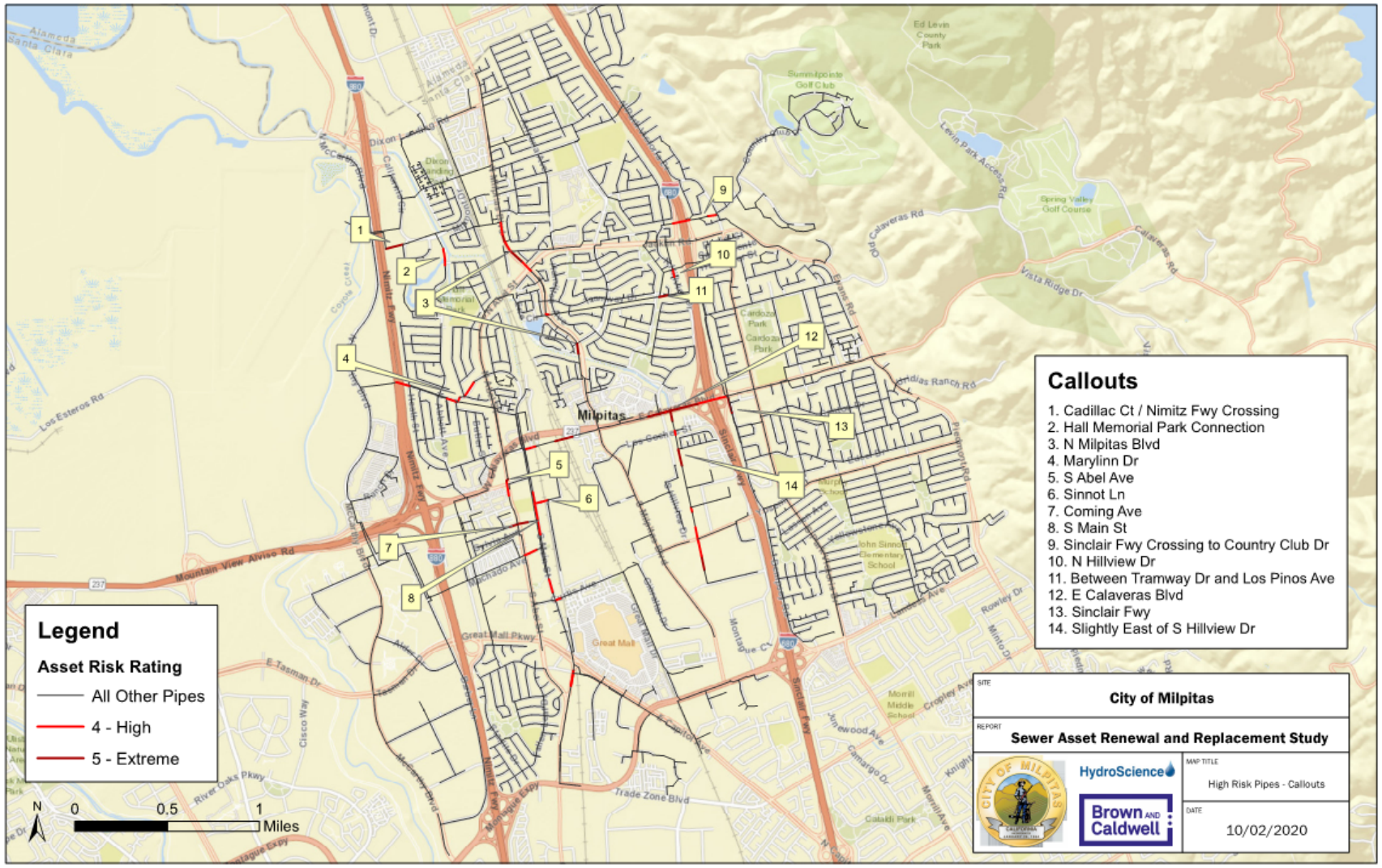


Figure 3-12: High Risk Pipes

Extreme risk pipes (21 segments) were further analyzed for drivers of high LOF and COF scores in Table 3-5. The top 3 (or 4 when tied) LOF and COF factors are noted for each pipe segment. The table is sorted alphabetically by street name

Table 3-5. Extreme Risk Pipes – Drivers of High LOF and COF Scores

Street Name	Segment ID	Install Year	Pipe Diameter	Pipe Material	Segment Length (LF)	LOF Score	COF Score	LOF Drivers	COF Drivers
Between Tramway Dr and Los Pinos Ave	12043-12021	-	30	RCP	258	56	36	Pipe Obstruction Rating – 25/25 Structural Rating – 10/25 Liquefaction Susceptibility – 9/10	Waterway – 15/15 Diameter – 10/10 Depth – 5/5
Cadillac Ct / Nimitz Freeway Crossing	12589-12601	-	42	RCP	494	52	37	Pipe Obstruction Rating – 20/25 Liquefaction Susceptibility – 15/15 Age – 6/10 Material – 6/10	Waterbodies – 12/15 Diameter – 10/10 Easement – 6/10
Coming Ave	10395-10396	1954	8	VCP	284	76	39	Required Pipe Cleaning – 25/25 Pipe Obstruction Rating – 20/25 Liquefaction Susceptibility – 12/15	Waterway - 15/15 Traffic – 9/15 Depth – 5/5
	10012-10394	1954	8	VCP	234	61	36	Structural Rating – 25/25 Liquefaction Susceptibility – 12/15 Age – 10/10 Pipe Obstruction Rating – 10/25	Waterway – 12/15 Traffic – 9/15 Depth – 5/5
	10395-10394	1954	8	VCP	15	51	36	Required Pipe Cleaning – 25/25 Liquefaction Susceptibility – 12/15 Age – 10/10	Waterway – 12/15 Traffic – 9/15 Depth – 5/5
E Calaveras Blvd	12717-12718	-	15	VCP	312	59	43	Structural Rating – 25/25 Pipe Obstruction Rating – 15/25 Liquefaction Susceptibility– 9/15	Traffic – 12/15 Waterway – 12/15 Diameter – 6/10
	12719-12720	-	16	CIP	127	50	46	Pipe Obstruction Rating – 20/25 Material – 10/10 Liquefaction Susceptibility – 9/15	Waterway – 15/15 Traffic – 12/15 Diameter – 6/10
	12721-12722	-	15	VCP	116	59	37	Structural Rating – 25/25 Pipe Obstruction Rating – 15/25 Liquefaction Susceptibility – 9/15	Traffic – 12/15 Waterway – 6/15 Diameter – 6/10

Table 3-5. Extreme Risk Pipes – Drivers of High LOF and COF Scores									
Street Name	Segment ID	Install Year	Pipe Diameter	Pipe Material	Segment Length (LF)	LOF Score	COF Score	LOF Drivers	COF Drivers
	12721-12722	-	15	VCP	16	59	37	Same as above. Same Segment ID	Same as above.
	12722-12711	-	15	VCP	362	59	31	Structural Rating – 25/25 Pipe Obstruction Rating – 15/25 Liquefaction Susceptibility – 9/15	Traffic – 12/15 Diameter – 6/10 Critical Facilities – 5/5 Depth – 5/5
	12729-12717	-	15	VCP	500	59	31	Structural Rating – 20/25 Pipe Obstruction Rating – 20/25 Liquefaction Susceptibility – 9/15	Traffic – 12/15 Diameter – 6/10 Critical Facilities – 5/5 Depth – 5/5
	12488-12496	-	21	VCP	501	47	35	Pipe Obstruction Rating – 15/25 Liquefaction Susceptibility – 12/15 Structural Rating – 10/25	Waterway – 12/15 Diameter – 8/10 Railroad – 5/5 Depth – 5/5
N Milpitas Blvd	12232-12251	-	39	RCP	434	54	36	Pipe Obstruction Rating – 20/25 Liquefaction Susceptibility – 12/15 Structural Rating – 10/25	Diameter – 10/10 Waterway – 9/15 Traffic – 9/15
	12218-12522	-	33	RCP	201	54	33	Pipe Obstruction Rating – 25/25 Liquefaction Susceptibility – 12/15 Age – 6/10 Material – 6/10	Diameter – 10/10 Traffic – 9/15 Waterway – 6/15
	12457-12154	1981	21	VCP	310	47	34	Pipe Obstruction Rating – 15/25 Liquefaction Susceptibility – 12/15 Structural Rating – 10/25	Waterway – 9/15 Traffic – 9/15 Diameter – 8/10
S Abel Ave	10480-10481	1982	18	VCP	66	47	35	Pipe Obstruction Rating - 20/25 Liquefaction Susceptibility – 12/15 Age – 6/10	Waterway – 12/15 Traffic – 9/15 Diameter – 6/10
Sinclair Freeway	10883-10972	1965	21	VCP	495	56	31	Required Pipe Cleaning – 20/25 Pipe Obstruction Rating – 10/25 Liquefaction Susceptibility – 9/15	Diameter – 8/10 Traffic – 9/15 Waterway – 6/15

Table 3-5. Extreme Risk Pipes – Drivers of High LOF and COF Scores									
Street Name	Segment ID	Install Year	Pipe Diameter	Pipe Material	Segment Length (LF)	LOF Score	COF Score	LOF Drivers	COF Drivers
Slightly East of S Hillview Dr	12716-12719	-	0	UNK	302	49	41	Pipe Obstruction Rating – 20/25 Structural Rating – 10/25 Liquefaction Susceptibility – 9/15	Waterway – 12/15 Traffic – 12/15 Critical Facilities – 5/5 Depth – 5/5
	10176-10177	-	15	VCP	408	54	33	Pipe Obstruction Rating – 25/25 Structural Rating – 10/25 Liquefaction Susceptibility – 9/15	Waterway – 12/15 Diameter – 6/10 Railroad – 5/5 Depth – 5/5
	10185-10184	-	15	VCP	448	54	33	Structural Rating – 20/25 Pipe Obstruction Rating – 15/25 Liquefaction Susceptibility - 9/15	Waterway – 12/15 Diameter – 6/10 Railroad – 5/5 Depth – 5/5
	10185-10184	-	15	VCP	43	54	33	Same as above. Same Segment ID	Same as above.

Figures 3-13 and 3-14 summarize the LOF and COF drivers previously presented in Table 3-5.

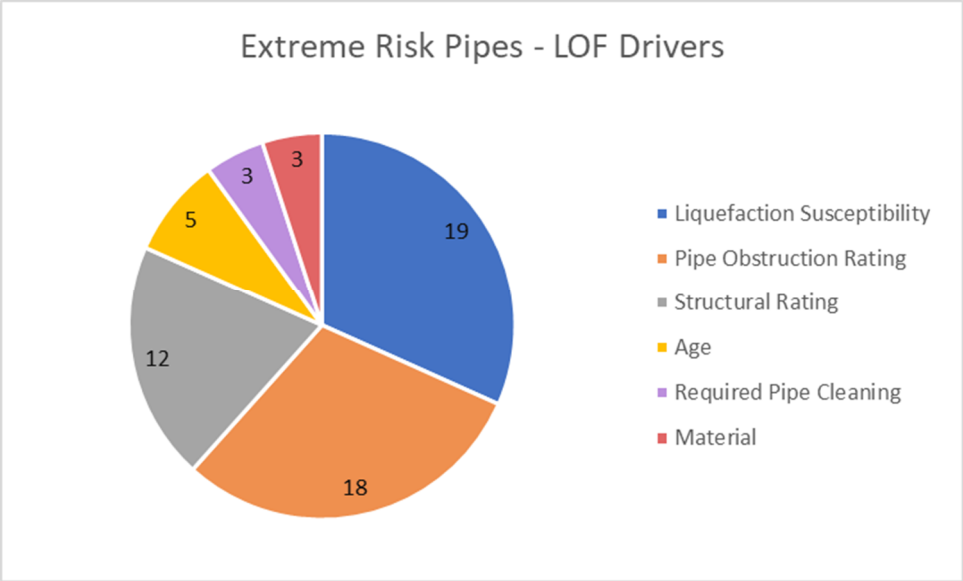


Figure 3-13: Extreme Risk Pipes – LOF Drivers

Liquefaction susceptibility, pipe obstruction rating, and structural rating are among the most common LOF drivers of extreme risk pipes. That is, of the extreme risk pipes, these LOF factors reoccur most often.

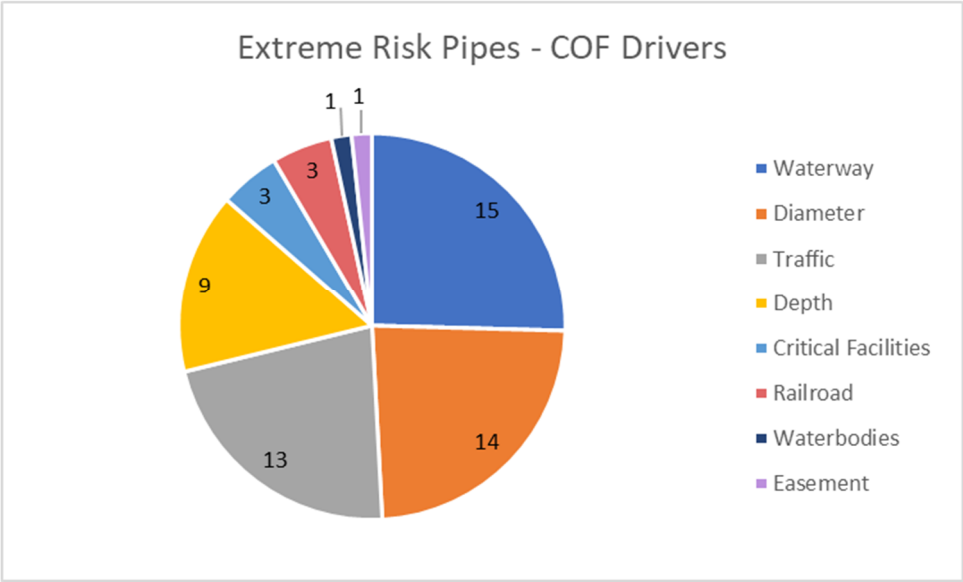


Figure 3-14: Extreme Risk Pipes – COF Drivers

Proximity to waterways, large pipe diameter, and proximity to high traffic flow areas are among the most common COF drivers of extreme risk pipes.

In summary, a desktop risk analysis of all pipe segments revealed that pipe mains located along E Calaveras Blvd, N Milpitas Blvd, S Main St, I-680 (crossing), Machado Ave, Sylvia Ave, Cadillac Ct, S Abel Ave, Coming Ave, Sinclair Freeway, S Hillview Drive, Sinnot Ln, and Tramway Dr were rated to be high or extreme risk. Pipe segments considered high or extreme risk are at the greatest likelihood of deterioration and/or have the highest consequence of failing. As such, pipe rehabilitation and inspection for these pipelines are prioritized in the R&R Plan (Section 4). The most common LOF drivers of high risk rating were liquefaction susceptibility, pipe obstruction rating, and structural rating. On the other hand, the most common COF drivers of high risk rating were proximity to waterways, large pipe diameter, and proximity to high traffic flow areas. Appendix F provides the risk rating for all pipes in shapefile and excel format for the City GIS department's use. See the "Risk column" located in the last few columns.

Section 4: Renewal and Replacement Plan

Based on desktop condition assessment and CCTV inspection results, sewer segments were analyzed for required system improvements and recommended CCTV surveys. The Renewal and Replacement Plan involves a discussion of methodology and costs, a review of the recent projects from the current CIP to ensure recommended improvements and inspections were aligned with the current efforts, a summary of the major deficiencies present in the Main and Venus Way Lift Stations, and a summary of project recommendations.

4.1 Rehabilitation Selection Methodology

For pipe segments without inspection data, risk and diameter was evaluated for CCTV prioritization. Pipe segments with a risk rating of medium of greater (three of five or greater) were recommended to be surveyed. In addition, large diameter pipes (24-inch diameter pipe or larger) of any risk rating were recommended to be surveyed. Figure 4-1 illustrates this risk and large diameter data consideration. While the initial plan was to CCTV high and extreme risk pipes outputted from the desktop risk analysis, further evaluation revealed that the budget allowed for medium risk pipelines to be included in the CCTV recommendations. Note that the CCTV prioritization map does not distinguish inspection data availability, and as such will differ from the rehabilitation recommendation map where pipe condition data (CCTV survey) allows for more fine-tuned rehabilitation recommendations.

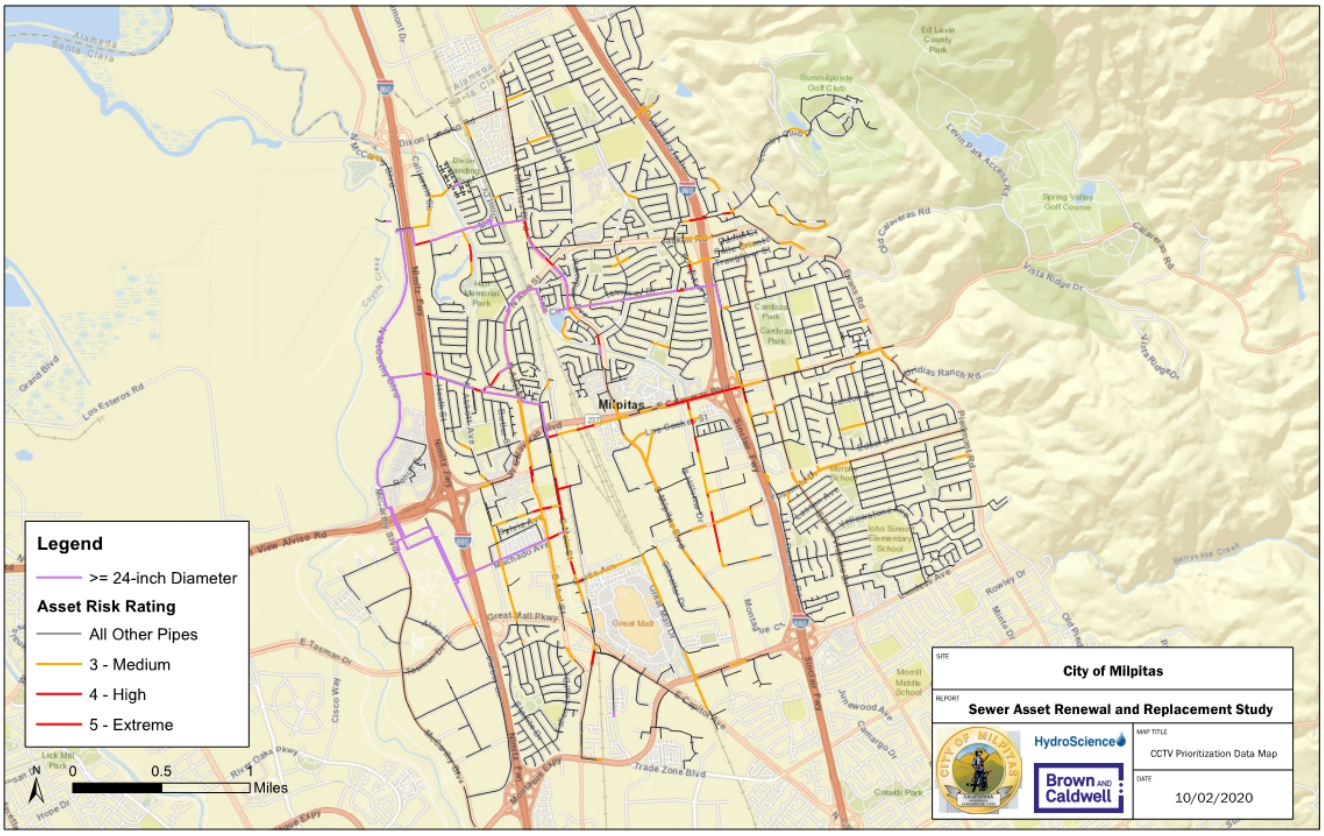


Figure 4-1: CCTV Prioritization Data Map

For pipe segments with survey data, a two-part process determined a pipe's final rehabilitation recommendation. First, defect-level rehabilitation methods such as point repair, lining, or no action (blank) are selected for each defect in the "defect codes" module. Second, a decision tree was prepared that determines the pipe rehabilitation recommendation by analyzing the following:

- CCTV structural peak score and overall peak score
- Number of point repairs and lining recommendations (output) by the defect-level rehabilitation methods or "defect codes" module
- Number of defects
- Length of major (score of four or five) and/or minor defects (score of three)
- Presence of specific defects such as ID (infiltration drippers) or SRCC (Reinforcement Corroded Chemical)

4.1.1 Defect Codes

Defect-level rehabilitation methods were selected and imported into the "Defect Codes" input window of the IAP program. Appendix H provides a full list of defect-level rehabilitation methods assigned for defects of all scores and all types. Table 4-1 presents a sample of the rehabilitation methods assigned for structural defects with a score of five.

Table 4-1. Sample Defect Codes with Associated Rehabilitation Methods

Defect Code	Default Score	Defect Type	Description	Rehabilitation Method
BSV	5	Structural	Broken Soil Visible	Point Repair
BVV	5	Structural	Broken Void Visible	Point Repair
DI	5	Structural	Dropped Invert	Point Repair
DV	5	Structural	Deformed Vertical Brick	Point Repair
HSV	5	Structural	Hole Soil Visible	Point Repair
HVV	5	Structural	Hole Void Visible	Point Repair
SMW	5	Structural	Missing Wall	Point Repair
SMWC	5	Structural	Missing Wall Chemical	Point Repair
SMWM	5	Structural	Missing Wall Mechanical	Point Repair
SMWZ	5	Structural	Missing Wall Unknown	Point Repair
SRC	5	Structural	Reinforcement Corroded	Point Repair
SRCC	5	Structural	Reinforcement Corroded Chemical	Point Repair
SRCM	5	Structural	Reinforcement Corroded Mechanical	Point Repair
SRCZ	5	Structural	Reinforcement Corroded Unknown	Point Repair
SRP	5	Structural	Reinforcement Projecting	Lining
SRVM	5	Structural	Reinforcement Visible Mechanical	Lining
SRVZ	5	Structural	Reinforcement Visible Unknown	Lining
XB	5	Structural	Collapse Brick Sewer	Point Repair
XP	5	Structural	Collapse Pipe Sewer	Point Repair

4.1.2 Rehabilitation Decision Tree

Figure 4-2 illustrates the rehabilitation selection process. First, survey data availability is checked in the "[Has CCTV Data]" condition box. Pipes without survey data are then evaluated for risk and large diameter pipes. Pipes with survey data are then screened for inspection score. As the decision tree progresses, each pipe is analyzed for its number of point repairs and lining recommendations outputted by the "defect codes" module, number of defects, length of defects, and presence of specific minor but not negligible defects. When multiple rehabilitation options are present, a cost comparison is done to determine the best action. This is to ensure that a pipe would not be recommended to have 10 sectional liners when a full liner would be more cost efficient. In another example, when multiple point repair(s) by excavation or sectional liner(s) are present, the cost to replace or cost to perform a "full liner + point repair(s) by excavation" is compared to ensure the best action is recommended.

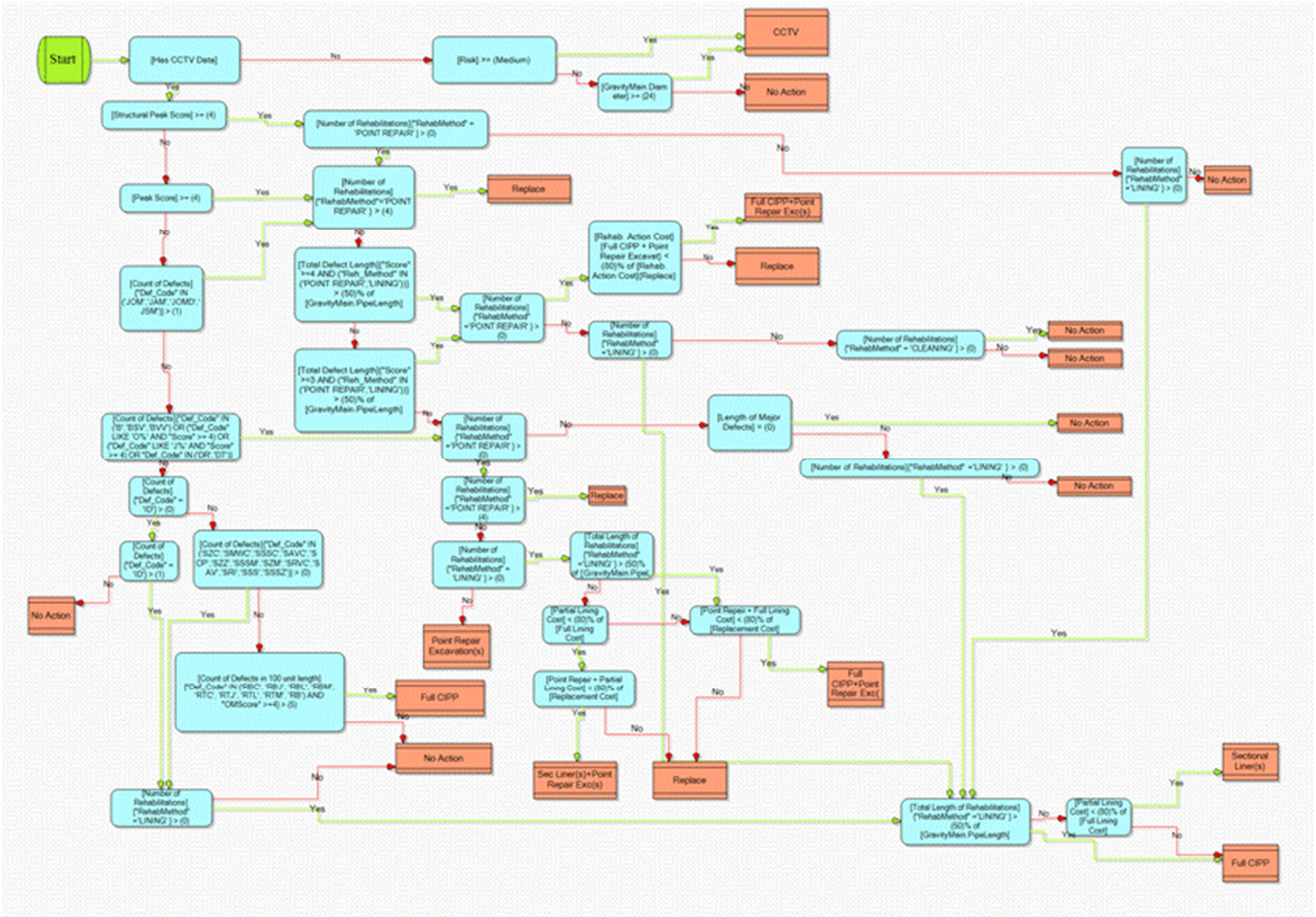
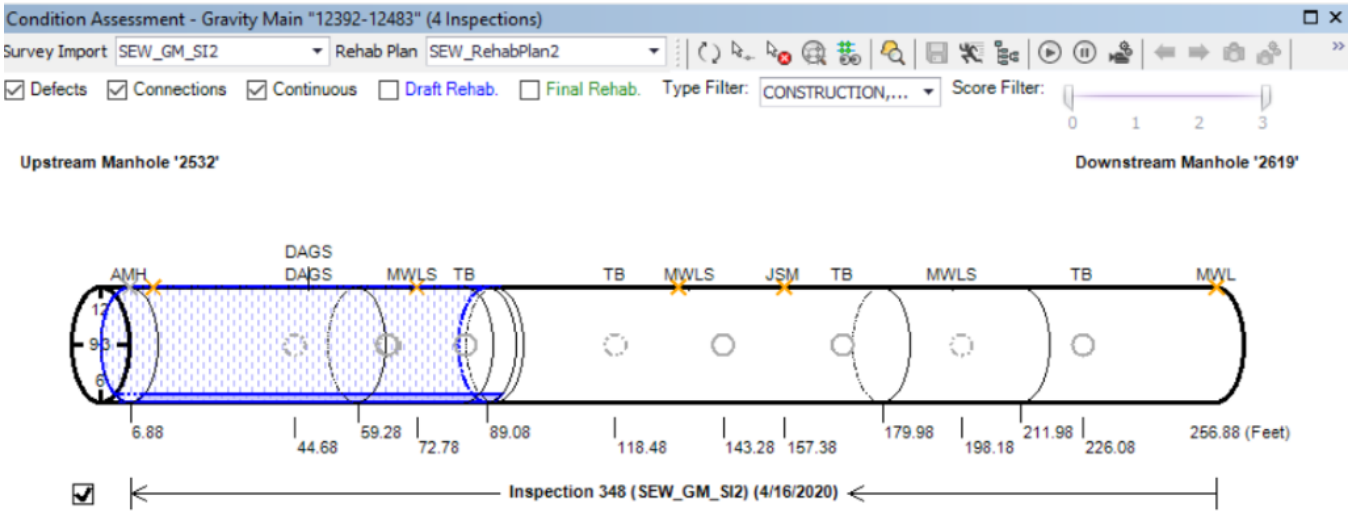


Figure 4-2: Rehabilitation Decision Tree

4.1.3 Analysis Quality Check

For each decision tree branch, spot checks were performed to see if the rehabilitation recommendations matched engineering expectations. For example, Figure 4-3 illustrates a pipe which was recommended to be replaced. Using the IAP program, defects present in the pipe and suggested rehab methods were reviewed and validated. At least 20 percent of each decision tree branch was reviewed for each rehabilitation type except pipes with “No Action” which have received a risk score of one (negligible) or two (low).



Inspections | Defects | Connections | Continuous | Draft Rehab. | Final Rehab. | ConditionScore

	Def_Code	Distance	S...	Rehab Method	Description	Clock	Clock To	Remarks
1	JSM	256.88	3	POINT REPAIR	Joint Separated Medium	0		
2	JSM	157.38	3	POINT REPAIR	Joint Separated Medium	0		
3	JSM	133.08	3	POINT REPAIR	Joint Separated Medium	0		
4	JSM	72.78	3	POINT REPAIR	Joint Separated Medium	0		
5	JSM	12.08	3	POINT REPAIR	Joint Separated Medium	0		
6	MWM	256.88	0		Miscellaneous Water Mark	0		
7	MWL	256.88	0		Miscellaneous Water Level	0		
8	AMH	256.88	0		Manhole	0		2619
9	AMH	6.78	0		Manhole	0		2532

Figure 4-3: Example Analysis Quality Check in IAP

4.1.4 Staff Input

Prior to draft report submission, a preliminary rehabilitation decision tree was sent to the City in July 2020 in the event that preliminary staff input was desired. At the time, review was deferred until after draft report submission. Thus, recommendations are currently based on prior condition assessment projects and

engineering experience. Defect-level rehabilitation methods and decision tree can be adjusted to best suit City operational preferences.

4.2 Basis of Cost Assumptions

Detailed unit costs for the rehabilitation items used in the Class 5 cost estimate can be found in Appendix J. The cost per foot is specified by pipe size. Unit costs are provided for the following:

- CCTV
- Pipe Replacement
- Point Repair(s) by Excavation
- Sectional Liner(s)
- Full Pipe Length Cured in Place Pipe (Full CIPP)

In general, material costs were provided by vendor quotations and labor costs were estimated using RSMeans construction cost database. For pipes with unknown diameters, the average pipe diameter of nine inches was used for costing. For pipes with unknown depths, the average pipe depth of 11 feet was assumed. The unit costs used to develop rehabilitation recommendations are budgetary construction costs and do not include engineering, permitting, legal, administrative, or other planning costs typical of budgetary capital improvement planning. City input for CIP planning level costs either in the form of percentage breakdown or recent bid tabulations would further calibrate the model to ensure the best recommendations are made.

4.3 Review of Recent Projects

As a part of this renewal and replacement study, a review of recent City projects was performed to ensure our recommendations are aligned with recent and planned projects.

Table 4-2 presents recent or ongoing sewer utility and lift station improvement projects from the City's 2019-24 CIP.

Table 4-2. Recent Sewer Utility Improvement Projects

Project ID	Project	Description	Status
6119	Sanitary Sewer Condition Assessment Program	Citywide CCTV	Ongoing. Summary of recommendations for CCTV are described in Section 4.5. For a full list of CCTV recommendations, see Appendix A
6123	Sanitary Sewer Overflow Improvements	Smart manholes	Ongoing
6124	Sewer Pump Station Rehabilitation Program	In Fiscal Year (FY)2018-19 and FY2019-20 Pump 3 replacement at Main Lift Station and assessment of Pumps 4 and 5	Per 2020 Lift Station Inspections (Task 2 submittal to HSE and briefly described in next section): • Pump 3 is in poor condition and requires replacement • Pumps 4 and 5 are in good condition
6126	Minor Sewer Projects	In FY 2018-19, replace Pump 2 at Main Lift Station and one pump at Venus Station	To be determined

Table 4-2. Recent Sewer Utility Improvement Projects			
Project ID	Project	Description	Status
6131	Sanitary Sewer Cathodic Protection Improvements	Two magnetic flow meters at the Main Sewer Pump Station will to be replaced and isolated from cathodic protection to prevent reading interference. Design to start in FY2019-20	To be determined
6132	Sewer Master Plan 2019	This update will identify deficiencies in the collection system and recommend corrective actions. Funding is added to FY2019-20 to include assessment of City's main sewer pipes.	Ongoing. Summary of deficiencies and recommendations are reflected in this report.
Not Provided	Sewer Line Replacement at E. Curtis	This line is at full capacity and requires replacement/upgrades.	To be determined

4.4 Lift Station Rehabilitation

In early 2020, an inspection of the Main Lift Station and Venus Way Lift Station was completed, and deficiencies were catalogued. Table 4-3 summarizes the major lift station deficiencies that require attention. The *Main and Venus Way Lift Station Inspections Report* submitted to City in May 2020 (Appendix K) provides a more comprehensive scoring and inspection notes for lift station assets.

Table 4-3. Main Lift Station Deficiencies			
Asset Name	Field Assessment/Comments	Condition Score	Performance Score
Mag Meter (Flow Meter A)	Not in Operation	4 - Poor Condition Major defects observed, asset integrity may be compromised.	4 - Poor Performance In service, but function is highly impaired.
Manifold PV #2 Actuator	Does not work	5 - Failing or Failed Asset integrity is compromised, asset may be out of service.	5 - Failing or Failed Asset is not functioning as intended or is out of service.
Pump #3	Has exceeded useful life	4 - Poor Condition Major defects observed, asset integrity may be compromised.	4 - Poor Performance In service, but function is highly impaired.
Grinder #1	Excessive vibration and inadequate supports	5 - Failing or Failed Asset integrity is compromised, asset may be out of service.	5 - Failing or Failed Asset is not functioning as intended or is out of service.
2" Combination Air/Vacuum Valve	N/A	4 - Poor Condition Major defects observed, asset integrity may be compromised.	4 - Poor Performance In service, but function is highly impaired.
Flow Meter B	Operable, but no accurate	4 - Poor Condition Major defects observed, asset integrity may be compromised.	4 - Poor Performance In service, but function is highly impaired.
Air Vacuum 1 to 15	Cavitation, coating failure, and inadequate supports	5 - Failing or Failed Asset integrity is compromised, asset may be out of service.	5 - Failing or Failed Asset is not functioning as intended or is out of service.
Variable Frequency	No corrosion identified, arc flash labels	4 - Poor Condition	2 - In service

Table 4-3. Main Lift Station Deficiencies			
Asset Name	Field Assessment/Comments	Condition Score	Performance Score
Drive P2	missing	Asset integrity may be moderately compromised.	Higher than expected O&M.
Variable Frequency Drive P3	No corrosion identified, understood from City that IGBT was replaced a year ago, arc flash labels missing	4 - Poor Condition Asset integrity may be moderately compromised.	2 - In service Higher than expected O&M.
Variable Frequency Drive P4	No corrosion identified, arc flash labels missing	4 - Poor Condition Asset integrity may be moderately compromised.	2 - In service Higher than expected O&M.
Variable Frequency Drive P5	No corrosion identified, understood from City that cooling fans were replaced a year ago, arc flash labels missing	4 - Poor Condition Asset integrity may be moderately compromised.	2 - In service Higher than expected O&M.

4.5 Summary of Recommendations

Recommendations of system improvements and CCTV inspections total $17.4 million in construction costs. Asset renewal and replacement priorities were assessed based on inspection data, desktop risk evaluation, and rehabilitation selection methodology described in previous sections. The results are presented below.

4.5.1 Sewer Main Pipelines

Of the approximately 105,000 LF (449 segments) of sewer inspected, about 50,000 LF (178 segments) require improvement. The construction cost of system improvements is estimated at approximately $17 million. Of the remaining 685,000 LF segments with no inspection data, it is recommended that 55,000 LF of medium to extreme risk pipes and/or large diameter pipes receive CCTV inspection, with an estimated cost totaling approximately $400,000. Recommendations of system improvements and CCTV inspections total $17.4 million in construction costs. Large diameter pipe is currently defined as 24-inch diameter and can be adjusted. Recommended improvements include:

- Additional CCTV
- Pipe Replacement
- Full Cured-In-Place Pipe (CIPP)
- Full CIPP + Point Repair(s) by Excavation
- Point Repair(s) by Excavation
- Sectional Liner(s)
- Sectional Liner(s) + Point Repair(s) by Excavation

Figure 4-4 provides the sewer main pipeline rehabilitation recommendations. The capital improvement program (CIP) recommendations for each asset is also included in GIS and tabular format in Appendix A. Note that these recommendations are subject to change depending on future discussions with operational staff prefers to determine rehabilitation preferences of the various levels and types of defects. The Class 5 cost estimates are high level (1-2% planning level) and will be refined as project scopes are further defined. Detailed cost estimates are recommended when further CIP budgeting and planning takes place.

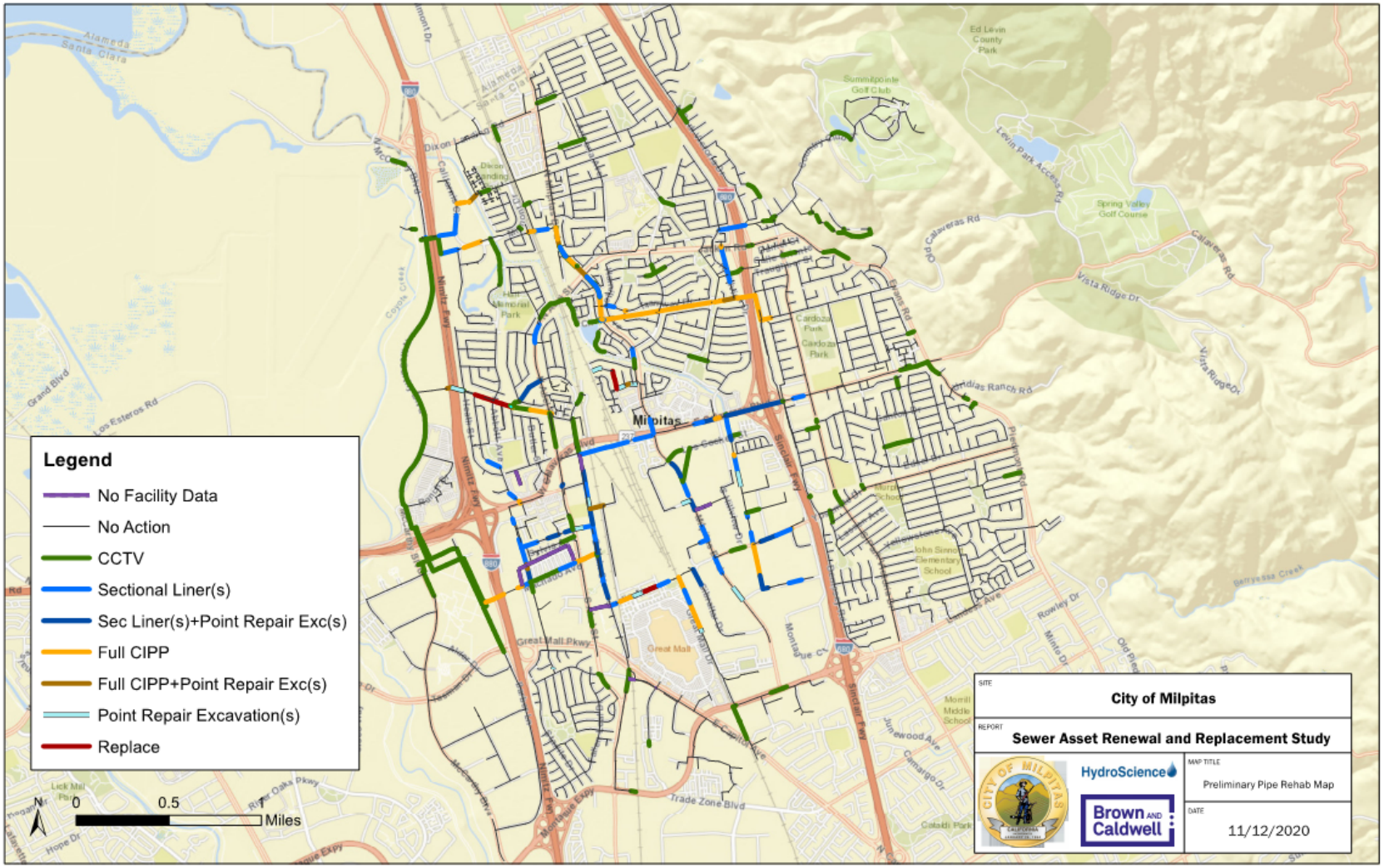


Figure 4-4: Preliminary Pipe Rehabilitation Recommendations Map

4.5.2 CCTV Inspection

Medium to extreme risk pipes and large diameter pipes are recommended for CCTV inspection. Large diameter pipe is currently defined as 24-inch diameter and can be adjusted. Figure 4-5 presents the CCTV inspection map of these highest priority areas. As shown on the figure, CCTV inspections include the long west-side pipeline stretch starting from Barber Lane through N McCarthy Boulevard and throughout the City. These inspections total 55,000 LF, with an estimated cost totaling approximately $400,000.

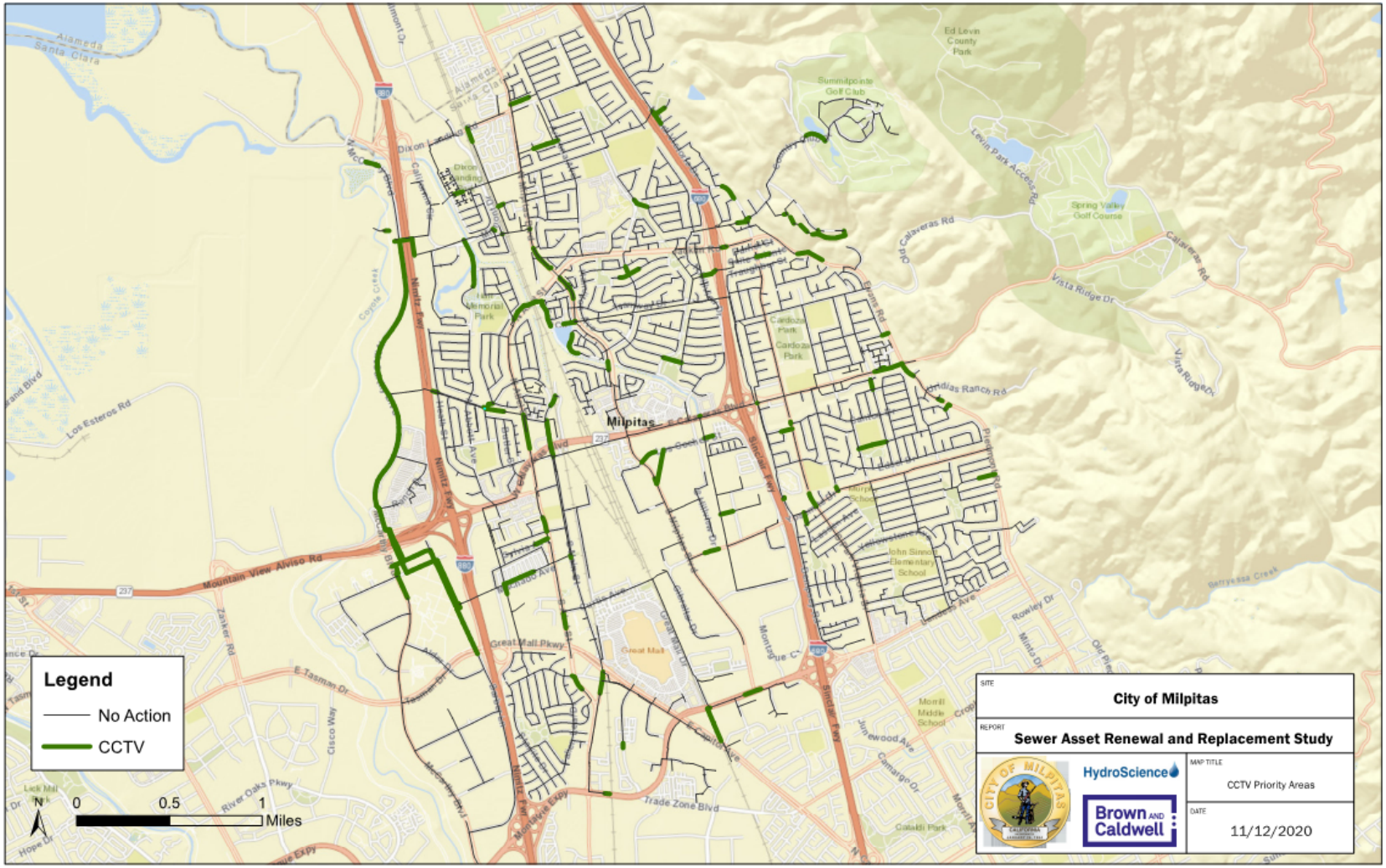


Figure 4-5: Priority CCTV Areas

4.5.3 Preliminary Capital Improvement Plan Alternatives Summary

BC has developed three distinct Capital Improvement Plan (CIP) alternatives to phase out the necessary rehabilitation efforts. Alternative A presents CIP grouping based on risk grades. Alternative B focuses rehabilitation geographically within the sewer basin. Alternative C is a hybrid approach wherein pipes with risk and significant defects are prioritized in the first year and after which a geographic approach is applied for ease of construction. With the given data, Alternative C is recommended among the three alternatives explored here.

However, note that the CIP grouping presented in Alternatives A, B, and C serve as preliminary groupings of sewer pipe rehabilitations. The alternatives presented at this stage are not exhaustive of other possibilities and modifications. Within Appendix A, you will find a "Preliminary Rehab Recommendation.shp" shapefile and excel export results to help facilitate further development of the CIP. The shapefile attribute table contains column "CIP_Phase" which match up with the 4 phases in Alternative A and B. The table also includes column "CIP_ST" which allows sorting of pipes along the same street to facilitate the development of visuals or further analysis of risk and rehabilitation data for CIP development.

4.5.4 Preliminary Sewer Pipeline Capital Improvement Plan – Alternative A

Alternative A presents CIP grouping based on risk grades. Table 4-4 provides an overview of Alternative A. Note that the same street may have GIS segments of various risk grades and may thus be split in this alternative.

Table 4-4. Preliminary Sewer Pipeline Capital Improvement Plan - Alternative A Summary

Year	Description	Construction Cost[1]	Construction Cost Per Year
1	Rehabilitate Extreme Risk Assets	$1,700,000	-
	CCTV Large Diameter and Medium to Extreme Risk Assets	$400,000	-
2	Rehabilitate High Risk Assets	$2,600,000	-
3-7	Rehabilitate Medium Risk Assets	$10,900,000	$2,200,000
8	Rehabilitate Low Risk Assets	$1,800,000	-
Total Cost		$17,400,000	$2,175,000

[1]Contingencies amounting to 45% are included in the cost estimate (5% Mobilization/Demobilization, 10% Sewer Bypassing, 30% Construction Cost and Market Contingency). Additionally, traffic control during construction amounting to $10,000 to $30,000 depending on roadway traffic rating was also assumed. Administrative, engineering, or other planning costs typical of CIP planning are not included.

Year 1

The first year includes rehabilitating extreme risk assets (grade 5 out of 5) and CCTV inspection of the most critical assets as described in Section 4.5.2 involving the long west-side pipeline stretch starting from Barber Lane through N McCarthy Boulevard and throughout City. Table 4-5 presents the pipe rehabilitation details for year 1.

Table 4-5. Alternative A CIP – Year 1, Extreme Risk Pipes

Street Name	Size (inch)	Material	Construction Cost	Facility ID(s)	Notes
Between Tramway Dr and Los Pinos Ave	30	RCP	$200,000	12043-12021	Full CIPP 250 ft
Coming Ave	8	VCP	$70,000	10395-10396 10012-10394	Full CIPP 500 ft
E Calaveras Blvd	15, 21	VCP	$400,000	12717-12718 12721-12722 12722-12711 12488-12496 12729-12717 12721-12722	Full CIPP, Point Repair(s), Sectional Liner(s) 1,800 ft
Just East of S Hillview Dr	15	VCP	$300,000	10176-10177 12716-12719 10185-10184 10185-10184	Full CIPP, Sectional Liner(s) 1,200 ft
N Milpitas Blvd	33, 39	RCP	$600,000	12232-12251 12218-12522	Full CIPP, Point Repair(s) 600 ft
Nimitz Freeway and California Cir	42	RCP)	$34,000	12589-12601	Sectional Liner(s) 500 ft
S Abel St	18	VCP	$42,000	10480-10481	Point Repair(s), Sectional Liner(s). 65 feet, 1 pipe segment

Year 2

The second year consists of various rehabilitation of high risk (grade 4 out of 5) assets.

Table 4-6. Alternative A CIP – Year 2, High Risk Pipes

Street Name	Size (inch)	Material	Construction Cost	Facility ID (s)	Notes
Between Tramway Dr and Los Pinos Ave	24	VCP	$100,000	12439-12446 12439-12446	Full CIPP 85 ft
Curtis Ave	18	VCP	$50,000	10333-10347	Sectional Liner(s) 170 ft
E Calaveras Blvd*	21	VCP	$70,000	10462-10463	Sectional Liner(s) 330 ft
Just East of S Hillview Dr*	15	VCP	$335,000	12706-12733 10188-10187 10179-10159 10177-10178 10178-10179	Full CIPP, Point Repair(s), Sectional Liner(s) 1,100 ft
Machado Ave	24	RCP	$280,000	10403-10418 10403-10418	Full CIPP 400 ft
Marylinn Dr	27	VCP	$500,000	11647-11695 11678-11680	Pipe Replacement, Point Repair(s), Sectional Liner(s) 770 ft
N Hillview Dr	12	VCP	$40,000	12088-12081	Sectional Liner(s) 220 ft
N Milpitas Blvd*	33, 39	RCP	$800,000	12218-12219 12522-12526 12251-12219 12248-12233	Full CIPP, Point Repair(s), Sectional Liner(s) 1,060 ft
S Main St	18, 21	VCP	$250,000	10331-10350 10404-10398 10399-10467 10467-10474	Point Repair(s) and Sectional Liner(s) 1,600 ft
Sinnot Ln	12	VCP	$180,000	10472-10467 10472-10467	Full CIPP 400 ft

Note:

*: This street also has a GIS segment requiring rehabilitation in Year 1.

Years 3-7

Years 3-7 feature rehabilitation of medium risk assets (grade 3 out of 5) as described in Table 4-7.

Table 4-7. Alternative A CIP – Years 3-7, Medium Risk Pipes

Street Name	Rehabilitation Action
Ames Ave	Sectional Liner(s)
Between Tramway and Los Pinos Ave*	Full CIPP, Sectional Liner(s)
Coming Ave*	Point Repair(s), Sectional Liner(s)
Connection between N Milpitas Blvd and Summerwind Way****	Full CIPP, Sectional Liner(s)
Connection to Southwest Community Starting from W Calaveras Blvd****	Full CIPP, Point Repair(s), Sectional Liner(s)
Curtis Ave**	Full CIPP, Pipe Replacement, Point Repair(s), Sectional Liner(s)
E Calaveras Blvd*	Point Repair(s), Sectional Liner(s)
Gibraltar Dr	Point Repair(s), Sectional Liner(s)
Great Mall Dr	Full CIPP, Sectional Liner(s)
Just east of S Hillview Dr*	Point Repair(s), Sectional Liner(s)
Kennedy Dr	Full CIPP
Machado Ave**	Sectional Liner(s), Full CIPP
Marylinn Dr**	Full CIPP, Pipe Replacement, Point Repair(s), Sectional Liner(s)
N Abel St	Sectional Liner(s)
N Hillview Dr**	Sectional Liner(s)
N McCarthy Blvd	Sectional Liner(s)
N Milpitas Blvd*	Full CIPP, Sectional Liner(s)
Nimitz Freeway and California Cir*	2 Crossings near - Sectional Liner(s), Full CIPP
River Rock Rd	Full CIPP
S Abbot Ave	Sectional Liner(s)
S Main St**	Point Repair(s), Sectional Liner(s)
S Milpitas Blvd	Point Repair(s), Sectional Liner(s)
Sinclair Freeway Crossing near Fox Hollow Ct	Sectional Liner(s)
Smithwood St	Sectional Liner(s)
Wool Dr	Full CIPP
Yosemite Dr	Full CIPP, Point Repair(s), Sectional Liner(s)

Notes:

*: the street also has repairs in year 1.

**: the street also has repairs in year 2.

****: the street also has repairs in year 8.

Year 8

Year 8 of Alternative A includes rehabilitation of low risk assets (grade 1 or 2) as described in Table 4-8. The 2020 CCTV inspections included several lower risk assets which identified defects requiring rehabilitation.

Table 4-8. Alternative A CIP – Year 8, Low Risk Pipes

Street Name	Rehabilitation Action
Between Tramway and Los Pinos Dr*	Full CIPP
Coming Ave*	Sectional Liner(s)
Connection to SW Community Starting from W Calaveras Blvd***	Sectional Liner(s)
Great Mall Dr***	Point Repair(s)
Machado Ave**	Full CIPP
N Hillview Dr**	Sectional Liner(s)
Silverlake Dr	Full CIPP and Point Repair
Sinclair Freeway	Full CIPP
Turquoise St	Point Repair
Tramway Dr	Sectional Liner(s)
Meadowland Dr	Pipe Replacement and Point Repair(s)

Notes:

*: the street also has repairs in year 1.

**: the street also has repairs in year 2.

***: the street also has repairs in years 3-7.

4.5.5 Preliminary Sewer Pipeline Capital Improvement Plan – Alternative B

Alternative B presents CIP grouping based on risk while grouping pipes on the same street that have a rehabilitation action associated with it. Table 4-9 provides an overview of Alternative B.

Table 4-9. Preliminary Sewer Pipeline Capital Improvement Plan - Alternative B Summary

Year	Description	Construction Cost[1]	Construction Cost Per Year
1-4	Rehabilitate Extreme Risk Pipes and Other Pipes Along the Same Street With Rehabilitation Needs	$7,800,000	$2,050,000
	CCTV Large Diameter and Medium to Extreme Risk Pipes	$400,000	
5-6	Rehabilitate High Risk Pipes and Pipes Along the Same Street	$5,400,000	$2,700,000
7-8	Rehabilitate Medium Risk Pipes and Pipes Along the Same Street	$2,800,000	-
8	Rehabilitate Low Risk Streets	$1,000,000	-
Total Cost		$17,400,000	$2,175,000

[1]Contingencies amounting to 45% are included in the cost estimate (5% Mobilization/Demobilization, 10% Sewer Bypassing, 30% Construction Cost and Market Contingency). Additionally, traffic control during construction amounting to $10,000 to $30,000 depending on roadway traffic rating was also assumed. Administrative, engineering, or other planning costs typical of CIP planning are not included.

Years 1-4

Years 1-4 include rehabilitating extreme risk pipes and pipes with rehabilitation needs (of any risk grading) along the same street and CCTV inspection of the most critical assets as described in Section 4.5.2 involving the long west-side pipeline stretch starting from Barber Lane through N McCarthy Boulevard and throughout City. Table 4-10 provides the list of pipes requiring rehabilitation in more detail.

Table 4-10. Alternative B CIP – Years 1-4, Streets With Extreme Risk Segments

Risk Grade Average	Street Name	Size (inch)	Material	Total Construction Cost of Street	Cost of Rehabilitating Grade 4 or 5 GIS Segments Only	Notes
5.0	S Abel St	18	VCP	$42,000	-	Point Repair(s), Sectional Liner(s). 65 feet, 1 pipe segment
4.1	Just East of S Hillview Dr	12, 15	VCP	$720,000	$615,000	Full CIPP, Point Repair(s), Sectional Liner(s) 2,300/3,450 ft of high/extreme risk pipe
3.9	E Calaveras Blvd	12, 15, 18, 21	VCP	$727,000	$450,000	Full CIPP, Point Repair(s), Sectional Liner(s) 2,150/4,650 ft of high/extreme risk pipe
3.7	N Milpitas Blvd	33, 39	RCP	$2,300,000	$1,400,000	Full CIPP, Sectional Liner(s) 1,700/3,050 ft of high/extreme risk pipe
3.5	Coming Ave	8	VCP	$220,000	$70,000	Full CIPP 500/1,600 ft of extreme risk pipe
3.5	Nimitz Freeway and California Cir	18, 42	VCP, RCP (respectively)	$615,000	$34,000	Full CIPP, Sectional Liner(s) 500/2000 ft of extreme risk pipe
2.8	Between Tramway Dr and Los Pinos Ave	24, 30	VCP, RCP	$3,200,000	$300,000	Full CIPP, Sectional Liner(s) 350/4,500 ft of high/extreme risk pipe

Years 5-6

The 5th and 6th year consist of various rehabilitation of high risk (grade 4 out of 5) pipes and pipes along the same street which require rehabilitation of any risk rating. Table 4-11 presents the list of pipes

Table 4-11. Alternative B CIP – Years 5-6, Streets with High Risk Segments

Risk Grade Average	Street Name	Size (inch)	Material	Total Construction Cost of Street	Cost of Rehabilitating Grade 4 Pipes Only	Notes
4.0	Sinnot Ln	12	VCP	$180,000	-	Full CIPP 400 feet, 2 pipes
3.44	S Main St	18, 21	VCP	$650,000	$250,000	Point Repair(s) and Sectional Liner(s) 1,600/3,600 ft of high risk pipes
3.17	Marylinn Dr	27, 30	RCP, VCP	$2,300,000	$500,000	Full CIPP, Pipe Replacement, Point Repair(s), Sectional Liner(s) 750/3,100 ft of high risk pipes
3.08	Curtis Ave	15, 18	VCP	$800,000	$50,000	Full CIPP, Pipe Replacement, Point Repair(s), Sectional Liner(s), 200/1,600 ft of high risk pipes
2.92	Machado Ave	24, 30	RCP, VCP	$1,300,000	$280,000	Full CIPP, Sectional Liner(s) 400/2,150 ft of high risk pipes
2.6	N Hillview Dr	12	DIP, CIP	$170,000	$40,000	Sectional Liner(s) 200/1,050 ft of high risk pipes

Years 7-8, Medium Risk Pipes

Years 7-8 include rehabilitating medium risk pipes as detailed in Table 4-12

Table 4-12. Alternative B CIP – Years 7-8, Medium Risk Pipes

Street Name	Rehabilitation Action
Ames Ave	Sectional Liner(s)
Connection to Southwest Community Starting from W Calaveras Blvd	Full CIPP, Point Repair(s), Sectional Liner(s)
Connection Between N Milpitas Blvd and Summerwind Way	Full CIPP, Sectional Liner(s)
Gibraltar Dr	Point Repair(s), Sectional Liner(s)
Great Mall Dr	Full CIPP, Sectional Liner(s)
Kennedy Dr	Full CIPP
N Abel St	Sectional Liner(s)
N McCarthy Blvd	Sectional Liner(s)
River Rock Rd	Full CIPP
S Abbot Ave	Sectional Liner(s)
S Milpitas Blvd	Point Repair(s), Sectional Liner(s)
Sinclair Freeway Crossing near Fox Hollow Ct	Sectional Liner(s)
Smithwood St	Sectional Liner(s)
Wool Dr	Full CIPP
Yosemite Dr	Full CIPP, Point Repair(s), Sectional Liner(s)

Year 8, Low Risk Pipes

Year 8 also includes rehabilitating low risk pipes as detailed in Table 4-13.

Table 4-13. Alternative B CIP – Year 8, Low Risk Pipes

Street Name	Rehabilitation Action
Silverlake Dr	Full CIPP and Point Repair
Sinclair Freeway	Full CIPP
Turquoise St	Point Repair
Tramway Dr	Sectional Liner(s)
Meadowland Dr	Pipe Replacement and Point Repair(s)

4.5.6 Preliminary Sewer Pipeline Capital Improvement Plan – Alternative C (Recommended)

Alternative C presents a hybrid approach of Alternative A and B. The most pressing defects within the high and extreme risk pipe subset are addressed in the first year to reduce the likelihood of catastrophic failures. Following this, street by street rehabilitation (sorted by risk) similar to Alternative B is recommended for ease of construction.

Table 4-14. Preliminary Sewer Pipeline Capital Improvement Plan - Alternative C Summary

Year	Description	Construction Cost[1]	Construction Cost Per Year
1	Rehabilitate Extreme and High Risk Pipes with Significant Defects	$1,300,000	$3,000,000
	CCTV Large Diameter and Medium to Extreme Risk Pipes	$400,000	
1-3	Rehabilitate Extreme Risk Pipes and Pipes Along the Same Street Requiring Rehabilitation	$7,400,000	
4	Rehabilitate High Risk Pipes and Pipes Along the Same Street	$1,900,000	-
5-7	Rehabilitate Medium Risk Pipes and Pipes Along the Same Street	$5,400,000	$1,800,000
8	Rehabilitate Low Risk Streets	$1,000,000	-
Total Cost		$17,400,000	$2,175,000

[1]Contingencies amounting to 45% are included in the cost estimate (5% Mobilization/Demobilization, 10% Sewer Bypassing, 30% Construction Cost and Market Contingency). Additionally, traffic control during construction amounting to $10,000 to $30,000 depending on roadway traffic rating was also assumed. Administrative, engineering, or other planning costs typical of CIP planning are not included.

Year 1

In year 1, extreme and high risk pipes with significant defects are addressed. Table 4-15 provides the list of extreme risk pipes with significant defects. Additionally, CCTV inspection of the most critical assets involving the long west-side pipeline stretch starting from Barber Lane through N McCarthy Boulevard and throughout City as depicted in Figure 4-4 is recommended (Section 4.5.2).

Table 4-15. Alternative C CIP – Year 1, Extreme Risk Pipes With Significant Defects

Street Name	Size	Material	Significant Defects Observed	Rehab Recommendation	Construction Cost	Facility ID
Coming Ave	8	VCP	Broken Soil Visible Surface Corrosion Metal Pipe	Sectional Liner(s), Point Repair(s)	$40,000	10012-10394
E Calaveras Blvd	15	VCP	Broken	Sectional Liner(s), Point Repair(s)	$85,000	12717-12718
E Calaveras Blvd	15	VCP	Broken	Full CIPP	$75,000	12721-12722
E Calaveras Blvd	15	VCP	Hole Soil Visible Broken (3) Broken Soil Visible	Full CIPP	$40,000	12721-12722
E Calaveras Blvd	15	VCP	Broken (3)	Sectional Liner(s), Point Repair(s)	$70,000	12722-12711
E Calaveras Blvd	15	VCP	Broken (3)	Sectional Liner(s), Point Repair(s)	$80,000	12729-12717
Just East of S Hillview Dr	15	VCP	Broken (2)	Sectional Liner(s)	$35,000	10185-10184
Just East of S Hillview Dr	15	VCP	Broken	Full CIPP	$30,000	10185-10184
Total Construction Cost					**$500,000**	

Table 4-16 provides the list of high risk pipes with significant defects.

Table 4-16. Alternative C CIP – Year 1, High Risk Pipes With Significant Defects

Street Name	Size	Material	Significant Defects Observed	Rehab Recommendation	Construction Cost	Facility ID
Curtis Ave	18	VCP	Broken	Sectional Liner(s)	$50,000	10333-10347
Marylinn Dr	27	VCP	Broken (3)	Pipe Replacement	$390,000	11678-11680
Marylinn Dr	27	RCP	Broken (2)	Full CIPP, Point Repair(s)	$30,000	11657-11678
N Hillview Dr	12	VCP	Obstruction Intruding Through Wall	Sectional Liner(s)	$40,000	12088-12081
S Main St	18	VCP	Broken (2)	Sectional Liner(s)	$50,000	10404-10398
S Main St	21	VCP	Broken (2)	Point Repair(s)	$35,000	10467-10474
Sinnot Ln	12	VCP	Surface Damage Reinforcement Visible	Full CIPP, Point Repair(s)	$95,000	10472-10467
Sinnot Ln	12	VCP	Surface Damage Reinforcement Projecting	Full CIPP, Point Repair(s)	$85,000	10472-10467
Total Construction Cost					**$800,000**	

Years 1-3

In years 1-3, extreme risk pipes and pipes with rehabilitation needs (of any risk grading) along the same street which were not addressed in year 1 are recommended at this stage. Table 4-17 provides the list of pipes requiring rehabilitation in more detail.

Table 4-17. Alternative C CIP – Years 1-3, Streets with Extreme Risk Segments

Risk Grade Average	Street Name	Size (inch)	Material	Total Construction Cost of Street	Cost of Rehabilitating Grade 4 or 5 GIS Segments Only	Notes
5.0	S Abel St	18	VCP	$42,000	-	Point Repair(s), Sectional Liner(s). 65 feet, 1 pipe segment
3.9	Just East of S Hillview Dr*	12, 15	VCP	$655,000	$550,000	Full CIPP, Point Repair(s), Sectional Liner(s) 2,300/3,450 ft of high/extreme risk pipe
3.7	N Milpitas Blvd	33, 39	RCP	$2,300,000	$1,400,000	Full CIPP, Sectional Liner(s) 1,700/3,050 ft of high/extreme risk pipe
3.5	Nimitz Freeway and California Cir	18, 42	VCP, RCP (respectively)	$615,000	$34,000	Full CIPP, Sectional Liner(s) 500/2000 ft of extreme risk pipe
3.3	E Calaveras Blvd*	12, 15, 18, 21	VCP	$370,000	$95,000	Full CIPP, Point Repair(s), Sectional Liner(s) 2,150/4,650 ft of high/extreme risk pipe
3.2	Coming Ave*	8	VCP	$180,000	$30,000	Full CIPP 500/1,600 ft of extreme risk pipe
2.8	Between Tramway Dr and Los Pinos Ave	24, 30	VCP, RCP	$3,200,000	$300,000	Full CIPP, Sectional Liner(s) 350/4,500 ft of high/extreme risk pipe
Total Construction Cost					**$7,400,000**	

Note:

*: This street had some rehabilitation done in year 1.

Year 4

The 4th year consist of various rehabilitation of high risk (grade 4 out of 5) pipes and other pipes requiring rehabilitation along the same street. Table 4-18 presents the list of pipes.

Table 4-18. Alternative C CIP – Year 4, Streets with High Risk Segments

Risk Grade Average	Street Name	Size (inch)	Material	Total Construction Cost of Street	Cost of Rehabilitating Grade 4 Pipes Only	Notes
3.3	S Main St*	18, 21	VCP	$570,000	$170,000	Point Repair(s) and Sectional Liner(s) 1,600/3,600 ft of high risk pipes
2.9	Machado Ave	24, 30	RCP, VCP	$1,300,000	$280,000	Full CIPP, Sectional Liner(s) 400/2,150 ft of high risk pipes
Total Construction Cost					**$1,900,000**	

Note:

*: This street had some rehabilitation done in year 1.

Years 5-7, Medium Risk Pipes

Years 5-7 include rehabilitating medium risk pipes as detailed in Table 4-19.

Table 4-19. Alternative C CIP – Years 5-7, Medium Risk Pipes

Street Name	Rehabilitation Action
Ames Ave	Sectional Liner(s)
Connection to Southwest Community Starting from W Calaveras Blvd	Full CIPP, Point Repair(s), Sectional Liner(s)
Connection Between N Milpitas Blvd and Summerwind Way	Full CIPP, Sectional Liner(s)
Curtis Ave	Full CIPP, Pipe Replacement, Point Repair(s), Sectional Liner(s)
Gibraltar Dr	Point Repair(s), Sectional Liner(s)
Great Mall Dr	Full CIPP, Sectional Liner(s)
Kennedy Dr	Full CIPP
Marylinn Dr	Full CIPP, Pipe Replacement, Point Repair(s), Sectional Liner(s)
N Abel St	Sectional Liner(s)
N Hillview Dr	Full CIPP, Sectional Liner(s)
N McCarthy Blvd	Sectional Liner(s)
River Rock Rd	Full CIPP
S Abbot Ave	Sectional Liner(s)
S Milpitas Blvd	Point Repair(s), Sectional Liner(s)
Sinclair Freeway Crossing near Fox Hollow Ct	Sectional Liner(s)
Smithwood St	Sectional Liner(s)
Wool Dr	Full CIPP
Yosemite Dr	Full CIPP, Point Repair(s), Sectional Liner(s)

Year 8, Low Risk Pipes

Year 8 also includes rehabilitating low risk pipes as detailed in Table 4-20.

Table 4-20. Alternative C CIP – Year 8, Low Risk Pipes

Street Name	Rehabilitation Action
Silverlake Dr	Full CIPP and Point Repair
Sinclair Freeway	Full CIPP
Turquoise St	Point Repair
Tramway Dr	Sectional Liner(s)
Meadowland Dr	Pipe Replacement and Point Repair(s)

4.5.7 Sewer Lift Station Rehabilitation

The Main Lift Station and Venus Way Lift Station were inspected, and major deficiencies were catalogued (refer to Table 4-3). The variable frequency drives (VFDs), pump #3, and grinder are the main items requiring rehabilitation. The detailed score for each inventory item is provided in Appendix K, *Main and Venus Way Lift Station Inspections Report*. Per City's 2019-24 CIP, project 6124, an allowance of $100,000 annual investment from FY 2019-20 through 2022-23 is planned to address these rehabilitation needs.

4.5.8 Estimated Construction Cost

The Association for the Advancement of Cost Engineering (AACE) Class 5 Estimate is a rough order-of-magnitude estimate typically used to evaluate alternatives and is the class of estimate used in this report. Standard unit prices were developed for the primary components in each proposed construction contract. Scope items were parametrically estimated using cost data from similar projects in scope and size and adjusted to suit the specific requirements of this project. The estimated construction costs presented are considered conceptual and include a 45 percent contingency factor. Additionally, the presented costs are budgetary construction costs and do not include engineering, permitting, legal, administrative, or other planning costs typical of budgetary capital improvement planning.

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Appendix A: Rehabilitation Table, GIS, and Figures

This Appendix is a file export from Microsoft Excel.

Appendix B: Planned CCTV Inspection Scope

City of Milpitas
CCTV Inspection Scope
November 14, 2019

Scope of Work

HydroScience Engineers (HSE) plans to contract with National Plant (Contractor) to inspect portions of the City of Milpitas' large-diameter trunk sewers and other local collector sewers with high-definition CCTV equipment. For large-diameter trunk sewers in the Trunk A grouping below, provide an option to collect 2D laser and sonar data in addition to CCTV. CCTV inspections shall be NASSCO PACP compliant. The actual length to be inspected and inspection methods will be determined later based on pricing, field production, and available budget. During contracting, HSE and Contractor will determine the inspection equipment specifications.

Each "Priority" group below contains groupings of reaches, also listed in order of priority. We expect the Contractor will be able to inspect all the Priority 1 reaches. For Priority 2 reaches, the Contractor should inspect the first grouping and then move onto the second grouping, starting with the largest diameters reaches and working towards the smaller diameters. Within the grouping, the inspection Contractor will be allowed to select the order in which to inspect the reaches based on ease of access, traffic control, and other factors; however, the inspected reaches shall be contiguous as much as possible.

See the attached figures and spreadsheet for the candidate list of reaches planned for inspection. Also provided are shapefiles of the sewer pipes and manholes. The two fields in the sewer pipes attribute table, [CCTV_Plan] and [Diam_CCTV], contain the designated grouping and the expected pipe diameters, respectively. Lengths are based off of the [MEASUREDLE] field. Groupings below have the same names as the inspection maps, with GIS attribute label [CCTV_Plan] in parentheses.

PRIORITY 1

Trunk A_P1 (Trunk1)
Reinforced concrete pipe (RCP), diameters of 33, 36, 39, 42, 54, and 66 inches. 37 reaches, total length 8,830 linear feet (lf). Provide option to perform 2D laser and sonar inspection on a portion of the pipeline.

Trunk B_P1 (Trunk2)
RCP and vitrified clay pipe (VCP), diameters of 27 and 33 inches. 24 reaches, total length 5,760 lf.

Trunk C_P1 (Trunk3)
RCP and VCP, diameters of 24 and 30 inches. 15 reaches, total length 4,850 lf.

SW Area 21-24_P1 (Sub_21-24)
Mostly VCP, diameters of 21 and 24 inches. 19 reaches, total length 4,520 lf.

SW Area 10-18_P1 (Sub_10-18)
Mostly VCP, diameters of 10, 12 ,15, and 18 inches. 162 reaches, total length 46,720 lf.

SW Area 8_P1 (Sub_8)
Mostly VCP, 8-inch-diameter, 26 reaches, total length 8,660 lf.

PRIORITY 2

Misc 21-36_P2 (Sub_21-36_P2)
Mostly VCP, some RCP, diameters of 21, 24, 27, 30, 36 inches. 66 reaches, total length 16,890 lf.

Misc 12-18_P2 (Sub_12-18_P2)
Mostly VCP, diameters of 12 ,15, and 18 inches. 141 reaches, total length 31,000 lf.

CITY INSPECTIONS
To be inspected by City of Milpitas forces using City-owned equipment (WinCan). Mostly 6- and 8-inch-diameter VCP pipes. 389 reaches, total length 98,750 lf.

Manholes

There is no plan to perform MACP inspections on manholes; however, during CCTV inspection, the inspection Contractor shall capture video footage in each manhole to allow a basic assessment of manhole conditions.

Cleaning

Cleaning is not anticipated for sewers 15-inch-diameter and larger, and only targeted cleaning is anticipated for 8-inch- to 12-inch-diameter sewers. The Contractor shall attempt to inspect each sewer reach without cleaning. If unable to complete an inspection, mark the record "MSA" per NASSCO PACP, and alert the City immediately. Depending on availability, City forces may be dispatched to clean the pipe at that time, or may clean the pipe later for potential reinspection.

Estimated Pricing (based on communication with National Plant in November 2019)

Diameter	CCTV, per lf	2D Laser + Sonar, per lf
8-inch to 18-inch	$1.61	n/a
21-inch	$1.61 - $2.11	n/a
24-inch to 66-inch	$2.11 – 2.40	$6.00

Attachments:

1. Pipe reach summary tables (count and total length by diameter)
2. Inspection plan maps

City of Milpitas Inspection Plan
Pipe Reach Count

Count of FID *	Column Labels																	
Row Labels	**0**	**6**	**8**	**10**	**12**	**15**	**16**	**18**	**21**	**24**	**27**	**30**	**33**	**36**	**39**	**42**	**54**	**66**	**Grand Total**
City	10	220	114	22	13	7				2						1			389
Trunk1													5	4	9	12	2	5	37
Trunk2											21	3							24
Trunk3										6		9							15
Sub_21-24									11	8									19
Sub_10-18				28	23	68	1	42											162
Sub_8			26																26
Sub_21-36_P2									35	5	4	13		9					66
Sub_12-18_P2			1		72	43	1	24											141
Grand Total	**10**	**220**	**141**	**50**	**108**	**118**	**2**	**66**	**46**	**21**	**25**	**25**	**5**	**13**	**9**	**13**	**2**	**5**	**879**

Sum of MEASUREDLE	Column Labels																		
Row Labels	**0**	**6**	**8**	**10**	**12**	**15**	**16**	**18**	**21**	**24**	**27**	**30**	**33**	**36**	**39**	**42**	**54**	**66**	**Grand Total**
City	1,198	59,521	28,690	5,158	2,785	1,123				250						11			98,736
Trunk1													1,334	729	2,485	2,995	251	1,035	8,829
Trunk2											4,716	1,045							5,761
Trunk3										1,422		3,427							4,849
Sub_21-24									3,205	1,311									4,516
Sub_10-18				8,321	6,673	19,933	126	11,667											46,720
Sub_8			8,663																8,663
Sub_21-36_P2									7,897	1,368	781	4,242		2,599					16,887
Sub_12-18_P2			134		15,803	9,972	68	5,024											31,001
Grand Total	**1,198**	**59,521**	**37,487**	**13,479**	**25,261**	**31,028**	**194**	**16,691**	**11,102**	**4,351**	**5,497**	**8,714**	**1,334**	**3,328**	**2,485**	**3,006**	**251**	**1,035**	**225,962**

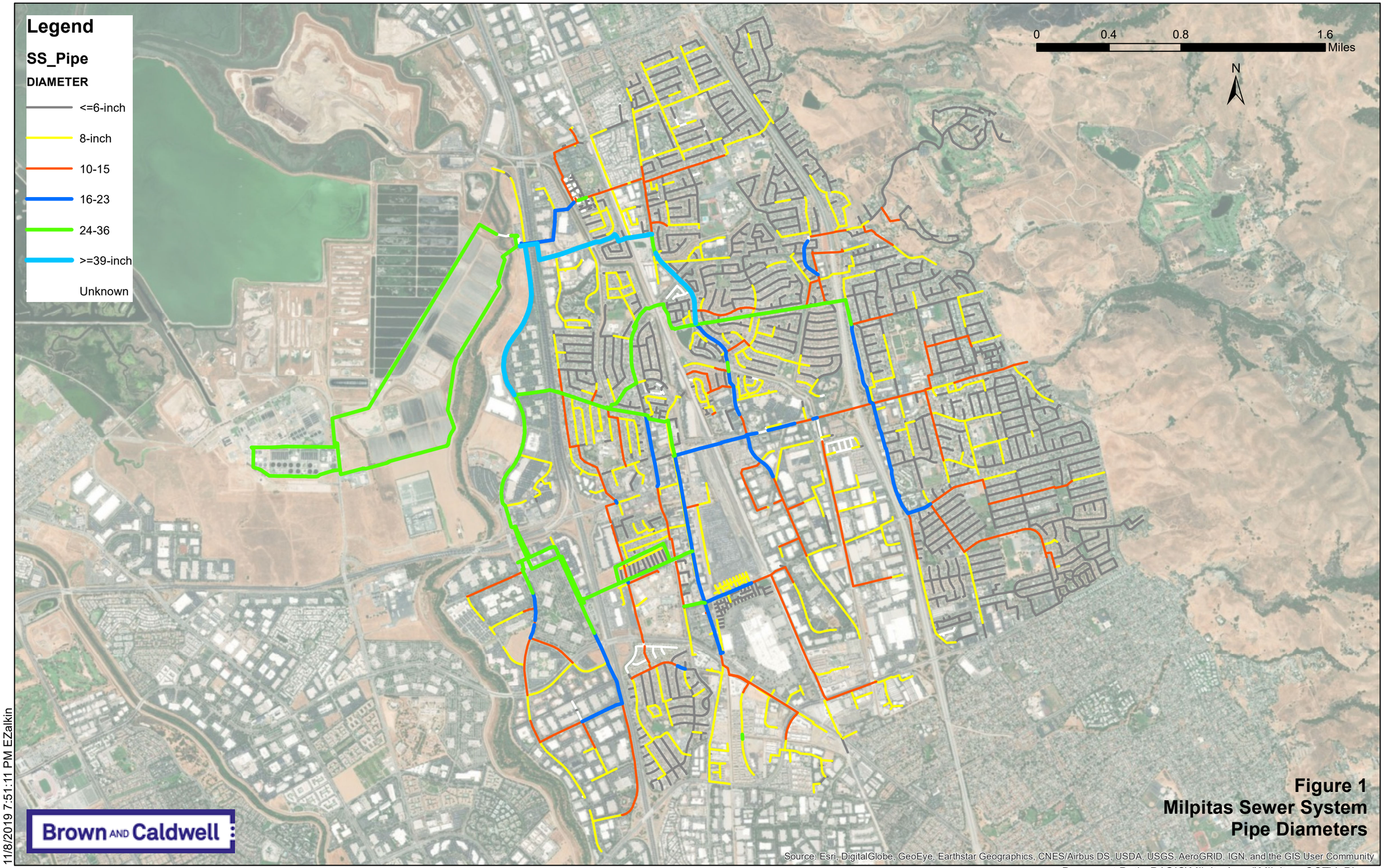


Figure 1
Milpitas Sewer System
Pipe Diameters

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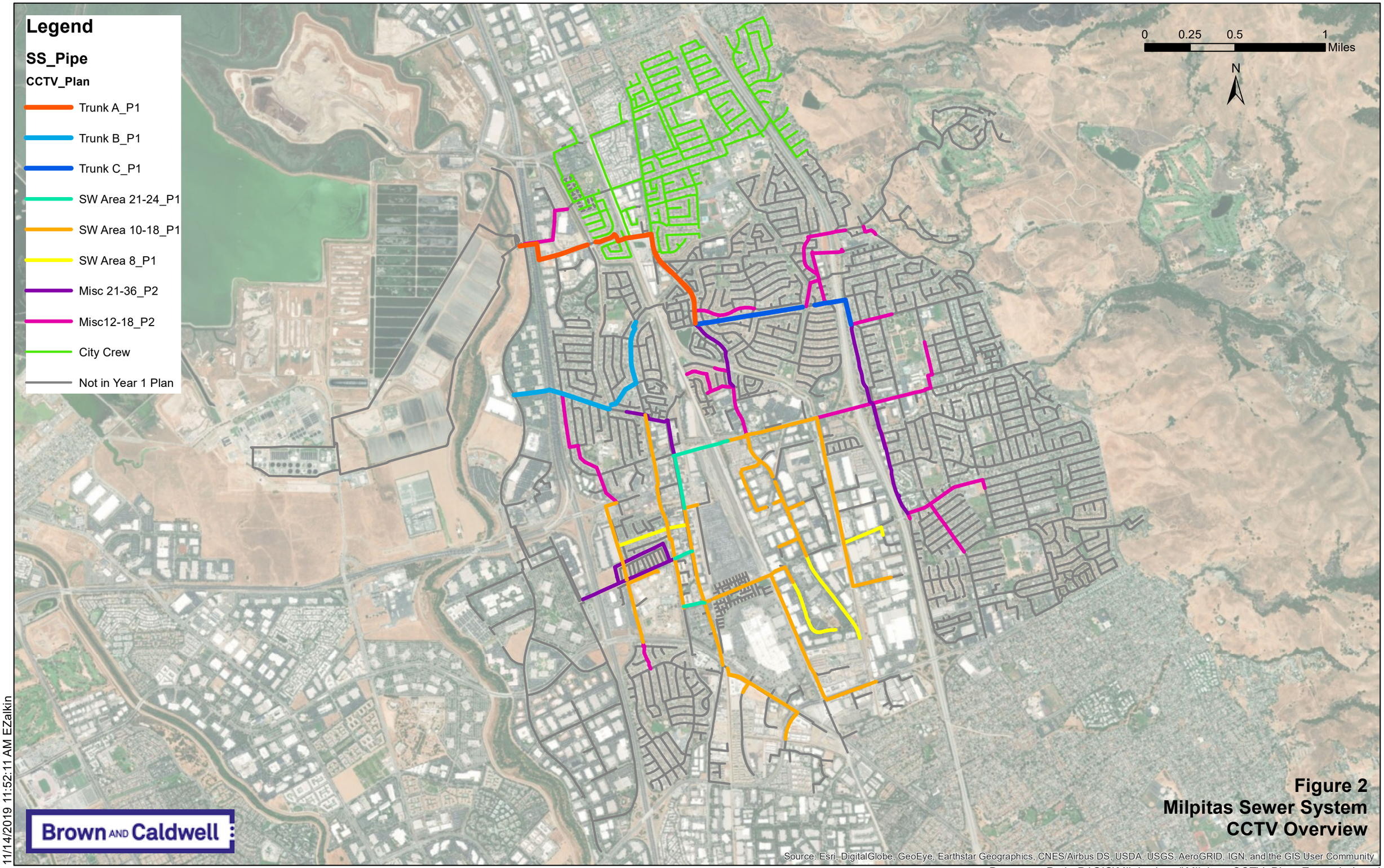


Figure 2
Milpitas Sewer System
CCTV Overview

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Legend

SS_Pipe

CCTV_Plan

- Trunk A_P1
- Trunk B_P1
- Trunk C_P1
- SW Area 21-24_P1
- SW Area 10-18_P1
- SW Area 8_P1
- Misc 21-36_P2
- Misc12-18_P2
- City Crew
- Not in Year 1 Plan

0 0.125 0.25 0.5 Miles

N

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Figure 3
Milpitas Sewer System
Trunk CCTV

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

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Legend

SS_Pipe

CCTV_Plan

- Trunk A_P1
- Trunk B_P1
- Trunk C_P1
- SW Area 21-24_P1
- SW Area 10-18_P1
- SW Area 8_P1
- Misc 21-36_P2
- Misc 12-18_P2
- City Crew
- Not in Year 1 Plan

0 0.125 0.25 0.5 Miles

N

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Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Figure 4
Milpitas Sewer System
SW Area CCTV

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Legend

SS_Pipe

CCTV_Plan

- Trunk A_P1
- Trunk B_P1
- Trunk C_P1
- SW Area 21-24_P1
- SW Area 10-18_P1
- SW Area 8_P1
- Misc 21-36_P2
- Misc 12-18_P2
- City Crew
- Not in Year 1 Plan

0 0.125 0.25 0.5 Miles

N

Brown AND Caldwell

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Figure 5
Milpitas Sewer System
City Crew CCTV

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Document Path: P:\GIS\Milpitas\mxd\Milpitas_CCTV_Plan_Expanded.mxd

Appendix C: QC Comments Log

City of Milpitas - CCTV Review Summary												
US node ID	DS node ID	Structure quick rating	Reviewed by	QC Header Information (UT26)	QC Coding (UT27)	QC General Comments (UT28)	Inspection ID	Direction of survey	Height (in)	Material	Length surveyed (ft)	Pipe length (ft)
1148	2852	5341	DSkipper	Header information is accurate.		From 276-282 there are multiple cracks. The one that was coded was a continuous crack at 12 oclock but the camera doesnt look up to clarify where this crack actually ends? And the pipe is broken at 6 oclock, grade 5, at 276	1148_D_20200501_0315	D	15	VCP	388.3	388
1417	979	4A31	DSkipper	Header information is accurate.		Significant fractures from 30-90ft. Coded correctly,.	1417_D_20200423_0239	D	12	VCP	344.3	343
210	582	5134	DSkipper	Header information is accurate.		Hole Soil Visible at 177, scored correctly as 5. Survey incomplete, crawler unable to proceed after 198 feet due to SIphon	210_D_20200421_2304	D	8	VCP	198.8	233
2229	2222	5141	DSkipper	Header information is accurate.		Broken VCP in two locations, coded correctly.	2229_D_20200422_0512	D	12	VCP	218.7	218
2290	2652	3H2D	DSkipper	Header information is accurate.		Corrected pipe material and shape to 66" RCP per defect log.	2290_U_20200415_0447	U	66	RCP	193.6	200
2321	2317	3N2F	DSkipper	Header information is accurate.		no additional comments	2321_D_20200409_0528	D	39	RCP	236.1	238
2373	2391	3R00	DSkipper	Header information is accurate.		DS MH does not exist. Geoplan indicates it should have been at 415 feet. They continued on until 430 feet and declared it nonexistent.	2373_D_20200413_0537	D	39	RCP	430.1	415
2388	2373	3Y2G	DSkipper	Header information is accurate.		No comments, operator was thorough	2388_D_20200413_0500	D	39	RCP	374.3	370
2584	2321	3M2J	DSkipper	Header information is accurate.		no additional comments	2584_U_20200409_0435	U	39	RCP	367.7	372
2652	2650	3F00	DSkipper	Header information is accurate.		Pipe material is marked as unknown. Pipe appears to be lined	2652_U_20200409_2343	U	62	XXX	148.8	157
2723	2735	3H2H	DSkipper	Header information is accurate.		Changed pipe length to 493 per the geoplan. Inspection only made it part way to 231 ft due to water level	2723_D_20200410_0454	D	40	RCP	231.7	493
2724	2723	3G2F	DSkipper	Header information is accurate.		Correctedpipe size to 40" per comment in the defect log.	2724_D_20200410_0420	D	42	RCP	182.6	187

US node ID	DS node ID	Structure quick rating	Reviewed by	QC Header Information (UT26)	QC Coding (UT27)	QC General Comments (UT28)	Inspection ID	Direction of survey	Height (in)	Material	Length surveyed (ft)	Pipe length (ft)
2725	2724	3Z00	DSkipper	Header information is accurate.		Why is unknown debris a continuous defect for the entire pipe? There is enough flow to obscure the bottom of pipe so not clear what debris is being referenced.	2725_D_20200410_0309	D	42	ZZZ	518.1	507
2726	2725	3W00	DSkipper	Header information is accurate.		Unable to disern pipe material due to liner.	2726_D_20200410_0249	D	42	ZZZ	281.5	292
2840	2842	5B41	DSkipper	Header information is accurate.		Coded correctly, several continuous cracks at 12 oclock, graded as a 5	2840_D_20200501_0439	D	15	VCP	311.9	302
2852	2840	5142	DSkipper	Header information is accurate.		No additional comments, coded correctly	2852_D_20200501_0356	D	15	VCP	500.3	499
340	352	5241	DSkipper	Header information is accurate.		no additional comments	340_D_20200403_0613	D	15	VCP	398.4	422
346	346A	412K	DSkipper	Header information is accurate.		Changed the fractures multiple at 4 feet to broken. the VCP is definitely brokern, not merely fractured.	346_D_20200403_0456	D	15	VCP	399.5	239.331
356A	356	4131	DSkipper	Header information is accurate.		In IAM the survey direction was marked incorrectly	356_U_20200406_0016	U	15	VCP	6.6	14.314
374	142	5126	DSkipper	Header information is accurate.		142 is an undocumented manhole. downstream survey was done beginning at 142 and continuing on to 373.	374_D_20200428_0521	D	15	VCP	217.9	
525	539	412D	DSkipper	Header information is accurate.		inspection incomplete due to water level	525_D_20200407_0517	D	18	VCP	152.6	168
558	551	5233	DSkipper	Header information is accurate.		Changed structural grade from 3 to 4 at 154 feet. Broken pipe later on in pipe scored as 5.	558_D_20200429_0306	D	15	VCP	226.5	216
572	570	512F	DSkipper	Header information is accurate.		Broken pipe at 333. Coded correctly as a five. No other comments, looks properly coded.	572_D_20200429_0020	D	15	VCP	385.5	388
659	659A	432F	DSkipper	Header information is accurate.		659A- new uncharted manhole found.	659_D_20200408_0203	D	12	VCP	213.8	244.97
723	743	3P2R	DSkipper	Header information is accurate.		Video header indicates RCP but defect comment log indicates could be Asbestos pipe. Changed in infoasset to Asbestos Cement as pipe material.	723_D_20200417_0019	D	30	AC	433.1	432

US node ID	DS node ID	Structure quick rating	Reviewed by	QC Header Information (UT26)	QC Coding (UT27)	QC General Comments (UT28)	Inspection ID	Direction of survey	Height (in)	Material	Length surveyed (ft)	Pipe length (ft)
727	65	412M	DSkipper	Header information is accurate.		Looks good, he stopped at all the taps.	727_D_20200430_0808	D	15	VCP	384.7	
742A	738	3G2G	DSkipper	742 should be changed to 742A in the video header.		Video file labeled just as 742_738, not 742A	742A_U_20200420_0208	U	30	RCP	220.7	135.744
743	742	3F2F	DSkipper	Header information is accurate.		Pipe material marked as unknown but comment says possibly asbestos. MSA at 185ft - unable to continue with survey. Incomplete Survey	743_D_20200417_0102	D	30	XXX	185.1	224
1019	2195	3A2O	DSkipper	Header information is accurate.		The SRI. SAV, and SSS codes seem to be used concurrently and interchangeably. SSS used for entire pipe but SAV and SRI used for just smaller sections? Not clear what the difference is and why codes were used like that.	1	D	24	VCP	370.5	368
1673	20134	442A	DSkipper	Header information is accurate.		No additional comments	24	D	27	ZZZ	382	392
1805	1826	5232	DSkipper	Header information is accurate.		US survey only 18 feet. Everything looks good.	29	U	27	RCP	18.7	18
1826	1828	5H3J	DSkipper	Header information is accurate.		Video says VCP but recorded as RCP here in infoasset (Correction Noted in Video starting after 0.00 ft)	17	D	27	RCP	271.2	273
1828	1830	5D3D	DSkipper	Header information is accurate.		no additional comments	18	D	27	RCP	146.7	142
1830	1831	5D3C	DSkipper	Header information is accurate.		SRC and SAV at 8.04: Defect Wanders? I don't see what they mean.	19	D	27	RCP	110.3	109
1831	1846	5P3K	DSkipper	Header information is accurate.		at249.9 Is it TBD? Why defective? Correct to another tap code?	20	D	27	RCP	318	319
1846	1847	5I3G	DSkipper	Header information is accurate.		60.60 is this actually TB? Or correct to TF? Same for 99.3 - TBA or TBA?	21	D	27	RCP	222.2	225
2168	2181	3J2I	DSkipper	Header information is accurate.		MH 2391 Not Found. Pipe length was supposed to be 415 ft and they continued to 430 ft before indicating it was NF. Much of the video is sideways or underwater but no fault of the operator, flow was pretty high	3	D	24	RCP	299.2	297

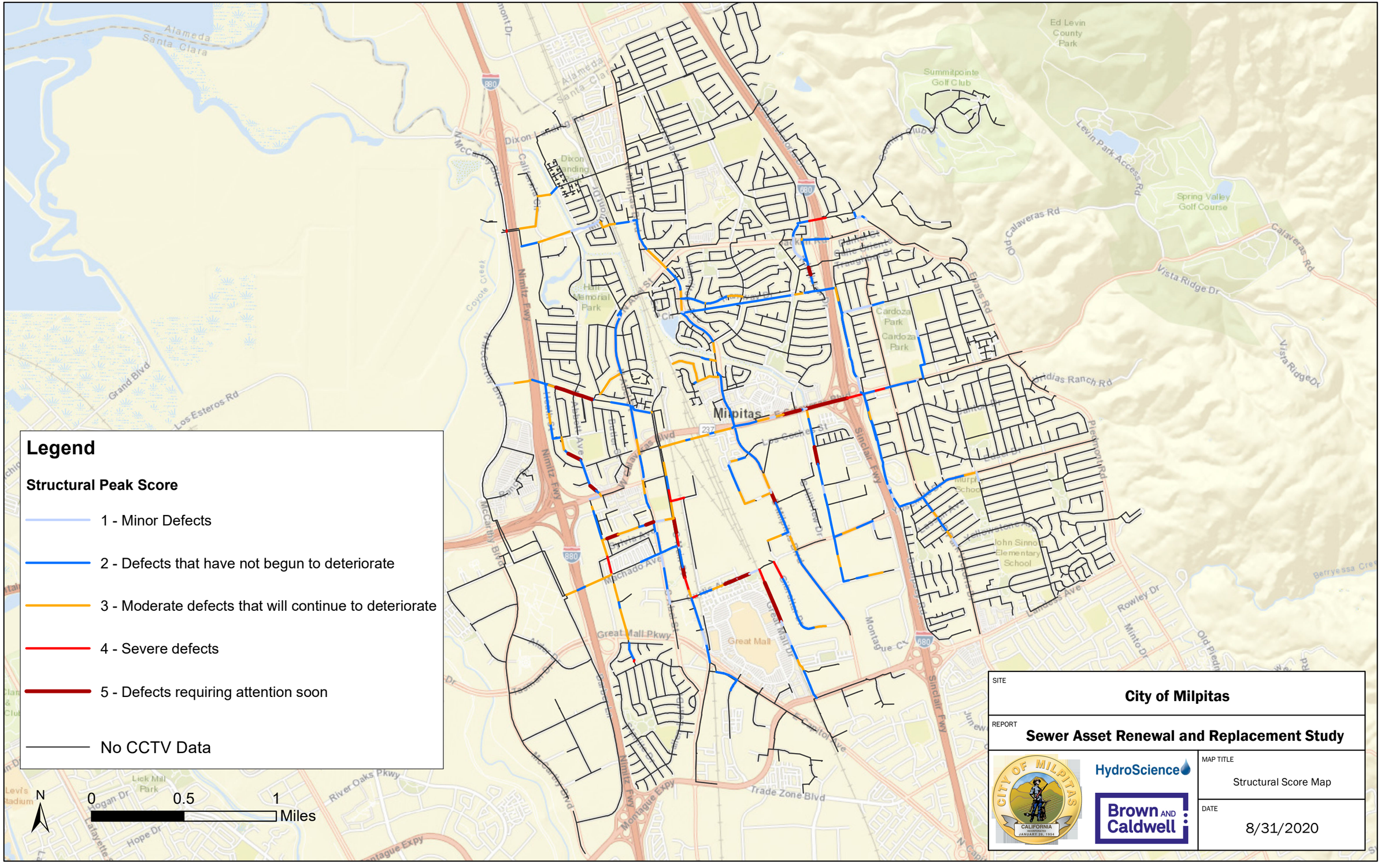
US node ID	DS node ID	Structure quick rating	Reviewed by	QC Header Information (UT26)	QC Coding (UT27)	QC General Comments (UT28)	Inspection ID	Direction of survey	Height (in)	Material	Length surveyed (ft)	Pipe length (ft)
2195	2168	3T2P	DSkipper	Header information is accurate.		No additional comments	2	D	24	RCP	365.4	368
2237	2240	3S2Z	DSkipper	Header information is accurate.		Video is really blurry. SSS and SAV used concurrently/interchangeably for entirety of pipe. Two SAV scores added for continuous sections with significant wall loss	11	D	30	XXX	502.4	500
2240	2241	3R2Z	DSkipper	Header information is accurate.		Video is unfocused	16	D	30	XXX	497.5	497
2241	2592	3S2R	DSkipper	Header information is accurate.		Video is unfocused	13	U	30	XXX	505.7	505
2284	2237	3E2Z	DSkipper	Header information is accurate.		No additional comments	10	D	30	ZZZ	519.2	519
2487	2634	2R11	DSkipper	Header information is accurate.		unclear why there is a comment about not being able to find the upstream MH. It was found near where it was supposed to be, pipe length indicated as 505 feet.	94	U	18	VCP	498.5	505
2589	2577	3R2Y	DSkipper	Header information is accurate.		Video is blurry due to steam. Unfocused but still viewable	14	D	30	XXX	501.4	520
2592	2589	3R2Q	DSkipper	Header information is accurate.		No additional comments	12	U	30	XXX	501	502
2837	2838	3K29	DSkipper	Header information is accurate.		No additional comments.	90	D	18	VCP	368.4	363
2844	2845A	5346	DSkipper	Header information is accurate.		No additional comments	125	D	15	VCP	117.2	76.827
2845	2834	5233	DSkipper	Header information is accurate.		Everything looks accurate	124	D	15	VCP	362.3	361
377	376A	512N	DSkipper	Header information is accurate.		Why did they end at uncharted MH 376A and not continue to 376?	135	D	15	VCP	449.4	342.098
389	390	2911	DSkipper	Header information is accurate.		Pipe lined. nothing much of interest. Deposits throughout and one tap	114	D	10	PE	300.5	302

US node ID	DS node ID	Structure quick rating	Reviewed by	QC Header Information (UT26)	QC Coding (UT27)	QC General Comments (UT28)	Inspection ID	Direction of survey	Height (in)	Material	Length surveyed (ft)	Pipe length (ft)
393	401	5131	DSkipper	Header information is accurate.		no additional comments	104	D	12	VCP	302.3	307
404	378	0	DSkipper	Header information is accurate.		US MH found via CCTV but not found above ground. PAved over.	133	U	15	VCP	258.7	254
523	542	4131	DSkipper	Header information is accurate.		no additional comments	64	D	18	VCP	398.9	423
542	602	5146	DSkipper	Header information is accurate.		no additional comments	65	D	18	VCP	299.4	275
543	592	4131	DSkipper	Header information is accurate.		Looks good - Survey stopped due to crawler unable to get over rock	61	D	18	VCP	277.1	378
543	592	422A	DSkipper	Header information is accurate.		No additional comments	62	U	18	VCP	93.4	378
592	586	544A	DSkipper	Header information is accurate.		no additional comments	63	D	18	VCP	412	410
605	607	2J00	DSkipper	Header information is accurate.		Pipe is lined all the way through.	49	D	12	ZZZ	578.3	578
725	732	5131	DSkipper	Header information is accurate.		No additional comments	131	D	8	VCP	325.2	325
1045	1037	2D00	DHill	Header information is accurate.		No additional comments	1045_D_20200504_0220	D	12	VCP	169.5	157
1060	1145	2I11	DHill	Header information is accurate		No additional comments	1060_D_20200505_0006	D	12	VCP	293.9	292
1113	1149	5531	DHill	Header information is accurate	Changed broken to fractures multiple	No additional comments	1113_D_20200504_0347	D	12	VCP	302.5	303
1149	1151	2500	DHill	Header information is accurate		No additional comments	1149_D_20200504_0410	D	12	VCP	296.3	295

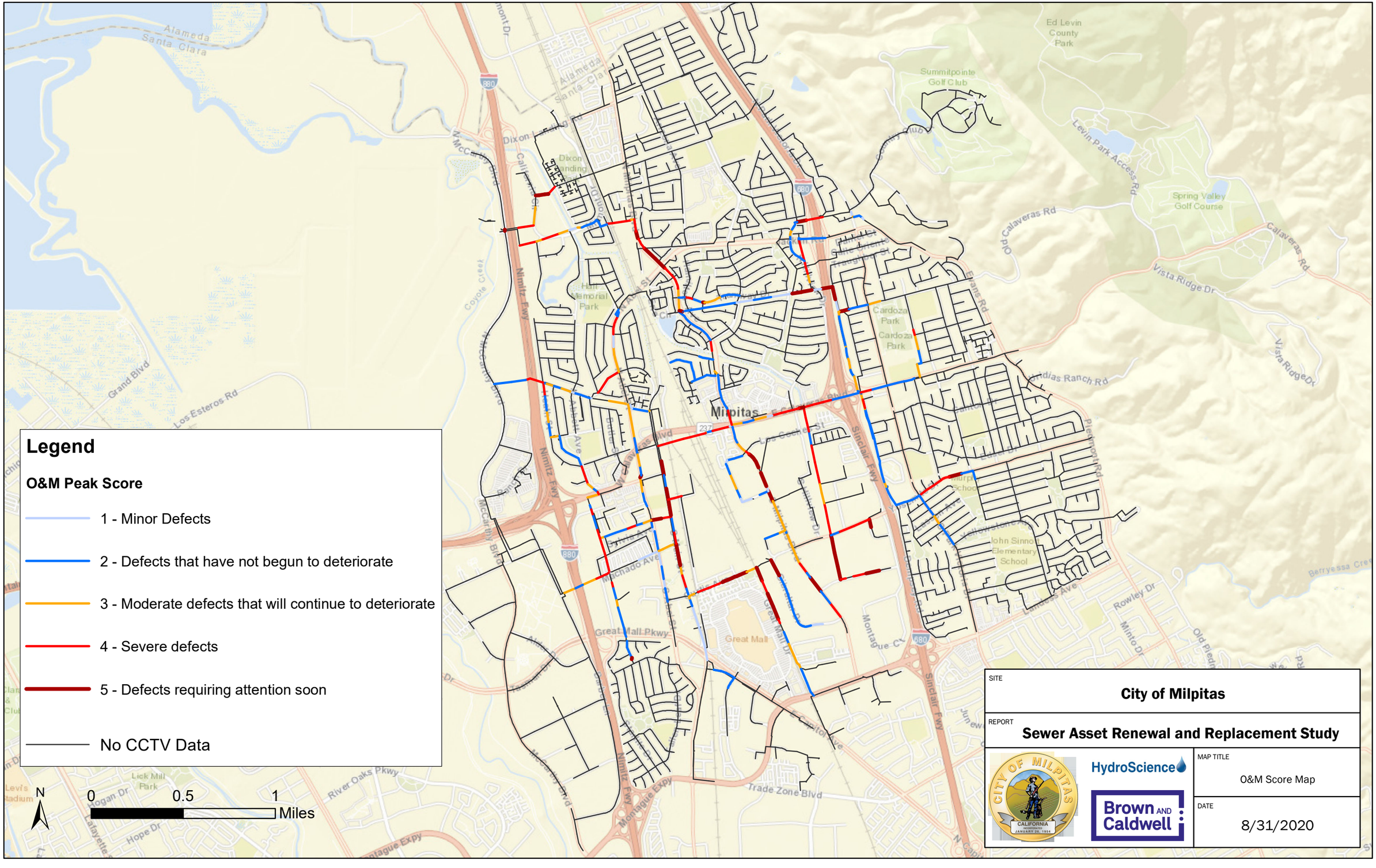
US node ID	DS node ID	Structure quick rating	Reviewed by	QC Header Information (UT26)	QC Coding (UT27)	QC General Comments (UT28)	Inspection ID	Direction of survey	Height (in)	Material	Length surveyed (ft)	Pipe length (ft)
1152	1148	522C	DHill	Header information is accurate	Changed broken to fracture multiple	No additional comments	1152_U_20200504_0501	U	15	VCP	479.2	481
1165	1143	2H00	DHill	Header information is accurate.		No additional comments	1165_D_20200504_2301	D	12	VCP	299.5	294
157	527	5100	DHill	Header information is accurate		Camera blocked by debris	157_D_20200506_0601	D	18	VCP	46.6	
2015	2743	4131	DHill	Header information is accurate		No additional comments	2015_D_20200515_0132	D	18	VCP	44.2	45
2076	2088	2400	DHill	Header information is accurate		No additional comments	2076_U_20200512_0415	U	12	VCP	252.1	288
2078	2076	512G	DHill	Header information is accurate	Changed broken to factures multiple	No additional comments	2078_U_20200512_0444	U	12	VCP	496.7	364
2089	2093	2900	DHill	header information is accurate		No additional comments	2089_D_20200507_0027	D	18	VCP	65.4	64
2094	2205	2G00	DHill	header information is accurate		No additional comments	2094_D_20200507_0053	D	18	VCP	218.6	217
2219	2204	2B00	DHill	Header information is accurate		No additional comments	2219_D_20200507_2352	D	15	VCP	370	397
2358	2658	3G2F	DHill	Header information is accurate		No additional comments	2358_D_20200514_0437	D	33	RCP	199.4	200
2359	2358	3400	DHill	Header information is accurate		No additional comments	2359_D_20200514_0425	D	33	RCP	21.7	24
2391	2359	3722	DHill	Header information is accurate		No additional comments	2391_U_20200514_0326	U	39	RCP	313.2	318
2529	2602	2F00	DHill	Header information is accurate		No additional comments	2529_D_20200512_0020	D	12	PE	240.5	251

US node ID	DS node ID	Structure quick rating	Reviewed by	QC Header Information (UT26)	QC Coding (UT27)	QC General Comments (UT28)	Inspection ID	Direction of survey	Height (in)	Material	Length surveyed (ft)	Pipe length (ft)
2534	2533	2F14	DHill	Header information is accurate		no additional comments	2534_U_20200515_0018	U	15	PE	287.3	292
2602	2593	3D26	DHill	Header information is accurate		No additional comments	2602_D_20200512_0048	D	12	PE	165.5	161
2638	2736	352F	DHill	Header information is accurate		Camera is blocked by debris	2638_D_20200511_0002	D	18	VCP	230.6	446
2658	2661	3H2H	DHill	Header information is accurate		No additional comments	2658_D_20200514_0456	D	33	RCP	231.5	349
2658	2661	3525	DHill	Header information is accurate		Camera is blocked by debris	2658_U_20200514_0549	U	33	RCP	24.8	349
2666	2638	3A2M	DHill	Header information is accurate		No additional comments	2666_D_20200511_0131	D	18	VCP	526.4	524
2714	2718	3321	DHill	Header information is accurate		Camera is blocked by debris	2714_U_20200514_0051	U	42	RCP	21.2	392
2753	2759	3I2I	DHill	Changed pipe material to RCP		No additional comments	2753_U_20200515_0319	U	18	DIP	274.8	272
2760C	2760D	1200	DHill	MH numbers do not match GIS		Need contrator map to match to GIS	2760C_D_20200515_0432	D	18	PVC	148.4	
372	152	0	DHill	Manhole numbers do not match GIS		Need contrator map to match to GIS	372_D_20200506_0507	D	18	VCP	87	
547	681	3C00	DHill	Header information is accurate		No additionl comments	547_D_20200507_2242	D	15	VCP	126.9	136
604	605	0	DHill	Header information is accurate		No additional comments	604_D_20200507_2136	D	15	VCP	0	102
160	161	342B	DHill	Manhole numbers do not match GIS		Need info from contractor to associate with GIS	160_D_20200506_0646	D	18	VCP	253.6	

Appendix D: CCTV Structural Scores Map


Legend
Structural Peak Score
1 - Minor Defects
2 - Defects that have not begun to deteriorate
3 - Moderate defects that will continue to deteriorate
4 - Severe defects
5 - Defects requiring attention soon
No CCTV Data
N
0
0.5
1
Miles
Milpitas
Alameda Santa Clara
Dixon Landing
Coyote Creek
Nimitz Fwy
Sinclair Fwy
Montague Expy
Great Mall Pkwy
Great Mall
Trade Zone Blvd
Calaveras Rd
Old Calaveras Rd
Vista Ridge Dr
Spring Valley Golf Course
Ed Levin County Park
Summitpointe Golf Club
Levin Park Access Rd
Cardoza Park
Hall Memorial Park
Lick Mill Park
John Sinnott Elementary School
Grand Blvd
Los Esteros Rd
River Oaks Pkwy
Hope Dr
Hogan Dr
Rowley Dr
Minto Dr
Evans Rd
Piedmont Rd
Berryessa Creek
SITE
City of Milpitas
REPORT
Sewer Asset Renewal and Replacement Study
HydroScience
Brown AND Caldwell
MAP TITLE
Structural Score Map
DATE
8/31/2020

Appendix E: CCTV O&M Scores Map


Legend
O&M Peak Score
1 - Minor Defects
2 - Defects that have not begun to deteriorate
3 - Moderate defects that will continue to deteriorate
4 - Severe defects
5 - Defects requiring attention soon
No CCTV Data
N
0
0.5
1
Miles
Milpitas
Alameda Santa Clara
Dixon Landing
Coyote Creek
Nimitz Fwy
McCarthy Blvd
Great Mall Pkwy
Great Mall
Montague Expy
Trade Zone Blvd
Sinclair Fwy
Ed Levin County Park
Summitpointe Golf Club
Spring Valley Golf Course
Old Calaveras Rd
Calaveras Rd
Vista Ridge Dr
Evans Rd
Cardoza Park
Piedmont Rd
John Sinnott Elementary School
Rowley Dr
Minto Dr
Grand Blvd
Los Esteros Rd
Lick Mill Park
River Oaks Pkwy
Hope Dr
Hogan Dr
SITE
City of Milpitas
REPORT
Sewer Asset Renewal and Replacement Study
HydroScience
Brown AND Caldwell
MAP TITLE
O&M Score Map
DATE
8/31/2020

Appendix F: Risk Table and GIS

This Appendix is a file export from Microsoft Excel.

Appendix G: Risk Maps

This Appendix is not used.

Appendix H: Defect-Level Rehabilitation Methods

Defect Code	Default Score	Type	Description	Rehab. Method	Alternative Method	Comments	Clock Pos. Grade1	Clock Pos. Grade2	Clock Pos. Grade3	Clock Pos. Grade4	Value % Grade1	Value % Grade2	Value % Grade3	Value % Grade4	Alter. Rehab. Cutoff
ACB	0	CONSTRUCTION	Catch Basin				0	0	0	0	0	0	0	0	
ACOH	0	CONSTRUCTION	Cleanout House				0	0	0	0	0	0	0	0	
ACOM	0	CONSTRUCTION	Cleanout Mainline				0	0	0	0	0	0	0	0	
ACOP	0	CONSTRUCTION	Cleanout Property line				0	0	0	0	0	0	0	0	
ACOS	0	MISCELLANEOUS	Cleanout Saddle				0	0	0	0	0	0	0	0	
ADP	0	CONSTRUCTION	Discharge Point				0	0	0	0	0	0	0	0	
AEP	0	CONSTRUCTION	End of Pipe				0	0	0	0	0	0	0	0	
AJB	0	CONSTRUCTION	Junction Box				0	0	0	0	0	0	0	0	
AM	0	CONSTRUCTION	Meter				0	0	0	0	0	0	0	0	
AMH	0	CONSTRUCTION	Manhole				0	0	0	0	0	0	0	0	
AML	0	MISCELLANEOUS	Mainline				0	0	0	0	0	0	0	0	
AOC	0	CONSTRUCTION	Special Chamber				0	0	0	0	0	0	0	0	
ATC	0	CONSTRUCTION	Tee Connection				0	0	0	0	0	0	0	0	
AW	0	MISCELLANEOUS	Wye				0	0	0	0	0	0	0	0	
AWA	0	CONSTRUCTION	Wastewater Access Device				0	0	0	0	0	0	0	0	
AWD	0	MISCELLANEOUS	Double Wye				0	0	0	0	0	0	0	0	
AWW	0	CONSTRUCTION	Wet Well				0	0	0	0	0	0	0	0	
AZ	0	MISCELLANEOUS	Access Point Other				0	0	0	0	0	0	0	0	
B	4	STRUCTURAL	Broken	LINING	LINING		0	0	1	2	0	0	0	0	
BSV	5	STRUCTURAL	Broken Soil Visible	POINT REPAIR	POINT REPAIR		0	0	0	0	0	0	0	0	
BVV	5	STRUCTURAL	Broken Void Visible	POINT REPAIR	POINT REPAIR		0	0	0	0	0	0	0	0	
CC	1	STRUCTURAL	Crack Circumferential	LINING	LINING		0	0	0	0	0	0	0	0	
CH2	2	STRUCTURAL	Crack Longitudinal Hinge, 2	LINING	LINING		0	0	0	0	0	0	0	0	
CH3	3	STRUCTURAL	Crack Longitudinal Hinge, 3	LINING	LINING		0	0	0	0	0	0	0	0	
CH4	4	STRUCTURAL	Crack Longitudinal Hinge, 4	LINING	LINING		0	0	0	0	0	0	0	0	
CI	0	CONSTRUCTION	Intruding Connection	HEAVY CLEANING	HEAVY CLEANING		0	0	0	0	0	0	0	0	
CL	2	STRUCTURAL	Crack Longitudinal	LINING	LINING		0	0	0	0	0	0	0	0	
CM	3	STRUCTURAL	Crack Multiple	LINING	LINING		0	0	0	0	0	0	0	0	
CN	0	CONSTRUCTION	Connection				0	0	0	0	0	0	0	0	
CS	2	STRUCTURAL	Crack Spiral	LINING	LINING		0	0	0	0	0	0	0	0	
CU	0	MISCELLANEOUS	Camera Underwater				0	0	0	0	0	0	0	0	
CX	0	MISCELLANEOUS	Defective Connection	POINT REPAIR	POINT REPAIR		0	0	0	0	0	0	0	0	

Defect Code	Default Score	Type	Description	Rehab. Method	Alternative Method	Comments	Clock Pos. Grade1	Clock Pos. Grade2	Clock Pos. Grade3	Clock Pos. Grade4	Value % Grade1	Value % Grade2	Value % Grade3	Value % Grade4	Alter. Rehab. Cutoff
D	0	MISCELLANEOUS	Deformed	POINT REPAIR	POINT REPAIR		0	0	0	0	0	0	0	10	
DAE	0	SERVICE	Deposits Attached Encrustation	CLEANING	CLEANING		0	0	0	0	0	10	20	30	
DAGS	0	SERVICE	Deposits Attached Grease	CLEANING	CLEANING		0	0	0	0	0	10	20	30	
DAR	0	SERVICE	Deposits Attached Ragging	CLEANING	CLEANING		0	0	0	0	0	10	20	30	
DAZ	0	MISCELLANEOUS	Deposits Attached Other	CLEANING	CLEANING		0	0	0	0	0	10	20	30	
DB	3	STRUCTURAL	Displaced Brick	POINT REPAIR	POINT REPAIR		0	0	0	0	0	0	0	0	
DBFI	5	MISCELLANEOUS	Deformed Flexible Bulging Inverse Curvature	POINT REPAIR	POINT REPAIR		0	0	0	0	0	0	0	0	
DC	0	MISCELLANEOUS	Change in Sewer Dimension				0	0	0	0	0	0	0	0	
DE	0	MISCELLANEOUS	Debris	CLEANING	CLEANING		0	0	0	0	0	0	0	0	
DFBR	0	MISCELLANEOUS	Deformed Flexible Bulging Round				0	0	5	10	0	0	0	0	
DFC	5	MISCELLANEOUS	Deformed Flexible Bulging Creasing	POINT REPAIR	POINT REPAIR		0	0	0	0	0	0	0	0	
DFE	3	MISCELLANEOUS	Deformed Flexible Elliptical	LINING	LINING		0	0	0	0	0	0	0	0	
DG	0	MISCELLANEOUS	Debris Grease	CLEANING	CLEANING		0	0	0	0	0	0	0	0	
DH	5	MISCELLANEOUS	Deformed Horizontal Brick	POINT REPAIR	POINT REPAIR		0	0	0	0	0	0	0	0	
DI	5	STRUCTURAL	Dropped Invert	POINT REPAIR	POINT REPAIR		0	0	0	0	0	0	0	0	
DNF	0	SERVICE	Deposits Ingressed Fine	CLEANING	CLEANING		0	0	0	0	0	10	20	30	
DNGV	0	SERVICE	Deposits Ingressed Gravel	CLEANING	CLEANING		0	0	0	0	0	10	20	30	
DNZ	0	SERVICE	Deposits Ingressed Other	CLEANING	CLEANING		0	0	0	0	0	10	20	30	
DR	0	MISCELLANEOUS	Deformed Rigid	POINT REPAIR	POINT REPAIR		0	0	0	5	0	0	0	0	
DS	0	MISCELLANEOUS	Debris Silt	CLEANING	CLEANING		0	0	0	0	0	0	0	0	
DSC	0	SERVICE	Deposits Settled Compacted	CLEANING	CLEANING		0	0	0	0	0	10	20	30	
DSF	0	SERVICE	Deposits Settled Fine	CLEANING	CLEANING		0	0	0	0	0	10	20	30	
DSGV	0	SERVICE	Deposits Settled Gravel	CLEANING	CLEANING		0	0	0	0	0	10	20	30	

Defect Code	Default Score	Type	Description	Rehab. Method	Alternative Method	Comments	Clock Pos. Grade1	Clock Pos. Grade2	Clock Pos. Grade3	Clock Pos. Grade4	Value % Grade1	Value % Grade2	Value % Grade3	Value % Grade4	Alter. Rehab. Cutoff
DSZ	0	SERVICE	Deposits Settled Other	CLEANING	CLEANING		0	0	0	0	0	10	20	30	
DTBI	5	MISCELLANEOUS	Deformed Brick Bulging Inverse Curvature	POINT REPAIR	POINT REPAIR		0	0	0	0	0	0	0	0	
DTBR	0	MISCELLANEOUS	Deformed Brick Bulging Round				0	0	0	5	0	0	0	0	
DV	5	STRUCTURAL	Deformed Vertical Brick	POINT REPAIR	POINT REPAIR		0	0	0	0	0	0	0	0	
FBEM	0	MISCELLANEOUS					0	0	0	0	0	0	0	0	
FBEMD	0	STRUCTURAL	Fitting Mitered Bend Down				0	0	0	0	0	0	0	0	
FBEMLD	0	STRUCTURAL	Fitting Mitered Bend Left Down				0	0	0	0	0	0	0	0	
FBEMLU	0	STRUCTURAL	Fitting Mitered Bend Left Up				0	0	0	0	0	0	0	0	
FBEMR	0	STRUCTURAL	Fitting Mitered Bend Right				0	0	0	0	0	0	0	0	
FBEMRD	0	STRUCTURAL	Fitting Mitered Bend Right Down				0	0	0	0	0	0	0	0	
FBEMRU	0	STRUCTURAL	Fitting Mitered Bend Right Up				0	0	0	0	0	0	0	0	
FBEMU	0	STRUCTURAL	Fitting Mitered Bend Up				0	0	0	0	0	0	0	0	
FBES	0	MISCELLANEOUS					0	0	0	0	0	0	0	0	
FBESD	0	STRUCTURAL	Fitting Sweep Bend Down				0	0	0	0	0	0	0	0	
FBESL	0	STRUCTURAL	Fitting Sweep Bend Left				0	0	0	0	0	0	0	0	
FBESLD	0	STRUCTURAL	Fitting Sweep Bend Left Down				0	0	0	0	0	0	0	0	
FBESLU	0	STRUCTURAL	Fitting Sweep Bend Left Up				0	0	0	0	0	0	0	0	
FBESR	0	STRUCTURAL	Fitting Sweep Bend Right				0	0	0	0	0	0	0	0	
FBESRD	0	STRUCTURAL	Fitting Sweep Bend Right Down				0	0	0	0	0	0	0	0	
FBESRU	0	STRUCTURAL	Fitting Sweep Bend Right Up				0	0	0	0	0	0	0	0	
FBESU	0	STRUCTURAL	Fitting Sweep Bend Up				0	0	0	0	0	0	0	0	
FC	2	STRUCTURAL	Fracture Circumferential	LINING	LINING		0	0	0	0	0	0	0	0	
FCA	0	MISCELLANEOUS	Fitting Cap				0	0	0	0	0	0	0	0	
FCAF	0	MISCELLANEOUS	Fitting Cap Fitting				0	0	0	0	0	0	0	0	

Defect Code	Default Score	Type	Description	Rehab. Method	Alternative Method	Comments	Clock Pos. Grade1	Clock Pos. Grade2	Clock Pos. Grade3	Clock Pos. Grade4	Value % Grade1	Value % Grade2	Value % Grade3	Value % Grade4	Alter. Rehab. Cutoff
FCAS	0	MISCELLANEOUS	Fitting Cap Seal				0	0	0	0	0	0	0	0	
FH2	3	STRUCTURAL	Fracture Longitudinal Hinge, 2	LINING	LINING		0	0	0	0	0	0	0	0	
FH3	4	STRUCTURAL	Fracture Longitudinal Hinge, 3	LINING	LINING		0	0	0	0	0	0	0	0	
FH4	4	STRUCTURAL	Fracture Longitudinal Hinge, 4	LINING	LINING		0	0	0	0	0	0	0	0	
FL	3	STRUCTURAL	Fracture Longitudinal	LINING	LINING		0	0	0	0	0	0	0	0	
FM	4	STRUCTURAL	Fracture Multiple	LINING	LINING		0	0	0	0	0	0	0	0	
FRV	0	MISCELLANEOUS	Fitting Vertical Riser				0	0	0	0	0	0	0	0	
FS	3	STRUCTURAL	Fracture Spiral	LINING	LINING		0	0	0	0	0	0	0	0	
FTDS	0	MISCELLANEOUS	Fitting Double Sweep Tee				0	0	0	0	0	0	0	0	
FTS	0	MISCELLANEOUS	Fitting Sweep Tee				0	0	0	0	0	0	0	0	
GRT	0	MISCELLANEOUS	Grout at a Location				0	0	0	0	0	0	0	0	
GTFJ	0	MISCELLANEOUS	Grout Test Fail Joint				0	0	0	0	0	0	0	0	
GTFL	0	MISCELLANEOUS	Grout Test Fail Lateral				0	0	0	0	0	0	0	0	
GTPJ	0	MISCELLANEOUS	Grout Test Pass Joint				0	0	0	0	0	0	0	0	
GTPL	0	MISCELLANEOUS	Grout Test Pass Lateral				0	0	0	0	0	0	0	0	
GTUJ	0	MISCELLANEOUS	Grout Test Unable to Test Joint				0	0	0	0	0	0	0	0	
GTUL	0	MISCELLANEOUS	Grout Test Unable to Test Lateral				0	0	0	0	0	0	0	0	
H	0	STRUCTURAL	Hole	POINT REPAIR	POINT REPAIR		0	0	0	2	0	0	0	0	
HSV	5	STRUCTURAL	Hole Soil Visible	POINT REPAIR	POINT REPAIR		0	0	0	0	0	0	0	0	
HVV	5	STRUCTURAL	Hole Void Visible	POINT REPAIR	POINT REPAIR		0	0	0	0	0	0	0	0	
ID	3	MISCELLANEOUS	Infil Dripper	LINING	LINING		0	0	0	0	0	0	0	0	
IDB	3	SERVICE	Infiltration Dripper Barrel	LINING	LINING		0	0	0	0	0	0	0	0	
IDC	3	SERVICE	Infiltration Dripper Connection	LINING	LINING		0	0	0	0	0	0	0	0	
IDJ	3	SERVICE	Infiltration Dripper Joint	LINING	LINING		0	0	0	0	0	0	0	0	

Defect Code	Default Score	Type	Description	Rehab. Method	Alternative Method	Comments	Clock Pos. Grade1	Clock Pos. Grade2	Clock Pos. Grade3	Clock Pos. Grade4	Value % Grade1	Value % Grade2	Value % Grade3	Value % Grade4	Alter. Rehab. Cutoff
IDL	3	SERVICE	Infiltration Dripper Lateral	LINING	LINING		0	0	0	0	0	0	0	0	
IG	5	MISCELLANEOUS	Infil Gusher	LINING	LINING		0	0	0	0	0	0	0	0	
IGB	5	SERVICE	Infiltration Gusher Barrel	LINING	LINING		0	0	0	0	0	0	0	0	
IGC	5	SERVICE	Infiltration Gusher Connection	LINING	LINING		0	0	0	0	0	0	0	0	
IGJ	5	SERVICE	Infiltration Gusher Joint	LINING	LINING		0	0	0	0	0	0	0	0	
IGL	5	SERVICE	Infiltration Gusher Lateral	LINING	LINING		0	0	0	0	0	0	0	0	
IR	4	SERVICE	Infil Runner	LINING	LINING		0	0	0	0	0	0	0	0	
IRB	4	SERVICE	Infiltration Runner Barrel	LINING	LINING		0	0	0	0	0	0	0	0	
IRC	4	SERVICE	Infiltration Runner Connection	LINING	LINING		0	0	0	0	0	0	0	0	
IRJ	4	SERVICE	Infiltration Runner Joint	LINING	LINING		0	0	0	0	0	0	0	0	
IRL	4	SERVICE	Infiltration Runner Lateral	LINING	LINING		0	0	0	0	0	0	0	0	
IS	1	SERVICE	Infil Stain				0	0	0	0	0	0	0	0	
ISB	1	SERVICE	Infiltration Stain Barrel				0	0	0	0	0	0	0	0	
ISC	1	SERVICE	Infiltration Stain Connection				0	0	0	0	0	0	0	0	
ISGT	0	CONSTRUCTION	Intruding Sealing Material Grout	HEAVY CLEANING	HEAVY CLEANING		0	0	0	0	0	10	20	30	
ISJ	1	SERVICE	Infiltration Stain Joint				0	0	0	0	0	0	0	0	
ISL	1	SERVICE	Infiltration Stain Lateral				0	0	0	0	0	0	0	0	
ISSR	0	CONSTRUCTION	Intruding Sealing Material Sealing Ring	HEAVY CLEANING	HEAVY CLEANING		0	0	0	0	0	10	20	30	
ISSRB	0	CONSTRUCTION	Intruding Sealing Material Sealing Ring Broken	HEAVY CLEANING	HEAVY CLEANING		0	0	0	0	0	10	20	30	
ISSRH	0	CONSTRUCTION	Intruding Sealing Material Sealing Ring Hanging	HEAVY CLEANING	HEAVY CLEANING		0	0	0	0	0	10	20	30	
ISSRL	0	CONSTRUCTION	Intruding Sealing Material Sealing Ring Loose/Poor	HEAVY CLEANING	HEAVY CLEANING		0	0	0	0	0	10	20	30	
ISZ	0	CONSTRUCTION	Intruding Sealing Material Other	HEAVY CLEANING	HEAVY CLEANING		0	0	0	0	0	10	20	30	

Defect Code	Default Score	Type	Description	Rehab. Method	Alternative Method	Comments	Clock Pos. Grade1	Clock Pos. Grade2	Clock Pos. Grade3	Clock Pos. Grade4	Value % Grade1	Value % Grade2	Value % Grade3	Value % Grade4	Alter. Rehab. Cutoff
IW	2	SERVICE	Infil Weeper				0	0	0	0	0	0	0	0	
IWB	2	SERVICE	Infiltration Weeper Barrel				0	0	0	0	0	0	0	0	
IWC	2	SERVICE	Infiltration Weeper Connection				0	0	0	0	0	0	0	0	
IWJ	2	SERVICE	Infiltration Weeper Joint				0	0	0	0	0	0	0	0	
IWL	2	SERVICE	Infiltration Weeper Lateral				0	0	0	0	0	0	0	0	
JAL	4	STRUCTURAL	Joint Angular Large	POINT REPAIR	POINT REPAIR		0	0	0	0	0	0	0	0	
JAM	3	MISCELLANEOUS	Joint Angular Medium	LINING	LINING		0	0	0	0	0	0	0	0	
JAS	0	MISCELLANEOUS	Joint Angular Small				0	0	0	0	0	0	0	0	
JL	0	STRUCTURAL	Displaced Joint Large	POINT REPAIR	POINT REPAIR		0	0	0	0	0	0	0	0	
JM	0	STRUCTURAL	Displaced Joint Medium	LINING	LINING		0	0	0	0	0	0	0	0	
JOL	4	STRUCTURAL	Joint Offset Large	POINT REPAIR	POINT REPAIR		0	0	0	0	0	0	0	0	
JOLD	4	MISCELLANEOUS	Joint Offset Large Defective	POINT REPAIR	POINT REPAIR		0	0	0	0	0	0	0	0	
JOM	3	STRUCTURAL	Joint Offset Medium	LINING	LINING		0	0	0	0	0	0	0	0	
JOMD	3	MISCELLANEOUS	Joint Offset Medium Defective	LINING	LINING		0	0	0	0	0	0	0	0	
JOS	0	MISCELLANEOUS	Joint Offset Small				0	0	0	0	0	0	0	0	
JOSD	0	MISCELLANEOUS	Joint Offset Small Defective				0	0	0	0	0	0	0	0	
JSL	4	STRUCTURAL	Joint Separated Large	POINT REPAIR	POINT REPAIR		0	0	0	0	0	0	0	0	
JSM	3	STRUCTURAL	Joint Separated Medium	POINT REPAIR	POINT REPAIR		0	0	0	0	0	0	0	0	
JSS	0	MISCELLANEOUS	Joint Seprated Small				0	0	0	0	0	0	0	0	
KD	0	MISCELLANEOUS	Buckling Dimpling				0	0	0	0	0	0	0	0	
KI	0	MISCELLANEOUS	Inverse Curvature				0	0	0	0	0	0	0	0	
KW	0	MISCELLANEOUS	Buckling Wall				0	0	0	0	0	0	0	0	
LC	0	MISCELLANEOUS	Change in Sewer Lining				0	0	0	0	0	0	0	0	
LD	0	SERVICE	Line Down				0	0	0	0	10	20	0	20	
LFAC	0	STRUCTURAL	Lining Feature Abandoned Connection	POINT REPAIR	POINT REPAIR		0	0	0	0	0	0	0	0	

Defect Code	Default Score	Type	Description	Rehab. Method	Alternative Method	Comments	Clock Pos. Grade1	Clock Pos. Grade2	Clock Pos. Grade3	Clock Pos. Grade4	Value % Grade1	Value % Grade2	Value % Grade3	Value % Grade4	Alter. Rehab. Cutoff
LFAS	3	STRUCTURAL	Lining Feature Annular Space	LINING	LINING		0	0	0	0	0	0	0	0	
LFB	3	STRUCTURAL	Lining Feature Blistered	POINT REPAIR	POINT REPAIR		0	0	0	0	0	0	0	0	
LFBK	3	STRUCTURAL	Lining Failure Buckled	POINT REPAIR	POINT REPAIR		0	0	0	0	0	0	0	0	
LFBU	3	STRUCTURAL	Lining Failure Bulges	LINING	LINING		0	0	0	0	0	0	0	0	
LFCS	3	STRUCTURAL	Lining Feature Service Cut Shifted	LINING	LINING		0	0	0	0	0	0	0	0	
LFD	3	STRUCTURAL	Lining Feature Detached	LINING	LINING		0	0	0	0	0	0	0	0	
LFDC	3	STRUCTURAL	Lining Feature Discoloration	LINING	LINING		0	0	0	0	0	0	0	0	
LFDE	3	STRUCTURAL	Lining Feature Defective End	LINING	LINING		0	0	0	0	0	0	0	0	
LFDL	3	STRUCTURAL	Lining Feature Delaminating	LINING	LINING		0	0	0	0	0	0	0	0	
LFOC	3	STRUCTURAL	Lining Feature Overcut Service	LINING	LINING		0	0	0	0	0	0	0	0	
LFPH	3	MISCELLANEOUS	Lining Failure Pinhole	LINING	LINING		0	0	0	0	0	0	0	0	
LFRS	3		Lining Failure Resin slug	LINING	LINING		0	0	0	0	0	0	0	0	
LFUC	3	STRUCTURAL	Lining Feature Undercut Service	LINING	LINING		0	0	0	0	0	0	0	0	
LFW	3	STRUCTURAL	Lining Feature Wrinkled	LINING	LINING		0	0	0	0	0	0	0	0	
LFZ	0	STRUCTURAL	Lining Feature Other	LINING	LINING		0	0	0	0	0	0	0	0	
LL	0	CONSTRUCTION	Line Left				0	0	0	0	10	20	20	100	
LLD	0	CONSTRUCTION	Line Left Down				0	0	0	0	10	20	20	100	
LLU	0	CONSTRUCTION	Ling Left Up				0	0	0	0	10	20	20	100	
LN	0	CONSTRUCTION	Lining Defect				0	0	0	0	0	0	0	0	
LR	0	CONSTRUCTION	Line Right				0	0	0	0	10	20	20	100	
LRD	0	CONSTRUCTION	Line Right Down				0	0	0	0	10	20	20	100	
LRU	0	CONSTRUCTION	Line Right Up				0	0	0	0	10	20	20	100	
LU	0	SERVICE	Line Up				0	0	0	0	10	20	20	100	
MB	4	STRUCTURAL	Missing Brick	LINING	LINING		0	0	0	0	0	0	0	0	
MC	0	MISCELLANEOUS	Change in Sewer Material				0	0	0	0	0	0	0	0	
MCU	4	MISCELLANEOUS	Miscellaneous Camera Underwater	LINING	LINING		0	0	0	0	0	0	0	0	

Defect Code	Default Score	Type	Description	Rehab. Method	Alternative Method	Comments	Clock Pos. Grade1	Clock Pos. Grade2	Clock Pos. Grade3	Clock Pos. Grade4	Value % Grade1	Value % Grade2	Value % Grade3	Value % Grade4	Alter. Rehab. Cutoff
MGO	0	MISCELLANEOUS	Miscellaneous General Observation				0	0	0	0	0	0	0	0	
MGP	0	MISCELLANEOUS	Miscellaneous General Photograph				0	0	0	0	0	0	0	0	
MH	0	MISCELLANEOUS	Manhole				0	0	0	0	0	0	0	0	
MJL	0	MISCELLANEOUS	Miscellaneous Pipe Joint Length Change				0	0	0	0	0	0	0	0	
MLC	0	MISCELLANEOUS	Miscellaneous Lining Change				0	0	0	0	0	0	0	0	
MMC	0	MISCELLANEOUS	Miscellaneous Material Change				0	0	0	0	0	0	0	0	
MML	3	MISCELLANEOUS	Missing Mortar Large	LINING	LINING		0	0	0	0	0	0	0	0	
MMM	3	MISCELLANEOUS	Missing Mortar Medium	LINING	LINING		0	0	0	0	0	0	0	0	
MMS	2	MISCELLANEOUS	Missing Mortar Small				0	0	0	0	0	0	0	0	
MSA	0	MISCELLANEOUS	Miscellaneous Survey Abandoned				0	0	0	0	0	0	0	0	
MSC	0	MISCELLANEOUS	Miscellaneous Shape/Size Change				0	0	0	0	0	0	0	0	
MU	0	MISCELLANEOUS	Unplotted Manhole				0	0	0	0	0	0	0	0	
MWL	0	MISCELLANEOUS	Miscellaneous Water Level				0	0	0	0	0	0	0	0	
MWLS	0	STRUCTURAL	Miscellaneous Water Level Sag				0	0	0	0	0	30	50	75	
MWM	0	MISCELLANEOUS	Miscellaneous Water Mark				0	0	0	0	49	49	49	75	
MYN	3	MISCELLANEOUS	Miscellaneous Dye Test Not Visible	LINING	LINING		0	0	0	0	0	0	0	0	
MYV	5	MISCELLANEOUS	Miscellaneous Dye Test Visible	LINING	LINING		0	0	0	0	0	0	0	0	
OB	0	SERVICE	Obstruction	POINT REPAIR	POINT REPAIR		0	0	0	0	0	0	0	0	
OBB	0	SERVICE	Obstruction Brick or Masonry	POINT REPAIR	POINT REPAIR		0	0	0	0	0	10	20	30	
OBC	0	SERVICE	Obstruction Through Connection	POINT REPAIR	POINT REPAIR		0	0	0	0	0	10	20	30	
OBI	5	SERVICE	Obstruction Intruding Through Wall	POINT REPAIR	POINT REPAIR		0	0	0	0	0	0	0	0	

Defect Code	Default Score	Type	Description	Rehab. Method	Alternative Method	Comments	Clock Pos. Grade1	Clock Pos. Grade2	Clock Pos. Grade3	Clock Pos. Grade4	Value % Grade1	Value % Grade2	Value % Grade3	Value % Grade4	Alter. Rehab. Cutoff
OBJ	0	SERVICE	Obstruction Wedged In The Joint	POINT REPAIR	POINT REPAIR		0	0	0	0	0	10	20	30	
OBM	0	SERVICE	Obstruction Pipe Material in Invert	POINT REPAIR	POINT REPAIR		0	0	0	0	0	10	20	30	
OBN	0	SERVICE	Obstruction Construction Debris	POINT REPAIR	POINT REPAIR		0	0	0	0	0	10	20	30	
OBP	0	SERVICE	Obstruction External Pipe or Cable	POINT REPAIR	POINT REPAIR		0	0	0	0	0	10	20	30	
OBR	0	SERVICE	Obstruction Rocks	POINT REPAIR	POINT REPAIR		0	0	0	0	0	10	20	30	
OBS	0	SERVICE	Obstruction Built Into Structure	POINT REPAIR	POINT REPAIR		0	0	0	0	0	10	20	30	
OBZ	0	SERVICE	Obstruction Other	POINT REPAIR	POINT REPAIR		0	0	0	0	0	10	20	30	
OL	0	STRUCTURAL	Open Joint Large	POINT REPAIR	POINT REPAIR		0	0	0	0	0	0	0	0	
OM	0	STRUCTURAL	Open Joint Medium	POINT REPAIR	POINT REPAIR		0	0	0	0	0	0	0	0	
QH	0	STRUCTURAL	Corrosion Heavy	LINING	LINING		0	0	0	0	0	0	0	0	
QL	0	STRUCTURAL	Corrosion Light	LINING	LINING		0	0	0	0	0	0	0	0	
QM	0	STRUCTURAL	Corrosion Medium	LINING	LINING		0	0	0	0	0	0	0	0	
RBB	5	SERVICE	Roots Ball Barrel	HEAVY CLEANING	HEAVY CLEANING		0	0	0	0	0	0	0	0	
RBC	4	SERVICE	Roots Ball Connection	HEAVY CLEANING	HEAVY CLEANING		0	0	0	0	0	0	0	0	
RBJ	4	SERVICE	Roots Ball Joint	HEAVY CLEANING	HEAVY CLEANING		0	0	0	0	0	0	0	0	
RBL	4	SERVICE	Roots Ball Lateral	HEAVY CLEANING	HEAVY CLEANING		0	0	0	0	0	0	0	0	
RF	0	SERVICE	Roots Fine				0	0	0	0	0	0	0	0	
RFB	2	SERVICE	Roots Fine Barrel	CLEANING	CLEANING		0	0	0	0	0	0	0	0	
RFC	1	SERVICE	Roots Fine Connection	CLEANING	CLEANING		0	0	0	0	0	0	0	0	
RFJ	1	SERVICE	Roots Fine Joint	CLEANING	CLEANING		0	0	0	0	0	0	0	0	
RFL	1	SERVICE	Roots Fine Lateral	CLEANING	CLEANING		0	0	0	0	0	0	0	0	
RH	0	SERVICE	Roots Heavy	HEAVY CLEANING	HEAVY CLEANING		0	0	0	0	0	0	0	0	
RMB	4	SERVICE	Roots Medium Barrel	CLEANING	CLEANING		0	0	0	0	0	0	0	0	
RMC	3	SERVICE	Roots Medium Connection	CLEANING	CLEANING		0	0	0	0	0	0	0	0	
RMJ	3	SERVICE	Roots Medium Joint	CLEANING	CLEANING		0	0	0	0	0	0	0	0	

Defect Code	Default Score	Type	Description	Rehab. Method	Alternative Method	Comments	Clock Pos. Grade1	Clock Pos. Grade2	Clock Pos. Grade3	Clock Pos. Grade4	Value % Grade1	Value % Grade2	Value % Grade3	Value % Grade4	Alter. Rehab. Cutoff
RML	3	SERVICE	Roots Medium Lateral	CLEANING	CLEANING		0	0	0	0	0	0	0	0	
RPL	0	STRUCTURAL	Point Repair Liner				0	0	0	0	0	0	0	0	
RPLD	4	STRUCTURAL	Point Repaie Liner Defective	POINT REPAIR	POINT REPAIR		0	0	0	0	0	0	0	0	
RPP	0	STRUCTURAL	Point Repair Patch				0	0	0	0	0	0	0	0	
RPPD	4	STRUCTURAL	Point Repair Patch Patch Defective	POINT REPAIR	POINT REPAIR		0	0	0	0	0	0	0	0	
RPR	0	STRUCTURAL	Point Repair Replacement				0	0	0	0	0	0	0	0	
RPRD	4	STRUCTURAL	Point Repair Replacement Defective	POINT REPAIR	POINT REPAIR		0	0	0	0	0	0	0	0	
RPZ	0	STRUCTURAL	Point Repair Other				0	0	0	0	0	0	0	0	
RPZD	0	STRUCTURAL	Point Repair Other Defective	POINT REPAIR	POINT REPAIR		0	0	0	0	0	0	0	0	
RTB	3	SERVICE	Roots Tap Barrel	CLEANING	CLEANING		0	0	0	0	0	0	0	0	
RTC	2	SERVICE	Roots Tap Connection	CLEANING	CLEANING		0	0	0	0	0	0	0	0	
RTJ	2	SERVICE	Roots Tap Joint	CLEANING	CLEANING		0	0	0	0	0	0	0	0	
RTL	2	SERVICE	Roots Tap Lateral	CLEANING	CLEANING		0	0	0	0	0	0	0	0	
SA	0	MISCELLANEOUS	Survey Abandoned				0	0	0	0	0	0	0	0	
SAM	4	STRUCTURAL	Surface Damage Aggregate Missing	LINING	LINING		0	0	0	0	0	0	0	0	
SAMC	4	STRUCTURAL	Surface Aggregate Missing Chemic	LINING	LINING		0	0	0	0	0	0	0	0	
SAMM	4	STRUCTURAL	Surface Aggregate Missing Mechan	LINING	LINING		0	0	0	0	0	0	0	0	
SAMZ	4	STRUCTURAL	Surface Aggregate Missing Unknow	LINING	LINING		0	0	0	0	0	0	0	0	
SAP	3	STRUCTURAL	Surface Damage Aggregate Projecting	LINING	LINING		0	0	0	0	0	0	0	0	
SAPC	3	STRUCTURAL	Surface Aggregate Projecting Che	LINING	LINING		0	0	0	0	0	0	0	0	
SAPM	3	STRUCTURAL	Surface Aggregate Projecting Mec	LINING	LINING		0	0	0	0	0	0	0	0	
SAPZ	3	STRUCTURAL	Surface Aggregate Projecting Unk	LINING	LINING		0	0	0	0	0	0	0	0	
SAV	2	STRUCTURAL	Surface Damage Aggregate Visible	LINING	LINING		0	0	0	0	0	0	0	0	
SAVC	3	STRUCTURAL	Surface Aggregate Visible Chemic	LINING	LINING		0	0	0	0	0	0	0	0	
SAVM	3	STRUCTURAL	Surface Aggregate Visible Mechan	LINING	LINING		0	0	0	0	0	0	0	0	

Defect Code	Default Score	Type	Description	Rehab. Method	Alternative Method	Comments	Clock Pos. Grade1	Clock Pos. Grade2	Clock Pos. Grade3	Clock Pos. Grade4	Value % Grade1	Value % Grade2	Value % Grade3	Value % Grade4	Alter. Rehab. Cutoff
SAVZ	3	STRUCTURAL	Surface Aggregate Visible Unknow	LINING	LINING		0	0	0	0	0	0	0	0	
SCP	3	STRUCTURAL	Surface Corrosion Metal Pipe	LINING	LINING		0	0	0	0	0	0	0	0	
SG	0	SERVICE	Line Sags	POINT REPAIR	POINT REPAIR		0	0	0	0	0	0	0	0	
SMW	5	STRUCTURAL	Surface Damage Missing Wall	POINT REPAIR	POINT REPAIR		0	0	0	0	0	0	0	0	
SMWC	5	STRUCTURAL	Surface Missing Wall Chemical	POINT REPAIR	POINT REPAIR		0	0	0	0	0	0	0	0	
SMWM	5	STRUCTURAL	Surface Missing Wall Mechanical	POINT REPAIR	POINT REPAIR		0	0	0	0	0	0	0	0	
SMWZ	5	STRUCTURAL	Surface Missing Wall Unknown	POINT REPAIR	POINT REPAIR		0	0	0	0	0	0	0	0	
SRC	5	STRUCTURAL	Surface Damage Reinforcement Cement	POINT REPAIR	POINT REPAIR		0	0	0	0	0	0	0	0	
SRCC	5	STRUCTURAL	Surface Reinforcement Corroded C	POINT REPAIR	POINT REPAIR		0	0	0	0	0	0	0	0	
SRCM	5	STRUCTURAL	Surface Reinforcement Corroded M	POINT REPAIR	POINT REPAIR		0	0	0	0	0	0	0	0	
SRCZ	5	STRUCTURAL	Surface Reinforcement Corroded U	POINT REPAIR	POINT REPAIR		0	0	0	0	0	0	0	0	
SRI	1	MISCELLANEOUS	Surface Roughness Increased				0	0	0	0	0	0	0	0	
SRIC	1	STRUCTURAL	Surface Roughness Increased Chem	LINING	LINING		0	0	0	0	0	0	0	0	
SRIM	1	STRUCTURAL	Surface Roughness Increased Mech	LINING	LINING		0	0	0	0	0	0	0	0	
SRIZ	1	STRUCTURAL	Surface Roughness Increased Unkn	LINING	LINING		0	0	0	0	0	0	0	0	
SRP	5	STRUCTURAL	Surface Reinforcement Projecting	LINING	LINING		0	0	0	0	0	0	0	0	
SRPC	3	STRUCTURAL	Surface Reinforcement Projecting	LINING	LINING		0	0	0	0	0	0	0	0	
SRPM	3	MISCELLANEOUS	Surface Reinforcement Projecting	LINING	LINING		0	0	0	0	0	0	0	0	

Defect Code	Default Score	Type	Description	Rehab. Method	Alternative Method	Comments	Clock Pos. Grade1	Clock Pos. Grade2	Clock Pos. Grade3	Clock Pos. Grade4	Value % Grade1	Value % Grade2	Value % Grade3	Value % Grade4	Alter. Rehab. Cutoff
SRPZ	3	STRUCTURAL	Surface Reinforcement Projecting	LINING	LINING		0	0	0	0	0	0	0	0	
SRV	4	STRUCTURAL	Surface Damage Reinforcement Visible	LINING	LINING		0	0	0	0	0	0	0	0	
SRVC	5	MISCELLANEOUS	Surface Reinforcement Visible Ch	LINING	LINING		0	0	0	0	0	0	0	0	
SRVM	5	STRUCTURAL	Surface Reinforcement Visible Me	LINING	LINING		0	0	0	0	0	0	0	0	
SRVZ	5	STRUCTURAL	Surface Reinforcement Visible Un	LINING	LINING		0	0	0	0	0	0	0	0	
SSC	1	MISCELLANEOUS	Surface Spilling of Damage Coating				0	0	0	0	0	0	0	0	
SSS	2	STRUCTURAL	Surface Damage Surface Spalling	LINING	LINING		0	0	0	0	0	0	0	0	
SSSC	2	STRUCTURAL	Surface Spalling Chemical	LINING	LINING		0	0	0	0	0	0	0	0	
SSSM	2	STRUCTURAL	Surface Spalling Mechanical	LINING	LINING		0	0	0	0	0	0	0	0	
SSSZ	2	MISCELLANEOUS	Surface Spalling Other	LINING	LINING		0	0	0	0	0	0	0	0	
SZ	0	STRUCTURAL	Surface Damage Other	LINING	LINING		0	0	0	0	0	0	0	0	
SZC	0	STRUCTURAL	Surface Other Chemical	LINING	LINING		0	0	0	0	0	0	0	0	
SZM	0	STRUCTURAL	Surface Other Mechanical	LINING	LINING		0	0	0	0	0	0	0	0	
SZZ	0	STRUCTURAL	Surface Other Unknown	LINING	LINING		0	0	0	0	0	0	0	0	
TB	0	CONSTRUCTION	Tap Break-in				0	0	0	0	0	0	0	0	
TBA	0	CONSTRUCTION	Tap Break-in Active				0	0	0	0	0	0	0	0	
TBB	0	CONSTRUCTION	Tap Break-in Abandoned				0	0	0	0	0	0	0	0	
TBC	2	CONSTRUCTION	Tap Break-in Capped				0	0	0	0	0	0	0	0	
TBD	3	CONSTRUCTION	Tap Break-in Defective	POINT REPAIR	POINT REPAIR		0	0	0	0	0	0	0	0	
TBI	0	CONSTRUCTION	Tap Break-in Intruding	POINT REPAIR	POINT REPAIR		0	0	0	0	0	10	20	30	
TF	0	CONSTRUCTION	Tap Factory				0	0	0	0	0	0	0	0	

Defect Code	Default Score	Type	Description	Rehab. Method	Alternative Method	Comments	Clock Pos. Grade1	Clock Pos. Grade2	Clock Pos. Grade3	Clock Pos. Grade4	Value % Grade1	Value % Grade2	Value % Grade3	Value % Grade4	Alter. Rehab. Cutoff
TFA	0	CONSTRUCTION	Tap Factory Activity				0	0	0	0	0	0	0	0	
TFB	0	CONSTRUCTION	Tap Factory Abandoned				0	0	0	0	0	0	0	0	
TFC	0	CONSTRUCTION	Tap Factory Capped				0	0	0	0	0	0	0	0	
TFD	2	CONSTRUCTION	Tap Factory Defective				0	0	0	0	0	0	0	0	
TFI	0	CONSTRUCTION	Tap Factory Intruding				0	0	0	0	0	10	20	30	
TR	0	CONSTRUCTION	Tap Rehabilitated				0	0	0	0	0	0	0	0	
TRA	0	MISCELLANEOUS	Tap Rehabilitated Activity				0	0	0	0	0	0	0	0	
TRB	0	MISCELLANEOUS	Tap Rehabilitated Abandoned				0	0	0	0	0	0	0	0	
TRC	0	MISCELLANEOUS	Tap Rehabilitated Capped				0	0	0	0	0	0	0	0	
TRD	2	CONSTRUCTION	Tap Rehabilitated Defective				0	0	0	0	0	0	0	0	
TRI	0	CONSTRUCTION	Tap Rehabilitated Intruding				0	0	0	0	0	10	20	30	
TS	0	CONSTRUCTION	Tap Saddle				0	0	0	0	0	0	0	0	
TSA	0	CONSTRUCTION	Tap Saddle Activity				0	0	0	0	0	0	0	0	
TSB	0	CONSTRUCTION	Tap Saddle Abandoned				0	0	0	0	0	0	0	0	
TSC	0	CONSTRUCTION	Tap Saddle Capped				0	0	0	0	0	0	0	0	
TSD	2	CONSTRUCTION	Tap Saddle Defective				0	0	0	0	0	0	0	0	
TSI	0	CONSTRUCTION	Tap Saddle Intruding	POINT REPAIR	POINT REPAIR		0	0	0	0	0	10	20	30	
VC	1	SERVICE	Vermin Cockroach				0	0	0	0	0	0	0	0	
VR	2	SERVICE	Vermin Rat				0	0	0	0	0	0	0	0	
VZ	1	SERVICE	Vermin Other				0	0	0	0	0	0	0	0	
WFC	2	STRUCTURAL	Weld Feature Circumferential	LINING	LINING		0	0	0	0	0	0	0	0	
WFL	2	STRUCTURAL	Weld Feature Longitudinal	LINING	LINING		0	0	0	0	0	0	0	0	
WFM	3	STRUCTURAL	Weld Feature Multiple	LINING	LINING		0	0	0	0	0	0	0	0	
WFS	2	STRUCTURAL	Weld Feature Spiral	LINING	LINING		0	0	0	0	0	0	0	0	
WFZ	0	STRUCTURAL	Weld Feature Other	LINING	LINING		0	0	0	0	0	0	0	0	
WL	0	MISCELLANEOUS	Water Level				0	0	0	0	0	0	0	0	
X	0	STRUCTURAL	Collapse	POINT REPAIR	POINT REPAIR		5	0	0	0	0	0	0	0	

Defect Code	Default Score	Type	Description	Rehab. Method	Alternative Method	Comments	Clock Pos. Grade1	Clock Pos. Grade2	Clock Pos. Grade3	Clock Pos. Grade4	Value % Grade1	Value % Grade2	Value % Grade3	Value % Grade4	Alter. Rehab. Cutoff
XB	5	STRUCTURAL	Collapse Brick Sewer	POINT REPAIR	POINT REPAIR		0	0	0	0	0	0	0	0	
XP	5	STRUCTURAL	Collapse Pipe Sewer	POINT REPAIR	POINT REPAIR		0	0	0	0	0	0	0	0	

Appendix I: GIS Updates

See section below and see 2 GIS shapefiles attached related to the Appendix I sub-section “GIS fixes”

- Appx I_duplicate_pipes.zip
- Appx I_before_rehab_adjustments.zip.

Appendix I

GIS Updates

GIS Data Received

A copy of the City GIS was provided in the Fall of 2019. There are 17,880 assets where 3240 are sewer pipes and 14,640 are laterals. On June 17, 2020, HSE provided GIS updates with revisions to drawing number, shape length, elevations, material, year, abandoned tag, diameter, private ownership tag, and added GIS segments.

GIS Updates

In the process of the desktop condition assessment task and renewal and replacement plan, two updated GIS shapefiles were created – risk GIS (Appendix F) and rehabilitation GIS (Appendix A). To both updates GIS shapefiles, the City GIS was updated based upon results of the CCTV and modeling efforts. It was then joined with CCTV inspection score data, rough pavement presence was determined, and depth was calculated by subtracting pipe inverts from known manhole rim elevations. Then, this was joined with risk updates (first shapefile) or rehabilitation updates (second shapefile).

Risk GIS

The first GIS shapefile involves the risk updates (desktop condition assessment). The attribute table provides the risk scores (normalized from 1-5, normalized from 1-100, and total mathematical score) as well as LOF COF scores and their constituents. Each LOF and COF factor has their own column where the number shown is the rating multiplied by the weighting described earlier in this report.

Rehabilitation GIS

The second GIS shapefile involves renewal and replacement fields. Important fields added to the City GIS in this version includes rehabilitation recommendation for each asset, number of rehabilitations (point repair(s), section liner(s), full lining), and flow chart branch (the decision tree path that led to the recommendation). The “total cost” column was the default name by InfoAsset and factors in traffic control and a 45% markup for sewer bypassing, mobilization/demobilization, and construction cost and market contingency. However, the cost does not include planning costs such as engineering, permitting, legal, administrative, or other items as stated in summary tables throughout the report.

GIS Fixes

Some minor post rehabilitation analysis fixes had to be made. These edited pipes were exported as shapefiles and provided as attachments in this appendix - (duplicate pipes.zip and before rehabilitation adjustments.zip). The first issue involved duplicate GIS pipes. These were reviewed and removed. Facility IDs with more than 1 pipe were exported into the “Appx I_duplicate pipes.zip”. The second issue involved the choice of “Facility ID” as the unique identifier for CCTV surveys. Upon further review, this identifier is not unique for around 50 of the 3240 pipes with Facility ID. For around 50 pipes, 2 to 4 pipes had identical facility ID but spatially different GIS segments along the same path. As a result, a rehabilitation cost was attributed to the first of many pipes with the same facility ID and the other pipes of different lengths was then assigned the exact same rehabilitation, rehabilitation length, and associated cost. For example, the 2 pipe GIS segments with Facility ID “10160-10164” were each assigned a “Full CIPP” rehabilitation recommendation with a cost of $36,000 of each with the rehab length assumption of 393 feet. However, one of the GIS segments had a pipe length of 10 feet. This resulted in a vastly greater cost than it should have. In addition, the number of

rehabilitation items was attributed to each GIS segment. Other identifiers were searched in the attribute table, but ultimately because this identifier was used for the CCTV surveys, this is the identifier we had to stick with. Resolution: for these 50 pipes, BC edited this GIS version to fix the planning cost and properly assign the number of rehab and rehab length. These 50 pipes were exported into “Appx I_before_rehab_adjustments.zip”. In future GIS updates, City staff should consider generating a new and unique facility ID field.

Appendix J: Basis of Cost Estimate Details

Appendix J: Basis of Cost Assumptions

J.1 Basis of cost assumptions

This section describes the cost basis for rehabilitation items. Items related to quotes from manufacturers only include material and installation costs. These do not include labor or agency costs used for master planning such as administrative, permitting, or other costs. For pipes with unknown diameters, the average pipe diameter of nine inches was used for costing. For pipes with unknown depths, the average pipe depth of 11 feet was assumed.

J.1.1 CCTV Costs

Table J-1 presents CCTV costs used in the analysis.

Table J-1. CCTV Cost By Pipe Diameter

Pipe Diameter (inch)[1, 2]	Cost ($/LF)
Up to 18	4
19 to 24	5
25 to 36	6
37 to 66[2]	8

[1]*CCTV bids are from City of Bloomington FY 2017 CCTV Inspections PROJECT NO. # 50-18-53007-17-00. CITY BID NO. 2017-16. The costs shown here are an average of the bids from Michels Pipe Services, National Power Rodding Corp., and Bloomington City engineer estimate. G.A. Rich & Sons, Inc. was excluded due to low bids.*

[2]*CCTV cost* for pipe diameters between 37-inch and 66-inch was *extrapolated.*

J.1.2 Pipe Replacement

Table J-2 and J-3 presents pipe replacement costs for pipes located under pavement and not under pavement, respectively. The cost shown on the tables below reflect pipe material, installation, backfill, and excavation costs. Since GIS data did not provide pavement information, the presence of pavement was determined by the "select by location" and intersecting pipes with the USGS transportation and road segments layer. Of 3254 pipes, 90% of the pipes (2937 pipes) were under pavement.

Table J-2. Pipe Replacement, Pavement Present

Pipe Diameter (inch)[1]	Cost ($/LF)			
	0-8 Feet Below Grade	8-12 Feet Below Grade	12-16 Feet Below Grade	Over 16 Feet Below Grade
6	$195	$210	$225	$260
8	$265	$280	$295	$330
10	$335	$350	$365	$400
12	$405	$420	$435	$475
15	$505	$525	$545	$585
18	$610	$630	$650	$695
21	$715	$735	$755	$805
24	$815	$840	$865	$915
27	$920	$945	$970	$1,025
30	$1,025	$1,050	$1,075	$1,130
33	$1,125	$1,155	$1,185	$1,245
36	$1,230	$1,260	$1,290	$1,350
39	$1,330	$1,365	$1,400	$1,465
42	$1,435	$1,470	$1,505	$1,575
48	$1,645	$1,680	$1,715	$1,790
54	$1,850	$1,890	$1,930	$2,010
66	$2,265	$2,310	$2,355	$2,450

[1]Pipe material costs are provided by 2020 quotes from Northern Pipe (RCP Pipe) and Mission Clay Products (VCP Pipe)

[2]Backfill, Excavation, and pavement are provided by RSMeans construction cost database

Table J-3. Pipe Replacement, No Pavement				
Pipe Diameter (inch) [1]	Cost ($/LF)			
	0-8 Feet Below Grade	8-12 Feet Below Grade	12-16 Feet Below Grade	Over 16 Feet Below Grade
6	$165	$180	$195	$230
8	$225	$240	$255	$290
10	$285	$300	$315	$350
12	$345	$360	$375	$415
15	$430	$450	$470	$510
18	$520	$540	$560	$605
21	$610	$630	$650	$700
24	$695	$720	$745	$795
27	$785	$810	$835	$890
30	$875	$900	$925	$980
33	$960	$990	$1,020	$1,080
36	$1,050	$1,080	$1,110	$1,170
39	$1,135	$1,170	$1,205	$1,270
42	$1,225	$1,260	$1,295	$1,365
48	$1,405	$1,440	$1,475	$1,550
54	$1,580	$1,620	$1,660	$1,740
66	$1,935	$1,980	$2,025	$2,120

[1]Pipe material costs are provided by 2020 quotes from Northern Pipe (RCP Pipe) and Mission Clay Products (VCP Pipe)

[2]Backfill, Excavation, and pavement are provided by RSMeans construction cost database

J.1.3 Point Repair(s) by Excavation

Table X-X and X-X presents point repair(s) by excavation costs used in the analysis. The costs presented are per point repair. A pipe assigned the rehabilitation recommendation “point repair(s)” or a combination of lining and “point repair(s)” may have more than one point repair. The excavation cost assumes 10 feet sections. The unit costs ($/LF) are taken from pipe replacement section and multiplied by 10. No additional multiplier was applied at the moment. This may result in a lower end of cost estimation. Typically, a point repair compared to a full pipe replacement will have a much greater unit cost due to similar equipment, machine rental, and labor costs.

Table J-4. Point Repair by Excavation, Pavement Present				
Pipe Diameter (inch) [1]	Cost ($/LF)			
	0-8 Feet Below Grade	8-12 Feet Below Grade	12-16 Feet Below Grade	Over 16 Feet Below Grade
6	$600	$800	$1,000	$1,300
8	$700	$900	$1,000	$1,400
10	$800	$1,000	$1,200	$1,500
12	$900	$1,100	$1,300	$1,600
15	$1,100	$1,400	$1,600	$2,000
18	$1,400	$1,600	$1,800	$2,200
21	$1,700	$1,900	$2,200	$2,600
24	$2,000	$2,300	$2,500	$3,000
27	$2,400	$2,700	$2,900	$3,500
30	$2,700	$3,000	$3,300	$3,800
33	$3,500	$3,800	$4,100	$4,700
36	$3,700	$4,000	$4,300	$5,000
39	$3,400	$3,800	$4,100	$4,700
42	$3,900	$4,200	$4,600	$5,300
48	$5,000	$5,400	$5,700	$6,500
54	$6,200	$6,600	$7,000	$7,800
66	$8,600	$9,100	$9,600	$10,500

[1]Pipe material costs are provided by 2020 quotes from Northern Pipe (RCP Pipe) and Mission Clay Products (VCP Pipe)

[2]Backfill, Excavation, and pavement are provided by RSMeans construction cost database

Table J-5. Point Repair by Excavation, No Pavement				
Pipe Diameter (inch) [1]	Cost ($/LF)			
	0-8 Feet Below Grade	8-12 Feet Below Grade	12-16 Feet Below Grade	Over 16 Feet Below Grade
6	$400	$600	$800	$1,100
8	$400	$600	$800	$1,100
10	$500	$700	$900	$1,200
12	$600	$800	$900	$1,300
15	$800	$1,000	$1,200	$1,600
18	$900	$1,100	$1,300	$1,700
21	$1,100	$1,400	$1,600	$2,100
24	$1,300	$1,600	$1,800	$2,300
27	$1,600	$1,900	$2,100	$2,700
30	$1,800	$2,000	$2,300	$2,900
33	$2,400	$2,700	$3,000	$3,600
36	$2,400	$2,700	$3,000	$3,600
39	$1,900	$2,200	$2,500	$3,200
42	$2,100	$2,400	$2,800	$3,400
48	$2,800	$3,100	$3,500	$4,300
54	$3,400	$3,800	$4,200	$5,000
66	$4,800	$5,200	$5,700	$6,600

[1]Pipe material costs are provided by 2020 quotes from Northern Pipe (RCP Pipe) and Mission Clay Products (VCP Pipe)

[2]Backfill, Excavation, and pavement are provided by RSMeans construction cost database

J.1.4 Sectional Liner(s)

Table J-6 presents sectional liner(s) costs used in the analysis.

Table J-6. Sectional Lining Costs

Pipe Diameter (inch) [1]	Cost ($/LF)
6[2]	3,000
8	3,000
10[2]	4,500
12[2]	6,000
15[2]	7,500
18[2]	7,500
21[2]	9,000
24[2]	9,000
27[2]	10,500
30[2]	10,500
33[2]	12,000
36[2]	12,000
39[2]	13,500
42[2]	13,500
48[2]	13,500
54[2]	13,500
66[2]	15,000

[1]Prices from Virginia Beach Annual Services Construction Contract #17 bid tab
[2]Medium to large diameter sectional lining based on extrapolation.

J.1.5 Full Pipe Length Cured in Place Pipe (Full CIPP)

Table J-7 presents full CIPP costs used in the analysis.

Table J-7. Full CIPP Costs

Pipe Diameter (inch) [1]	Cost ($/LF)
6	96
8	128
10	160
12	192
15	240
18	288
21	336
24	384
27	432
30	480
33	528
36	576
39	624
42	672
48	768
54	864
66	1056

[1]Based on evaluations of North Davis Sewer District Bid Tabs, Project 3 through Project 7, escalated to 2020 dollars

Costs do not include bypass pumping or traffic control. Unit Diameter Costs are based on 200 ft lateral spacing and

2000 ft project length

[2]Larger diameter (36-inch to 66-inch) full CIPP based on Salt Lake City BODR

Appendix K: Main and Venus Way Lift Station Inspections Draft Report, May 2020

Brown AND Caldwell

DRAFT

Main and Venus Way Lift Station Inspections Report

Prepared for
City of Milpitas – Sewer Master Plan
Milpitas, CA
May 14, 2020

DRAFT

Main and Venus Way Lift Station Inspections Report

Prepared for
City of Milpitas – Sewer Master Plan
Milpitas, California
May 14, 2020

This is a draft and is not intended to be a final representation of the work done or recommendations made by Brown and Caldwell. It should not be relied upon; consult the final report.

Brown AND Caldwell
201 North Civic Dr, Suite 300
Walnut Creek, CA 94596

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Lift Station Inspections Report v1d REV changes from inspection team review.docx

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List of Abbreviations

A	ampere (amp)
AIC	ampere interrupting capacity
ARV	air release valve
ATS	automatic transfer switch
BFV	butterfly valve
CAV	combination air valve
FM	force main
kV	kilovolt
kVA	kilovolt-ampere
HP	horsepower
LCP	local control panel
MAS	multi-agent system
MCC	motor control center
NEMA	National Electrical Manufacturers Association
PG&E	Pacific Gas & Electric
ph	phase
PLC	programmable logic controller
PV	plug valve
PVC	polyvinyl chloride
SME	subject matter expert
SS	stainless steel
SSMH	sanitary sewer manhole
V	volt
VFD	variable frequency drive
W	watt

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Section 1

Introduction

City of Milpitas (City) and HydroScience Engineers, Inc. (HydroScience) entered into an agreement dated October 18, 2019 for professional services for the following project: City of Milpitas – Sewer Master Plan (Project). Brown and Caldwell is performing work on the Project as a subconsultant to HydroScience. The purpose of this report is to document the visual investigations performed by Brown and Caldwell at two sewer facilities, Main Lift Station and Venus Way Lift Station, as part of the Project scope of work, Task 2. Data Collection/Preliminary Research/System Review/ Field Inspection. The facility locations are shown on Figure 1.

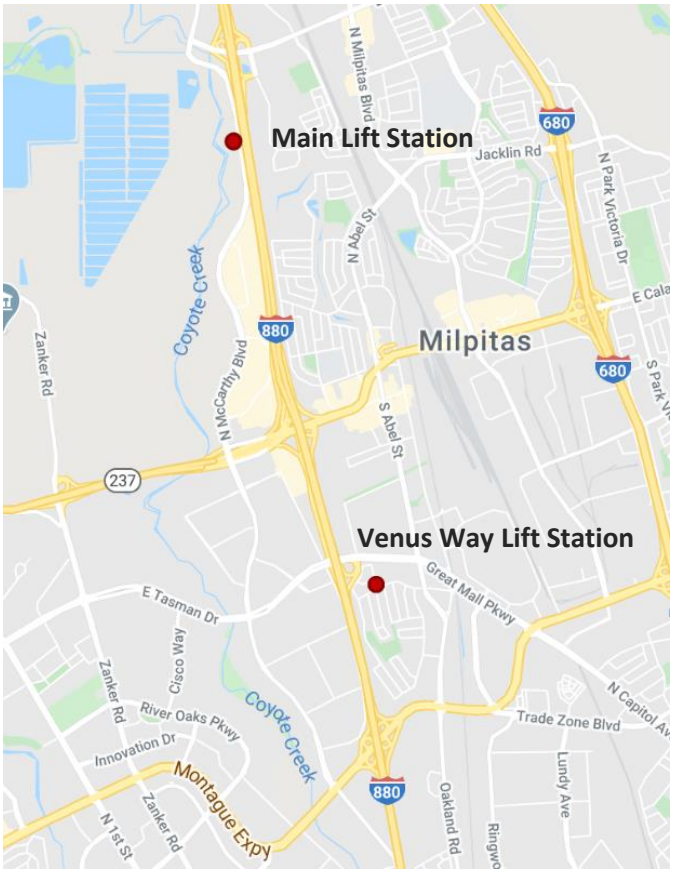


Figure 1. Facility Locations Map

The inspection information in this report is organized in the following sections:

Section 2 - System Information and Data

Section 3 – Main Lift Station Inspections

Section 4 – Venus Way Lift Station Inspections

Appendix A through Appendix F – Main Lift Station Inspection Records

Appendix G through Appendix K – Venus Way Lift Station Inspections

Section 2

System Information and Data

Review of the available system information and data, and the selection of the asset inventory to be used to perform field inspections are summarized in this section.

2.1 Existing Reports and Information

Existing reports and information provided by the City and reviewed for the Main Lift Station and Venus Way Lift Station are included in Table 2-1.

Table 2-1. Lift Station Existing Reports and Information

Document Title	Type	Project Number	Drawing Reference	Pages	Description/Notes	Date(s)
Main and Venus Lift Stations						
Sewer Inventory Master	Spreadsheet					_
Main Lift Station						
Main Sewage Pump Station Improvements Project Project No. 6103	Record Drawing	6103	2-1066	95	Prepared by Winzler & Kelly Consulting Engineers	Nov 2008
Letter Anthony Petroccitto, Winzler & Kelly to Tom Yousch, City of Milpitas Subject: Milpitas Main Sewage Pump Station Capacity – Existing Station and New Station Under Construction	Letter	6103		3	New pump station capacity including system head curves	Undated, 2008
Project No. 6078 Plans for the Construction of Parallel Force Main Project 2000	Record Drawing	6078	2-1031	32	Prepared by Kennedy/Jenks Consultants Sheets 18-19 revised May 2020 Sheet 30 revised June 2004	Oct 2002 Jun 2004 May 2020
Main Sewage Pump Station Improvements Project November 1997 Project No. 6071 Volume 4 - Contract Drawings	Record Drawing	6071	2-986	32	Prepared by Carollo Engineers Final revision per owner comments	Apr 2001
Venus Way Lift Station						
Venus Pump Station Improvement Project No. 6101 Project Drawings June 2008	As-Built Drawing	6101	2-1107	21	Prepared by Dodson Psomas	Feb 2009
Approved Submittal 01a from Anderson Pacific Engineering Construction, Inc. Project No. 6101 Section 11130, Submersible Pumps	Submittal	6101		25	Flygt pumps, motors, accessories	Sep 2008

2.2 Asset Inventory for Inspections

The existing reports and information for the lift stations were reviewed by a team of subject matter experts (SMEs) covering the following disciplines:

- Mechanical
- Electrical
- Instrumentation
- Civil
- Structural

The SMEs identified the assets to be inspected, and the assets were entered into Fulcrum for field inspection data collection and condition assessment by asset. The asset types used for the inspections are included in Table 2-2. Specific assets are discussed in Section 3 for the Main Lift Station and Section 4 for the Venus Way Lift Station.

Table 2-2. Asset Types for Inspections

Mechanical Asset Type		Electrical Asset Type	Instrumentation Asset Type	Structure Asset Type
Actuator		Battery	Flow Transmitter	Basin
Air Compressor		Battery Bank	Level Switch	Building
Controller		Building	Panel	Clarifier
Crane		Buss Duct	Remote Telemetry Unit	Crane
Discharge Pipes		Circuit Breaker	Radio (Transceiver)	Tank
Fan		Generator		Tank Cover
Fish Screen Rake		Motor		Roof
Flow Meter		Motor Control Center		Slab
Gate	Bulkhead	Motor Starter		Vault
	Slide	Panel		
	Sluice	PLC		
	N/A	Protective Relay		
Grinder		Rectifier		
Pig Launcher		Switch		
Piping		Switchgear		
Pump		Transformer		
Screens		Uninterruptable Power Supply		
Stoplog		Variable Freq Drive		
Tank				
Valve	ARV/CAV			
	Butterfly			
	Check			
	Diaphragm			
	Gate			
	Pinch			
	Plug			

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Assets that were reviewed but not included in the final asset inventory for inspections, and the reasons, are included in Table 2-3. All of these assets were identified from information found in the Sewer Inventory Master spreadsheet.

Table 2-3. Assets Not Included in the Inventory for Inspections

Asset Names/Types	Reason Not Included	Asset Types	Project/ Drawing Reference	Year of Construction
Main Lift Station				
Pump #1 and Pump #6 pumps, piping, valves	Future per Sewer Inventory Master. Base assembly, piping, and rail system installed under Project 6103/2-1066 Drawing Number M-101	Pump Piping Valves		
Grinders #5, #6, #7, #8	Future per Sewer Inventory Master	Grinder		
Venus Way Lift Station				
8" Bypass Line	Unknown[1]	Piping	6101/2-1107	2008
Seal holes in slab, valve vault	Assess with valve vault		6101/2-1107	2008
Vertical Pipe Supports	Assess under Miscellaneous		6101/2-1107	2008
Pumps, electrical, valves, vaults, piping, vents	Replaced in/updated with Project 6101	Various	6064/2-849	1994
Cathodic protection, bubbler piping, electrical service	Replaced in/updated with Project 6101	Various	6040/2-660	1984
Piping, valves, covers, manholes, electroliers, luminaires, electrical, fire hydrants and valves	Replaced in/updated with Project 6101	Various	2-161	1965
Existing SSMH 1-2 and 15" Gravity Sewer	Different asset class On Sheet C-1 of Project 6101 (2-1107)	Gravity Sewer		1965
Dry Well	Replaced in/updated with Project 6101	Tank		1964
Other				
Force Main A, venturi meter and vault	Force main, not lift station asset	Force main, flow meter and vault	2-343	1975
Butterfly Valve	Force main, not lift station asset	Valve and vault	2-986	1997

[1] Piping in Venus Way station was all in good condition

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Section 3

Main Lift Station Inspections

3.1 Assets

The assets for Main Lift Station inspections are included in Table 3-1 (Mechanical), Table 3-2 (Electrical), Table 3-3 (Instrumentation), Table 3-4 (Civil), and Table 3-5 (Structural).

Table 3-1. Mechanical Assets

Asset Name	Asset Description	Asset ID	Asset Type	Year Installed
Pig Launcher A	36" Pig Launcher	PIG-A	Pig Launcher	2002
Pig Launcher B	36" Pig Launcher	PIG-B	Pig Launcher	2002
Pinch Valve 1	36'' Pinch Valve (1 of 3)		Valve	2002
Pinch Valve 2	36'' Pinch Valve (2 of 3)		Valve	2002
Pinch Valve 3	36'' Pinch Valve (3 of 3)		Valve	2002
Mag Meter (flow meter A)	24'' Magnetic Meter		Flow Meter	2002
Venturi Meter- Removed in 2008	36'' Venturi Meter (taken out)		Flow Meter	1975
Butterfly Valve	36'' Butterfly Valve, FM interconnect		Valve	1970
Manifold Piping	36-inch flanged coupling adapter. 36-inch ductile iron 45' MJ x MJ bend. 20-inch or 36-inch FLxPE spool through sleeve with link seal. 36'' x 20'' x 36'' ductile iron tee (force main A)		Piping	2008
Manifold Piping Butterfly Valve	36-inch diameter BFV, middle of manifold		Valve	2008
Manifold Piping Plug Valve #1	36-inch diameter PV, pumps 1, 2, 3		Valve	2008
Manifold PV #1 Actuator	plug valve #1 electric actuator		Actuator	2008
Manifold Piping Plug Valve #2	36-inch diameter PV, pumps 4, 5, 6		Valve	2008
Manifold PV #2 Actuator	plug valve #2 electric actuator		Actuator	2008
Pump #2	FLYGT CP3531-775, 170HP Submersible Pump		Pump	2008
Pump #2 Piping	20-Inch Ductile Iron Vertical Discharge Pipe, 20-Inch Ductile Iron 90 Elbow, 20-Inch Flanged Coupling Adapter		Piping	2008
Pump #2 Check Valve	20-Inch Diameter Spring Loaded Check Valve		Valve	2008
Pump #2 Plug Valve	20-Inch Diameter Plug Valve		Valve	2008
Pump #3	FLYGT CP3531-775, 170HP Submersible Pump		Pump	2008
Pump #3 Piping	20-Inch Ductile Iron Vertical Discharge Pipe, 20-Inch Ductile Iron 90 Elbow, 20-Inch Flanged Coupling Adapter		Piping	2008
Pump #3 Check Valve	20-Inch Diameter Spring Loaded Check Valve		Valve	2008

Table 3-1. Mechanical Assets				
Asset Name	Asset Description	Asset ID	Asset Type	Year Installed
Pump #3 Plug Valve	20-Inch Diameter Plug Valve		Valve	2008
Pump #4	FLYGT CP3531-775, 170HP Submersible Pump		Pump	2008
Pump #4 Piping	20-Inch Ductile Iron Vertical Discharge Pipe, 20-Inch Ductile Iron 90 Elbow, 20-Inch Flanged Coupling Adapter		Piping	2008
Pump #4 Check Valve	20-Inch Diameter Spring Loaded Check Valve		Valve	2008
Pump #4 Plug Valve	20-Inch Diameter Plug Valve		Valve	2008
Pump #5 (not installed yet)	FLYGT CP3531-775, 170HP Submersible Pump		Pump	
Pump #5 Piping	20-Inch Ductile Iron Vertical Discharge Pipe, 20-Inch Ductile Iron 90 Elbow, 20-Inch Flanged Coupling Adapter		Piping	2008
Pump #5 Check Valve	20-Inch Diameter Spring Loaded Check Valve		Valve	2008
Pump #5 Plug Valve	20-Inch Diameter Plug Valve		Valve	2008
Main Head Gate	54-inch sluice gate with manual actuator		Gate	2008
Head Gate #1	48-inch sluice gate with electric actuator		Gate	2008
Head Gate #2	48-inch sluice gate with electric actuator		Gate	2008
Head Gate #3	48-inch sluice gate with electric actuator		Gate	2008
Head Gate #4	48-inch sluice gate with electric actuator		Gate	2008
Grinder #1	5-hp electric driven		Grinder	2008
Grinder #2	10-hp electric driven		Grinder	2008
Grinder #3	10-hp electric driven		Grinder	2008
Grinder #4	5-hp electric driven		Grinder	2008
Air Supply Fan	PS ventilation system		Fan	2008
Exhaust Fan & Stack	PS ventilation system		Fan	2008
Miscellaneous	Pipe support, 5' x 7' aluminum hatch, galv grating, 3'' SS guide rail, 4-inch diameter PVC drain, pipe wall anchor bracket			
2” combo air/vac valve				
Force Main A B Flow Recorder				
Eye wash				
Flow Meter B	This is for force main B			
Air vac 1 to 15	All across the pump station.			

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Table 3-2. Electrical Assets				
Asset Name	Asset Description	Asset ID	Asset Type	Year Installed
Main Transformer	1000 kVA, 12 kV-480 V, 3-ph (PG&E)		Transformer	2000
Outdoor Utility Disconnect and Metering Panel	Outdoor NEMA 3R Enclosure		Panel	2000
Main Switchgear	Located in Existing Generator Building		Switchgear	2000
Variable Frequency Drive P2	VFD for Pump 2 (170 HP)		Variable Freq Drive	2008
Variable Frequency Drive P3	VFD for Pump 3 (170 HP)		Variable Freq Drive	2008
Variable Frequency Drive P4	VFD for Pump 4 (170 HP)		Variable Freq Drive	2008
Variable Frequency Drive P5	VFD for Pump 5 (170 HP)		Variable Freq Drive	2008
Local Disconnect for Engine Jacket Water Heater	30A/3P		Switch	2000
Motor Control Center 2	600 A, 480 V, 3-ph, 3W, 65000 AIC	MCC-2	Motor Control Center	2000
Motor Control Center 2A	600 A, 480 V, 3-ph, 3W, 65000 AIC	MCC-2A	Motor Control Center	2000
Dry Type Transformer	30 kVA, 480-208/120 V, Dry Type		Transformer	2008
Lighting panel (LP-1)		LA	Panel	2008
Dry Type Transformer	30 kVA, 480-208/120 V, Dry Type		Transformer	2000
Lighting panel (LA)	100 A, 1-Ph, 3 Wire	LP-1	Panel	2000
Electrical/Generator Building-Electrical			Building	2000
Motor Control Center A	400 A, 480 V, 3-ph, 3W, 65000 AIC	MCC-A	Motor Control Center	2008
Motor Control Center B	400 A, 480 V, 3-ph, 3W, 65000 AIC	MCC-B	Motor Control Center	2008
Dry Type Transformer	10 kVA, 480-240/120 V, Dry Type		Transformer	2008
Distribution panel(DP-1)	125 A, NEMA Type 1	DP-1	Panel	2008
Dry Type Transformer	75 kVA, 480-208/120 V, Dry Type		Transformer	2008
Distribution Panel (DP-2)	125 A, NEMA Type 1	DP-2	Panel	2008
Local Control Panel for Grinder#1	LCP grinder1		Panel	2008
Local Control Panel for Grinder#2	LCP grinder2		Panel	2008
Local Control Panel for Grinder#3	LCP grinder3		Panel	2008
Local Control Panel for Grinder#4	LCP grinder4		Panel	2008
Local Disconnect for CU-1 (for FC-1)	30A/3P		Switch	2008
Local Disconnect for EF-1 (for Control Room)	30A/3P		Switch	2008
Local Disconnect for EF-5 (for wetwell)	60A/3P		Switch	2008
Local Disconnect for SF-1 (for Wet Well)	60A/3P		Switch	2008
Local Disconnect for HP-1 (for FC-2)	30A/3P		Switch	2008
Local Disconnect for FC-1 (for Control Room)	30A/3P		Switch	2008
Generator	1000 kVA, 480 V Diesel Driven Engine Generator		Generator	2000
Automatic Transfer Switch	ATS, 1600 A		Switch	2000

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Table 3-3. Instrumentation Assets				
Asset Name	Asset Description	Asset ID	Asset Type	Year Installed
MAS Enclosure and Pump Motor Monitor Panel	MAS	MAS 711	Panel	2008
Level Switch	Level High High	LSHH-201	Level Switch	2008
Level Switch	Ultrasonic level	LE-202	Level Switch	2008
Level Switch	Ultrasonic level	LE-203	Level Switch	2008
Generator and Fuel System Control Panel	Local Control Panel		Panel	2000

Table 3-4. Civil Assets			
Asset Name	Asset Description	Asset Type	Year Installed
Electrical building		Building	
Control building		Building	
Site civil		Asphalt Pavement	

Table 3-5. Structural Assets			
Asset Name	Asset Description	Asset Type	Year Installed
Pinch Valve Vault 1	Pinch Valve Vault (1 of 3)	Vault	2002
Pinch Valve Vault 2	Pinch Valve Vault (2 of 3)	Vault	2002
Pinch Valve Vault 3	Pinch Valve Vault (3 of 3)	Vault	2002
Mag Meter Vault	24'' Magnetic Meter Vault	Vault	2002
Venturi Meter Vault	36'' Venturi Meter Vault	Vault	1975
Butterfly Valve Vault	36'' Butterfly Valve Vault	Vault	1997
Electrical/Generator Building-Structural		Building	2000
Fuel Tank (bulk)	2,000-gal UL-2085 above ground vault tank	Tank	2008
Fuel Tank (day)		Tank	2000
Control Building		Building	2008
Grit Chamber/Inflow Structure		Tank	2008
Wet Well		Tank	2008
Garage		Building	2008

3.2 Condition Data

Field inspections were completed on February 11, 2020 and March 11, 2020. The condition data and scores for Main Lift Station inspections are included in Table 3-6 (Mechanical), Table 3-7 (Electrical), Table 3-8 (Instrumentation), Table 3-9 (Civil), and Table 3-10 (Structural). Condition and performance scores for instrumentation, civil, and structure were 1 (no defects and asset functioning as intended) or 2 (minor defects, higher than expected O&M). Mechanical and electrical components received scores of 4 (major defects, function highly impaired) and mechanical components received scores of 5 (failing/failed, not functioning as intended), see Tables 3-6 and 3-7.

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Table 3-6. Mechanical Condition Data				
Asset Name	Field Assessment	Comments	Condition Score	Performance Score
Pig Launcher A	None		1 - Good – No defects observed.	1 - Good – Asset functioning as intended.
Pig Launcher B	None		1 - Good – No defects observed.	1 - Good – Asset functioning as intended.
Pinch Valve 1			NA - Not enough information available.	NA - Not enough information available.
Pinch Valve 2			NA - Not enough information available.	NA - Not enough information available.
Pinch Valve 3			NA - Not enough information available.	NA - Not enough information available.
Mag Meter (flow meter A)	Not in Operation		4 - Poor – Major defects observed. Asset integrity may be compromised.	4 - Poor – In service, but function is highly impaired.
Venturi Meter- Removed in 2008			NA - Not enough information available.	NA - Not enough information available.
Butterfly Valve			NA - Not enough information available.	NA - Not enough information available.
Manifold Piping	None		2 - Fair – Only minor defects observed.	2 - Fair – In service, but higher than expected O&M.
Manifold Piping Butterfly Valve	None		1 - Good – No defects observed.	1 - Good – Asset functioning as intended.
Manifold Piping Plug Valve #1			1 - Good – No defects observed.	NA - Not enough information available.
Manifold PV #1 Actuator	None		1 - Good – No defects observed.	NA - Not enough information available.
Manifold Piping Plug Valve #2	None		2 - Fair – Only minor defects observed.	2 - Fair – In service, but higher than expected O&M.
Manifold PV #2 Actuator		Does not work.	5 - Failing or Failed – Asset integrity is compromised. Asset may be out of service.	5 - Failing or Failed – Asset is not functioning as intended or is out of service.
Pump #2	None		1 - Good – No defects observed.	1 - Good – Asset functioning as intended.
Pump #2 Piping	None		2 - Fair – Only minor defects observed.	2 - Fair – In service, but higher than expected O&M.
Pump #2 Check Valve	None		2 - Fair – Only minor defects observed.	1 - Good – Asset functioning as intended.
Pump #2 Plug Valve			1 - Good – No defects observed.	1 - Good – Asset functioning as intended.
Pump #3		passed life limit	4 - Poor – Major defects observed. Asset integrity may be compromised.	4 - Poor – In service, but function is highly impaired.
Pump #3 Piping	None		2 - Fair – Only minor defects observed.	2 - Fair – In service, but higher than expected O&M.
Pump #3 Check Valve	None		2 - Fair – Only minor defects observed.	1 - Good – Asset functioning as intended.
Pump #3 Plug Valve			2 - Fair – Only minor defects observed.	1 - Good – Asset functioning as intended.
Pump #4	None		1 - Good – No defects observed.	1 - Good – Asset functioning as intended.
Pump #4 Piping	None		2 - Fair – Only minor defects observed.	2 - Fair – In service, but higher than expected O&M.

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Table 3-6. Mechanical Condition Data				
Asset Name	Field Assessment	Comments	Condition Score	Performance Score
Pump #4 Check Valve	None		2 - Fair – Only minor defects observed.	1 - Good – Asset functioning as intended.
Pump #4 Plug Valve			2 - Fair – Only minor defects observed.	1 - Good – Asset functioning as intended.
Pump #5 (not installed yet)			N/A	N/A
Pump #5 Piping	None		1 - Good – No defects observed.	NA - Not enough information available.
Pump #5 Check Valve			1 - Good – No defects observed.	NA - Not enough information available.
Pump #5 Plug Valve			1 - Good – No defects observed.	NA - Not enough information available.
Main Head Gate	None		1 - Good – No defects observed.	1 - Good – Asset functioning as intended.
Head Gate #1	None		1 - Good – No defects observed.	1 - Good – Asset functioning as intended.
Head Gate #2	None		1 - Good – No defects observed.	1 - Good – Asset functioning as intended.
Head Gate #3	None		1 - Good – No defects observed.	1 - Good – Asset functioning as intended.
Head Gate #4	None		1 - Good – No defects observed.	1 - Good – Asset functioning as intended.
Grinder #1	Excessive Vibration,Inadequate Supports		5 - Failing or Failed – Asset integrity is compromised. Asset may be out of service.	5 - Failing or Failed – Asset is not functioning as intended or is out of service.
Grinder #2	None		1 - Good – No defects observed.	1 - Good – Asset functioning as intended.
Grinder #3	None		1 - Good – No defects observed.	1 - Good – Asset functioning as intended.
Grinder #4	None		1 - Good – No defects observed.	1 - Good – Asset functioning as intended.
Air Supply Fan			1 - Good – No defects observed.	1 - Good – Asset functioning as intended.
Exhaust Fan & Stack			1 - Good – No defects observed.	2 - Fair – In service, but higher than expected O&M.
Miscellaneous				
2” combo air/vac valve			4 - Poor – Major defects observed. Asset integrity may be compromised.	4 - Poor – In service, but function is highly impaired.
Force Main A B Flow Recorder			1 - Good – No defects observed.	1 - Good – Asset functioning as intended.
Eye wash			1 - Good – No defects observed.	1 - Good – Asset functioning as intended.
Flow Meter B		It works but the operation is not accurate.	4 - Poor – Major defects observed. Asset integrity may be compromised.	4 - Poor – In service, but function is highly impaired.
Air vac 1 to 15	Cavitation,Coating Failure,Inadequate Supports		5 - Failing or Failed – Asset integrity is compromised. Asset may be out of service.	5 - Failing or Failed – Asset is not functioning as intended or is out of service.

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Table 3-7. Electrical Condition Data				
Asset Name	Field Assessment	Comments	Condition Score	Performance Score
Main Transformer	No defects noted		1 - Excellent	1 - Component Functioning as Intended
Outdoor Utility Disconnect and Metering Panel	No Corrosion Noted	ArcFlash labels missing	1 - Excellent	1 - Component Functioning as Intended
Main Switchgear	No Corrosion Noted	ArcFlash labels missing	1 - Excellent	1 - Component Functioning as Intended
Variable Frequency Drive P2	No Corrosion Noted	ArcFlash labels missing	4 - Integrity of Component Moderately Compromised	2 - In-Service, but Higher than Expected O&M
Variable Frequency Drive P3	No Corrosion Noted. Understood from City that IGBT was replaced a year ago.	ArcFlash labels missing	4 - Integrity of Component Moderately Compromised	2 - In-Service, but Higher than Expected O&M
Variable Frequency Drive P4	No Corrosion Noted	ArcFlash labels missing	4 - Integrity of Component Moderately Compromised	2 - In-Service, but Higher than Expected O&M
Variable Frequency Drive P5	No Corrosion Noted. Understood from City that Cooling Fans were replaced year ago	ArcFlash labels missing	4 - Integrity of Component Moderately Compromised	2 - In-Service, but Higher than Expected O&M
Local Disconnect for Engine Jacket Water Heater	No Corrosion Noted		1 - Excellent	1 - Component Functioning as Intended
Motor Control Center 2	No Corrosion Noted.	ArcFlash labels missing	1 - Excellent	1 - Component Functioning as Intended
Motor Control Center 2A	No Corrosion Noted	ArcFlash labels missing	1 - Excellent	1 - Component Functioning as Intended
Dry Type Transformer	No Corrosion Noted		1 - Excellent	1 - Component Functioning as Intended
Lighting panel (LP-1)	No Corrosion Noted	ArcFlash labels missing	1 - Excellent	1 - Component Functioning as Intended
Dry Type Transformer	No Corrosion Noted		1 - Excellent	1 - Component Functioning as Intended
Lighting panel (LA)	No Corrosion Noted	ArcFlash labels missing	1 - Excellent	1 - Component Functioning as Intended
Electrical/Generator Building-Electrical		Lighting – Outdated technology	1 - Excellent	1 - Component Functioning as Intended
Motor Control Center A	No Corrosion Noted	ArcFlash labels missing	1 - Excellent	1 - Component Functioning as Intended
Motor Control Center B	No Corrosion Noted	ArcFlash labels missing	1 - Excellent	1 - Component Functioning as Intended
Dry Type Transformer	No corrosion Noted		1 - Excellent	1 - Component Functioning as Intended
Distribution panel(DP-1)	No Corrosion Noted	ArcFlash labels missing	1 - Excellent	1 - Component Functioning as Intended

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Table 3-7. Electrical Condition Data				
Asset Name	Field Assessment	Comments	Condition Score	Performance Score
Dry Type Transformer	No Corrosion Noted		1 - Excellent	1 - Component Functioning as Intended
Distribution Panel (DP-2)	No Corrosion Noted	ArcFlash labels missing	1 - Excellent	1 - Component Functioning as Intended
Local Control Panel for Grinder#1	No Corrosion Noted	ArcFlash labels missing	1 - Excellent	1 - Component Functioning as Intended
Local Control Panel for Grinder#2	No Corrosion Noted	ArcFlash labels missing	1 - Excellent	1 - Component Functioning as Intended
Local Control Panel for Grinder#3	No Corrosion Noted	ArcFlash labels missing	1 - Excellent	1 - Component Functioning as Intended
Local Control Panel for Grinder#4	No Corrosion Noted	ArcFlash labels missing	1 - Excellent	1 - Component Functioning as Intended
Local Disconnect for CU-1 (for FC-1)			1 - Excellent	1 - Component Functioning as Intended
Local Disconnect for EF-1 (for Control Room)	No Corrosion Noted		1 - Excellent	1 - Component Functioning as Intended
Local Disconnect for EF-5 (for wetwell)	No Corrosion Noted		1 - Excellent	1 - Component Functioning as Intended
Local Disconnect for SF-1 (for Wet Well)	No Corrosion Noted		1 - Excellent	1 - Component Functioning as Intended
Local Disconnect for HP-1 (for FC-2)	No Corrosion Noted		1 - Excellent	1 - Component Functioning as Intended
Local Disconnect for FC-1 (for Control Room)	No Corrosion Noted		1 - Excellent	1 - Component Functioning as Intended
Generator	Good condition		1 - Excellent	1 - Component Functioning as Intended
Automatic Transfer Switch	No Corrosion Noted	ArcFlash labels missing	1 - Excellent	1 - Component Functioning as Intended

Table 3-8. Instrumentation Condition Data				
Asset Name	Asset ID	Field Assessment	Condition Score	Performance Score
MAS Enclosure and Pump Motor Monitor Panel	MAS 711	No Corrosion Noted	1 - Good – No defects observed.	1 - Good – Asset functioning as intended.
Level Switch	LSHH-201	In Good Condition	1 - Good – No defects observed.	1 - Good – Asset functioning as intended.
Level Switch	LE-202	In Good Condition	1 - Good – No defects observed.	1 - Good – Asset functioning as intended.
Level Switch	LE-203	Not accessible	N/A	N/A
Generator and Fuel System Control Panel		No Corrosion Noted	1 - Good – No defects observed.	1 - Good – Asset functioning as intended.

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Table 3-9. Civil Condition Data				
Asset Name	Field Assessment	Comments	Condition Score	Performance Score
Electrical building			1 - Good – No defects observed.	1 - Good – Asset functioning as intended.
Control building			1 - Good – No defects observed.	1 - Good – Asset functioning as intended.
Site civil			1 - Good – No defects observed.	1 - Good – Asset functioning as intended.

Table 3-10. Structural Condition Data					
Asset Name	Material	Field Assessment	Comments	Condition Score	Performance Score
Pinch Valve Vault 1	Concrete	Corrosion of metal walls	None	1 - Good – No defects observed.	1 - Good – Asset functioning as intended.
Pinch Valve Vault 2	Concrete		Exposed aggregates	1 - Good – No defects observed.	1 - Good – Asset functioning as intended.
Pinch Valve Vault 3	Concrete		None	1 - Good – No defects observed.	1 - Good – Asset functioning as intended.
Mag Meter Vault	Concrete	Corrosion of metal walls	Corroded metal at hatch opening	2 - Fair – Only minor defects observed.	1 - Good – Asset functioning as intended.
Venturi Meter Vault	Concrete	Cracks in walls	No cracking inside, surface cracks on outside, coating still present on inside	1 - Good – No defects observed.	1 - Good – Asset functioning as intended.
Butterfly Valve Vault	Concrete		No visible cracks besides on curb outside	1 - Good – No defects observed.	1 - Good – Asset functioning as intended.
Electrical/Generator Building-Structural	Masonry	Cracks in walls,Moisture issues	Some cracks inside and outside, cosmetic cracks	1 - Good – No defects observed.	1 - Good – Asset functioning as intended.
Fuel Tank (bulk)	Metal		None	1 - Good – No defects observed.	1 - Good – Asset functioning as intended.
Fuel Tank (day)	Metal		None	1 - Good – No defects observed.	1 - Good – Asset functioning as intended.
Control Building	Masonry	Cracks in walls	None	1 - Good – No defects observed.	1 - Good – Asset functioning as intended.
Grit Chamber/Inflow Structure	Concrete		Poor lighting	1 - Good – No defects observed.	1 - Good – Asset functioning as intended.
Wet Well	Concrete	Paint issues	Coating appears to be deteriorating towards bottom, tanks were in operation, no inspection of walls and slab below liquid line	1 - Good – No defects observed.	1 - Good – Asset functioning as intended.
Garage	Concrete	Corrosion of metal walls	Water accumulation inside when it's raining, water seeps thru slab	1 - Good – No defects observed.	1 - Good – Asset functioning as intended.

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Section 4

Venus Way Lift Station Inspections

4.1 Assets

The assets for Venus Way Lift Station inspections are included in Table 4-1 (Mechanical), Table 4-2 (Electrical), Table 4-3 (Instrumentation), Table 4-4 (Civil), and Table 4-5 (Structural).

Table 4-1. Mechanical Assets

Asset Name	Asset Description	Asset ID	Asset Type	Year Installed
Pump #1	FLYGT CP3102-441, 5HP 3ph 230V Submersible Pump		Pump	2008
Pump #2	FLYGT CP3102-441, 5HP 3ph 230V Submersible Pump		Pump	2008
Pump Guide Rails	Reinstalled in 2008			2008
8'' Gate Valve, Pump 1 and 2	8'' Gate Valve, Pump 1 and 2		Valve	2008
8'' Gate Valve, Pump 2	8'' Gate Valve, Pump 2		Valve	2008
8'' Gate Valve, Pump 1 and 2	8'' Gate Valve, Pump 1 and 2		Valve	2008
8'' Check Valve, Pump 1	8'' Check Valve, Pump 1		Valve	2008
8'' Check Valve, Pump 2	8'' Check Valve, Pump 2		Valve	2008
4'' Flap Gate	4'' Flap Gate in wet well		Valve	2008
2'' Combo Air/vacuum valve	2'' Combo Air/vacuum valve		Valve	2008

Table 4-2. Electrical Assets

Asset Name	Asset Description	Asset ID	Asset Type	Year Installed
Utility Transformer	240/120 V, 3-Ph, 3 W	XFMR T-1	Transformer	2000
Service Pedestal	Service Disconnect and Metering			2008
Pump Control Panel	Starter panel for Pumps #1 and 2 (Each 5 HP)		Panel	2008

Table 4-3. Instrumentation Assets

Asset Name	Asset Description	Asset ID	Asset Type	Year Installed
Level Instrument	Wet Well Level Sensor	LSHH-01	Level Switch	2008

Table 4-4. Civil Assets

Asset Name	Asset Description	Asset ID	Asset Type	Year Installed
Site civil				

Table 4-5. Structural Assets				
Asset Name	Asset Description	Asset ID	Asset Type	Year Installed
Wet Well	72" Diameter Reinforced Concrete Pipe		Tank	1964
Valve Vault			Vault	1994
Aluminum Hatch-Vault	Aluminum Hatch, slide-in		Vault	2008
Aluminum Hatch-Wet Well	Aluminum Hatch w/ safety grate		Vault	2008

4.2 Condition Data

Field inspections were completed on February 11, 2020 and March 11, 2020. The condition data and scores for Venus Way Lift Station inspections are included in Table 4-6 (Mechanical), Table 4-7 (Electrical), Table 4-8 (Instrumentation), Table 4-9 (Civil), and Table 4-10 (Structural). Condition and performance scores were all 1 (no defects and asset functioning as intended).

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Table 4-6. Mechanical Condition Data				
Asset Name	Field Assessment	Comments	Condition Score	Performance Score
Pump #1		None	1 - Good – No defects observed.	1 - Good – Asset functioning as intended.
Pump #2		None	1 - Good – No defects observed.	1 - Good – Asset functioning as intended.
Pump Guide Rails		None	1 - Good – No defects observed.	1 - Good – Asset functioning as intended.
8'' Gate Valve, Pump 1 and 2		None	1 - Good – No defects observed.	1 - Good – Asset functioning as intended.
8'' Gate Valve, Pump 2		None	1 - Good – No defects observed.	1 - Good – Asset functioning as intended.
8'' Gate Valve, Pump 1 and 2		None	1 - Good – No defects observed.	1 - Good – Asset functioning as intended.
8'' Check Valve, Pump 1		None	1 - Good – No defects observed.	1 - Good – Asset functioning as intended.
8'' Check Valve, Pump 2		None	1 - Good – No defects observed.	1 - Good – Asset functioning as intended.
4'' Flap Gate	Could not find	None	NA - Not enough information available.	NA - Not enough information available.
2'' Combo Air/vacuum valve		None	1 - Good – No defects observed.	1 - Good – Asset functioning as intended.

Table 4-7. Electrical Condition Data				
Asset Name	Field Assessment	Comments	Condition Score	Performance Score
Utility Transformer		No Corrosion Noted	1 - Excellent	1 - Component Functioning as Intended
Service Pedestal			1 - Excellent	1 - Component Functioning as Intended
Pump Control Panel		No Corrosion Noted	1 - Excellent	1 - Component Functioning as Intended

Table 4-8. Instrumentation Condition Data				
Asset Name	Field Assessment	Comments	Condition Score	Performance Score
Level Instrument		See wet well photos	1 - Good – No defects observed.	1 - Good – Asset functioning as intended.

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Table 4-9. Civil Condition Data				
Asset Name	Field Assessment	Comments	Condition Score	Performance Score
Site civil			1 - Good – No defects observed.	1 - Good – Asset functioning as intended.

Table 4-10. Structural Condition Data					
Asset Name	Material	Field Assessment	Comments	Condition Score	Performance Score
Wet Well	Concrete	Oxidation	None	1 - Good – No defects observed.	1 - Good – Asset functioning as intended.
Valve Vault	Concrete		None	1 - Good – No defects observed.	1 - Good – Asset functioning as intended.
Aluminum Hatch-Vault			None	1 - Good – No defects observed.	1 - Good – Asset functioning as intended.
Aluminum Hatch-Wet Well	Metal		None	1 - Good – No defects observed.	1 - Good – Asset functioning as intended.

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Section 5

Limitations

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Appendix A: Main Lift Station – Mechanical

Main Pump Station-Mech

Created	2020-02-07 16:28:52 PST by Erik Zalkin
Updated	2020-02-20 17:14:36 PST by Hamed Hakimelahi
Location	37.4476, -121.922806
Asset Location	Main Pump Station-Mech

Pig Launcher A, PIG-A

Equipment Data

Mechanical Asset Name	Pig Launcher A
Mechanical Asset Description	36" Pig Launcher
Asset ID	PIG-A
Asset Type	Pig Launcher
Year Installed	2002
Size/Diameter	36
Coated?	Yes
Mechanical Field Assessment	None
Coating Condition	In tact
Mechanical Equipment Photos	





Mechanical Observation Comments	Has never been used

Condition

Mechanical Condition Score	1 - Good – No defects observed.

Performance

Mechanical Performance Score	1 - Good – Asset functioning as intended.

Pig Launcher B, PIG-B

Equipment Data

Mechanical Asset Name	Pig Launcher B
Mechanical Asset Description	36" Pig Launcher
Asset ID	PIG-B
Asset Type	Pig Launcher
Year Installed	2002
Size/Diameter	36
Coated?	Yes
Mechanical Field Assessment	None
Coating Condition	In tact
Mechanical Equipment Photos	





Mechanical Observation Comments	Never been used

Condition

Mechanical Condition Score	1 - Good – No defects observed.

Performance

Mechanical Performance Score	1 - Good – Asset functioning as intended.

Pinch Valve 1

Equipment Data

Mechanical Asset Name	Pinch Valve 1
Mechanical Asset Description	36" Pinch Valve (1 of 3)
Asset Type	Valve
Year Installed	2002
Mechanical Observation Comments	None

Condition

Mechanical Condition Score	NA - Not enough information available.

Performance

Mechanical Performance Score	NA - Not enough information available.

Pinch Valve 2

Equipment Data

Mechanical Asset Name	Pinch Valve 2
Mechanical Asset Description	36" Pinch Valve (2 of 3)
Asset Type	Valve
Year Installed	2002
Mechanical Observation Comments	None

Condition

Mechanical Condition Score	NA - Not enough information available.

Performance

Mechanical Performance Score	NA - Not enough information available.

Pinch Valve 3

Equipment Data

Mechanical Asset Name	Pinch Valve 3
Mechanical Asset Description	36" Pinch Valve (3 of 3)
Asset Type	Valve
Year Installed	2002
Mechanical Observation Comments	None

Condition

Mechanical Condition Score	NA - Not enough information available.

Performance

Mechanical Performance Score	NA - Not enough information available.

Mag Meter (flow meter A)

Equipment Data

Mechanical Asset Name	Mag Meter (flow meter A)
Mechanical Asset Description	24" Magnetic Meter

Asset Type	Flow Meter
Year Installed	2002
Flow Meter Type	Magnetic
Size/Diameter	24"
Coated?	No
Mechanical Field Assessment	Not in Operation
Mechanical Equipment Photos	





Mechanical Observation Comments	None

Condition

Mechanical Condition Score	4 - Poor – Major defects observed. Asset integrity may be compromised.

Performance

Mechanical Performance Score	4 - Poor – In service, but function is highly impaired.

Venturi Meter- Removed in 2008

Equipment Data

Mechanical Asset Name	Venturi Meter- Removed in 2008
Mechanical Asset Description	36" Venturi Meter (taken out)
Asset Type	Flow Meter
Year Installed	1975
Flow Meter Type	Venturi
Size/Diameter	36
Mechanical Observation Comments	None

Condition

Mechanical Condition Score	NA - Not enough information available.

Performance

Mechanical Performance Score	NA - Not enough information available.

Butteryfly Valve

Equipment Data

Mechanical Asset Name	Butteryfly Valve
Mechanical Asset Description	36" Butterfly Valve, FM interconnect
Asset Type	Valve
Year Installed	1970
Mechanical Field Assessment	
Mechanical Observation Comments	Could not find it in the field

Condition

Mechanical Condition Score	NA - Not enough information available.

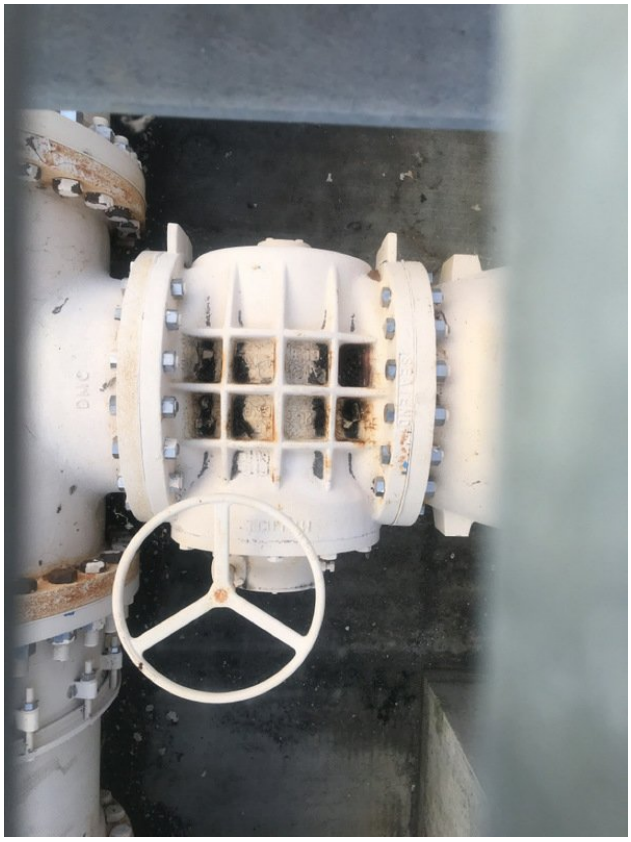
Performance

Mechanical Performance Score	NA - Not enough information available.

Manifold Piping

Equipment Data

Mechanical Asset Name	Manifold Piping
Mechanical Asset Description	36-inch flanged coupling adapter. 36-inch ductile iron 45' MJ x MJ bend. 20-inch or 36-inch FLxPE spool through sleeve with link seal. 36'' x 20'' x 36'' ductile iron tee (force main A)
Asset Type	Piping
Year Installed	2008
Size/Diameter	36
Coated?	Yes

Mechanical Field Assessment	None
Coating Condition	Blistered
Mechanical Equipment Photos	
	







Mechanical Observation Comments	According to staff, the pipes operate well.

Condition

Mechanical Condition Score	2 - Fair – Only minor defects observed.

Performance

Mechanical Performance Score	2 - Fair – In service, but higher than expected O&M.

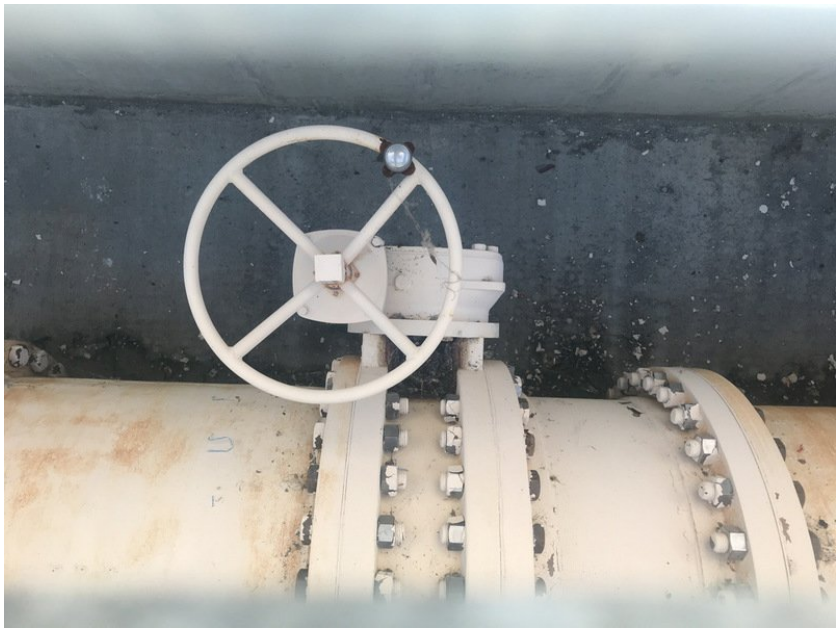
Manifold Piping Butterfly Valve

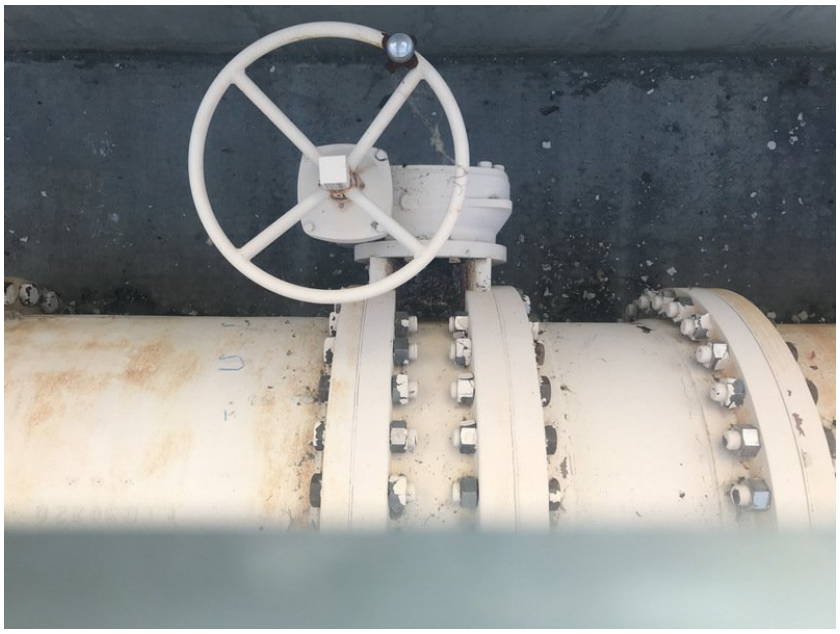
Equipment Data

Mechanical Asset Name	Manifold Piping Butterfly Valve
Mechanical Asset Description	36-inch diameter BFV, middle of manifold
Asset Type	Valve
Year Installed	2008
Control Type	Local
Drive Type	Manual
Valve Type	Butterfly
Size/Diameter	36
Mechanical Field Assessment	None

Mechanical Equipment Photos







Mechanical Observation Comments	None

Condition

Mechanical Condition Score	1 - Good – No defects observed.

Performance

Mechanical Performance Score	1 - Good – Asset functioning as intended.

Manifold Piping Plug Valve #1

Equipment Data

Mechanical Asset Name	Manifold Piping Plug Valve #1
Mechanical Asset Description	36-inch diameter PV, pumps 1, 2, 3
Asset Type	Valve
Year Installed	2008
Drive Type	Manual
Valve Type	Plug
Size/Diameter	36
Mechanical Field Assessment	

Mechanical Equipment Photos	
Mechanical Observation Comments	Pump 1 has not been installed yet

Condition

Mechanical Condition Score	1 - Good – No defects observed.

Performance

Mechanical Performance Score	NA - Not enough information available.

Manifold PV #1 Actuator

Equipment Data

Mechanical Asset Name	Manifold PV #1 Actuator
Mechanical Asset Description	plug valve #1 electric actuator
Asset Type	Actuator
Year Installed	2008
Control Type	Local
Drive Type	Electric
Mechanical Field Assessment	None
Mechanical Equipment Photos	





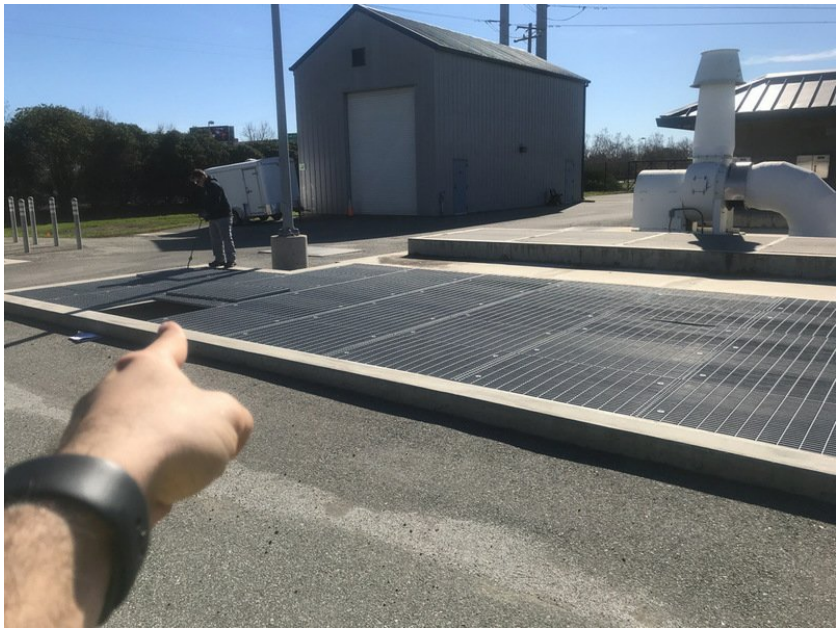












Mechanical Observation Comments	operator has never used this. The operator dont know if the actuator works.

Condition

Mechanical Condition Score	1 - Good – No defects observed.

Performance

Mechanical Performance Score	NA - Not enough information available.

Manifold Piping Plug Valve #2

Equipment Data

Mechanical Asset Name	Manifold Piping Plug Valve #2
Mechanical Asset Description	36-inch diameter PV, pumps 4, 5, 6
Asset Type	Valve

Year Installed	2008
Valve Type	Plug
Size/Diameter	36
Mechanical Field Assessment	None
Mechanical Equipment Photos	
Mechanical Observation Comments	None

Condition

Mechanical Condition Score	2 - Fair – Only minor defects observed.

Performance

Mechanical Performance Score	2 - Fair – In service, but higher than expected O&M.

Manifold PV #2 Actuator

Equipment Data

Mechanical Asset Name	Manifold PV #2 Actuator
Mechanical Asset Description	plug valve #2 electric actuator
Asset Type	Actuator
Year Installed	2008
Control Type	Local
Drive Type	Electric
Mechanical Field Assessment	Does not work.
Mechanical Equipment Photos	






MILLIKEN


MILLIKEN



Mechanical Observation Comments	None

Condition

Mechanical Condition Score	5 - Failing or Failed – Asset integrity is compromised. Asset may be out of service.

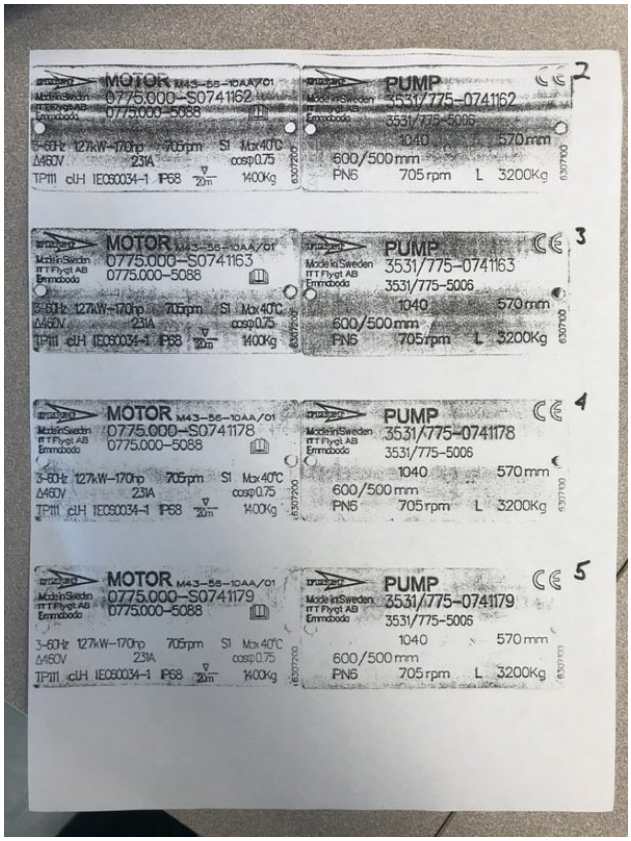
Performance

Mechanical Performance Score	5 - Failing or Failed – Asset is not functioning as intended or is out of service.

Pump #2

Equipment Data

Mechanical Asset Name	Pump #2
Mechanical Asset Description	FLYGT CP3531-775, 170HP Submersible Pump
Asset Type	Pump
Year Installed	2008
Pump Type	Submersible
Mechanical Field Assessment	None
Mechanical Equipment Photos	


MOTOR M43-5S-10AA/01
0775.000-S0741162
0775.000-5088
3~60Hz 127kW-170hp 705rpm SI Max40°C
Δ460V 231A cosφ0.75
TP111 cl.H IEC60034-1 IP68 20m 1400Kg
PUMP
Made in Sweden
ITT Flygt AB
Emmaboda
3531/775-0741162
3531/775-5006
1040 570mm
600/500mm
PN6 705rpm L 3200Kg
2
MOTOR M43-5S-10AA/01
0775.000-S0741163
0775.000-5088
PUMP
3531/775-0741163
3531/775-5006
3
MOTOR M43-5S-10AA/01
0775.000-S0741178
0775.000-5088
PUMP
3531/775-0741178
3531/775-5006
4
MOTOR M43-5S-10AA/01
0775.000-S0741179
0775.000-5088
PUMP
3531/775-0741179
3531/775-5006
5


IR INSPECTION
PUMP 2
VFD
LEAD "A"
SPEED
werFlex
VFD #2



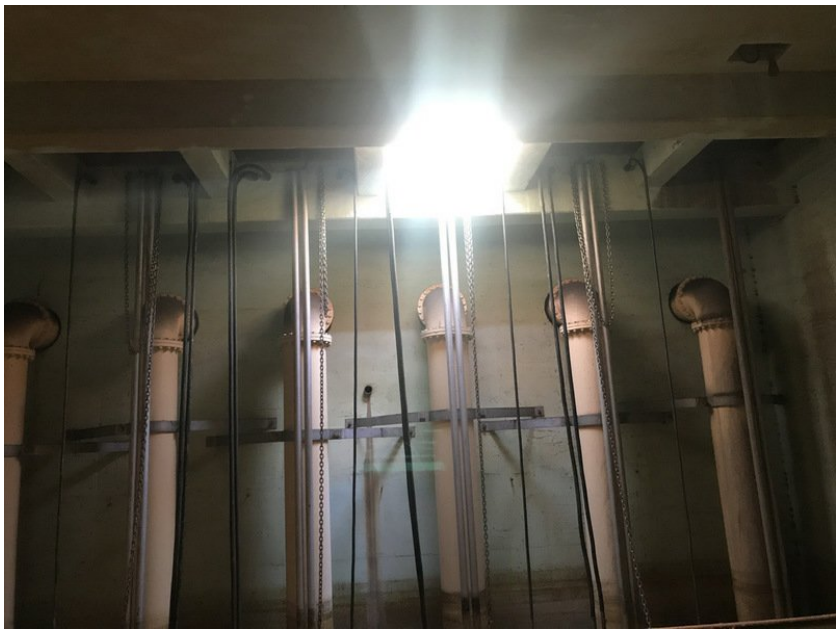





CAUTION
THIS MACHINE
STARTS AND STOPS
AUTOMATICALLY







Mechanical Observation Comments	Rebuilt 1.5 yeara ago

Condition

Mechanical Condition Score	1 - Good – No defects observed.

Performance

Mechanical Performance Score	1 - Good – Asset functioning as intended.

Pump #2 Piping

Equipment Data

Mechanical Asset Name	Pump #2 Piping
Mechanical Asset Description	20-Inch Ductile Iron Vertical Discharge Pipe, 20-Inch Ductile Iron 90 Elbow, 20-Inch Flanged Coupling Adapter
Asset Type	Piping
Year Installed	2008
Size/Diameter	20"
Coated?	Yes
Mechanical Field Assessment	None
Coating Condition	In tact
Mechanical Observation Comments	None

Condition

Mechanical Condition Score	2 - Fair – Only minor defects observed.

Performance

Mechanical Performance Score	2 - Fair – In service, but higher than expected O&M.

Pump #2 Check Valve

Equipment Data

Mechanical Asset Name	Pump #2 Check Valve

Mechanical Asset Description	20-Inch Diameter Spring Loaded Check Valve
Asset Type	Valve
Year Installed	2008
Valve Type	Check
Size/Diameter	20
Mechanical Field Assessment	None
Mechanical Equipment Photos	









Mechanical Observation Comments	None

Condition

Mechanical Condition Score	2 - Fair – Only minor defects observed.

Performance

Mechanical Performance Score	1 - Good – Asset functioning as intended.

Pump #2 Plug Valve

Equipment Data

Mechanical Asset Name	Pump #2 Plug Valve
Mechanical Asset Description	20-Inch Diameter Plug Valve
Asset Type	Valve
Year Installed	2008
Control Type	Local
Valve Type	Plug
Size/Diameter	20

Mechanical Equipment Photos	
	
Mechanical Observation Comments	None

Condition

Mechanical Condition Score	1 - Good – No defects observed.

Performance

Mechanical Performance Score	1 - Good – Asset functioning as intended.

Pump #3

Equipment Data

Mechanical Asset Name	Pump #3
Mechanical Asset Description	FLYGT CP3531-775, 170HP Submersible Pump
Asset Type	Pump
Year Installed	2008
Pump Type	Submersible
Mechanical Field Assessment	passed life limit
Mechanical Equipment Photos	



Mechanical Observation Comments	It has 50,000 hours on it. Should be replaced.

Condition

Mechanical Condition Score	4 - Poor – Major defects observed. Asset integrity may be compromised.

Performance

Mechanical Performance Score	4 - Poor – In service, but function is highly impaired.

Pump #3 Piping

Equipment Data

Mechanical Asset Name	Pump #3 Piping
Mechanical Asset Description	20-Inch Ductile Iron Vertical Discharge Pipe, 20-Inch Ductile Iron 90 Elbow, 20-Inch Flanged Coupling Adapter
Asset Type	Piping
Year Installed	2008
Size/Diameter	20"
Coated?	Yes
Mechanical Field Assessment	None
Coating Condition	In tact

Mechanical Equipment Photos	
Mechanical Observation Comments	None

Condition

Mechanical Condition Score	2 - Fair – Only minor defects observed.

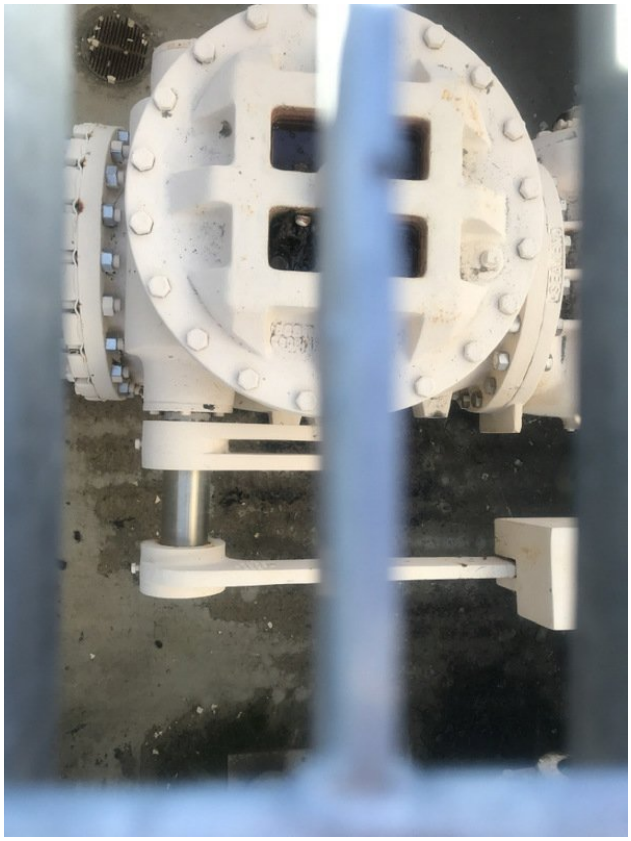
Performance

Mechanical Performance Score	2 - Fair – In service, but higher than expected O&M.

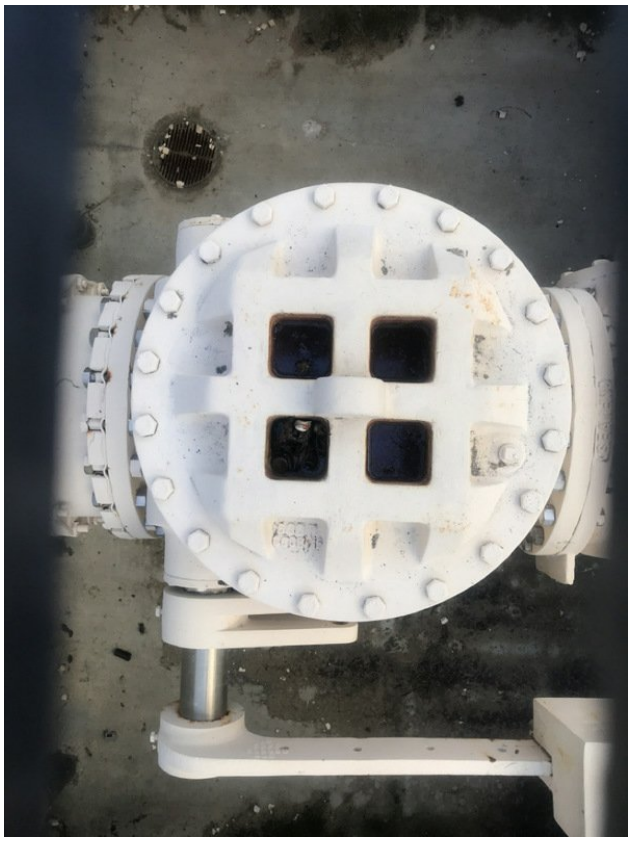
Pump #3 Check Valve

Equipment Data

Mechanical Asset Name	Pump #3 Check Valve
Mechanical Asset Description	20-Inch Diameter Spring Loaded Check Valve
Asset Type	Valve
Year Installed	2008
Size/Diameter	20"
Mechanical Field Assessment	None
Mechanical Equipment Photos	







Mechanical Observation Comments	None

Condition

Mechanical Condition Score	2 - Fair – Only minor defects observed.

Performance

Mechanical Performance Score	1 - Good – Asset functioning as intended.

Pump #3 Plug Valve

Equipment Data

Mechanical Asset Name	Pump #3 Plug Valve
Mechanical Asset Description	20-Inch Diameter Plug Valve
Asset Type	Valve
Year Installed	2008
Valve Type	Plug
Size/Diameter	20"

Mechanical Equipment Photos	
Mechanical Observation Comments	None

Condition

Mechanical Condition Score	2 - Fair – Only minor defects observed.

Performance

Mechanical Performance Score	1 - Good – Asset functioning as intended.

Pump #4

Equipment Data

Mechanical Asset Name	Pump #4
Mechanical Asset Description	FLYGT CP3531-775, 170HP Submersible Pump
Asset Type	Pump
Year Installed	2008
Pump Type	Submersible
Mechanical Field Assessment	None

Mechanical Equipment Photos	 
Mechanical Observation Comments	None

Condition

Mechanical Condition Score	1 - Good – No defects observed.

Performance

Mechanical Performance Score	1 - Good – Asset functioning as intended.

Pump #4 Piping

Equipment Data

Mechanical Asset Name	Pump #4 Piping
Mechanical Asset Description	20-Inch Ductile Iron Vertical Discharge Pipe, 20-Inch Ductile Iron 90 Elbow, 20-Inch Flanged Coupling Adapter
Asset Type	Piping
Year Installed	2008
Size/Diameter	20"
Coated?	Yes
Mechanical Field Assessment	None
Coating Condition	In tact
Mechanical Equipment Photos	
Mechanical Observation Comments	None

Condition

Mechanical Condition Score	2 - Fair – Only minor defects observed.

Performance

Mechanical Performance Score	2 - Fair – In service, but higher than expected O&M.

Pump #4 Check Valve

Equipment Data

Mechanical Asset Name	Pump #4 Check Valve
Mechanical Asset Description	20-Inch Diameter Spring Loaded Check Valve
Asset Type	Valve
Year Installed	2008
Valve Type	Check
Size/Diameter	20"
Mechanical Field Assessment	None
Mechanical Observation Comments	None

Condition

Mechanical Condition Score	2 - Fair – Only minor defects observed.

Performance

Mechanical Performance Score	1 - Good – Asset functioning as intended.

Pump #4 Plug Valve

Equipment Data

Mechanical Asset Name	Pump #4 Plug Valve
Mechanical Asset Description	20-Inch Diameter Plug Valve
Asset Type	Valve
Year Installed	2008
Valve Type	Plug
Size/Diameter	20
Mechanical Observation Comments	None

Condition

Mechanical Condition Score	2 - Fair – Only minor defects observed.

Performance

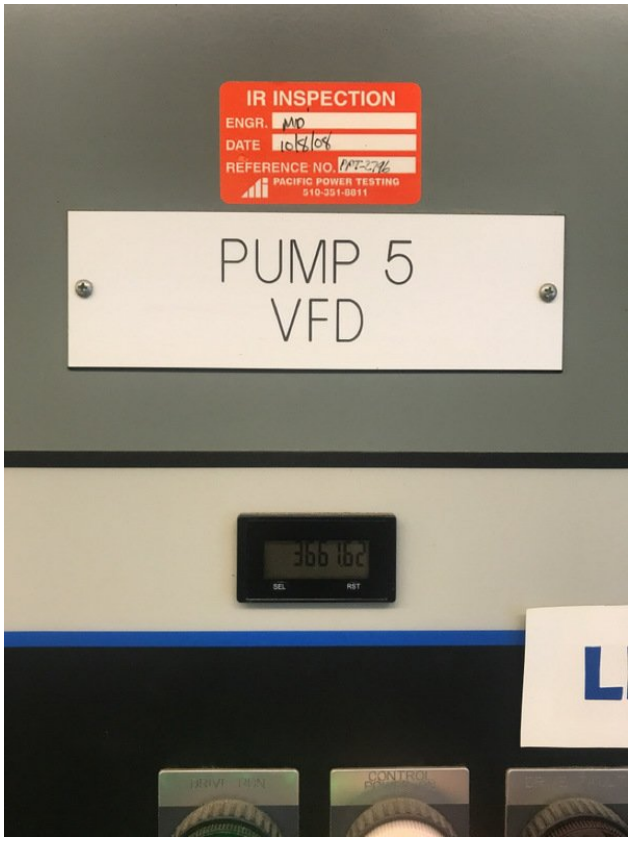
Mechanical Performance Score	1 - Good – Asset functioning as intended.

Pump #5 (not installed yet)

Equipment Data

Mechanical Asset Name	Pump #5 (not installed yet)
Mechanical Asset Description	FLYGT CP3531-775, 170HP Submersible Pump
Asset Type	Pump

Mechanical Equipment Photos





Mechanical Observation Comments	None

Pump #5 Piping

Equipment Data

Mechanical Asset Name	Pump #5 Piping
Mechanical Asset Description	20-Inch Ductile Iron Vertical Discharge Pipe, 20-Inch Ductile Iron 90 Elbow, 20-Inch Flanged Coupling Adapter
Asset Type	Piping

Year Installed	2008
Mechanical Field Assessment	None
Mechanical Observation Comments	The piping is not being used,

Condition

Mechanical Condition Score	1 - Good – No defects observed.

Performance

Mechanical Performance Score	NA - Not enough information available.

Pump #5 Check Valve

Equipment Data

Mechanical Asset Name	Pump #5 Check Valve
Mechanical Asset Description	20-Inch Diameter Spring Loaded Check Valve
Asset Type	Valve
Year Installed	2008
Mechanical Observation Comments	Not being used,

Condition

Mechanical Condition Score	1 - Good – No defects observed.

Performance

Mechanical Performance Score	NA - Not enough information available.

Pump #5 Plug Valve

Equipment Data

Mechanical Asset Name	Pump #5 Plug Valve
Mechanical Asset Description	20-Inch Diameter Plug Valve
Asset Type	Valve
Year Installed	2008
Mechanical Observation Comments	Not being used

Condition

Mechanical Condition Score	1 - Good – No defects observed.

Performance

Mechanical Performance Score	NA - Not enough information available.

Main Head Gate

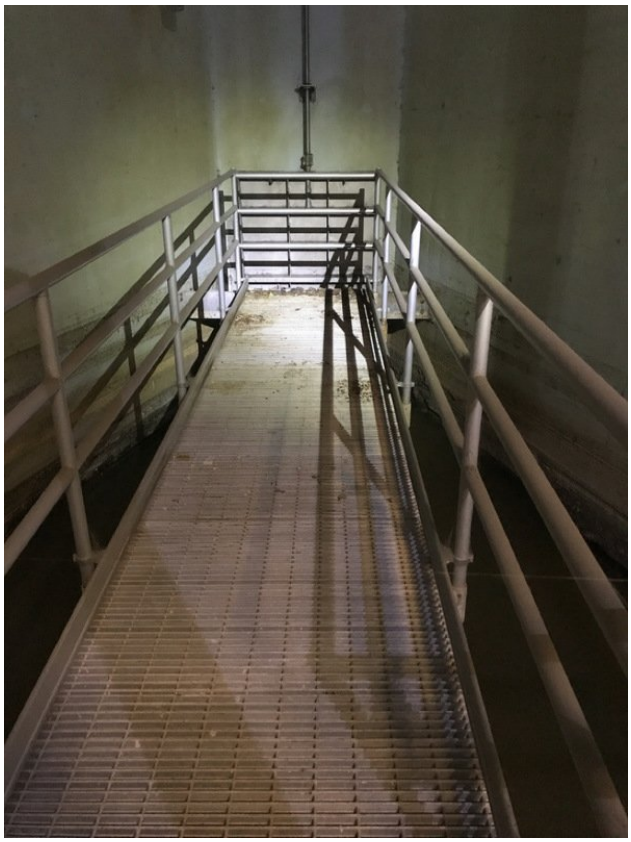
Equipment Data

Mechanical Asset Name	Main Head Gate
Mechanical Asset Description	54-inch sluice gate with manual actuator
Asset Type	Gate
Year Installed	2008
Control Type	Local
Drive Type	Manual

Gate Type	Sluice
Size/Diameter	54"
Mechanical Field Assessment	None
Mechanical Equipment Photos	











Mechanical Observation Comments	None

Condition

Mechanical Condition Score	1 - Good – No defects observed.

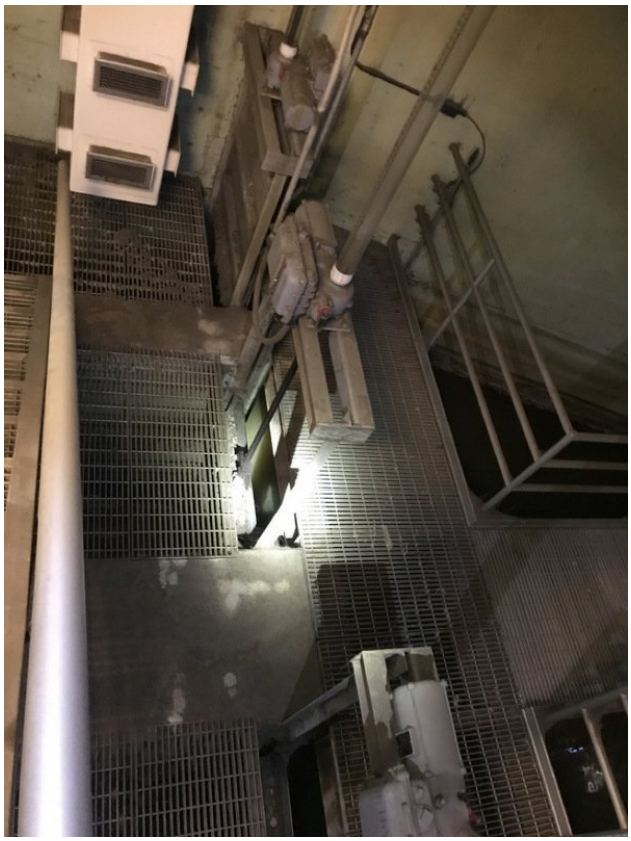
Performance

Mechanical Performance Score	1 - Good – Asset functioning as intended.

Head Gate #1

Equipment Data

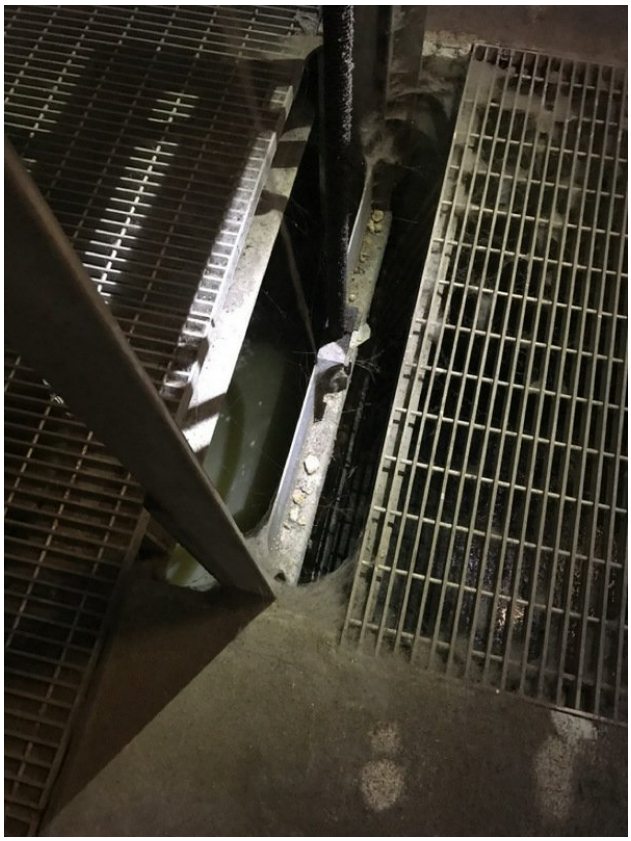
Mechanical Asset Name	Head Gate #1
Mechanical Asset Description	48-inch sluice gate with electric actuator
Asset Type	Gate
Year Installed	2008
Control Type	Local
Drive Type	Electric
Gate Type	Sluice
Size/Diameter	48"
Mechanical Field Assessment	None
Mechanical Equipment Photos	






WARNING
THIS MACHINE IS AUTOMATICALLY CONTROLLED
IT MAY START AT ANY TIME


CONTROLS
WARNING
IT MAY START AT ANY TIME




EIM
CONTROLS
OPEN
OFF ON





Mechanical Observation Comments	None

Condition

Mechanical Condition Score	1 - Good – No defects observed.

Performance

Mechanical Performance Score	1 - Good – Asset functioning as intended.

Head Gate #2

Equipment Data

Mechanical Asset Name	Head Gate #2
Mechanical Asset Description	48-inch sluice gate with electric actuator
Asset Type	Gate
Year Installed	2008
Control Type	Local
Drive Type	Electric
Gate Type	Sluice
Size/Diameter	48
Mechanical Field Assessment	None
Mechanical Equipment Photos	
Mechanical Observation Comments	None

Condition

Mechanical Condition Score	1 - Good – No defects observed.

Performance

Mechanical Performance Score	1 - Good – Asset functioning as intended.

Head Gate #3

Equipment Data

Mechanical Asset Name	Head Gate #3
Mechanical Asset Description	48-inch sluice gate with electric actuator
Asset Type	Gate
Year Installed	2008
Control Type	Local
Drive Type	Electric
Gate Type	Sluice
Size/Diameter	48
Mechanical Field Assessment	None
Mechanical Observation Comments	None

Condition

Mechanical Condition Score	1 - Good – No defects observed.

Performance

Mechanical Performance Score	1 - Good – Asset functioning as intended.

Head Gate #4

Equipment Data

Mechanical Asset Name	Head Gate #4
Mechanical Asset Description	48-inch sluice gate with electric actuator
Asset Type	Gate
Year Installed	2008
Control Type	Local
Drive Type	Electric
Gate Type	Sluice
Size/Diameter	48
Mechanical Field Assessment	None

Mechanical Equipment Photos	 
Mechanical Observation Comments	None

Condition

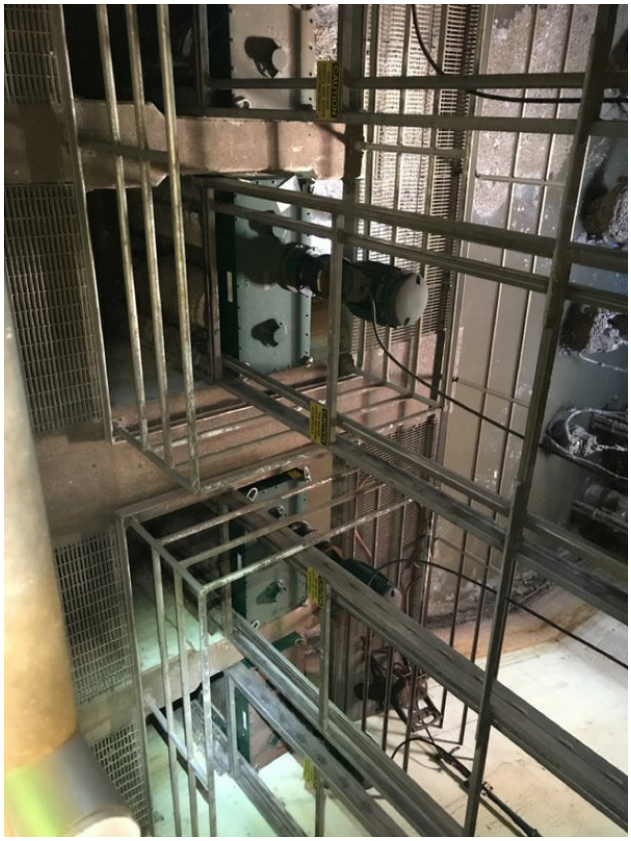
Mechanical Condition Score	1 - Good – No defects observed.

Performance

Mechanical Performance Score	1 - Good – Asset functioning as intended.

Grinder #1

Equipment Data

Mechanical Asset Name	Grinder #1
Mechanical Asset Description	5-hp electric driven
Asset Type	Grinder
Year Installed	2008
Control Type	Local
Drive Type	Electric
Mechanical Field Assessment	Excessive Vibration, Inadequate Supports
Mechanical Equipment Photos	









Mechanical Observation Comments	None

Condition

Mechanical Condition Score	5 - Failing or Failed – Asset integrity is compromised. Asset may be out of service.

Performance

Mechanical Performance Score	5 - Failing or Failed – Asset is not functioning as intended or is out of service.

Grinder #2

Equipment Data

Mechanical Asset Name	Grinder #2
Mechanical Asset Description	10-hp electric driven
Asset Type	Grinder

Year Installed	2008
Control Type	Local
Drive Type	Electric
Mechanical Field Assessment	None

Mechanical Equipment Photos	
	
Mechanical Observation Comments	None

Condition

Mechanical Condition Score	1 - Good – No defects observed.

Performance

Mechanical Performance Score	1 - Good – Asset functioning as intended.

Grinder #3

Equipment Data

Mechanical Asset Name	Grinder #3
Mechanical Asset Description	10-hp electric driven
Asset Type	Grinder
Year Installed	2008
Control Type	Local
Drive Type	Electric
Mechanical Field Assessment	None
Mechanical Observation Comments	None

Condition

Mechanical Condition Score	1 - Good – No defects observed.

Performance

Mechanical Performance Score	1 - Good – Asset functioning as intended.

Grinder #4

Equipment Data

Mechanical Asset Name	Grinder #4
Mechanical Asset Description	5-hp electric driven
Asset Type	Grinder
Year Installed	2008
Control Type	Local
Drive Type	Electric
Mechanical Field Assessment	None
Mechanical Observation Comments	None

Condition

Mechanical Condition Score	1 - Good – No defects observed.

Performance

Mechanical Performance Score	1 - Good – Asset functioning as intended.

Air Supply Fan

Equipment Data

Mechanical Asset Name	Air Supply Fan
Mechanical Asset Description	PS ventilation system
Asset Type	Fan
Year Installed	2008

Mechanical Equipment Photos



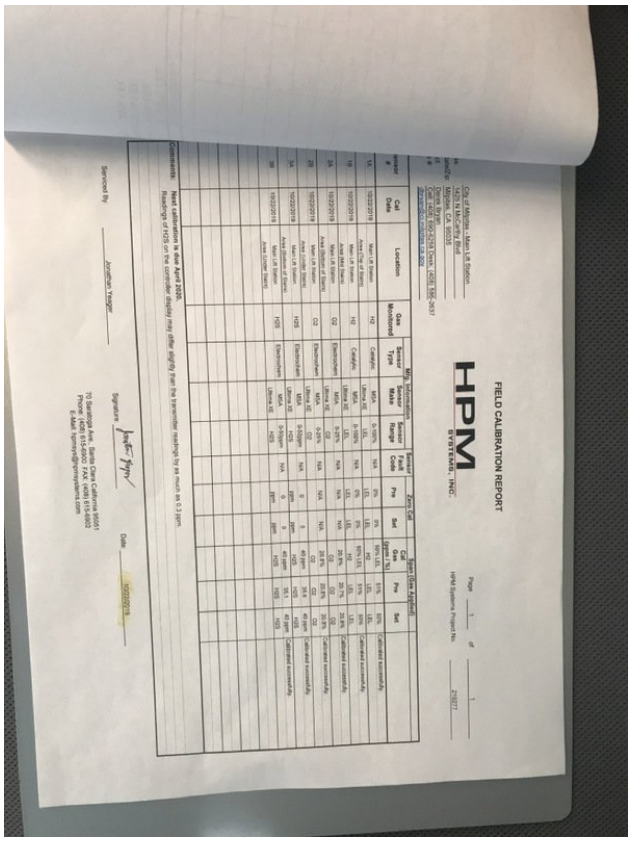









LEL %
OXY %
H2S
110/220V. AC POWER
HORN/ALARM ACKNOWLEDGE
WET WELL AIR MONITORING
MSA
MODEL 5300
MONITOR


FIELD CALIBRATION REPORT

HPM

Mechanical Observation Comments	None

Condition

Mechanical Condition Score	1 - Good – No defects observed.

Performance

Mechanical Performance Score	1 - Good – Asset functioning as intended.

Exhause Fan & Stack

Equipment Data

Mechanical Asset Name	Exhause Fan & Stack
Mechanical Asset Description	PS ventilation system
Asset Type	Fan
Year Installed	2008

Mechanical Equipment Photos













Mechanical Observation Comments	None

Condition

Mechanical Condition Score	1 - Good – No defects observed.

Performance

Mechanical Performance Score	2 - Fair – In service, but higher than expected O&M.

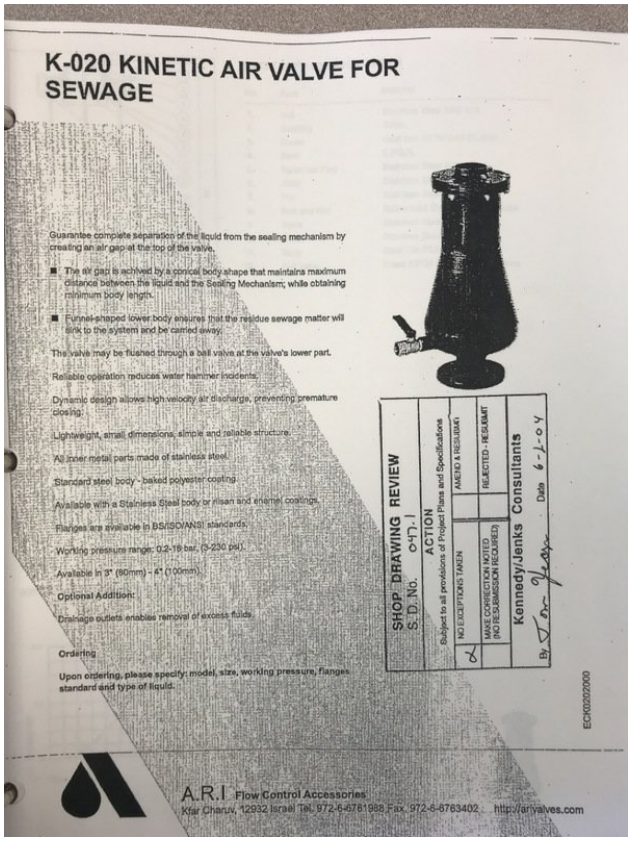
Miscellaneous

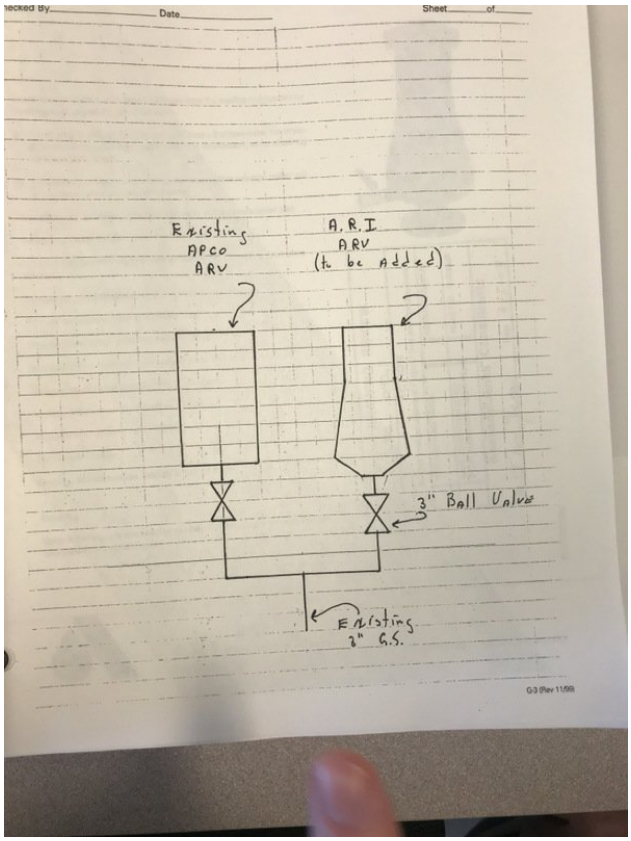
Equipment Data

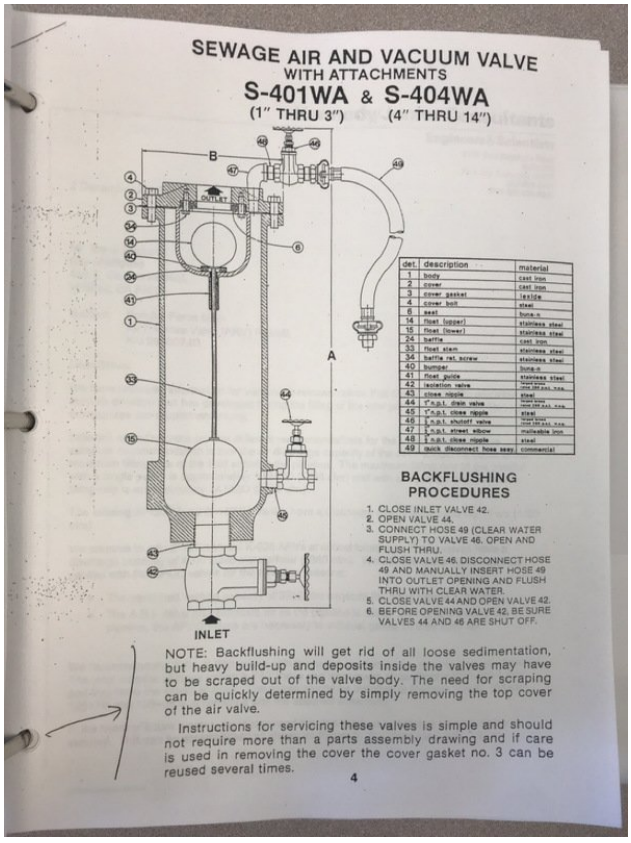
Mechanical Asset Name	Miscellaneous
Mechanical Asset Description	Pipe support, 5' x 7' aluminum hatch, galv grating, 3'' SS guide rail, 4-inch diameter PVC drain, pipe wall anchor bracket
Mechanical Observation Comments	None

2” combo air/vac valve

Equipment Data

Mechanical Asset Name	2” combo air/vac valve
Mechanical Equipment Photos	





SEWAGE AIR AND VACUUM VALVE
WITH ATTACHMENTS
S-401WA & S-404WA
(1" THRU 3") (4" THRU 14")

det.	description	material
1	body	cast iron
2	cover	cast iron
3	cover gasket	rexlite
4	cover bolt	steel
6	seat	buna-n
14	float (upper)	stainless steel
15	float (lower)	stainless steel
24	baffle	cast iron
33	float stem	stainless steel
34	baffle ret. screw	stainless steel
40	bumper	buna-n
41	float guide	stainless steel
42	isolation valve	
43	close nipple	steel
44	1" n.p.t. drain valve	
45	1" n.p.t. close nipple	steel
46	¼ n.p.t. shutoff valve	
47	¼ n.p.t. street elbow	malleable iron
48	¼ n.p.t. close nipple	steel
49	quick disconnect hose assy.	commercial

BACKFLUSHING PROCEDURES

1. CLOSE INLET VALVE 42.
2. OPEN VALVE 44.
3. CONNECT HOSE 49 (CLEAR WATER SUPPLY) TO VALVE 46. OPEN AND FLUSH THRU.
4. CLOSE VALVE 46. DISCONNECT HOSE 49 AND MANUALLY INSERT HOSE 49 INTO OUTLET OPENING AND FLUSH THRU WITH CLEAR WATER.
5. CLOSE VALVE 44 AND OPEN VALVE 42.
6. BEFORE OPENING VALVE 42, BE SURE VALVES 44 AND 46 ARE SHUT OFF.

INLET

NOTE: Backflushing will get rid of all loose sedimentation, but heavy build-up and deposits inside the valves may have to be scraped out of the valve body. The need for scraping can be quickly determined by simply removing the top cover of the air valve.

Instructions for servicing these valves is simple and should not require more than a parts assembly drawing and if care is used in removing the cover the cover gasket no. 3 can be reused several times.

4

Mechanical Observation Comments	None

Condition

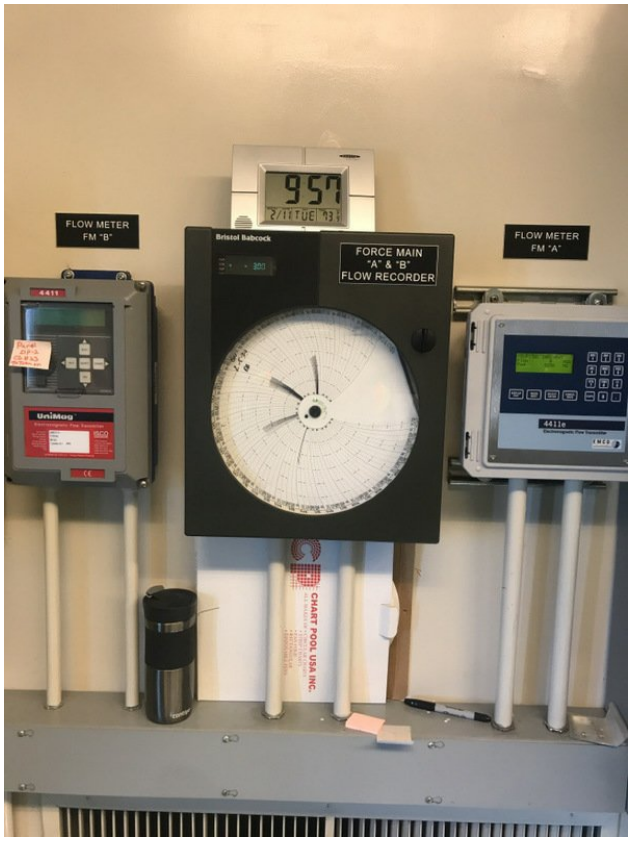
Mechanical Condition Score	4 - Poor – Major defects observed. Asset integrity may be compromised.

Performance

Mechanical Performance Score	4 - Poor – In service, but function is highly impaired.

Force Main A B Flow Recorder

Equipment Data

Mechanical Asset Name	Force Main A B Flow Recorder
Mechanical Equipment Photos	
Mechanical Observation Comments	None

Condition

Mechanical Condition Score	1 - Good – No defects observed.

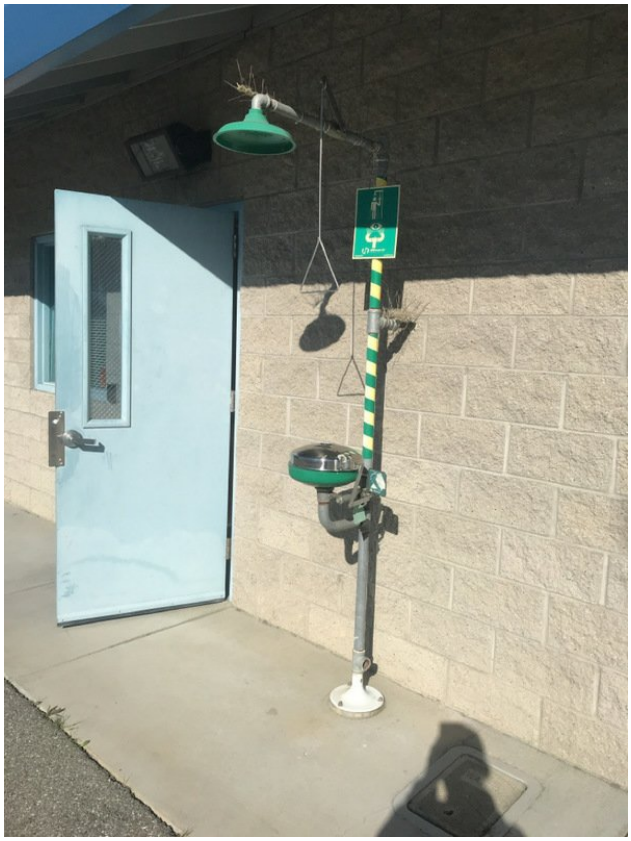
Performance

Mechanical Performance Score	1 - Good – Asset functioning as intended.

Eye wash

Equipment Data

Mechanical Asset Name	Eye wash
Mechanical Equipment Photos	





Mechanical Observation Comments	None

Condition

Mechanical Condition Score	1 - Good – No defects observed.

Performance

Mechanical Performance Score	1 - Good – Asset functioning as intended.

Flow Meter B

Equipment Data

Mechanical Asset Name	Flow Meter B
Mechanical Asset Description	This is for force main B
Mechanical Field Assessment	It works but the operation is not accurate.
Mechanical Equipment Photos	







Mechanical Observation Comments	None

Condition

Mechanical Condition Score	4 - Poor – Major defects observed. Asset integrity may be compromised.

Performance

Mechanical Performance Score	4 - Poor – In service, but function is highly impaired.

Air vac 1 to 15

Equipment Data

Mechanical Asset Name	Air vac 1 to 15
Mechanical Asset Description	All across the pump station.
Mechanical Field Assessment	Cavitation, Coating Failure, Inadequate Supports

Mechanical Equipment Photos









Mechanical Observation Comments	None

Condition

Mechanical Condition Score	5 - Failing or Failed – Asset integrity is compromised. Asset may be out of service.

Performance

Mechanical Performance Score	5 - Failing or Failed – Asset is not functioning as intended or is out of service.

Appendix B: Main Lift Station – Electrical

Main Pump Station-Elec

Created	2020-02-07 23:14:55 UTC by Erik Zalkin
Updated	2020-02-22 00:03:47 UTC by Sundara Palani
Location	37.44755, -121.922864
Asset Location	Main Pump Station-Elec

Main Transformer

Electrical Asset Name	Main Transformer
Electrical Asset Description	1000 kVA, 12 kV-480 V, 3-ph (PG&E)
Electrical Asset Type	Transformer
Year Installed	2000

Electrical Equipment

Electrical Equipment Observations

Age	20
Manufacturer	PG&E
Electrical Enclosure Condition	Good Condition
Electrical Heat Release	Normal
Electrical Arcflash Labels	N/A
Electrical Equipment Photos	







Electrical Equipment Observations	No defects noted
Electrical Equipment Condition Score	1 - Excellent
Electrical Equipment Performance Score	1 - Component Functioning as Intended

Outdoor Utility Disconnect and Metering Panel

Electrical Asset Name	Outdoor Utility Disconnect and Metering Panel
Electrical Asset Description	Outdoor NEMA 3R Enclosure
Electrical Asset Type	Panel
Year Installed	2000

Electrical Equipment

Electrical Equipment Observations

Age	20 Years
Manufacturer	Eaton
Electrical Enclosure Condition	Good Condition
Electrical Heat Release	Normal
Electrical Arcflash Labels	Missing

Electrical Equipment Photos




WARNING
E·T·N




EATON





Electrical Equipment Observations	No Corrosion Noted
Electrical Equipment Condition Score	1 - Excellent
Electrical Equipment Performance Score	1 - Component Functioning as Intended

Main Switchgear

Electrical Asset Name	Main Switchgear
Electrical Asset Description	Located in Existing Generator Building
Electrical Asset Type	Switchgear
Year Installed	2000

Electrical Equipment

Electrical Equipment Observations

Age	20 Years
Manufacturer	RSE- SIERRA
Electrical Enclosure Condition	Good Condition
Electrical Heat Release	Normal
Electrical Arcflash Labels	Missing
Number of Available Spares and Spaces	Two Space available
Electrical Equipment Photos	



Electrical Equipment Observations	No Corrosion Noted
Electrical Equipment Condition Score	1 - Excellent
Electrical Equipment Performance Score	1 - Component Functioning as Intended

Variable Frequency Drive P2

Electrical Asset Name	Variable Frequency Drive P2
Electrical Asset Description	VFD for Pump 2 (170 HP)
Electrical Asset Type	Variable Freq Drive
Year Installed	2008

Electrical Equipment

Electrical Equipment Observations

Age	12 years
Manufacturer	Allen Bradley
Model	Power Flex 700 Series
Electrical Enclosure Condition	Good Condition
Electrical Heat Release	Normal
Electrical Arcflash Labels	Missing

Electrical Equipment Photos


Allen-Bradley
PowerFlex


Allen-Bradley
LEAD "A"
PowerFlex




Allen-Bradley
LAC "A"
PowerFlex





Electrical Equipment Observations	No Corrosion Noted
Electrical Equipment Condition Score	4 - Integrity of Component Moderately Compromised
Electrical Equipment Performance Score	2 - In-Service, but Higher than Expected O&M

Variable Frequency Drive P3

Electrical Asset Name	Variable Frequency Drive P3
Electrical Asset Description	VFD for Pump 3 (170 HP)
Electrical Asset Type	Variable Freq Drive
Year Installed	2008

Electrical Equipment

Electrical Equipment Observations

Age	12 Years
Manufacturer	Allen Bradley
Model	Power Flex 700 Series
Electrical Enclosure Condition	Good Condition
Electrical Heat Release	Normal
Electrical Arcflash Labels	Missing
Number of Available Spares and Spaces	Not Applicable
Electrical Equipment Observations	No Corrosion Noted. Understood from City that IGBT was replaced a year ago.
Electrical Equipment Condition Score	4 - Integrity of Component Moderately Compromised
Electrical Equipment Performance Score	2 - In-Service, but Higher than Expected O&M

Variable Frequency Drive P4

Electrical Asset Name	Variable Frequency Drive P4
Electrical Asset Description	VFD for Pump 4 (170 HP)
Electrical Asset Type	Variable Freq Drive
Year Installed	2008

Electrical Equipment

Electrical Equipment Observations

Age	12 Years
Manufacturer	Allen Bradley
Model	Power Flex 700 Series
Electrical Enclosure Condition	Good Condition
Electrical Heat Release	Normal
Electrical Arcflash Labels	Missing
Number of Available Spares and Spaces	NA
Electrical Equipment Observations	No Corrosion Noted
Electrical Equipment Condition Score	4 - Integrity of Component Moderately Compromised
Electrical Equipment Performance Score	2 - In-Service, but Higher than Expected O&M

Variable Frequency Drive P5

Electrical Asset Name	Variable Frequency Drive P5
Electrical Asset Description	VFD for Pump 5 (170 HP)
Electrical Asset Type	Variable Freq Drive
Year Installed	2008

Electrical Equipment

Electrical Equipment Observations

Age	12 Years
Manufacturer	Allen Bradley
Model	Power Flex 700 Series
Electrical Enclosure Condition	Good Condition
Electrical Heat Release	Normal
Electrical Arcflash Labels	Missing
Number of Available Spares and Spaces	NA
Electrical Equipment Observations	No Corrosion Noted. Understood from City that Cooling Fans were replaced year ago
Electrical Equipment Condition Score	4 - Integrity of Component Moderately Compromised
Electrical Equipment Performance Score	2 - In-Service, but Higher than Expected O&M

Local Disconnect for Engine Jacket Water Heater

Electrical Asset Name	Local Disconnect for Engine Jacket Water Heater
Electrical Asset Description	30A/3P
Electrical Asset Type	Switch
Year Installed	2000

Electrical Equipment

Electrical Equipment Observations

Age	20 Years
Electrical Enclosure Condition	Good Condition
Electrical Heat Release	Normal
Electrical Arcflash Labels	NA
Number of Available Spares and Spaces	NA

Electrical Equipment Photos



Electrical Equipment Observations	No Corrosion Noted
Electrical Equipment Condition Score	1 - Excellent
Electrical Equipment Performance Score	1 - Component Functioning as Intended

Motor Control Center 2

Electrical Asset Name	Motor Control Center 2
Electrical Asset Description	600 A, 480 V, 3-ph, 3W, 65000 AIC
Asset ID	MCC-2
Electrical Asset Type	Motor Control Center
Year Installed	2000

Electrical Equipment

Electrical Equipment Observations

Age	20 Years
Manufacturer	Eaton
Model	Freedom Series 2100
Electrical Enclosure Condition	Good Condition
Electrical Heat Release	Normal
Electrical Arcflash Labels	Missing
Number of Available Spares and Spaces	Spaces available

Electrical Equipment Photos	
Electrical Equipment Observations	No Corrosion Noted.
Electrical Equipment Condition Score	1 - Excellent
Electrical Equipment Performance Score	1 - Component Functioning as Intended

Motor Control Center 2A

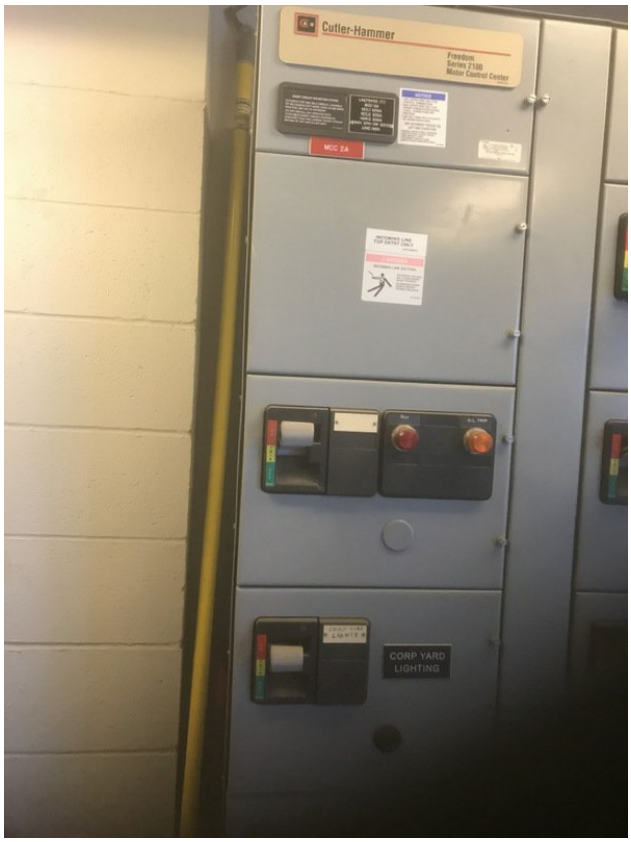
Electrical Asset Name	Motor Control Center 2A
Electrical Asset Description	600 A, 480 V, 3-ph, 3W, 65000 AIC
Asset ID	MCC-2A
Electrical Asset Type	Motor Control Center
Year Installed	2000

Electrical Equipment

Electrical Equipment Observations

Age	20 Years
Manufacturer	Eaton
Model	Freedom 2100 Series
Electrical Enclosure Condition	Good Condition
Electrical Heat Release	Normal
Electrical Arcflash Labels	Missing
Number of Available Spares and Spaces	Spaces Available
Electrical Equipment Photos	





Electrical Equipment Observations	No Corrosion Noted
Electrical Equipment Condition Score	1 - Excellent
Electrical Equipment Performance Score	1 - Component Functioning as Intended

Dry Type Transformer

Electrical Asset Name	Dry Type Transformer
Electrical Asset Description	30 kVA, 480-208/120 V, Dry Type
Electrical Asset Type	Transformer
Year Installed	2008

Electrical Equipment

Electrical Equipment Observations

Age	12 Years
Manufacturer	Eaton
Electrical Enclosure Condition	Good Condition
Electrical Heat Release	Normal
Electrical Arcflash Labels	NA
Number of Available Spares and Spaces	NA
Electrical Equipment Photos	
Electrical Equipment Observations	No Corrosion Noted
Electrical Equipment Condition Score	1 - Excellent
Electrical Equipment Performance Score	1 - Component Functioning as Intended

Lighting panel (LP-1)

Electrical Asset Name	Lighting panel (LP-1)
Asset ID	LA
Electrical Asset Type	Panel
Year Installed	2008

Electrical Equipment

Electrical Equipment Observations

Age	12 Years
Manufacturer	Eaton
Electrical Enclosure Condition	Good Condition
Electrical Heat Release	Normal
Electrical Arcflash Labels	Missing
Number of Available Spares and Spaces	10 Spares available
Electrical Equipment Photos	
Electrical Equipment Observations	No Corrosion Noted
Electrical Equipment Condition Score	1 - Excellent
Electrical Equipment Performance Score	1 - Component Functioning as Intended

Dry Type Transformer

Electrical Asset Name	Dry Type Transformer
Electrical Asset Description	30 kVA, 480-208/120 V, Dry Type
Electrical Asset Type	Transformer
Year Installed	2000

Electrical Equipment

Electrical Equipment Observations

Age	20 Years
Manufacturer	GE

Electrical Enclosure Condition	Good Condition
Electrical Heat Release	Normal
Electrical Arcflash Labels	NA
Number of Available Spares and Spaces	NA
Electrical Equipment Photos	
Electrical Equipment Observations	No Corrosion Noted
Electrical Equipment Condition Score	1 - Excellent
Electrical Equipment Performance Score	1 - Component Functioning as Intended

Lighting panel (LA)

Electrical Asset Name	Lighting panel (LA)
Electrical Asset Description	100 A, 1-Ph, 3 Wire
Asset ID	LP-1
Electrical Asset Type	Panel
Year Installed	2000

Electrical Equipment

Electrical Equipment Observations

Age	20 Years
Manufacturer	GE
Electrical Enclosure Condition	Good Condition
Electrical Heat Release	Normal
Electrical Arcflash Labels	Missing
Number of Available Spares and Spaces	10 Spares available

Electrical Equipment Photos





Electrical Equipment Observations	No Corrosion Noted
Electrical Equipment Condition Score	1 - Excellent

Electrical Equipment Performance Score	1 - Component Functioning as Intended

Electrical/Generator Building-Electrical

Electrical Asset Name	Electrical/Generator Building-Electrical
Electrical Asset Type	Building
Year Installed	2000

Electrical Building

Electrical Building Observations

Electrical Conduits	Good Condition
Electrical Pull and Junction Boxes	Good Condition
Electrical Lighting	Outdated Technology
Electrical Building Photos	



Electrical Building Observations	No Corrosion Noted on Conduits and Pull Boxes
Electrical Building Condition Score	1 - Excellent
Electrical Building Performance Score	1 - Component Functioning as Intended

Motor Control Center A

Electrical Asset Name	Motor Control Center A
Electrical Asset Description	400 A, 480 V, 3-ph, 3W, 65000 AIC
Asset ID	MCC-A
Electrical Asset Type	Motor Control Center
Year Installed	2008

Electrical Equipment

Electrical Equipment Observations

Age	12 Years
Manufacturer	Eaton
Model	Freedom 2000 Series
Electrical Heat Release	Normal
Electrical Arcflash Labels	Missing
Number of Available Spares and Spaces	2 Space available
Electrical Equipment Photos	





Electrical Equipment Observations	No Corrosion Noted
Electrical Equipment Condition Score	1 - Excellent
Electrical Equipment Performance Score	1 - Component Functioning as Intended

Motor Control Center B

Electrical Asset Name	Motor Control Center B
Electrical Asset Description	400 A, 480 V, 3-ph, 3W, 65000 AIC
Asset ID	MCC-B
Electrical Asset Type	Motor Control Center
Year Installed	2008

Electrical Equipment

Electrical Equipment Observations

Age	12 Years
Manufacturer	Eaton
Model	Freedom 2000 Series
Electrical Enclosure Condition	Good Condition
Electrical Heat Release	Normal
Electrical Arcflash Labels	Missing
Number of Available Spares and Spaces	3 Spaces available
Electrical Equipment Photos	
Electrical Equipment Observations	No Corrosion Noted
Electrical Equipment Condition Score	1 - Excellent
Electrical Equipment Performance Score	1 - Component Functioning as Intended

Dry Type Transformer

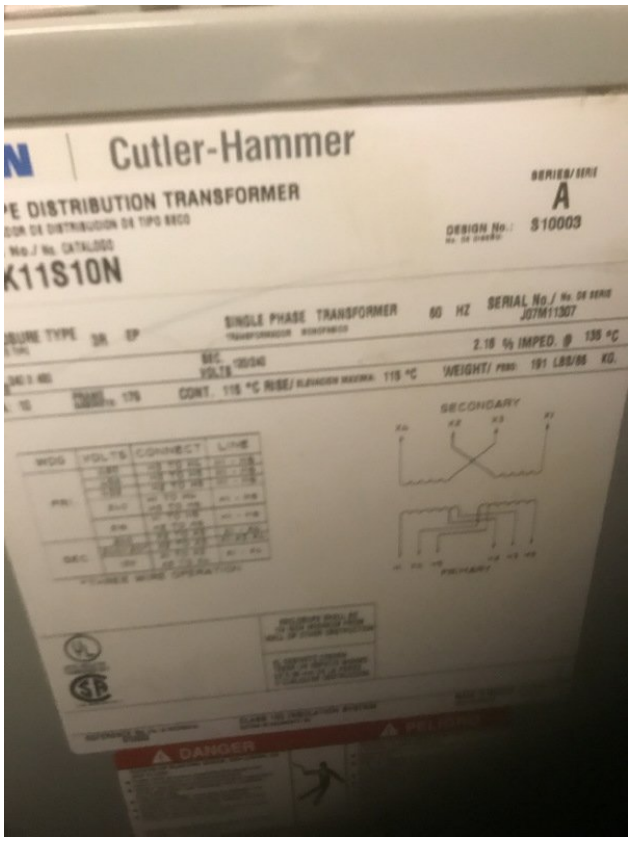
Electrical Asset Name	Dry Type Transformer
Electrical Asset Description	10 kVA, 480-240/120 V, Dry Type

Electrical Asset Type	Transformer
Year Installed	2008

Electrical Equipment

Electrical Equipment Observations

Age	12 Years
Manufacturer	Eaton
Electrical Enclosure Condition	Good Condition
Electrical Heat Release	Normal
Electrical Arcflash Labels	NA
Number of Available Spares and Spaces	NA
Electrical Equipment Photos	



Electrical Equipment Observations	No corrosion Noted
Electrical Equipment Condition Score	1 - Excellent
Electrical Equipment Performance Score	1 - Component Functioning as Intended

Distribution panel(DP-1)

Electrical Asset Name	Distribution panel(DP-1)
Electrical Asset Description	125 A, NEMA Type 1
Asset ID	DP-1
Electrical Asset Type	Panel
Year Installed	2008

Electrical Equipment

Electrical Equipment Observations

Age	12 Years
Manufacturer	Eaton
Electrical Enclosure Condition	Good Condition
Electrical Heat Release	Normal
Electrical Arcflash Labels	Missing
Number of Available Spares and Spaces	15 Spare Breakers available
Electrical Equipment Photos	





Electrical Equipment Observations	No Corrosion Noted
Electrical Equipment Condition Score	1 - Excellent
Electrical Equipment Performance Score	1 - Component Functioning as Intended

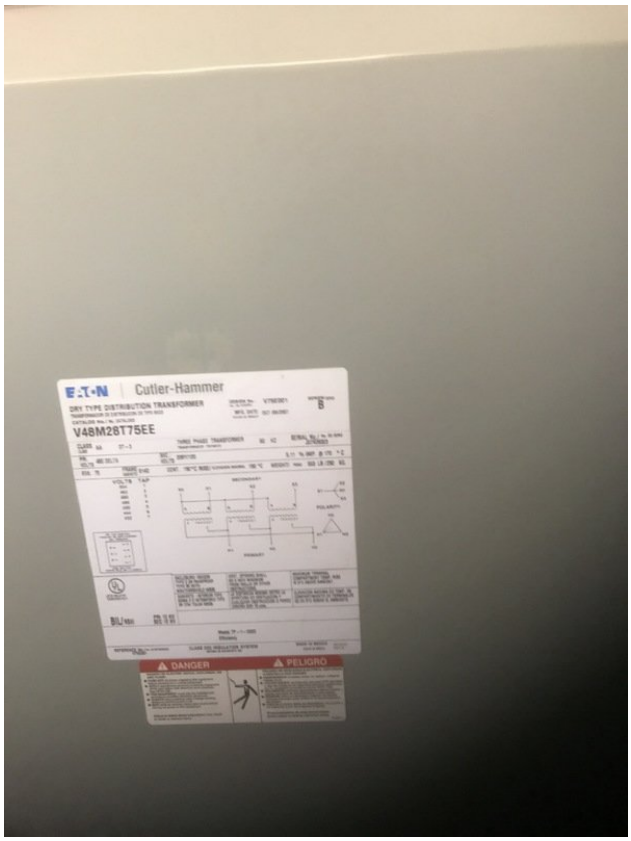
Dry Type Transformer

Electrical Asset Name	Dry Type Transformer
Electrical Asset Description	75 kVA, 480-208/120 V, Dry Type
Electrical Asset Type	Transformer
Year Installed	2008

Electrical Equipment

Electrical Equipment Observations

Age	12 Years
Manufacturer	Eaton
Electrical Enclosure Condition	Good Condition
Electrical Heat Release	Normal
Electrical Arcflash Labels	NA
Number of Available Spares and Spaces	NA
Electrical Equipment Photos	





Electrical Equipment Observations	No Corrosion Noted
Electrical Equipment Condition Score	1 - Excellent
Electrical Equipment Performance Score	1 - Component Functioning as Intended

Distribution Panel (DP-2)

Electrical Asset Name	Distribution Panel (DP-2)
Electrical Asset Description	125 A, NEMA Type 1
Asset ID	DP-2
Electrical Asset Type	Panel
Year Installed	2008

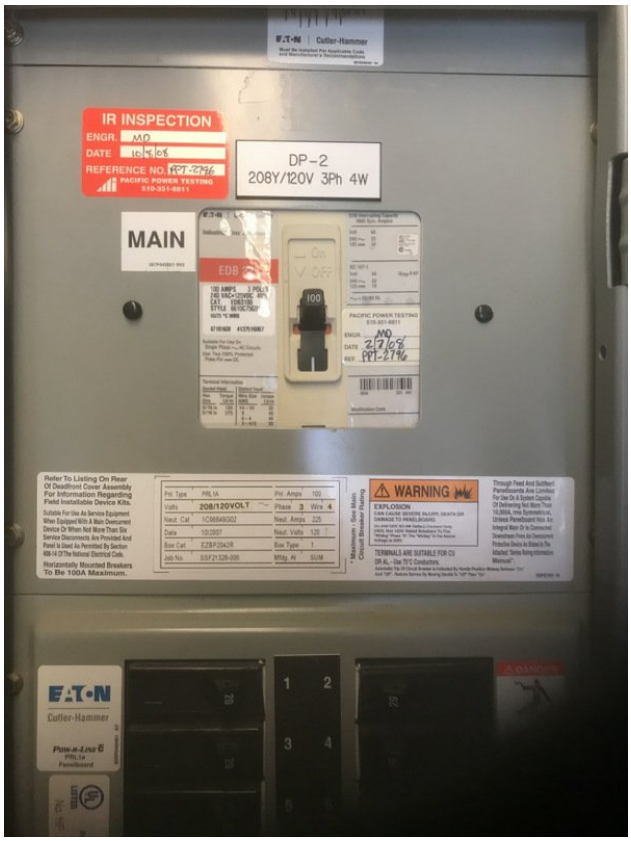
Electrical Equipment

Electrical Equipment Observations

Age	12 Years
Manufacturer	Eaton
Electrical Enclosure Condition	Good Condition
Electrical Heat Release	Normal
Electrical Arcflash Labels	Missing
Number of Available Spares and Spaces	6 Spares available
Electrical Equipment Photos	


DP-2
MAIN
NOTICE


DP-2
NOTICE



Electrical Equipment Observations	No Corrosion Noted
Electrical Equipment Condition Score	1 - Excellent
Electrical Equipment Performance Score	1 - Component Functioning as Intended

Local Control Panel for Grinder#1

Electrical Asset Name	Local Control Panel for Grinder#1
Electrical Asset Description	LCP grinder1
Electrical Asset Type	Panel
Year Installed	2008

Electrical Equipment

Electrical Equipment Observations

Age	12 Years
Electrical Enclosure Condition	Good Condition
Electrical Heat Release	Normal
Electrical Arcflash Labels	Missing
Number of Available Spares and Spaces	NA

Electrical Equipment Photos



Electrical Equipment Observations	No Corrosion Noted
Electrical Equipment Condition Score	1 - Excellent
Electrical Equipment Performance Score	1 - Component Functioning as Intended

Local Control Panel for Grinder#2

Electrical Asset Name	Local Control Panel for Grinder#2
Electrical Asset Description	LCP grinder2
Electrical Asset Type	Panel
Year Installed	2008

Electrical Equipment

Electrical Equipment Observations

Age	12 Years
Electrical Enclosure Condition	Good Condition
Electrical Heat Release	Normal
Electrical Arcflash Labels	Missing
Number of Available Spares and Spaces	NA

Electrical Equipment Photos



Electrical Equipment Observations	No Corrosion Noted
Electrical Equipment Condition Score	1 - Excellent
Electrical Equipment Performance Score	1 - Component Functioning as Intended

Local Control Panel for Grinder#3

Electrical Asset Name	Local Control Panel for Grinder#3
Electrical Asset Description	LCP grinder3
Electrical Asset Type	Panel
Year Installed	2008

Electrical Equipment

Electrical Equipment Observations

Age	12 Years
Electrical Enclosure Condition	Good Condition
Electrical Heat Release	Normal
Electrical Arcflash Labels	Missing
Number of Available Spares and Spaces	NA

Electrical Equipment Photos	
Electrical Equipment Observations	No Corrosion Noted
Electrical Equipment Condition Score	1 - Excellent
Electrical Equipment Performance Score	1 - Component Functioning as Intended

Local Control Panel for Grinder#4

Electrical Asset Name	Local Control Panel for Grinder#4
Electrical Asset Description	LCP grinder4
Electrical Asset Type	Panel
Year Installed	2008

Electrical Equipment

Electrical Equipment Observations

Age	12 Years
Electrical Enclosure Condition	Good Condition
Electrical Heat Release	Normal
Electrical Arcflash Labels	Missing
Number of Available Spares and Spaces	NA
Electrical Equipment Photos	


POWER ON
RUN
FAIL SEE O&M MANUAL
OFF/RESET ON REMOTE
FORWD REVERSE
DANGER
ALLOW GRINDERS TO STOP BEFORE REVERSING
muffin monster
CAUTION
WARNING


OPEN
CLOSE
STOP



Electrical Equipment Observations	No Corrosion Noted
Electrical Equipment Condition Score	1 - Excellent
Electrical Equipment Performance Score	1 - Component Functioning as Intended

Local Disconnect for CU-1 (for FC-1)

Electrical Asset Name	Local Disconnect for CU-1 (for FC-1)
Electrical Asset Description	30A/3P
Electrical Asset Type	Switch
Year Installed	2008

Electrical Equipment

Electrical Equipment Observations

Electrical Equipment Photos



Local Disconnect for EF-1 (for Control Room)

Electrical Asset Name	Local Disconnect for EF-1 (for Control Room)
Electrical Asset Description	30A/3P
Electrical Asset Type	Switch
Year Installed	2008

Electrical Equipment

Electrical Equipment Observations

Age	12 Years
Electrical Enclosure Condition	Good Condition
Electrical Heat Release	Normal
Electrical Arcflash Labels	NA
Number of Available Spares and Spaces	NA
Electrical Equipment Observations	No Corrosion Noted
Electrical Equipment Condition Score	1 - Excellent
Electrical Equipment Performance Score	1 - Component Functioning as Intended

Local Disconnect for EF-5 (for wetwell)

Electrical Asset Name	Local Disconnect for EF-5 (for wetwell)
Electrical Asset Description	60A/3P
Electrical Asset Type	Switch
Year Installed	2008

Electrical Equipment

Electrical Equipment Observations

Age	12 Years
Electrical Enclosure Condition	Good Condition
Electrical Heat Release	Normal
Electrical Arcflash Labels	NA
Number of Available Spares and Spaces	NA
Electrical Equipment Observations	No Corrosion Noted
Electrical Equipment Condition Score	1 - Excellent
Electrical Equipment Performance Score	1 - Component Functioning as Intended

Local Disconnect for SF-1 (for Wet Well)

Electrical Asset Name	Local Disconnect for SF-1 (for Wet Well)
Electrical Asset Description	60A/3P
Electrical Asset Type	Switch
Year Installed	2008

Electrical Equipment

Electrical Equipment Observations

Age	12 Years
Electrical Enclosure Condition	Good Condition
Electrical Heat Release	Normal
Electrical Arcflash Labels	NA
Number of Available Spares and Spaces	NA
Electrical Equipment Observations	No Corrosion Noted
Electrical Equipment Condition Score	1 - Excellent
Electrical Equipment Performance Score	1 - Component Functioning as Intended

Local Disconnect for HP-1 (for FC-2)

Electrical Asset Name	Local Disconnect for HP-1 (for FC-2)
Electrical Asset Description	30A/3P
Electrical Asset Type	Switch
Year Installed	2008

Electrical Equipment

Electrical Equipment Observations

Age	12 Years
Manufacturer	Square D
Electrical Enclosure Condition	Good Condition
Electrical Heat Release	Normal
Electrical Arcflash Labels	NA

Electrical Equipment Photos



Electrical Equipment Observations	No Corrosion Noted
Electrical Equipment Condition Score	1 - Excellent
Electrical Equipment Performance Score	1 - Component Functioning as Intended

Local Disconnect for FC-1 (for Control Room)

Electrical Asset Name	Local Disconnect for FC-1 (for Control Room)
Electrical Asset Description	30A/3P
Electrical Asset Type	Switch
Year Installed	2008

Electrical Equipment

Electrical Equipment Observations

Age	12 Years
Electrical Enclosure Condition	Good Condition
Electrical Heat Release	Normal
Electrical Arcflash Labels	NA
Number of Available Spares and Spaces	NA
Electrical Equipment Observations	No Corrosion Noted
Electrical Equipment Condition Score	1 - Excellent
Electrical Equipment Performance Score	1 - Component Functioning as Intended

Generator

Electrical Asset Name	Generator
Electrical Asset Description	1000 kVA, 480 V Diesel Driven Engine Generator

Electrical Asset Type	Generator
Year Installed	2000

Electrical Motor or Generator

Electrical Motor or Generator Observations

Age	20 Years
Manufacturer	Caterpillar
Electrical Enclosure Condition	Good Condition
Electrical Heat Release	Normal
Visible Motor Monitoring Equipment	Good Condition
Electrical Motor Photos	

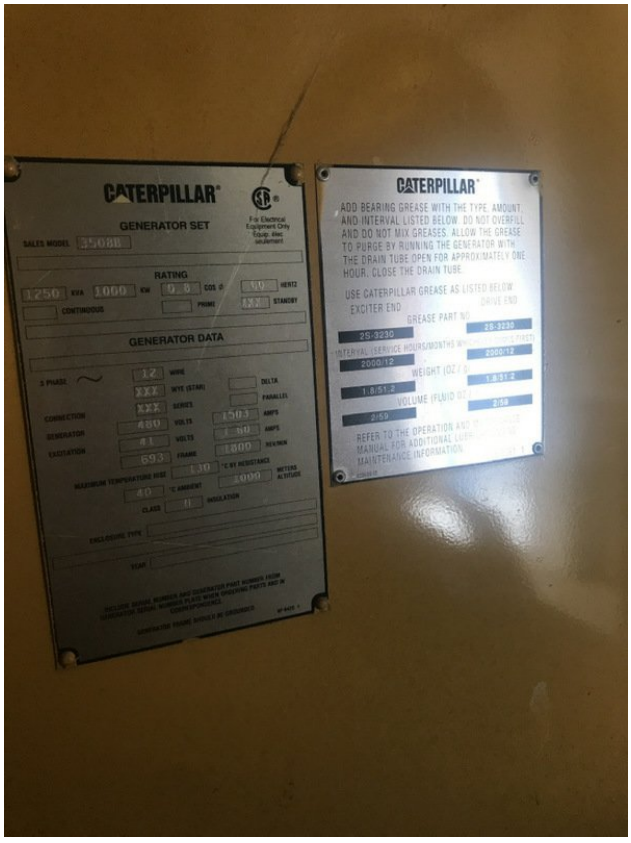

DANGER
DIESEL FUEL

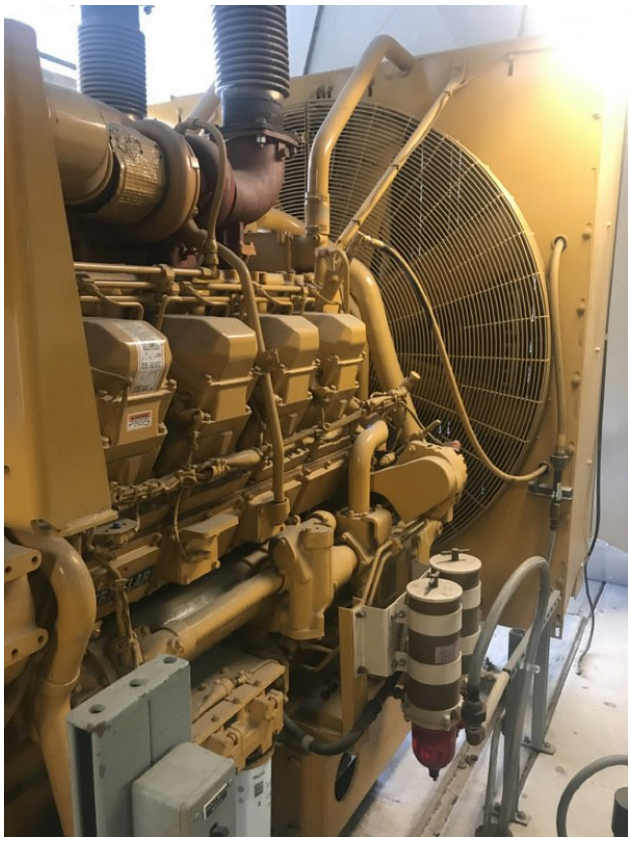






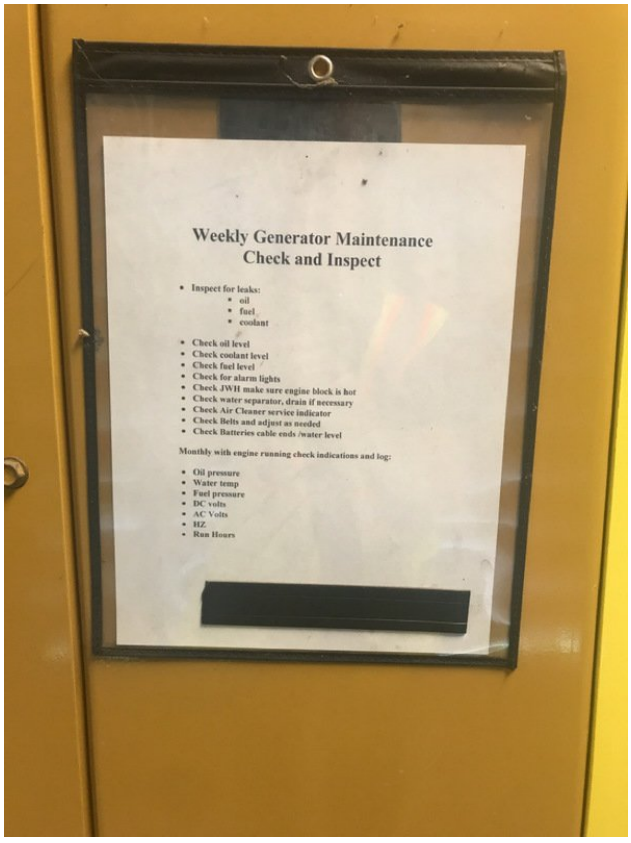

DIESEL
SST-75
DAY TANK


CATERPILLAR
GENERATOR SET
RATING
GENERATOR DATA
CATERPILLAR
ADD BEARING GREASE WITH THE TYPE, AMOUNT, AND INTERVAL LISTED BELOW. DO NOT OVERFILL AND DO NOT MIX GREASES. ALLOW THE GREASE TO PURGE BY RUNNING THE GENERATOR WITH THE DRAIN TUBE OPEN FOR APPROXIMATELY ONE HOUR. CLOSE THE DRAIN TUBE.
USE CATERPILLAR GREASE AS LISTED BELOW
EXCITER END
DRIVE END
2S-3230
2000/12
1.8/51.2
2/59







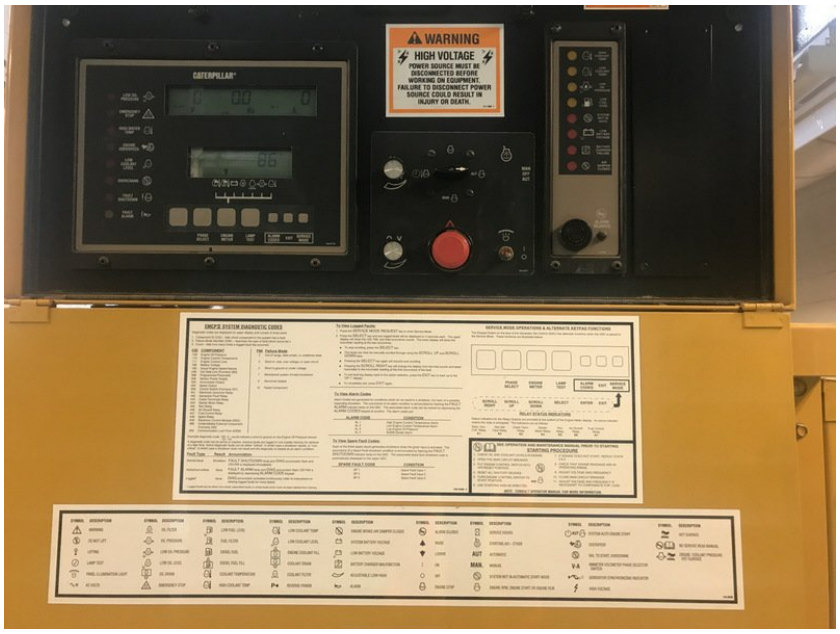


Weekly Generator Maintenance
Check and Inspect

- Inspect for leaks:
  - oil
  - fuel
  - coolant
- Check oil level
- Check coolant level
- Check fuel level
- Check for alarm lights
- Check JWH make sure engine block is hot
- Check water separator, drain if necessary
- Check Air Cleaner service indicator
- Check Belts and adjust as needed
- Check Batteries cable ends /water level

Monthly with engine running check indications and log:

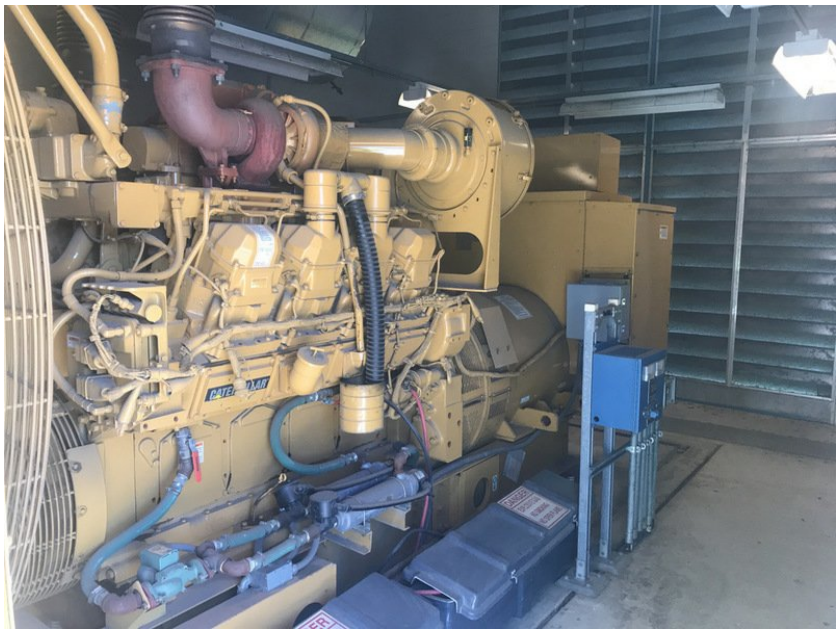
- Oil pressure
- Water temp
- Fuel pressure
- DC volts
- AC Volts
- HZ
- Run Hours


WARNING
HIGH VOLTAGE
POWER SOURCE MUST BE DISCONNECTED BEFORE WORKING ON EQUIPMENT. FAILURE TO DISCONNECT POWER SOURCE COULD RESULT IN INJURY OR DEATH.
CAUTERPILLAR


AUTOMATIC
BATTERY CHARGER
MASTER CONTROL SYSTEMS INC
NO SMOKING
NO OPEN FLAME




CONTROL
CONTRACTURING
COMPANY, INC.
GENERATOR BUILDING
CONTROL PANEL
STANDBY GENERATOR
FUEL TANK
GENERATOR ROOM
EXHAUST FAN
FAIL
TROUBLE
FAIL
RUNNING
ALARM RESET
RUNNING
READY
HAND
OFF
AUTO
OVERLOAD RESET
RESET




DANGER



Electrical Motor Observations	No Corrosion Noted
Electrical Motor Condition Score	1 - Excellent
Electrical Motor Performance Score	1 - Component Functioning as Intended

Automatic Transfer Switch

Electrical Asset Name	Automatic Transfer Switch
Electrical Asset Description	ATS, 1600 A
Electrical Asset Type	Switch
Year Installed	2000

Electrical Equipment

Electrical Equipment Observations

Age	20 Years
Manufacturer	ASCO
Model	ASCO 7 Series
Electrical Enclosure Condition	Good Condition
Electrical Heat Release	Normal
Electrical Arcflash Labels	Missing
Number of Available Spares and Spaces	NA

Electrical Equipment Photos





Electrical Equipment Observations	No Corrosion Noted
Electrical Equipment Condition Score	1 - Excellent
Electrical Equipment Performance Score	1 - Component Functioning as Intended

Appendix C: Main Lift Station – Instrumentation

DRAFT for review purposes only. Use of contents on this sheet is subject to the limitations specified at the end of this document.
Lift Station Inspections Report v1d REV changes from inspection team review.docx

Main Pump Station-Instr

Created	2020-02-08 00:28:37 UTC by Erik Zalkin
Updated	2020-02-19 17:40:26 UTC by Sundara Palani
Location	37.447504, -121.922779
Asset Location	Main Pump Station-Instr

MAS Enclosure and Pump Motor Monitor Panel, MAS 711

Asset Name	MAS Enclosure and Pump Motor Monitor Panel
Asset Description	MAS
Asset ID	MAS 711
Asset Type	Panel
Year Installed	2008
Instrumentation Photos	



Instrumentation Observation Comments	No Corrosion Noted

Condition

Instrumentation Condition Score	1 - Good – No defects observed.

Performance

Instrumentation Performance Score	1 - Good – Asset functioning as intended.

Level Switch, LSHH-201

Asset Name	Level Switch
Asset Description	Level High High
Asset ID	LSHH-201
Asset Type	Level Switch
Year Installed	2008
Instrumentation Observation Comments	In Good Condition

Condition

Instrumentation Condition Score	1 - Good – No defects observed.

Performance

Instrumentation Performance Score	1 - Good – Asset functioning as intended.

Level Switch, LE-202

Asset Name	Level Switch
Asset Description	Ultrosonic level
Asset ID	LE-202

Asset Type	Level Switch
Year Installed	2008
Instrumentation Observation Comments	In Good Condition

Condition

Instrumentation Condition Score	1 - Good – No defects observed.

Performance

Instrumentation Performance Score	1 - Good – Asset functioning as intended.

Level Switch, LE-203

Asset Name	Level Switch
Asset Description	Ultrosonic level
Asset ID	LE-203
Asset Type	Level Switch
Year Installed	2008

Generator and Fuel System Control Panel

Asset Name	Generator and Fuel System Control Panel
Asset Description	Local Control Panel
Asset Type	Panel
Year Installed	2000
Instrumentation Photos	



Instrumentation Observation Comments	No Corrosion Noted

Condition

Instrumentation Condition Score	1 - Good – No defects observed.

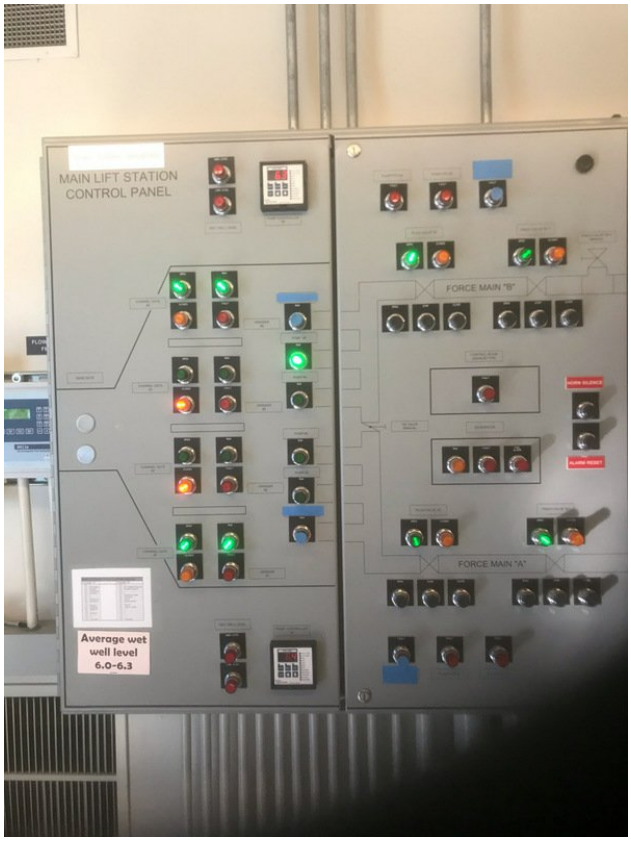
Performance

Instrumentation Performance Score	1 - Good – Asset functioning as intended.

Main Lift Station Control Panel

Asset Name	Main Lift Station Control Panel
Asset Description	Local Control Panel
Asset Type	Panel
Year Installed	2008

Instrumentation Photos



Condition

Instrumentation Condition Score	1 - Good – No defects observed.

Performance

Instrumentation Performance Score	1 - Good – Asset functioning as intended.

Appendix D: Main Lift Station – Civil

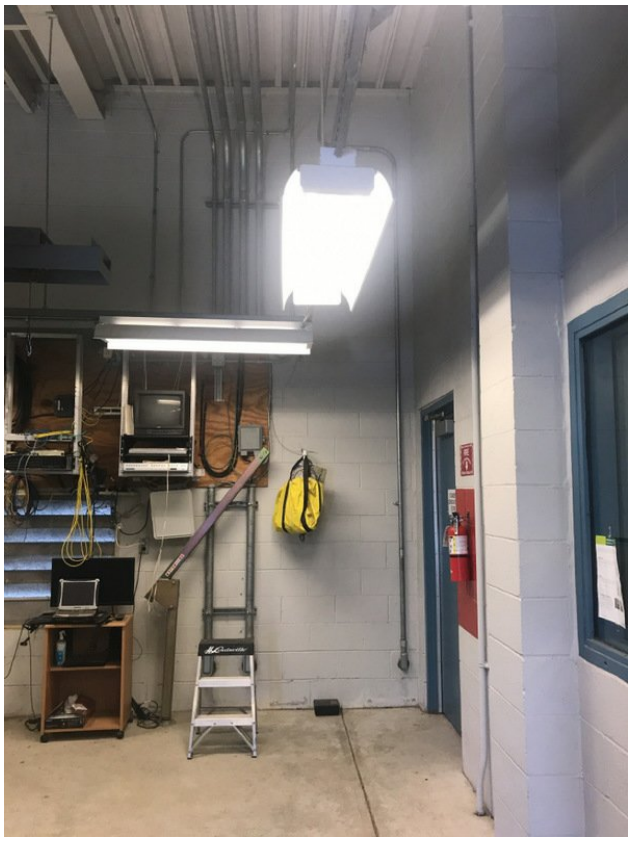
Main Pump Station-Civil

Created	2020-02-07 16:28:25 PST by Erik Zalkin
Updated	2020-02-11 11:12:14 PST by Hamed Hakimelahi
Location	37.447588, -121.922757
Asset Location	Main Pump Station-Civil

Electrical building

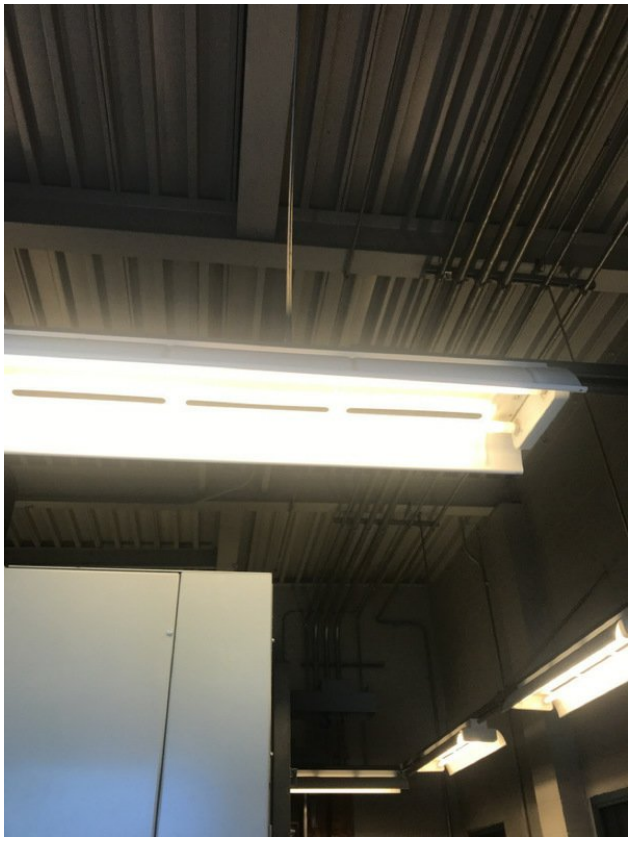
Grounds/Site Improvements

Asset Name	Electrical building
Civil Photos	





















Control building

Grounds/Site Improvements

Asset Name	Control building
Civil Photos	 





Condition

Civil Condition Score	1 - Good – No defects observed.

Performance

Civil Performance Score	1 - Good – Asset functioning as intended.

Site civil

Grounds/Site Improvements

Asset Name	Site civil

Civil Field Assessment

Road/Driveway

Road/Driveway Type	Asphalt Pavement
Road/Driveway Observations	Fine

Grading

Erosion	No
Landscaping	Yes

Drainage

Drainage Type	Storm Drains
Drainage Observations	All fine

Civil Photos
































EXIT







Condition

Civil Condition Score	1 - Good – No defects observed.

Performance

Civil Performance Score	1 - Good – Asset functioning as intended.

Appendix E: Main Lift Station – Structural

Main Pump Station-Struct

Created	2020-02-08 00:29:05 UTC by Erik Zalkin
Updated	2020-03-12 16:27:27 UTC by Dwight Evans
Location	37.447546, -121.9228
Asset Location	Main Pump Station-Struct

Pinch Valve Vault 1

Structural Equipment

Asset Name	Pinch Valve Vault 1
Asset Description	Pinch Valve Vault (1 of 3)
Type of Structure	Vault
Year Installed	2002
Material	Concrete
Structural Field Assessment	Corrosion of metal walls
Structural Photos	

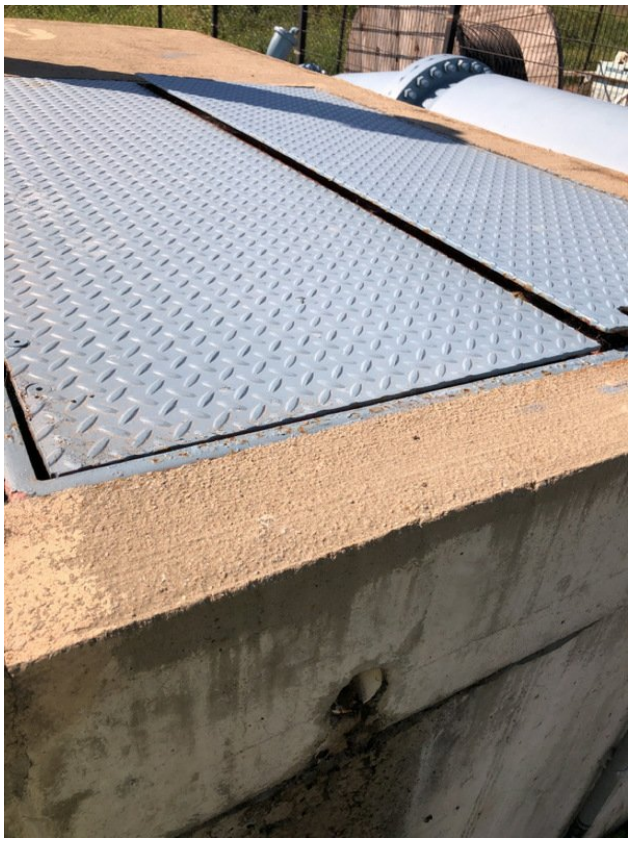


Cold joint



Exposed rebar





Corroded lid

Structural Observation Comments	None

Condition

Structural Condition Score	1 - Good – No defects observed.

Performance

Structural Performance Score	1 - Good – Asset functioning as intended.

Pinch Valve Vault 2

Structural Equipment

Asset Name	Pinch Valve Vault 2
Asset Description	Pinch Valve Vault (2 of 3)
Type of Structure	Vault
Year Installed	2002
Material	Concrete
Structural Photos	





Exposed aggregates

Structural Observation Comments	Exposed aggregates

Condition

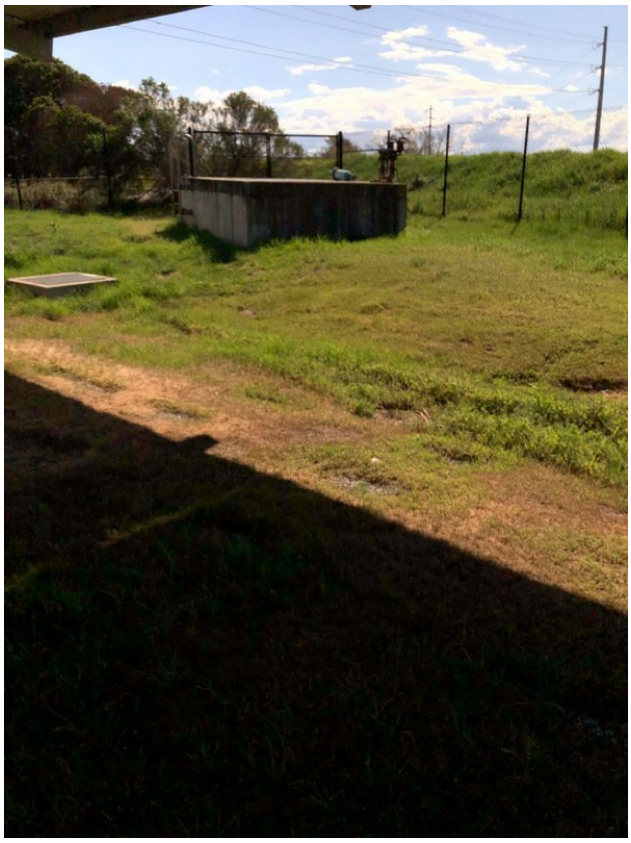
Structural Condition Score	1 - Good – No defects observed.

Performance

Structural Performance Score	1 - Good – Asset functioning as intended.

Pinch Valve Vault 3

Structural Equipment

Asset Name	Pinch Valve Vault 3
Asset Description	Pinch Valve Vault (3 of 3)
Type of Structure	Vault
Year Installed	2002
Material	Concrete
Structural Photos	



Exposed aggregates, sim to 2



Corroded metal attachment



Spalling concrete



Structural Observation Comments	None

Condition

Structural Condition Score	1 - Good – No defects observed.

Performance

Structural Performance Score	1 - Good – Asset functioning as intended.

Mag Meter Vault

Structural Equipment

Asset Name	Mag Meter Vault
Asset Description	24'' Magnetic Meter Vault
Type of Structure	Vault
Year Installed	2002
Material	Concrete
Structural Field Assessment	Corrosion of metal walls
Structural Photos	



Corroded metal



Corroded metal



Does not close All the way due to expansion from corrosion

Structural Observation Comments	Corroded metal at hatch opening

Condition

Structural Condition Score	2 - Fair – Only minor defects observed.

Performance

Structural Performance Score	1 - Good – Asset functioning as intended.

Venturi Meter Vault

Structural Equipment

Asset Name	Venturi Meter Vault
Asset Description	36" Venturi Meter Vault
Type of Structure	Vault
Year Installed	1975
Material	Concrete
Structural Field Assessment	Cracks in walls

Structural Photos









Structural Observation Comments	No cracking inside, surface cracks on outside, coating still present on inside

Condition

Structural Condition Score	1 - Good – No defects observed.

Performance

Structural Performance Score	1 - Good – Asset functioning as intended.

Butteryfly Valve Vault

Structural Equipment

Asset Name	Butteryfly Valve Vault
Asset Description	36" Butterfly Valve Vault
Type of Structure	Vault
Year Installed	1997
Material	Concrete
Structural Photos	



No visible cracks on inside



Structural Observation Comments	No visible cracks besides on curb outside

Condition

Structural Condition Score	1 - Good – No defects observed.

Performance

Structural Performance Score	1 - Good – Asset functioning as intended.

Electrical/Generator Building-Structural

Structural Equipment

Asset Name	Electrical/Generator Building-Structural
Type of Structure	Building
Year Installed	2000
Material	Masonry
Structural Field Assessment	Cracks in walls, Moisture issues
Structural Photos	

Outside, front entrance



Outside, left of entrance



Cracks on left side of building, next to equipment cabinet



Back side



Cracks, back side



Right side of building



Cracks inside, right side of building



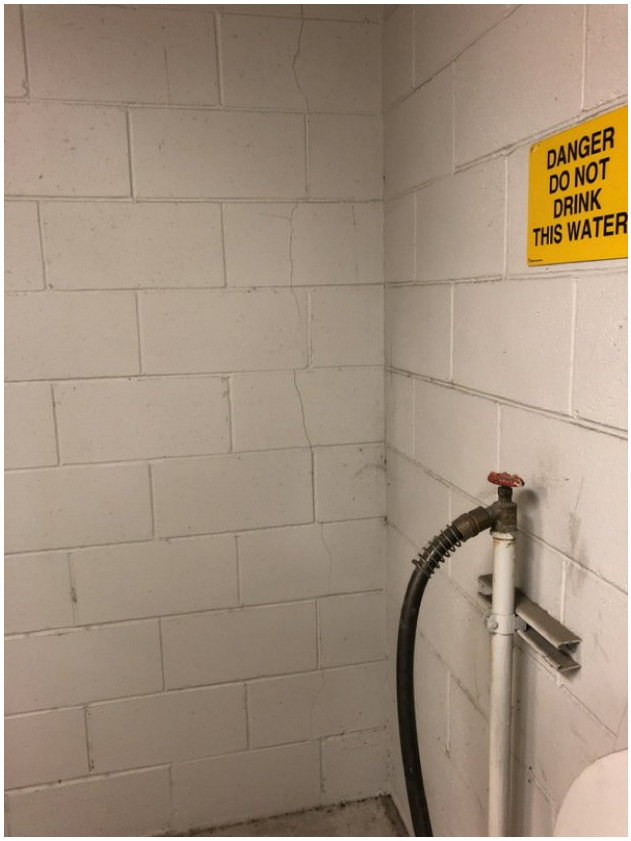
Moisture inside, right side of building



TYP wall to roof connection



TYP wall to roof connection



Vertical crack in corner, crack starts from bottom and goes to the top



Electrical equipment supposedly anchored, though not visible outside





Roof beams

Structural Observation Comments	Some cracks inside and outside, cosmetic cracks

Condition

Structural Condition Score	1 - Good – No defects observed.

Performance

Structural Performance Score	1 - Good – Asset functioning as intended.

Fuel Tank (bulk)

Structural Equipment

Asset Name	Fuel Tank (bulk)
Asset Description	2,000-gal UL-2085 above ground vault tank
Type of Structure	Tank
Year Installed	2008
Material	Metal

Structural Photos

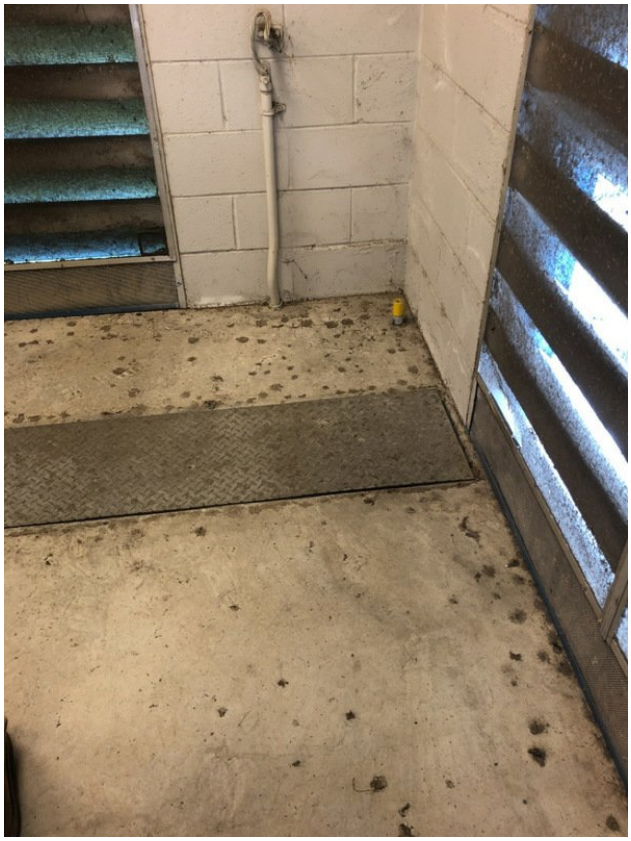




Stainless steel anchors

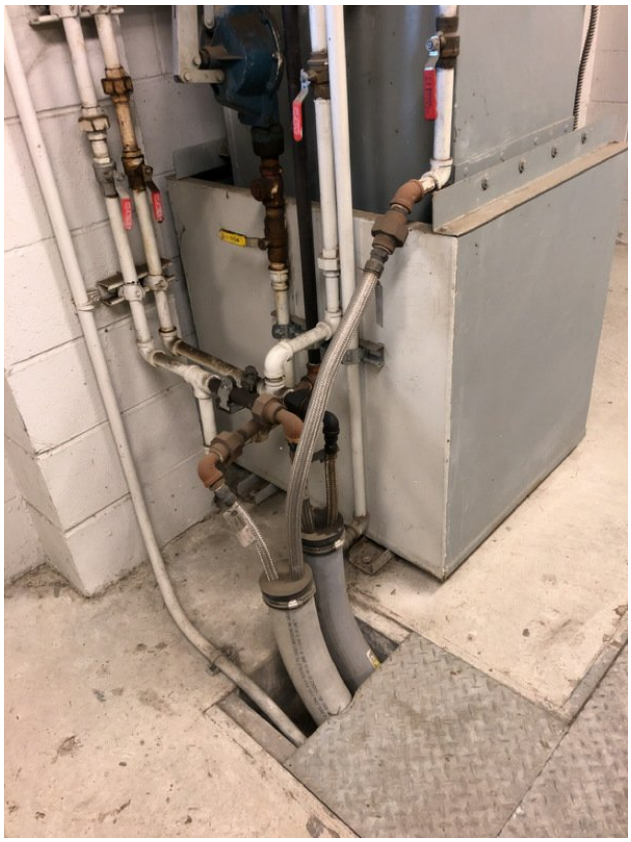


Not flexible



Pipe continues inside building, underneath Grating/cover plate





Connects to day tank, flexible coupling here

Structural Observation Comments	None

Condition

Structural Condition Score	1 - Good – No defects observed.

Performance

Structural Performance Score	1 - Good – Asset functioning as intended.

Fuel Tank (day)

Structural Equipment

Asset Name	Fuel Tank (day)
Type of Structure	Tank
Year Installed	2000
Material	Metal
Structural Photos	

4 anchors



Piping on one side, piping attached to wall, flexible connection for 2 lines only (2 gray pipes coming out of slab), 4 red shutoff valves



	No flexible coupling here
Structural Observation Comments	None

Condition

Structural Condition Score	1 - Good – No defects observed.

Performance

Structural Performance Score	1 - Good – Asset functioning as intended.

Control Building

Structural Equipment

Asset Name	Control Building
Type of Structure	Building
Year Installed	2008
Material	Masonry
Structural Field Assessment	Cracks in walls
Structural Photos	

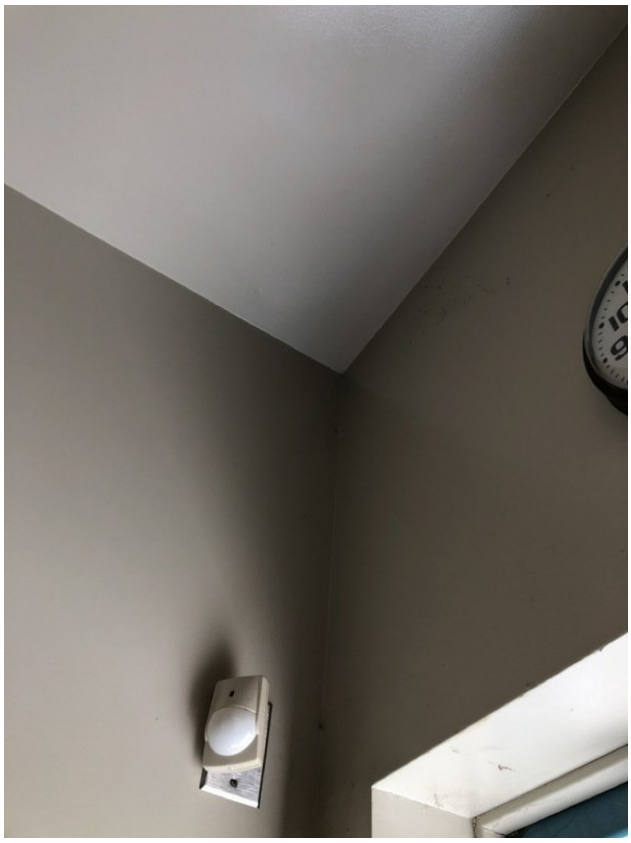
Front



Connection to roof, from outside, vertical blocking different than what is shown on drawing



Flexible coupling



Concealed finished ceiling, have to peep thru hatch to see roof to wall connection from inside

Structural Observation Comments	None

Condition

Structural Condition Score	1 - Good – No defects observed.

Performance

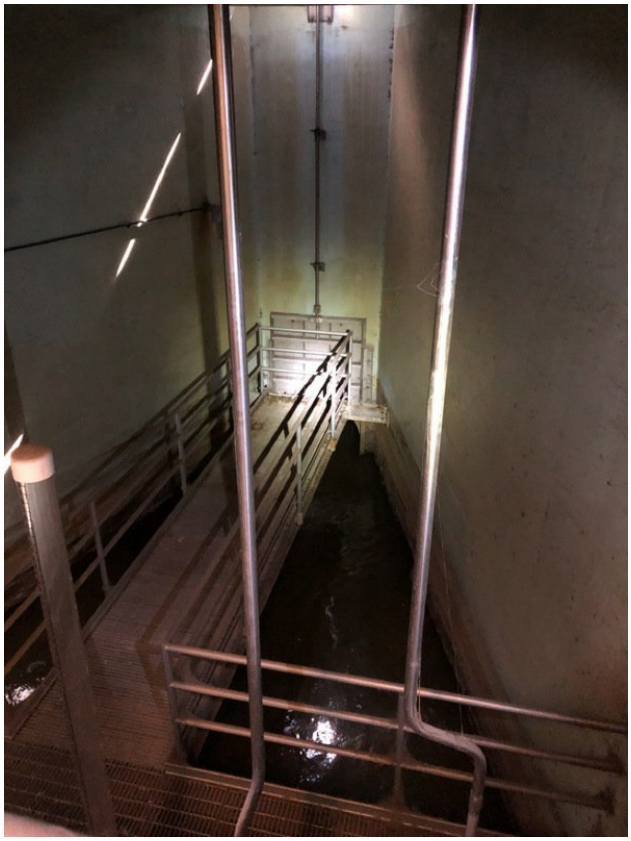
Structural Performance Score	1 - Good – Asset functioning as intended.

Grit Chamber/Inflow Structure

Structural Equipment

Asset Name	Grit Chamber/Inflow Structure
Type of Structure	Tank
Year Installed	2008
Material	Concrete

Structural Photos

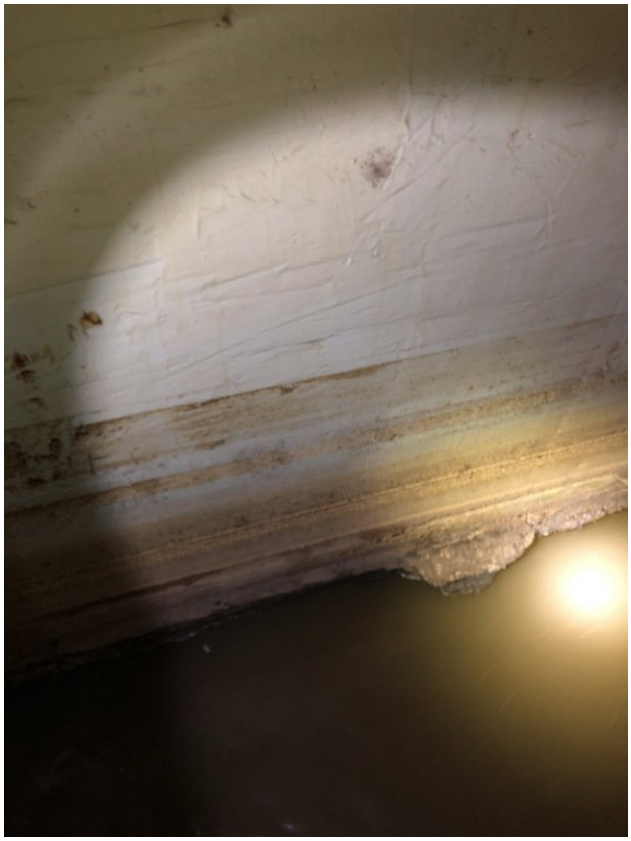




Eroding of coating and concrete, color change at bottom



Dirt on steel not corrosion



Structural Observation Comments	Poor lighting

Condition

Structural Condition Score	1 - Good – No defects observed.

Performance

Structural Performance Score	1 - Good – Asset functioning as intended.

Wet Well

Structural Equipment

Asset Name	Wet Well
Type of Structure	Tank
Year Installed	2008
Material	Concrete
Structural Field Assessment	Paint issues
Structural Photos	

Building on top of wet well, entrance to wet well



Stair knee brace connection













Penetration on opposite side of grit chamber



Compromised coating

Structural Observation Comments	Coating appears to be deteriorating towards bottom, tanks were in operation, no inspection of walls and slab below liquid line

Condition

Structural Condition Score	1 - Good – No defects observed.

Performance

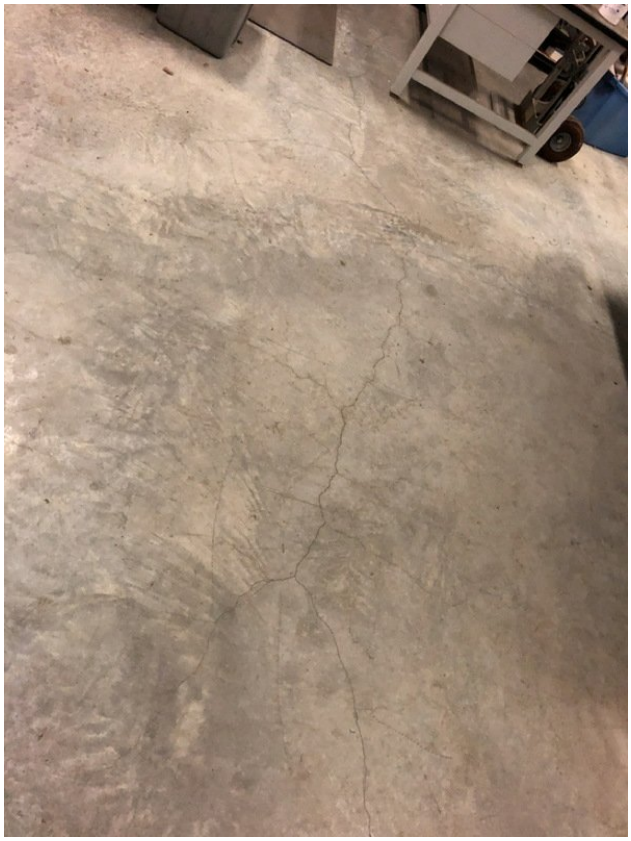
Structural Performance Score	1 - Good – Asset functioning as intended.

Garage

Structural Equipment

Asset Name	Garage
Type of Structure	Building
Year Installed	2008
Structural Photos	

Outside, PEMB



Cracks in slab, inside view, when it rains, water propagation follows cracks (water may have come up through cracks)



TYP wind girts



Tension brace, middle bay only



Tension brace in roof, end bay only, 3 bays total



Structural Observation Comments	Water accumulation inside when it’s raining, water seeps thru slab

Condition

Structural Condition Score	1 - Good – No defects observed.

Performance

Structural Performance Score	1 - Good – Asset functioning as intended.

Appendix F: Venus Way Lift Station – Mechanical

Venus Way-Mech

Created	2020-02-07 16:27:36 PST by Erik Zalkin
Updated	2020-02-11 12:30:18 PST by Hamed Hakimelahi
Location	37.413692, -121.909061
Asset Location	Venus Way-Mech

Pump #1

Equipment Data

Mechanical Asset Name	Pump #1
Mechanical Asset Description	FLYGT CP3102-441, 5HP 3ph 230V Submersible Pump
Asset Type	Pump
Year Installed	2008
Mechanical Observation Comments	None

Condition

Mechanical Condition Score	1 - Good – No defects observed.

Performance

Mechanical Performance Score	1 - Good – Asset functioning as intended.

Pump #2

Equipment Data

Mechanical Asset Name	Pump #2
Mechanical Asset Description	FLYGT CP3102-441, 5HP 3ph 230V Submersible Pump
Asset Type	Pump
Year Installed	2008
Mechanical Observation Comments	None

Condition

Mechanical Condition Score	1 - Good – No defects observed.

Performance

Mechanical Performance Score	1 - Good – Asset functioning as intended.

Pump Guide Rails

Equipment Data

Mechanical Asset Name	Pump Guide Rails
Mechanical Asset Description	Reinstalled in 2008
Year Installed	2008
Mechanical Observation Comments	None

Condition

Mechanical Condition Score	1 - Good – No defects observed.

Performance

Mechanical Performance Score	1 - Good – Asset functioning as intended.

8" Gate Valve, Pump 1 and 2

Equipment Data

Mechanical Asset Name	8" Gate Valve, Pump 1 and 2
Mechanical Asset Description	8" Gate Valve, Pump 1 and 2
Asset Type	Valve
Year Installed	2008
Mechanical Equipment Photos	
Mechanical Observation Comments	None

Condition

Mechanical Condition Score	1 - Good – No defects observed.

Performance

Mechanical Performance Score	1 - Good – Asset functioning as intended.

8" Gate Valve, Pump 2

Equipment Data

Mechanical Asset Name	8" Gate Valve, Pump 2
Mechanical Asset Description	8" Gate Valve, Pump 2
Asset Type	Valve
Year Installed	2008

Mechanical Equipment Photos	
Mechanical Observation Comments	None

Condition

Mechanical Condition Score	1 - Good – No defects observed.

Performance

Mechanical Performance Score	1 - Good – Asset functioning as intended.

8" Gate Valve, Pump 1 and 2

Equipment Data

Mechanical Asset Name	8" Gate Valve, Pump 1 and 2
Mechanical Asset Description	8" Gate Valve, Pump 1 and 2
Asset Type	Valve
Year Installed	2008

Mechanical Equipment Photos





Mechanical Observation Comments	None

Condition

Mechanical Condition Score	1 - Good – No defects observed.

Performance

Mechanical Performance Score	1 - Good – Asset functioning as intended.

8" Check Valve, Pump 1

Equipment Data

Mechanical Asset Name	8" Check Valve, Pump 1
Mechanical Asset Description	8" Check Valve, Pump 1
Asset Type	Valve
Year Installed	2008

Mechanical Equipment Photos	
	
Mechanical Observation Comments	None

Condition

Mechanical Condition Score	1 - Good – No defects observed.

Performance

Mechanical Performance Score	1 - Good – Asset functioning as intended.

8" Check Valve, Pump 2

Equipment Data

Mechanical Asset Name	8" Check Valve, Pump 2
Mechanical Asset Description	8" Check Valve, Pump 2
Asset Type	Valve
Year Installed	2008
Mechanical Equipment Photos	
Mechanical Observation Comments	None

Condition

Mechanical Condition Score	1 - Good – No defects observed.

Performance

Mechanical Performance Score	1 - Good – Asset functioning as intended.

4" Flap Gate

Equipment Data

Mechanical Asset Name	4" Flap Gate
Mechanical Asset Description	4" Flap Gate in wet well
Asset Type	Valve

Year Installed	2008
Mechanical Field Assessment	Could bot find
Mechanical Observation Comments	None

Condition

Mechanical Condition Score	NA - Not enough information available.

Performance

Mechanical Performance Score	NA - Not enough information available.

2" Combo Air/vacuum valve

Equipment Data

Mechanical Asset Name	2" Combo Air/vacuum valve
Mechanical Asset Description	2" Combo Air/vacuum valve
Asset Type	Valve
Year Installed	2008
Mechanical Equipment Photos	



Mechanical Observation Comments	None

Condition

Mechanical Condition Score	1 - Good – No defects observed.

Performance

Mechanical Performance Score	1 - Good – Asset functioning as intended.

Appendix G: Venus Way Lift Station – Electrical

Venus Way-Elec

Created	2020-02-08 00:26:11 UTC by Erik Zalkin
Updated	2020-02-22 00:00:26 UTC by Sundara Palani
Location	37.413686, -121.909069
Asset Location	Venus Way-Elec

Utility Transformer

Electrical Asset Name	Utility Transformer
Electrical Asset Description	240/120 V, 3-Ph, 3 W
Asset ID	XFMR T-1
Electrical Asset Type	Transformer
Year Installed	2000

Electrical Equipment

Electrical Equipment Observations

Age	20 Years
Manufacturer	PG&E Owned
Electrical Enclosure Condition	Good Condition
Electrical Heat Release	Normal
Electrical Arcflash Labels	NA
Number of Available Spares and Spaces	NA
Electrical Equipment Photos	
Electrical Equipment Observations	No Corrosion Noted
Electrical Equipment Condition Score	1 - Excellent

Electrical Equipment Performance Score	1 - Component Functioning as Intended

Service Pedestal

Electrical Asset Name	Service Pedestal
Electrical Asset Description	Service Disconnect and Metering
Year Installed	2008

Pump Control Panel

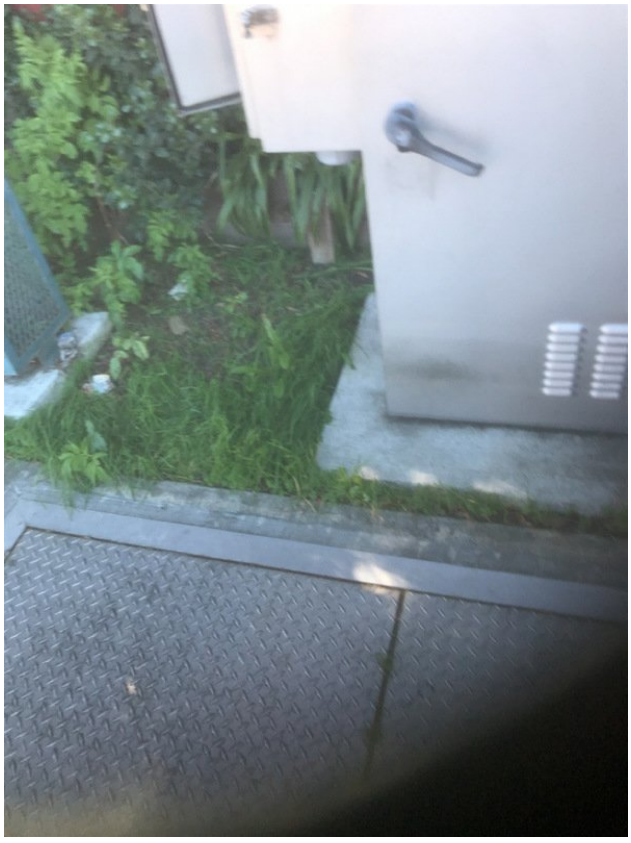
Electrical Asset Name	Pump Control Panel
Electrical Asset Description	Starter panel for Pumps #1 and 2 (Each 5 HP)
Electrical Asset Type	Panel
Year Installed	2008

Electrical Equipment

Electrical Equipment Observations

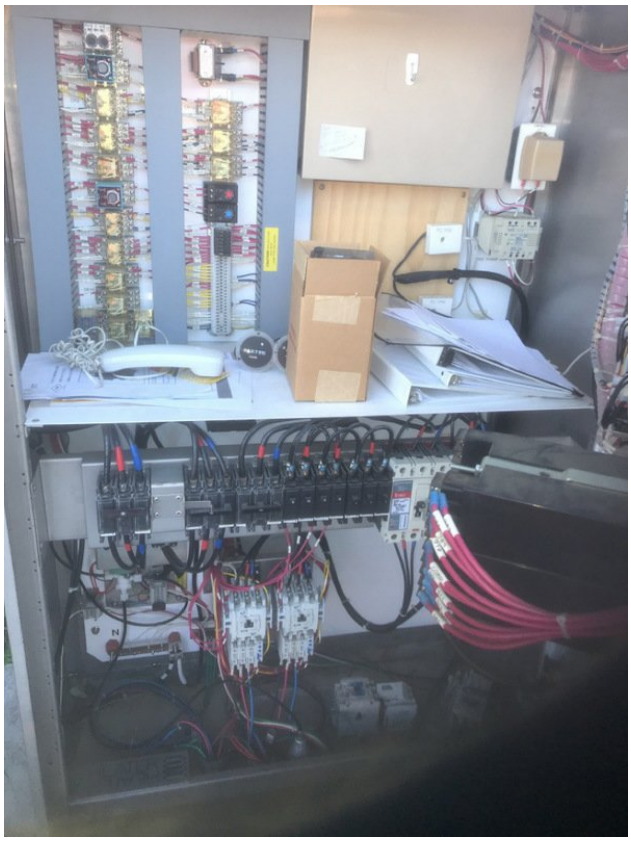
Age	12 Years
Electrical Enclosure Condition	Good Condition
Electrical Heat Release	Normal
Electrical Arcflash Labels	Missing
Number of Available Spares and Spaces	NA
Electrical Equipment Photos	


1085 VENUS WAY
GUARD IT






1085 VENUS WAY



Electrical Equipment Observations	No Corrosion Noted
Electrical Equipment Condition Score	1 - Excellent
Electrical Equipment Performance Score	1 - Component Functioning as Intended

Appendix H: Venus Way Lift Station – Instrumentation

Venus Way-Instr

Created	2020-02-07 16:27:21 PST by Erik Zalkin
Updated	2020-02-14 15:32:15 PST by Erik Zalkin
Location	37.413684, -121.909056
Asset Location	Venus Way-Instr

Level Instrument, LSHH-01

Asset Name	Level Instrument
Asset Description	Wet Well Level Sensor
Asset ID	LSHH-01
Asset Type	Level Switch
Year Installed	2008
Instrumentation Observation Comments	Did not obtain photo; see wet well photos (mechanical)

Condition

Instrumentation Condition Score	1 - Good – No defects observed.

Performance

Instrumentation Performance Score	1 - Good – Asset functioning as intended.

Appendix I: Venus Way Lift Station – Civil

Venus Way-Civil

Created	2020-02-07 16:26:57 PST by Erik Zalkin
Updated	2020-02-11 12:30:21 PST by Hamed Hakimelahi
Location	37.413677, -121.909062
Asset Location	Venus Way-Civil

Site civil

Grounds/Site Improvements

Asset Name	Site civil
Civil Photos	 













Condition

Civil Condition Score	1 - Good – No defects observed.

Performance

Civil Performance Score	1 - Good – Asset functioning as intended.

Appendix J: Venus Way Lift Station – Structural

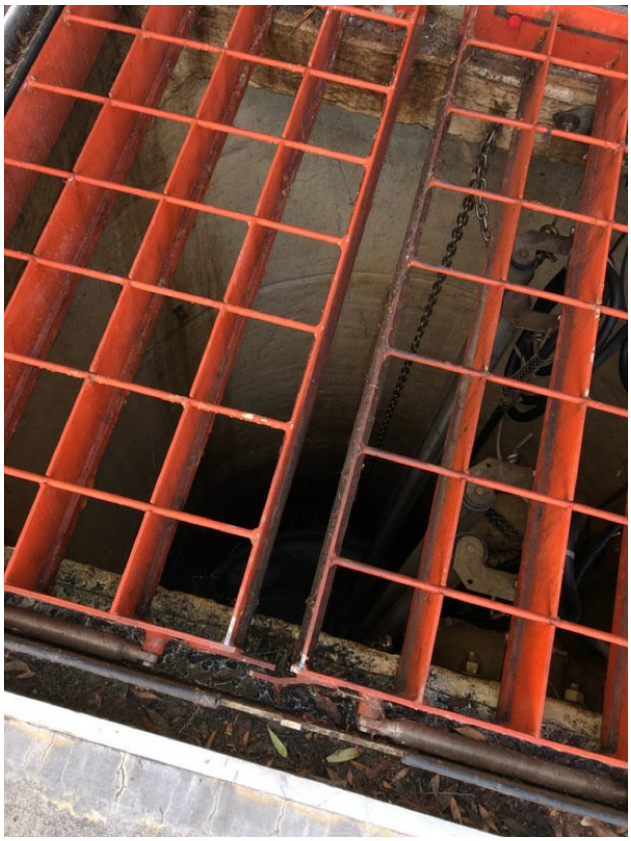
Venus Way-Struct

Created	2020-02-07 16:27:46 PST by Erik Zalkin
Updated	2020-03-12 14:47:14 PDT by Erik Zalkin
Location	37.413696, -121.909065
Asset Location	Venus Way-Struct

Wet Well

Structural Equipment

Asset Name	Wet Well
Asset Description	72" Diameter Reinforced Concrete Pipe
Type of Structure	Tank
Year Installed	1964
Material	Concrete
Structural Photos	





Oxidation

Structural Observation Comments	None

Condition

Structural Condition Score	1 - Good – No defects observed.

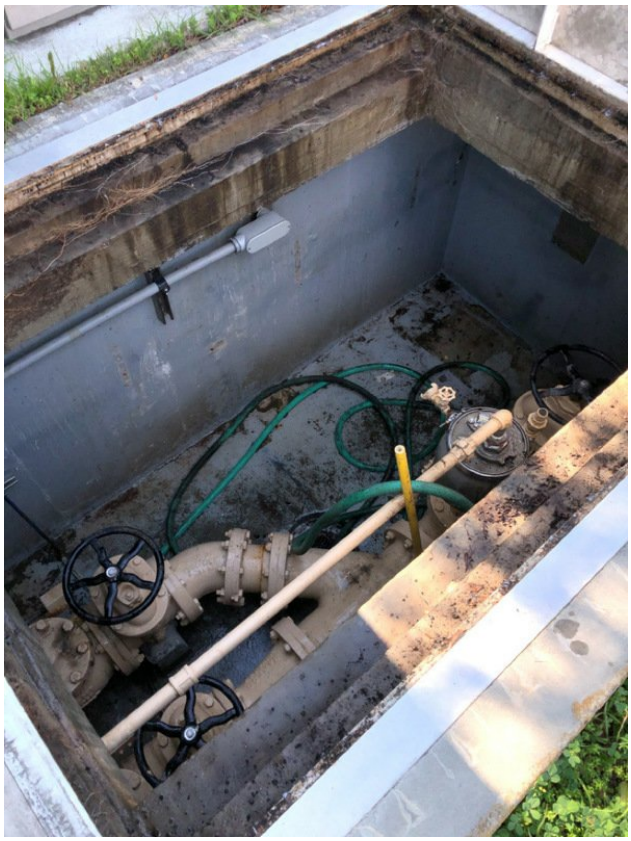
Performance

Structural Performance Score	1 - Good – Asset functioning as intended.

Valve Vault

Structural Equipment

Asset Name	Valve Vault
Type of Structure	Vault
Year Installed	1994
Material	Concrete
Structural Photos	



Structural Observation Comments	None

Condition

Structural Condition Score	1 - Good – No defects observed.

Performance

Structural Performance Score	1 - Good – Asset functioning as intended.

Aluminum Hatch-Vault

Structural Equipment

Asset Name	Aluminum Hatch-Vault
Asset Description	Aluminum Hatch, slide-in
Type of Structure	Vault
Year Installed	2008

Structural Photos	
Structural Observation Comments	None

Condition

Structural Condition Score	1 - Good – No defects observed.

Performance

Structural Performance Score	1 - Good – Asset functioning as intended.

Aluminum Hatch-Wet Well

Structural Equipment

Asset Name	Aluminum Hatch-Wet Well
Asset Description	Aluminum Hatch w/ safety grate
Type of Structure	Vault
Year Installed	2008
Material	Metal

Structural Photos	
Structural Observation Comments	None

Condition

Structural Condition Score	1 - Good – No defects observed.

Performance

Structural Performance Score	1 - Good – Asset functioning as intended.

APPENDIX B

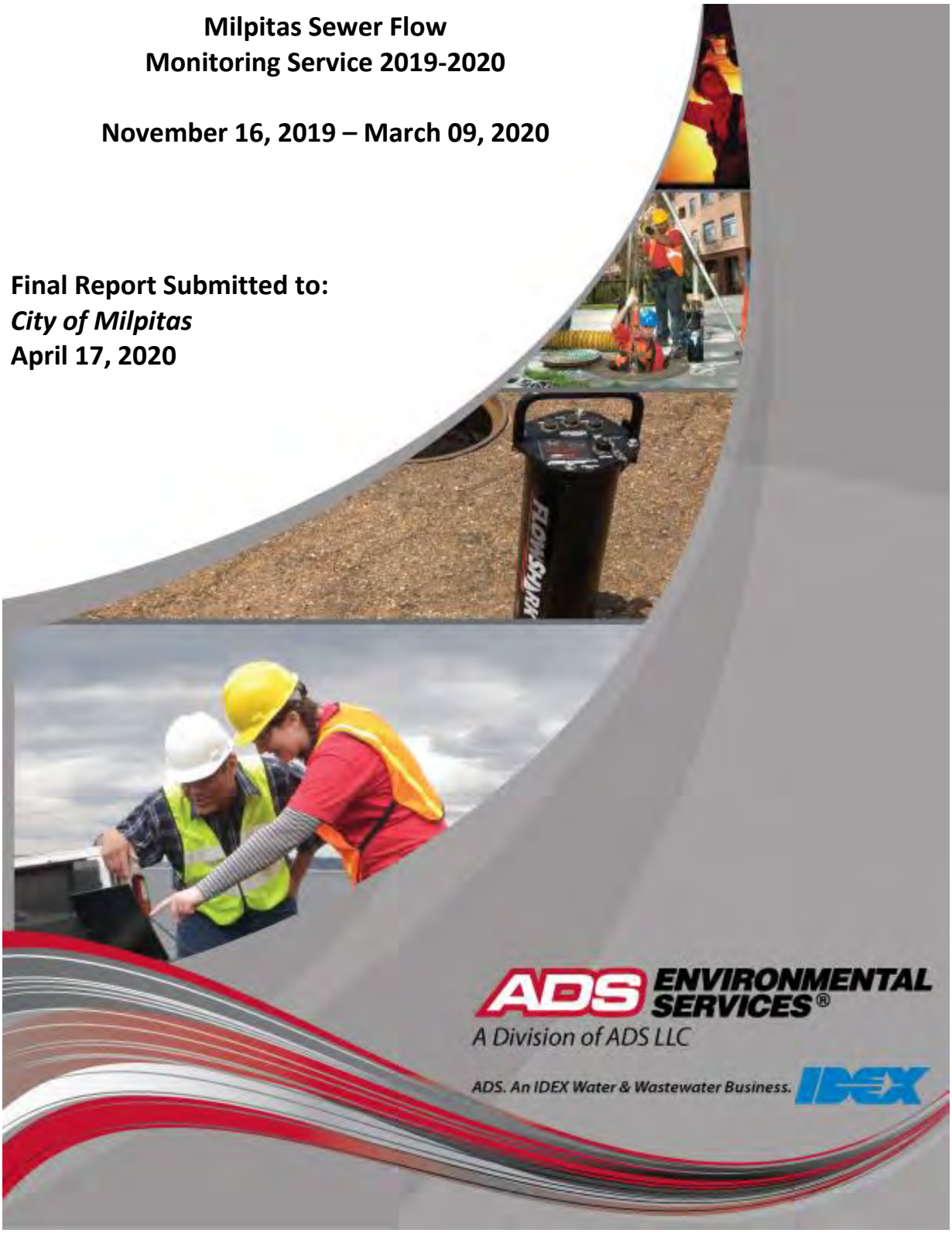
City of Milpitas
Sewer Master Plan Study
Milpitas Sewer Flow Monitoring Report 2019-2020

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Milpitas Sewer Flow Monitoring Service 2019-2020

November 16, 2019 – March 09, 2020

Final Report Submitted to:
City of Milpitas
April 17, 2020



Milpitas Sewer Flow Monitoring Service
2019 - 2020

Prepared for:

Theodore Alicante
City of Milpitas
455 E. Calaveras Boulevard
Milpitas, CA 95035

Prepared by:

ADS, LLC
15201 Springdale Street
Huntington Beach, CA 92649

Letter of Transmittal

ADS LLC

April 17, 2020

Theodore Alicante
City of Milpitas
455 E. Calaveras Boulevard
Milpitas, CA 95035

SUBJECT: Milpitas Sewer Flow Monitoring Service 2019 - 2020

Dear Theodore,

ADS is pleased to submit the report for the Milpitas Sewer Flow Monitoring Service 2019 - 2020 conducted on behalf of the City of Milpitas. The metering was contracted for ninety (90) days at twenty-three (23) flow monitor and two (2) rain rauge locations. The study period is November 16, 2019 - March 09, 2020. All available data has been provided.

The report contains hourly averaged depth, velocity, and quantity hydrographs as well as daily long tables for the metering period in pdf format. Depth, quantity, and velocity entities for each monitoring location have been provided on Prism.

In addition, we would be happy to further explain any details about the report that may seem unclear. Should you have any questions or comments, you may contact the Project Manager, Paul Mitchell at (714) 379-9778 ext 223.

It has been our pleasure to serve you in the performance of this project. Thank you for choosing ADS products and services to meet your flow monitoring needs.

Sincerely,
ADS ENVIRONMENTAL SERVICES

Mackenzie Michaud
Data Analyst

Scope and Methodology

Introduction

City of Milpitas entered into an agreement with ADS Environmental Services to conduct flow monitoring at twenty-three (23) metering points in the City of Milpitas Collection System. The study was conducted over a ninety (90) day period. The study period is November 16, 2019 - March 09, 2020. The primary objective of the monitoring was to determine current flows for wet weather planning purposes.

Project Scope

The scope of this study involved using flow monitors to quantify wastewater flows at the designated locations. Specifically, the study included the following key components.

- Investigate the proposed flow-monitoring sites for adequate hydraulic conditions.
- Flow monitor installations.
- Flow monitor confirmations and data collections.
- Flow data analysis.

Equipment installation was completed on November 15, 2019. The study period began on November 16, 2019 and was completed on March 09, 2020 .

Flow Monitoring Equipment





The ***ADS FlowShark Triton*** monitor was selected for this project. This flow monitor is an area velocity flow monitor that uses both the Continuity and Manning's equations to measure flow.

The ADS FlowShark Triton monitor consists of data acquisition sensors and a battery-powered microcomputer. The microcomputer includes a processor unit, data storage, and an on-board clock to control and synchronize the sensor recordings. The monitor was programmed to acquire and store depth of flow and velocity readings at 5-minute intervals.

The FS Triton monitor features cross-checking using multiple technologies in each sensor for continuous running of comparisons and tolerances. The FS Triton monitor can support two (2) sets of sensors. The sensor option used for this project was:

The Peak Combo Sensor installed at the bottom of the pipe includes three types of data acquisition technologies.

The ***up looking ultrasonic depth*** uses sound waves from two independent transceivers to measure the distance from the sensor upward toward the flow surface; applying the speed of sound in the water and the temperature measured by sensor to calculate depth.

The ***pressure depth*** is calculated by using a piezo-resistive crystal to determine the difference between hydrostatic and atmospheric pressure. The pressure sensor is temperature compensated and vented to the atmosphere through a

desiccant filled breather tube.

To obtain ***peak velocity*****,** the sensor sends an ultrasonic signal at an angle upward through the widest cross-section of the oncoming flow. The signal is reflected by suspended particles, air bubbles, or organic matter with a frequency shift proportional to the velocity of the reflecting objects. The reflected signal is received by the sensor and processed using digital spectrum analysis to determine the peak flow velocity.

Installation

Installation of flow monitoring equipment typically proceeds in four steps. First, the site is investigated for safety and to determine physical and hydraulic suitability for the flow monitoring equipment. Second, the equipment is physically installed at the selected location. Third, the monitor is tested to assure proper operation of the velocity and depth of flow sensors and verify that the monitor clock is operational and synchronized to the master computer clock. Fourth, the depth and velocity sensors are confirmed and line confirmations are performed.

In pipes up to 42 inches in diameter, the sensors were mounted on expandable stainless steel rings, inserted at least a foot upstream into influent pipes and tightened against the inside walls of the pipes. Influent pipe installations reduce the influences of turbulence and backwater often caused by changes in channel geometry in manholes.





Data Collection, Confirmation, and Quality Assurance

Data collects were done remotely via wireless connect on a weekly basis via ADS Field Representatives. During the monitoring period, field crews visit each monitoring location to verify proper monitor operation and document field conditions. The following quality assurance steps are taken to assure the integrity of the collected data:

Measure power supplies: monitors were powered by dry cell battery packs. Voltages were recorded and battery packs replaced, as necessary. Separate batteries provided back-up power to memory allowing primary batteries to be replaced without loss of data.

Clock synchronization: Field crews synchronized monitor clocks to master clocks.

Confirm depth and velocity readings: Field crews descended into meter manholes to manually measure depths and velocities and compare them meter readings to confirm that they agreed. They also measured silt levels, if any, in the inverts of the pipes. Silt areas were subtracted from flow areas to compute true areas of flow.

Confirm average velocities through cross-sectional velocity profiles: Since ADS velocity sensors measure peak velocity, field crews collected cross-sectional velocity profiles in order to develop a relationship between peak and average velocity in lines that meet the hydraulic criteria.

Upload and Review Data: Data collected from the monitors were uploaded and reviewed by a Data Analyst for completeness, outliers and deviations in the flow patterns, which indicate system anomalies or equipment failure.

Flow Quantification Methods

There are two main equations used to measure open channel flow: the ***Continuity Equation*** and the ***Manning Equation.*** The Continuity Equation, which is considered the most accurate, can be used if both depth of flow and velocity are available. In cases where velocity measurements are not available or not practical to obtain, the Manning Equation can be used to estimate velocity from the depth data based on certain physical characteristics of the pipe (i.e. the slope and roughness of the pipe being measured). However, the Manning equation assumes uniform, steady flow hydraulic conditions with non-varying roughness, which are typically invalid assumptions in most sanitary sewers. The Continuity Equation was used exclusively for this study.

Continuity Equation

The Continuity Equation states that the flow quantity (Q) is equal to the wetted area (A) multiplied by the average velocity (V) of the flow.

$$Q = A * V$$

This equation is applicable in a variety of conditions including backwater, surcharge, and reverse flow.

Data Analysis and Presentation

Data Analysis

A flow monitor is typically programmed to collect data at either 15-minute or 5-minute intervals throughout the monitoring period. The monitor stores raw data consisting of (1) the ultrasonic depth, (2) the peak velocity and (3) the pressure depth. The data is imported into ADS's proprietary software and is examined by a data analyst to verify its integrity. The data analyst also reviews the daily field reports and site visit records to identify conditions that would affect the collected data.

Velocity profiles and the line confirmation data developed by the field personnel are reviewed by the data analyst to

identify inconsistencies and verify data integrity. Velocity profiles are reviewed and an average to peak velocity ratio is calculated for the site. This ratio is used in converting the peak velocity measured by the sensor to the average velocity used in the Continuity equation. The data analyst selects which depth sensor entity will be used to calculate the final depth information. Silt levels present at each site visit are reviewed and representative silt levels established.

Occasionally the velocity sensor's performance may be compromised resulting in invalid readings sporadically during the monitoring period. This is generally caused by excessive debris (silt) blocking the sensor's crystals, shallow flows (~< 1") that may drop below the top of the sensor or very clear flows lacking the particles needed to measure rate. In order to use the Continuity equation to quantify the flow during these periods, a Data Analyst and/or Engineer will use the site's historical pipe curve (depth vs. velocity) data along with valid field confirmations to reconstitute and replace the false velocity recordings with expected velocity readings for a given historical depth along the curve.

Selections for the above parameters can be constant or can change during the monitoring period. While the data analysis process is described in a linear manner, it often requires an iterative approach to accurately complete.

Data Presentation

This type of flow monitoring project generates a large volume of data. To facilitate review of the data, results have been provided in graphical and tabular formats. The flow data is presented graphically in the form of scattergraphs and hydrographs. Hydrographs are based on 5-minute averaging. Tables are provided in daily average format. These tables show the flow rate for each day, along with the daily minimum and maximums, the times they were observed, the total daily flow, and total flow for the month (or monitoring period). The following explanation of terms may aid in interpretation of the tables and hydrographs.

DEPTH - Final calculated depth measurement (in inches)

QUANTITY - Final calculated flow rate (in MGD)

VELOCITY - Final calculated flow velocity (in feet per second)

REPORT TOTAL - Total volume of flow recorded for the indicated time period (in MG)

Site Commentary

Site Information

MIL_0041	
Pipe Dimensions	23
Silt Level	0.00"

Overview

Site MIL_0041 functioned under normal conditions during the period Saturday, November 16, 2019 to Monday, March 9, 2020 . This site exhibited an observable response to the wet weather events of November 26, 2019 - November 27, 2019, December 7, 2019 - December 8, 2019, and January 16, 2020 - January 17, 2020. Review of the scattergraph shows that both free flow and mild backwater flows were recorded during the study period.

Flow depth and velocity measurements recorded by the flow monitor are consistent with field confirmations conducted to date and support the relative accuracy of the flow monitor at this location.

Observations

Average flow depth, velocity, and quantity data observed during Saturday, November 16, 2019 to Monday, March 9, 2020 , along with observed minimum and maximum data, are provided in the following table.

Observed Flow Conditions			
Item	Depth (in)	Velocity (ft/s)	Quantity (MGD)
Average	6.51	1.54	0.709
Minimum	3.96	0.73	0.178
Maximum	9.42	2.30	1.647
Time of Minimum	2/1/2020 5:05 AM	3/2/2020 3:25 AM	1/7/2020 5:20 AM
Time of Maximum	2/26/2020 8:40 AM	2/1/2020 12:40 PM	2/1/2020 12:40 PM

Data Quality

Data uptime observed during the Saturday, November 16, 2019 to the Monday, March 9, 2020 monitoring period is provided in the table below. Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

Percent Uptime	
Depth (in)	100
Velocity (ft/s)	100
Quantity (MGD)	100

Milpitas Temp Study 2019-20

Flow Monitoring Site Report

ADS ENVIRONMENTAL SERVICES®

Site Name

MIL_0041

Site Address /Location:	S Abel St and Curtis Ave, Milpitas, CA			Monitor Series	Location Type
				TRITON+	Temporary
Site Access Details:	DRIVE.	Latitude:	37.418531°	Pipe Size (H x W)	Pipe Shape
		Longitude:	-121.904896°	23.00"x23.50"	Circular



Manhole #	System Characteristics
#0041	Residential/Commercial
Access	Traffic
Drive	Medium







Installation Information

Installation Date:	Installation Type:
Thursday, November 14, 2019	Doppler Standard Ring and Crank
Monitoring Location (Sensors):	Monitor Location:
Upstream 0-5 FT	Manhole
Sensors / Devices:	Pressure Sensor Range (psi)
Peak Combo (CS4)	0 - 5 psi

Installation Confirmation:

Confirmation Time:	Pipe Size (HxW)
5:37:00 AM	23.00"x23.50"
Depth of Flow (Wet DOF) (in)	Range (Air DOF) (in)
5.50"	
Downlooker Physical Offset (in)	Measurement Confidence (in)
NA	0.25"
Peak Velocity (fps)	Velocity Sensor Offset (in)
1.40'	0''
Silt (in)	Silt Type
0.0"	

Hydraulic Comments:

Smooth flow with medium depth and moderate velocity

Manhole / Pipe Information:

Manhole Depth (Approx. FT):	Manhole Configuration
7'	Single
Manhole Material:	Manhole Condition:
Concrete	Good
Manhole Opening Diameter (in)	Manhole Diameter (Approx.):
26''	54''
Manhole Cover	Manhole Frame
Unbolted	Normal
Active Drop Connections	Air Quality:
No	Normal
Pipe Material	Pipe Condition:
Concrete	Good

Communication Information:

Communication Type	Antenna Location
Wireless	Drilled Pavement / Concrete

Additional Site Info. / Comments:

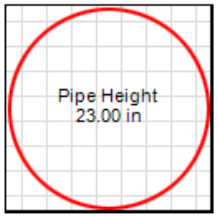
ADS Project Name:	Milpitas.WWTFM.CA2019-2020
ADS Project Number:	22431.11.325

SCATTERGRAPH REPORT

MIL_0041

Flow Monitor

MIL_0041

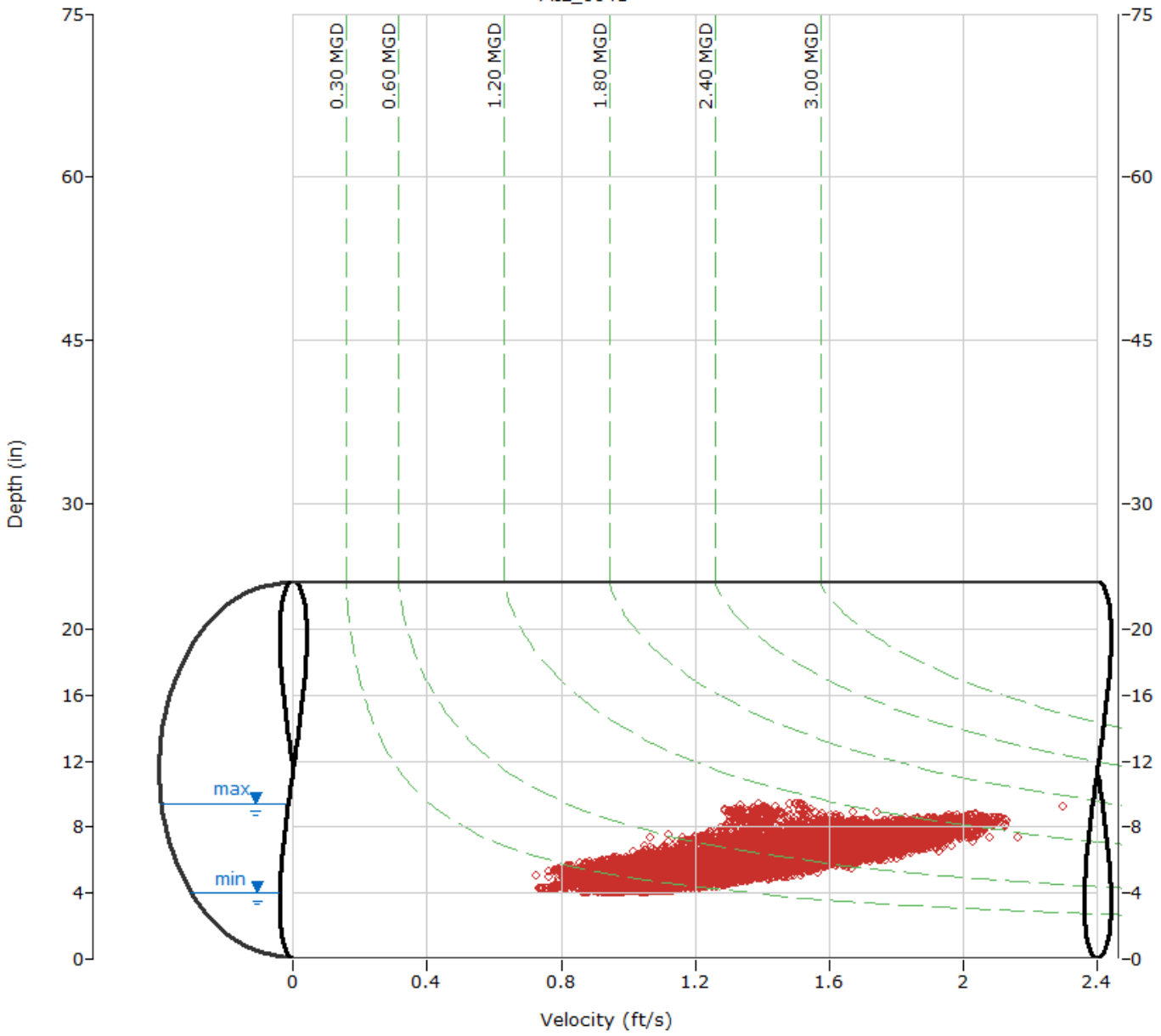


Report Period

11/16/2019
To
3/9/2020

Legend

- Depth - Velocity
- Iso-Q™
- Silt
- Min-Max Depth



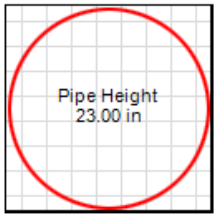
ADS ENVIRONMENTAL SERVICES

HYDROGRAPH REPORT

MIL_0041

Flow Monitor

MIL_0041

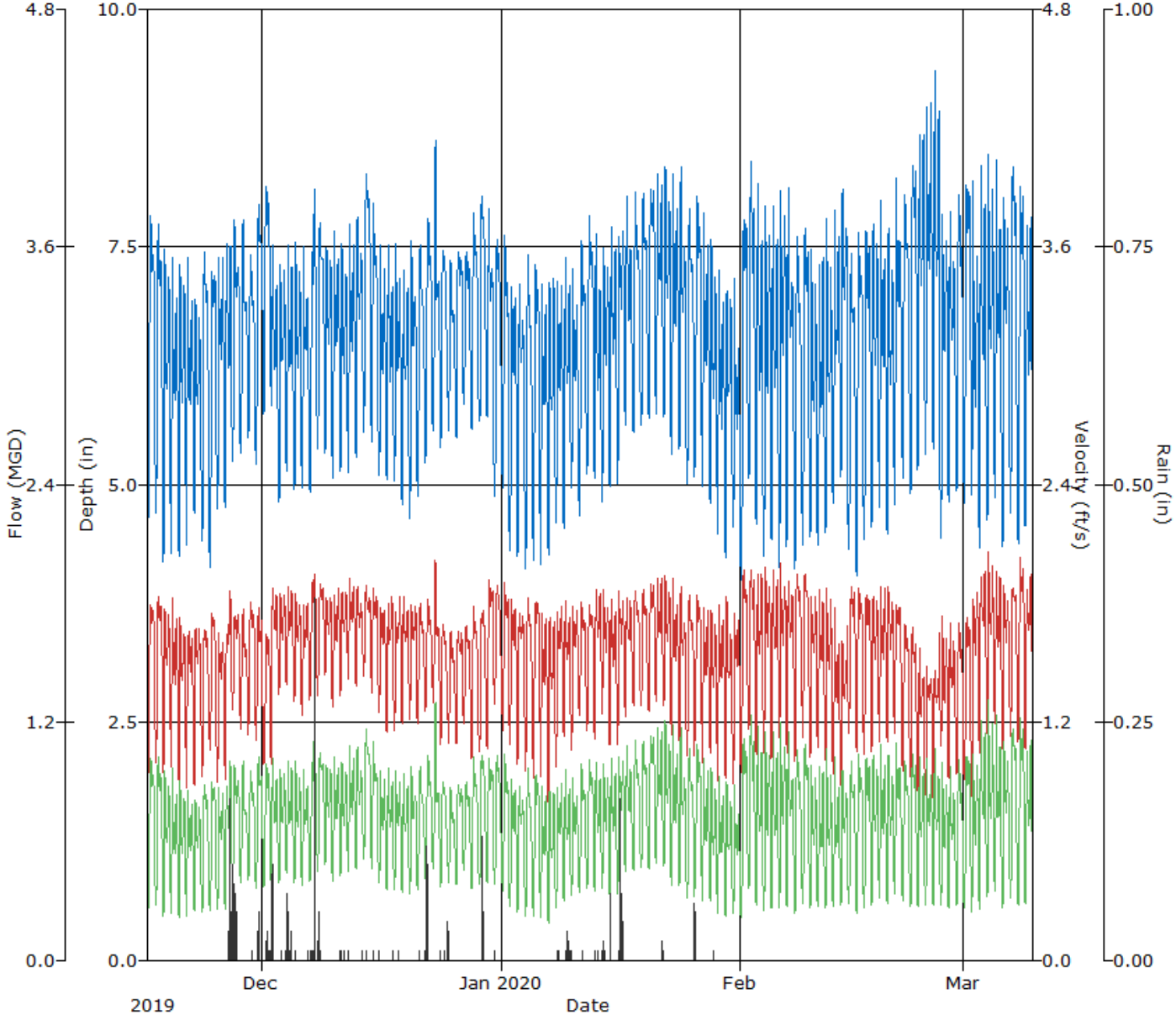


Report Period

11/16/2019
To
3/9/2020

Legend

- Depth
- Velocity
- Quantity
- Rain



Daily Tabular Report For The Period 11/16/2019 00:00 - 03/09/2020 23:59

MIL_0041, Pipe Height: 23.00 in, Silt: 0.00 in

Daily Tabular Report

Date	Depth (in)				Velocity (ft/s)				Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
11/16/2019	05:15	4.62	12:05	7.88	6.62	05:25	0.88	11:25	1.93	1.52	05:25	0.241	11:25	1.094	0.726	0.726	
11/17/2019	05:20	4.67	11:25	8.34	6.52	05:20	0.97	11:25	1.95	1.56	05:20	0.270	11:25	1.217	0.723	0.723	
11/18/2019	04:15	4.15	08:30	7.55	6.01	03:05	0.85	08:15	1.83	1.47	04:05	0.210	08:15	0.985	0.608	0.608	
11/19/2019	04:55	4.19	08:20	7.48	5.96	04:55	0.88	08:15	1.91	1.46	04:55	0.208	08:15	1.027	0.596	0.596	
11/20/2019	04:15	4.19	08:35	7.39	5.98	05:40	0.79	08:30	1.81	1.40	04:35	0.196	08:30	0.954	0.575	0.575	
11/21/2019	04:25	4.31	08:30	7.43	6.00	05:10	0.80	11:05	1.80	1.40	05:10	0.205	08:30	0.900	0.575	0.575	
11/22/2019	05:15	4.66	08:55	7.07	5.95	03:35	0.81	08:40	1.78	1.43	03:35	0.226	08:40	0.879	0.576	0.576	
11/23/2019	05:00	4.37	11:55	7.48	6.29	04:45	0.88	10:40	1.81	1.43	04:45	0.225	12:10	0.942	0.630	0.630	
11/24/2019	04:45	4.02	12:40	7.30	6.19	06:05	1.01	17:25	1.81	1.48	04:45	0.232	12:30	0.935	0.644	0.644	
11/25/2019	05:15	4.66	09:10	7.50	6.34	05:15	0.79	20:50	1.71	1.39	05:15	0.219	09:15	0.919	0.616	0.616	
11/26/2019	04:20	4.70	12:15	8.19	6.41	04:20	0.81	20:35	1.95	1.52	04:20	0.227	12:20	1.088	0.682	0.682	0.36
11/27/2019	05:15	5.22	09:50	7.91	6.72	02:25	1.16	10:15	1.83	1.58	05:15	0.388	10:10	1.047	0.746	0.746	0.63
11/28/2019	06:40	5.31	12:10	7.83	6.58	05:05	1.05	10:45	1.87	1.52	05:05	0.353	12:05	1.052	0.699	0.699	
11/29/2019	05:00	5.46	12:00	7.46	6.63	04:45	1.08	11:35	1.88	1.57	04:45	0.375	11:35	0.998	0.729	0.729	0.02
11/30/2019	05:40	5.20	13:30	7.97	6.83	05:10	0.99	12:35	1.83	1.51	05:10	0.320	12:35	1.066	0.737	0.737	0.10
12/01/2019	05:40	5.70	11:20	8.27	7.25	05:30	0.95	13:35	1.81	1.37	05:40	0.349	13:35	1.088	0.725	0.725	0.06
12/02/2019	04:40	5.80	09:10	7.62	6.59	05:10	0.94	08:45	2.00	1.57	05:10	0.357	08:45	1.080	0.719	0.719	0.30
12/03/2019	04:55	4.79	08:35	7.45	6.30	04:15	1.31	22:25	1.94	1.66	04:15	0.380	08:45	1.018	0.719	0.719	0.01
12/04/2019	03:10	5.10	08:40	7.65	6.44	03:15	1.34	08:45	1.96	1.69	03:15	0.420	08:45	1.089	0.749	0.749	0.39
12/05/2019	04:55	4.93	08:35	7.69	6.41	02:40	1.25	08:15	1.91	1.63	04:50	0.384	09:10	1.046	0.723	0.723	0.01
12/06/2019	04:20	4.94	09:00	7.58	6.37	05:10	1.17	20:00	1.87	1.61	05:10	0.351	08:45	1.014	0.705	0.705	0.01
12/07/2019	05:10	4.91	18:40	8.25	6.63	04:30	1.25	12:05	2.08	1.70	04:30	0.376	18:40	1.266	0.795	0.795	0.67
12/08/2019	06:00	5.35	12:25	7.84	6.84	05:25	1.28	13:35	1.97	1.70	05:25	0.433	13:35	1.083	0.822	0.822	0.20
12/09/2019	04:55	5.30	08:50	7.64	6.59	02:20	1.35	23:05	1.92	1.68	04:45	0.468	23:05	1.041	0.767	0.767	
12/10/2019	04:10	5.03	09:05	7.79	6.55	04:05	1.22	23:30	2.03	1.64	04:10	0.377	08:40	1.086	0.747	0.747	
12/11/2019	04:45	5.11	08:45	7.68	6.43	04:20	1.32	12:20	1.93	1.67	04:45	0.418	08:50	1.060	0.740	0.740	0.03
12/12/2019	04:20	5.10	08:45	7.84	6.55	04:10	1.39	20:55	2.03	1.72	04:20	0.438	08:55	1.152	0.782	0.782	0.01
12/13/2019	05:05	5.27	08:45	7.93	6.72	04:45	1.32	09:40	2.01	1.68	04:45	0.437	09:40	1.150	0.791	0.791	0.01
12/14/2019	05:00	5.51	13:30	8.30	7.22	05:00	1.42	10:45	2.05	1.70	05:00	0.498	10:45	1.202	0.890	0.890	0.01
12/15/2019	05:20	5.43	11:10	8.56	6.91	04:35	1.32	11:15	2.01	1.69	05:20	0.455	11:15	1.269	0.830	0.830	0.01
12/16/2019	04:40	5.08	08:35	7.61	6.38	05:10	1.19	10:10	1.85	1.61	05:10	0.372	08:30	0.990	0.705	0.705	0.01
12/17/2019	04:25	5.04	08:50	7.62	6.40	03:35	1.11	21:45	1.90	1.58	03:55	0.345	09:05	0.993	0.698	0.698	0.01
12/18/2019	04:45	5.02	09:00	7.65	6.39	05:00	1.11	22:00	1.89	1.57	05:00	0.343	08:55	1.001	0.694	0.694	0.01
12/19/2019	04:30	4.75	09:05	7.28	6.19	04:20	1.11	08:55	1.93	1.60	04:20	0.318	08:55	0.997	0.677	0.677	
12/20/2019	04:55	4.61	09:35	7.61	6.29	03:30	1.15	09:30	1.83	1.59	04:50	0.323	09:30	1.004	0.690	0.690	
12/21/2019	05:25	4.85	12:10	7.56	6.46	04:20	1.17	11:15	1.91	1.57	05:20	0.346	11:15	1.012	0.708	0.708	0.01
12/22/2019	04:25	5.21	13:25	7.83	6.75	04:20	1.23	13:10	1.87	1.58	04:20	0.400	13:10	1.067	0.754	0.754	0.41
12/23/2019	06:15	5.50	13:10	8.75	6.92	06:30	1.23	14:40	2.11	1.64	06:15	0.433	13:10	1.357	0.814	0.814	
12/24/2019	04:55	5.36	11:55	7.50	6.69	04:50	1.06	13:55	1.77	1.47	04:55	0.358	13:05	0.945	0.691	0.691	0.02
12/25/2019	04:45	5.54	11:35	7.38	6.52	05:10	1.06	11:35	1.74	1.42	05:10	0.375	11:35	0.916	0.642	0.642	0.08
12/26/2019	04:45	5.46	12:50	7.47	6.76	04:10	1.06	12:05	1.81	1.46	05:25	0.373	12:05	0.966	0.698	0.698	
12/27/2019	04:05	5.79	12:25	7.49	6.84	04:05	1.17	12:10	1.79	1.50	04:05	0.442	12:10	0.954	0.722	0.722	
12/28/2019	05:00	5.54	12:20	7.94	6.87	04:25	0.97	12:25	1.85	1.47	04:25	0.348	12:25	1.076	0.723	0.723	
12/29/2019	06:10	5.64	12:40	8.04	7.02	05:10	1.00	12:10	1.83	1.49	05:10	0.364	12:10	1.083	0.759	0.759	0.22
12/30/2019	05:15	5.67	10:50	7.96	6.85	05:05	1.00	12:00	2.04	1.61	05:05	0.365	12:00	1.086	0.785	0.785	
12/31/2019	04:25	4.83	11:15	7.71	6.53	03:55	1.16	11:10	1.97	1.67	04:20	0.345	11:10	1.102	0.763	0.763	0.01

Date	Depth (in)				Velocity (ft/s)				Quantity (MGD - Total MG)					Rain (in)
	Time	Min Time	Max	Avg	Time	Min Time	Max	Avg	Time	Min Time	Max	Avg	Total	Total
01/01/2020	06:25	4.93 13:00	7.65	6.43	06:00	1.10 13:00	1.96	1.60	06:20	0.332 13:00	1.088	0.719	0.719	
01/02/2020	05:05	4.24 09:50	7.29	5.99	05:05	1.03 09:35	1.93	1.56	05:05	0.250 09:40	0.995	0.637	0.637	
01/03/2020	04:10	4.22 09:55	7.20	5.95	05:00	0.92 09:50	1.86	1.52	05:00	0.220 09:50	0.943	0.618	0.618	
01/04/2020	05:30	4.08 13:20	7.48	5.97	05:45	0.93 13:35	1.90	1.49	05:30	0.213 13:35	1.021	0.617	0.617	
01/05/2020	05:25	4.14 11:15	7.37	6.08	05:30	0.83 20:35	1.94	1.51	05:30	0.196 12:55	0.981	0.645	0.645	
01/06/2020	05:15	4.07 08:45	7.21	5.83	04:25	0.90 08:50	1.85	1.43	05:15	0.204 08:50	0.938	0.566	0.566	
01/07/2020	04:30	4.21 08:50	7.25	5.93	05:20	0.73 09:20	1.82	1.38	05:20	0.178 09:00	0.918	0.564	0.564	
01/08/2020	03:55	4.51 08:45	7.34	6.12	03:55	0.95 08:30	1.91	1.51	03:55	0.249 08:35	0.988	0.635	0.635	0.02
01/09/2020	04:50	4.53 08:50	7.52	6.14	03:55	1.07 08:25	1.90	1.54	03:55	0.286 08:50	1.022	0.647	0.647	0.18
01/10/2020	05:05	4.95 08:40	7.35	6.21	04:05	1.01 08:40	1.85	1.54	05:05	0.305 08:40	0.969	0.655	0.655	0.02
01/11/2020	05:30	4.65 12:40	7.60	6.39	05:15	1.13 11:45	1.92	1.58	05:15	0.314 11:45	1.033	0.706	0.706	0.01
01/12/2020	05:10	5.10 13:25	7.90	6.73	05:40	1.07 12:45	1.91	1.57	05:40	0.336 12:45	1.082	0.753	0.753	
01/13/2020	04:10	5.05 08:15	7.91	6.33	05:00	1.05 09:10	1.99	1.62	05:00	0.328 09:10	1.077	0.703	0.703	0.02
01/14/2020	05:10	4.78 08:55	7.56	6.29	04:50	1.17 08:00	1.94	1.60	04:50	0.338 08:55	1.044	0.690	0.690	0.11
01/15/2020	04:20	4.96 08:50	7.82	6.52	04:00	1.01 08:10	1.90	1.52	04:00	0.308 08:40	1.061	0.696	0.696	0.07
01/16/2020	05:15	4.98 21:30	7.71	6.70	03:10	1.04 08:20	2.00	1.57	04:05	0.320 08:20	1.102	0.747	0.747	0.66
01/17/2020	05:10	5.60 08:45	8.05	6.90	04:25	1.19 09:15	1.87	1.60	04:25	0.431 09:15	1.109	0.785	0.785	
01/18/2020	05:10	5.54 11:35	8.13	6.95	05:00	1.19 10:30	1.93	1.64	05:00	0.423 11:35	1.137	0.815	0.815	
01/19/2020	05:20	5.61 12:45	8.09	7.03	05:00	1.20 12:25	1.97	1.64	05:00	0.435 12:25	1.175	0.827	0.827	
01/20/2020	05:15	5.67 16:15	8.32	7.24	05:10	1.21 20:05	2.02	1.67	05:10	0.443 20:05	1.214	0.878	0.878	
01/21/2020	04:25	5.72 08:50	8.43	7.21	02:55	1.24 10:25	2.05	1.68	04:20	0.470 09:00	1.224	0.877	0.877	
01/22/2020	05:10	5.69 08:55	8.40	7.11	04:00	1.19 08:55	2.00	1.65	04:00	0.441 08:55	1.261	0.843	0.843	0.03
01/23/2020	04:15	5.29 08:45	8.43	6.88	03:55	1.08 08:40	2.00	1.57	03:55	0.358 08:40	1.264	0.771	0.771	
01/24/2020	04:50	5.32 09:45	8.45	6.87	03:50	1.08 09:35	1.98	1.54	05:00	0.364 09:35	1.247	0.755	0.755	
01/25/2020	05:50	4.98 11:50	7.98	6.71	05:45	0.97 11:45	1.98	1.53	05:45	0.297 11:45	1.162	0.736	0.736	
01/26/2020	04:55	4.98 12:10	8.07	6.83	04:50	1.00 12:40	1.91	1.55	04:50	0.303 12:40	1.125	0.765	0.765	0.16
01/27/2020	04:20	4.95 08:40	7.98	6.44	05:20	0.95 09:10	1.90	1.46	05:20	0.288 09:10	1.098	0.659	0.659	
01/28/2020	04:00	4.76 08:50	7.68	6.20	04:10	0.95 08:45	1.86	1.45	04:05	0.273 08:45	1.037	0.618	0.618	0.01
01/29/2020	04:20	4.40 08:40	7.37	5.94	04:25	0.81 08:35	1.87	1.44	04:25	0.205 08:35	0.985	0.584	0.584	
01/30/2020	05:05	4.11 09:00	7.30	5.92	05:05	0.87 08:25	1.93	1.41	05:05	0.201 09:15	0.966	0.572	0.572	
01/31/2020	05:15	4.48 08:30	7.35	5.81	05:10	0.86 08:35	1.88	1.45	05:10	0.224 08:35	0.985	0.566	0.566	
02/01/2020	05:05	3.96 12:40	9.25	6.29	04:40	0.87 12:40	2.30	1.56	04:55	0.191 12:40	1.647	0.714	0.714	
02/02/2020	06:00	5.04 12:40	8.45	6.90	04:50	1.11 20:10	2.04	1.65	04:50	0.343 12:00	1.266	0.828	0.828	
02/03/2020	04:10	4.56 08:40	8.31	6.47	05:00	0.96 08:50	2.02	1.58	05:00	0.264 08:50	1.250	0.728	0.728	
02/04/2020	04:05	4.23 09:00	8.06	6.25	04:50	0.97 09:20	2.06	1.61	04:50	0.236 08:40	1.214	0.707	0.707	
02/05/2020	03:45	4.37 08:55	8.14	6.26	05:00	0.96 08:45	2.13	1.58	05:00	0.243 08:50	1.279	0.694	0.694	
02/06/2020	03:45	4.08 08:40	8.23	6.35	04:35	1.08 08:15	2.08	1.61	03:45	0.248 08:25	1.262	0.725	0.725	
02/07/2020	03:50	4.23 08:55	8.30	6.39	04:00	0.98 08:30	1.96	1.60	04:00	0.250 08:55	1.202	0.722	0.722	
02/08/2020	05:15	4.07 13:00	7.64	6.20	05:35	0.97 12:45	2.06	1.62	05:35	0.224 12:50	1.128	0.709	0.709	
02/09/2020	04:45	4.30 12:15	7.75	6.34	07:10	1.02 12:25	2.01	1.65	04:45	0.263 12:25	1.137	0.741	0.741	
02/10/2020	04:05	4.43 08:35	7.57	6.02	05:00	0.98 08:25	2.01	1.55	05:00	0.252 08:25	1.095	0.638	0.638	
02/11/2020	04:35	4.33 10:30	7.60	6.03	04:10	1.02 10:30	2.02	1.54	04:10	0.260 10:30	1.108	0.639	0.639	
02/12/2020	04:50	4.48 08:35	8.01	6.15	04:15	0.96 08:05	1.91	1.50	04:15	0.252 08:40	1.117	0.642	0.642	
02/13/2020	04:30	4.78 09:00	7.96	6.47	04:10	0.84 08:10	1.90	1.37	04:10	0.242 08:10	1.090	0.627	0.627	
02/14/2020	05:10	5.02 08:45	8.19	6.87	04:15	0.83 09:00	1.68	1.31	04:15	0.258 09:00	1.020	0.645	0.645	
02/15/2020	04:35	4.27 12:35	7.50	6.23	06:00	1.02 12:15	2.02	1.64	06:00	0.257 12:15	1.063	0.712	0.712	
02/16/2020	05:10	3.99 12:10	7.74	6.22	06:05	1.02 12:00	2.00	1.59	05:10	0.231 12:00	1.121	0.699	0.699	
02/17/2020	05:10	4.39 11:35	7.68	6.46	04:40	1.00 10:05	1.96	1.58	04:40	0.257 10:05	1.088	0.728	0.728	
02/18/2020	05:00	4.52 09:15	7.87	6.33	04:55	1.02 09:15	1.96	1.54	04:55	0.269 09:15	1.128	0.681	0.681	
02/19/2020	04:10	4.73 08:55	8.11	6.40	05:10	1.04 08:45	1.93	1.55	05:10	0.297 08:50	1.151	0.695	0.695	
02/20/2020	05:00	4.46 09:05	7.88	6.20	04:00	1.05 08:30	2.01	1.58	04:00	0.276 09:00	1.142	0.680	0.680	
02/21/2020	04:15	4.77 09:25	8.37	6.69	03:45	1.05 09:30	1.85	1.60	03:45	0.304 09:30	1.155	0.761	0.761	
02/22/2020	05:40	5.03 11:25	8.11	6.88	04:40	0.88 11:20	1.80	1.41	04:40	0.273 11:20	1.077	0.702	0.702	
02/23/2020	05:40	4.84 12:55	8.41	7.11	04:25	0.86 12:45	1.77	1.37	04:25	0.260 12:45	1.114	0.720	0.720	
02/24/2020	03:40	5.07 09:00	8.91	7.24	04:15	0.80 09:05	1.74	1.24	04:15	0.253 09:05	1.182	0.663	0.663	

Date	Depth (in)					Velocity (ft/s)					Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
02/25/2020	04:15	5.23	08:45	9.10	7.45	05:00	0.76	08:45	1.54	1.25	05:00	0.250	08:45	1.083	0.695	0.695	
02/26/2020	04:25	5.32	08:40	9.42	7.39	04:30	0.78	22:50	1.78	1.28	04:30	0.261	08:15	1.106	0.696	0.696	
02/27/2020	04:40	4.39	08:40	7.99	6.36	03:10	0.93	08:10	1.87	1.41	03:10	0.249	08:35	1.082	0.624	0.624	
02/28/2020	04:35	4.79	08:50	8.04	6.54	03:40	0.86	08:20	1.78	1.37	03:40	0.252	08:45	1.045	0.633	0.633	
02/29/2020	05:15	4.88	11:55	8.11	6.79	06:10	0.86	11:55	1.77	1.39	06:10	0.255	11:55	1.061	0.682	0.682	
03/01/2020	05:35	4.76	11:05	8.19	6.93	04:55	0.79	11:00	1.80	1.40	04:55	0.232	11:00	1.089	0.715	0.715	
03/02/2020	04:50	4.86	08:40	8.48	6.34	03:25	0.73	09:00	1.95	1.47	03:25	0.222	09:00	1.101	0.650	0.650	
03/03/2020	04:30	4.29	09:00	8.65	6.46	04:50	0.96	21:30	2.03	1.64	04:50	0.243	09:05	1.319	0.759	0.759	
03/04/2020	04:45	4.59	08:20	8.56	6.65	03:50	1.10	08:10	2.13	1.68	03:50	0.302	08:25	1.362	0.802	0.802	
03/05/2020	04:30	4.80	08:45	8.55	6.71	04:25	1.14	08:45	2.07	1.66	04:25	0.328	08:45	1.333	0.791	0.791	
03/06/2020	04:55	4.29	08:50	8.10	6.52	04:45	1.01	08:45	1.96	1.59	04:50	0.248	08:45	1.174	0.740	0.740	
03/07/2020	05:10	4.64	12:15	8.39	6.91	05:10	1.10	12:50	1.95	1.64	05:10	0.304	12:50	1.214	0.829	0.829	
03/08/2020	05:15	4.36	11:20	8.18	6.66	04:40	1.00	11:20	2.12	1.67	04:40	0.252	11:20	1.286	0.812	0.812	
03/09/2020	04:00	4.54	20:30	7.88	6.40	04:05	1.00	20:40	1.98	1.61	04:05	0.266	20:30	1.140	0.728	0.727	

Report Summary For The Period 11/16/2019 00:00 - 03/09/2020 23:59

	Depth (in)	Velocity (ft/s)	Quantity (MGD - Total MG)	Rain (in)
Total			81.489	4.90
Avg	6.51	1.54	0.709	

Site Commentary

Site Information

MIL_0186	
Pipe Dimensions	8
Silt Level	1.63"

Overview

Site MIL_0186 functioned under normal conditions during the period Saturday, November 16, 2019 to Monday, March 9, 2020 . This site exhibited an observable response to the wet weather events of November 26, 2019 - November 27, 2019 and December 7, 2019 - December 8, 2019. Surcharge conditions were experienced at this location. Review of the scattergraph shows free flow conditions during the study period.

Flow depth and velocity measurements recorded by the flow monitor are consistent with field confirmations conducted to date and support the relative accuracy of the flow monitor at this location. Data confidence is less than typical due to sediment. A data gap also occurs beginning February 02, 2020 through February 14, 2020 and another data gap on March 02, 2020 through March 05, 2020 resulting from a meter malfunction.

Observations

Average flow depth, velocity, and quantity data observed during Saturday, November 16, 2019 to Monday, March 9, 2020 , along with observed minimum and maximum data, are provided in the following table.

Observed Flow Conditions			
Item	Depth (in)	Velocity (ft/s)	Quantity (MGD)
Average	4.25	1.45	0.133
Minimum	2.64	0.71	0.030
Maximum	8.80	2.50	0.482
Time of Minimum	2/23/2020 3:35 AM	11/18/2019 3:25 AM	11/18/2019 3:25 AM
Time of Maximum	3/6/2020 2:15 PM	12/4/2019 5:30 AM	12/4/2019 5:30 AM

Data Quality

Data uptime observed during the Saturday, November 16, 2019 to the Monday, March 9, 2020 monitoring period is provided in the table below. Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period. 90 days of data provided.

Percent Uptime	
Depth (in)	88
Velocity (ft/s)	88
Quantity (MGD)	88

Milpitas Temp Study 2019-20

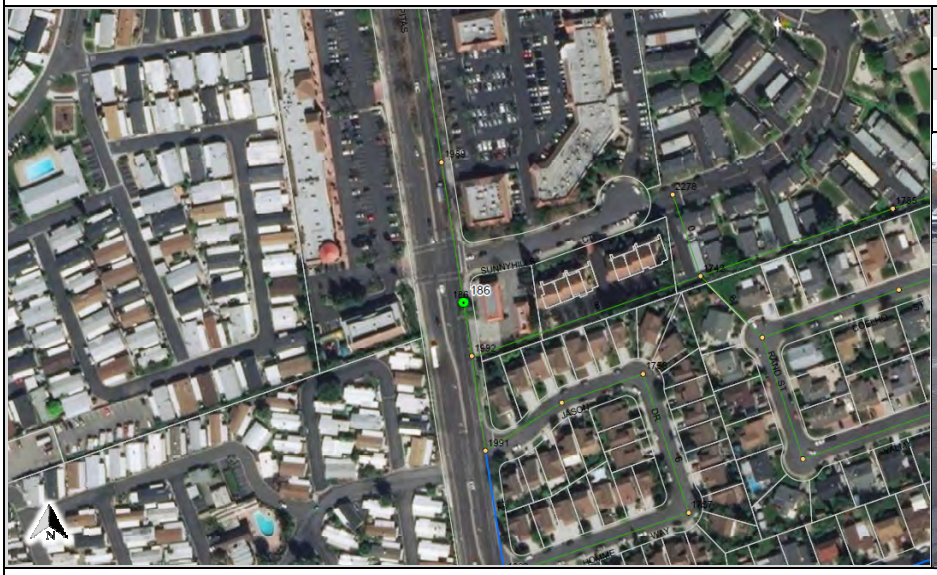
Flow Monitoring Site Report

ADS ENVIRONMENTAL SERVICES®

Site Name

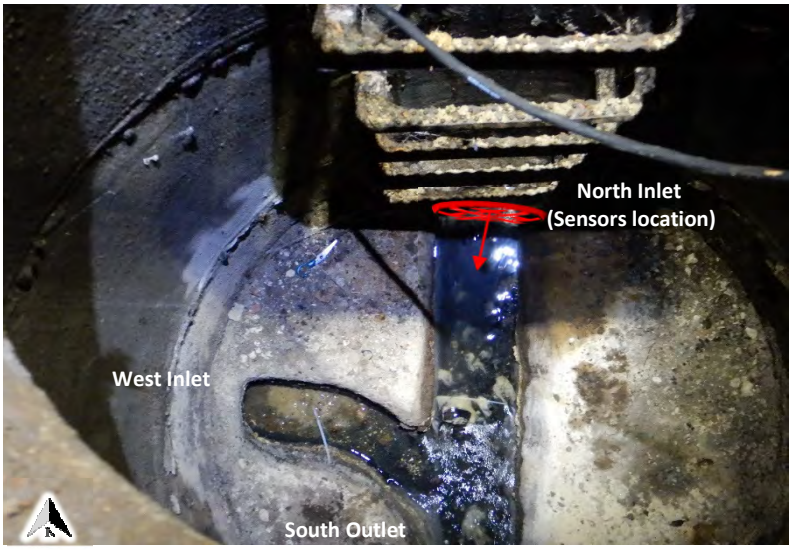
MIL_0186

Site Address /Location:	N Milpitas Blvd and Sunnyhills Ct			Monitor Series: TRITON+	Location Type: Temporary
Site Access Details:	Drive	Latitude:	37.454452°	Pipe Size (H x W): 8.0" x 8.0"	Pipe Shape: Circular
		Longitude:	-121.910707°		



Manhole #	System Characteristics
186	Residential
Access	**Traffic**
Drive	Medium







Installation Information

Installation Date:	Installation Type:
Tuesday, November 12, 2019	Doppler Standard Ring and Crank
Monitoring Location (Sensors):	**Monitor Location:**
Upstream 0-5 FT	Manhole
Sensors / Devices:	**Pressure Sensor Range (psi)**
Peak Combo (CS4)	0 - 5 psi

Installation Confirmation:

Confirmation Time:	Pipe Size (HxW)
3:47:18 AM	8.0" x 8.0"
Depth of Flow (Wet DOF) (in)	**Range (Air DOF) (in)**
3.75	0.00"
Downlooker Physical Offset (in)	**Measurement Confidence (in)**
NA	0.25"
Peak Velocity (fps)	**Velocity Sensor Offset (in)**
0.91	0''
Silt (in)	**Silt Type**
1.63	

Hydraulic Comments:

Medium depth with moderate velocity

Manhole / Pipe Information:

Manhole Depth (Approx. FT):	Manhole Configuration
7'	Single
Manhole Material:	**Manhole Condition:**
Concrete	Good
Manhole Opening Diameter (in)	**Manhole Diameter (Approx.):**
26''	54''
Manhole Cover	**Manhole Frame**
Unbolted	Normal
Active Drop Connections	**Air Quality:**
No	Normal
Pipe Material	**Pipe Condition:**
PVC	Good

Communication Information:

Communication Type	Antenna Location
Wireless	Manhole Pick / Vent Hole

Additional Site Info. / Comments:

ADS Project Name:	Milpitas.WWTFM.CA19-20
ADS Project Number:	22431.11.325

SCATTERGRAPH REPORT

MIL_0186

Flow Monitor

MIL_0186

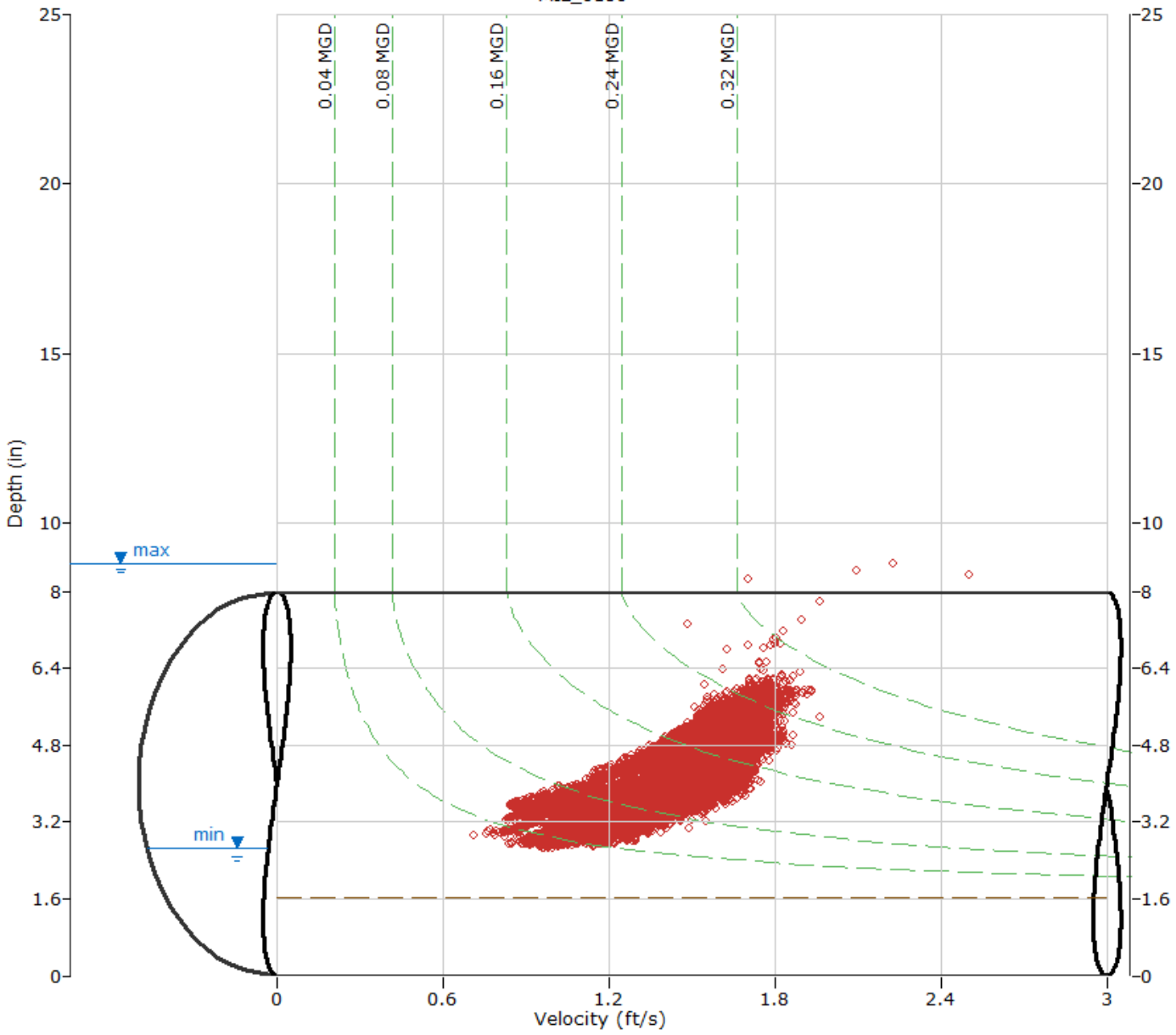
Pipe Height
8.00 in

Report Period

11/16/2019
To
3/9/2020

Legend

- Depth - Velocity
- Iso-Q™
- Silt
- Min-Max Depth



ADS ENVIRONMENTAL SERVICES

HYDROGRAPH REPORT

MIL_0186

Flow Monitor

MIL_0186

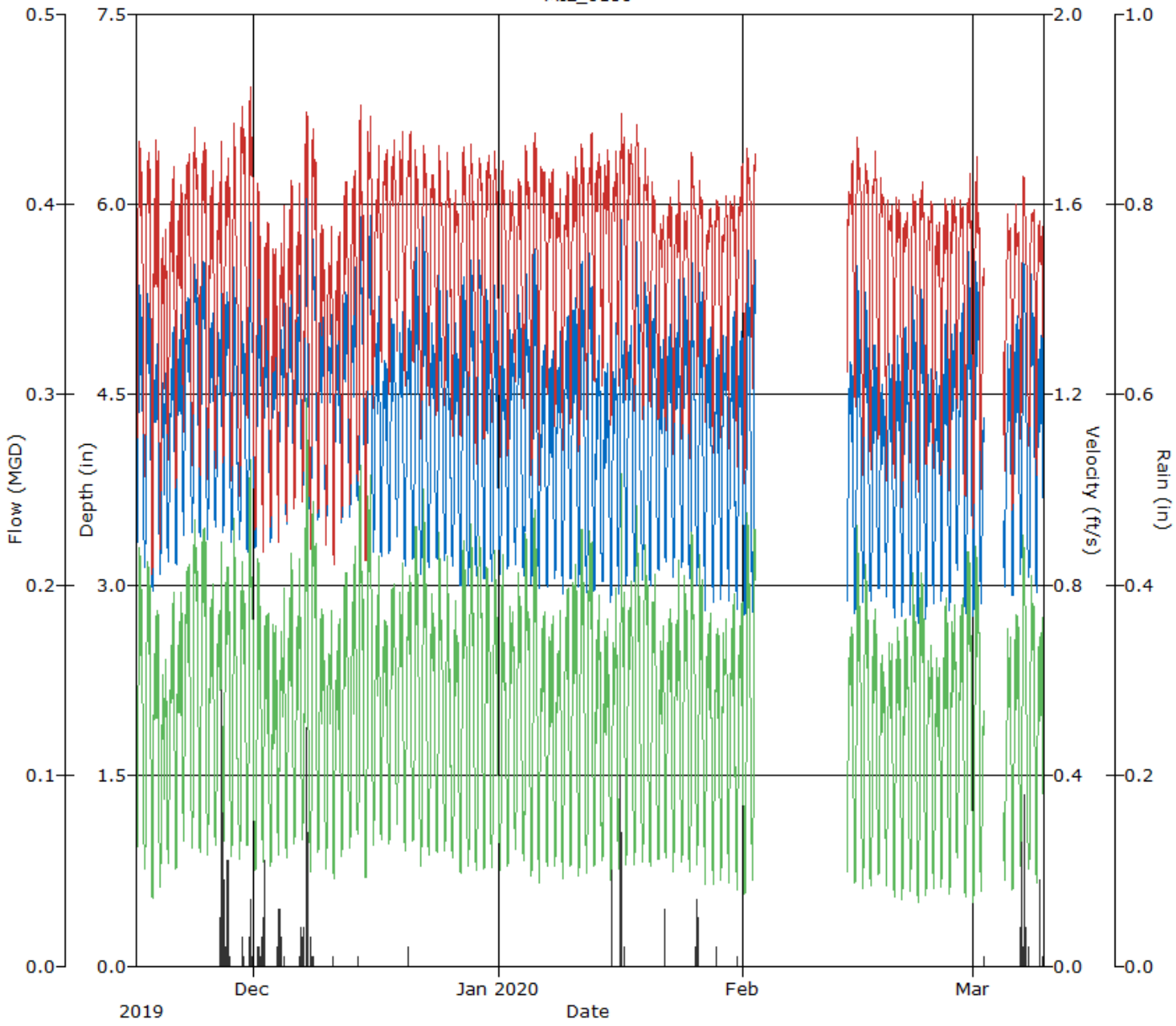
Pipe Height
8.00 in

Report Period

11/16/2019
To
3/9/2020

Legend

- Depth
- Velocity
- Quantity
- Rain



ADS ENVIRONMENTAL SERVICES

Daily Tabular Report For The Period 11/16/2019 00:00 - 03/09/2020 23:59

MIL_0186, Pipe Height: 8.00 in, Silt: 1.63 in

Daily Tabular Report

Date	Depth (in)				Velocity (ft/s)				Quantity (MGD - Total MG)					Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
11/16/2019	05:15	3.20	12:20	5.64	4.37	05:55	1.05	10:50	1.77	1.48	05:15	0.057	12:20	0.237	0.143	0.143	
11/17/2019	03:40	3.11	11:25	5.54	4.33	04:25	0.98	10:45	1.76	1.44	04:25	0.048	11:30	0.230	0.139	0.139	
11/18/2019	03:05	2.88	18:05	5.00	4.10	03:25	0.71	18:20	1.84	1.40	03:25	0.030	17:35	0.203	0.123	0.123	
11/19/2019	04:00	3.00	19:00	4.98	3.98	04:00	0.83	17:40	1.69	1.32	04:00	0.037	19:00	0.187	0.108	0.108	
11/20/2019	03:45	3.15	20:10	5.37	4.22	03:25	1.00	19:40	1.74	1.44	03:25	0.051	20:10	0.223	0.130	0.130	
11/21/2019	03:05	3.12	18:15	5.37	4.27	03:55	0.95	19:15	1.70	1.41	03:55	0.047	19:15	0.216	0.130	0.130	
11/22/2019	01:50	3.18	14:25	6.22	4.64	01:50	0.96	14:25	1.87	1.51	01:50	0.049	14:25	0.289	0.159	0.159	
11/23/2019	04:40	3.36	17:35	5.69	4.62	04:40	1.02	14:05	1.87	1.48	04:40	0.058	14:05	0.246	0.156	0.156	
11/24/2019	04:05	3.32	14:10	6.25	4.65	04:05	0.93	14:10	1.83	1.47	04:05	0.052	14:10	0.285	0.157	0.157	
11/25/2019	03:40	3.31	18:30	5.37	4.41	04:00	1.00	18:30	1.71	1.42	03:40	0.055	18:30	0.219	0.138	0.138	
11/26/2019	02:20	3.39	20:15	5.60	4.41	02:20	0.99	19:20	1.77	1.43	02:20	0.057	20:15	0.238	0.139	0.139	0.63
11/27/2019	03:15	3.37	20:10	5.55	4.51	03:25	0.97	20:10	1.73	1.45	03:25	0.057	20:10	0.232	0.147	0.147	0.77
11/28/2019	04:25	3.27	11:00	5.69	4.34	05:15	0.99	11:00	1.85	1.43	04:25	0.054	11:00	0.256	0.137	0.137	
11/29/2019	03:55	3.29	17:40	5.39	4.24	03:50	0.91	17:40	1.97	1.48	03:50	0.050	17:40	0.253	0.136	0.136	0.05
11/30/2019	04:10	3.20	11:50	6.33	4.48	03:00	1.06	13:00	1.90	1.52	03:00	0.057	11:50	0.300	0.154	0.154	0.14
12/01/2019	05:10	3.23	13:35	5.79	4.46	02:25	0.87	13:35	1.68	1.32	05:05	0.046	13:35	0.239	0.133	0.133	0.06
12/02/2019	04:35	3.51	12:00	5.39	4.47	04:10	0.85	18:40	1.66	1.30	04:10	0.053	12:00	0.210	0.130	0.130	0.36
12/03/2019	03:55	3.30	11:25	5.34	4.34	03:55	0.87	11:15	1.65	1.25	03:55	0.048	11:25	0.195	0.119	0.119	
12/04/2019	02:35	3.53	05:30	8.48	4.49	02:35	0.84	05:30	2.50	1.32	02:35	0.053	05:30	0.482	0.132	0.132	0.44
12/05/2019	02:15	3.42	18:15	6.88	4.50	02:15	0.91	18:45	1.83	1.34	02:15	0.053	18:15	0.295	0.136	0.136	
12/06/2019	05:05	3.53	17:50	6.03	4.54	03:25	0.87	17:50	1.79	1.34	03:25	0.057	17:50	0.268	0.137	0.137	0.06
12/07/2019	04:25	3.57	06:55	8.34	4.79	02:55	0.87	18:40	1.91	1.42	02:55	0.057	17:25	0.330	0.160	0.160	0.84
12/08/2019	03:40	3.32	10:55	5.95	4.65	03:40	0.86	11:20	1.86	1.39	03:40	0.048	10:55	0.269	0.151	0.151	0.10
12/09/2019	02:55	3.49	12:55	5.47	4.43	02:55	0.94	12:55	1.65	1.31	02:55	0.057	12:55	0.217	0.128	0.128	
12/10/2019	03:10	3.34	19:00	5.46	4.38	03:10	0.87	19:00	1.65	1.29	03:10	0.049	19:00	0.217	0.124	0.124	0.01
12/11/2019	03:40	3.25	20:05	5.32	4.32	03:40	0.83	20:05	1.61	1.26	03:40	0.044	20:05	0.204	0.120	0.120	0.00
12/12/2019	03:45	3.45	12:40	5.53	4.52	03:45	0.92	19:15	1.75	1.37	03:45	0.055	19:15	0.233	0.140	0.140	
12/13/2019	04:10	3.49	18:25	7.77	4.54	04:10	0.94	18:25	1.96	1.38	04:10	0.058	18:25	0.374	0.142	0.142	
12/14/2019	03:10	3.61	11:45	6.10	4.71	03:10	0.99	10:50	1.93	1.40	03:10	0.065	10:50	0.282	0.154	0.154	0.01
12/15/2019	05:15	3.26	18:30	6.35	4.70	05:15	0.83	19:50	1.82	1.40	05:15	0.045	18:30	0.280	0.158	0.158	
12/16/2019	03:15	3.25	19:00	5.69	4.33	02:40	1.14	18:50	1.76	1.50	03:05	0.061	19:00	0.242	0.141	0.141	
12/17/2019	03:35	3.17	11:35	5.00	4.15	04:55	1.21	19:10	1.76	1.55	04:55	0.063	11:30	0.201	0.135	0.135	
12/18/2019	03:35	3.19	13:25	5.40	4.28	02:05	1.10	14:15	1.80	1.54	03:35	0.059	13:25	0.223	0.142	0.142	
12/19/2019	04:20	3.32	20:25	5.64	4.29	04:20	1.26	20:25	1.80	1.55	04:20	0.070	20:25	0.247	0.143	0.143	
12/20/2019	03:25	3.07	18:50	5.49	4.24	03:25	1.14	20:50	1.79	1.55	03:25	0.053	18:50	0.234	0.141	0.141	0.02
12/21/2019	03:40	3.16	10:30	6.15	4.39	05:15	1.14	13:25	1.77	1.51	05:15	0.061	11:10	0.267	0.146	0.146	
12/22/2019	04:00	3.03	13:10	6.16	4.35	05:20	1.03	13:10	1.80	1.48	05:20	0.047	13:10	0.276	0.143	0.143	
12/23/2019	03:55	3.10	15:05	5.78	4.20	03:55	1.16	11:40	1.79	1.50	03:55	0.055	15:05	0.244	0.135	0.135	
12/24/2019	03:20	3.16	12:15	5.83	4.29	04:35	1.07	12:25	1.80	1.48	03:20	0.054	12:30	0.247	0.138	0.138	
12/25/2019	05:30	3.14	11:35	5.87	4.13	03:25	1.12	11:35	1.81	1.49	05:35	0.057	11:35	0.261	0.129	0.129	
12/26/2019	05:35	3.10	11:45	5.49	4.14	03:30	1.07	11:45	1.69	1.44	05:25	0.053	11:45	0.223	0.126	0.126	
12/27/2019	04:30	2.92	13:50	5.86	4.20	04:30	1.07	13:20	1.75	1.49	04:30	0.044	13:50	0.250	0.135	0.135	
12/28/2019	04:10	2.96	10:50	6.81	4.29	03:15	1.09	10:45	1.79	1.48	03:10	0.049	10:50	0.302	0.139	0.139	
12/29/2019	04:05	2.99	12:00	5.94	4.37	05:10	0.99	18:35	1.78	1.47	05:05	0.046	12:00	0.250	0.144	0.144	
12/30/2019	04:00	3.00	11:20	5.74	4.19	04:05	1.00	17:30	1.74	1.50	04:05	0.044	11:20	0.229	0.135	0.135	
12/31/2019	04:20	2.98	12:55	5.49	4.20	02:00	1.08	11:10	1.74	1.50	04:20	0.048	12:55	0.230	0.135	0.135	

Date	Depth (in)					Velocity (ft/s)					Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
01/01/2020	05:30	3.00	12:40	5.79	4.11	05:20	0.99	12:55	1.73	1.45	05:20	0.045	12:40	0.243	0.126	0.126	
01/02/2020	02:55	3.05	05:20	8.60	4.21	02:55	1.03	05:20	2.10	1.45	02:55	0.047	05:20	0.404	0.131	0.131	
01/03/2020	03:40	3.15	11:25	5.54	4.28	04:05	1.13	11:25	1.69	1.48	03:40	0.061	11:25	0.226	0.136	0.136	
01/04/2020	04:25	2.98	11:45	5.85	4.27	04:30	1.02	10:25	1.79	1.49	04:30	0.046	11:45	0.252	0.139	0.139	
01/05/2020	04:30	2.96	13:05	6.15	4.33	03:30	0.97	13:05	1.78	1.46	04:30	0.042	13:05	0.272	0.142	0.142	
01/06/2020	03:10	2.93	19:00	5.10	4.06	03:10	0.94	10:05	1.73	1.51	03:10	0.039	19:00	0.203	0.128	0.128	
01/07/2020	02:00	2.91	18:45	5.29	3.99	03:25	1.06	19:15	1.76	1.51	02:00	0.047	18:45	0.214	0.123	0.123	
01/08/2020	04:25	3.01	18:15	5.36	4.12	04:20	1.09	20:40	1.69	1.47	04:20	0.049	18:15	0.209	0.127	0.127	
01/09/2020	03:20	2.91	19:10	5.53	4.21	03:35	1.03	18:55	1.75	1.47	03:35	0.042	19:15	0.226	0.133	0.133	
01/10/2020	03:40	2.97	12:00	5.53	4.22	04:35	1.12	13:50	1.74	1.49	03:40	0.048	19:25	0.227	0.135	0.135	
01/11/2020	03:30	2.94	10:45	6.03	4.34	03:35	1.01	10:50	1.79	1.49	03:35	0.043	10:45	0.267	0.144	0.144	
01/12/2020	04:15	2.91	18:55	5.99	4.35	04:55	1.08	18:50	1.82	1.53	04:10	0.045	18:55	0.268	0.147	0.147	
01/13/2020	02:50	2.91	18:30	5.22	3.96	02:50	1.09	20:00	1.74	1.54	02:50	0.045	18:30	0.213	0.124	0.124	
01/14/2020	04:55	2.96	21:00	4.97	4.01	05:10	1.12	20:50	1.74	1.54	05:10	0.048	21:00	0.198	0.127	0.106	
01/15/2020	05:10	2.84	21:15	5.56	4.02	06:00	1.09	21:05	1.79	1.52	05:35	0.044	21:20	0.227	0.126	0.126	0.10
01/16/2020	05:40	2.91	13:55	6.07	4.18	06:00	1.15	12:45	1.83	1.57	05:30	0.048	13:45	0.269	0.140	0.140	0.66
01/17/2020	04:10	2.98	21:15	5.31	4.18	04:10	1.13	12:30	1.80	1.55	04:10	0.049	19:25	0.224	0.138	0.138	
01/18/2020	05:20	2.98	14:10	6.16	4.32	05:20	1.13	14:30	1.81	1.53	05:20	0.049	14:10	0.272	0.145	0.145	
01/19/2020	06:55	3.01	13:40	5.86	4.31	08:00	1.08	13:05	1.79	1.49	06:55	0.050	13:40	0.253	0.141	0.141	
01/20/2020	05:35	2.93	18:50	5.77	4.29	04:50	1.13	17:50	1.77	1.47	05:35	0.048	18:50	0.236	0.136	0.136	
01/21/2020	06:15	3.05	13:10	5.09	4.12	07:00	1.08	20:30	1.66	1.43	06:15	0.052	20:30	0.189	0.124	0.124	0.01
01/22/2020	05:15	3.12	13:45	5.34	4.22	05:20	1.04	21:00	1.69	1.45	05:20	0.051	20:35	0.208	0.130	0.130	0.09
01/23/2020	02:55	3.04	19:40	5.66	4.29	02:40	1.04	19:20	1.70	1.44	03:30	0.048	20:25	0.231	0.134	0.123	
01/24/2020	05:30	3.10	13:25	6.38	4.33	05:00	1.08	12:15	1.71	1.42	05:30	0.052	13:25	0.258	0.135	0.135	
01/25/2020	05:40	3.02	12:20	5.91	4.20	05:30	1.03	11:00	1.84	1.47	05:40	0.047	12:20	0.257	0.133	0.133	
01/26/2020	03:30	2.97	11:15	5.69	4.25	03:05	1.14	11:05	1.68	1.49	03:25	0.050	11:15	0.227	0.136	0.136	0.16
01/27/2020	04:50	2.78	11:25	5.34	4.09	05:10	1.07	08:05	1.67	1.44	03:50	0.041	20:15	0.206	0.124	0.113	
01/28/2020	04:45	2.79	22:10	5.13	4.03	04:00	1.04	19:25	1.66	1.47	04:45	0.039	20:15	0.193	0.123	0.123	0.02
01/29/2020	03:55	2.83	20:40	5.37	4.11	03:35	1.05	21:40	1.66	1.46	03:35	0.042	20:40	0.211	0.125	0.125	
01/30/2020	03:40	2.84	19:55	5.43	4.09	03:20	1.03	16:15	1.70	1.47	03:40	0.042	19:50	0.214	0.126	0.126	
01/31/2020	05:10	2.77	19:25	5.28	4.05	04:05	0.95	20:05	1.77	1.50	04:05	0.036	21:50	0.213	0.127	0.127	0.01
02/01/2020	04:45	2.73	14:55	6.17	4.26	02:50	0.94	12:20	1.76	1.46	04:55	0.035	11:35	0.266	0.138	0.138	
02/02/2020	04:45	2.75	10:30	6.14	4.00	04:20	1.15	12:20	1.75	1.49	04:45	0.041	10:30	0.261	0.125	0.076	
02/03/2020	00:00		00:00			00:00		00:00			00:00		00:00				
02/04/2020	00:00		00:00			00:00		00:00			00:00		00:00				
02/05/2020	00:00		00:00			00:00		00:00			00:00		00:00				
02/06/2020	00:00		00:00			00:00		00:00			00:00		00:00				
02/07/2020	00:00		00:00			00:00		00:00			00:00		00:00				
02/08/2020	00:00		00:00			00:00		00:00			00:00		00:00				
02/09/2020	00:00		00:00			00:00		00:00			00:00		00:00				
02/10/2020	00:00		00:00			00:00		00:00			00:00		00:00				
02/11/2020	00:00		00:00			00:00		00:00			00:00		00:00				
02/12/2020	00:00		00:00			00:00		00:00			00:00		00:00				
02/13/2020	00:00		00:00			00:00		00:00			00:00		00:00				
02/14/2020	05:00	2.84	19:35	5.05	4.19	05:00	1.10	20:30	1.78	1.60	05:00	0.043	19:35	0.199	0.140	0.112	
02/15/2020	05:15	2.69	11:50	5.78	4.08	05:50	1.13	11:50	1.77	1.54	05:15	0.039	11:50	0.251	0.133	0.133	
02/16/2020	04:55	2.81	11:05	5.62	4.11	03:10	0.97	16:55	1.78	1.47	05:05	0.037	11:05	0.232	0.129	0.129	
02/17/2020	04:05	2.85	19:40	5.43	3.94	04:20	0.98	17:20	1.76	1.46	04:15	0.039	19:40	0.218	0.119	0.119	
02/18/2020	04:15	2.90	13:20	4.65	3.87	02:40	1.03	14:10	1.75	1.48	04:15	0.043	13:40	0.167	0.115	0.115	
02/19/2020	02:50	2.87	12:50	5.24	3.98	02:35	0.97	08:50	1.76	1.44	02:35	0.039	12:50	0.200	0.118	0.118	
02/20/2020	03:15	2.71	11:45	5.28	3.99	03:15	0.95	18:45	1.66	1.44	03:15	0.033	11:45	0.201	0.119	0.119	
02/21/2020	02:55	2.68	18:20	5.48	4.01	03:00	0.92	18:45	1.68	1.41	02:55	0.032	18:20	0.211	0.118	0.118	
02/22/2020	04:25	2.70	13:40	5.70	4.10	04:20	0.96	13:40	1.67	1.42	04:25	0.033	13:40	0.232	0.124	0.124	
02/23/2020	03:35	2.64	12:40	5.61	4.16	03:30	0.96	17:35	1.73	1.42	03:30	0.031	13:35	0.232	0.129	0.129	
02/24/2020	03:50	2.70	11:45	6.05	3.94	03:45	0.99	21:25	1.69	1.43	03:50	0.034	11:45	0.232	0.115	0.115	

Date	Depth (in)					Velocity (ft/s)					Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
02/25/2020	03:40	2.82	21:00	5.11	3.95	04:50	1.01	21:00	1.62	1.40	03:40	0.039	21:00	0.192	0.113	0.113	
02/26/2020	02:45	2.74	19:15	5.58	4.13	02:35	0.95	19:05	1.64	1.43	02:45	0.034	19:15	0.219	0.125	0.125	
02/27/2020	02:45	2.70	11:45	5.42	4.14	03:10	0.91	16:35	1.62	1.44	03:10	0.032	11:40	0.206	0.127	0.127	
02/28/2020	04:20	3.05	18:30	5.46	4.24	04:20	1.14	19:50	1.64	1.46	04:20	0.052	19:50	0.212	0.133	0.133	
02/29/2020	04:15	2.72	10:40	5.87	4.28	04:35	0.90	18:10	1.70	1.41	04:35	0.032	10:40	0.235	0.134	0.134	
03/01/2020	05:15	2.73	11:45	5.96	4.27	04:20	0.84	13:25	1.72	1.40	04:20	0.030	11:45	0.245	0.133	0.133	
03/02/2020	03:30	2.82	07:45	4.60	3.48	02:50	0.95	07:30	1.52	1.24	03:25	0.037	07:45	0.148	0.079	0.034	0.01
03/03/2020																	
03/04/2020																	
03/05/2020	03:40	2.93	12:45	5.21	4.10	02:30	0.94	12:45	1.60	1.41	02:30	0.039	12:45	0.196	0.121	0.121	
03/06/2020	04:20	2.85	14:15	8.80	4.14	04:05	0.92	14:15	2.23	1.40	04:05	0.036	14:15	0.429	0.123	0.123	
03/07/2020	05:05	3.01	14:15	5.90	4.41	05:05	1.07	15:10	1.77	1.44	05:05	0.048	15:10	0.257	0.141	0.141	0.58
03/08/2020	04:30	2.96	12:35	5.73	4.30	04:30	1.04	14:05	1.63	1.42	04:30	0.045	12:35	0.227	0.133	0.133	0.02
03/09/2020	04:05	2.91	20:05	5.34	4.08	04:05	1.01	12:40	1.60	1.39	04:05	0.041	20:00	0.202	0.119	0.119	0.11

Report Summary For The Period 11/16/2019 00:00 - 03/09/2020 23:59

	Depth (in)	Velocity (ft/s)	Quantity (MGD - Total MG)	Rain (in)
Total			13.410	5.26
Avg	4.25	1.45	0.133	

Site Commentary

Site Information

MIL_0190	
Pipe Dimensions	18
Silt Level	0.00"

Overview

Site MIL_0190 functioned under normal conditions during the period Saturday, November 16, 2019 to Monday, March 9, 2020 . This site exhibited an observable response to the wet weather events of November 26, 2019 - November 27, 2019, December 7, 2019 - December 8, 2019, and January 16, 2020 - January 17, 2020. Review of the scattergraph shows that free flow conditions were recorded during the study period.

Flow depth and velocity measurements recorded by the flow monitor are consistent with field confirmations conducted to date and support the relative accuracy of the flow monitor at this location.

This location was installed upstream of site MIL_1790. (See MIL_1790 Site Commentary for More Details)

Observations

Average flow depth, velocity, and quantity data observed during Saturday, November 16, 2019 to Monday, March 9, 2020 , along with observed minimum and maximum data, are provided in the following table.

Observed Flow Conditions			
Item	Depth (in)	Velocity (ft/s)	Quantity (MGD)
Average	2.47	0.96	0.093
Minimum	1.80	0.41	0.024
Maximum	3.29	1.47	0.198
Time of Minimum	11/22/2019 4:00 AM	11/22/2019 3:50 AM	11/22/2019 3:50 AM
Time of Maximum	12/12/2019 1:55 PM	3/6/2020 9:10 AM	3/6/2020 9:10 AM

Data Quality

Data uptime observed during the Saturday, November 16, 2019 to the Monday, March 9, 2020 monitoring period is provided in the table below. Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

Percent Uptime	
Depth (in)	100
Velocity (ft/s)	100
Quantity (MGD)	100

Milpitas Temp Study 2019-20

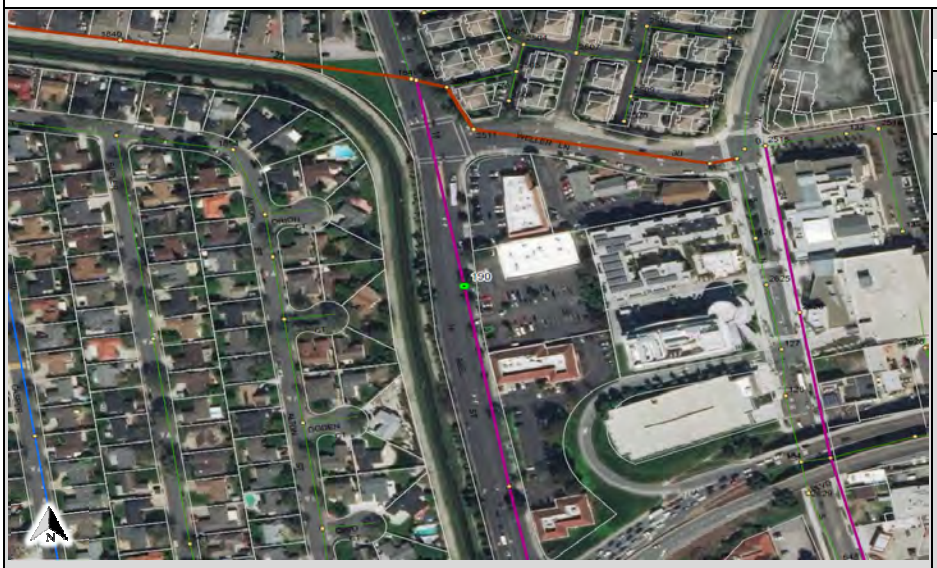
Flow Monitoring Site Report

ADS ENVIRONMENTAL SERVICES®

Site Name

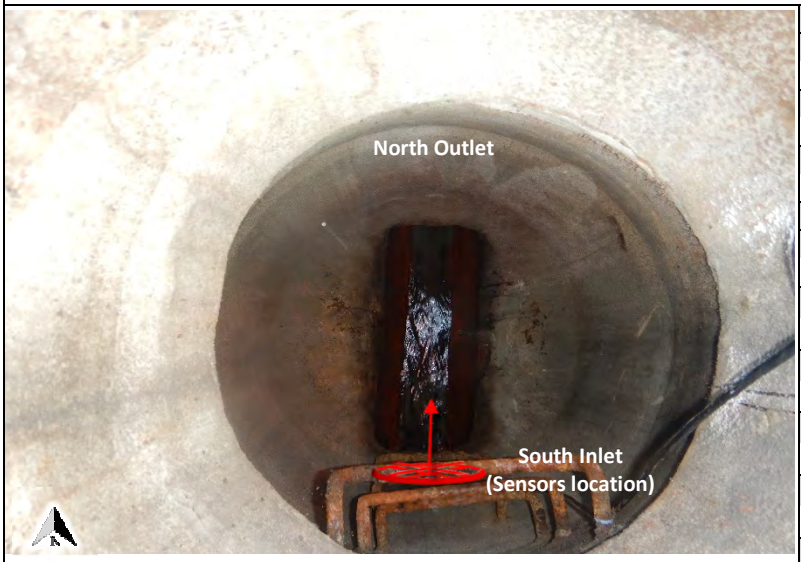
MIL_0190

Site Address /Location:	N Abel St and Weller Ln			Monitor Series	Location Type
				TRITON+	Temporary
Site Access Details:	middle of N bound lanes	Latitude:	37.432482°	Pipe Size (H x W)	Pipe Shape
		Longitude:	-121.909452°	18.0" x 18.0"	Circular



Manhole #	System Characteristics
190	Residential
Access	Traffic
Drive	Heavy







Installation Information

Installation Date:	Installation Type:
Wednesday, November 13, 2019	Doppler Standard Ring and Crank
Monitoring Location (Sensors):	Monitor Location:
Upstream 0-5 FT	Manhole
Sensors / Devices:	Pressure Sensor Range (psi)
Peak Combo (CS4)	0 - 5 psi

Installation Confirmation:

Confirmation Time:	Pipe Size (HxW)
10:04:15 AM	18.0" x 18.0"
Depth of Flow (Wet DOF) (in)	Range (Air DOF) (in)
3.00	0.00"
Downlooker Physical Offset (in)	Measurement Confidence (in)
NA	0.25"
Peak Velocity (fps)	Velocity Sensor Offset (in)
0.97	0''
Silt (in)	Silt Type
0''	

Hydraulic Comments:

Smooth shallow flow with moderate velocity

Manhole / Pipe Information:

Manhole Depth (Approx. FT):	Manhole Configuration
8'	Single
Manhole Material:	Manhole Condition:
Concrete	Good
Manhole Opening Diameter (in)	Manhole Diameter (Approx.):
26''	54''
Manhole Cover	Manhole Frame
Unbolted	Normal
Active Drop Connections	Air Quality:
No	Normal
Pipe Material	Pipe Condition:
Vitrified Clay Pipe	Good

Communication Information:

Communication Type	Antenna Location
Wireless	Manhole Pick / Vent Hole

Additional Site Info. / Comments:

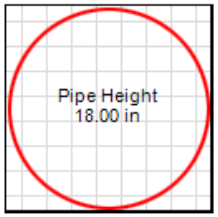
ADS Project Name:	Milpitas.WWTFM.CA19-20
ADS Project Number:	22431

SCATTERGRAPH REPORT

MIL_0190

Flow Monitor

MIL_0190

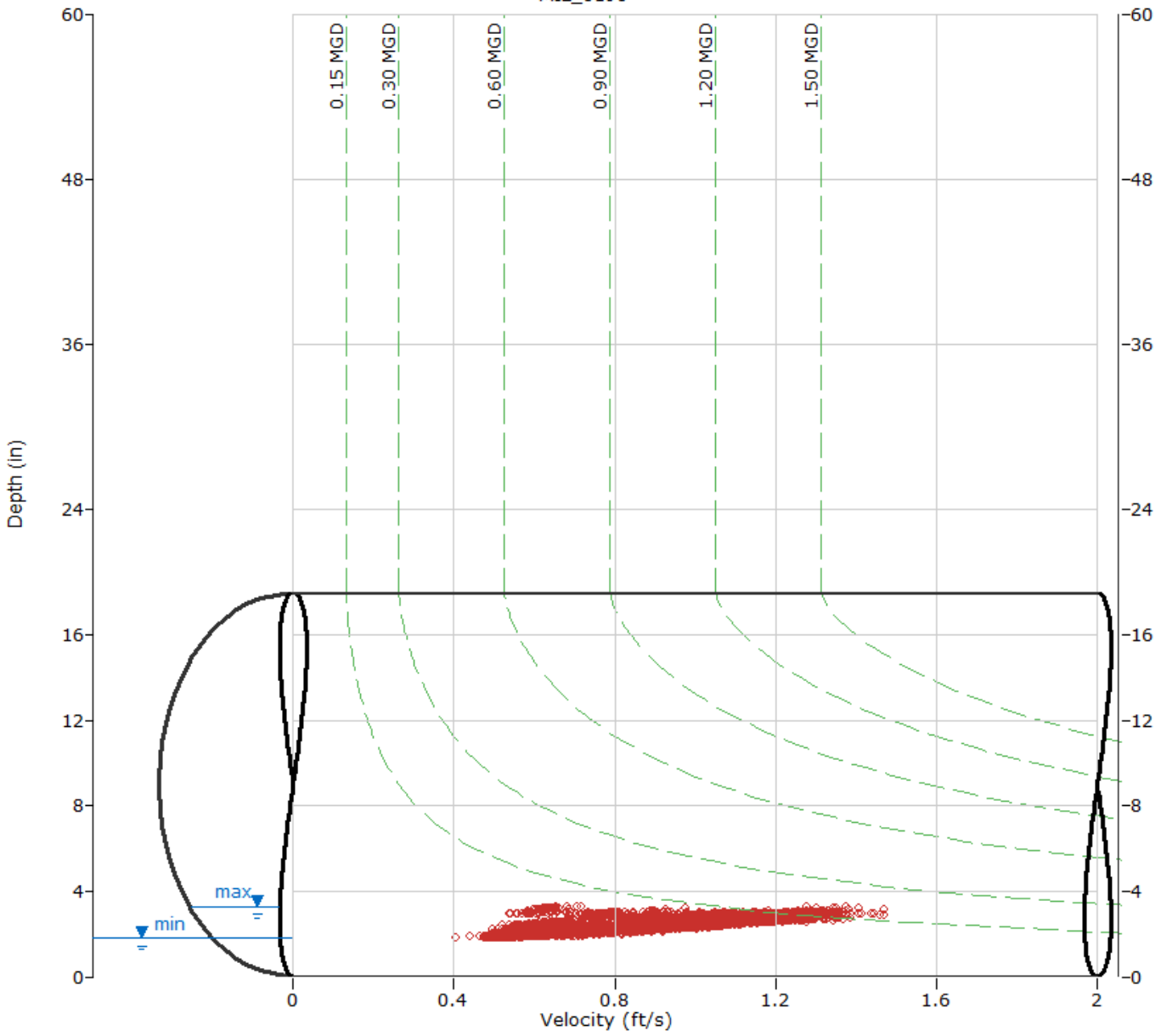


Report Period

11/16/2019
To
3/9/2020

Legend

- Depth - Velocity
- Iso-Q™
- Silt
- Min-Max Depth



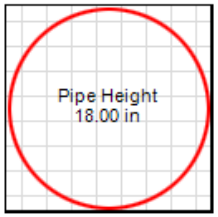
ADS ENVIRONMENTAL SERVICES

HYDROGRAPH REPORT

MIL_0190

Flow Monitor

MIL_0190

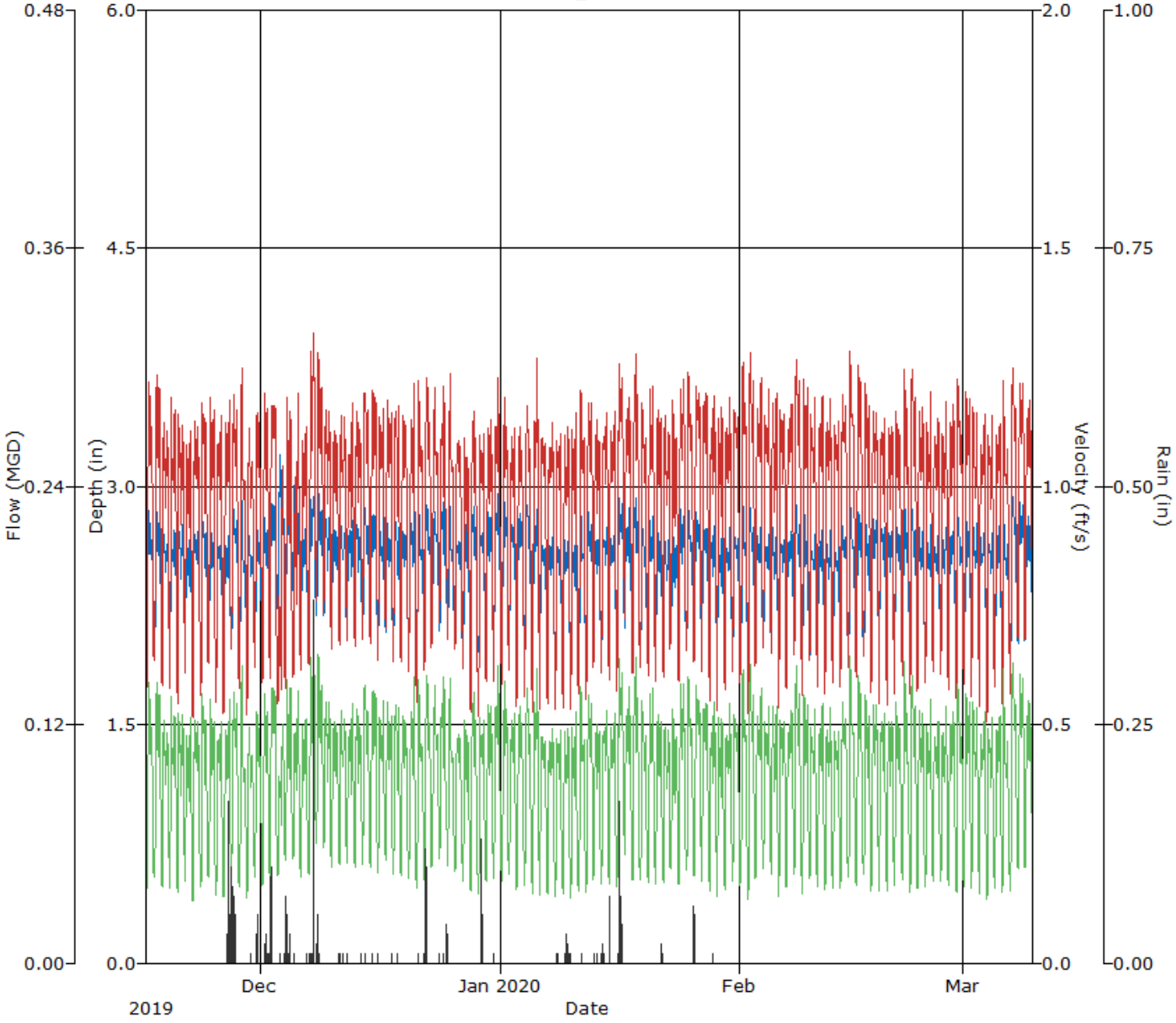


Report Period

11/16/2019
To
3/9/2020

Legend

- Depth
- Velocity
- Quantity
- Rain



Daily Tabular Report For The Period 11/16/2019 00:00 - 03/09/2020 23:59

MIL_0190, Pipe Height: 18.00 in, Silt: 0.00 in

Daily Tabular Report

Date	Depth (in)				Velocity (ft/s)				Quantity (MGD - Total MG)					Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
11/16/2019	05:40	1.91	11:20	2.88	2.45	05:30	0.55	12:55	1.35	0.96	05:30	0.036	13:00	0.155	0.093	0.093	
11/17/2019	05:05	1.95	11:00	3.02	2.48	04:10	0.58	10:55	1.36	0.98	04:10	0.040	10:55	0.172	0.097	0.097	
11/18/2019	03:55	1.91	11:05	2.74	2.42	03:45	0.53	20:00	1.23	0.94	03:45	0.034	11:10	0.130	0.089	0.089	
11/19/2019	05:35	1.89	09:05	2.81	2.44	05:35	0.54	18:45	1.38	0.95	05:35	0.034	18:45	0.150	0.091	0.091	
11/20/2019	04:35	1.91	19:10	2.80	2.46	04:25	0.49	08:35	1.25	0.94	04:25	0.032	19:05	0.137	0.091	0.091	
11/21/2019	04:40	1.95	21:10	2.88	2.41	04:40	0.55	18:35	1.19	0.92	04:40	0.037	21:15	0.138	0.086	0.086	
11/22/2019	04:00	1.80	10:45	2.76	2.41	03:50	0.41	10:25	1.23	0.93	03:50	0.024	10:35	0.134	0.088	0.088	
11/23/2019	03:20	1.96	10:15	2.91	2.46	05:00	0.54	11:15	1.30	0.94	05:00	0.037	10:15	0.150	0.092	0.092	
11/24/2019	03:40	1.98	12:35	2.81	2.44	03:35	0.57	21:55	1.25	0.96	03:35	0.039	22:00	0.141	0.092	0.092	
11/25/2019	05:35	1.83	21:30	2.69	2.38	04:20	0.53	20:30	1.20	0.93	05:35	0.032	18:50	0.126	0.087	0.087	
11/26/2019	05:40	1.84	21:15	2.87	2.39	03:50	0.44	12:50	1.28	0.93	03:50	0.027	21:15	0.147	0.088	0.088	0.36
11/27/2019	05:25	2.00	12:45	2.95	2.52	05:10	0.61	12:40	1.29	0.98	05:10	0.043	12:40	0.157	0.099	0.099	0.63
11/28/2019	05:25	1.92	12:45	3.00	2.41	06:25	0.52	12:50	1.30	0.93	06:25	0.034	12:50	0.160	0.088	0.088	
11/29/2019	05:40	1.85	10:35	2.74	2.35	04:40	0.50	12:25	1.24	0.90	05:50	0.031	10:35	0.135	0.082	0.082	0.02
11/30/2019	05:35	1.99	11:05	2.78	2.42	05:15	0.58	14:20	1.22	0.94	05:15	0.040	11:05	0.135	0.089	0.089	0.10
12/01/2019	06:25	1.92	11:30	2.84	2.43	06:25	0.55	11:30	1.29	0.94	06:25	0.036	11:30	0.150	0.091	0.091	0.06
12/02/2019	05:15	1.92	09:00	2.95	2.56	04:10	0.55	09:00	1.20	1.00	04:10	0.037	09:00	0.147	0.104	0.104	0.30
12/03/2019	06:05	2.19	13:25	3.24	2.75	03:50	0.50	18:45	1.12	0.74	03:50	0.041	20:10	0.130	0.082	0.082	0.01
12/04/2019	02:15	2.36	11:10	2.98	2.72	05:15	0.52	09:10	1.26	0.91	04:00	0.048	09:10	0.153	0.101	0.101	0.39
12/05/2019	04:45	2.33	15:10	3.18	2.67	04:55	0.57	21:45	1.25	0.87	04:55	0.050	15:15	0.152	0.094	0.094	0.01
12/06/2019	03:50	2.01	19:25	2.89	2.49	05:20	0.58	19:25	1.28	0.95	03:20	0.041	19:25	0.152	0.094	0.094	0.01
12/07/2019	05:25	2.01	21:05	2.98	2.58	05:15	0.59	12:50	1.44	1.03	05:15	0.042	12:50	0.174	0.108	0.108	0.67
12/08/2019	04:25	2.18	10:50	2.99	2.63	05:15	0.72	10:55	1.37	1.07	05:15	0.056	10:55	0.170	0.113	0.113	0.20
12/09/2019	03:50	2.16	21:25	2.84	2.55	04:05	0.65	22:00	1.28	1.00	04:05	0.050	11:30	0.144	0.101	0.101	
12/10/2019	04:35	2.05	19:00	2.77	2.50	03:40	0.61	11:00	1.23	0.96	03:40	0.044	11:00	0.134	0.094	0.094	
12/11/2019	03:45	2.07	09:10	2.79	2.50	05:00	0.64	20:55	1.25	0.97	05:00	0.047	20:00	0.137	0.095	0.095	0.03
12/12/2019	03:45	2.08	13:55	3.29	2.50	03:55	0.63	13:50	1.38	0.97	03:55	0.047	13:55	0.196	0.095	0.095	0.01
12/13/2019	05:00	2.02	14:00	2.87	2.49	05:10	0.62	13:50	1.25	0.97	05:10	0.044	10:40	0.144	0.095	0.095	0.01
12/14/2019	05:35	2.05	11:05	2.90	2.53	04:55	0.66	12:05	1.30	1.01	05:35	0.048	11:00	0.150	0.102	0.102	0.01
12/15/2019	04:20	2.04	20:50	2.85	2.53	05:20	0.64	13:45	1.29	1.00	05:20	0.046	13:45	0.149	0.101	0.101	0.01
12/16/2019	04:10	2.01	21:15	2.89	2.48	03:50	0.59	11:25	1.27	0.98	03:50	0.042	21:15	0.145	0.096	0.096	0.01
12/17/2019	04:45	2.05	10:10	2.80	2.49	05:20	0.62	20:55	1.33	1.00	05:20	0.045	20:55	0.142	0.098	0.098	0.01
12/18/2019	04:45	1.99	14:30	2.81	2.48	05:30	0.58	22:00	1.36	0.98	05:30	0.040	22:00	0.148	0.096	0.096	0.01
12/19/2019	03:50	1.98	13:05	2.77	2.47	04:50	0.57	09:30	1.24	0.97	04:50	0.040	09:10	0.138	0.094	0.094	
12/20/2019	04:20	1.98	20:55	2.92	2.49	04:00	0.54	20:55	1.29	0.95	04:00	0.038	20:55	0.155	0.093	0.093	
12/21/2019	05:40	1.97	11:05	2.92	2.46	05:30	0.49	11:05	1.35	0.94	05:30	0.034	11:05	0.162	0.092	0.092	0.01
12/22/2019	06:25	1.94	11:10	2.91	2.50	05:15	0.52	11:00	1.38	0.99	05:15	0.035	11:00	0.163	0.099	0.099	0.41
12/23/2019	05:10	2.04	13:40	2.91	2.52	03:40	0.63	10:45	1.32	0.97	03:40	0.045	13:40	0.154	0.097	0.097	
12/24/2019	05:25	2.07	18:25	2.95	2.54	04:55	0.64	20:25	1.25	0.98	04:55	0.047	18:30	0.150	0.099	0.099	0.02
12/25/2019	06:00	2.02	12:30	2.94	2.47	05:30	0.65	14:30	1.47	0.96	05:55	0.047	14:30	0.174	0.093	0.093	0.08
12/26/2019	04:55	2.00	10:40	2.70	2.42	05:10	0.63	19:45	1.20	0.94	04:55	0.044	19:45	0.128	0.088	0.088	
12/27/2019	04:50	1.94	13:05	2.82	2.44	04:45	0.53	19:35	1.17	0.91	04:45	0.035	13:05	0.134	0.087	0.087	
12/28/2019	06:30	1.95	14:20	2.93	2.48	06:20	0.49	14:30	1.22	0.91	06:20	0.033	14:30	0.145	0.090	0.090	
12/29/2019	06:05	1.94	10:30	2.84	2.45	05:40	0.50	21:30	1.19	0.89	05:50	0.033	20:05	0.133	0.087	0.087	0.22
12/30/2019	04:45	1.99	12:55	2.91	2.50	05:45	0.56	12:55	1.21	0.92	05:45	0.039	12:55	0.145	0.092	0.092	
12/31/2019	05:15	2.01	19:25	3.00	2.56	04:20	0.54	19:00	1.26	0.95	05:05	0.039	19:25	0.157	0.098	0.098	0.01

Date	Depth (in)				Velocity (ft/s)				Quantity (MGD - Total MG)					Rain (in)
	Time	Min Time	Max	Avg	Time	Min Time	Max	Avg	Time	Min Time	Max	Avg	Total	Total
01/01/2020	06:05	2.01 17:10	3.07	2.51	06:15	0.56 17:10	1.31	0.93	06:15	0.039 17:10	0.170	0.093	0.093	
01/02/2020	05:30	2.04 21:25	2.85	2.50	04:45	0.59 15:10	1.19	0.92	04:45	0.042 21:20	0.134	0.091	0.091	
01/03/2020	05:20	1.96 13:10	2.87	2.48	04:25	0.50 12:40	1.19	0.90	04:25	0.035 13:05	0.138	0.089	0.089	
01/04/2020	05:50	2.01 13:20	2.91	2.50	05:15	0.54 12:40	1.21	0.92	05:15	0.038 12:40	0.144	0.092	0.092	
01/05/2020	05:55	1.93 21:00	3.01	2.47	05:40	0.50 21:00	1.34	0.93	05:40	0.033 21:00	0.168	0.093	0.093	
01/06/2020	05:00	1.86 20:55	2.72	2.40	04:45	0.46 11:20	1.22	0.93	04:45	0.029 12:05	0.128	0.087	0.087	
01/07/2020	04:55	1.85 21:00	2.80	2.38	04:55	0.50 20:55	1.30	0.92	04:55	0.031 20:55	0.148	0.086	0.086	
01/08/2020	05:30	1.84 21:25	2.77	2.39	05:20	0.50 21:15	1.20	0.92	05:30	0.031 21:15	0.131	0.086	0.086	0.02
01/09/2020	05:00	1.88 08:55	2.71	2.41	04:45	0.51 21:15	1.19	0.92	04:55	0.033 21:15	0.127	0.087	0.087	0.18
01/10/2020	05:10	1.82 20:40	2.78	2.38	04:55	0.50 09:35	1.26	0.93	05:10	0.030 09:35	0.135	0.086	0.086	0.02
01/11/2020	05:25	1.87 11:10	2.93	2.43	05:05	0.52 12:40	1.32	0.94	05:05	0.033 12:40	0.154	0.091	0.091	0.01
01/12/2020	05:10	1.88 11:15	2.92	2.46	05:35	0.54 19:05	1.29	0.96	05:35	0.034 11:15	0.147	0.094	0.094	
01/13/2020	03:45	1.94 20:45	2.81	2.43	04:25	0.58 20:45	1.18	0.95	04:25	0.040 20:45	0.134	0.091	0.091	0.02
01/14/2020	03:35	1.90 19:45	2.82	2.44	02:25	0.57 19:40	1.31	0.96	03:25	0.038 19:40	0.149	0.092	0.092	0.11
01/15/2020	04:55	1.91 21:10	2.77	2.44	04:45	0.56 19:35	1.23	0.95	04:45	0.037 21:10	0.137	0.091	0.091	0.07
01/16/2020	04:30	1.93 12:40	3.22	2.52	03:20	0.54 12:50	1.38	1.00	03:50	0.036 12:40	0.186	0.102	0.102	0.66
01/17/2020	04:40	2.08 19:05	2.90	2.54	04:45	0.71 10:55	1.29	1.03	04:45	0.052 19:00	0.149	0.103	0.103	
01/18/2020	05:40	1.98 14:40	3.02	2.51	03:40	0.55 14:40	1.35	0.99	03:40	0.040 14:40	0.170	0.099	0.099	
01/19/2020	04:35	1.95 10:40	2.84	2.43	04:10	0.58 14:00	1.32	0.95	04:10	0.039 14:00	0.146	0.090	0.090	
01/20/2020	05:20	1.95 20:05	2.85	2.44	06:10	0.55 11:00	1.35	0.97	06:10	0.038 11:00	0.149	0.093	0.093	
01/21/2020	04:55	1.94 21:00	2.85	2.45	05:10	0.57 21:05	1.27	0.97	05:10	0.038 21:05	0.147	0.094	0.094	
01/22/2020	05:25	1.92 09:10	2.74	2.41	05:30	0.55 08:55	1.25	0.96	05:25	0.036 09:00	0.135	0.090	0.090	0.03
01/23/2020	05:20	2.01 09:20	2.76	2.42	02:45	0.59 09:00	1.29	0.96	02:45	0.042 11:55	0.138	0.090	0.090	
01/24/2020	05:05	1.92 19:45	3.01	2.49	05:10	0.54 19:45	1.32	1.00	05:10	0.035 19:45	0.165	0.099	0.099	
01/25/2020	06:20	2.00 10:45	2.93	2.49	06:05	0.55 10:25	1.32	1.00	06:05	0.039 10:25	0.157	0.099	0.099	
01/26/2020	04:15	1.97 11:55	2.87	2.49	03:45	0.58 11:55	1.30	1.00	03:45	0.040 11:55	0.152	0.099	0.099	0.16
01/27/2020	04:40	1.97 19:45	2.78	2.48	04:20	0.55 08:35	1.30	1.00	04:20	0.037 21:05	0.139	0.098	0.098	
01/28/2020	04:50	1.91 20:30	2.83	2.44	04:40	0.51 20:25	1.27	0.97	04:50	0.033 20:25	0.145	0.092	0.092	0.01
01/29/2020	05:25	1.83 09:15	2.79	2.39	05:10	0.48 19:20	1.28	0.94	05:10	0.029 09:10	0.136	0.088	0.088	
01/30/2020	05:15	1.90 19:40	2.79	2.40	04:50	0.54 19:35	1.27	0.96	04:50	0.035 19:40	0.143	0.090	0.090	
01/31/2020	04:00	1.95 09:05	2.74	2.46	04:40	0.57 13:50	1.25	1.00	04:40	0.039 13:50	0.135	0.096	0.096	
02/01/2020	04:10	1.90 14:10	2.91	2.45	03:50	0.54 20:10	1.37	0.99	03:50	0.035 14:10	0.157	0.097	0.097	
02/02/2020	05:35	1.83 12:15	2.88	2.45	05:30	0.50 12:35	1.46	0.99	05:30	0.031 12:35	0.171	0.097	0.097	
02/03/2020	03:55	1.95 21:05	2.87	2.45	04:05	0.56 21:00	1.33	0.99	04:05	0.037 21:00	0.157	0.096	0.096	
02/04/2020	04:00	2.02 20:05	2.74	2.45	03:10	0.63 22:10	1.28	1.00	04:00	0.046 20:20	0.139	0.096	0.096	
02/05/2020	05:30	1.98 10:20	2.82	2.45	06:00	0.60 20:55	1.37	0.99	06:00	0.041 20:55	0.145	0.094	0.094	
02/06/2020	04:20	1.84 10:55	2.70	2.41	03:20	0.51 21:25	1.23	0.96	03:00	0.033 21:25	0.130	0.091	0.091	
02/07/2020	05:15	1.88 20:35	2.75	2.42	05:05	0.50 20:35	1.28	0.97	05:05	0.033 20:35	0.141	0.092	0.092	
02/08/2020	05:20	1.98 09:45	3.01	2.47	04:05	0.61 09:40	1.41	1.02	05:05	0.042 09:40	0.173	0.099	0.099	
02/09/2020	06:10	1.83 13:15	2.90	2.40	06:10	0.52 10:50	1.30	0.96	06:10	0.032 10:50	0.149	0.091	0.091	
02/10/2020	05:20	1.91 21:15	2.76	2.41	03:50	0.60 07:55	1.34	0.98	03:50	0.039 07:55	0.136	0.092	0.092	
02/11/2020	04:35	1.91 21:25	2.82	2.42	04:25	0.53 21:20	1.27	0.97	04:25	0.035 21:20	0.144	0.092	0.092	
02/12/2020	04:05	1.87 21:25	2.76	2.42	03:45	0.51 20:00	1.21	0.98	03:45	0.033 21:25	0.133	0.093	0.093	
02/13/2020	04:50	1.88 08:50	2.75	2.40	04:20	0.55 22:45	1.22	0.97	05:00	0.035 09:00	0.129	0.090	0.090	
02/14/2020	05:05	1.88 11:05	2.77	2.44	03:20	0.53 20:40	1.32	0.99	03:20	0.034 20:40	0.141	0.095	0.095	
02/15/2020	03:25	1.99 09:30	2.99	2.48	04:20	0.60 09:20	1.44	1.01	04:20	0.042 09:20	0.176	0.100	0.100	
02/16/2020	05:15	1.90 13:40	2.88	2.45	05:25	0.57 14:10	1.28	0.99	05:25	0.037 13:45	0.151	0.097	0.097	
02/17/2020	05:05	1.94 10:50	2.86	2.43	04:50	0.55 12:35	1.29	0.98	04:50	0.037 10:45	0.148	0.094	0.094	
02/18/2020	03:35	1.87 18:10	2.84	2.45	03:45	0.54 18:10	1.20	0.95	03:30	0.034 18:10	0.139	0.092	0.092	
02/19/2020	04:10	1.95 12:05	2.82	2.47	04:15	0.53 20:45	1.21	0.94	04:10	0.035 20:45	0.137	0.092	0.092	
02/20/2020	04:55	1.91 12:45	2.77	2.45	05:05	0.51 18:45	1.22	0.93	05:05	0.033 20:30	0.131	0.090	0.090	
02/21/2020	05:15	1.97 09:30	2.86	2.48	04:35	0.53 18:45	1.27	0.95	04:35	0.036 09:30	0.140	0.093	0.093	
02/22/2020	06:10	1.97 11:10	3.00	2.48	05:55	0.56 11:50	1.27	0.96	05:55	0.038 11:10	0.158	0.095	0.095	
02/23/2020	05:15	1.87 11:25	2.87	2.45	06:00	0.54 10:10	1.35	0.98	06:00	0.034 10:10	0.152	0.096	0.096	
02/24/2020	03:55	1.89 19:50	2.81	2.43	04:05	0.48 19:40	1.25	0.97	04:05	0.031 19:40	0.142	0.093	0.093	

Date	Depth (in)					Velocity (ft/s)					Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
02/25/2020	04:55	1.88	21:15	2.81	2.42	04:40	0.52	19:55	1.26	0.95	04:40	0.034	21:10	0.139	0.090	0.090	
02/26/2020	05:05	1.92	21:15	2.74	2.42	04:50	0.55	20:30	1.27	0.96	04:55	0.036	20:30	0.135	0.091	0.091	
02/27/2020	04:55	1.94	20:55	2.78	2.44	05:00	0.57	08:50	1.26	0.96	05:00	0.038	20:30	0.138	0.091	0.091	
02/28/2020	05:10	1.91	20:35	2.75	2.44	05:05	0.51	20:45	1.21	0.95	05:05	0.033	21:20	0.132	0.091	0.091	
02/29/2020	06:15	1.89	09:35	2.93	2.43	06:10	0.52	09:30	1.29	0.95	06:15	0.033	09:35	0.156	0.091	0.091	
03/01/2020	05:00	1.90	21:10	2.84	2.44	06:10	0.55	12:30	1.33	0.96	06:10	0.036	12:30	0.148	0.093	0.093	
03/02/2020	04:30	1.93	09:15	2.85	2.46	04:20	0.54	09:10	1.30	0.95	04:20	0.036	09:10	0.149	0.092	0.092	
03/03/2020	05:40	1.90	21:40	2.79	2.44	05:20	0.52	19:10	1.22	0.93	05:20	0.034	19:10	0.136	0.089	0.089	
03/04/2020	04:55	1.86	21:10	2.77	2.41	05:05	0.48	21:05	1.21	0.92	05:05	0.030	21:05	0.135	0.088	0.088	
03/05/2020	04:10	1.91	20:55	2.78	2.44	03:30	0.55	18:55	1.16	0.94	03:35	0.036	21:10	0.129	0.091	0.091	
03/06/2020	04:50	1.89	09:25	3.19	2.42	04:45	0.51	09:10	1.47	0.93	04:45	0.033	09:10	0.198	0.088	0.088	
03/07/2020	05:30	1.88	13:55	3.03	2.52	05:10	0.54	16:10	1.31	1.00	05:25	0.034	13:55	0.166	0.102	0.102	
03/08/2020	05:30	1.98	17:50	3.10	2.56	05:30	0.66	13:35	1.33	1.03	05:30	0.045	17:50	0.173	0.105	0.105	
03/09/2020	03:50	2.01	11:50	2.91	2.49	03:45	0.63	11:40	1.24	0.99	03:45	0.044	11:50	0.145	0.098	0.098	

Report Summary For The Period 11/16/2019 00:00 - 03/09/2020 23:59

	Depth (in)	Velocity (ft/s)	Quantity (MGD - Total MG)	Rain (in)
Total			10.748	4.90
Avg	2.47	0.96	0.093	

Site Commentary

Site Information

MIL_0229	
Pipe Dimensions	21
Silt Level	0.00"

Overview

Site MIL_0229 functioned under normal conditions during the period Saturday, November 16, 2019 to Monday, March 9, 2020 . This site exhibited an observable response to the wet weather events of November 26, 2019 - November 27, 2019, December 7, 2019 - December 8, 2019, and January 16, 2020 - January 17, 2020. Review of the scattergraph shows free flow conditions were recorded during the study period.

Flow depth and velocity measurements recorded by the flow monitor are consistent with field confirmations conducted to date and support the relative accuracy of the flow monitor at this location.

This location was installed upstream of site MIL_2808. (See MIL_2808 Site Commentary for More Details)

Observations

Average flow depth, velocity, and quantity data observed during Saturday, November 16, 2019 to Monday, March 9, 2020 , along with observed minimum and maximum data, are provided in the following table.

Observed Flow Conditions			
Item	Depth (in)	Velocity (ft/s)	Quantity (MGD)
Average	3.46	0.59	0.103
Minimum	1.78	0.19	0.021
Maximum	5.18	0.94	0.253
Time of Minimum	11/29/2019 7:00 AM	2/26/2020 4:00 AM	11/29/2019 7:05 AM
Time of Maximum	12/6/2019 3:20 PM	11/21/2019 9:05 AM	1/21/2020 1:55 PM

Data Quality

Data uptime observed during the Saturday, November 16, 2019 to the Monday, March 9, 2020 monitoring period is provided in the table below. Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

Percent Uptime	
Depth (in)	100
Velocity (ft/s)	100
Quantity (MGD)	100

Milpitas Temp Study 2019-20

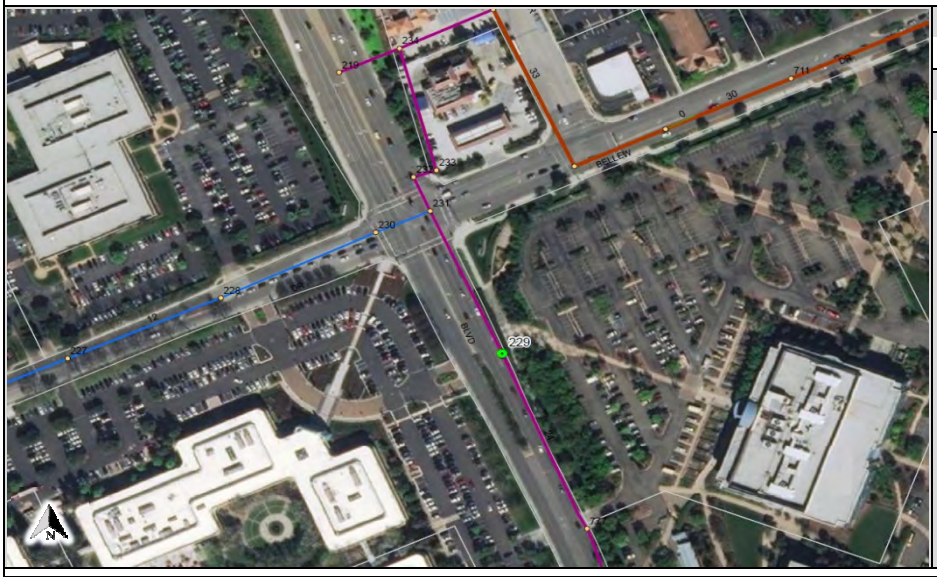
Flow Monitoring Site Report

ADS ENVIRONMENTAL SERVICES®

Site Name

MIL_0229

Site Address /Location:	Bellew Dr and McCarthy Blvd			Monitor Series	Location Type
				TRITON+	Temporary
Site Access Details:	In right lane of road	Latitude:	37.420574°	Pipe Size (H x W)	Pipe Shape
		Longitude:	-121.921605°	21.0" x 21.0"	Circular



Manhole #	System Characteristics
229	Residential/Commercial
Access	Traffic
Drive	Medium







Installation Information

Installation Date:	Installation Type:
Tuesday, November 12, 2019	Doppler Standard Ring and Crank
Monitoring Location (Sensors):	Monitor Location:
Upstream 0-5 FT	Manhole
Sensors / Devices:	Pressure Sensor Range (psi)
Peak Combo (CS4)	0 - 5 psi

Installation Confirmation:

Confirmation Time:	Pipe Size (HxW)
4:21:29 AM	21.0" x 21.0"
Depth of Flow (Wet DOF) (in)	Range (Air DOF) (in)
2.25	0.00"
Downlooker Physical Offset (in)	Measurement Confidence (in)
NA	0.25"
Peak Velocity (fps)	Velocity Sensor Offset (in)
0.25	0''
Silt (in)	Silt Type
0.25''	Soft / Loose

Hydraulic Comments:

Shallow depth with slow velocity

Manhole / Pipe Information:

Manhole Depth (Approx. FT):	Manhole Configuration
15'	Single
Manhole Material:	Manhole Condition:
Concrete	Good
Manhole Opening Diameter (in)	Manhole Diameter (Approx.):
26''	54''
Manhole Cover	Manhole Frame
Unbolted	Normal
Active Drop Connections	Air Quality:
No	Normal
Pipe Material	Pipe Condition:
Concrete	Good

Communication Information:

Communication Type	Antenna Location
Wireless	Manhole Pick / Vent Hole

Additional Site Info. / Comments:

ADS Project Name:	Milpitas.WWTFM.CA19-20
ADS Project Number:	22431

SCATTERGRAPH REPORT

MIL_0229

Flow Monitor

MIL_0229

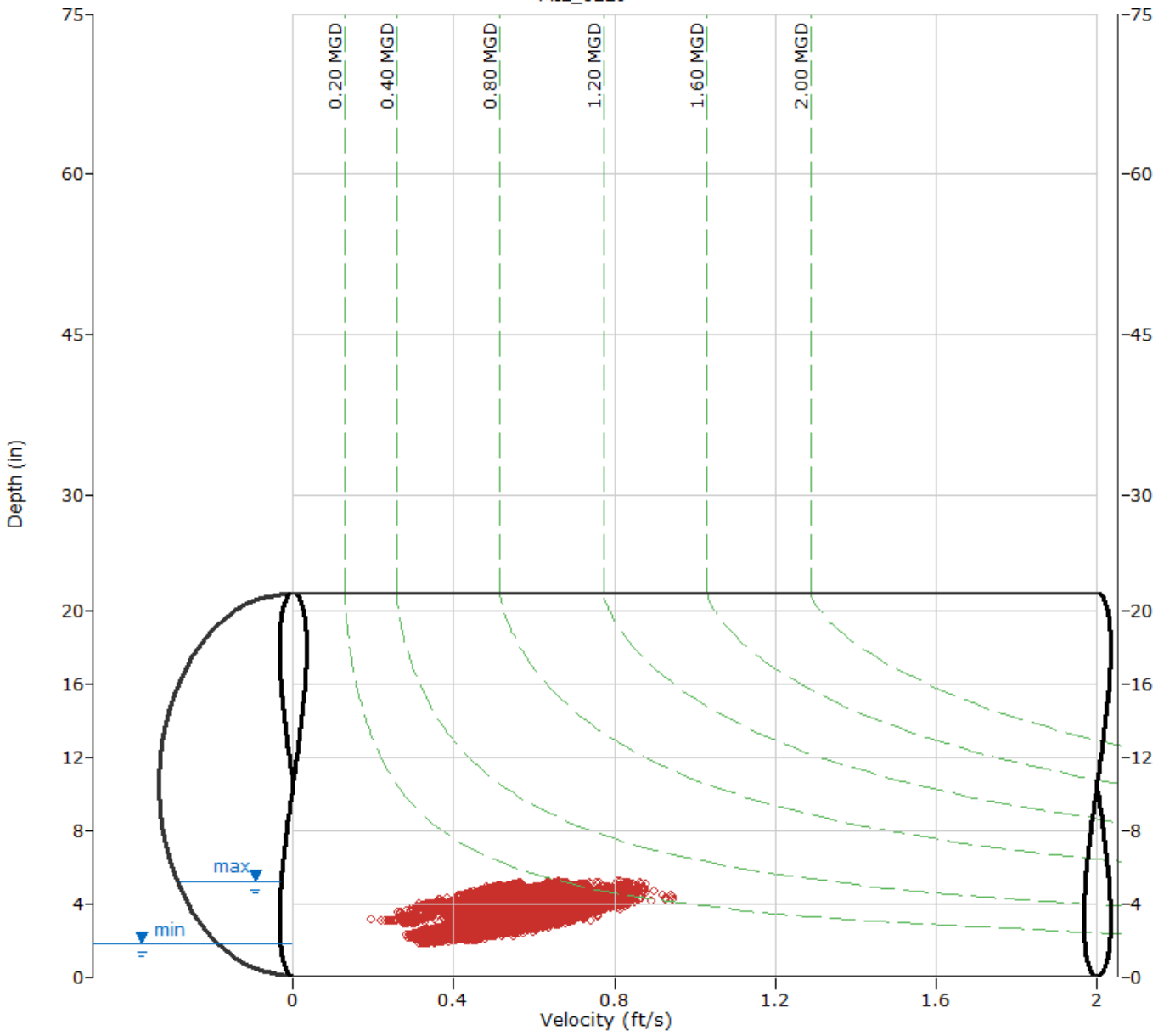
Pipe Height
21.00 in

Report Period

11/16/2019
To
3/9/2020

Legend

- Depth - Velocity
- Iso-Q™
- Silt
- Min-Max Depth



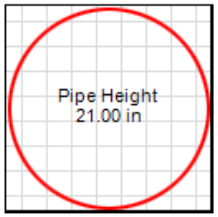
ADS ENVIRONMENTAL SERVICES

HYDROGRAPH REPORT

MIL_0229

Flow Monitor

MIL_0229

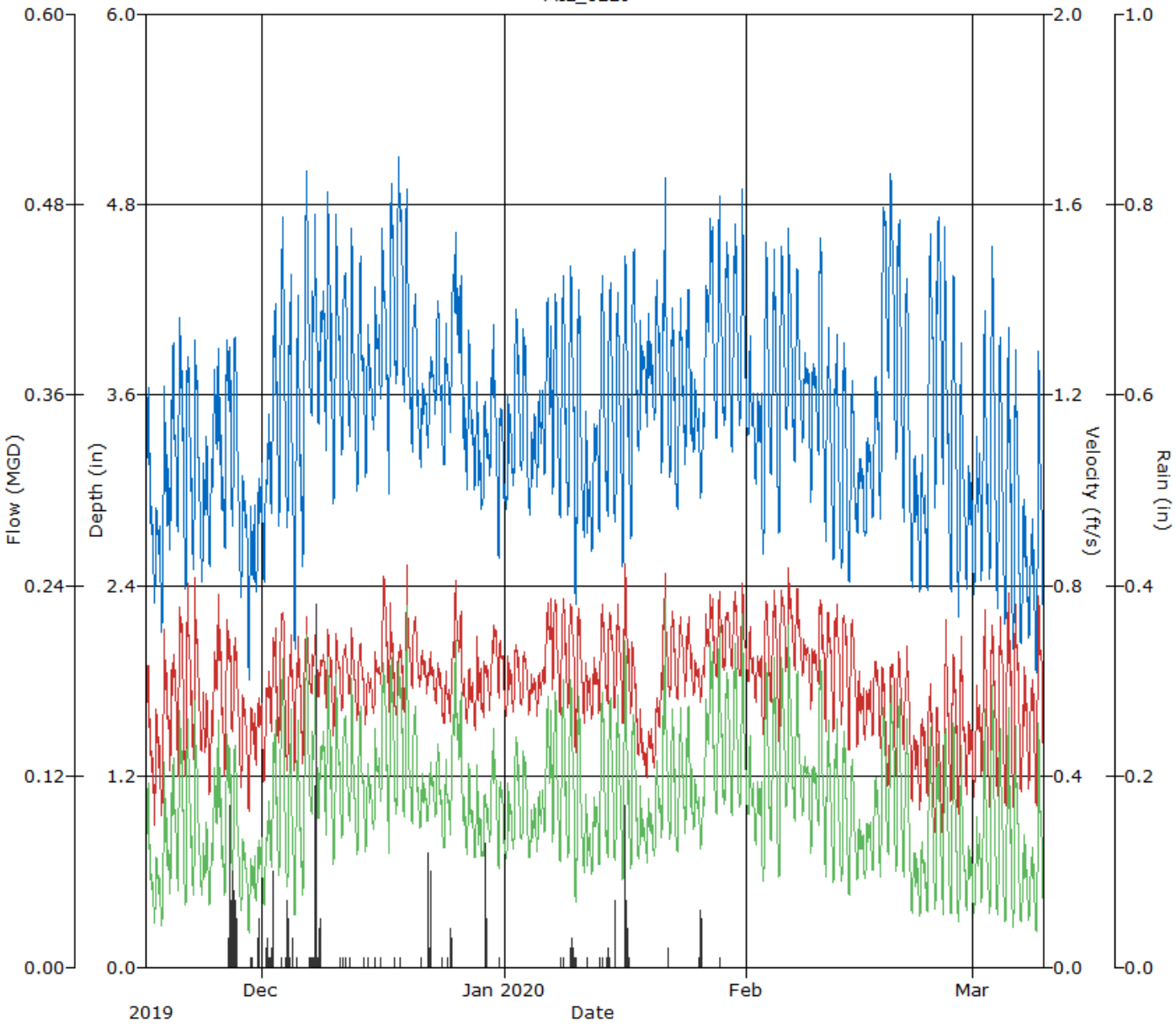


Report Period

11/16/2019
To
3/9/2020

Legend

- Depth
- Velocity
- Quantity
- Rain



Daily Tabular Report For The Period 11/16/2019 00:00 - 03/09/2020 23:59

MIL_0229, Pipe Height: 21.00 in, Silt: 0.00 in

Daily Tabular Report

Date	Depth (in)				Velocity (ft/s)				Quantity (MGD - Total MG)					Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
11/16/2019	21:15	2.61	10:30	4.06	3.16	23:25	0.39	10:30	0.75	0.52	20:50	0.044	10:30	0.157	0.079	0.079	
11/17/2019	07:10	2.27	10:00	3.04	2.63	05:30	0.28	09:55	0.62	0.43	05:30	0.026	09:55	0.085	0.050	0.050	
11/18/2019	03:25	2.07	10:15	3.89	2.91	02:45	0.29	10:10	0.78	0.52	03:15	0.023	10:15	0.153	0.072	0.072	
11/19/2019	05:55	2.56	15:45	4.10	3.30	05:45	0.35	15:55	0.74	0.57	05:55	0.038	15:55	0.155	0.091	0.091	
11/20/2019	03:35	2.72	09:40	4.27	3.35	03:40	0.37	09:40	0.82	0.59	03:40	0.044	09:40	0.185	0.099	0.099	
11/21/2019	03:55	2.34	09:10	4.19	3.17	03:30	0.39	09:05	0.94	0.58	03:30	0.037	09:05	0.208	0.091	0.091	
11/22/2019	04:40	2.46	09:15	4.42	3.20	04:00	0.40	09:20	0.94	0.60	04:00	0.041	09:15	0.225	0.093	0.093	
11/23/2019	07:30	2.40	21:55	3.38	2.90	15:45	0.42	08:25	0.61	0.50	07:35	0.043	22:00	0.095	0.066	0.066	
11/24/2019	07:05	2.49	21:15	3.92	3.07	06:50	0.34	20:55	0.68	0.50	07:05	0.036	21:15	0.134	0.073	0.073	
11/25/2019	20:45	2.82	08:30	3.95	3.32	23:50	0.48	08:40	0.83	0.62	23:55	0.063	08:25	0.168	0.098	0.098	
11/26/2019	06:05	2.61	21:05	4.22	3.37	04:05	0.38	21:05	0.79	0.59	04:05	0.044	21:05	0.176	0.099	0.099	0.36
11/27/2019	05:55	2.73	10:00	4.09	3.37	02:35	0.46	12:50	0.78	0.60	06:00	0.057	10:00	0.154	0.099	0.099	0.63
11/28/2019	05:35	2.21	12:00	3.37	2.75	05:40	0.34	12:00	0.63	0.49	05:40	0.030	12:00	0.101	0.060	0.060	
11/29/2019	07:00	1.78	14:15	3.10	2.51	06:00	0.31	17:20	0.64	0.46	07:05	0.021	14:15	0.084	0.050	0.050	0.02
11/30/2019	06:05	2.34	22:05	3.32	2.79	04:10	0.41	12:45	0.63	0.51	04:10	0.040	12:45	0.096	0.063	0.063	0.10
12/01/2019	05:55	2.39	20:25	3.57	2.95	07:50	0.37	21:50	0.63	0.51	07:50	0.037	20:25	0.110	0.070	0.070	0.06
12/02/2019	04:25	2.82	18:10	4.36	3.59	23:55	0.47	10:05	0.76	0.61	04:25	0.060	18:10	0.169	0.110	0.110	0.30
12/03/2019	04:05	2.73	14:55	4.79	3.72	04:05	0.43	14:00	0.80	0.62	04:05	0.051	14:00	0.212	0.120	0.120	0.01
12/04/2019	23:55	2.51	16:25	4.47	3.40	03:00	0.39	16:40	0.74	0.56	05:00	0.048	16:40	0.174	0.095	0.095	0.39
12/05/2019	05:30	1.98	13:15	4.45	3.16	03:55	0.39	13:15	0.76	0.57	03:55	0.030	13:15	0.182	0.088	0.088	0.01
12/06/2019	03:25	2.50	15:20	5.18	3.79	04:55	0.41	15:20	0.82	0.59	04:15	0.043	15:20	0.243	0.121	0.121	0.01
12/07/2019	06:10	3.39	18:20	4.95	3.99	06:10	0.56	18:20	0.71	0.63	06:10	0.092	18:20	0.199	0.130	0.130	0.67
12/08/2019	05:50	3.37	21:05	4.61	3.89	05:50	0.56	21:05	0.69	0.62	05:50	0.091	21:05	0.173	0.124	0.124	0.20
12/09/2019	03:15	3.25	09:30	5.02	4.05	03:15	0.54	09:30	0.72	0.63	03:15	0.083	09:30	0.205	0.134	0.134	
12/10/2019	03:25	2.87	13:45	5.11	3.81	02:15	0.47	13:45	0.75	0.60	02:45	0.063	13:45	0.221	0.119	0.119	
12/11/2019	04:20	3.21	14:25	4.50	3.86	04:20	0.54	17:30	0.71	0.62	04:20	0.081	14:25	0.166	0.123	0.123	0.03
12/12/2019	04:15	3.32	13:55	4.71	3.81	01:45	0.54	14:00	0.74	0.62	23:30	0.088	14:00	0.191	0.122	0.122	0.01
12/13/2019	03:50	2.97	14:50	4.64	3.73	04:25	0.48	15:10	0.72	0.61	04:25	0.065	14:50	0.177	0.116	0.116	0.01
12/14/2019	06:50	3.07	14:40	4.17	3.59	05:55	0.50	12:25	0.67	0.57	06:20	0.070	12:25	0.138	0.102	0.102	0.01
12/15/2019	06:05	3.37	11:10	4.31	3.78	07:05	0.52	11:10	0.66	0.60	07:05	0.085	11:10	0.153	0.115	0.115	0.01
12/16/2019	03:35	3.55	10:00	4.86	4.00	03:35	0.52	10:05	0.86	0.70	03:35	0.090	10:05	0.216	0.146	0.146	0.01
12/17/2019	04:05	2.95	13:35	5.04	4.10	05:40	0.51	09:35	0.83	0.64	04:05	0.069	13:40	0.217	0.140	0.140	0.01
12/18/2019	03:35	3.66	11:45	5.16	4.41	03:35	0.53	14:10	0.69	0.61	03:35	0.096	10:15	0.199	0.148	0.148	0.01
12/19/2019	22:35	3.46	11:05	4.99	4.03	03:45	0.52	12:15	0.87	0.66	04:20	0.092	12:15	0.235	0.141	0.141	
12/20/2019	05:40	3.22	15:45	4.28	3.76	04:25	0.55	14:55	0.79	0.66	04:25	0.085	14:55	0.177	0.126	0.126	
12/21/2019	07:00	3.12	11:35	3.79	3.44	04:35	0.58	11:30	0.71	0.62	04:35	0.086	11:30	0.135	0.104	0.104	0.01
12/22/2019	06:25	3.24	14:30	3.92	3.60	02:15	0.55	14:30	0.72	0.62	02:15	0.088	14:30	0.143	0.110	0.110	0.41
12/23/2019	03:30	3.46	11:30	4.27	3.78	06:05	0.52	04:20	0.71	0.59	06:20	0.090	14:05	0.148	0.113	0.113	
12/24/2019	06:35	3.14	12:15	4.13	3.58	04:45	0.49	12:30	0.65	0.56	07:15	0.072	12:30	0.139	0.099	0.099	0.02
12/25/2019	05:00	3.34	18:30	4.66	4.10	03:10	0.50	18:25	0.84	0.66	04:45	0.080	18:25	0.215	0.145	0.145	0.08
12/26/2019	19:55	3.21	01:00	4.41	3.84	23:00	0.51	12:05	0.76	0.65	18:55	0.085	12:25	0.178	0.128	0.128	
12/27/2019	05:45	2.99	11:20	4.07	3.50	04:00	0.47	12:10	0.64	0.57	04:00	0.066	11:25	0.132	0.098	0.098	
12/28/2019	05:00	2.98	12:50	4.09	3.21	06:45	0.48	13:00	0.74	0.57	06:45	0.066	12:50	0.151	0.086	0.086	
12/29/2019	02:10	2.86	12:15	3.60	3.21	07:20	0.50	17:45	0.76	0.59	07:20	0.066	12:15	0.123	0.090	0.090	0.22
12/30/2019	02:20	3.07	11:20	4.08	3.53	02:55	0.52	18:35	0.76	0.65	02:55	0.074	14:50	0.155	0.113	0.113	
12/31/2019	06:45	2.53	11:50	3.64	3.15	04:55	0.54	00:55	0.71	0.64	06:40	0.058	11:50	0.122	0.094	0.094	0.01

Date	Depth (in)				Velocity (ft/s)				Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
01/01/2020	05:40	2.87	12:50	3.74	3.21	03:45	0.49	16:50	0.70	0.59	05:40	0.064	12:50	0.126	0.089	0.089	
01/02/2020	03:20	2.99	13:10	4.21	3.60	04:30	0.51	09:45	0.72	0.62	04:30	0.070	13:10	0.157	0.111	0.111	
01/03/2020	07:15	3.10	10:40	4.07	3.56	02:45	0.52	12:35	0.68	0.61	02:45	0.075	10:15	0.143	0.107	0.107	
01/04/2020	07:10	2.81	11:55	3.54	3.16	06:05	0.52	22:35	0.64	0.58	07:40	0.066	19:35	0.109	0.085	0.085	
01/05/2020	04:40	3.01	21:40	3.76	3.35	04:40	0.51	10:30	0.68	0.58	04:40	0.070	21:35	0.120	0.094	0.094	
01/06/2020	04:15	3.08	13:40	4.30	3.70	04:15	0.59	22:15	0.81	0.68	04:15	0.084	13:35	0.181	0.128	0.128	
01/07/2020	05:35	2.96	12:10	4.45	3.63	05:35	0.54	12:10	0.84	0.69	05:35	0.072	12:10	0.202	0.126	0.126	
01/08/2020	03:05	2.81	13:30	4.50	3.56	03:10	0.51	13:30	0.82	0.66	03:10	0.063	13:30	0.199	0.119	0.119	0.02
01/09/2020	04:00	2.82	13:40	4.58	3.63	04:25	0.53	11:40	0.79	0.66	04:25	0.066	11:40	0.197	0.122	0.122	0.18
01/10/2020	04:45	2.27	12:25	4.52	3.35	04:45	0.44	14:40	0.79	0.62	04:45	0.040	12:25	0.193	0.105	0.105	0.02
01/11/2020	06:05	2.68	12:20	3.62	2.96	05:55	0.49	10:40	0.68	0.58	05:55	0.057	12:20	0.118	0.078	0.078	0.01
01/12/2020	05:25	2.59	11:35	3.55	3.08	02:45	0.51	18:50	0.67	0.59	03:15	0.057	11:30	0.115	0.084	0.084	
01/13/2020	04:15	2.71	13:30	4.56	3.56	03:50	0.50	14:10	0.79	0.65	03:50	0.060	13:30	0.190	0.117	0.117	0.02
01/14/2020	05:50	2.81	14:20	4.47	3.55	05:45	0.54	13:30	0.82	0.66	05:45	0.067	13:30	0.191	0.117	0.117	0.11
01/15/2020	04:35	2.78	13:35	4.31	3.52	05:30	0.52	13:55	0.78	0.65	05:30	0.063	13:30	0.175	0.115	0.115	0.07
01/16/2020	03:10	2.52	12:35	4.66	3.47	04:30	0.49	12:35	0.90	0.65	04:30	0.053	12:35	0.231	0.114	0.114	0.66
01/17/2020	05:45	2.65	13:50	4.59	3.69	23:15	0.47	10:25	0.75	0.59	05:45	0.059	13:35	0.173	0.111	0.111	
01/18/2020	05:55	3.23	10:25	4.08	3.64	19:50	0.41	00:50	0.61	0.47	05:40	0.064	10:00	0.120	0.085	0.085	
01/19/2020	05:45	3.37	10:50	4.21	3.74	05:50	0.38	04:35	0.59	0.45	05:50	0.061	19:50	0.112	0.085	0.085	
01/20/2020	05:40	3.43	13:15	4.39	3.86	04:10	0.41	18:20	0.69	0.49	04:40	0.068	13:20	0.139	0.098	0.098	
01/21/2020	03:25	3.10	13:55	5.06	3.86	03:25	0.57	13:55	0.88	0.67	03:25	0.081	13:55	0.253	0.135	0.135	
01/22/2020	23:55	3.01	13:50	4.24	3.57	04:10	0.55	13:40	0.77	0.65	04:10	0.077	13:40	0.172	0.116	0.116	0.03
01/23/2020	04:35	2.88	14:10	4.30	3.56	02:45	0.54	14:15	0.76	0.66	04:40	0.070	14:15	0.175	0.117	0.117	
01/24/2020	03:30	3.15	14:25	4.33	3.69	03:20	0.54	16:10	0.76	0.66	03:20	0.080	14:30	0.174	0.122	0.122	
01/25/2020	06:55	3.23	01:30	4.08	3.46	06:45	0.56	01:30	0.71	0.61	06:55	0.085	01:30	0.150	0.103	0.103	
01/26/2020	04:55	2.91	22:05	4.36	3.51	04:10	0.54	19:10	0.76	0.63	04:10	0.072	20:45	0.173	0.110	0.110	0.16
01/27/2020	23:55	3.53	09:20	4.87	4.19	23:45	0.63	09:15	0.82	0.71	23:55	0.108	09:15	0.224	0.157	0.157	
01/28/2020	03:35	3.31	13:25	4.91	3.99	04:45	0.59	13:30	0.81	0.69	04:45	0.094	13:30	0.223	0.145	0.145	0.01
01/29/2020	02:50	3.38	10:05	4.68	3.96	01:55	0.59	17:05	0.79	0.70	23:55	0.098	10:05	0.197	0.143	0.143	
01/30/2020	03:25	3.22	13:50	4.74	3.94	05:45	0.60	13:10	0.83	0.70	05:45	0.092	13:10	0.215	0.143	0.143	
01/31/2020	04:05	3.39	11:00	5.13	3.96	03:05	0.58	10:50	0.87	0.69	03:05	0.097	10:55	0.252	0.142	0.142	
02/01/2020	07:20	3.33	13:00	3.99	3.55	07:25	0.59	11:00	0.77	0.64	07:25	0.093	11:00	0.151	0.113	0.113	
02/02/2020	23:30	2.95	21:20	3.84	3.32	23:30	0.51	21:20	0.70	0.61	23:30	0.068	21:20	0.135	0.096	0.096	
02/03/2020	04:15	2.57	13:55	4.66	3.59	04:15	0.48	13:30	0.78	0.65	04:15	0.053	13:45	0.197	0.120	0.120	
02/04/2020	03:25	3.07	13:20	4.65	3.72	23:30	0.54	13:15	0.84	0.67	23:30	0.077	13:15	0.215	0.129	0.129	
02/05/2020	04:05	2.71	13:35	4.61	3.69	03:55	0.45	16:10	0.81	0.67	04:00	0.054	13:35	0.200	0.129	0.129	
02/06/2020	23:50	3.35	09:30	4.84	3.89	02:45	0.60	09:20	0.87	0.72	02:45	0.097	09:20	0.234	0.145	0.145	
02/07/2020	04:05	3.17	09:45	4.60	3.77	06:20	0.60	12:40	0.87	0.70	05:30	0.091	09:40	0.207	0.135	0.135	
02/08/2020	04:15	3.30	13:25	3.92	3.61	04:05	0.59	08:40	0.72	0.65	04:05	0.093	13:25	0.139	0.117	0.117	
02/09/2020	06:10	2.89	14:05	3.93	3.50	06:05	0.52	11:40	0.70	0.63	06:05	0.067	14:05	0.138	0.107	0.107	
02/10/2020	05:00	3.09	13:25	4.69	3.75	05:15	0.56	14:20	0.81	0.68	05:15	0.083	13:25	0.207	0.130	0.130	
02/11/2020	05:30	2.66	13:35	4.19	3.33	05:35	0.48	07:35	0.83	0.64	05:35	0.055	07:35	0.176	0.104	0.104	
02/12/2020	04:55	2.56	14:15	4.22	3.24	05:00	0.47	14:15	0.79	0.64	05:00	0.051	14:15	0.177	0.101	0.101	
02/13/2020	03:10	2.49	13:35	4.09	3.16	04:35	0.50	15:40	0.79	0.65	04:35	0.053	13:35	0.167	0.098	0.098	
02/14/2020	04:10	2.41	13:35	3.78	3.07	04:30	0.45	12:20	0.75	0.62	04:35	0.045	13:35	0.139	0.090	0.090	
02/15/2020	05:55	2.73	14:00	3.40	2.99	04:55	0.45	00:55	0.65	0.54	04:55	0.054	14:00	0.100	0.074	0.074	
02/16/2020	04:50	2.69	11:55	3.61	3.05	04:45	0.46	19:55	0.67	0.55	04:45	0.054	11:55	0.117	0.077	0.077	
02/17/2020	03:15	2.81	12:15	3.90	3.31	04:10	0.46	13:30	0.70	0.57	03:40	0.058	12:00	0.132	0.092	0.092	
02/18/2020	03:45	2.79	13:45	4.86	3.99	23:45	0.41	13:55	0.70	0.54	03:45	0.055	13:55	0.188	0.113	0.113	
02/19/2020	05:35	3.69	11:30	5.10	4.33	02:45	0.37	11:55	0.68	0.53	05:35	0.069	13:55	0.185	0.125	0.125	
02/20/2020	06:00	3.18	14:20	4.75	3.93	04:00	0.37	10:25	0.79	0.54	04:00	0.056	10:25	0.203	0.113	0.113	
02/21/2020	03:55	2.76	13:25	4.48	3.53	03:50	0.43	14:10	0.70	0.55	03:50	0.052	13:30	0.169	0.099	0.099	
02/22/2020	03:05	2.35	20:25	3.40	2.84	03:00	0.31	09:55	0.55	0.44	03:00	0.029	09:55	0.087	0.056	0.056	
02/23/2020	06:35	2.34	14:10	3.39	2.80	05:10	0.32	20:05	0.55	0.44	06:30	0.030	14:10	0.088	0.055	0.055	
02/24/2020	04:10	2.34	14:15	4.75	3.60	02:05	0.31	13:15	0.64	0.47	02:05	0.031	13:25	0.164	0.088	0.088	

Date	Depth (in)					Velocity (ft/s)					Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
02/25/2020	04:30	2.86	16:30	4.82	3.96	04:40	0.27	10:00	0.60	0.42	04:40	0.035	13:30	0.153	0.089	0.089	
02/26/2020	22:40	2.73	11:10	4.73	3.60	04:00	0.19	12:05	0.80	0.48	04:00	0.028	14:30	0.180	0.089	0.089	
02/27/2020	04:45	2.33	13:30	4.55	3.32	03:45	0.33	13:30	0.70	0.51	03:45	0.031	13:30	0.173	0.086	0.086	
02/28/2020	05:50	2.14	11:45	4.13	3.06	05:55	0.29	14:40	0.77	0.50	05:55	0.024	14:40	0.156	0.075	0.075	
02/29/2020	05:40	2.37	18:55	3.32	2.80	05:20	0.34	15:20	0.57	0.45	05:20	0.033	15:20	0.086	0.057	0.057	
03/01/2020	05:20	2.33	11:40	3.68	2.83	05:35	0.34	11:35	0.71	0.48	05:35	0.032	11:35	0.127	0.062	0.062	
03/02/2020	03:20	2.42	13:20	4.39	3.20	03:30	0.39	13:50	0.80	0.55	03:30	0.039	13:20	0.181	0.087	0.087	
03/03/2020	03:40	2.43	13:25	4.60	3.34	02:45	0.32	10:10	0.75	0.54	03:35	0.032	13:15	0.188	0.093	0.093	
03/04/2020	04:00	2.24	10:50	4.19	3.06	03:50	0.34	13:50	0.85	0.55	03:50	0.030	13:50	0.180	0.082	0.082	
03/05/2020	03:45	2.14	13:05	4.09	2.97	05:00	0.31	13:50	0.80	0.56	05:00	0.027	14:00	0.168	0.081	0.081	
03/06/2020	03:20	1.98	13:30	4.29	2.83	03:20	0.32	13:25	0.86	0.55	03:20	0.024	13:25	0.189	0.075	0.075	
03/07/2020	03:55	2.01	16:15	3.02	2.48	03:50	0.34	16:35	0.66	0.49	03:50	0.026	16:35	0.089	0.052	0.052	
03/08/2020	05:25	2.03	14:05	3.00	2.40	04:35	0.35	14:05	0.67	0.49	04:35	0.028	14:05	0.091	0.050	0.050	
03/09/2020	03:00	1.84	10:50	3.95	2.82	05:15	0.32	10:30	0.82	0.58	03:25	0.022	10:30	0.161	0.079	0.079	

Report Summary For The Period 11/16/2019 00:00 - 03/09/2020 23:59

	Depth (in)	Velocity (ft/s)	Quantity (MGD - Total MG)	Rain (in)
Total			11.840	4.90
Avg	3.46	0.59	0.103	

Site Commentary

Site Information

MIL_0386	
Pipe Dimensions	18
Silt Level	0.00"

Overview

Site MIL_0386 functioned under normal conditions during the period Saturday, November 16, 2019 to Monday, March 9, 2020 . This site exhibited an observable response to the wet weather events of November 26, 2019 - November 27, 2019, December 7, 2019 - December 8, 2019, and January 16, 2020 - January 17, 2020. Review of the scattergraph shows free flow conditions during the study period.

Flow depth and velocity measurements recorded by the flow monitor are consistent with field confirmations conducted to date and support the relative accuracy of the flow monitor at this location.

This location was installed upstream of sites MIL_0649 and MIL_2491. (See MIL_0649 and MIL_2491 Site Commentary for More Details)

Observations

Average flow depth, velocity, and quantity data observed during Saturday, November 16, 2019 to Monday, March 9, 2020 , along with observed minimum and maximum data, are provided in the following table.

Observed Flow Conditions			
Item	Depth (in)	Velocity (ft/s)	Quantity (MGD)
Average	6.43	1.38	0.512
Minimum	5.11	0.93	0.262
Maximum	9.17	2.04	1.187
Time of Minimum	2/9/2020 4:10 AM	12/26/2019 2:40 AM	12/26/2019 2:40 AM
Time of Maximum	2/6/2020 1:35 PM	1/16/2020 10:45 AM	2/6/2020 1:35 PM

Data Quality

Data uptime observed during the Saturday, November 16, 2019 to the Monday, March 9, 2020 monitoring period is provided in the table below. Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

Percent Uptime	
Depth (in)	100
Velocity (ft/s)	100
Quantity (MGD)	100

Milpitas Temp Study 2019-20

Flow Monitoring Site Report

ADS ENVIRONMENTAL SERVICES®

Site Name

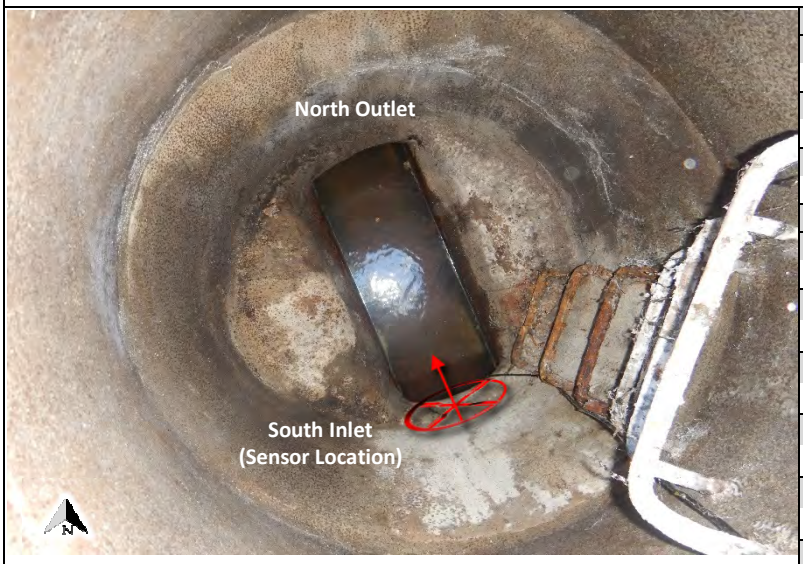
MIL_0386

Site Address /Location:	Milpitas Blvd and Los Coches St, Milpitas, CA			Monitor Series	Location Type
				TRITON+	Temporary
Site Access Details:	DRIVE.	Latitude:	37.430913°	Pipe Size (H x W)	Pipe Shape
		Longitude:	-121.898992°	18.00"x18.00"	Circular



Manhole #	System Characteristics
#0386	Residential/Commercial
Access	Traffic
Drive	Medium







Installation Information

Installation Date:	Installation Type:
Friday, November 15, 2019	Doppler Standard Ring and Crank
Monitoring Location (Sensors):	Monitor Location:
Upstream 0-5 FT	Manhole
Sensors / Devices:	Pressure Sensor Range (psi)
Peak Combo (CS4)	0 - 5 psi

Installation Confirmation:

Confirmation Time:	Pipe Size (HxW)
8:54:00 AM	18.00"x18.00"
Depth of Flow (Wet DOF) (in)	Range (Air DOF) (in)
7.25"	
Downlooker Physical Offset (in)	Measurement Confidence (in)
NA	0.25"
Peak Velocity (fps)	Velocity Sensor Offset (in)
1.76'	0''
Silt (in)	Silt Type
0.0"	

Hydraulic Comments:

Smooth flow with medium depth and moderate velocity

Manhole / Pipe Information:

Manhole Depth (Approx. FT):	Manhole Configuration
14'	Single
Manhole Material:	Manhole Condition:
Concrete	Good
Manhole Opening Diameter (in)	Manhole Diameter (Approx.):
26''	54''
Manhole Cover	Manhole Frame
Unbolted	Normal
Active Drop Connections	Air Quality:
No	Normal
Pipe Material	Pipe Condition:
Concrete	Good

Communication Information:

Communication Type	Antenna Location
Wireless	Drilled Pavement / Concrete

Additional Site Info. / Comments:

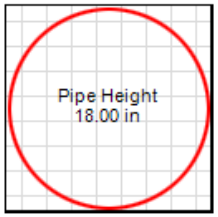
ADS Project Name:	Milpitas.WWTFM.CA2019-2020
ADS Project Number:	22431.11.325

SCATTERGRAPH REPORT

MIL_0386

Flow Monitor

MIL_0386

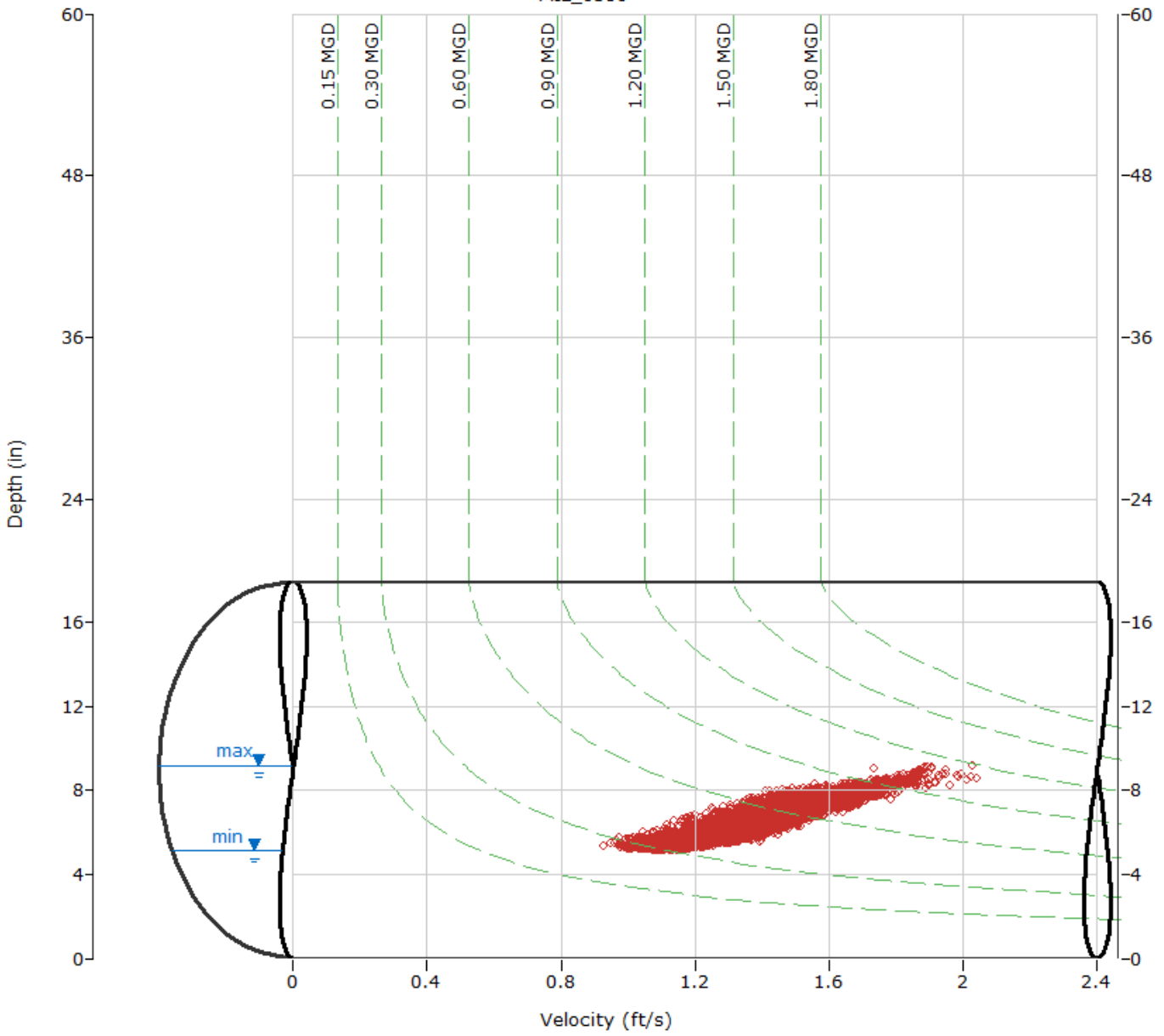


Report Period

11/16/2019
To
3/9/2020

Legend

- Depth - Velocity
- Iso-Q™
- Silt
- Min-Max Depth



ADS ENVIRONMENTAL SERVICES

HYDROGRAPH REPORT

MIL_0386

Flow Monitor

MIL_0386

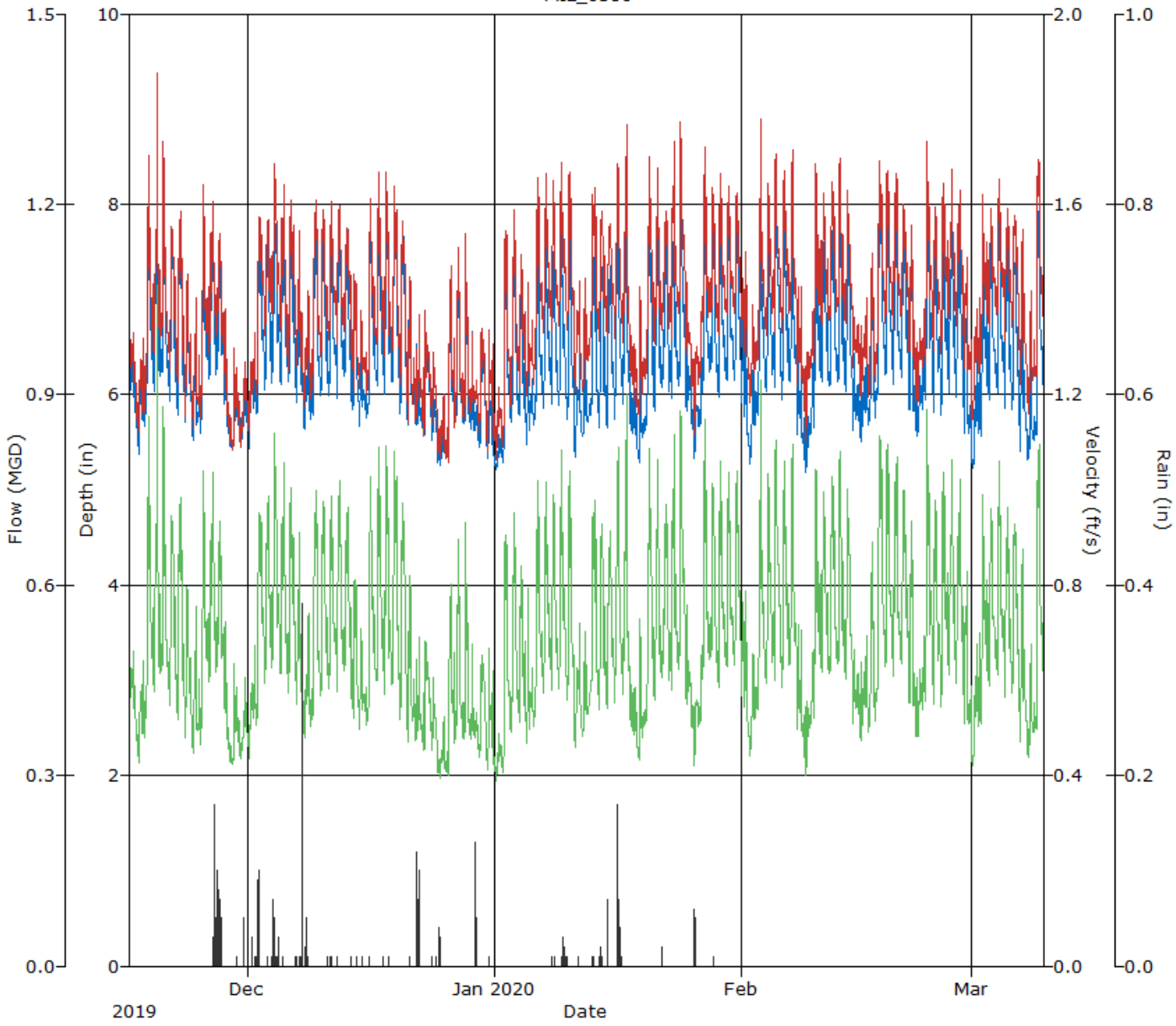
Pipe Height
18.00 in

Report Period

11/16/2019
To
3/9/2020

Legend

- Depth
- Velocity
- Quantity
- Rain



ADS ENVIRONMENTAL SERVICES

Daily Tabular Report For The Period 11/16/2019 00:00 - 03/09/2020 23:59

MIL_0386, Pipe Height: 18.00 in, Silt: 0.00 in

Daily Tabular Report

Date	Depth (in)				Velocity (ft/s)				Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
11/16/2019	22:30	5.72	14:55	6.75	6.11	16:20	1.11	14:55	1.42	1.27	16:20	0.360	14:55	0.557	0.434	0.434	
11/17/2019	06:15	5.34	19:25	6.81	5.80	16:55	0.97	19:15	1.42	1.20	16:55	0.295	19:20	0.560	0.382	0.382	
11/18/2019	00:35	5.50	13:15	8.86	6.79	02:55	1.09	13:10	1.87	1.40	00:35	0.334	13:15	1.046	0.564	0.564	
11/19/2019	04:35	5.95	15:20	9.13	6.85	02:55	1.23	15:00	1.95	1.44	04:30	0.415	15:00	1.109	0.581	0.581	
11/20/2019	23:25	5.95	09:30	8.58	6.73	15:40	1.19	10:15	1.83	1.41	03:15	0.417	10:15	0.976	0.557	0.557	
11/21/2019	04:40	5.86	09:45	7.84	6.69	04:40	1.22	09:45	1.65	1.40	04:40	0.392	09:45	0.790	0.545	0.545	
11/22/2019	04:10	5.75	14:35	7.98	6.74	11:50	1.18	10:00	1.68	1.39	04:25	0.384	08:05	0.813	0.550	0.550	
11/23/2019	04:40	5.58	06:50	7.14	6.26	04:40	1.11	08:40	1.50	1.29	04:40	0.336	08:40	0.630	0.458	0.458	
11/24/2019	03:10	5.42	11:05	7.13	5.97	00:45	1.00	11:05	1.50	1.23	00:45	0.310	11:05	0.632	0.409	0.409	
11/25/2019	00:00	5.54	08:40	8.17	6.61	01:45	1.12	08:40	1.77	1.38	00:15	0.338	08:40	0.890	0.532	0.532	
11/26/2019	04:00	6.11	16:30	8.15	6.84	03:30	1.12	16:30	1.70	1.43	03:30	0.402	16:30	0.854	0.572	0.572	0.36
11/27/2019	00:10	6.10	09:50	7.64	6.78	20:50	1.16	08:35	1.62	1.41	20:50	0.430	09:45	0.745	0.557	0.557	0.63
11/28/2019	20:00	5.34	02:55	6.98	5.85	10:45	0.98	02:50	1.41	1.20	20:00	0.299	02:50	0.578	0.388	0.388	
11/29/2019	04:00	5.43	07:10	6.91	5.81	03:10	0.96	07:05	1.47	1.17	03:10	0.282	07:05	0.593	0.375	0.375	0.02
11/30/2019	06:15	5.40	17:30	6.70	5.75	01:20	0.95	10:45	1.38	1.17	01:20	0.277	17:30	0.516	0.370	0.370	0.10
12/01/2019	03:10	5.38	21:20	7.14	5.92	13:30	1.05	21:25	1.46	1.21	04:30	0.311	21:20	0.613	0.398	0.398	0.06
12/02/2019	03:55	5.70	11:10	7.83	6.72	00:30	1.12	11:05	1.67	1.42	00:30	0.348	11:10	0.792	0.559	0.559	0.30
12/03/2019	03:55	5.96	09:55	7.99	6.80	04:00	1.28	13:05	1.64	1.45	04:00	0.422	10:00	0.792	0.578	0.578	0.01
12/04/2019	00:15	6.04	09:35	8.27	6.96	16:00	1.29	09:25	1.75	1.50	00:10	0.455	09:25	0.893	0.614	0.614	0.39
12/05/2019	03:40	6.08	13:35	8.08	6.90	23:55	1.26	14:50	1.67	1.45	02:15	0.446	13:40	0.828	0.590	0.590	0.01
12/06/2019	00:35	6.08	09:20	8.26	6.83	01:05	1.24	09:15	1.72	1.44	00:30	0.422	09:15	0.875	0.576	0.576	0.01
12/07/2019	23:55	5.61	12:25	7.69	6.39	13:30	1.12	12:05	1.61	1.34	23:55	0.357	12:25	0.745	0.491	0.491	0.67
12/08/2019	03:35	5.56	15:40	7.18	5.97	21:05	1.09	14:10	1.52	1.26	03:35	0.338	15:40	0.605	0.418	0.418	0.20
12/09/2019	04:45	5.68	13:15	7.99	6.74	01:10	1.14	13:15	1.71	1.43	01:10	0.368	13:15	0.835	0.564	0.564	
12/10/2019	04:45	5.93	15:10	7.90	6.78	04:25	1.25	16:30	1.70	1.44	04:25	0.416	15:10	0.813	0.571	0.571	
12/11/2019	04:50	5.88	11:05	7.72	6.69	05:00	1.27	12:50	1.78	1.43	04:45	0.411	12:50	0.811	0.559	0.559	0.03
12/12/2019	05:00	5.92	12:10	7.98	6.82	03:50	1.28	10:30	1.69	1.44	03:55	0.423	12:20	0.824	0.577	0.577	0.01
12/13/2019	04:40	5.97	14:10	7.87	6.79	01:25	1.29	14:00	1.61	1.44	04:35	0.432	14:00	0.765	0.570	0.570	0.01
12/14/2019	06:10	5.72	12:55	7.28	6.39	06:10	1.18	12:55	1.60	1.32	06:10	0.368	12:55	0.693	0.483	0.483	0.01
12/15/2019	06:05	5.55	06:35	7.19	6.04	11:40	1.08	06:40	1.53	1.27	06:05	0.338	06:40	0.644	0.428	0.428	0.01
12/16/2019	03:25	5.72	11:10	8.53	6.73	00:50	1.17	11:10	1.75	1.41	03:25	0.372	11:10	0.931	0.557	0.557	0.01
12/17/2019	05:00	6.01	10:35	8.28	6.93	00:10	1.25	10:35	1.76	1.45	05:15	0.432	10:35	0.900	0.593	0.593	0.01
12/18/2019	03:15	5.93	09:20	8.48	6.89	03:10	1.26	09:20	1.80	1.43	03:10	0.414	09:20	0.952	0.583	0.583	0.01
12/19/2019	05:55	6.04	10:30	8.31	6.93	05:55	1.25	10:25	1.71	1.42	05:55	0.419	10:30	0.880	0.584	0.584	
12/20/2019	04:05	5.76	12:50	8.05	6.74	21:10	1.13	17:00	1.68	1.39	04:05	0.381	17:05	0.822	0.550	0.550	
12/21/2019	04:15	5.60	09:25	7.29	6.25	03:00	1.02	11:10	1.52	1.27	03:00	0.319	09:30	0.657	0.452	0.452	0.01
12/22/2019	03:20	5.43	14:25	7.01	5.93	23:25	1.04	14:20	1.49	1.22	03:25	0.313	14:25	0.607	0.402	0.402	0.41
12/23/2019	05:50	5.50	09:50	6.95	6.12	04:50	1.00	07:30	1.53	1.25	04:50	0.308	07:30	0.604	0.429	0.429	
12/24/2019	20:20	5.23	07:10	6.67	5.68	22:25	0.98	07:05	1.38	1.18	22:25	0.275	07:05	0.531	0.367	0.367	0.02
12/25/2019	03:55	5.20	15:55	6.31	5.42	21:25	1.01	15:55	1.31	1.11	05:40	0.279	15:55	0.469	0.323	0.323	0.08
12/26/2019	04:40	5.26	13:20	7.15	6.15	02:40	0.93	11:10	1.51	1.25	02:40	0.262	11:10	0.636	0.437	0.437	
12/27/2019	00:40	5.66	11:05	8.06	6.27	03:25	1.07	11:05	1.64	1.27	03:25	0.328	11:05	0.812	0.457	0.457	
12/28/2019	05:55	5.64	10:20	8.01	6.18	23:05	1.00	10:10	1.68	1.26	23:05	0.312	10:20	0.817	0.442	0.442	
12/29/2019	23:55	5.46	05:15	6.77	5.83	09:50	1.03	06:00	1.44	1.21	09:50	0.311	05:10	0.542	0.388	0.388	0.22
12/30/2019	04:40	5.38	10:10	6.95	5.96	02:30	1.05	08:45	1.46	1.23	04:35	0.304	10:10	0.586	0.407	0.407	
12/31/2019	04:55	5.30	08:40	7.04	5.71	22:00	0.98	07:25	1.46	1.20	22:00	0.280	08:35	0.583	0.375	0.375	0.01

Date	Depth (in)				Velocity (ft/s)				Quantity (MGD - Total MG)					Rain (in)
	Time	Min Time	Max	Avg	Time	Min Time	Max	Avg	Time	Min Time	Max	Avg	Total	Total
01/01/2020	06:25	5.16 13:40	5.66	5.37	05:50	0.99 13:40	1.26	1.14	05:50	0.274 13:40	0.388	0.326	0.326	
01/02/2020	03:20	5.20 07:15	8.56	6.25	03:10	1.01 07:20	1.85	1.31	03:10	0.278 07:15	0.988	0.471	0.471	
01/03/2020	01:45	5.66 12:30	7.75	6.41	00:40	1.13 12:20	1.71	1.35	04:55	0.354 12:20	0.799	0.501	0.501	
01/04/2020	23:55	5.63 10:30	7.39	6.34	03:55	1.18 10:25	1.57	1.35	03:55	0.370 10:25	0.694	0.489	0.489	
01/05/2020	03:25	5.43 07:05	7.24	5.90	22:50	1.07 05:45	1.59	1.28	22:50	0.335 07:05	0.666	0.419	0.419	
01/06/2020	01:05	5.58 13:00	7.78	6.56	01:15	1.22 12:50	1.77	1.45	01:15	0.370 12:50	0.831	0.550	0.550	
01/07/2020	03:45	5.76 14:20	7.85	6.63	00:35	1.31 14:20	1.80	1.47	03:40	0.413 14:20	0.860	0.566	0.566	
01/08/2020	05:45	5.81 15:05	7.66	6.58	05:45	1.31 10:30	1.70	1.46	05:45	0.419 10:35	0.779	0.557	0.557	0.02
01/09/2020	03:30	5.78 10:00	7.94	6.64	15:40	1.30 10:45	1.75	1.49	03:30	0.416 10:45	0.848	0.574	0.574	0.18
01/10/2020	05:30	5.65 10:35	7.90	6.48	20:30	1.30 10:25	1.80	1.46	05:30	0.404 10:30	0.864	0.548	0.548	0.02
01/11/2020	03:45	5.31 18:00	7.01	5.83	23:55	1.16 17:45	1.55	1.31	04:45	0.331 17:55	0.632	0.421	0.421	0.01
01/12/2020	03:35	5.53 09:00	6.88	5.83	10:50	1.07 08:45	1.53	1.29	01:30	0.334 09:00	0.612	0.416	0.416	
01/13/2020	04:30	5.74 17:35	7.65	6.56	00:00	1.27 13:00	1.69	1.47	00:05	0.400 13:00	0.778	0.557	0.557	0.02
01/14/2020	04:55	5.59 13:05	7.67	6.46	16:25	1.16 10:05	1.69	1.45	04:50	0.390 13:05	0.771	0.538	0.538	0.11
01/15/2020	04:55	5.62 12:15	7.56	6.48	04:20	1.31 11:45	1.68	1.45	04:55	0.400 11:45	0.746	0.539	0.539	0.07
01/16/2020	04:00	5.69 14:00	8.78	6.74	04:10	1.31 10:45	2.04	1.49	04:00	0.406 13:50	1.097	0.588	0.588	0.66
01/17/2020	04:30	5.83 15:00	8.83	6.72	04:30	1.29 15:00	1.90	1.46	04:30	0.414 15:00	1.058	0.574	0.574	
01/18/2020	22:45	5.41 16:05	6.86	5.76	22:45	1.15 16:10	1.45	1.25	22:45	0.332 16:10	0.580	0.396	0.396	
01/19/2020	04:40	5.20 08:45	6.94	5.66	04:35	1.12 08:45	1.50	1.24	04:35	0.307 08:45	0.609	0.384	0.384	
01/20/2020	00:05	5.56 12:25	8.11	6.65	04:35	1.21 12:20	1.77	1.45	00:25	0.371 12:25	0.881	0.562	0.562	
01/21/2020	05:20	5.67 12:40	8.18	6.61	05:20	1.26 14:00	1.89	1.44	05:20	0.389 14:00	0.938	0.552	0.552	
01/22/2020	00:45	5.95 17:00	7.99	6.74	00:45	1.30 17:00	1.75	1.46	00:45	0.427 17:00	0.855	0.574	0.574	0.03
01/23/2020	00:30	5.86 14:55	8.36	6.79	05:55	1.31 14:50	1.96	1.49	06:00	0.424 14:50	1.004	0.593	0.593	
01/24/2020	01:40	6.04 11:00	8.67	6.90	03:15	1.31 10:50	2.01	1.52	01:40	0.450 10:55	1.078	0.617	0.617	
01/25/2020	22:30	5.50 07:00	6.85	6.08	22:20	1.04 06:20	1.50	1.31	22:20	0.313 06:20	0.594	0.447	0.447	
01/26/2020	05:05	5.29 00:15	6.25	5.71	02:25	1.09 00:10	1.40	1.25	04:50	0.310 00:10	0.494	0.389	0.389	0.16
01/27/2020	00:40	5.84 10:40	8.42	6.83	00:20	1.27 10:35	1.86	1.46	00:40	0.413 10:35	0.974	0.588	0.588	
01/28/2020	04:50	6.06 13:10	7.91	6.83	04:40	1.32 13:10	1.71	1.47	04:45	0.449 13:10	0.828	0.590	0.590	0.01
01/29/2020	04:40	5.93 08:15	8.02	6.76	03:20	1.24 08:00	1.74	1.46	03:20	0.422 08:20	0.848	0.578	0.578	
01/30/2020	04:55	6.08 11:05	8.09	6.81	11:45	1.33 11:00	1.72	1.47	05:00	0.456 11:00	0.851	0.588	0.588	
01/31/2020	05:05	6.06 12:30	8.18	6.84	05:00	1.33 12:30	1.74	1.48	05:05	0.450 12:30	0.876	0.593	0.593	
02/01/2020	23:55	5.46 14:15	7.17	6.12	23:50	1.20 14:15	1.58	1.36	23:50	0.352 14:15	0.670	0.470	0.470	
02/02/2020	02:25	5.23 15:15	6.83	5.73	03:20	1.11 15:05	1.50	1.27	03:20	0.312 15:10	0.591	0.398	0.398	
02/03/2020	02:20	5.74 13:10	8.54	6.79	22:45	1.20 13:05	1.90	1.46	02:25	0.394 13:05	1.010	0.585	0.585	
02/04/2020	03:55	5.94 11:05	7.86	6.77	22:10	1.27 10:25	1.69	1.46	03:50	0.430 10:25	0.797	0.580	0.580	
02/05/2020	06:40	6.04 09:45	8.07	6.90	17:45	1.30 08:25	1.77	1.49	06:20	0.442 09:40	0.875	0.604	0.604	
02/06/2020	04:40	5.87 13:35	9.17	6.75	04:40	1.29 13:35	2.03	1.48	04:40	0.416 13:35	1.187	0.584	0.584	
02/07/2020	02:05	5.99 11:25	7.98	6.73	15:35	1.31 11:15	1.78	1.48	02:10	0.445 11:15	0.855	0.580	0.580	
02/08/2020	23:50	5.25 14:35	6.79	5.85	23:50	1.13 14:40	1.47	1.29	23:50	0.313 14:35	0.579	0.418	0.418	
02/09/2020	04:10	5.11 01:40	6.27	5.62	03:30	1.00 00:20	1.38	1.24	03:30	0.280 01:40	0.477	0.378	0.378	
02/10/2020	04:55	5.33 09:00	7.84	6.66	04:55	1.20 11:30	1.77	1.45	04:55	0.340 11:30	0.841	0.563	0.563	
02/11/2020	06:05	6.04 11:35	7.73	6.80	04:50	1.31 10:15	1.67	1.47	04:55	0.442 11:35	0.779	0.584	0.584	
02/12/2020	04:00	5.95 09:35	7.82	6.82	04:15	1.31 11:50	1.72	1.49	04:15	0.431 11:50	0.817	0.593	0.593	
02/13/2020	05:20	6.07 10:20	7.93	6.83	01:50	1.34 10:05	1.75	1.48	01:50	0.462 10:15	0.838	0.593	0.593	
02/14/2020	06:05	5.96 13:15	7.72	6.75	16:25	1.25 10:25	1.67	1.46	06:00	0.430 10:25	0.777	0.577	0.577	
02/15/2020	23:05	5.56 17:10	6.63	5.93	22:35	1.15 17:05	1.44	1.30	22:35	0.349 17:05	0.548	0.428	0.428	
02/16/2020	01:55	5.41 18:55	6.93	5.89	00:40	1.10 18:55	1.50	1.28	00:40	0.328 18:55	0.608	0.418	0.418	
02/17/2020	01:35	5.60 13:45	7.68	6.25	03:35	1.09 13:45	1.55	1.31	03:35	0.337 13:45	0.719	0.467	0.467	
02/18/2020	00:00	5.81 12:10	8.37	6.96	00:00	1.21 08:45	1.73	1.47	00:00	0.387 12:15	0.883	0.607	0.607	
02/19/2020	05:40	6.09 09:40	8.43	6.98	02:25	1.33 09:35	1.78	1.49	02:25	0.454 09:35	0.933	0.614	0.614	
02/20/2020	02:30	5.95 16:25	8.21	6.95	02:35	1.31 16:30	1.74	1.49	02:30	0.431 16:30	0.880	0.612	0.612	
02/21/2020	07:10	6.09 13:20	7.89	6.86	00:35	1.33 12:30	1.71	1.47	07:10	0.461 12:30	0.813	0.592	0.592	
02/22/2020	23:10	5.58 12:30	8.05	6.34	23:45	1.01 12:30	1.69	1.35	23:45	0.312 12:30	0.838	0.491	0.491	
02/23/2020	03:50	5.50 23:25	6.61	5.93	06:35	1.11 02:05	1.39	1.27	03:50	0.338 02:25	0.514	0.418	0.418	
02/24/2020	04:45	5.87 10:55	8.81	6.87	02:20	1.24 10:45	1.87	1.45	04:40	0.404 10:50	1.032	0.589	0.589	

Date	Depth (in)					Velocity (ft/s)					Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
02/25/2020	04:35	5.79	09:30	7.84	6.74	04:30	1.27	09:20	1.71	1.45	04:30	0.405	09:25	0.814	0.569	0.569	
02/26/2020	04:35	5.77	14:20	7.91	6.76	04:00	1.25	13:15	1.66	1.47	04:00	0.395	13:30	0.789	0.580	0.580	
02/27/2020	02:05	5.82	12:25	8.09	6.76	17:40	1.25	12:25	1.79	1.48	02:05	0.424	12:25	0.893	0.583	0.583	
02/28/2020	00:35	5.92	14:45	7.85	6.79	00:40	1.32	12:40	1.68	1.48	00:35	0.432	14:45	0.792	0.589	0.589	
02/29/2020	02:50	5.53	10:10	7.26	6.08	22:55	1.12	10:00	1.56	1.33	20:50	0.358	10:10	0.673	0.454	0.454	
03/01/2020	03:20	5.20	18:05	7.05	5.66	03:00	1.00	18:05	1.53	1.25	03:00	0.273	18:05	0.636	0.387	0.387	
03/02/2020	03:25	5.55	09:20	7.66	6.56	02:50	1.22	09:05	1.68	1.43	02:55	0.366	09:15	0.770	0.545	0.545	
03/03/2020	04:45	5.92	11:35	7.83	6.68	04:35	1.32	11:35	1.73	1.46	04:35	0.432	11:35	0.827	0.566	0.566	
03/04/2020	06:10	5.93	12:10	8.10	6.75	03:20	1.32	12:10	1.77	1.48	03:20	0.434	12:10	0.882	0.582	0.582	
03/05/2020	04:20	5.83	12:00	7.83	6.69	04:40	1.27	10:50	1.65	1.47	04:40	0.409	12:05	0.769	0.572	0.572	
03/06/2020	01:55	5.48	08:45	7.65	6.65	01:55	1.28	08:25	1.66	1.47	01:55	0.376	08:25	0.744	0.566	0.566	
03/07/2020	02:00	5.39	08:00	7.36	6.06	01:45	1.17	08:00	1.62	1.35	01:45	0.341	08:00	0.709	0.459	0.459	
03/08/2020	02:00	5.24	13:35	6.52	5.65	18:20	1.10	13:35	1.46	1.26	03:50	0.316	13:35	0.544	0.390	0.390	
03/09/2020	04:00	5.52	12:25	8.08	6.66	01:15	1.20	09:05	1.77	1.46	03:50	0.361	12:20	0.875	0.570	0.569	

Report Summary For The Period 11/16/2019 00:00 - 03/09/2020 23:59

	Depth (in)	Velocity (ft/s)	Quantity (MGD - Total MG)	Rain (in)
Total			58.839	4.90
Avg	6.43	1.38	0.512	

Site Commentary

Site Information

MIL_0602	
Pipe Dimensions	18
Silt Level	0.00"

Overview

Site MIL_0602 functioned under normal conditions during the period Saturday, November 16, 2019 to Monday, March 9, 2020 . This site exhibited an observable response to the wet weather events of November 26, 2019 - November 27, 2019, December 7, 2019 - December 8, 2019, and January 16, 2020 - January 17, 2020. Review of the scattergraph shows free flow conditions during the study period.

Flow depth and velocity measurements recorded by the flow monitor are consistent with field confirmations conducted to date and support the relative accuracy of the flow monitor at this location.

Observations

Average flow depth, velocity, and quantity data observed during Saturday, November 16, 2019 to Monday, March 9, 2020 , along with observed minimum and maximum data, are provided in the following table.

Observed Flow Conditions			
Item	Depth (in)	Velocity (ft/s)	Quantity (MGD)
Average	3.67	1.53	0.274
Minimum	1.21	0.39	0.014
Maximum	6.31	2.37	0.844
Time of Minimum	3/7/2020 5:50 AM	3/9/2020 4:30 AM	3/9/2020 5:55 AM
Time of Maximum	1/7/2020 8:40 AM	1/7/2020 8:40 AM	1/7/2020 8:40 AM

Data Quality

Data uptime observed during the Saturday, November 16, 2019 to the Monday, March 9, 2020 monitoring period is provided in the table below. Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

Percent Uptime	
Depth (in)	100
Velocity (ft/s)	100
Quantity (MGD)	100

Milpitas Temp Study 2019-20

Flow Monitoring Site Report

Site Name

MIL_0602

Site Address /Location:	Main St and Curtis Ave			Monitor Series	Location Type
				TRITON+	Temporary
Site Access Details:	Parking lane	Latitude:	37.424137°	Pipe Size (H x W)	Pipe Shape
		Longitude:	-121.905174°	18.0" x 18.0"	Circular



Manhole #	System Characteristics
602	Residential/Commercial
Access	Traffic
Drive	Light







Installation Information

Installation Date:	Installation Type:
Tuesday, November 12, 2019	Doppler Standard Ring and Crank
Monitoring Location (Sensors):	Monitor Location:
Upstream 0-5 FT	Manhole
Sensors / Devices:	Pressure Sensor Range (psi)
Peak Combo (CS4)	0 - 5 psi

Installation Confirmation:

Confirmation Time:	Pipe Size (HxW)
9:11:40 AM	18.0" x 18.0"
Depth of Flow (Wet DOF) (in)	Range (Air DOF) (in)
6.25	0.00"
Downlooker Physical Offset (in)	Measurement Confidence (in)
NA	0.25"
Peak Velocity (fps)	Velocity Sensor Offset (in)
1.52	0''
Silt (in)	Silt Type
0''	

Hydraulic Comments:

Smooth flow with medium depth and moderate velocity

Manhole / Pipe Information:

Manhole Depth (Approx. FT):	Manhole Configuration
7'	Single
Manhole Material:	Manhole Condition:
Concrete	Good
Manhole Opening Diameter (in)	Manhole Diameter (Approx.):
26''	54''
Manhole Cover	Manhole Frame
Unbolted	Normal
Active Drop Connections	Air Quality:
No	Normal
Pipe Material	Pipe Condition:
Concrete	Good

Communication Information:

Communication Type	Antenna Location
Wireless	Manhole Pick / Vent Hole

Additional Site Info. / Comments:

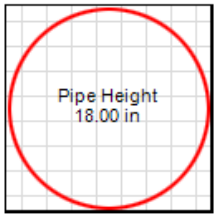
ADS Project Name:	Milpitas.WWTFM.CA19-20
ADS Project Number:	22431

SCATTERGRAPH REPORT

MIL_0602

Flow Monitor

MIL_0602

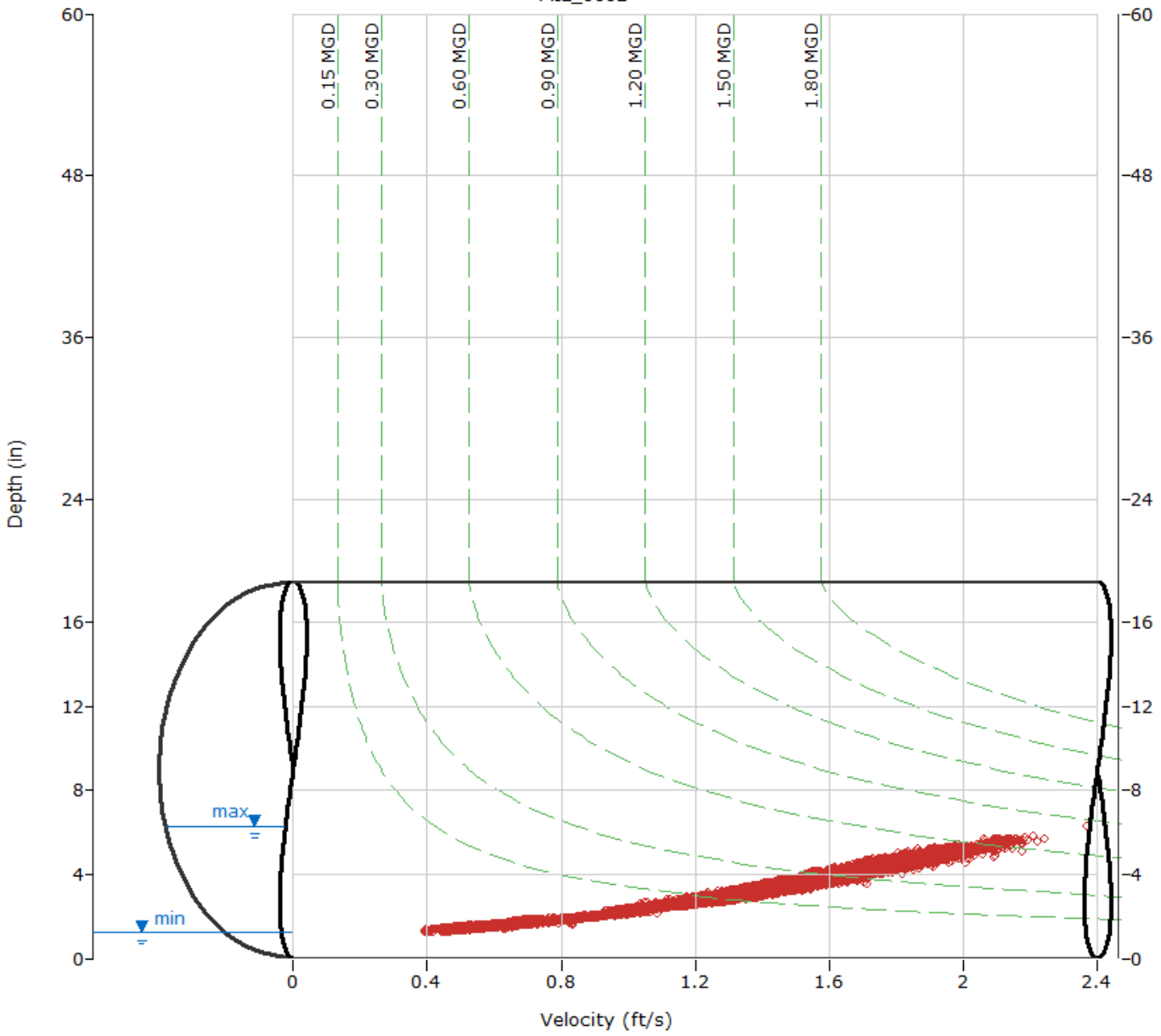


Report Period

11/16/2019
To
3/9/2020

Legend

- Depth - Velocity
- Iso-Q™
- Silt
- Min-Max Depth



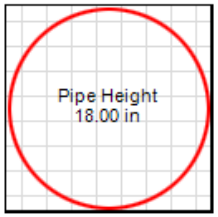
ADS ENVIRONMENTAL SERVICES

HYDROGRAPH REPORT

MIL_0602

Flow Monitor

MIL_0602

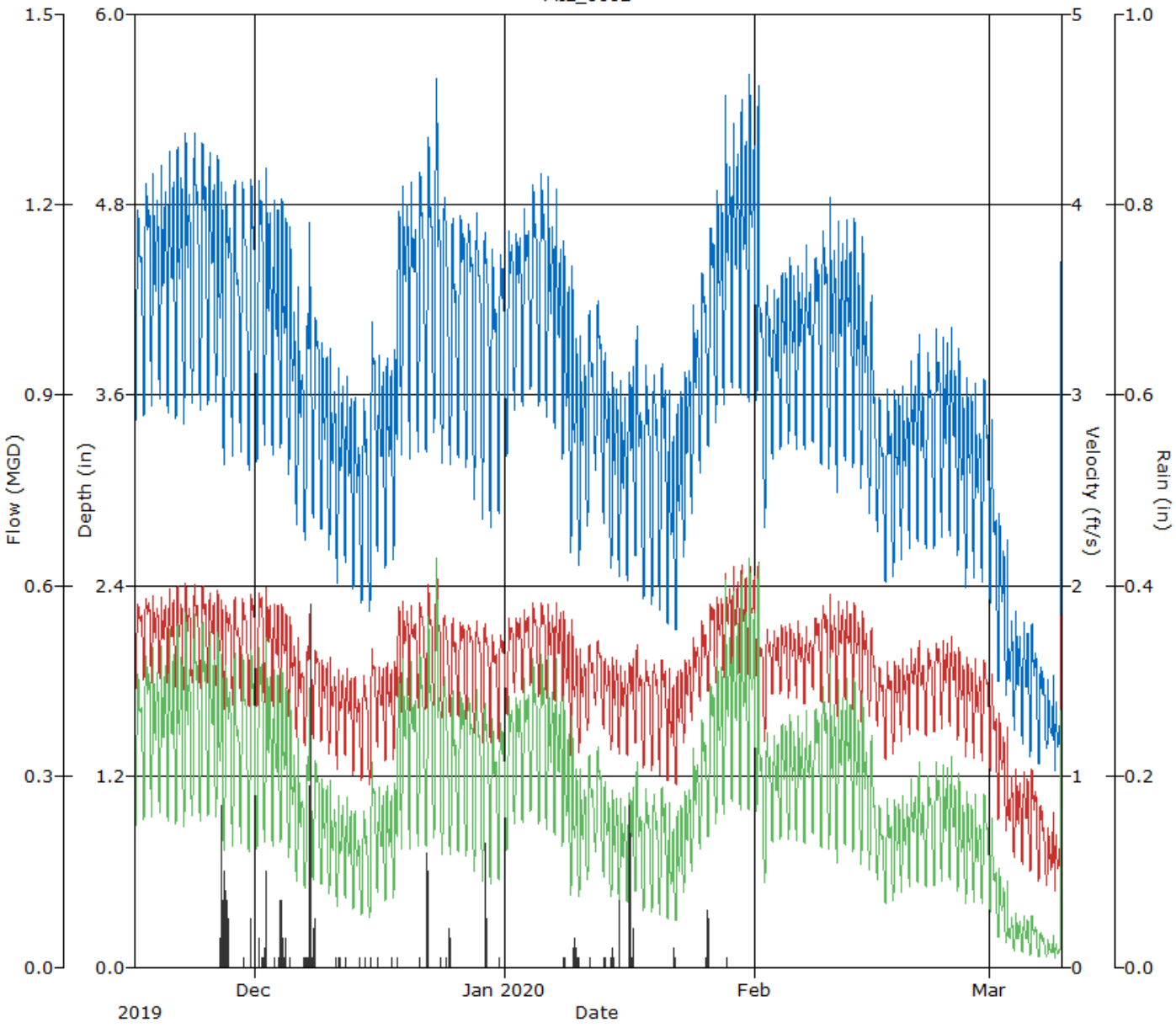


Report Period

11/16/2019
To
3/9/2020

Legend

- Depth
- Velocity
- Quantity
- Rain



Daily Tabular Report For The Period 11/16/2019 00:00 - 03/09/2020 23:59

MIL_0602, Pipe Height: 18.00 in, Silt: 0.00 in

Daily Tabular Report

Date	Depth (in)				Velocity (ft/s)				Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
11/16/2019	03:55	3.43	12:05	4.79	4.22	05:55	1.45	12:35	1.95	1.74	05:55	0.222	11:55	0.473	0.361	0.361	
11/17/2019	06:00	3.44	13:00	4.96	4.37	05:00	1.48	15:05	2.01	1.78	06:05	0.226	11:20	0.502	0.388	0.388	
11/18/2019	04:40	3.52	08:45	5.09	4.35	03:50	1.47	08:30	1.99	1.75	04:40	0.233	08:30	0.527	0.379	0.379	
11/19/2019	04:25	3.57	08:55	5.11	4.40	04:35	1.49	08:45	2.00	1.76	04:35	0.240	08:45	0.531	0.386	0.386	
11/20/2019	04:20	3.46	08:55	5.21	4.41	03:10	1.44	09:15	2.05	1.76	04:20	0.225	09:15	0.557	0.387	0.387	
11/21/2019	04:35	3.44	09:05	5.26	4.42	04:25	1.45	08:55	2.07	1.76	04:25	0.222	08:55	0.571	0.390	0.390	
11/22/2019	03:55	3.41	08:45	5.30	4.43	05:10	1.44	09:00	2.06	1.76	05:10	0.217	09:00	0.578	0.392	0.392	
11/23/2019	05:00	3.54	12:50	5.29	4.53	03:30	1.47	12:20	2.03	1.78	05:05	0.236	12:20	0.565	0.410	0.410	
11/24/2019	05:40	3.48	12:15	5.21	4.51	04:45	1.45	12:05	2.05	1.78	05:40	0.225	12:05	0.560	0.407	0.407	
11/25/2019	04:40	3.53	09:20	5.17	4.44	04:35	1.48	09:25	2.01	1.76	04:40	0.234	09:25	0.545	0.391	0.391	
11/26/2019	05:00	3.53	10:05	5.16	4.34	04:55	1.45	20:50	2.03	1.73	04:55	0.229	20:50	0.540	0.373	0.373	0.36
11/27/2019	05:25	3.13	09:50	5.00	4.24	05:30	1.33	09:25	1.93	1.71	05:30	0.176	10:00	0.495	0.358	0.358	0.63
11/28/2019	06:30	3.20	12:15	4.99	4.12	05:45	1.36	12:45	1.99	1.68	05:45	0.188	12:45	0.508	0.339	0.339	
11/29/2019	05:25	3.23	12:05	4.96	4.26	05:10	1.38	11:30	1.94	1.73	05:10	0.192	12:10	0.495	0.364	0.364	0.02
11/30/2019	05:50	3.11	12:45	4.98	4.20	05:35	1.34	12:25	2.09	1.72	05:40	0.178	12:25	0.523	0.359	0.359	0.10
12/01/2019	05:50	3.16	12:50	4.97	4.26	05:35	1.35	11:35	2.09	1.74	05:35	0.184	11:35	0.512	0.371	0.371	0.06
12/02/2019	04:45	3.27	09:20	5.08	4.22	03:55	1.38	09:25	2.18	1.72	04:50	0.195	09:25	0.574	0.358	0.358	0.30
12/03/2019	05:05	3.20	08:45	4.86	4.12	05:05	1.35	20:10	2.02	1.68	05:05	0.185	20:10	0.484	0.339	0.339	0.01
12/04/2019	03:20	3.25	08:55	4.96	4.11	02:30	1.35	08:40	1.93	1.67	03:15	0.192	08:45	0.491	0.335	0.335	0.39
12/05/2019	05:05	3.07	08:40	4.79	3.83	04:45	1.30	08:35	1.88	1.58	05:05	0.169	08:35	0.458	0.286	0.286	0.01
12/06/2019	04:30	2.77	09:00	4.35	3.49	02:55	1.19	08:55	1.77	1.46	04:35	0.133	08:55	0.375	0.232	0.232	0.01
12/07/2019	05:55	2.67	18:50	4.84	3.62	05:40	1.14	18:45	1.96	1.50	05:40	0.121	18:45	0.483	0.256	0.256	0.67
12/08/2019	06:10	2.80	12:25	4.12	3.61	05:30	1.19	13:10	1.69	1.50	06:25	0.136	13:10	0.329	0.250	0.250	0.20
12/09/2019	05:20	2.74	09:00	4.03	3.40	05:15	1.17	08:55	1.66	1.44	05:15	0.129	08:55	0.315	0.219	0.219	
12/10/2019	05:10	2.61	09:05	3.96	3.26	04:15	1.08	08:10	1.70	1.39	04:15	0.112	08:40	0.304	0.200	0.200	
12/11/2019	05:00	2.40	08:50	3.89	3.18	04:20	1.02	08:45	1.63	1.35	05:05	0.093	08:45	0.296	0.189	0.189	0.03
12/12/2019	05:35	2.53	08:40	3.78	3.16	05:30	1.10	08:40	1.60	1.36	05:30	0.107	08:40	0.279	0.187	0.187	0.01
12/13/2019	04:30	2.37	09:00	3.63	3.04	04:10	1.00	09:45	1.55	1.31	04:25	0.089	08:45	0.252	0.170	0.170	0.01
12/14/2019	05:25	2.28	13:30	3.62	3.03	05:45	0.97	11:45	1.57	1.30	05:45	0.081	11:45	0.253	0.170	0.170	0.01
12/15/2019	06:05	2.23	11:20	4.43	3.25	06:40	0.93	11:20	1.80	1.37	05:55	0.077	11:20	0.393	0.205	0.205	0.01
12/16/2019	05:20	2.60	09:40	3.87	3.28	05:10	1.04	08:45	1.61	1.39	05:10	0.105	09:40	0.288	0.202	0.202	0.01
12/17/2019	05:10	2.51	09:20	3.86	3.28	05:00	1.07	09:25	1.61	1.39	05:00	0.103	09:25	0.288	0.202	0.202	0.01
12/18/2019	04:50	2.55	21:45	4.78	3.68	04:15	1.08	21:40	1.92	1.52	04:55	0.107	21:45	0.467	0.270	0.270	0.01
12/19/2019	04:40	3.19	09:10	4.95	4.25	04:40	1.32	08:55	1.99	1.69	04:40	0.181	09:00	0.506	0.355	0.355	
12/20/2019	05:05	3.16	09:40	4.98	4.25	03:45	1.32	09:40	1.98	1.68	05:10	0.179	09:40	0.511	0.354	0.354	
12/21/2019	05:25	3.23	12:20	5.04	4.32	05:30	1.35	11:35	1.96	1.70	05:30	0.188	11:40	0.508	0.368	0.368	0.01
12/22/2019	06:00	3.22	13:30	5.28	4.35	04:30	1.34	13:35	2.05	1.71	04:35	0.186	13:35	0.573	0.374	0.374	0.41
12/23/2019	05:35	3.32	13:15	5.71	4.47	05:30	1.35	12:15	2.19	1.73	05:30	0.195	12:15	0.666	0.396	0.396	
12/24/2019	05:05	3.16	12:05	4.87	4.19	04:55	1.27	10:40	1.88	1.64	04:55	0.173	12:05	0.467	0.339	0.339	0.02
12/25/2019	04:55	3.15	12:25	4.75	4.00	05:00	1.29	19:25	1.87	1.59	04:55	0.173	12:20	0.444	0.308	0.308	0.08
12/26/2019	05:00	3.18	12:05	4.75	4.18	05:10	1.30	22:50	1.87	1.64	04:55	0.177	10:55	0.440	0.337	0.337	
12/27/2019	04:20	3.10	13:20	4.71	4.11	04:15	1.28	09:45	1.96	1.62	04:15	0.168	09:45	0.443	0.326	0.326	
12/28/2019	04:35	2.91	12:30	4.79	4.00	04:30	1.21	12:20	1.88	1.59	04:30	0.145	12:25	0.455	0.309	0.309	
12/29/2019	06:25	2.81	13:25	4.65	3.93	06:20	1.17	13:55	1.84	1.57	06:20	0.133	13:25	0.422	0.298	0.298	0.22
12/30/2019	05:55	2.75	11:10	4.54	3.81	05:30	1.15	11:20	1.81	1.53	05:30	0.128	11:20	0.408	0.278	0.278	
12/31/2019	04:45	2.84	11:20	4.53	3.89	05:15	1.17	12:40	1.91	1.55	05:15	0.136	12:40	0.419	0.290	0.290	0.01

Date	Depth (in)				Velocity (ft/s)				Quantity (MGD - Total MG)					Rain (in)
	Time	Min Time	Max	Avg	Time	Min Time	Max	Avg	Time	Min Time	Max	Avg	Total	Total
01/01/2020	05:40	3.20 12:25	4.65	4.06	06:35	1.30 12:05	1.88	1.62	06:35	0.181 19:10	0.436	0.321	0.321	
01/02/2020	04:35	3.49 10:25	4.64	4.23	04:05	1.42 21:00	1.86	1.69	04:05	0.223 10:35	0.431	0.351	0.351	
01/03/2020	04:25	3.50 10:10	4.83	4.30	04:55	1.43 10:05	1.89	1.71	04:20	0.223 10:10	0.465	0.363	0.363	
01/04/2020	04:10	3.61 11:55	4.94	4.36	04:20	1.45 16:40	2.01	1.72	04:20	0.238 12:15	0.500	0.373	0.373	
01/05/2020	04:45	3.52 12:10	5.06	4.38	05:25	1.40 13:50	2.06	1.72	05:25	0.221 13:50	0.525	0.376	0.376	
01/06/2020	04:35	3.46 08:55	5.05	4.25	05:15	1.40 08:50	1.94	1.69	05:05	0.216 08:50	0.508	0.353	0.353	
01/07/2020	04:50	3.38 08:40	6.31	4.14	04:25	1.36 08:40	2.37	1.68	04:25	0.204 08:40	0.844	0.339	0.339	
01/08/2020	04:45	3.16 08:35	4.79	3.81	04:40	1.36 08:35	1.94	1.59	04:40	0.183 08:35	0.471	0.285	0.285	0.02
01/09/2020	05:05	2.58 08:50	4.57	3.44	05:00	1.09 08:35	1.90	1.46	05:00	0.110 08:35	0.425	0.230	0.230	0.18
01/10/2020	04:15	2.51 08:40	4.12	3.33	05:20	1.11 08:40	1.70	1.44	04:55	0.108 08:40	0.334	0.215	0.215	0.02
01/11/2020	05:40	2.76 12:55	4.14	3.54	05:40	1.23 12:55	1.70	1.50	05:40	0.137 12:55	0.337	0.243	0.243	0.01
01/12/2020	06:00	3.09 12:45	4.22	3.73	06:00	1.36 12:45	1.72	1.57	06:00	0.178 12:45	0.350	0.271	0.271	
01/13/2020	05:20	2.74 09:00	3.91	3.36	05:20	1.23 09:00	1.63	1.46	05:20	0.135 09:00	0.298	0.218	0.218	0.02
01/14/2020	05:20	2.49 09:05	3.78	3.17	05:20	1.12 09:00	1.67	1.41	05:20	0.107 09:00	0.292	0.195	0.195	0.11
01/15/2020	04:30	2.45 09:05	3.71	3.12	05:10	1.11 08:55	1.60	1.39	03:55	0.104 09:05	0.271	0.188	0.188	0.07
01/16/2020	05:30	2.42 21:40	3.82	3.26	05:25	1.08 21:40	1.64	1.43	05:25	0.099 21:40	0.289	0.208	0.208	0.66
01/17/2020	05:25	2.58 09:20	4.05	3.27	05:15	1.15 09:30	1.72	1.44	05:15	0.116 09:30	0.329	0.209	0.209	
01/18/2020	05:25	2.31 11:10	3.83	3.14	05:25	1.02 11:25	1.63	1.38	05:25	0.087 11:45	0.287	0.192	0.192	
01/19/2020	05:25	2.28 12:55	3.75	3.11	05:15	0.98 12:30	1.60	1.37	05:15	0.083 12:55	0.274	0.188	0.188	
01/20/2020	05:30	2.23 12:00	3.81	3.16	04:30	1.00 13:05	1.65	1.38	05:30	0.081 13:05	0.289	0.195	0.195	
01/21/2020	04:40	2.14 09:00	3.72	2.87	04:40	0.95 09:05	1.60	1.28	04:40	0.073 08:55	0.272	0.155	0.155	
01/22/2020	04:25	2.11 21:30	3.63	2.93	04:55	0.95 09:10	1.71	1.30	05:20	0.071 09:10	0.278	0.165	0.165	0.03
01/23/2020	04:20	2.57 09:00	3.80	3.28	04:50	1.15 08:55	1.71	1.44	04:50	0.116 08:55	0.301	0.209	0.209	
01/24/2020	05:00	2.84 09:05	4.18	3.62	05:15	1.27 09:05	1.76	1.55	05:15	0.148 09:05	0.355	0.259	0.259	
01/25/2020	05:05	3.09 11:50	4.39	3.89	05:05	1.37 13:55	1.85	1.63	05:05	0.179 11:50	0.394	0.302	0.302	
01/26/2020	05:00	3.27 12:50	4.69	4.12	05:25	1.43 13:00	1.93	1.73	05:25	0.202 12:50	0.457	0.347	0.347	0.16
01/27/2020	05:10	3.40 08:50	4.98	4.26	05:10	1.47 09:20	2.02	1.76	05:10	0.221 09:20	0.509	0.368	0.368	
01/28/2020	04:25	3.53 09:10	5.57	4.53	02:45	1.50 09:10	2.09	1.82	04:25	0.239 09:10	0.630	0.418	0.418	0.01
01/29/2020	04:50	3.63 09:05	5.41	4.54	04:10	1.54 09:05	2.18	1.83	04:55	0.255 09:05	0.628	0.422	0.422	
01/30/2020	04:35	3.58 08:55	5.55	4.62	04:10	1.52 09:20	2.16	1.85	04:35	0.245 09:00	0.640	0.437	0.437	
01/31/2020	05:25	3.53 08:55	5.72	4.67	04:20	1.50 08:55	2.18	1.87	05:30	0.242 08:55	0.682	0.448	0.448	
02/01/2020	12:50	2.55 12:05	5.81	4.22	12:50	1.17 11:15	2.22	1.72	12:50	0.115 12:05	0.706	0.359	0.359	
02/02/2020	05:00	2.76 12:55	4.30	3.71	05:50	1.15 12:30	1.80	1.55	05:50	0.127 12:30	0.377	0.271	0.271	
02/03/2020	04:35	3.18 08:55	4.30	3.82	05:15	1.40 08:45	1.80	1.62	04:35	0.194 08:50	0.375	0.290	0.290	
02/04/2020	04:35	3.25 08:50	4.45	3.93	04:35	1.42 08:40	1.85	1.65	04:35	0.199 08:40	0.404	0.309	0.309	
02/05/2020	04:40	3.27 09:05	4.53	3.96	05:20	1.40 09:00	1.83	1.64	04:40	0.199 09:00	0.412	0.309	0.309	
02/06/2020	04:20	3.24 08:45	4.50	3.96	04:20	1.39 08:40	1.91	1.64	04:20	0.194 08:40	0.426	0.310	0.310	
02/07/2020	03:50	3.25 09:00	4.58	3.97	03:55	1.35 09:05	1.83	1.61	03:55	0.189 09:05	0.418	0.304	0.304	
02/08/2020	06:10	3.25 13:30	4.48	4.03	06:10	1.44 13:20	1.87	1.69	06:10	0.202 13:20	0.412	0.328	0.328	
02/09/2020	06:00	3.13 12:30	4.65	4.07	06:25	1.36 12:35	1.93	1.71	06:25	0.182 12:35	0.452	0.338	0.338	
02/10/2020	05:00	3.07 08:15	5.65	4.03	05:00	1.37 08:15	2.24	1.69	05:00	0.177 08:15	0.688	0.328	0.328	
02/11/2020	04:10	2.98 08:40	4.80	4.01	04:40	1.27 08:55	1.99	1.69	04:40	0.157 08:55	0.482	0.329	0.329	
02/12/2020	04:50	3.17 08:40	4.84	4.07	05:20	1.39 08:50	1.96	1.70	04:55	0.188 08:50	0.483	0.335	0.335	
02/13/2020	04:30	3.12 08:40	4.81	3.95	04:25	1.32 09:00	1.95	1.67	04:35	0.176 09:00	0.472	0.315	0.315	
02/14/2020	04:40	3.00 08:55	4.67	3.80	03:55	1.27 09:25	1.89	1.62	04:40	0.159 08:55	0.442	0.289	0.289	
02/15/2020	05:50	2.83 11:30	4.28	3.54	04:50	1.29 11:20	1.80	1.56	05:40	0.150 11:20	0.373	0.251	0.251	
02/16/2020	04:55	2.73 11:35	3.61	3.19	04:55	1.24 11:00	1.59	1.44	04:55	0.135 12:20	0.259	0.198	0.198	
02/17/2020	04:55	2.42 10:05	3.66	3.10	05:00	1.05 10:00	1.62	1.40	05:00	0.096 10:00	0.268	0.188	0.188	
02/18/2020	04:30	2.45 09:00	3.64	3.11	04:25	1.10 09:50	1.62	1.41	04:25	0.103 08:55	0.267	0.190	0.190	
02/19/2020	04:55	2.54 09:10	3.69	3.18	05:40	1.17 09:35	1.62	1.44	05:05	0.116 09:10	0.273	0.199	0.199	
02/20/2020	05:10	2.62 10:10	3.89	3.31	03:50	1.19 10:10	1.69	1.49	03:50	0.124 10:10	0.308	0.218	0.218	
02/21/2020	04:40	2.67 09:40	4.02	3.32	05:05	1.22 09:35	1.75	1.49	04:55	0.130 09:35	0.332	0.220	0.220	
02/22/2020	05:30	2.62 11:30	3.89	3.37	04:45	1.18 11:30	1.70	1.50	04:45	0.123 11:30	0.308	0.227	0.227	
02/23/2020	05:40	2.60 12:40	4.05	3.45	06:05	1.20 12:35	1.72	1.53	06:05	0.123 12:35	0.330	0.240	0.240	
02/24/2020	05:00	2.68 08:45	4.05	3.40	05:05	1.24 08:35	1.73	1.52	04:55	0.132 08:35	0.331	0.232	0.232	

Date	Depth (in)					Velocity (ft/s)					Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
02/25/2020	04:55	2.69	08:50	4.14	3.41	05:20	1.20	08:50	1.79	1.52	05:20	0.129	08:50	0.356	0.233	0.233	
02/26/2020	04:50	2.56	08:30	3.94	3.22	04:30	1.18	08:40	1.69	1.45	04:50	0.118	08:40	0.312	0.205	0.205	
02/27/2020	04:55	2.38	08:30	3.75	3.15	04:55	1.10	08:40	1.66	1.42	04:55	0.098	08:40	0.287	0.195	0.195	
02/28/2020	04:55	2.43	08:55	3.71	3.09	04:25	1.09	08:55	1.63	1.38	04:55	0.101	08:55	0.277	0.184	0.184	
02/29/2020	05:35	2.41	11:10	3.72	3.17	05:35	1.06	13:15	1.64	1.41	05:35	0.097	11:10	0.278	0.196	0.196	
03/01/2020	05:45	2.27	11:15	3.47	2.79	05:40	1.00	11:10	1.55	1.27	05:40	0.084	11:15	0.238	0.145	0.145	
03/02/2020	05:05	1.78	08:40	2.97	2.36	04:45	0.77	08:40	1.39	1.07	04:50	0.045	08:40	0.171	0.098	0.098	
03/03/2020	04:30	1.69	08:55	2.80	2.00	04:50	0.70	08:55	1.32	0.88	04:30	0.039	08:55	0.149	0.063	0.063	
03/04/2020	05:30	1.46	08:50	2.30	1.87	03:35	0.56	09:10	1.07	0.81	05:30	0.025	08:55	0.091	0.053	0.053	
03/05/2020	05:30	1.38	21:00	2.29	1.83	04:35	0.52	09:10	1.06	0.81	05:15	0.022	21:00	0.087	0.051	0.051	
03/06/2020	04:45	1.31	09:00	2.19	1.82	04:00	0.49	08:10	1.09	0.81	04:45	0.019	08:20	0.084	0.051	0.051	
03/07/2020	05:50	1.21	13:40	1.92	1.67	05:00	0.45	13:45	0.88	0.69	05:50	0.015	13:45	0.058	0.038	0.038	
03/08/2020	06:00	1.37	10:30	1.89	1.51	05:20	0.42	08:50	0.83	0.58	05:20	0.017	10:30	0.050	0.027	0.027	
03/09/2020	06:35	1.23	21:50	5.37	1.75	04:30	0.39	21:50	2.13	0.70	05:55	0.014	21:50	0.608	0.060	0.060	

Report Summary For The Period 11/16/2019 00:00 - 03/09/2020 23:59

	Depth (in)	Velocity (ft/s)	Quantity (MGD - Total MG)	Rain (in)
Total			31.478	4.90
Avg	3.67	1.53	0.274	

Site Commentary

Site Information

MIL_0649	
Pipe Dimensions	21.5
Silt Level	0.00"

Overview

Site MIL_0649 functioned under normal conditions during the period Saturday, November 16, 2019 to Monday, March 9, 2020 . This site exhibited an observable response to the wet weather events of November 26, 2019 - November 27, 2019, December 7, 2019 - December 8, 2019, and January 16, 2020 - January 17, 2020. Review of the scattergraph shows that free flow conditions were recorded during the study period.

Flow depth and velocity measurements recorded by the flow monitor are consistent with field confirmations conducted to date and support the relative accuracy of the flow monitor at this location.

This location was installed upstream of site MIL_1790 and downstream of the combined flows of sites MIL_0386 and MIL_2840. A review of balancing with the combined flows of MIL_0386 and MIL_2840 into MIL_0649 and MIL_2491 shows a net flow between the sites of 0.426 MGD.

Observations

Average flow depth, velocity, and quantity data observed during Saturday, November 16, 2019 to Monday, March 9, 2020 , along with observed minimum and maximum data, are provided in the following table.

Observed Flow Conditions			
Item	Depth (in)	Velocity (ft/s)	Quantity (MGD)
Average	8.66	1.24	0.777
Minimum	6.64	0.82	0.386
Maximum	11.63	1.64	1.448
Time of Minimum	3/1/2020 3:15 AM	2/1/2020 11:40 PM	2/17/2020 1:55 AM
Time of Maximum	2/18/2020 11:55 AM	12/5/2019 2:35 PM	1/9/2020 10:45 AM

Data Quality

Data uptime observed during the Saturday, November 16, 2019 to the Monday, March 9, 2020 monitoring period is provided in the table below. Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

Percent Uptime	
Depth (in)	100
Velocity (ft/s)	100
Quantity (MGD)	100

Milpitas Temp Study 2019-20

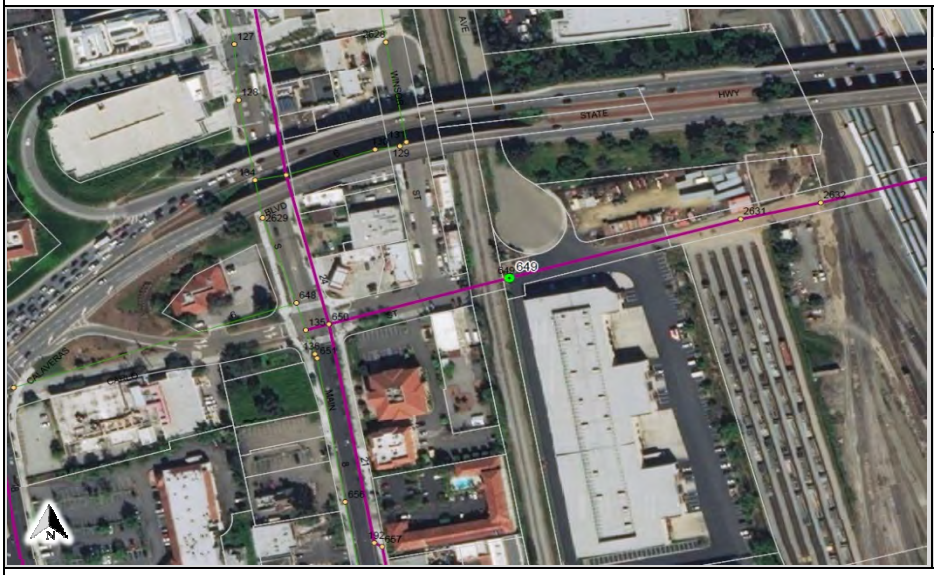
Flow Monitoring Site Report

ADS ENVIRONMENTAL SERVICES®

Site Name

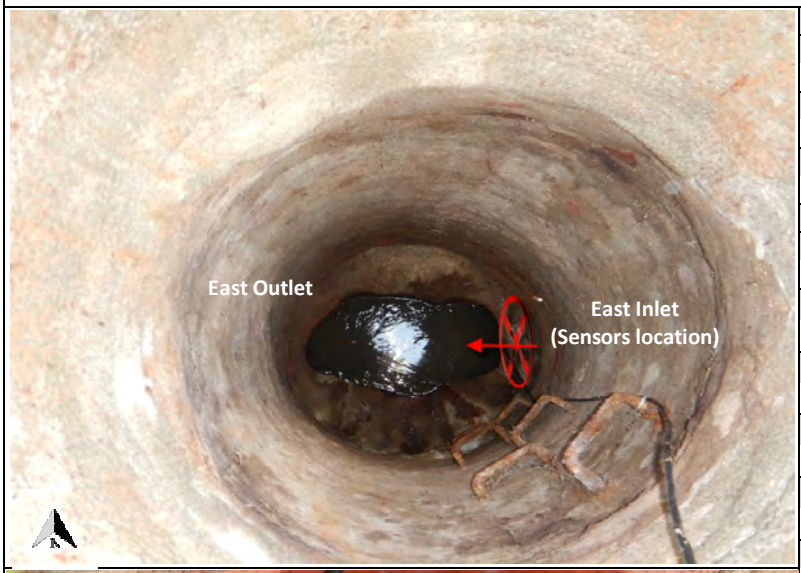
MIL_0649

Site Address /Location:	79 Railroad Avenue			Monitor Series	Location Type
				TRITON+	Temporary
Site Access Details:	Drive	Latitude:	37.430840°	Pipe Size (H x W)	Pipe Shape
		Longitude:	-121.905657	21.50" x 21.50"	Circular



Manhole #	System Characteristics
649	Residential/Commercial
Access	Traffic
Drive	Light







Installation Information

Installation Date:	Installation Type:
Tuesday, November 12, 2019	Doppler Standard Ring and Crank
Monitoring Location (Sensors):	Monitor Location:
Upstream 0-5 FT	Manhole
Sensors / Devices:	Pressure Sensor Range (psi)
Peak Combo (CS4)	0 - 5 psi

Installation Confirmation:

Confirmation Time:	Pipe Size (HxW)
10:22:26 AM	21.50" x 21.50"
Depth of Flow (Wet DOF) (in)	Range (Air DOF) (in)
10.50	0.00"
Downlooker Physical Offset (in)	Measurement Confidence (in)
NA	0.25"
Peak Velocity (fps)	Velocity Sensor Offset (in)
1.61	0''
Silt (in)	Silt Type
0''	

Hydraulic Comments:

Smooth deep flow with moderate velocity

Manhole / Pipe Information:

Manhole Depth (Approx. FT):	Manhole Configuration
10'	Single
Manhole Material:	Manhole Condition:
Concrete	Good
Manhole Opening Diameter (in)	Manhole Diameter (Approx.):
26''	54''
Manhole Cover	Manhole Frame
Unbolted	Normal
Active Drop Connections	Air Quality:
No	Normal
Pipe Material	Pipe Condition:
PVC	Good

Communication Information:

Communication Type	Antenna Location
Wireless	Manhole Pick / Vent Hole

Additional Site Info. / Comments:

ADS Project Name:	Milpitas.WWTFM.CA19-20
ADS Project Number:	22431

SCATTERGRAPH REPORT

MIL_0649

Flow Monitor

MIL_0649

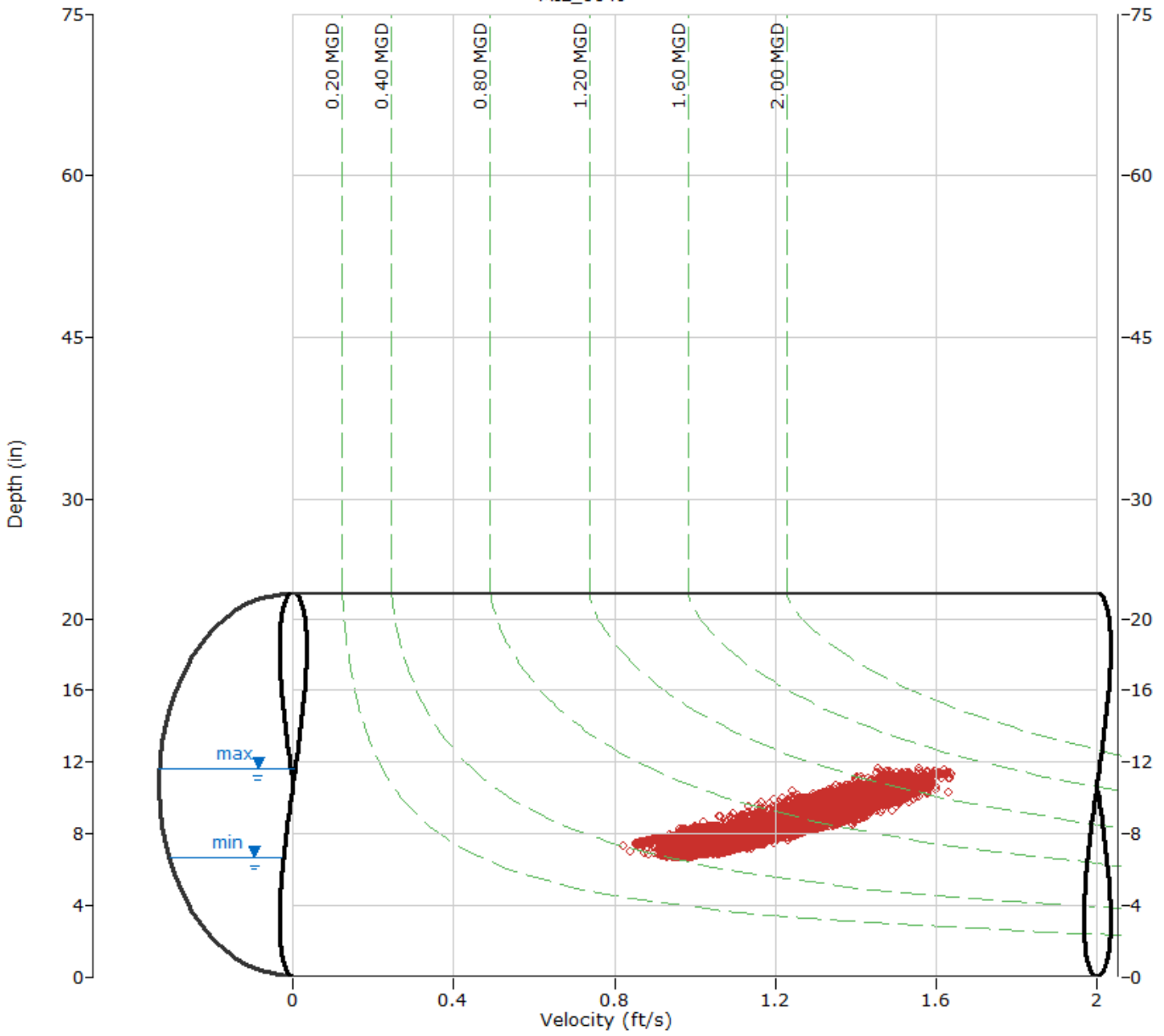
Pipe Height
21.50 in

Report Period

11/16/2019
To
3/9/2020

Legend

- Depth - Velocity
- Iso-Q™
- Silt
- Min-Max Depth



ADS ENVIRONMENTAL SERVICES

HYDROGRAPH REPORT

MIL_0649

Flow Monitor

MIL_0649

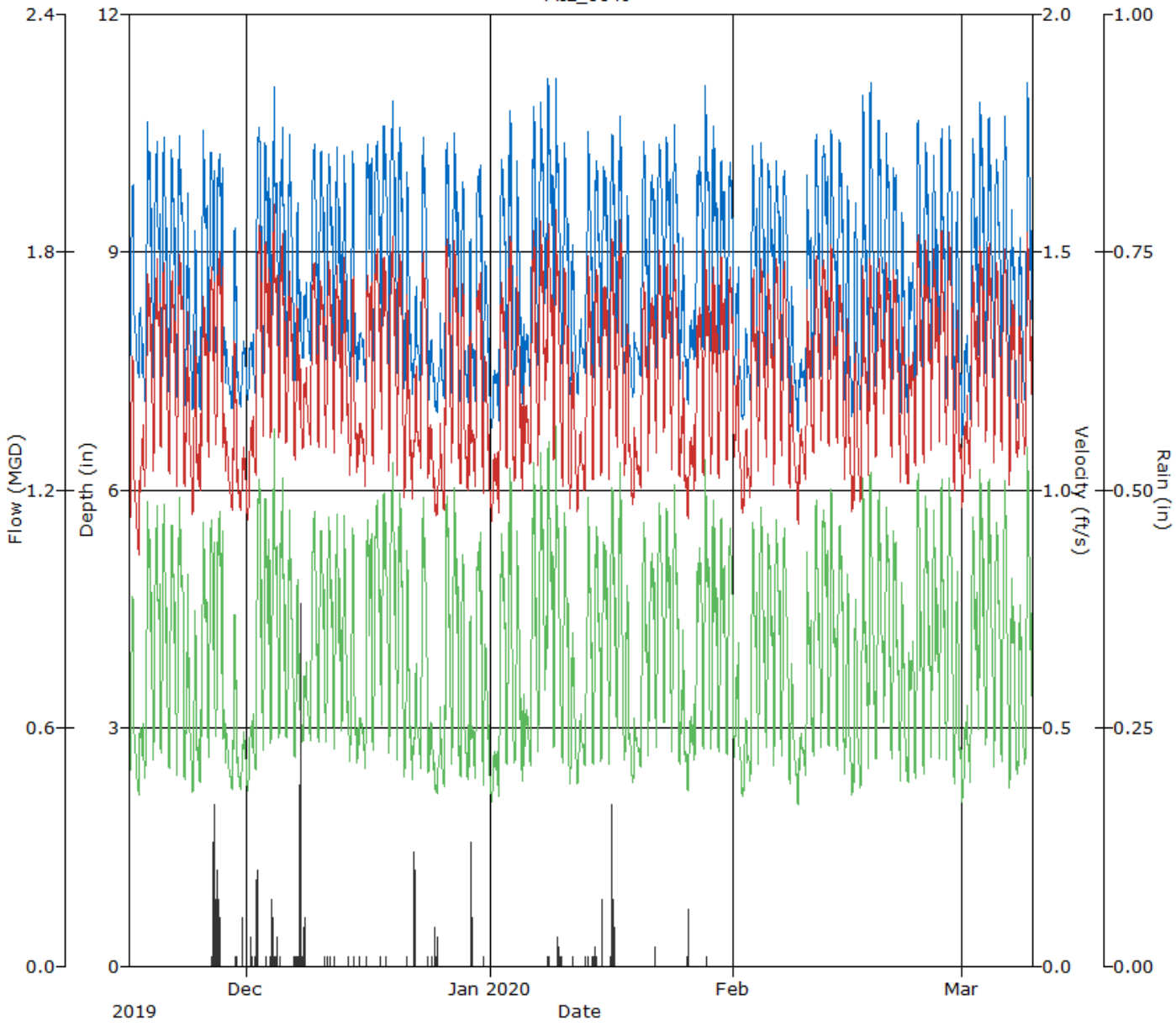
Pipe Height
21.50 in

Report Period

11/16/2019
To
3/9/2020

Legend

- Depth
- Velocity
- Quantity
- Rain



ADS ENVIRONMENTAL SERVICES

Daily Tabular Report For The Period 11/16/2019 00:00 - 03/09/2020 23:59

MIL_0649, Pipe Height: 21.50 in, Silt: 0.00 in

Daily Tabular Report

Date	Depth (in)					Velocity (ft/s)					Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
11/16/2019	04:20	7.62	12:25	10.26	8.49	04:45	0.93	12:30	1.34	1.07	04:00	0.480	12:30	1.024	0.648	0.648	
11/17/2019	23:55	7.22	15:05	8.57	7.75	06:20	0.85	15:05	1.24	0.99	06:20	0.423	15:05	0.748	0.527	0.527	
11/18/2019	00:55	7.00	10:15	11.13	9.05	03:35	1.00	10:15	1.54	1.27	00:55	0.462	10:15	1.311	0.848	0.848	
11/19/2019	04:50	7.37	15:50	10.61	9.09	05:15	1.01	15:50	1.55	1.30	05:15	0.504	15:50	1.244	0.865	0.865	
11/20/2019	03:30	7.27	12:30	10.87	8.85	03:30	1.06	12:30	1.54	1.28	03:30	0.514	12:30	1.273	0.823	0.823	
11/21/2019	04:20	7.18	11:05	10.80	9.00	04:25	1.03	11:00	1.53	1.30	04:20	0.489	11:00	1.251	0.854	0.854	
11/22/2019	04:40	7.12	11:40	11.16	9.10	04:40	0.99	11:35	1.63	1.32	04:40	0.464	11:35	1.382	0.879	0.879	
11/23/2019	05:05	7.01	12:10	9.90	8.01	04:55	1.00	12:45	1.41	1.13	05:00	0.459	12:10	1.014	0.633	0.633	
11/24/2019	03:25	6.97	13:00	9.71	7.79	03:20	0.93	12:05	1.39	1.09	03:25	0.425	13:00	0.984	0.587	0.587	
11/25/2019	03:50	6.96	12:35	10.77	8.89	02:10	0.97	12:30	1.45	1.24	02:10	0.443	12:30	1.184	0.803	0.803	
11/26/2019	04:20	7.31	09:40	10.62	9.16	04:10	1.05	10:10	1.52	1.32	04:20	0.518	10:10	1.212	0.883	0.883	0.36
11/27/2019	03:20	7.70	10:05	10.48	9.23	03:15	1.09	13:05	1.54	1.34	03:15	0.569	13:10	1.198	0.906	0.906	0.63
11/28/2019	20:20	7.16	00:00	8.75	7.60	23:50	0.90	00:00	1.26	1.07	23:50	0.433	00:00	0.787	0.555	0.555	
11/29/2019	04:20	7.00	14:10	9.99	7.88	22:45	0.92	13:55	1.42	1.10	04:15	0.435	09:15	1.034	0.603	0.603	0.02
11/30/2019	06:30	6.97	17:45	8.05	7.47	06:25	0.93	17:35	1.13	1.02	06:25	0.427	17:45	0.627	0.513	0.513	0.10
12/01/2019	06:05	7.08	21:35	8.27	7.55	06:05	0.91	21:40	1.20	1.05	06:05	0.427	21:40	0.695	0.537	0.537	0.06
12/02/2019	04:15	7.16	13:35	10.70	9.14	04:10	1.02	10:40	1.63	1.34	04:10	0.483	10:40	1.255	0.905	0.905	0.30
12/03/2019	04:20	7.30	10:05	10.72	8.96	04:10	1.10	10:10	1.56	1.34	04:10	0.536	10:10	1.261	0.870	0.870	0.01
12/04/2019	02:45	7.45	12:15	11.41	9.35	02:20	1.11	12:10	1.64	1.39	02:45	0.557	12:10	1.436	0.957	0.957	0.39
12/05/2019	03:30	7.61	14:40	11.30	9.20	03:35	1.10	14:35	1.64	1.35	03:35	0.569	14:35	1.418	0.908	0.908	0.01
12/06/2019	02:15	7.60	12:40	10.59	9.00	01:40	1.02	17:50	1.48	1.29	01:40	0.536	12:55	1.173	0.843	0.843	0.01
12/07/2019	06:00	7.33	11:50	9.77	8.30	06:05	1.05	11:45	1.49	1.21	06:05	0.516	11:50	1.068	0.710	0.710	0.67
12/08/2019	04:15	7.64	07:45	9.62	8.11	05:40	1.08	07:45	1.43	1.17	04:15	0.562	07:45	1.008	0.659	0.659	0.20
12/09/2019	04:40	7.53	16:50	10.46	9.15	04:35	1.08	13:35	1.53	1.32	04:35	0.549	13:35	1.179	0.887	0.887	
12/10/2019	05:10	7.57	12:00	10.57	9.13	04:00	1.08	10:35	1.49	1.31	05:00	0.557	11:55	1.179	0.872	0.872	
12/11/2019	04:20	7.58	13:20	10.40	9.07	04:05	1.08	12:35	1.51	1.31	04:00	0.554	13:20	1.173	0.867	0.867	0.03
12/12/2019	04:30	7.49	12:45	10.46	9.06	04:20	1.07	13:25	1.50	1.31	04:20	0.539	12:40	1.173	0.865	0.865	0.01
12/13/2019	01:50	7.61	12:20	10.35	8.74	01:55	1.09	12:20	1.52	1.27	01:55	0.564	12:20	1.180	0.796	0.796	0.01
12/14/2019	04:10	7.39	13:25	10.37	8.35	03:45	1.01	13:50	1.48	1.19	03:45	0.506	13:25	1.129	0.707	0.707	0.01
12/15/2019	03:10	7.25	06:55	8.09	7.78	09:10	1.00	06:50	1.17	1.10	06:20	0.487	06:50	0.655	0.584	0.584	0.01
12/16/2019	03:45	7.35	08:25	10.48	9.18	03:40	1.00	12:55	1.49	1.29	03:45	0.493	12:50	1.171	0.875	0.875	0.01
12/17/2019	05:15	7.52	16:55	10.65	9.38	03:55	1.04	16:50	1.56	1.34	05:15	0.528	16:50	1.256	0.934	0.934	0.01
12/18/2019	04:20	7.59	12:50	10.77	9.53	04:20	1.07	12:45	1.51	1.36	04:20	0.549	12:45	1.232	0.953	0.953	0.01
12/19/2019	04:35	7.56	13:25	11.00	9.49	04:35	1.02	13:05	1.56	1.34	04:35	0.522	13:05	1.299	0.945	0.945	
12/20/2019	05:05	7.32	14:20	10.74	9.30	05:00	1.00	14:20	1.53	1.32	05:00	0.489	14:20	1.247	0.902	0.902	
12/21/2019	04:25	7.24	11:25	10.10	8.35	05:40	0.97	11:20	1.46	1.16	04:30	0.472	11:20	1.095	0.688	0.688	0.01
12/22/2019	03:25	7.15	14:35	8.70	7.74	03:25	0.97	14:35	1.29	1.10	03:25	0.457	14:35	0.795	0.584	0.584	0.41
12/23/2019	04:40	7.12	11:35	10.73	9.01	04:05	1.04	11:35	1.53	1.31	04:45	0.491	11:35	1.244	0.867	0.867	
12/24/2019	03:10	7.11	00:10	8.79	7.55	18:30	0.96	00:10	1.31	1.07	23:40	0.478	00:10	0.821	0.548	0.548	0.02
12/25/2019	06:00	6.95	16:10	8.45	7.42	01:20	0.93	16:10	1.19	1.02	05:45	0.426	16:10	0.706	0.509	0.509	0.08
12/26/2019	03:10	7.13	13:20	10.47	8.91	01:20	0.90	13:30	1.60	1.28	01:55	0.445	13:30	1.254	0.842	0.842	
12/27/2019	02:50	7.15	11:00	10.96	9.02	02:50	1.04	10:50	1.56	1.32	02:50	0.491	11:00	1.290	0.873	0.873	
12/28/2019	06:15	7.08	13:50	10.07	8.28	06:10	0.99	14:15	1.47	1.20	06:10	0.466	14:15	1.097	0.708	0.708	
12/29/2019	07:30	7.01	09:20	9.47	7.84	01:55	0.94	10:10	1.37	1.12	01:55	0.451	09:20	0.945	0.609	0.609	0.22
12/30/2019	03:35	7.11	18:55	10.29	8.95	02:50	1.00	18:40	1.58	1.28	03:00	0.473	18:40	1.199	0.839	0.839	
12/31/2019	05:10	6.91	08:50	9.14	7.96	05:10	0.97	08:50	1.34	1.14	05:10	0.441	08:50	0.885	0.631	0.631	0.01

Date	Depth (in)				Velocity (ft/s)				Quantity (MGD - Total MG)					Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
01/01/2020	06:35	6.75	14:05	7.61	7.22	06:10	0.89	02:20	1.10	1.02	06:10	0.393	13:55	0.564	0.489	0.489	
01/02/2020	03:35	6.84	07:40	10.59	8.94	04:15	0.87	07:35	1.58	1.26	04:15	0.396	07:35	1.263	0.828	0.828	
01/03/2020	03:05	7.23	15:20	10.97	8.90	22:35	0.94	15:15	1.57	1.28	05:05	0.482	15:15	1.297	0.835	0.835	
01/04/2020	03:30	7.42	11:35	10.41	8.44	03:30	1.01	11:10	1.58	1.21	03:30	0.503	11:10	1.209	0.729	0.729	
01/05/2020	03:35	7.06	07:20	8.31	7.67	03:35	0.98	07:15	1.27	1.12	03:35	0.457	07:15	0.736	0.585	0.585	
01/06/2020	04:35	7.15	13:10	11.00	9.07	01:25	1.03	12:20	1.59	1.31	04:35	0.493	15:35	1.322	0.876	0.876	
01/07/2020	04:00	7.48	12:40	11.07	9.28	03:50	1.03	12:35	1.60	1.32	03:55	0.522	12:35	1.349	0.907	0.907	
01/08/2020	04:30	7.94	12:35	11.43	9.75	00:55	1.10	12:35	1.60	1.38	04:30	0.617	12:35	1.405	1.002	1.002	0.02
01/09/2020	03:50	7.55	10:45	11.57	9.35	03:45	1.04	10:50	1.62	1.33	03:45	0.531	10:45	1.448	0.919	0.919	0.18
01/10/2020	05:15	7.50	12:35	10.49	9.02	05:40	1.00	12:30	1.49	1.27	05:40	0.507	12:30	1.177	0.839	0.839	0.02
01/11/2020	06:15	7.15	13:55	9.43	8.01	03:25	0.92	13:55	1.35	1.12	03:25	0.438	13:55	0.925	0.625	0.625	0.01
01/12/2020	04:00	7.19	14:20	8.26	7.67	03:00	0.86	15:30	1.16	1.04	03:00	0.416	15:30	0.668	0.546	0.546	
01/13/2020	04:40	7.37	13:15	10.57	8.93	01:20	0.98	13:15	1.52	1.25	04:35	0.487	13:15	1.212	0.816	0.816	0.02
01/14/2020	04:55	7.37	13:10	10.29	8.99	04:55	1.01	15:05	1.50	1.28	04:55	0.499	15:15	1.148	0.839	0.839	0.11
01/15/2020	04:40	7.36	12:15	10.21	9.12	04:35	1.02	12:10	1.45	1.30	04:35	0.502	12:05	1.107	0.865	0.865	0.07
01/16/2020	04:30	7.39	14:05	10.85	9.26	04:10	1.01	14:05	1.57	1.33	04:10	0.505	14:05	1.293	0.904	0.904	0.66
01/17/2020	04:55	7.83	15:35	10.79	9.11	04:50	1.06	15:05	1.58	1.31	04:50	0.570	15:30	1.292	0.874	0.874	
01/18/2020	06:25	7.42	12:35	9.73	8.13	04:05	0.98	11:50	1.42	1.14	04:05	0.487	11:50	0.989	0.653	0.653	
01/19/2020	05:00	7.11	09:00	8.23	7.62	00:20	0.95	09:00	1.20	1.05	05:10	0.448	09:00	0.690	0.543	0.543	
01/20/2020	05:00	7.38	14:50	10.46	8.94	05:00	0.98	15:20	1.47	1.24	05:00	0.484	15:20	1.148	0.814	0.814	
01/21/2020	04:10	7.42	12:45	10.15	9.18	04:10	1.01	09:40	1.45	1.29	04:10	0.503	12:45	1.099	0.866	0.866	
01/22/2020	04:15	7.49	12:50	10.51	9.24	04:15	1.06	12:45	1.56	1.33	04:15	0.536	12:45	1.232	0.903	0.903	0.03
01/23/2020	04:20	7.68	09:05	10.54	9.36	03:50	1.10	15:30	1.49	1.32	04:20	0.578	09:05	1.179	0.910	0.910	
01/24/2020	04:55	7.63	12:40	10.83	9.25	04:50	1.03	11:00	1.56	1.30	04:50	0.534	11:15	1.267	0.887	0.887	
01/25/2020	03:30	7.34	15:05	9.45	8.02	20:55	0.93	15:00	1.33	1.10	20:55	0.482	15:05	0.912	0.611	0.611	
01/26/2020	05:20	7.02	21:40	8.97	7.69	08:45	0.92	21:35	1.26	1.03	05:20	0.431	21:40	0.807	0.543	0.543	0.16
01/27/2020	00:55	7.55	15:45	10.43	9.27	00:25	0.95	15:35	1.43	1.25	00:25	0.492	15:40	1.120	0.852	0.852	
01/28/2020	05:05	7.64	10:00	11.35	9.43	05:05	1.00	10:35	1.52	1.28	05:05	0.520	10:05	1.324	0.897	0.897	0.01
01/29/2020	04:35	7.60	09:45	10.80	9.18	04:35	1.01	09:40	1.53	1.26	04:35	0.520	09:40	1.250	0.848	0.848	
01/30/2020	02:15	7.68	11:20	10.28	9.06	02:10	1.01	11:15	1.53	1.28	02:10	0.529	11:15	1.176	0.849	0.849	
01/31/2020	05:10	7.40	12:30	10.35	9.01	03:55	1.01	14:20	1.51	1.30	03:55	0.512	12:35	1.150	0.856	0.856	
02/01/2020	03:45	7.26	14:45	9.12	7.86	23:40	0.82	08:45	1.35	1.13	23:40	0.399	14:45	0.878	0.614	0.614	
02/02/2020	02:45	6.88	15:30	8.12	7.40	21:05	0.92	12:25	1.18	1.03	06:15	0.425	12:25	0.663	0.514	0.514	
02/03/2020	02:35	7.10	10:35	10.44	8.94	00:55	0.97	10:30	1.51	1.26	02:40	0.462	10:30	1.182	0.822	0.822	
02/04/2020	04:10	7.26	13:20	10.51	8.97	03:55	1.02	13:00	1.53	1.28	04:20	0.498	13:00	1.203	0.840	0.840	
02/05/2020	04:20	7.46	10:00	10.20	9.12	04:30	1.03	09:35	1.48	1.30	04:30	0.521	09:35	1.121	0.863	0.863	
02/06/2020	04:50	7.38	13:50	10.35	9.07	04:50	0.99	13:45	1.55	1.30	04:50	0.492	13:45	1.202	0.863	0.863	
02/07/2020	02:25	7.30	11:00	10.23	8.93	02:20	1.05	10:55	1.55	1.30	02:20	0.512	10:55	1.181	0.842	0.842	
02/08/2020	04:05	6.92	11:30	8.67	7.59	22:20	0.95	11:35	1.28	1.10	04:05	0.452	11:35	0.789	0.569	0.569	
02/09/2020	04:35	6.70	13:35	7.72	7.29	05:20	0.91	11:55	1.16	1.05	05:05	0.398	11:55	0.606	0.513	0.513	
02/10/2020	04:30	7.08	08:10	10.11	8.52	00:45	0.92	08:10	1.46	1.21	00:50	0.462	08:10	1.095	0.739	0.739	
02/11/2020	04:30	7.26	13:00	10.71	9.08	04:10	1.05	13:05	1.54	1.31	04:30	0.519	13:05	1.248	0.868	0.868	
02/12/2020	04:30	7.23	12:05	10.47	9.29	04:25	1.06	09:55	1.53	1.34	04:25	0.510	12:05	1.199	0.914	0.914	
02/13/2020	02:15	7.42	10:40	10.69	9.06	02:15	1.07	10:30	1.55	1.31	02:15	0.535	10:35	1.254	0.869	0.869	
02/14/2020	04:35	7.35	13:10	10.56	9.17	05:05	1.08	10:35	1.47	1.31	05:05	0.536	13:10	1.165	0.879	0.879	
02/15/2020	03:25	6.97	11:50	10.38	8.15	02:10	0.90	11:45	1.44	1.16	02:10	0.432	11:45	1.117	0.669	0.669	
02/16/2020	02:15	6.86	12:30	10.02	7.96	04:30	0.88	12:35	1.41	1.10	02:55	0.417	12:35	1.046	0.614	0.614	
02/17/2020	04:45	6.98	12:30	11.07	8.66	01:55	0.84	12:25	1.50	1.20	01:55	0.386	12:25	1.265	0.756	0.756	
02/18/2020	04:00	7.08	11:55	11.63	9.17	03:35	0.97	11:55	1.56	1.28	03:35	0.465	11:55	1.399	0.861	0.861	
02/19/2020	04:35	7.26	11:20	10.90	9.04	02:05	1.04	13:45	1.53	1.29	02:05	0.503	11:25	1.236	0.857	0.857	
02/20/2020	04:30	7.37	12:45	10.65	9.14	03:00	1.09	16:20	1.52	1.33	04:25	0.546	12:30	1.208	0.886	0.886	
02/21/2020	03:25	7.27	10:10	10.24	8.74	03:10	1.05	14:50	1.52	1.29	03:10	0.508	10:10	1.156	0.813	0.813	
02/22/2020	04:45	6.91	13:15	9.92	8.12	06:40	0.90	10:55	1.47	1.20	06:40	0.407	13:15	1.064	0.686	0.686	
02/23/2020	06:05	6.85	20:15	9.05	7.96	05:50	0.94	19:55	1.36	1.16	05:50	0.426	19:55	0.872	0.643	0.643	
02/24/2020	04:30	6.86	10:45	11.18	8.92	04:20	0.93	11:05	1.60	1.33	04:20	0.419	11:05	1.364	0.867	0.867	

Date	Depth (in)					Velocity (ft/s)					Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
02/25/2020	04:55	6.92	14:00	10.51	8.85	04:35	1.04	12:30	1.56	1.32	04:55	0.472	13:55	1.234	0.849	0.849	
02/26/2020	04:35	6.97	10:25	10.67	8.86	04:30	1.03	13:30	1.56	1.34	04:30	0.472	10:20	1.228	0.856	0.856	
02/27/2020	04:45	7.05	12:40	10.71	9.02	04:40	1.07	12:45	1.57	1.36	04:40	0.498	12:45	1.274	0.896	0.896	
02/28/2020	02:20	7.09	10:35	10.78	8.92	00:30	1.07	11:40	1.58	1.33	02:20	0.509	10:30	1.286	0.868	0.868	
02/29/2020	03:05	6.92	11:00	10.62	7.97	02:50	0.98	11:00	1.51	1.15	03:00	0.444	11:00	1.208	0.642	0.642	
03/01/2020	03:15	6.64	18:20	8.11	7.30	03:05	0.93	18:25	1.24	1.07	03:05	0.400	18:25	0.696	0.524	0.524	
03/02/2020	03:20	6.85	10:35	10.66	8.91	03:10	1.01	10:40	1.55	1.28	03:15	0.453	10:40	1.249	0.836	0.836	
03/03/2020	05:20	7.40	10:05	11.11	9.27	03:20	1.07	10:10	1.61	1.33	05:15	0.539	10:10	1.364	0.909	0.909	
03/04/2020	03:30	7.22	09:10	11.00	9.17	03:10	1.05	12:20	1.54	1.33	03:10	0.506	09:05	1.285	0.899	0.899	
03/05/2020	04:40	7.10	13:30	10.54	9.04	04:30	1.04	13:25	1.57	1.32	04:35	0.490	13:30	1.242	0.868	0.868	
03/06/2020	02:10	6.88	15:40	10.99	8.95	02:10	1.03	14:15	1.55	1.32	02:10	0.462	15:35	1.273	0.863	0.863	
03/07/2020	02:25	6.80	11:35	10.26	8.12	02:45	0.91	17:45	1.49	1.23	02:45	0.404	11:35	1.111	0.706	0.706	
03/08/2020	02:15	6.84	10:40	9.79	7.88	02:20	1.06	10:40	1.42	1.20	02:15	0.472	10:40	1.029	0.655	0.655	
03/09/2020	03:25	7.04	12:00	11.45	9.16	01:50	1.06	13:30	1.59	1.32	03:25	0.495	13:30	1.388	0.895	0.895	

Report Summary For The Period 11/16/2019 00:00 - 03/09/2020 23:59

	Depth (in)	Velocity (ft/s)	Quantity (MGD - Total MG)	Rain (in)
Total			89.337	4.90
Avg	8.66	1.24	0.777	

Site Commentary

Site Information

MIL_0715	
Pipe Dimensions	30.5
Silt Level	0.00"

Overview

Site MIL_0715 functioned under normal conditions during the period Saturday, November 16, 2019 to Monday, March 9, 2020 . This site exhibited an observable response to the wet weather events of November 26, 2019 - November 27, 2019, December 7, 2019 - December 8, 2019, and January 16, 2020 - January 17, 2020. Review of the scattergraph shows that free flow conditions were recorded during the study period.

Flow depth and velocity measurements recorded by the flow monitor are consistent with field confirmations conducted to date and support the relative accuracy of the flow monitor at this location. Due to meter malfunction, data confidence is less than typical during January 27, 2020 through February 04, 2020. Also a data gap occured beginning January 05, 2020 through January 09, 2020.

This location was installed upstream of site MIL_2808. (See MIL_2808 Site Commentary for More Details)

Observations

Average flow depth, velocity, and quantity data observed during Saturday, November 16, 2019 to Monday, March 9, 2020 , along with observed minimum and maximum data, are provided in the following table.

Observed Flow Conditions			
Item	Depth (in)	Velocity (ft/s)	Quantity (MGD)
Average	7.53	1.46	0.969
Minimum	4.42	0.41	0.120
Maximum	10.33	2.18	2.069
Time of Minimum	1/30/2020 5:55 AM	1/30/2020 5:40 AM	1/30/2020 5:40 AM
Time of Maximum	3/8/2020 1:30 PM	3/3/2020 9:20 AM	3/8/2020 1:45 PM

Data Quality

Data uptime observed during the Saturday, November 16, 2019 to the Monday, March 9, 2020 monitoring period is provided in the table below. Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

Percent Uptime	
Depth (in)	96
Velocity (ft/s)	96
Quantity (MGD)	96

Milpitas Temp Study 2019-20

Flow Monitoring Site Report

ADS ENVIRONMENTAL SERVICES®

Site Name

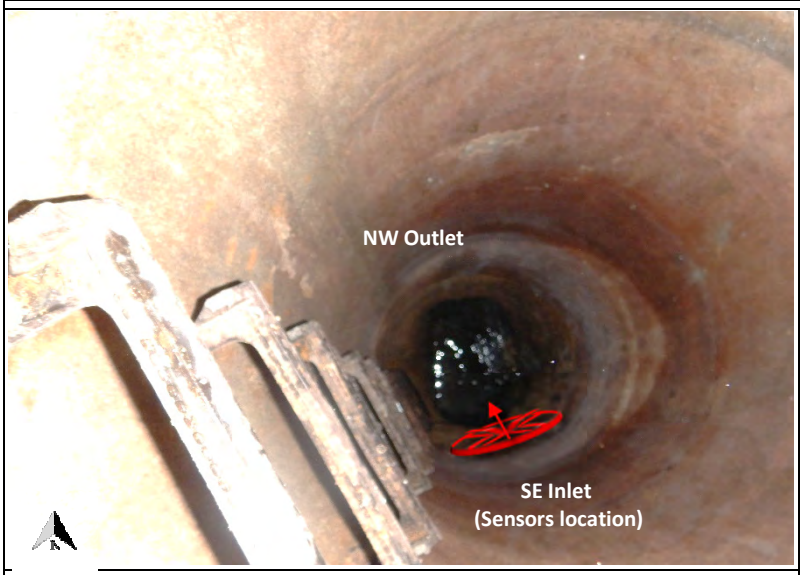
MIL_0715

Site Address /Location:	Barber Ln and Bellew Dr			Monitor Series	Location Type
				TRITON+	Temporary
Site Access Details:	In Parking Lot	Latitude:	37.421203°	Pipe Size (H x W)	Pipe Shape
		Longitude:	-121.917399	30.5" x 30.0"	Circular



Manhole #	System Characteristics
715	Residential/Commercial
Access	Traffic
Drive	Light







Installation Information

Installation Date:	Installation Type:
Tuesday, November 12, 2019	Doppler Standard Ring and Crank
Monitoring Location (Sensors):	Monitor Location:
Upstream 0-5 FT	Manhole
Sensors / Devices:	Pressure Sensor Range (psi)
Peak Combo (CS4)	0 - 5 psi

Installation Confirmation:

Confirmation Time:	Pipe Size (HxW)
5:47:56 AM	30.5" x 30.0"
Depth of Flow (Wet DOF) (in)	Range (Air DOF) (in)
5.63	0.00"
Downlooker Physical Offset (in)	Measurement Confidence (in)
NA	0.25"
Peak Velocity (fps)	Velocity Sensor Offset (in)
1.03	0''
Silt (in)	Silt Type
0''	

Hydraulic Comments:

Smooth flow with medium depth and moderate velocity

Manhole / Pipe Information:

Manhole Depth (Approx. FT):	Manhole Configuration
5'	Single
Manhole Material:	Manhole Condition:
Concrete	Good
Manhole Opening Diameter (in)	Manhole Diameter (Approx.):
26''	54''
Manhole Cover	Manhole Frame
Unbolted	Normal
Active Drop Connections	Air Quality:
No	Normal
Pipe Material	Pipe Condition:
Concrete	Good

Communication Information:

Communication Type	Antenna Location
Wireless	Manhole Pick / Vent Hole

Additional Site Info. / Comments:

ADS Project Name:	Milpitas.WWTFM.CA19-20
ADS Project Number:	22431

SCATTERGRAPH REPORT

MIL_0715

Flow Monitor

MIL_0715

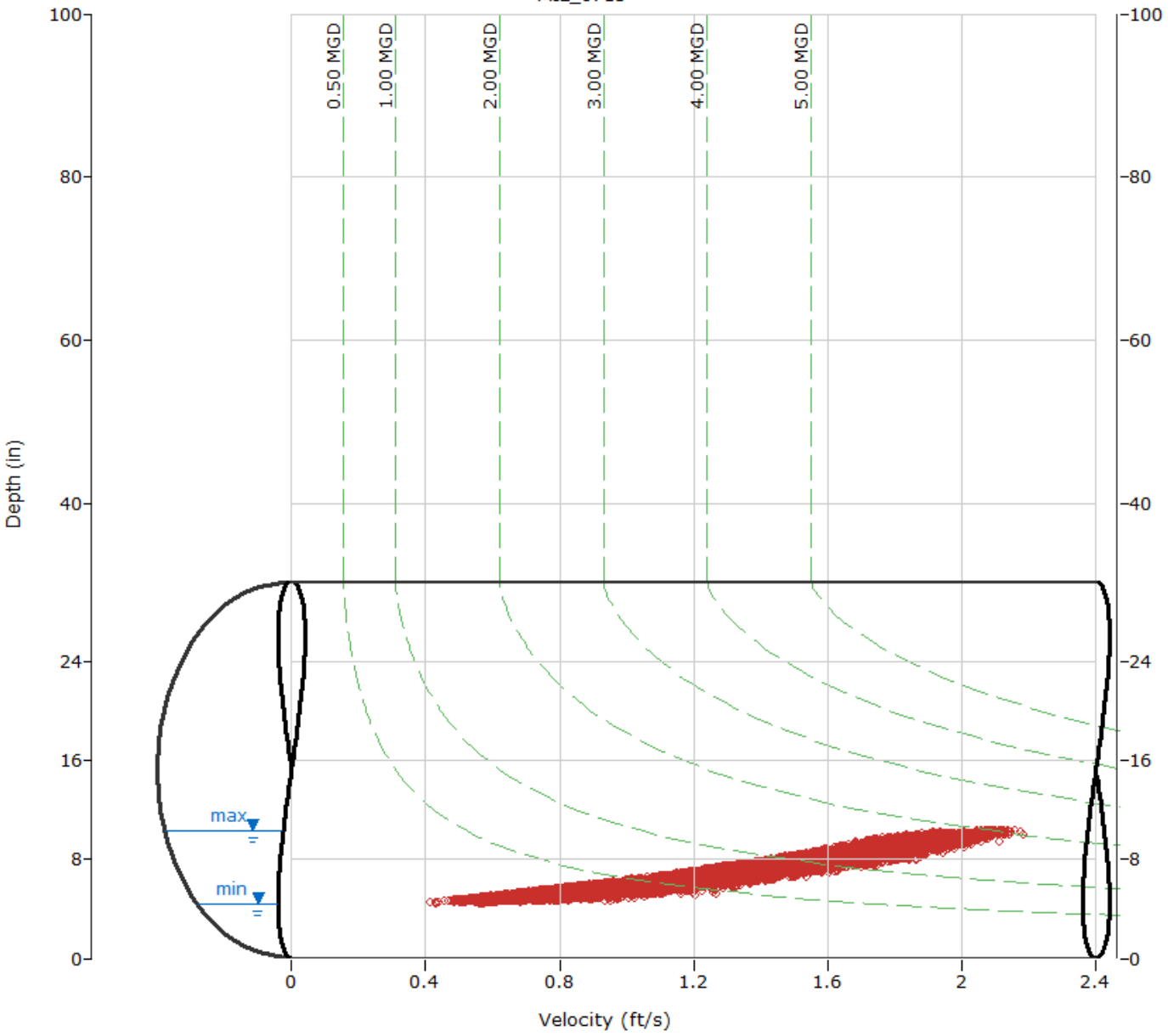
Pipe Height
30.50 in

Report Period

11/16/2019
To
3/9/2020

Legend

- Depth - Velocity
- Iso-Q™
- Silt
- Min-Max Depth



ADS ENVIRONMENTAL SERVICES

HYDROGRAPH REPORT

MIL_0715

Flow Monitor

MIL_0715

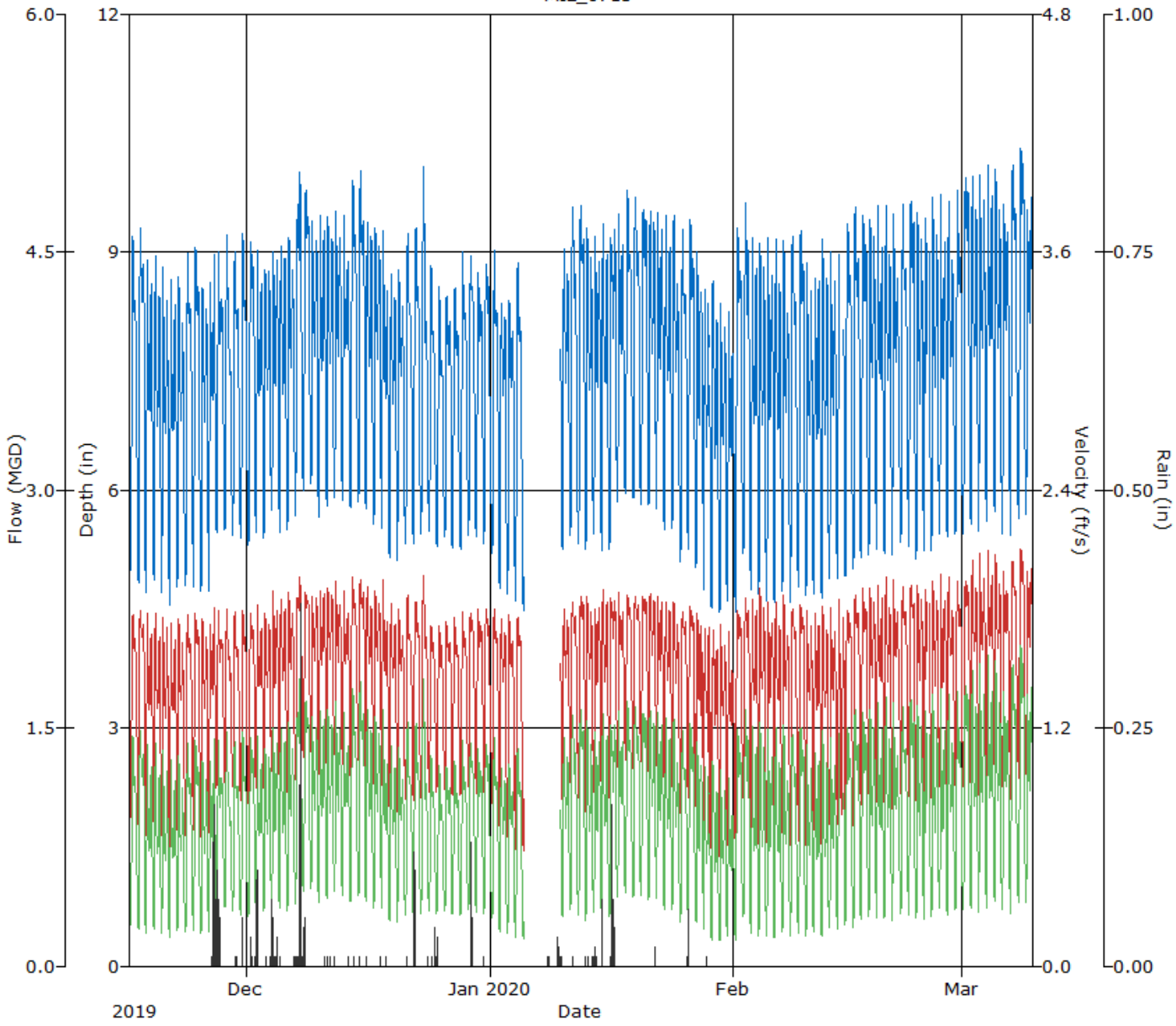
Pipe Height
30.50 in

Report Period

11/16/2019
To
3/9/2020

Legend

- Depth
- Velocity
- Quantity
- Rain



ADS ENVIRONMENTAL SERVICES

Daily Tabular Report For The Period 11/16/2019 00:00 - 03/09/2020 23:59

MIL_0715, Pipe Height: 30.50 in, Silt: 0.00 in

Daily Tabular Report

Date	Depth (in)				Velocity (ft/s)				Quantity (MGD - Total MG)					Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
11/16/2019	06:25	4.95	11:55	9.20	7.43	05:00	0.66	13:45	1.88	1.39	05:00	0.225	13:45	1.517	0.912	0.912	
11/17/2019	06:10	4.81	12:15	9.36	7.49	04:55	0.58	11:45	1.87	1.40	04:55	0.196	12:40	1.544	0.939	0.939	
11/18/2019	05:25	4.68	09:20	8.94	7.09	03:45	0.61	09:05	1.84	1.31	05:25	0.204	09:10	1.436	0.802	0.802	
11/19/2019	05:55	4.84	09:30	8.99	7.09	05:10	0.56	08:40	1.87	1.32	05:10	0.185	09:35	1.465	0.803	0.803	
11/20/2019	05:15	4.68	09:20	8.90	6.97	04:00	0.65	09:00	1.92	1.31	05:15	0.204	09:00	1.464	0.777	0.777	
11/21/2019	05:25	4.52	09:15	8.71	6.93	03:50	0.56	09:15	1.80	1.29	05:25	0.178	09:15	1.368	0.764	0.764	
11/22/2019	05:20	4.76	09:35	8.75	6.99	06:40	0.61	09:05	1.81	1.32	04:25	0.206	09:05	1.353	0.781	0.781	
11/23/2019	06:05	4.77	13:05	9.03	7.27	06:10	0.51	12:00	1.84	1.37	06:10	0.165	12:05	1.445	0.871	0.871	
11/24/2019	05:50	4.75	13:20	9.10	7.35	05:25	0.57	11:00	1.93	1.39	05:25	0.188	11:55	1.492	0.907	0.907	
11/25/2019	05:15	4.71	09:55	8.66	6.99	04:40	0.54	09:40	1.87	1.31	04:40	0.174	09:40	1.400	0.782	0.782	
11/26/2019	05:25	4.71	21:35	9.03	7.16	04:35	0.58	21:35	1.94	1.36	04:35	0.189	21:35	1.553	0.845	0.845	0.36
11/27/2019	05:35	5.44	10:30	9.06	7.54	06:10	0.76	09:30	1.89	1.45	06:10	0.301	10:35	1.493	0.942	0.942	0.63
11/28/2019	05:35	5.48	13:20	9.29	7.36	06:45	0.76	13:10	1.86	1.40	06:45	0.304	13:10	1.546	0.882	0.882	
11/29/2019	06:20	5.39	12:55	9.04	7.47	06:10	0.80	14:10	1.90	1.43	06:10	0.309	14:10	1.487	0.916	0.916	0.02
11/30/2019	06:40	5.38	13:25	9.28	7.49	06:10	0.72	13:45	1.86	1.41	06:10	0.278	13:45	1.535	0.918	0.918	0.10
12/01/2019	06:05	5.30	13:40	9.13	7.59	06:25	0.69	14:35	1.85	1.42	06:25	0.260	14:35	1.504	0.946	0.946	0.06
12/02/2019	05:50	5.43	09:50	9.15	7.45	04:10	0.81	09:45	1.89	1.43	05:55	0.316	09:50	1.538	0.914	0.914	0.30
12/03/2019	05:40	5.38	09:35	8.83	7.41	05:55	0.72	09:50	1.84	1.44	05:55	0.276	09:50	1.422	0.909	0.909	0.01
12/04/2019	04:05	5.72	09:30	9.05	7.58	04:20	0.84	09:50	1.98	1.50	04:20	0.351	09:50	1.582	0.972	0.972	0.39
12/05/2019	05:15	5.46	09:35	9.13	7.59	05:15	0.81	09:10	1.90	1.48	05:15	0.317	09:40	1.541	0.974	0.974	0.01
12/06/2019	05:20	5.48	09:35	9.24	7.69	04:50	0.76	09:40	1.94	1.50	04:50	0.305	09:40	1.596	0.997	0.997	0.01
12/07/2019	06:20	5.65	19:20	10.08	8.16	06:00	0.81	18:50	2.02	1.57	06:00	0.336	19:15	1.862	1.156	1.156	0.67
12/08/2019	06:20	5.97	13:30	9.78	8.36	07:00	0.94	11:20	1.98	1.61	07:00	0.421	11:20	1.737	1.209	1.209	0.20
12/09/2019	05:40	6.05	09:35	9.47	7.99	05:20	0.95	09:40	1.93	1.58	05:20	0.436	09:40	1.642	1.093	1.093	
12/10/2019	05:05	5.65	09:40	9.52	7.86	05:05	0.81	09:15	2.02	1.57	05:05	0.333	09:15	1.711	1.079	1.079	
12/11/2019	05:30	5.79	09:30	9.50	7.89	04:45	0.88	11:20	1.98	1.59	04:45	0.383	09:20	1.675	1.091	1.091	0.03
12/12/2019	05:15	5.89	09:25	9.54	7.94	04:55	0.89	09:10	2.01	1.59	04:55	0.395	10:00	1.723	1.096	1.096	0.01
12/13/2019	05:10	5.86	09:30	9.52	7.91	05:15	0.86	10:10	1.95	1.54	05:15	0.375	10:10	1.667	1.061	1.061	0.01
12/14/2019	05:55	5.74	13:40	9.92	8.18	05:15	0.85	12:35	2.02	1.59	05:15	0.367	12:35	1.810	1.164	1.164	0.01
12/15/2019	06:15	5.82	12:05	10.12	8.29	05:30	0.93	12:35	2.00	1.62	06:50	0.406	12:15	1.842	1.209	1.209	0.01
12/16/2019	05:25	5.74	09:25	9.43	7.88	06:15	0.87	08:55	2.01	1.56	05:45	0.373	09:20	1.665	1.069	1.069	0.01
12/17/2019	05:10	5.54	09:30	9.36	7.81	05:10	0.78	10:10	1.94	1.54	05:10	0.313	10:10	1.616	1.049	1.049	0.01
12/18/2019	05:25	5.50	09:35	9.34	7.55	05:15	0.77	09:30	2.01	1.51	05:15	0.307	09:30	1.678	0.982	0.982	0.01
12/19/2019	05:30	5.13	10:15	8.79	7.25	05:50	0.64	08:50	1.89	1.44	05:50	0.229	09:25	1.436	0.889	0.889	
12/20/2019	05:55	5.08	10:25	8.81	7.33	05:50	0.66	10:40	1.98	1.44	05:50	0.233	10:40	1.522	0.899	0.899	
12/21/2019	06:00	5.31	12:50	9.30	7.52	06:20	0.71	13:35	1.94	1.46	06:20	0.268	13:35	1.597	0.958	0.958	0.01
12/22/2019	05:40	5.29	14:10	9.35	7.61	06:40	0.71	12:35	1.91	1.47	06:40	0.270	14:05	1.590	0.984	0.984	0.41
12/23/2019	05:20	5.43	13:45	10.14	7.69	05:50	0.75	12:40	2.04	1.50	05:50	0.292	12:40	1.875	1.018	1.018	
12/24/2019	05:50	5.47	12:45	8.86	7.36	06:20	0.76	12:45	1.79	1.42	06:20	0.300	12:45	1.394	0.891	0.891	0.02
12/25/2019	05:55	5.28	13:15	8.66	7.00	05:55	0.76	14:20	1.80	1.38	05:55	0.286	13:20	1.330	0.806	0.806	0.08
12/26/2019	05:45	5.37	12:50	8.46	7.23	06:20	0.75	11:25	1.83	1.43	06:20	0.290	11:25	1.327	0.877	0.877	
12/27/2019	04:50	5.23	11:35	8.59	7.23	06:50	0.73	11:45	1.80	1.42	06:50	0.280	11:45	1.339	0.873	0.873	
12/28/2019	06:00	5.24	13:05	9.09	7.34	07:00	0.71	13:05	1.84	1.42	07:00	0.265	13:05	1.481	0.900	0.900	
12/29/2019	06:05	5.41	13:05	8.96	7.45	05:05	0.74	19:05	1.85	1.44	05:05	0.288	13:55	1.445	0.933	0.933	0.22
12/30/2019	05:55	5.39	12:15	8.77	7.44	06:05	0.74	11:50	1.88	1.48	06:05	0.285	11:55	1.436	0.947	0.947	
12/31/2019	05:45	5.30	13:50	8.87	7.44	06:30	0.73	13:10	1.85	1.47	06:30	0.276	13:10	1.431	0.941	0.941	0.01

Date	Depth (in)					Velocity (ft/s)					Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
01/01/2020	07:15	5.16	13:40	9.05	7.28	05:45	0.70	12:50	1.87	1.43	07:35	0.256	12:50	1.471	0.897	0.897	
01/02/2020	06:05	4.74	11:00	8.50	7.00	04:45	0.55	10:05	1.84	1.37	06:20	0.180	10:35	1.303	0.816	0.816	
01/03/2020	05:25	4.67	11:00	8.44	6.97	05:35	0.49	10:05	1.86	1.36	05:35	0.152	10:05	1.315	0.805	0.805	
01/04/2020	05:25	4.58	13:10	8.88	7.03	05:50	0.46	11:30	1.86	1.36	05:50	0.140	13:15	1.431	0.838	0.838	
01/05/2020	06:30	4.46	00:00	7.34	5.48	05:25	0.49	00:00	1.48	0.92	05:25	0.151	00:00	0.882	0.395	0.136	
01/06/2020																	
01/07/2020																	
01/08/2020	00:00		00:00														0.02
01/09/2020	00:00		00:00														0.18
01/10/2020	05:00	5.24	09:25	9.13	7.53	04:35	0.69	09:25	1.92	1.46	04:35	0.259	09:25	1.555	0.954	0.950	0.02
01/11/2020	06:25	5.41	12:05	9.62	7.81	06:25	0.79	13:55	1.95	1.52	06:25	0.306	13:55	1.677	1.044	1.044	0.01
01/12/2020	05:55	5.29	13:55	9.60	7.87	06:55	0.71	13:35	1.95	1.54	06:55	0.271	13:35	1.696	1.079	1.079	
01/13/2020	05:15	5.24	09:30	9.35	7.51	05:15	0.67	08:55	1.91	1.49	05:15	0.249	09:25	1.598	0.966	0.966	0.02
01/14/2020	05:30	5.42	09:30	9.25	7.54	05:45	0.76	21:20	1.90	1.47	05:45	0.293	09:30	1.517	0.957	0.957	0.11
01/15/2020	05:20	5.23	09:25	9.38	7.55	05:35	0.68	09:15	1.95	1.49	05:35	0.253	09:40	1.645	0.981	0.981	0.07
01/16/2020	05:10	5.23	21:20	9.32	7.82	05:50	0.69	09:40	1.91	1.55	05:50	0.260	22:05	1.571	1.069	1.069	0.66
01/17/2020	04:40	5.84	09:20	9.49	7.97	05:10	0.89	09:45	2.01	1.57	05:10	0.385	09:45	1.716	1.095	1.095	
01/18/2020	05:40	5.93	12:00	9.83	8.11	05:25	0.89	12:10	1.93	1.59	05:25	0.395	12:10	1.726	1.141	1.141	
01/19/2020	05:25	5.87	13:15	9.72	8.09	05:40	0.88	11:05	1.96	1.58	05:40	0.385	11:05	1.684	1.133	1.133	
01/20/2020	05:45	5.79	13:15	9.57	8.16	04:55	0.86	12:00	1.96	1.61	04:55	0.373	12:00	1.687	1.172	1.172	
01/21/2020	04:50	5.78	09:05	9.62	7.96	04:55	0.86	08:55	2.04	1.59	04:55	0.367	08:55	1.767	1.103	1.103	
01/22/2020	04:45	5.74	09:10	9.55	7.85	05:40	0.85	21:10	2.00	1.55	05:40	0.364	21:10	1.668	1.056	1.056	0.03
01/23/2020	04:35	5.47	08:55	9.59	7.70	05:05	0.81	08:55	1.93	1.50	05:05	0.321	08:55	1.673	1.002	1.002	
01/24/2020	05:35	5.49	10:20	9.49	7.61	05:15	0.78	09:40	1.89	1.47	05:15	0.312	10:35	1.616	0.967	0.967	
01/25/2020	05:35	5.07	12:40	9.33	7.53	05:45	0.62	12:05	1.85	1.46	05:45	0.220	12:05	1.520	0.968	0.968	
01/26/2020	05:15	5.13	12:55	9.46	7.67	04:35	0.72	11:50	1.92	1.49	05:00	0.260	11:50	1.591	1.006	1.006	0.16
01/27/2020	05:30	4.99	09:20	9.06	7.08	06:35	0.62	20:30	1.85	1.35	05:25	0.217	09:25	1.467	0.831	0.658	
01/28/2020	05:50	4.73	09:00	8.68	6.92	20:00	0.44	08:55	1.82	1.31	06:10	0.167	08:55	1.371	0.779	0.649	0.01
01/29/2020	04:55	4.47	08:25	8.63	6.70	05:00	0.44	08:15	1.79	1.31	05:00	0.129	08:20	1.341	0.713	0.609	
01/30/2020	05:55	4.42	09:45	8.51	6.66	05:40	0.41	10:10	1.80	1.26	05:40	0.120	09:45	1.298	0.705	0.705	
01/31/2020	05:10	4.58	09:35	8.37	6.64	05:45	0.50	09:40	1.76	1.25	05:45	0.155	09:40	1.268	0.688	0.688	
02/01/2020	05:55	4.44	13:35	9.49	7.23	06:15	0.43	13:20	1.85	1.36	06:15	0.126	13:20	1.566	0.886	0.886	
02/02/2020	05:45	5.17	13:00	9.69	7.67	06:15	0.67	12:45	1.93	1.48	06:15	0.242	12:45	1.687	1.009	1.009	
02/03/2020	05:35	4.71	09:20	9.25	7.18	04:55	0.55	09:35	1.97	1.39	05:25	0.174	09:35	1.621	0.865	0.865	
02/04/2020	05:15	4.68	09:20	9.14	7.17	05:50	0.50	09:50	1.98	1.40	05:50	0.160	09:50	1.592	0.873	0.873	
02/05/2020	05:10	4.59	09:30	9.27	7.09	05:35	0.51	09:40	1.88	1.37	05:35	0.157	09:40	1.554	0.838	0.838	
02/06/2020	05:00	4.57	09:20	9.22	7.04	04:45	0.47	09:25	1.94	1.36	04:45	0.143	09:25	1.592	0.825	0.825	
02/07/2020	04:55	4.73	09:30	9.22	7.12	04:55	0.52	09:20	2.01	1.37	04:55	0.166	09:20	1.643	0.840	0.840	
02/08/2020	06:25	4.56	12:30	9.21	7.29	06:30	0.50	11:00	1.85	1.41	06:30	0.149	13:05	1.487	0.910	0.910	
02/09/2020	06:00	4.75	13:05	9.32	7.46	06:00	0.52	12:40	1.88	1.43	06:00	0.167	12:40	1.545	0.955	0.955	
02/10/2020	05:40	4.65	09:20	8.93	6.98	04:20	0.50	09:35	1.84	1.35	05:20	0.158	09:35	1.440	0.806	0.806	
02/11/2020	05:25	4.67	09:15	8.80	6.99	04:40	0.53	08:45	1.89	1.35	04:40	0.171	09:05	1.425	0.806	0.806	
02/12/2020	05:35	4.61	09:20	9.22	7.04	04:30	0.51	09:05	1.97	1.34	05:35	0.163	09:05	1.602	0.810	0.810	
02/13/2020	05:55	4.87	09:20	9.05	7.15	05:30	0.59	09:35	1.96	1.37	05:30	0.198	09:35	1.570	0.840	0.840	
02/14/2020	05:20	4.87	09:20	9.02	6.65	05:55	0.58	08:50	1.89	1.26	05:55	0.193	09:15	1.489	0.717	0.359	
02/15/2020	05:35	4.89	13:15	9.39	7.63	05:40	0.64	13:25	1.86	1.49	05:40	0.214	13:25	1.572	0.999	0.999	
02/16/2020	05:55	4.99	12:30	9.59	7.70	06:35	0.59	12:05	1.91	1.50	06:35	0.206	12:05	1.643	1.032	1.032	
02/17/2020	05:50	5.13	11:00	9.50	7.80	05:25	0.67	10:40	1.96	1.52	06:05	0.238	11:10	1.674	1.057	1.057	
02/18/2020	05:20	5.16	09:45	9.45	7.58	05:40	0.72	10:10	1.95	1.49	05:40	0.260	09:45	1.654	0.987	0.987	
02/19/2020	05:15	5.24	09:25	9.63	7.60	05:55	0.70	09:55	1.96	1.49	05:55	0.263	09:30	1.698	0.989	0.989	
02/20/2020	05:30	5.18	09:30	9.66	7.59	04:30	0.68	09:15	2.01	1.50	04:30	0.251	09:30	1.737	0.995	0.995	
02/21/2020	05:00	5.15	09:45	9.55	7.57	04:45	0.65	09:40	2.02	1.49	04:45	0.235	09:40	1.746	0.988	0.988	
02/22/2020	07:05	5.33	13:20	9.64	7.80	07:25	0.73	14:05	1.99	1.54	07:25	0.276	14:05	1.713	1.061	1.061	
02/23/2020	07:45	5.27	14:20	9.65	7.91	08:00	0.74	12:45	1.99	1.55	08:00	0.275	14:20	1.711	1.103	1.103	
02/24/2020	06:00	5.11	10:35	9.58	7.50	05:15	0.68	10:25	1.99	1.50	05:15	0.251	10:25	1.713	0.980	0.980	

Date	Depth (in)					Velocity (ft/s)					Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
02/25/2020	06:00	5.21	10:20	9.50	7.40	06:25	0.70	09:30	2.00	1.45	06:25	0.258	10:30	1.690	0.942	0.674	
02/26/2020	05:10	5.21	09:15	9.76	7.63	05:05	0.69	08:50	2.07	1.51	05:05	0.255	08:50	1.790	1.009	1.009	
02/27/2020	05:20	5.43	09:15	9.84	7.73	05:30	0.76	09:00	2.05	1.53	05:30	0.297	09:00	1.821	1.034	1.034	
02/28/2020	05:30	5.39	09:25	9.70	7.73	05:25	0.74	09:35	2.03	1.54	05:25	0.285	09:35	1.784	1.040	1.040	
02/29/2020	05:50	5.41	13:45	9.92	7.93	05:45	0.83	13:35	2.04	1.57	05:45	0.321	13:35	1.836	1.110	1.110	
03/01/2020	06:05	5.44	13:15	9.97	8.20	06:10	0.75	11:50	2.09	1.60	06:10	0.292	11:50	1.882	1.197	1.197	
03/02/2020	05:10	5.56	09:20	10.01	7.97	05:35	0.79	09:45	2.08	1.59	05:35	0.318	09:15	1.905	1.119	1.119	
03/03/2020	05:25	5.45	09:45	10.15	8.02	05:20	0.75	09:20	2.18	1.60	05:20	0.294	09:45	2.004	1.148	1.148	
03/04/2020	05:35	5.59	09:25	10.16	8.10	05:35	0.79	09:20	2.18	1.62	05:35	0.319	09:20	2.041	1.174	1.174	
03/05/2020	05:25	5.71	09:35	10.10	8.11	05:30	0.82	09:05	2.14	1.65	05:30	0.341	09:35	1.971	1.183	1.183	
03/06/2020	05:40	5.43	09:55	9.69	7.97	05:40	0.73	09:45	2.04	1.60	05:40	0.285	09:45	1.789	1.132	1.132	
03/07/2020	06:10	5.39	13:25	10.11	8.26	06:05	0.73	17:05	2.11	1.65	06:05	0.281	13:05	1.947	1.243	1.243	
03/08/2020	07:05	5.62	13:30	10.33	8.44	06:30	0.83	13:45	2.16	1.68	06:30	0.345	13:45	2.069	1.309	1.309	
03/09/2020	05:55	5.69	22:20	9.71	8.15	04:50	0.83	21:40	2.07	1.65	04:50	0.350	21:40	1.825	1.199	1.198	

Report Summary For The Period 11/16/2019 00:00 - 03/09/2020 23:59

	Depth (in)	Velocity (ft/s)	Quantity (MGD - Total MG)	Rain (in)
Total			105.605	4.90
Avg	7.53	1.46	0.969	

Site Commentary

Site Information

MIL_0744	
Pipe Dimensions	15
Silt Level	0.00"

Overview

Site MIL_0744 functioned under normal conditions during the period Saturday, November 16, 2019 to Monday, March 9, 2020 . This site exhibited an observable response to the wet weather events of November 26, 2019 - November 27, 2019, December 7, 2019 - December 8, 2019, and January 16, 2020 - January 17, 2020. Surcharged conditions were experienced at this location. Review of the scattergraph shows that both free flow and backwater conditions were recorded during the study period.

Flow depth and velocity measurements recorded by the flow monitor are consistent with field confirmations conducted to date and support the relative accuracy of the flow monitor at this location.

Observations

Average flow depth, velocity, and quantity data observed during Saturday, November 16, 2019 to Monday, March 9, 2020 , along with observed minimum and maximum data, are provided in the following table.

Observed Flow Conditions			
Item	Depth (in)	Velocity (ft/s)	Quantity (MGD)
Average	6.17	0.94	0.283
Minimum	2.74	0.16	0.080
Maximum	34.98	1.78	1.416
Time of Minimum	3/1/2020 5:45 AM	2/27/2020 5:30 PM	2/6/2020 3:40 AM
Time of Maximum	3/8/2020 2:15 PM	3/8/2020 2:15 PM	3/8/2020 2:15 PM

Data Quality

Data uptime observed during the Saturday, November 16, 2019 to the Monday, March 9, 2020 monitoring period is provided in the table below. Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period. Site installed later than other sites on November 22, 2019. Uptime reflects time in service.

Percent Uptime	
Depth (in)	100
Velocity (ft/s)	100
Quantity (MGD)	100

Milpitas Temp Study 2019-20

Flow Monitoring Site Report

ADS ENVIRONMENTAL SERVICES®

Site Name

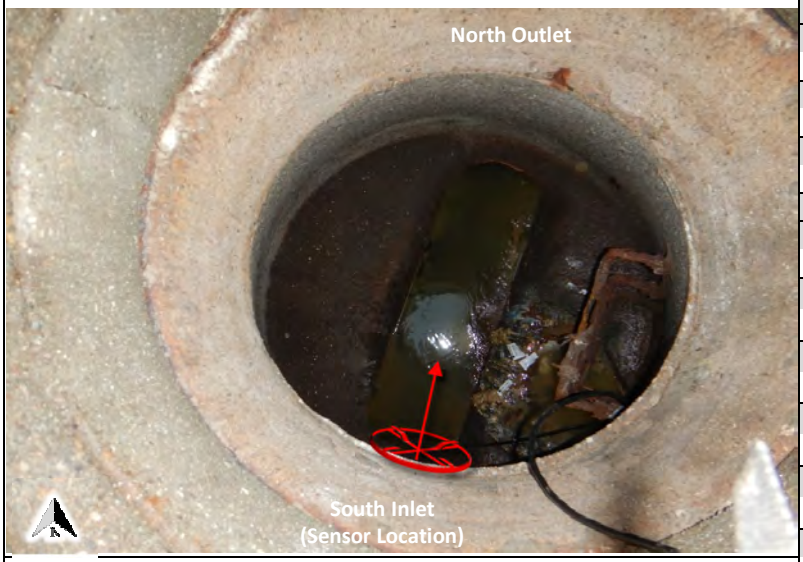
MIL_0744

Site Address /Location:	Thompson Court and Machado Avenue			Monitor Series	Location Type
				TRITON+	Temporary
Site Access Details:	Drive	Latitude:	37.419309°	Pipe Size (H x W)	Pipe Shape
		Longitude:	-121.911002°	15.0" x 15.0"	Circular



Manhole #	System Characteristics
744	Residential
Access	Traffic
Drive	Light







Installation Information

Installation Date:	Installation Type:
Tuesday, November 12, 2019	Doppler Standard Ring and Crank
Monitoring Location (Sensors):	Monitor Location:
Upstream 0-5 FT	Manhole
Sensors / Devices:	Pressure Sensor Range (psi)
Peak Combo (CS4)	0 - 5 psi

Installation Confirmation:

Confirmation Time:	Pipe Size (HxW)
6:52:52 AM	15.0" x 15.0"
Depth of Flow (Wet DOF) (in)	Range (Air DOF) (in)
5.50	0.00"
Downlooker Physical Offset (in)	Measurement Confidence (in)
NA	0.25"
Peak Velocity (fps)	Velocity Sensor Offset (in)
1.05	0''
Silt	Silt Type
0''	

Hydraulic Comments:

Smooth flow with medium depth and velocity

Manhole / Pipe Information:

Manhole Depth (Approx. FT):	Manhole Configuration
5'	Single
Manhole Material:	Manhole Condition:
Concrete	Good
Manhole Opening Diameter (in)	Manhole Diameter (Approx.):
26''	54''
Manhole Cover	Manhole Frame
Unbolted	Normal
Active Drop Connections	Air Quality:
No	Normal
Pipe Material	Pipe Condition:
PVC	Good

Communication Information:

Communication Type	Antenna Location
Wireless	Manhole Pick / Vent Hole

Additional Site Info. / Comments:

ADS Project Name:	Milpitas.WWTFM.CA19-20
ADS Project Number:	22431

SCATTERGRAPH REPORT

MIL_0744

Flow Monitor

MIL_0744

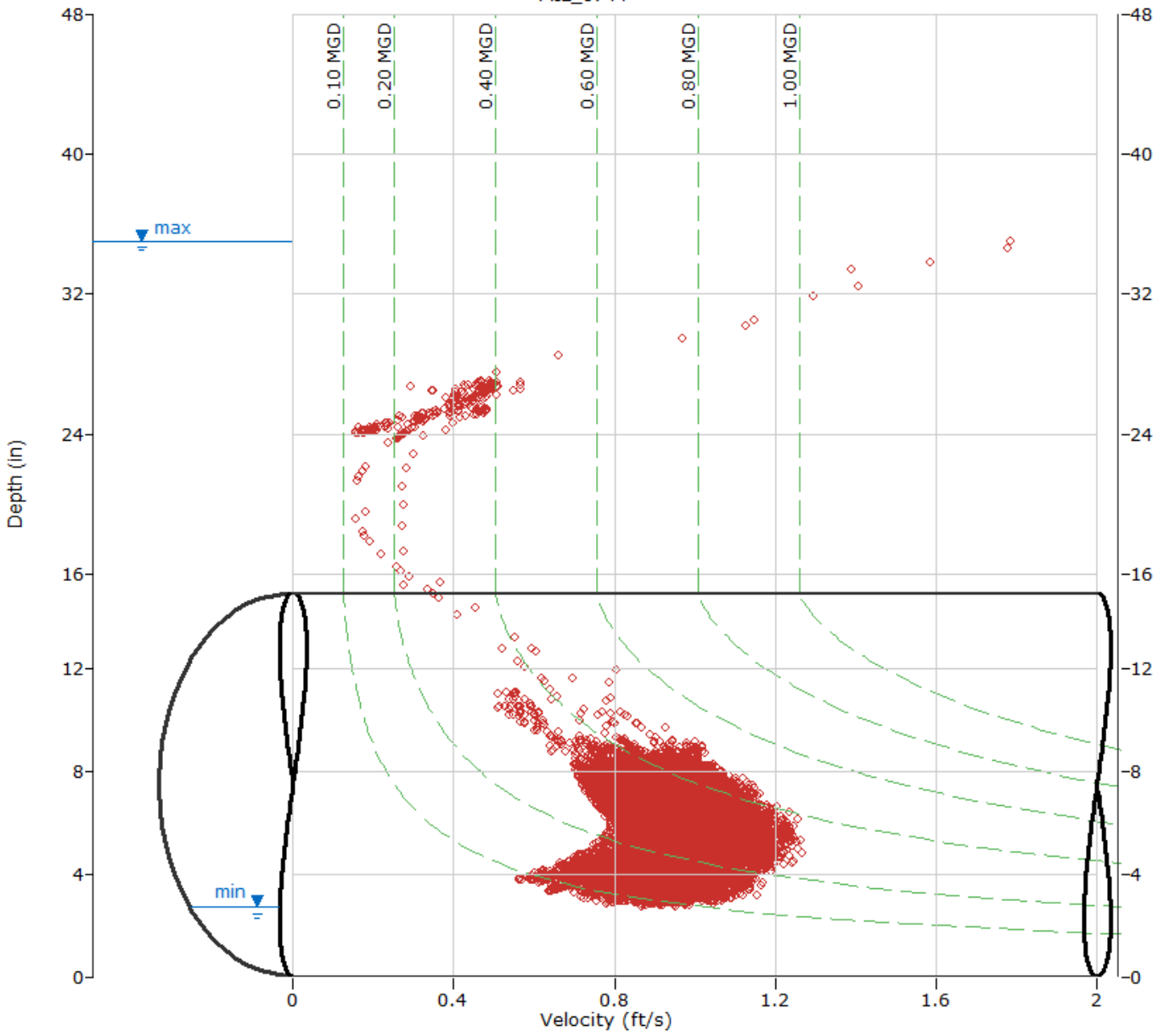
Pipe Height
15.00 in

Report Period

11/16/2019
To
3/9/2020

Legend

- Depth - Velocity
- Iso-Q™
- Silt
- Min-Max Depth



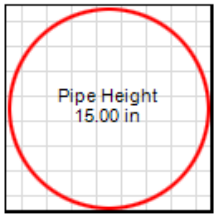
ADS ENVIRONMENTAL SERVICES

HYDROGRAPH REPORT

MIL_0744

Flow Monitor

MIL_0744

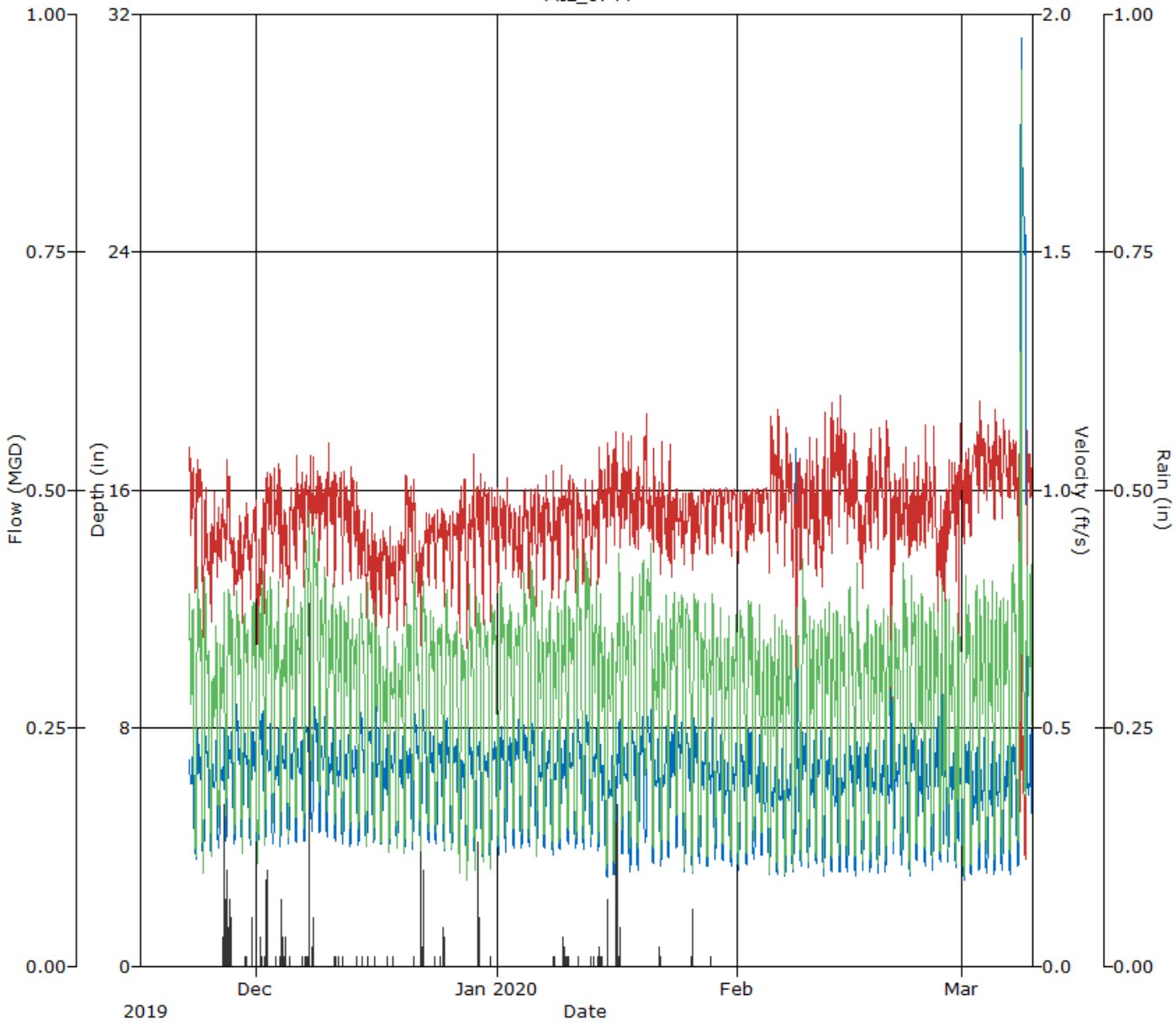


Report Period

11/16/2019
To
3/9/2020

Legend

- Depth
- Velocity
- Quantity
- Rain



Daily Tabular Report For The Period 11/16/2019 00:00 - 03/09/2020 23:59

MIL_0744, Pipe Height: 15.00 in, Silt: 0.00 in

Daily Tabular Report

Date	Depth (in)				Velocity (ft/s)				Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
11/16/2019	00:00		00:00			00:00		00:00			00:00		00:00				
11/17/2019	00:00		00:00			00:00		00:00			00:00		00:00				
11/18/2019	00:00		00:00			00:00		00:00			00:00		00:00				
11/19/2019	00:00		00:00			00:00		00:00			00:00		00:00				
11/20/2019	00:00		00:00			00:00		00:00			00:00		00:00				
11/21/2019	00:00		00:00			00:00		00:00			00:00		00:00				
11/22/2019	23:50	5.35	22:20	7.49	6.47	14:55	0.82	09:25	1.13	1.01	15:05	0.250	22:25	0.403	0.333	0.214	
11/23/2019	05:40	3.43	10:55	8.49	5.95	03:20	0.67	19:05	1.12	0.96	05:25	0.099	10:35	0.451	0.289	0.289	
11/24/2019	05:30	3.43	10:25	8.27	6.10	05:25	0.64	14:15	1.09	0.87	05:25	0.088	10:25	0.454	0.270	0.270	
11/25/2019	05:05	3.63	19:40	7.82	5.81	05:10	0.61	13:25	1.06	0.87	05:10	0.091	21:50	0.428	0.250	0.250	
11/26/2019	03:10	3.81	21:40	8.27	6.02	03:20	0.64	16:55	1.06	0.91	03:20	0.103	21:45	0.435	0.272	0.272	0.36
11/27/2019	03:05	4.05	19:20	8.19	6.46	02:20	0.73	06:40	1.10	0.93	03:10	0.130	09:55	0.412	0.305	0.305	0.63
11/28/2019	05:25	4.07	12:05	9.02	6.58	05:45	0.72	21:55	1.09	0.85	05:40	0.126	14:30	0.469	0.285	0.285	
11/29/2019	05:35	3.84	11:10	8.30	6.25	05:35	0.69	19:50	1.11	0.88	05:35	0.110	10:00	0.437	0.281	0.281	0.02
11/30/2019	06:05	3.92	10:55	8.34	6.32	05:45	0.67	21:35	1.09	0.89	05:45	0.111	14:00	0.456	0.287	0.287	0.10
12/01/2019	06:10	3.73	20:30	8.83	6.59	05:45	0.56	00:00	1.12	0.84	05:55	0.088	20:30	0.451	0.285	0.285	0.06
12/02/2019	03:30	3.89	21:20	8.59	6.30	03:00	0.61	17:55	1.12	0.94	03:00	0.105	21:15	0.458	0.303	0.303	0.30
12/03/2019	04:20	3.93	21:40	8.37	6.16	03:30	0.71	23:40	1.12	0.95	03:30	0.131	20:00	0.416	0.295	0.295	0.01
12/04/2019	03:45	3.94	19:55	8.06	6.37	04:05	0.69	07:10	1.14	0.89	04:05	0.129	21:20	0.425	0.287	0.287	0.39
12/05/2019	03:35	3.90	21:45	8.49	6.25	03:15	0.64	09:45	1.07	0.91	03:40	0.107	09:45	0.433	0.290	0.290	0.01
12/06/2019	05:10	4.03	20:55	7.82	6.20	04:10	0.71	07:30	1.12	0.95	04:10	0.126	19:30	0.422	0.296	0.296	0.01
12/07/2019	05:15	4.06	19:10	9.08	6.79	03:10	0.74	00:00	1.07	0.96	03:30	0.131	19:45	0.501	0.340	0.340	0.67
12/08/2019	05:05	4.47	10:05	9.22	7.10	03:50	0.77	08:05	1.12	0.98	03:50	0.179	09:45	0.508	0.363	0.363	0.20
12/09/2019	05:15	4.35	21:05	8.75	6.50	02:55	0.80	07:05	1.12	0.97	02:55	0.160	21:10	0.458	0.321	0.321	
12/10/2019	02:40	4.22	21:55	8.12	6.28	03:25	0.68	07:05	1.13	0.96	03:25	0.126	21:05	0.417	0.305	0.305	
12/11/2019	03:15	4.08	21:05	7.89	6.10	03:30	0.71	07:10	1.14	0.96	04:05	0.135	08:45	0.408	0.294	0.294	0.03
12/12/2019	03:25	3.80	22:20	8.06	6.16	04:00	0.69	07:55	1.11	0.94	04:00	0.123	21:55	0.434	0.293	0.293	0.01
12/13/2019	05:05	3.88	20:45	7.81	6.09	04:00	0.71	07:25	1.12	0.94	04:00	0.131	09:15	0.386	0.286	0.286	0.01
12/14/2019	05:35	3.92	13:45	8.88	6.45	03:55	0.70	00:20	1.07	0.89	03:10	0.128	11:55	0.433	0.290	0.290	0.01
12/15/2019	05:20	3.90	10:55	8.49	6.59	04:50	0.68	23:55	1.09	0.85	05:40	0.115	10:15	0.444	0.286	0.286	0.01
12/16/2019	03:35	3.88	09:10	10.28	6.53	09:35	0.54	00:00	1.06	0.82	03:35	0.113	08:35	0.440	0.272	0.272	0.01
12/17/2019	05:00	3.92	21:20	7.91	5.99	02:50	0.62	12:35	1.05	0.84	03:25	0.105	21:20	0.376	0.252	0.252	0.01
12/18/2019	03:15	3.76	21:55	8.23	6.22	04:05	0.59	23:40	1.00	0.82	03:15	0.094	21:50	0.372	0.259	0.259	0.01
12/19/2019	03:25	3.79	22:55	7.85	6.15	03:30	0.58	07:05	0.97	0.83	03:25	0.093	21:40	0.369	0.259	0.259	
12/20/2019	03:25	3.78	21:20	7.56	6.10	03:35	0.61	07:30	1.12	0.91	03:35	0.097	08:40	0.399	0.282	0.282	
12/21/2019	03:40	3.74	11:40	8.58	6.50	04:10	0.67	07:30	1.06	0.89	03:45	0.109	11:15	0.458	0.294	0.294	0.01
12/22/2019	05:35	3.73	13:45	9.05	6.67	06:00	0.62	00:10	0.97	0.85	05:45	0.098	13:45	0.417	0.295	0.295	0.41
12/23/2019	05:10	4.00	10:20	8.07	6.28	05:10	0.77	23:55	0.97	0.90	05:10	0.132	10:20	0.383	0.287	0.287	
12/24/2019	05:00	3.90	19:30	7.77	6.23	05:00	0.76	23:25	0.97	0.90	05:00	0.124	19:30	0.369	0.283	0.283	0.02
12/25/2019	05:35	3.79	14:00	8.71	6.43	05:35	0.74	00:05	0.96	0.89	05:35	0.116	14:00	0.409	0.291	0.291	0.08
12/26/2019	05:05	3.79	19:15	8.07	6.15	05:05	0.74	23:50	0.97	0.89	05:05	0.116	19:15	0.383	0.278	0.278	
12/27/2019	05:25	3.33	13:20	7.24	5.73	05:25	0.64	11:35	1.10	0.91	05:25	0.084	11:40	0.385	0.259	0.259	
12/28/2019	05:10	3.31	12:10	8.23	5.96	04:00	0.61	00:00	1.10	0.90	05:10	0.083	12:05	0.417	0.272	0.272	
12/29/2019	05:45	3.36	21:50	8.00	5.98	03:55	0.63	00:30	1.10	0.94	05:45	0.086	17:05	0.416	0.283	0.283	0.22
12/30/2019	03:50	3.56	13:15	7.37	5.84	03:50	0.69	11:45	1.09	0.95	03:50	0.099	13:10	0.395	0.276	0.276	
12/31/2019	05:25	3.44	10:25	7.90	6.03	04:00	0.59	10:05	1.07	0.91	05:25	0.091	17:35	0.404	0.279	0.279	0.01

Date	Depth (in)				Velocity (ft/s)				Quantity (MGD - Total MG)					Rain (in)
	Time	Min Time	Max	Avg	Time	Min Time	Max	Avg	Time	Min Time	Max	Avg	Total	Total
01/01/2020	05:15	3.66 14:05	8.32	6.32	04:50	0.71 01:00	1.11	0.92	04:50	0.113 13:25	0.443	0.295	0.295	
01/02/2020	04:10	3.69 19:50	7.90	6.20	03:20	0.71 07:50	1.13	0.93	04:05	0.111 22:40	0.405	0.291	0.291	
01/03/2020	05:30	3.78 20:10	8.44	6.42	03:35	0.73 23:55	1.04	0.88	03:35	0.131 20:30	0.405	0.288	0.288	
01/04/2020	05:15	3.92 13:50	8.35	6.36	03:45	0.72 17:55	1.06	0.92	03:45	0.122 14:00	0.434	0.301	0.301	
01/05/2020	06:10	3.85 13:40	8.29	6.53	03:45	0.72 10:15	1.08	0.91	06:00	0.119 10:30	0.457	0.309	0.309	
01/06/2020	03:50	3.65 21:45	8.05	6.02	04:05	0.67 07:25	1.10	0.91	03:25	0.103 19:30	0.433	0.277	0.277	
01/07/2020	04:05	3.75 22:35	8.03	6.21	02:45	0.70 10:20	1.08	0.93	03:55	0.116 10:20	0.394	0.291	0.291	
01/08/2020	05:20	3.62 22:25	8.27	6.07	03:20	0.71 07:20	1.08	0.91	03:25	0.112 19:00	0.409	0.277	0.277	0.02
01/09/2020	05:20	3.74 22:30	8.30	6.15	02:05	0.70 15:35	1.15	0.94	05:15	0.113 22:05	0.448	0.292	0.292	0.18
01/10/2020	05:35	3.96 19:15	8.00	6.23	04:55	0.76 06:50	1.15	0.94	03:15	0.136 09:00	0.422	0.296	0.296	0.02
01/11/2020	04:55	3.86 11:05	8.41	6.35	04:55	0.70 19:05	1.06	0.92	04:55	0.114 11:30	0.458	0.302	0.302	0.01
01/12/2020	05:20	3.86 14:25	8.71	6.51	04:05	0.69 11:40	1.10	0.91	04:05	0.113 11:50	0.457	0.309	0.309	
01/13/2020	03:20	3.85 21:05	8.08	6.17	04:00	0.73 18:15	1.13	0.93	04:00	0.125 20:20	0.425	0.290	0.290	0.02
01/14/2020	03:00	3.81 08:40	7.99	5.78	03:10	0.70 07:30	1.12	0.95	03:10	0.112 08:35	0.410	0.273	0.273	0.11
01/15/2020	05:10	2.74 21:10	7.23	5.28	04:15	0.70 07:40	1.25	0.99	03:30	0.085 20:35	0.374	0.251	0.251	0.07
01/16/2020	03:30	2.82 19:35	8.52	5.88	04:05	0.73 07:05	1.20	0.99	03:20	0.095 19:25	0.458	0.287	0.287	0.66
01/17/2020	03:25	3.55 08:55	8.25	5.93	03:30	0.73 07:00	1.21	1.00	03:30	0.126 20:40	0.395	0.292	0.292	
01/18/2020	05:20	3.05 11:40	8.04	6.00	21:10	0.77 00:10	1.19	0.97	05:25	0.118 11:15	0.441	0.287	0.287	
01/19/2020	05:35	3.12 21:50	8.80	6.19	04:05	0.75 05:45	1.15	0.98	05:15	0.117 21:50	0.451	0.304	0.304	
01/20/2020	05:30	4.11 13:40	9.28	6.70	16:00	0.76 06:35	1.21	1.00	05:30	0.157 13:30	0.459	0.339	0.339	
01/21/2020	05:10	3.31 21:35	7.91	5.69	03:50	0.75 07:45	1.15	0.95	03:45	0.110 21:50	0.399	0.265	0.265	
01/22/2020	03:25	3.21 22:40	8.31	5.88	03:15	0.71 07:40	1.13	0.95	03:25	0.095 22:15	0.419	0.276	0.276	0.03
01/23/2020	03:35	3.43 21:55	8.83	6.29	11:55	0.73 07:15	1.14	0.93	03:40	0.116 13:25	0.400	0.294	0.294	
01/24/2020	05:10	3.85 22:20	8.39	6.52	22:20	0.86 07:45	1.00	0.95	05:10	0.148 22:20	0.393	0.312	0.312	
01/25/2020	05:35	3.13 19:25	8.13	6.06	05:35	0.83 00:25	1.00	0.94	05:35	0.100 19:25	0.388	0.287	0.287	
01/26/2020	05:30	2.96 11:10	8.51	6.24	05:30	0.81 00:30	1.00	0.92	05:30	0.089 11:10	0.394	0.291	0.291	0.16
01/27/2020	03:35	3.19 21:25	8.09	5.82	03:35	0.84 00:00	1.00	0.96	03:35	0.104 21:25	0.387	0.276	0.276	
01/28/2020	05:10	3.08 20:00	8.74	5.85	20:00	0.83 15:25	1.00	0.95	05:10	0.097 20:00	0.396	0.276	0.276	0.01
01/29/2020	03:25	3.18 21:30	8.17	5.84	03:25	0.84 18:05	1.00	0.96	03:25	0.103 21:30	0.389	0.278	0.278	
01/30/2020	03:20	3.43 22:25	7.77	5.66	03:20	0.87 23:50	1.00	0.97	03:20	0.119 22:25	0.379	0.269	0.269	
01/31/2020	05:05	3.20 19:30	7.81	5.71	05:05	0.84 23:35	1.00	0.96	05:05	0.105 19:30	0.380	0.271	0.271	
02/01/2020	03:25	3.10 10:00	7.71	5.75	03:25	0.83 23:40	1.00	0.95	03:25	0.098 10:00	0.377	0.272	0.272	
02/02/2020	03:40	3.31 12:30	8.50	6.00	12:30	0.85 08:30	1.00	0.94	03:40	0.112 12:30	0.394	0.282	0.282	
02/03/2020	03:30	3.48 21:30	7.92	5.75	03:30	0.88 07:30	1.00	0.96	03:30	0.123 21:30	0.383	0.273	0.273	
02/04/2020	03:15	3.53 08:50	7.21	5.32	03:15	0.89 17:00	1.00	0.98	03:15	0.126 08:50	0.360	0.249	0.249	
02/05/2020	02:55	2.93 21:45	6.87	5.14	06:25	0.80 07:40	1.25	1.02	02:55	0.087 11:25	0.400	0.253	0.253	
02/06/2020	03:40	2.80 19:10	7.96	5.29	03:15	0.74 07:40	1.23	1.00	03:40	0.080 19:15	0.385	0.254	0.254	
02/07/2020	03:55	2.91 21:20	7.10	5.29	03:00	0.72 11:55	1.19	1.02	03:00	0.083 08:55	0.379	0.260	0.260	
02/08/2020	05:30	3.06 15:15	25.11	5.77	15:25	0.16 23:40	1.11	0.92	03:30	0.094 16:20	0.407	0.241	0.241	
02/09/2020	05:30	3.30 11:15	8.27	6.03	11:20	0.73 00:00	1.17	0.96	05:55	0.101 11:15	0.470	0.291	0.291	
02/10/2020	03:35	3.12 21:00	7.73	5.70	05:15	0.74 07:30	1.23	0.97	03:40	0.091 19:50	0.418	0.273	0.273	
02/11/2020	04:50	3.17 22:25	8.30	6.09	22:05	0.71 07:25	1.15	0.90	03:05	0.091 09:05	0.394	0.275	0.275	
02/12/2020	03:10	2.94 19:25	7.95	5.79	19:55	0.74 07:20	1.26	0.98	02:50	0.093 19:10	0.408	0.279	0.279	
02/13/2020	03:25	2.94 19:55	7.12	5.34	04:00	0.77 07:35	1.24	1.05	03:35	0.089 21:50	0.415	0.270	0.270	
02/14/2020	03:30	3.03 08:45	7.87	5.43	03:35	0.77 07:25	1.27	1.05	03:35	0.088 20:05	0.424	0.274	0.274	
02/15/2020	05:15	3.12 10:45	8.15	5.71	04:35	0.73 00:05	1.18	1.00	04:35	0.093 10:40	0.436	0.282	0.282	
02/16/2020	05:35	2.89 12:30	7.85	5.72	04:00	0.78 00:50	1.18	0.97	06:00	0.091 11:25	0.460	0.270	0.270	
02/17/2020	05:00	3.07 20:15	7.73	5.73	04:35	0.72 23:40	1.13	0.93	04:40	0.091 20:05	0.425	0.265	0.265	
02/18/2020	03:20	2.98 19:45	7.61	5.52	02:35	0.75 00:00	1.18	1.00	04:50	0.095 18:50	0.389	0.268	0.268	
02/19/2020	03:35	3.04 21:40	8.09	5.55	22:00	0.74 10:30	1.26	1.00	03:25	0.094 19:45	0.404	0.271	0.271	
02/20/2020	03:40	3.06 21:05	11.07	6.09	22:30	0.51 07:25	1.20	0.95	03:05	0.104 23:05	0.444	0.272	0.272	
02/21/2020	03:10	3.58 08:15	9.33	6.13	08:15	0.65 23:30	1.11	0.95	02:45	0.110 18:55	0.393	0.290	0.290	
02/22/2020	06:00	3.24 10:30	8.20	6.00	10:50	0.72 08:10	1.19	0.96	06:05	0.111 10:35	0.443	0.287	0.287	
02/23/2020	05:35	2.93 10:50	8.46	6.10	05:25	0.76 18:10	1.14	0.94	05:25	0.084 12:40	0.437	0.288	0.288	
02/24/2020	04:55	3.37 20:45	7.93	5.75	04:50	0.75 07:30	1.15	0.95	04:10	0.103 19:25	0.414	0.270	0.270	

Date	Depth (in)					Velocity (ft/s)					Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
02/25/2020	03:35	3.02	22:25	7.81	5.65	04:15	0.75	07:20	1.24	0.97	03:15	0.102	21:25	0.403	0.270	0.270	
02/26/2020	03:15	3.11	19:35	9.23	6.17	19:25	0.67	07:30	1.18	0.93	03:30	0.092	20:30	0.419	0.282	0.282	
02/27/2020	04:20	3.28	17:30	19.17	6.12	17:30	0.16	09:35	1.13	0.89	04:30	0.100	09:00	0.545	0.262	0.262	
02/28/2020	05:05	3.30	08:55	7.51	5.69	03:55	0.77	06:55	1.14	0.97	02:55	0.107	08:35	0.414	0.269	0.269	
02/29/2020	05:50	3.23	13:15	23.46	5.72	13:20	0.16	18:15	1.22	0.96	04:30	0.094	14:20	0.502	0.257	0.257	
03/01/2020	05:45	2.74	21:25	7.88	5.70	04:25	0.78	18:25	1.22	1.00	04:25	0.084	11:45	0.433	0.283	0.283	
03/02/2020	05:05	2.90	20:10	7.69	5.28	02:40	0.80	18:20	1.20	1.03	03:30	0.091	19:20	0.422	0.264	0.264	
03/03/2020	05:00	2.90	21:50	7.93	5.37	03:25	0.83	07:25	1.24	1.07	03:25	0.099	21:25	0.429	0.277	0.277	
03/04/2020	05:00	2.99	20:25	7.84	5.43	02:35	0.89	07:45	1.23	1.05	02:35	0.102	21:15	0.418	0.276	0.276	
03/05/2020	03:15	2.84	20:00	7.32	5.44	04:15	0.80	06:55	1.23	1.05	03:25	0.089	19:50	0.415	0.278	0.278	
03/06/2020	03:05	2.95	21:00	7.50	5.53	03:15	0.86	07:25	1.22	1.05	03:15	0.096	21:10	0.399	0.283	0.283	
03/07/2020	03:35	2.92	20:05	7.83	5.79	13:45	0.89	19:00	1.20	1.05	03:45	0.107	12:35	0.454	0.300	0.300	
03/08/2020	04:00	3.28	14:15	34.98	16.56	11:00	0.26	14:15	1.78	0.71	05:10	0.110	14:15	1.416	0.316	0.316	
03/09/2020	23:55	4.57	06:40	25.25	11.60	03:20	0.16	11:30	1.20	0.81	03:20	0.125	07:05	0.472	0.300	0.300	

Report Summary For The Period 11/16/2019 00:00 - 03/09/2020 23:59

	Depth (in)	Velocity (ft/s)	Quantity (MGD - Total MG)	Rain (in)
Total			30.779	4.90
Avg	6.17	0.94	0.283	

Site Commentary

Site Information

MIL_1043	
Pipe Dimensions	20.75
Silt Level	0.00"

Overview

Site MIL_1043 functioned under normal conditions during the period Saturday, November 16, 2019 to Monday, March 9, 2020 . This site exhibited a small response to the wet weather events of November 26, 2019 - November 27, 2019, December 7, 2019 - December 8, 2019, and January 16, 2020 - January 17, 2020. Review of the scattergraph shows that free flow conditions were recorded during the study period.

Flow depth and velocity measurements recorded by the flow monitor are consistent with field confirmations conducted to date and support the relative accuracy of the flow monitor at this location.

This location was installed downstream of MIL_1193. A review of balancing of combined flows MIL_1043 and MIL_2840 shows a net flow of 0.663 MGD.

Observations

Average flow depth, velocity, and quantity data observed during Saturday, November 16, 2019 to Monday, March 9, 2020 , along with observed minimum and maximum data, are provided in the following table.

Observed Flow Conditions			
Item	Depth (in)	Velocity (ft/s)	Quantity (MGD)
Average	5.25	4.00	1.263
Minimum	3.29	1.93	0.306
Maximum	7.55	4.98	2.432
Time of Minimum	2/26/2020 3:35 AM	3/2/2020 4:00 AM	3/2/2020 4:00 AM
Time of Maximum	12/7/2019 6:15 PM	11/28/2019 12:30 PM	12/7/2019 6:15 PM

Data Quality

Data uptime observed during the Saturday, November 16, 2019 to the Monday, March 9, 2020 monitoring period is provided in the table below. Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

Percent Uptime	
Depth (in)	100
Velocity (ft/s)	100
Quantity (MGD)	100

Milpitas Temp Study 2019-20

Flow Monitoring Site Report

ADS ENVIRONMENTAL SERVICES®

Site Name

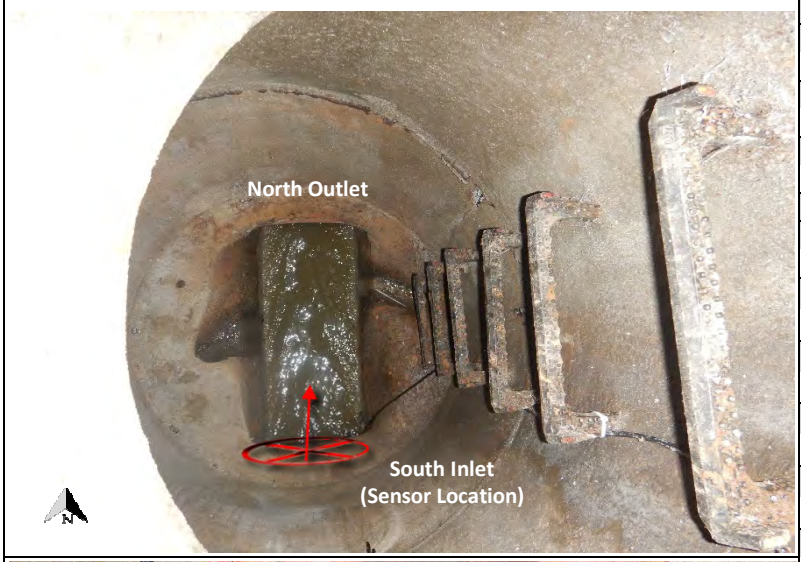
MIL_1043

Site Address /Location:	Ayer St and Park Hill Dr, Milpitas, CA			Monitor Series	Location Type
				TRITON+	Temporary
Site Access Details:	DRIVE.	Latitude:	37.436384°	Pipe Size (H x W)	Pipe Shape
		Longitude:	-121.887700°	20.75"x20.75"	Circular



Manhole #	System Characteristics
1043	Residential/Commercial
Access	Traffic
Drive	Medium







Installation Information

Installation Date:	Installation Type:
Thursday, November 14, 2019	Doppler Standard Ring and Crank
Monitoring Location (Sensors):	Monitor Location:
Upstream 0-5 FT	Manhole
Sensors / Devices:	Pressure Sensor Range (psi)
Peak Combo (CS4)	0 - 5 psi

Installation Confirmation:

Confirmation Time:	Pipe Size (HxW)
6:52:00 AM	20.75"x20.75"
Depth of Flow (Wet DOF) (in)	Range (Air DOF) (in)
6.38"	
Downlooker Physical Offset (in)	Measurement Confidence (in)
NA	0.25"
Peak Velocity (fps)	Velocity Sensor Offset (in)
4.50'	0''
Silt (in)	Silt Type
0.0"	

Hydraulic Comments:

Medium depth with fast velocity and small waves

Manhole / Pipe Information:

Manhole Depth (Approx. FT):	Manhole Configuration
10'	Single
Manhole Material:	Manhole Condition:
Concrete	Good
Manhole Opening Diameter (in)	Manhole Diameter (Approx.):
26''	54''
Manhole Cover	Manhole Frame
Unbolted	Normal
Active Drop Connections	Air Quality:
No	Normal
Pipe Material	Pipe Condition:
Concrete	Good

Communication Information:

Communication Type	Antenna Location
Wireless	Drilled Pavement / Concrete

Additional Site Info. / Comments:

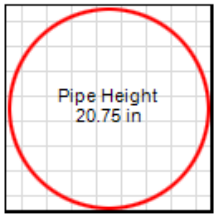
ADS Project Name:	Milpitas.WWTFM.CA2019-2020
ADS Project Number:	22431.11.325

SCATTERGRAPH REPORT

MIL_1043

Flow Monitor

MIL_1043

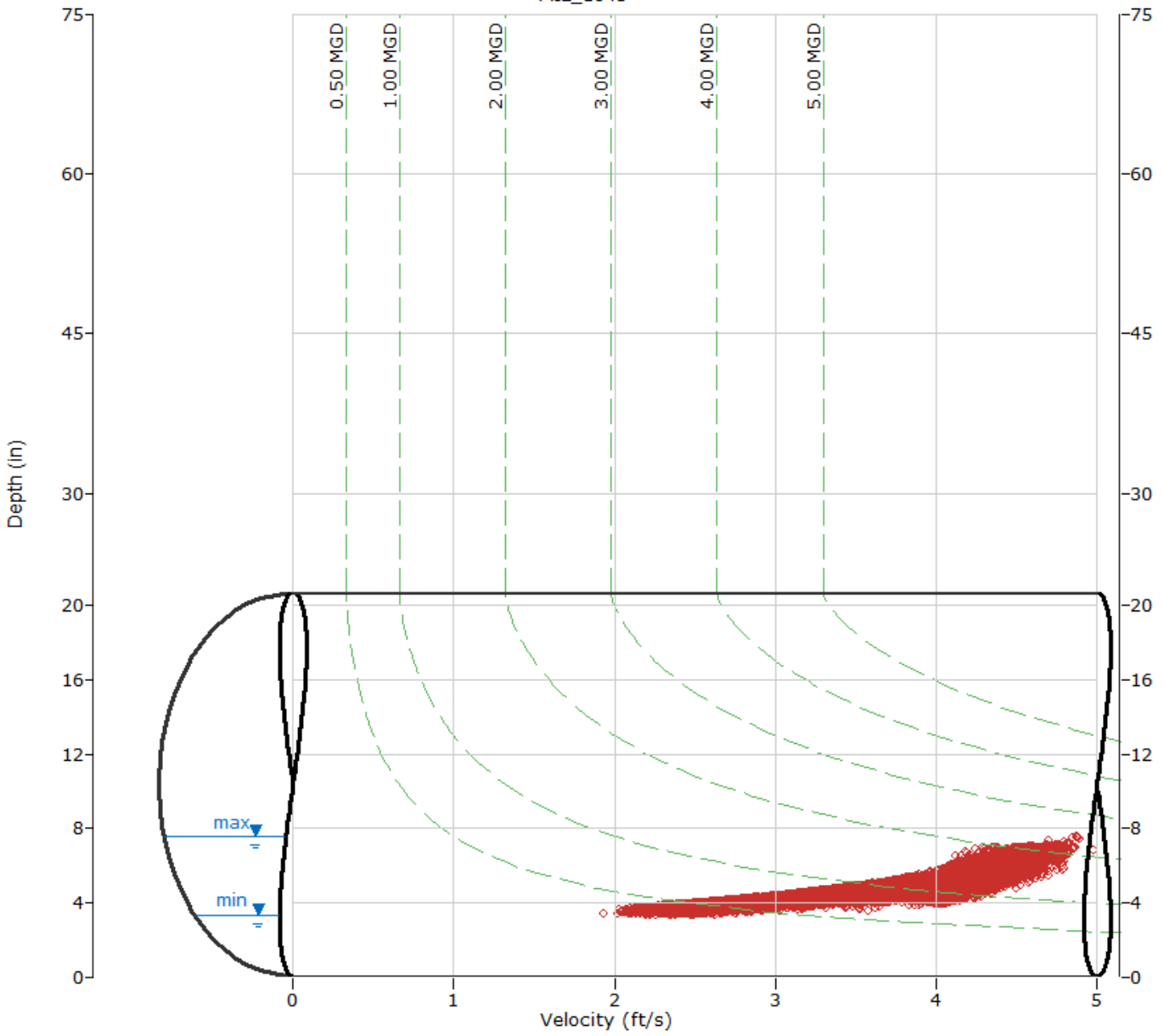


Report Period

11/16/2019
To
3/9/2020

Legend

- Depth - Velocity
- Iso-Q™
- Silt
- Min-Max Depth



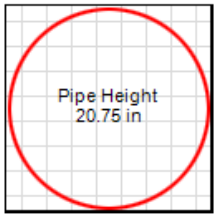
ADS ENVIRONMENTAL SERVICES

HYDROGRAPH REPORT

MIL_1043

Flow Monitor

MIL_1043

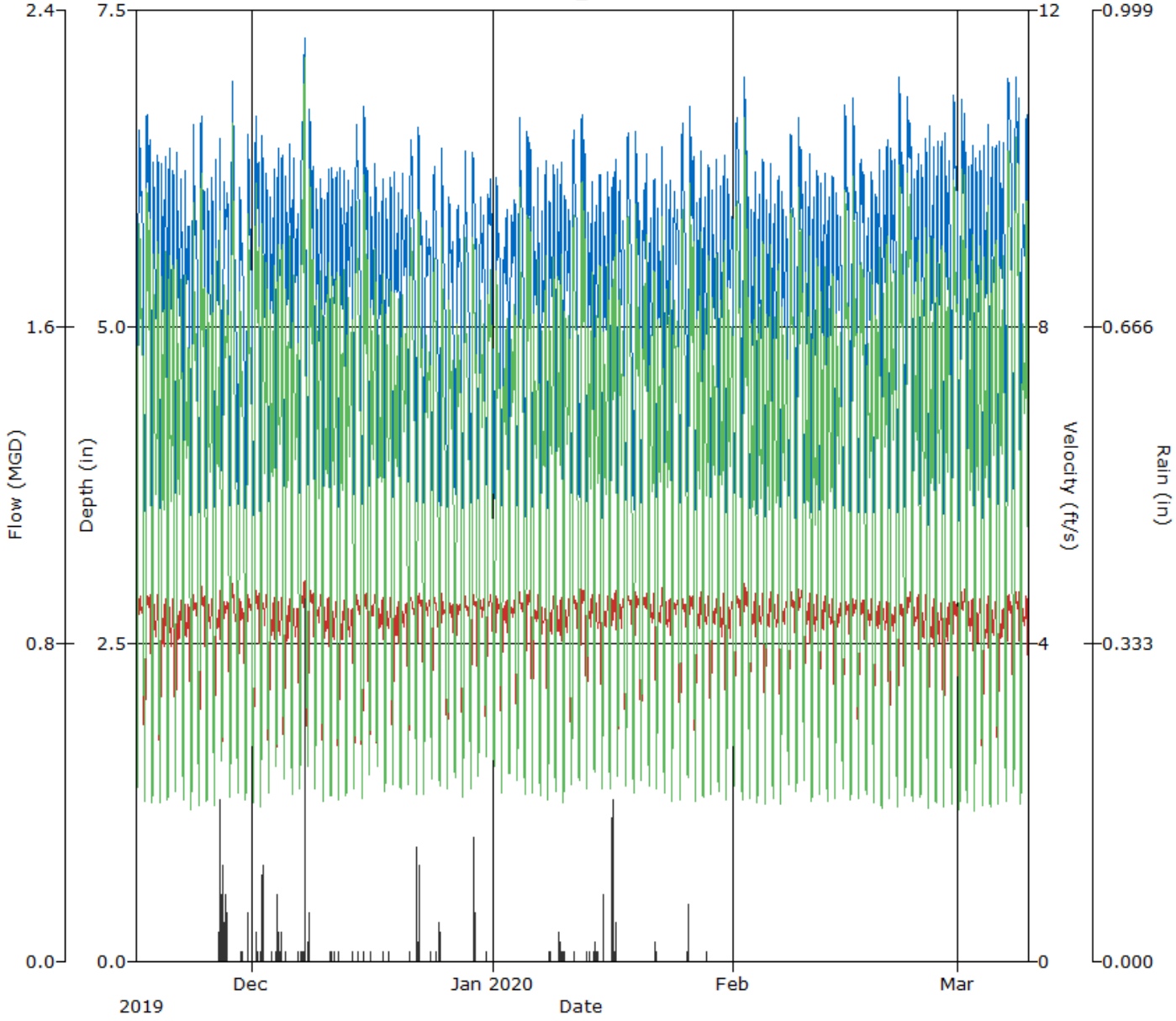


Report Period

11/16/2019
To
3/9/2020

Legend

- Depth
- Velocity
- Quantity
- Rain



ADS ENVIRONMENTAL SERVICES

Daily Tabular Report For The Period 11/16/2019 00:00 - 03/09/2020 23:59

MIL_1043, Pipe Height: 20.75 in, Silt: 0.00 in

Daily Tabular Report

Date	Depth (in)				Velocity (ft/s)				Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
11/16/2019	03:25	3.55	10:30	6.60	5.43	04:55	2.20	13:25	4.68	3.94	04:55	0.387	10:25	1.915	1.316	1.316	
11/17/2019	04:45	3.48	10:40	6.86	5.50	04:30	2.20	21:10	4.74	3.99	04:30	0.373	10:50	2.066	1.366	1.366	
11/18/2019	03:25	3.47	07:55	6.71	5.27	02:20	2.15	20:15	4.73	3.94	04:20	0.372	07:55	2.002	1.251	1.251	
11/19/2019	04:35	3.51	08:05	6.55	5.27	02:55	2.17	07:35	4.63	3.90	04:20	0.381	08:05	1.888	1.238	1.238	
11/20/2019	04:25	3.59	08:10	6.63	5.26	03:30	2.11	07:55	4.70	3.91	03:30	0.377	08:00	1.938	1.235	1.235	
11/21/2019	04:25	3.59	07:55	6.68	5.27	03:35	2.20	18:15	4.70	3.93	03:35	0.400	07:55	1.961	1.242	1.242	
11/22/2019	03:35	3.58	08:05	6.49	5.26	04:25	2.14	08:05	4.62	3.94	04:25	0.382	08:05	1.873	1.240	1.240	
11/23/2019	04:30	3.47	11:00	6.70	5.31	04:00	2.13	11:20	4.71	3.94	04:30	0.361	11:25	1.978	1.276	1.276	
11/24/2019	04:40	3.49	11:10	6.75	5.35	04:45	2.07	11:35	4.82	4.00	04:45	0.350	11:10	2.035	1.314	1.314	
11/25/2019	04:10	3.45	08:05	6.32	5.12	03:20	2.21	21:55	4.65	3.95	04:10	0.371	08:10	1.811	1.203	1.203	
11/26/2019	04:10	3.51	08:00	6.68	5.18	03:45	2.13	07:55	4.82	3.94	03:45	0.373	08:00	2.033	1.223	1.223	0.36
11/27/2019	03:10	3.66	10:10	6.24	5.40	02:35	2.38	21:15	4.64	4.07	03:10	0.439	10:25	1.771	1.324	1.324	0.63
11/28/2019	05:00	3.43	12:10	7.05	5.30	05:00	2.28	12:30	4.98	3.98	05:00	0.375	12:30	2.164	1.288	1.288	
11/29/2019	04:05	3.40	11:15	6.18	5.05	04:20	2.25	11:50	4.70	3.95	04:05	0.390	11:15	1.731	1.177	1.177	0.02
11/30/2019	03:45	3.41	13:15	6.57	5.17	04:10	2.13	11:50	4.69	3.97	05:00	0.357	11:50	1.931	1.237	1.237	0.10
12/01/2019	04:55	3.42	12:45	6.70	5.38	04:15	2.23	18:20	4.74	4.03	04:55	0.366	12:40	2.007	1.334	1.334	0.06
12/02/2019	04:05	3.40	08:15	6.81	5.23	03:05	2.10	08:10	4.75	4.03	03:05	0.348	08:05	2.038	1.267	1.267	0.30
12/03/2019	03:25	3.41	07:55	6.43	5.21	04:25	2.14	20:25	4.64	3.96	04:25	0.375	08:00	1.848	1.232	1.232	0.01
12/04/2019	03:25	3.52	08:05	6.61	5.39	03:25	2.25	08:05	4.77	4.02	03:25	0.383	08:05	1.984	1.303	1.303	0.39
12/05/2019	04:35	3.53	21:35	6.46	5.29	04:10	2.17	07:55	4.66	3.94	04:35	0.392	07:55	1.859	1.251	1.251	0.01
12/06/2019	03:30	3.58	08:15	6.57	5.31	04:45	2.24	17:25	4.62	3.94	03:35	0.402	08:15	1.812	1.253	1.253	0.01
12/07/2019	03:25	3.55	18:15	7.55	5.61	04:25	2.22	18:05	4.90	4.04	04:35	0.392	18:15	2.432	1.417	1.417	0.67
12/08/2019	05:05	3.60	10:55	6.83	5.53	03:35	2.44	20:20	4.75	4.14	05:05	0.436	10:50	2.054	1.404	1.404	0.20
12/09/2019	04:25	3.52	08:05	6.43	5.18	02:40	2.03	20:30	4.71	4.01	02:40	0.364	08:10	1.859	1.233	1.233	
12/10/2019	03:50	3.45	20:50	6.38	5.17	03:45	2.11	20:55	4.68	3.95	03:45	0.356	20:55	1.845	1.212	1.212	
12/11/2019	04:40	3.56	08:10	6.39	5.27	03:30	2.17	20:40	4.62	3.92	04:30	0.387	08:15	1.813	1.240	1.240	0.03
12/12/2019	04:00	3.48	08:00	6.35	5.23	04:05	2.10	08:00	4.60	3.89	04:05	0.356	08:00	1.811	1.220	1.220	0.01
12/13/2019	04:15	3.58	07:55	6.35	5.28	03:15	2.15	07:40	4.63	3.91	03:15	0.386	07:55	1.776	1.237	1.237	0.01
12/14/2019	04:35	3.57	11:05	6.65	5.42	03:25	2.20	14:05	4.68	3.99	03:35	0.397	11:05	1.941	1.322	1.322	0.01
12/15/2019	04:35	3.40	10:50	6.87	5.42	04:15	2.20	10:30	4.71	4.03	04:30	0.380	11:05	2.051	1.347	1.347	0.01
12/16/2019	04:30	3.60	21:20	6.36	5.20	02:40	2.30	21:50	4.66	4.06	03:20	0.422	21:15	1.834	1.256	1.256	0.01
12/17/2019	04:40	3.67	21:55	6.25	5.17	04:25	2.49	21:00	4.67	4.04	04:25	0.460	21:55	1.774	1.229	1.229	0.01
12/18/2019	02:50	3.51	07:50	6.31	5.19	02:55	2.23	22:05	4.68	3.99	02:55	0.390	22:10	1.802	1.232	1.232	0.01
12/19/2019	03:05	3.54	08:25	6.38	5.25	03:20	2.23	07:45	4.71	3.98	03:20	0.399	07:45	1.813	1.246	1.246	
12/20/2019	04:25	3.57	08:05	6.32	5.30	04:40	2.18	18:50	4.68	3.97	04:40	0.399	08:05	1.764	1.259	1.259	
12/21/2019	03:40	3.66	11:55	6.52	5.36	03:30	2.26	14:00	4.67	4.00	04:50	0.418	12:00	1.888	1.302	1.302	0.01
12/22/2019	04:25	3.43	11:00	6.61	5.31	04:15	2.19	19:35	4.75	4.05	04:15	0.379	11:30	1.930	1.304	1.304	0.41
12/23/2019	04:30	3.45	11:00	5.94	5.12	04:25	2.20	12:40	4.62	4.06	04:25	0.373	11:00	1.640	1.224	1.224	
12/24/2019	03:55	3.63	11:50	6.41	5.19	03:30	2.26	12:55	4.78	4.06	03:30	0.414	11:50	1.833	1.252	1.252	0.02
12/25/2019	05:15	3.42	11:15	6.51	5.03	05:25	2.23	11:15	4.72	4.04	05:25	0.387	11:15	1.924	1.190	1.190	0.08
12/26/2019	04:25	3.47	10:10	6.37	5.05	05:00	2.35	10:05	4.67	3.99	04:25	0.406	10:10	1.830	1.188	1.188	
12/27/2019	03:50	3.48	11:45	6.05	5.10	04:30	2.30	22:05	4.61	4.02	04:25	0.393	12:15	1.655	1.207	1.207	
12/28/2019	04:25	3.43	12:05	6.46	5.14	04:45	2.13	12:10	4.64	3.97	04:45	0.373	12:05	1.865	1.220	1.220	
12/29/2019	03:55	3.47	11:55	6.51	5.16	04:35	2.16	10:45	4.73	4.01	04:35	0.381	11:50	1.894	1.242	1.242	0.22
12/30/2019	04:30	3.55	11:30	6.10	5.11	03:30	2.27	12:45	4.79	4.06	03:30	0.396	12:45	1.717	1.226	1.226	
12/31/2019	04:25	3.70	18:20	6.24	5.21	04:20	2.55	19:10	4.68	4.13	04:20	0.469	18:20	1.787	1.275	1.275	0.01

Date	Depth (in)				Velocity (ft/s)				Quantity (MGD - Total MG)					Rain (in)
	Time	Min Time	Max	Avg	Time	Min Time	Max	Avg	Time	Min Time	Max	Avg	Total	Total
01/01/2020	05:40	3.47 12:10	6.24	5.04	05:20	2.63 12:00	4.67	4.08	05:40	0.463 12:10	1.796	1.205	1.205	
01/02/2020	03:45	3.46 21:10	6.01	5.08	03:35	2.27 21:50	4.59	4.05	03:50	0.392 20:30	1.657	1.208	1.208	
01/03/2020	03:00	3.59 19:45	6.07	5.21	03:10	2.28 20:50	4.58	4.04	04:15	0.419 19:45	1.682	1.248	1.248	
01/04/2020	03:30	3.45 12:45	6.72	5.30	04:55	2.41 12:10	4.72	4.03	04:55	0.408 12:10	1.988	1.299	1.299	
01/05/2020	04:25	3.38 10:25	6.66	5.37	04:20	2.27 20:30	4.76	4.08	04:20	0.382 20:30	1.966	1.341	1.341	
01/06/2020	04:00	3.46 20:35	6.33	5.15	03:40	2.12 19:45	4.73	4.04	04:15	0.376 20:35	1.813	1.235	1.235	
01/07/2020	03:25	3.53 21:00	6.38	5.16	04:50	2.25 21:00	4.66	3.96	03:30	0.400 21:00	1.848	1.216	1.216	
01/08/2020	03:55	3.50 09:50	6.39	5.25	03:45	2.18 20:45	4.63	3.94	03:45	0.375 21:00	1.820	1.242	1.242	0.02
01/09/2020	04:10	3.49 08:00	6.57	5.28	04:10	2.25 21:05	4.62	3.97	04:10	0.379 08:00	1.894	1.262	1.262	0.18
01/10/2020	03:10	3.51 08:05	6.34	5.23	03:50	2.12 08:05	4.61	3.96	03:55	0.364 08:05	1.808	1.238	1.238	0.02
01/11/2020	04:05	3.58 11:35	6.58	5.31	04:35	2.26 10:30	4.77	4.01	04:35	0.416 11:45	1.934	1.292	1.292	0.01
01/12/2020	04:10	3.46 12:20	6.82	5.38	03:55	2.24 10:15	4.76	4.09	03:55	0.385 12:15	2.034	1.349	1.349	
01/13/2020	03:45	3.50 07:55	6.35	5.08	02:25	2.25 08:00	4.68	4.04	03:20	0.396 08:00	1.839	1.212	1.212	0.02
01/14/2020	02:30	3.65 08:00	6.31	5.11	02:10	2.42 21:45	4.74	4.01	02:35	0.451 21:45	1.839	1.209	1.209	0.11
01/15/2020	04:30	3.33 20:40	6.32	5.07	04:35	2.47 21:35	4.66	4.03	04:35	0.391 20:40	1.805	1.202	1.202	0.07
01/16/2020	03:25	3.54 20:35	6.43	5.32	03:20	2.27 13:05	4.79	4.08	03:30	0.393 20:25	1.902	1.311	1.311	0.66
01/17/2020	03:40	3.54 09:00	6.89	5.19	04:30	2.32 08:15	4.66	4.07	04:30	0.409 09:00	2.050	1.251	1.251	
01/18/2020	04:00	3.48 11:15	6.56	5.21	04:05	2.28 12:15	4.72	4.07	04:05	0.385 11:15	1.916	1.274	1.274	
01/19/2020	05:00	3.38 11:00	6.68	5.19	04:40	2.31 10:55	4.73	4.07	04:40	0.376 11:00	1.993	1.271	1.271	
01/20/2020	04:05	3.48 21:10	6.45	5.22	04:05	2.39 14:45	4.80	4.11	04:05	0.402 21:10	1.886	1.284	1.284	
01/21/2020	03:45	3.56 21:55	6.25	5.05	04:35	2.24 20:45	4.78	4.05	04:35	0.401 21:50	1.795	1.197	1.197	
01/22/2020	03:00	3.54 21:35	6.48	5.12	04:05	2.17 19:20	4.75	4.06	04:05	0.382 20:55	1.905	1.228	1.228	0.03
01/23/2020	04:35	3.50 08:05	6.41	5.15	03:30	2.13 07:20	4.67	4.03	03:30	0.369 08:00	1.835	1.228	1.228	
01/24/2020	03:15	3.53 10:35	6.15	5.26	04:20	2.15 19:40	4.60	4.04	03:45	0.374 10:35	1.697	1.275	1.275	
01/25/2020	05:20	3.52 11:35	6.75	5.30	04:20	2.18 11:25	4.69	4.01	04:20	0.382 11:35	1.967	1.286	1.286	
01/26/2020	04:10	3.54 12:15	6.80	5.42	03:40	2.33 19:40	4.68	4.09	04:10	0.415 11:30	2.006	1.352	1.352	0.16
01/27/2020	03:40	3.39 20:55	6.46	5.17	04:15	2.16 20:05	4.70	4.02	03:40	0.370 20:50	1.889	1.240	1.240	
01/28/2020	04:15	3.51 20:30	6.46	5.11	03:55	2.17 20:30	4.71	3.98	03:35	0.378 20:30	1.898	1.208	1.208	0.01
01/29/2020	04:20	3.46 21:05	6.37	5.15	03:50	2.09 22:15	4.66	3.99	03:50	0.369 19:50	1.819	1.220	1.220	
01/30/2020	03:45	3.58 21:55	6.44	5.21	04:30	2.14 20:50	4.78	3.98	02:50	0.392 20:50	1.917	1.237	1.237	
01/31/2020	04:00	3.40 08:05	6.34	5.18	02:55	2.12 18:35	4.69	3.98	04:00	0.361 08:10	1.782	1.228	1.228	
02/01/2020	04:15	3.53 10:45	6.85	5.42	04:15	2.34 10:05	4.76	4.06	04:15	0.401 10:45	2.032	1.344	1.344	
02/02/2020	04:50	3.38 11:35	7.06	5.34	03:50	2.18 12:00	4.87	4.09	03:50	0.370 12:00	2.186	1.340	1.340	
02/03/2020	03:50	3.43 21:10	6.29	5.02	03:40	2.25 19:25	4.72	4.05	03:40	0.380 21:10	1.832	1.194	1.194	
02/04/2020	04:15	3.40 20:45	6.49	5.05	04:10	2.22 20:55	4.72	4.04	04:10	0.363 20:45	1.911	1.203	1.203	
02/05/2020	03:10	3.42 20:45	6.34	5.05	03:00	2.20 21:05	4.71	4.02	03:00	0.369 21:00	1.849	1.197	1.197	
02/06/2020	04:10	3.37 21:25	6.28	5.06	03:40	2.13 20:45	4.68	4.02	04:10	0.358 21:25	1.801	1.198	1.198	
02/07/2020	03:25	3.49 08:05	6.37	5.09	03:30	2.12 07:50	4.64	4.00	03:20	0.367 08:05	1.806	1.200	1.200	
02/08/2020	03:55	3.49 11:45	6.62	5.31	03:55	2.14 12:10	4.70	4.08	03:55	0.360 11:50	1.952	1.310	1.310	
02/09/2020	04:25	3.38 10:45	6.81	5.32	03:40	2.22 10:50	4.80	4.09	03:40	0.370 10:50	2.066	1.331	1.331	
02/10/2020	04:15	3.47 08:00	6.61	5.08	02:50	2.28 20:50	4.77	4.08	04:10	0.386 08:00	1.958	1.223	1.223	
02/11/2020	04:40	3.47 08:05	6.35	5.01	03:15	2.18 20:00	4.67	4.00	03:15	0.365 20:45	1.806	1.176	1.176	
02/12/2020	04:10	3.35 08:05	6.35	5.07	04:15	2.16 08:15	4.67	4.02	04:15	0.345 08:15	1.828	1.204	1.204	
02/13/2020	04:10	3.32 07:55	6.36	5.07	03:30	2.19 07:55	4.70	4.00	04:10	0.349 07:55	1.852	1.198	1.198	
02/14/2020	04:00	3.40 08:05	6.19	5.14	04:55	2.19 18:10	4.60	4.00	04:00	0.360 07:55	1.735	1.215	1.215	
02/15/2020	04:25	3.41 10:45	6.81	5.38	04:40	2.24 11:05	4.66	4.03	04:25	0.388 11:05	1.992	1.323	1.323	
02/16/2020	03:40	3.34 11:15	6.86	5.34	03:30	2.18 10:30	4.67	3.98	03:45	0.367 11:10	2.015	1.308	1.308	
02/17/2020	04:25	3.43 10:45	6.50	5.28	04:05	2.14 10:55	4.62	3.99	03:50	0.380 10:55	1.868	1.277	1.277	
02/18/2020	04:25	3.30 20:20	6.30	5.10	03:20	2.24 20:10	4.62	4.01	04:20	0.368 20:20	1.798	1.208	1.208	
02/19/2020	03:00	3.45 22:00	6.53	5.22	03:25	2.20 18:35	4.58	3.95	03:00	0.372 22:00	1.855	1.238	1.238	
02/20/2020	03:30	3.38 21:10	6.55	5.32	04:45	2.12 20:55	4.80	3.93	04:35	0.357 20:55	1.911	1.265	1.265	
02/21/2020	04:15	3.53 09:10	6.47	5.36	04:55	2.16 09:10	4.57	3.91	03:35	0.381 09:10	1.845	1.273	1.273	
02/22/2020	04:25	3.42 11:25	7.00	5.53	04:25	2.07 09:20	4.67	3.93	04:25	0.340 11:25	2.061	1.355	1.355	
02/23/2020	04:40	3.39 11:05	6.89	5.59	03:45	2.17 12:50	4.70	4.02	04:40	0.370 10:55	2.051	1.410	1.410	
02/24/2020	04:05	3.43 21:45	6.49	5.24	04:30	2.15 20:10	4.71	3.98	04:30	0.365 21:40	1.863	1.255	1.255	

Date	Depth (in)					Velocity (ft/s)					Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
02/25/2020	03:20	3.52	21:50	6.55	5.24	03:50	2.11	20:40	4.66	3.93	03:50	0.374	20:45	1.907	1.239	1.239	
02/26/2020	03:35	3.29	08:05	6.65	5.27	04:15	2.06	21:30	4.65	3.89	04:15	0.337	08:05	1.927	1.241	1.241	
02/27/2020	04:05	3.36	07:55	6.60	5.31	04:30	2.04	20:10	4.56	3.90	03:20	0.341	08:00	1.868	1.250	1.250	
02/28/2020	02:55	3.41	08:35	6.63	5.35	04:05	2.12	20:10	4.55	3.90	04:05	0.355	08:35	1.870	1.264	1.264	
02/29/2020	04:10	3.42	11:30	6.93	5.55	04:20	2.04	18:05	4.64	3.95	04:20	0.340	11:30	2.053	1.364	1.364	
03/01/2020	04:55	3.36	11:05	6.91	5.51	04:20	2.09	10:40	4.83	4.00	04:20	0.342	10:40	2.097	1.380	1.380	
03/02/2020	04:00	3.34	07:50	6.60	5.23	04:00	1.93	07:35	4.69	3.94	04:00	0.306	07:50	1.945	1.239	1.239	
03/03/2020	04:00	3.29	08:00	6.50	5.23	04:10	2.04	19:50	4.63	3.88	04:35	0.336	08:05	1.856	1.226	1.226	
03/04/2020	03:30	3.40	07:55	6.73	5.31	04:05	2.14	07:55	4.83	3.91	04:05	0.353	07:55	2.059	1.256	1.256	
03/05/2020	04:50	3.42	20:15	6.57	5.32	04:25	2.15	20:15	4.63	3.92	04:00	0.362	20:15	1.912	1.264	1.264	
03/06/2020	04:10	3.53	08:00	6.59	5.43	03:55	2.06	07:50	4.56	3.89	03:55	0.354	07:55	1.887	1.286	1.286	
03/07/2020	04:45	3.52	11:35	7.03	5.66	03:35	2.14	12:30	4.70	3.96	04:45	0.376	12:30	2.101	1.410	1.410	
03/08/2020	05:15	3.65	11:40	7.12	5.65	03:50	2.10	09:50	4.77	4.02	03:50	0.378	11:40	2.161	1.427	1.427	
03/09/2020	02:35	3.46	20:35	6.75	5.39	02:35	2.06	20:10	4.72	3.95	02:35	0.343	20:10	1.980	1.296	1.295	

Report Summary For The Period 11/16/2019 00:00 - 03/09/2020 23:59

	Depth (in)	Velocity (ft/s)	Quantity (MGD - Total MG)	Rain (in)
Total			145.284	4.90
Avg	5.25	4.00	1.263	

Site Commentary

Site Information

MIL_1193	
Pipe Dimensions	21
Silt Level	0.00"

Overview

Site MIL_1193 functioned under normal conditions during the period Saturday, November 16, 2019 to Monday, March 9, 2020 . This site exhibited a small response to the wet weather events of November 26, 2019 - November 27, 2019, December 7, 2019 - December 8, 2019, and January 16, 2020 - January 17, 2020. Review of the scattergraph shows that free flow conditions were recorded during the study period.

Flow depth and velocity measurements recorded by the flow monitor are consistent with field confirmations conducted to date and support the relative accuracy of the flow monitor at this location. Due to a meter malfunction, data confidence is less than typical during December 16, 2019 through December 20, 2019. A data gap occurs during December 20, 2020 at 10:00 pm through December 27, 2020 at 6:00 am.

This location was installed upstream of sites MIL_1043 and MIL_2840. (See MIL_1043 and MIL_2840 Site Commentary for More Details)

Observations

Average flow depth, velocity, and quantity data observed during Saturday, November 16, 2019 to Monday, March 9, 2020 , along with observed minimum and maximum data, are provided in the following table.

Observed Flow Conditions			
Item	Depth (in)	Velocity (ft/s)	Quantity (MGD)
Average	4.15	2.59	0.600
Minimum	2.34	1.36	0.136
Maximum	6.11	3.72	1.368
Time of Minimum	11/19/2019 4:20 AM	3/4/2020 3:15 AM	2/18/2020 3:50 AM
Time of Maximum	1/8/2020 9:25 AM	2/2/2020 1:10 PM	1/8/2020 9:25 AM

Data Quality

Data uptime observed during the Saturday, November 16, 2019 to the Monday, March 9, 2020 monitoring period is provided in the table below. Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

Percent Uptime	
Depth (in)	95
Velocity (ft/s)	95
Quantity (MGD)	95

Milpitas Temp Study 2019-20

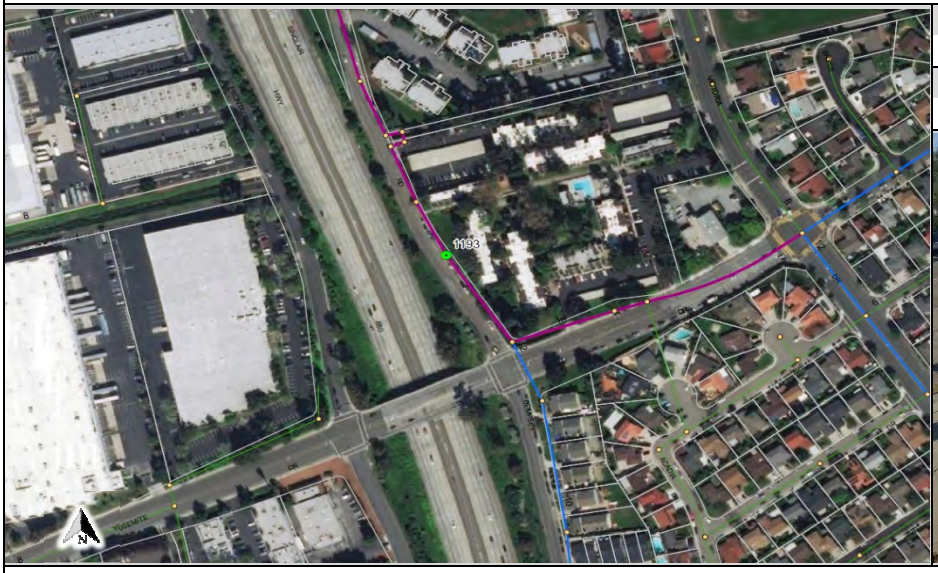
Flow Monitoring Site Report

ADS ENVIRONMENTAL SERVICES®

Site Name

MIL_1193

Site Address /Location:	Yosemite Dr and Dempsey Rd, Milpitas, CA			Monitor Series	Location Type
				TRITON+	Temporary
Site Access Details:	DRIVE.	Latitude:	37.426666°	Pipe Size (H x W)	Pipe Shape
		Longitude:	-121.883676°	21.00"x21.00"	Circular



Manhole #	System Characteristics
1193	Residential/Commercial
Access	Traffic
Drive	Light







Installation Information

Installation Date:	Installation Type:
Thursday, November 14, 2019	Doppler Standard Ring and Crank
Monitoring Location (Sensors):	Monitor Location:
Upstream 0-5 FT	Manhole
Sensors / Devices:	Pressure Sensor Range (psi)
Peak Combo (CS4)	0 - 5 psi

Installation Confirmation:

Confirmation Time:	Pipe Size (HxW)
8:09:00 AM	21.00"x21.00"
Depth of Flow (Wet DOF) (in)	Range (Air DOF) (in)
5.13"	
Downlooker Physical Offset (in)	Measurement Confidence (in)
NA	0.25"
Peak Velocity (fps)	Velocity Sensor Offset (in)
3.50'	0''
Silt (in)	Silt Type
0.0"	

Hydraulic Comments:

Smooth flow with medium depth and moderate velocity

Manhole / Pipe Information:

Manhole Depth (Approx. FT):	Manhole Configuration
15'	Single
Manhole Material:	Manhole Condition:
Concrete	Good
Manhole Opening Diameter (in)	Manhole Diameter (Approx.):
26''	54''
Manhole Cover	Manhole Frame
Unbolted	Normal
Active Drop Connections	Air Quality:
No	Normal
Pipe Material	Pipe Condition:
Concrete	Good

Communication Information:

Communication Type	Antenna Location
Wireless	Drilled Pavement / Concrete

Additional Site Info. / Comments:

ADS Project Name:	Milpitas.WWTFM.CA2019-2020
ADS Project Number:	22431.11.325

SCATTERGRAPH REPORT

MIL_1193

Flow Monitor

MIL_1193

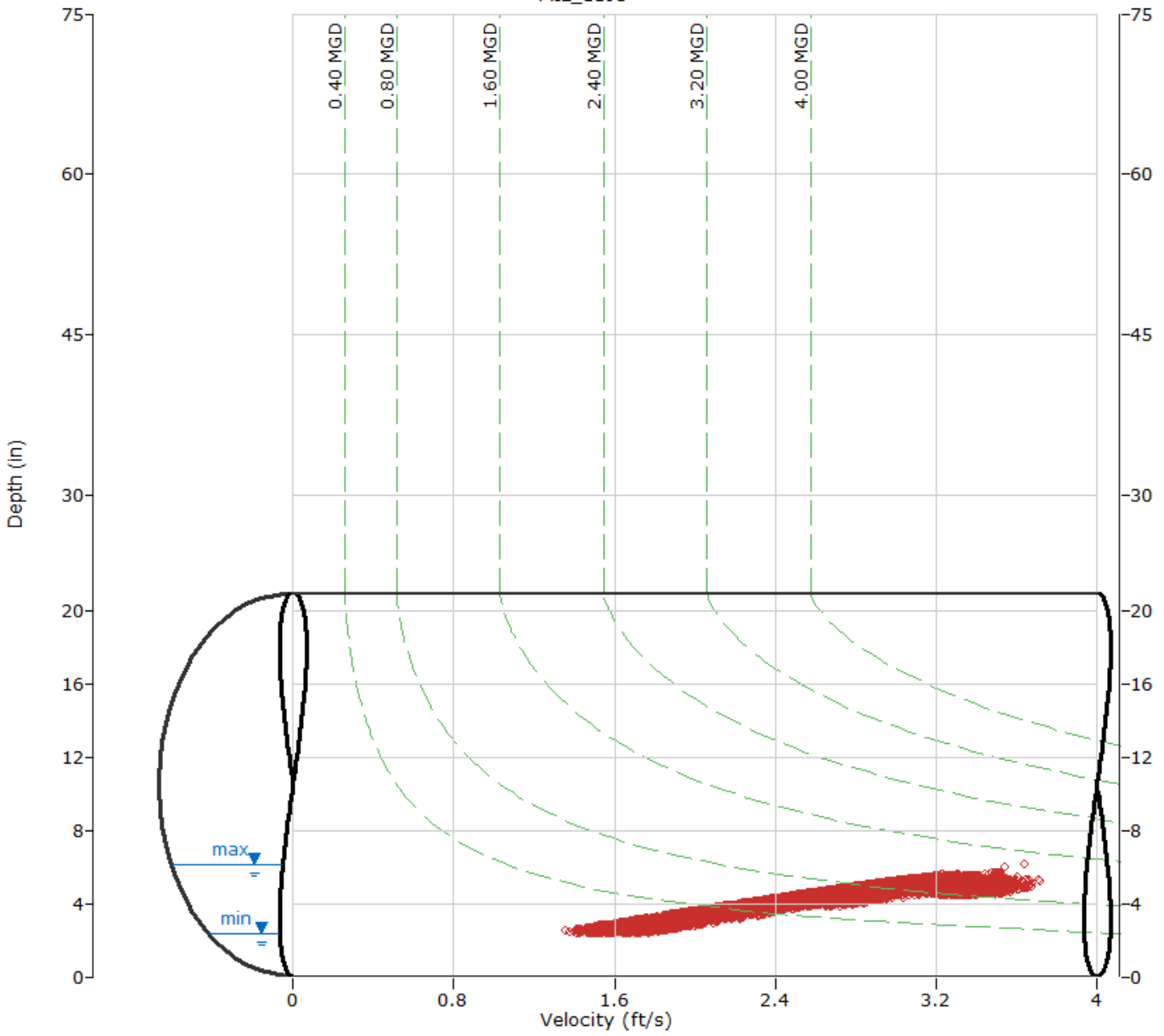
Pipe Height
21.00 in

Report Period

11/16/2019
To
3/9/2020

Legend

- Depth - Velocity
- Iso-Q™
- Silt
- Min-Max Depth



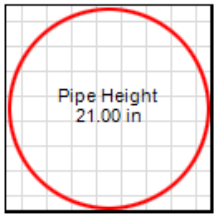
ADS ENVIRONMENTAL SERVICES

HYDROGRAPH REPORT

MIL_1193

Flow Monitor

MIL_1193

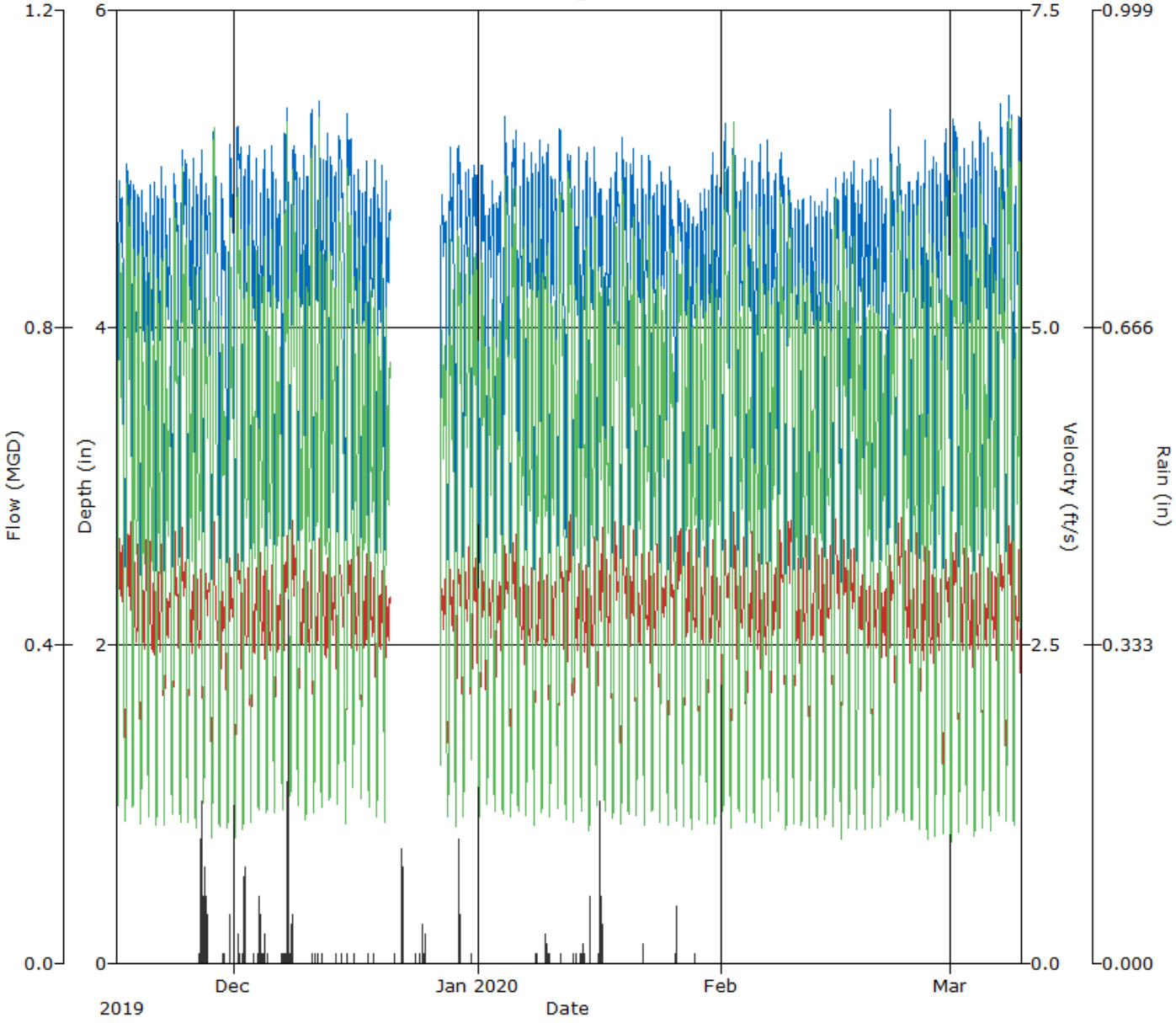


Report Period

11/16/2019
To
3/9/2020

Legend

- Depth
- Velocity
- Quantity
- Rain



Daily Tabular Report For The Period 11/16/2019 00:00 - 03/09/2020 23:59

MIL_1193, Pipe Height: 21.00 in, Silt: 0.00 in

Daily Tabular Report

Date	Depth (in)				Velocity (ft/s)				Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
11/16/2019	04:20	2.45	10:35	4.97	4.10	05:00	1.62	12:00	3.42	2.66	04:20	0.176	10:35	0.938	0.607	0.607	
11/17/2019	05:25	2.41	10:20	5.31	4.16	04:00	1.60	10:20	3.60	2.76	05:25	0.161	10:20	1.111	0.653	0.653	
11/18/2019	03:15	2.54	07:45	5.11	4.01	04:40	1.67	07:50	3.54	2.62	04:40	0.186	07:50	1.027	0.572	0.572	
11/19/2019	04:20	2.34	07:50	5.05	3.92	04:45	1.62	21:40	3.44	2.61	04:15	0.161	07:50	0.981	0.555	0.555	
11/20/2019	04:20	2.37	07:50	5.24	3.99	04:15	1.53	07:45	3.48	2.57	04:15	0.150	07:50	1.053	0.558	0.558	
11/21/2019	03:55	2.39	07:45	5.11	4.01	03:45	1.52	22:00	3.50	2.59	03:55	0.149	07:45	0.993	0.568	0.568	
11/22/2019	03:55	2.37	07:50	5.13	4.02	03:40	1.60	07:45	3.50	2.56	03:40	0.156	07:50	1.024	0.560	0.560	
11/23/2019	05:30	2.36	09:00	5.14	4.12	05:25	1.52	12:00	3.58	2.68	05:25	0.149	10:40	1.038	0.617	0.617	
11/24/2019	04:20	2.41	11:05	5.21	4.23	04:10	1.54	10:50	3.62	2.67	04:10	0.154	10:50	1.080	0.643	0.643	
11/25/2019	04:20	2.44	21:45	5.13	4.08	02:35	1.54	07:45	3.51	2.51	04:00	0.164	07:45	0.991	0.566	0.566	
11/26/2019	04:10	2.42	20:40	5.20	4.09	04:10	1.49	07:40	3.55	2.51	04:10	0.148	07:40	1.050	0.570	0.570	0.36
11/27/2019	03:10	2.64	09:30	5.03	4.20	04:20	1.57	10:45	3.25	2.59	03:10	0.189	10:55	0.908	0.604	0.604	0.63
11/28/2019	04:45	2.37	10:55	5.34	4.12	04:35	1.47	13:10	3.60	2.57	04:35	0.143	11:50	1.082	0.598	0.598	
11/29/2019	03:55	2.43	10:55	5.14	4.02	04:35	1.47	10:50	3.16	2.45	04:35	0.154	10:50	0.933	0.542	0.542	0.02
11/30/2019	04:55	2.46	12:45	5.23	4.20	04:05	1.47	13:35	3.30	2.53	04:45	0.152	13:35	0.968	0.603	0.603	0.10
12/01/2019	04:10	2.43	11:50	5.43	4.32	04:30	1.43	21:05	3.39	2.60	04:30	0.143	11:45	1.051	0.651	0.651	0.06
12/02/2019	03:10	2.51	21:30	5.46	4.18	03:35	1.43	08:00	3.38	2.51	03:35	0.151	21:30	1.067	0.588	0.588	0.30
12/03/2019	04:20	2.52	07:45	5.36	4.09	02:40	1.52	07:45	3.30	2.49	04:20	0.166	07:45	1.032	0.562	0.562	0.01
12/04/2019	03:05	2.53	21:40	5.18	4.13	02:55	1.54	07:45	3.55	2.54	02:55	0.167	07:15	0.999	0.578	0.578	0.39
12/05/2019	04:00	2.48	20:45	5.23	4.13	04:00	1.41	07:35	3.39	2.51	04:00	0.145	21:35	0.967	0.573	0.573	0.01
12/06/2019	04:05	2.59	07:55	5.18	4.14	04:00	1.56	07:55	3.18	2.49	04:00	0.173	07:55	0.949	0.567	0.567	0.01
12/07/2019	04:00	2.60	18:00	5.68	4.33	04:15	1.64	18:20	3.54	2.65	04:15	0.184	18:00	1.195	0.656	0.656	0.67
12/08/2019	04:35	2.68	19:10	5.37	4.34	04:25	1.67	10:50	3.61	2.73	04:25	0.194	13:05	1.058	0.676	0.676	0.20
12/09/2019	04:15	2.60	07:35	5.25	4.16	03:20	1.56	07:55	3.42	2.53	03:20	0.178	07:45	1.007	0.582	0.582	
12/10/2019	03:20	2.50	20:30	5.44	4.17	03:00	1.49	20:30	3.36	2.52	03:00	0.159	20:30	1.073	0.586	0.586	
12/11/2019	04:10	2.56	21:40	5.63	4.24	04:20	1.42	21:40	3.48	2.56	04:20	0.157	21:40	1.167	0.609	0.609	0.03
12/12/2019	03:45	2.61	08:00	5.53	4.22	02:45	1.52	08:00	3.41	2.55	02:45	0.182	08:00	1.116	0.599	0.599	0.01
12/13/2019	03:15	2.66	21:35	5.49	4.27	04:40	1.54	21:35	3.39	2.59	04:40	0.184	21:35	1.096	0.616	0.616	0.01
12/14/2019	04:25	2.68	09:00	5.35	4.33	04:10	1.51	09:00	3.29	2.61	04:10	0.180	09:00	1.027	0.638	0.638	0.01
12/15/2019	05:25	2.56	10:25	5.50	4.42	04:30	1.43	10:35	3.34	2.66	04:30	0.155	10:35	1.069	0.682	0.682	0.01
12/16/2019	04:15	2.75	07:35	5.13	4.18	03:45	1.54	21:25	3.51	2.60	03:45	0.189	07:40	0.985	0.598	0.598	0.01
12/17/2019	04:35	2.63	20:25	5.30	4.10	03:55	1.68	21:20	3.51	2.57	04:30	0.196	20:55	1.018	0.578	0.578	0.01
12/18/2019	03:30	2.63	21:30	5.12	4.10	03:10	1.58	21:35	3.52	2.56	03:10	0.183	21:35	0.959	0.578	0.578	0.01
12/19/2019	04:00	2.53	07:40	5.23	4.03	04:50	1.51	07:45	3.32	2.50	04:50	0.164	19:55	0.941	0.551	0.551	
12/20/2019	04:50	2.56	08:05	5.23	4.14	04:20	1.53	08:10	3.17	2.50	04:20	0.167	08:10	0.941	0.572	0.467	
12/21/2019	00:00		00:00			00:00		00:00			00:00		00:00				0.01
12/22/2019	00:00		00:00			00:00		00:00			00:00		00:00				0.41
12/23/2019	00:00		00:00			00:00		00:00			00:00		00:00				
12/24/2019	00:00		00:00			00:00		00:00			00:00		00:00				0.02
12/25/2019	00:00		00:00			00:00		00:00			00:00		00:00				0.08
12/26/2019	00:00		00:00			00:00		00:00			00:00		00:00				
12/27/2019	05:50	2.90	21:50	5.20	4.47	06:15	1.82	21:35	3.54	2.72	05:50	0.246	21:50	1.001	0.669	0.506	
12/28/2019	04:55	2.49	19:50	5.39	4.16	02:50	1.60	19:50	3.32	2.53	05:35	0.171	19:50	1.048	0.591	0.591	
12/29/2019	05:20	2.49	13:20	5.33	4.25	05:10	1.43	10:30	3.33	2.57	05:10	0.150	13:20	1.019	0.622	0.622	0.22
12/30/2019	04:30	2.52	22:00	5.16	4.18	04:30	1.59	21:05	3.56	2.59	04:30	0.168	21:05	0.977	0.605	0.605	
12/31/2019	03:55	2.95	18:45	5.17	4.26	03:20	1.72	10:55	3.61	2.64	03:20	0.233	10:55	1.013	0.623	0.623	0.01

Date	Depth (in)				Velocity (ft/s)				Quantity (MGD - Total MG)					Rain (in)
	Time	Min Time	Max	Avg	Time	Min Time	Max	Avg	Time	Min Time	Max	Avg	Total	Total
01/01/2020	05:15	2.39 11:45	5.15	4.10	05:20	1.57 10:50	3.47	2.56	05:15	0.162 12:00	0.966	0.581	0.581	
01/02/2020	03:25	2.60 22:00	5.08	4.14	03:25	1.59 22:00	3.29	2.54	03:25	0.177 22:00	0.956	0.577	0.577	
01/03/2020	03:45	2.44 18:00	4.98	4.16	03:50	1.57 18:00	3.20	2.56	03:50	0.166 18:00	0.903	0.587	0.587	
01/04/2020	03:35	2.46 12:25	5.60	4.24	03:35	1.56 12:25	3.46	2.62	03:35	0.159 12:25	1.152	0.630	0.630	
01/05/2020	04:40	2.54 19:05	5.53	4.30	03:25	1.52 21:30	3.68	2.66	04:30	0.174 19:05	1.117	0.657	0.657	
01/06/2020	03:55	2.54 19:20	5.25	4.22	04:10	1.54 19:20	3.37	2.55	04:10	0.172 19:20	1.025	0.599	0.599	
01/07/2020	04:15	2.51 19:45	5.19	4.19	04:05	1.48 19:40	3.23	2.52	04:05	0.161 19:45	0.962	0.589	0.589	
01/08/2020	03:25	2.37 09:25	6.11	4.17	03:35	1.50 09:25	3.64	2.53	03:35	0.146 09:25	1.368	0.590	0.590	0.02
01/09/2020	03:20	2.58 07:50	5.26	4.19	04:00	1.63 21:25	3.17	2.51	04:00	0.181 07:45	0.958	0.587	0.587	0.18
01/10/2020	04:05	2.45 07:45	5.30	4.18	03:50	1.57 21:50	3.24	2.53	03:50	0.162 07:50	0.975	0.586	0.586	0.02
01/11/2020	04:35	2.59 10:00	5.33	4.27	04:25	1.60 10:10	3.36	2.64	04:25	0.177 10:10	1.002	0.641	0.641	0.01
01/12/2020	04:25	2.60 17:45	5.36	4.31	03:35	1.53 20:55	3.68	2.73	04:25	0.171 10:40	1.056	0.676	0.676	
01/13/2020	03:55	2.51 20:30	5.25	4.14	03:35	1.55 07:45	3.49	2.55	03:50	0.166 07:45	1.015	0.584	0.584	0.02
01/14/2020	04:05	2.57 20:45	5.29	4.15	02:55	1.62 08:00	3.53	2.55	04:20	0.181 21:25	1.010	0.588	0.588	0.11
01/15/2020	03:15	2.44 07:40	5.26	4.10	03:55	1.47 21:35	3.65	2.55	03:55	0.150 07:40	1.037	0.582	0.582	0.07
01/16/2020	04:10	2.57 07:30	5.12	4.15	05:05	1.58 07:45	3.57	2.71	04:15	0.180 09:20	0.994	0.623	0.623	0.66
01/17/2020	04:10	2.52 09:00	5.10	4.13	03:50	1.54 07:50	3.55	2.59	04:25	0.165 07:50	0.955	0.590	0.590	
01/18/2020	03:35	2.53 12:45	5.43	4.18	03:55	1.55 11:00	3.59	2.66	03:35	0.174 12:45	1.028	0.629	0.629	
01/19/2020	04:30	2.48 09:55	5.32	4.23	04:20	1.49 12:00	3.65	2.65	04:20	0.161 10:40	1.063	0.638	0.638	
01/20/2020	03:45	2.54 19:20	5.33	4.24	04:55	1.57 21:05	3.64	2.62	04:20	0.173 19:05	1.016	0.627	0.627	
01/21/2020	04:20	2.48 07:35	5.29	4.12	03:15	1.59 21:30	3.53	2.55	03:15	0.172 21:30	1.001	0.580	0.580	
01/22/2020	03:40	2.43 19:45	5.18	4.15	04:05	1.54 21:35	3.63	2.61	04:05	0.161 21:35	1.044	0.601	0.601	0.03
01/23/2020	04:15	2.48 07:45	5.07	4.07	04:25	1.52 21:35	3.49	2.58	04:25	0.159 07:45	1.001	0.577	0.577	
01/24/2020	04:10	2.41 09:15	5.16	4.16	04:00	1.59 08:30	3.20	2.61	04:00	0.158 21:45	0.906	0.602	0.602	
01/25/2020	03:50	2.45 12:55	5.15	4.09	04:20	1.61 10:55	3.57	2.63	04:20	0.166 10:55	1.024	0.600	0.600	
01/26/2020	04:50	2.40 17:30	5.02	4.10	04:50	1.62 12:05	3.57	2.77	04:50	0.159 11:35	0.980	0.635	0.635	0.16
01/27/2020	04:20	2.39 18:30	5.05	4.01	04:30	1.53 21:20	3.64	2.63	04:20	0.150 21:05	0.975	0.578	0.578	
01/28/2020	03:50	2.36 08:00	5.34	3.95	04:25	1.54 21:40	3.61	2.63	03:50	0.152 08:00	1.085	0.564	0.564	0.01
01/29/2020	03:55	2.49 08:15	5.17	4.05	04:25	1.56 19:25	3.46	2.58	04:25	0.171 21:05	0.963	0.574	0.574	
01/30/2020	03:40	2.46 21:50	5.27	4.10	03:05	1.60 20:30	3.46	2.56	03:50	0.167 21:35	0.988	0.581	0.581	
01/31/2020	04:10	2.48 08:15	5.19	4.10	03:10	1.59 07:50	3.46	2.55	03:55	0.166 07:35	0.969	0.574	0.574	
02/01/2020	04:35	2.56 10:25	5.55	4.29	04:35	1.60 10:35	3.48	2.64	04:35	0.172 10:25	1.134	0.644	0.644	
02/02/2020	04:25	2.41 11:50	5.28	4.23	04:35	1.59 13:10	3.72	2.72	04:25	0.159 11:50	1.137	0.660	0.660	
02/03/2020	04:10	2.43 20:05	5.25	4.09	04:05	1.50 21:05	3.50	2.61	04:05	0.150 20:00	0.981	0.589	0.589	
02/04/2020	04:00	2.43 19:50	5.22	4.07	04:10	1.60 20:30	3.49	2.59	04:00	0.162 07:35	1.013	0.581	0.581	
02/05/2020	03:05	2.47 21:15	5.43	4.08	03:45	1.63 20:20	3.51	2.55	03:05	0.171 21:15	1.066	0.575	0.575	
02/06/2020	04:15	2.46 21:10	5.27	4.13	04:30	1.54 08:00	3.46	2.52	04:15	0.161 08:00	1.009	0.578	0.578	
02/07/2020	03:50	2.46 19:20	5.09	4.15	03:25	1.64 07:35	3.36	2.56	03:50	0.171 19:20	0.964	0.589	0.589	
02/08/2020	03:45	2.52 09:00	5.25	4.25	04:50	1.65 10:10	3.58	2.71	04:50	0.179 12:25	1.010	0.654	0.654	
02/09/2020	04:50	2.40 14:25	5.04	4.08	04:40	1.53 20:15	3.64	2.80	04:40	0.152 10:45	1.024	0.644	0.644	
02/10/2020	04:20	2.46 22:10	5.05	3.97	03:20	1.62 21:40	3.49	2.64	03:50	0.167 07:45	0.992	0.572	0.572	
02/11/2020	04:20	2.42 07:45	5.00	3.95	03:00	1.52 07:40	3.59	2.62	03:00	0.155 07:40	1.005	0.563	0.563	
02/12/2020	04:05	2.39 18:55	5.04	3.99	03:50	1.49 20:05	3.46	2.60	03:50	0.150 07:50	0.946	0.566	0.566	
02/13/2020	03:50	2.37 19:10	5.07	3.98	02:30	1.64 19:50	3.49	2.61	03:50	0.159 19:50	0.983	0.567	0.567	
02/14/2020	04:15	2.40 08:55	4.98	4.00	03:35	1.52 21:50	3.46	2.66	03:35	0.160 07:25	0.907	0.580	0.580	
02/15/2020	04:40	2.38 11:00	5.12	4.08	04:30	1.54 11:00	3.66	2.73	04:30	0.150 11:00	1.075	0.623	0.623	
02/16/2020	04:20	2.35 13:40	5.13	4.11	04:40	1.48 18:55	3.60	2.67	04:40	0.143 18:55	0.994	0.618	0.618	
02/17/2020	04:00	2.49 12:40	5.15	4.17	04:30	1.41 10:15	3.49	2.61	04:30	0.151 11:45	0.969	0.614	0.614	
02/18/2020	04:00	2.36 19:55	5.24	4.10	03:50	1.41 20:00	3.45	2.51	03:50	0.136 20:00	0.966	0.571	0.571	
02/19/2020	03:40	2.47 21:35	5.18	4.09	04:10	1.49 21:25	3.31	2.47	04:10	0.157 21:40	0.979	0.558	0.558	
02/20/2020	03:40	2.48 21:40	5.25	4.12	03:35	1.49 21:15	3.18	2.51	03:35	0.158 21:40	0.960	0.573	0.573	
02/21/2020	04:00	2.47 08:50	5.03	4.10	04:15	1.52 20:45	3.09	2.50	04:15	0.159 08:50	0.878	0.565	0.565	
02/22/2020	03:20	2.58 11:00	5.51	4.23	04:20	1.48 10:35	3.37	2.59	04:25	0.169 10:45	1.081	0.621	0.621	
02/23/2020	05:10	2.60 11:05	5.23	4.25	03:45	1.55 20:55	3.66	2.76	04:15	0.176 12:25	1.035	0.671	0.671	
02/24/2020	04:20	2.44 20:45	5.13	4.08	02:10	1.50 21:25	3.50	2.61	04:20	0.162 19:45	0.975	0.589	0.589	

Date	Depth (in)					Velocity (ft/s)					Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
02/25/2020	04:15	2.51	21:15	5.13	4.05	04:30	1.54	20:25	3.58	2.57	04:00	0.163	20:25	1.004	0.574	0.574	
02/26/2020	04:15	2.39	21:00	5.36	4.11	03:55	1.45	21:05	3.50	2.53	04:15	0.144	21:40	1.058	0.579	0.579	
02/27/2020	04:20	2.42	07:40	5.31	4.14	04:00	1.38	07:35	3.56	2.51	04:00	0.140	07:40	1.097	0.580	0.580	
02/28/2020	03:15	2.43	07:30	5.41	4.16	04:15	1.49	07:45	3.46	2.49	03:20	0.152	07:40	1.029	0.577	0.577	
02/29/2020	03:45	2.39	11:10	5.42	4.27	05:25	1.42	11:10	3.26	2.59	05:25	0.148	11:10	1.037	0.635	0.635	
03/01/2020	05:00	2.40	19:00	5.40	4.33	04:35	1.40	20:05	3.57	2.65	04:35	0.137	22:15	1.089	0.671	0.671	
03/02/2020	04:00	2.39	07:50	5.24	4.11	03:50	1.43	07:20	3.56	2.53	03:55	0.143	07:35	1.031	0.582	0.582	
03/03/2020	04:05	2.43	07:20	5.26	4.13	02:45	1.46	07:45	3.41	2.53	04:05	0.157	21:15	0.997	0.584	0.584	
03/04/2020	04:10	2.40	20:25	5.49	4.13	03:15	1.36	07:30	3.54	2.53	03:15	0.139	20:25	1.099	0.585	0.585	
03/05/2020	04:20	2.38	21:15	5.45	4.19	04:15	1.42	07:35	3.33	2.53	04:15	0.139	07:35	1.053	0.595	0.595	
03/06/2020	04:05	2.45	07:30	5.37	4.18	03:50	1.43	07:35	3.33	2.53	03:50	0.146	07:45	1.036	0.591	0.591	
03/07/2020	04:30	2.55	10:30	5.47	4.32	05:00	1.58	10:10	3.36	2.64	04:15	0.174	10:10	1.079	0.655	0.655	
03/08/2020	04:30	2.57	11:35	5.58	4.40	03:05	1.52	20:35	3.60	2.69	04:30	0.170	12:00	1.135	0.689	0.689	
03/09/2020	03:15	2.47	19:55	5.60	4.21	03:15	1.41	19:40	3.48	2.55	03:15	0.144	19:55	1.100	0.602	0.602	

Report Summary For The Period 11/16/2019 00:00 - 03/09/2020 23:59

	Depth (in)	Velocity (ft/s)	Quantity (MGD - Total MG)	Rain (in)
Total			65.190	4.90
Avg	4.15	2.59	0.600	

Site Commentary

Site Information

MIL_1564	
Pipe Dimensions	8
Silt Level	0.00"

Overview

Site MIL_1564 functioned under normal conditions during the period Saturday, November 16, 2019 to Monday, March 9, 2020 . This site exhibited an observable response to the wet weather events of November 26, 2019 - November 27, 2019 and December 7, 2019 - December 8, 2019. Surcharge conditions were experienced at this location. Review of the scattergraph shows that both free flow and backwater flows were recorded during the study period.

Flow depth and velocity measurements recorded by the flow monitor are consistent with field confirmations conducted to date and support the relative accuracy of the flow monitor at this location.

Observations

Average flow depth, velocity, and quantity data observed during Saturday, November 16, 2019 to Monday, March 9, 2020 , along with observed minimum and maximum data, are provided in the following table.

Observed Flow Conditions			
Item	Depth (in)	Velocity (ft/s)	Quantity (MGD)
Average	1.60	2.40	0.078
Minimum	1.17	0.49	0.011
Maximum	21.57	4.82	0.785
Time of Minimum	2/10/2020 4:45 AM	2/16/2020 4:10 AM	2/16/2020 4:10 AM
Time of Maximum	1/29/2020 6:30 PM	1/24/2020 9:45 PM	1/29/2020 6:20 PM

Data Quality

Data uptime observed during the Saturday, November 16, 2019 to the Monday, March 9, 2020 monitoring period is provided in the table below. Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

Percent Uptime	
Depth (in)	100
Velocity (ft/s)	100
Quantity (MGD)	100

Milpitas Temp Study 2019-20

Flow Monitoring Site Report

ADS ENVIRONMENTAL SERVICES®

Site Name

MIL_1564

Site Address /Location:	Country Club Dr and Park Victoria Dr, Milpitas, CA			Monitor Series	Location Type
				TRITON+	Temporary
Site Access Details:	DRIVE.	Latitude:	37.449480°	Pipe Size (H x W)	Pipe Shape
		Longitude:	-121.887946°	8.00"x8.00"	Circular



Manhole #	System Characteristics
1564	Residential/Commercial
Access	Traffic
Drive	Medium







Installation Information

Installation Date:	Installation Type:
Thursday, November 14, 2019	Doppler Standard Ring and Crank
Monitoring Location (Sensors):	Monitor Location:
Upstream 0-5 FT	Manhole
Sensors / Devices:	Pressure Sensor Range (psi)
Peak Combo (CS4)	0 - 5 psi

Installation Confirmation:

Confirmation Time:	Pipe Size (HxW)
4:25:00 AM	8.00"x8.00"
Depth of Flow (Wet DOF) (in)	Range (Air DOF) (in)
0.63"	
Downlooker Physical Offset (in)	Measurement Confidence (in)
NA	0.25"
Peak Velocity (fps)	Velocity Sensor Offset (in)
1.69	0''
Silt (in)	Silt Type
0.0"	

Hydraulic Comments:

Shallow depth with moderate velocity

Manhole / Pipe Information:

Manhole Depth (Approx. FT):	Manhole Configuration
4'	Single
Manhole Material:	Manhole Condition:
Concrete	Good
Manhole Opening Diameter (in)	Manhole Diameter (Approx.):
26''	54''
Manhole Cover	Manhole Frame
Unbolted	Normal
Active Drop Connections	Air Quality:
No	Normal
Pipe Material	Pipe Condition:
Concrete	Good

Communication Information:

Communication Type	Antenna Location
Wireless	Drilled Pavement / Concrete

Additional Site Info. / Comments:

ADS Project Name:	Milpitas.WWTFM.CA2019-2020
ADS Project Number:	22431.11.325

SCATTERGRAPH REPORT

MIL_1564

Flow Monitor

MIL_1564

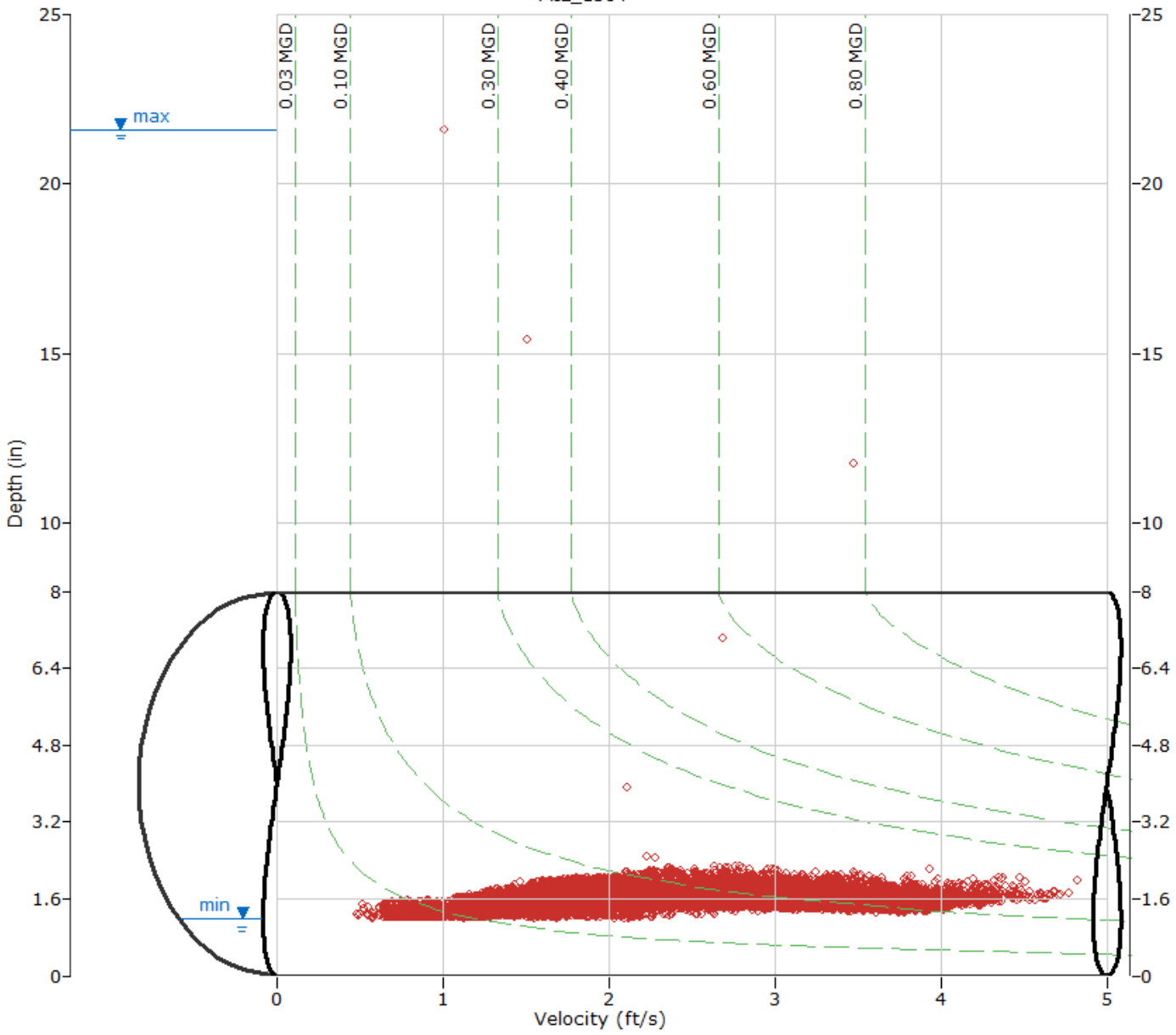
Pipe Height
8.00 in

Report Period

11/16/2019
To
3/9/2020

Legend

- Depth - Velocity
- Iso-Q™
- Silt
- Min-Max Depth



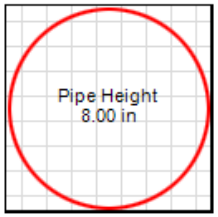
ADS ENVIRONMENTAL SERVICES

HYDROGRAPH REPORT

MIL_1564

Flow Monitor

MIL_1564

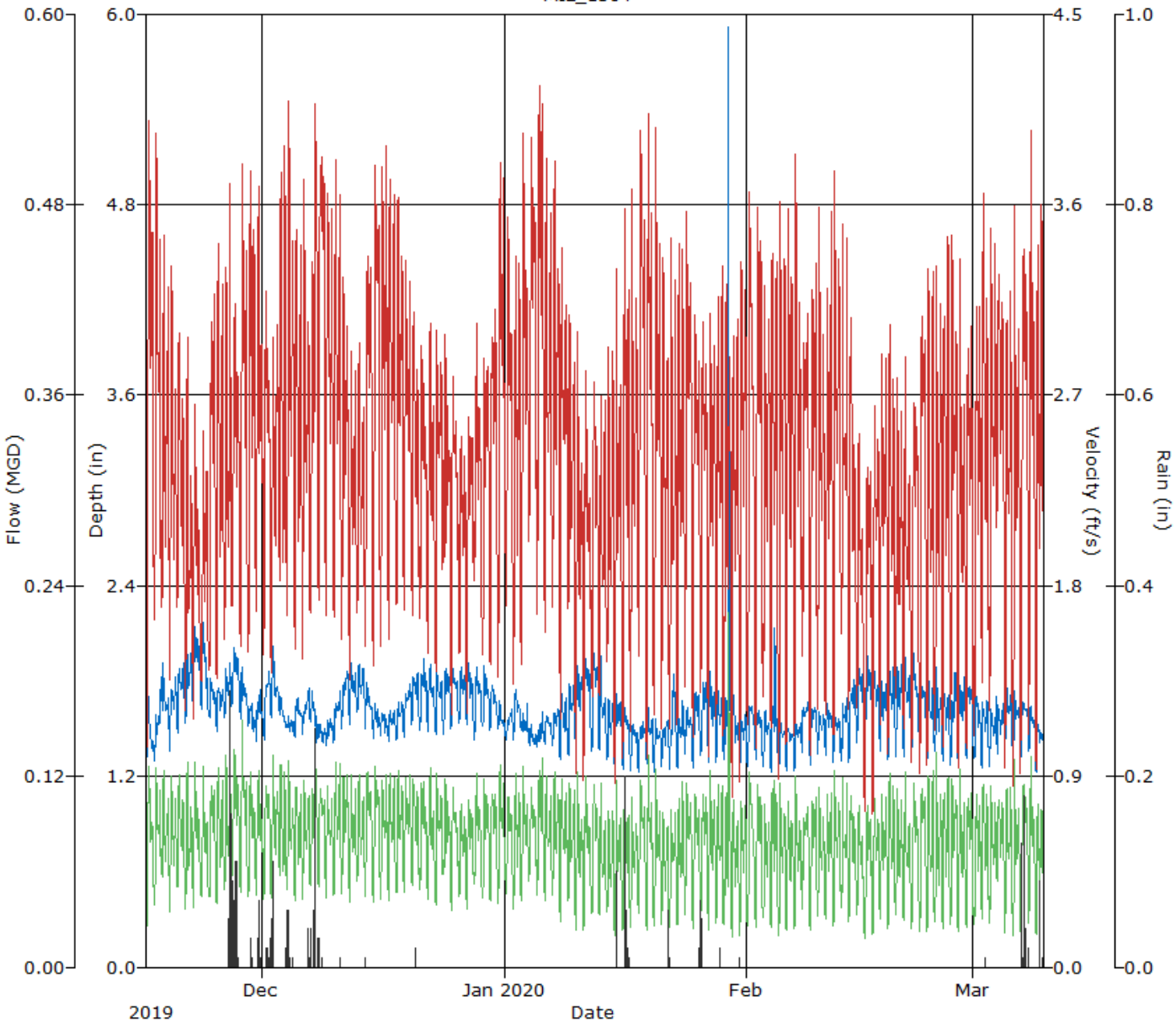


Report Period

11/16/2019
To
3/9/2020

Legend

- Depth
- Velocity
- Quantity
- Rain



Daily Tabular Report For The Period 11/16/2019 00:00 - 03/09/2020 23:59

MIL_1564, Pipe Height: 8.00 in, Silt: 0.00 in

Daily Tabular Report

Date	Depth (in)				Velocity (ft/s)				Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
11/16/2019	05:00	1.30	08:25	1.81	1.47	04:40	0.86	09:30	4.23	2.63	04:40	0.021	09:30	0.149	0.076	0.076	
11/17/2019	03:45	1.28	23:55	1.80	1.49	06:40	1.25	08:50	4.53	2.74	06:40	0.030	08:50	0.143	0.081	0.081	
11/18/2019	16:10	1.46	07:10	2.48	1.70	05:20	1.07	10:15	4.44	2.45	05:20	0.034	10:15	0.174	0.086	0.086	
11/19/2019	03:35	1.34	22:15	1.94	1.64	04:55	0.92	09:30	4.01	2.31	04:55	0.023	09:30	0.146	0.079	0.079	
11/20/2019	04:35	1.46	21:20	2.10	1.74	05:35	1.42	12:40	3.62	2.30	05:35	0.040	21:25	0.152	0.085	0.085	
11/21/2019	03:45	1.52	08:25	2.08	1.81	03:35	1.04	10:25	3.44	1.96	03:35	0.031	10:25	0.152	0.077	0.077	
11/22/2019	04:40	1.58	09:35	2.22	1.91	04:35	1.08	10:25	3.01	1.86	04:35	0.035	08:40	0.152	0.079	0.079	
11/23/2019	04:35	1.61	09:55	2.28	1.88	04:35	1.15	21:10	3.21	1.91	04:35	0.037	09:50	0.147	0.079	0.079	
11/24/2019	07:10	1.54	00:40	1.88	1.69	02:55	1.20	21:50	3.80	2.33	02:55	0.037	10:20	0.133	0.082	0.082	
11/25/2019	04:30	1.46	11:50	1.89	1.65	05:40	1.17	08:25	4.05	2.35	05:40	0.034	08:25	0.164	0.081	0.081	
11/26/2019	04:15	1.56	20:20	2.05	1.75	03:40	1.42	20:20	4.47	2.40	03:40	0.044	20:20	0.204	0.089	0.089	0.63
11/27/2019	01:55	1.61	10:25	2.08	1.85	03:55	1.45	11:25	3.80	2.46	01:55	0.047	08:45	0.166	0.099	0.099	0.77
11/28/2019	04:50	1.55	11:45	2.01	1.73	04:50	1.39	11:50	4.51	2.66	04:50	0.043	11:50	0.191	0.097	0.097	
11/29/2019	22:55	1.42	00:40	1.88	1.59	03:45	1.36	11:15	4.28	2.70	06:20	0.040	11:20	0.159	0.086	0.086	0.05
11/30/2019	05:50	1.39	13:45	1.82	1.60	05:25	1.34	12:15	3.97	2.68	05:25	0.036	12:15	0.147	0.087	0.087	0.14
12/01/2019	05:35	1.40	21:15	1.98	1.68	04:15	1.20	17:55	3.81	2.44	04:15	0.035	12:15	0.149	0.086	0.086	0.06
12/02/2019	03:00	1.51	08:10	2.16	1.76	05:00	0.97	23:10	3.86	2.23	05:00	0.029	08:15	0.177	0.084	0.084	0.36
12/03/2019	22:45	1.46	10:15	1.88	1.61	17:00	1.32	21:15	4.72	2.67	17:00	0.042	10:15	0.171	0.087	0.087	
12/04/2019	11:30	1.40	07:55	1.75	1.53	04:40	1.40	10:40	4.59	2.85	04:40	0.041	10:40	0.157	0.086	0.086	0.44
12/05/2019	04:20	1.43	13:55	1.76	1.59	04:30	1.36	22:05	4.29	2.57	04:30	0.037	22:05	0.134	0.083	0.083	
12/06/2019	04:20	1.44	23:05	1.80	1.62	04:15	1.22	10:10	3.99	2.56	04:15	0.034	10:10	0.147	0.084	0.084	0.06
12/07/2019	21:05	1.36	10:05	1.97	1.60	04:10	1.39	19:05	4.67	2.81	04:10	0.041	10:05	0.186	0.090	0.090	0.84
12/08/2019	13:00	1.35	20:55	1.72	1.48	13:10	1.51	11:50	4.66	3.18	13:10	0.039	11:50	0.159	0.091	0.091	0.10
12/09/2019	04:20	1.37	09:55	1.66	1.49	03:25	1.50	09:35	4.20	2.83	03:25	0.039	09:00	0.138	0.082	0.082	
12/10/2019	03:20	1.40	22:05	1.90	1.59	04:35	1.43	22:05	4.26	2.75	04:35	0.039	22:05	0.175	0.089	0.089	0.01
12/11/2019	04:25	1.47	21:10	1.96	1.73	04:20	1.27	10:20	3.80	2.49	04:20	0.036	21:30	0.146	0.091	0.091	0.00
12/12/2019	04:25	1.50	05:35	2.06	1.75	04:20	1.21	09:00	3.66	2.20	04:20	0.036	05:35	0.154	0.082	0.082	
12/13/2019	04:00	1.55	01:20	2.04	1.77	03:55	1.41	09:25	3.48	2.26	03:55	0.043	09:25	0.154	0.085	0.085	
12/14/2019	04:25	1.49	00:10	1.93	1.68	04:35	1.21	08:25	4.21	2.69	04:35	0.036	08:25	0.160	0.093	0.093	0.01
12/15/2019	18:20	1.37	12:10	1.85	1.56	04:10	1.21	11:55	4.69	2.87	04:10	0.035	12:10	0.173	0.090	0.090	
12/16/2019	04:20	1.39	04:55	1.75	1.54	03:50	1.31	21:10	4.43	2.82	03:50	0.037	07:35	0.151	0.086	0.086	
12/17/2019	03:10	1.40	21:45	1.88	1.53	03:50	1.40	08:05	4.22	2.84	03:55	0.038	21:45	0.171	0.086	0.086	
12/18/2019	03:45	1.41	12:15	1.79	1.57	03:25	1.47	09:15	4.31	2.72	05:50	0.040	09:20	0.159	0.086	0.086	
12/19/2019	03:40	1.42	21:45	1.89	1.66	03:40	1.41	08:10	3.99	2.61	03:40	0.038	08:10	0.150	0.090	0.090	
12/20/2019	02:10	1.48	23:50	1.94	1.72	05:35	1.28	11:00	3.75	2.35	05:35	0.038	08:55	0.148	0.085	0.085	0.02
12/21/2019	04:25	1.46	17:20	2.04	1.74	05:40	1.43	11:50	3.59	2.36	05:40	0.042	11:50	0.150	0.087	0.087	
12/22/2019	06:10	1.45	13:25	2.07	1.71	05:45	1.24	13:25	3.80	2.28	05:45	0.035	13:25	0.175	0.083	0.083	
12/23/2019	05:30	1.45	09:00	2.22	1.69	05:20	1.23	09:00	3.94	2.31	05:20	0.034	09:00	0.201	0.082	0.082	
12/24/2019	04:10	1.44	09:20	1.93	1.72	03:20	1.23	10:55	3.80	2.36	03:20	0.038	10:55	0.158	0.085	0.085	
12/25/2019	03:40	1.48	09:10	1.96	1.73	05:05	1.06	00:35	3.36	2.17	05:10	0.031	10:45	0.138	0.079	0.079	
12/26/2019	04:50	1.52	21:20	1.97	1.74	04:45	1.28	09:30	2.97	2.09	04:45	0.038	09:30	0.125	0.077	0.077	
12/27/2019	04:45	1.52	08:45	1.99	1.74	04:15	1.13	21:00	2.89	2.10	04:15	0.034	08:45	0.124	0.077	0.077	
12/28/2019	04:25	1.41	11:35	2.01	1.68	01:40	1.70	11:30	3.60	2.37	04:30	0.049	10:30	0.146	0.083	0.083	
12/29/2019	02:35	1.50	11:35	2.07	1.69	06:20	1.30	11:25	3.65	2.31	06:20	0.038	11:25	0.166	0.082	0.082	
12/30/2019	04:00	1.48	10:00	1.87	1.66	03:30	1.26	08:55	3.85	2.45	04:30	0.038	08:55	0.140	0.084	0.084	
12/31/2019	19:35	1.46	09:15	1.73	1.57	03:55	1.23	20:10	4.47	2.72	03:55	0.036	20:10	0.153	0.086	0.086	

Date	Depth (in)				Velocity (ft/s)				Quantity (MGD - Total MG)					Rain (in)
	Time	Min Time	Max	Avg	Time	Min Time	Max	Avg	Time	Min Time	Max	Avg	Total	Total
01/01/2020	05:35	1.41 23:45	1.67	1.53	06:35	1.59 10:20	4.49	2.71	06:35	0.044 10:20	0.146	0.083	0.083	
01/02/2020	05:10	1.42 10:55	1.82	1.61	05:10	1.20 23:00	4.02	2.36	05:10	0.032 10:55	0.141	0.078	0.078	
01/03/2020	14:15	1.38 09:50	1.90	1.54	03:25	1.25 12:00	4.35	2.78	03:25	0.036 09:50	0.169	0.084	0.084	
01/04/2020	14:05	1.29 13:40	1.82	1.44	14:05	1.25 20:35	4.51	3.06	14:05	0.030 13:40	0.164	0.085	0.085	
01/05/2020	10:40	1.34 12:10	1.68	1.46	05:55	1.43 11:20	4.72	3.14	05:55	0.037 12:10	0.158	0.089	0.089	
01/06/2020	03:40	1.36 08:25	1.70	1.51	05:10	1.42 08:20	4.44	2.72	05:10	0.037 08:25	0.145	0.081	0.081	
01/07/2020	04:00	1.37 09:50	1.88	1.53	03:20	1.56 08:15	4.77	2.73	04:00	0.041 08:15	0.169	0.084	0.084	
01/08/2020	03:30	1.27 09:30	1.83	1.54	05:45	0.81 10:10	3.97	2.47	05:45	0.019 09:30	0.139	0.078	0.078	
01/09/2020	05:30	1.29 07:55	2.00	1.63	05:00	0.65 07:55	3.99	2.43	05:00	0.015 07:55	0.176	0.081	0.081	
01/10/2020	04:55	1.34 09:45	1.99	1.69	05:00	0.71 09:50	3.68	1.98	05:00	0.018 09:55	0.148	0.071	0.071	
01/11/2020	04:30	1.28 08:35	2.11	1.71	04:20	0.63 10:25	3.59	1.91	04:20	0.015 10:20	0.160	0.071	0.071	
01/12/2020	04:50	1.33 10:50	2.12	1.72	04:20	0.67 18:00	3.52	2.07	04:20	0.017 18:00	0.167	0.076	0.076	
01/13/2020	05:00	1.32 08:40	2.13	1.61	04:55	0.73 20:55	3.09	1.96	04:55	0.018 08:40	0.148	0.065	0.065	
01/14/2020	04:55	1.28 21:50	1.89	1.53	06:15	0.76 20:50	3.87	2.13	06:15	0.019 20:50	0.148	0.066	0.066	
01/15/2020	05:15	1.19 08:20	1.93	1.52	05:35	0.58 08:10	4.48	2.08	05:35	0.012 08:10	0.173	0.065	0.065	0.10
01/16/2020	05:35	1.21 10:40	1.89	1.50	05:10	0.77 10:40	4.06	2.36	05:40	0.017 10:40	0.165	0.071	0.071	0.66
01/17/2020	20:05	1.19 07:25	1.59	1.43	04:05	0.75 22:00	4.28	2.40	04:05	0.017 09:50	0.133	0.067	0.067	
01/18/2020	04:40	1.21 14:35	1.69	1.44	06:50	1.05 11:30	4.62	2.92	04:45	0.023 14:35	0.150	0.082	0.082	
01/19/2020	05:40	1.26 11:50	1.85	1.47	05:30	0.78 11:15	4.38	2.62	05:30	0.018 11:50	0.166	0.076	0.076	
01/20/2020	04:40	1.22 10:35	1.80	1.44	04:25	0.96 11:20	4.52	2.64	04:25	0.021 08:45	0.160	0.074	0.074	
01/21/2020	03:00	1.23 22:50	1.63	1.44	05:35	0.95 08:05	3.80	2.36	03:00	0.021 08:05	0.114	0.067	0.067	0.01
01/22/2020	04:25	1.21 17:15	1.97	1.52	02:10	0.92 22:40	3.85	2.27	05:10	0.021 21:25	0.112	0.069	0.069	0.09
01/23/2020	04:15	1.22 23:10	1.79	1.48	02:35	0.89 08:15	3.81	2.32	02:35	0.020 20:20	0.131	0.069	0.069	
01/24/2020	02:55	1.28 21:45	1.97	1.51	04:10	0.92 21:45	4.82	2.62	04:10	0.023 21:45	0.208	0.079	0.079	
01/25/2020	04:50	1.22 22:55	1.91	1.56	04:00	0.85 09:55	3.80	2.44	04:00	0.019 23:00	0.140	0.078	0.078	
01/26/2020	03:15	1.31 18:00	1.92	1.61	03:10	1.14 11:15	3.64	2.32	03:10	0.027 22:25	0.137	0.077	0.077	0.16
01/27/2020	04:05	1.27 08:10	1.94	1.60	03:50	0.83 10:10	3.66	2.24	03:50	0.019 08:20	0.147	0.076	0.076	
01/28/2020	04:05	1.27 07:30	1.81	1.55	04:00	0.87 21:25	4.07	2.26	04:00	0.020 21:20	0.149	0.072	0.072	0.02
01/29/2020	02:15	1.20 18:30	21.57	1.72	01:25	0.68 08:20	3.89	2.16	01:25	0.017 18:20	0.785	0.074	0.074	
01/30/2020	04:00	1.22 07:40	1.81	1.49	03:45	0.58 11:35	3.80	2.16	03:45	0.013 11:35	0.135	0.065	0.065	
01/31/2020	04:10	1.21 20:55	1.66	1.46	04:10	0.70 07:40	4.05	2.45	04:10	0.015 07:40	0.133	0.072	0.072	0.01
02/01/2020	03:45	1.21 05:20	1.84	1.53	02:55	0.79 10:10	4.19	2.52	02:55	0.018 10:10	0.154	0.078	0.078	
02/02/2020	05:25	1.28 07:50	1.78	1.51	04:35	0.76 12:15	3.90	2.50	04:35	0.018 12:15	0.127	0.076	0.076	
02/03/2020	02:50	1.23 08:10	1.68	1.48	05:00	1.02 07:45	3.65	2.32	05:00	0.024 07:50	0.117	0.068	0.068	
02/04/2020	03:30	1.22 14:40	2.24	1.54	03:30	0.85 07:45	4.24	2.39	03:30	0.019 07:45	0.148	0.075	0.075	
02/05/2020	04:40	1.22 08:20	1.69	1.44	05:50	0.58 08:20	4.00	2.40	05:50	0.013 08:20	0.139	0.068	0.068	
02/06/2020	04:05	1.21 07:50	1.56	1.43	03:50	0.84 08:15	4.09	2.39	03:50	0.018 07:50	0.122	0.067	0.067	
02/07/2020	05:25	1.22 08:40	1.77	1.44	03:55	0.93 08:20	4.43	2.44	03:55	0.020 08:40	0.148	0.069	0.069	
02/08/2020	02:50	1.27 04:30	1.97	1.59	02:55	1.15 08:35	4.21	2.47	02:50	0.027 08:35	0.133	0.079	0.079	
02/09/2020	05:20	1.26 12:15	1.79	1.53	05:50	0.84 12:05	3.95	2.36	05:50	0.019 09:10	0.129	0.074	0.074	
02/10/2020	04:45	1.17 08:30	1.89	1.51	04:10	0.99 08:30	4.08	2.40	04:10	0.026 08:30	0.166	0.072	0.072	
02/11/2020	03:30	1.28 09:00	1.88	1.53	01:15	0.95 20:15	3.84	2.40	04:50	0.023 09:00	0.154	0.074	0.074	
02/12/2020	04:00	1.25 08:25	1.82	1.49	04:00	0.76 08:25	4.34	2.48	04:00	0.017 08:25	0.168	0.074	0.074	
02/13/2020	01:35	1.23 09:40	1.86	1.54	02:50	1.23 09:40	4.28	2.45	04:35	0.030 09:40	0.170	0.076	0.076	
02/14/2020	03:25	1.27 18:45	1.95	1.61	05:35	1.04 08:25	3.50	2.16	05:35	0.024 09:25	0.139	0.072	0.072	
02/15/2020	04:25	1.38 20:20	2.12	1.69	05:30	1.06 10:05	2.85	1.80	05:30	0.028 12:00	0.126	0.065	0.065	
02/16/2020	04:25	1.26 12:15	2.19	1.69	04:10	0.49 09:50	3.35	1.70	04:10	0.011 09:50	0.149	0.062	0.062	
02/17/2020	06:10	1.44 11:55	1.96	1.69	03:45	0.52 09:20	3.53	1.92	03:45	0.015 09:20	0.146	0.069	0.069	
02/18/2020	05:05	1.32 08:00	1.89	1.62	04:10	0.89 09:35	3.40	2.13	04:10	0.023 08:00	0.130	0.072	0.072	
02/19/2020	04:05	1.28 08:35	2.09	1.67	03:55	0.88 07:40	3.61	2.12	03:55	0.021 08:40	0.160	0.076	0.076	
02/20/2020	04:00	1.29 22:00	2.09	1.68	04:30	0.70 22:00	3.12	2.04	04:30	0.019 22:00	0.146	0.073	0.073	
02/21/2020	03:35	1.28 19:25	2.10	1.71	03:20	0.76 08:40	3.43	1.94	03:20	0.018 08:40	0.153	0.070	0.070	
02/22/2020	04:05	1.31 11:10	2.06	1.69	03:45	0.83 23:55	3.33	2.05	03:45	0.020 23:55	0.140	0.074	0.074	
02/23/2020	07:05	1.26 12:05	1.93	1.62	07:05	0.49 11:35	3.79	2.25	07:05	0.011 11:35	0.145	0.077	0.077	
02/24/2020	05:35	1.26 21:50	1.88	1.59	05:35	0.84 20:15	3.88	2.16	05:35	0.019 20:15	0.143	0.072	0.072	

Date	Depth (in)					Velocity (ft/s)					Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
02/25/2020	02:40	1.32	08:30	2.00	1.60	05:05	0.88	19:50	4.28	2.21	05:05	0.021	19:50	0.153	0.074	0.074	
02/26/2020	04:50	1.26	20:50	1.85	1.57	04:40	0.87	20:50	4.22	2.29	04:40	0.020	20:50	0.167	0.074	0.074	
02/27/2020	04:50	1.25	17:45	1.91	1.59	04:20	0.88	14:30	4.09	2.42	04:20	0.020	14:30	0.150	0.079	0.079	
02/28/2020	04:10	1.23	22:45	1.90	1.61	04:10	0.72	08:40	3.85	2.08	04:10	0.016	08:40	0.146	0.071	0.071	
02/29/2020	04:30	1.29	20:35	1.93	1.63	04:25	0.88	20:45	3.99	2.21	04:30	0.021	20:40	0.147	0.075	0.075	
03/01/2020	06:15	1.27	15:55	2.03	1.55	06:15	0.73	15:55	4.35	2.23	06:15	0.017	15:55	0.196	0.070	0.070	
03/02/2020	05:30	1.20	07:40	2.04	1.51	04:15	0.93	07:40	4.37	2.50	04:45	0.020	07:40	0.198	0.076	0.076	0.01
03/03/2020	02:00	1.24	22:50	1.71	1.49	05:55	0.92	22:50	4.36	2.48	05:55	0.021	22:50	0.154	0.074	0.074	
03/04/2020	04:15	1.19	01:35	2.27	1.55	01:00	1.67	07:40	4.32	2.72	01:00	0.041	07:40	0.145	0.084	0.084	
03/05/2020	03:40	1.22	09:15	1.94	1.59	02:55	0.82	21:00	3.98	2.26	03:40	0.018	09:15	0.148	0.075	0.075	
03/06/2020	04:00	1.25	08:45	1.93	1.56	03:50	0.71	08:25	4.11	2.24	03:50	0.016	08:25	0.172	0.072	0.072	
03/07/2020	03:40	1.23	01:15	1.79	1.57	04:10	0.68	10:30	3.98	2.55	03:40	0.018	10:35	0.136	0.082	0.082	0.58
03/08/2020	05:55	1.30	11:35	1.88	1.53	04:15	0.92	11:00	4.60	2.51	04:15	0.023	11:35	0.173	0.077	0.077	0.02
03/09/2020	03:40	1.22	20:10	1.69	1.43	03:40	0.81	20:10	4.20	2.45	03:40	0.018	20:10	0.146	0.069	0.069	0.11

Report Summary For The Period 11/16/2019 00:00 - 03/09/2020 23:59

	Depth (in)	Velocity (ft/s)	Quantity (MGD - Total MG)	Rain (in)
Total			9.014	5.26
Avg	1.60	2.40	0.078	

Site Commentary

Site Information

MIL_1790	
Pipe Dimensions	28
Silt Level	0.00"

Overview

Site MIL_1790 functioned under normal conditions during the period Saturday, November 16, 2019 to Monday, March 9, 2020 . This site exhibited an observable response to the wet weather events of November 26, 2019 - November 27, 2019, December 7, 2019 - December 8, 2019, and January 16, 2020 - January 17, 2020. Review of the scattergraph shows that free flow conditions were recorded during the study period.

Flow depth and velocity measurements recorded by the flow monitor are consistent with field confirmations conducted to date and support the relative accuracy of the flow monitor at this location.

This location was installed downstream of sites MIL_0190, MIL_0649 and MIL_1795. A check of balancing shows a net flow of 0.837 MGD between the sites.

Observations

Average flow depth, velocity, and quantity data observed during Saturday, November 16, 2019 to Monday, March 9, 2020 , along with observed minimum and maximum data, are provided in the following table.

Observed Flow Conditions			
Item	Depth (in)	Velocity (ft/s)	Quantity (MGD)
Average	10.91	1.97	2.006
Minimum	7.93	1.32	0.852
Maximum	13.37	2.51	3.219
Time of Minimum	3/1/2020 5:45 AM	3/1/2020 5:40 AM	3/1/2020 5:40 AM
Time of Maximum	12/23/2019 12:05 PM	11/27/2019 10:55 AM	12/23/2019 12:05 PM

Data Quality

Data uptime observed during the Saturday, November 16, 2019 to the Monday, March 9, 2020 monitoring period is provided in the table below. Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

Percent Uptime	
Depth (in)	100
Velocity (ft/s)	100
Quantity (MGD)	100

Milpitas Temp Study 2019-20

Flow Monitoring Site Report

ADS ENVIRONMENTAL SERVICES®

Site Name

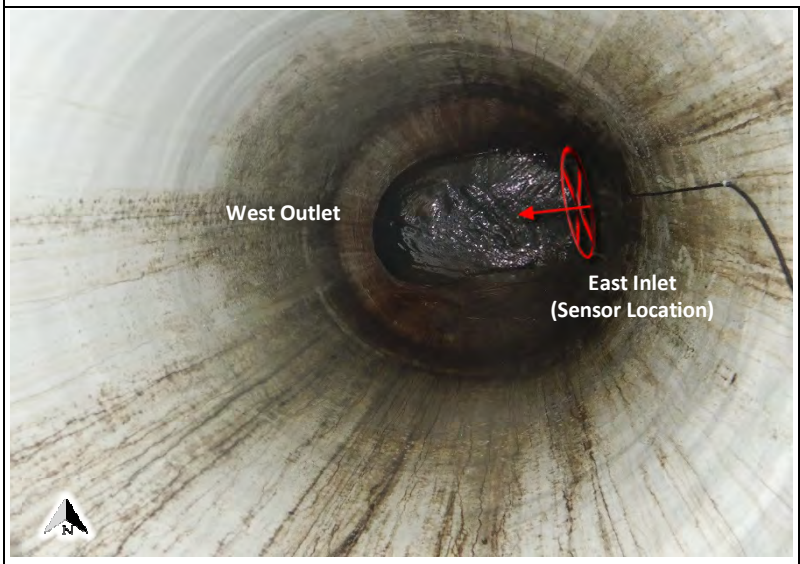
MIL_1790

Site Address /Location:	490 N McCarthy Blvd, Milpitas, CA			Monitor Series	Location Type
				TRITON+	Temporary
Site Access Details:	DRIVE.	Latitude:	37.435578°	Pipe Size (H x W)	Pipe Shape
		Longitude:	-121.919933°	28.00"x28.00"	Circular



Manhole #	System Characteristics
1790	Residential/Commercial
Access	Traffic
Drive	Light







Installation Information

Installation Date:	Installation Type:
Friday, November 15, 2019	Doppler Standard Ring and Crank
Monitoring Location (Sensors):	Monitor Location:
Upstream 0-5 FT	Manhole
Sensors / Devices:	Pressure Sensor Range (psi)
Peak Combo (CS4)	0 - 5 psi

Installation Confirmation:

Confirmation Time:	Pipe Size (HxW)
4:26:00 AM	28.00"x28.00"
Depth of Flow (Wet DOF) (in)	Range (Air DOF) (in)
9.00"	
Downlooker Physical Offset (in)	Measurement Confidence (in)
NA	0.25"
Peak Velocity (fps)	Velocity Sensor Offset (in)
1.82'	0''
Silt (in)	Silt Type
0.0"	

Hydraulic Comments:

Smooth flow with deep depth and moderate velocity

Manhole / Pipe Information:

Manhole Depth (Approx. FT):	Manhole Configuration
12'	Single
Manhole Material:	Manhole Condition:
Concrete	Good
Manhole Opening Diameter (in)	Manhole Diameter (Approx.):
26''	54''
Manhole Cover	Manhole Frame
Unbolted	Normal
Active Drop Connections	Air Quality:
No	Normal
Pipe Material	Pipe Condition:
Concrete	Good

Communication Information:

Communication Type	Antenna Location
Wireless	Drilled Pavement / Concrete

Additional Site Info. / Comments:

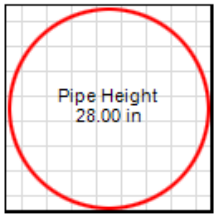
ADS Project Name:	Milpitas.WWTFM.CA2019-2020
ADS Project Number:	22431.11.325

SCATTERGRAPH REPORT

MIL_1790

Flow Monitor

MIL_1790

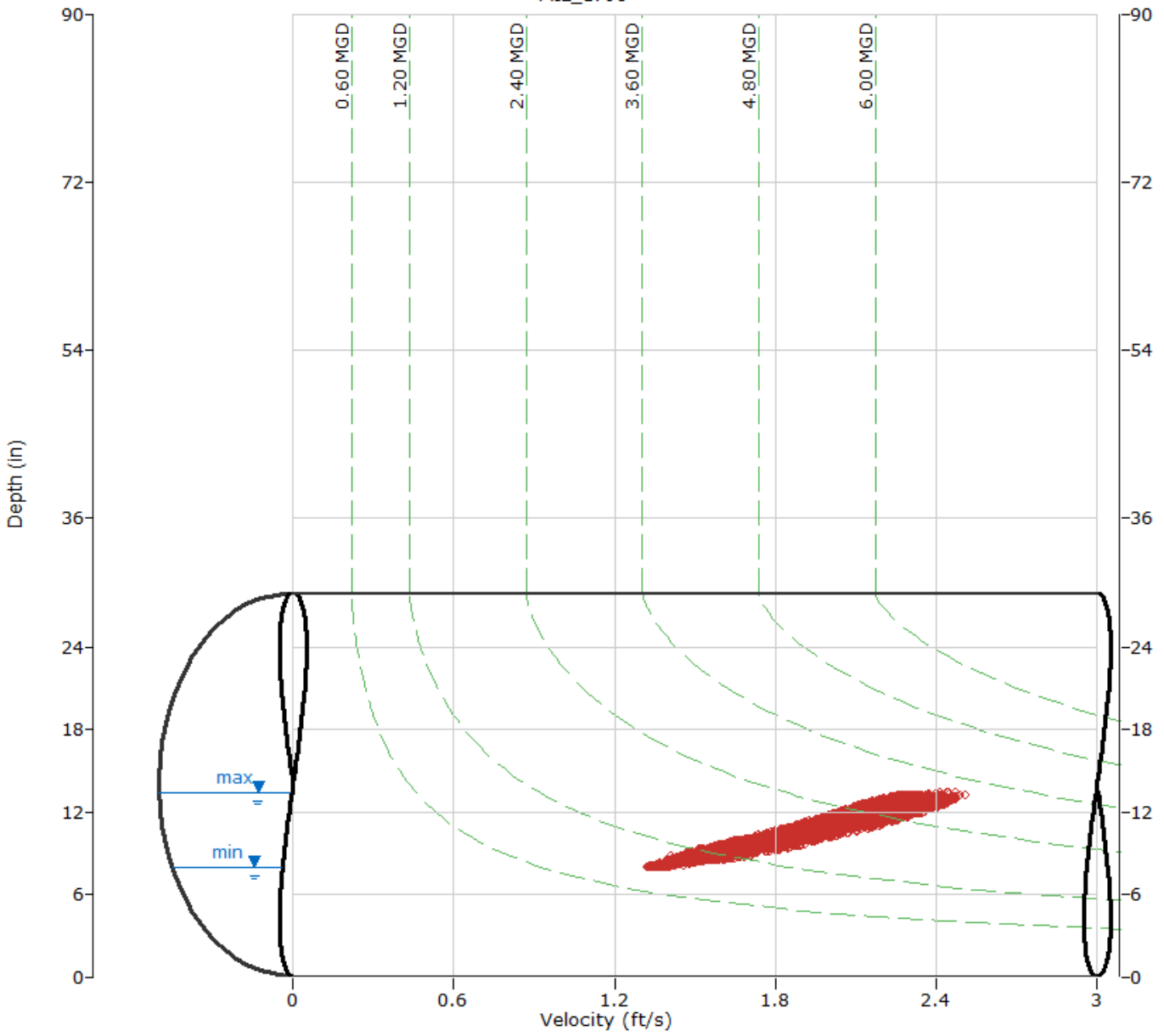


Report Period

11/16/2019
To
3/9/2020

Legend

- Depth - Velocity
- Iso-Q™
- Silt
- Min-Max Depth



ADS ENVIRONMENTAL SERVICES

HYDROGRAPH REPORT

MIL_1790

Flow Monitor

MIL_1790

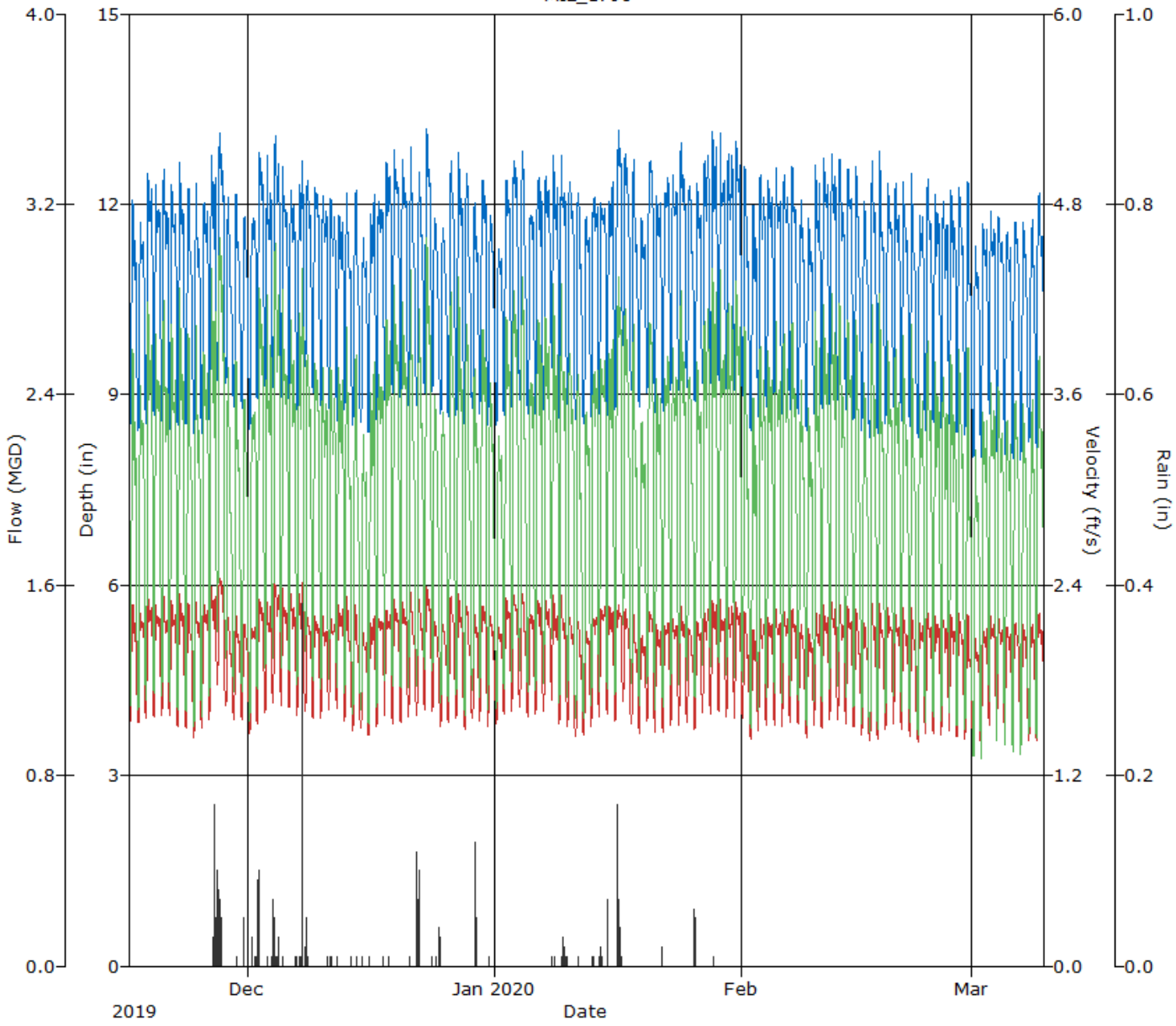
Pipe Height
28.00 in

Report Period

11/16/2019
To
3/9/2020

Legend

- Depth
- Velocity
- Quantity
- Rain



Daily Tabular Report For The Period 11/16/2019 00:00 - 03/09/2020 23:59

MIL_1790, Pipe Height: 28.00 in, Silt: 0.00 in

Daily Tabular Report

Date	Depth (in)				Velocity (ft/s)				Quantity (MGD - Total MG)					Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
11/16/2019	04:50	8.41	13:00	12.14	10.48	04:50	1.49	13:05	2.35	1.96	04:50	1.042	13:05	2.693	1.892	1.892	
11/17/2019	05:10	8.36	11:25	11.76	10.38	05:00	1.50	11:30	2.26	1.96	05:00	1.043	11:15	2.492	1.863	1.863	
11/18/2019	03:55	8.47	10:55	12.74	11.03	04:05	1.54	10:40	2.41	2.05	04:05	1.085	10:45	2.934	2.124	2.124	
11/19/2019	04:30	8.64	10:30	12.37	11.03	04:35	1.56	09:20	2.31	2.04	04:30	1.130	10:30	2.717	2.101	2.101	
11/20/2019	04:20	8.59	10:20	12.63	10.92	03:55	1.56	10:40	2.36	2.02	03:55	1.124	10:40	2.840	2.058	2.058	
11/21/2019	04:45	8.43	09:55	12.75	10.93	04:35	1.56	10:00	2.36	2.04	04:35	1.095	09:55	2.893	2.079	2.079	
11/22/2019	04:05	8.48	10:30	12.74	11.03	05:05	1.49	10:40	2.39	2.03	03:55	1.059	10:40	2.911	2.105	2.105	
11/23/2019	05:30	8.52	13:00	12.43	10.62	05:00	1.49	11:25	2.33	1.96	04:55	1.057	11:25	2.735	1.929	1.929	
11/24/2019	04:50	8.32	11:50	12.42	10.50	04:35	1.42	11:00	2.33	1.95	04:50	0.980	11:55	2.752	1.897	1.897	
11/25/2019	04:10	8.35	13:00	12.08	10.80	03:55	1.49	12:15	2.31	2.03	03:55	1.031	12:15	2.618	2.041	2.041	
11/26/2019	03:45	8.54	10:00	12.85	11.16	03:40	1.49	10:00	2.46	2.10	03:40	1.064	10:00	3.038	2.202	2.202	0.36
11/27/2019	03:30	9.16	10:35	13.21	11.60	03:30	1.64	10:55	2.51	2.20	03:30	1.285	10:55	3.198	2.420	2.420	0.63
11/28/2019	05:55	9.13	12:15	12.16	10.64	05:55	1.63	10:45	2.29	1.95	05:55	1.274	12:15	2.542	1.896	1.896	
11/29/2019	05:05	8.72	14:45	12.30	10.67	05:05	1.53	18:15	2.24	1.94	05:05	1.123	14:45	2.601	1.910	1.910	0.02
11/30/2019	06:50	8.72	13:05	11.84	10.52	06:50	1.53	13:05	2.16	1.91	06:50	1.126	13:05	2.400	1.843	1.843	0.10
12/01/2019	06:55	8.39	16:00	11.80	10.50	06:55	1.45	22:05	2.16	1.89	06:55	1.010	22:10	2.376	1.833	1.833	0.06
12/02/2019	04:40	8.91	09:20	12.88	11.47	04:20	1.52	10:50	2.35	2.06	04:25	1.151	09:30	2.909	2.240	2.240	0.30
12/03/2019	04:25	9.10	10:15	12.85	11.19	04:55	1.57	21:30	2.35	2.04	04:55	1.227	10:30	2.880	2.133	2.133	0.01
12/04/2019	04:25	8.62	10:05	13.23	11.53	04:25	1.51	09:45	2.44	2.14	04:25	1.090	10:00	3.092	2.336	2.336	0.39
12/05/2019	04:35	8.92	09:40	12.68	11.22	04:30	1.62	10:55	2.42	2.09	04:30	1.228	09:40	2.931	2.197	2.197	0.01
12/06/2019	04:25	8.85	09:45	12.34	10.95	03:00	1.52	09:45	2.39	2.05	03:00	1.162	09:45	2.800	2.090	2.090	0.01
12/07/2019	04:00	8.72	19:55	12.74	10.99	03:25	1.55	20:15	2.44	2.07	04:50	1.150	19:55	2.988	2.135	2.135	0.67
12/08/2019	06:20	9.41	11:30	12.40	11.14	06:30	1.56	13:40	2.23	1.97	06:30	1.273	10:50	2.621	2.046	2.046	0.20
12/09/2019	04:45	8.99	09:50	12.37	11.20	03:55	1.51	09:30	2.27	1.99	03:55	1.172	09:45	2.644	2.088	2.088	
12/10/2019	04:30	8.80	10:05	12.20	10.96	04:15	1.49	09:20	2.25	1.97	04:15	1.119	09:25	2.587	2.004	2.004	
12/11/2019	03:50	8.74	11:20	12.19	10.87	04:05	1.55	09:05	2.27	2.00	04:05	1.148	11:20	2.570	2.010	2.010	0.03
12/12/2019	04:35	8.56	09:55	11.95	10.77	03:05	1.57	11:35	2.32	2.05	04:20	1.161	11:35	2.574	2.040	2.040	0.01
12/13/2019	03:55	8.75	10:10	12.54	10.61	03:55	1.54	10:15	2.37	1.96	03:55	1.137	10:10	2.832	1.916	1.916	0.01
12/14/2019	04:45	8.48	14:40	12.24	10.45	04:45	1.47	12:00	2.34	1.90	04:45	1.040	12:00	2.658	1.827	1.827	0.01
12/15/2019	03:45	8.49	12:15	11.66	10.25	03:45	1.47	12:15	2.13	1.86	03:45	1.043	12:15	2.322	1.732	1.732	0.01
12/16/2019	03:50	8.27	21:35	12.25	10.76	03:50	1.42	22:10	2.32	1.95	03:50	0.971	22:10	2.668	1.951	1.951	0.01
12/17/2019	04:15	8.56	10:55	12.12	10.94	04:15	1.49	10:55	2.20	1.99	04:15	1.068	10:55	2.523	2.024	2.024	0.01
12/18/2019	04:50	8.81	11:10	12.72	11.41	04:50	1.55	10:15	2.28	2.04	04:50	1.159	11:10	2.775	2.192	2.192	0.01
12/19/2019	04:15	8.96	10:40	12.98	11.54	04:00	1.51	11:05	2.36	2.04	04:20	1.155	10:40	2.908	2.238	2.238	
12/20/2019	05:35	8.91	10:55	12.85	11.40	05:00	1.51	10:45	2.37	2.04	05:00	1.145	10:50	2.925	2.195	2.195	
12/21/2019	04:50	8.76	11:10	12.98	10.98	04:45	1.54	12:00	2.38	2.00	04:45	1.139	11:25	2.970	2.048	2.048	0.01
12/22/2019	04:30	8.77	14:25	12.58	10.86	04:25	1.55	15:00	2.36	1.99	04:25	1.152	15:00	2.816	2.014	2.014	0.41
12/23/2019	04:20	8.98	12:05	13.37	11.47	04:30	1.60	12:05	2.47	2.09	04:30	1.226	12:05	3.219	2.280	2.280	
12/24/2019	04:55	9.01	11:45	11.85	10.67	04:55	1.58	12:55	2.19	1.95	04:55	1.212	11:45	2.436	1.910	1.910	0.02
12/25/2019	07:20	8.64	11:55	11.72	10.39	06:15	1.41	11:55	2.18	1.90	06:15	1.037	11:55	2.385	1.805	1.805	0.08
12/26/2019	04:10	8.56	13:45	12.77	11.05	04:15	1.49	12:50	2.39	2.02	04:10	1.071	13:20	2.889	2.101	2.101	
12/27/2019	04:35	8.59	11:25	12.92	11.09	05:35	1.55	11:20	2.39	2.02	04:30	1.117	11:25	2.969	2.107	2.107	
12/28/2019	06:15	8.43	11:30	12.54	10.69	05:00	1.45	14:55	2.29	1.94	05:00	1.036	11:30	2.729	1.926	1.926	
12/29/2019	03:55	8.63	13:00	12.08	10.52	03:45	1.53	11:50	2.26	1.93	03:55	1.117	11:50	2.567	1.865	1.865	0.22
12/30/2019	05:00	8.63	12:05	12.49	11.06	04:10	1.52	12:10	2.30	2.03	04:50	1.112	12:10	2.745	2.100	2.100	
12/31/2019	04:55	8.48	12:10	11.96	10.57	04:00	1.49	12:00	2.25	1.95	04:55	1.056	12:00	2.512	1.897	1.897	0.01

Date	Depth (in)					Velocity (ft/s)					Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
01/01/2020	06:40	8.45	11:15	11.44	10.24	06:05	1.50	13:00	2.15	1.90	06:50	1.062	13:40	2.250	1.769	1.769	
01/02/2020	04:55	8.64	14:00	12.47	11.10	04:45	1.57	14:05	2.36	2.06	05:00	1.141	14:05	2.803	2.140	2.140	
01/03/2020	04:15	8.73	12:50	12.84	11.17	04:10	1.57	12:40	2.42	2.04	04:10	1.158	12:40	2.975	2.147	2.147	
01/04/2020	04:40	8.87	11:50	13.21	10.98	04:35	1.61	11:50	2.42	2.03	04:50	1.213	11:50	3.104	2.078	2.078	
01/05/2020	04:15	8.67	12:00	11.86	10.68	04:05	1.55	12:15	2.32	1.98	04:15	1.134	12:15	2.581	1.951	1.951	
01/06/2020	05:00	8.63	13:45	12.51	11.13	04:50	1.55	10:45	2.35	2.05	04:50	1.128	10:45	2.804	2.142	2.142	
01/07/2020	04:25	8.73	09:55	12.56	11.21	04:25	1.59	09:30	2.39	2.06	04:25	1.166	09:30	2.848	2.173	2.173	
01/08/2020	05:00	9.14	10:50	12.92	11.34	04:50	1.60	10:40	2.45	2.07	04:50	1.261	10:40	3.044	2.202	2.202	0.02
01/09/2020	04:20	8.55	11:15	13.09	11.17	03:40	1.51	10:45	2.39	2.01	04:20	1.080	11:05	3.005	2.110	2.110	0.18
01/10/2020	04:30	8.79	10:20	12.42	11.06	04:00	1.49	10:05	2.22	1.94	04:20	1.113	10:40	2.629	2.007	2.007	0.02
01/11/2020	04:00	8.51	12:55	12.28	10.62	04:00	1.42	12:50	2.23	1.85	04:00	1.006	12:50	2.596	1.823	1.823	0.01
01/12/2020	04:10	8.51	11:50	11.85	10.50	06:15	1.44	11:50	2.16	1.86	04:10	1.023	11:50	2.406	1.797	1.797	
01/13/2020	04:20	8.58	13:55	12.28	10.93	04:25	1.48	22:35	2.28	1.98	04:25	1.066	13:55	2.606	2.016	2.016	0.02
01/14/2020	04:00	8.64	09:50	12.09	10.94	02:15	1.52	10:35	2.34	2.03	04:00	1.125	10:35	2.645	2.077	2.077	0.11
01/15/2020	04:25	8.64	20:10	12.45	11.09	04:25	1.56	11:10	2.36	2.06	04:25	1.128	11:10	2.687	2.129	2.129	0.07
01/16/2020	04:50	8.69	14:25	13.23	11.54	04:50	1.52	12:45	2.32	2.04	04:50	1.114	14:00	2.970	2.243	2.243	0.66
01/17/2020	04:10	9.72	10:35	12.87	11.64	04:55	1.64	09:40	2.28	2.03	04:05	1.407	09:40	2.809	2.226	2.226	
01/18/2020	04:40	9.03	12:55	12.88	10.93	04:40	1.52	10:50	2.26	1.89	04:40	1.168	12:45	2.801	1.929	1.929	
01/19/2020	06:00	8.73	11:45	11.92	10.57	04:15	1.45	14:35	2.11	1.84	04:15	1.076	11:45	2.359	1.794	1.794	
01/20/2020	03:45	8.99	15:25	12.78	11.27	04:10	1.51	12:55	2.25	1.97	03:45	1.170	15:15	2.750	2.096	2.096	
01/21/2020	04:55	8.63	10:15	12.24	11.02	04:45	1.44	10:15	2.18	1.93	04:45	1.043	10:15	2.529	1.977	1.977	
01/22/2020	04:20	8.72	20:10	12.46	11.16	04:20	1.46	19:55	2.22	1.94	04:20	1.072	20:00	2.633	2.037	2.037	0.03
01/23/2020	04:35	9.06	09:50	12.69	11.30	04:50	1.49	09:25	2.23	1.97	04:50	1.152	09:50	2.687	2.093	2.093	
01/24/2020	04:45	9.02	11:30	13.07	11.46	04:45	1.50	12:00	2.29	1.99	04:45	1.158	11:30	2.891	2.159	2.159	
01/25/2020	04:35	9.03	15:15	12.37	10.91	04:35	1.51	12:15	2.18	1.88	04:35	1.166	11:30	2.537	1.907	1.907	
01/26/2020	05:35	8.87	11:30	12.42	10.90	04:55	1.47	13:40	2.20	1.91	04:55	1.112	11:40	2.599	1.940	1.940	0.16
01/27/2020	04:20	9.13	20:40	12.82	11.47	03:20	1.59	09:40	2.33	2.02	04:35	1.252	09:40	2.855	2.193	2.193	
01/28/2020	04:05	9.12	10:30	13.20	11.57	04:00	1.56	11:00	2.34	2.04	04:00	1.217	10:55	2.986	2.245	2.245	0.01
01/29/2020	04:20	9.14	10:15	13.19	11.53	02:55	1.58	09:40	2.37	2.03	04:20	1.246	09:40	3.013	2.212	2.212	
01/30/2020	04:30	9.07	21:30	12.86	11.45	03:20	1.56	10:55	2.31	2.02	04:30	1.213	10:55	2.855	2.190	2.190	
01/31/2020	04:45	9.04	09:35	13.05	11.54	04:45	1.55	09:55	2.38	2.03	04:45	1.193	09:55	2.995	2.227	2.227	
02/01/2020	04:30	8.93	11:50	12.66	10.87	04:35	1.54	10:35	2.28	1.92	04:35	1.173	10:40	2.756	1.936	1.936	
02/02/2020	05:50	8.37	13:20	12.05	10.42	05:40	1.39	13:50	2.14	1.83	05:40	0.966	12:30	2.413	1.754	1.754	
02/03/2020	04:15	8.60	10:50	12.57	11.06	04:30	1.45	11:10	2.26	1.95	04:00	1.052	11:10	2.703	2.019	2.019	
02/04/2020	03:45	8.73	09:50	12.47	11.14	03:50	1.50	09:20	2.25	1.96	03:50	1.102	09:25	2.660	2.050	2.050	
02/05/2020	04:15	8.88	10:40	12.68	11.19	04:10	1.50	10:35	2.26	1.99	04:15	1.131	10:40	2.740	2.084	2.084	
02/06/2020	04:30	8.67	10:05	12.55	11.15	04:30	1.50	09:50	2.25	1.99	04:30	1.091	10:05	2.693	2.082	2.082	
02/07/2020	04:20	8.71	10:50	12.66	11.16	04:05	1.52	11:25	2.28	1.99	04:25	1.120	11:25	2.761	2.083	2.083	
02/08/2020	04:35	8.67	16:10	12.60	10.62	03:45	1.51	16:10	2.26	1.90	04:35	1.105	16:10	2.726	1.858	1.858	
02/09/2020	05:10	8.41	11:40	11.84	10.41	06:15	1.42	12:05	2.15	1.86	05:10	0.997	12:05	2.372	1.774	1.774	
02/10/2020	04:30	8.66	09:45	12.79	11.02	04:25	1.50	10:10	2.34	1.97	04:25	1.090	10:10	2.866	2.025	2.025	
02/11/2020	05:00	8.73	09:35	12.83	11.31	04:55	1.49	09:45	2.32	1.99	05:00	1.094	09:45	2.850	2.128	2.128	
02/12/2020	05:00	8.79	10:40	12.82	11.40	04:45	1.52	10:00	2.32	2.03	04:55	1.136	10:40	2.859	2.187	2.187	
02/13/2020	04:40	8.81	09:35	12.81	11.16	05:20	1.52	09:20	2.33	2.00	05:15	1.142	09:25	2.868	2.089	2.089	
02/14/2020	04:40	8.71	11:05	12.67	11.19	04:35	1.52	11:05	2.30	2.00	04:35	1.116	11:05	2.791	2.102	2.102	
02/15/2020	04:00	8.50	12:15	12.72	10.65	04:00	1.47	12:20	2.31	1.91	04:00	1.042	12:15	2.818	1.881	1.881	
02/16/2020	04:50	8.31	13:10	12.24	10.40	04:40	1.41	13:05	2.18	1.86	04:45	0.969	13:05	2.531	1.774	1.774	
02/17/2020	05:15	8.29	11:30	12.82	10.70	06:00	1.40	11:35	2.33	1.90	06:00	0.959	11:35	2.864	1.908	1.908	
02/18/2020	04:30	8.31	10:45	12.93	10.89	04:25	1.41	10:15	2.32	1.96	04:25	0.969	10:50	2.855	1.984	1.984	
02/19/2020	04:35	8.51	10:45	12.39	10.85	03:05	1.46	10:35	2.29	1.96	03:40	1.045	10:45	2.701	1.987	1.987	
02/20/2020	05:00	8.69	11:30	12.43	10.95	04:55	1.50	11:30	2.25	1.97	04:55	1.097	11:30	2.667	2.000	2.000	
02/21/2020	04:40	8.56	10:55	12.63	10.77	03:55	1.46	10:50	2.33	1.93	03:55	1.046	10:50	2.795	1.926	1.926	
02/22/2020	06:35	8.46	11:30	12.56	10.54	06:50	1.44	11:15	2.29	1.89	06:20	1.016	11:15	2.737	1.836	1.836	
02/23/2020	06:45	8.26	20:50	11.96	10.49	06:00	1.39	11:40	2.19	1.88	06:40	0.952	11:30	2.444	1.826	1.826	
02/24/2020	03:55	8.42	11:30	12.52	10.87	05:00	1.43	11:30	2.27	1.96	05:00	1.003	11:30	2.718	1.984	1.984	

Date	Depth (in)					Velocity (ft/s)					Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
02/25/2020	05:15	8.41	10:15	12.22	10.84	05:00	1.41	10:20	2.24	1.95	05:05	0.995	10:20	2.584	1.967	1.967	
02/26/2020	05:00	8.35	10:55	12.23	10.78	04:50	1.43	10:55	2.22	1.95	05:00	0.993	10:55	2.581	1.942	1.942	
02/27/2020	05:20	8.44	09:55	12.33	10.84	04:30	1.46	10:10	2.24	1.95	05:20	1.034	09:55	2.618	1.959	1.959	
02/28/2020	04:20	8.37	11:05	12.44	10.75	03:50	1.43	09:55	2.26	1.92	04:35	0.994	11:05	2.664	1.924	1.924	
02/29/2020	04:05	8.25	14:10	12.89	10.38	03:50	1.40	14:00	2.33	1.85	03:50	0.957	14:10	2.893	1.760	1.760	
03/01/2020	05:45	7.93	12:35	11.38	10.01	05:40	1.32	12:10	2.08	1.77	05:40	0.852	12:10	2.189	1.611	1.611	
03/02/2020	04:35	7.99	09:45	12.02	10.50	04:35	1.33	20:50	2.21	1.88	04:35	0.864	20:50	2.488	1.827	1.827	
03/03/2020	05:55	8.52	11:00	12.07	10.65	04:50	1.46	11:00	2.27	1.95	05:50	1.050	11:00	2.588	1.914	1.914	
03/04/2020	03:45	8.00	09:40	12.22	10.51	03:45	1.40	09:35	2.26	1.93	03:45	0.911	09:35	2.607	1.868	1.868	
03/05/2020	04:15	7.99	10:55	11.62	10.43	04:25	1.36	11:00	2.20	1.91	04:25	0.888	11:00	2.379	1.831	1.831	
03/06/2020	04:20	7.96	12:35	11.81	10.44	04:10	1.35	12:30	2.21	1.90	04:10	0.877	12:35	2.447	1.827	1.827	
03/07/2020	04:30	7.94	12:10	11.94	10.24	03:40	1.34	10:20	2.21	1.86	03:40	0.872	12:05	2.474	1.745	1.745	
03/08/2020	05:30	8.22	15:05	12.34	10.08	04:25	1.39	15:00	2.26	1.83	04:25	0.947	15:05	2.655	1.678	1.678	
03/09/2020	03:25	8.15	12:20	12.27	10.71	03:15	1.41	12:10	2.25	1.94	03:25	0.942	12:20	2.618	1.930	1.928	

Report Summary For The Period 11/16/2019 00:00 - 03/09/2020 23:59

	Depth (in)	Velocity (ft/s)	Quantity (MGD - Total MG)	Rain (in)
Total			230.723	4.90
Avg	10.91	1.97	2.006	

Site Commentary

Site Information

MIL_1795	
Pipe Dimensions	27
Silt Level	1.50"

Overview

Site MIL_1795 functioned under normal conditions during the period Saturday, November 16, 2019 to Monday, March 9, 2020 . This site exhibited an observable response to the wet weather events of November 26, 2019 - November 27, 2019, December 7, 2019 - December 8, 2019, and January 16, 2020 - January 17, 2020. Review of the scattergraph shows that free flow conditions were recorded during the study period.

Flow depth and velocity measurements recorded by the flow monitor are consistent with field confirmations conducted to date and support the relative accuracy of the flow monitor at this location. Sediment and slow flow conditions render data of lower confidence than typical.

This location was installed upstream of site MIL_1790. (See MIL_1790 Site Commentary for More Details)

Observations

Average flow depth, velocity, and quantity data observed during Saturday, November 16, 2019 to Monday, March 9, 2020 , along with observed minimum and maximum data, are provided in the following table.

Observed Flow Conditions			
Item	Depth (in)	Velocity (ft/s)	Quantity (MGD)
Average	9.47	0.40	0.299
Minimum	6.32	0.17	0.087
Maximum	12.80	0.54	0.503
Time of Minimum	2/7/2020 3:55 AM	11/22/2019 4:40 AM	2/7/2020 3:55 AM
Time of Maximum	1/9/2020 11:40 AM	3/8/2020 1:35 PM	12/30/2019 12:35 PM

Data Quality

Data uptime observed during the Saturday, November 16, 2019 to the Monday, March 9, 2020 monitoring period is provided in the table below. Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

Percent Uptime	
Depth (in)	100
Velocity (ft/s)	100
Quantity (MGD)	100

Milpitas Temp Study 2019-20

Flow Monitoring Site Report

ADS ENVIRONMENTAL SERVICES®

Site Name

MIL_1795

Site Address /Location:	Marylinn Dr and Penitencia St, Milpitas, CA			Monitor Series	Location Type
				TRITON+	Temporary
Site Access Details:	DRIVE.	Latitude:	37.435797°	Pipe Size (H x W)	Pipe Shape
		Longitude:	-121.911864°	27.00"x27.00"	Circular



Manhole #	System Characteristics
1795	Residential/Commercial
Access	Traffic
Drive	Medium







Installation Information

Installation Date:	Installation Type:
Friday, November 15, 2019	Doppler Standard Ring and Crank
Monitoring Location (Sensors):	Monitor Location:
Upstream 0-5 FT	Manhole
Sensors / Devices:	Pressure Sensor Range (psi)
Peak Combo (CS4)	0 - 5 psi

Installation Confirmation:

Confirmation Time:	Pipe Size (HxW)
6:23:00 AM	27.00"x27.00"
Depth of Flow (Wet DOF) (in)	Range (Air DOF) (in)
9.75"	
Downlooker Physical Offset (in)	Measurement Confidence (in)
NA	0.25"
Peak Velocity (fps)	Velocity Sensor Offset (in)
0.34'	0''
Silt (in)	Silt Type
3.0"	Soft / Loose

Hydraulic Comments:

Smooth flow with deep depth and slow velocity

Manhole / Pipe Information:

Manhole Depth (Approx. FT):	Manhole Configuration
8'	Single
Manhole Material:	Manhole Condition:
Concrete	Good
Manhole Opening Diameter (in)	Manhole Diameter (Approx.):
26''	54''
Manhole Cover	Manhole Frame
Unbolted	Normal
Active Drop Connections	Air Quality:
No	Normal
Pipe Material	Pipe Condition:
Concrete	Good

Communication Information:

Communication Type	Antenna Location
Wireless	Drilled Pavement / Concrete

Additional Site Info. / Comments:

ADS Project Name:	Milpitas.WWTFM.CA2019-2020
ADS Project Number:	22431.11.325

SCATTERGRAPH REPORT

MIL_1795

Flow Monitor

MIL_1795

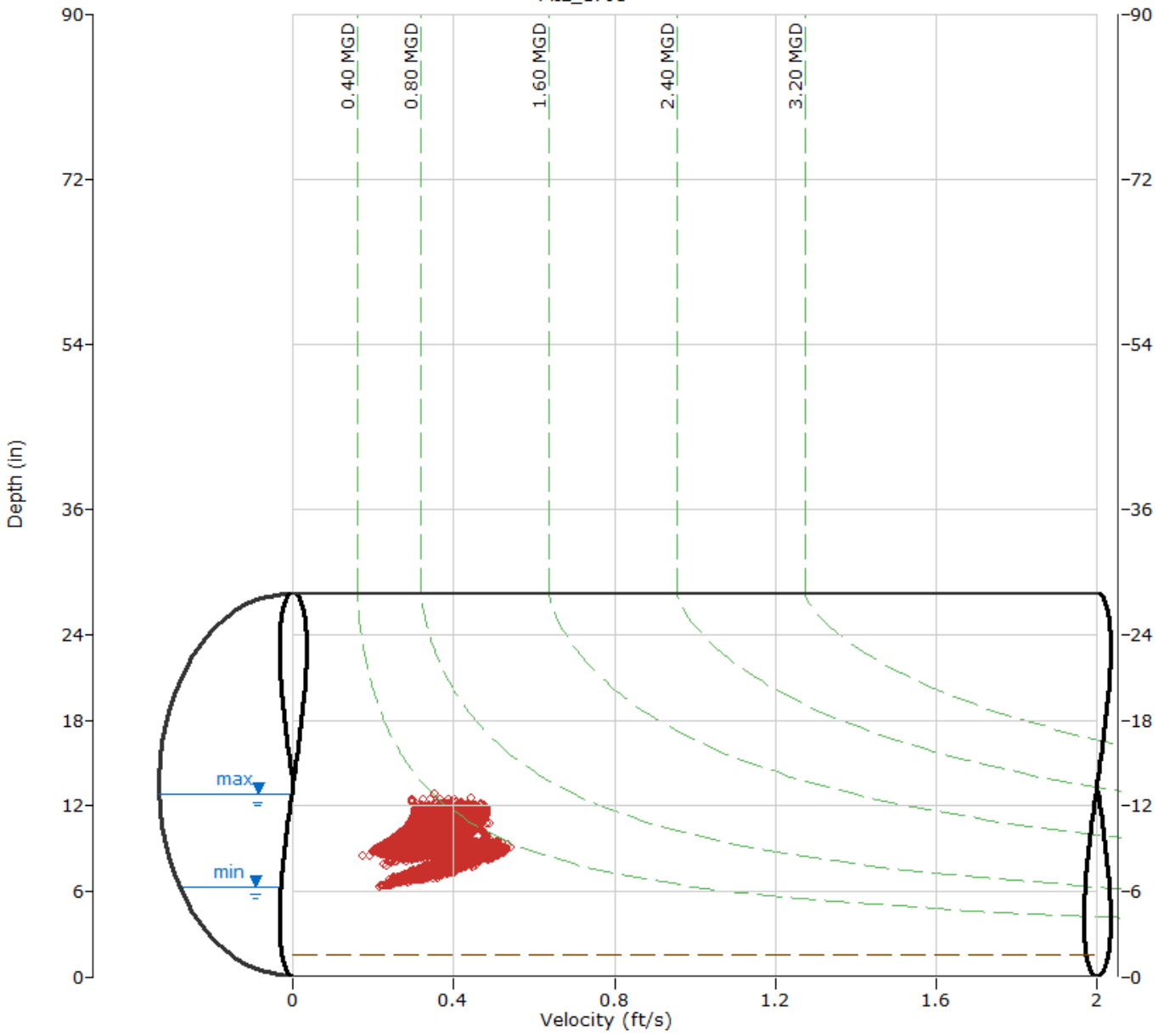
Pipe Height
27.00 in

Report Period

11/16/2019
To
3/9/2020

Legend

- Depth - Velocity
- Iso-Q™
- Silt
- Min-Max Depth



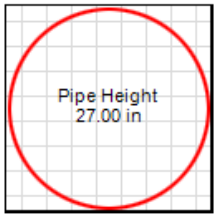
ADS ENVIRONMENTAL SERVICES

HYDROGRAPH REPORT

MIL_1795

Flow Monitor

MIL_1795

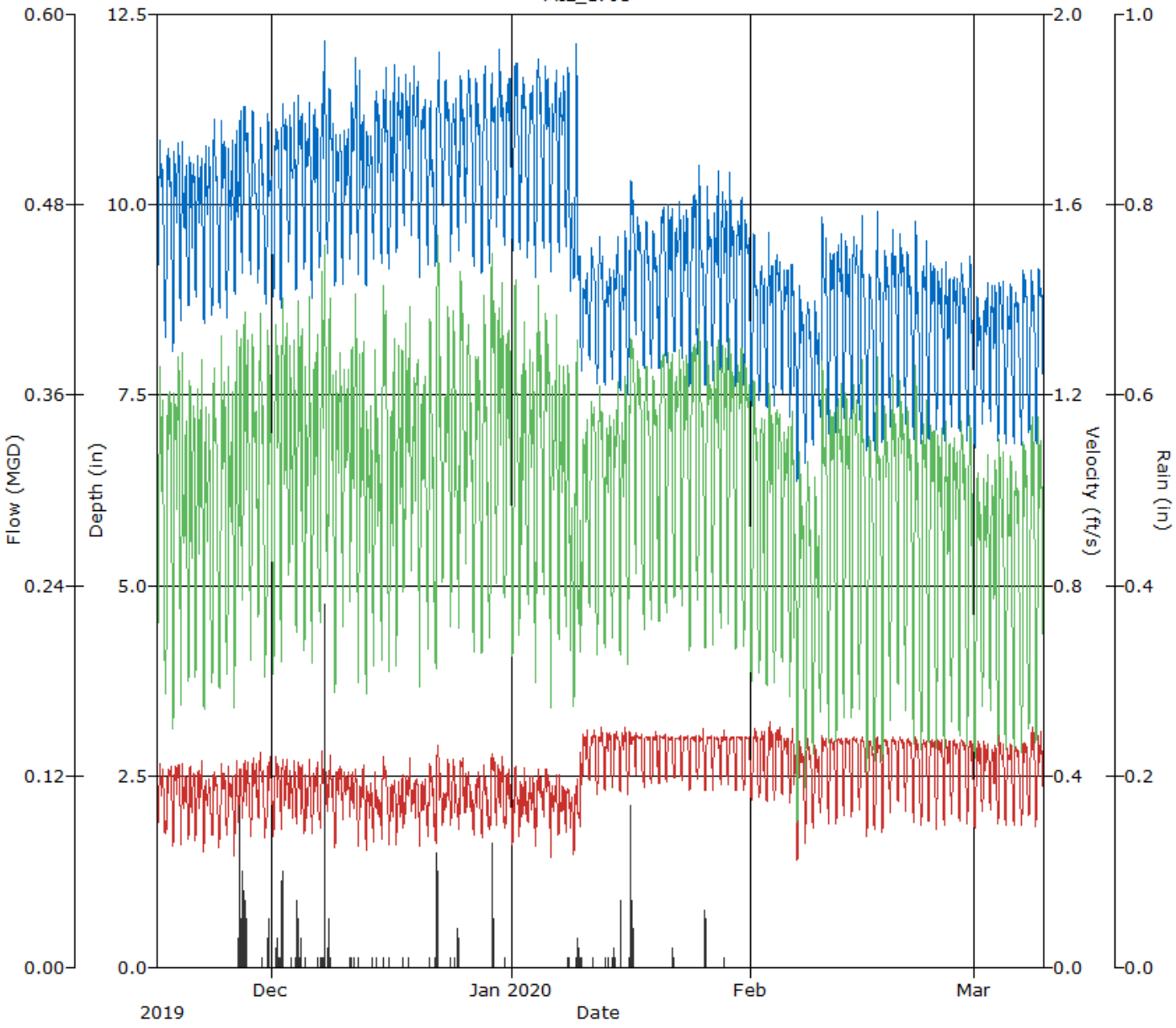


Report Period

11/16/2019
To
3/9/2020

Legend

- Depth
- Velocity
- Quantity
- Rain



ADS ENVIRONMENTAL SERVICES

Daily Tabular Report For The Period 11/16/2019 00:00 - 03/09/2020 23:59

MIL_1795, Pipe Height: 27.00 in, Silt: 1.50 in

Daily Tabular Report

Date	Depth (in)				Velocity (ft/s)				Quantity (MGD - Total MG)					Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
11/16/2019	04:40	8.99	11:20	10.88	10.01	04:15	0.22	13:40	0.46	0.36	04:15	0.156	13:40	0.412	0.297	0.297	
11/17/2019	05:20	8.24	13:15	10.80	9.77	05:50	0.24	11:15	0.46	0.36	05:50	0.148	11:15	0.409	0.287	0.287	
11/18/2019	04:20	8.06	08:10	10.91	9.74	04:05	0.24	21:55	0.47	0.37	04:05	0.140	21:55	0.427	0.292	0.292	
11/19/2019	03:30	8.46	07:55	10.99	9.73	04:35	0.22	08:50	0.46	0.35	04:35	0.142	08:45	0.408	0.278	0.278	
11/20/2019	02:40	8.63	17:40	10.85	9.82	04:10	0.21	07:30	0.46	0.36	04:10	0.140	09:05	0.398	0.286	0.286	
11/21/2019	02:40	8.76	20:40	10.77	9.93	02:20	0.24	20:45	0.46	0.36	02:20	0.158	20:45	0.409	0.295	0.295	
11/22/2019	04:15	8.41	17:05	11.12	9.87	04:40	0.17	21:50	0.47	0.34	04:40	0.110	21:50	0.410	0.275	0.275	
11/23/2019	03:55	8.51	13:20	11.32	9.92	05:25	0.23	13:05	0.47	0.35	05:25	0.147	13:05	0.448	0.287	0.287	
11/24/2019	04:45	8.62	12:00	11.14	10.10	02:50	0.21	09:05	0.47	0.36	02:50	0.142	10:45	0.432	0.299	0.299	
11/25/2019	03:30	8.47	20:20	10.88	9.94	04:45	0.20	19:40	0.45	0.36	04:45	0.132	19:40	0.405	0.290	0.290	
11/26/2019	04:15	8.80	21:05	11.28	10.08	04:10	0.20	07:45	0.47	0.35	04:10	0.135	07:45	0.439	0.292	0.292	0.36
11/27/2019	03:20	9.00	09:50	11.41	10.48	05:05	0.29	12:00	0.48	0.39	03:20	0.208	10:35	0.459	0.337	0.337	0.63
11/28/2019	05:25	9.04	11:05	11.32	10.25	05:30	0.22	14:50	0.47	0.37	05:30	0.155	12:30	0.437	0.313	0.313	
11/29/2019	04:05	8.87	10:55	11.05	10.09	04:20	0.23	10:40	0.47	0.38	04:20	0.160	10:40	0.436	0.311	0.311	0.02
11/30/2019	06:00	8.66	11:35	11.32	9.98	03:15	0.21	11:30	0.48	0.36	03:15	0.142	11:30	0.458	0.299	0.299	0.10
12/01/2019	05:50	8.76	15:10	11.11	10.17	06:40	0.21	12:50	0.48	0.37	06:40	0.150	12:50	0.444	0.313	0.313	0.06
12/02/2019	03:35	8.62	08:50	11.52	10.37	04:45	0.24	16:00	0.48	0.38	04:45	0.157	08:20	0.458	0.326	0.326	0.30
12/03/2019	03:10	9.15	19:15	11.56	10.43	04:35	0.27	22:10	0.47	0.38	04:35	0.207	20:10	0.451	0.325	0.325	0.01
12/04/2019	03:10	8.77	08:45	11.59	10.53	03:25	0.26	20:55	0.47	0.38	03:25	0.176	10:35	0.461	0.332	0.332	0.39
12/05/2019	04:00	9.10	21:25	11.42	10.43	05:00	0.23	21:55	0.48	0.36	05:00	0.166	21:55	0.455	0.310	0.310	0.01
12/06/2019	04:10	8.72	07:50	11.41	10.33	03:55	0.21	12:10	0.47	0.37	03:55	0.137	12:10	0.443	0.316	0.316	0.01
12/07/2019	02:50	9.15	18:35	12.16	10.63	05:55	0.26	12:00	0.48	0.38	05:55	0.193	17:45	0.501	0.339	0.339	0.67
12/08/2019	05:50	9.33	10:20	11.56	10.56	23:55	0.28	11:35	0.48	0.38	23:55	0.230	11:35	0.476	0.335	0.335	0.20
12/09/2019	04:10	8.91	06:50	11.26	10.25	04:05	0.21	19:40	0.47	0.37	04:05	0.142	19:40	0.437	0.311	0.311	
12/10/2019	04:20	8.95	08:40	11.04	10.30	04:40	0.27	20:25	0.47	0.38	04:40	0.184	20:25	0.432	0.321	0.321	
12/11/2019	04:10	9.24	20:25	12.06	10.70	04:50	0.25	20:00	0.46	0.37	04:50	0.181	20:00	0.474	0.334	0.334	0.03
12/12/2019	04:55	9.03	08:20	11.94	10.45	04:05	0.23	22:00	0.47	0.35	04:05	0.164	22:00	0.443	0.305	0.305	0.01
12/13/2019	04:05	8.91	07:00	11.11	10.26	04:20	0.21	07:05	0.45	0.34	04:20	0.142	07:05	0.417	0.290	0.290	0.01
12/14/2019	03:35	9.23	19:35	11.88	10.53	04:30	0.24	14:55	0.46	0.33	04:30	0.175	14:55	0.433	0.291	0.291	0.01
12/15/2019	05:30	9.22	19:20	11.90	10.67	06:10	0.24	11:55	0.48	0.38	05:15	0.175	11:55	0.471	0.337	0.337	0.01
12/16/2019	03:25	9.04	19:15	12.04	10.56	04:30	0.23	20:55	0.47	0.35	04:30	0.168	20:55	0.475	0.306	0.306	0.01
12/17/2019	03:00	9.35	11:25	11.82	10.81	03:20	0.23	21:00	0.47	0.34	03:20	0.171	21:00	0.460	0.310	0.310	0.01
12/18/2019	03:20	9.69	09:05	11.84	10.90	03:30	0.25	08:55	0.48	0.37	03:30	0.198	08:55	0.488	0.340	0.340	0.01
12/19/2019	03:10	9.40	21:45	11.97	10.96	05:30	0.27	16:10	0.47	0.36	05:30	0.216	17:55	0.449	0.335	0.335	
12/20/2019	04:00	8.98	19:15	11.49	10.60	04:10	0.23	21:35	0.45	0.34	04:10	0.157	18:55	0.421	0.306	0.306	
12/21/2019	05:05	9.18	14:15	11.67	10.37	05:55	0.23	12:45	0.48	0.36	05:40	0.164	14:30	0.462	0.309	0.309	0.01
12/22/2019	06:00	9.09	15:05	12.18	10.70	05:50	0.22	12:45	0.48	0.37	05:50	0.158	12:40	0.474	0.333	0.333	0.41
12/23/2019	05:10	9.93	10:40	11.67	10.90	02:45	0.28	20:25	0.48	0.36	01:20	0.228	20:45	0.457	0.329	0.329	
12/24/2019	04:50	9.20	19:15	11.56	10.58	04:55	0.28	13:45	0.48	0.36	04:55	0.199	13:45	0.450	0.319	0.319	0.02
12/25/2019	05:10	9.37	11:55	11.70	10.65	04:20	0.25	19:10	0.47	0.37	04:20	0.187	12:00	0.465	0.333	0.333	0.08
12/26/2019	02:45	9.69	12:55	11.93	10.97	02:50	0.27	14:10	0.48	0.37	02:50	0.212	14:10	0.480	0.339	0.339	
12/27/2019	04:55	9.18	11:35	11.70	10.65	04:45	0.24	16:25	0.47	0.35	04:45	0.172	12:25	0.439	0.318	0.318	
12/28/2019	05:05	9.03	14:20	11.92	10.57	05:30	0.24	13:50	0.48	0.34	05:30	0.171	13:50	0.470	0.305	0.305	
12/29/2019	05:05	9.20	13:25	11.80	10.72	06:55	0.27	13:40	0.48	0.37	05:40	0.196	09:45	0.488	0.337	0.337	0.22
12/30/2019	03:55	9.62	12:50	12.09	11.03	03:10	0.26	15:55	0.48	0.38	03:35	0.203	12:35	0.503	0.357	0.357	
12/31/2019	04:10	9.43	19:50	11.96	10.81	06:00	0.26	19:00	0.48	0.36	06:00	0.207	19:00	0.459	0.328	0.328	0.01

Date	Depth (in)				Velocity (ft/s)				Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
01/01/2020	06:20	9.37	18:45	12.51	10.90	05:00	0.24	20:00	0.47	0.34	05:00	0.185	18:45	0.491	0.318	0.318	
01/02/2020	03:35	9.39	13:40	11.71	10.83	02:25	0.25	19:10	0.47	0.34	04:30	0.188	19:10	0.467	0.314	0.314	
01/03/2020	03:00	9.16	19:35	11.60	10.72	05:20	0.24	20:50	0.47	0.35	05:20	0.182	20:50	0.459	0.316	0.316	
01/04/2020	04:15	9.03	13:25	11.96	10.76	04:15	0.21	13:05	0.45	0.35	04:15	0.149	13:05	0.464	0.320	0.320	
01/05/2020	04:45	9.38	12:20	11.88	10.84	05:15	0.24	09:20	0.47	0.37	05:15	0.178	09:20	0.456	0.341	0.341	
01/06/2020	04:00	9.02	21:40	11.80	10.72	04:05	0.22	21:20	0.48	0.34	04:00	0.151	21:20	0.490	0.310	0.310	
01/07/2020	04:50	9.35	20:05	11.71	10.90	04:50	0.26	06:15	0.47	0.34	04:50	0.190	06:20	0.435	0.311	0.311	
01/08/2020	15:20	7.76	10:15	11.81	10.31	15:25	0.23	14:35	0.47	0.34	15:25	0.129	14:35	0.434	0.292	0.292	0.02
01/09/2020	23:55	8.58	11:40	12.80	9.84	03:00	0.22	10:40	0.45	0.32	04:25	0.150	11:45	0.465	0.258	0.258	0.18
01/10/2020	03:50	7.77	19:20	9.17	8.61	03:35	0.38	19:00	0.52	0.45	03:35	0.212	19:00	0.364	0.296	0.296	0.02
01/11/2020	05:10	7.93	11:00	9.52	8.81	05:10	0.39	12:30	0.52	0.45	05:10	0.223	12:30	0.380	0.308	0.308	0.01
01/12/2020	05:00	7.61	11:00	9.82	8.72	04:50	0.34	15:55	0.52	0.45	04:50	0.181	11:00	0.380	0.299	0.299	
01/13/2020	04:15	7.61	19:40	9.24	8.59	04:15	0.37	21:15	0.52	0.45	04:15	0.199	21:15	0.367	0.291	0.291	0.02
01/14/2020	02:15	7.68	20:30	9.62	8.74	03:35	0.35	08:15	0.52	0.45	03:35	0.194	20:30	0.370	0.304	0.304	0.11
01/15/2020	04:55	7.52	20:30	9.69	8.65	04:20	0.36	19:00	0.52	0.45	04:20	0.194	21:20	0.380	0.298	0.298	0.07
01/16/2020	04:00	7.44	13:15	10.33	9.21	04:00	0.36	10:05	0.52	0.45	04:00	0.186	13:15	0.395	0.330	0.330	0.66
01/17/2020	04:50	8.28	09:50	9.95	9.22	04:50	0.40	07:20	0.52	0.47	04:50	0.247	09:50	0.386	0.339	0.339	
01/18/2020	05:40	7.83	14:15	9.85	8.91	05:55	0.35	22:25	0.52	0.45	05:55	0.200	14:15	0.382	0.312	0.312	
01/19/2020	04:55	7.85	11:55	9.74	8.86	04:55	0.38	22:50	0.52	0.45	04:55	0.217	11:55	0.376	0.310	0.310	
01/20/2020	04:40	7.84	15:20	10.01	9.16	04:40	0.38	23:35	0.52	0.46	04:40	0.216	15:20	0.388	0.329	0.329	
01/21/2020	03:55	7.87	11:45	10.30	9.14	03:55	0.39	07:25	0.52	0.46	03:55	0.219	11:45	0.395	0.329	0.329	
01/22/2020	05:00	8.01	21:15	10.12	9.17	05:00	0.39	07:35	0.52	0.46	05:00	0.229	21:15	0.391	0.331	0.331	0.03
01/23/2020	04:35	7.98	19:45	10.10	9.12	04:35	0.39	23:30	0.52	0.46	04:35	0.227	19:45	0.391	0.328	0.328	
01/24/2020	04:50	7.59	17:45	10.20	9.19	04:55	0.36	08:35	0.51	0.45	04:55	0.194	17:45	0.393	0.327	0.327	
01/25/2020	05:05	8.00	10:35	10.74	9.09	05:05	0.39	21:20	0.52	0.46	05:05	0.228	10:35	0.438	0.327	0.327	
01/26/2020	05:05	7.59	11:15	10.31	9.05	05:10	0.37	09:00	0.52	0.45	05:05	0.197	11:15	0.395	0.319	0.319	0.16
01/27/2020	05:20	7.67	21:20	10.68	9.17	05:05	0.34	08:10	0.48	0.46	05:05	0.184	21:05	0.396	0.328	0.328	
01/28/2020	04:30	7.76	10:45	10.40	9.18	04:30	0.38	14:35	0.52	0.46	04:30	0.211	10:45	0.396	0.332	0.332	0.01
01/29/2020	04:05	7.76	10:05	10.69	9.20	04:05	0.38	00:00	0.52	0.46	04:05	0.211	10:20	0.396	0.331	0.331	
01/30/2020	04:05	7.59	22:25	10.33	9.14	04:05	0.37	07:35	0.51	0.46	04:05	0.198	22:25	0.395	0.328	0.328	
01/31/2020	04:55	7.62	10:40	9.84	8.99	04:55	0.37	22:50	0.51	0.45	04:55	0.200	10:40	0.381	0.318	0.318	
02/01/2020	04:40	7.32	11:30	9.64	8.60	04:40	0.35	09:50	0.52	0.44	04:40	0.176	11:30	0.371	0.290	0.290	
02/02/2020	04:55	7.41	10:45	9.24	8.40	04:55	0.35	21:30	0.52	0.43	04:55	0.183	21:30	0.366	0.271	0.271	
02/03/2020	04:05	7.32	08:55	10.48	8.57	04:05	0.35	13:30	0.52	0.44	04:05	0.176	09:00	0.396	0.289	0.289	
02/04/2020	04:35	7.34	13:50	9.45	8.62	06:10	0.34	08:20	0.52	0.45	04:35	0.177	08:20	0.364	0.295	0.295	
02/05/2020	05:30	7.48	20:55	9.34	8.56	03:50	0.33	19:15	0.52	0.44	03:50	0.176	09:15	0.368	0.286	0.286	
02/06/2020	15:00	6.59	14:50	9.92	8.19	15:00	0.26	11:40	0.52	0.42	15:00	0.114	14:50	0.385	0.258	0.258	
02/07/2020	03:55	6.32	11:20	8.99	7.91	03:55	0.22	20:10	0.50	0.39	03:55	0.087	11:20	0.328	0.231	0.231	
02/08/2020	04:00	6.57	12:00	8.81	7.88	04:45	0.24	11:00	0.50	0.40	04:00	0.107	12:10	0.337	0.233	0.233	
02/09/2020	03:50	6.83	11:20	8.82	7.82	04:35	0.25	21:55	0.48	0.39	04:35	0.117	11:20	0.316	0.224	0.224	
02/10/2020	03:20	7.20	09:25	9.88	8.65	01:45	0.29	15:55	0.50	0.43	01:45	0.144	09:25	0.383	0.289	0.289	
02/11/2020	03:40	6.95	21:05	9.40	8.58	04:50	0.29	10:05	0.48	0.43	04:50	0.138	09:10	0.353	0.285	0.285	
02/12/2020	04:05	7.00	20:10	9.76	8.68	04:15	0.27	16:25	0.51	0.44	04:15	0.127	20:10	0.377	0.294	0.294	
02/13/2020	04:00	7.13	11:55	9.57	8.65	03:35	0.29	21:00	0.51	0.44	03:35	0.142	21:00	0.376	0.293	0.293	
02/14/2020	04:00	7.12	11:25	9.65	8.74	03:50	0.28	22:55	0.51	0.44	03:50	0.138	19:20	0.372	0.299	0.299	
02/15/2020	05:30	7.13	12:20	9.92	8.50	06:15	0.30	13:55	0.48	0.43	06:15	0.150	12:20	0.385	0.280	0.280	
02/16/2020	04:45	6.74	13:10	9.27	8.18	04:45	0.24	19:55	0.49	0.41	04:45	0.107	13:10	0.344	0.255	0.255	
02/17/2020	04:50	6.75	13:25	9.99	8.37	03:00	0.27	10:45	0.51	0.41	04:50	0.122	13:25	0.387	0.267	0.267	
02/18/2020	03:50	6.85	11:00	9.50	8.45	04:55	0.27	08:30	0.50	0.43	05:25	0.123	11:00	0.358	0.277	0.277	
02/19/2020	04:30	7.06	12:10	9.75	8.61	04:30	0.31	13:25	0.51	0.44	04:30	0.150	13:25	0.383	0.289	0.289	
02/20/2020	03:30	7.30	11:20	9.64	8.72	04:20	0.31	21:45	0.51	0.45	04:20	0.160	11:20	0.371	0.299	0.299	
02/21/2020	04:20	7.10	11:00	9.56	8.48	03:50	0.29	11:00	0.48	0.44	03:50	0.145	11:00	0.367	0.281	0.281	
02/22/2020	05:40	6.88	12:05	9.91	8.34	03:40	0.28	12:35	0.48	0.42	05:45	0.135	12:05	0.384	0.267	0.267	
02/23/2020	05:35	6.85	20:20	9.71	8.32	03:00	0.28	17:55	0.50	0.42	05:15	0.129	20:20	0.375	0.265	0.265	
02/24/2020	04:30	6.91	11:40	9.34	8.37	01:50	0.29	14:50	0.51	0.42	03:50	0.137	14:50	0.360	0.271	0.271	

Date	Depth (in)					Velocity (ft/s)					Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
02/25/2020	05:10	7.00	20:45	9.19	8.44	03:55	0.28	10:55	0.50	0.43	03:55	0.133	10:55	0.351	0.277	0.277	
02/26/2020	04:15	6.90	08:30	9.34	8.33	05:15	0.27	08:50	0.48	0.43	05:15	0.127	08:30	0.348	0.268	0.268	
02/27/2020	04:10	7.06	12:30	9.10	8.41	04:05	0.29	07:50	0.50	0.43	04:05	0.139	07:50	0.336	0.276	0.276	
02/28/2020	04:05	7.00	11:00	9.33	8.41	04:55	0.29	12:25	0.50	0.43	04:55	0.140	11:00	0.350	0.276	0.276	
02/29/2020	03:55	6.85	13:55	9.42	8.13	03:45	0.26	12:10	0.50	0.41	03:45	0.118	12:10	0.363	0.250	0.250	
03/01/2020	05:30	6.79	12:55	8.88	7.97	03:10	0.25	20:40	0.51	0.41	03:15	0.116	14:25	0.328	0.239	0.239	
03/02/2020	04:25	7.12	20:55	9.06	8.22	01:50	0.29	08:55	0.52	0.42	04:00	0.146	08:40	0.336	0.256	0.256	
03/03/2020	04:40	7.14	20:20	9.01	8.18	04:40	0.33	07:55	0.52	0.41	04:40	0.160	07:55	0.353	0.247	0.247	
03/04/2020	03:50	6.87	09:40	9.11	8.21	03:50	0.30	11:45	0.53	0.42	03:50	0.137	11:45	0.361	0.258	0.258	
03/05/2020	03:35	6.84	20:45	9.08	8.16	04:30	0.29	09:40	0.48	0.41	04:30	0.133	20:45	0.331	0.251	0.251	
03/06/2020	05:35	6.83	10:35	8.98	8.16	05:35	0.29	10:35	0.47	0.41	05:35	0.134	10:35	0.323	0.252	0.252	
03/07/2020	05:15	6.78	11:05	9.25	8.19	04:55	0.28	20:40	0.52	0.40	04:55	0.126	20:40	0.348	0.248	0.248	
03/08/2020	04:50	6.98	11:30	9.18	8.17	04:50	0.31	13:35	0.54	0.42	04:50	0.146	13:35	0.379	0.257	0.257	
03/09/2020	03:30	6.86	10:25	9.21	8.25	01:40	0.27	10:20	0.53	0.41	02:40	0.130	10:20	0.383	0.257	0.257	

Report Summary For The Period 11/16/2019 00:00 - 03/09/2020 23:59

	Depth (in)	Velocity (ft/s)	Quantity (MGD - Total MG)	Rain (in)
Total			34.416	4.90
Avg	9.47	0.40	0.299	

Site Commentary

Site Information

MIL_2300	
Pipe Dimensions	10.25
Silt Level	0.00"

Overview

Site MIL_2300 functioned under normal conditions during the period Saturday, November 16, 2019 to Monday, March 9, 2020 . This site exhibited a small response to the wet weather events of November 26, 2019 - November 27, 2019 and December 7, 2019 - December 8, 2019. Review of the scattergraph shows that free flow conditions were recorded during the study period.

Flow depth and velocity measurements recorded by the flow monitor are consistent with field confirmations conducted to date and support the relative accuracy of the flow monitor at this location.

Observations

Average flow depth, velocity, and quantity data observed during Saturday, November 16, 2019 to Monday, March 9, 2020 , along with observed minimum and maximum data, are provided in the following table.

Observed Flow Conditions			
Item	Depth (in)	Velocity (ft/s)	Quantity (MGD)
Average	1.65	1.40	0.056
Minimum	0.93	0.33	0.006
Maximum	2.44	2.89	0.177
Time of Minimum	1/13/2020 4:15 AM	2/27/2020 3:50 AM	1/13/2020 3:55 AM
Time of Maximum	11/28/2019 12:45 PM	12/13/2019 11:10 AM	11/28/2019 12:50 PM

Data Quality

Data uptime observed during the Saturday, November 16, 2019 to the Monday, March 9, 2020 monitoring period is provided in the table below. Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

Percent Uptime	
Depth (in)	100
Velocity (ft/s)	100
Quantity (MGD)	100

Milpitas Temp Study 2019-20

Flow Monitoring Site Report

ADS ENVIRONMENTAL SERVICES®

Site Name

MIL_2300

				Monitor Series	Location Type
Site Address /Location:	Washington Dr and Fontainbleu Avenue, Milpitas, CA			TRITON+	Temporary
Site Access Details:	In between lanes w/buses	Latitude:	37.452734	Pipe Size (H x W)	Pipe Shape
		Longitude:	-121.909412	10.25" x 10.25"	Circular



Manhole #	System Characteristics
2300	Residential
Access	Traffic
Drive	Medium







Installation Information

Installation Date:	Installation Type:
Tuesday, November 12, 2019	Doppler Standard Ring and Crank
Monitoring Location (Sensors):	Monitor Location:
Upstream 0-5 FT	Manhole
Sensors / Devices:	Pressure Sensor Range (psi)
Peak Combo (CS4)	0 - 5 psi

Installation Confirmation:

Confirmation Time:	Pipe Size (HxW)
3:03:34 AM	10.25" x 10.25"
Depth of Flow (Wet DOF) (in)	Range (Air DOF) (in)
1.13"	0.00"
Downlooker Physical Offset (in)	Measurement Confidence (in)
NA	0.25"
Peak Velocity (fps)	Velocity Sensor Offset (in)
1.2	0''
Silt (in)	Silt Type
0''	

Hydraulic Comments:

Good flow shallow depth, moderate velocity

Manhole / Pipe Information:

Manhole Depth (Approx. FT):	Manhole Configuration
6'	Single
Manhole Material:	Manhole Condition:
Concrete	Good
Manhole Opening Diameter (in)	Manhole Diameter (Approx.):
26''	54''
Manhole Cover	Manhole Frame
Unbolted	Normal
Active Drop Connections	Air Quality:
No	Normal
Pipe Material	Pipe Condition:
PVC	Good

Communication Information:

Communication Type	Antenna Location
Wireless	Manhole Pick / Vent Hole

Additional Site Info. / Comments:

ADS Project Name:	Milpitas.WWTFM.CA19-20
ADS Project Number:	22431

SCATTERGRAPH REPORT

MIL_2300

Flow Monitor

MIL_2300

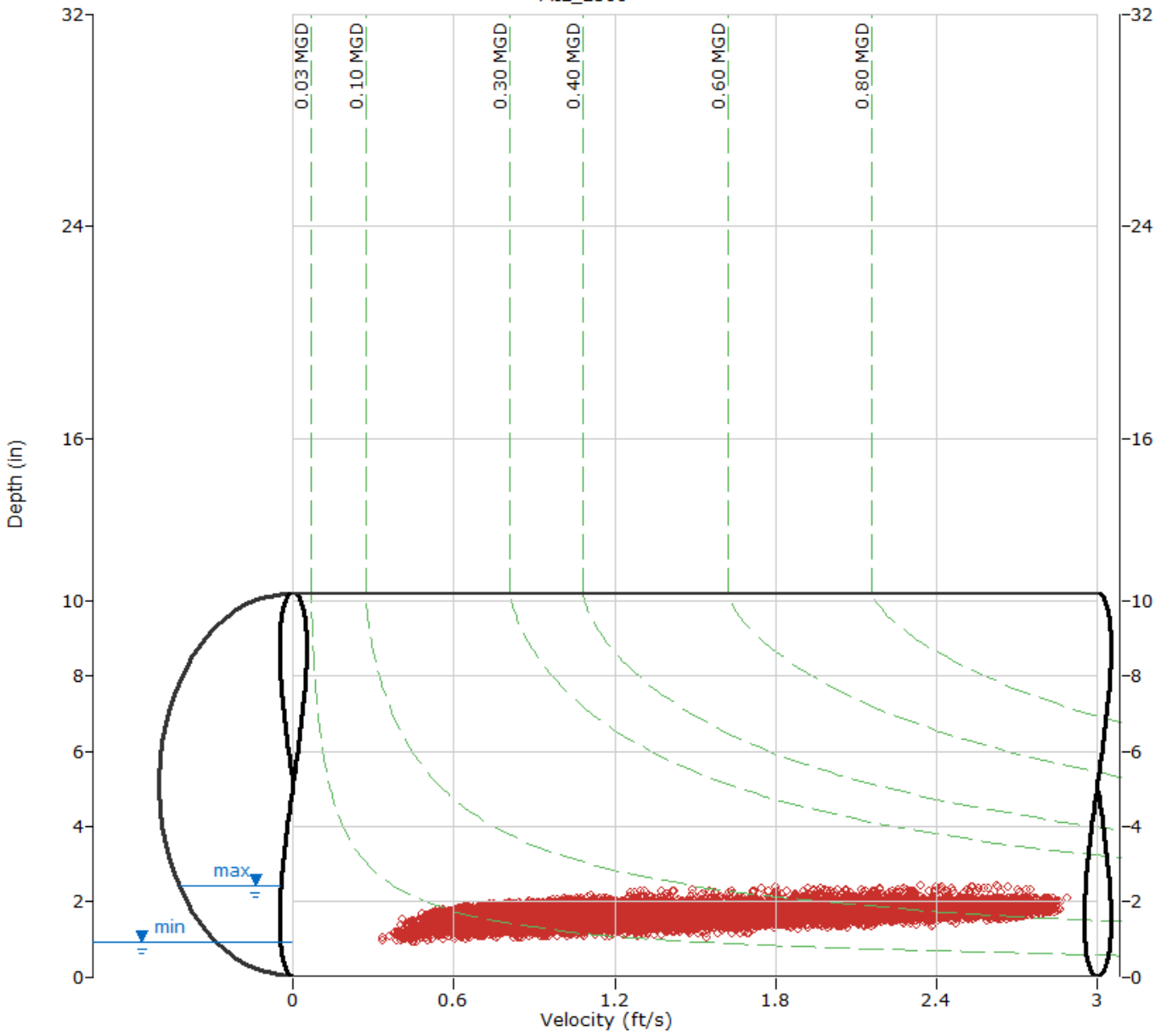
Pipe Height
10.25 in

Report Period

11/16/2019
To
3/9/2020

Legend

- Depth - Velocity
- Iso-Q™
- Silt
- Min-Max Depth



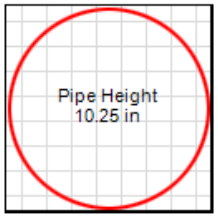
ADS ENVIRONMENTAL SERVICES

HYDROGRAPH REPORT

MIL_2300

Flow Monitor

MIL_2300

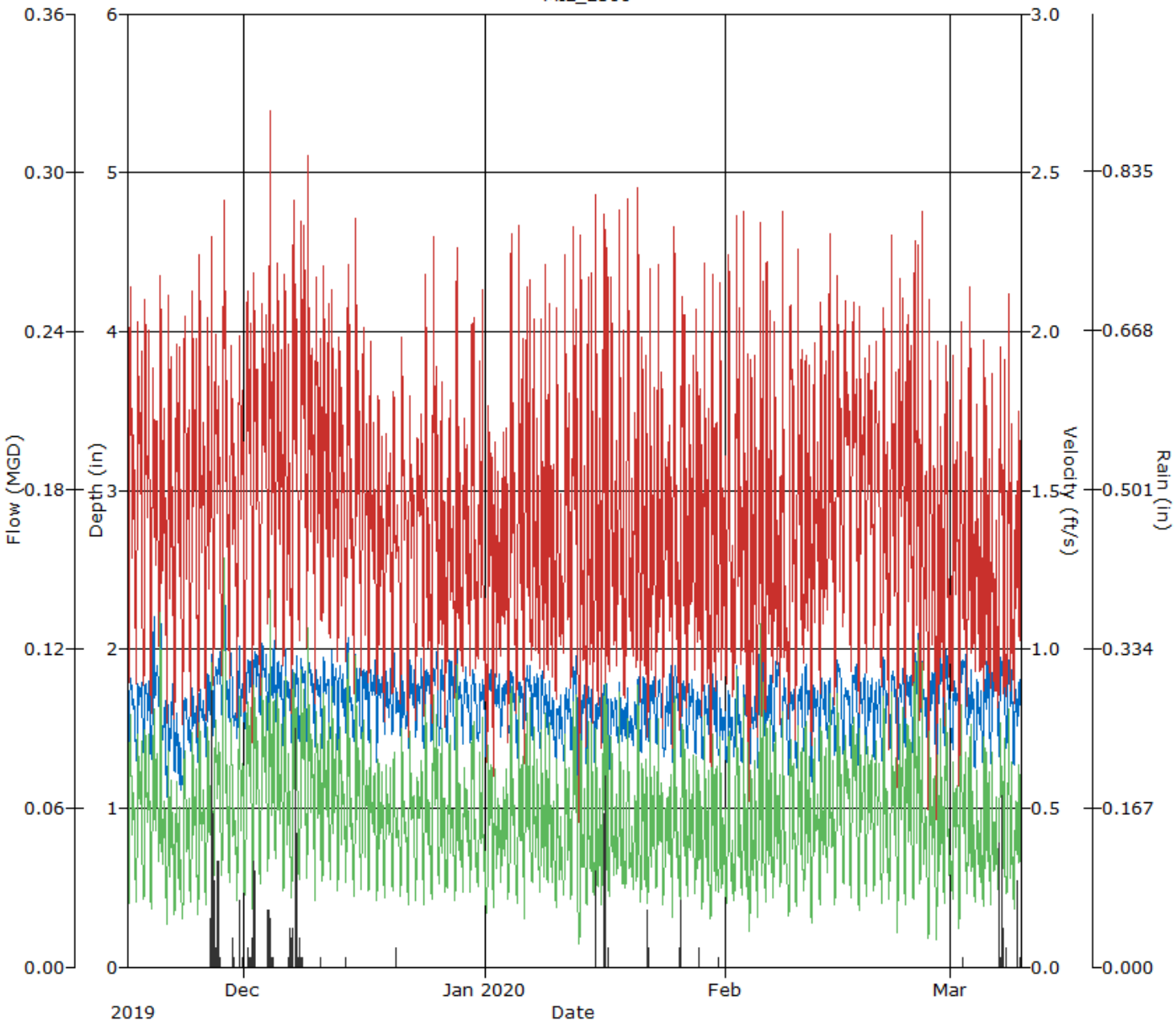


Report Period

11/16/2019
To
3/9/2020

Legend

- Depth
- Velocity
- Quantity
- Rain



Daily Tabular Report For The Period 11/16/2019 00:00 - 03/09/2020 23:59

MIL_2300, Pipe Height: 10.25 in, Silt: 0.00 in

Daily Tabular Report

Date	Depth (in)				Velocity (ft/s)				Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
11/16/2019	05:45	1.20	11:55	1.86	1.60	04:05	0.54	11:55	2.71	1.45	04:05	0.014	11:55	0.125	0.055	0.055	
11/17/2019	05:25	1.27	20:00	2.02	1.61	05:25	0.65	20:00	2.83	1.47	05:25	0.017	20:00	0.146	0.057	0.057	
11/18/2019	01:55	1.30	19:25	1.93	1.63	00:35	0.65	18:50	2.58	1.49	04:25	0.020	18:50	0.118	0.058	0.058	
11/19/2019	03:05	1.22	11:15	2.33	1.74	23:50	0.54	07:50	2.59	1.40	02:25	0.015	11:20	0.143	0.061	0.061	
11/20/2019	23:40	1.32	07:35	2.40	1.67	02:40	0.65	07:40	2.63	1.43	23:25	0.021	07:40	0.172	0.058	0.058	
11/21/2019	04:15	0.99	14:00	2.04	1.43	03:40	0.36	14:10	2.66	1.37	03:40	0.008	14:00	0.133	0.045	0.045	
11/22/2019	23:50	1.05	07:55	1.71	1.34	02:30	0.49	10:10	2.67	1.43	02:35	0.013	14:20	0.100	0.042	0.042	
11/23/2019	00:15	1.04	13:40	2.05	1.46	03:20	0.54	12:25	2.82	1.48	03:15	0.012	12:25	0.115	0.050	0.050	
11/24/2019	03:50	1.31	09:50	1.95	1.54	05:15	0.50	09:50	2.82	1.46	05:15	0.014	09:50	0.138	0.052	0.052	
11/25/2019	02:40	1.24	11:15	1.88	1.56	03:15	0.46	11:25	2.76	1.45	03:15	0.012	11:25	0.127	0.053	0.053	
11/26/2019	03:40	1.29	23:55	2.22	1.69	04:00	0.50	21:50	2.74	1.47	04:00	0.014	20:50	0.143	0.061	0.061	0.63
11/27/2019	03:30	1.43	22:05	2.09	1.78	03:55	0.45	22:05	2.67	1.53	03:55	0.015	22:05	0.144	0.067	0.067	0.77
11/28/2019	04:15	1.55	12:45	2.44	1.89	04:10	0.61	11:45	2.75	1.58	04:10	0.021	12:50	0.177	0.078	0.078	
11/29/2019	18:05	1.43	08:55	2.08	1.66	05:20	0.56	10:25	2.44	1.43	05:20	0.019	10:25	0.118	0.057	0.057	0.05
11/30/2019	04:10	1.42	10:25	2.14	1.70	02:40	0.53	19:15	2.73	1.51	02:40	0.017	19:15	0.143	0.063	0.063	0.14
12/01/2019	03:40	1.47	14:30	2.07	1.77	05:05	0.41	12:10	2.70	1.58	05:05	0.014	14:30	0.144	0.070	0.070	0.06
12/02/2019	04:50	1.35	14:50	2.17	1.79	05:05	0.49	14:30	2.76	1.57	04:25	0.017	14:50	0.148	0.071	0.071	0.36
12/03/2019	04:35	1.45	09:55	2.18	1.84	03:20	0.58	08:05	2.73	1.59	03:20	0.020	08:05	0.147	0.074	0.074	
12/04/2019	03:10	1.45	22:00	2.12	1.80	04:05	0.80	09:50	2.84	1.70	04:05	0.027	09:50	0.154	0.077	0.077	0.44
12/05/2019	23:55	1.51	09:40	2.01	1.78	04:30	0.61	07:30	2.80	1.58	04:30	0.027	07:30	0.136	0.069	0.069	
12/06/2019	05:20	1.32	09:00	2.15	1.68	02:00	0.62	11:10	2.75	1.49	02:00	0.019	09:20	0.147	0.061	0.061	0.06
12/07/2019	03:30	1.37	20:15	2.04	1.72	04:20	0.50	17:45	2.84	1.66	04:50	0.015	19:45	0.138	0.070	0.070	0.84
12/08/2019	01:25	1.34	10:25	2.00	1.72	04:45	0.55	19:20	2.82	1.73	04:45	0.018	12:00	0.132	0.073	0.073	0.10
12/09/2019	04:05	1.28	07:40	2.04	1.75	04:10	0.58	07:15	2.84	1.66	04:10	0.016	07:20	0.147	0.072	0.072	
12/10/2019	03:30	1.29	09:15	2.03	1.70	02:55	0.61	10:10	2.74	1.57	03:30	0.018	10:25	0.132	0.065	0.065	0.01
12/11/2019	03:05	1.35	08:30	2.08	1.71	00:55	0.47	21:00	2.78	1.58	00:55	0.015	08:30	0.135	0.066	0.066	0.00
12/12/2019	05:10	1.36	07:35	2.07	1.73	01:45	0.68	15:30	2.75	1.53	01:45	0.022	08:05	0.142	0.065	0.065	
12/13/2019	02:50	1.29	11:20	2.12	1.69	05:05	0.57	11:10	2.89	1.48	03:05	0.017	11:10	0.157	0.061	0.061	
12/14/2019	03:00	1.27	13:30	2.21	1.71	03:55	0.49	08:40	2.79	1.51	03:55	0.016	08:40	0.145	0.063	0.063	0.01
12/15/2019	05:35	1.35	09:20	2.12	1.68	07:25	0.65	18:45	2.73	1.53	03:20	0.020	11:05	0.141	0.063	0.063	
12/16/2019	05:05	1.39	12:15	2.13	1.71	02:40	0.61	08:30	2.74	1.46	02:40	0.020	08:30	0.135	0.061	0.061	
12/17/2019	02:55	1.37	09:15	2.16	1.72	02:50	0.59	07:35	2.72	1.38	02:50	0.018	07:35	0.139	0.058	0.058	
12/18/2019	01:50	1.18	07:00	2.03	1.67	03:45	0.60	09:10	2.41	1.34	03:45	0.018	11:25	0.109	0.054	0.054	
12/19/2019	02:55	1.41	08:50	2.01	1.69	03:05	0.63	11:30	2.39	1.34	03:05	0.020	21:25	0.112	0.054	0.054	
12/20/2019	04:40	1.41	10:35	2.08	1.66	02:40	0.66	08:25	2.45	1.31	02:40	0.023	08:25	0.118	0.052	0.052	0.02
12/21/2019	05:35	1.42	09:35	1.97	1.62	05:05	0.69	09:35	2.51	1.39	05:05	0.022	09:35	0.125	0.053	0.053	
12/22/2019	04:35	1.33	11:30	2.26	1.70	03:50	0.57	10:50	2.40	1.33	03:50	0.017	10:50	0.134	0.055	0.055	
12/23/2019	02:40	1.39	20:30	2.00	1.70	23:35	0.66	22:45	2.70	1.37	02:30	0.022	22:45	0.128	0.056	0.056	
12/24/2019	04:20	1.31	09:55	2.01	1.70	00:25	0.56	13:55	2.71	1.35	03:20	0.019	09:50	0.132	0.055	0.055	
12/25/2019	06:40	1.36	20:40	2.06	1.74	23:55	0.56	11:50	2.75	1.44	05:45	0.019	09:45	0.139	0.062	0.062	
12/26/2019	04:50	1.33	11:05	2.08	1.69	23:25	0.54	11:05	2.77	1.23	04:50	0.018	11:05	0.149	0.050	0.050	
12/27/2019	04:20	1.32	21:15	2.07	1.70	00:15	0.55	11:40	2.59	1.33	00:15	0.019	09:10	0.133	0.055	0.055	
12/28/2019	03:55	1.26	10:35	2.05	1.68	05:00	0.45	10:35	2.77	1.33	05:00	0.014	10:35	0.146	0.055	0.055	
12/29/2019	05:45	1.38	13:45	1.97	1.67	17:35	0.54	10:35	2.65	1.30	05:50	0.017	08:25	0.122	0.052	0.052	
12/30/2019	04:50	1.32	11:35	1.97	1.68	23:15	0.60	11:35	2.65	1.38	03:00	0.021	11:35	0.132	0.056	0.056	
12/31/2019	03:05	1.33	22:00	1.88	1.64	15:40	0.63	16:20	2.80	1.34	03:15	0.019	17:30	0.124	0.052	0.052	

Date	Depth (in)				Velocity (ft/s)				Quantity (MGD - Total MG)					Rain (in)
	Time	Min Time	Max	Avg	Time	Min Time	Max	Avg	Time	Min Time	Max	Avg	Total	Total
01/01/2020	05:10	1.24 11:00	2.00	1.68	05:05	0.41 11:00	2.73	1.20	05:05	0.011 11:00	0.138	0.050	0.050	
01/02/2020	05:05	1.47 09:10	1.96	1.71	02:25	0.48 08:35	2.69	1.21	03:20	0.018 09:05	0.130	0.050	0.050	
01/03/2020	01:30	1.40 09:05	1.90	1.67	06:55	0.50 19:10	2.69	1.31	06:55	0.016 19:10	0.126	0.052	0.052	
01/04/2020	04:10	1.40 10:10	1.96	1.67	03:25	0.47 09:50	2.83	1.39	03:25	0.016 11:30	0.135	0.056	0.056	
01/05/2020	04:30	1.27 09:30	1.94	1.64	01:00	0.50 11:20	2.82	1.36	05:15	0.018 11:20	0.129	0.054	0.054	
01/06/2020	03:15	1.29 12:00	2.02	1.71	04:05	0.40 09:50	2.78	1.41	04:05	0.012 09:50	0.134	0.059	0.059	
01/07/2020	03:05	1.33 08:40	1.97	1.69	23:50	0.55 19:25	2.76	1.34	23:50	0.021 07:35	0.131	0.054	0.054	
01/08/2020	02:45	1.32 08:00	1.94	1.65	14:25	0.51 21:30	2.79	1.32	02:30	0.017 11:10	0.131	0.052	0.052	
01/09/2020	10:40	1.32 09:45	1.86	1.59	23:35	0.57 10:10	2.76	1.32	23:35	0.017 07:15	0.124	0.050	0.050	
01/10/2020	04:35	1.12 20:20	1.75	1.53	01:00	0.58 09:30	2.71	1.30	04:30	0.015 08:20	0.107	0.046	0.046	
01/11/2020	03:45	1.21 23:10	1.94	1.57	07:10	0.54 13:50	2.80	1.45	05:25	0.017 11:05	0.116	0.053	0.053	
01/12/2020	23:50	1.14 19:50	2.02	1.64	01:05	0.47 10:40	2.86	1.52	01:05	0.014 19:10	0.144	0.061	0.061	
01/13/2020	04:15	0.93 17:35	2.03	1.47	03:55	0.33 20:50	2.74	1.15	03:55	0.006 12:00	0.127	0.041	0.041	
01/14/2020	04:35	1.26 21:00	1.87	1.59	06:35	0.47 20:25	2.84	1.22	03:20	0.015 21:00	0.129	0.046	0.046	
01/15/2020	04:40	1.20 20:00	1.78	1.55	23:50	0.53 21:30	2.71	1.27	23:50	0.018 21:30	0.116	0.046	0.046	0.10
01/16/2020	23:45	1.34 12:50	1.93	1.62	00:45	0.49 19:50	2.77	1.50	00:45	0.016 07:25	0.131	0.059	0.059	0.66
01/17/2020	01:20	1.22 14:50	1.98	1.55	01:00	0.52 12:20	2.79	1.39	01:00	0.014 07:55	0.121	0.050	0.050	
01/18/2020	22:45	1.33 10:25	1.86	1.55	01:10	0.50 10:15	2.79	1.39	01:10	0.017 10:25	0.124	0.050	0.050	
01/19/2020	05:30	1.38 09:45	1.81	1.55	01:30	0.58 14:50	2.85	1.42	03:50	0.020 14:50	0.120	0.051	0.051	
01/20/2020	23:55	1.35 19:15	1.97	1.57	01:10	0.61 18:10	2.86	1.40	01:10	0.020 18:50	0.135	0.052	0.052	
01/21/2020	04:25	1.24 20:35	2.05	1.59	00:20	0.55 12:30	2.80	1.34	00:20	0.016 20:35	0.137	0.050	0.050	0.01
01/22/2020	00:35	1.34 17:45	1.89	1.65	01:10	0.51 13:25	2.71	1.30	00:55	0.018 17:45	0.125	0.051	0.051	0.09
01/23/2020	23:50	1.33 17:10	1.93	1.62	00:10	0.55 19:45	2.71	1.36	23:50	0.017 07:25	0.124	0.052	0.052	
01/24/2020	12:10	1.19 10:55	2.05	1.57	00:10	0.68 13:05	2.68	1.35	00:10	0.017 22:20	0.114	0.049	0.049	
01/25/2020	03:20	1.19 13:10	1.98	1.64	01:05	0.54 09:30	2.82	1.36	05:00	0.014 13:10	0.137	0.054	0.054	
01/26/2020	18:30	1.13 21:55	1.88	1.62	04:50	0.52 11:10	2.83	1.45	04:50	0.014 11:10	0.130	0.056	0.056	0.16
01/27/2020	01:15	1.18 19:00	1.87	1.61	23:50	0.45 19:50	2.74	1.31	23:50	0.013 19:00	0.123	0.050	0.050	
01/28/2020	18:10	1.18 15:05	1.83	1.55	00:35	0.46 21:25	2.79	1.32	00:35	0.014 15:05	0.121	0.047	0.047	0.02
01/29/2020	00:55	1.05 08:40	1.98	1.56	01:35	0.52 19:20	2.81	1.36	00:55	0.013 19:20	0.134	0.050	0.050	
01/30/2020	00:05	1.23 10:35	2.17	1.60	01:10	0.43 10:00	2.73	1.30	01:10	0.013 19:45	0.133	0.050	0.050	
01/31/2020	17:35	1.20 16:05	1.78	1.49	15:40	0.57 16:10	2.82	1.31	17:35	0.015 16:10	0.121	0.045	0.045	0.01
02/01/2020	03:05	1.15 10:05	1.86	1.49	07:45	0.58 11:05	2.73	1.37	07:45	0.018 13:10	0.114	0.047	0.047	
02/02/2020	01:55	1.20 11:45	2.04	1.57	23:10	0.57 14:10	2.74	1.48	23:10	0.016 11:45	0.127	0.056	0.056	
02/03/2020	05:10	1.12 21:05	1.95	1.59	00:10	0.49 07:10	2.81	1.33	00:10	0.014 21:05	0.122	0.050	0.050	
02/04/2020	00:40	1.15 20:30	1.88	1.53	03:35	0.39 22:25	2.79	1.26	03:35	0.009 22:25	0.118	0.045	0.045	
02/05/2020	03:50	1.21 12:05	2.40	1.75	04:40	0.47 20:25	2.81	1.26	04:40	0.013 12:05	0.168	0.056	0.056	
02/06/2020	03:20	1.34 13:45	1.98	1.65	03:25	0.52 20:20	2.75	1.40	03:25	0.015 20:20	0.130	0.056	0.056	
02/07/2020	05:00	1.28 11:15	2.13	1.73	15:55	0.64 14:15	2.81	1.29	04:25	0.019 14:15	0.147	0.054	0.054	
02/08/2020	06:50	1.39 19:25	1.95	1.63	22:45	0.57 10:00	2.75	1.23	22:45	0.019 14:00	0.121	0.047	0.047	
02/09/2020	04:50	1.10 08:25	1.87	1.53	23:30	0.44 19:45	2.82	1.37	23:30	0.014 08:30	0.121	0.050	0.050	
02/10/2020	04:10	1.16 11:30	2.00	1.60	00:20	0.58 19:55	2.84	1.45	04:40	0.018 13:25	0.128	0.056	0.056	
02/11/2020	02:15	1.34 08:30	1.98	1.65	13:25	0.67 07:30	2.81	1.34	16:25	0.023 07:30	0.137	0.053	0.053	
02/12/2020	02:05	1.08 10:15	2.02	1.59	06:10	0.50 10:05	2.86	1.37	02:00	0.012 10:15	0.146	0.052	0.052	
02/13/2020	02:00	1.25 09:50	1.90	1.61	14:05	0.58 13:20	2.83	1.41	04:35	0.019 07:55	0.127	0.054	0.054	
02/14/2020	04:00	1.40 13:00	2.01	1.62	15:30	0.63 10:05	2.83	1.55	15:30	0.021 13:00	0.140	0.060	0.060	
02/15/2020	02:20	1.27 09:30	2.04	1.70	03:00	0.60 09:05	2.75	1.51	03:00	0.016 09:30	0.141	0.064	0.064	
02/16/2020	05:35	1.26 16:20	1.85	1.61	00:25	0.53 16:30	2.69	1.61	00:25	0.018 16:20	0.112	0.061	0.061	
02/17/2020	04:15	1.26 20:50	1.94	1.67	04:15	0.58 17:40	2.51	1.57	04:15	0.015 14:45	0.121	0.064	0.064	
02/18/2020	04:20	1.20 18:55	1.94	1.62	04:35	0.55 18:55	2.83	1.52	04:35	0.013 18:55	0.138	0.059	0.059	
02/19/2020	04:35	1.30 08:05	1.96	1.62	23:55	0.60 20:25	2.53	1.53	04:20	0.017 08:10	0.122	0.059	0.059	
02/20/2020	04:20	1.24 10:20	1.92	1.60	00:00	0.55 09:25	2.44	1.47	00:00	0.018 09:25	0.109	0.056	0.056	
02/21/2020	03:30	1.25 09:15	2.10	1.63	02:20	0.43 09:15	2.73	1.38	02:20	0.013 09:15	0.149	0.054	0.054	
02/22/2020	03:45	1.30 14:10	1.95	1.68	00:35	0.50 09:35	2.83	1.52	00:35	0.018 09:35	0.130	0.061	0.061	
02/23/2020	04:05	1.10 19:50	2.00	1.63	04:25	0.38 18:05	2.74	1.46	04:10	0.009 18:05	0.131	0.058	0.058	
02/24/2020	03:25	1.33 11:30	2.06	1.67	23:40	0.50 11:30	2.81	1.47	03:05	0.015 11:30	0.149	0.059	0.059	

Date	Depth (in)					Velocity (ft/s)					Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
02/25/2020	04:05	1.27	13:40	2.25	1.79	03:50	0.75	21:35	2.86	1.57	03:55	0.020	20:45	0.151	0.071	0.071	
02/26/2020	23:50	1.44	00:00	2.04	1.71	02:40	0.50	10:00	2.84	1.32	23:05	0.017	10:00	0.143	0.055	0.055	
02/27/2020	04:10	0.99	12:30	1.95	1.62	03:50	0.33	07:35	2.68	1.22	03:50	0.006	18:00	0.120	0.049	0.049	
02/28/2020	03:55	1.03	14:35	2.40	1.64	03:50	0.41	14:35	2.67	1.15	03:50	0.009	14:35	0.176	0.047	0.047	
02/29/2020	05:15	1.33	11:25	2.07	1.71	05:00	0.49	11:40	2.57	1.23	05:00	0.014	11:40	0.132	0.051	0.051	
03/01/2020	05:40	1.29	16:40	1.95	1.62	00:05	0.55	21:05	2.50	1.32	00:05	0.020	21:05	0.120	0.051	0.051	
03/02/2020	01:50	1.20	12:50	2.10	1.75	02:30	0.47	07:30	2.70	1.27	02:30	0.012	07:30	0.138	0.056	0.056	0.01
03/03/2020	04:25	1.35	14:00	1.99	1.63	23:15	0.53	14:05	2.85	1.29	04:25	0.016	14:00	0.144	0.050	0.050	
03/04/2020	04:25	1.18	12:50	1.97	1.56	03:25	0.45	10:25	2.72	1.23	03:25	0.011	12:50	0.123	0.045	0.045	
03/05/2020	04:00	1.21	13:35	2.25	1.66	04:00	0.53	10:10	2.74	1.30	04:00	0.013	13:55	0.144	0.052	0.052	
03/06/2020	03:20	1.17	21:10	1.99	1.69	11:25	0.60	20:45	2.46	1.12	03:20	0.019	20:45	0.116	0.045	0.045	
03/07/2020	04:55	1.24	14:05	2.04	1.72	03:15	0.47	14:00	2.74	1.30	03:15	0.014	14:00	0.142	0.055	0.055	0.58
03/08/2020	04:35	1.34	09:45	2.03	1.68	03:35	0.51	21:50	2.72	1.25	03:35	0.016	09:45	0.125	0.051	0.051	0.02
03/09/2020	04:20	1.22	22:00	1.90	1.59	04:25	0.50	07:10	2.60	1.27	04:25	0.013	19:45	0.108	0.047	0.047	0.11

Report Summary For The Period 11/16/2019 00:00 - 03/09/2020 23:59

	Depth (in)	Velocity (ft/s)	Quantity (MGD - Total MG)	Rain (in)
Total			6.402	5.26
Avg	1.65	1.40	0.056	

Site Commentary

Site Information

MIL_2334	
Pipe Dimensions	12.5
Silt Level	0.00"

Overview

Site MIL_2334 functioned under normal conditions during the period Saturday, November 16, 2019 to Monday, March 9, 2020 . This site exhibited little to no response to the wet weather events of November 26, 2019 - November 27, 2019 and December 7, 2019 - December 8, 2019. Review of the scattergraph shows that free flow conditions were recorded during the study period.

Flow depth and velocity measurements recorded by the flow monitor are consistent with field confirmations conducted to date and support the relative accuracy of the flow monitor at this location.

Observations

Average flow depth, velocity, and quantity data observed during Saturday, November 16, 2019 to Monday, March 9, 2020 , along with observed minimum and maximum data, are provided in the following table.

Observed Flow Conditions			
Item	Depth (in)	Velocity (ft/s)	Quantity (MGD)
Average	2.12	2.77	0.175
Minimum	1.55	1.24	0.052
Maximum	3.31	3.62	0.352
Time of Minimum	11/25/2019 3:50 AM	2/28/2020 3:55 AM	2/28/2020 3:55 AM
Time of Maximum	12/8/2019 2:25 PM	3/6/2020 9:45 AM	12/8/2019 2:25 PM

Data Quality

Data uptime observed during the Saturday, November 16, 2019 to the Monday, March 9, 2020 monitoring period is provided in the table below. Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

Percent Uptime	
Depth (in)	100
Velocity (ft/s)	100
Quantity (MGD)	100

Milpitas Temp Study 2019-20

Flow Monitoring Site Report

ADS ENVIRONMENTAL SERVICES®

Site Name

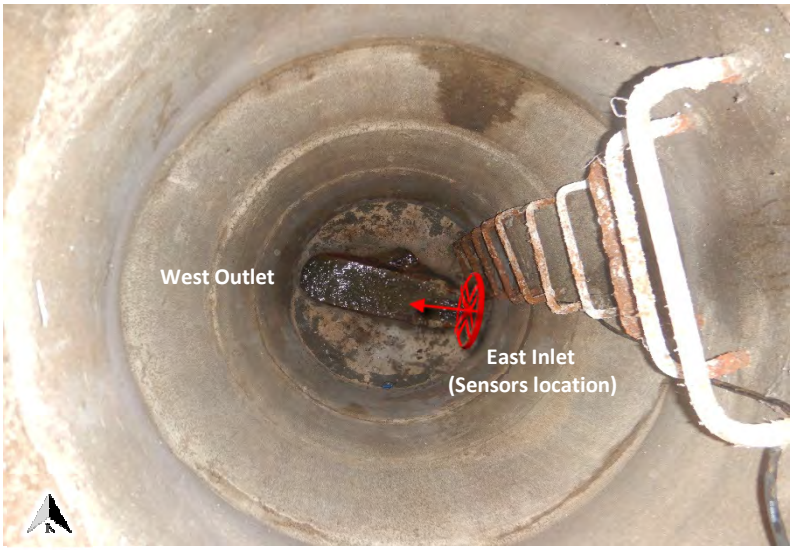
MIL_2334

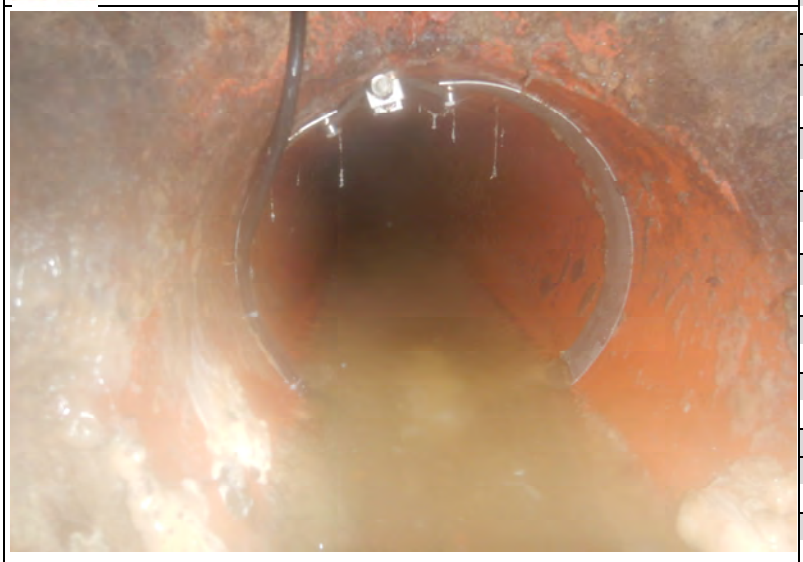
Site Address /Location:	Tramway Dr and Strickroth Dr			Monitor Series	Location Type
				TRITON+	Temporary
Site Access Details:	Drive	Latitude:	37.44209	Pipe Size (H x W)	Pipe Shape
		Longitude:	-121.903338	12.5" x 12.5"	Circular



Manhole #	System Characteristics
2334	Residential
Access	Traffic
Drive	Light







Installation Information

Installation Date:	Installation Type:
Friday, November 15, 2019	Doppler Standard Ring and Crank
Monitoring Location (Sensors):	Monitor Location:
Upstream 0-5 FT	Manhole
Sensors / Devices:	Pressure Sensor Range (psi)
Peak Combo (CS4)	0 - 5 psi

Installation Confirmation:

Confirmation Time:	Pipe Size (HxW)
7:47:00 AM	12.5" x 12.5"
Depth of Flow (Wet DOF) (in)	Range (Air DOF) (in)
2.25"	0.00"
Downlooker Physical Offset (in)	Measurement Confidence (in)
NA	0.25"
Peak Velocity (fps)	Velocity Sensor Offset (in)
3.52	0''
Silt (in)	Silt Type
0''	

Hydraulic Comments:

good flow, shallow and moderate velocity

Manhole / Pipe Information:

Manhole Depth (Approx. FT):	Manhole Configuration
12'	Single
Manhole Material:	Manhole Condition:
Concrete	Good
Manhole Opening Diameter (in)	Manhole Diameter (Approx.):
26''	54''
Manhole Cover	Manhole Frame
Unbolted	Normal
Active Drop Connections	Air Quality:
No	Normal
Pipe Material	Pipe Condition:
Vitrified Clay Pipe	Good

Communication Information:

Communication Type	Antenna Location
Wireless	Manhole Pick / Vent Hole

Additional Site Info. / Comments:

ADS Project Name:	Milpitas.WWTFM.CA19-20
ADS Project Number:	22431

SCATTERGRAPH REPORT

MIL_2334

Flow Monitor

MIL_2334

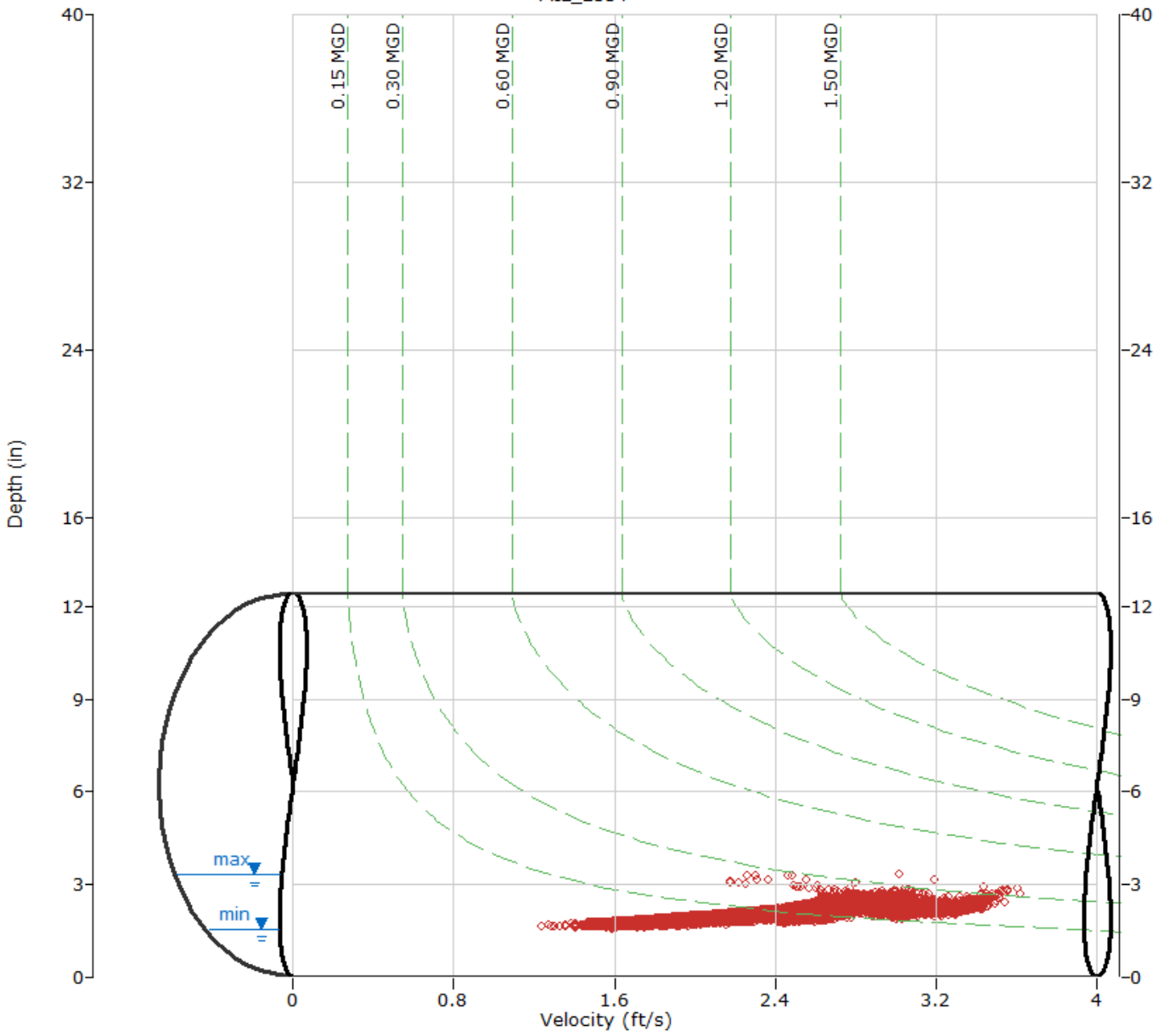
Pipe Height
12.50 in

Report Period

11/16/2019
To
3/9/2020

Legend

- Depth - Velocity
- Iso-Q™
- Silt
- Min-Max Depth



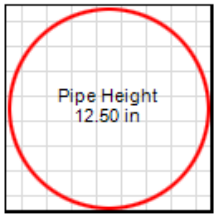
ADS ENVIRONMENTAL SERVICES

HYDROGRAPH REPORT

MIL_2334

Flow Monitor

MIL_2334

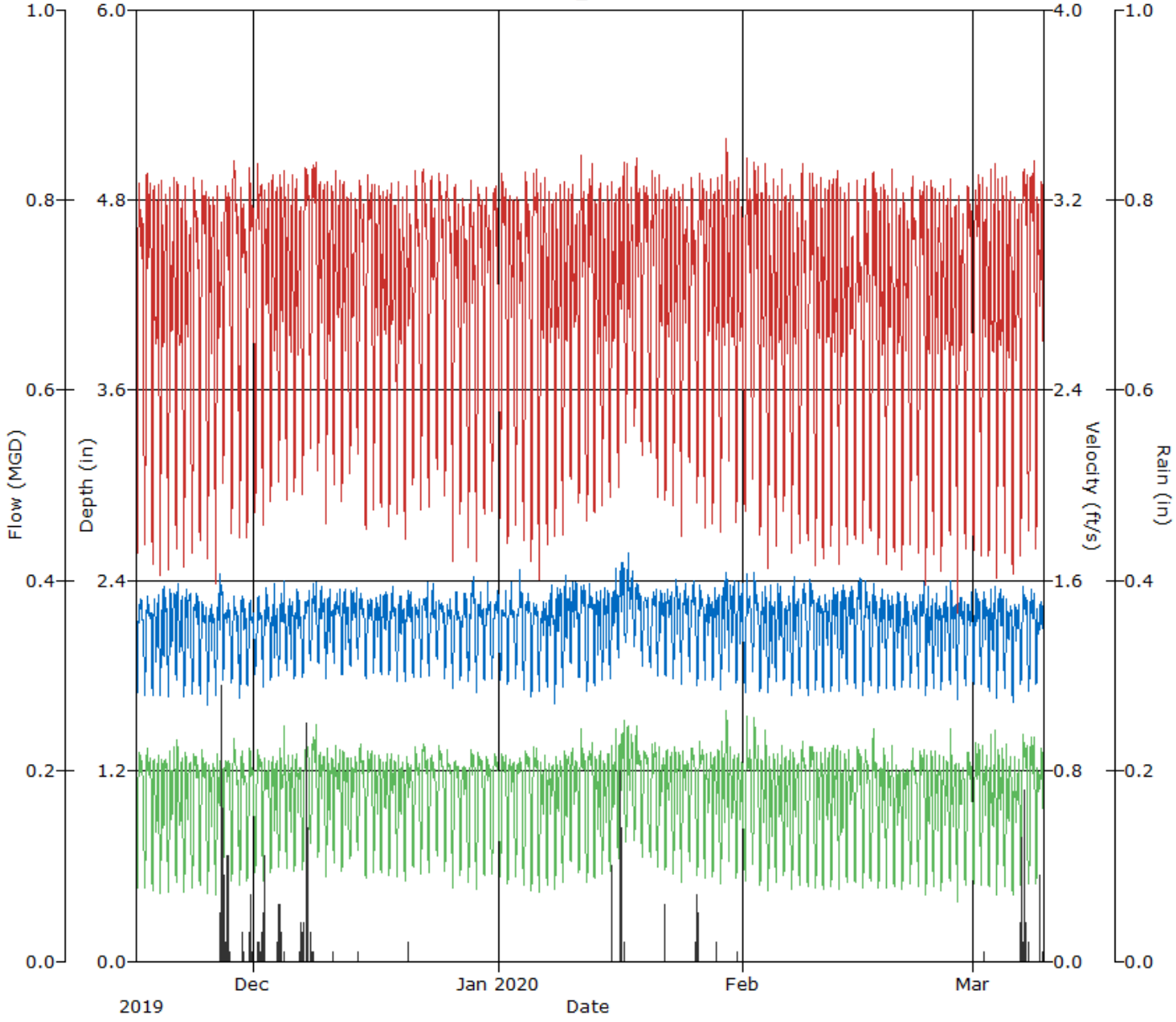


Report Period

11/16/2019
To
3/9/2020

Legend

- Depth
- Velocity
- Quantity
- Rain



ADS ENVIRONMENTAL SERVICES

Daily Tabular Report For The Period 11/16/2019 00:00 - 03/09/2020 23:59

MIL_2334, Pipe Height: 12.50 in, Silt: 0.00 in

Daily Tabular Report

Date	Depth (in)				Velocity (ft/s)				Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
11/16/2019	03:55	1.64	18:45	2.65	2.08	04:10	1.41	12:05	3.37	2.74	04:10	0.062	17:40	0.252	0.170	0.170	
11/17/2019	04:05	1.63	12:25	2.68	2.09	03:45	1.50	11:15	3.41	2.81	03:50	0.067	14:30	0.254	0.175	0.175	
11/18/2019	04:00	1.63	17:25	2.50	2.07	03:55	1.47	08:15	3.35	2.70	03:55	0.062	07:50	0.239	0.165	0.165	
11/19/2019	03:10	1.66	19:15	2.58	2.09	03:10	1.36	20:20	3.38	2.71	03:10	0.059	11:15	0.237	0.168	0.168	
11/20/2019	03:50	1.64	07:10	2.65	2.10	03:50	1.46	20:25	3.38	2.67	03:50	0.062	07:10	0.245	0.168	0.168	
11/21/2019	03:55	1.72	23:00	2.48	2.10	04:00	1.51	07:35	3.41	2.65	04:00	0.070	07:35	0.256	0.166	0.166	
11/22/2019	03:55	1.59	09:15	2.52	2.10	03:40	1.51	07:55	3.38	2.66	03:40	0.063	07:40	0.242	0.167	0.167	
11/23/2019	04:05	1.63	16:55	2.87	2.10	04:15	1.33	10:45	3.35	2.78	04:15	0.057	16:55	0.290	0.174	0.174	
11/24/2019	05:30	1.67	10:55	2.75	2.08	04:35	1.53	10:25	3.39	2.82	04:35	0.071	10:55	0.276	0.173	0.173	
11/25/2019	03:50	1.55	11:40	2.50	2.05	04:10	1.41	21:20	3.34	2.73	04:10	0.057	11:45	0.225	0.165	0.165	
11/26/2019	04:00	1.63	19:05	2.59	2.13	03:55	1.29	08:40	3.34	2.66	03:55	0.054	20:35	0.238	0.170	0.170	0.63
11/27/2019	03:00	1.76	14:45	2.46	2.10	01:40	1.78	11:40	3.38	2.89	01:40	0.089	17:45	0.220	0.179	0.179	0.77
11/28/2019	03:55	1.72	11:50	2.50	2.10	03:40	1.56	11:50	3.47	2.91	03:40	0.073	11:50	0.271	0.180	0.180	
11/29/2019	04:40	1.60	16:35	2.69	2.08	05:30	1.56	09:35	3.33	2.80	05:30	0.067	16:40	0.260	0.171	0.171	0.05
11/30/2019	03:30	1.70	12:00	2.96	2.06	03:35	1.52	11:20	3.37	2.83	03:35	0.068	12:00	0.248	0.172	0.172	0.14
12/01/2019	04:30	1.79	13:55	3.12	2.09	04:05	1.79	10:45	3.39	2.89	04:05	0.088	13:55	0.254	0.178	0.178	0.06
12/02/2019	03:15	1.69	13:05	2.45	2.10	02:35	1.65	07:45	3.36	2.80	03:10	0.077	08:00	0.244	0.174	0.174	0.36
12/03/2019	03:45	1.76	12:15	2.47	2.07	03:40	1.70	08:30	3.35	2.78	03:40	0.081	08:05	0.223	0.169	0.169	
12/04/2019	02:15	1.77	19:15	2.88	2.13	02:10	1.86	19:15	3.61	2.85	03:10	0.089	19:15	0.346	0.180	0.180	0.44
12/05/2019	03:35	1.80	07:30	2.46	2.11	02:25	1.75	20:45	3.34	2.81	02:25	0.086	07:35	0.234	0.174	0.174	
12/06/2019	03:45	1.75	10:20	2.50	2.13	03:35	1.80	08:05	3.35	2.77	03:35	0.086	08:05	0.240	0.174	0.174	0.06
12/07/2019	04:20	1.75	00:00	2.52	2.13	04:10	1.76	20:55	3.39	2.92	04:10	0.084	20:55	0.234	0.185	0.185	0.84
12/08/2019	02:35	1.86	14:25	3.31	2.18	04:40	1.86	19:40	3.56	3.00	04:45	0.098	14:25	0.352	0.195	0.195	0.10
12/09/2019	03:50	1.79	09:50	2.52	2.16	03:05	1.80	08:10	3.38	2.84	03:05	0.091	07:55	0.244	0.183	0.183	
12/10/2019	03:20	1.77	16:20	2.58	2.13	03:30	1.62	07:35	3.39	2.79	03:30	0.077	07:35	0.250	0.176	0.176	0.01
12/11/2019	01:20	1.83	23:45	2.47	2.18	03:45	1.93	07:55	3.41	2.83	03:25	0.099	07:55	0.252	0.184	0.184	0.00
12/12/2019	03:45	1.78	10:30	2.54	2.12	04:35	1.84	22:15	3.39	2.78	03:50	0.090	07:30	0.251	0.175	0.175	
12/13/2019	05:20	1.78	09:05	2.52	2.16	03:00	1.78	08:05	3.34	2.77	03:00	0.088	09:05	0.233	0.179	0.179	
12/14/2019	05:55	1.86	17:25	2.60	2.16	03:50	1.90	11:10	3.31	2.91	03:50	0.101	17:25	0.243	0.187	0.187	0.01
12/15/2019	04:05	1.75	18:15	3.13	2.11	04:10	1.63	21:05	3.39	2.85	04:10	0.077	18:15	0.249	0.179	0.179	
12/16/2019	03:40	1.79	09:10	2.83	2.14	04:00	1.75	08:05	3.35	2.80	04:00	0.086	07:50	0.248	0.177	0.177	
12/17/2019	03:35	1.80	10:45	2.58	2.13	02:30	1.75	07:35	3.36	2.77	02:30	0.087	11:40	0.231	0.175	0.175	
12/18/2019	03:05	1.79	13:45	2.47	2.14	03:55	1.67	08:10	3.42	2.76	03:55	0.083	08:10	0.241	0.175	0.175	
12/19/2019	03:20	1.73	09:05	2.58	2.10	03:20	1.73	07:45	3.34	2.75	03:20	0.079	07:40	0.242	0.171	0.171	
12/20/2019	03:50	1.74	11:45	2.53	2.14	03:15	1.59	07:35	3.38	2.74	03:15	0.075	07:35	0.232	0.175	0.175	0.02
12/21/2019	06:35	1.75	23:25	2.50	2.11	04:10	1.80	12:25	3.37	2.85	04:10	0.086	23:15	0.236	0.178	0.178	
12/22/2019	04:20	1.76	18:55	2.67	2.13	04:20	1.65	17:10	3.50	2.87	04:20	0.078	17:10	0.267	0.183	0.183	
12/23/2019	04:50	1.77	13:30	2.52	2.13	04:55	1.63	09:50	3.42	2.84	04:55	0.078	13:20	0.236	0.179	0.179	
12/24/2019	03:55	1.84	21:00	2.49	2.14	03:40	1.84	17:20	3.43	2.90	03:40	0.097	17:20	0.234	0.184	0.184	
12/25/2019	05:30	1.77	18:45	2.65	2.12	04:40	1.78	11:00	3.37	2.87	04:40	0.086	18:45	0.250	0.180	0.180	
12/26/2019	05:05	1.67	16:40	2.57	2.09	04:40	1.58	11:50	3.43	2.79	04:40	0.072	15:30	0.237	0.173	0.173	
12/27/2019	03:40	1.72	14:15	2.64	2.13	03:50	1.64	12:45	3.32	2.75	03:50	0.075	14:15	0.236	0.173	0.173	
12/28/2019	03:30	1.73	14:30	2.65	2.15	04:35	1.57	12:40	3.36	2.74	04:35	0.073	21:55	0.257	0.177	0.177	
12/29/2019	05:25	1.66	18:25	2.53	2.09	03:50	1.50	20:50	3.35	2.80	05:10	0.068	10:45	0.244	0.174	0.174	
12/30/2019	04:00	1.74	17:05	2.63	2.12	04:00	1.55	11:15	3.31	2.79	04:00	0.072	14:50	0.243	0.176	0.176	
12/31/2019	04:45	1.76	17:05	2.67	2.13	03:10	1.61	18:15	3.36	2.81	03:10	0.078	17:05	0.254	0.178	0.178	

Date	Depth (in)				Velocity (ft/s)				Quantity (MGD - Total MG)					Rain (in)
	Time	Min Time	Max	Avg	Time	Min Time	Max	Avg	Time	Min Time	Max	Avg	Total	Total
01/01/2020	05:20	1.76 22:55	2.55	2.11	05:55	1.78 10:25	3.38	2.84	05:55	0.085 22:55	0.235	0.177	0.177	
01/02/2020	03:55	1.72 14:45	2.46	2.12	03:05	1.59 11:55	3.35	2.77	03:55	0.074 11:55	0.223	0.175	0.175	
01/03/2020	04:40	1.76 21:50	2.59	2.15	04:45	1.66 07:45	3.26	2.74	04:45	0.079 17:50	0.241	0.176	0.176	
01/04/2020	05:40	1.67 20:40	2.64	2.11	03:35	1.57 10:35	3.38	2.78	03:35	0.073 20:40	0.253	0.175	0.175	
01/05/2020	04:20	1.64 11:35	2.33	2.09	04:20	1.48 14:05	3.39	2.83	04:20	0.063 11:40	0.236	0.176	0.176	
01/06/2020	03:35	1.68 09:20	2.55	2.08	03:10	1.38 08:20	3.38	2.73	03:10	0.062 09:20	0.232	0.169	0.169	
01/07/2020	03:40	1.69 06:40	2.51	2.11	03:45	1.56 21:30	3.38	2.73	03:45	0.069 17:50	0.225	0.171	0.171	
01/08/2020	04:00	1.61 09:00	2.60	2.12	03:45	1.67 08:00	3.32	2.71	03:45	0.069 09:00	0.245	0.172	0.172	
01/09/2020	03:20	1.68 23:05	2.55	2.13	04:25	1.59 08:05	3.36	2.71	03:20	0.072 07:50	0.252	0.173	0.173	
01/10/2020	01:10	1.85 08:10	2.60	2.18	03:40	1.81 07:35	3.41	2.77	03:40	0.094 08:10	0.271	0.181	0.181	
01/11/2020	05:15	1.76 17:50	2.64	2.16	05:10	1.77 11:00	3.49	2.80	05:10	0.084 11:00	0.252	0.181	0.181	
01/12/2020	04:10	1.67 10:45	3.06	2.12	02:50	1.61 21:20	3.40	2.82	05:10	0.076 14:50	0.270	0.179	0.179	
01/13/2020	03:50	1.70 09:50	2.56	2.13	02:10	1.74 07:40	3.35	2.74	03:45	0.079 09:50	0.250	0.174	0.174	
01/14/2020	02:40	1.72 06:45	2.62	2.13	02:20	1.71 22:15	3.33	2.72	02:40	0.082 14:25	0.247	0.173	0.173	
01/15/2020	04:15	1.76 22:15	2.81	2.16	02:40	1.75 07:45	3.40	2.71	04:30	0.085 22:15	0.285	0.176	0.176	0.10
01/16/2020	03:40	1.88 17:45	2.76	2.27	03:40	1.83 21:20	3.42	2.81	03:40	0.096 12:35	0.276	0.195	0.195	0.66
01/17/2020	01:25	1.90 21:40	2.80	2.28	03:05	2.03 08:00	3.45	2.83	03:05	0.114 21:40	0.282	0.197	0.197	
01/18/2020	03:40	1.93 00:55	2.69	2.24	05:10	2.00 11:15	3.42	2.92	05:10	0.112 00:55	0.263	0.197	0.197	
01/19/2020	03:15	1.81 18:50	2.75	2.17	02:15	1.83 19:25	3.46	2.90	02:15	0.095 18:50	0.243	0.188	0.188	
01/20/2020	05:40	1.84 13:45	2.69	2.15	05:00	1.99 17:50	3.37	2.88	05:00	0.102 13:50	0.245	0.184	0.184	
01/21/2020	03:50	1.76 17:35	2.50	2.15	02:40	1.78 23:50	3.40	2.77	03:45	0.088 23:50	0.252	0.178	0.178	0.01
01/22/2020	05:05	1.78 10:00	2.54	2.16	04:05	1.71 22:00	3.41	2.73	04:05	0.083 22:05	0.238	0.177	0.177	0.09
01/23/2020	03:50	1.74 09:50	2.56	2.17	03:55	1.72 07:45	3.35	2.75	03:55	0.080 12:15	0.244	0.180	0.180	
01/24/2020	03:55	1.71 22:35	2.61	2.17	03:20	1.58 09:00	3.37	2.79	03:20	0.073 22:35	0.245	0.181	0.181	
01/25/2020	04:10	1.77 19:20	2.59	2.17	04:00	1.84 13:00	3.33	2.81	04:00	0.088 23:45	0.239	0.183	0.183	
01/26/2020	04:10	1.67 11:05	2.97	2.13	04:00	1.64 12:25	3.37	2.85	04:00	0.073 11:05	0.262	0.182	0.182	0.16
01/27/2020	03:40	1.73 06:30	2.64	2.12	03:55	1.62 07:45	3.40	2.76	03:55	0.078 06:30	0.243	0.174	0.174	
01/28/2020	04:05	1.75 17:15	2.55	2.13	03:30	1.63 20:10	3.37	2.75	03:30	0.077 06:45	0.236	0.174	0.174	0.02
01/29/2020	03:40	1.68 12:55	2.59	2.17	03:45	1.74 20:00	3.54	2.79	03:45	0.078 20:15	0.276	0.184	0.184	
01/30/2020	04:15	1.79 18:25	2.56	2.18	04:15	1.92 20:35	3.37	2.82	04:15	0.093 07:50	0.251	0.183	0.183	
01/31/2020	03:40	1.73 22:10	2.55	2.13	02:40	1.60 08:25	3.36	2.70	03:45	0.074 07:50	0.238	0.172	0.172	0.01
02/01/2020	05:10	1.65 10:45	2.68	2.13	03:30	1.69 10:40	3.51	2.84	05:35	0.076 10:40	0.304	0.181	0.181	
02/02/2020	03:35	1.80 12:00	3.28	2.16	05:05	1.86 10:15	3.47	2.86	03:45	0.094 10:15	0.292	0.185	0.185	
02/03/2020	03:50	1.68 01:20	2.55	2.11	04:10	1.61 20:10	3.52	2.72	04:10	0.073 20:10	0.281	0.171	0.171	
02/04/2020	03:40	1.66 08:45	2.53	2.09	03:50	1.46 08:00	3.36	2.69	03:50	0.064 10:00	0.242	0.166	0.166	
02/05/2020	03:50	1.73 09:30	2.57	2.11	03:35	1.57 21:40	3.40	2.69	03:50	0.074 07:55	0.238	0.169	0.169	
02/06/2020	02:25	1.74 09:05	2.70	2.10	02:20	1.64 07:30	3.34	2.72	02:20	0.077 09:05	0.259	0.170	0.170	
02/07/2020	04:00	1.65 18:10	2.57	2.12	03:35	1.61 09:20	3.37	2.66	03:35	0.071 10:20	0.237	0.169	0.169	
02/08/2020	04:50	1.68 21:25	2.62	2.15	03:30	1.52 11:15	3.37	2.73	03:30	0.070 14:40	0.244	0.177	0.177	
02/09/2020	05:10	1.66 11:55	3.29	2.13	04:55	1.61 12:05	3.38	2.78	05:00	0.071 11:55	0.262	0.178	0.178	
02/10/2020	02:40	1.67 09:20	2.52	2.11	03:50	1.52 07:30	3.41	2.67	02:45	0.068 07:35	0.233	0.168	0.168	
02/11/2020	03:40	1.65 10:45	2.56	2.09	03:30	1.49 08:05	3.35	2.69	04:10	0.066 10:45	0.245	0.167	0.167	
02/12/2020	03:55	1.68 23:25	2.58	2.13	02:45	1.63 08:00	3.41	2.70	03:50	0.073 08:00	0.253	0.172	0.172	
02/13/2020	04:15	1.68 20:45	2.91	2.10	04:25	1.49 07:35	3.41	2.65	04:25	0.068 20:45	0.246	0.165	0.165	
02/14/2020	03:50	1.65 09:20	2.65	2.13	03:55	1.54 07:50	3.39	2.67	03:55	0.067 07:50	0.252	0.170	0.170	
02/15/2020	05:10	1.67 17:35	2.60	2.16	04:20	1.50 11:20	3.41	2.70	04:20	0.070 11:35	0.251	0.176	0.176	
02/16/2020	05:25	1.64 14:25	2.69	2.12	04:10	1.50 12:05	3.39	2.76	04:10	0.067 14:25	0.256	0.174	0.174	
02/17/2020	04:00	1.68 10:55	2.93	2.11	04:00	1.55 11:00	3.55	2.77	04:00	0.069 10:55	0.338	0.174	0.174	
02/18/2020	03:30	1.67 10:15	2.73	2.10	03:30	1.51 20:25	3.43	2.68	03:30	0.066 20:20	0.265	0.167	0.167	
02/19/2020	03:10	1.68 22:35	2.58	2.12	03:10	1.49 21:00	3.41	2.72	03:10	0.066 22:35	0.245	0.172	0.172	
02/20/2020	03:50	1.67 18:50	2.59	2.09	03:55	1.50 08:00	3.29	2.64	03:55	0.066 18:50	0.232	0.163	0.163	
02/21/2020	03:40	1.68 17:55	2.58	2.09	02:45	1.53 09:45	3.35	2.67	03:50	0.070 20:45	0.236	0.165	0.165	
02/22/2020	04:20	1.68 13:25	2.55	2.08	03:30	1.54 10:05	3.41	2.75	04:20	0.071 11:35	0.228	0.169	0.169	
02/23/2020	04:40	1.66 10:05	3.26	2.12	04:15	1.56 21:45	3.40	2.81	04:20	0.069 10:05	0.263	0.178	0.178	
02/24/2020	03:30	1.65 06:35	2.55	2.08	03:25	1.27 07:30	3.39	2.66	03:25	0.055 07:55	0.235	0.164	0.164	

Date	Depth (in)					Velocity (ft/s)					Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
02/25/2020	04:00	1.65	13:55	2.53	2.10	02:25	1.50	07:30	3.39	2.68	02:25	0.066	07:50	0.233	0.167	0.167	
02/26/2020	02:55	1.62	18:30	2.58	2.11	03:00	1.40	07:35	3.39	2.66	03:00	0.060	07:50	0.248	0.167	0.167	
02/27/2020	04:30	1.72	07:50	2.87	2.10	03:45	1.46	07:50	3.55	2.68	03:45	0.067	07:50	0.339	0.168	0.168	
02/28/2020	03:50	1.61	23:00	2.56	2.10	03:55	1.24	08:10	3.34	2.65	03:55	0.052	07:50	0.234	0.166	0.166	
02/29/2020	04:05	1.68	23:25	2.54	2.09	05:30	1.48	12:05	3.35	2.79	05:30	0.069	22:45	0.237	0.173	0.173	
03/01/2020	05:30	1.69	10:25	3.29	2.10	05:25	1.52	10:20	3.39	2.80	05:25	0.068	10:25	0.285	0.176	0.176	
03/02/2020	03:40	1.72	13:20	2.49	2.11	02:50	1.48	08:10	3.41	2.72	03:55	0.068	07:50	0.260	0.171	0.171	0.01
03/03/2020	02:50	1.66	06:40	2.58	2.08	03:00	1.46	21:20	3.47	2.66	03:00	0.064	21:20	0.279	0.164	0.164	
03/04/2020	03:35	1.61	09:55	2.50	2.13	03:35	1.42	08:05	3.39	2.68	03:35	0.059	07:55	0.238	0.171	0.171	
03/05/2020	03:30	1.69	17:45	2.73	2.08	03:15	1.50	07:55	3.36	2.70	03:30	0.068	17:45	0.246	0.166	0.166	
03/06/2020	03:35	1.62	09:45	2.70	2.08	04:05	1.49	09:45	3.62	2.70	04:05	0.064	09:45	0.317	0.167	0.167	
03/07/2020	03:05	1.67	12:50	2.74	2.12	05:05	1.46	12:05	3.42	2.86	05:05	0.065	12:50	0.259	0.182	0.182	0.58
03/08/2020	04:05	1.65	10:30	3.13	2.11	04:45	1.68	09:50	3.43	2.86	04:45	0.075	10:30	0.345	0.181	0.181	0.02
03/09/2020	02:50	1.70	12:05	2.58	2.09	02:30	1.56	21:15	3.37	2.78	02:30	0.073	19:45	0.235	0.172	0.172	0.11

Report Summary For The Period 11/16/2019 00:00 - 03/09/2020 23:59

	Depth (in)	Velocity (ft/s)	Quantity (MGD - Total MG)	Rain (in)
Total			20.139	5.26
Avg	2.12	2.77	0.175	

Site Commentary

Site Information

MIL_2491	
Pipe Dimensions	15
Silt Level	0.00"

Overview

Site MIL_2491 functioned under normal conditions during the period Saturday, November 16, 2019 to Monday, March 9, 2020 . This site exhibited an observable response to the wet weather events of November 26, 2019 - November 27, 2019, December 7, 2019 - December 8, 2019, and January 16, 2020 - January 17, 2020. Review of the scattergraph shows that free flow conditions were recorded during the study period.

Flow depth and velocity measurements recorded by the flow monitor are consistent with field confirmations conducted to date and support the relative accuracy of the flow monitor at this location. Due to a meter malfunction, data confidence is less than typical from January 28, 2020 through February 22, 2020. A data gap also occurs February 23, 2020 through March 2, 2020.

This location was installed upstream of site MIL_2569 and downstream of the combined flows of sites MIL_0386 and MIL_2840. A review of balancing with the combined flows of MIL_0386 and MIL_2840 into MIL_0649 and MIL_2491 shows a net flow between the sites of 0.426 MGD.

Observations

Average flow depth, velocity, and quantity data observed during Saturday, November 16, 2019 to Monday, March 9, 2020 , along with observed minimum and maximum data, are provided in the following table.

Observed Flow Conditions			
Item	Depth (in)	Velocity (ft/s)	Quantity (MGD)
Average	2.34	2.36	0.216
Minimum	1.07	0.37	0.010
Maximum	4.18	3.84	0.682
Time of Minimum	1/3/2020 9:55 PM	3/8/2020 3:05 AM	3/8/2020 3:05 AM
Time of Maximum	1/17/2020 1:15 PM	11/21/2019 9:30 AM	11/21/2019 9:30 AM

Data Quality

Data uptime observed during the Saturday, November 16, 2019 to the Monday, March 9, 2020 monitoring period is provided in the table below. Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

Percent Uptime	
Depth (in)	91
Velocity (ft/s)	91
Quantity (MGD)	91

Milpitas Temp Study 2019-20

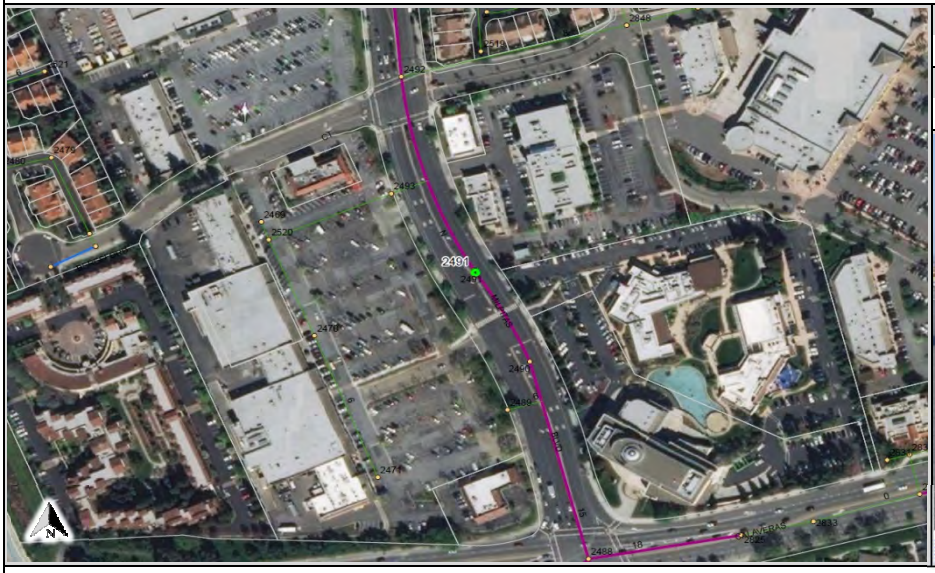
Flow Monitoring Site Report

ADS ENVIRONMENTAL SERVICES®

Site Name

MIL_2491

Site Address /Location:	N Milpitas Blvd and E Calaveras Blvd, Milpitas, CA			Monitor Series	Location Type
				TRITON+	Temporary
Site Access Details:	Drive	Latitude:	37.433991	Pipe Size (H x W)	Pipe Shape
		Longitude:	-121.900388	15.0" x 15.0"	Circular



Manhole #	System Characteristics
2491	Residential/Commercial
Access	Traffic
Drive	Heavy







Installation Information

Installation Date:	Installation Type:
Wednesday, November 13, 2019	Doppler Standard Ring and Crank
Monitoring Location (Sensors):	Monitor Location:
Upstream 0-5 FT	Manhole
Sensors / Devices:	Pressure Sensor Range (psi)
Peak Combo (CS4)	0 - 5 psi

Installation Confirmation:

Confirmation Time:	Pipe Size (HxW)
9:04:37 AM	15.0" x 15.0"
Depth of Flow (Wet DOF) (in)	Range (Air DOF) (in)
3.25"	0.00"
Downlooker Physical Offset (in)	Measurement Confidence (in)
NA	0.25"
Peak Velocity (fps)	Velocity Sensor Offset (in)
3.74	0''
Silt (in)	Silt Type
0''	

Hydraulic Comments:

Good flow, Moderate depth and velocity

Manhole / Pipe Information:

Manhole Depth (Approx. FT):	Manhole Configuration
10'	Single
Manhole Material:	Manhole Condition:
Vitrified Clay Pipe	Good
Manhole Opening Diameter (in)	Manhole Diameter (Approx.):
26''	54''
Manhole Cover	Manhole Frame
Unbolted	Normal
Active Drop Connections	Air Quality:
No	Normal
Pipe Material	Pipe Condition:
PVC	Good

Communication Information:

Communication Type	Antenna Location
Wireless	Manhole Pick / Vent Hole

Additional Site Info. / Comments:

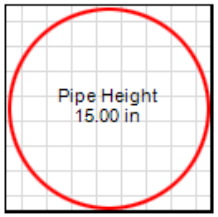
ADS Project Name:	Milpitas.WWTFM.CA19-20
ADS Project Number:	22431

SCATTERGRAPH REPORT

MIL_2491

Flow Monitor

MIL_2491

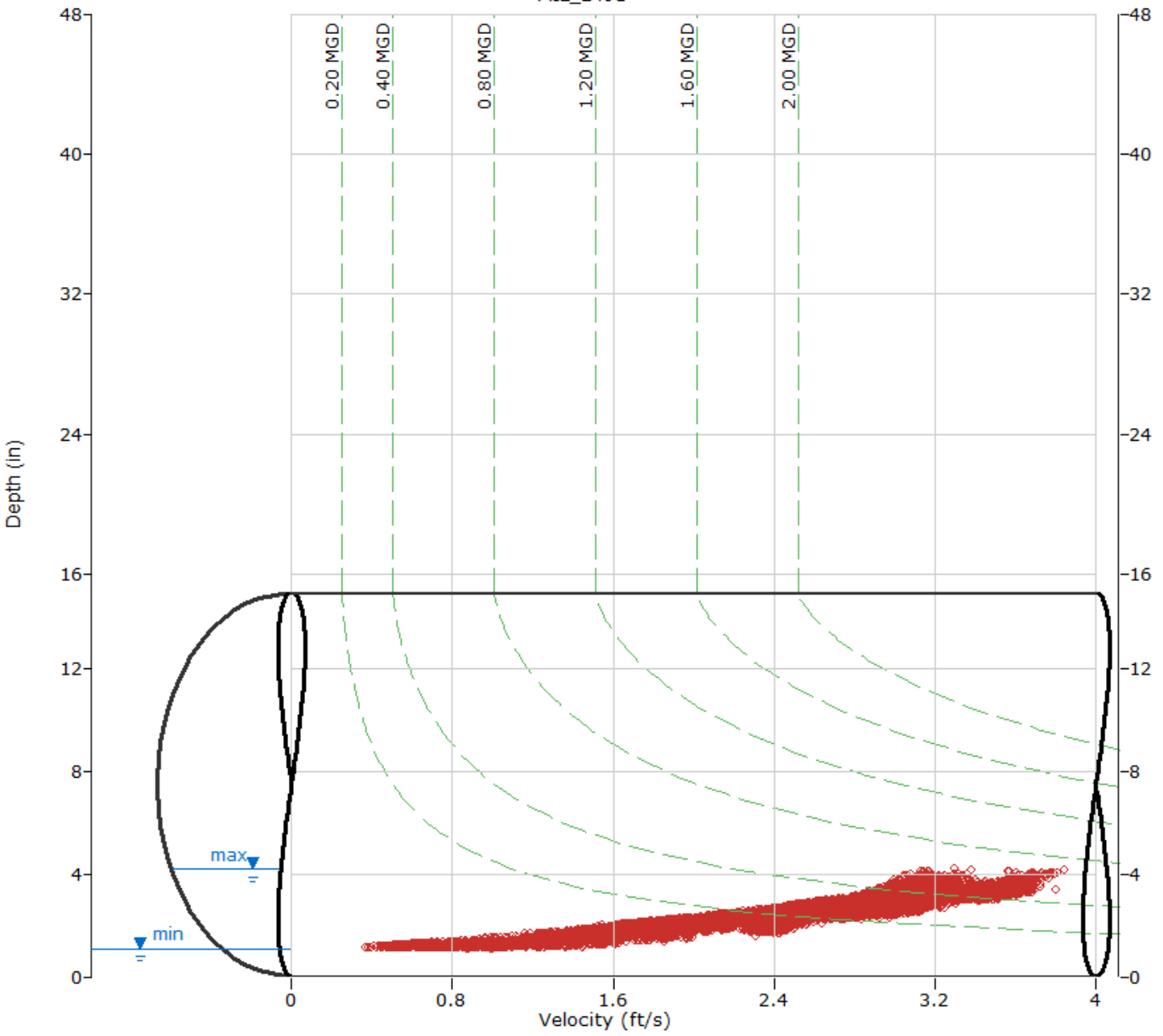


Report Period

11/16/2019
To
3/9/2020

Legend

- Depth - Velocity
- Iso-Q™
- Silt
- Min-Max Depth



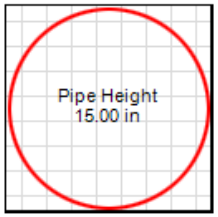
ADS ENVIRONMENTAL SERVICES

HYDROGRAPH REPORT

MIL_2491

Flow Monitor

MIL_2491

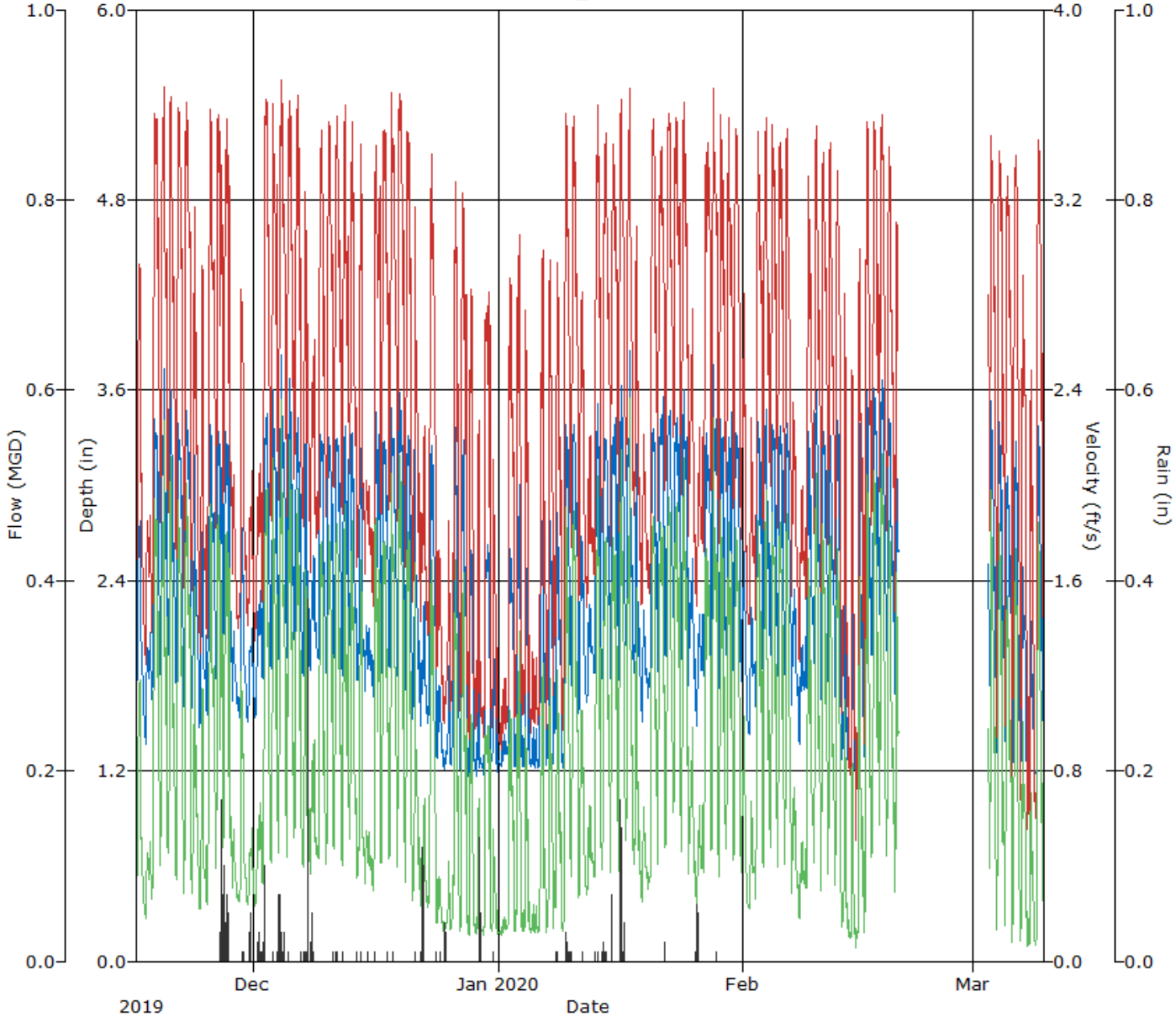


Report Period

11/16/2019
To
3/9/2020

Legend

- Depth
- Velocity
- Quantity
- Rain



Daily Tabular Report For The Period 11/16/2019 00:00 - 03/09/2020 23:59

MIL_2491, Pipe Height: 15.00 in, Silt: 0.00 in

Daily Tabular Report

Date	Depth (in)					Velocity (ft/s)					Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
11/16/2019	23:25	1.71	12:20	3.63	2.11	22:35	1.41	12:20	3.30	2.11	22:35	0.071	12:20	0.488	0.153	0.153	
11/17/2019	06:30	1.33	19:25	2.32	1.75	07:55	1.17	19:30	2.22	1.60	06:20	0.042	19:25	0.171	0.085	0.085	
11/18/2019	00:45	1.57	14:50	3.97	2.72	01:00	1.25	13:25	3.72	2.77	00:45	0.056	13:25	0.582	0.300	0.300	
11/19/2019	04:45	1.76	15:30	3.93	2.76	04:55	1.72	15:45	3.72	2.88	04:55	0.092	15:30	0.615	0.308	0.308	
11/20/2019	03:25	1.82	12:20	3.94	2.66	03:05	1.81	12:20	3.72	2.75	03:25	0.100	12:20	0.618	0.280	0.280	
11/21/2019	04:10	1.68	09:30	4.13	2.70	03:00	1.60	09:30	3.84	2.81	04:15	0.080	09:30	0.682	0.295	0.295	
11/22/2019	04:30	1.58	11:30	3.91	2.79	04:20	1.52	11:30	3.69	2.88	04:20	0.069	11:30	0.607	0.315	0.315	
11/23/2019	05:00	1.55	12:05	3.76	2.14	04:55	1.47	12:00	3.41	2.15	04:55	0.064	12:05	0.504	0.159	0.159	
11/24/2019	03:20	1.44	09:30	3.57	1.98	05:30	1.05	11:15	3.21	1.89	05:30	0.044	09:30	0.452	0.128	0.128	
11/25/2019	02:00	1.51	16:45	3.74	2.58	02:20	1.12	12:40	3.63	2.65	02:05	0.047	12:25	0.519	0.268	0.268	
11/26/2019	04:10	1.75	13:35	3.61	2.75	05:10	1.58	13:10	3.68	2.89	05:10	0.085	13:35	0.493	0.306	0.306	0.36
11/27/2019	03:10	1.92	10:20	3.75	2.79	02:55	1.76	13:55	3.60	2.86	02:00	0.107	21:05	0.502	0.307	0.307	0.63
11/28/2019	20:05	1.59	02:50	2.32	1.86	22:45	1.22	00:00	2.34	1.77	20:00	0.058	09:20	0.177	0.102	0.102	
11/29/2019	04:15	1.50	09:10	3.87	2.01	05:55	1.28	14:05	3.35	1.98	04:25	0.057	09:10	0.524	0.137	0.137	0.02
11/30/2019	06:20	1.46	17:25	2.26	1.79	06:25	1.30	17:35	2.35	1.68	06:25	0.052	17:25	0.172	0.091	0.091	0.10
12/01/2019	06:00	1.49	21:25	2.54	1.94	04:15	1.25	21:40	2.62	1.73	04:15	0.054	21:40	0.223	0.107	0.107	0.06
12/02/2019	04:10	1.74	08:30	3.62	2.77	04:10	1.39	15:20	3.68	2.79	04:10	0.071	13:20	0.513	0.308	0.308	0.30
12/03/2019	04:05	1.79	10:00	4.05	2.75	04:10	1.82	09:55	3.69	2.80	04:05	0.097	10:00	0.636	0.298	0.298	0.01
12/04/2019	01:45	1.87	12:05	4.04	2.92	03:20	1.84	12:05	3.81	2.97	02:00	0.109	12:05	0.656	0.341	0.341	0.39
12/05/2019	03:25	1.88	14:30	4.04	2.82	03:10	1.72	13:25	3.80	2.92	03:10	0.102	14:30	0.643	0.318	0.318	0.01
12/06/2019	05:00	1.87	14:45	3.76	2.73	01:15	1.90	12:30	3.69	2.84	05:00	0.111	14:45	0.524	0.295	0.295	0.01
12/07/2019	06:00	1.76	11:35	3.72	2.35	05:45	1.74	12:15	3.51	2.39	05:45	0.091	11:35	0.508	0.200	0.200	0.67
12/08/2019	03:50	1.82	07:40	3.31	2.11	05:30	1.48	07:35	3.16	2.05	05:30	0.082	07:40	0.410	0.143	0.143	0.20
12/09/2019	04:20	1.82	17:05	3.83	2.69	01:10	1.53	13:30	3.58	2.79	04:15	0.086	17:05	0.507	0.288	0.288	
12/10/2019	04:55	1.78	09:20	3.94	2.70	05:10	1.80	14:40	3.63	2.81	05:10	0.096	09:20	0.540	0.291	0.291	
12/11/2019	04:15	1.87	09:40	3.85	2.74	02:40	1.88	13:10	3.63	2.85	03:55	0.109	14:20	0.532	0.298	0.298	0.03
12/12/2019	04:20	1.77	17:05	3.81	2.72	04:10	1.84	12:30	3.65	2.85	04:20	0.097	17:05	0.518	0.295	0.295	0.01
12/13/2019	01:40	1.92	12:55	3.75	2.57	23:50	1.89	12:25	3.57	2.66	01:40	0.119	12:55	0.515	0.254	0.254	0.01
12/14/2019	03:05	1.74	15:20	3.69	2.30	02:05	1.49	14:05	3.51	2.31	02:05	0.079	15:20	0.510	0.194	0.194	0.01
12/15/2019	06:15	1.61	11:30	2.25	1.93	23:45	1.46	06:35	2.29	1.85	03:10	0.071	11:35	0.160	0.111	0.111	0.01
12/16/2019	03:40	1.64	14:00	4.10	2.75	04:05	1.32	10:05	3.58	2.69	04:05	0.065	14:00	0.556	0.294	0.294	0.01
12/17/2019	05:10	1.75	09:40	3.65	2.74	05:10	1.78	15:35	3.59	2.86	05:10	0.092	16:45	0.470	0.303	0.303	0.01
12/18/2019	04:05	1.68	09:05	3.72	2.82	03:40	1.66	11:15	3.71	2.96	04:05	0.084	11:15	0.551	0.323	0.323	0.01
12/19/2019	03:35	1.77	18:35	3.79	2.84	04:25	1.78	10:15	3.70	2.96	04:25	0.094	13:10	0.561	0.328	0.328	
12/20/2019	04:55	1.63	15:50	3.84	2.69	04:30	1.60	10:20	3.58	2.80	05:00	0.076	15:50	0.538	0.287	0.287	
12/21/2019	04:20	1.50	11:15	3.82	2.15	04:25	1.44	11:20	3.32	2.16	04:25	0.060	11:15	0.514	0.166	0.166	0.01
12/22/2019	03:15	1.44	14:30	2.50	1.77	03:05	1.35	14:30	2.49	1.72	03:30	0.053	14:30	0.217	0.093	0.093	0.41
12/23/2019	01:05	1.40	16:20	3.71	2.47	01:20	1.23	09:50	3.52	2.50	01:20	0.046	16:20	0.493	0.238	0.238	
12/24/2019	22:40	1.25	00:00	2.57	1.49	20:20	1.03	00:00	2.53	1.43	23:50	0.033	00:00	0.229	0.061	0.061	0.02
12/25/2019	01:30	1.18	16:00	1.98	1.36	01:25	0.90	15:45	1.99	1.23	01:30	0.027	16:00	0.123	0.046	0.046	0.08
12/26/2019	02:05	1.17	15:20	3.72	2.27	03:40	1.01	13:15	3.39	2.24	02:15	0.031	14:40	0.486	0.199	0.199	
12/27/2019	02:50	1.16	09:50	3.66	2.23	02:50	1.03	10:55	3.53	2.29	02:50	0.029	13:50	0.494	0.197	0.197	
12/28/2019	03:55	1.10	12:05	2.92	1.73	06:35	0.82	13:00	3.05	1.73	06:35	0.022	13:00	0.318	0.109	0.109	
12/29/2019	03:20	1.10	11:40	2.73	1.41	01:45	0.78	09:15	2.79	1.29	01:45	0.022	11:40	0.252	0.056	0.056	0.22
12/30/2019	01:00	1.08	08:30	2.93	2.03	00:55	0.80	17:40	3.05	2.06	00:55	0.021	17:40	0.328	0.152	0.152	
12/31/2019	21:30	1.11	08:40	2.26	1.48	18:05	0.82	08:45	2.32	1.35	18:05	0.023	08:45	0.170	0.059	0.059	0.01

Date	Depth (in)				Velocity (ft/s)				Quantity (MGD - Total MG)					Rain (in)
	Time	Min Time	Max	Avg	Time	Min Time	Max	Avg	Time	Min Time	Max	Avg	Total	Total
01/01/2020	14:05	1.14 16:35	1.68	1.30	07:05	0.86 16:35	1.55	1.03	14:05	0.026 16:35	0.076	0.035	0.035	
01/02/2020	23:30	1.23 07:30	3.51	2.01	23:35	0.95 07:30	3.29	2.01	23:35	0.030 07:30	0.465	0.146	0.146	
01/03/2020	21:55	1.07 15:10	3.39	1.92	00:30	0.89 15:10	3.16	1.90	21:55	0.025 15:10	0.425	0.139	0.139	
01/04/2020	19:50	1.14 12:35	2.84	1.64	05:55	0.83 11:00	2.94	1.55	05:55	0.025 12:35	0.282	0.087	0.087	
01/05/2020	11:50	1.11 17:35	2.14	1.29	11:55	0.75 17:35	2.21	1.07	11:50	0.020 17:35	0.153	0.037	0.037	
01/06/2020	00:05	1.22 13:05	3.31	1.93	00:00	0.89 13:05	3.14	1.90	00:00	0.027 13:05	0.408	0.134	0.134	
01/07/2020	23:45	1.13 14:30	2.99	1.92	01:05	0.87 12:30	3.02	1.92	01:05	0.027 12:35	0.323	0.133	0.133	
01/08/2020	04:25	1.12 08:35	3.04	2.01	04:30	0.98 08:35	3.16	2.04	04:30	0.026 08:35	0.364	0.143	0.143	0.02
01/09/2020	02:05	1.09 10:45	4.03	2.41	05:05	0.86 10:45	3.69	2.42	02:05	0.023 10:45	0.633	0.245	0.245	0.18
01/10/2020	05:05	1.72 16:00	3.89	2.68	02:30	1.66 14:05	3.62	2.76	05:05	0.085 16:00	0.538	0.287	0.287	0.02
01/11/2020	06:05	1.53 13:50	3.23	2.09	06:05	1.43 17:45	2.96	2.12	06:05	0.061 13:50	0.371	0.151	0.151	0.01
01/12/2020	03:40	1.62 14:05	2.39	1.94	03:30	1.16 14:15	2.38	1.80	03:30	0.055 14:05	0.193	0.110	0.110	
01/13/2020	04:30	1.72 14:50	3.86	2.68	03:10	1.50 12:55	3.66	2.71	04:25	0.079 13:05	0.535	0.282	0.282	0.02
01/14/2020	04:50	1.74 08:25	3.94	2.70	04:50	1.68 12:50	3.55	2.75	04:50	0.086 08:25	0.555	0.287	0.287	0.11
01/15/2020	04:15	1.73 10:30	4.01	2.80	03:45	1.67 12:10	3.54	2.84	04:20	0.087 10:30	0.542	0.306	0.306	0.07
01/16/2020	04:20	1.75 14:00	4.00	2.84	04:05	1.78 14:00	3.75	2.93	04:20	0.093 14:00	0.637	0.323	0.323	0.66
01/17/2020	04:40	1.89 13:15	4.18	2.77	05:00	1.92 15:00	3.74	2.84	04:45	0.113 15:00	0.629	0.301	0.301	
01/18/2020	07:25	1.68 12:40	3.38	2.18	22:15	1.53 12:40	3.17	2.23	22:15	0.083 12:40	0.425	0.169	0.169	
01/19/2020	04:50	1.46 08:55	2.39	1.81	19:55	1.43 08:55	2.42	1.78	04:50	0.057 08:55	0.197	0.099	0.099	
01/20/2020	00:40	1.63 11:00	3.70	2.64	03:15	1.37 14:55	3.58	2.68	00:55	0.068 12:30	0.495	0.279	0.279	
01/21/2020	04:00	1.75 17:20	3.99	2.91	04:00	1.78 12:40	3.60	2.89	04:00	0.092 17:20	0.562	0.327	0.327	
01/22/2020	04:15	1.84 09:25	3.87	2.87	04:05	1.92 12:50	3.62	2.93	04:15	0.108 09:25	0.516	0.327	0.327	0.03
01/23/2020	04:10	1.94 13:15	3.75	2.92	04:10	1.92 08:55	3.61	2.96	04:10	0.116 15:05	0.503	0.333	0.333	
01/24/2020	04:50	1.88 19:00	4.11	2.81	02:45	1.90 11:05	3.72	2.87	04:45	0.112 11:05	0.594	0.313	0.313	
01/25/2020	23:15	1.66 14:00	2.76	2.07	23:15	1.50 11:10	2.95	2.12	23:15	0.072 11:10	0.287	0.145	0.145	
01/26/2020	03:20	1.42 19:10	2.70	1.88	02:30	1.32 08:15	2.91	1.84	03:20	0.054 08:15	0.270	0.108	0.108	0.16
01/27/2020	22:35	1.84 08:50	3.78	2.76	01:25	1.81 14:40	3.55	2.89	01:15	0.105 08:50	0.495	0.305	0.305	
01/28/2020	22:55	1.70 05:15	3.83	2.81	23:35	1.69 05:10	3.76	2.85	22:55	0.086 05:10	0.599	0.315	0.315	0.01
01/29/2020	21:05	1.84 10:25	3.82	2.69	21:10	1.88 03:25	3.61	2.80	21:05	0.105 03:25	0.505	0.285	0.285	
01/30/2020	18:25	1.78 05:50	3.87	2.76	18:00	1.82 03:20	3.69	2.84	18:25	0.097 05:50	0.529	0.299	0.299	
01/31/2020	17:50	1.67 02:45	3.90	2.67	17:40	1.68 03:05	3.59	2.72	17:50	0.082 02:45	0.528	0.280	0.280	
02/01/2020	14:55	1.39 03:30	2.78	1.84	15:00	1.35 03:30	2.96	1.85	15:00	0.050 03:30	0.300	0.111	0.111	
02/02/2020	13:00	1.58 19:45	3.71	2.24	12:55	1.21 23:15	3.53	2.20	12:55	0.055 19:45	0.490	0.189	0.189	
02/03/2020	13:05	1.73 20:15	3.73	2.77	12:55	1.73 21:15	3.62	2.82	13:00	0.089 21:45	0.524	0.302	0.302	
02/04/2020	11:10	1.85 21:40	3.65	2.80	11:05	1.88 16:10	3.58	2.88	11:10	0.106 21:40	0.490	0.307	0.307	
02/05/2020	09:25	1.75 17:00	3.82	2.75	09:25	1.73 17:35	3.68	2.83	09:25	0.089 17:35	0.584	0.297	0.297	
02/06/2020	04:50	1.73 14:50	3.81	2.76	04:25	1.73 13:10	3.57	2.79	04:50	0.088 14:50	0.505	0.295	0.295	
02/07/2020	03:25	1.55 11:00	2.68	1.94	22:55	1.23 10:40	2.47	1.88	22:55	0.053 10:55	0.234	0.117	0.117	
02/08/2020	01:15	1.34 11:15	2.26	1.75	02:40	1.16 11:15	2.26	1.65	03:55	0.041 11:15	0.170	0.087	0.087	
02/09/2020	01:55	1.65 10:10	3.64	2.50	00:15	1.46 04:30	3.36	2.45	01:55	0.069 10:10	0.456	0.230	0.230	
02/10/2020	20:35	1.62 08:05	4.14	2.71	20:55	1.44 06:30	3.58	2.70	21:00	0.067 08:05	0.603	0.284	0.284	
02/11/2020	16:45	1.70 02:50	4.00	2.80	15:55	1.56 02:00	3.54	2.78	16:45	0.085 02:50	0.537	0.304	0.304	
02/12/2020	16:20	1.57 22:00	4.10	2.62	16:15	1.53 00:10	3.50	2.62	16:25	0.068 22:00	0.553	0.262	0.262	
02/13/2020	12:25	1.15 01:50	3.91	2.17	13:10	0.81 00:00	3.39	2.13	12:45	0.026 01:50	0.522	0.180	0.180	
02/14/2020	16:20	1.13 21:40	2.89	1.67	16:15	0.43 19:25	2.77	1.48	16:15	0.012 21:40	0.280	0.088	0.088	
02/15/2020	06:00	1.12 18:00	4.07	1.79	06:00	0.39 16:35	3.16	1.56	06:00	0.010 18:00	0.544	0.110	0.110	
02/16/2020	04:35	1.20 16:25	4.09	2.40	04:35	0.51 16:35	3.61	2.32	04:35	0.015 16:35	0.625	0.231	0.231	
02/17/2020	08:15	1.83 12:40	3.85	2.79	06:30	1.64 14:00	3.57	2.74	08:05	0.098 14:05	0.546	0.301	0.301	
02/18/2020	06:55	1.93 19:20	4.01	2.96	06:55	1.69 14:35	3.60	2.90	06:55	0.101 14:30	0.563	0.336	0.336	
02/19/2020	02:05	1.89 13:00	3.83	2.69	01:50	1.62 11:00	3.52	2.62	01:50	0.100 16:55	0.514	0.271	0.271	
02/20/2020	06:05	1.60 10:40	3.78	2.43	04:35	1.19 12:40	3.43	2.35	04:35	0.057 12:40	0.498	0.214	0.137	
02/21/2020														
02/22/2020														
02/23/2020														
02/24/2020														

Date	Depth (in)					Velocity (ft/s)					Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
02/25/2020																	
02/26/2020																	
02/27/2020																	
02/28/2020																	
02/29/2020																	
03/01/2020																	
03/02/2020																	
03/03/2020	23:50	1.45	10:00	3.65	2.56	05:05	1.01	10:00	3.56	2.80	23:50	0.040	10:00	0.530	0.270	0.238	
03/04/2020	04:35	1.16	09:00	3.60	2.44	04:35	0.50	11:50	3.52	2.56	04:35	0.014	09:00	0.511	0.247	0.247	
03/05/2020	04:35	1.32	08:30	3.42	2.40	04:40	0.72	08:40	3.49	2.63	04:40	0.025	08:30	0.474	0.234	0.234	
03/06/2020	04:15	1.11	15:35	3.39	2.23	03:40	0.50	15:20	3.43	2.43	03:40	0.015	15:35	0.461	0.212	0.212	
03/07/2020	03:35	1.10	11:25	2.98	1.68	03:55	0.48	11:25	3.31	1.81	01:05	0.013	11:25	0.370	0.105	0.105	
03/08/2020	05:15	1.11	11:45	2.77	1.50	03:05	0.37	13:40	3.09	1.40	03:05	0.010	11:45	0.303	0.072	0.072	
03/09/2020	03:50	1.17	12:00	3.55	2.19	02:30	0.45	13:25	3.53	2.30	02:30	0.013	12:00	0.503	0.205	0.205	

Report Summary For The Period 11/16/2019 00:00 - 03/09/2020 23:59

	Depth (in)	Velocity (ft/s)	Quantity (MGD - Total MG)	Rain (in)
Total			22.365	4.90
Avg	2.34	2.36	0.216	

Site Commentary

Site Information

MIL_2569	
Pipe Dimensions	21
Silt Level	0.00"

Overview

Site MIL_2569 functioned under normal conditions during the period Saturday, November 16, 2019 to Monday, March 9, 2020 . This site exhibited a small response to the wet weather events of November 26, 2019 - November 27, 2019 and December 7, 2019 - December 8, 2019. Review of the scattergraph shows that free flow conditions were recorded during the study period.

Flow depth and velocity measurements recorded by the flow monitor are consistent with field confirmations conducted to date and support the relative accuracy of the flow monitor at this location.

This location was installed downstream of site MIL_2491. A check of balancing shows a net flow of 0.225 MGD between the sites.

Observations

Average flow depth, velocity, and quantity data observed during Saturday, November 16, 2019 to Monday, March 9, 2020 , along with observed minimum and maximum data, are provided in the following table.

Observed Flow Conditions			
Item	Depth (in)	Velocity (ft/s)	Quantity (MGD)
Average	6.43	1.05	0.441
Minimum	4.32	0.45	0.121
Maximum	9.03	1.68	0.966
Time of Minimum	11/16/2019 5:00 AM	2/18/2020 3:50 AM	2/18/2020 3:50 AM
Time of Maximum	12/23/2019 3:10 PM	12/4/2019 12:25 PM	12/23/2019 3:10 PM

Data Quality

Data uptime observed during the Saturday, November 16, 2019 to the Monday, March 9, 2020 monitoring period is provided in the table below. Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

Percent Uptime	
Depth (in)	100
Velocity (ft/s)	100
Quantity (MGD)	100

Milpitas Temp Study 2019-20

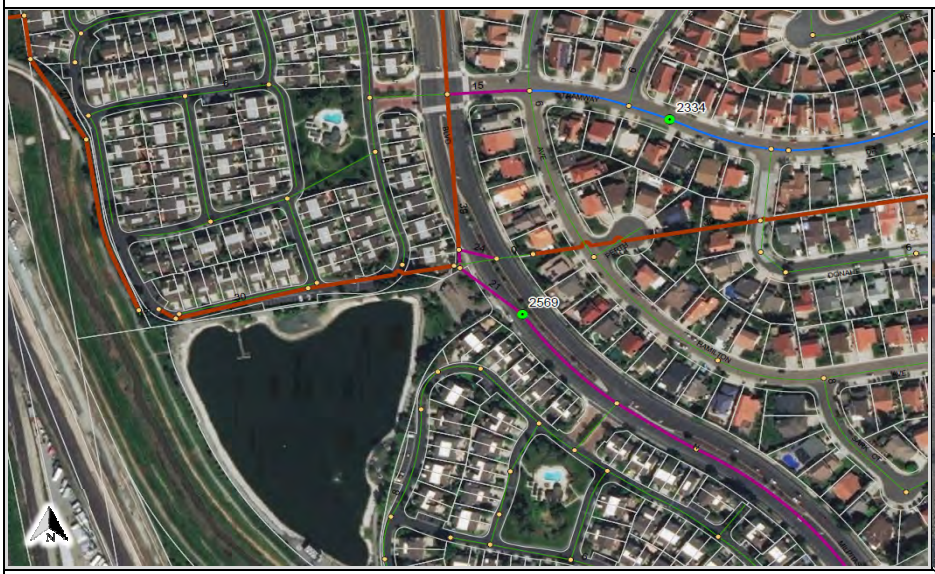
Flow Monitoring Site Report

ADS ENVIRONMENTAL SERVICES®

Site Name

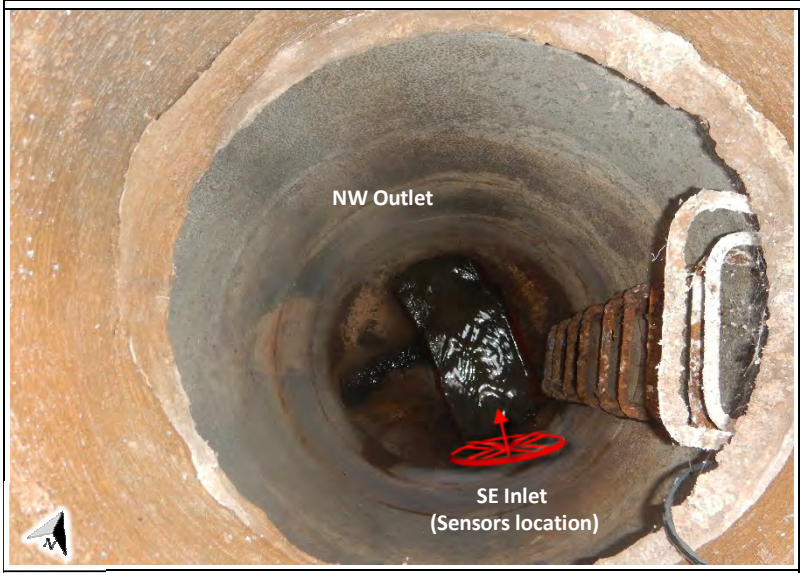
MIL_2569

Site Address /Location:	Milipitas Blvd and Tramway Dr			Monitor Series	Location Type
				TRITON+	Temporary
Site Access Details:	Drive	Latitude:	37.440801	Pipe Size (H x W)	Pipe Shape
		Longitude:	-121.9044	21.0" x 21.0"	Circular



Manhole #	System Characteristics
2569	Residential/Commercial
Access	Traffic
Drive	Medium







Installation Information	
Installation Date:	Installation Type:
Wednesday, November 13, 2019	Doppler Standard Ring and Crank
Monitoring Location (Sensors):	Monitor Location:
Upstream 0-5 FT	Manhole
Sensors / Devices:	Pressure Sensor Range (psi)
Peak Combo (CS4)	0 - 5 psi
Installation Confirmation:	
Confirmation Time:	Pipe Size (HxW)
8:15:00 AM	21.0" x 21.0"
Depth of Flow (Wet DOF) (in)	Range (Air DOF) (in)
7.5"	0.00"
Downlooker Physical Offset (in)	Measurement Confidence (in)
NA	0.25"
Peak Velocity (fps)	Velocity Sensor Offset (in)
1.26	0''
Silt (in)	Silt Type
0''	
Hydraulic Comments:	
Smooth good flow, Medium depth and velocity	
Manhole / Pipe Information:	
Manhole Depth (Approx. FT):	Manhole Configuration
10'	Single
Manhole Material:	Manhole Condition:
Vitrified Clay Pipe	Good
Manhole Opening Diameter (in)	Manhole Diameter (Approx.):
26''	54''
Manhole Cover	Manhole Frame
Unbolted	Normal
Active Drop Connections	Air Quality:
No	Normal
Pipe Material	Pipe Condition:
PVC	Good
Communication Information:	
Communication Type	Antenna Location
Wireless	Manhole Pick / Vent Hole
Additional Site Info. / Comments:	

ADS Project Name:	Milpitas.WWTFM.CA19-20
ADS Project Number:	22431

SCATTERGRAPH REPORT

MIL_2569

Flow Monitor

MIL_2569

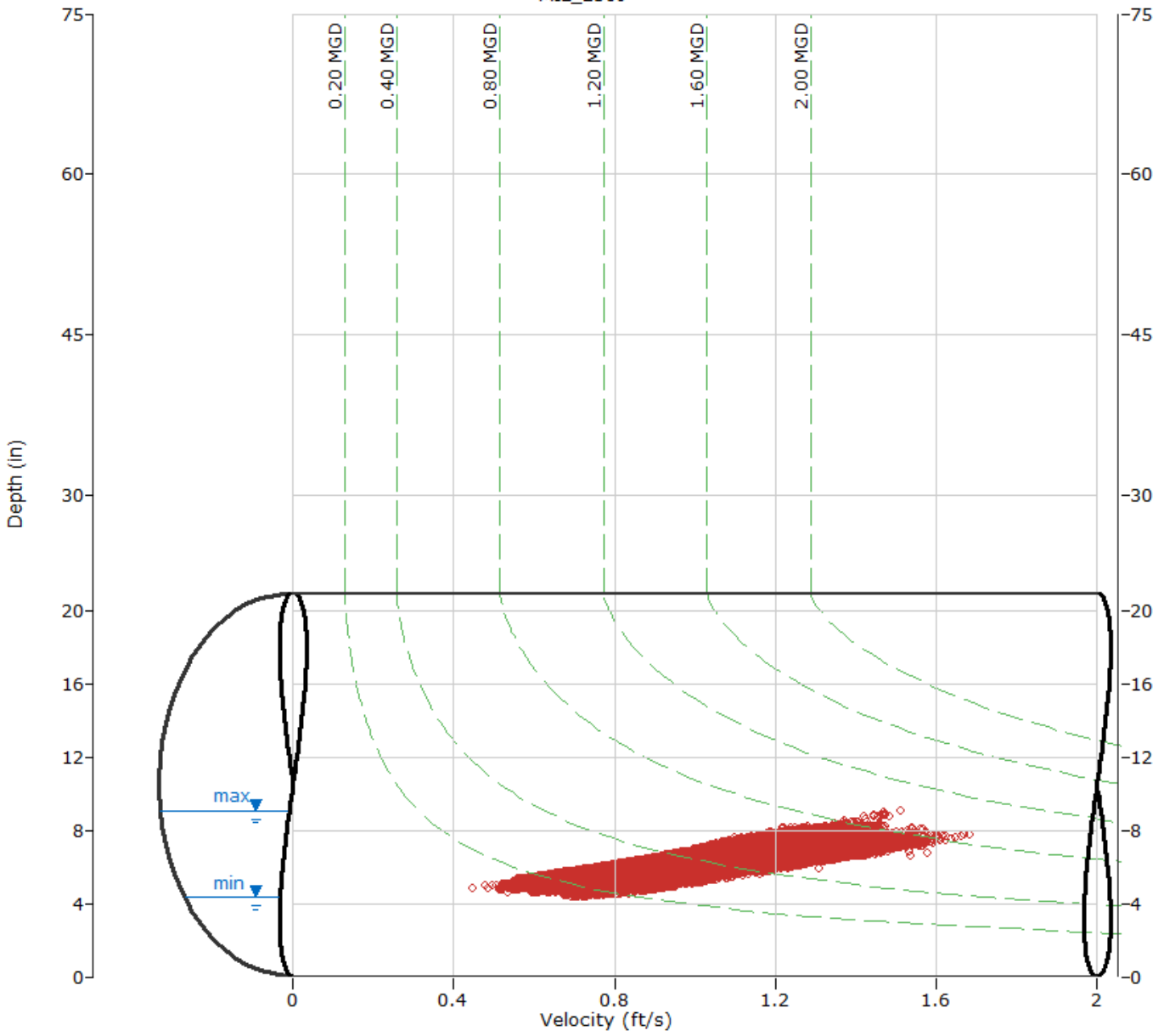
Pipe Height
21.00 in

Report Period

11/16/2019
To
3/9/2020

Legend

- Depth - Velocity
- Iso-Q™
- Silt
- Min-Max Depth



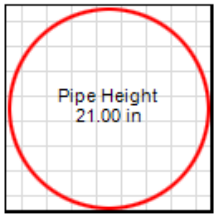
ADS ENVIRONMENTAL SERVICES

HYDROGRAPH REPORT

MIL_2569

Flow Monitor

MIL_2569

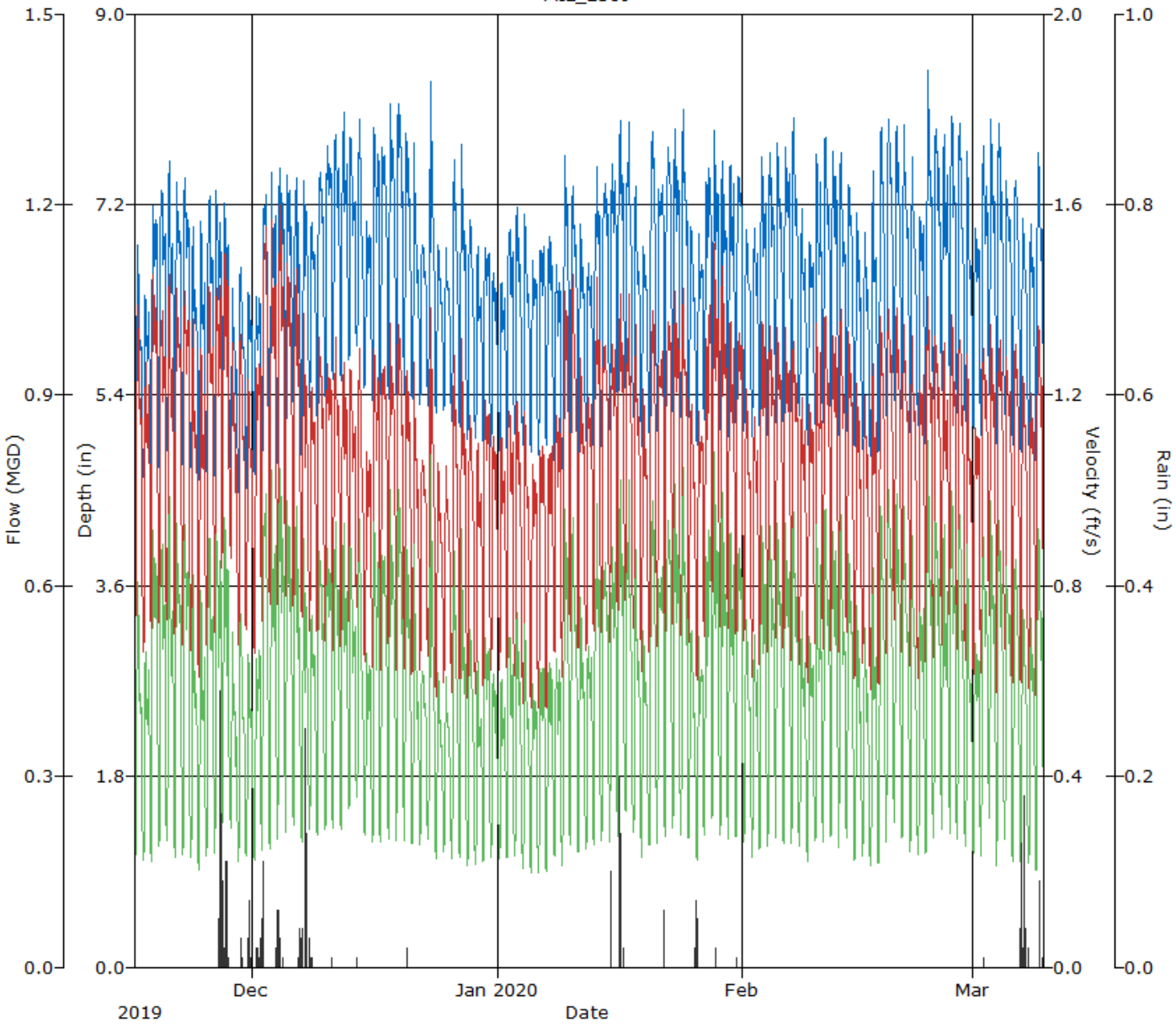


Report Period

11/16/2019
To
3/9/2020

Legend

- Depth
- Velocity
- Quantity
- Rain



ADS ENVIRONMENTAL SERVICES

Daily Tabular Report For The Period 11/16/2019 00:00 - 03/09/2020 23:59

MIL_2569, Pipe Height: 21.00 in, Silt: 0.00 in

Daily Tabular Report

Date	Depth (in)				Velocity (ft/s)				Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
11/16/2019	05:00	4.32	11:20	6.92	5.69	04:50	0.70	11:10	1.42	1.10	05:00	0.161	11:20	0.631	0.389	0.389	
11/17/2019	03:40	4.61	09:30	6.49	5.63	03:20	0.61	10:50	1.29	1.02	03:20	0.153	10:50	0.507	0.352	0.352	
11/18/2019	03:55	4.38	10:30	7.50	6.21	02:55	0.67	10:35	1.55	1.18	03:15	0.163	10:30	0.773	0.475	0.475	
11/19/2019	05:20	4.71	16:05	7.66	6.46	03:50	0.69	16:00	1.50	1.15	03:50	0.183	16:00	0.771	0.488	0.488	
11/20/2019	04:45	4.82	10:05	7.76	6.34	03:45	0.71	12:35	1.49	1.13	03:45	0.194	10:05	0.780	0.465	0.465	
11/21/2019	04:50	4.70	09:50	7.82	6.35	04:15	0.64	09:50	1.52	1.15	04:15	0.167	09:50	0.801	0.475	0.475	
11/22/2019	05:00	4.71	20:45	7.96	6.47	04:05	0.67	20:50	1.57	1.17	04:00	0.175	20:50	0.845	0.499	0.499	
11/23/2019	05:10	4.67	12:25	7.10	5.94	05:25	0.64	12:50	1.41	1.04	05:25	0.166	12:50	0.654	0.388	0.388	
11/24/2019	05:15	4.57	10:00	7.10	5.89	05:15	0.60	09:55	1.34	1.00	05:15	0.149	09:55	0.619	0.372	0.372	
11/25/2019	04:15	4.66	12:45	7.48	6.21	04:55	0.66	12:45	1.51	1.13	04:55	0.171	12:45	0.749	0.454	0.454	
11/26/2019	05:25	4.60	09:55	7.59	6.31	04:15	0.67	09:40	1.54	1.19	05:30	0.174	09:45	0.772	0.486	0.486	0.63
11/27/2019	03:30	4.60	09:15	7.38	6.17	03:20	0.81	10:10	1.57	1.26	03:20	0.205	10:15	0.759	0.497	0.497	0.77
11/28/2019	05:45	4.53	12:00	6.44	5.53	05:40	0.83	11:40	1.33	1.07	05:40	0.206	12:40	0.535	0.357	0.357	
11/29/2019	04:50	4.40	14:25	6.80	5.65	03:50	0.54	14:25	1.38	1.05	03:50	0.133	14:25	0.602	0.365	0.365	0.05
11/30/2019	04:55	4.48	12:00	6.43	5.60	03:50	0.68	11:40	1.26	1.00	03:50	0.166	11:40	0.506	0.341	0.341	0.14
12/01/2019	05:55	4.61	21:55	6.45	5.70	05:40	0.63	22:05	1.32	1.04	05:45	0.159	22:00	0.533	0.366	0.366	0.06
12/02/2019	04:50	4.50	17:20	7.33	6.29	02:00	0.67	17:00	1.59	1.27	02:00	0.178	17:05	0.763	0.521	0.521	0.36
12/03/2019	04:40	4.46	10:15	7.67	6.20	04:40	0.73	10:05	1.62	1.23	04:40	0.177	10:05	0.833	0.494	0.494	
12/04/2019	03:05	4.74	12:25	7.74	6.49	03:05	0.74	12:25	1.68	1.27	03:05	0.195	12:25	0.875	0.541	0.541	0.44
12/05/2019	04:30	4.83	14:55	7.78	6.51	04:25	0.76	14:50	1.56	1.23	04:25	0.205	14:50	0.814	0.521	0.521	
12/06/2019	05:35	4.97	12:55	7.57	6.44	03:00	0.69	12:55	1.52	1.18	05:35	0.209	12:55	0.765	0.493	0.493	0.06
12/07/2019	05:00	4.77	12:45	7.47	6.32	05:10	0.73	12:15	1.39	1.07	05:05	0.193	12:05	0.689	0.437	0.437	0.84
12/08/2019	05:15	5.27	11:30	7.07	6.33	06:00	0.66	11:10	1.23	1.01	06:00	0.202	11:10	0.562	0.410	0.410	0.10
12/09/2019	05:00	5.12	09:35	7.65	6.72	04:55	0.68	09:30	1.42	1.09	04:55	0.200	09:35	0.715	0.484	0.484	
12/10/2019	05:10	5.36	12:25	7.85	6.92	04:25	0.67	14:50	1.32	1.07	04:30	0.210	12:20	0.696	0.493	0.493	0.01
12/11/2019	03:30	5.52	11:10	7.96	7.00	03:15	0.65	13:35	1.33	1.06	03:15	0.213	13:35	0.715	0.495	0.495	
12/12/2019	04:55	5.50	12:55	8.11	7.06	05:10	0.64	12:55	1.33	1.05	05:10	0.209	12:55	0.735	0.496	0.496	
12/13/2019	05:10	5.63	12:40	7.99	6.96	05:10	0.67	12:40	1.33	1.05	05:10	0.226	12:40	0.720	0.482	0.482	
12/14/2019	05:25	5.84	13:35	8.06	6.87	04:30	0.73	11:05	1.34	1.03	04:30	0.260	13:40	0.728	0.464	0.464	0.01
12/15/2019	03:40	5.41	11:10	7.12	6.43	03:40	0.62	23:00	1.12	0.92	03:40	0.196	11:15	0.520	0.377	0.377	
12/16/2019	03:45	5.31	08:40	8.39	6.92	03:35	0.58	08:35	1.40	1.04	03:35	0.179	08:35	0.813	0.485	0.485	
12/17/2019	04:55	5.37	08:25	7.95	6.97	03:35	0.59	17:05	1.32	1.07	03:35	0.184	08:25	0.713	0.499	0.499	
12/18/2019	04:45	5.30	11:35	8.30	7.09	04:50	0.63	10:20	1.38	1.08	04:50	0.194	11:40	0.782	0.518	0.518	
12/19/2019	05:05	5.36	10:55	8.32	7.13	05:10	0.58	13:35	1.38	1.09	05:10	0.182	10:55	0.790	0.527	0.527	
12/20/2019	05:00	5.32	09:00	8.01	6.98	05:30	0.60	14:45	1.33	1.05	05:05	0.187	14:45	0.712	0.487	0.487	0.02
12/21/2019	03:45	5.31	10:00	7.85	6.51	03:50	0.57	11:35	1.29	0.95	03:50	0.175	10:05	0.685	0.403	0.403	
12/22/2019	04:30	5.28	11:05	6.97	6.26	04:45	0.61	11:05	1.12	0.91	04:45	0.189	11:05	0.503	0.360	0.360	
12/23/2019	05:20	5.29	15:10	9.03	6.68	05:55	0.64	15:10	1.51	1.00	05:55	0.196	15:10	0.966	0.446	0.446	
12/24/2019	05:05	5.20	12:10	6.85	6.18	05:00	0.55	12:50	1.17	0.86	05:00	0.165	12:50	0.514	0.334	0.334	
12/25/2019	05:00	5.23	12:15	6.85	6.09	04:45	0.55	11:25	1.09	0.85	04:45	0.169	11:25	0.475	0.324	0.324	
12/26/2019	03:50	5.12	13:40	7.71	6.51	03:40	0.55	13:35	1.33	0.97	03:40	0.162	13:35	0.685	0.416	0.416	
12/27/2019	04:55	5.06	11:15	7.87	6.45	05:00	0.57	11:15	1.35	0.97	05:00	0.164	11:15	0.720	0.411	0.411	
12/28/2019	05:20	4.97	11:10	7.25	6.18	04:50	0.55	11:35	1.30	0.91	04:50	0.156	11:35	0.584	0.361	0.361	
12/29/2019	05:20	4.96	11:35	6.86	5.94	05:15	0.56	09:50	1.12	0.87	05:15	0.156	11:05	0.490	0.321	0.321	
12/30/2019	03:40	4.93	19:10	6.92	6.13	03:25	0.57	19:05	1.26	0.97	03:25	0.160	19:05	0.561	0.381	0.381	
12/31/2019	05:25	4.91	11:00	6.59	5.90	04:50	0.60	10:55	1.13	0.92	05:15	0.168	11:00	0.473	0.337	0.337	

Date	Depth (in)				Velocity (ft/s)				Quantity (MGD - Total MG)					Rain (in)
	Time	Min Time	Max	Avg	Time	Min Time	Max	Avg	Time	Min Time	Max	Avg	Total	Total
01/01/2020	05:25	4.85 12:15	6.51	5.83	05:55	0.60 12:15	1.14	0.91	05:55	0.163 12:15	0.467	0.328	0.328	
01/02/2020	04:45	4.83 10:40	7.01	6.17	03:45	0.60 10:35	1.21	0.96	03:45	0.165 10:35	0.549	0.380	0.380	
01/03/2020	04:45	4.99 12:40	7.24	6.21	02:50	0.58 12:40	1.24	0.94	02:50	0.169 12:40	0.587	0.375	0.375	
01/04/2020	05:05	4.88 11:50	7.28	6.06	05:20	0.52 11:50	1.21	0.88	05:20	0.143 11:50	0.579	0.339	0.339	
01/05/2020	05:25	4.84 11:05	6.79	6.00	05:15	0.52 12:00	1.08	0.86	05:15	0.142 11:05	0.468	0.325	0.325	
01/06/2020	04:50	4.79 12:40	7.01	6.15	04:00	0.49 10:35	1.16	0.91	04:00	0.131 12:45	0.522	0.357	0.357	
01/07/2020	03:20	4.90 12:55	7.03	6.17	05:25	0.51 12:55	1.13	0.90	05:25	0.143 12:55	0.518	0.356	0.356	
01/08/2020	04:45	4.67 10:55	6.68	5.90	04:45	0.63 12:50	1.20	0.98	04:45	0.163 10:55	0.508	0.361	0.361	
01/09/2020	04:40	4.67 11:10	7.79	6.39	03:45	0.59 11:10	1.49	1.10	03:45	0.153 11:10	0.783	0.467	0.467	
01/10/2020	04:40	4.82 13:10	7.44	6.39	03:20	0.68 13:15	1.48	1.15	03:20	0.185 13:15	0.728	0.479	0.479	
01/11/2020	05:20	4.76 11:15	7.15	6.08	03:50	0.64 11:15	1.36	1.02	05:30	0.172 11:15	0.635	0.393	0.393	
01/12/2020	05:30	4.94 11:35	6.70	5.99	05:10	0.65 11:30	1.22	1.00	05:35	0.181 11:35	0.518	0.374	0.374	
01/13/2020	03:30	4.84 13:25	7.66	6.42	03:20	0.68 13:35	1.49	1.13	03:25	0.185 13:35	0.760	0.474	0.474	
01/14/2020	04:40	4.87 13:25	7.50	6.52	02:15	0.68 08:55	1.36	1.10	04:40	0.189 13:20	0.670	0.470	0.470	
01/15/2020	04:40	5.06 12:15	7.69	6.74	04:15	0.67 12:25	1.35	1.10	04:15	0.194 12:25	0.691	0.489	0.489	0.10
01/16/2020	04:45	5.08 14:15	8.22	6.88	04:40	0.68 14:10	1.47	1.14	04:40	0.198 14:10	0.825	0.524	0.524	0.66
01/17/2020	05:10	5.35 15:20	8.19	6.79	05:10	0.74 15:25	1.45	1.12	05:10	0.231 15:20	0.815	0.499	0.499	
01/18/2020	04:35	5.14 13:00	7.56	6.34	03:35	0.69 13:00	1.44	1.04	04:35	0.204 13:00	0.725	0.424	0.424	
01/19/2020	05:20	4.89 10:30	6.86	6.07	05:20	0.60 10:25	1.25	0.95	05:20	0.166 10:25	0.551	0.366	0.366	
01/20/2020	05:20	5.01 12:45	8.10	6.72	03:45	0.60 15:00	1.40	1.09	03:45	0.172 12:45	0.770	0.491	0.491	
01/21/2020	04:15	5.06 21:55	7.60	6.73	04:05	0.66 21:45	1.36	1.11	04:05	0.190 21:55	0.690	0.492	0.492	0.01
01/22/2020	04:40	5.18 12:55	7.81	6.85	04:35	0.67 17:15	1.39	1.14	04:35	0.199 13:05	0.721	0.521	0.521	0.09
01/23/2020	04:40	5.16 09:15	8.02	6.84	04:40	0.70 19:25	1.47	1.15	04:40	0.207 09:15	0.797	0.522	0.522	
01/24/2020	04:45	5.14 11:20	8.24	6.83	05:05	0.68 11:10	1.47	1.13	05:05	0.201 11:20	0.829	0.515	0.515	
01/25/2020	03:40	5.15 11:55	7.03	6.21	03:45	0.66 12:40	1.20	0.97	03:45	0.194 11:50	0.543	0.383	0.383	
01/26/2020	05:35	4.90 11:05	7.06	6.11	05:30	0.59 10:45	1.28	0.95	05:30	0.161 11:05	0.584	0.369	0.369	0.16
01/27/2020	03:00	5.12 18:35	7.84	6.67	02:10	0.66 18:40	1.46	1.13	02:55	0.202 18:35	0.758	0.500	0.500	
01/28/2020	04:05	5.19 10:15	8.02	6.70	03:50	0.77 10:30	1.58	1.20	03:55	0.230 10:15	0.856	0.531	0.531	0.02
01/29/2020	04:55	5.04 10:00	7.69	6.52	04:35	0.71 10:00	1.51	1.16	04:50	0.203 10:00	0.780	0.493	0.493	
01/30/2020	04:45	4.95 11:30	7.66	6.59	02:45	0.66 10:30	1.38	1.12	02:45	0.190 10:30	0.700	0.483	0.483	
01/31/2020	03:30	5.12 12:50	7.71	6.69	03:30	0.68 12:40	1.41	1.13	03:30	0.200 12:45	0.730	0.497	0.497	0.01
02/01/2020	04:10	5.04 11:40	7.11	6.22	03:45	0.66 11:35	1.30	0.99	03:45	0.191 11:35	0.600	0.390	0.390	
02/02/2020	05:20	4.98 12:50	7.10	6.15	05:15	0.59 12:35	1.19	0.93	05:15	0.167 12:50	0.550	0.364	0.364	
02/03/2020	04:45	5.09 10:35	7.73	6.60	03:35	0.62 11:20	1.43	1.09	03:35	0.181 10:40	0.715	0.476	0.476	
02/04/2020	04:50	5.00 13:30	7.77	6.64	03:15	0.62 13:20	1.39	1.09	03:15	0.177 13:25	0.724	0.478	0.478	
02/05/2020	04:45	5.10 09:50	7.91	6.75	04:45	0.67 10:00	1.38	1.11	04:45	0.196 10:00	0.737	0.495	0.495	
02/06/2020	04:40	5.09 11:30	8.02	6.79	05:20	0.65 11:25	1.45	1.09	04:40	0.188 11:30	0.784	0.493	0.493	
02/07/2020	03:30	5.20 11:15	8.10	6.83	03:10	0.62 08:45	1.37	1.08	03:10	0.187 11:10	0.757	0.490	0.490	
02/08/2020	03:45	5.18 11:35	7.37	6.24	04:25	0.58 11:35	1.26	0.97	04:25	0.174 11:35	0.612	0.382	0.382	
02/09/2020	05:40	4.90 11:05	6.87	6.12	05:45	0.58 13:55	1.20	0.97	05:45	0.161 11:25	0.526	0.376	0.376	
02/10/2020	03:55	5.10 08:20	7.98	6.52	03:05	0.63 08:20	1.47	1.06	03:05	0.193 08:20	0.796	0.453	0.453	
02/11/2020	05:00	5.07 13:20	7.97	6.78	04:45	0.64 13:15	1.44	1.11	04:55	0.184 13:15	0.776	0.502	0.502	
02/12/2020	04:40	5.26 09:05	7.86	6.82	03:25	0.56 12:15	1.35	1.12	03:25	0.170 09:05	0.715	0.505	0.505	
02/13/2020	04:40	5.00 11:15	7.82	6.53	03:10	0.63 11:15	1.44	1.09	03:10	0.182 11:15	0.759	0.469	0.469	
02/14/2020	03:55	5.04 10:50	7.50	6.52	03:40	0.68 10:20	1.36	1.09	03:40	0.195 10:45	0.667	0.463	0.463	
02/15/2020	03:50	4.87 12:10	7.48	6.10	03:20	0.55 12:05	1.31	0.95	03:20	0.153 12:05	0.650	0.371	0.371	
02/16/2020	05:10	4.86 11:10	7.04	6.00	05:10	0.63 12:45	1.26	0.95	05:10	0.171 12:45	0.572	0.358	0.358	
02/17/2020	05:10	4.78 12:45	7.56	6.16	05:55	0.48 11:05	1.33	0.96	05:55	0.135 11:05	0.667	0.381	0.381	
02/18/2020	03:45	4.83 12:25	8.16	6.56	03:50	0.45 12:15	1.54	1.05	03:50	0.121 12:20	0.856	0.458	0.458	
02/19/2020	05:00	5.16 12:55	8.14	6.88	03:10	0.56 11:25	1.45	1.11	03:10	0.167 11:25	0.796	0.515	0.515	
02/20/2020	04:55	5.24 11:25	8.09	6.93	04:55	0.70 11:15	1.44	1.13	04:55	0.212 11:15	0.793	0.522	0.522	
02/21/2020	04:40	5.21 10:15	7.98	6.71	03:20	0.59 10:20	1.38	1.07	03:20	0.181 10:20	0.747	0.475	0.475	
02/22/2020	05:10	5.01 11:35	7.71	6.42	05:05	0.61 11:40	1.39	1.03	05:05	0.174 11:40	0.718	0.428	0.428	
02/23/2020	05:55	5.06 10:00	7.14	6.31	06:05	0.56 20:40	1.27	1.00	06:05	0.162 20:40	0.585	0.407	0.407	
02/24/2020	03:45	4.89 11:05	8.78	6.87	03:55	0.60 11:20	1.48	1.11	03:55	0.166 11:05	0.905	0.513	0.513	

Date	Depth (in)					Velocity (ft/s)					Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
02/25/2020	05:00	5.30	12:40	8.03	6.93	05:10	0.62	12:50	1.38	1.07	05:10	0.190	12:50	0.750	0.498	0.498	
02/26/2020	04:55	5.34	10:35	7.98	6.92	05:00	0.63	12:55	1.48	1.07	05:00	0.197	12:55	0.784	0.492	0.492	
02/27/2020	04:55	5.32	12:55	8.12	6.98	04:50	0.61	12:50	1.41	1.10	04:50	0.190	12:50	0.781	0.513	0.513	
02/28/2020	03:35	5.21	10:40	8.05	6.79	02:45	0.64	12:05	1.37	1.07	03:35	0.194	10:55	0.740	0.486	0.486	
02/29/2020	03:30	5.14	11:10	8.12	6.39	03:05	0.62	11:15	1.37	0.98	03:05	0.183	11:15	0.760	0.405	0.405	
03/01/2020	05:50	5.08	12:35	7.05	6.23	05:20	0.55	11:30	1.18	0.94	05:20	0.161	12:35	0.536	0.376	0.376	
03/02/2020	03:35	5.00	10:40	7.86	6.69	03:55	0.60	10:55	1.36	1.06	03:45	0.170	10:55	0.715	0.473	0.473	0.01
03/03/2020	05:40	5.30	10:20	8.14	6.81	05:35	0.70	10:05	1.40	1.08	05:35	0.215	10:15	0.773	0.485	0.485	
03/04/2020	03:45	4.89	09:20	8.20	6.71	03:30	0.55	09:25	1.37	1.06	03:30	0.152	09:25	0.771	0.476	0.476	
03/05/2020	04:55	5.07	08:50	7.82	6.61	04:55	0.59	08:55	1.38	1.07	04:55	0.170	08:50	0.724	0.461	0.461	
03/06/2020	05:10	4.88	15:55	7.57	6.48	03:05	0.49	15:45	1.36	1.04	03:05	0.139	15:45	0.675	0.446	0.446	
03/07/2020	05:05	4.79	11:55	7.44	6.16	05:25	0.56	11:55	1.47	0.99	05:25	0.151	11:55	0.723	0.390	0.390	0.58
03/08/2020	04:55	4.90	11:00	7.14	6.11	05:20	0.50	10:55	1.24	0.95	05:20	0.139	11:00	0.577	0.370	0.370	0.02
03/09/2020	03:20	4.74	12:10	7.84	6.44	03:20	0.52	12:15	1.42	1.05	03:20	0.135	12:10	0.753	0.449	0.449	0.11

Report Summary For The Period 11/16/2019 00:00 - 03/09/2020 23:59

	Depth (in)	Velocity (ft/s)	Quantity (MGD - Total MG)	Rain (in)
Total			50.750	5.26
Avg	6.43	1.05	0.441	

Site Commentary

Site Information

MIL_2666	
Pipe Dimensions	17.88
Silt Level	0.00"

Overview

Site MIL_2666 functioned under normal conditions during the period Saturday, November 16, 2019 to Monday, March 9, 2020 . This site exhibited a moderate response to the wet weather events of November 26, 2019 - November 27, 2019 and December 7, 2019 - December 8, 2019. Surcharge conditions were experienced at this site. Review of the scattergraph shows that both free flow and backwater conditions were recorded during the study period.

Flow depth and velocity measurements recorded by the flow monitor are consistent with field confirmations conducted to date and support the relative accuracy of the flow monitor at this location.

Observations

Average flow depth, velocity, and quantity data observed during Saturday, November 16, 2019 to Monday, March 9, 2020 , along with observed minimum and maximum data, are provided in the following table.

Observed Flow Conditions			
Item	Depth (in)	Velocity (ft/s)	Quantity (MGD)
Average	8.74	1.74	0.949
Minimum	5.81	0.77	0.363
Maximum	21.77	2.28	1.470
Time of Minimum	2/14/2020 2:55 AM	3/3/2020 7:40 AM	2/25/2020 3:25 AM
Time of Maximum	1/26/2020 11:35 AM	2/25/2020 7:30 AM	1/13/2020 8:00 AM

Data Quality

Data uptime observed during the Saturday, November 16, 2019 to the Monday, March 9, 2020 monitoring period is provided in the table below. Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

Percent Uptime	
Depth (in)	100
Velocity (ft/s)	100
Quantity (MGD)	100

Milpitas Temp Study 2019-20

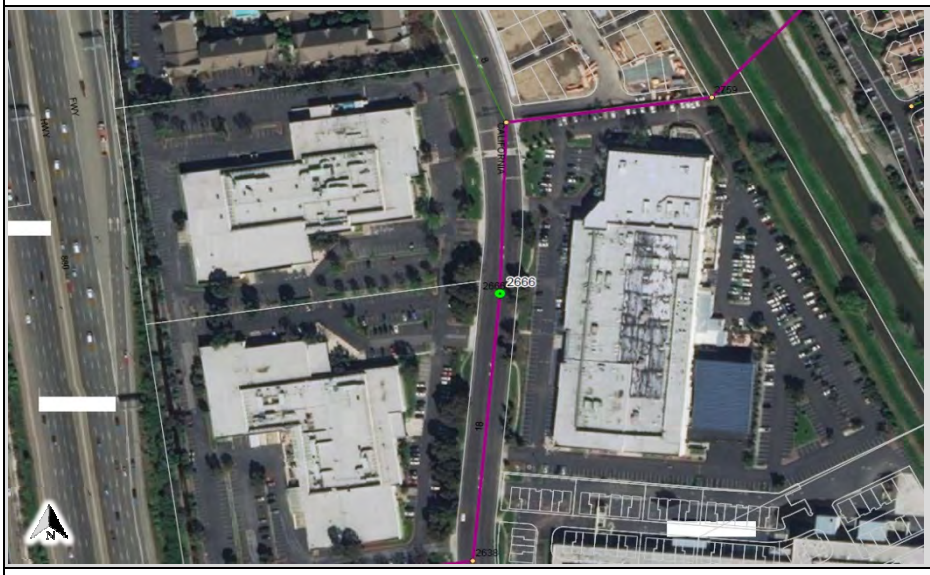
Flow Monitoring Site Report

ADS ENVIRONMENTAL SERVICES®

Site Name

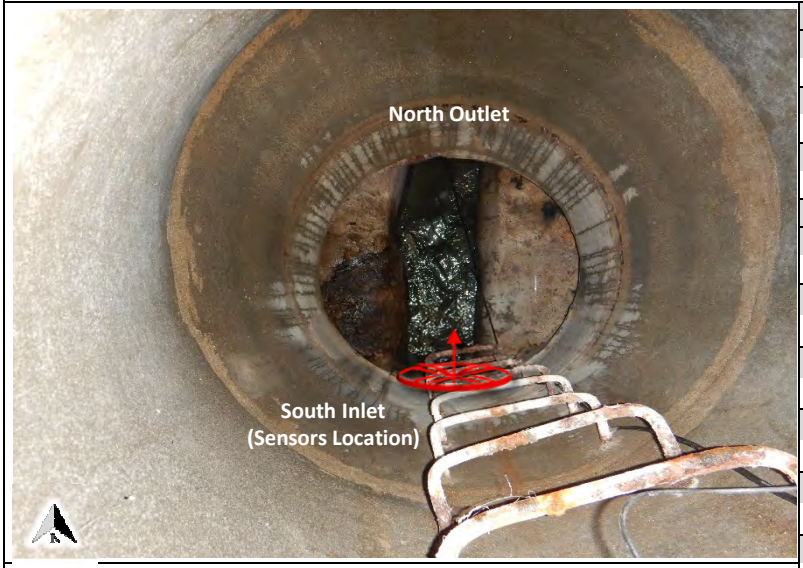
MIL_2666

Site Address /Location:	California Cir and Cadillac Court, Milpitas, CA			Monitor Series	Location Type
				TRITON+	Temporary
Site Access Details:	Drive	Latitude:	37.449182°	Pipe Size (H x W)	Pipe Shape
		Longitude:	-121.919254°	17.88" x 17.88"	Circular



Manhole #	System Characteristics
2666	Residential/Commercial
Access	Traffic
Drive	Medium







Installation Information

Installation Date:	Installation Type:
Tuesday, November 12, 2019	Doppler Standard Ring and Crank
Monitoring Location (Sensors):	Monitor Location:
Upstream 0-5 FT	Manhole
Sensors / Devices:	Pressure Sensor Range (psi)
Peak Combo (CS4)	0 - 5 psi

Installation Confirmation:

Confirmation Time:	Pipe Size (HxW)
4:33:04 AM	17.88" x 17.88"
Depth of Flow (Wet DOF) (in)	Range (Air DOF) (in)
6.25"	0.00"
Downlooker Physical Offset (in)	Measurement Confidence (in)
NA	0.25"
Peak Velocity (fps)	Velocity Sensor Offset (in)
1.58	0''
Silt (in)	Silt Type
0''	

Hydraulic Comments:

good flow, medium depth and velocity

Manhole / Pipe Information:

Manhole Depth (Approx. FT):	Manhole Configuration
9'	Single
Manhole Material:	Manhole Condition:
Concrete	Good
Manhole Opening Diameter (in)	Manhole Diameter (Approx.):
26''	54''
Manhole Cover	Manhole Frame
Unbolted	Normal
Active Drop Connections	Air Quality:
No	Normal
Pipe Material	Pipe Condition:
PVC	Good

Communication Information:

Communication Type	Antenna Location
Wireless	Manhole Pick / Vent Hole

Additional Site Info. / Comments:

ADS Project Name:	Milpitas.WWTFM.CA19-20
ADS Project Number:	22431

SCATTERGRAPH REPORT

MIL_2666

Flow Monitor

MIL_2666

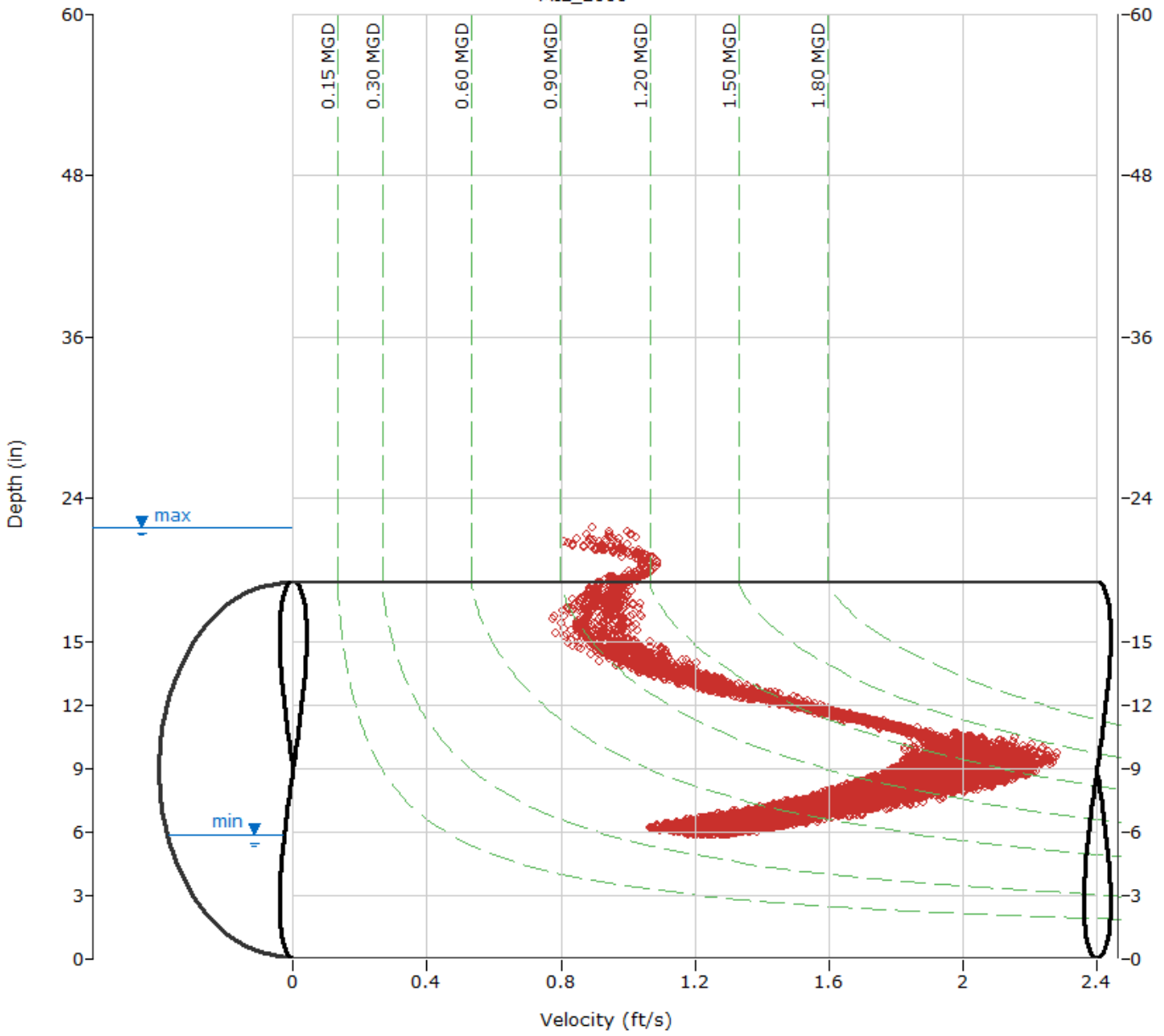
Pipe Height
17.88 in

Report Period

11/16/2019
To
3/9/2020

Legend

- Depth - Velocity
- Iso-Q™
- Silt
- Min-Max Depth



ADS ENVIRONMENTAL SERVICES

HYDROGRAPH REPORT

MIL_2666

Flow Monitor

MIL_2666

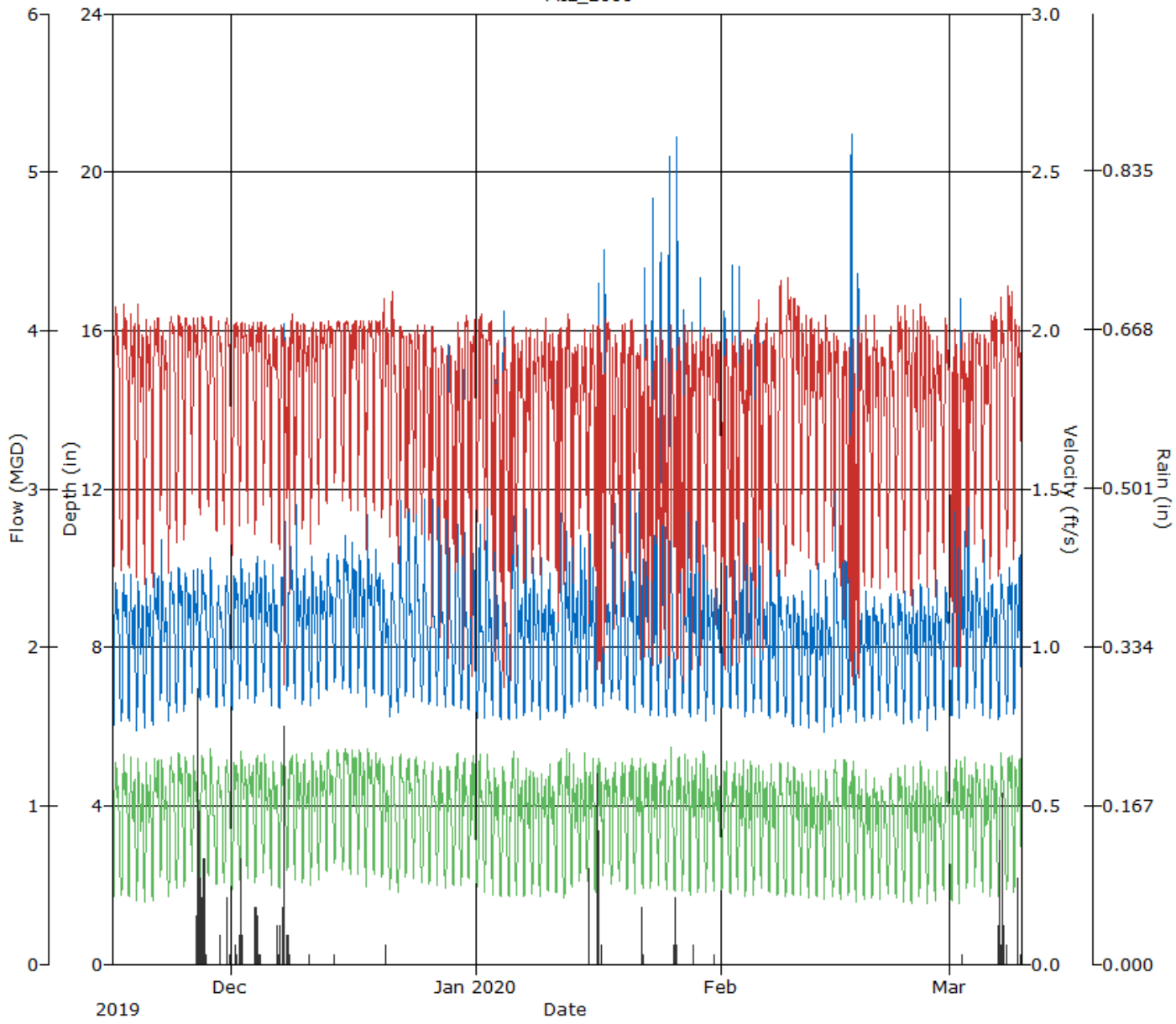
Pipe Height
17.88 in

Report Period

11/16/2019
To
3/9/2020

Legend

- Depth
- Velocity
- Quantity
- Rain



ADS ENVIRONMENTAL SERVICES

Daily Tabular Report For The Period 11/16/2019 00:00 - 03/09/2020 23:59

MIL_2666, Pipe Height: 17.88 in, Silt: 0.00 in

Daily Tabular Report

Date	Depth (in)				Velocity (ft/s)				Quantity (MGD - Total MG)					Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
11/16/2019	04:30	5.94	11:15	9.75	8.10	04:10	1.19	10:35	2.15	1.78	04:10	0.393	12:50	1.313	0.912	0.912	
11/17/2019	04:10	6.11	10:45	10.15	8.25	03:35	1.20	20:00	2.14	1.78	05:05	0.413	11:15	1.385	0.935	0.935	
11/18/2019	03:25	6.10	07:35	10.12	8.22	02:55	1.19	19:55	2.14	1.79	02:55	0.412	07:40	1.391	0.931	0.931	
11/19/2019	03:40	5.87	07:45	10.35	8.08	02:20	1.14	08:05	2.19	1.78	04:10	0.381	07:35	1.437	0.905	0.905	
11/20/2019	03:45	5.91	07:35	10.48	8.17	03:45	1.18	19:20	2.06	1.78	03:45	0.383	07:35	1.389	0.915	0.915	
11/21/2019	03:45	6.02	08:10	10.54	8.58	03:35	1.13	08:00	2.09	1.84	03:35	0.379	08:10	1.396	1.012	1.012	
11/22/2019	03:45	6.64	07:40	11.30	8.47	03:45	1.42	09:20	2.16	1.84	03:45	0.540	08:10	1.372	0.975	0.975	
11/23/2019	04:10	6.09	11:05	10.26	8.34	03:50	1.18	12:35	2.06	1.79	03:50	0.405	11:05	1.363	0.954	0.954	
11/24/2019	05:05	6.33	12:35	10.23	8.53	05:05	1.32	11:00	2.07	1.83	05:05	0.471	11:45	1.363	0.995	0.995	
11/25/2019	03:55	6.35	07:50	10.47	8.59	03:55	1.32	07:40	2.07	1.86	03:55	0.475	07:45	1.409	1.017	1.017	
11/26/2019	03:45	6.80	07:45	10.52	8.68	03:45	1.47	20:40	2.04	1.88	03:45	0.578	07:45	1.394	1.037	1.037	0.63
11/27/2019	03:30	6.63	08:40	10.23	8.82	03:25	1.37	09:40	2.04	1.90	03:25	0.520	08:40	1.359	1.069	1.069	0.77
11/28/2019	04:40	6.68	11:30	10.47	8.48	04:40	1.43	10:55	2.04	1.84	04:40	0.551	11:30	1.389	0.985	0.985	
11/29/2019	05:05	6.46	10:55	9.77	8.21	05:05	1.36	10:55	2.04	1.80	05:05	0.499	10:55	1.285	0.927	0.927	0.05
11/30/2019	05:25	6.50	12:05	10.15	8.34	05:25	1.38	11:55	2.04	1.82	05:25	0.509	12:05	1.348	0.957	0.957	0.14
12/01/2019	05:15	6.41	11:15	10.05	8.49	05:15	1.29	11:55	2.09	1.80	05:15	0.467	11:15	1.320	0.976	0.976	0.06
12/02/2019	03:35	6.68	07:55	10.76	8.77	03:35	1.38	08:00	2.06	1.86	03:35	0.529	08:00	1.398	1.044	1.044	0.36
12/03/2019	03:50	6.67	07:35	10.41	8.65	03:50	1.38	20:00	2.03	1.86	03:50	0.528	07:40	1.361	1.021	1.021	
12/04/2019	03:15	6.56	08:20	11.02	8.79	03:15	1.34	20:40	2.03	1.87	03:15	0.501	07:35	1.378	1.049	1.049	0.44
12/05/2019	03:40	6.84	08:20	10.59	8.62	03:40	1.43	19:00	2.12	1.84	03:40	0.568	08:20	1.377	1.003	1.003	
12/06/2019	03:40	6.48	07:55	10.81	8.50	03:40	1.31	09:20	2.08	1.83	03:40	0.483	08:15	1.339	0.980	0.980	0.06
12/07/2019	04:55	6.41	18:05	16.58	9.36	19:55	0.87	17:15	2.18	1.67	04:35	0.462	17:15	1.414	0.959	0.959	0.84
12/08/2019	03:55	6.90	11:55	13.35	9.32	12:00	1.12	15:50	2.16	1.77	05:00	0.567	17:55	1.412	1.044	1.044	0.10
12/09/2019	03:15	6.68	07:50	12.68	8.79	07:55	1.29	10:00	2.03	1.83	03:15	0.530	08:45	1.356	1.019	1.019	
12/10/2019	03:25	6.51	08:15	10.66	8.46	02:45	1.31	20:45	2.05	1.83	02:45	0.491	08:20	1.368	0.974	0.974	0.01
12/11/2019	03:25	6.51	08:30	10.68	8.55	03:30	1.29	14:05	2.07	1.82	03:30	0.477	08:15	1.384	0.988	0.988	0.00
12/12/2019	03:45	6.66	07:40	10.43	8.65	03:45	1.37	10:10	2.03	1.86	03:45	0.525	07:40	1.364	1.023	1.023	
12/13/2019	03:00	6.88	08:15	10.59	8.88	03:00	1.44	08:50	2.03	1.90	03:00	0.577	08:15	1.377	1.074	1.074	
12/14/2019	04:20	7.04	10:40	10.60	8.98	04:20	1.49	15:30	2.03	1.89	04:20	0.616	10:40	1.377	1.087	1.087	0.01
12/15/2019	04:40	6.93	11:05	10.95	9.10	04:40	1.46	14:25	2.03	1.87	04:40	0.590	10:50	1.383	1.096	1.096	
12/16/2019	03:45	6.77	08:25	10.78	9.05	03:45	1.41	20:50	2.03	1.89	03:45	0.552	08:40	1.377	1.095	1.095	
12/17/2019	03:35	6.81	07:40	10.73	8.87	03:35	1.42	11:10	2.03	1.89	03:35	0.559	07:35	1.376	1.067	1.067	
12/18/2019	03:45	6.43	08:20	11.98	8.99	04:10	1.26	21:05	2.03	1.86	04:10	0.464	08:50	1.383	1.073	1.073	
12/19/2019	03:35	6.82	08:00	10.95	9.02	03:35	1.42	19:15	2.03	1.89	03:35	0.562	07:40	1.380	1.093	1.093	
12/20/2019	05:05	6.59	08:25	10.05	8.25	05:10	1.38	09:30	2.26	1.86	05:10	0.523	07:40	1.408	0.961	0.961	0.02
12/21/2019	05:00	6.21	11:00	10.40	8.15	04:25	1.32	10:05	2.28	1.80	04:25	0.464	11:00	1.395	0.921	0.921	
12/22/2019	04:45	6.32	12:15	12.19	8.67	04:30	1.24	10:05	2.09	1.75	04:30	0.444	14:25	1.370	0.968	0.968	
12/23/2019	03:25	6.72	12:15	13.17	8.97	12:20	1.18	08:50	2.03	1.79	03:25	0.538	13:40	1.377	1.019	1.019	
12/24/2019	04:05	6.63	11:15	12.60	8.92	04:05	1.36	14:05	2.03	1.78	04:05	0.518	13:40	1.374	1.004	1.004	
12/25/2019	05:20	6.61	13:10	12.38	8.45	05:20	1.35	11:20	2.11	1.76	05:20	0.512	13:55	1.376	0.936	0.936	
12/26/2019	04:10	6.51	11:55	14.17	8.82	11:35	0.97	18:10	2.10	1.72	04:10	0.490	14:00	1.374	0.943	0.943	
12/27/2019	04:15	6.46	11:55	14.12	9.00	11:55	0.98	14:30	2.03	1.67	03:35	0.480	14:05	1.374	0.930	0.930	
12/28/2019	05:00	6.46	12:25	16.08	9.04	11:35	0.86	09:50	2.09	1.62	05:00	0.470	15:10	1.375	0.900	0.900	
12/29/2019	05:05	6.52	11:15	13.33	9.13	11:10	1.15	20:30	2.03	1.66	06:00	0.484	17:25	1.380	0.966	0.966	
12/30/2019	04:05	6.41	11:45	15.44	9.14	12:05	0.83	18:00	2.20	1.68	03:30	0.484	09:15	1.374	0.937	0.937	
12/31/2019	03:25	6.28	11:45	15.22	9.04	11:45	0.87	14:50	2.14	1.72	03:30	0.480	09:55	1.380	0.950	0.950	

Date	Depth (in)				Velocity (ft/s)				Quantity (MGD - Total MG)					Rain (in)
	Time	Min Time	Max	Avg	Time	Min Time	Max	Avg	Time	Min Time	Max	Avg	Total	Total
01/01/2020	05:35	6.16 12:20	11.50	8.08	04:10	1.35 16:50	2.19	1.81	05:30	0.474 13:25	1.381	0.913	0.913	
01/02/2020	03:20	6.21 12:10	12.67	8.65	05:05	1.24 18:25	2.13	1.79	03:45	0.437 13:10	1.383	0.973	0.973	
01/03/2020	04:10	6.18 12:05	15.89	9.08	12:15	0.86 08:00	2.04	1.63	04:10	0.417 09:55	1.381	0.909	0.909	
01/04/2020	04:50	6.18 12:55	16.78	9.08	12:25	0.80 15:05	2.02	1.57	04:45	0.377 14:45	1.366	0.862	0.862	
01/05/2020	05:05	6.11 11:00	15.63	9.47	10:55	0.82 22:45	2.07	1.56	05:05	0.395 19:10	1.371	0.924	0.924	
01/06/2020	04:05	6.17 08:15	11.25	8.25	03:15	1.21 10:35	2.07	1.74	03:15	0.420 08:00	1.370	0.905	0.905	
01/07/2020	03:55	6.26 08:10	13.58	8.37	08:10	1.04 07:25	2.11	1.72	03:35	0.417 08:30	1.378	0.906	0.906	
01/08/2020	04:00	6.36 08:05	11.90	8.26	03:40	1.16 07:25	2.09	1.75	03:40	0.419 07:45	1.380	0.908	0.908	
01/09/2020	03:40	6.12 08:10	11.96	8.23	05:00	1.14 21:40	2.11	1.75	03:40	0.403 07:40	1.383	0.910	0.910	
01/10/2020	03:40	6.35 08:35	10.00	8.26	03:10	1.21 18:55	2.13	1.76	03:10	0.436 08:30	1.312	0.912	0.912	
01/11/2020	04:40	6.29 12:35	14.83	9.30	12:45	0.91 09:40	2.10	1.62	04:25	0.425 20:35	1.382	0.957	0.957	
01/12/2020	05:35	6.18 11:05	12.10	8.41	05:10	1.15 19:35	2.17	1.74	05:10	0.397 11:25	1.383	0.939	0.939	
01/13/2020	03:40	6.47 08:35	14.71	8.47	08:40	0.95 08:00	2.15	1.73	03:40	0.483 08:00	1.470	0.915	0.915	
01/14/2020	03:10	6.62 08:00	14.30	8.54	08:00	0.95 09:50	2.03	1.77	04:50	0.492 20:45	1.381	0.954	0.954	
01/15/2020	03:45	6.60 08:00	15.26	8.81	08:00	0.87 10:10	2.02	1.73	03:45	0.514 10:00	1.382	0.949	0.949	0.10
01/16/2020	04:15	6.44 13:20	17.95	10.81	08:00	0.80 15:35	2.02	1.45	03:35	0.445 11:05	1.381	0.954	0.954	0.66
01/17/2020	03:55	6.42 08:50	20.36	9.07	09:30	0.87 11:35	2.19	1.79	04:15	0.523 09:55	1.373	0.979	0.979	
01/18/2020	05:00	6.68 11:05	14.00	9.04	11:05	1.00 15:50	2.10	1.66	04:55	0.492 10:05	1.383	0.935	0.935	
01/19/2020	05:35	6.64 11:45	13.98	8.94	11:50	1.00 18:35	2.12	1.70	05:50	0.484 13:55	1.369	0.945	0.945	
01/20/2020	03:45	6.39 11:40	13.75	8.87	11:50	1.06 18:30	2.16	1.71	04:00	0.439 13:50	1.371	0.953	0.953	
01/21/2020	03:15	6.32 20:45	15.12	9.19	20:55	0.89 14:10	2.08	1.62	03:10	0.425 17:40	1.379	0.918	0.918	0.01
01/22/2020	03:55	6.45 08:20	18.11	9.90	09:05	0.87 07:15	2.11	1.62	04:10	0.472 10:25	1.383	0.978	0.978	0.09
01/23/2020	03:35	6.25 08:50	20.32	10.37	10:45	0.87 06:55	2.12	1.58	03:25	0.466 19:00	1.383	0.967	0.967	
01/24/2020	03:55	6.24 10:10	18.25	11.02	12:40	0.87 07:05	2.07	1.49	03:55	0.483 07:55	1.373	0.985	0.985	
01/25/2020	05:00	6.19 12:00	20.73	10.31	12:05	0.82 22:25	2.05	1.57	05:25	0.395 19:15	1.383	0.935	0.935	
01/26/2020	05:00	6.25 11:35	21.77	10.90	10:15	0.83 16:45	2.02	1.46	04:55	0.450 17:45	1.381	0.943	0.943	0.16
01/27/2020	03:55	6.45 08:15	16.90	9.44	08:00	0.78 07:15	2.14	1.63	03:45	0.448 11:15	1.383	0.949	0.949	
01/28/2020	03:45	6.20 08:10	17.31	9.02	08:40	0.87 07:25	2.06	1.68	03:50	0.428 09:40	1.379	0.944	0.944	0.02
01/29/2020	03:45	6.27 08:20	17.83	9.14	09:10	0.87 11:40	2.06	1.70	04:10	0.440 20:10	1.380	0.954	0.954	
01/30/2020	03:45	6.10 08:20	14.39	8.47	08:20	0.94 19:30	2.12	1.77	03:30	0.437 09:05	1.364	0.935	0.935	
01/31/2020	02:55	6.27 08:15	14.81	8.66	08:15	0.90 07:30	2.19	1.72	03:30	0.448 07:30	1.380	0.927	0.927	0.01
02/01/2020	03:35	6.45 12:10	16.80	9.52	11:05	0.87 08:50	2.05	1.57	03:40	0.433 15:10	1.304	0.915	0.915	
02/02/2020	05:05	6.41 12:10	18.12	9.75	10:55	0.87 16:40	2.07	1.53	04:25	0.437 09:55	1.312	0.902	0.902	
02/03/2020	03:50	6.43 08:15	18.18	9.21	08:55	0.83 07:15	2.18	1.66	03:30	0.440 07:15	1.388	0.940	0.940	
02/04/2020	03:35	6.23 07:55	15.84	8.73	07:45	0.85 07:20	2.08	1.69	03:30	0.407 10:00	1.304	0.918	0.918	
02/05/2020	04:10	6.30 08:15	17.09	9.05	08:10	0.86 18:55	2.19	1.67	04:10	0.420 07:25	1.361	0.935	0.935	
02/06/2020	03:40	6.35 08:10	17.37	8.70	08:25	0.82 11:25	2.17	1.73	03:20	0.467 09:50	1.303	0.925	0.925	
02/07/2020	03:45	6.19 08:05	14.72	8.40	08:00	0.85 18:40	2.08	1.75	02:25	0.441 08:40	1.303	0.917	0.917	
02/08/2020	05:10	6.28 08:30	15.11	8.18	08:30	0.87 13:15	2.27	1.77	05:00	0.414 11:50	1.345	0.909	0.909	
02/09/2020	05:30	6.17 10:40	9.52	8.05	05:30	1.17 12:05	2.26	1.81	05:30	0.404 10:40	1.357	0.920	0.920	
02/10/2020	03:40	5.93 07:55	10.11	7.99	03:40	1.29 07:30	2.23	1.85	03:40	0.422 07:55	1.449	0.923	0.923	
02/11/2020	03:50	5.99 07:55	10.11	7.93	02:30	1.28 07:45	2.25	1.80	02:50	0.428 07:45	1.388	0.888	0.888	
02/12/2020	03:25	5.96 08:10	11.00	7.92	02:25	1.24 07:40	2.21	1.79	03:35	0.409 07:40	1.393	0.883	0.883	
02/13/2020	03:20	6.06 07:55	11.30	7.96	03:05	1.22 09:40	2.18	1.77	03:00	0.412 07:35	1.354	0.879	0.879	
02/14/2020	02:55	5.81 08:30	10.12	7.85	03:45	1.22 07:25	2.17	1.80	03:45	0.391 08:30	1.300	0.878	0.878	
02/15/2020	04:40	5.96 12:20	12.23	8.30	04:40	1.14 18:55	2.14	1.72	04:40	0.374 13:15	1.304	0.900	0.900	
02/16/2020	04:00	6.08 11:30	14.05	8.73	11:30	0.99 17:25	2.12	1.62	05:10	0.389 13:30	1.311	0.895	0.895	
02/17/2020	04:15	6.31 13:10	21.29	11.84	13:30	0.81 08:25	2.03	1.33	04:10	0.414 18:05	1.304	0.913	0.913	
02/18/2020	03:00	6.05 09:15	17.91	9.05	08:20	0.78 12:20	2.15	1.63	03:20	0.368 07:45	1.304	0.881	0.881	
02/19/2020	03:15	6.09 08:10	9.70	8.05	03:20	1.14 08:40	2.21	1.74	03:20	0.386 08:05	1.312	0.878	0.878	
02/20/2020	03:55	6.15 09:00	9.50	8.05	03:50	1.17 10:50	2.16	1.74	03:50	0.401 10:10	1.252	0.874	0.874	
02/21/2020	04:10	6.02 08:20	9.30	8.03	04:00	1.13 14:00	2.06	1.72	04:00	0.377 12:10	1.169	0.865	0.865	
02/22/2020	04:35	6.34 12:15	9.46	8.10	04:40	1.15 11:55	2.09	1.71	04:40	0.411 11:55	1.234	0.869	0.869	
02/23/2020	04:50	6.26 11:10	9.60	8.11	05:35	1.11 11:45	2.25	1.75	05:35	0.391 11:45	1.343	0.899	0.899	
02/24/2020	03:35	6.01 07:25	9.90	8.01	02:55	1.16 07:35	2.25	1.77	03:35	0.389 07:35	1.388	0.887	0.887	

Date	Depth (in)					Velocity (ft/s)					Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
02/25/2020	03:15	6.07	07:40	10.11	8.00	03:25	1.07	07:30	2.28	1.74	03:25	0.363	08:00	1.448	0.872	0.872	
02/26/2020	03:10	6.17	07:25	10.20	8.15	03:15	1.18	07:20	2.16	1.77	03:15	0.408	07:25	1.411	0.903	0.903	
02/27/2020	03:40	5.85	07:35	10.02	7.99	04:00	1.14	08:25	2.21	1.73	04:00	0.373	08:25	1.381	0.866	0.866	
02/28/2020	03:25	6.14	07:50	10.19	8.08	03:25	1.08	07:30	2.01	1.73	03:25	0.371	07:30	1.313	0.876	0.876	
02/29/2020	04:30	6.32	11:20	9.65	8.16	04:30	1.27	11:25	2.16	1.75	04:30	0.451	11:25	1.338	0.899	0.899	
03/01/2020	05:05	6.23	12:00	15.82	9.83	11:40	0.83	15:25	2.02	1.46	05:10	0.391	18:45	1.316	0.890	0.890	
03/02/2020	03:40	6.18	08:00	18.41	9.10	08:40	0.85	11:20	2.02	1.65	03:35	0.368	19:55	1.316	0.930	0.930	0.01
03/03/2020	03:30	6.42	08:05	17.17	8.71	07:40	0.77	20:25	2.06	1.75	03:30	0.477	08:25	1.309	0.949	0.949	
03/04/2020	04:05	6.40	07:50	10.38	8.52	04:05	1.30	09:10	2.16	1.81	04:05	0.471	07:35	1.343	0.978	0.978	
03/05/2020	03:10	6.25	07:40	11.68	8.31	02:30	1.12	07:10	2.22	1.76	02:30	0.400	07:10	1.326	0.919	0.919	
03/06/2020	04:10	6.15	08:15	9.97	8.23	02:55	1.13	20:15	2.21	1.82	02:55	0.399	07:55	1.359	0.941	0.941	
03/07/2020	04:45	6.14	12:20	10.36	8.35	04:35	1.08	12:45	2.21	1.77	04:35	0.369	12:45	1.402	0.943	0.943	0.58
03/08/2020	05:05	6.31	11:20	10.38	8.42	02:45	1.22	20:55	2.25	1.83	04:20	0.439	20:10	1.428	0.981	0.981	0.02
03/09/2020	03:00	6.28	20:10	10.66	8.50	02:20	1.24	07:40	2.16	1.81	02:20	0.440	06:40	1.374	0.978	0.977	0.11

Report Summary For The Period 11/16/2019 00:00 - 03/09/2020 23:59

	Depth (in)	Velocity (ft/s)	Quantity (MGD - Total MG)	Rain (in)
Total			109.178	5.26
Avg	8.74	1.74	0.949	

Site Commentary

Site Information

MIL_2721	
Pipe Dimensions	8
Silt Level	0.00"

Overview

Site MIL_2721 functioned under normal conditions during the period Saturday, November 16, 2019 to Monday, March 9, 2020 . This site exhibited a moderate response to the wet weather events of November 26, 2019 - November 27, 2019 and December 7, 2019 - December 8, 2019. Review of the scattergraph shows that free flow conditions were recorded during the study period.

Flow depth and velocity measurements recorded by the flow monitor are consistent with field confirmations conducted to date and support the relative accuracy of the flow monitor at this location. Due to the high flows at the creek, crews could not access the meter and data stops on March 02, 2020 for this location.

Observations

Average flow depth, velocity, and quantity data observed during Saturday, November 16, 2019 to Monday, March 9, 2020 , along with observed minimum and maximum data, are provided in the following table.

Observed Flow Conditions			
Item	Depth (in)	Velocity (ft/s)	Quantity (MGD)
Average	6.23	1.05	0.198
Minimum	3.86	0.53	0.080
Maximum	9.28	1.61	0.363
Time of Minimum	3/2/2020 3:05 AM	2/2/2020 5:45 AM	2/2/2020 5:45 AM
Time of Maximum	1/17/2020 8:05 AM	1/17/2020 8:10 AM	1/17/2020 8:10 AM

Data Quality

Data uptime observed during the Saturday, November 16, 2019 to the Monday, March 2, 2020 monitoring period is provided in the table below. Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

Percent Uptime	
Depth (in)	100
Velocity (ft/s)	100
Quantity (MGD)	100

Milpitas Temp Study 2019-20

Flow Monitoring Site Report

ADS ENVIRONMENTAL SERVICES®

Site Name

MIL_2721

Site Address /Location:	1545 N Milpitas Blvd			Monitor Series	Location Type
				TRITON+	Temporary
Site Access Details:	Gate access. Need hip waders to cross stream.	Latitude:	37.452946°	Pipe Size (H x W)	Pipe Shape
		Longitude:	-121.914112°	8.0" x 8.0"	Circular



Manhole #	System Characteristics
2721	Residential
Access	Traffic
Drive	Light







Installation Information

Installation Date:	Installation Type:
Friday, November 15, 2019	Doppler Standard Ring and Crank
Monitoring Location (Sensors):	Monitor Location:
Upstream 0-5 FT	Manhole
Sensors / Devices:	Pressure Sensor Range (psi)
Peak Combo (CS4)	0 - 5 psi

Installation Confirmation:

Confirmation Time:	Pipe Size (HxW)
9:56:00 AM	8.0" x 8.0"
Depth of Flow (Wet DOF) (in)	Range (Air DOF) (in)
5.50"	0.00"
Downlooker Physical Offset (in)	Measurement Confidence (in)
NA	0.25"
Peak Velocity (fps)	Velocity Sensor Offset (in)
1.7	0''
Silt (in)	Silt Type
0''	

Hydraulic Comments:

Good flow medium depth and velocity

Manhole / Pipe Information:

Manhole Depth (Approx. FT):	Manhole Configuration
6'	Single
Manhole Material:	Manhole Condition:
Concrete	Good
Manhole Opening Diameter (in)	Manhole Diameter (Approx.):
26''	54''
Manhole Cover	Manhole Frame
Unbolted	Normal
Active Drop Connections	Air Quality:
No	Normal
Pipe Material	Pipe Condition:
PVC	Good

Communication Information:

Communication Type	Antenna Location
Wireless	Manhole Pick / Vent Hole

Additional Site Info. / Comments:

ADS Project Name:	Milpitas.WWTFM.CA19-20
ADS Project Number:	22431

SCATTERGRAPH REPORT

MIL_2721

Flow Monitor

MIL_2721

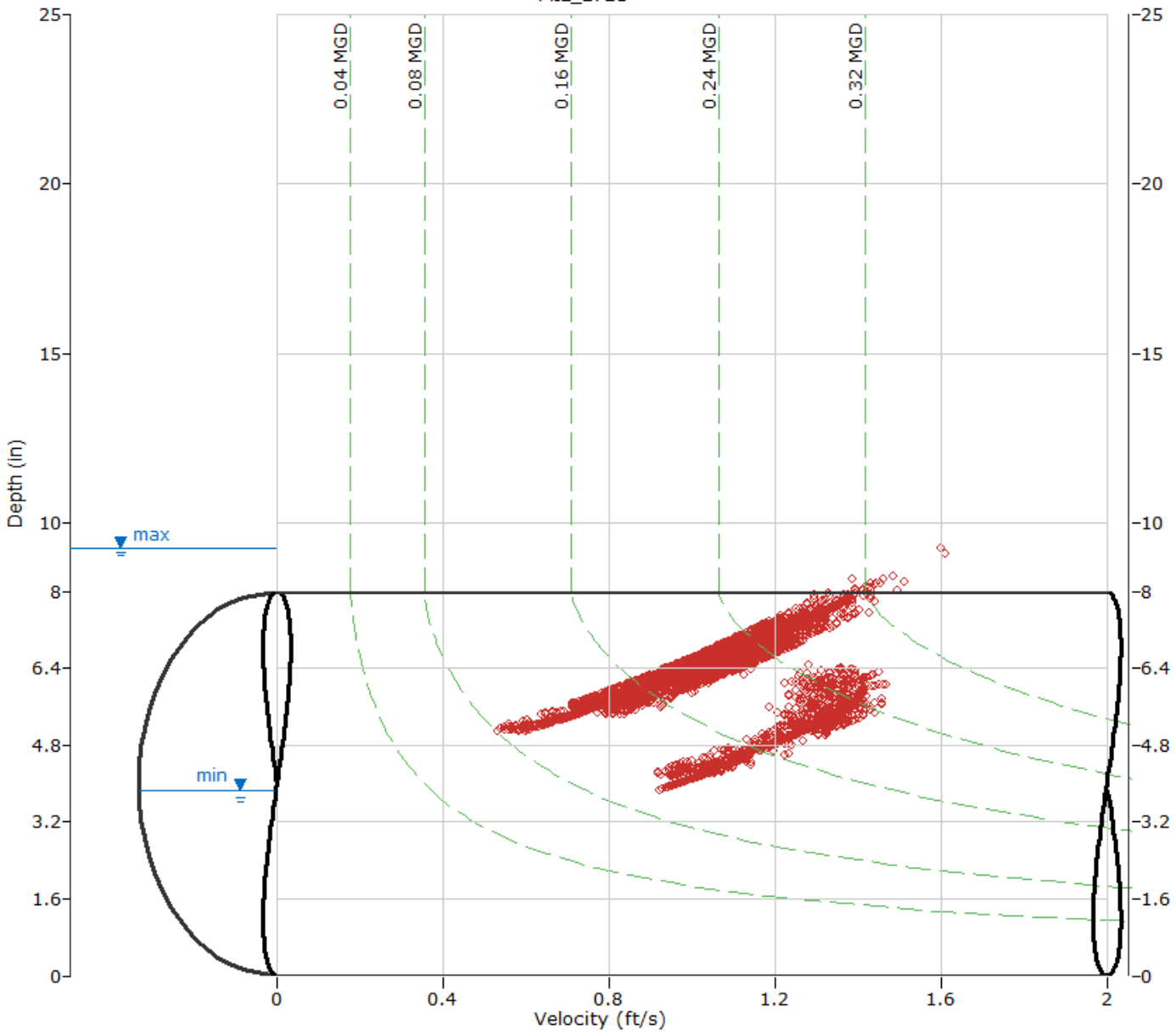
Pipe Height
8.00 in

Report Period

11/16/2019
To
3/9/2020

Legend

- Depth - Velocity
- Iso-Q™
- Silt
- Min-Max Depth



ADS ENVIRONMENTAL SERVICES

HYDROGRAPH REPORT

MIL_2721

Flow Monitor

MIL_2721

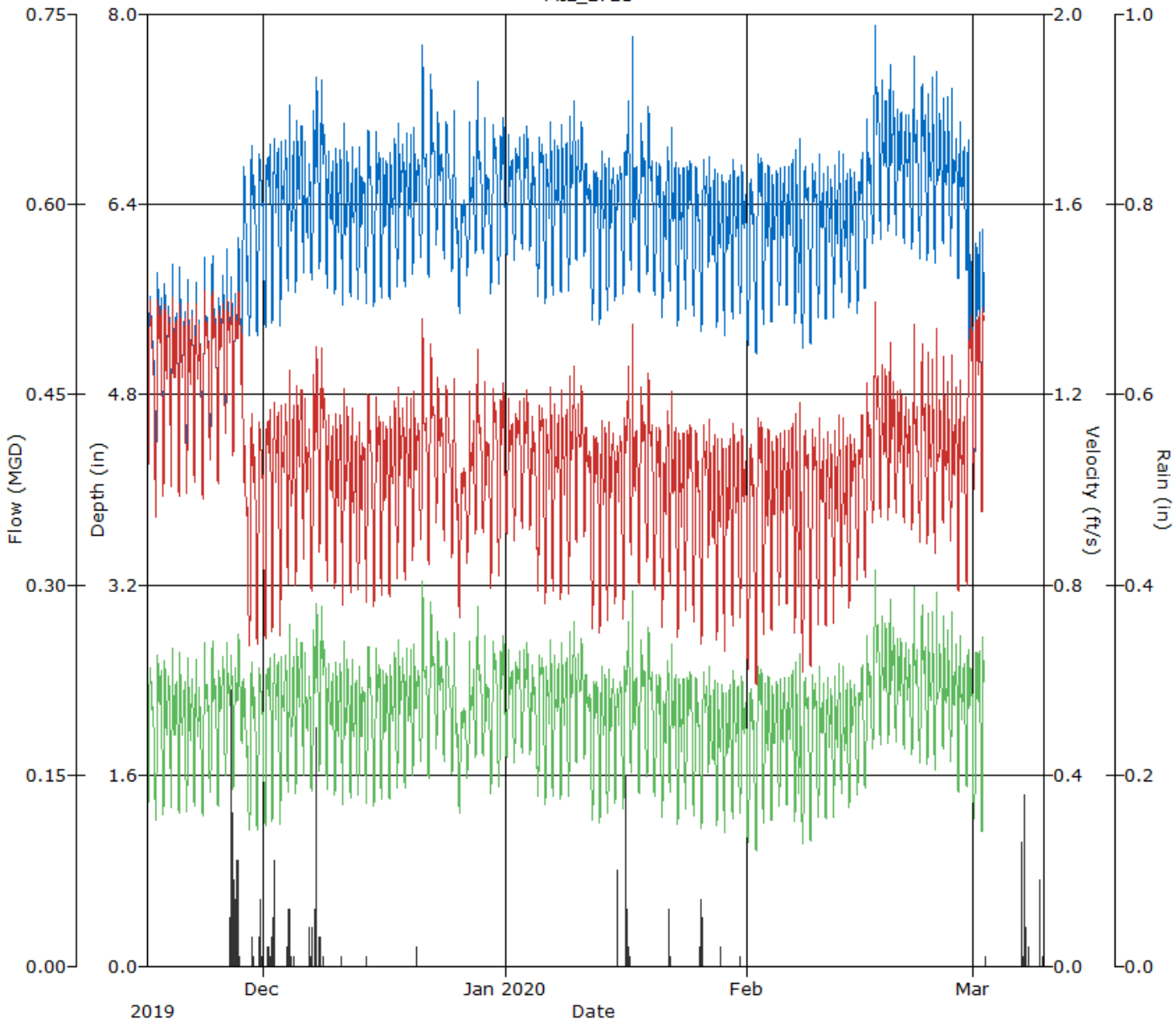
Pipe Height
8.00 in

Report Period

11/16/2019
To
3/9/2020

Legend

- Depth
- Velocity
- Quantity
- Rain



ADS ENVIRONMENTAL SERVICES

Daily Tabular Report For The Period 11/16/2019 00:00 - 03/09/2020 23:59

MIL_2721, Pipe Height: 8.00 in, Silt: 0.00 in

Daily Tabular Report

Date	Depth (in)				Velocity (ft/s)				Quantity (MGD - Total MG)					Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
11/16/2019	03:25	4.20	10:20	5.97	5.03	04:30	1.01	09:55	1.46	1.24	04:30	0.123	10:20	0.255	0.188	0.188	
11/17/2019	03:35	4.18	09:20	6.03	5.11	05:15	0.92	09:25	1.42	1.24	05:20	0.110	09:25	0.257	0.191	0.191	
11/18/2019	02:55	4.16	07:50	5.95	5.08	02:55	0.95	07:50	1.41	1.25	02:55	0.113	07:50	0.254	0.191	0.191	
11/19/2019	03:35	4.28	07:50	6.27	5.07	03:35	1.00	07:20	1.43	1.25	03:35	0.123	07:20	0.261	0.190	0.190	
11/20/2019	03:00	4.19	07:45	6.37	5.04	03:00	0.97	07:55	1.41	1.24	03:00	0.116	07:45	0.261	0.187	0.187	
11/21/2019	03:10	4.20	07:50	6.12	5.03	03:10	0.97	07:55	1.46	1.24	03:10	0.116	07:55	0.267	0.187	0.187	
11/22/2019	02:20	4.28	07:40	6.00	5.03	02:20	1.00	07:40	1.42	1.24	02:20	0.123	07:40	0.257	0.186	0.186	
11/23/2019	04:30	4.15	10:20	6.12	5.09	04:30	0.95	10:15	1.47	1.25	04:30	0.112	10:15	0.269	0.191	0.191	
11/24/2019	04:40	4.41	09:45	6.26	5.19	04:40	1.05	10:35	1.45	1.27	04:40	0.134	09:45	0.272	0.199	0.199	
11/25/2019	03:50	4.22	19:15	6.14	5.19	03:50	0.98	19:10	1.41	1.27	03:50	0.118	19:15	0.256	0.199	0.199	
11/26/2019	01:30	4.57	07:40	6.34	5.29	01:30	1.11	07:25	1.45	1.30	01:30	0.148	07:50	0.271	0.207	0.207	0.63
11/27/2019	04:20	4.42	18:30	6.33	5.34	04:20	1.05	21:25	1.47	1.30	04:20	0.135	18:25	0.277	0.210	0.210	0.77
11/28/2019	04:30	4.82	11:10	6.82	5.85	23:55	0.85	08:20	1.40	1.11	23:55	0.150	08:20	0.247	0.194	0.194	
11/29/2019	04:40	5.27	10:45	7.15	6.21	04:40	0.67	10:45	1.22	0.96	04:40	0.105	10:45	0.260	0.183	0.183	0.05
11/30/2019	04:40	5.23	13:30	7.09	6.19	04:40	0.65	13:30	1.21	0.96	04:40	0.102	13:30	0.256	0.181	0.181	0.14
12/01/2019	05:35	5.34	19:25	7.32	6.31	05:35	0.68	19:25	1.27	1.00	05:35	0.108	19:25	0.275	0.192	0.192	0.06
12/02/2019	02:45	5.31	07:50	7.41	6.35	02:45	0.67	07:50	1.29	1.01	02:45	0.106	07:50	0.282	0.196	0.196	0.36
12/03/2019	03:30	5.32	07:25	7.08	6.34	03:30	0.67	07:25	1.22	1.01	03:30	0.107	07:25	0.257	0.195	0.195	
12/04/2019	02:15	5.65	07:40	7.51	6.39	02:15	0.79	07:40	1.31	1.03	02:15	0.135	07:40	0.289	0.199	0.199	0.44
12/05/2019	02:20	5.63	19:30	7.37	6.52	02:20	0.79	19:30	1.28	1.06	02:20	0.133	19:30	0.279	0.210	0.210	
12/06/2019	03:25	5.77	07:50	7.16	6.37	03:25	0.84	07:55	1.29	1.03	03:25	0.146	07:55	0.274	0.200	0.200	0.06
12/07/2019	04:05	5.72	17:40	7.81	6.66	02:50	0.75	17:40	1.37	1.08	02:50	0.129	17:40	0.308	0.218	0.218	0.84
12/08/2019	04:55	5.79	10:50	7.74	6.68	04:55	0.84	10:50	1.36	1.11	04:55	0.147	10:50	0.304	0.223	0.223	0.10
12/09/2019	04:15	5.62	07:45	7.11	6.38	04:15	0.78	07:45	1.22	1.02	04:15	0.133	07:45	0.259	0.198	0.198	
12/10/2019	02:35	5.59	07:40	7.16	6.33	02:35	0.77	07:40	1.23	1.01	02:35	0.130	07:40	0.263	0.194	0.194	0.01
12/11/2019	02:55	5.51	07:45	7.40	6.30	02:55	0.74	07:45	1.29	1.02	02:55	0.123	07:45	0.281	0.195	0.195	0.00
12/12/2019	04:15	5.55	07:20	7.11	6.30	04:15	0.76	07:55	1.26	0.99	04:15	0.127	07:55	0.261	0.190	0.190	
12/13/2019	03:00	5.57	07:45	7.03	6.31	04:10	0.75	08:00	1.19	0.99	04:10	0.126	08:00	0.249	0.190	0.190	
12/14/2019	03:55	5.51	10:05	7.35	6.40	03:55	0.74	10:05	1.28	1.03	03:55	0.123	10:05	0.277	0.200	0.200	0.01
12/15/2019	03:45	5.49	11:00	7.46	6.39	03:45	0.73	11:00	1.30	1.02	03:45	0.121	11:00	0.285	0.199	0.199	
12/16/2019	02:50	5.57	07:45	7.10	6.33	02:50	0.76	07:45	1.22	1.01	02:50	0.128	07:45	0.258	0.194	0.194	
12/17/2019	01:25	5.57	20:35	7.07	6.39	01:25	0.76	20:35	1.21	1.03	01:25	0.128	20:35	0.256	0.199	0.199	
12/18/2019	03:15	5.65	07:25	7.29	6.46	03:15	0.79	07:25	1.26	1.05	03:15	0.135	07:25	0.273	0.206	0.206	
12/19/2019	03:15	5.63	07:40	7.44	6.42	03:15	0.79	07:40	1.30	1.03	03:15	0.133	07:40	0.284	0.202	0.202	
12/20/2019	03:05	5.71	07:30	7.35	6.50	03:05	0.82	07:30	1.28	1.06	03:05	0.140	07:30	0.277	0.208	0.208	0.02
12/21/2019	04:40	5.89	09:50	7.90	6.65	04:40	0.88	09:50	1.39	1.10	04:40	0.156	09:50	0.313	0.221	0.221	
12/22/2019	04:25	5.75	13:25	7.91	6.70	04:25	0.83	13:25	1.39	1.11	04:25	0.144	13:25	0.313	0.224	0.224	
12/23/2019	04:20	6.01	09:40	7.43	6.61	04:20	0.92	09:40	1.30	1.09	04:20	0.167	09:40	0.283	0.218	0.218	
12/24/2019	04:20	5.92	09:40	7.32	6.59	04:20	0.89	09:40	1.27	1.08	04:20	0.159	09:40	0.275	0.216	0.216	
12/25/2019	23:25	5.75	11:35	8.01	6.31	23:25	0.83	11:35	1.41	1.00	23:25	0.144	11:35	0.318	0.192	0.192	
12/26/2019	04:20	5.42	08:25	6.60	6.14	04:20	0.71	08:25	1.09	0.95	04:20	0.115	08:25	0.218	0.178	0.178	
12/27/2019	03:45	5.76	09:35	7.60	6.33	03:45	0.83	09:25	1.43	1.01	03:45	0.145	09:25	0.315	0.194	0.194	
12/28/2019	06:20	5.92	12:45	7.79	6.60	06:20	0.89	12:45	1.37	1.09	06:20	0.159	12:45	0.307	0.217	0.217	
12/29/2019	02:55	5.95	10:35	7.52	6.44	02:55	0.84	10:35	1.31	1.04	02:55	0.151	10:35	0.289	0.204	0.204	
12/30/2019	02:50	5.60	17:35	7.32	6.47	02:50	0.78	17:35	1.27	1.05	02:50	0.131	17:35	0.275	0.205	0.205	
12/31/2019	04:15	5.67	19:05	7.45	6.52	04:15	0.80	19:05	1.30	1.06	04:15	0.137	19:05	0.284	0.210	0.210	

Date	Depth (in)				Velocity (ft/s)				Quantity (MGD - Total MG)					Rain (in)
	Time	Min Time	Max	Avg	Time	Min Time	Max	Avg	Time	Min Time	Max	Avg	Total	Total
01/01/2020	03:55	5.94 10:10	7.26	6.52	03:55	0.89 10:10	1.26	1.07	03:55	0.161 10:10	0.271	0.211	0.211	
01/02/2020	04:25	5.87 09:15	7.18	6.52	04:25	0.87 09:15	1.24	1.07	04:25	0.154 09:15	0.264	0.210	0.210	
01/03/2020	04:15	5.93 17:35	7.45	6.61	04:15	0.89 17:35	1.30	1.09	04:15	0.160 17:35	0.284	0.218	0.218	
01/04/2020	04:00	5.91 11:25	6.98	6.45	04:00	0.88 11:25	1.19	1.05	04:00	0.158 11:25	0.249	0.205	0.205	
01/05/2020	05:40	5.60 20:55	7.20	6.44	05:40	0.78 20:55	1.24	1.04	05:40	0.131 20:55	0.266	0.203	0.203	
01/06/2020	02:25	5.53 18:55	7.42	6.38	04:20	0.71 18:55	1.29	1.02	04:20	0.120 18:55	0.282	0.199	0.199	
01/07/2020	02:25	5.59 20:15	7.17	6.40	02:25	0.77 20:15	1.24	1.03	02:25	0.130 20:15	0.264	0.200	0.200	
01/08/2020	03:20	5.64 07:45	7.45	6.44	02:15	0.75 07:50	1.32	1.03	02:25	0.127 07:50	0.288	0.201	0.201	
01/09/2020	02:50	5.59 19:55	7.54	6.56	03:55	0.71 07:45	1.35	1.06	03:55	0.121 07:45	0.292	0.211	0.211	
01/10/2020	01:30	5.83 07:00	7.22	6.62	01:30	0.86 07:00	1.25	1.09	01:30	0.151 07:00	0.267	0.219	0.219	
01/11/2020	04:15	5.74 09:00	7.10	6.42	04:15	0.83 09:00	1.22	1.04	04:15	0.143 09:00	0.258	0.202	0.202	
01/12/2020	03:30	5.39 17:15	6.87	6.21	03:30	0.70 17:15	1.16	0.97	03:30	0.113 17:15	0.240	0.184	0.184	
01/13/2020	03:40	5.30 08:00	7.49	6.20	03:40	0.66 08:10	1.31	0.97	03:40	0.105 08:00	0.285	0.183	0.183	
01/14/2020	01:45	5.44 07:35	6.97	6.26	01:55	0.64 07:35	1.19	0.98	01:55	0.105 07:35	0.248	0.187	0.187	
01/15/2020	02:35	5.55 09:05	6.95	6.32	01:10	0.71 09:15	1.22	0.99	02:55	0.120 09:15	0.250	0.191	0.191	0.10
01/16/2020	02:40	5.58 18:50	7.48	6.57	02:40	0.71 18:50	1.31	1.06	02:40	0.119 18:50	0.287	0.211	0.211	0.66
01/17/2020	03:35	5.82 08:05	9.28	6.45	03:35	0.85 08:10	1.61	1.04	03:35	0.150 08:10	0.363	0.203	0.203	
01/18/2020	03:10	5.61 09:40	7.41	6.46	03:10	0.78 09:40	1.29	1.04	03:10	0.132 09:40	0.282	0.205	0.205	
01/19/2020	05:10	5.77 09:45	7.80	6.48	05:10	0.84 09:45	1.37	1.05	05:10	0.146 09:45	0.308	0.207	0.207	
01/20/2020	03:30	5.61 20:05	6.90	6.31	03:30	0.78 20:05	1.17	1.00	03:30	0.132 20:05	0.242	0.192	0.192	
01/21/2020	03:00	5.38 21:35	7.07	6.18	04:40	0.65 21:35	1.21	0.96	04:40	0.107 21:35	0.256	0.181	0.181	0.01
01/22/2020	02:35	5.62 08:00	7.17	6.34	02:35	0.78 08:00	1.24	1.01	02:35	0.133 08:00	0.264	0.195	0.195	0.09
01/23/2020	03:15	5.30 19:40	6.92	6.19	03:15	0.66 19:40	1.18	0.97	03:15	0.105 19:40	0.244	0.182	0.182	
01/24/2020	03:05	5.45 09:40	7.00	6.32	03:05	0.72 09:40	1.20	1.01	03:05	0.118 09:40	0.250	0.193	0.193	
01/25/2020	03:10	5.43 12:10	6.92	6.17	03:10	0.71 12:10	1.18	0.96	03:10	0.116 12:10	0.244	0.181	0.181	
01/26/2020	04:40	5.26 11:15	6.98	6.20	04:40	0.65 11:15	1.19	0.96	04:40	0.101 11:15	0.249	0.183	0.183	0.16
01/27/2020	05:55	5.59 05:25	7.24	6.23	00:05	0.78 05:25	1.25	0.98	06:00	0.135 05:25	0.269	0.185	0.185	
01/28/2020	02:35	5.33 07:40	6.83	6.08	02:35	0.67 07:40	1.15	0.93	02:35	0.107 07:40	0.237	0.173	0.173	0.02
01/29/2020	03:20	5.27 19:10	6.82	6.11	03:20	0.65 19:10	1.15	0.94	03:20	0.102 19:10	0.236	0.176	0.176	
01/30/2020	03:05	5.38 07:55	6.95	6.21	03:05	0.69 07:55	1.18	0.97	03:05	0.112 07:55	0.246	0.184	0.184	
01/31/2020	02:55	5.43 08:15	6.88	6.18	02:55	0.71 08:15	1.17	0.96	02:55	0.116 08:15	0.241	0.181	0.181	0.01
02/01/2020	02:55	5.15 08:00	7.09	6.04	04:30	0.56 08:00	1.19	0.92	04:30	0.087 08:00	0.251	0.169	0.169	
02/02/2020	06:05	5.08 21:20	7.08	6.15	05:45	0.53 21:20	1.22	0.94	05:45	0.080 21:20	0.257	0.178	0.178	
02/03/2020	03:35	5.36 07:45	6.92	6.18	03:35	0.68 07:45	1.18	0.96	03:35	0.110 07:45	0.244	0.181	0.181	
02/04/2020	02:15	5.36 18:45	6.91	6.19	02:15	0.68 18:45	1.17	0.97	02:15	0.110 18:45	0.243	0.182	0.182	
02/05/2020	04:05	5.50 07:25	6.89	6.21	04:05	0.74 07:25	1.17	0.97	04:05	0.122 07:25	0.242	0.184	0.184	
02/06/2020	02:25	5.50 21:05	7.16	6.25	02:25	0.74 21:05	1.23	0.99	02:25	0.122 21:05	0.263	0.187	0.187	
02/07/2020	03:10	5.30 18:10	7.26	6.07	03:10	0.66 18:10	1.26	0.93	03:10	0.105 18:10	0.271	0.172	0.172	
02/08/2020	04:20	5.16 09:35	6.93	6.12	04:20	0.60 09:35	1.18	0.94	04:20	0.093 09:35	0.245	0.176	0.176	
02/09/2020	05:00	5.13 12:35	7.04	6.15	05:00	0.59 12:35	1.21	0.95	05:00	0.090 12:35	0.254	0.179	0.179	
02/10/2020	03:30	5.38 07:45	7.14	6.21	03:30	0.69 07:45	1.23	0.97	03:30	0.112 07:45	0.261	0.184	0.184	
02/11/2020	03:45	5.37 07:50	6.94	6.19	03:45	0.69 07:50	1.18	0.96	03:45	0.111 07:50	0.246	0.182	0.182	
02/12/2020	02:05	5.41 07:45	7.02	6.23	02:05	0.70 07:45	1.20	0.98	02:05	0.114 07:45	0.252	0.186	0.186	
02/13/2020	04:05	5.56 07:30	6.96	6.22	04:05	0.76 07:30	1.19	0.98	04:05	0.127 07:30	0.247	0.185	0.185	
02/14/2020	03:30	5.50 07:45	6.84	6.22	03:30	0.74 18:40	1.17	0.99	03:30	0.122 07:45	0.237	0.187	0.187	
02/15/2020	05:10	5.44 15:55	7.03	6.27	03:05	0.79 15:55	1.24	1.02	03:10	0.130 15:55	0.261	0.194	0.194	
02/16/2020	02:20	5.66 10:15	7.49	6.44	04:15	0.79 10:00	1.31	1.05	04:15	0.135 10:15	0.286	0.205	0.205	
02/17/2020	04:20	5.98 10:00	8.34	6.92	04:20	0.90 10:05	1.51	1.14	04:20	0.163 10:05	0.341	0.235	0.235	
02/18/2020	03:05	6.06 09:30	7.95	6.85	03:05	0.93 09:30	1.39	1.12	03:05	0.170 09:30	0.314	0.230	0.230	
02/19/2020	02:45	6.01 08:35	7.78	6.84	02:45	0.91 08:45	1.37	1.11	02:45	0.166 08:35	0.304	0.229	0.229	
02/20/2020	04:20	6.05 09:00	7.73	6.77	04:20	0.92 09:05	1.34	1.10	04:20	0.169 09:05	0.300	0.223	0.223	
02/21/2020	03:40	6.01 18:45	7.58	6.69	03:40	0.91 18:45	1.32	1.07	03:40	0.166 18:45	0.292	0.217	0.217	
02/22/2020	05:00	5.89 10:20	8.07	6.77	05:00	0.87 10:20	1.39	1.10	05:00	0.156 10:20	0.315	0.224	0.224	
02/23/2020	05:15	5.89 11:05	7.88	6.74	05:15	0.87 11:00	1.39	1.10	05:15	0.156 11:05	0.310	0.223	0.223	
02/24/2020	03:15	5.87 19:50	8.34	6.69	03:15	0.87 19:50	1.46	1.08	03:15	0.154 19:50	0.330	0.217	0.217	

Date	Depth (in)					Velocity (ft/s)					Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
02/25/2020	02:30	5.85	07:40	7.89	6.64	02:30	0.79	07:45	1.43	1.07	02:30	0.140	07:45	0.322	0.215	0.215	
02/26/2020	04:10	6.02	07:40	7.55	6.65	04:10	0.91	07:35	1.38	1.07	04:10	0.167	07:35	0.301	0.214	0.214	
02/27/2020	02:50	5.90	07:10	7.61	6.59	02:50	0.88	07:10	1.40	1.07	02:50	0.156	07:10	0.311	0.213	0.213	
02/28/2020	03:10	5.71	07:35	7.69	6.49	02:55	0.74	07:35	1.35	1.03	03:00	0.128	07:35	0.300	0.203	0.203	
02/29/2020	23:50	4.83	11:05	7.31	5.91	03:30	0.79	14:30	1.43	1.15	03:30	0.139	11:05	0.273	0.204	0.204	
03/01/2020	04:35	4.05	20:55	6.58	5.30	04:35	0.99	12:35	1.42	1.24	04:35	0.113	19:40	0.265	0.199	0.199	
03/02/2020	03:05	3.86	07:35	6.38	4.60	03:05	0.92	07:00	1.41	1.12	03:05	0.100	07:30	0.267	0.153	0.055	0.01
03/03/2020																	
03/04/2020																	
03/05/2020																	
03/06/2020																	
03/07/2020																	0.58
03/08/2020																	0.02
03/09/2020																	0.11

Report Summary For The Period 11/16/2019 00:00 - 03/09/2020 23:59

	Depth (in)	Velocity (ft/s)	Quantity (MGD - Total MG)	Rain (in)
Total			21.255	5.26
Avg	6.23	1.05	0.198	

Site Commentary

Site Information

MIL_2724	
Pipe Dimensions	39.88
Silt Level	0.00"

Overview

Site MIL_2724 functioned under normal conditions during the period Saturday, November 16, 2019 to Monday, March 9, 2020 . This site exhibited an observable response to the wet weather events of November 26, 2019 - November 27, 2019 and December 7, 2019 - December 8, 2019. Review of the scattergraph shows that free flow conditions were recorded during the study period.

Flow depth and velocity measurements recorded by the flow monitor are consistent with field confirmations conducted to date and support the relative accuracy of the flow monitor at this location.

Observations

Average flow depth, velocity, and quantity data observed during Saturday, November 16, 2019 to Monday, March 9, 2020 , along with observed minimum and maximum data, are provided in the following table.

Observed Flow Conditions			
Item	Depth (in)	Velocity (ft/s)	Quantity (MGD)
Average	18.34	0.78	2.042
Minimum	13.49	0.43	0.744
Maximum	22.23	1.11	3.446
Time of Minimum	3/4/2020 5:30 AM	3/4/2020 4:40 AM	3/4/2020 4:40 AM
Time of Maximum	12/7/2019 7:45 PM	12/2/2019 10:10 AM	12/4/2019 10:25 PM

Data Quality

Data uptime observed during the Saturday, November 16, 2019 to the Monday, March 9, 2020 monitoring period is provided in the table below. Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

Percent Uptime	
Depth (in)	100
Velocity (ft/s)	100
Quantity (MGD)	100

Milpitas Temp Study 2019-20

Flow Monitoring Site Report

ADS ENVIRONMENTAL SERVICES®

Site Name

MIL_2724

Site Address /Location:	California Cir and Cadillac Court, Milpitas, CA			Monitor Series	Location Type
				TRITON+	Temporary
Site Access Details:	Drive	Latitude:	37.446644°	Pipe Size (H x W)	Pipe Shape
		Longitude:	-121.918485°	39.88" x 40.50"	Circular



Manhole #	System Characteristics
2724	Residential/Commercial
Access	Traffic
Drive	Light







Installation Information

Installation Date:	Installation Type:
Tuesday, November 12, 2019	Doppler Standard Ring and Crank
Monitoring Location (Sensors):	Monitor Location:
Upstream 0-5 FT	Manhole
Sensors / Devices:	Pressure Sensor Range (psi)
Peak Combo (CS4)	0 - 5 psi

Installation Confirmation:

Confirmation Time:	Pipe Size (HxW)
5:37:34 AM	39.88" x 40.50"
Depth of Flow (Wet DOF) (in)	Range (Air DOF) (in)
14.00"	0.00"
Downlooker Physical Offset (in)	Measurement Confidence (in)
NA	0.25"
Peak Velocity (fps)	Velocity Sensor Offset (in)
0.89	0"
Silt (in)	Silt Type
0"	

Hydraulic Comments:

Ok flow, Deep and slow

Manhole / Pipe Information:

Manhole Depth (Approx. FT):	Manhole Configuration
20'	Single
Manhole Material:	Manhole Condition:
Concrete	Good
Manhole Opening Diameter (in)	Manhole Diameter (Approx.):
26"	54"
Manhole Cover	Manhole Frame
Unbolted	Normal
Active Drop Connections	Air Quality:
No	Normal
Pipe Material	Pipe Condition:
PVC	Good

Communication Information:

Communication Type	Antenna Location
Wireless	Manhole Pick / Vent Hole

Additional Site Info. / Comments:

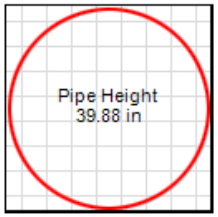
ADS Project Name:	Milpitas.WWTFM.CA19-20
ADS Project Number:	22431

SCATTERGRAPH REPORT

MIL_2724

Flow Monitor

MIL_2724

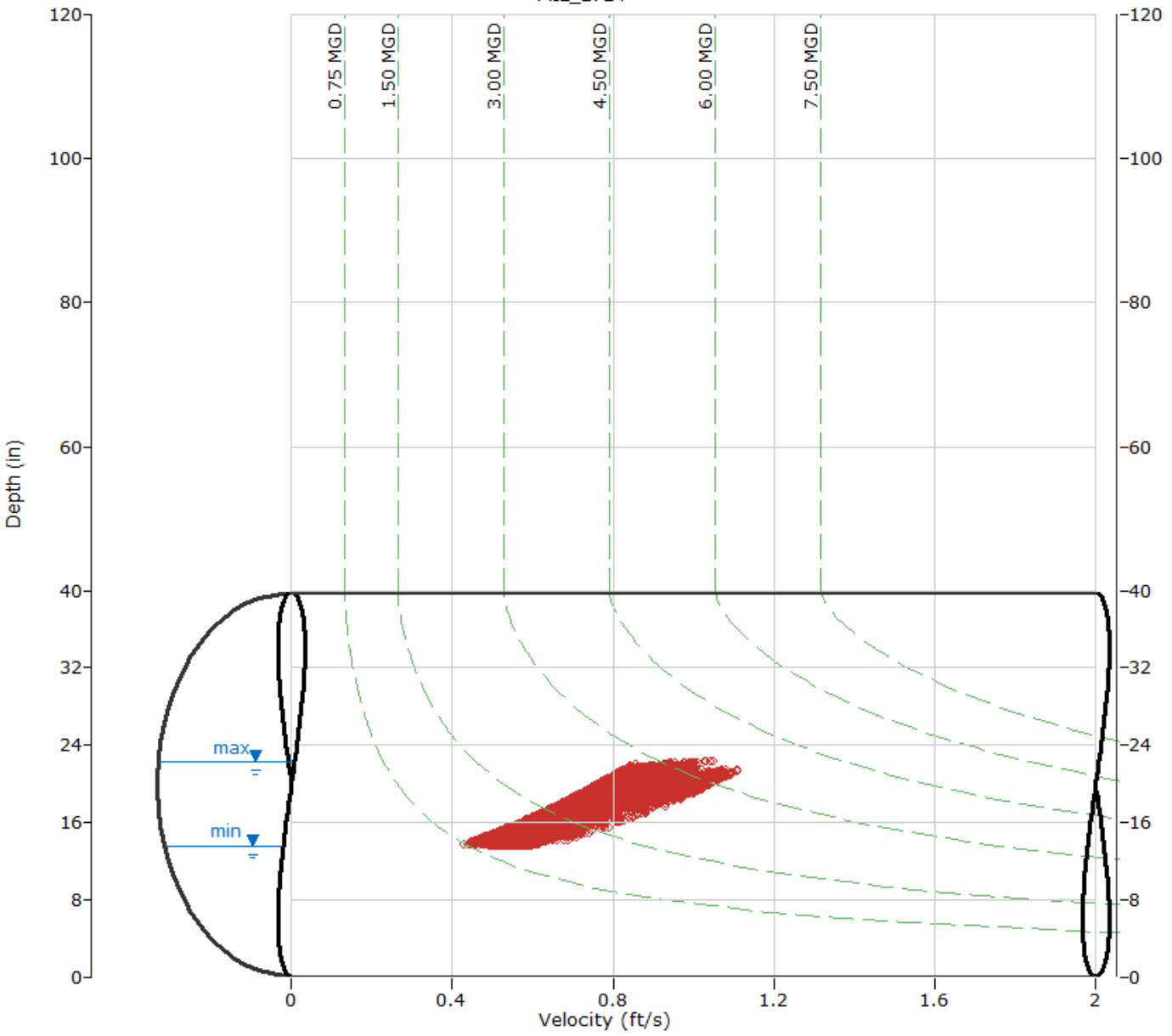


Report Period

11/16/2019
To
3/9/2020

Legend

- Depth - Velocity
- Iso-Q™
- Silt
- Min-Max Depth



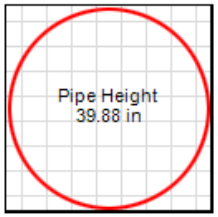
ADS ENVIRONMENTAL SERVICES

HYDROGRAPH REPORT

MIL_2724

Flow Monitor

MIL_2724

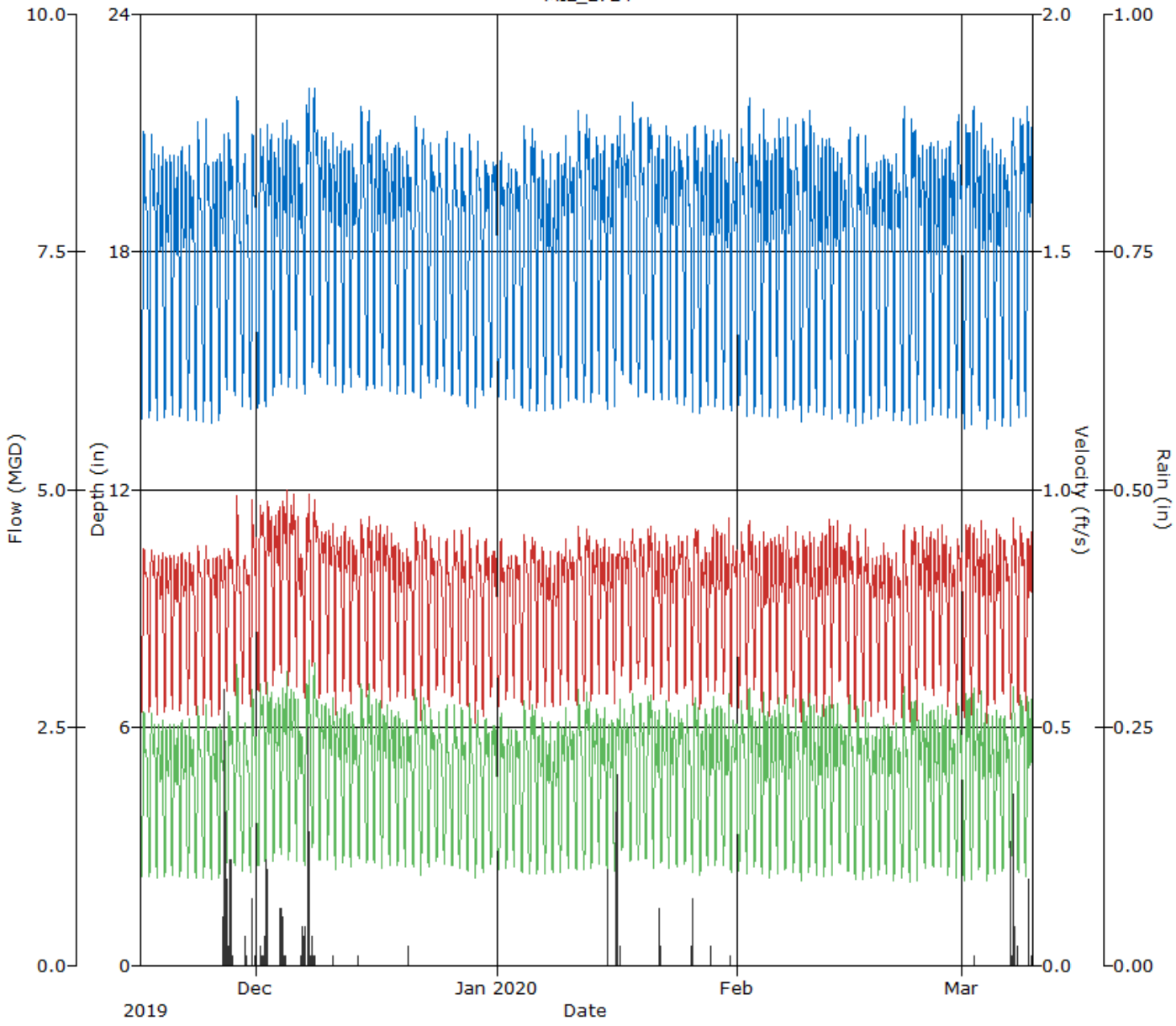


Report Period

11/16/2019
To
3/9/2020

Legend

- Depth
- Velocity
- Quantity
- Rain



Daily Tabular Report For The Period 11/16/2019 00:00 - 03/09/2020 23:59

MIL_2724, Pipe Height: 39.88 in, Silt: 0.00 in

Daily Tabular Report

Date	Depth (in)					Velocity (ft/s)					Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
11/16/2019	06:05	13.74	12:15	21.05	18.02	06:05	0.53	12:15	0.88	0.75	06:05	0.917	12:15	2.670	1.935	1.935	
11/17/2019	06:05	13.78	12:45	20.99	18.15	06:05	0.53	12:45	0.87	0.76	06:05	0.925	12:45	2.656	1.968	1.968	
11/18/2019	05:30	13.71	22:10	20.69	18.05	05:30	0.53	22:10	0.87	0.76	05:30	0.910	22:10	2.587	1.942	1.942	
11/19/2019	05:35	13.80	09:50	20.54	18.07	05:35	0.53	09:50	0.86	0.76	05:35	0.931	09:50	2.551	1.949	1.949	
11/20/2019	05:25	13.88	09:50	20.59	18.03	05:25	0.54	09:50	0.86	0.76	05:25	0.946	09:50	2.564	1.938	1.938	
11/21/2019	05:40	13.81	10:10	20.70	18.02	05:40	0.53	10:10	0.87	0.76	05:40	0.932	10:10	2.589	1.937	1.937	
11/22/2019	05:30	13.71	10:05	20.76	18.09	05:30	0.53	10:05	0.87	0.76	05:30	0.912	10:05	2.603	1.953	1.953	
11/23/2019	06:05	13.69	12:45	21.31	18.08	06:05	0.52	12:45	0.88	0.76	06:05	0.906	12:45	2.729	1.951	1.951	
11/24/2019	06:25	13.67	12:30	21.38	18.19	06:25	0.52	12:30	0.88	0.76	06:25	0.902	12:30	2.746	1.977	1.977	
11/25/2019	05:35	13.64	09:55	20.41	17.97	05:35	0.52	09:55	0.86	0.75	05:35	0.897	09:55	2.520	1.925	1.925	
11/26/2019	05:35	13.71	22:15	21.05	18.15	05:35	0.53	22:15	0.88	0.76	05:35	0.911	22:15	2.671	1.968	1.968	0.63
11/27/2019	04:50	14.44	11:30	21.02	18.67	04:50	0.57	11:30	0.88	0.78	04:50	1.065	11:30	2.664	2.093	2.093	0.77
11/28/2019	06:40	14.33	13:45	21.91	18.41	06:40	0.57	13:45	1.00	0.77	06:40	1.043	13:45	3.198	2.040	2.040	
11/29/2019	06:20	14.05	12:50	20.54	17.82	06:20	0.55	12:50	0.86	0.75	06:20	0.981	12:50	2.552	1.884	1.884	0.05
11/30/2019	06:00	13.99	13:50	21.00	17.98	05:40	0.51	11:55	1.06	0.79	05:40	0.914	13:35	3.216	2.021	2.021	0.14
12/01/2019	06:35	14.06	13:45	21.12	18.38	05:15	0.53	12:35	1.09	0.83	06:35	0.950	13:15	3.333	2.196	2.196	0.06
12/02/2019	05:35	14.07	10:05	21.27	18.67	05:45	0.51	10:10	1.11	0.84	05:45	0.916	10:10	3.427	2.251	2.251	0.36
12/03/2019	05:35	14.37	22:15	20.89	18.45	05:25	0.57	21:35	1.08	0.84	05:25	1.051	23:10	3.240	2.193	2.193	
12/04/2019	04:55	14.58	22:25	21.36	18.87	04:50	0.58	22:25	1.11	0.87	04:50	1.091	22:25	3.446	2.348	2.348	0.44
12/05/2019	05:30	14.58	10:05	21.01	18.69	05:45	0.55	10:30	1.07	0.86	05:45	1.039	10:30	3.235	2.303	2.303	
12/06/2019	05:30	14.54	10:15	20.84	18.47	05:00	0.55	09:10	1.06	0.80	05:15	1.034	09:10	3.106	2.087	2.087	0.06
12/07/2019	06:10	14.37	19:45	22.23	18.99	06:40	0.51	19:45	1.05	0.81	06:40	0.953	19:45	3.419	2.231	2.231	0.84
12/08/2019	06:30	15.07	12:25	22.18	19.31	04:35	0.58	12:25	1.00	0.84	06:00	1.140	12:25	3.264	2.341	2.341	0.10
12/09/2019	05:35	14.80	09:50	21.02	18.87	05:05	0.51	21:20	0.97	0.82	05:05	0.991	22:45	2.940	2.204	2.204	
12/10/2019	05:35	14.64	22:50	21.07	18.60	06:00	0.52	22:30	0.98	0.81	06:00	0.993	22:30	2.988	2.153	2.153	0.01
12/11/2019	05:25	14.61	22:55	20.85	18.60	05:05	0.50	10:25	0.96	0.80	05:20	0.935	23:15	2.887	2.115	2.115	0.00
12/12/2019	05:35	14.43	10:00	20.73	18.44	04:45	0.50	09:20	0.96	0.80	04:45	0.932	10:20	2.871	2.097	2.097	
12/13/2019	05:45	14.57	09:50	20.80	18.46	04:50	0.50	10:50	0.94	0.79	05:45	0.932	10:50	2.815	2.078	2.078	
12/14/2019	06:20	14.81	12:30	21.71	18.85	06:35	0.52	13:20	1.01	0.80	06:35	1.006	13:20	3.176	2.176	2.176	0.01
12/15/2019	06:35	14.51	12:30	21.60	18.72	05:20	0.51	12:00	1.00	0.79	06:25	0.978	12:40	3.116	2.141	2.141	
12/16/2019	05:35	14.52	22:40	21.09	18.64	05:35	0.58	10:15	0.98	0.81	05:35	1.078	23:05	2.982	2.152	2.152	
12/17/2019	05:40	14.60	22:55	20.78	18.58	05:35	0.50	09:40	0.96	0.80	05:35	0.935	23:20	2.876	2.127	2.127	
12/18/2019	05:25	14.46	22:30	20.69	18.58	04:55	0.50	10:25	0.96	0.79	04:55	0.947	10:25	2.836	2.100	2.100	
12/19/2019	05:35	14.39	10:00	20.84	18.55	05:55	0.50	09:40	0.94	0.78	05:55	0.935	09:40	2.804	2.051	2.051	
12/20/2019	05:40	14.38	10:10	20.54	18.50	05:50	0.49	10:30	0.93	0.78	05:50	0.899	10:30	2.739	2.039	2.039	0.02
12/21/2019	06:15	14.41	12:50	21.47	18.43	06:40	0.49	11:30	0.99	0.79	06:40	0.906	13:20	3.084	2.093	2.093	
12/22/2019	06:25	14.30	13:20	21.12	18.49	06:05	0.48	13:40	0.99	0.79	06:15	0.876	13:40	3.029	2.093	2.093	
12/23/2019	06:00	14.63	12:50	20.84	18.53	05:35	0.50	11:25	0.96	0.78	05:40	0.939	12:35	2.866	2.071	2.071	
12/24/2019	06:00	14.53	13:20	20.76	18.30	07:00	0.50	12:25	0.95	0.77	07:00	0.941	14:05	2.826	2.004	2.004	
12/25/2019	07:05	14.40	13:15	21.12	18.00	07:05	0.57	13:10	0.95	0.76	07:05	1.051	13:10	2.921	1.927	1.927	
12/26/2019	05:55	14.29	13:00	20.76	18.16	05:55	0.56	12:25	0.97	0.77	05:55	1.029	13:05	2.912	1.998	1.998	
12/27/2019	05:55	14.31	12:15	20.62	18.16	04:50	0.49	12:15	0.96	0.77	05:55	0.893	12:15	2.860	1.998	1.998	
12/28/2019	06:35	14.09	13:35	20.99	18.06	07:10	0.49	12:20	0.96	0.75	07:10	0.880	12:35	2.881	1.928	1.928	
12/29/2019	06:30	14.06	13:20	20.82	18.02	06:25	0.46	13:40	0.96	0.75	06:25	0.823	13:40	2.890	1.933	1.933	
12/30/2019	05:55	14.35	12:55	20.33	18.20	05:15	0.50	12:10	0.95	0.77	05:55	0.913	12:10	2.767	1.991	1.991	
12/31/2019	06:05	14.53	13:00	20.30	18.28	04:55	0.50	19:40	0.94	0.76	06:40	0.951	19:40	2.733	1.974	1.974	

Date	Depth (in)					Velocity (ft/s)					Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
01/01/2020	07:20	14.33	13:45	20.53	17.98	06:05	0.50	12:50	0.96	0.75	06:25	0.922	13:55	2.842	1.912	1.912	
01/02/2020	05:50	14.22	11:50	20.44	18.11	05:40	0.50	11:45	0.94	0.76	05:40	0.919	11:50	2.750	1.948	1.948	
01/03/2020	05:50	14.26	12:35	20.09	18.12	05:50	0.56	12:35	0.86	0.76	05:50	1.023	12:35	2.472	1.960	1.960	
01/04/2020	06:30	14.06	13:30	21.19	18.21	06:30	0.55	13:30	0.91	0.77	06:30	0.980	13:30	2.786	1.993	1.993	
01/05/2020	06:45	13.97	13:15	21.14	18.39	06:20	0.46	12:45	0.91	0.77	06:20	0.819	12:45	2.775	2.038	2.038	
01/06/2020	05:35	13.96	22:20	20.57	18.05	05:35	0.54	22:20	0.88	0.76	05:35	0.960	22:20	2.607	1.945	1.945	
01/07/2020	05:35	13.98	22:10	20.49	17.96	05:35	0.54	22:10	0.88	0.75	05:35	0.965	22:10	2.585	1.914	1.914	
01/08/2020	05:50	13.98	22:20	20.50	17.98	05:50	0.54	21:55	0.92	0.75	05:50	0.965	21:55	2.703	1.908	1.908	
01/09/2020	05:35	14.03	22:00	20.97	18.39	05:35	0.54	21:10	0.94	0.77	05:35	0.974	21:20	2.859	2.032	2.032	
01/10/2020	05:40	14.23	10:00	20.40	18.44	05:40	0.56	23:05	0.88	0.78	05:40	1.016	10:00	2.560	2.042	2.042	
01/11/2020	06:20	14.26	13:30	21.59	18.52	06:30	0.49	13:30	0.92	0.78	06:30	0.890	13:30	2.902	2.069	2.069	
01/12/2020	06:20	14.18	12:55	21.48	18.67	06:20	0.55	13:10	0.92	0.78	06:20	1.006	13:10	2.869	2.111	2.111	
01/13/2020	05:25	14.19	22:50	20.89	18.48	05:25	0.56	22:50	0.89	0.78	05:25	1.008	22:50	2.698	2.057	2.057	
01/14/2020	05:45	14.42	22:20	20.92	18.42	05:45	0.57	22:20	0.89	0.78	05:45	1.057	22:20	2.707	2.042	2.042	
01/15/2020	05:30	13.93	22:00	20.77	18.28	05:30	0.54	19:55	0.95	0.77	05:30	0.956	19:55	2.723	1.998	1.998	0.10
01/16/2020	05:30	14.07	22:10	21.46	18.85	03:40	0.51	20:30	0.98	0.79	05:35	0.934	20:30	2.975	2.130	2.130	0.66
01/17/2020	05:30	14.90	10:00	21.03	18.91	03:40	0.55	10:05	0.95	0.79	04:50	1.115	10:05	2.890	2.145	2.145	
01/18/2020	06:15	14.62	13:40	21.78	18.71	06:35	0.51	11:10	0.98	0.79	06:35	0.963	11:20	2.982	2.116	2.116	
01/19/2020	06:30	14.32	13:00	21.43	18.49	05:25	0.49	14:20	0.98	0.78	05:25	0.918	14:20	2.980	2.074	2.074	
01/20/2020	06:00	14.37	13:45	21.42	18.85	04:05	0.52	22:00	0.99	0.80	04:10	1.017	22:00	3.042	2.167	2.167	
01/21/2020	05:35	14.26	22:45	20.98	18.47	05:30	0.47	09:35	0.96	0.78	05:30	0.863	21:50	2.846	2.050	2.050	0.01
01/22/2020	05:45	14.24	22:30	21.20	18.58	04:55	0.49	21:20	0.97	0.78	06:00	0.905	21:20	2.956	2.071	2.071	0.09
01/23/2020	05:40	14.23	10:00	21.02	18.50	05:45	0.48	22:45	0.97	0.78	05:45	0.879	22:45	2.893	2.049	2.049	
01/24/2020	05:50	14.12	12:00	20.91	18.63	05:10	0.49	10:45	0.96	0.80	05:10	0.884	10:45	2.847	2.122	2.122	
01/25/2020	06:15	14.09	13:15	21.03	18.17	07:20	0.52	12:55	0.97	0.78	07:20	0.970	12:55	2.935	2.003	2.003	
01/26/2020	06:15	13.91	13:30	21.20	18.32	05:15	0.47	13:45	0.99	0.79	05:15	0.846	13:45	3.036	2.075	2.075	0.16
01/27/2020	05:40	13.88	21:55	21.17	18.27	05:40	0.54	22:45	0.97	0.77	05:40	0.946	22:45	2.982	1.996	1.996	
01/28/2020	05:20	14.11	21:50	21.09	18.40	04:15	0.52	22:15	0.98	0.79	05:20	0.952	22:15	2.987	2.061	2.061	0.02
01/29/2020	05:30	14.06	22:20	21.11	18.38	05:15	0.57	21:35	0.98	0.79	05:15	1.015	21:35	2.975	2.074	2.074	
01/30/2020	05:35	14.00	22:15	21.00	18.27	05:20	0.54	23:00	0.98	0.79	05:20	0.968	23:00	2.946	2.050	2.050	
01/31/2020	05:35	13.96	10:05	20.42	18.29	04:35	0.49	09:40	0.95	0.78	05:30	0.885	09:40	2.757	2.035	2.035	0.01
02/01/2020	06:15	14.11	12:05	21.13	18.31	05:40	0.50	14:35	0.98	0.78	05:40	0.903	12:30	2.973	2.051	2.051	
02/02/2020	06:30	13.83	13:30	21.92	18.34	05:50	0.48	15:05	0.99	0.78	05:50	0.845	14:10	3.084	2.068	2.068	
02/03/2020	05:30	13.88	22:25	20.98	18.34	04:45	0.48	09:50	0.95	0.78	04:45	0.852	22:35	2.819	2.031	2.031	
02/04/2020	05:45	13.83	10:10	21.72	18.50	04:10	0.47	10:35	0.99	0.78	05:40	0.839	10:05	3.098	2.061	2.061	
02/05/2020	05:30	13.84	22:15	20.86	18.19	05:50	0.45	09:45	0.96	0.77	05:50	0.797	09:45	2.820	1.988	1.988	
02/06/2020	05:35	13.79	10:25	21.37	18.51	06:05	0.50	10:00	0.96	0.78	06:05	0.880	10:00	2.988	2.075	2.075	
02/07/2020	05:35	13.97	12:10	21.45	18.56	04:25	0.48	11:25	0.98	0.79	04:25	0.873	11:25	3.000	2.101	2.101	
02/08/2020	06:05	13.98	12:50	21.28	18.29	05:20	0.48	12:20	0.97	0.77	05:20	0.862	12:50	3.008	2.003	2.003	
02/09/2020	06:30	13.68	12:50	21.39	18.35	05:30	0.48	12:55	0.97	0.77	05:30	0.849	12:55	3.015	2.027	2.027	
02/10/2020	05:45	13.91	10:35	21.64	18.34	04:50	0.47	09:30	0.98	0.77	04:50	0.846	10:55	3.022	2.024	2.024	
02/11/2020	05:40	13.93	22:20	20.89	18.30	05:45	0.46	22:45	0.96	0.78	05:45	0.815	22:45	2.874	2.030	2.030	
02/12/2020	05:20	13.87	22:25	20.89	18.28	04:10	0.48	22:45	0.98	0.78	04:10	0.875	22:45	2.948	2.044	2.044	
02/13/2020	05:45	13.77	10:00	20.68	18.17	05:10	0.44	10:15	0.97	0.79	05:10	0.777	10:15	2.874	2.048	2.048	
02/14/2020	05:40	13.90	10:15	20.40	18.17	04:55	0.56	09:55	0.95	0.80	04:55	0.994	09:55	2.789	2.052	2.052	
02/15/2020	06:20	13.69	12:55	21.28	17.98	05:20	0.48	12:20	0.98	0.77	05:20	0.842	13:05	3.009	1.979	1.979	
02/16/2020	06:50	13.59	13:00	21.00	17.91	05:55	0.46	12:10	0.96	0.76	05:55	0.799	13:10	2.910	1.933	1.933	
02/17/2020	05:50	13.62	13:05	20.97	17.99	06:10	0.47	13:30	0.95	0.75	06:10	0.812	13:30	2.883	1.931	1.931	
02/18/2020	05:35	13.73	22:05	20.32	18.02	05:30	0.46	11:05	0.92	0.75	05:30	0.803	11:05	2.610	1.915	1.915	
02/19/2020	05:45	13.82	23:05	20.49	18.19	06:10	0.47	22:50	0.94	0.75	06:10	0.842	22:50	2.761	1.954	1.954	
02/20/2020	05:35	13.96	11:40	20.35	18.22	04:55	0.46	09:55	0.93	0.76	04:55	0.831	21:00	2.643	1.960	1.960	
02/21/2020	05:25	13.73	11:25	20.49	18.03	04:50	0.45	19:35	0.90	0.74	05:45	0.790	12:15	2.604	1.900	1.900	
02/22/2020	06:25	13.70	12:30	21.74	18.19	05:35	0.46	12:10	1.00	0.75	05:35	0.807	12:10	3.175	1.960	1.960	
02/23/2020	06:45	13.60	12:35	21.39	18.40	07:10	0.44	22:35	0.97	0.77	07:10	0.761	22:35	2.966	2.056	2.056	
02/24/2020	05:40	13.65	22:10	20.68	18.25	05:15	0.45	22:20	0.97	0.77	05:15	0.772	22:20	2.887	2.006	2.006	

Date	Depth (in)					Velocity (ft/s)					Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
02/25/2020	05:25	13.72	22:30	20.76	18.16	06:10	0.53	22:20	0.98	0.78	06:10	0.935	22:20	2.919	2.022	2.022	
02/26/2020	05:45	13.85	09:50	20.90	18.24	05:55	0.54	23:15	0.97	0.79	05:55	0.944	23:15	2.918	2.059	2.059	
02/27/2020	06:05	13.77	09:45	20.68	18.24	06:35	0.55	09:50	0.97	0.80	06:35	0.986	09:50	2.898	2.065	2.065	
02/28/2020	05:25	13.79	10:05	20.86	18.29	04:10	0.48	20:20	0.93	0.76	04:10	0.857	09:25	2.706	1.985	1.985	
02/29/2020	06:40	13.81	12:30	21.47	18.32	06:45	0.45	11:55	0.99	0.76	06:45	0.781	11:55	3.083	2.008	2.008	
03/01/2020	06:35	13.50	13:05	21.27	18.34	05:40	0.46	13:05	0.99	0.78	05:40	0.787	13:05	3.052	2.064	2.064	
03/02/2020	05:35	13.63	11:30	21.72	18.55	05:05	0.45	23:10	0.98	0.78	05:05	0.772	11:05	3.028	2.081	2.081	0.01
03/03/2020	05:40	13.94	10:10	21.48	18.22	05:05	0.51	09:45	1.00	0.78	05:05	0.906	10:05	3.126	2.016	2.016	
03/04/2020	05:30	13.49	22:20	20.92	18.10	04:40	0.43	10:05	0.97	0.77	04:40	0.744	10:05	2.906	1.981	1.981	
03/05/2020	05:50	13.72	09:45	20.67	18.04	06:10	0.46	09:50	0.97	0.78	06:10	0.799	09:50	2.897	2.003	2.003	
03/06/2020	05:40	13.56	14:05	20.51	18.19	06:30	0.53	14:15	0.96	0.78	06:30	0.939	14:15	2.840	2.017	2.017	
03/07/2020	05:45	13.50	13:10	21.42	18.27	03:50	0.48	13:20	1.00	0.77	05:45	0.868	13:20	3.120	2.037	2.037	0.58
03/08/2020	06:05	13.77	13:20	21.37	18.58	07:00	0.51	14:45	0.98	0.79	07:00	0.913	13:40	3.000	2.113	2.113	0.02
03/09/2020	04:10	13.82	10:55	21.69	18.65	04:10	0.53	20:45	0.98	0.78	04:10	0.934	20:45	2.985	2.091	2.090	0.11

Report Summary For The Period 11/16/2019 00:00 - 03/09/2020 23:59

	Depth (in)	Velocity (ft/s)	Quantity (MGD - Total MG)	Rain (in)
Total			234.802	5.26
Avg	18.34	0.78	2.042	

Site Commentary

Site Information

MIL_2808	
Pipe Dimensions	36
Silt Level	0.00"

Overview

Site MIL_2808 functioned under normal conditions during the period Saturday, November 16, 2019 to Monday, March 9, 2020 . This site exhibited an observable response to the wet weather events of November 26, 2019 - November 27, 2019, December 7, 2019 - December 8, 2019, and January 16, 2020 - January 17, 2020. Review of the scattergraph shows that free flow conditions were recorded during the study period.

Flow depth and velocity measurements recorded by the flow monitor are consistent with field confirmations conducted to date and support the relative accuracy of the flow monitor at this location.

This location was installed downstream of sites MIL_0229 and MIL_0715. A review of balancing shows a net flow of 0.938 MGD between the sites.

Observations

Average flow depth, velocity, and quantity data observed during Saturday, November 16, 2019 to Monday, March 9, 2020 , along with observed minimum and maximum data, are provided in the following table.

Observed Flow Conditions			
Item	Depth (in)	Velocity (ft/s)	Quantity (MGD)
Average	8.74	2.26	2.009
Minimum	5.84	1.16	0.567
Maximum	11.20	3.09	3.591
Time of Minimum	1/5/2020 6:30 AM	1/4/2020 6:30 AM	1/4/2020 6:30 AM
Time of Maximum	12/23/2019 2:10 PM	1/23/2020 9:45 AM	3/4/2020 9:55 AM

Data Quality

Data uptime observed during the Saturday, November 16, 2019 to the Monday, March 9, 2020 monitoring period is provided in the table below. Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

Percent Uptime	
Depth (in)	100
Velocity (ft/s)	100
Quantity (MGD)	100

Milpitas Temp Study 2019-20

Flow Monitoring Site Report

ADS ENVIRONMENTAL SERVICES®

Site Name

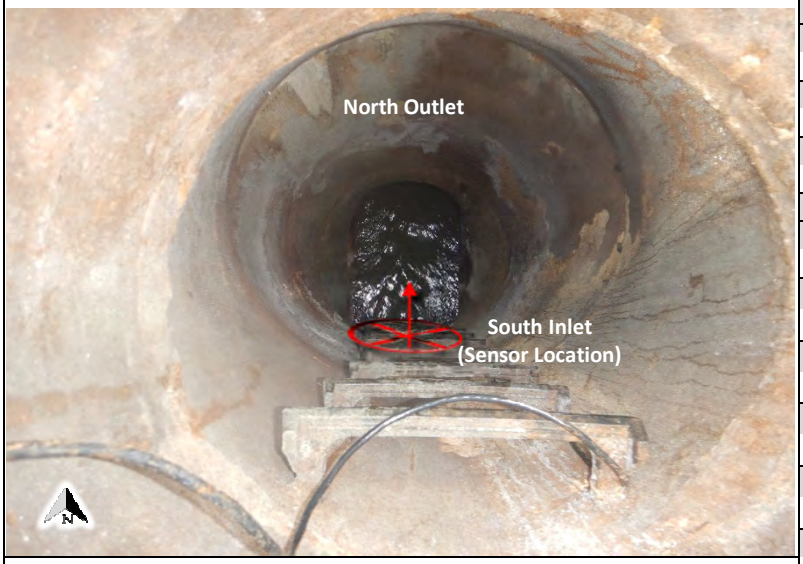
MIL_2808

Site Address /Location:	N McCarthy Blvd and Ranch Dr, Milpitas, CA			Monitor Series	Location Type
				TRITON+	Temporary
Site Access Details:	DRIVE.	Latitude:	37.433534°	Pipe Size (H x W)	Pipe Shape
		Longitude:	-121.922138°	36.00"x36.00"	Circular



Manhole #	System Characteristics
2808	Residential/Commercial
Access	Traffic
Drive	Heavy







Installation Information

Installation Date:	Installation Type:
Wednesday, November 13, 2019	Doppler Standard Ring and Crank
Monitoring Location (Sensors):	Monitor Location:
Upstream 0-5 FT	Manhole
Sensors / Devices:	Pressure Sensor Range (psi)
Peak Combo (CS4)	0 - 5 psi

Installation Confirmation:

Confirmation Time:	Pipe Size (HxW)
12:08:00 AM	36.00"x36.00"
Depth of Flow (Wet DOF) (in)	Range (Air DOF) (in)
11.25"	
Downlooker Physical Offset (in)	Measurement Confidence (in)
NA	0.25"
Peak Velocity (fps)	Velocity Sensor Offset (in)
2.45'	0''
Silt (in)	Silt Type
0.0"	

Hydraulic Comments:

Smooth flow with deep depth and moderate velocity

Manhole / Pipe Information:

Manhole Depth (Approx. FT):	Manhole Configuration
12'	Single
Manhole Material:	Manhole Condition:
Concrete	Good
Manhole Opening Diameter (in)	Manhole Diameter (Approx.):
26''	54''
Manhole Cover	Manhole Frame
Unbolted	Normal
Active Drop Connections	Air Quality:
No	Normal
Pipe Material	Pipe Condition:
Concrete	Good

Communication Information:

Communication Type	Antenna Location
Wireless	Drilled Pavement / Concrete

Additional Site Info. / Comments:

ADS Project Name:	Milpitas.WWTFM.CA2019-2020
ADS Project Number:	22431.11.325

SCATTERGRAPH REPORT

MIL_2808

Flow Monitor

MIL_2808

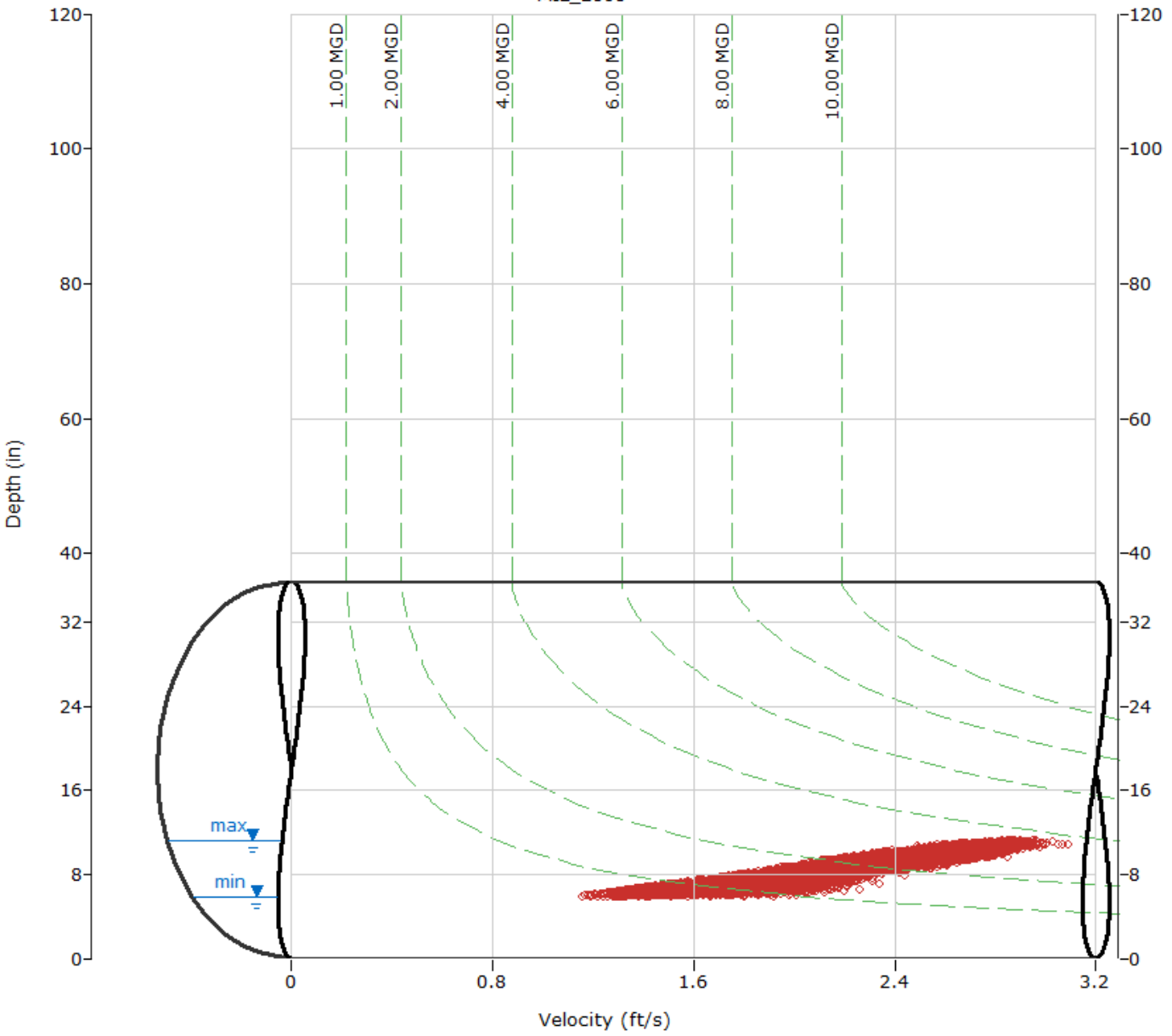
Pipe Height
36.00 in

Report Period

11/16/2019
To
3/9/2020

Legend

- Depth - Velocity
- Iso-Q™
- Silt
- Min-Max Depth



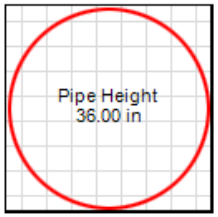
ADS ENVIRONMENTAL SERVICES

HYDROGRAPH REPORT

MIL_2808

Flow Monitor

MIL_2808

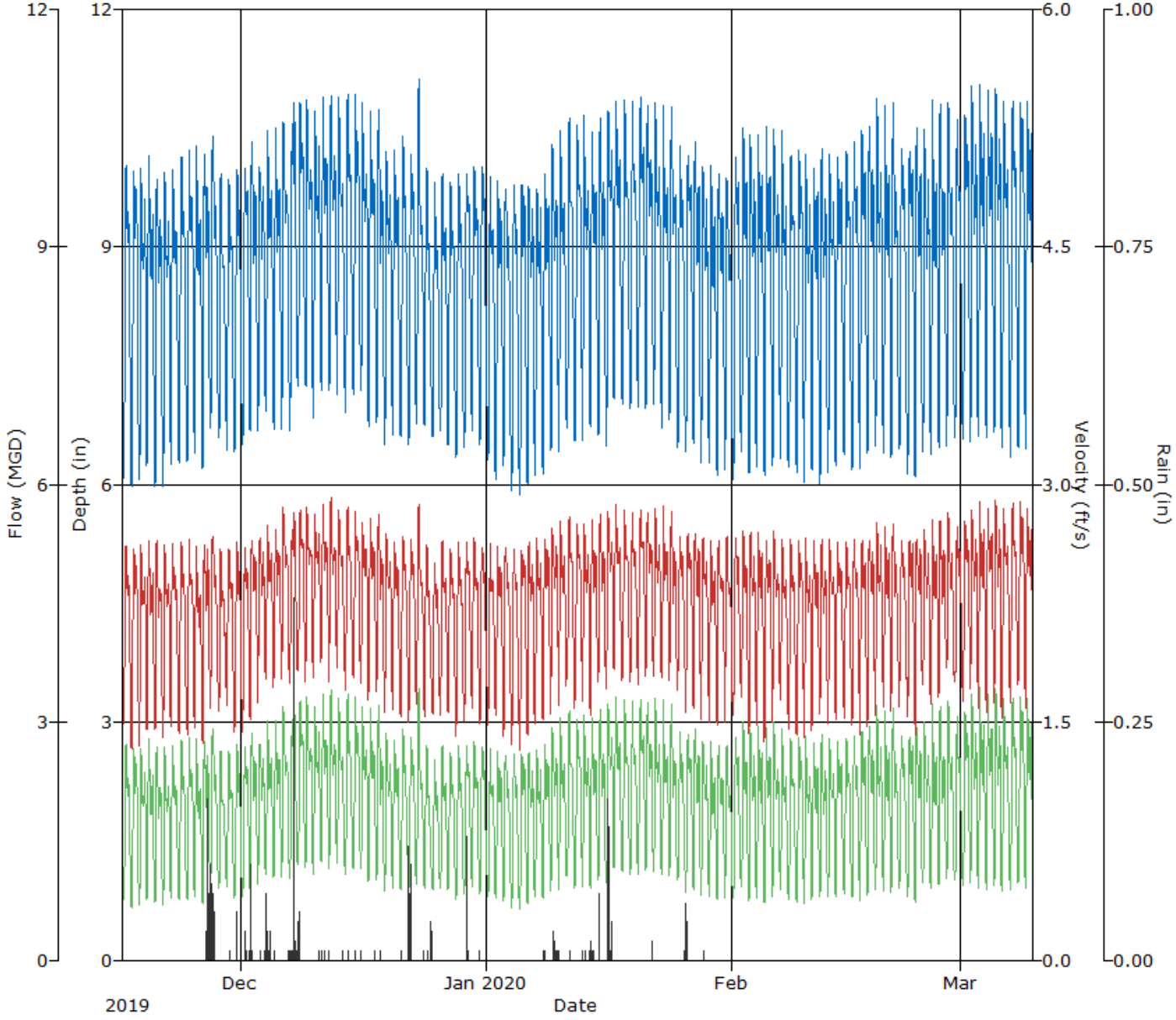


Report Period

11/16/2019
To
3/9/2020

Legend

- Depth
- Velocity
- Quantity
- Rain



ADS ENVIRONMENTAL SERVICES

Daily Tabular Report For The Period 11/16/2019 00:00 - 03/09/2020 23:59

MIL_2808, Pipe Height: 36.00 in, Silt: 0.00 in

Daily Tabular Report

Date	Depth (in)					Velocity (ft/s)					Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
11/16/2019	06:00	6.05	13:00	10.14	8.37	05:20	1.25	13:30	2.73	2.15	06:00	0.638	13:30	2.852	1.816	1.816	
11/17/2019	06:25	5.94	12:50	10.15	8.39	06:10	1.19	20:00	2.70	2.12	06:10	0.593	12:55	2.766	1.812	1.812	
11/18/2019	05:25	6.04	10:05	10.08	8.43	04:45	1.23	09:20	2.74	2.14	04:45	0.632	09:55	2.810	1.819	1.819	
11/19/2019	04:40	6.18	09:55	10.21	8.48	04:35	1.31	10:55	2.84	2.17	04:35	0.686	10:55	2.954	1.848	1.848	
11/20/2019	06:00	5.93	10:10	9.95	8.35	06:10	1.27	11:00	2.75	2.15	06:10	0.625	11:00	2.777	1.794	1.794	
11/21/2019	06:05	5.93	10:25	10.00	8.40	05:50	1.17	09:25	2.67	2.15	05:55	0.580	10:25	2.715	1.814	1.814	
11/22/2019	05:35	6.19	12:05	10.05	8.47	05:30	1.26	10:10	2.76	2.17	05:30	0.660	10:10	2.863	1.845	1.845	
11/23/2019	06:05	6.26	13:10	10.24	8.52	07:20	1.31	12:35	2.75	2.14	07:20	0.705	12:35	2.910	1.846	1.846	
11/24/2019	07:00	6.23	13:10	10.38	8.54	07:05	1.31	11:45	2.78	2.12	07:05	0.694	13:00	2.939	1.843	1.843	
11/25/2019	06:40	6.37	10:45	10.35	8.57	05:35	1.33	10:45	2.69	2.10	05:35	0.738	10:45	2.921	1.818	1.818	
11/26/2019	05:50	6.17	11:05	10.22	8.58	06:25	1.26	21:50	2.71	2.14	06:25	0.664	10:55	2.869	1.870	1.870	0.36
11/27/2019	05:40	6.69	11:15	10.47	8.78	05:00	1.45	12:10	2.76	2.25	05:10	0.855	11:15	2.981	2.001	2.001	0.63
11/28/2019	07:25	6.55	13:50	9.99	8.33	07:00	1.43	12:55	2.66	2.12	07:00	0.818	13:00	2.723	1.745	1.745	
11/29/2019	07:00	6.39	12:30	9.90	8.35	05:45	1.35	12:35	2.72	2.17	05:45	0.763	12:35	2.746	1.795	1.795	0.02
11/30/2019	06:35	6.39	13:55	10.16	8.43	07:30	1.34	14:30	2.74	2.14	07:30	0.747	13:50	2.859	1.811	1.811	0.10
12/01/2019	07:50	6.47	13:55	10.08	8.53	07:25	1.34	15:25	2.75	2.14	07:25	0.754	15:25	2.854	1.843	1.843	0.06
12/02/2019	06:25	6.62	10:35	10.40	8.73	06:10	1.40	11:25	2.72	2.23	06:10	0.814	10:35	2.955	1.973	1.973	0.30
12/03/2019	05:30	6.66	10:50	10.05	8.77	05:15	1.42	22:20	2.80	2.29	05:15	0.827	11:55	2.782	2.031	2.031	0.01
12/04/2019	05:00	6.81	10:25	10.54	8.95	05:00	1.54	09:55	2.83	2.35	05:00	0.926	10:25	3.108	2.137	2.137	0.39
12/05/2019	05:20	6.68	10:35	10.54	8.92	04:45	1.53	09:40	2.89	2.35	04:45	0.901	09:40	3.117	2.130	2.130	0.01
12/06/2019	05:30	6.65	10:40	10.64	8.98	05:25	1.45	10:20	2.98	2.39	05:25	0.844	10:20	3.330	2.188	2.188	0.01
12/07/2019	05:55	6.66	20:00	10.89	9.09	06:10	1.48	19:15	2.94	2.38	06:10	0.863	20:10	3.399	2.241	2.241	0.67
12/08/2019	06:45	7.19	12:10	10.89	9.28	06:55	1.61	14:25	3.00	2.39	06:55	1.049	14:25	3.449	2.299	2.299	0.20
12/09/2019	06:20	7.20	10:20	10.91	9.23	04:40	1.58	10:15	2.95	2.40	04:50	1.040	10:15	3.444	2.274	2.274	
12/10/2019	05:25	6.83	11:00	10.76	9.18	04:35	1.47	10:40	2.92	2.43	04:35	0.907	10:40	3.336	2.287	2.287	
12/11/2019	06:10	7.14	09:55	10.95	9.28	04:35	1.68	10:30	2.99	2.44	05:10	1.106	10:30	3.491	2.323	2.323	0.03
12/12/2019	04:55	7.14	09:50	10.96	9.32	04:00	1.63	09:25	3.07	2.44	04:55	1.093	09:25	3.534	2.341	2.341	0.01
12/13/2019	05:50	7.09	10:20	10.97	9.25	05:05	1.65	10:10	2.93	2.42	05:05	1.073	10:10	3.421	2.297	2.297	0.01
12/14/2019	06:40	6.86	13:35	10.99	9.18	05:55	1.49	13:20	2.98	2.36	05:55	0.923	13:20	3.493	2.240	2.240	0.01
12/15/2019	07:05	7.08	13:05	11.02	9.25	07:20	1.55	13:25	2.96	2.37	07:20	0.990	13:25	3.491	2.269	2.269	0.01
12/16/2019	06:00	7.11	10:50	10.97	9.20	05:55	1.57	10:10	2.90	2.36	05:55	1.005	10:10	3.321	2.228	2.228	0.01
12/17/2019	04:55	6.71	10:45	10.78	9.08	04:50	1.49	10:15	2.93	2.35	04:50	0.880	10:15	3.330	2.192	2.192	0.01
12/18/2019	05:30	6.76	10:30	10.78	9.00	04:50	1.44	10:45	2.91	2.33	04:50	0.870	09:55	3.303	2.141	2.141	0.01
12/19/2019	05:00	6.48	10:20	10.41	8.76	05:45	1.35	10:10	2.80	2.27	05:45	0.762	10:25	3.041	2.015	2.015	
12/20/2019	06:25	6.60	11:00	10.32	8.75	06:50	1.39	10:05	2.79	2.23	06:50	0.802	10:05	2.873	1.980	1.980	
12/21/2019	07:05	6.57	13:30	10.48	8.66	05:30	1.42	13:25	2.72	2.23	05:30	0.815	13:30	3.007	1.954	1.954	0.01
12/22/2019	06:30	6.47	14:50	10.27	8.67	07:15	1.39	14:45	2.78	2.22	07:15	0.803	14:45	2.968	1.955	1.955	0.41
12/23/2019	06:25	6.74	14:10	11.20	8.83	06:00	1.43	12:55	2.97	2.25	06:15	0.850	14:15	3.580	2.042	2.042	
12/24/2019	06:45	6.73	12:50	10.04	8.48	06:00	1.45	13:40	2.70	2.16	06:00	0.858	14:00	2.787	1.825	1.825	0.02
12/25/2019	06:35	6.58	13:35	9.84	8.22	05:25	1.39	13:15	2.65	2.07	06:25	0.798	13:20	2.665	1.674	1.674	0.08
12/26/2019	06:10	6.67	13:40	9.99	8.46	05:50	1.47	13:00	2.71	2.17	05:50	0.866	13:50	2.773	1.834	1.834	
12/27/2019	05:40	6.46	13:30	9.86	8.40	04:50	1.38	12:45	2.79	2.16	06:20	0.772	12:45	2.809	1.814	1.814	
12/28/2019	06:45	6.31	13:00	9.98	8.35	06:20	1.30	14:10	2.73	2.13	06:20	0.706	14:10	2.800	1.786	1.786	
12/29/2019	06:15	6.44	13:55	10.02	8.48	06:05	1.33	13:05	2.72	2.16	06:05	0.744	12:50	2.775	1.849	1.849	0.22
12/30/2019	06:20	6.66	12:55	10.11	8.63	06:20	1.41	13:15	2.77	2.21	06:20	0.820	13:15	2.897	1.916	1.916	
12/31/2019	06:25	6.46	13:30	10.04	8.59	06:35	1.35	14:20	2.76	2.18	06:35	0.753	14:20	2.838	1.892	1.892	0.01

Date	Depth (in)				Velocity (ft/s)				Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
01/01/2020	07:55	6.27	14:00	9.92	8.26	07:10	1.33	14:50	2.71	2.12	07:10	0.722	14:50	2.744	1.741	1.741	
01/02/2020	05:30	6.04	11:50	9.90	8.35	05:35	1.35	11:55	2.77	2.17	05:35	0.686	11:55	2.825	1.812	1.812	
01/03/2020	06:20	6.20	11:50	9.83	8.36	07:10	1.31	11:10	2.69	2.16	06:25	0.700	13:20	2.681	1.806	1.806	
01/04/2020	06:30	5.90	13:35	9.84	8.18	06:30	1.16	13:50	2.71	2.10	06:30	0.567	13:50	2.720	1.722	1.722	
01/05/2020	06:30	5.84	14:30	9.84	8.22	07:30	1.19	13:30	2.70	2.12	07:30	0.578	13:30	2.699	1.753	1.753	
01/06/2020	06:05	5.92	11:00	9.83	8.32	06:05	1.18	11:00	2.73	2.17	06:05	0.579	11:00	2.760	1.810	1.810	
01/07/2020	06:05	6.01	09:45	9.79	8.40	05:15	1.29	10:25	2.73	2.22	06:20	0.673	10:25	2.713	1.863	1.863	
01/08/2020	06:00	6.04	10:20	9.98	8.48	06:05	1.24	10:20	2.78	2.25	06:05	0.628	10:20	2.871	1.923	1.923	0.02
01/09/2020	06:10	6.39	09:50	10.41	8.71	04:10	1.40	09:50	2.87	2.30	04:10	0.795	09:50	3.143	2.028	2.028	0.18
01/10/2020	05:25	6.39	10:45	10.55	8.74	04:25	1.37	10:20	2.84	2.32	04:25	0.785	11:15	3.111	2.049	2.049	0.02
01/11/2020	05:55	6.70	13:45	10.74	8.83	04:35	1.55	13:05	2.86	2.34	05:05	0.911	13:25	3.222	2.096	2.096	0.01
01/12/2020	06:05	6.47	14:15	10.64	8.83	05:05	1.38	12:10	2.86	2.29	05:05	0.794	12:10	3.162	2.077	2.077	
01/13/2020	06:00	6.48	10:25	10.69	8.85	05:00	1.46	14:25	2.85	2.29	06:00	0.820	10:35	3.182	2.065	2.065	0.02
01/14/2020	04:55	6.71	10:45	10.56	8.87	05:05	1.41	10:30	2.87	2.31	05:05	0.831	10:45	3.173	2.086	2.086	0.11
01/15/2020	06:00	6.55	10:05	10.68	8.91	03:20	1.57	10:20	2.85	2.35	06:25	0.919	10:20	3.222	2.129	2.129	0.07
01/16/2020	05:25	6.46	13:55	10.84	9.17	05:00	1.47	10:15	2.94	2.40	05:00	0.823	10:15	3.346	2.279	2.279	0.66
01/17/2020	04:50	7.02	10:50	10.91	9.27	04:00	1.55	10:15	2.93	2.42	04:00	1.004	10:15	3.391	2.314	2.314	
01/18/2020	07:10	6.95	12:55	10.94	9.08	07:15	1.62	12:30	2.95	2.35	07:15	1.002	12:30	3.418	2.189	2.189	
01/19/2020	06:00	6.94	12:55	10.92	9.09	06:30	1.48	12:05	2.91	2.35	06:30	0.913	12:05	3.380	2.194	2.194	
01/20/2020	05:55	6.97	14:25	10.97	9.18	05:30	1.55	13:45	2.94	2.37	05:30	0.972	14:30	3.450	2.254	2.254	
01/21/2020	05:55	6.94	10:30	10.83	9.19	04:30	1.61	10:55	2.90	2.39	04:30	1.008	10:55	3.309	2.261	2.261	
01/22/2020	05:20	6.98	10:20	10.89	9.16	04:45	1.58	10:35	2.92	2.38	04:45	1.012	10:30	3.389	2.236	2.236	0.03
01/23/2020	05:15	6.70	09:55	10.95	9.03	04:45	1.58	09:45	3.09	2.38	05:00	0.931	09:45	3.580	2.200	2.200	
01/24/2020	05:30	6.80	10:15	10.80	9.00	05:35	1.62	10:35	2.90	2.36	05:35	0.971	11:10	3.323	2.161	2.161	
01/25/2020	06:15	6.45	13:15	10.43	8.62	08:20	1.39	13:05	2.74	2.26	08:20	0.810	13:05	2.977	1.964	1.964	
01/26/2020	06:25	6.39	13:50	10.24	8.66	05:30	1.34	13:10	2.77	2.27	05:30	0.751	13:40	2.918	1.994	1.994	0.16
01/27/2020	05:55	6.44	10:25	10.42	8.69	04:20	1.39	10:10	2.80	2.25	04:20	0.796	10:10	3.026	1.982	1.982	
01/28/2020	05:35	6.24	10:15	10.11	8.57	05:45	1.27	09:45	2.80	2.25	05:45	0.676	09:45	2.847	1.934	1.934	0.01
01/29/2020	05:45	6.22	10:35	10.17	8.44	05:10	1.39	09:30	2.70	2.21	05:50	0.737	10:35	2.863	1.864	1.864	
01/30/2020	05:25	6.09	10:20	9.98	8.41	05:50	1.28	10:35	2.79	2.22	05:50	0.662	10:35	2.861	1.861	1.861	
01/31/2020	05:00	6.13	10:55	9.91	8.35	05:25	1.31	11:15	2.77	2.20	05:25	0.684	11:15	2.810	1.826	1.826	
02/01/2020	06:55	6.04	14:10	10.26	8.43	04:35	1.31	15:15	2.74	2.20	07:20	0.673	14:20	2.869	1.875	1.875	
02/02/2020	06:30	6.39	13:20	10.57	8.62	06:00	1.36	13:15	2.80	2.23	06:00	0.756	13:15	3.126	1.946	1.946	
02/03/2020	06:20	6.09	10:25	10.47	8.62	05:35	1.25	11:30	2.85	2.21	05:35	0.645	10:35	3.072	1.938	1.938	
02/04/2020	05:55	6.19	10:10	10.51	8.66	05:05	1.28	10:05	2.81	2.24	05:05	0.678	10:05	3.114	1.967	1.967	
02/05/2020	05:30	6.09	10:00	10.69	8.67	05:50	1.23	09:45	2.80	2.22	05:50	0.632	09:45	3.131	1.961	1.961	
02/06/2020	05:20	6.20	09:55	10.69	8.68	05:20	1.29	10:00	2.75	2.23	05:20	0.677	10:00	3.113	1.958	1.958	
02/07/2020	06:00	6.30	10:05	10.53	8.65	04:10	1.42	09:45	2.81	2.22	05:50	0.769	09:45	3.103	1.941	1.941	
02/08/2020	06:10	6.18	12:55	10.32	8.48	06:05	1.26	12:00	2.72	2.17	06:05	0.659	13:30	2.864	1.862	1.862	
02/09/2020	06:40	6.11	13:45	10.28	8.56	06:15	1.26	13:00	2.85	2.17	06:15	0.656	13:00	3.012	1.893	1.893	
02/10/2020	05:40	5.97	10:35	10.20	8.44	05:40	1.17	10:30	2.76	2.15	05:40	0.582	10:30	2.935	1.828	1.828	
02/11/2020	06:30	6.14	11:50	10.05	8.50	04:05	1.23	12:15	2.80	2.19	04:05	0.639	12:15	2.900	1.872	1.872	
02/12/2020	05:40	5.97	10:00	10.47	8.49	04:15	1.34	10:10	2.71	2.21	06:05	0.682	10:05	2.943	1.882	1.882	
02/13/2020	05:40	6.13	10:00	10.25	8.61	04:10	1.30	11:25	2.74	2.22	04:55	0.707	11:25	2.852	1.931	1.931	
02/14/2020	05:05	6.21	11:15	10.22	8.66	06:10	1.33	09:45	2.73	2.22	06:10	0.704	09:45	2.844	1.946	1.946	
02/15/2020	06:50	6.32	13:30	10.28	8.63	07:35	1.36	12:10	2.72	2.20	07:35	0.740	13:30	2.897	1.924	1.924	
02/16/2020	06:50	6.15	13:25	10.36	8.63	06:25	1.26	11:50	2.71	2.18	06:25	0.661	13:25	2.950	1.921	1.921	
02/17/2020	06:15	6.17	12:05	10.60	8.78	06:50	1.35	11:30	2.77	2.20	06:50	0.713	11:30	3.075	1.987	1.987	
02/18/2020	05:40	6.35	10:50	10.68	8.82	05:00	1.35	10:55	2.74	2.22	05:00	0.753	10:55	3.093	2.006	2.006	
02/19/2020	05:25	6.47	10:20	10.94	8.89	04:15	1.43	10:15	2.89	2.28	04:45	0.822	10:15	3.388	2.074	2.074	
02/20/2020	05:20	6.33	10:25	10.89	8.88	06:20	1.36	10:15	2.85	2.28	06:20	0.760	10:15	3.269	2.072	2.072	
02/21/2020	05:45	6.30	11:00	10.91	8.81	05:45	1.41	10:30	2.85	2.26	05:45	0.759	10:30	3.320	2.031	2.031	
02/22/2020	06:15	6.39	13:00	10.32	8.68	04:55	1.38	12:15	2.73	2.23	04:55	0.800	12:55	2.945	1.966	1.966	
02/23/2020	06:20	6.10	12:55	10.29	8.63	06:20	1.36	22:00	2.75	2.21	06:20	0.695	13:00	2.876	1.949	1.949	
02/24/2020	04:40	6.06	10:45	10.59	8.66	04:40	1.23	10:10	2.73	2.23	04:40	0.624	10:45	3.004	1.972	1.972	

Date	Depth (in)					Velocity (ft/s)					Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
02/25/2020	06:10	6.34	10:05	10.55	8.70	04:35	1.36	10:05	2.84	2.29	04:35	0.772	10:05	3.169	2.015	2.015	
02/26/2020	05:45	6.34	10:15	10.98	8.81	04:30	1.44	10:05	2.89	2.28	06:05	0.800	10:05	3.371	2.048	2.048	
02/27/2020	05:30	6.44	09:55	10.95	8.88	03:45	1.43	10:00	2.88	2.31	04:50	0.818	10:00	3.378	2.096	2.096	
02/28/2020	05:45	6.42	10:50	10.96	8.90	06:25	1.34	10:30	2.91	2.33	06:25	0.755	10:50	3.376	2.111	2.111	
02/29/2020	06:25	6.53	14:30	10.69	8.81	05:10	1.52	13:50	2.88	2.29	05:10	0.888	13:05	3.203	2.055	2.055	
03/01/2020	05:45	6.54	14:10	10.78	8.92	05:25	1.44	14:25	2.88	2.30	06:15	0.837	14:25	3.261	2.118	2.118	
03/02/2020	06:00	6.42	10:40	11.12	9.05	04:45	1.39	10:30	2.92	2.35	04:45	0.804	10:30	3.472	2.194	2.194	
03/03/2020	06:05	6.53	10:35	11.07	9.14	06:25	1.45	10:55	2.97	2.36	06:05	0.836	10:55	3.540	2.240	2.240	
03/04/2020	06:15	6.54	10:00	11.02	9.20	06:10	1.38	09:55	3.03	2.38	06:10	0.784	09:55	3.591	2.275	2.275	
03/05/2020	06:00	6.61	10:05	11.06	9.23	05:00	1.40	10:45	3.01	2.38	05:00	0.823	10:45	3.549	2.277	2.277	
03/06/2020	06:05	6.45	10:05	10.89	9.05	06:05	1.37	10:20	2.99	2.36	06:05	0.760	10:20	3.482	2.209	2.209	
03/07/2020	06:55	6.28	13:30	10.89	9.02	06:50	1.41	12:45	2.98	2.37	06:50	0.759	14:45	3.390	2.223	2.223	
03/08/2020	05:55	6.43	13:55	10.86	9.12	05:30	1.38	12:45	3.05	2.41	05:35	0.771	12:45	3.522	2.287	2.287	
03/09/2020	05:00	6.42	10:35	10.91	9.08	04:45	1.38	10:30	2.93	2.38	04:45	0.766	10:30	3.412	2.239	2.238	

Report Summary For The Period 11/16/2019 00:00 - 03/09/2020 23:59

	Depth (in)	Velocity (ft/s)	Quantity (MGD - Total MG)	Rain (in)
Total			231.008	4.90
Avg	8.74	2.26	2.009	

Site Commentary

Site Information

MIL_2840	
Pipe Dimensions	15
Silt Level	0.00"

Overview

Site MIL_2840 functioned under normal conditions during the period Saturday, November 16, 2019 to Monday, March 9, 2020 . This site exhibited an observable response to the wet weather events of November 26, 2019 - November 27, 2019, December 7, 2019 - December 8, 2019, and January 16, 2020 - January 17, 2020. Review of the scattergraph shows that both free flow and backwater flows were recorded during the study period.

Flow depth and velocity measurements recorded by the flow monitor are consistent with field confirmations conducted to date and support the relative accuracy of the flow monitor at this location.

This location was installed upstream of sites MIL_0649 and MIL_2491, and downstream of MIL_1193. A review of balancing of combined flows MIL_1043 and MIL_2840 shows a net flow of 0.663 MGD.

Observations

Average flow depth, velocity, and quantity data observed during Saturday, November 16, 2019 to Monday, March 9, 2020 , along with observed minimum and maximum data, are provided in the following table.

Observed Flow Conditions			
Item	Depth (in)	Velocity (ft/s)	Quantity (MGD)
Average	1.99	1.38	0.087
Minimum	1.80	0.99	0.055
Maximum	2.26	1.82	0.131
Time of Minimum	11/21/2019 3:35 PM	11/24/2019 7:15 AM	11/24/2019 7:15 AM
Time of Maximum	12/8/2019 6:00 PM	12/10/2019 5:35 PM	12/9/2019 5:25 PM

Data Quality

Data uptime observed during the Saturday, November 16, 2019 to the Monday, March 9, 2020 monitoring period is provided in the table below. Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

Percent Uptime	
Depth (in)	100
Velocity (ft/s)	100
Quantity (MGD)	100

Milpitas Temp Study 2019-20

Flow Monitoring Site Report

ADS ENVIRONMENTAL SERVICES®

Site Name

MIL_2840

Site Address /Location:	S Abel St and Curtis Ave, Milpitas, CA			Monitor Series	Location Type
				TRITON+	Temporary
Site Access Details:	DRIVE.	Latitude:	37.433982°	Pipe Size (H x W)	Pipe Shape
		Longitude:	-121.891547°	15.00"x15.00"	Circular



Manhole #	System Characteristics
2840	Residential/Commercial
Access	Traffic
Drive	Heavy







Installation Information

Installation Date:	Installation Type:
Wednesday, November 13, 2019	Doppler Standard Ring and Crank
Monitoring Location (Sensors):	Monitor Location:
Upstream 0-5 FT	Manhole
Sensors / Devices:	Pressure Sensor Range (psi)
Peak Combo (CS4)	0 - 5 psi

Installation Confirmation:

Confirmation Time:	Pipe Size (HxW)
11:04:00 AM	15.00"x15.00"
Depth of Flow (Wet DOF) (in)	Range (Air DOF) (in)
2.00"	
Downlooker Physical Offset (in)	Measurement Confidence (in)
NA	0.25"
Peak Velocity (fps)	Velocity Sensor Offset (in)
1.28'	0''
Silt (in)	Silt Type
0.0"	

Hydraulic Comments:

Smooth flow with shallow depth and moderate velocity

Manhole / Pipe Information:

Manhole Depth (Approx. FT):	Manhole Configuration
10'	Single
Manhole Material:	Manhole Condition:
Concrete	Good
Manhole Opening Diameter (in)	Manhole Diameter (Approx.):
26''	54''
Manhole Cover	Manhole Frame
Unbolted	Normal
Active Drop Connections	Air Quality:
No	Normal
Pipe Material	Pipe Condition:
Concrete	Good

Communication Information:

Communication Type	Antenna Location
Wireless	Drilled Pavement / Concrete

Additional Site Info. / Comments:

ADS Project Name:	Milpitas.WWTFM.CA2019-2020
ADS Project Number:	22431.11.325

SCATTERGRAPH REPORT

MIL_2840

Flow Monitor

MIL_2840

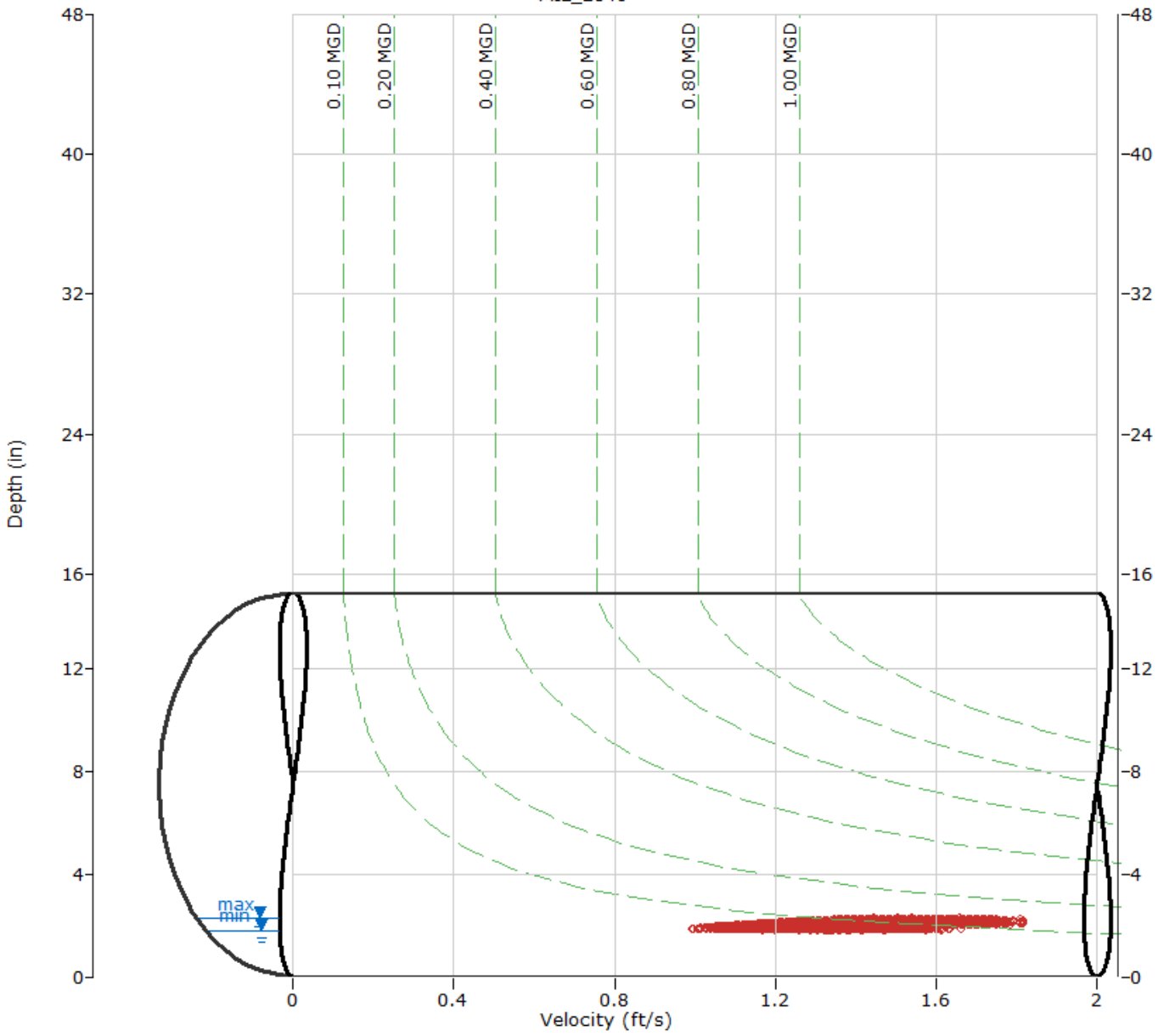
Pipe Height
15.00 in

Report Period

11/16/2019
To
3/9/2020

Legend

- Depth - Velocity
- Iso-Q™
- Silt
- Min-Max Depth



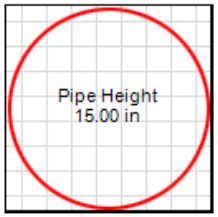
ADS ENVIRONMENTAL SERVICES

HYDROGRAPH REPORT

MIL_2840

Flow Monitor

MIL_2840

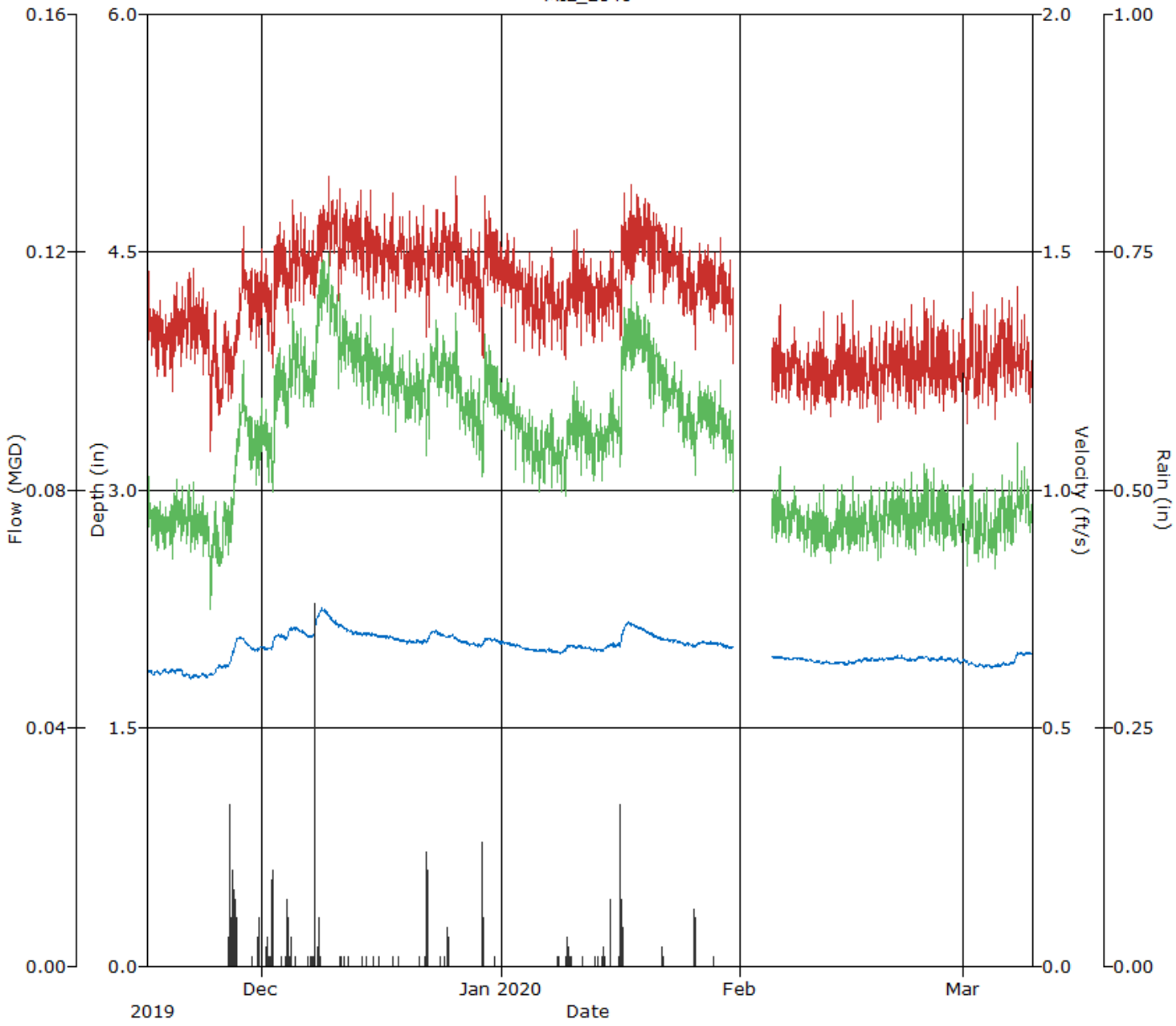


Report Period

11/16/2019
To
3/9/2020

Legend

- Depth
- Velocity
- Quantity
- Rain



ADS ENVIRONMENTAL SERVICES

Daily Tabular Report For The Period 11/16/2019 00:00 - 03/09/2020 23:59

MIL_2840, Pipe Height: 15.00 in, Silt: 0.00 in

Daily Tabular Report

Date	Depth (in)				Velocity (ft/s)				Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
11/16/2019	21:25	1.83	13:55	1.86	1.85	23:15	1.11	02:50	1.63	1.35	23:15	0.062	02:50	0.091	0.076	0.076	
11/17/2019	16:55	1.83	07:55	1.86	1.85	16:35	1.05	15:05	1.56	1.32	16:35	0.059	15:05	0.087	0.074	0.074	
11/18/2019	19:25	1.84	09:30	1.87	1.85	12:05	1.06	19:50	1.66	1.31	00:30	0.060	19:50	0.093	0.074	0.074	
11/19/2019	16:25	1.84	22:40	1.88	1.86	08:20	1.07	21:30	1.57	1.33	08:20	0.060	22:25	0.090	0.075	0.075	
11/20/2019	23:05	1.83	10:10	1.88	1.85	17:45	1.04	08:45	1.61	1.34	17:45	0.058	08:45	0.092	0.076	0.076	
11/21/2019	15:35	1.80	06:00	1.85	1.83	06:35	1.10	11:30	1.62	1.35	06:35	0.061	11:30	0.090	0.074	0.074	
11/22/2019	00:05	1.81	06:35	1.84	1.83	19:10	1.13	10:35	1.58	1.35	19:10	0.062	10:35	0.087	0.074	0.074	
11/23/2019	21:05	1.81	08:20	1.85	1.83	14:30	1.10	01:10	1.58	1.34	14:30	0.061	01:10	0.087	0.074	0.074	
11/24/2019	00:05	1.82	23:50	1.87	1.84	07:15	0.99	01:00	1.55	1.25	07:15	0.055	23:50	0.086	0.070	0.070	
11/25/2019	00:45	1.85	14:00	1.90	1.88	18:05	1.02	00:55	1.54	1.23	18:05	0.058	00:55	0.087	0.071	0.071	
11/26/2019	05:00	1.87	23:50	1.94	1.90	16:50	1.04	15:50	1.58	1.28	16:50	0.061	15:50	0.091	0.075	0.075	0.36
11/27/2019	00:30	1.94	22:45	2.07	2.02	06:00	1.09	22:00	1.52	1.30	06:00	0.067	22:00	0.100	0.083	0.083	0.63
11/28/2019	22:20	2.03	01:15	2.08	2.06	15:00	1.19	09:40	1.69	1.43	15:00	0.078	09:40	0.111	0.094	0.094	
11/29/2019	18:55	1.99	00:50	2.04	2.01	10:50	1.14	00:40	1.72	1.40	10:50	0.072	00:40	0.111	0.089	0.089	0.02
11/30/2019	08:10	1.98	22:15	2.02	2.00	05:15	1.12	04:15	1.63	1.40	05:15	0.070	04:15	0.102	0.088	0.088	0.10
12/01/2019	11:05	1.98	06:50	2.02	2.00	22:35	1.13	00:05	1.62	1.41	22:35	0.071	00:05	0.103	0.089	0.089	0.06
12/02/2019	05:20	1.99	20:10	2.10	2.04	08:45	1.14	22:35	1.70	1.39	08:45	0.072	22:35	0.113	0.090	0.090	0.30
12/03/2019	22:30	2.06	03:40	2.10	2.08	05:15	1.20	09:50	1.76	1.49	05:15	0.080	09:50	0.116	0.099	0.099	0.01
12/04/2019	02:35	2.05	18:15	2.14	2.10	09:00	1.22	23:35	1.73	1.44	04:15	0.081	23:35	0.119	0.097	0.097	0.39
12/05/2019	22:45	2.10	03:30	2.14	2.12	19:50	1.23	03:00	1.71	1.49	19:50	0.083	03:00	0.118	0.102	0.102	0.01
12/06/2019	22:15	2.06	05:40	2.12	2.09	08:05	1.24	01:00	1.72	1.49	19:55	0.083	01:00	0.116	0.100	0.100	0.01
12/07/2019	03:45	2.06	22:45	2.17	2.09	16:10	1.20	08:55	1.70	1.46	16:10	0.080	08:55	0.113	0.098	0.098	0.67
12/08/2019	00:00	2.17	18:00	2.26	2.22	00:50	1.31	03:05	1.73	1.52	00:50	0.094	17:45	0.126	0.112	0.112	0.20
12/09/2019	23:30	2.17	00:15	2.25	2.22	19:10	1.35	17:25	1.81	1.55	18:35	0.097	17:25	0.131	0.113	0.113	
12/10/2019	23:00	2.13	00:10	2.20	2.16	21:00	1.29	17:35	1.82	1.55	23:15	0.089	02:05	0.128	0.109	0.109	
12/11/2019	16:20	2.11	04:55	2.16	2.14	18:15	1.27	01:50	1.77	1.53	18:15	0.088	01:50	0.123	0.106	0.106	0.03
12/12/2019	16:15	2.08	00:00	2.12	2.11	16:50	1.24	08:10	1.79	1.53	16:50	0.085	08:10	0.122	0.104	0.104	0.01
12/13/2019	22:00	2.07	03:15	2.12	2.10	21:15	1.24	18:25	1.75	1.53	21:15	0.083	20:20	0.118	0.103	0.103	0.01
12/14/2019	00:00	2.08	07:35	2.11	2.09	00:30	1.21	10:55	1.73	1.51	00:30	0.081	10:55	0.116	0.101	0.101	0.01
12/15/2019	03:30	2.07	00:00	2.10	2.09	12:30	1.26	02:10	1.74	1.51	12:30	0.084	02:10	0.117	0.101	0.101	0.01
12/16/2019	00:10	2.06	01:00	2.10	2.08	12:05	1.24	01:00	1.81	1.50	12:00	0.083	01:00	0.122	0.100	0.100	0.01
12/17/2019	00:05	2.06	06:15	2.09	2.07	08:35	1.26	23:55	1.82	1.50	08:35	0.083	23:55	0.120	0.099	0.099	0.01
12/18/2019	17:05	2.04	00:05	2.07	2.06	08:20	1.21	00:05	1.81	1.49	08:20	0.079	00:05	0.120	0.098	0.098	0.01
12/19/2019	20:10	2.02	03:50	2.06	2.05	23:20	1.16	07:55	1.72	1.49	23:20	0.075	03:50	0.113	0.097	0.097	
12/20/2019	02:05	2.03	03:10	2.06	2.04	20:20	1.22	23:35	1.72	1.48	20:20	0.079	23:35	0.111	0.096	0.096	
12/21/2019	17:25	2.02	06:15	2.07	2.04	14:05	1.18	21:55	1.75	1.49	14:05	0.077	21:55	0.113	0.097	0.097	0.01
12/22/2019	06:20	2.03	22:45	2.11	2.06	07:35	1.17	23:00	1.70	1.46	07:35	0.075	23:00	0.115	0.096	0.096	0.41
12/23/2019	19:00	2.08	13:00	2.13	2.10	08:40	1.29	13:50	1.82	1.51	08:40	0.087	13:50	0.124	0.102	0.102	
12/24/2019	14:50	2.07	00:55	2.10	2.08	02:35	1.28	18:10	1.74	1.51	02:35	0.086	15:30	0.115	0.101	0.101	0.02
12/25/2019	03:25	2.06	07:50	2.09	2.08	15:50	1.21	14:20	1.72	1.49	15:50	0.081	14:20	0.115	0.099	0.099	0.08
12/26/2019	19:20	2.03	01:35	2.08	2.05	17:45	1.24	04:25	1.74	1.50	17:45	0.081	04:25	0.115	0.098	0.098	
12/27/2019	20:55	2.01	01:45	2.05	2.03	08:00	1.19	14:25	1.67	1.44	08:00	0.077	14:25	0.108	0.093	0.093	
12/28/2019	23:30	2.00	01:55	2.04	2.02	20:45	1.19	03:00	1.68	1.43	20:45	0.076	03:50	0.108	0.092	0.092	
12/29/2019	01:10	2.01	23:40	2.07	2.03	06:10	1.17	20:25	1.72	1.41	06:10	0.074	20:25	0.111	0.091	0.091	0.22
12/30/2019	03:45	2.04	00:15	2.07	2.06	21:55	1.22	02:30	1.74	1.51	21:55	0.079	02:30	0.114	0.099	0.099	
12/31/2019	14:35	2.03	01:30	2.07	2.05	06:55	1.17	03:45	1.71	1.49	06:55	0.077	03:45	0.111	0.097	0.097	0.01

Date	Depth (in)				Velocity (ft/s)				Quantity (MGD - Total MG)					Rain (in)
	Time	Min Time	Max	Avg	Time	Min Time	Max	Avg	Time	Min Time	Max	Avg	Total	Total
01/01/2020	11:50	2.02 00:05	2.06	2.04	03:15	1.19 13:25	1.77	1.45	03:15	0.077 13:25	0.114	0.094	0.094	
01/02/2020	03:15	2.01 00:45	2.04	2.03	22:15	1.16 18:20	1.68	1.44	22:15	0.074 18:20	0.107	0.092	0.092	
01/03/2020	21:15	1.99 00:20	2.03	2.01	22:50	1.19 21:50	1.78	1.43	22:50	0.075 21:50	0.113	0.091	0.091	
01/04/2020	10:10	1.98 00:00	2.01	2.00	00:15	1.20 02:30	1.75	1.41	17:05	0.075 02:30	0.109	0.088	0.088	
01/05/2020	10:00	1.97 01:05	2.00	1.99	15:55	1.13 00:25	1.67	1.37	15:55	0.071 00:25	0.104	0.085	0.085	
01/06/2020	19:40	1.97 01:20	2.00	1.99	00:30	1.13 07:45	1.60	1.38	00:30	0.071 07:45	0.100	0.086	0.086	
01/07/2020	16:30	1.97 04:15	2.01	1.99	18:45	1.18 16:15	1.70	1.41	18:45	0.073 16:15	0.106	0.088	0.088	
01/08/2020	07:20	1.96 00:30	1.99	1.98	07:55	1.10 00:15	1.60	1.37	07:55	0.067 00:15	0.099	0.085	0.085	0.02
01/09/2020	00:00	1.97 13:45	2.02	2.00	09:40	1.12 23:10	1.70	1.38	09:40	0.070 23:10	0.107	0.087	0.087	0.18
01/10/2020	21:00	1.99 09:25	2.03	2.01	18:25	1.14 11:30	1.71	1.43	18:25	0.073 11:30	0.109	0.091	0.091	0.02
01/11/2020	17:30	1.99 04:35	2.03	2.01	10:45	1.13 01:45	1.64	1.42	10:45	0.072 01:45	0.104	0.090	0.090	0.01
01/12/2020	21:35	1.98 01:10	2.02	2.00	20:25	1.16 18:15	1.70	1.40	20:25	0.072 18:15	0.106	0.088	0.088	
01/13/2020	00:45	1.98 05:25	2.01	1.99	02:45	1.12 23:30	1.64	1.40	02:45	0.070 23:30	0.101	0.088	0.088	0.02
01/14/2020	02:50	1.97 13:25	2.02	2.00	02:40	1.16 11:05	1.64	1.40	02:40	0.072 11:05	0.103	0.088	0.088	0.11
01/15/2020	01:10	2.01 12:05	2.04	2.02	15:45	1.18 06:45	1.69	1.43	15:45	0.075 06:45	0.107	0.091	0.091	0.07
01/16/2020	10:15	2.00 23:40	2.13	2.05	11:40	1.15 23:10	1.77	1.43	11:40	0.073 23:40	0.120	0.093	0.093	0.66
01/17/2020	00:00	2.12 11:55	2.17	2.15	03:15	1.30 17:05	1.77	1.52	03:15	0.090 17:05	0.124	0.106	0.106	
01/18/2020	20:00	2.11 00:30	2.16	2.14	02:50	1.28 21:40	1.78	1.54	04:30	0.089 01:20	0.123	0.107	0.107	
01/19/2020	11:20	2.10 03:20	2.14	2.12	07:20	1.30 17:55	1.78	1.54	07:20	0.088 18:25	0.121	0.105	0.105	
01/20/2020	17:55	2.07 00:00	2.11	2.09	13:45	1.21 10:40	1.77	1.50	13:45	0.081 10:40	0.118	0.101	0.101	
01/21/2020	16:20	2.04 00:00	2.09	2.07	18:25	1.24 03:40	1.76	1.52	18:25	0.082 03:40	0.116	0.100	0.100	
01/22/2020	01:50	2.04 03:55	2.07	2.05	01:10	1.21 13:00	1.71	1.48	01:10	0.079 13:00	0.113	0.097	0.097	0.03
01/23/2020	22:35	2.03 02:40	2.06	2.05	00:00	1.25 12:15	1.70	1.48	00:00	0.081 12:15	0.111	0.097	0.097	
01/24/2020	04:00	2.02 06:55	2.06	2.03	18:15	1.14 09:35	1.67	1.45	18:15	0.073 09:35	0.108	0.093	0.093	
01/25/2020	02:05	2.01 02:45	2.05	2.03	19:25	1.15 21:55	1.69	1.43	19:25	0.073 21:55	0.108	0.092	0.092	
01/26/2020	03:50	2.00 14:40	2.05	2.03	02:10	1.17 13:40	1.70	1.42	02:10	0.074 13:40	0.110	0.091	0.091	0.16
01/27/2020	10:35	2.02 03:55	2.05	2.04	09:00	1.22 20:25	1.68	1.45	09:00	0.078 20:25	0.109	0.094	0.094	
01/28/2020	03:15	2.02 00:45	2.05	2.03	04:05	1.16 06:15	1.69	1.43	04:05	0.075 06:15	0.108	0.092	0.092	0.01
01/29/2020	21:55	2.00 00:10	2.04	2.02	10:55	1.17 01:15	1.64	1.43	10:55	0.075 01:15	0.106	0.092	0.092	
01/30/2020	06:15	1.99 03:30	2.03	2.01	16:05	1.15 00:50	1.66	1.42	16:05	0.072 00:50	0.105	0.090	0.090	
01/31/2020	01:00	1.99 00:35	2.02	2.01	00:05	1.21 00:20	1.58	1.38	00:05	0.076 00:20	0.100	0.087	0.015	
02/01/2020														
02/02/2020														
02/03/2020														
02/04/2020														
02/05/2020	15:55	1.93 17:25	1.96	1.94	05:30	1.08 17:40	1.57	1.26	14:45	0.065 17:40	0.095	0.076	0.063	
02/06/2020	22:45	1.93 04:30	1.96	1.94	15:00	1.07 06:10	1.52	1.26	15:00	0.064 06:10	0.092	0.076	0.076	
02/07/2020	18:30	1.92 03:10	1.95	1.94	19:45	1.06 17:45	1.48	1.25	19:45	0.063 17:45	0.088	0.075	0.075	
02/08/2020	23:05	1.93 06:35	1.95	1.94	20:05	1.06 04:55	1.52	1.26	20:05	0.063 04:55	0.092	0.076	0.076	
02/09/2020	23:25	1.91 04:05	1.95	1.93	16:50	1.06 19:40	1.51	1.24	20:30	0.062 19:40	0.090	0.074	0.074	
02/10/2020	14:00	1.91 06:25	1.94	1.92	22:40	1.06 00:10	1.50	1.24	22:40	0.062 00:10	0.089	0.074	0.074	
02/11/2020	14:25	1.90 05:05	1.93	1.91	01:20	1.05 11:05	1.63	1.26	15:30	0.062 11:05	0.096	0.074	0.074	
02/12/2020	21:00	1.90 07:35	1.93	1.91	21:50	1.04 08:40	1.61	1.23	21:50	0.061 08:40	0.095	0.072	0.072	
02/13/2020	00:10	1.89 13:30	1.92	1.91	06:15	1.04 02:00	1.49	1.25	06:15	0.061 02:00	0.087	0.073	0.073	
02/14/2020	17:50	1.89 01:40	1.92	1.91	12:05	1.04 05:10	1.50	1.27	12:05	0.061 05:10	0.089	0.074	0.074	
02/15/2020	01:30	1.89 05:15	1.93	1.91	06:35	1.05 19:50	1.54	1.26	11:00	0.062 19:55	0.091	0.074	0.074	
02/16/2020	00:45	1.90 04:25	1.93	1.92	00:50	1.05 00:40	1.51	1.24	00:50	0.061 11:25	0.089	0.074	0.074	
02/17/2020	21:50	1.92 06:05	1.95	1.93	19:25	1.06 11:00	1.54	1.24	19:25	0.063 11:00	0.092	0.074	0.074	
02/18/2020	23:45	1.92 04:35	1.95	1.93	23:50	1.05 20:40	1.49	1.24	23:50	0.062 20:40	0.089	0.074	0.074	
02/19/2020	00:00	1.92 06:50	1.94	1.93	19:30	1.05 05:00	1.55	1.24	19:30	0.063 05:00	0.093	0.074	0.074	
02/20/2020	17:45	1.92 04:35	1.95	1.94	19:05	1.06 01:05	1.52	1.26	19:05	0.064 01:05	0.091	0.076	0.076	
02/21/2020	00:00	1.93 14:25	1.96	1.94	16:15	1.07 04:40	1.58	1.25	21:05	0.064 04:40	0.096	0.076	0.076	
02/22/2020	21:35	1.91 03:45	1.96	1.93	17:50	1.05 10:00	1.52	1.26	17:50	0.062 10:00	0.091	0.076	0.076	
02/23/2020	00:10	1.92 03:25	1.94	1.93	15:55	1.05 13:10	1.54	1.24	15:55	0.062 13:10	0.092	0.074	0.074	
02/24/2020	01:05	1.93 12:10	1.95	1.94	21:45	1.06 09:25	1.54	1.25	21:45	0.064 09:25	0.093	0.075	0.075	

Date	Depth (in)					Velocity (ft/s)					Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
02/25/2020	22:10	1.92	05:15	1.96	1.94	20:20	1.06	01:50	1.52	1.29	20:05	0.063	03:05	0.092	0.077	0.077	
02/26/2020	14:25	1.92	00:55	1.95	1.93	10:00	1.06	15:15	1.53	1.26	10:00	0.064	15:15	0.091	0.075	0.075	
02/27/2020	18:45	1.92	05:50	1.96	1.93	19:40	1.06	17:20	1.48	1.27	19:40	0.063	08:50	0.089	0.076	0.076	
02/28/2020	20:55	1.91	02:40	1.95	1.93	17:55	1.06	03:20	1.49	1.25	16:55	0.063	03:20	0.090	0.074	0.074	
02/29/2020	22:10	1.90	07:20	1.94	1.92	01:05	1.06	23:40	1.51	1.26	22:05	0.063	23:45	0.089	0.075	0.075	
03/01/2020	20:20	1.89	04:15	1.93	1.92	15:10	1.05	02:55	1.51	1.25	15:10	0.062	02:55	0.090	0.074	0.074	
03/02/2020	18:30	1.88	05:00	1.92	1.90	12:45	1.04	08:25	1.58	1.29	12:45	0.061	08:25	0.093	0.075	0.075	
03/03/2020	20:15	1.87	04:45	1.91	1.89	14:35	1.08	18:20	1.50	1.28	14:35	0.062	01:10	0.087	0.074	0.074	
03/04/2020	22:00	1.87	06:15	1.90	1.89	18:45	1.03	01:50	1.52	1.26	18:45	0.059	01:50	0.088	0.073	0.073	
03/05/2020	11:00	1.88	14:50	1.90	1.89	07:05	1.05	02:35	1.55	1.28	07:05	0.061	02:35	0.090	0.074	0.074	
03/06/2020	18:05	1.88	05:20	1.91	1.90	05:10	1.06	05:05	1.59	1.31	05:10	0.062	05:05	0.093	0.076	0.076	
03/07/2020	00:35	1.88	23:25	1.96	1.92	11:00	1.05	08:05	1.53	1.29	11:00	0.062	08:05	0.090	0.076	0.076	
03/08/2020	01:15	1.95	15:25	1.98	1.97	01:10	1.08	16:40	1.54	1.28	01:10	0.065	16:40	0.094	0.079	0.079	
03/09/2020	21:35	1.95	08:20	1.98	1.97	09:45	1.09	12:40	1.60	1.26	09:45	0.067	12:40	0.099	0.077	0.077	

Report Summary For The Period 11/16/2019 00:00 - 03/09/2020 23:59

	Depth (in)	Velocity (ft/s)	Quantity (MGD - Total MG)	Rain (in)
Total			9.571	4.90
Avg	1.99	1.38	0.087	

Rainfall data

MIL_RG01	
Rain Collector Dimensions	8"

The rainfall measured at MIL_RG01 from November 16, 2019 to March 09, 2020 is 4.90 inches.

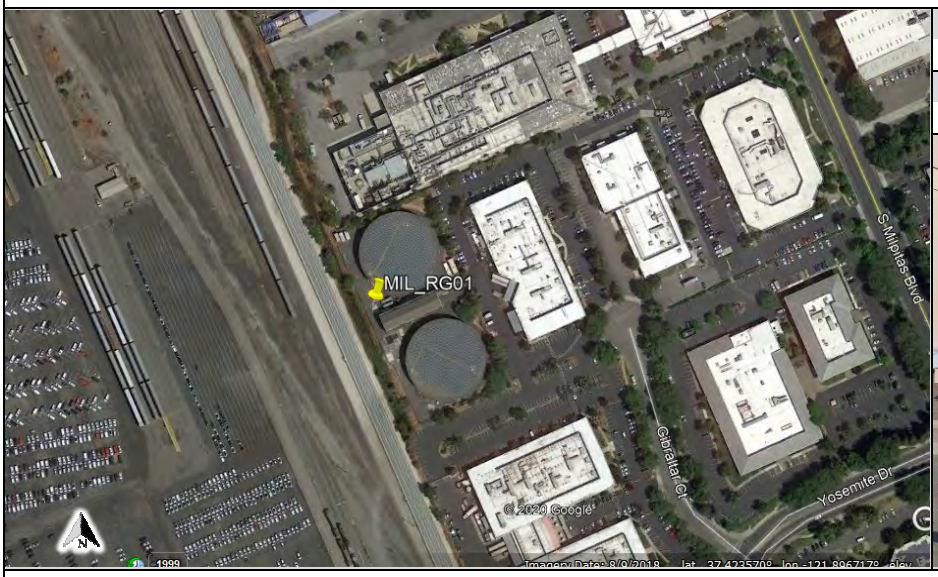
Milpitas Temp Study 2019-20

Flow Monitoring Site Report

Site Name

MIL_RG01

Site Address /Location:	641 Gibraltar Court, Milpitas, CA			Monitor Series: Rain Alert III	Location Type: Temporary
Site Access Details:	DRIVE.	Latitude:	37.423469°	Pipe Size (H x W)	Pipe Shape
		Longitude:	-121.898106°		



Manhole #	System Characteristics
	Commercial
Access	**Traffic**
Drive	Light







Installation Information

Installation Date:	Installation Type:
Friday, November 15, 2019	Rain Gauge
Monitoring Location (Sensors):	Monitor Location:
Field	Building
Sensors / Devices:	Pressure Sensor Range (psi)
Rain Gauge Tipping Bucket	

Installation Confirmation:

Confirmation Time:	Pipe Size (HxW)
Depth of Flow (Wet DOF) (in)	Range (Air DOF) (in)
Downlooker Physical Offset (in)	Measurement Confidence (in)
NA	
Peak Velocity (fps)	Velocity Sensor Offset (in)
	0''
Silt (in)	Silt Type
0.0"	

Hydraulic Comments:

Manhole / Pipe Information:

Manhole Depth (Approx. FT):	Manhole Configuration
	Single
Manhole Material:	Manhole Condition:
Concrete	Good
Manhole Opening Diameter (in)	Manhole Diameter (Approx.):
26''	54''
Manhole Cover	Manhole Frame
Active Drop Connections	Air Quality:
	Normal
Pipe Material	Pipe Condition:
Concrete	

Communication Information:

Communication Type	Antenna Location
Wireless	

Additional Site Info. / Comments:

Need key to access.

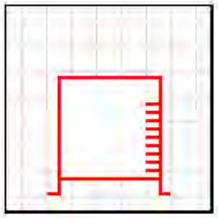
ADS Project Name:	Milpitas.WWTFM.CA2019-2020
ADS Project Number:	22431.11.325

HYDROGRAPH REPORT

MIL_RG01

Rain Gauge

MIL_RG01

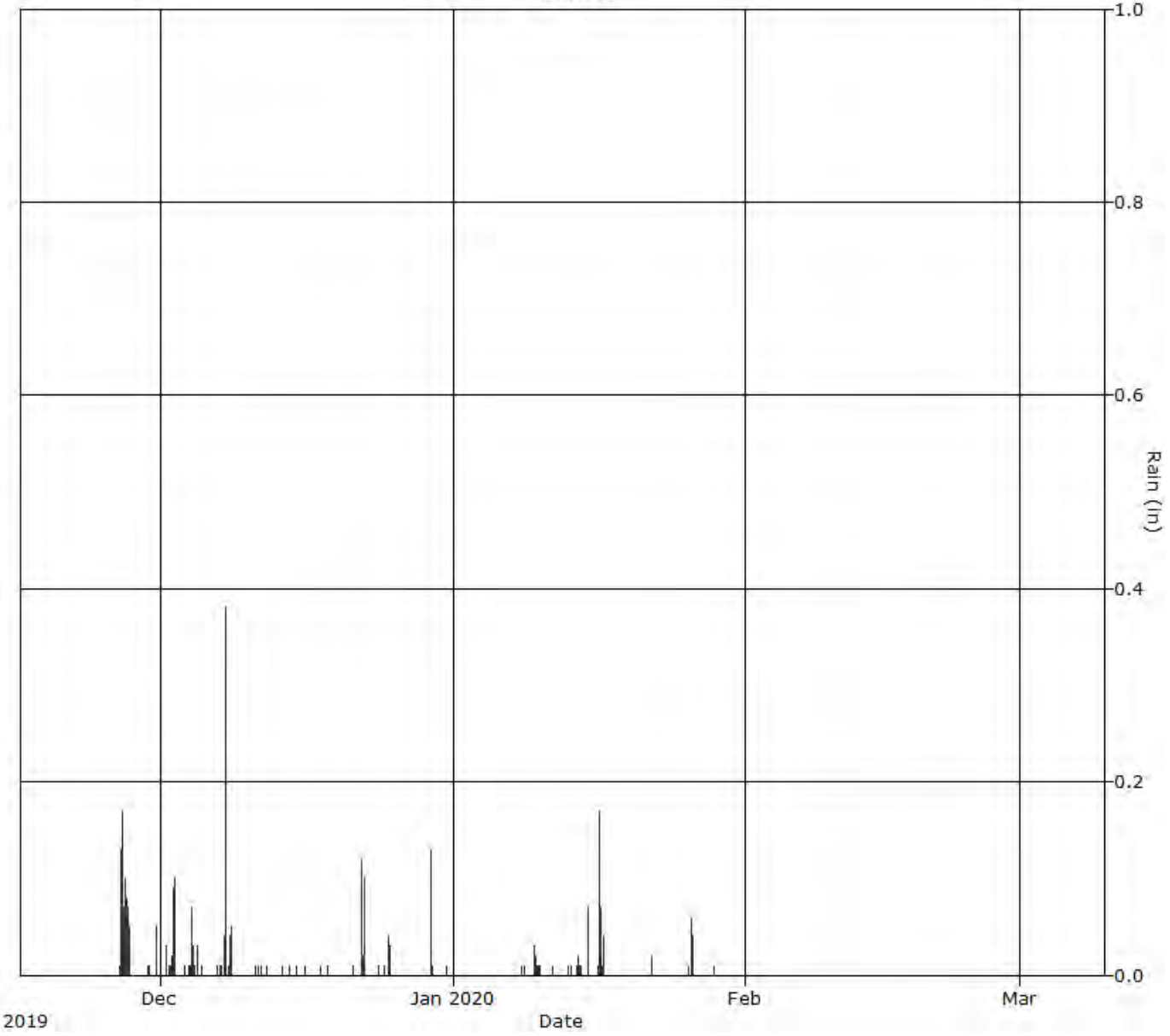


Report Period

11/16/2019
To
3/9/2020

Legend

Rain



ADS ENVIRONMENTAL SERVICES

Daily Tabular Report

Date	Depth (in)					Velocity (ft/s)					Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
11/16/2019																	
11/17/2019																	
11/18/2019																	
11/19/2019																	
11/20/2019																	
11/21/2019																	
11/22/2019																	
11/23/2019																	
11/24/2019																	
11/25/2019																	
11/26/2019																	0.36
11/27/2019																	0.63
11/28/2019																	
11/29/2019																	0.02
11/30/2019																	0.10
12/01/2019																	0.06
12/02/2019																	0.30
12/03/2019																	0.01
12/04/2019																	0.39
12/05/2019																	0.01
12/06/2019																	0.01
12/07/2019																	0.67
12/08/2019																	0.20
12/09/2019																	
12/10/2019																	
12/11/2019																	0.03
12/12/2019																	0.01
12/13/2019																	0.01
12/14/2019																	0.01
12/15/2019																	0.01
12/16/2019																	0.01
12/17/2019																	0.01
12/18/2019																	0.01
12/19/2019																	
12/20/2019																	
12/21/2019																	0.01
12/22/2019																	0.41
12/23/2019																	
12/24/2019																	0.02
12/25/2019																	0.08
12/26/2019																	
12/27/2019																	
12/28/2019																	
12/29/2019																	0.22
12/30/2019																	
12/31/2019																	0.01

Date	Depth (in)					Velocity (ft/s)					Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
01/01/2020																	
01/02/2020																	
01/03/2020																	
01/04/2020																	
01/05/2020																	
01/06/2020																	
01/07/2020																	
01/08/2020																	0.02
01/09/2020																	0.18
01/10/2020																	0.02
01/11/2020																	0.01
01/12/2020																	
01/13/2020																	0.02
01/14/2020																	0.11
01/15/2020																	0.07
01/16/2020																	0.66
01/17/2020																	
01/18/2020																	
01/19/2020																	
01/20/2020																	
01/21/2020																	
01/22/2020																	0.03
01/23/2020																	
01/24/2020																	
01/25/2020																	
01/26/2020																	0.16
01/27/2020																	
01/28/2020																	0.01
01/29/2020																	
01/30/2020																	
01/31/2020																	
02/01/2020																	
02/02/2020																	
02/03/2020																	
02/04/2020																	
02/05/2020																	
02/06/2020																	
02/07/2020																	
02/08/2020																	
02/09/2020																	
02/10/2020																	
02/11/2020																	
02/12/2020																	
02/13/2020																	
02/14/2020																	
02/15/2020																	
02/16/2020																	
02/17/2020																	
02/18/2020																	
02/19/2020																	
02/20/2020																	
02/21/2020																	
02/22/2020																	
02/23/2020																	
02/24/2020																	

Date	Depth (in)					Velocity (ft/s)					Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
02/25/2020																	
02/26/2020																	
02/27/2020																	
02/28/2020																	
02/29/2020																	
03/01/2020																	
03/02/2020																	
03/03/2020																	
03/04/2020																	
03/05/2020																	
03/06/2020																	
03/07/2020																	
03/08/2020																	
03/09/2020																	

Report Summary For The Period 11/16/2019 00:00 - 03/09/2020 23:59

	Rain (in)
Total	4.90
Avg	

Rainfall data

MIL_RG02	
Rain Collector Dimensions	8"

The rainfall measured at MIL_RG02 from November 16, 2019 to March 09, 2020 is 5.26 inches.

Milpitas Temp Study 2019-20

Flow Monitoring Site Report

ADS ENVIRONMENTAL SERVICES®

Site Name

MIL_RG02

Site Address /Location:	1328 Tularcitos Drive, Milpitas, CA			Monitor Series	Location Type
				Rain Alert III	Temporary
Site Access Details:	DRIVE.	Latitude:	37.455939°	Pipe Size (H x W)	Pipe Shape
		Longitude:	-121.875253°		



Manhole #	System Characteristics
	Commercial
Access	Traffic
Drive	Light







Installation Information

Installation Date:	Installation Type:
Friday, November 15, 2019	Rain Gauge
Monitoring Location (Sensors):	Monitor Location:
Field	Building
Sensors / Devices:	Pressure Sensor Range (psi)
Rain Gauge Tipping Bucket	

Installation Confirmation:

Confirmation Time:	Pipe Size (HxW)
1:30:00 AM	
Depth of Flow (Wet DOF) (in)	Range (Air DOF) (in)
Downlooker Physical Offset (in)	Measurement Confidence (in)
NA	
Peak Velocity (fps)	Velocity Sensor Offset (in)
	0''
Silt (in)	Silt Type
0.0"	

Hydraulic Comments:

Manhole / Pipe Information:

Manhole Depth (Approx. FT):	Manhole Configuration
	Single
Manhole Material:	Manhole Condition:
Concrete	Good
Manhole Opening Diameter (in)	Manhole Diameter (Approx.):
26''	54''
Manhole Cover	Manhole Frame
Active Drop Connections	Air Quality:
No	Normal
Pipe Material	Pipe Condition:
Concrete	

Communication Information:

Communication Type	Antenna Location
Wireless	

Additional Site Info. / Comments:

Tularcitos Pump Station. Needs passcode and key.

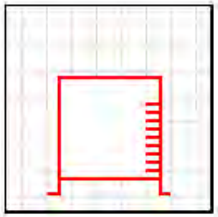
ADS Project Name:	Milpitas.WWTFM.CA2019-2020
ADS Project Number:	22431.11.325

HYDROGRAPH REPORT

MIL_RG02

Rain Gauge

MIL_RG02

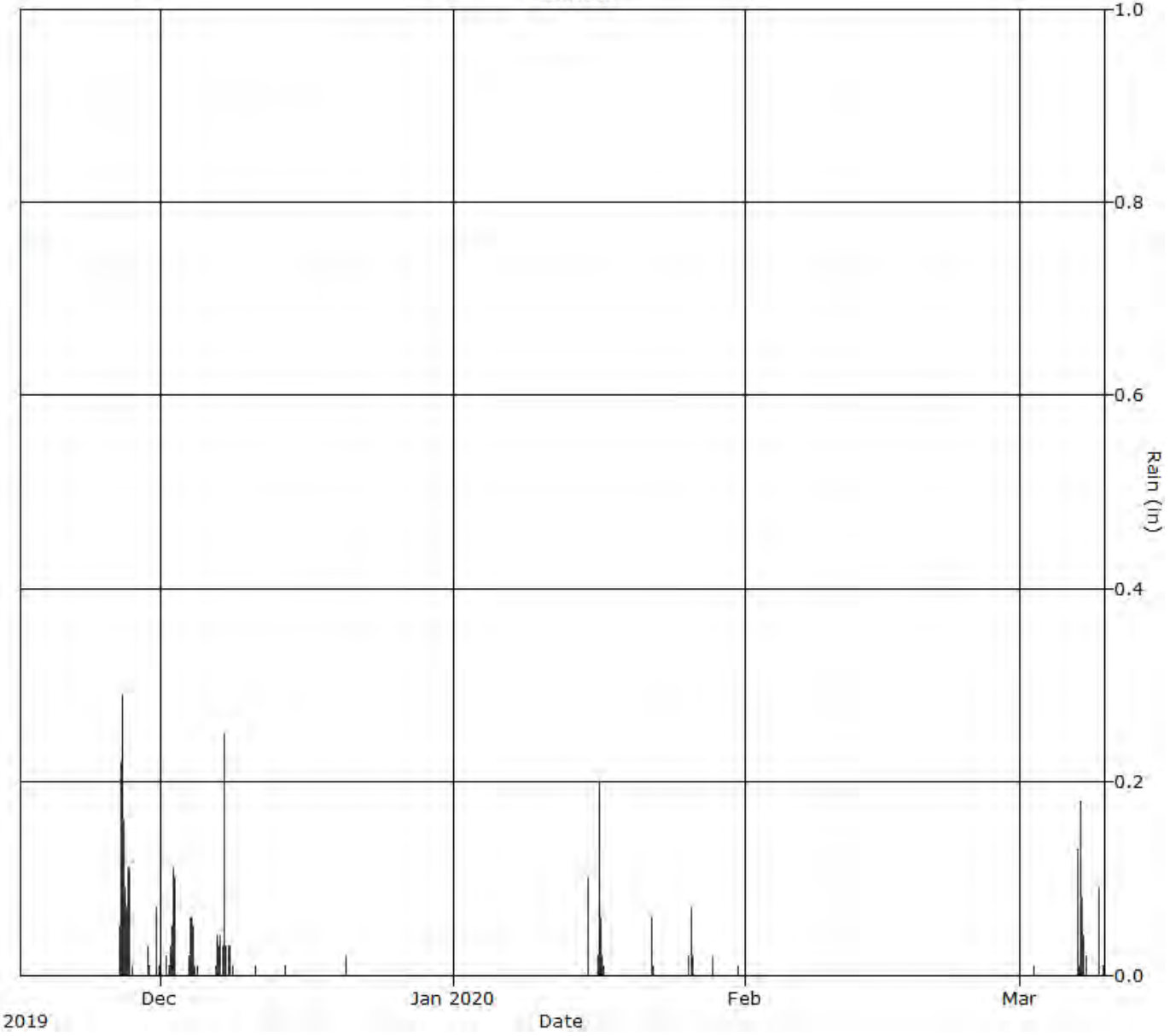


Report Period

11/16/2019
To
3/9/2020

Legend

Rain



ADS ENVIRONMENTAL SERVICES

Daily Tabular Report

Date	Depth (in)					Velocity (ft/s)					Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
11/16/2019																	
11/17/2019																	
11/18/2019																	
11/19/2019																	
11/20/2019																	
11/21/2019																	
11/22/2019																	
11/23/2019																	
11/24/2019																	
11/25/2019																	
11/26/2019																	0.63
11/27/2019																	0.77
11/28/2019																	
11/29/2019																	0.05
11/30/2019																	0.14
12/01/2019																	0.06
12/02/2019																	0.36
12/03/2019																	
12/04/2019																	0.44
12/05/2019																	
12/06/2019																	0.06
12/07/2019																	0.84
12/08/2019																	0.10
12/09/2019																	
12/10/2019																	0.01
12/11/2019																	0.00
12/12/2019																	
12/13/2019																	
12/14/2019																	0.01
12/15/2019																	
12/16/2019																	
12/17/2019																	
12/18/2019																	
12/19/2019																	
12/20/2019																	0.02
12/21/2019																	
12/22/2019																	
12/23/2019																	
12/24/2019																	
12/25/2019																	
12/26/2019																	
12/27/2019																	
12/28/2019																	
12/29/2019																	
12/30/2019																	
12/31/2019																	

Date	Depth (in)					Velocity (ft/s)					Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
01/01/2020																	
01/02/2020																	
01/03/2020																	
01/04/2020																	
01/05/2020																	
01/06/2020																	
01/07/2020																	
01/08/2020																	
01/09/2020																	
01/10/2020																	
01/11/2020																	
01/12/2020																	
01/13/2020																	
01/14/2020																	
01/15/2020																	0.10
01/16/2020																	0.66
01/17/2020																	
01/18/2020																	
01/19/2020																	
01/20/2020																	
01/21/2020																	0.01
01/22/2020																	0.09
01/23/2020																	
01/24/2020																	
01/25/2020																	
01/26/2020																	0.16
01/27/2020																	
01/28/2020																	0.02
01/29/2020																	
01/30/2020																	
01/31/2020																	0.01
02/01/2020																	
02/02/2020																	
02/03/2020																	
02/04/2020																	
02/05/2020																	
02/06/2020																	
02/07/2020																	
02/08/2020																	
02/09/2020																	
02/10/2020																	
02/11/2020																	
02/12/2020																	
02/13/2020																	
02/14/2020																	
02/15/2020																	
02/16/2020																	
02/17/2020																	
02/18/2020																	
02/19/2020																	
02/20/2020																	
02/21/2020																	
02/22/2020																	
02/23/2020																	
02/24/2020																	

Date	Depth (in)					Velocity (ft/s)					Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
02/25/2020																	
02/26/2020																	
02/27/2020																	
02/28/2020																	
02/29/2020																	
03/01/2020																	
03/02/2020																	0.01
03/03/2020																	
03/04/2020																	
03/05/2020																	
03/06/2020																	
03/07/2020																	0.58
03/08/2020																	0.02
03/09/2020																	0.11

Report Summary For The Period 11/16/2019 00:00 - 03/09/2020 23:59

	Rain (in)
Total	5.26
Avg	

APPENDIX C

City of Milpitas
Sewer Master Plan Study
Summary of GIS Updates

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GIS Updates

The City provided their most up-to-date records of the wastewater collection system as an ArcGIS geodatabase (GIS) as well as a hard-drive containing most of the record drawings on file. The GIS had not been updated with any recent CIP projects implemented since the last model update in 2009. The City also provided a spreadsheet listing all of the record drawings and designating them as one of the following seven categories:

1. Category 1: Pre-2002, DWG # is not referenced on GIS, plat sheet # has been identified;
2. Category 2: Pre-2002, DWG # is referenced on GIS, plat sheet # has not been identified;
3. Category 3: Pre-2002, DWG # is not referenced on GIS, plat sheet # has not been identified;
4. Category 4: Post-2002, DWG # is referenced on GIS, plat sheet # has not been identified;
5. Category 5: Post-2002, DWG # is referenced on GIS, plat sheet # has been identified;
6. Category 6: Post-2002, DWG # is not referenced on GIS, plat sheet # has been identified, alignment not drawn in GIS; and
7. Category 7: Post-2002, No utility improvements but existing utilities shown on plan for reference.

Based on these categories, the following drawing reviews were completed to update the GIS:

1. All category 1, 4, and 5 record drawings, along with many category 2 record drawings, were reviewed and updates were made where there was missing information;
2. All available category 3 record drawings were reviewed, but none of the available drawings had any sanitary sewer pipe information;
3. All category 6 record drawings were reviewed and new alignments were added;
4. Benchmark and/or datum information found on each reviewed drawing was recorded or it was noted if there was no information.

Based on the review of the abovementioned record drawings, the following information was added to or updated in the GIS:

1. Pipe GIS updates:
    - Material, diameter, upstream and downstream invert elevations, measured length, slope, year built, and drawing number were updated where information was found in the set of available record drawings;
    - The actual length was also calculated using one dimensional horizontal distance calculator in ArcGIS once all updates were complete;
    - Where siphons are located throughout the system, “siphon” was listed in the “slope” field;
    - All existing pipe segments with the material “High Density Polyurethane” were changed to “HDPE” for consistency with the rest of the system;
    - In cases where the pipe material was not specified on the drawing, but it was listed in the notes that all sanitary sewer pipes on this drawing should be, for example, “VCP or ABS or other approved material,” the material was listed as “VCP/ABS”;
    - Where the material was listed as “SS” or “SSP” and no material was listed in the record drawings, these were left as “SS” or “SSP.” When referring to pipe material, these

acronyms often represent stainless steel pipe; however, for a gravity collection system, it is assumed that these are simply to indicate that the pipelines are “sanitary sewer” and are not a representation of the pipe material;

- An attribute column titled “HSE_NOTES” was added for tracking notes and edits made to the pipeline GIS file. Notes were standardized to the extent possible for streamlined sorting. Notes indicated in that column include the following:
  - If a drawing indicated that a liner was added to an existing pipe or the pipe was rehabilitated, the year built was updated to indicate the year the liner was added or the rehab was completed, and “UPDT_YR(NEWLINER)” or “UPDT_YR(REHAB)” was added;
  - Abandoned pipes were labeled “ABANDONED”;
  - New pipes were labeled “ADDED_SEGMENT”;
  - Pipes that were already in GIS but were indicated as private on record drawings were labeled “PRIVATE”;

2. Manhole GIS updates:
   - Rim elevation, year of installation, and drawing number were updated where available;
   - Manhole invert elevations were not typically available on record drawings and were not prioritized;
   - An attribute column titled “HSE_NOTES” was also added for tracking notes and edits made to the manhole GIS file. Notes indicated in that column include the following:
     - Abandoned and floating manholes were labeled “ABANDONED” or “DISCONNECTED,” respectively;
     - New manholes were labeled “ADDED_MH”;
3. Two of the fields included in the attributes table for both the pipeline and manhole GIS files are DRAWINGNO (drawing number) and UPDTSRC (update source). The DRAWINGNO was reserved for the original utility construction drawing. The UPDTSRC field indicated the drawing number for updates made during our review and generally referred to record drawings of new facilities that might show the facility as “existing.”

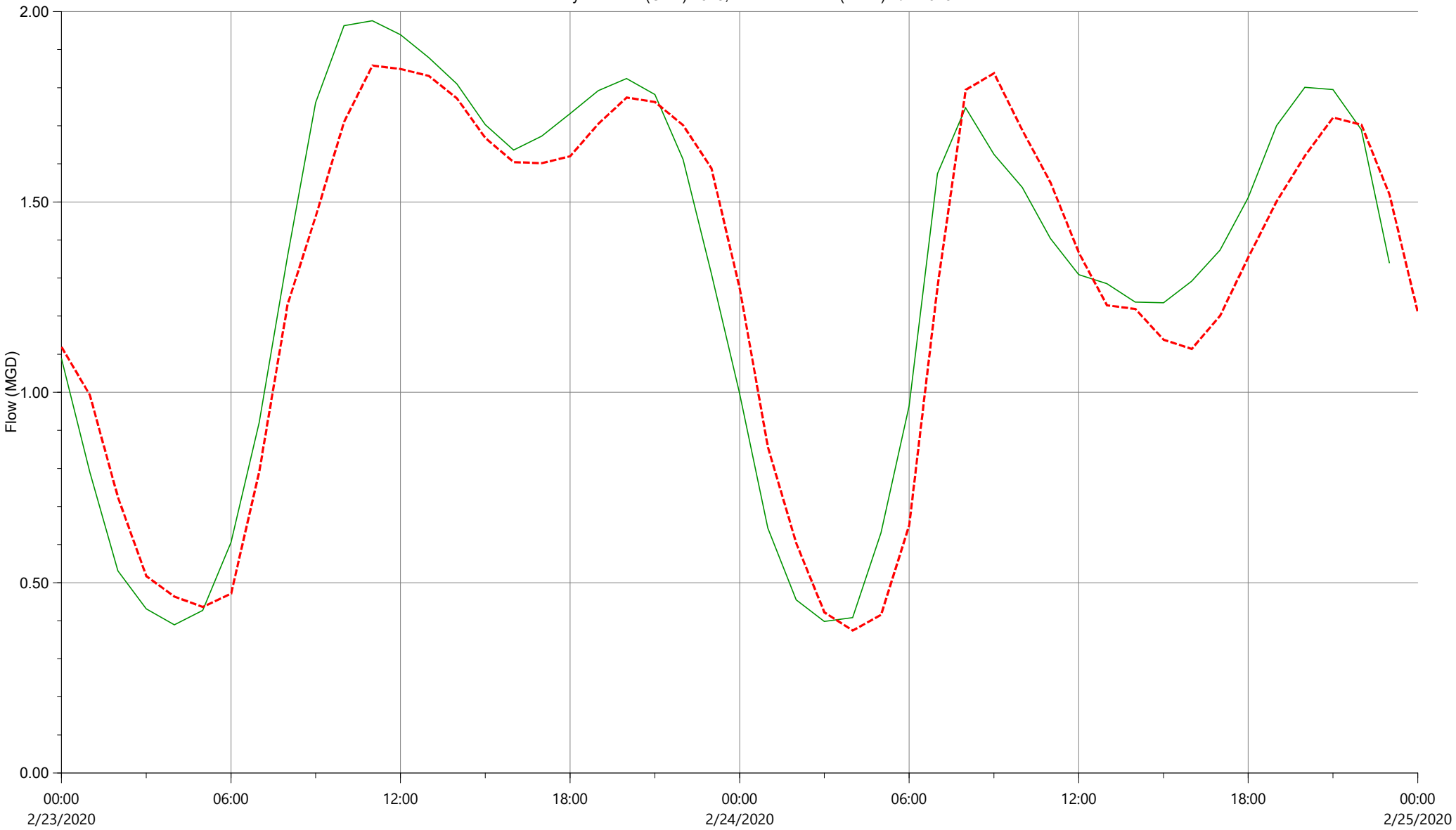
During the GIS update process, the update of model information for areas containing either flow splits or where critical information, such as pipe diameter, material, invert elevations, and year built, was missing was prioritized.

APPENDIX D

City of Milpitas
Sewer Master Plan Study
Dry Weather Calibration Charts

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Flow Survey Location (Obs.) 1043, Model Location (Pred.) D/S 1043.1

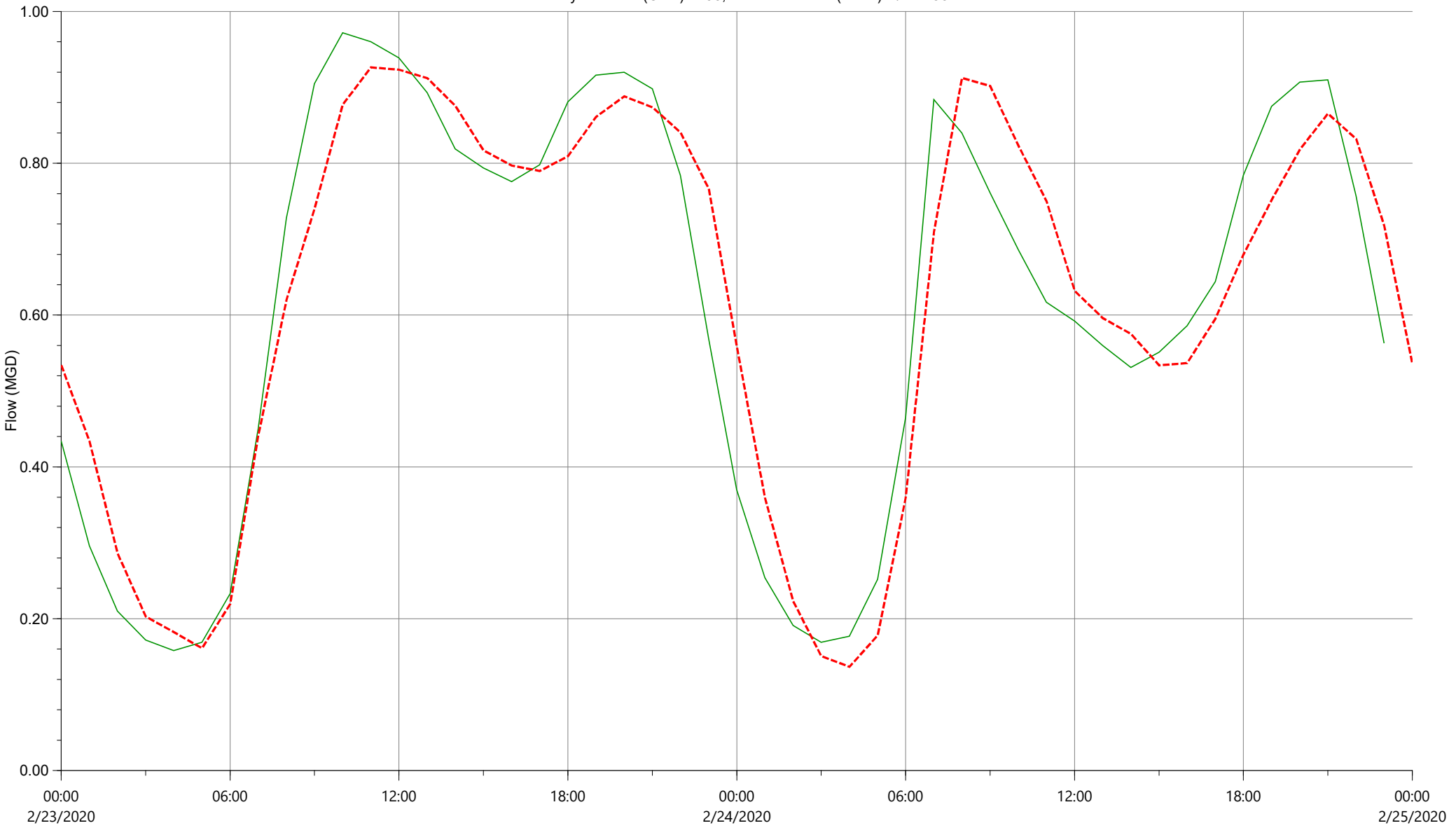


	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.389	1.976	2.570
Model	0.374	1.858	2.572

Observed / Predicted Report (Custom graph) - DWF Calibration FINAL

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Flow Survey Location (Obs.) 1193, Model Location (Pred.) D/S 1193.1

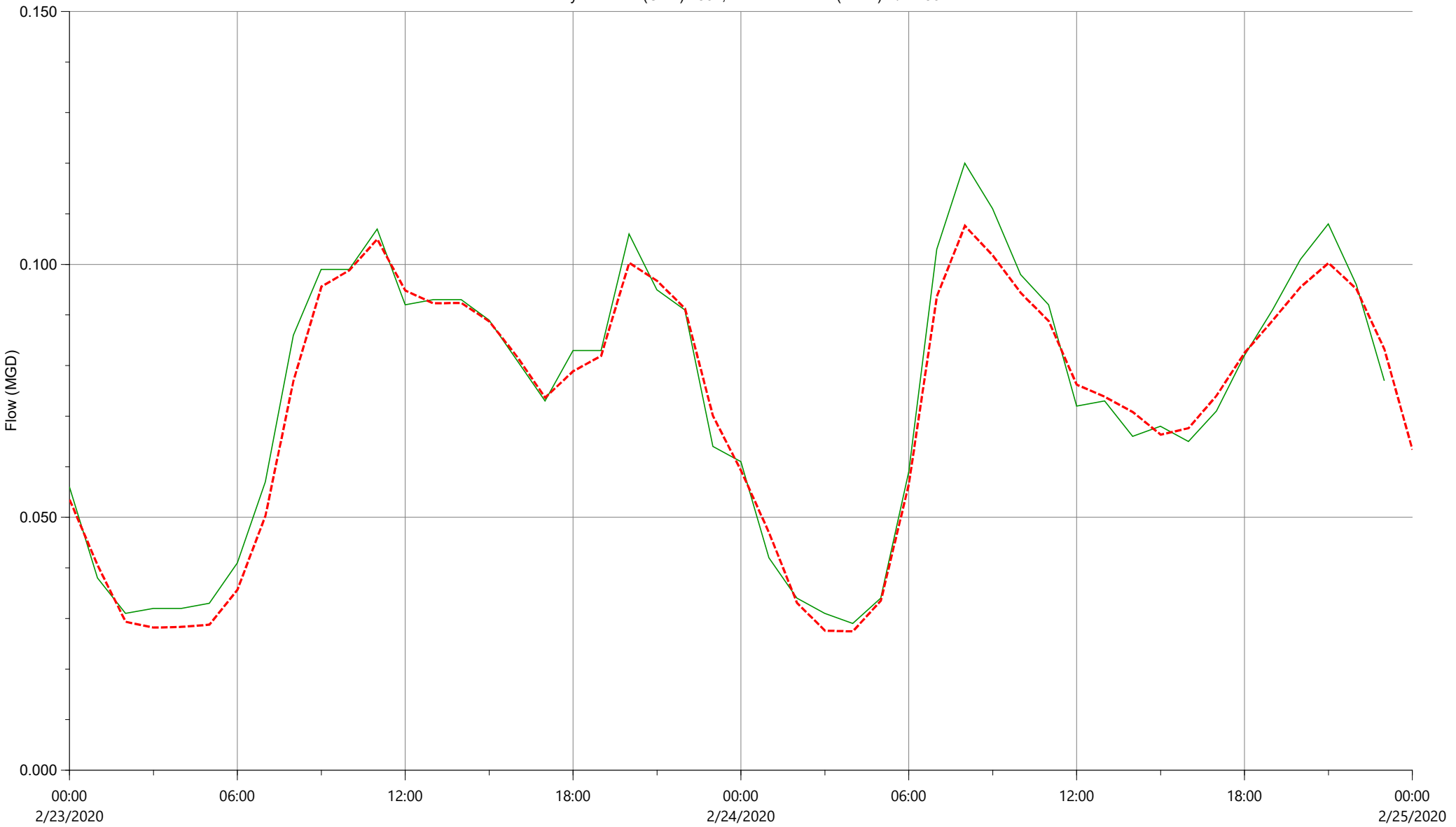


	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.158	0.972	1.213
Model	0.137	0.926	1.249

Observed / Predicted Report (Custom graph) - DWF Calibration FINAL

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Flow Survey Location (Obs.) 1564, Model Location (Pred.) D/S 1564.1

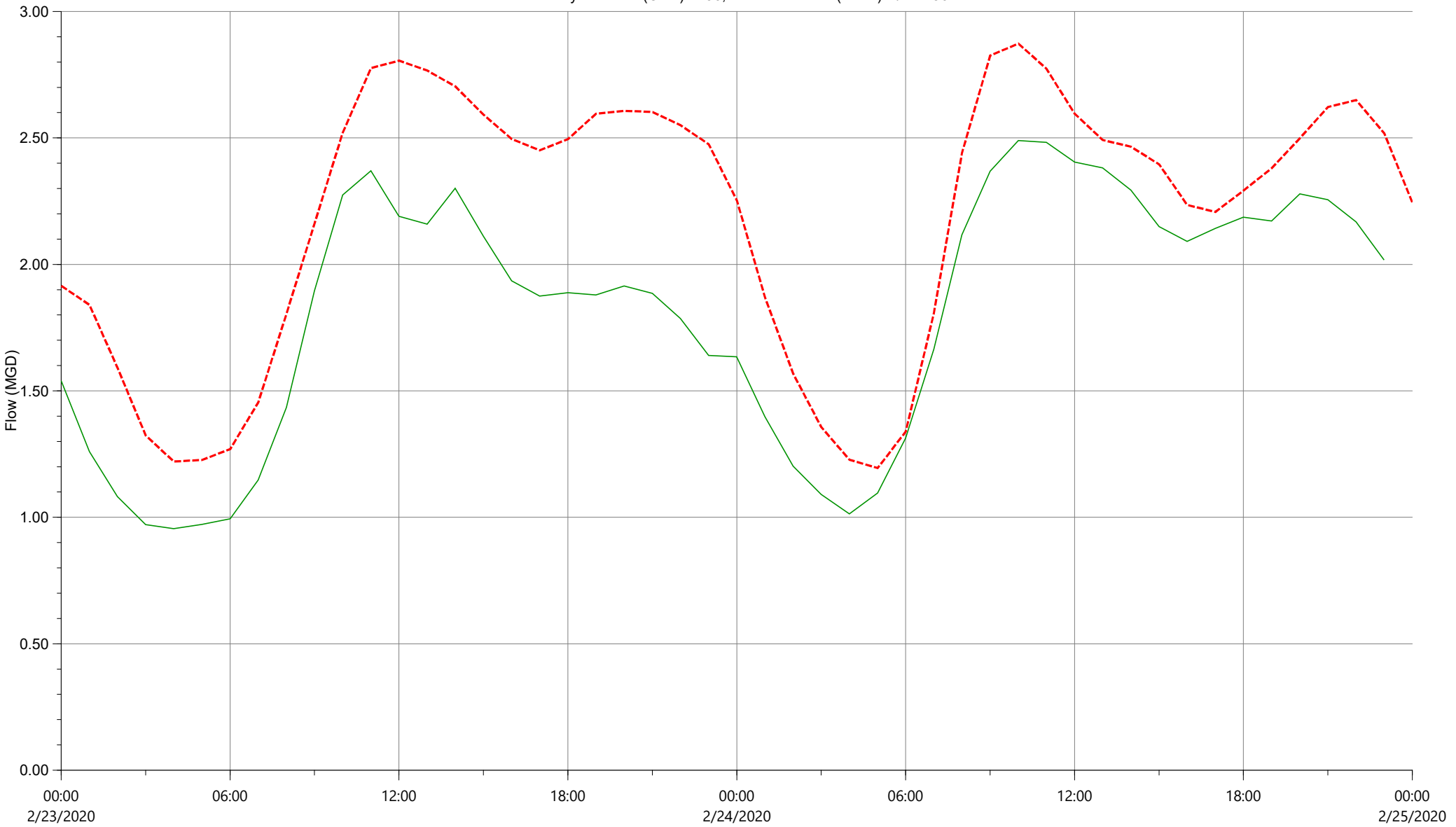


	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.029	0.120	0.145
Model	0.027	0.108	0.144

Observed / Predicted Report (Custom graph) - DWF Calibration FINAL

Powered by InfoWorks®

Flow Survey Location (Obs.) 1790, Model Location (Pred.) D/S 1790.1

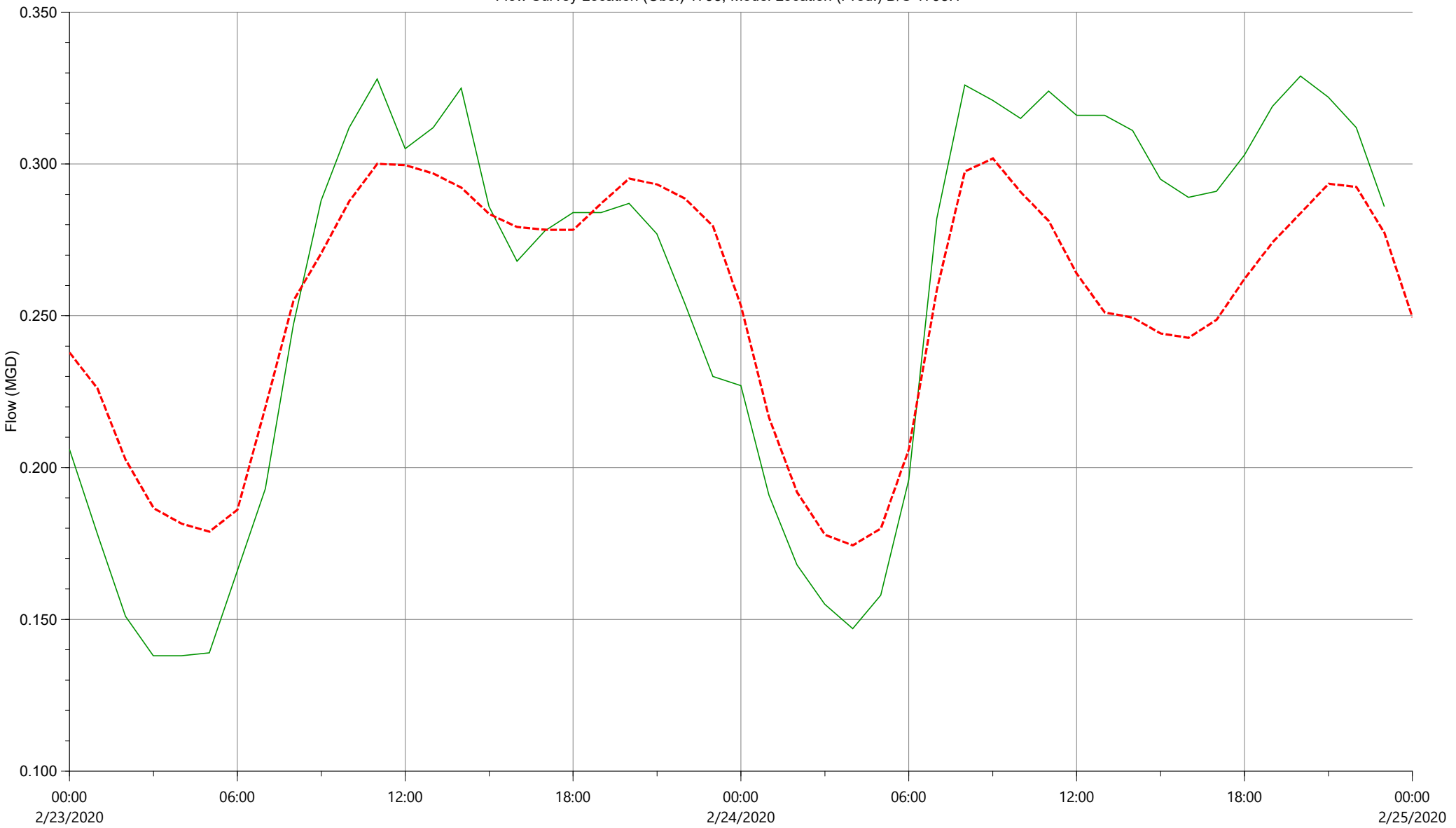


	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.955	2.490	3.546
Model	1.196	2.874	4.388

Observed / Predicted Report (Custom graph) - DWF Calibration FINAL

Powered by InfoWorks®

Flow Survey Location (Obs.) 1795, Model Location (Pred.) D/S 1795.1

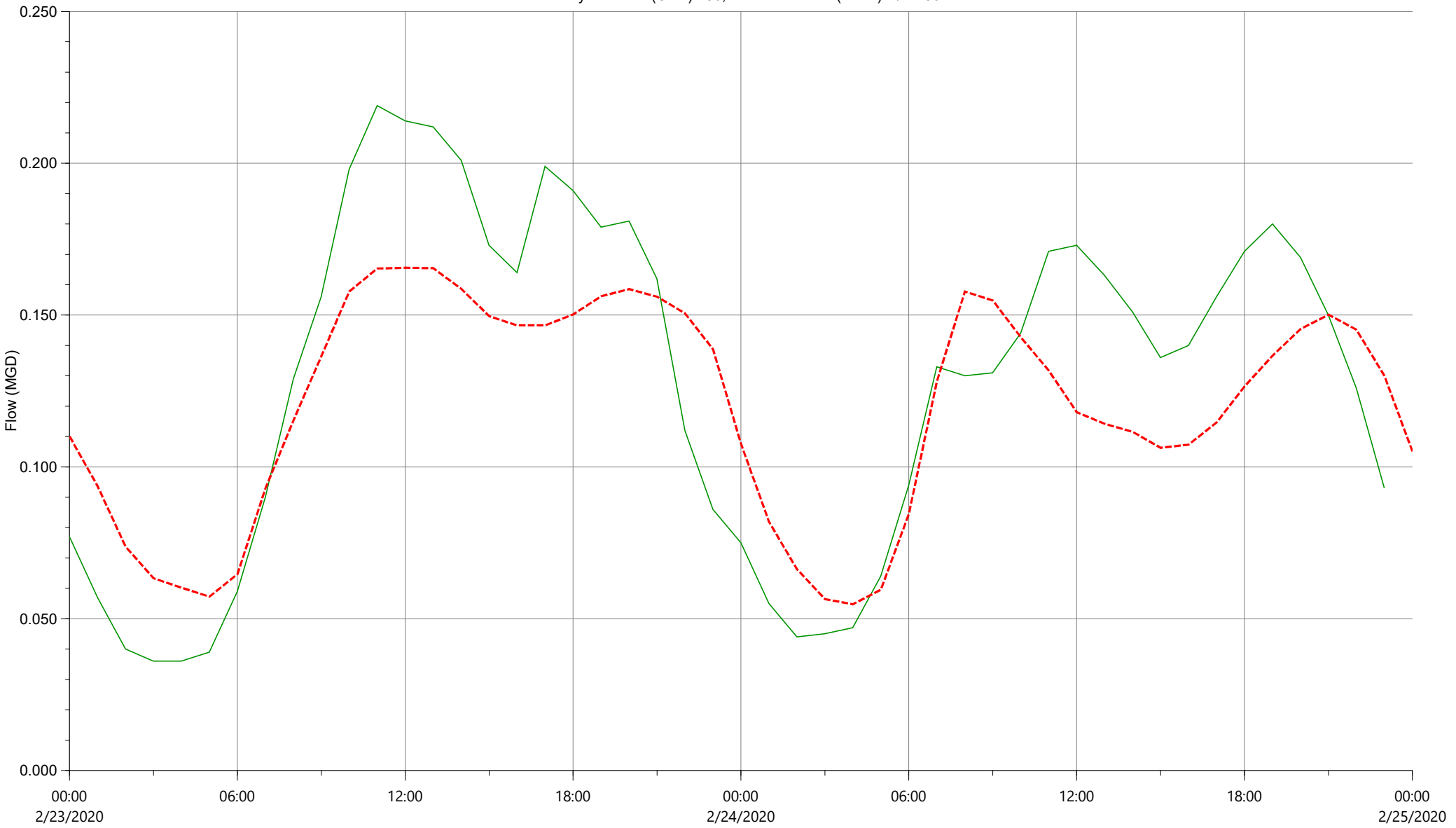


	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.138	0.329	0.505
Model	0.174	0.302	0.509

Observed / Predicted Report (Custom graph) - DWF Calibration FINAL

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Flow Survey Location (Obs.) 186, Model Location (Pred.) D/S 186.1

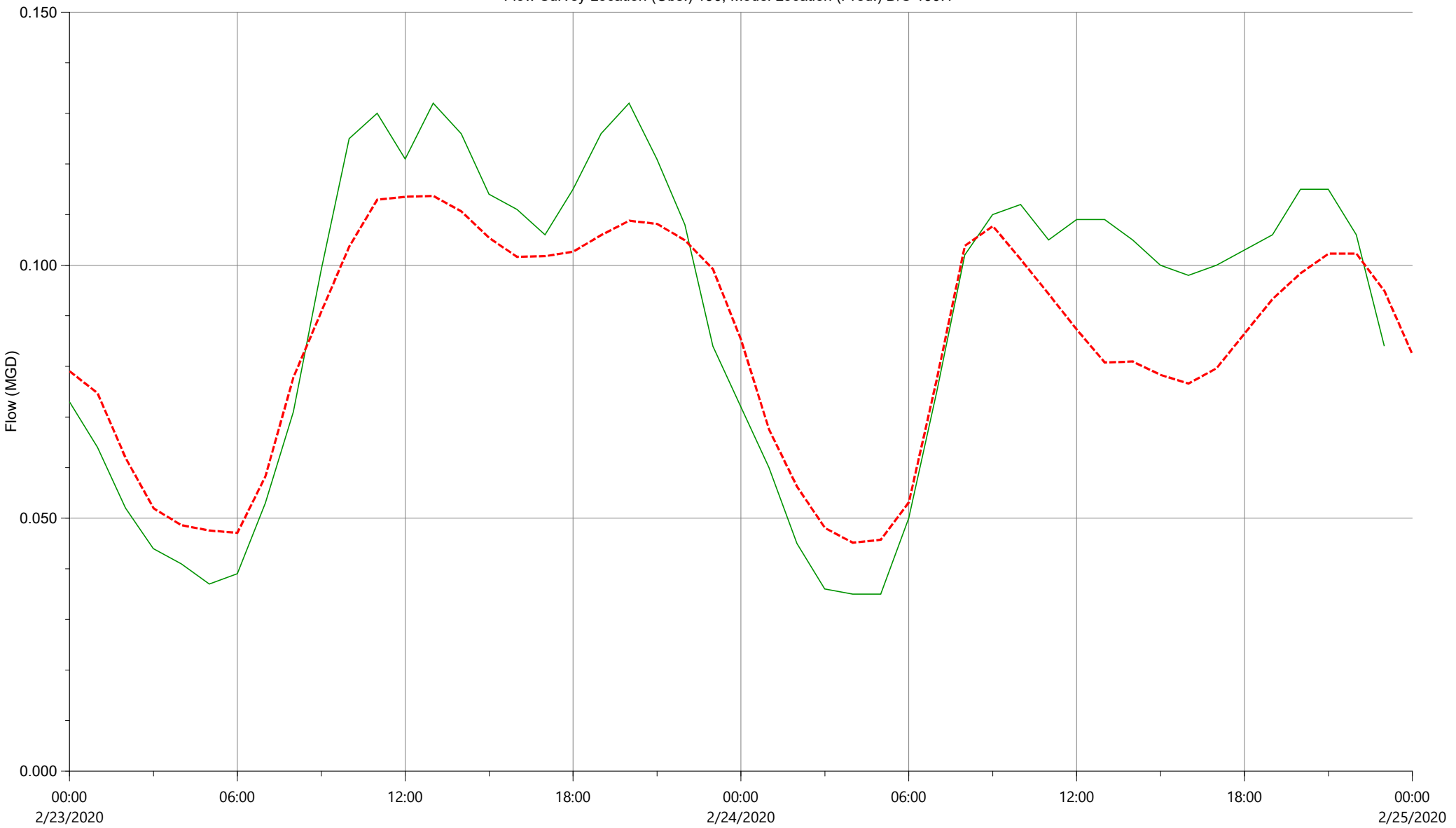


	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.036	0.219	0.253
Model	0.055	0.166	0.240

Observed / Predicted Report (Custom graph) - DWF Calibration FINAL

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Flow Survey Location (Obs.) 190, Model Location (Pred.) D/S 190.1

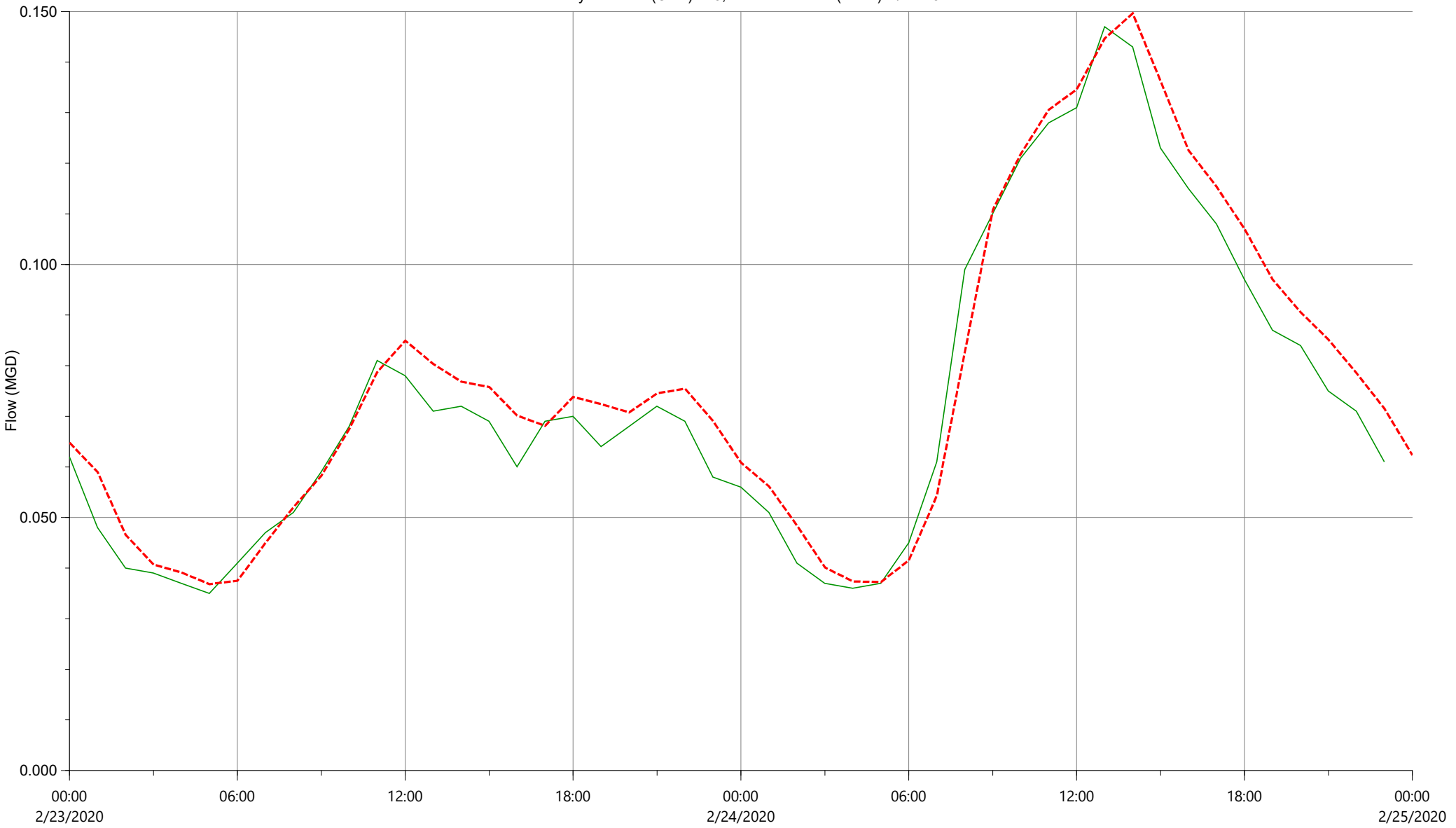


	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.035	0.132	0.176
Model	0.045	0.114	0.170

Observed / Predicted Report (Custom graph) - DWF Calibration FINAL

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Flow Survey Location (Obs.) 229, Model Location (Pred.) D/S 229.1

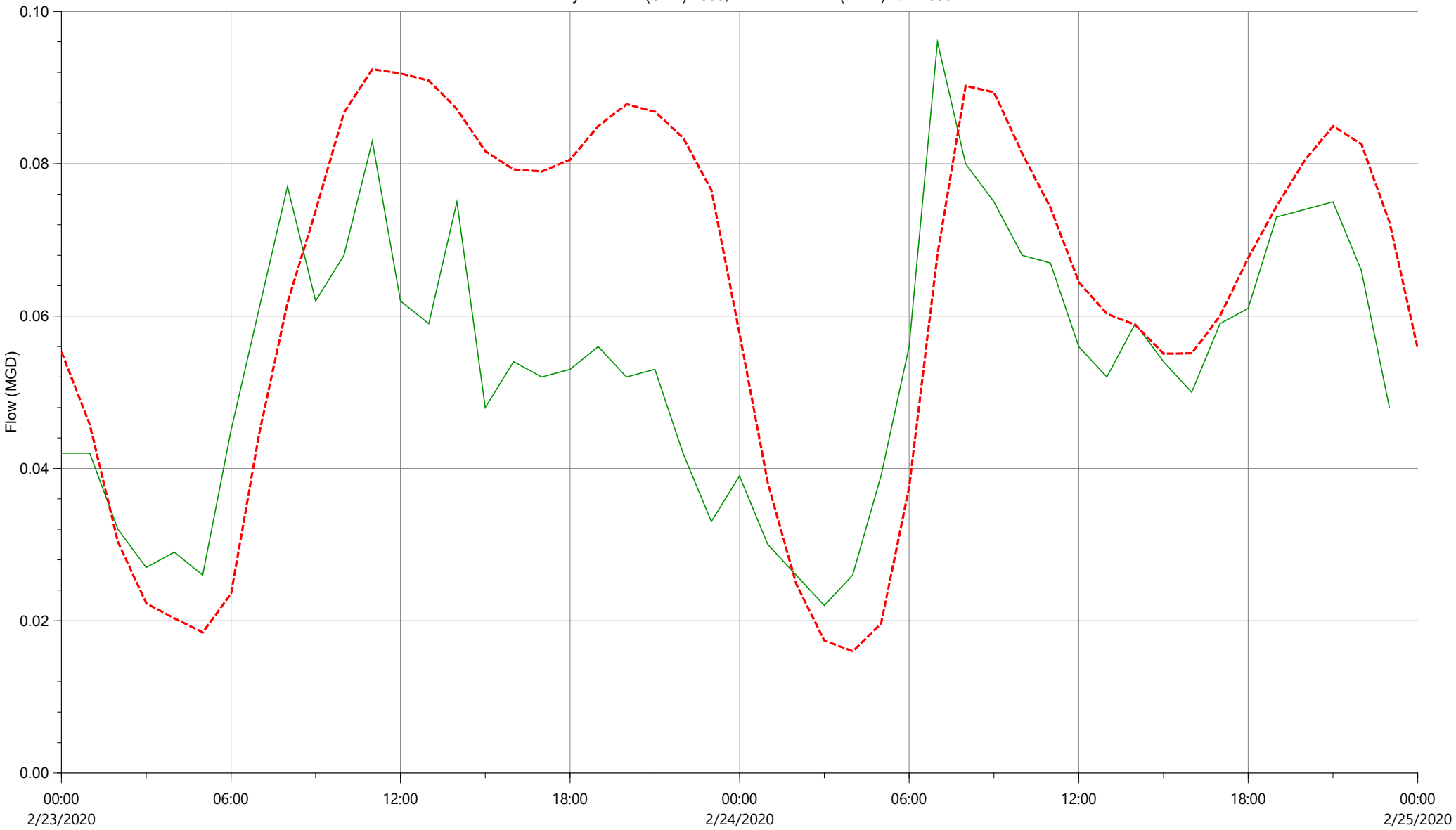


	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.035	0.147	0.143
Model	0.037	0.150	0.153

Observed / Predicted Report (Custom graph) - DWF Calibration FINAL

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Flow Survey Location (Obs.) 2300, Model Location (Pred.) D/S 2300.1

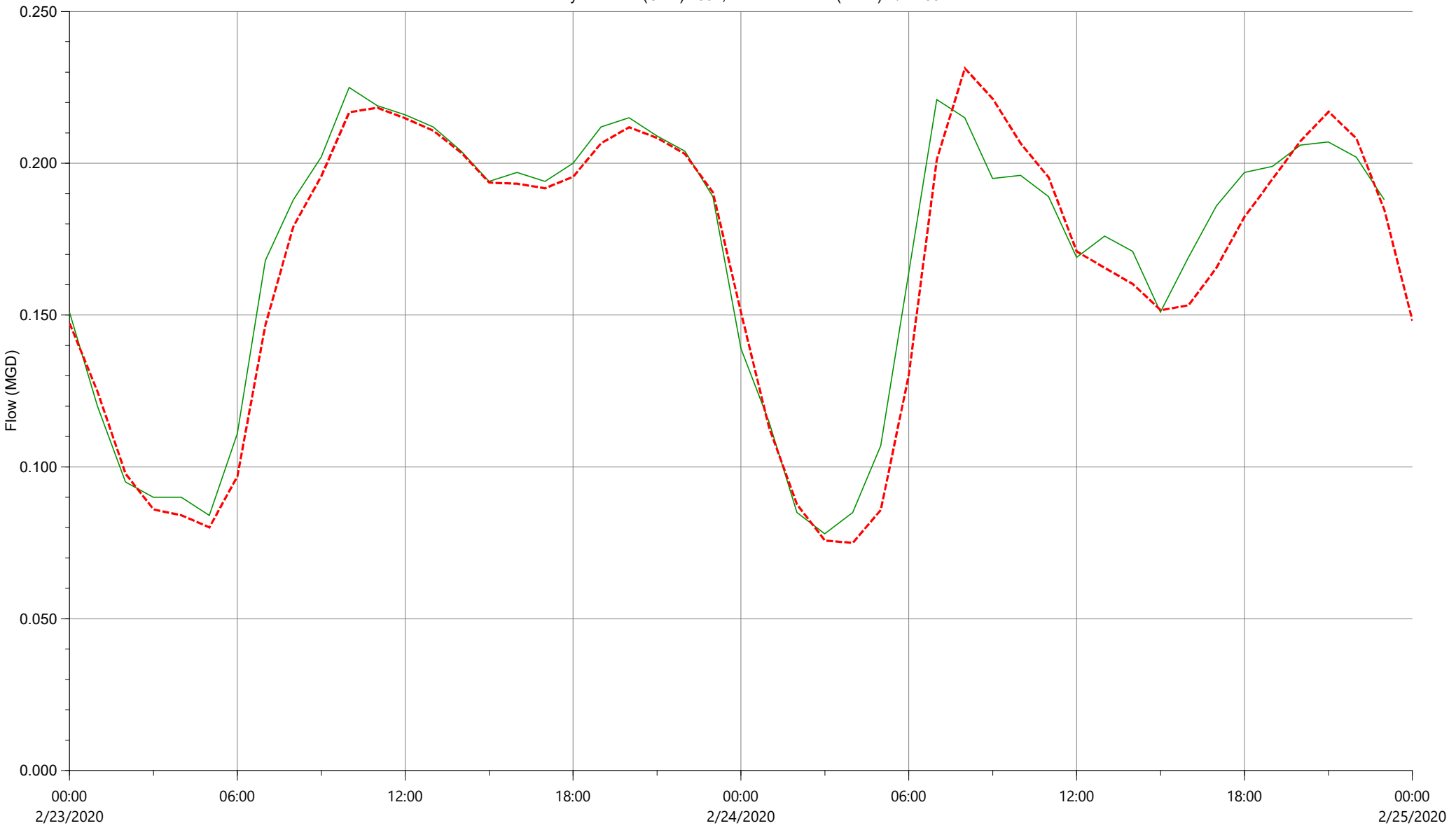


	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.022	0.096	0.106
Model	0.016	0.092	0.126

Observed / Predicted Report (Custom graph) - DWF Calibration FINAL

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Flow Survey Location (Obs.) 2334, Model Location (Pred.) D/S 2334.1

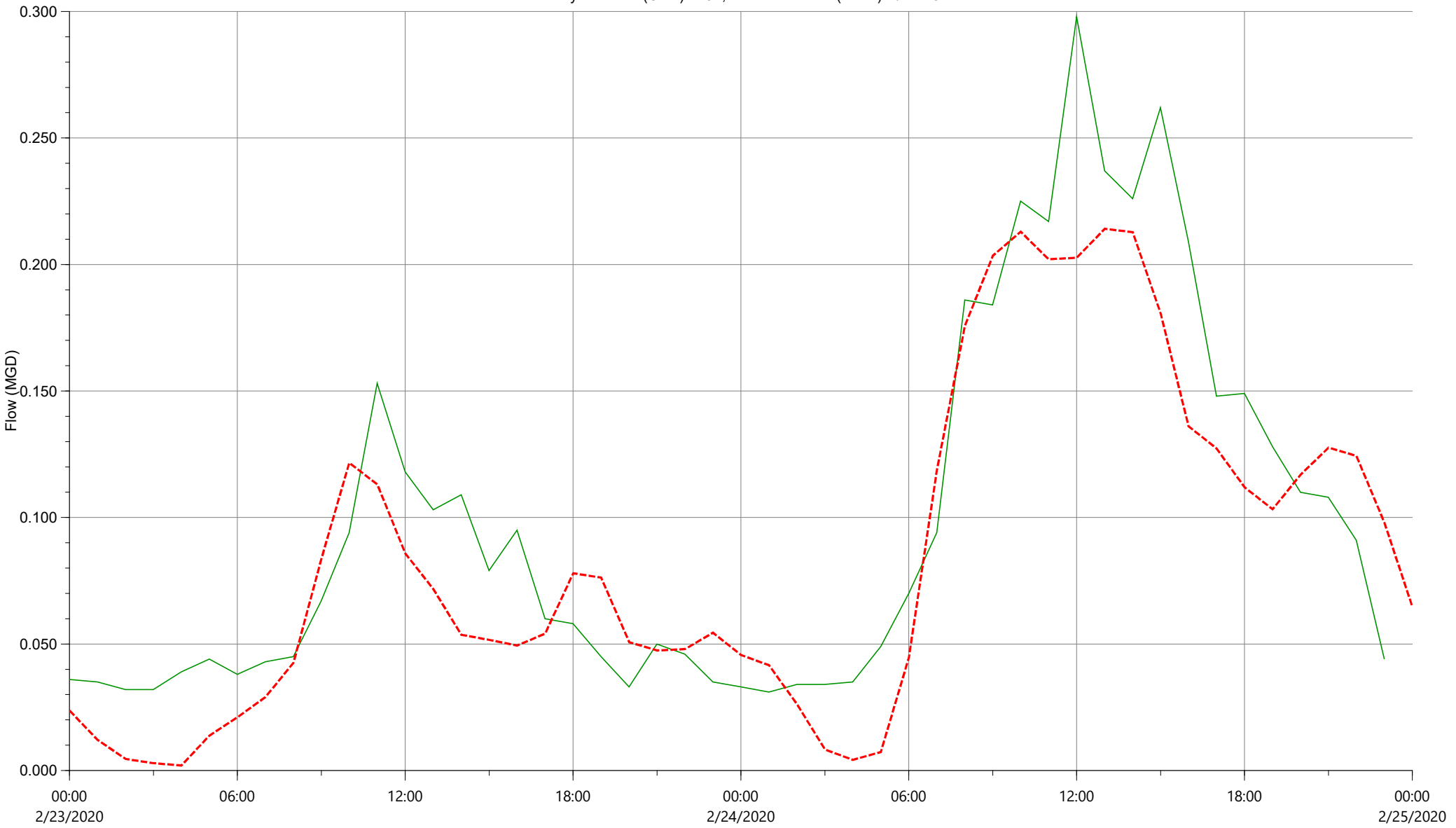


	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.078	0.225	0.335
Model	0.075	0.231	0.335

Observed / Predicted Report (Custom graph) - DWF Calibration FINAL

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Flow Survey Location (Obs.) 2491, Model Location (Pred.) D/S 2491.1

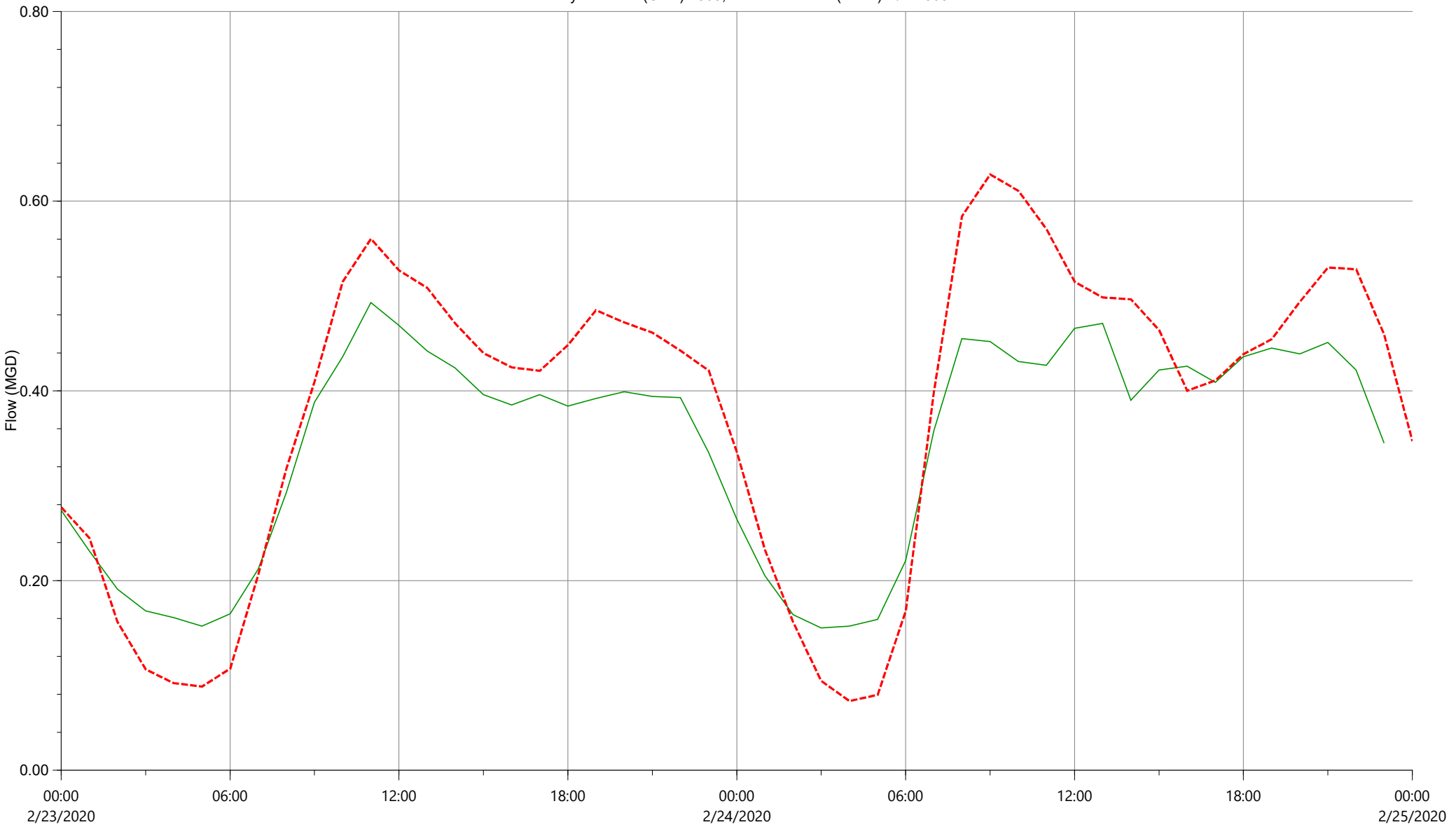


	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.031	0.298	0.194
Model	0.002	0.214	0.169

Observed / Predicted Report (Custom graph) - DWF Calibration FINAL

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Flow Survey Location (Obs.) 2569, Model Location (Pred.) D/S 2569.1

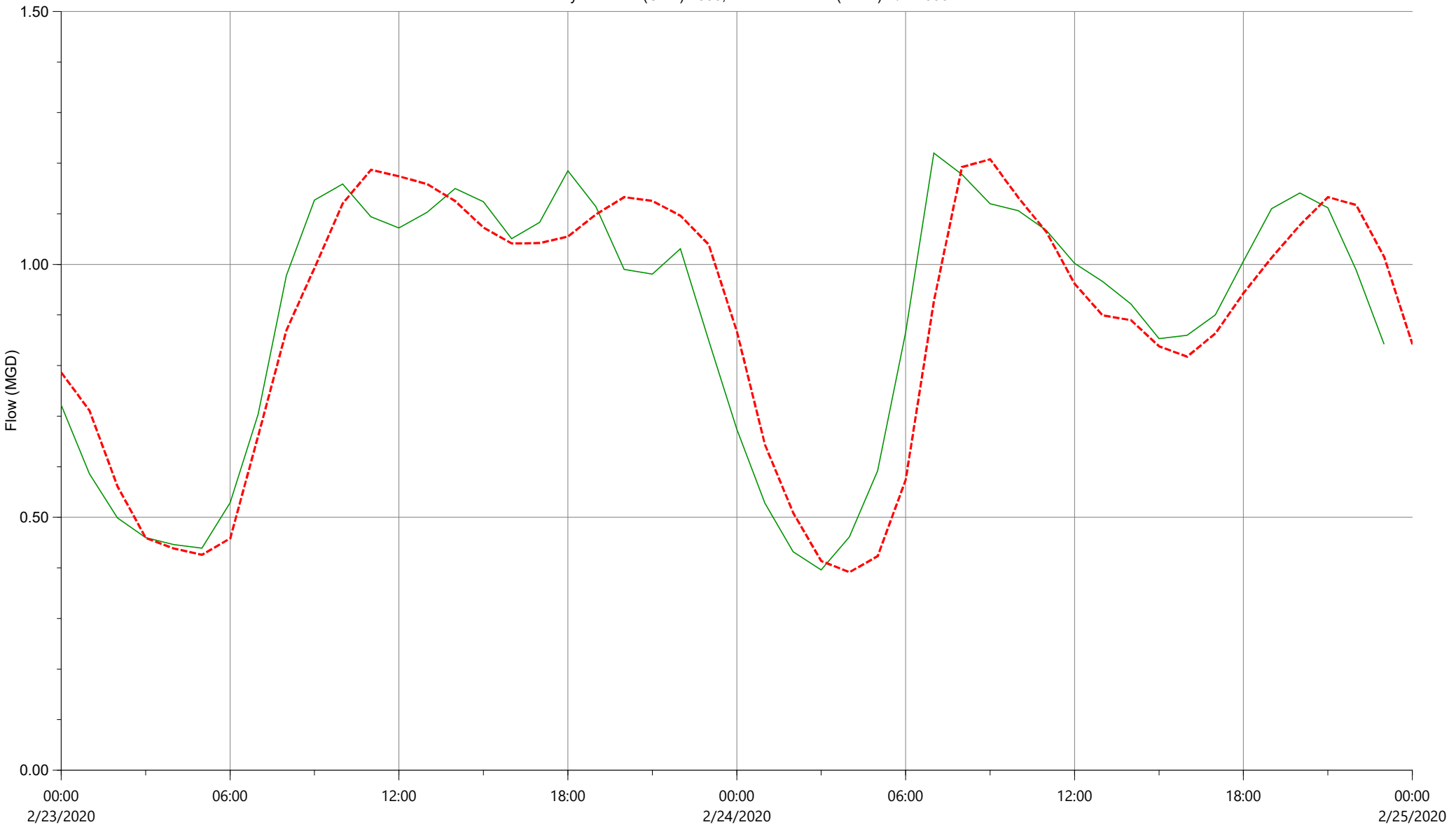


	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.150	0.493	0.676
Model	0.073	0.628	0.761

Observed / Predicted Report (Custom graph) - DWF Calibration FINAL

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Flow Survey Location (Obs.) 2666, Model Location (Pred.) D/S 2666.1

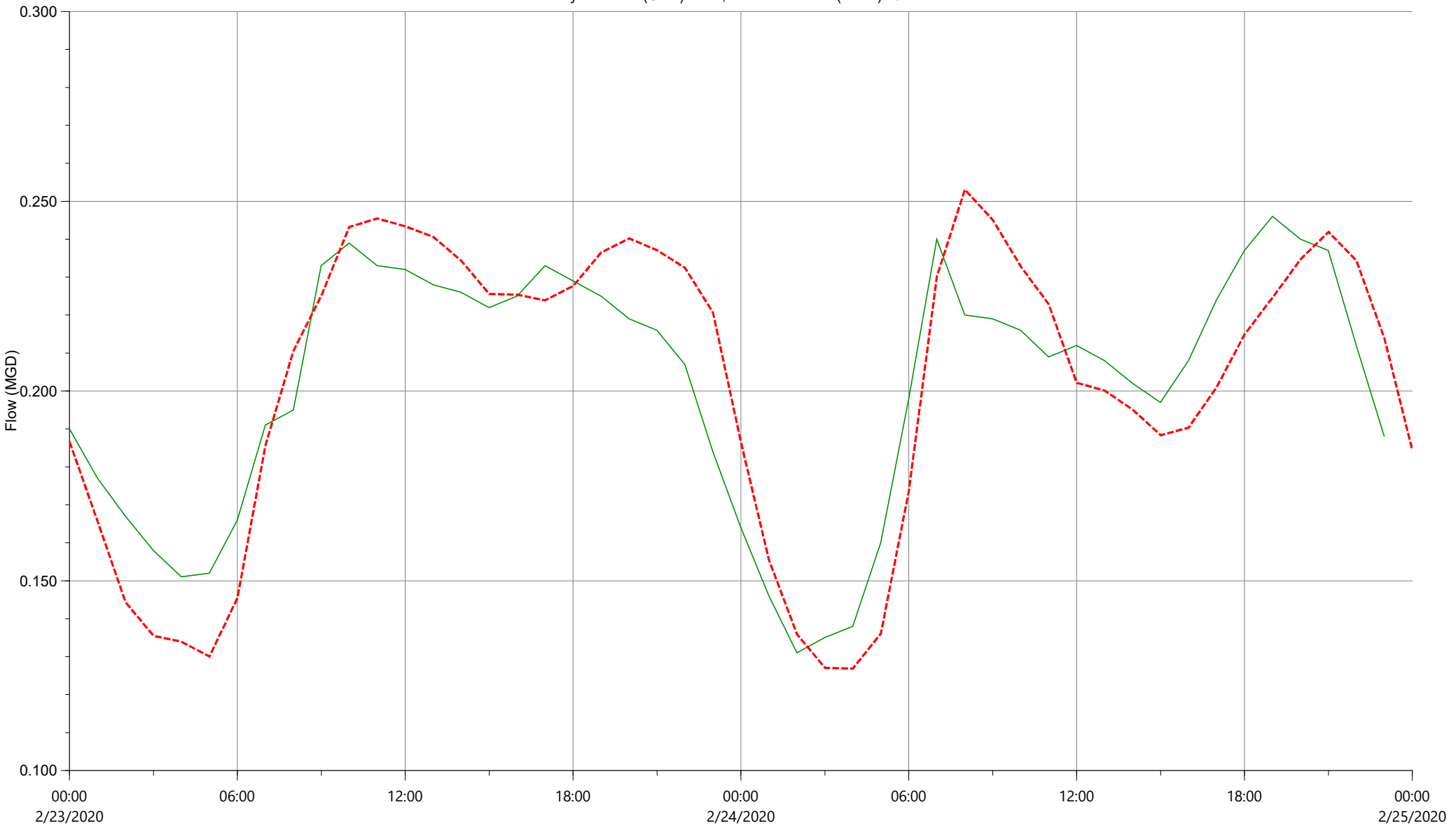


	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.396	1.220	1.752
Model	0.392	1.208	1.783

Observed / Predicted Report (Custom graph) - DWF Calibration FINAL

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Flow Survey Location (Obs.) 2721, Model Location (Pred.) D/S 2721.1

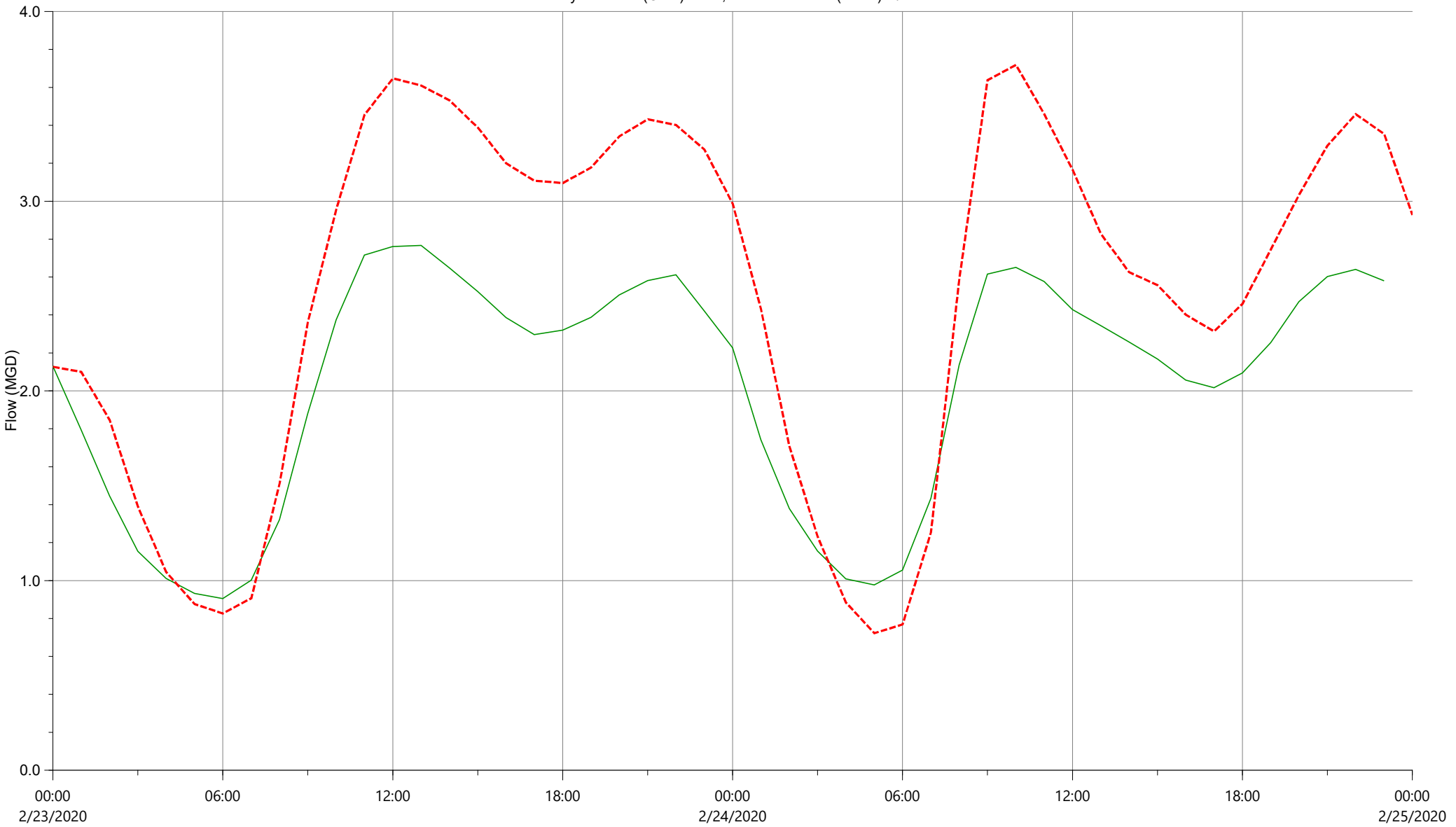


	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.131	0.246	0.396
Model	0.127	0.253	0.404

Observed / Predicted Report (Custom graph) - DWF Calibration FINAL

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Flow Survey Location (Obs.) 2724, Model Location (Pred.) D/S 2724.1

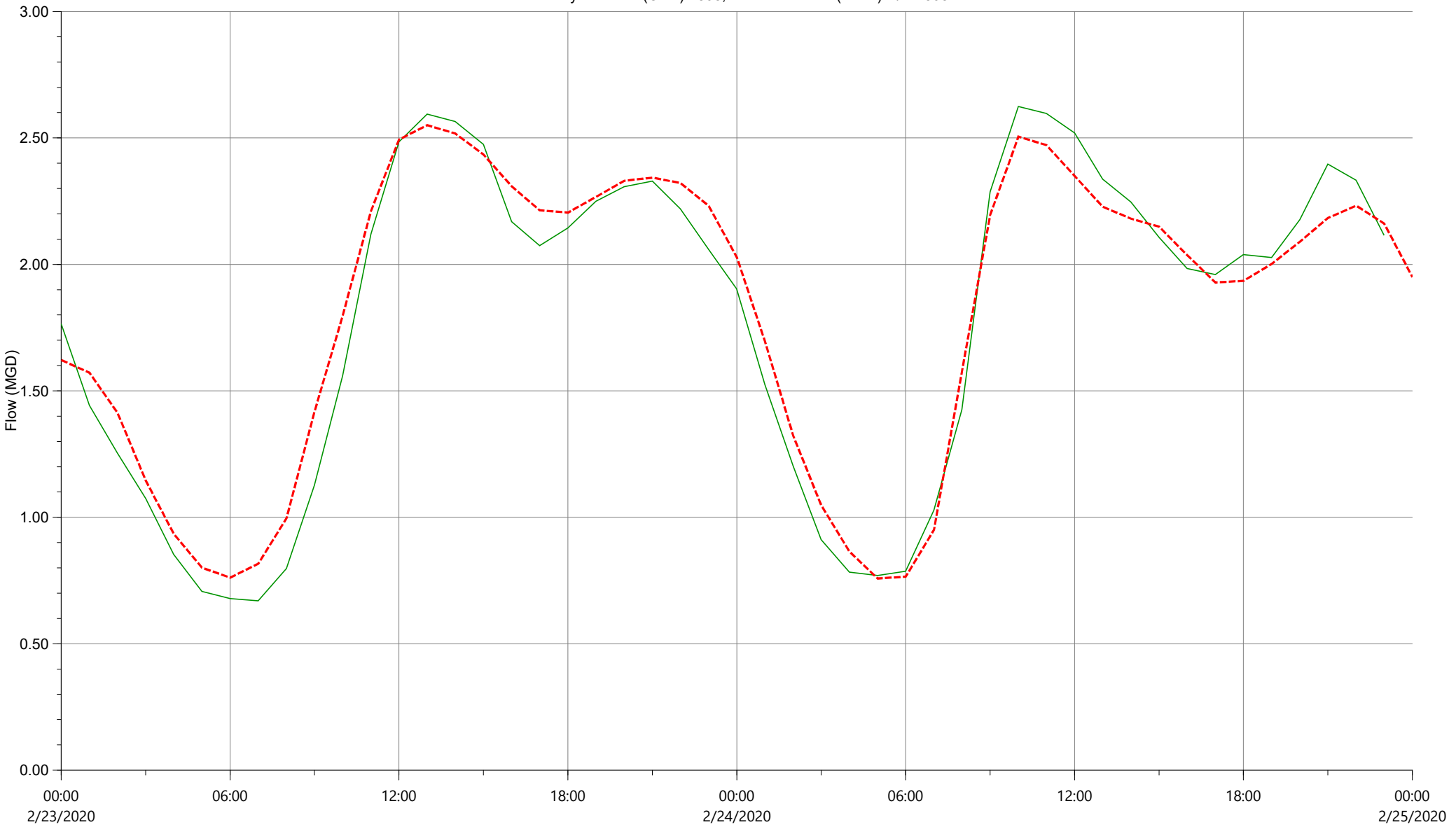


	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.905	2.767	3.975
Model	0.723	3.719	5.069

Observed / Predicted Report (Custom graph) - DWF Calibration FINAL

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Flow Survey Location (Obs.) 2808, Model Location (Pred.) D/S 2808.1

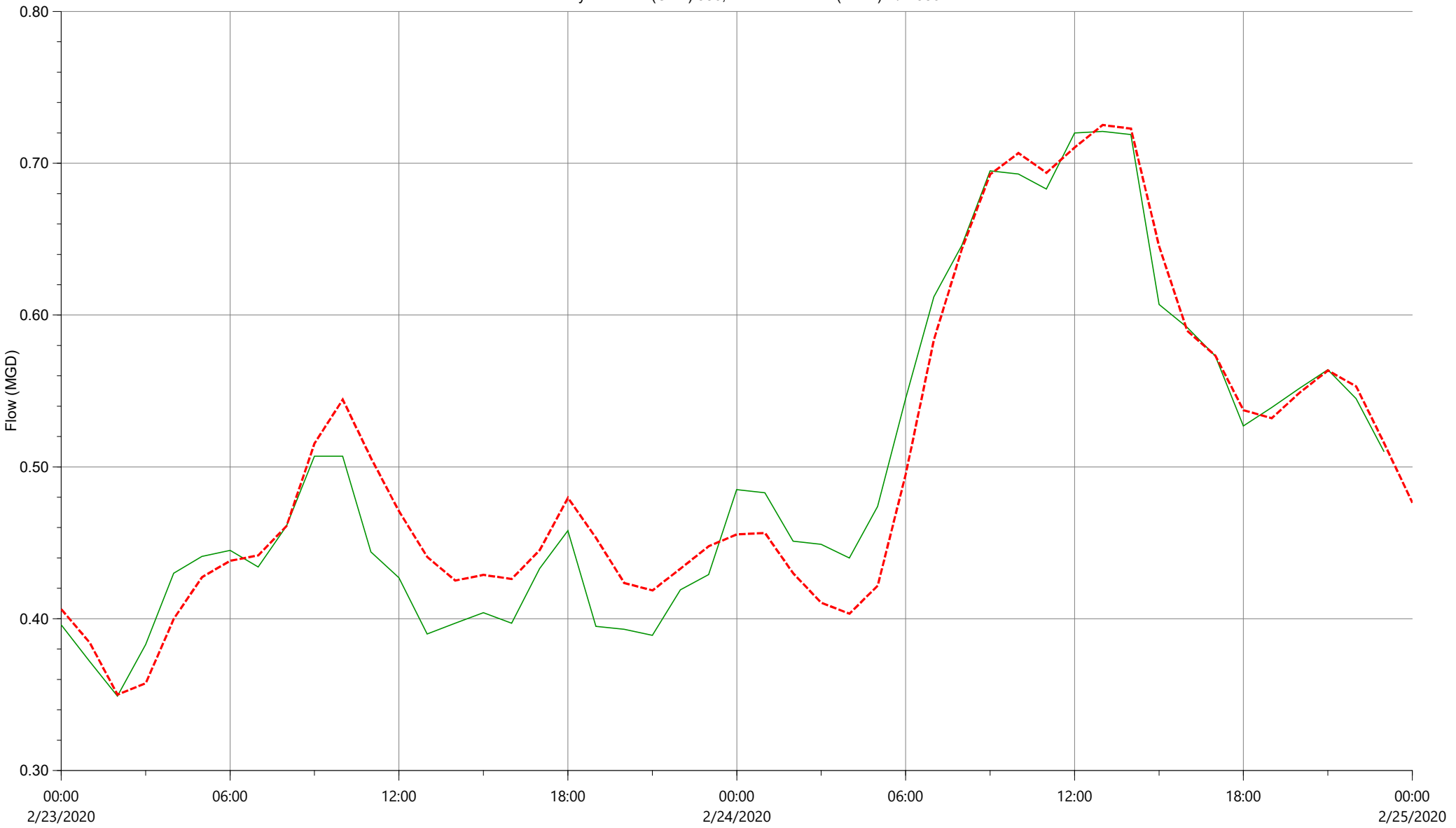


	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.670	2.624	3.494
Model	0.758	2.551	3.648

Observed / Predicted Report (Custom graph) - DWF Calibration FINAL

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Flow Survey Location (Obs.) 386, Model Location (Pred.) D/S 386.1

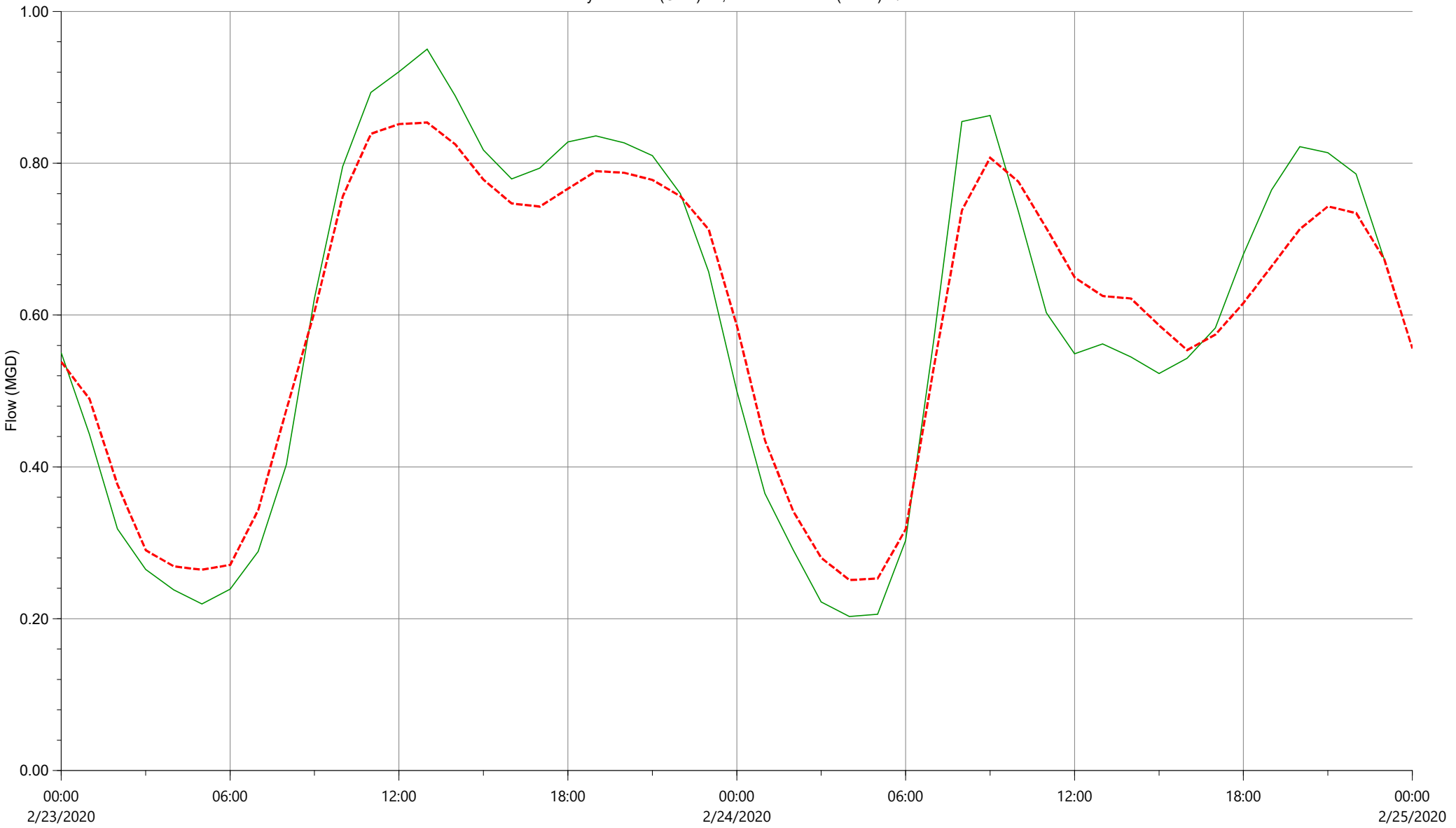


	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.349	0.721	0.978
Model	0.350	0.725	1.007

Observed / Predicted Report (Custom graph) - DWF Calibration FINAL

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Flow Survey Location (Obs.) 41, Model Location (Pred.) D/S 41.1

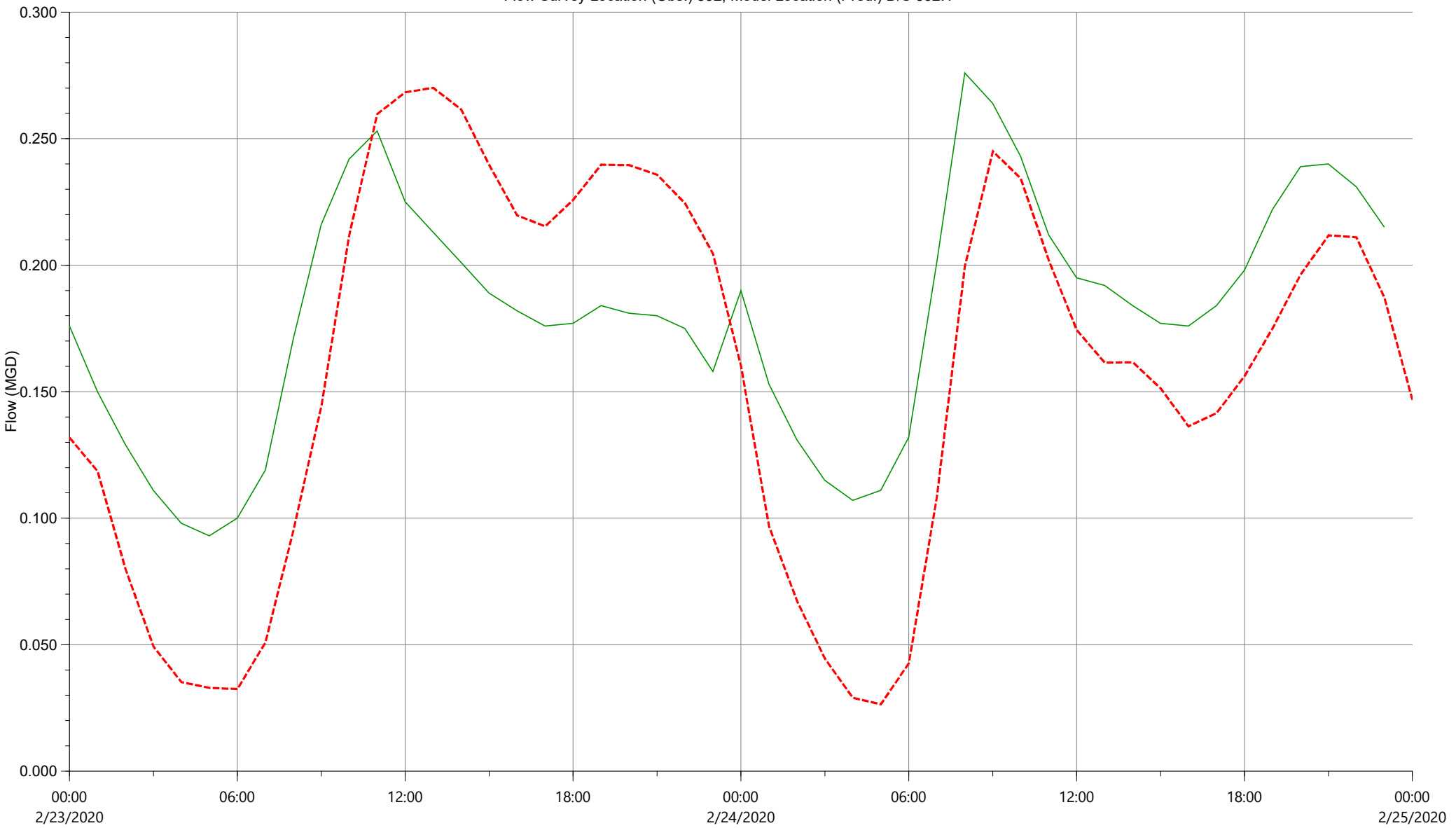


	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.203	0.951	1.171
Model	0.251	0.854	1.196

Observed / Predicted Report (Custom graph) - DWF Calibration FINAL

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Flow Survey Location (Obs.) 592, Model Location (Pred.) D/S 592.1

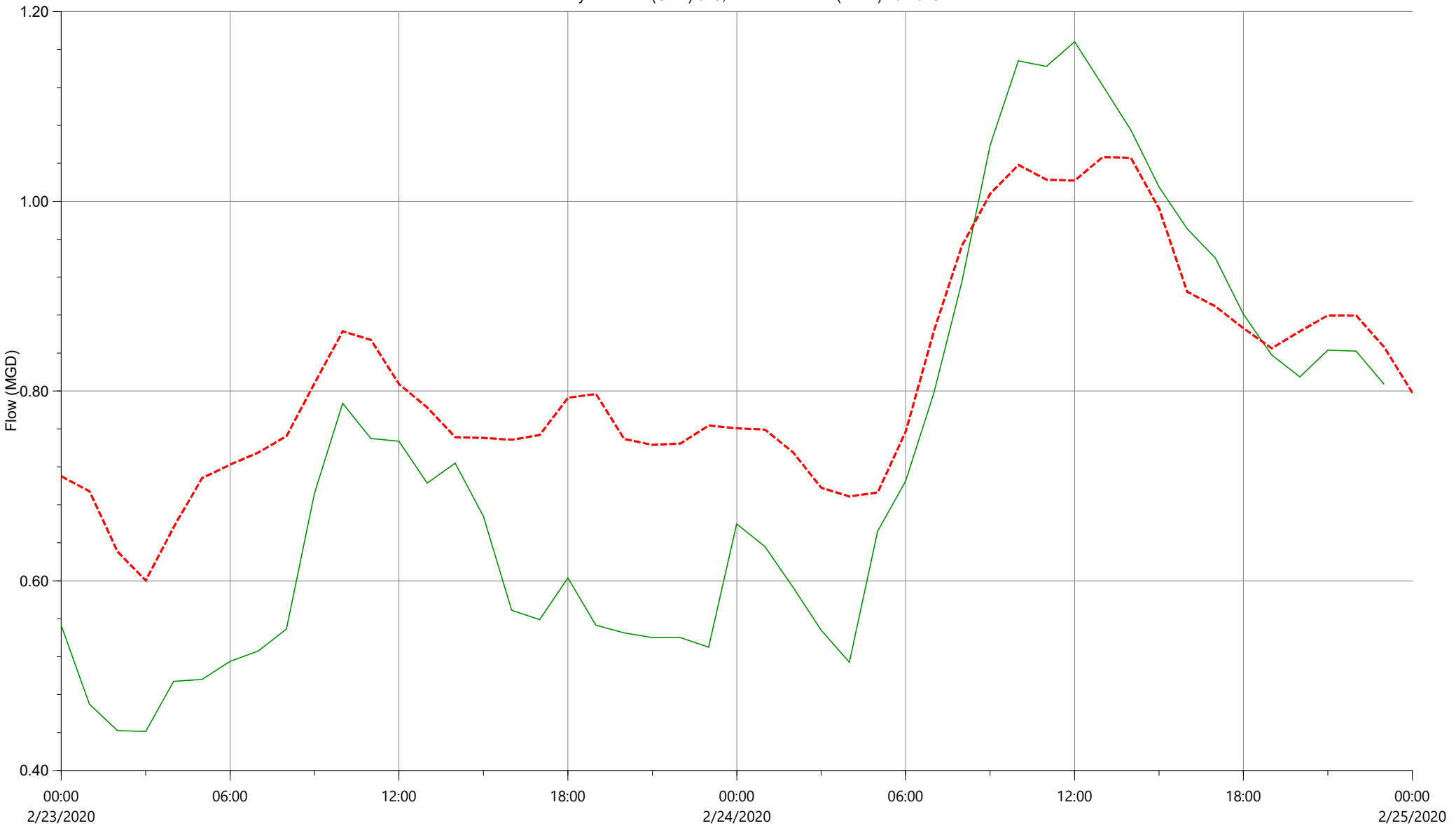


	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.093	0.276	0.354
Model	0.027	0.270	0.317

Observed / Predicted Report (Custom graph) - DWF Calibration FINAL

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Flow Survey Location (Obs.) 649, Model Location (Pred.) D/S 649.1

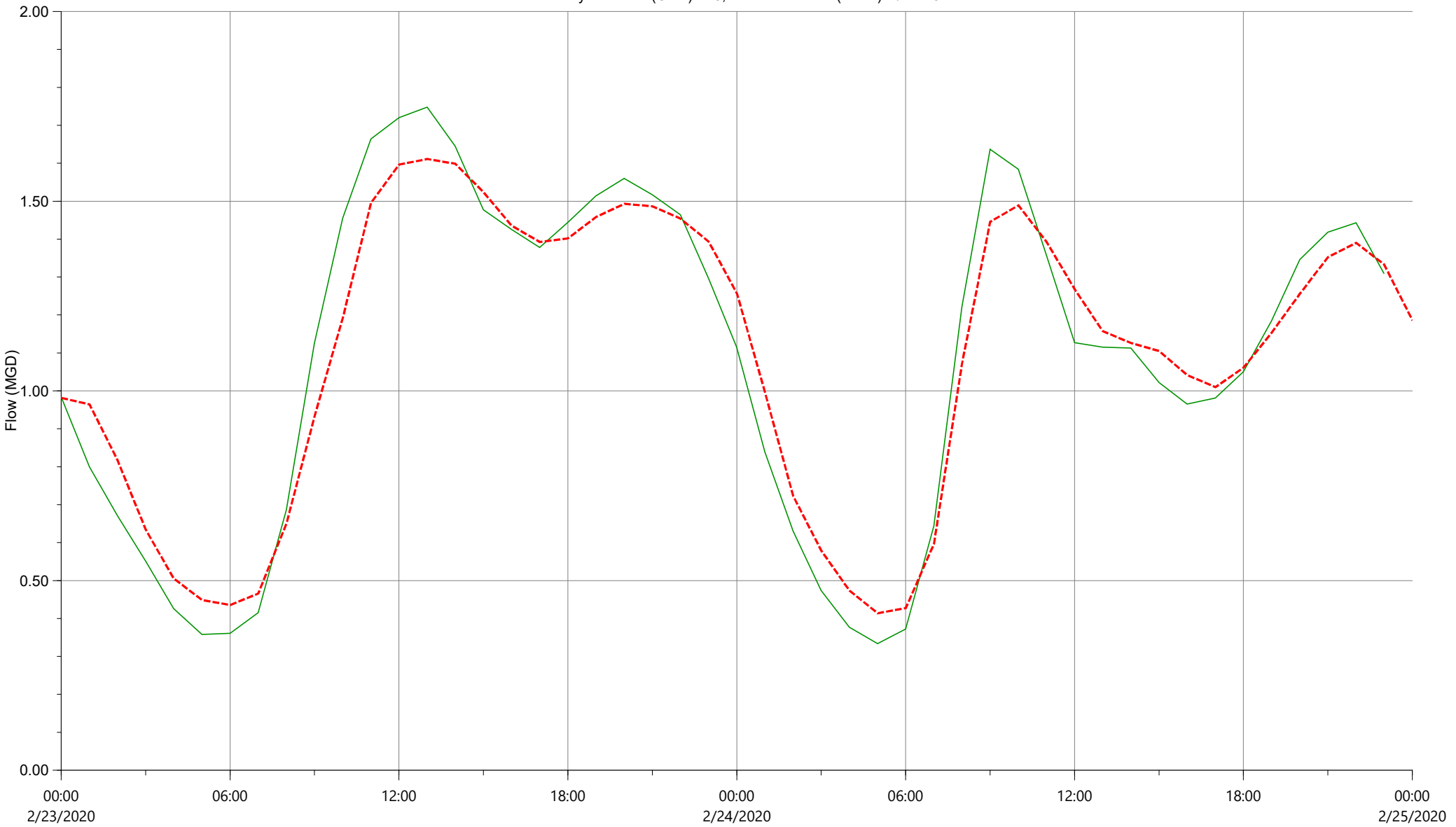


	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.441	1.168	1.417
Model	0.600	1.047	1.626

Observed / Predicted Report (Custom graph) - DWF Calibration FINAL

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Flow Survey Location (Obs.) 715, Model Location (Pred.) D/S 715.1

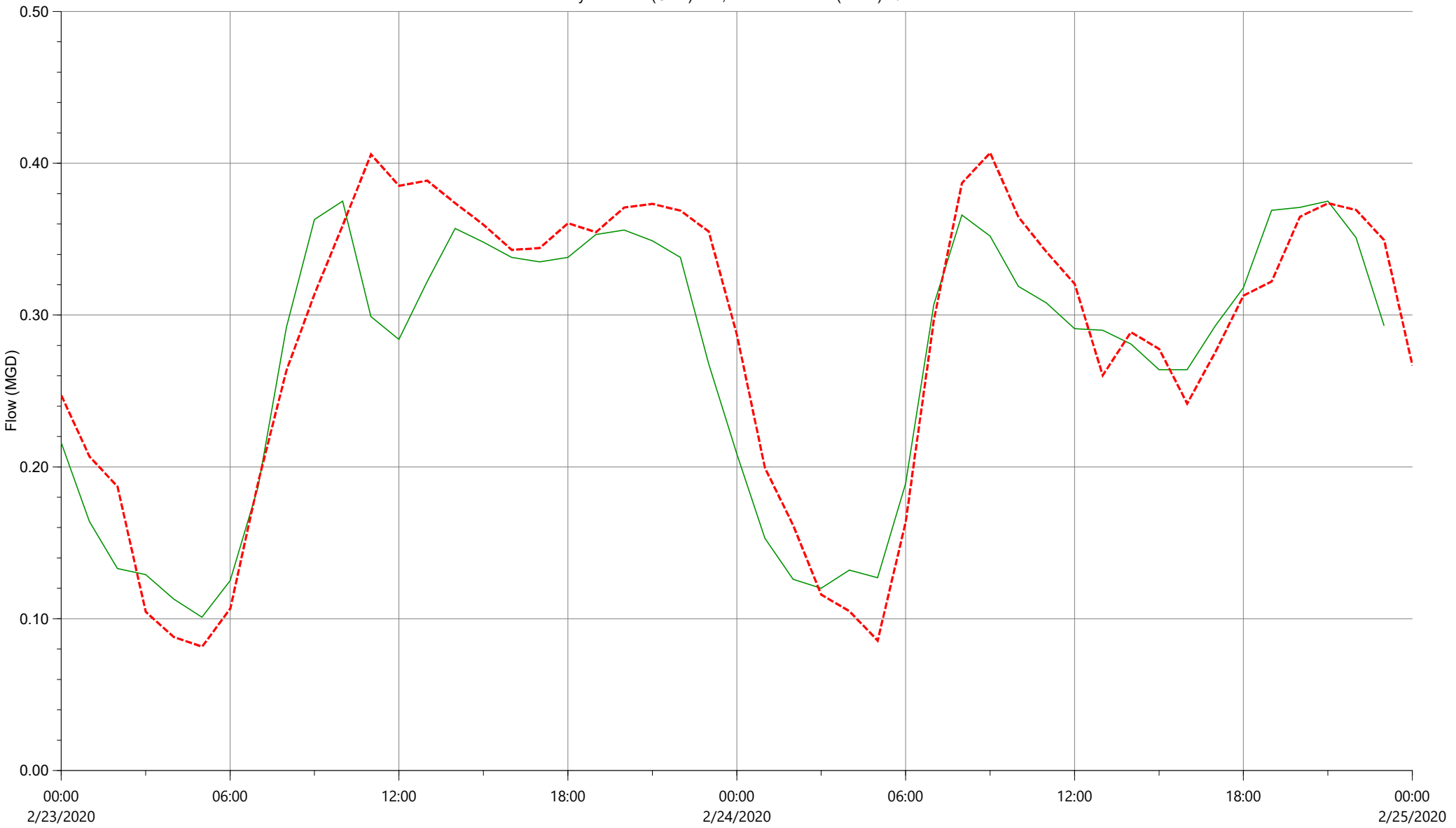


	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.334	1.748	2.133
Model	0.414	1.611	2.192

Observed / Predicted Report (Custom graph) - DWF Calibration FINAL

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Flow Survey Location (Obs.) 744, Model Location (Pred.) D/S 744.1



	Flow		
	Min (MGD)	Max (MGD)	Volume (US Mgal)
Observed	0.101	0.375	0.529
Model	0.082	0.407	0.567

Observed / Predicted Report (Custom graph) - DWF Calibration FINAL

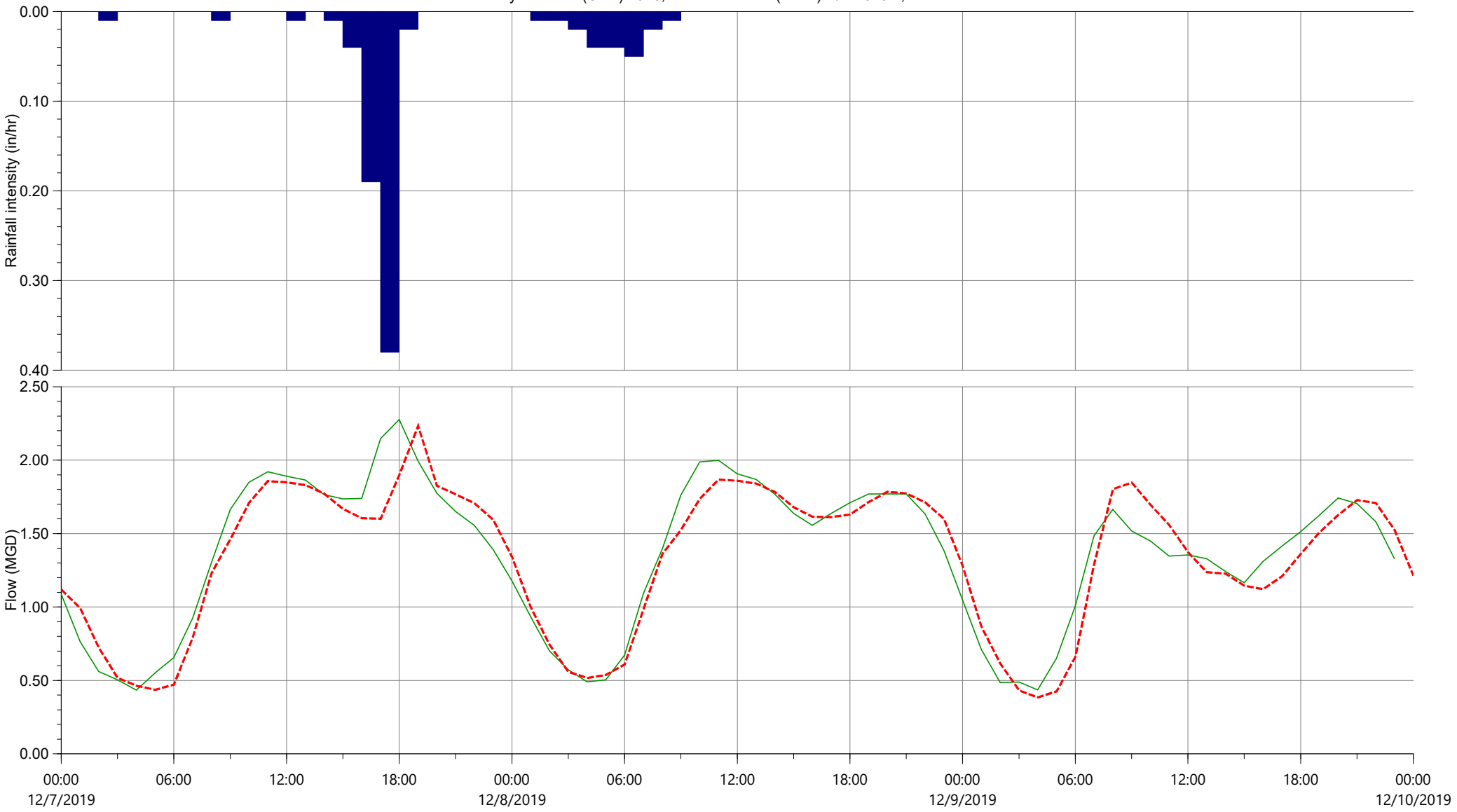
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APPENDIX E

City of Milpitas
Sewer Master Plan Study
Wet Weather Calibration Charts

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Flow Survey Location (Obs.) 1043, Model Location (Pred.) D/S 1043.1, Rainfall Profile: 1

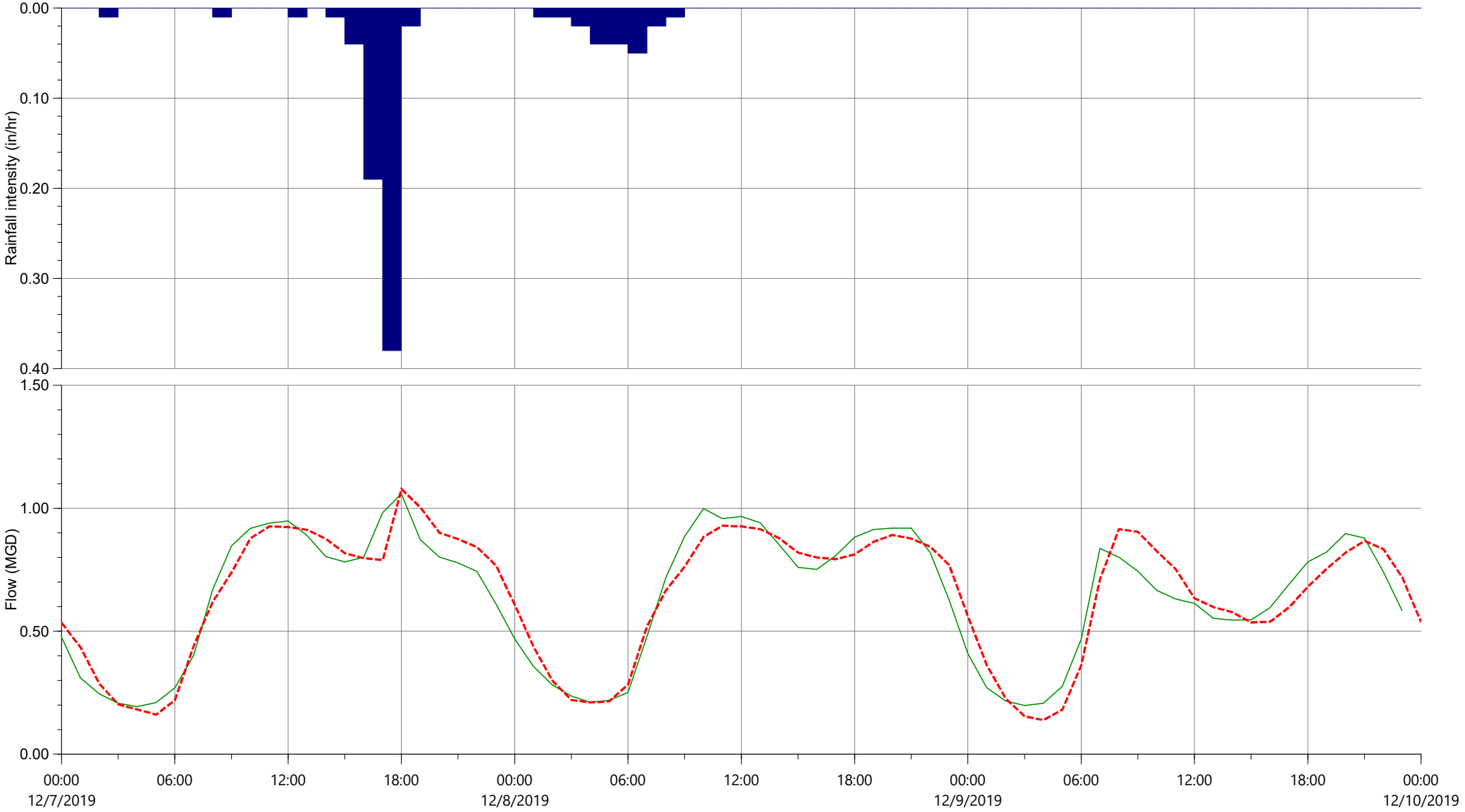


	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.870	0.380	0.012			
Observed				0.433	2.277	4.004
Model				0.384	2.235	4.010

Observed / Predicted Report (Custom graph) - Wet Weather Calibration FINAL

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Flow Survey Location (Obs.) 1193, Model Location (Pred.) D/S 1193.1, Rainfall Profile: 1

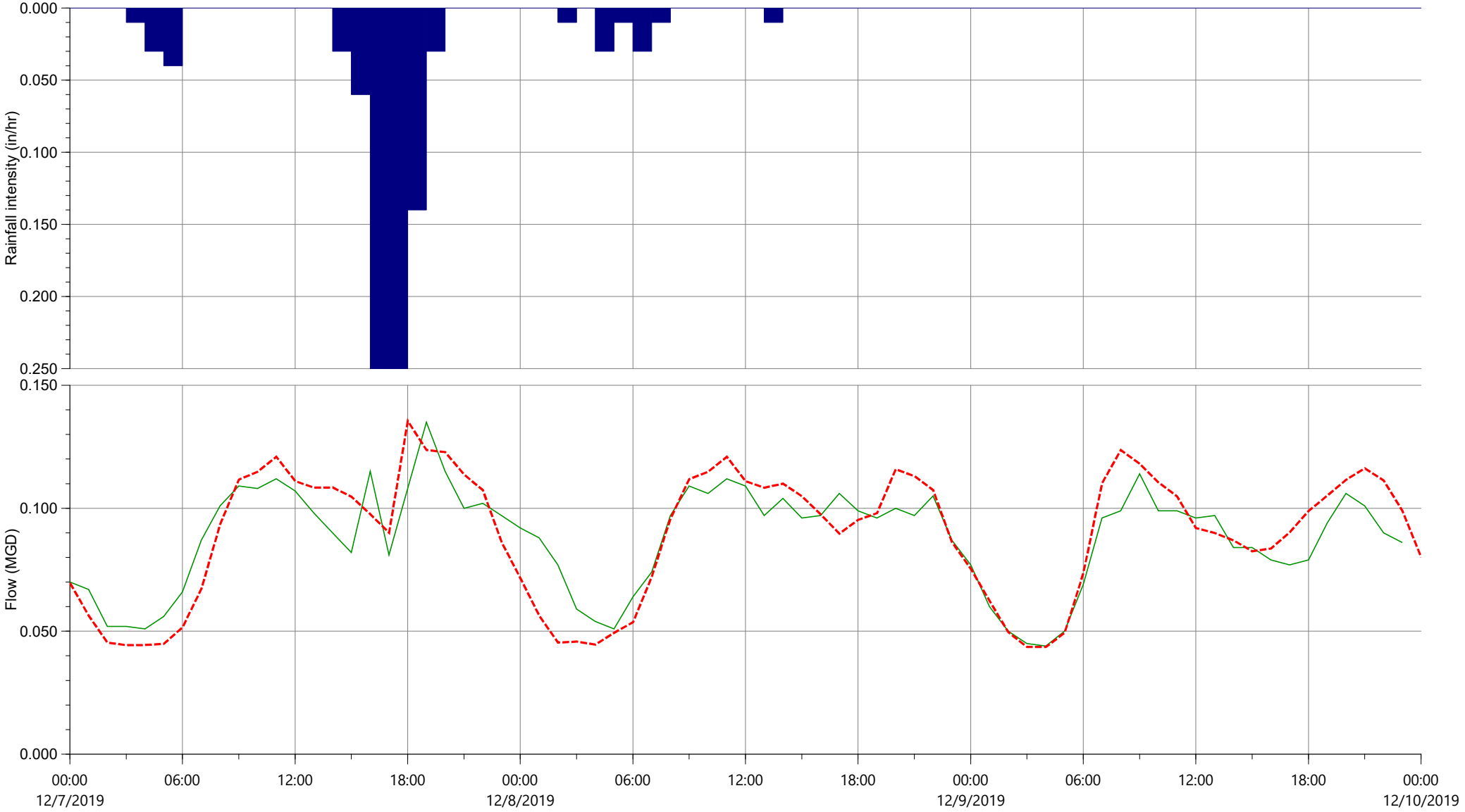


	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.870	0.380	0.012			
Observed				0.193	1.058	1.892
Model				0.139	1.079	1.946

Observed / Predicted Report (Custom graph) - Wet Weather Calibration FINAL

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Flow Survey Location (Obs.) 1564, Model Location (Pred.) D/S 1564.1, Rainfall Profile: 2

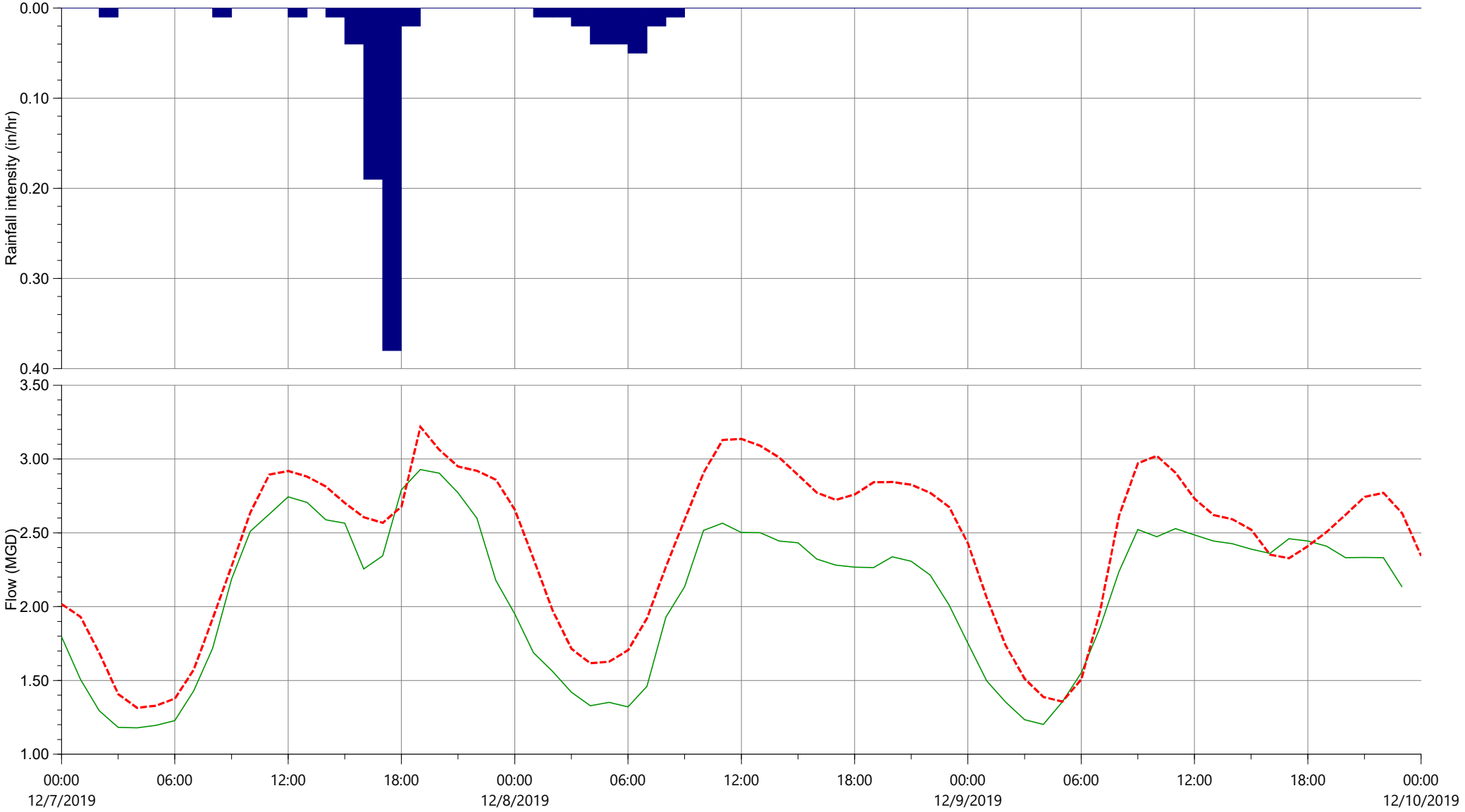


	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.940	0.250	0.013			
Observed				0.044	0.135	0.260
Model				0.044	0.135	0.268

Observed / Predicted Report (Custom graph) - Wet Weather Calibration FINAL

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Flow Survey Location (Obs.) 1790, Model Location (Pred.) D/S 1790.1, Rainfall Profile: 1

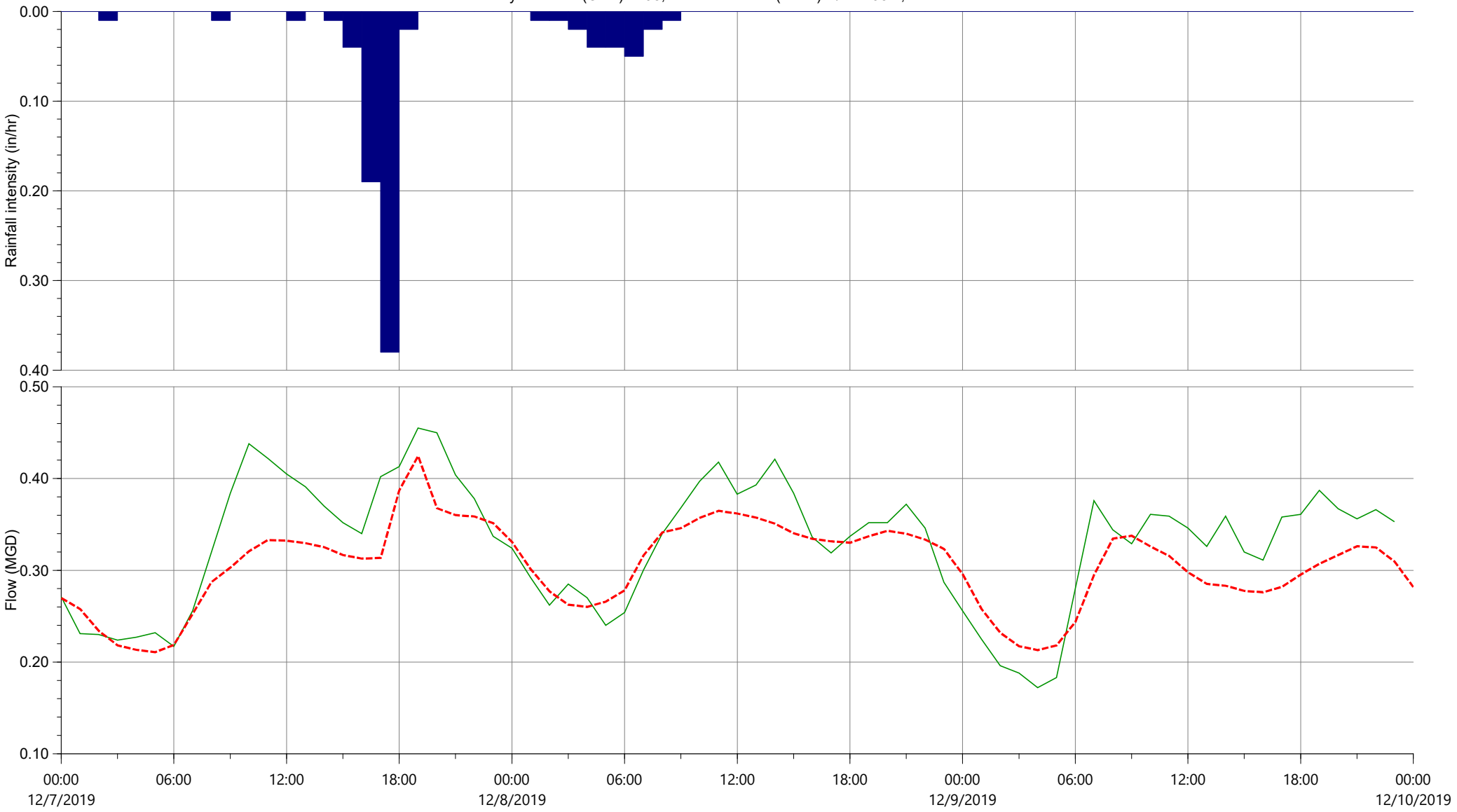


	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.870	0.380	0.012			
Observed				1.179	2.929	6.187
Model				1.314	3.219	7.243

Observed / Predicted Report (Custom graph) - Wet Weather Calibration FINAL

Powered by InfoWorks®

Flow Survey Location (Obs.) 1795, Model Location (Pred.) D/S 1795.1, Rainfall Profile: 1

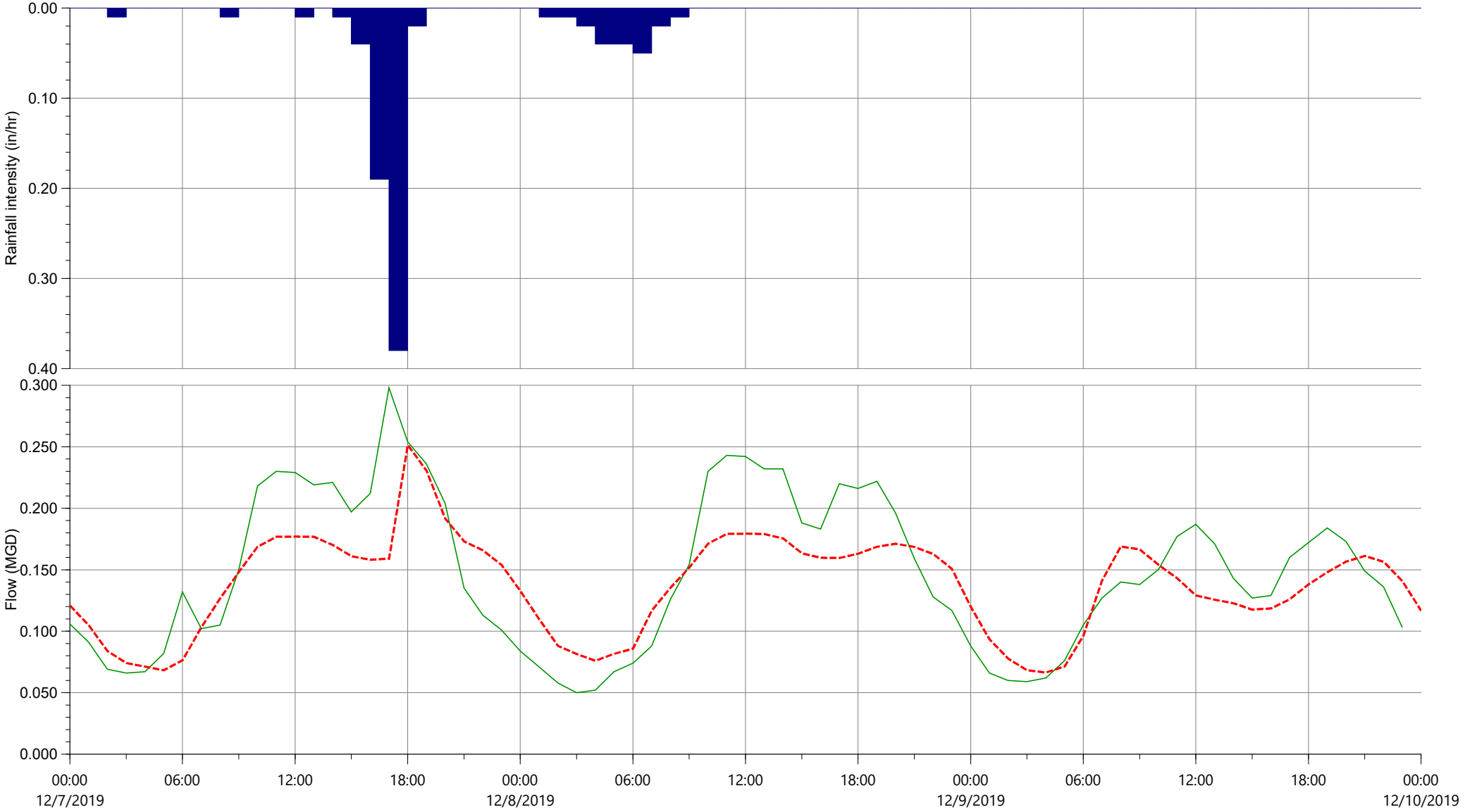


	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.870	0.380	0.012			
Observed				0.172	0.455	0.973
Model				0.211	0.425	0.915

Observed / Predicted Report (Custom graph) - Wet Weather Calibration FINAL

Powered by InfoWorks®

Flow Survey Location (Obs.) 186, Model Location (Pred.) D/S 186.1, Rainfall Profile: 1

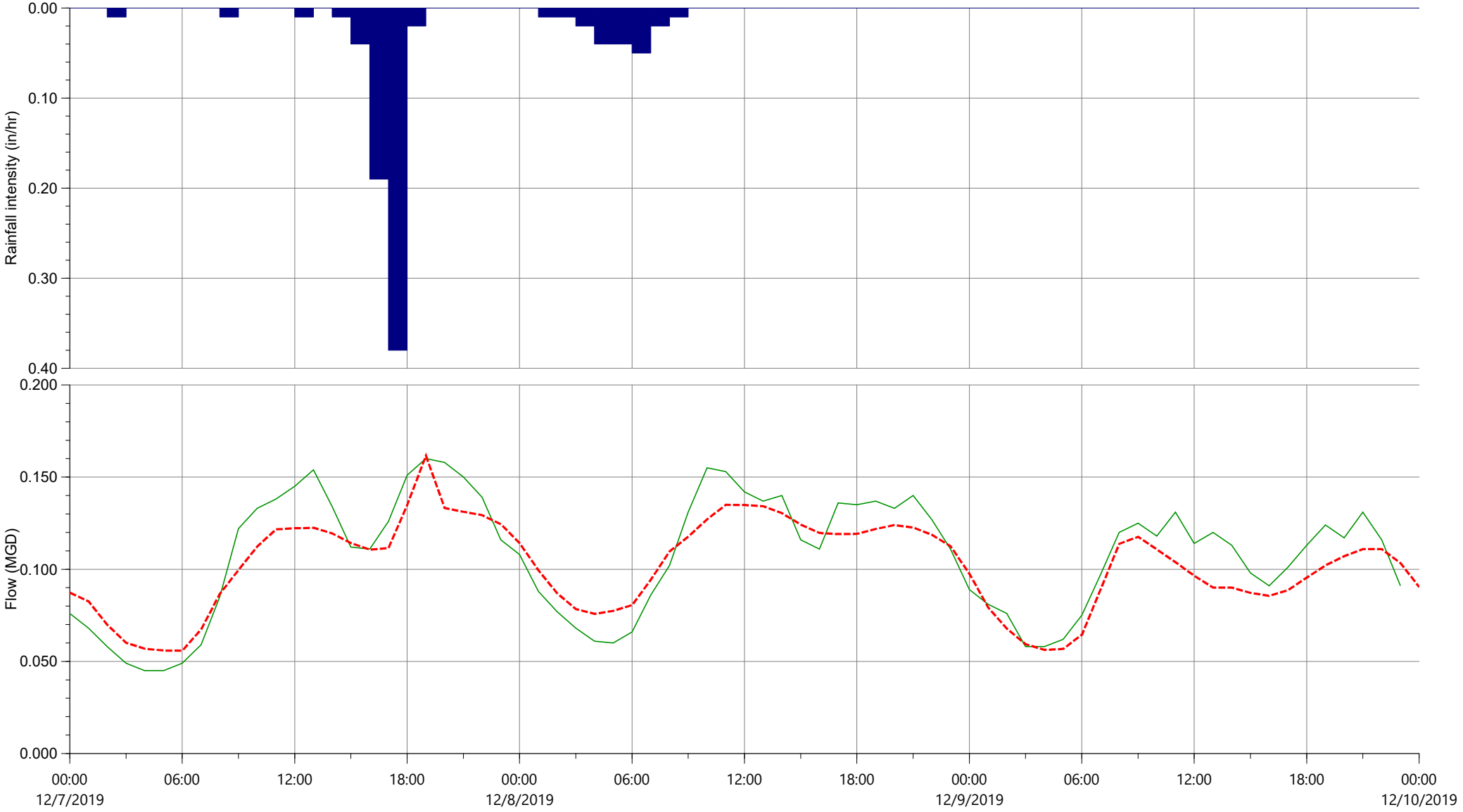


	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.870	0.380	0.012			
Observed				0.050	0.298	0.435
Model				0.067	0.251	0.413

Observed / Predicted Report (Custom graph) - Wet Weather Calibration FINAL

Powered by InfoWorks®

Flow Survey Location (Obs.) 190, Model Location (Pred.) D/S 190.1, Rainfall Profile: 1

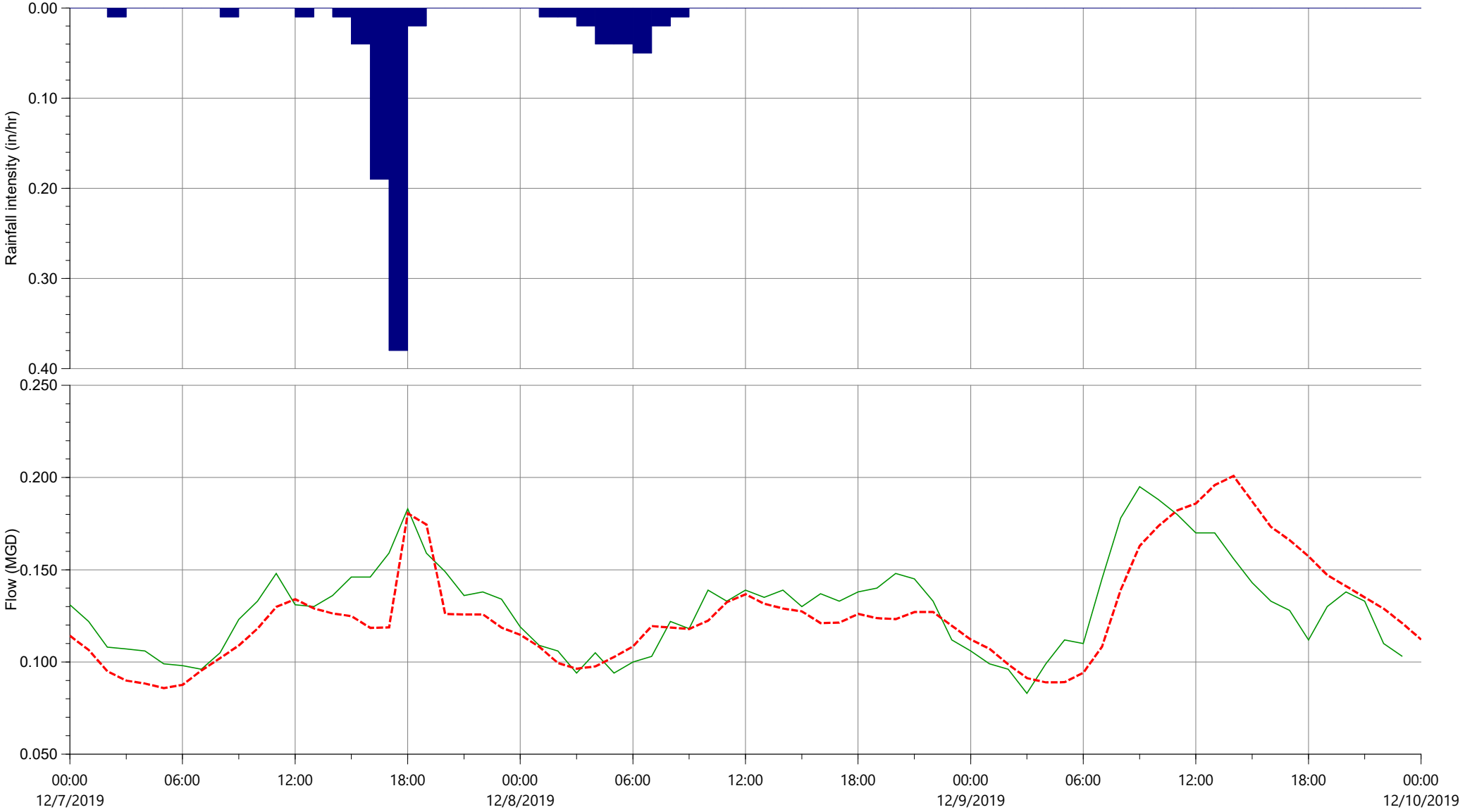


	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.870	0.380	0.012			
Observed				0.045	0.160	0.318
Model				0.056	0.162	0.306

Observed / Predicted Report (Custom graph) - Wet Weather Calibration FINAL

Powered by InfoWorks®

Flow Survey Location (Obs.) 229, Model Location (Pred.) D/S 229.1, Rainfall Profile: 1

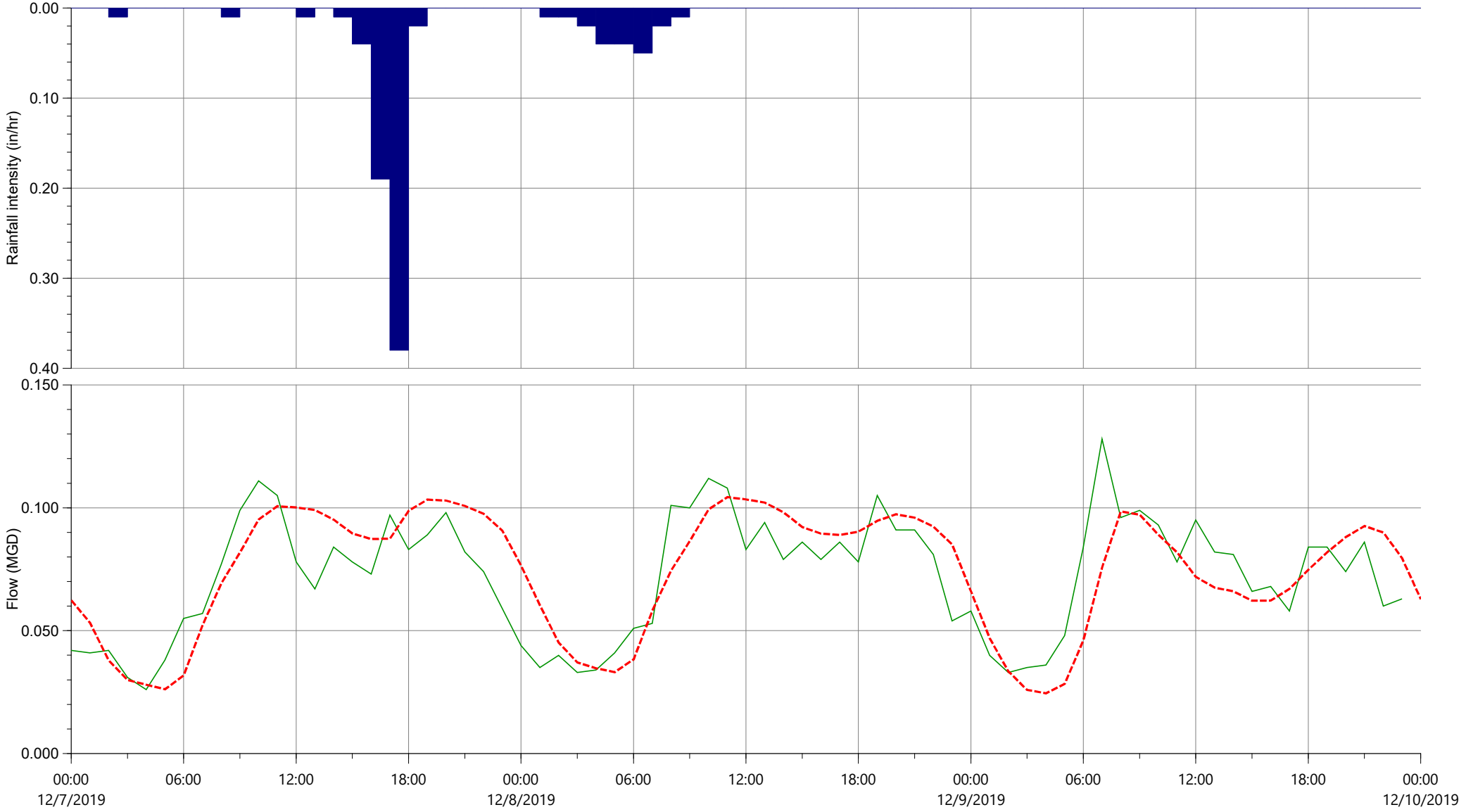


	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.870	0.380	0.012			
Observed				0.083	0.195	0.383
Model				0.086	0.201	0.378

Observed / Predicted Report (Custom graph) - Wet Weather Calibration FINAL

Powered by InfoWorks®

Flow Survey Location (Obs.) 2300, Model Location (Pred.) D/S 2300.1, Rainfall Profile: 1

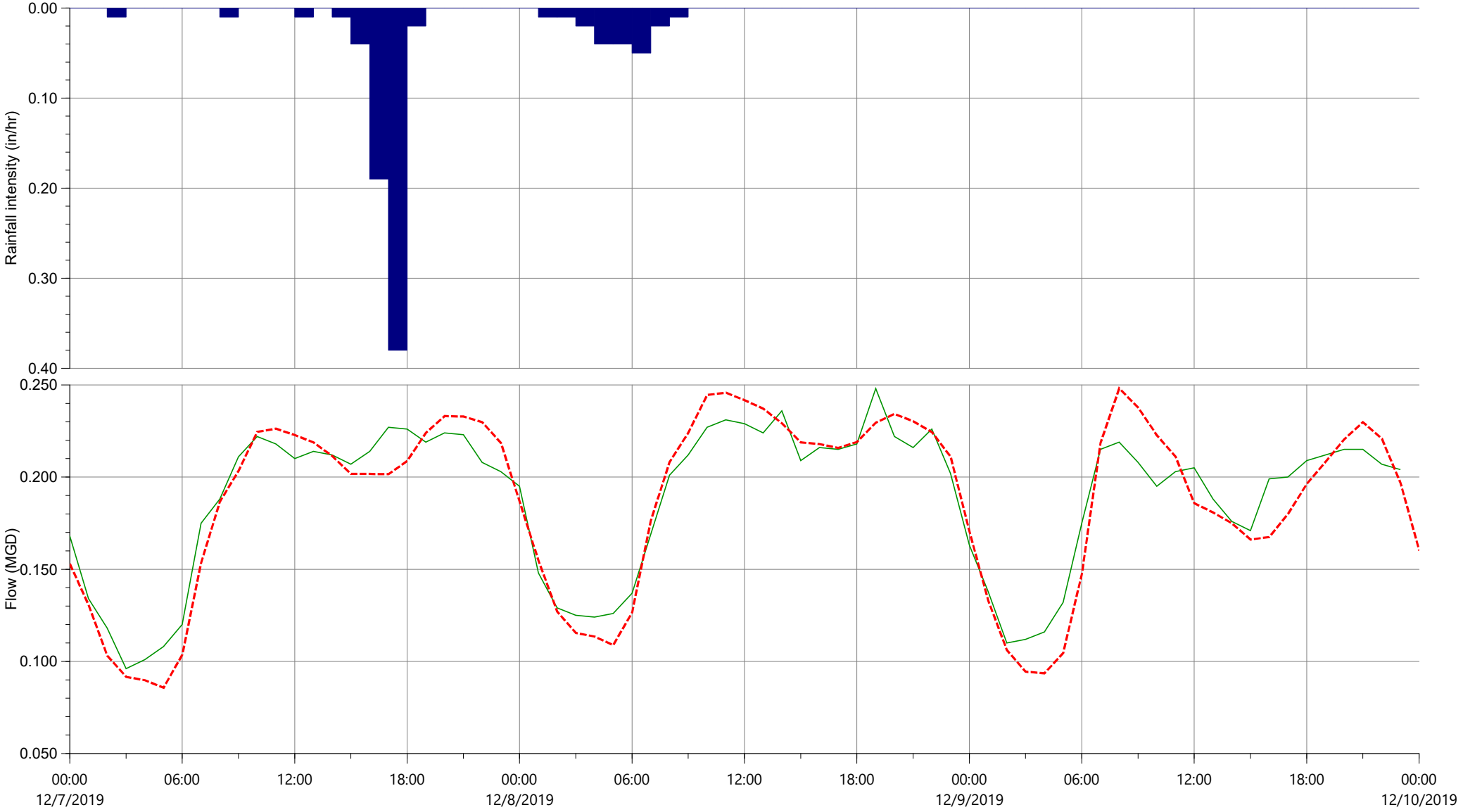


	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.870	0.380	0.012			
Observed				0.026	0.128	0.213
Model				0.025	0.104	0.222

Observed / Predicted Report (Custom graph) - Wet Weather Calibration FINAL

Powered by InfoWorks®

Flow Survey Location (Obs.) 2334, Model Location (Pred.) D/S 2334.1, Rainfall Profile: 1

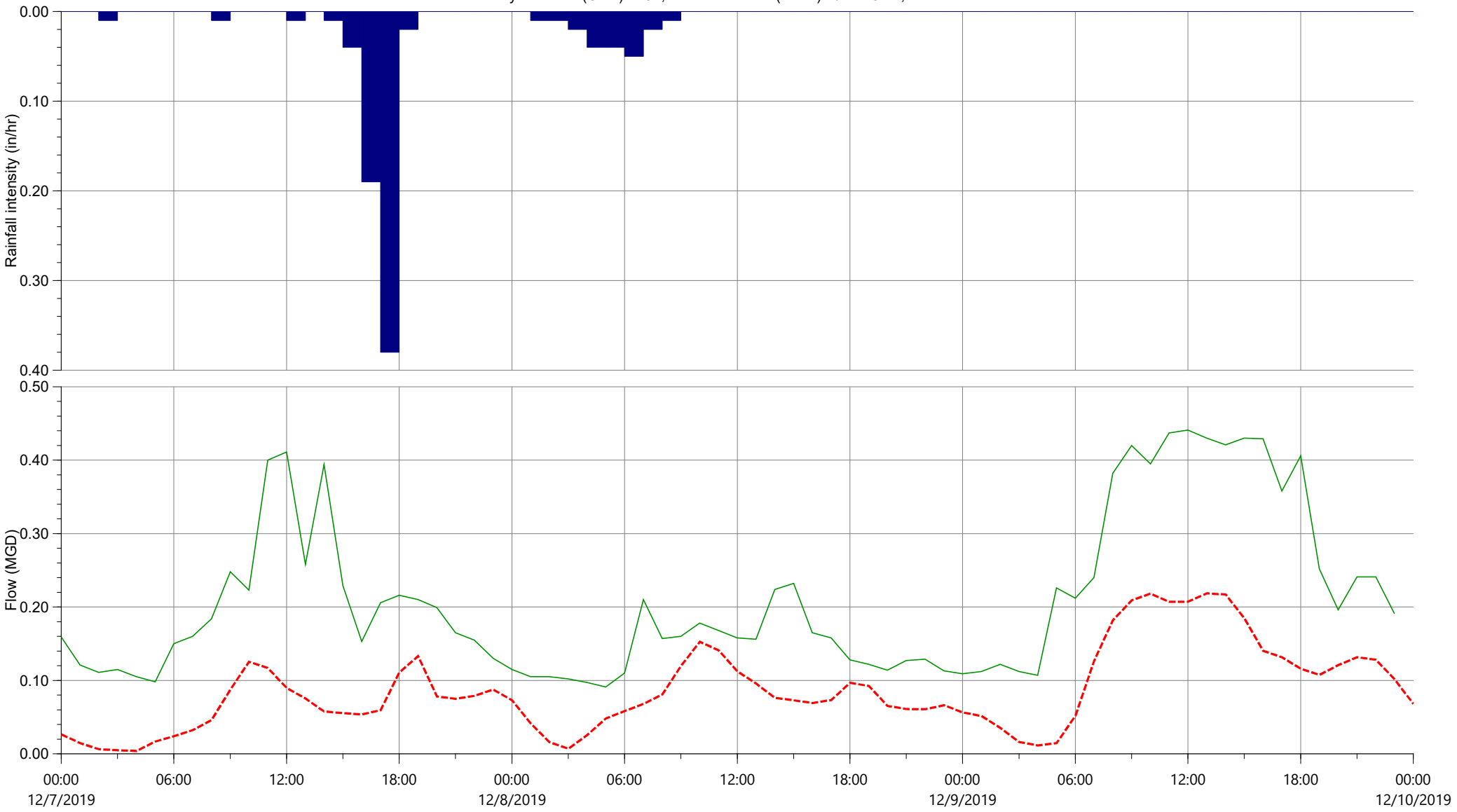


	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.870	0.380	0.012			
Observed				0.096	0.248	0.555
Model				0.086	0.248	0.559

Observed / Predicted Report (Custom graph) - Wet Weather Calibration FINAL

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Flow Survey Location (Obs.) 2491, Model Location (Pred.) D/S 2491.1, Rainfall Profile: 1

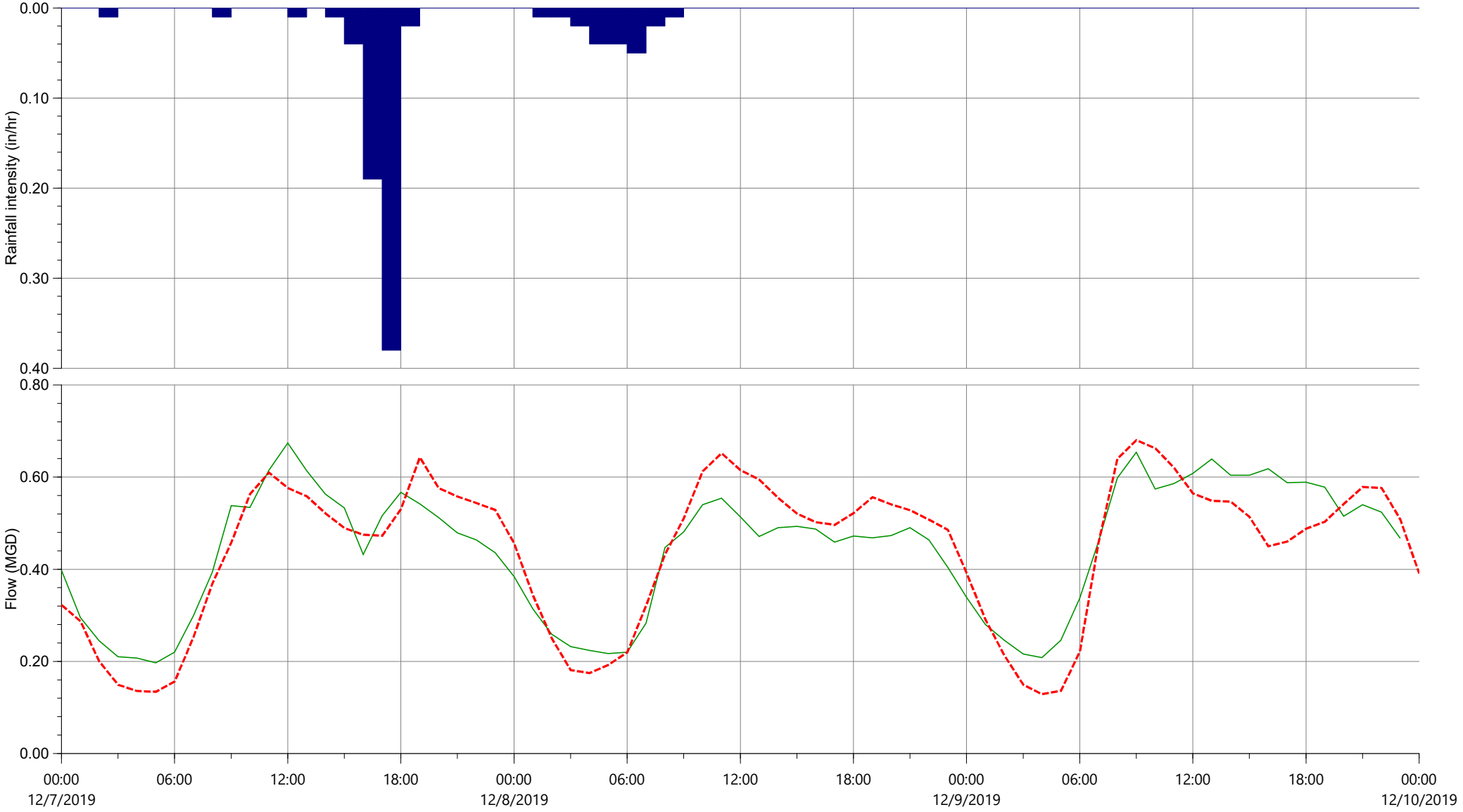


	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.870	0.380	0.012			
Observed				0.091	0.441	0.623
Model				0.004	0.219	0.260

Observed / Predicted Report (Custom graph) - Wet Weather Calibration FINAL

Powered by InfoWorks®

Flow Survey Location (Obs.) 2569, Model Location (Pred.) D/S 2569.1, Rainfall Profile: 1

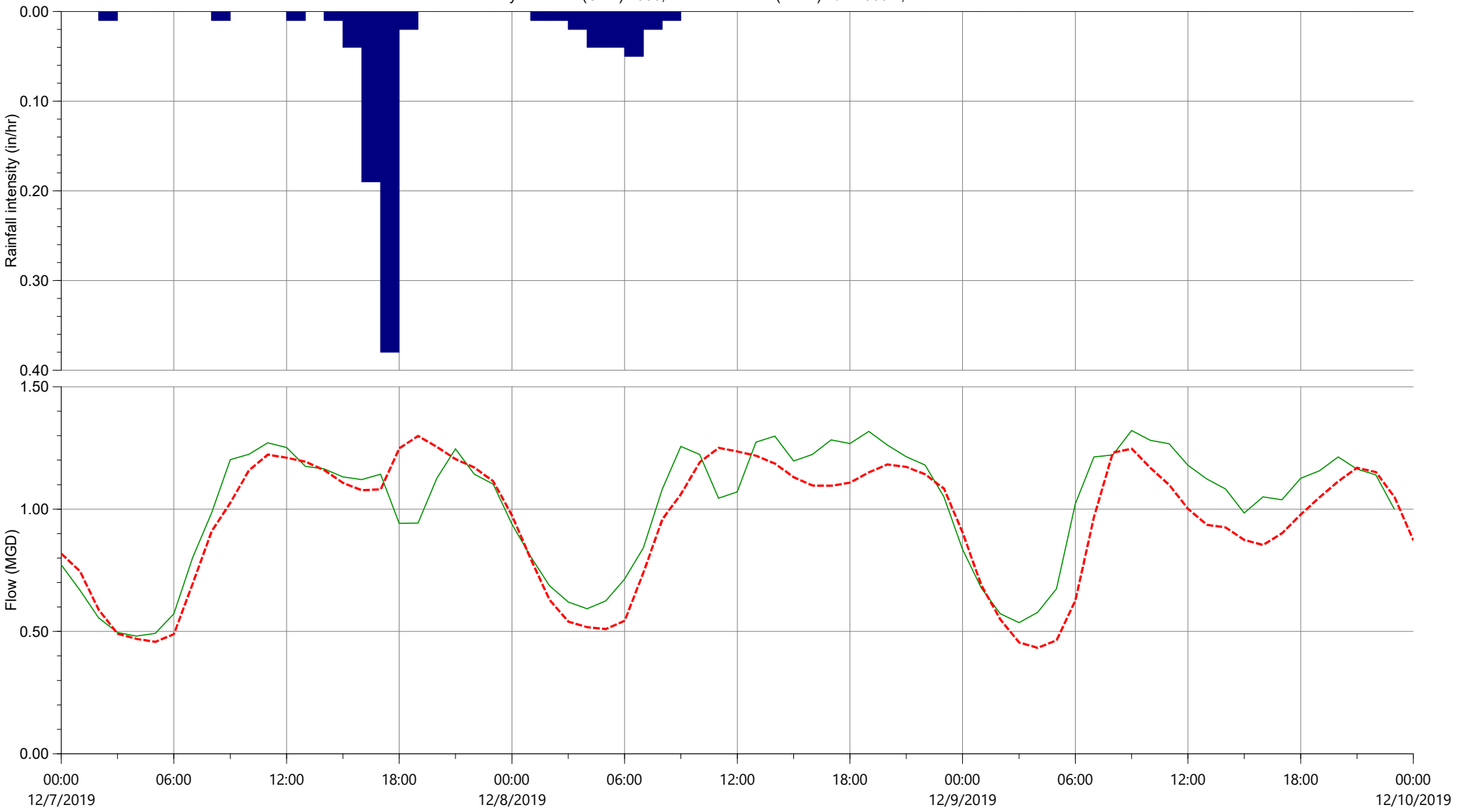


	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.870	0.380	0.012			
Observed				0.197	0.674	1.313
Model				0.129	0.680	1.325

Observed / Predicted Report (Custom graph) - Wet Weather Calibration FINAL

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Flow Survey Location (Obs.) 2666, Model Location (Pred.) D/S 2666.1, Rainfall Profile: 1

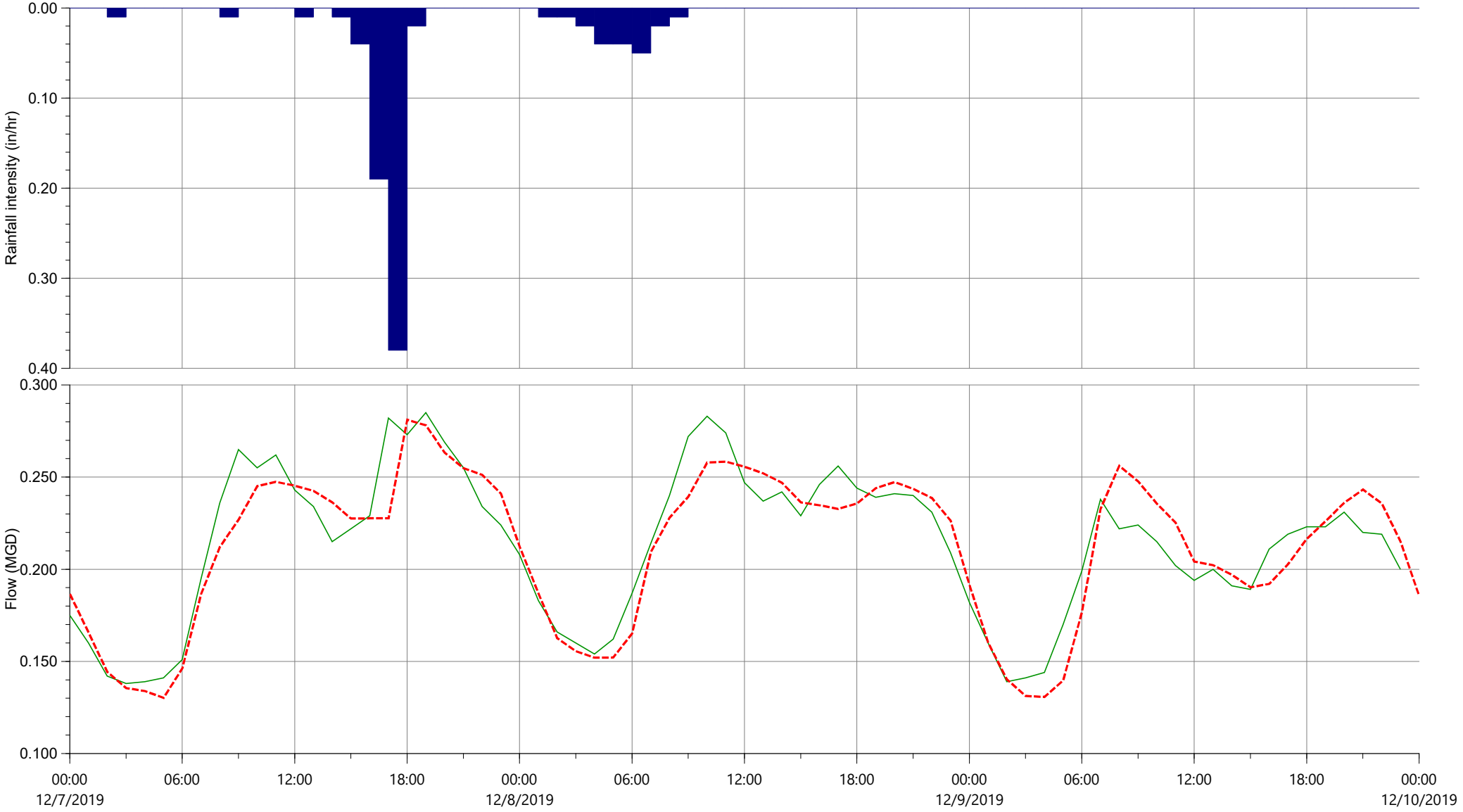


	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.870	0.380	0.012			
Observed				0.481	1.321	2.985
Model				0.433	1.299	2.858

Observed / Predicted Report (Custom graph) - Wet Weather Calibration FINAL

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Flow Survey Location (Obs.) 2721, Model Location (Pred.) D/S 2721.1, Rainfall Profile: 1

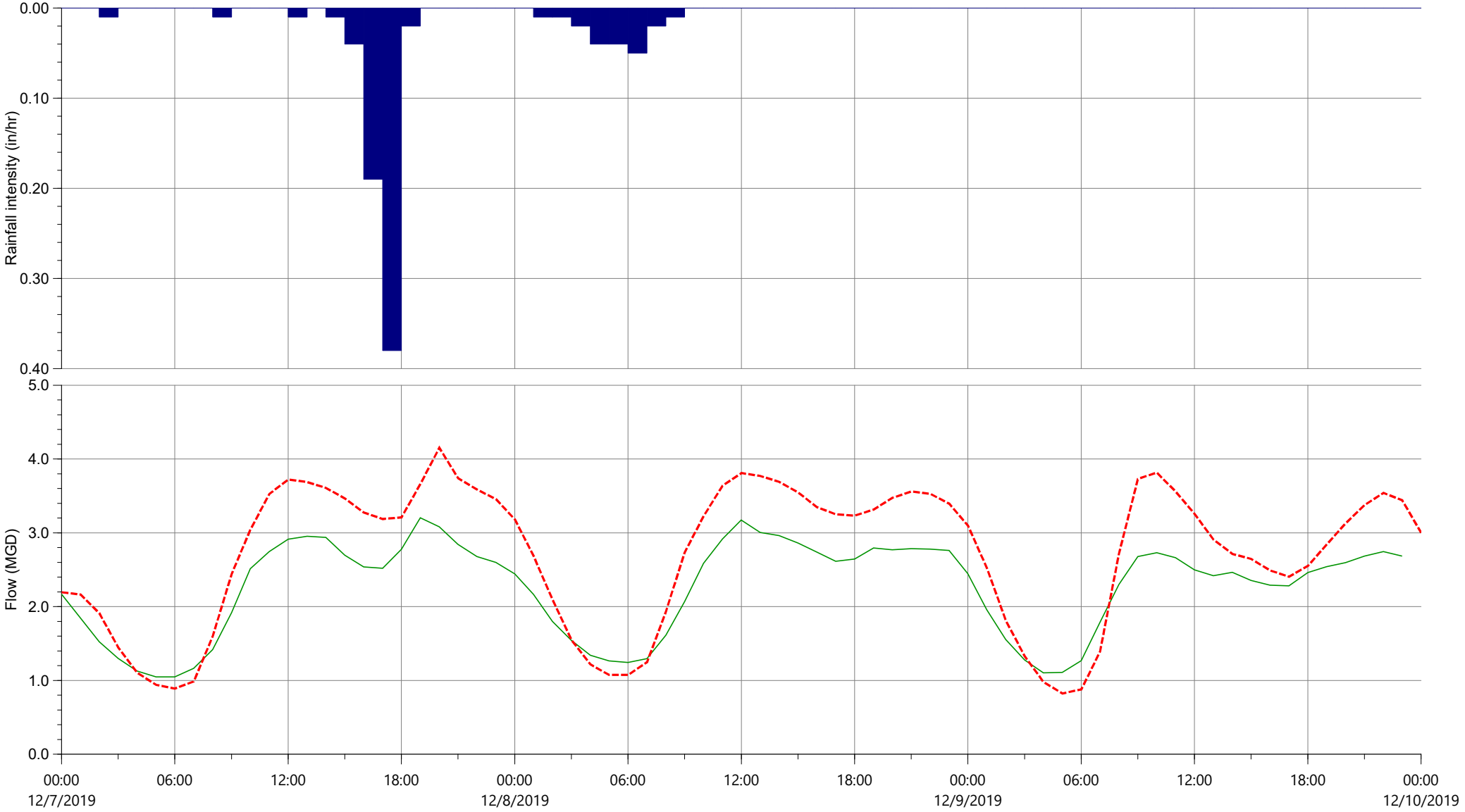


	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.870	0.380	0.012			
Observed				0.138	0.285	0.632
Model				0.130	0.281	0.635

Observed / Predicted Report (Custom graph) - Wet Weather Calibration FINAL

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Flow Survey Location (Obs.) 2724, Model Location (Pred.) D/S 2724.1, Rainfall Profile: 1

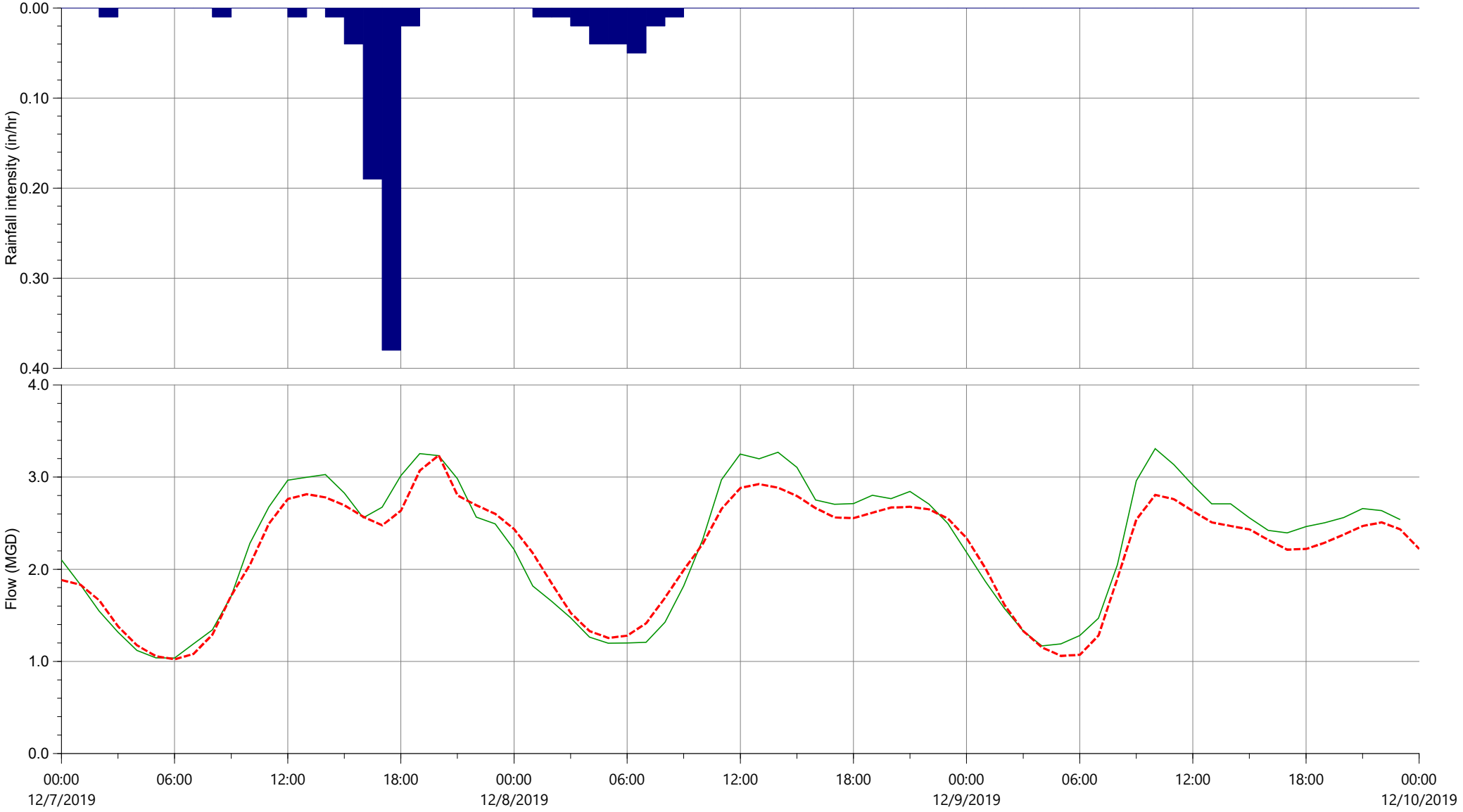


	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.870	0.380	0.012			
Observed				1.047	3.205	6.675
Model				0.824	4.153	8.127

Observed / Predicted Report (Custom graph) - Wet Weather Calibration FINAL

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Flow Survey Location (Obs.) 2808, Model Location (Pred.) D/S 2808.1, Rainfall Profile: 1

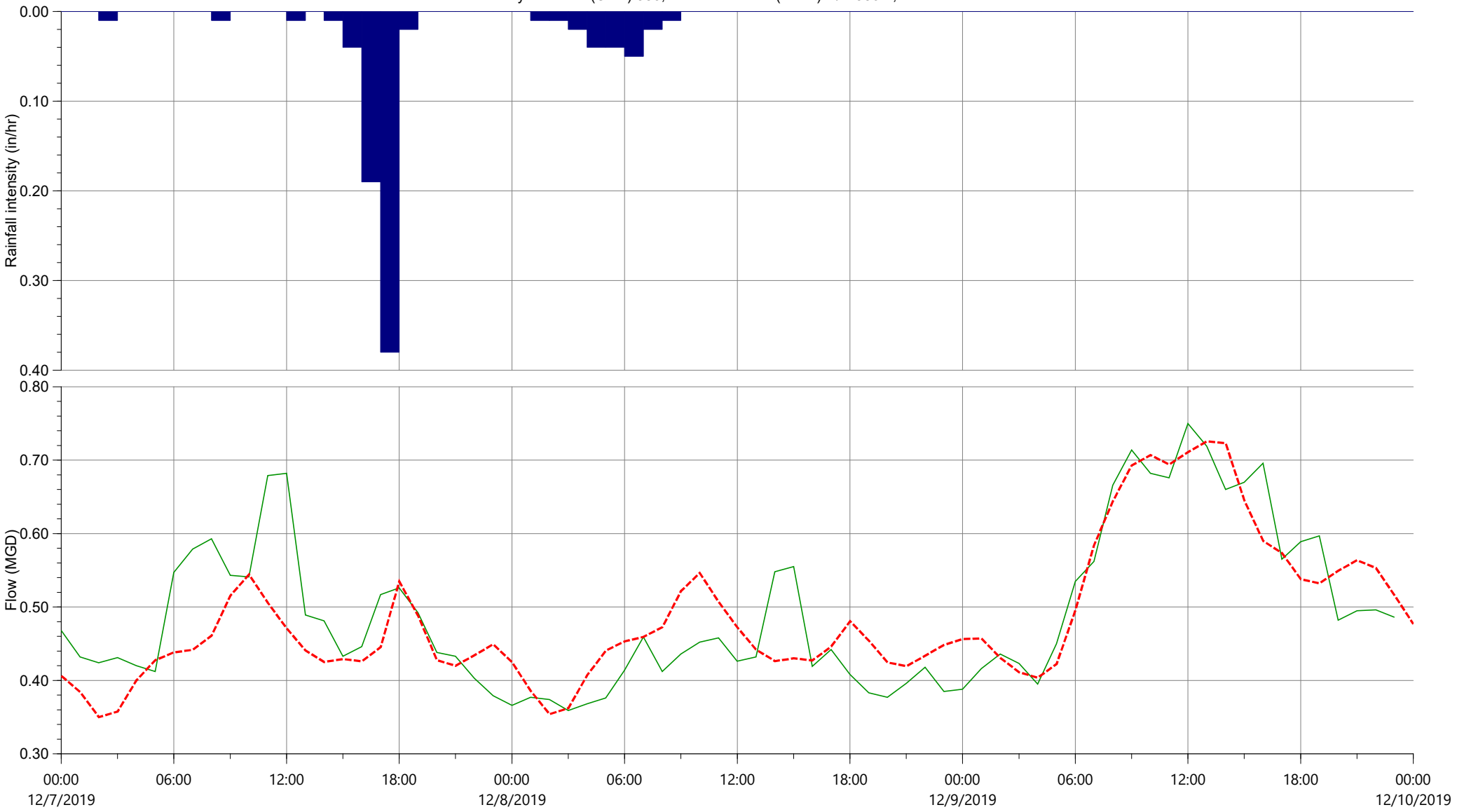


	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.870	0.380	0.012			
Observed				1.036	3.308	6.717
Model				1.023	3.238	6.544

Observed / Predicted Report (Custom graph) - Wet Weather Calibration FINAL

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Flow Survey Location (Obs.) 386, Model Location (Pred.) D/S 386.1, Rainfall Profile: 1

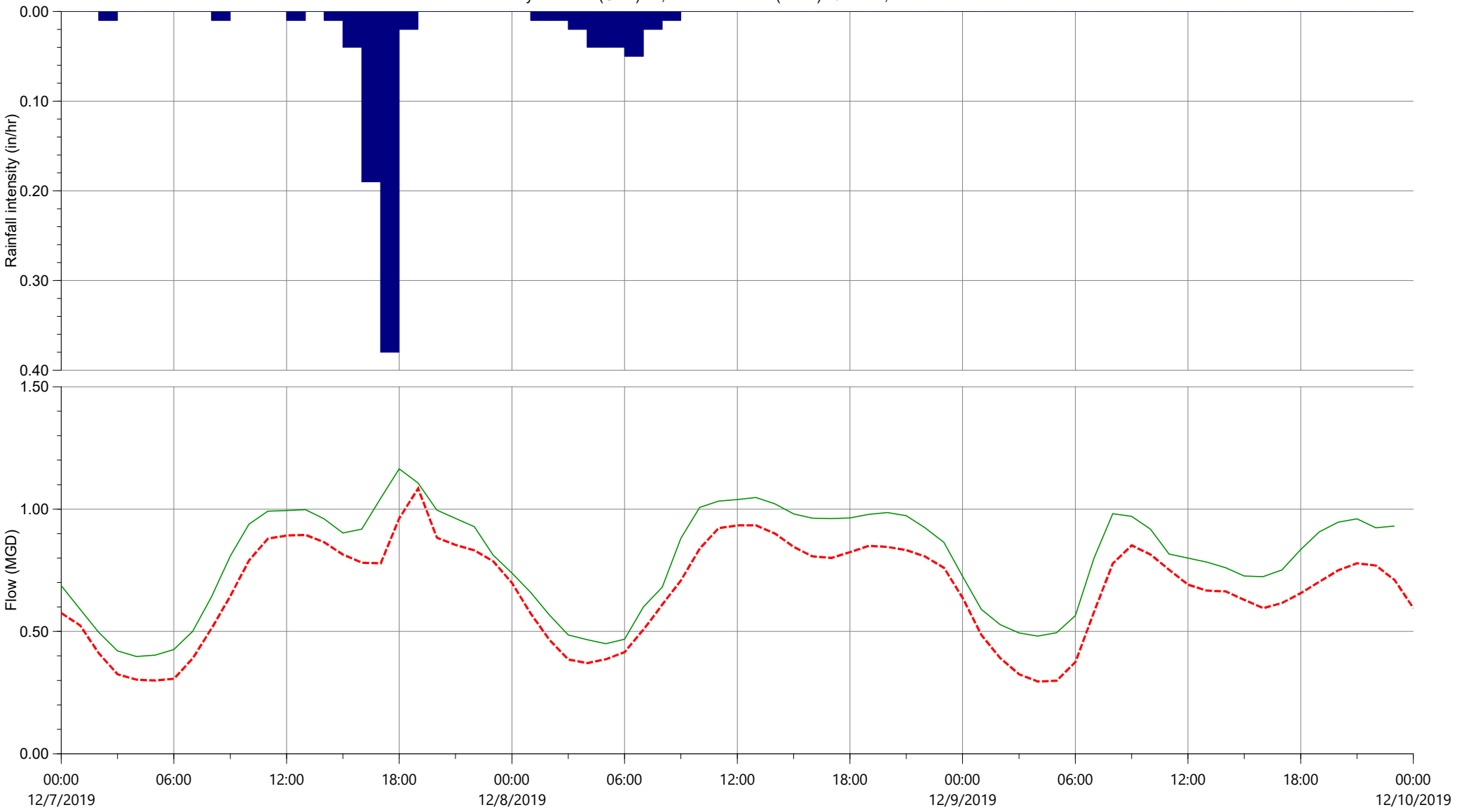


	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.870	0.380	0.012			
Observed				0.359	0.750	1.454
Model				0.350	0.726	1.455

Observed / Predicted Report (Custom graph) - Wet Weather Calibration FINAL

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Flow Survey Location (Obs.) 41, Model Location (Pred.) D/S 41.1, Rainfall Profile: 1

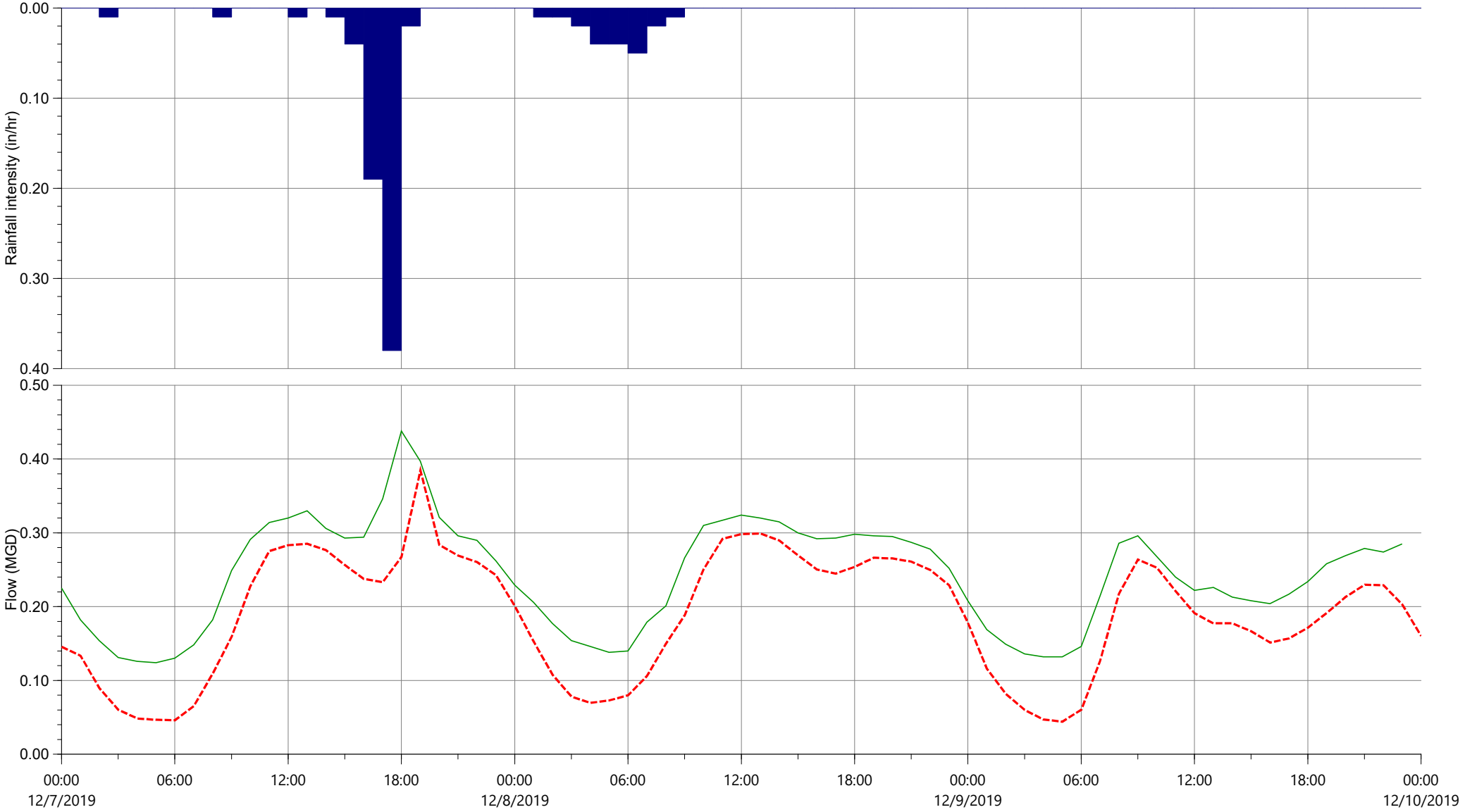


	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.870	0.380	0.012			
Observed				0.398	1.165	2.351
Model				0.296	1.085	2.011

Observed / Predicted Report (Custom graph) - Wet Weather Calibration FINAL

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Flow Survey Location (Obs.) 592, Model Location (Pred.) D/S 592.1, Rainfall Profile: 1

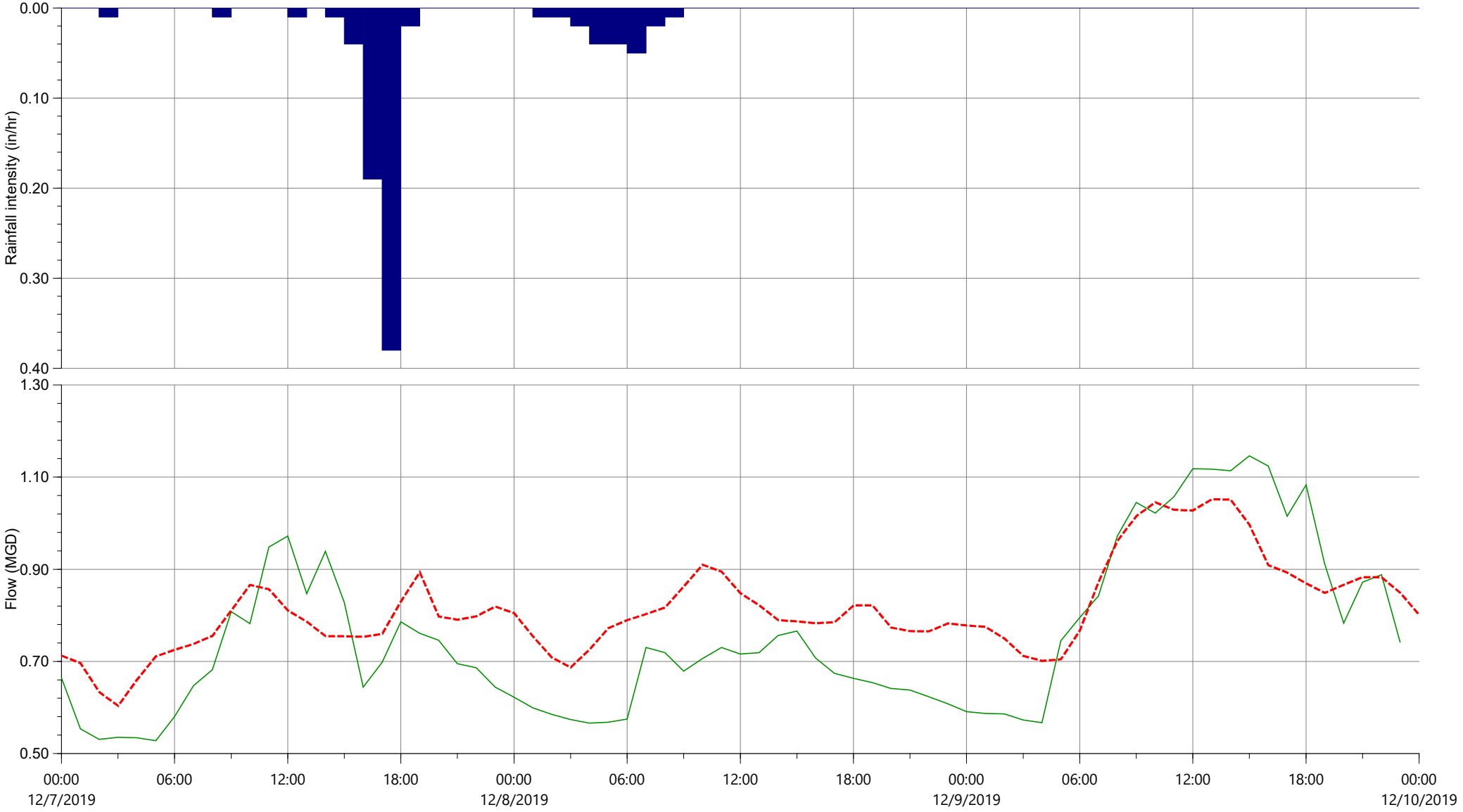


	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.870	0.380	0.012			
Observed				0.124	0.438	0.715
Model				0.044	0.385	0.565

Observed / Predicted Report (Custom graph) - Wet Weather Calibration FINAL

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Flow Survey Location (Obs.) 649, Model Location (Pred.) D/S 649.1, Rainfall Profile: 1

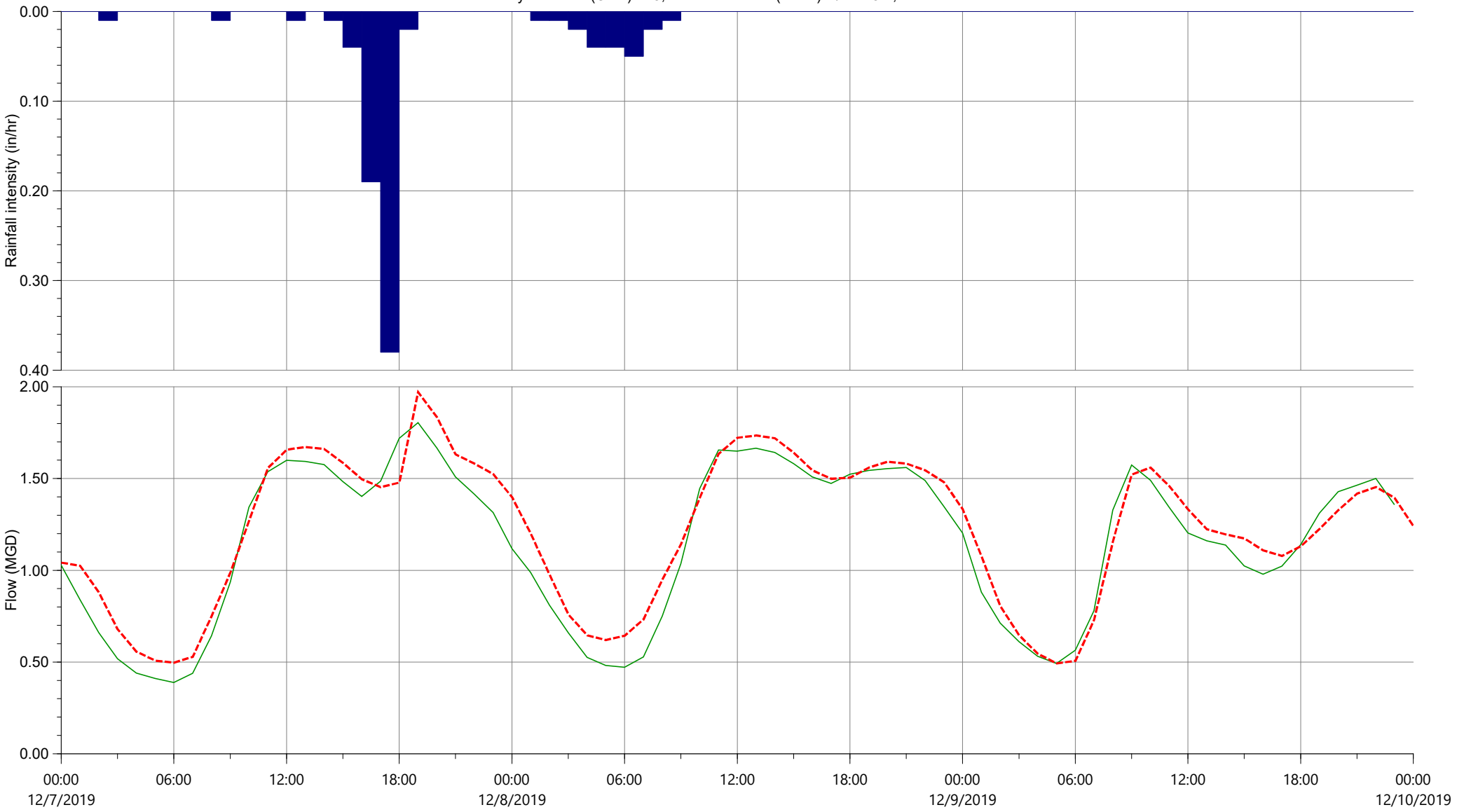


	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.870	0.380	0.012			
Observed				0.528	1.146	2.227
Model				0.603	1.052	2.445

Observed / Predicted Report (Custom graph) - Wet Weather Calibration FINAL

Powered by InfoWorks®

Flow Survey Location (Obs.) 715, Model Location (Pred.) D/S 715.1, Rainfall Profile: 1

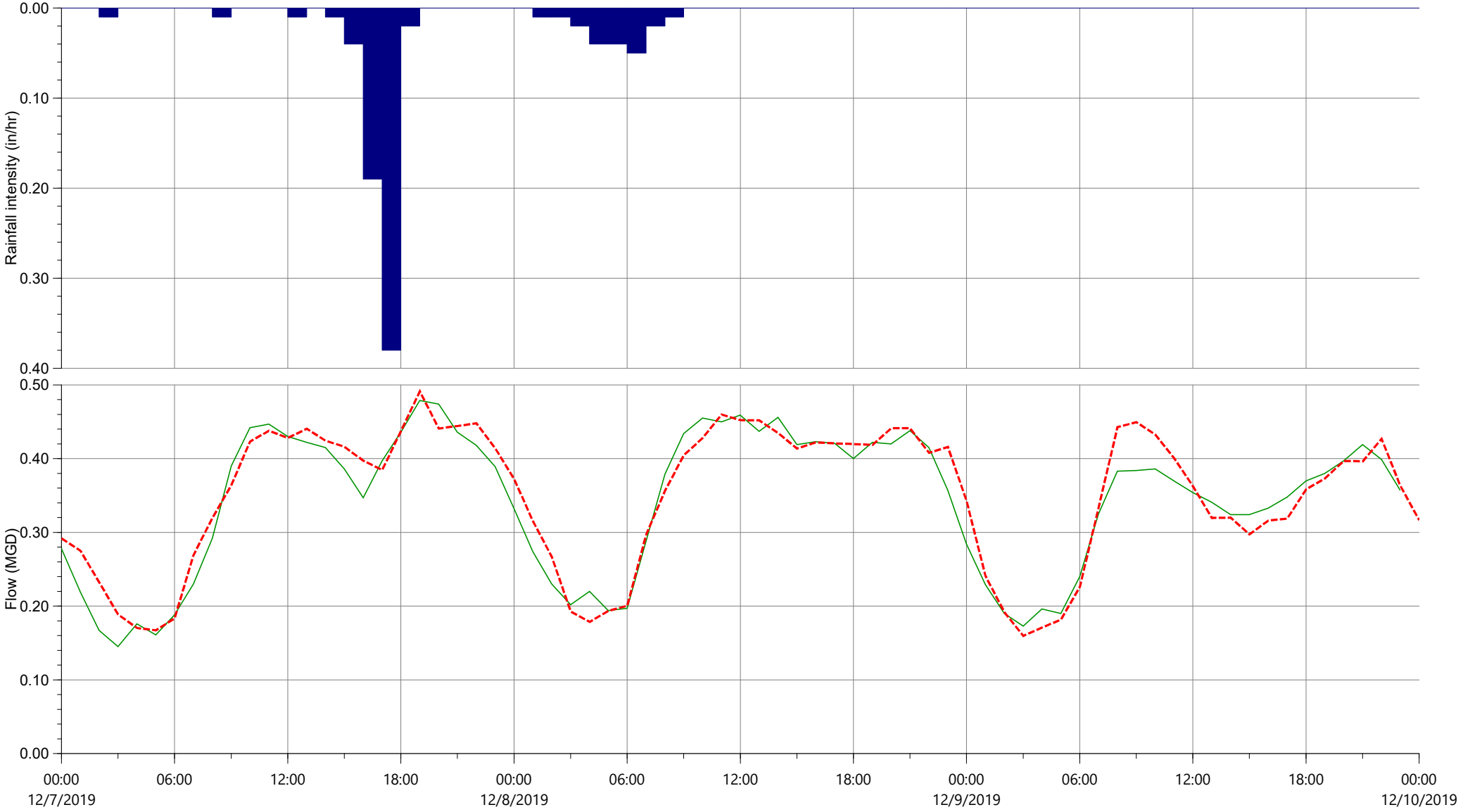


	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.870	0.380	0.012			
Observed				0.388	1.804	3.408
Model				0.494	1.971	3.670

Observed / Predicted Report (Custom graph) - Wet Weather Calibration FINAL

Powered by InfoWorks®

Flow Survey Location (Obs.) 744, Model Location (Pred.) D/S 744.1, Rainfall Profile: 1



	Rainfall			Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (MGD)	Max (MGD)	Volume (US Mgal)
Rain	0.870	0.380	0.012			
Observed				0.145	0.479	1.011
Model				0.160	0.492	1.047

Observed / Predicted Report (Custom graph) - Wet Weather Calibration FINAL

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APPENDIX F

City of Milpitas
Sewer Master Plan Study
Los Esteros Ranch Agreement

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DOCUMENT: 490116

Pages: 41

Fees.... * No Fees
Taxes...
Copies..
AMT PAID

BRENDA DAVIS
SANTA CLARA COUNTY RECORDER
Recorded at the request of
City

RDE # 003
11/25/2003
9:18 AM

Control No. 2003-008

Recording requested by:
City of Milpitas
When recorded mail to:
City of Milpitas
City Engineer's Office
455 E. Calaveras Blvd.
Milpitas, Ca 95035

Record without fee under Section 6103-Government Code, State of California

AGREEMENT BETWEEN THE CITY OF MILPITAS AND LOS ESTEROS RANCH PARTNERSHIP FOR USE OF CERTAIN CITY OF MILPITAS SANITARY SEWER AND WATER FACILITIES BY THE CITY OF SAN JOSE

This agreement ("Agreement"), is made and entered into this 6th day of August, 2003 ("Effective Date"), by and between the City of Milpitas, California, a general law city of the State of California ("Milpitas") and Los Esteros Ranch Partnership ("Property Owner"). Milpitas and Property Owner may be referred to herein individually as a "Party" or collectively as the "Parties" or the "Parties to this Agreement".

RECITALS

The purpose for which this Agreement is made, and all pertinent recitals, is described below:

A. Property Owner owns or leases certain real property located in the city of San Jose as shown on Exhibit A. The properties subject to this Agreement are Parcel 1, hereinafter referred to as the "East of McCarthy Boulevard Parcel", Parcel 2, hereinafter referred to as the "West of McCarthy Boulevard Parcel" and Parcel 3, hereinafter referred to as the "BFI Recyclery Parcel" ("Subject Properties"). Parcel 1 and Parcel 2 are jointly subject to the terms and conditions of San Jose PDC No. 99-09-078

and PD 01-084. Parcel 3 is subject to the terms and conditions of San Jose Planned Development Zoning PDC93-044, Planned Development Permit PD95-068, and Planned Development Permit Adjustments AD01-637 and AD02-679.

B. Property Owner wishes to be allowed to discharge sewage into the Milpitas-Owned Sewer System as shown on Exhibit B; and receive potable water from the Milpitas-Owned Water System.

C The City of Jose and Milpitas are preparing to enter into sewer and water agreements to enable the Subject Properties to receive sewage discharge and receive water services from the City of Milpitas without cost or expense to Milpitas ("City Agreements") attached hereto and incorporated herein as Exhibit C.

D. Property Owner, in consideration for Milpitas entering into the City Agreements, provides the commitments herein.

Therefore, in consideration of their mutual covenants, promises and undertakings, Property Owner and Milpitas agree as follows:

1. EFFECTIVE DATE

This Agreement will become effective immediately upon the execution of both the City Agreements by San Jose and Milpitas and this Agreement.

2. DEFINITIONS

For the purpose of this Agreement, the following words or terms shall have the following meanings, unless otherwise stated in this Agreement:

A. Milpitas-Owned Sewer System - "Milpitas-Owned Sewer Lines" means those sewer lines and related facilities including pump stations within the legal boundaries of Milpitas, or outside Milpitas where rights are defined by ownership of property, easements, public right of way or other agreements.

B. Milpitas-Owned Water System – "Milpitas-Owned Water Lines" means those water lines and related facilities within the legal boundaries of Milpitas, or outside Milpitas where rights are defined by ownership of property, easements, public right of way or other agreements.

3. LAND USE CONSENT

A. Property Owner acknowledges that the subject Property is located adjacent to the McCarthy Business Park and is in an area that serves as a gateway entrance to Milpitas. Milpitas, therefore, has a significant interest in ensuring that any new development or redevelopment on the subject Property is consistent and/or compatible with the McCarthy Business Park and with the City's goals for this gateway area. Property Owner hereby agrees that there shall be no new change in use, or other development, redevelopment, or change in design of the subject Property, or improvement thereon, without the prior consent of the Milpitas Planning Manager or employee with equivalent responsibilities.

B. Milpitas has reviewed and approved the terms and conditions of San Jose PDC99-09-078 and the plans for the development of the West of McCarthy Boulevard Parcel. Milpitas consents to this development receiving sewer and water service. All connections to Milpitas facilities will be performed at no cost to Milpitas.

C. No development has been initiated for the East of McCarthy Boulevard Parcel. Prior to any future development on this parcel receiving water and sewer service pursuant to the City Agreements, the Property Owner shall comply with Section 3.A of this Agreement.

D. The BFI Recyclery Parcel contains an existing use and improvements. This Agreement shall serve as Milpitas' consent to this parcel receiving sewer and water service from San Jose to serve this existing use.

4. INDEMNIFICATION

A. The City of San Jose has agreed to defend, hold harmless, and indemnify Milpitas, its elective and appointive boards and commissions; and its officers, agents, and employees for loss or damage to any person or entity, and to defend, indemnify, hold harmless and release Milpitas, its agents and employees, from and against any and all actions, regulatory proceedings, claims, damages, liabilities, fines, penalties, or expenses that may be asserted by any person or entity, including San Jose arising out of or in connection with the performance of the Agreement hereunder, whether or not there is concurrent negligence on the part of the Milpitas, but excluding liability due to the sole active negligence or sole willful misconduct of the Milpitas.

B. Property Owner has agreed to provide an indemnification to the City of San Jose which indemnifies that city to the full extent of its indemnification of Milpitas.

5. WAIVERS

Waiver by any party to this Agreement of any breach, default, or violation of any term or condition of this Agreement shall not be deemed to be a waiver of any other term or condition of this Agreement, or a waiver of any subsequent breach or violation of the same, or any other term or condition.

6. NOTICES

All notices and other communications required or permitted to be given under this Agreement shall be in writing and shall be personally served or mailed, postage prepaid and return-receipt requested, addressed to the respective Parties, or by facsimile, as follows:

To Property Owner: Los Esteros Ranch
c/o Mr. Will Oswald
1125 North Amphlett Blvd.
San Mateo, CA 94401

Copy To: Realty Law, LLP
c/o Joan Gallo
125 S. Market St. Suite 500
San Jose, CA 95112

To Milpitas: City Engineer
City of Milpitas
455 E. Calavaras Blvd.
Milpitas, CA 95035
Or by facsimile at (408) 586-3305

Notice shall be deemed effective on the date personally delivered or, if mailed, three (3) days after deposit in the mail.

7. NO TITLE OR PROPERTY RIGHTS CONFERRED

This Agreement is not intended to and shall not confer title or any other property right to Property Owner in any part of Milpitas Owned Sewer or Water Lines.

8. RECORDATION

This Agreement is intended to and shall run with the land. Property Owner shall cause this Agreement to be recorded within thirty (30) days after the effective date and shall provide a copy of the recorded document to Milpitas.

9. TERMINATION AND NONRENEWAL

The City Agreements give rights of termination to both cities. Milpitas shall immediately give notice to Property Owner of any violation under the City Agreements Termination clause. In addition, the City Agreements are subject to a limited term of twenty years with a provision that allows for an extension of not more than ten (10) years. Milpitas shall endeavor to provide property owners with one year advance notice should it determine for any reason that it will not extend either of the City Agreements. This Agreement shall terminate if such termination or refusal to extend by either City shall ever become effective. If in the future, for any reason, services to a property subject to this Agreement are provided by the City of San Jose, this Agreement shall terminate with respect to that property. In addition, each Property Owner may terminate this Agreement on ninety (90) days advance written notice to the City, at which time this Agreement will be of no further force or effect.

10. GOVERNING LAW

The law governing this Agreement shall be that of the State of California.

11. COMPLIANCE WITH LAWS

Parties agree to comply with all applicable laws, ordinances, codes and regulations of the federal, state and local governments.

12. VENUE

In the event that suit shall be brought by either Party to this Agreement, the Parties agree that venue shall be exclusively vested in the State Courts of the County of Santa Clara, or where otherwise appropriate, exclusively in the United States District Court, Northern District of California, San Jose, California.

13. PRIOR AGREEMENTS AND AMENDMENTS

This Agreement, including all Exhibits attached hereto, represents the entire understanding of the Parties as to those matters contained herein. No prior or written understanding shall be of any force or effect with respect to those matters covered hereunder.

14. INTERPRETATION OF AGREEMENT

The Parties to this Agreement acknowledge that each Party and their respective counsel have participated in the drafting and revision of this Agreement. Accordingly, the Parties agree that any rule of construction to the effect that ambiguities are to be resolved against the drafting party shall not apply in the interpretation of this Agreement or any Exhibit hereto.

15. THIRD PARTY BENEFICIARY

This Agreement shall be binding on and inure to the benefit of the Parties any owner, tenant or other person with an interest in the subject Properties.

16. AMENDMENT

This Agreement may be modified only by a written amendment duly executed by the Parties to this Agreement.

The Parties acknowledge and accept the terms and conditions of this Agreement as evidenced by the following signatures of their duly authorized representatives. It is the intent of the Parties that this Agreement shall become operative on the Effective Date.

PROPERTY OWNER

Will Oswald, Partner
Los Esteros Ranch Partnership

MILPITAS

Approved as to Form:

for Steven T. Mattas, City Attorney

By: Thomas J. Wilson
THOMAS WILSON
City Manager

ATTEST:

Gail Blalock, City Clerk

Attach Notary Certificate

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT

State of CALIFORNIA

County of SAN MATEO

On AUGUST 6, 2003 (Date) before me, LORI L. HORN, NOTARY PUBLIC (Name and Title of Officer (e.g., "Jane Doe, Notary Public"))

personally appeared WILL OSWALD (Name(s) of Signer(s))

☐ personally known to me – OR – ☒ proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

LORI L. HORN
COMM. # 1284833
NOTARY PUBLIC • CALIFORNIA
SAN MATEO COUNTY
Comm. Exp. DEC. 17, 2004

WITNESS my hand and official seal.

Signature of Notary Public

OPTIONAL

Though the information below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent removal and reattachment of this form to another document.

Description of Attached Document

Title or Type of Document: _____

Document Date: _____ Number of Pages: _____

Signer(s) Other Than Named Above: _____

Capacity(ies) Claimed by Signer(s)

Signer's Name: _____

☐ Individual
☐ Corporate Officer
Title(s): _____
☐ Partner — ☐ Limited ☐ General
☐ Attorney-in-Fact
☐ Trustee
☐ Guardian or Conservator
☐ Other: _____

Signer Is Representing:

RIGHT THUMBPRINT OF SIGNER
Top of thumb here

Signer's Name: _____

☐ Individual
☐ Corporate Officer
Title(s): _____
☐ Partner — ☐ Limited ☐ General
☐ Attorney-in-Fact
☐ Trustee
☐ Guardian or Conservator
☐ Other: _____

Signer Is Representing:

RIGHT THUMBPRINT OF SIGNER
Top of thumb here

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CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT

State of California

County of Santa Clara } ss.

On 11-20-2003 (Date), before me, Gail A. Blalock Notary Public (Name and Title of Officer (e.g., "Jane Doe, Notary Public")),

personally appeared Thomas J. Wilson (Name(s) of Signer(s)),

☒ personally known to me
☐ proved to me on the basis of satisfactory evidence

to be the person(s) whose name(s) is/~~are~~ subscribed to the within instrument and acknowledged to me ~~that~~ he/~~she/they~~ executed the same in his/~~her/their~~ authorized capacity(~~ies~~), and that by his/~~her/their~~ signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

WITNESS my hand and official seal.

Gail A. Blalock
Signature of Notary Public

GAIL A. BLALOCK
Commission # 1283395
Notary Public - California
Santa Clara County
My Comm. Expires Dec 6, 2004

Place Notary Seal Above

OPTIONAL

Though the information below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent removal and reattachment of this form to another document.

Description of Attached Document

Title or Type of Document: Agreement for Sanitary Sewer & Water

Document Date: August 6, 2003 Number of Pages: 6 + exhibits

Signer(s) Other Than Named Above: Will Oswald

Capacity(ies) Claimed by Signer

Signer's Name: Thomas J. Wilson

☐ Individual
☒ Corporate Officer — Title(s): City Manager
☐ Partner — ☐ Limited ☐ General
☐ Attorney in Fact
☐ Trustee
☐ Guardian or Conservator
☐ Other: _____

Signer Is Representing: City of Milpitas

RIGHT THUMBPRINT OF SIGNER
Top of thumb here

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William J. Wagner
Thomas A. Armstrong
Michael L. Morsilli
David M. Wilson
James E. Thompson

July 9, 2003
HMH 2734-01-099

EXHIBIT "A"

All that certain real property situate in the City of San Jose, County of Santa Clara, State of California, described as follows:

PARCEL A

A portion of that certain parcel of land described in the deed from J. E. Fifer and Ellie E. Fifer, His Wife, to A. M. Standish dated September 23, 1946 and recorded in Book 1534 Official Records at page 499, Santa Clara County Records, said portion being bounded and described as follows:

COMMENCING at a 3/4 inch iron pipe found in the Northerly line of said parcel conveyed from J. E. Fifer, et ux, to A. M. Standish at the Westerly line of a 60 foot strip of land conveyed by William Boots, et al., to the County of Santa Clara, by deed dated April 26, 1876 and recorded July 11, 1876 in Book 41 of Deeds, page 469, Santa Clara County Records, said 3/4 inch iron pipe being N. 34° 39' 00" E., 3209.7 feet from a one (1) inch bar found at the section corner common to Sections 1 and 2, Township 6 South, Range 1 West, M.D.B. & M. and Sections 35 and 36, Township 5 South, Range 1 West, M.D.B. & M. as surveyed by Mission Engineers, Inc., in April 1963.

THENCE, along said Westerly line of a 60 foot strip of land conveyed by William Boots, et al, to the County of Santa Clara, the following courses and distances:

S. 69° 34' 00" E., 473.39 feet; S. 9° 09' 00" E., 111.36 feet; S. 48° 59' 00" W., 99.64 feet; S. 77° 15' 00" W., 478.87 feet; N. 85° 56' 00" W., 250.14 feet;

Thence S. 53° 33' 00" W. a distance of 11.67 feet, more or less, to the point of intersection with the Easterly prolongation of the common boundary lines of Parcels 1 and 2 above described (the course of said common boundary being N. 89° 58' 00" W.); thence N. 89° 58' 00" W. along said Easterly prolongation of said common boundary line a distance of 122.09 feet, more or less, to the Southeasterly corner of said Parcel 1 above described; thence along the Easterly boundary line of said Parcel 1 N. 43° 02' 00" E. a distance of 595.61 feet to a one (1) inch iron pipe in the said Northerly line of the said parcel conveyed to A. M. Standish; thence along said Northerly line S. 89° 58' 00" E., a distance of 55.46 feet to the point of commencement.

Being a portion of the Swamp and Overflow Survey No. 59 in Section 36, Township 5 South, Range 1 West, M.D.B. & M.

1570 Oakland Road, Suite 200 • P.O. Box 611510 • San Jose, CA 95161-1510 • Tel: (408) 487-2200 • Fax: (408) 487-2222
4456 Black Avenue, Suite 100 • Pleasanton, CA 94566-6147 • Tel: (925) 600-7335 • Fax: (925) 600-8895
7951 Wren Avenue, Suite D • Gilroy, CA 95020-4903 • Tel: (408) 846-0707 • Fax: (408) 846-0676

PARCEL B

BEGINNING at a point on the general Southerly line of that certain parcel of land described in the Deed from J. E. Fifer et ux to A. M. Standish, recorded December 1, 1947 in Book 1534, Official Records, at page 499, Santa Clara County Records distant thereof North 77° 15' 00" East 175.16 feet from the Southwesterly terminus of that certain course designated as North 77° 15' 00" East, 478.87 feet; thence leaving said point of beginning along said general Southerly line North 77°15' 00" East 279.04 feet to a point hereinafter referred to as Point "A"; thence leaving said general Southerly line from a tangent bearing of South 42° 14' 45" West along a curve to the right with a radius of 190.00 feet through a central angle of 48° 03' 04" for an arc length of 159.34 feet and North 89° 42' 11" West, 130.53 feet to the point of beginning.

PARCEL THREE

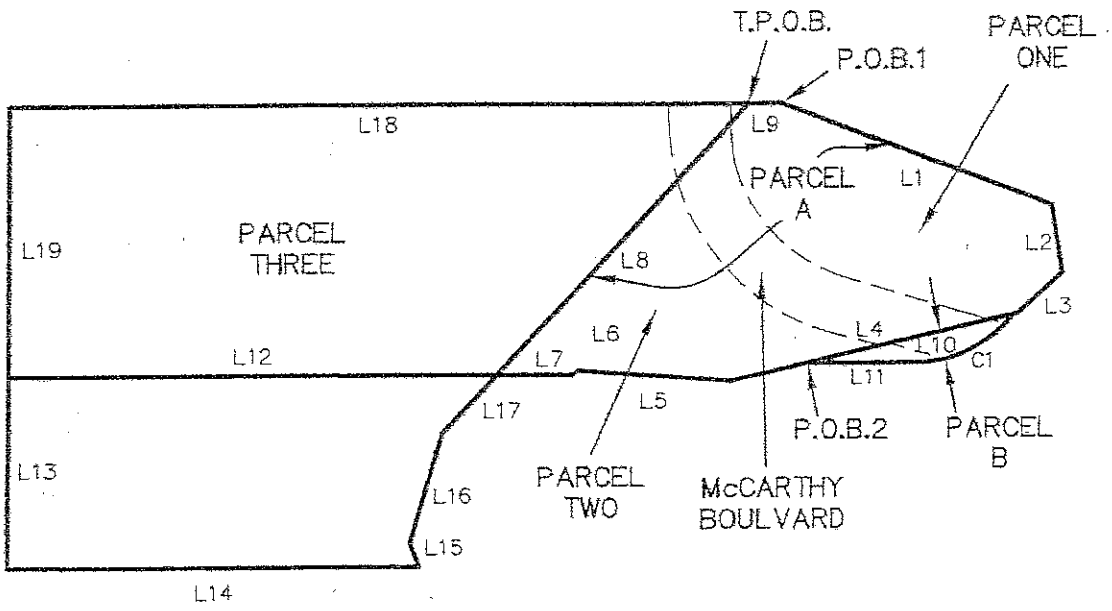
A portion of that certain parcel of land described in the deed from J. E. Filer and Ellie E. Filer, his wife, to A. M. Standish dated September 23, 1946 and recorded in Book 1534 Official Records at page 499, Santa Clara County Records, said portion being bounded and described as follows:

COMENCING at a 3/4 inch iron pipe found in the northerly line of said parcel conveyed from J. E. Filer, et ux to A. M. Standish at the westerly line of a 60 foot strip of land conveyed by William Boots, et al., to the County of Santa Clara, by deed dated April 26 1876 and recorded July 11, 1876 in Book 41 of Deeds, page 469, Santa Clara County Records, said 3/4 inch iron pipe being N. 34° 39' 00" E.,3209.7 feet from a one (1) inch bar found at the section corner common to Sections 1 and 2, Township 6 South, Range 1 West, M.D.B.& M. and Sections 35 and 36; Township 5 South, Range 1 West, M.D.B.& M. as surveyed by Mission Engineers, Inc. in April, 1963.

THENCE, on and along the said northerly line of said parcel conveyed to A. M. Standish N. 89° 58' 00" W., 55.46 feet to a one (1) inch iron pipe and the TRUE POINT OF COMMENCMENT.

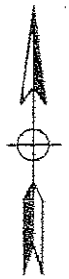
THENCE, along said northerly line N. 89° 58' 00" W., 1203.10 feet to a one (1) inch iron pipe; thence, S. 0° 02' 00" W., 435.60 feet to a one (1) inch iron pine; thence, S. 89° 58' 00" E., 796.90 feet to a one (1) inch iron pipe; thence, N. 43° 02' 00" E., 595.61 feet to the true point of commencement.

And being a portion of the Swamp and Overflow Survey No. 59 in Section 36, Township 5 South, Range 1 West, M.D.B.& M.



LINE	BEARING	DISTANCE
L1	S69°34'00"E	473.39'
L2	S09°09'00"E	111.36'
L3	S48°59'00"W	99.64'
L4	S77°15'00"W	478.87'
L5	N85°56'00"W	250.14'
L6	S53°33'00"W	11.67'
L7	N89°58'00"W	122.09'
L8	N43°02'00"E	595.61'
L9	S89°58'00"E	55.46'
L10	N77°15'00"E	279.04'
L11	N89°42'11"W	130.53'
L12	S89°58'00"E	796.90'
L13	S00°02'00"W	310.52'
L14	S89°58'00"E	671.84'
L15	N22°54'00"W	41.59'
L16	S16°40'00"W	185.40'
L17	N43°02'00"E	129.32'
L18	N89°58'00"W	1203.10'
L19	S00°02'00"W	435.60'

CURVE	RADIUS	DELTA	LENGTH
C1	190.00'	48°03'04"	159.34'





GRAPHIC SCALE
1 INCH = 300 FT.

SHEET 1 OF 1

Date:	7-09-03
Scale:	1"=300'
Designed:	–
Drawn:	dt
Checked:	DT
Proj. Engr.:	–
Dwg Name:	2734PL11

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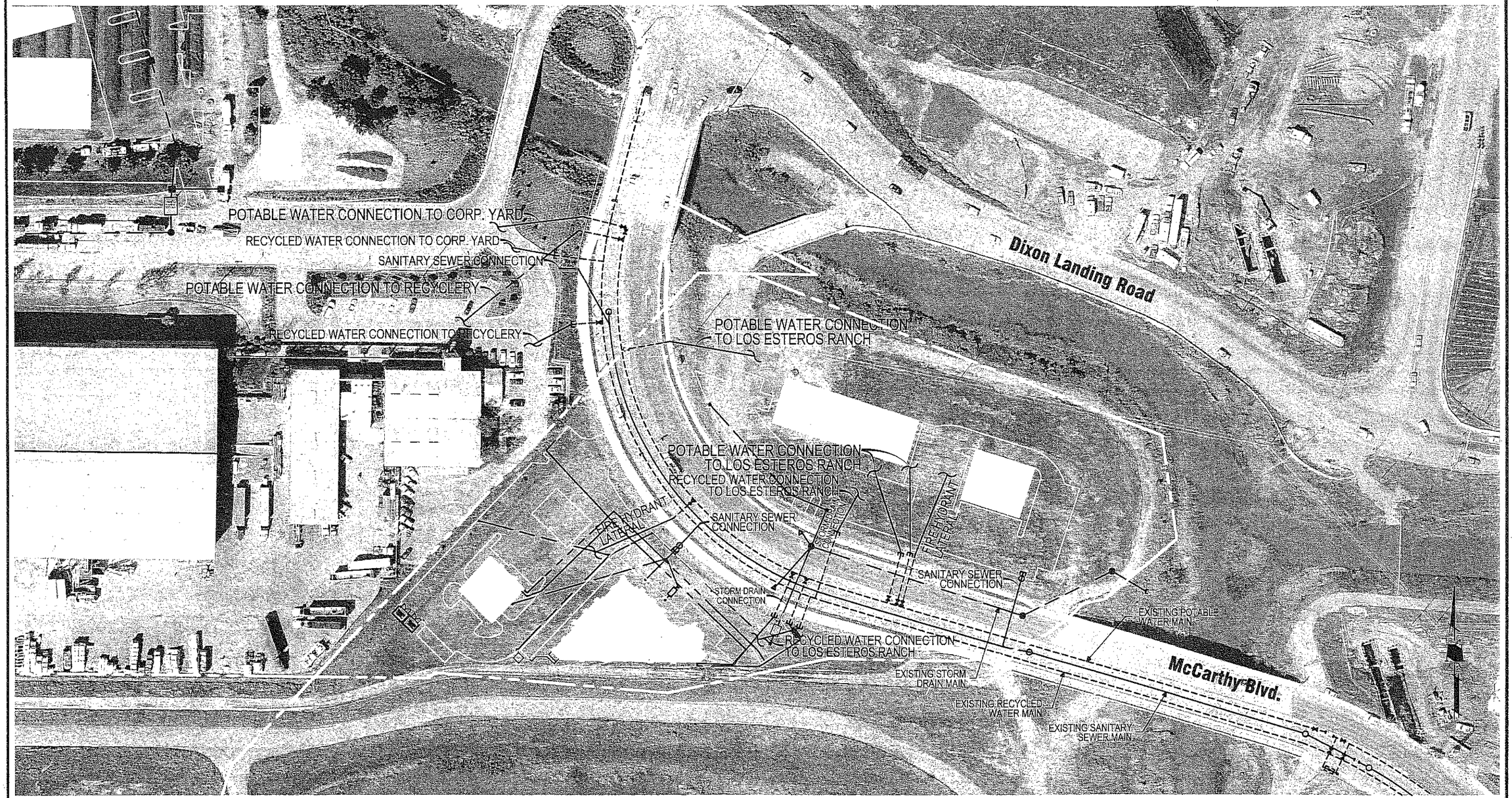
PLAT TO ACCOMPANY
EXHIBIT "A"
LOS ESTEROS RANCH PROPERTIES"
SAN JOSE CALIFORNIA

20030709.1113

EXHIBIT B

LEGEND

POTABLE WATER LINE	EXISTING	PROPOSED	SANITARY SEWER	EXISTING	PROPOSED
RECYCLED WATER LINE	EXISTING	PROPOSED	STORM DRAIN	EXISTING	PROPOSED



BY	DATE	REVISIONS

The Los Esteros Ranch
1125 N. Amphlett
San Mateo, CA 94401

Date:	7.29.03
Scale:	1"=100'
Designed:	DRR
Drawn:	JAM
Checked:	RTH
Proj. Engr:	DRR
File:	273401EX04

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The Los Esteros Ranch - Site One & Two
BFI Proposed Corporation Yard
Utility Connections

Sheet 1 of 1 Sheets
JOB NUMBER 2734-01

LEGEND

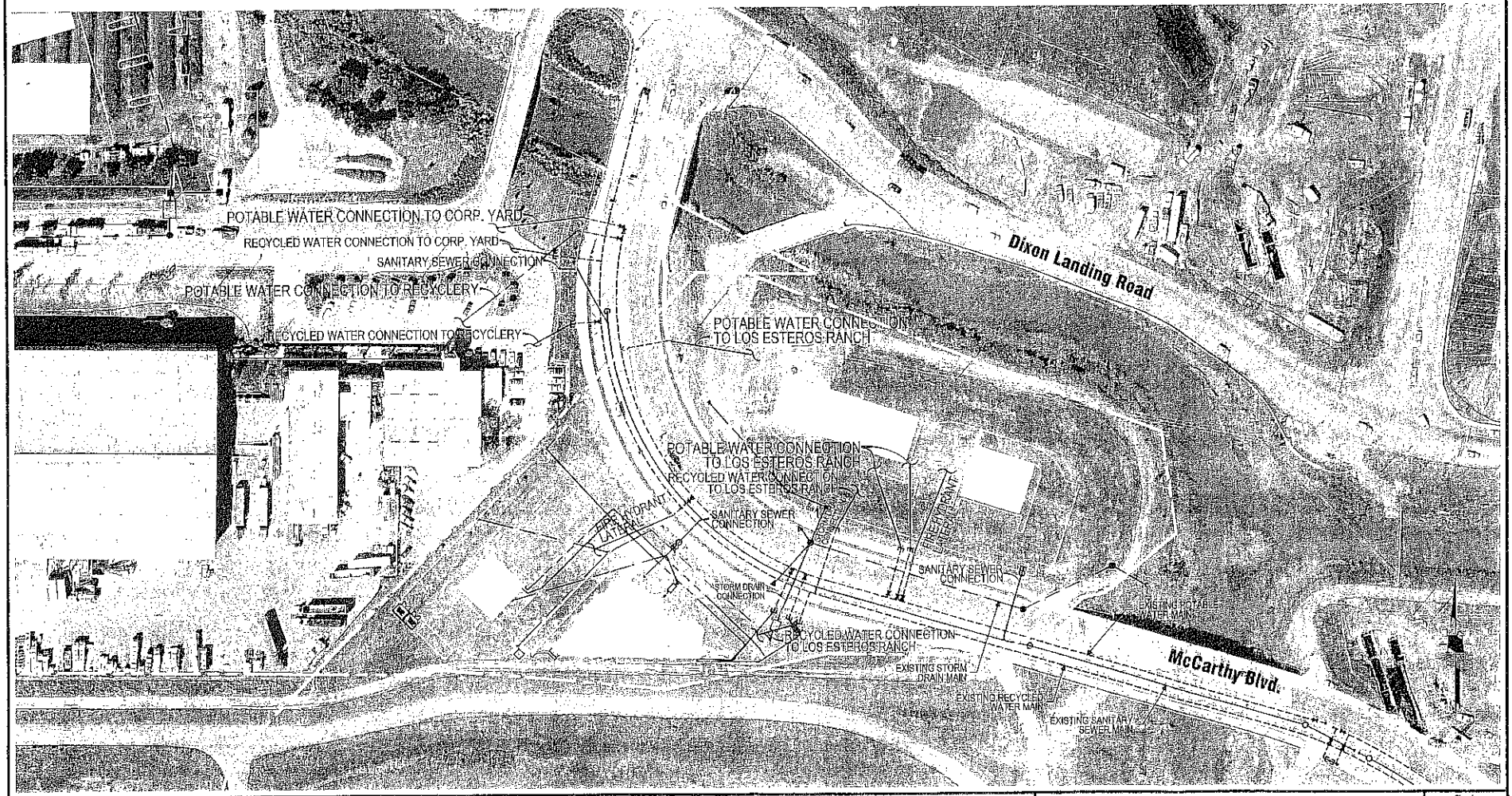
EXISTING ---------- POTABLE WATER LINE ———— PROPOSED

EXISTING ---------- RECYCLED WATER LINE ———— PROPOSED

EXISTING ———— SANITARY SEWER ———— PROPOSED

EXISTING ———— STORM DRAIN ———— PROPOSED

EXHIBIT B



BY	DATE	REVISIONS

The Los Esteros Ranch
1125 N. Amphlett
San Mateo, CA 94401

Date:	7.28.03
Scale:	1"=100'
Designed:	DRR
Drawn:	JAM
Checked:	RTH
Proj. Engr:	DRR
File:	2734-01EX04

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Pleasanton (925) 398-7338
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The Los Esteros Ranch - Site One & Two
BFI Proposed Corporation Yard
Utility Connections

Sheet 1 of 1 Sheets
JOB NUMBER 2734-01

EXHIBIT C

City Agreements

APPENDIX G

City of Milpitas
Sewer Master Plan Study
Raftelis Wastewater Financial Plan Options Report

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RAFTELIS

Project Memo

DATE:	June 9, 2022
TO:	Tony Ndah Public Works Director
FROM:	Todd Cristiano Senior Manager
SUBJECT:	Draft Wastewater Financial Plan Options

Introduction

The City of Milpitas retained Raftelis to complete a comprehensive financial planning forecast for their water, wastewater[1], and stormwater utilities[2]. Separate financial plans and memorandums were developed for each utility. This memorandum summarizes the wastewater financial plan results. The analysis included the following:

1. ***Revenue forecast.*** Includes the projection of rate revenues, the number of accounts, growth in accounts, and billed volume per account; projection of other operating and non-operating income, and development fees.
2. ***Expenditures forecast.*** Includes the projection of operation and maintenance expenses, transfers to the general fund, payments on existing debt service, and capital projects identified in the most recent master plan documents.
3. ***Revenue adjustments***. Optimizing the use of rate revenues and bond issues to minimize revenue adjustments while meeting annual revenue requirements, debt service coverage, and reserve targets.

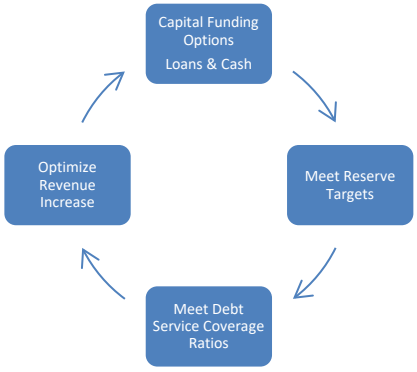
The forecast presented in this memo is for the study period FY 2022 through FY 2040. The City's wastewater utility is financially self-sufficient with funding for capital and operating requirements derived primarily from rates.

[1] Wastewater and sewer utility are used interchangeably throughout this memo.
[2] Stormwater activities are currently within the general fund and is not a stand-alone utility. For the purposes of this study, we created a cash flow consolidating the O&M costs for the various areas in the general fund and projects identified in the most recent master plan.

Financial Planning Process

A primary consideration in developing an 'optimal' financial plan is minimizing annual revenue increases by balancing the use of reserves, existing rate revenue, and debt proceeds. This balance is subject to the constraints of meeting the City's target reserve policies and debt service coverage requirements on any proposed debt.

This approach is an iterative process. For example, while issuing debt to fund a capital project may keep revenue increases low, new debt payments may decrease the coverage below the target level. As a result, a revenue increase may be needed to maintain compliance with the target. This revenue may produce an ending balance which exceeds the target reserve. This excess can be used to partially fund the capital project which, in turn, could reduce the proposed debt issuance amount.



Reserves

The City maintains three reserves for the wastewater utility. The excerpts below are from the City's financial reserve policy 11. These descriptions can also be found in the City's consolidated annual financial report. The proposed financial plan allows the City to maintain reserves in compliance with this policy.

Capital reserves for emergencies. The City will maintain capital reserves in the Water and Sewer utility enterprise funds to provide for future capital projects and unanticipated emergencies. The City will attempt to maintain a capital reserve of approximately 30% of the annual operating and maintenance expenses for the Water utility fund and 25% of the annual operating and maintenance expenses for the Sewer utility fund.

Rate stabilization reserve. The City will maintain a Rate Stabilization Reserve (RSR) in the Water and Sewer utility enterprise funds with a goal of at least 16.67% or two months of the respective annual operating expenditures after the Capital Reserve requirements have been met. The RSR shall be used to mitigate the effects of occasional shortfalls in revenue or unanticipated expenditures that cannot be rebalanced within existing budgeted resources in any given fiscal year.

Public Employees Retirement (PERS) Rate Stabilization Reserve. The City will maintain in the Utility Enterprise Funds or in a Section 115 Trust a Public Employees Retirement (PERS) Rate Stabilization Reserve to be funded by 20% of any General Fund or Enterprise Funds annual operating surpluses. The Water and Sewer Utility Enterprise Funds' portion of the Unfunded Actuarial Liability for the Miscellaneous Retirement Plan is 8.5% and 6.6%, respectively. The Utility Funds' portion of the contribution to the PERS Rate Stabilization Reserve shall be consistent with the General Fund contributions and only be funded after the Capital Reserve and Rate Stabilization Reserve (RSR) requirements in the Water and Sewer utility funds have been met.

Wastewater Utility Findings

Raftelis used the assumptions shown in Table 1 to develop the financial plan options. Changes in these assumptions could materially affect the results. These assumptions were based on information provided by Staff over the course of the study which included annual budgets, detailed billing data, forecasts of new customer connections, and master plan reports. The detailed wastewater cash flows are attached at the end of this memorandum.

Table 1: Wastewater Utility Assumptions

Item	Description
FY 2022 Beginning Fund Balance	
Capital Reserve for Emergencies	$3,675,927
Rate Stabilization Reserve	$2,451,108
Capital Fund	$35,522,844
TASP Fund	$0
Debt Issues	
Term	20 years
Interest Rate	4.25%
Debt Service Coverage Target	1.25x debt service payments
Average growth in number of accounts	2.2%
Annual average O&M Inflation [1]	3.5%
Average Annual Capital Projects Inflation	6.0% (FY 2023 – FY 2026) 4.0% (FY 2027 – FY 2040) Study period average ~4.3%
San José-Santa Clara Regional Wastewater Facility O&M Inflation	4%
[1] Include the City's portion of the Jose San José-Santa Clara Regional Wastewater Facility costs	

The wastewater utility financial plan consists of three sub-funds:

- ***Operating Fund.*** Funds activities associated with annual operation and maintenance of the utility, debt service payments, the City's portion of the San José-Santa Clara Regional Wastewater Facility treatment costs, maintaining emergency and rate stabilization reserves, and transfers of any surplus to the Capital Fund.
- ***Capital Fund***. Tracks activities associated with previously adopted CIP projects, projects identified in the master plan, and the City's capital portion of the San José-Santa Clara Regional Wastewater Facility costs. Primary sources of funding include transfers from the operating fund and debt issuance proceeds.
- ***TASP Fund***. Tracks funding and projects that have specifically been identified as being funded by TASP or future METRO development fees.

Operating Fund

Sources of Funds

Sources of funds consist primarily of rate revenue, other operating income, and non-operating income. Rate revenues with proposed increases is projected to increase from $21.7 million in FY 2023 to $27.1 million in FY 2040. This includes an average annual account growth of 2.2% from FY 2023 to FY 2040 based on future METRO plan development forecasts.

Uses of funds

Uses of Funds consist of operation and maintenance expense, debt service on the existing Series 2017 and Series 2019, and transfers to the capital fund to assist in funding the capital improvement program. O&M consists of the items required to collect wastewater and the costs the City pays to San Jose for wastewater treatment services, as well as costs associated with administration of the utility, and customer services. San José-Santa Clara Regional Wastewater Facility costs are projected to increase 4.0% annually based on information from San Jose. O&M expenses for the City's core operations (personnel services, general supplies, contractual services excluding water purchases, etc.) will increase by 4.0% from FY 2023 through FY 2025. This short-term inflation estimates are based on publications from the Philadelphia Federal Reserve. Inflation from FY 2026 through FY 2040 is estimated at 3.0% based on historical trends of the Consumer Price Index (CPI). Total O&M including wastewater treatment expense will increase by an average of 3.5% annually over the study period or from $13.0 million in FY 2023 to $24.0 million in FY 2040.

Capital Fund

Sources of Funds

Primary sources of funding include transfers from the operating fund and bond proceeds. Transfers from the operating fund are made in years where operating revenue exceeds operating expenses and required transfers to reserve funds.

Uses of Funds

Expenditures include capital projects identified in the adopted FY 2023 – FY 2040 capital budget and the master plan as well as the capital portion of the San José-Santa Clara Regional Wastewater Facility treatment capital costs from San Jose. Capital improvement program costs total $208.6 million for the study period which includes annual inflation of 6.0% from FY 2023 through FY 2025 and 4.0% from FY 2026 through FY 2040.

Revenue Requirement

Revenue from rates and other miscellaneous revenue should be sufficient to meet annual revenue requirements in the operating and capital funds; however, the City could issue a bond to accelerate implementation of critical projects. Revenue requirements include operation and maintenance expenses, capital project funding, payments on proposed debt service, and meeting target debt service coverage and reserves. Raftelis and City staff developed a financial plan to fully fund expenses, including the master plan projects, using revenue derived from rates and an option to issue bonds to accelerate project implementation.

Financial Plan Options

Raftelis and City staff developed two financial planning options to fully fund the expenses described above. Each option will ensure that the City is able to meet its obligations to San Jose for the San José-Santa Clara Regional Wastewater Facility expenses, continue to make debt service payments, operate and maintain the wastewater collection system, complete all projects identified in the master plan, and meet required reserve targets. The primary difference in the financial plan options relate to the timing and funding source for the Force main A project, which is a 40-year steel pipeline which conveys sewage from the City to the San José-Santa Clara Regional Wastewater Facility for treatment. The pipeline is in a corrosive environment and the condition of the pipeline is unknown due to the inability to dewater and inspect the pipeline

Option 1 – Bond Financing

Under this option, the City would issue a $30 million revenue bond in FY 2025 to fund the Force main A project. In addition to funding the O&M and capital expenditures described above, the City could make the required annual debt service payments (estimated at $2.3 million per year) with annual rate increases of 4.0% from FY 2024 through FY 2040.

- ***Operating and Capital Fund.*** Annual increases to sewer user charges of 4.0% are required in FY 2024 through FY 2040 in order to meet the annual revenue requirements. The revenue from these increases will adequately fund O&M, sewer treatment, reserve requirements, and provide surplus revenue to transfer to the CALPERS and capital funds.
- ***Bill Impact.*** Based on the rate increases proposed for this option, the bimonthly bill for typical single-family residential customer is projected to increase $4.97 from $124.14 to $129.11.

Option 1 has the following advantages:

- ***Lower rate impact on customers*** (4% increase in FY 2024) versus Option 2 (6% increase in FY 2024).
- ***Intergenerational equity***. The use of bonds recovers the cost of the asset over a time horizon that is closer to its useful life ensuring that future users, who will also benefit from the use of the force main, will participate in funding it.
- ***No reliance on development fees***. Does not rely on revenue from future METRO development fees that have not yet been determined
- ***Timely replacement***. Since the current condition of the Force main is unknown, it is safer to replace it sooner than later.

Option 2 – Cash and TASP Financing

Under this option, the Force main A project would be completed in FY 2030 and be 20% funded by future METRO development fees. This plan requires wastewater rate increases of 6% each year from FY 2024 to FY 2029 and 4% each year thereafter. This higher rate increase allows the City to generate the cash needed to fund approximately $29 million of the Force main A project expense. Additionally, the City must ensure that future METRO development fees are sufficient to provide $7.3 million by FY 2030 for the remainder of the project.

- ***Operating and Capital Fund.*** Annual increases to sewer user charges of 6.0% are required from FY 2024 through FY 2029 and 4.0% from FY 2029 through FY 2040. The revenue from these increases will adequately fund O&M, sewer treatment, reserve requirements, and provide surplus revenue to transfer to the CALPERS and capital funds.
- ***Bill Impact.*** Based on the rate increases proposed for this option, the bimonthly bill for typical single-family residential customer is projected to increase $7.45 from $124.14 to $131.59.

The primary advantage of this option is the savings on interest expense by cash funding the CIP rather than debt funding (Option 1). In addition, cash financing the CIP will not impact debt service coverage.

Reliance on City Provided Data

During this project, the City (and/or its representatives) provided Raftelis with a variety of technical information, including cost and revenue data. Raftelis did not independently assess or test for the accuracy of such data – historic or projected. Raftelis has relied on this data in the formulation of our findings and subsequent recommendations, as well as in the preparation of this memorandum.

There are often differences between actual and projected data. Some of the assumptions used for projections in this memorandum will not be realized, and unanticipated events and circumstances may occur. Therefore, there are likely to be differences between the data or results projected in this memorandum and actual results achieved, and those differences may be material. As a result, Raftelis takes no responsibility for the accuracy of data or projections provided by or prepared on behalf of the City, nor do we have any responsibility for updating this memorandum for events occurring after the date of this memorandum.

Table B-4
City of Milpitas, CA
Sewer Utility Cash Flow Analysis
Option 1 - Bond Finance Forcemain

Line No.	Description	Budget FY 2022	FY 2023	FY 2024	Projected FY 2025	FY 2026	FY 2027	FY 2028	FY 2029	FY 2030	FY 2031
		$	$	$	$	$	$	$	$	$	$
	Sources of Funds										
1	Revenue from Existing Wastewater Fees	20,236,812	21,735,520	22,042,585	22,373,301	22,695,210	23,017,441	23,340,002	23,662,901	23,986,148	24,318,934
2	Add'l Wastewater Fee Revenue from Rate Increases	-	-	881,703	1,825,661	2,833,815	3,909,709	5,056,679	6,278,218	7,577,986	8,963,207
3	Total Wastewater Fee Revenue	20,236,812	21,735,520	22,924,289	24,198,962	25,529,025	26,927,150	28,396,681	29,941,119	31,564,134	33,282,141
4	Investment Interest	251,000	205,863	128,475	135,749	140,330	163,748	168,270	168,270	172,524	177,612
5	**Total Sources**	**20,487,812**	**21,941,383**	**23,052,764**	**24,334,711**	**25,669,354**	**27,090,899**	**28,564,951**	**30,109,389**	**31,736,658**	**33,459,753**
	Revenue Requirements										
6	Operation and Maintenance Expense	12,647,178	12,984,506	13,829,820	14,383,013	14,937,446	15,483,703	16,050,272	16,637,921	17,247,445	17,879,671
7	Debt Service	2,435,875	2,431,275	2,458,700	2,455,200	4,710,795	4,707,045	4,060,545	4,063,295	4,064,295	4,063,545
8	**Total Revenue Requirements**	**$ 15,083,053**	**$ 15,415,781**	**$ 16,288,520**	**$ 16,838,213**	**$ 19,648,241**	**$ 20,190,748**	**$ 20,110,817**	**$ 20,701,216**	**$ 21,311,740**	**$ 21,943,216**
9	**Operating Surplus**	5,404,759	6,525,602	6,764,244	7,496,498	6,021,113	6,900,151	8,454,133	9,408,172	10,424,917	11,516,537
	Reserve Fund Summary										
10	Capital for Emergencies	3,770,763	3,853,945	4,072,130	4,209,553	4,912,060	5,047,687	5,047,687	5,175,304	5,327,935	5,485,804
11	Rate Stabilization	2,514,345	2,569,811	2,715,296	2,806,930	3,275,362	3,365,798	3,365,798	3,450,893	3,552,667	3,657,934
12	CALPERS	2,377,519	3,654,910	4,935,025	6,388,513	7,358,548	8,693,365	10,384,192	12,223,284	14,257,386	16,508,067
13	Infrastructure	31,767,093	30,810,141	26,925,283	19,492,104	13,487,785	13,000,029	12,635,035	15,944,039	14,768,426	11,180,628
14	**Total Reserves**	**$ 40,429,720**	**$ 40,888,807**	**$ 38,647,734**	**$ 32,897,100**	**$ 29,033,755**	**$ 30,106,879**	**$ 31,432,712**	**$ 36,793,519**	**$ 37,906,415**	**$ 36,832,433**
	Reserves less CALPERS	*6,285,108*	*6,423,756*	*6,787,426*	*7,016,483*	*8,187,422*	*8,413,485*	*8,626,197*	*8,880,602*	*9,143,738*	
		6,285,108	*6,423,756*	*6,787,426*	*7,016,483*	*8,187,422*	*8,413,485*	*8,380,178*	*8,626,197*	*8,880,602*	*9,143,738*
17	Annualized Wastewater Service Revenue Increase	0.0%	0.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
18	Cumulative Revenue Increase	0.0%	0.0%	4.0%	8.2%	12.5%	17.0%	21.7%	26.5%	31.6%	36.9%
19	Debt Service Coverage	3.22	3.68	3.75	4.05	2.28	2.47	3.08	3.32	3.57	3.83

Line No.	Reserve Fund Detail	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028	FY 2029	FY 2030	FY 2031
	Capital Reserve for Emergencies										
1	Beginning Balance	$ 3,675,927	$ 3,770,763	$ 3,853,945	$ 4,072,130	$ 4,209,553	$ 4,912,060	$ 5,047,687	$ 5,047,687	$ 5,175,304	$ 5,327,935
2	Contribution	94,836	83,182	218,185	137,423	702,507	135,627	-	127,617	152,631	157,869
3	**Ending Balance**	**$ 3,770,763**	**$ 3,853,945**	**$ 4,072,130**	**$ 4,209,553**	**$ 4,912,060**	**$ 5,047,687**	**$ 5,047,687**	**$ 5,175,304**	**$ 5,327,935**	**$ 5,485,804**
4	*Target*	*3,770,763*	*3,853,945*	*4,072,130*	*4,209,553*	*4,912,060*	*5,047,687*	*5,027,704*	*5,175,304*	*5,327,935*	*5,485,804*
	Rate Stabilization Reserve										
5	Beginning Balance	$ 2,451,108	2,514,345	2,569,811	2,715,296	2,806,930	3,275,362	3,365,798	3,365,798	3,450,893	3,552,667
6	Contribution	63,237	55,466	145,486	91,634	468,432	90,436	-	85,095	101,774	105,267
7	**Ending Balance**	**$ 2,514,345**	**$ 2,569,811**	**$ 2,715,296**	**$ 2,806,930**	**$ 3,275,362**	**$ 3,365,798**	**$ 3,365,798**	**$ 3,450,893**	**$ 3,552,667**	**$ 3,657,934**
8	*Target*	*2,514,345*	*2,569,811*	*2,715,296*	*2,806,930*	*3,275,362*	*3,365,798*	*3,352,473*	*3,450,893*	*3,552,667*	*3,657,934*
	CALPERS Reserve										
9	Beginning Balance	$ 1,328,182	2,377,519	3,654,910	4,935,025	6,388,513	7,358,548	8,693,365	10,384,192	12,223,284	14,257,386
10	Contribution	1,049,337	1,277,391	1,280,115	1,453,488	970,035	1,334,818	1,690,827	1,839,092	2,034,102	2,250,680
11	**Ending Balance**	**$ 2,377,519**	**$ 3,654,910**	**$ 4,935,025**	**$ 6,388,513**	**$ 7,358,548**	**$ 8,693,365**	**$ 10,384,192**	**$ 12,223,284**	**$ 14,257,386**	**$ 16,508,067**
12	**Transfer to Infrastructure Replacement**	$ 4,197,349	$ 5,109,563	$ 5,120,459	$ 5,813,953	$ 3,880,139	$ 5,339,271	$ 6,763,307	$ 7,356,368	$ 8,136,410	$ 9,002,721
	Check	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE
	Infrastructure Replacement										
13	Beginning Balance	$ 35,522,844	$ 31,767,093	$ 30,810,141	$ 26,925,283	$ 19,492,104	$ 13,487,785	$ 13,000,029	$ 12,635,035	$ 15,944,039	$ 14,768,426
14	Contribution	(3,755,751)	(956,952)	(3,884,858)	(7,433,179)	(6,004,319)	(487,756)	(364,994)	3,309,004	(1,175,612)	(3,587,798)
15	**Ending Balance**	**$ 31,767,093**	**$ 30,810,141**	**$ 26,925,283**	**$ 19,492,104**	**$ 13,487,785**	**$ 13,000,029**	**$ 12,635,035**	**$ 15,944,039**	**$ 14,768,426**	**$ 11,180,628**
	Target	*2,000,000*	*2,000,000*	*2,000,000*	*2,000,000*	*2,000,000*	*2,000,000*	*2,000,000*	*2,000,000*	*2,000,000*	*2,000,000*

Table B-4
City of Milpitas, CA
Sewer Utility Cash Flow Analysis
Option 1 - Bond Finance Forcemain

Line No.	Description	Projected FY 2032	FY 2033	FY 2034	FY 2035	FY 2036	FY 2037	FY 2038	FY 2039	FY 2040
		$	$	$	$	$	$	$	$	$
	Sources of Funds									
1	Revenue from Existing Wastewater Fees	24,652,571	24,987,076	25,322,469	25,658,771	25,996,002	26,334,184	26,673,339	27,013,488	27,133,054
2	Add'l Wastewater Fee Revenue from Rate Increases	10,435,724	11,999,900	13,660,309	15,421,748	17,289,252	19,268,102	21,363,838	23,582,269	25,719,435
3	Total Wastewater Fee Revenue	35,088,295	36,986,976	38,982,778	41,080,519	43,285,255	45,602,287	48,037,176	50,595,757	52,852,489
4	Investment Interest	182,875	188,319	194,223	199,381	204,754	210,326	216,086	222,039	228,234
5	**Total Sources**	**35,271,170**	**37,175,295**	**39,177,001**	**41,279,899**	**43,490,009**	**45,812,612**	**48,253,262**	**50,817,796**	**53,080,723**
	Revenue Requirements									
6	Operation and Maintenance Expense	18,535,455	19,243,111	19,863,208	20,506,219	21,173,003	21,864,452	22,581,494	23,325,089	24,096,236
7	Debt Service	4,061,045	4,061,795	4,060,545	4,062,295	4,064,045	4,063,795	4,061,045	4,060,795	4,062,795
8	**Total Revenue Requirements**	**$ 22,596,500**	**$ 23,304,906**	**$ 23,923,753**	**$ 24,568,514**	**$ 25,237,048**	**$ 25,928,247**	**$ 26,642,539**	**$ 27,385,884**	**$ 28,159,031**
9	**Operating Surplus**	12,674,670	13,870,389	15,253,247	16,711,385	18,252,961	19,884,365	21,610,724	23,431,912	24,921,692
	Reserve Fund Summary									
10	Capital for Emergencies	5,649,125	5,826,226	5,980,938	6,142,129	6,309,262	6,482,062	6,660,635	6,846,471	7,039,758
11	Rate Stabilization	3,766,836	3,884,928	3,988,090	4,095,571	4,207,016	4,322,239	4,441,311	4,565,227	4,694,111
12	CALPERS	18,988,556	21,703,595	24,702,670	27,991,213	31,586,089	35,505,358	39,767,973	44,392,405	49,312,310
13	Infrastructure	19,296,211	18,803,709	19,885,515	22,128,922	23,615,088	27,395,292	35,362,200	44,463,662	54,429,953
14	**Total Reserves**	**$ 47,700,728**	**$ 50,218,459**	**$ 54,557,213**	**$ 60,357,835**	**$ 65,717,455**	**$ 73,704,950**	**$ 86,232,119**	**$ 100,267,765**	**$ 115,476,131**
	Reserves less CALPERS	*9,415,961*	*9,711,154*	*9,969,028*	*10,237,700*	*10,516,278*	*10,804,301*	*11,101,946*	*11,411,698*	*11,733,868*
		9,415,961	*9,711,154*	*9,969,028*	*10,237,700*	*10,516,278*	*10,804,301*	*11,101,946*	*11,411,698*	*11,733,868*
17	Annualized Wastewater Service Revenue Increase	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
18	Cumulative Revenue Increase	42.3%	48.0%	53.9%	60.1%	66.5%	73.2%	80.1%	87.3%	94.8%
19	Debt Service Coverage	4.12	4.41	4.76	5.11	5.49	5.89	6.32	6.77	7.13

Line No.	Reserve Fund Detail	FY 2032	FY 2033	FY 2034	FY 2035	FY 2036	FY 2037	FY 2038	FY 2039	FY 2040
	Capital Reserve for Emergencies									
1	Beginning Balance	$ 5,485,804	$ 5,649,125	$ 5,826,226	$ 5,980,938	$ 6,142,129	$ 6,309,262	$ 6,482,062	$ 6,660,635	$ 6,846,471
2	Contribution	163,321	177,102	154,712	161,190	167,133	172,800	178,573	185,836	193,287
3	**Ending Balance**	**$ 5,649,125**	**$ 5,826,226**	**$ 5,980,938**	**$ 6,142,129**	**$ 6,309,262**	**$ 6,482,062**	**$ 6,660,635**	**$ 6,846,471**	**$ 7,039,758**
4	*Target*	*5,649,125*	*5,826,226*	*5,980,938*	*6,142,129*	*6,309,262*	*6,482,062*	*6,660,635*	*6,846,471*	*7,039,758*
	Rate Stabilization Reserve									
5	Beginning Balance	3,657,934	3,766,836	3,884,928	3,988,090	4,095,571	4,207,016	4,322,239	4,441,311	4,565,227
6	Contribution	108,902	118,091	103,162	107,482	111,445	115,223	119,072	123,916	128,884
7	**Ending Balance**	**$ 3,766,836**	**$ 3,884,928**	**$ 3,988,090**	**$ 4,095,571**	**$ 4,207,016**	**$ 4,322,239**	**$ 4,441,311**	**$ 4,565,227**	**$ 4,694,111**
8	*Target*	*3,766,836*	*3,884,928*	*3,988,090*	*4,095,571*	*4,207,016*	*4,322,239*	*4,441,311*	*4,565,227*	*4,694,111*
	CALPERS Reserve									
9	Beginning Balance	16,508,067	18,988,556	21,703,595	24,702,670	27,991,213	31,586,089	35,505,358	39,767,973	44,392,405
10	Contribution	2,480,489	2,715,039	2,999,075	3,288,543	3,594,877	3,919,268	4,262,616	4,624,432	4,919,904
11	**Ending Balance**	**$ 18,988,556**	**$ 21,703,595**	**$ 24,702,670**	**$ 27,991,213**	**$ 31,586,089**	**$ 35,505,358**	**$ 39,767,973**	**$ 44,392,405**	**$ 49,312,310**
12	**Transfer to Infrastructure Replacement**	$ 9,921,957	$ 10,860,157	$ 11,996,299	$ 13,154,171	$ 14,379,506	$ 15,677,074	$ 17,050,463	$ 18,497,728	$ 19,679,617
	Check	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE
	Infrastructure Replacement									
13	Beginning Balance	$ 11,180,628	$ 19,296,211	$ 18,803,709	$ 19,885,515	$ 22,128,922	$ 23,615,088	$ 27,395,292	$ 35,362,200	$ 44,463,662
14	Contribution	8,115,582	(492,501)	1,081,806	2,243,407	1,486,165	3,780,204	7,966,908	9,101,462	9,966,291
15	**Ending Balance**	**$ 19,296,211**	**$ 18,803,709**	**$ 19,885,515**	**$ 22,128,922**	**$ 23,615,088**	**$ 27,395,292**	**$ 35,362,200**	**$ 44,463,662**	**$ 54,429,953**
	Target	*2,000,000*	*2,000,000*	*2,000,000*	*2,000,000*	*2,000,000*	*2,000,000*	*2,000,000*	*2,000,000*	*2,000,000*

Table B-5
City of Milpitas, CA
Sewer Capital Improvement Plan (CIP)
Option 1 - Bond Finance Forcemain

Line No.	Capital Financing Plan	Budget FY 2022	FY 2023	FY 2024	FY 2025	Projected FY 2026	FY 2027	FY 2028	FY 2029	FY 2030	FY 2031
		$	$	$	$	$	$	$	$	$	$
	Sources of Funds										
1	Beginning Balance	$ 35,522,844	$ 31,767,093	$ 30,810,141	$ 26,925,283	$ 19,492,104	$ 13,487,785	$ 13,000,029	$ 12,635,035	$ 15,944,039	$ 14,768,426
2	Revenue Bonds	-	-	-	30,000,000	-	-	-	-	-	-
3	Development Fees	452,000	1,417,137	452,000	452,000	452,000	452,000	452,000	452,000	452,000	452,000
4	Interest	394,900	156,722	308,101	269,253	194,921	134,878	130,000	126,350	159,440	147,684
5	Transfer of Surplus from O&M	4,197,349	5,109,563	5,120,459	5,813,953	3,880,139	5,339,271	6,763,307	7,356,368	8,136,410	9,002,721
6	**Subtotal: Sources**	$ 40,567,093	$ 38,450,515	$ 36,690,701	$ 63,460,488	$ 24,019,164	$ 19,413,934	$ 20,345,336	$ 20,569,754	$ 24,691,889	$ 24,370,832
	Uses of Funds										
7	CIP Projects	$ 8,800,000	$ 7,640,374	$ 9,765,418	$ 43,968,384	$ 10,531,379	$ 6,413,905	$ 7,710,301	$ 4,625,715	$ 9,923,462	$ 13,190,204
8	**Subtotal: Uses**	$ 8,800,000	$ 7,640,374	$ 9,765,418	$ 43,968,384	$ 10,531,379	$ 6,413,905	$ 7,710,301	$ 4,625,715	$ 9,923,462	$ 13,190,204
9	**Ending Balance**	$ 31,767,093	$ 30,810,141	$ 26,925,283	$ 19,492,104	$ 13,487,785	$ 13,000,029	$ 12,635,035	$ 15,944,039	$ 14,768,426	$ 11,180,628
	CIP Adjustments										
10	Completion Percentage	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
11	Annual Cost Inflation		6.0%	6.0%	6.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
12	Cumulative Inflation Rate	100.0%	106.0%	112.4%	119.1%	123.9%	128.8%	134.0%	139.3%	144.9%	150.7%

Table B-5
City of Milpitas, CA
Sewer Capital Improvement Plan (CIP)
Option 1 - Bond Finance Forcemain

Line No.	Capital Financing Plan	Projected FY 2032	FY 2033	FY 2034	FY 2035	FY 2036	FY 2037	FY 2038	FY 2039	FY 2040
		$	$	$	$	$	$	$	$	$
	Sources of Funds									
1	Beginning Balance	$ 11,180,628	$ 19,296,211	$ 18,803,709	$ 19,885,515	$ 22,128,922	$ 23,615,088	$ 27,395,292	$ 35,362,200	$ 44,463,662
2	Revenue Bonds	-	-	-	-	-	-	-	-	-
3	Development Fees	452,000	452,000	452,000	452,000	452,000	452,000	452,000	452,000	452,000
4	Interest	111,806	192,962	188,037	198,855	221,289	236,151	273,953	353,622	444,637
5	Transfer of Surplus from O&M	9,921,957	10,860,157	11,996,299	13,154,171	14,379,506	15,677,074	17,050,463	18,497,728	19,679,617
6	**Subtotal: Sources**	$ 21,666,392	$ 30,801,330	$ 31,440,045	$ 33,690,541	$ 37,181,717	$ 39,980,312	$ 45,171,707	$ 54,665,550	$ 65,039,916
	Uses of Funds									
7	CIP Projects	$ 2,370,181	$ 11,997,621	$ 11,554,530	$ 11,561,619	$ 13,566,630	$ 12,585,020	$ 9,809,508	$ 10,201,888	$ 10,609,963
8	**Subtotal: Uses**	$ 2,370,181	$ 11,997,621	$ 11,554,530	$ 11,561,619	$ 13,566,630	$ 12,585,020	$ 9,809,508	$ 10,201,888	$ 10,609,963
9	**Ending Balance**	$ 19,296,211	$ 18,803,709	$ 19,885,515	$ 22,128,922	$ 23,615,088	$ 27,395,292	$ 35,362,200	$ 44,463,662	$ 54,429,953
	CIP Adjustments									
10	Completion Percentage	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
11	Annual Cost Inflation	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
12	Cumulative Inflation Rate	156.7%	163.0%	169.5%	176.3%	183.4%	190.7%	198.3%	206.2%	214.5%

Table B-6
City of Milpitas, CA
Sewer Capital Improvement Plan - TASP
Option 1 - Bond Finance Forcemain

Line No.	Capital Financing Plan	Budget FY 2022	Projected FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028	FY 2029	FY 2030	FY 2031
		$	$	$	$	$	$	$	$	$	$
	Sources of Funds										
1	Beginning Balance		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2	Additional Rate Funded Capital										
3	**Subtotal: Sources**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Uses of Funds										
4	CIP Projects	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
5	**Subtotal: Uses**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
6	**Ending Balance**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	CIP Adjustments										
7	Cumulative Inflation Rate	100.0%	106.0%	112.4%	119.1%	123.9%	128.8%	134.0%	139.3%	144.9%	150.7%

Table B-6
City of Milpitas, CA
Sewer Capital Improvement Plan - TASP
Option 1 - Bond Finance Forcemain

Line No.	Capital Financing Plan	Projected FY 2032	FY 2033	FY 2034	FY 2035	FY 2036	FY 2037	FY 2038	FY 2039	FY 2040
		$	$	$	$	$	$	$	$	$
	Sources of Funds									
1	Beginning Balance	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2	Additional Rate Funded Capital									
3	**Subtotal: Sources**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Uses of Funds									
4	CIP Projects	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
5	**Subtotal: Uses**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
6	**Ending Balance**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	CIP Adjustments									
7	Cumulative Inflation Rate	156.7%	163.0%	169.5%	176.3%	183.4%	190.7%	198.3%	206.2%	214.5%

Table B-4
City of Milpitas, CA
Sewer Utility Cash Flow Analysis
Option 2 - Cash Finance Forcemain

Line No.	Description	Budget FY 2022	FY 2023	FY 2024	Projected FY 2025	FY 2026	FY 2027	FY 2028	FY 2029	FY 2030	FY 2031
		$	$	$	$	$	$	$	$	$	$
	Sources of Funds										
1	Revenue from Existing Wastewater Fees	20,236,812	21,735,520	22,042,585	22,373,301	22,695,210	23,017,441	23,340,002	23,662,901	23,986,148	24,318,934
2	Add'l Wastewater Fee Revenue from Rate Increases	-	-	1,322,555	2,765,340	4,335,148	6,041,548	7,894,186	9,903,376	11,399,654	12,992,884
3	Total Wastewater Fee Revenue	20,236,812	21,735,520	23,365,140	25,138,641	27,030,358	29,058,989	31,234,188	33,566,278	35,385,801	37,311,818
4	Investment Interest	251,000	205,863	128,475	135,749	140,330	145,116	149,643	149,643	153,908	159,002
5	**Total Sources**	**20,487,812**	**21,941,383**	**23,493,615**	**25,274,390**	**27,170,688**	**29,204,105**	**31,383,830**	**33,715,920**	**35,539,709**	**37,470,820**
	Revenue Requirements										
6	Operation and Maintenance Expense	12,647,178	12,984,506	13,829,820	14,383,013	14,958,333	15,505,216	16,072,431	16,660,745	17,270,954	17,903,884
7	Debt Service	2,435,875	2,431,275	2,458,700	2,455,200	2,454,200	2,450,450	1,803,950	1,806,700	1,807,700	1,806,950
8	**Total Revenue Requirements**	**$ 15,083,053**	**$ 15,415,781**	**$ 16,288,520**	**$ 16,838,213**	**$ 17,412,533**	**$ 17,955,666**	**$ 17,876,381**	**$ 18,467,445**	**$ 19,078,654**	**$ 19,710,834**
9	**Operating Surplus**	5,404,759	6,525,602	7,205,095	8,436,177	9,758,154	11,248,438	13,507,449	15,248,475	16,461,055	17,759,985
	Reserve Fund Summary										
10	Capital for Emergencies	3,770,763	3,853,945	4,072,130	4,209,553	4,353,133	4,488,917	4,488,917	4,616,861	4,769,663	4,927,709
11	Rate Stabilization	2,514,345	2,569,811	2,715,296	2,806,930	2,902,669	2,993,210	2,993,210	3,078,523	3,180,412	3,285,796
12	CALPERS	2,377,519	3,654,910	5,023,195	6,664,619	8,568,386	10,772,809	13,474,299	16,481,342	19,722,615	23,221,926
13	Infrastructure	31,767,093	30,810,141	27,277,964	20,375,455	18,114,899	21,151,835	24,911,011	33,014,580	7,857,294	9,194,907
14	**Total Reserves**	**$ 40,429,720**	**$ 40,888,807**	**$ 39,088,585**	**$ 34,056,557**	**$ 33,939,087**	**$ 39,406,770**	**$ 45,867,436**	**$ 57,191,306**	**$ 35,529,984**	**$ 40,630,338**
	Reserves less CALPERS	*6,285,108*	*6,423,756*	*6,787,426*	*7,016,483*	*7,255,803*	*7,482,126*	*7,482,126*	*7,695,384*	*7,950,075*	*8,213,505*
		6,285,108	*6,423,756*	*6,787,426*	*7,016,483*	*7,255,803*	*7,482,126*	*7,449,088*	*7,695,384*	*7,950,075*	*8,213,505*
17	Annualized Wastewater Service Revenue Increase	0.0%	0.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	4.0%	4.0%
18	Cumulative Revenue Increase	0.0%	0.0%	6.0%	12.4%	19.1%	26.2%	33.8%	41.9%	47.5%	53.4%
19	Debt Service Coverage	3.22	3.68	3.93	4.44	4.98	5.59	8.49	9.44	10.11	10.83

Line No.	Reserve Fund Detail	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028	FY 2029	FY 2030	FY 2031
	Capital Reserve for Emergencies										
1	Beginning Balance	$ 3,675,927	$ 3,770,763	$ 3,853,945	$ 4,072,130	$ 4,209,553	$ 4,353,133	$ 4,488,917	$ 4,488,917	$ 4,616,861	$ 4,769,663
2	Contribution	94,836	83,182	218,185	137,423	143,580	135,783	-	127,945	152,802	158,045
3	**Ending Balance**	**$ 3,770,763**	**$ 3,853,945**	**$ 4,072,130**	**$ 4,209,553**	**$ 4,353,133**	**$ 4,488,917**	**$ 4,488,917**	**$ 4,616,861**	**$ 4,769,663**	**$ 4,927,709**
4	*Target*	*3,770,763*	*3,853,945*	*4,072,130*	*4,209,553*	*4,353,133*	*4,488,917*	*4,469,095*	*4,616,861*	*4,769,663*	*4,927,709*
	Rate Stabilization Reserve										
5	Beginning Balance	$ 2,451,108	2,514,345	2,569,811	2,715,296	2,806,930	2,902,669	2,993,210	2,993,210	3,078,523	3,180,412
6	Contribution	63,237	55,466	145,486	91,634	95,739	90,540	-	85,313	101,888	105,384
7	**Ending Balance**	**$ 2,514,345**	**$ 2,569,811**	**$ 2,715,296**	**$ 2,806,930**	**$ 2,902,669**	**$ 2,993,210**	**$ 2,993,210**	**$ 3,078,523**	**$ 3,180,412**	**$ 3,285,796**
8	*Target*	*2,514,345*	*2,569,811*	*2,715,296*	*2,806,930*	*2,902,669*	*2,993,210*	*2,979,993*	*3,078,523*	*3,180,412*	*3,285,796*
	CALPERS Reserve										
9	Beginning Balance	$ 1,328,182	2,377,519	3,654,910	5,023,195	6,664,619	8,568,386	10,772,809	13,474,299	16,481,342	19,722,615
10	Contribution	1,049,337	1,277,391	1,368,285	1,641,424	1,903,767	2,204,423	2,701,490	3,007,043	3,241,273	3,499,311
11	**Ending Balance**	**$ 2,377,519**	**$ 3,654,910**	**$ 5,023,195**	**$ 6,664,619**	**$ 8,568,386**	**$ 10,772,809**	**$ 13,474,299**	**$ 16,481,342**	**$ 19,722,615**	**$ 23,221,926**
12	**Transfer to Infrastructure Replacement**	$ 4,197,349	$ 5,109,563	$ 5,473,140	$ 6,565,696	$ 7,615,068	$ 8,817,692	$ 10,805,959	$ 12,028,174	$ 12,965,092	$ 13,997,245
	Check	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE
	Infrastructure Replacement										
13	Beginning Balance	$ 35,522,844	$ 31,767,093	$ 30,810,141	$ 27,277,964	$ 20,375,455	$ 18,114,899	$ 21,151,835	$ 24,911,011	$ 33,014,580	$ 7,857,294
14	Contribution	(3,755,751)	(956,952)	(3,532,177)	(6,902,509)	(2,260,556)	3,036,936	3,759,176	8,103,569	(25,157,286)	1,337,614
15	**Ending Balance**	**$ 31,767,093**	**$ 30,810,141**	**$ 27,277,964**	**$ 20,375,455**	**$ 18,114,899**	**$ 21,151,835**	**$ 24,911,011**	**$ 33,014,580**	**$ 7,857,294**	**$ 9,194,907**
	Target	*2,000,000*	*2,000,000*	*2,000,000*	*2,000,000*	*2,000,000*	*2,000,000*	*2,000,000*	*2,000,000*	*2,000,000*	*2,000,000*

Table B-4
City of Milpitas, CA
Sewer Utility Cash Flow Analysis
Option 2 - Cash Finance Forcemain

Line No.	Description	Projected FY 2032	FY 2033	FY 2034	FY 2035	FY 2036	FY 2037	FY 2038	FY 2039	FY 2040
		$	$	$	$	$	$	$	$	$
	Sources of Funds									
1	Revenue from Existing Wastewater Fees	24,652,571	24,987,076	25,322,469	25,658,771	25,996,002	26,334,184	26,673,339	27,013,488	27,133,054
2	Add'l Wastewater Fee Revenue from Rate Increases	14,684,084	16,478,145	18,380,197	20,395,624	22,530,069	24,789,457	27,179,999	29,708,214	32,118,617
3	Total Wastewater Fee Revenue	39,336,655	41,465,221	43,702,666	46,054,394	48,526,071	51,123,641	53,853,338	56,721,702	59,251,671
4	Investment Interest	164,270	169,721	175,631	180,795	186,175	191,753	197,521	203,481	209,683
5	**Total Sources**	**39,500,925**	**41,634,941**	**43,878,297**	**46,235,189**	**48,712,246**	**51,315,394**	**54,050,859**	**56,925,183**	**59,461,354**
	Revenue Requirements									
6	Operation and Maintenance Expense	18,560,395	19,268,799	19,889,667	20,533,472	21,201,073	21,893,365	22,611,274	23,355,762	24,127,830
7	Debt Service	1,804,450	1,805,200	1,803,950	1,805,700	1,807,450	1,807,200	1,804,450	1,804,200	1,806,200
8	**Total Revenue Requirements**	**$ 20,364,845**	**$ 21,073,999**	**$ 21,693,617**	**$ 22,339,172**	**$ 23,008,523**	**$ 23,700,565**	**$ 24,415,724**	**$ 25,159,962**	**$ 25,934,030**
9	**Operating Surplus**	19,136,080	20,560,942	22,184,680	23,896,017	25,703,723	27,614,829	29,635,135	31,765,221	33,527,325
	Reserve Fund Summary									
10	Capital for Emergencies	5,091,211	5,268,500	5,423,404	5,584,793	5,752,131	5,925,141	6,103,931	6,289,991	6,483,507
11	Rate Stabilization	3,394,820	3,513,036	3,616,326	3,723,940	3,835,521	3,950,884	4,070,101	4,194,166	4,323,203
12	CALPERS	26,994,637	31,047,724	35,433,021	40,158,424	45,243,385	50,708,676	56,576,102	62,867,121	69,508,075
13	Infrastructure	22,459,518	27,350,843	34,063,009	42,195,632	49,842,802	60,069,374	74,782,263	90,944,275	108,259,571
14	**Total Reserves**	**$ 57,940,186**	**$ 67,180,102**	**$ 78,535,761**	**$ 91,662,789**	**$ 104,673,838**	**$ 120,654,075**	**$ 141,532,397**	**$ 164,295,552**	**$ 188,574,356**
	Reserves less CALPERS	*8,486,031*	*8,781,535*	*9,039,730*	*9,308,733*	*9,587,652*	*9,876,025*	*10,174,032*	*10,484,156*	*10,806,710*
		8,486,031	*8,781,535*	*9,039,730*	*9,308,733*	*9,587,652*	*9,876,025*	*10,174,032*	*10,484,156*	*10,806,710*
17	Annualized Wastewater Service Revenue Increase	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
18	Cumulative Revenue Increase	59.6%	65.9%	72.6%	79.5%	86.7%	94.1%	101.9%	110.0%	118.4%
19	Debt Service Coverage	11.60	12.39	13.30	14.23	15.22	16.28	17.42	18.61	19.56

Line No.	Reserve Fund Detail	FY 2032	FY 2033	FY 2034	FY 2035	FY 2036	FY 2037	FY 2038	FY 2039	FY 2040
	Capital Reserve for Emergencies									
1	Beginning Balance	$ 4,927,709	$ 5,091,211	$ 5,268,500	$ 5,423,404	$ 5,584,793	$ 5,752,131	$ 5,925,141	$ 6,103,931	$ 6,289,991
2	Contribution	163,503	177,289	154,905	161,389	167,338	173,010	178,790	186,060	193,517
3	**Ending Balance**	**$ 5,091,211**	**$ 5,268,500**	**$ 5,423,404**	**$ 5,584,793**	**$ 5,752,131**	**$ 5,925,141**	**$ 6,103,931**	**$ 6,289,991**	**$ 6,483,507**
4	*Target*	*5,091,211*	*5,268,500*	*5,423,404*	*5,584,793*	*5,752,131*	*5,925,141*	*6,103,931*	*6,289,991*	*6,483,507*
	Rate Stabilization Reserve									
5	Beginning Balance	3,285,796	3,394,820	3,513,036	3,616,326	3,723,940	3,835,521	3,950,884	4,070,101	4,194,166
6	Contribution	109,024	118,216	103,290	107,614	111,581	115,363	119,217	124,065	129,037
7	**Ending Balance**	**$ 3,394,820**	**$ 3,513,036**	**$ 3,616,326**	**$ 3,723,940**	**$ 3,835,521**	**$ 3,950,884**	**$ 4,070,101**	**$ 4,194,166**	**$ 4,323,203**
8	*Target*	*3,394,820*	*3,513,036*	*3,616,326*	*3,723,940*	*3,835,521*	*3,950,884*	*4,070,101*	*4,194,166*	*4,323,203*
	CALPERS Reserve									
9	Beginning Balance	23,221,926	26,994,637	31,047,724	35,433,021	40,158,424	45,243,385	50,708,676	56,576,102	62,867,121
10	Contribution	3,772,711	4,053,088	4,385,297	4,725,403	5,084,961	5,465,291	5,867,426	6,291,019	6,640,954
11	**Ending Balance**	**$ 26,994,637**	**$ 31,047,724**	**$ 35,433,021**	**$ 40,158,424**	**$ 45,243,385**	**$ 50,708,676**	**$ 56,576,102**	**$ 62,867,121**	**$ 69,508,075**
12	**Transfer to Infrastructure Replacement**	$ 15,090,843	$ 16,212,350	$ 17,541,188	$ 18,901,612	$ 20,339,843	$ 21,861,164	$ 23,469,703	$ 25,164,077	$ 26,563,817
	Check	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE
	Infrastructure Replacement									
13	Beginning Balance	$ 9,194,907	$ 22,459,518	$ 27,350,843	$ 34,063,009	$ 42,195,632	$ 49,842,802	$ 60,069,374	$ 74,782,263	$ 90,944,275
14	Contribution	13,264,611	4,891,324	6,712,166	8,132,623	7,647,170	10,226,572	14,712,889	16,162,012	17,315,296
15	**Ending Balance**	**$ 22,459,518**	**$ 27,350,843**	**$ 34,063,009**	**$ 42,195,632**	**$ 49,842,802**	**$ 60,069,374**	**$ 74,782,263**	**$ 90,944,275**	**$ 108,259,571**
	Target	*2,000,000*	*2,000,000*	*2,000,000*	*2,000,000*	*2,000,000*	*2,000,000*	*2,000,000*	*2,000,000*	*2,000,000*

Table B-5
City of Milpitas, CA
Sewer Capital Improvement Plan (CIP)
Option 2 - Cash Finance Forcemain

Line No.	Capital Financing Plan	Budget FY 2022	FY 2023	FY 2024	FY 2025	Projected FY 2026	FY 2027	FY 2028	FY 2029	FY 2030	FY 2031
		$	$	$	$	$	$	$	$	$	$
	Sources of Funds										
1	Beginning Balance	$ 35,522,844	$ 31,767,093	$ 30,810,141	$ 27,277,964	$ 20,375,455	$ 18,114,899	$ 21,151,835	$ 24,911,011	$ 33,014,580	$ 7,857,294
2	Revenue Bonds	-	-	-	-	-	-	-	-	-	-
3	Development Fees	452,000	1,417,137	452,000	452,000	452,000	452,000	452,000	452,000	452,000	452,000
4	Interest	394,900	156,722	308,101	272,780	203,755	181,149	211,518	249,110	330,146	78,573
5	Transfer of Surplus from O&M	4,197,349	5,109,563	5,473,140	6,565,696	7,615,068	8,817,692	10,805,959	12,028,174	12,965,092	13,997,245
6	**Subtotal: Sources**	$ 40,567,093	$ 38,450,515	$ 37,043,382	$ 34,568,439	$ 28,646,278	$ 27,565,740	$ 32,621,312	$ 37,640,295	$ 46,761,817	$ 22,385,111
	Uses of Funds										
7	CIP Projects	$ 8,800,000	$ 7,640,374	$ 9,765,418	$ 14,192,984	$ 10,531,379	$ 6,413,905	$ 7,710,301	$ 4,625,715	$ 38,904,524	$ 13,190,204
8	**Subtotal: Uses**	$ 8,800,000	$ 7,640,374	$ 9,765,418	$ 14,192,984	$ 10,531,379	$ 6,413,905	$ 7,710,301	$ 4,625,715	$ 38,904,524	$ 13,190,204
9	**Ending Balance**	$ 31,767,093	$ 30,810,141	$ 27,277,964	$ 20,375,455	$ 18,114,899	$ 21,151,835	$ 24,911,011	$ 33,014,580	$ 7,857,294	$ 9,194,907
	CIP Adjustments										
10	Completion Percentage	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
11	Annual Cost Inflation		6.0%	6.0%	6.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
12	Cumulative Inflation Rate	100.0%	106.0%	112.4%	119.1%	123.9%	128.8%	134.0%	139.3%	144.9%	150.7%

Table B-5
City of Milpitas, CA
Sewer Capital Improvement Plan (CIP)
Option 2 - Cash Finance Forcemain

Line No.	Capital Financing Plan	Projected FY 2032	FY 2033	FY 2034	FY 2035	FY 2036	FY 2037	FY 2038	FY 2039	FY 2040
		$	$	$	$	$	$	$	$	$
	Sources of Funds									
1	Beginning Balance	$ 9,194,907	$ 22,459,518	$ 27,350,843	$ 34,063,009	$ 42,195,632	$ 49,842,802	$ 60,069,374	$ 74,782,263	$ 90,944,275
2	Revenue Bonds	-	-	-	-	-	-	-	-	-
3	Development Fees	452,000	452,000	452,000	452,000	452,000	452,000	452,000	452,000	452,000
4	Interest	91,949	224,595	273,508	340,630	421,956	498,428	600,694	747,823	909,443
5	Transfer of Surplus from O&M	15,090,843	16,212,350	17,541,188	18,901,612	20,339,843	21,861,164	23,469,703	25,164,077	26,563,817
6	**Subtotal: Sources**	$ 24,829,699	$ 39,348,463	$ 45,617,539	$ 53,757,251	$ 63,409,432	$ 72,654,394	$ 84,591,770	$ 101,146,162	$ 118,869,534
	Uses of Funds									
7	CIP Projects	$ 2,370,181	$ 11,997,621	$ 11,554,530	$ 11,561,619	$ 13,566,630	$ 12,585,020	$ 9,809,508	$ 10,201,888	$ 10,609,963
8	**Subtotal: Uses**	$ 2,370,181	$ 11,997,621	$ 11,554,530	$ 11,561,619	$ 13,566,630	$ 12,585,020	$ 9,809,508	$ 10,201,888	$ 10,609,963
9	**Ending Balance**	$ 22,459,518	$ 27,350,843	$ 34,063,009	$ 42,195,632	$ 49,842,802	$ 60,069,374	$ 74,782,263	$ 90,944,275	$ 108,259,571
	CIP Adjustments									
10	Completion Percentage	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
11	Annual Cost Inflation	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
12	Cumulative Inflation Rate	156.7%	163.0%	169.5%	176.3%	183.4%	190.7%	198.3%	206.2%	214.5%

Table B-6
City of Milpitas, CA
Sewer Capital Improvement Plan - TASP
Option 2 - Cash Finance Forcemain

Line No.	Capital Financing Plan	Budget FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	Projected FY 2027	FY 2028	FY 2029	FY 2030	FY 2031
		$	$	$	$	$	$	$	$	$	$
	Sources of Funds										
1	Beginning Balance		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ (7,245,265)
2	Additional Rate Funded Capital										
3	**Subtotal: Sources**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ (7,245,265)
	Uses of Funds										
4	CIP Projects	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 7,245,265	$ -
5	**Subtotal: Uses**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 7,245,265	$ -
6	**Ending Balance**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ (7,245,265)	$ (7,245,265)
	CIP Adjustments										
7	Cumulative Inflation Rate	100.0%	106.0%	112.4%	119.1%	123.9%	128.8%	134.0%	139.3%	144.9%	150.7%

Table B-6
City of Milpitas, CA
Sewer Capital Improvement Plan - TASP
Option 2 - Cash Finance Forcemain

Line No.	Capital Financing Plan	Projected FY 2032	FY 2033	FY 2034	FY 2035	FY 2036	FY 2037	FY 2038	FY 2039	FY 2040
		$	$	$	$	$	$	$	$	$
	Sources of Funds									
1	Beginning Balance	$ (7,245,265)	$ (7,245,265)	$ (7,245,265)	$ (7,245,265)	$ (7,245,265)	$ (7,245,265)	$ (7,245,265)	$ (7,245,265)	$ (7,245,265)
2	Additional Rate Funded Capital									
3	**Subtotal: Sources**	$ (7,245,265)	$ (7,245,265)	$ (7,245,265)	$ (7,245,265)	$ (7,245,265)	$ (7,245,265)	$ (7,245,265)	$ (7,245,265)	$ (7,245,265)
	Uses of Funds									
4	CIP Projects	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
5	**Subtotal: Uses**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
6	**Ending Balance**	$ (7,245,265)	$ (7,245,265)	$ (7,245,265)	$ (7,245,265)	$ (7,245,265)	$ (7,245,265)	$ (7,245,265)	$ (7,245,265)	$ (7,245,265)
	CIP Adjustments									
7	Cumulative Inflation Rate	156.7%	163.0%	169.5%	176.3%	183.4%	190.7%	198.3%	206.2%	214.5%

APPENDIX H

City of Milpitas
Sewer Master Plan Study
Sanitary Sewer Force Main Cleaning and CCTV Inspection
Project Report

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PROJECT REPORT

SANITARY SEWER FORCE MAIN CLEANING AND CCTV INSPECTION

CITY OF MILPITAS
ENGINEERING DEPARTMENT
PREPARED BY: LYHAK EAM, P.E.
REVIEWED BY: MICHAEL SILVEIRA, P.E.
DATE: FEBRUARY 22, 2021



EXECUTIVE SUMMARY

The City of Milpitas sanitary sewer system consists of two force mains that carries the City's wastewater from the City of Milpitas Main Lift Sewer Pump Station at North McCarthy Boulevard to the San Jose-Santa Clara Regional Wastewater Treatment Plants. Force Main A and B were constructed in 1974 and 2000, respectively. The objective of this project was to perform an internal assessment of Force Main A ("FM-A"), but it was not possible to complete within budget due to unforeseen conditions and challenges. Engineering Department reported the findings to Public Works and recommends FM-A be either rehabilitated or replaced due to the its condition and age.

PROJECT BACKGROUND

Cathodic Protection Improvement Project No. 6131 ("Project") is in the approved Capital Improvement Program 2020-2025. The Project provides for the replacement of two existing mag meters at the Milpitas Main Lift Station, installation of cathodic protection system along the FM-A, removal or abandonment of the existing diverter valve vault near the Coyote Creek, evaluation and renovation of existing pinch valve vaults, and an assessment of FM-A. Per the "Water Pollution Control Facilities Project" record drawing dated April 1972 (**Attachment A),** FM-A is approximate 12,000 feet including 12 access manholes spaced approximately 1,000 feet apart. The force main extends from the Main Lift Pump Station, crossing under the Coyote Creek as a siphon, going underneath San Jose Residual Sludge Management (RSM) drying beds (Lagoons) and Zander Road, and connecting to the San Jose-Santa Clara Regional Wastewater Treatment Plants. (***Figure 01)***.

JDH Corrosion Consultant, Inc. was retained to perform an indirect pipe assessment by using a Close Interval Survey (CIS) to measure the soil corrosivity surrounding the FM-A. The survey concluded the soils are inherently very corrosive and can potentially corrode and damage the steel force main (**Attachment B**). Based on the survey and the age of the system, Pipe and Plant Solutions Inc (PPSI) was retained to perform the cleaning and CCTV inspection to assess the internal condition of the force main. The work included site investigation of all sewer manholes, replacement of any corroded bolts and gaskets as needed, clearing and grubbing surrounding areas for safe and secure access, removal and disposal of any debris from the sanitary sewer force main, and performing CCTV inspection.



***Figure 1**- Ariel Map of City Force Mains*

SITE INVESTIGATION FINDINGS/CHALLANGES

The following is a summary of findings/challenges that Engineering staff encountered during the site investigation.

1. RIGHT-OF-WAY/PERMITTING PROCESS

The entire FM-A (**Figure 02**) is located within the Santa Clara-San Jose Wastewater Treatment Plant property, and the City of Milpitas has an easement to maintain and operate the facility at any time (**Attachment B**). Without any additional provisions or requirements mentioned in the easement, the City of San Jose requires the City of Milpitas to enter into Right of Entry agreement (**Attachment C**) to access the City right-of-way for any work. The City attorney reviewed the languages in the easement and re-affirmed that the City of Milpitas has the right to access and perform work necessary without any further restriction by San Jose. Due to the schedule and need to investigate the FM-A, Engineering applied for a Right of Entry permit and tabled the discussion of the City of Milpitas rights to their Right of way. The permit process took approximately 3 months.



***Figure 2**- Force Main A Alignment*

In addition, the City is required to obtain an encroachment permit from Santa Clara Valley Water District (Valley Water) to access manhole #1 because of its close proximity to Coyote Creek that falls under their jurisdiction (**Figure 3**). At the time, Valley Water issued a permit for pedestrian access for site investigation search of the manhole with no excavation allowed. To obtain a vehicle access permit, the Valley Water will require an environmental assessment of invasive plants in the area. The assessment shall include the impacts of the work and any mitigation measures to preserve the surrounding area.

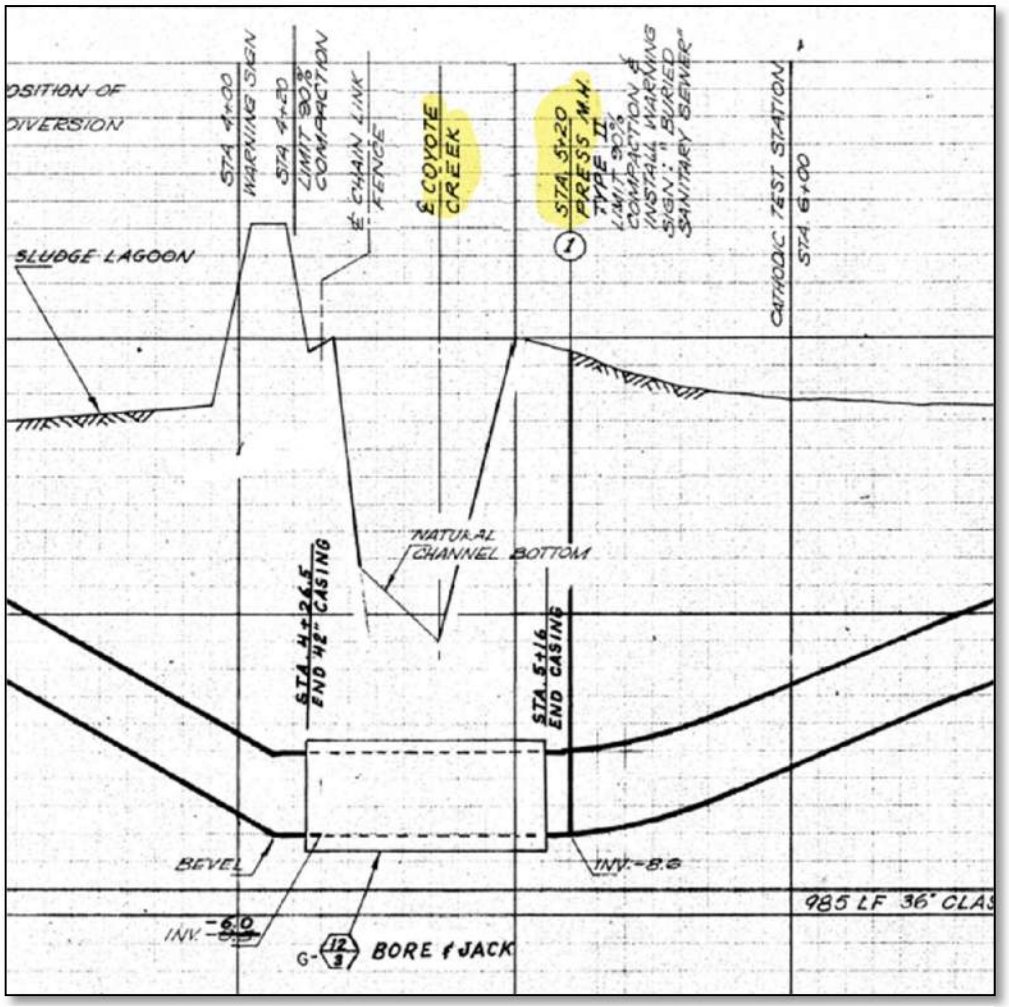


***Figure 3**- Manhole #1 Location Per As built*

2. MISSING MANHOLES

After securing necessary permits, the contractor began to locate and assess all the manholes to access FM-A for cleaning and CCTV inspection. The contractor was able to locate manhole #2-6, 9-12, but unable to locate manhole #1, 7, and 8.

Manhole #1: Per Record Drawings, the manhole is located adjacent to Coyote Creek (**Figure 04**) under District jurisdiction. The manhole was not found because the permit issued by Valley Water is limited to pedestrian access and no excavation or removal of vegetation allowed. In order to locate the manhole, heavy equipment will have to be used to excavate and remove the vegetation around the area.



***Figure 4**: Force Main Manhole #1 Location*

Manhole #7: Per Record Drawings, the manhole is approximate 972 feet from manhole #6 (**Figure 05**). Contractor was unable to locate the manhole and speculated it is buried under the existing access road.



Figure 5: *Force Main Manhole #7 Location*

According to the force main profile shown in **Figure 06**, manhole #7 is a critical access point to remove debris from pipe segment between manhole 6-7, 7-8 & 8-9 because it is the low point in the system.



Figure 6: *Force Main Profile*

Manhole #8: Contractor searched for the manhole without success but found a 30' high vertical pipe where the manhole should be located as shown in **Figure 07**. It is assumed the manhole was modified for this vertical pipe. Public Works staff does not have knowledges or the functionality of this pipe. The City does not have existing records of this modification.



***Figure 7**: Force Main Manhole #8 Location*

3. CORRODED MANHOLES' COMPONENTS

The Contractor investigated available manholes and the internal components including air release valves, bolts, gaskets and blind flanges. The components in manholes #9-12 appeared to be in good conditions. However, components in manholes #2 – 6, located in the lagoon area, are significantly corroded and not functional, see **Figure 8 &9.**

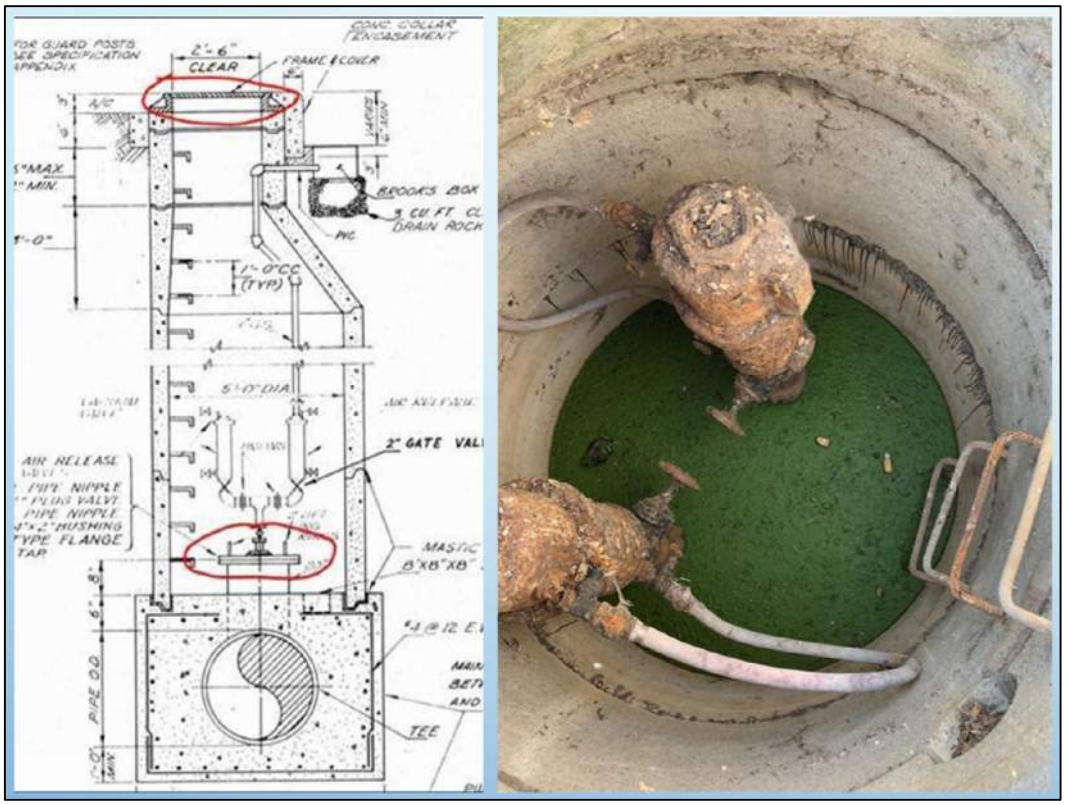


***Figure 8**: Force Main Manhole*



***Figure 9**: Corroded Air Release Valve and Blind Flange*

In order to access the force main at manholes, both air release valves and blind flanges must be removed. Since components at manhole #2-6 are significantly corroded, they must be replaced to ensure the force main is properly sealed. The cost of replacing these components with stainless steel is approximately $25,000, which is not included in the project scope and budget. Therefore, the cleaning and CCTV inspection of the segments between manhole #2-6 were postponed until the aforementioned issues are resolved.

4. HIGH LEL AND H2S GAS LEVELS

During first attempt of the removal of the blind flange at MH#12, the Contractor encountered H2S and LEL gases levels that were beyond the maximum value of 100%, which was considered very hazardous. The Contractor had to immediately seal the blind flange and evacuate the area. It was assumed that the existence of high gas levels was due to the stagnant wastewater in the force main for approximate 4 weeks and could not be completely flush out of the system due to challenges accessing the system. Not knowing the exact source of the gases, staff recommended to resume the operation of the FM-A for 48-hours in the hope the gas would dissipate. The strategy was successful, and the Contractor was able to access the manhole safely. The source of the gases were not determined and may appear again in future work if the wastewater is stagnant for a period of time.

5. SEWER OVERFLOW INCIDENT AND UNFUNCTIONAL SLIDE GATE

After resolving the gas issue, Public Works switched the wastewater operation from Force Main A to Force Main B (FM-B) to allow the Contractor to access manhole #12. As the contractor began to remove the blind flange, effluent started to overflow out of the manhole as shown in **Figure 10**. The overflow was a result from the wastewater from FM-B backflowing into FM-A at the Milpitas structure (**Figure 11**). Both FM-A and FM-B are connected directly to the Milpitas structure (**Figure 12)** that serves as a detention basin to receive and store all effluent before sending down to the Plant for treatment via an overflow weir wall.

In order to prevent the backflow from FM-B to FM-A, the FM-A sliding gate in the structure needs to be closed which is currently non-operational. Public Works shut down both force mains to stop the

overflow and allow the contractor to re-install the blind flange. The non-functional sliding gate caused effluent to backflow into the entire system because the elevation of force main A is lower than the Milpitas Structure. Such condition will create the potential overflow situation at other manholes similar to that encountered at manhole #12. To conduct any inspections of FM-A by CCTV, the sliding gate needs to be repaired to isolate the force main from one another.

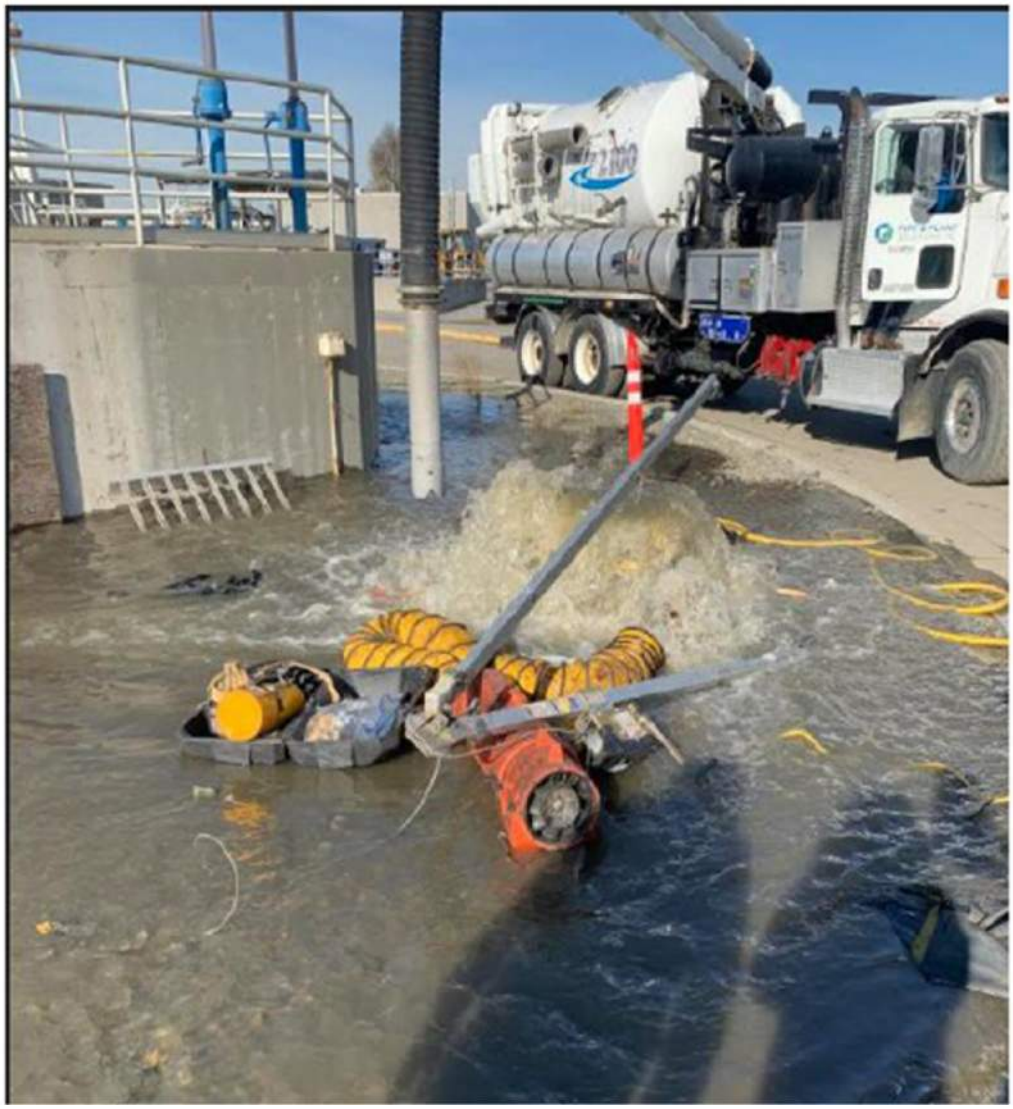


Figure 10: *Sewer Overflow at MH #12*

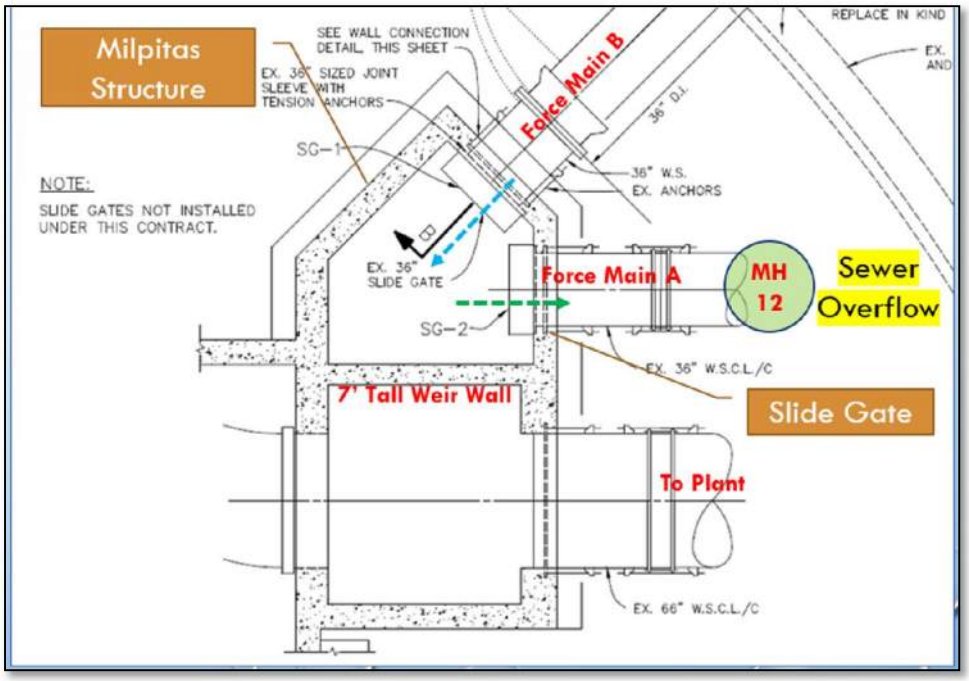


Figure 11: *Milpitas Structure Drawing*



Figure 12*: Milpitas Structure*

CONCLUSION

Due to numerous issues as described, the following tasks shall be completed prior to performing the cleaning and CCTV inspection of the force main.

1. Locate all missing manholes along the force main including manholes #1, 7, and 8.
2. Replace all corroded air release valves and blind flanges for manhole #2 to #6.
3. Repair slide gate at Milpitas Structure so that the FM-A can be isolated from the structure itself.

Based upon this preliminary evaluation, the cost to complete the cleaning and CCTV inspection and all associated work is approximate $ 850,000. The following is the summary of the cost breakdown.

Description	Cost
Cleaning and CCTV inspection	$350,000
Replacement of (6) manholes' parts (bolts, blind flange, gasket, ARV)	$150,000
Repair slide gate and bypass pumping	$150,000
Permitting process	$30,000
Bidding process and construction administration	$30,000
Construction contingency (20%)	$140,000
TOTAL	$850,000

It is assumed the condition of the force main is deteriorating and doesn't meet industrial standards due to the age of the system, level of soil corrosivity surrounding the steel pipe, and the minimal routine maintenance since it was installed in 1974. The City should consider to either rehabilitate or replace the system in the near future. Rehabilitation of existing force main with a liner may extend its service life; however, the City should hire a professional license engineer to evaluate the existing system and provide improvement options and estimated cost. The installation of new force main is another option that the City should consider to ensure the well-being of this critical infrastructure for next 50 years. The estimated project cost for the construction of a new force main is as follows, and detailed cost breakdown is provided in **Attachment D**.

Improvement Cost	$14,197,000
Design (20%)	$ 2,839,400
Administration (15%)	$ 2,129,550
Testing and Inspection (5%)	$ 709,850
Environmental Review & Permitting (5%)	$ 709,850
TOTAL	**$20,585,650**

Note the Engineering cost estimate provided are based on the construction cost of the Force Main B in 2000 and cost escalations over the past decades. No details planning or study has been conducted as part of this process. The basis for this estimate includes the following assumptions:

- 12,000 linear feet of 36" HDPE line
- The new force main is parallel to the existing force main B (HDPE)
- 12 manholes access with air release valves
- Bore and Jack under Zanker Road & Milpitas Structure
- Micro-tunneling- Coyote Creek crossing

ATTACHMENTS

Attachment A : Water Pollution Control Facilities As built
Attachment B : Close Internal Survey Report
Attachment C : Right of Entry Agreement
Attachment C : Detailed Cost Estimate to Construct New Fore Main



HydroScience is a civil engineering firm that plans, designs, and manages the construction of water, wastewater, and recycled water projects. With offices in Berkeley, San Jose, and Sacramento, we understand and address the complex water and wastewater needs of Northern California.

HydroScience

741 Allston Way
Berkeley, CA 94710
510.540.7100