APPENDIX D

Villalobos and Associates (V&A) 2021 Sewer Flow Monitoring and Inflow/Infiltration Study

City of South San Francisco

Sewer Flow Monitoring and Inflow/Infiltration Study

Prepared for:

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Prepared by:

V&A consulting engineers

V&A Project No. 20-0334

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Abbreviations and Acronyms

Abbreviations/Acronyms	Definition
ADWF	Average Dry Weather Flow
AVG.	Average
CCTV	Closed-Circuit Television
CDEC	California Data Exchange Center
CIP	Capital Improvement Plan
CO	Carbon Monoxide
CWOP	Citizen Weather Observing Program
DIA.	Diameter
d/D	Depth/Diameter Ratio
FT.	Feet
FM	Flow Monitor
GPD	Gallons per Day
GPM	Gallons per Minute
GWI	Groundwater Infiltration
H2S	Hydrogen Sulfide
IN.	Inch
I/I	Inflow and Infiltration
IDM	Inch-Diameter Mile
IDW	Inverse Distance Weighting
LEL	Lower Explosive Limit
MAX.	Maximum
MGD	Million Gallons per Day
MIN.	Minimum
NOAA	National Oceanic and Atmospheric Administration
N/A	Not applicable
PF	Peaking Factor
PWS	Private Weather Station
Q	Flow Rate
RDI	Rainfall-Dependent Infiltration
RG	Rain Gauge
V&A	V&A Consulting Engineers, Inc.
WEF	Water Environment Federation
WRCC	Western Regional Climate Center

Terms and Definitions

Term	Definition
Average dry weather flow (ADWF)	The average flow rate or pattern from days without noticeable inflow or infiltration response. ADWF usage patterns for weekdays and weekends differ and must be computed separately. ADWF is expressed as a numeric average and may include the influence of normal groundwater infiltration (not related to a rain event).
Basin	Sanitary sewer collection system upstream of a given location (often a flow meter), including all pipelines, inlets, and appurtenances. Also refers to the ground surface area near and enclosed by pipelines. A basin may refer to the entire collection system upstream from a flow meter or exclude separately monitored basins upstream.
Depth/diameter (*d*/*D*) ratio	Depth of water in a pipe as a fraction of the pipe's diameter. A measure of the fullness of the pipe used in the capacity analysis.
Infiltration and inflow	**Infiltration and inflow (I/I)** rates are calculated by subtracting the ADWF flow curve from the instantaneous flow measurements taken during and after a storm event. Flow in excess of the baseline consists of inflow, rainfall-responsive infiltration, and rainfall-dependent infiltration. **Total I/I** is the total sum in gallons of additional flow attributable to a storm event.
Infiltration, groundwater	**Groundwater infiltration (GWI)** is groundwater that enters the collection system through pipe defects. GWI depends on the depth of the groundwater table above the pipelines as well as the percentage of the system that is submerged. The variation of groundwater levels and subsequent groundwater infiltration rates are seasonal by nature. On a day-to-day basis, groundwater infiltration rates are relatively steady and will not fluctuate greatly.
Infiltration, rainfall-dependent	**Rainfall-dependent infiltration (RDI)** is similar to groundwater infiltration but occurs as a result of stormwater. The stormwater percolates into the soil, submerges more of the pipe system, and enters through pipe defects. RDI is the slowest component of storm-related infiltration and inflow, beginning gradually and often lasting 24 hours or longer. The response time depends on the soil permeability and saturation levels.
Inflow	Inflow is defined as water discharged into the sewer system, including private sewer laterals, from direct connections such as downspouts, yard, and area drains, holes in manhole covers, cross-connections from storm drains, or catch basins. Inflow creates a peak flow problem in the sewer system and often dictates the required capacity of downstream pipes and transport facilities to carry these peak instantaneous flows. Overflows are often attributable to high inflow rates.
Peak Wet Weather Flow	The highest daily flow during and immediately after a significant storm event. Includes sanitary flow, infiltration, and inflow.
Peaking factor (PF)	PF is the ratio of peak measured flow to average dry weather flow. This ratio expresses the degree of fluctuation in flow rate over the monitoring period and is used in capacity analysis.
Surcharge	When the flow level is higher than the crown of the pipe, then the pipeline is said to be in a **surcharged** condition. The pipeline is surcharged when the *d*/*D* ratio is greater than 1.0.

Executive Summary

Scope and Purpose

V&A Consulting Engineers (V&A) was retained by Akel Engineering Group (AEG) to perform sanitary sewer flow monitoring in support of the master planning update effort for the City of South San Francisco (City). Flow and rainfall monitoring were performed over a period of over 3 months from January 14, 2021, to April 18, 2021. Open-channel flow monitoring was performed at 24 sites and data was captured from 3 rain gauges. There were three general purposes of this study.

1. Establish the baseline sanitary sewer flows at the flow monitoring sites.
2. Establish the peak flow condition during the rainfall events and estimate available sewer capacity.
3. Quantify inflow/ infiltration (I/I) at the applicable flow monitoring sites.

Background

V&A performed flow monitoring for AEG with the City in 2018 in support of the City master plan. Sites 1, 4, and 11 were the same for both studies. This proved important as the wet weather season for the 2021 effort had considerably less rainfall and thus less inflow and infiltration (I/I) response. Sites 1, 4, and 11 were utilized as calibration flow meters so that I/I response results across both wet weather seasons could be compared, specifically for the R-Value metric utilized for modelling purposes.

Monitoring Sites

The flow monitoring site locations were selected and approved by Akel and the City and are listed inTable ES-1, and shown in Figure ES-1.

Table ES-1. List of Flow Monitoring Sites

Monitoring Site	Monitored Pipe	Proposed MH ID	Dia (in)	Location
Site 1	E inlet	wD2594	24	Baden Avenue east of Linden Avenue
Site 1-1	NE inlet	wB2164	6	S San Francisco Drive at Northcrest Drive
Site 1-2	NE inlet	wC2441	15	Airport Boulevard at Oyster Point Boulevard
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Site 6-2	W inlet	wG1321	7.5	Arroyo Drive and Camaritas Avenue
Site 6-3	SW inlet	wG1151	8.5	Del Monte Avenue and Lacrosse Avenue
Site 6-4	SW inlet	wG1150	8.5	136 San Felipe Avenue
Site 6-5	W inlet	wG1322	12	104 Del Monte Avenue
Site 6-6	SW inlet	wG1330	12	Arroyo Drive and Indio Drive
Site 6-7	S inlet	wG1361	8	205 Arroyo Drive
Site 7	W inlet	Manhole not on GIS (1 manhole downstream of wI834)	18	Exit Driveway at 150 S Linden Avenue
Site 10-1	S inlet	wH1838	8.5	Path behind 612 Mayfair Avenue
Site 10-2	N effluent	wH1836	8.5	Mayfair Avenue and S Magnolia Avenue
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Site 11	SW inlet	wI790	15	245 S Spruce Avenue

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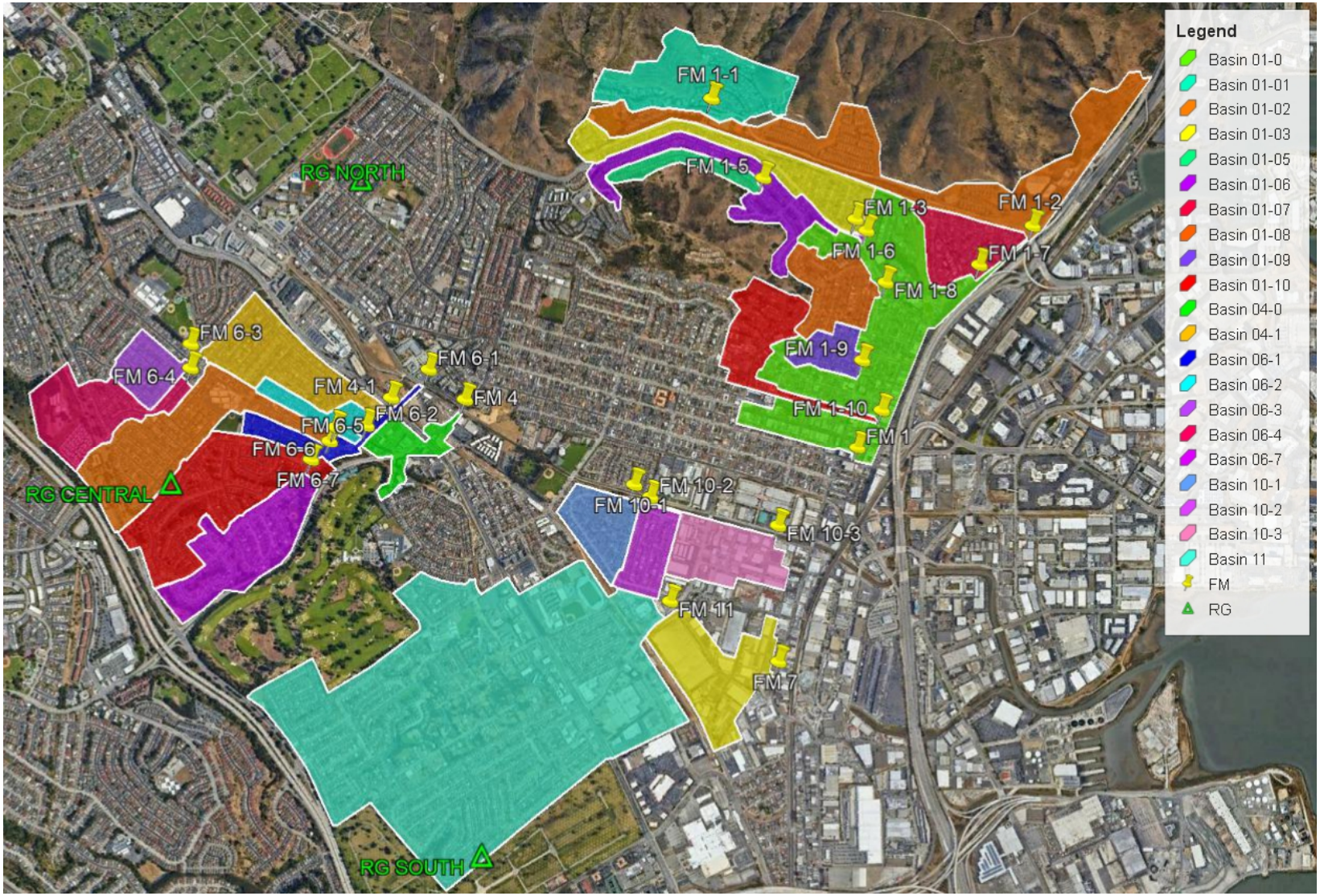

Figure ES-1. Map of Flow Monitoring Sites and Basins– Overall

Rainfall Monitoring

There were approximately 6.35 inches of rainfall observed during the duration of the flow monitoring study (Figure ES-2). Rainfall was approximately 52% of normal over the course of the flow monitoring periods (Figure ES-3). Two rainfall events were identified during the flow monitoring period:

- Event 1 (January 26 – February 08, 2021) was classified as a 2-Yr, 3-Hour event by rain gauge South and <1-Yr event by rain gauge North and Central.
- Event 2 (February 11 – 22, 2021) was classified as a <1-Yr event by rain gauge North and South, and as <1-Yr event by rain gauge Central.

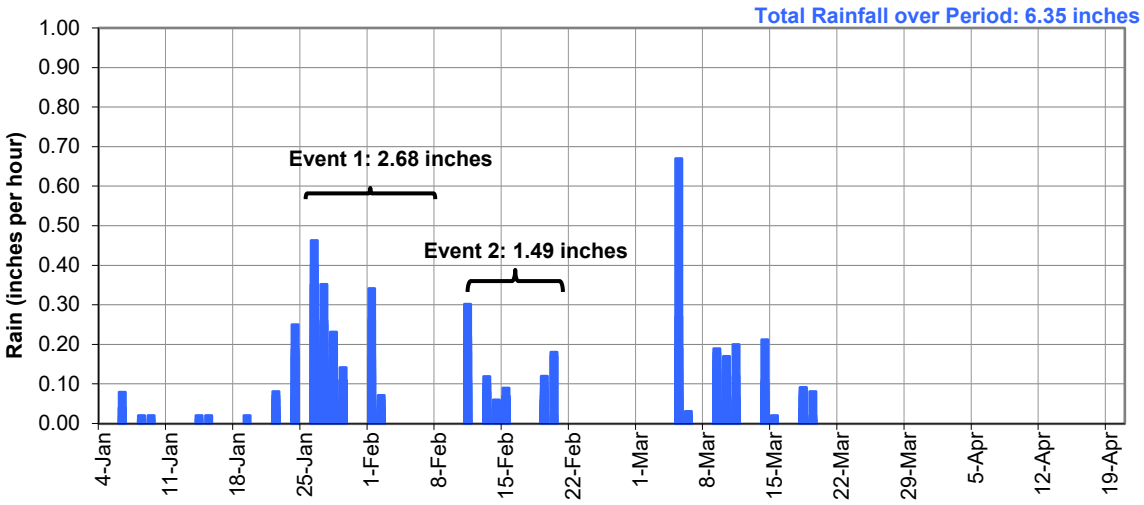

Figure ES-2. Rainfall during Flow Monitoring Period

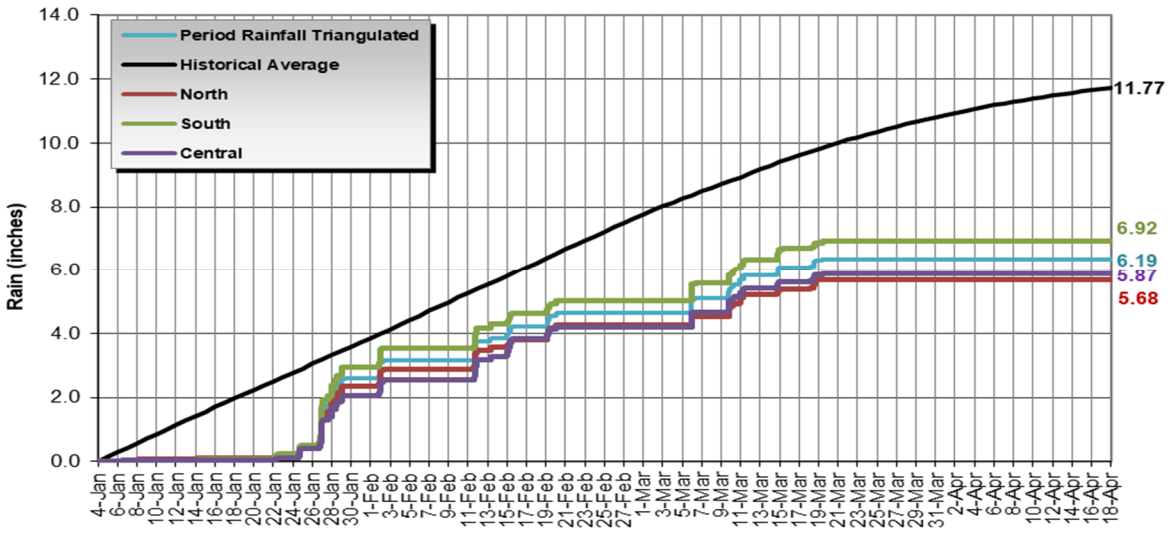

Figure ES-3. Rainfall Accumulation Plot – Triangulated to South San Francisco Conference Center

Average, Peak Measured Flows, and Pipeline Capacity Analysis

Flow monitoring was successful over the three month flow monitoring period. Average dry weather Average dry weather flow (ADWF) curves were established during dry days when I/I had the least impact on the baseline flow.

Peak measured flows and hydraulic grade line data are important to understanding the capacity limitations of a collection system. Relevant capacity analysis terms are defined as follows:

- **Peaking Factor**: Peaking factor is defined as the peak measured flow divided by the ADWF. Peaking factors are influenced by many factors including size/topography of the tributary area, flow attenuation, flow restrictions, and characteristics of I/I entering the collection system. Municipal standards for peaking factor vary agency by agency; The City should refer to jurisdictional standards when evaluating peaking factors[1]. For this study, peaking factors over 5.0 are highlighted YELLOW and over 10 are highlighted in RED.
- **d/D Ratio**: The d/D ratio is the peak measured depth of flow (d) divided by the pipe diameter (D). The d/D ratio for each site was computed based on the maximum depth of flow for the study. Standards for d/D ratio vary from agency to agency but typically range between $d/D > 0.5$ and $d/D \leq 0.75$. The City should refer to jurisdictional standards when evaluating d/D ratios, to be used at the discretion of City engineers. For this study, d/D ratios that exceed 0.50 are highlighted YELLOW. Surcharged sites are highlighted RED.

Table ES-2 summarizes the average dry weather flows, peak recorded flows, levels, d/D ratios, and peaking factors per site during the flow monitoring period. Figure ES-4 illustrates a flow schematic of the collection system at the monitoring sites during peak flow conditions.

Capacity analysis data is presented on a site-by-site basis and represents the hydraulic conditions only at the site locations; hydraulic conditions in other areas of the collection system will differ. The following capacity analysis results are noted:

- **Peaking Factors**: Five sites had peaking factors over 10, and 14 sites had peaking factors between 5 and 10. The highest-peaking factor was at Site 1-5 and was PF = 44.43. However, the skewed high value is very likely due to the extreme low ADWF. The same can also be applied to Site 6-4.
- **Peak flows**: The peak measured flows were taken from the whole monitoring study. The highest peak flow was at Site 1 and was 4.01 MGD
- **d/D Ratio**: Five sites surcharged during the study. Eleven sites had a d/D ratio between 0.5 and 1, where Site 6-7 had a d/D ratio of 0.94, showing an alarming signal of surcharging.

[1] WEF Manual of Practice FD-6 and ASCE Manual No. 62 suggests typical peaking factor ratios range between 3 and 4, with higher values possibly indicative of pronounced I/I flows.

Table ES-2. Capacity Analysis Summary

Monitored Site	ADWF (MGD)	Peak Measured Flow	Peaking Factor	Pipe Diameter, *D* (IN)	Max Depth, *d* (IN)	Max d/*D* Ratio	Surcharge or not
Site 1	0.577	4.01	6.95	24	17.42	0.73	No
Site 1-1	0.008	0.04	5.08	6	2.10	0.35	No
Site 1-2	0.088	0.18	2.10	15	5.57	0.37	No
Site 1-3	0.113	1.27	11.22	8.5	31.91	3.75	Yes
Site 1-5	0.002	0.08	44.43	6	1.84	0.31	No
Site 1-6	0.120	0.85	7.02	6	4.44	0.74	No
Site 1-7	0.018	0.14	7.55	6	0.97	0.16	No
Site 1-8	0.051	0.82	16.09	6	4.27	0.71	No
Site 1-9	0.059	0.94	15.82	6	4.83	0.81	No
Site 1-10	0.060	0.35	5.89	6	4.46	0.74	No
Site 4	0.106	0.46	4.36	18	6.41	0.36	No
Site 4-1	0.089	0.69	7.74	8	6.63	0.83	No
Site 6-1	0.266	1.12	4.21	14.5	14.87	1.03	Yes
Site 6-2	0.012	0.09	7.38	7.5	2.57	0.34	No
Site 6-3	0.021	0.17	8.06	8.5	4.26	0.50	No
Site 6-4	0.001	0.02	17.75	8.5	1.57	0.19	No
Site 6-5	0.076	0.46	5.98	12	2.67	0.22	No
Site 6-6	0.160	1.05	6.57	12	7.88	0.66	No
Site 6-7	0.058	0.39	6.64	8	7.51	0.94	No
Site 7	0.457	2.55	5.58	18	14.12	0.78	No
Site 10-1	0.023	0.23	9.99	8.5	21.37	2.51	Yes
Site 10-2	0.020	0.10	4.92	8.5	4.47	0.53	No
Site 10-3	0.166	1.33	7.99	12	51.03	4.25	Yes
Site 11	0.334	1.64	4.92	15	23.60	1.57	Yes

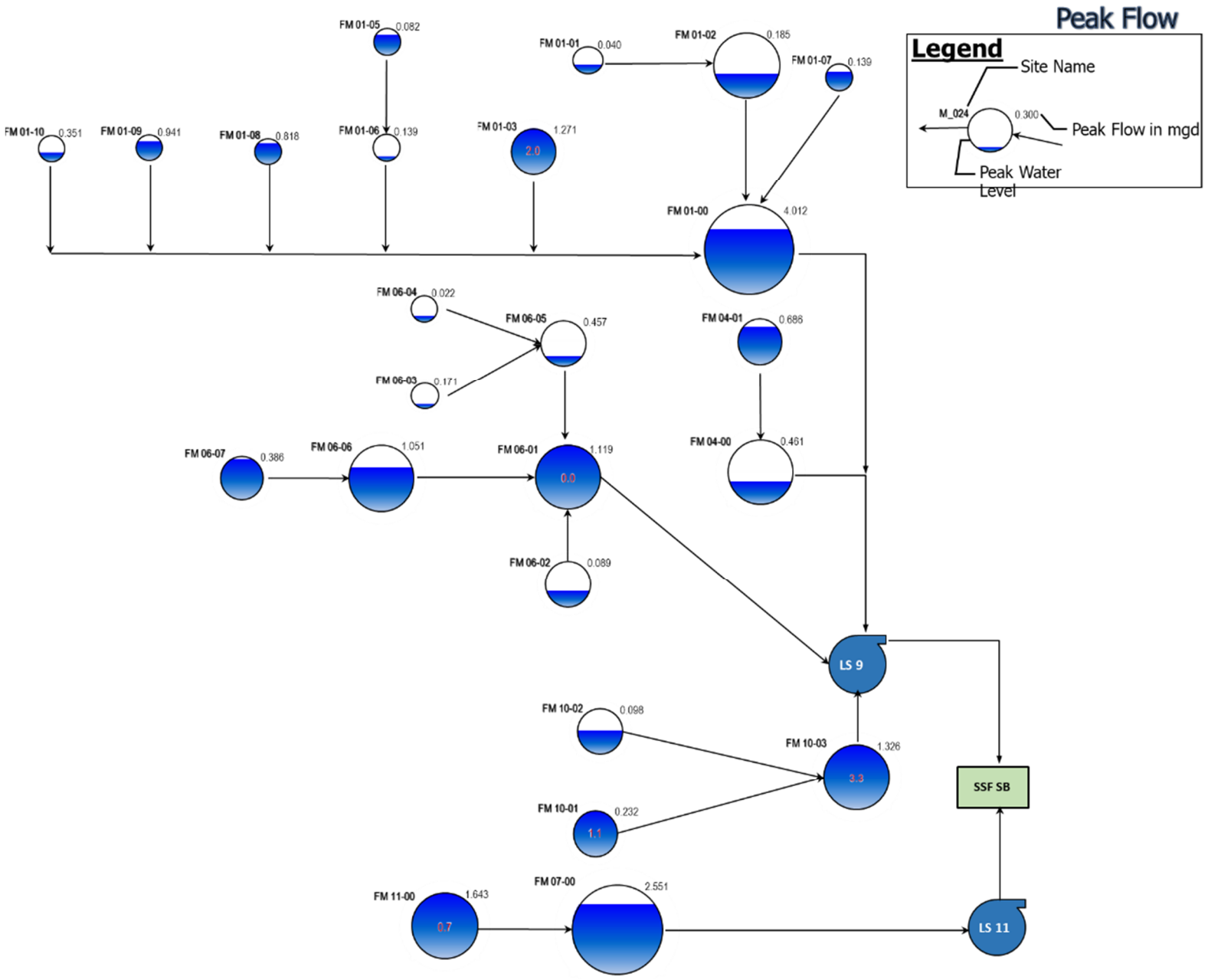

Figure ES-4. Peak Measured Flow (Flow Schematic)

Infiltration and Inflow

Flow monitoring basins are localized areas of a sanitary sewer collection system upstream of a given location (often a flow meter), including all pipelines, inlets, and appurtenances. The basin refers to the ground surface area near and enclosed by the pipelines. A basin may refer to the entire collection system upstream from a flow meter or may exclude separately monitored basins upstream. I/I analysis in this report will be conducted on a basin-by-basin basis. For this study, subtraction of flows was required to isolate the drainage areas of some flow monitoring basins[2].

During the process of isolating those basins, it was observed that Basins 1, 4, and 6-1 are merely the summation of their upstream basins, thus making them unsuitable for I/I analysis. Therefore Basins 1, 4, and 6-1 are excluded from basin I/I analysis for this study. The I/I results were developed based on rain Event 1 (January 26 – February 08, 2021), because rain Event 1 is larger than rain Event 2 and it has a better recession pattern for RDI analysis.

Table ES-3 summarizes the I/I results for this study; The "Top 3" ranked basins in each metric have been shaded red. Please refer to Section 2.7 I/I Methods for more information on inflow and infiltration analysis methods and ranking methods. Temperature maps for the ranked inflow, RDI, and Total I/I response metrics are shown in Figure ES-4, Figure ES-5, and Figure ES-6. The following results are noted:

- Basin 01-3 ranked the highest in RDI and Total I/I, and ranked 3rd for Inflow I/I
- Basin 01-6 ranked 2nd in RDI and Total I/I.
- Basin 01-9 ranked highest in Final Inflow I/I
- No Basin showed evidence of GWI

Figure ES-5, Figure ES-5, and Figure ES-7 show temperature maps illustrating the inflow and total I/I results. Please refer to the I/I Methods section for more information on inflow and infiltration analysis methods and ranking methods.

[2] The flow monitoring basins and basin isolation equations used to define the limits of the basin boundaries are listed in Table 1-2

Table ES-3. I/I Analysis Summary

Metering Basin	Peak I/I Rate (mgd)	RDI Rate (mgd)	Total I/I (gallons)	2021 R-Value (%)	Normalized to 2018 R-Value (%)	Inflow Rank	RDI Rank	Total I/I Rank	Evidence of GWI?
Upstream area of Site 01	3.67	0.164	3,619,800	9.0%	17.3%	-	-	-	No
Basin 01	-	NA	-	-	-	-	-	-	No
Basin 01-1	0.02	ND[3]	1,923	0.0%	0.0%	22	17	22	No
Basin 01-2	0.04	0.010	134,642	1.6%	3.1%	21	10	19	No
Basin 01-3	1.21	0.045	1,488,027	43.0%	82.7%	3	1	1	No
Basin 01-5	0.08	0.001	21,256	2.1%	4.0%	9	13	13	No
Basin 01-6	0.74	0.045	1,273,847	41.0%	78.8%	6	2	2	No
Basin 01-7	0.12	0.008	144,380	6.1%	11.7%	16	4	9	No
Basin 01-8	0.81	0.007	671,321	27.1%	52.1%	4	7	3	No
Basin 01-9	0.92	ND	374,327	33.7%	64.8%	1	17	4	No
Basin 01-10	0.31	ND	294,783	10.2%	19.6%	11	17	8	No
Upstream area of Site 04	0.72	0.002	409,854	8.4%	24.9%	-	-	-	No
Basin 04	0.10-	ND	2,468	0.2%	0.6%	17	17	21	No
Basin 04-1	0.63	0.014	407,385	11.6%	34.4%	7	5	6	No
Upstream area of Site 06-1	0.87	0.004	486,484	2.4%	5.5%	-	-	-	No
Basin 06-1	-	NA	-	-	-	-	-	-	No
Basin 06-2	0.07	0.002	32,474	3.5%	8.0%	14	9	14	No
Basin 06-3	0.16	0.004	144,041	11.1%	25.4%	10	6	5	No
Basin 06-4	0.02	0.001	17,904	0.6%	1.4%	15	11	14	No
Basin 06-5	0.25	0.004	195,222	4.0%	9.1%	18	15	12	No
Basin 06-6	0.59	0.023	433,754	8.3%	19.0%	12	3	10	No
Basin 06-7	0.34	ND	110,815	3.0%	6.9%	13	17	17	No
Basin 07	0.89	0.006	226,550	5.0%	11.4%	5	12	16	No
Basin 10-1	0.22	0.003	111,692	5.2%	11.9%	8	14	11	No
Basin 10-2	0.08	0.001	55,120	3.2%	7.3%	20	16	18	No
Basin 10-3	1.07	0.006	471,762	15.6%	35.7%	2	8	7	No
Basin 11	1.43	ND	800,065	2.1%	4.1%	19	17	20	No

[3] ND: Not detected

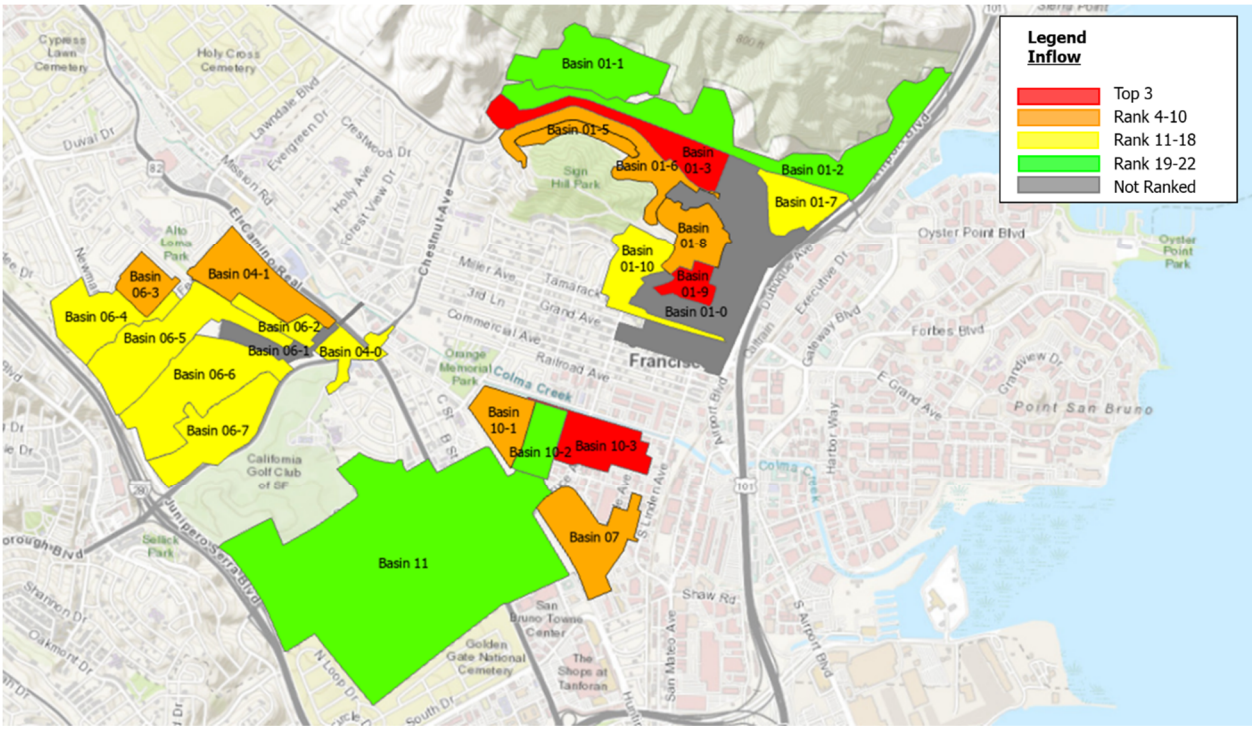

Figure ES-5. Temperature Map: Inflow Final Basin Rankings

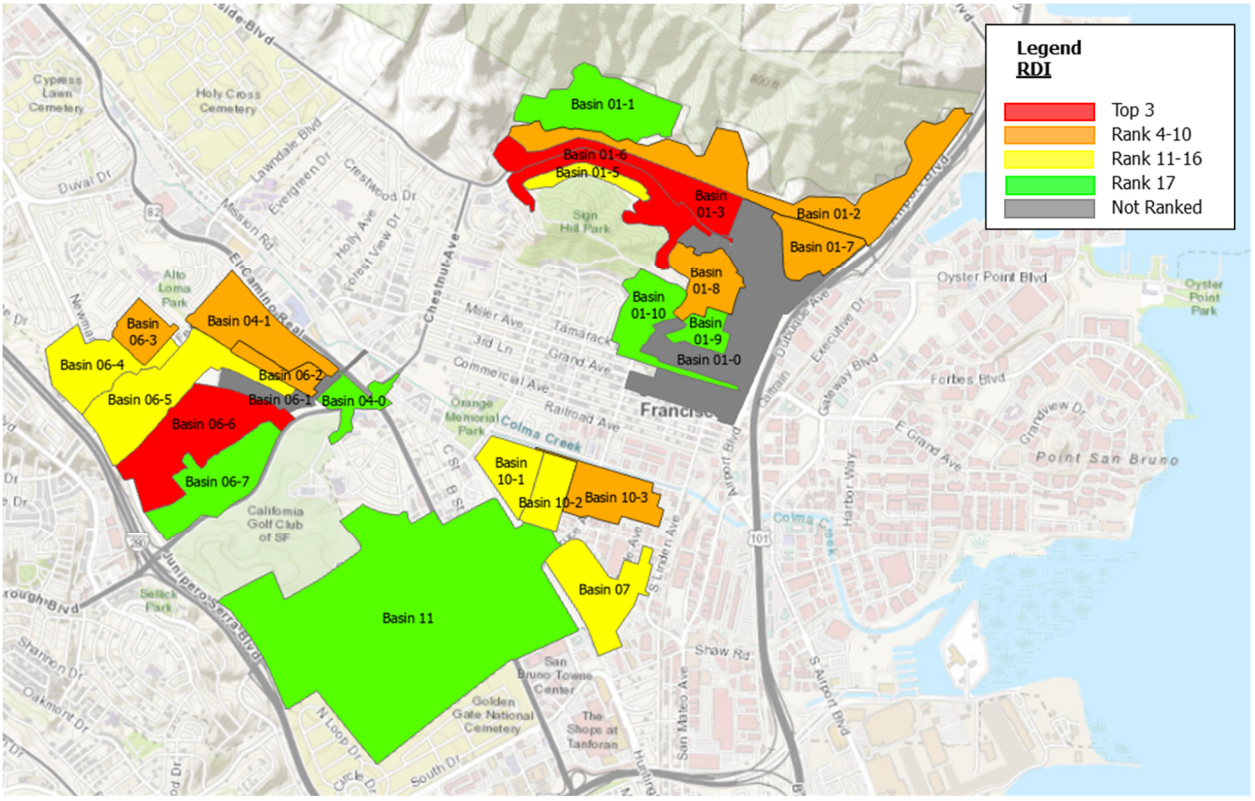

Figure ES-6. Temperature Map: RDI Final Basin Rankings

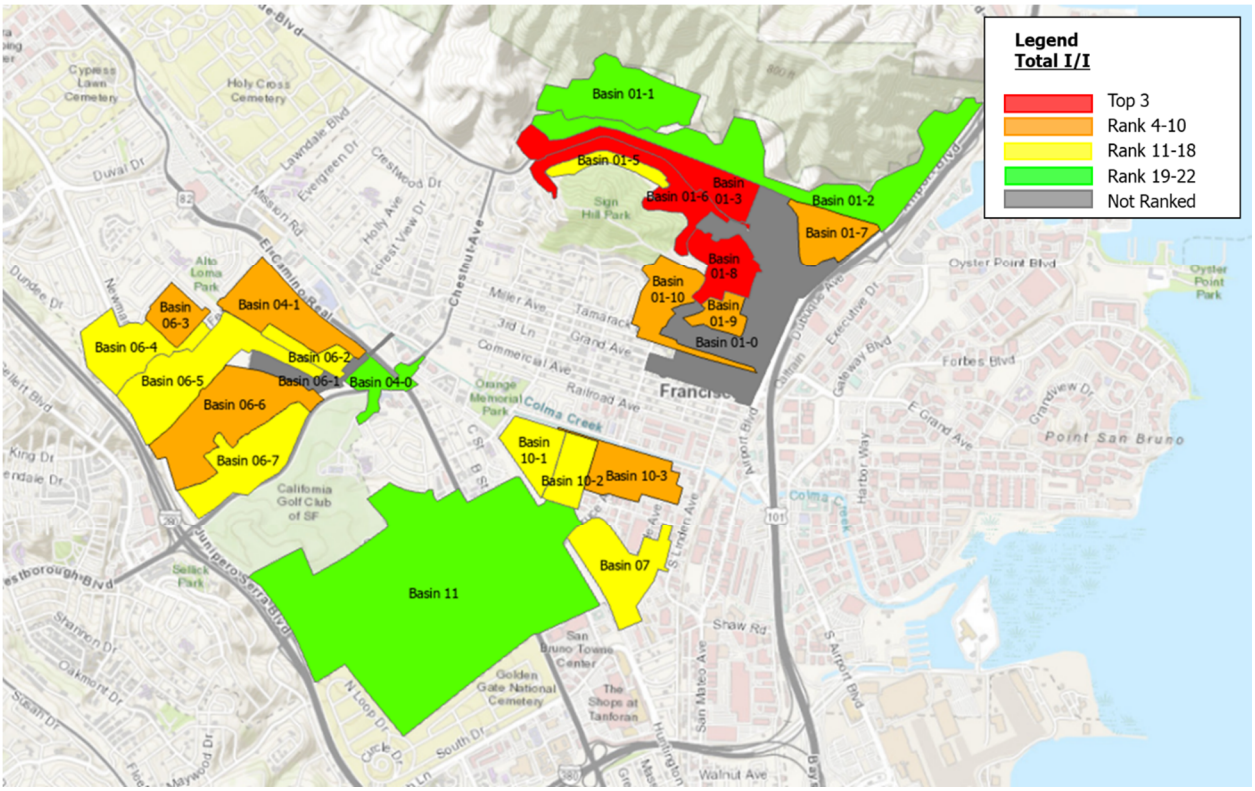

Figure ES-7. Temperature Map: Total I/I Final Basin Rankings

Recommendations

V&A advises that future I/I reduction plans consider the following recommendations:

1. **Master Plan and Model Implementation**: This study focuses on inflow and infiltration generation; however, the capacity deficiencies of the collection system may be of greater concern relative to I/I response during peak wet weather events. The City may wish to have a model designed and/or a master plan study conducted to determine the overall needs of the District relative to I/I. Or simply, the study results can be used to update the master plan and compare with previous model assumptions and flow monitoring results.
2. **Capacity Analysis:** Five sites showed signs of surcharge during the course of the study. The City may wish to evaluate capacity concerns in the local collection system near these sites.
3. **Determine I/I Reduction Program**: The District should examine its I/I reduction needs to determine their needs and goals for a future I/I reduction program.
    a. If peak flows, sanitary sewer overflows, and pipeline capacity issues are of greater concern, then priority can be given to investigate and reduce sources of inflow within the basins with the greatest inflow problems.
    b. If total infiltration and general pipeline deterioration are of greater concern, then the program can be weighted to investigate and reduce sources of infiltration within the basins with the greatest infiltration problems.
4. Basin 01-3 was ranked the highest for normalized RDI and Total I/I. The City may wish to focus initial I/I mitigation efforts in this basin.
5. **I/I Investigation Methods**: Potential I/I investigation methods include the following:
    a. smoke testing.
    b. mini-basin flow monitoring.
    c. night-time reconnaissance work to (1) investigate and determine direct point sources of inflow, and (2) determine the areas and/or pipe reaches responsible for high levels of infiltration contribution.
    d. CCTV inspection.
6. **I/I Reduction Cost-Effective Analysis**: The City should conduct a study to determine which is more cost-effective: (1) locating the sources of inflow/infiltration and systematically rehabilitating or replacing the faulty pipelines; or (2) continued treatment of the additional rainfall dependent I/I flow.

1 Introduction

1.1 Scope and Purpose

V&A Consulting Engineers (V&A) was retained by Akel Engineering Group (AEG) to perform sanitary sewer flow monitoring in support of the master planning update effort for the City of South San Francisco (City). Flow and rainfall monitoring were performed over a period of over 3 months from January 14, 2021, to April 18, 2021. Open-channel flow monitoring was performed at 24 sites and data was captured from 3 rain gauges. There were three general purposes of this study.

1. Establish the baseline sanitary sewer flows at the flow monitoring sites.
2. Establish the peak flow condition during the rainfall events and estimate available sewer capacity.
3. Quantify inflow/ infiltration (I/I) at the applicable flow monitoring sites.

1.2 Flow Monitoring Sites and Basins

Flow monitoring sites are identified as the manholes where the flow monitors were secured and the pipelines in which the flow sensors were placed. Capacity analysis and flow rate information are presented on a site-by-site basis. The flow monitoring site locations were selected and approved by AEG. Information regarding the flow monitoring locations is listed in Table 1-1.

Flow monitoring site data may include the flows of one or many drainage basins. Flow monitoring basins are localized areas of a sanitary sewer collection system upstream of a given location (often a flow meter), including all pipelines, inlets, and appurtenances. The basin refers to the ground surface area near and enclosed by the pipelines. A basin may refer to the entire collection system upstream from a flow meter or may exclude separately monitored basins upstream, requiring basin isolation (subtraction of upstream flows). The flow monitoring basins and basin isolation equations used to define the limits of the basin boundaries are listed in Table 1-2.

The approximate basins were drawn from the overall system map and should be confirmed by the reviewing Engineer. The I/I analysis performed for this project was analyzed on a basin-by-basin basis. Please note that Basins 1, and 6-1 are excluded from I/I analysis. Sites 1 and 6-1 were directly downstream from seven and three flow monitoring sites, respectively, causing subtraction of flow uncertainties (Section 2.4) that were too high to isolated these basins for I/I analysis.

Figure 1-1 illustrates the flow monitoring locations, basins, and rain gauge locations. Detailed descriptions of the individual flow monitoring sites, including photographs, are included in *Appendix A*.

1.3 Background

V&A performed flow monitoring for AEG with the City in 2018 in support of the City master plan. Sites 1, 4, and 11 were the same for both studies. This proved important as the wet weather season for the 2021 effort had considerably less rainfall and thus less inflow and infiltration (I/I) response. Sites 1, 4,

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Site 6-4	SW inlet	wG1150	8.5	136 San Felipe Avenue
Site 6-5	W inlet	wG1322	12	104 Del Monte Avenue
Site 6-6	SW inlet	wG1330	12	Arroyo Drive and Indio Drive
Site 6-7	S inlet	wG1361	8	205 Arroyo Drive
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Site 10-1	S inlet	wH1838	8.5	Path behind 612 Mayfair Avenue
Site 10-2	N effluent	wH1836	8.5	Mayfair Avenue and S Magnolia Avenue
Site 10-3	E effluent	wI2651	12	S Canal Street and S Maple Avenue
Site 11	SW inlet	wI790	15	245 S Spruce Avenue

Table 1-2. List of Flow Monitoring Basins

Isolated Basin	Flow Isolation Calculation	Area (Acres)
Basin 01	Q_{1}- (Q_{1-2} + Q_{1-3} + Q_{1-6} + Q_{1-7} + Q_{1-8} + Q_{1-9} + Q_{1-10})	152
Basin 01-1	Q_{1-1}	71
Basin 01-2	Q_{1-2} – Q_{1-1}	122
Basin 01-3	Q_{1-3}	51
Basin 01-5	Q_{1-5}	15
Basin 01-6	Q_{1-6} – Q_{1-5}	46
Basin 01-7	Q_{1-7}	34
Basin 01-8	Q_{1-8}	36
Basin 01-9	Q_{1-9}	16
Basin 01-10	Q_{1-10}	42
Basin 04	Q_{4} - Q_{4-1}	21
Basin 04-1	Q_{4-1}	56
Basin 06-1	Q_{6-1} – (Q_{6-2} + Q_{6-3} + Q_{6-4} + Q_{6-5} + Q_{6-6} + Q_{6-7})	19
Basin 06-2	Q_{6-2}	15
Basin 06-3	Q_{6-3}	22
Basin 06-4	Q_{6-4}	49
Basin 06-5	Q_{6-5} - (Q_{6-3} + Q_{6-4})	83
Basin 06-6	Q_{6-6} - Q_{6-7}	89
Basin 06-7	Q_{6-7}	61
Basin 07	Q_{7} - Q_{11}	58
Basin 10-1	Q_{10-1}	30
Basin 10-2	Q_{10-2}	24
Basin 10-3	Q_{10-3} –(Q_{10-1} + Q_{10-2})	42
Basin 11	Q_{11}	490

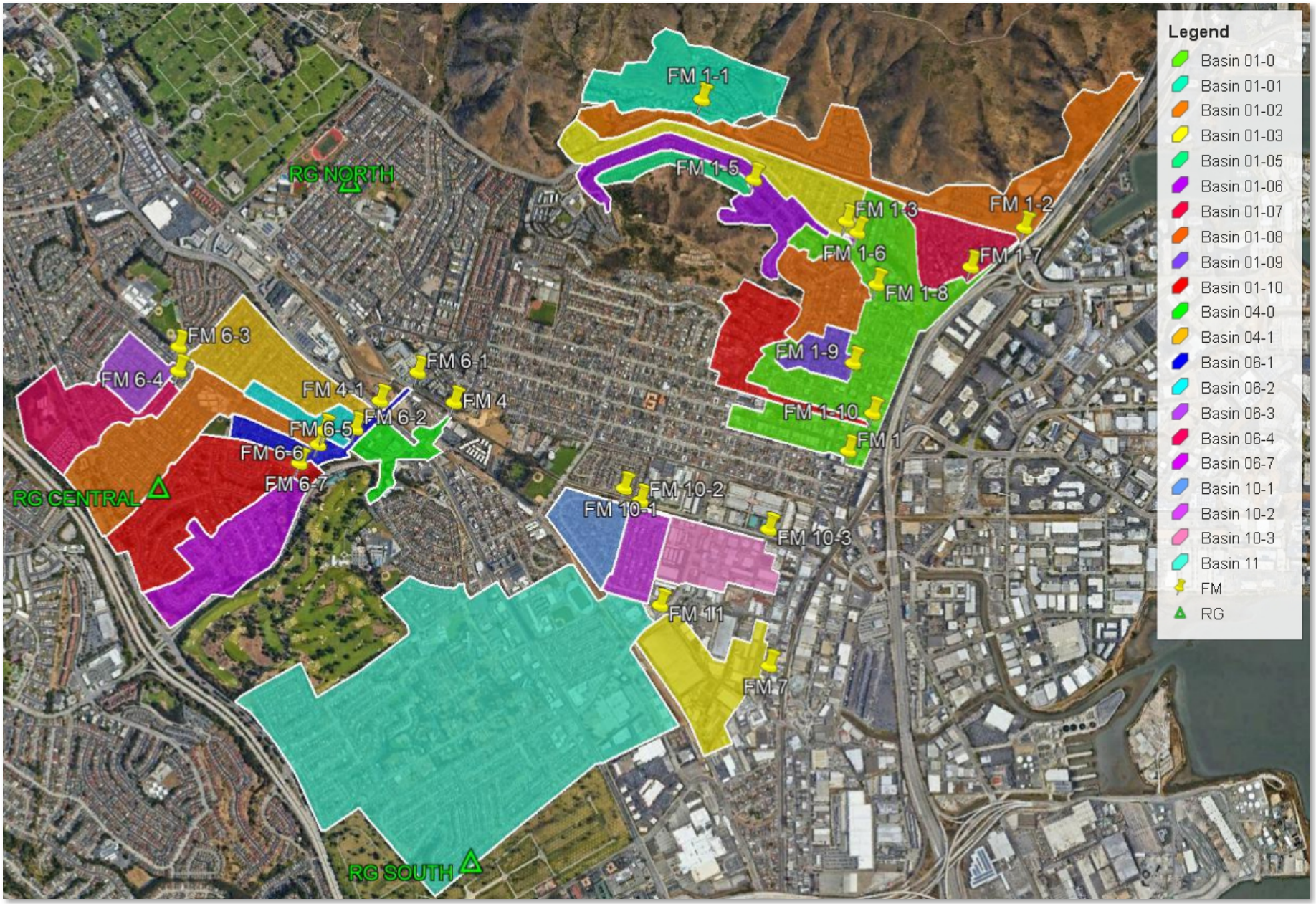


Figure 1-1. Map of Flow Monitoring Sites, Basins & Rain Gauge – Overall

2 Methods and Procedures

2.1 Confined Space Entry

A confined space (Photo 2-1) is defined as any space that is large enough and so configured that a person can bodily enter and perform assigned work, has limited or restricted means for entry or exit, and is not designed for continuous employee occupancy. In general, the atmosphere must be constantly monitored for sufficient levels of oxygen (19.5% to 23.5%), and the presence of hydrogen sulfide (H_2S) gas, carbon monoxide (CO) gas, and lower explosive limit (LEL) levels. A typical confined space entry crew has members with OSHA-defined responsibilities of Entrant, Attendant, and Supervisor. The Entrant is the individual performing the work. He or she is equipped with the necessary personal protective equipment needed to perform the job safely, including a personal four-gas monitor (Photo 2-2). If it is not possible to maintain line-of-sight with the Entrant, then more Entrants are required until line-of-sight can be maintained. The Attendant is responsible for maintaining contact with the Entrants to monitor the atmosphere using another four-gas monitor and maintaining records of all Entrants if there is more than one. The Supervisor is responsible for developing the safe work plan for the job at hand prior to entering.

Photo 2-1. Confined Space Entry

Photo 2-2. Typical Personal Four-Gas Monitor

2.2 Flow Meter Installation

V&A installed thirteen (13) HACH FL904 Sigma flow meters for temporary monitoring within the collection system. Ten used submerged sensors, three used non-contact Flo-Dar sensors.

FL904 Sigma submerged sensors use a pressure transducer to collect depth readings and an ultrasonic Doppler sensor to determine the average fluid velocity. The ultrasonic sensor emits high-frequency sound waves, which are reflected by air bubbles and suspended particles in the flow. The sensor receives the reflected signal and determines the Doppler frequency shift, which indicates the estimated average flow velocity. The sensor is typically mounted at a manhole inlet to take advantage of smoother upstream flow conditions. The sensor may be offset to one side to lessen the chances of fouling and sedimentation where these problems are expected to occur. Manual level and velocity measurements were taken during the installation of the flow meters and again when they were removed and compared to simultaneous level and velocity readings from the flow meters to ensure proper calibration and accuracy. Figure 2-1 shows a typical installation for a flow meter with a submerged sensor.

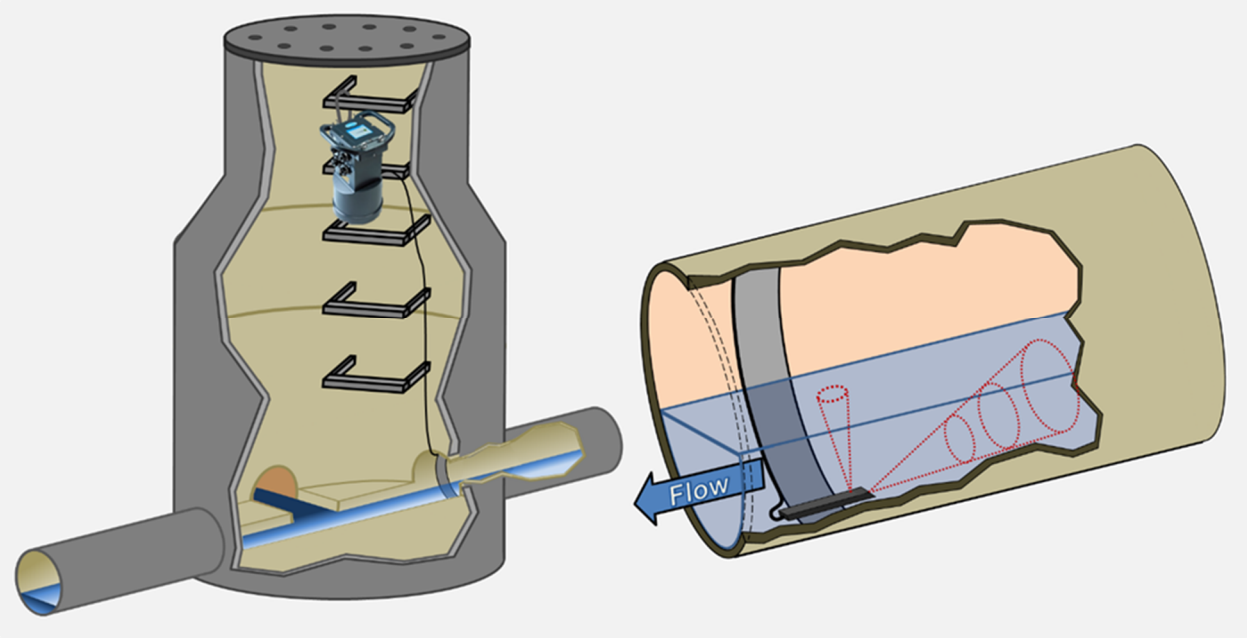


Figure 2-1. Typical Installation for FL904 Sigma Flow Meter with Submerged Sensor

A Flo-Dar flow meter is a non-contact flow meter that uses radar to measure velocity and a down-looking ultrasonic sensor to measure depth. Figure 2-2 illustrates a typical Flo-Dar installation.

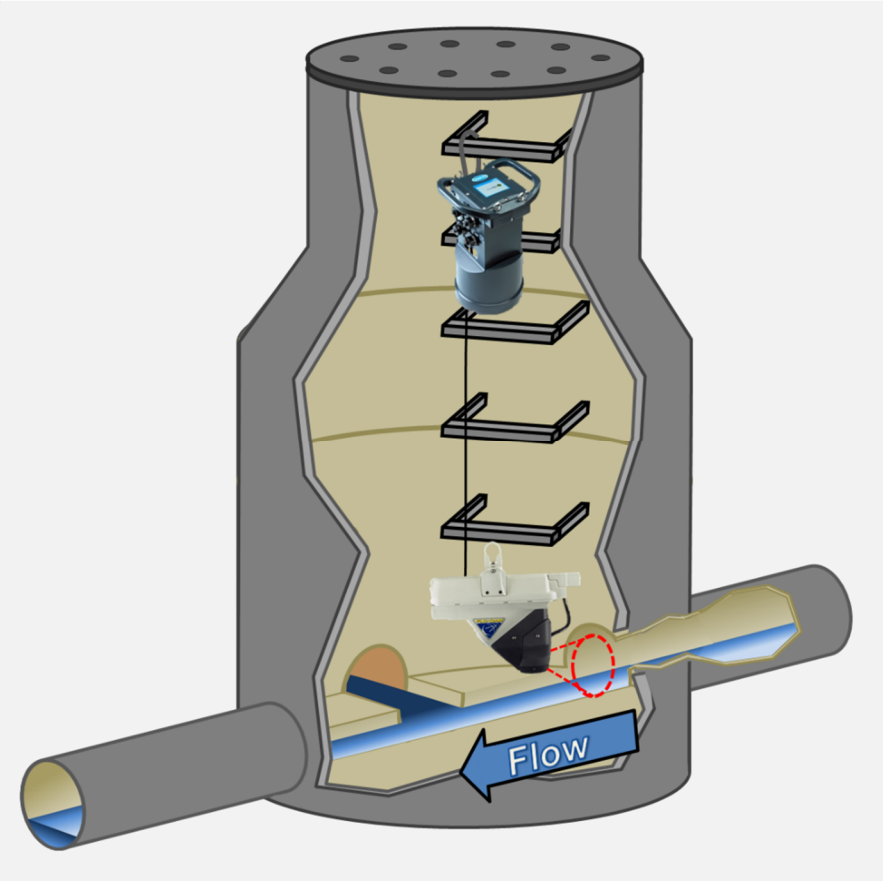


Figure 2-2. Typical Installation for FL904 Sigma Flow Meter with Flo-Dar

2.3 Flow Calculation

Data retrieved from the flow meters were placed into a spreadsheet program for analysis. Data analysis includes data comparison to field calibration measurements, as well as necessary geometric adjustments as required for sediment (sediment reduces the pipe's wetted cross-sectional area available to carry flow). Area-velocity flow metering uses the continuity equation,

$$Q = v \cdot A = v \cdot (A_T - A_S)$$

where Q: volume flow rate

v: average velocity as determined by the ultrasonic sensor

A: cross-sectional area available to carry the flow

A_T: total cross-sectional area with both wastewater and sediment

A_S: cross-sectional area of sediment.

For circular pipe,

$$A_T = \left[\frac{D^2}{4}\cos^{-1}\left(1-\frac{2d_W}{D}\right)\right] - \left[\left(\frac{D}{2}-d_W\right)\left(\frac{D}{2}\right)\sin\left(\cos^{-1}\left(1-\frac{2d_W}{D}\right)\right)\right]$$

$$A_S = \left[\frac{D^2}{4}\cos^{-1}\left(1-\frac{2d_S}{D}\right)\right] - \left[\left(\frac{D}{2}-d_S\right)\left(\frac{D}{2}\right)\sin\left(\cos^{-1}\left(1-\frac{2d_S}{D}\right)\right)\right]$$

where d_W: distance between wastewater level and pipe invert

d_S: depth of sediment

D: pipe diameter

2.4 Measurement Error and Uncertainty

For traditional engineering applications, measurement "error" is explained as a difference between a computed, estimated, or measured value and the generally accepted true or theoretically correct value. It can also be thought of as a difference between the desired and the actual performance of equipment. For equipment, error is usually expressed as a percentage relative to accuracy (i.e., "…the velocity sensor has an accuracy of ±2% of the reading…").

However, for this study and flow monitoring applications, the cause of the measurement difference is important and a distinction will be made between the equipment not performing to industry standards ("error") and expected inaccuracies ("uncertainty") associated with monitoring technology limitations.

Gauging **"error"** occurs when the equipment is not performing to industry standards. This can occur as a result of the following common categories of conditions that can be encountered at a wastewater monitoring site.

- Malfunctioning equipment (i.e. a sensor is damaged, battery life ends, or a desiccant canister becomes saturated)
- Improper equipment choice or maintenance (i.e. the selected gauging equipment technologies are incompatible with hydraulic conditions within the sewer, or excessive gravel deposits are allowed to accumulate around the sensors without being removed)
- Improper equipment calibration (i.e. depth and/or velocity measurements are incorrectly taken within the sewer, or equipment is allowed to drift out of calibration)
- Field conditions within the sewer, (i.e. foaming at the water surface that "blinds" an ultrasonic depth sensor, or toilet paper catching and accumulating on a combination sensor, blinding the acoustic Doppler velocity meter)

For flow monitoring applications, gauging **"uncertainty"** is used to describe and quantify the expected inaccuracies that result from the limitations of the technologies that utilize indirect measurements to quantify wastewater flow.

It is important to try and install flow meters in "ideal" flow conditions. Ideal flow conditions are generally defined as laminar flow in a straight-through, constant-slope pipeline with no disturbances (elbows, tees, hydraulic shifts, etc.) 10 diameters upstream and 5 diameters downstream from the flow monitoring location. If ideal flow conditions are met, then an expected uncertainty of final flow calculation from an open-channel flow meter may be approximately ±5%. For many situations, ideal flow conditions cannot be met and uncertainties increase.

2.4.1 Flow Addition versus Flow Subtraction

Due to the uncertainties involved in subtracting flows of similar magnitudes, the addition of flows at multiple monitoring sites is usually preferred over subtraction of flows. Subtraction becomes an issue especially when the flow difference from the subtraction falls within the measurement uncertainty range of the two larger flow data sets (i.e. subtracting a large flow from another large flow to obtain a small difference).

This concept is best demonstrated per the following example:

1. Meter A measures 2.00 MGD of flow and has an expected uncertainty of ±5%, thus the uncertainty range of the flow measurement is ±0.10 MGD.
2. Meter B measures 2.50 MGD of flow and has an expected uncertainty of ±6%, thus the uncertainty range of the flow measurement is ±0.15 MGD.

3. Meter C measures 0.50 MGD of flow and has an expected uncertainty of ±8%, thus the uncertainty range of the flow measurement is ±0.04 MGD.

- **Scenario 1 – Flow Addition**
  - Meter A + Meter B = 2.00 MGD (±0.10) + 2.50 MGD (±0.15) = 4.50 MGD (±0.25)
  - Overall uncertainty = ±0.25 / 4.50 = ±5.6%
  - For flow addition, the final uncertainty is essentially a weighted average of the component uncertainties.

- **Scenario 2 – Flow Subtraction, Large Flow less Small Flow**
  - Meter B - Meter C = 2.50 MGD (±0.15) - 0.50 MGD (±0.04) = 2.00 MGD (±0.19)
  - Overall uncertainty = ±0.19 / 2.00 = ±9.5%
  - For flow subtraction, the final uncertainty will always be greater than the component uncertainties.
  - When subtracting a small flow from a large flow, the resulting uncertainties can still be manageable.

- **Scenario 3 – Flow Subtraction, Large Flow less a similarly Large Flow**
  - Meter B - Meter A = 2.50 MGD (±0.15) – 2.00 MGD (±0.10) = 0.50 MGD (±0.25)
  - Overall uncertainty = ±0.25 / 0.50 = ±50%
  - When subtracting a similarly sized flow rates, the resulting uncertainties may not be manageable. In this example, an uncertainty of ±50% may be considered unacceptable for confident analyses.

Scenario 3 is a very "real-world" situation. The uncertainties for Meter A and Meter B are extremely reasonable (indeed, most flow monitoring service providers would be extremely pleased with true meter uncertainties of ±5% to ±6%). However, the reality of the math is clear, and the above example demonstrates the concept of flow subtraction and compounding or inflating uncertainty ranges.

The following points are emphasized in relation to the items of this section:

- For the subtraction of flows, the overall uncertainty can be an inflated value that far exceeds the component uncertainties.
- The smaller the resultant flow from the subtraction equation, the larger the percentage uncertainty.
- Whenever possible, basins flows should be directly measured, rather than calculated as a subtraction of two or more flow meters.
- If flow subtraction cannot be avoided, it is better to have the magnitudes of the component flows be as dissimilar as possible.

2.5 Average Dry Weather Flow Determination

For this study, four distinct average dry weather flow curves were established for each site location:

- Mondays – Thursdays
- Fridays
- Saturdays
- Sundays

Flows for many sites differ on Friday evenings compared to Mondays through Thursdays. Starting around 7 pm, the flows are often decreased (compared to Monday through Thursday). Similarly, flow patterns for Saturday and Sunday were also separated due to their unique evening flow pattern. This type of differentiation can be important when determining I/I response, especially if a rain event occurs on a Friday, Saturday, or Sunday evening.

Figure 2-3 illustrates a sample of varying flow patterns within a typical dry week.

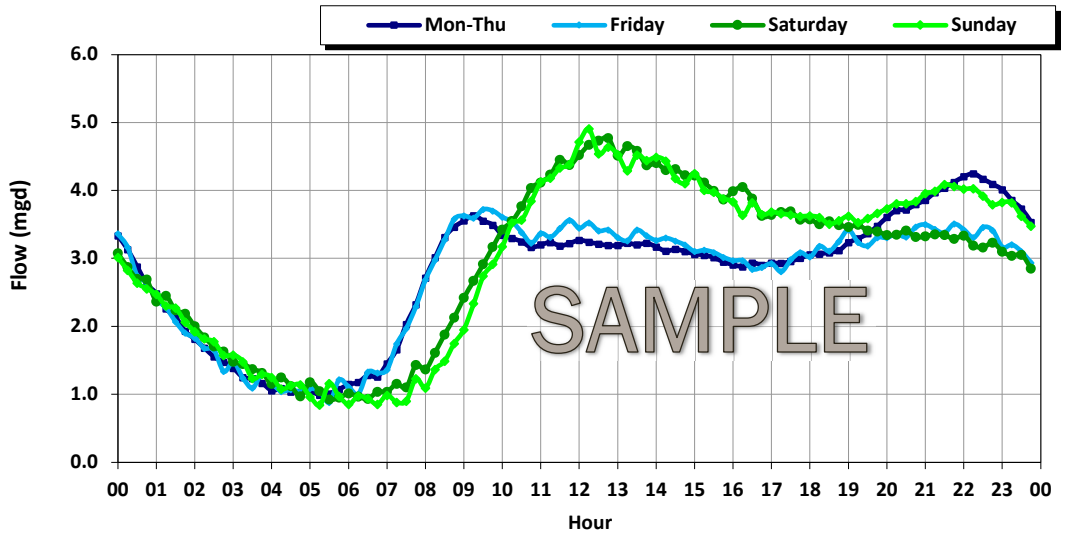


Figure 2-3. Sample ADWF Diurnal Flow Patterns

ADWF curves are taken from "Dry Days" when RDI had the least impact on the baseline flow. The overall average dry weather flow (ADWF) was calculated per the following equation:

$$ADWF = \left(ADWF_{Mon-Thu} \times \frac{4}{7} \right) + \left(ADWF_{Fri} \times \frac{1}{7} \right) + \left(ADWF_{Sat} \times \frac{1}{7} \right) + \left(ADWF_{Sun} \times \frac{1}{7} \right)$$

2.6 Flow Attenuation

Flow attenuation in a sewer collection system is the natural process of the reduction of the peak flow rate through redistribution of the same volume of flow over a longer period of time. This occurs as a result of friction (resistance), internal storage, and diffusion along the sewer pipes. Fluids are constantly working towards equilibrium. For example, a volume of fluid poured into a static vessel with no outside turbulence will eventually stabilize to a static state, with a smooth fluid surface without peaks and valleys. Attenuation within a sanitary sewer collection system is based upon this concept. A flow profile with a strong peak will tend to stabilize towards equilibrium, as shown in Figure 2-4.

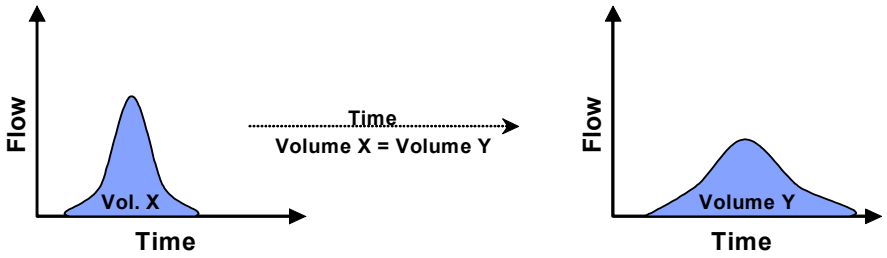


Figure 2-4. Attenuation Illustration

Within a sanitary sewer collection system, each individual basin will have a specific flow profile. As the flows from the basins combine within the trunk sewer lines, the peaks from each basin will (a) not necessarily coincide at the same time, and (b) due to the length and time of travel through the trunk sewers, peak flows will attenuate prior to reaching the treatment facility. The sum of the peak flows of the individual basins within a collection system will usually be greater than the peak flows observed at the treatment facility.

2.7 Inflow / Infiltration Analysis: Definitions and Identification

Inflow and infiltration (I/I) consists of stormwater and groundwater that enters the sewer system through pipe defects and improper storm drainage connections and is defined as follows:

- **Inflow**: Stormwater inflow is defined as water discharged into the sewer system, including private sewer laterals, from direct connections such as downspouts, yard and area drains, holes in manhole covers, cross-connections from storm drains, or catch basins.
- **Infiltration**: Infiltration is defined as water entering the sanitary sewer system through defects in pipes, pipe joints, and manhole walls, which may include cracks, offset joints, root intrusion points, and broken pipes.

Figure 2-5 illustrates the possible sources and components of I/I.

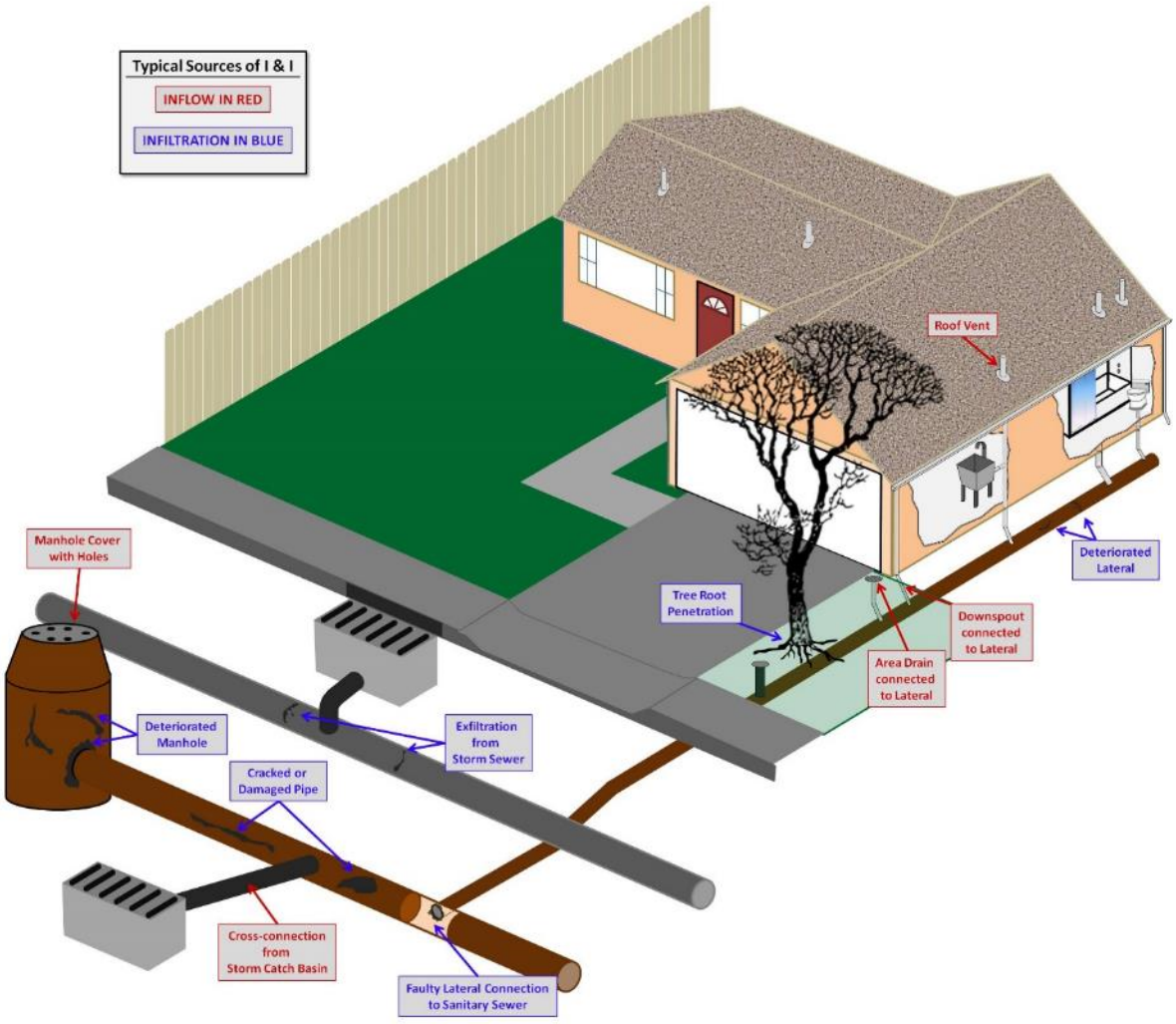


Figure 2-5. Typical Sources of Infiltration and Inflow

2.7.1 Infiltration Components

Infiltration can be further subdivided into components as follows:

- **Groundwater Infiltration**: Groundwater infiltration depends on the depth of the groundwater table above the pipelines as well as the percentage of the system submerged. The variation of groundwater levels and subsequent groundwater infiltration rates are seasonal by nature. On a day-to-day basis, groundwater infiltration rates are relatively steady and will not fluctuate greatly.
- **Rainfall-Dependent Infiltration**: This component occurs as a result of stormwater and enters the sewer system through pipe defects, as with groundwater infiltration. The stormwater first percolates directly into the soil and then migrates to an infiltration point. Typically, the time of concentration for rainfall-related infiltration may be 24 hours or longer, but this depends on the soil permeability and saturation levels.
- **Rainfall-Responsive Infiltration** is stormwater that enters the collection system indirectly through pipe defects, but normally in sewers constructed close to the ground surface such as private laterals. Rainfall-responsive infiltration is independent of the groundwater table and reaches defective sewers via the pipe trench in which the sewer is constructed, particularly if the pipe is placed in impermeable soil and is bedded and backfilled with a granular material. In this case, the pipe trench serves as a conduit similar to a French drain, conveying storm drainage to defective joints and other openings in the system. This type of infiltration can have a quick response and graphically can look very similar to inflow.

2.7.2 Impact and Cost of Source Detection and Removal

- **Inflow:**
  - Impact: Inflow creates a peak flow problem in the sewer system and often dictates the required capacity of downstream pipes and transport facilities to carry these peak instantaneous flows. Because the response and magnitude of inflow are tied closely to the intensity of the storm event, the short-term peak instantaneous flows may result in surcharging and overflows within a collection system. Severe inflow may result in sewage dilution, resulting in upsetting the biological treatment (secondary treatment) at the treatment facility.
  - Cost of Source Identification and Removal: Inflow locations are usually less difficult to find and less expensive to correct. These sources include direct and indirect cross-connections with storm drainage systems, roof downspouts, and various types of surface drains. Generally, the costs to identify and remove sources of inflow are low compared to potential benefits to public health and safety or the costs of building new facilities to convey and treat the resulting peak flows.
- **Infiltration:**
  - Impact: Infiltration typically creates long-term annual volumetric problems. The major impact is the cost of pumping and treating the additional volume of water, and of paying for treatment (for municipalities that are billed strictly on flow volume).
  - Cost of Source Detection and Removal: Infiltration sources are usually harder to find and more expensive to correct than inflow sources. Infiltration sources include defects in deteriorated sewer pipes or manholes that may be widespread throughout a sanitary sewer system.

2.7.3 Graphical Identification of I/I

Inflow is usually recognized graphically by large-magnitude, short-duration spikes immediately following a rain event. Infiltration is often recognized graphically by a gradual increase in flow after a wet-weather event. The increased flow typically sustains for a period after rainfall has stopped and then gradually drops off as soils become less saturated and groundwater levels recede to normal levels. Real-time flows are plotted against ADWF to analyze the I/I response to rainfall events. Figure 2-6 illustrates a sample of how this analysis is conducted and some of the measurements that are used to distinguish infiltration and inflow. Similar graphs have been generated for the individual flow monitoring sites and can be found in Appendix A.

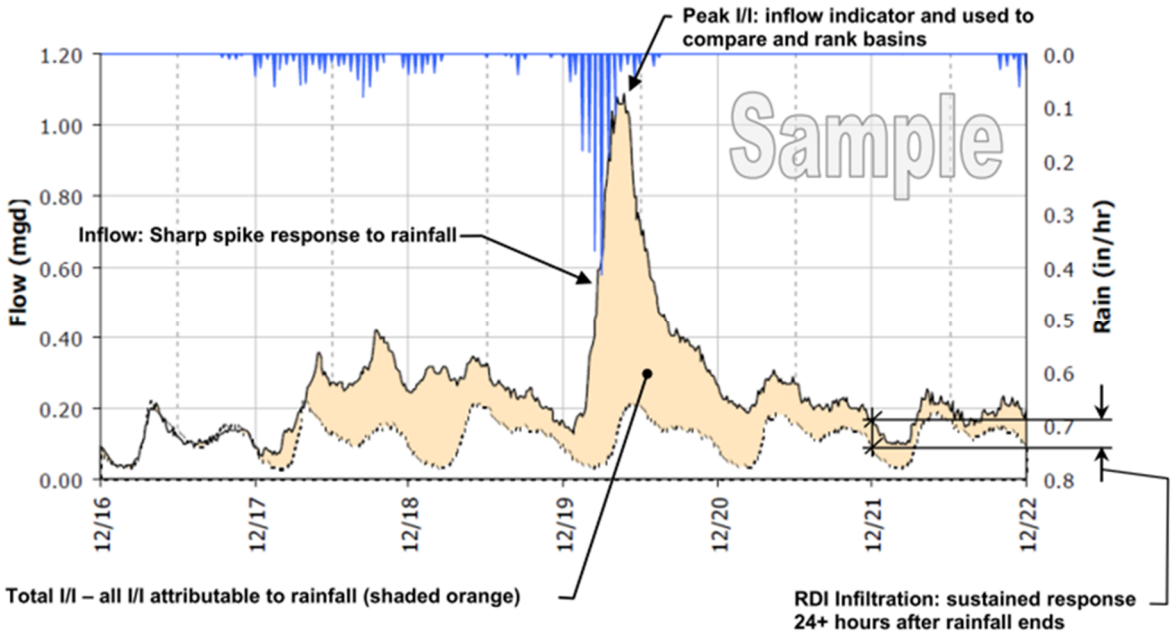


Figure 2-6. Sample Infiltration and Inflow Isolation Graph

2.7.4 Analysis Metrics

After differentiating I/I flows from ADWF flows, various calculations can be made to determine which I/I component (inflow or infiltration) is more prevalent at a particular site and to compare the relative magnitudes of the I/I components between drainage basins and between storm events:

- **Inflow – Peak I/I Flow Rate**: Inflow is characterized by sharp, direct spikes occurring during a rainfall event. Peak I/I rates are used for inflow analysis.[4]
- **Groundwater Infiltration (GWI)**: GWI analysis is conducted by looking at minimum dry weather flow to average dry weather flow ratios and comparing them to established standards to quantify the rate of excess groundwater infiltration.
- **Rainfall-Dependent Infiltration (RDI)**: RDI Analysis is conducted by looking at the infiltration rates at set periods after the conclusion of a storm event. Depending on the particular collection system and the time required for flows to return to ADWF levels, different periods may be

[4] I/I flow rate is the real-time flow less the estimated average dry weather flow rate. It is an estimate of flows attributable to rainfall. By using peak measured flow rates (inclusive of ADWF), the I/I flow rate would be skewed higher or lower depending on whether the storm event I/I response occurs during low-flow or high-flow hours.

examined to determine the basins with the greatest or most sustained rainfall-dependent infiltration rates.

- **Total I/I**: The total inflow and infiltration is measured in gallons per site and per storm event. Because it is based on total I/I volume, it is used to identify the overall volumetric influence of I/I within the monitoring basin.

2.7.5 Normalization Methods

There are three ways to *normalize* the I/I analysis metrics for an "apples-to-apples" comparison among the different drainage basins:

- **per-ADWF**: The metric is divided by the established average dry weather flow rate and is typically expressed as a ratio. Peaking Factors are examples of using ADWF to normalize data from different sites.
- **per-IDM**: The metric is divided by the length of pipe (IDM [inch-diameter mile]) contained within the upstream basin. Final units typically are gallons per day (gpd) per IDM.
- **per-ACRE**: The metric is divided by the acreage of the upstream basin. Final units typically are gallons per day (gpd) per ACRE.

The infiltration and inflow indicators were normalized by the per-IDM, per-ADWF, and the per-ACRE methods in this report. The per-IDM was weighted as 40%, per-ADWF was weighted as 30% and per-ADWF was weighted at 30%.

3 Results and Analysis

3.1 Rainfall

V&A captured rainfall data from publicly available private weather stations (PWS[5]). V&A performed QA/QC on the data from 3 rain gauges (refer to Figure 1-1). Graphs containing rainfall data overlaid with the flow data are included in Appendix A.

Figure 3-1 shows the rainfall during the flow monitoring period, of the three rain gauges, triangulated to South San Francisco Conference Center. Figure 3-2 shows the rain accumulation plot of the period rainfall, as well as the historical average rainfall[6] during this project duration, triangulated to South San Francisco Conference Center. Table 3-1 shows the precipitation amount of the three rainfall events for each rain gauge.

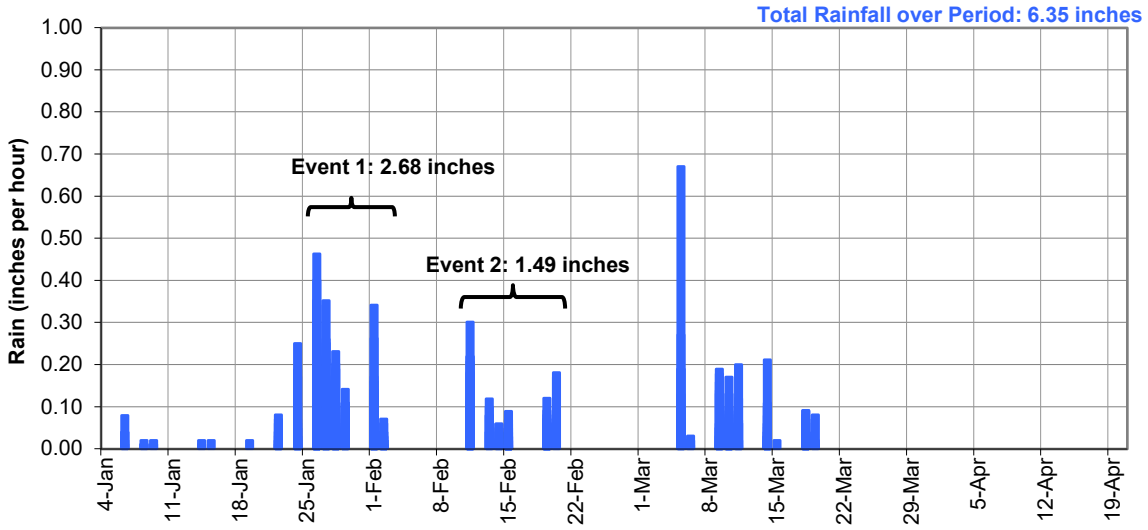


Figure 3-1. Rainfall During Flow Monitoring Period –3 Gauges triangulated to South San Francisco Conference Center

[5] National Oceanic and Atmospheric Administration (NOAA) Citizen Weather Observer Program (CWOP) members send data from their PWS to the NOAA MADIS server; the data undergoes quality checking and then is distributed. While V&A has no direct control over the rain gauges, V&A performs additional QA/QC on the data to ensure its suitability for use.

[6] Historical data taken from the WRCC (Station 47050 in Pomona Cal Poly and Station 41779 in Claremont Pomona College): http://www.wrcc.dri.edu/summary/climsmnca.html

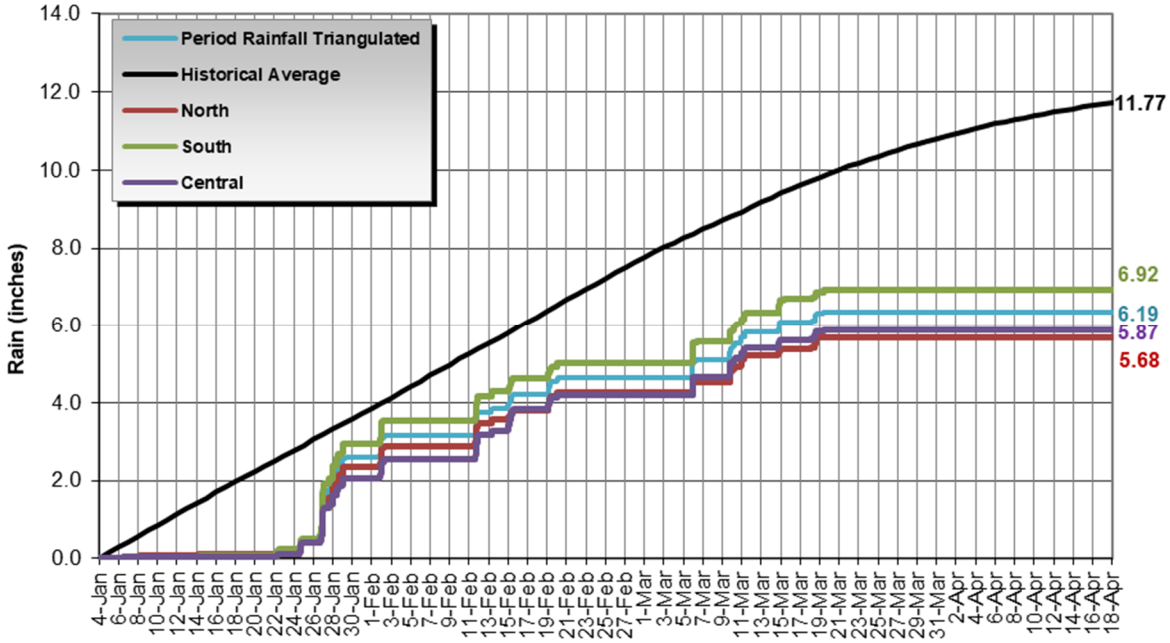


Figure 3-2. Rainfall Accumulation Plot – Triangulated to South San Francisco Conference Center

Table 3-1. Summary of Rainfall

Rain Gauge	Storm Event 1: Jan 26 – Feb 08, 2021 (inches)	Storm Event 2: Feb 11 – 22, 2021 (inches)
North	2.46	1.35
South	3.03	1.47
Central	2.13	1.66

3.1.1 Regional Rainfall Event Classification

It is important to classify the relative size of a major storm event that occurs over the course of a flow monitoring period[7]. Rainfall events are classified by intensity and duration. Based on historical data, frequency contour maps for storm events of given intensity and duration have been developed by the NOAA for all areas within the continental United States (Figure 3-3).

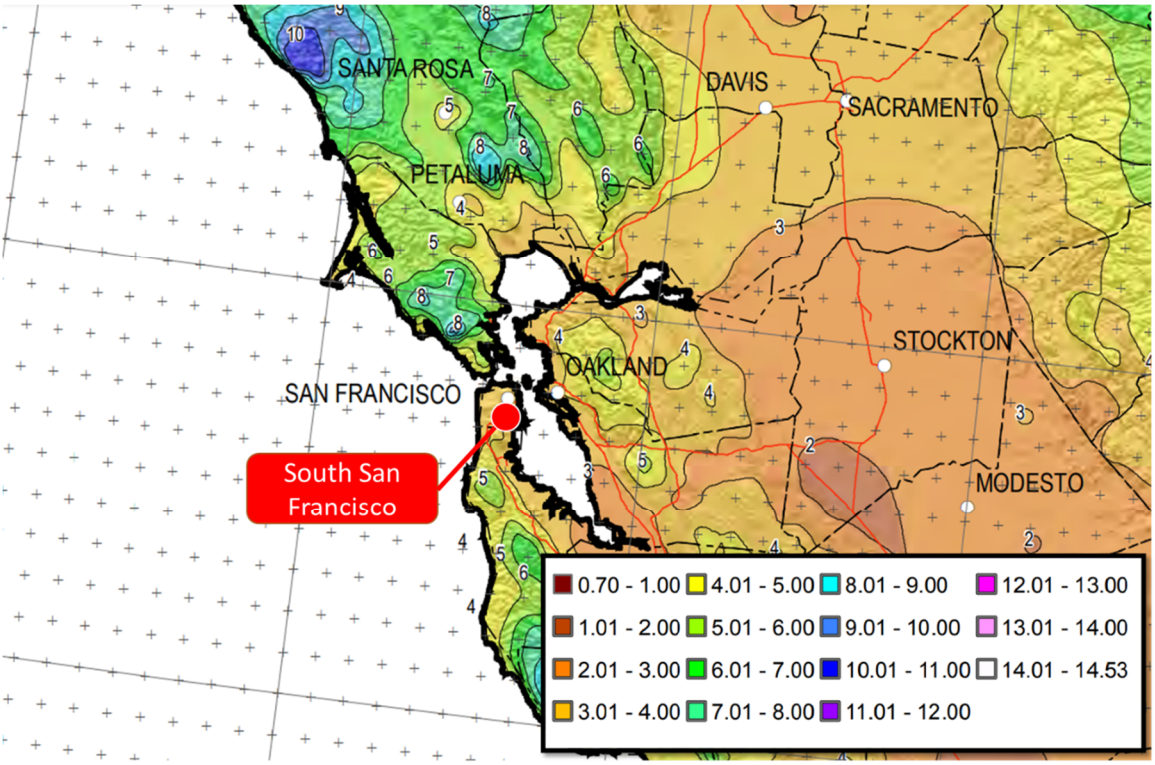


Figure 3-3. NOAA California Rainfall Frequency Map

For example, the NOAA Rainfall Frequency Atlas[8] classifies a 10-year, 24-hour storm event at the South rain gauge location with 3.84 inches. This means that in any given year, at this specific location, there is a 10% chance that 3.84 inches of rain will fall in any 24-hour period.

From the NOAA frequency maps, for a specific latitude and longitude, the rainfall densities for period durations ranging from 1 hour to 20 days are known for rain events ranging from 1-year to 10-year intensities. These are plotted to develop a rain event frequency map specific to each rainfall monitoring site. Superimposing the peak measured densities for the rainfall events on the rain event frequency plot determines the classification of the rainfall event.

Figure 3-4 through Figure 3-6 illustrate the rain event classification plots per the rain gauge locations.

[7] Sanitary sewers are often designed to withstand I/I contribution to sanitary flows for specific-sized "design" storm events.

[8] NOAA Western U.S. Precipitation Frequency Maps Atlas 14, Volume 6, 2011: http://hdsc.nws.noaa.gov/pub/hdsc/data/sw/ca10y24h.pdf

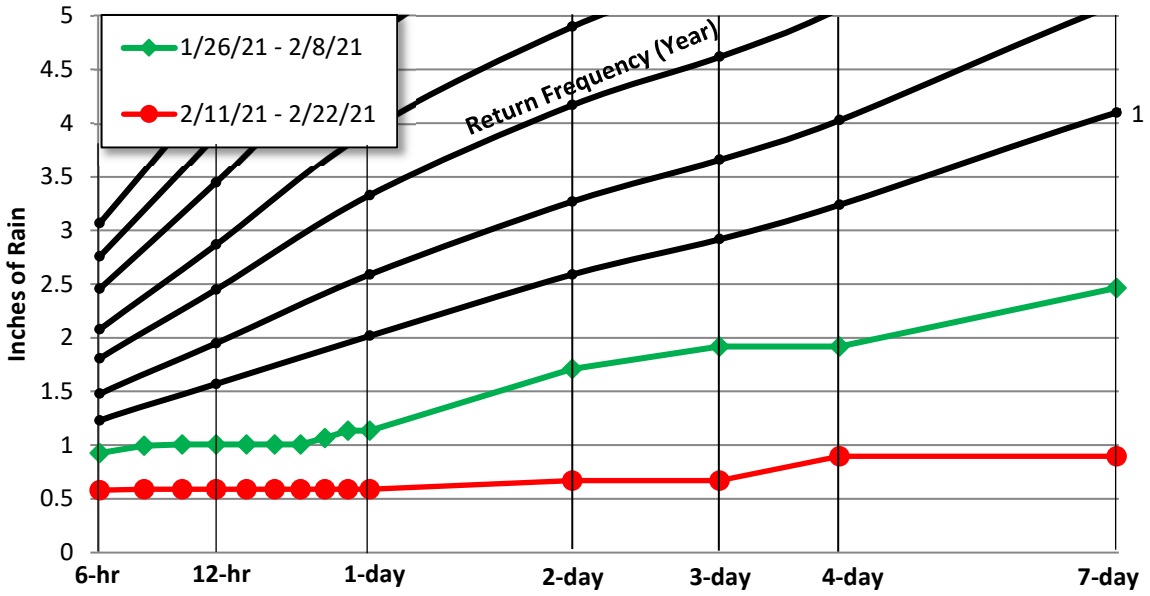


Figure 3-4. Rainfall Event Classification - North Rain Gauge

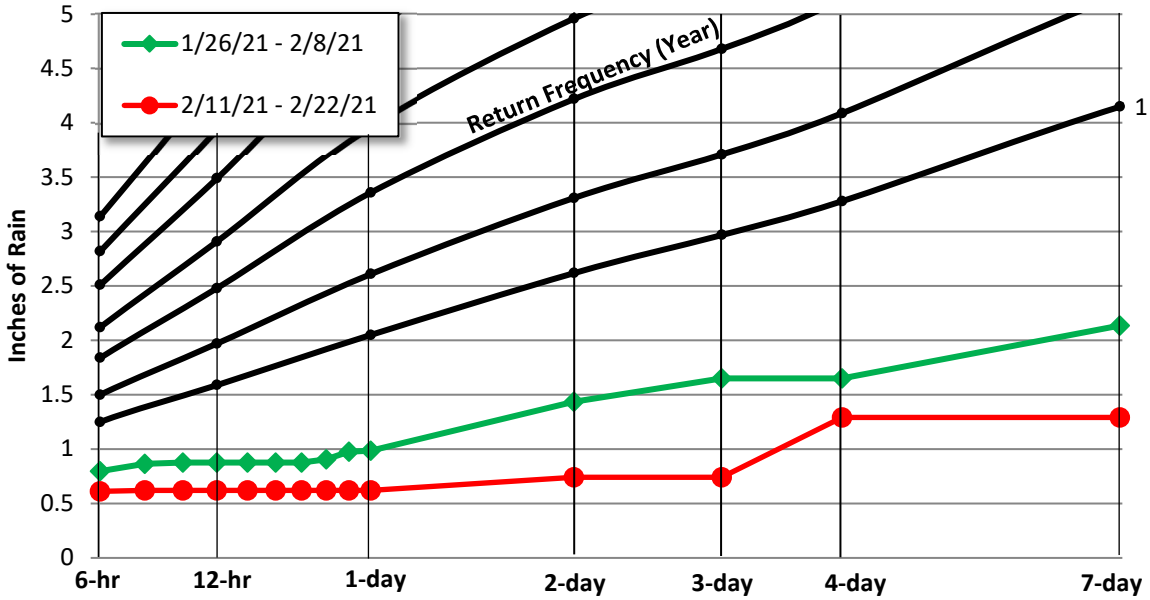


Figure 3-5. Rainfall Event Classification - Central Rain Gauge

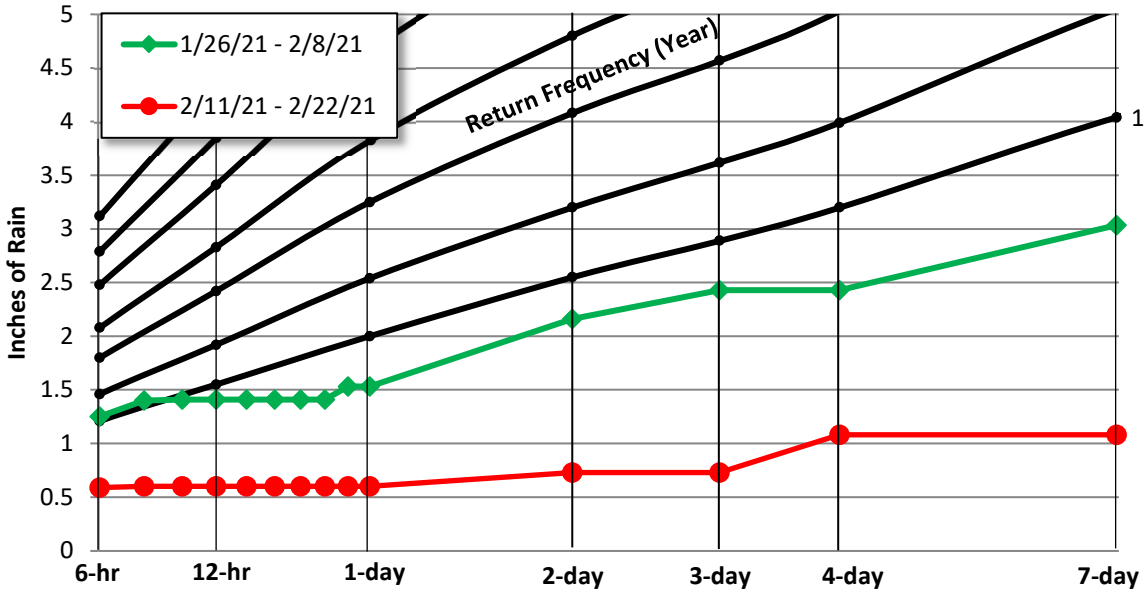


Figure 3-6. Rainfall Event Classification - South Rain Gauge

Table 3-2 summarizes the rain event classifications at each rain gauge. The maximum classification was a 2-year 3-hour storm event at the south rain gauge for rain event 1.

Table 3-2. Summary of Rainfall Classification

Rain Gauge	Storm Event 1: Jan 26 – 30, 2021 (inches)	Storm Event 2: Feb 11 – 20, 2021 (inches)
North	<1-Yr	<1-Yr
South	2-Yr, 3-Hr	<1-Yr
Central	<1-Yr	<1-Yr

3.2 Flow Monitoring

3.2.1 Average Flow Analysis

Average dry weather flow (ADWF) curves were established during dry days when I/I had the least impact on the baseline flow. Table 3-3 summarizes the dry weather flow data measured for this study. ADWF curves for each site can be found in Appendix A. Figure 3-7 illustrates a flow schematic of the ADWF values for the flow monitoring sites of this study.

Table 3-3. Dry Weather Flow

Monitored Site	Mon-Thu (MGD)	Fri (MGD)	Sat (MGD)	Sun (MGD)	Overall (MGD)
Site 1	0.576	0.566	0.580	0.594	0.577
Site 1-1	0.008	0.007	0.008	0.009	0.008
Site 1-2	0.089	0.083	0.088	0.090	0.088
Site 1-3	0.111	0.114	0.114	0.121	0.113
Site 1-5	0.002	0.002	0.002	0.002	0.002
Site 1-6	0.120	0.118	0.123	0.125	0.120
Site 1-7	0.019	0.017	0.018	0.019	0.018
Site 1-8	0.049	0.045	0.057	0.058	0.051
Site 1-9	0.059	0.057	0.061	0.061	0.059
Site 1-10	0.060	0.059	0.059	0.059	0.060
Site 4	0.104	0.100	0.112	0.110	0.106
Site 4-1	0.086	0.086	0.093	0.098	0.089
Site 6-1	0.264	0.254	0.270	0.278	0.266
Site 6-2	0.012	0.011	0.012	0.013	0.012
Site 6-3	0.021	0.021	0.022	0.023	0.021
Site 6-4	0.001	0.001	0.001	0.002	0.001
Site 6-5	0.077	0.078	0.075	0.075	0.076
Site 6-6	0.157	0.156	0.167	0.170	0.160
Site 6-7	0.057	0.056	0.060	0.061	0.058
Site 7	0.480	0.459	0.410	0.413	0.457
Site 10-1	0.023	0.022	0.024	0.025	0.023
Site 10-2	0.019	0.019	0.021	0.022	0.020
Site 10-3	0.176	0.166	0.154	0.138	0.166
Site 11	0.346	0.335	0.319	0.299	0.334

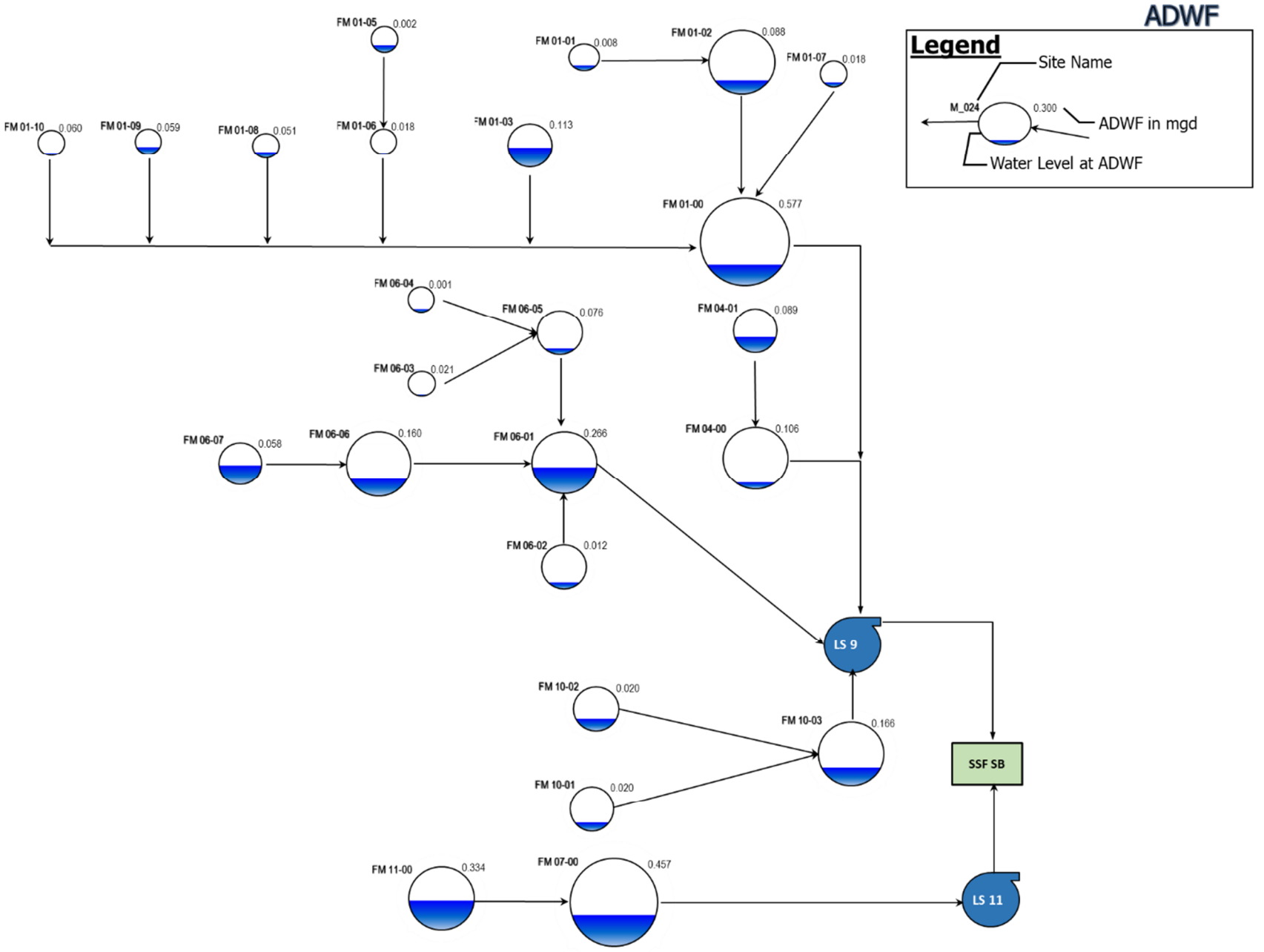


Figure 3-7. Average Dry Weather Flow (Flow Schematic)

3.2.2 Peak Measured Flows and Pipeline Capacity Analysis

Peak measured flows and the hydraulic grade line data (flow depths) are important to understanding the capacity limitations. The capacity analysis terms used in the text below are defined as follows:

- **Peaking Factor**: Peaking factor is defined as the peak measured flow divided by the average dry weather flow (ADWF). Peaking factors are influenced by many factors, including the size and topography of the tributary area, flow attenuation, flow restrictions, and characteristics of I/I entering the collection system. Municipal standards for peaking factor vary agency by agency; the City should refer to jurisdictional standards when evaluating peaking factors[9].
- **d/D Ratio**: The d/D ratio is the peak measured depth of flow (d) divided by the pipe diameter (D). The d/D ratio for each site was computed based on the maximum depth of flow for the study. Standards for d/D ratio vary from agency to agency but typically range between $d/D \geq 0.5$ and $d/D \leq 0.75$. The City should refer to jurisdictional standards when evaluating d/D ratios.

Table 3-4 summarizes the peak flows, levels, d/D ratios, and peaking factors during the flow monitoring period. Capacity analysis data are presented on a site-by-site basis and represent the hydraulic conditions only at the site nodes; hydraulic conditions in other areas of the collection system will differ.

The following capacity analysis results are noted:

- **Peaking Factors**: Five sites had peaking factors over 10, and 14 sites had peaking factors between 5 and 10. The highest-peaking factor was at Site 1-5 and was PF = 44.4. However, the skewed high value is very likely due to the extreme low ADWF. The same could also be applied to Site 6-4.
- **Peak flows**: The peak measured flows were taken from the whole monitoring study. The highest peak flow was at Site 1 and was 4.01 MGD
- **d/D Ratio**: Five sites surcharged during the study, and 11 sites had d/D ratios between 0.5 and 1.0.

Figure 3-8 and Figure 3-9 show bar graph summaries of the peaking factors and d/D ratios. Figure 3-10 illustrates the schematic diagram of the peak measured flows with peak flow levels of the whole monitoring period

[9] WEF Manual of Practice FD-6 and ASCE Manual No. 62 suggests typical peaking factor ratios range between 3 and 4, with higher values possibly indicative of pronounced I/I flows.

Table 3-4. Capacity Analysis Summary

Monitored Site	ADWF (MGD)	Peak Measured Flow	Peaking Factor	Pipe Diameter, *D* (IN)	Max Depth, *d* (IN)	Max d/*D* Ratio	Surcharge or not
Site 1	0.58	4.01	6.95	24	17.42	0.73	No
Site 1-1	0.01	0.04	5.08	6	2.10	0.35	No
Site 1-2	0.09	0.18	2.10	15	5.57	0.37	No
Site 1-3	0.11	1.27	11.22	8.5	31.91	3.75	Yes
Site 1-5	0.00	0.08	44.43	6	1.84	0.31	No
Site 1-6	0.12	0.85	7.02	6	4.44	0.74	No
Site 1-7	0.02	0.14	7.55	6	0.97	0.16	No
Site 1-8	0.05	0.82	16.09	6	4.27	0.71	No
Site 1-9	0.06	0.94	15.82	6	4.83	0.81	No
Site 1-10	0.06	0.35	5.89	6	4.46	0.74	No
Site 4	0.11	0.46	4.36	18	6.41	0.36	No
Site 4-1	0.09	0.69	7.74	8	6.63	0.83	No
Site 6-1	0.27	1.12	4.21	14.5	14.87	1.03	Yes
Site 6-2	0.01	0.09	7.38	7.5	2.57	0.34	No
Site 6-3	0.02	0.17	8.06	8.5	4.26	0.50	No
Site 6-4	0.00	0.02	17.75	8.5	1.57	0.19	No
Site 6-5	0.08	0.46	5.98	12	2.67	0.22	No
Site 6-6	0.16	1.05	6.57	12	7.88	0.66	No
Site 6-7	0.06	0.39	6.64	8	7.51	0.94	No
Site 7	0.46	2.55	5.58	18	14.12	0.78	No
Site 10-1	0.02	0.23	9.99	8.5	21.37	2.51	Yes
Site 10-2	0.02	0.10	4.92	8.5	4.47	0.53	No
Site 10-3	0.17	1.33	7.99	12	51.03	4.25	Yes
Site 11	0.33	1.64	4.92	15	23.60	1.57	Yes

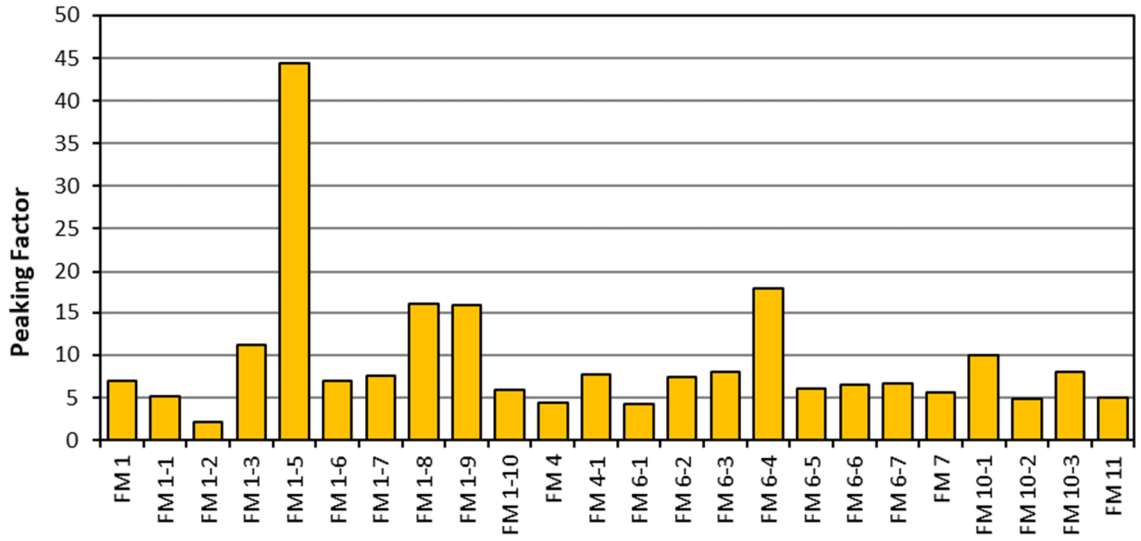


Figure 3-8. Capacity Analysis: Peaking Factors

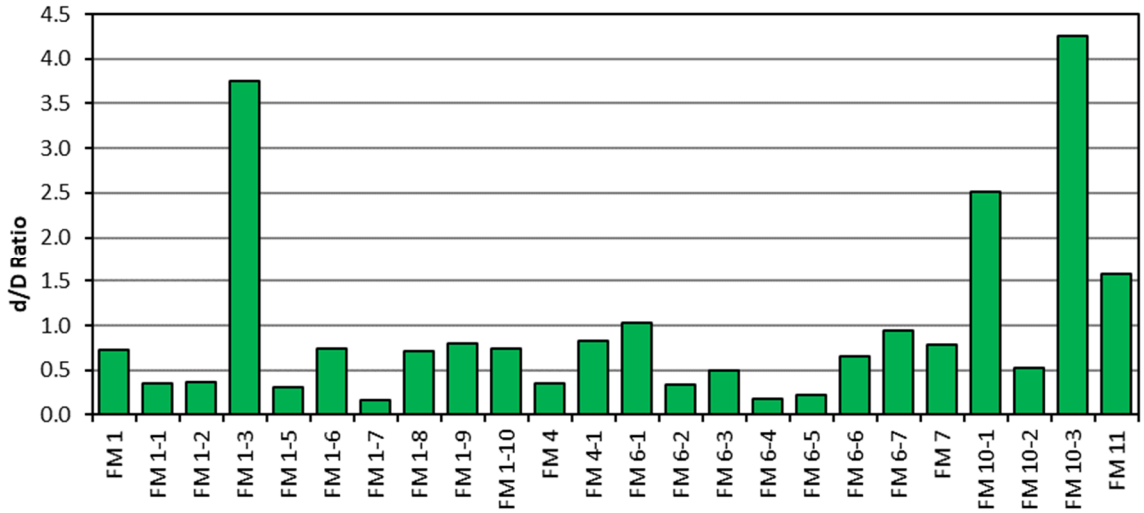


Figure 3-9. Capacity Analysis: d/D ratios

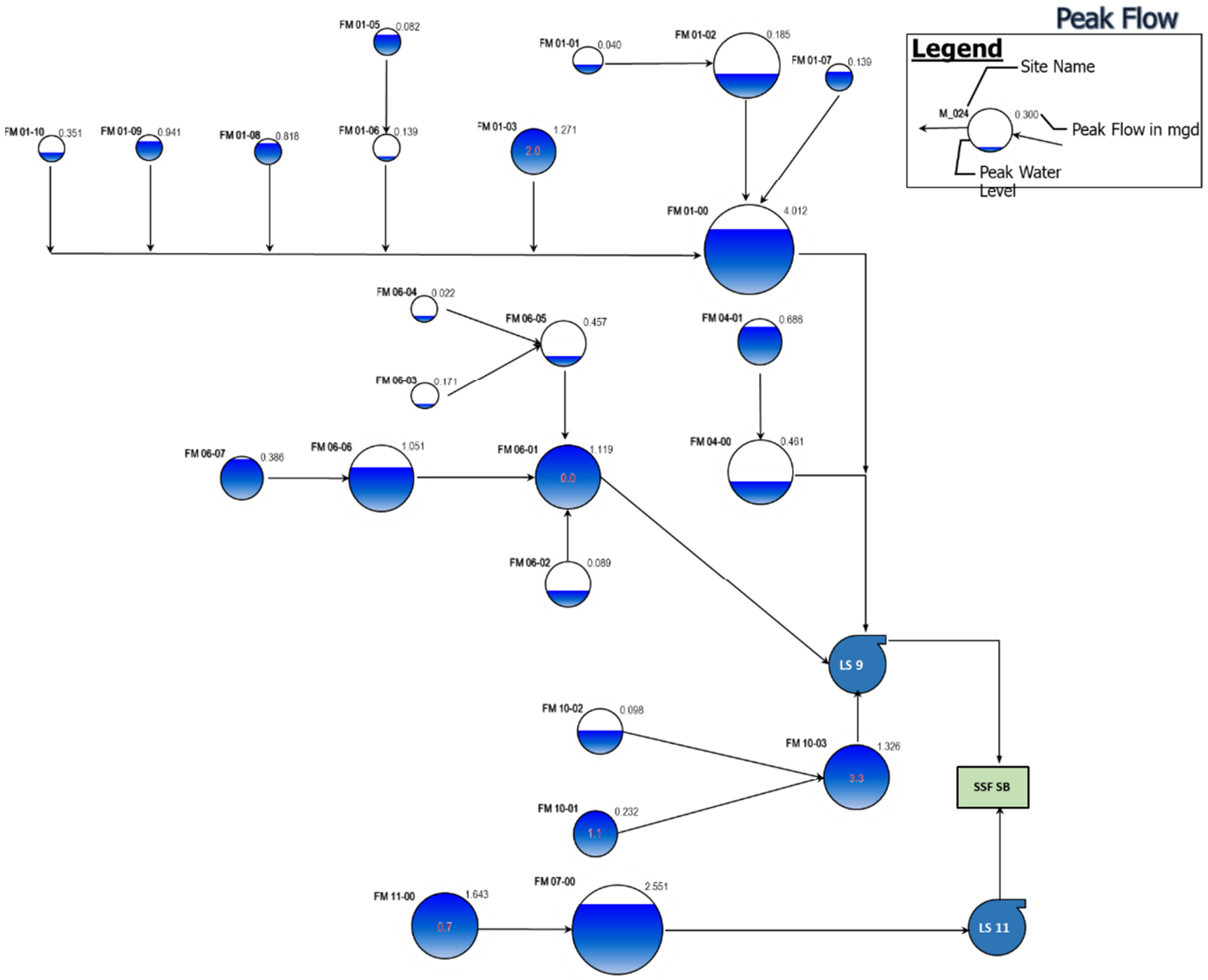


Figure 3-10. Peak Measured Flow (Flow Schematic)

3.3 Inflow and Infiltration: Results

3.3.1 Preface

Inflow and infiltration (I/I) analyses are presented on a basin-by-basin basis. The following I/I terms are defined and may be useful for the full capacity analysis with proposed development flows:

- **I/I Isolation**: The I/I flow rate is the real-time flow less the estimated average dry weather flow rate (shown in Figure 3-11 as the RED line).
- **Inflow**: Stormwater inflow is defined as water discharged into the sewer system, including private sewer laterals, from direct connections such as downspouts, yard, area drains, holes in manhole covers, cross-connections from storm drains, and/or catch basins.
- **Rain-Dependent Infiltration (RDI)**: Infiltration is defined as water entering the sanitary sewer system through defects in pipes, pipe joints, and manhole walls, which may include cracks, offset joints, root intrusion points, and broken pipes.
- **Total I/I**: the totalized volume (in gallons) of both inflow and RDI over the course of a rainfall event (shown below as the orange area).
- Please note that Basins 1, and 6-1 were excluded from I/I analysis as flow isolation requires many upstream flow subtractions (see Section 1.2) resulting in inflating uncertainties (see Section 2.4).
- From the flow data it was apparent that Sites 10-1 and 10-3 had upstream splits that diverted flow away from the basins during wet weather. Synthetic hydrographs were used to estimate RDI and total I/I originating from Basins 10-1 and 10-3.

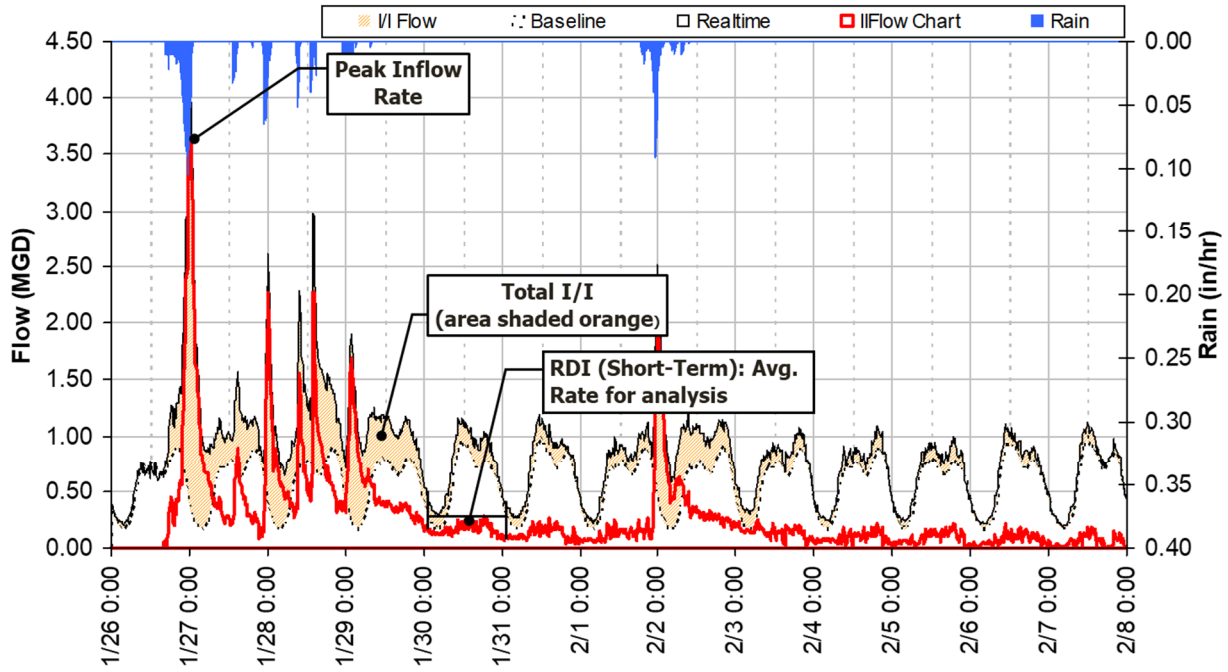


Figure 3-11. I/I during Rain Event 1 (Site 1)

3.3.2 2021 vs 2018 I/I Response Results

The rainfall that occurred for the 2018 master plan was 151% of typical average rainfall during the flow monitoring period, and included two different rainfall events classified as between 1 and 2-year rainfall events (refer to Figure 3-12). This resulted in a strong I/I response that could be extrapolated confidently, utilizing design storm event techniques for collection system modeling.

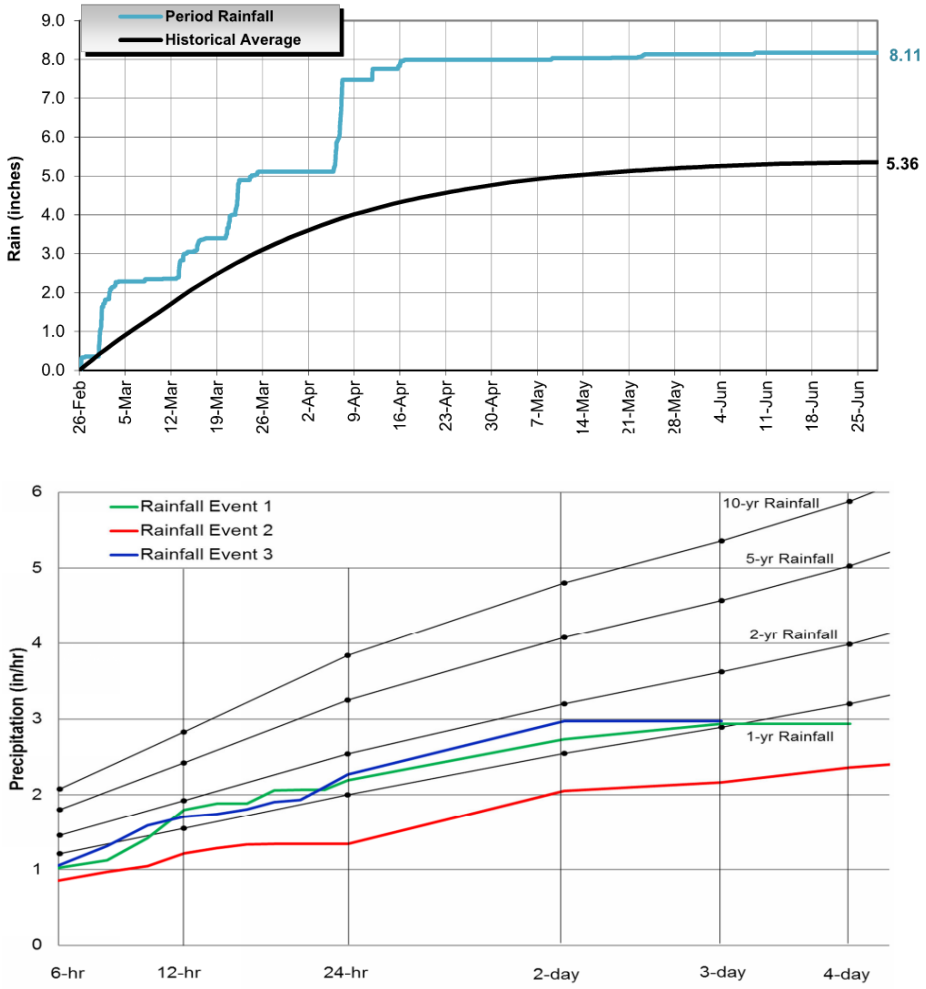


Figure 3-12. 2018 Rainfall Accumulation Plot and 2018 Storm Event Classifications

Year 2021 flow monitoring occurred during a year of drought. Rainfall was 53% of typical average rainfall during the flow monitoring period, and no classifiable rainfall events were captured (refer to Section 3.1).

The I/I response within the City was still very clear and solid and allowed for the relative basin-by-basin analyses to be conducted, but did not have the same magnitudes as would have been observed during a non-drought rainfall season. For modeling purposes, it is helpful to provide the R-Value metric appropriately normalized to compare with the 2018 higher rainfall season. Sites 1, 4, and 11 were monitored at the same location for both studies and were used to estimate the conversion of the 2021 measured R-Value to an associate 2018 R-Value. R-Value (Section 3.3.5) will be shown in both 2021 and 2018 values. Normalization to 2018 values was only conducted for the R-Value metric.

3.3.3 Inflow Results Summary

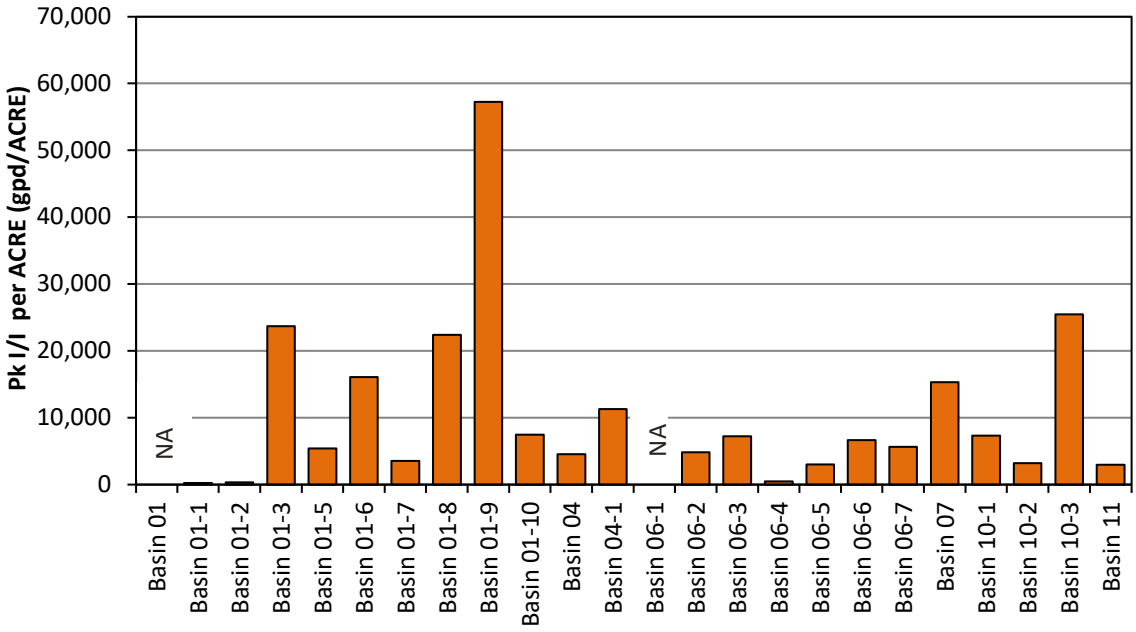
Inflow is stormwater discharged into the sewer system through direct connections such as downspouts, area drains, cross-connections to catch basins, etc. These sources transport rainwater directly into the sewer system and the corresponding flow rates are tied closely to the intensity of the storm. This component of I/I often causes a peak flow problem in the sewer system and often dictates the required capacity of downstream pipes and transport facilities to carry these peak instantaneous flows.

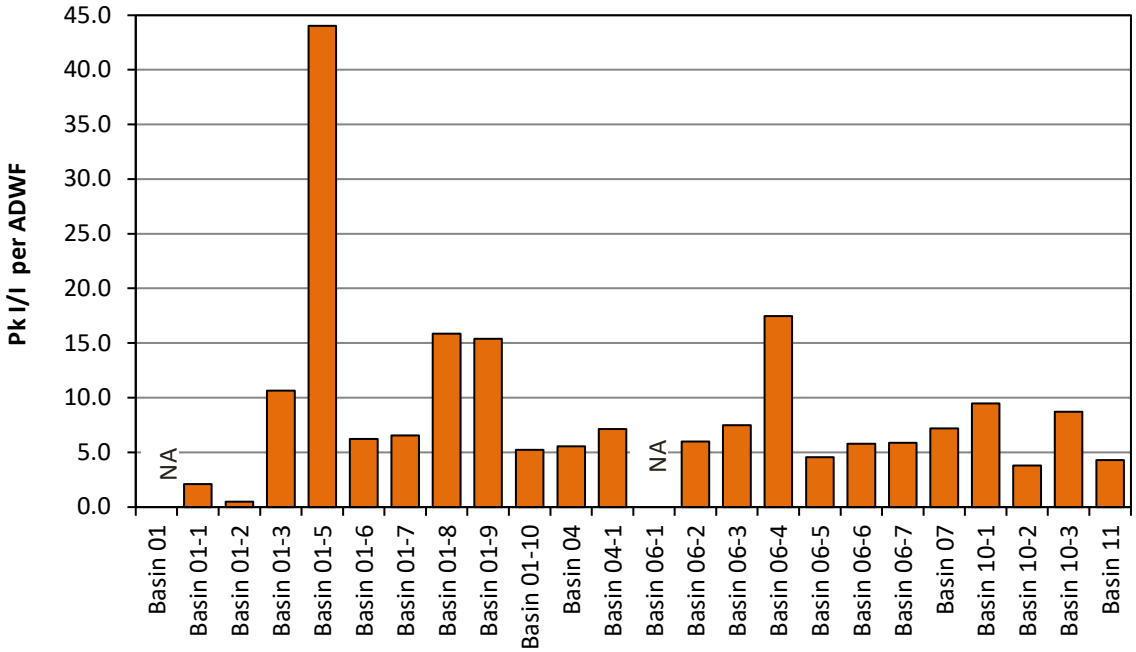
Table 3-5 and Figure 3-13 summarize the peak measured inflow analysis results by basin. The "top 3" ranked basins are highlighted in red. Figure 3-14 shows a temperature map showing the inflow rankings for each basin. The following items are noted:

- Basin 1-9 had the highest weighted, per-Acre, and per-IDM peak I/I rates and it ranked 4th in per-ADWF peak I/I rate, an indicator of high inflow upstream from the flow monitoring basin.
- Basin 1-3 and 1-8 also had high ranking consistently across all categories.
- Basin 1-5 and 6-4 ranked 1st and 2nd in per-ADWF peak I/I rate. However, this may be due to their extremely low ADWF values.

Table 3-5. Results and Rankings of Inflow Analysis

Metering Basin	Basin Acreage	ADWF (mgd)	IDM	Inflow Rate (mgd)	Inflow per-ADWF Ranking	Inflow per-Acre Ranking	Inflow per-IDM Ranking	Final Inflow Ranking
Upstream area of Site 01	585	0.577	126.3	3.67	-	-	-	-
Basin 01	152	0.067	48.02	NA	-	-	-	-
Basin 01-1	71	0.008	6.52	0.02	21	22	22	22
Basin 01-2	122	0.080	14.34	0.04	22	21	21	21
Basin 01-3	51	0.113	9.31	1.21	5	3	3	3
Basin 01-5	15	0.002	3.16	0.08	1	13	12	9
Basin 01-6	46	0.119	12.06	0.74	12	5	6	6
Basin 01-7	34	0.018	8.58	0.12	11	16	17	16
Basin 01-8	36	0.051	10.19	0.81	3	4	4	4
Basin 01-9	16	0.059	4.66	0.92	4	1	1	1
Basin 01-10	42	0.060	9.47	0.31	17	8	8	11
Upstream area of Site 04	77	0.106	23.13	0.72	-	-	-	-
Basin 04	21	0.017	8.59	0.10	16	15	18	17
Basin 04-1	56	0.089	14.54	0.63	10	7	7	7
Upstream area of Site 06-1	338	0.266	70.3	0.87	-	-	-	-
Basin 06-1	19	0.017	4.17	NA	-	-	-	-
Basin 06-2	15	0.012	3.69	0.07	13	14	14	14
Basin 06-3	22	0.021	5.45	0.16	8	10	10	10
Basin 06-4	49	0.001	4.67	0.02	2	20	20	15
Basin 06-5	83	0.054	15.95	0.25	18	18	16	18
Basin 06-6	89	0.102	21.87	0.59	15	11	11	12
Basin 06-7	61	0.058	14.5	0.34	14	12	13	13
Basin 07	58	0.123	13.64	0.89	9	6	5	5
Basin 10-1	30	0.023	7.35	0.22	6	9	9	8
Basin 10-2	24	0.020	6.89	0.08	20	17	19	20
Basin 10-3	42	0.123	6.88	1.07	7	2	2	2
Basin 11	490	0.334	90.92	1.43	19	19	15	19


Pk I/I per ACRE (gpd/ACRE)
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
NA
NA
Basin 01
Basin 01-1
Basin 01-2
Basin 01-3
Basin 01-5
Basin 01-6
Basin 01-7
Basin 01-8
Basin 01-9
Basin 01-10
Basin 04
Basin 04-1
Basin 06-1
Basin 06-2
Basin 06-3
Basin 06-4
Basin 06-5
Basin 06-6
Basin 06-7
Basin 07
Basin 10-1
Basin 10-2
Basin 10-3
Basin 11


Pk I/I per ADWF
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
NA
NA
Basin 01
Basin 01-1
Basin 01-2
Basin 01-3
Basin 01-5
Basin 01-6
Basin 01-7
Basin 01-8
Basin 01-9
Basin 01-10
Basin 04
Basin 04-1
Basin 06-1
Basin 06-2
Basin 06-3
Basin 06-4
Basin 06-5
Basin 06-6
Basin 06-7
Basin 07
Basin 10-1
Basin 10-2
Basin 10-3
Basin 11

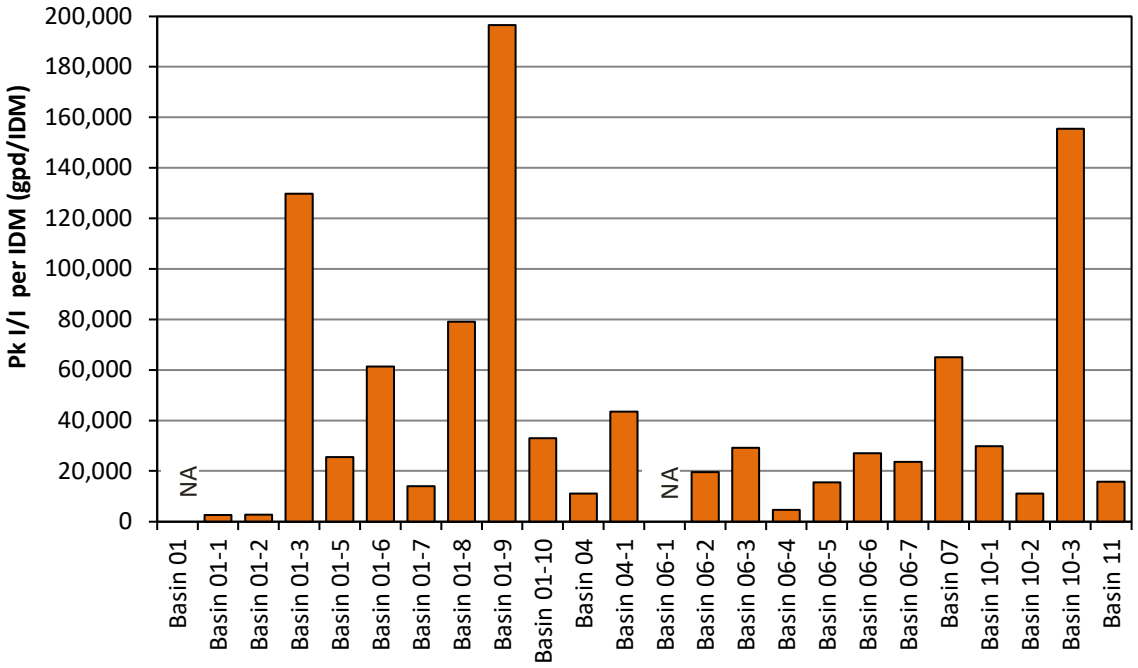


Figure 3-13. Bar Graphs: Inflow Analysis Summary

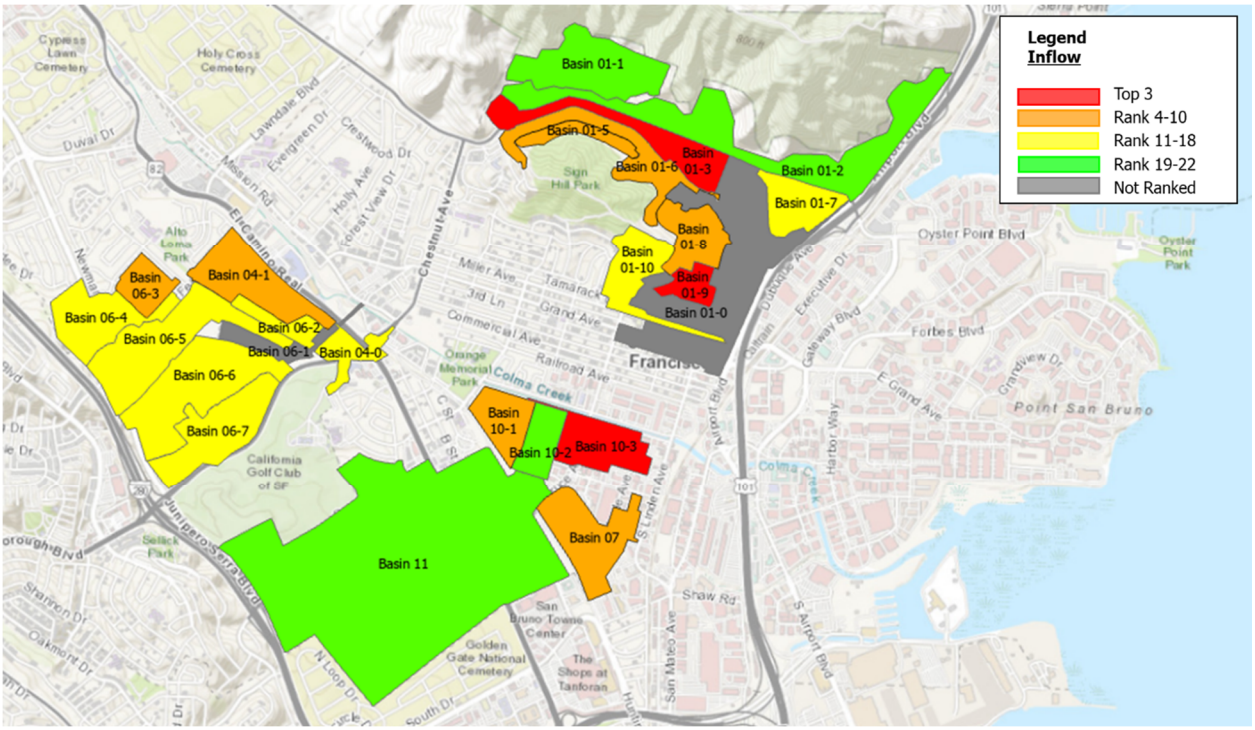


Figure 3-14. Temperature Map: Inflow Final Basin Rankings

3.3.4 Rainfall Dependent Infiltration Results Summary

Infiltration is defined as water entering the sanitary sewer system through defects in pipes, pipe joints, and manhole walls, which may include cracks, offset joints, root intrusion points, and broken pipes. Increased flows into the sanitary sewer system are usually tied to groundwater levels and soil saturation levels. Infiltration sources transport rainwater into the system indirectly; flow levels in the sanitary system increase gradually, are typically sustained for a period after rainfall has stopped, and then gradually decrease as soils become less saturated and as groundwater levels recede to normal.

Infiltration typically creates long-term annual volumetric problems. The major impact is the cost of pumping and treating the additional volume of water, and of paying for treatment (for municipalities that are billed strictly on flow volume).

RDI rankings are summarized in Table 3-6. The "Top 3" ranked basins have been shaded RED. Figure 3-15 shows bar graph summaries of the RDI results. Figure 3-16 illustrates a temperature map summary of the RDI analysis results per basin. The following RDI results are noted:

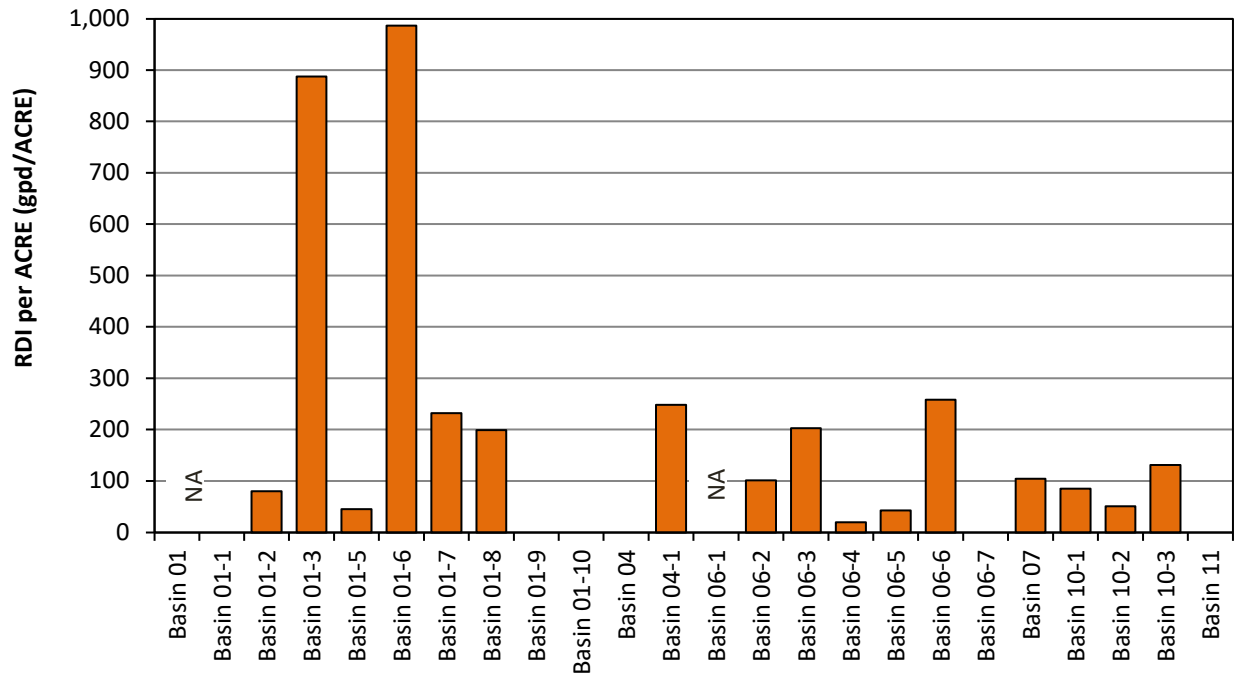
- Basins 01-3 and 01-6 had consistently high rankings in all categories. In particular, Basin 01-3 was ranked highest in normalized RDI and per-IDM RDI ranking, and Basin 01-6 was ranked highest in per-Acre RDI ranking.
- Basin 06-4 was ranked second in per-ADWF. However, it is due to its extremely low ADWF.
- Basins 01-1, 01-9, 01-10, 04, 06-7, and 11 had an undetectable level of RDI rate.

Table 3-6. RDI Analysis Summary

Metering Basin	Basin Acreage	ADWF (mgd)	IDM	RDI Rate (mgd)	Per-ADWF RDI Ranking	Per-ACRE RDI Ranking	Per-IDM RDI Ranking	Final RDI Ranking
Upstream area of Site 01	585	0.577	126.3	0.164	-	-	-	-
Basin 01	152	0.067	48.02	NA	-	-	-	-
Basin 01-1	71	0.008	6.52	ND[10]	17	17	17	17
Basin 01-2	122	0.080	14.34	0.010	11	12	9	10
Basin 01-3	51	0.113	9.31	0.045	3	2	1	1
Basin 01-5	15	0.002	3.16	0.001	5	14	14	13
Basin 01-6	46	0.119	12.06	0.045	4	1	2	2
Basin 01-7	34	0.018	8.58	0.008	2	5	5	4
Basin 01-8	36	0.051	10.19	0.007	9	7	8	7
Basin 01-9	16	0.059	4.66	ND	17	17	17	17
Basin 01-10	42	0.060	9.47	ND	17	17	17	17
Upstream area of Site 04	77	0.106	23.13	0.002	-	-	-	-
Basin 04	21	0.017	8.59	ND	17	17	17	17
Basin 04-1	56	0.089	14.54	0.014	8	4	4	5

[10] ND: Not detected

Metering Basin	Basin Acreage	ADWF (mgd)	IDM	RDI Rate (mgd)	Per-ADWF RDI Ranking	Per-ACRE RDI Ranking	Per-IDM RDI Ranking	Final RDI Ranking
Upstream area of Site 06-1	338	0.266	70.3	0.004	-	-	-	-
Basin 06-1	19	0.017	4.17	NA	-	-	-	-
Basin 06-2	15	0.012	3.69	0.002	10	10	11	9
Basin 06-3	22	0.021	5.45	0.004	7	6	6	6
Basin 06-4	49	0.001	4.67	0.001	1	16	15	11
Basin 06-5	83	0.054	15.95	0.004	13	15	13	15
Basin 06-6	89	0.102	21.87	0.023	6	3	3	3
Basin 06-7	61	0.058	14.50	ND	17	17	17	17
Basin 07	58	0.123	13.64	0.006	15	9	10	12
Basin 10-1	30	0.023	7.35	0.003	12	11	12	14
Basin 10-2	24	0.020	6.89	0.001	14	13	16	16
Basin 10-3	42	0.123	6.88	0.006	16	8	7	8
Basin 11	490	0.334	90.92	ND	17	17	17	17



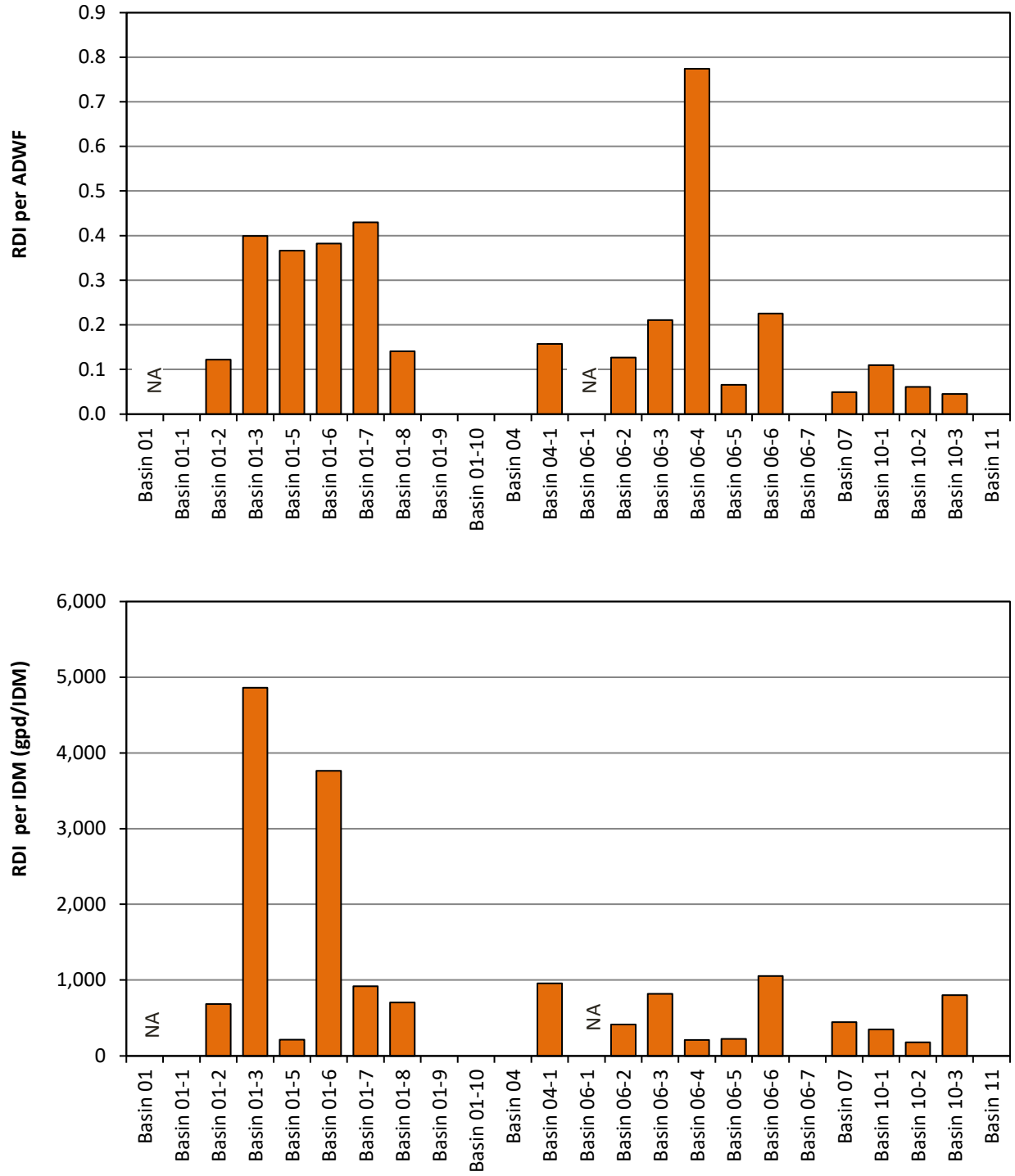


Figure 3-15. Bar Graphs: RDI Analysis Summary

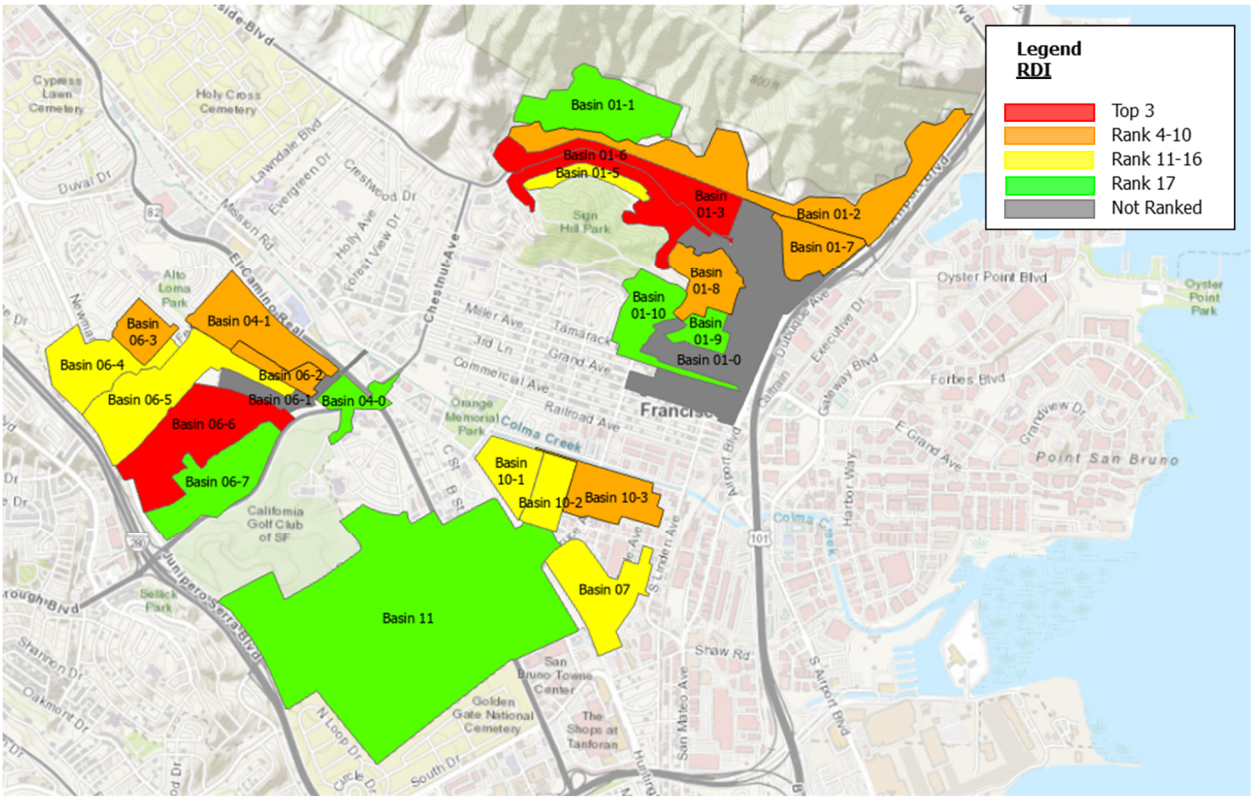


Figure 3-16. Temperature Map: RDI Final Basin Rankings

3.3.5 Total I/I Results

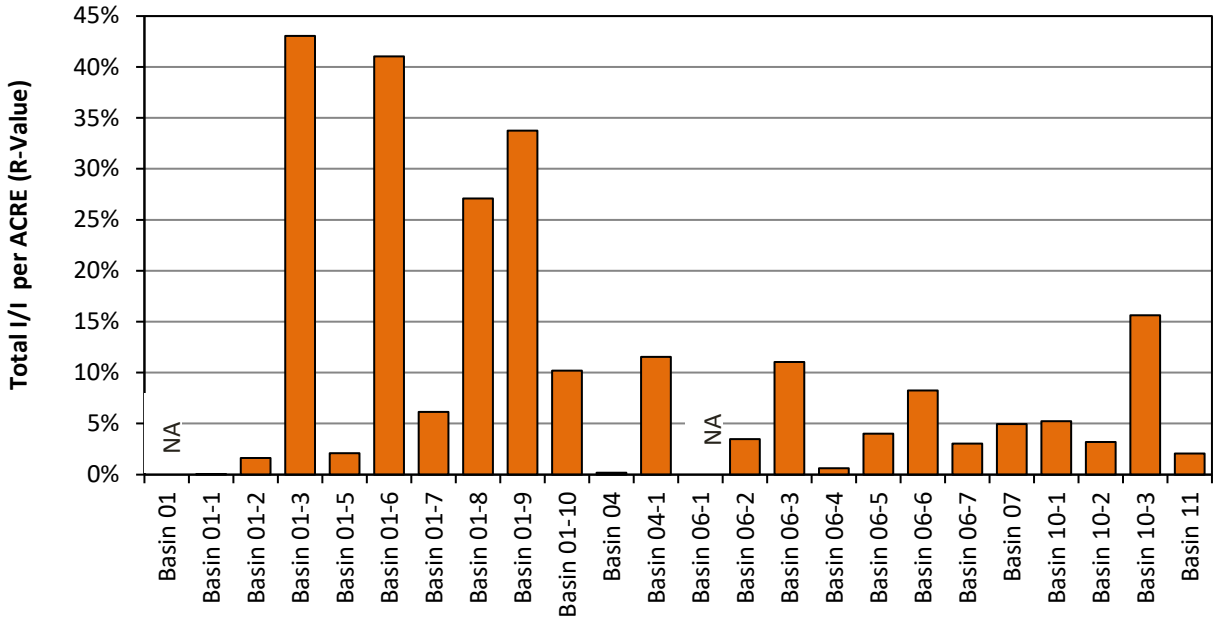
Total I/I analysis considers the totalized volume (in gallons) of both inflow and rainfall-dependent infiltration over the course of rain event 1. Table 3- and Figure 3-17 summarize the total I/I analysis results by basin. The "top 3" ranked basins are highlighted in red. Figure 3-18 shows a temperature map showing the Total I/I rankings for each basin. The following items are noted:

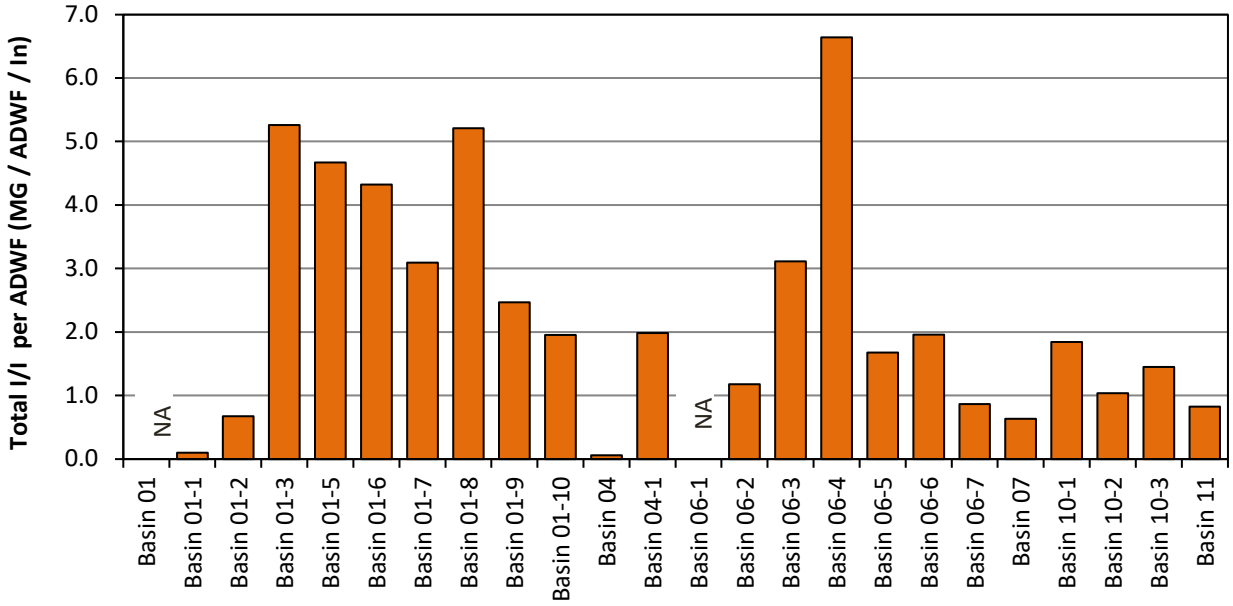
- Basin 01-3 had the highest normalized, per-IDM and per-Acre total I/I rates, and ranked 2nd in per-ADWF total I/I, an indicator of total I/I upstream from the flow monitoring basin.
- Basin 01-6 and 01-8 had consistent high rankings in all categories.
- Basin 06-4 was ranked highest in per-ADWF total I/I, but it is due to its extremely low ADWF.

Table 3-7. Total I/I Analysis Summary

Metering Basin	Total I/I (gallons)	2021 R-Value (%)	Normalized to 2018 R-Value (%)	Per-ADWF Total I/I Ranking	Per-ACRE Total I/I Ranking	Per-IDM Total I/I Ranking	Total I/I Ranking
Upstream area of Site 01	3,619,800	9.0%	17.3%	-	-	-	-
Basin 01	NA	-	-	-	-	-	-
Basin 01-1	1,922	0.0%	0.0%	21	22	22	22
Basin 01-2	134,642	1.6%	3.1%	19	19	15	19
Basin 01-3	1,488,027	43.0%	82.7%	2	1	1	1
Basin 01-5	21,256	2.1%	4.0%	4	17	19	13
Basin 01-6	1,273,847	41.0%	78.8%	5	2	2	2
Basin 01-7	144,380	6.1%	11.7%	7	10	10	9
Basin 01-8	671,321	27.1%	52.1%	3	4	4	3
Basin 01-9	374,327	33.7%	64.8%	8	3	3	4
Basin 01-10	294,783	10.2%	19.6%	11	8	6	8
Upstream area of Site 04	409,854	8.4%	24.9%	-	-	-	-
Basin 04	2,468	0.2%	0.6%	22	21	21	21
Basin 04-1	407,385	11.6%	34.4%	9	6	8	6
Upstream area of Site 06-1	486,484	2.4%	5.5%	-	-	-	-
Basin 06-1	NA	-	-	-	-	-	-
Basin 06-2	32,474	3.5%	8.0%	15	14	14	14
Basin 06-3	144,041	11.1%	25.4%	6	7	7	5
Basin 06-4	17,904	0.6%	1.4%	1	20	20	14
Basin 06-5	195,222	4.0%	9.1%	13	13	13	12
Basin 06-6	433,754	8.3%	19.0%	10	9	9	10
Basin 06-7	110,815	3.0%	6.9%	17	16	16	17
Basin 07	226,550	5.0%	11.4%	20	12	12	16
Basin 10-1	111,692	5.2%	11.9%	12	11	11	11

Metering Basin	Total I/I (gallons)	2021 R-Value (%)	Normalized to 2018 R-Value (%)	Per-ADWF Total I/I Ranking	Per-ACRE Total I/I Ranking	Per-IDM Total I/I Ranking	Total I/I Ranking
Basin 10-2	55,119	3.2%	7.3%	16	15	18	18
Basin 10-3	471,762	15.6%	35.7%	14	5	5	7
Basin 11	800,065	2.1%	4.1%	18	18	17	20





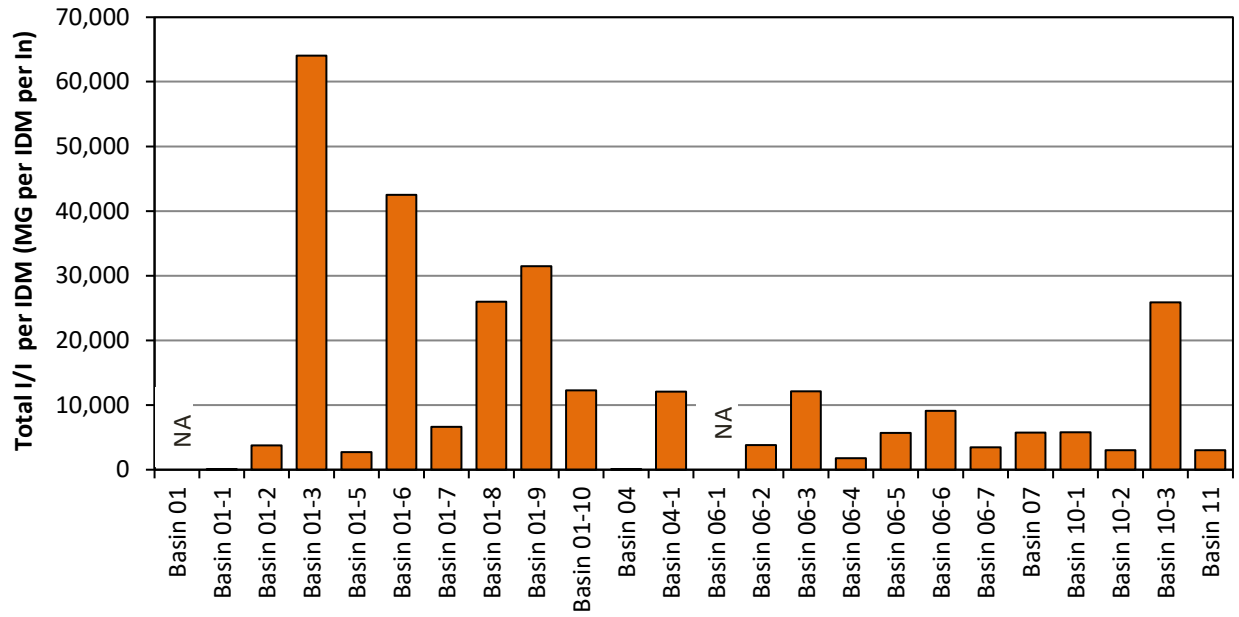


Figure 3-17. Bar Graphs: Total I/I Analysis Summary

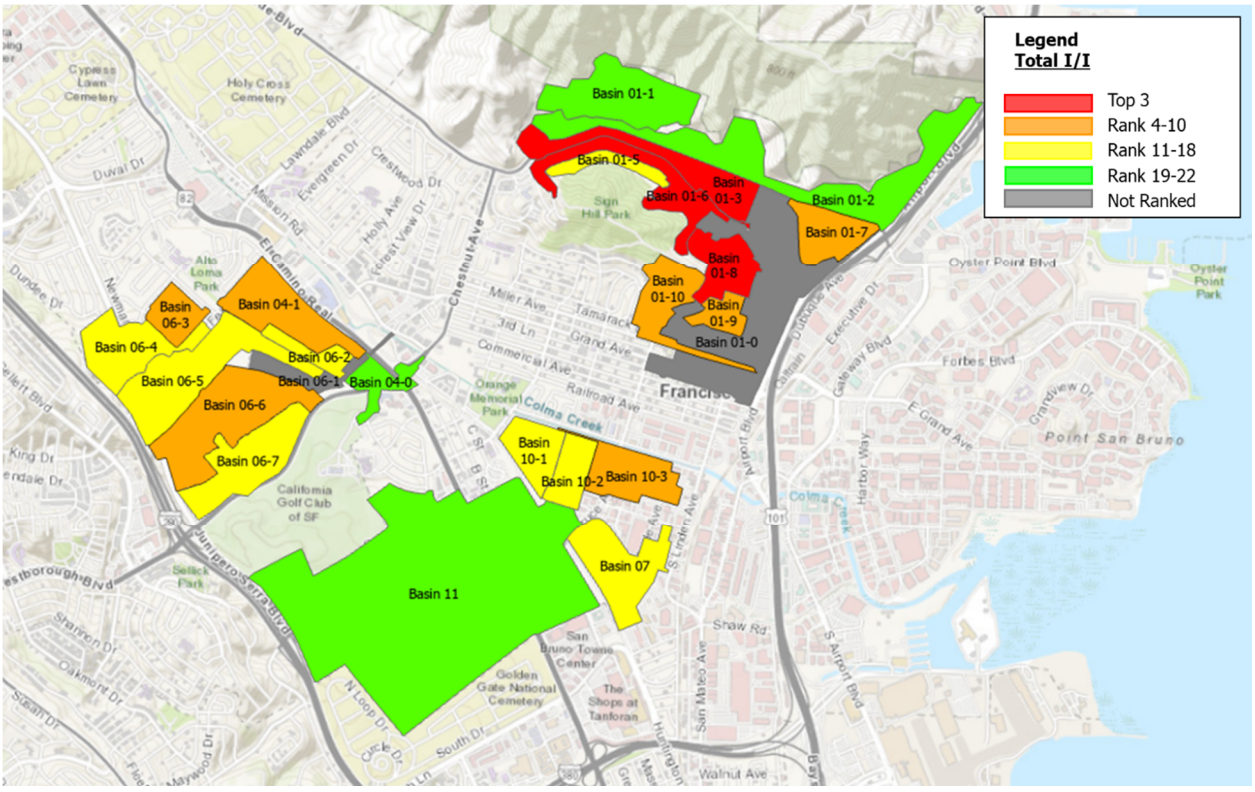


Figure 3-18. Temperature Map: Total I/I Final Basin Rankings

4 Recommendations

V&A advises that future I/I reduction plans consider the following recommendations:

1. **Master Plan and Model Implementation**: This study focuses on inflow and infiltration generation; however, the capacity deficiencies of the collection system may be of greater concern relative to I/I response during peak wet weather events. The City may wish to have a model designed and/or a master plan study conducted to determine the overall needs of the District relative to I/I. Or simply, the study results can be used to update the master plan and compare with previous model assumptions and flow monitoring results.
2. **Capacity Analysis:** Five sites showed signs of surcharge during the course of the study. The City may wish to evaluate capacity concerns in the local collection system near these sites.
3. **Determine I/I Reduction Program**: The District should examine its I/I reduction needs to determine their needs and goals for a future I/I reduction program.
    a. If peak flows, sanitary sewer overflows, and pipeline capacity issues are of greater concern, then priority can be given to investigate and reduce sources of inflow within the basins with the greatest inflow problems.
    b. If total infiltration and general pipeline deterioration are of greater concern, then the program can be weighted to investigate and reduce sources of infiltration within the basins with the greatest infiltration problems.
4. Basin 01-3 was ranked the highest for normalized RDI and Total I/I. The City may wish to focus initial I/I mitigation efforts in this basin.
5. **I/I Investigation Methods**: Potential I/I investigation methods include the following:
    a. smoke testing.
    b. mini-basin flow monitoring.
    c. night-time reconnaissance work to (1) investigate and determine direct point sources of inflow, and (2) determine the areas and/or pipe reaches responsible for high levels of infiltration contribution.
    d. CCTV inspection.
6. **I/I Reduction Cost-Effective Analysis**: The City should conduct a study to determine which is more cost-effective: (1) locating the sources of inflow/infiltration and systematically rehabilitating or replacing the faulty pipelines; or (2) continued treatment of the additional rainfall dependent I/I flow.

Appendix A
Flow Monitoring Sites: Data, Graphs, and Information

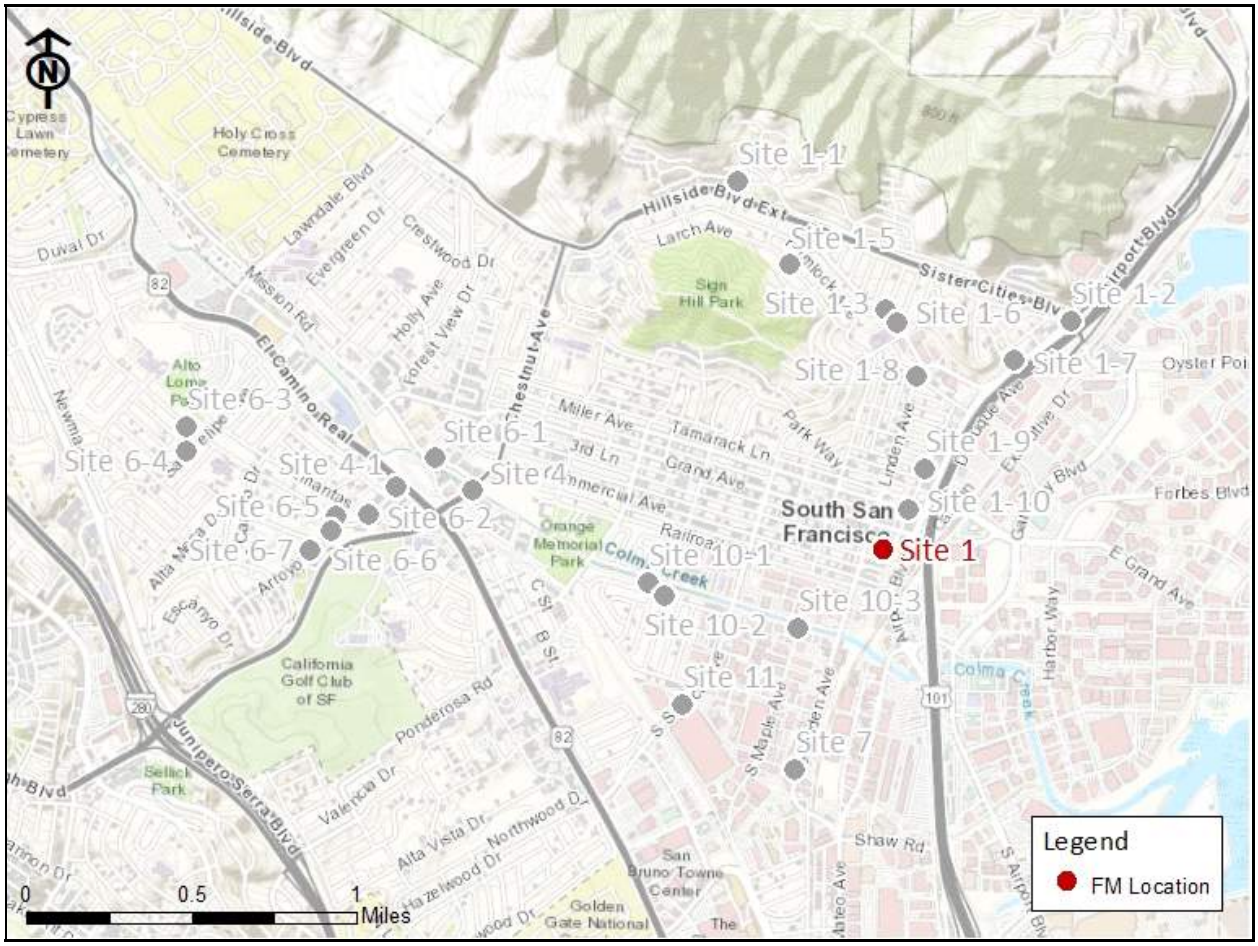
South San Francisco, CA

Sanitary Sewer Flow Monitoring
January 4 - April 14, 2021

Monitoring Site: FM 1

Location: Baden Avenue east of Linden Avenue

Data Summary Report



Vicinity Map: FM 1

FM 1

Site Information

Location: Baden Avenue east of Linden Avenue

Coordinates: 122.4095° W, 37.6540° N

Rim Elevation (Earth): 23 feet

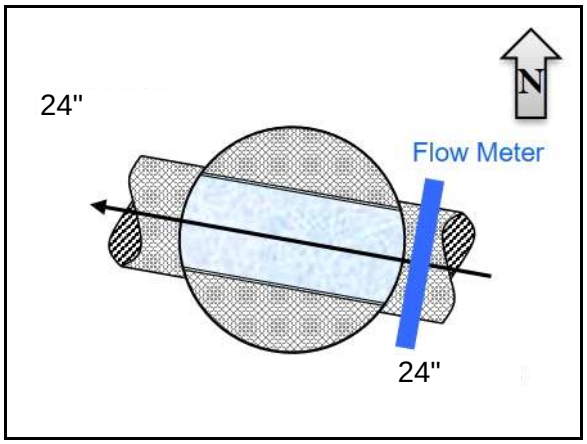
Pipe Diameter: 24 inches

ADWF: 0.577 mgd

Peak Measured Flow: 4.012 mgd

Satellite Map

Sanitary Map



Flow Sketch

Street View

Plan View

FM 1

Additional Site Photos

Effluent Pipe

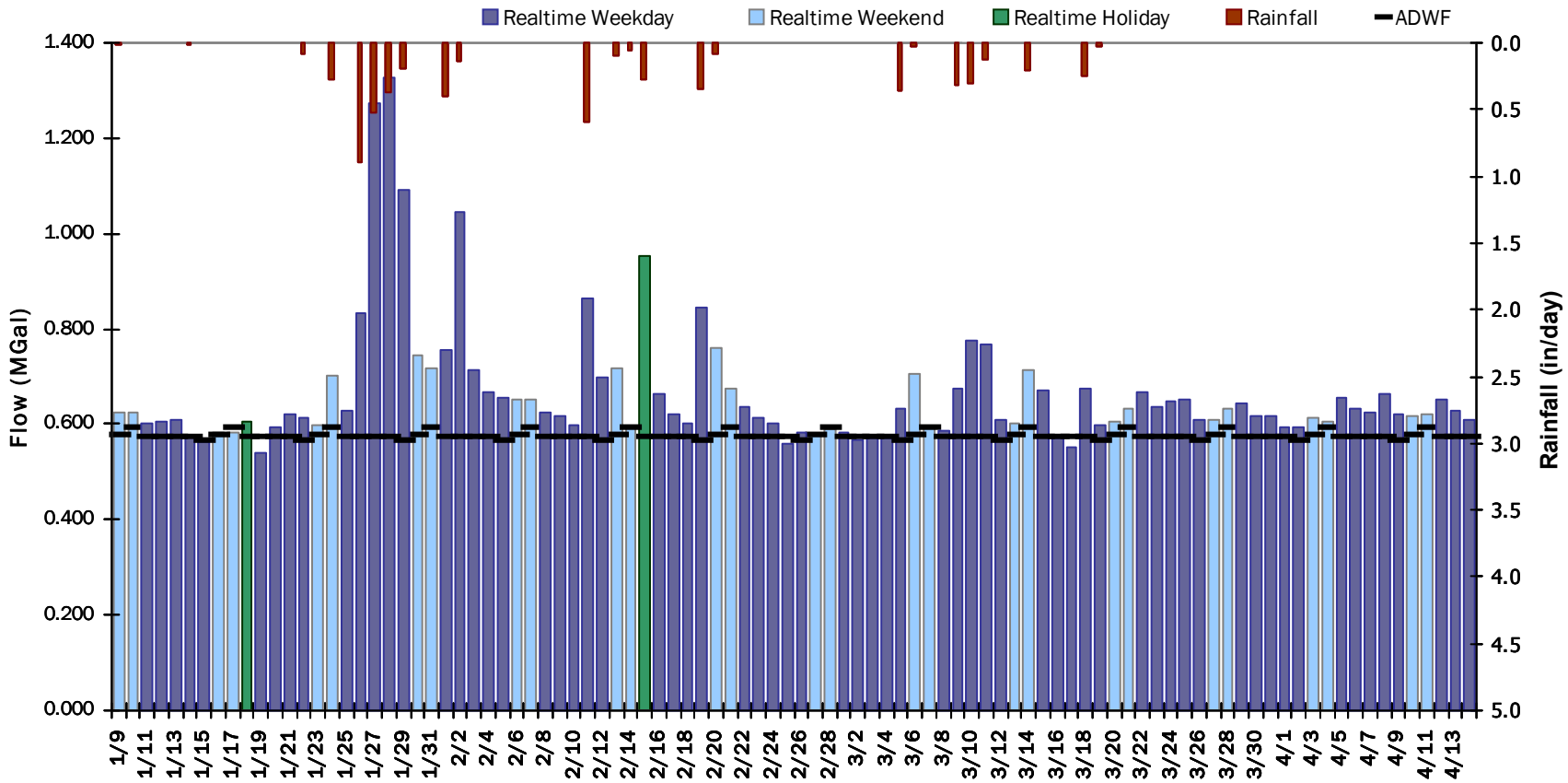
Monitored Influent Pipe

FM 1

Period Flow Summary: Daily Flow Totals

Avg Period Flow: 0.664 MGal Peak Daily Flow: 1.327 MGal Min Daily Flow: 0.538 MGal

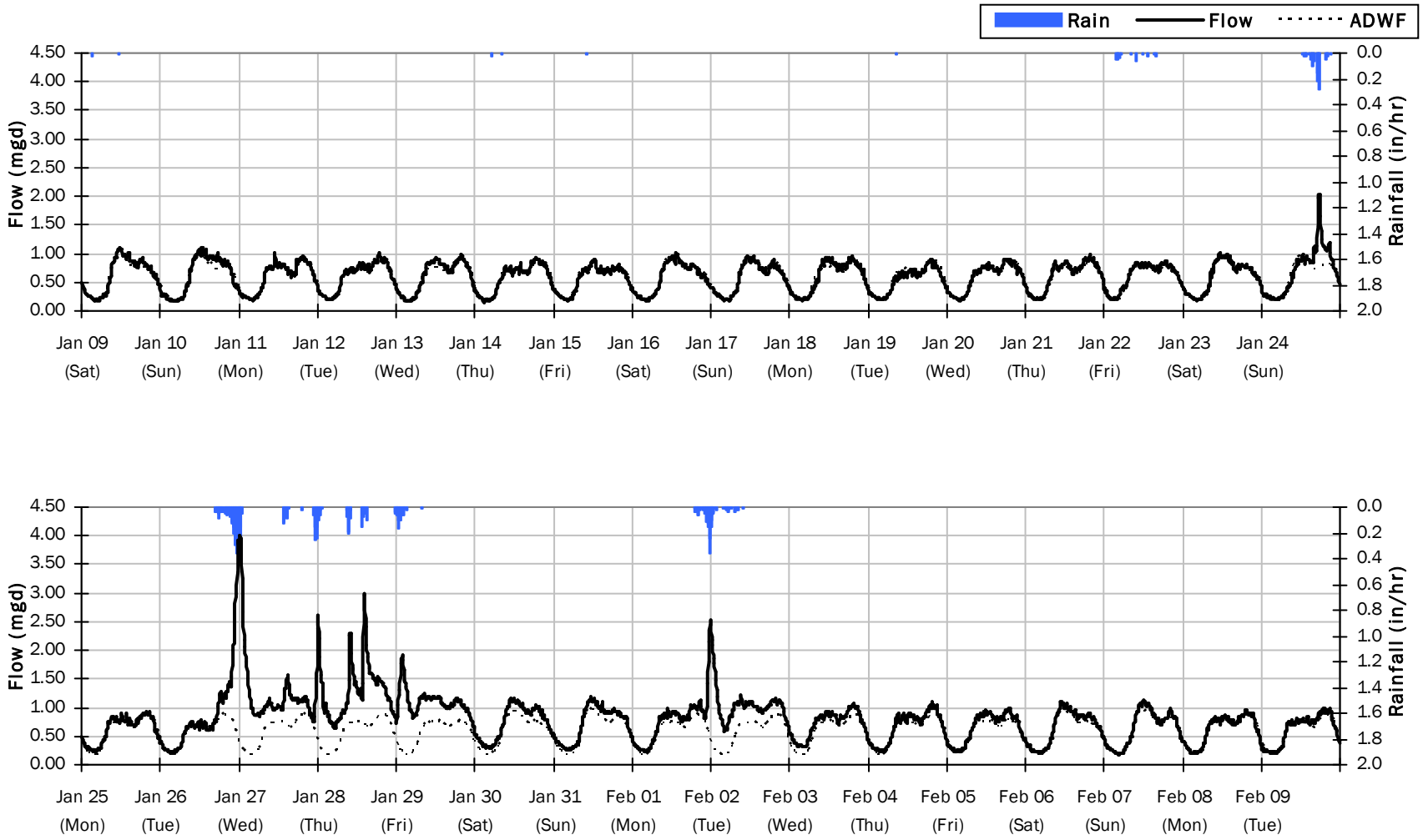
Total Period Rainfall: 5.94 inches



FM 1

Flow Summary: 1/9/2021 to 2/9/2021

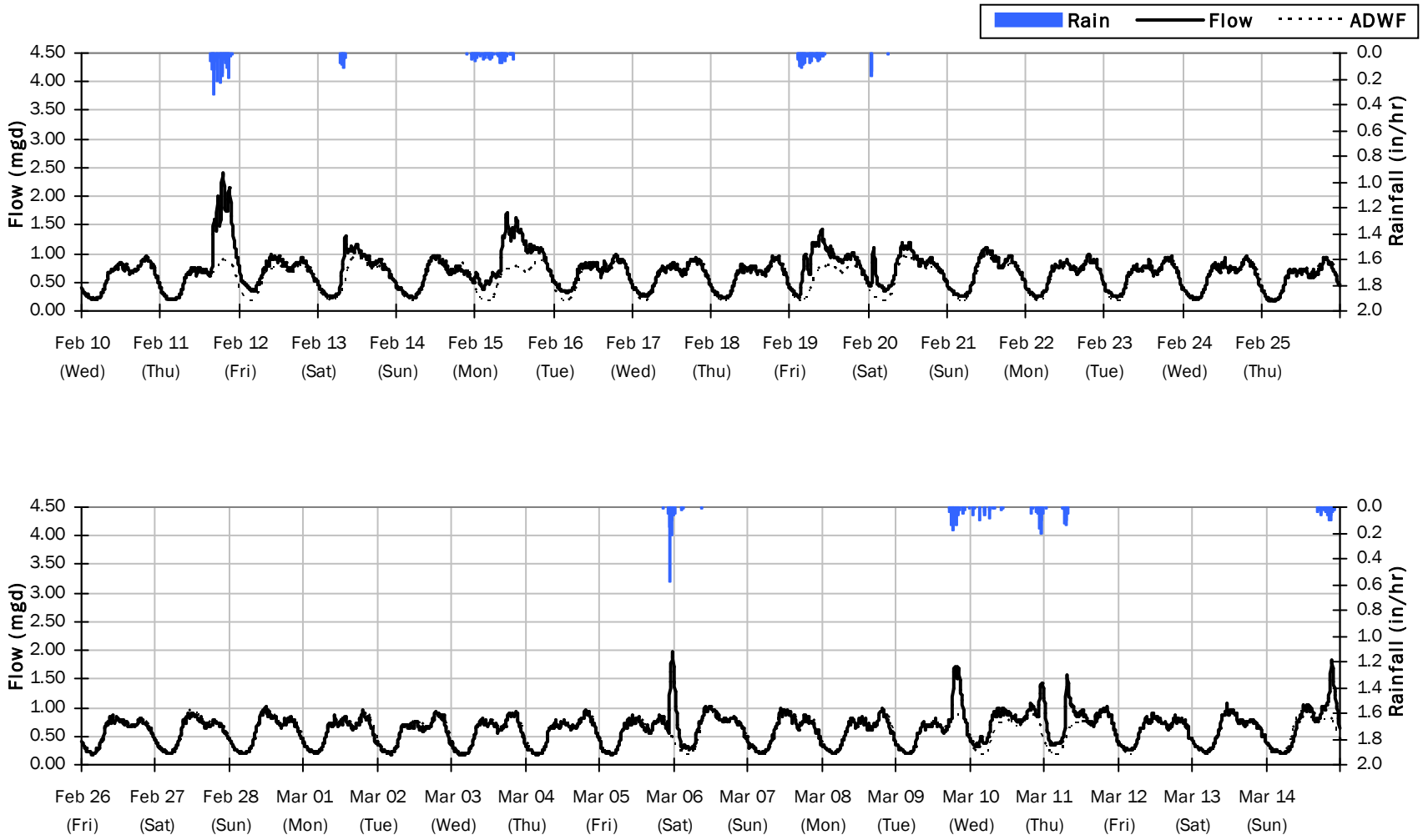
Total Period Rainfall: 2.90 inches Avg Flow: 0.707 mgd Peak Flow: 4.012 mgd Min Flow: 0.157 mgd



FM 1

Flow Summary: 2/10/2021 to 3/14/2021

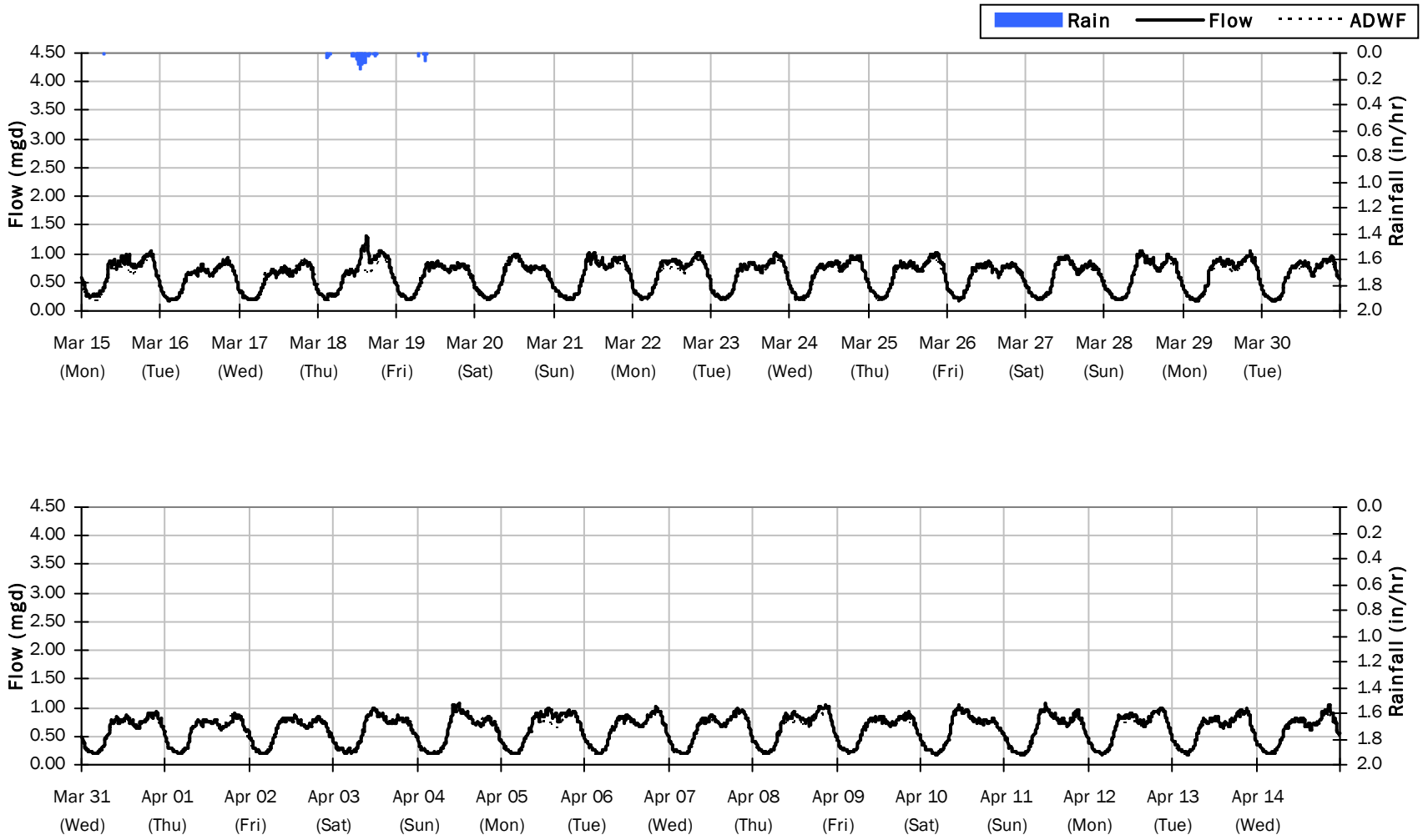
Total Period Rainfall: 2.77 inches Avg Flow: 0.658 mgd Peak Flow: 2.421 mgd Min Flow: 0.169 mgd



FM 1

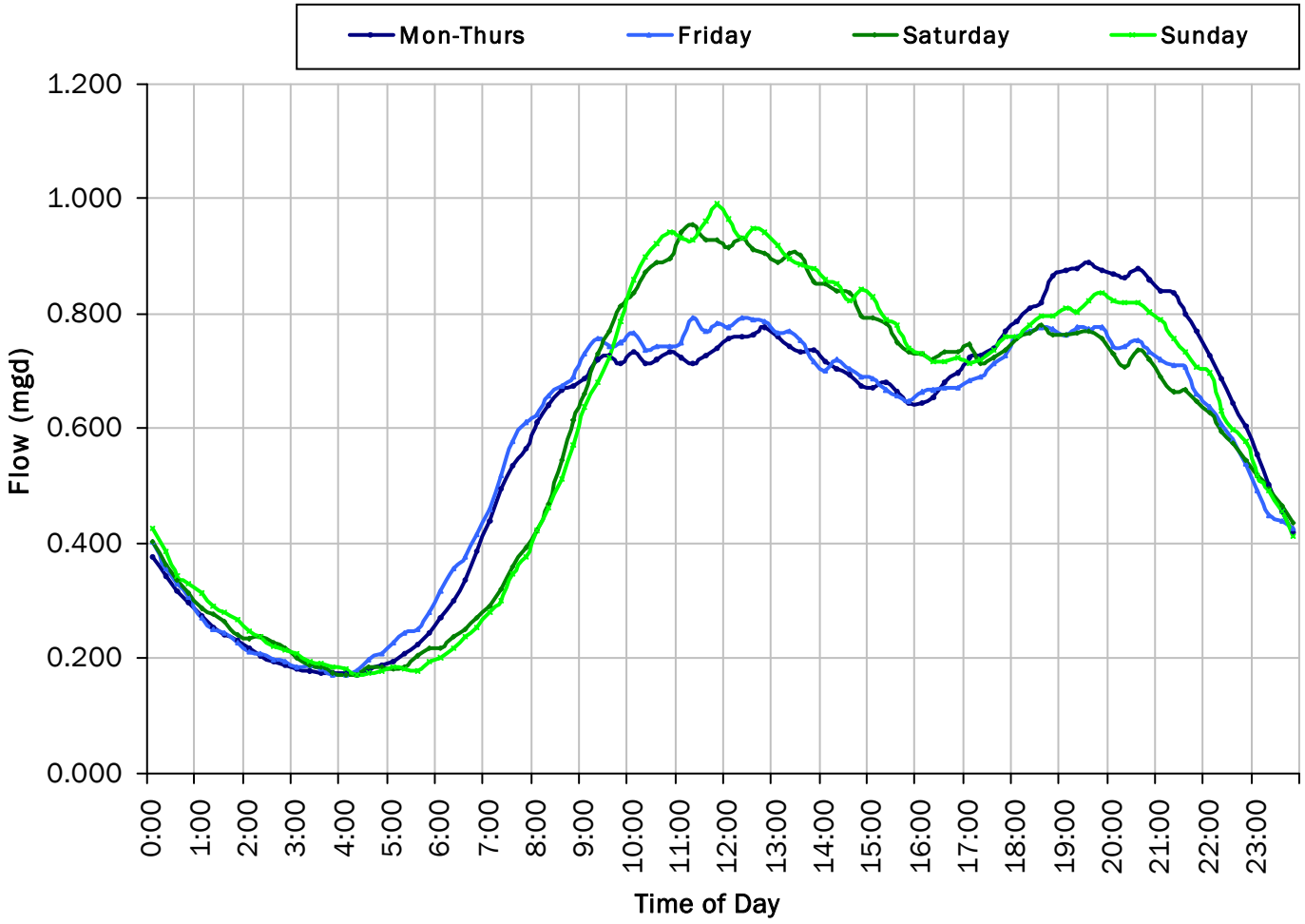
Flow Summary: 3/15/2021 to 4/14/2021

Total Period Rainfall: 0.28 inches Avg Flow: 0.625 mgd Peak Flow: 1.312 mgd Min Flow: 0.170 mgd



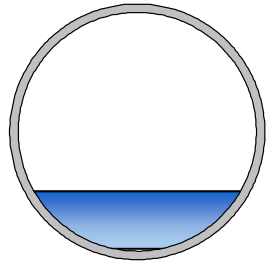
FM 1

Average Dry Weather Flow Hydrographs



ADWF:

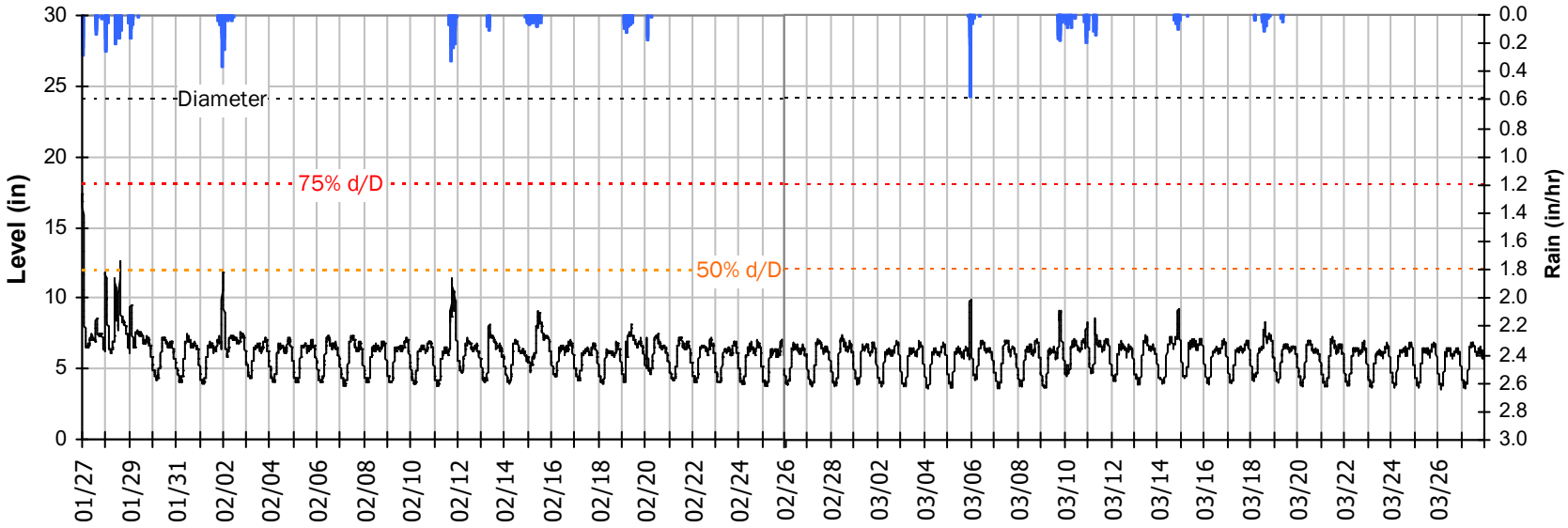
0.577 *mgd*

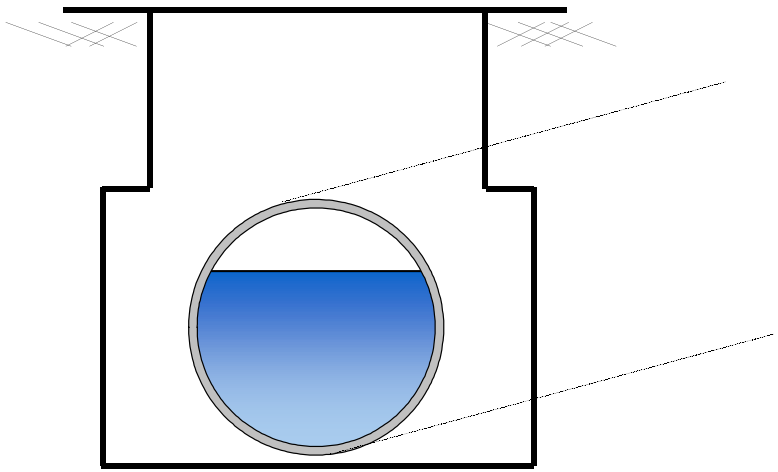


FM 1

Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Monitoring Period

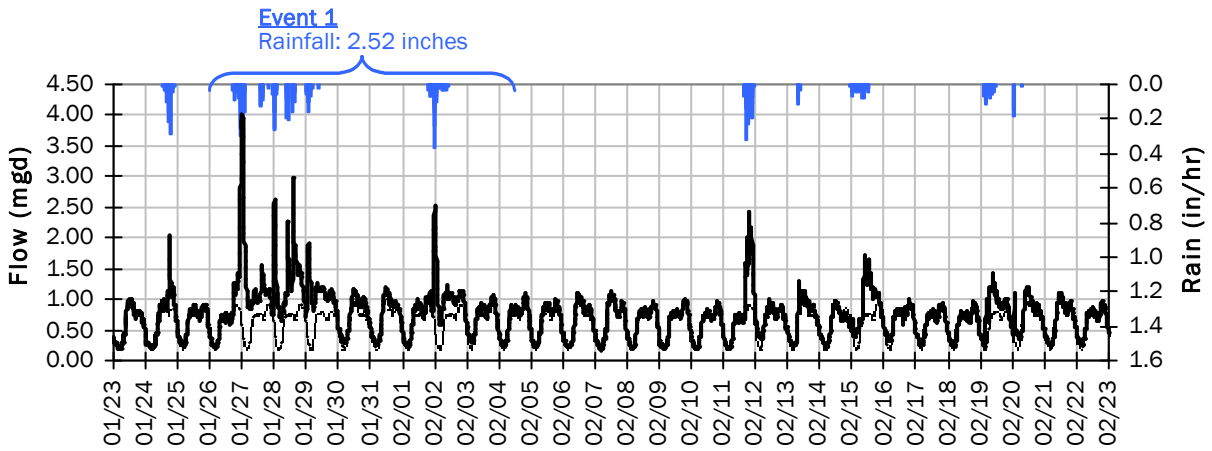




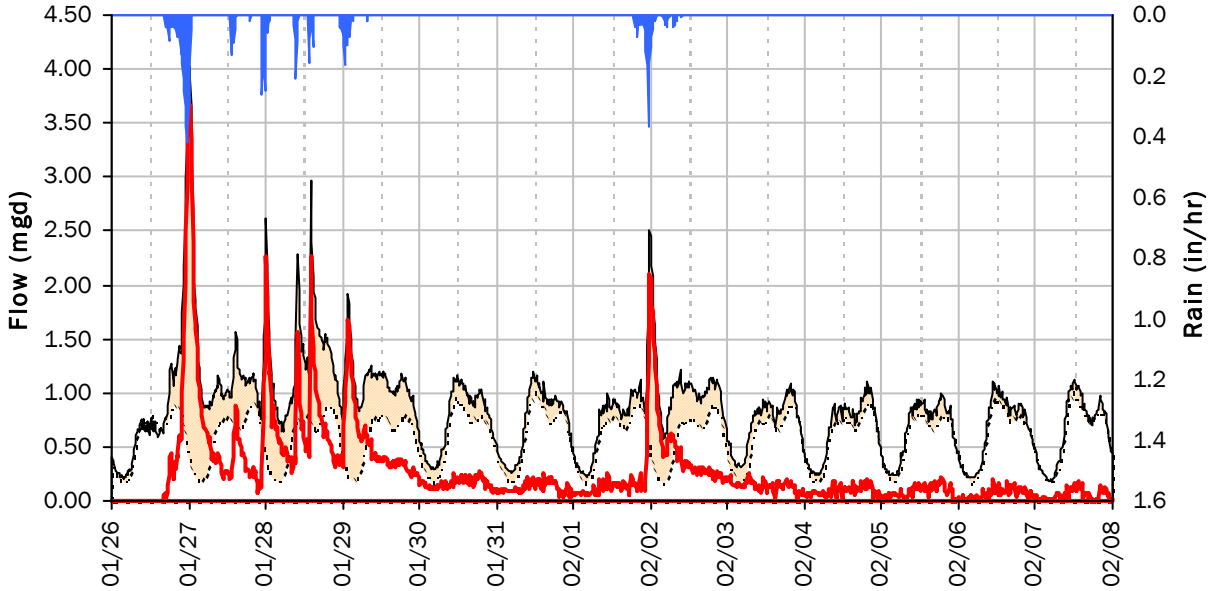
Pipe Diameter:	24	*inches*
Peak Measured Level:	17.4	*inches*
Peak d/D Ratio:	0.73	

FM 1
I/I Summary: Event 1

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



Event 1 Detail Graph

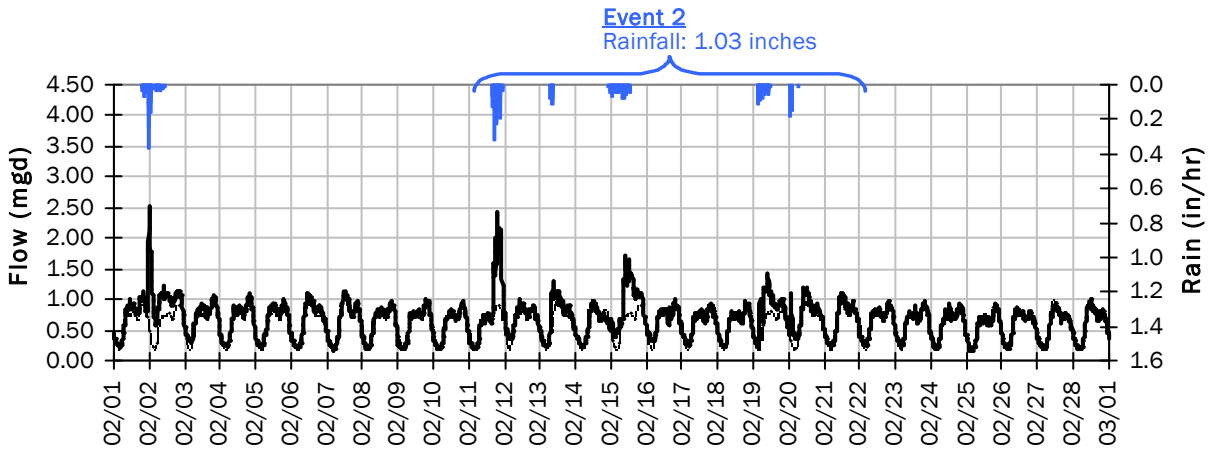


Storm Event I/I Analysis (Rain = 2.52 inches)

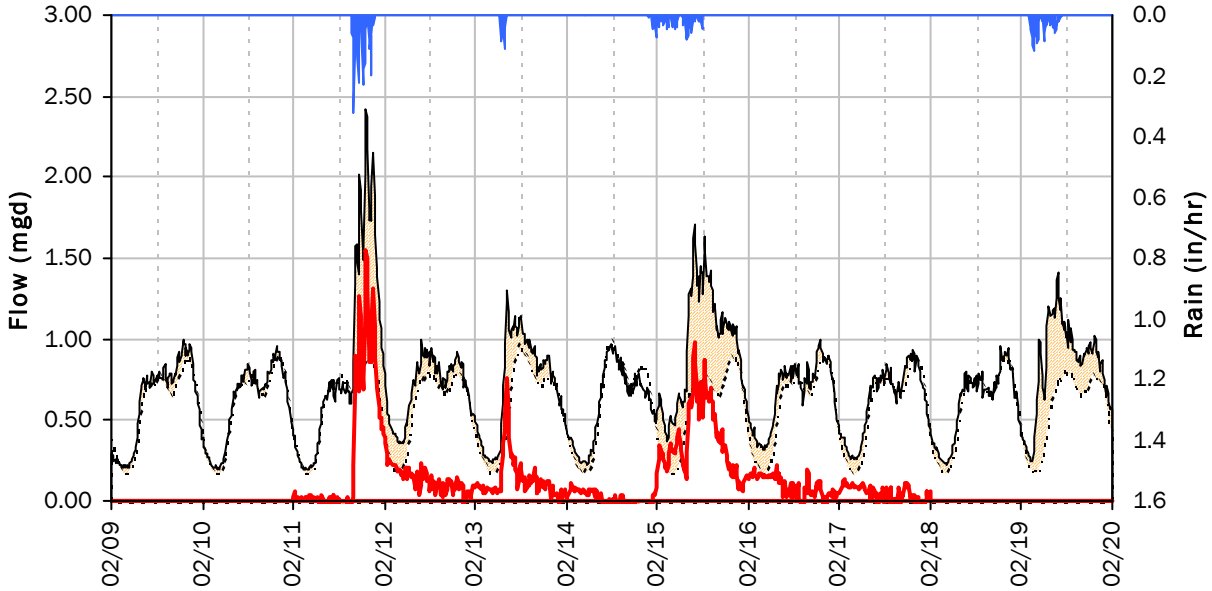
Capacity		Inflow / Infiltration	
Peak Flow:	4.01 *mgd*	**Peak I/I Rate:**	3.67 *mgd*
PF:	6.95	**Total I/I:**	3,620,000 *gallons*
Peak Level:	17.42 *in*		
d/D Ratio:	0.73		

FM 1
I/I Summary: Event 2

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



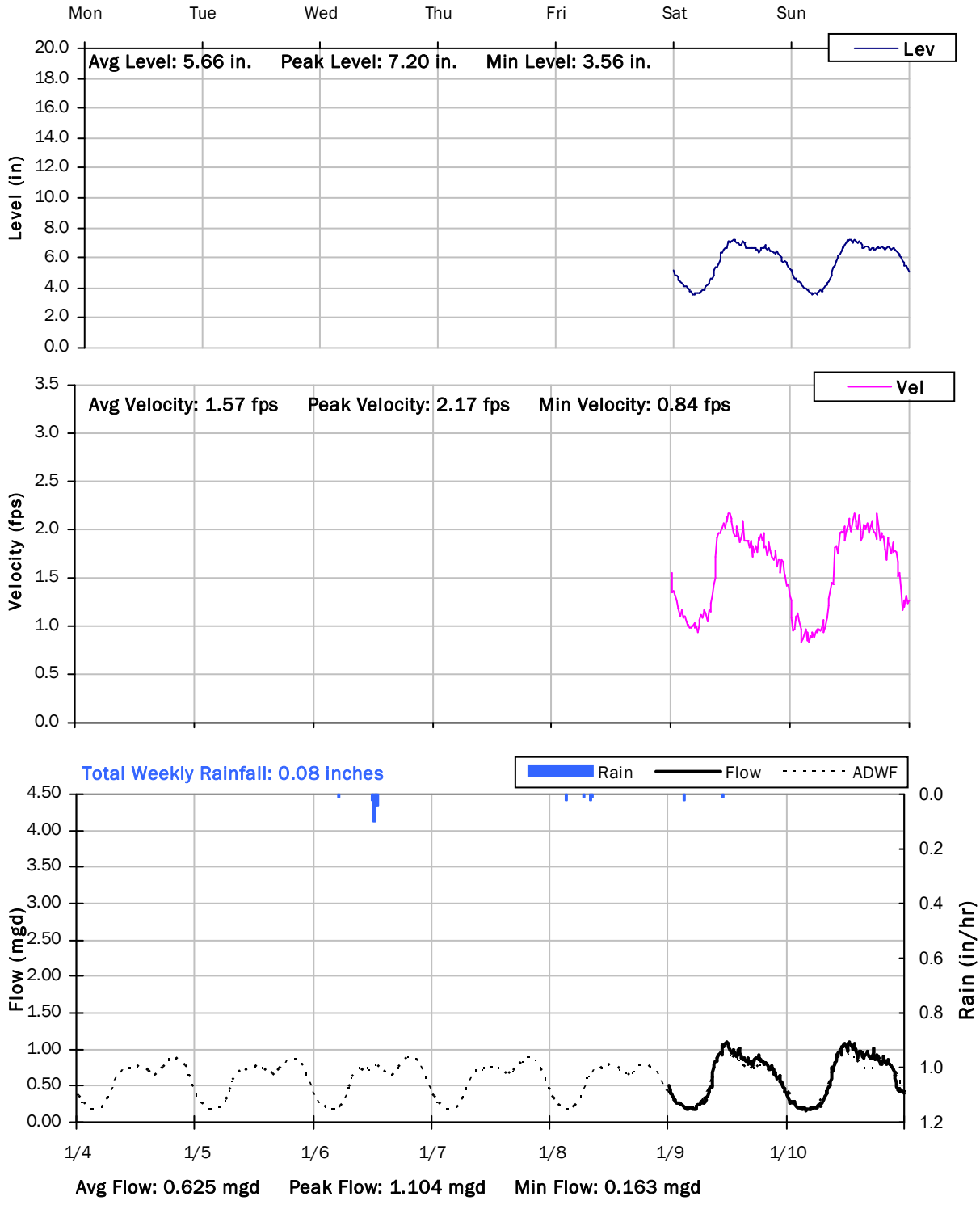
Event 2 Detail Graph



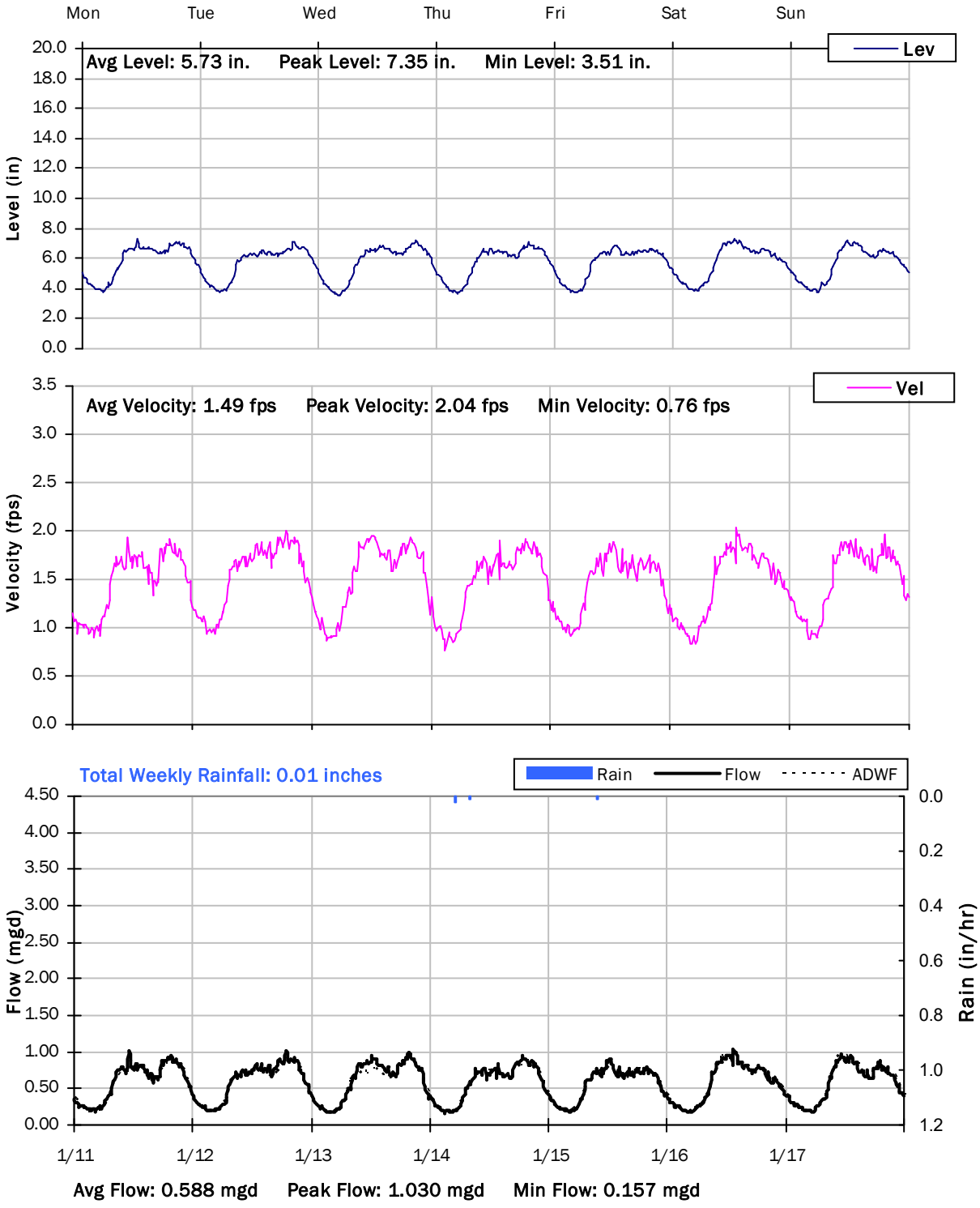
Storm Event I/I Analysis (Rain = 1.03 inches)

Capacity		Inflow / Infiltration	
Peak Flow:	2.42 *mgd*	**Peak I/I Rate:**	1.55 *mgd*
PF:	4.19	**Total I/I:**	1,073,000 *gallons*
Peak Level:	11.42 *in*		
d/D Ratio:	0.48		

FM 1
Weekly Level, Velocity and Flow Hydrographs
1/4/2021 to 1/11/2021



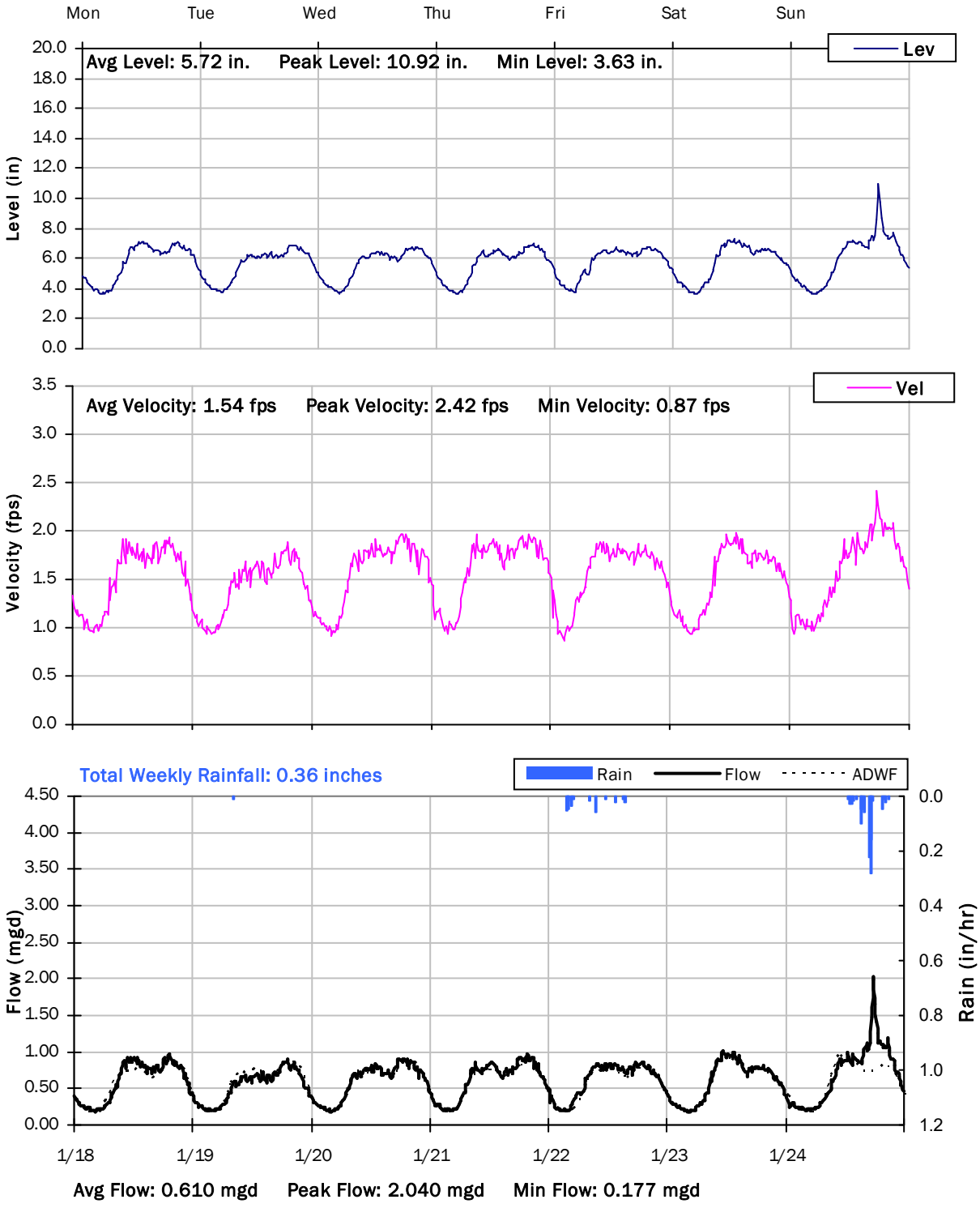
FM 1
Weekly Level, Velocity and Flow Hydrographs
1/11/2021 to 1/18/2021



FM 1

Weekly Level, Velocity and Flow Hydrographs

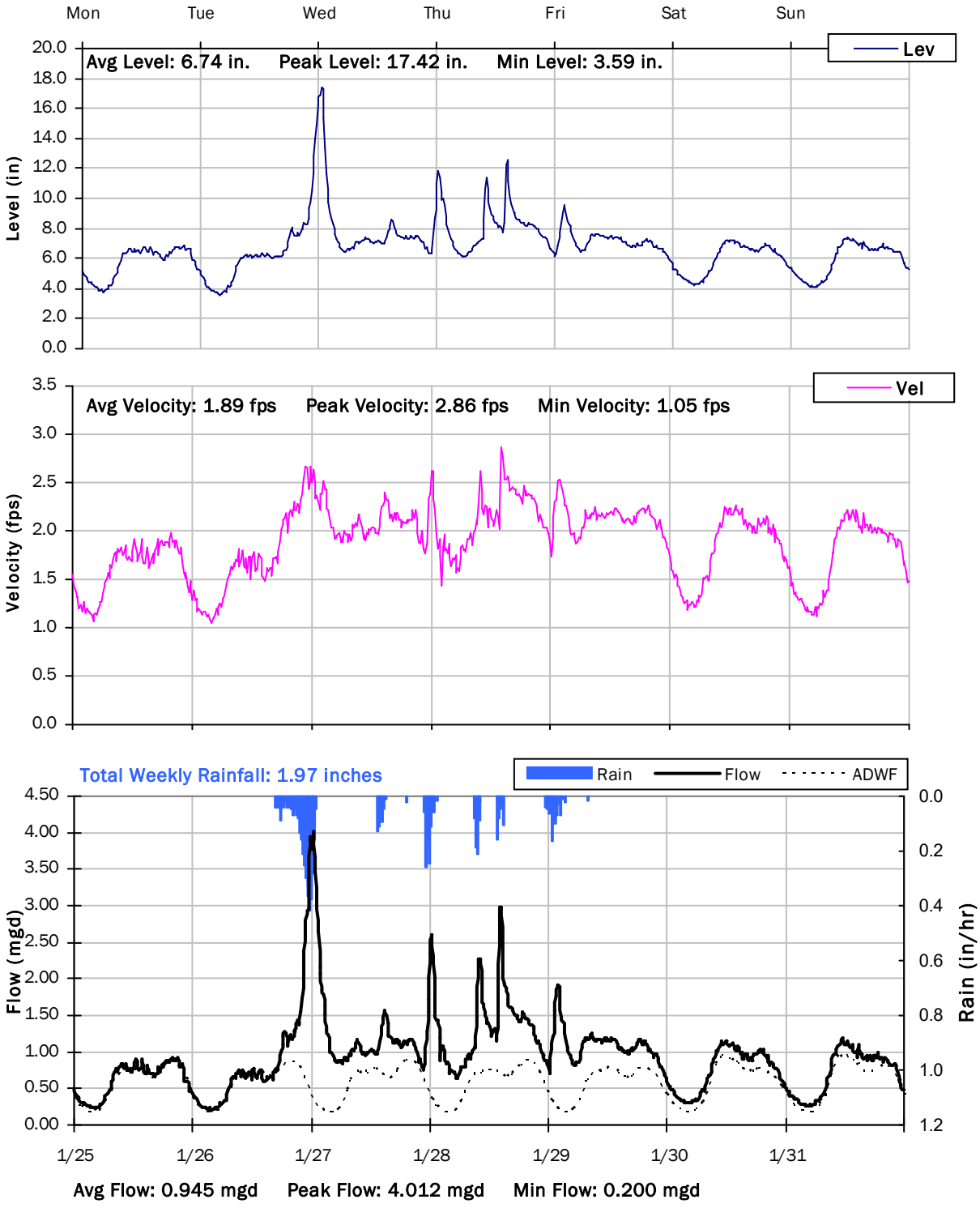
1/18/2021 to 1/25/2021



FM 1

Weekly Level, Velocity and Flow Hydrographs

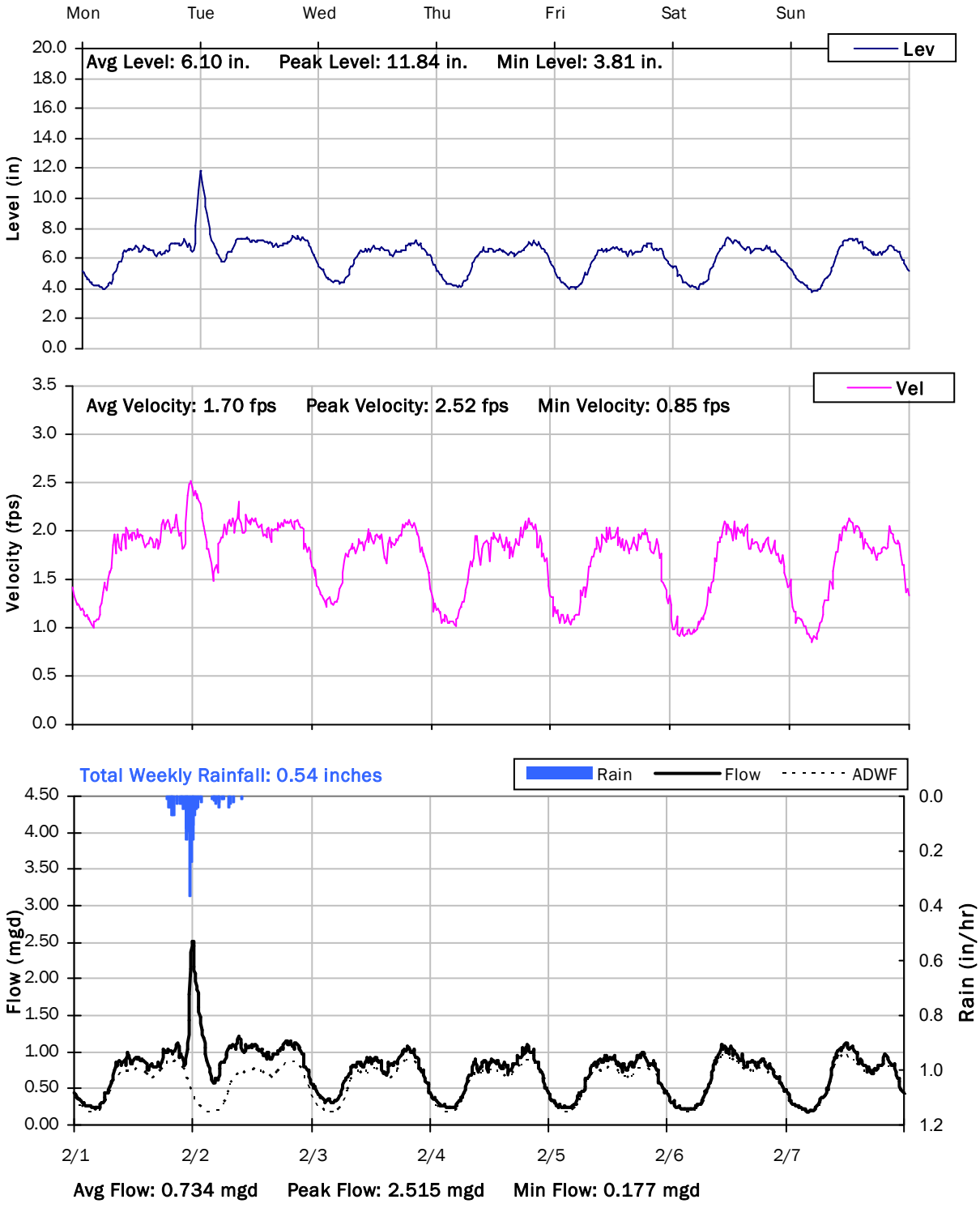
1/25/2021 to 2/1/2021



FM 1

Weekly Level, Velocity and Flow Hydrographs

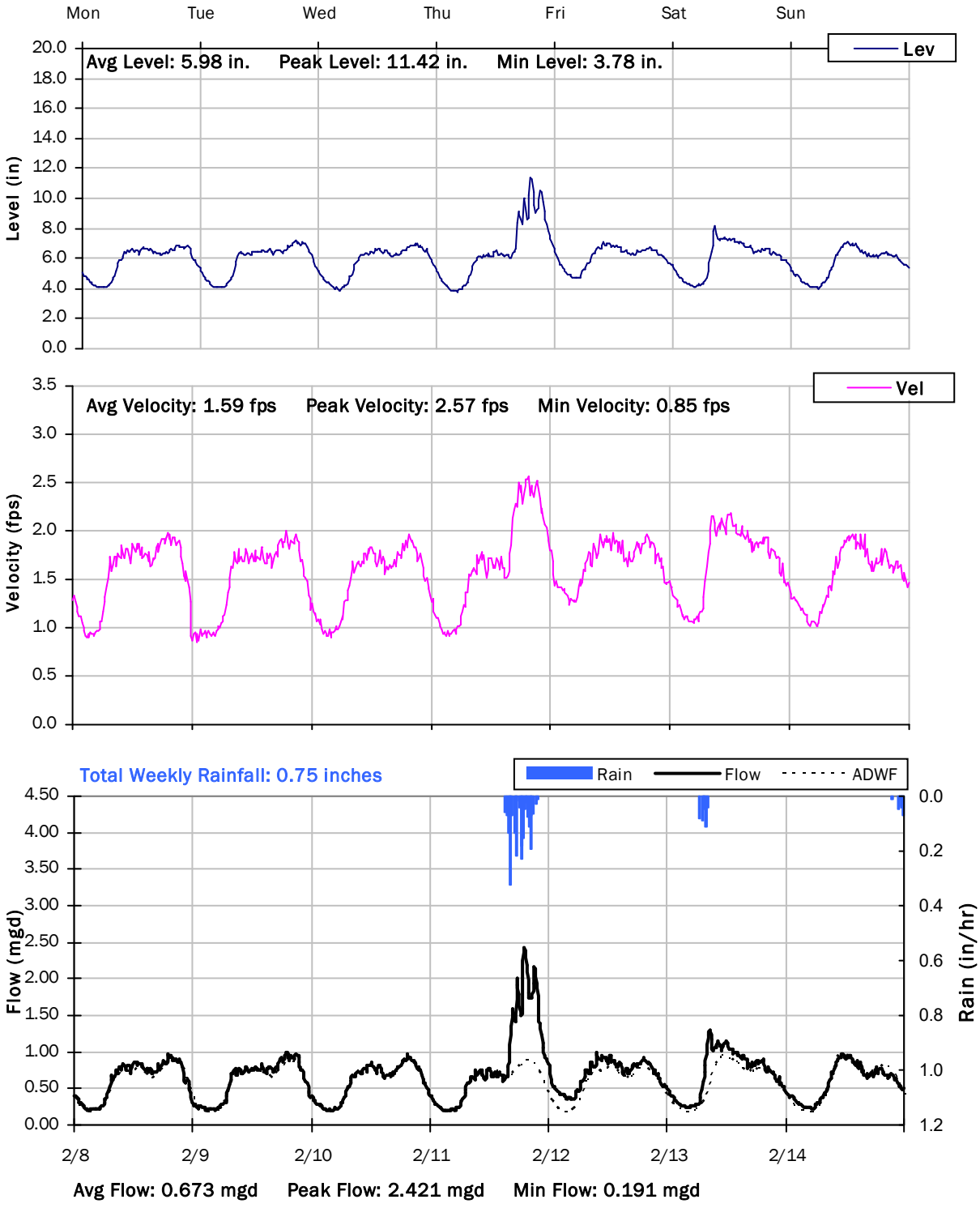
2/1/2021 to 2/8/2021



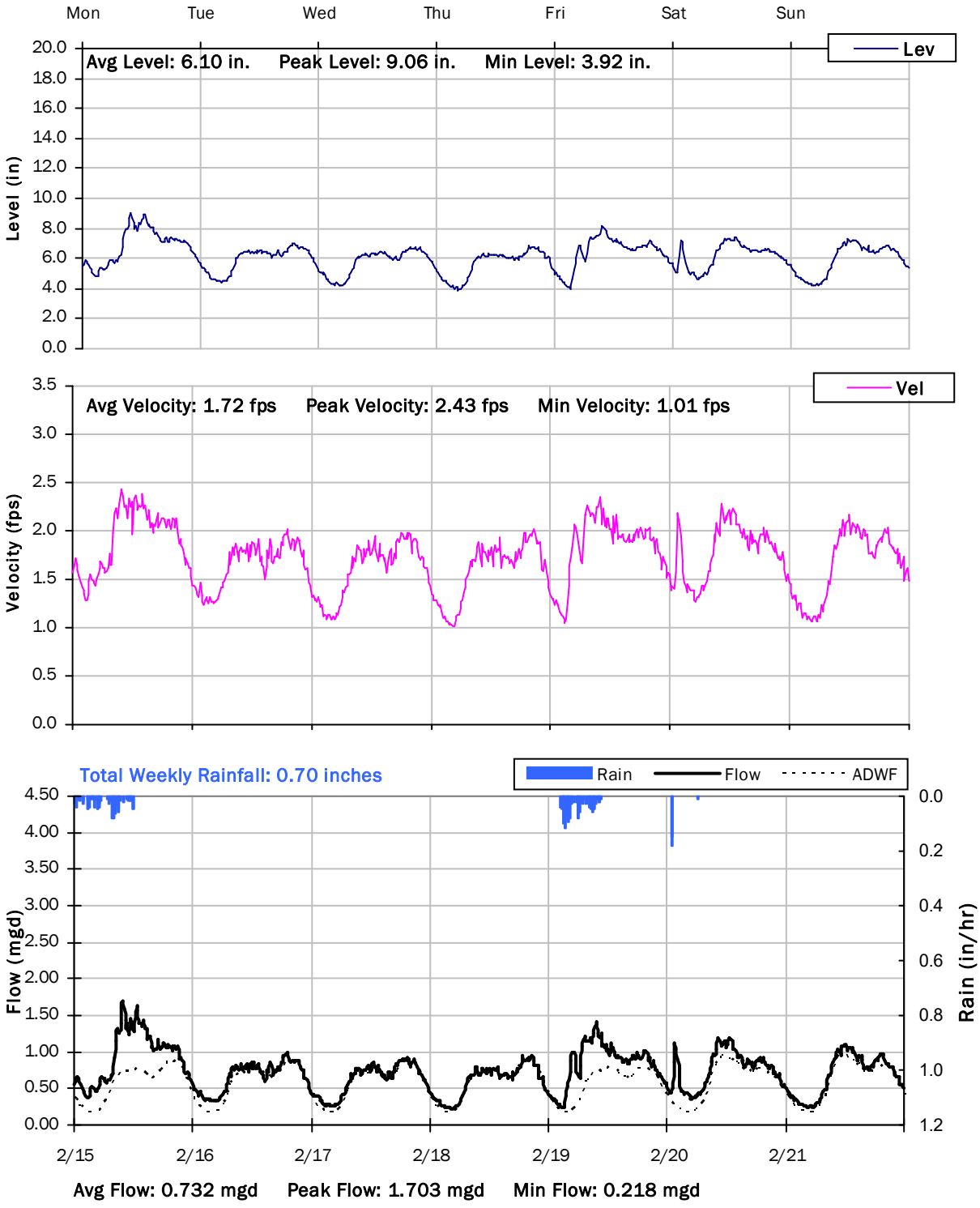
FM 1

Weekly Level, Velocity and Flow Hydrographs

2/8/2021 to 2/15/2021



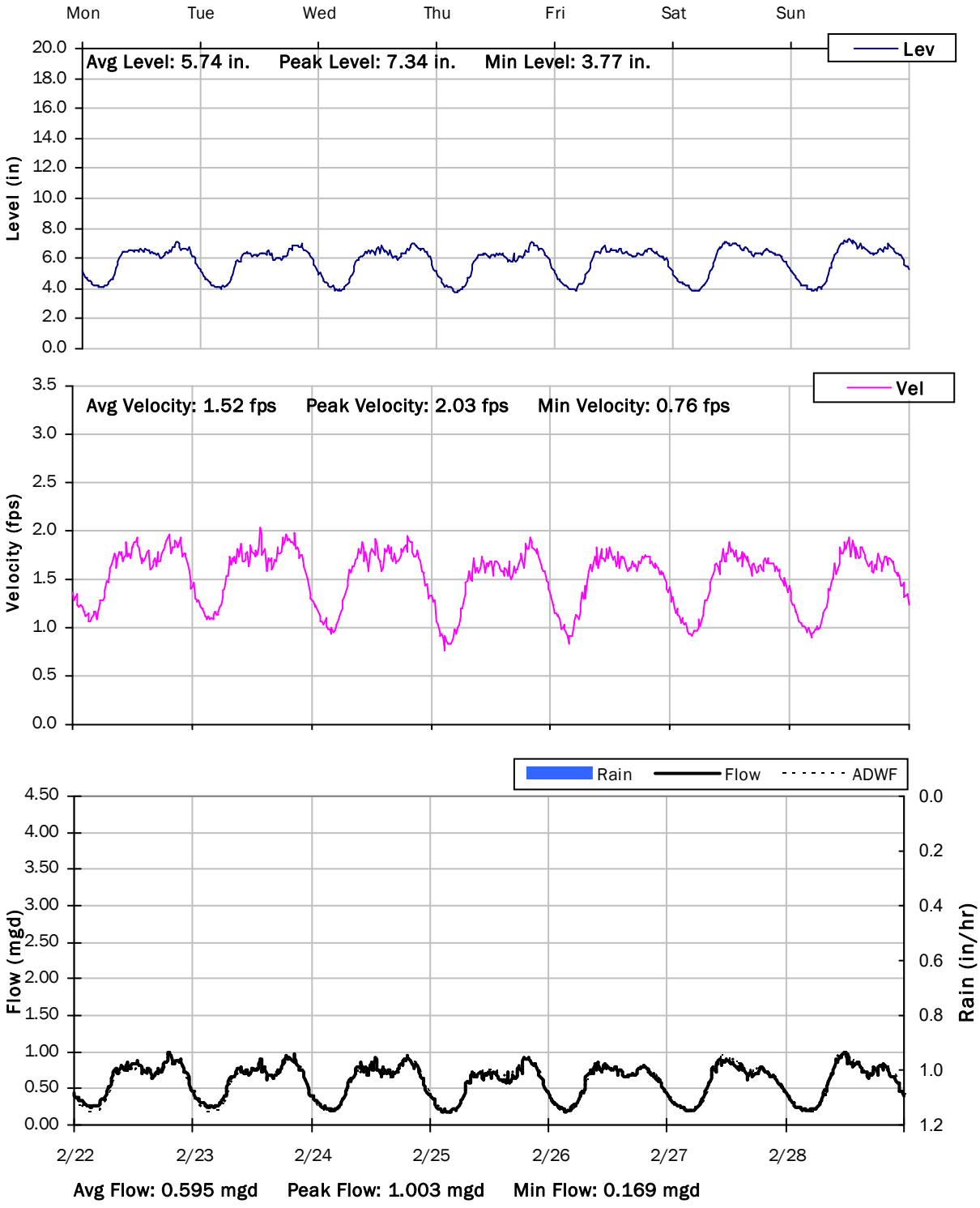
FM 1
Weekly Level, Velocity and Flow Hydrographs
2/15/2021 to 2/22/2021



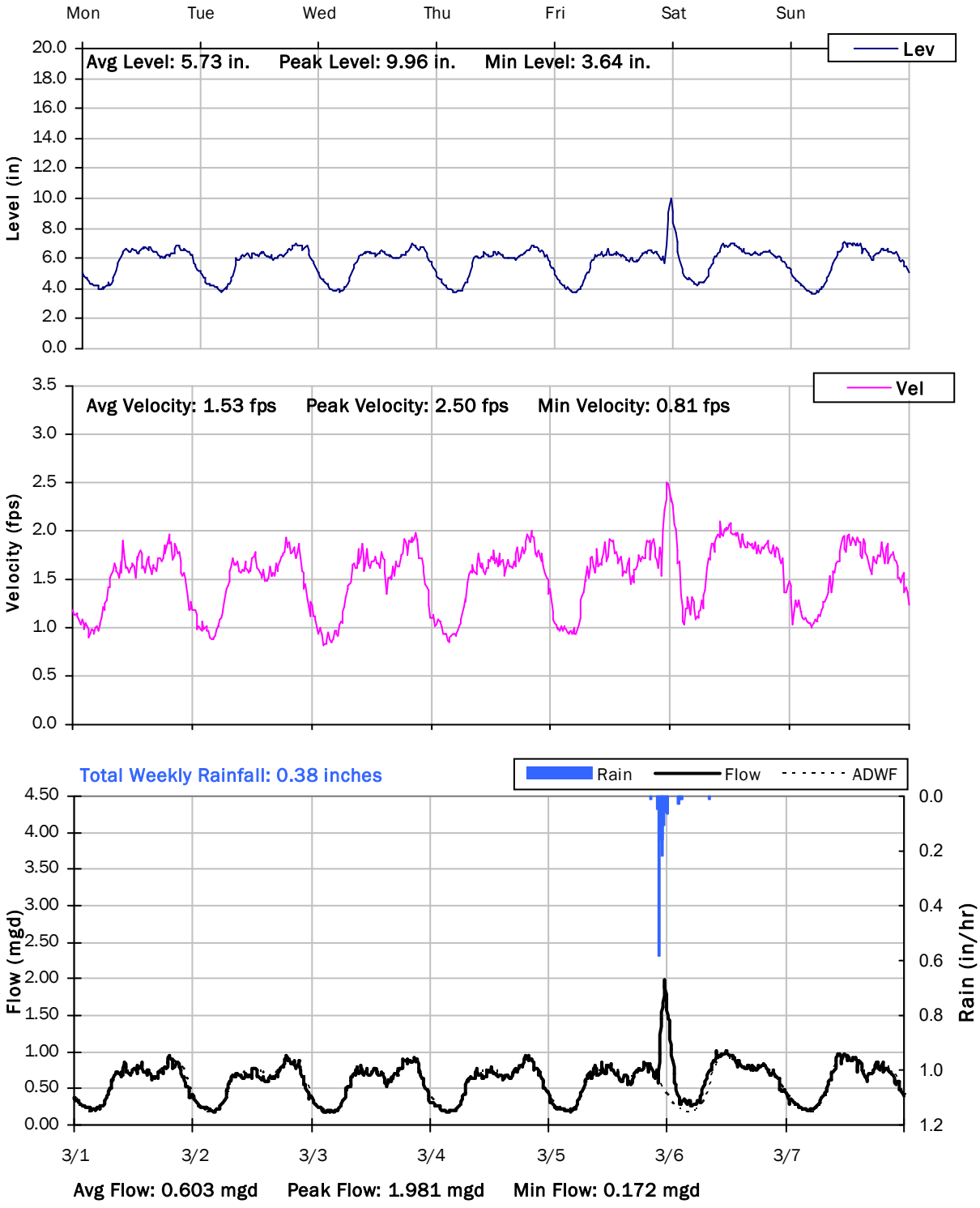
FM 1

Weekly Level, Velocity and Flow Hydrographs

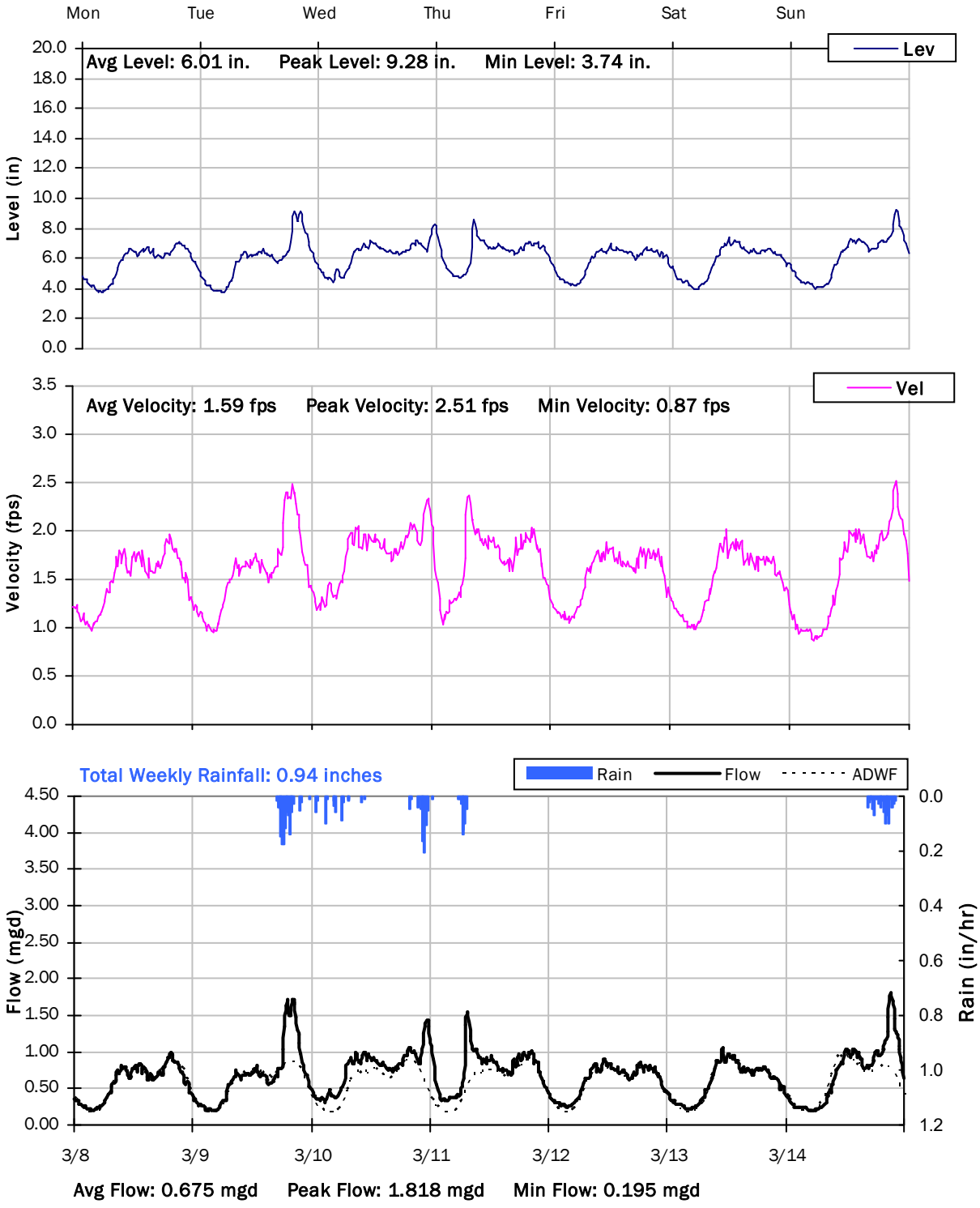
2/22/2021 to 3/1/2021



FM 1
Weekly Level, Velocity and Flow Hydrographs
3/1/2021 to 3/8/2021



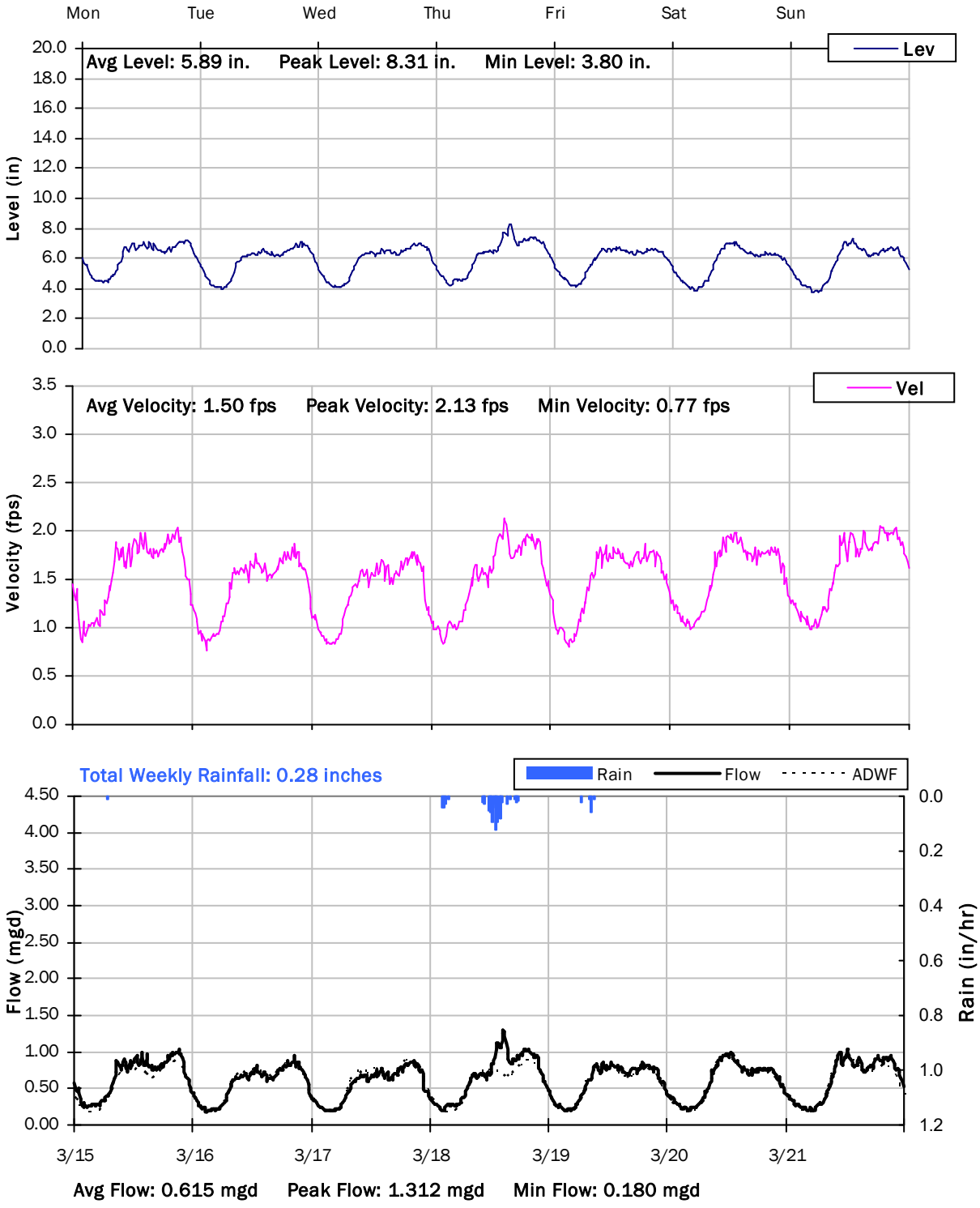
FM 1
Weekly Level, Velocity and Flow Hydrographs
3/8/2021 to 3/15/2021



FM 1

Weekly Level, Velocity and Flow Hydrographs

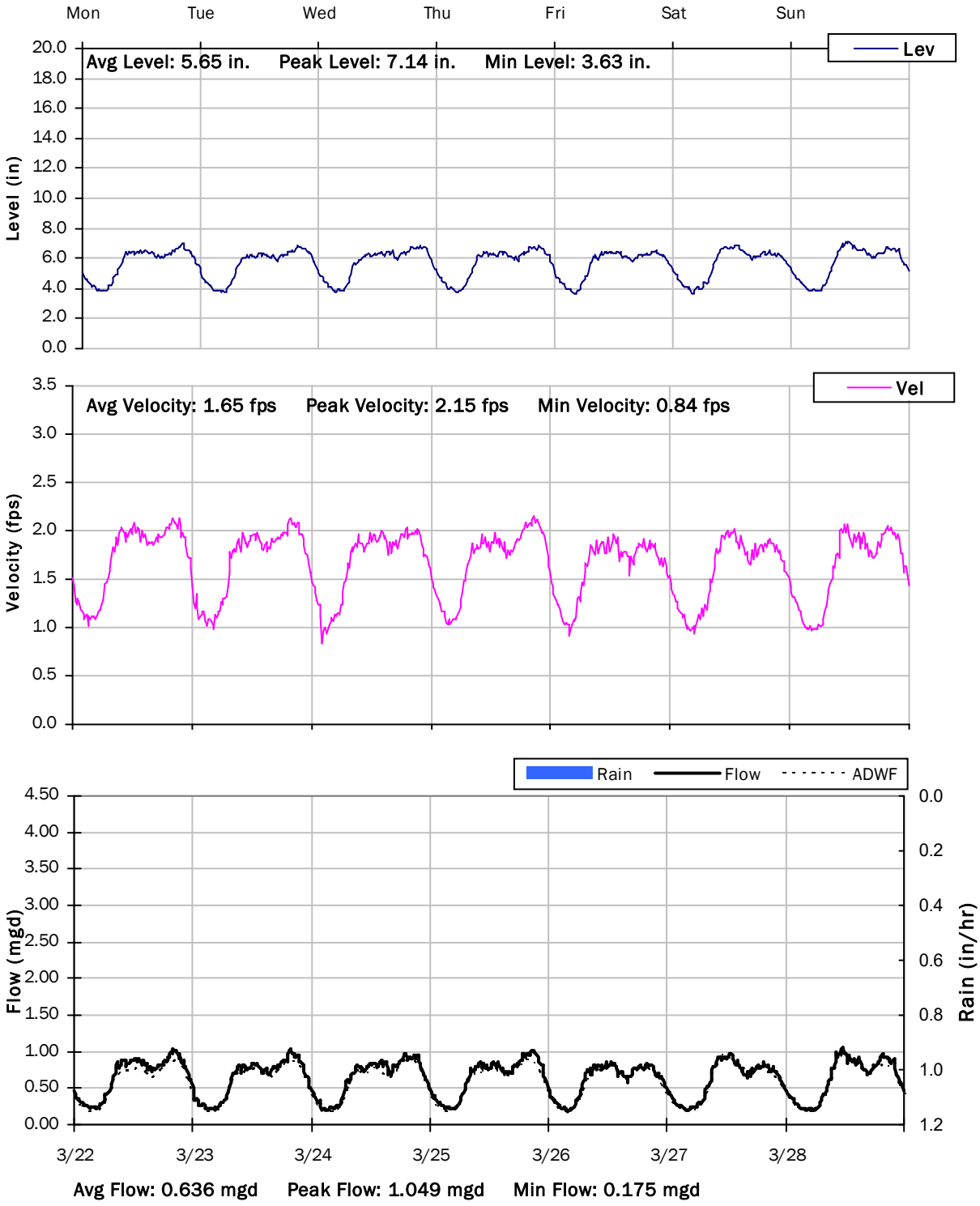
3/15/2021 to 3/22/2021



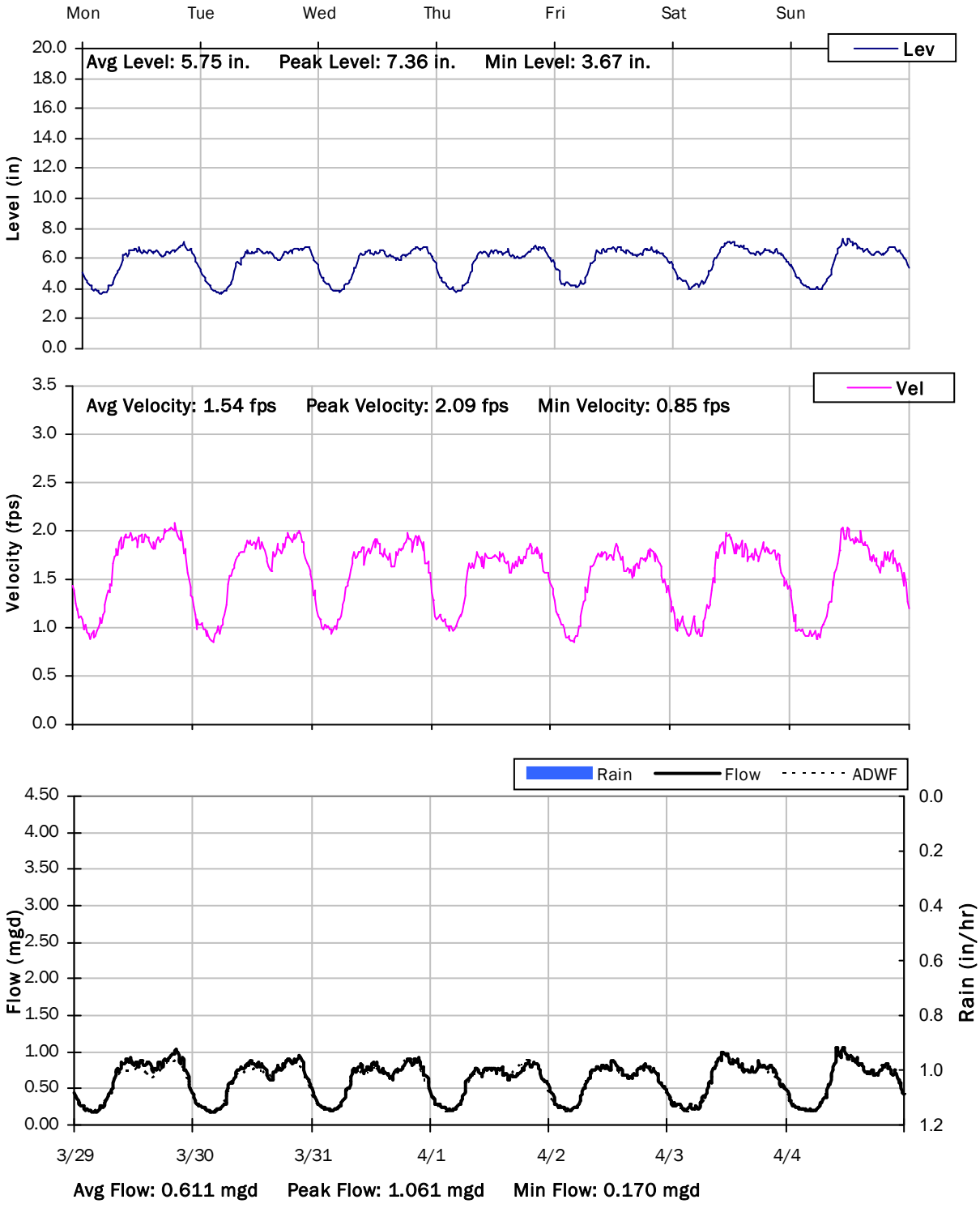
FM 1

Weekly Level, Velocity and Flow Hydrographs

3/22/2021 to 3/29/2021



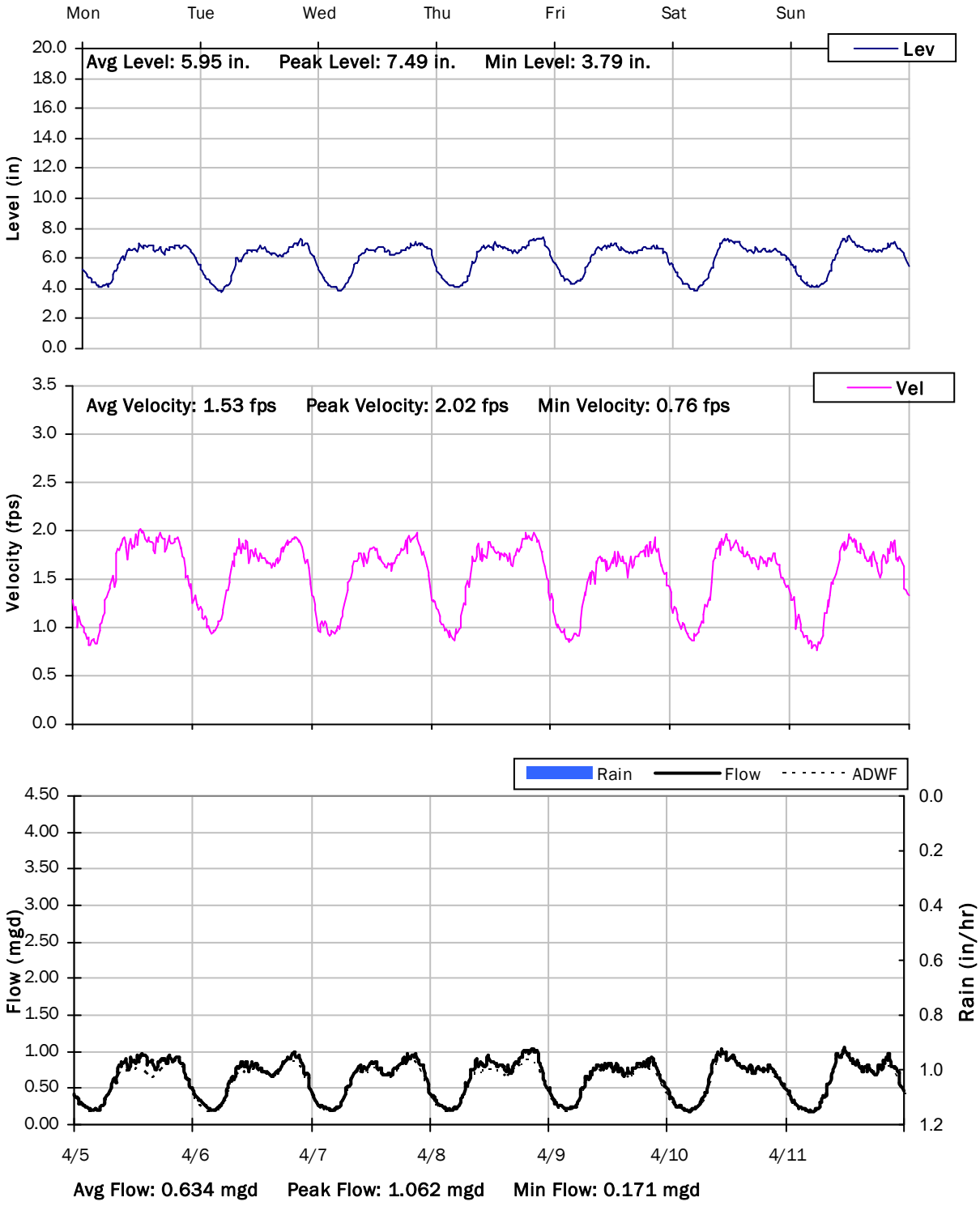
FM 1
Weekly Level, Velocity and Flow Hydrographs
3/29/2021 to 4/5/2021



FM 1

Weekly Level, Velocity and Flow Hydrographs

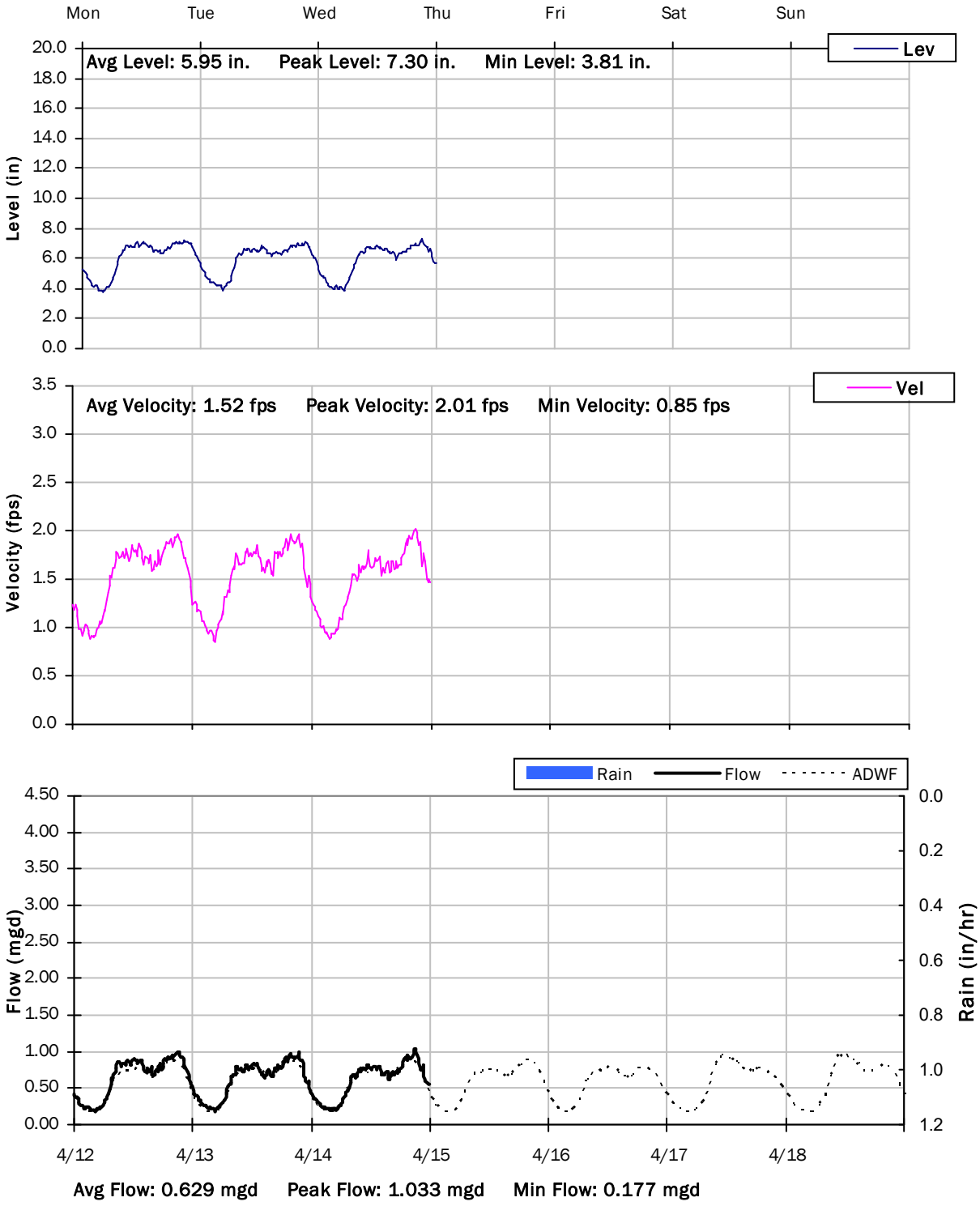
4/5/2021 to 4/12/2021



FM 1

Weekly Level, Velocity and Flow Hydrographs

4/12/2021 to 4/19/2021



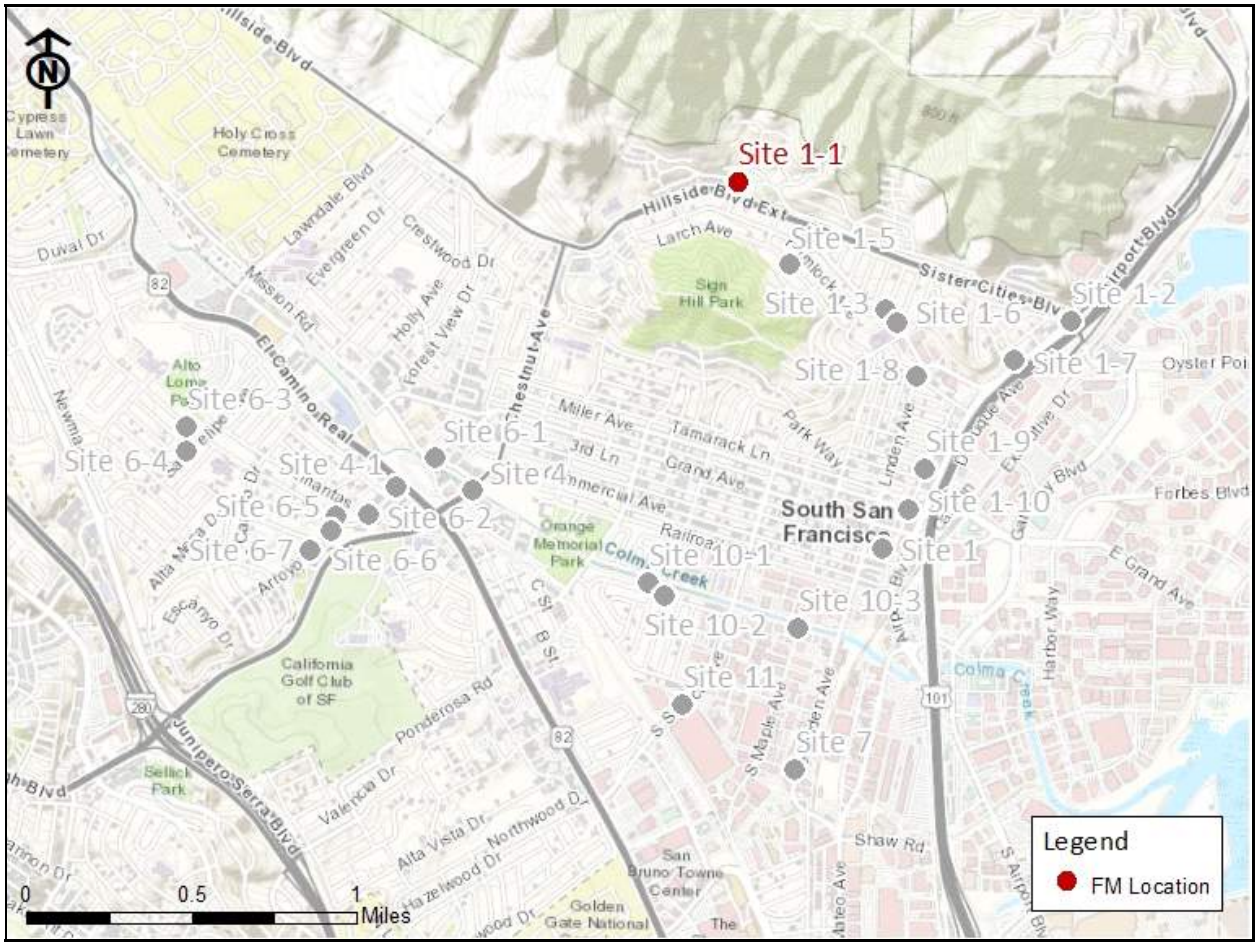
South San Francisco, CA

Sanitary Sewer Flow Monitoring
January 4 - April 14, 2021

Monitoring Site: FM 1-1

Location: S San Francisco Drive at Northcrest Drive

Data Summary Report



Vicinity Map: FM 1-1

FM 1-1

Site Information

Location: S San Francisco Drive at Northcrest Drive

Coordinates: 122.4179° W, 37.6701° N

Rim Elevation (Earth): 208 feet

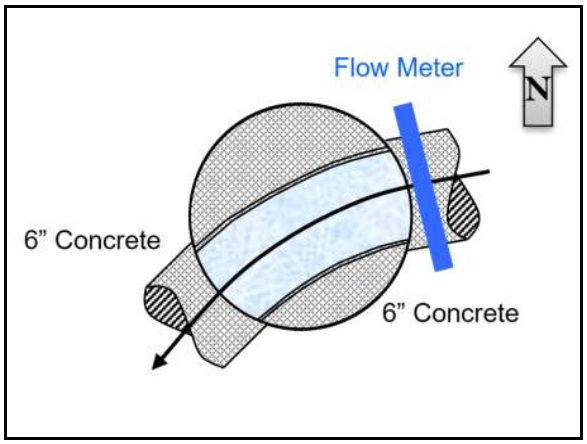
Pipe Diameter: 6 inches

ADWF: 0.008 mgd

Peak Measured Flow: 0.040 mgd

Satellite Map

Sanitary Map



Flow Sketch

Street View

Plan View

FM 1-1

Additional Site Photos

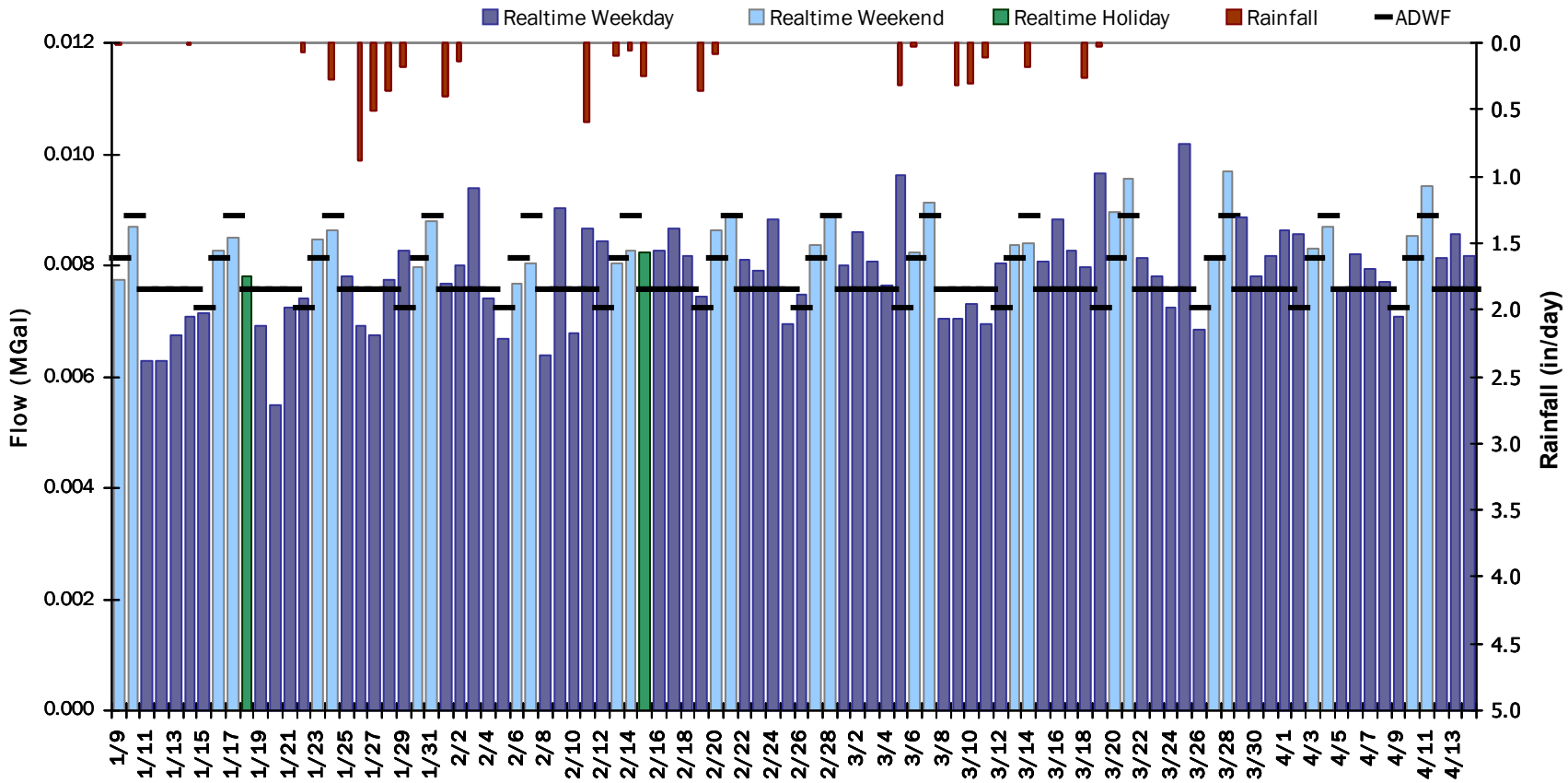
Effluent Pipe

Monitored Influent Pipe

FM 1-1
Period Flow Summary: Daily Flow Totals

Avg Period Flow: 0.008 MGal Peak Daily Flow: 0.010 MGal Min Daily Flow: 0.005 MGal

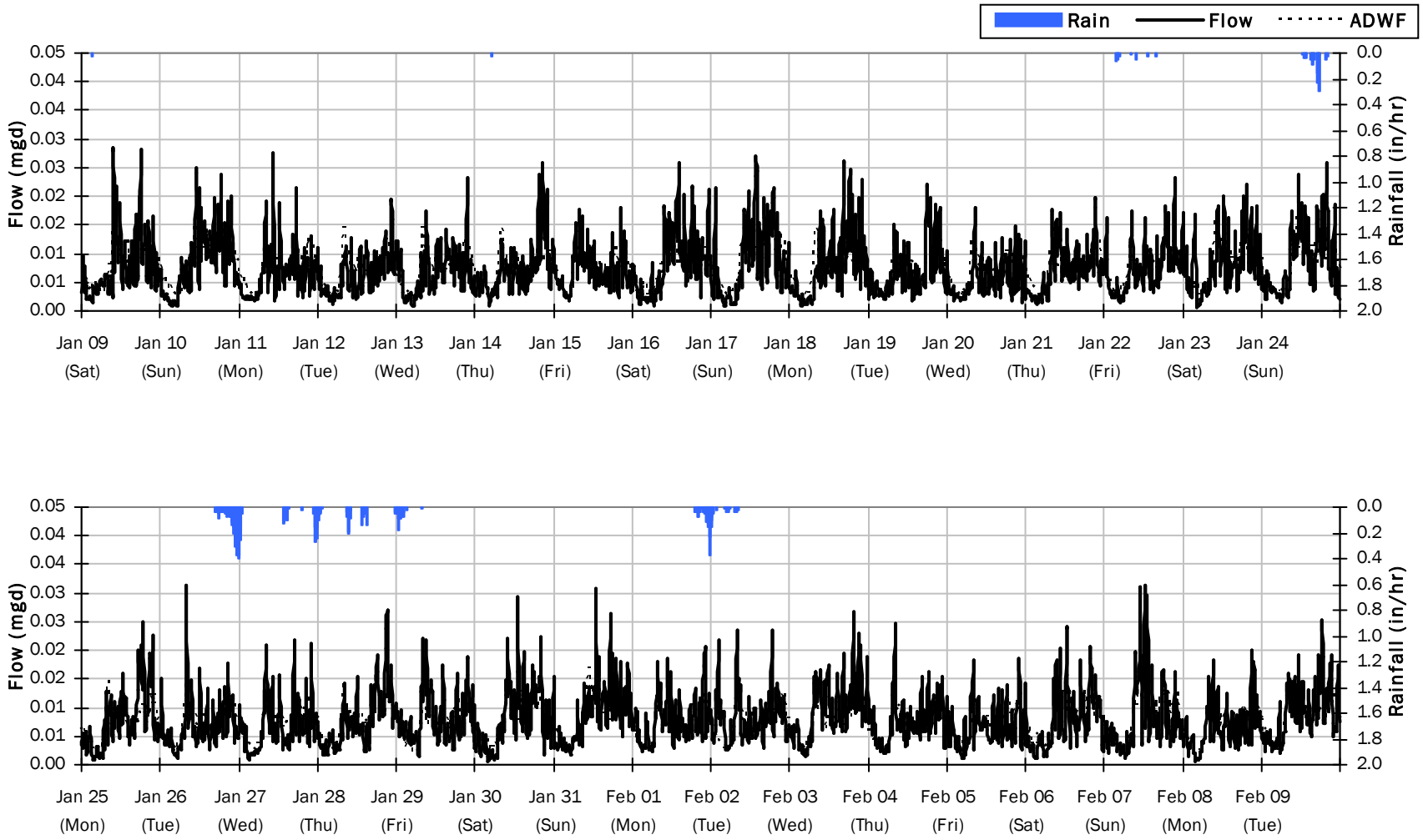
Total Period Rainfall: 5.83 inches



FM 1-1

Flow Summary: 1/9/2021 to 2/9/2021

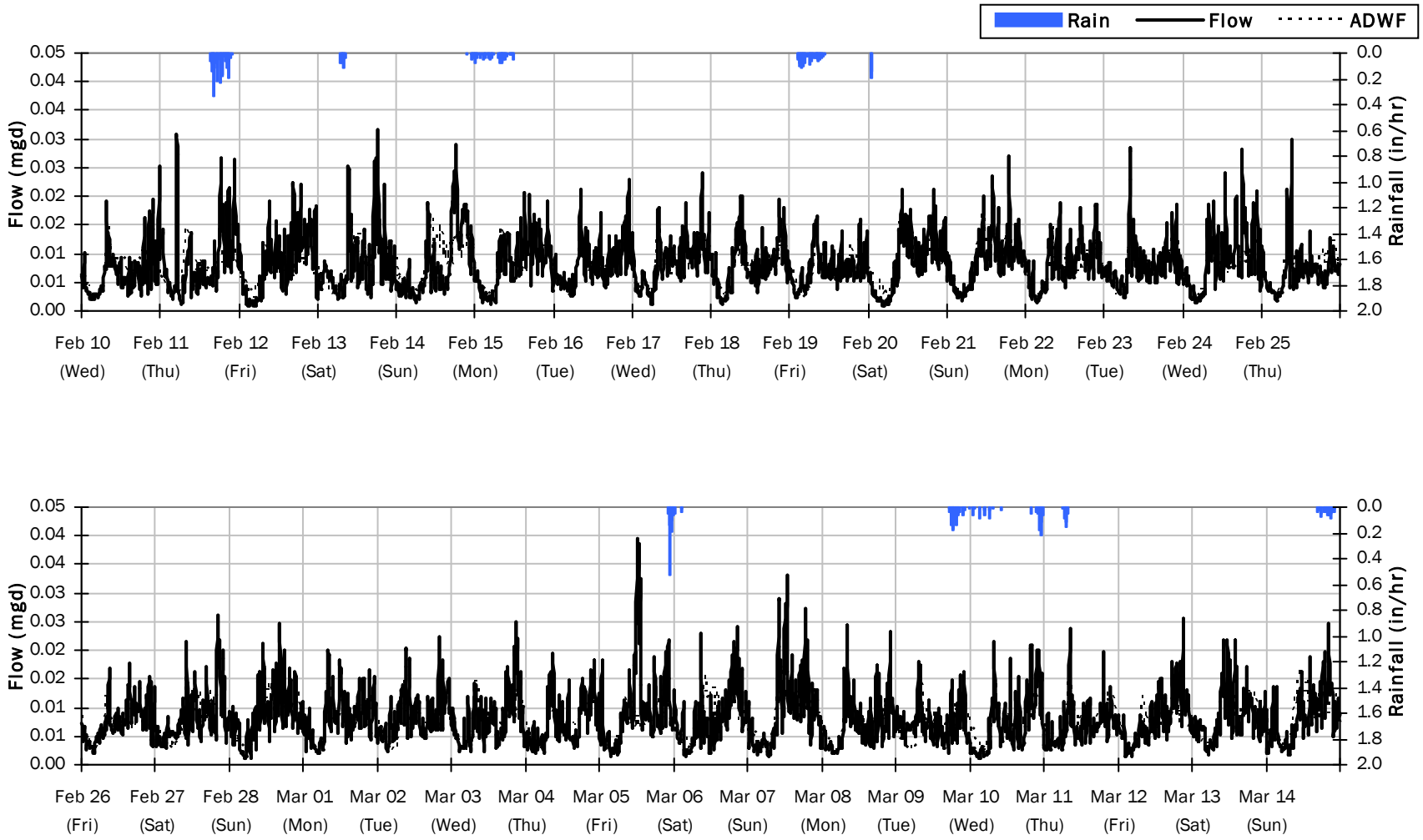
Total Period Rainfall: 2.84 inches Avg Flow: 0.008 mgd Peak Flow: 0.031 mgd Min Flow: 0.001 mgd



FM 1-1

Flow Summary: 2/10/2021 to 3/14/2021

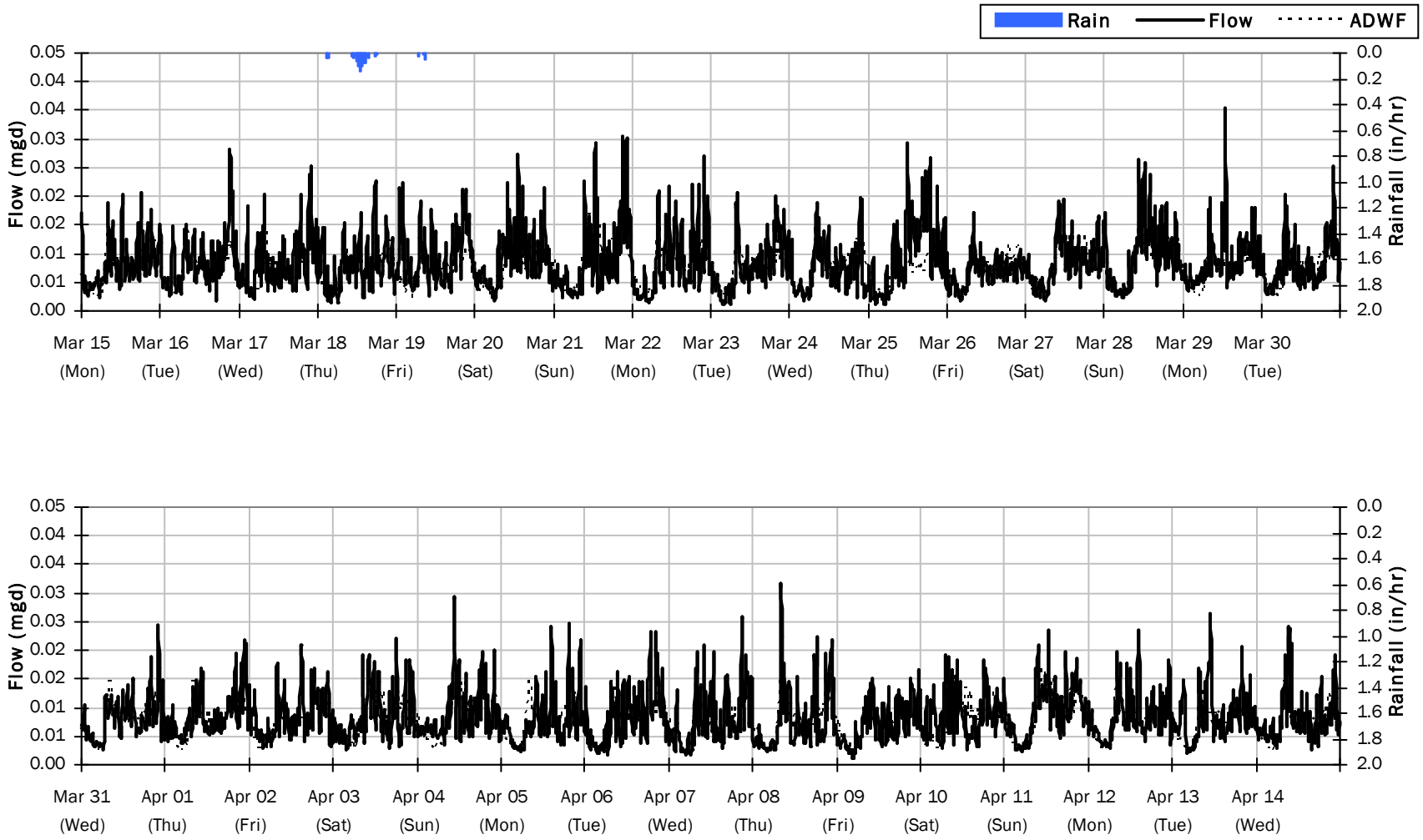
Total Period Rainfall: 2.68 inches Avg Flow: 0.008 mgd Peak Flow: 0.040 mgd Min Flow: 0.001 mgd



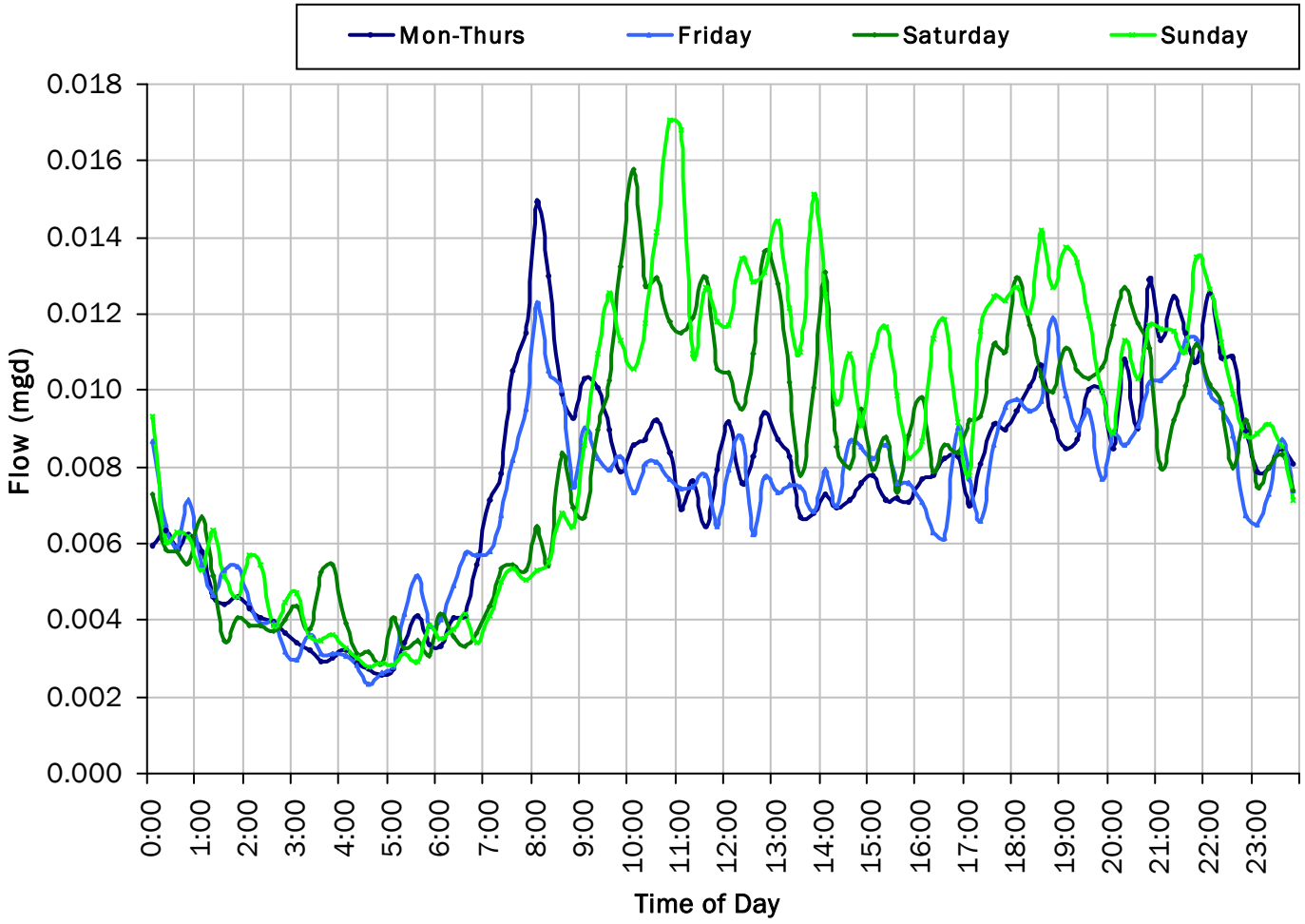
FM 1-1

Flow Summary: 3/15/2021 to 4/14/2021

Total Period Rainfall: 0.29 inches Avg Flow: 0.008 mgd Peak Flow: 0.036 mgd Min Flow: 0.001 mgd

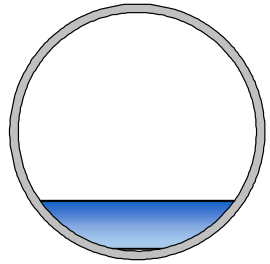


FM 1-1
Average Dry Weather Flow Hydrographs



ADWF:

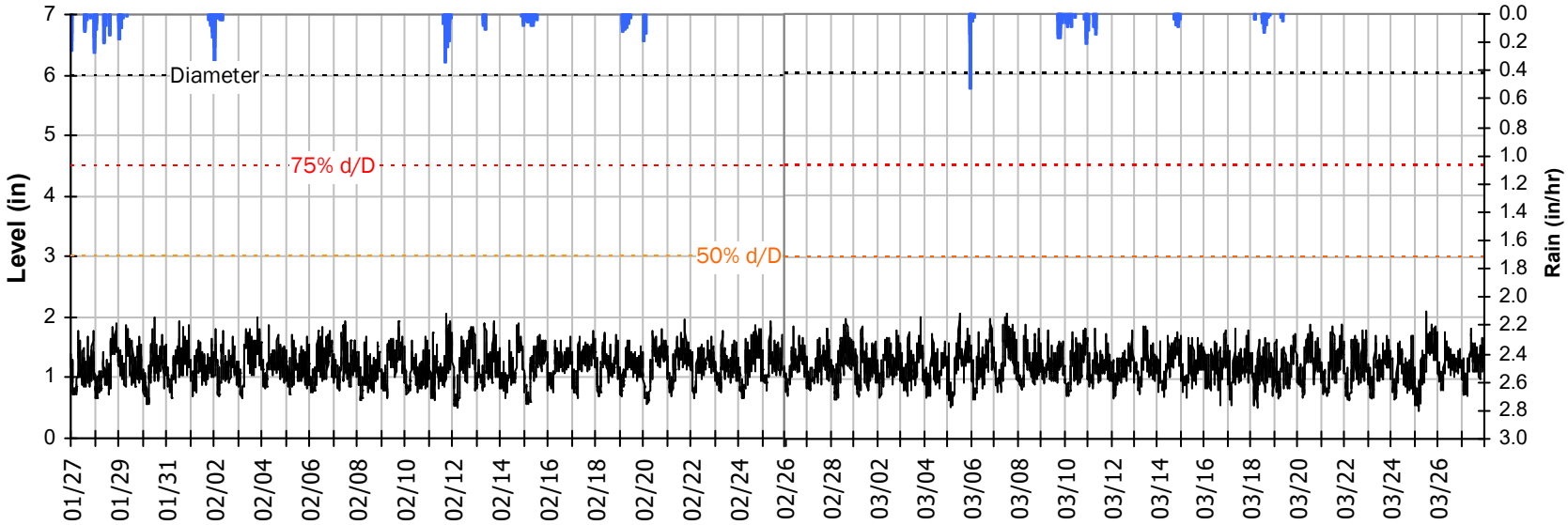
0.008 *mgd*

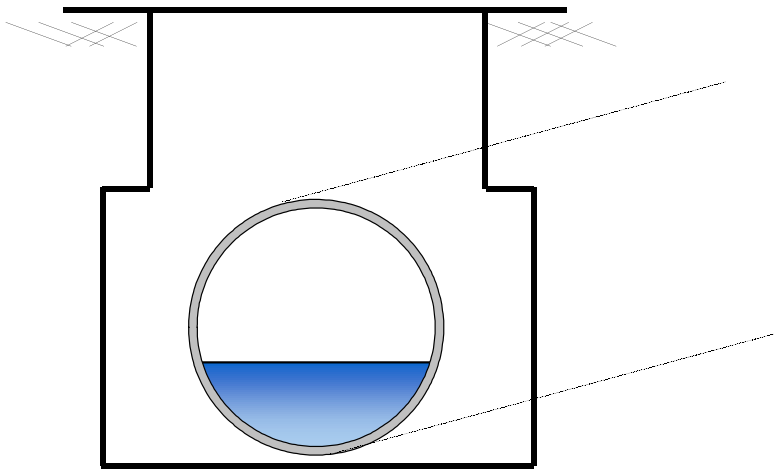


FM 1-1

Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Monitoring Period

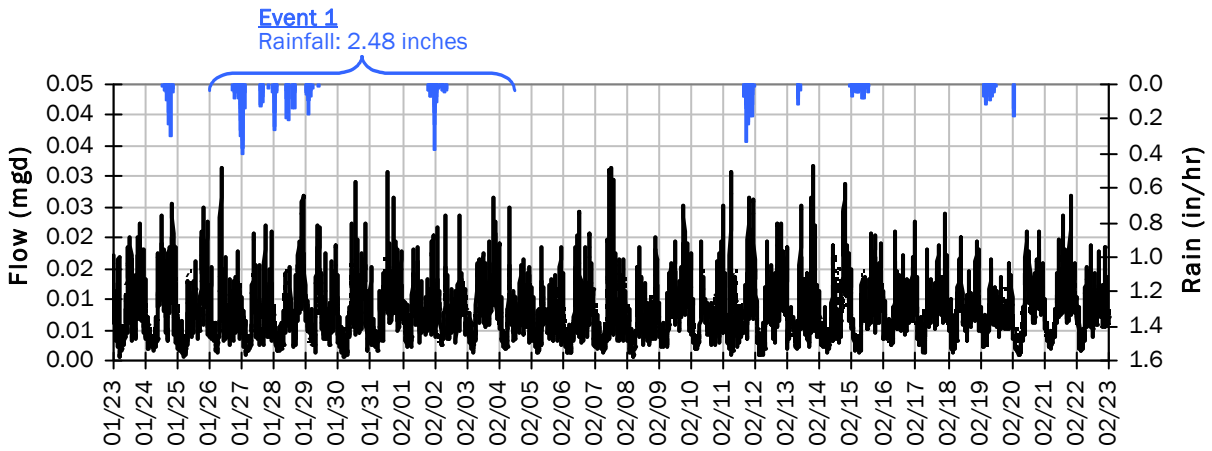




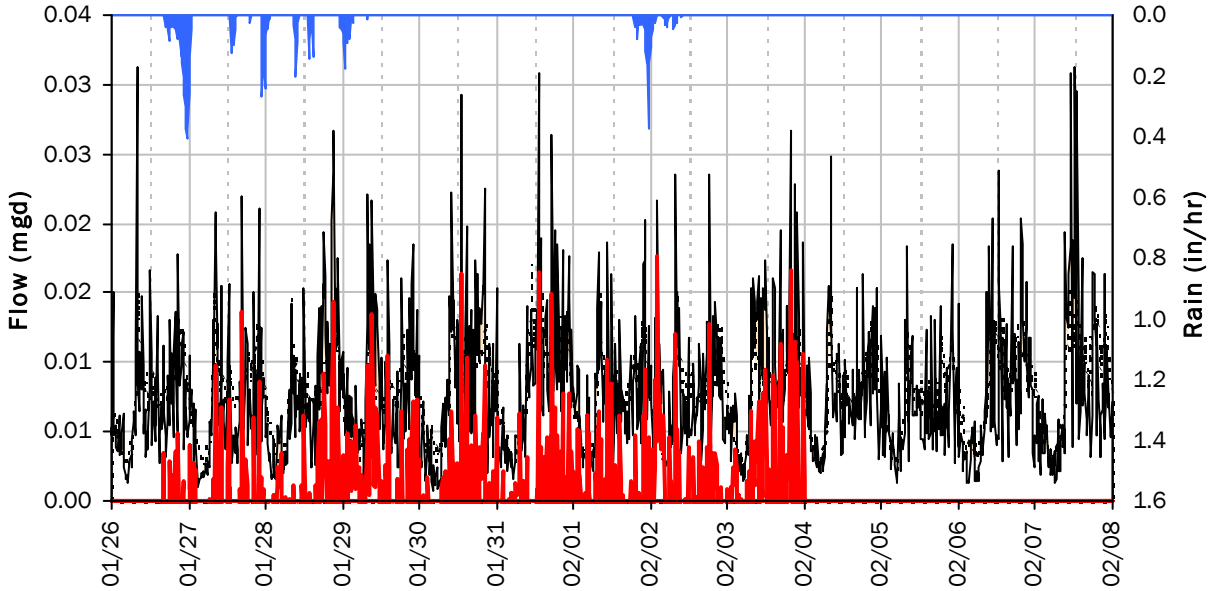
Pipe Diameter:	6	*inches*
Peak Measured Level:	2.1	*inches*
Peak d/D Ratio:	0.35	

FM 1-1
I/I Summary: Event 1

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



Event 1 Detail Graph

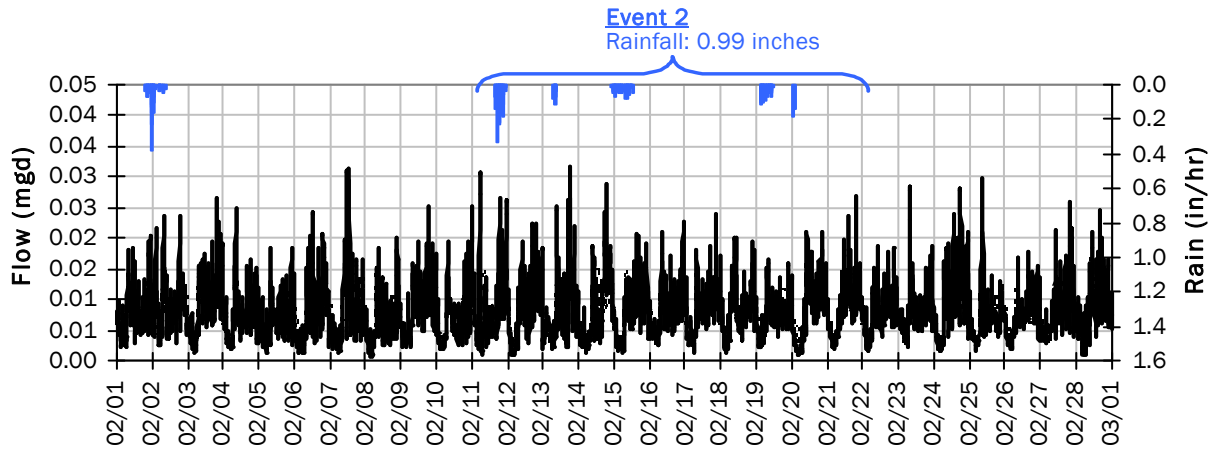


Storm Event I/I Analysis (Rain = 2.48 inches)

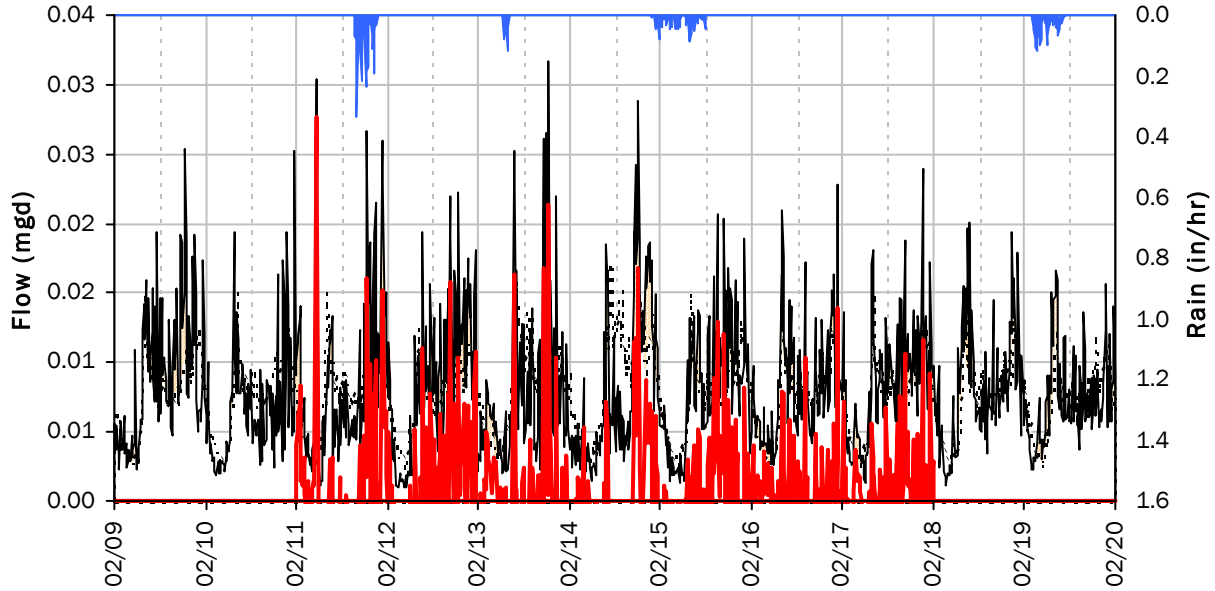
Capacity		Inflow / Infiltration	
Peak Flow:	0.03 *mgd*	**Peak I/I Rate:**	0.02 *mgd*
PF:	3.96	**Total I/I:**	2,000 *gallons*
Peak Level:	1.99 *in*		
d/D Ratio:	0.33		

FM 1-1
I/I Summary: Event 2

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



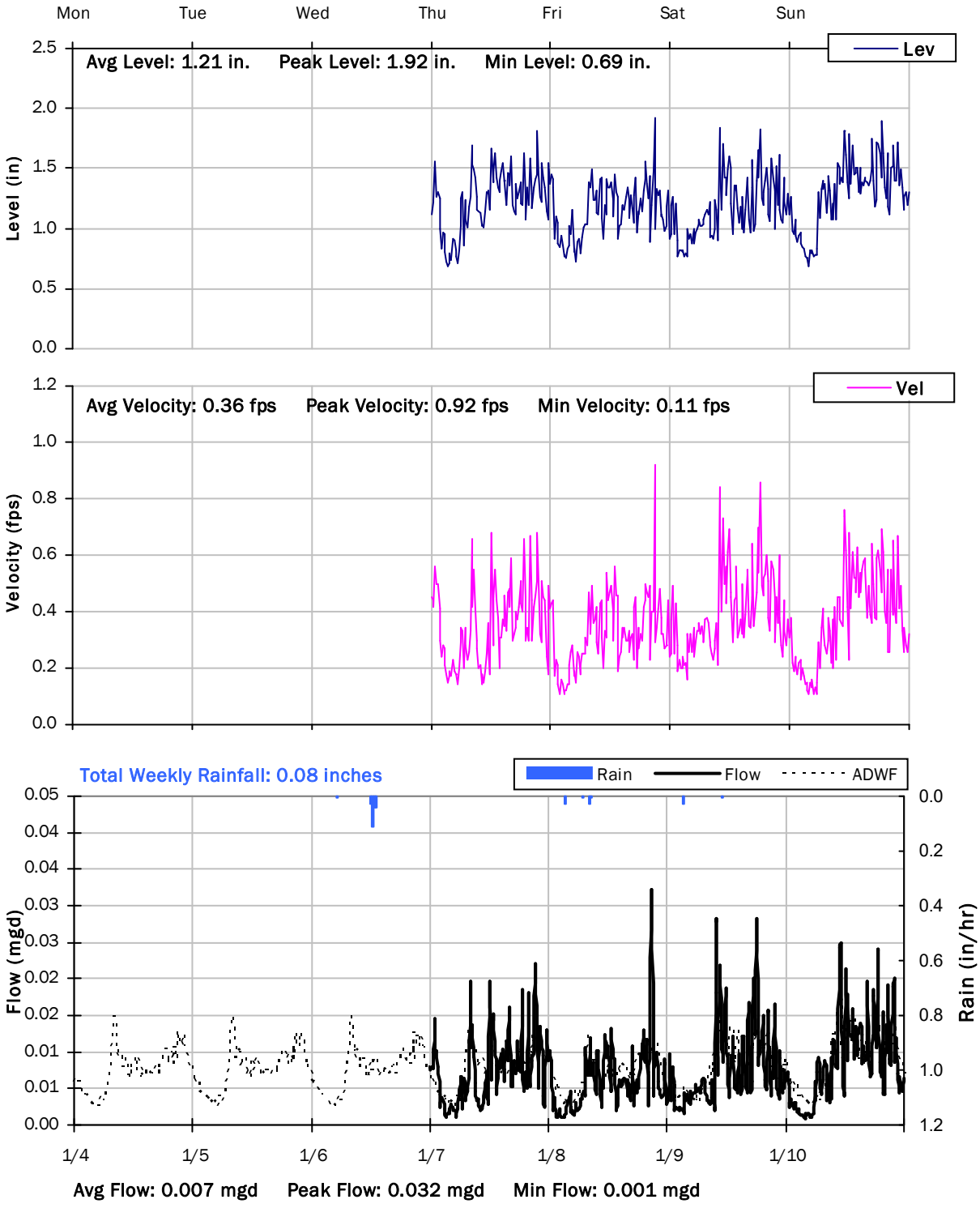
Event 2 Detail Graph



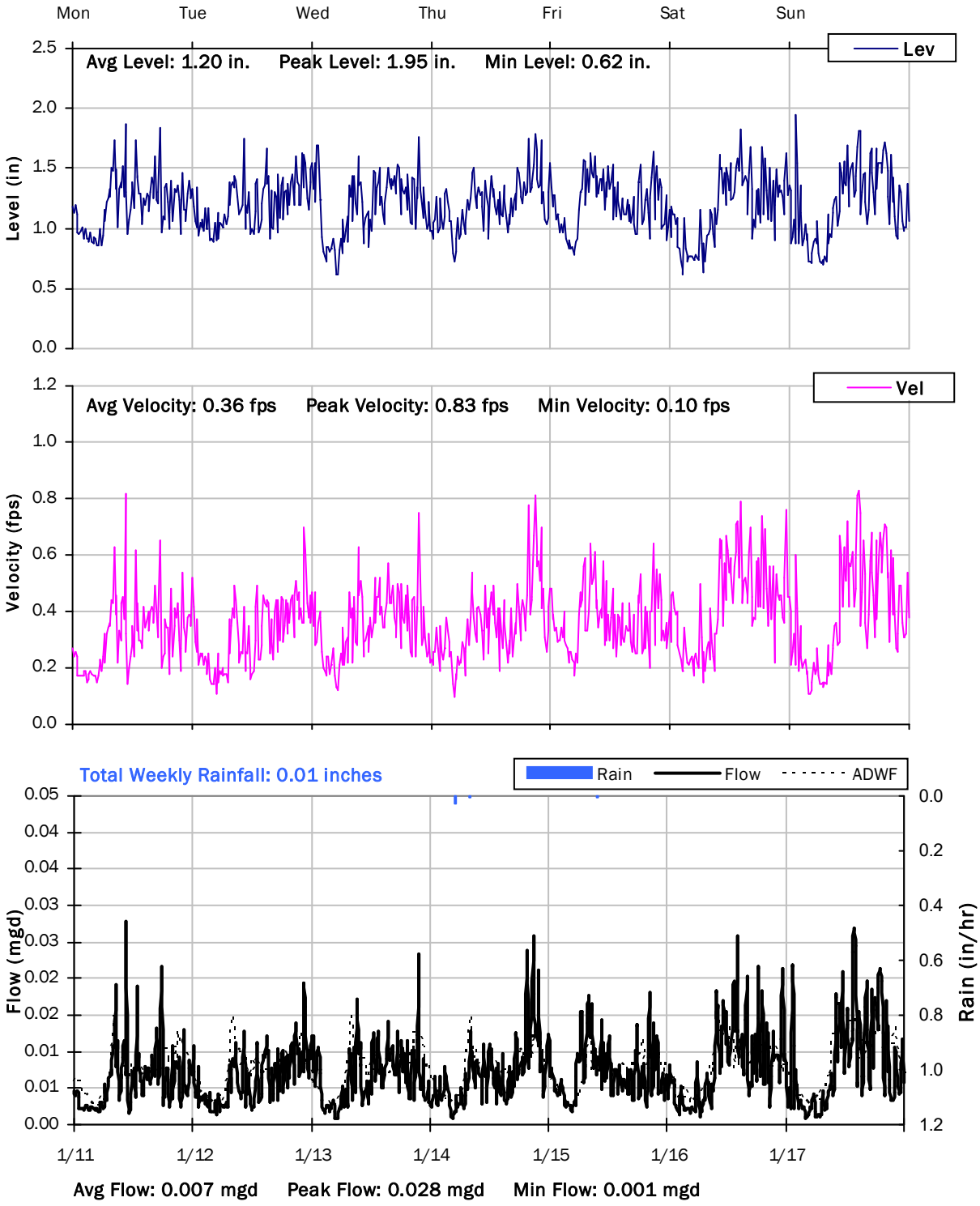
Storm Event I/I Analysis (Rain = 0.99 inches)

Capacity		Inflow / Infiltration	
Peak Flow:	0.03 *mgd*	**Peak I/I Rate:**	0.03 *mgd*
PF:	4.06	**Total I/I:**	4,000 *gallons*
Peak Level:	2.06 *in*		
d/D Ratio:	0.34		

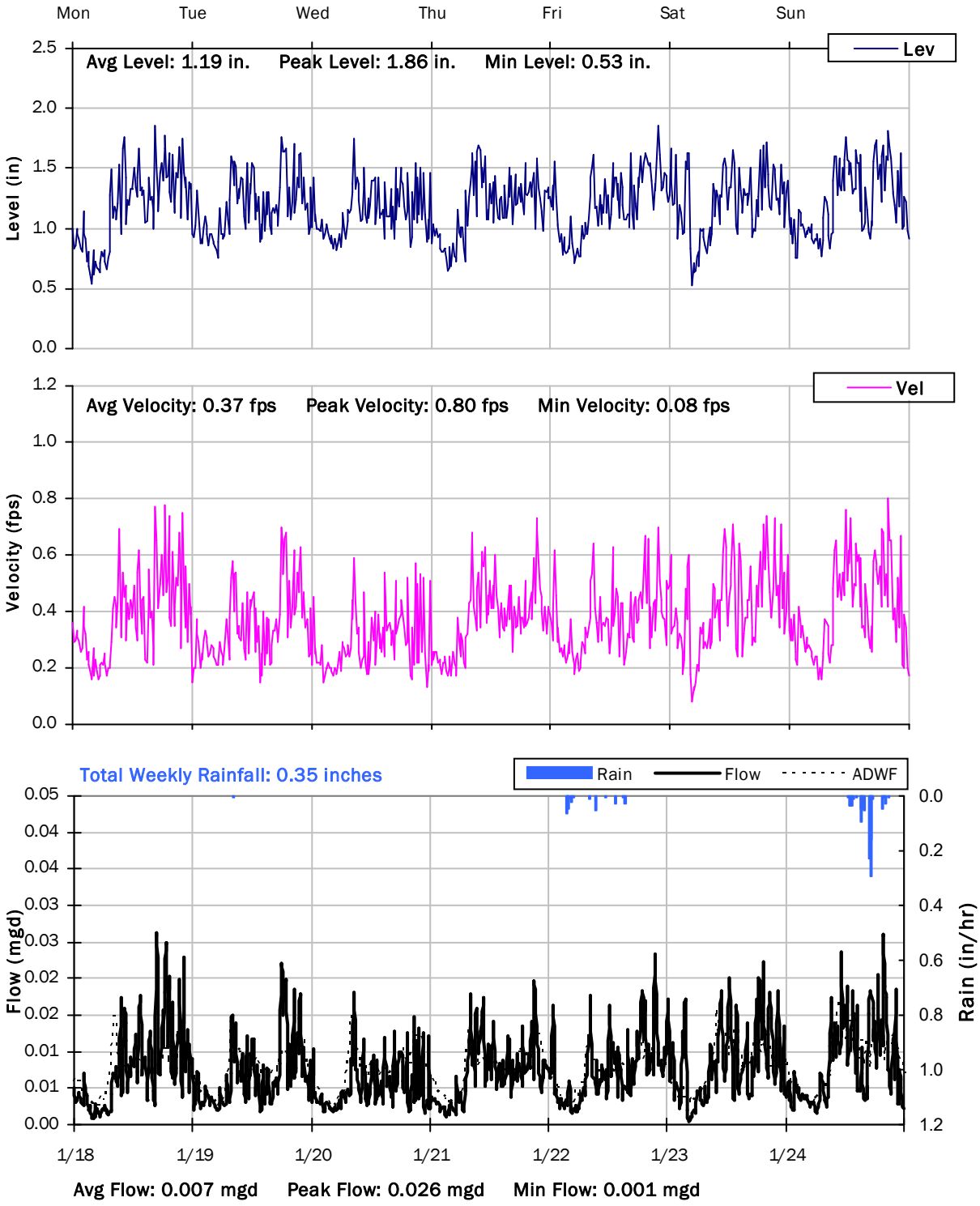
FM 1-1
Weekly Level, Velocity and Flow Hydrographs
1/4/2021 to 1/11/2021



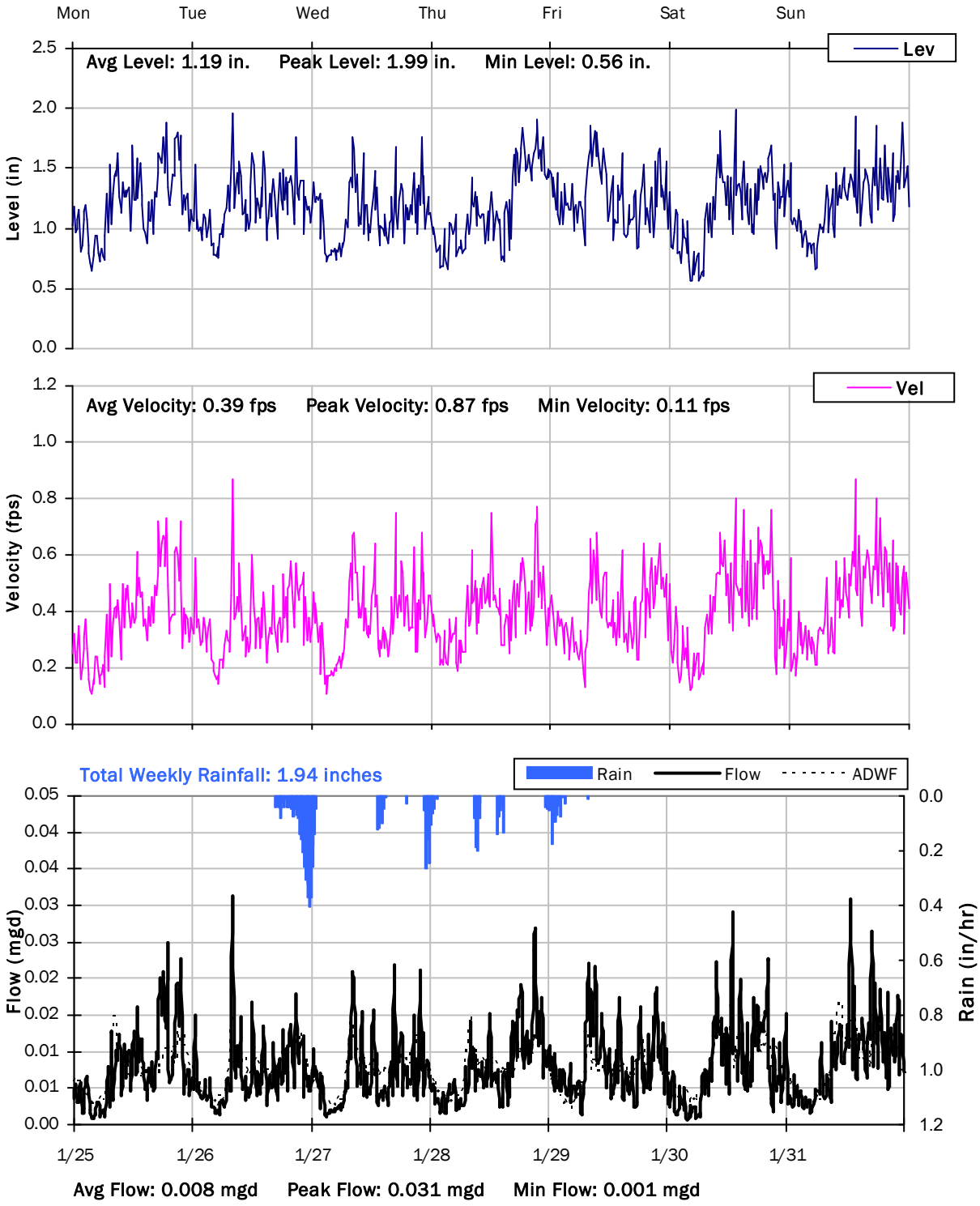
FM 1-1
Weekly Level, Velocity and Flow Hydrographs
1/11/2021 to 1/18/2021



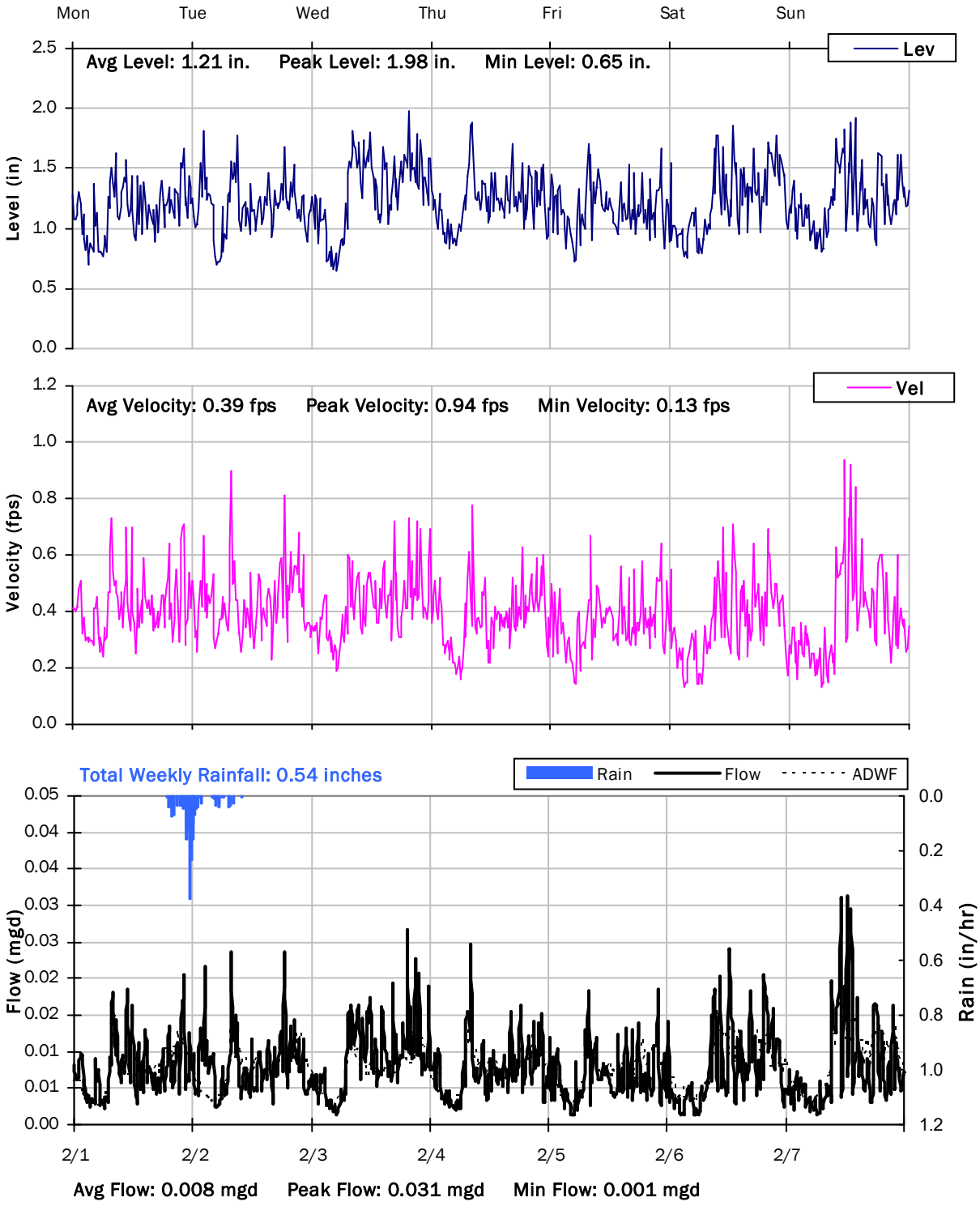
FM 1-1
Weekly Level, Velocity and Flow Hydrographs
1/18/2021 to 1/25/2021



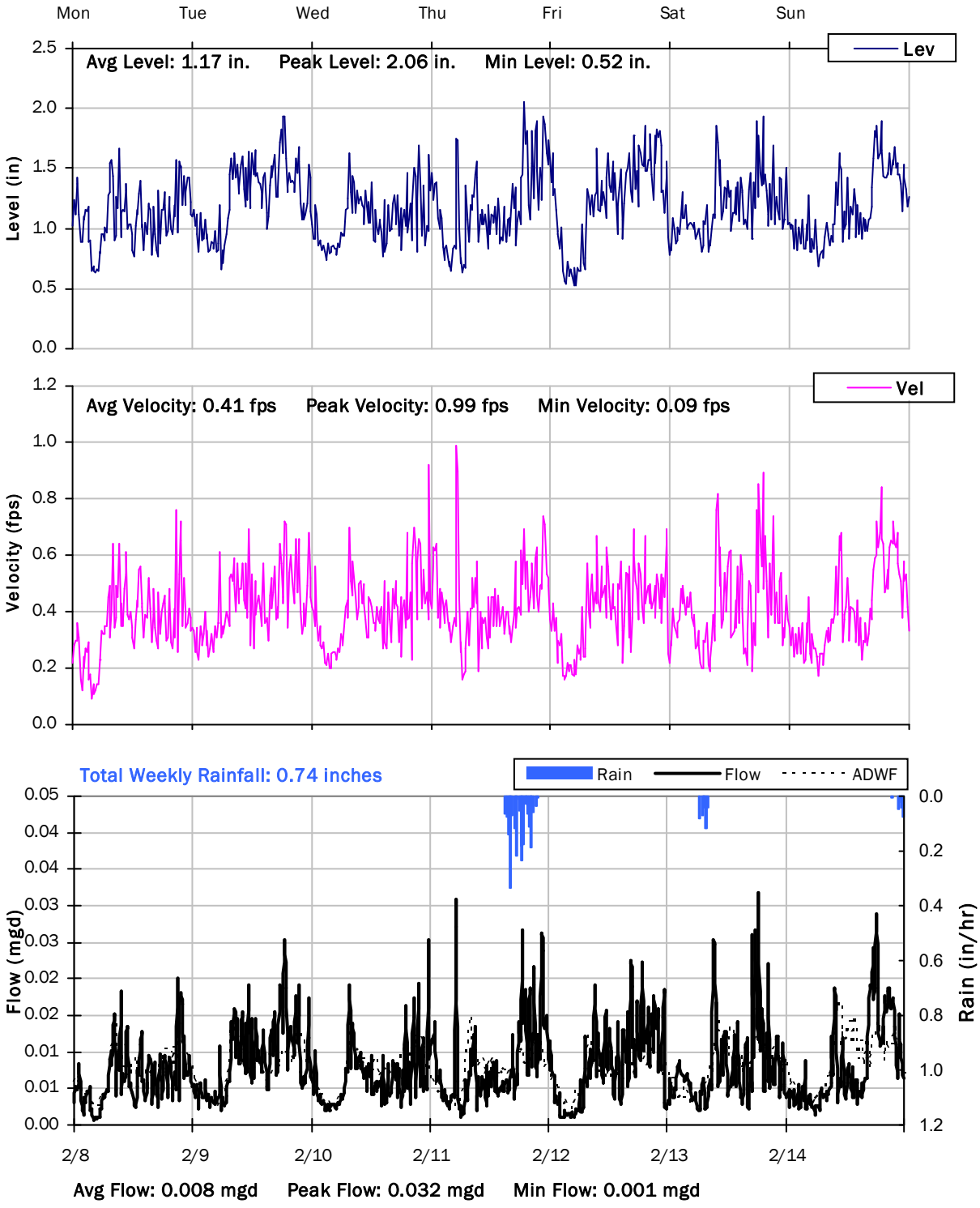
FM 1-1
Weekly Level, Velocity and Flow Hydrographs
1/25/2021 to 2/1/2021



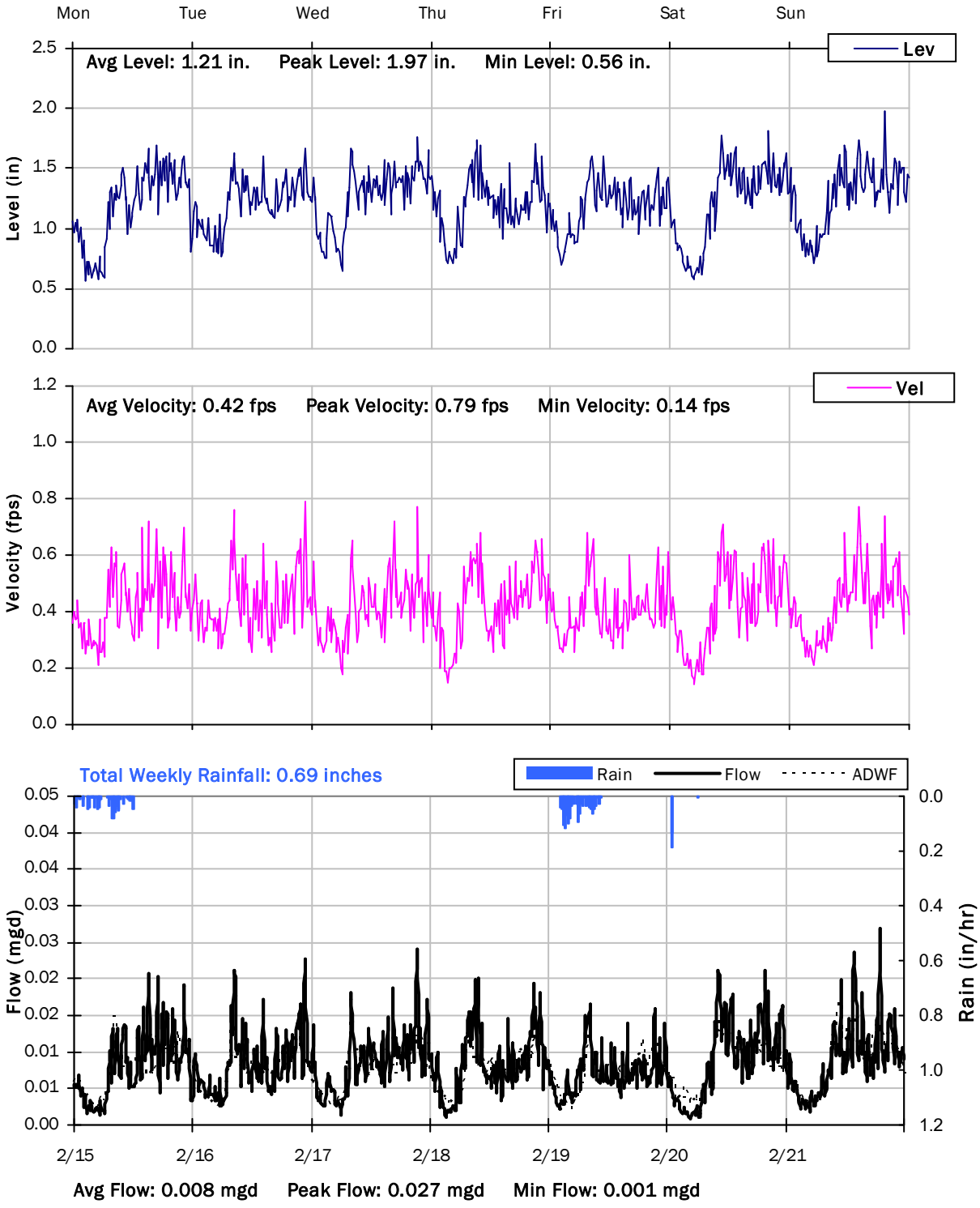
FM 1-1
Weekly Level, Velocity and Flow Hydrographs
2/1/2021 to 2/8/2021



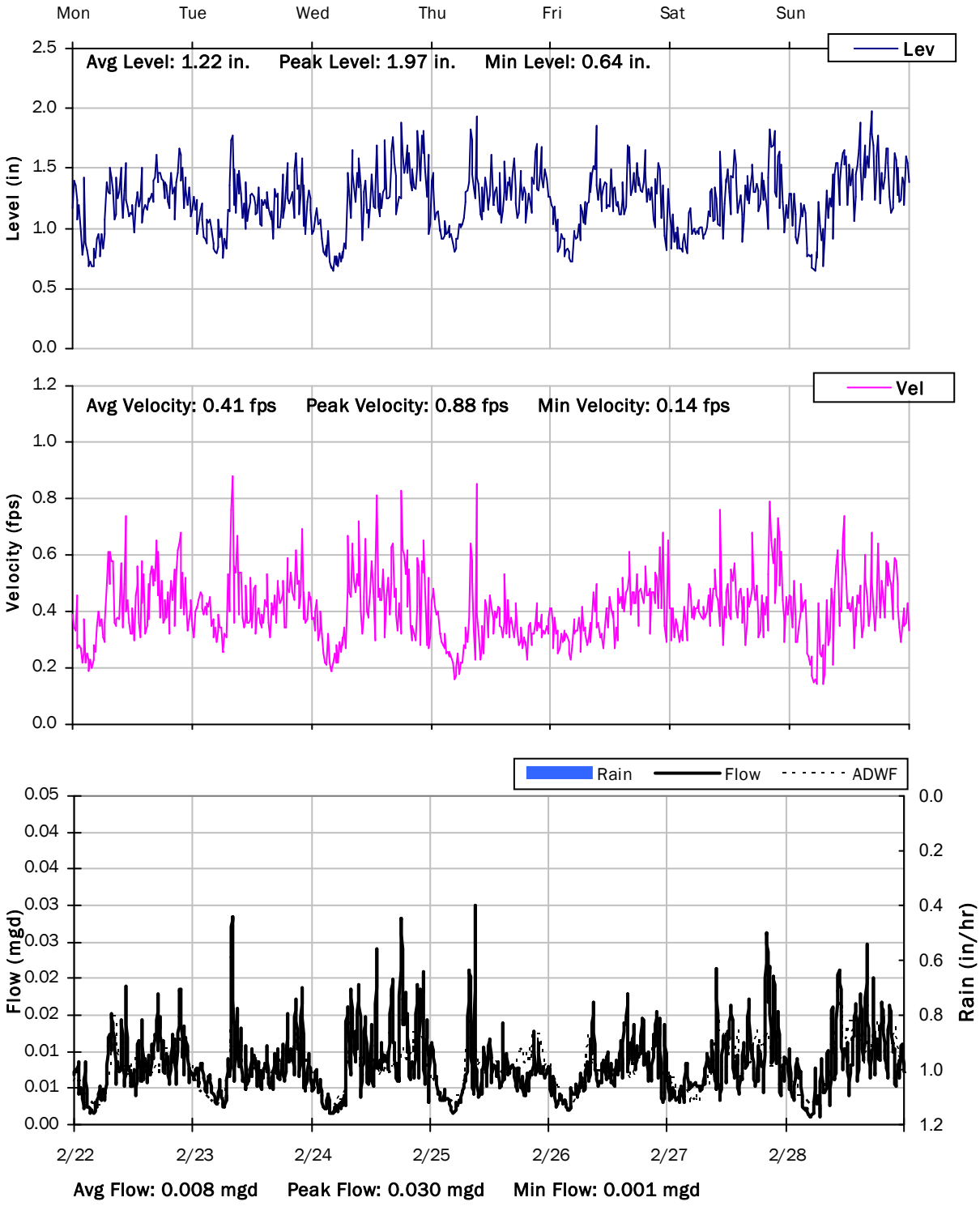
FM 1-1
Weekly Level, Velocity and Flow Hydrographs
2/8/2021 to 2/15/2021



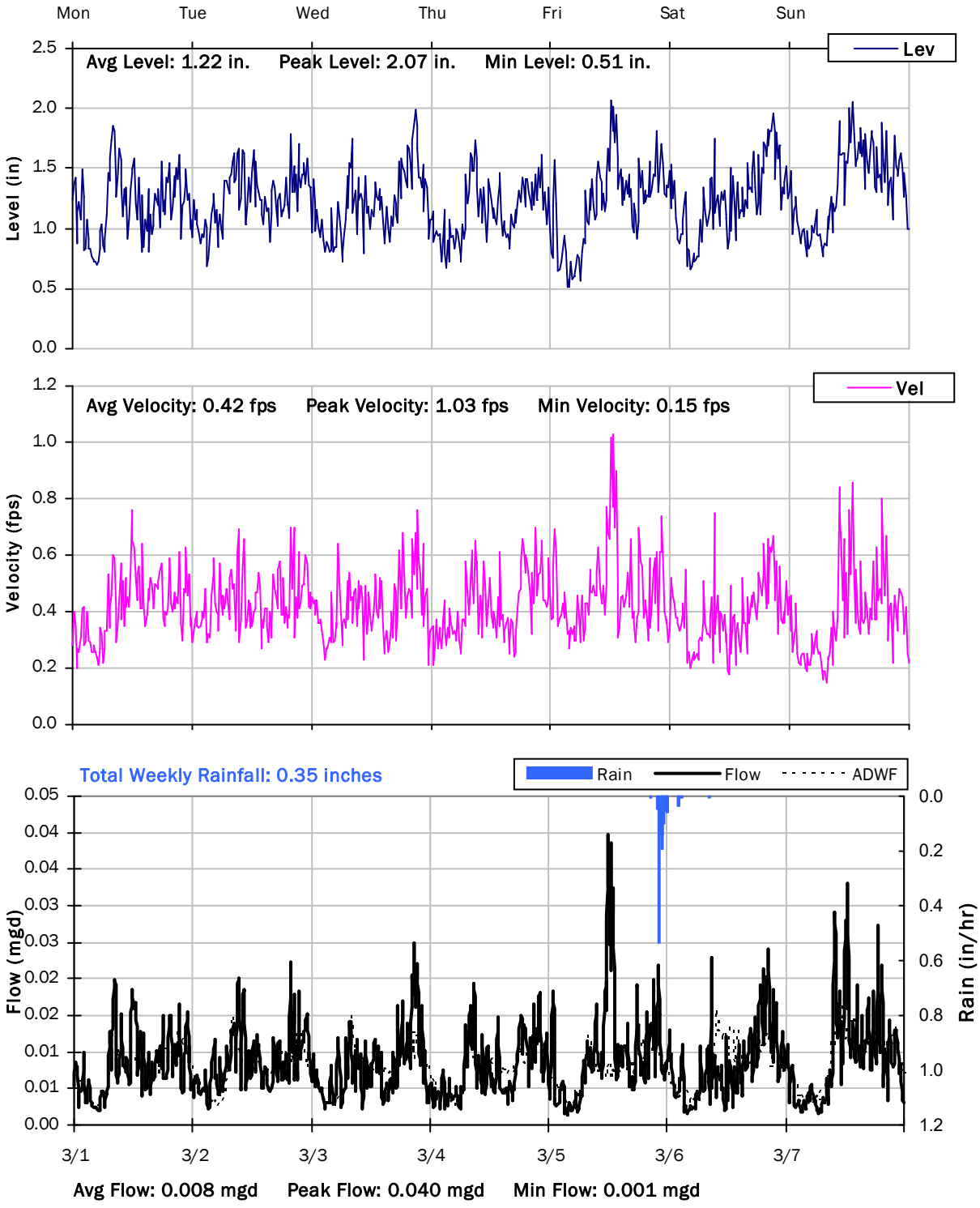
FM 1-1
Weekly Level, Velocity and Flow Hydrographs
2/15/2021 to 2/22/2021



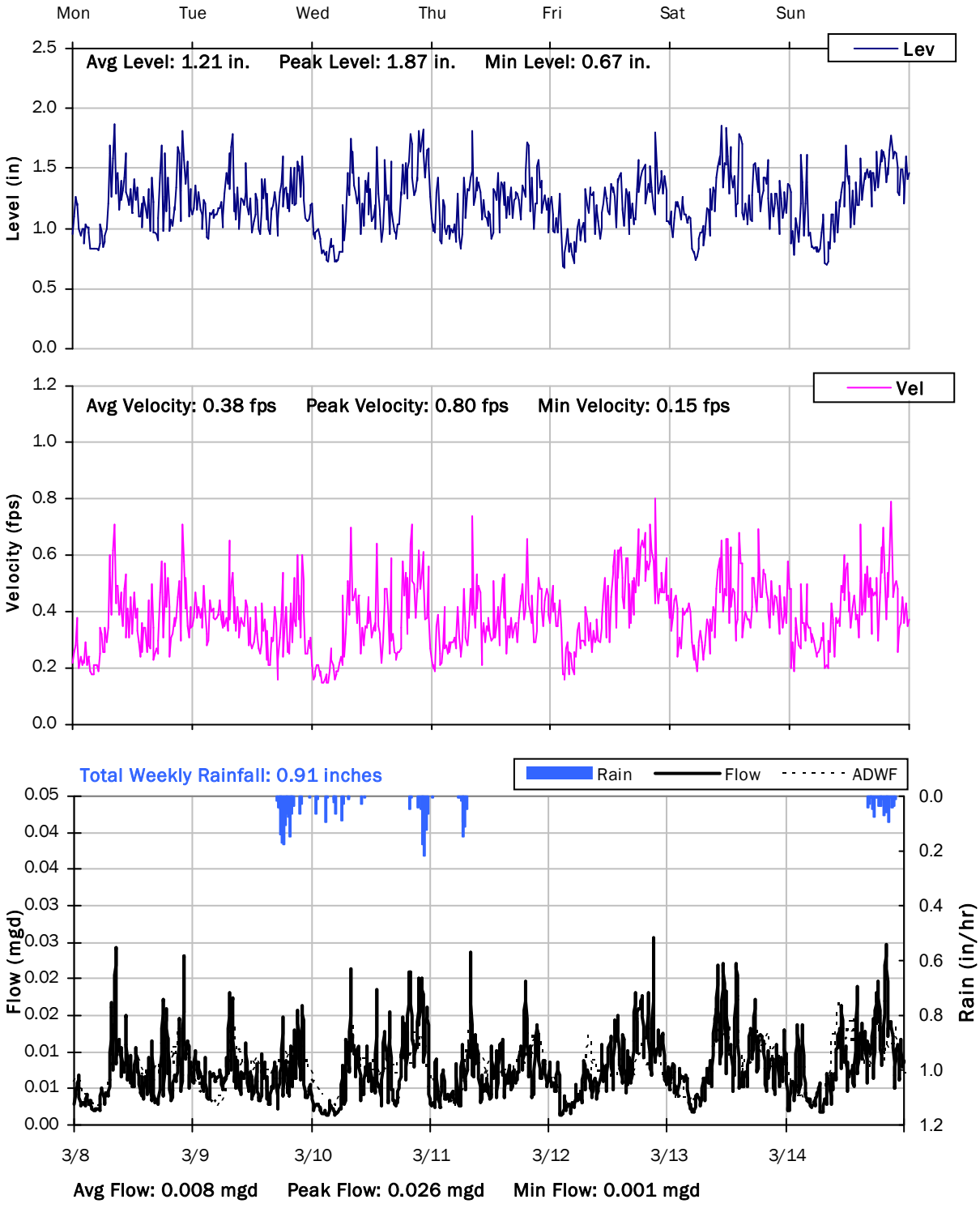
FM 1-1
Weekly Level, Velocity and Flow Hydrographs
2/22/2021 to 3/1/2021



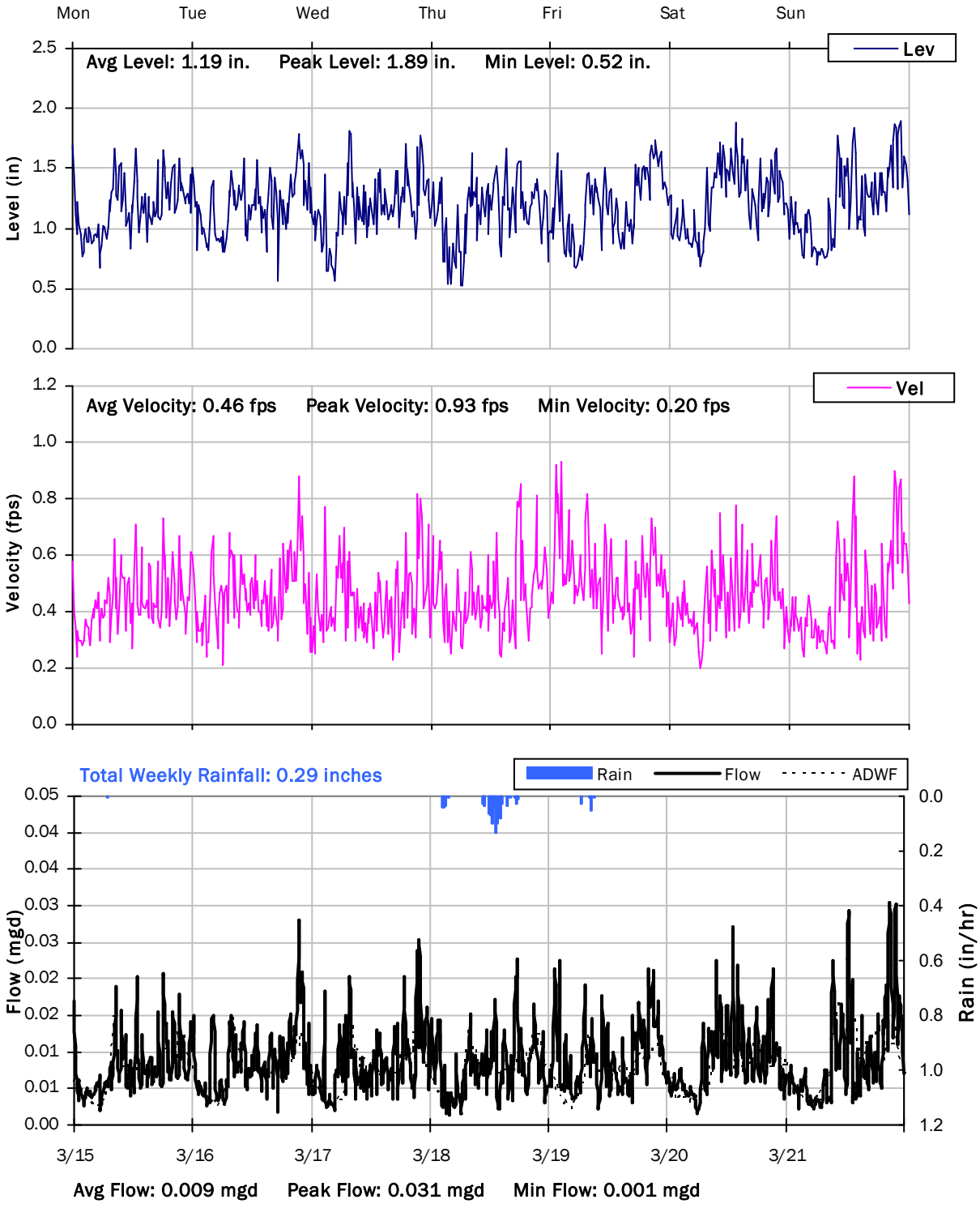
FM 1-1
Weekly Level, Velocity and Flow Hydrographs
3/1/2021 to 3/8/2021



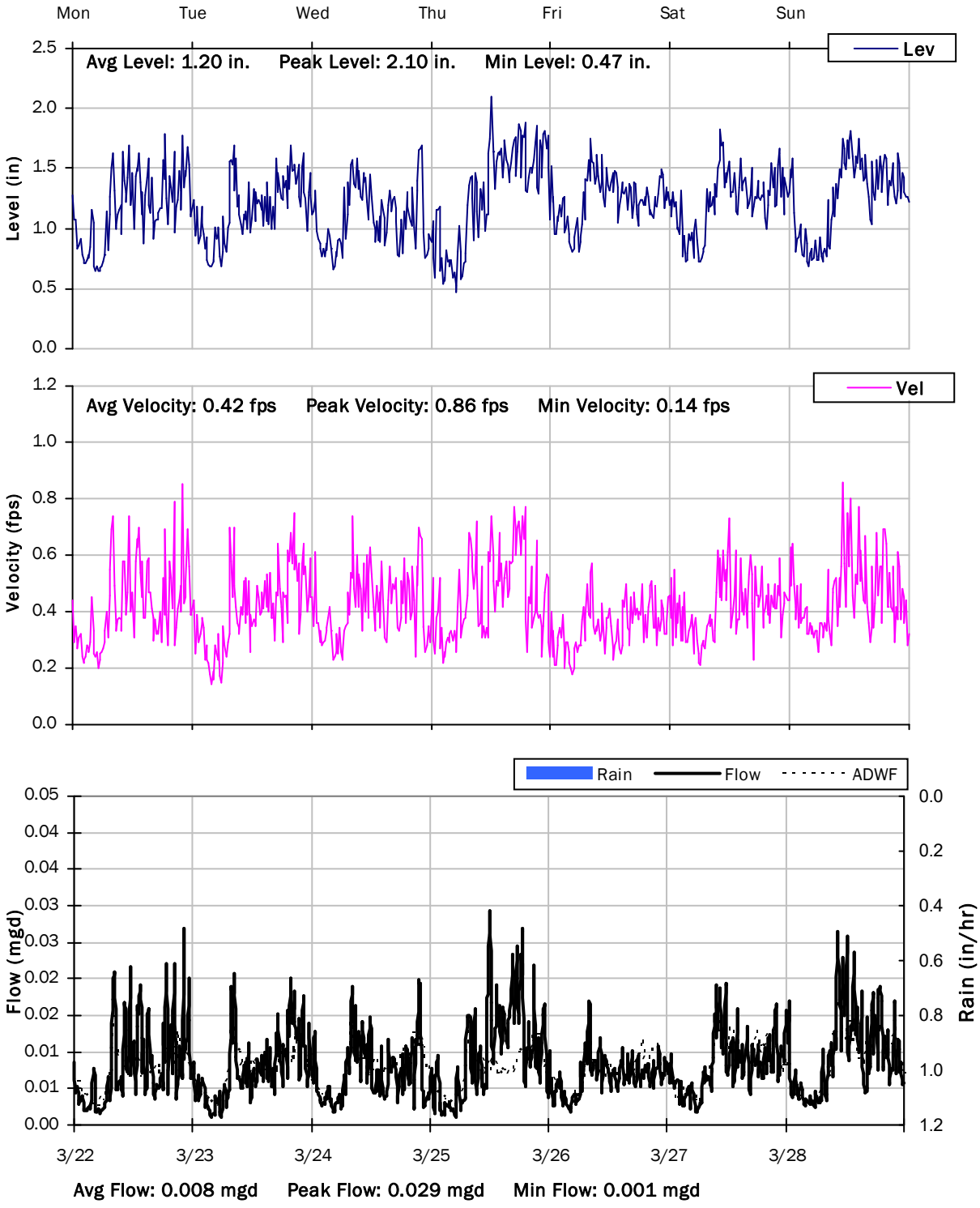
FM 1-1
Weekly Level, Velocity and Flow Hydrographs
3/8/2021 to 3/15/2021



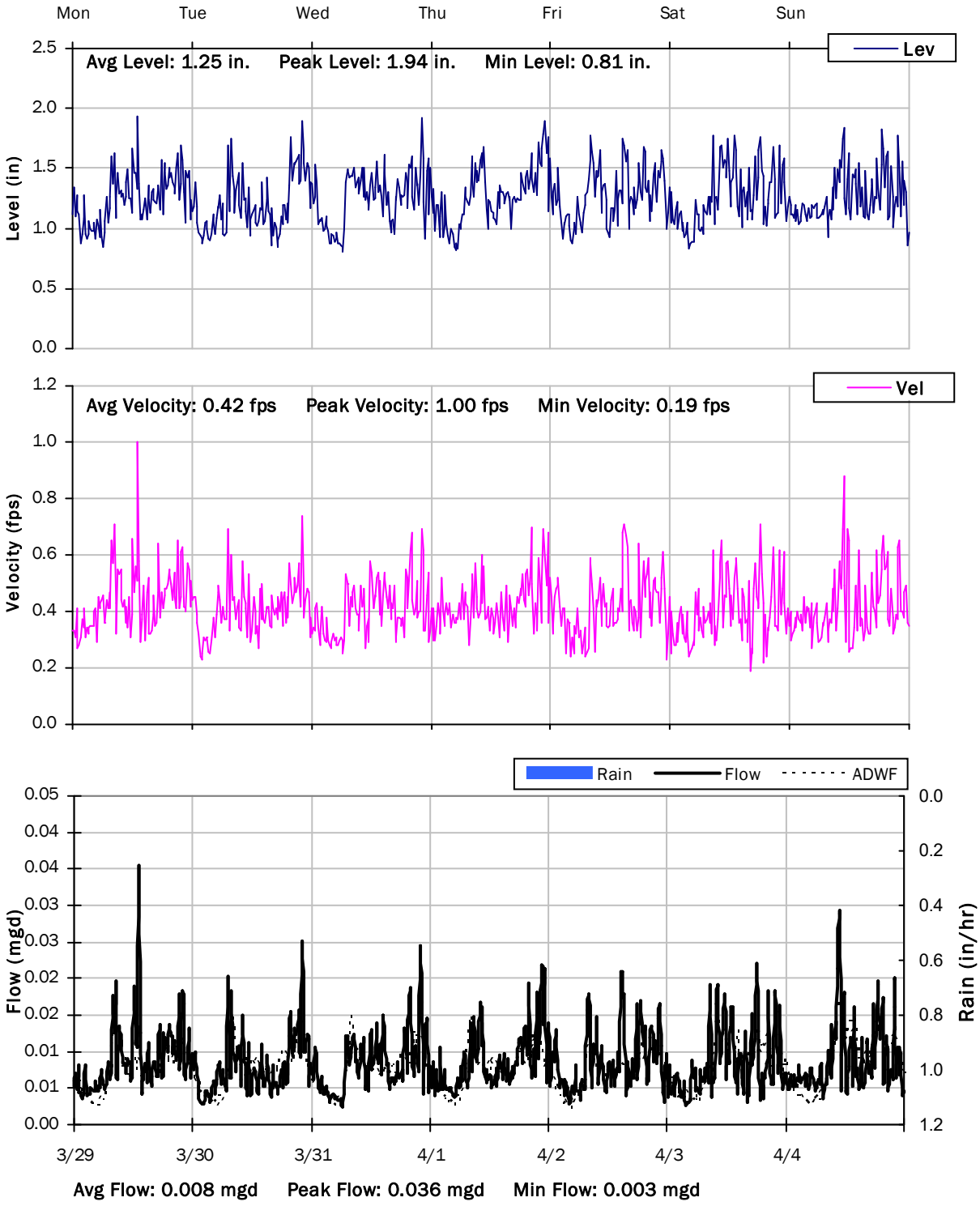
FM 1-1
Weekly Level, Velocity and Flow Hydrographs
3/15/2021 to 3/22/2021



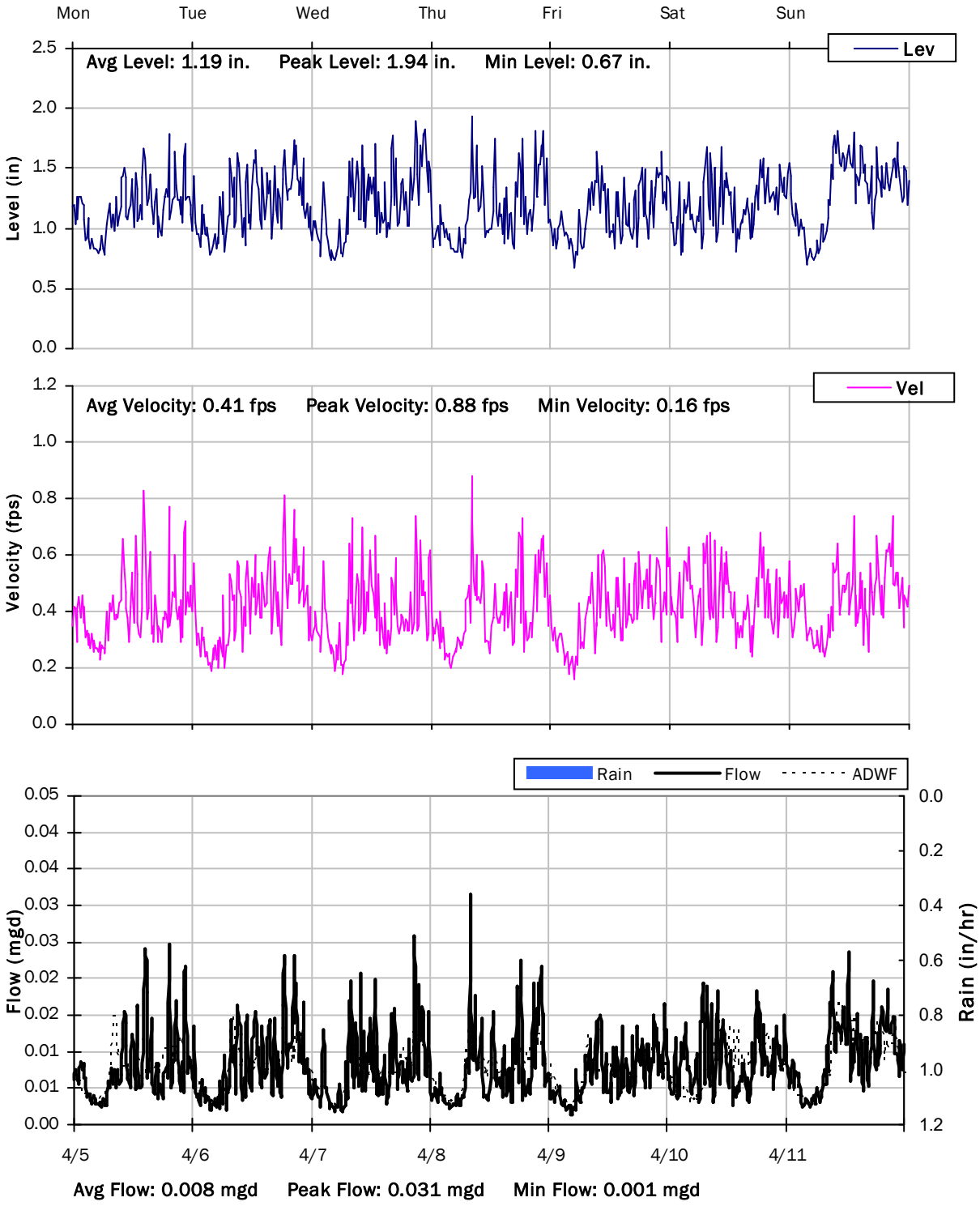
FM 1-1
Weekly Level, Velocity and Flow Hydrographs
3/22/2021 to 3/29/2021



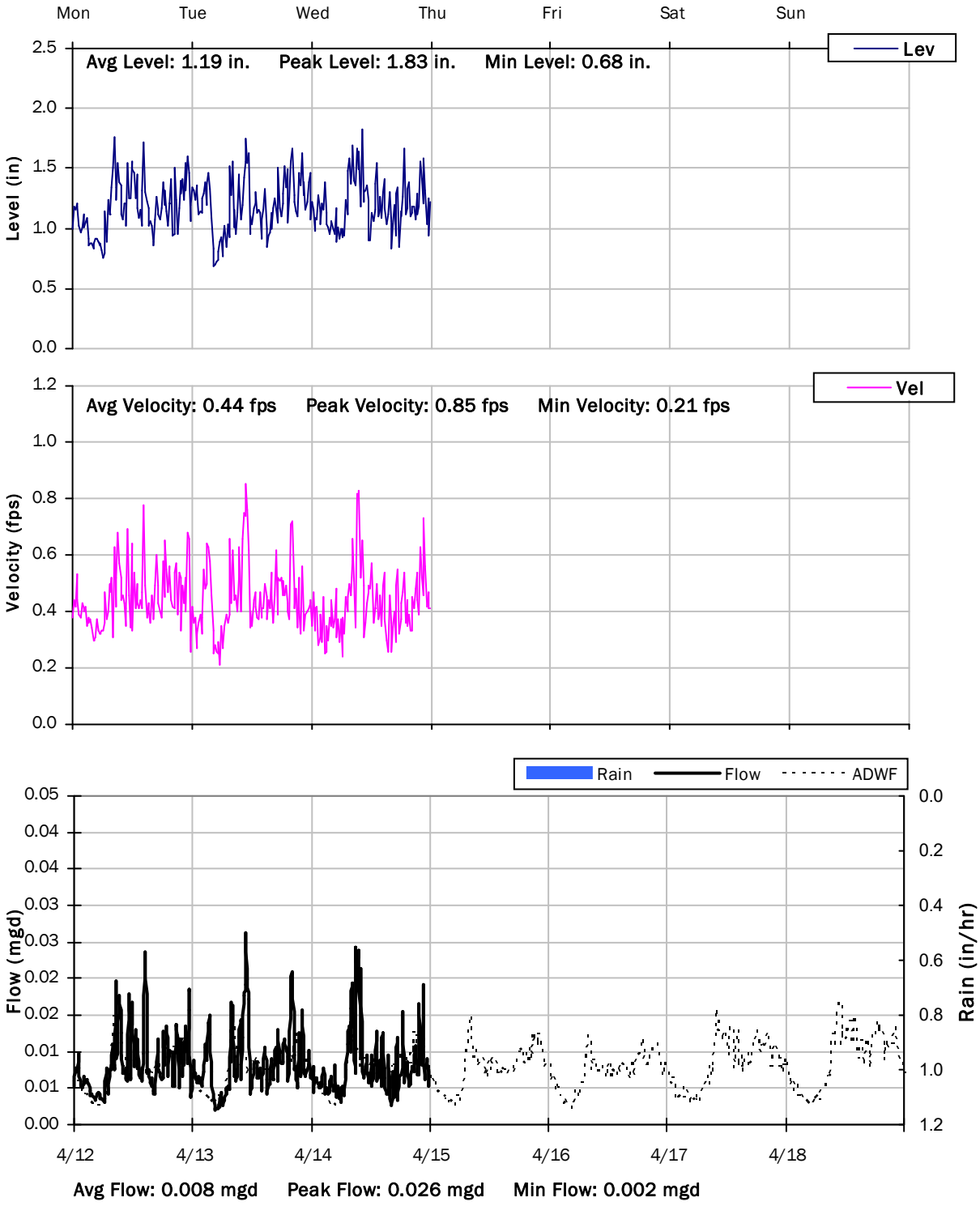
FM 1-1
Weekly Level, Velocity and Flow Hydrographs
3/29/2021 to 4/5/2021



FM 1-1
Weekly Level, Velocity and Flow Hydrographs
4/5/2021 to 4/12/2021



FM 1-1
Weekly Level, Velocity and Flow Hydrographs
4/12/2021 to 4/19/2021



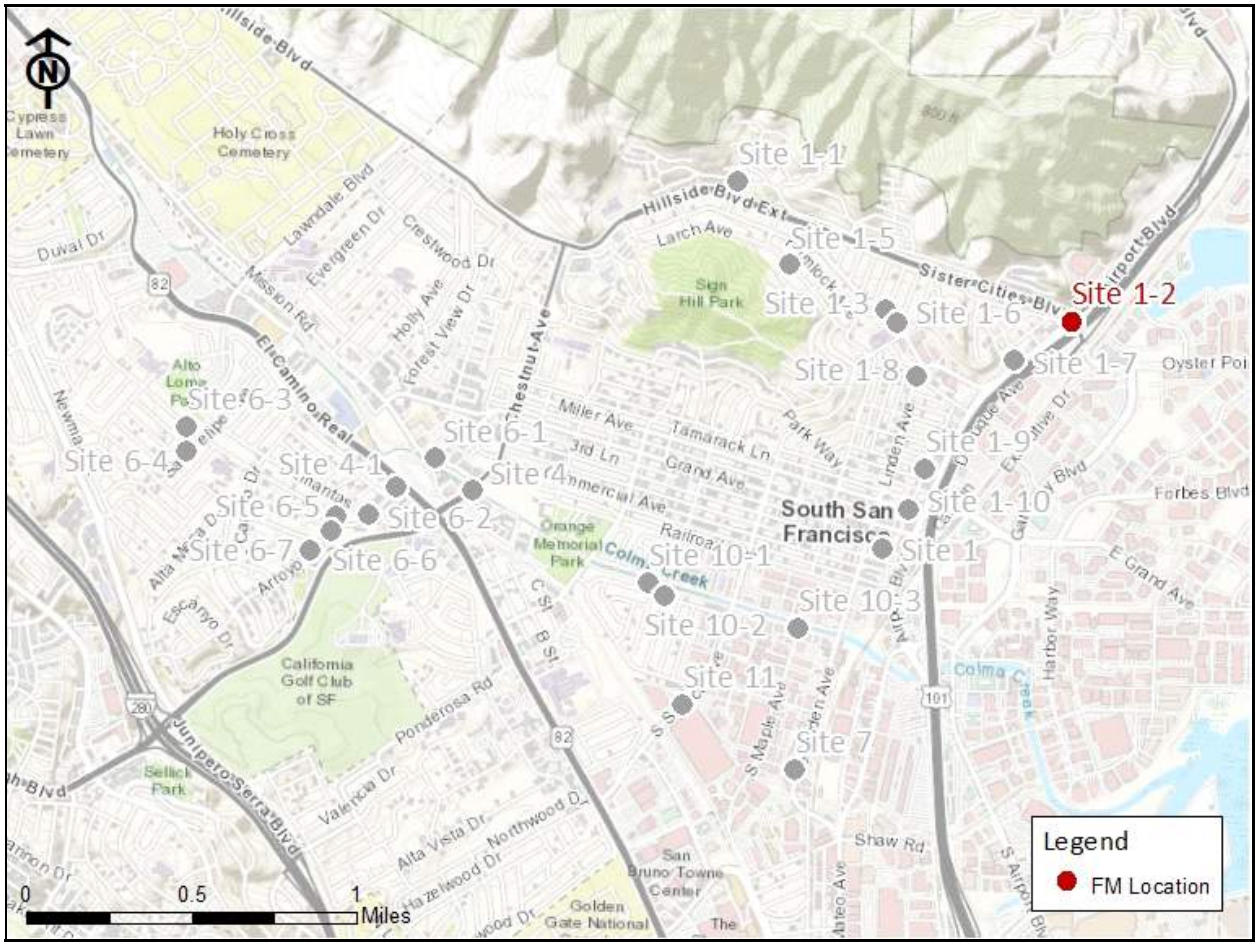
South San Francisco, CA

Sanitary Sewer Flow Monitoring
January 4 - April 14, 2021

Monitoring Site: FM 1-2

Location: Airport Boulevard at Oyster Point Boulevard

Data Summary Report



Vicinity Map: FM 1-2

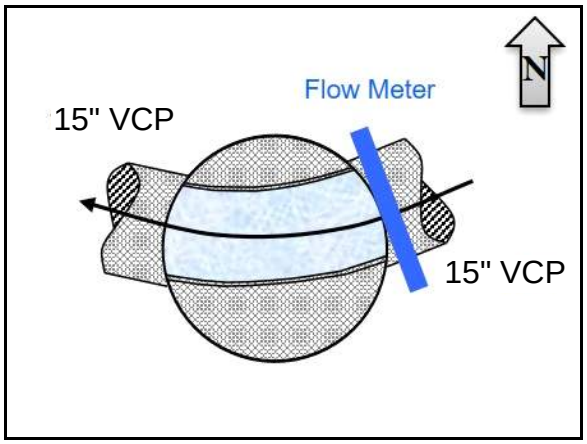
FM 1-2

Site Information

Location:	Airport Boulevard at Oyster Point Boulevard
Coordinates:	122.3993° W, 37.6642° N
Rim Elevation (Earth):	31 feet
Pipe Diameter:	15 inches
ADWF:	0.088 mgd
Peak Measured Flow:	0.185 mgd

Satellite Map

Sanitary Map



Flow Sketch

Street View

Plan View

FM 1-2

Additional Site Photos

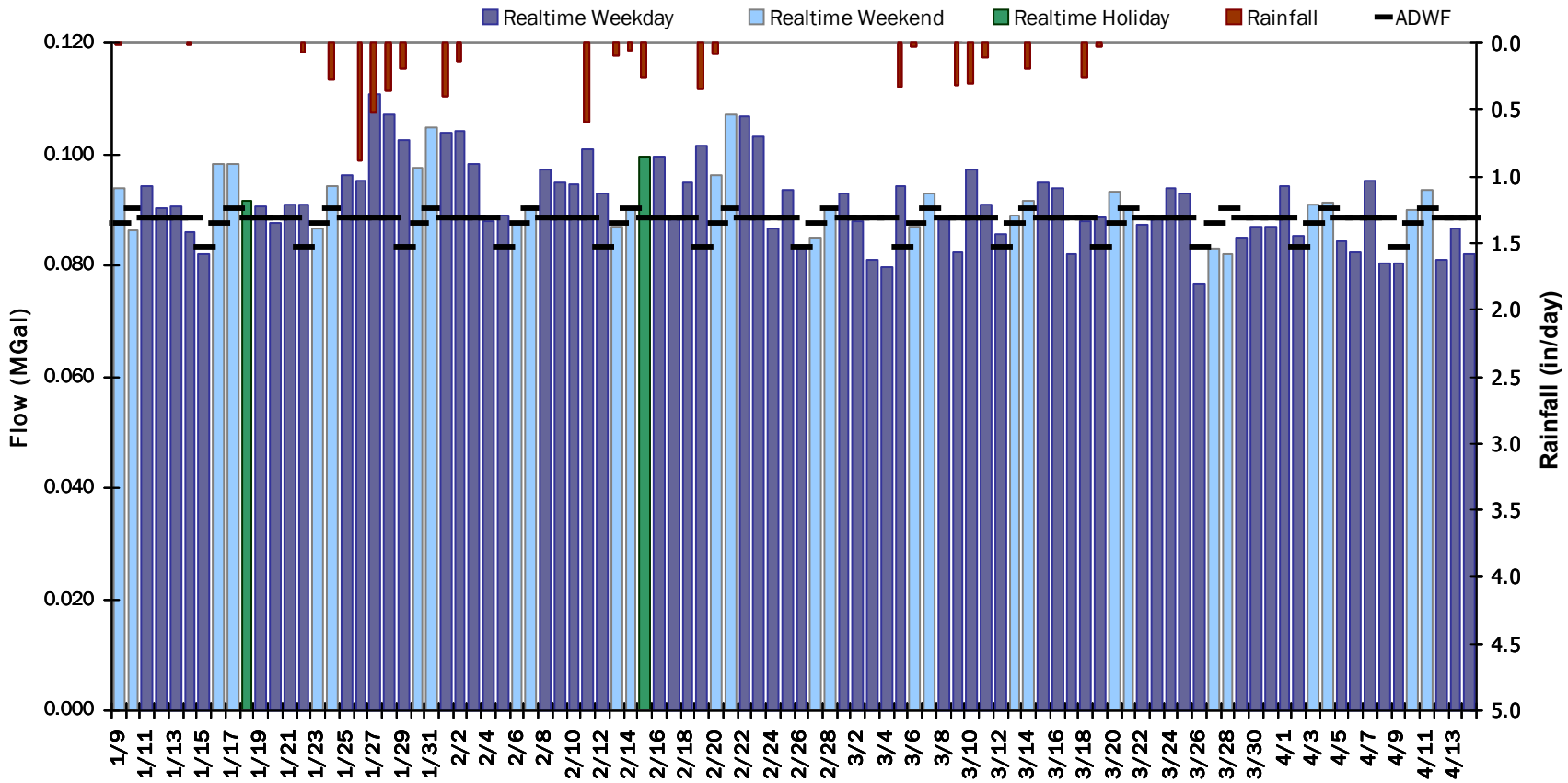
Effluent Pipe

Monitored Influent Pipe

FM 1-2
Period Flow Summary: Daily Flow Totals

Avg Period Flow: 0.091 MGal Peak Daily Flow: 0.111 MGal Min Daily Flow: 0.077 MGal

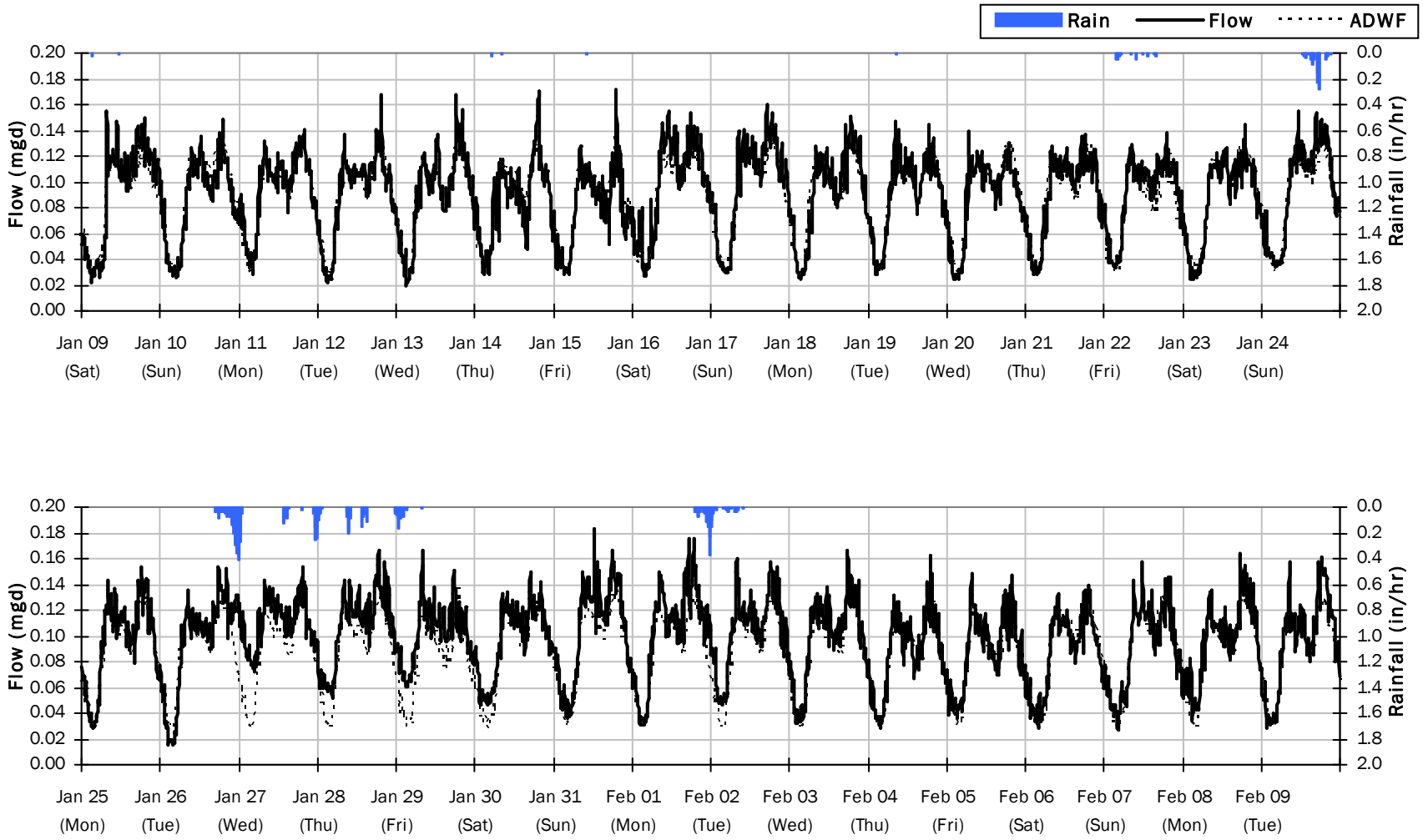
Total Period Rainfall: 5.88 inches



FM 1-2

Flow Summary: 1/9/2021 to 2/9/2021

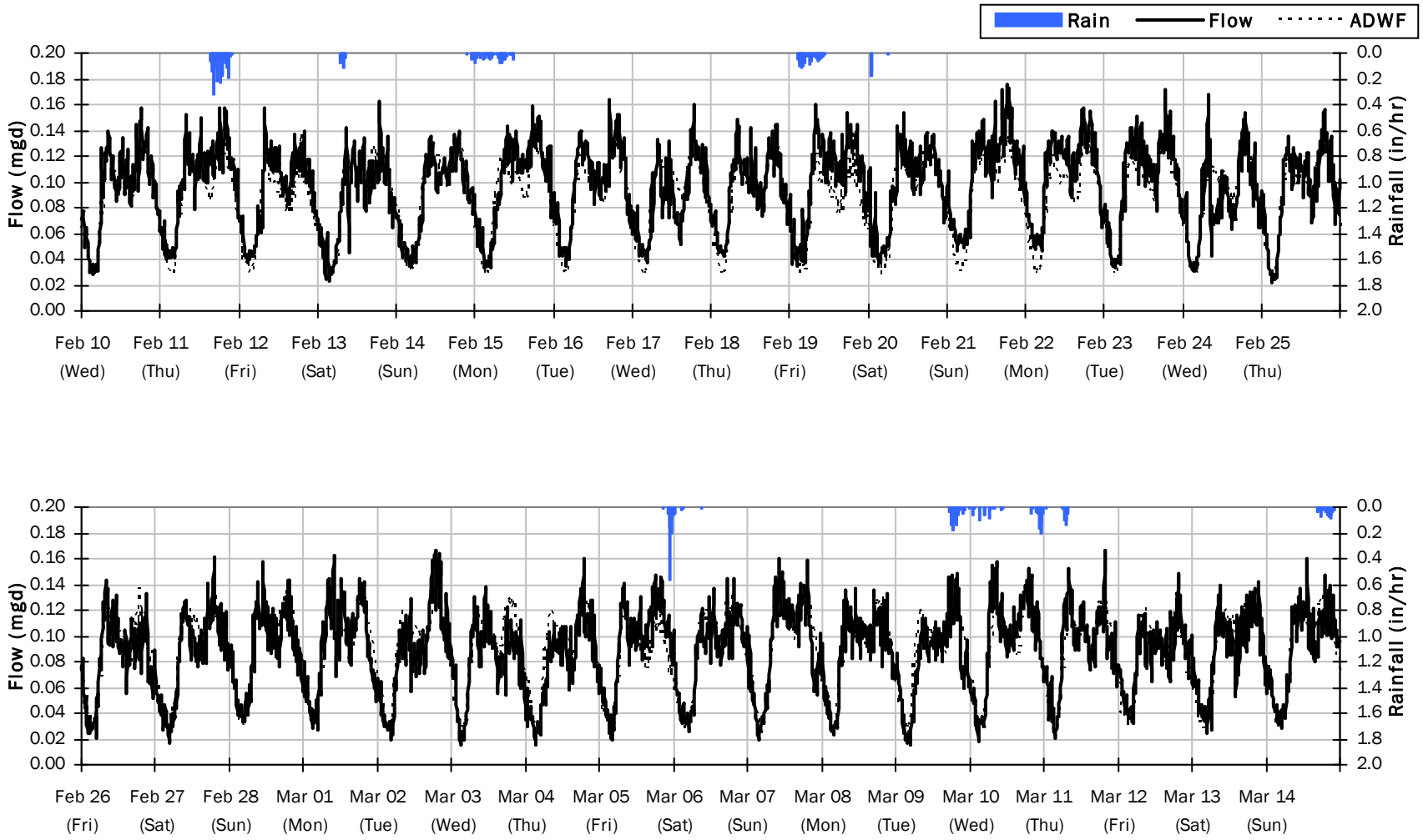
Total Period Rainfall: 2.87 inches Avg Flow: 0.094 mgd Peak Flow: 0.183 mgd Min Flow: 0.015 mgd



FM 1-2

Flow Summary: 2/10/2021 to 3/14/2021

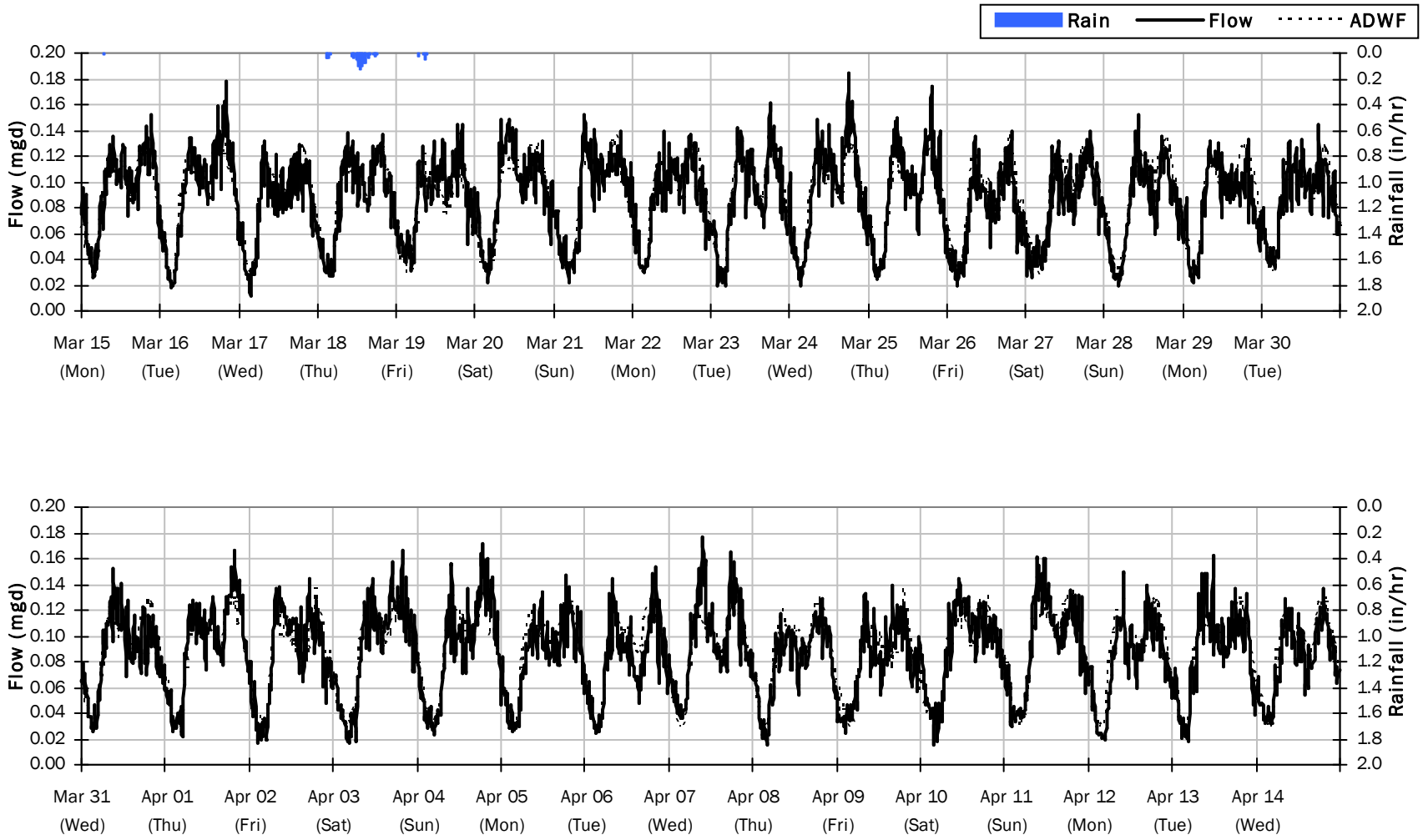
Total Period Rainfall: 2.73 inches Avg Flow: 0.092 mgd Peak Flow: 0.174 mgd Min Flow: 0.015 mgd



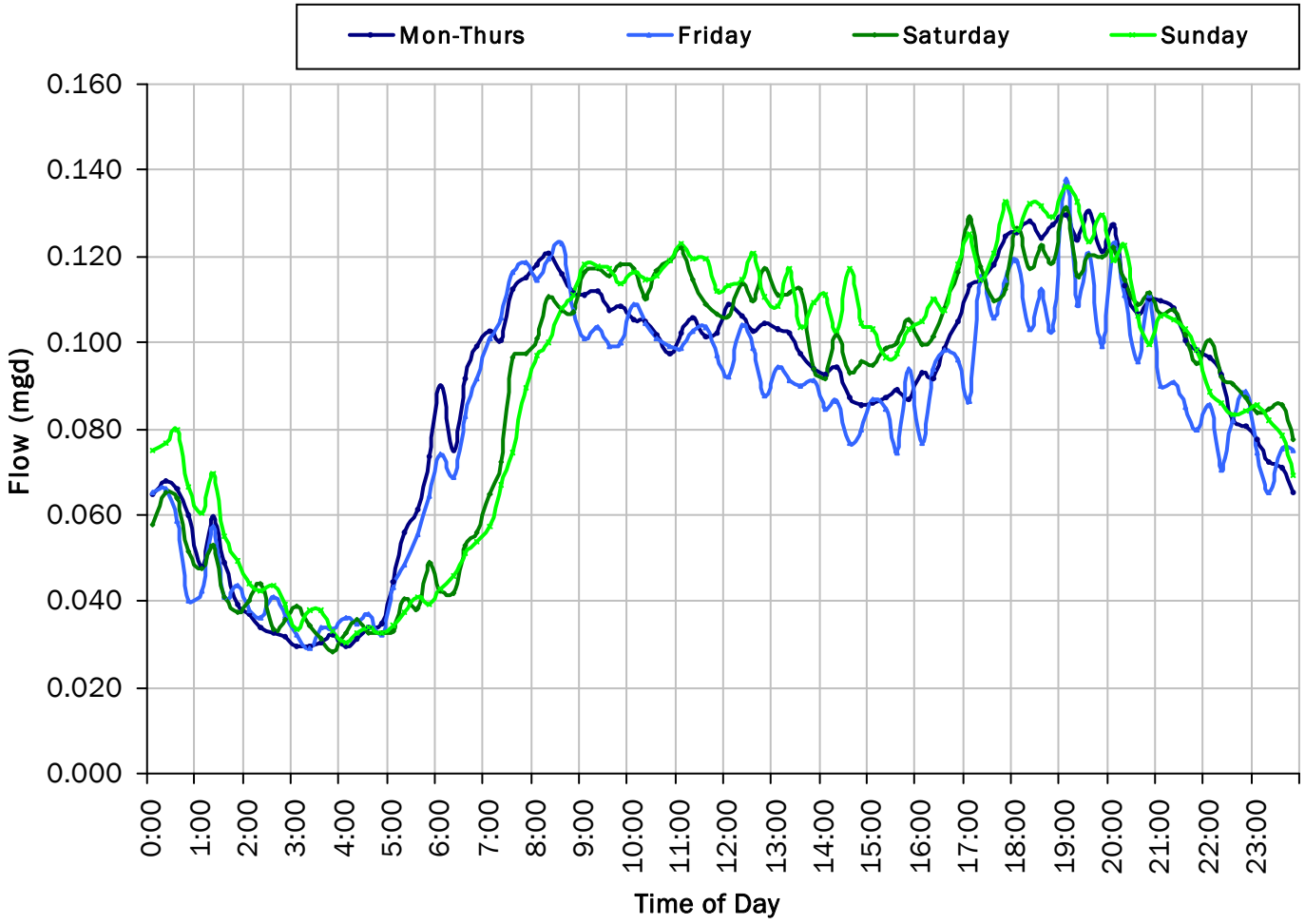
FM 1-2

Flow Summary: 3/15/2021 to 4/14/2021

Total Period Rainfall: 0.28 inches Avg Flow: 0.087 mgd Peak Flow: 0.185 mgd Min Flow: 0.012 mgd

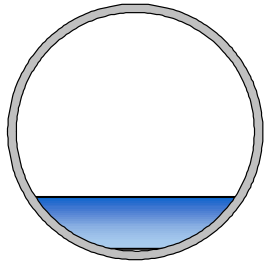


FM 1-2
Average Dry Weather Flow Hydrographs



ADWF:

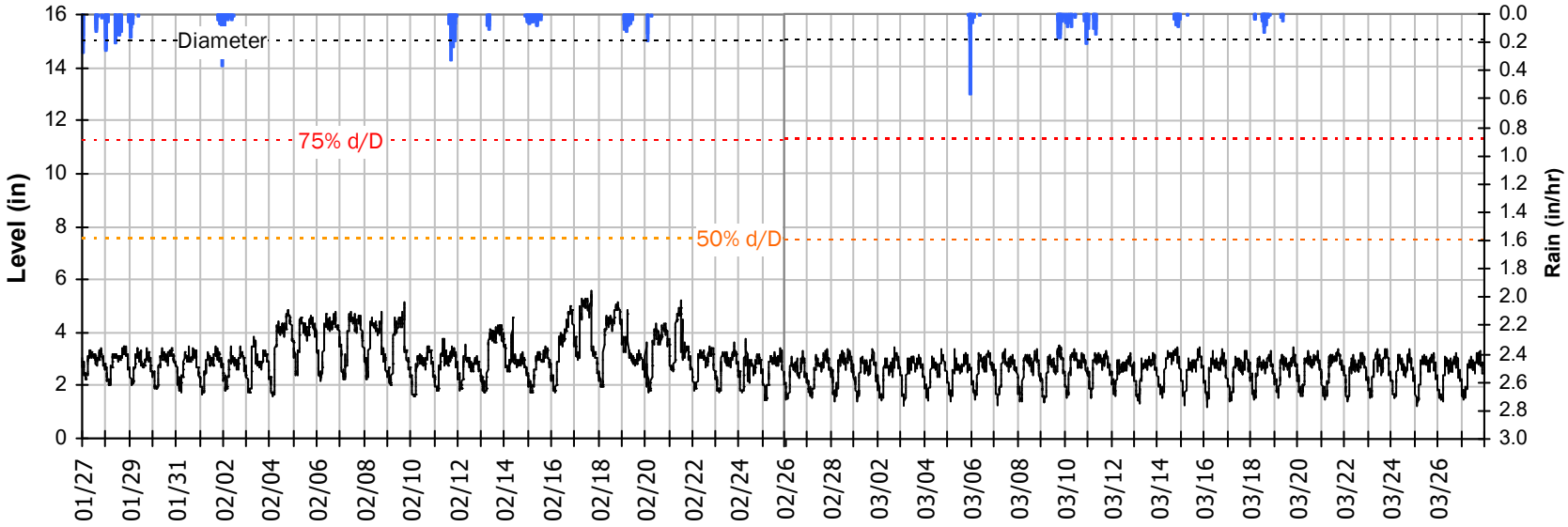
0.088 *mgd*

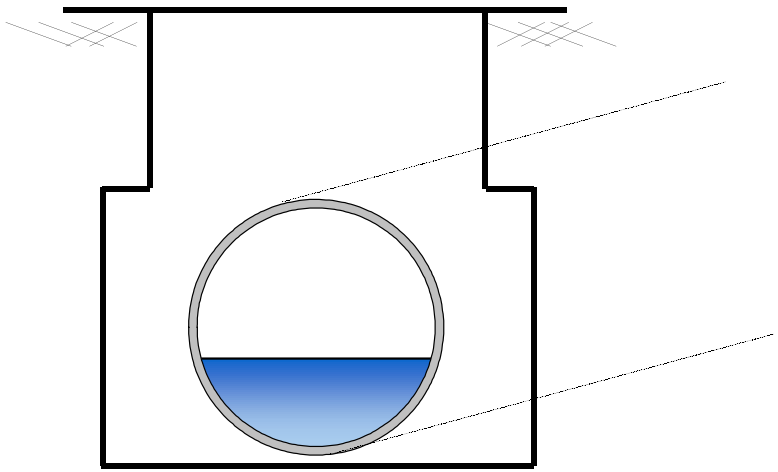


FM 1-2

Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Monitoring Period

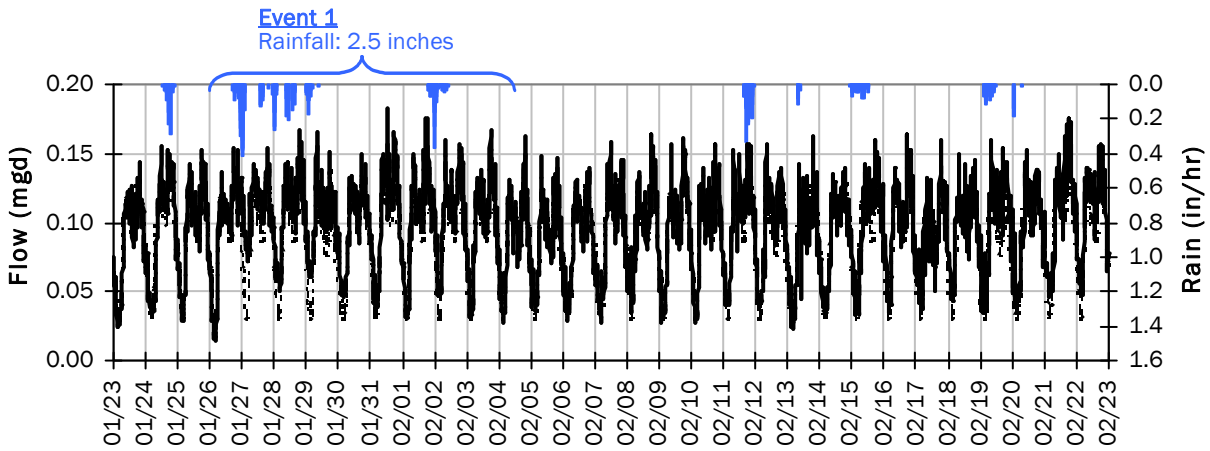




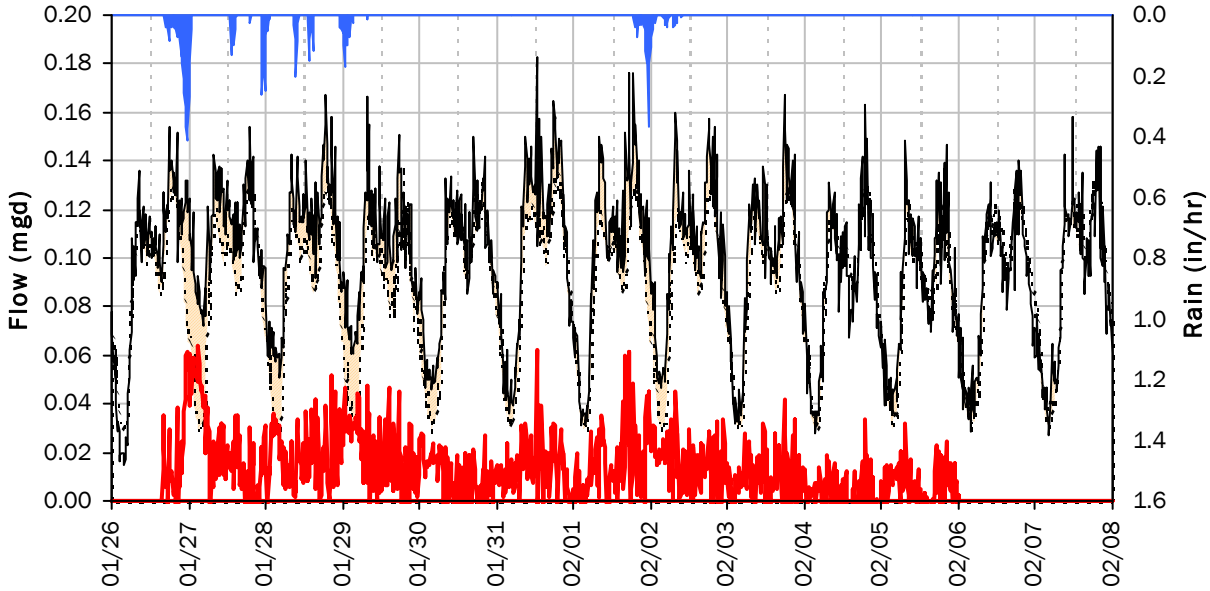
Pipe Diameter:	15	*inches*
Peak Measured Level:	5.57	*inches*
Peak d/D Ratio:	0.37	

FM 1-2
I/I Summary: Event 1

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



Event 1 Detail Graph

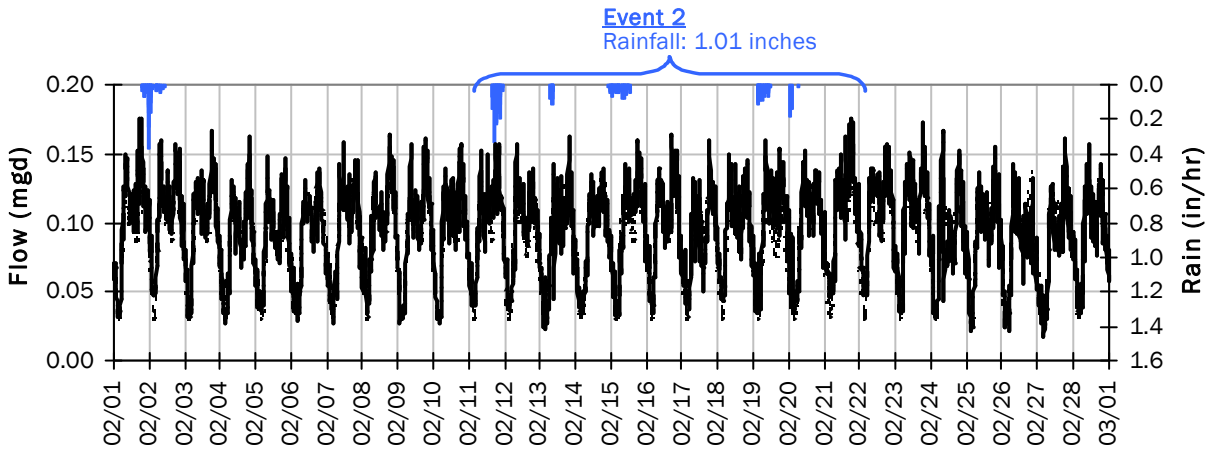


Storm Event I/I Analysis (Rain = 2.50 inches)

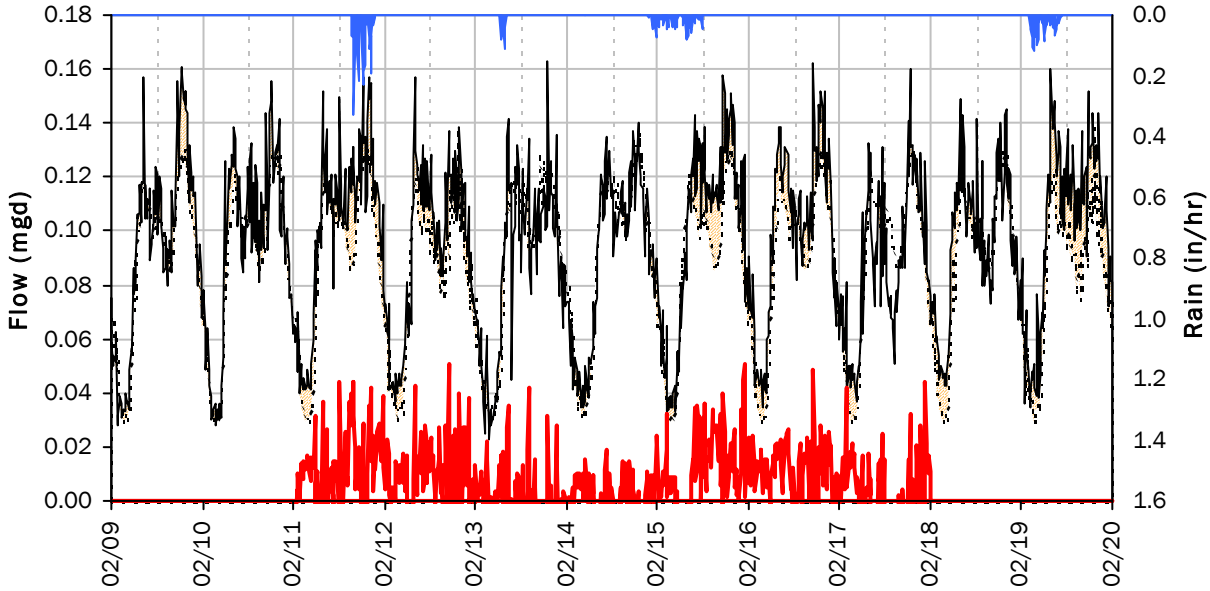
Capacity		Inflow / Infiltration	
Peak Flow:	0.18 *mgd*	**Peak I/I Rate:**	0.06 *mgd*
PF:	2.08	**Total I/I:**	137,000 *gallons*
Peak Level:	4.87 *in*		
d/D Ratio:	0.32		

FM 1-2
I/I Summary: Event 2

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



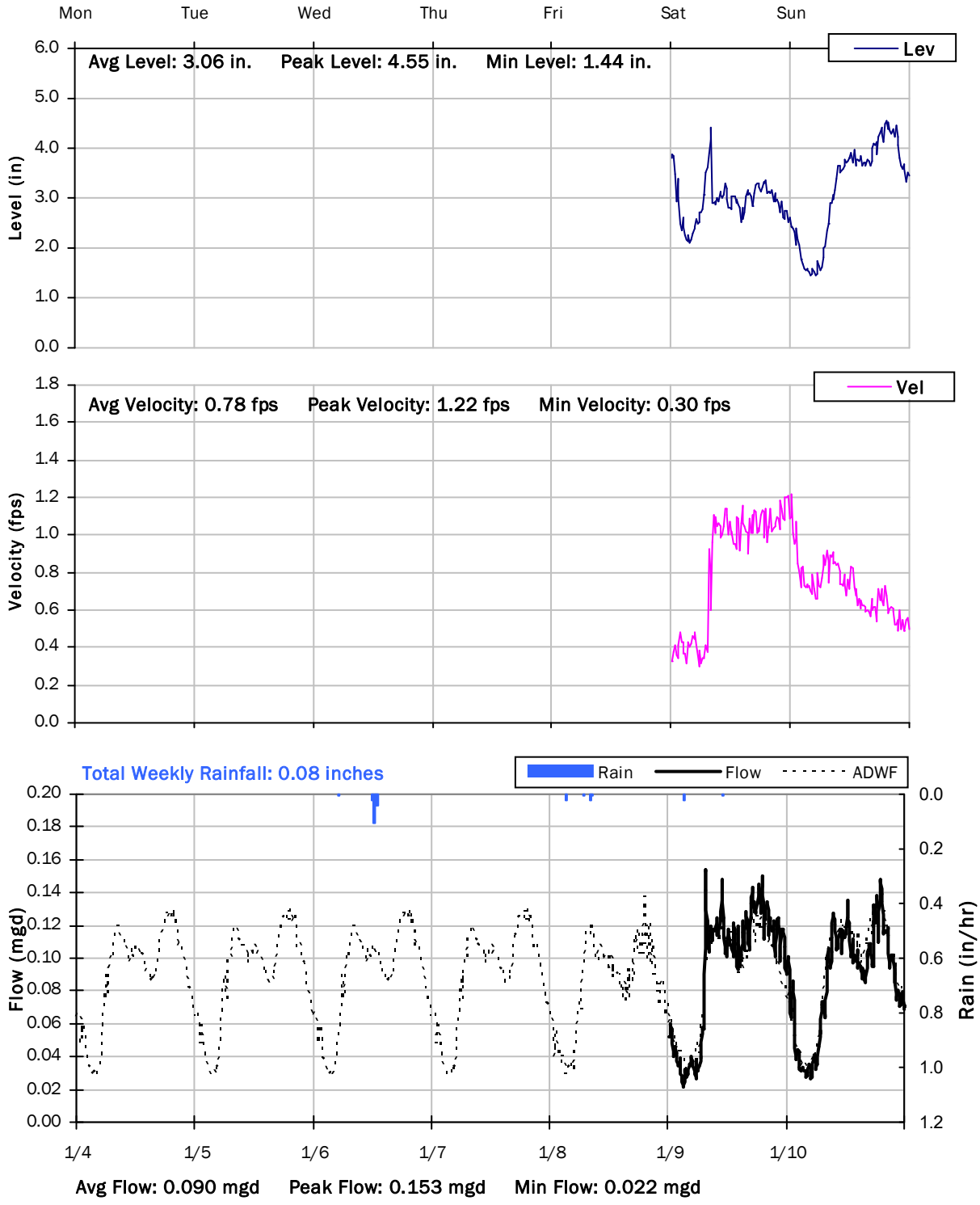
Event 2 Detail Graph



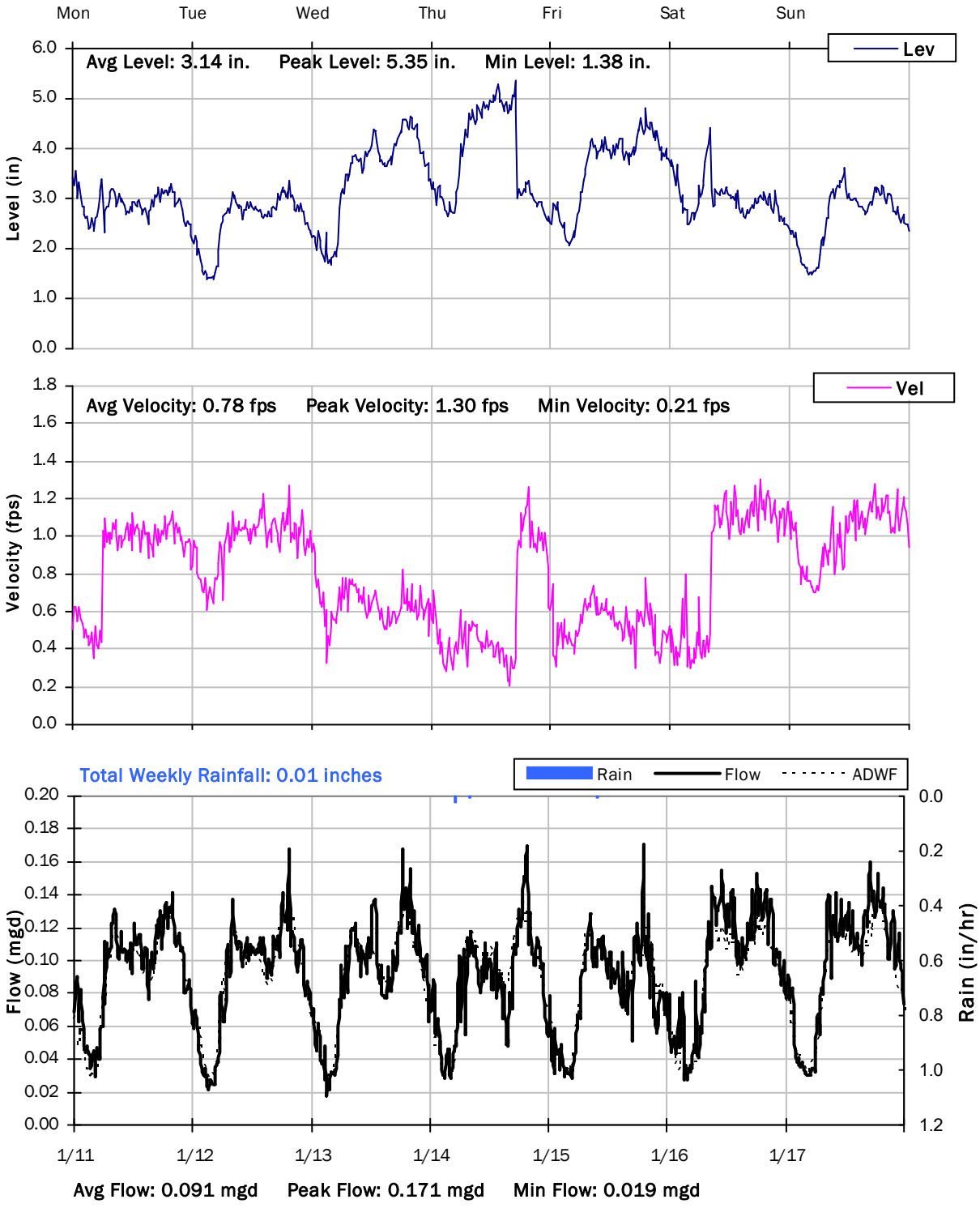
Storm Event I/I Analysis (Rain = 1.01 inches)

Capacity		Inflow / Infiltration	
Peak Flow:	0.16 *mgd*	**Peak I/I Rate:**	0.05 *mgd*
PF:	1.85	**Total I/I:**	43,000 *gallons*
Peak Level:	5.57 *in*		
d/D Ratio:	0.37		

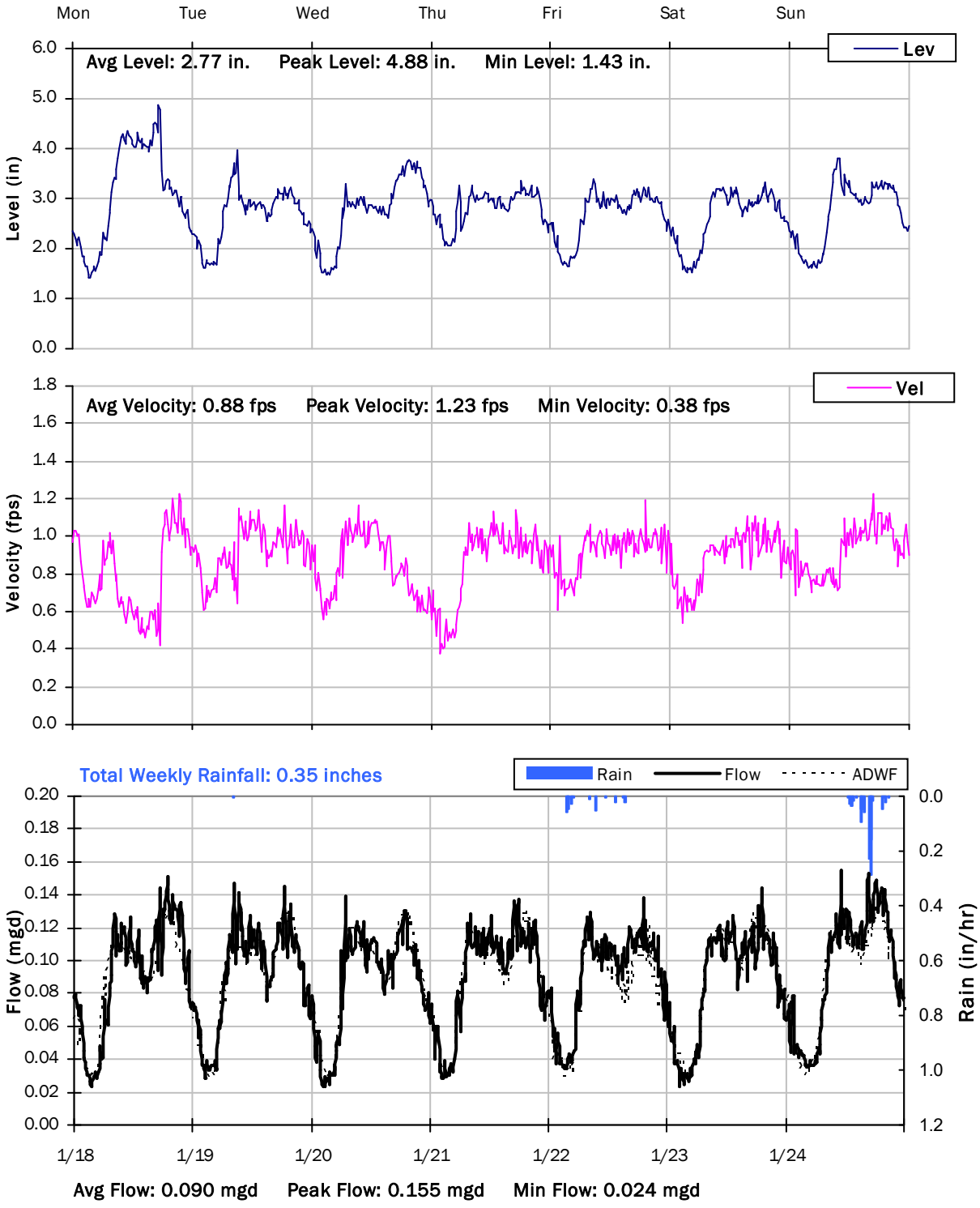
FM 1-2
Weekly Level, Velocity and Flow Hydrographs
1/4/2021 to 1/11/2021



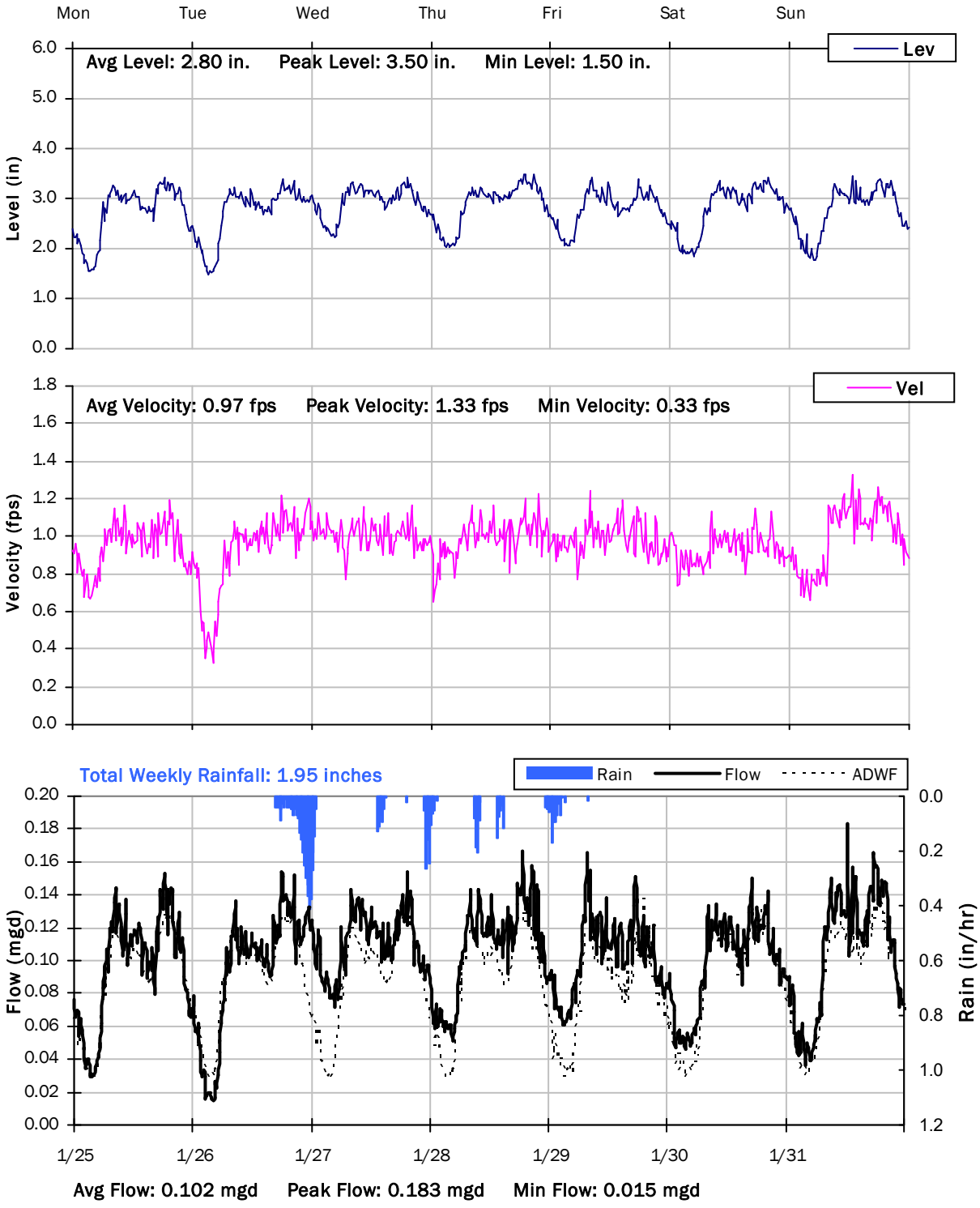
FM 1-2
Weekly Level, Velocity and Flow Hydrographs
1/11/2021 to 1/18/2021



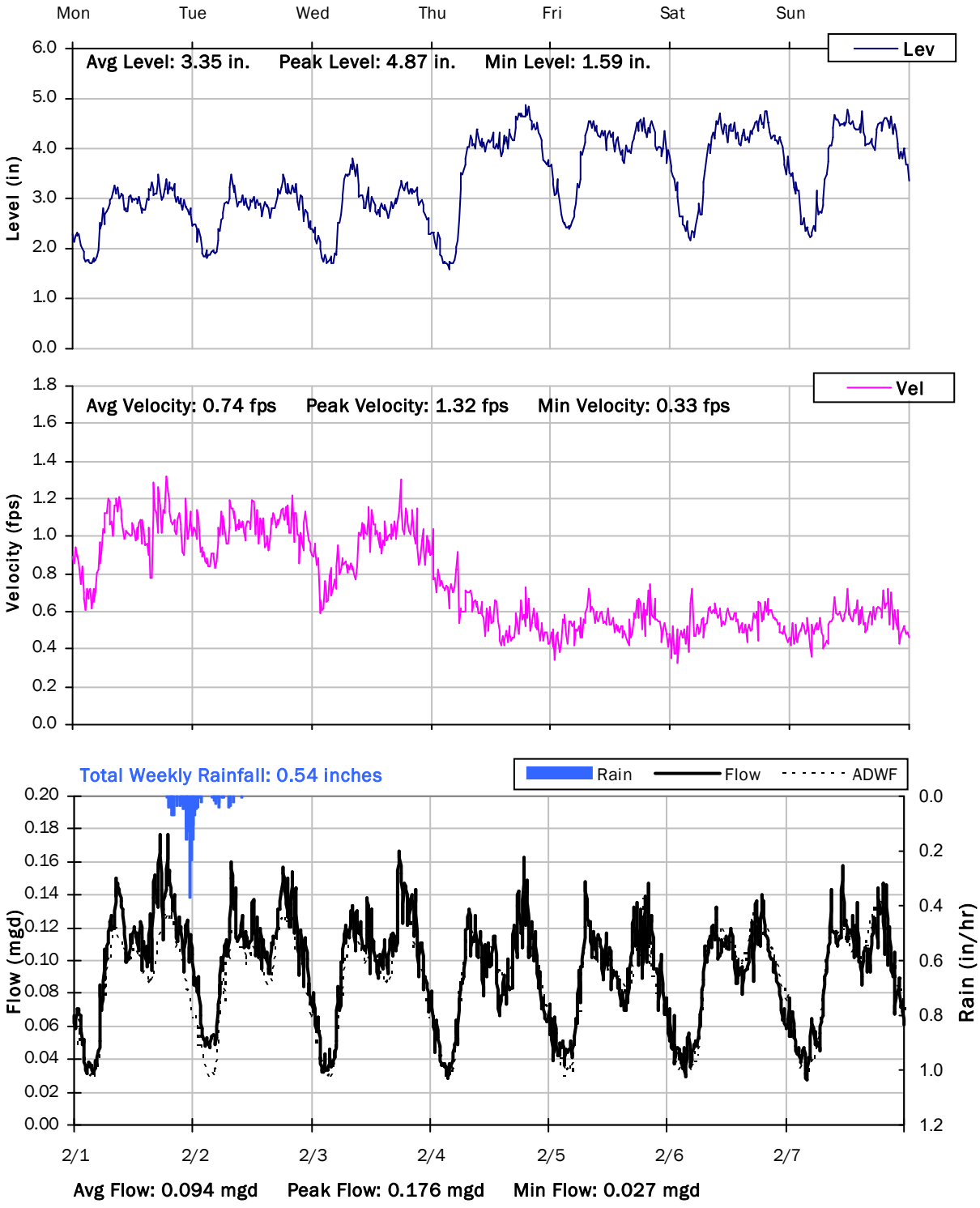
FM 1-2
Weekly Level, Velocity and Flow Hydrographs
1/18/2021 to 1/25/2021



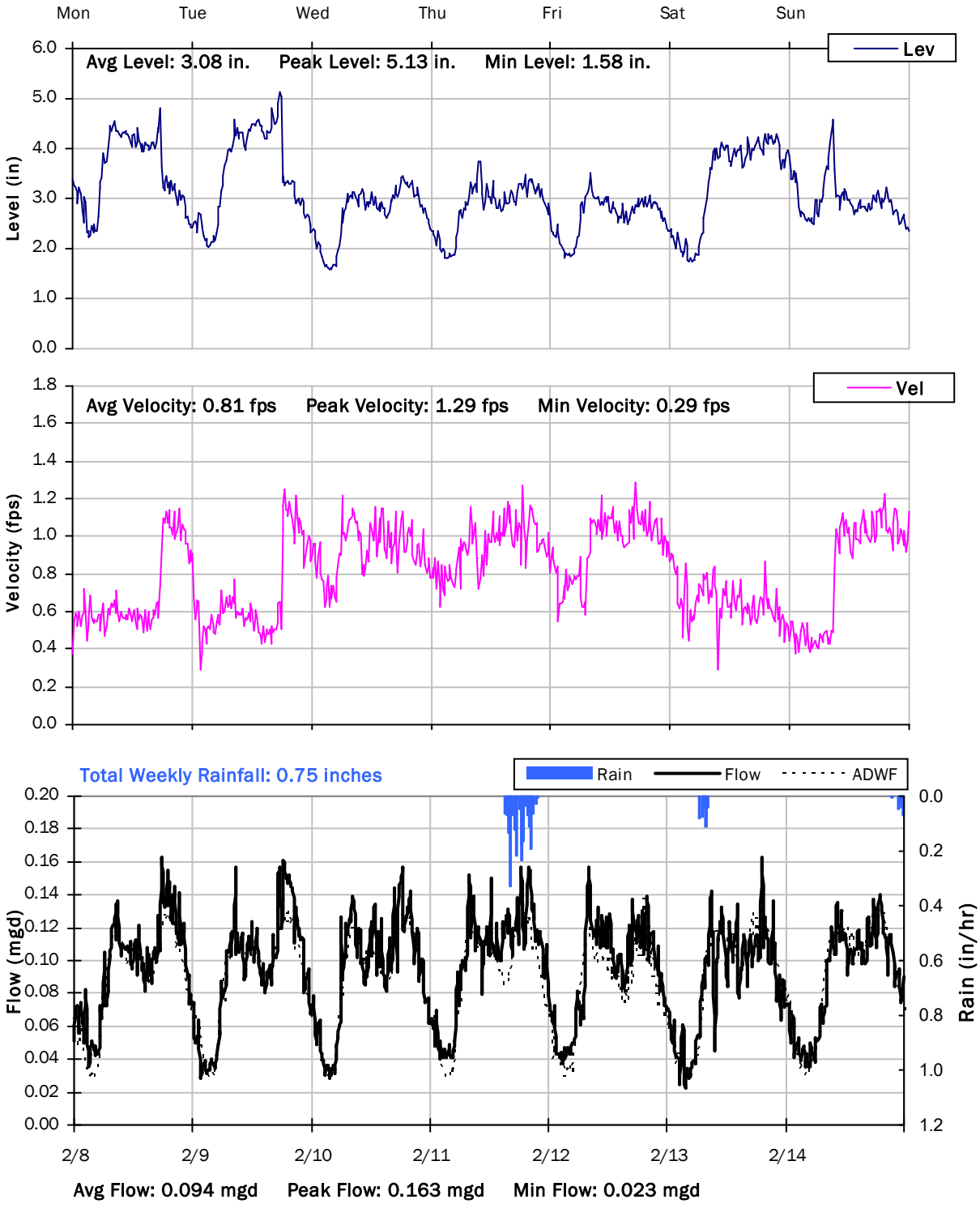
FM 1-2
Weekly Level, Velocity and Flow Hydrographs
1/25/2021 to 2/1/2021



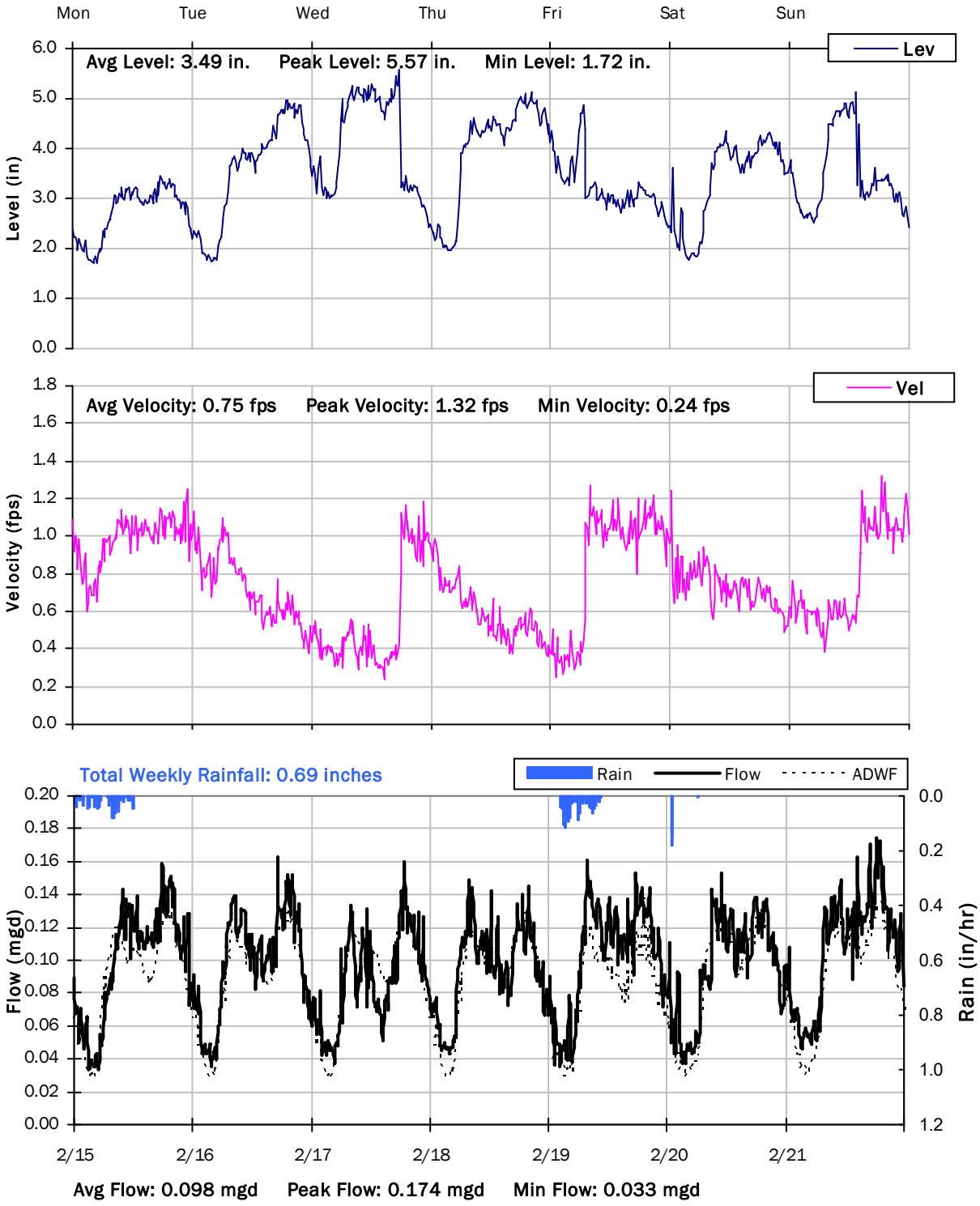
FM 1-2
Weekly Level, Velocity and Flow Hydrographs
2/1/2021 to 2/8/2021



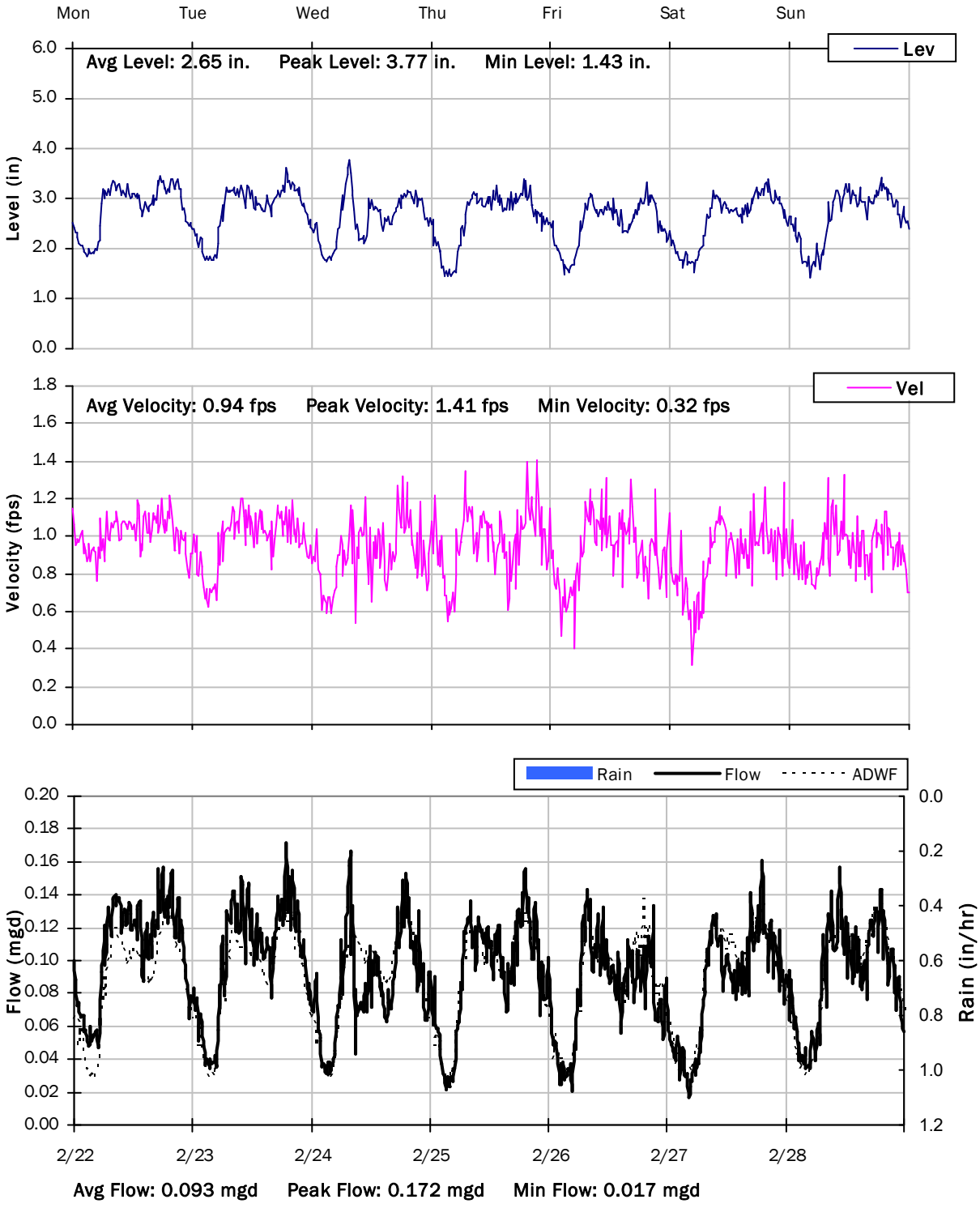
FM 1-2
Weekly Level, Velocity and Flow Hydrographs
2/8/2021 to 2/15/2021



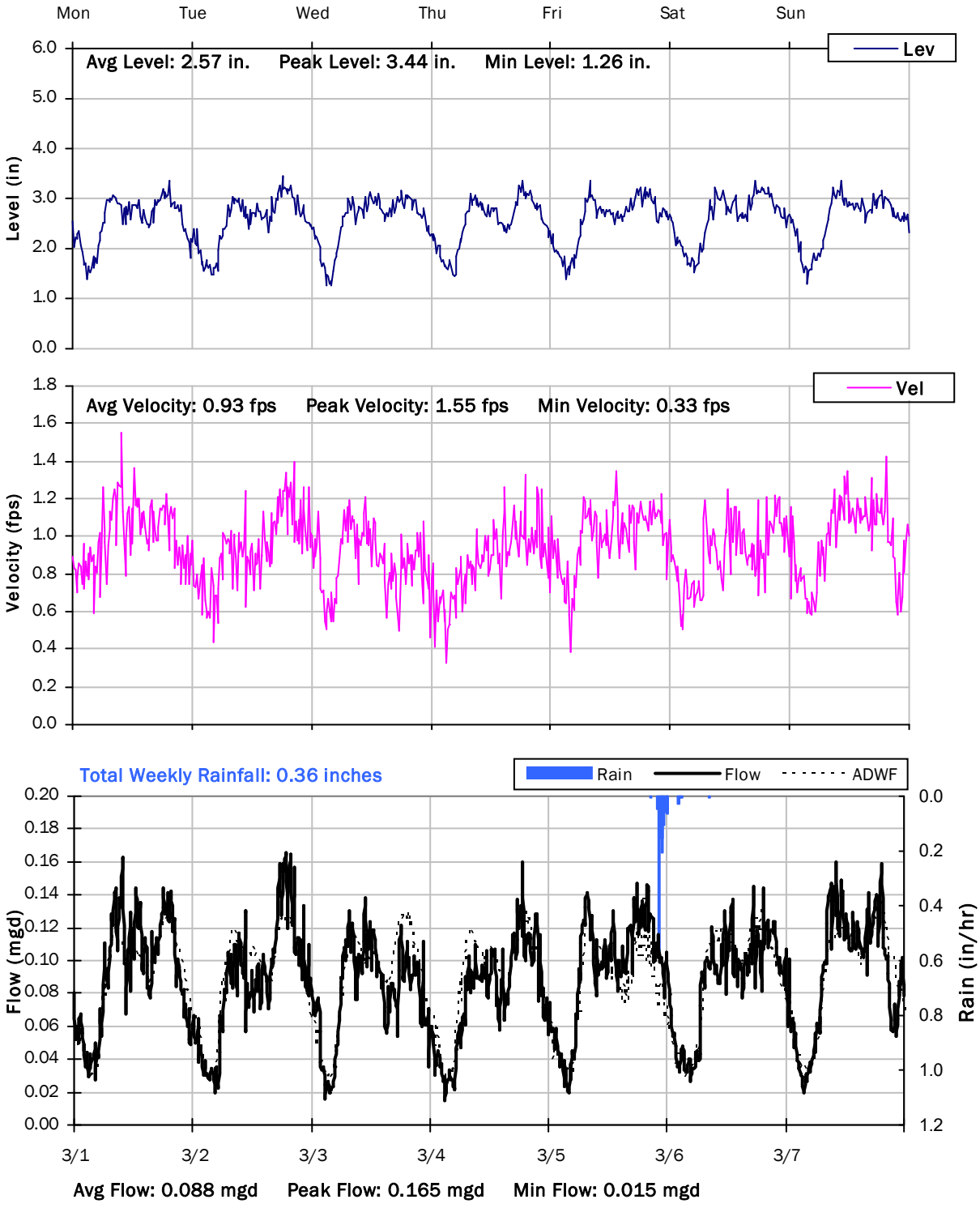
FM 1-2
Weekly Level, Velocity and Flow Hydrographs
2/15/2021 to 2/22/2021



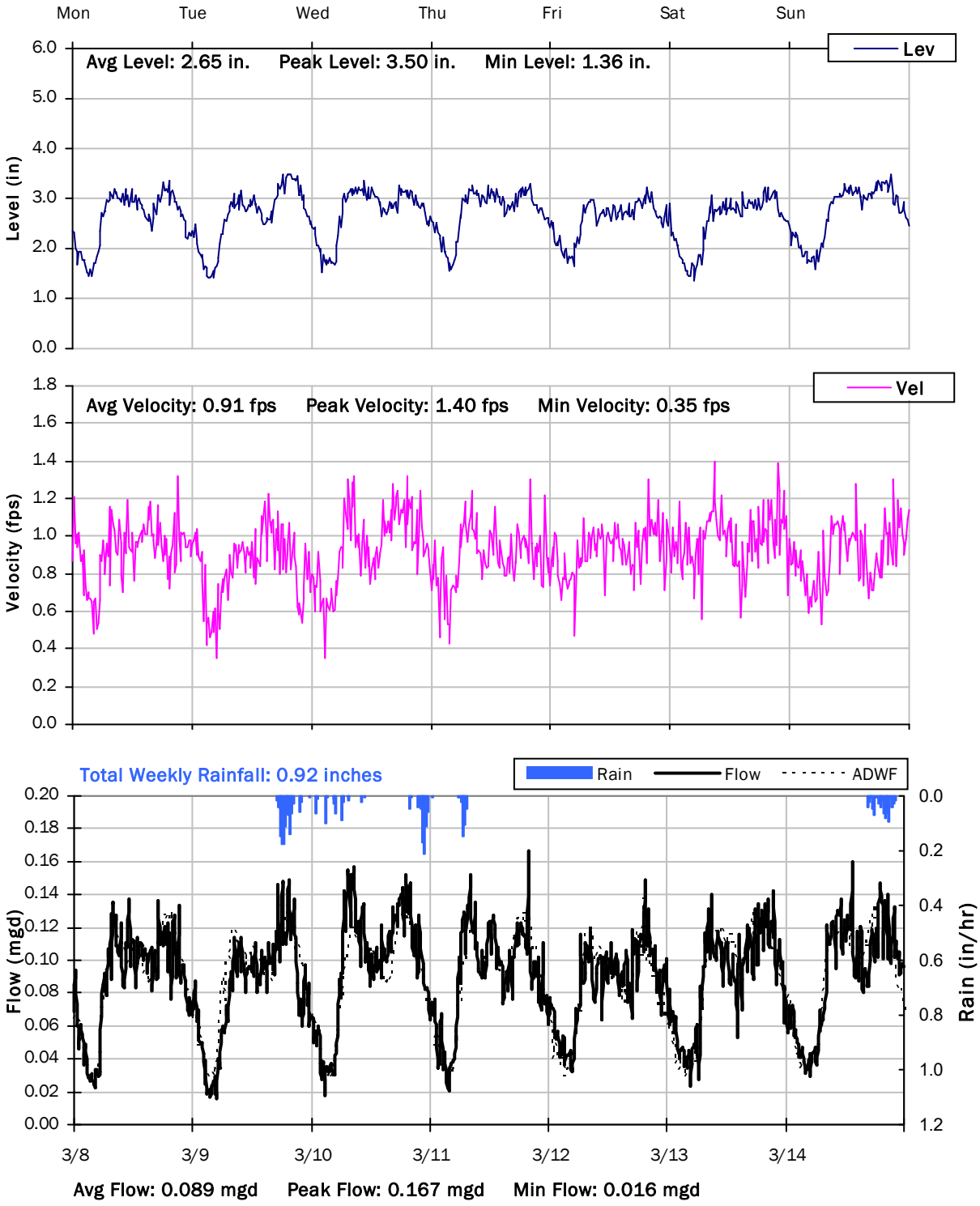
FM 1-2
Weekly Level, Velocity and Flow Hydrographs
2/22/2021 to 3/1/2021



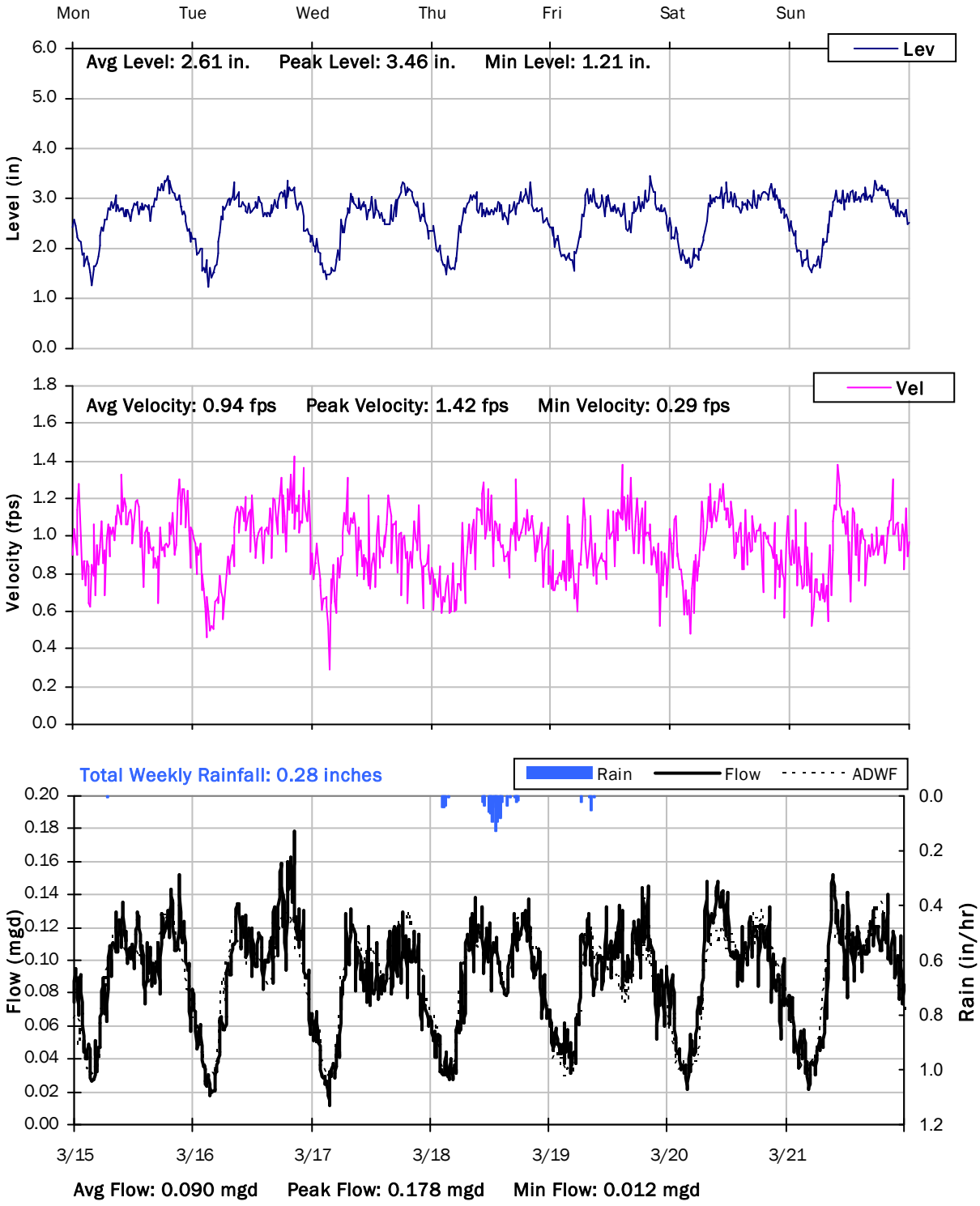
FM 1-2
Weekly Level, Velocity and Flow Hydrographs
3/1/2021 to 3/8/2021



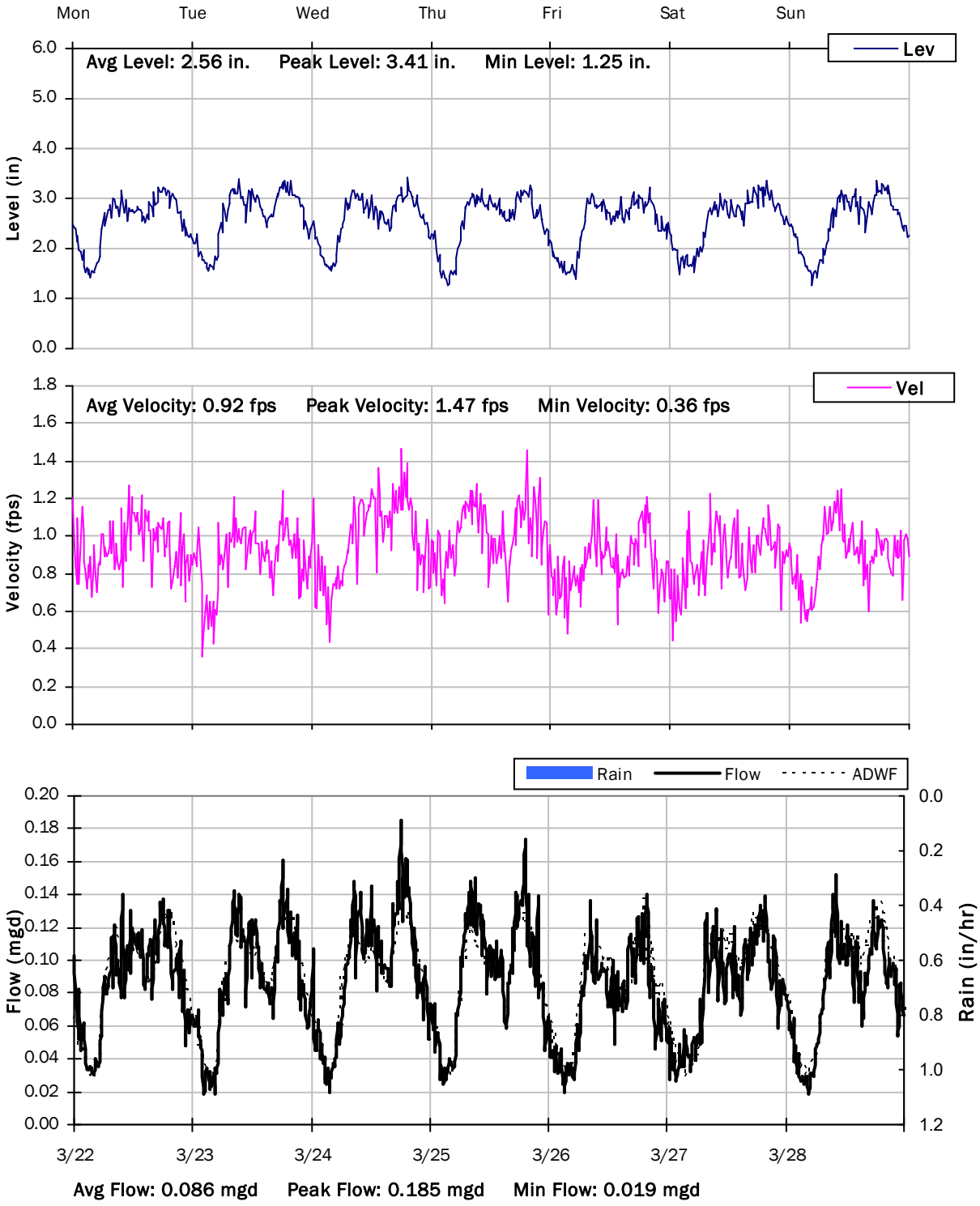
FM 1-2
Weekly Level, Velocity and Flow Hydrographs
3/8/2021 to 3/15/2021



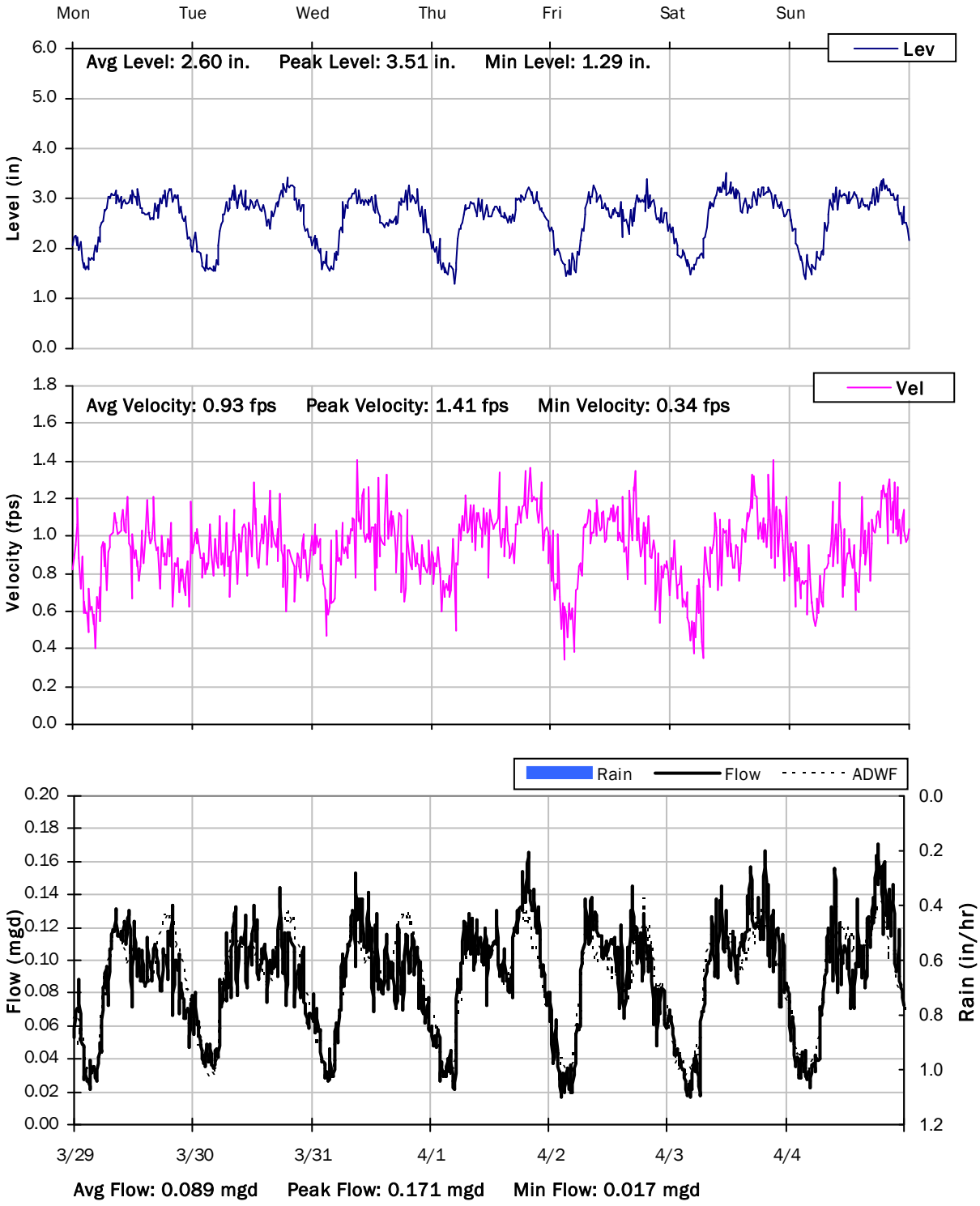
FM 1-2
Weekly Level, Velocity and Flow Hydrographs
3/15/2021 to 3/22/2021



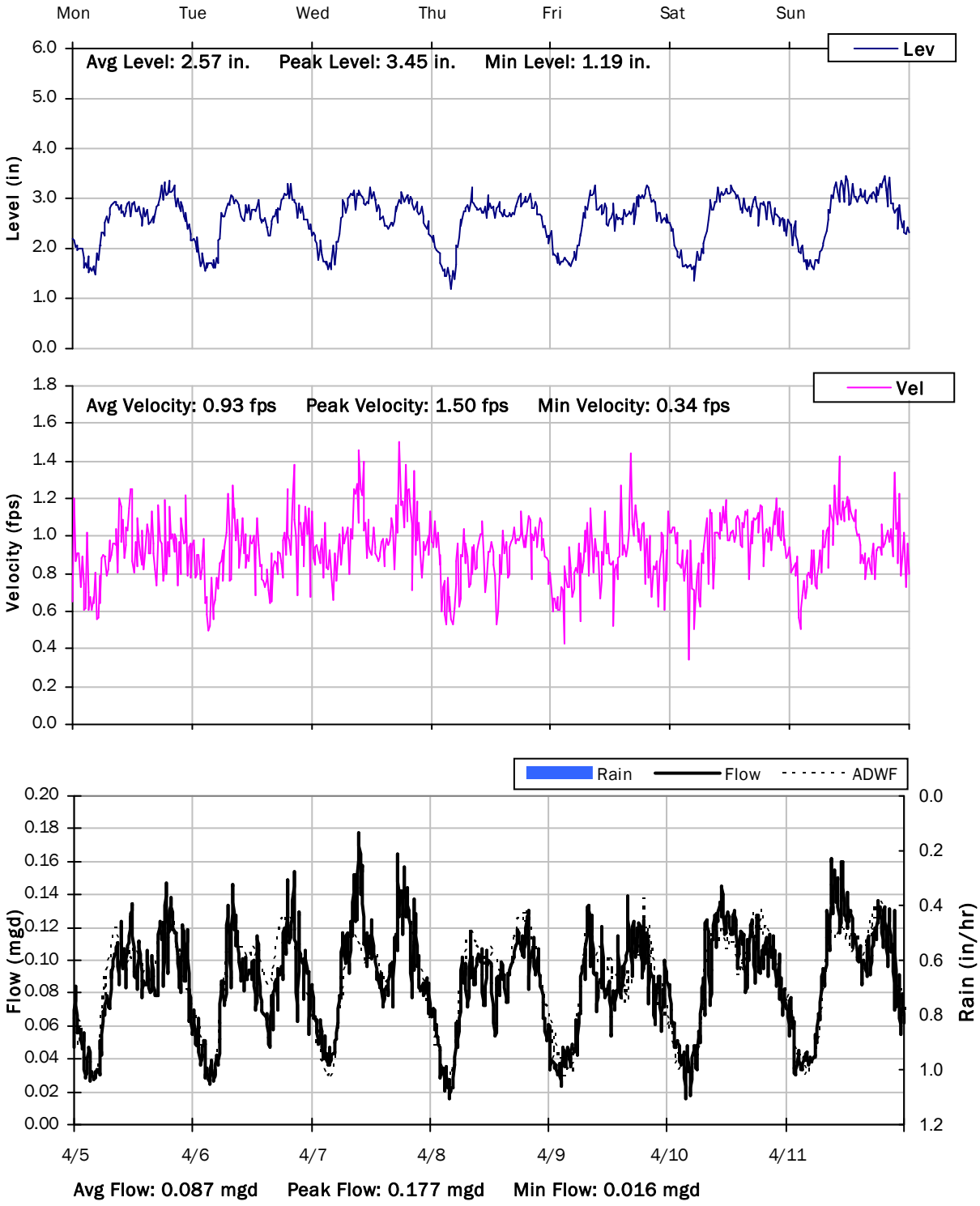
FM 1-2
Weekly Level, Velocity and Flow Hydrographs
3/22/2021 to 3/29/2021



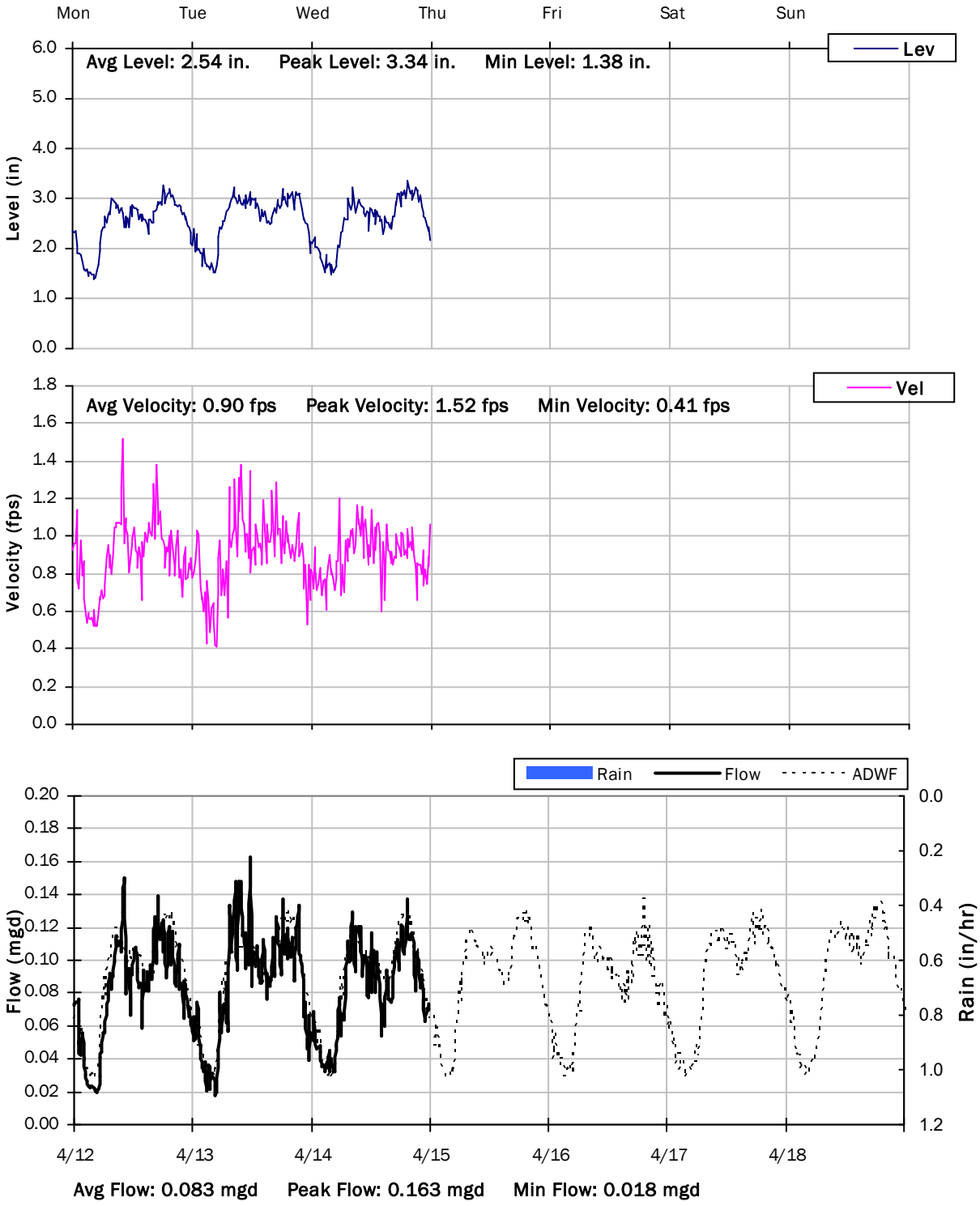
FM 1-2
Weekly Level, Velocity and Flow Hydrographs
3/29/2021 to 4/5/2021



FM 1-2
Weekly Level, Velocity and Flow Hydrographs
4/5/2021 to 4/12/2021



FM 1-2
Weekly Level, Velocity and Flow Hydrographs
4/12/2021 to 4/19/2021



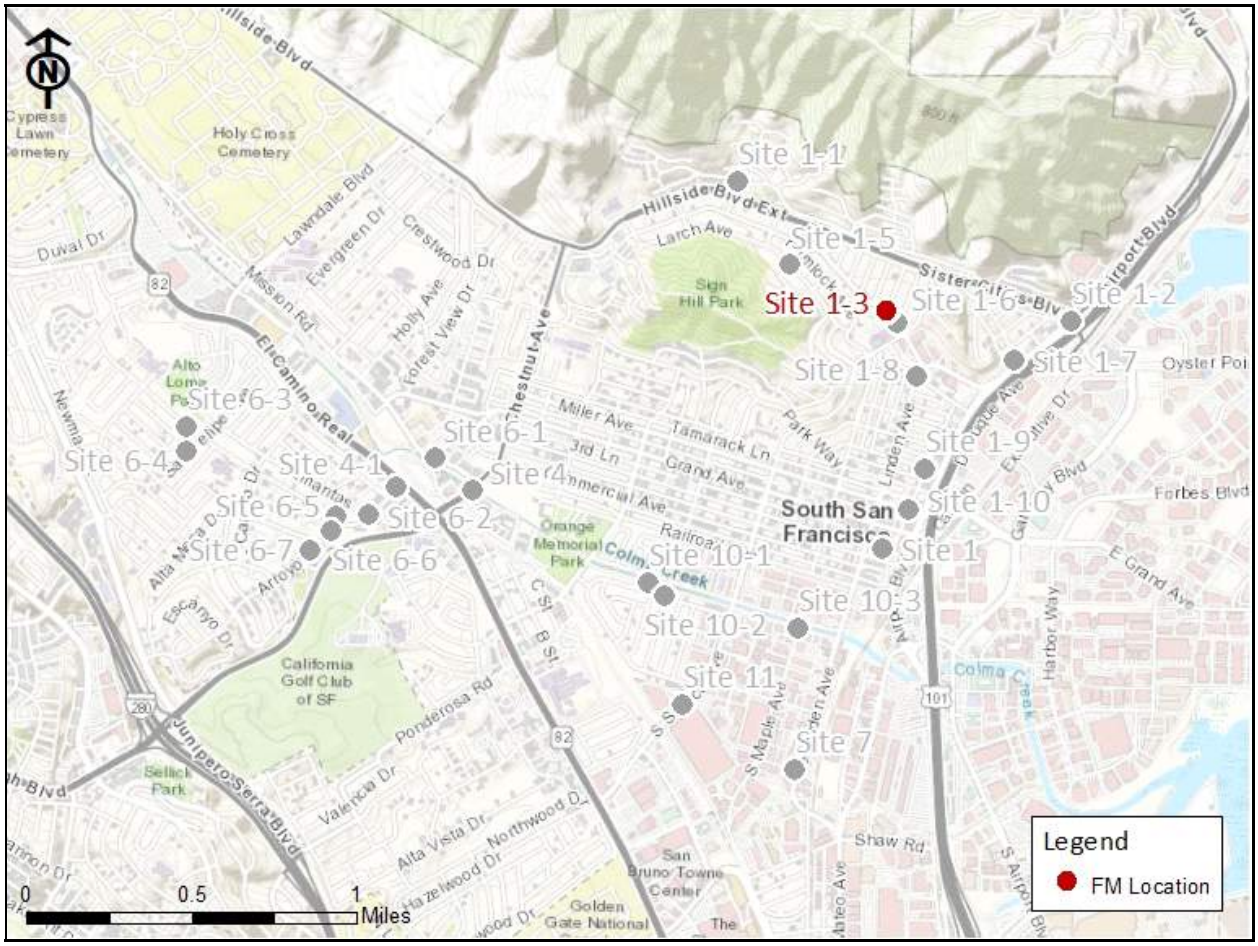
South San Francisco, CA

Sanitary Sewer Flow Monitoring
January 4 - April 14, 2021

Monitoring Site: FM 1-3

Location: Hillside Boulevard at Belmont Avenue

Data Summary Report



Vicinity Map: FM 1-3

FM 1-3

Site Information

Location: Hillside Boulevard at Belmont Avenue

Coordinates: 122.4096° W, 37.6645° N

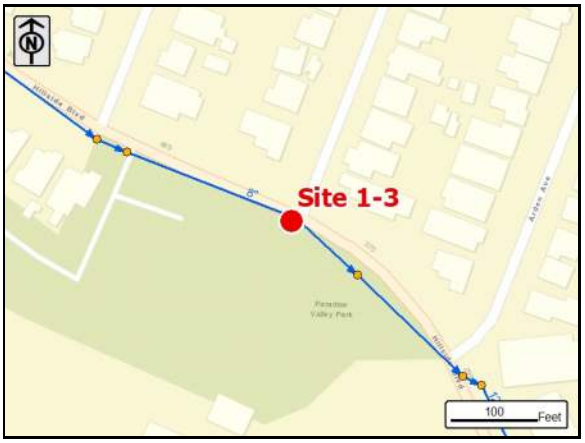
Rim Elevation (Earth): 85 feet

Pipe Diameter: 8.5 inches

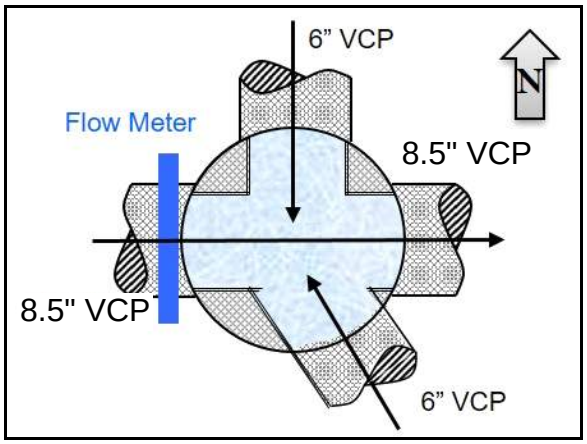
ADWF: 0.113 mgd

Peak Measured Flow: 1.271 mgd

Satellite Map



Sanitary Map



Flow Sketch

Street View

Plan View

FM 1-3

Additional Site Photos

Effluent Pipe

Monitored West Influent Pipe

FM 1-3

Additional Site Photos

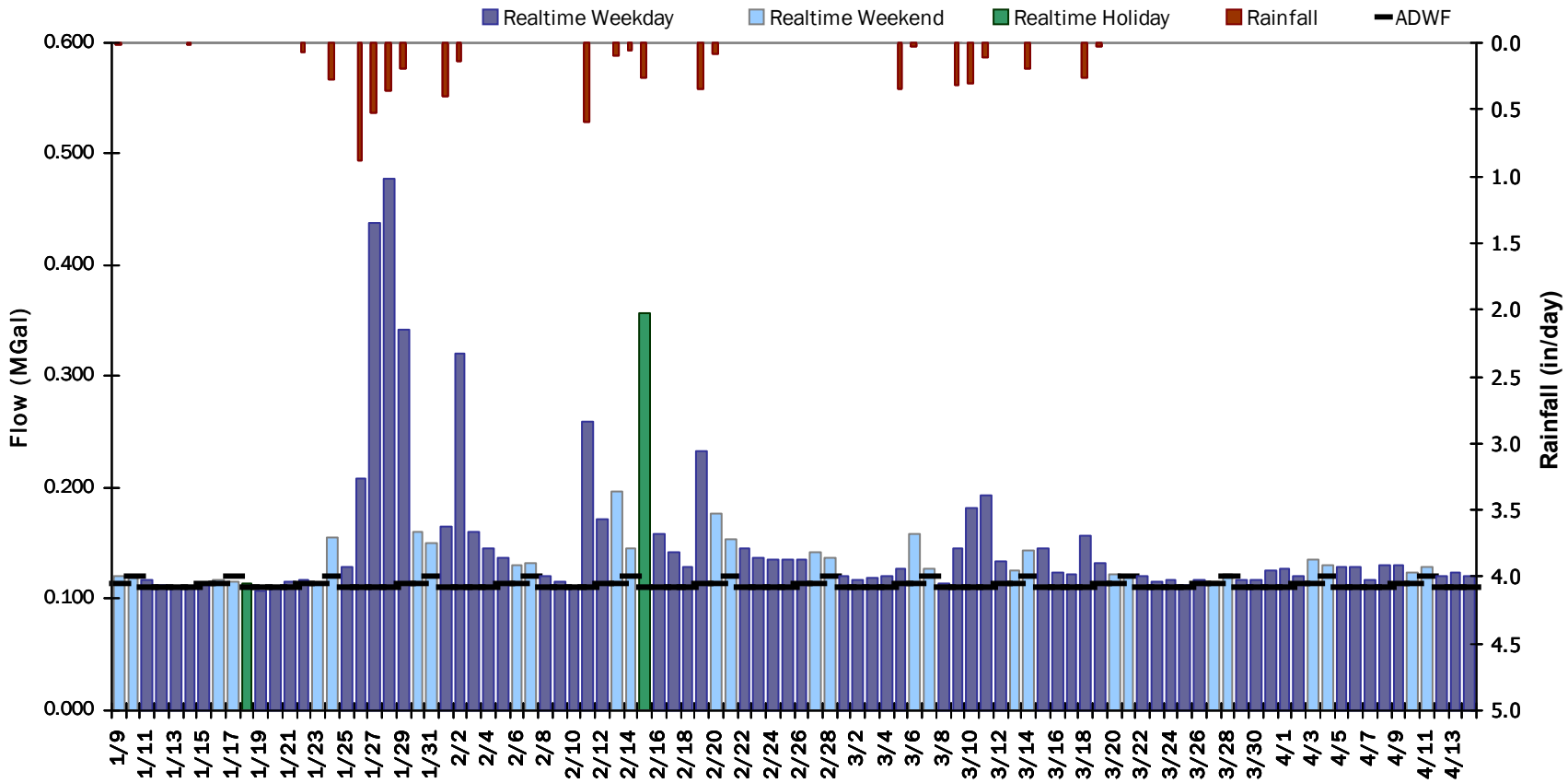
North Influent Pipe

Southeast Influent Pipe

FM 1-3
Period Flow Summary: Daily Flow Totals

Avg Period Flow: 0.148 MGal Peak Daily Flow: 0.478 MGal Min Daily Flow: 0.107 MGal

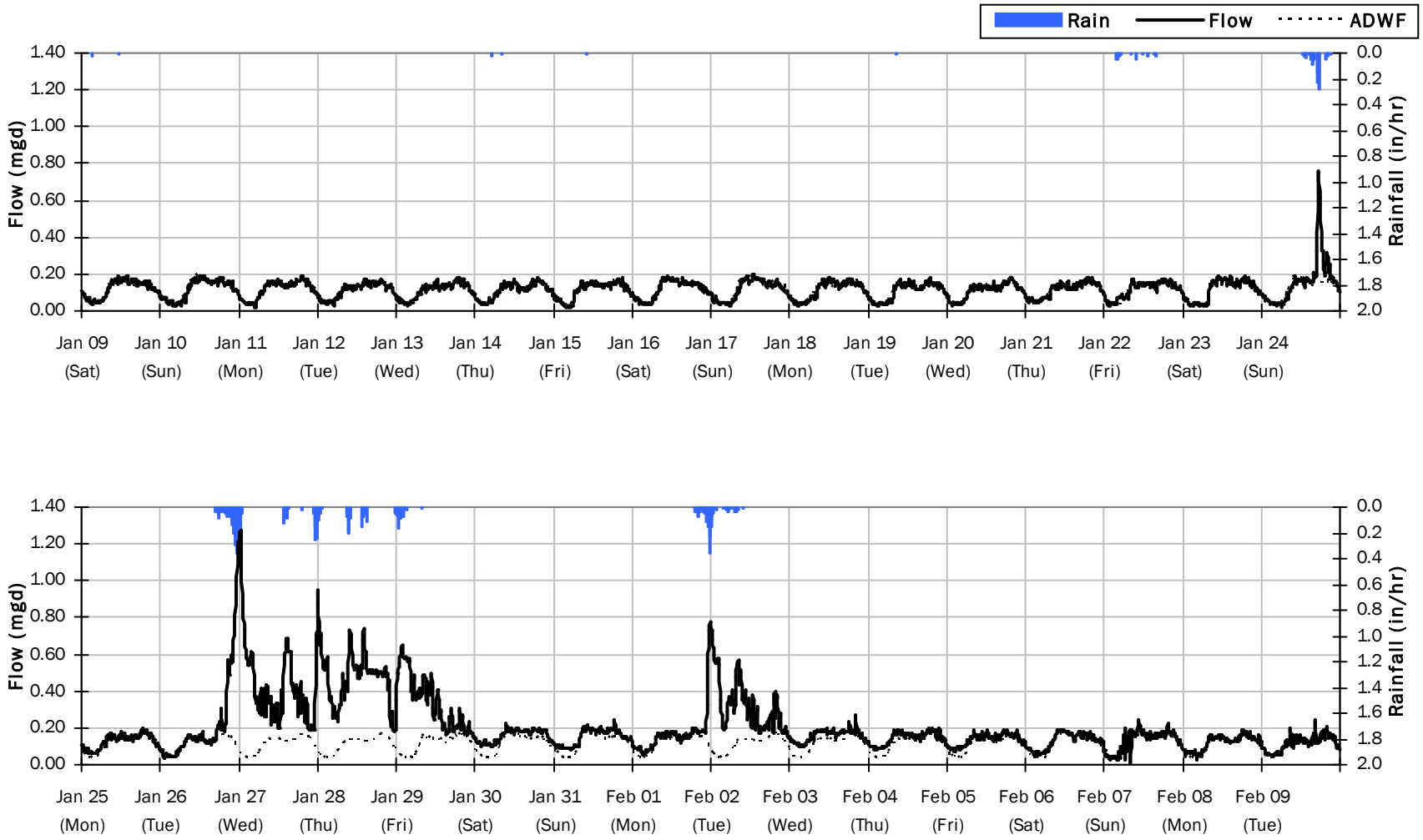
Total Period Rainfall: 5.88 inches



FM 1-3

Flow Summary: 1/9/2021 to 2/9/2021

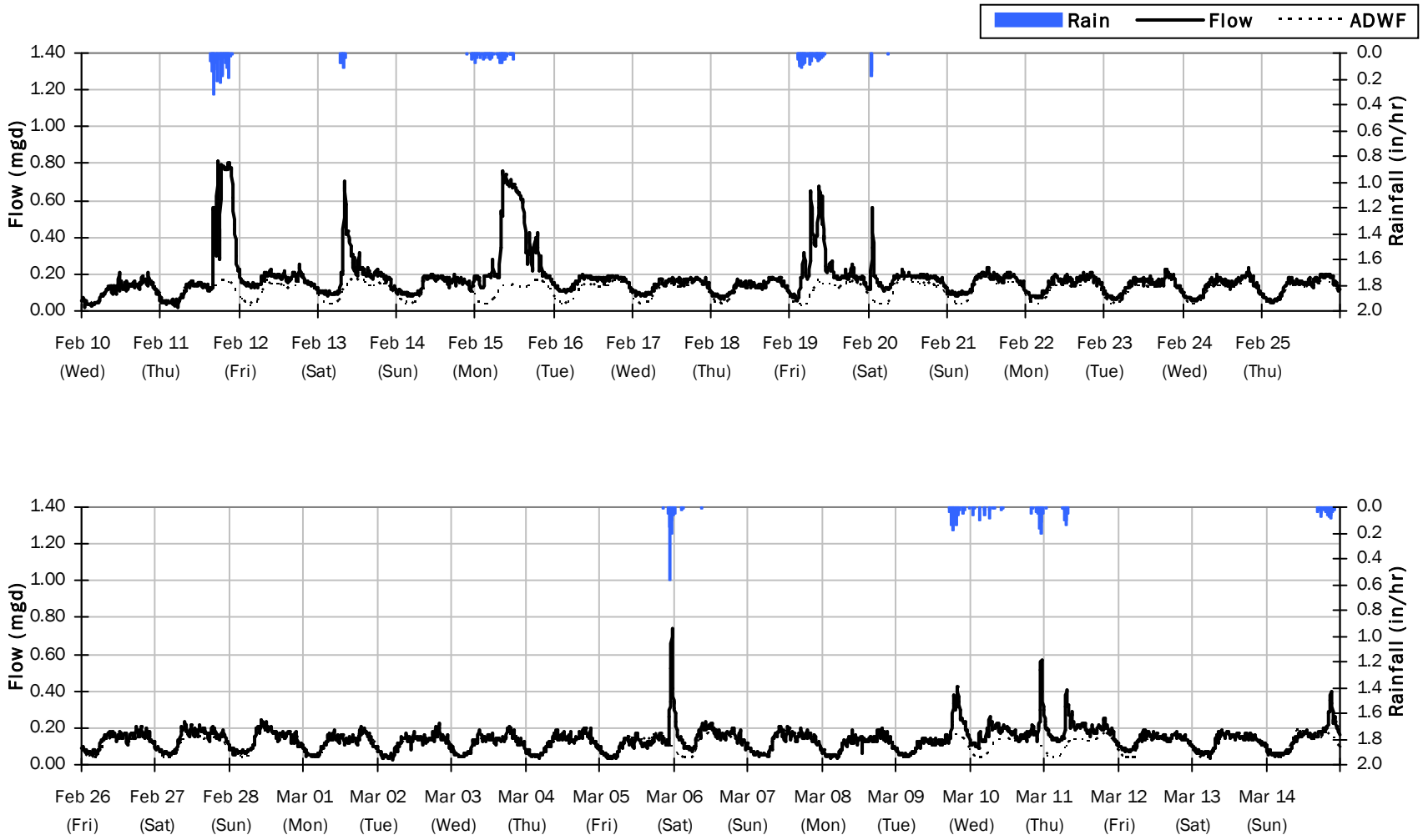
Total Period Rainfall: 2.87 inches Avg Flow: 0.163 mgd Peak Flow: 1.271 mgd Min Flow: 0.010 mgd



FM 1-3

Flow Summary: 2/10/2021 to 3/14/2021

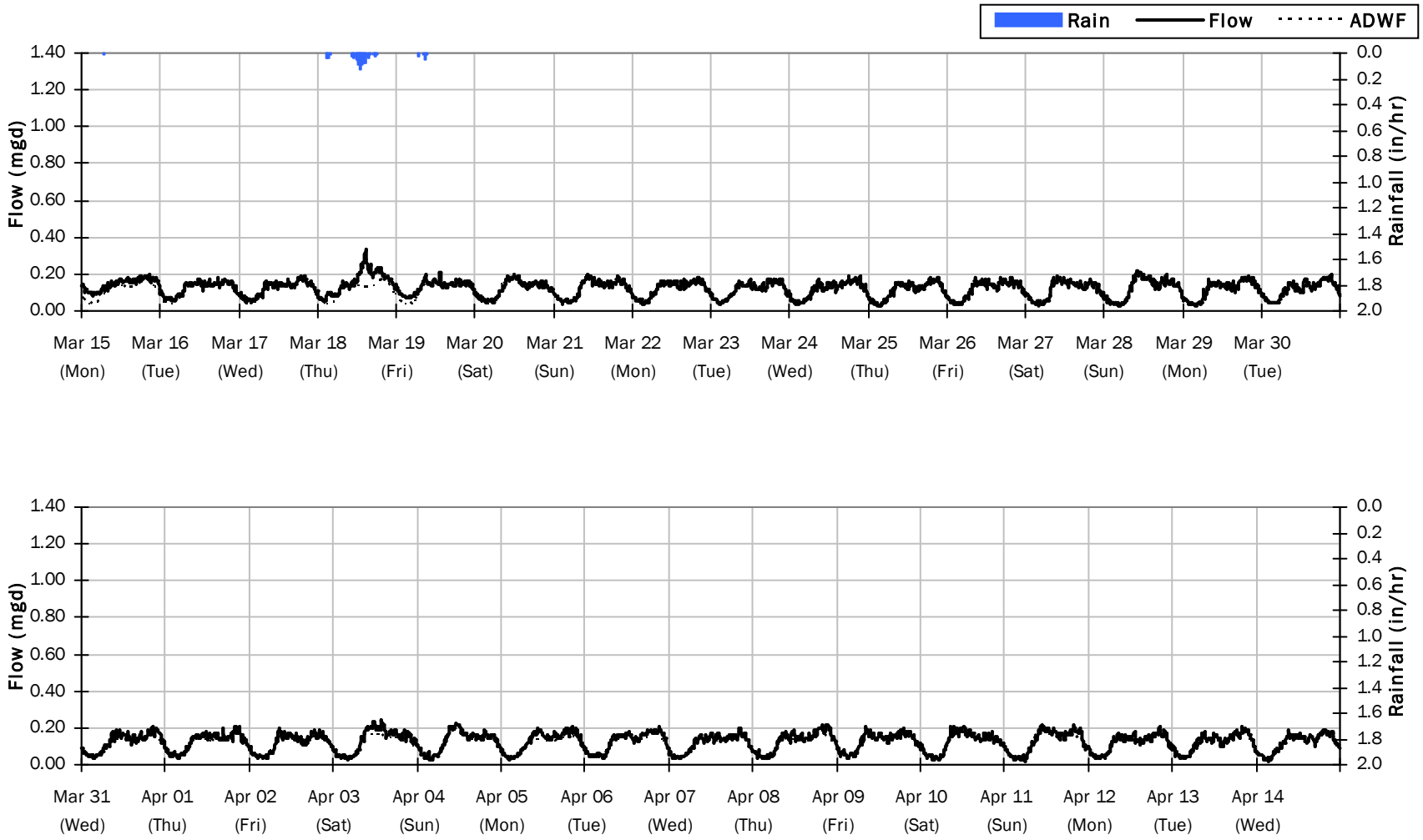
Total Period Rainfall: 2.73 inches Avg Flow: 0.155 mgd Peak Flow: 0.808 mgd Min Flow: 0.021 mgd



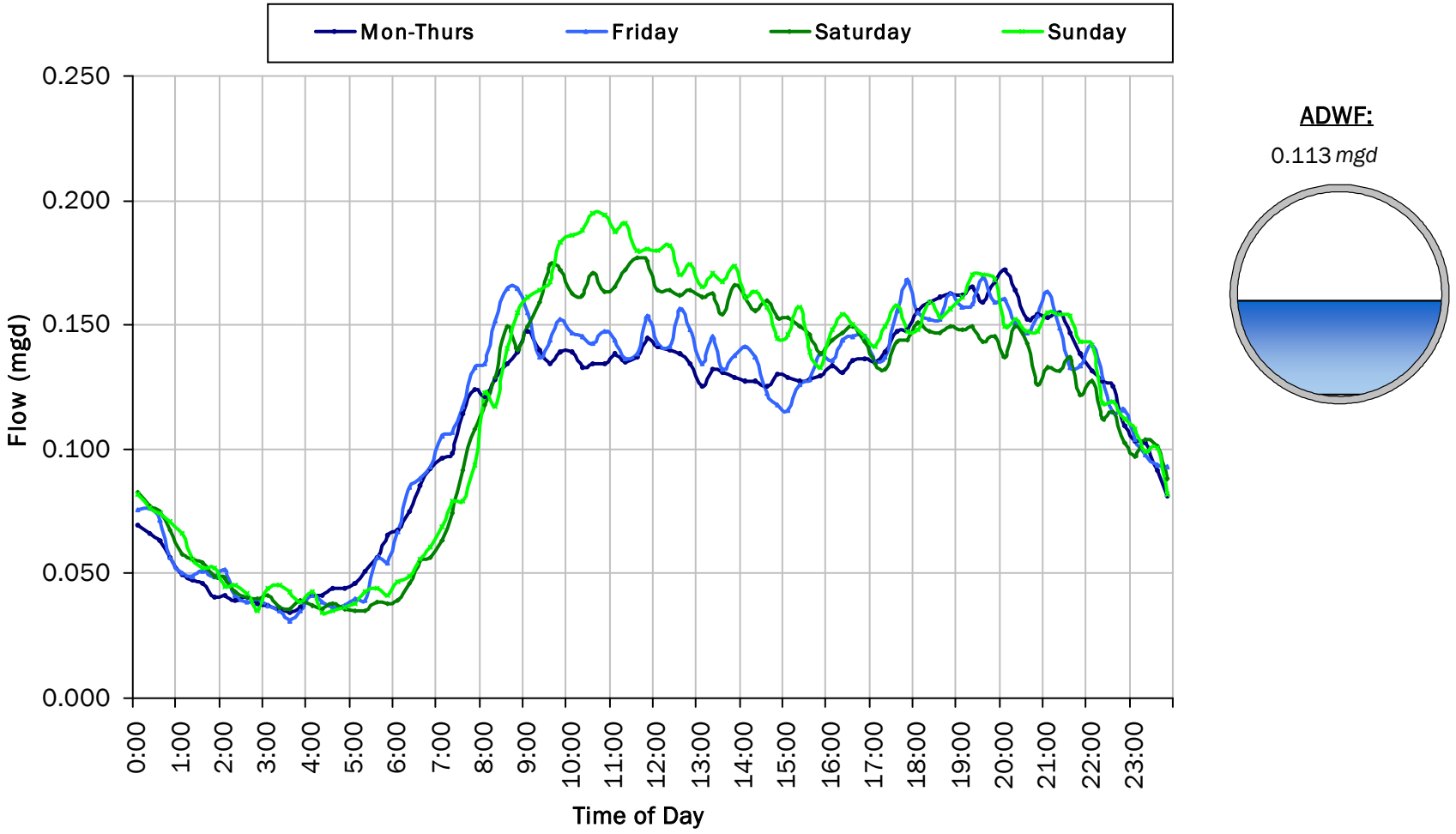
FM 1-3

Flow Summary: 3/15/2021 to 4/14/2021

Total Period Rainfall: 0.28 inches Avg Flow: 0.125 mgd Peak Flow: 0.337 mgd Min Flow: 0.020 mgd



FM 1-3
Average Dry Weather Flow Hydrographs



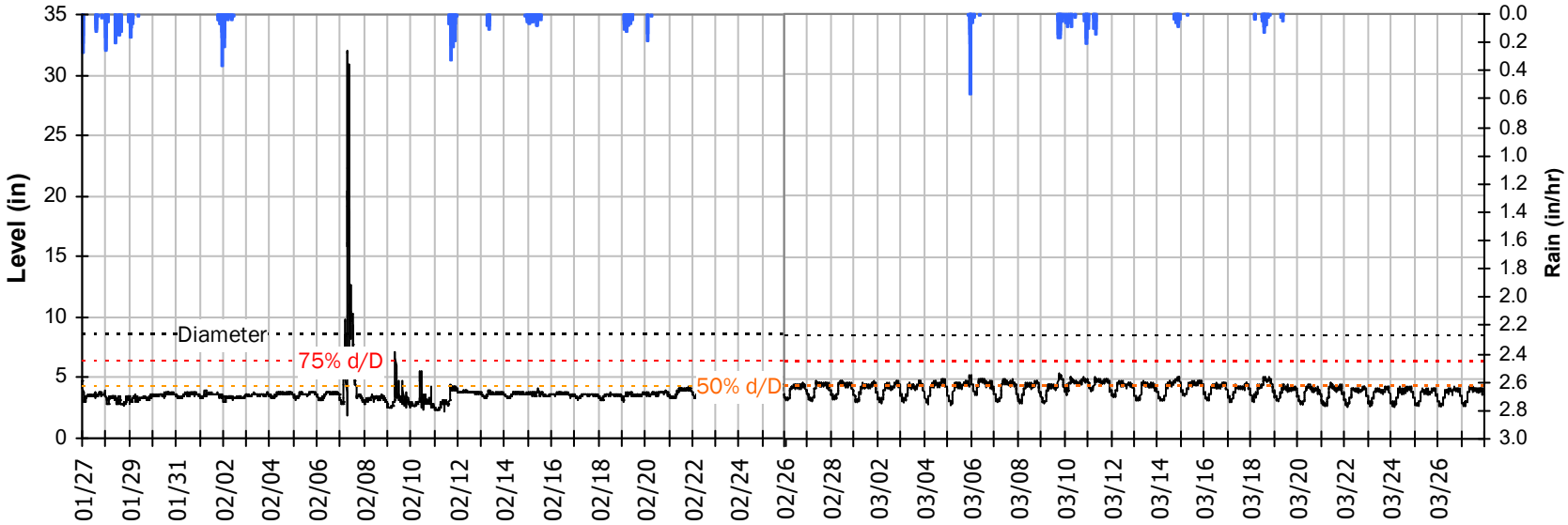
ADWF:

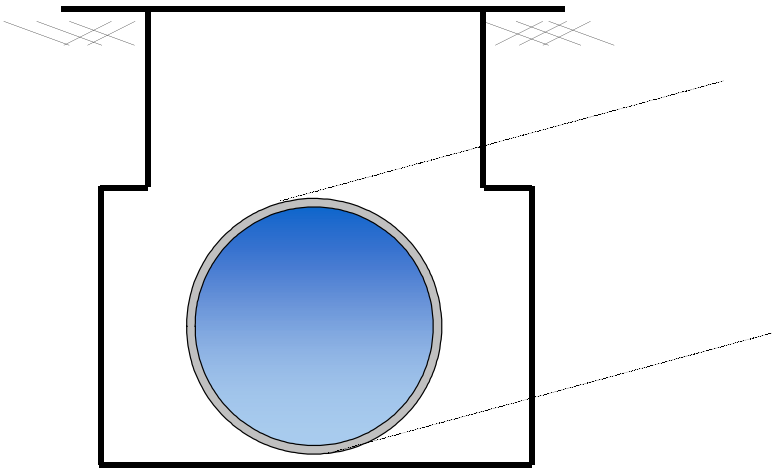
0.113 *mgd*

FM 1-3

Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Monitoring Period



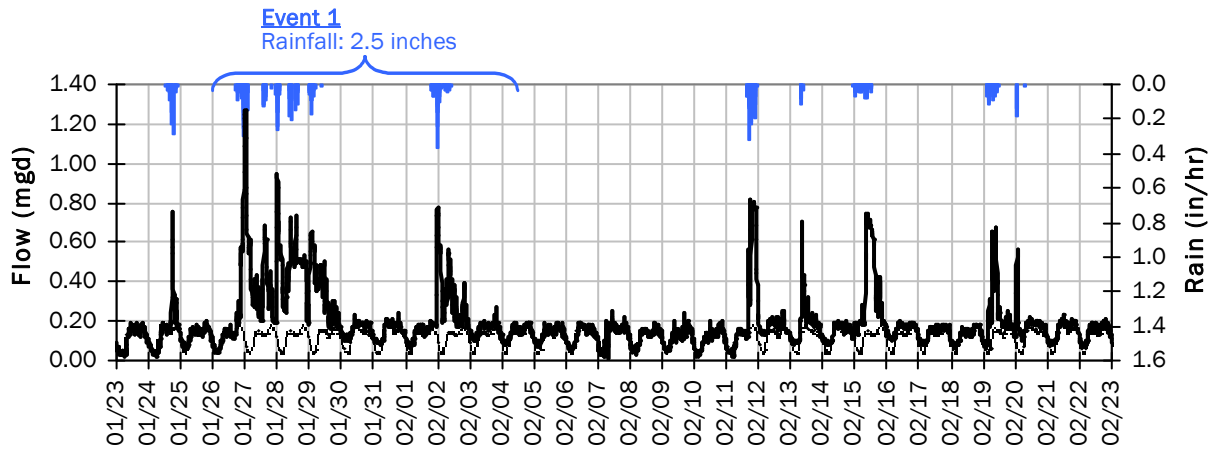


Pipe Diameter:	8.5	*inches*
Peak Measured Level:	31.9	*inches*
Peak d/D Ratio:	3.75	

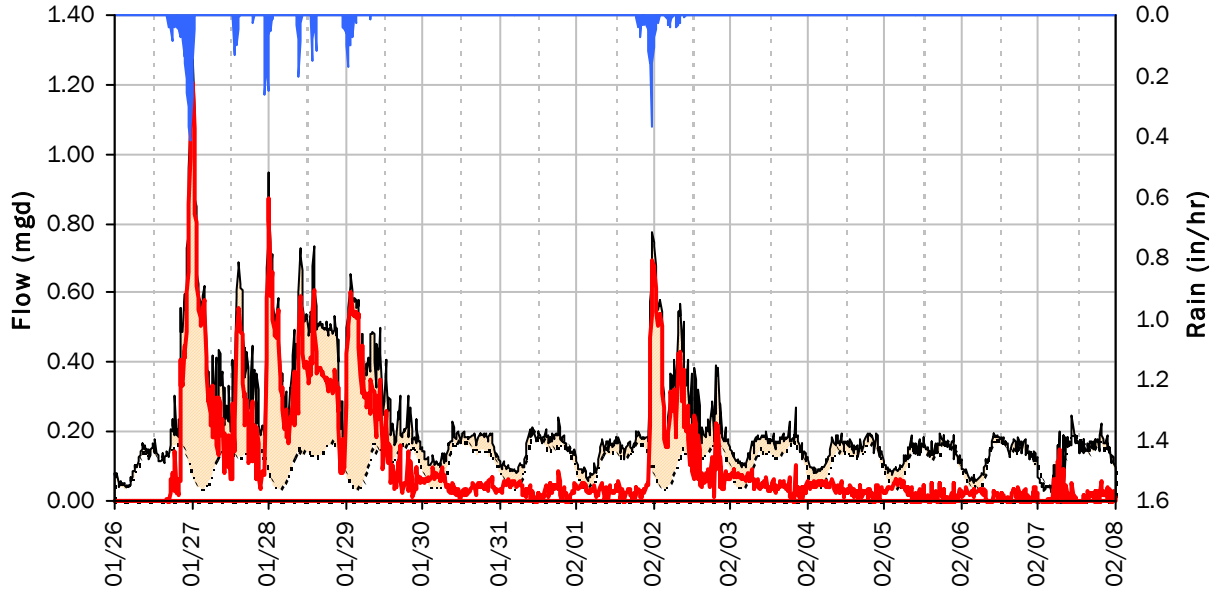
Surcharged 23.4 inches over crown

FM 1-3
I/I Summary: Event 1

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



Event 1 Detail Graph

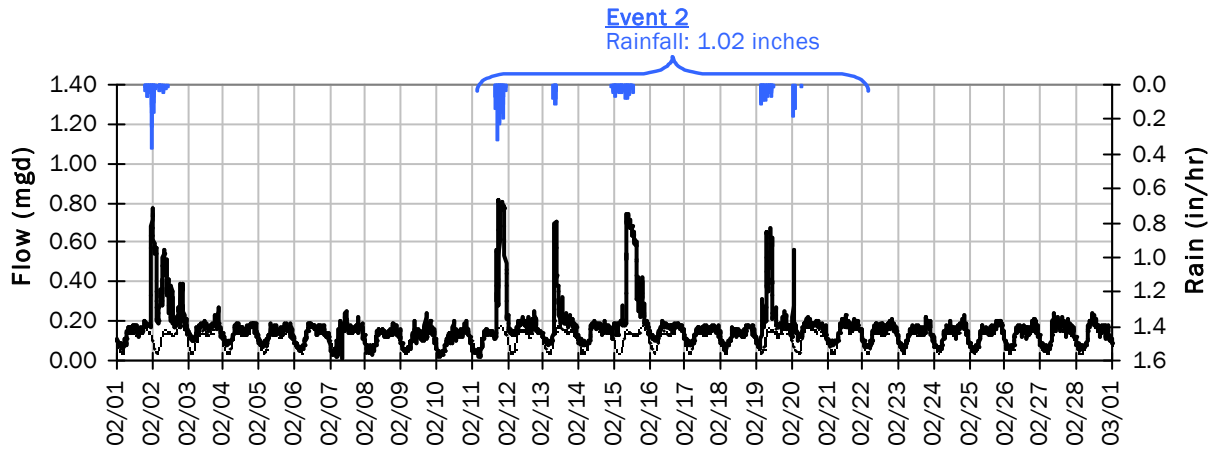


Storm Event I/I Analysis (Rain = 2.50 inches)

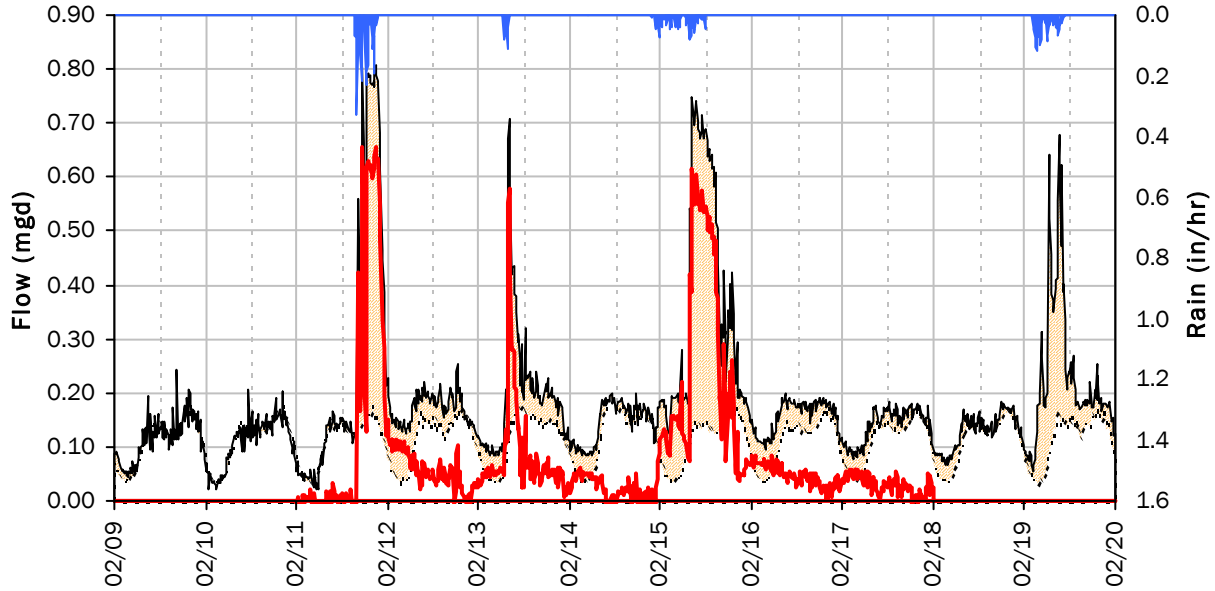
Capacity		Inflow / Infiltration	
Peak Flow:	1.27 *mgd*	**Peak I/I Rate:**	1.21 *mgd*
PF:	11.21	**Total I/I:**	1,488,000 *gallons*
Peak Level:	31.91 *in*		
d/D Ratio:	3.75		

FM 1-3
I/I Summary: Event 2

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



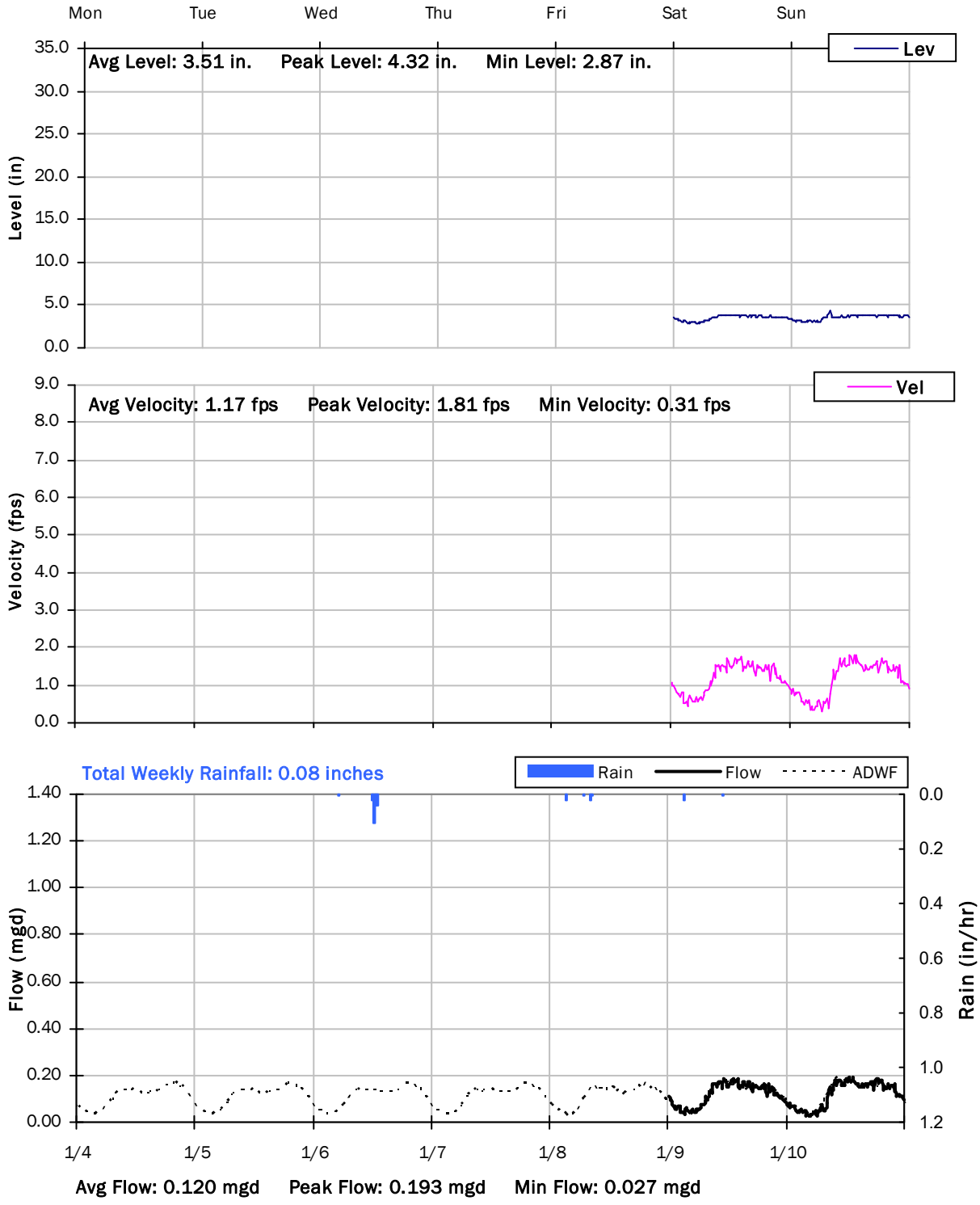
Event 2 Detail Graph



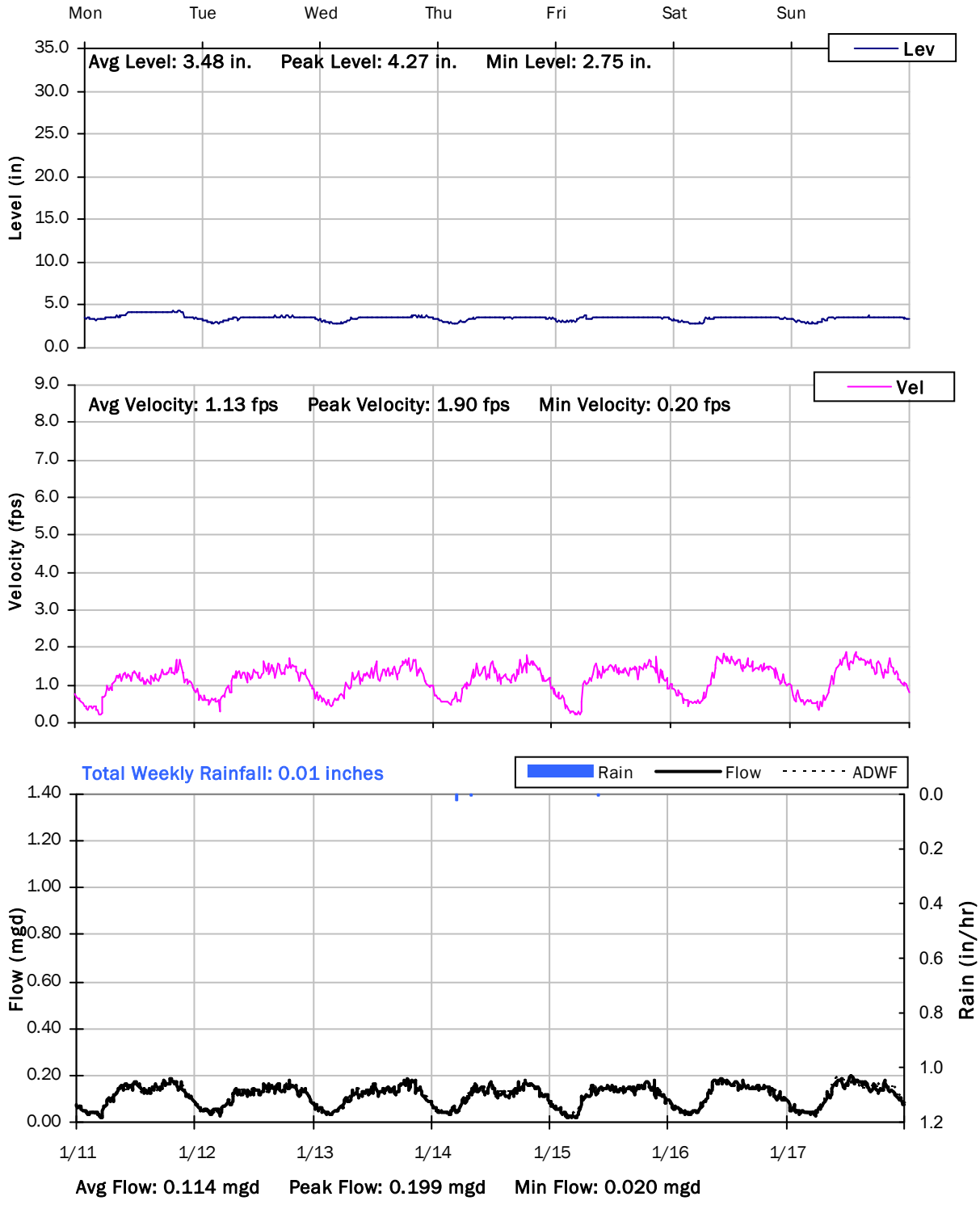
Storm Event I/I Analysis (Rain = 1.02 inches)

Capacity		Inflow / Infiltration	
Peak Flow:	0.81 *mgd*	**Peak I/I Rate:**	0.66 *mgd*
PF:	7.13	**Total I/I:**	635,000 *gallons*
Peak Level:	4.43 *in*		
d/D Ratio:	0.52		

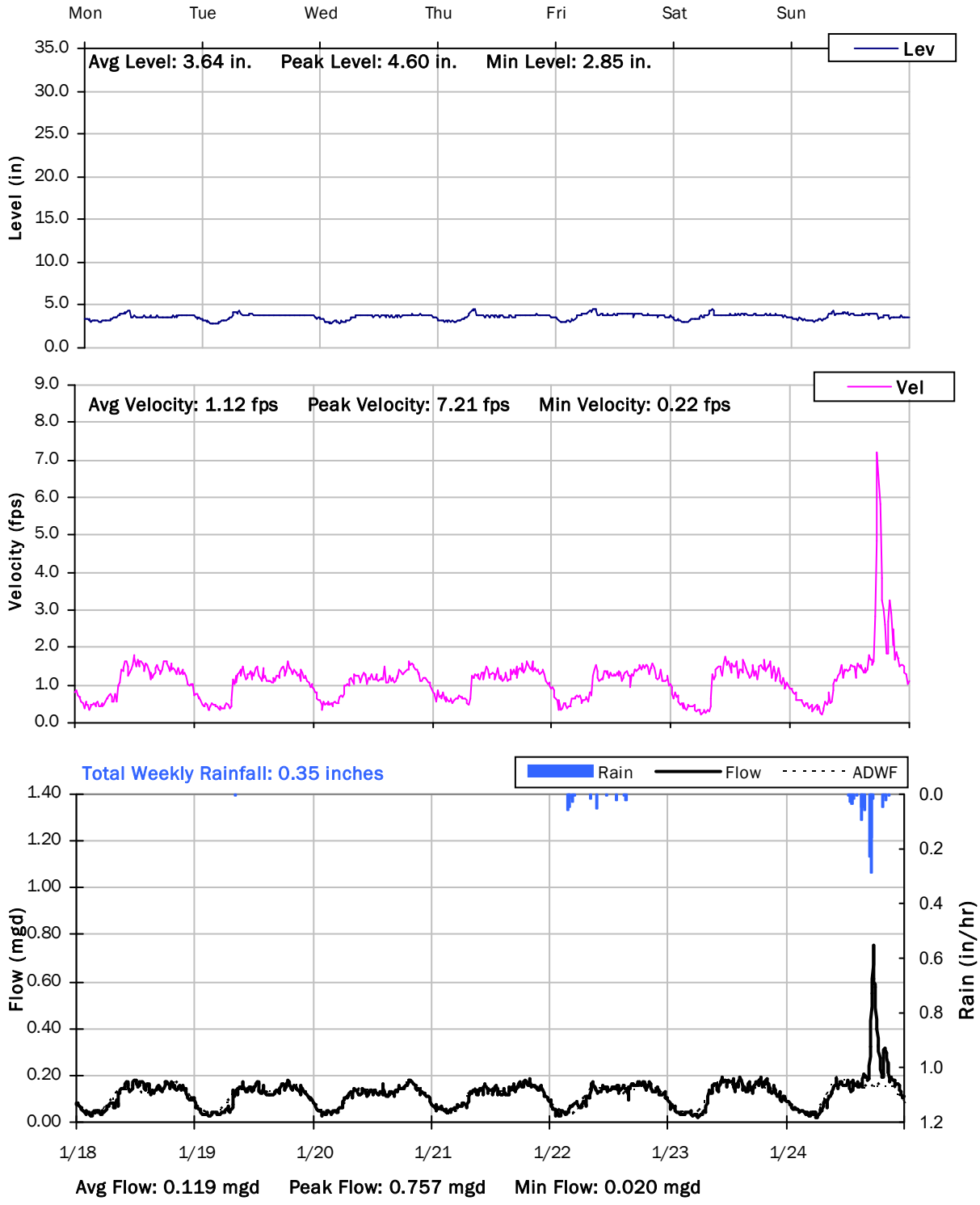
FM 1-3
Weekly Level, Velocity and Flow Hydrographs
1/4/2021 to 1/11/2021



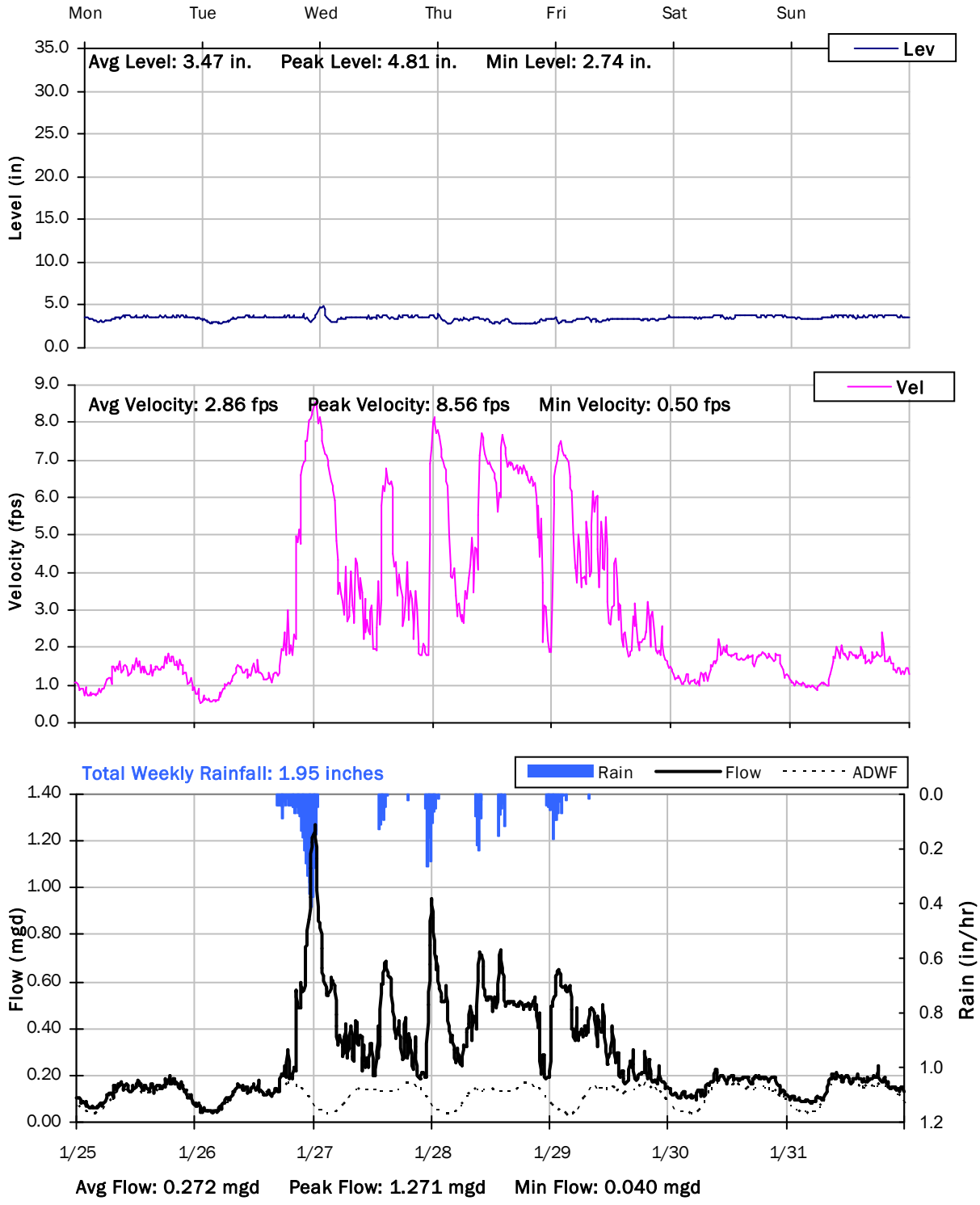
FM 1-3
Weekly Level, Velocity and Flow Hydrographs
1/11/2021 to 1/18/2021



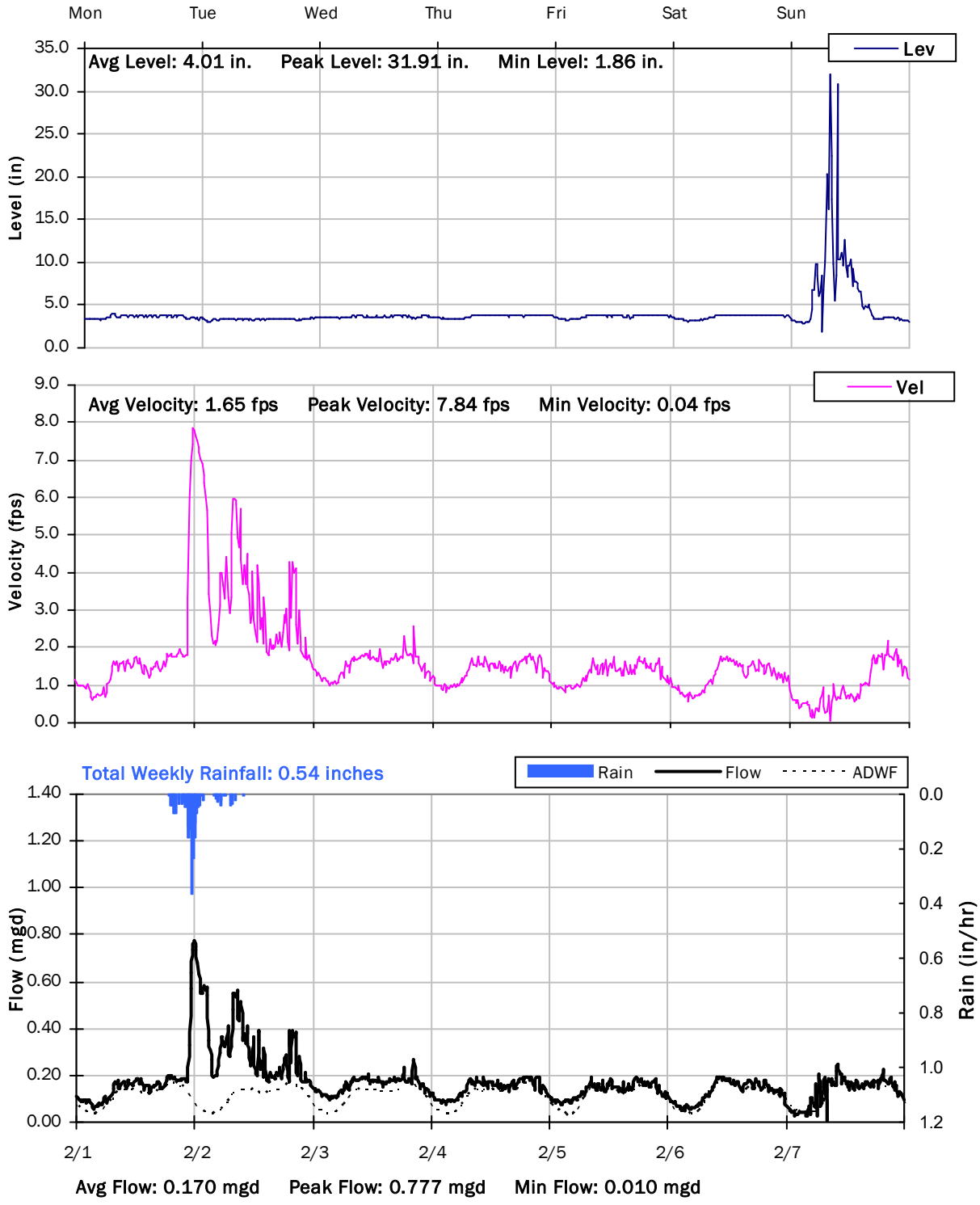
FM 1-3
Weekly Level, Velocity and Flow Hydrographs
1/18/2021 to 1/25/2021



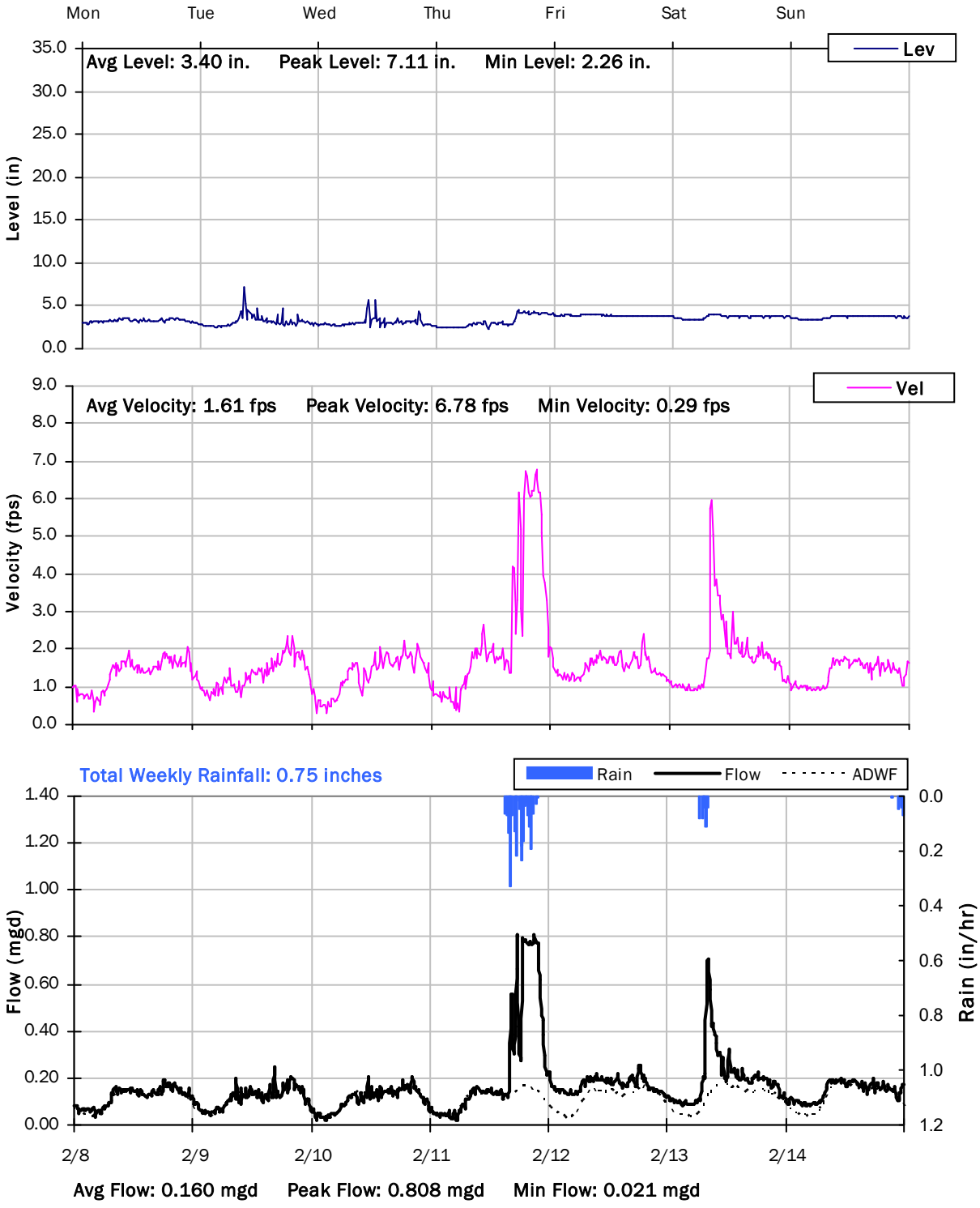
FM 1-3
Weekly Level, Velocity and Flow Hydrographs
1/25/2021 to 2/1/2021



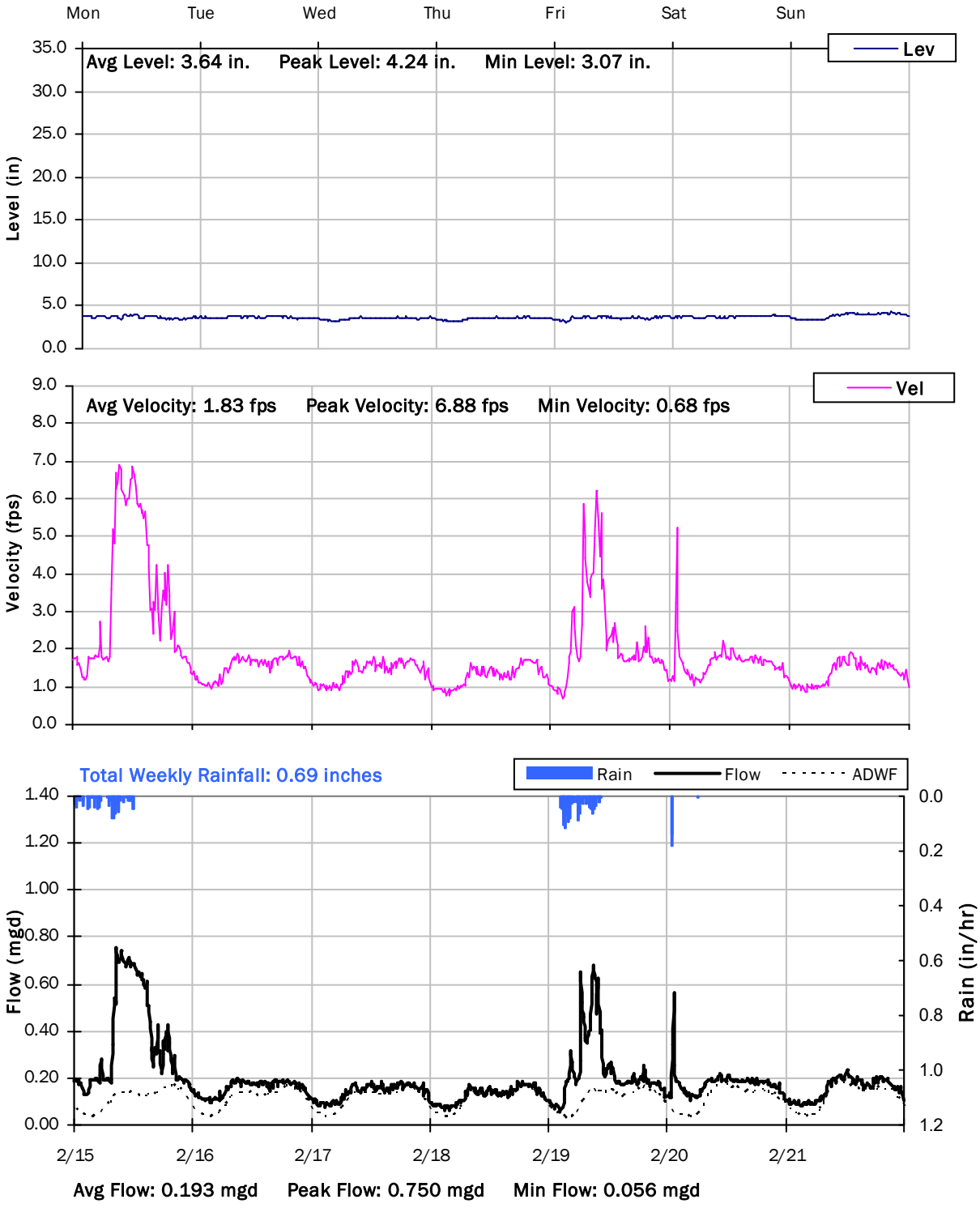
FM 1-3
Weekly Level, Velocity and Flow Hydrographs
2/1/2021 to 2/8/2021



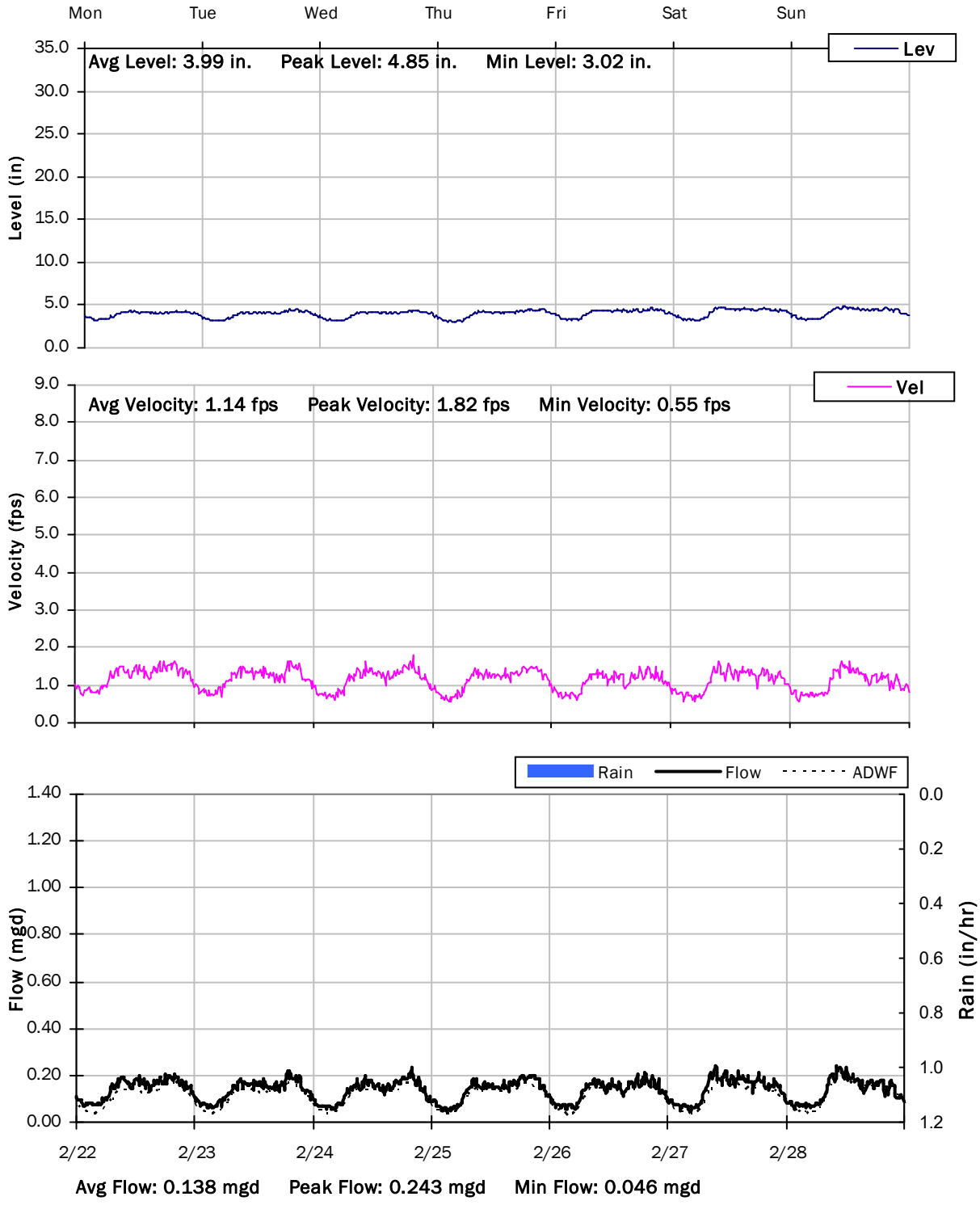
FM 1-3
Weekly Level, Velocity and Flow Hydrographs
2/8/2021 to 2/15/2021



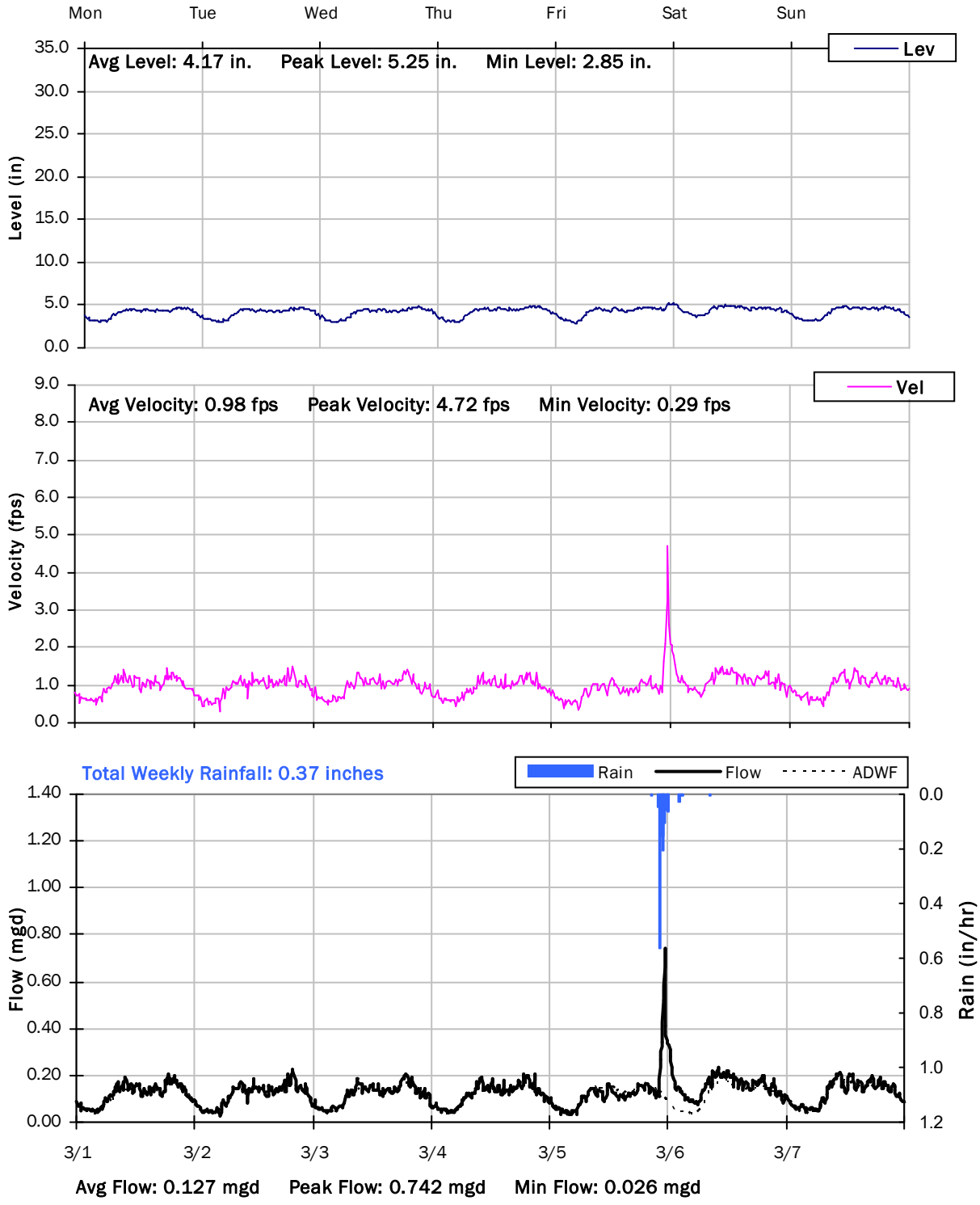
FM 1-3
Weekly Level, Velocity and Flow Hydrographs
2/15/2021 to 2/22/2021



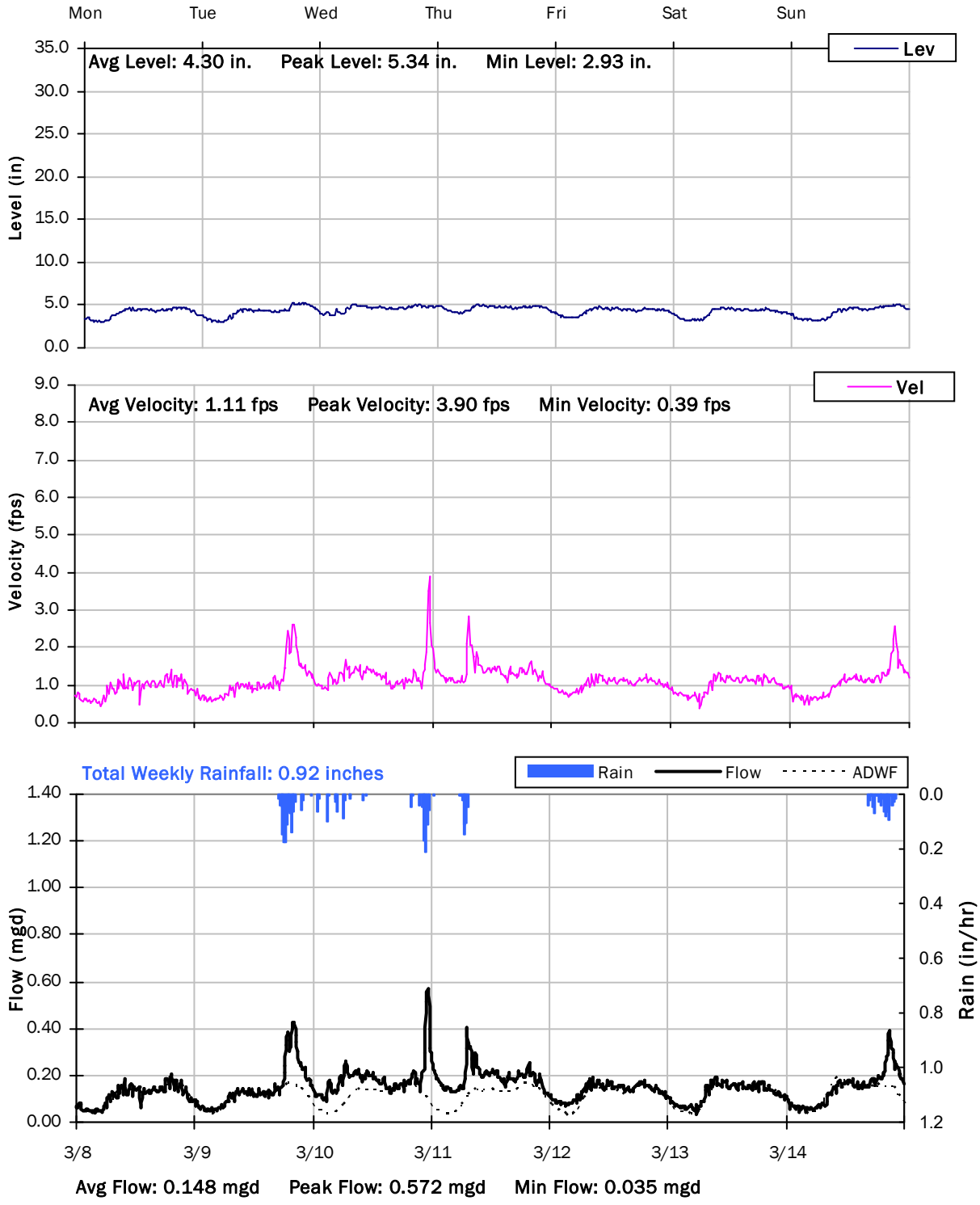
FM 1-3
Weekly Level, Velocity and Flow Hydrographs
2/22/2021 to 3/1/2021



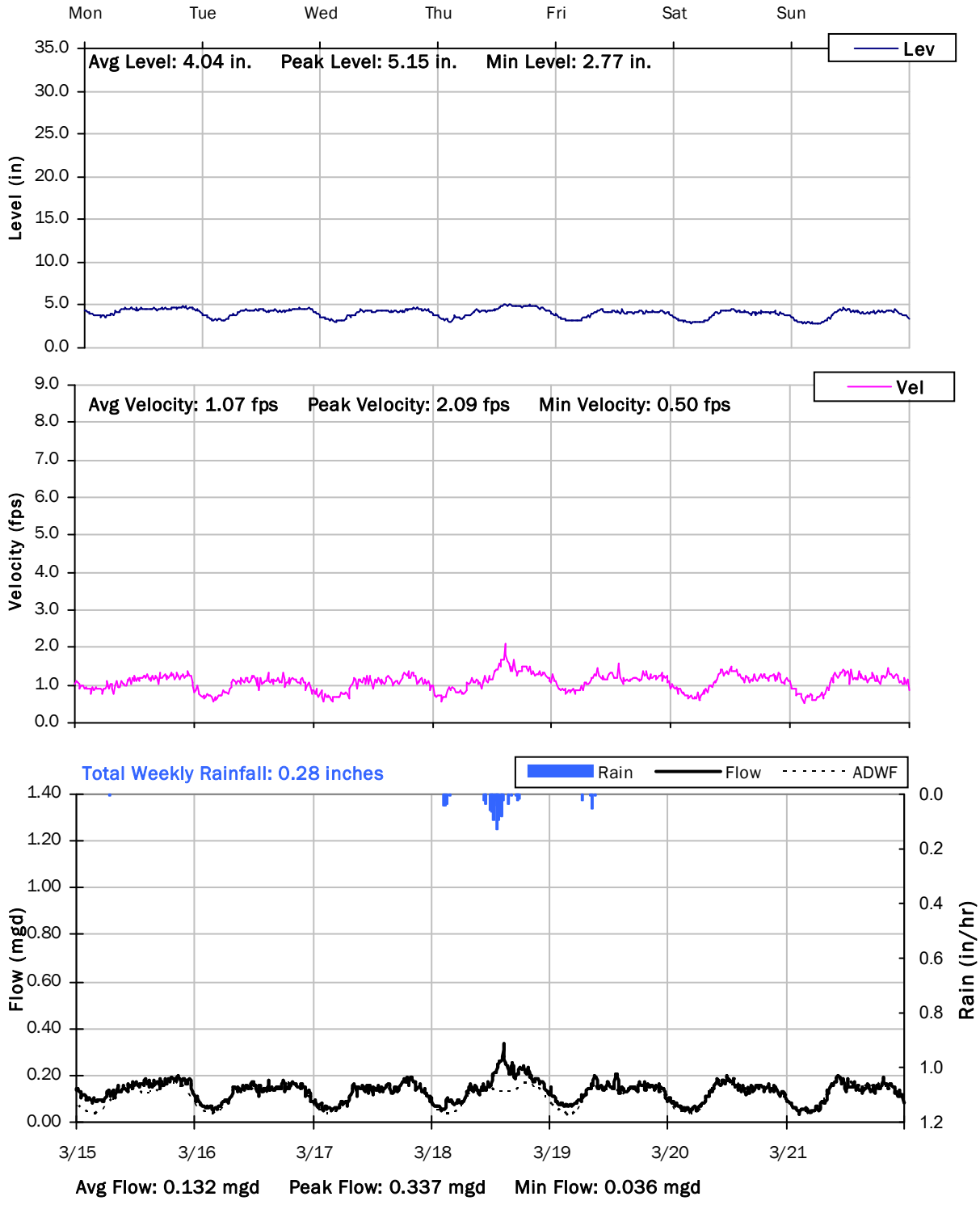
FM 1-3
Weekly Level, Velocity and Flow Hydrographs
3/1/2021 to 3/8/2021



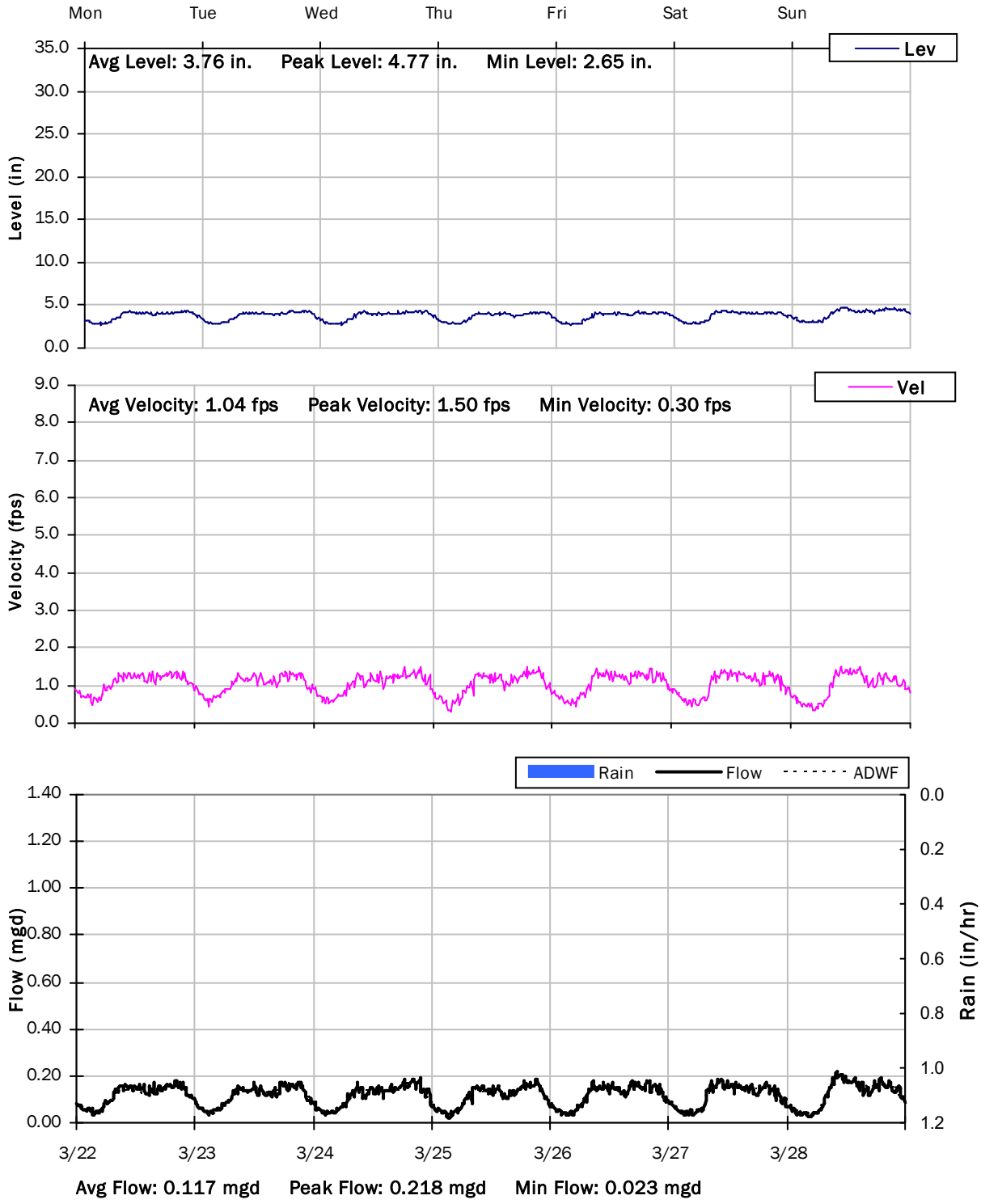
FM 1-3
Weekly Level, Velocity and Flow Hydrographs
3/8/2021 to 3/15/2021



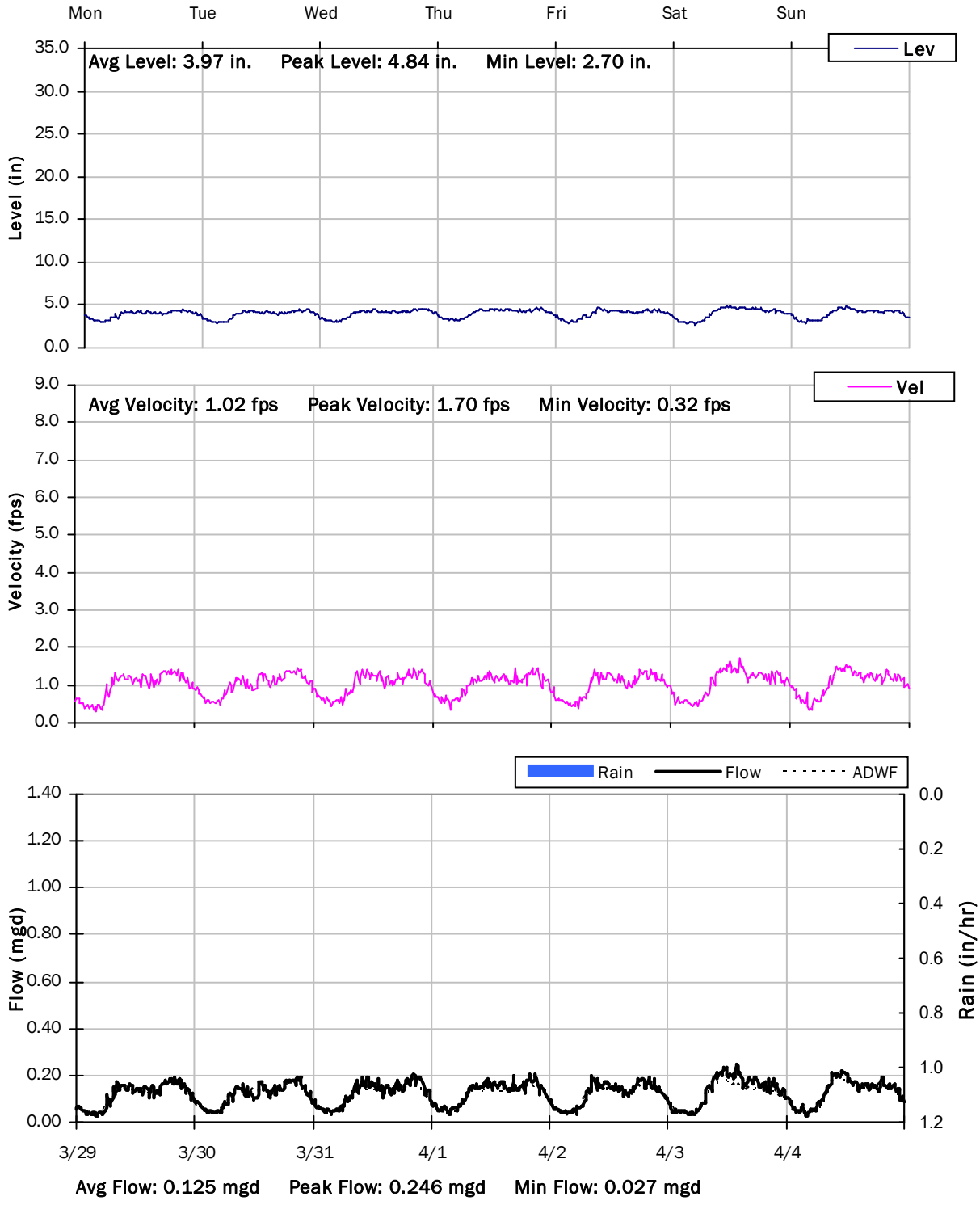
FM 1-3
Weekly Level, Velocity and Flow Hydrographs
3/15/2021 to 3/22/2021



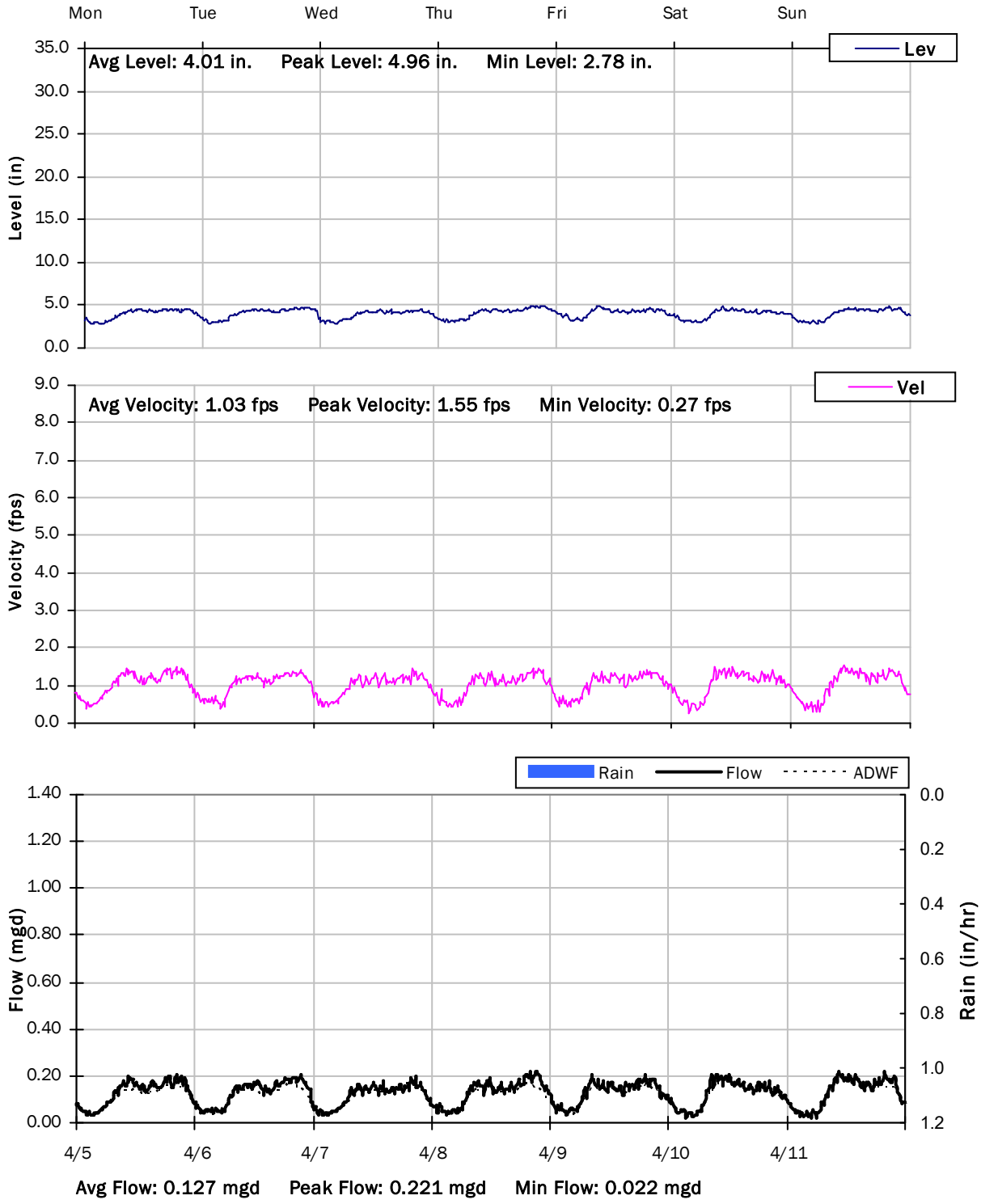
FM 1-3
Weekly Level, Velocity and Flow Hydrographs
3/22/2021 to 3/29/2021



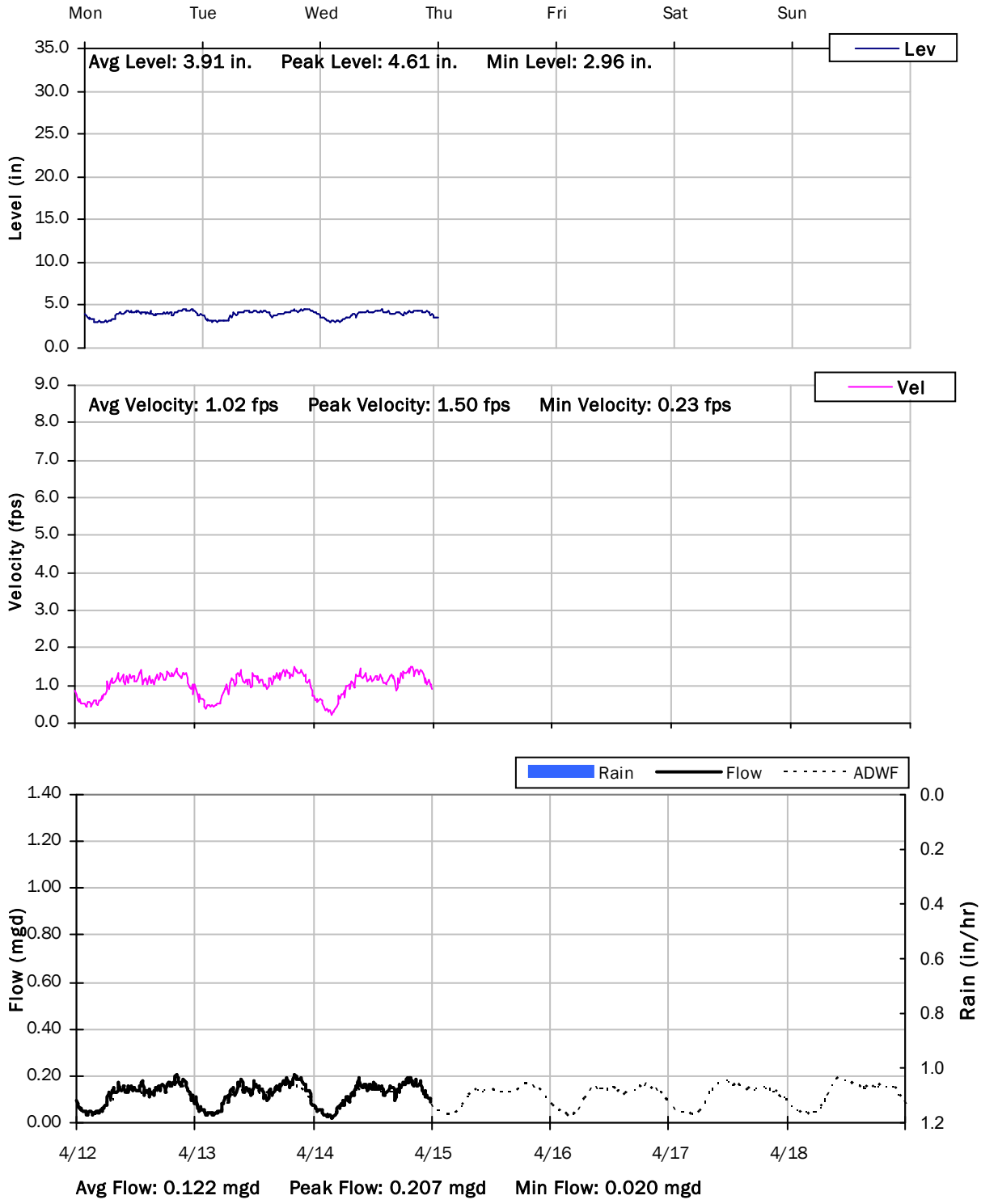
FM 1-3
Weekly Level, Velocity and Flow Hydrographs
3/29/2021 to 4/5/2021



FM 1-3
Weekly Level, Velocity and Flow Hydrographs
4/5/2021 to 4/12/2021



FM 1-3
Weekly Level, Velocity and Flow Hydrographs
4/12/2021 to 4/19/2021



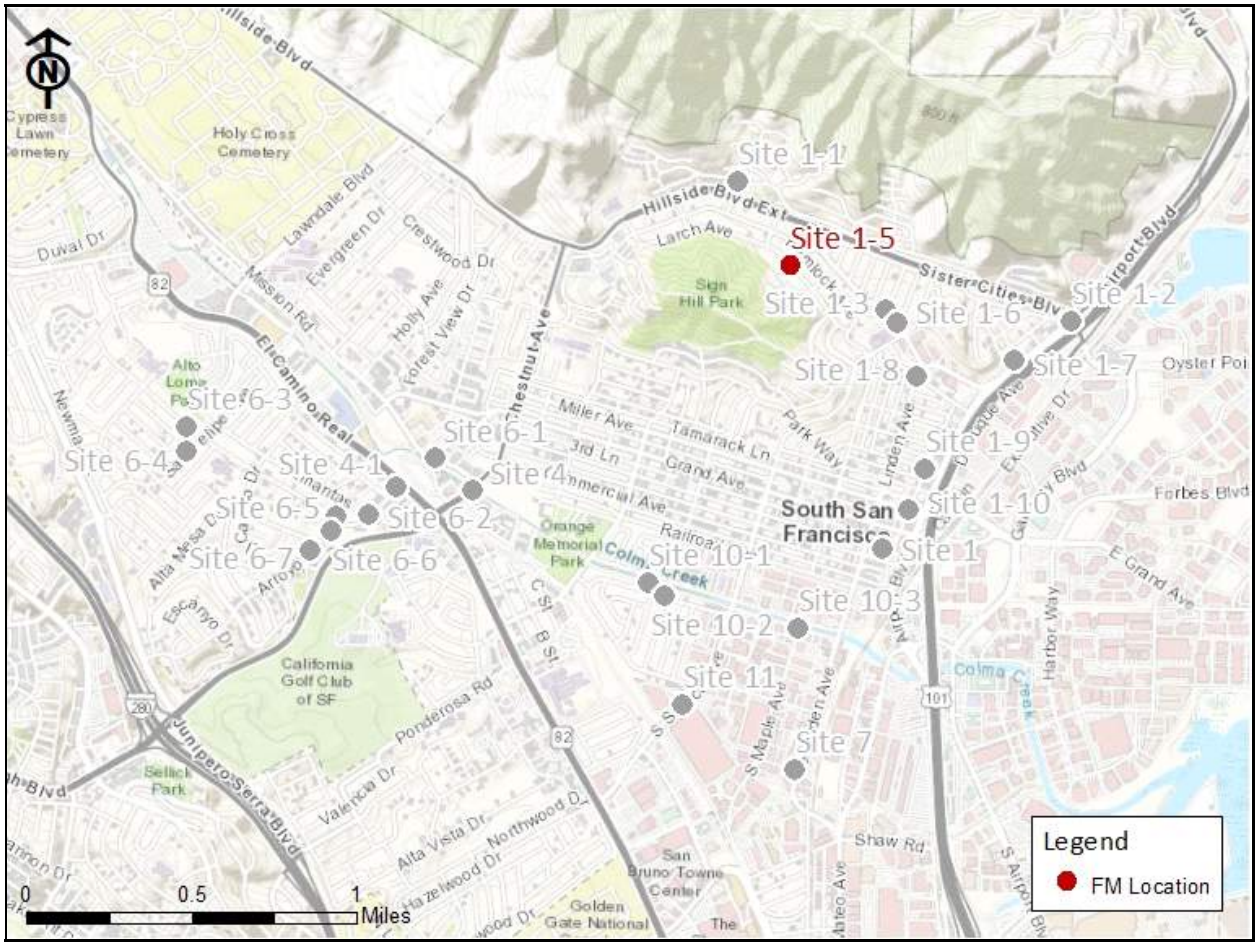
South San Francisco, CA

Sanitary Sewer Flow Monitoring
January 4 - April 14, 2021

Monitoring Site: FM 1-5

Location: Highland Avenue and Larch Avenue

Data Summary Report



Vicinity Map: FM 1-5

FM 1-5

Site Information

Location: Highland Avenue and Larch Avenue

Coordinates: 122.4149° W, 37.6664° N

Rim Elevation (Earth): 143 feet

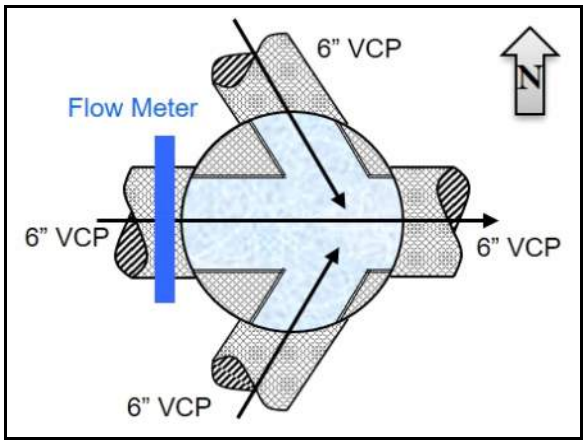
Pipe Diameter: 6 inches

ADWF: 0.002 mgd

Peak Measured Flow: 0.082 mgd

Satellite Map

Sanitary Map



Flow Sketch

Street View

Plan View

FM 1-5

Additional Site Photos

Effluent Pipe

Monitored West Influent Pipe

FM 1-5

Additional Site Photos

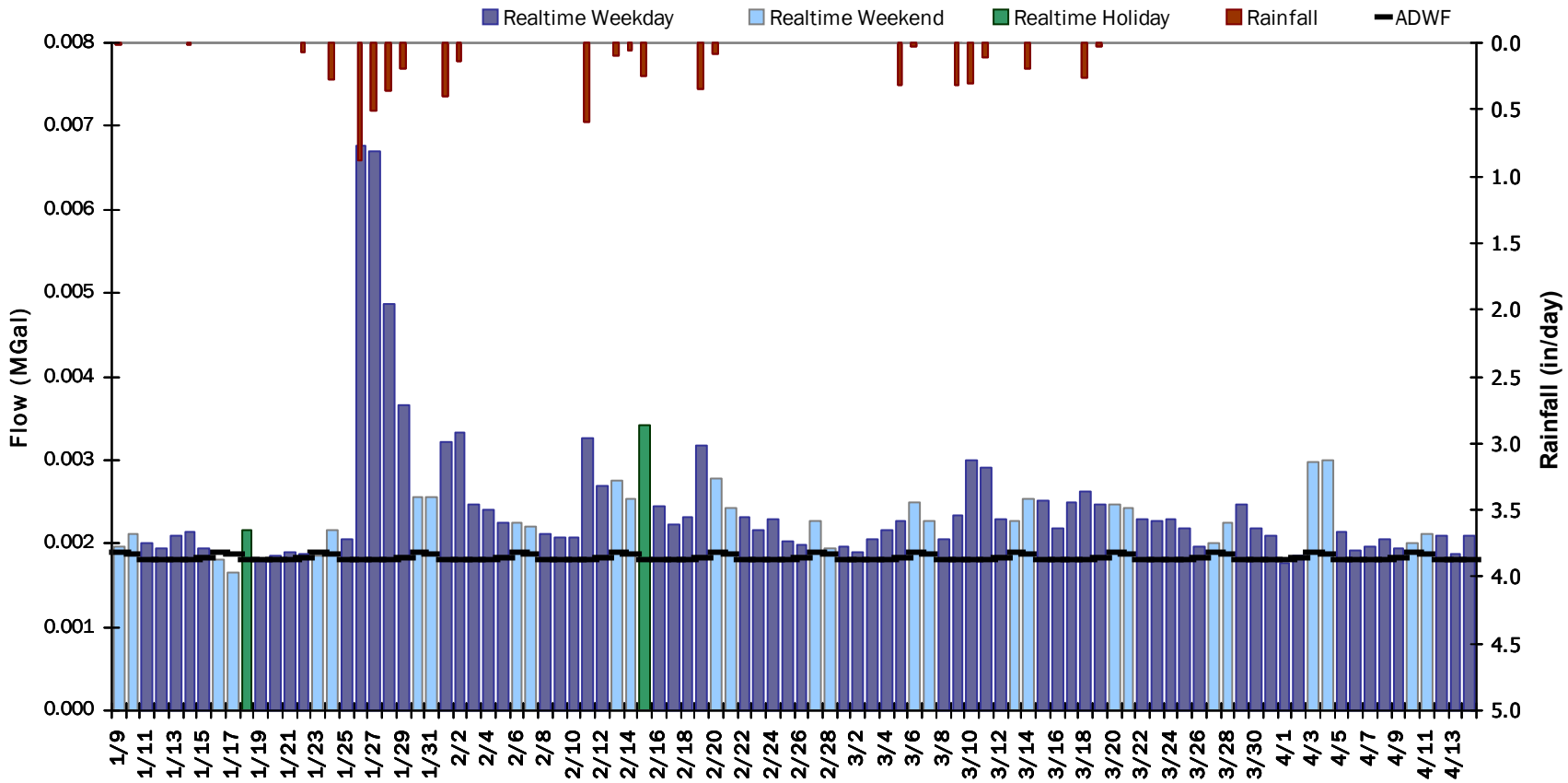
North Influent Pipe

South Influent Pipe

FM 1-5
Period Flow Summary: Daily Flow Totals

Avg Period Flow: 0.002 MGal Peak Daily Flow: 0.007 MGal Min Daily Flow: 0.002 MGal

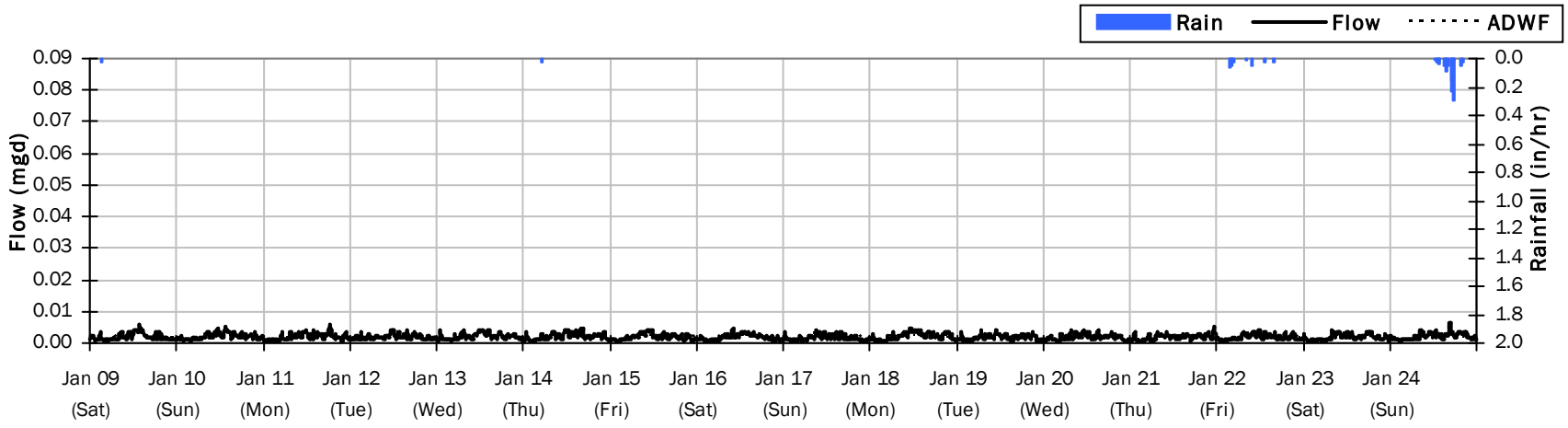
Total Period Rainfall: 5.84 inches

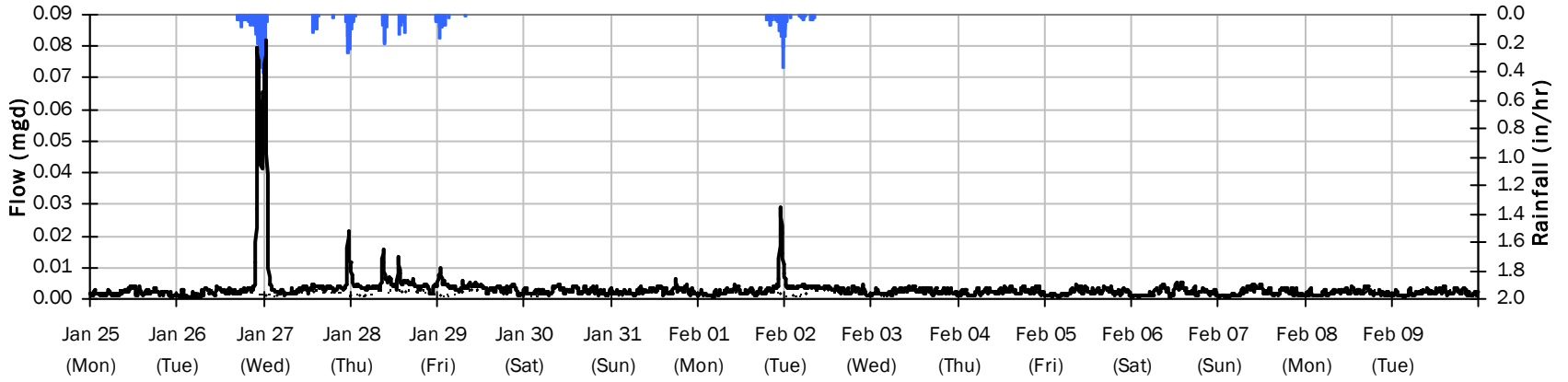


FM 1-5

Flow Summary: 1/9/2021 to 2/9/2021

Total Period Rainfall: 2.85 inches Avg Flow: 0.003 mgd Peak Flow: 0.082 mgd Min Flow: 0.000 mgd

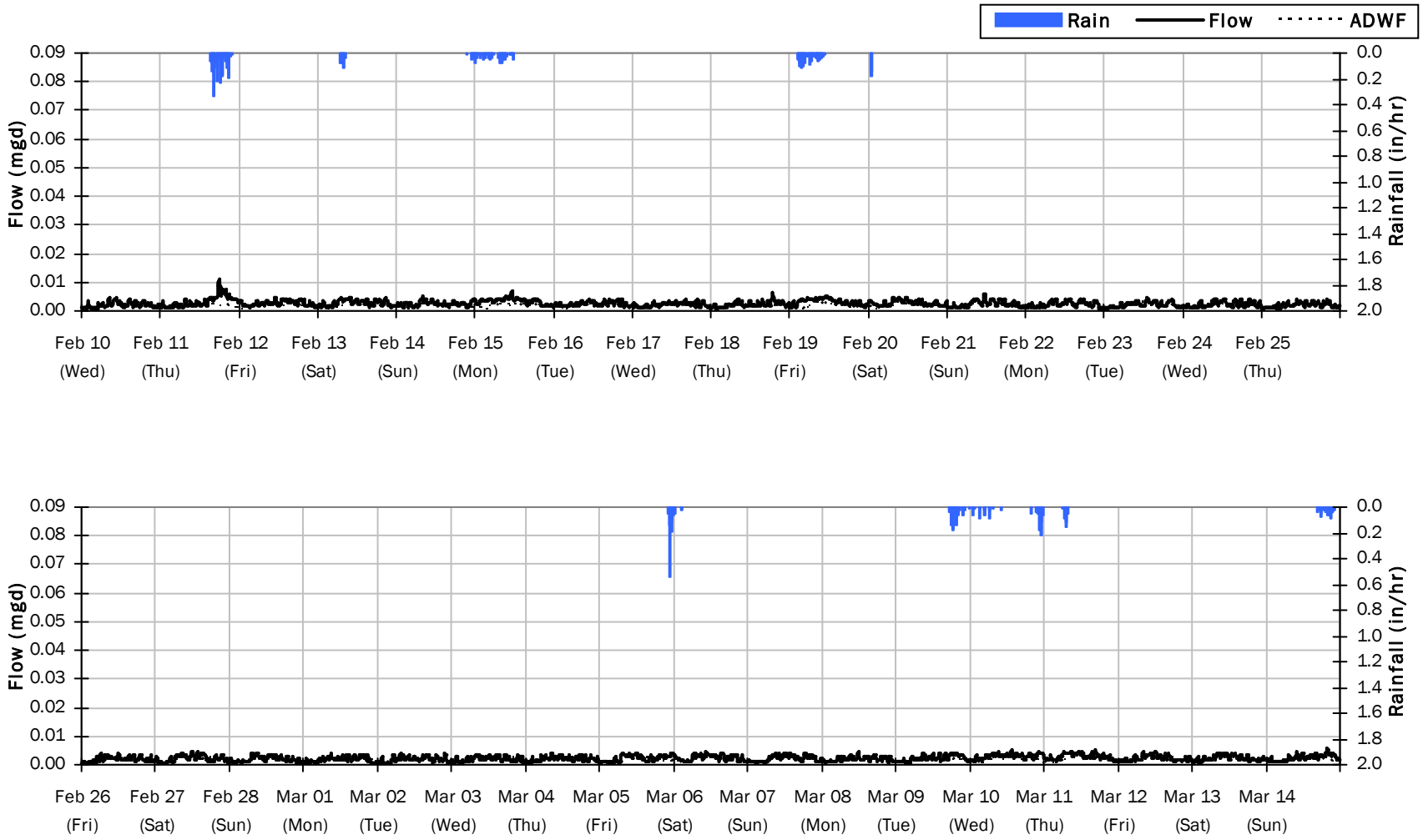




FM 1-5

Flow Summary: 2/10/2021 to 3/14/2021

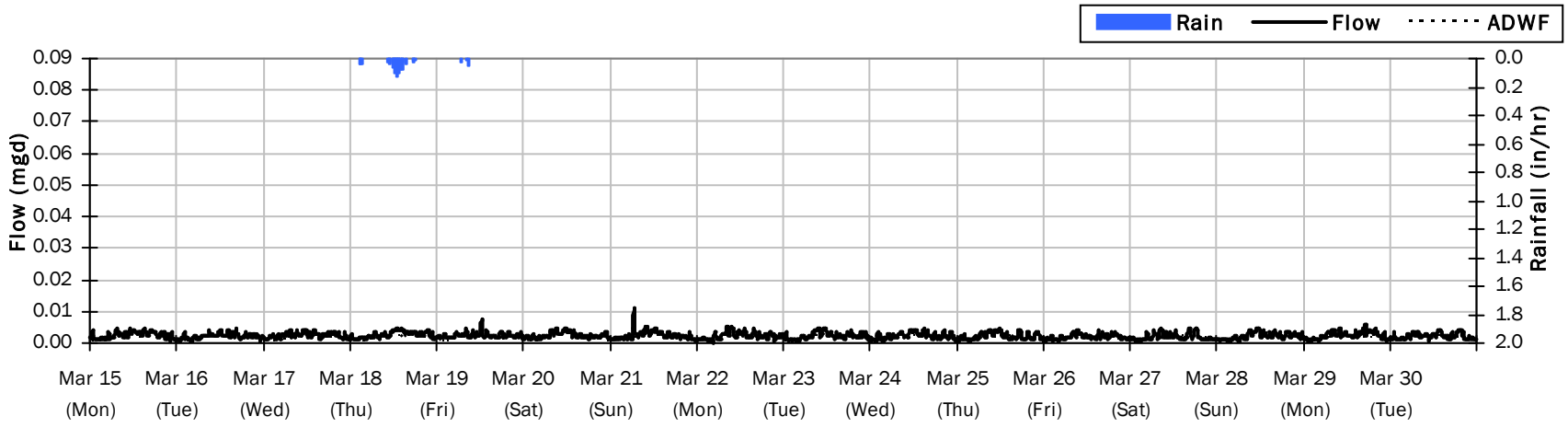
Total Period Rainfall: 2.69 inches Avg Flow: 0.002 mgd Peak Flow: 0.011 mgd Min Flow: 0.000 mgd

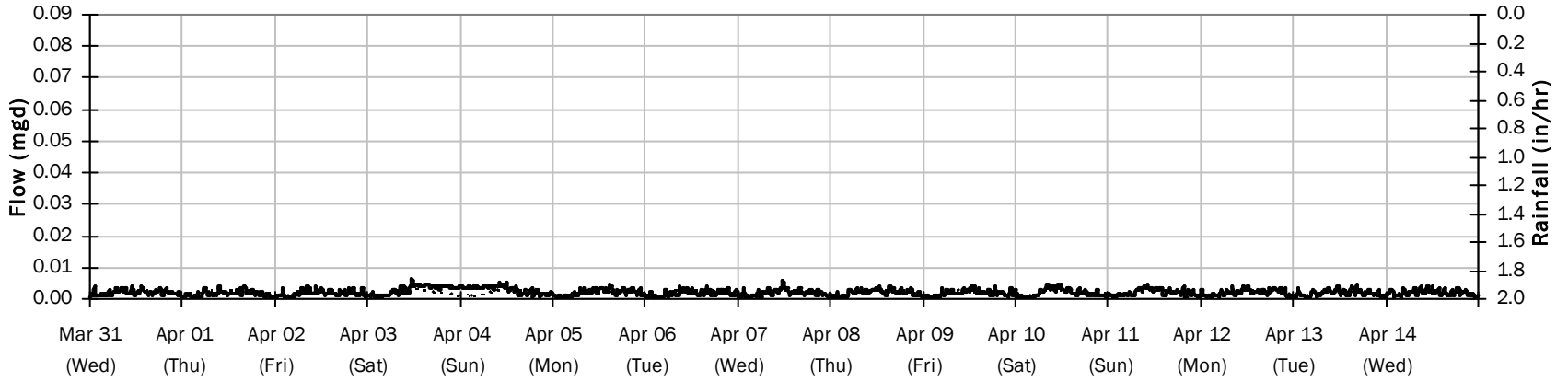


FM 1-5

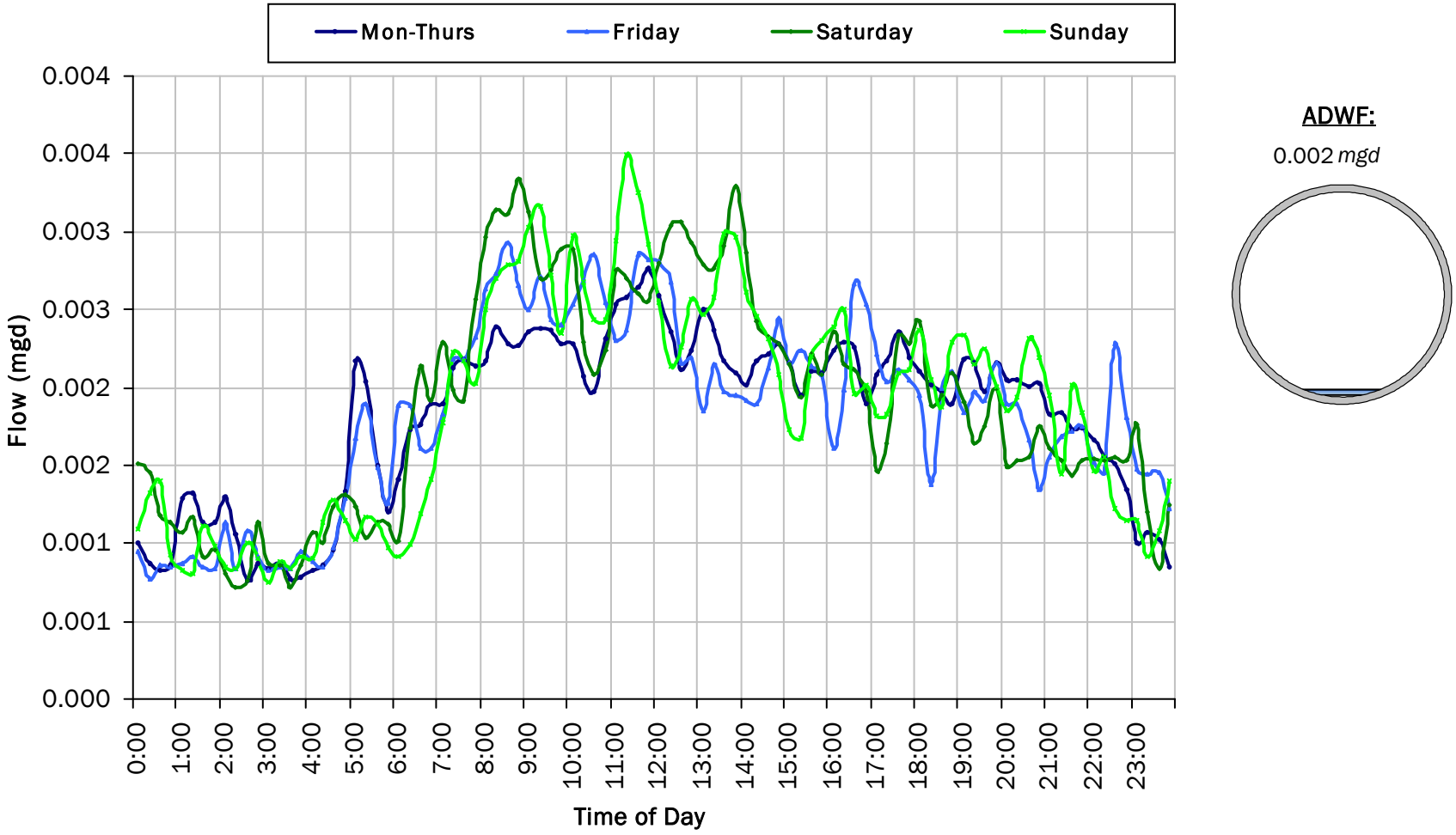
Flow Summary: 3/15/2021 to 4/14/2021

Total Period Rainfall: 0.29 inches Avg Flow: 0.002 mgd Peak Flow: 0.011 mgd Min Flow: 0.000 mgd





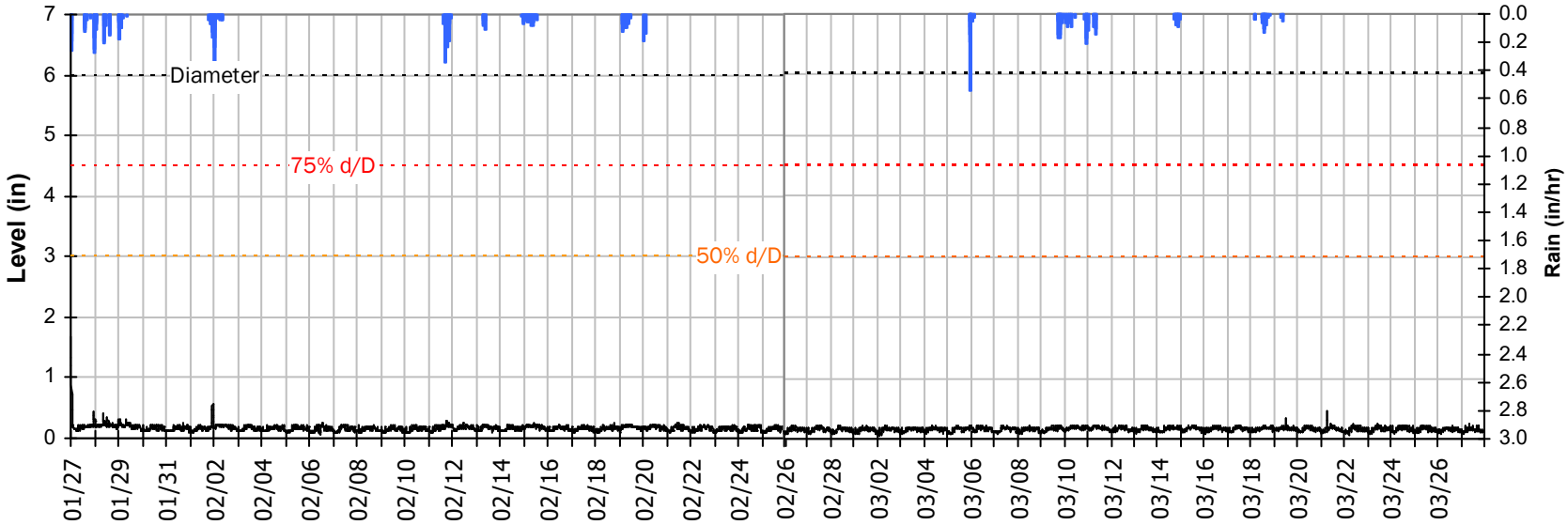
FM 1-5
Average Dry Weather Flow Hydrographs

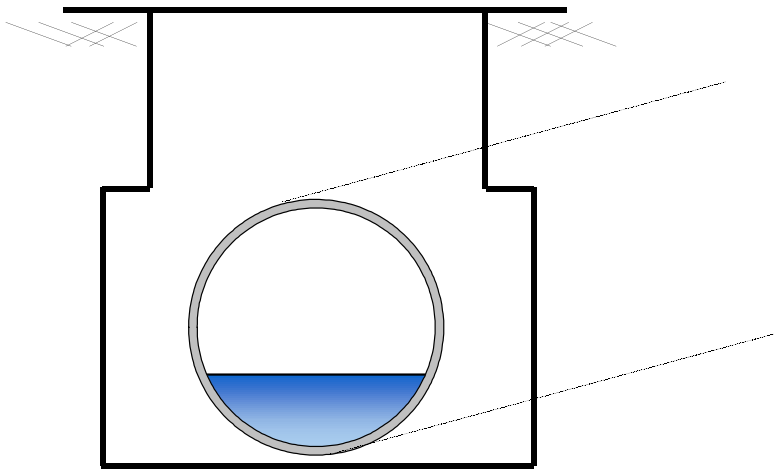


FM 1-5

Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Monitoring Period

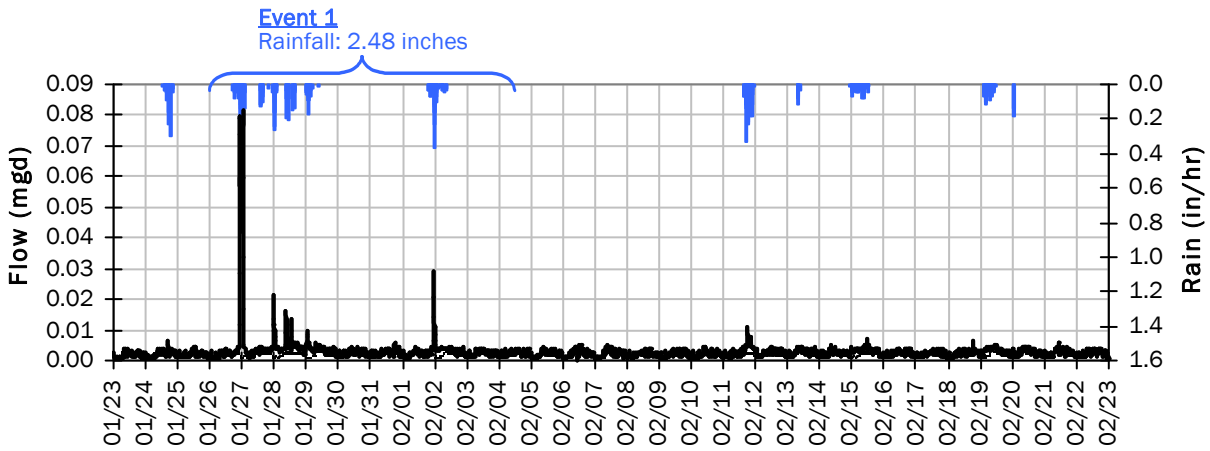




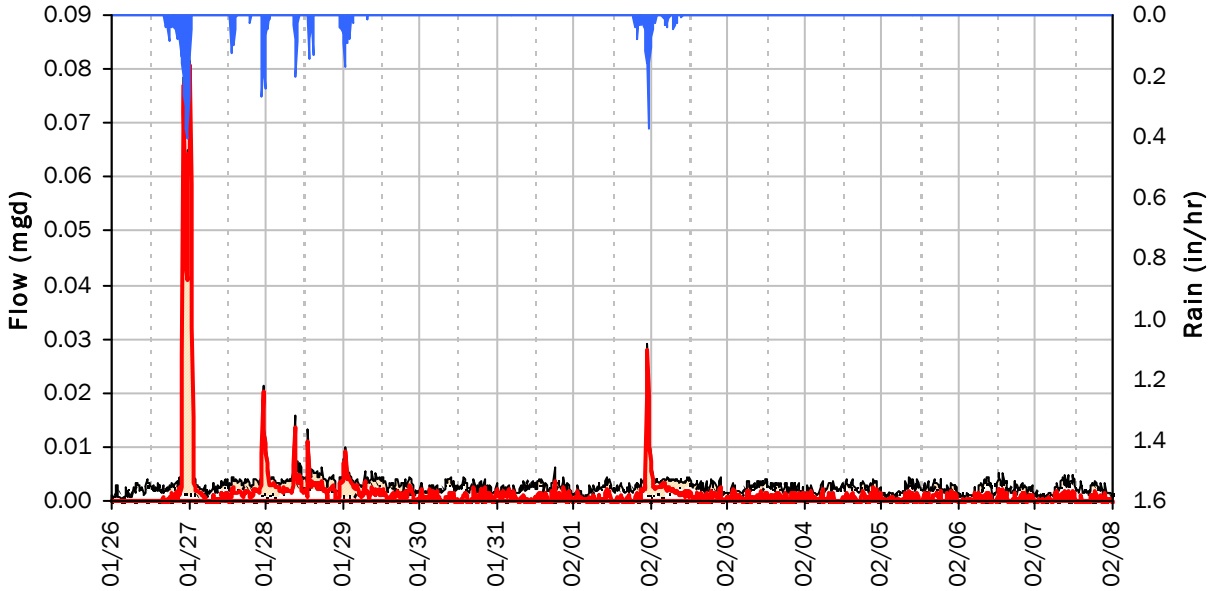
Pipe Diameter:	6	*inches*
Peak Measured Level:	1.84	*inches*
Peak d/D Ratio:	0.31	

FM 1-5
I/I Summary: Event 1

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



Event 1 Detail Graph

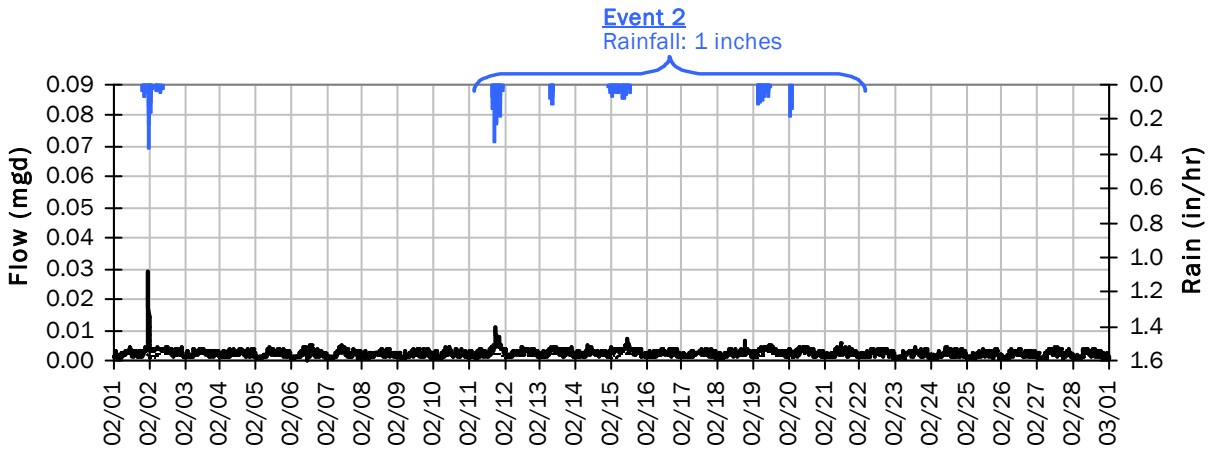


Storm Event I/I Analysis (Rain = 2.48 inches)

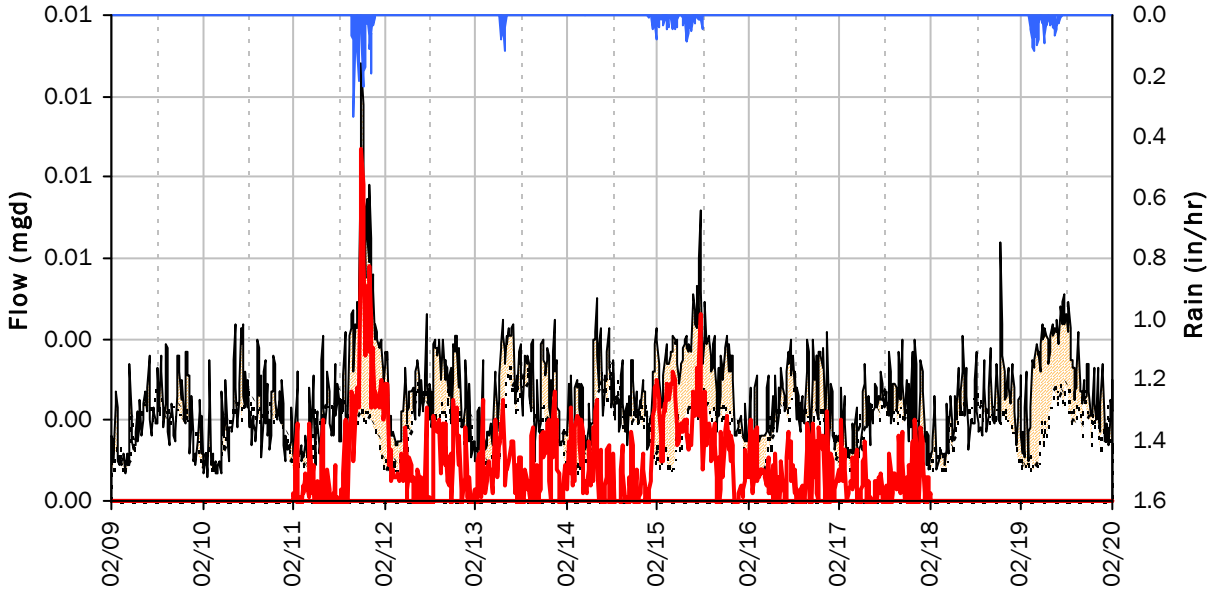
Capacity		Inflow / Infiltration	
Peak Flow:	0.08 *mgd*	**Peak I/I Rate:**	0.08 *mgd*
PF:	44.45	**Total I/I:**	21,000 *gallons*
Peak Level:	1.84 *in*		
d/D Ratio:	0.31		

FM 1-5
I/I Summary: Event 2

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



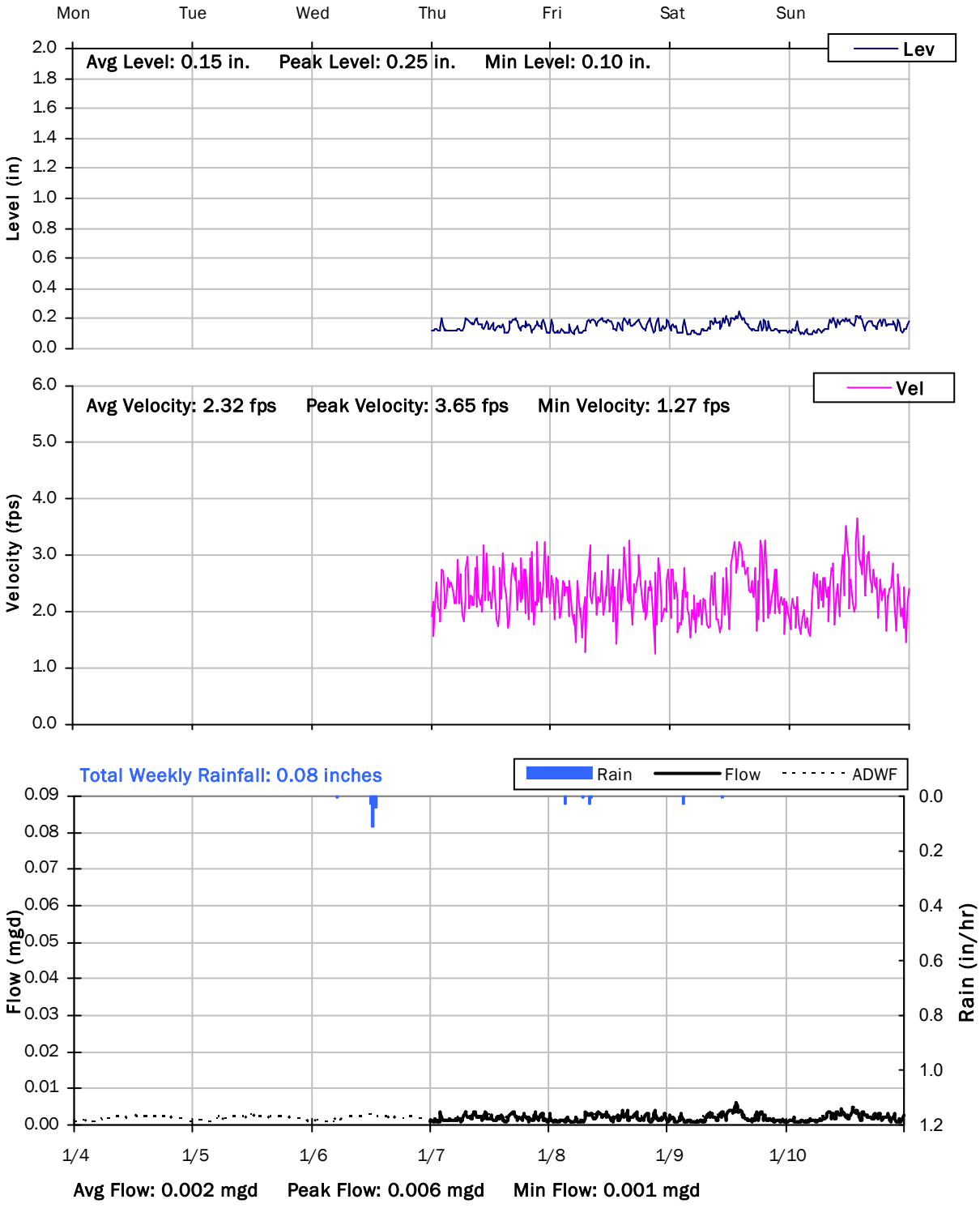
Event 2 Detail Graph



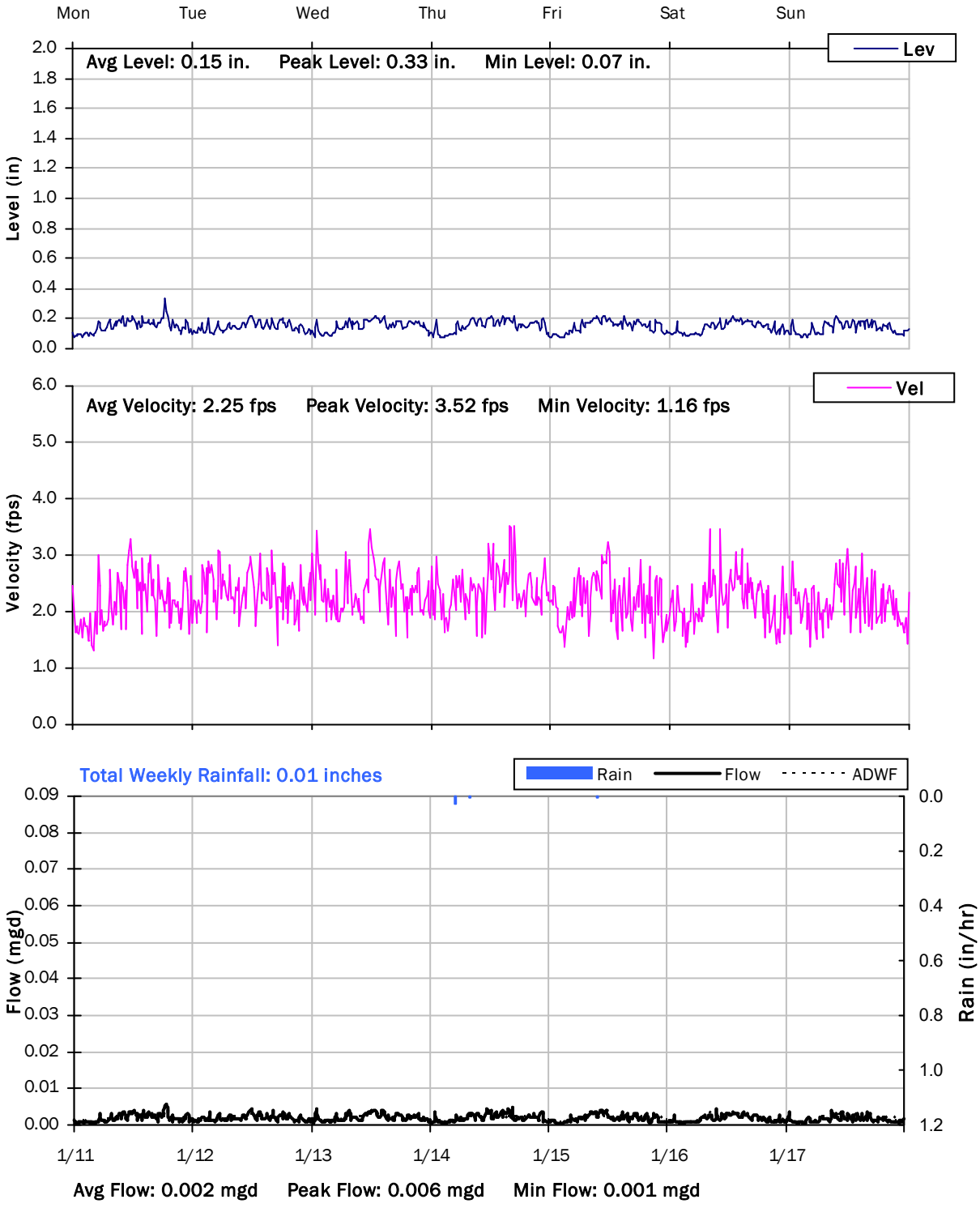
Storm Event I/I Analysis (Rain = 1.00 inches)

Capacity		Inflow / Infiltration	
Peak Flow:	0.01 *mgd*	**Peak I/I Rate:**	0.01 *mgd*
PF:	5.88	**Total I/I:**	6,000 *gallons*
Peak Level:	0.30 *in*		
d/D Ratio:	0.05		

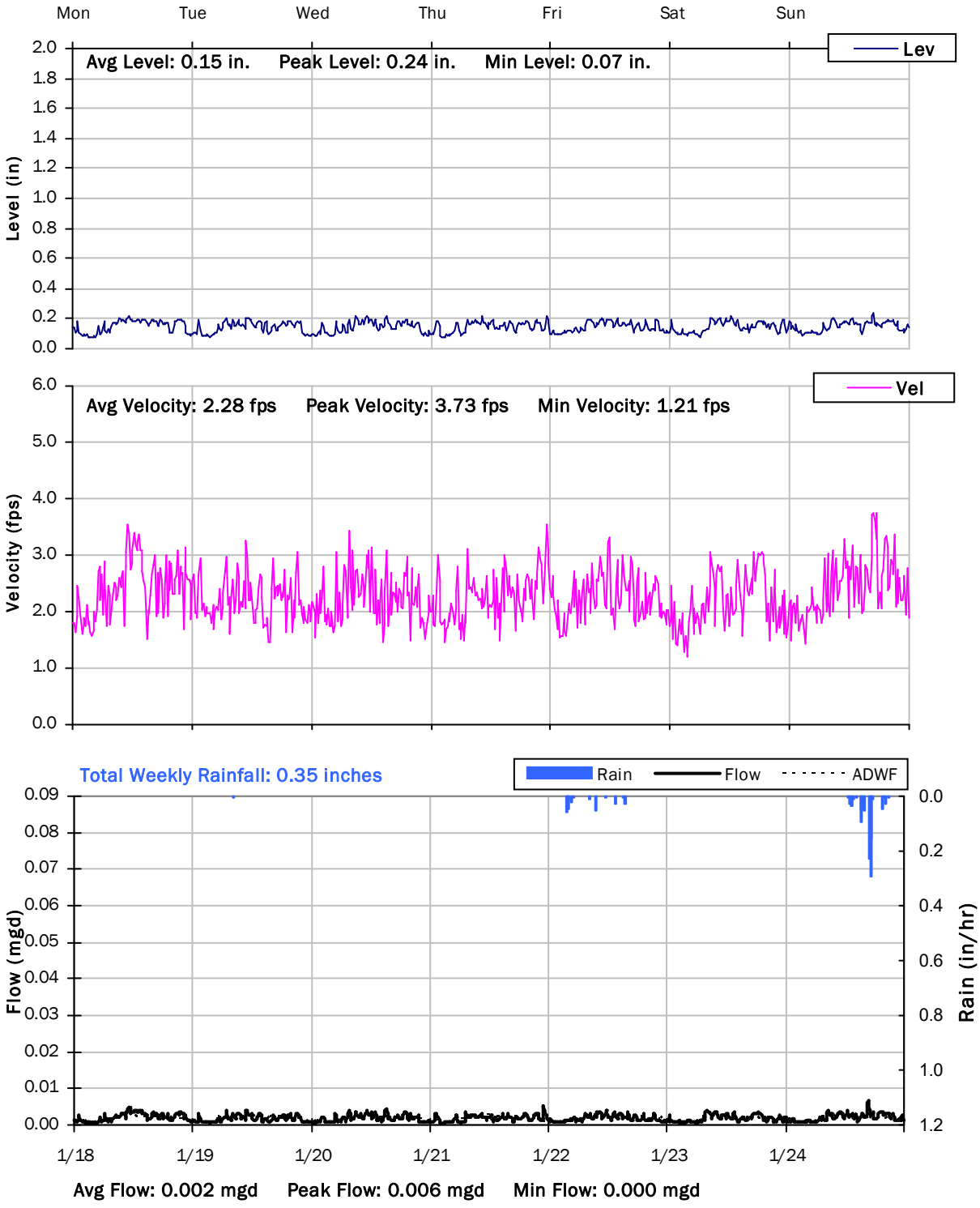
FM 1-5
Weekly Level, Velocity and Flow Hydrographs
1/4/2021 to 1/11/2021



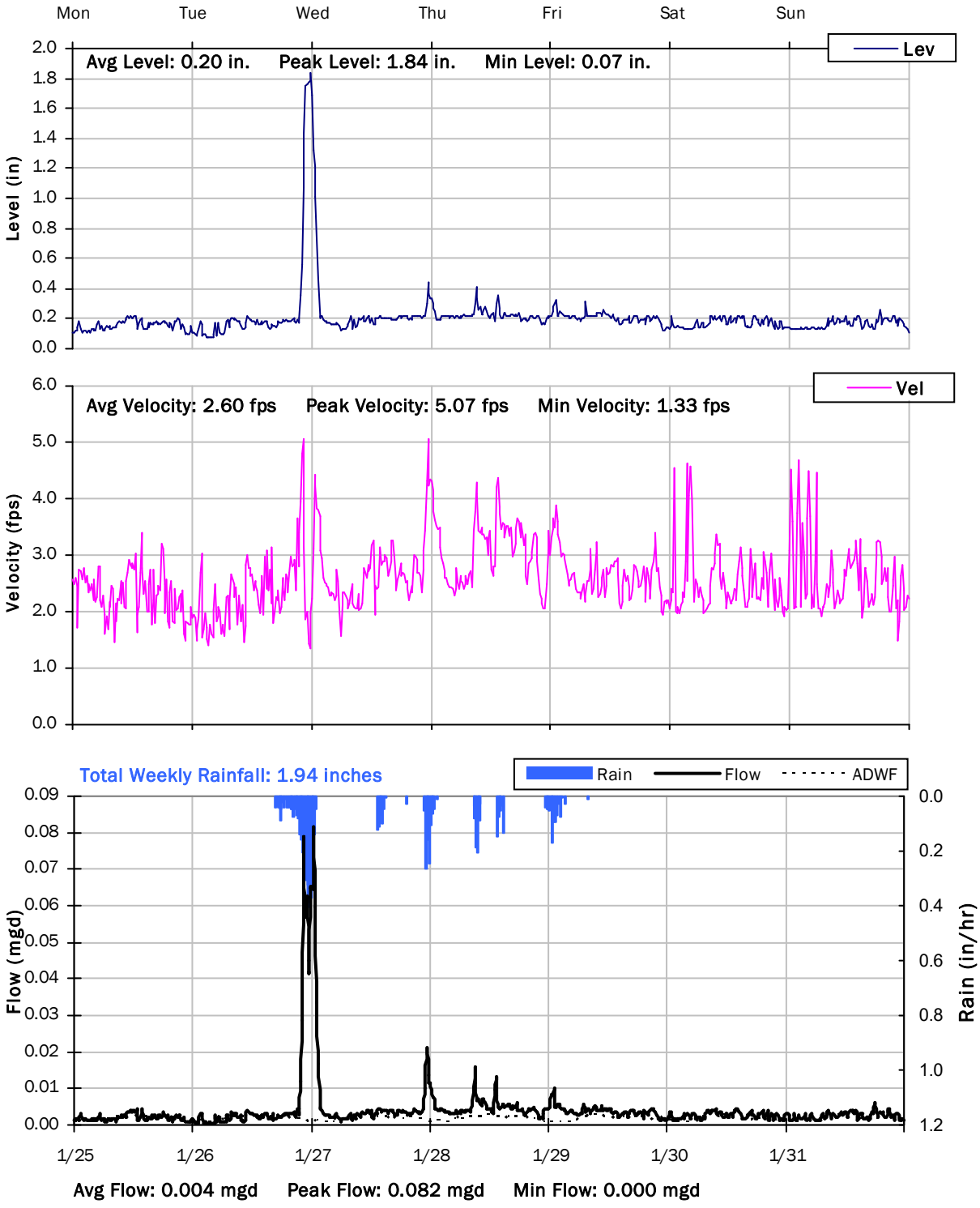
FM 1-5
Weekly Level, Velocity and Flow Hydrographs
1/11/2021 to 1/18/2021



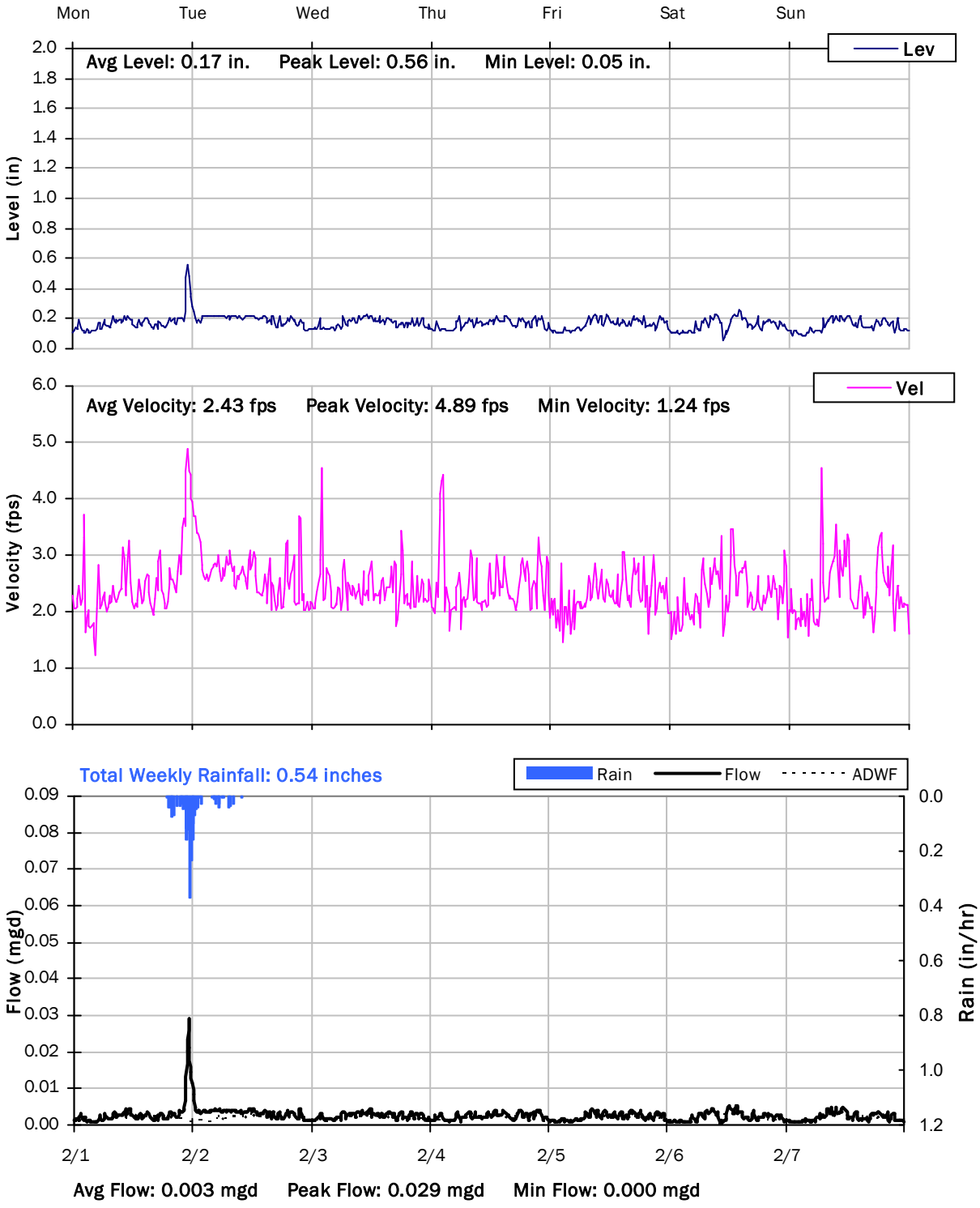
FM 1-5
Weekly Level, Velocity and Flow Hydrographs
1/18/2021 to 1/25/2021



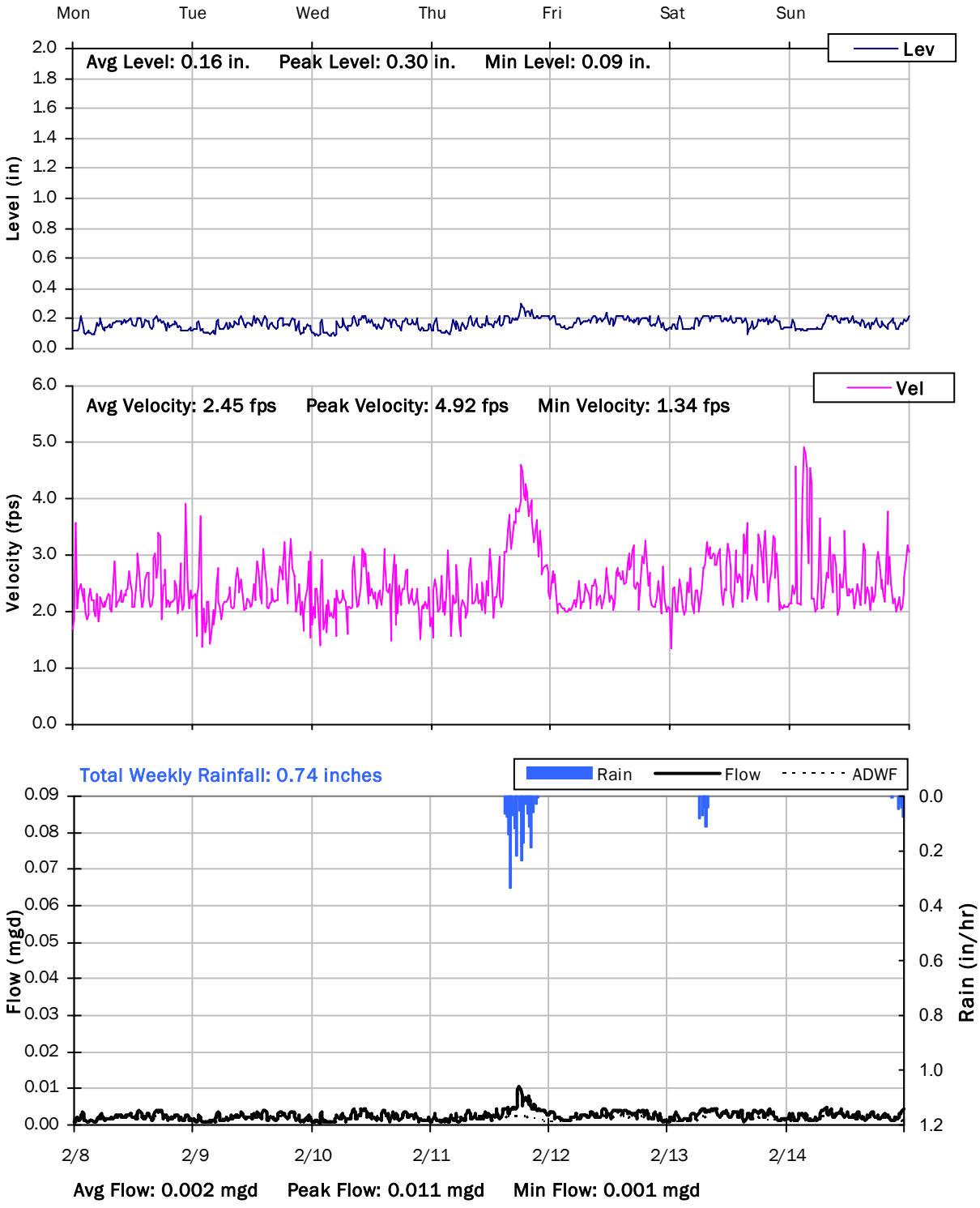
FM 1-5
Weekly Level, Velocity and Flow Hydrographs
1/25/2021 to 2/1/2021



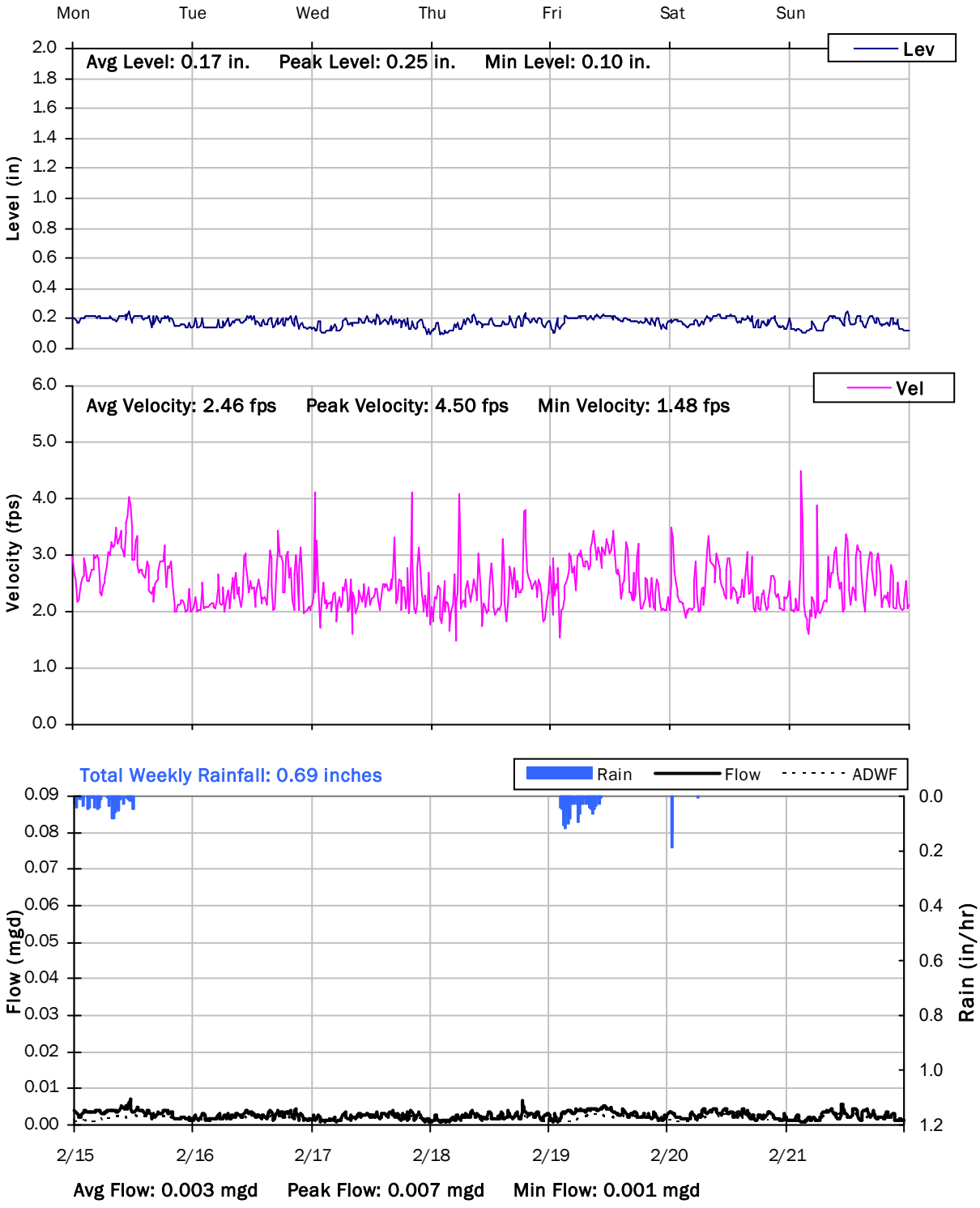
FM 1-5
Weekly Level, Velocity and Flow Hydrographs
2/1/2021 to 2/8/2021



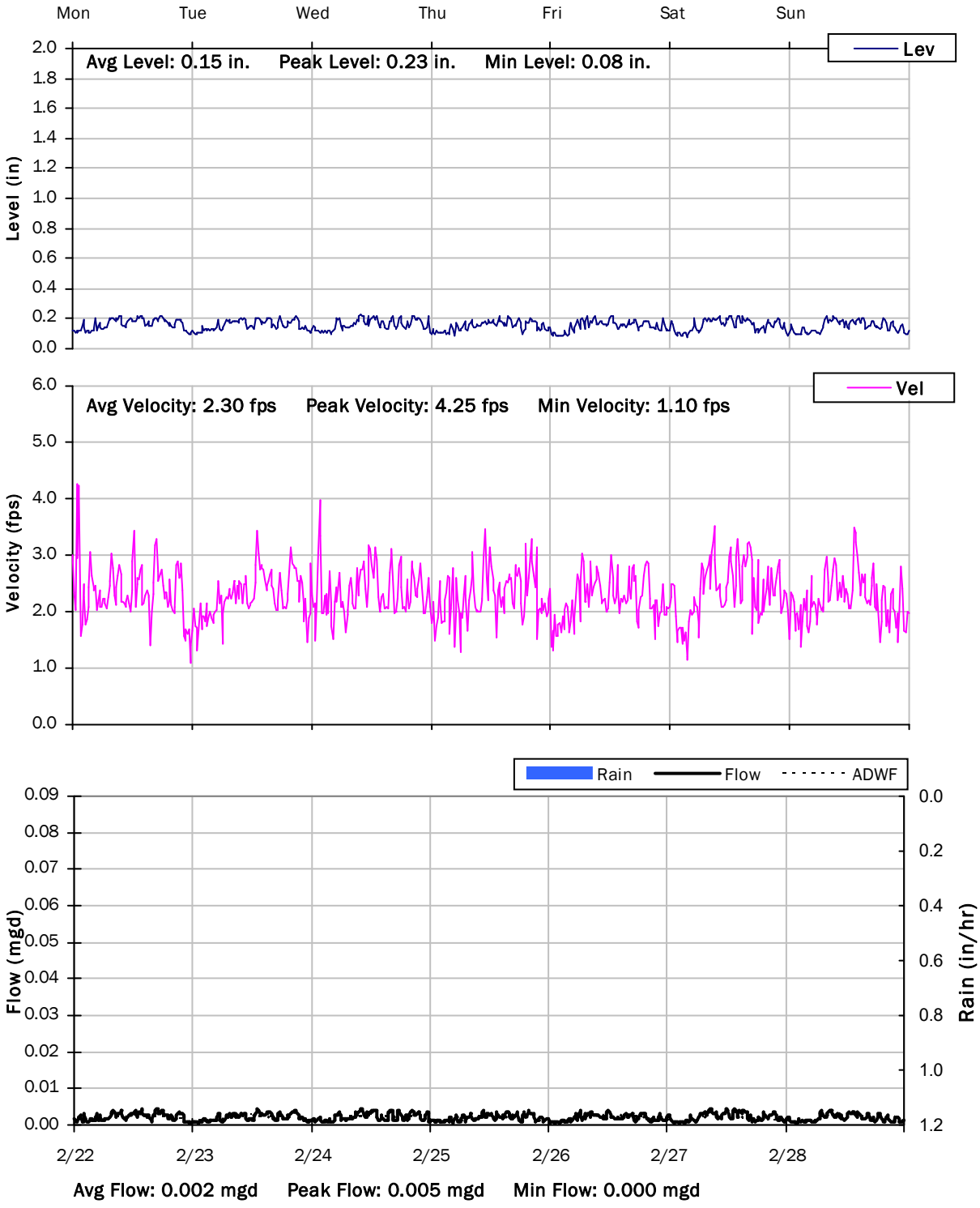
FM 1-5
Weekly Level, Velocity and Flow Hydrographs
2/8/2021 to 2/15/2021



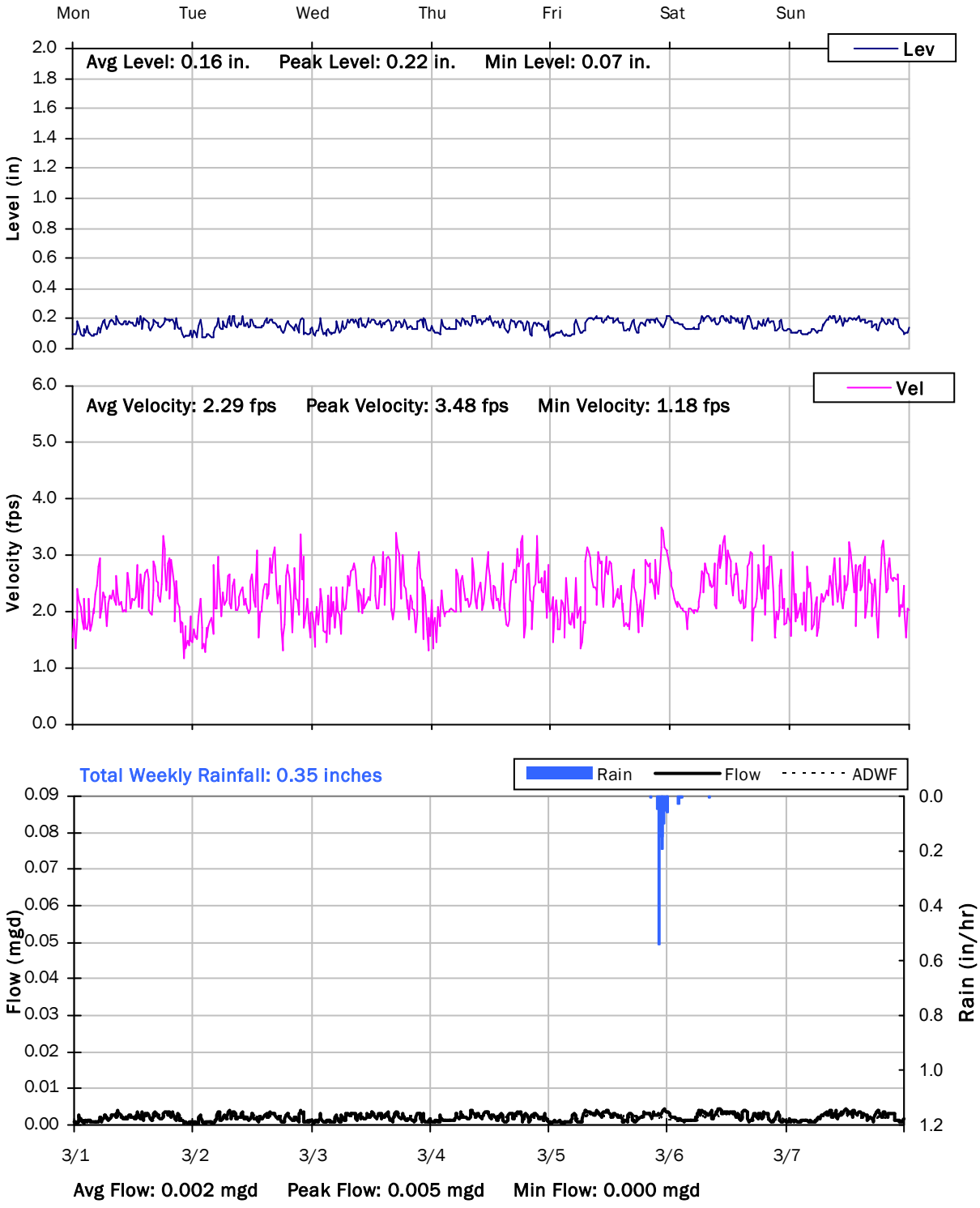
FM 1-5
Weekly Level, Velocity and Flow Hydrographs
2/15/2021 to 2/22/2021



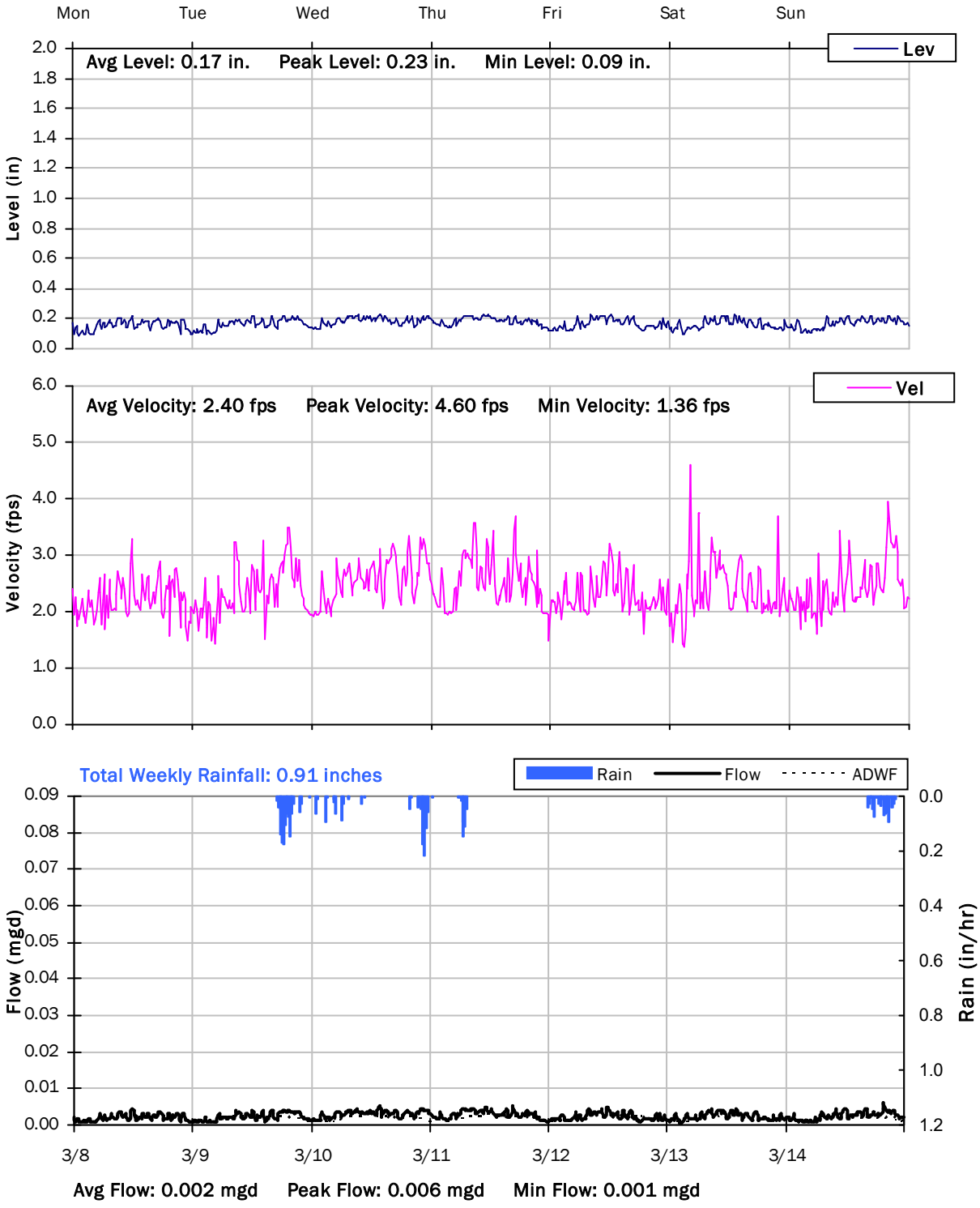
FM 1-5
Weekly Level, Velocity and Flow Hydrographs
2/22/2021 to 3/1/2021



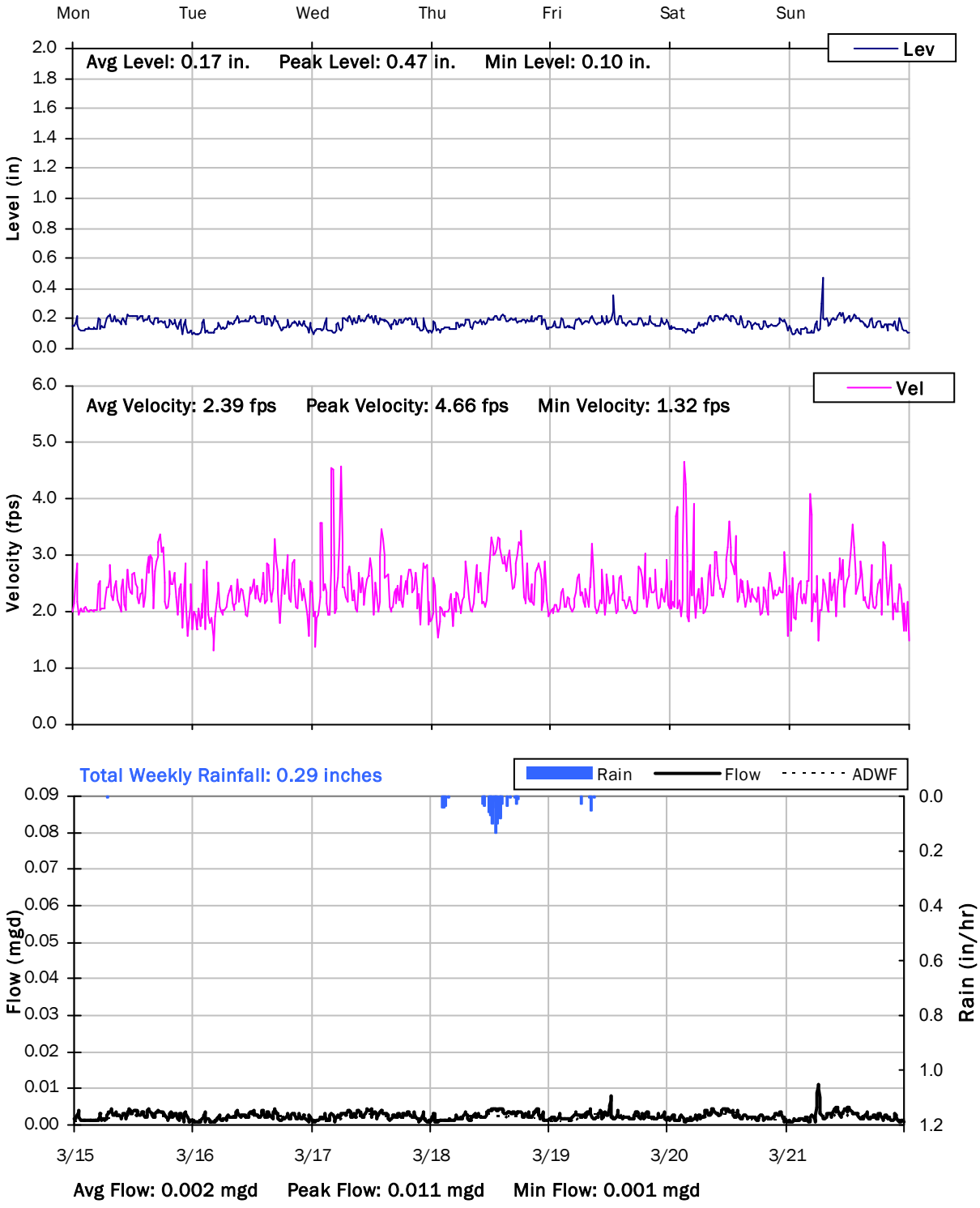
FM 1-5
Weekly Level, Velocity and Flow Hydrographs
3/1/2021 to 3/8/2021



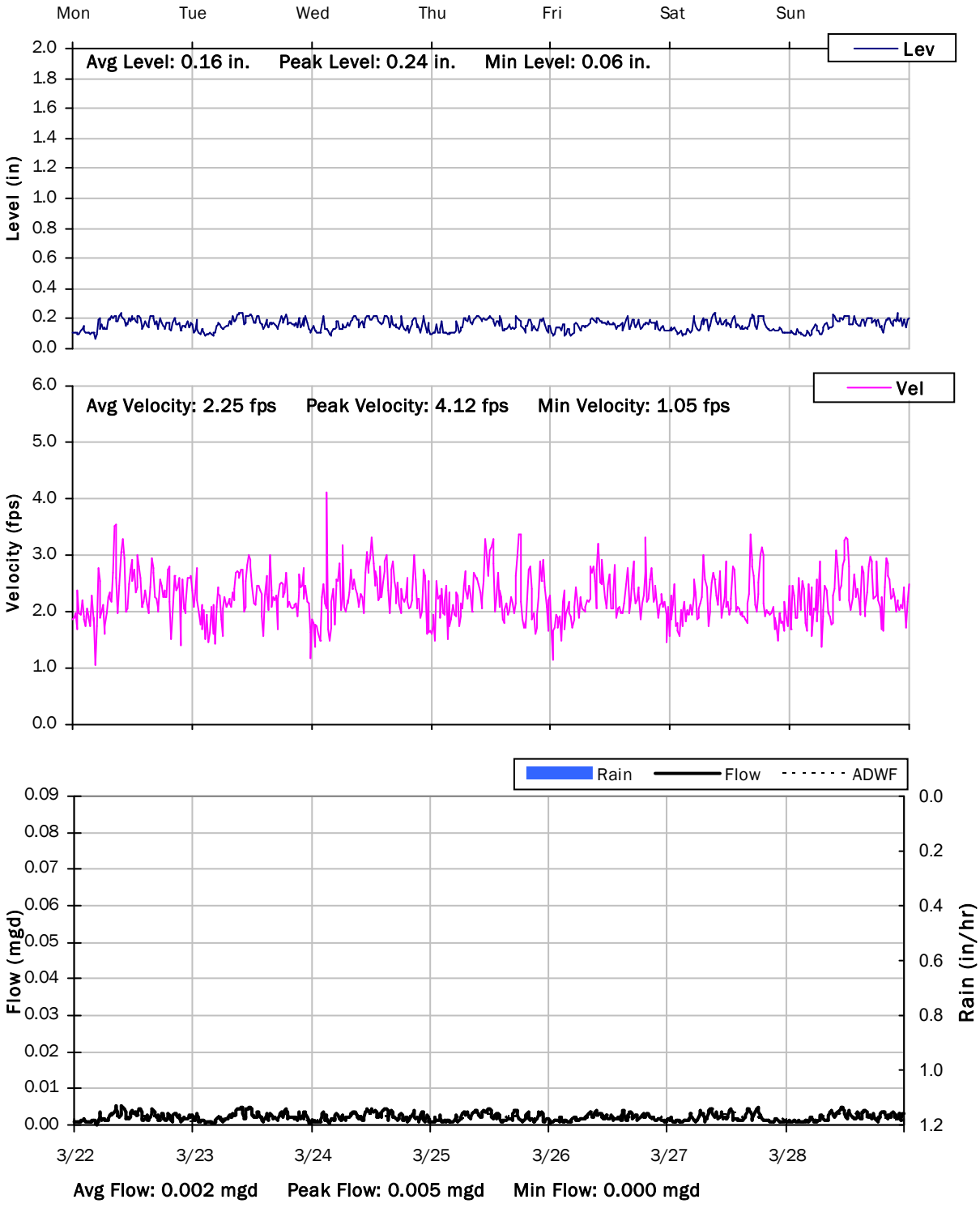
FM 1-5
Weekly Level, Velocity and Flow Hydrographs
3/8/2021 to 3/15/2021



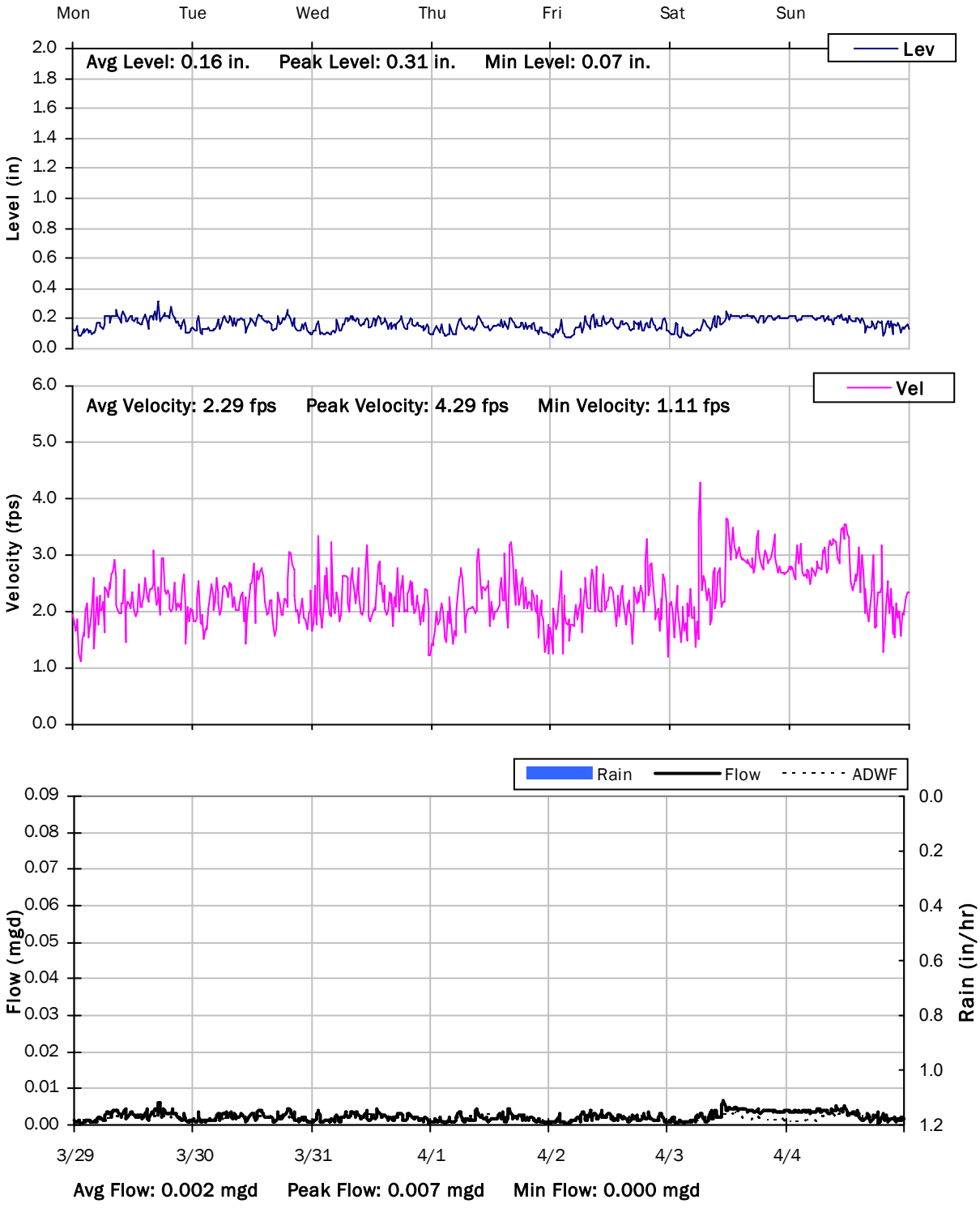
FM 1-5
Weekly Level, Velocity and Flow Hydrographs
3/15/2021 to 3/22/2021



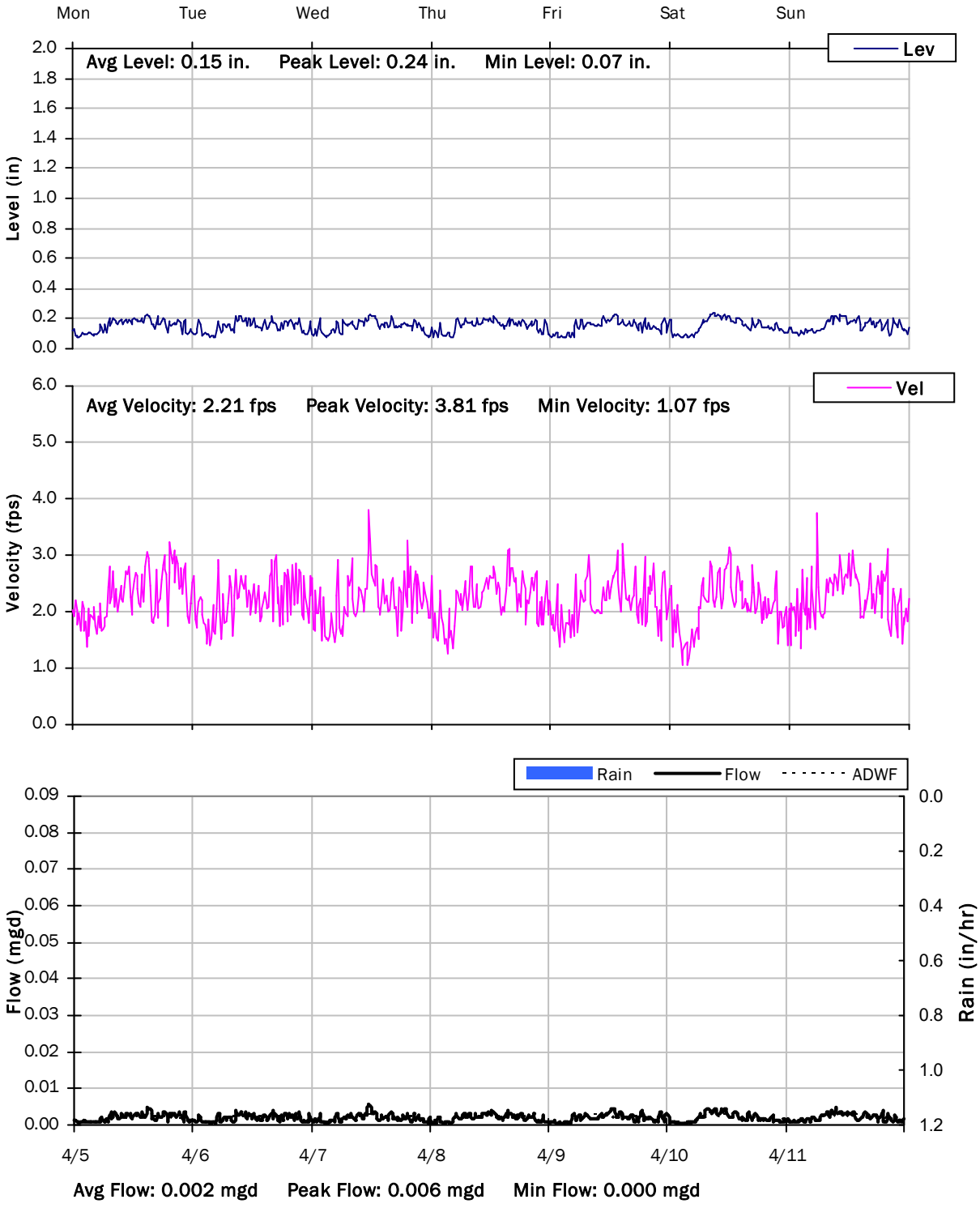
FM 1-5
Weekly Level, Velocity and Flow Hydrographs
3/22/2021 to 3/29/2021



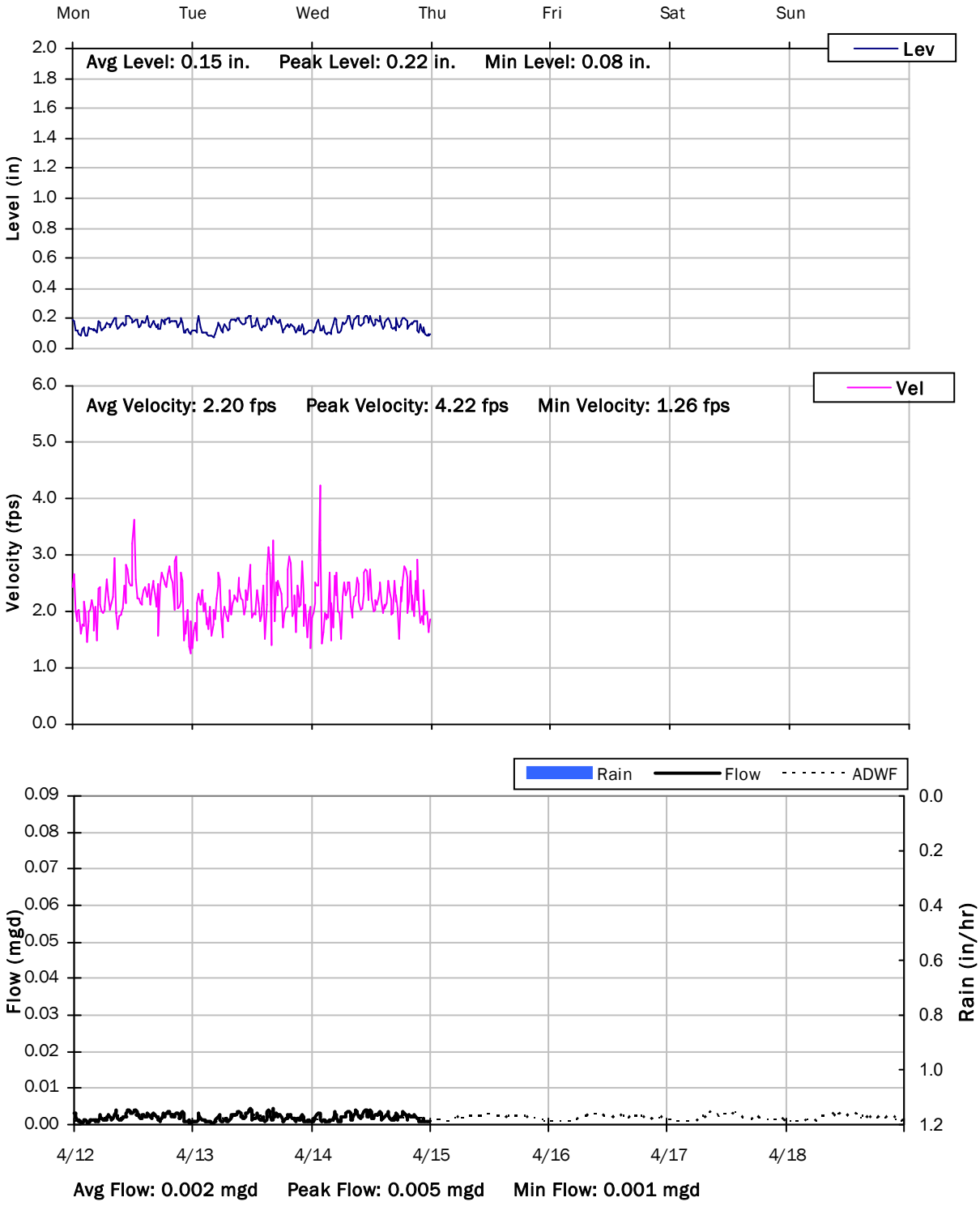
FM 1-5
Weekly Level, Velocity and Flow Hydrographs
3/29/2021 to 4/5/2021



FM 1-5
Weekly Level, Velocity and Flow Hydrographs
4/5/2021 to 4/12/2021



FM 1-5
Weekly Level, Velocity and Flow Hydrographs
4/12/2021 to 4/19/2021



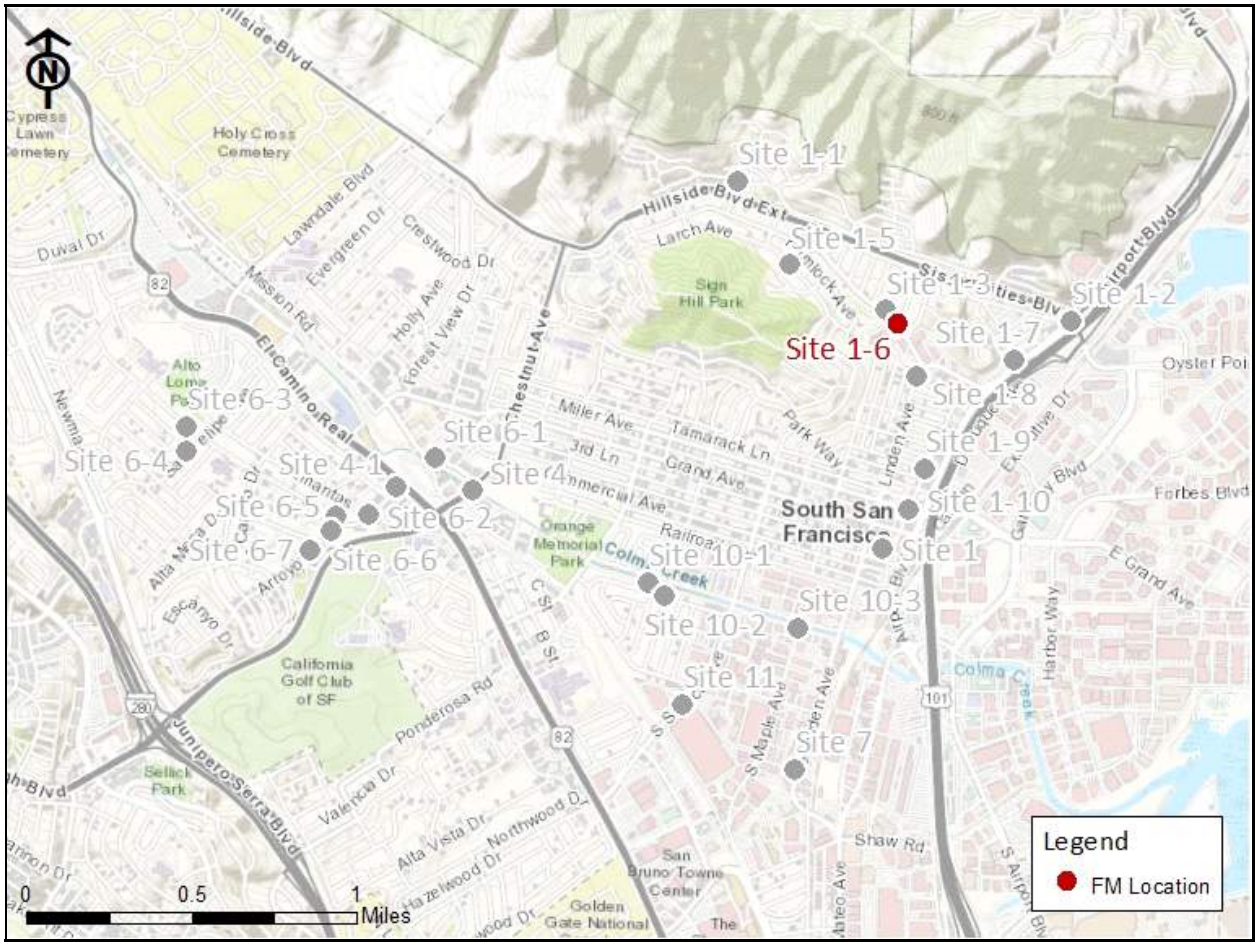
South San Francisco, CA

Sanitary Sewer Flow Monitoring
January 4 - April 14, 2021

Monitoring Site: FM 1-6

Location: Hillside Boulevard at Arden Avenue

Data Summary Report



Vicinity Map: FM 1-6

FM 1-6

Site Information

Location: Hillside Boulevard at Arden Avenue

Coordinates: 122.4089° W, 37.6640° N

Rim Elevation (Earth): 74 feet

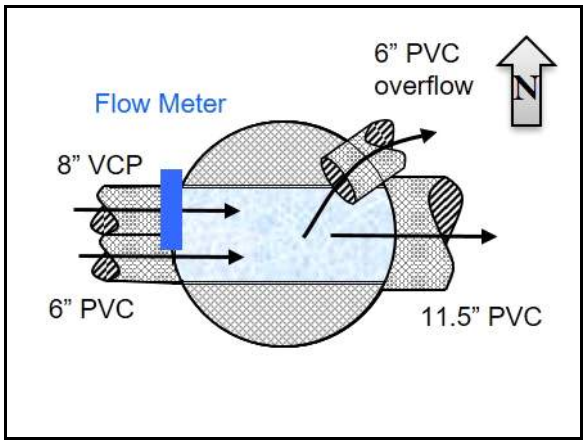
Pipe Diameter: 6 inches

ADWF: 0.120 mgd

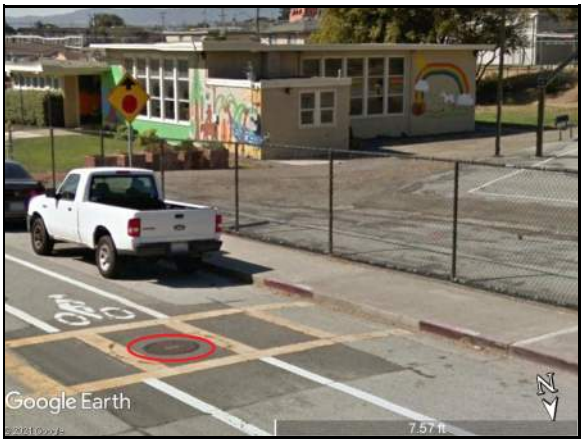
Peak Measured Flow: 0.846 mgd

Satellite Map

Sanitary Map



Flow Sketch



Street View

Plan View

FM 1-6

Additional Site Photos

Effluent Pipe

Monitored Northwest Influent Pipe

FM 1-6

Additional Site Photos

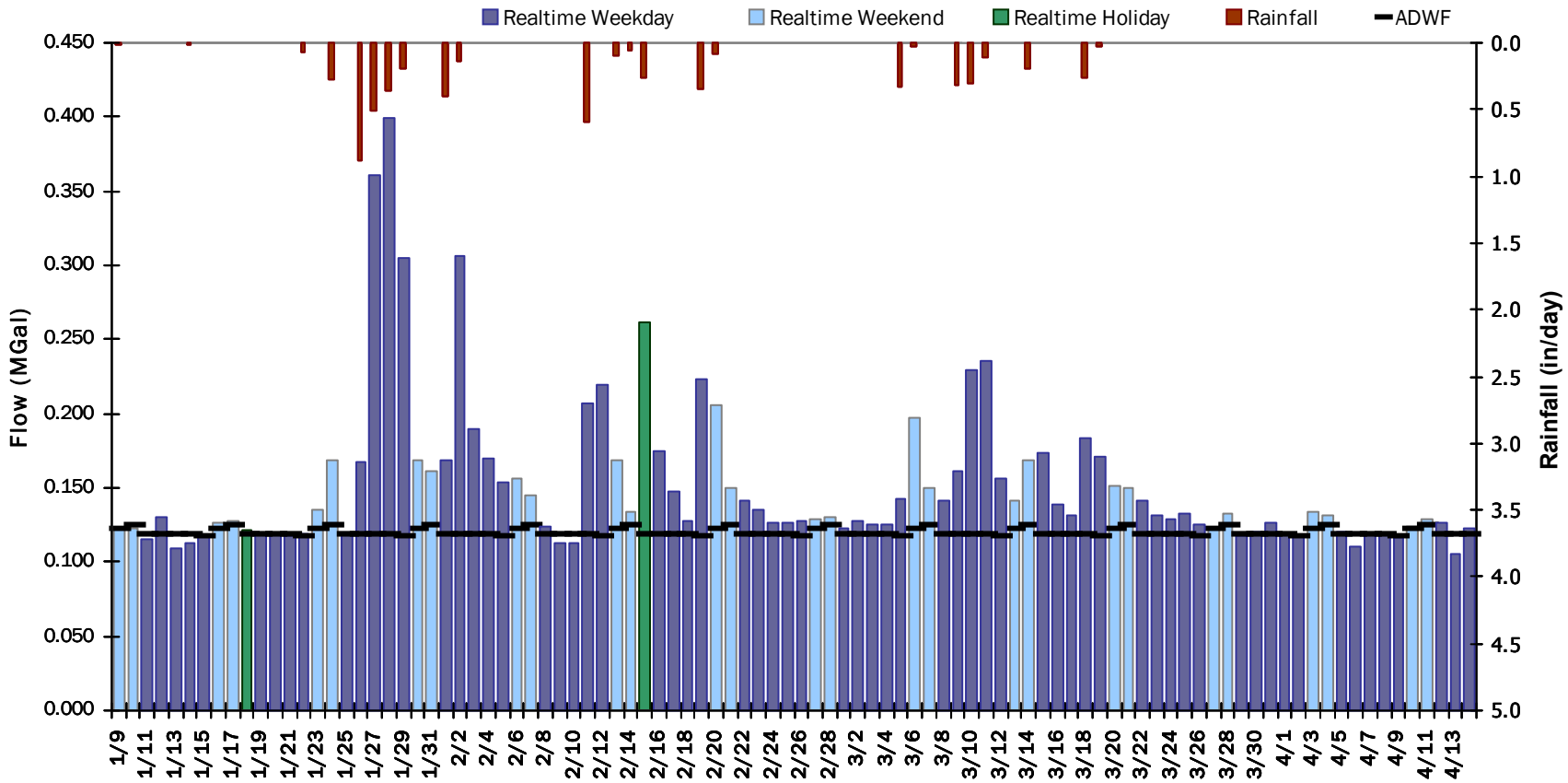
Southwest Influent Pipe

Overflow Pipe

FM 1-6
Period Flow Summary: Daily Flow Totals

Avg Period Flow: 0.151 MGal Peak Daily Flow: 0.399 MGal Min Daily Flow: 0.106 MGal

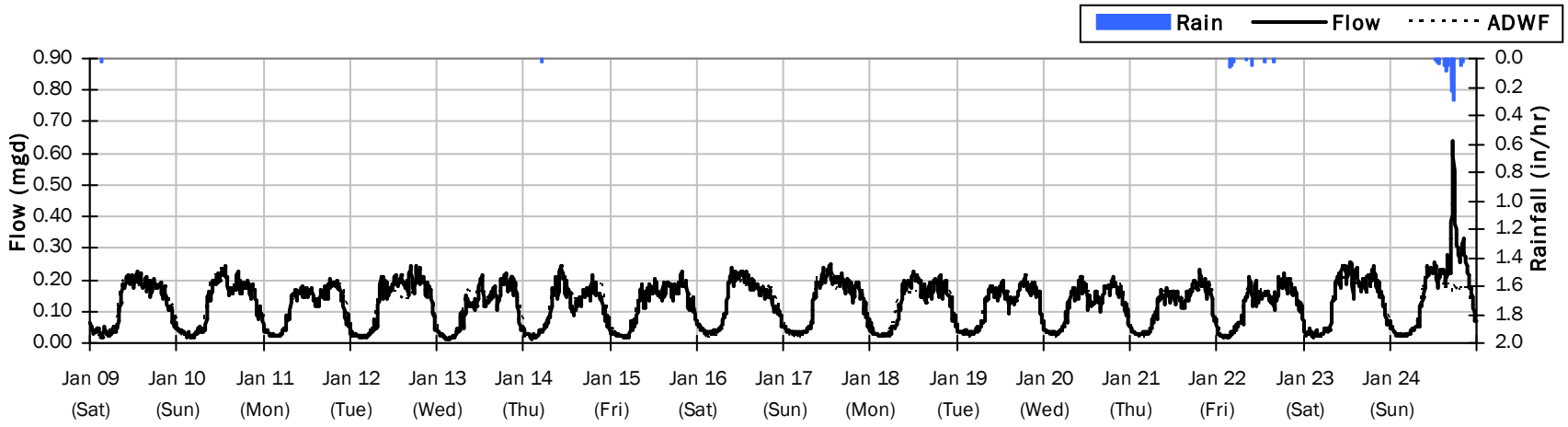
Total Period Rainfall: 5.86 inches

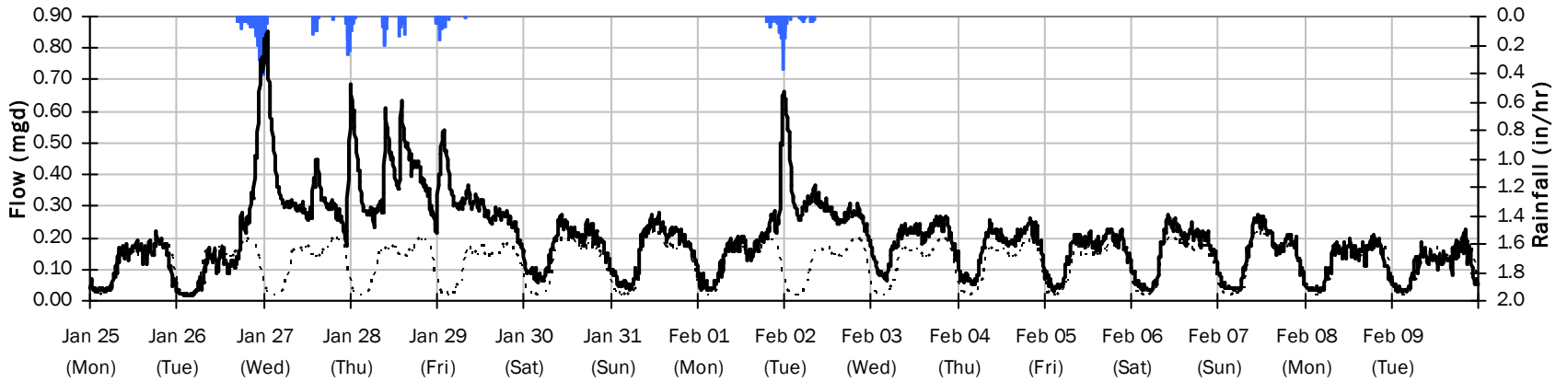


FM 1-6

Flow Summary: 1/9/2021 to 2/9/2021

Total Period Rainfall: 2.85 inches Avg Flow: 0.162 mgd Peak Flow: 0.846 mgd Min Flow: 0.010 mgd

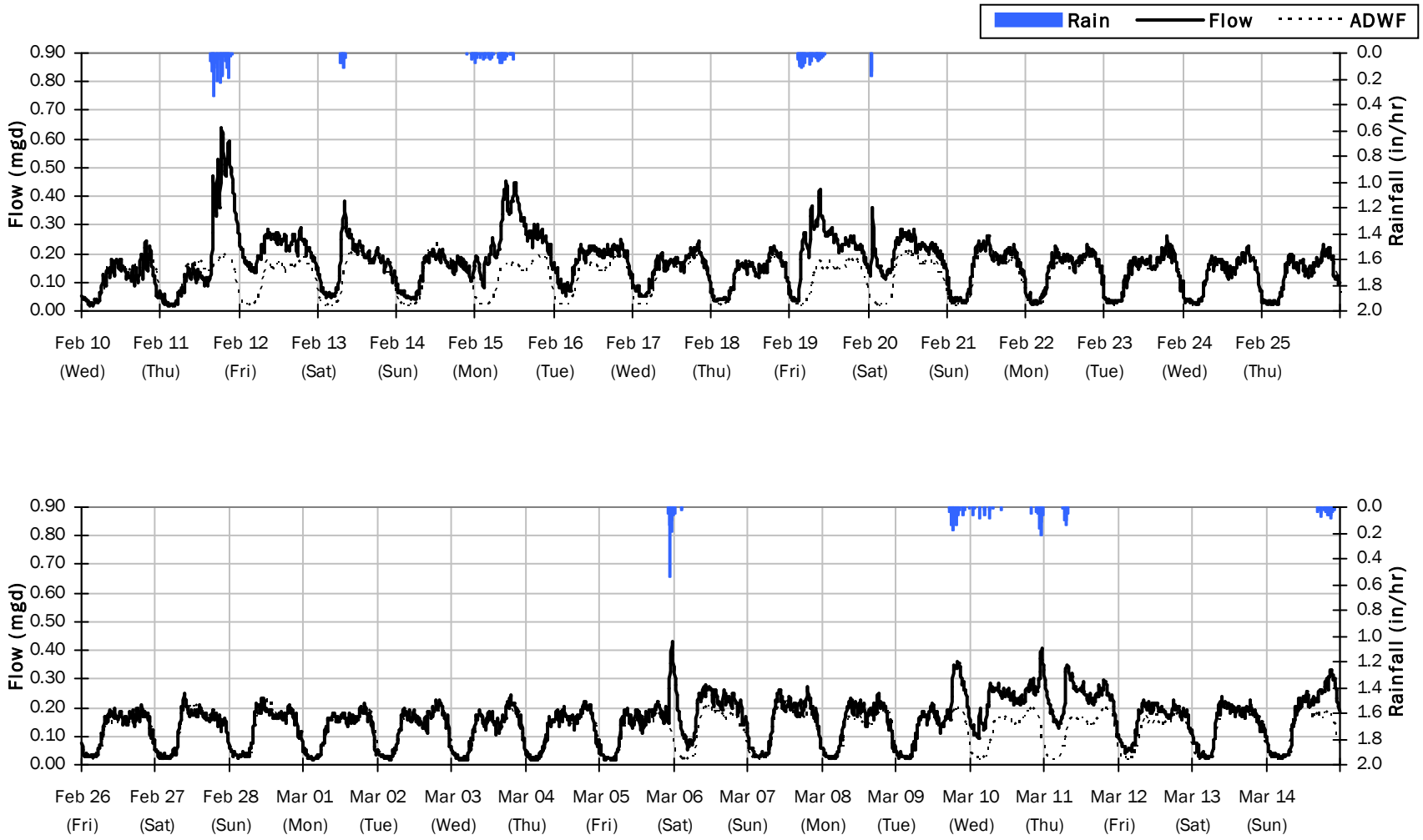




FM 1-6

Flow Summary: 2/10/2021 to 3/14/2021

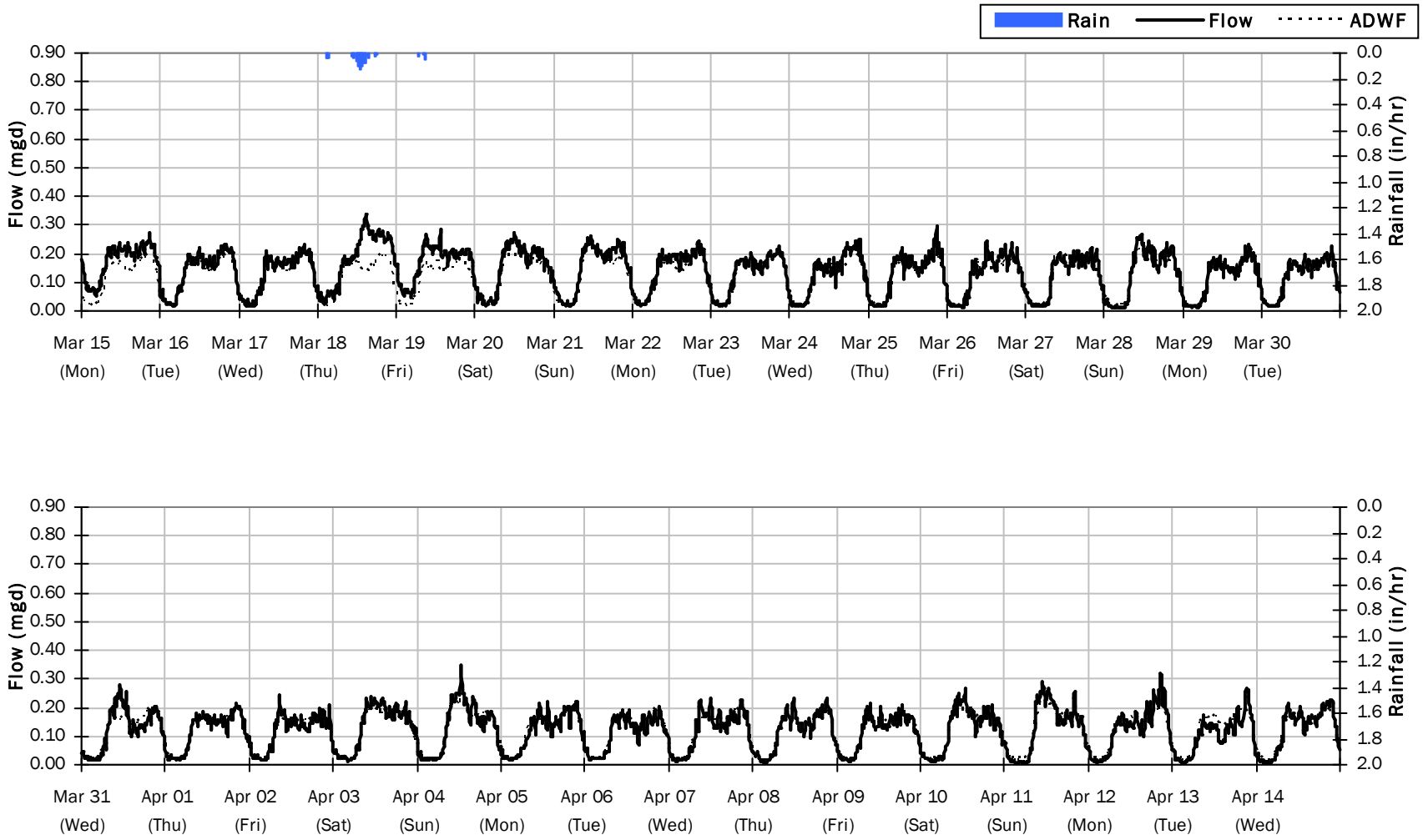
Total Period Rainfall: 2.70 inches Avg Flow: 0.160 mgd Peak Flow: 0.639 mgd Min Flow: 0.016 mgd



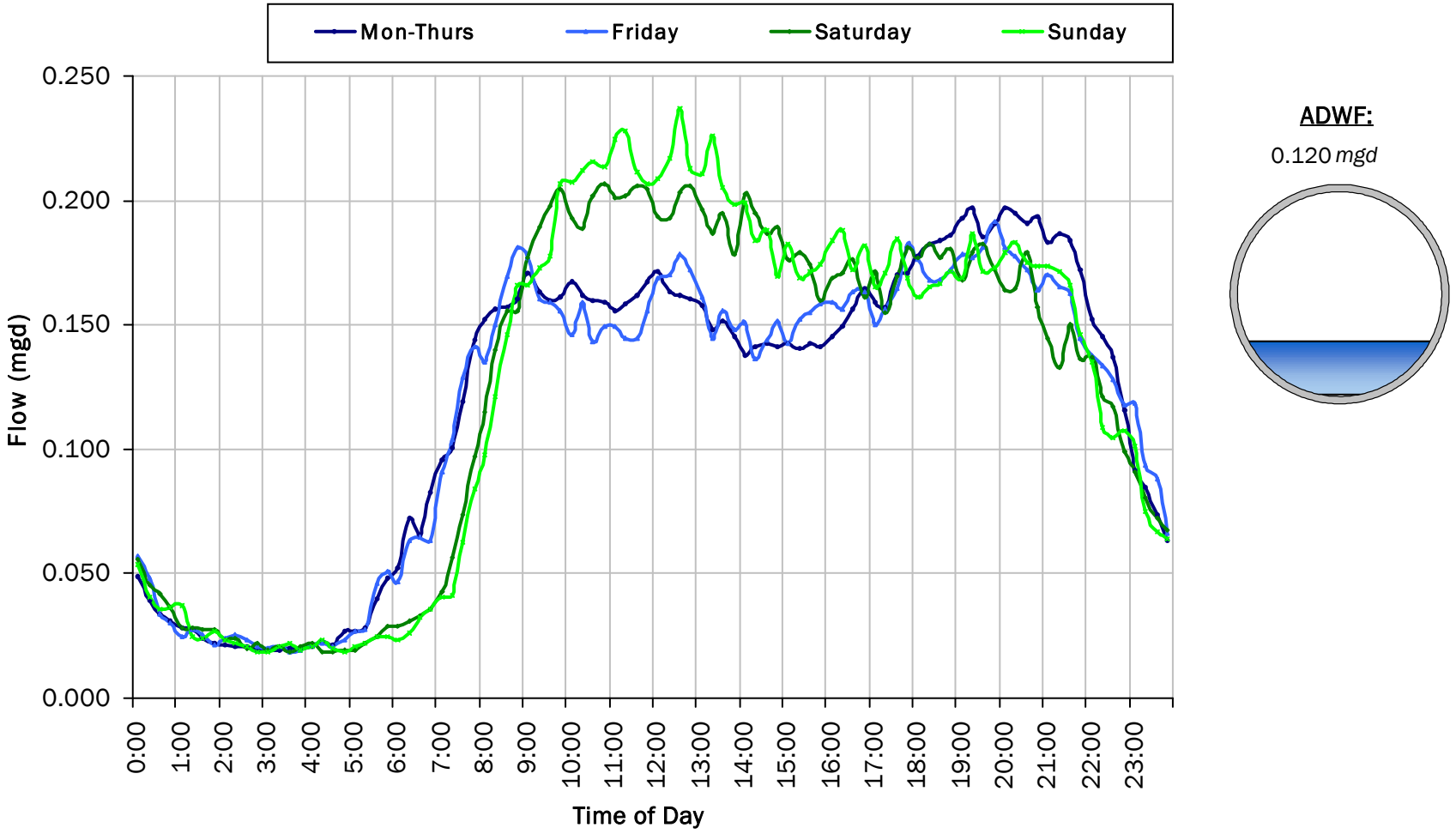
FM 1-6

Flow Summary: 3/15/2021 to 4/14/2021

Total Period Rainfall: 0.28 inches Avg Flow: 0.131 mgd Peak Flow: 0.351 mgd Min Flow: 0.003 mgd



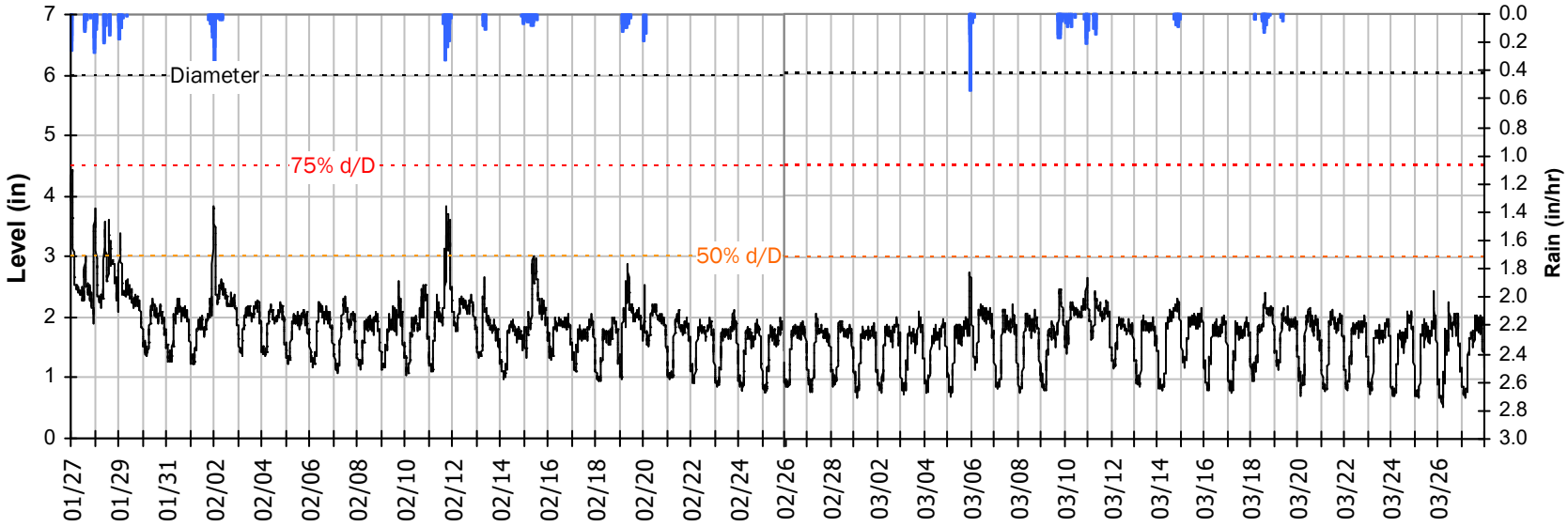
FM 1-6
Average Dry Weather Flow Hydrographs

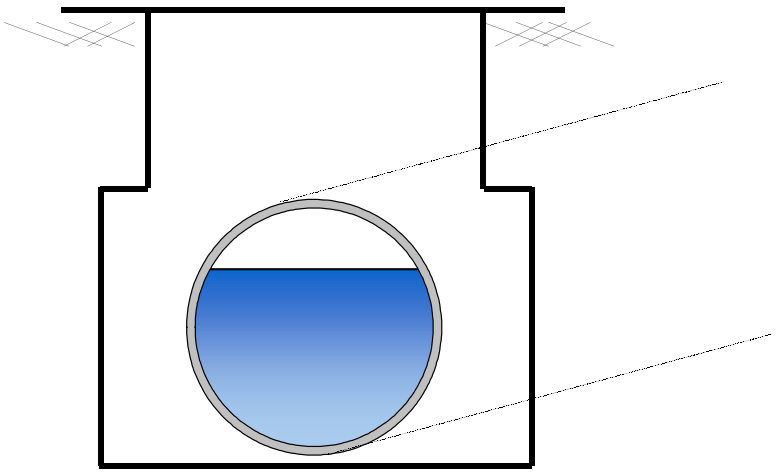


FM 1-6

Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Monitoring Period

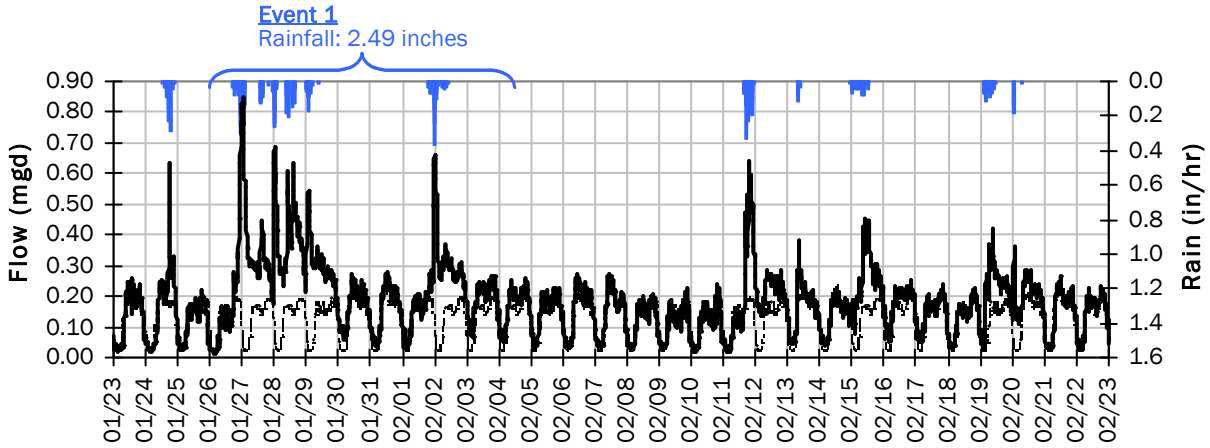




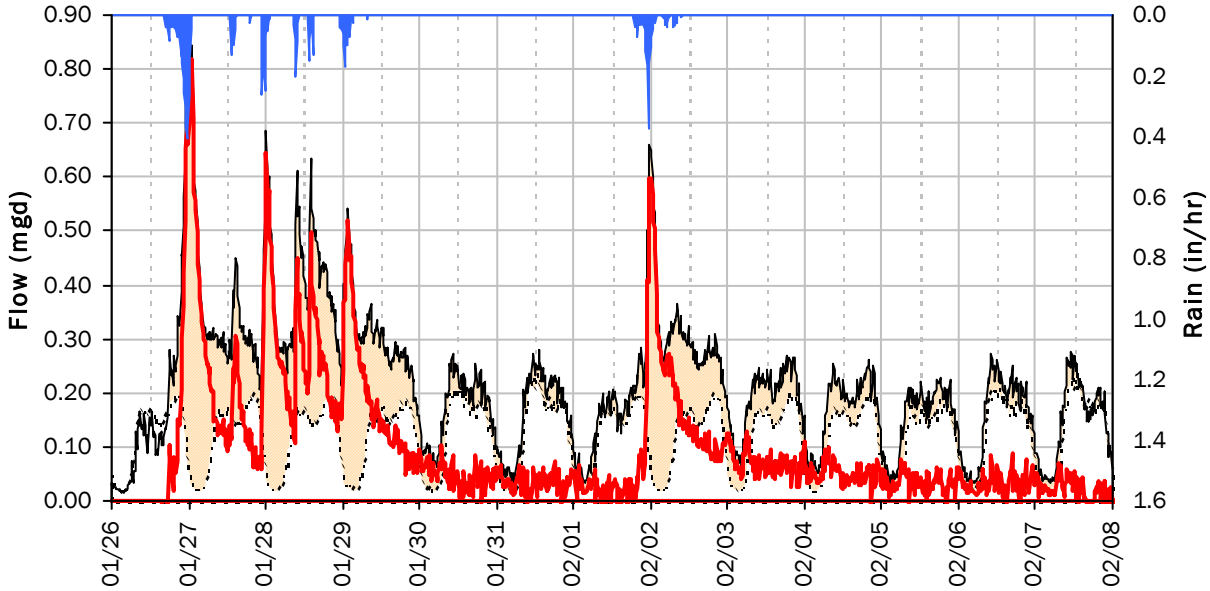
Pipe Diameter:	6	*inches*
Peak Measured Level:	4.44	*inches*
Peak d/D Ratio:	0.74	

FM 1-6
I/I Summary: Event 1

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



Event 1 Detail Graph

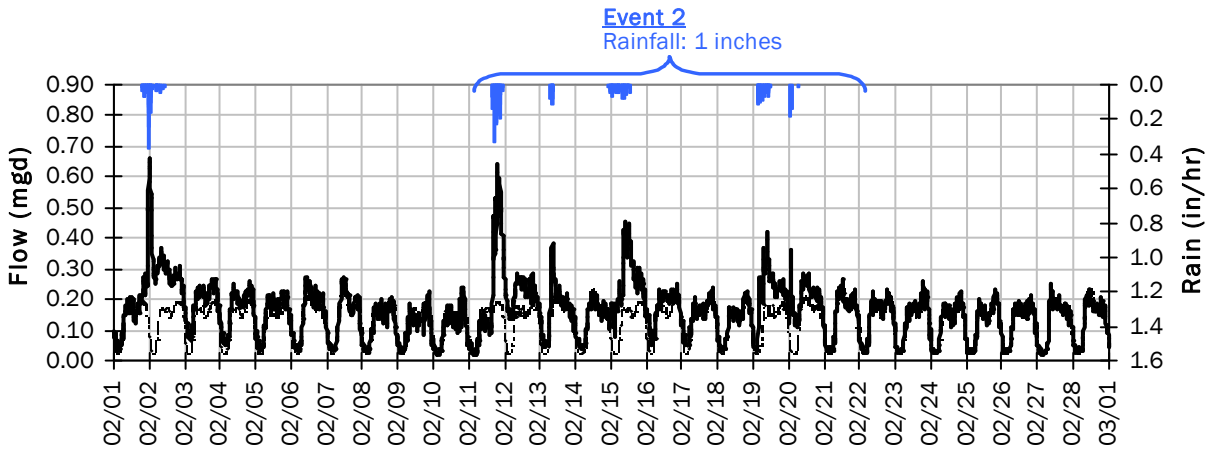


Storm Event I/I Analysis (Rain = 2.49 inches)

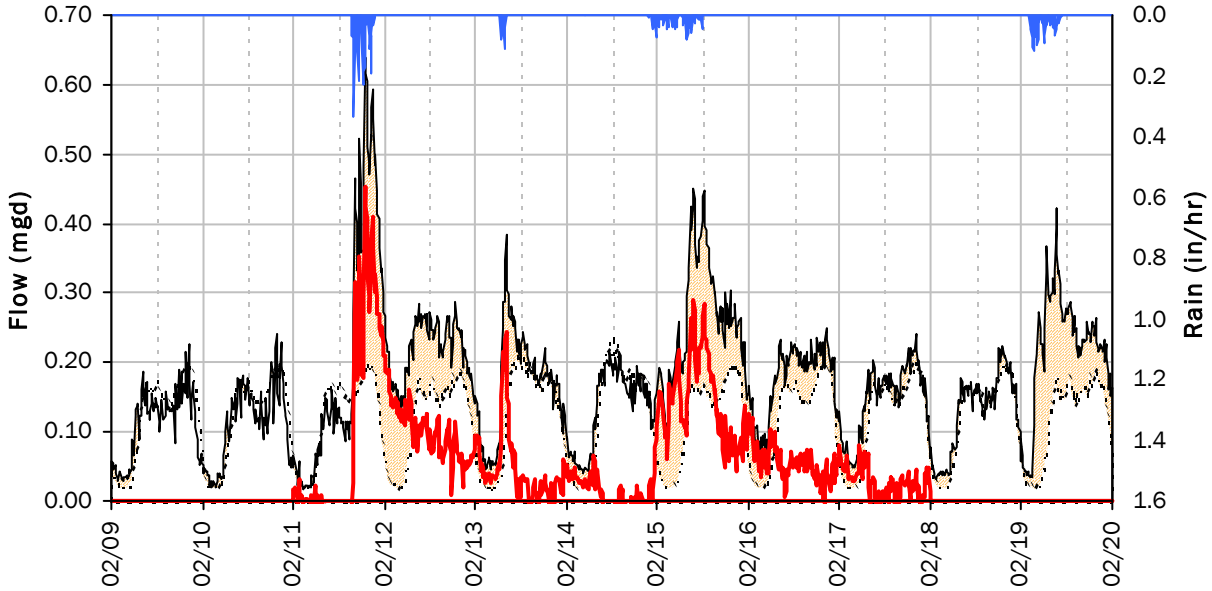
Capacity		Inflow / Infiltration	
Peak Flow:	0.85 *mgd*	**Peak I/I Rate:**	0.82 *mgd*
PF:	7.02	**Total I/I:**	1,295,000 *gallons*
Peak Level:	4.44 *in*		
d/D Ratio:	0.74		

FM 1-6
I/I Summary: Event 2

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



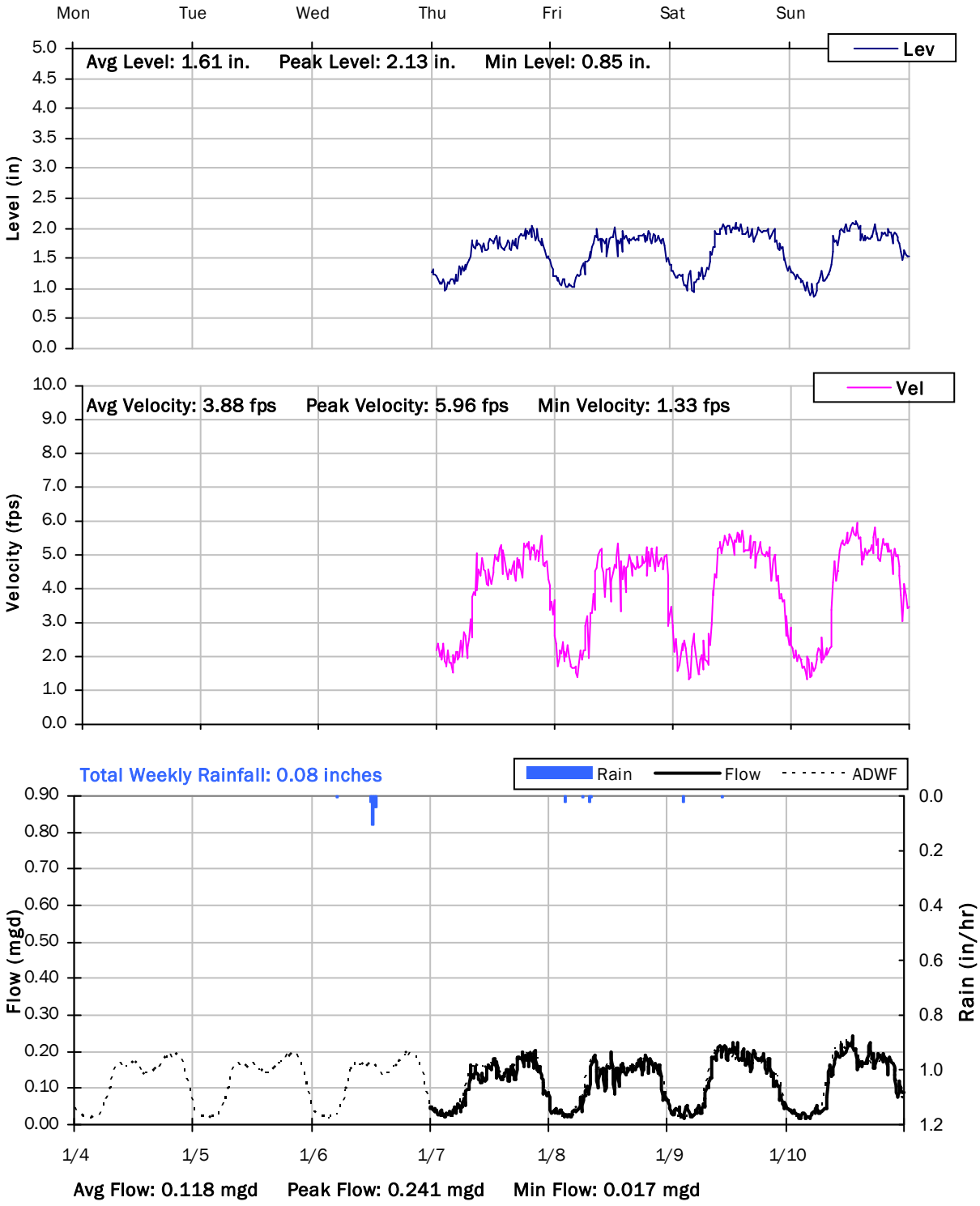
Event 2 Detail Graph



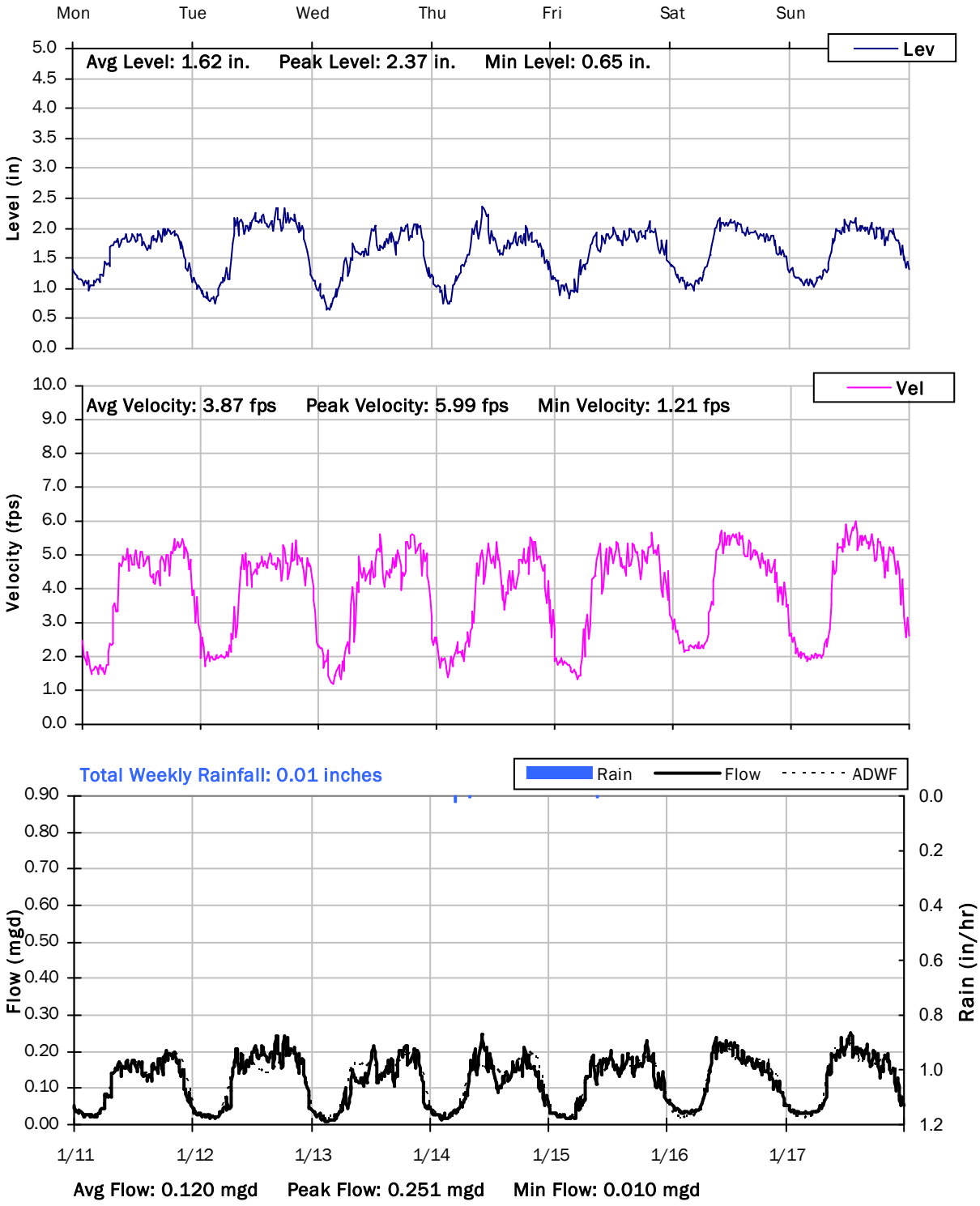
Storm Event I/I Analysis (Rain = 1.00 inches)

Capacity		Inflow / Infiltration	
Peak Flow:	0.64 *mgd*	**Peak I/I Rate:**	0.45 *mgd*
PF:	5.30	**Total I/I:**	470,000 *gallons*
Peak Level:	3.83 *in*		
d/D Ratio:	0.64		

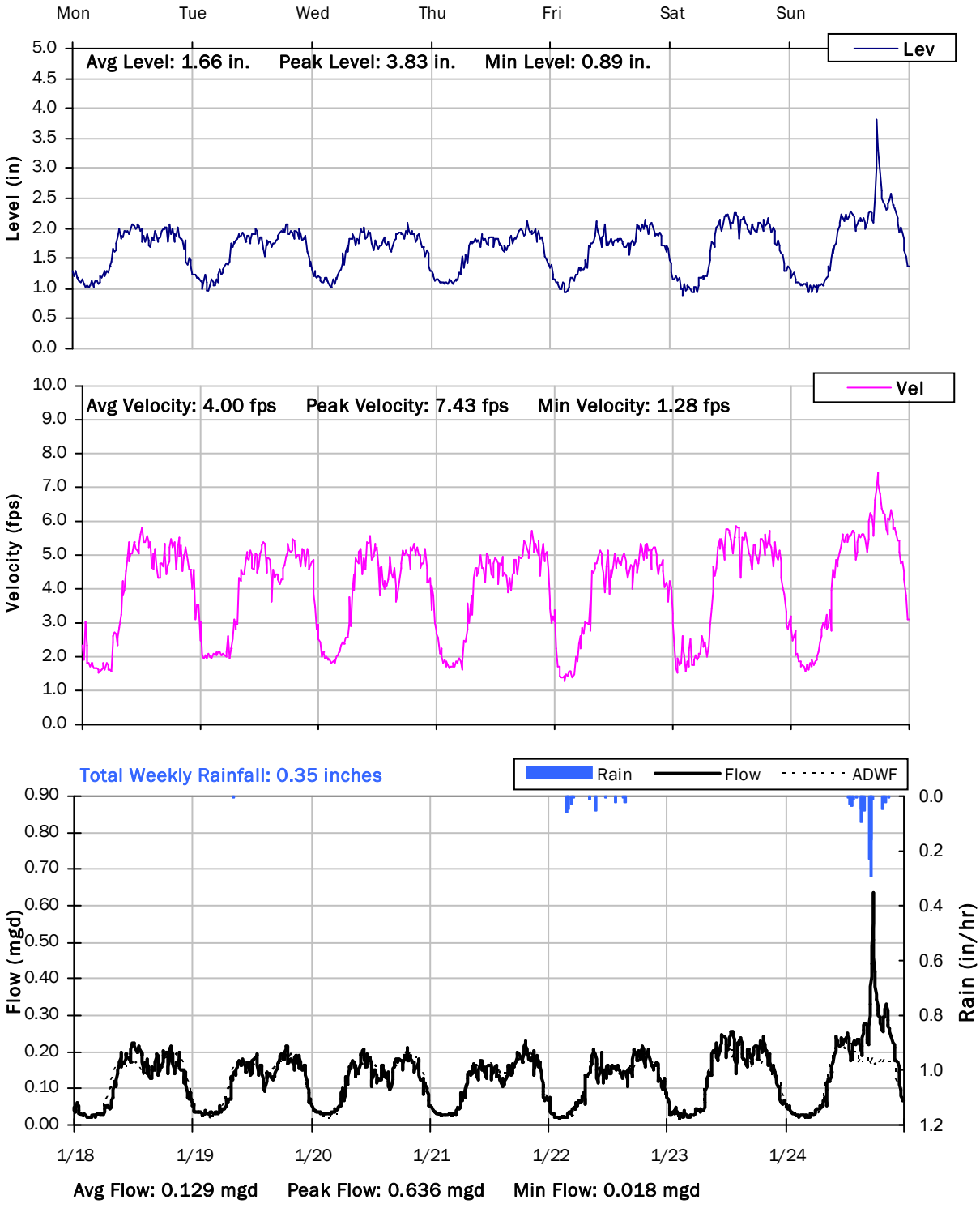
FM 1-6
Weekly Level, Velocity and Flow Hydrographs
1/4/2021 to 1/11/2021



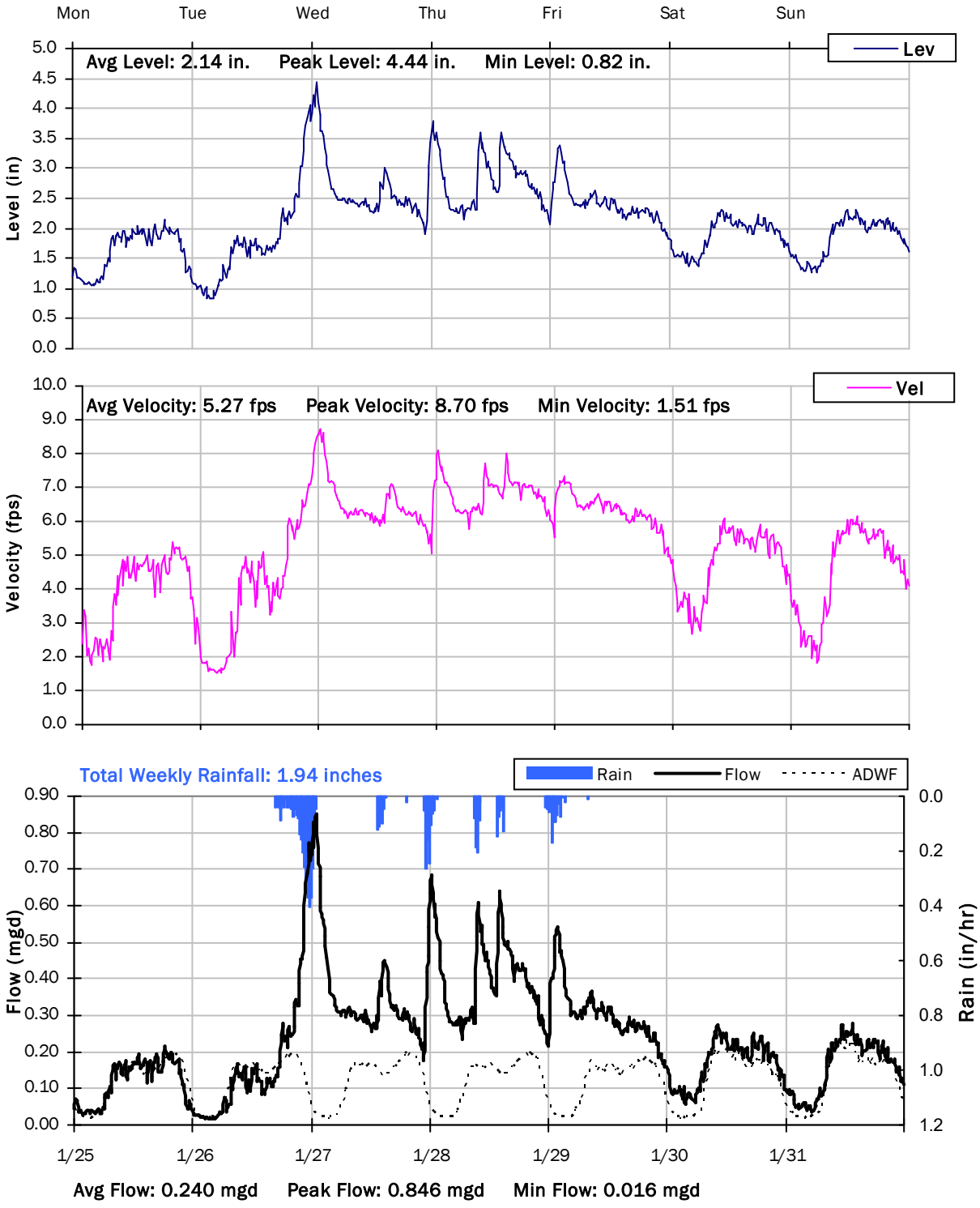
FM 1-6
Weekly Level, Velocity and Flow Hydrographs
1/11/2021 to 1/18/2021



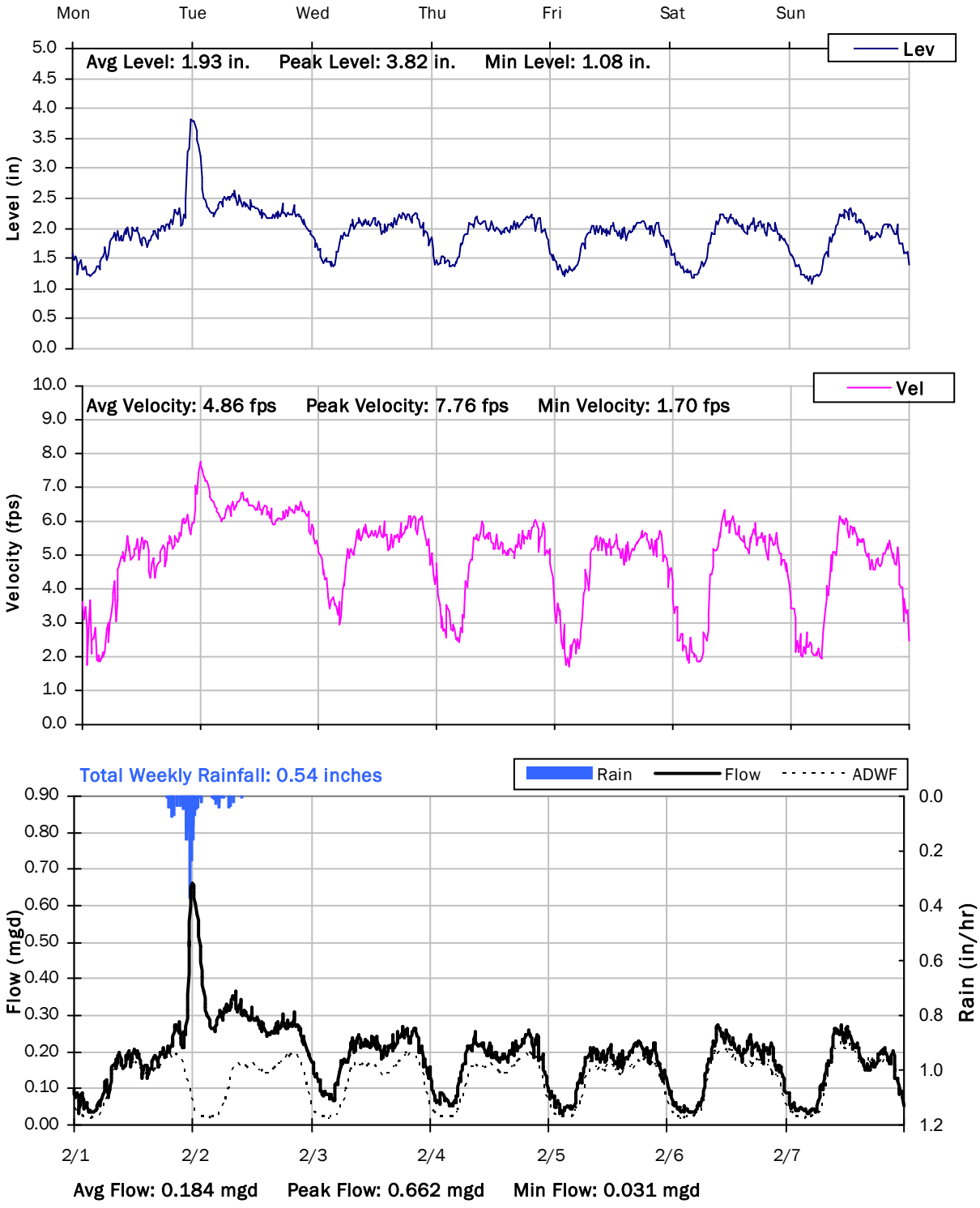
FM 1-6
Weekly Level, Velocity and Flow Hydrographs
1/18/2021 to 1/25/2021



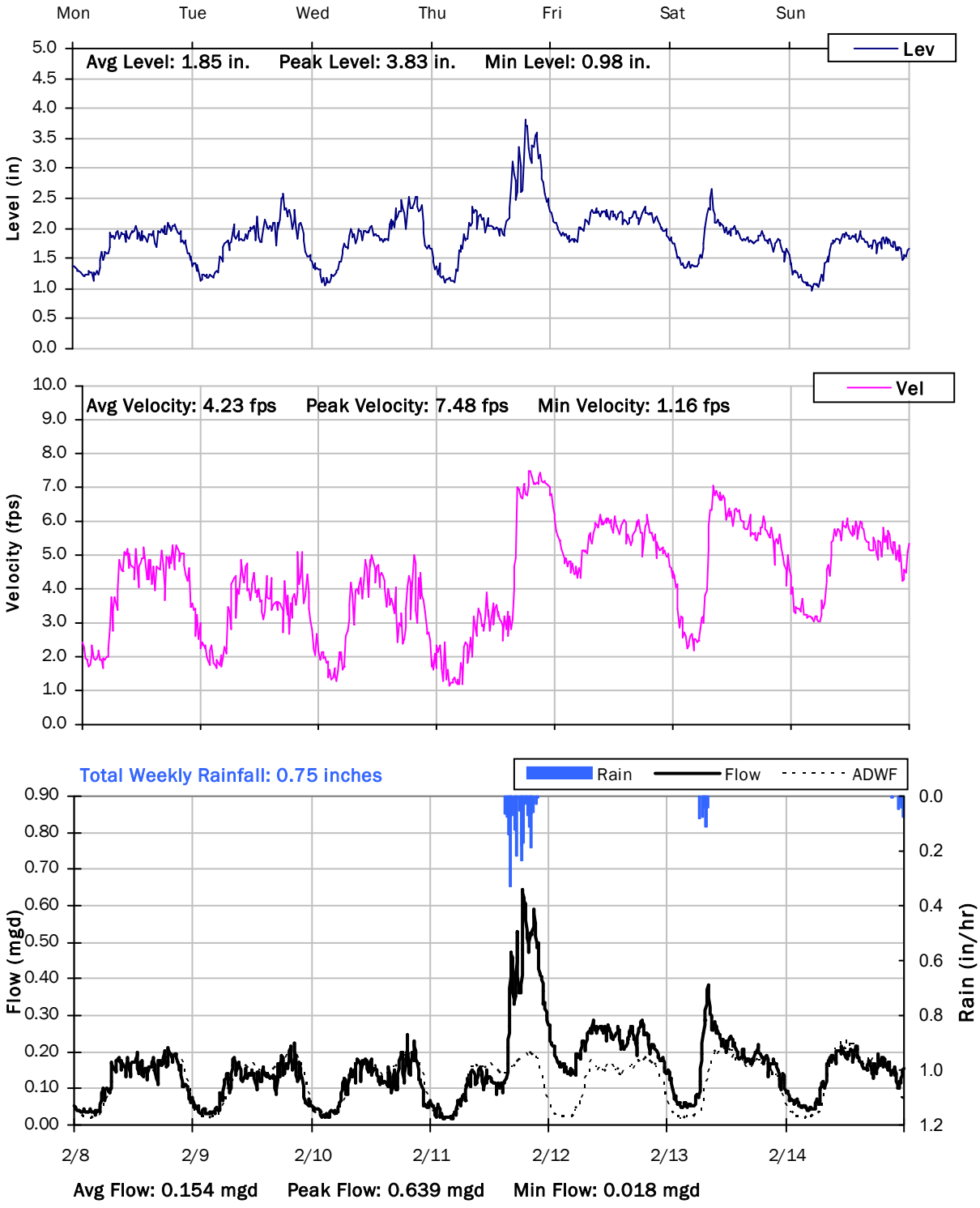
FM 1-6
Weekly Level, Velocity and Flow Hydrographs
1/25/2021 to 2/1/2021



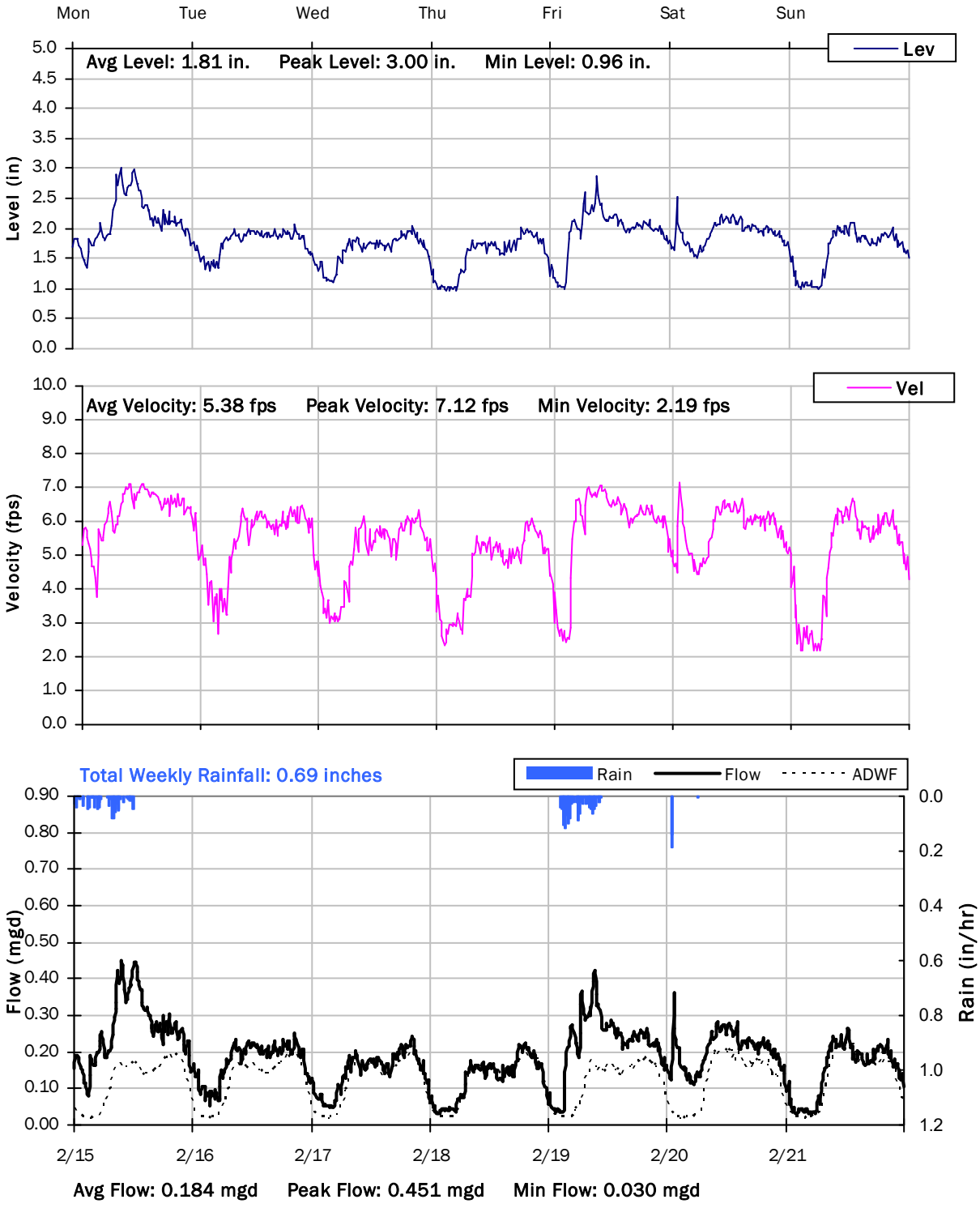
FM 1-6
Weekly Level, Velocity and Flow Hydrographs
2/1/2021 to 2/8/2021



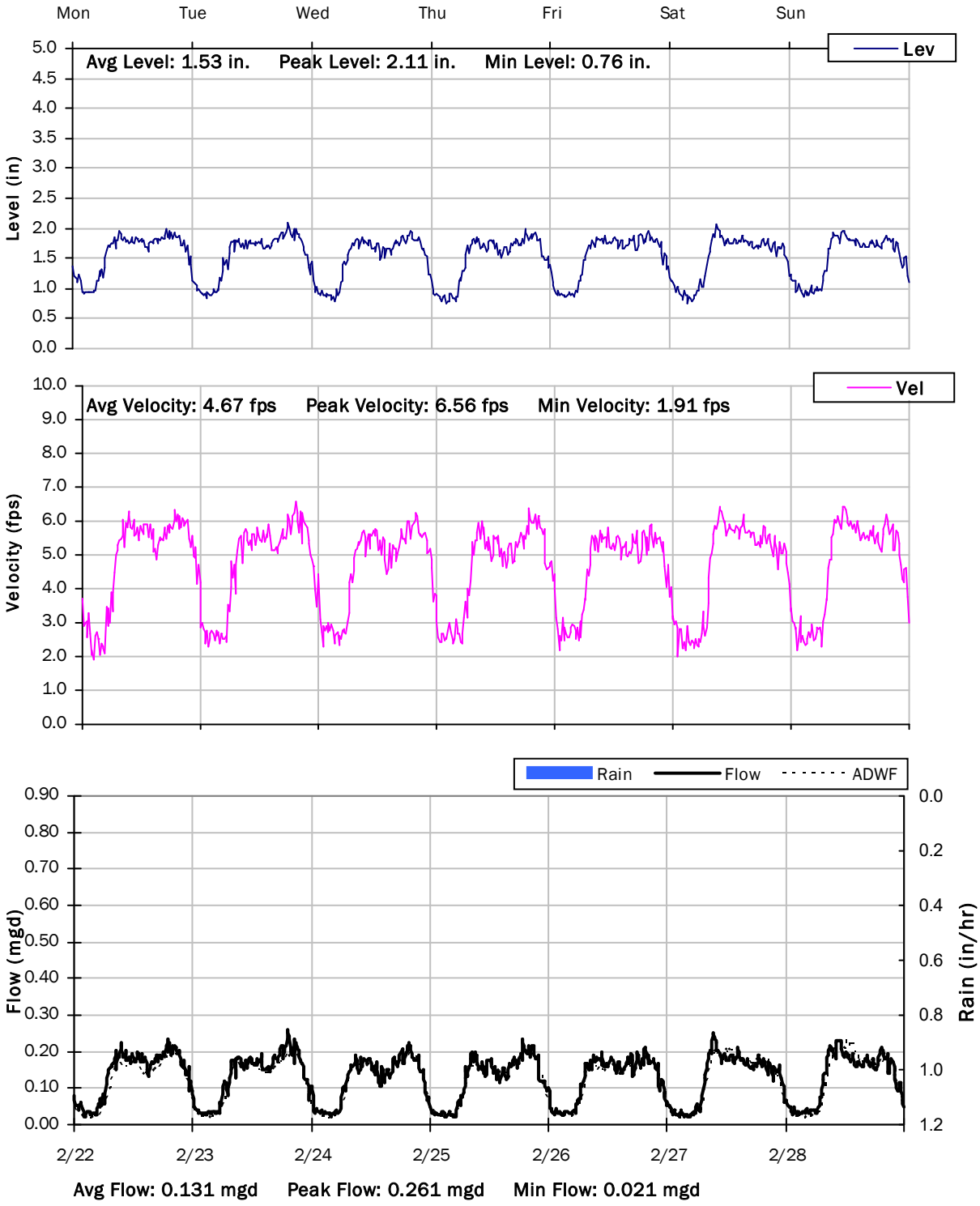
FM 1-6
Weekly Level, Velocity and Flow Hydrographs
2/8/2021 to 2/15/2021



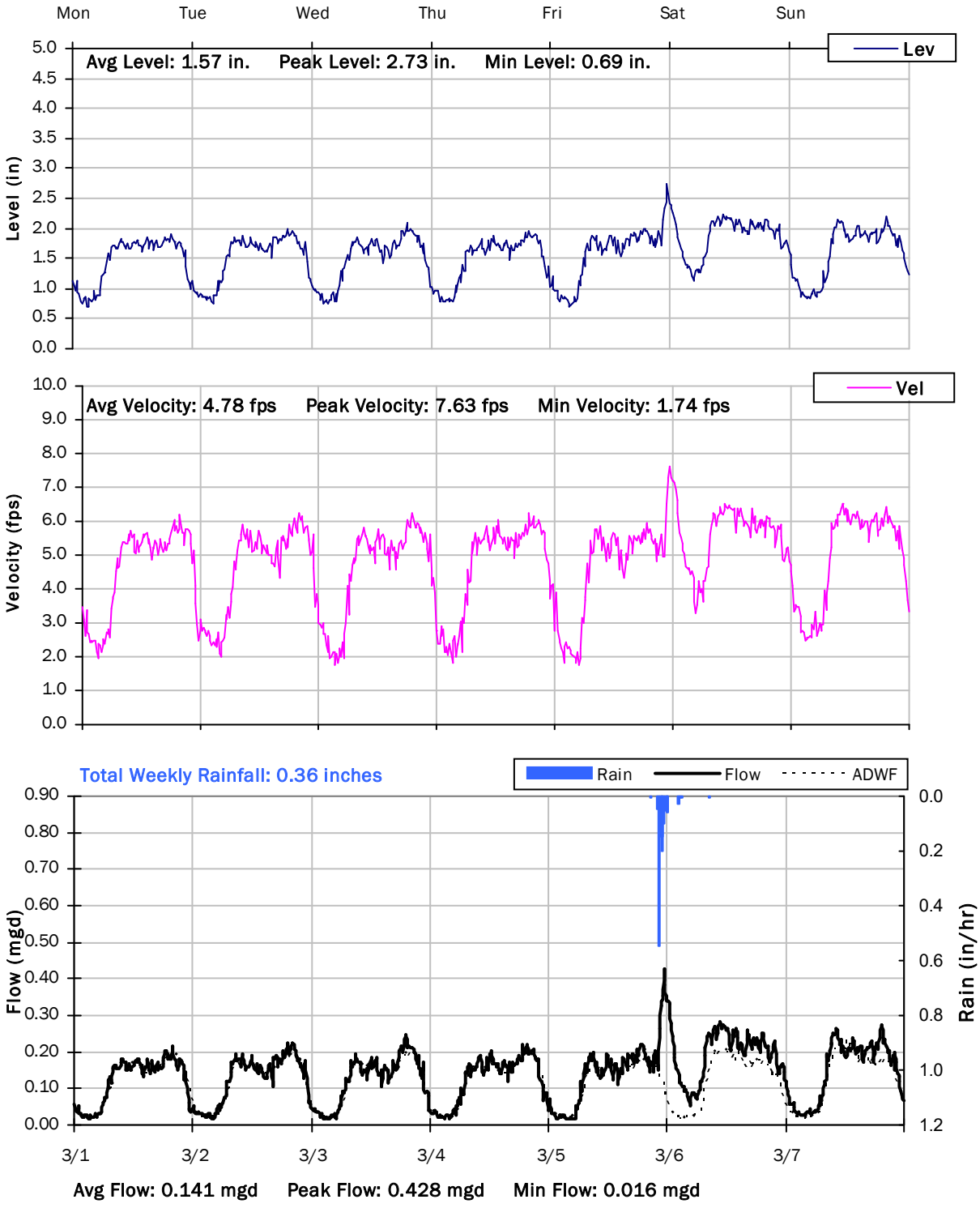
FM 1-6
Weekly Level, Velocity and Flow Hydrographs
2/15/2021 to 2/22/2021



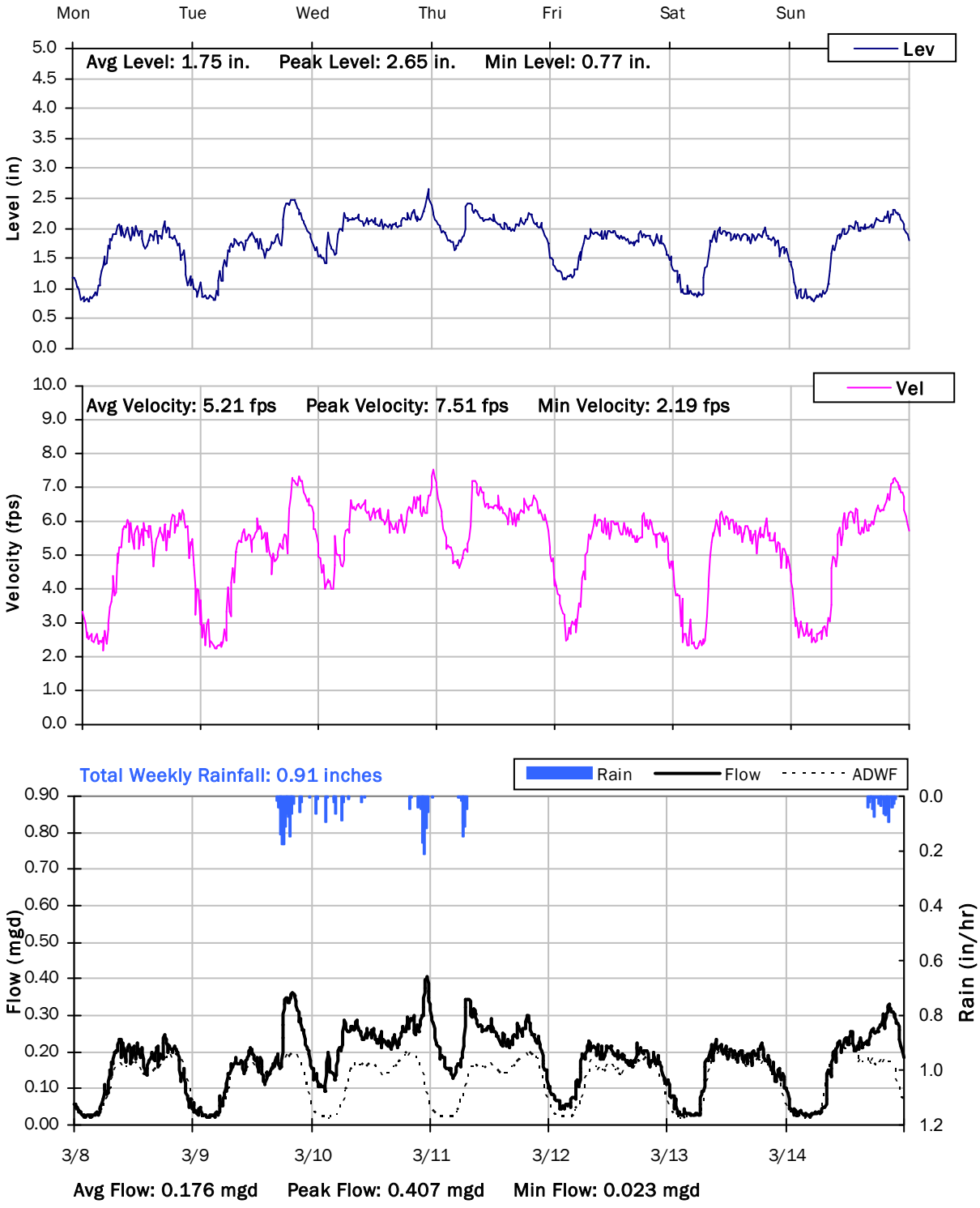
FM 1-6
Weekly Level, Velocity and Flow Hydrographs
2/22/2021 to 3/1/2021



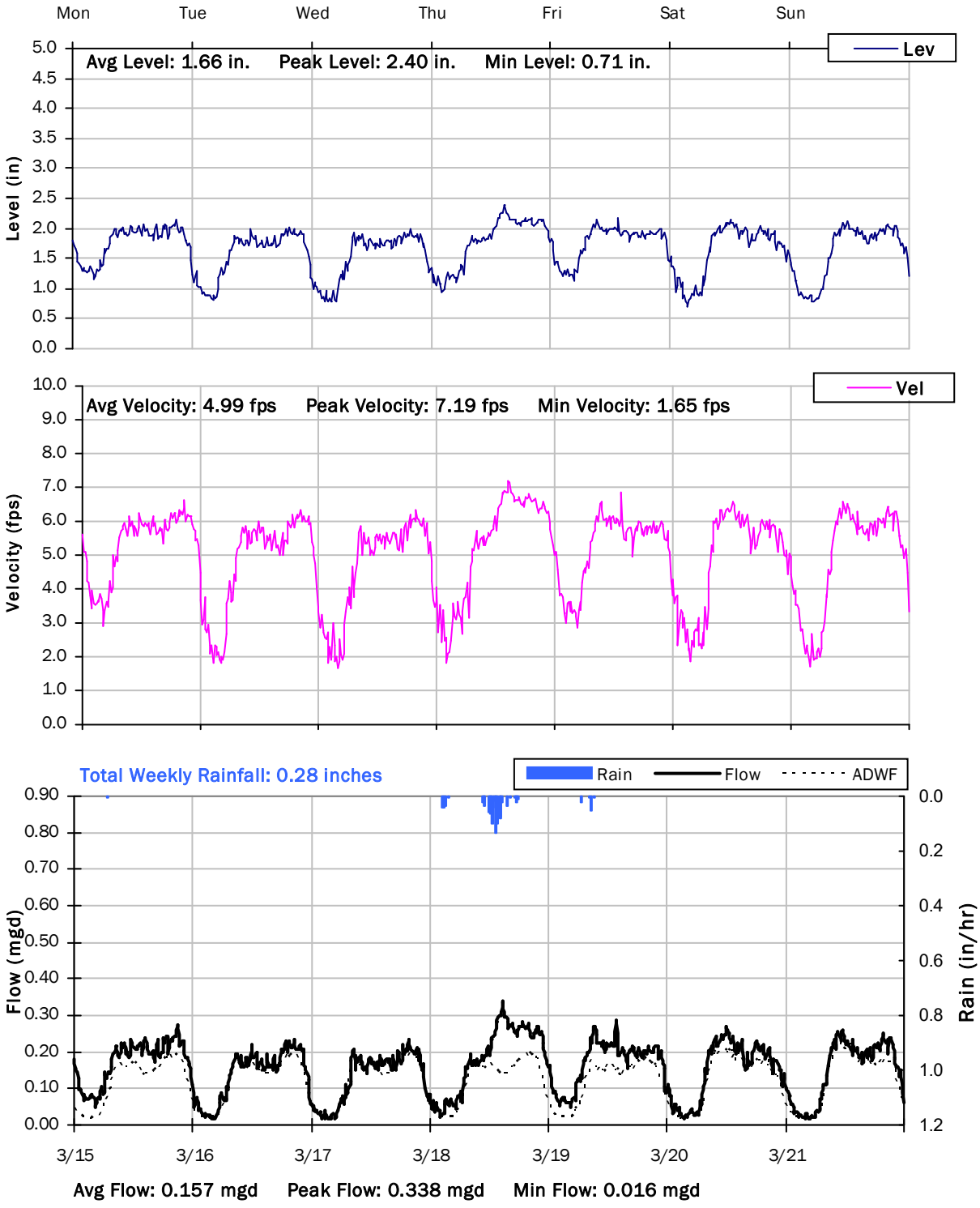
FM 1-6
Weekly Level, Velocity and Flow Hydrographs
3/1/2021 to 3/8/2021



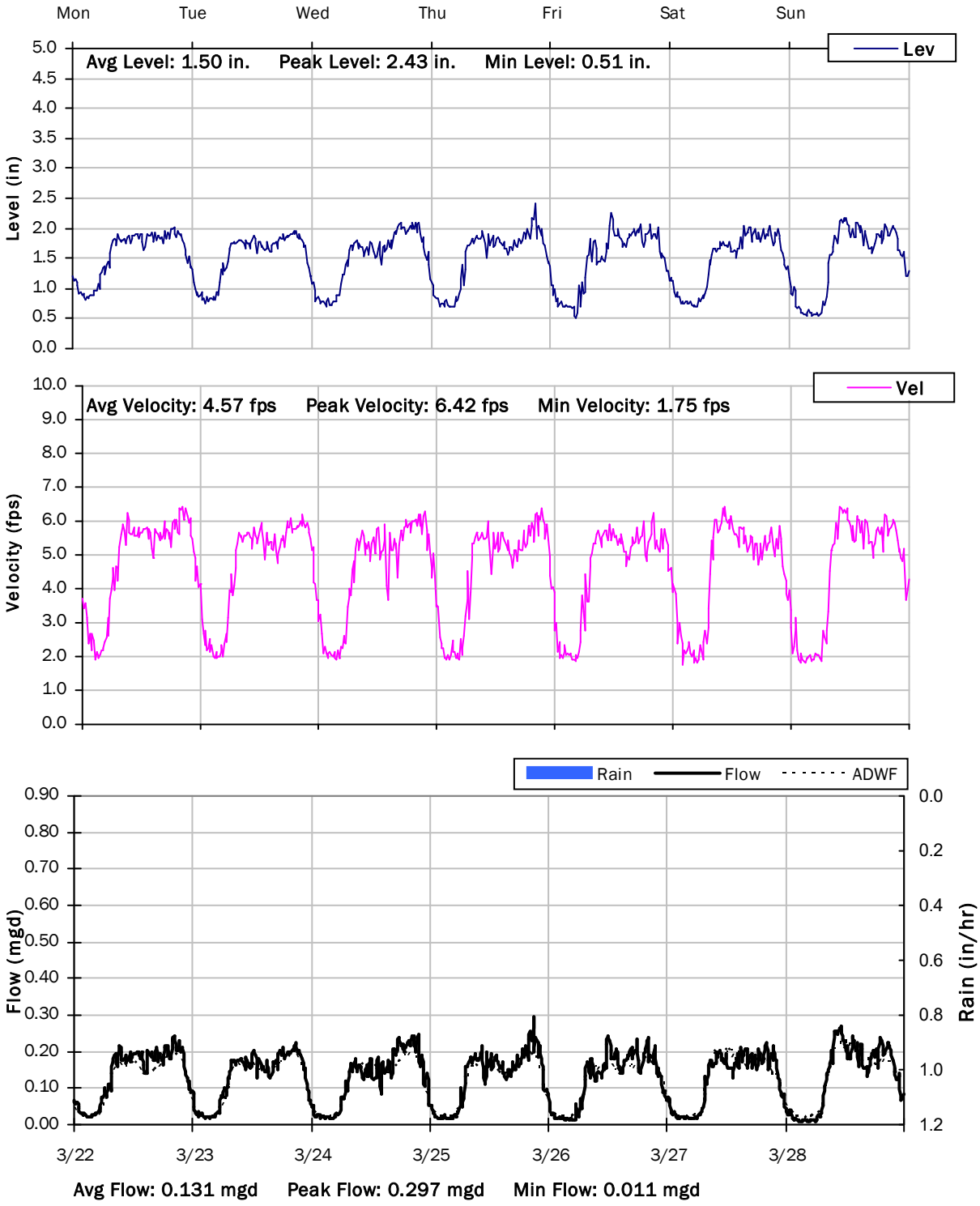
FM 1-6
Weekly Level, Velocity and Flow Hydrographs
3/8/2021 to 3/15/2021



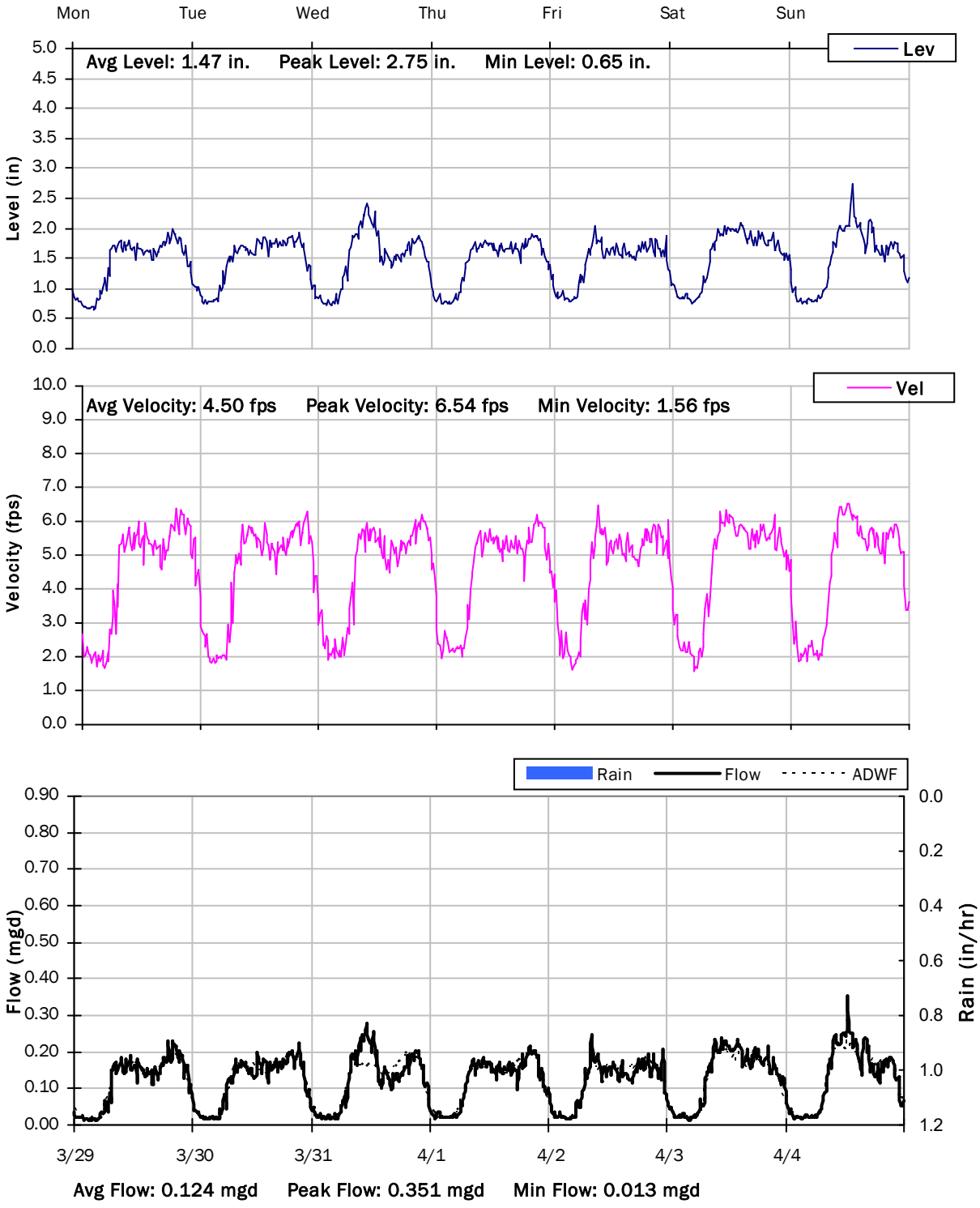
FM 1-6
Weekly Level, Velocity and Flow Hydrographs
3/15/2021 to 3/22/2021



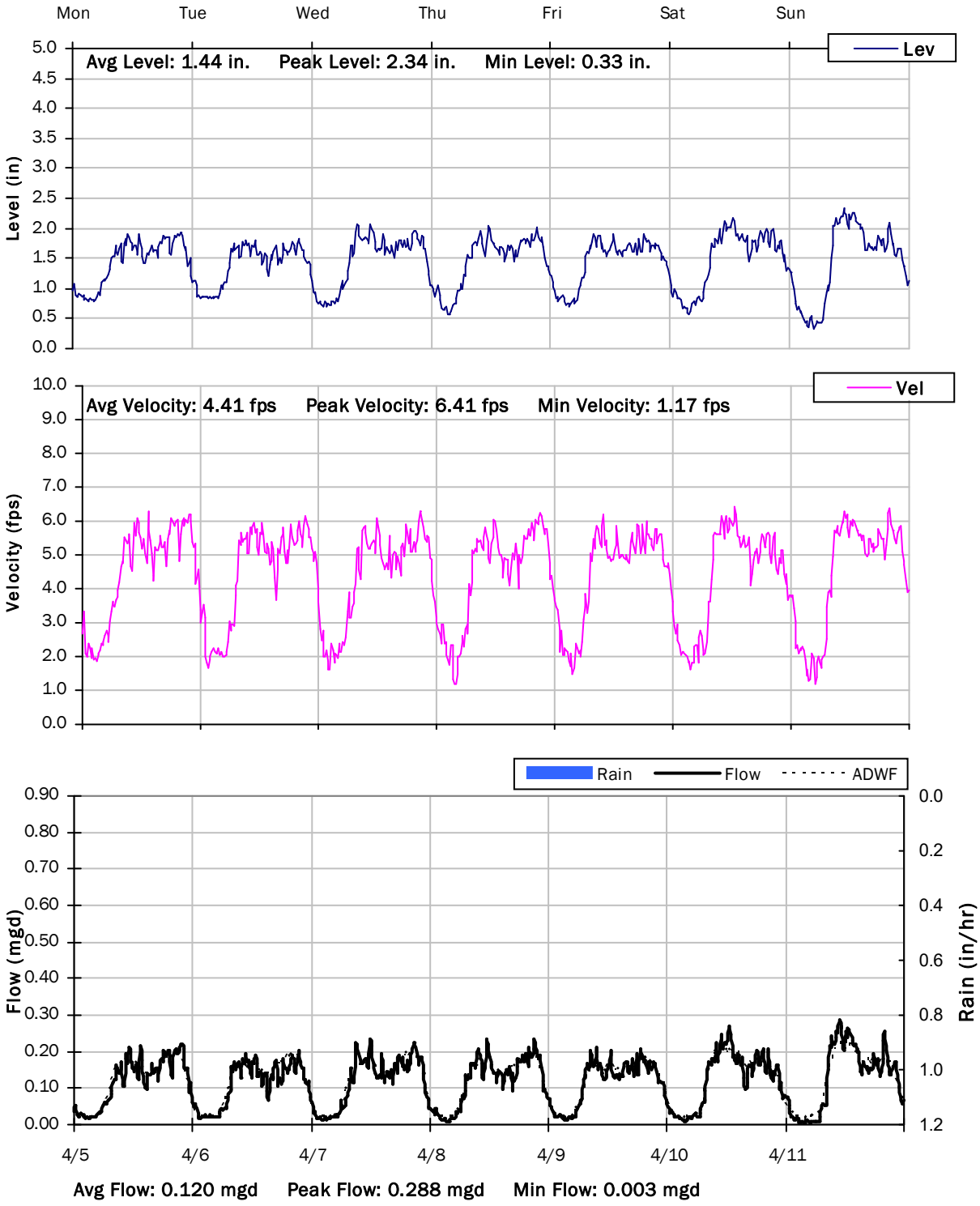
FM 1-6
Weekly Level, Velocity and Flow Hydrographs
3/22/2021 to 3/29/2021



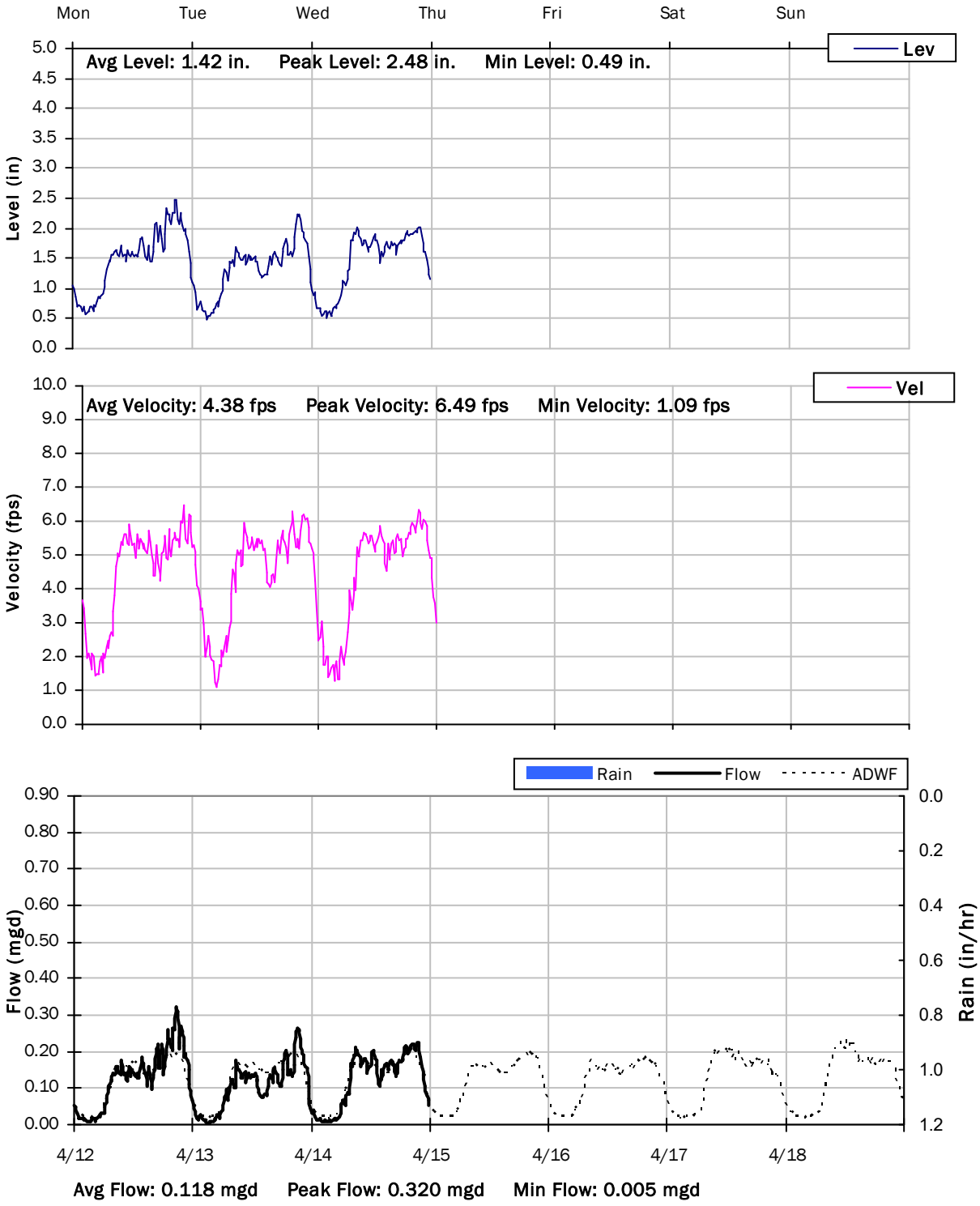
FM 1-6
Weekly Level, Velocity and Flow Hydrographs
3/29/2021 to 4/5/2021



FM 1-6
Weekly Level, Velocity and Flow Hydrographs
4/5/2021 to 4/12/2021



FM 1-6
Weekly Level, Velocity and Flow Hydrographs
4/12/2021 to 4/19/2021



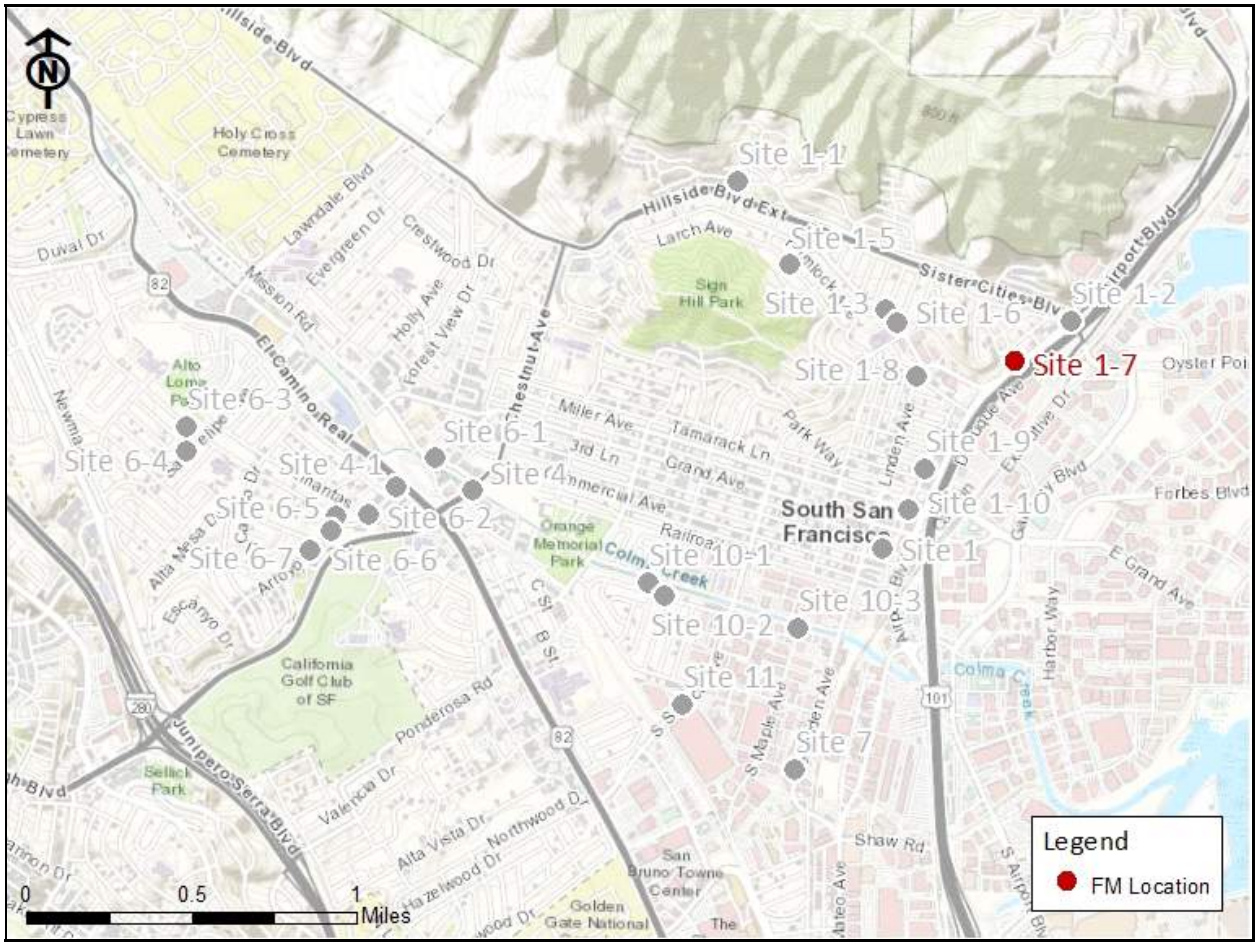
South San Francisco, CA

Sanitary Sewer Flow Monitoring
January 4 - April 14, 2021

Monitoring Site: FM 1-7

Location: Chapman Avenue north of Airport Boulevard

Data Summary Report



Vicinity Map: FM 1-7

FM 1-7

Site Information

Location: Chapman Avenue north of Airport Boulevard

Coordinates: 122.4024° W, 37.6624° N

Rim Elevation (Earth): 36 feet

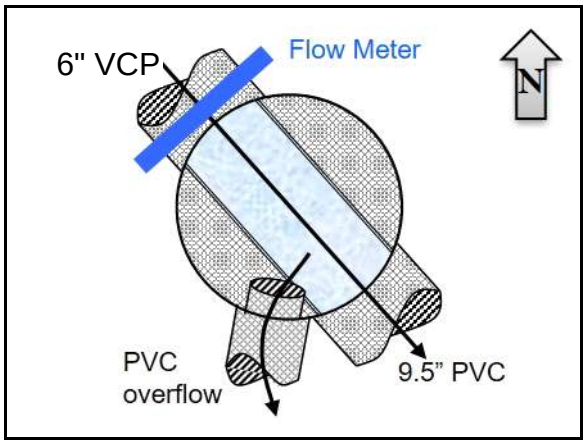
Pipe Diameter: 6 inches

ADWF: 0.018 mgd

Peak Measured Flow: 0.139 mgd

Satellite Map

Sanitary Map



Flow Sketch

Street View

Plan View

FM 1-7

Additional Site Photos

Effluent Pipe

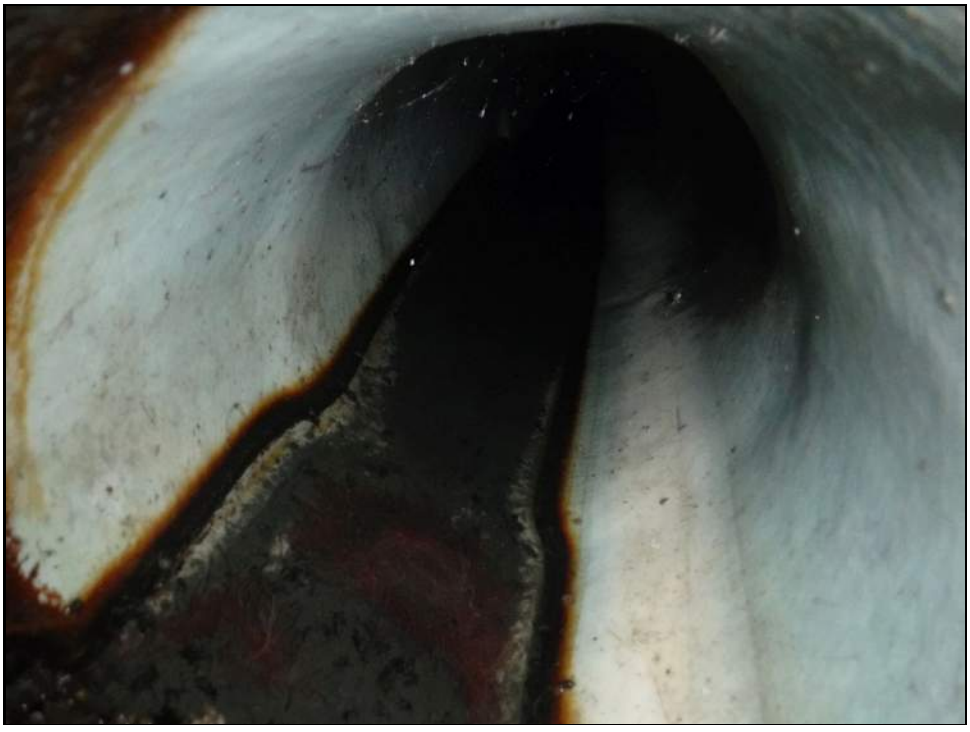
Monitored Lower Influent Pipe

FM 1-7

Additional Site Photos

Upper Influent Pipe

Overflow Pipe

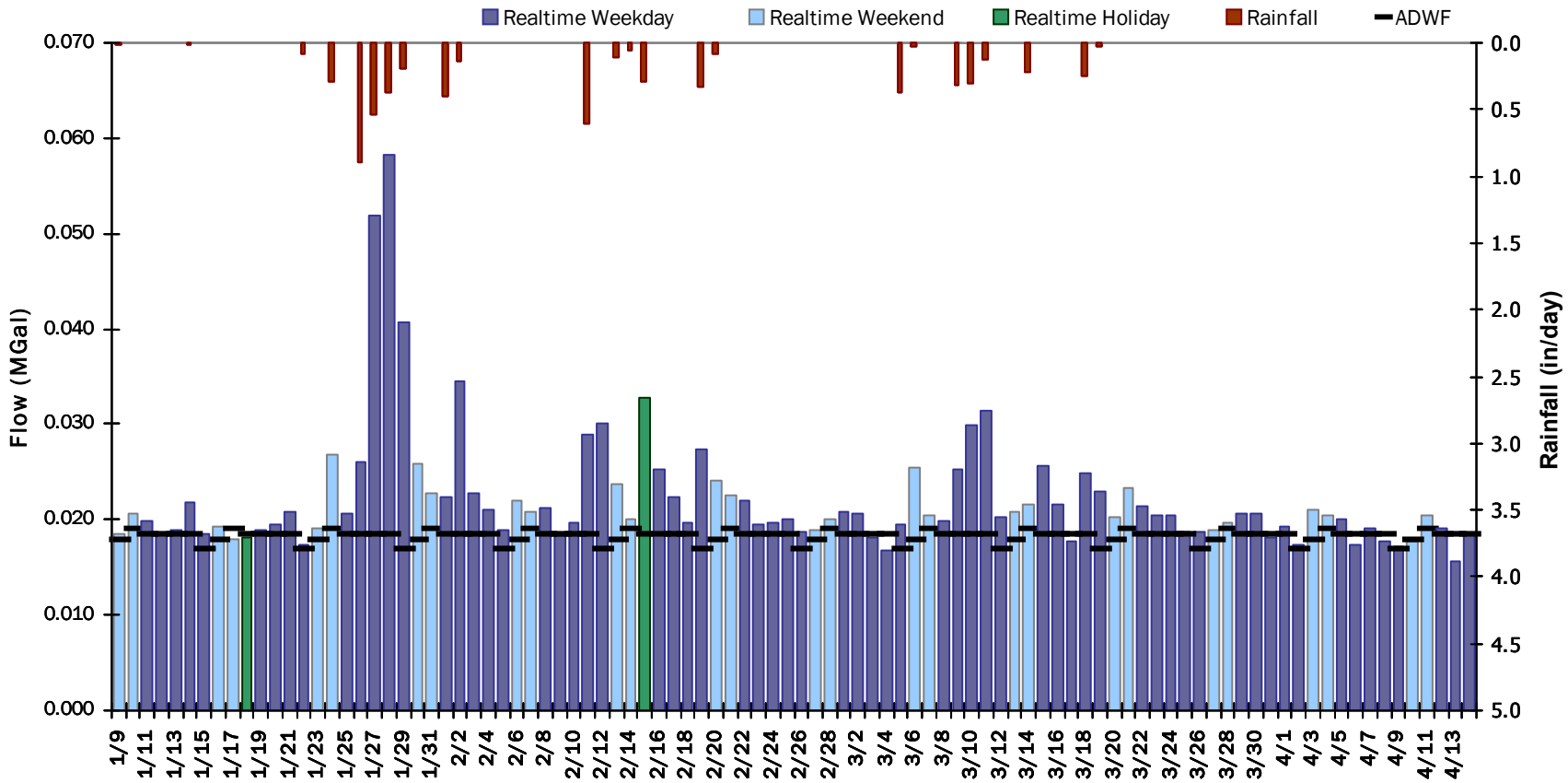


FM 1-7

Period Flow Summary: Daily Flow Totals

Avg Period Flow: 0.022 MGal Peak Daily Flow: 0.058 MGal Min Daily Flow: 0.016 MGal

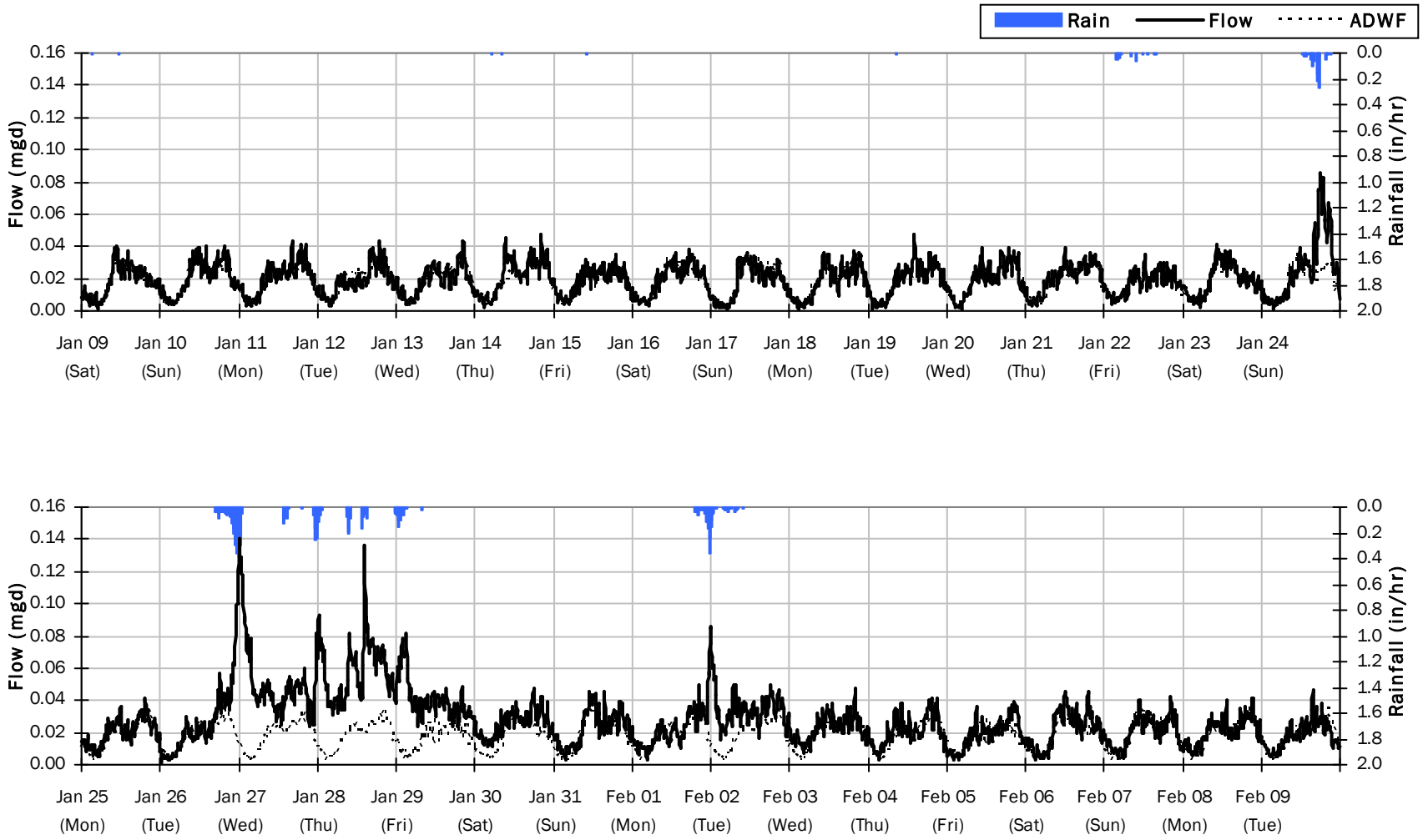
Total Period Rainfall: 6.01 inches



FM 1-7

Flow Summary: 1/9/2021 to 2/9/2021

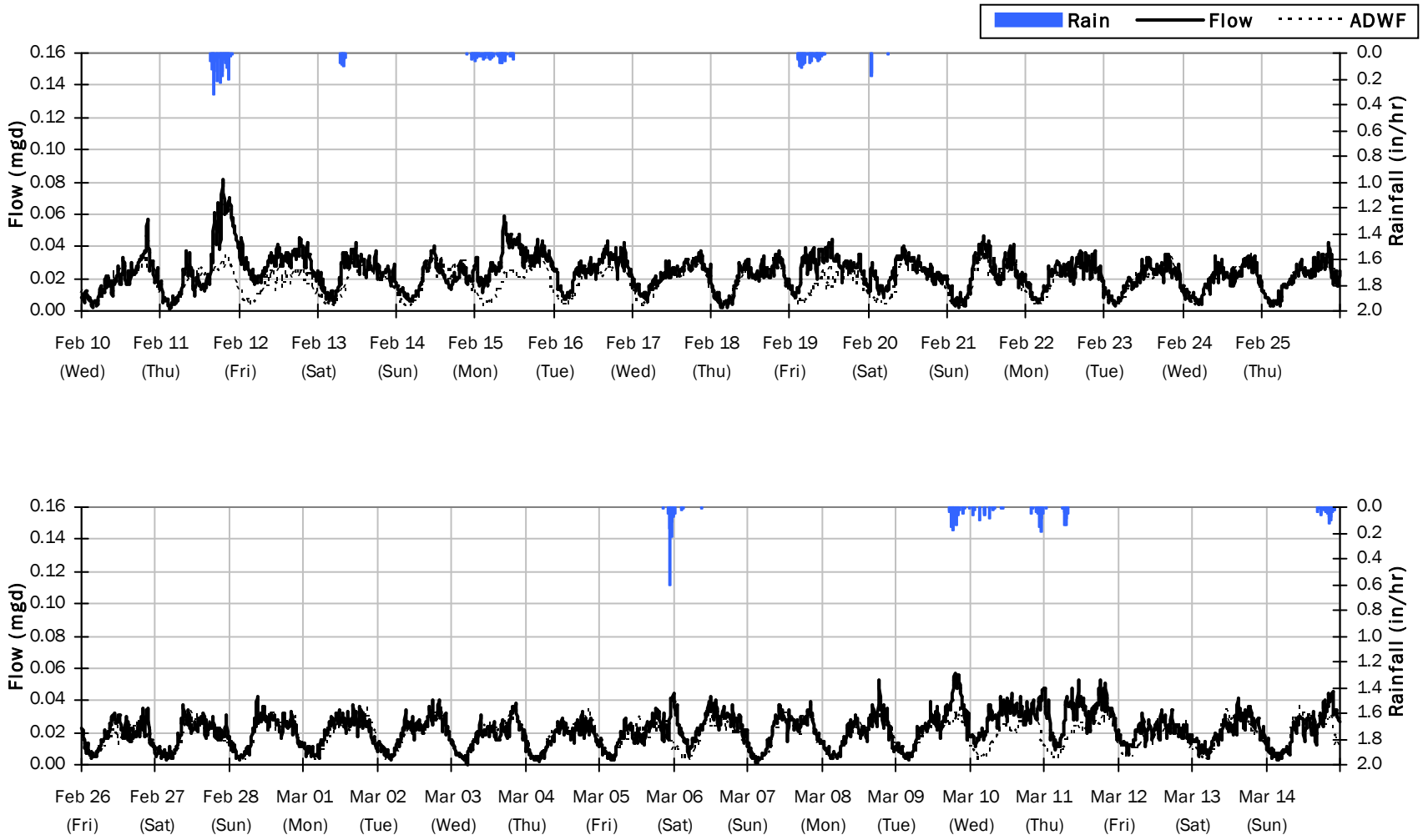
Total Period Rainfall: 2.93 inches Avg Flow: 0.024 mgd Peak Flow: 0.139 mgd Min Flow: 0.001 mgd



FM 1-7

Flow Summary: 2/10/2021 to 3/14/2021

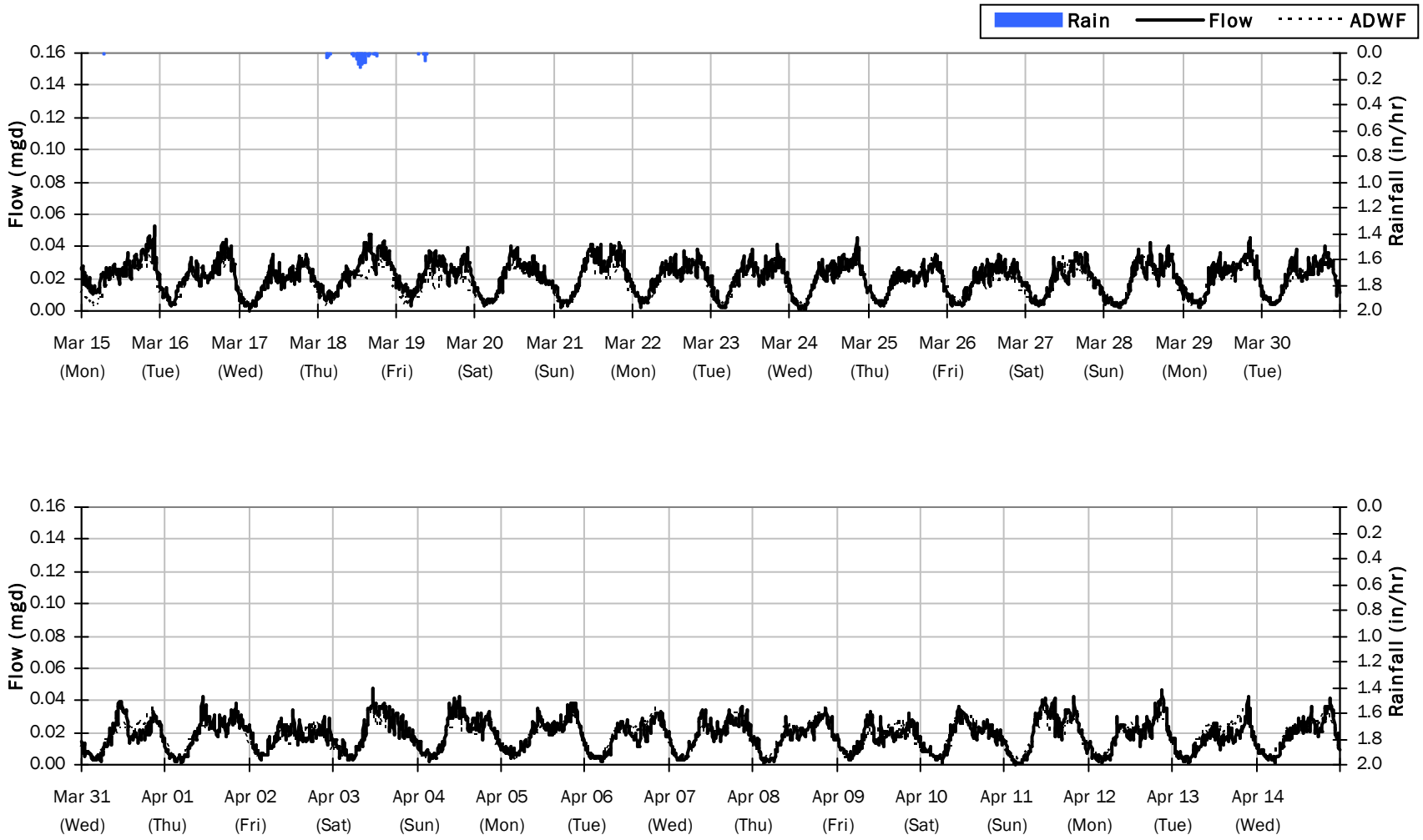
Total Period Rainfall: 2.81 inches Avg Flow: 0.023 mgd Peak Flow: 0.082 mgd Min Flow: 0.000 mgd



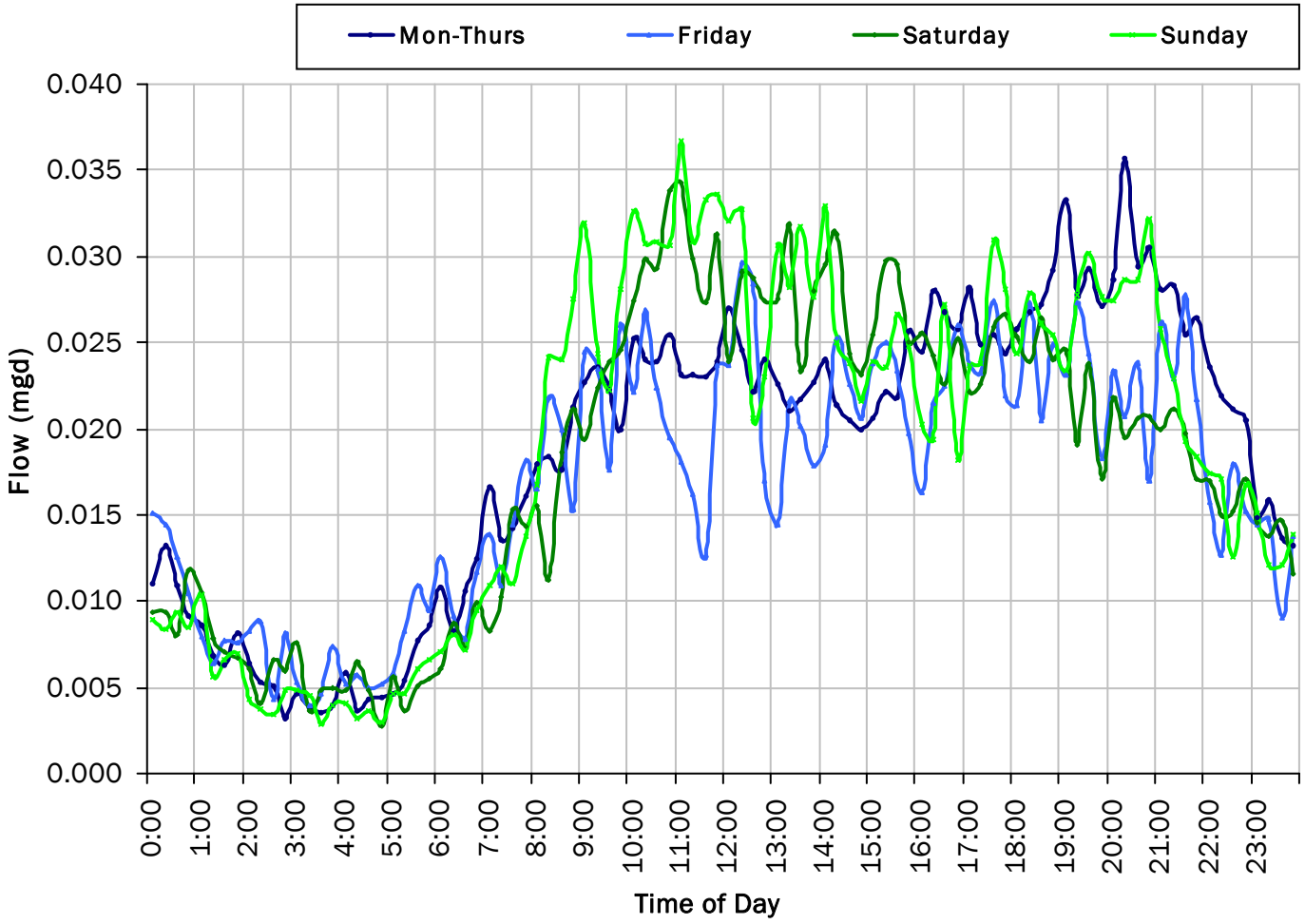
FM 1-7

Flow Summary: 3/15/2021 to 4/14/2021

Total Period Rainfall: 0.27 inches Avg Flow: 0.020 mgd Peak Flow: 0.053 mgd Min Flow: 0.000 mgd

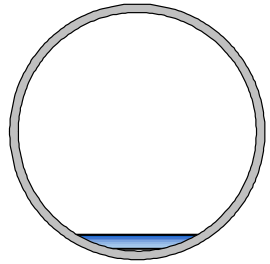


FM 1-7
Average Dry Weather Flow Hydrographs



ADWF:

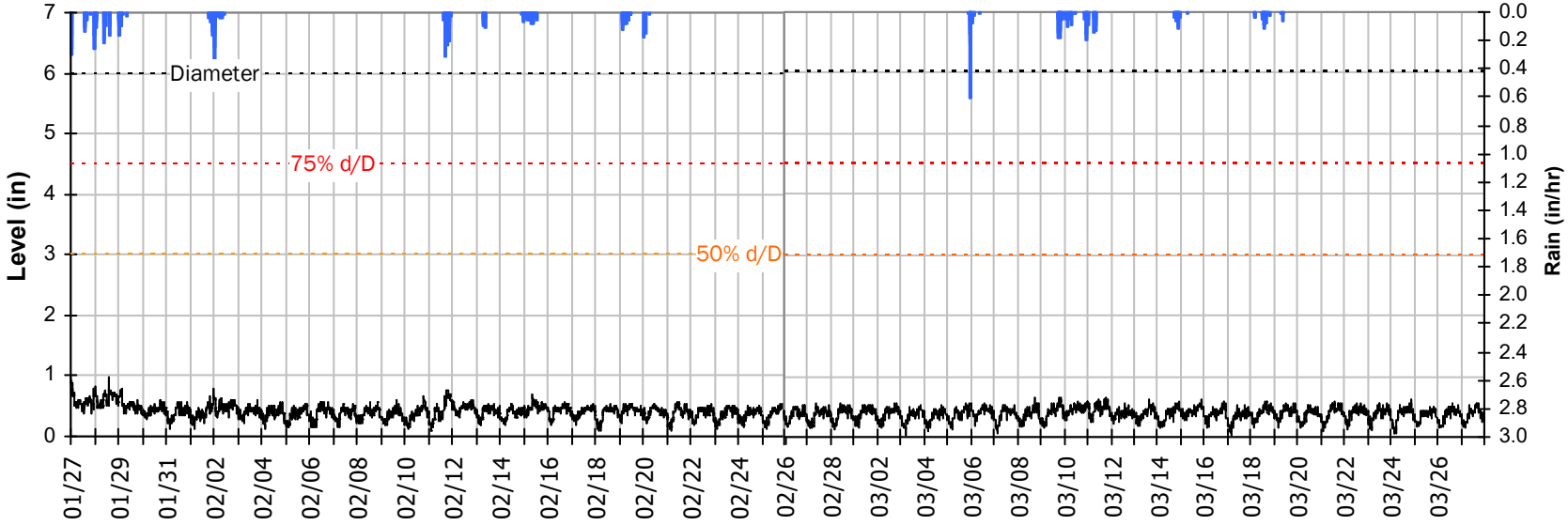
0.018 *mgd*

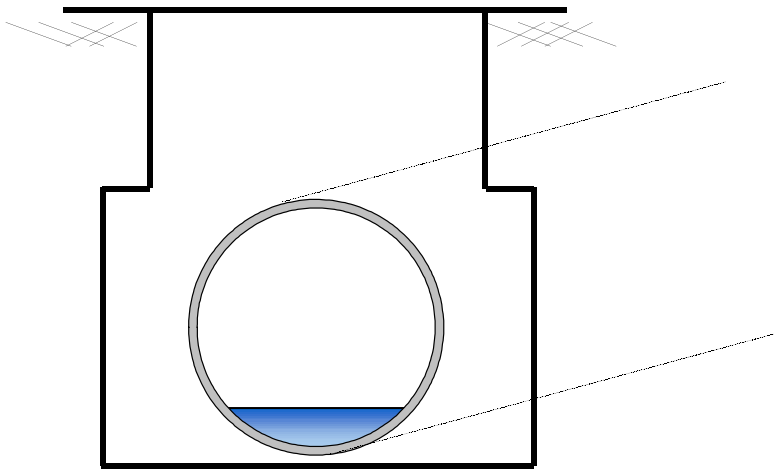


FM 1-7

Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Monitoring Period

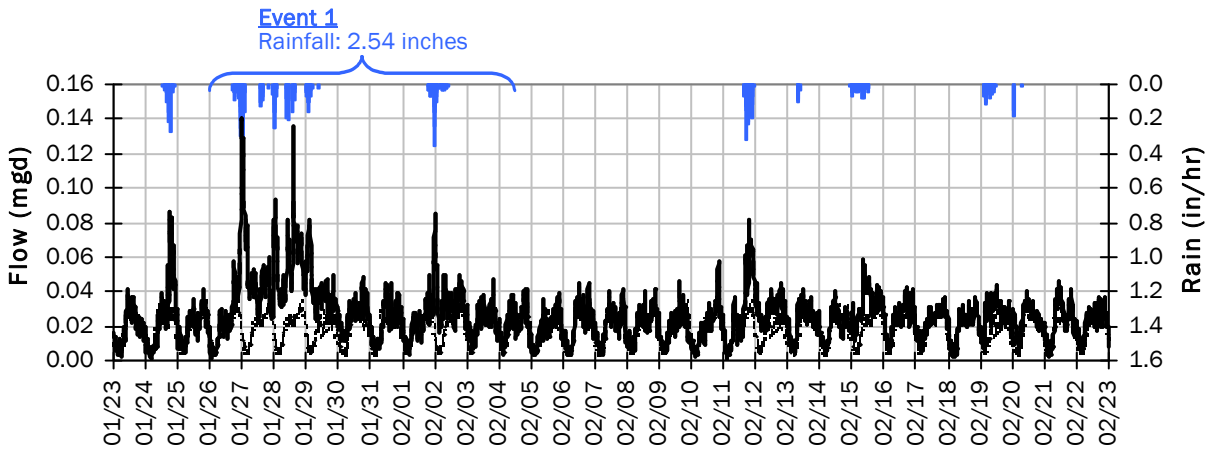




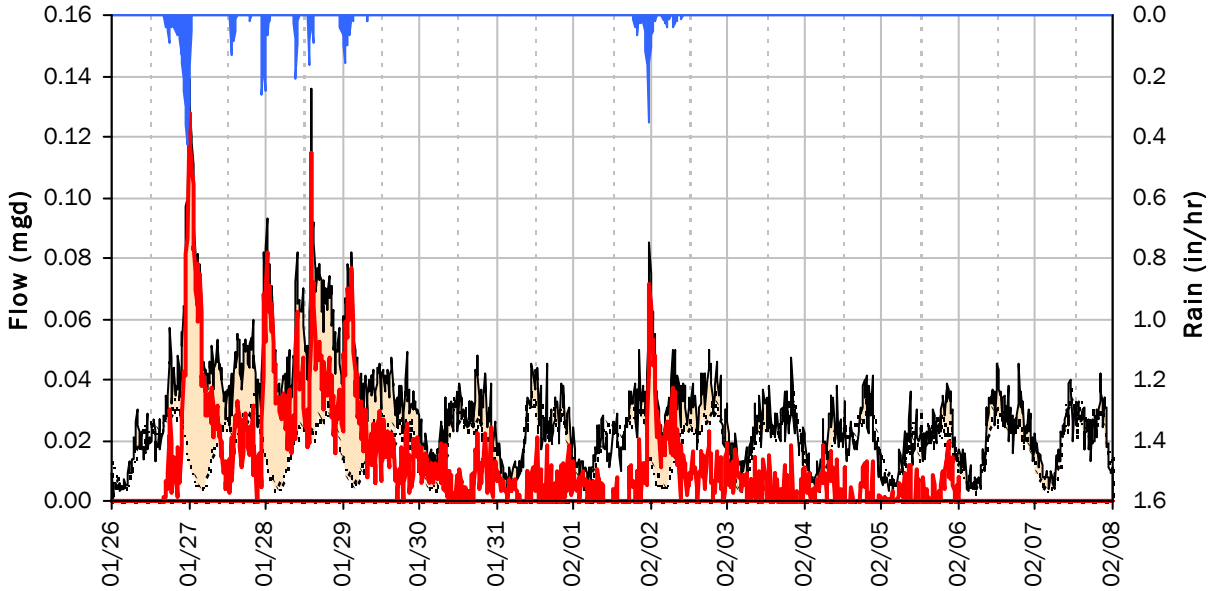
Pipe Diameter:	6	*inches*
Peak Measured Level:	0.97	*inches*
Peak d/D Ratio:	0.16	

FM 1-7
I/I Summary: Event 1

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



Event 1 Detail Graph

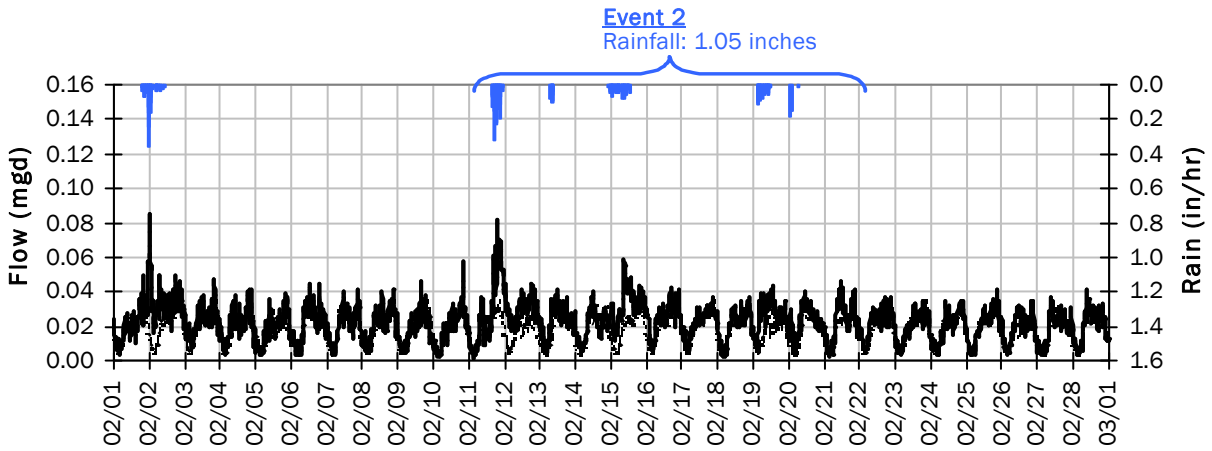


Storm Event I/I Analysis (Rain = 2.54 inches)

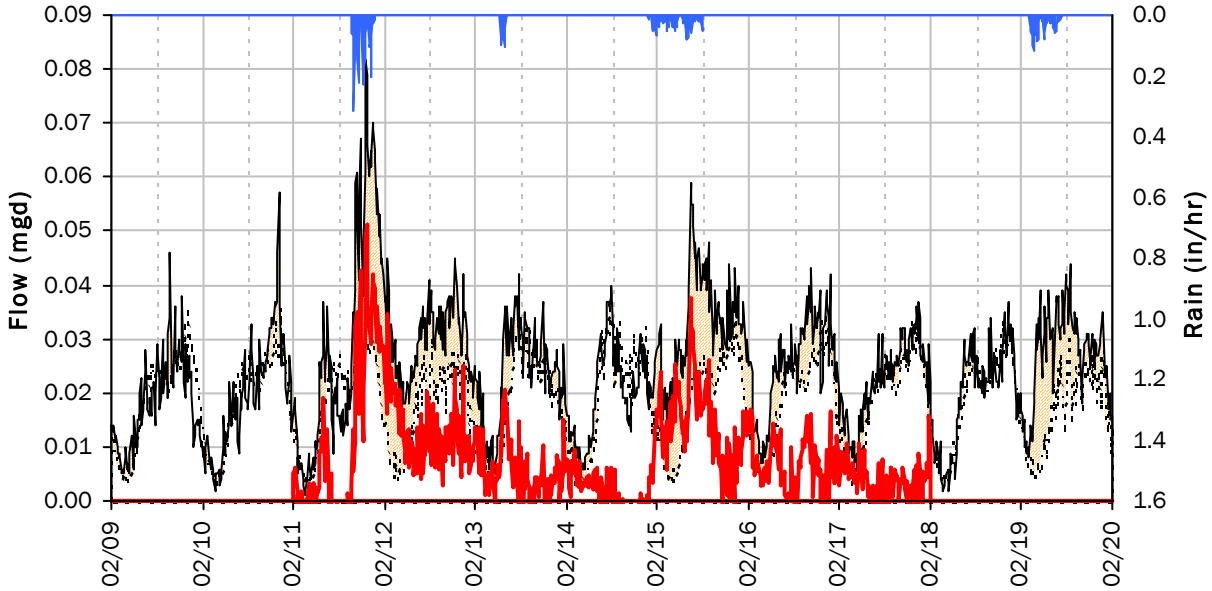
Capacity		Inflow / Infiltration	
Peak Flow:	0.14 *mgd*	**Peak I/I Rate:**	0.13 *mgd*
PF:	7.57	**Total I/I:**	144,000 *gallons*
Peak Level:	0.97 *in*		
d/D Ratio:	0.16		

FM 1-7
I/I Summary: Event 2

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



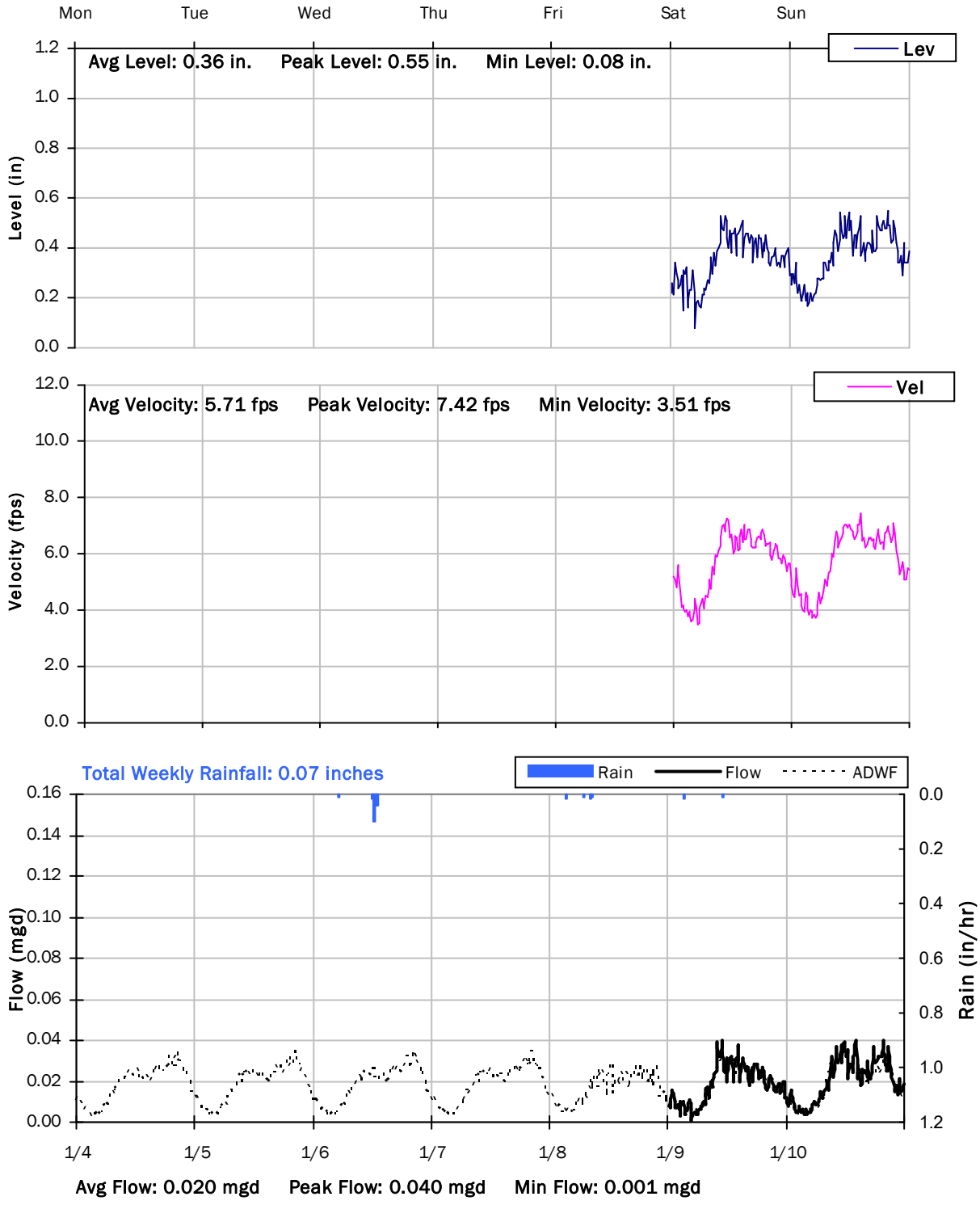
Event 2 Detail Graph



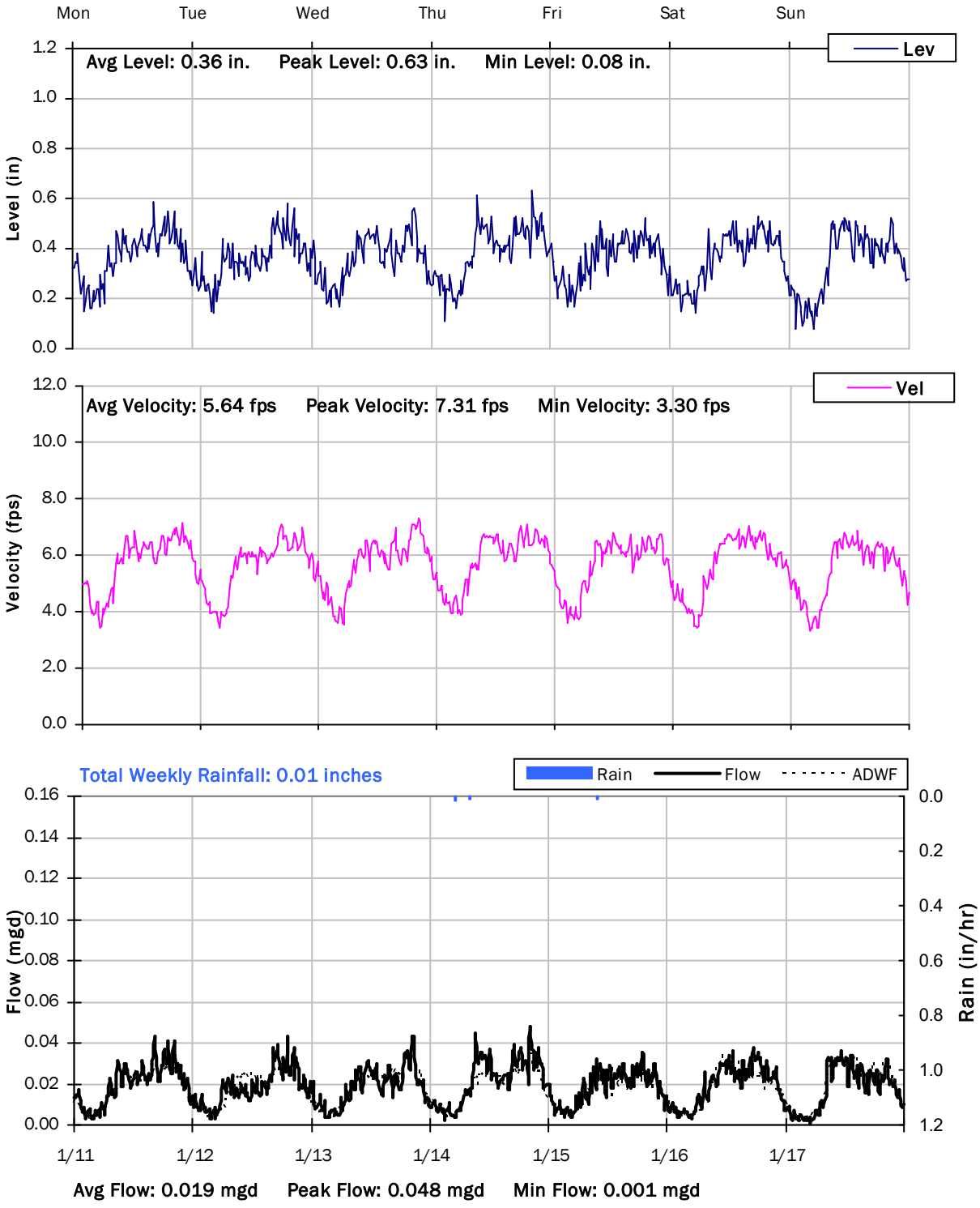
Storm Event I/I Analysis (Rain = 1.05 inches)

Capacity		Inflow / Infiltration	
Peak Flow:	0.08 *mgd*	**Peak I/I Rate:**	0.05 *mgd*
PF:	4.47	**Total I/I:**	55,000 *gallons*
Peak Level:	0.77 *in*		
d/D Ratio:	0.13		

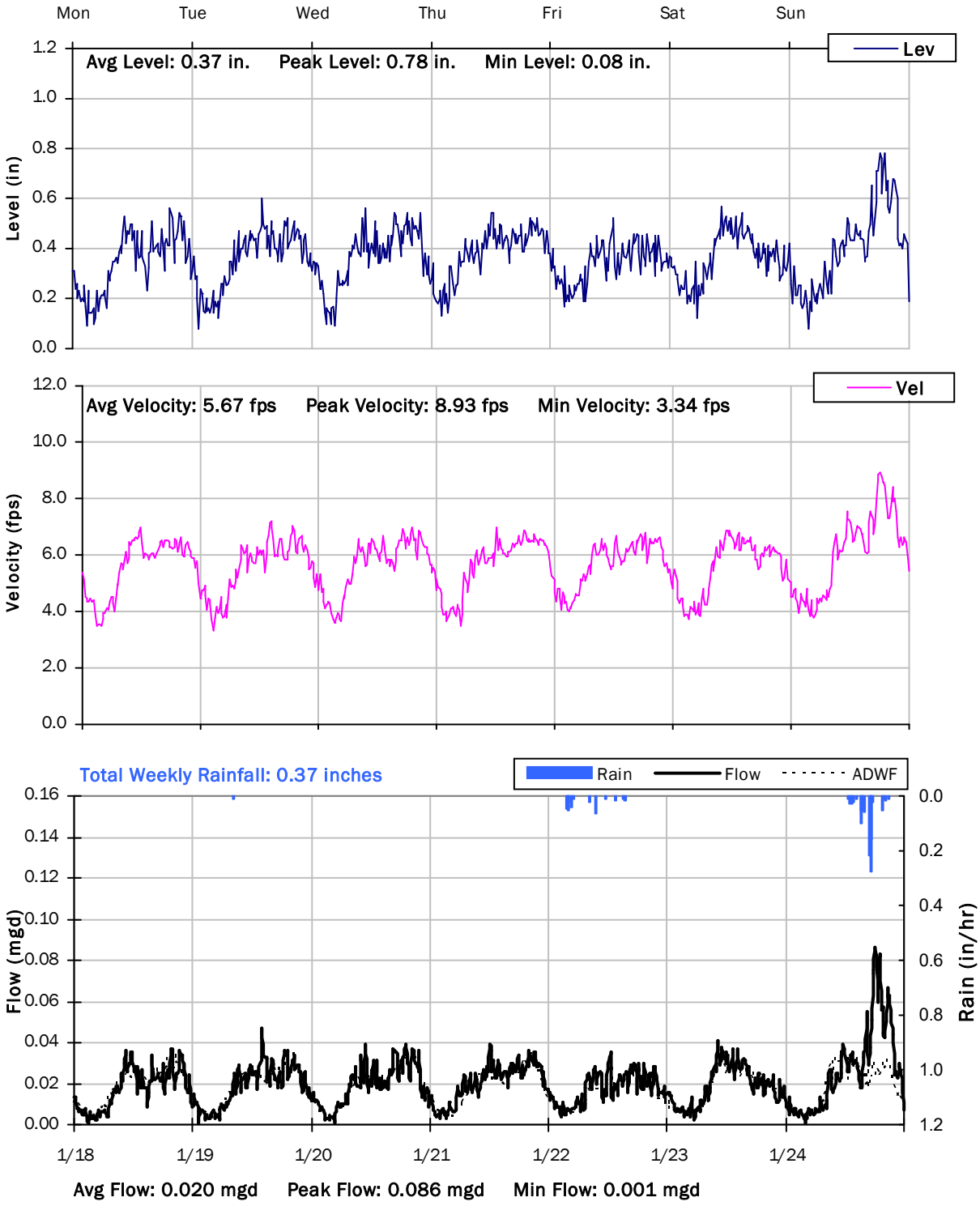
FM 1-7
Weekly Level, Velocity and Flow Hydrographs
1/4/2021 to 1/11/2021



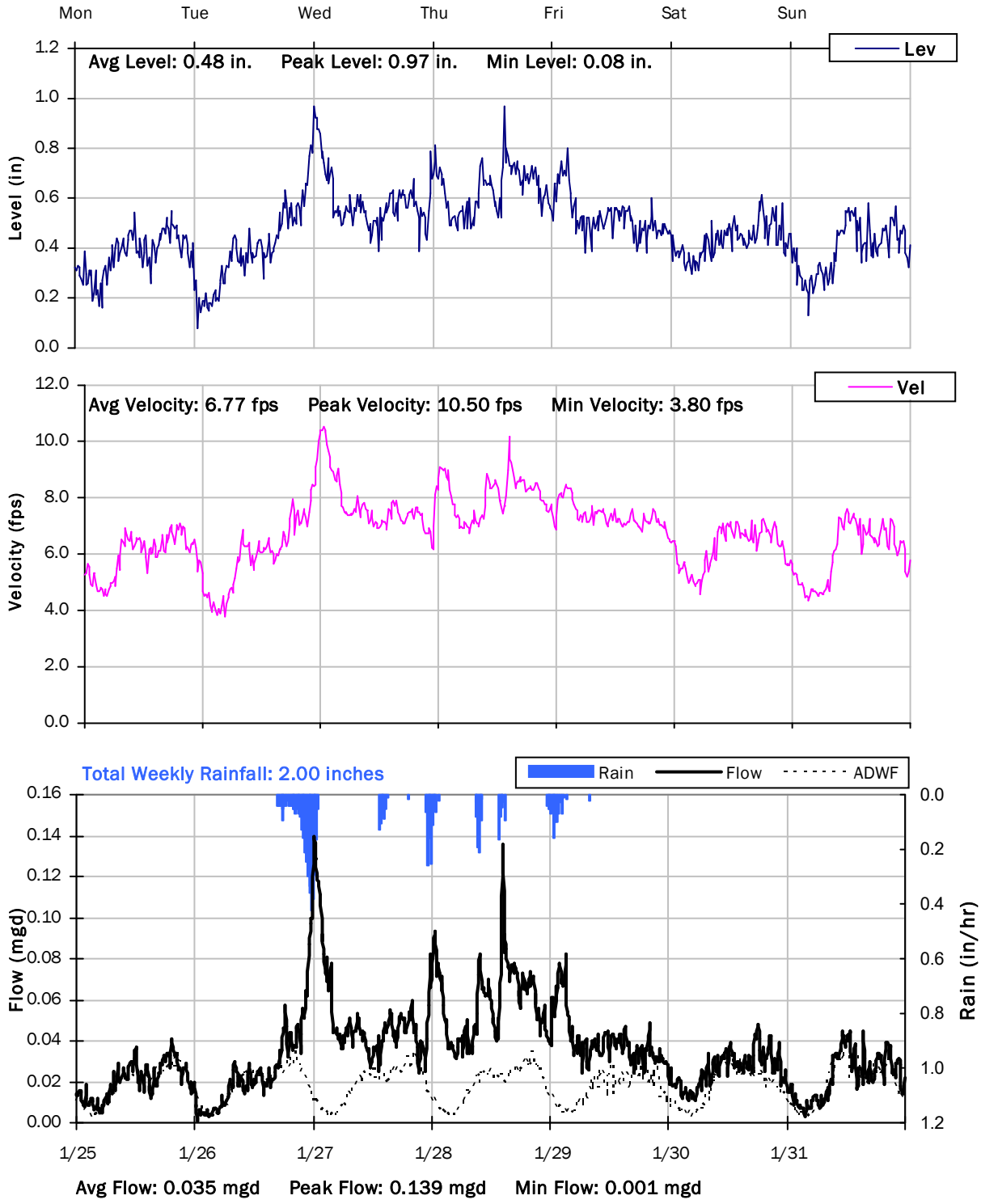
FM 1-7
Weekly Level, Velocity and Flow Hydrographs
1/11/2021 to 1/18/2021



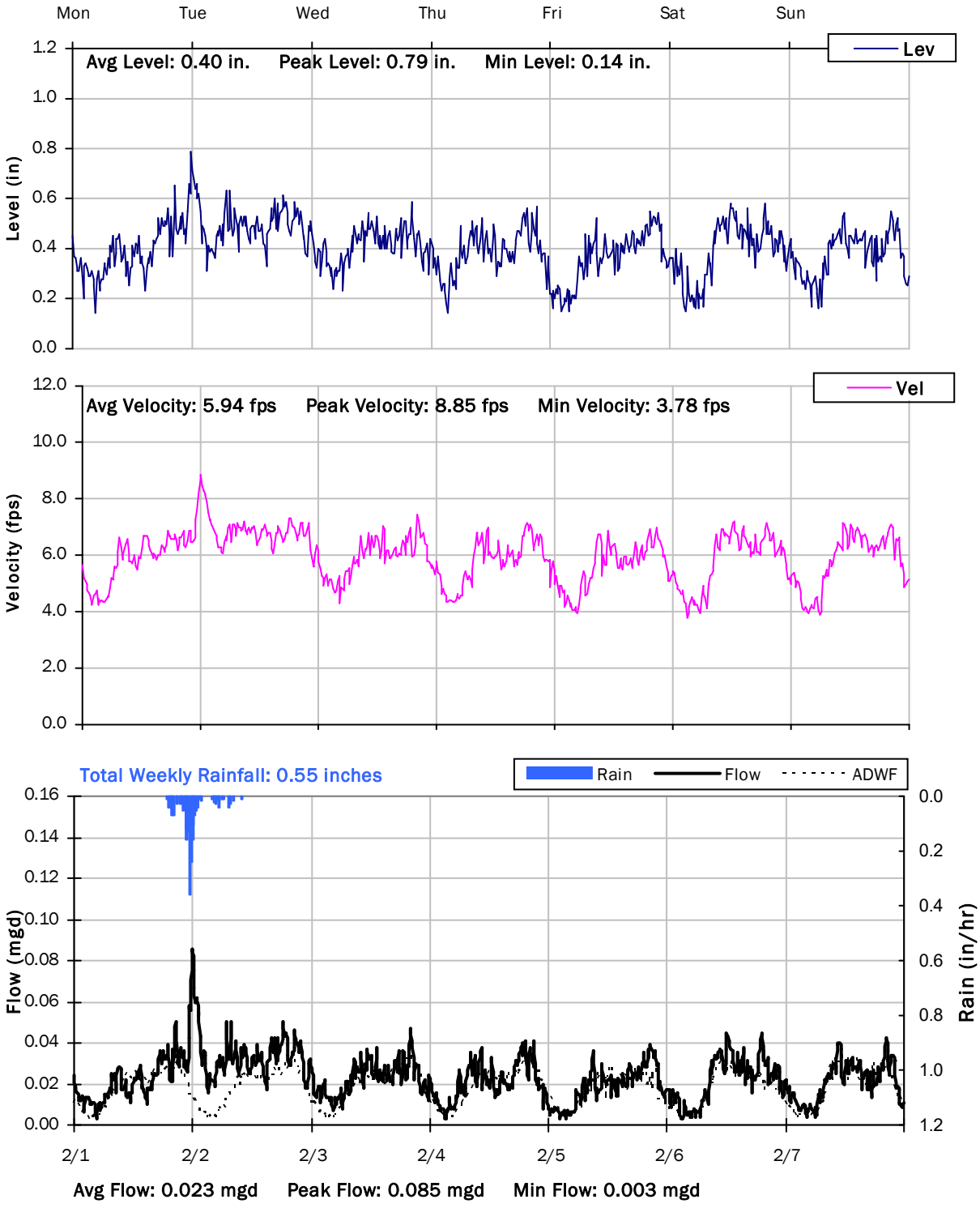
FM 1-7
Weekly Level, Velocity and Flow Hydrographs
1/18/2021 to 1/25/2021



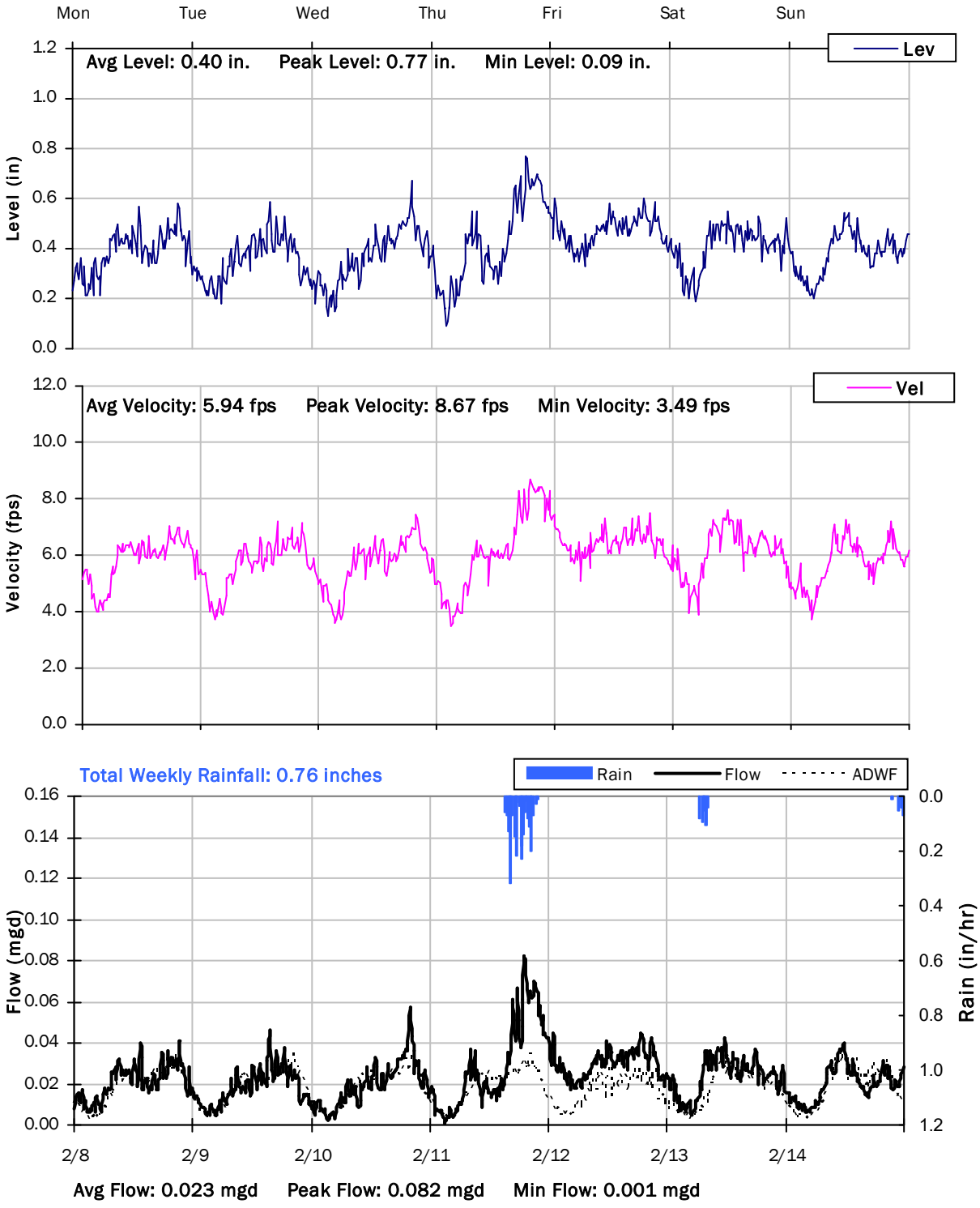
FM 1-7
Weekly Level, Velocity and Flow Hydrographs
1/25/2021 to 2/1/2021



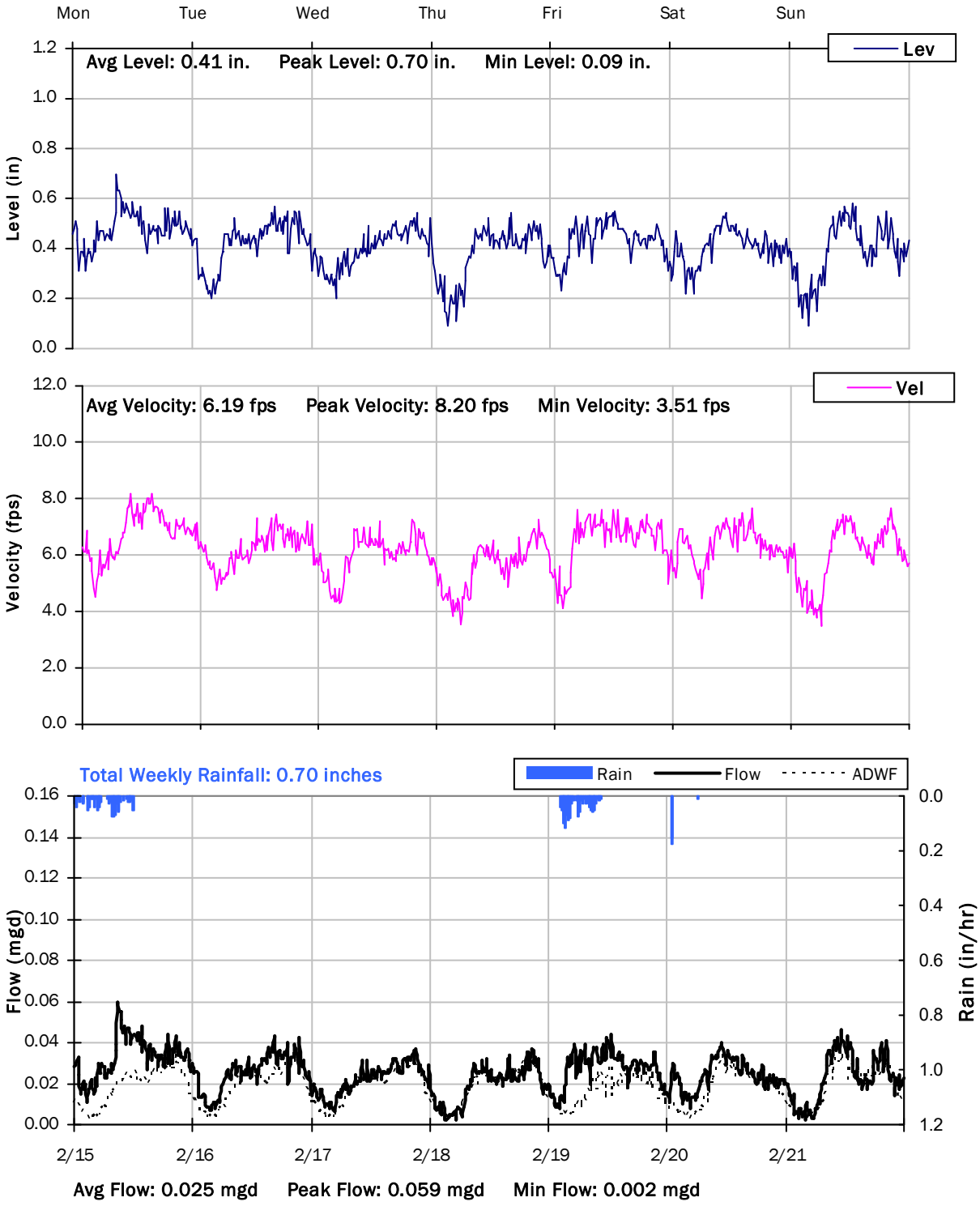
FM 1-7
Weekly Level, Velocity and Flow Hydrographs
2/1/2021 to 2/8/2021



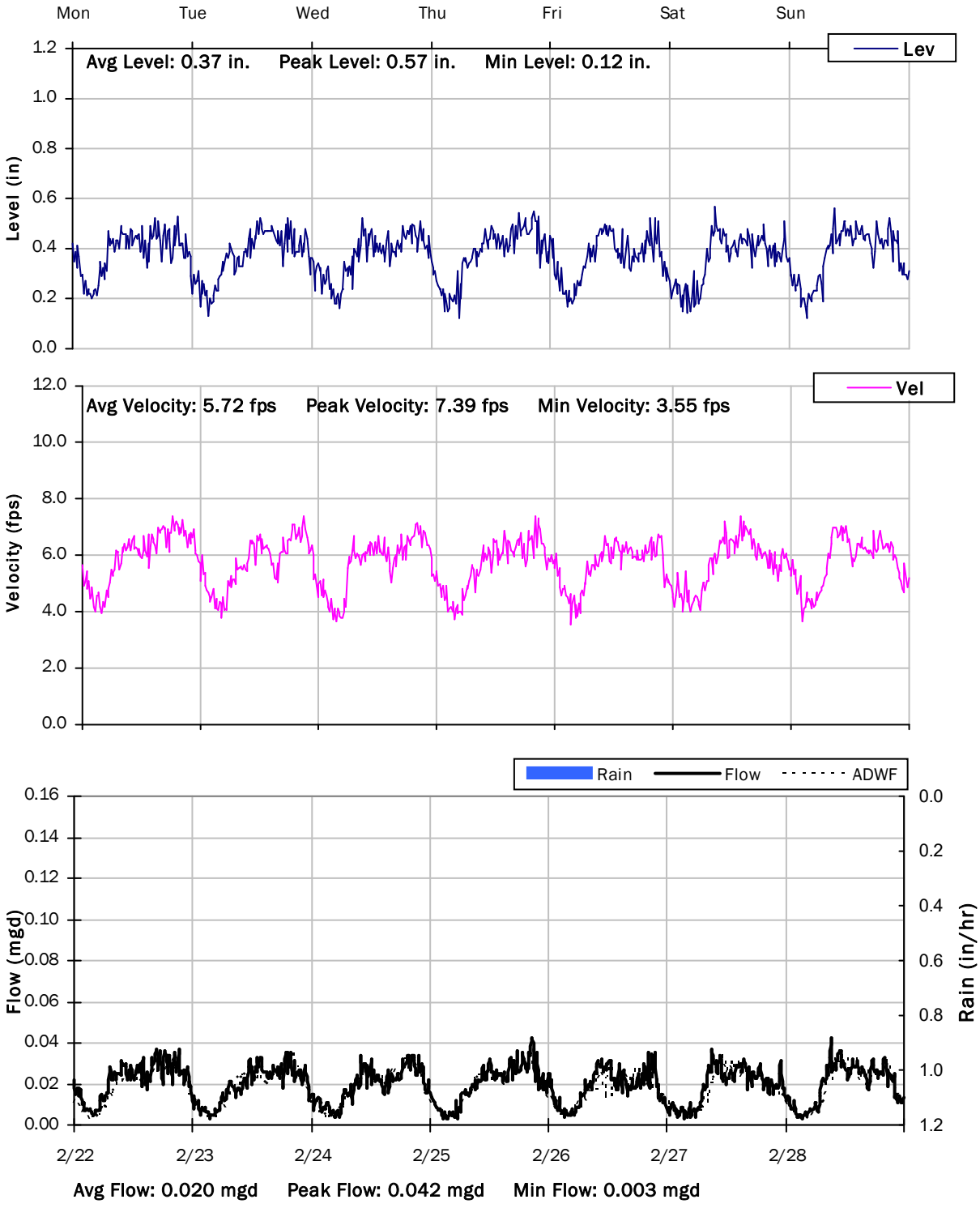
FM 1-7
Weekly Level, Velocity and Flow Hydrographs
2/8/2021 to 2/15/2021



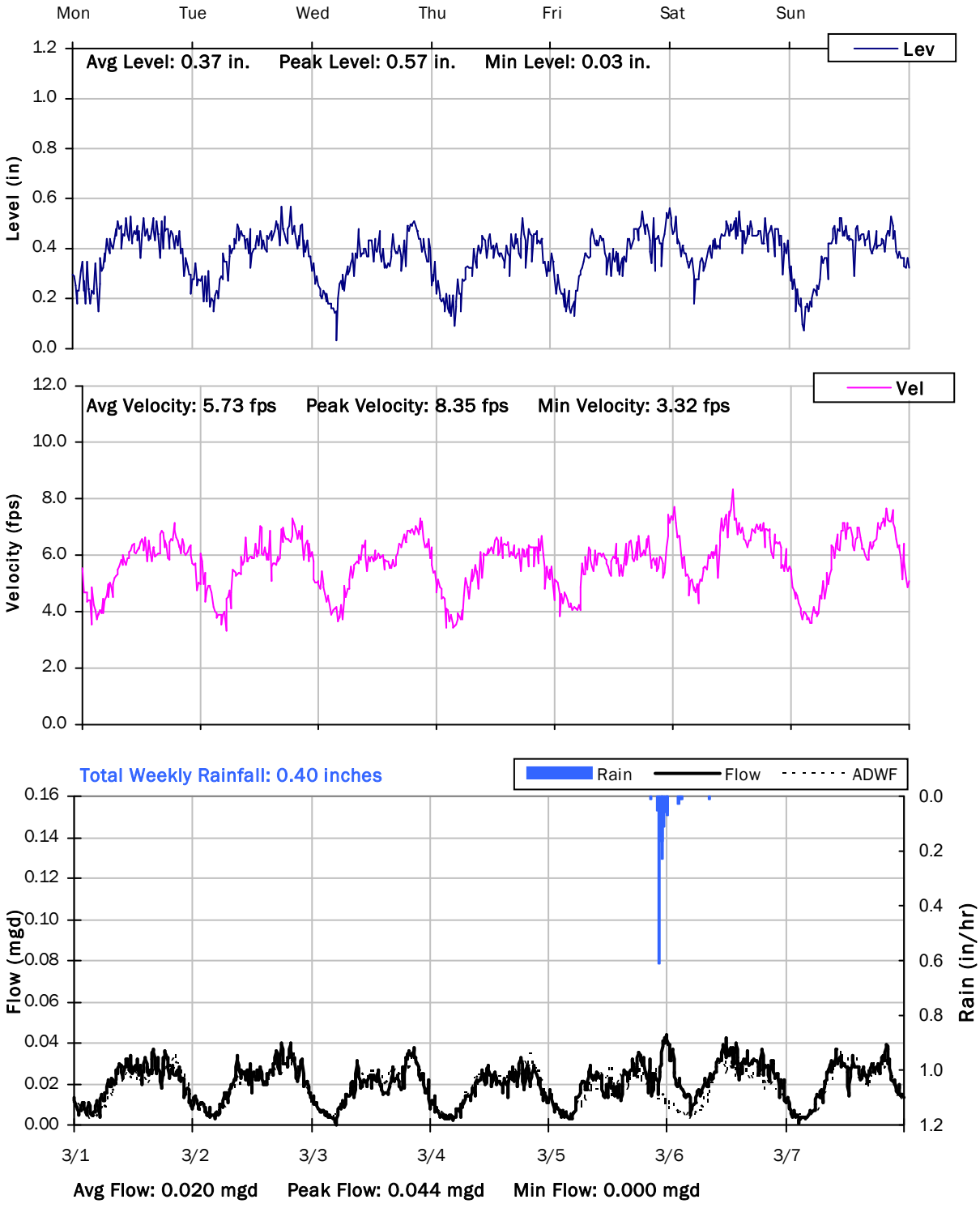
FM 1-7
Weekly Level, Velocity and Flow Hydrographs
2/15/2021 to 2/22/2021



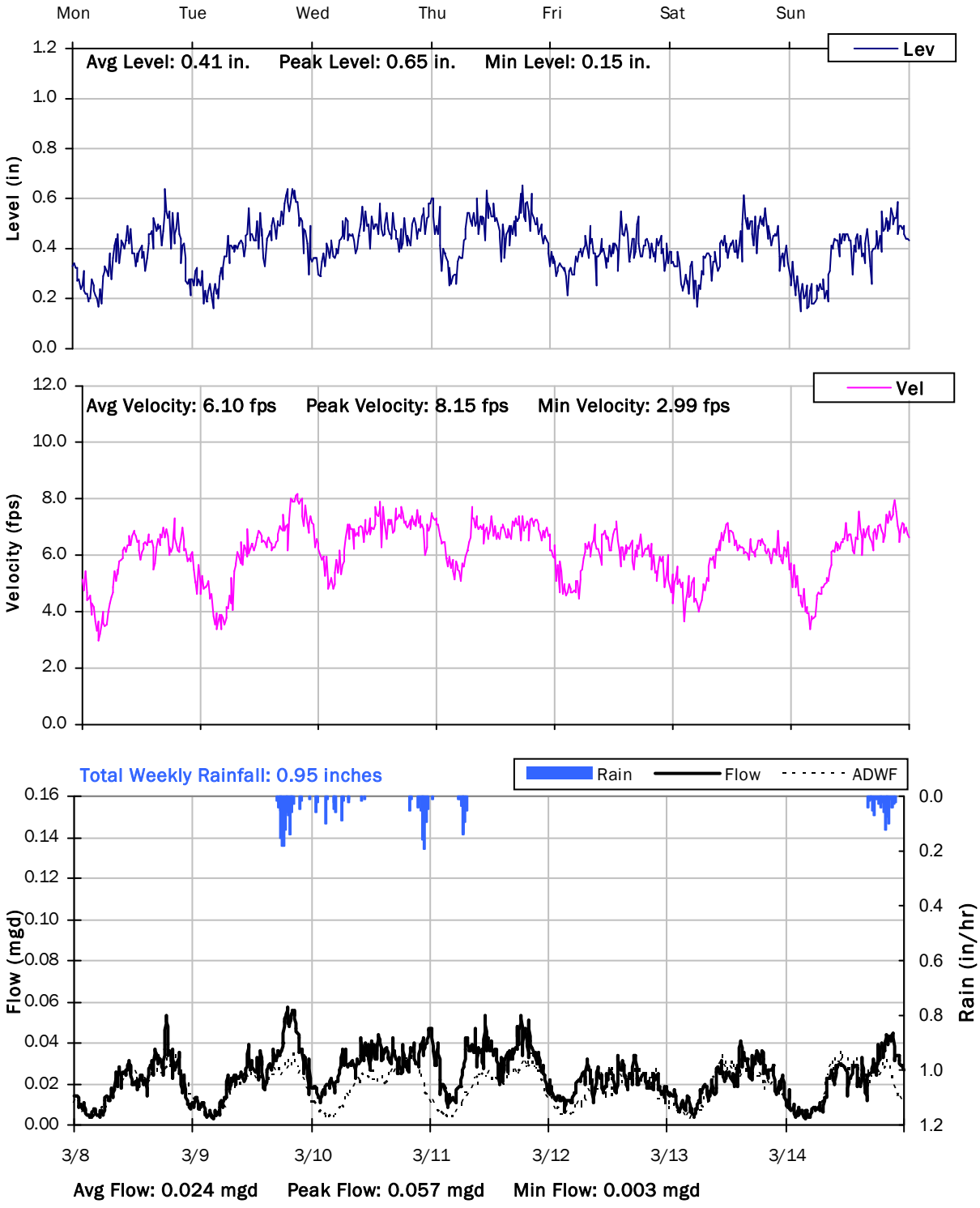
FM 1-7
Weekly Level, Velocity and Flow Hydrographs
2/22/2021 to 3/1/2021



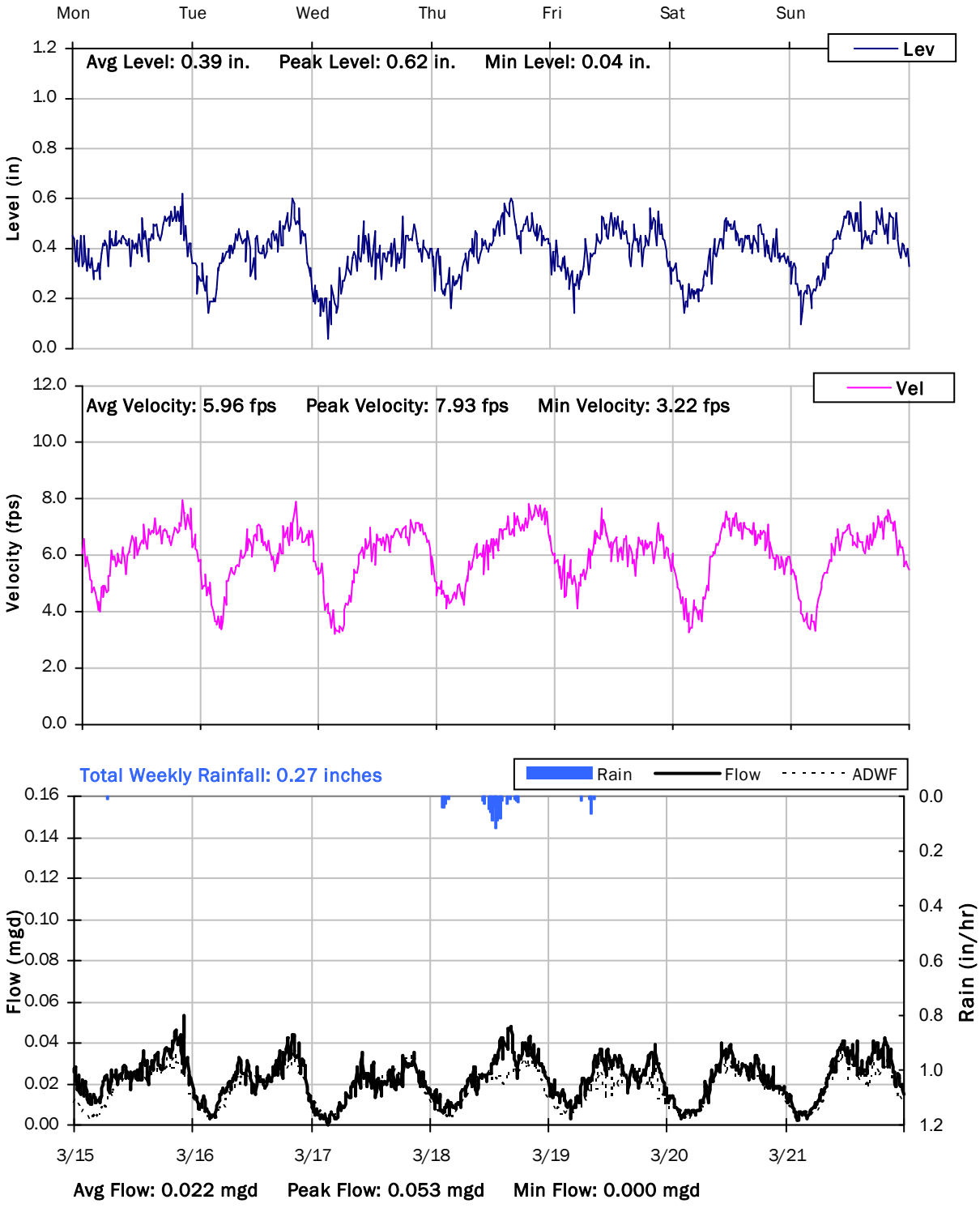
FM 1-7
Weekly Level, Velocity and Flow Hydrographs
3/1/2021 to 3/8/2021



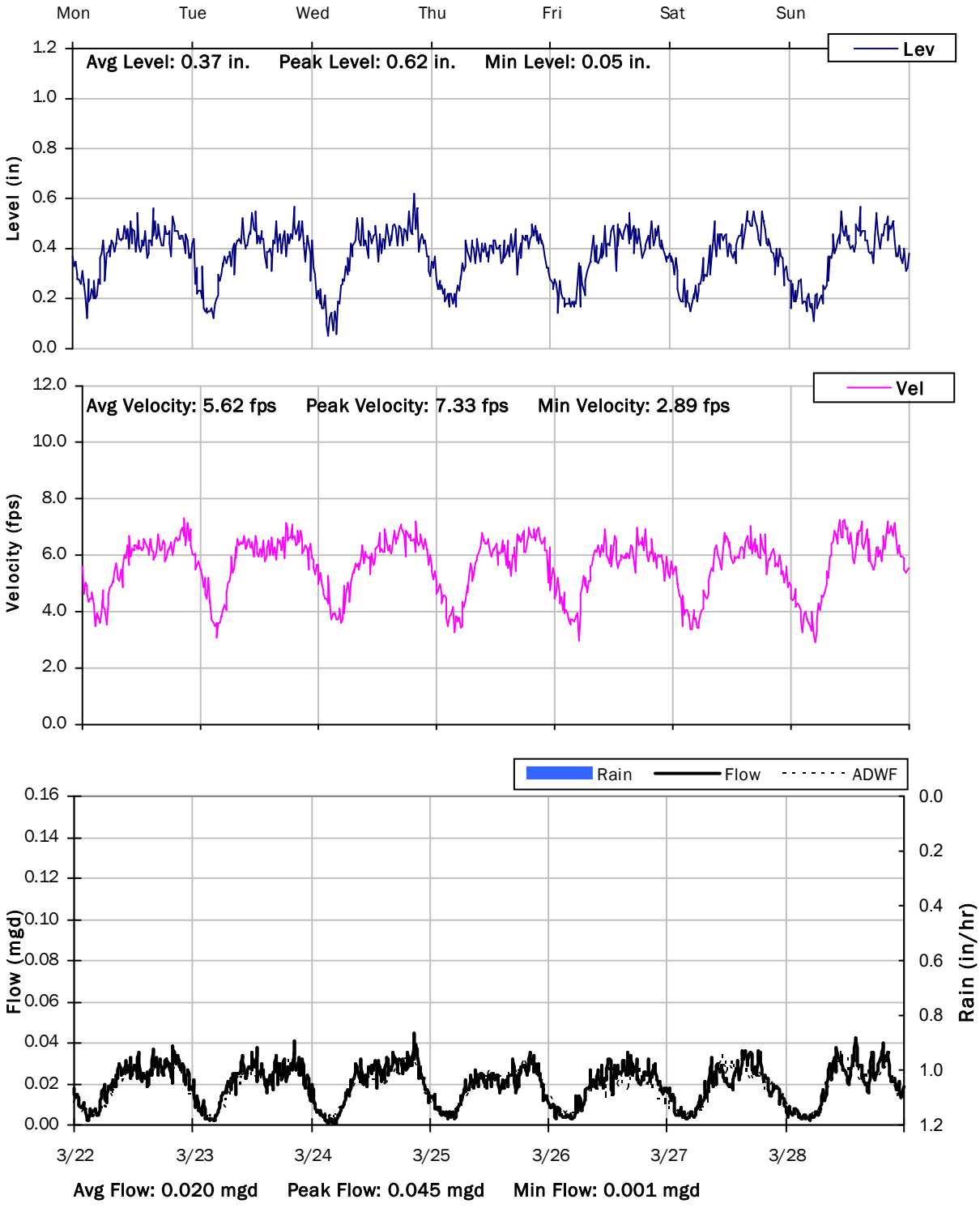
FM 1-7
Weekly Level, Velocity and Flow Hydrographs
3/8/2021 to 3/15/2021



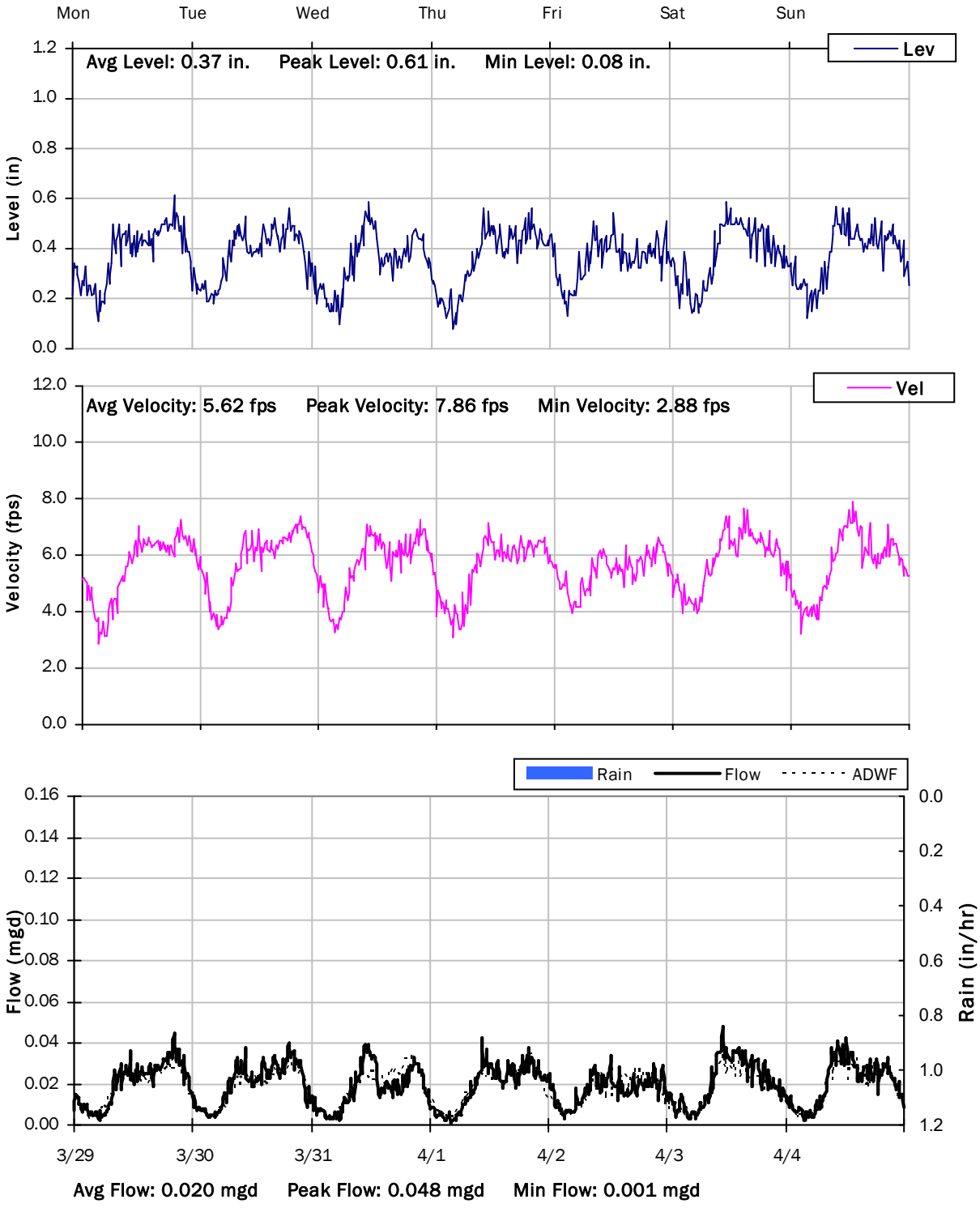
FM 1-7
Weekly Level, Velocity and Flow Hydrographs
3/15/2021 to 3/22/2021



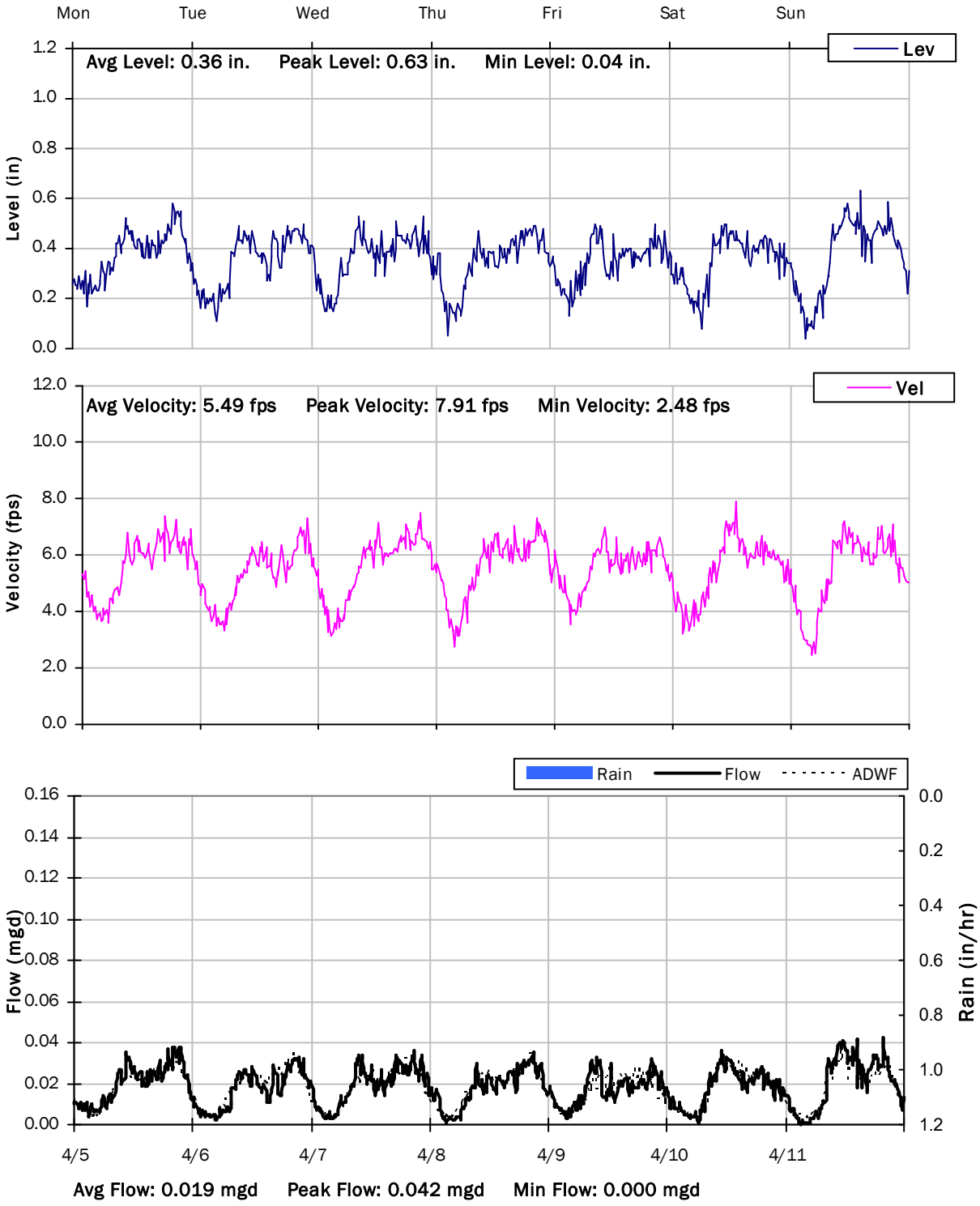
FM 1-7
Weekly Level, Velocity and Flow Hydrographs
3/22/2021 to 3/29/2021



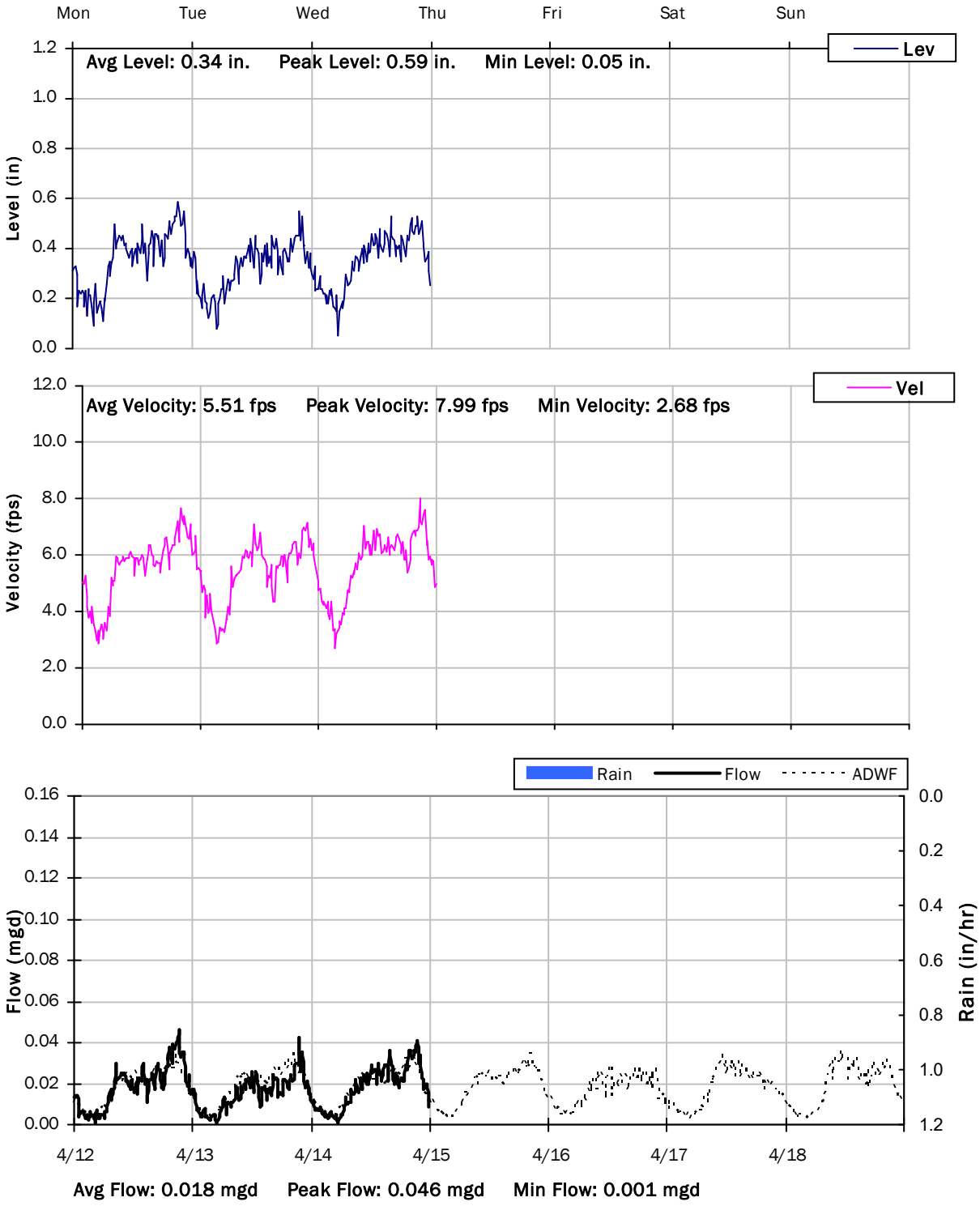
FM 1-7
Weekly Level, Velocity and Flow Hydrographs
3/29/2021 to 4/5/2021



FM 1-7
Weekly Level, Velocity and Flow Hydrographs
4/5/2021 to 4/12/2021



FM 1-7
Weekly Level, Velocity and Flow Hydrographs
4/12/2021 to 4/19/2021



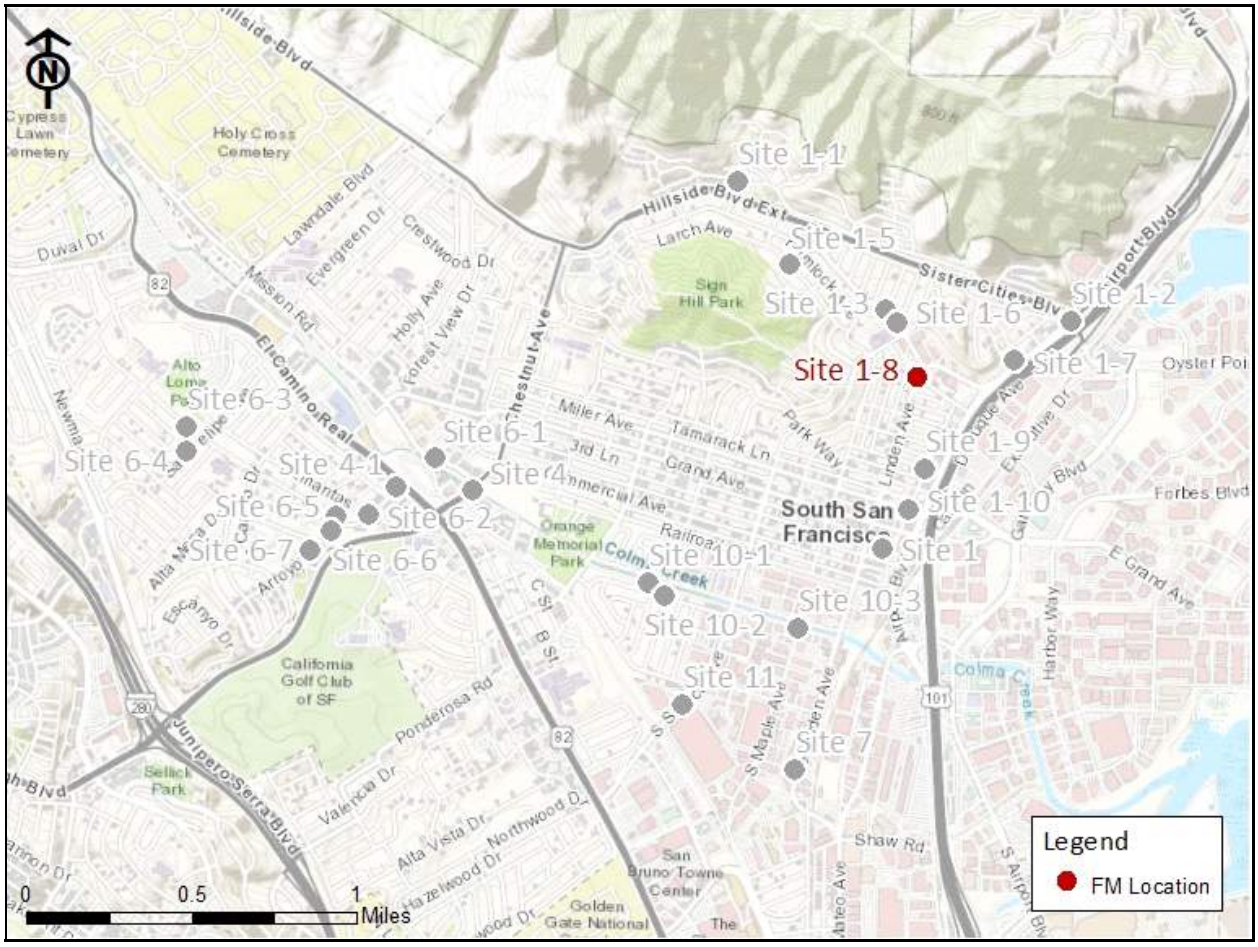
South San Francisco, CA

Sanitary Sewer Flow Monitoring
January 4 - April 14, 2021

Monitoring Site: FM 1-8

Location: Armour Avenue and Linden Avenue

Data Summary Report



Vicinity Map: FM 1-8

FM 1-8

Site Information

Location: Armour Avenue and Linden Avenue

Coordinates: 122.4078° W, 37.6616° N

Rim Elevation (Earth): 50 feet

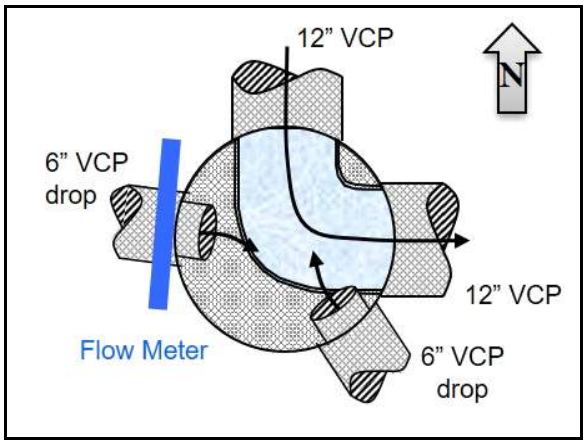
Pipe Diameter: 6 inches

ADWF: 0.051 mgd

Peak Measured Flow: 0.818 mgd

Satellite Map

Sanitary Map



Flow Sketch

Street View

Plan View

FM 1-8

Additional Site Photos

Effluent Pipe

Monitored West Influent Pipe

FM 1-8

Additional Site Photos

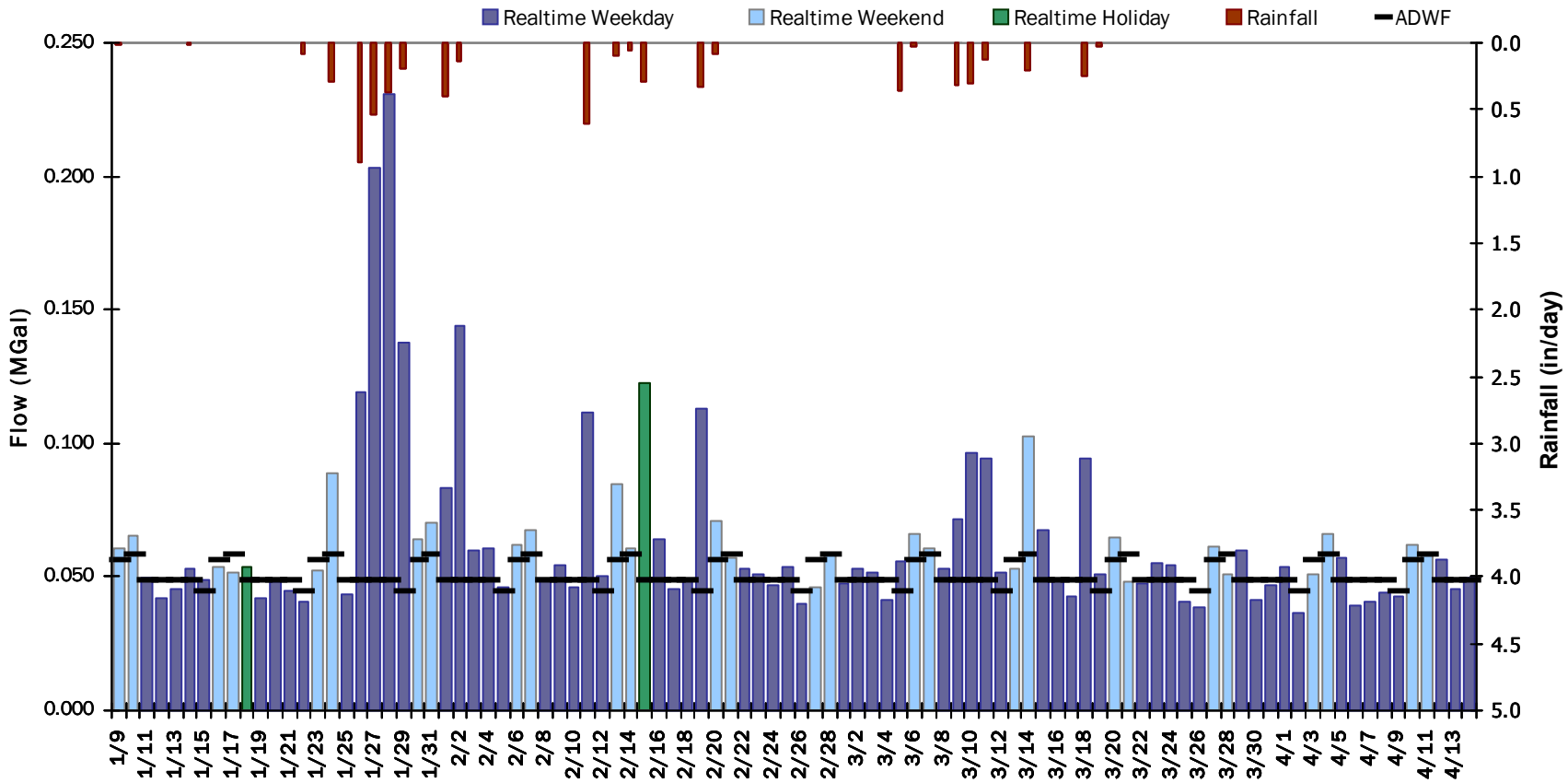
North Upper Influent Pipe

South Influent Pipe

FM 1-8
Period Flow Summary: Daily Flow Totals

Avg Period Flow: 0.063 MGal Peak Daily Flow: 0.231 MGal Min Daily Flow: 0.037 MGal

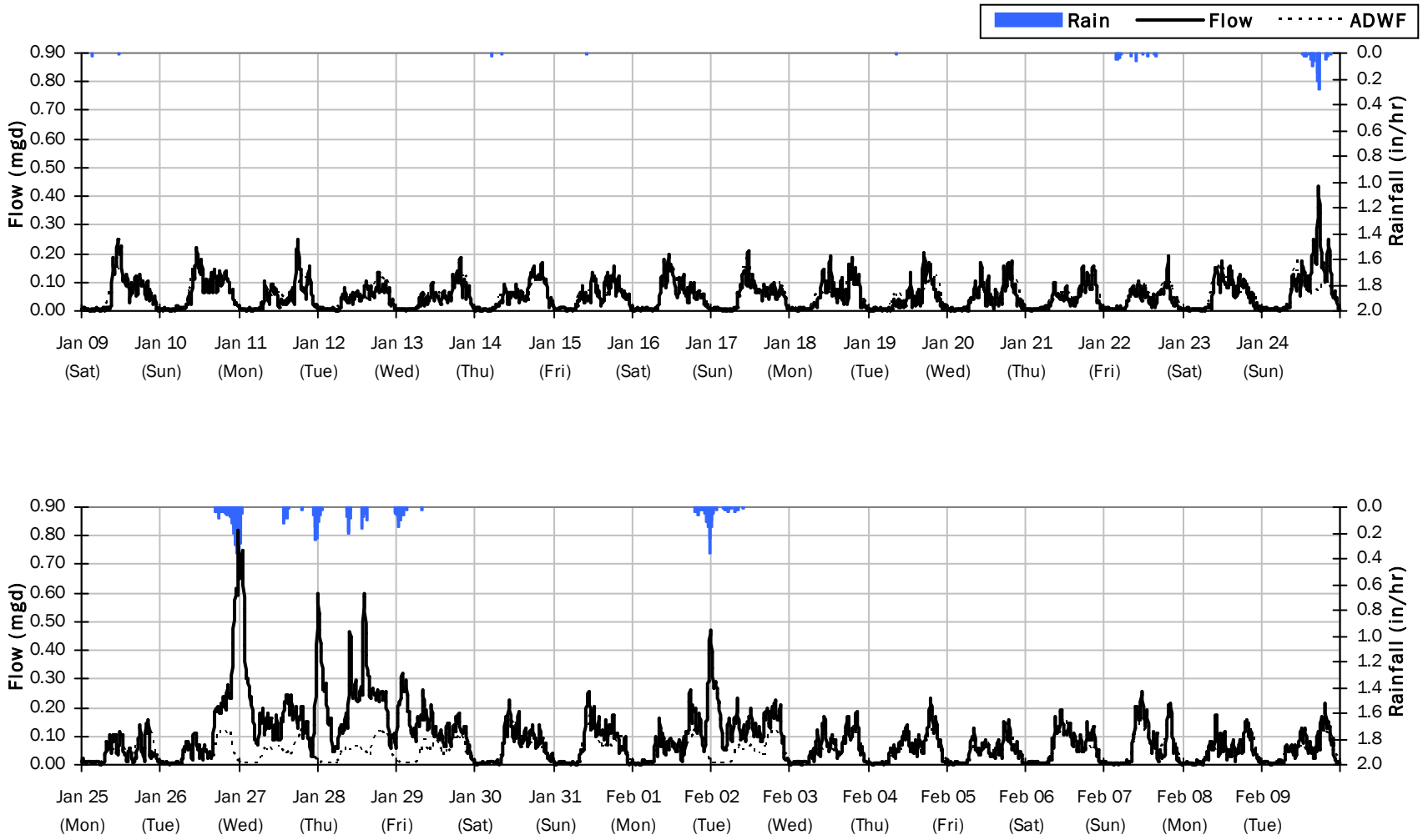
Total Period Rainfall: 6.00 inches



FM 1-8

Flow Summary: 1/9/2021 to 2/9/2021

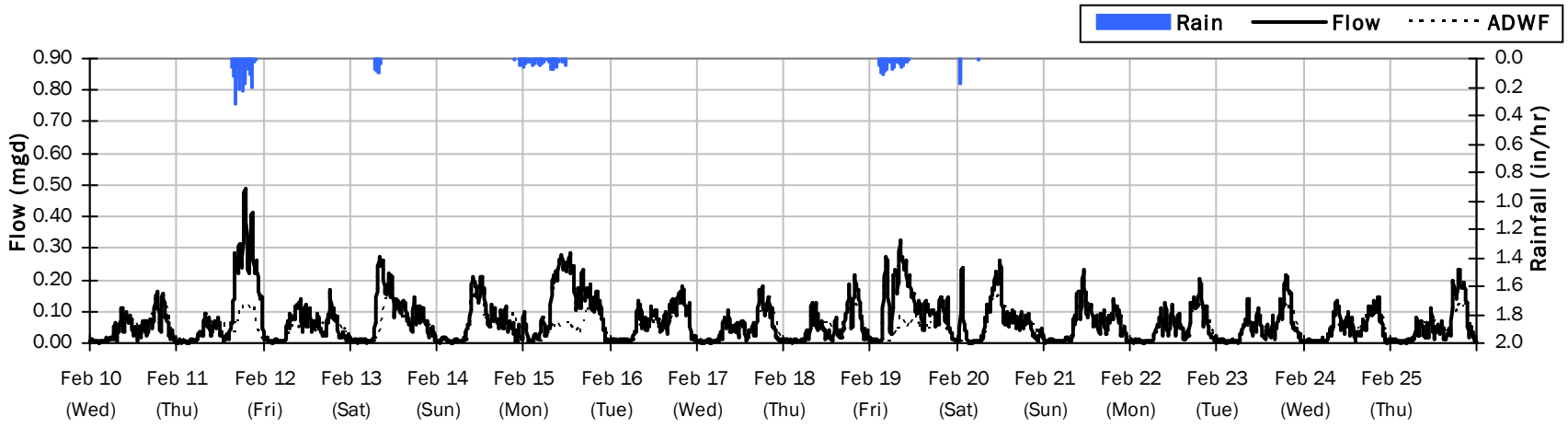
Total Period Rainfall: 2.92 inches Avg Flow: 0.073 mgd Peak Flow: 0.818 mgd Min Flow: 0.001 mgd

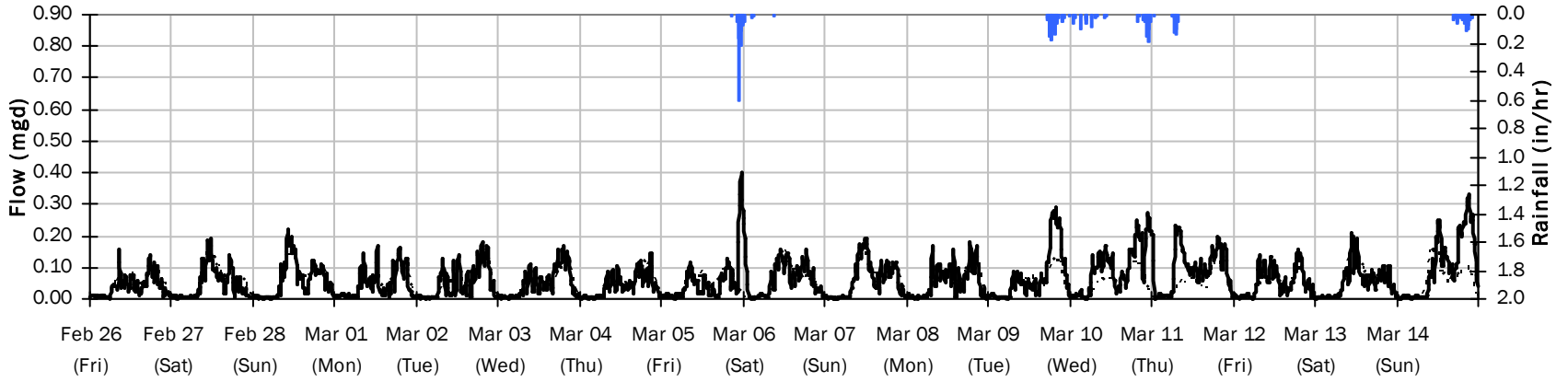


FM 1-8

Flow Summary: 2/10/2021 to 3/14/2021

Total Period Rainfall: 2.80 inches Avg Flow: 0.064 mgd Peak Flow: 0.490 mgd Min Flow: 0.000 mgd

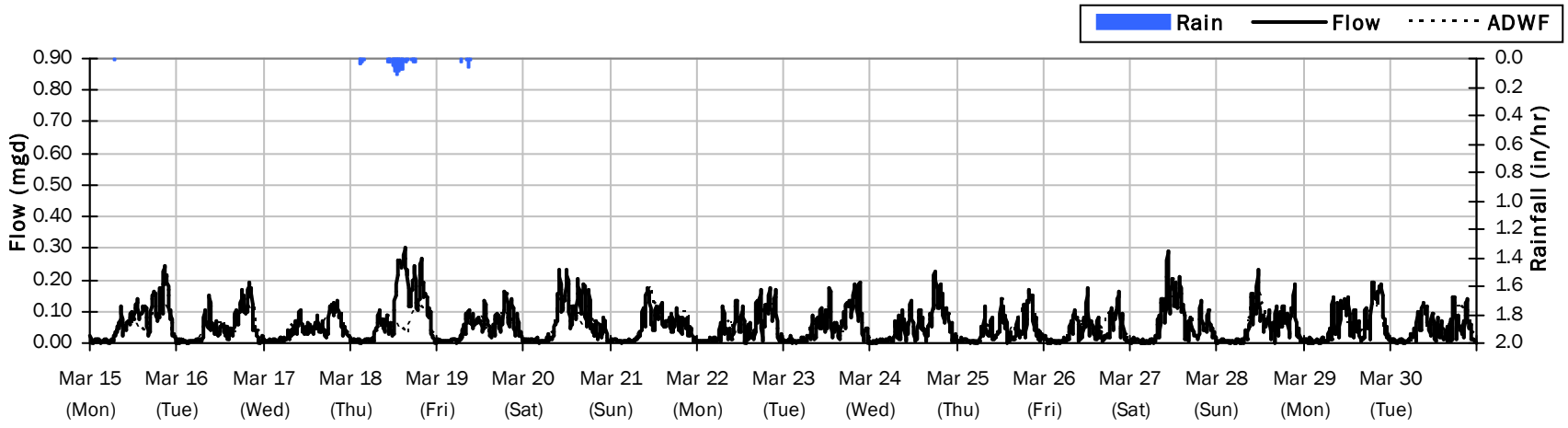


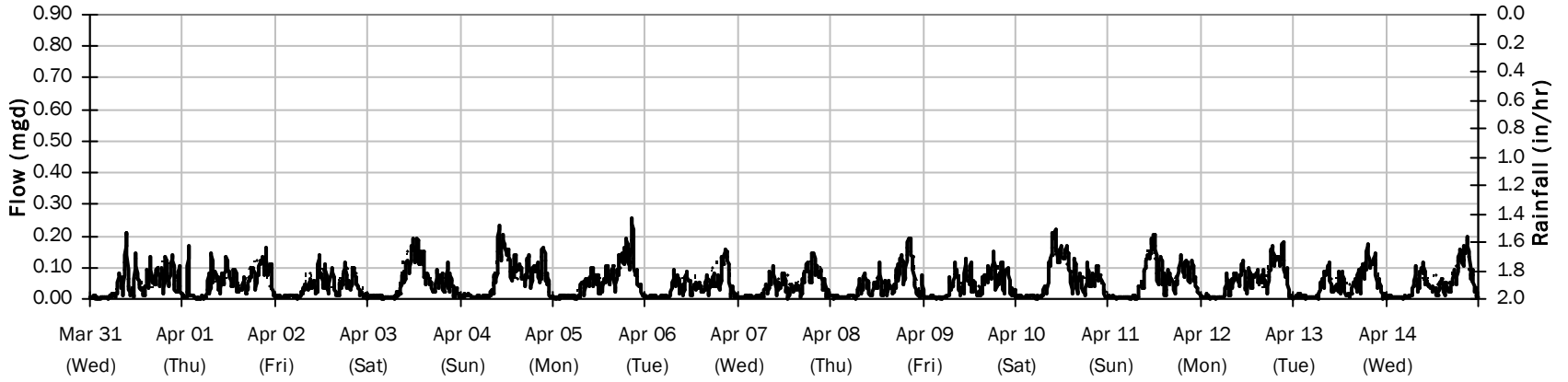


FM 1-8

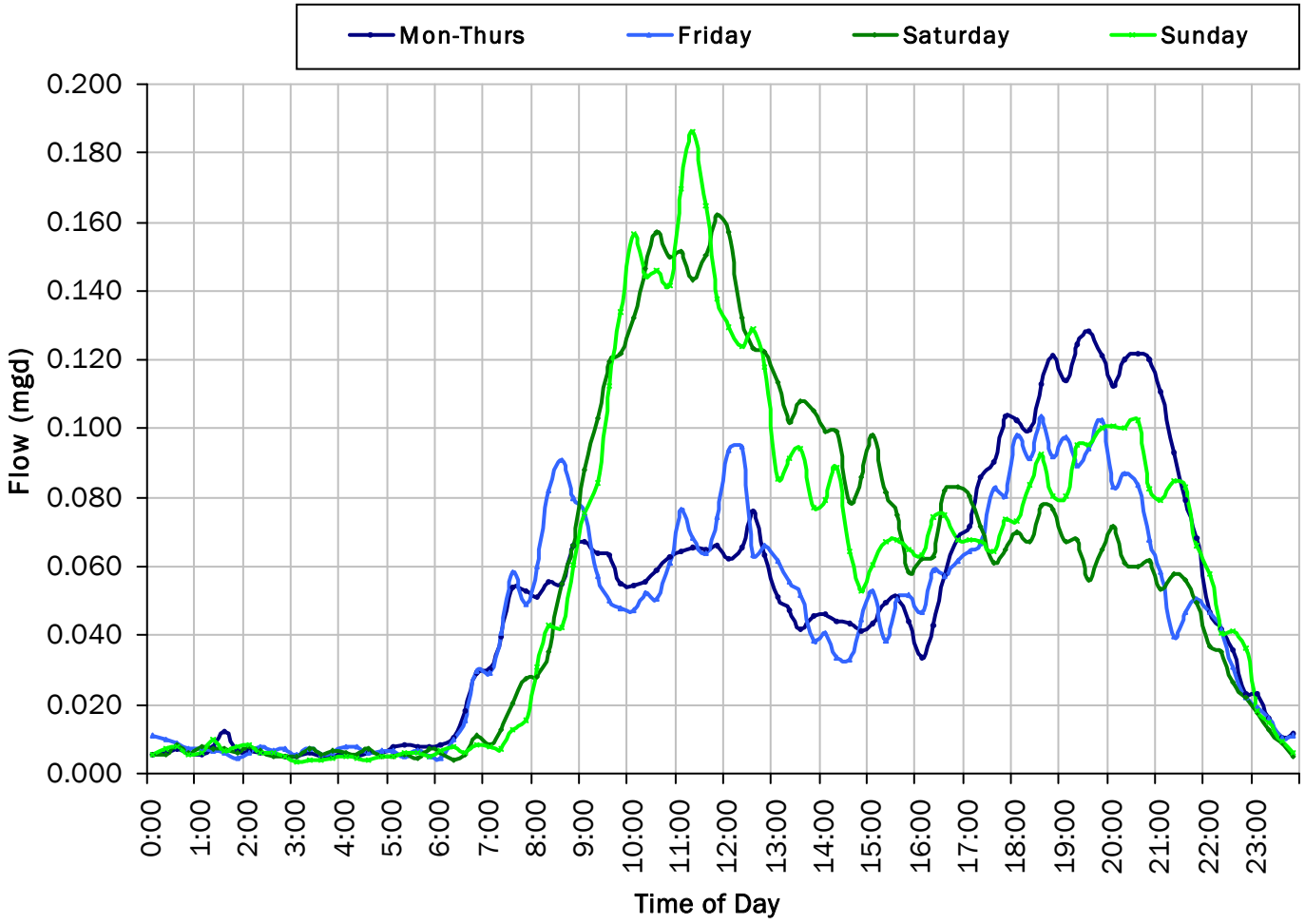
Flow Summary: 3/15/2021 to 4/14/2021

Total Period Rainfall: 0.27 inches Avg Flow: 0.052 mgd Peak Flow: 0.302 mgd Min Flow: 0.001 mgd



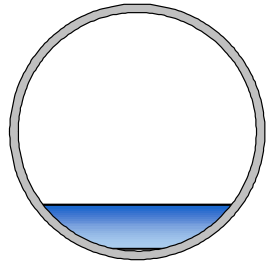


FM 1-8
Average Dry Weather Flow Hydrographs



ADWF:

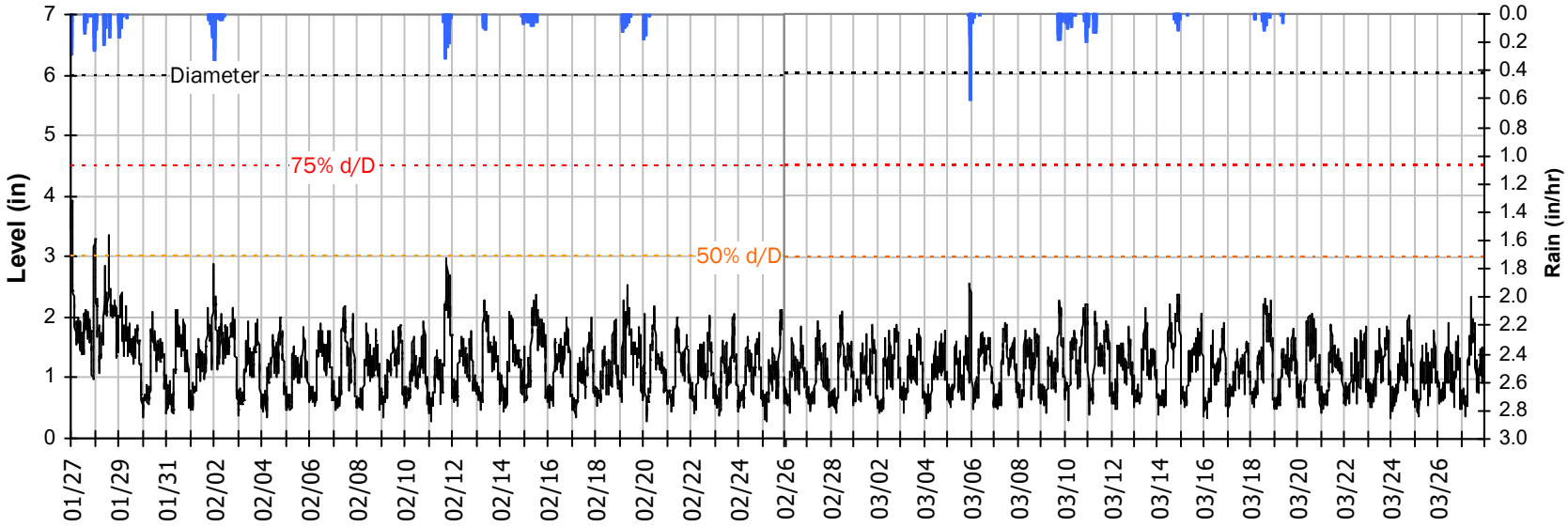
0.051 *mgd*

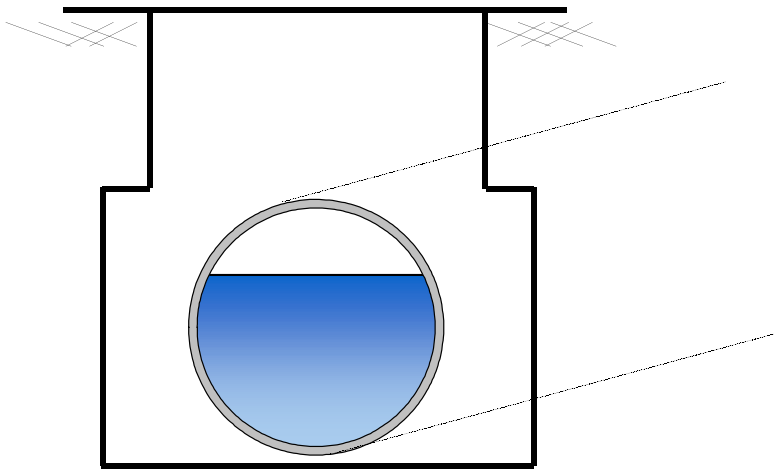


FM 1-8

Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Monitoring Period

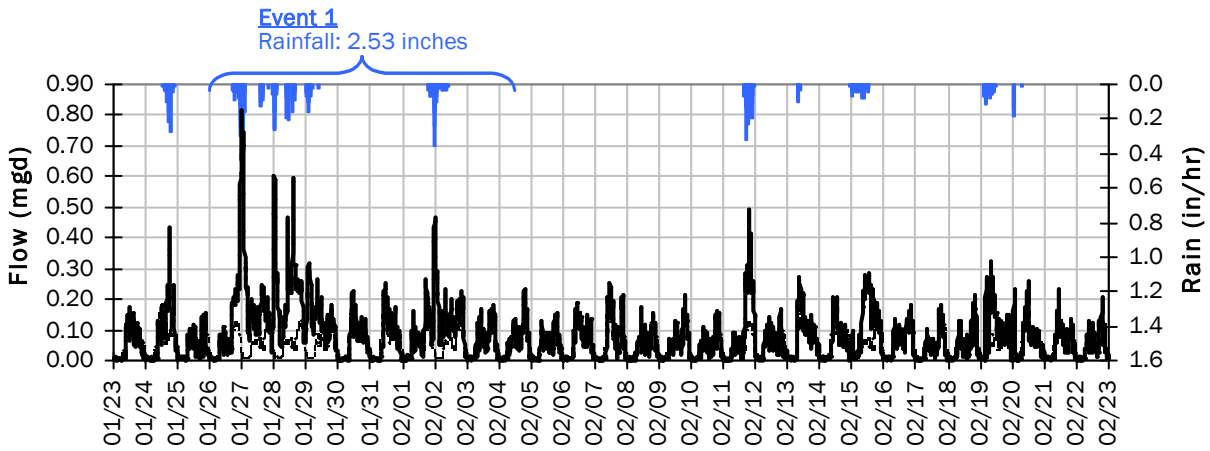




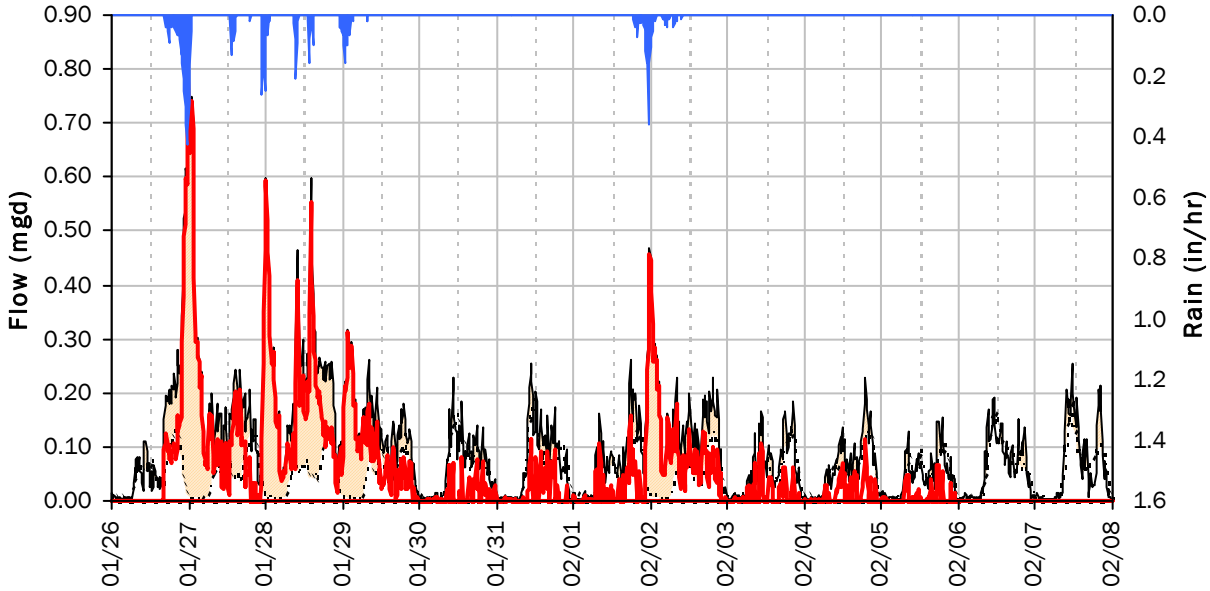
Pipe Diameter:	6	*inches*
Peak Measured Level:	4.27	*inches*
Peak d/D Ratio:	0.71	

FM 1-8
I/I Summary: Event 1

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



Event 1 Detail Graph

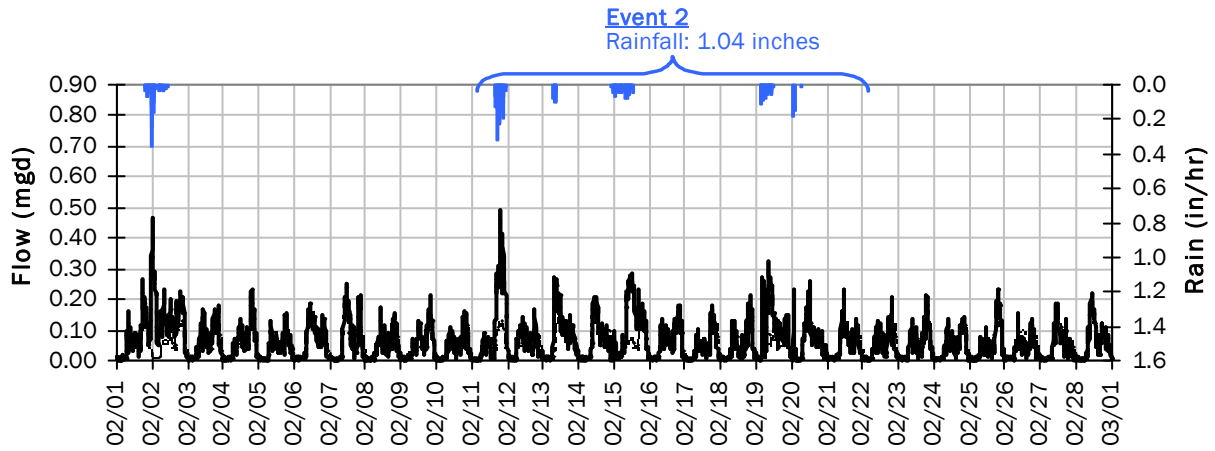


Storm Event I/I Analysis (Rain = 2.53 inches)

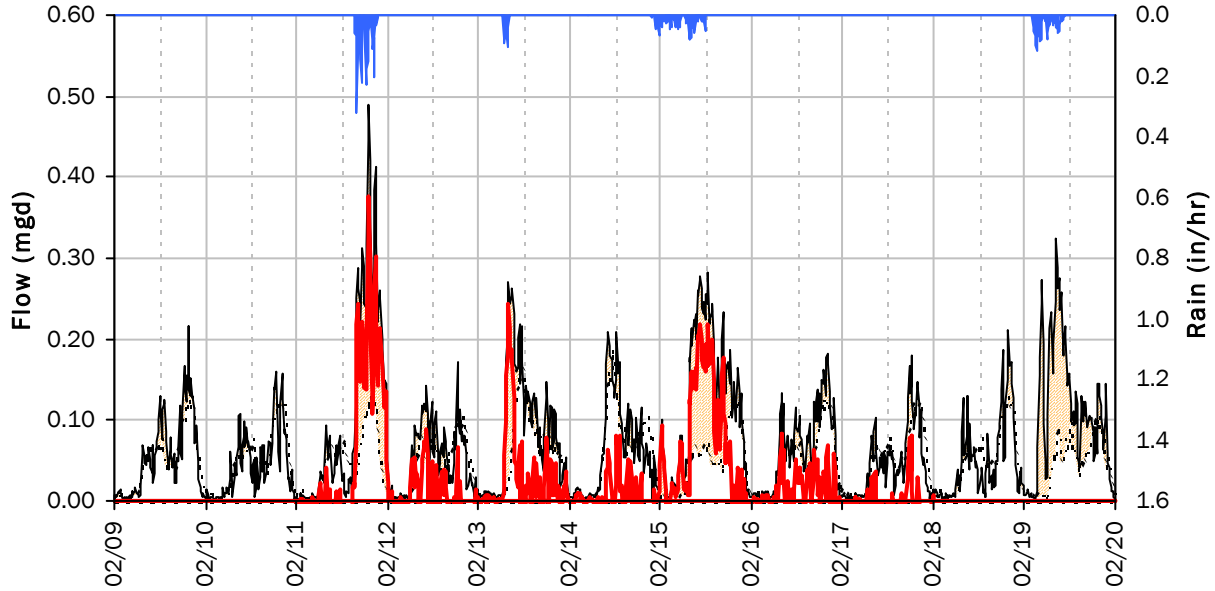
Capacity		Inflow / Infiltration	
Peak Flow:	0.82 *mgd*	**Peak I/I Rate:**	0.81 *mgd*
PF:	16.08	**Total I/I:**	671,000 *gallons*
Peak Level:	4.27 *in*		
d/D Ratio:	0.71		

FM 1-8
I/I Summary: Event 2

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



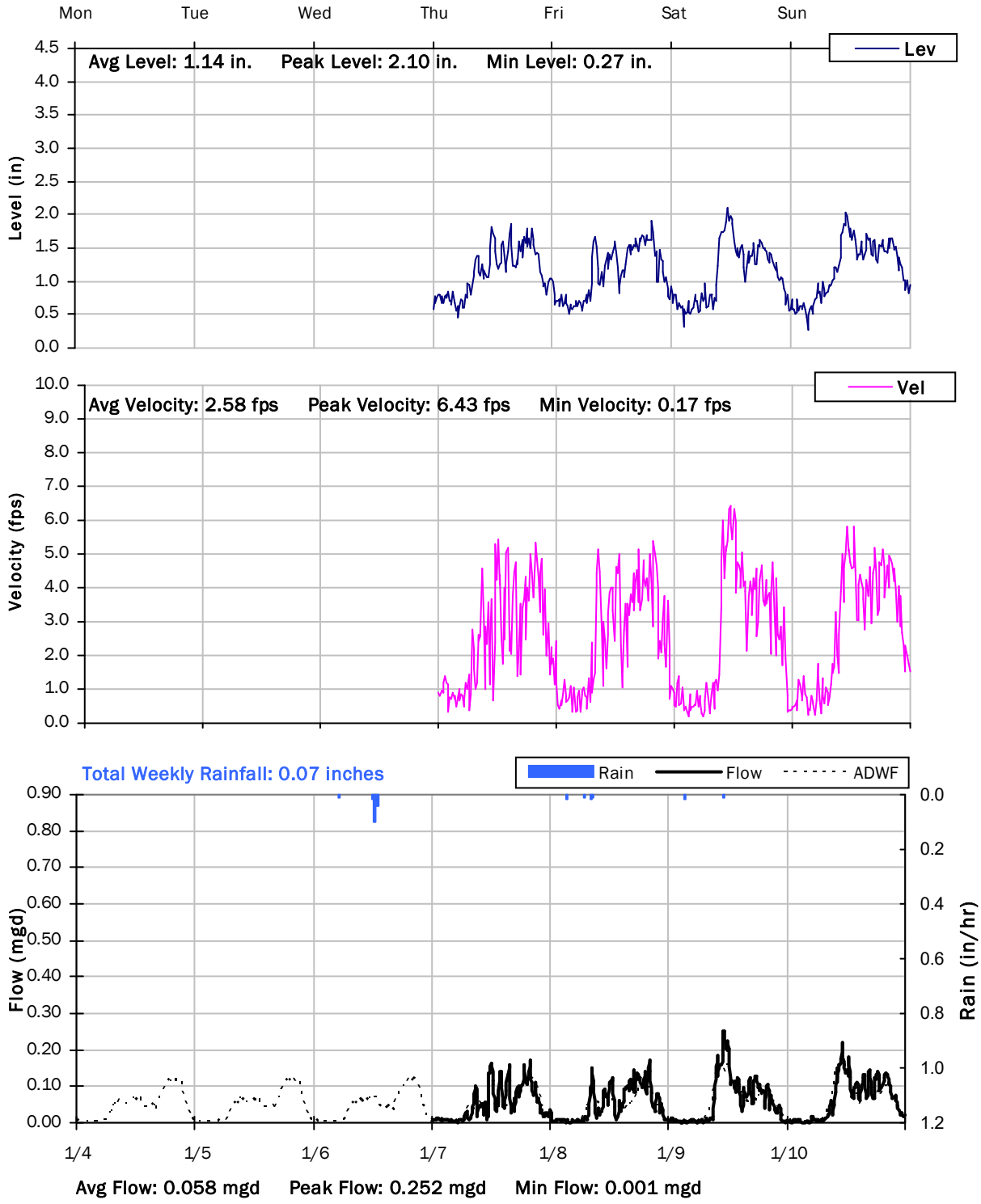
Event 2 Detail Graph



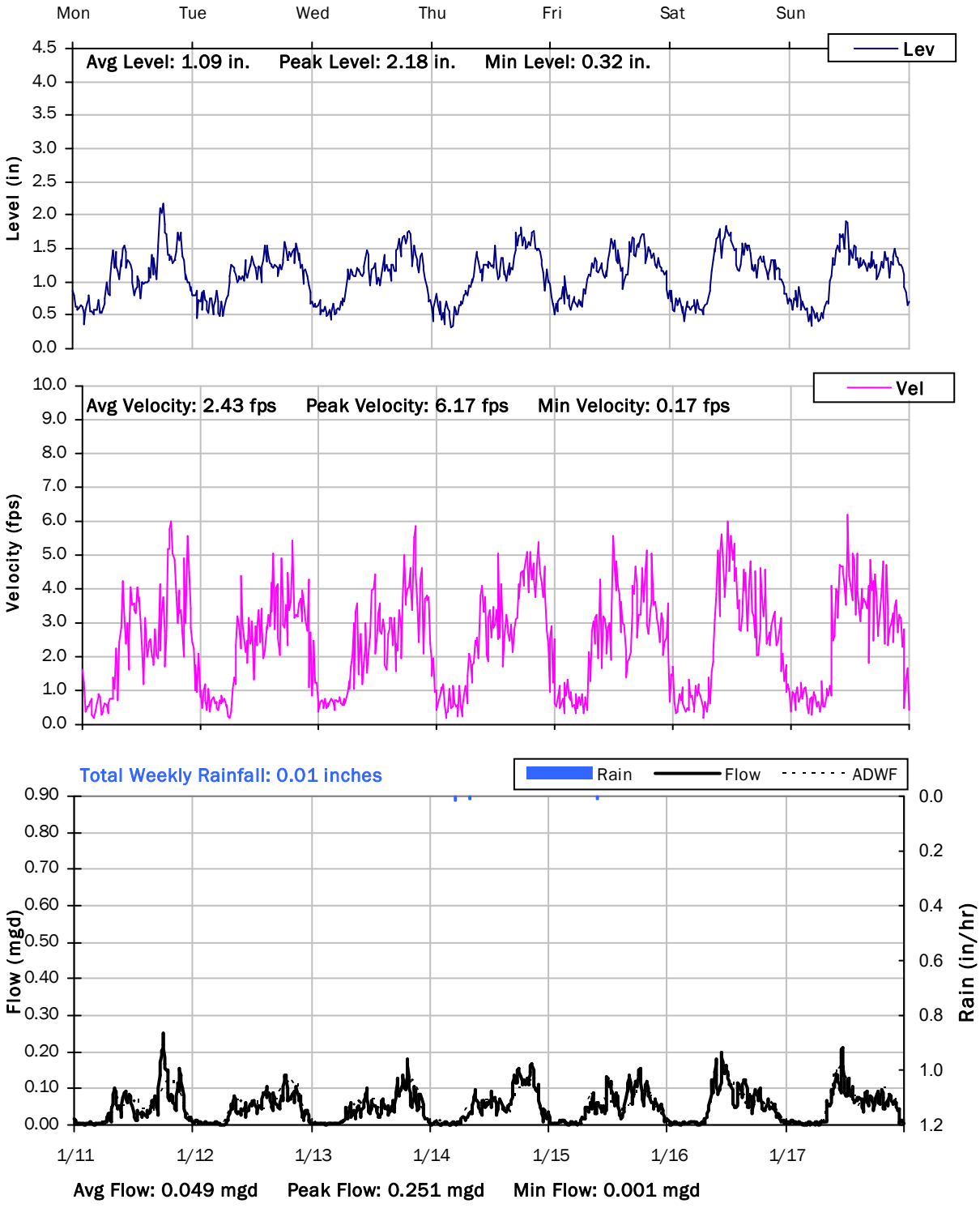
Storm Event I/I Analysis (Rain = 1.04 inches)

Capacity		Inflow / Infiltration	
Peak Flow:	0.49 *mgd*	**Peak I/I Rate:**	0.38 *mgd*
PF:	9.63	**Total I/I:**	183,000 *gallons*
Peak Level:	2.98 *in*		
d/D Ratio:	0.50		

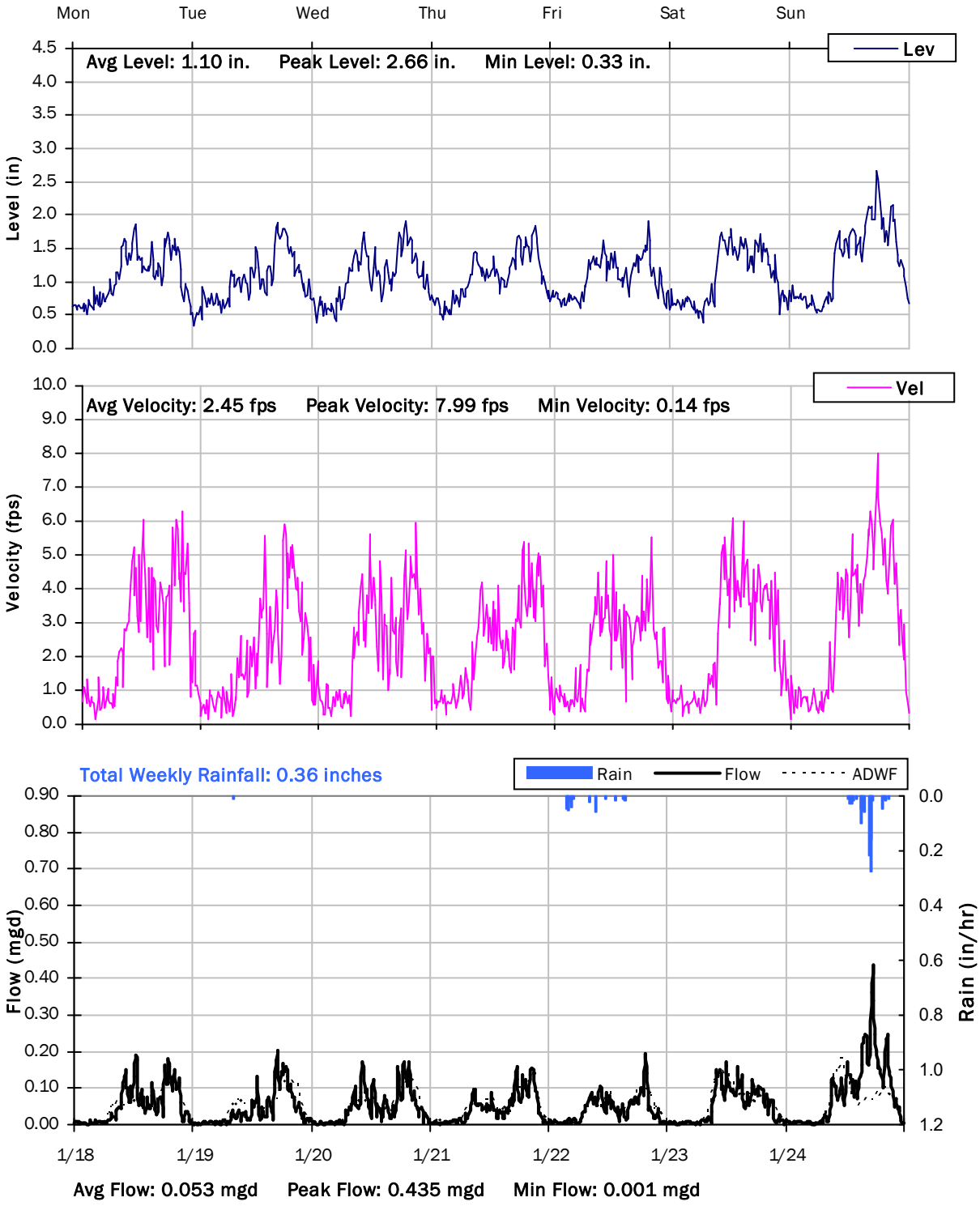
FM 1-8
Weekly Level, Velocity and Flow Hydrographs
1/4/2021 to 1/11/2021



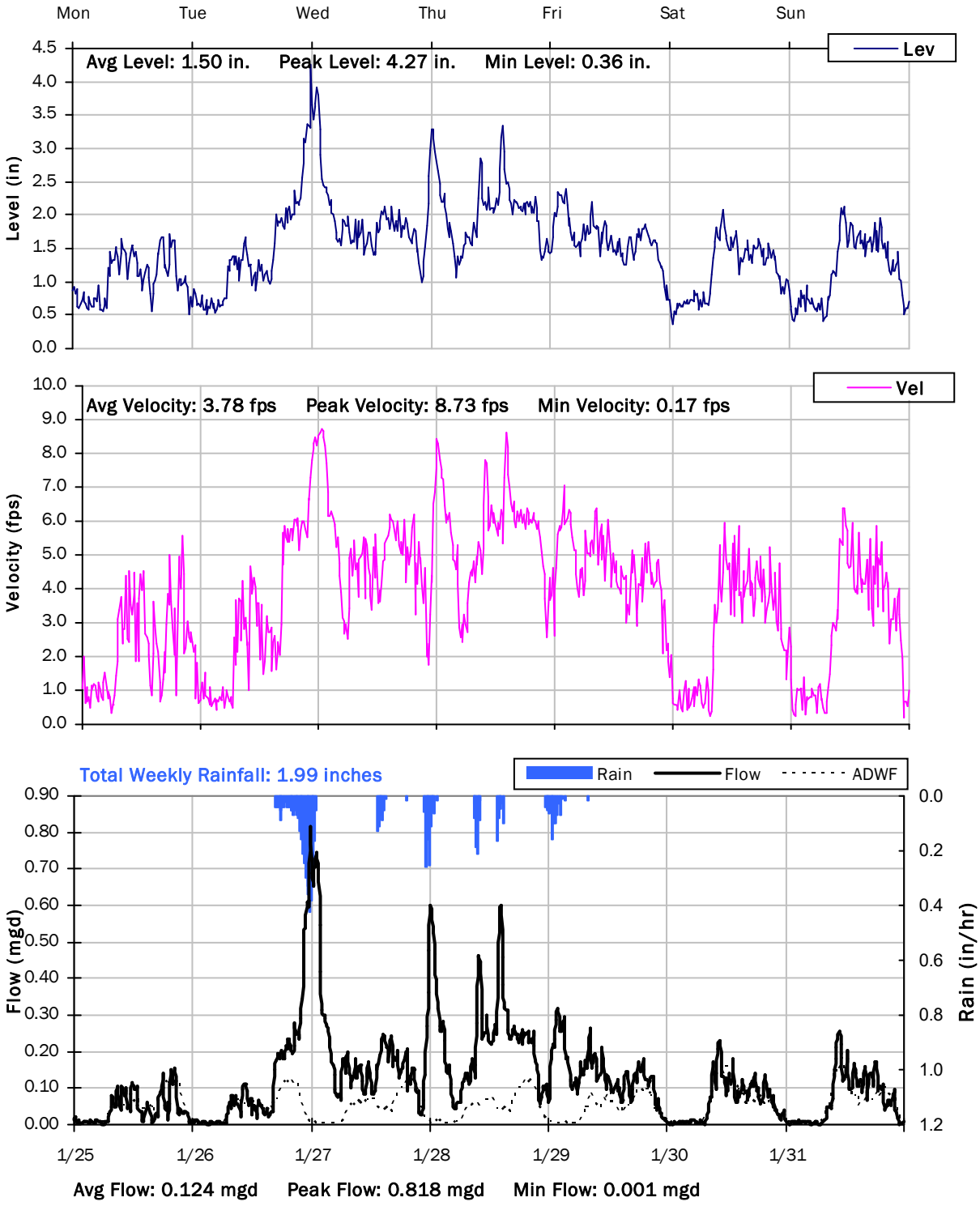
FM 1-8
Weekly Level, Velocity and Flow Hydrographs
1/11/2021 to 1/18/2021



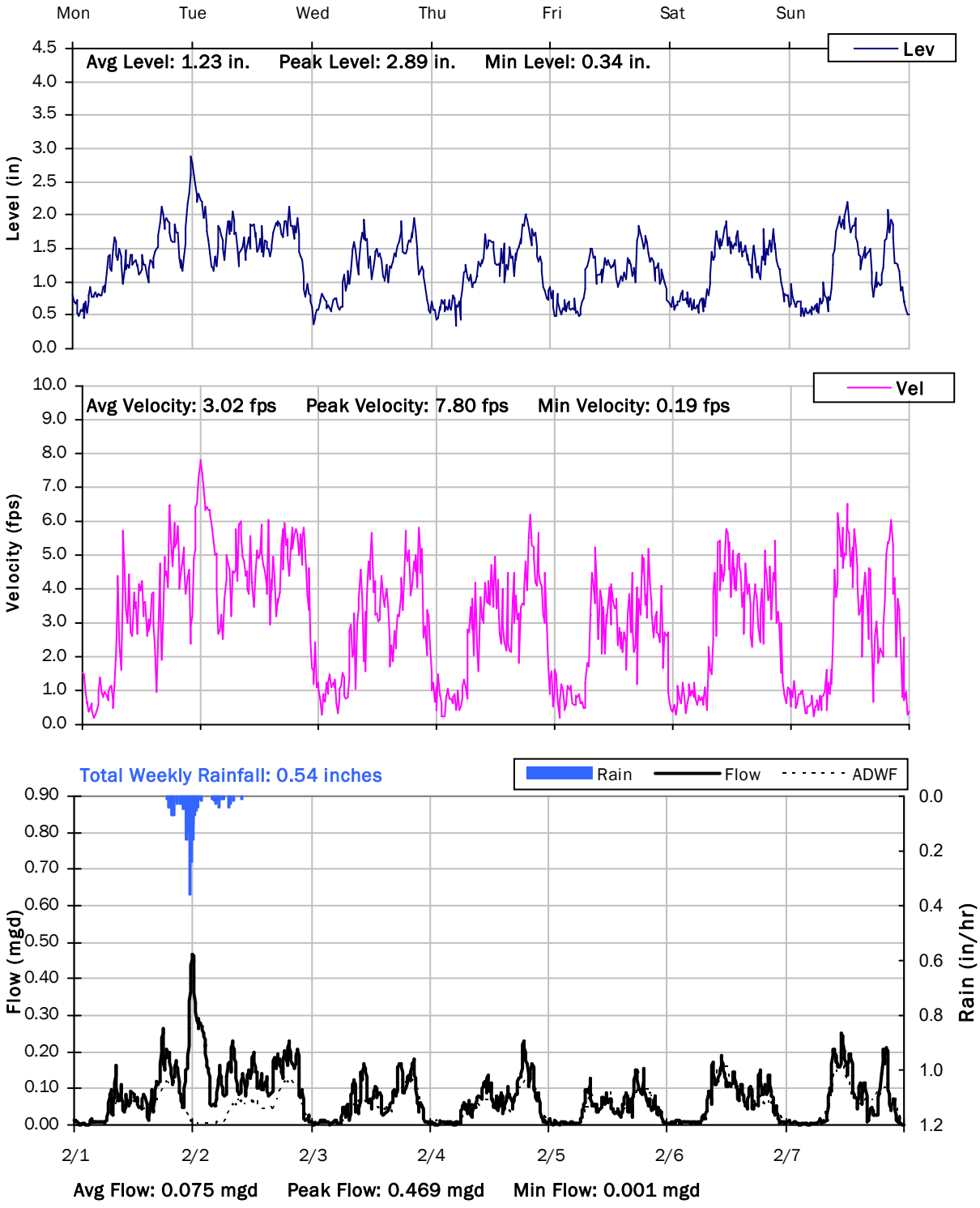
FM 1-8
Weekly Level, Velocity and Flow Hydrographs
1/18/2021 to 1/25/2021



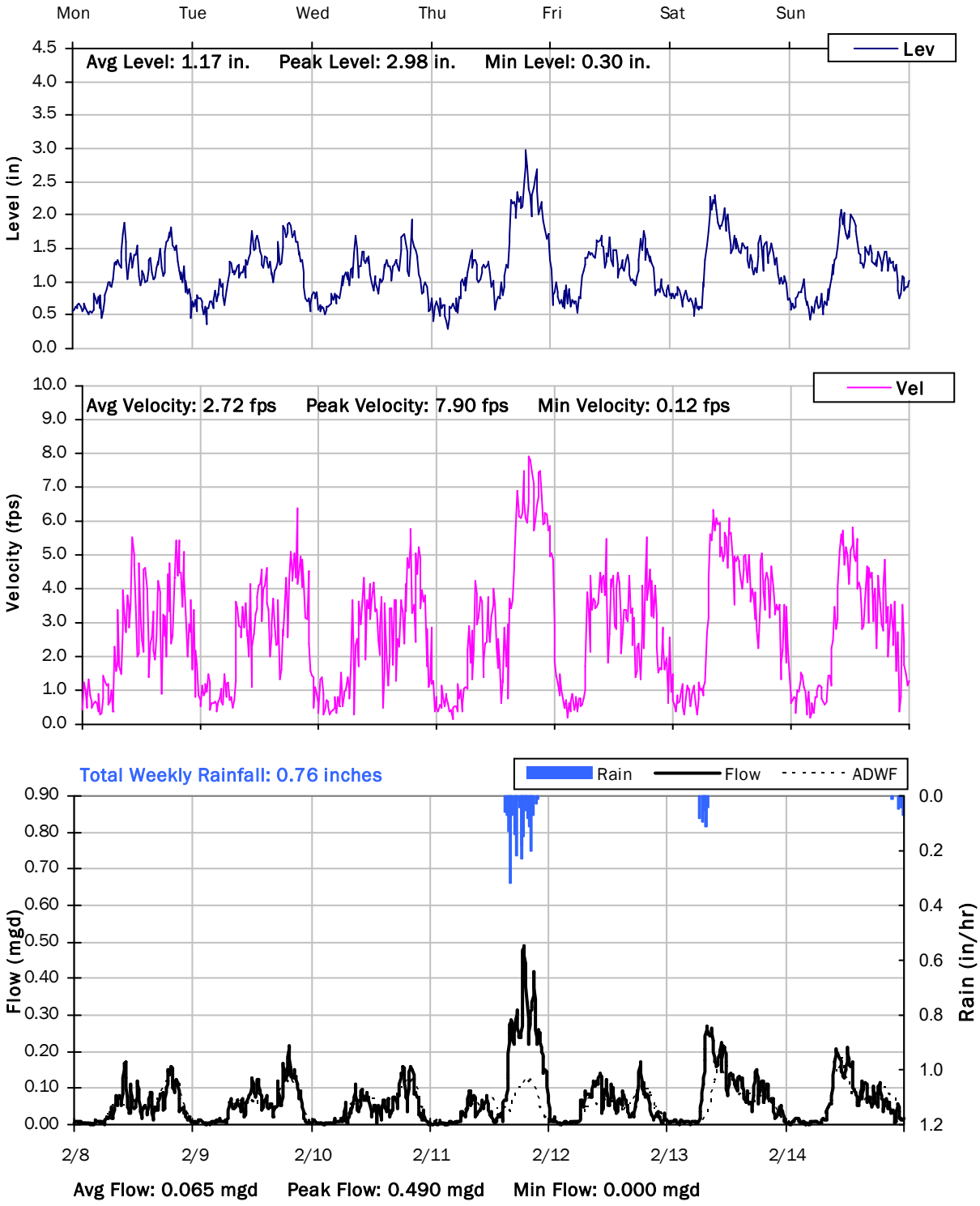
FM 1-8
Weekly Level, Velocity and Flow Hydrographs
1/25/2021 to 2/1/2021



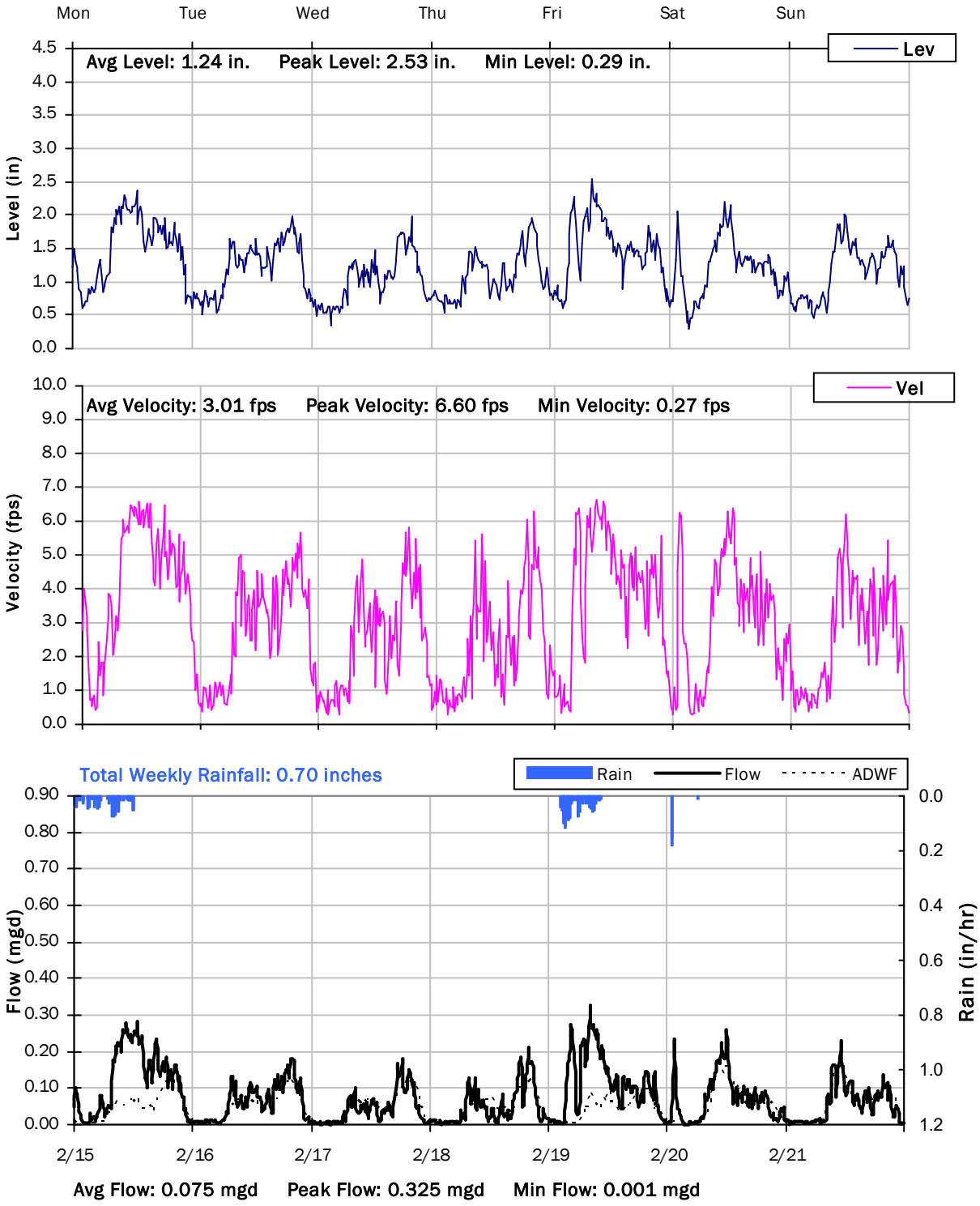
FM 1-8
Weekly Level, Velocity and Flow Hydrographs
2/1/2021 to 2/8/2021



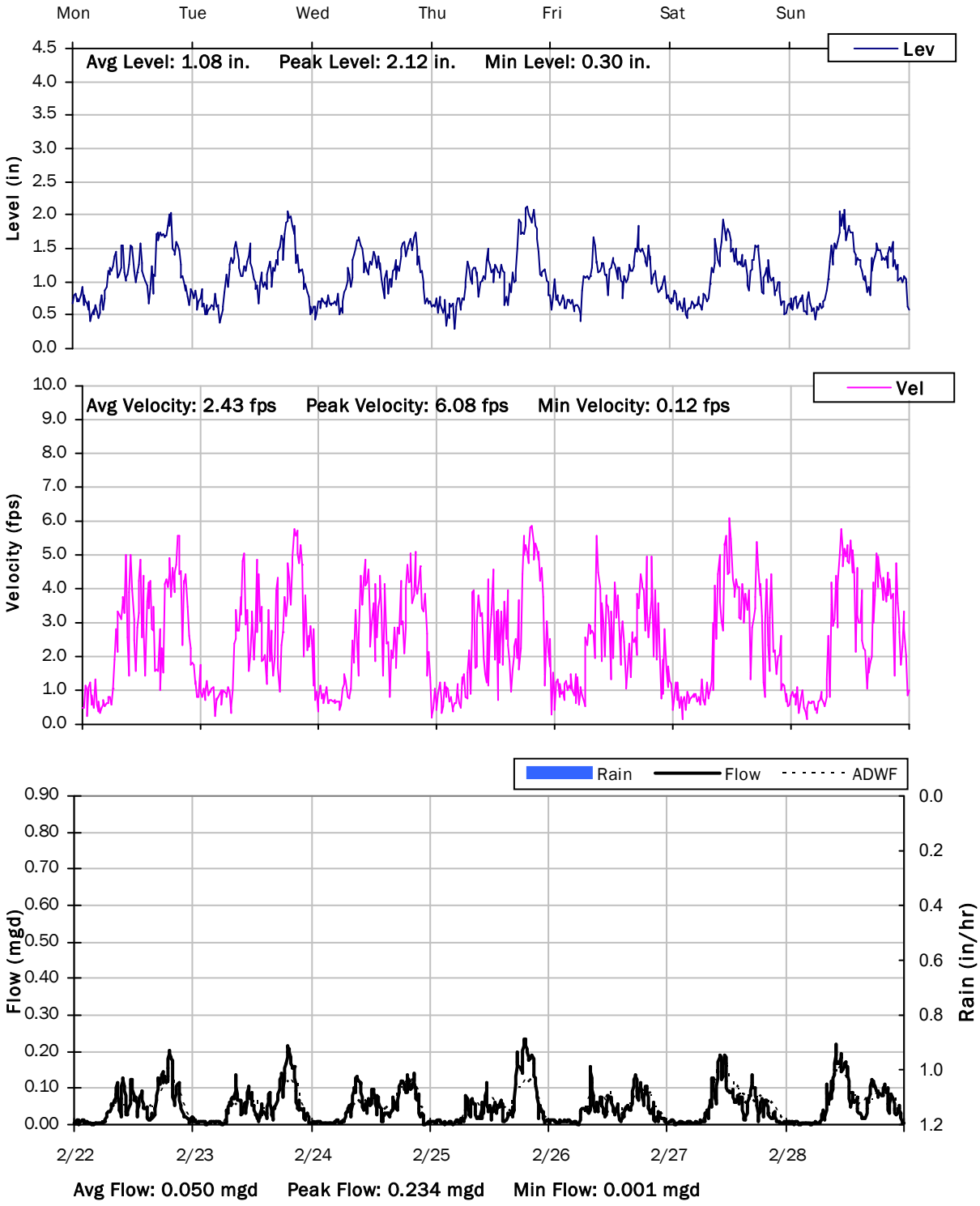
FM 1-8
Weekly Level, Velocity and Flow Hydrographs
2/8/2021 to 2/15/2021



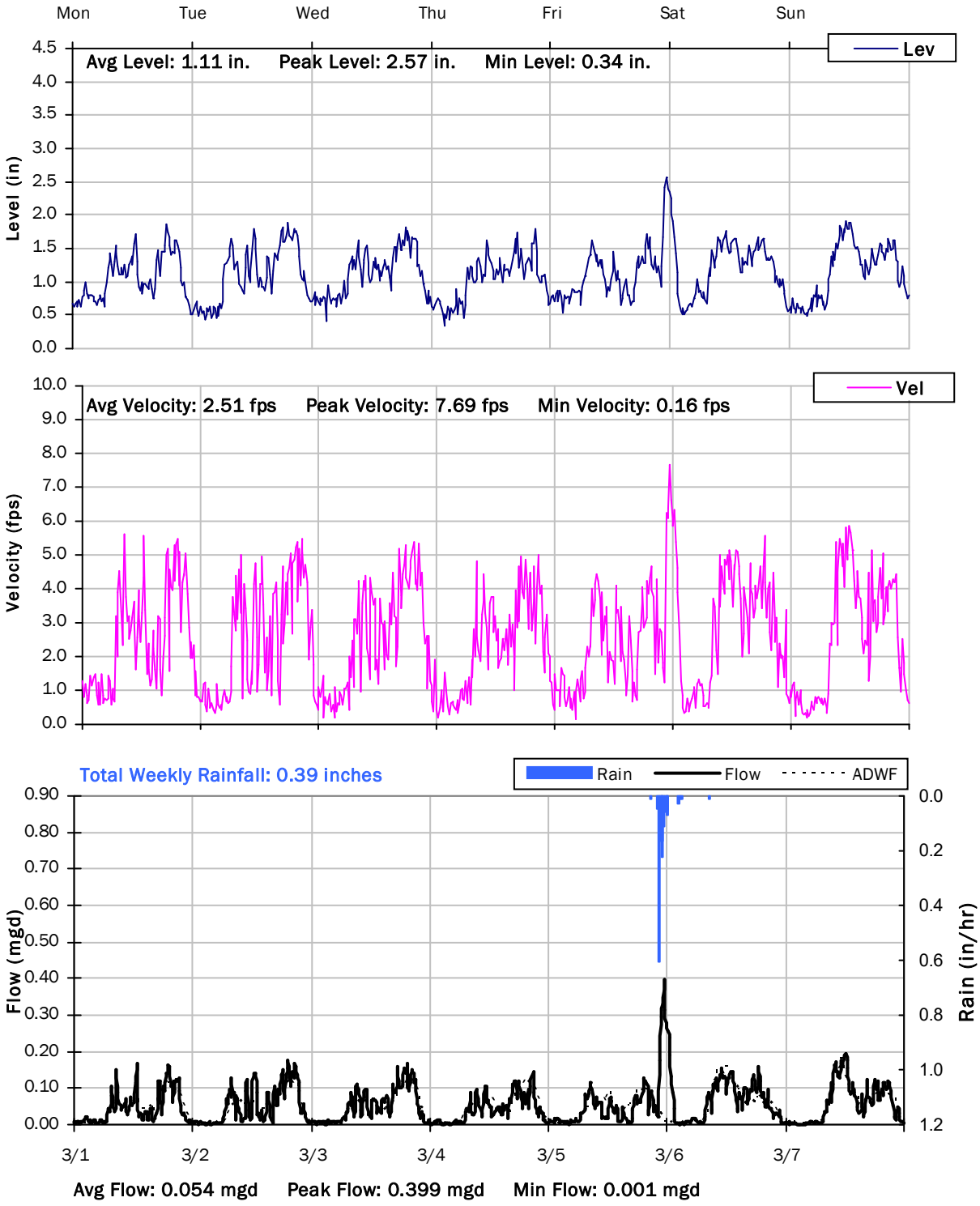
FM 1-8
Weekly Level, Velocity and Flow Hydrographs
2/15/2021 to 2/22/2021



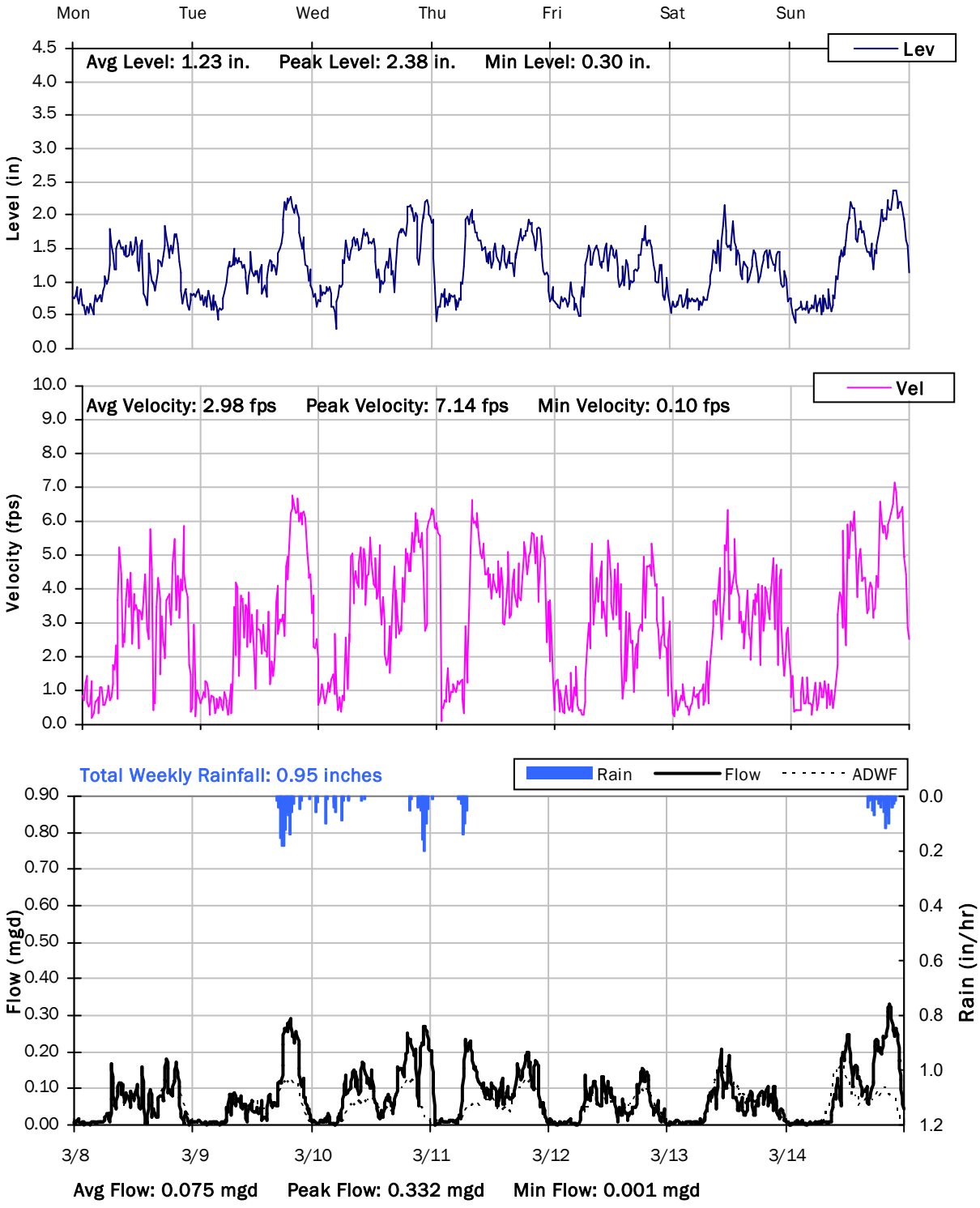
FM 1-8
Weekly Level, Velocity and Flow Hydrographs
2/22/2021 to 3/1/2021



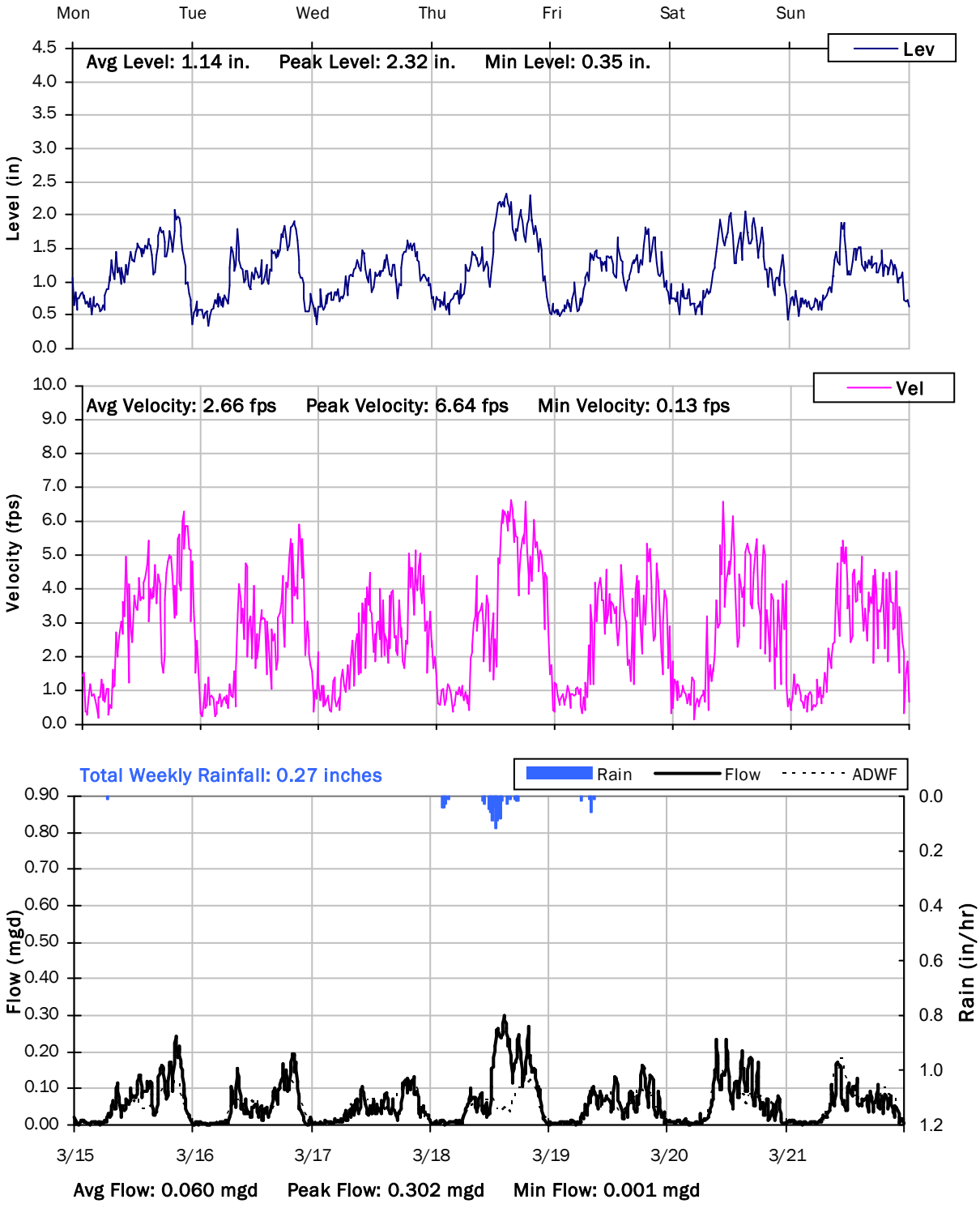
FM 1-8
Weekly Level, Velocity and Flow Hydrographs
3/1/2021 to 3/8/2021



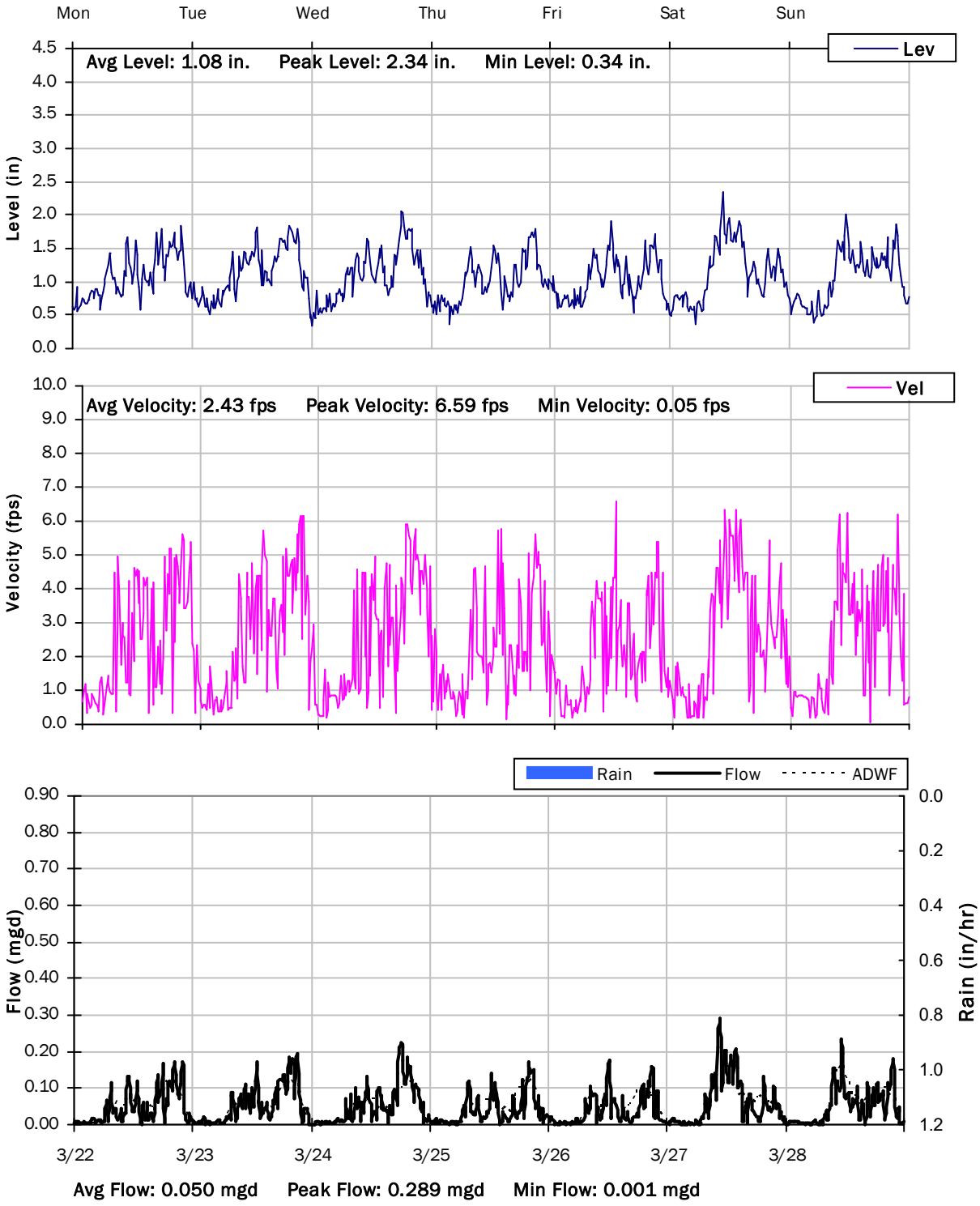
FM 1-8
Weekly Level, Velocity and Flow Hydrographs
3/8/2021 to 3/15/2021



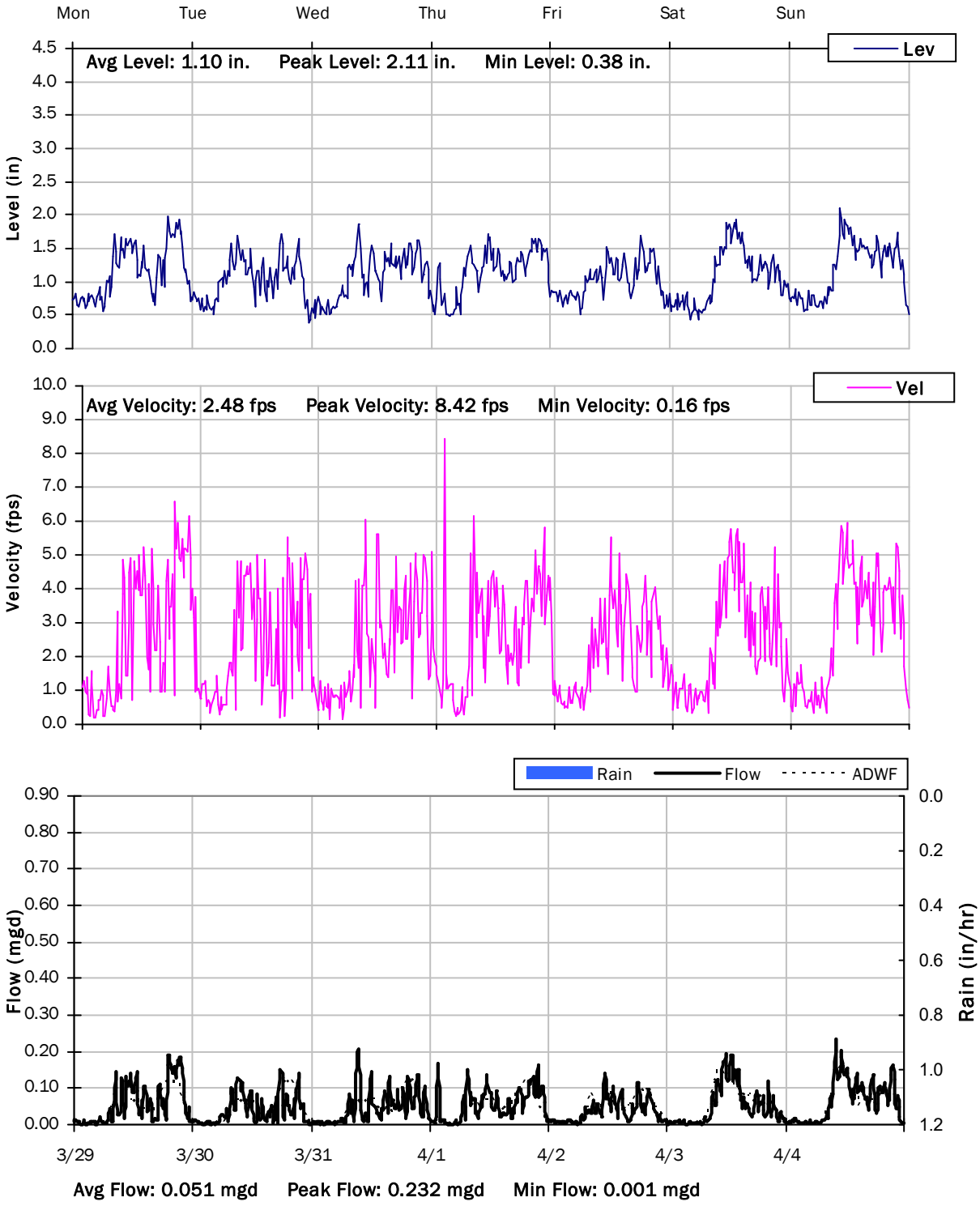
FM 1-8
Weekly Level, Velocity and Flow Hydrographs
3/15/2021 to 3/22/2021



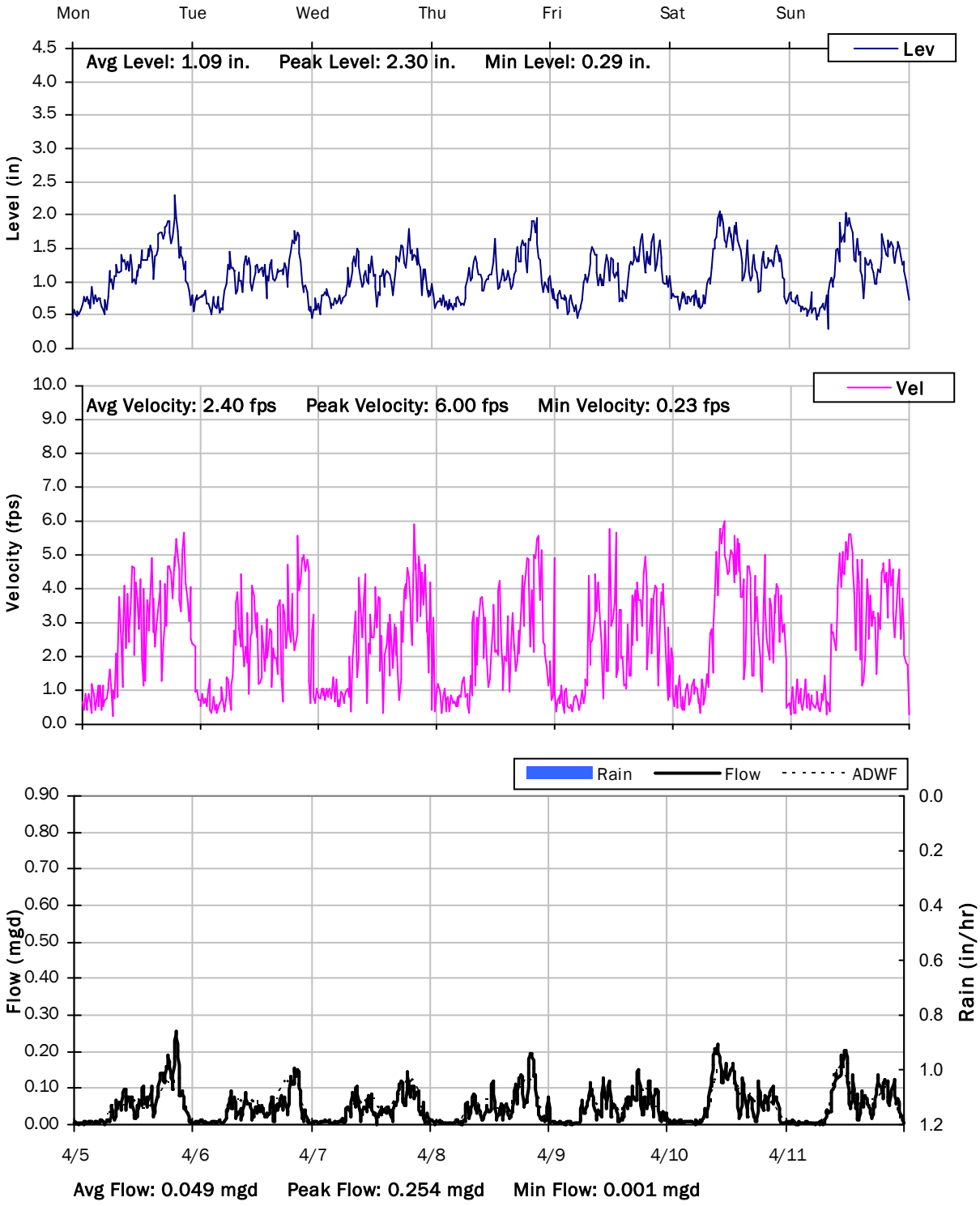
FM 1-8
Weekly Level, Velocity and Flow Hydrographs
3/22/2021 to 3/29/2021



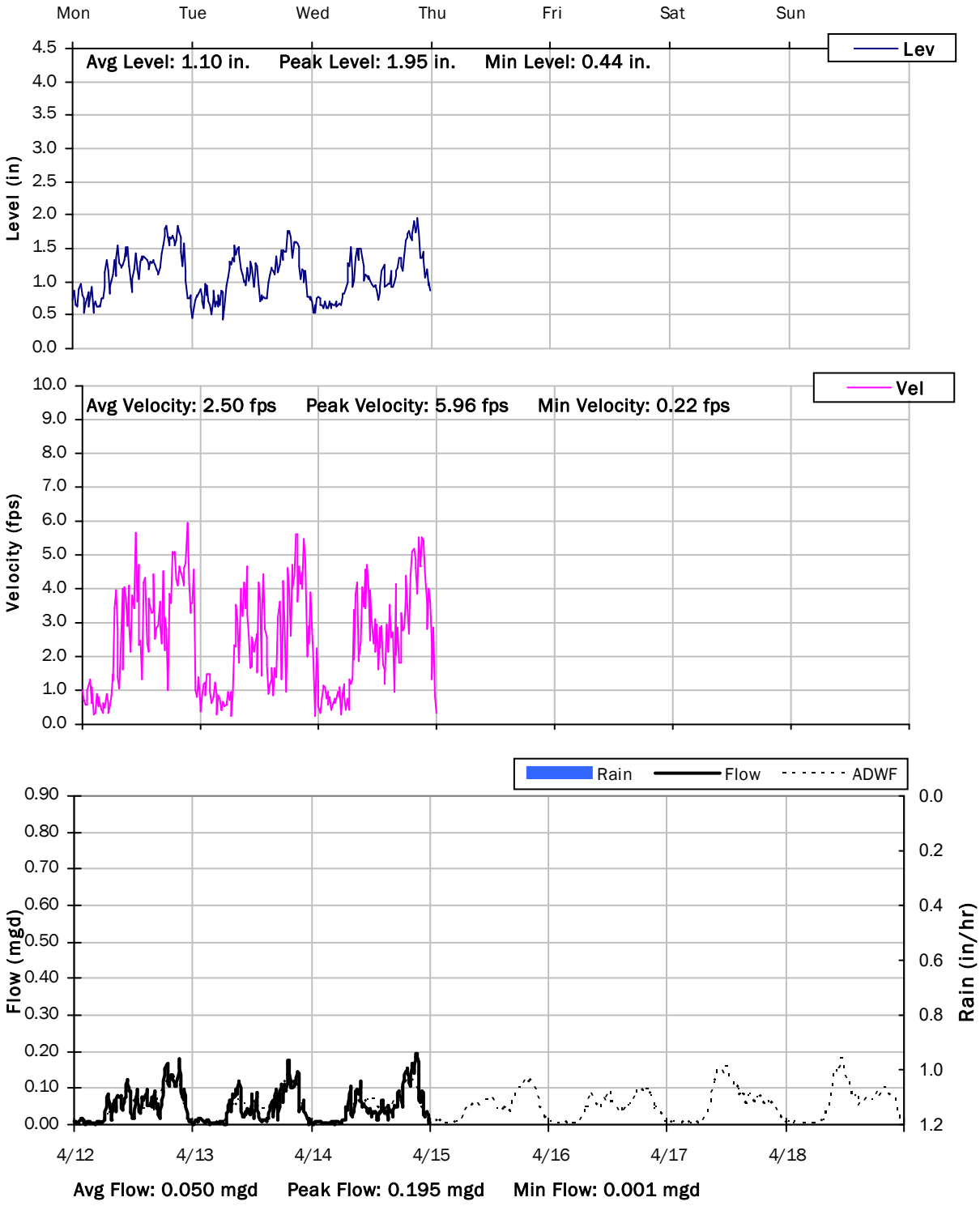
FM 1-8
Weekly Level, Velocity and Flow Hydrographs
3/29/2021 to 4/5/2021



FM 1-8
Weekly Level, Velocity and Flow Hydrographs
4/5/2021 to 4/12/2021



FM 1-8
Weekly Level, Velocity and Flow Hydrographs
4/12/2021 to 4/19/2021



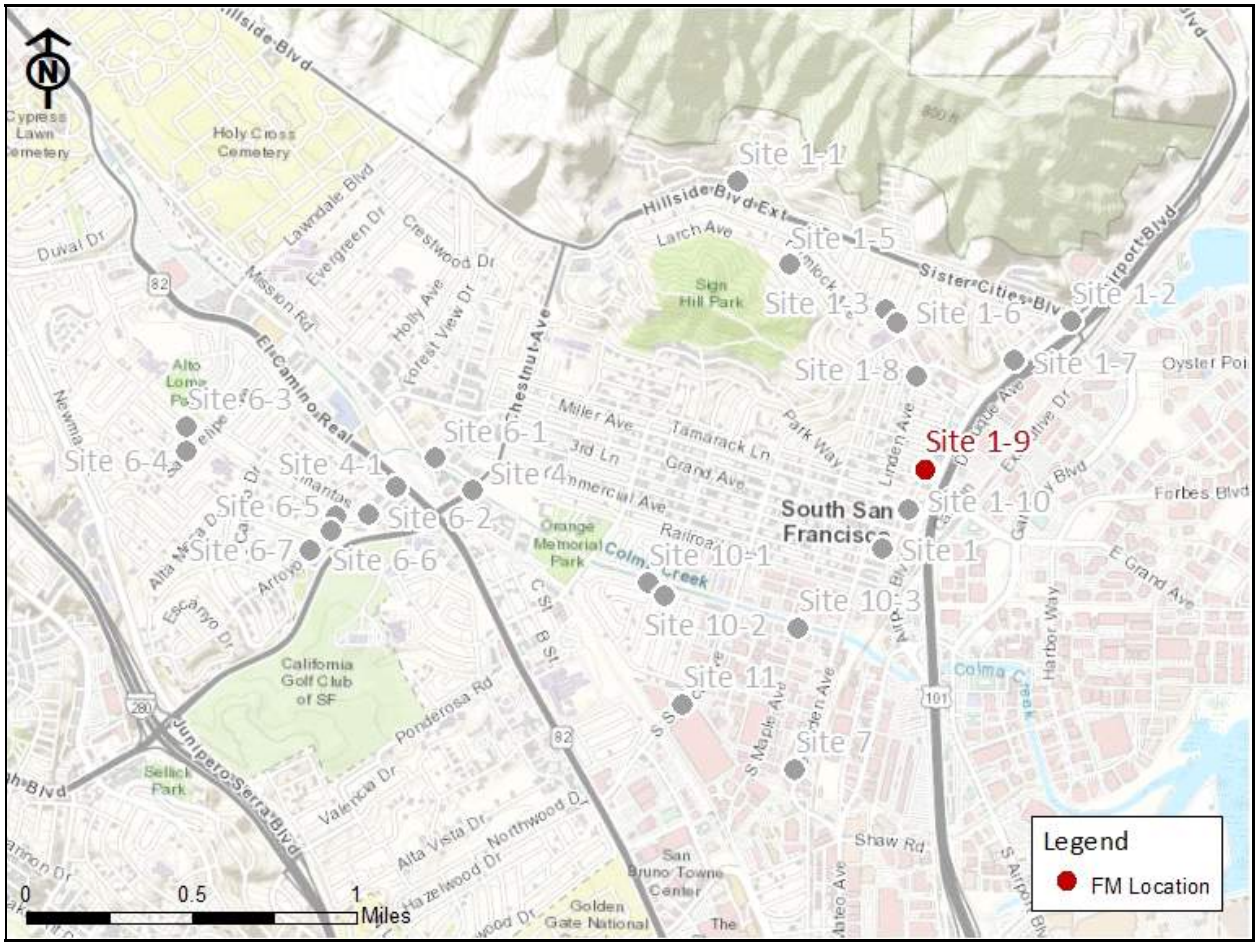
South San Francisco, CA

Sanitary Sewer Flow Monitoring
January 4 - April 14, 2021

Monitoring Site: FM 1-9

Location: Cypress Avenue and California Avenue

Data Summary Report



Vicinity Map: FM 1-9

FM 1-9

Site Information

Location: Cypress Avenue and California Avenue

Coordinates: 122.4072° W, 37.6576° N

Rim Elevation (Earth): 27 feet

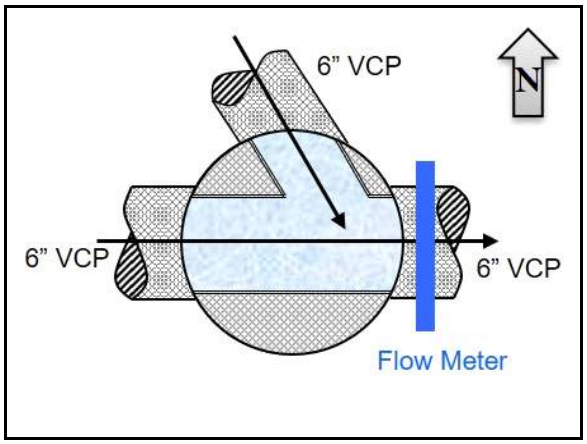
Pipe Diameter: 6 inches

ADWF: 0.059 mgd

Peak Measured Flow: 0.941 mgd

Satellite Map

Sanitary Map



Flow Sketch

Street View

Plan View

FM 1-9

Additional Site Photos

Monitored Effluent Pipe

West Influent Pipe

FM 1-9

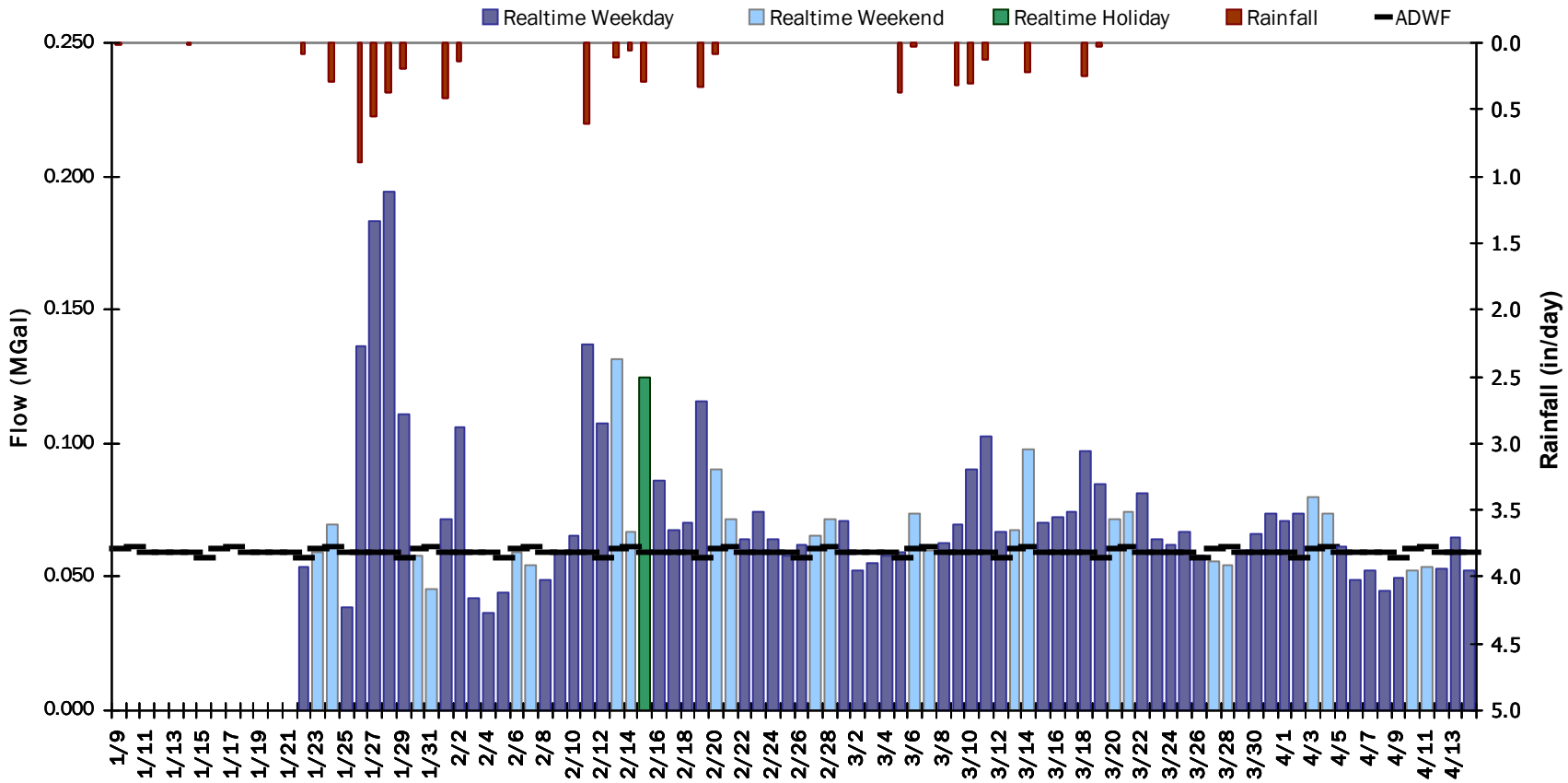
Additional Site Photos

North Influent Pipe

FM 1-9
Period Flow Summary: Daily Flow Totals

Avg Period Flow: 0.073 MGal Peak Daily Flow: 0.194 MGal Min Daily Flow: 0.037 MGal

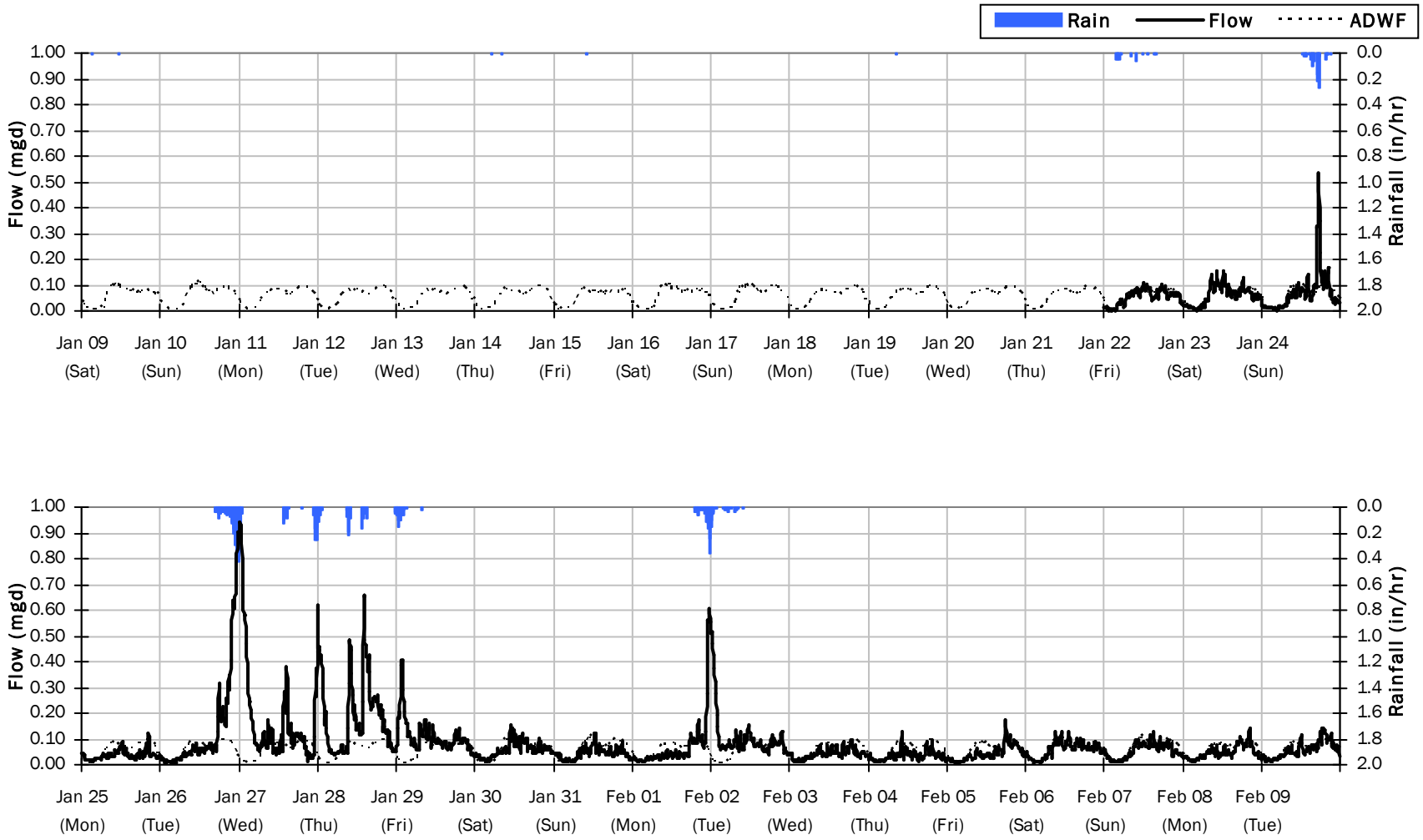
Total Period Rainfall: 6.01 inches



FM 1-9

Flow Summary: 1/9/2021 to 2/9/2021

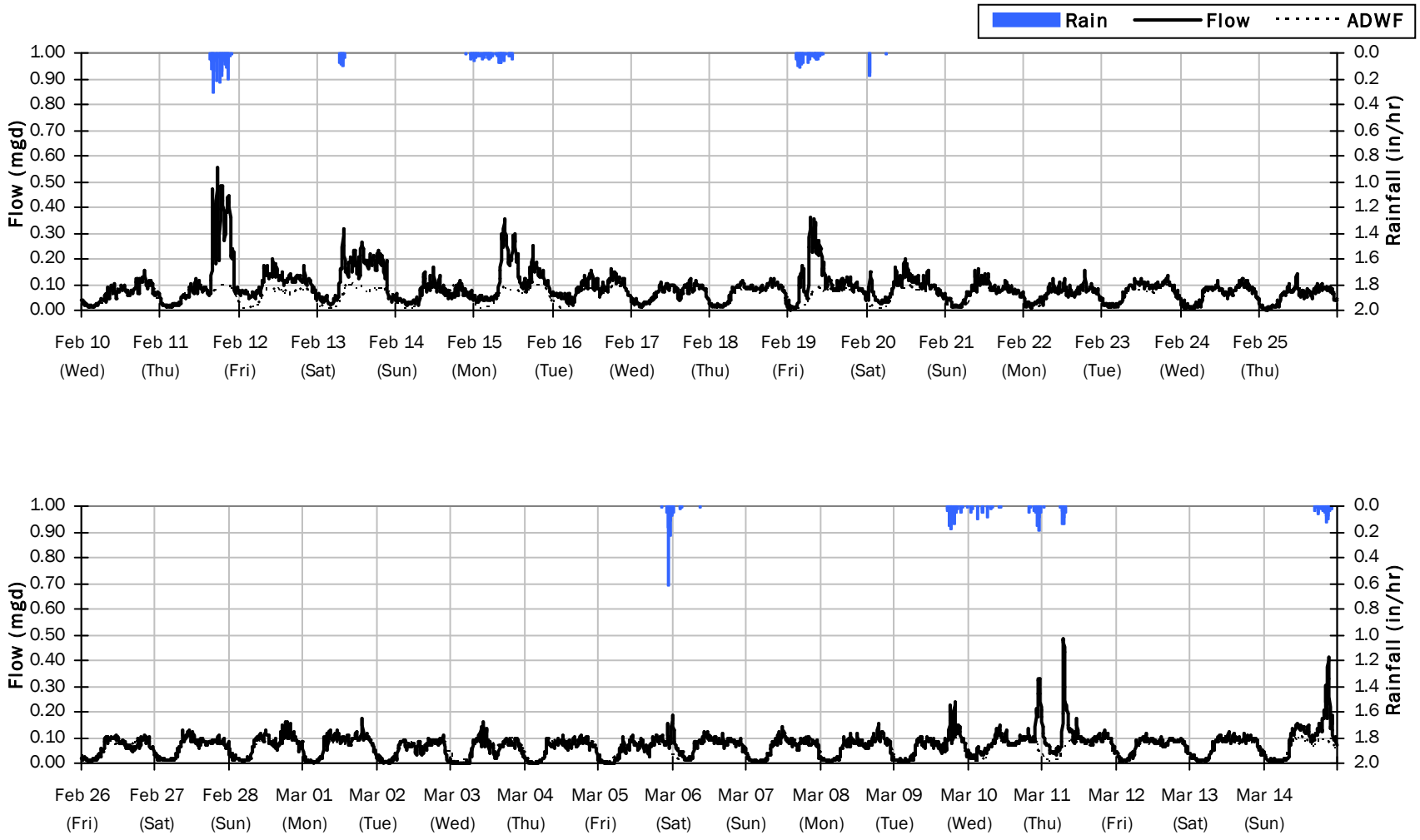
Total Period Rainfall: 2.94 inches Avg Flow: 0.077 mgd Peak Flow: 0.941 mgd Min Flow: 0.003 mgd



FM 1-9

Flow Summary: 2/10/2021 to 3/14/2021

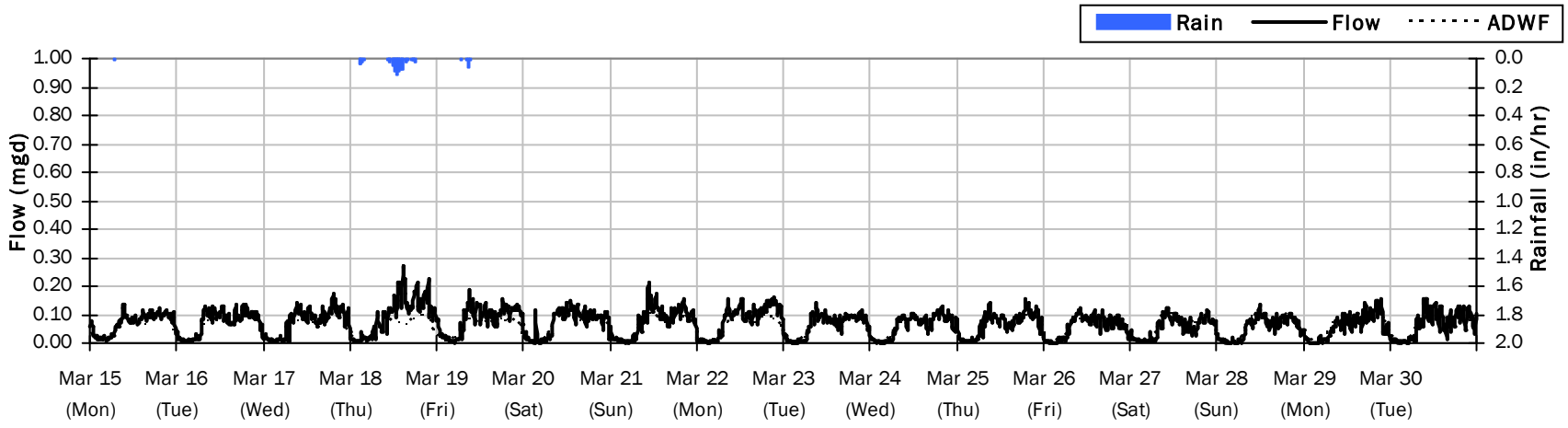
Total Period Rainfall: 2.82 inches Avg Flow: 0.078 mgd Peak Flow: 0.558 mgd Min Flow: 0.000 mgd

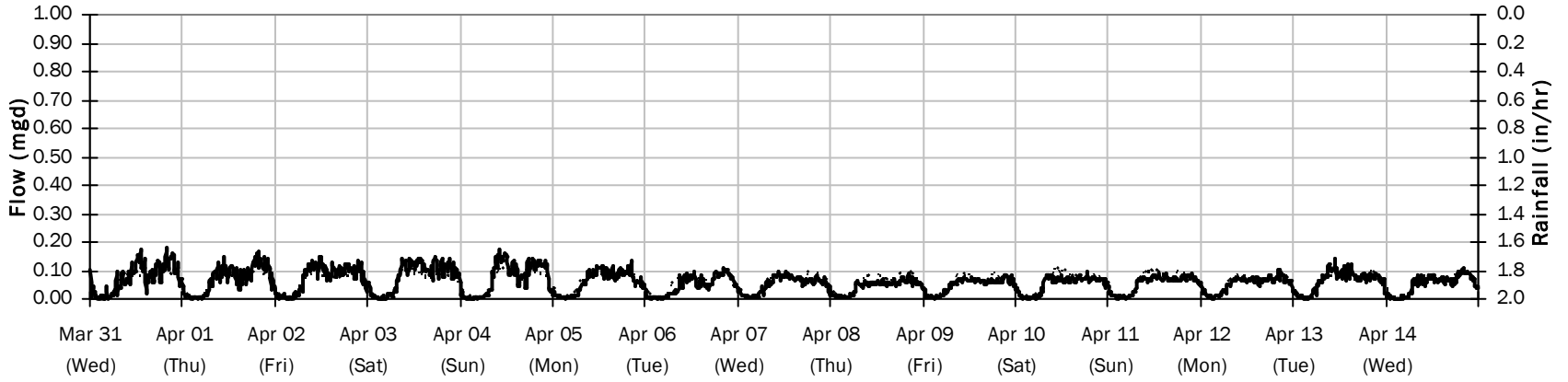


FM 1-9

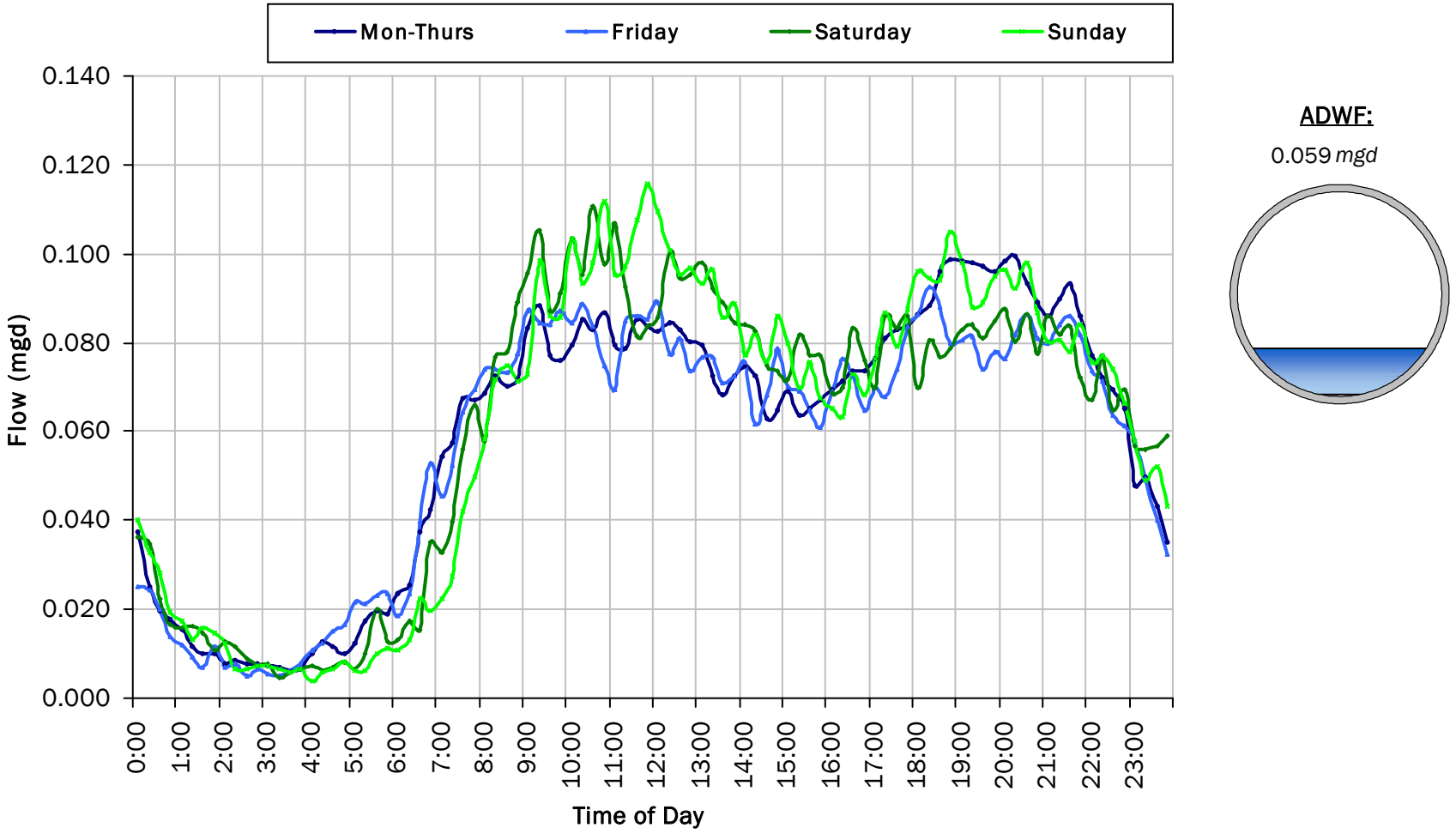
Flow Summary: 3/15/2021 to 4/14/2021

Total Period Rainfall: 0.27 inches Avg Flow: 0.065 mgd Peak Flow: 0.263 mgd Min Flow: 0.001 mgd





FM 1-9
Average Dry Weather Flow Hydrographs



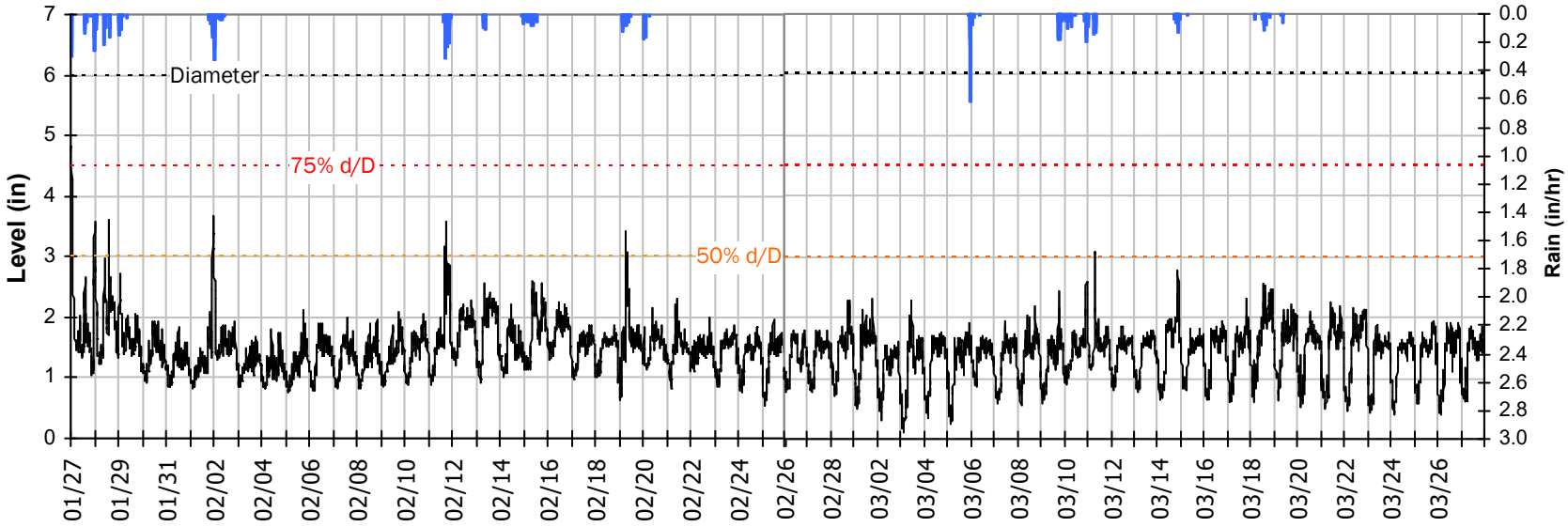
ADWF:

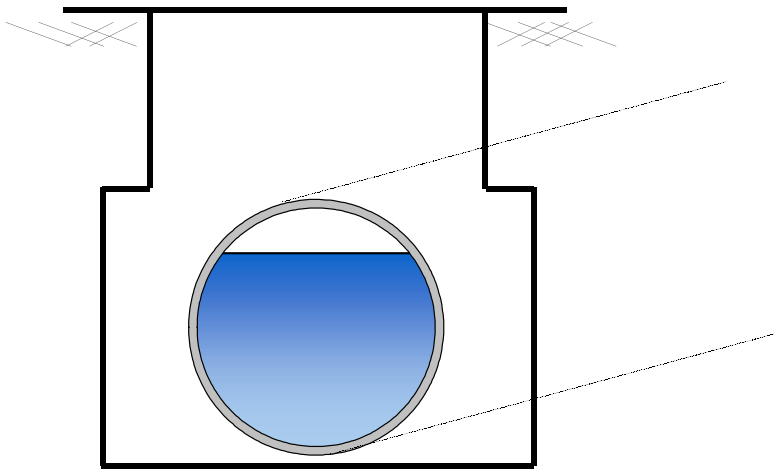
0.059 *mgd*

FM 1-9

Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Monitoring Period

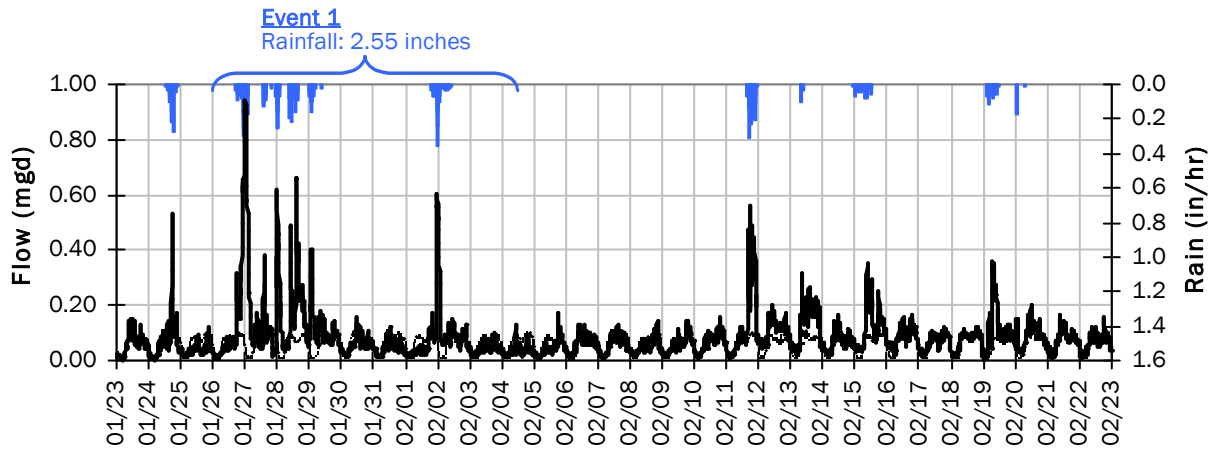




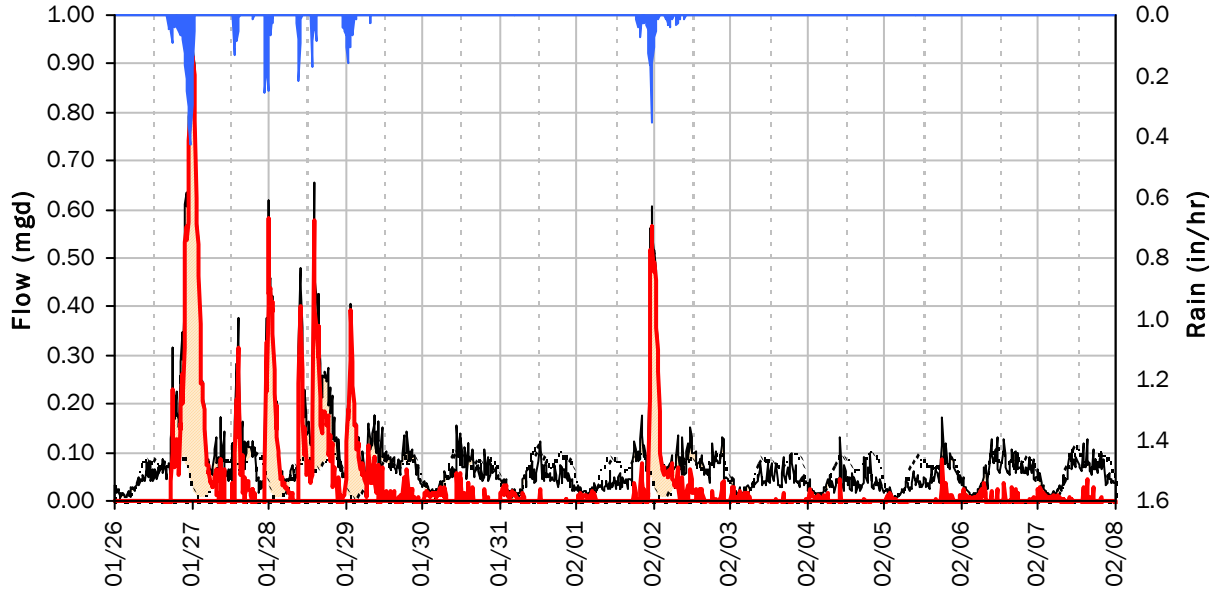
Pipe Diameter:	6	*inches*
Peak Measured Level:	4.83	*inches*
Peak d/D Ratio:	0.81	

FM 1-9
I/I Summary: Event 1

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



Event 1 Detail Graph

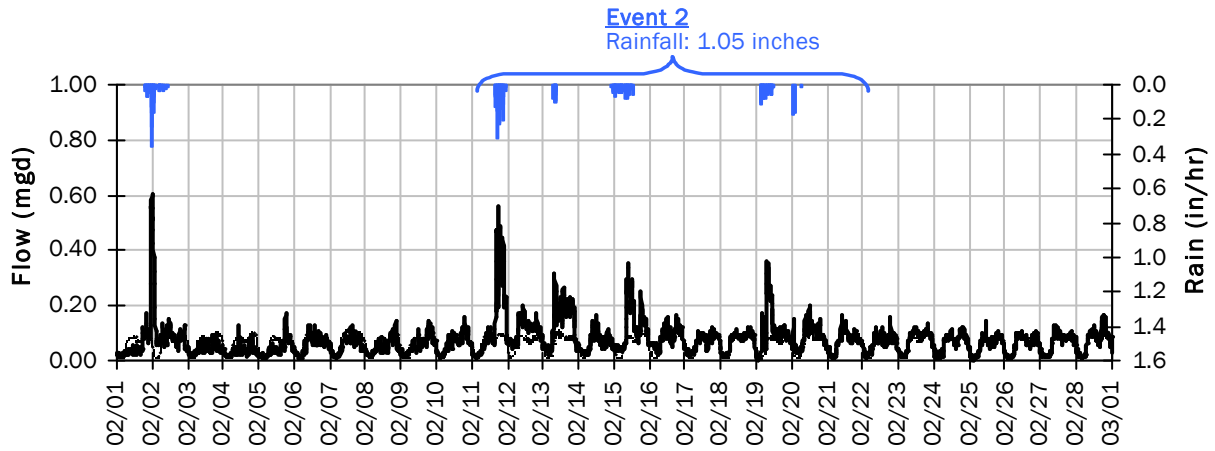


Storm Event I/I Analysis (Rain = 2.55 inches)

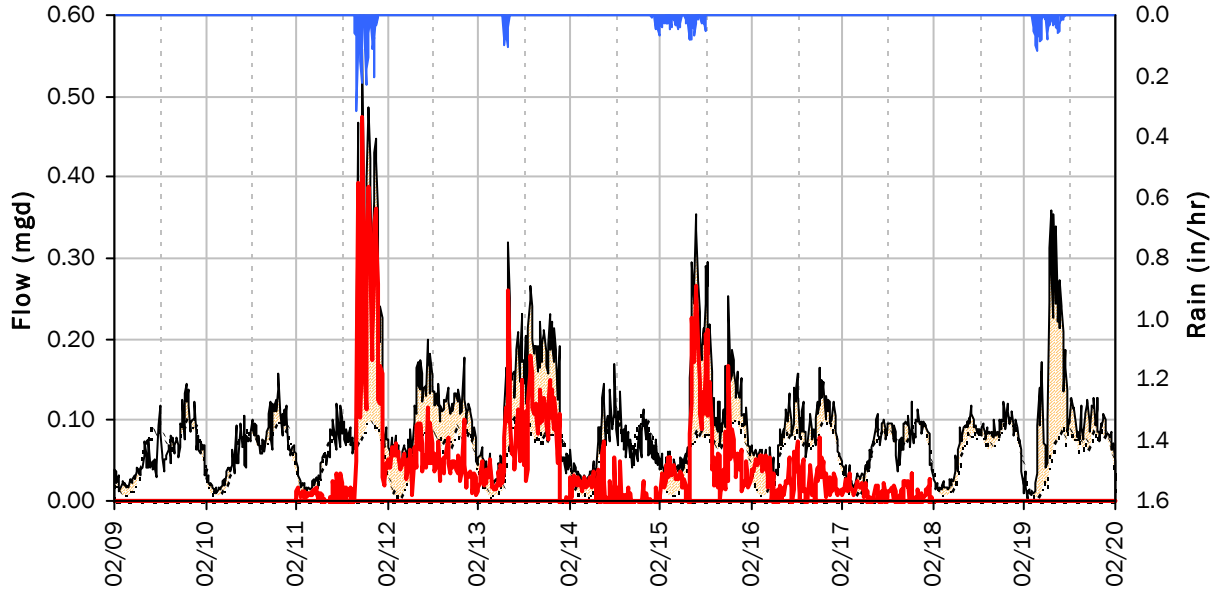
Capacity		Inflow / Infiltration	
Peak Flow:	0.94 *mgd*	**Peak I/I Rate:**	0.92 *mgd*
PF:	15.82	**Total I/I:**	374,000 *gallons*
Peak Level:	4.83 *in*		
d/D Ratio:	0.81		

FM 1-9
I/I Summary: Event 2

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



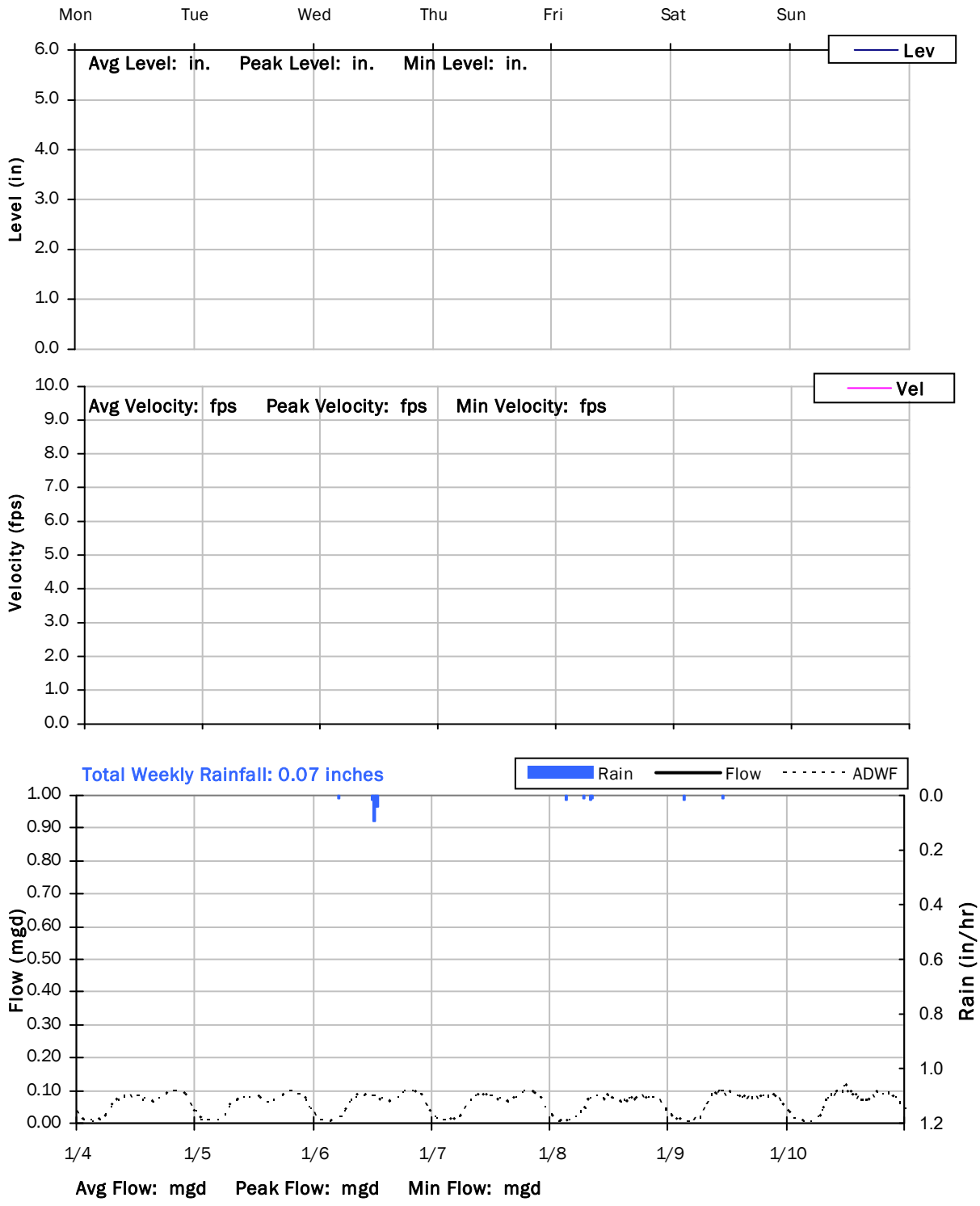
Event 2 Detail Graph



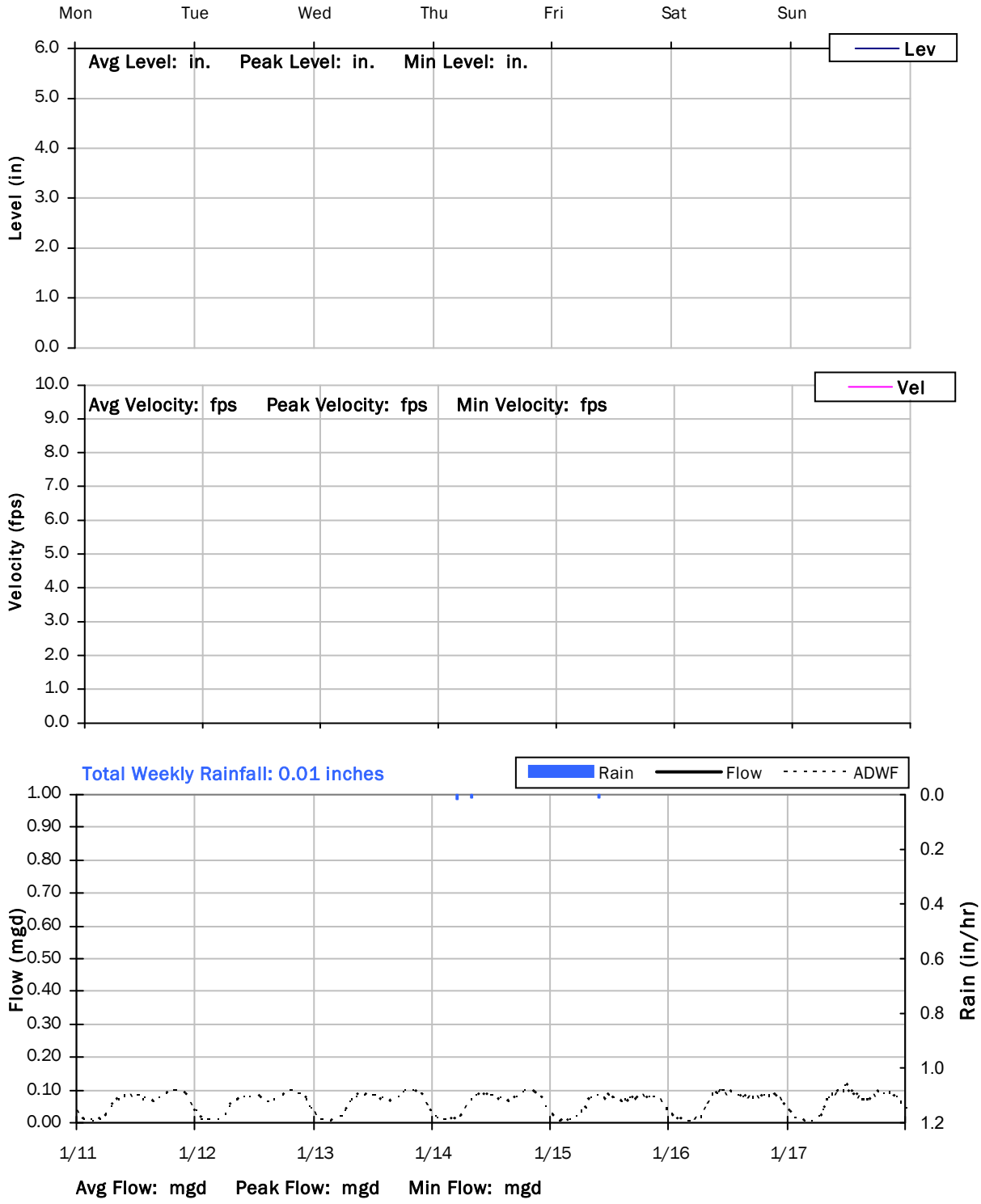
Storm Event I/I Analysis (Rain = 1.05 inches)

Capacity		Inflow / Infiltration	
Peak Flow:	0.56 *mgd*	**Peak I/I Rate:**	0.47 *mgd*
PF:	9.38	**Total I/I:**	304,000 *gallons*
Peak Level:	3.57 *in*		
d/D Ratio:	0.60		

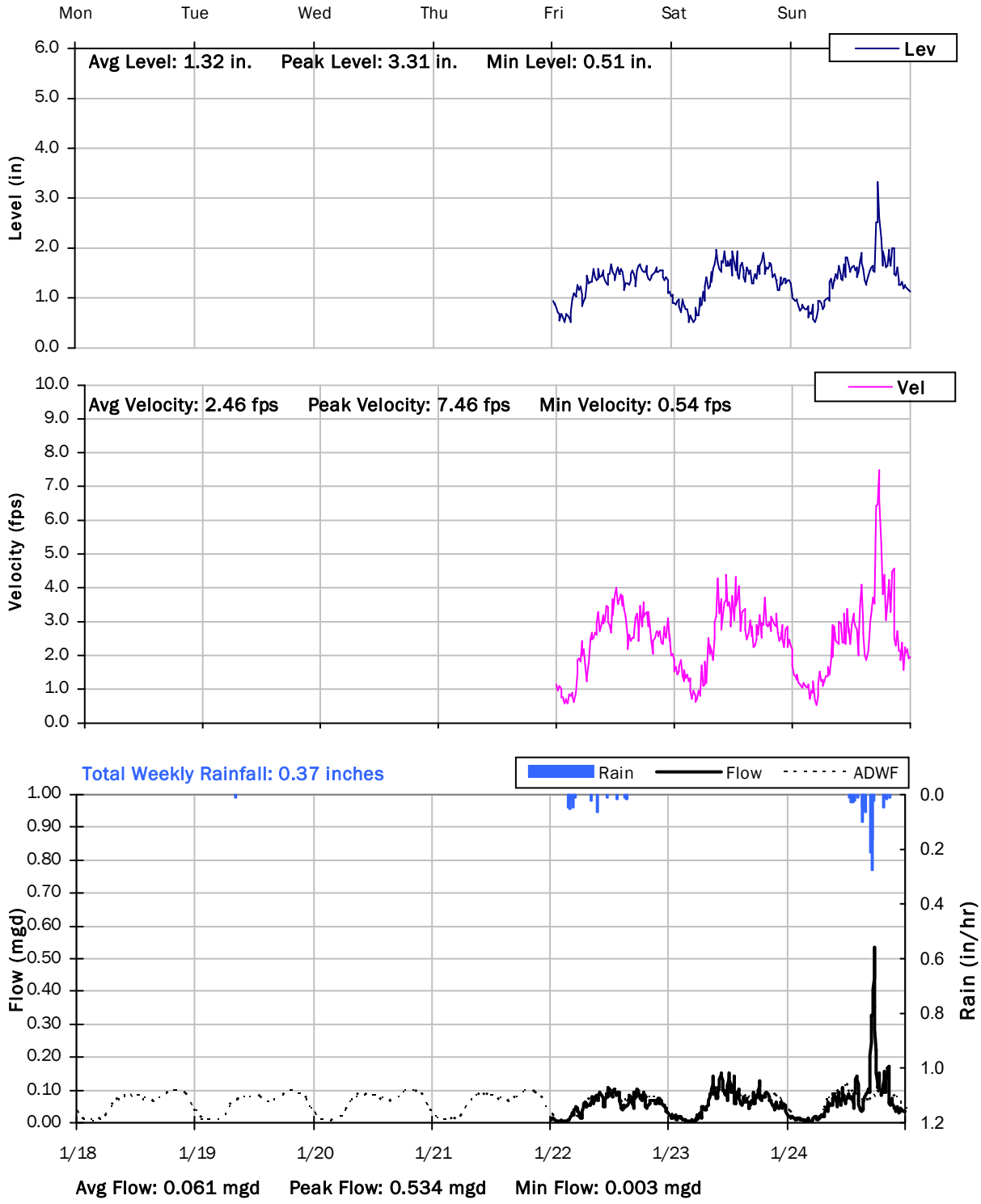
FM 1-9
Weekly Level, Velocity and Flow Hydrographs
1/4/2021 to 1/11/2021



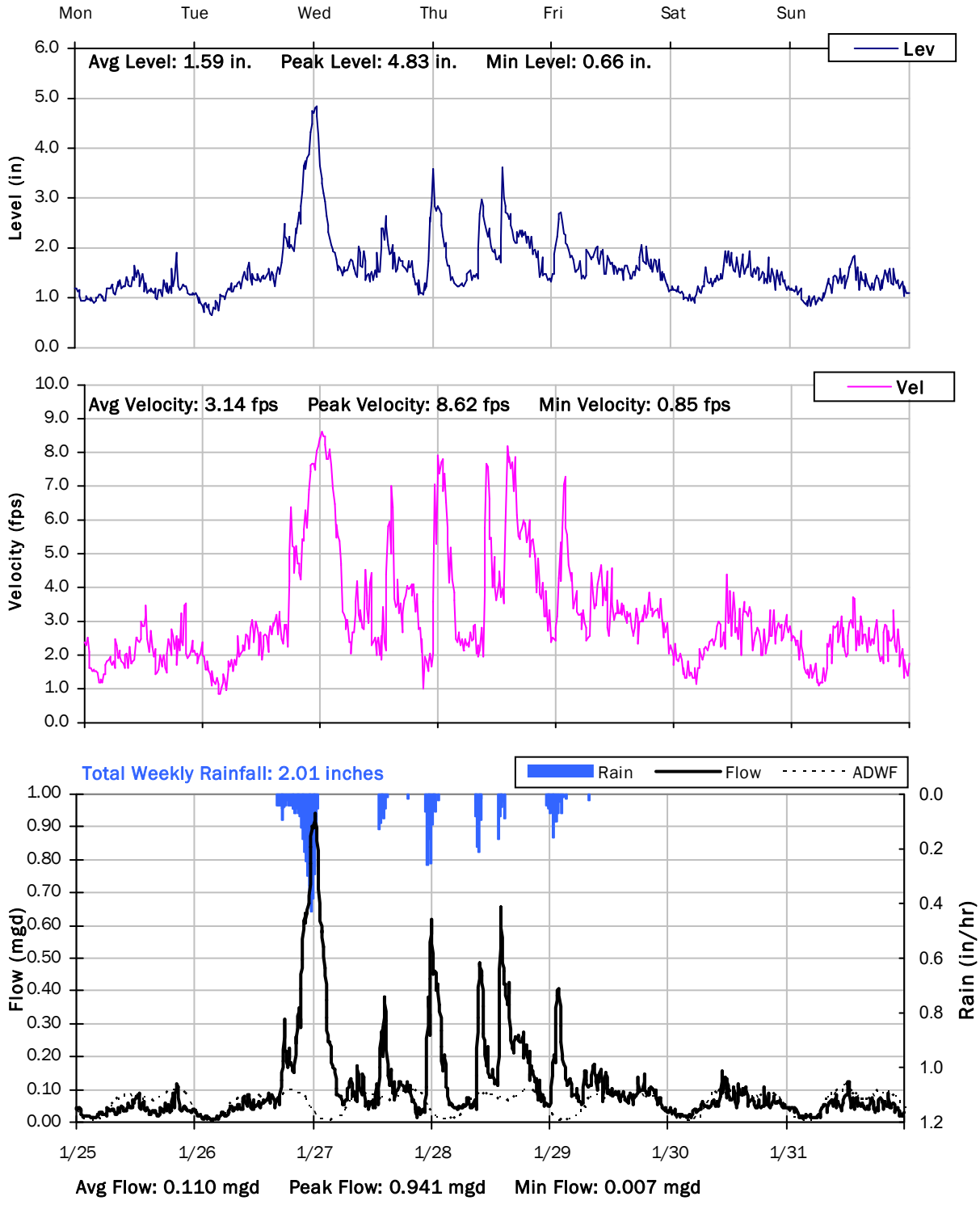
FM 1-9
Weekly Level, Velocity and Flow Hydrographs
1/11/2021 to 1/18/2021



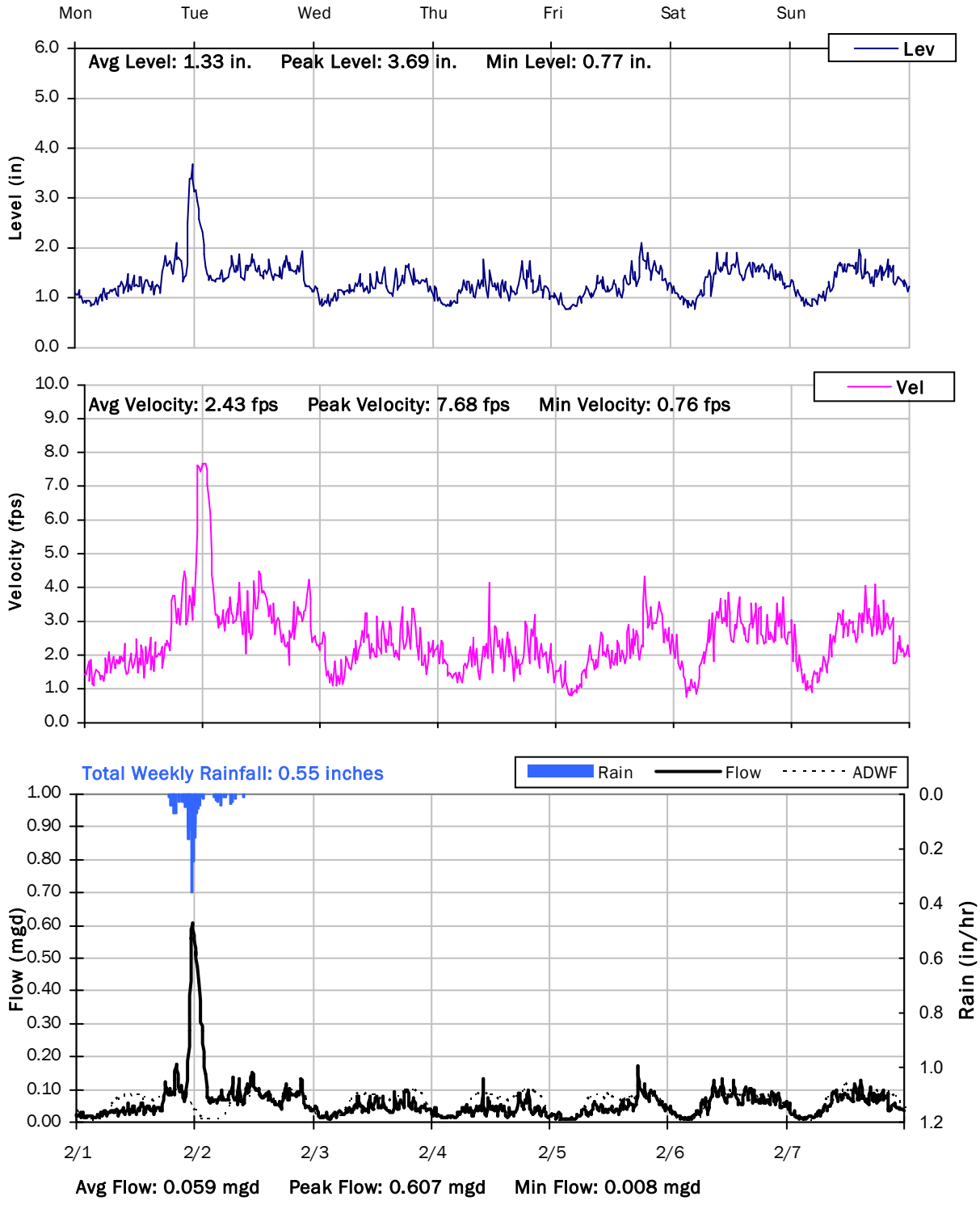
FM 1-9
Weekly Level, Velocity and Flow Hydrographs
1/18/2021 to 1/25/2021



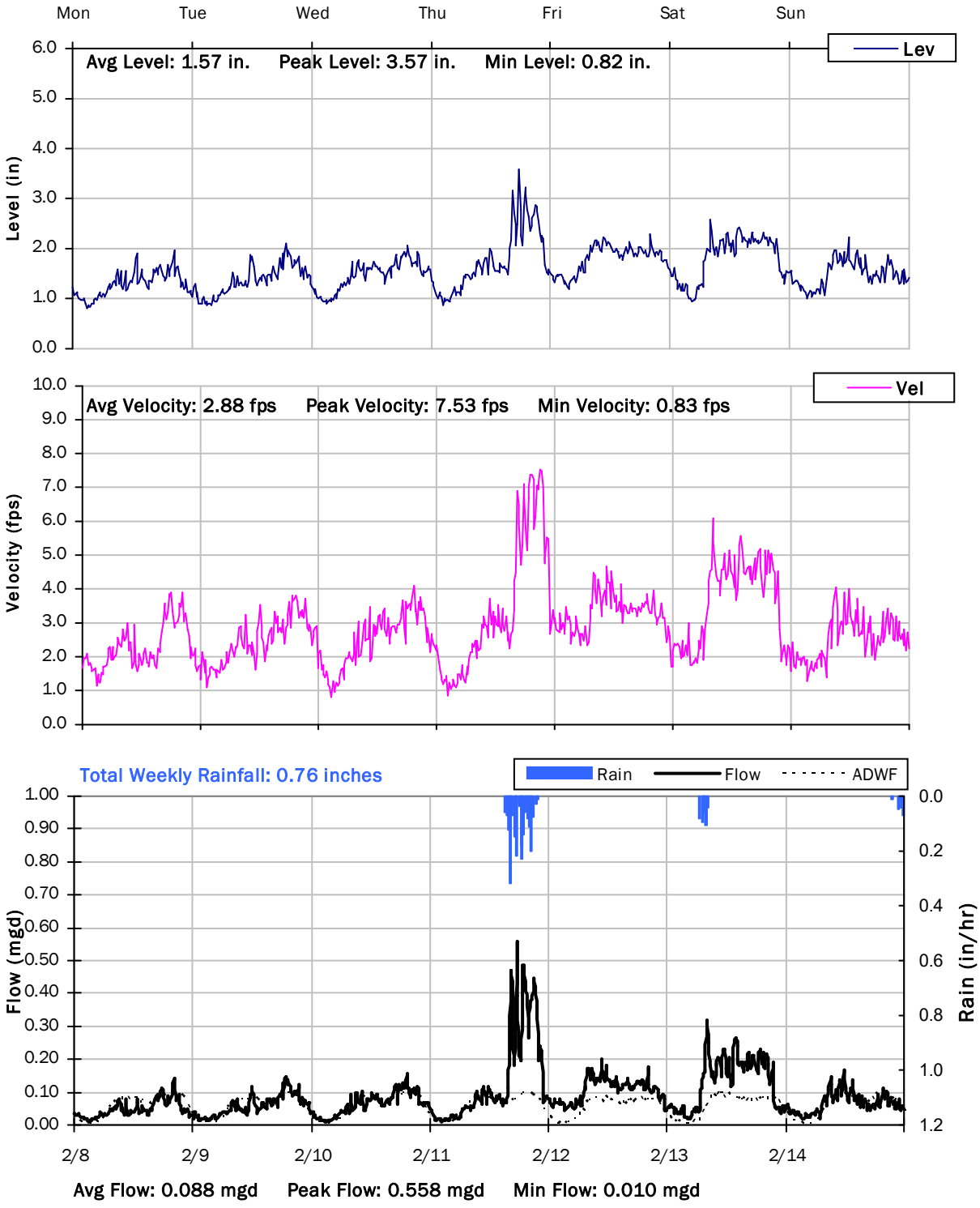
FM 1-9
Weekly Level, Velocity and Flow Hydrographs
1/25/2021 to 2/1/2021



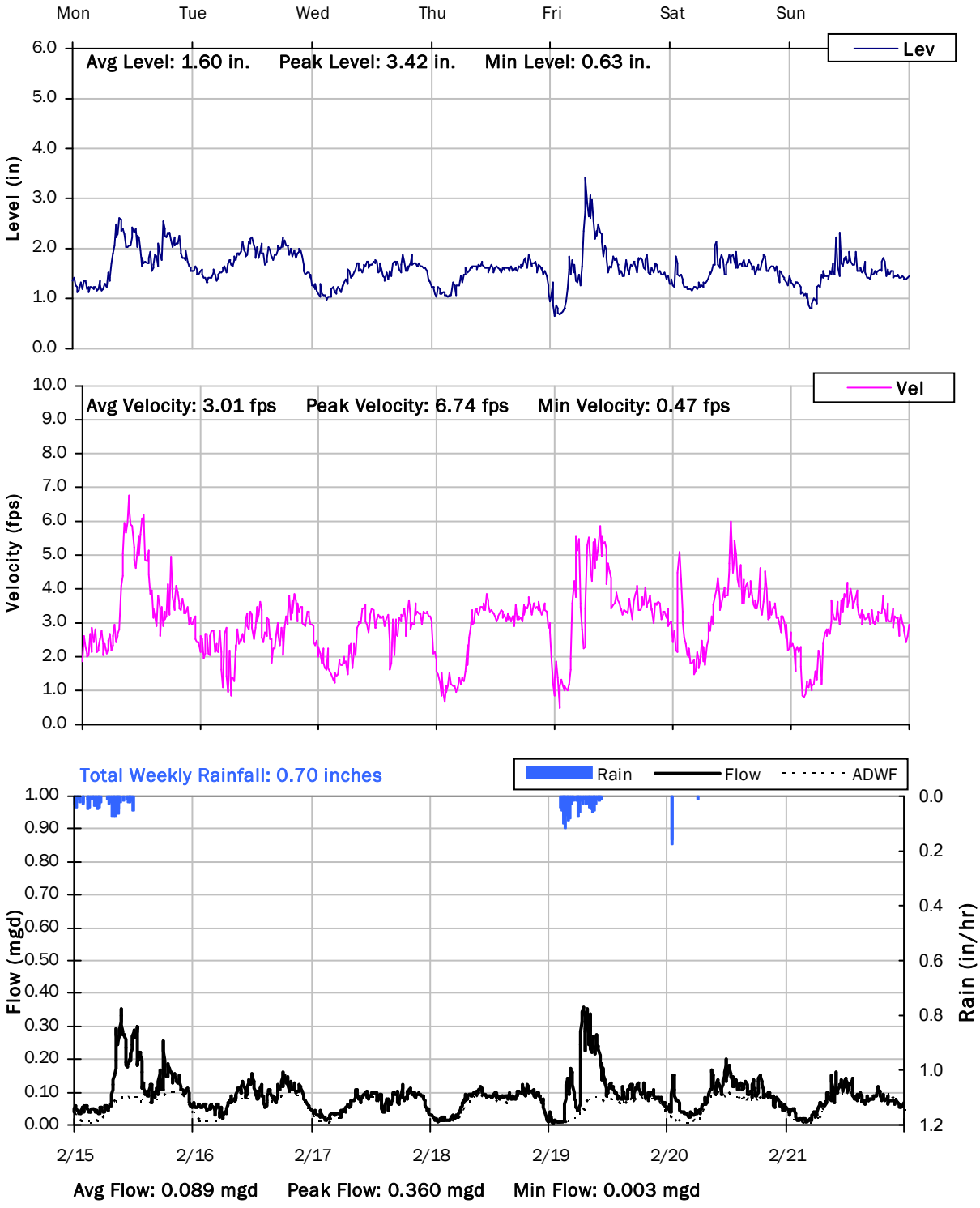
FM 1-9
Weekly Level, Velocity and Flow Hydrographs
2/1/2021 to 2/8/2021



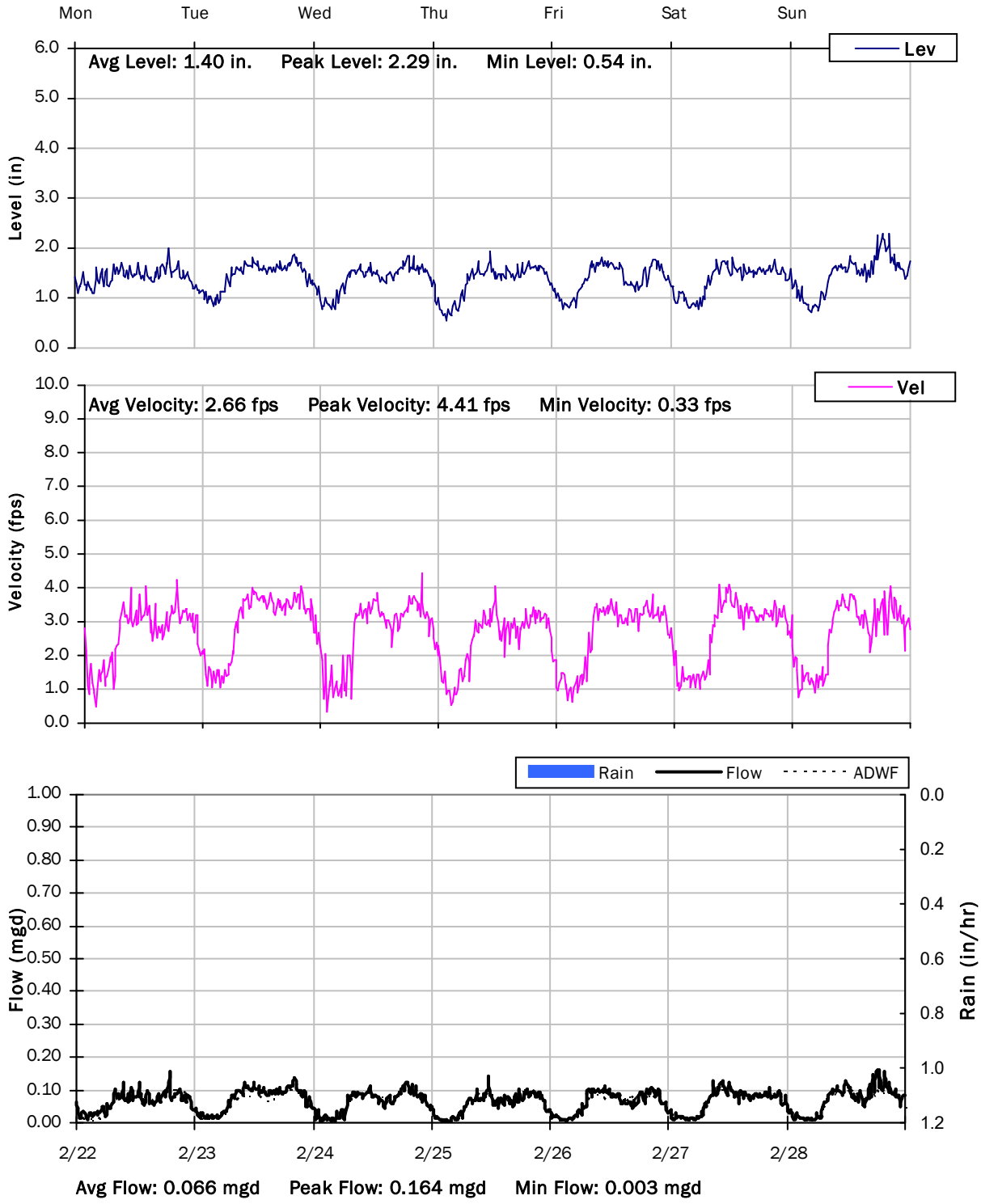
FM 1-9
Weekly Level, Velocity and Flow Hydrographs
2/8/2021 to 2/15/2021



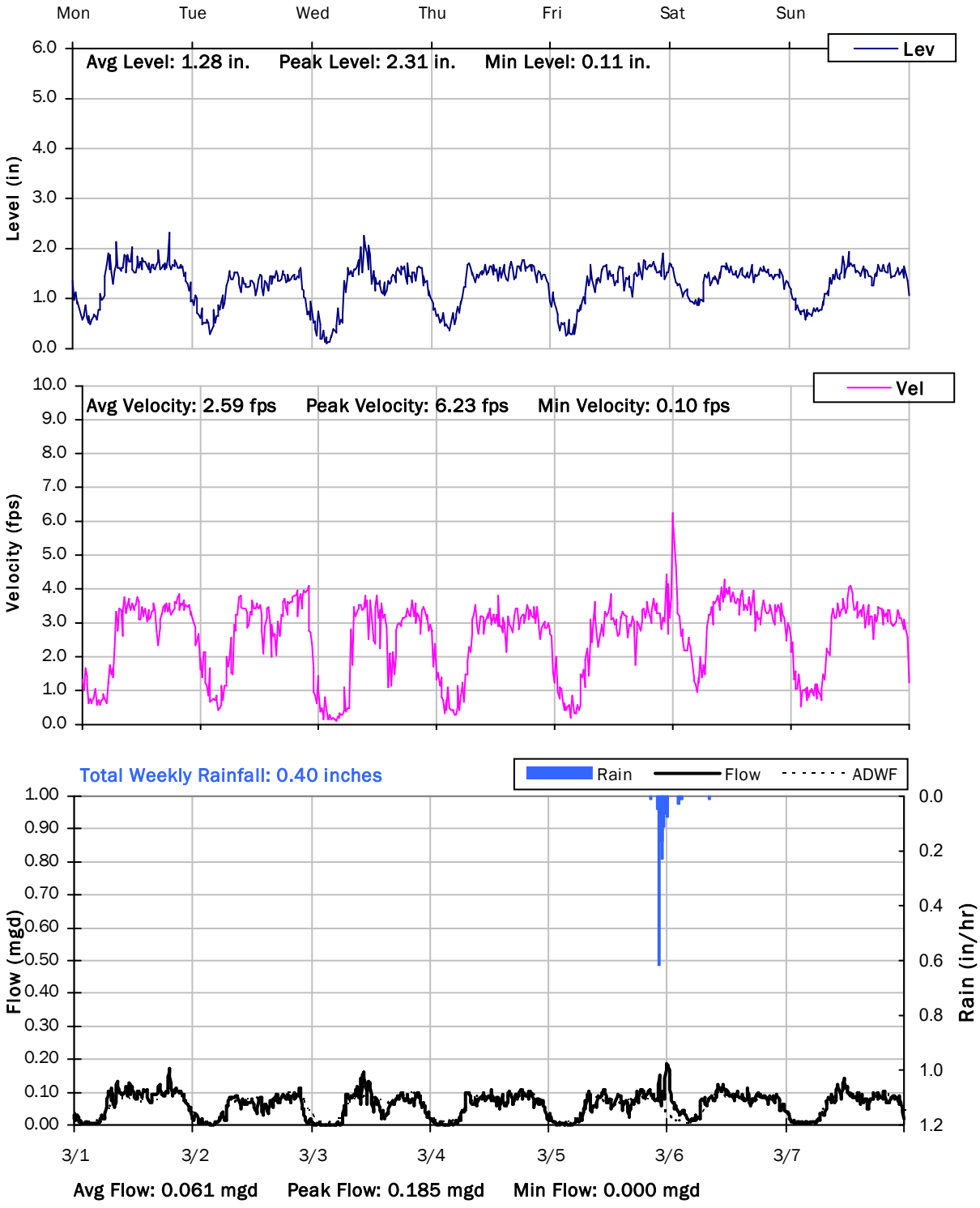
FM 1-9
Weekly Level, Velocity and Flow Hydrographs
2/15/2021 to 2/22/2021



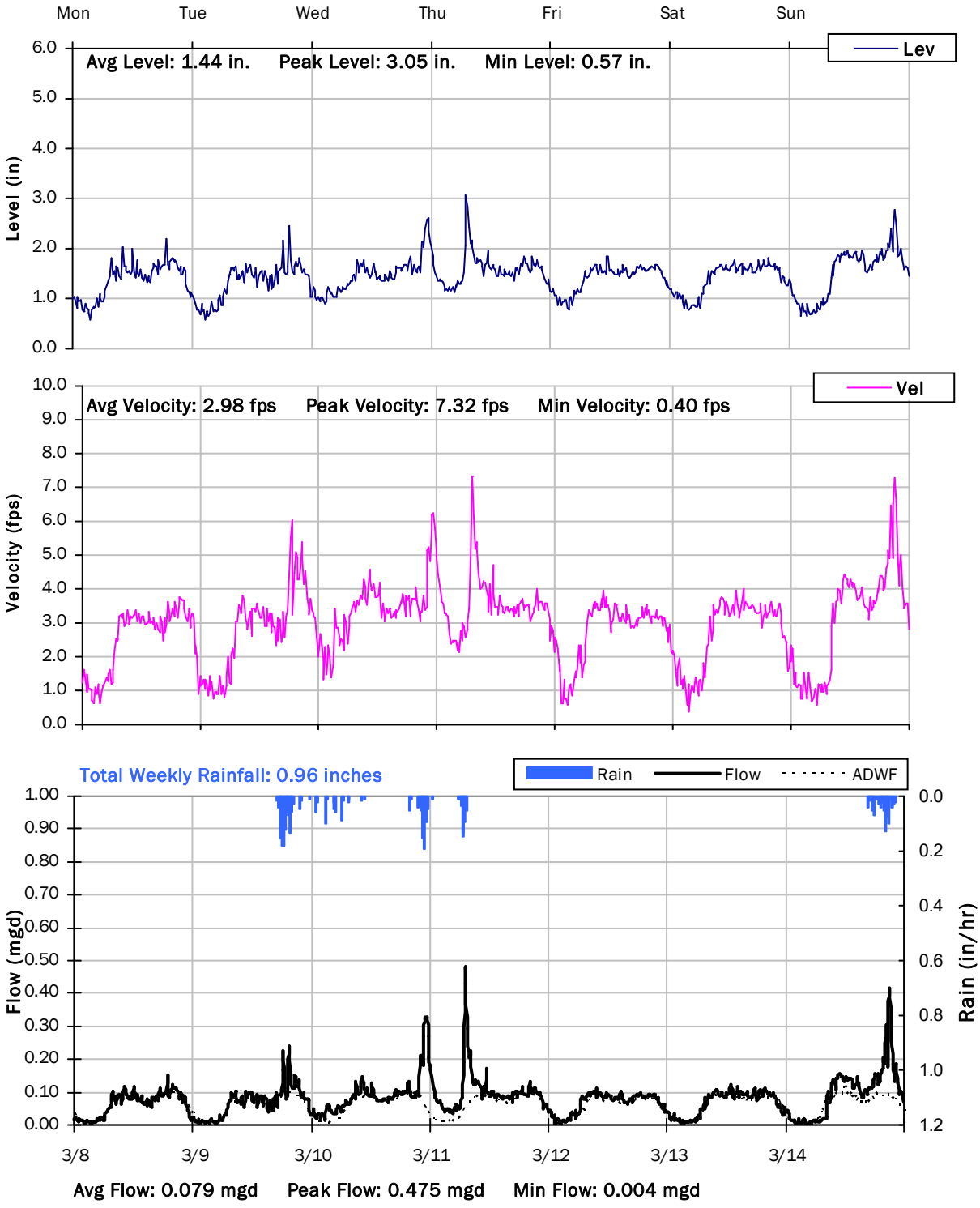
FM 1-9
Weekly Level, Velocity and Flow Hydrographs
2/22/2021 to 3/1/2021



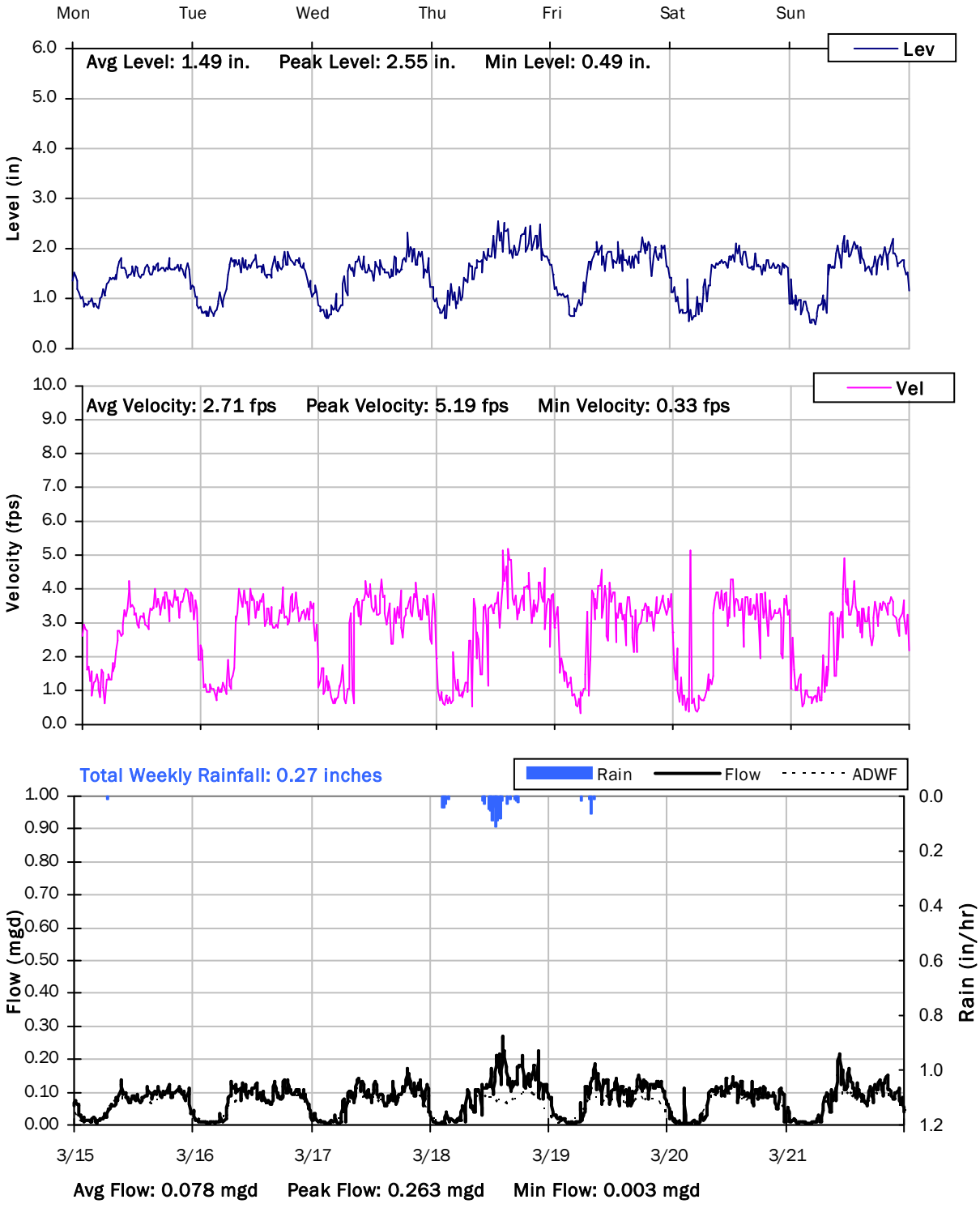
FM 1-9
Weekly Level, Velocity and Flow Hydrographs
3/1/2021 to 3/8/2021



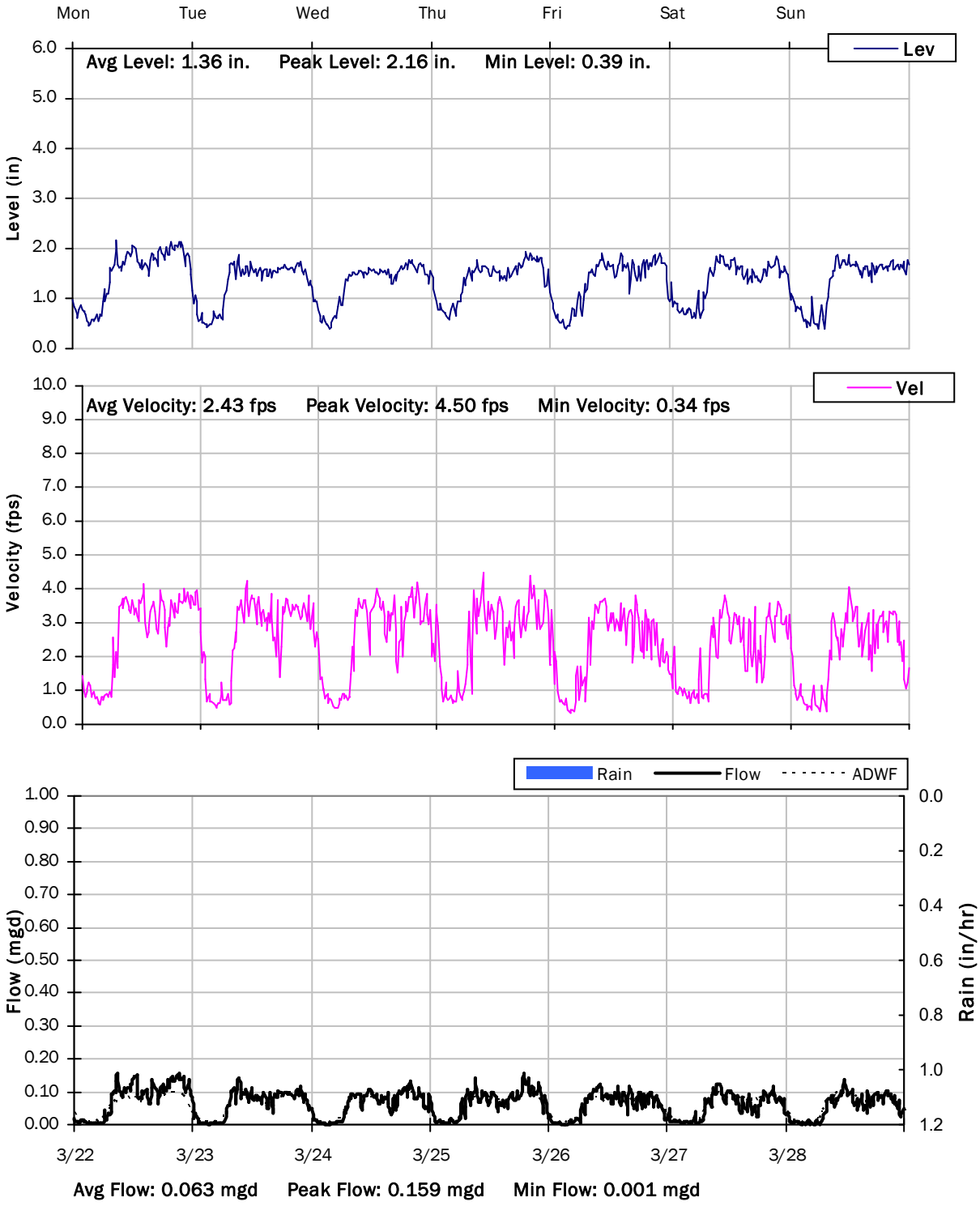
FM 1-9
Weekly Level, Velocity and Flow Hydrographs
3/8/2021 to 3/15/2021



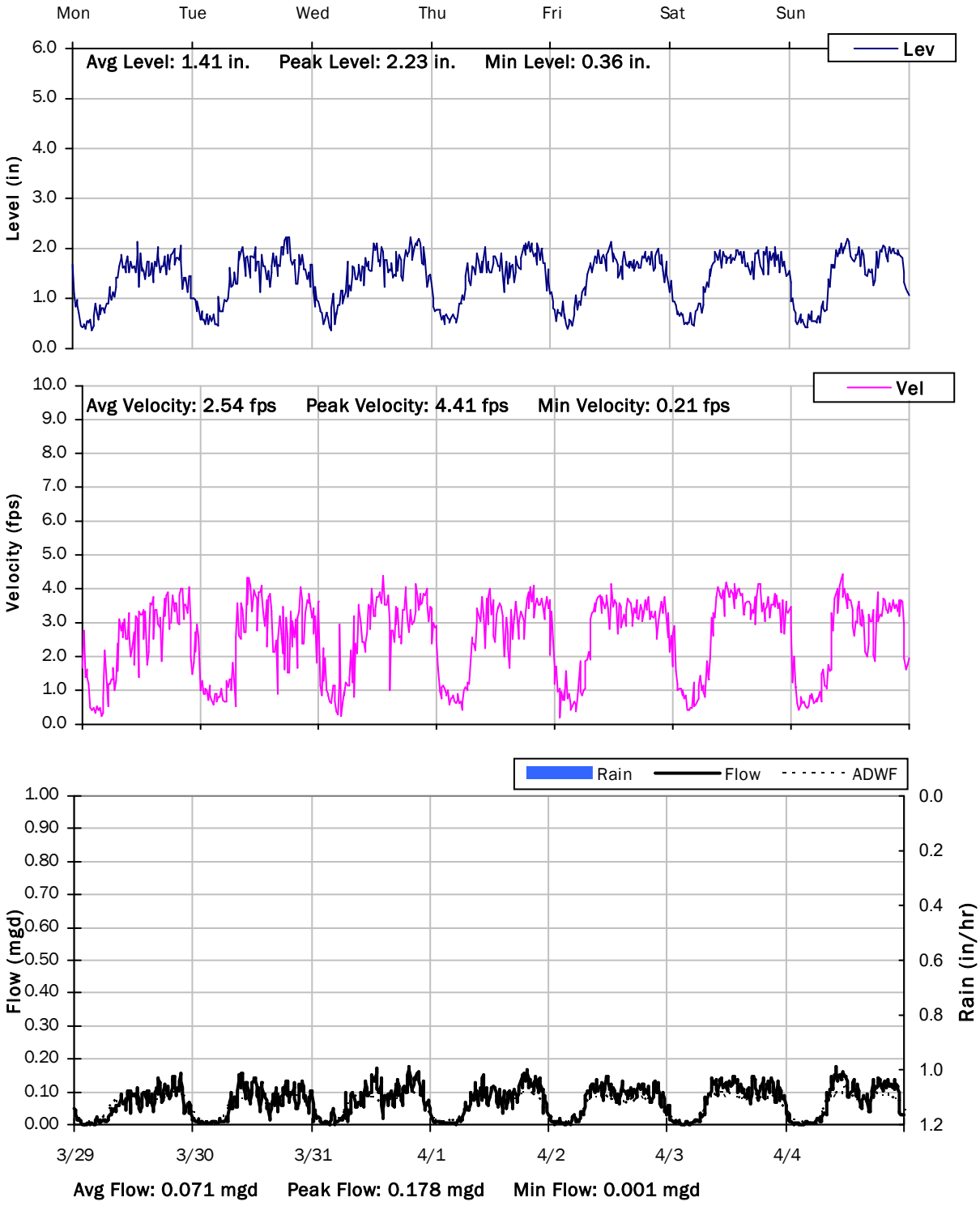
FM 1-9
Weekly Level, Velocity and Flow Hydrographs
3/15/2021 to 3/22/2021



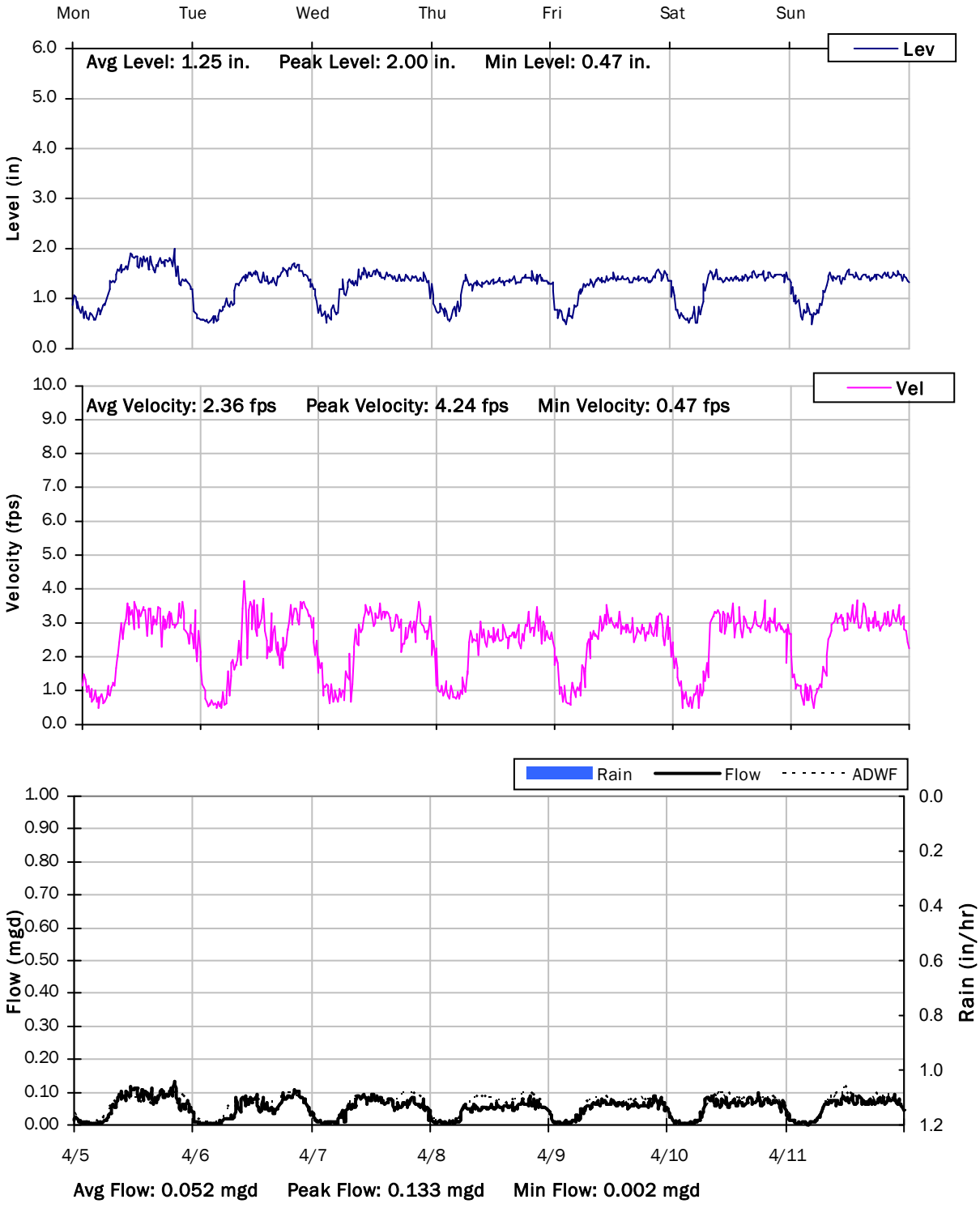
FM 1-9
Weekly Level, Velocity and Flow Hydrographs
3/22/2021 to 3/29/2021



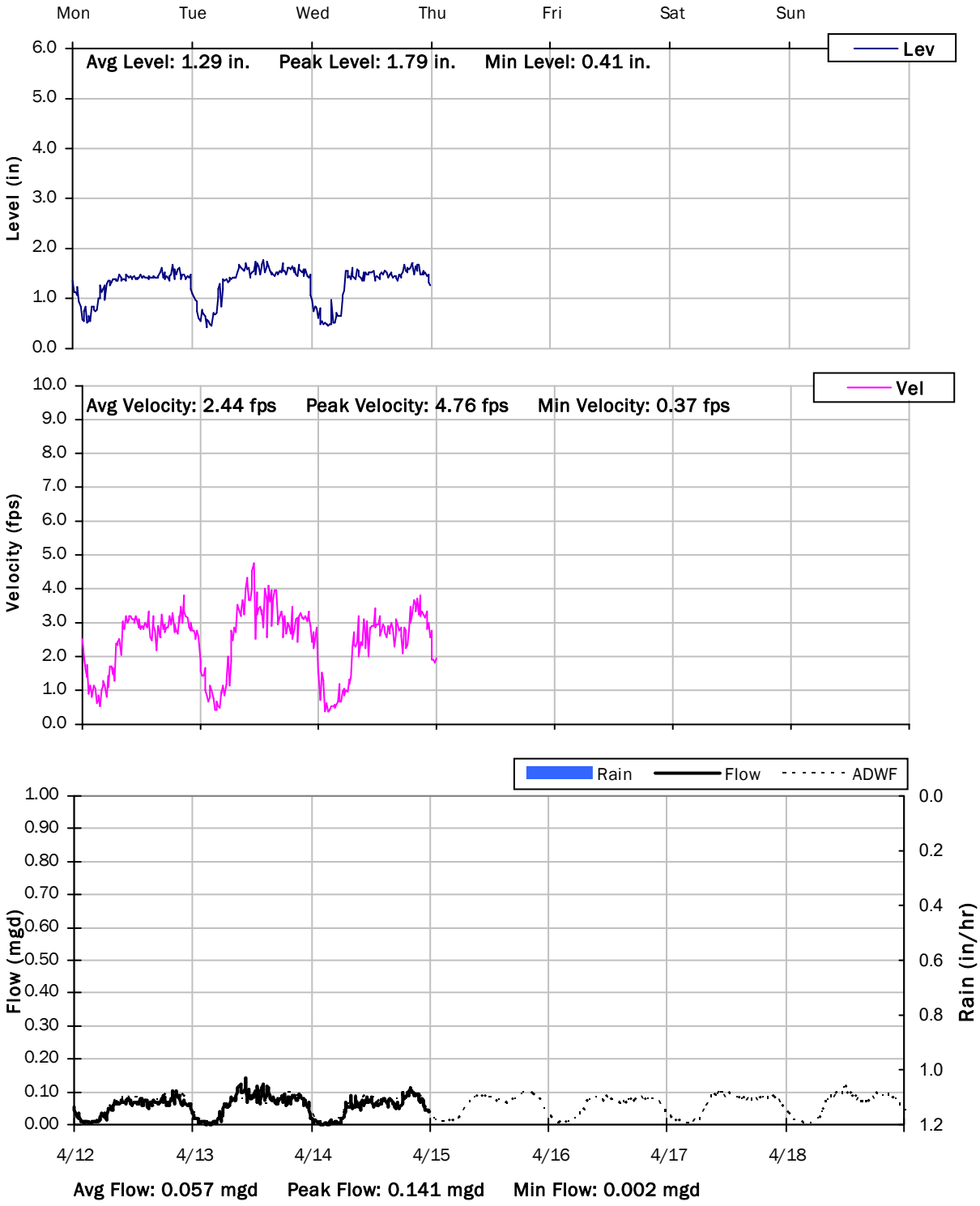
FM 1-9
Weekly Level, Velocity and Flow Hydrographs
3/29/2021 to 4/5/2021



FM 1-9
Weekly Level, Velocity and Flow Hydrographs
4/5/2021 to 4/12/2021



FM 1-9
Weekly Level, Velocity and Flow Hydrographs
4/12/2021 to 4/19/2021



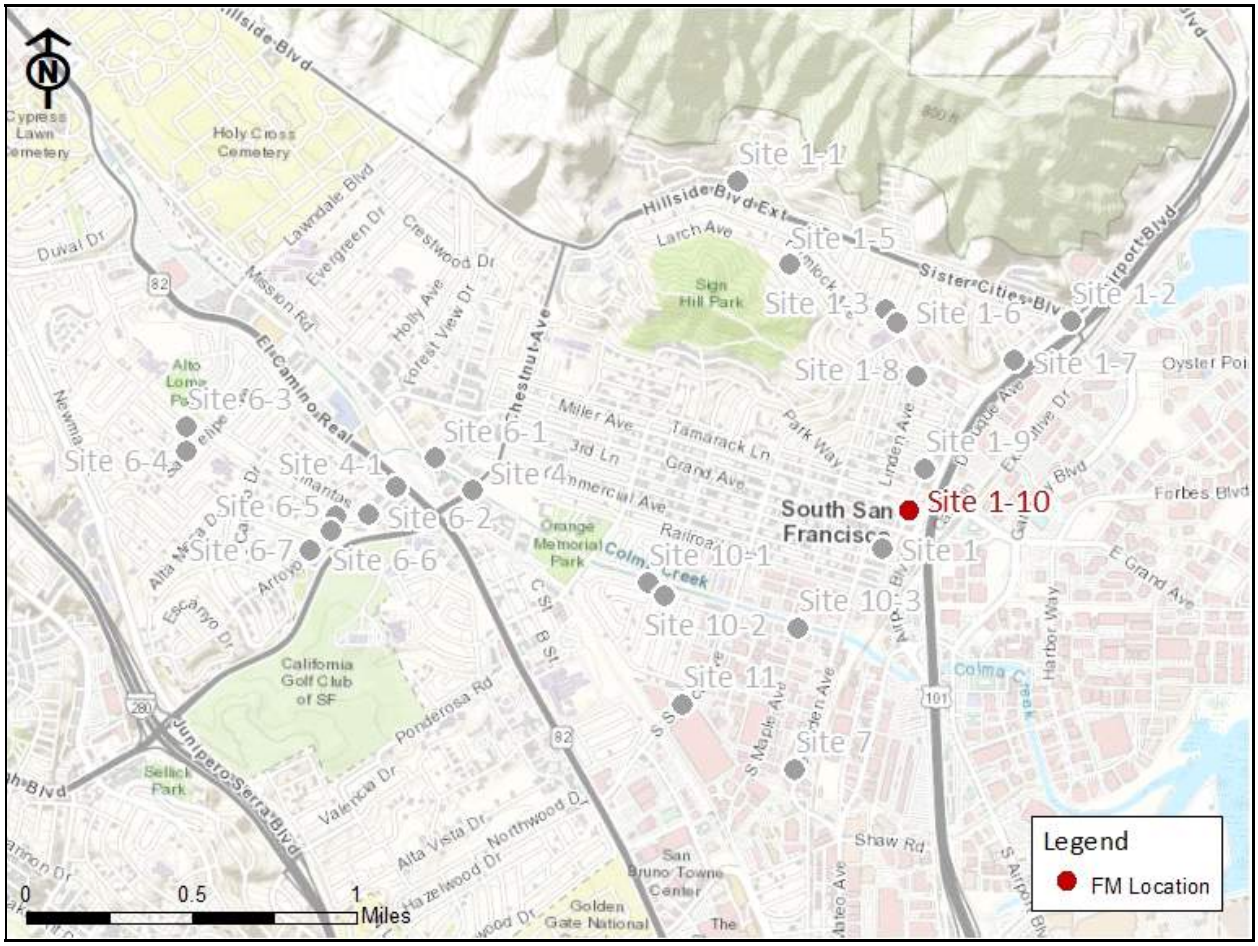
South San Francisco, CA

Sanitary Sewer Flow Monitoring
January 4 - April 14, 2021

Monitoring Site: FM 1-10

Location: Cypress Avenue and Miller Avenue

Data Summary Report



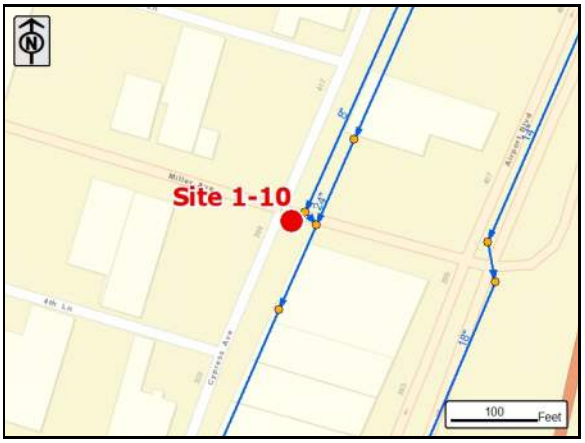
Vicinity Map: FM 1-10

FM 1-10

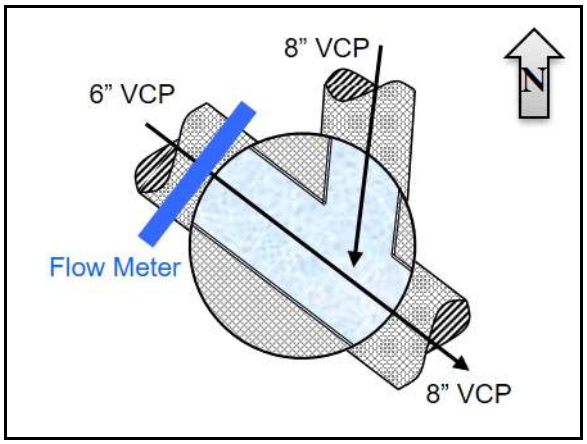
Site Information

Location:	Cypress Avenue and Miller Avenue
Coordinates:	122.4081° W, 37.6557° N
Rim Elevation (Earth):	24 feet
Pipe Diameter:	6 inches
ADWF:	0.060 mgd
Peak Measured Flow:	0.351 mgd

Satellite Map



Sanitary Map



Flow Sketch

Street View

Plan View

FM 1-10

Additional Site Photos

Effluent Pipe

Monitored Northwest Influent Pipe

FM 1-10

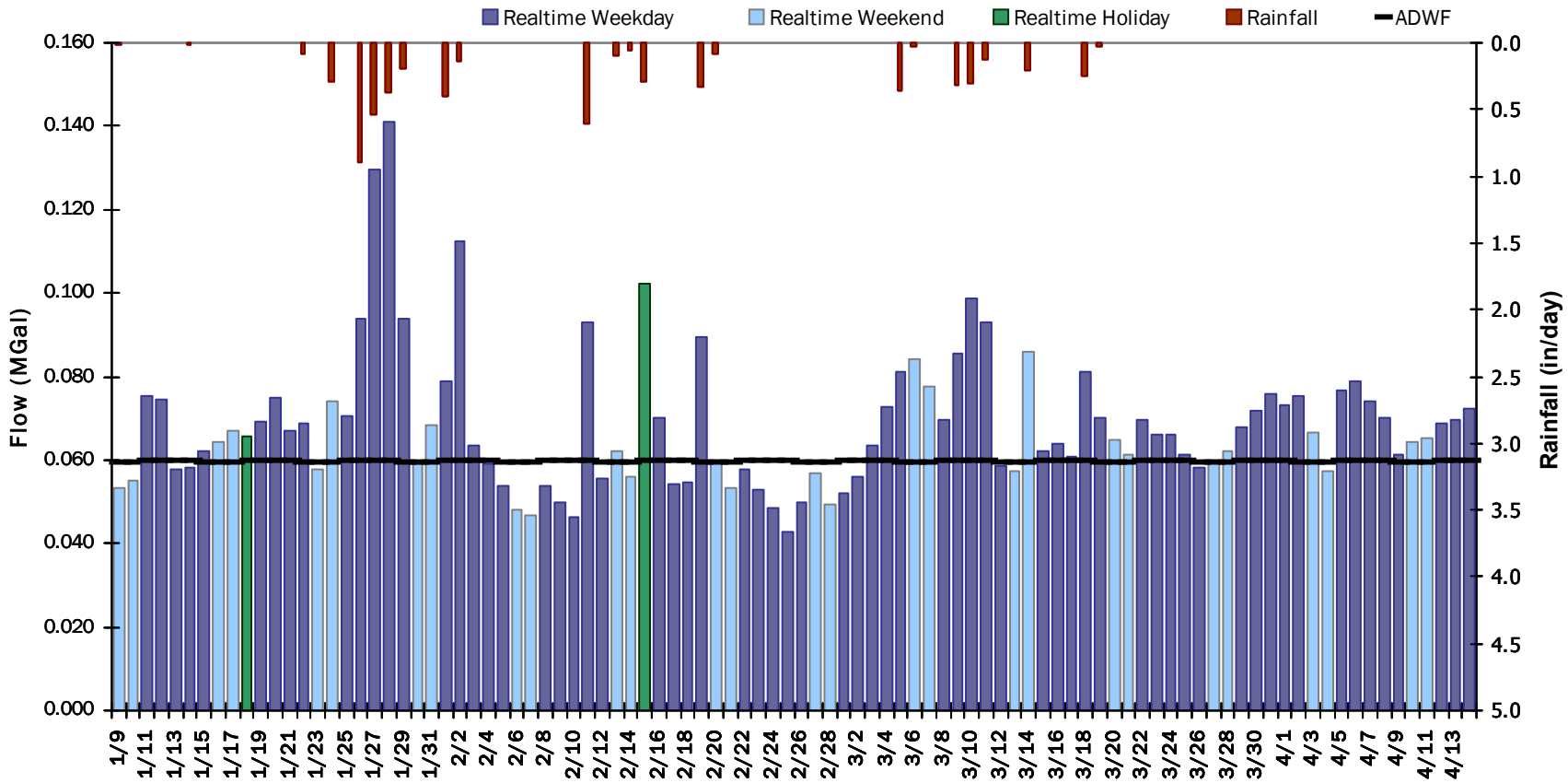
Additional Site Photos

Northeast Influent Pipe

FM 1-10
Period Flow Summary: Daily Flow Totals

Avg Period Flow: 0.068 MGal Peak Daily Flow: 0.141 MGal Min Daily Flow: 0.043 MGal

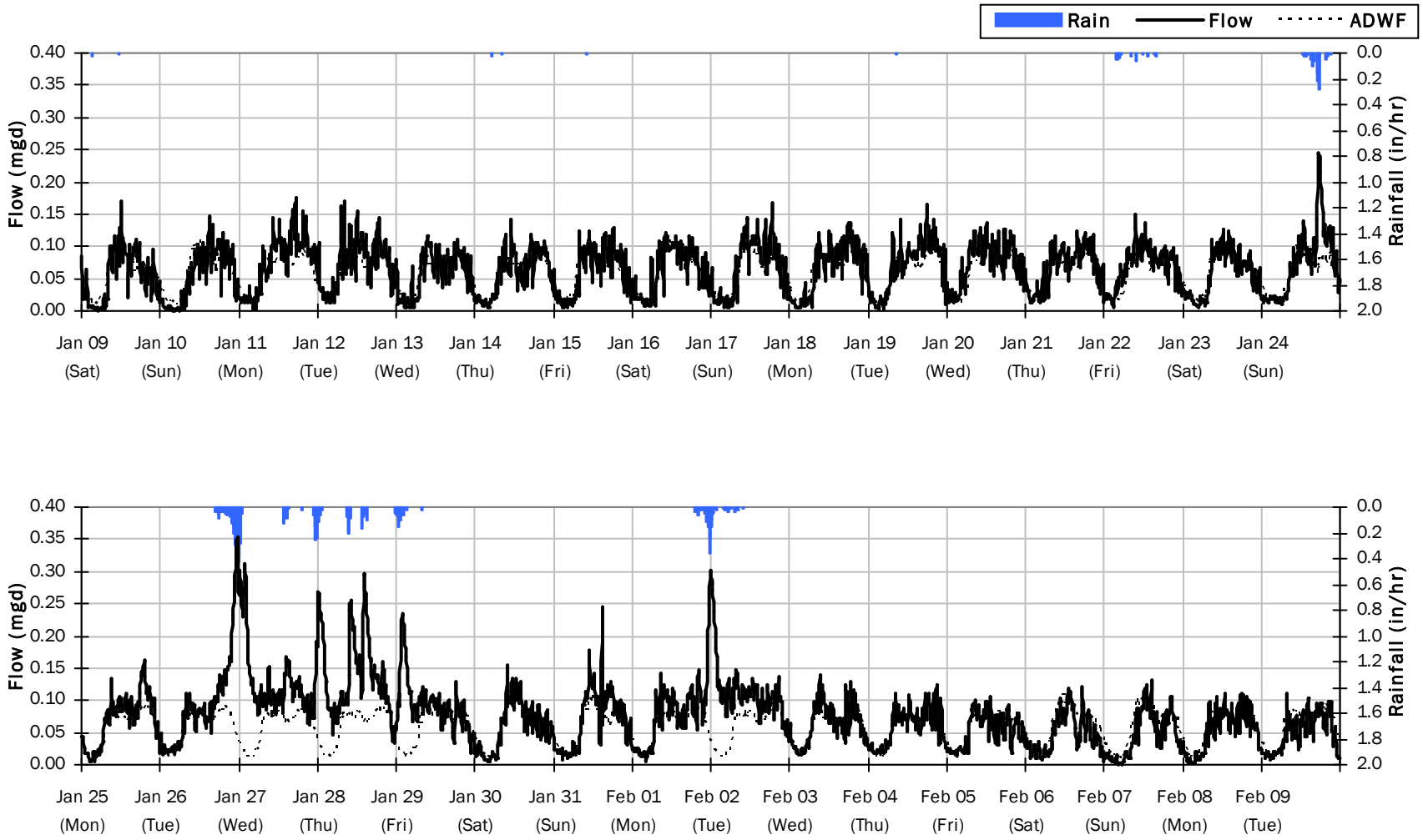
Total Period Rainfall: 6.00 inches



FM 1-10

Flow Summary: 1/9/2021 to 2/9/2021

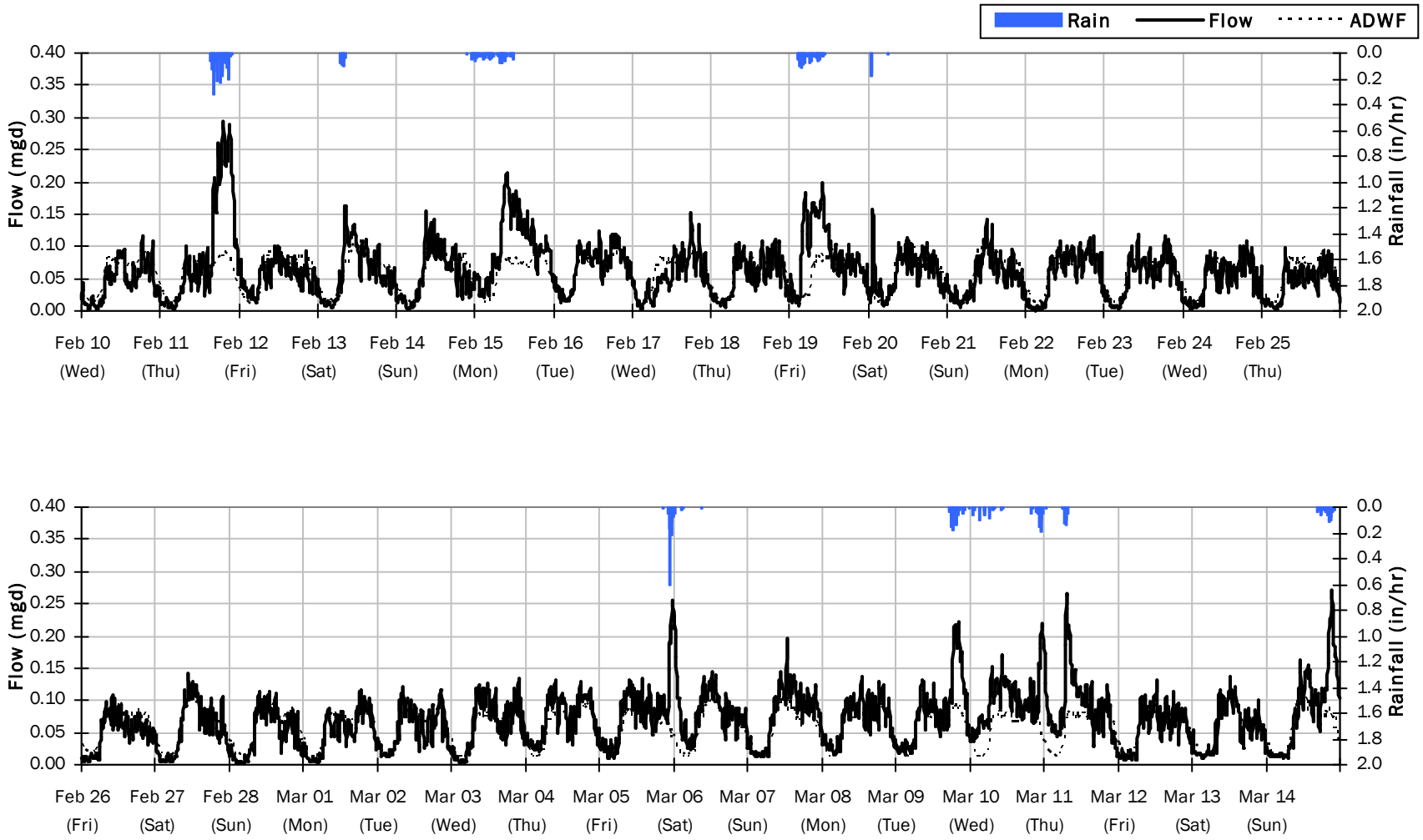
Total Period Rainfall: 2.92 inches Avg Flow: 0.071 mgd Peak Flow: 0.351 mgd Min Flow: 0.001 mgd



FM 1-10

Flow Summary: 2/10/2021 to 3/14/2021

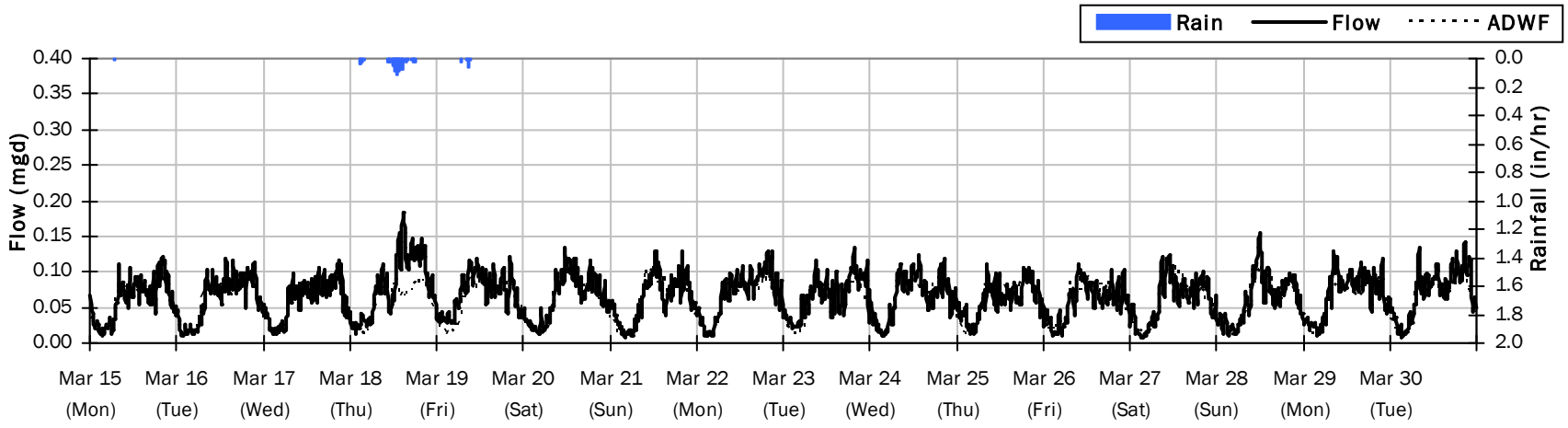
Total Period Rainfall: 2.80 inches Avg Flow: 0.066 mgd Peak Flow: 0.295 mgd Min Flow: 0.001 mgd

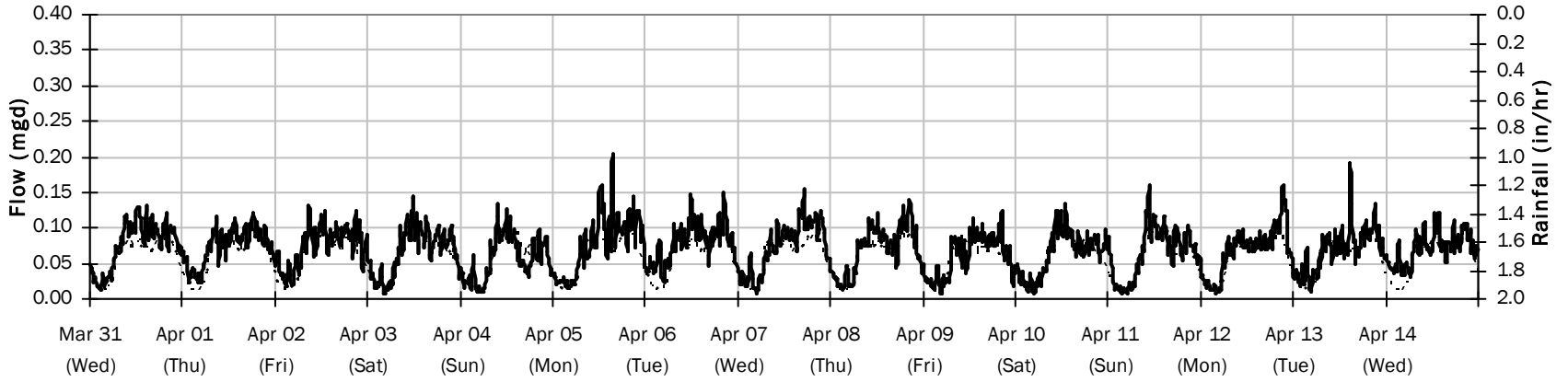


FM 1-10

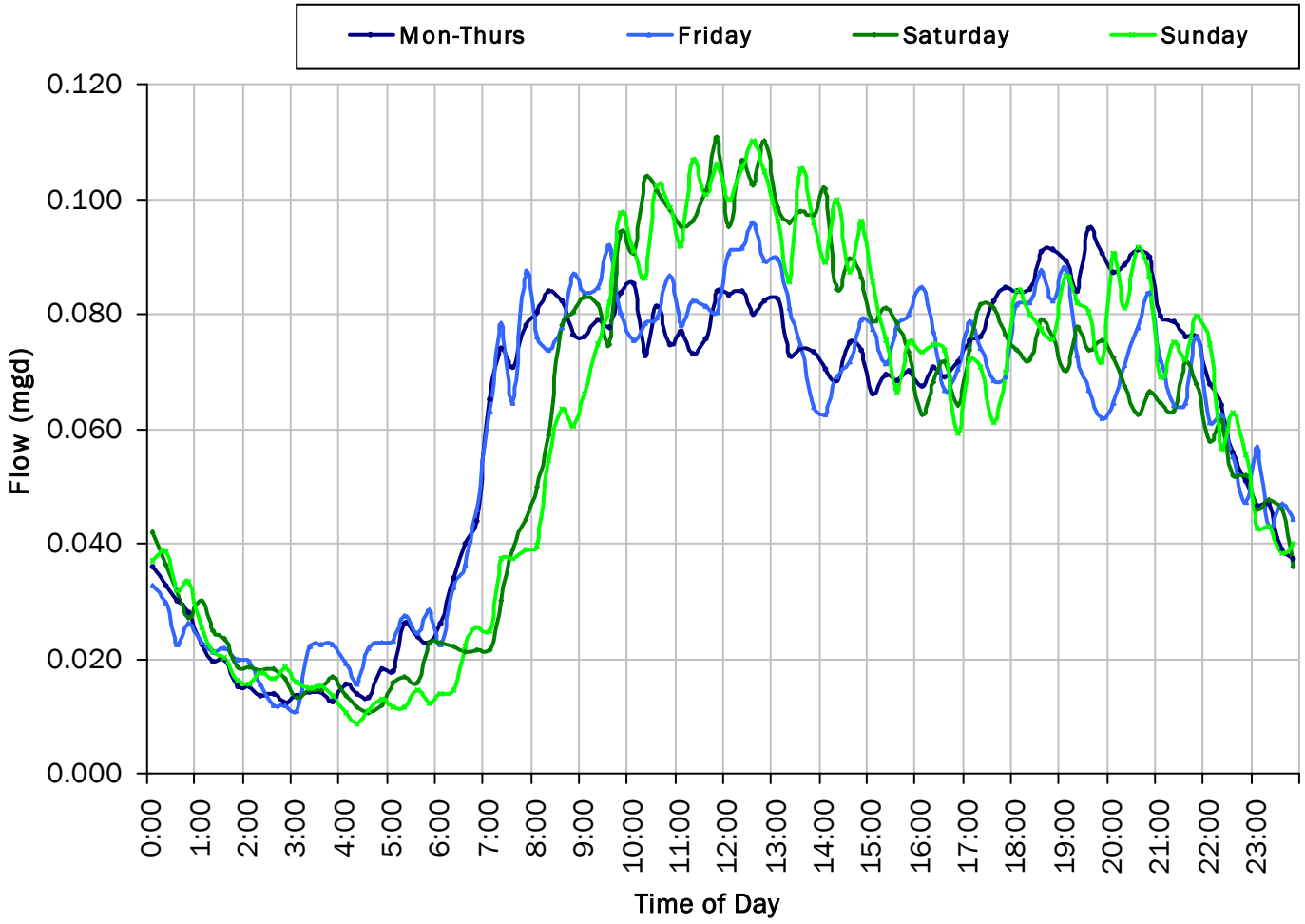
Flow Summary: 3/15/2021 to 4/14/2021

Total Period Rainfall: 0.27 inches Avg Flow: 0.068 mgd Peak Flow: 0.204 mgd Min Flow: 0.009 mgd



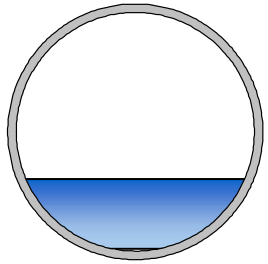


FM 1-10
Average Dry Weather Flow Hydrographs



ADWF:

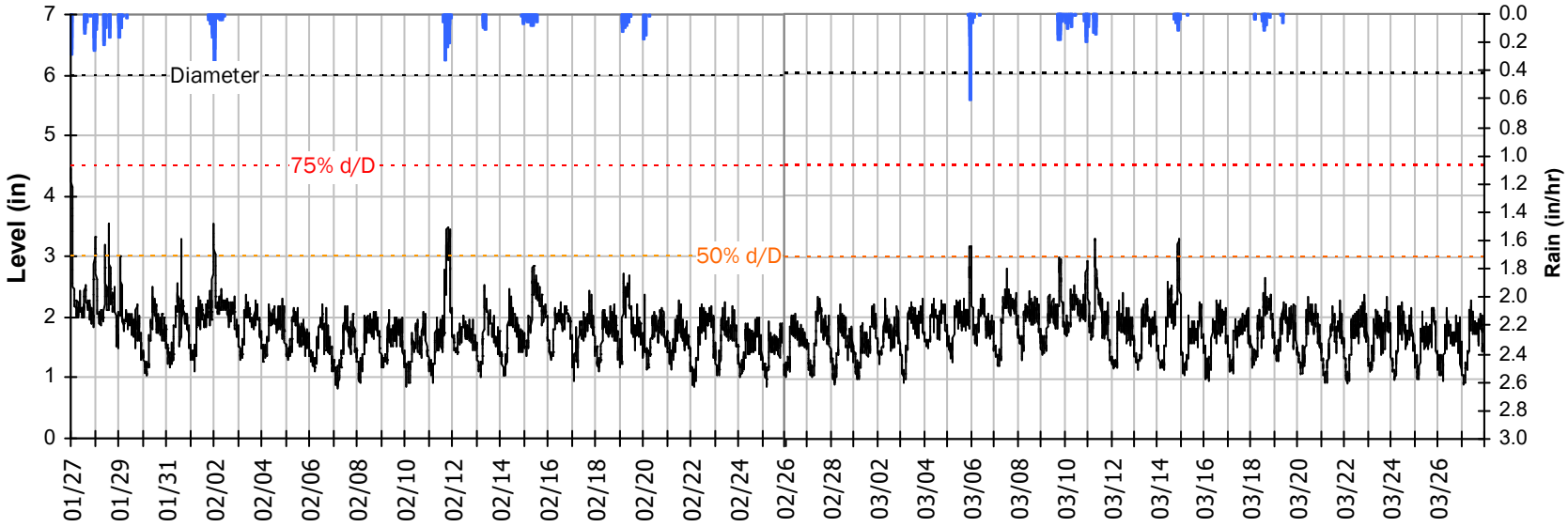
0.060 *mgd*

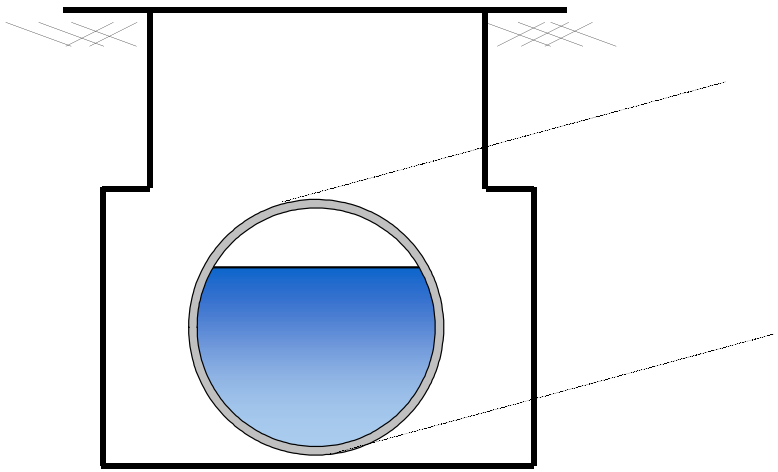


FM 1-10

Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Monitoring Period

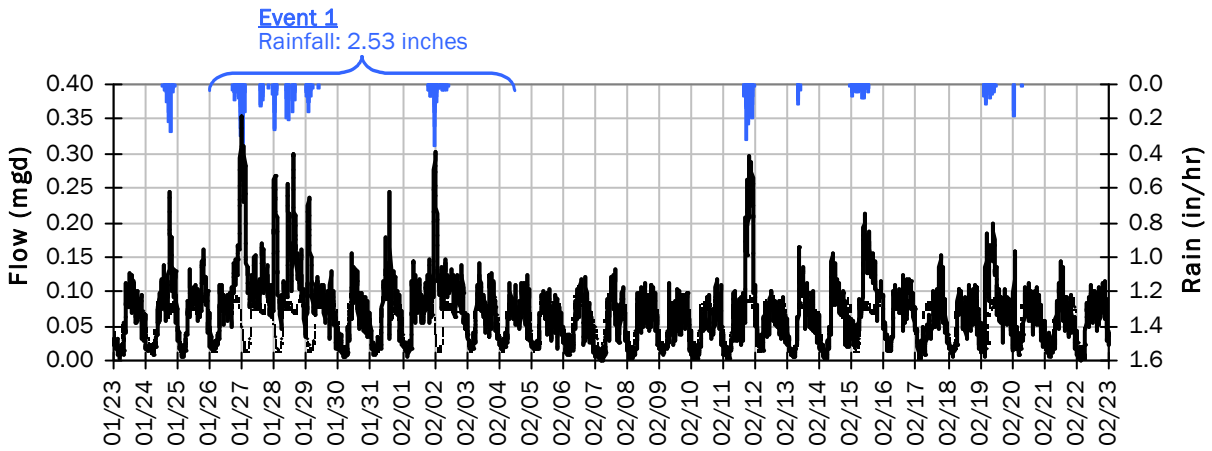




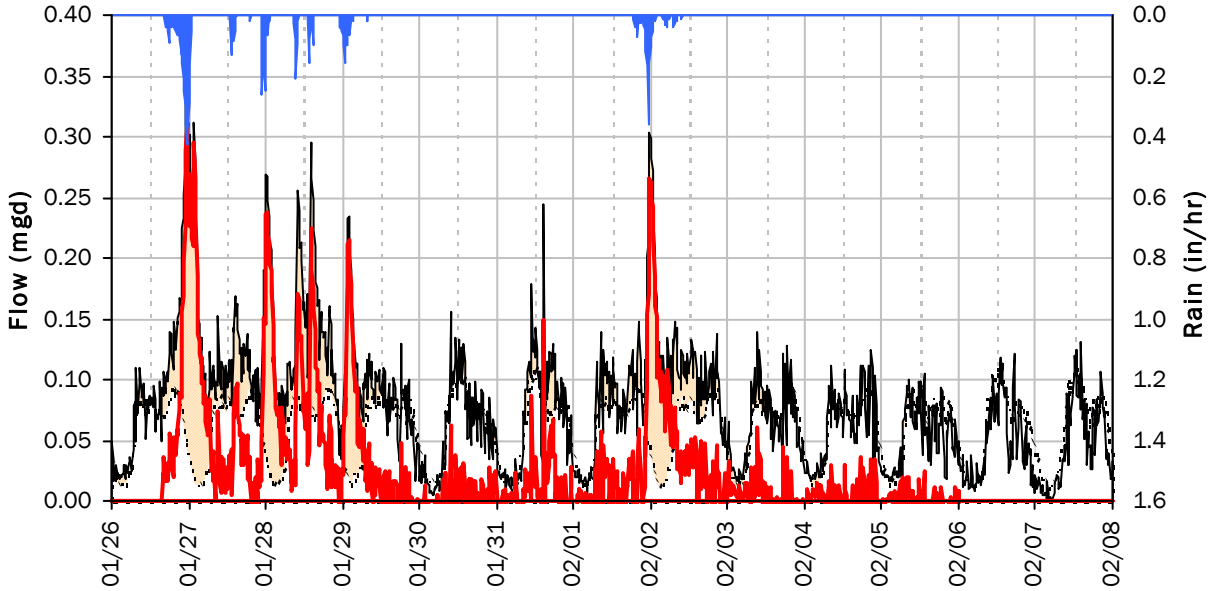
Pipe Diameter:	6	*inches*
Peak Measured Level:	4.46	*inches*
Peak d/D Ratio:	0.74	

FM 1-10
I/I Summary: Event 1

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



Event 1 Detail Graph

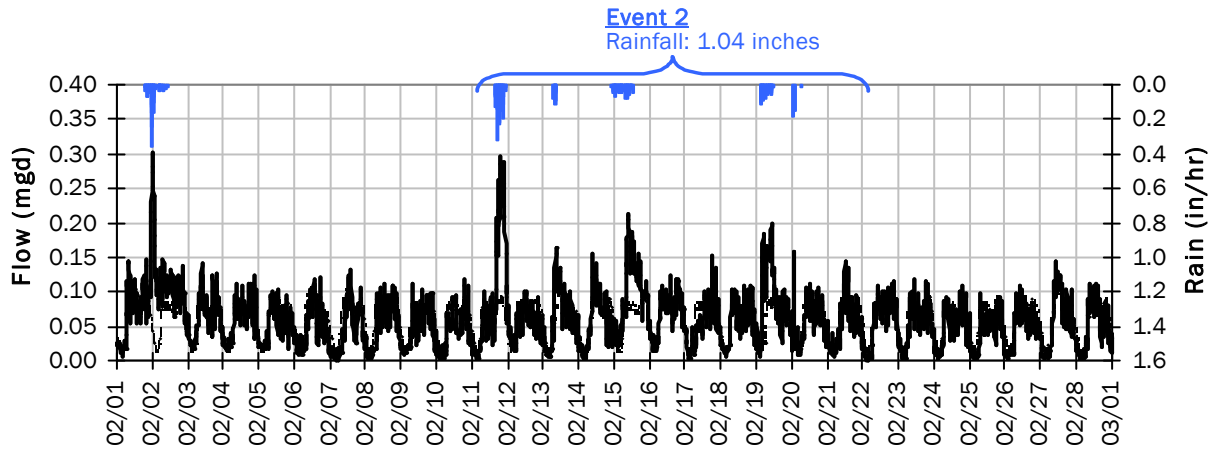


Storm Event I/I Analysis (Rain = 2.53 inches)

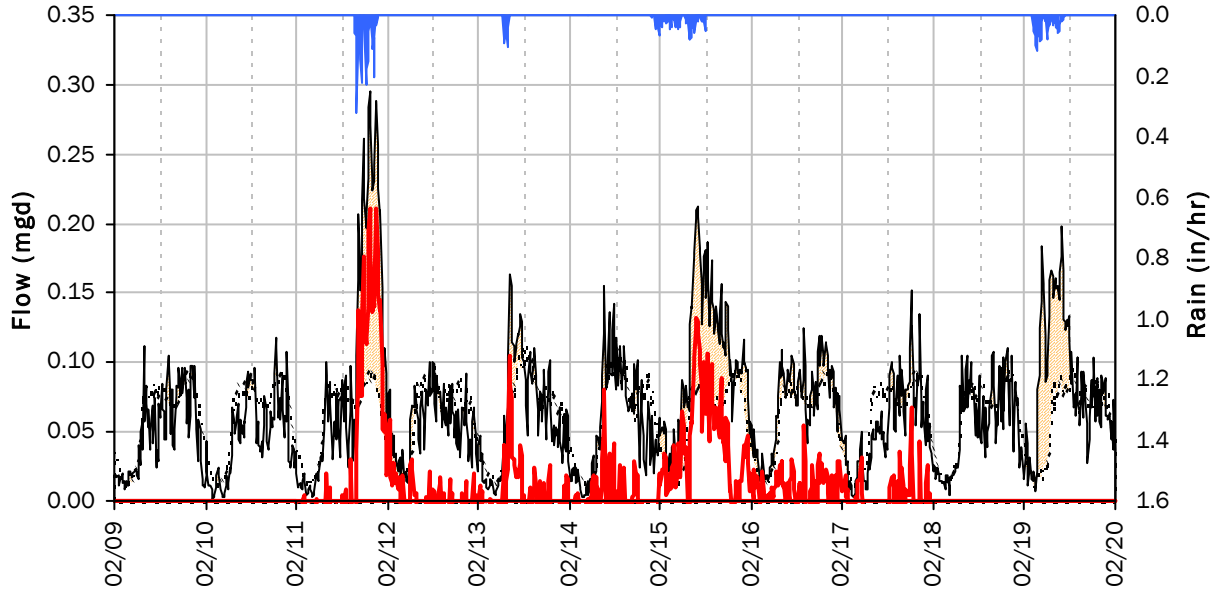
Capacity		Inflow / Infiltration	
Peak Flow:	0.35 *mgd*	**Peak I/I Rate:**	0.31 *mgd*
PF:	5.89	**Total I/I:**	295,000 *gallons*
Peak Level:	4.46 *in*		
d/D Ratio:	0.74		

FM 1-10
I/I Summary: Event 2

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



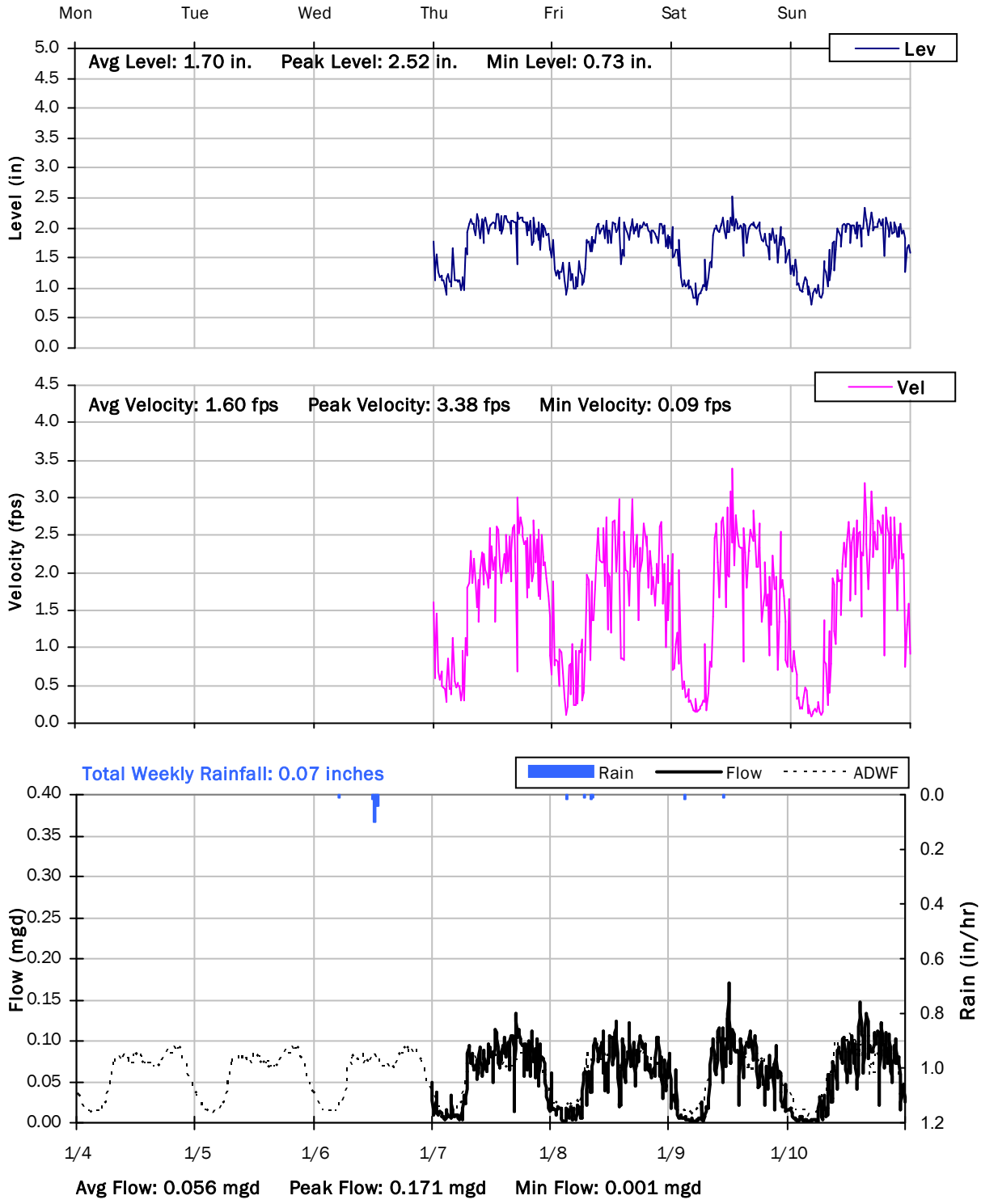
Event 2 Detail Graph



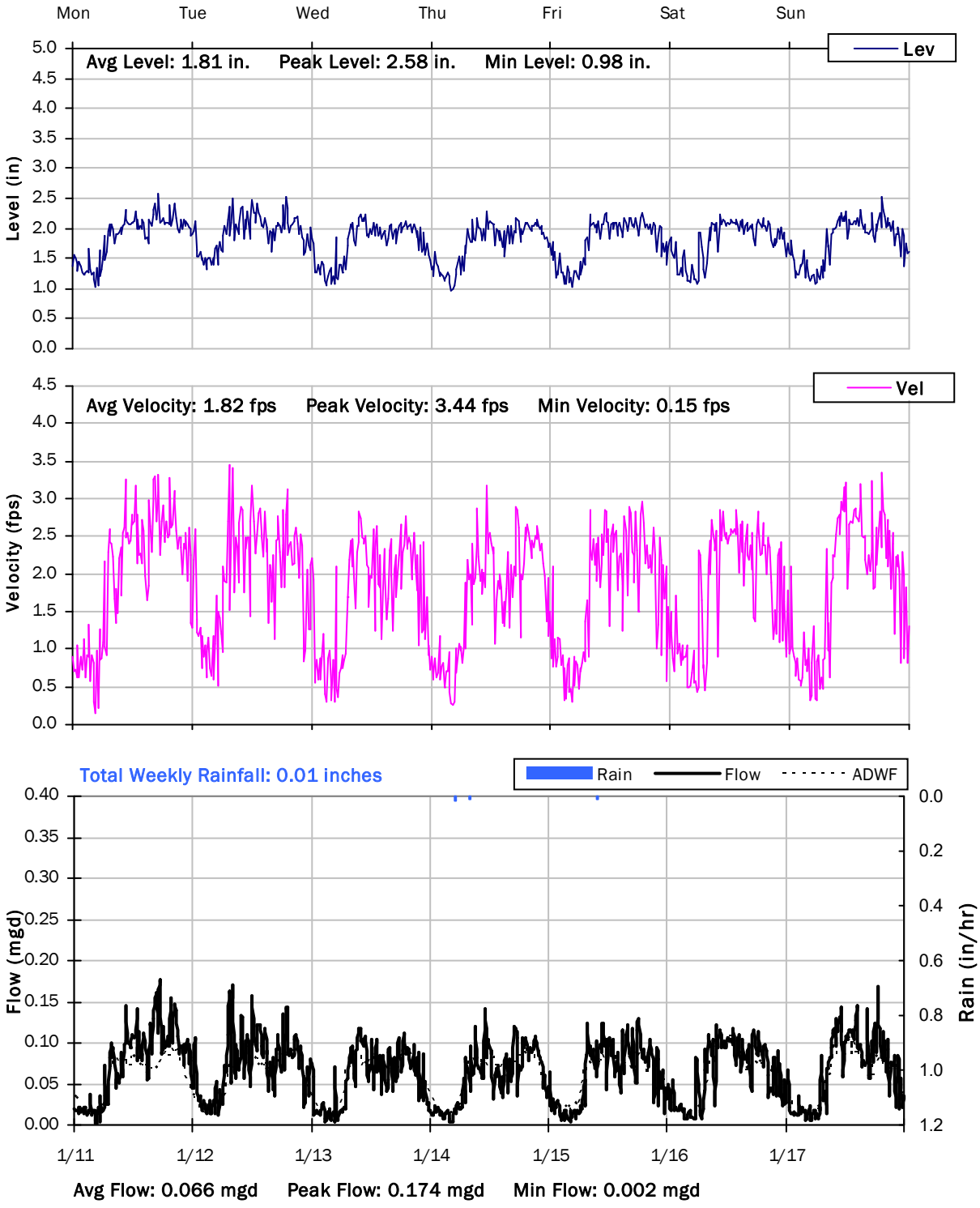
Storm Event I/I Analysis (Rain = 1.04 inches)

Capacity		Inflow / Infiltration	
Peak Flow:	0.30 *mgd*	**Peak I/I Rate:**	0.21 *mgd*
PF:	4.95	**Total I/I:**	76,000 *gallons*
Peak Level:	3.49 *in*		
d/D Ratio:	0.58		

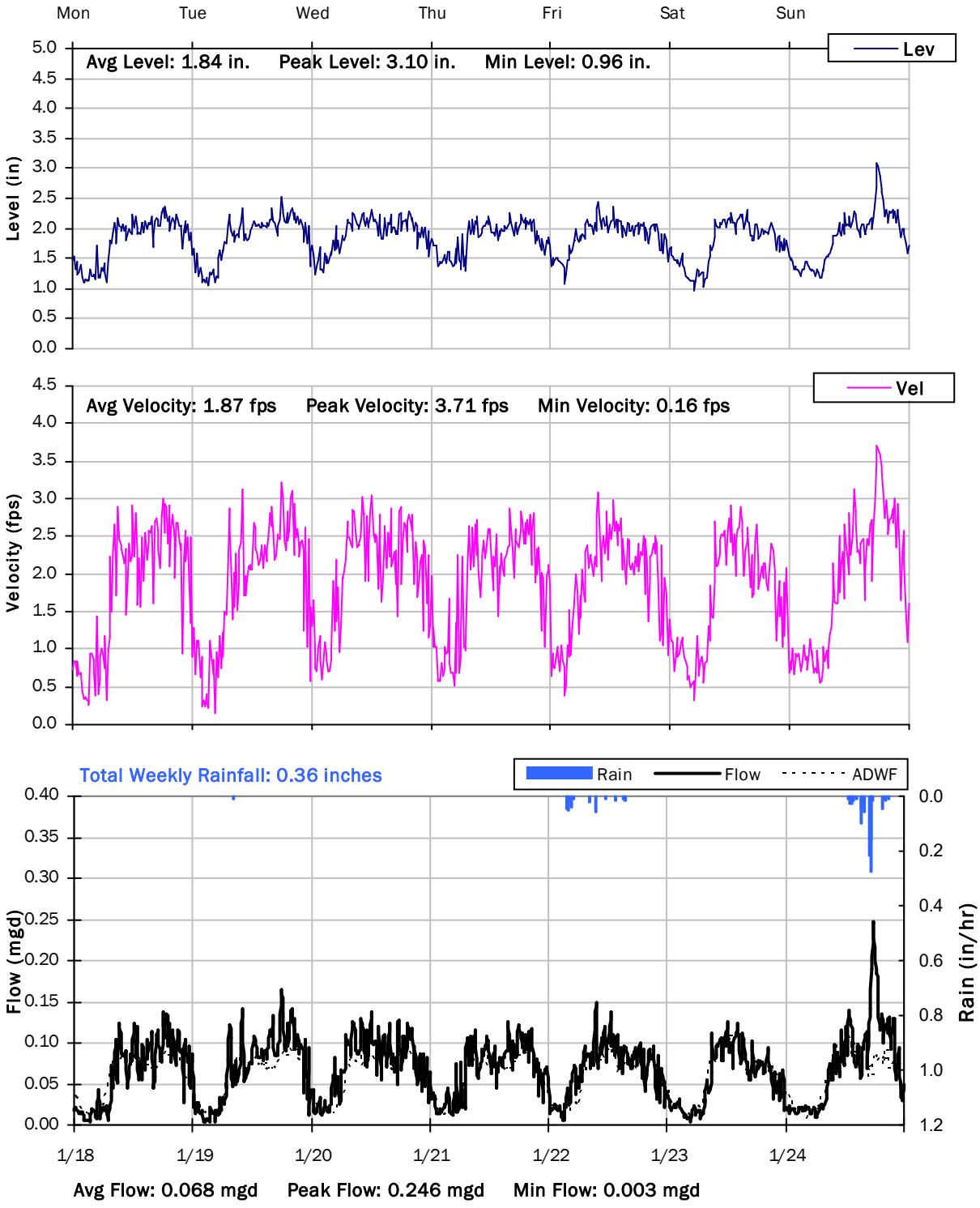
FM 1-10
Weekly Level, Velocity and Flow Hydrographs
1/4/2021 to 1/11/2021



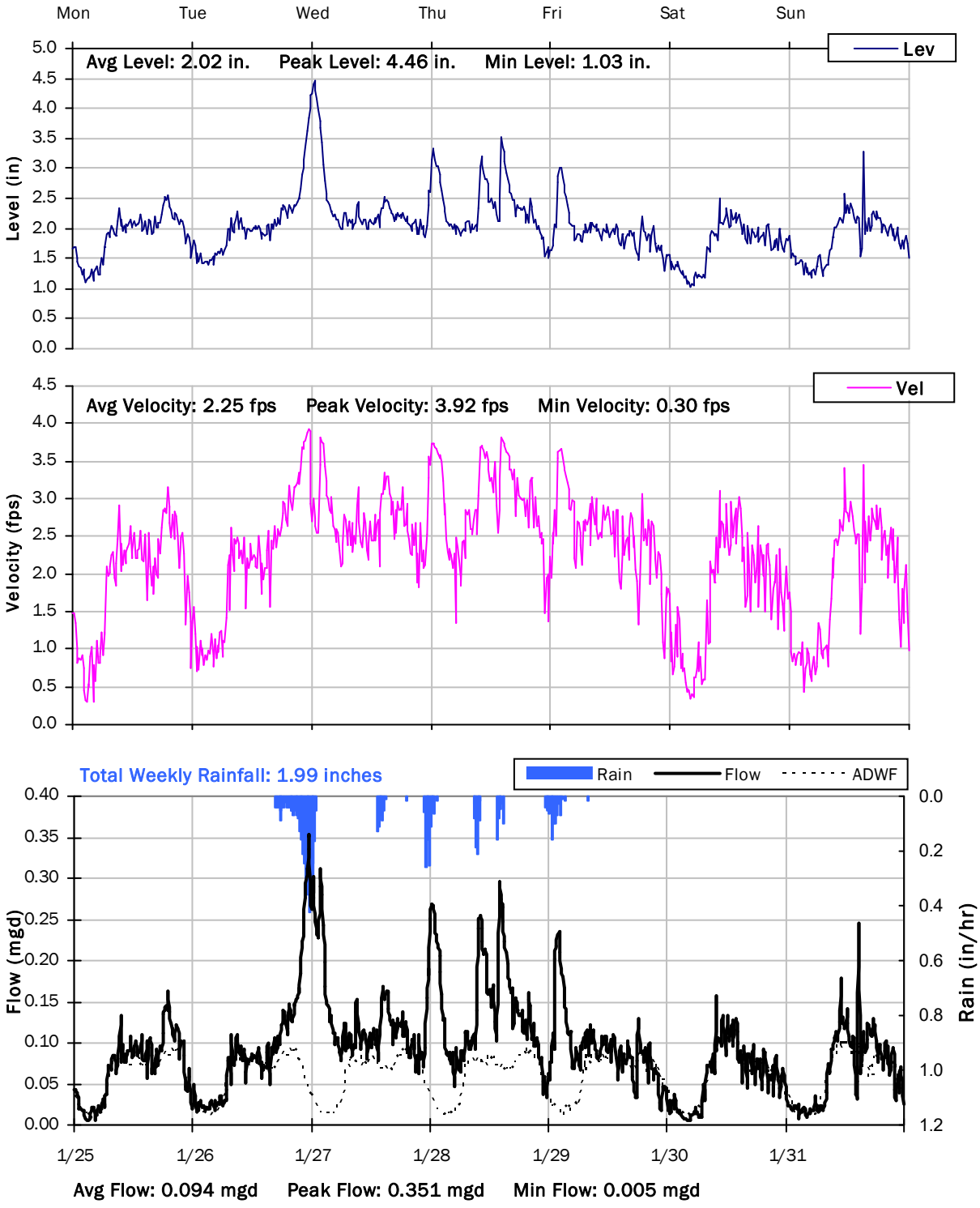
FM 1-10
Weekly Level, Velocity and Flow Hydrographs
1/11/2021 to 1/18/2021



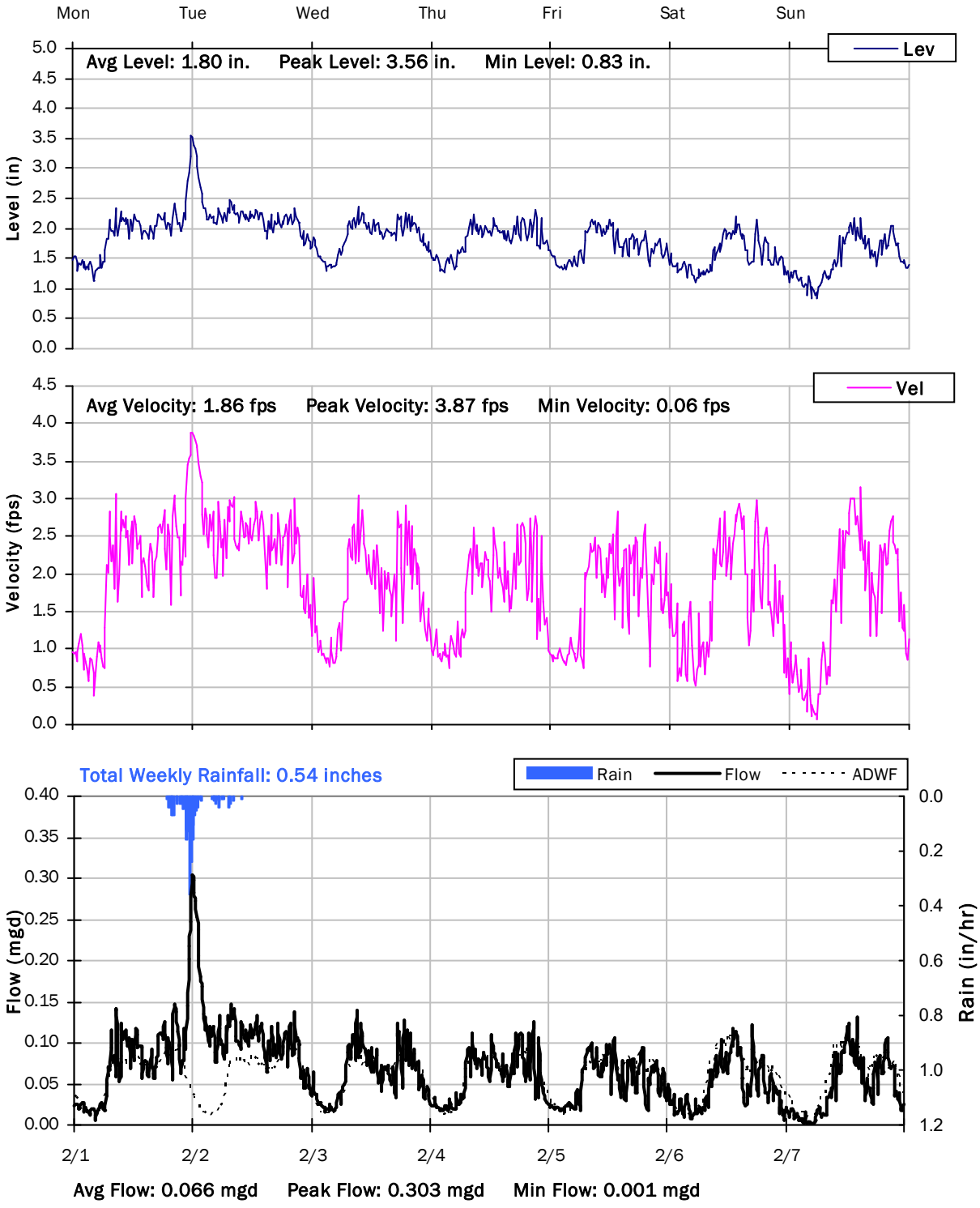
FM 1-10
Weekly Level, Velocity and Flow Hydrographs
1/18/2021 to 1/25/2021



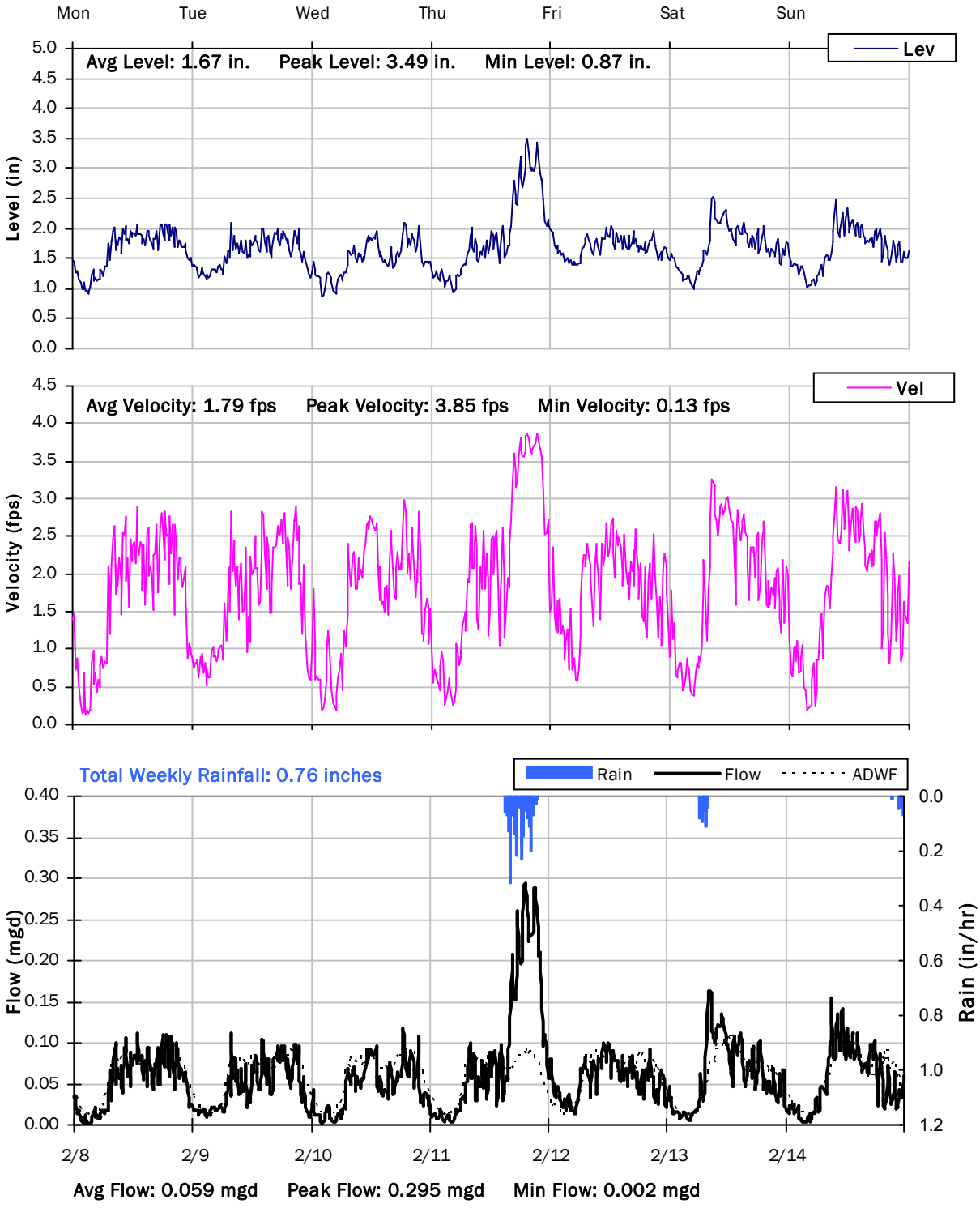
FM 1-10
Weekly Level, Velocity and Flow Hydrographs
1/25/2021 to 2/1/2021



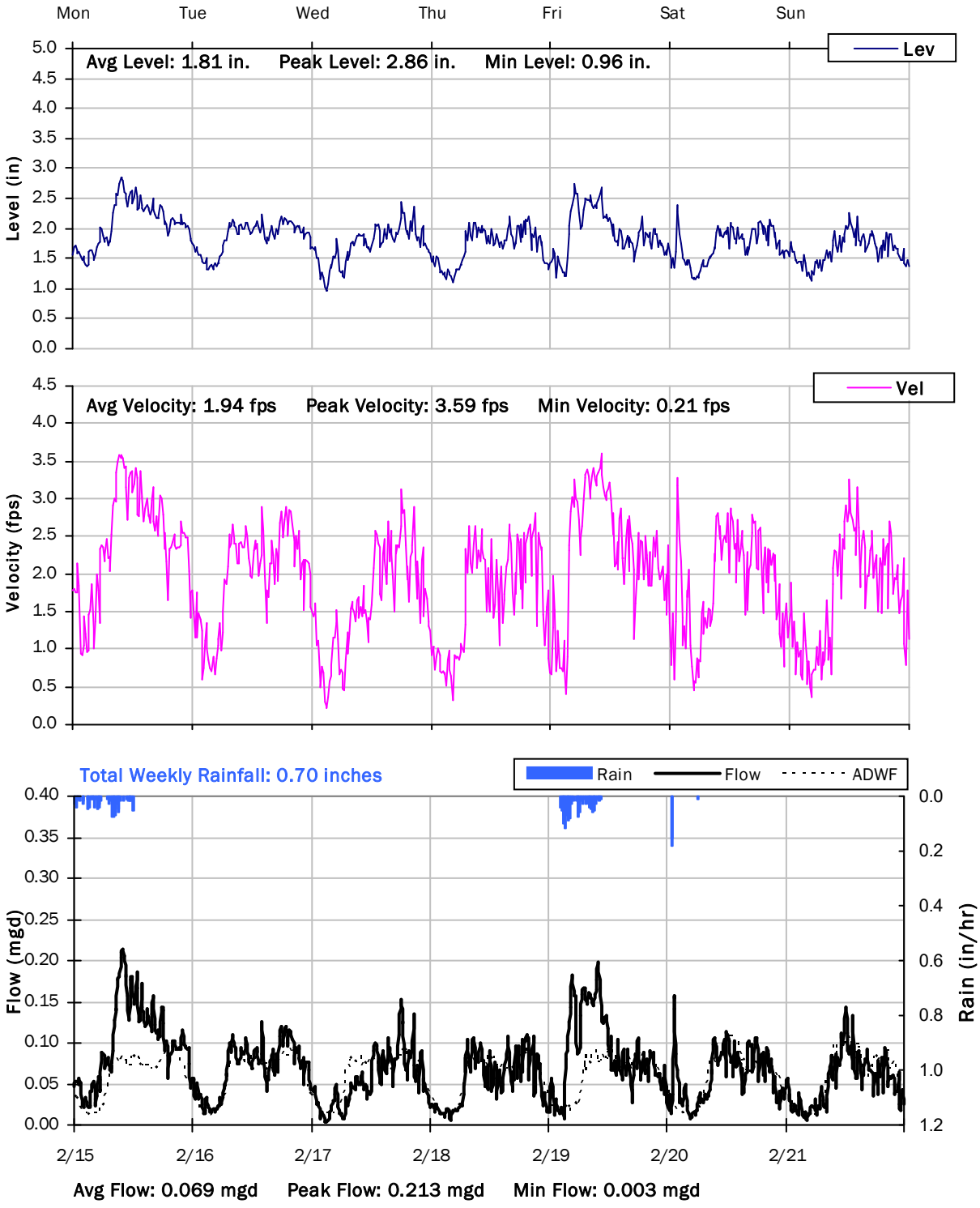
FM 1-10
Weekly Level, Velocity and Flow Hydrographs
2/1/2021 to 2/8/2021



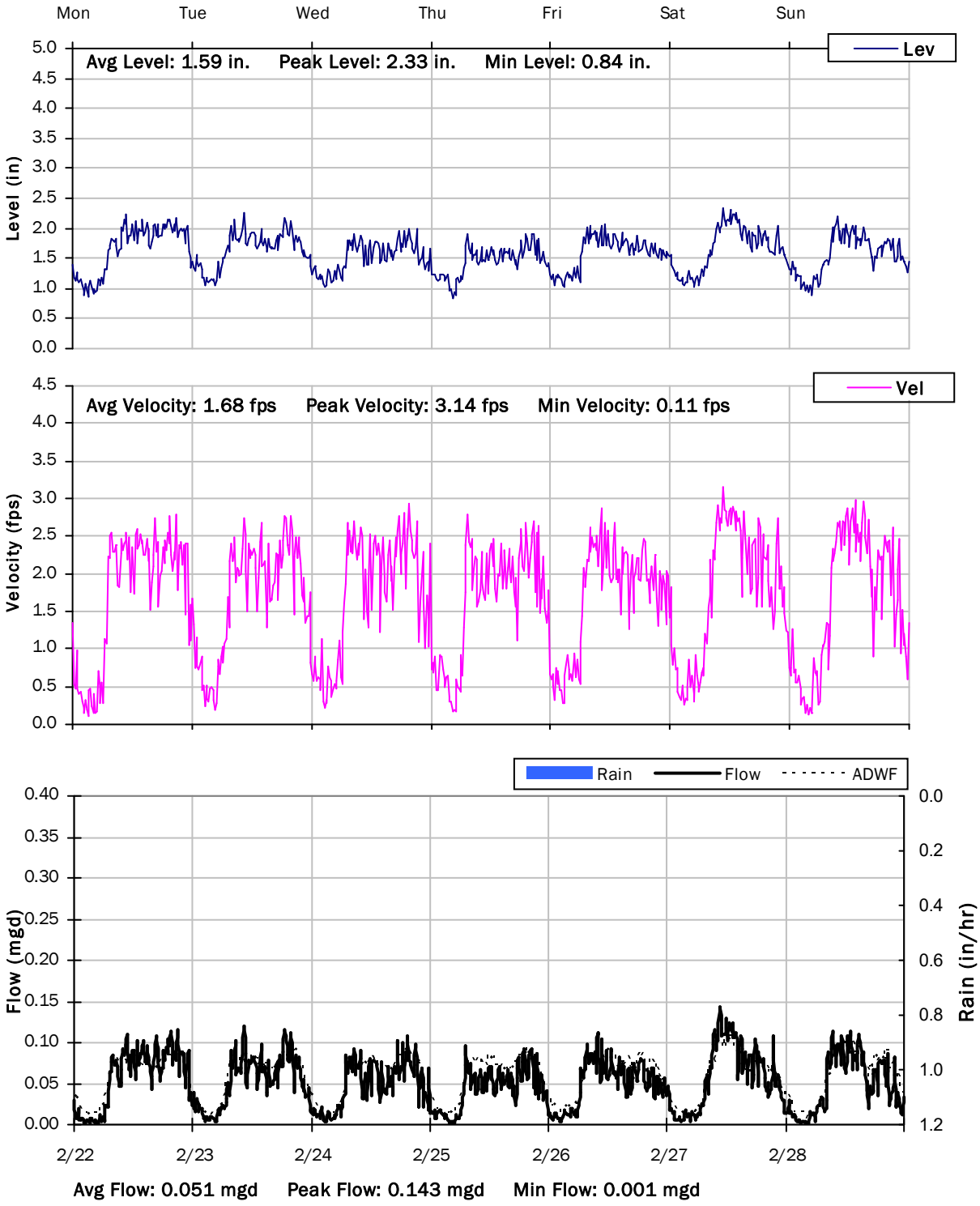
FM 1-10
Weekly Level, Velocity and Flow Hydrographs
2/8/2021 to 2/15/2021



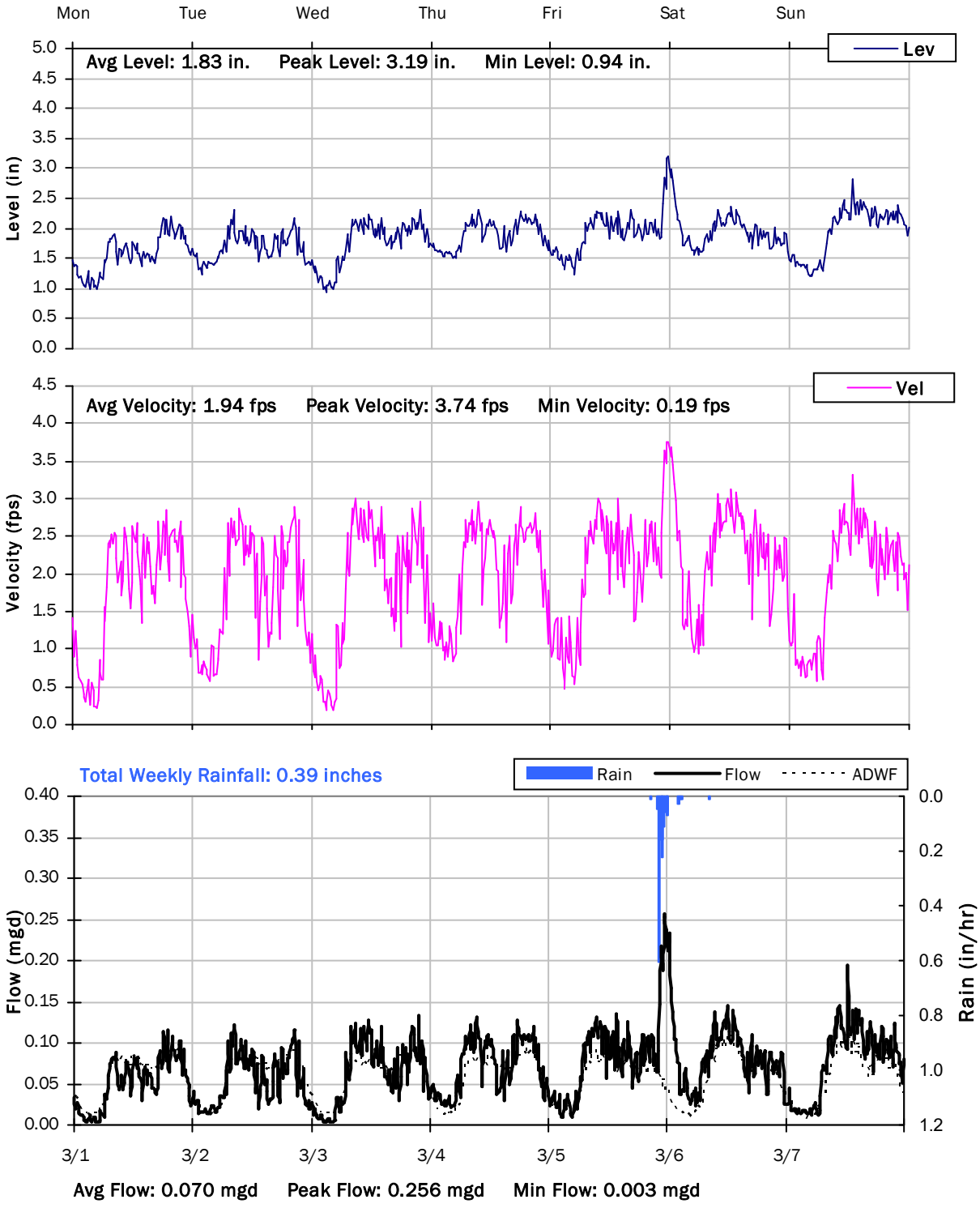
FM 1-10
Weekly Level, Velocity and Flow Hydrographs
2/15/2021 to 2/22/2021



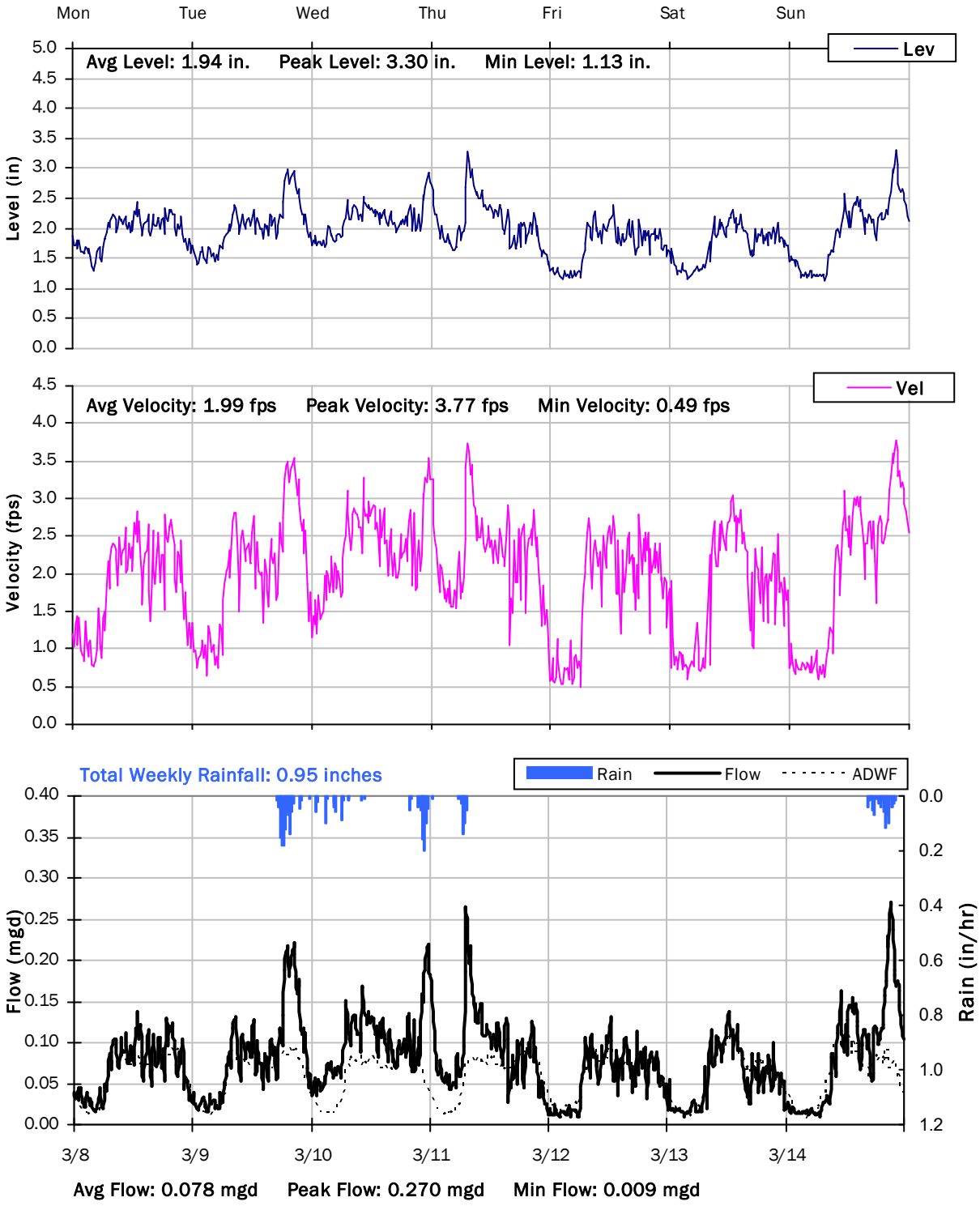
FM 1-10
Weekly Level, Velocity and Flow Hydrographs
2/22/2021 to 3/1/2021



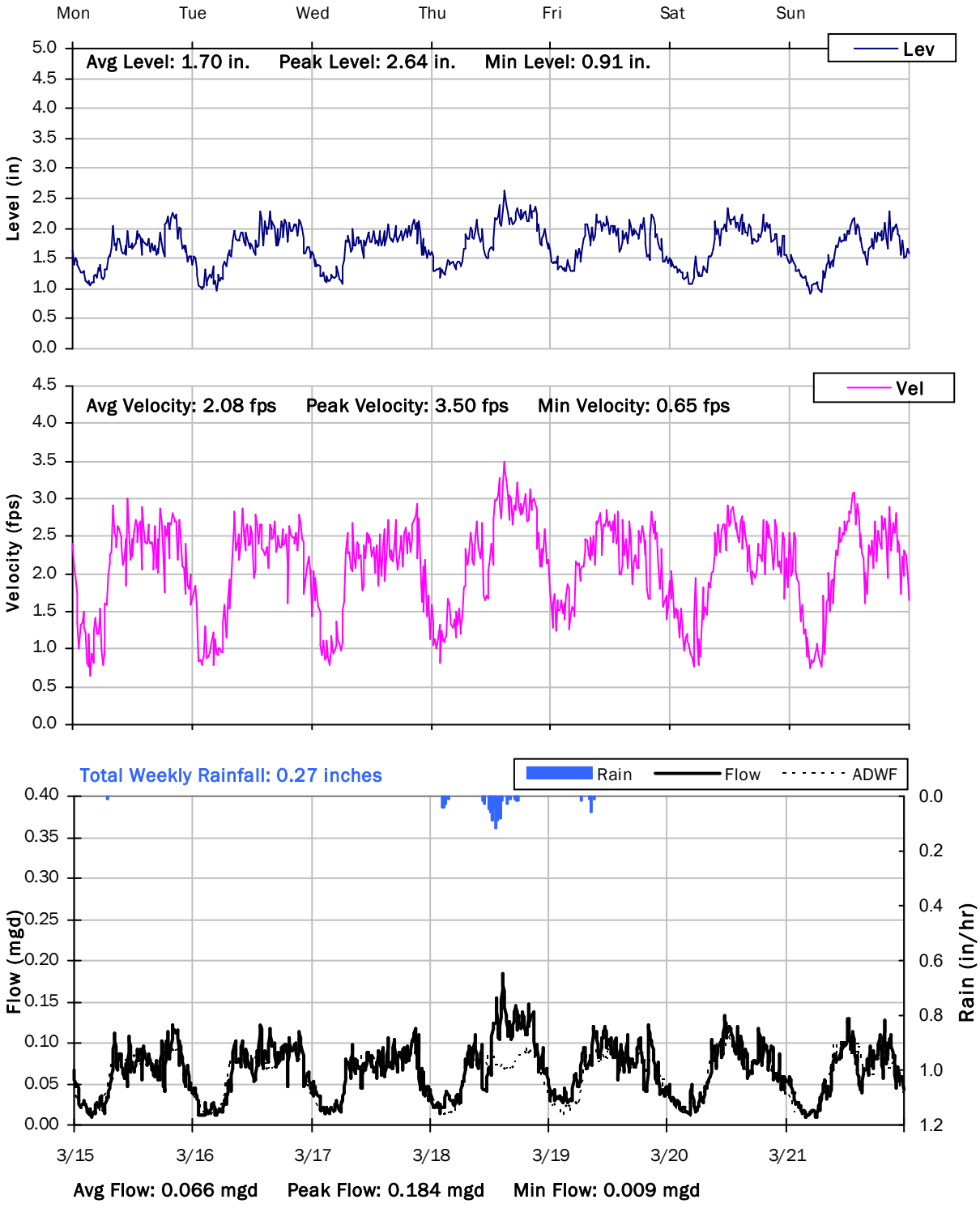
FM 1-10
Weekly Level, Velocity and Flow Hydrographs
3/1/2021 to 3/8/2021



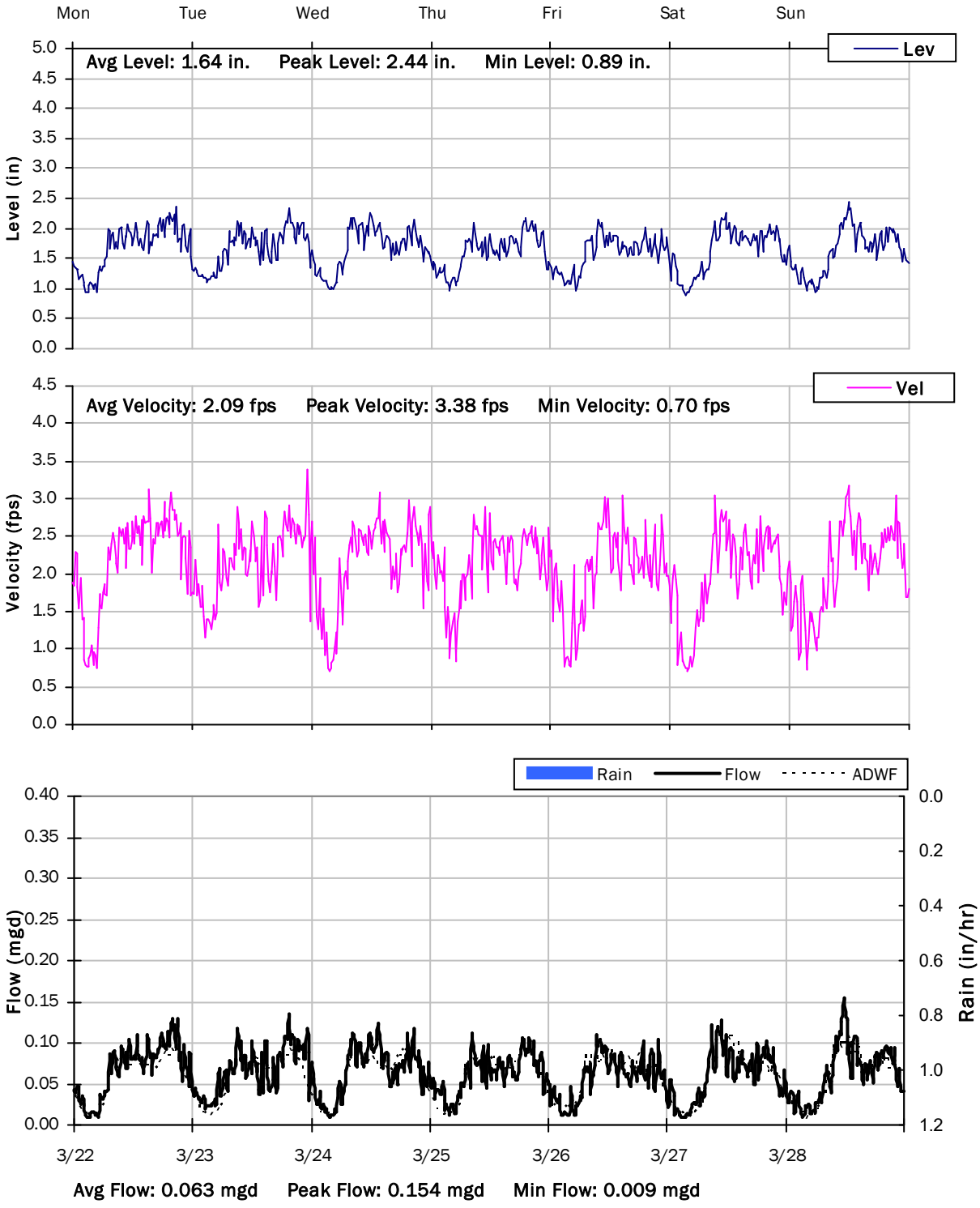
FM 1-10
Weekly Level, Velocity and Flow Hydrographs
3/8/2021 to 3/15/2021



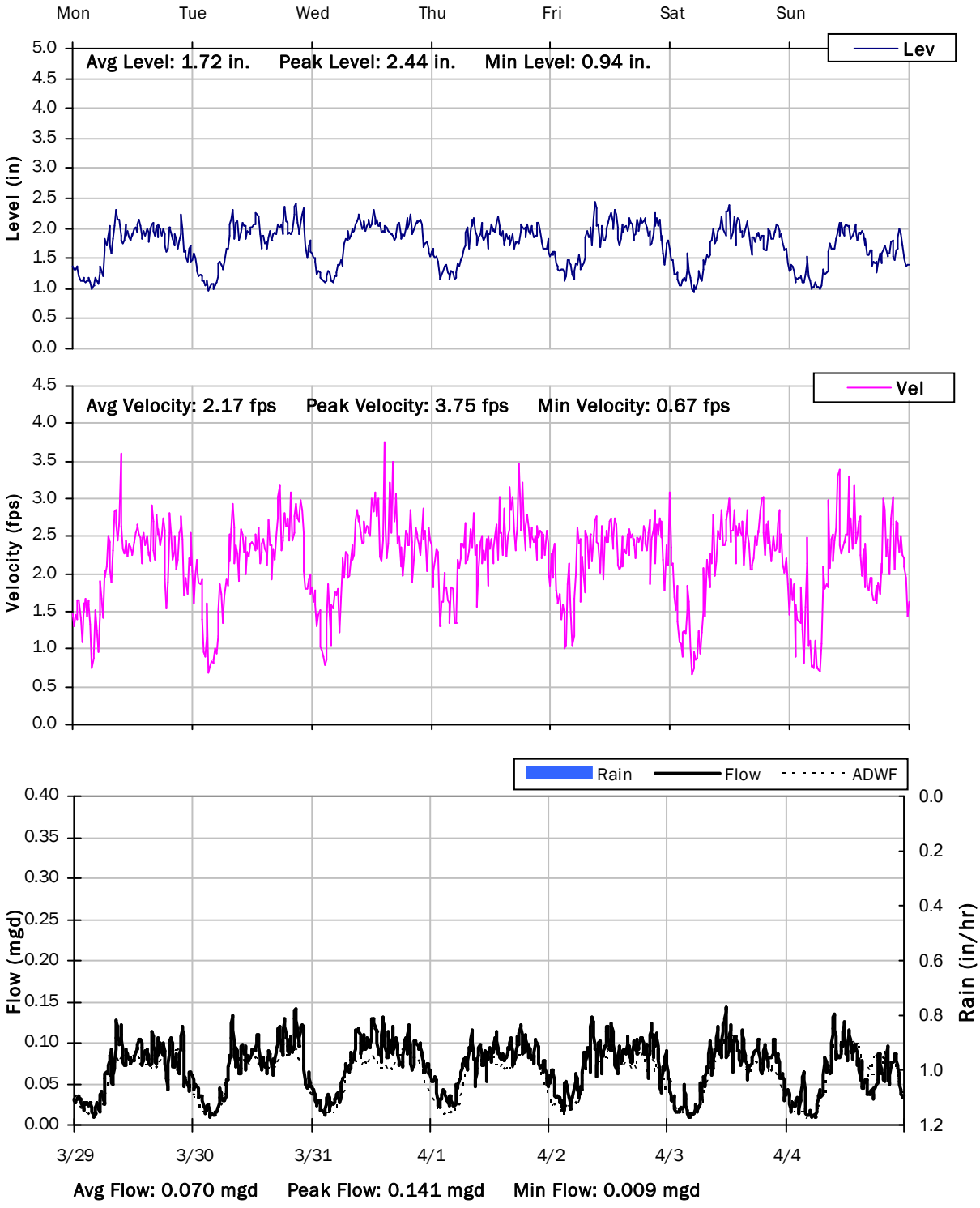
FM 1-10
Weekly Level, Velocity and Flow Hydrographs
3/15/2021 to 3/22/2021



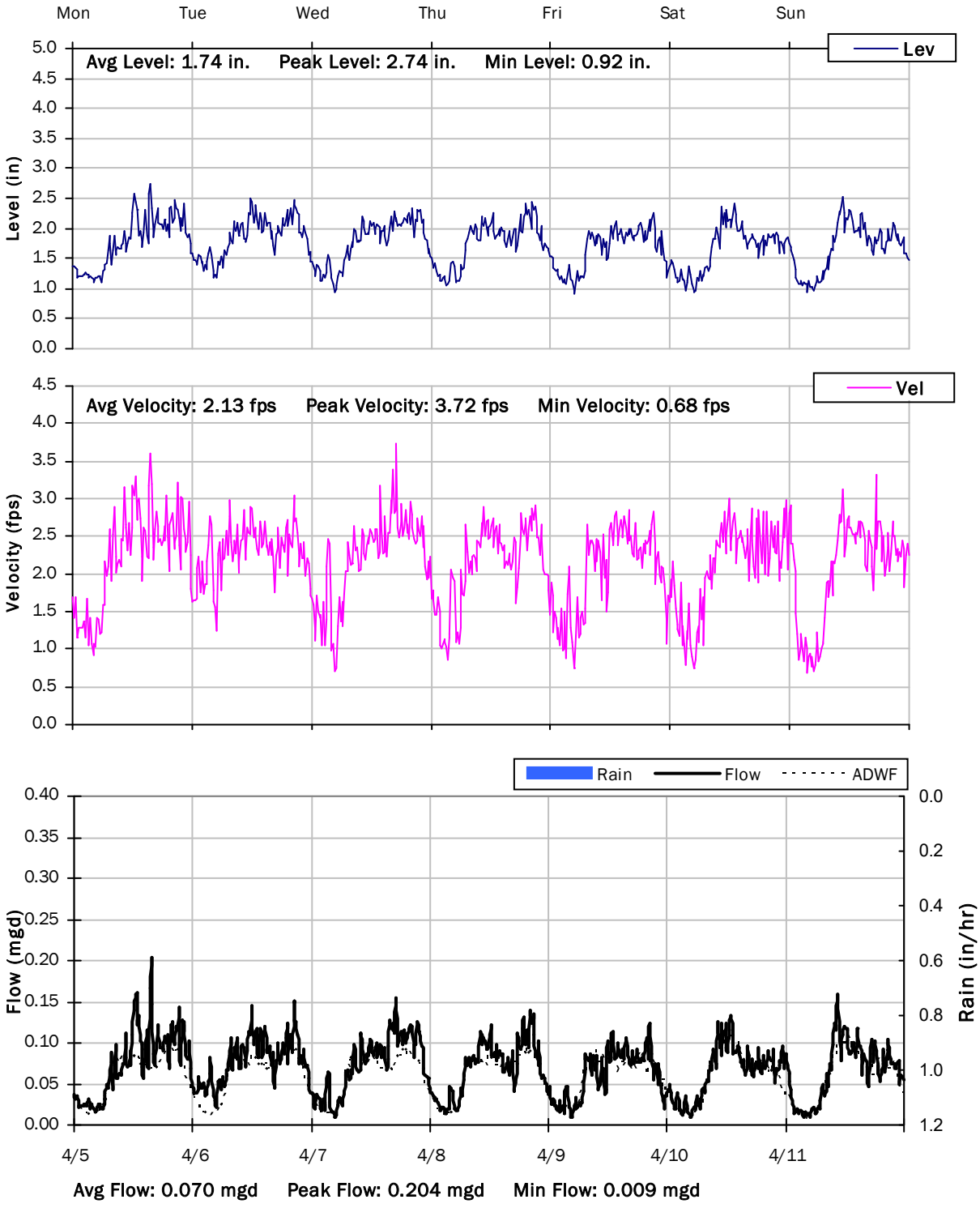
FM 1-10
Weekly Level, Velocity and Flow Hydrographs
3/22/2021 to 3/29/2021



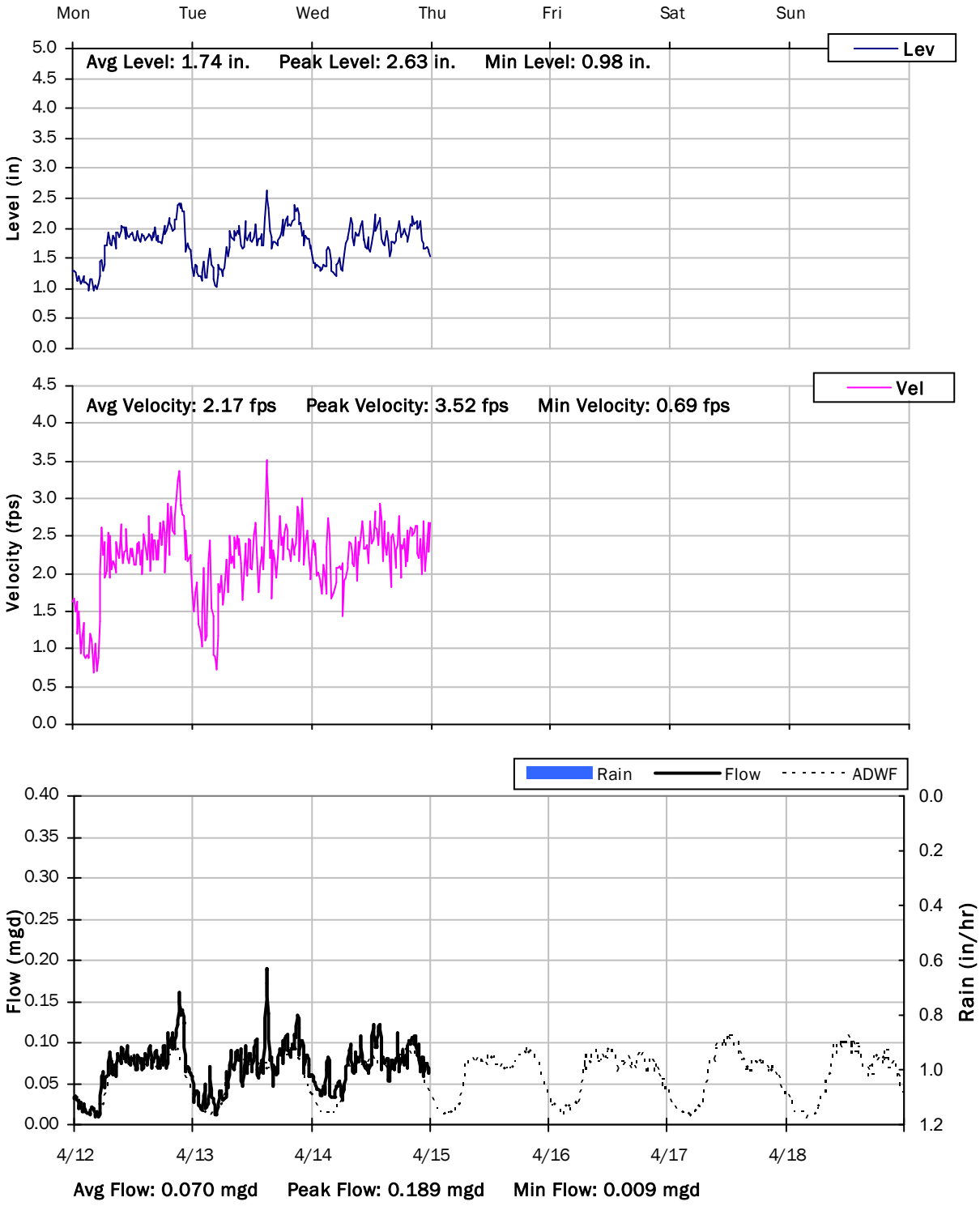
FM 1-10
Weekly Level, Velocity and Flow Hydrographs
3/29/2021 to 4/5/2021



FM 1-10
Weekly Level, Velocity and Flow Hydrographs
4/5/2021 to 4/12/2021



FM 1-10
Weekly Level, Velocity and Flow Hydrographs
4/12/2021 to 4/19/2021



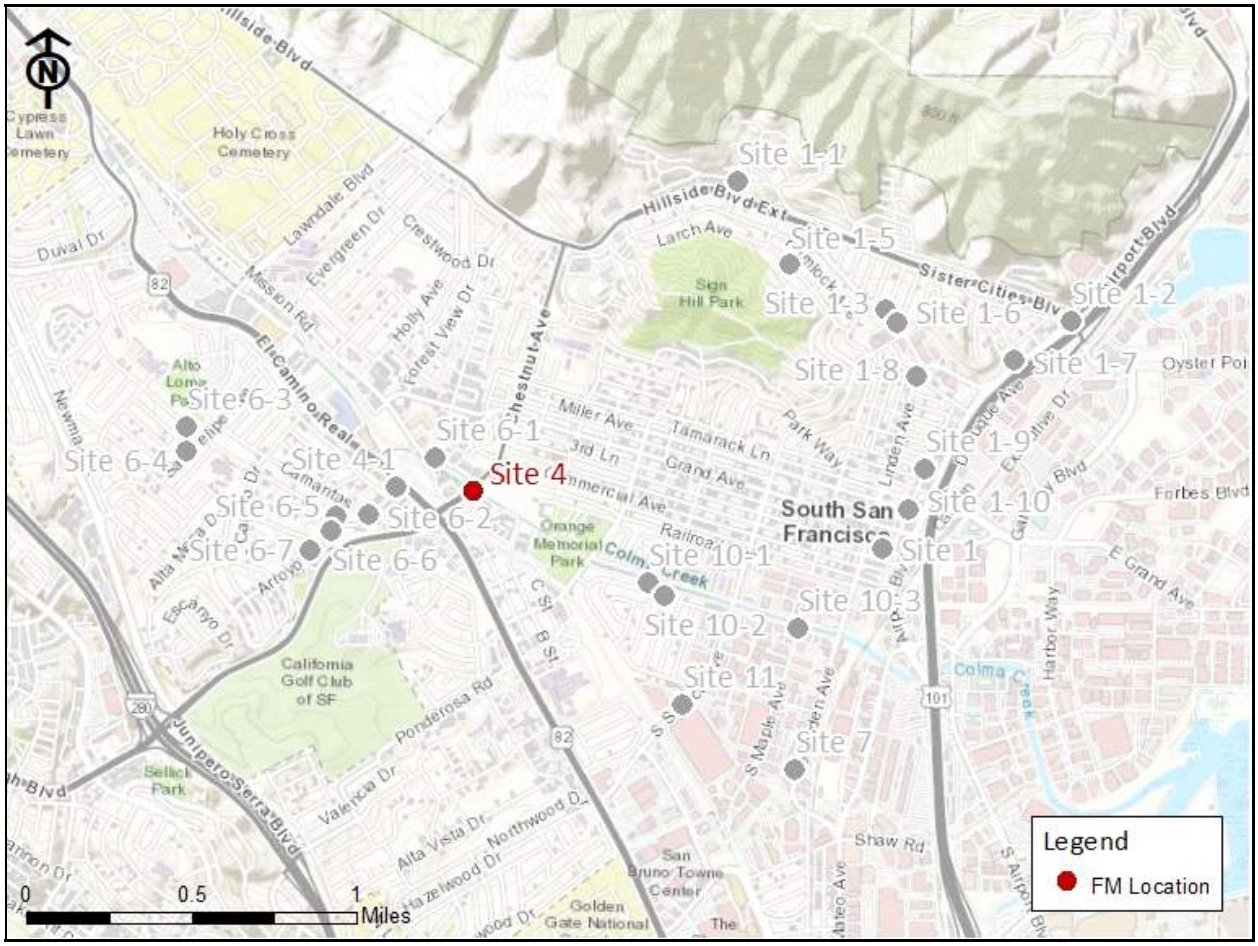
South San Francisco, CA

Sanitary Sewer Flow Monitoring
January 4 - April 14, 2021

Monitoring Site: FM 4

Location: Chestnut Avenue south of Mission Road

Data Summary Report



Vicinity Map: FM 4

FM 4

Site Information

Location: Chestnut Avenue south of Mission Road

Coordinates: 122.4322° W, 37.6562° N

Rim Elevation (Earth): 39 feet

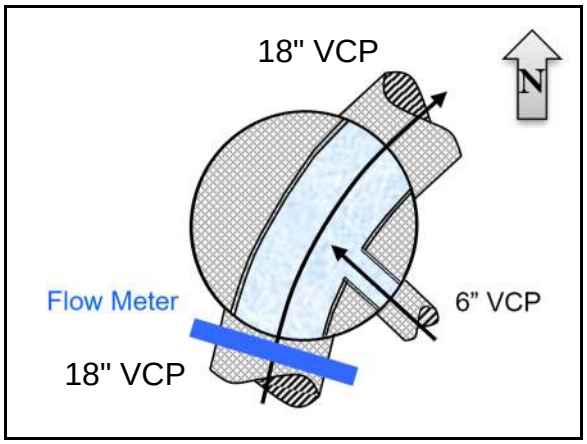
Pipe Diameter: 18 inches

ADWF: 0.106 mgd

Peak Measured Flow: 0.461 mgd

Satellite Map

Sanitary Map



Flow Sketch

Street View

Plan View

FM 4

Additional Site Photos

Effluent Pipe

Monitored Northwest Influent Pipe

FM 4

Additional Site Photos

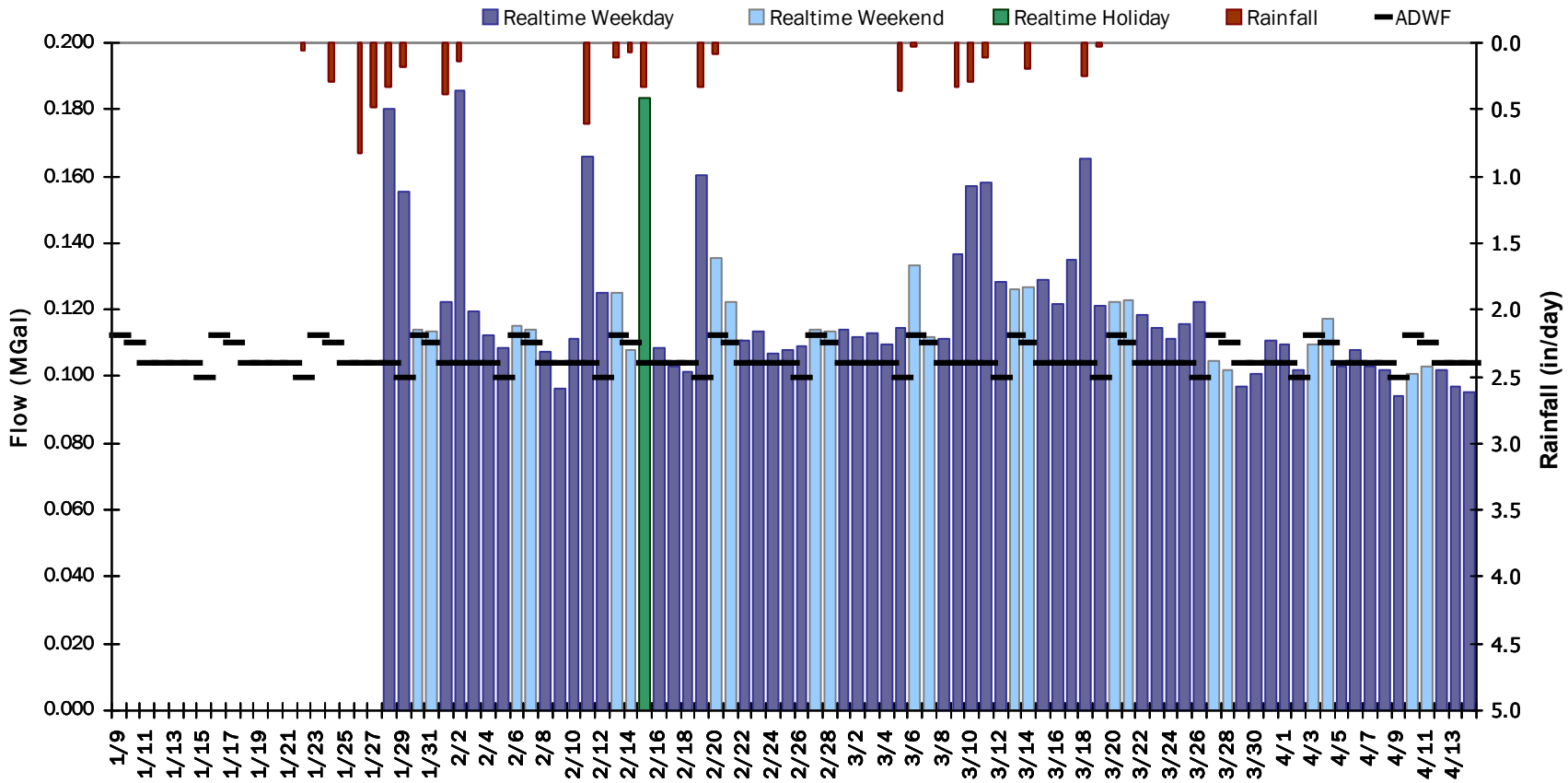
Southwest Influent Pipe

FM 4

Period Flow Summary: Daily Flow Totals

Avg Period Flow: 0.120 MGal Peak Daily Flow: 0.186 MGal Min Daily Flow: 0.094 MGal

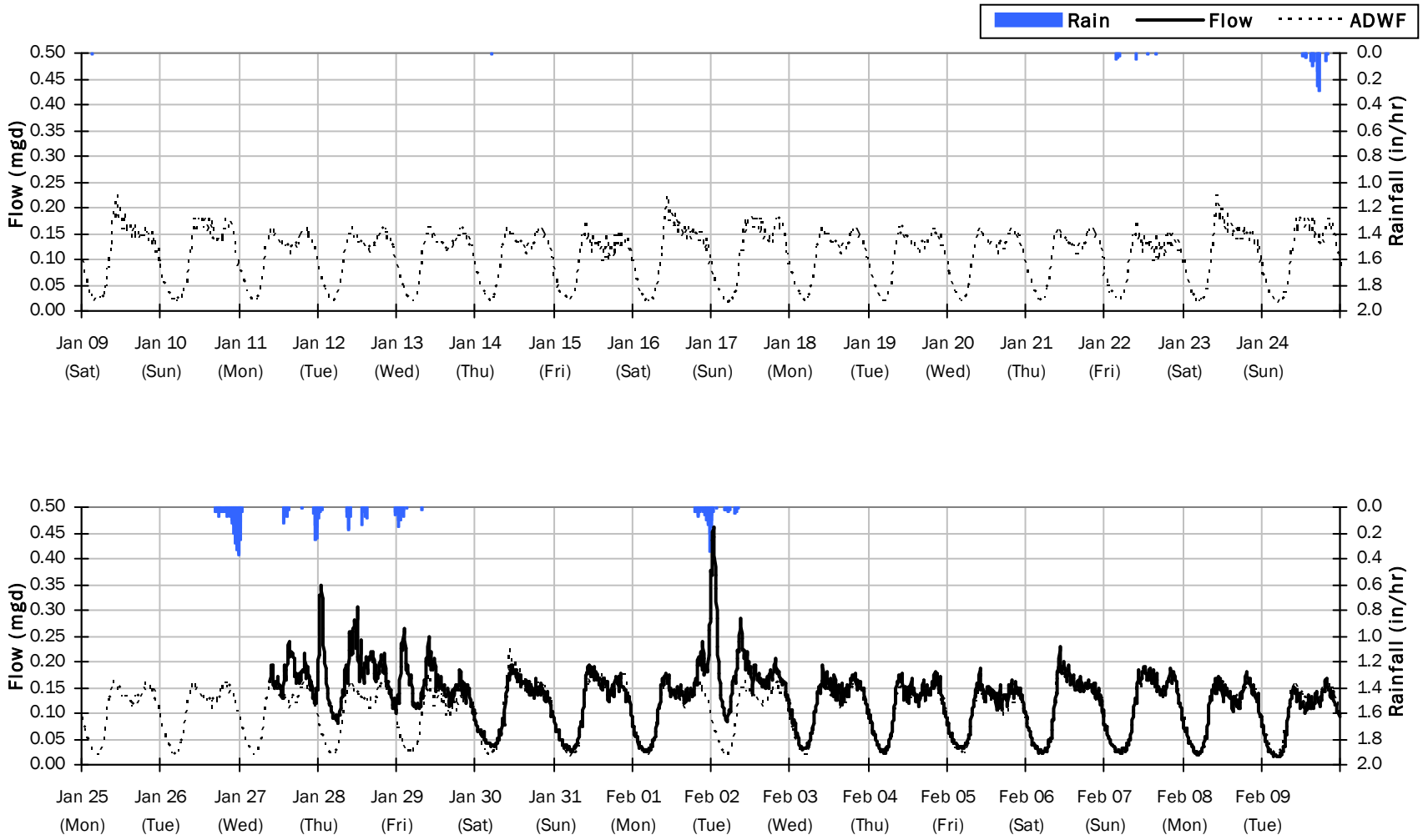
Total Period Rainfall: 4.47 inches



FM 4

Flow Summary: 1/9/2021 to 2/9/2021

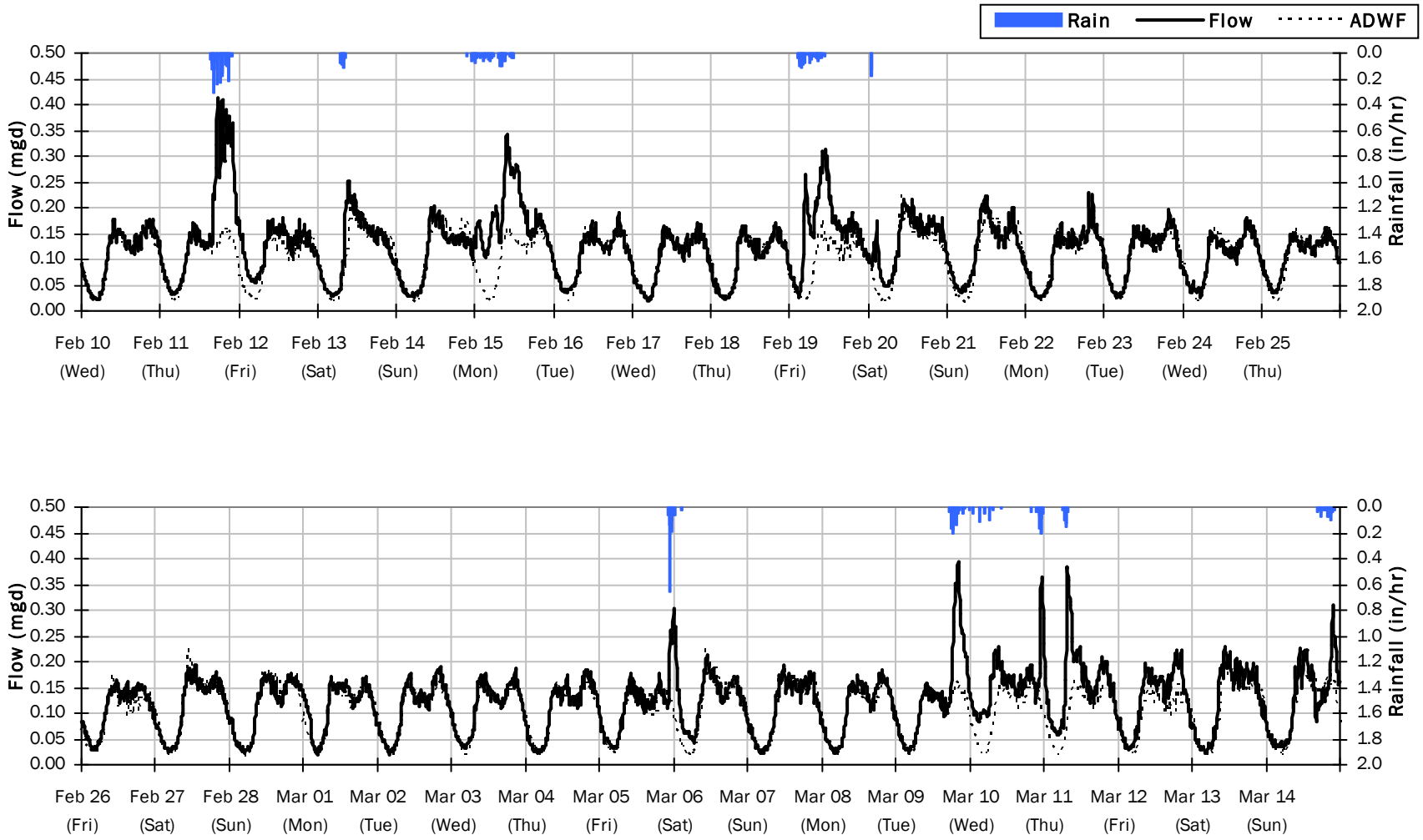
Total Period Rainfall: 2.69 inches Avg Flow: 0.129 mgd Peak Flow: 0.461 mgd Min Flow: 0.016 mgd



FM 4

Flow Summary: 2/10/2021 to 3/14/2021

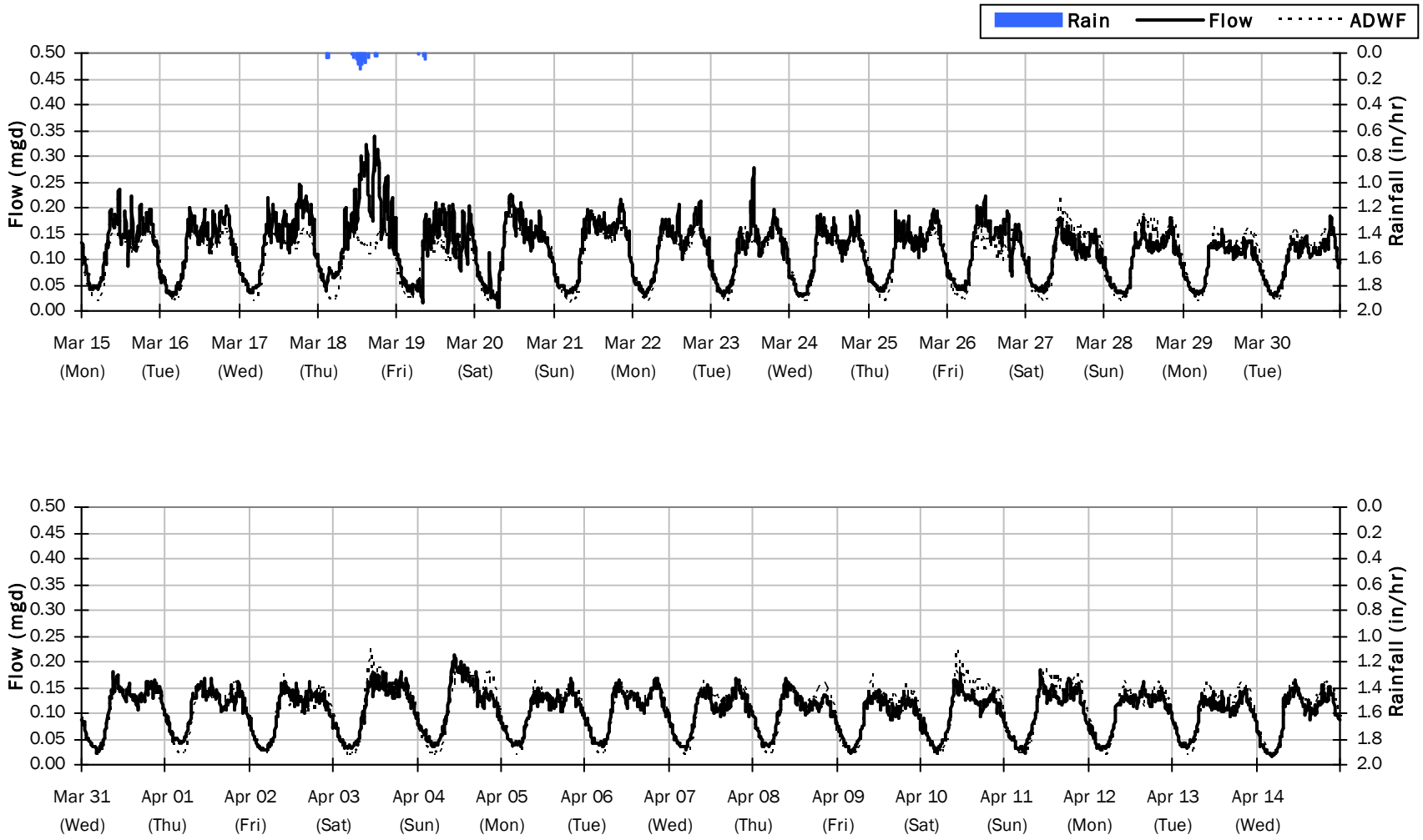
Total Period Rainfall: 2.83 inches Avg Flow: 0.124 mgd Peak Flow: 0.414 mgd Min Flow: 0.018 mgd



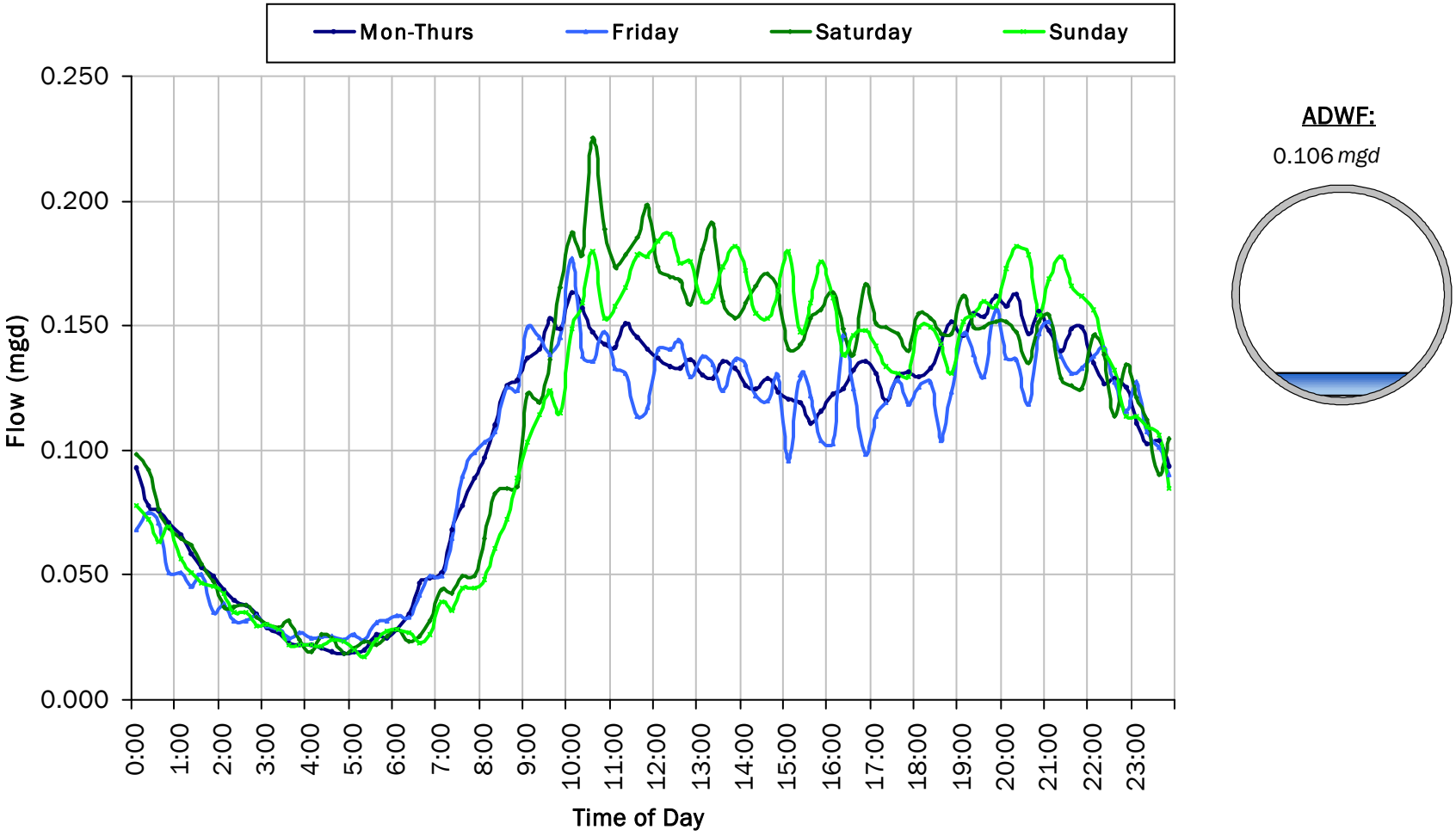
FM 4

Flow Summary: 3/15/2021 to 4/14/2021

Total Period Rainfall: 0.27 inches Avg Flow: 0.112 mgd Peak Flow: 0.335 mgd Min Flow: 0.008 mgd



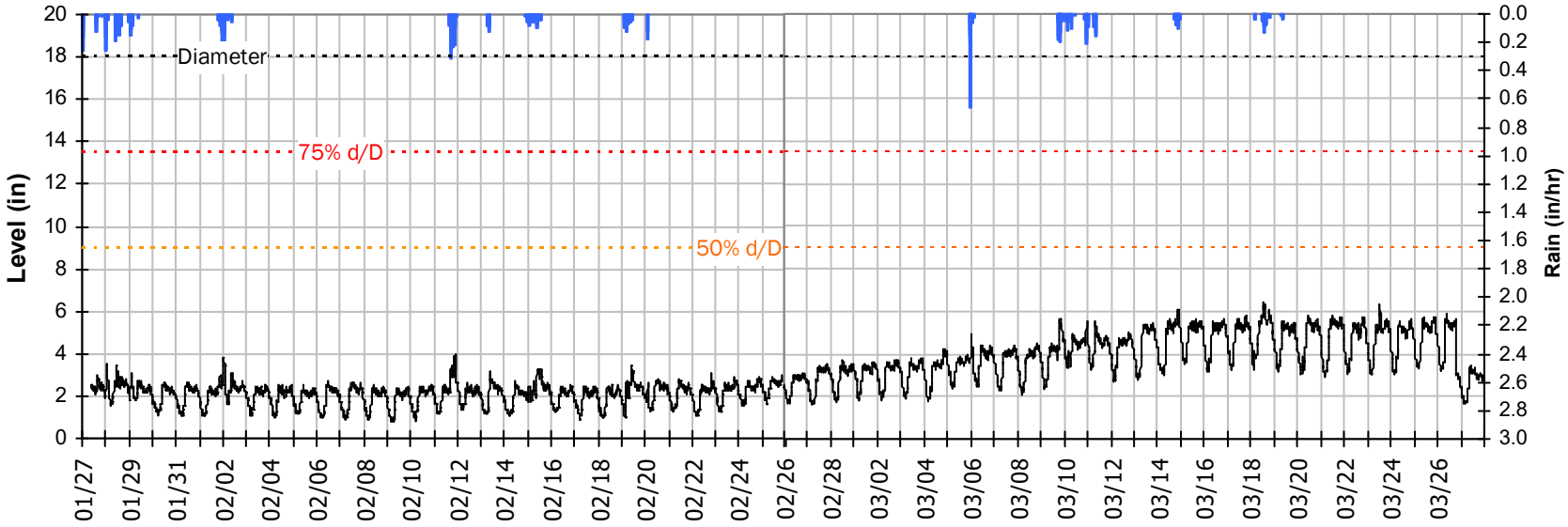
FM 4
Average Dry Weather Flow Hydrographs

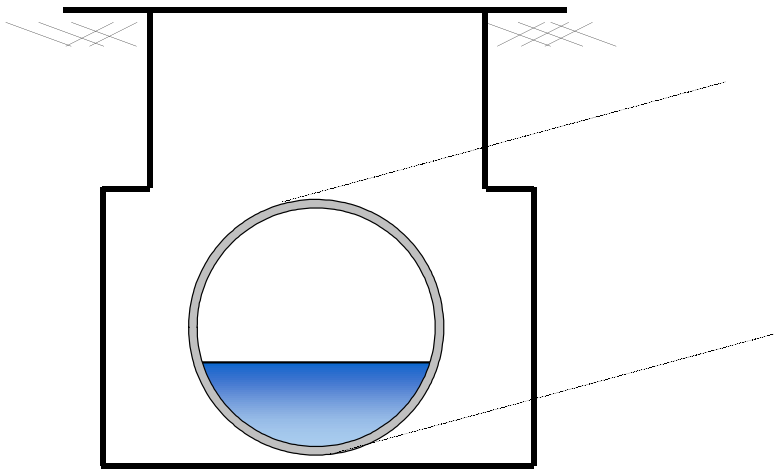


FM 4

Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Monitoring Period

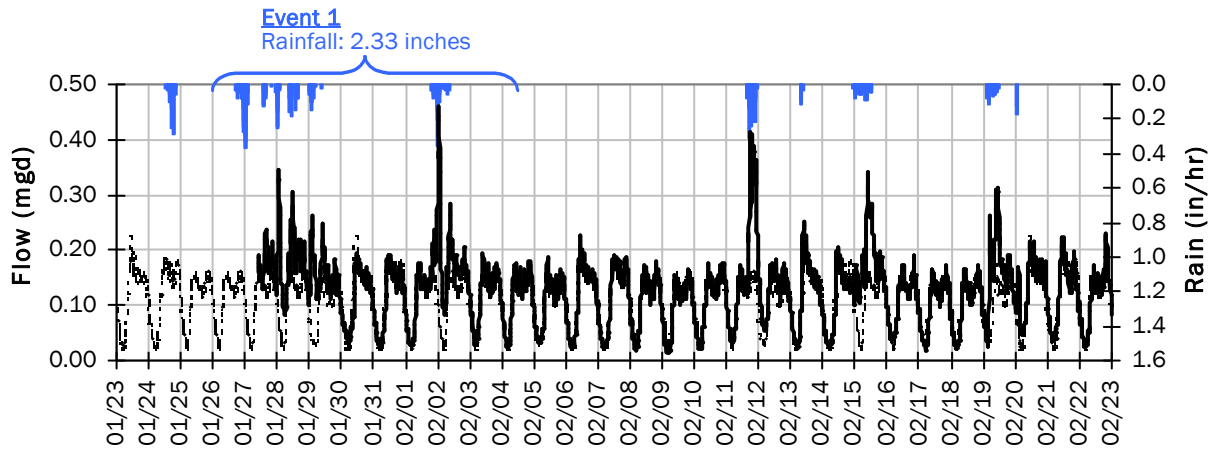




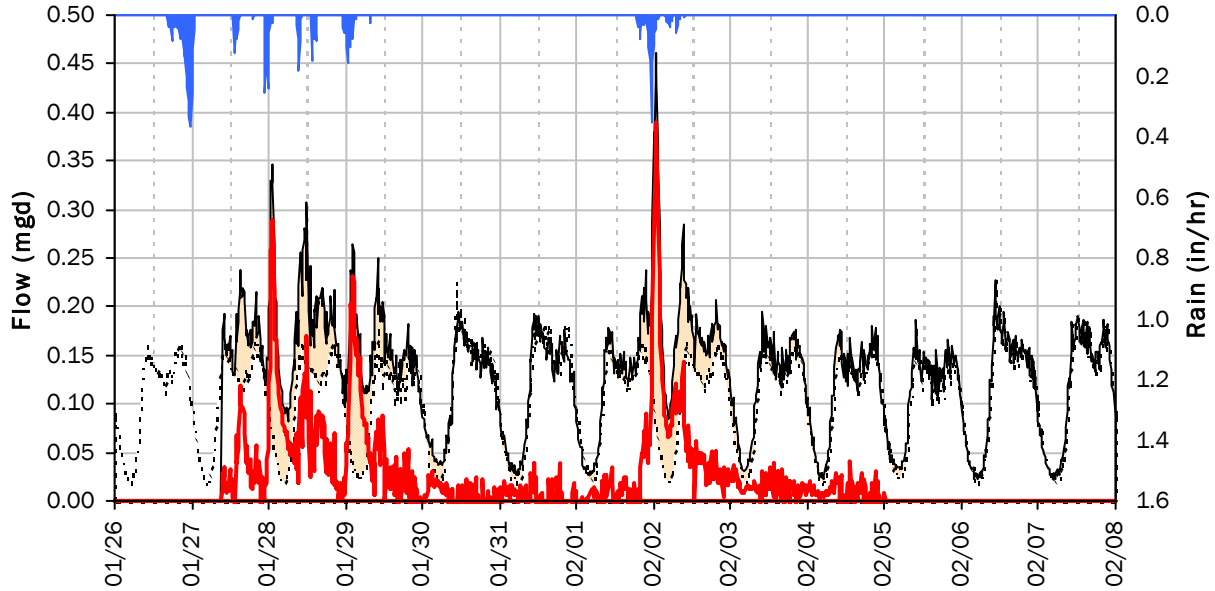
Pipe Diameter:	18	*inches*
Peak Measured Level:	6.41	*inches*
Peak d/D Ratio:	0.36	

FM 4
I/I Summary: Event 1

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



Event 1 Detail Graph

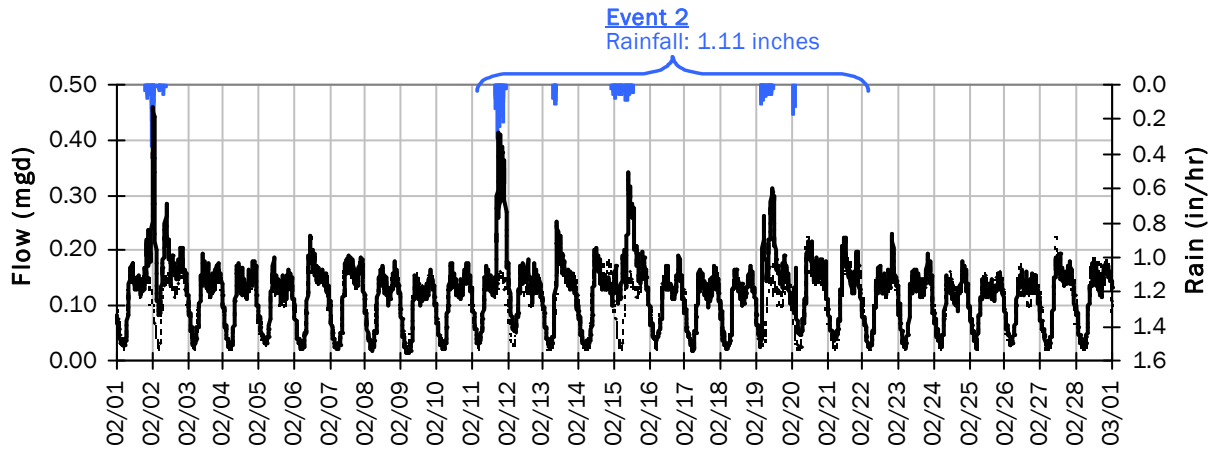


Storm Event I/I Analysis (Rain = 2.33 inches)

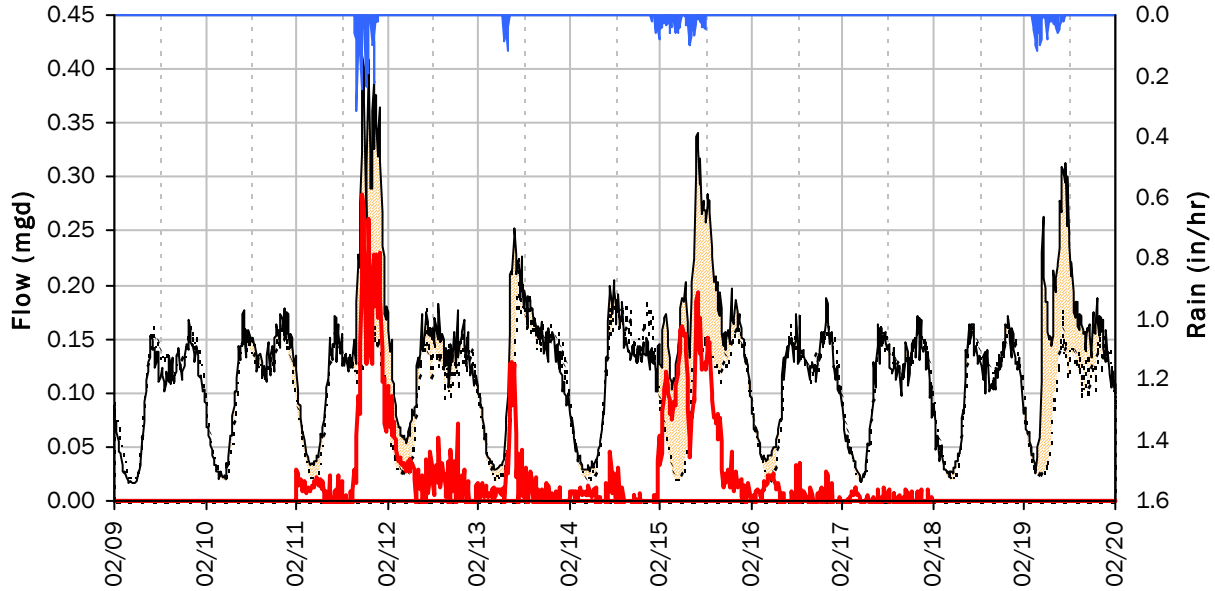
Capacity		Inflow / Infiltration	
Peak Flow:	0.46 *mgd*	**Peak I/I Rate:**	0.39 *mgd*
PF:	4.36	**Total I/I:**	281,000 *gallons*
Peak Level:	3.84 *in*		
d/D Ratio:	0.21		

FM 4
I/I Summary: Event 2

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



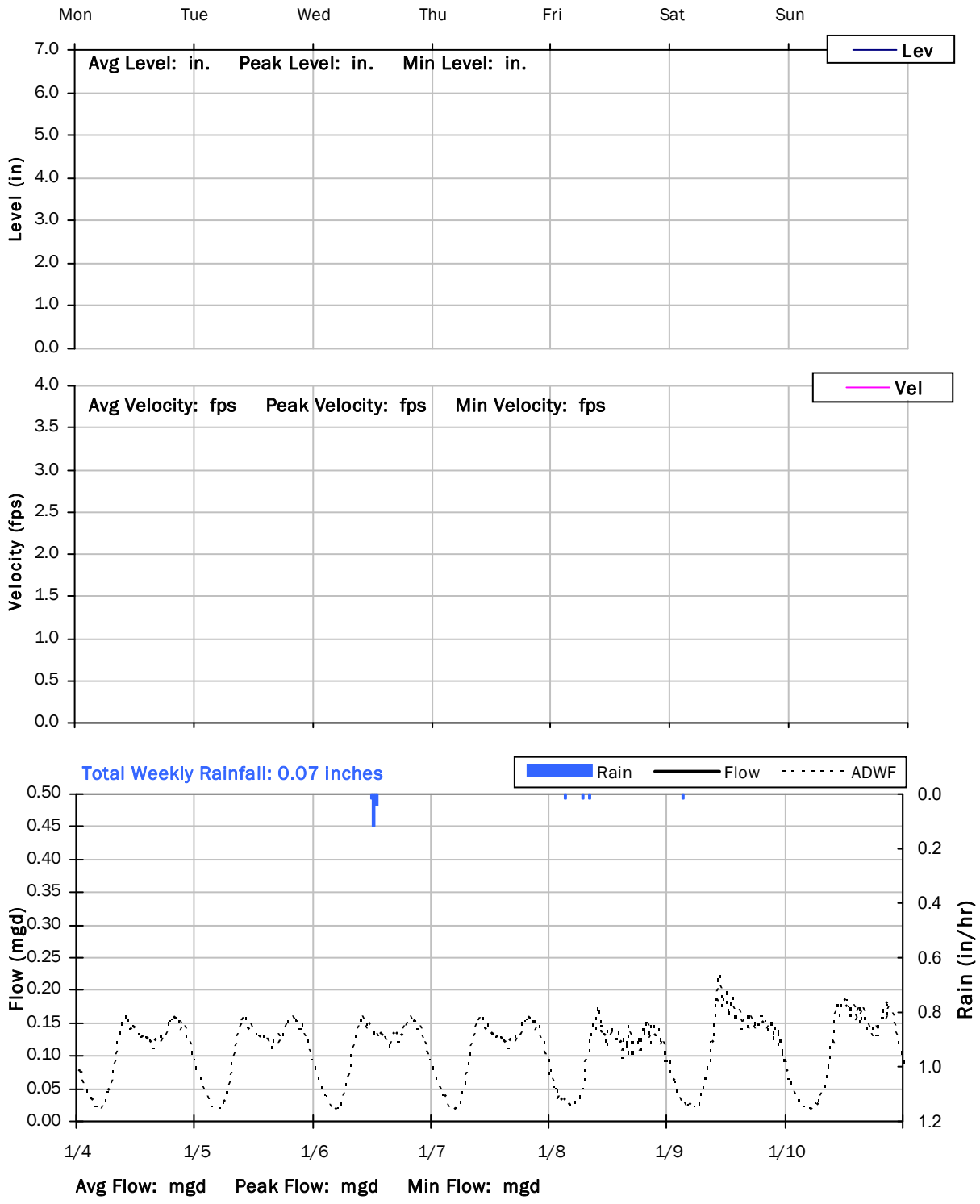
Event 2 Detail Graph



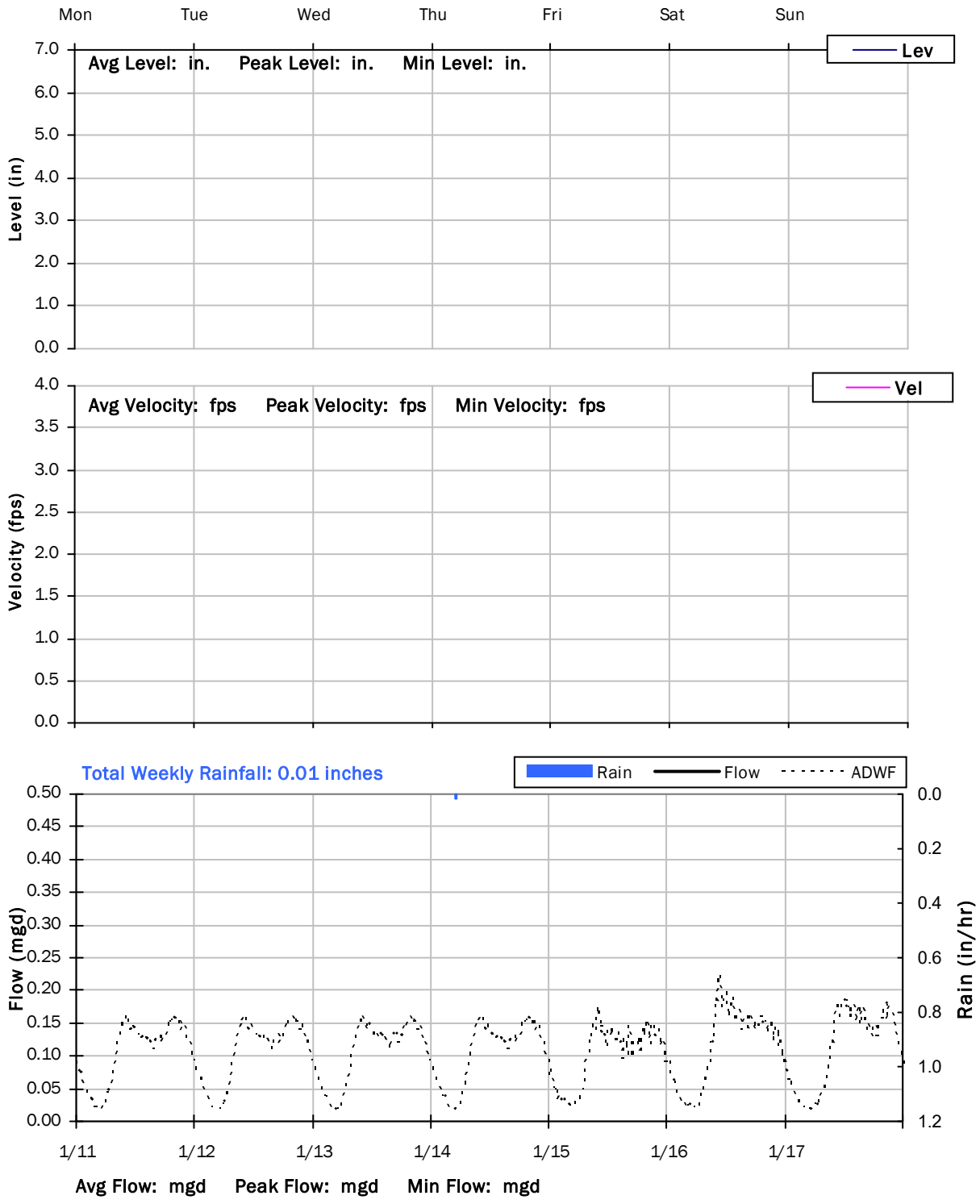
Storm Event I/I Analysis (Rain = 1.11 inches)

Capacity		Inflow / Infiltration	
Peak Flow:	0.41 *mgd*	**Peak I/I Rate:**	0.28 *mgd*
PF:	3.92	**Total I/I:**	179,000 *gallons*
Peak Level:	4.02 *in*		
d/D Ratio:	0.22		

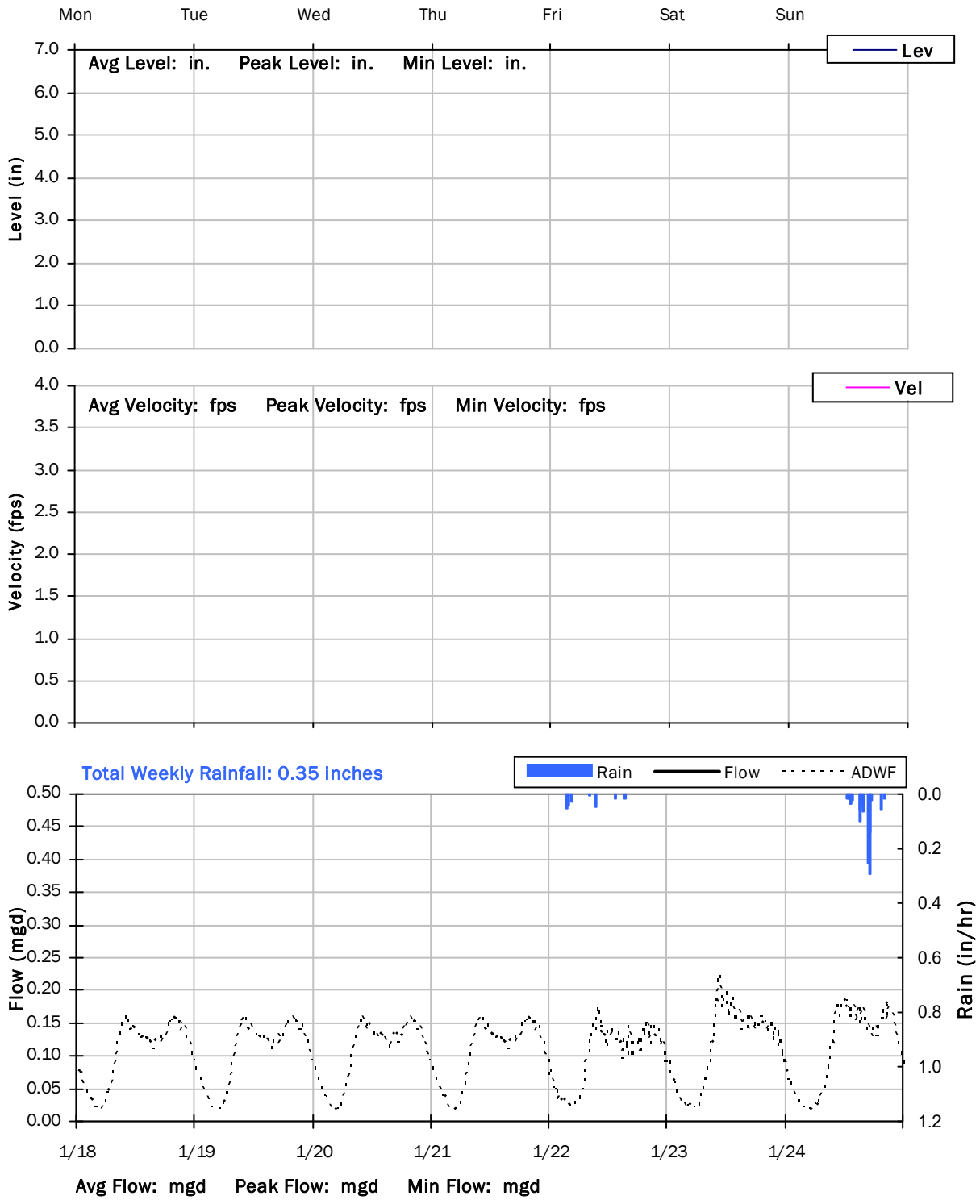
FM 4
Weekly Level, Velocity and Flow Hydrographs
1/4/2021 to 1/11/2021



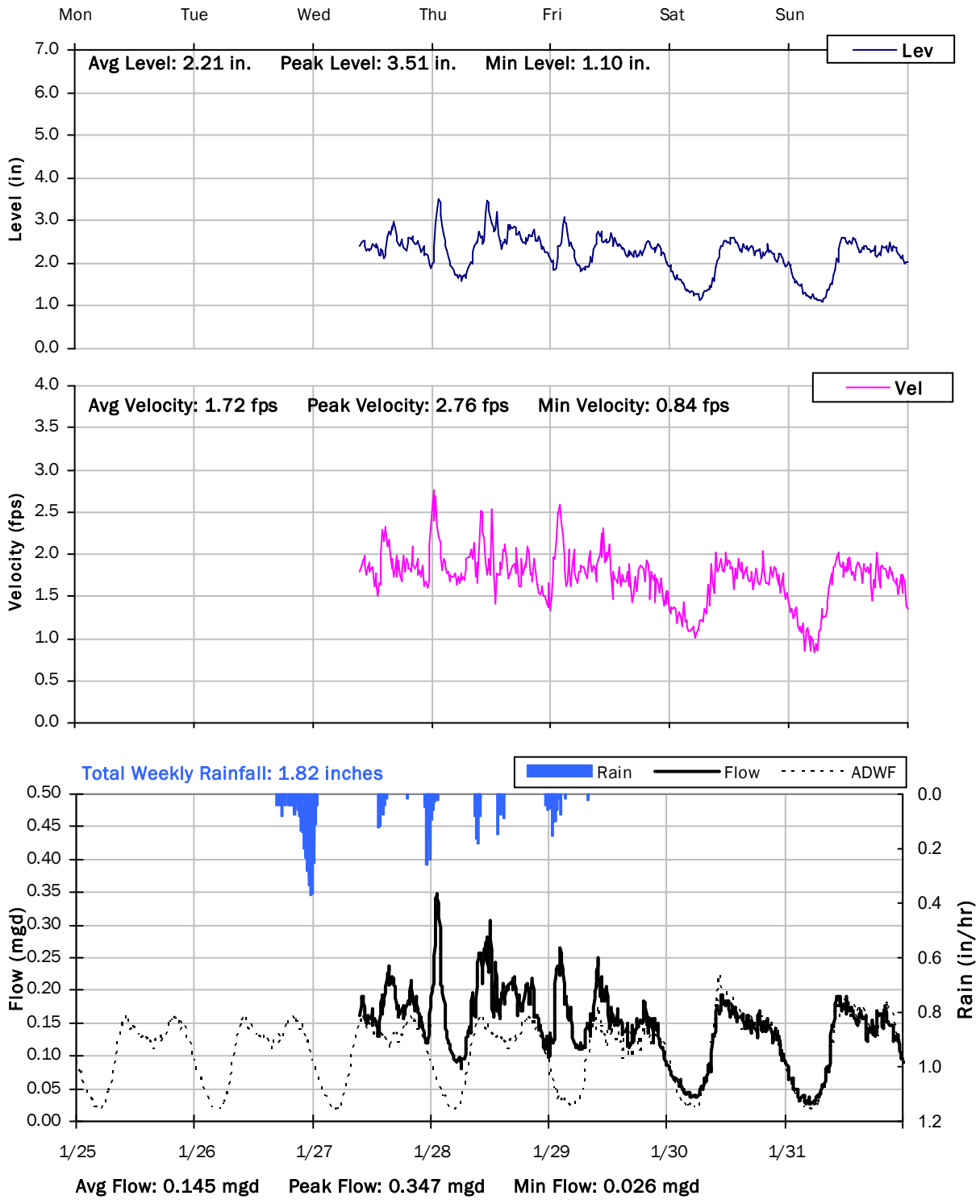
FM 4
Weekly Level, Velocity and Flow Hydrographs
1/11/2021 to 1/18/2021



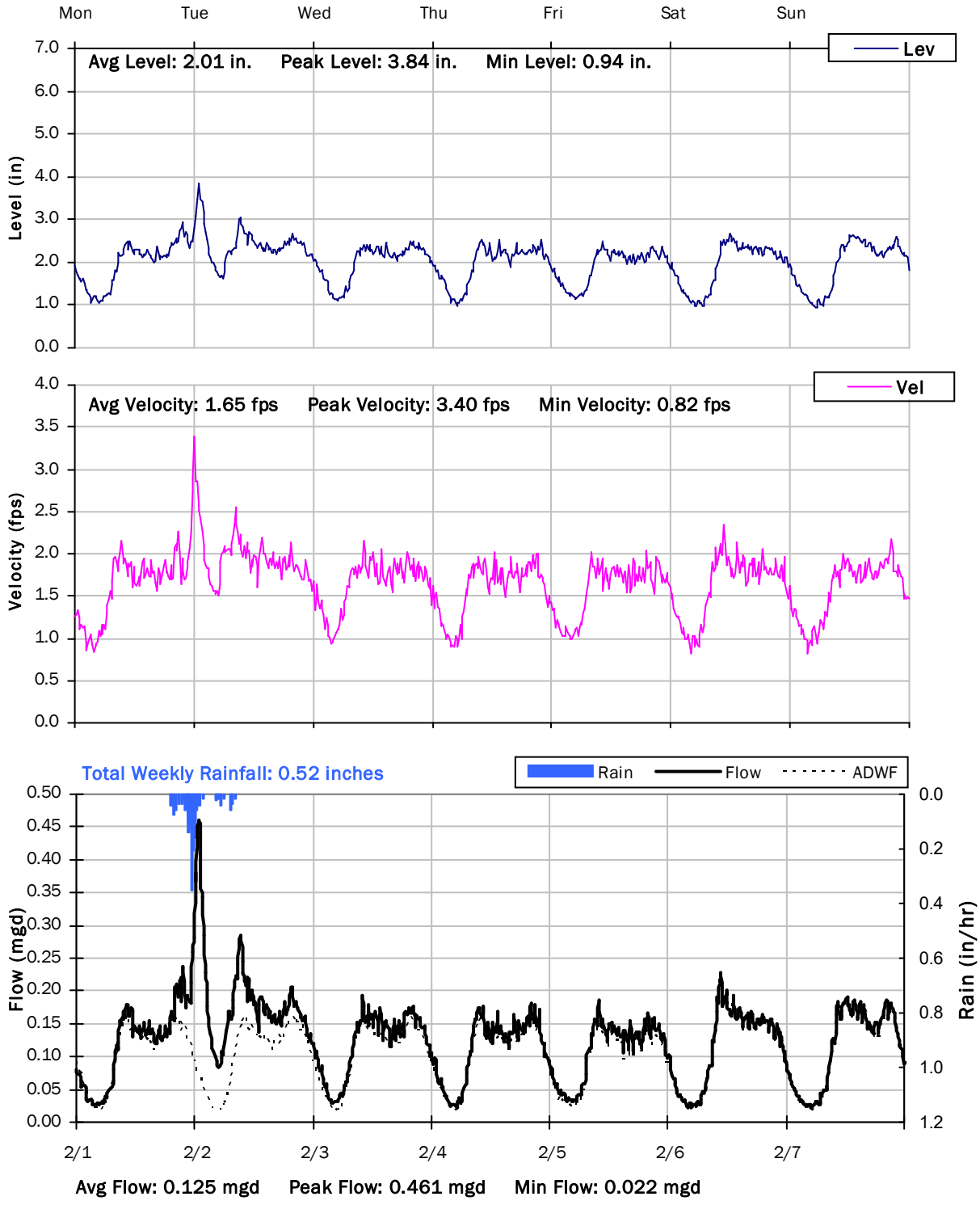
FM 4
Weekly Level, Velocity and Flow Hydrographs
1/18/2021 to 1/25/2021



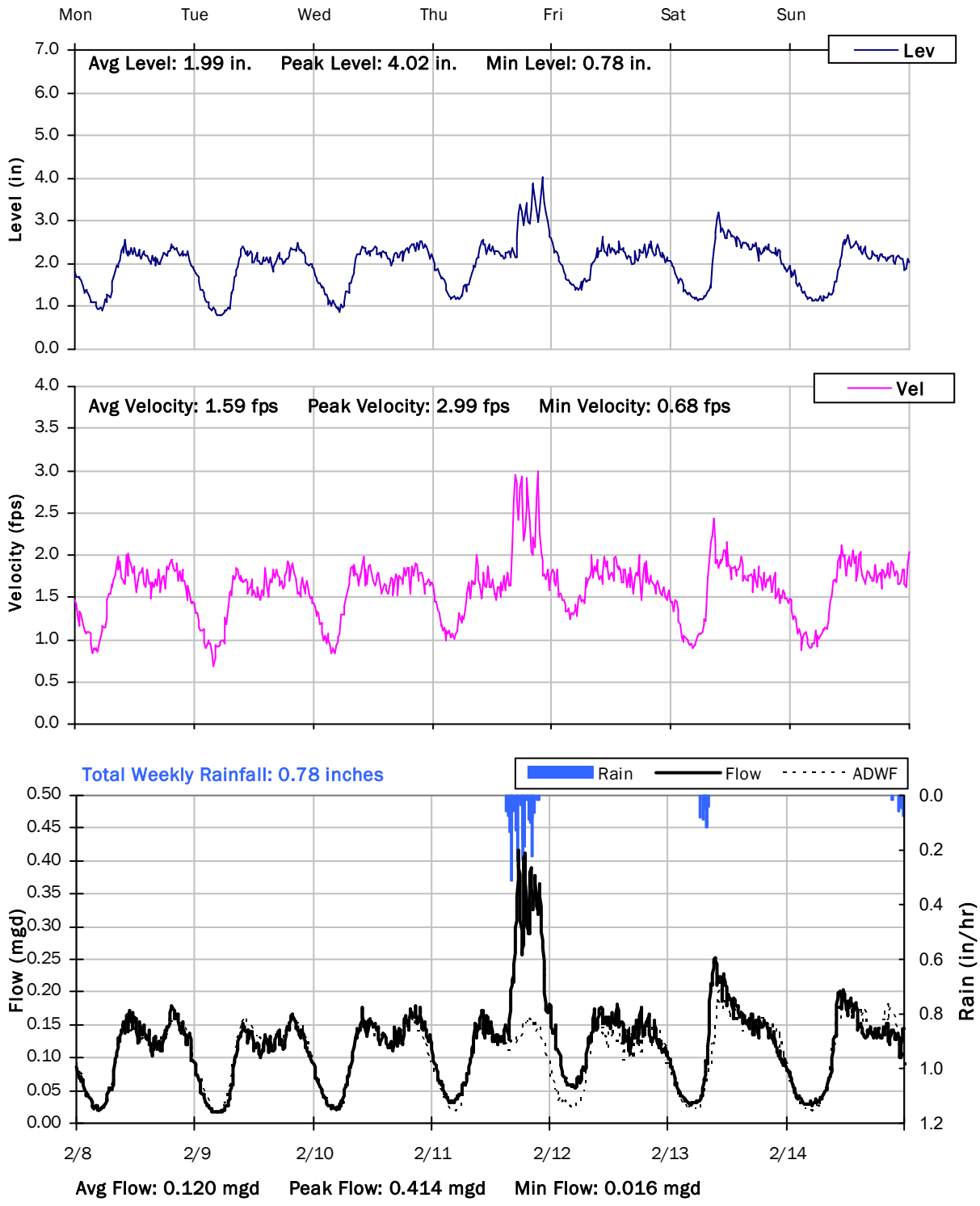
FM 4
Weekly Level, Velocity and Flow Hydrographs
1/25/2021 to 2/1/2021



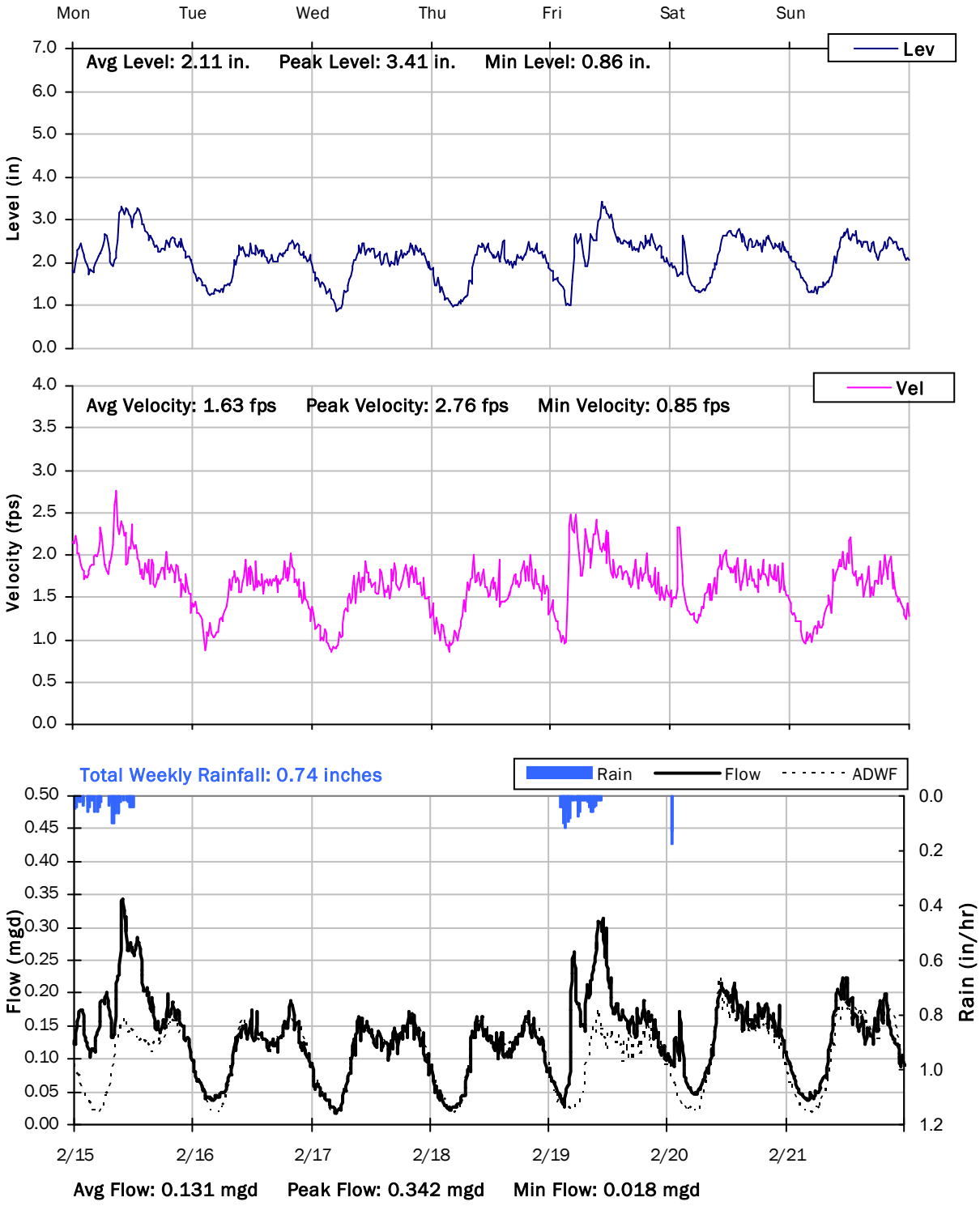
FM 4
Weekly Level, Velocity and Flow Hydrographs
2/1/2021 to 2/8/2021



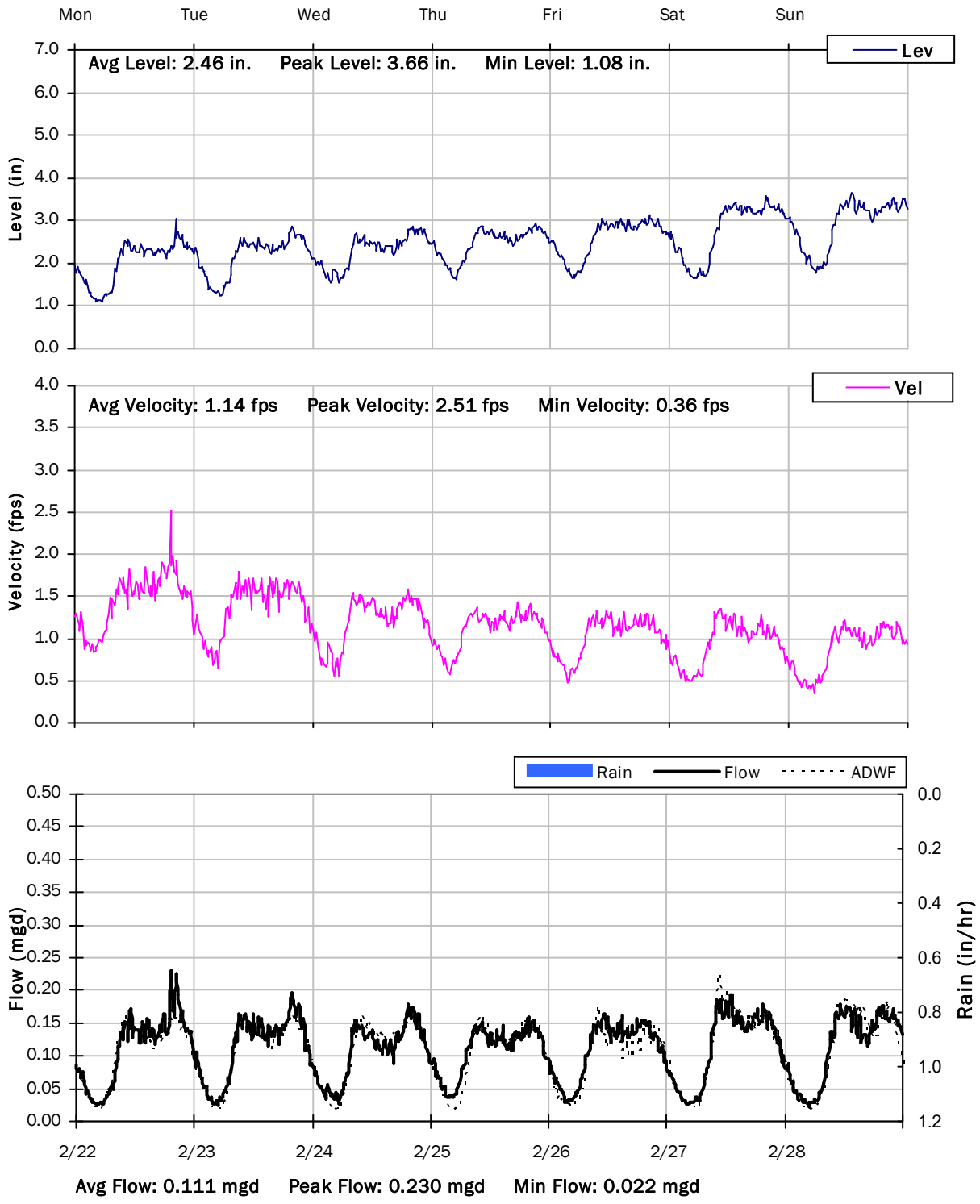
FM 4
Weekly Level, Velocity and Flow Hydrographs
2/8/2021 to 2/15/2021



FM 4
Weekly Level, Velocity and Flow Hydrographs
2/15/2021 to 2/22/2021



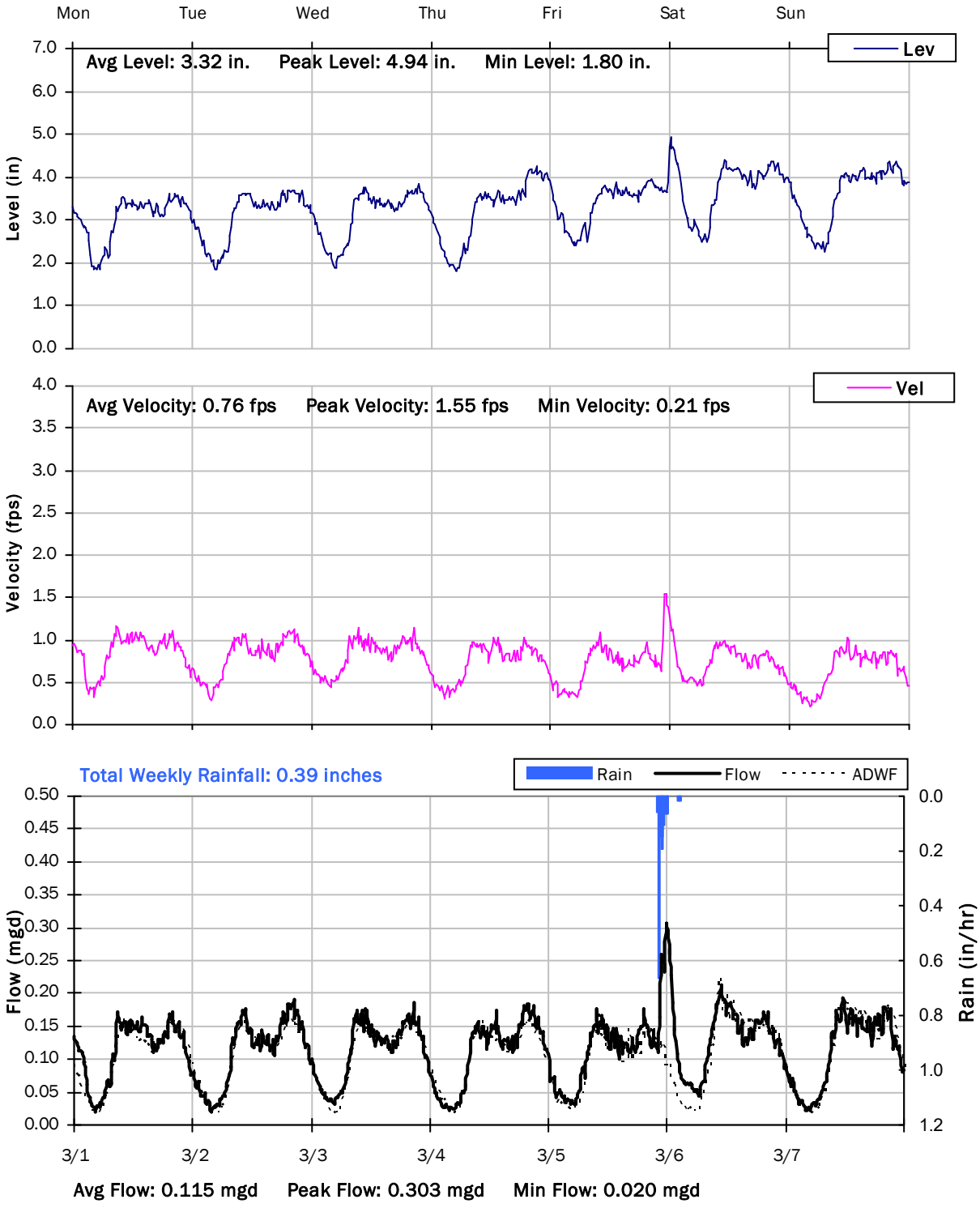
FM 4
Weekly Level, Velocity and Flow Hydrographs
2/22/2021 to 3/1/2021



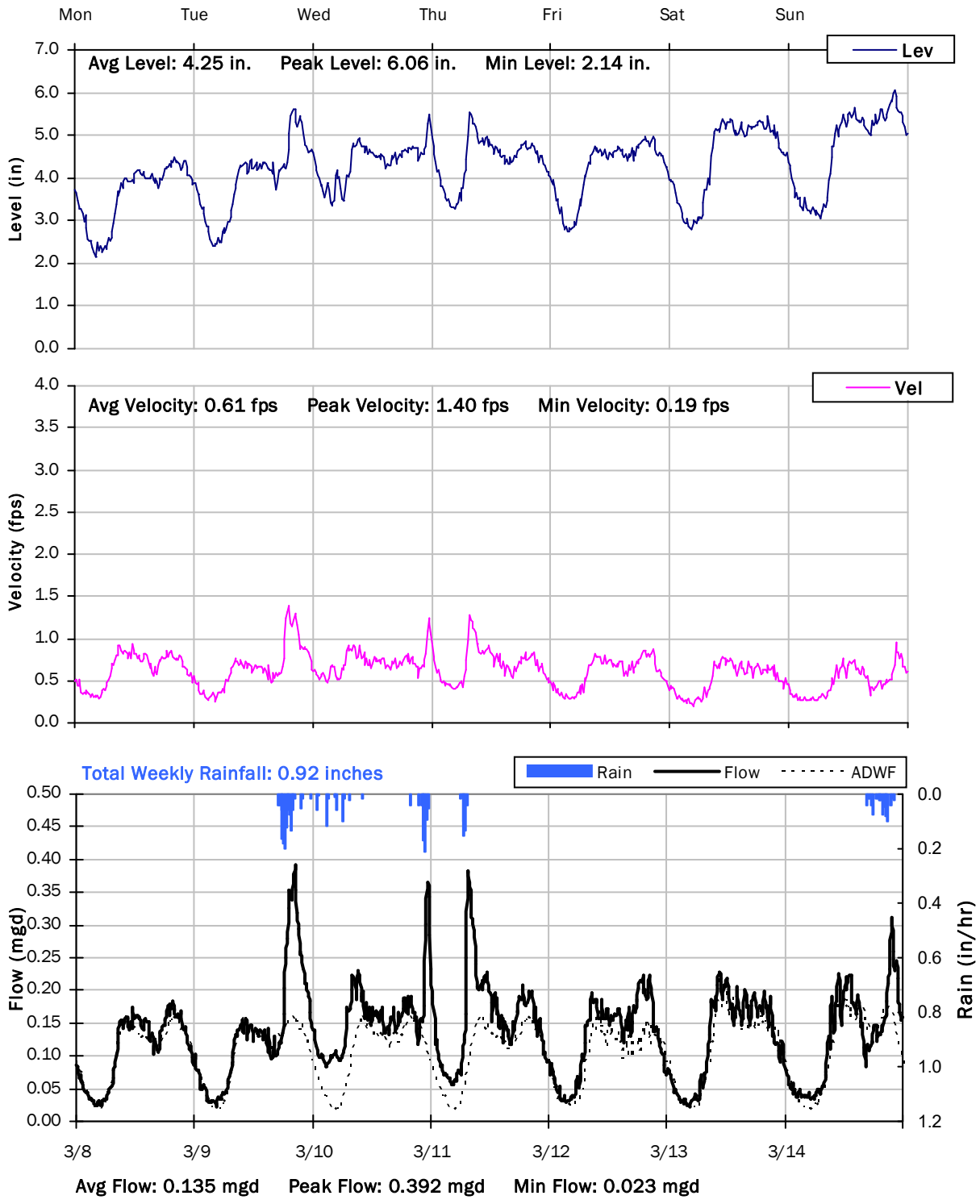
FM 4

Weekly Level, Velocity and Flow Hydrographs

3/1/2021 to 3/8/2021



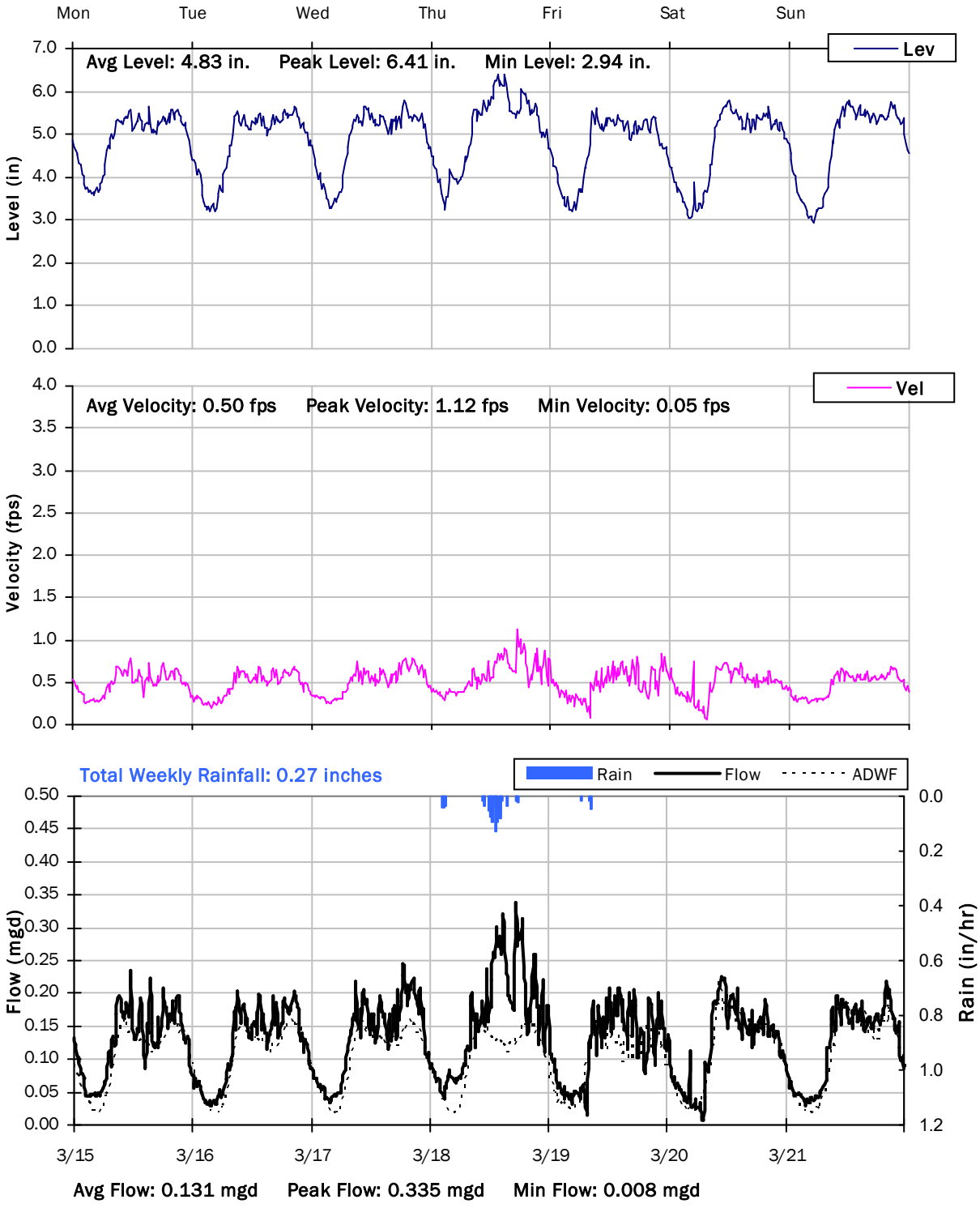
FM 4
Weekly Level, Velocity and Flow Hydrographs
3/8/2021 to 3/15/2021



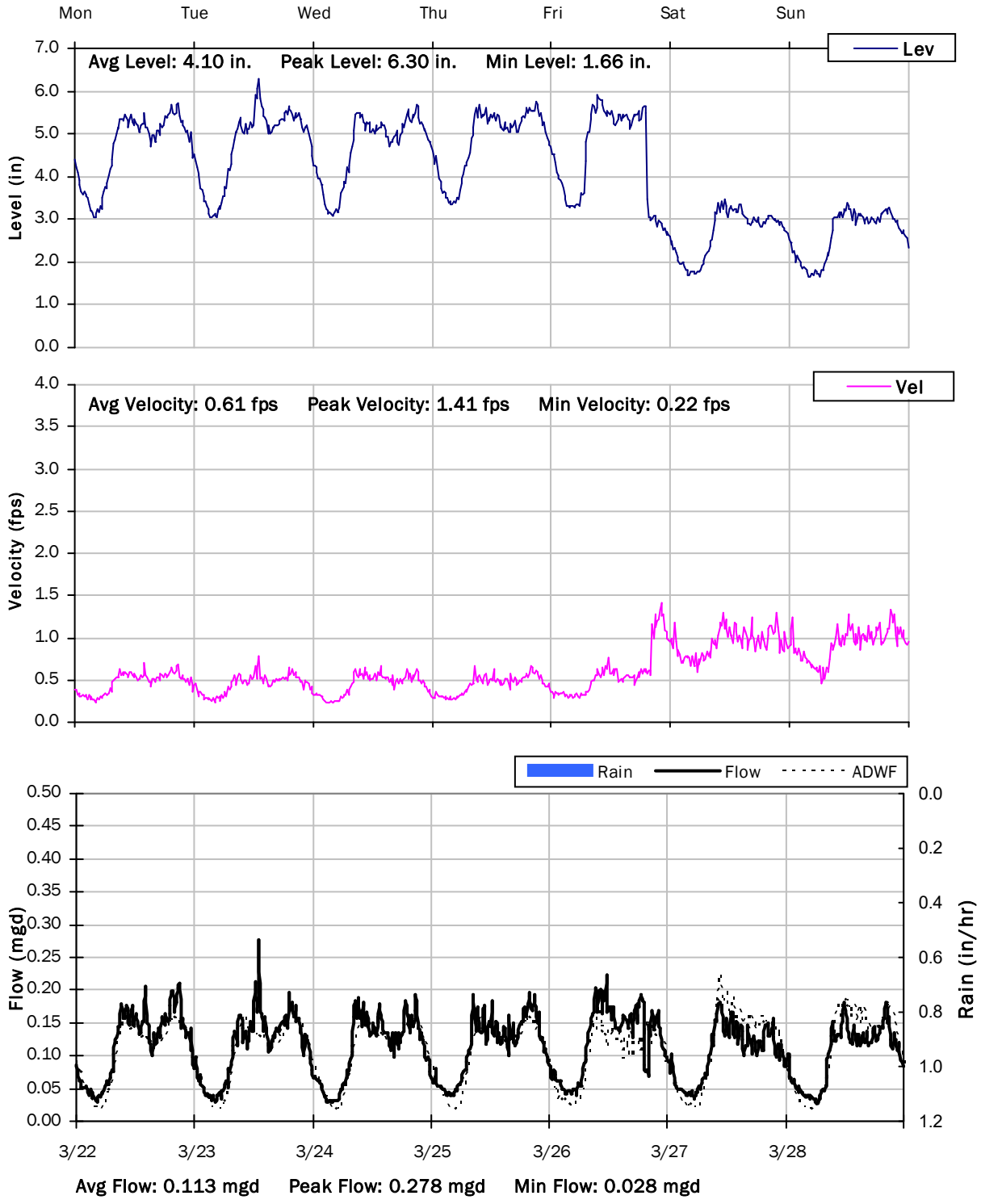
FM 4

Weekly Level, Velocity and Flow Hydrographs

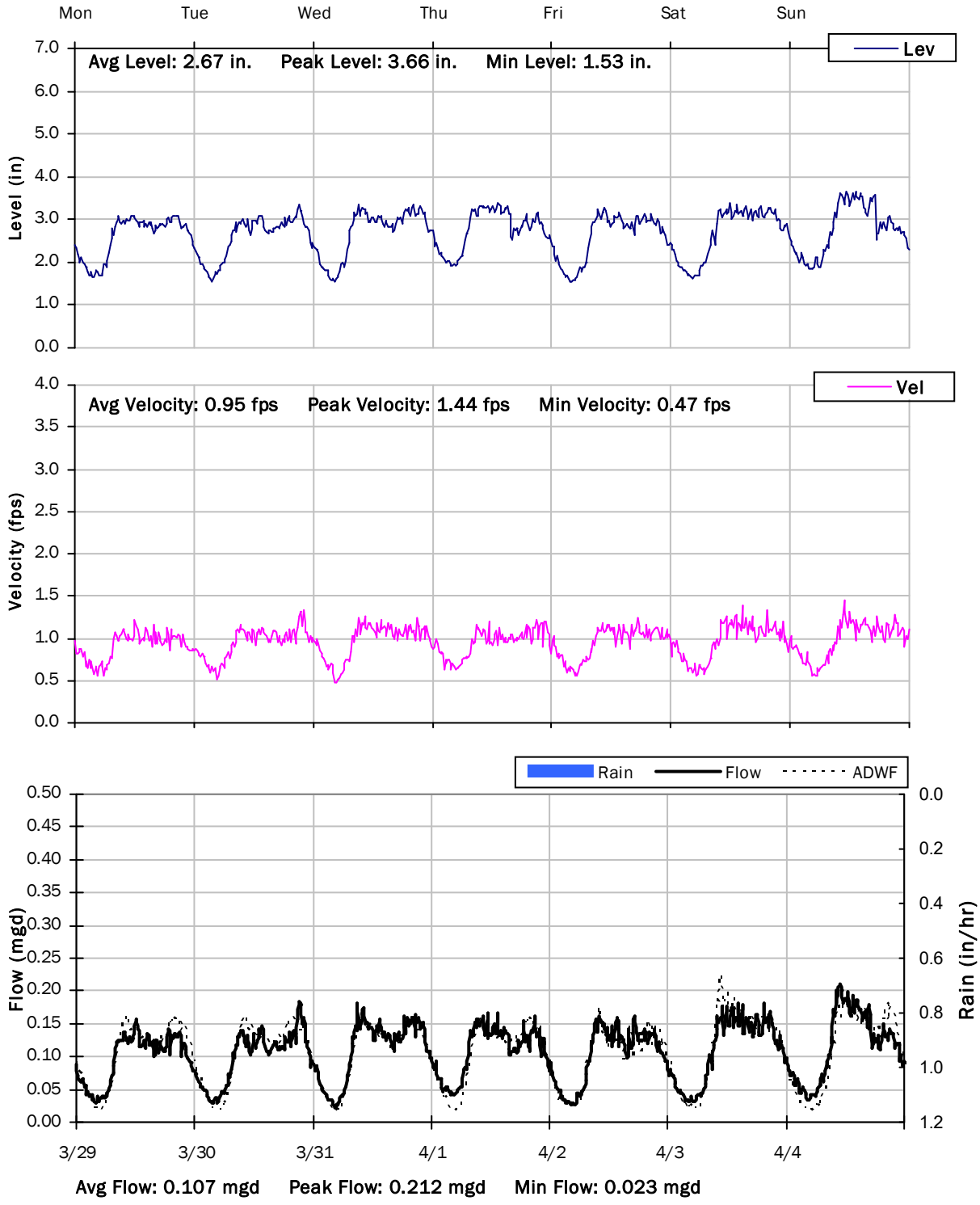
3/15/2021 to 3/22/2021



FM 4
Weekly Level, Velocity and Flow Hydrographs
3/22/2021 to 3/29/2021



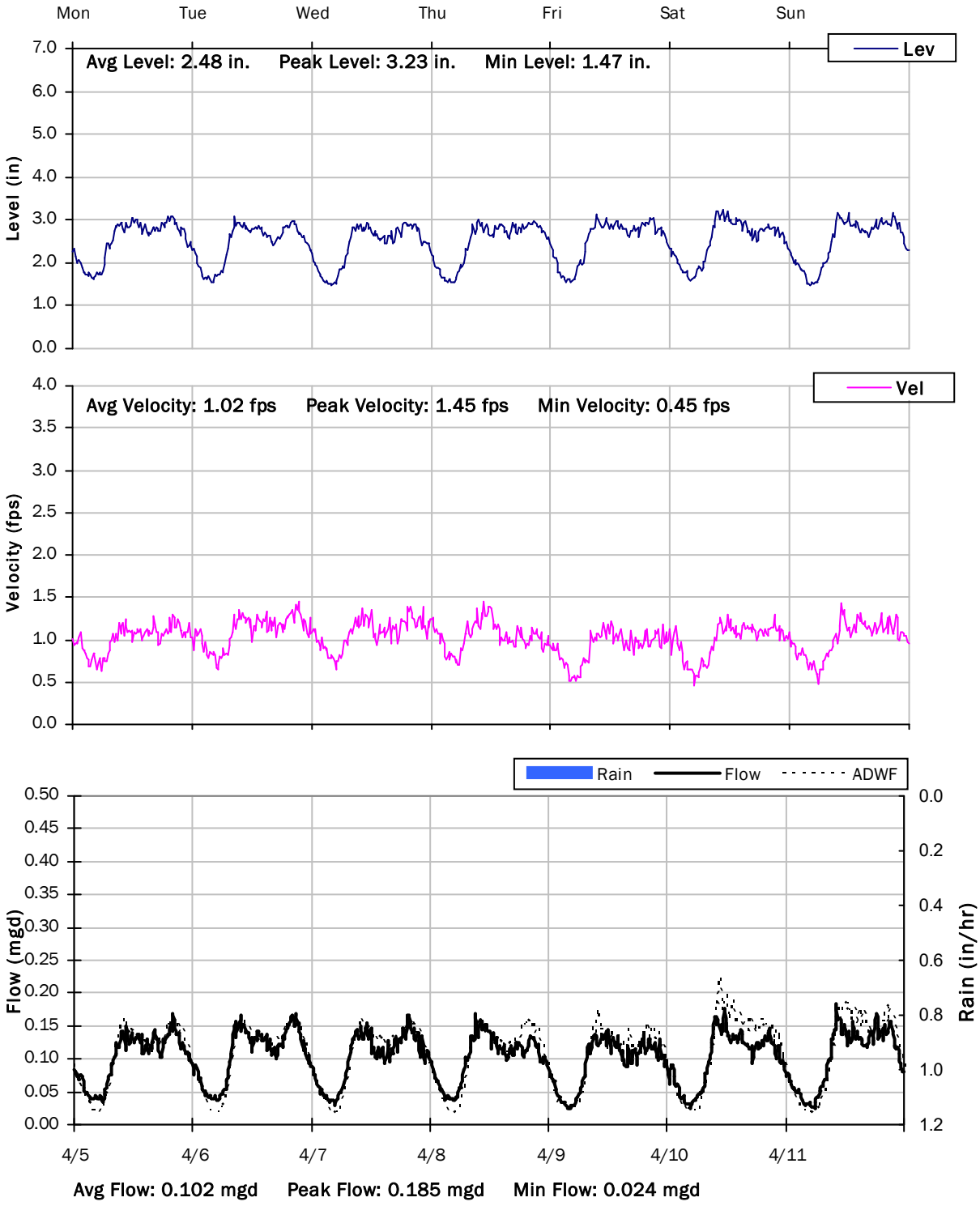
FM 4
Weekly Level, Velocity and Flow Hydrographs
3/29/2021 to 4/5/2021



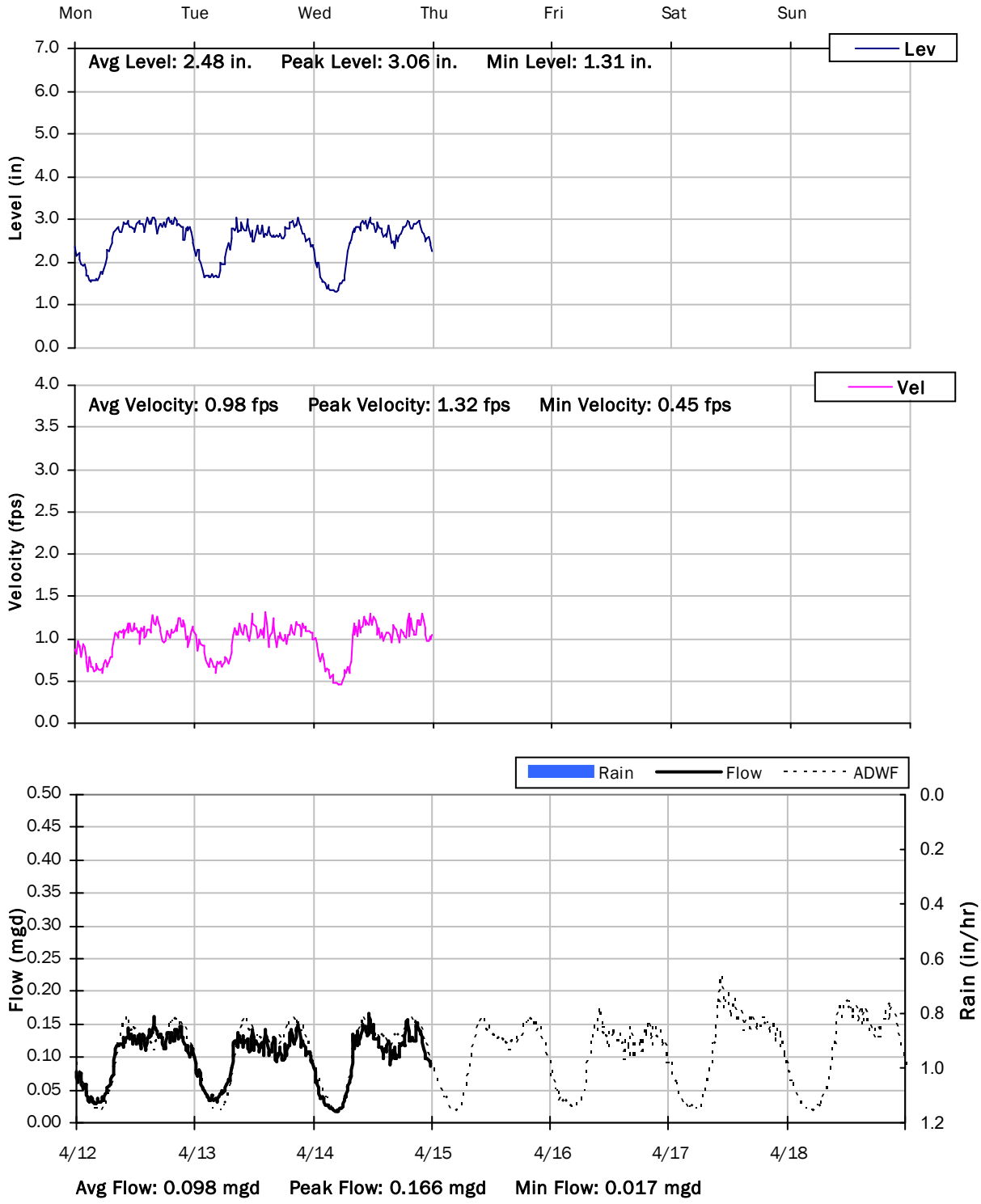
FM 4

Weekly Level, Velocity and Flow Hydrographs

4/5/2021 to 4/12/2021



FM 4
Weekly Level, Velocity and Flow Hydrographs
4/12/2021 to 4/19/2021



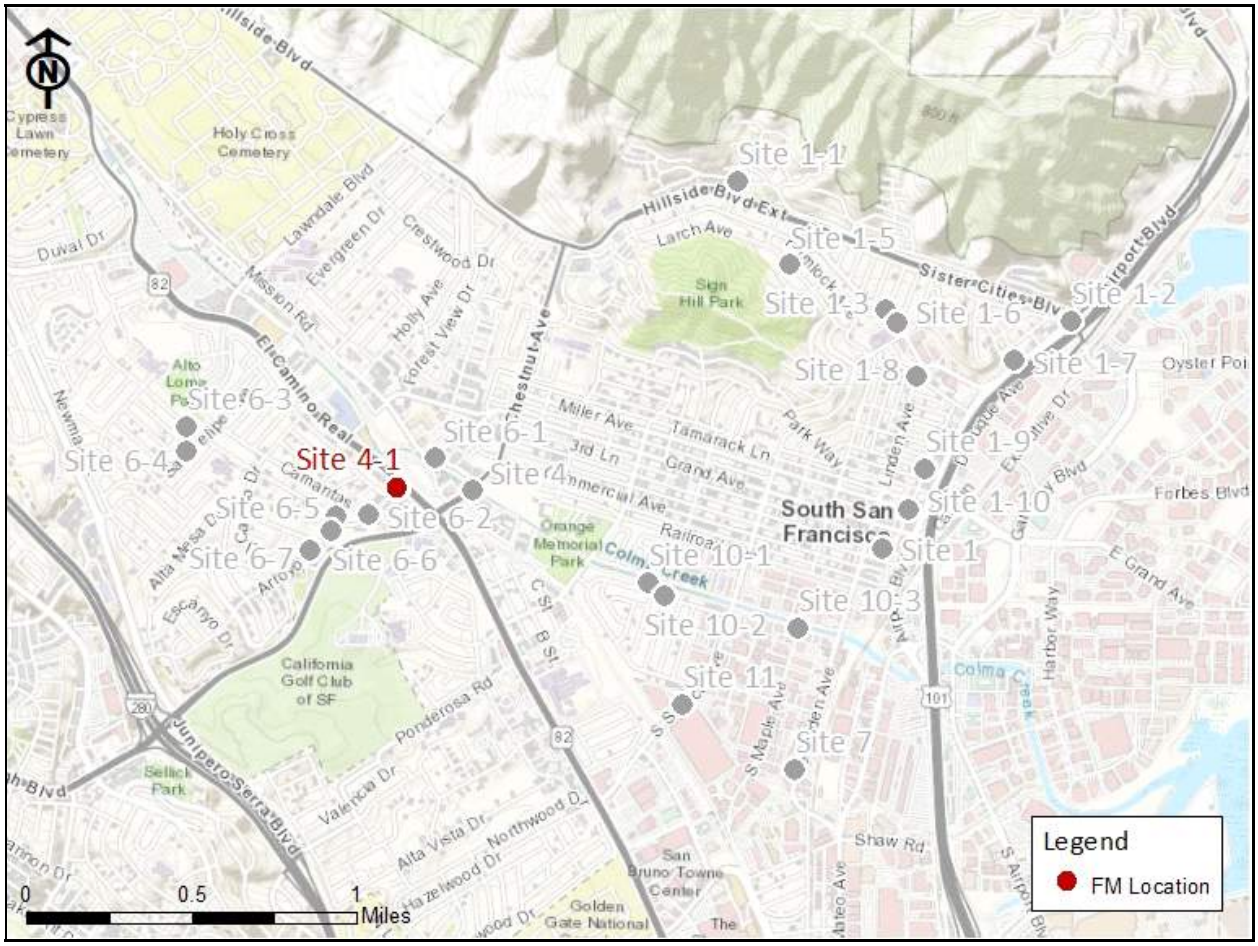
South San Francisco, CA

Sanitary Sewer Flow Monitoring
January 4 - April 14, 2021

Monitoring Site: FM 4-1

Location: Arroyo Drive and Del Paso Drive

Data Summary Report



Vicinity Map: FM 4-1

FM 4-1

Site Information

Location: Arroyo Drive and Del Paso Drive

Coordinates: 122.4365° W, 37.6563° N

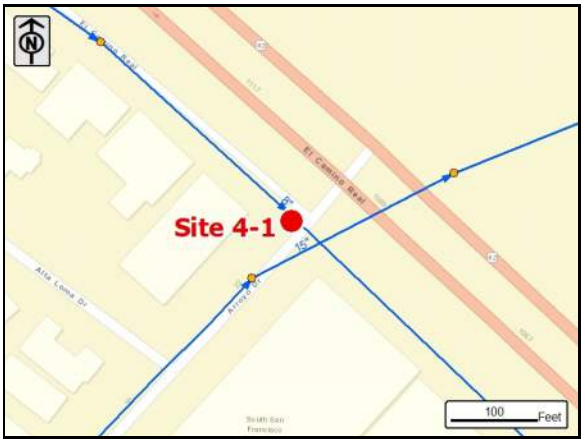
Rim Elevation (Earth): 69 feet

Pipe Diameter: 8 inches

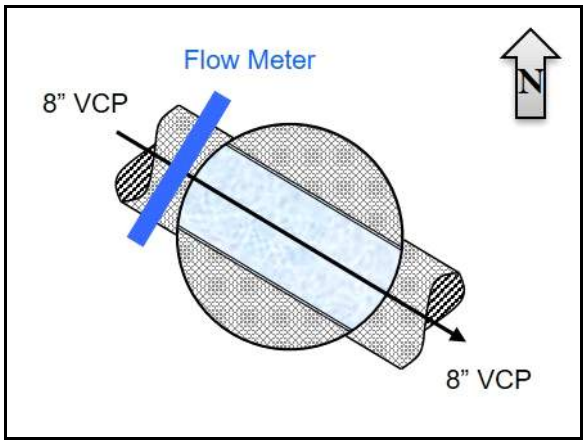
ADWF: 0.089 mgd

Peak Measured Flow: 0.686 mgd

Satellite Map



Sanitary Map



Flow Sketch

Street View

Plan View

FM 4-1

Additional Site Photos

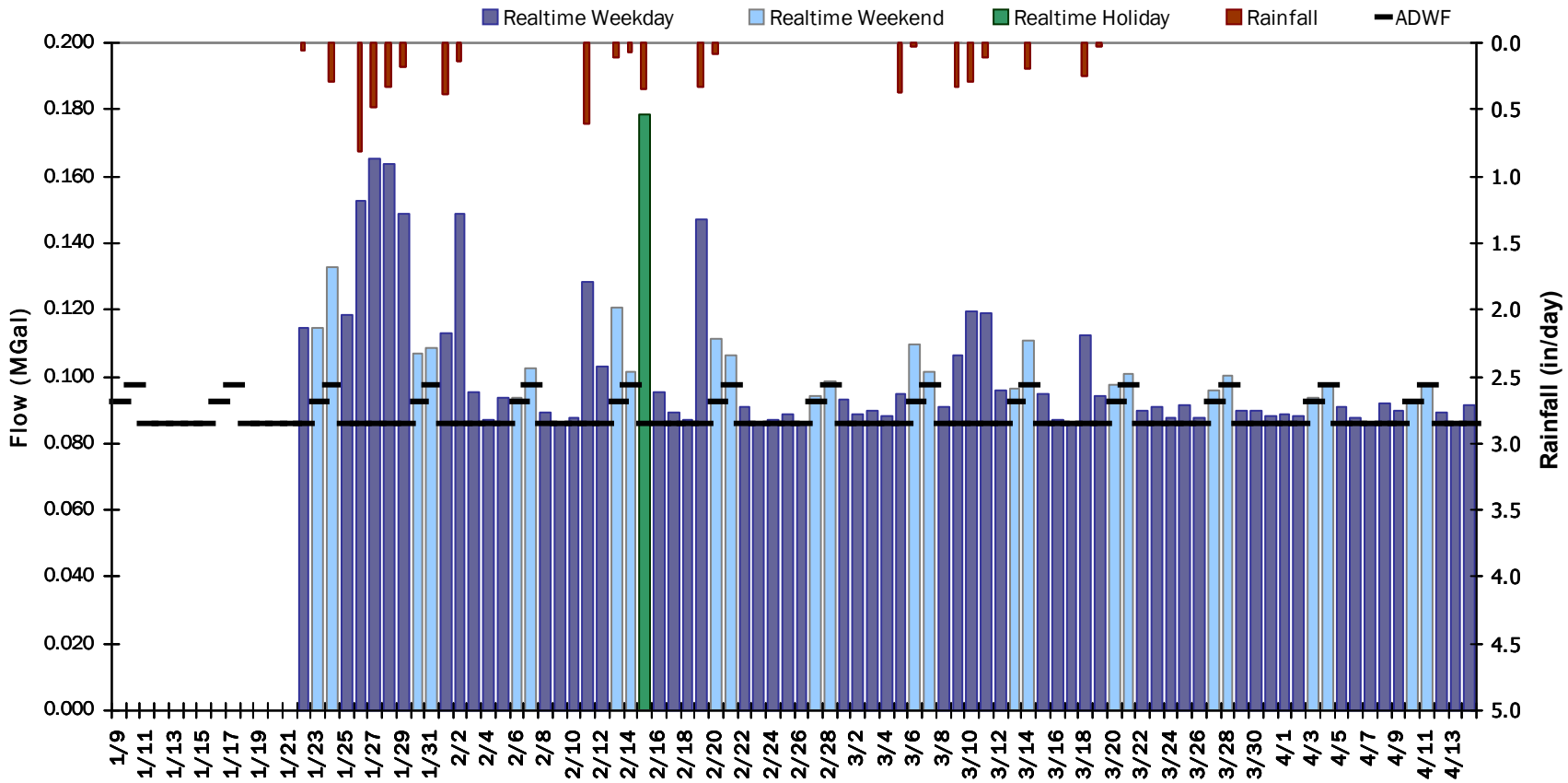
Effluent Pipe

Monitored Influent Pipe

FM 4-1
Period Flow Summary: Daily Flow Totals

Avg Period Flow: 0.102 MGal Peak Daily Flow: 0.179 MGal Min Daily Flow: 0.085 MGal

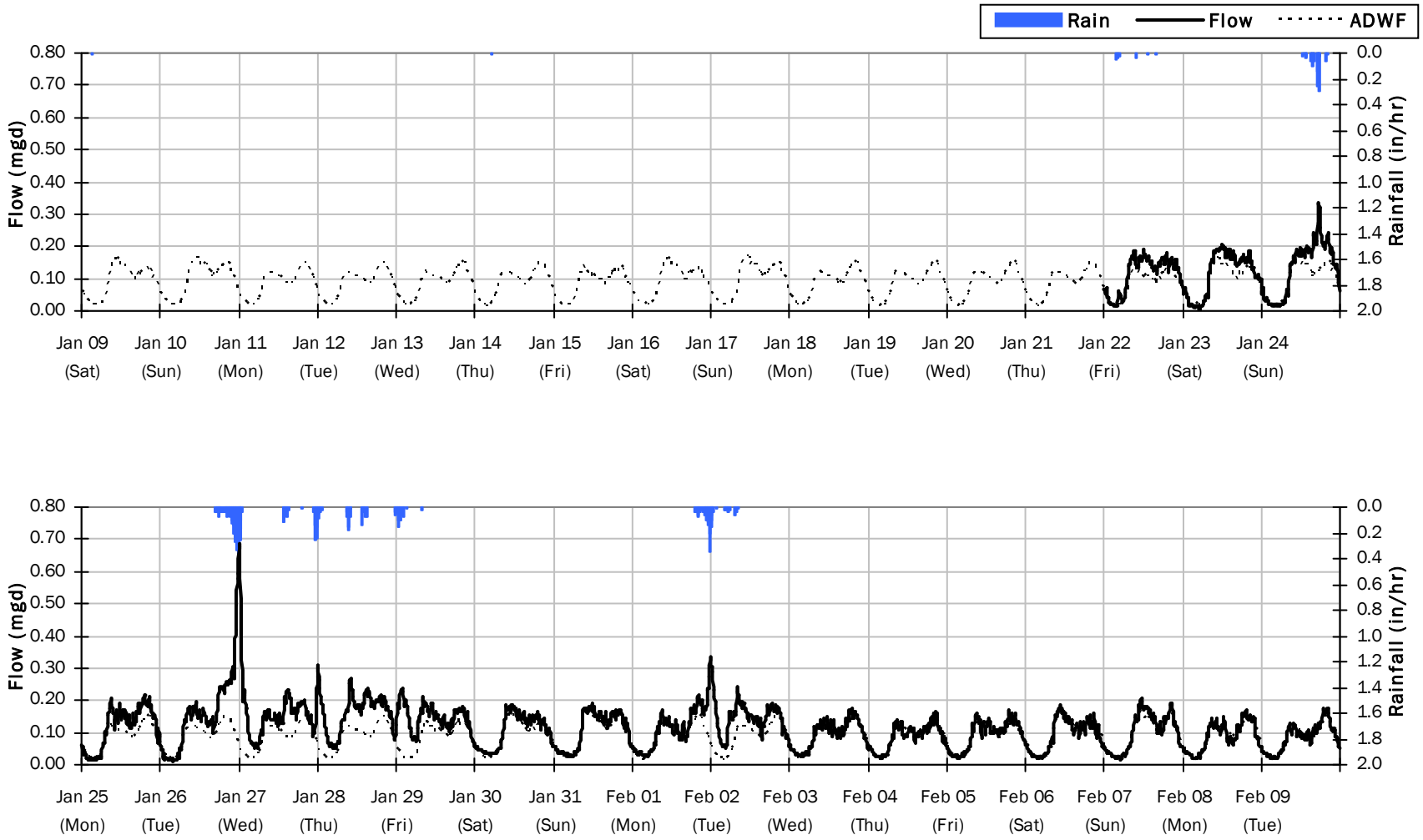
Total Period Rainfall: 5.77 inches



FM 4-1

Flow Summary: 1/9/2021 to 2/9/2021

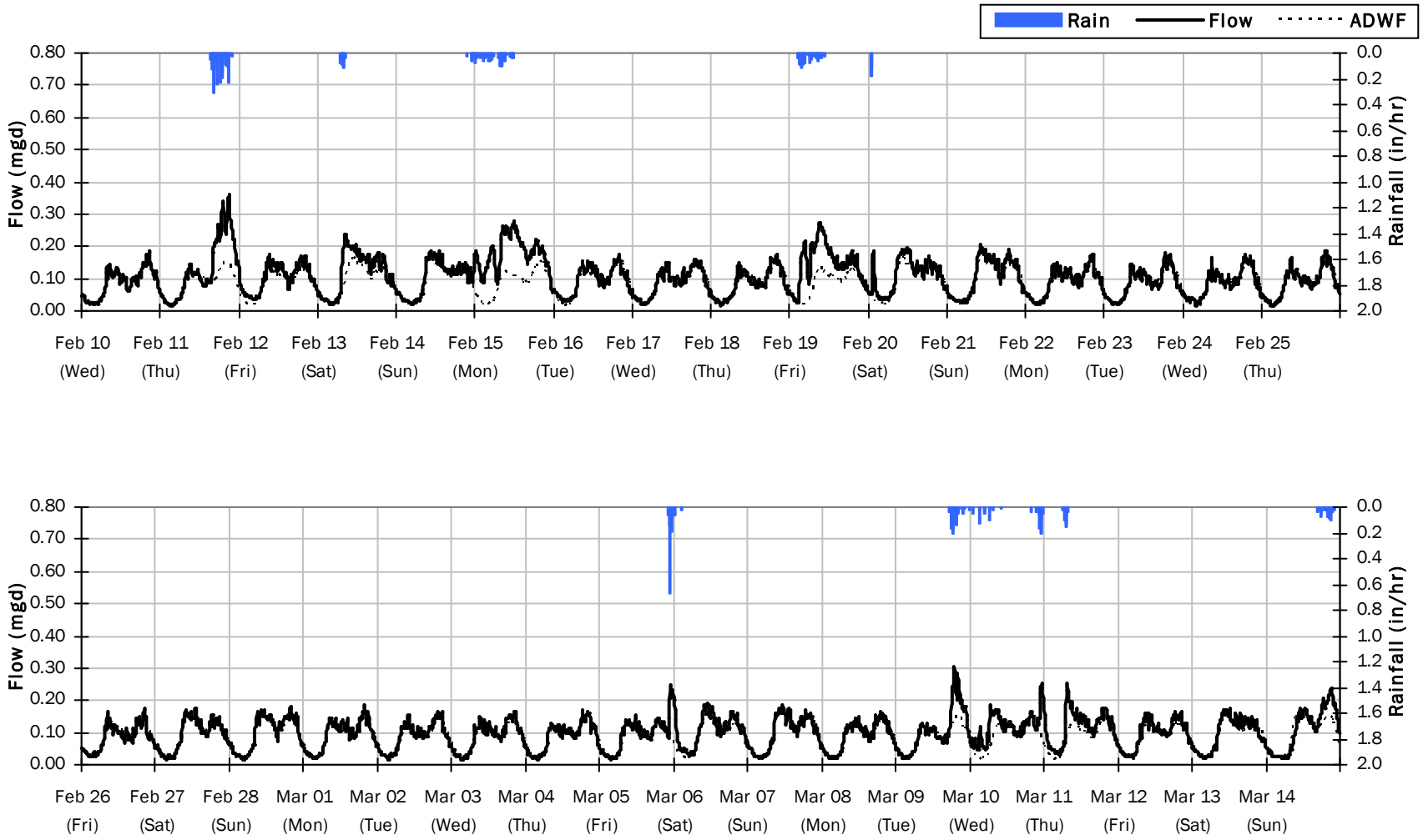
Total Period Rainfall: 2.68 inches Avg Flow: 0.118 mgd Peak Flow: 0.686 mgd Min Flow: 0.007 mgd



FM 4-1

Flow Summary: 2/10/2021 to 3/14/2021

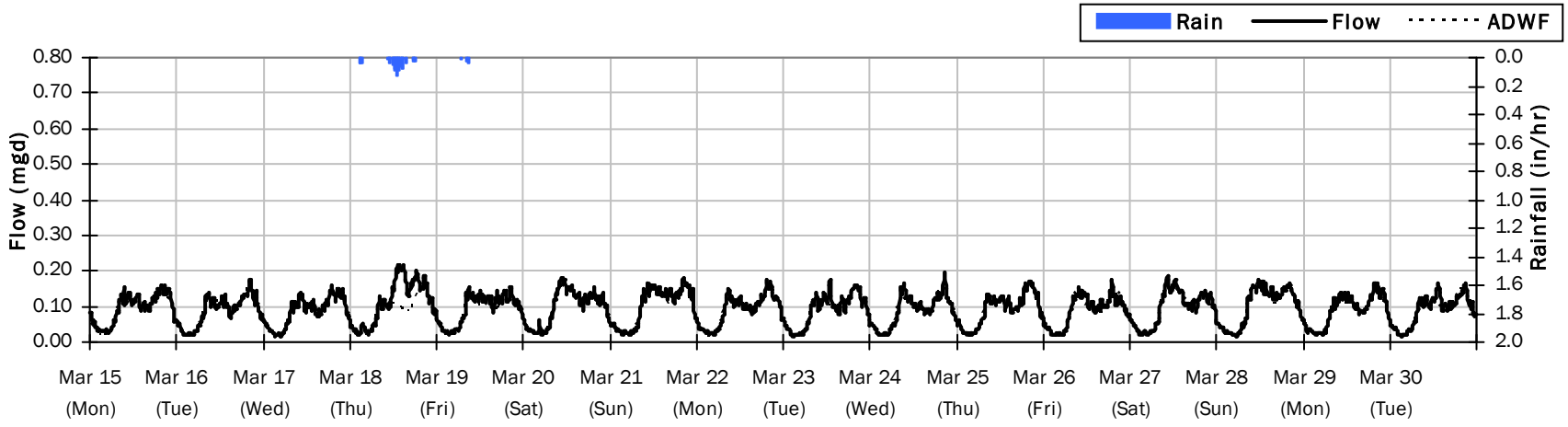
Total Period Rainfall: 2.84 inches Avg Flow: 0.103 mgd Peak Flow: 0.363 mgd Min Flow: 0.014 mgd

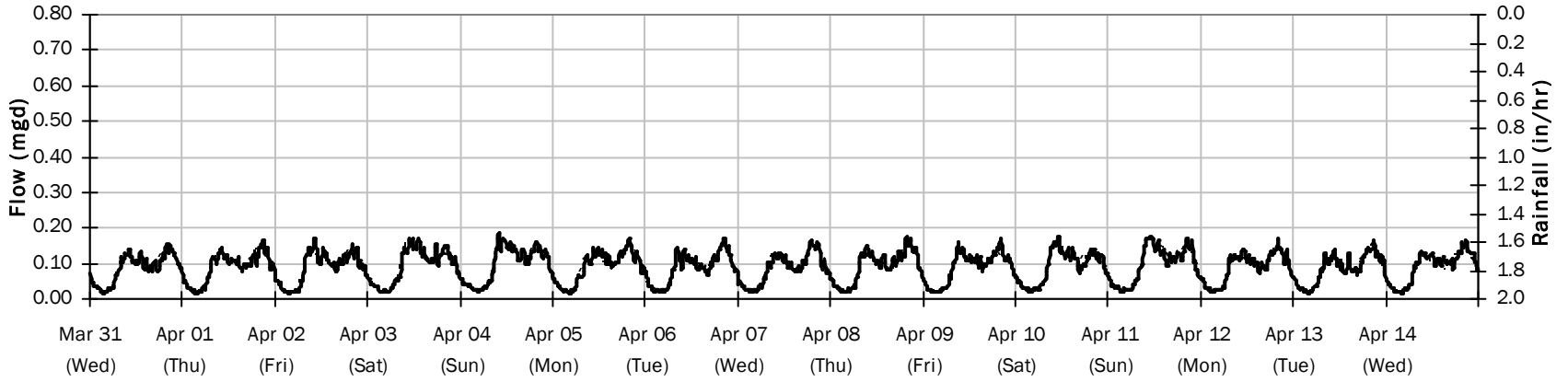


FM 4-1

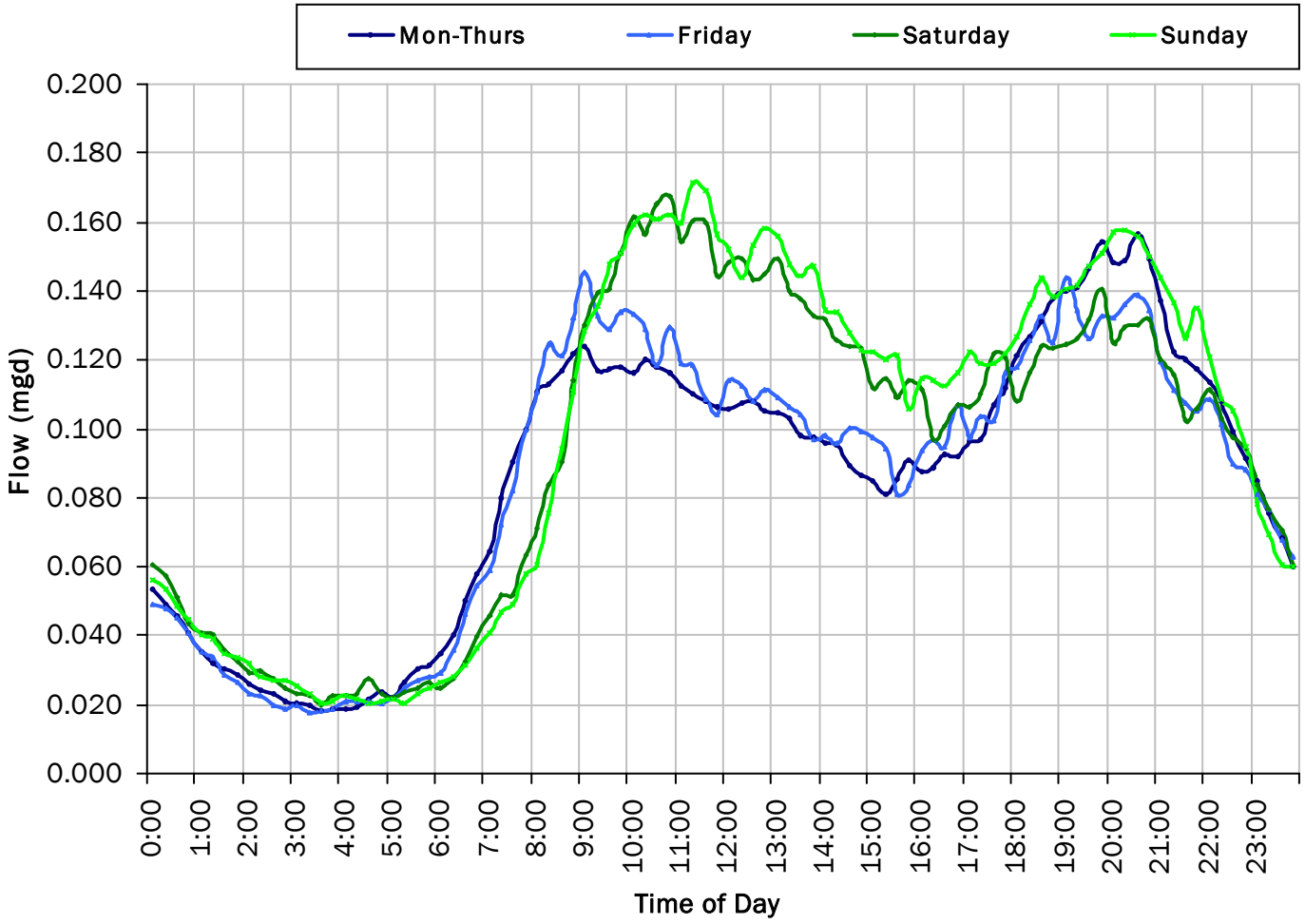
Flow Summary: 3/15/2021 to 4/14/2021

Total Period Rainfall: 0.27 inches Avg Flow: 0.092 mgd Peak Flow: 0.219 mgd Min Flow: 0.014 mgd



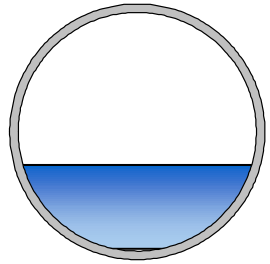


FM 4-1
Average Dry Weather Flow Hydrographs



ADWF:

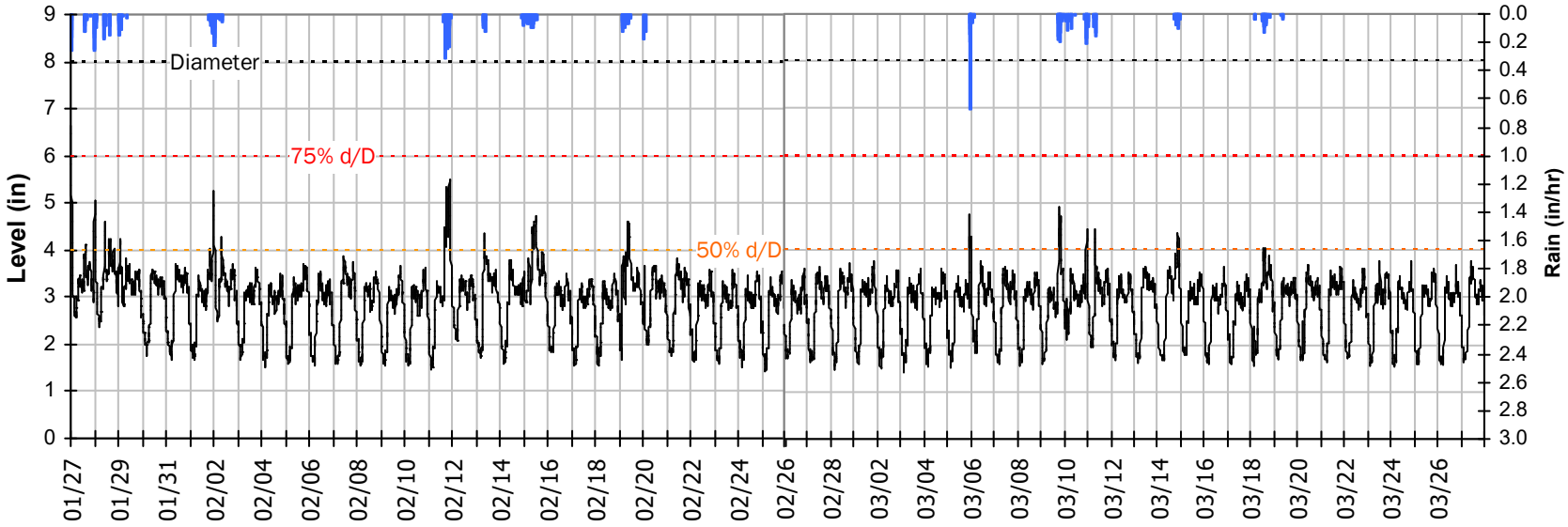
0.089 *mgd*

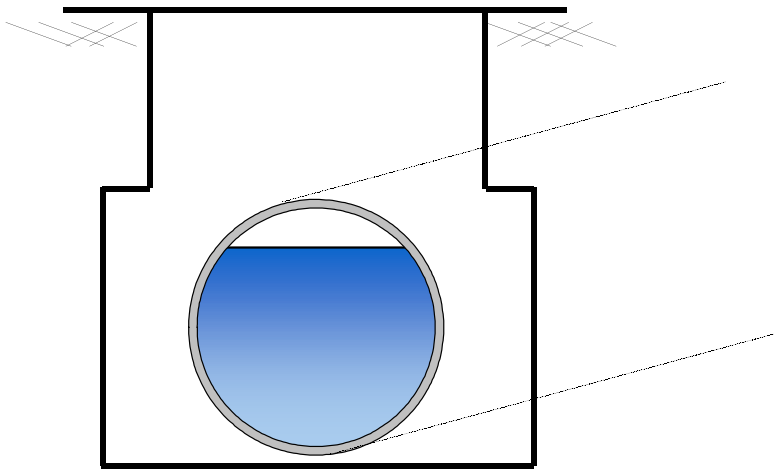


FM 4-1

Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Monitoring Period

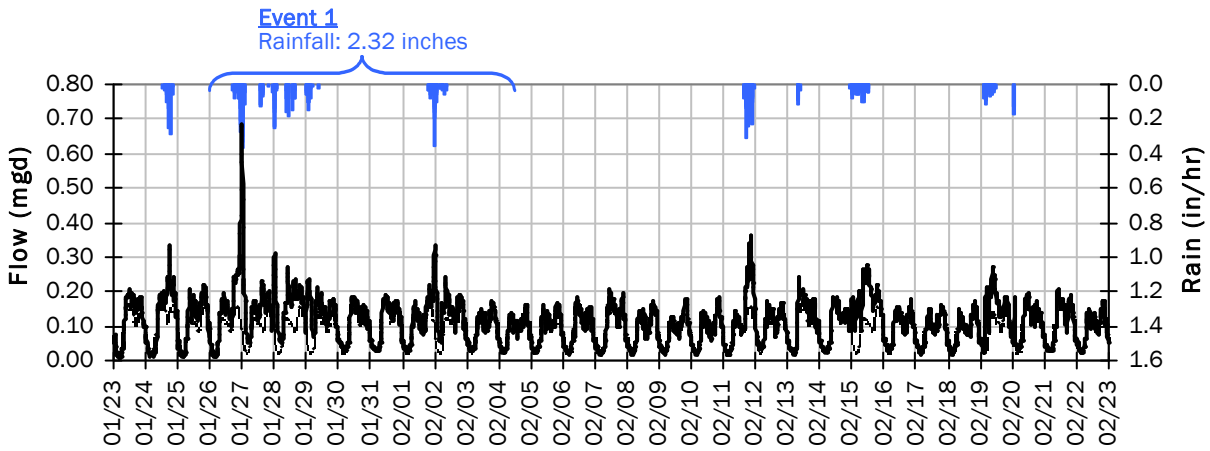




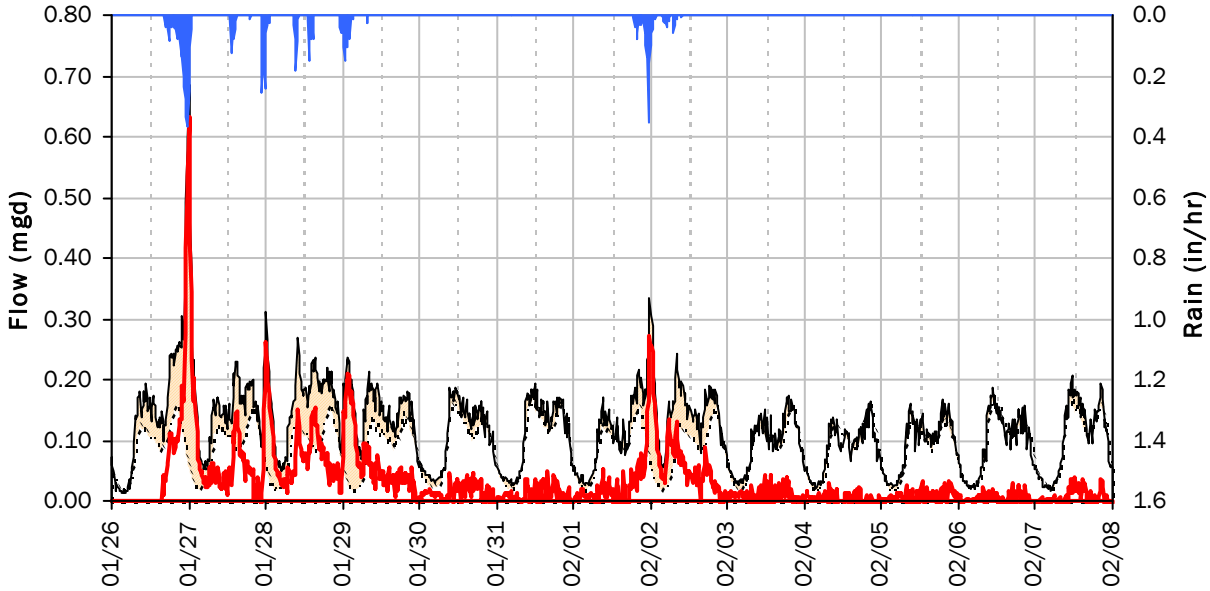
Pipe Diameter:	8	*inches*
Peak Measured Level:	6.63	*inches*
Peak d/D Ratio:	0.83	

FM 4-1
I/I Summary: Event 1

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



Event 1 Detail Graph

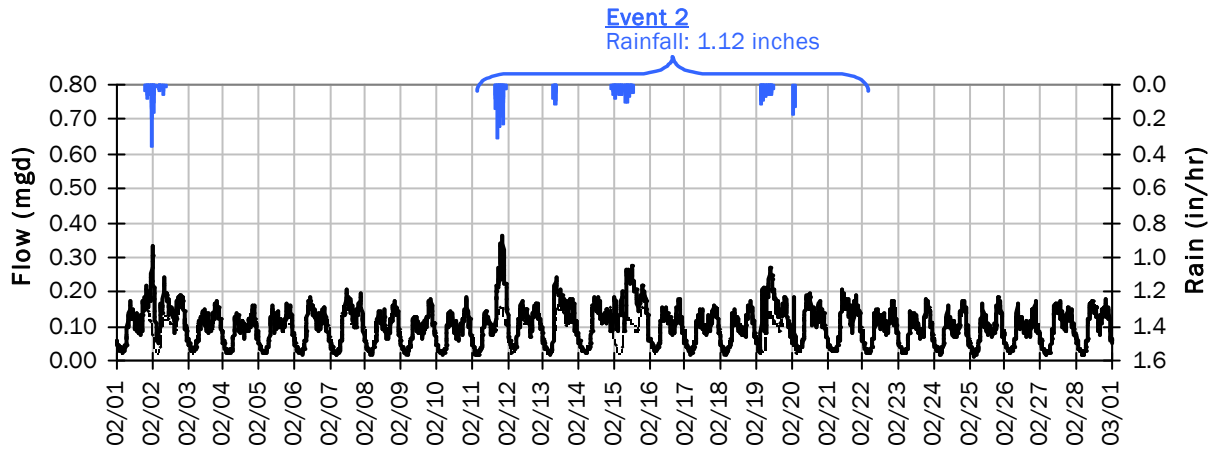


Storm Event I/I Analysis (Rain = 2.32 inches)

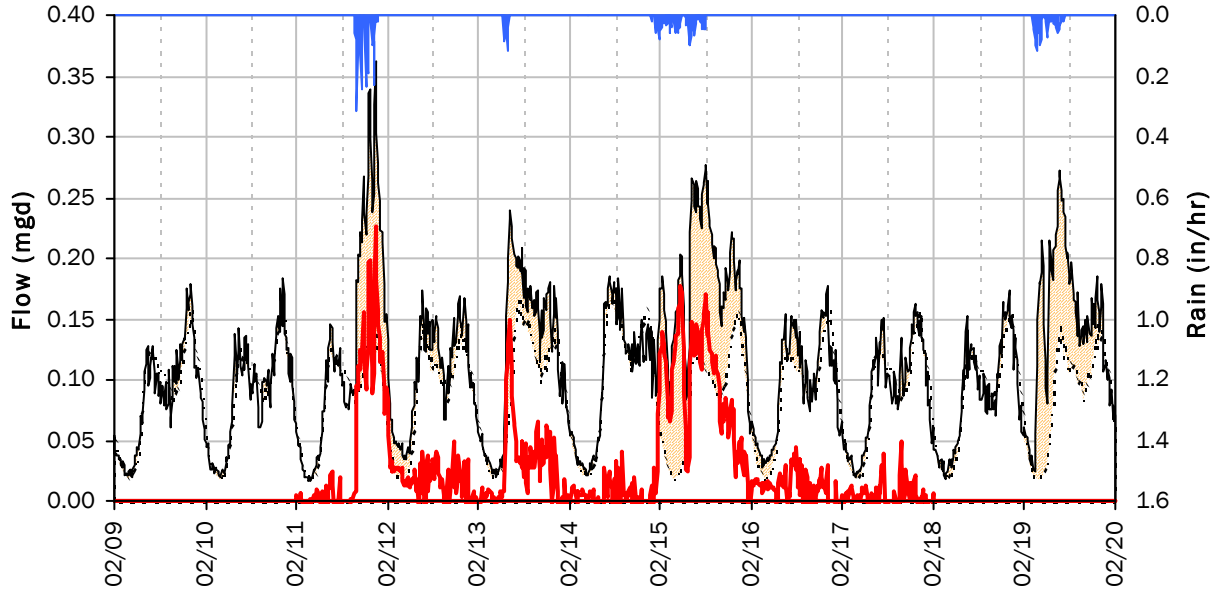
Capacity		Inflow / Infiltration	
Peak Flow:	0.69 *mgd*	**Peak I/I Rate:**	0.63 *mgd*
PF:	7.74	**Total I/I:**	407,000 *gallons*
Peak Level:	6.63 *in*		
d/D Ratio:	0.83		

FM 4-1
I/I Summary: Event 2

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



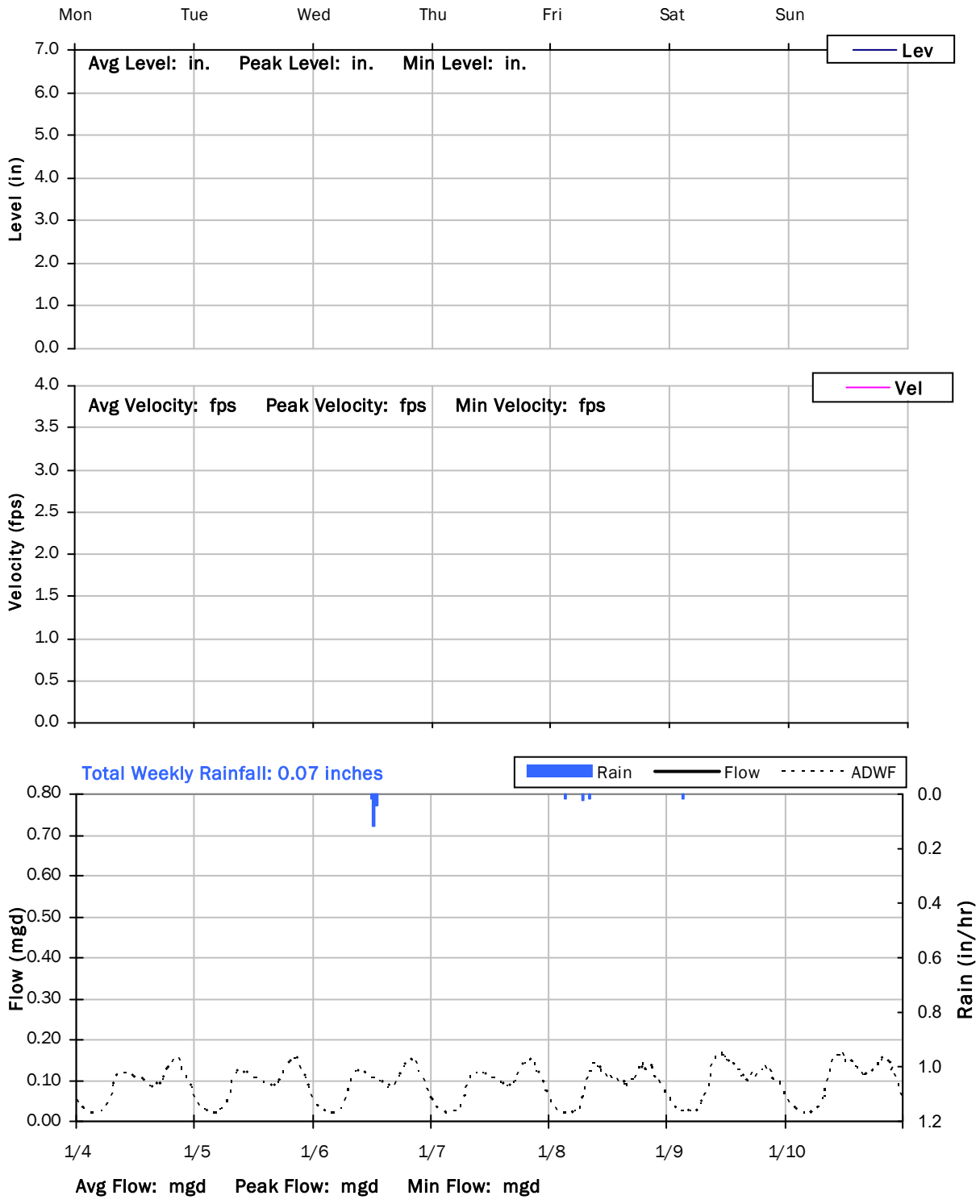
Event 2 Detail Graph



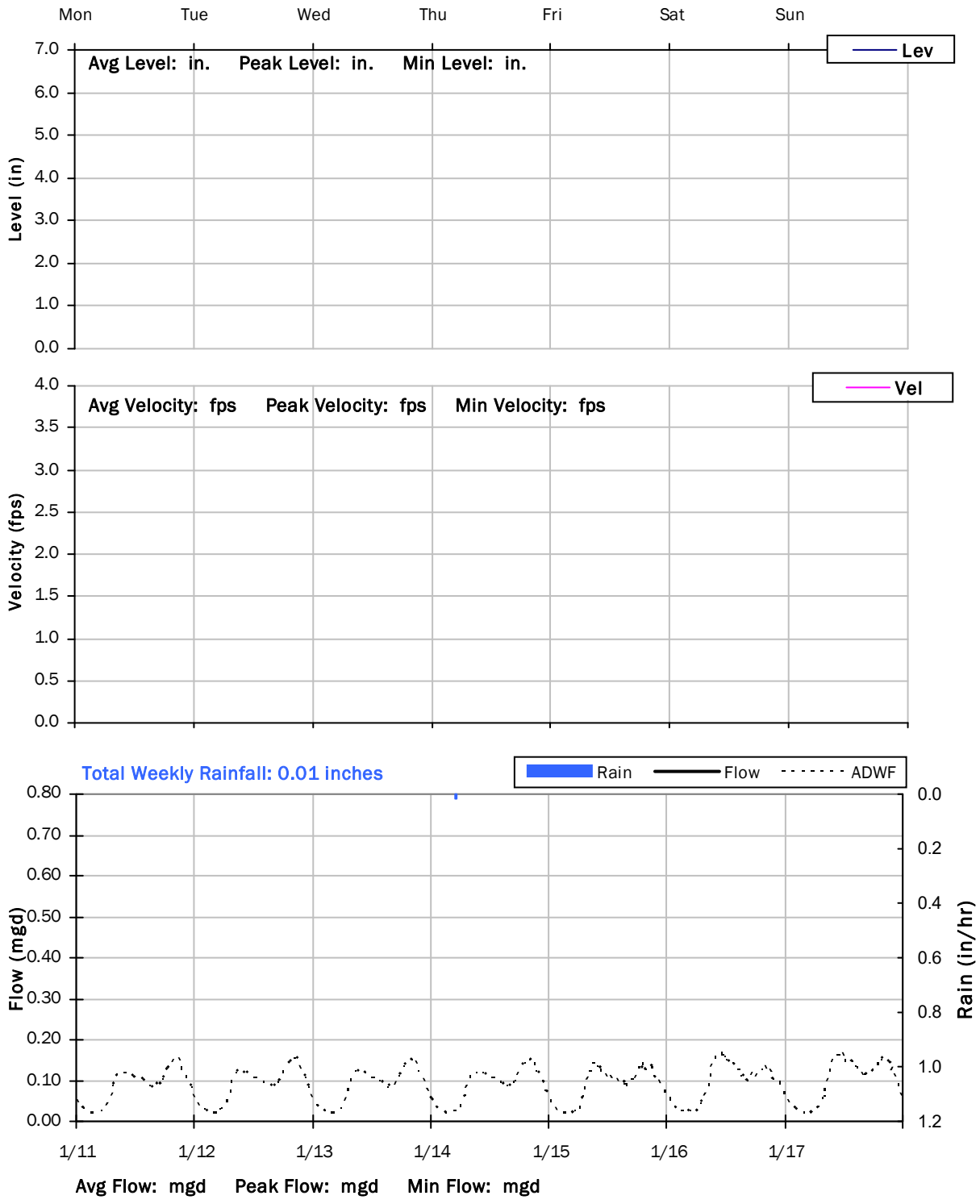
Storm Event I/I Analysis (Rain = 1.12 inches)

Capacity		Inflow / Infiltration	
Peak Flow:	0.36 *mgd*	**Peak I/I Rate:**	0.23 *mgd*
PF:	4.10	**Total I/I:**	196,000 *gallons*
Peak Level:	5.49 *in*		
d/D Ratio:	0.69		

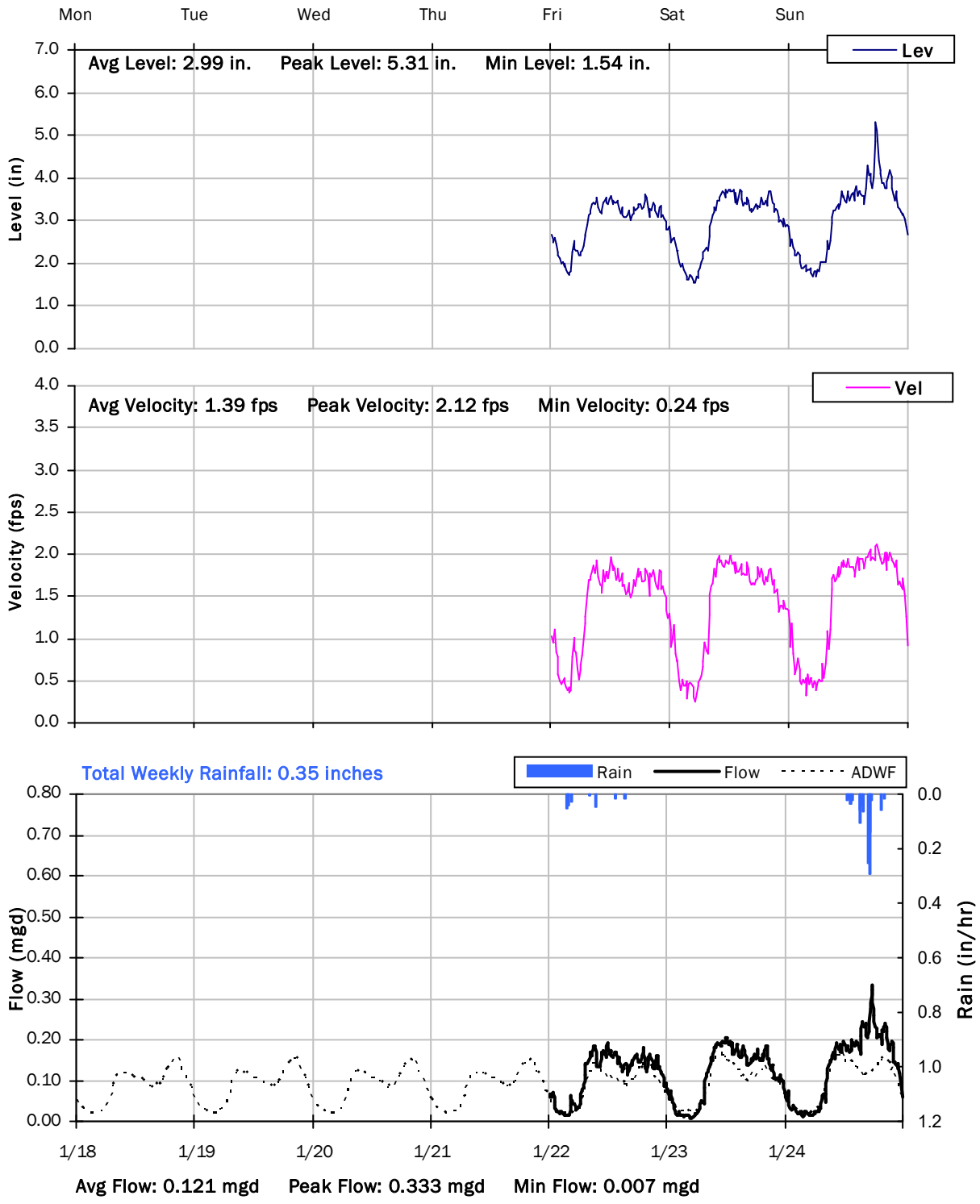
FM 4-1
Weekly Level, Velocity and Flow Hydrographs
1/4/2021 to 1/11/2021



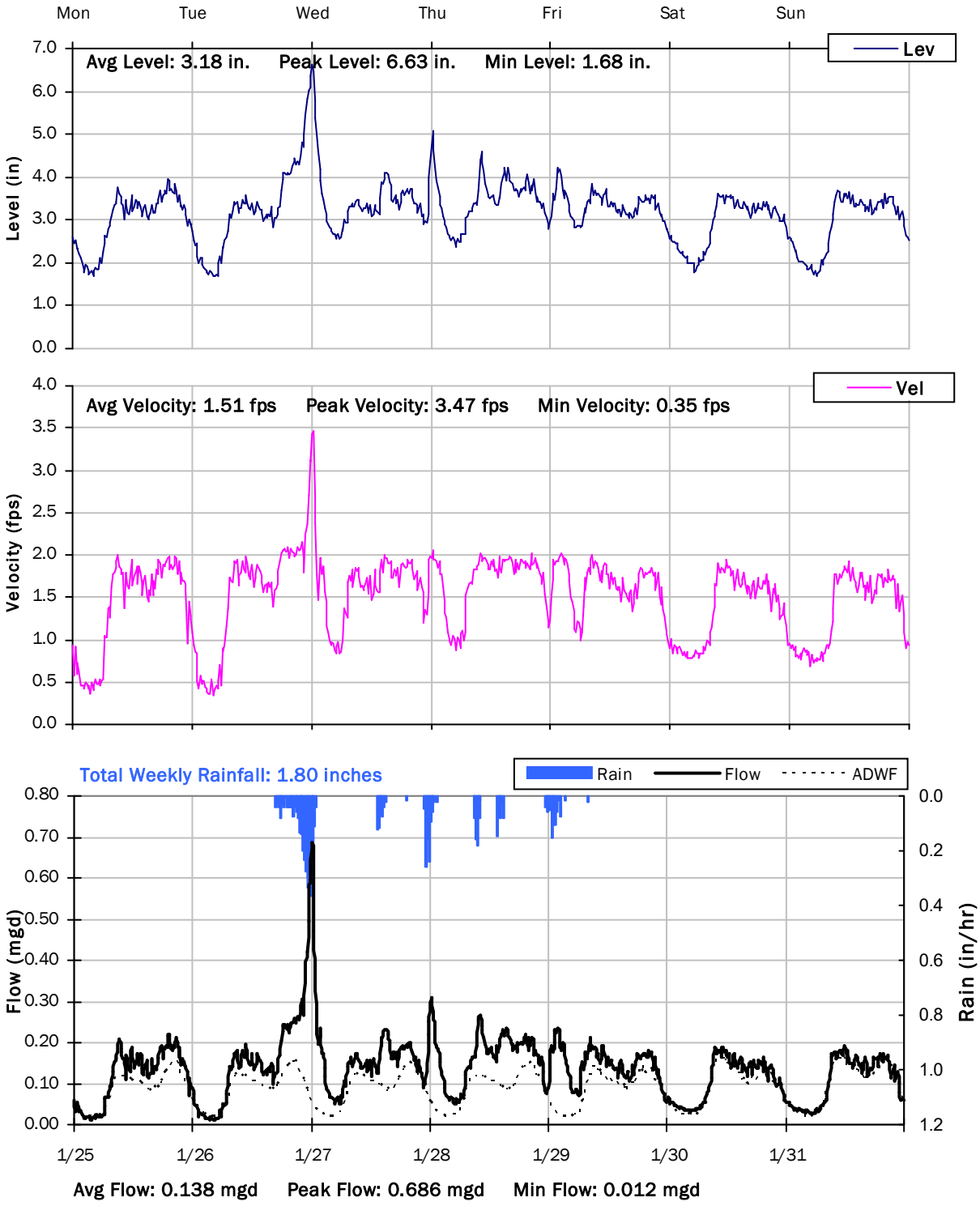
FM 4-1
Weekly Level, Velocity and Flow Hydrographs
1/11/2021 to 1/18/2021



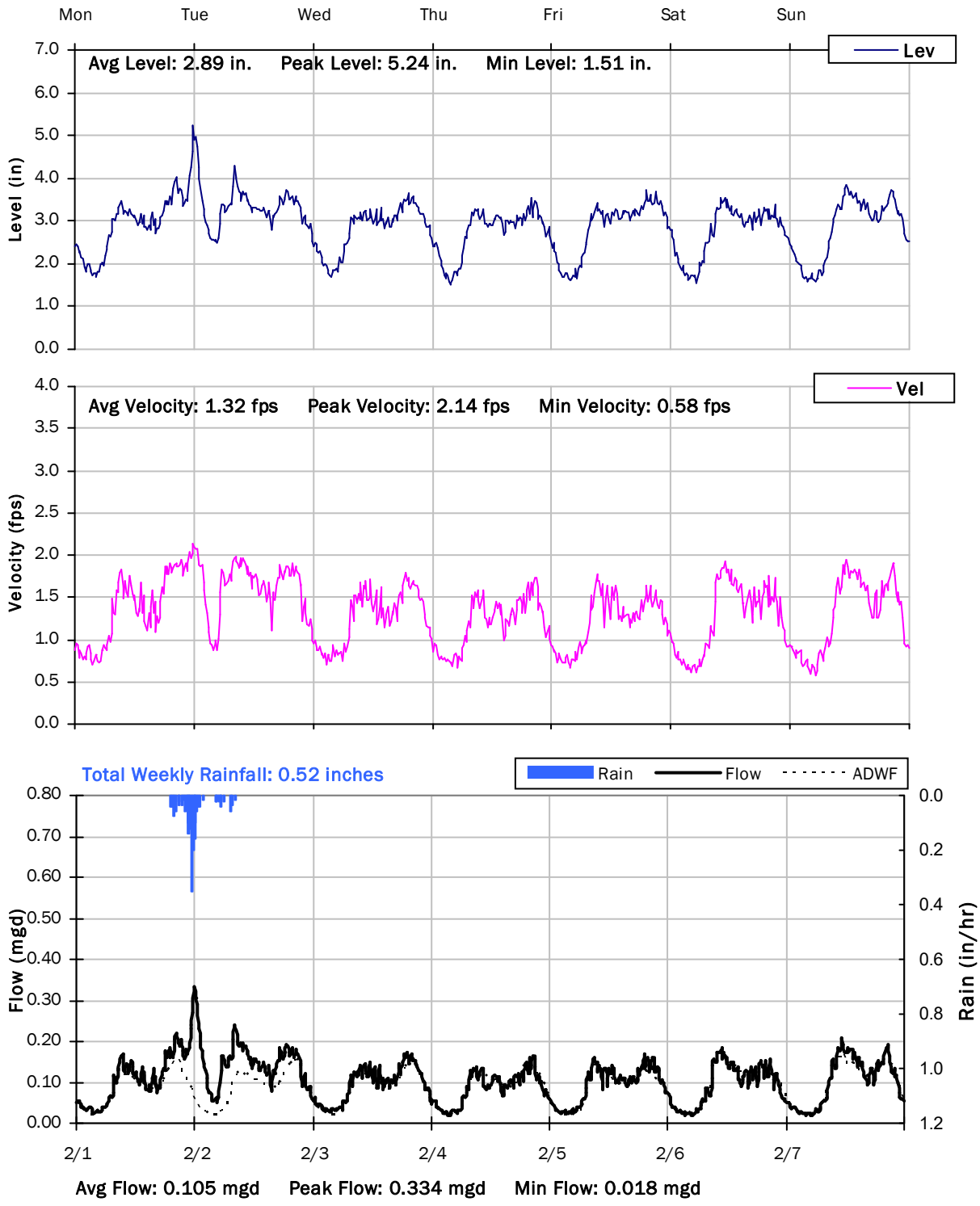
FM 4-1
Weekly Level, Velocity and Flow Hydrographs
1/18/2021 to 1/25/2021



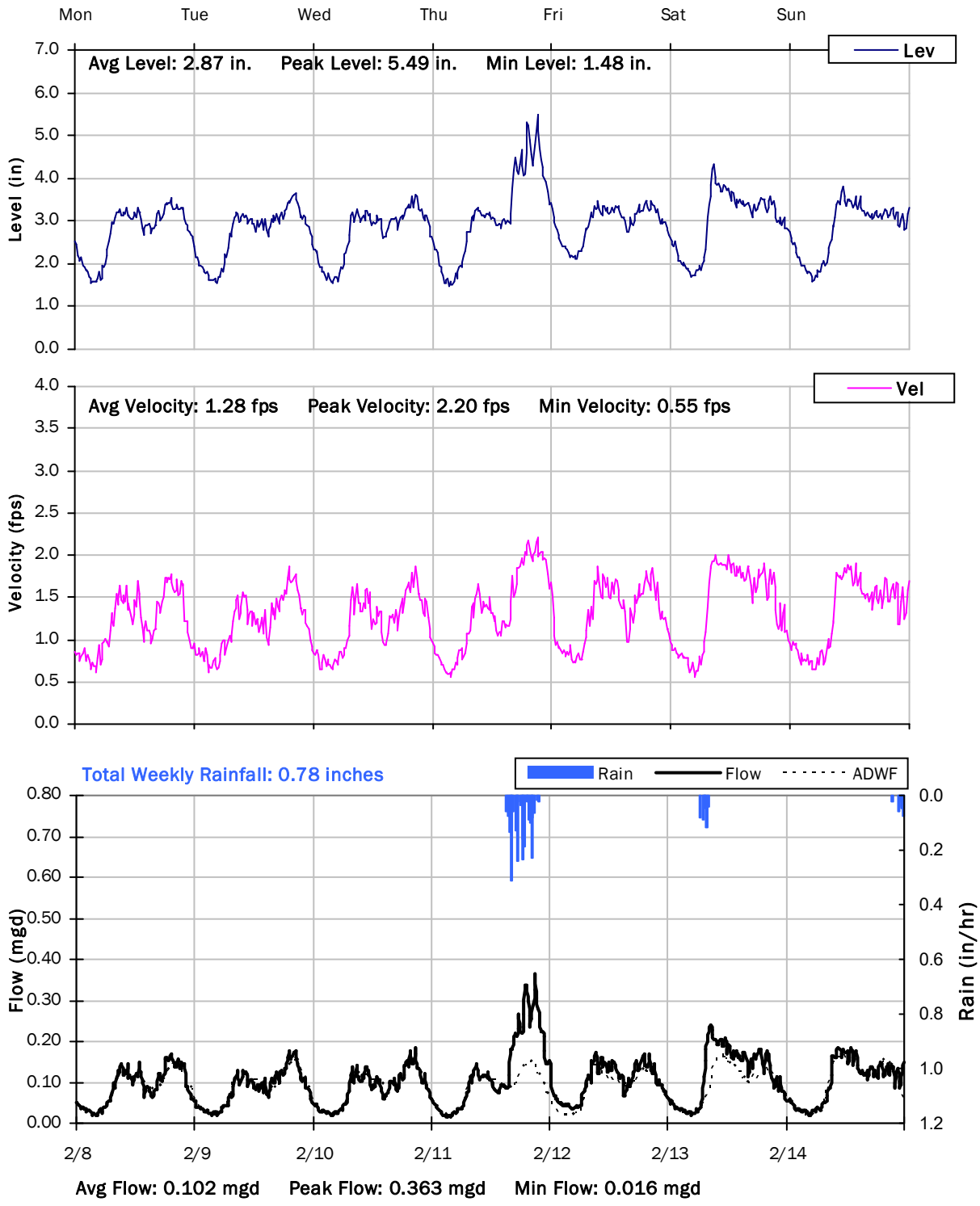
FM 4-1
Weekly Level, Velocity and Flow Hydrographs
1/25/2021 to 2/1/2021



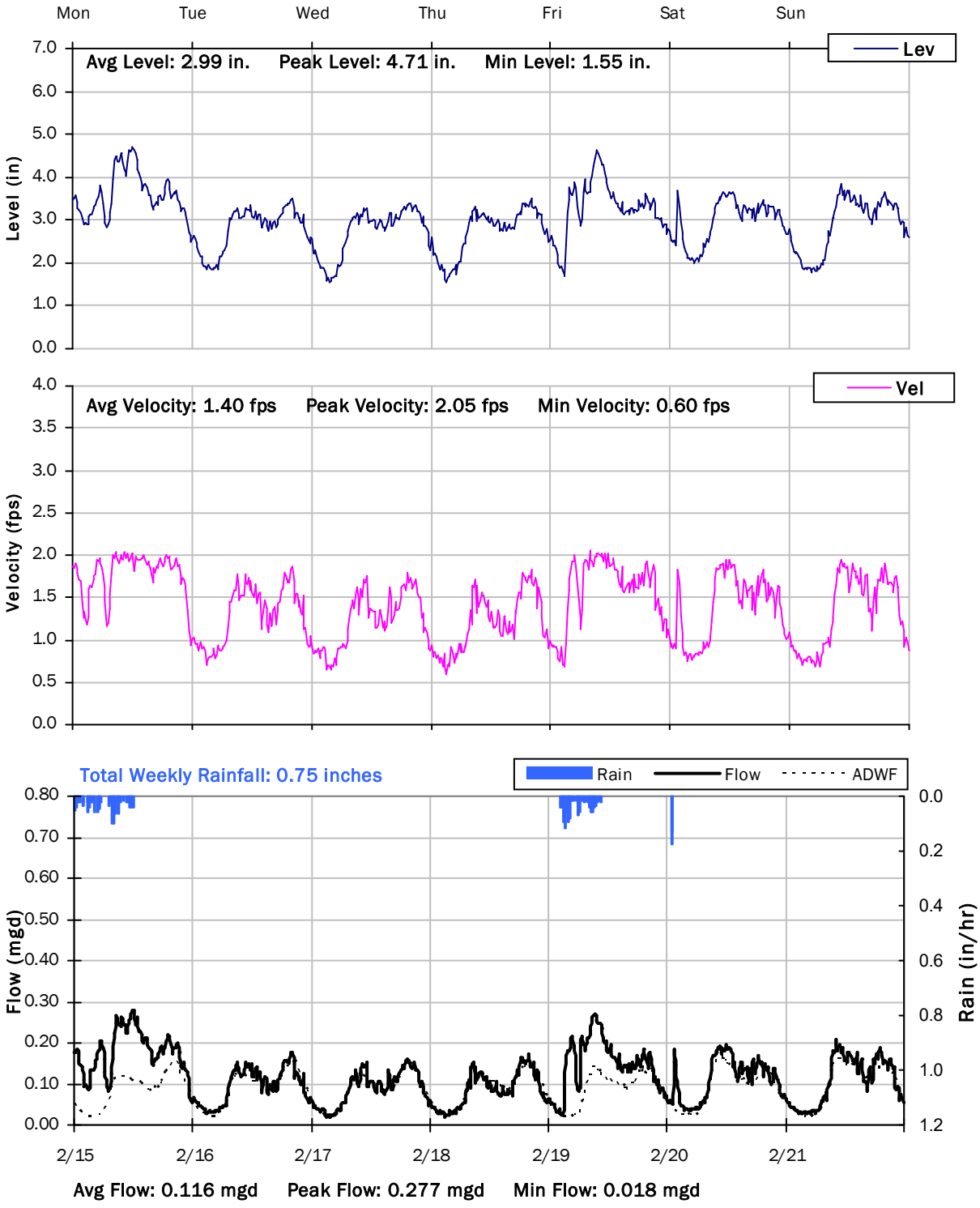
FM 4-1
Weekly Level, Velocity and Flow Hydrographs
2/1/2021 to 2/8/2021



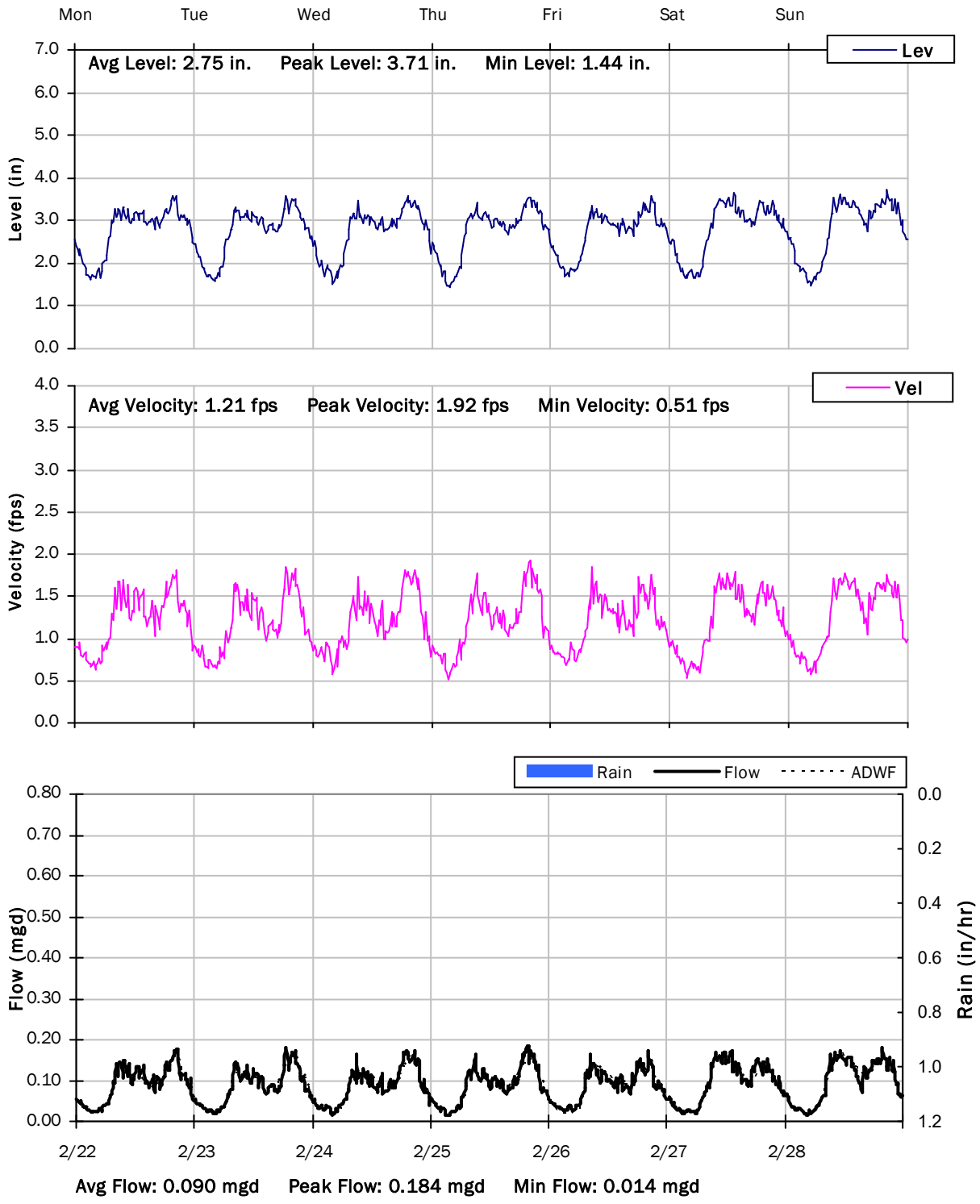
FM 4-1
Weekly Level, Velocity and Flow Hydrographs
2/8/2021 to 2/15/2021



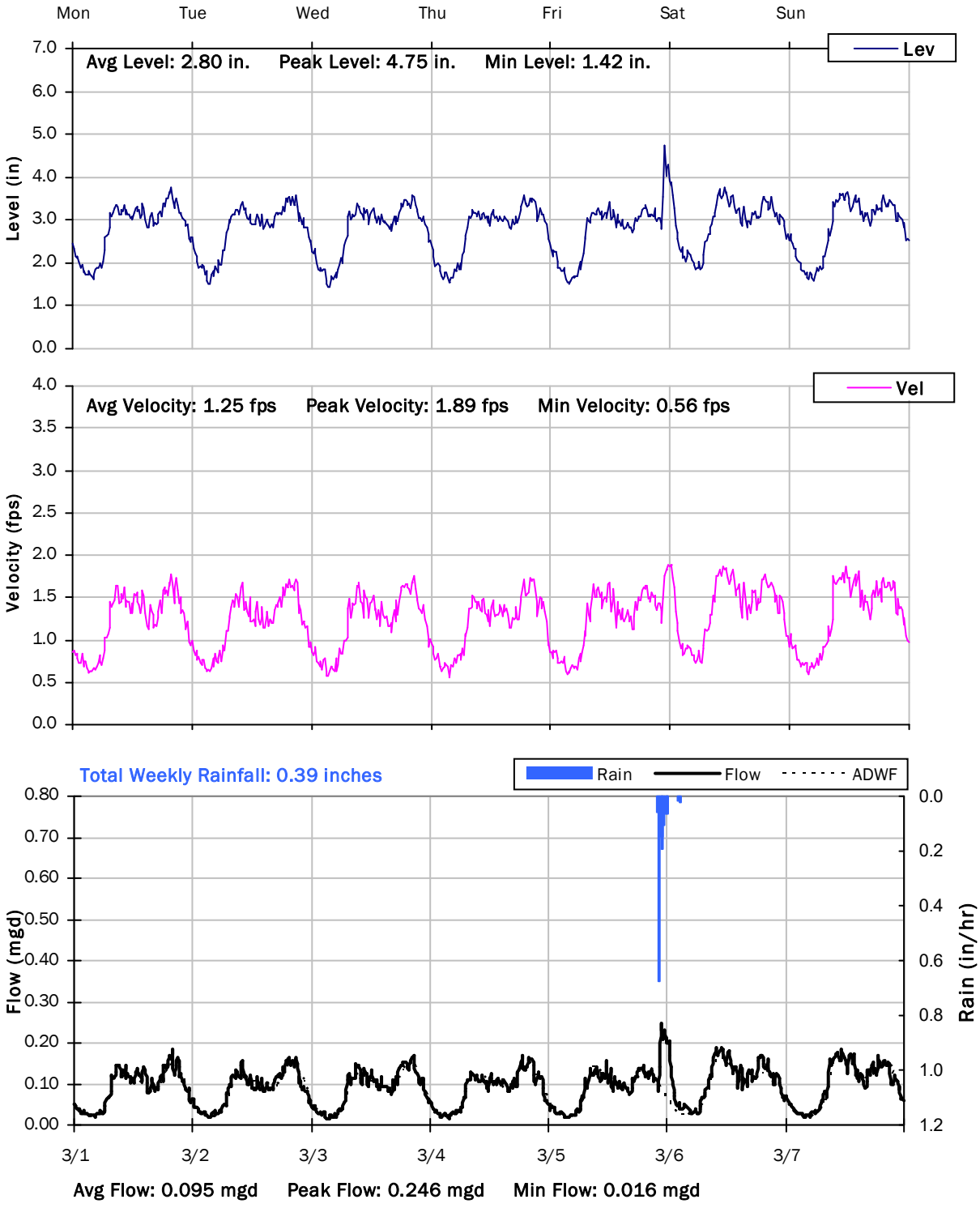
FM 4-1
Weekly Level, Velocity and Flow Hydrographs
2/15/2021 to 2/22/2021



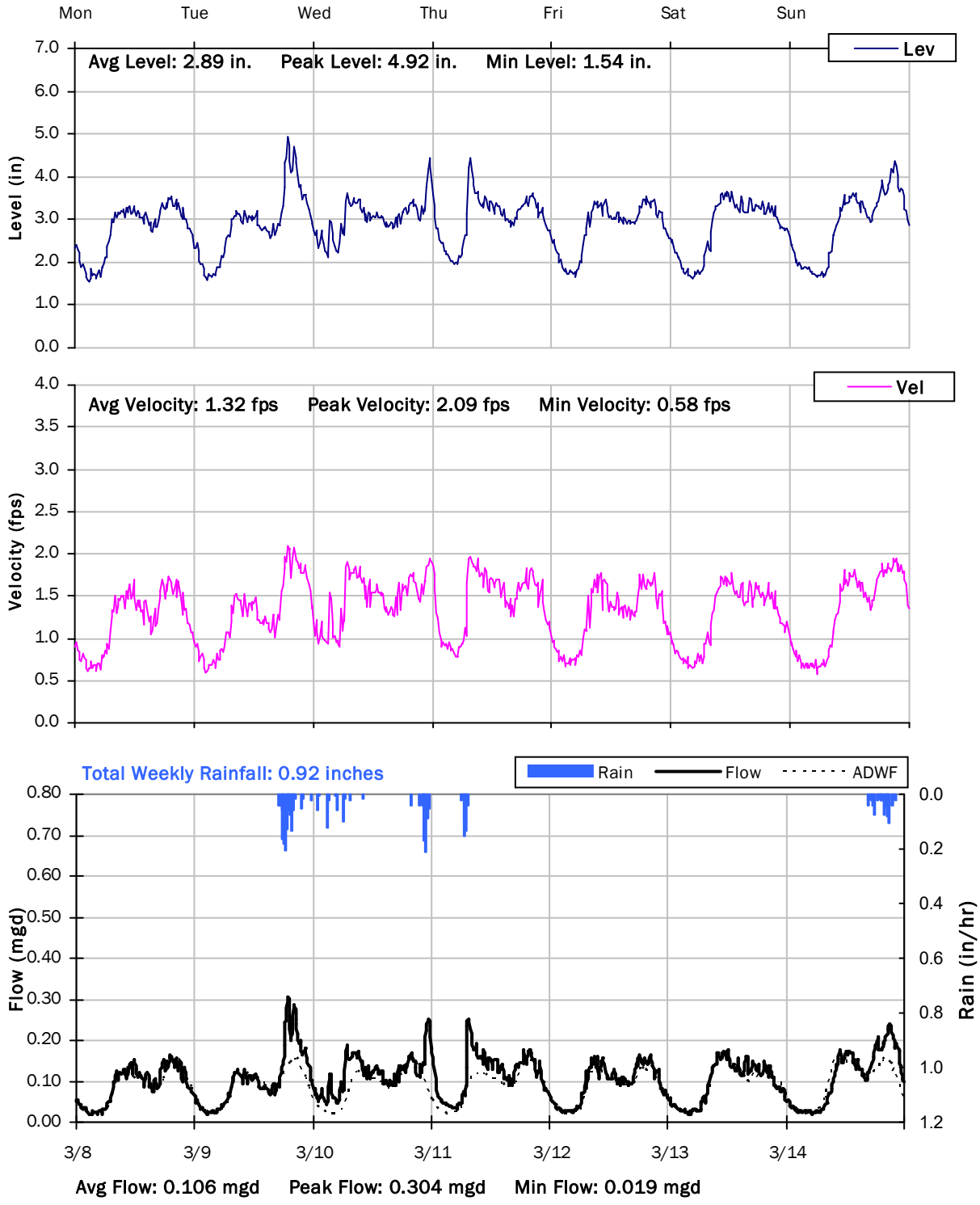
FM 4-1
Weekly Level, Velocity and Flow Hydrographs
2/22/2021 to 3/1/2021



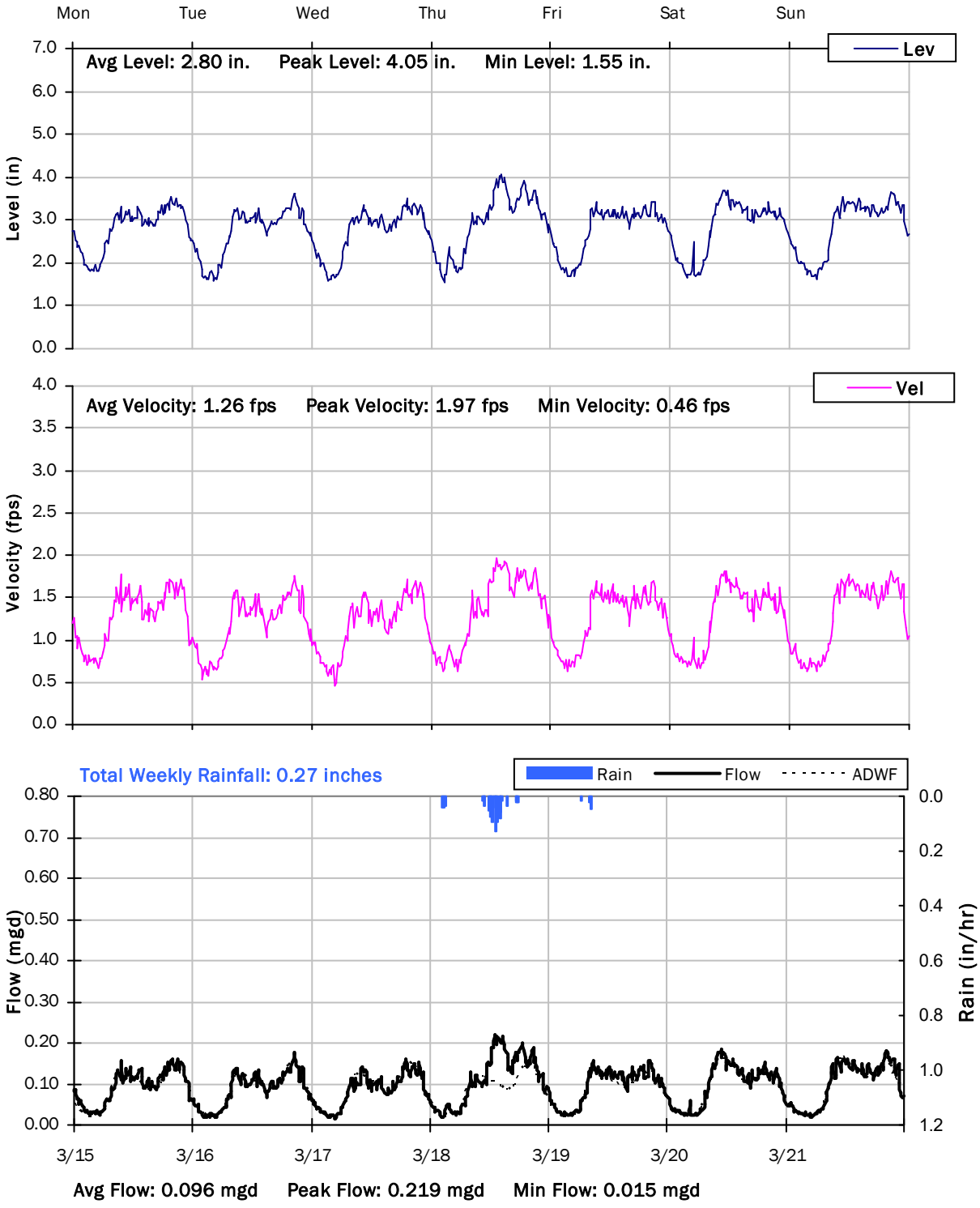
FM 4-1
Weekly Level, Velocity and Flow Hydrographs
3/1/2021 to 3/8/2021



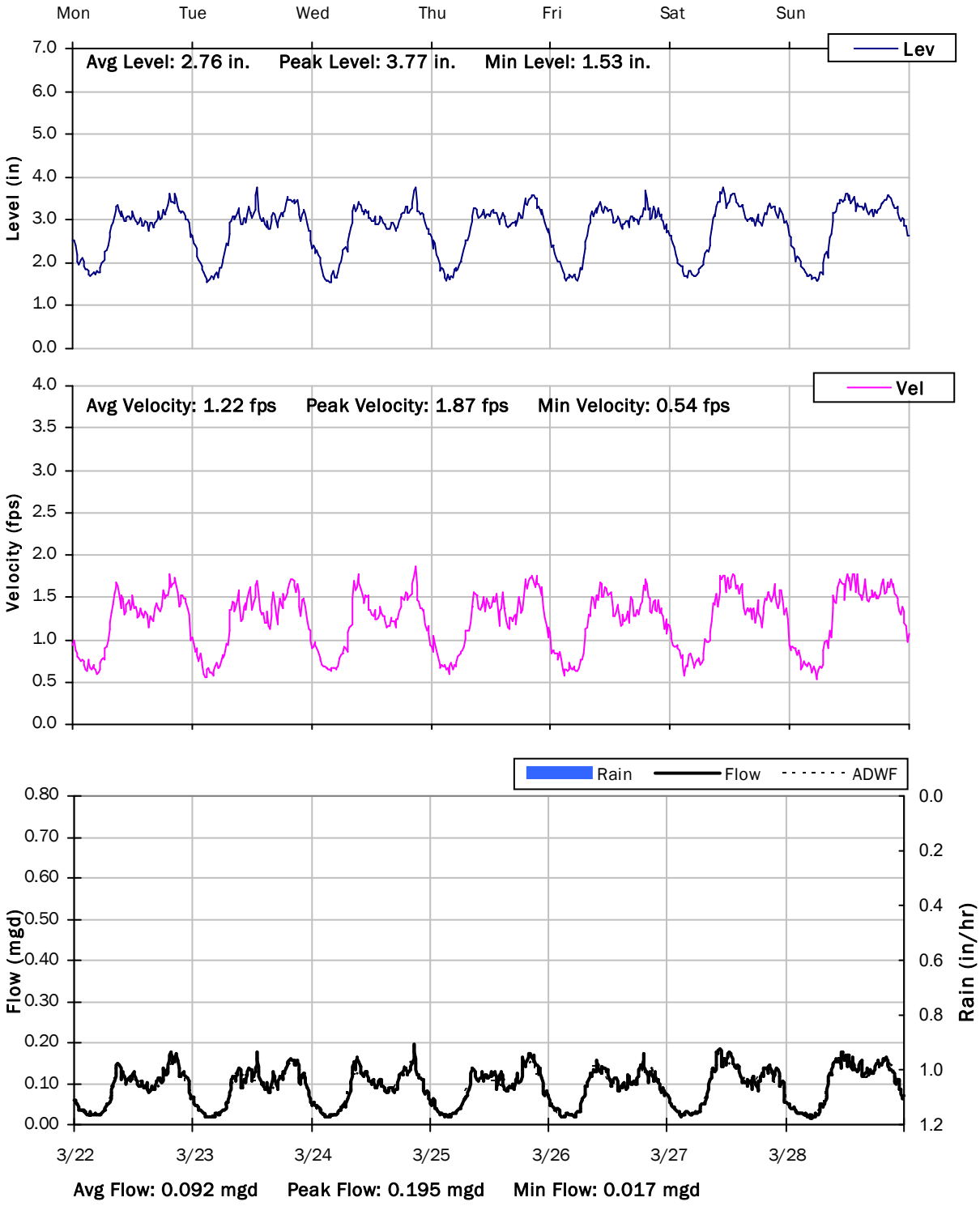
FM 4-1
Weekly Level, Velocity and Flow Hydrographs
3/8/2021 to 3/15/2021



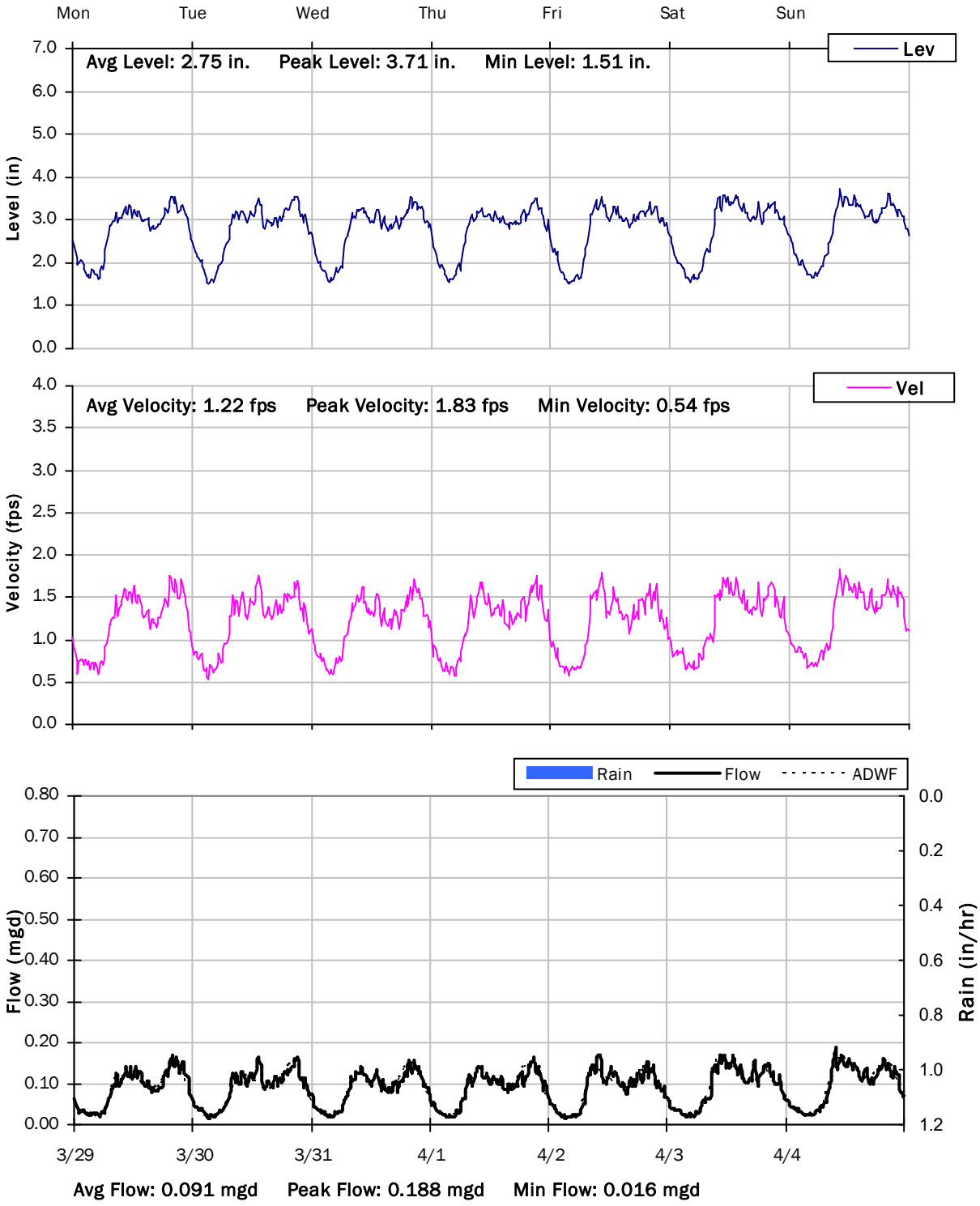
FM 4-1
Weekly Level, Velocity and Flow Hydrographs
3/15/2021 to 3/22/2021



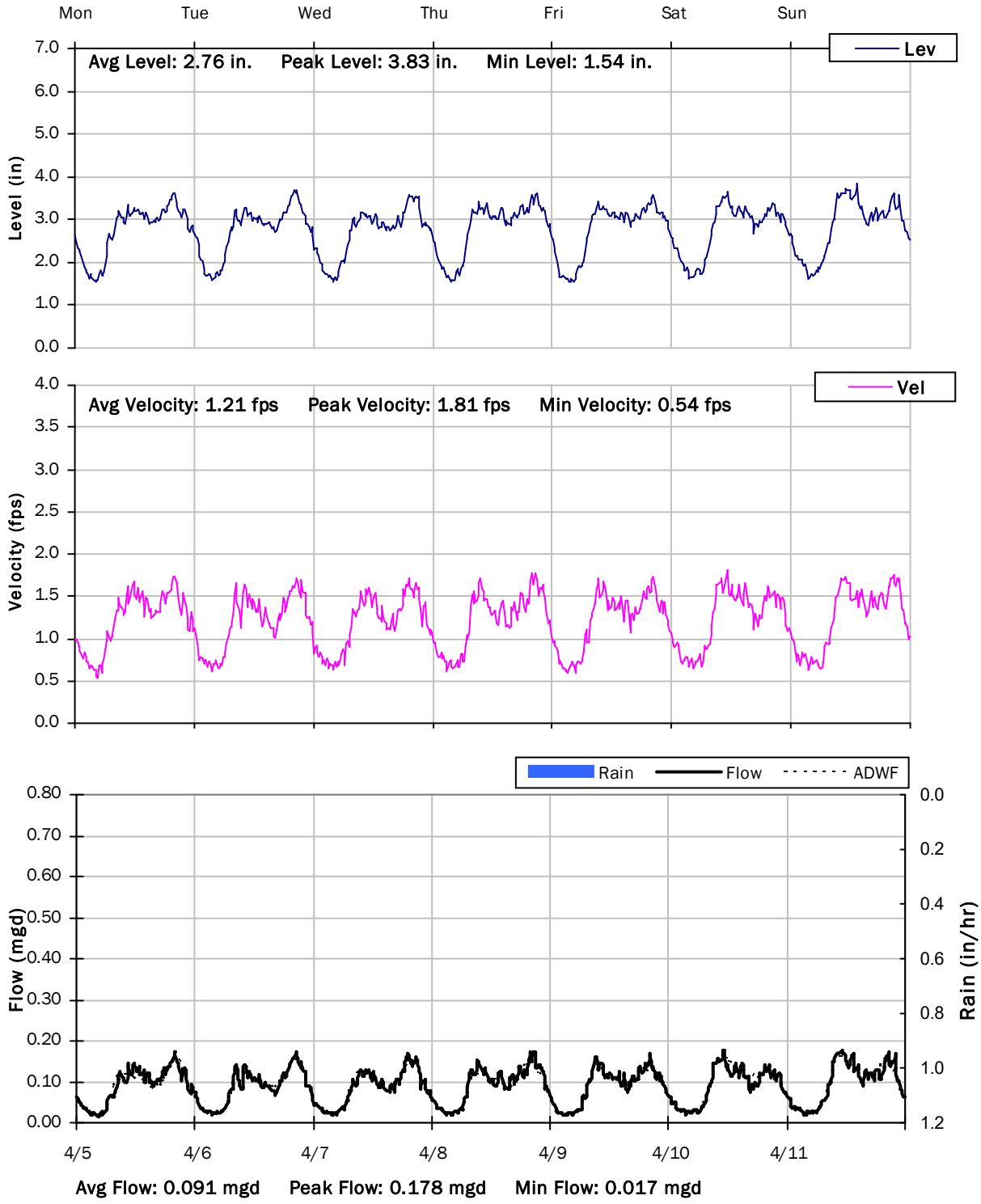
FM 4-1
Weekly Level, Velocity and Flow Hydrographs
3/22/2021 to 3/29/2021



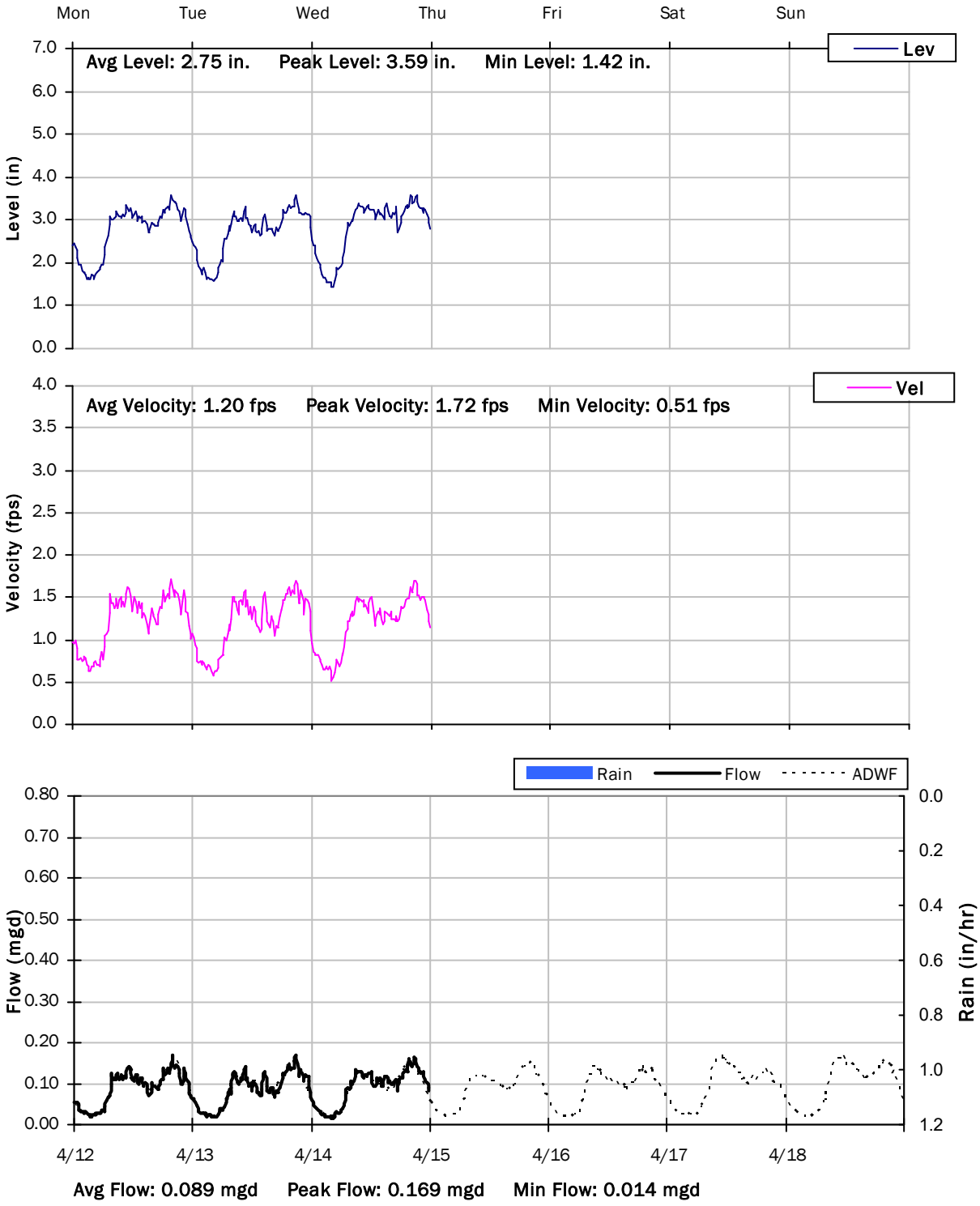
FM 4-1
Weekly Level, Velocity and Flow Hydrographs
3/29/2021 to 4/5/2021



FM 4-1
Weekly Level, Velocity and Flow Hydrographs
4/5/2021 to 4/12/2021



FM 4-1
Weekly Level, Velocity and Flow Hydrographs
4/12/2021 to 4/19/2021



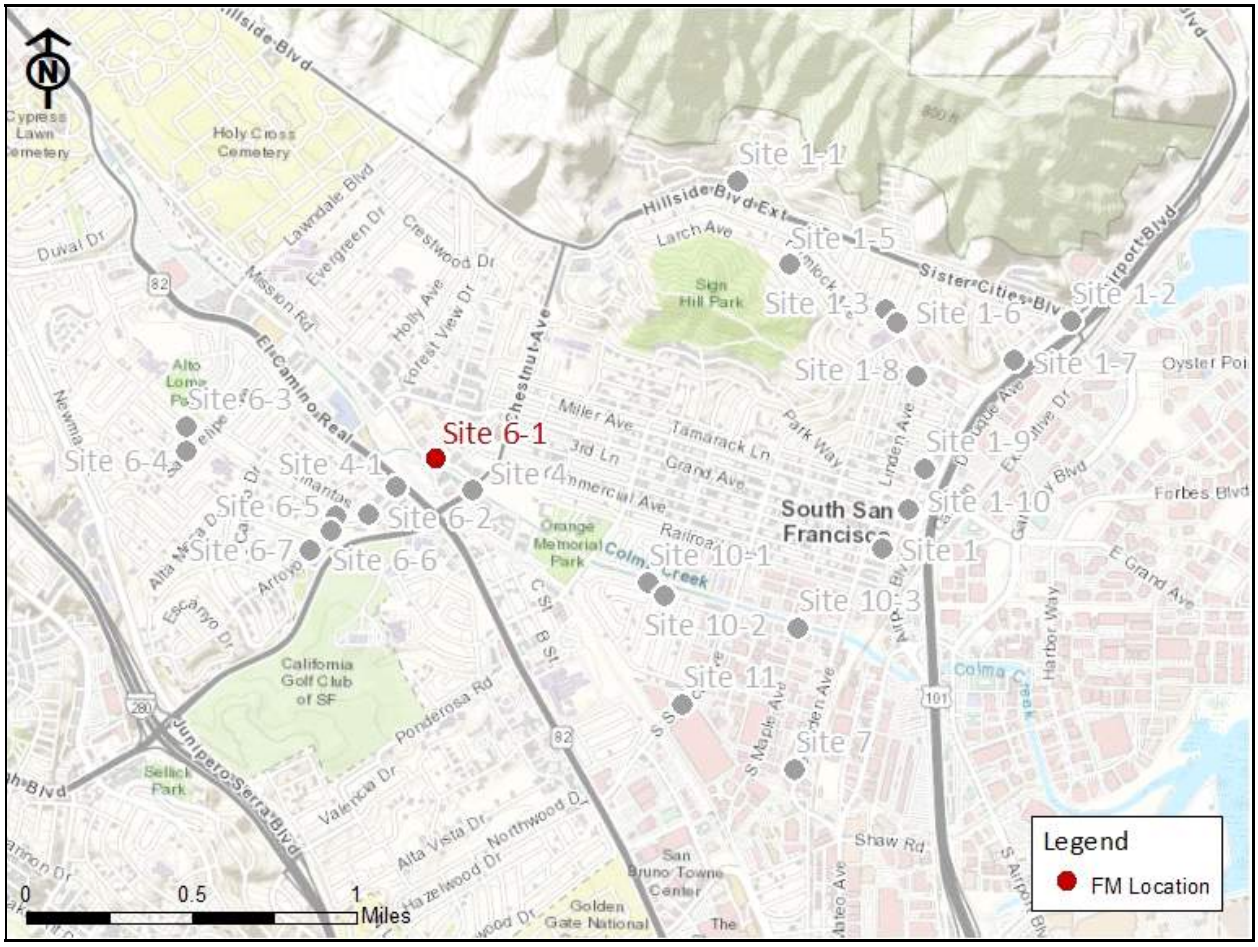
South San Francisco, CA

Sanitary Sewer Flow Monitoring
January 4 - April 14, 2021

Monitoring Site: FM 6-1

Location: Mission Road and Oak Avenue

Data Summary Report



Vicinity Map: FM 6-1

FM 6-1

Site Information

Location: Mission Road and Oak Avenue

Coordinates: 122.4343° W, 37.6576° N

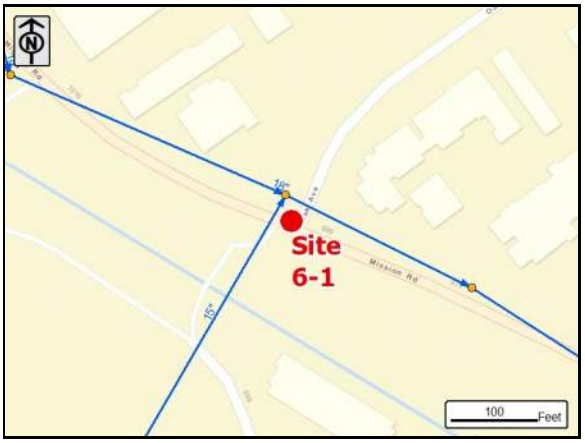
Rim Elevation (Earth): 40 feet

Pipe Diameter: 14.5 inches

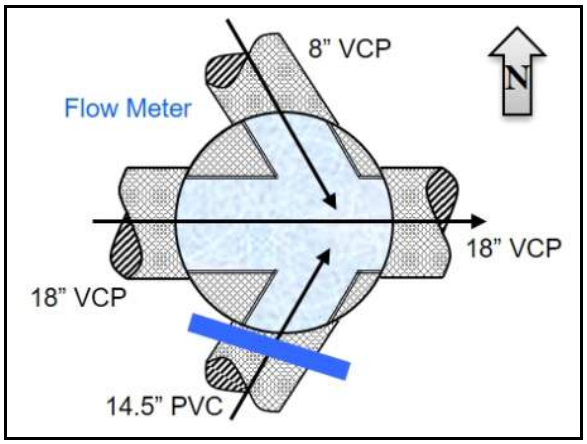
ADWF: 0.266 mgd

Peak Measured Flow: 1.119 mgd

Satellite Map



Sanitary Map



Flow Sketch

Street View

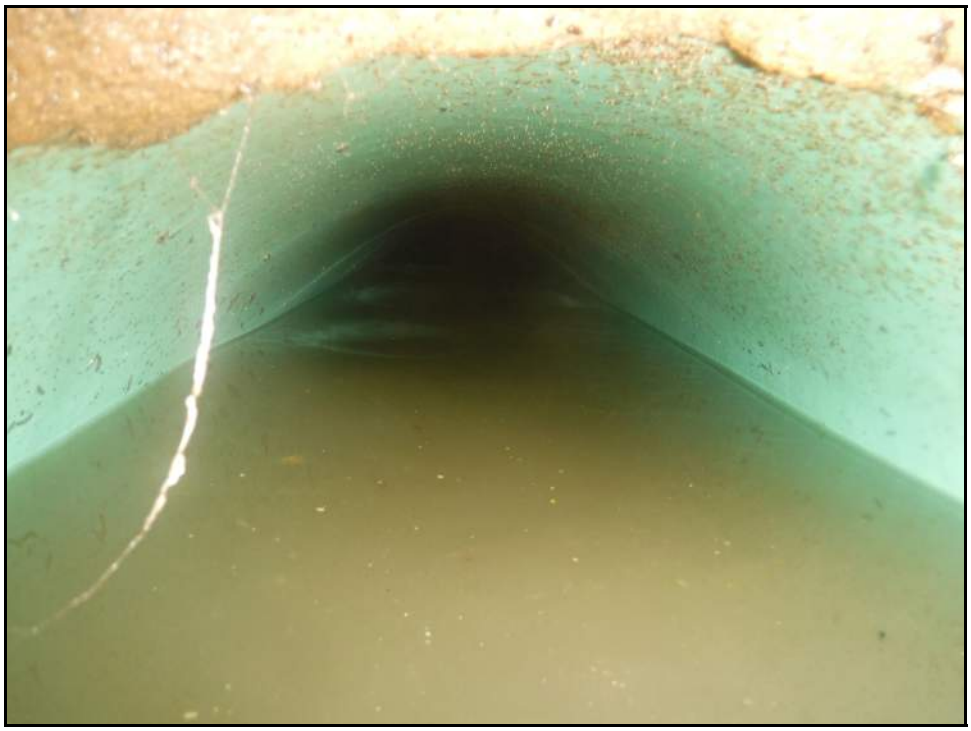
Plan View

FM 6-1

Additional Site Photos

Effluent Pipe

Monitored South Influent Pipe



FM 6-1

Additional Site Photos

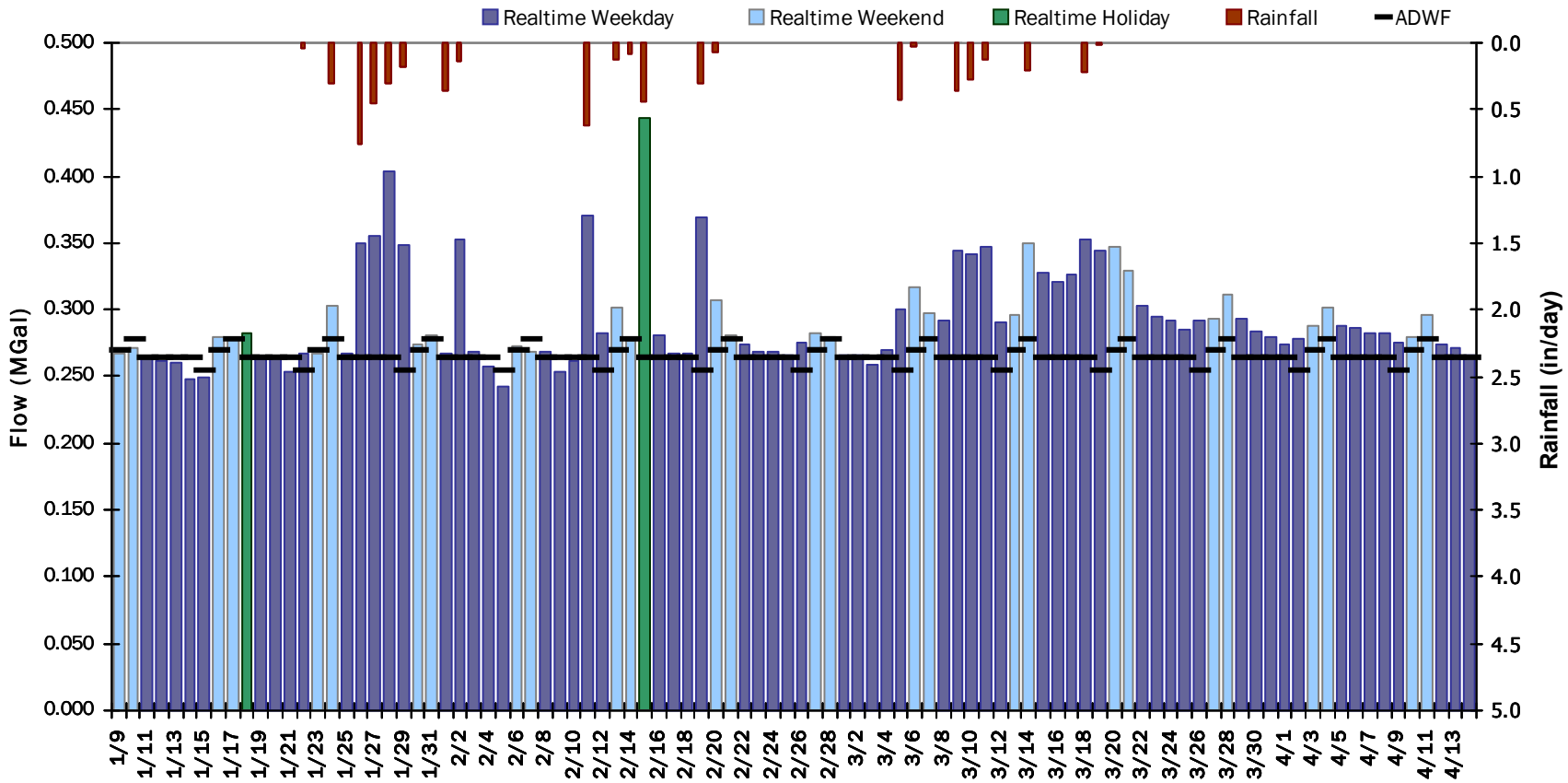
West Influent Pipe

North Influent Pipe

FM 6-1
Period Flow Summary: Daily Flow Totals

Avg Period Flow: 0.293 MGal Peak Daily Flow: 0.443 MGal Min Daily Flow: 0.243 MGal

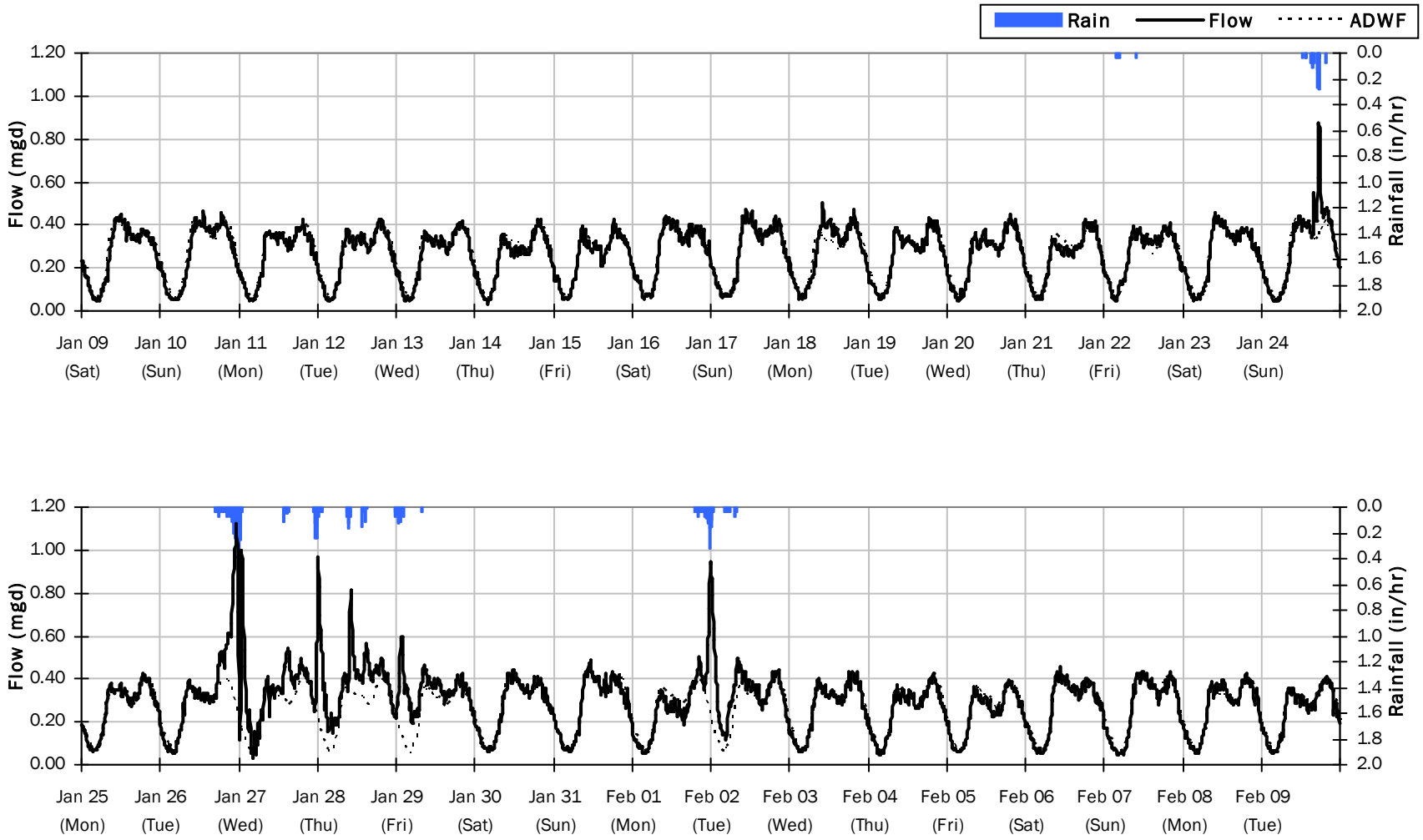
Total Period Rainfall: 5.82 inches



FM 6-1

Flow Summary: 1/9/2021 to 2/9/2021

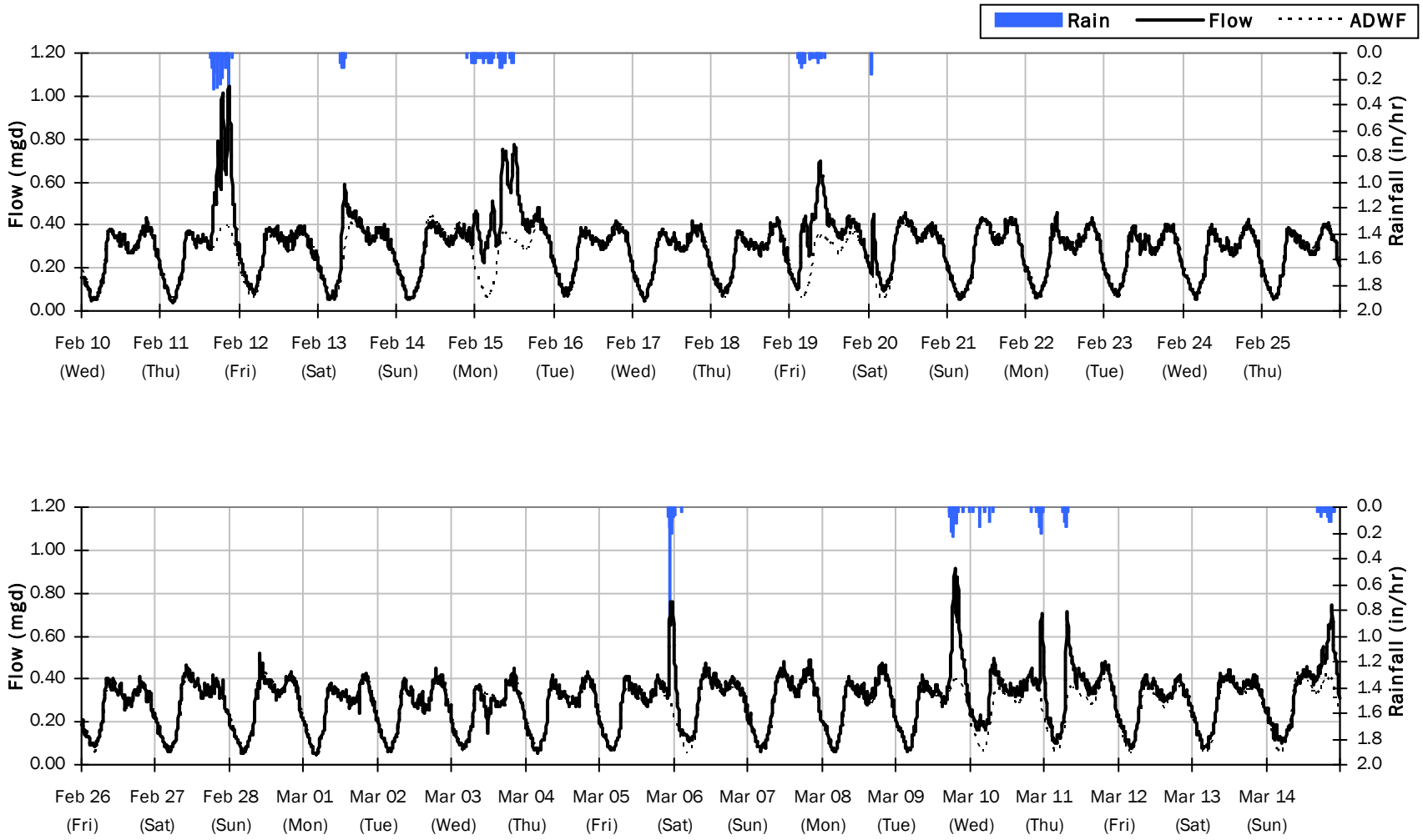
Total Period Rainfall: 2.53 inches Avg Flow: 0.282 mgd Peak Flow: 1.119 mgd Min Flow: 0.030 mgd



FM 6-1

Flow Summary: 2/10/2021 to 3/14/2021

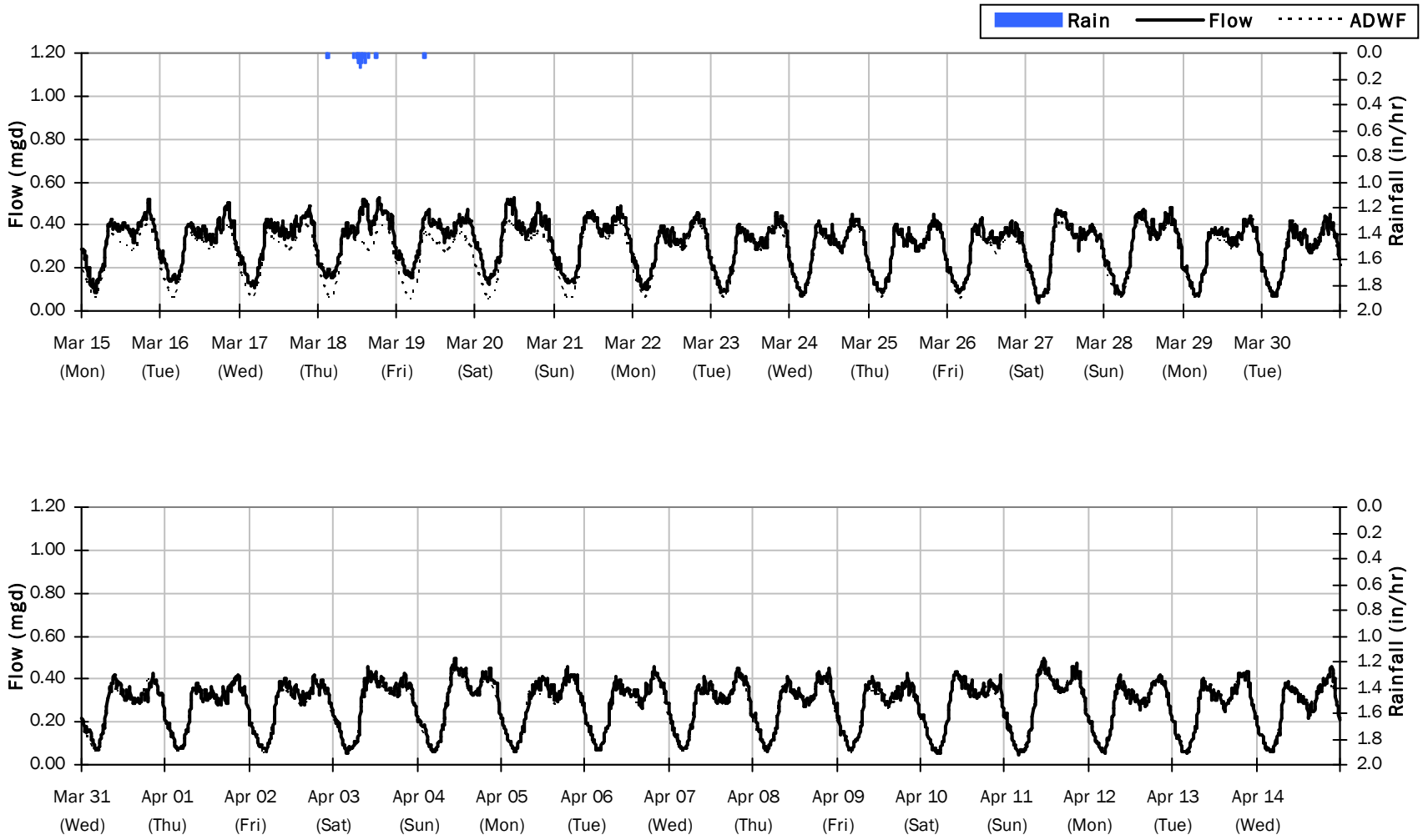
Total Period Rainfall: 3.04 inches Avg Flow: 0.299 mgd Peak Flow: 1.048 mgd Min Flow: 0.041 mgd



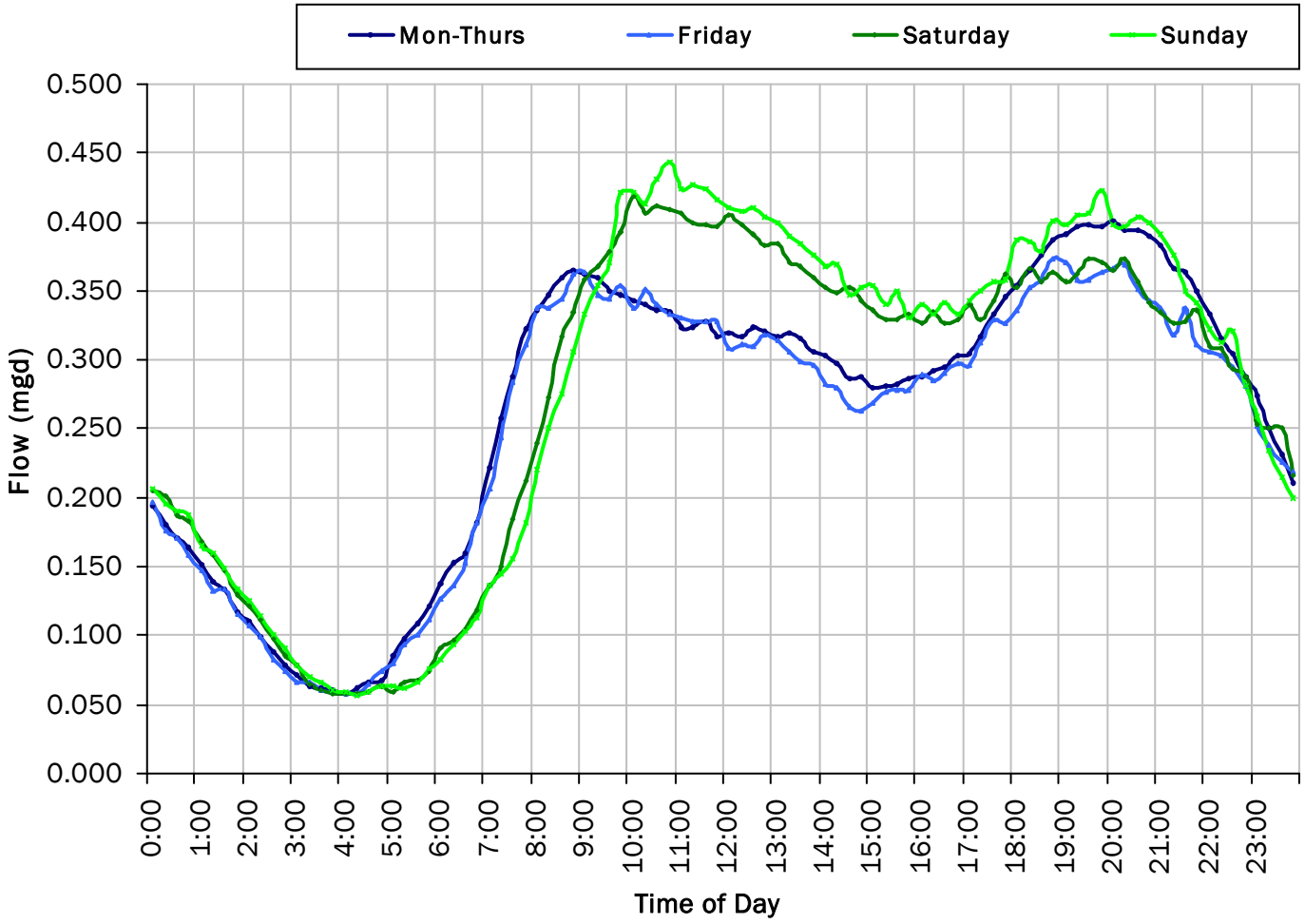
FM 6-1

Flow Summary: 3/15/2021 to 4/14/2021

Total Period Rainfall: 0.24 inches Avg Flow: 0.297 mgd Peak Flow: 0.524 mgd Min Flow: 0.042 mgd

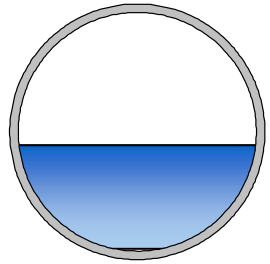


FM 6-1
Average Dry Weather Flow Hydrographs



ADWF:

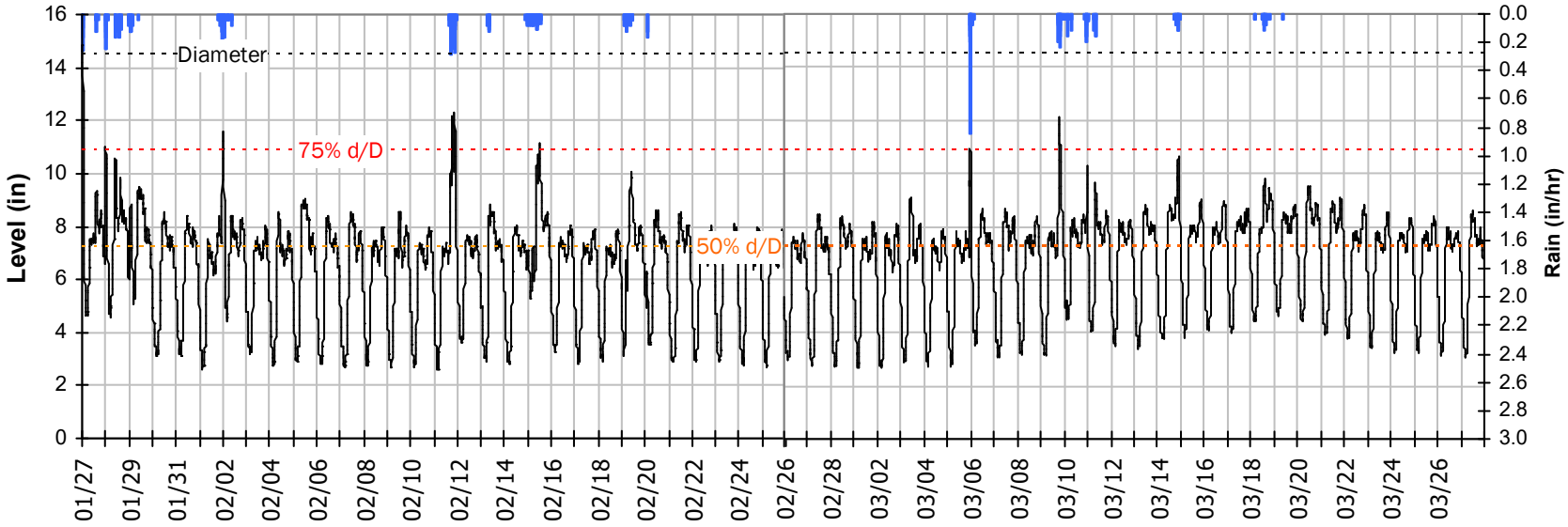
0.266 *mgd*

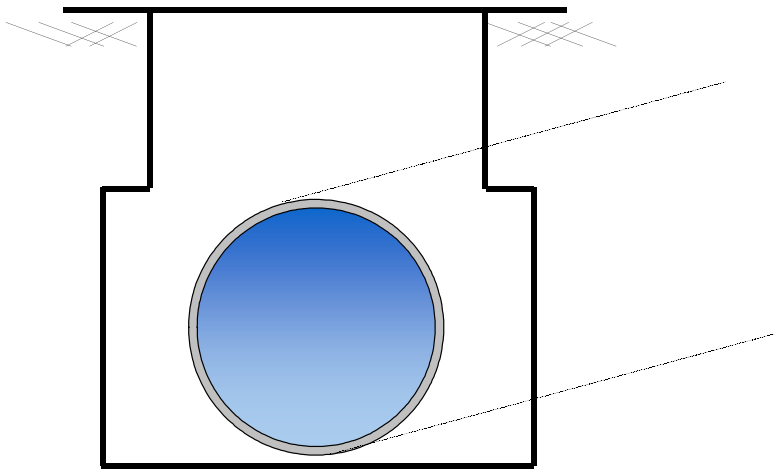


FM 6-1

Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Monitoring Period



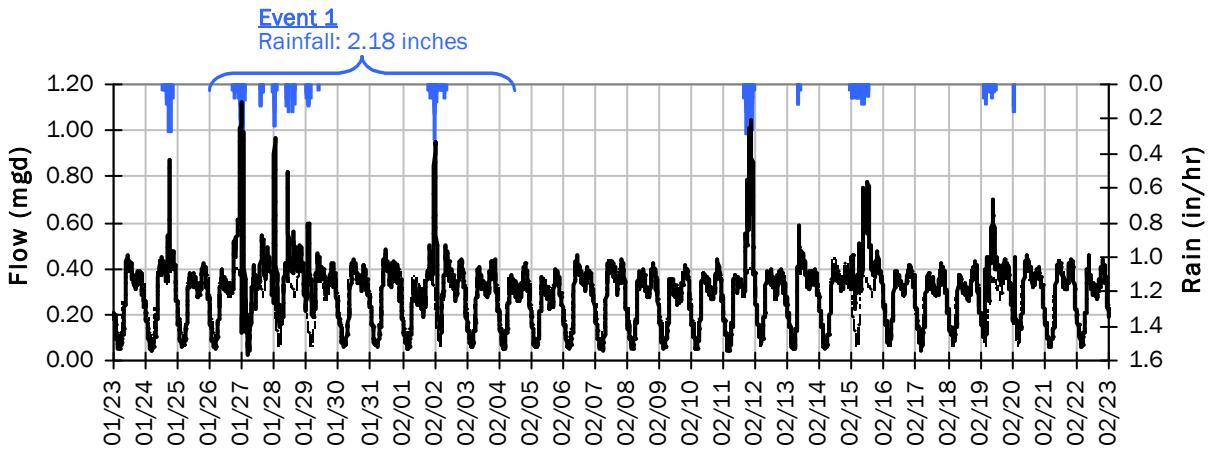


Pipe Diameter:	14.5	*inches*
Peak Measured Level:	14.9	*inches*
Peak d/D Ratio:	1.03	

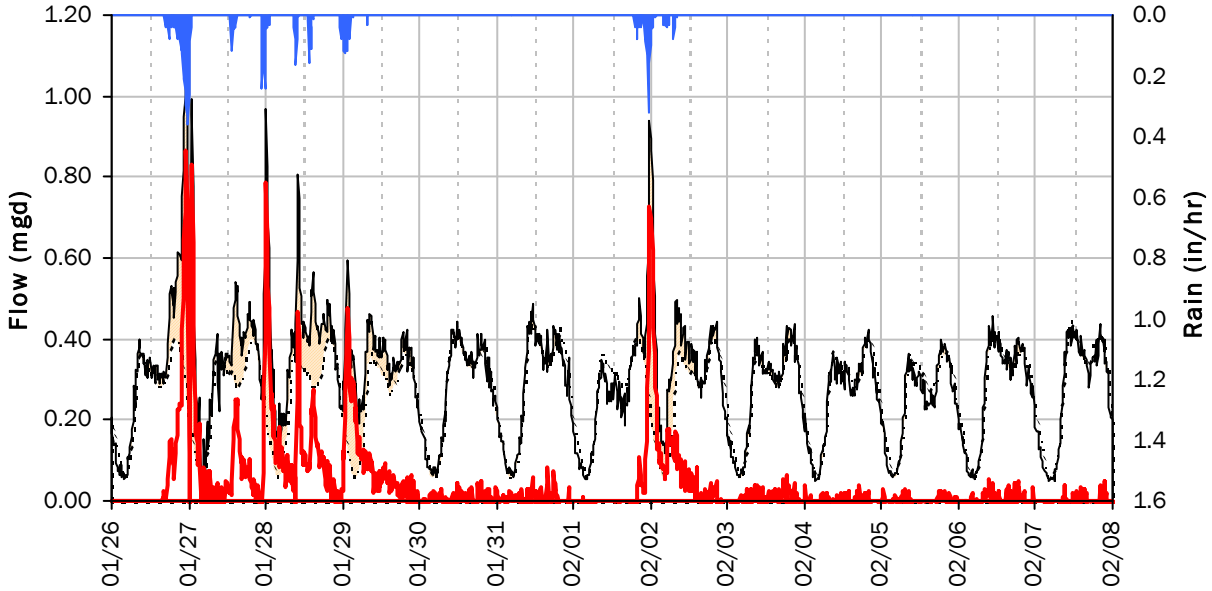
Surcharged 0.4 inches over crown

FM 6-1
I/I Summary: Event 1

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



Event 1 Detail Graph

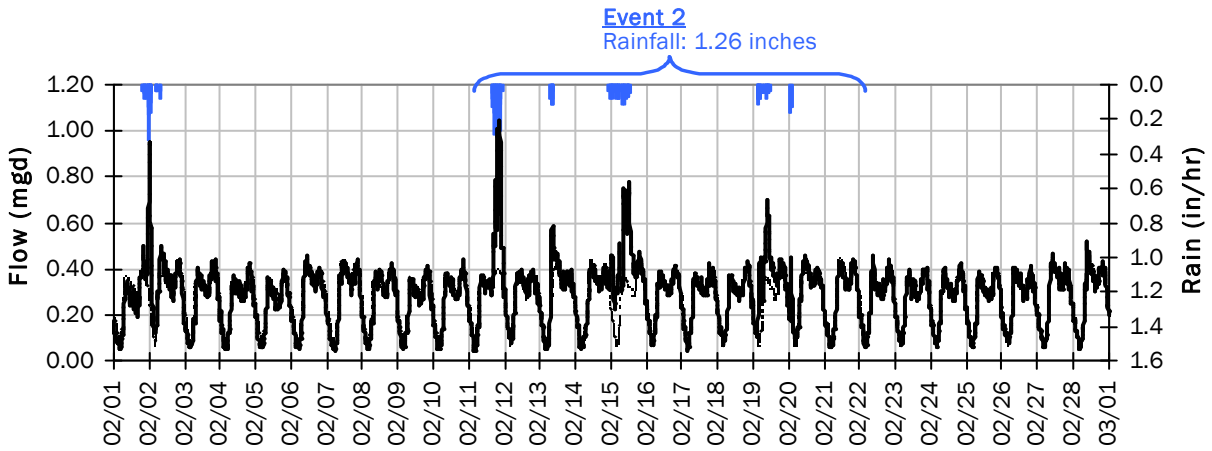


Storm Event I/I Analysis (Rain = 2.18 inches)

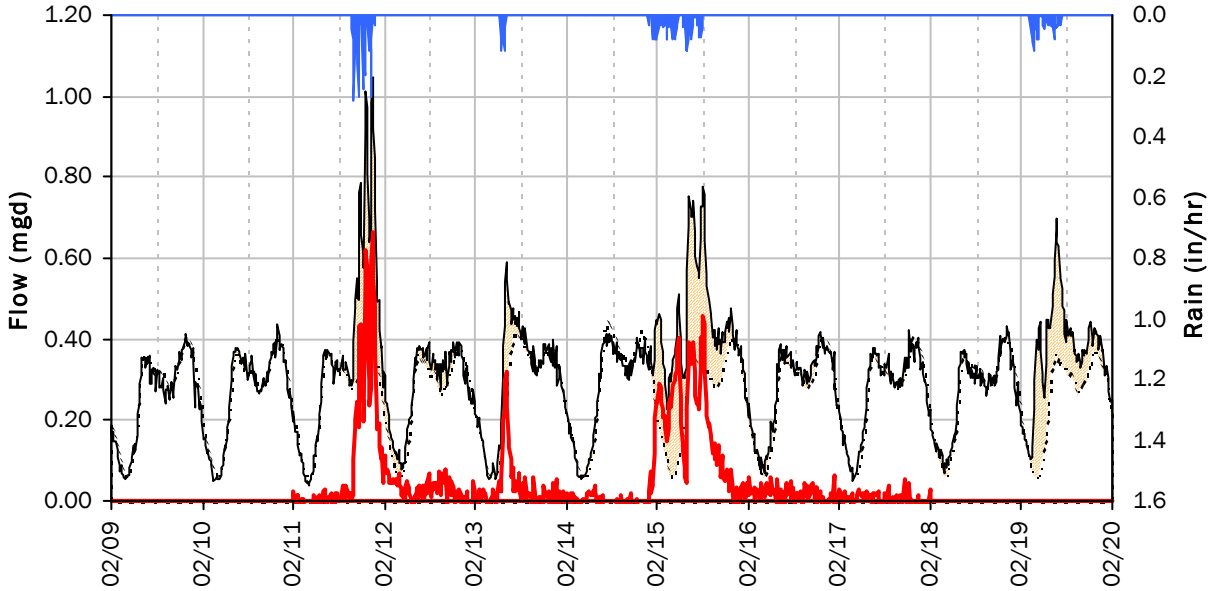
Capacity		Inflow / Infiltration	
Peak Flow:	1.12 *mgd*	**Peak I/I Rate:**	0.87 *mgd*
PF:	4.21	**Total I/I:**	486,000 *gallons*
Peak Level:	14.87 *in*		
d/D Ratio:	1.03		

FM 6-1
I/I Summary: Event 2

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



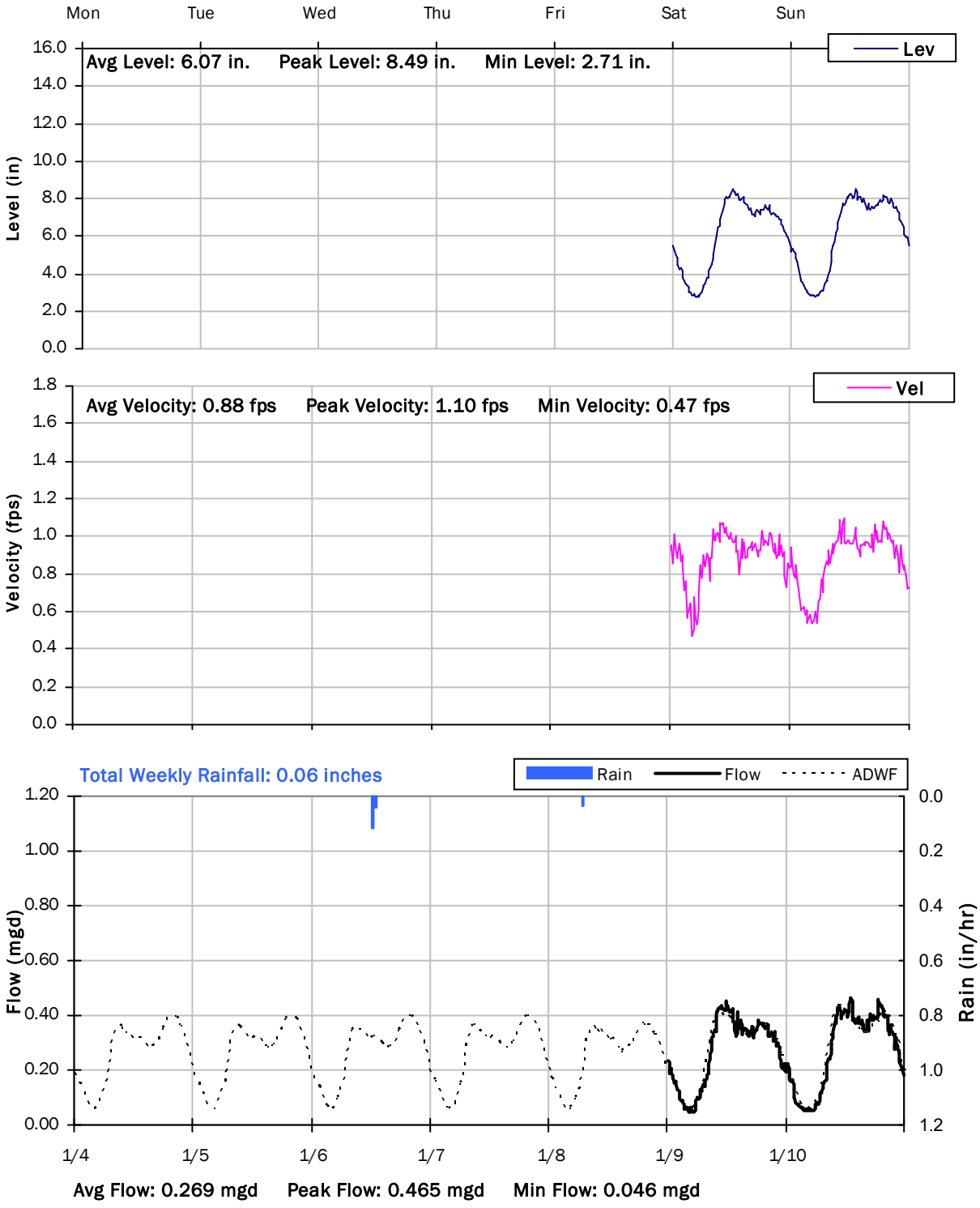
Event 2 Detail Graph



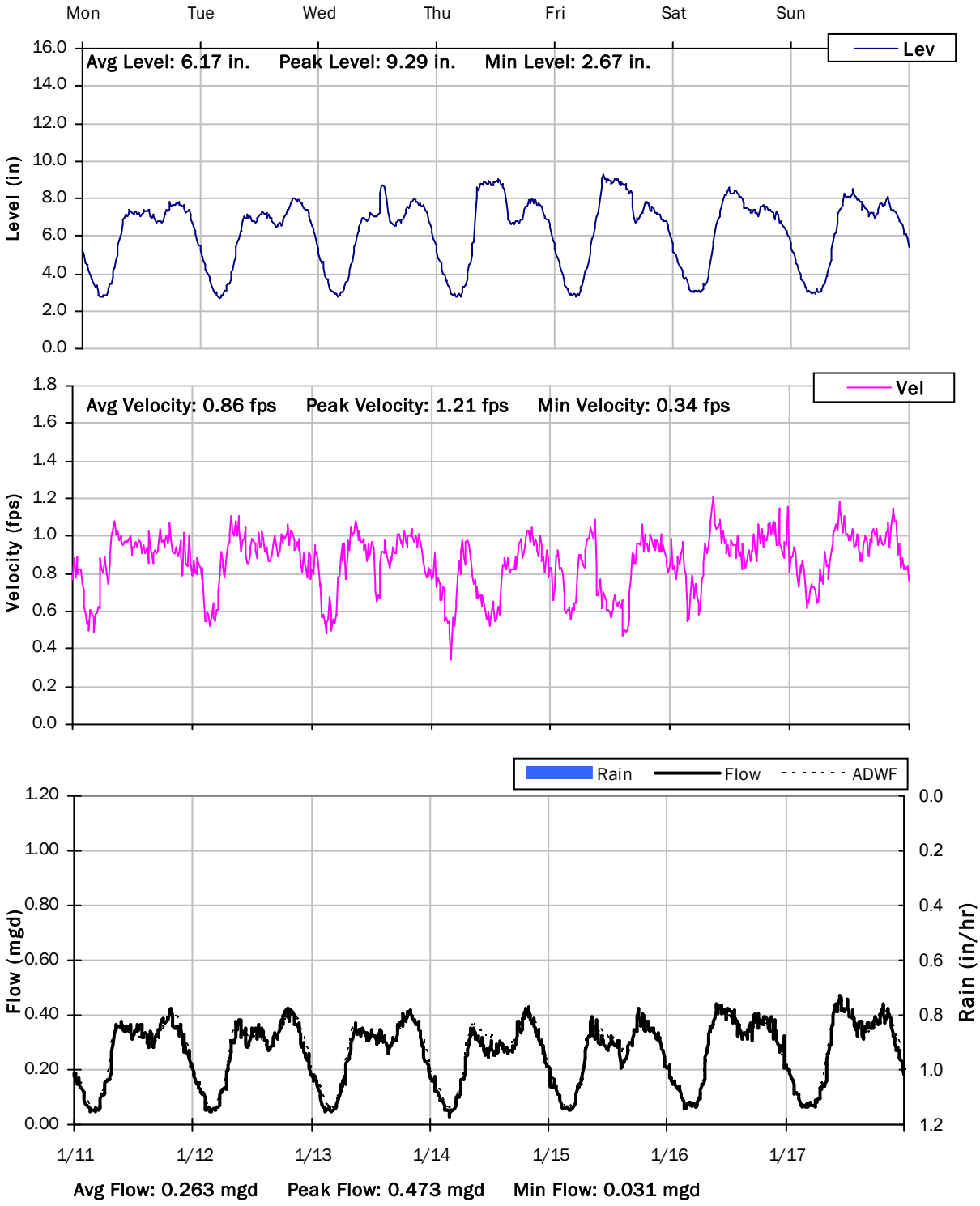
Storm Event I/I Analysis (Rain = 1.26 inches)

Capacity		Inflow / Infiltration	
Peak Flow:	1.05 *mgd*	**Peak I/I Rate:**	0.66 *mgd*
PF:	3.95	**Total I/I:**	364,000 *gallons*
Peak Level:	12.29 *in*		
d/D Ratio:	0.85		

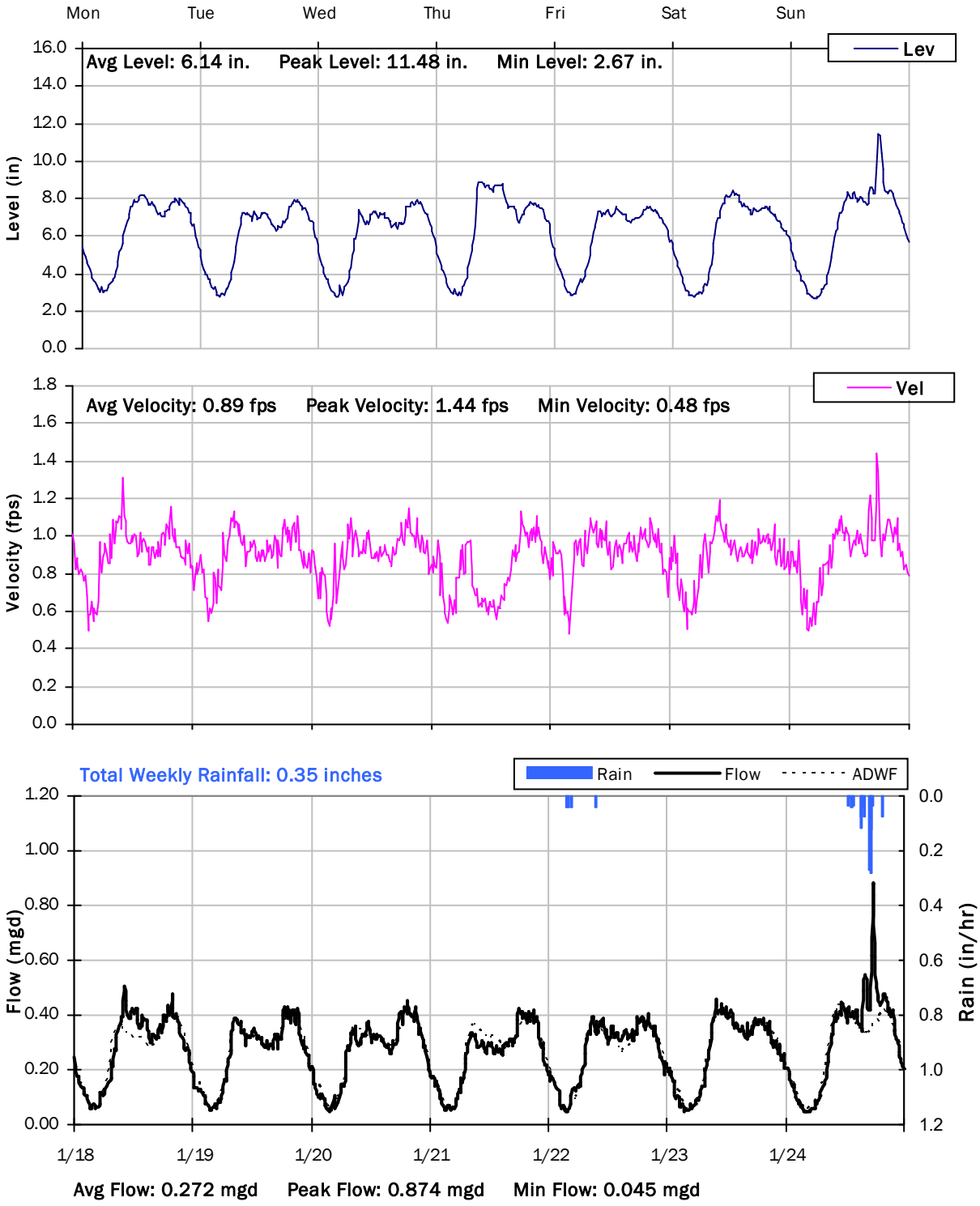
FM 6-1
Weekly Level, Velocity and Flow Hydrographs
1/4/2021 to 1/11/2021



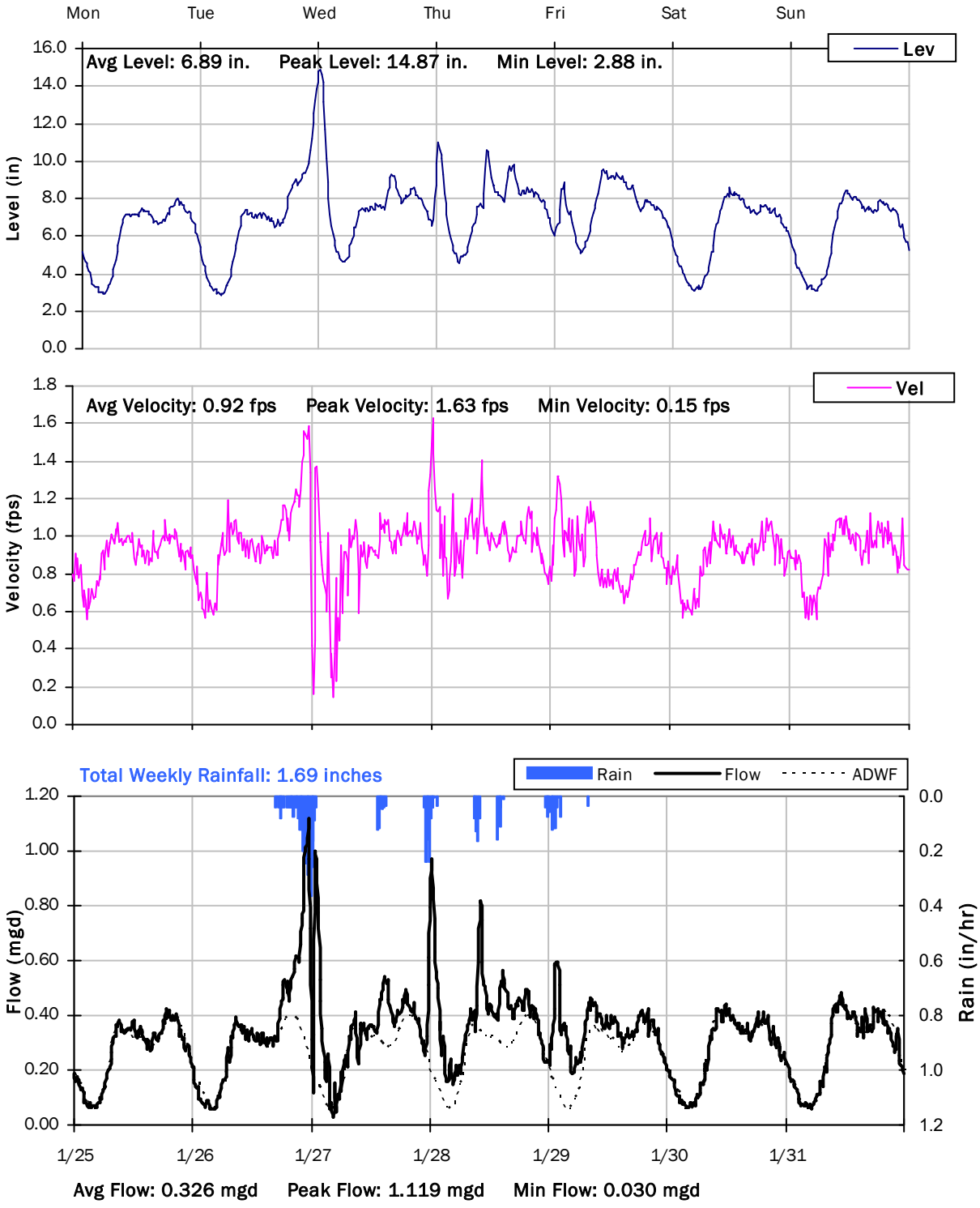
FM 6-1
Weekly Level, Velocity and Flow Hydrographs
1/11/2021 to 1/18/2021



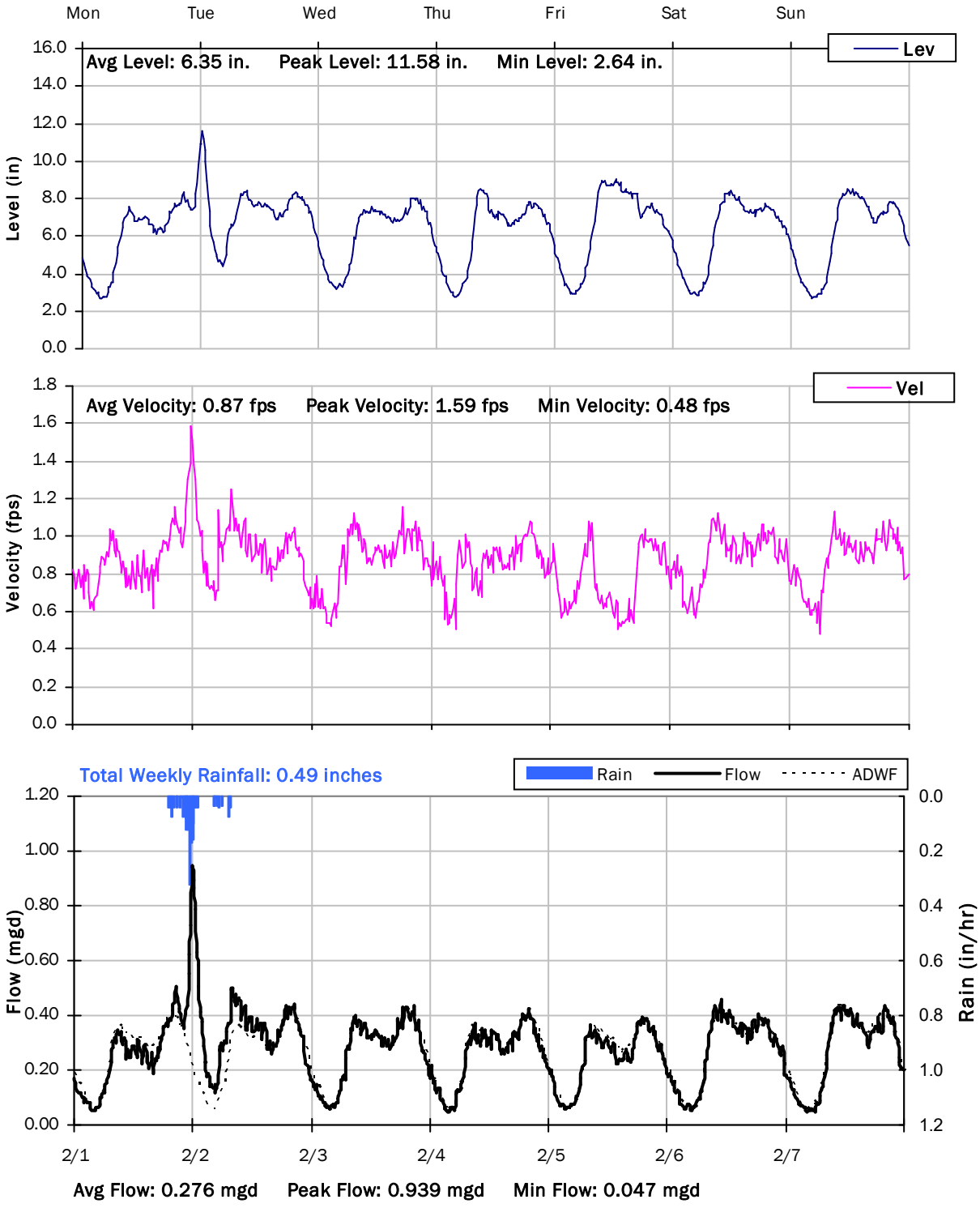
FM 6-1
Weekly Level, Velocity and Flow Hydrographs
1/18/2021 to 1/25/2021



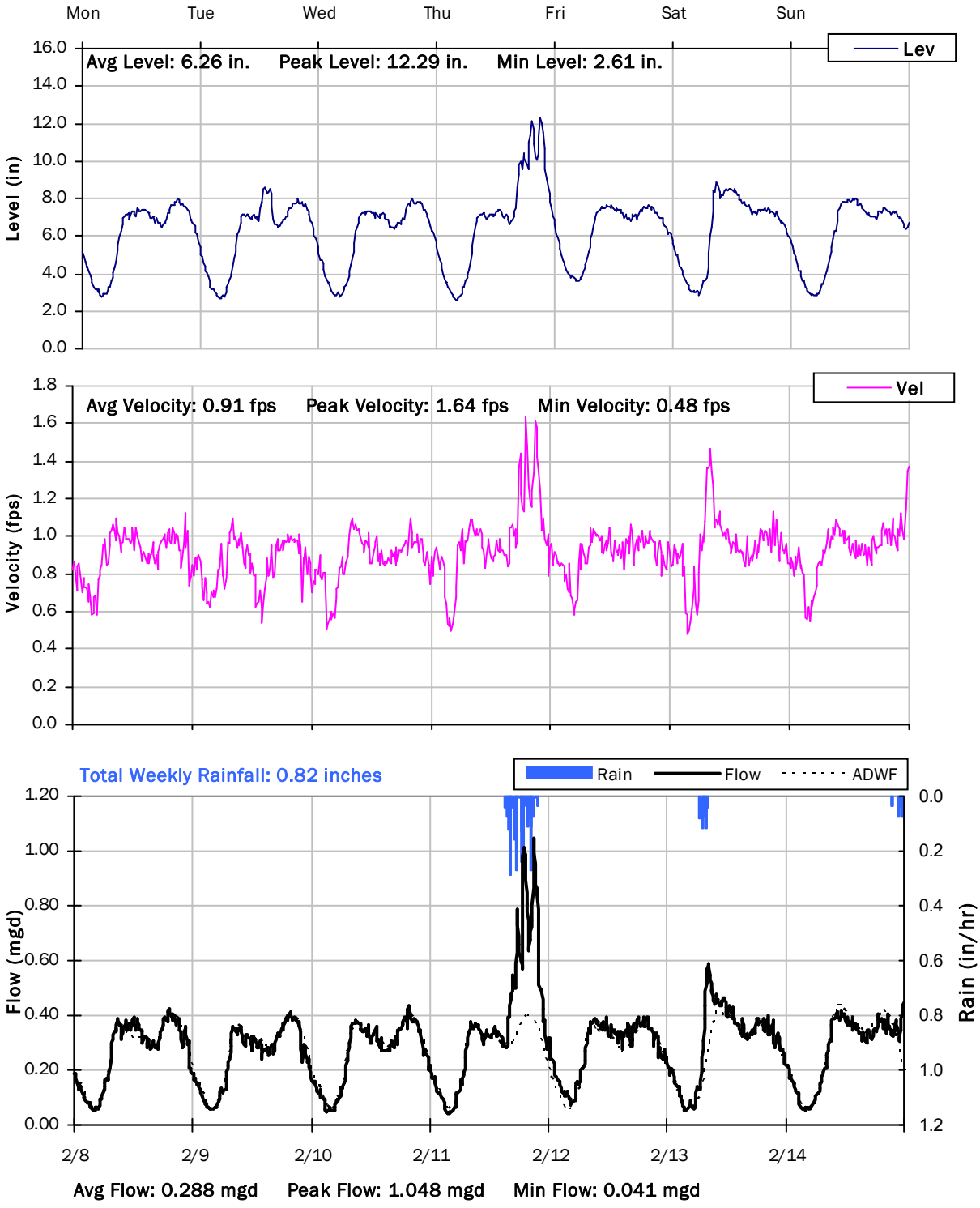
FM 6-1
Weekly Level, Velocity and Flow Hydrographs
1/25/2021 to 2/1/2021



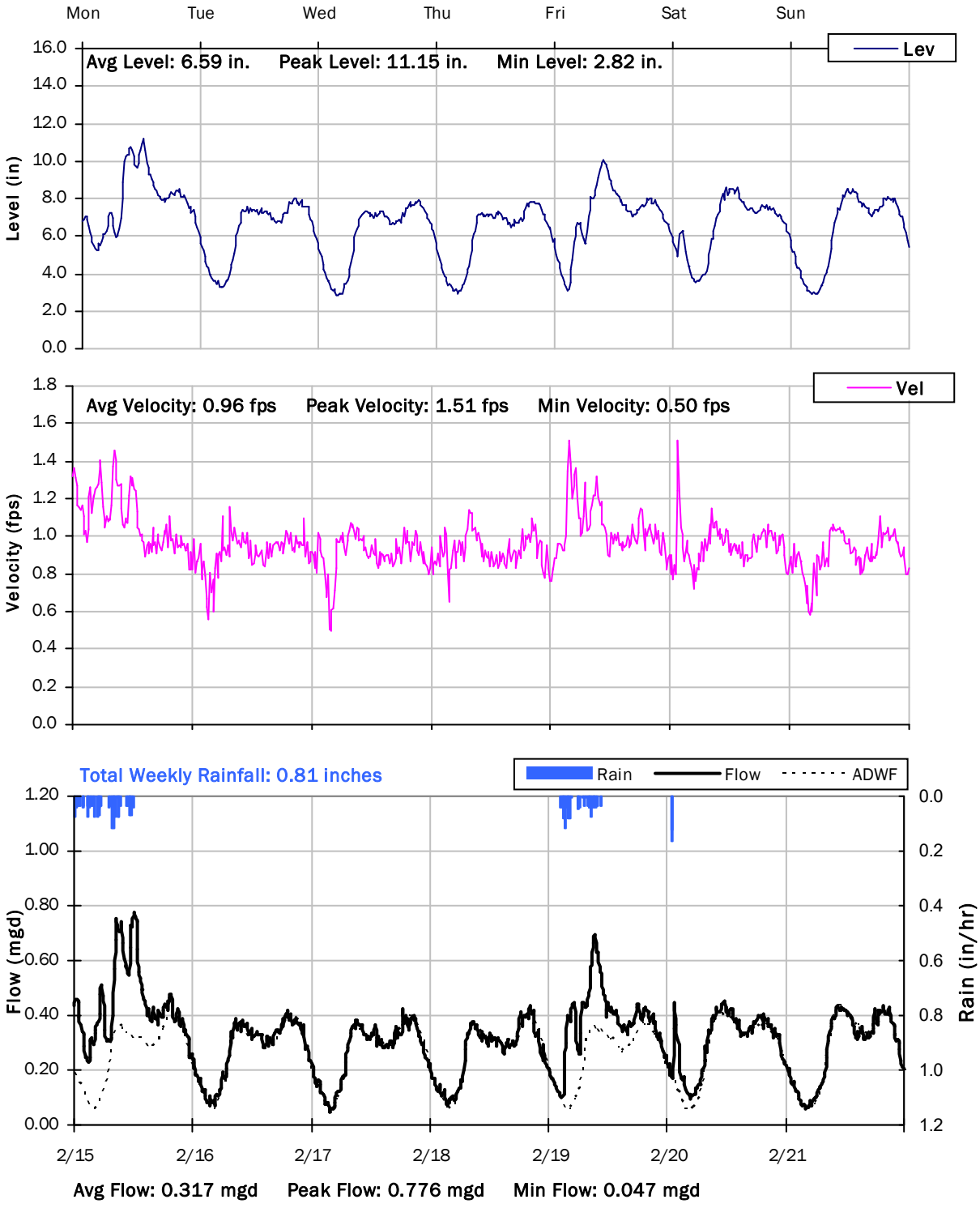
FM 6-1
Weekly Level, Velocity and Flow Hydrographs
2/1/2021 to 2/8/2021



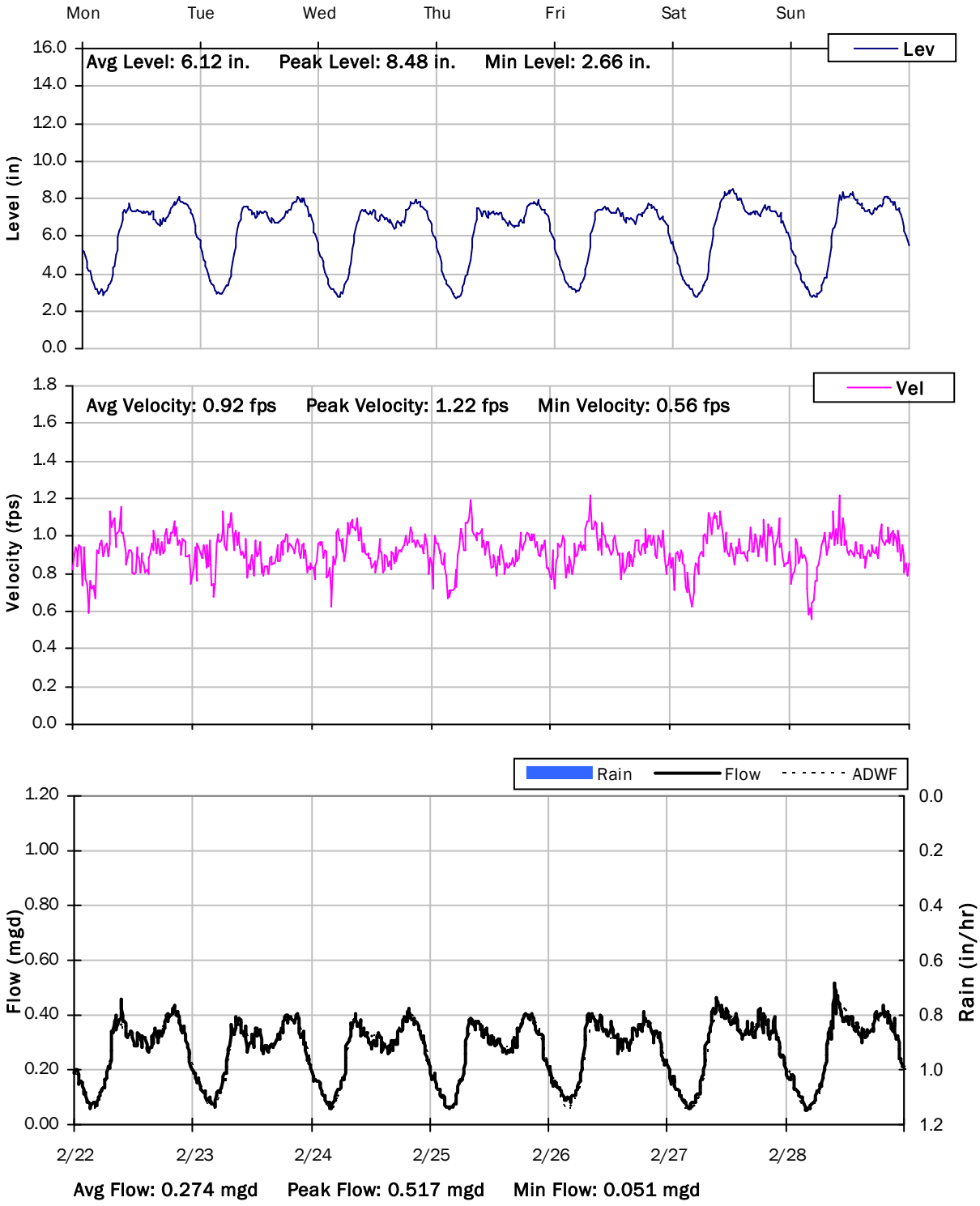
FM 6-1
Weekly Level, Velocity and Flow Hydrographs
2/8/2021 to 2/15/2021



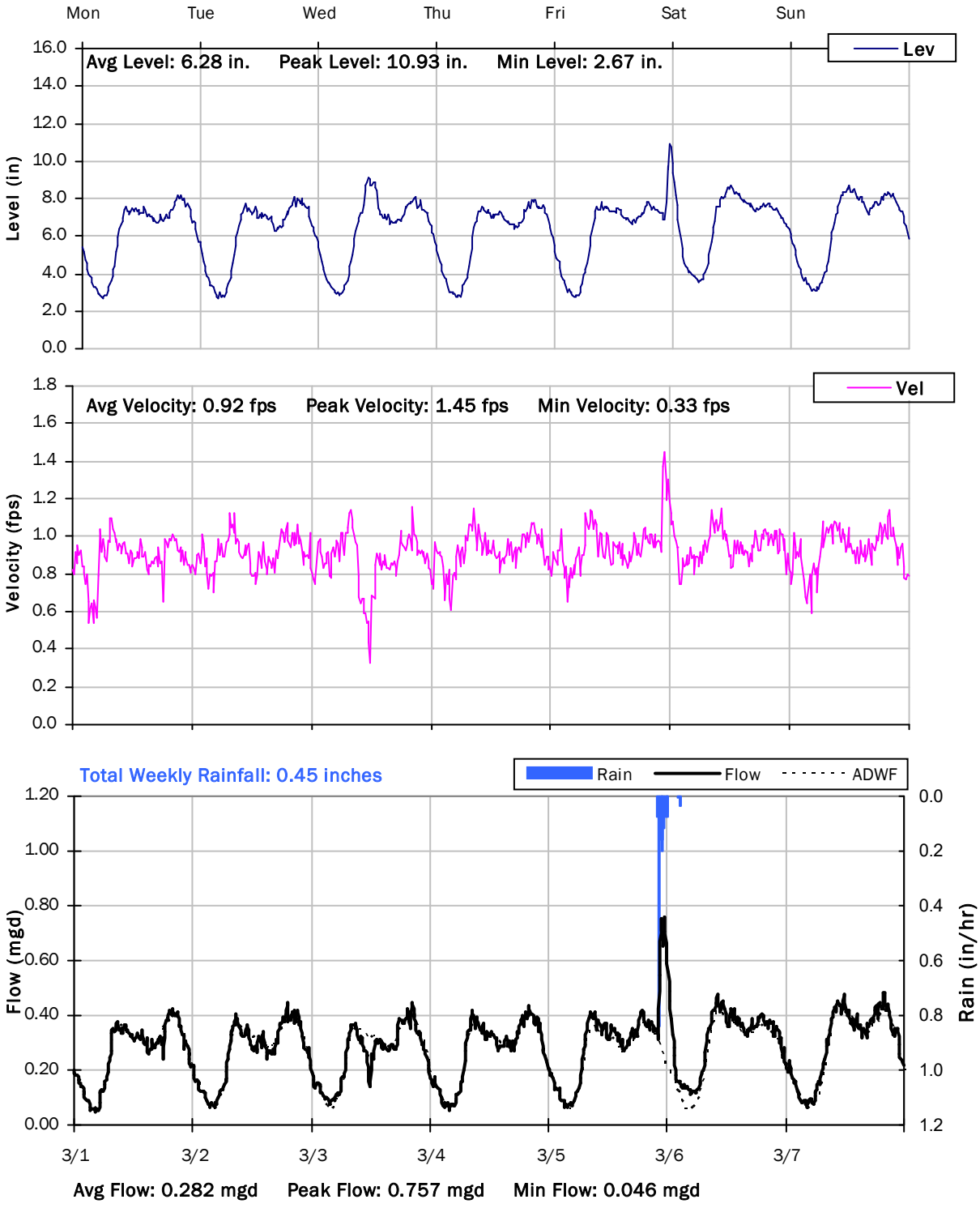
FM 6-1
Weekly Level, Velocity and Flow Hydrographs
2/15/2021 to 2/22/2021



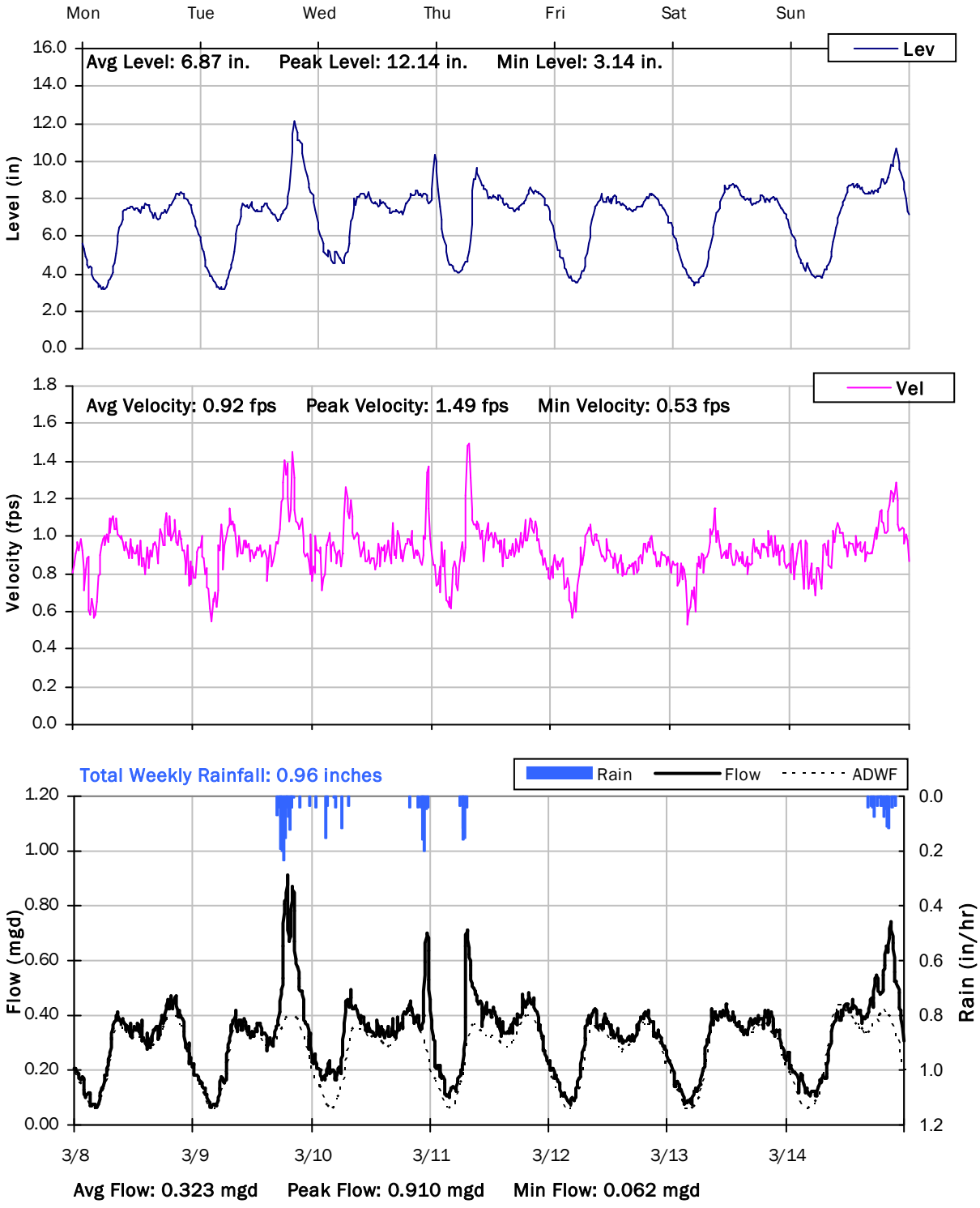
FM 6-1
Weekly Level, Velocity and Flow Hydrographs
2/22/2021 to 3/1/2021



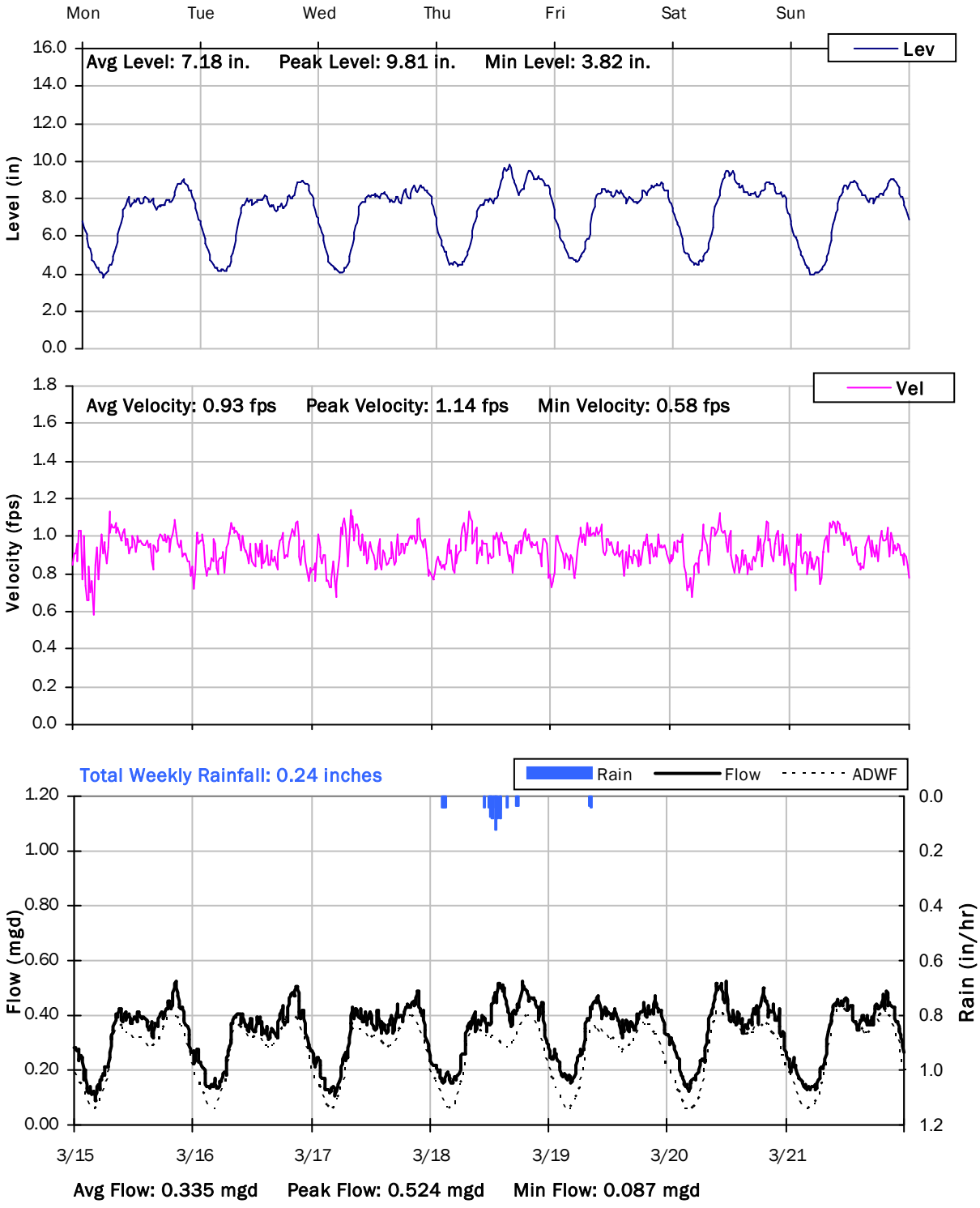
FM 6-1
Weekly Level, Velocity and Flow Hydrographs
3/1/2021 to 3/8/2021



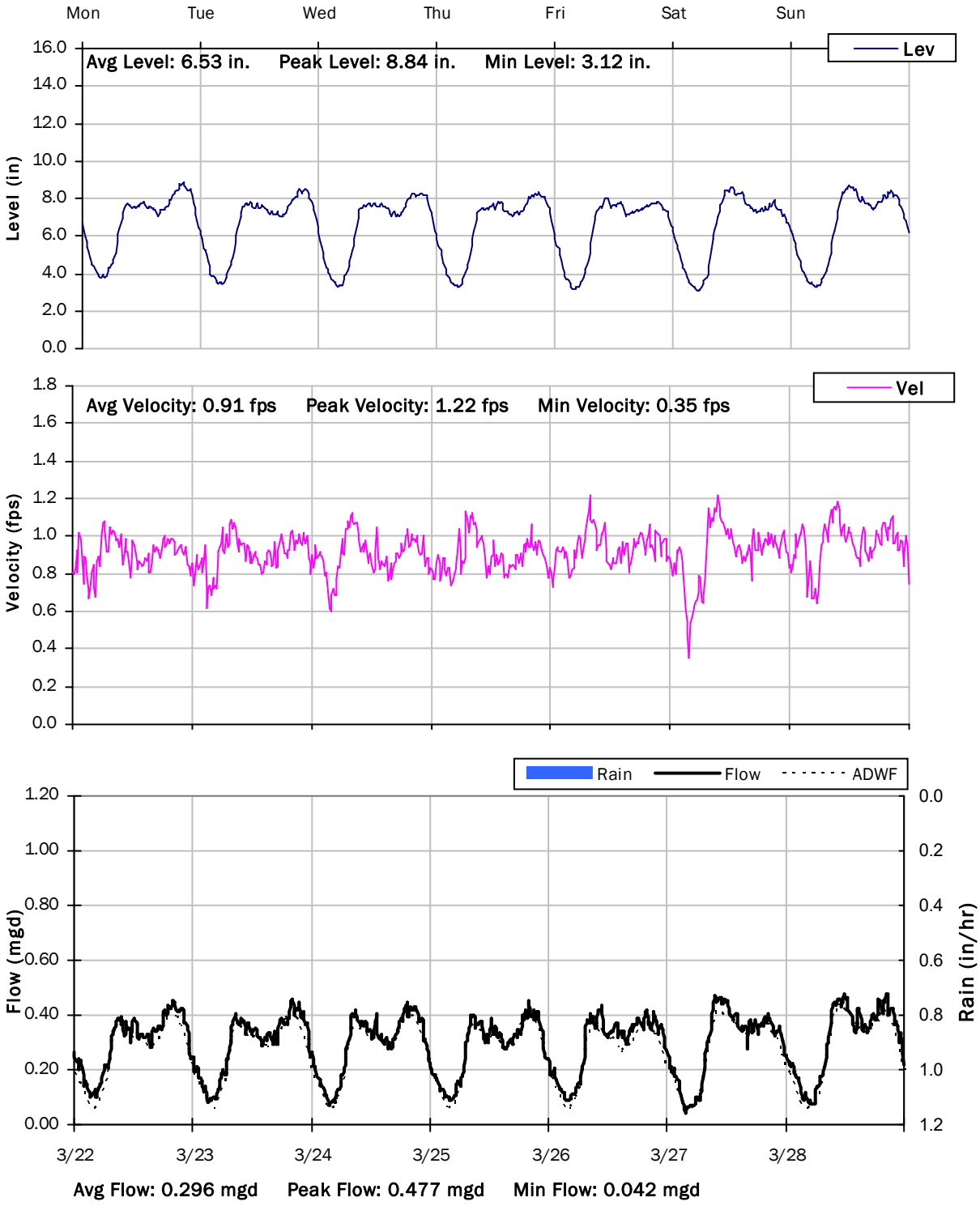
FM 6-1
Weekly Level, Velocity and Flow Hydrographs
3/8/2021 to 3/15/2021



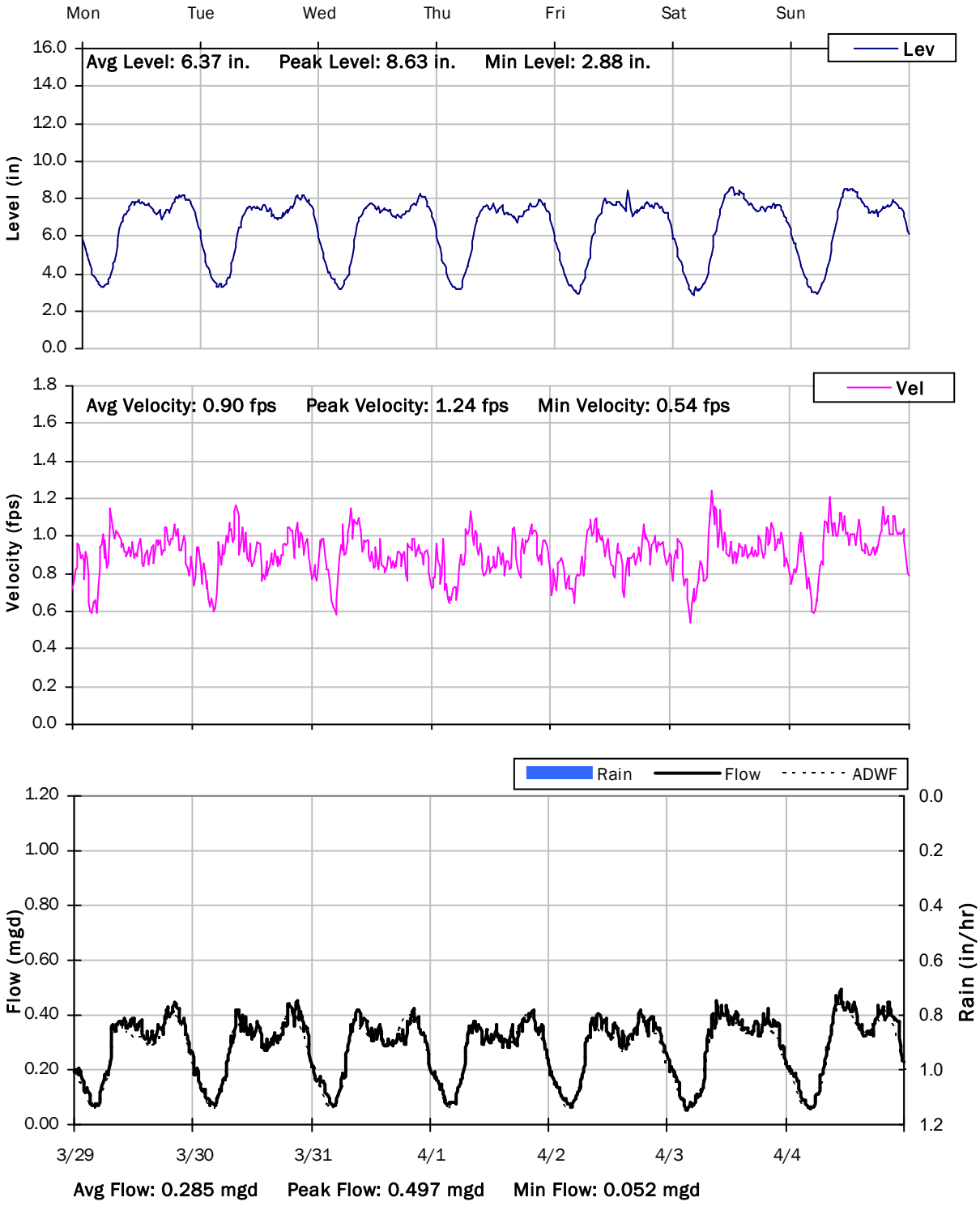
FM 6-1
Weekly Level, Velocity and Flow Hydrographs
3/15/2021 to 3/22/2021



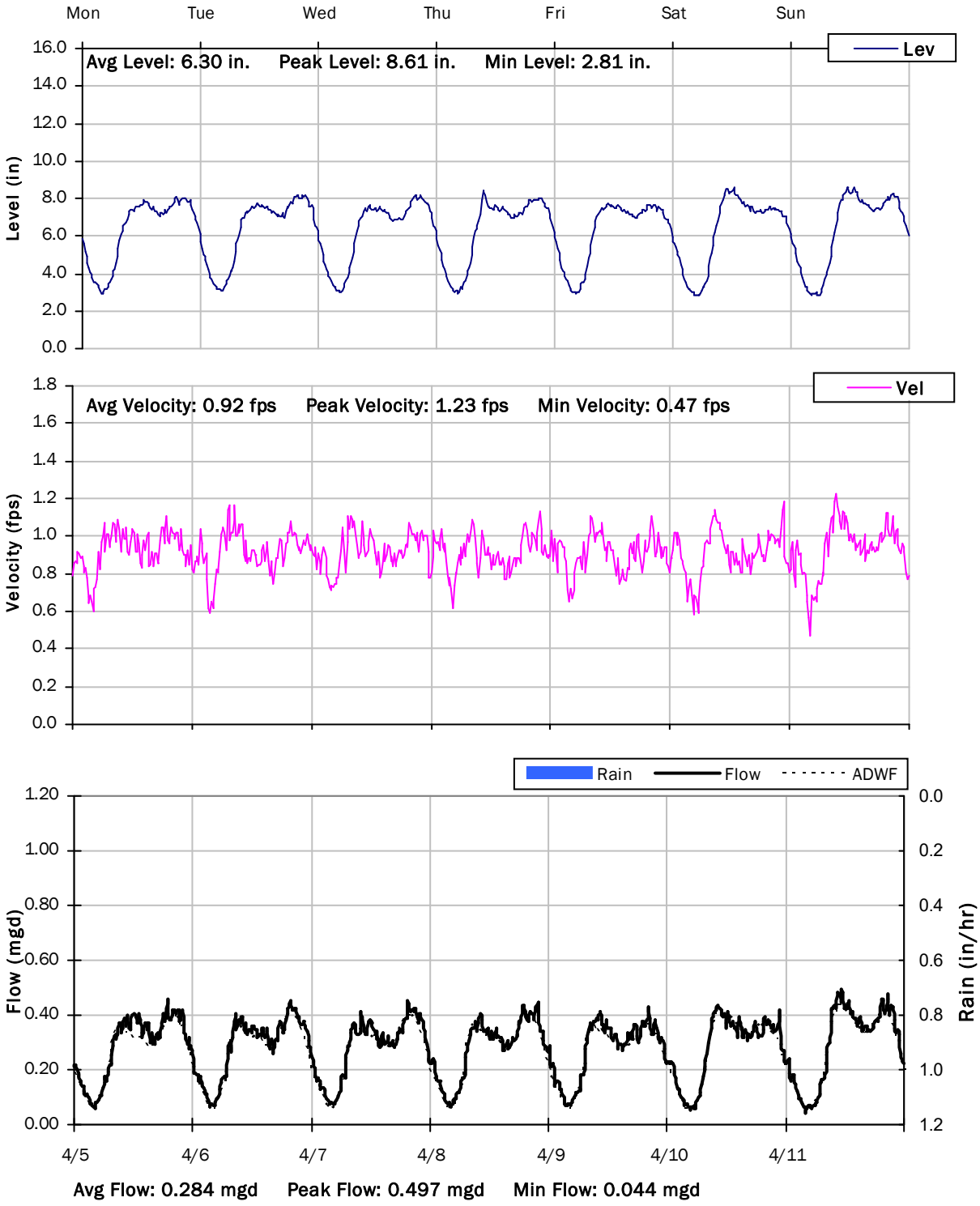
FM 6-1
Weekly Level, Velocity and Flow Hydrographs
3/22/2021 to 3/29/2021



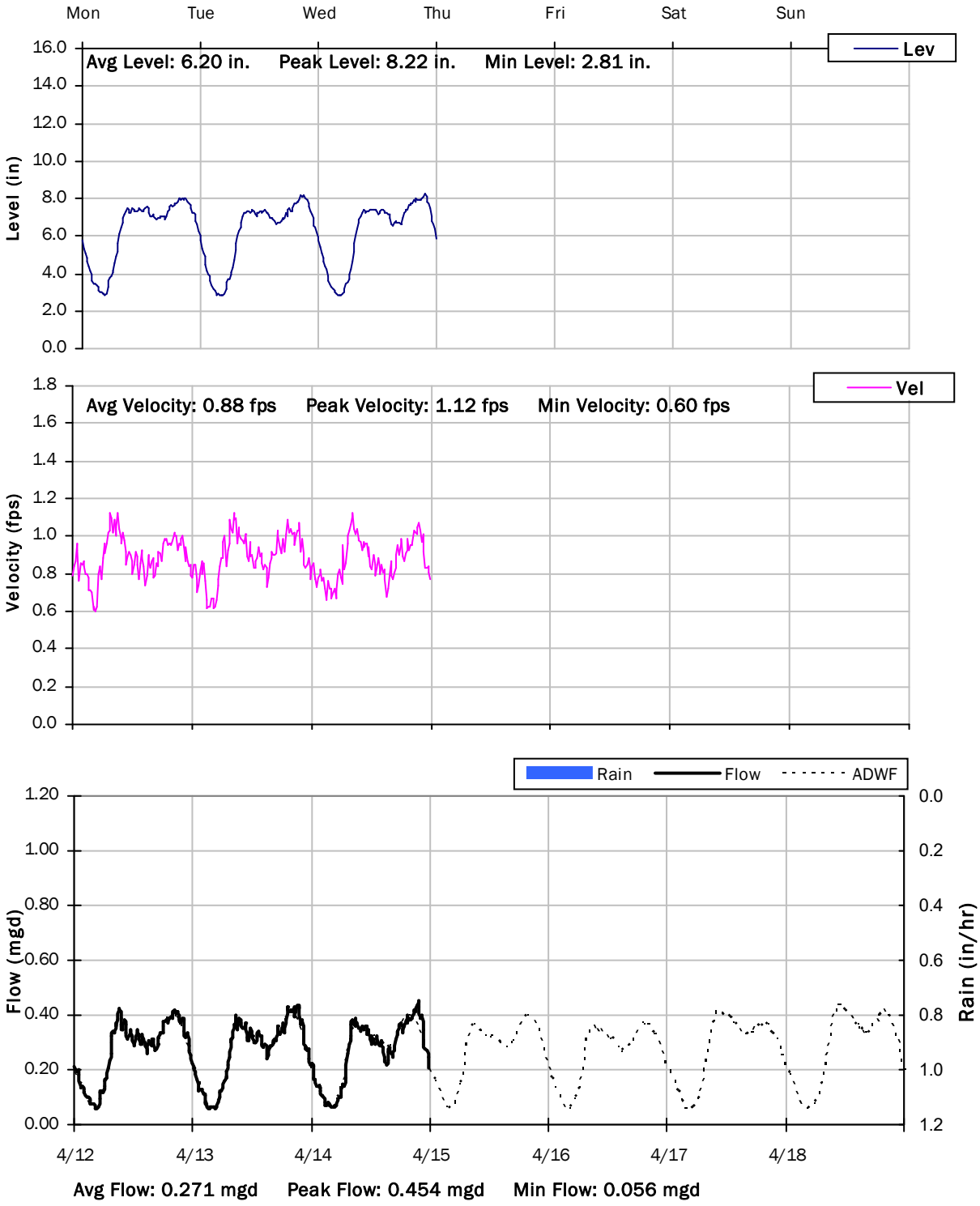
FM 6-1
Weekly Level, Velocity and Flow Hydrographs
3/29/2021 to 4/5/2021



FM 6-1
Weekly Level, Velocity and Flow Hydrographs
4/5/2021 to 4/12/2021



FM 6-1
Weekly Level, Velocity and Flow Hydrographs
4/12/2021 to 4/19/2021



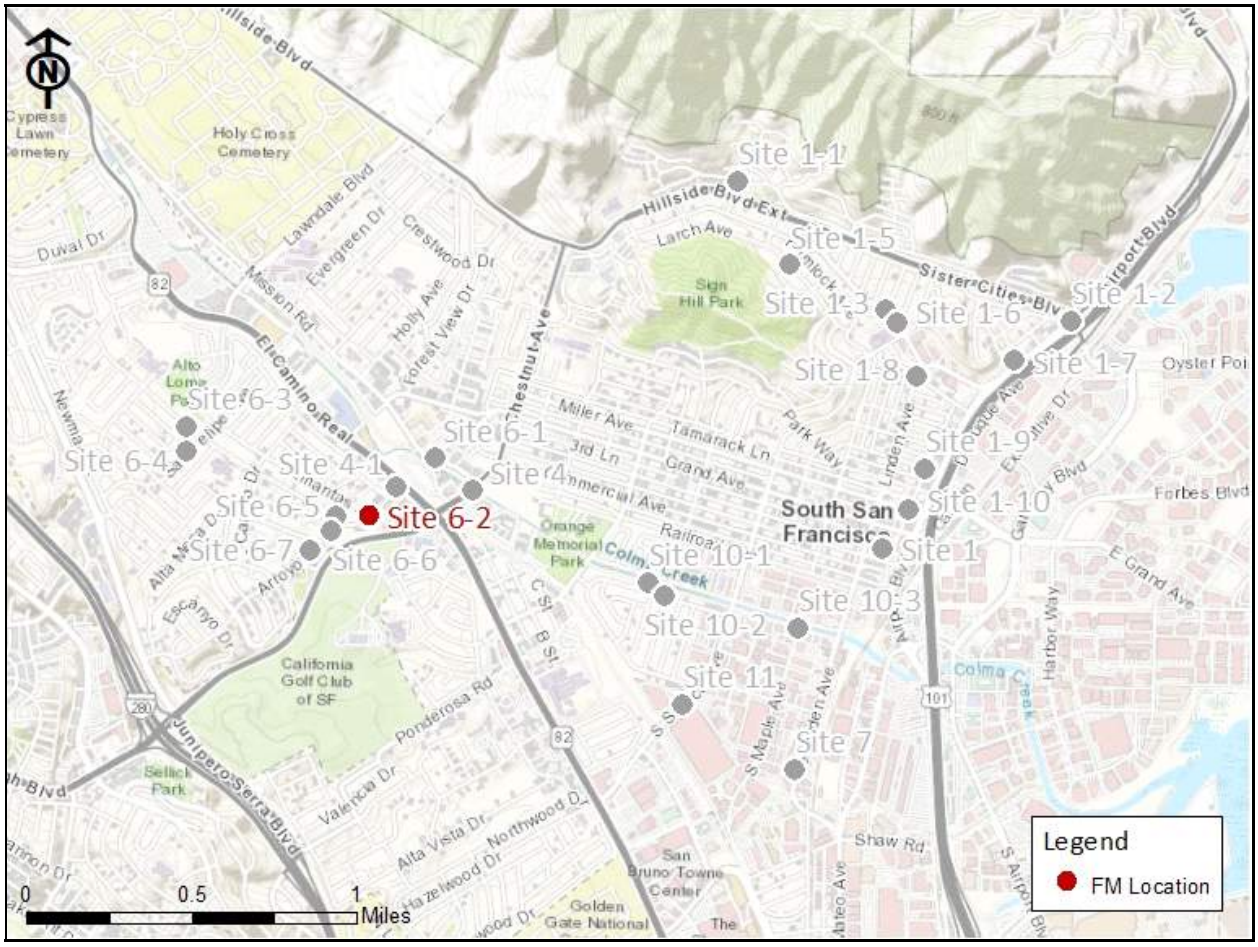
South San Francisco, CA

Sanitary Sewer Flow Monitoring
January 4 - April 14, 2021

Monitoring Site: FM 6-2

Location: Arroyo Drive and Camaritas Avenue

Data Summary Report



Vicinity Map: FM 6-2

FM 6-2

Site Information

Location: Arroyo Drive and Camaritas Avenue

Coordinates: 122.4379° W, 37.6550° N

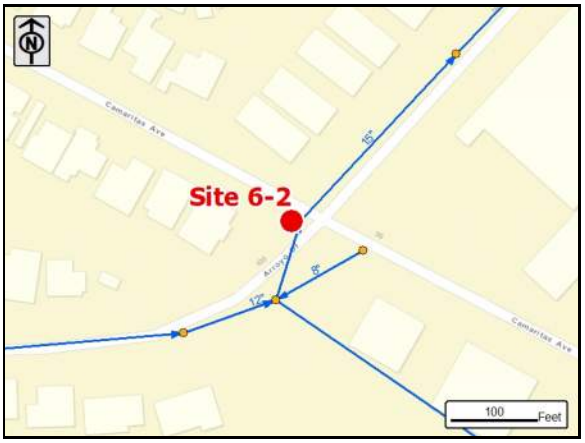
Rim Elevation (Earth): 64 feet

Pipe Diameter: 7.5 inches

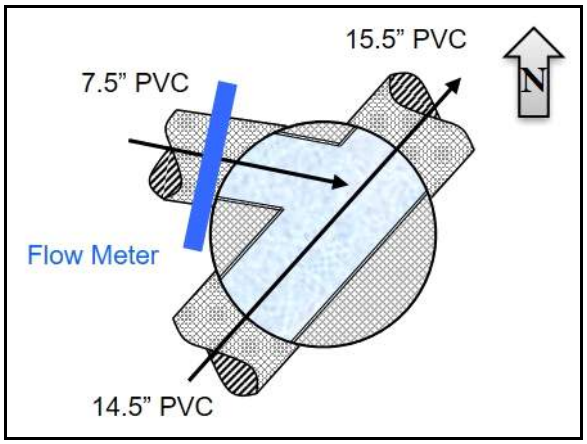
ADWF: 0.012 mgd

Peak Measured Flow: 0.089 mgd

Satellite Map



Sanitary Map



Flow Sketch

Street View

Plan View

FM 6-2

Additional Site Photos

Effluent Pipe

Monitored Northwest Influent Pipe

FM 6-2

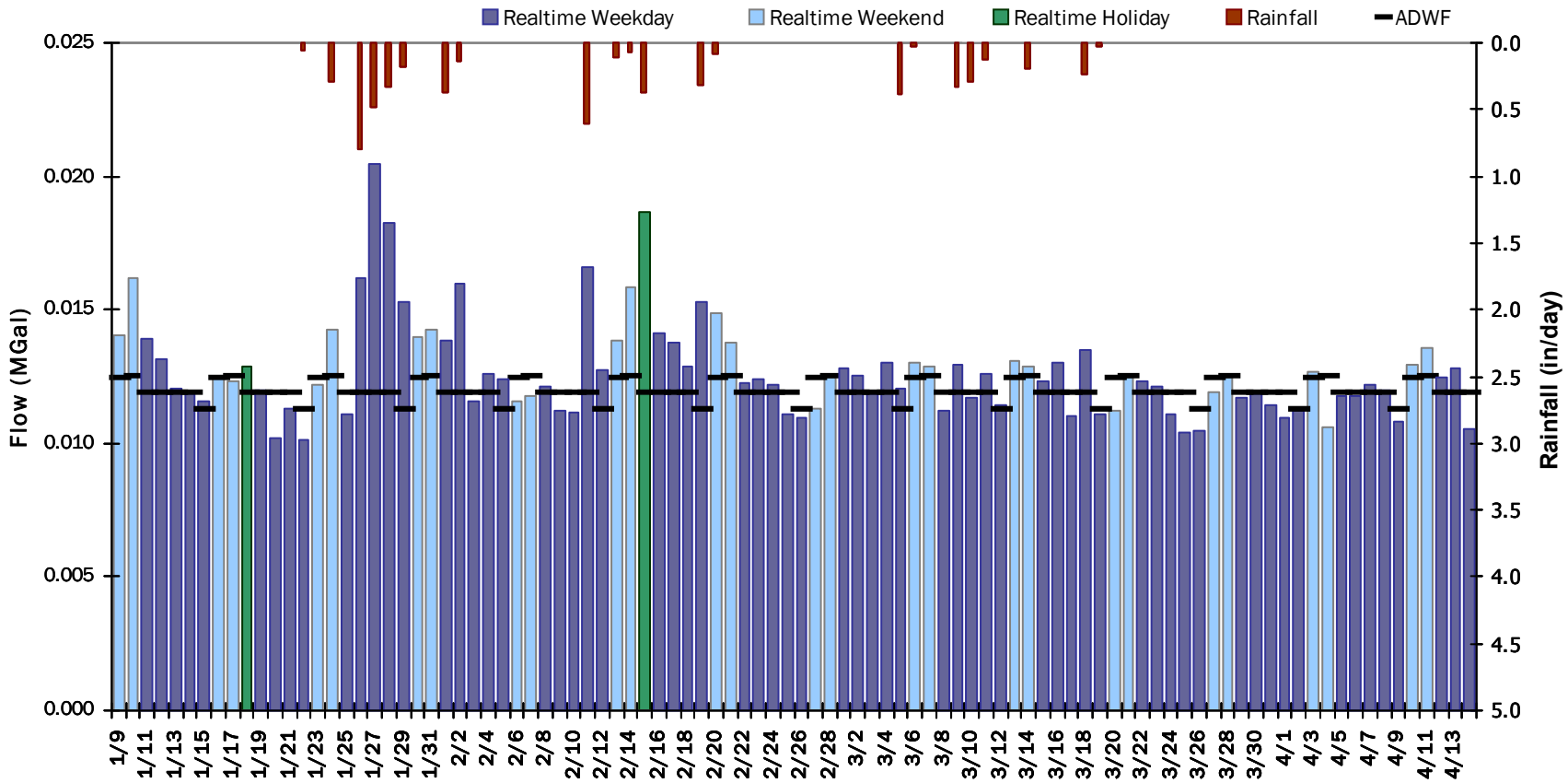
Additional Site Photos

Southwest Influent Pipe

FM 6-2
Period Flow Summary: Daily Flow Totals

Avg Period Flow: 0.013 MGal Peak Daily Flow: 0.020 MGal Min Daily Flow: 0.010 MGal

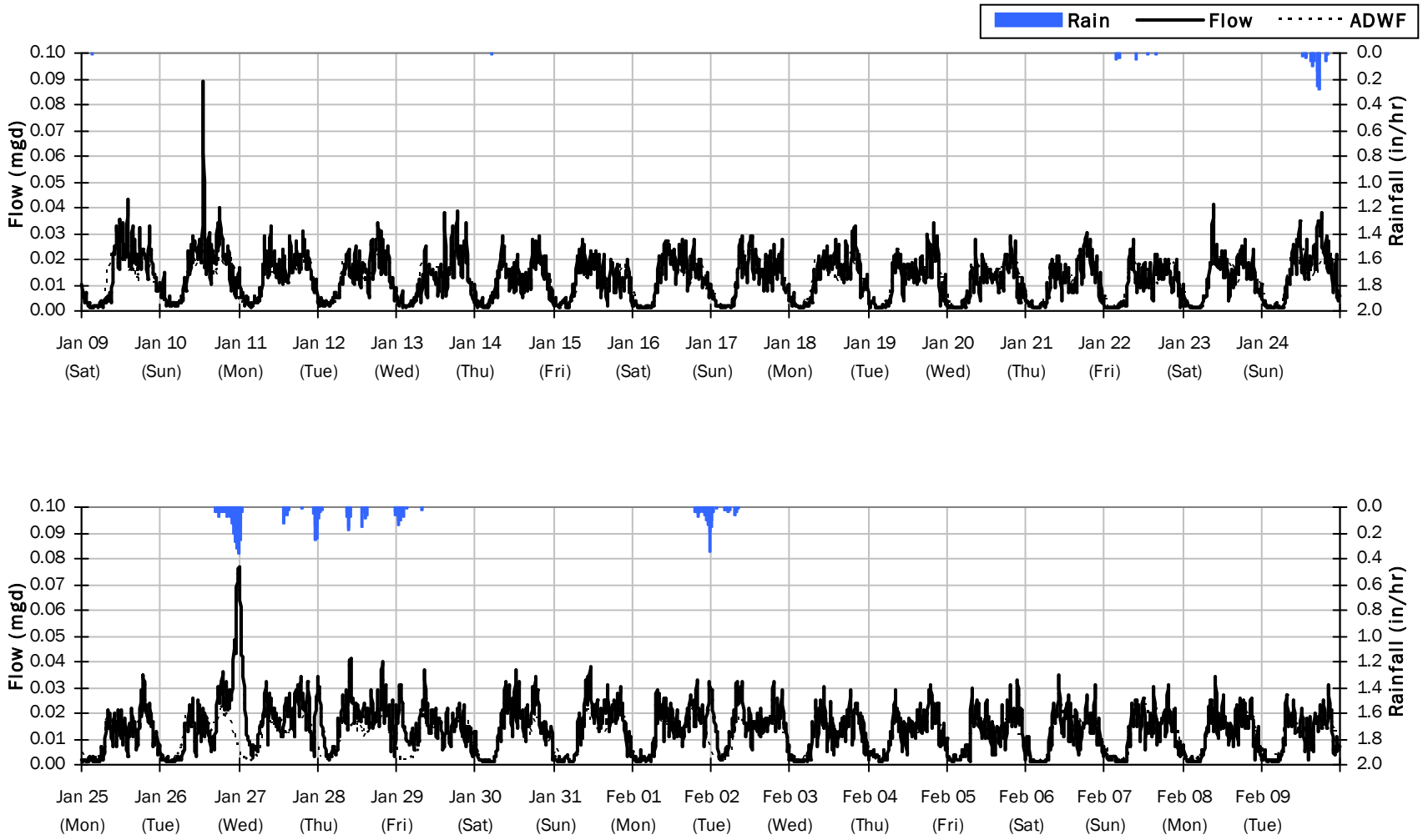
Total Period Rainfall: 5.84 inches



FM 6-2

Flow Summary: 1/9/2021 to 2/9/2021

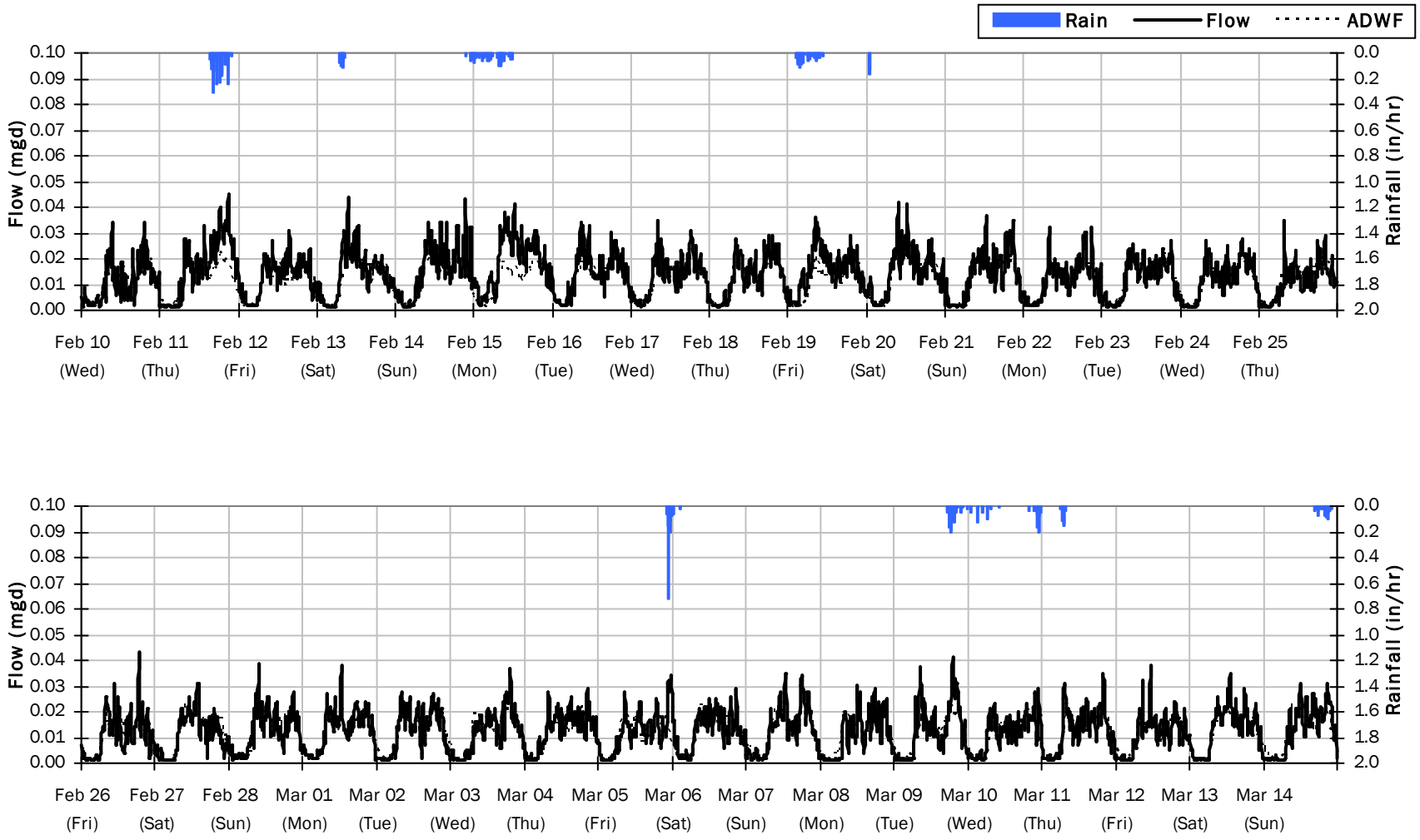
Total Period Rainfall: 2.66 inches Avg Flow: 0.013 mgd Peak Flow: 0.089 mgd Min Flow: 0.001 mgd



FM 6-2

Flow Summary: 2/10/2021 to 3/14/2021

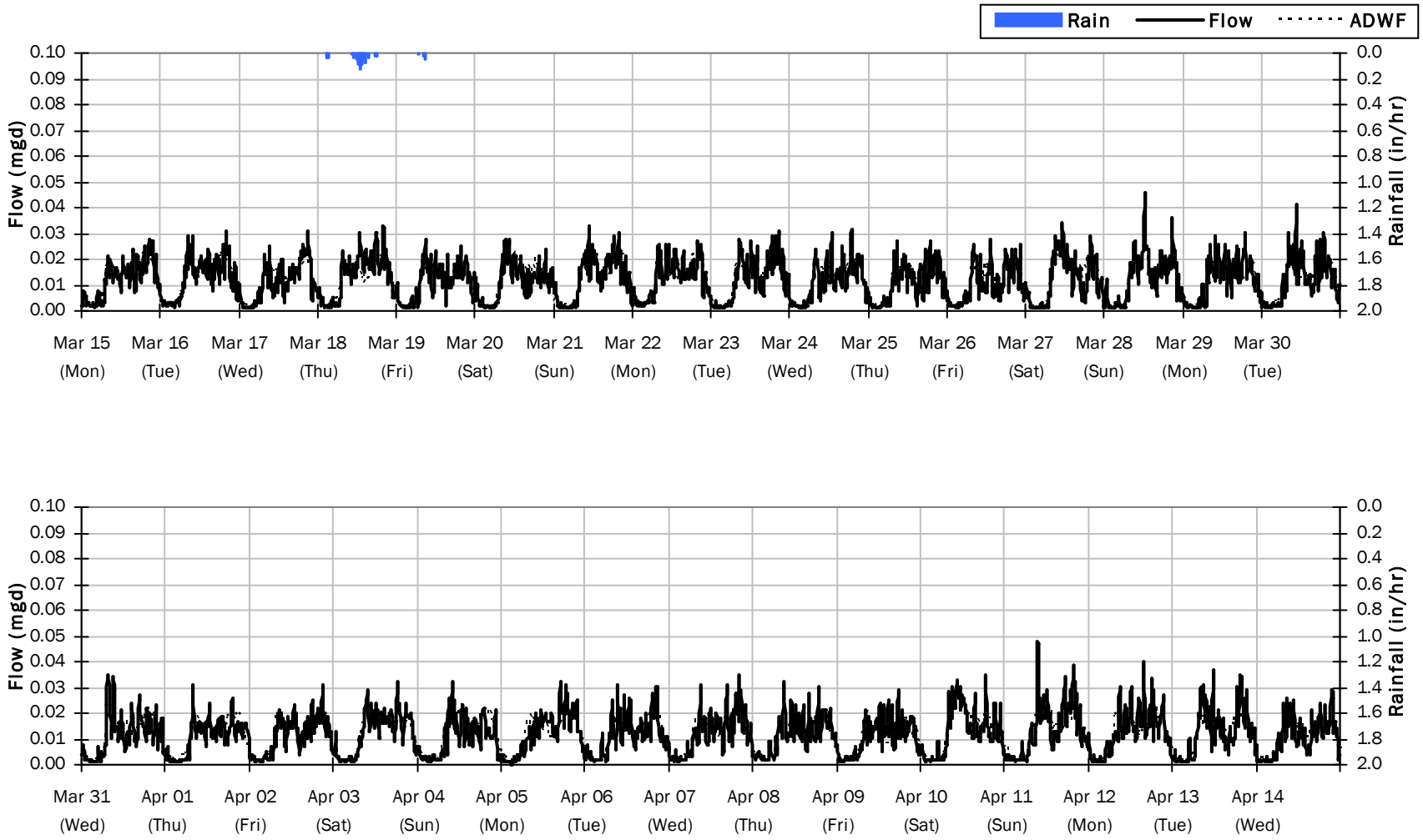
Total Period Rainfall: 2.91 inches Avg Flow: 0.013 mgd Peak Flow: 0.045 mgd Min Flow: 0.001 mgd



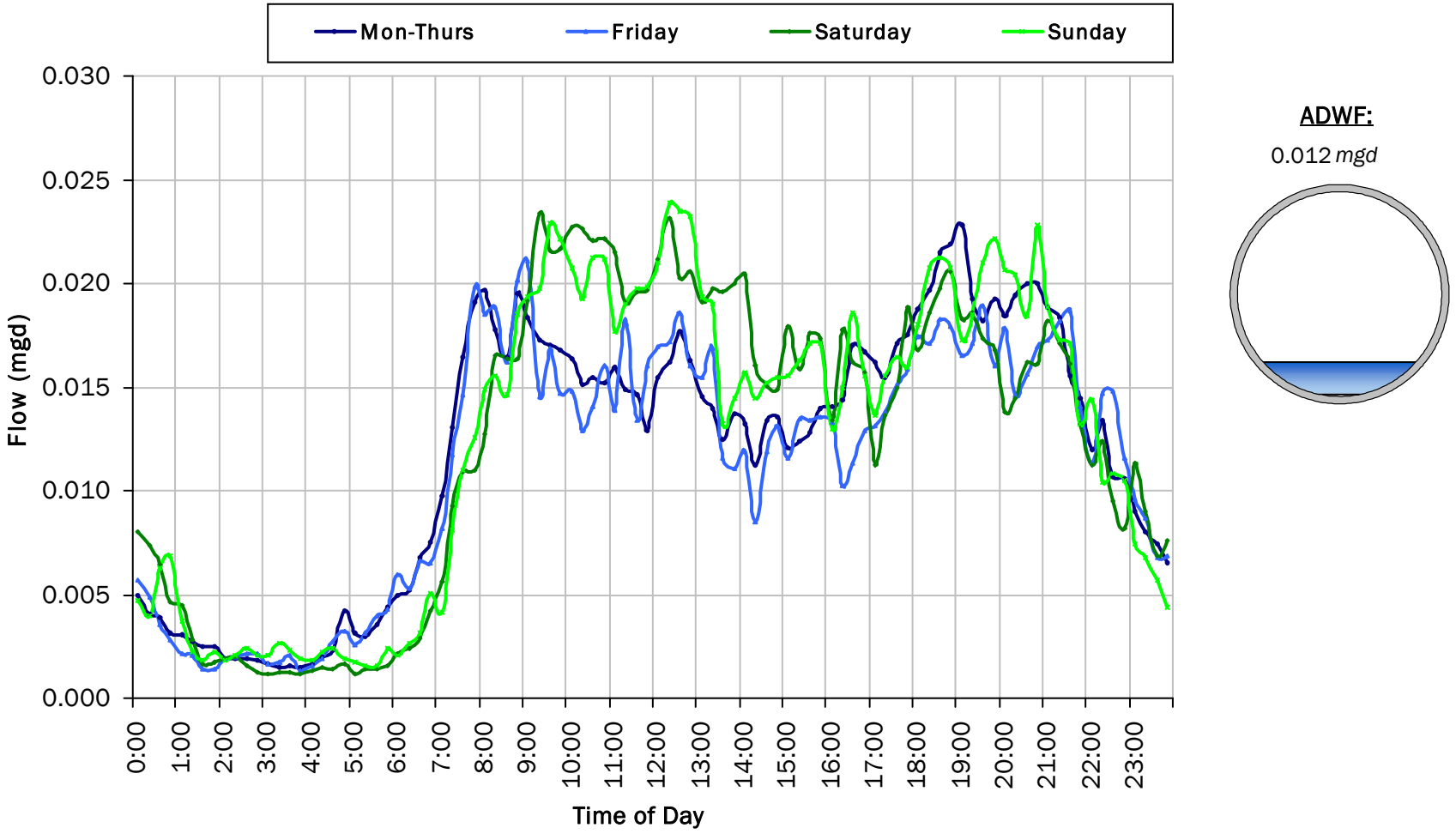
FM 6-2

Flow Summary: 3/15/2021 to 4/14/2021

Total Period Rainfall: 0.26 inches Avg Flow: 0.012 mgd Peak Flow: 0.048 mgd Min Flow: 0.000 mgd

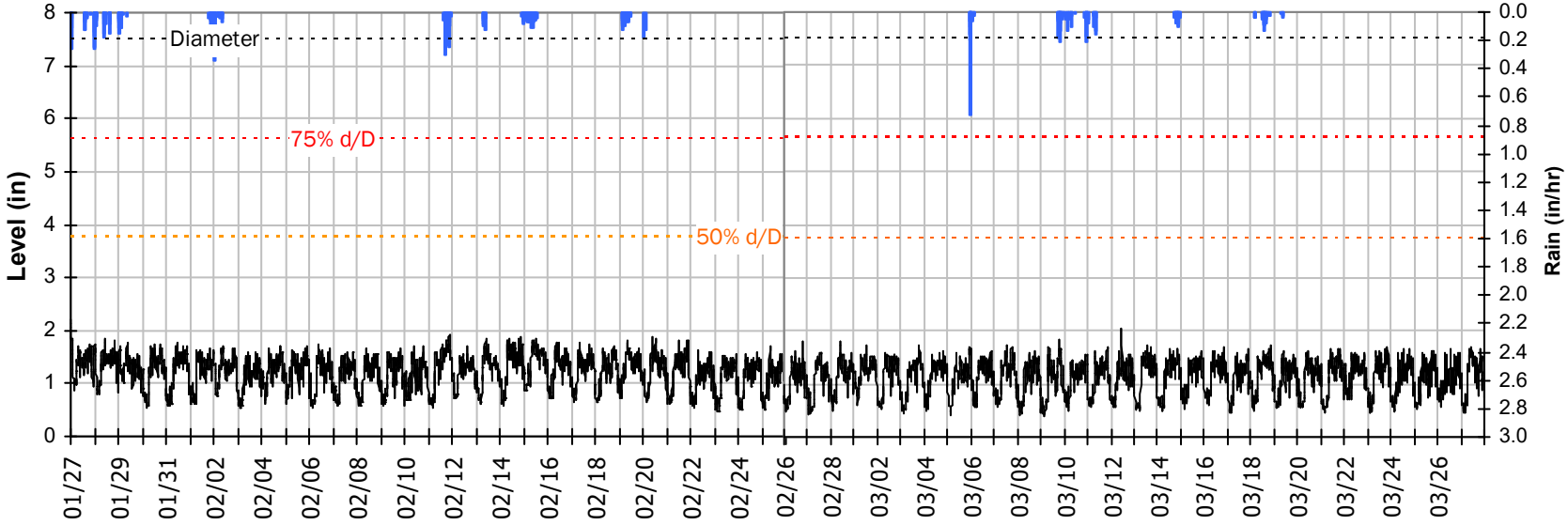


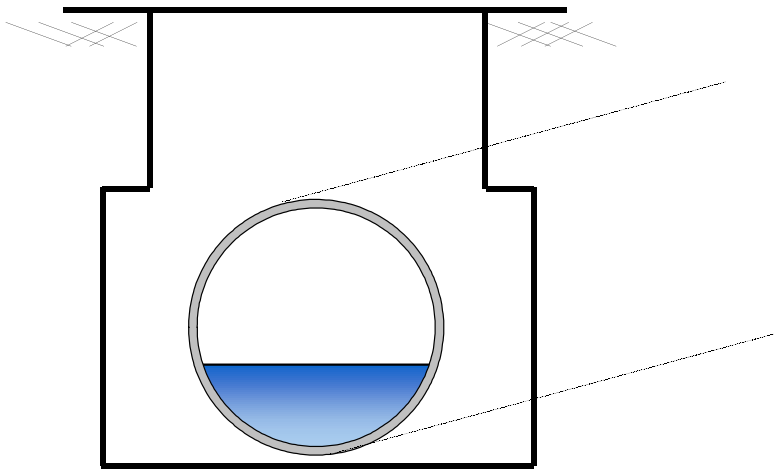
FM 6-2
Average Dry Weather Flow Hydrographs



FM 6-2
Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Monitoring Period

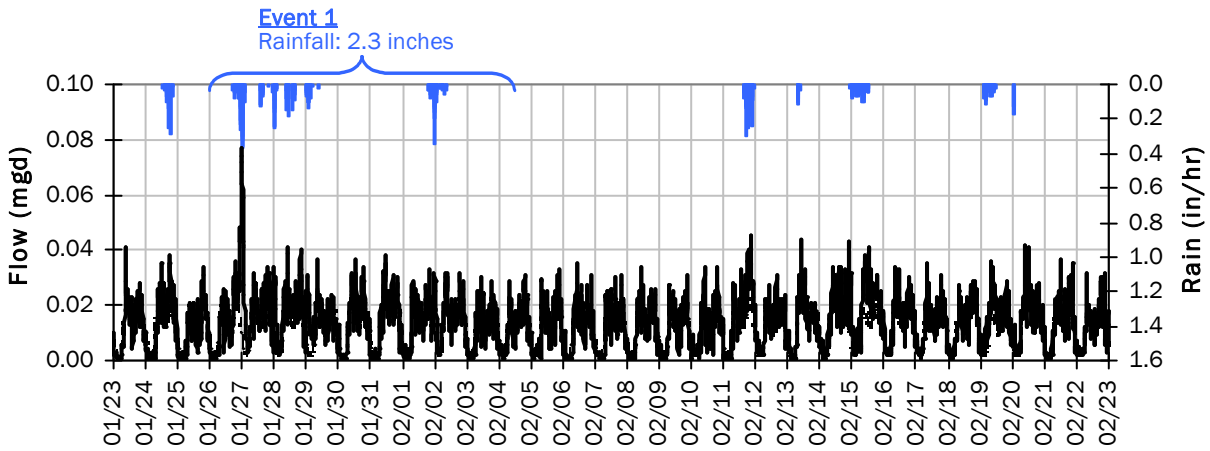




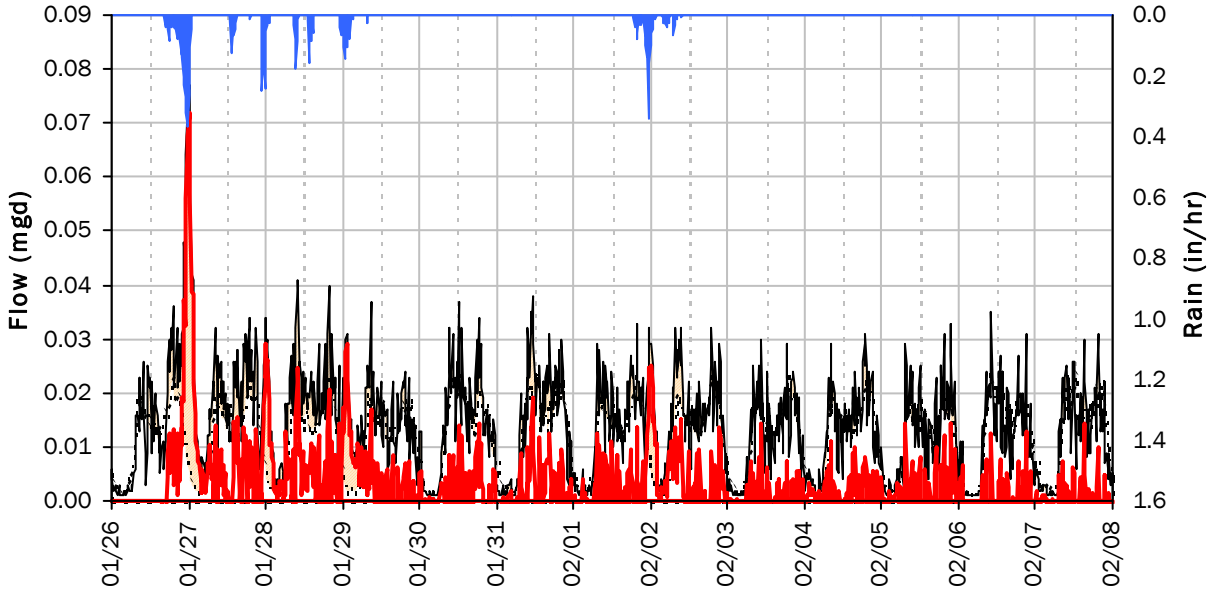
Pipe Diameter:	7.5	*inches*
Peak Measured Level:	2.57	*inches*
Peak d/D Ratio:	0.34	

FM 6-2
I/I Summary: Event 1

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



Event 1 Detail Graph

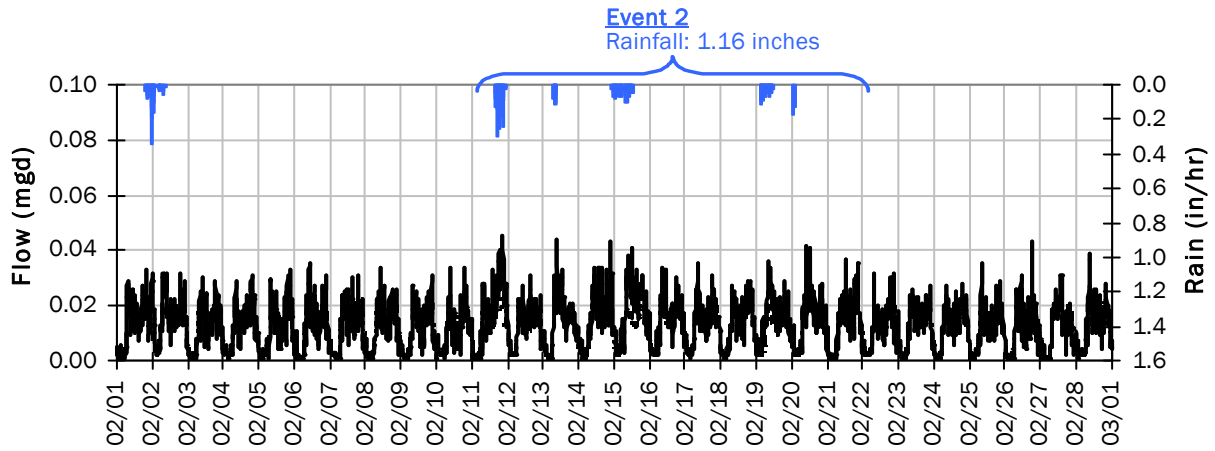


Storm Event I/I Analysis (Rain = 2.30 inches)

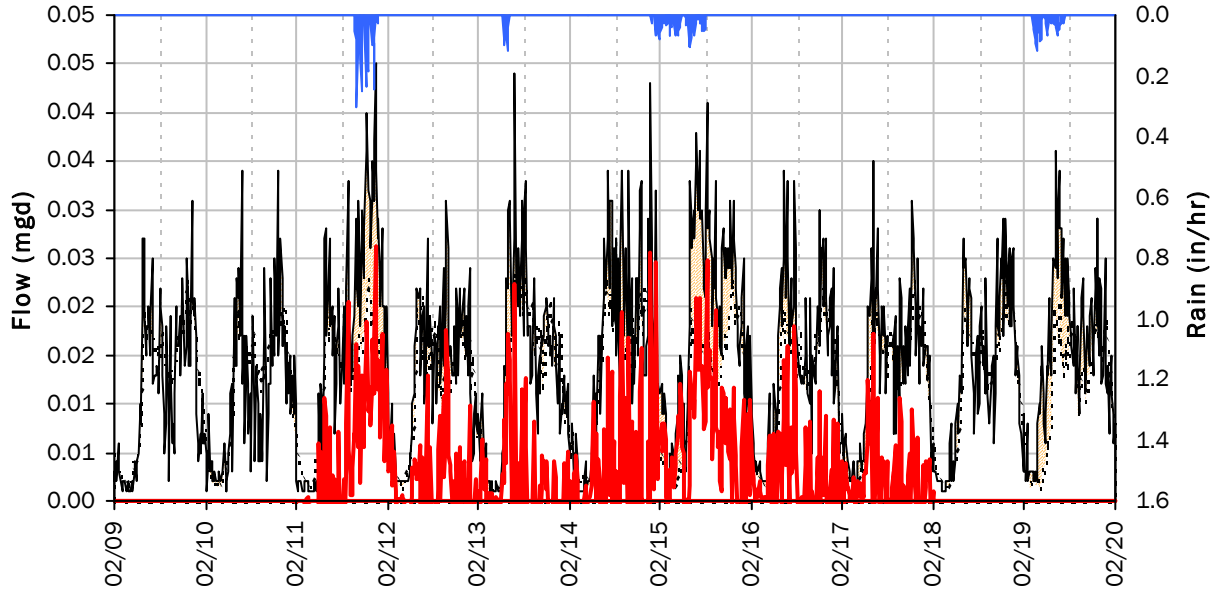
Capacity		Inflow / Infiltration	
Peak Flow:	0.08 *mgd*	**Peak I/I Rate:**	0.07 *mgd*
PF:	6.41	**Total I/I:**	32,000 *gallons*
Peak Level:	2.20 *in*		
d/D Ratio:	0.29		

FM 6-2
I/I Summary: Event 2

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



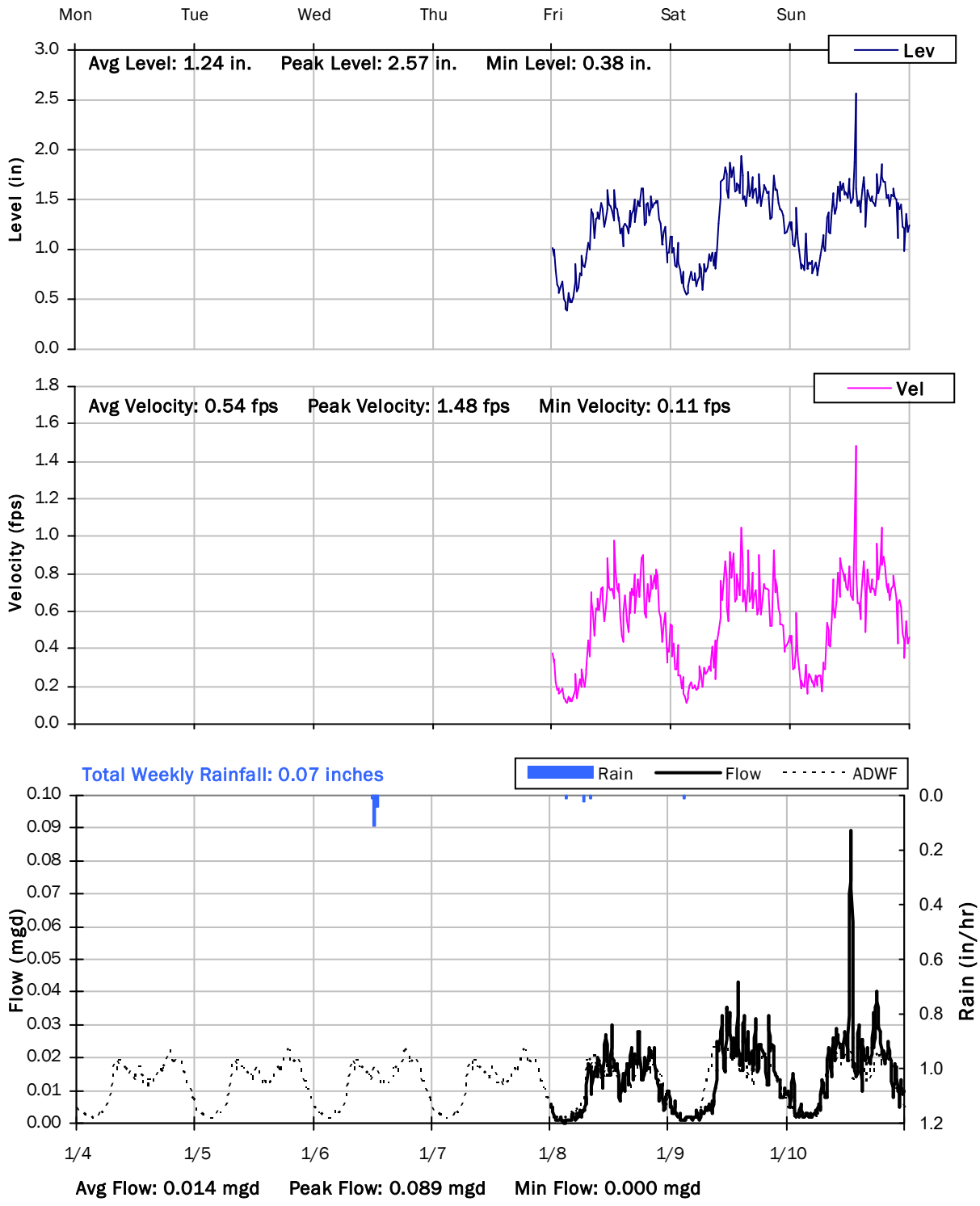
Event 2 Detail Graph



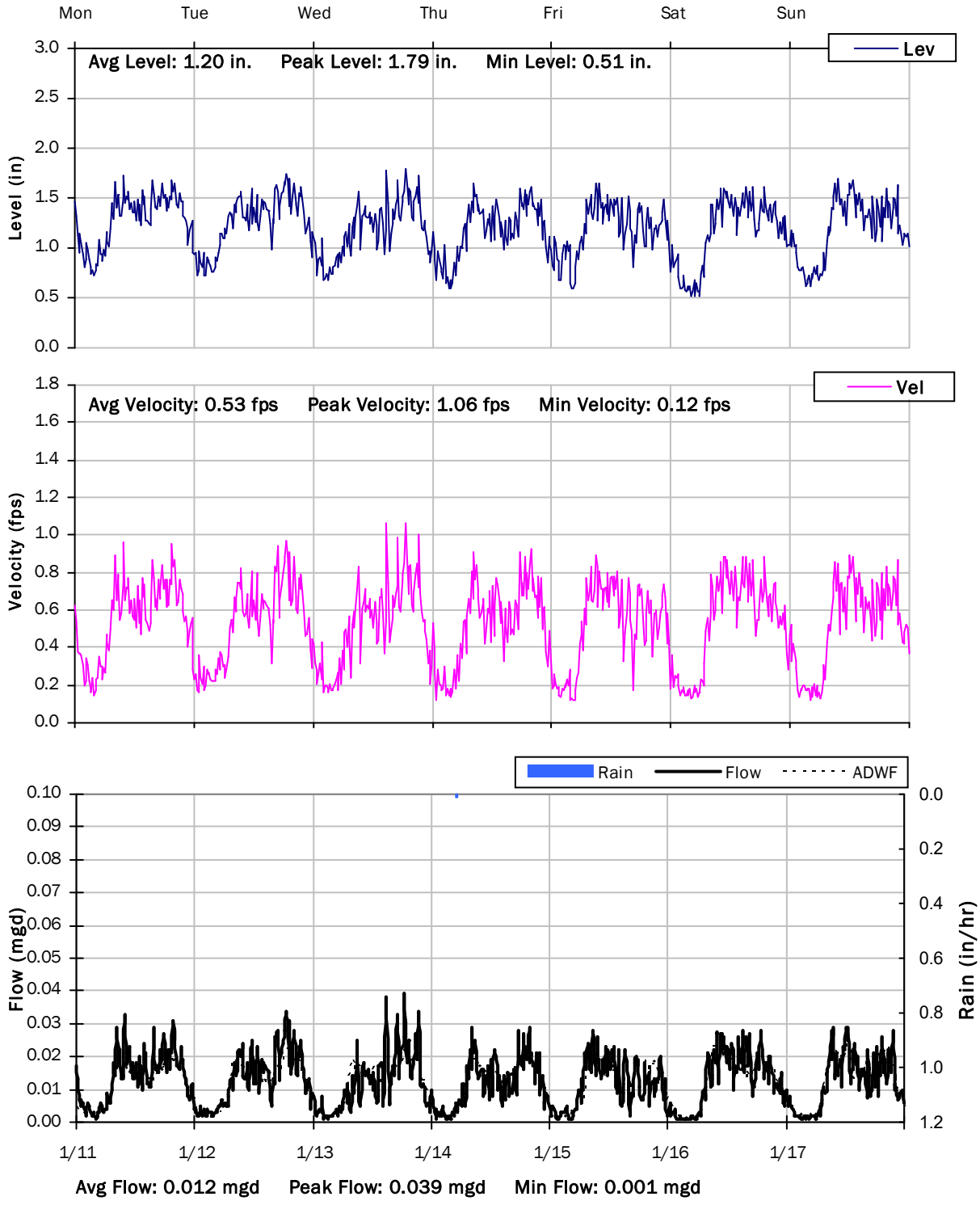
Storm Event I/I Analysis (Rain = 1.16 inches)

Capacity		Inflow / Infiltration	
Peak Flow:	0.05 *mgd*	**Peak I/I Rate:**	0.03 *mgd*
PF:	3.75	**Total I/I:**	22,000 *gallons*
Peak Level:	1.91 *in*		
d/D Ratio:	0.25		

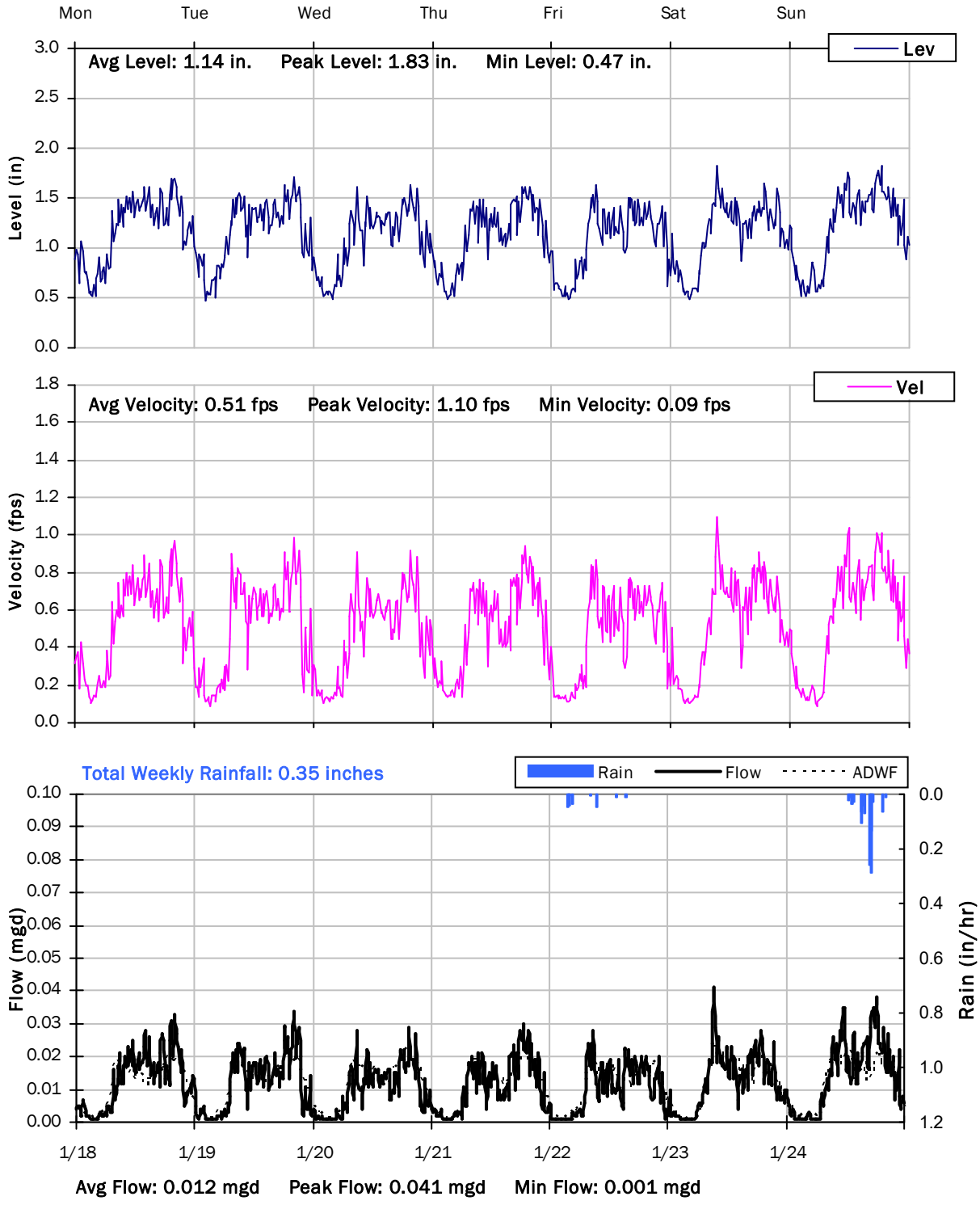
FM 6-2
Weekly Level, Velocity and Flow Hydrographs
1/4/2021 to 1/11/2021



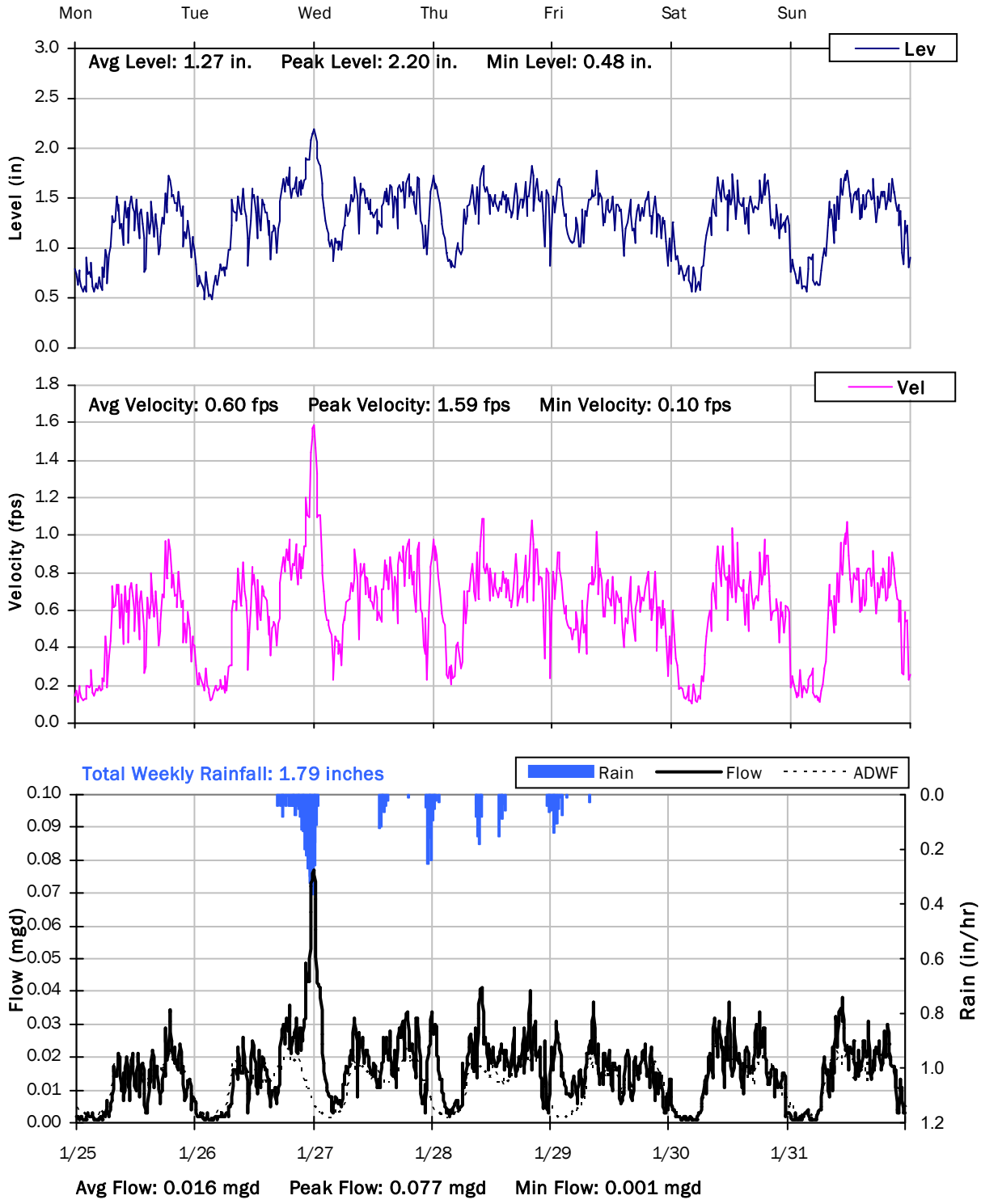
FM 6-2
Weekly Level, Velocity and Flow Hydrographs
1/11/2021 to 1/18/2021



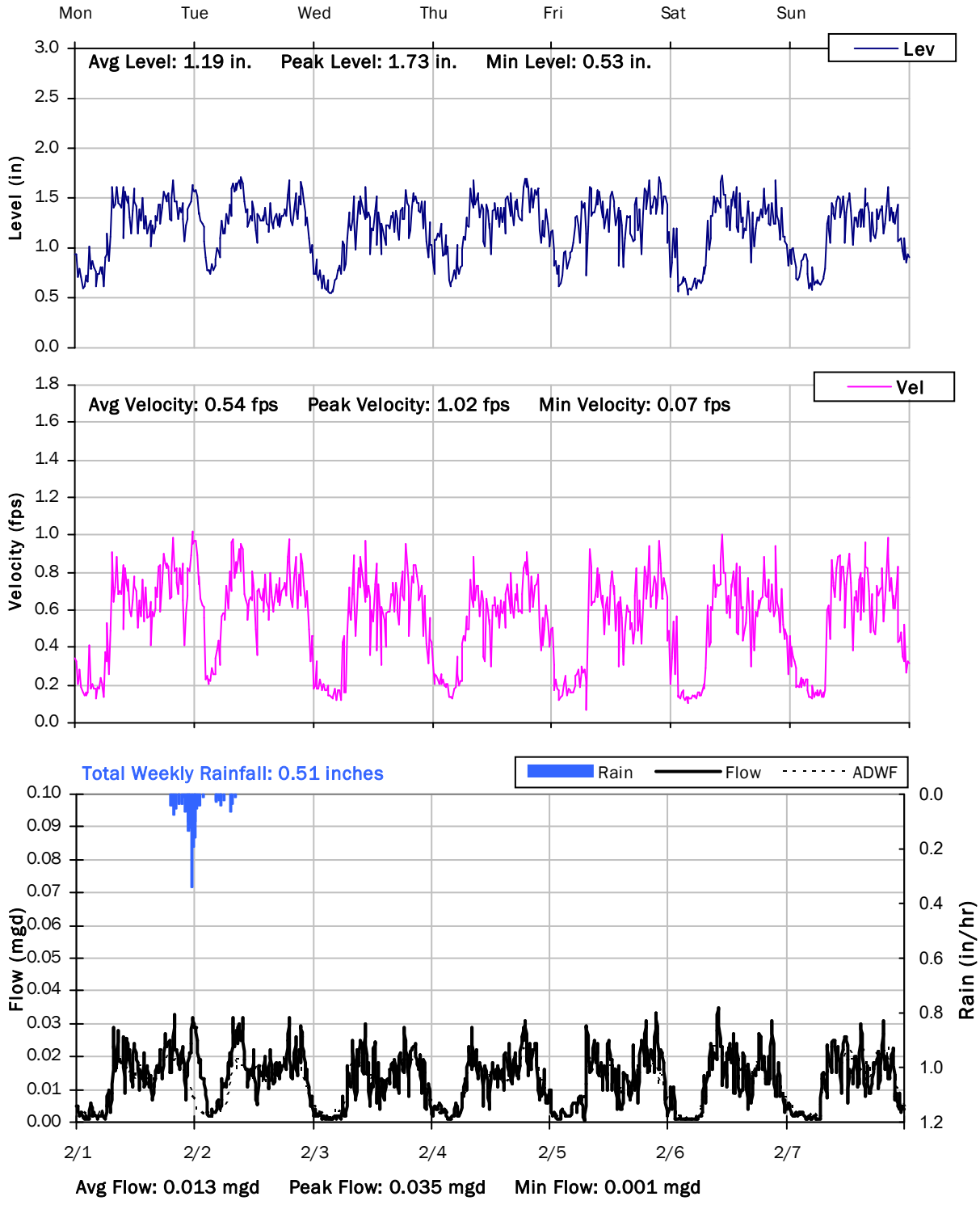
FM 6-2
Weekly Level, Velocity and Flow Hydrographs
1/18/2021 to 1/25/2021



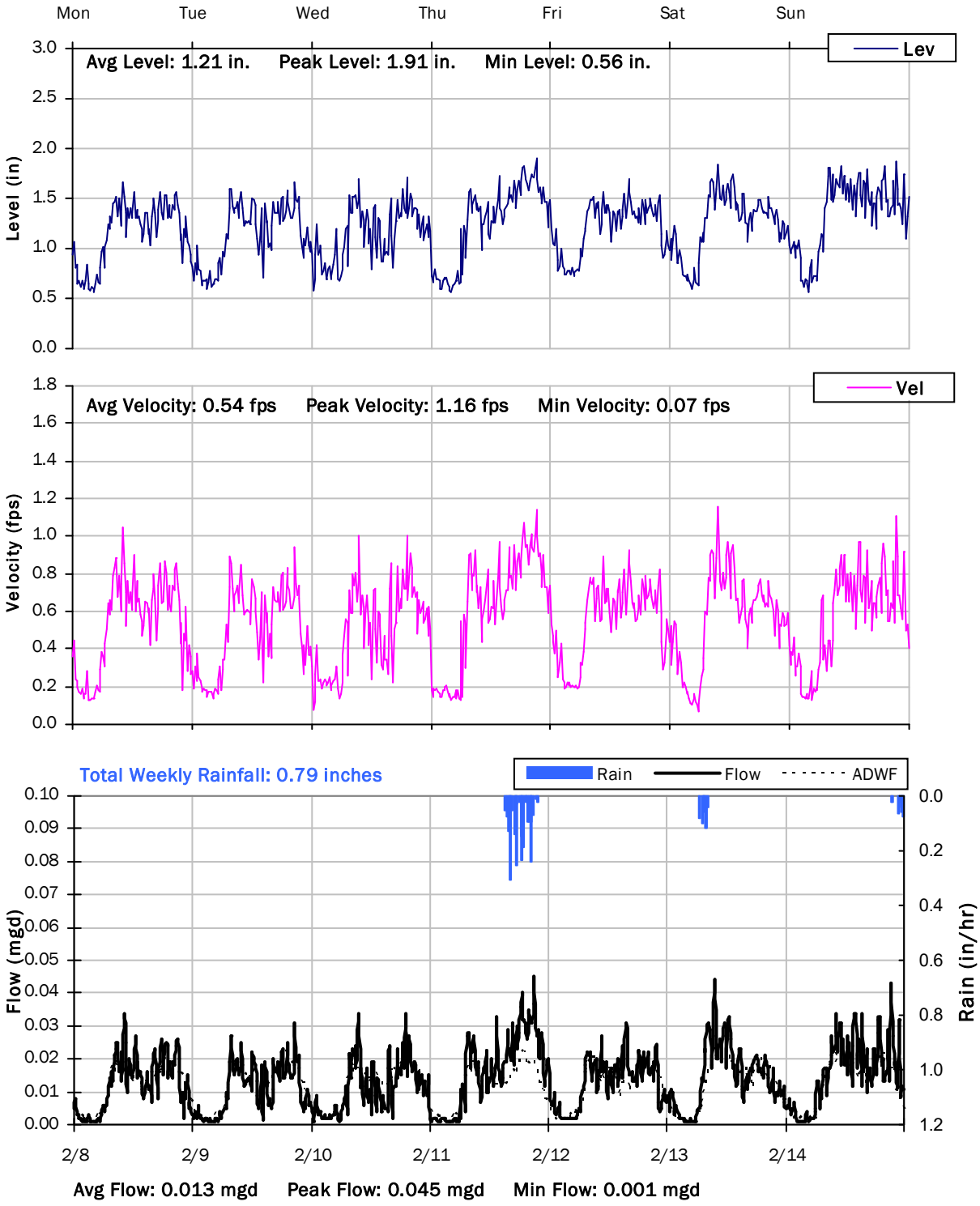
FM 6-2
Weekly Level, Velocity and Flow Hydrographs
1/25/2021 to 2/1/2021



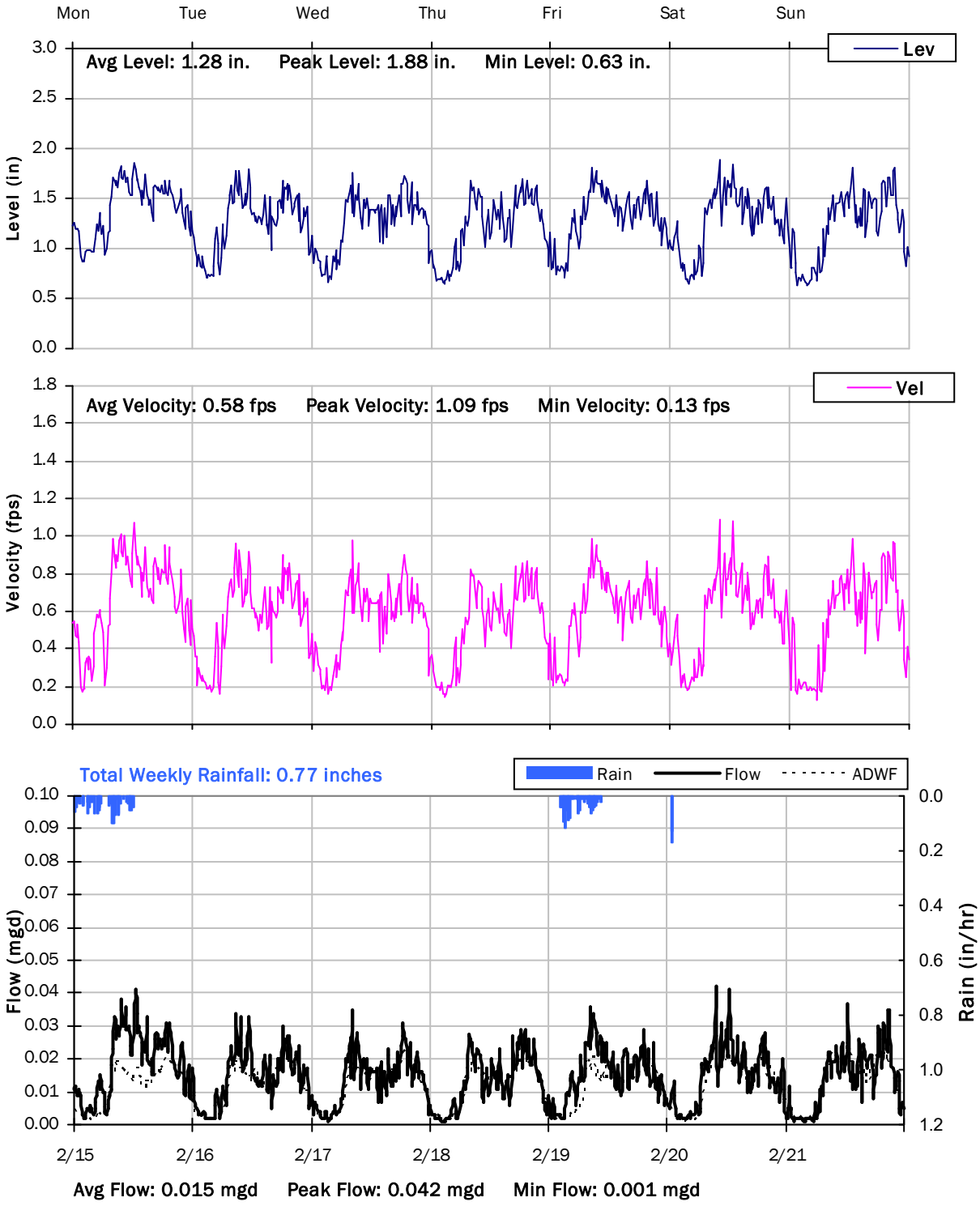
FM 6-2
Weekly Level, Velocity and Flow Hydrographs
2/1/2021 to 2/8/2021



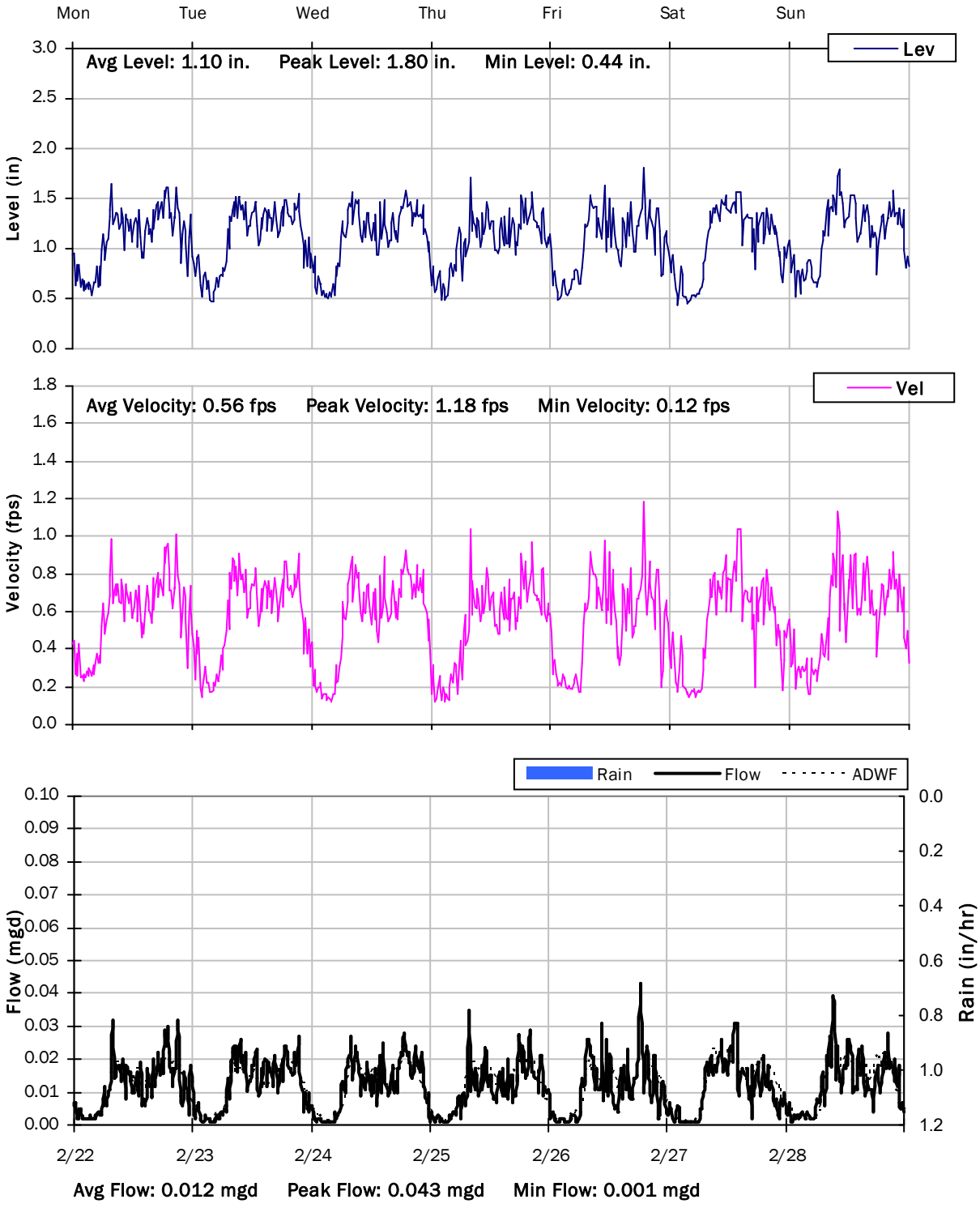
FM 6-2
Weekly Level, Velocity and Flow Hydrographs
2/8/2021 to 2/15/2021



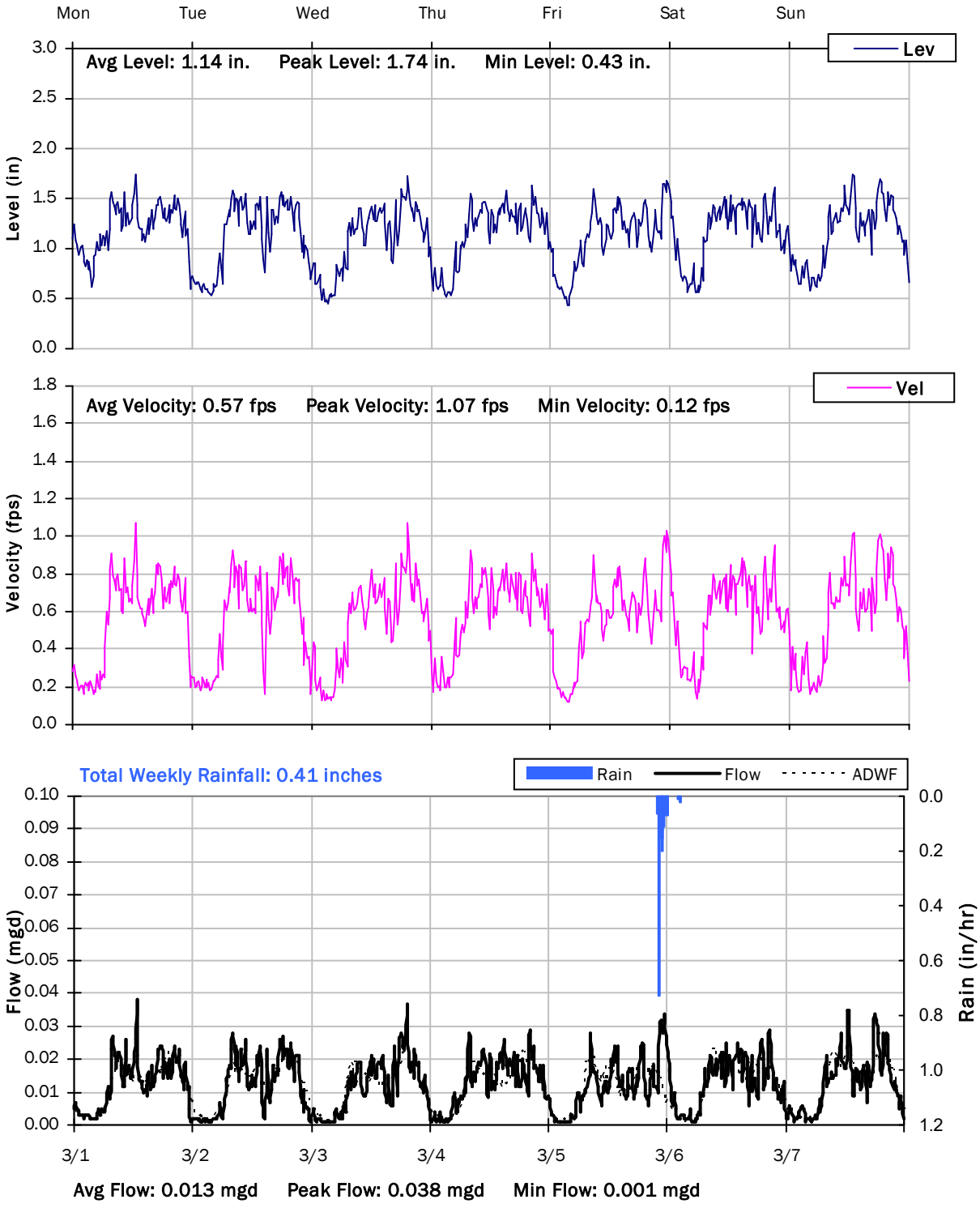
FM 6-2
Weekly Level, Velocity and Flow Hydrographs
2/15/2021 to 2/22/2021



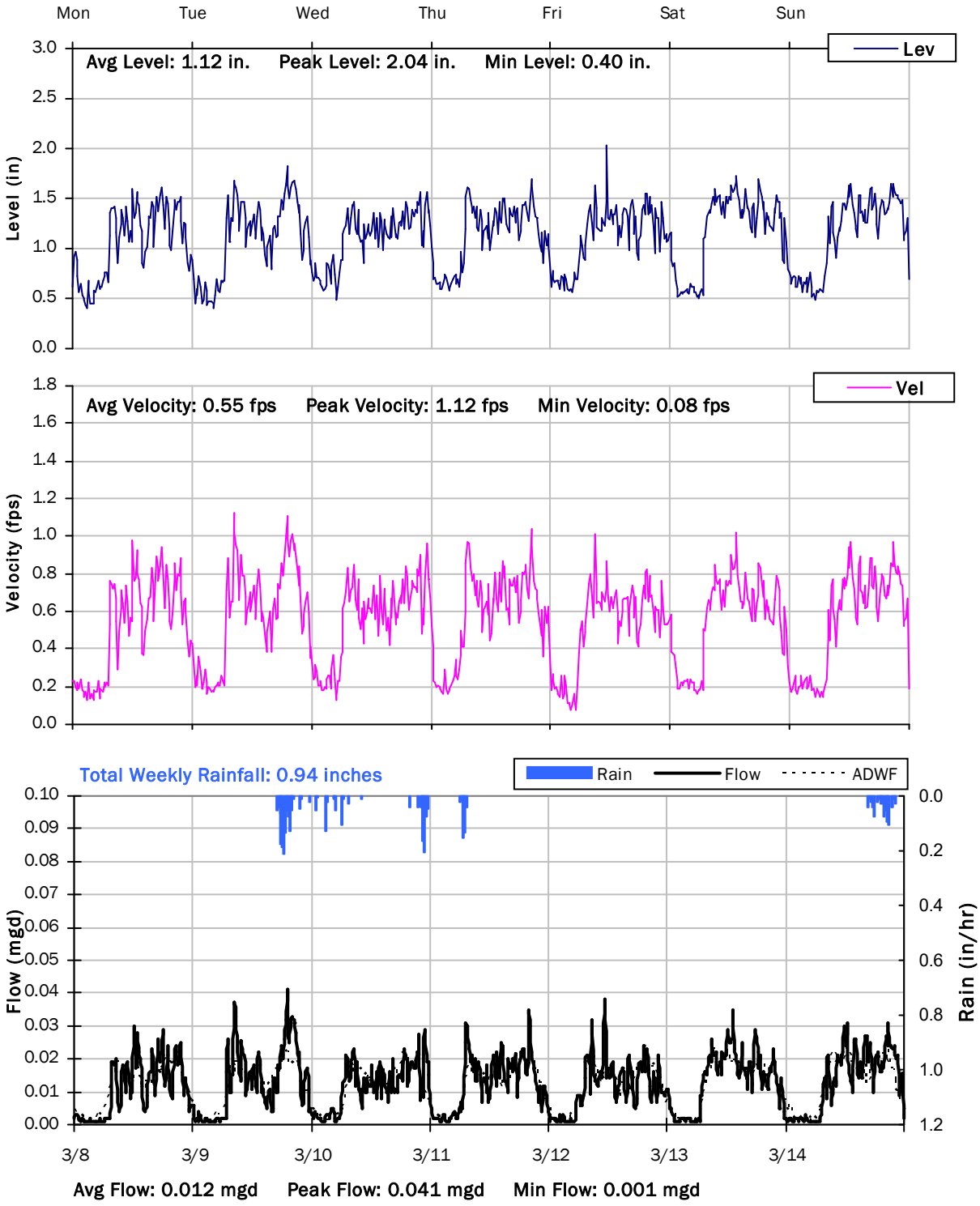
FM 6-2
Weekly Level, Velocity and Flow Hydrographs
2/22/2021 to 3/1/2021



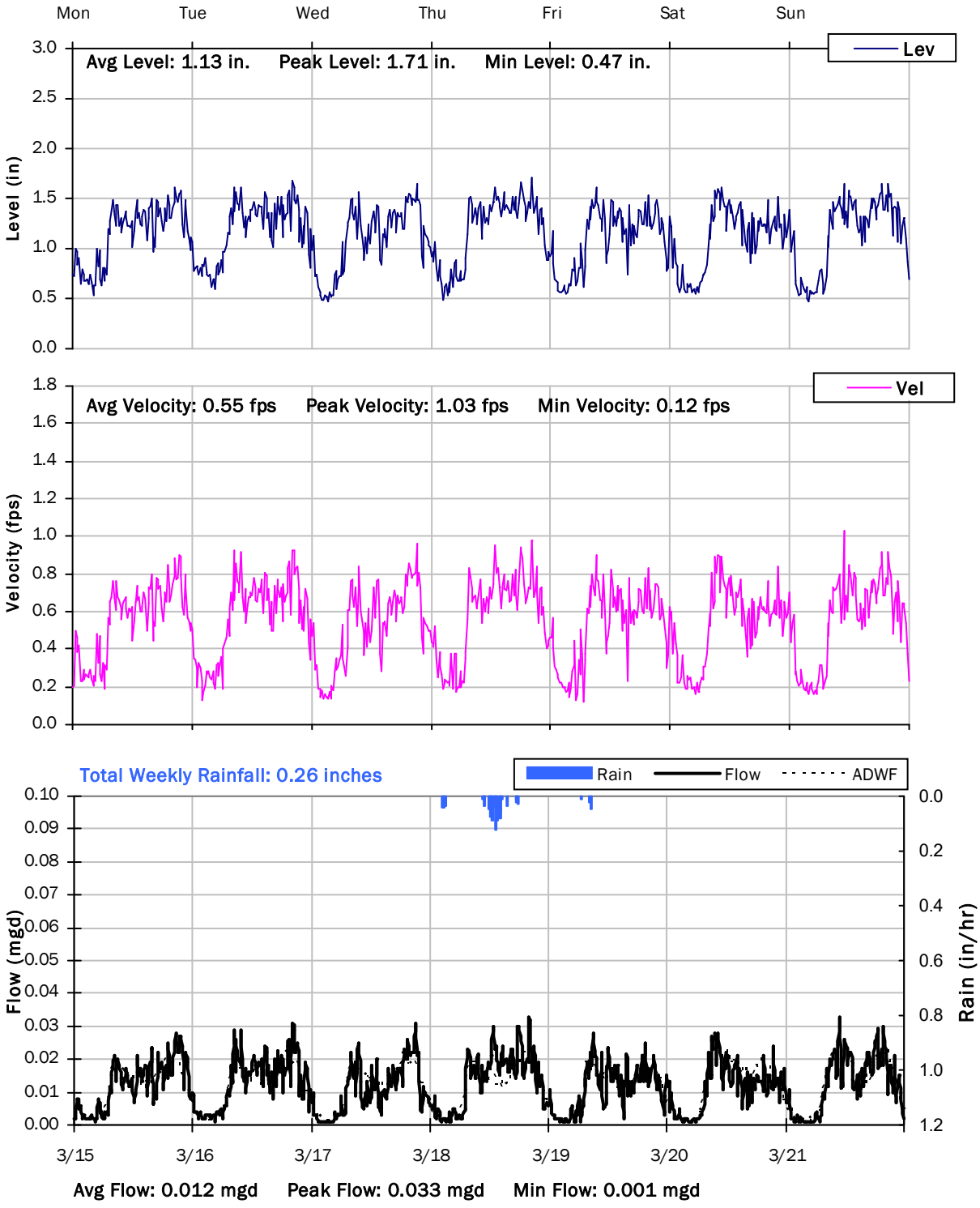
FM 6-2
Weekly Level, Velocity and Flow Hydrographs
3/1/2021 to 3/8/2021



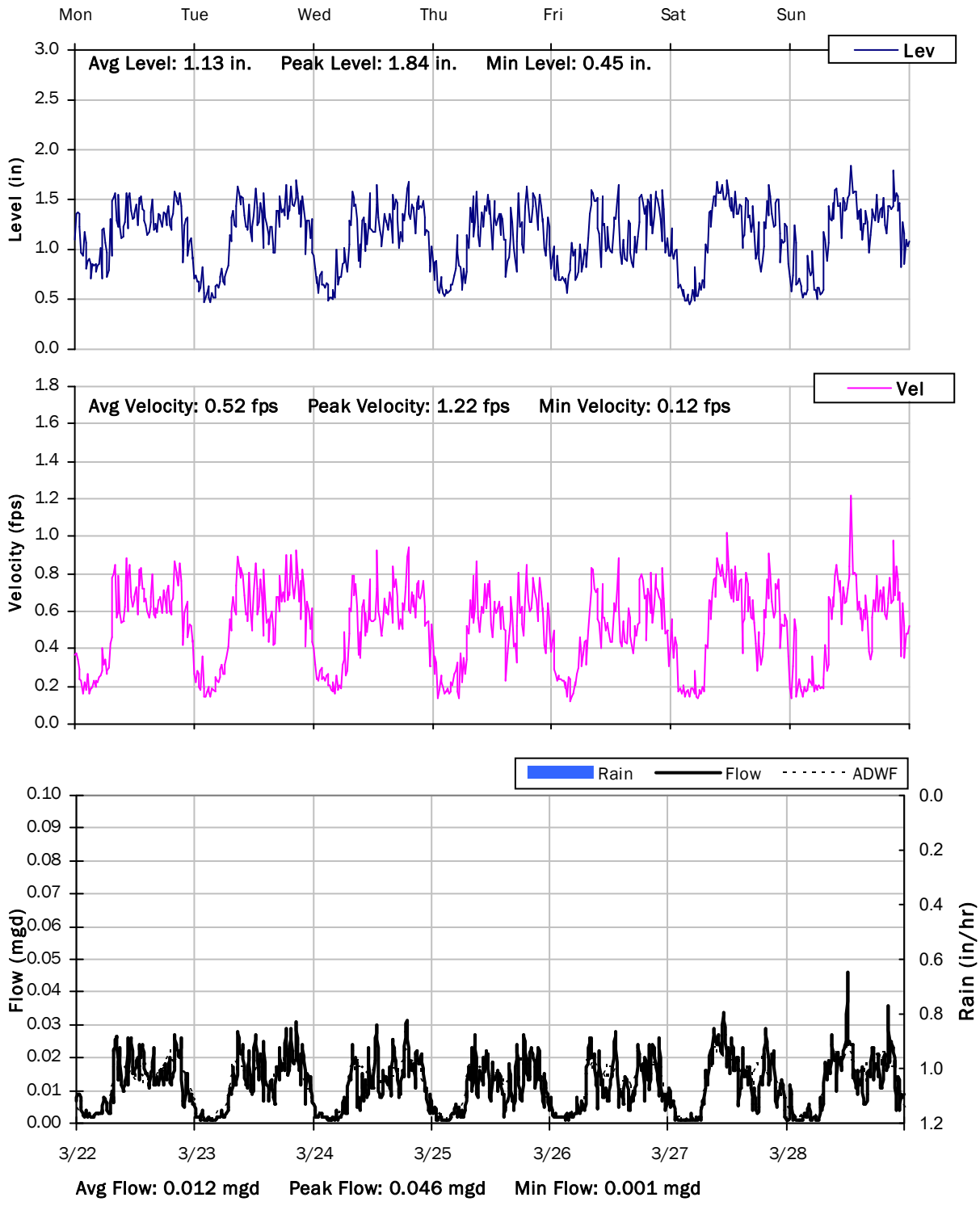
FM 6-2
Weekly Level, Velocity and Flow Hydrographs
3/8/2021 to 3/15/2021



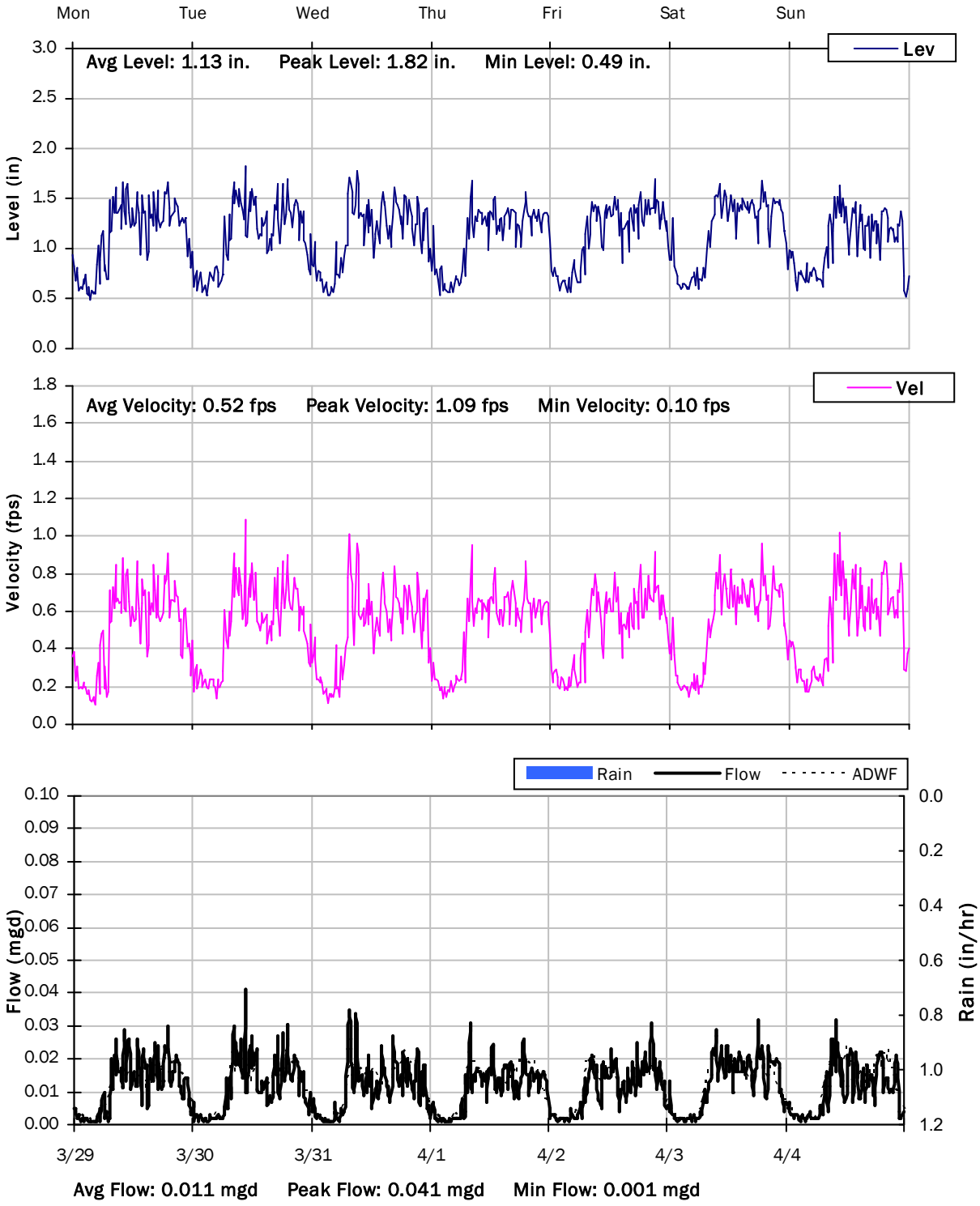
FM 6-2
Weekly Level, Velocity and Flow Hydrographs
3/15/2021 to 3/22/2021



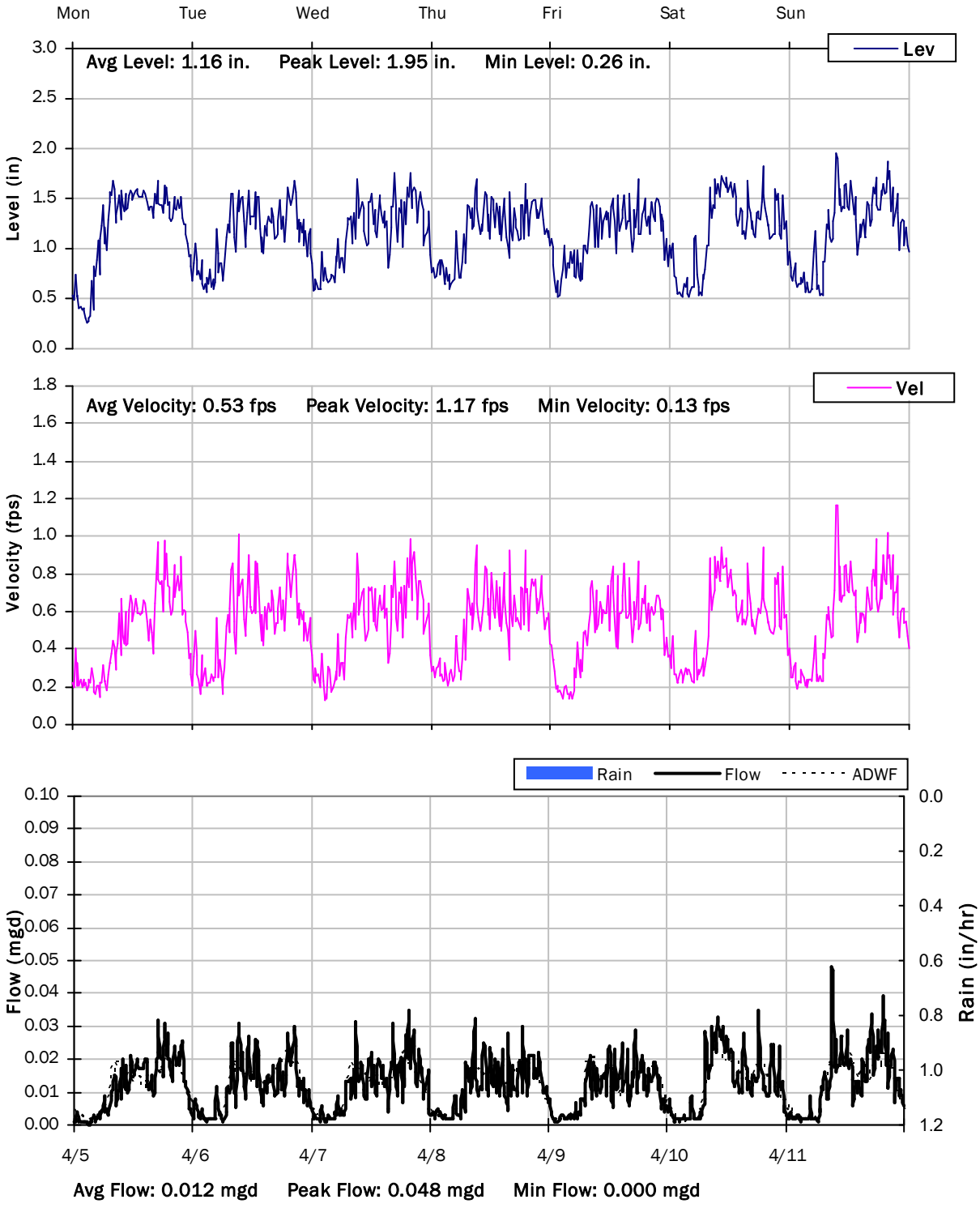
FM 6-2
Weekly Level, Velocity and Flow Hydrographs
3/22/2021 to 3/29/2021



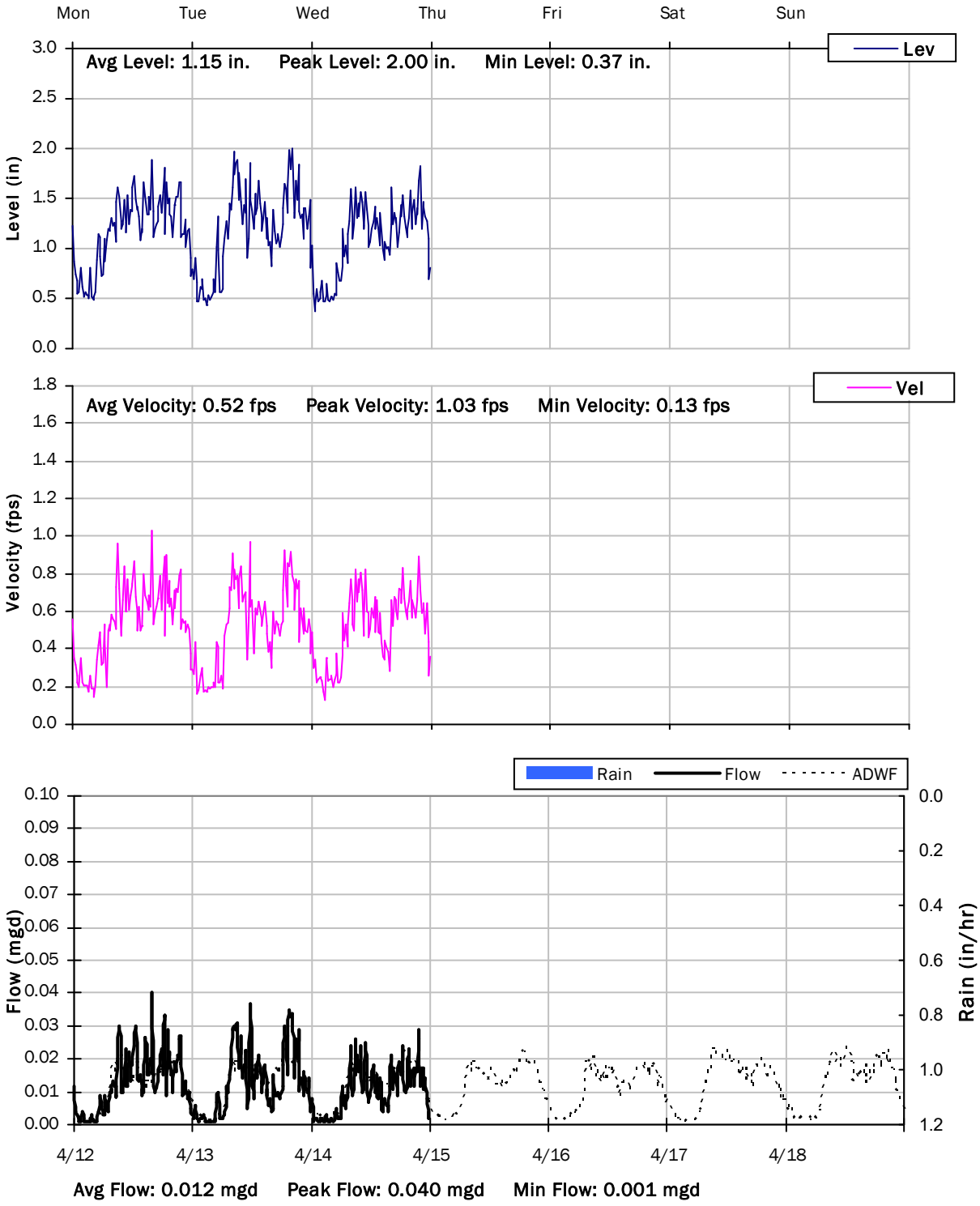
FM 6-2
Weekly Level, Velocity and Flow Hydrographs
3/29/2021 to 4/5/2021



FM 6-2
Weekly Level, Velocity and Flow Hydrographs
4/5/2021 to 4/12/2021



FM 6-2
Weekly Level, Velocity and Flow Hydrographs
4/12/2021 to 4/19/2021



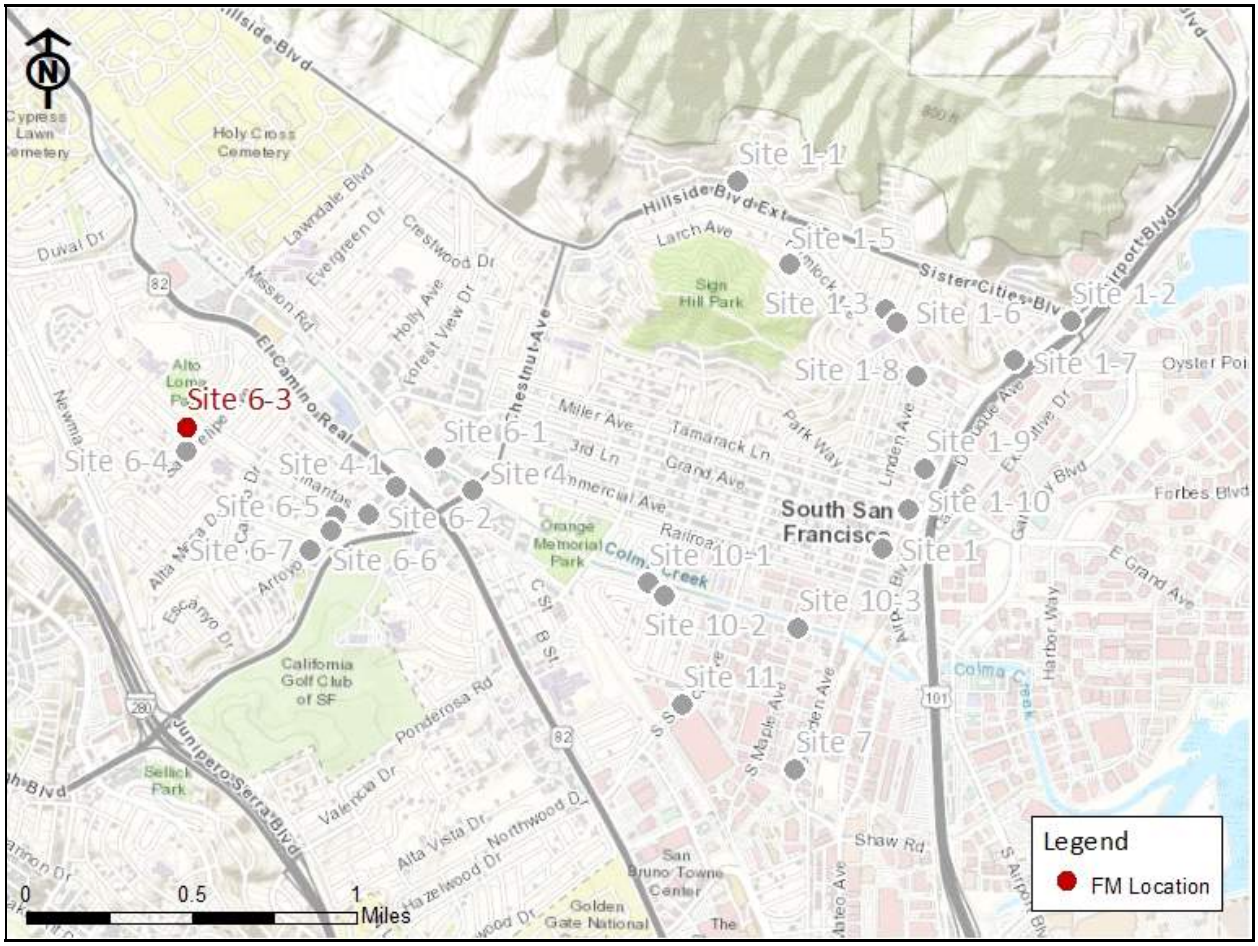
South San Francisco, CA

Sanitary Sewer Flow Monitoring
January 4 - April 14, 2021

Monitoring Site: FM 6-3

Location: Del Monte Avenue and Lacrosse Avenue

Data Summary Report



Vicinity Map: FM 6-3

FM 6-3

Site Information

Location: Del Monte Avenue and Lacrosse Avenue

Coordinates: 122.4481° W, 37.6588° N

Rim Elevation (Earth): 143 feet

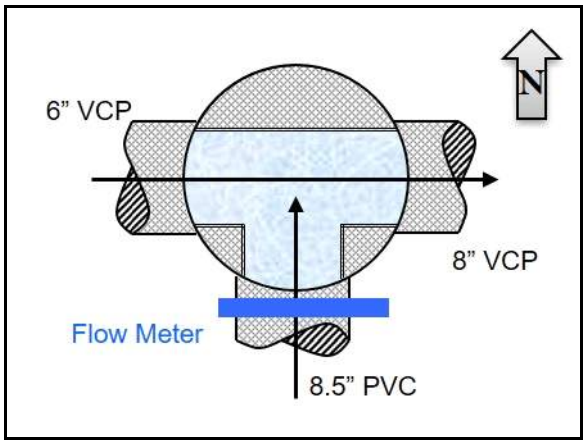
Pipe Diameter: 8.5 inches

ADWF: 0.021 mgd

Peak Measured Flow: 0.171 mgd

Satellite Map

Sanitary Map



Flow Sketch

Street View

Plan View

FM 6-3

Additional Site Photos

Effluent Pipe

Monitored South Influent Pipe

FM 6-3

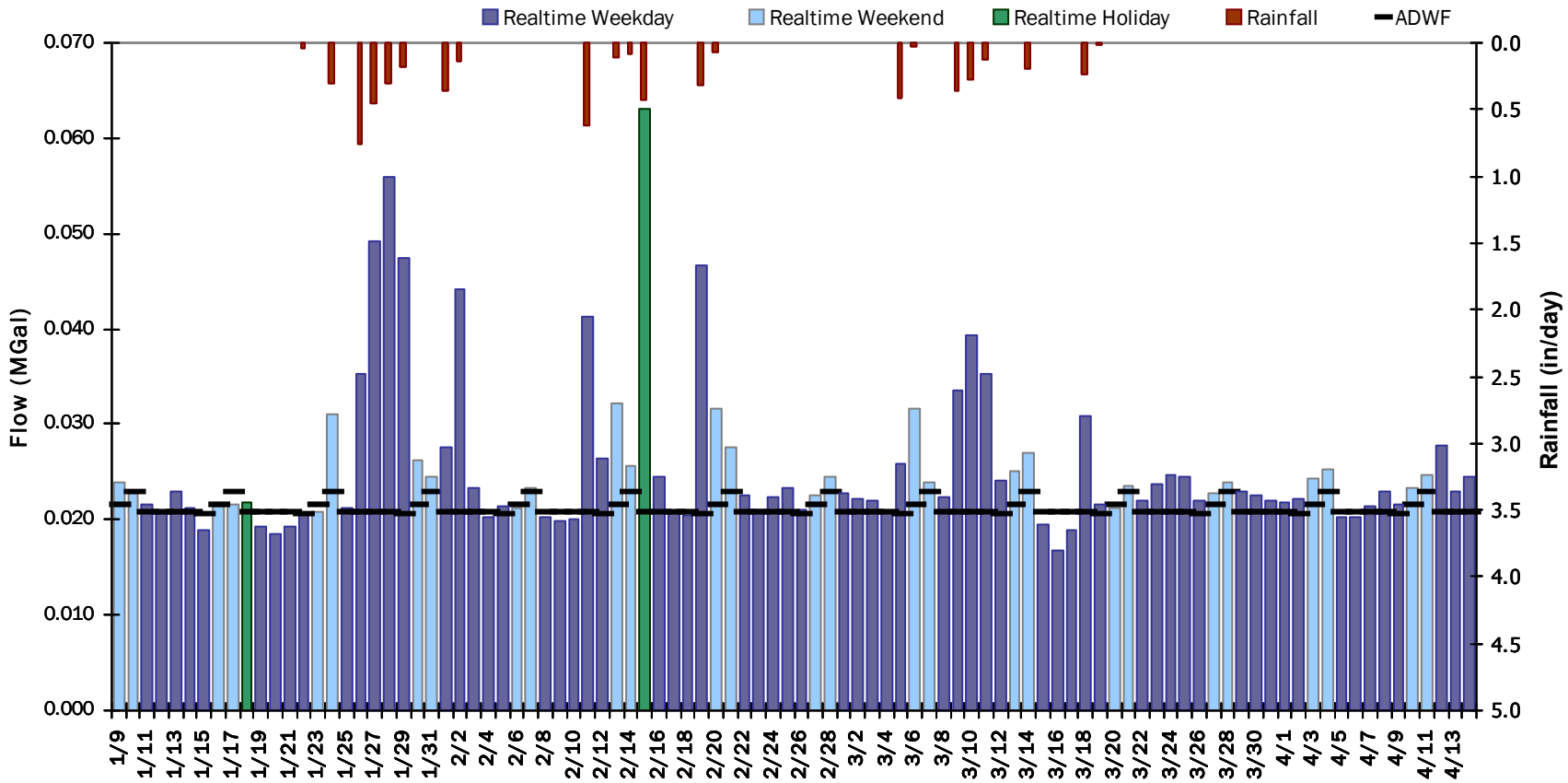
Additional Site Photos

West Influent Pipe

FM 6-3
Period Flow Summary: Daily Flow Totals

Avg Period Flow: 0.025 MGal Peak Daily Flow: 0.063 MGal Min Daily Flow: 0.017 MGal

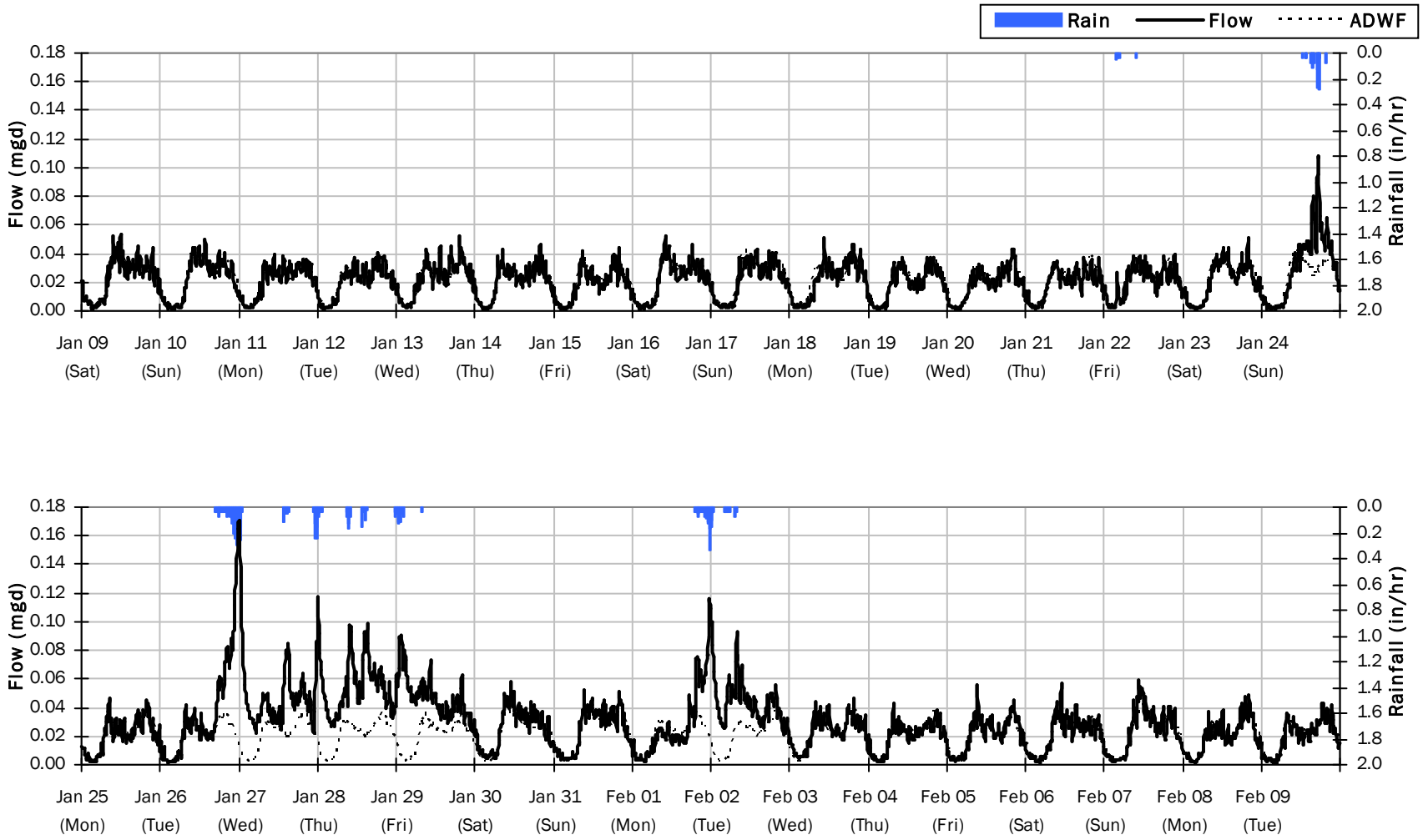
Total Period Rainfall: 5.79 inches



FM 6-3

Flow Summary: 1/9/2021 to 2/9/2021

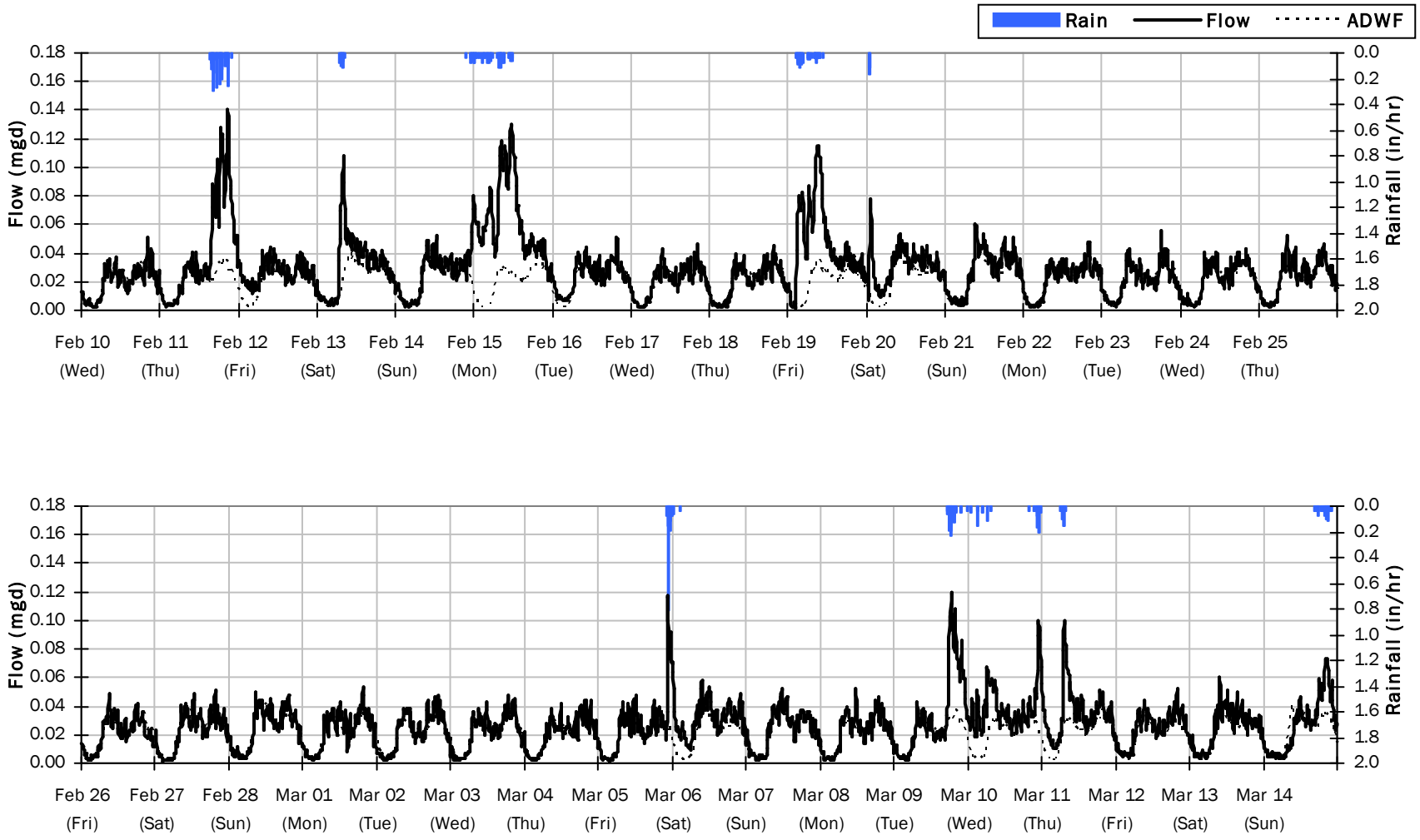
Total Period Rainfall: 2.53 inches Avg Flow: 0.026 mgd Peak Flow: 0.171 mgd Min Flow: 0.001 mgd



FM 6-3

Flow Summary: 2/10/2021 to 3/14/2021

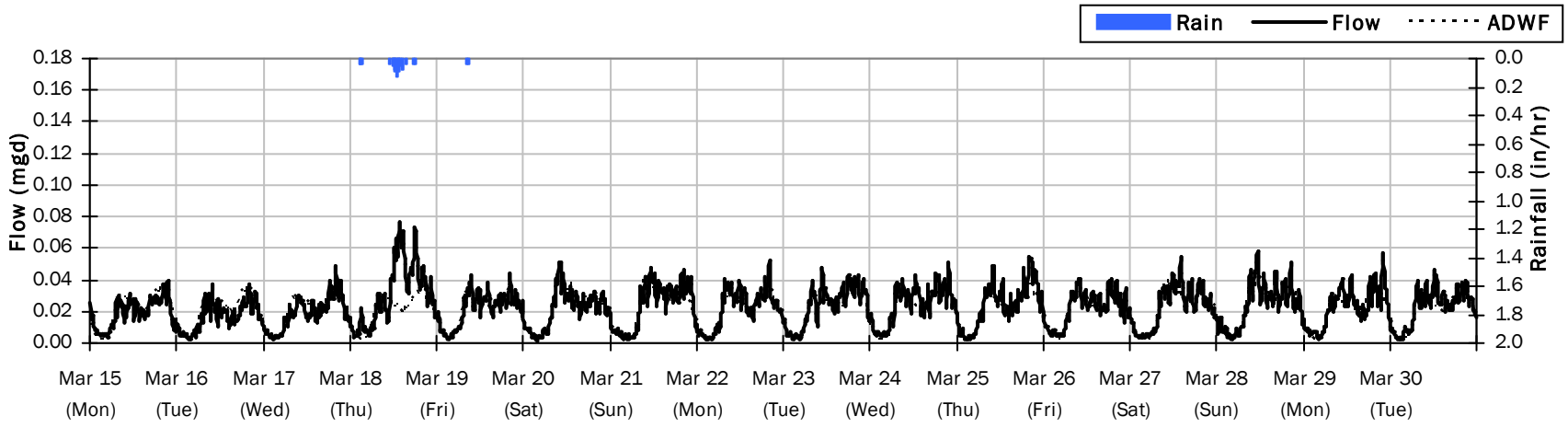
Total Period Rainfall: 3.00 inches Avg Flow: 0.028 mgd Peak Flow: 0.141 mgd Min Flow: 0.001 mgd

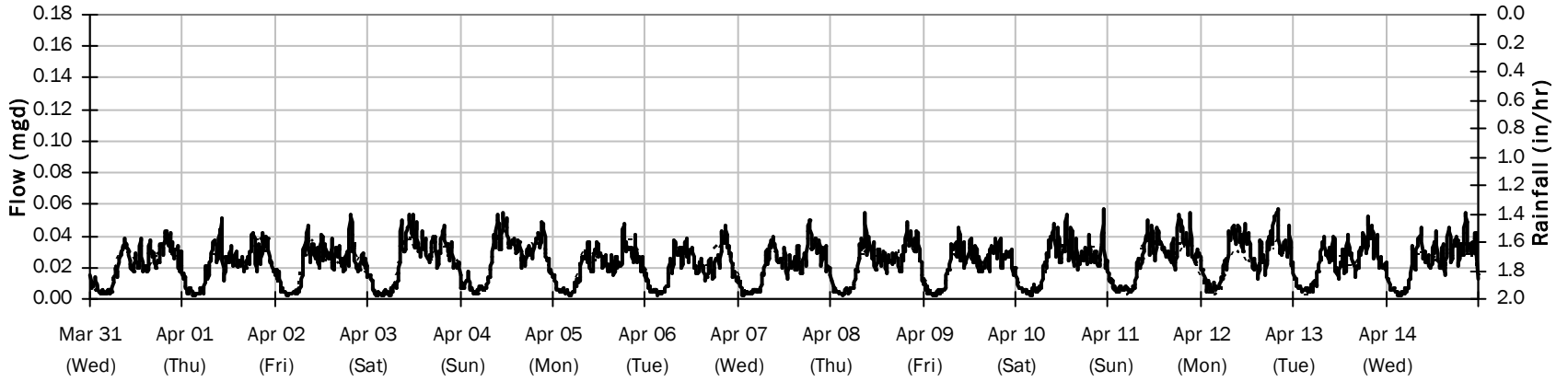


FM 6-3

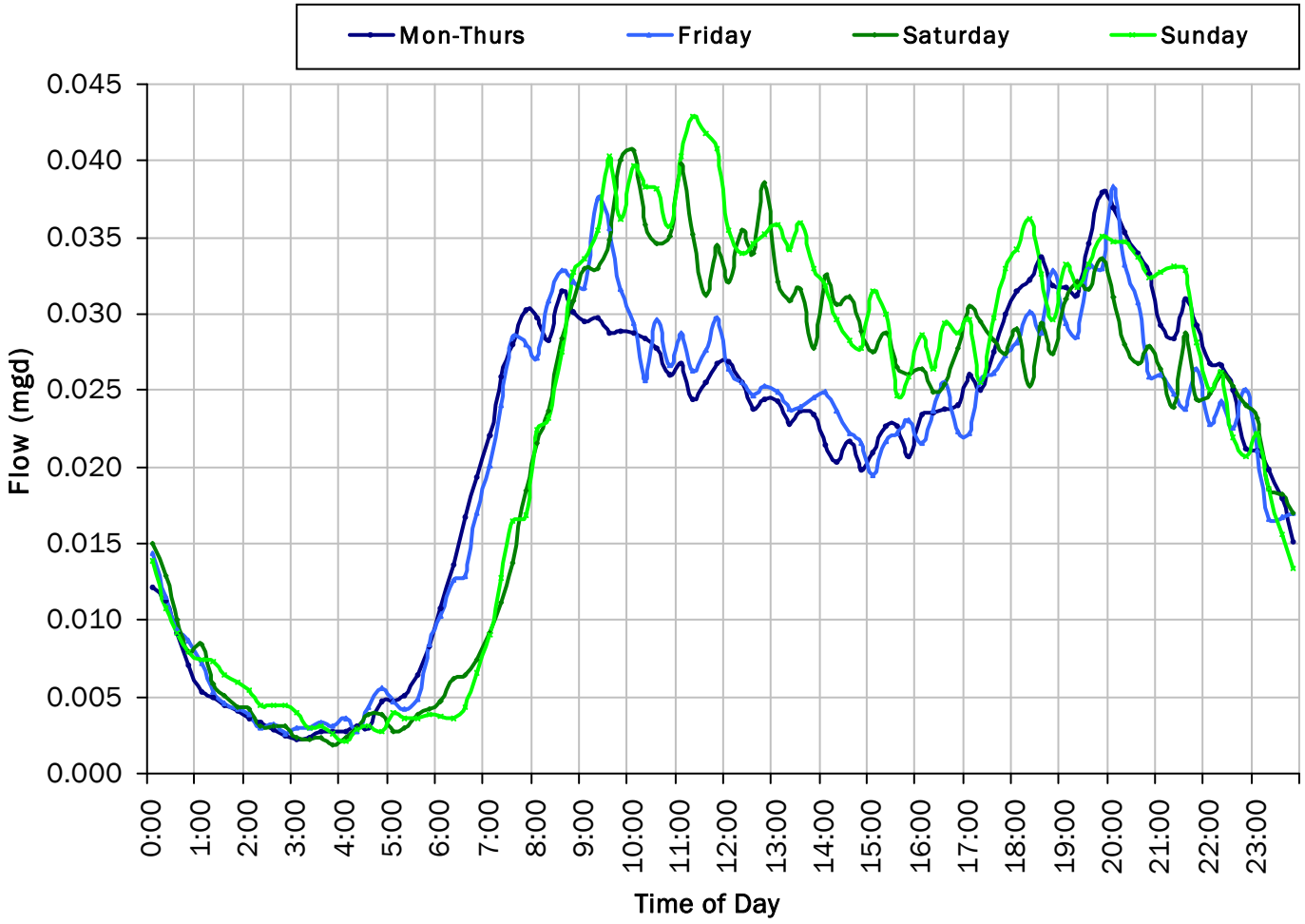
Flow Summary: 3/15/2021 to 4/14/2021

Total Period Rainfall: 0.25 inches Avg Flow: 0.023 mgd Peak Flow: 0.076 mgd Min Flow: 0.002 mgd



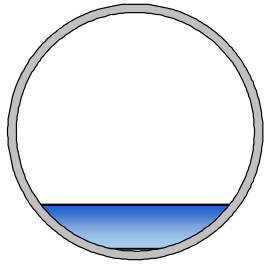


FM 6-3
Average Dry Weather Flow Hydrographs



ADWF:

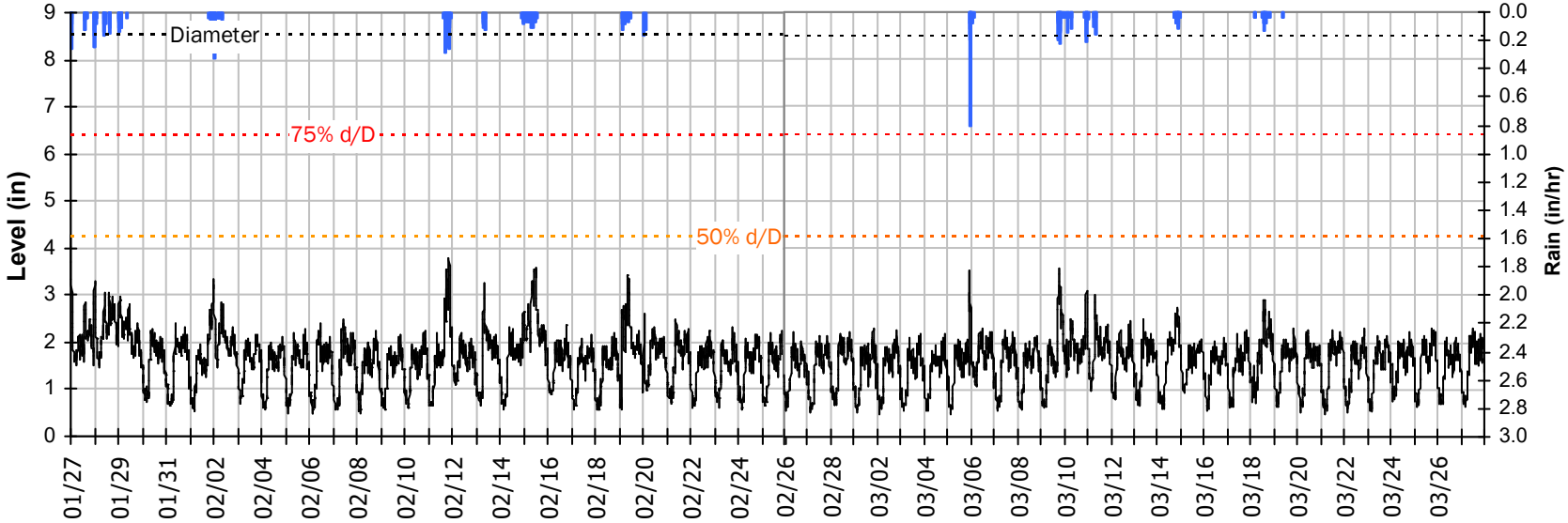
0.021 *mgd*

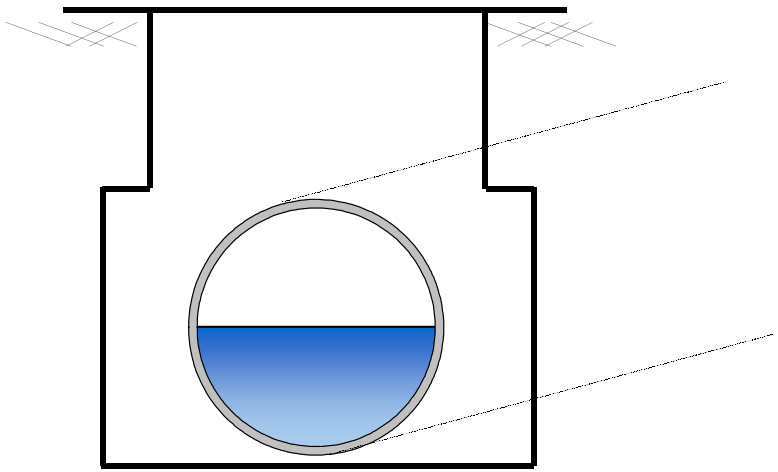


FM 6-3

Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Monitoring Period

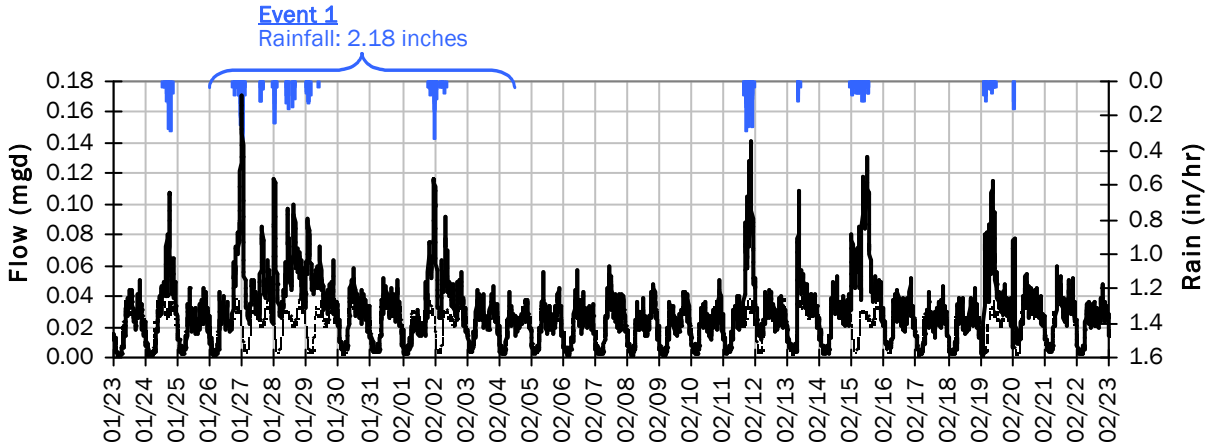




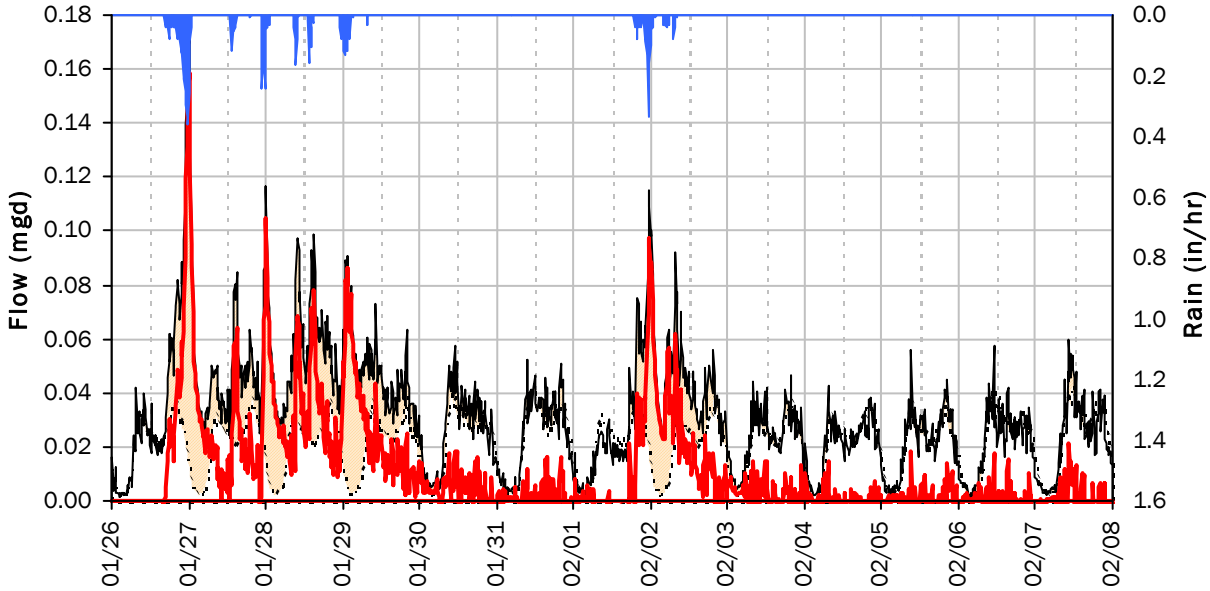
Pipe Diameter:	8.5	*inches*
Peak Measured Level:	4.26	*inches*
Peak d/D Ratio:	0.50	

FM 6-3
I/I Summary: Event 1

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



Event 1 Detail Graph

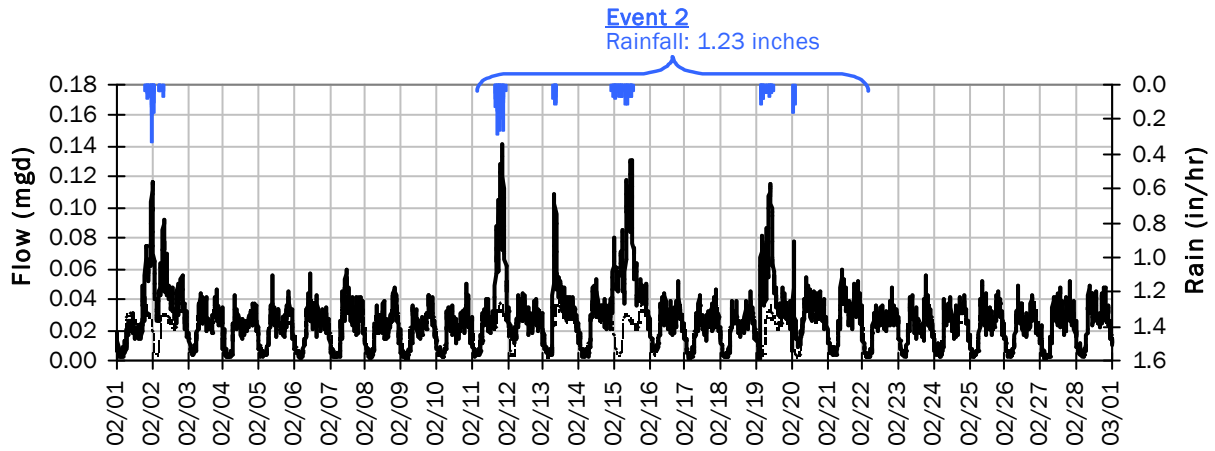


Storm Event I/I Analysis (Rain = 2.18 inches)

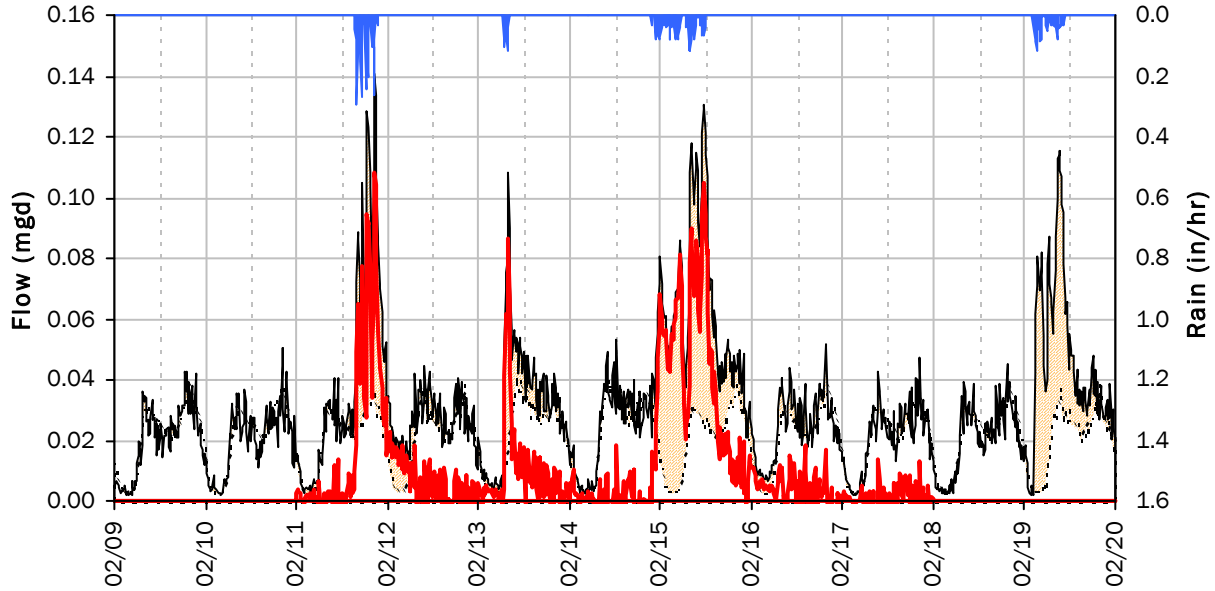
Capacity		Inflow / Infiltration	
Peak Flow:	0.17 *mgd*	**Peak I/I Rate:**	0.16 *mgd*
PF:	8.06	**Total I/I:**	144,000 *gallons*
Peak Level:	4.26 *in*		
d/D Ratio:	0.50		

FM 6-3
I/I Summary: Event 2

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



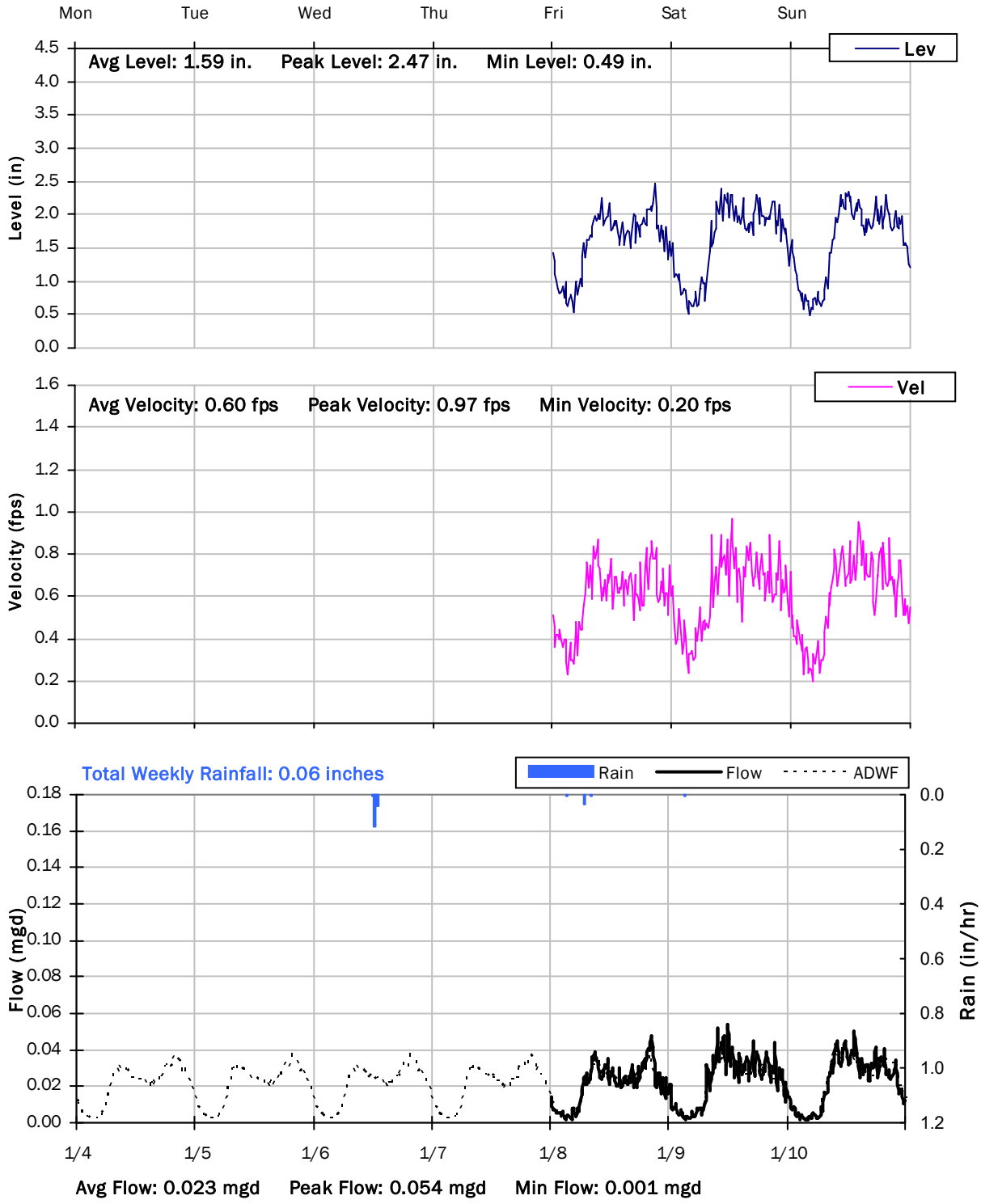
Event 2 Detail Graph



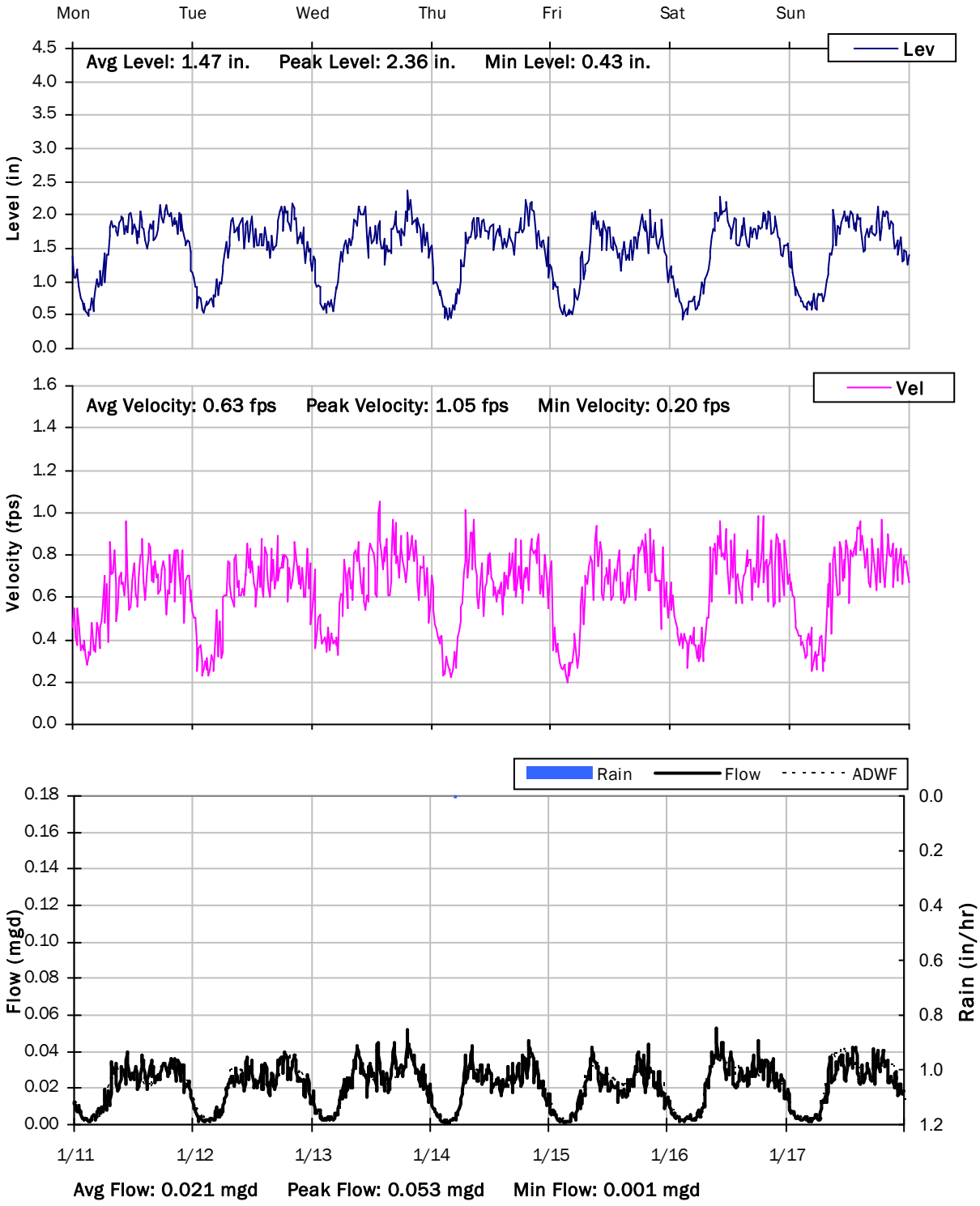
Storm Event I/I Analysis (Rain = 1.23 inches)

Capacity		Inflow / Infiltration	
Peak Flow:	0.14 *mgd*	**Peak I/I Rate:**	0.11 *mgd*
PF:	6.63	**Total I/I:**	85,000 *gallons*
Peak Level:	3.80 *in*		
d/D Ratio:	0.45		

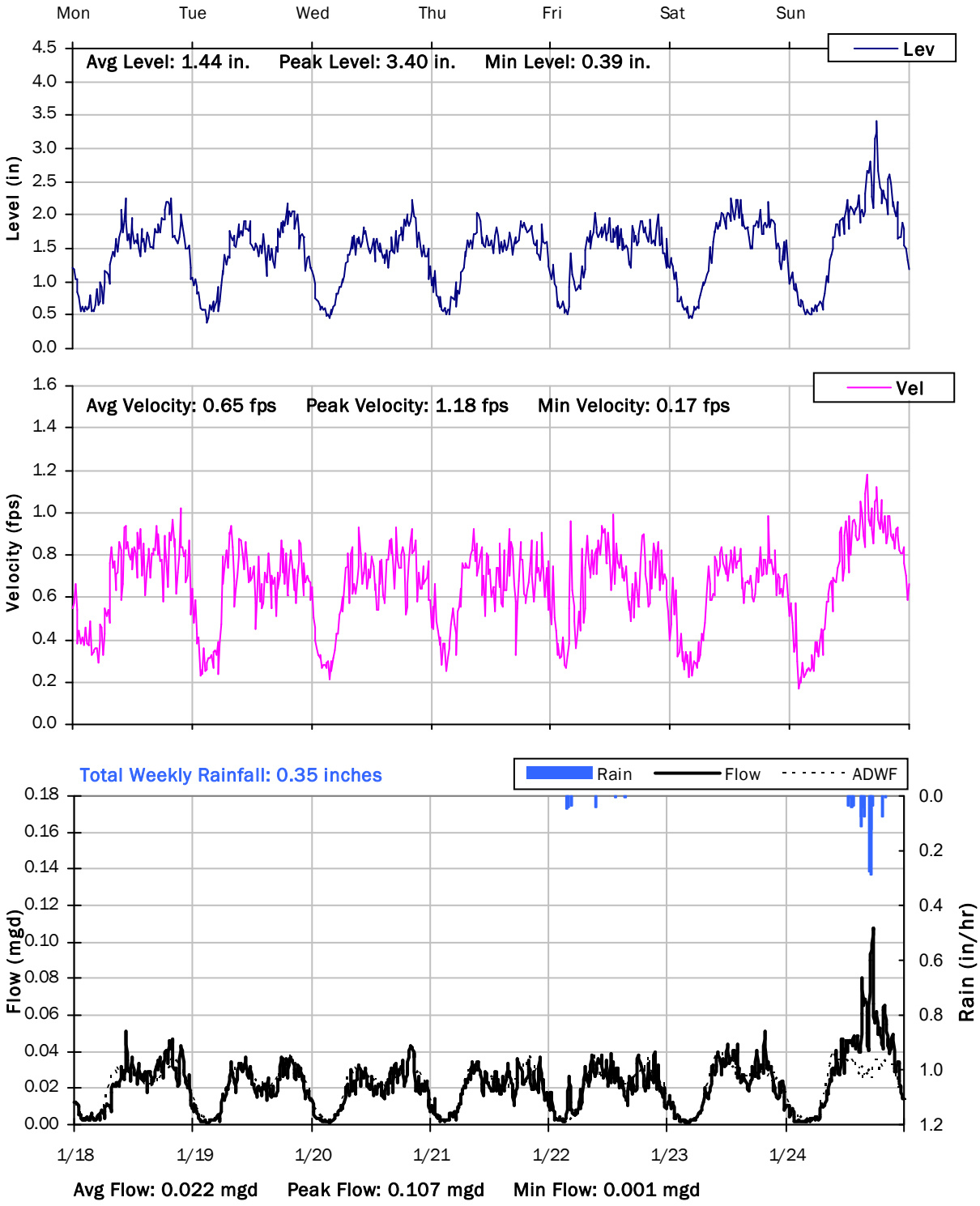
FM 6-3
Weekly Level, Velocity and Flow Hydrographs
1/4/2021 to 1/11/2021



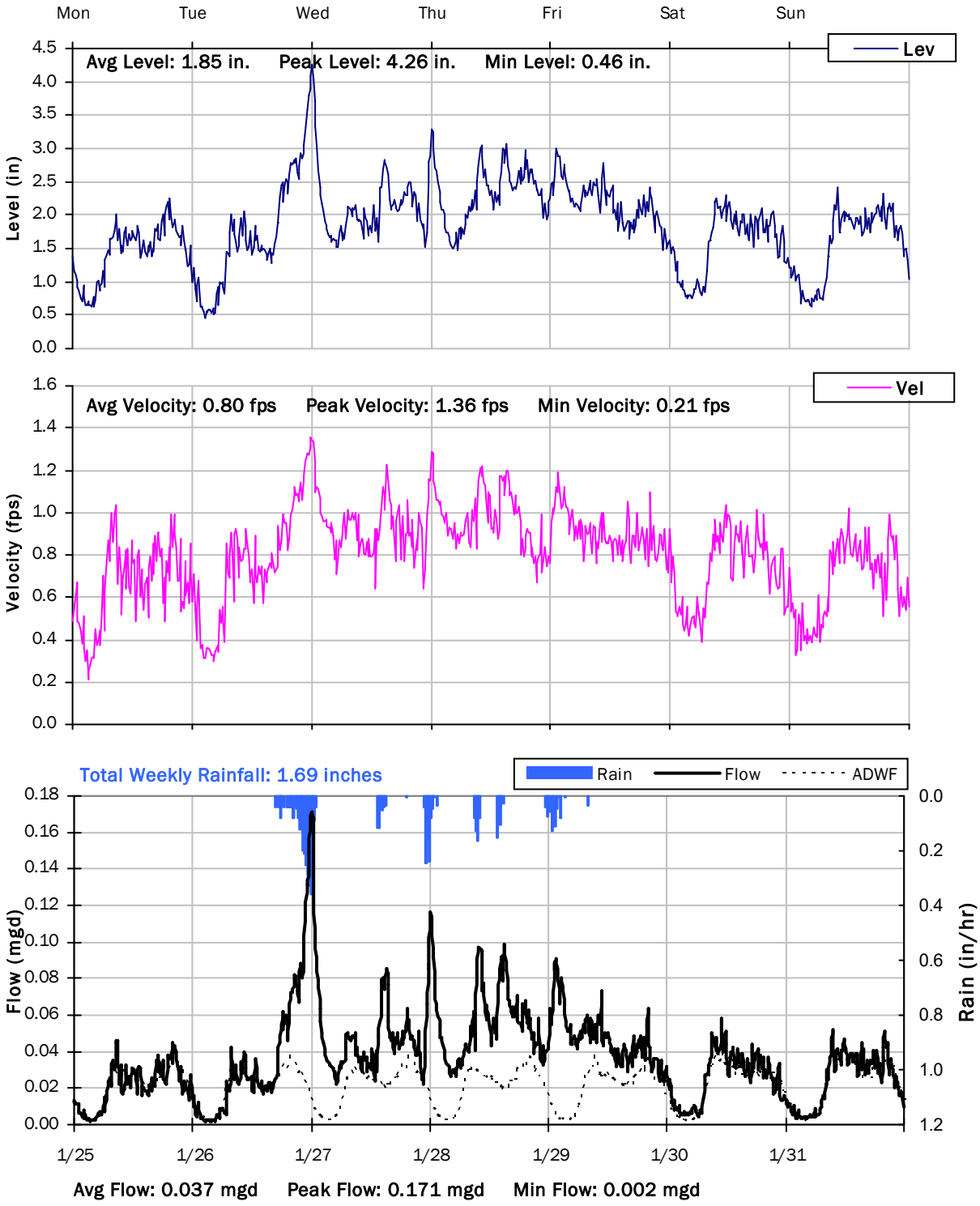
FM 6-3
Weekly Level, Velocity and Flow Hydrographs
1/11/2021 to 1/18/2021



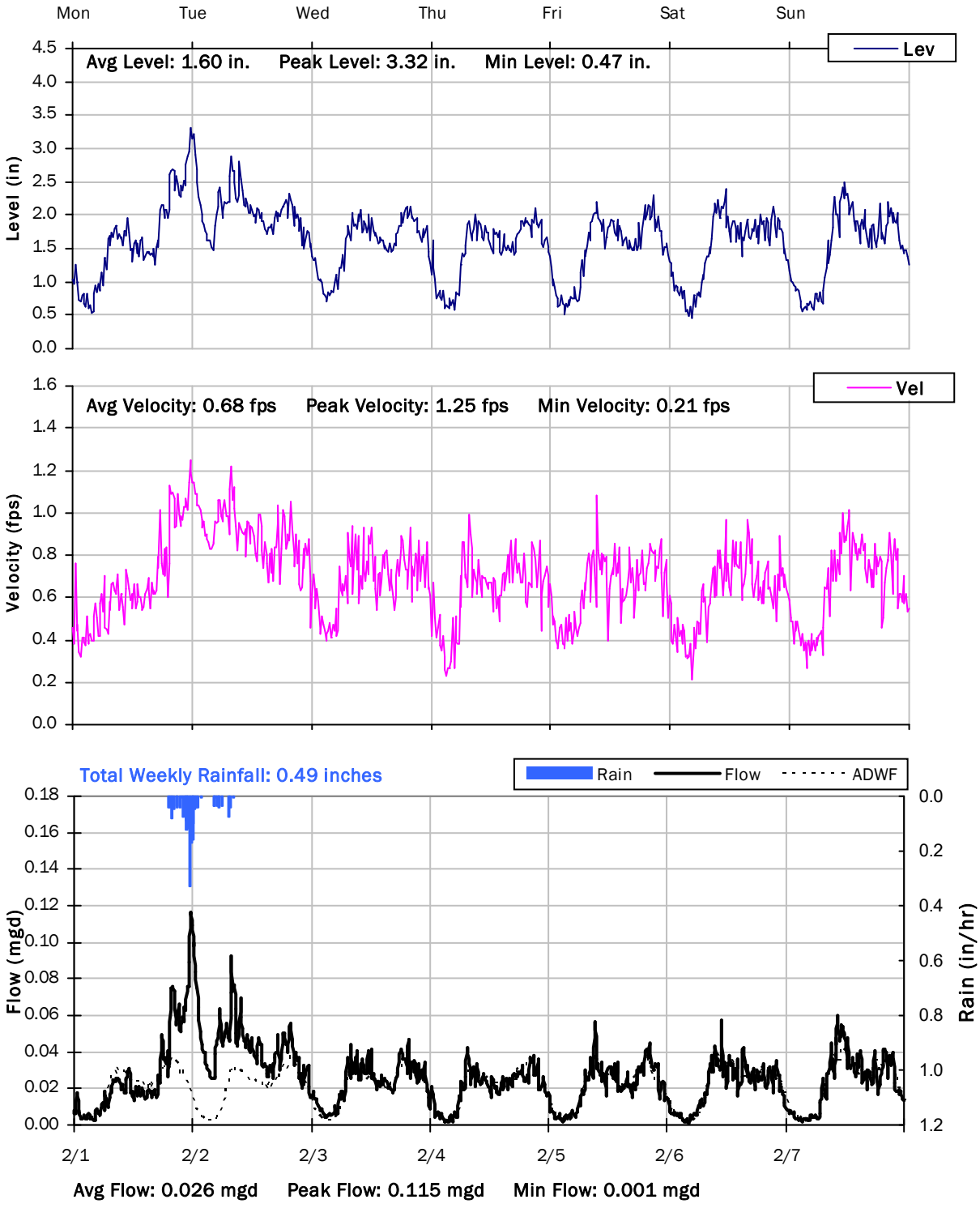
FM 6-3
Weekly Level, Velocity and Flow Hydrographs
1/18/2021 to 1/25/2021



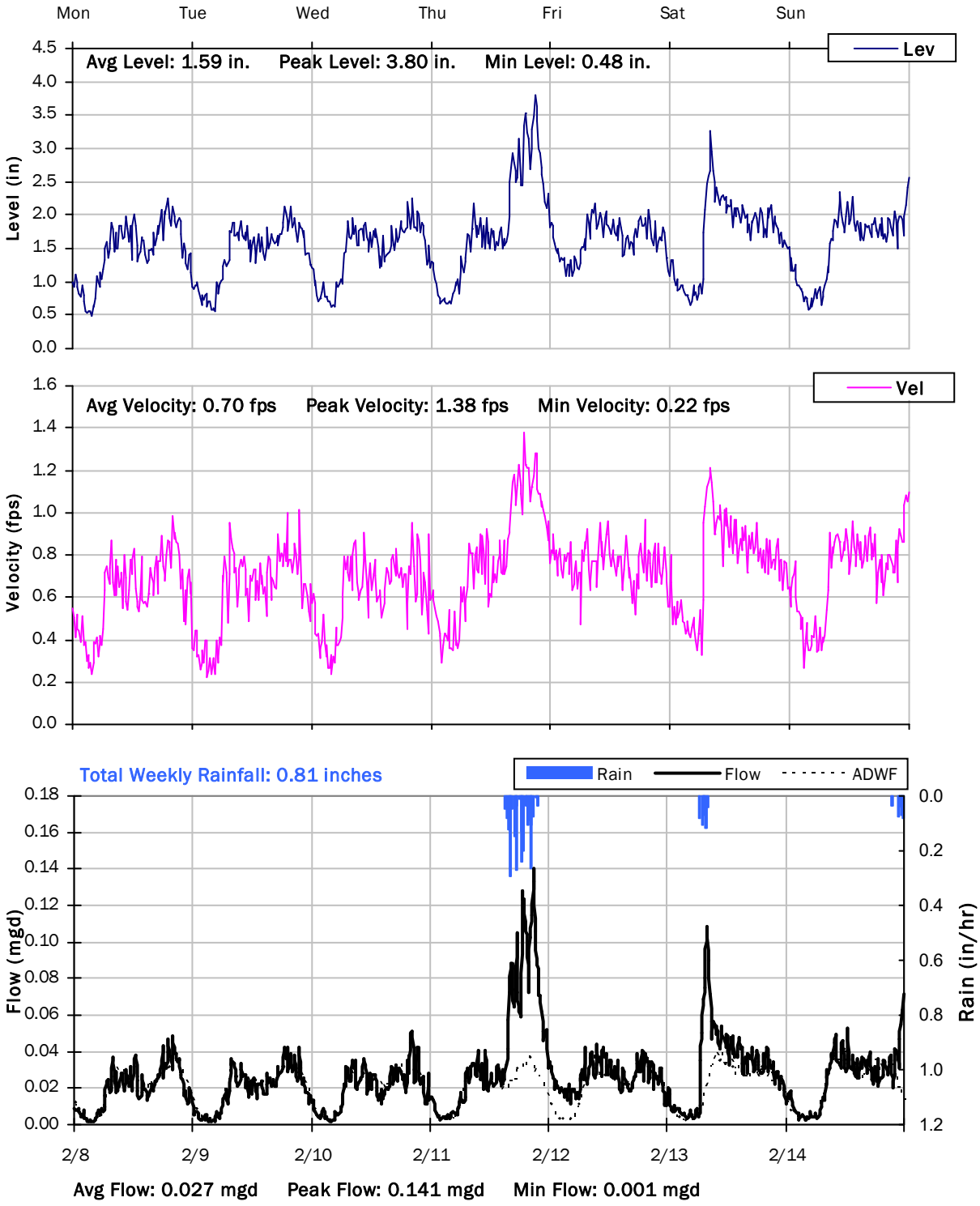
FM 6-3
Weekly Level, Velocity and Flow Hydrographs
1/25/2021 to 2/1/2021



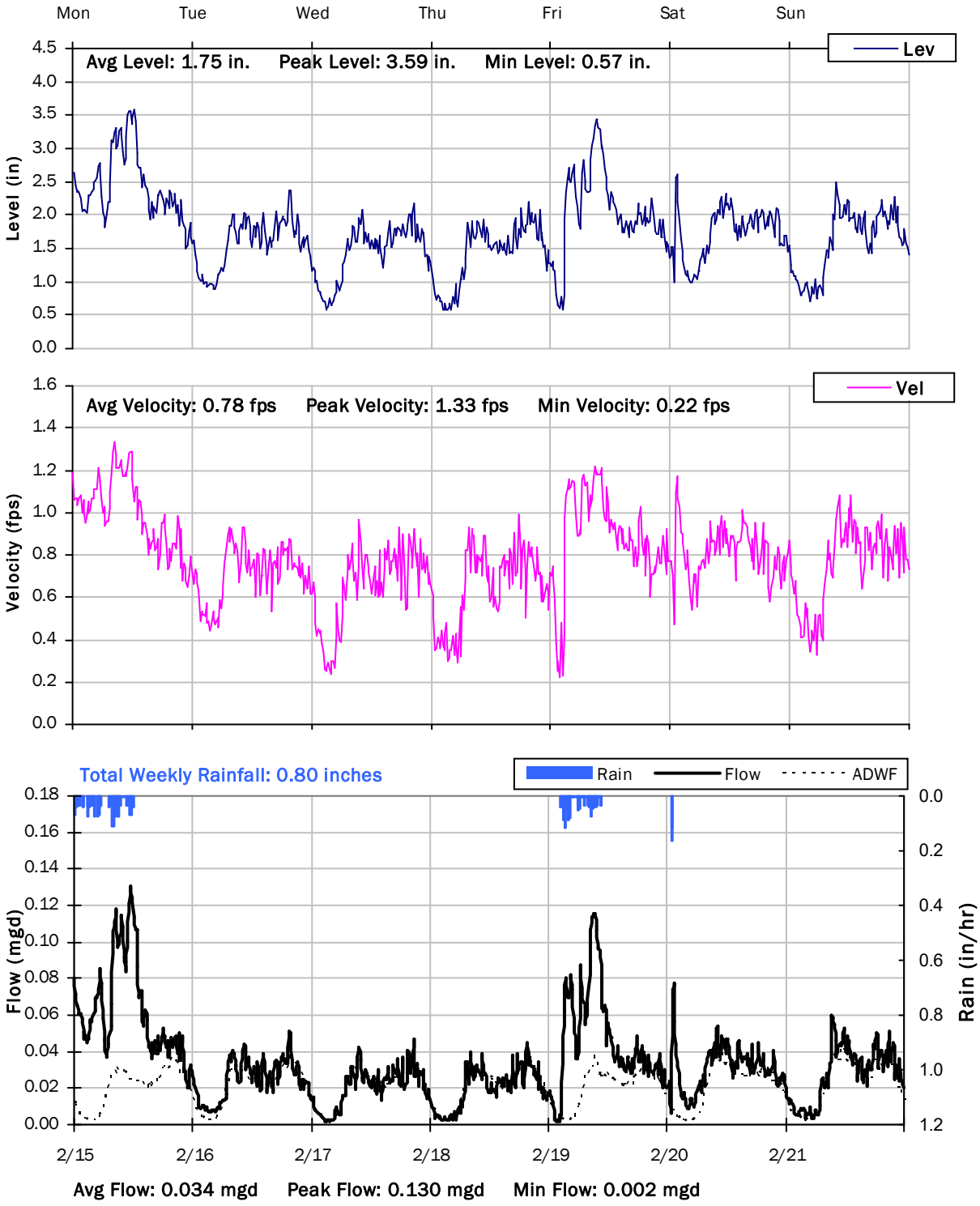
FM 6-3
Weekly Level, Velocity and Flow Hydrographs
2/1/2021 to 2/8/2021



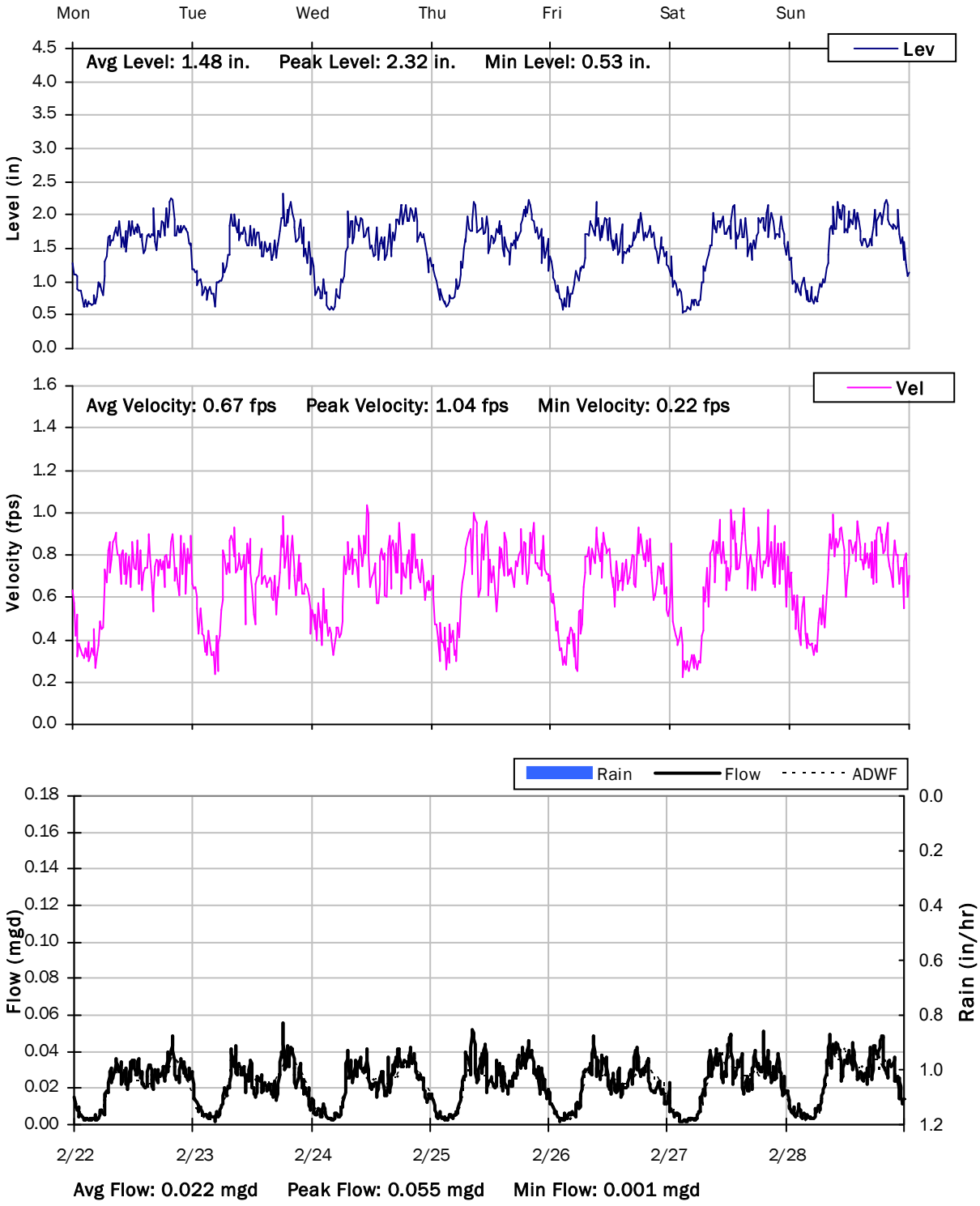
FM 6-3
Weekly Level, Velocity and Flow Hydrographs
2/8/2021 to 2/15/2021



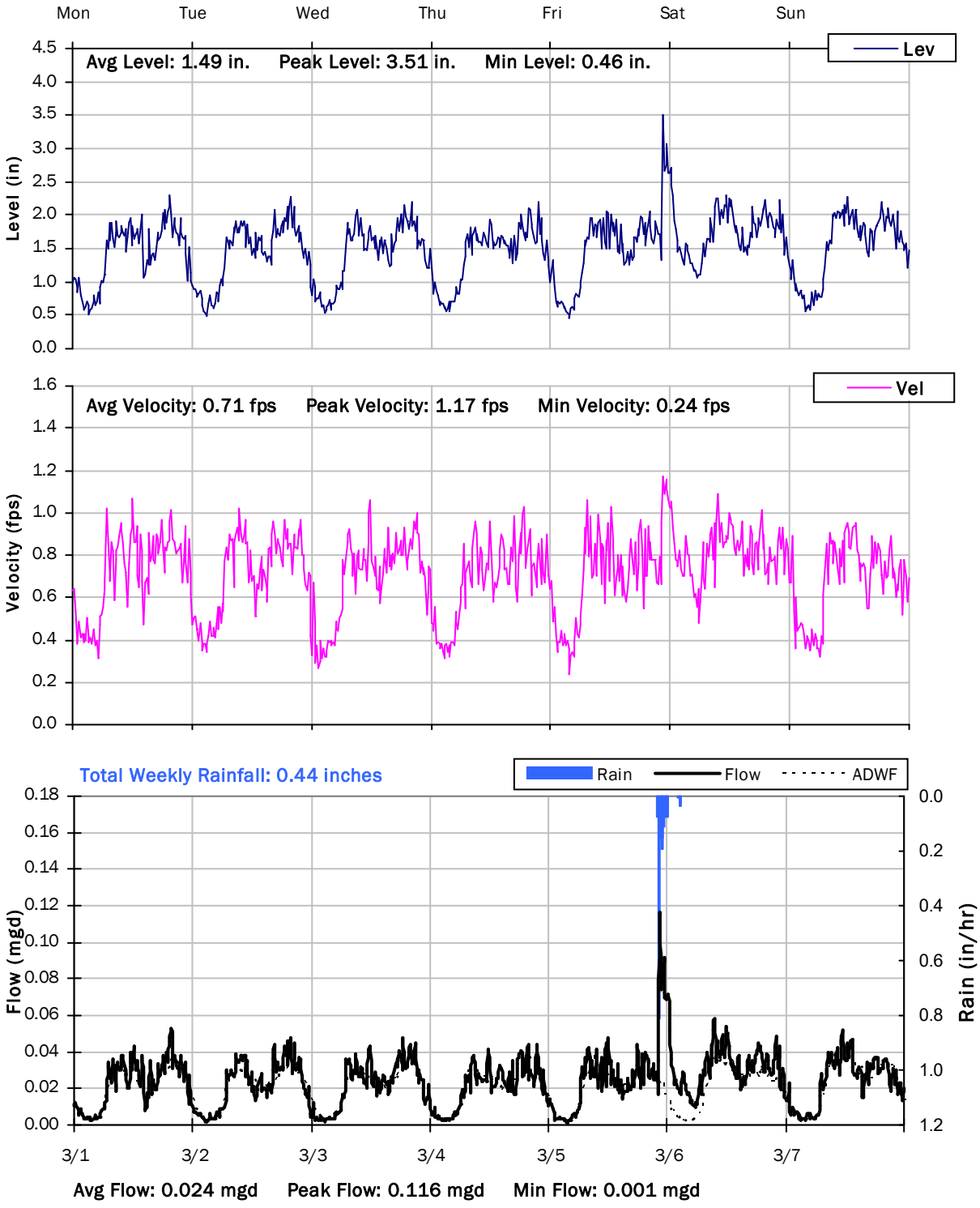
FM 6-3
Weekly Level, Velocity and Flow Hydrographs
2/15/2021 to 2/22/2021



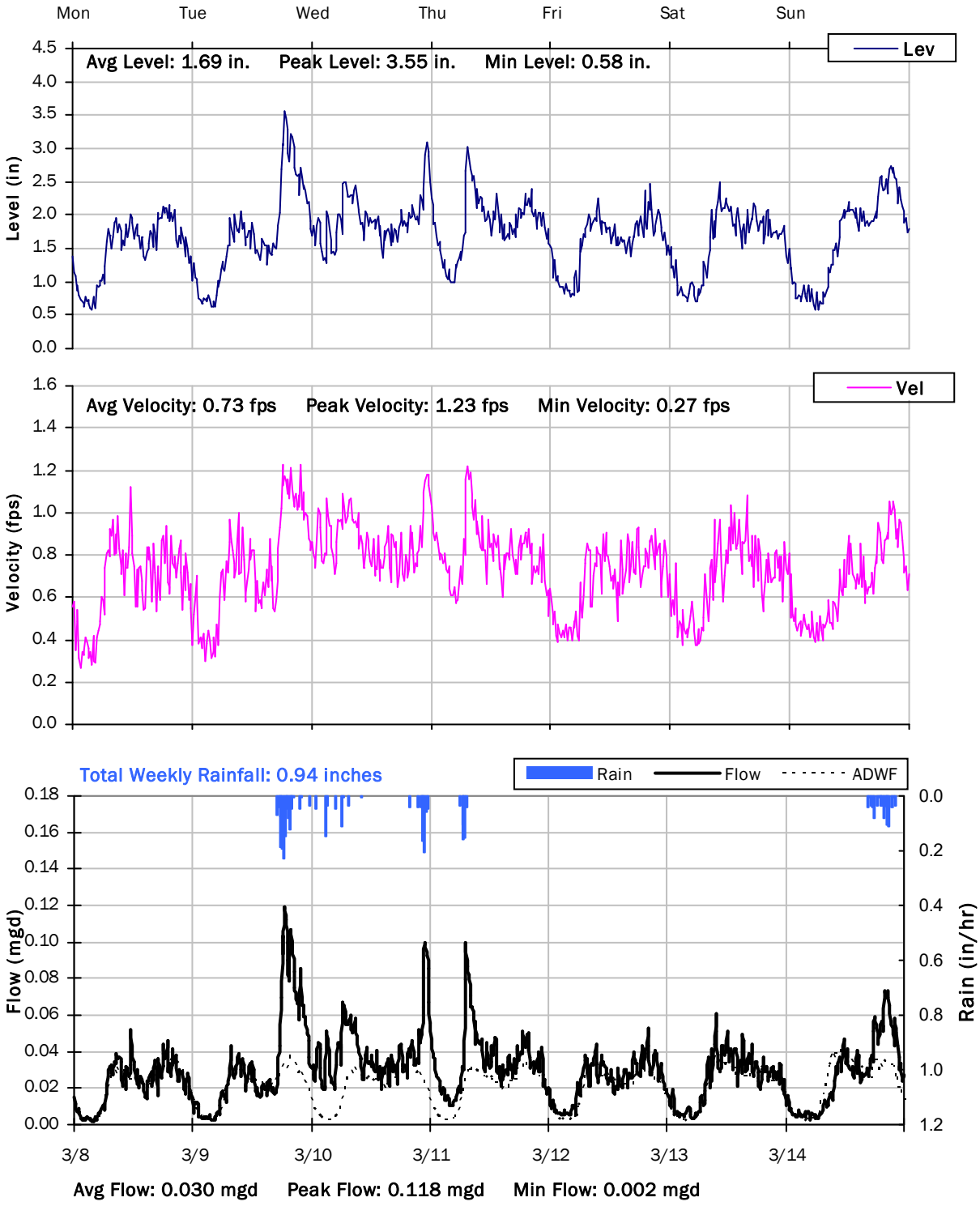
FM 6-3
Weekly Level, Velocity and Flow Hydrographs
2/22/2021 to 3/1/2021



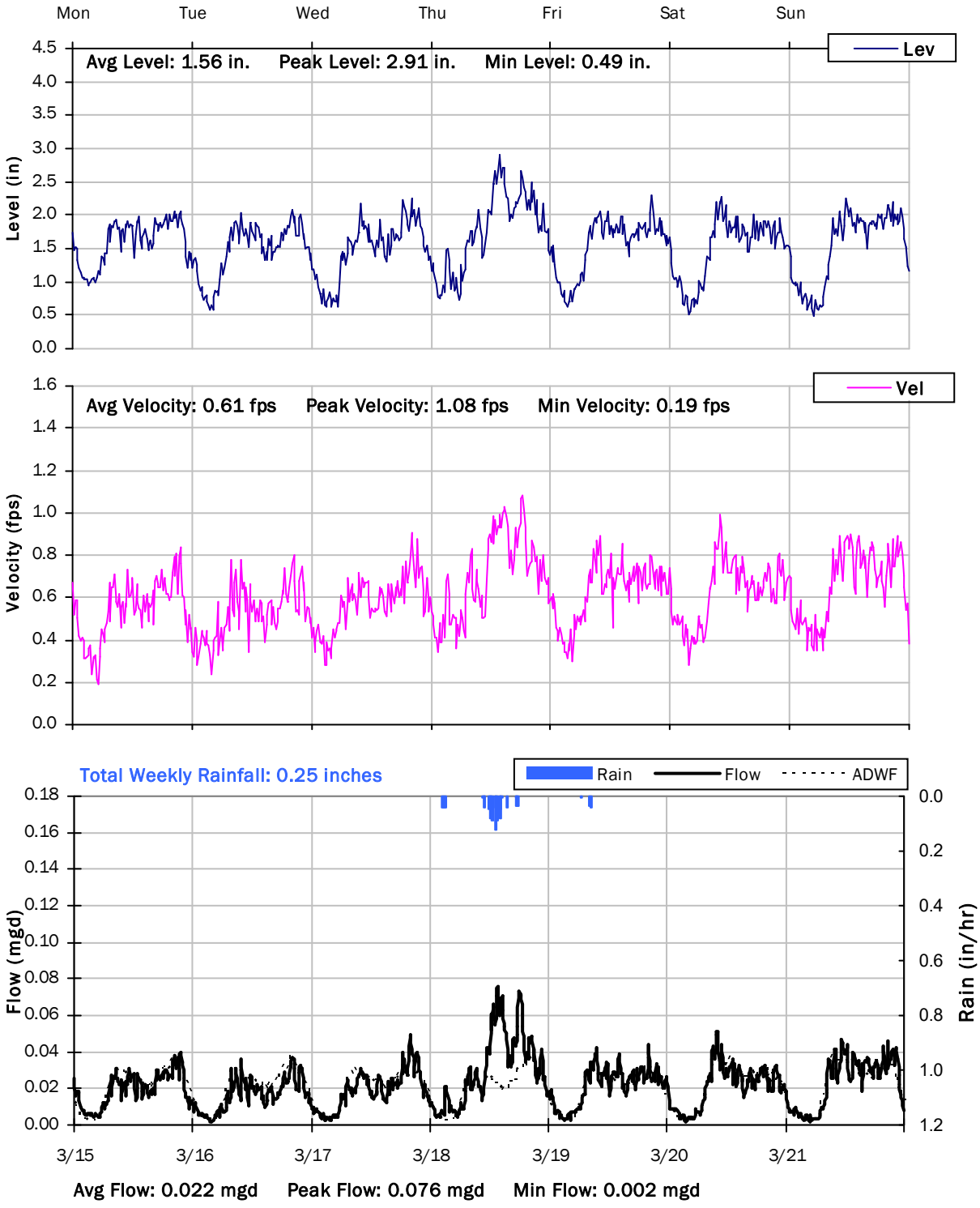
FM 6-3
Weekly Level, Velocity and Flow Hydrographs
3/1/2021 to 3/8/2021



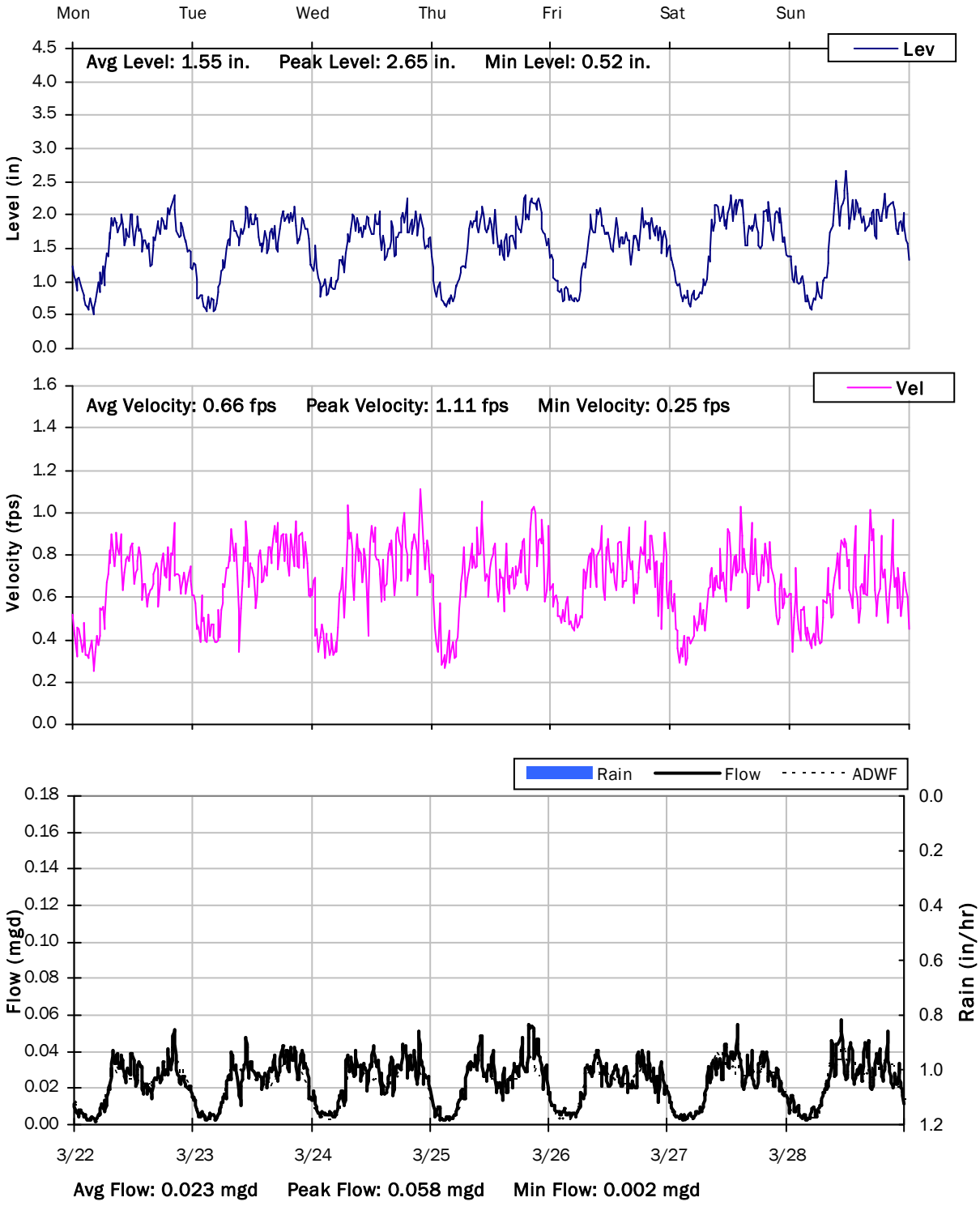
FM 6-3
Weekly Level, Velocity and Flow Hydrographs
3/8/2021 to 3/15/2021



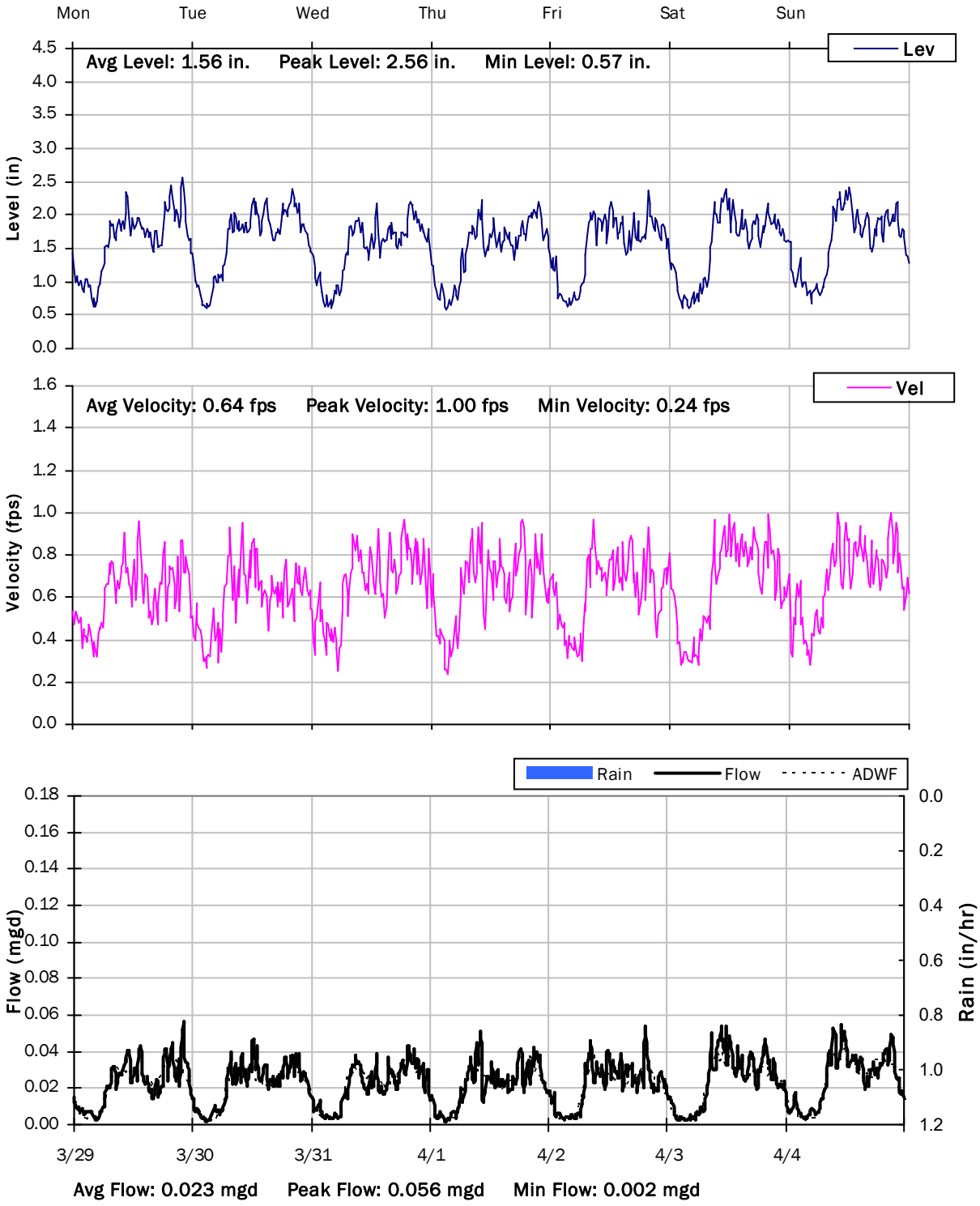
FM 6-3
Weekly Level, Velocity and Flow Hydrographs
3/15/2021 to 3/22/2021



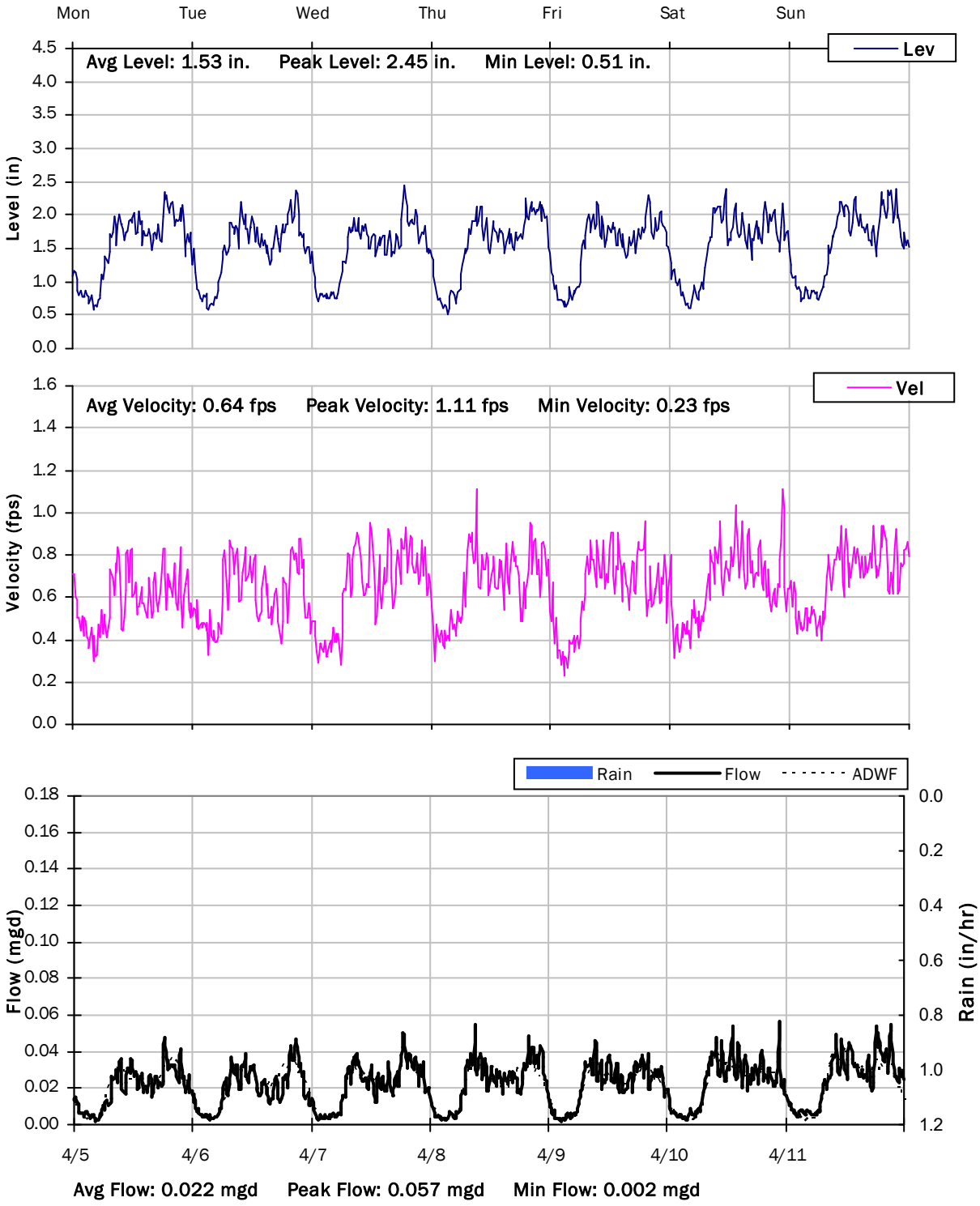
FM 6-3
Weekly Level, Velocity and Flow Hydrographs
3/22/2021 to 3/29/2021



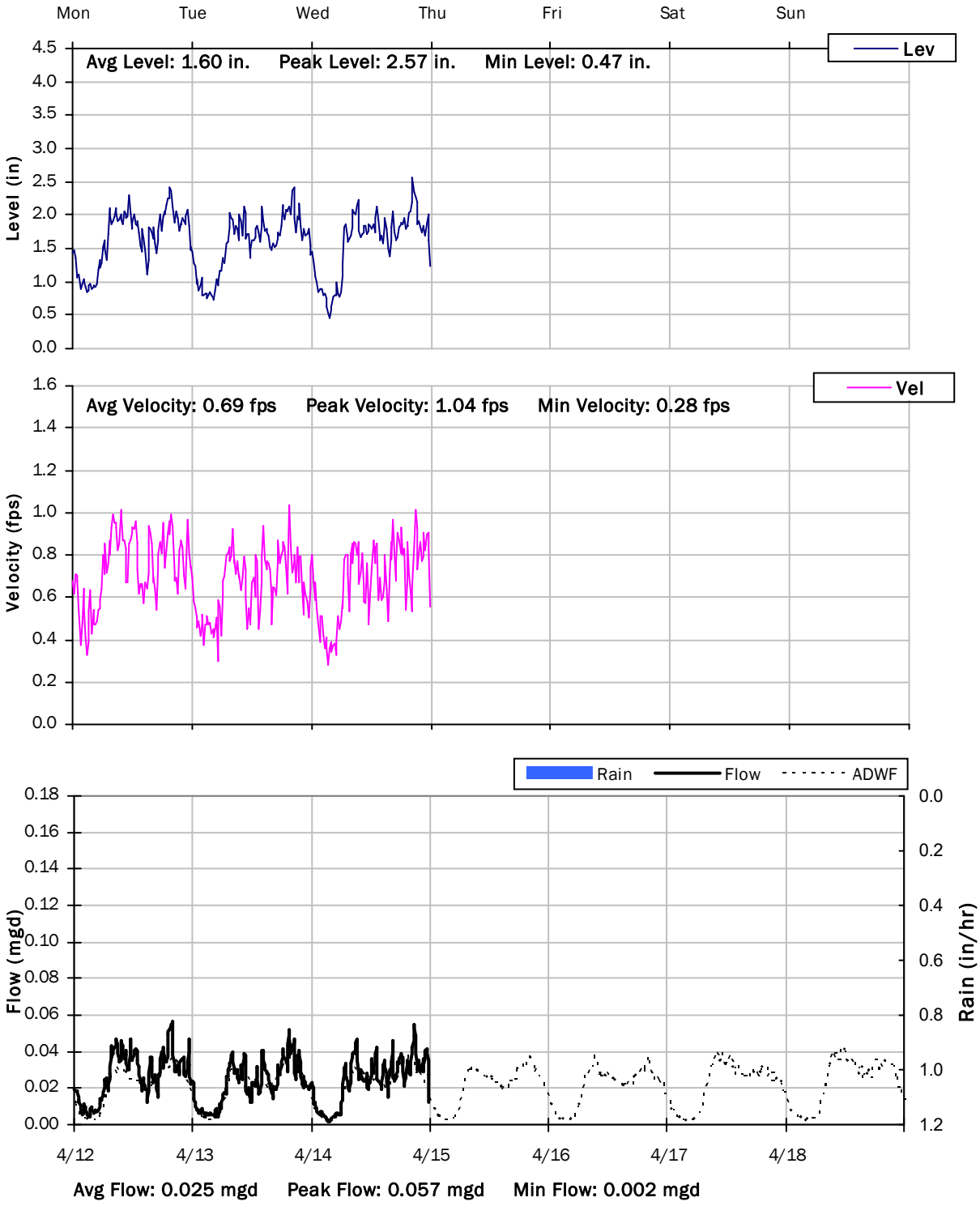
FM 6-3
Weekly Level, Velocity and Flow Hydrographs
3/29/2021 to 4/5/2021



FM 6-3
Weekly Level, Velocity and Flow Hydrographs
4/5/2021 to 4/12/2021



FM 6-3
Weekly Level, Velocity and Flow Hydrographs
4/12/2021 to 4/19/2021



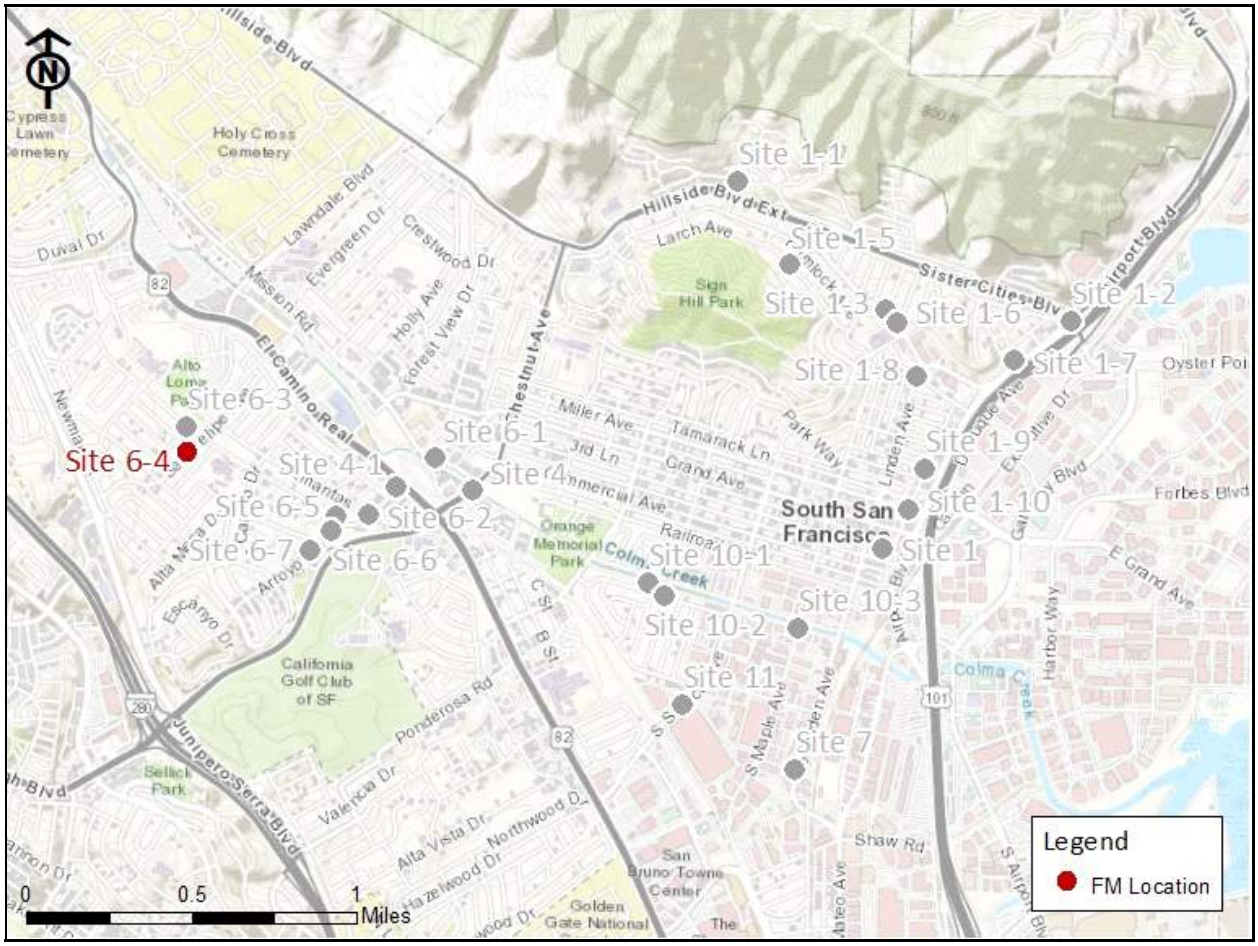
South San Francisco, CA

Sanitary Sewer Flow Monitoring
January 4 - April 14, 2021

Monitoring Site: FM 6-4

Location: 136 San Felipe Avenue

Data Summary Report



Vicinity Map: FM 6-4

FM 6-4

Site Information

Location: 136 San Felipe Avenue

Coordinates: 122.4481° W, 37.6577° N

Rim Elevation (Earth): 150 feet

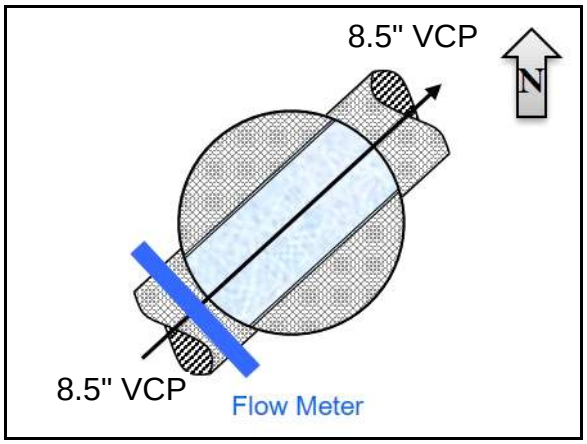
Pipe Diameter: 8.5 inches

ADWF: 0.001 mgd

Peak Measured Flow: 0.022 mgd

Satellite Map

Sanitary Map



Flow Sketch

Street View

Plan View

FM 6-4

Additional Site Photos

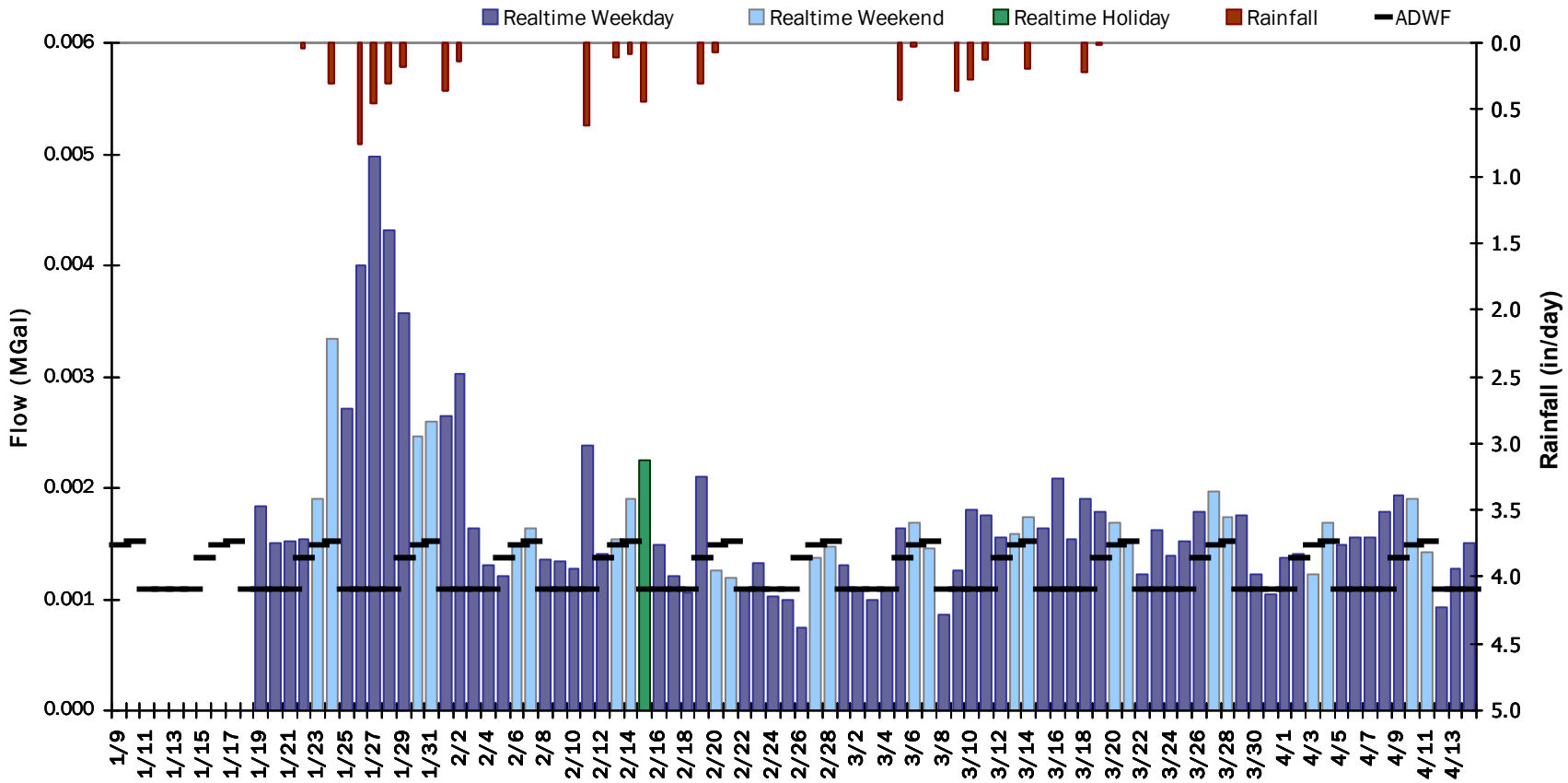
Effluent Pipe

Monitored Influent Pipe

FM 6-4
Period Flow Summary: Daily Flow Totals

Avg Period Flow: 0.002 MGal Peak Daily Flow: 0.005 MGal Min Daily Flow: 0.001 MGal

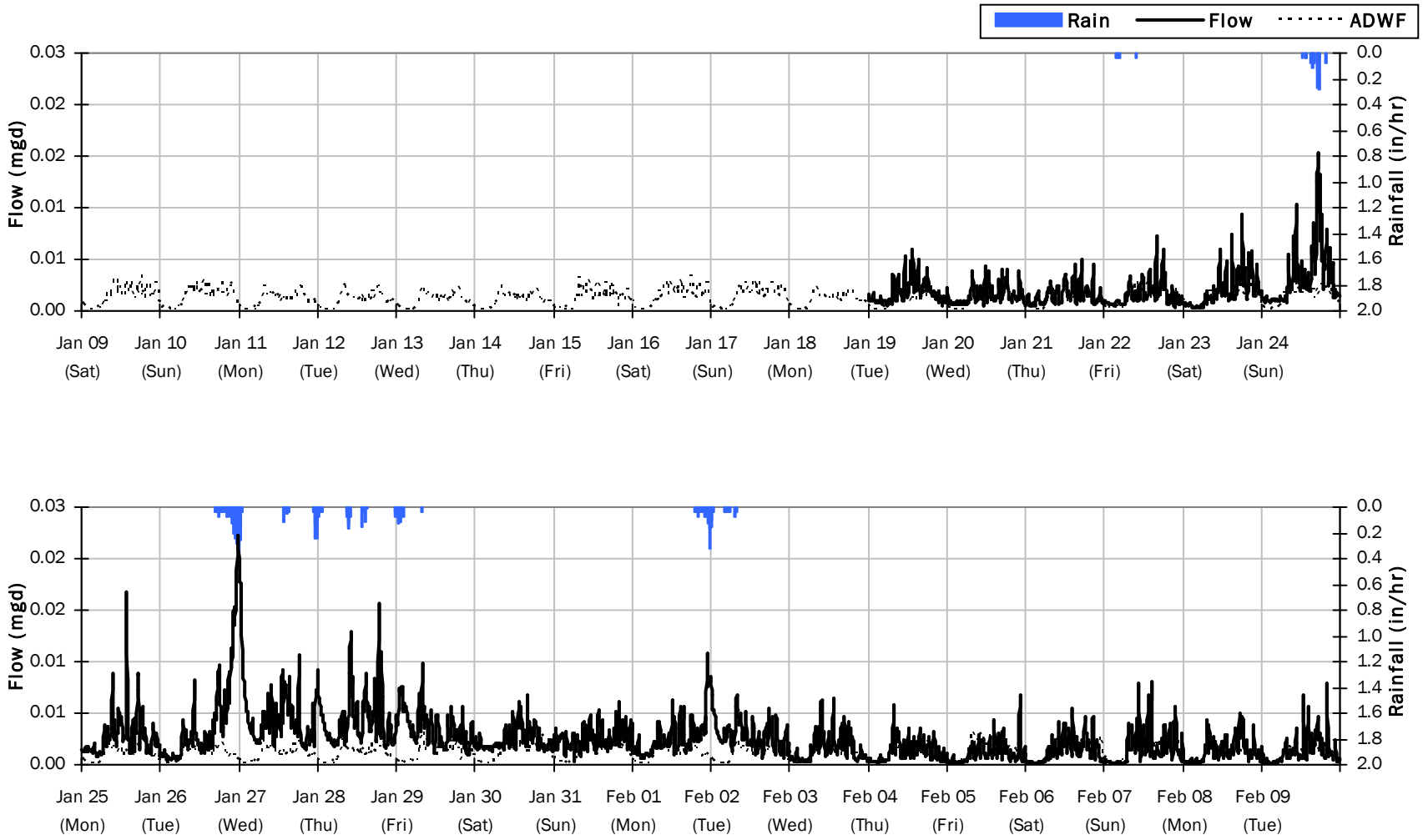
Total Period Rainfall: 5.79 inches



FM 6-4

Flow Summary: 1/9/2021 to 2/9/2021

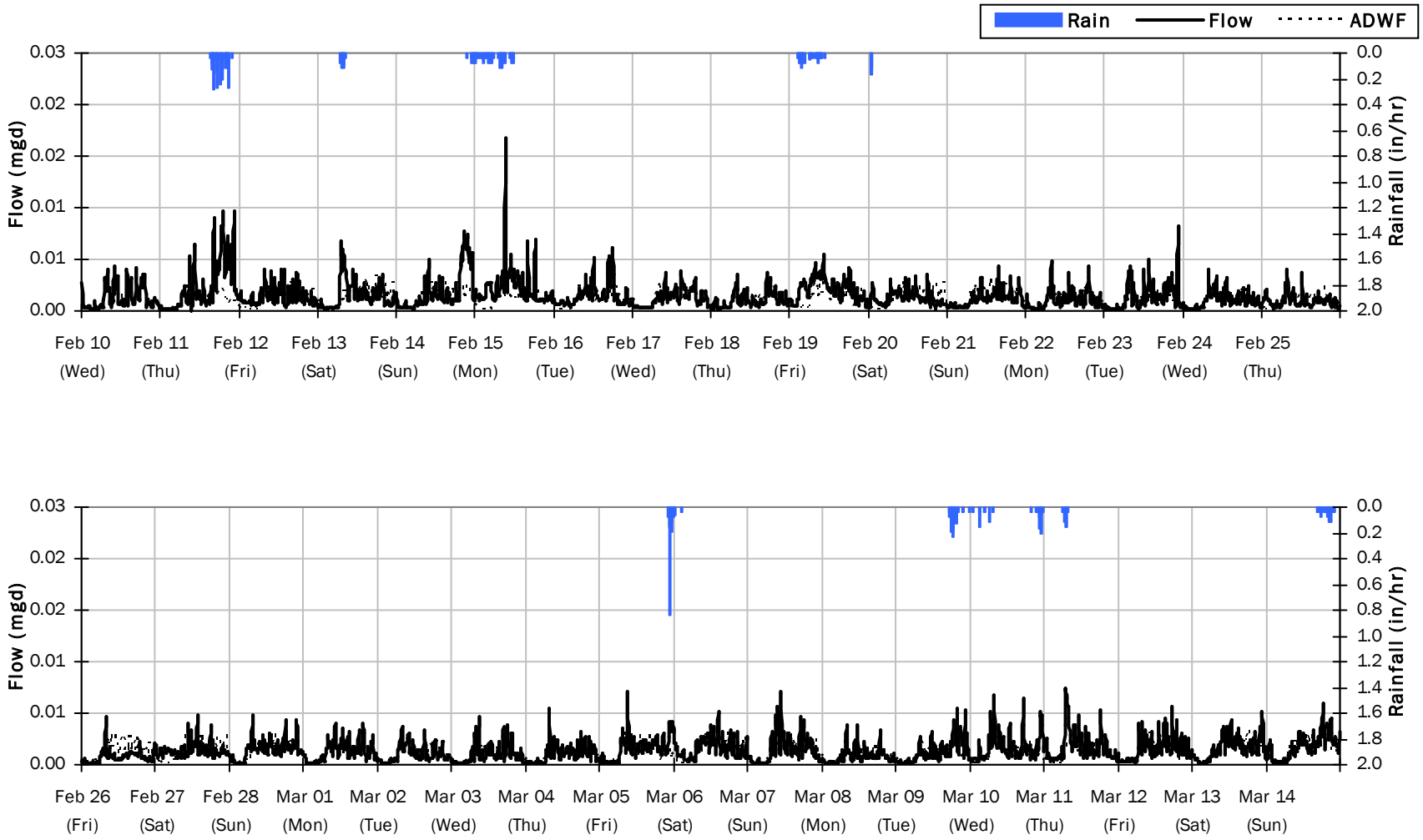
Total Period Rainfall: 2.51 inches Avg Flow: 0.002 mgd Peak Flow: 0.022 mgd Min Flow: 0.000 mgd



FM 6-4

Flow Summary: 2/10/2021 to 3/14/2021

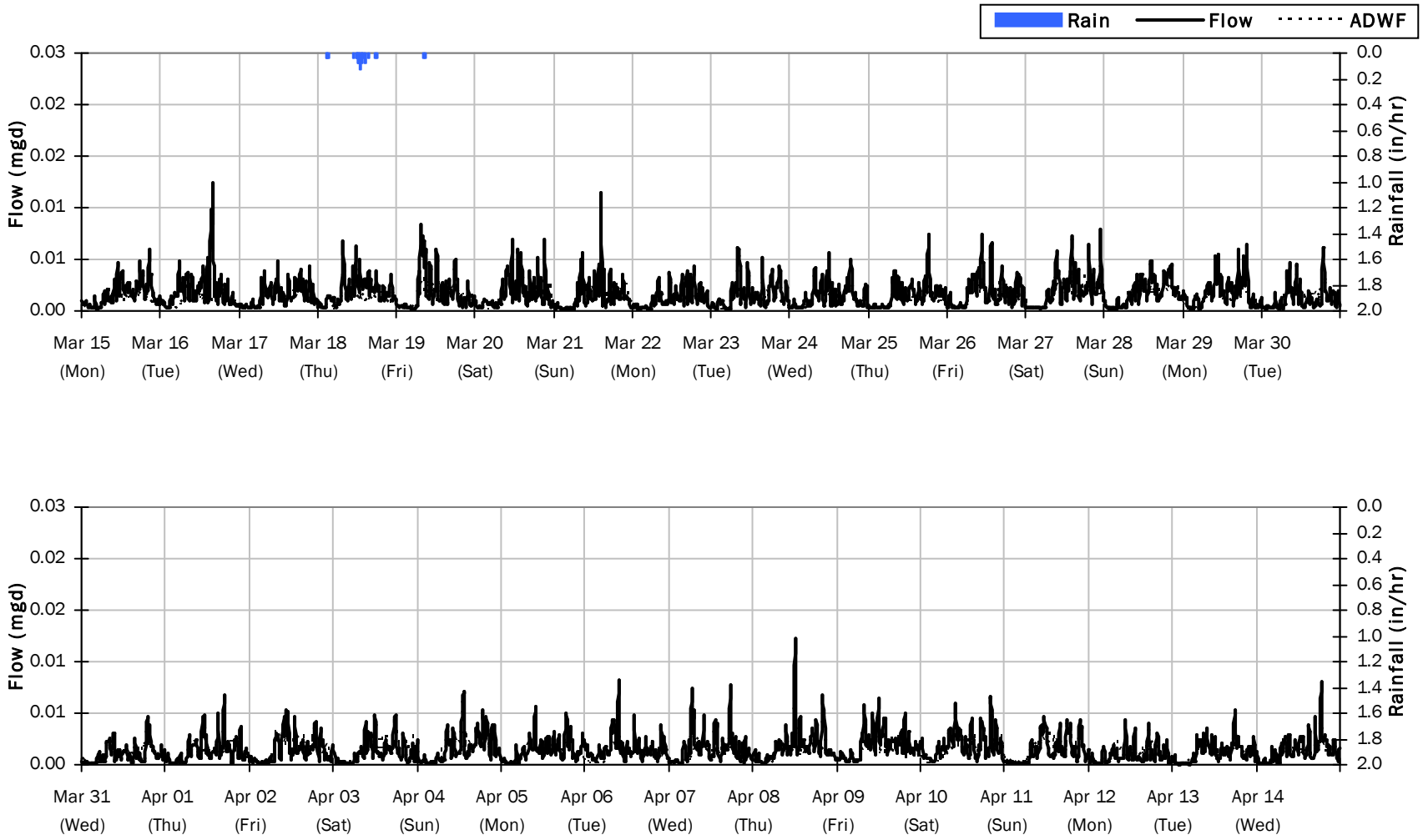
Total Period Rainfall: 3.04 inches Avg Flow: 0.001 mgd Peak Flow: 0.017 mgd Min Flow: 0.000 mgd



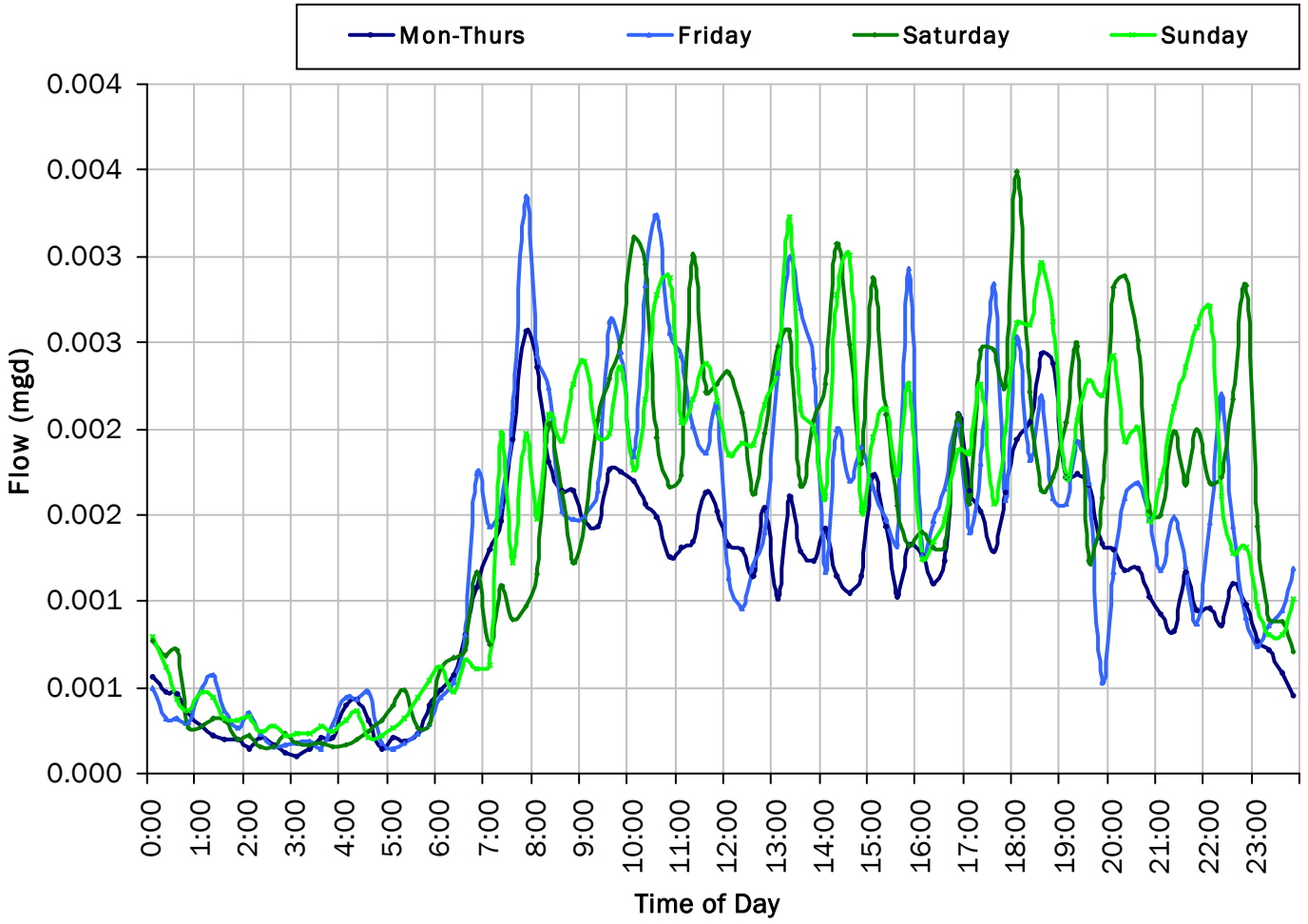
FM 6-4

Flow Summary: 3/15/2021 to 4/14/2021

Total Period Rainfall: 0.25 inches Avg Flow: 0.002 mgd Peak Flow: 0.012 mgd Min Flow: 0.000 mgd

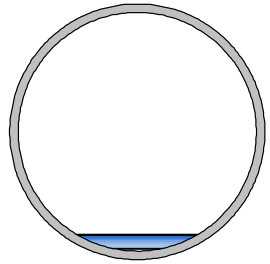


FM 6-4
Average Dry Weather Flow Hydrographs



ADWF:

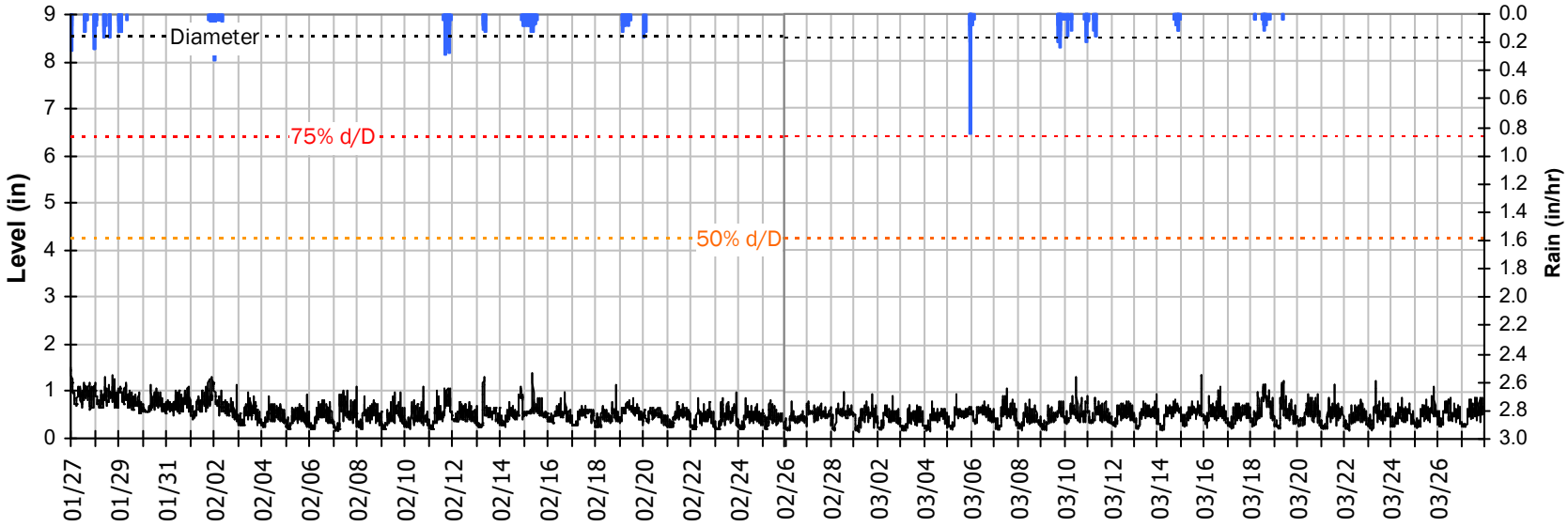
0.001 *mgd*

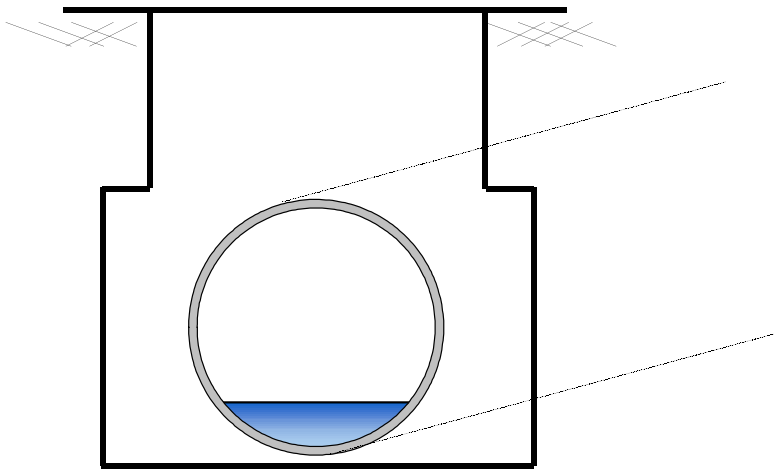


FM 6-4

Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Monitoring Period

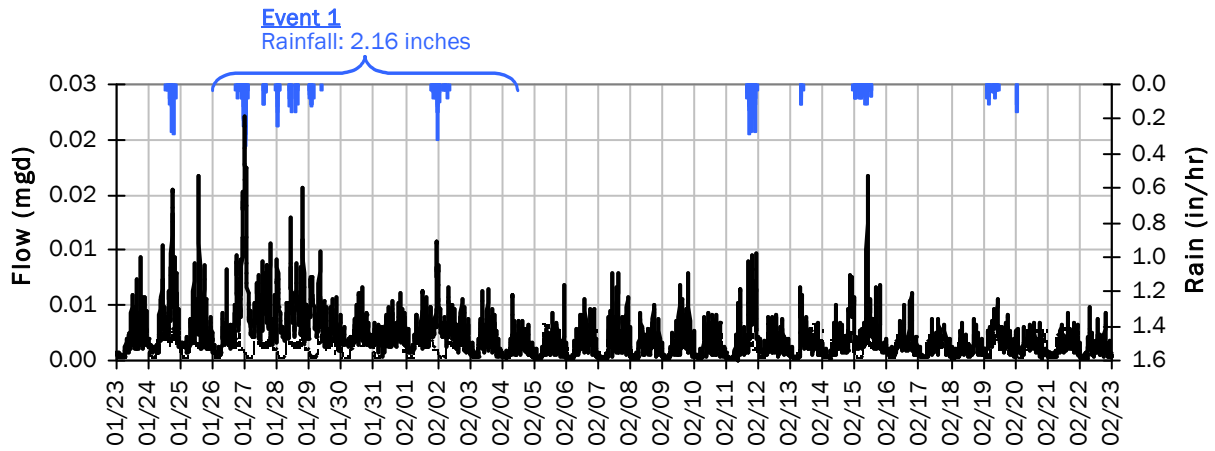




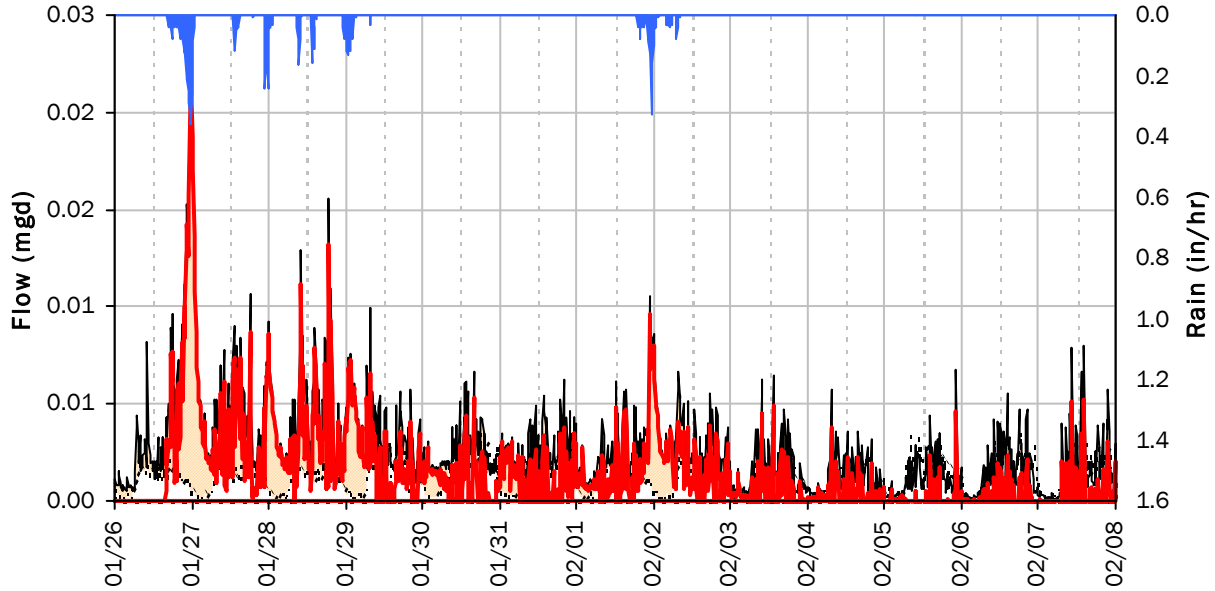
Pipe Diameter:	8.5	*inches*
Peak Measured Level:	1.57	*inches*
Peak d/D Ratio:	0.18	

FM 6-4
I/I Summary: Event 1

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



Event 1 Detail Graph

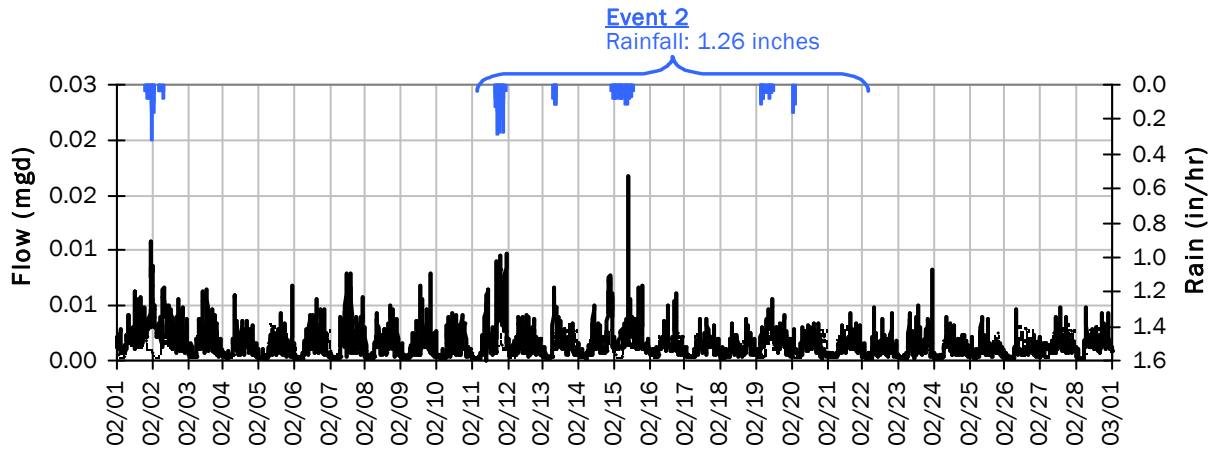


Storm Event I/I Analysis (Rain = 2.16 inches)

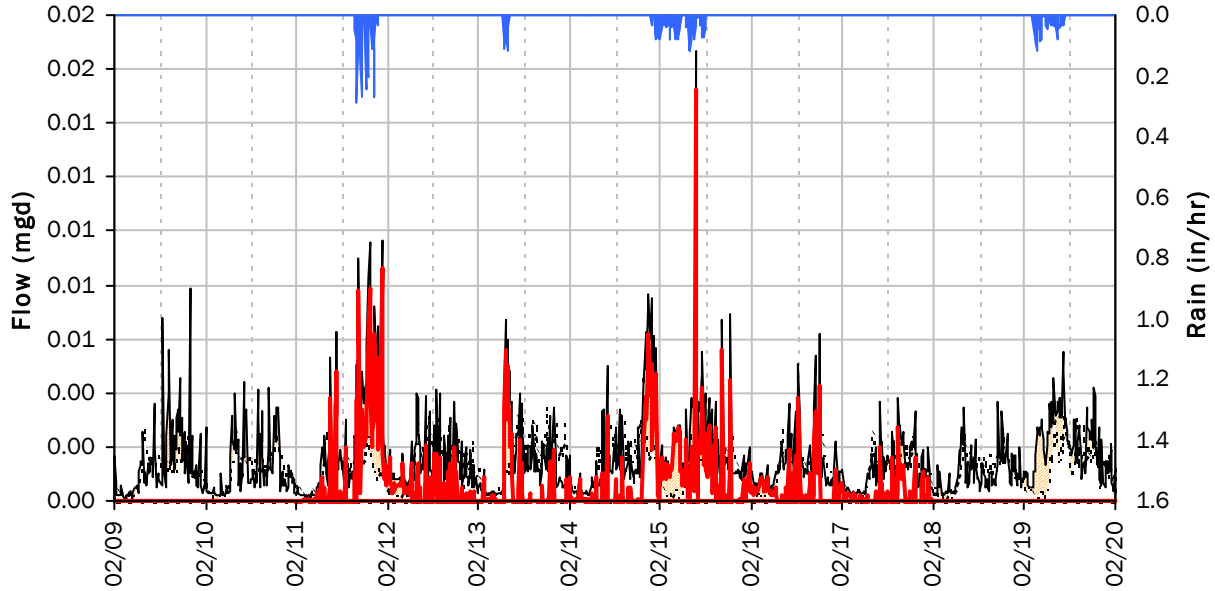
Capacity		Inflow / Infiltration	
Peak Flow:	0.02 *mgd*	**Peak I/I Rate:**	0.02 *mgd*
PF:	17.78	**Total I/I:**	18,000 *gallons*
Peak Level:	1.57 *in*		
d/D Ratio:	0.18		

FM 6-4
I/I Summary: Event 2

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



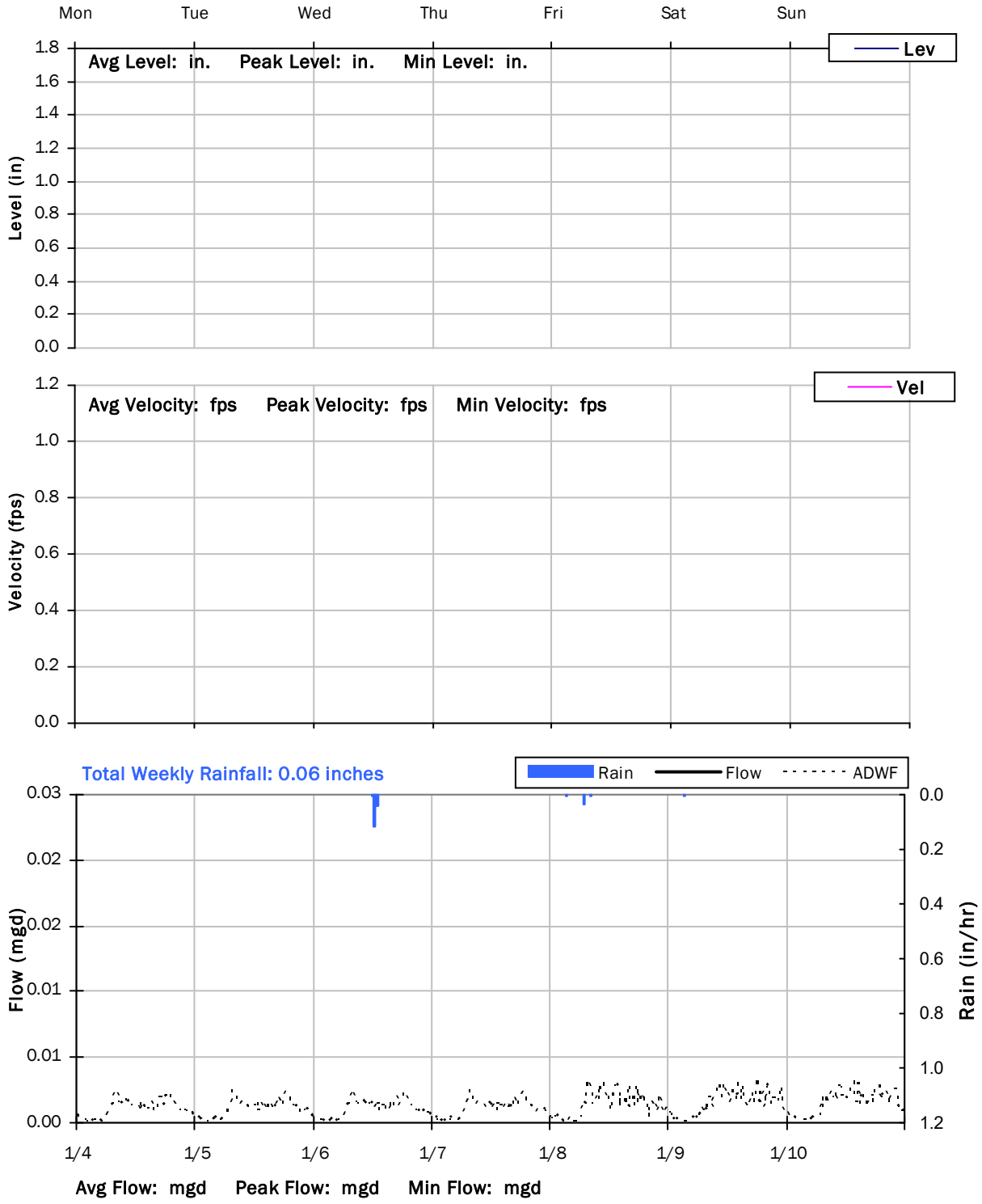
Event 2 Detail Graph



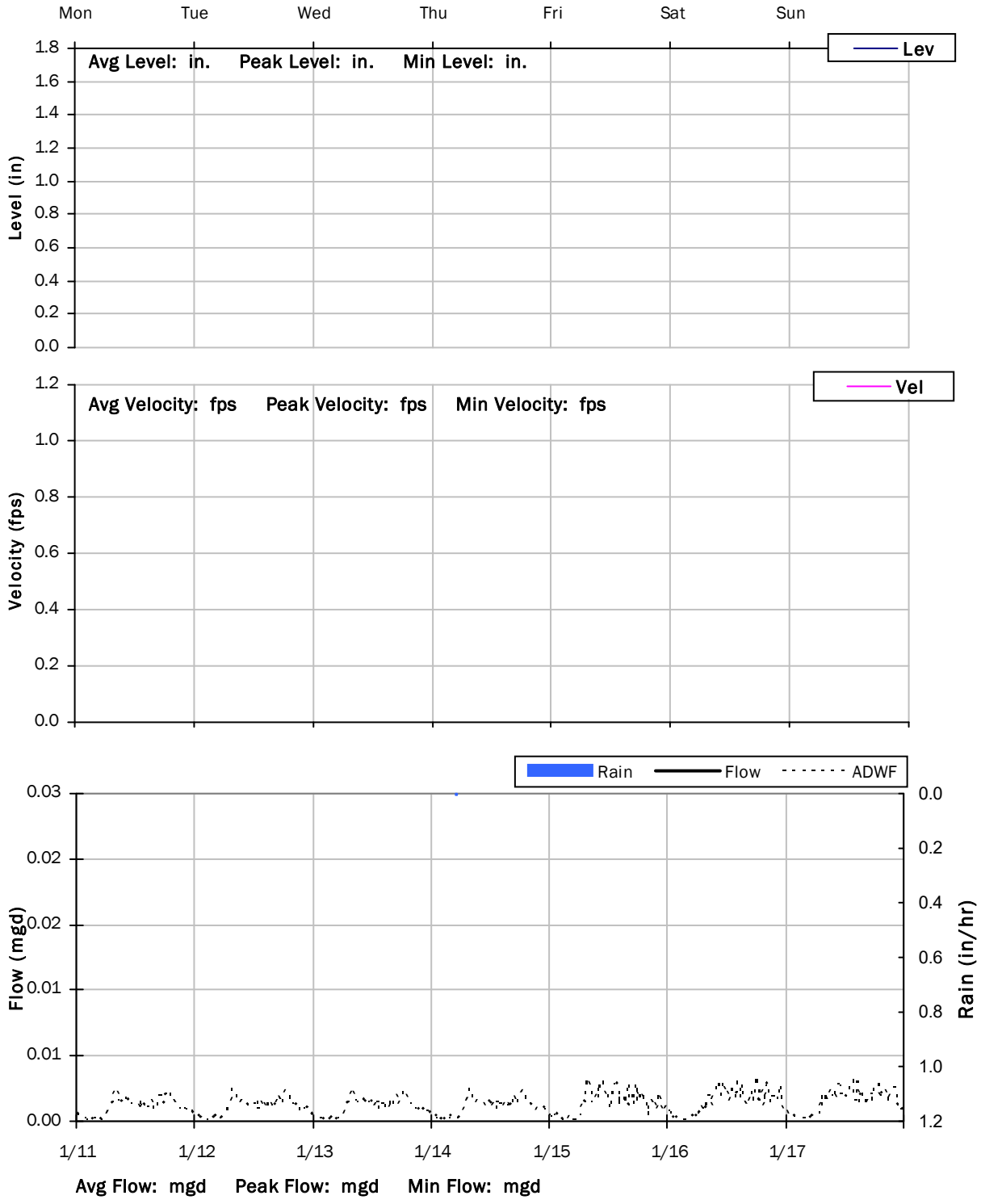
Storm Event I/I Analysis (Rain = 1.26 inches)

Capacity		Inflow / Infiltration	
Peak Flow:	0.02 *mgd*	**Peak I/I Rate:**	0.02 *mgd*
PF:	13.38	**Total I/I:**	3,000 *gallons*
Peak Level:	1.37 *in*		
d/D Ratio:	0.16		

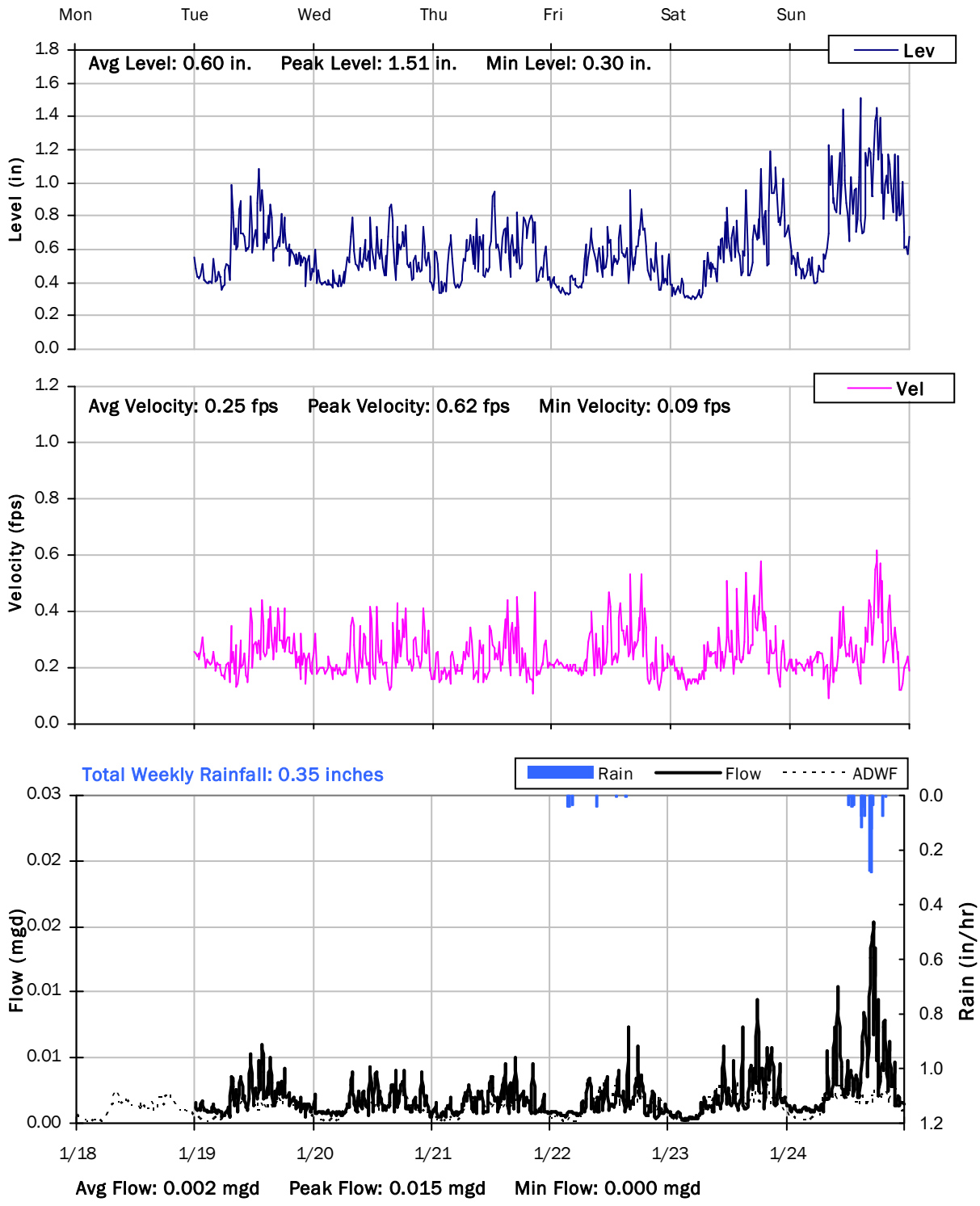
FM 6-4
Weekly Level, Velocity and Flow Hydrographs
1/4/2021 to 1/11/2021



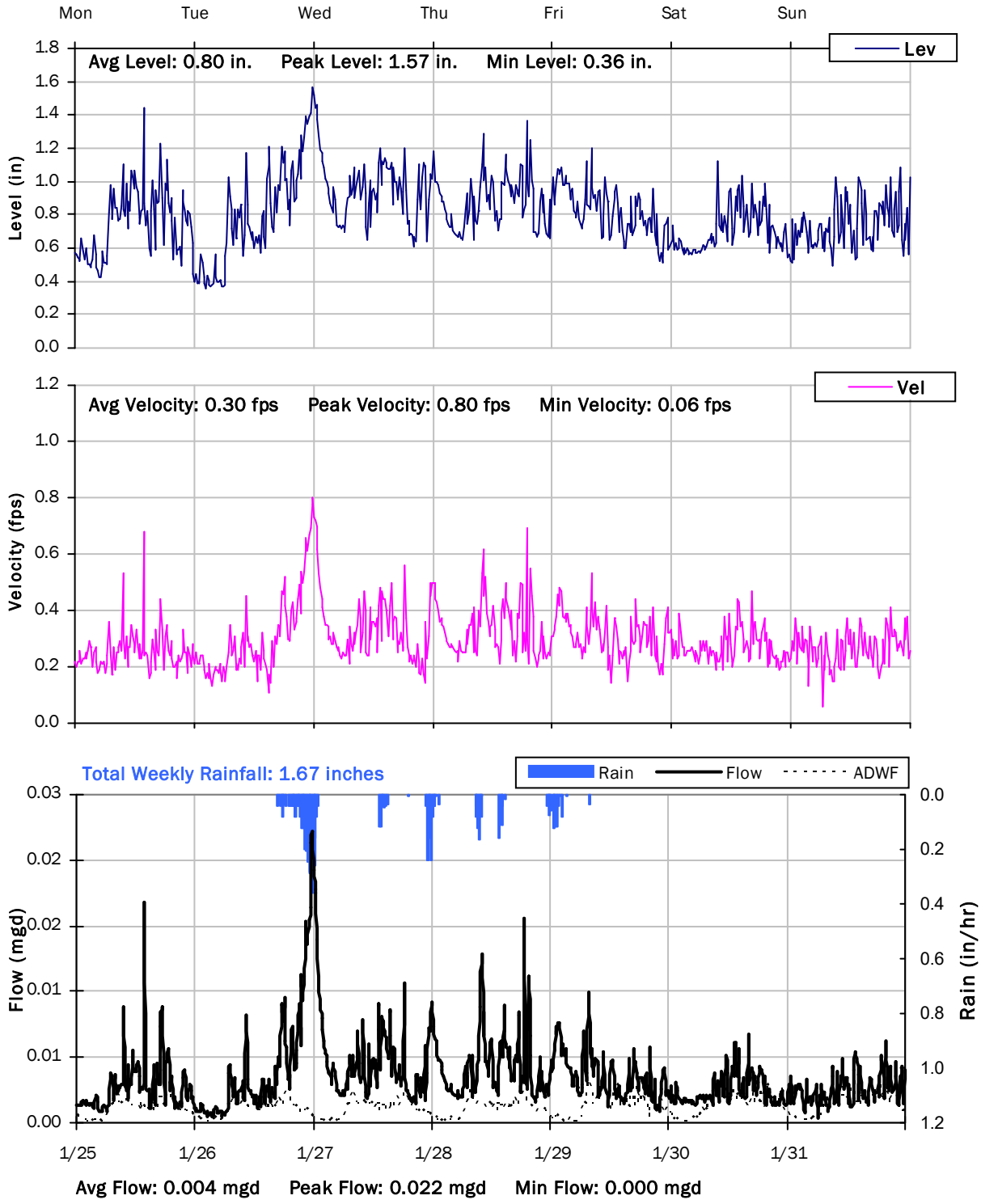
FM 6-4
Weekly Level, Velocity and Flow Hydrographs
1/11/2021 to 1/18/2021



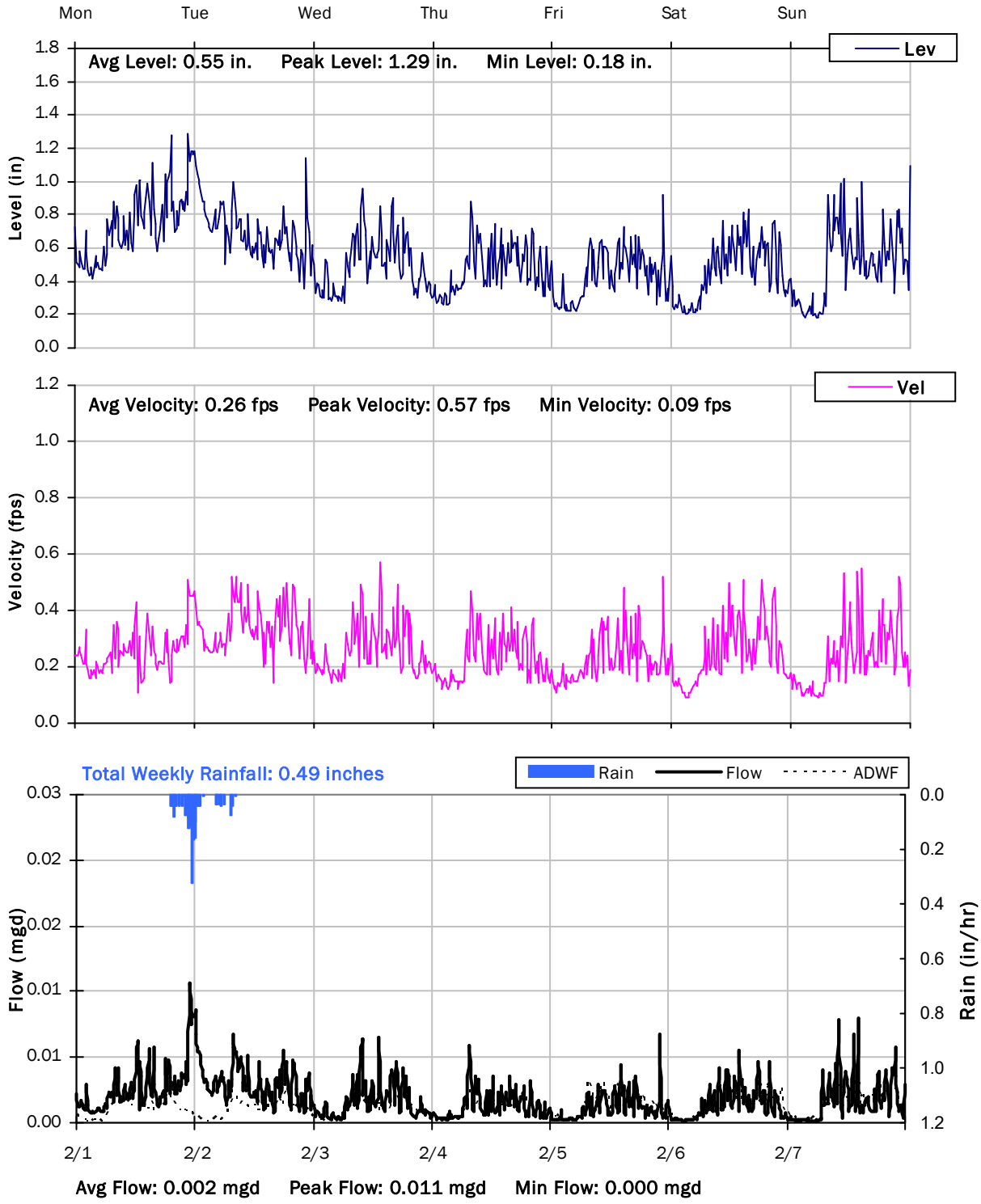
FM 6-4
Weekly Level, Velocity and Flow Hydrographs
1/18/2021 to 1/25/2021



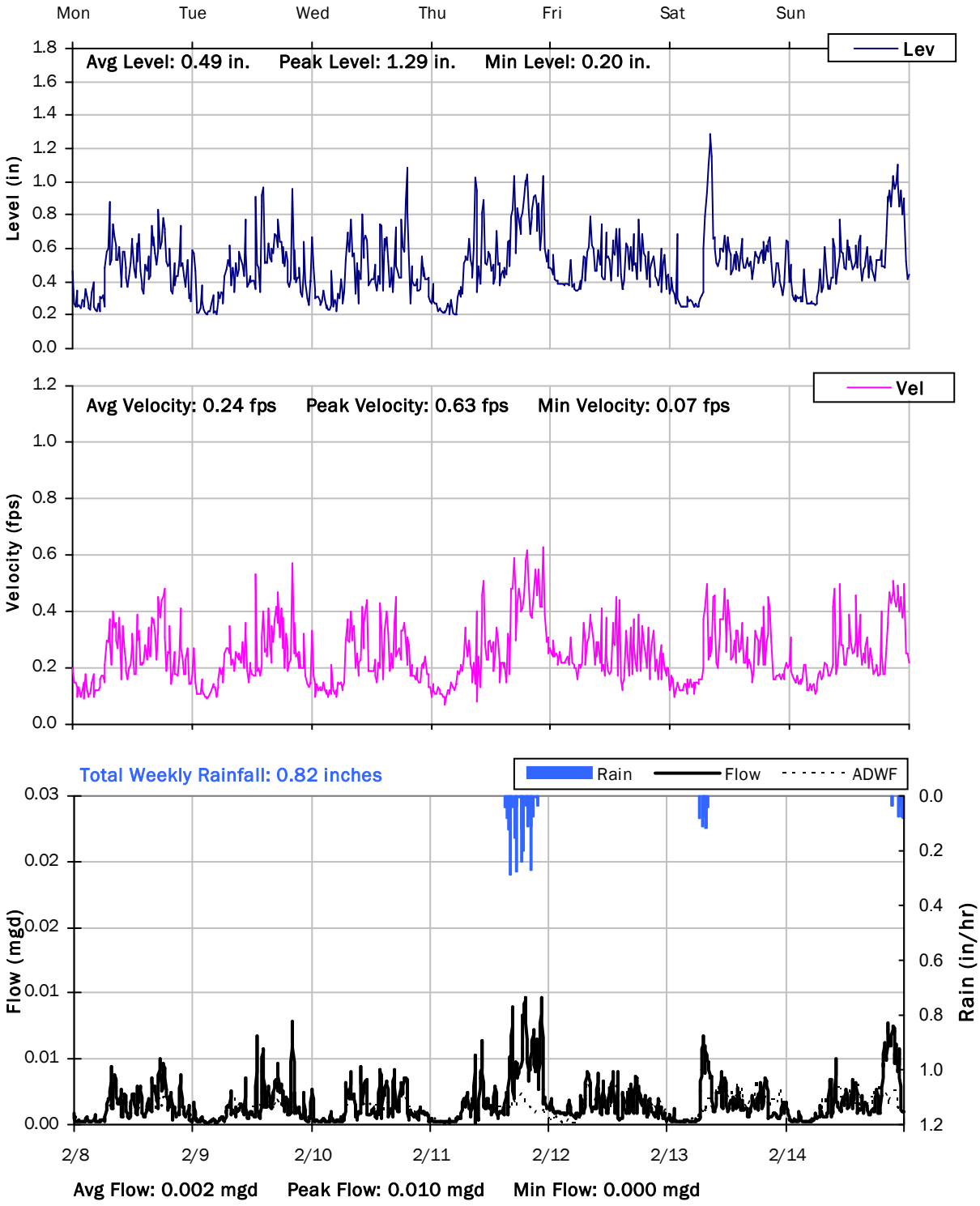
FM 6-4
Weekly Level, Velocity and Flow Hydrographs
1/25/2021 to 2/1/2021



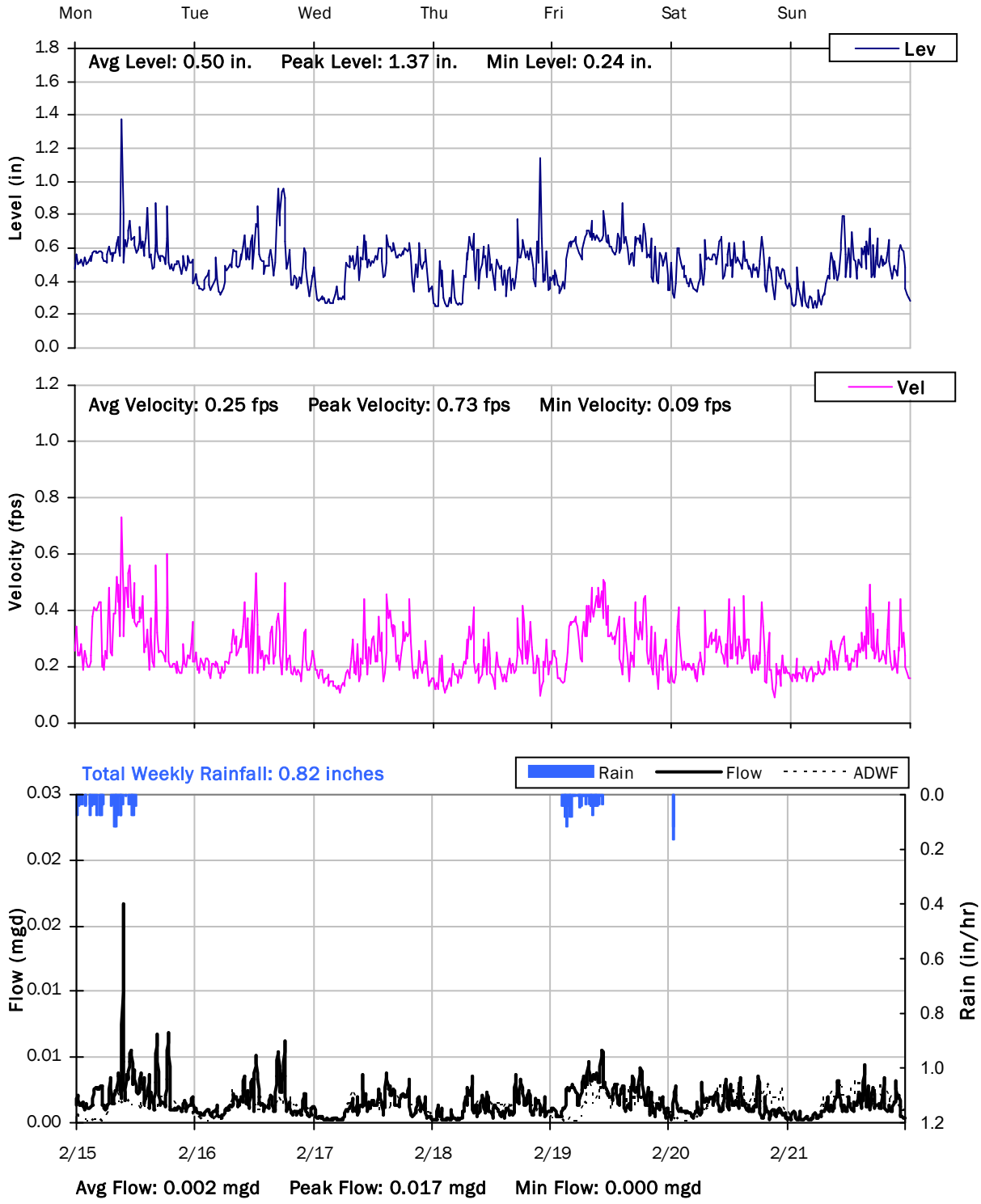
FM 6-4
Weekly Level, Velocity and Flow Hydrographs
2/1/2021 to 2/8/2021



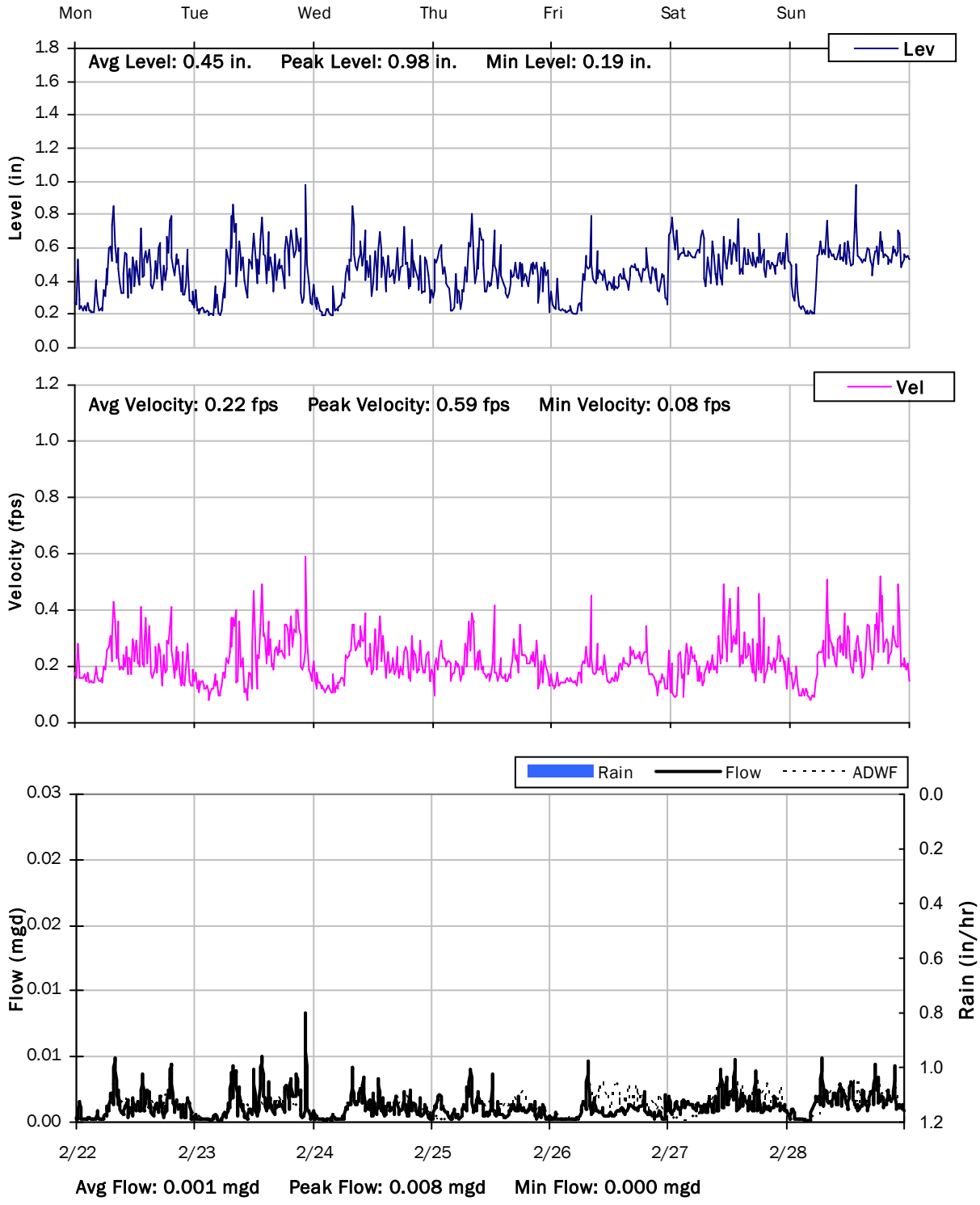
FM 6-4
Weekly Level, Velocity and Flow Hydrographs
2/8/2021 to 2/15/2021



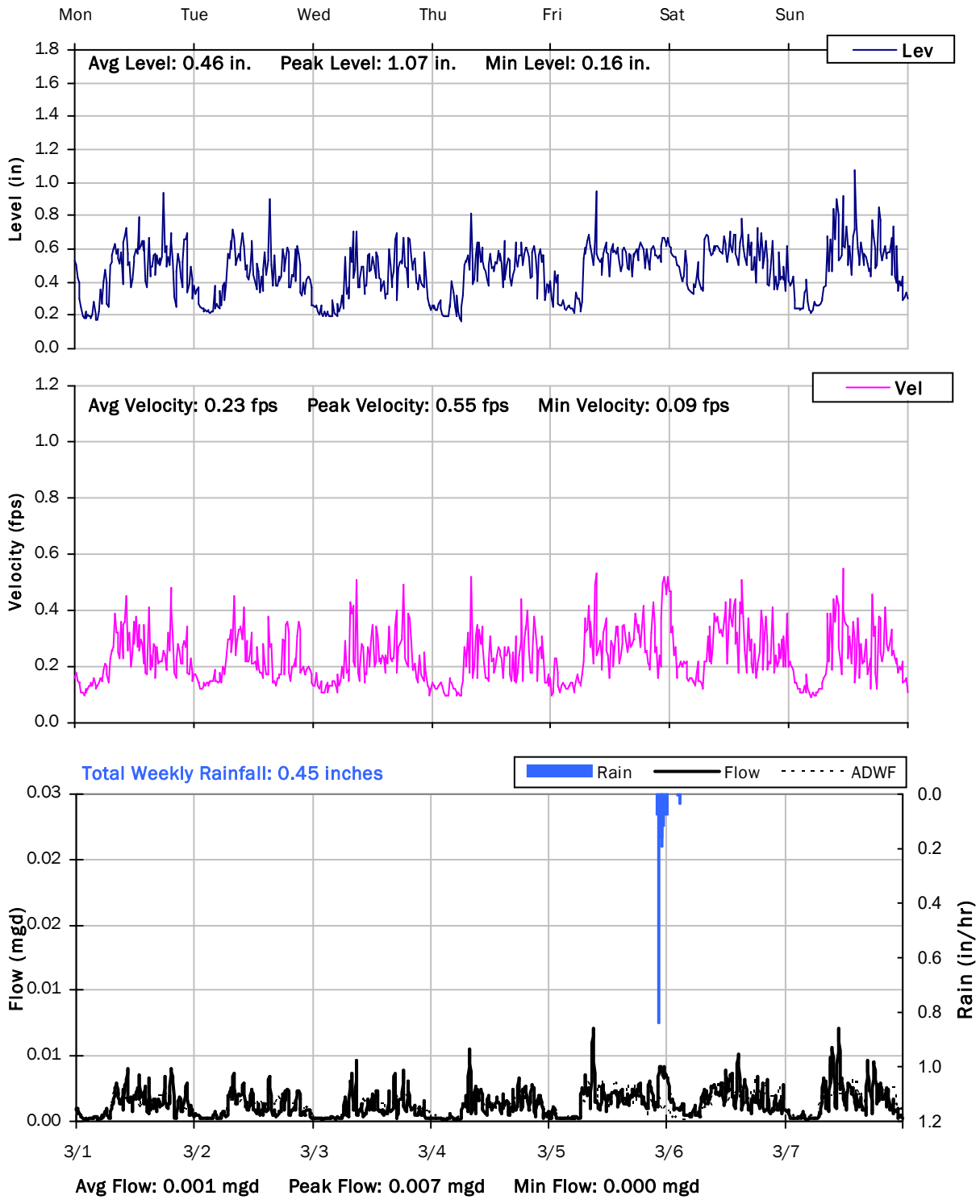
FM 6-4
Weekly Level, Velocity and Flow Hydrographs
2/15/2021 to 2/22/2021



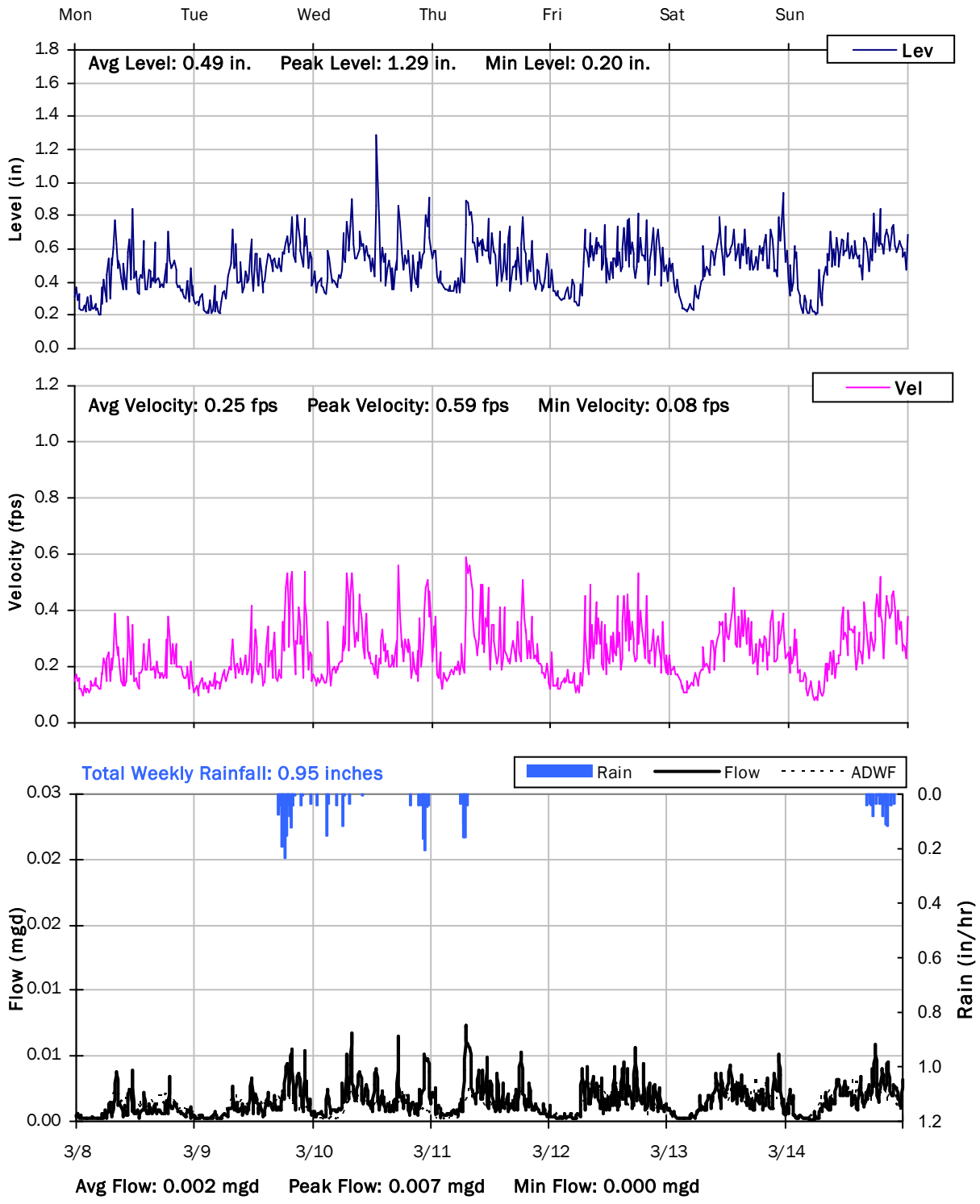
FM 6-4
Weekly Level, Velocity and Flow Hydrographs
2/22/2021 to 3/1/2021



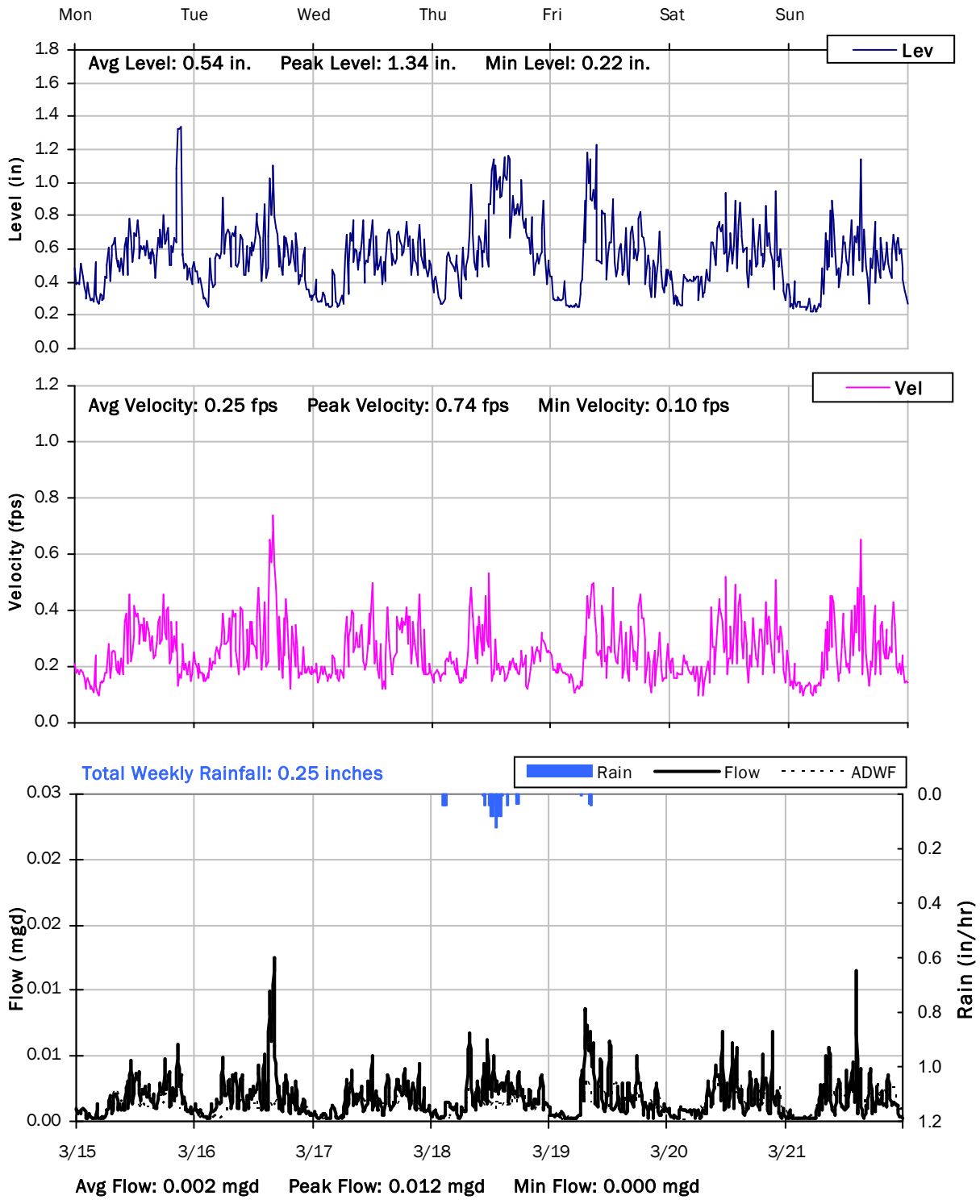
FM 6-4
Weekly Level, Velocity and Flow Hydrographs
3/1/2021 to 3/8/2021



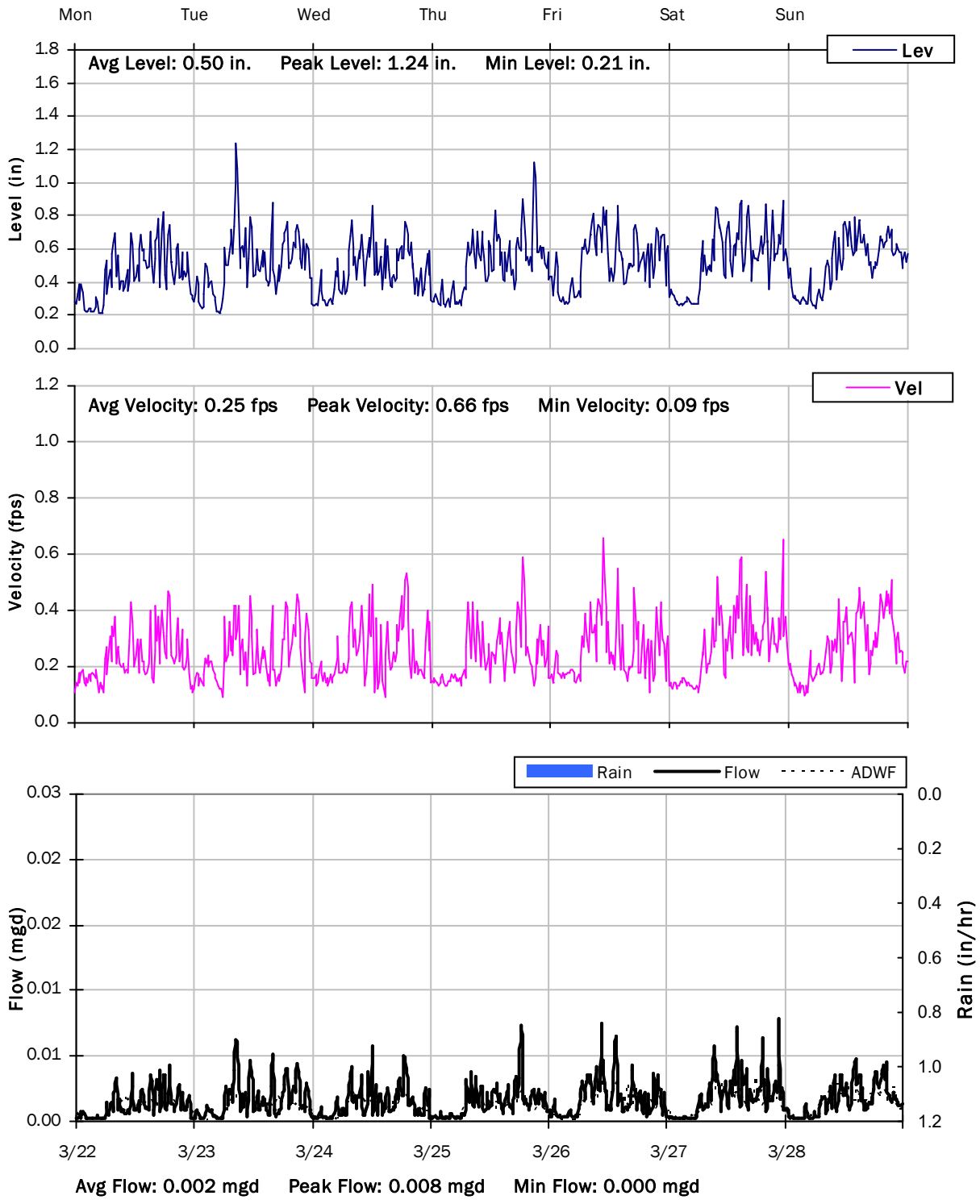
FM 6-4
Weekly Level, Velocity and Flow Hydrographs
3/8/2021 to 3/15/2021



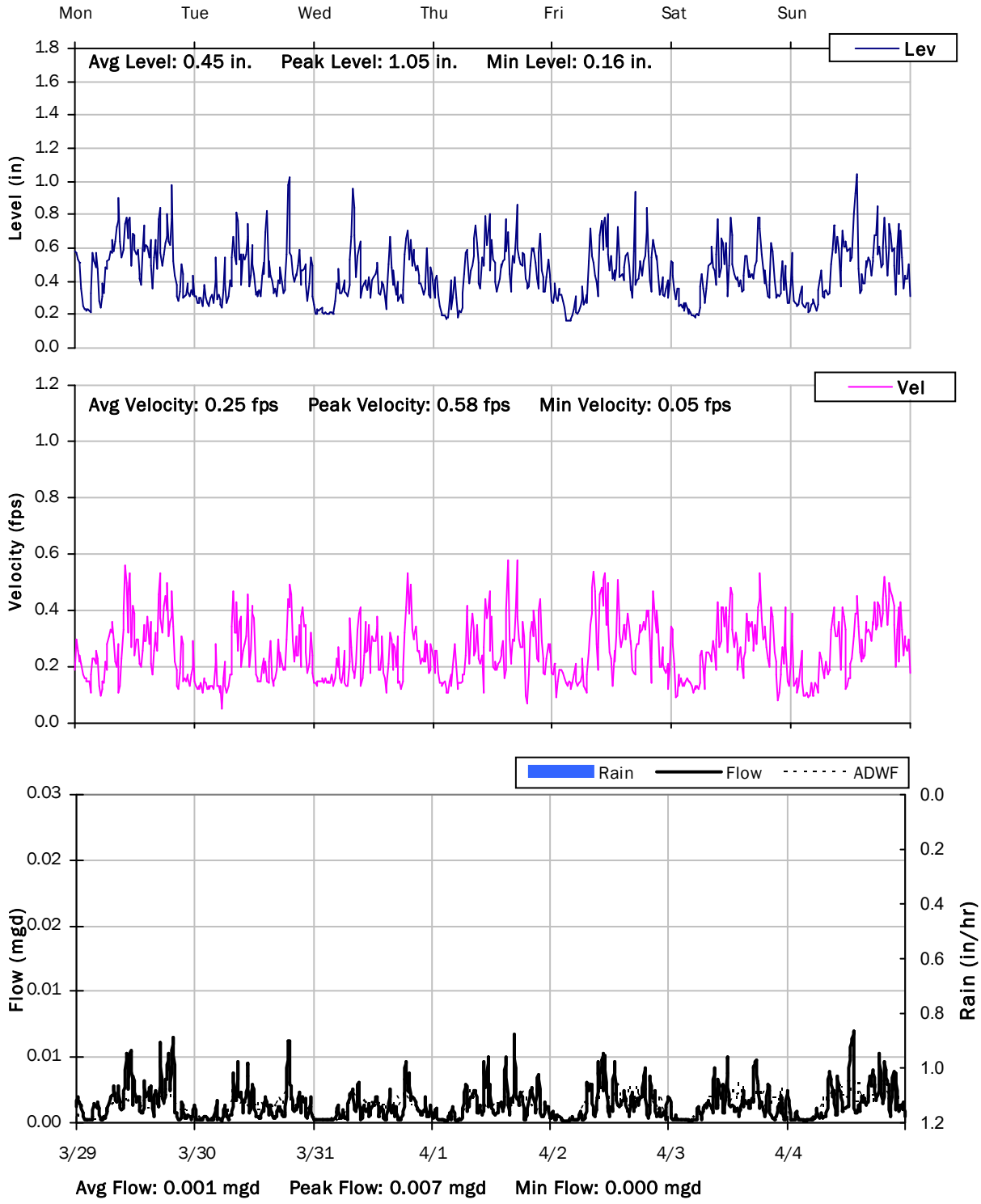
FM 6-4
Weekly Level, Velocity and Flow Hydrographs
3/15/2021 to 3/22/2021



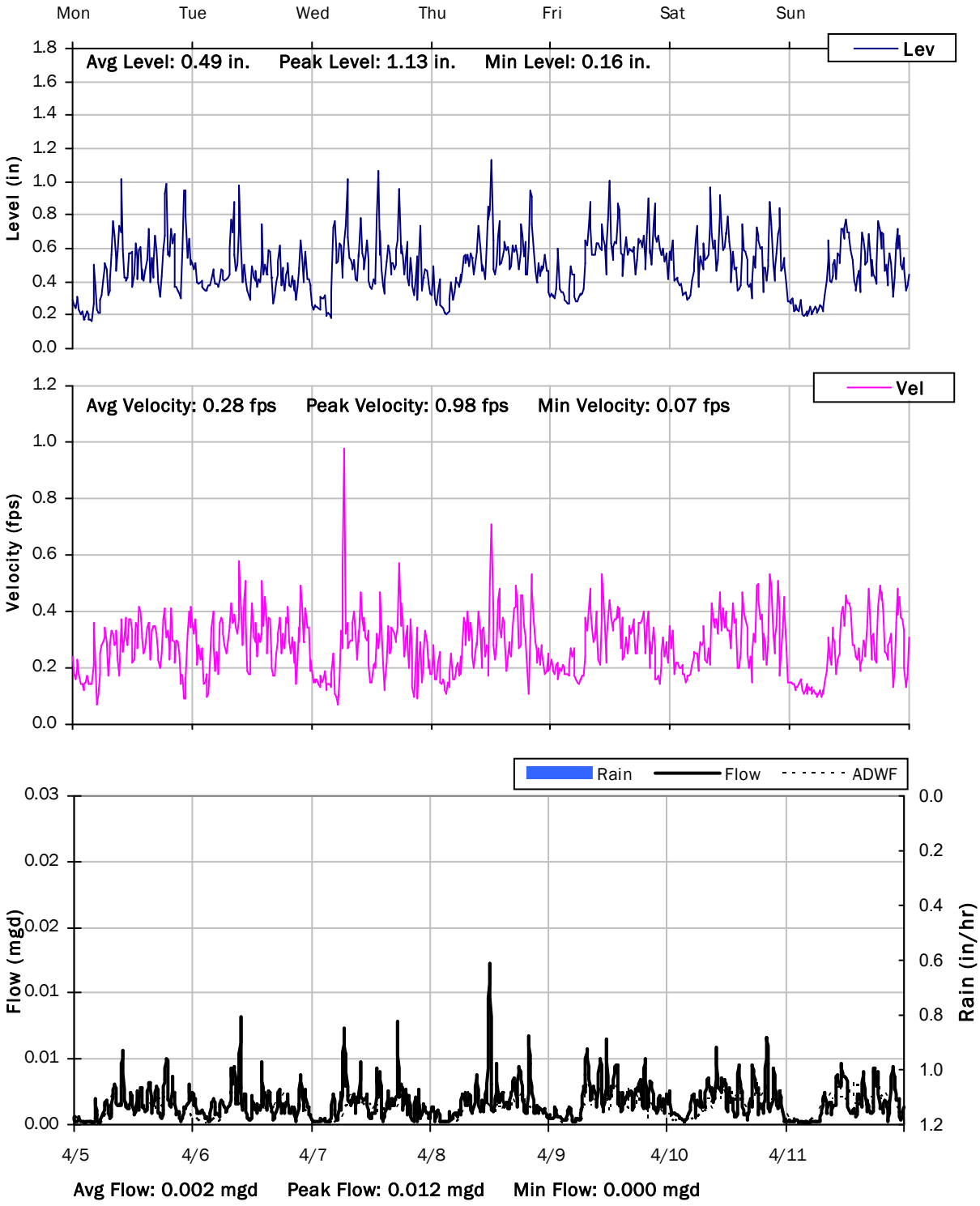
FM 6-4
Weekly Level, Velocity and Flow Hydrographs
3/22/2021 to 3/29/2021



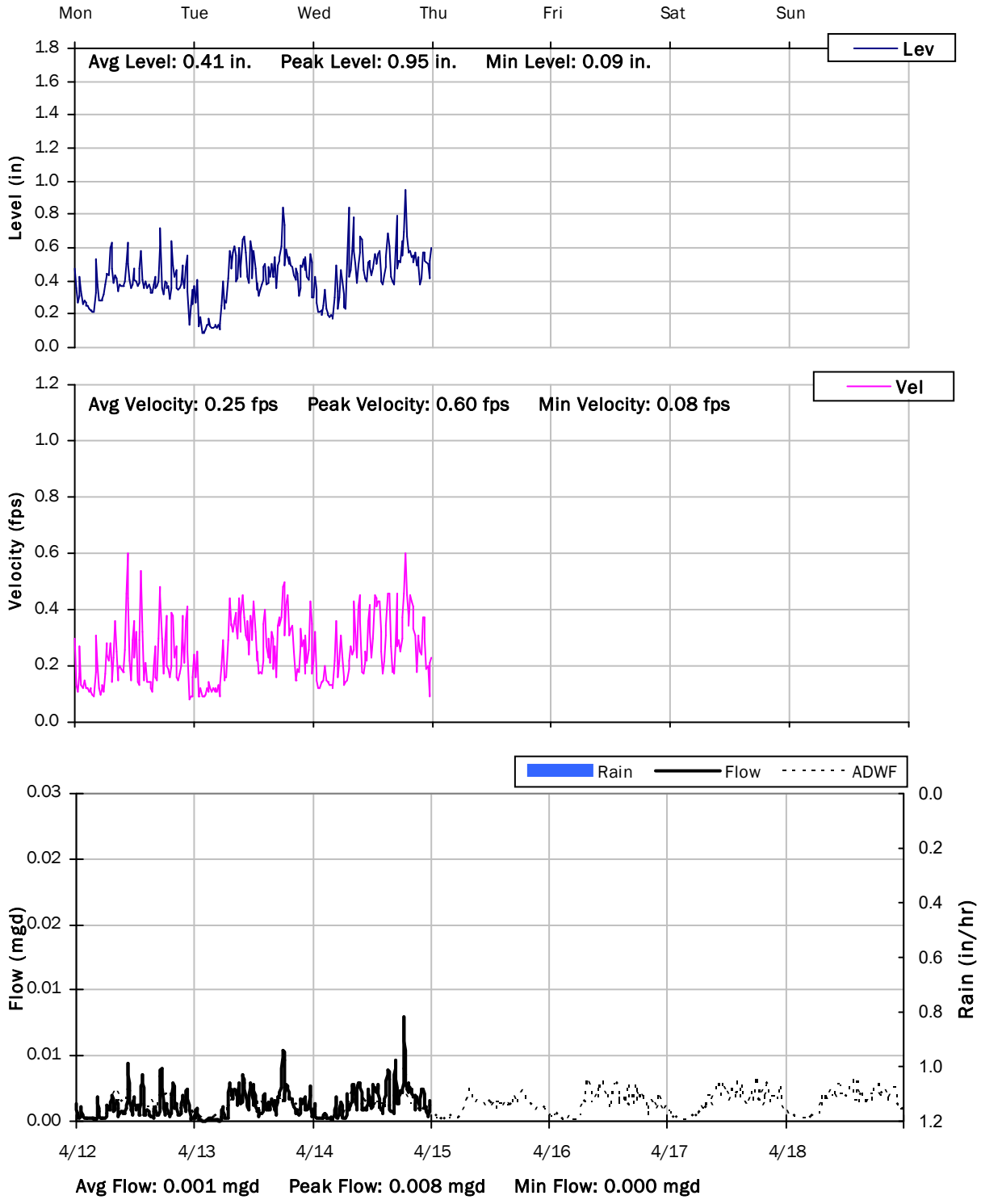
FM 6-4
Weekly Level, Velocity and Flow Hydrographs
3/29/2021 to 4/5/2021



FM 6-4
Weekly Level, Velocity and Flow Hydrographs
4/5/2021 to 4/12/2021



FM 6-4
Weekly Level, Velocity and Flow Hydrographs
4/12/2021 to 4/19/2021



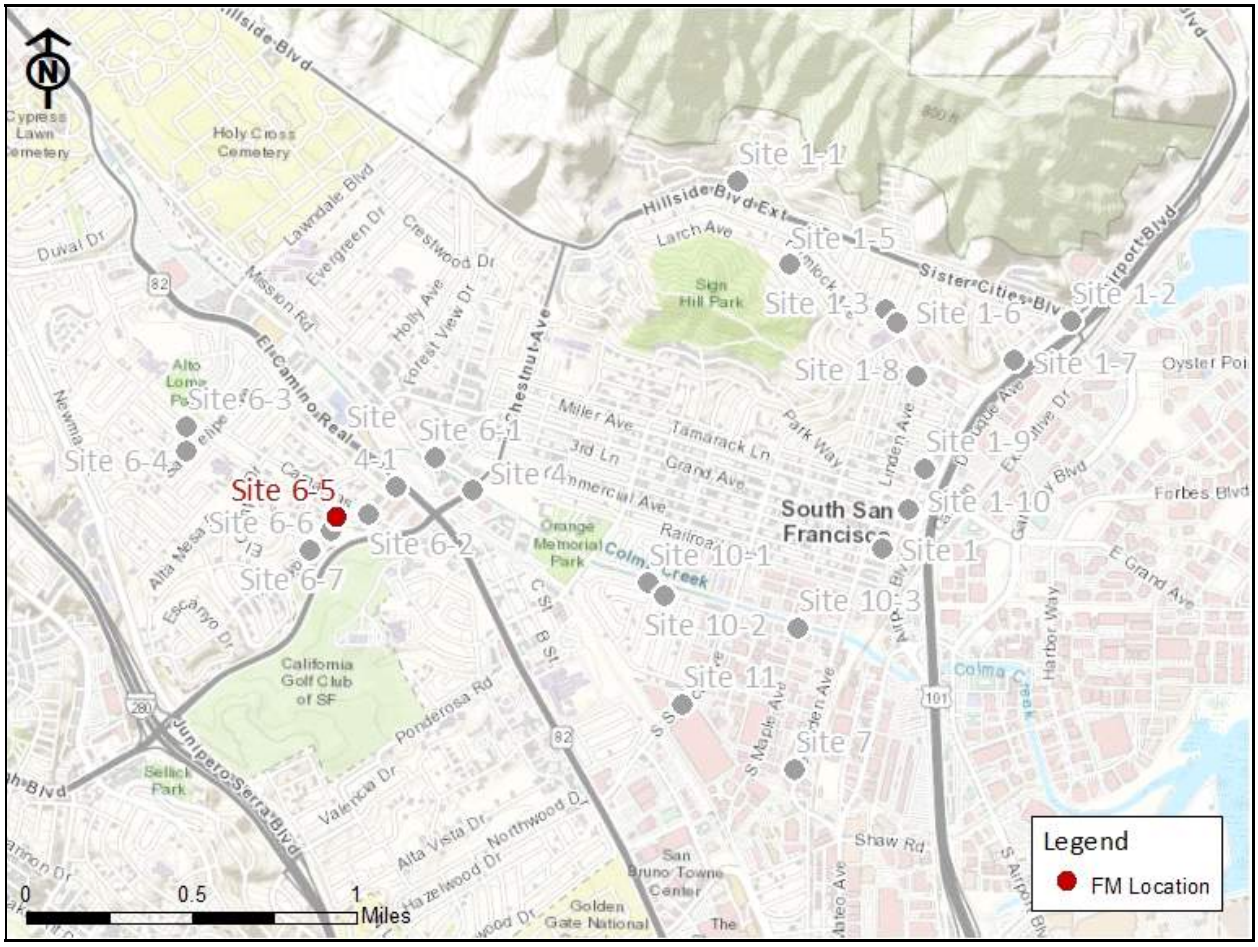
South San Francisco, CA

Sanitary Sewer Flow Monitoring
January 4 - April 14, 2021

Monitoring Site: FM 6-5

Location: 104 Del Monte Avenue

Data Summary Report



Vicinity Map: FM 6-5

FM 6-5

Site Information

Location: 104 Del Monte Avenue

Coordinates: 122.4397° W, 37.6550° N

Rim Elevation (Earth): 72 feet

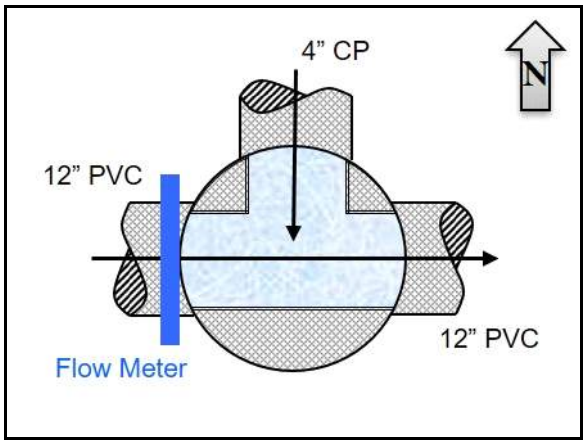
Pipe Diameter: 12 inches

ADWF: 0.076 mgd

Peak Measured Flow: 0.457 mgd

Satellite Map

Sanitary Map



Flow Sketch

Street View

Plan View

FM 6-5

Additional Site Photos

Effluent Pipe

Monitored West Influent Pipe

FM 6-5

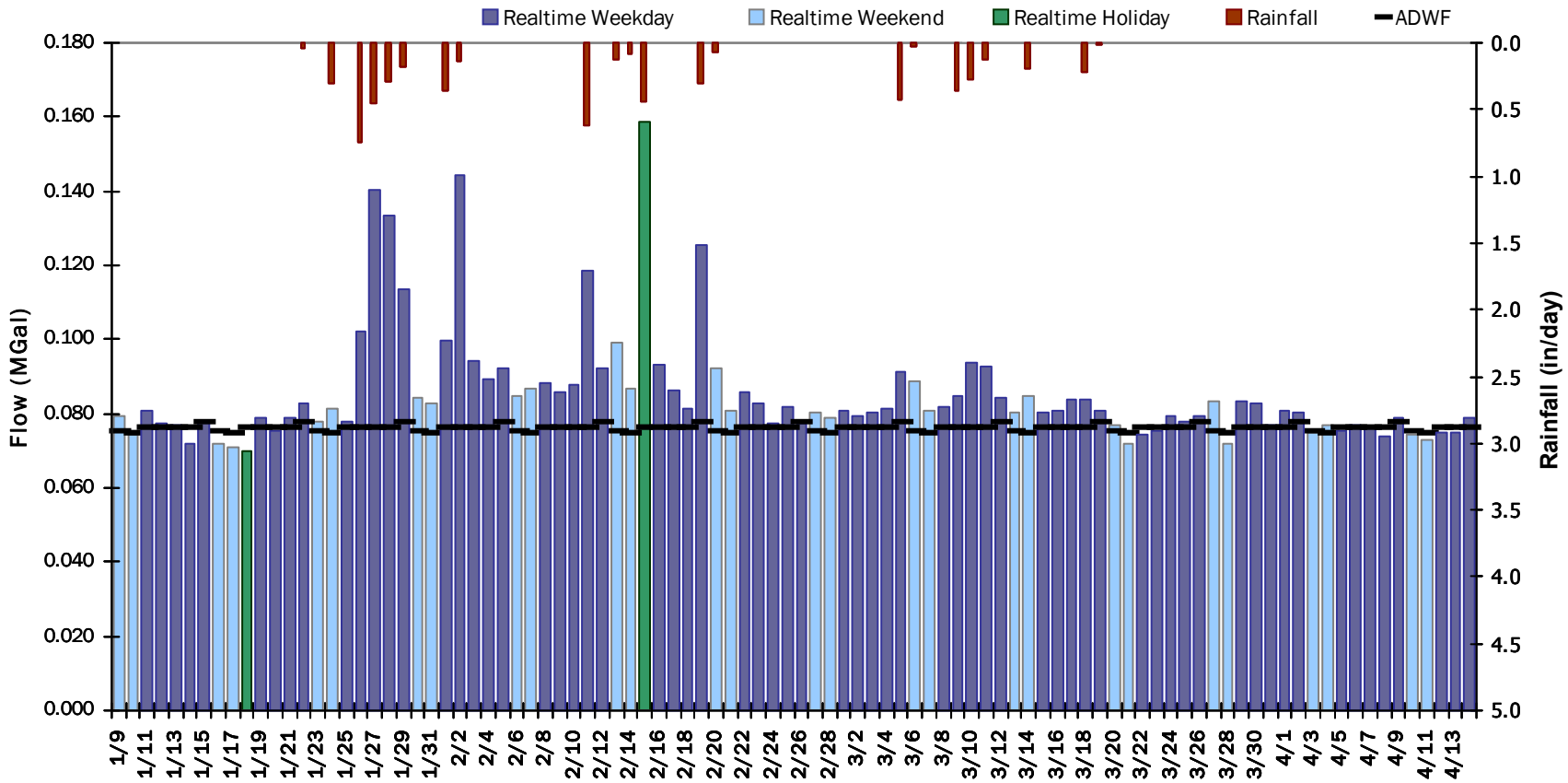
Additional Site Photos

North Influent Pipe

FM 6-5
Period Flow Summary: Daily Flow Totals

Avg Period Flow: 0.085 MGal Peak Daily Flow: 0.159 MGal Min Daily Flow: 0.070 MGal

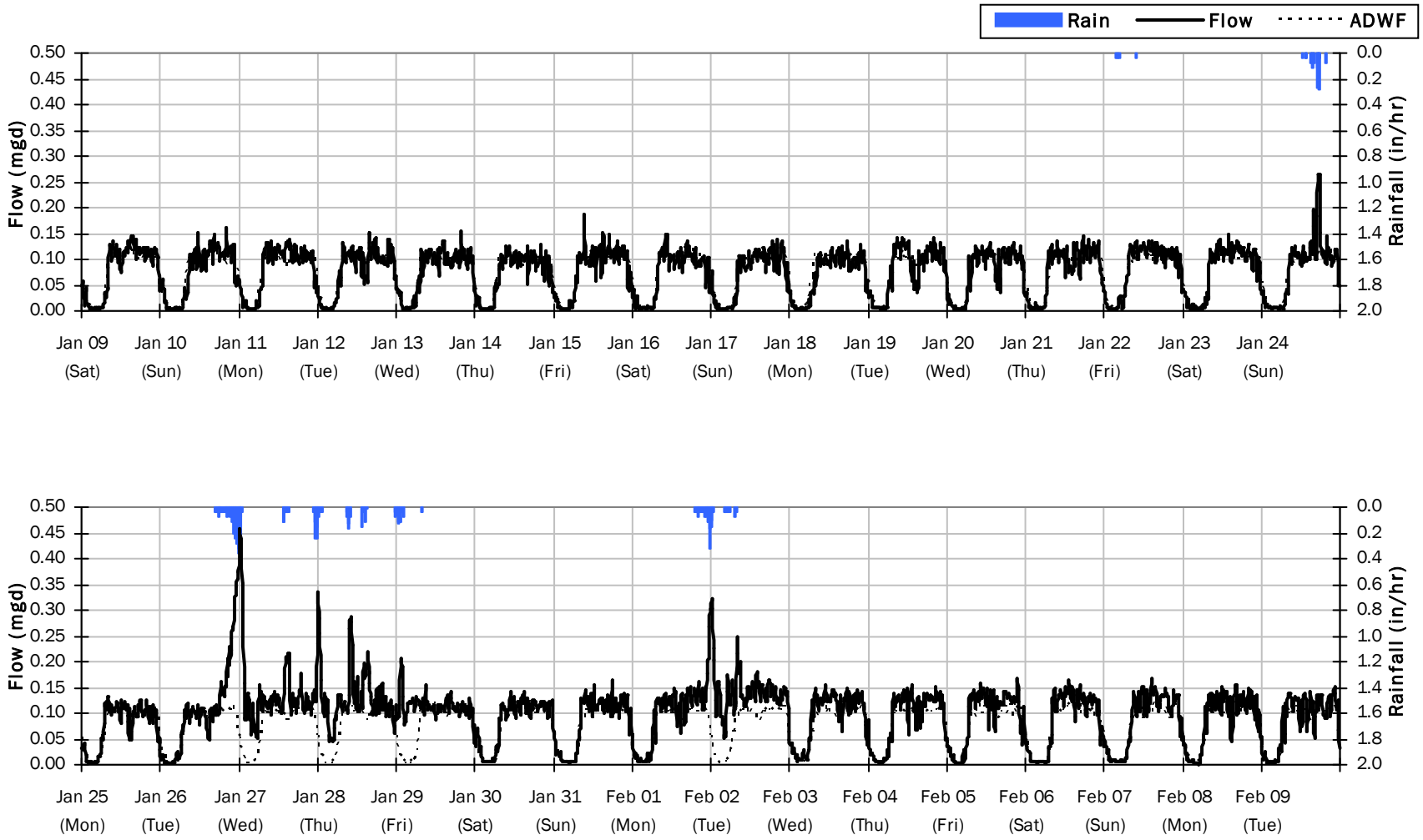
Total Period Rainfall: 5.81 inches



FM 6-5

Flow Summary: 1/9/2021 to 2/9/2021

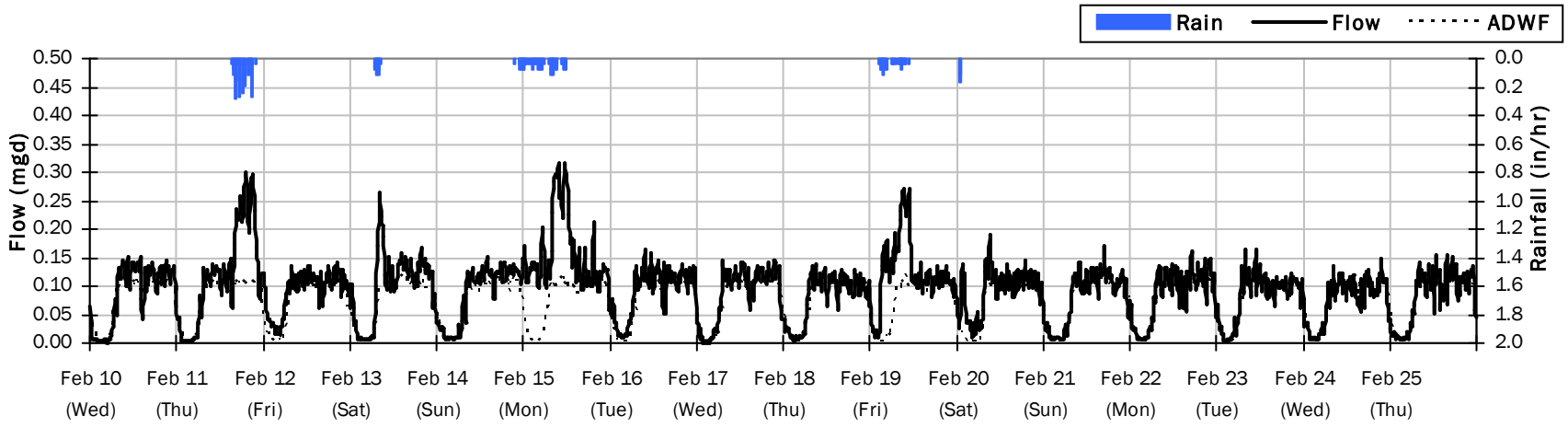
Total Period Rainfall: 2.51 inches Avg Flow: 0.088 mgd Peak Flow: 0.457 mgd Min Flow: 0.001 mgd

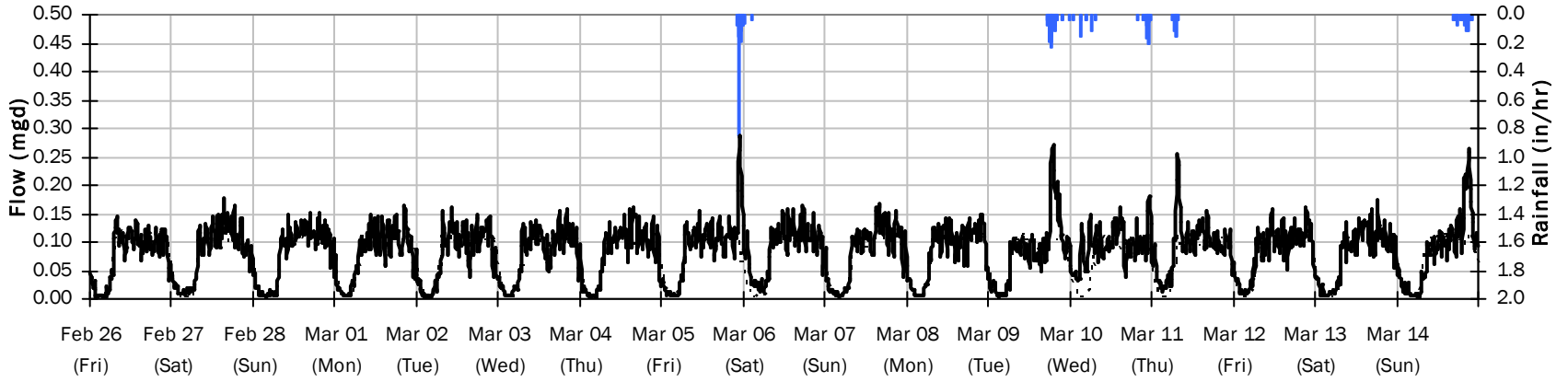


FM 6-5

Flow Summary: 2/10/2021 to 3/14/2021

Total Period Rainfall: 3.05 inches Avg Flow: 0.089 mgd Peak Flow: 0.317 mgd Min Flow: 0.000 mgd

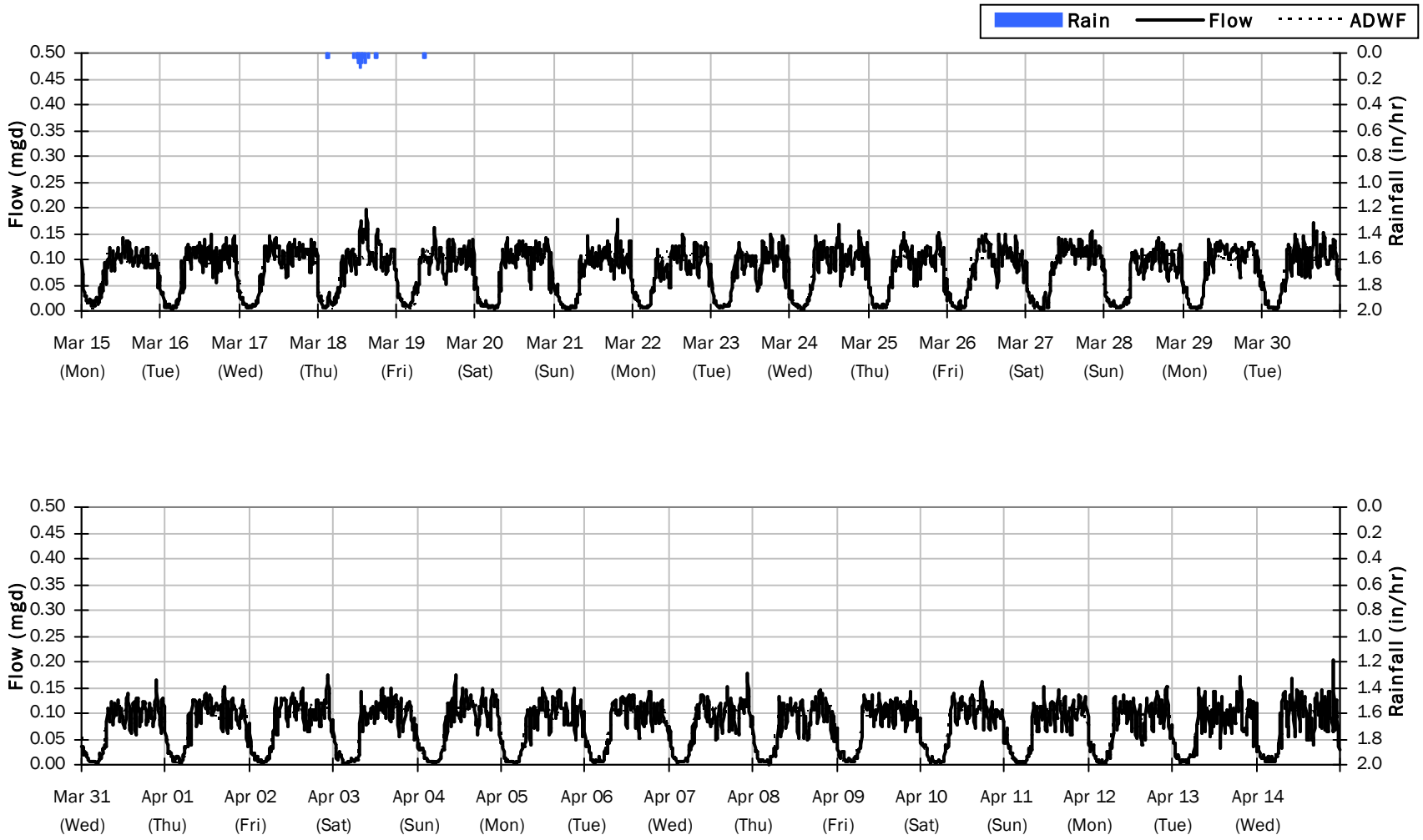




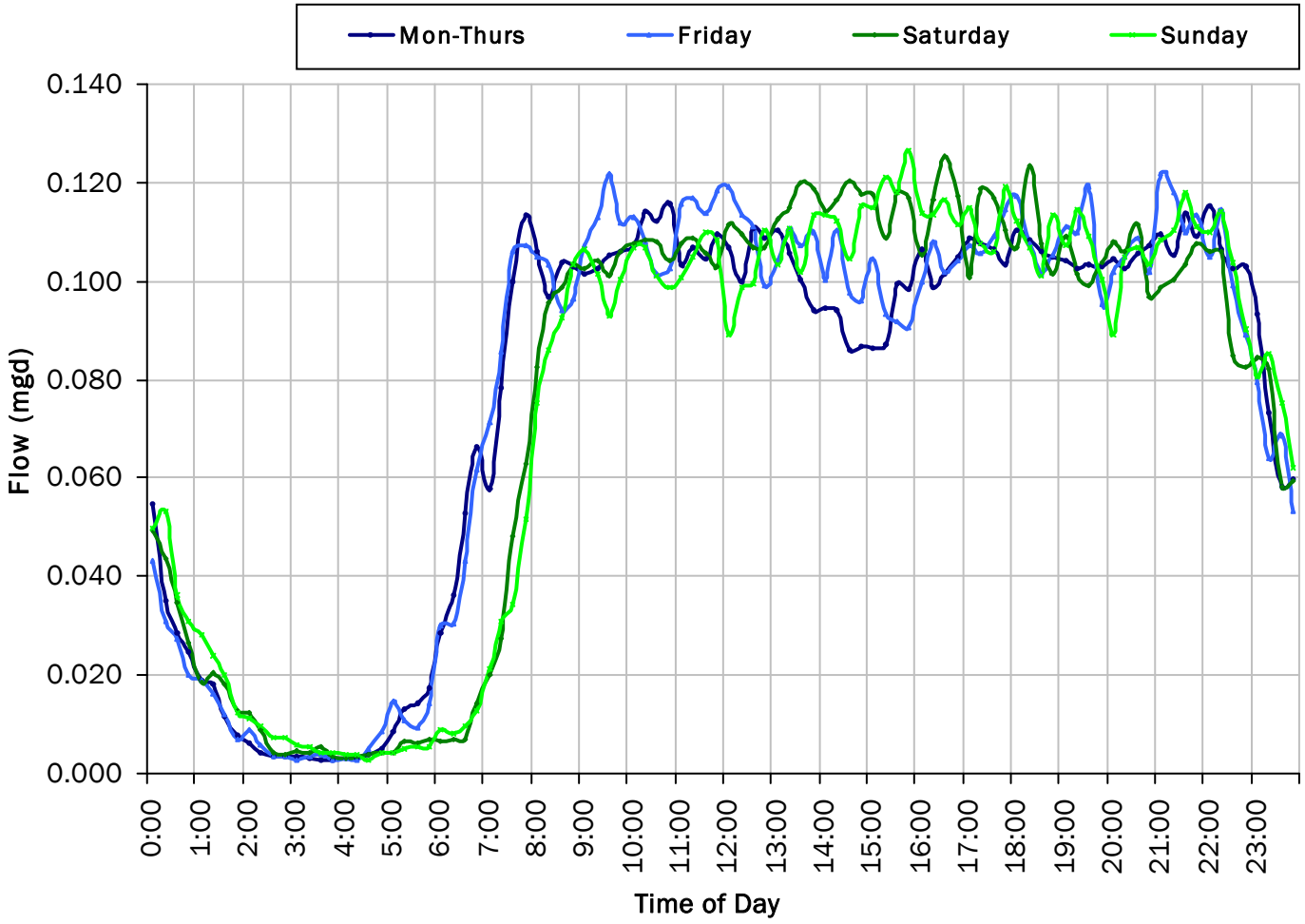
FM 6-5

Flow Summary: 3/15/2021 to 4/14/2021

Total Period Rainfall: 0.24 inches Avg Flow: 0.078 mgd Peak Flow: 0.203 mgd Min Flow: 0.001 mgd

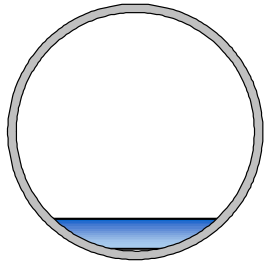


FM 6-5
Average Dry Weather Flow Hydrographs



ADWF:

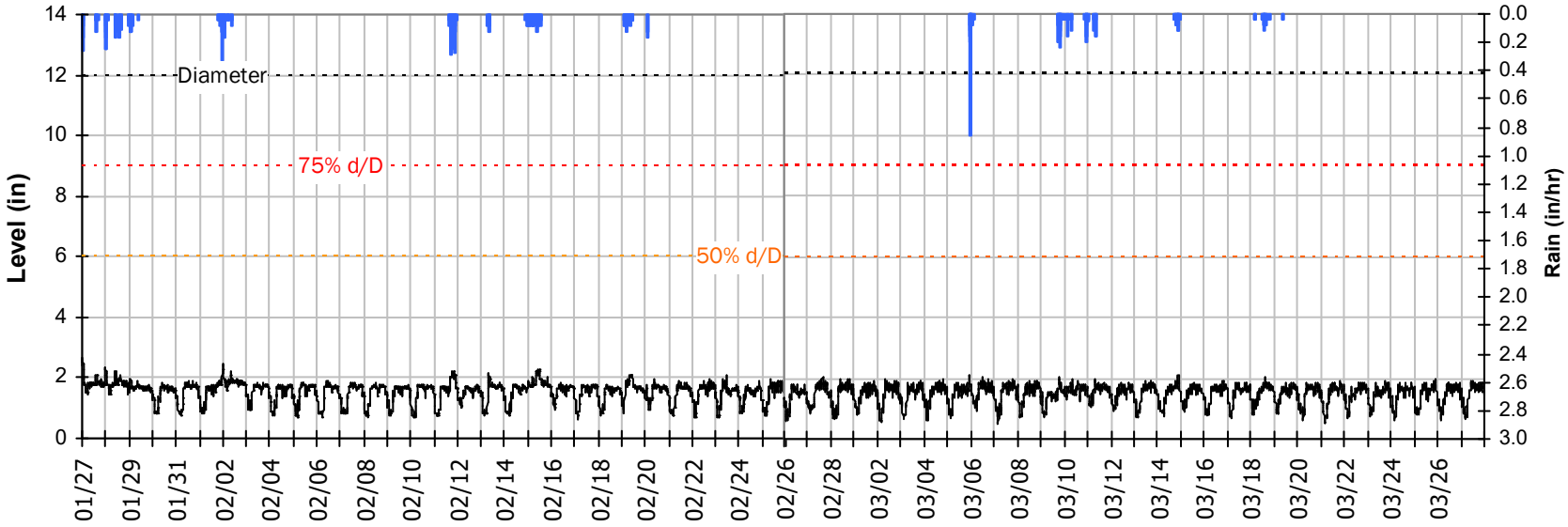
0.076 *mgd*

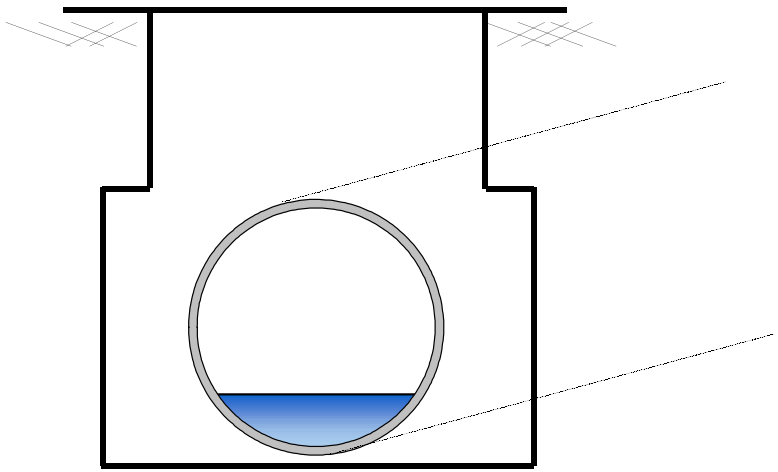


FM 6-5

Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Monitoring Period

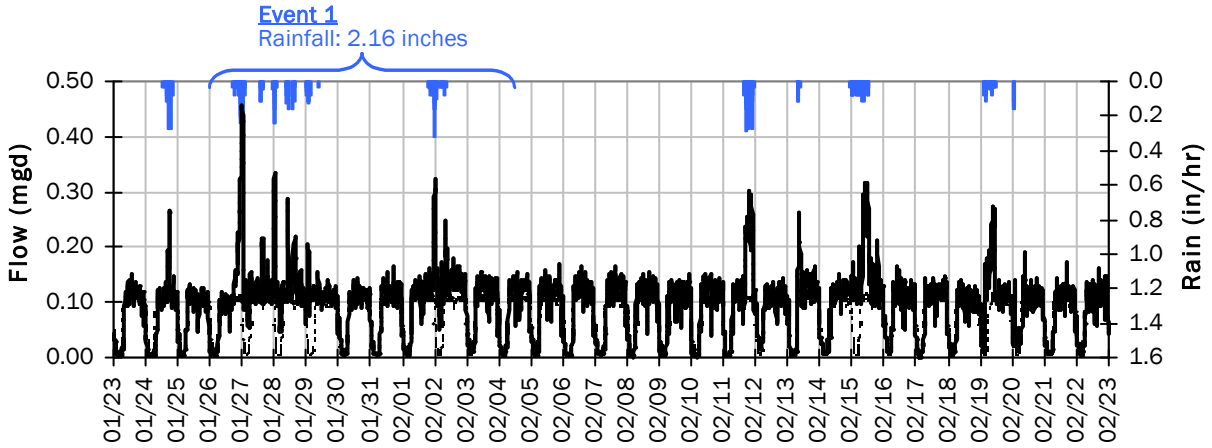




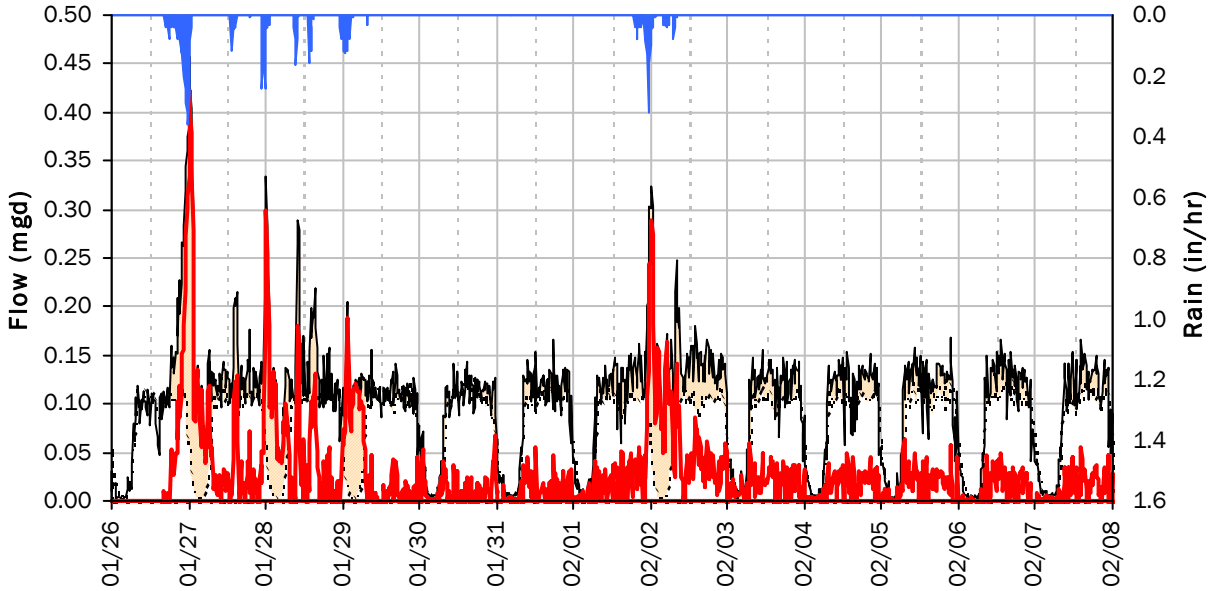
Pipe Diameter:	12	*inches*
Peak Measured Level:	2.67	*inches*
Peak d/D Ratio:	0.22	

FM 6-5
I/I Summary: Event 1

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



Event 1 Detail Graph

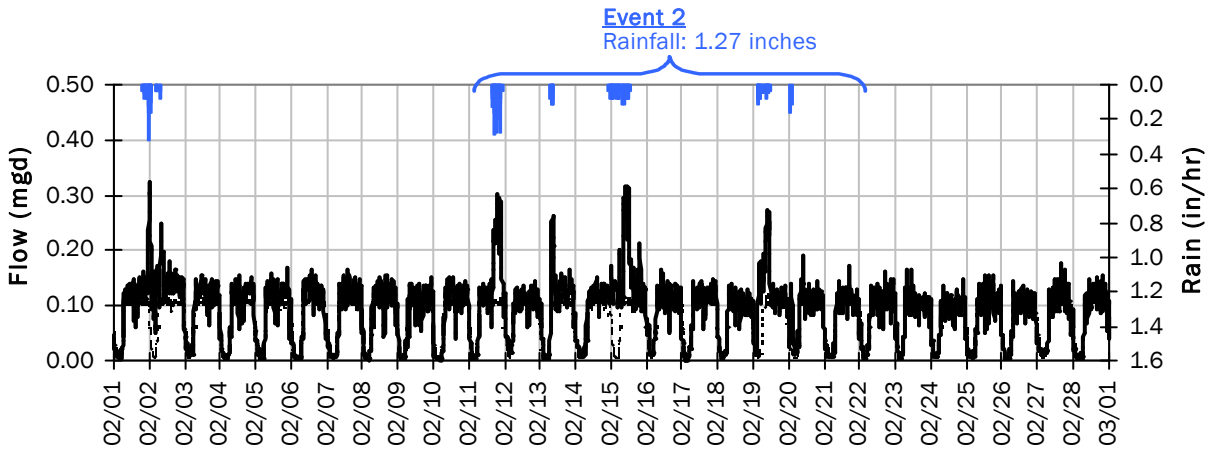


Storm Event I/I Analysis (Rain = 2.16 inches)

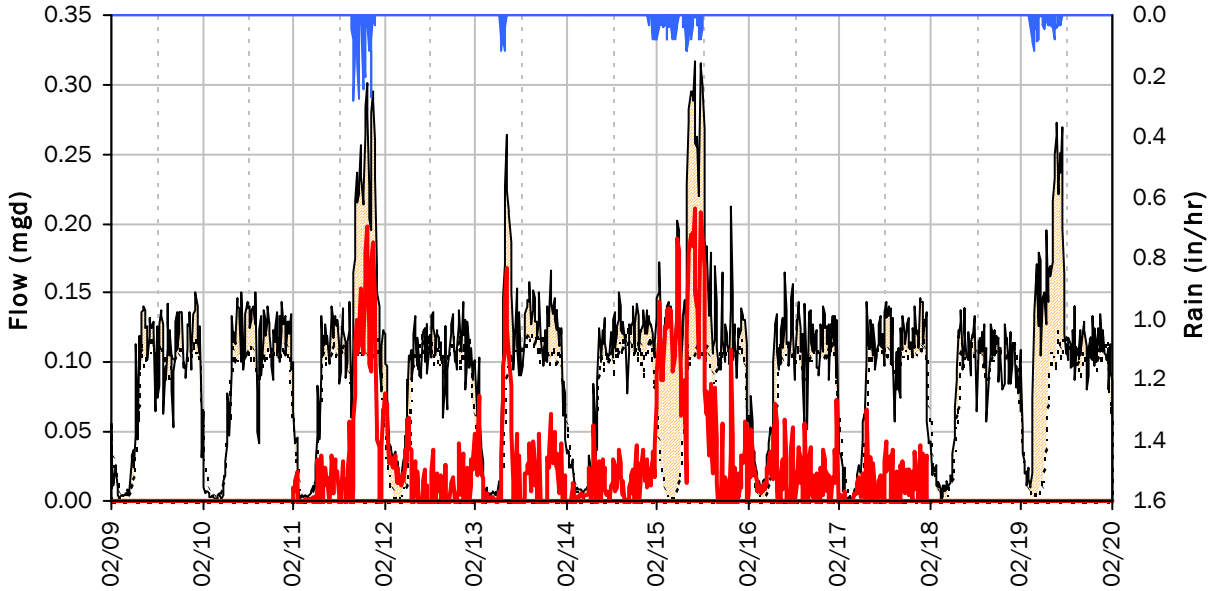
Capacity		Inflow / Infiltration	
Peak Flow:	0.46 *mgd*	**Peak I/I Rate:**	0.42 *mgd*
PF:	5.98	**Total I/I:**	357,000 *gallons*
Peak Level:	2.67 *in*		
d/D Ratio:	0.22		

FM 6-5
I/I Summary: Event 2

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



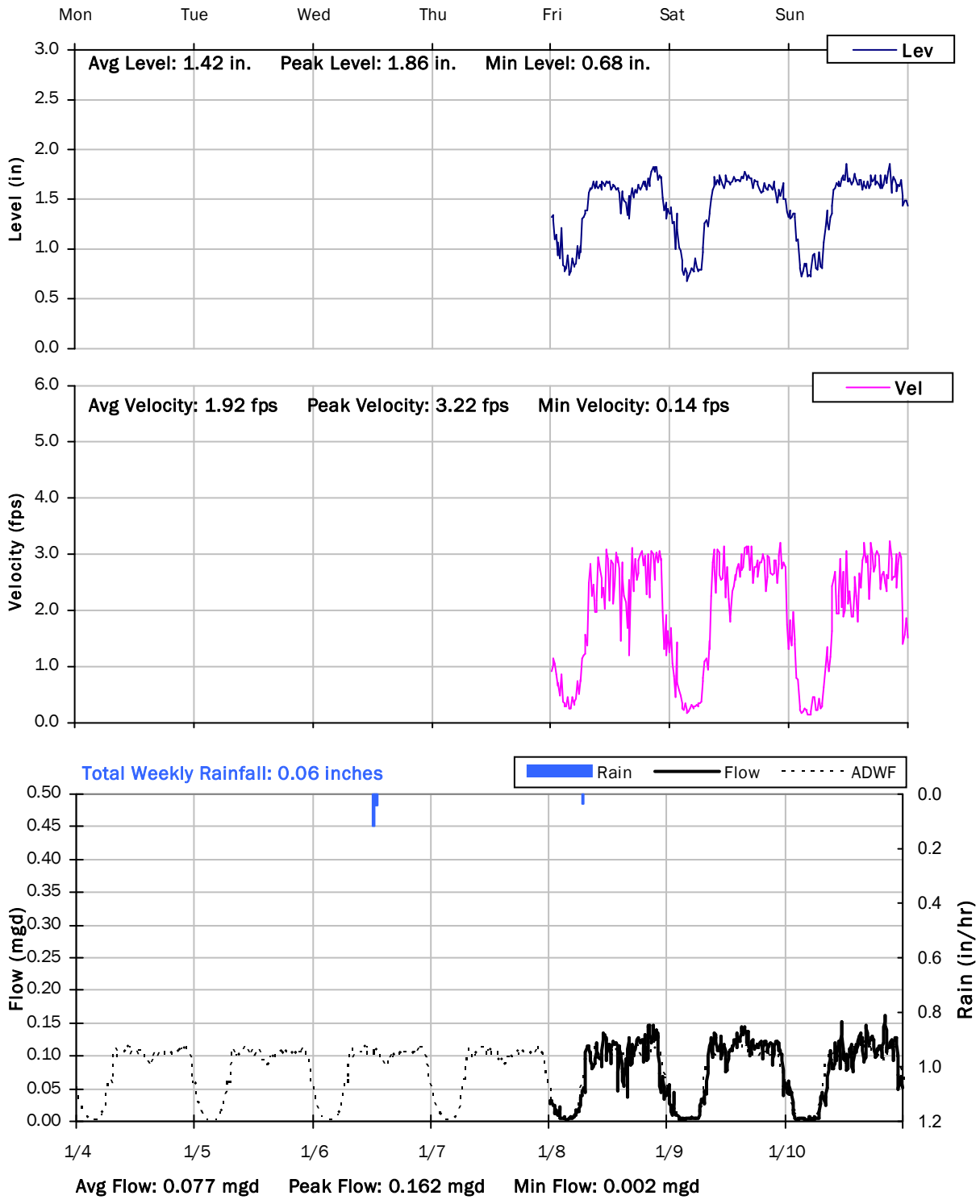
Event 2 Detail Graph



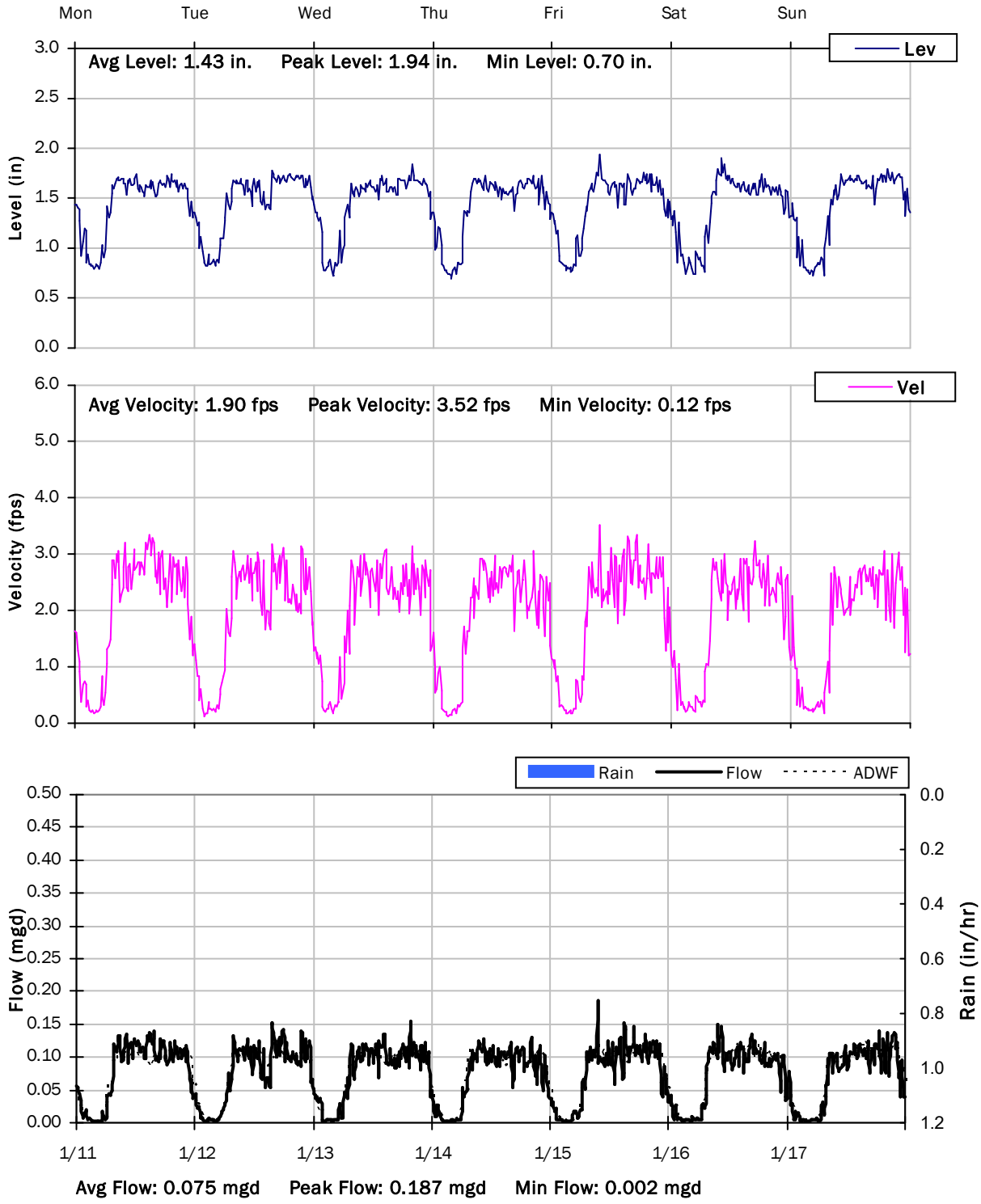
Storm Event I/I Analysis (Rain = 1.27 inches)

Capacity		Inflow / Infiltration	
Peak Flow:	0.32 *mgd*	**Peak I/I Rate:**	0.21 *mgd*
PF:	4.15	**Total I/I:**	200,000 *gallons*
Peak Level:	2.27 *in*		
d/D Ratio:	0.19		

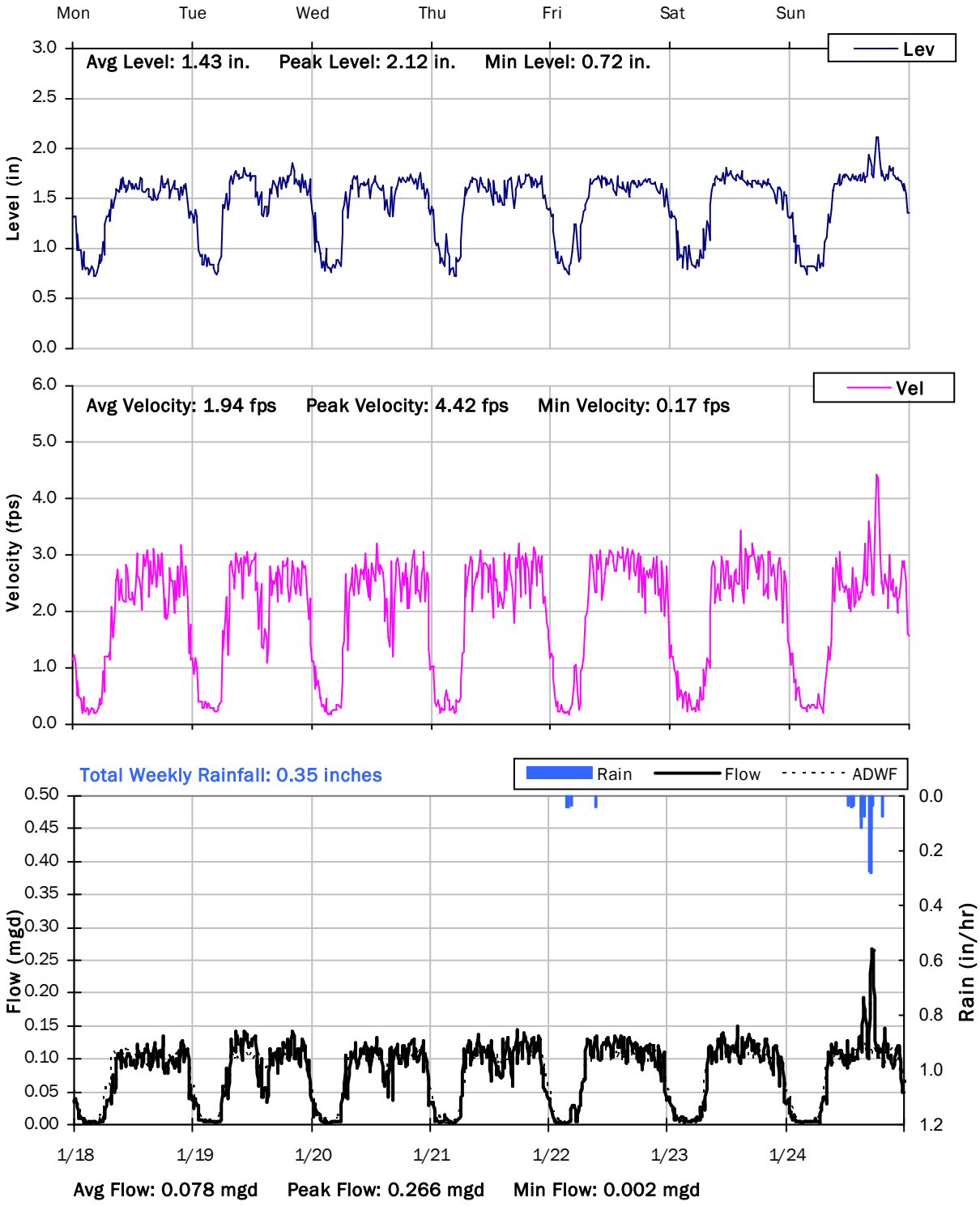
FM 6-5
Weekly Level, Velocity and Flow Hydrographs
1/4/2021 to 1/11/2021



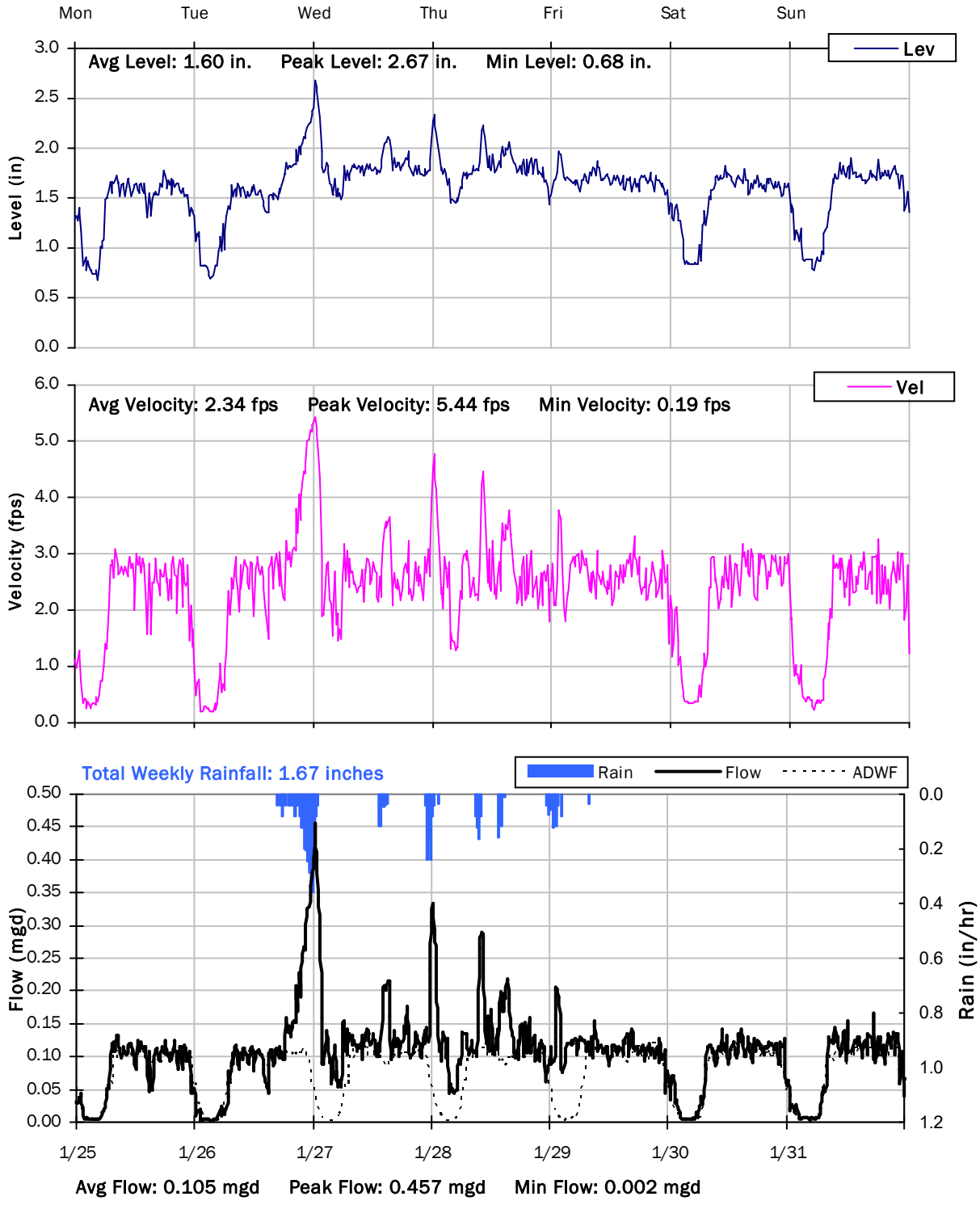
FM 6-5
Weekly Level, Velocity and Flow Hydrographs
1/11/2021 to 1/18/2021



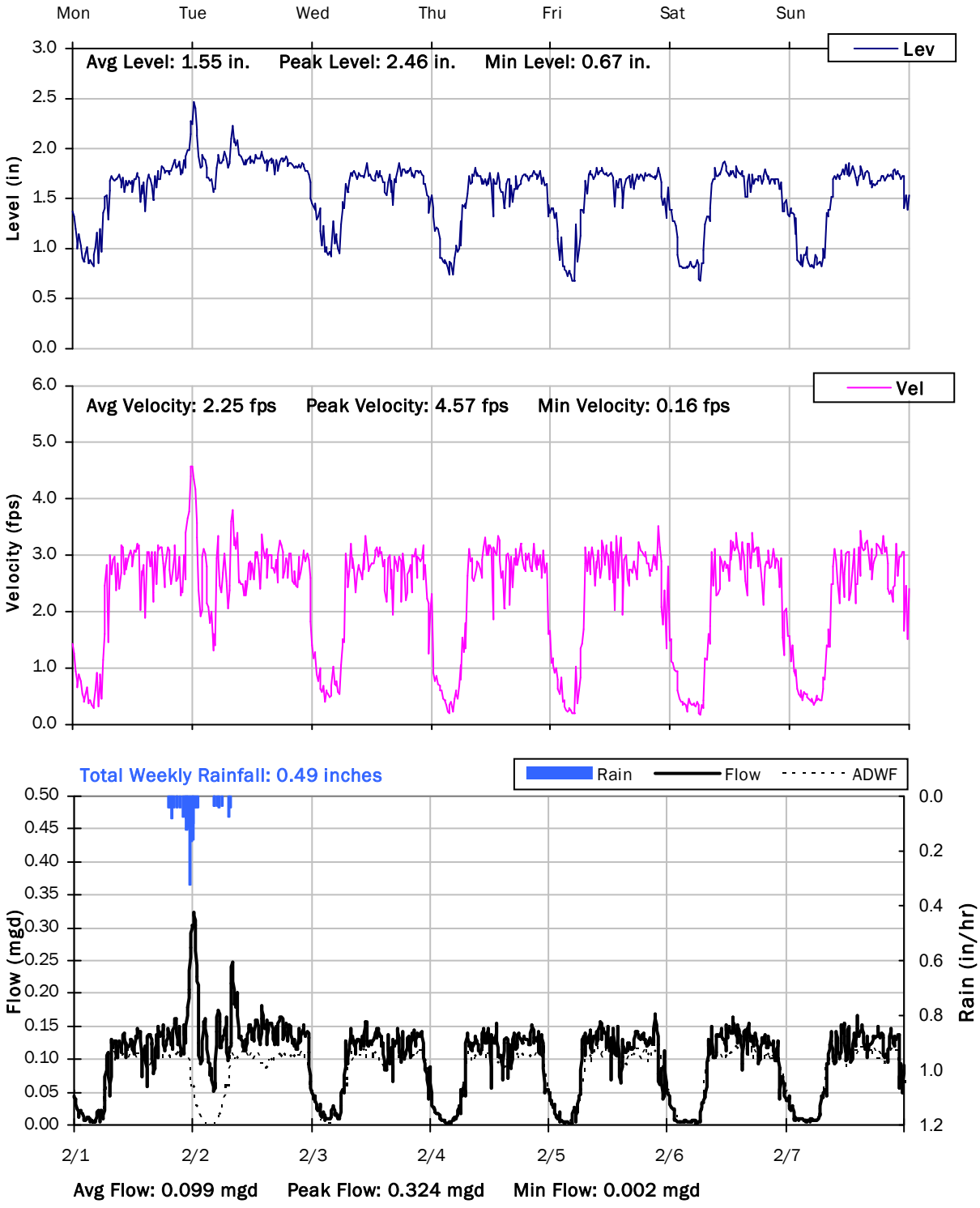
FM 6-5
Weekly Level, Velocity and Flow Hydrographs
1/18/2021 to 1/25/2021



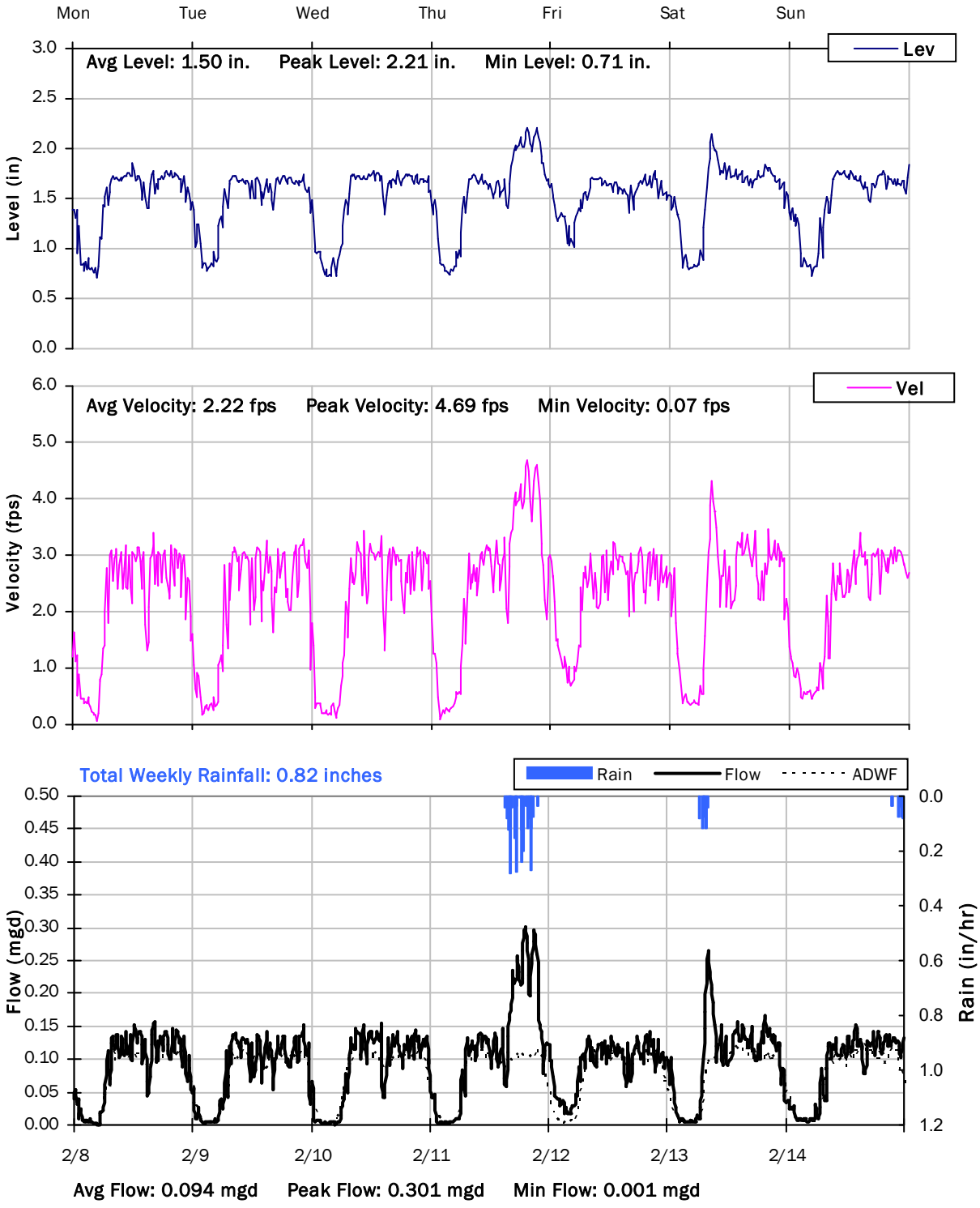
FM 6-5
Weekly Level, Velocity and Flow Hydrographs
1/25/2021 to 2/1/2021



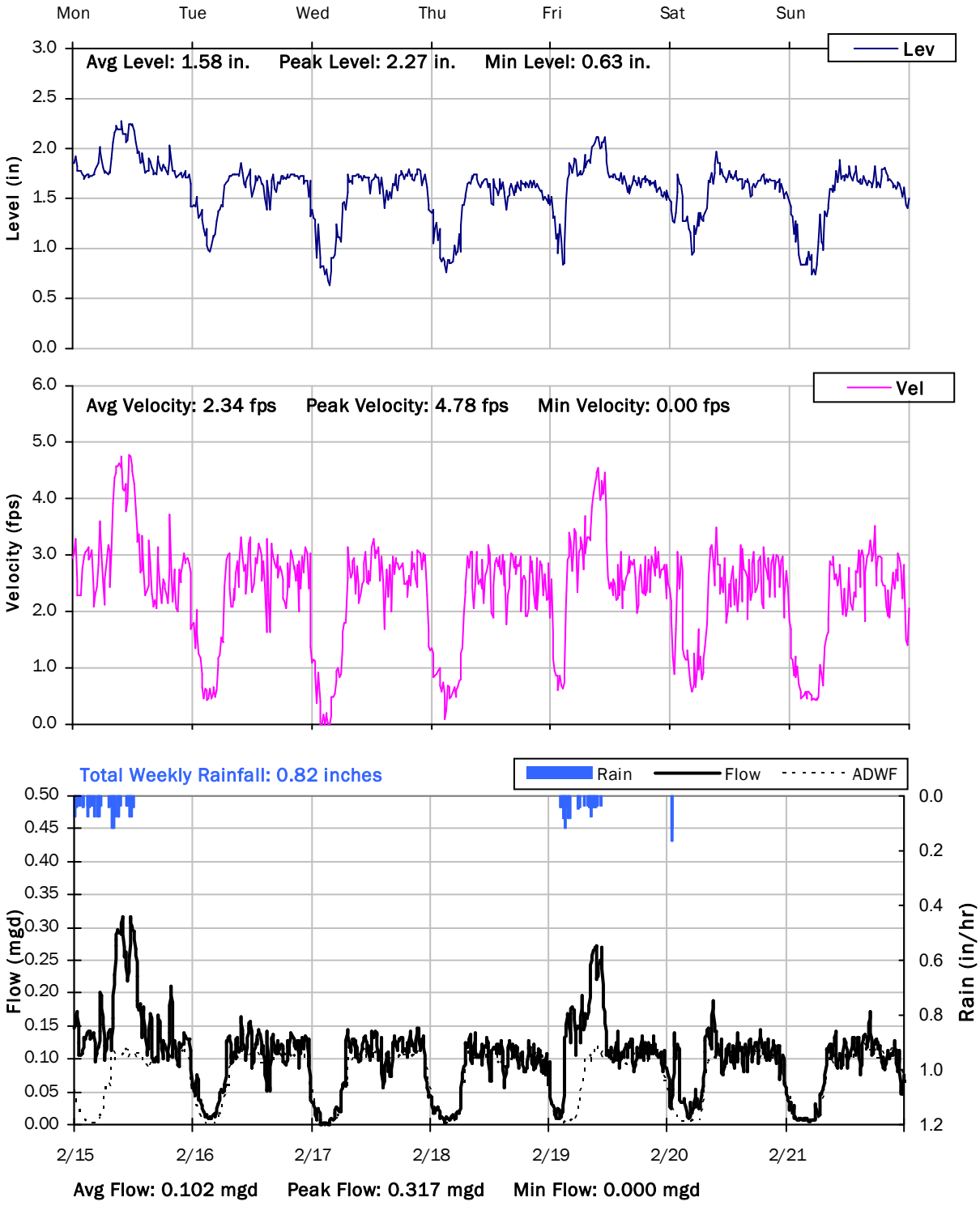
FM 6-5
Weekly Level, Velocity and Flow Hydrographs
2/1/2021 to 2/8/2021



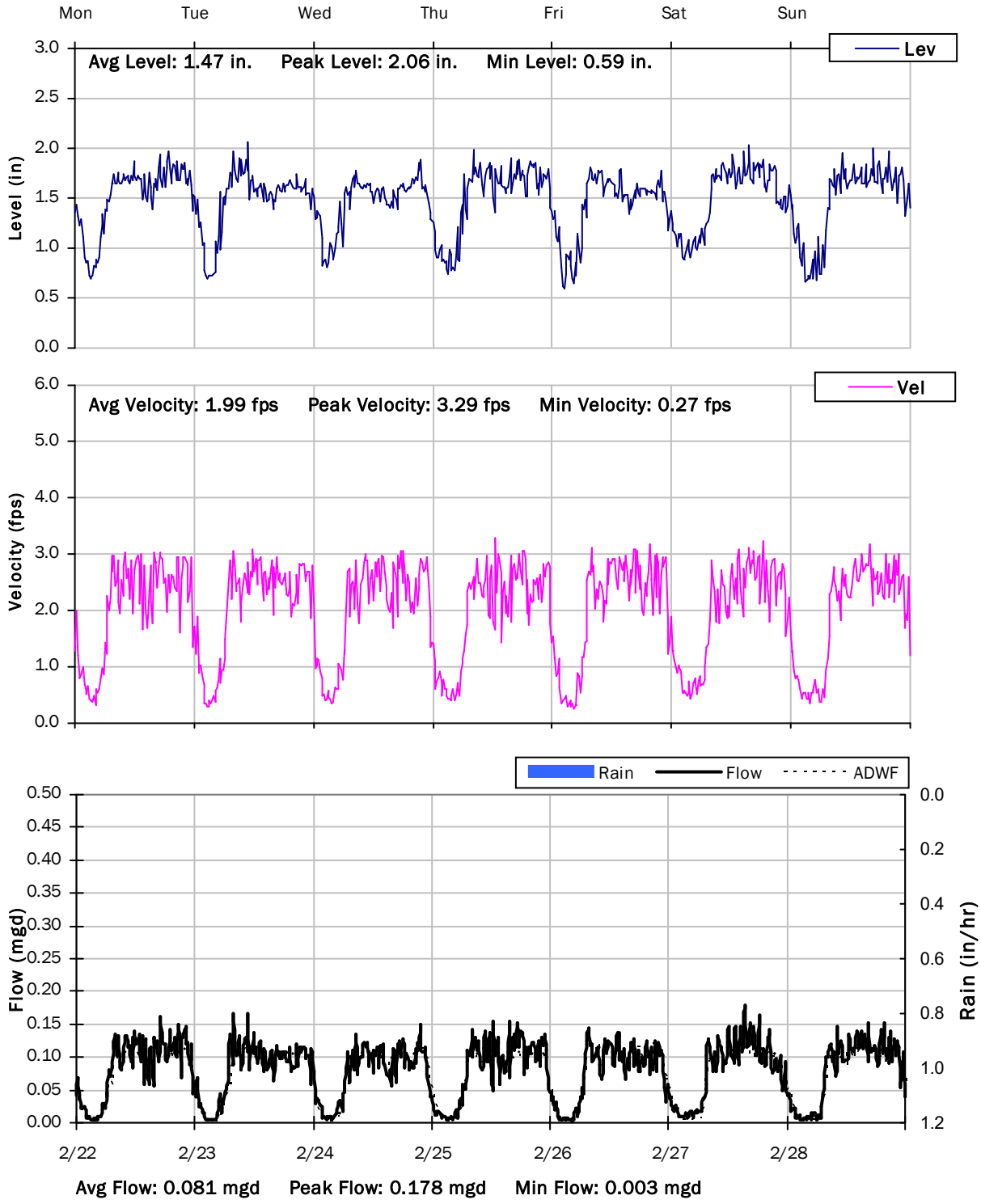
FM 6-5
Weekly Level, Velocity and Flow Hydrographs
2/8/2021 to 2/15/2021



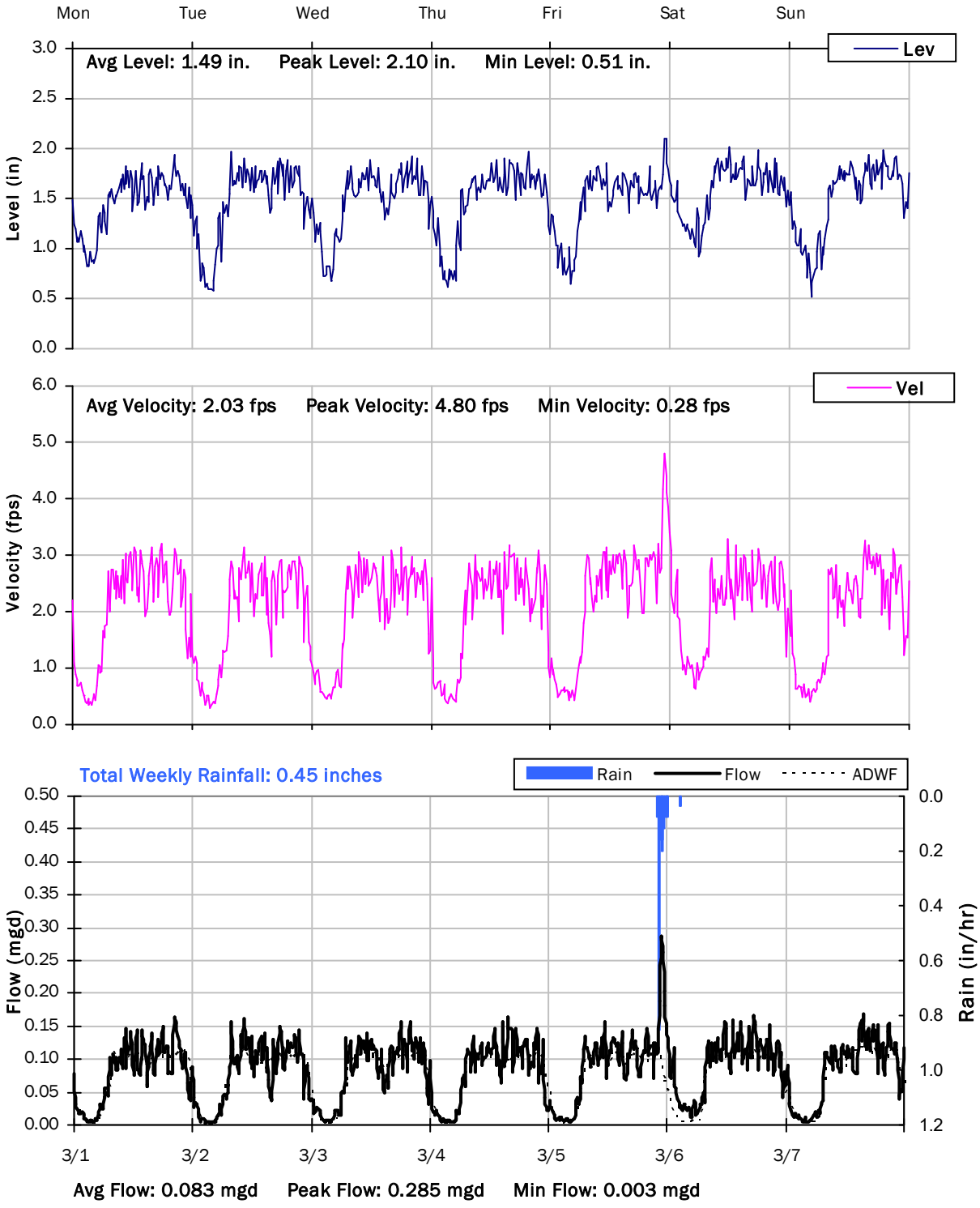
FM 6-5
Weekly Level, Velocity and Flow Hydrographs
2/15/2021 to 2/22/2021



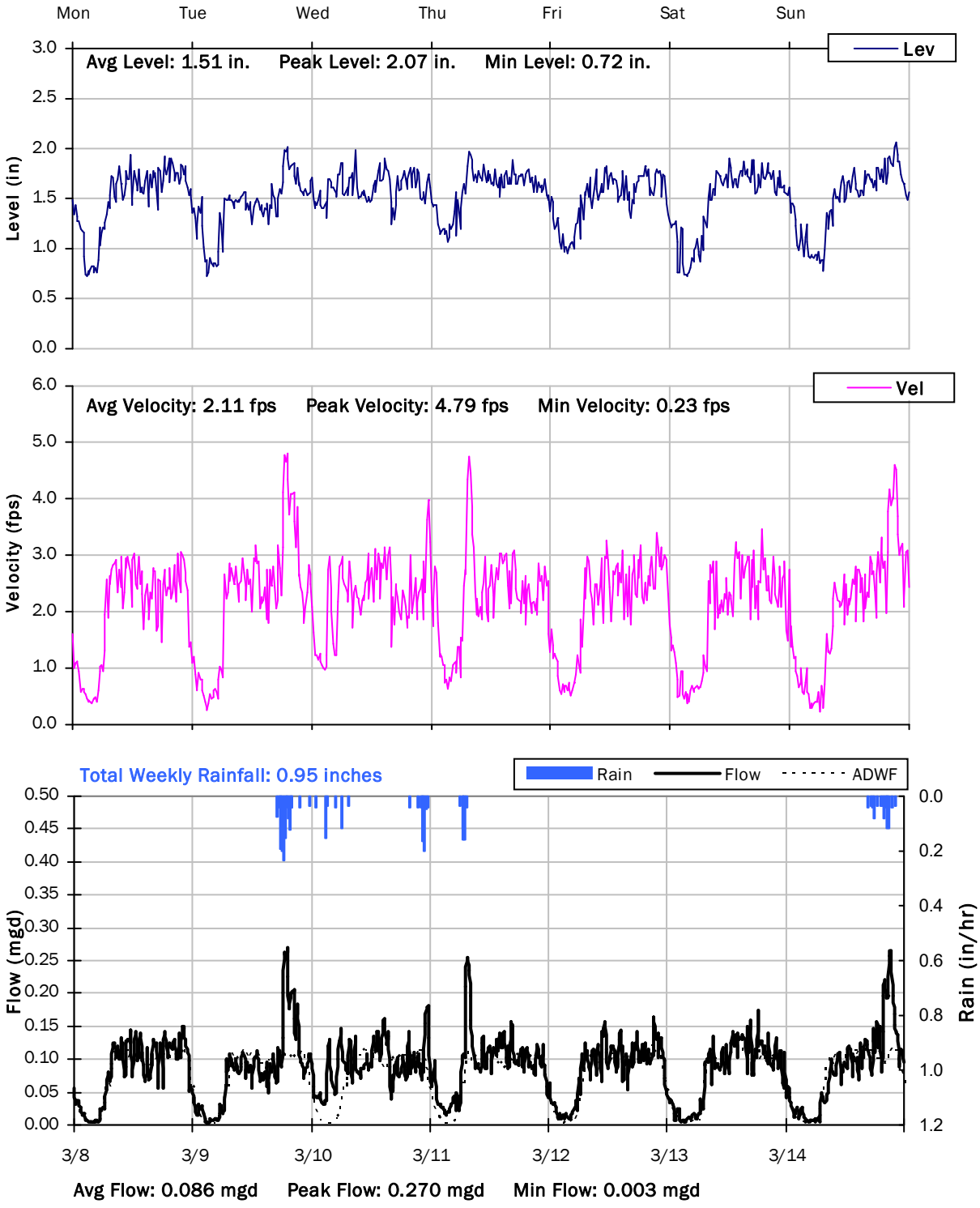
FM 6-5
Weekly Level, Velocity and Flow Hydrographs
2/22/2021 to 3/1/2021



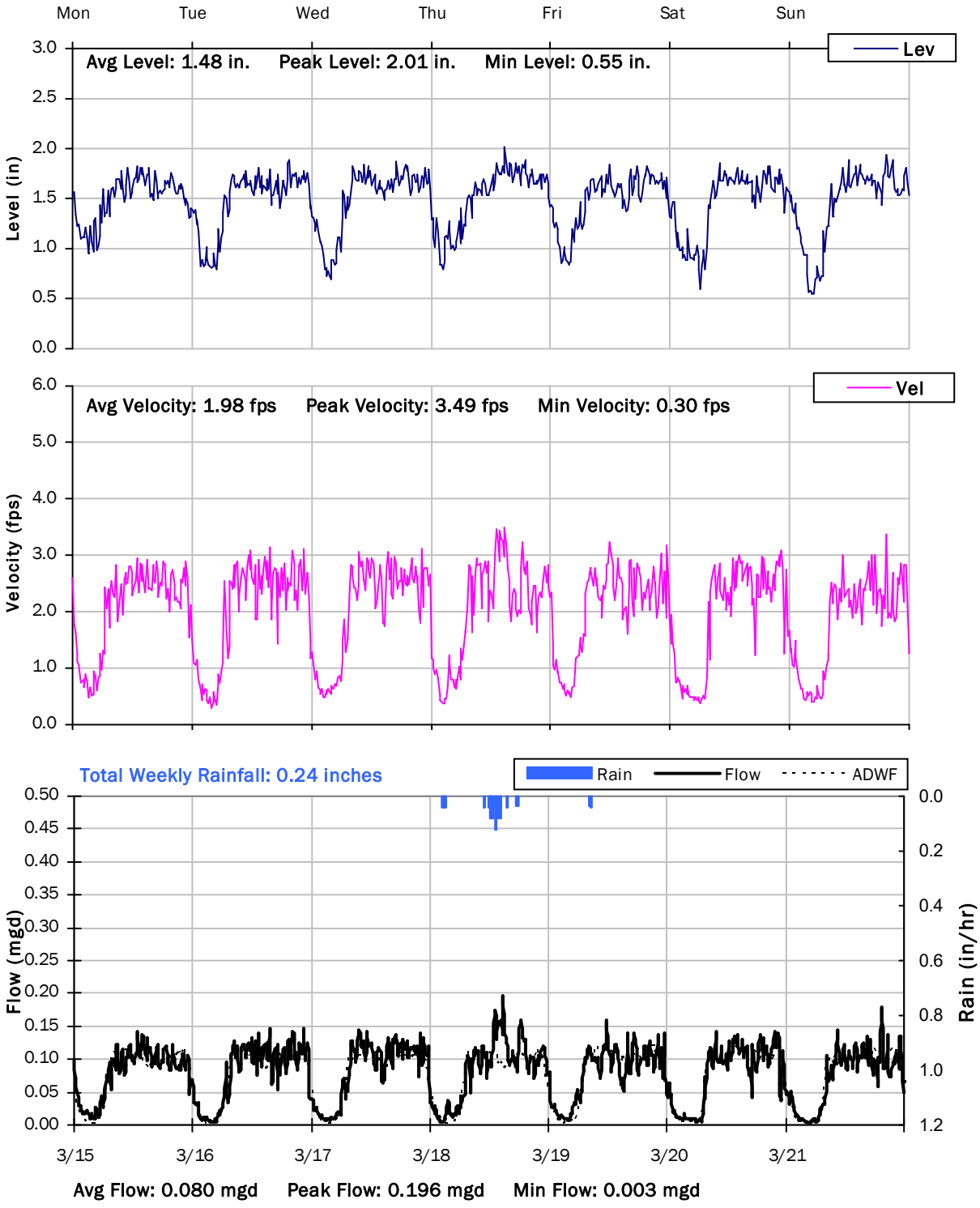
FM 6-5
Weekly Level, Velocity and Flow Hydrographs
3/1/2021 to 3/8/2021



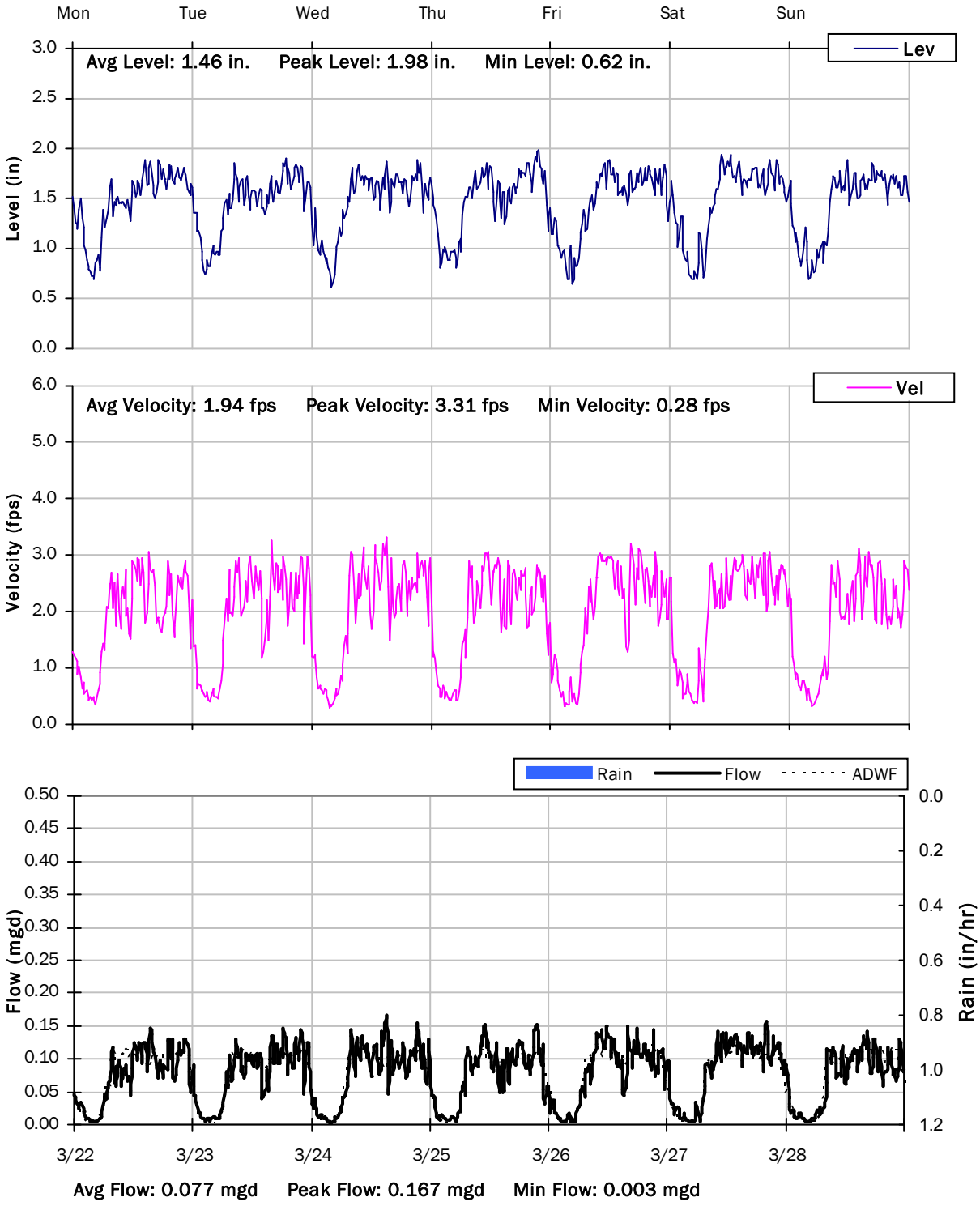
FM 6-5
Weekly Level, Velocity and Flow Hydrographs
3/8/2021 to 3/15/2021



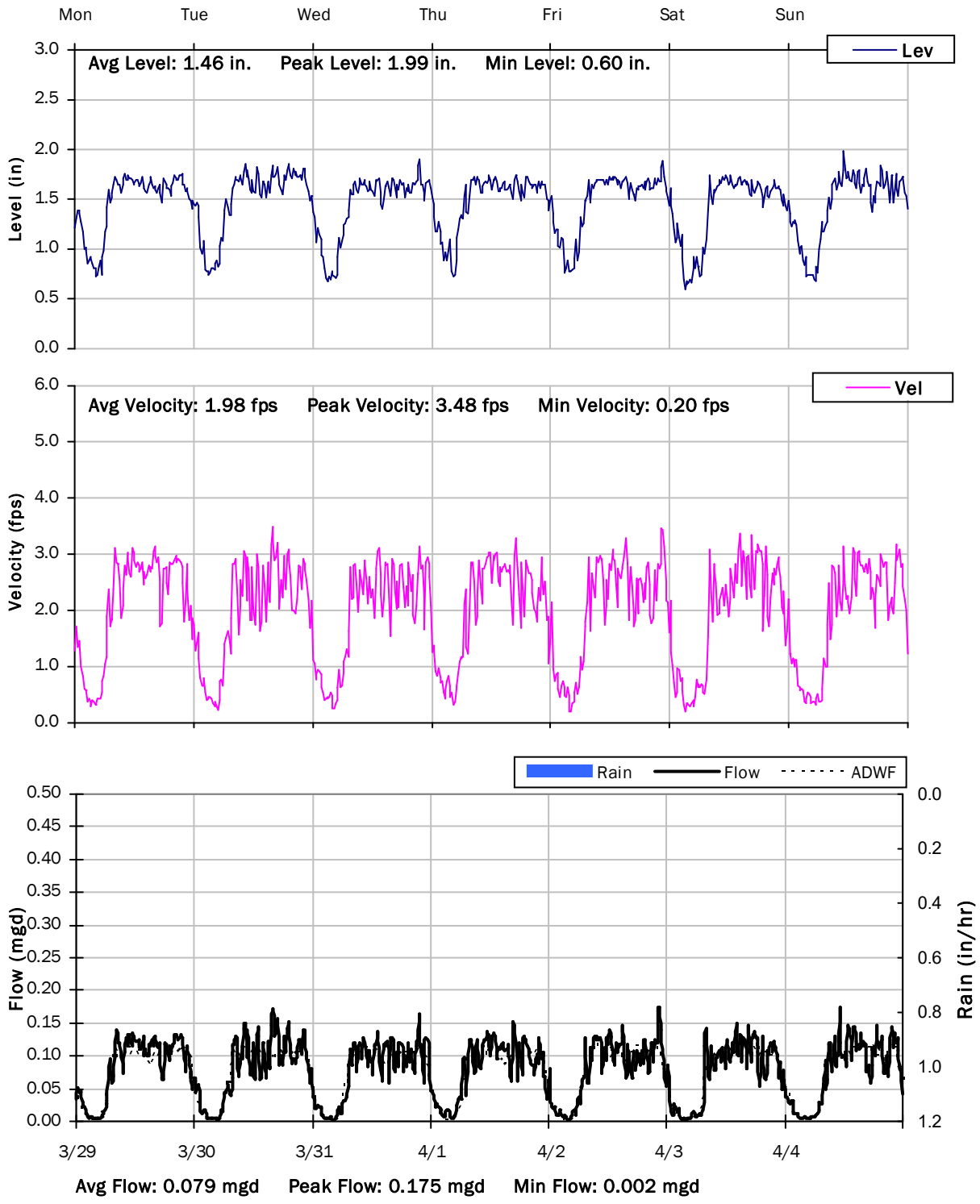
FM 6-5
Weekly Level, Velocity and Flow Hydrographs
3/15/2021 to 3/22/2021



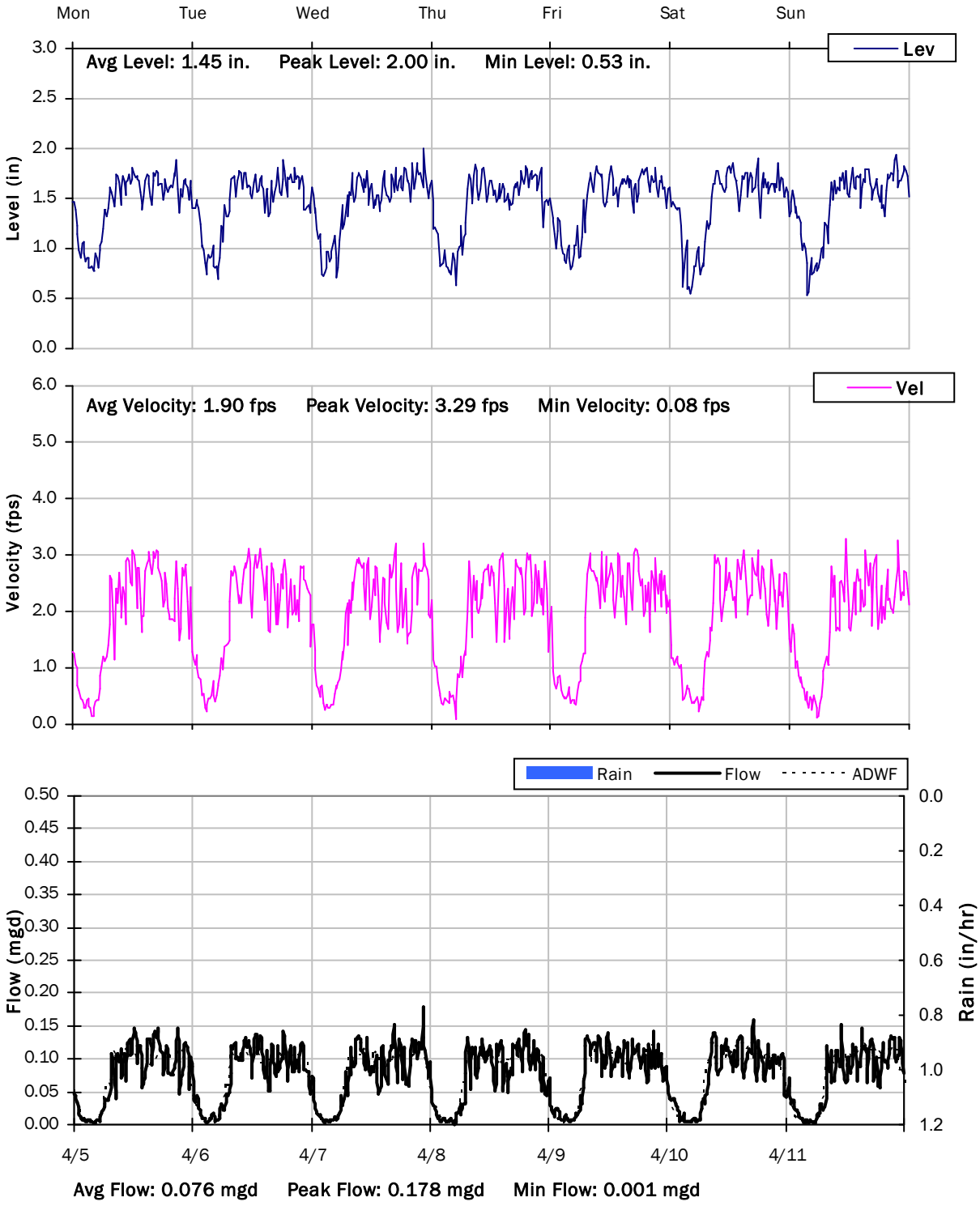
FM 6-5
Weekly Level, Velocity and Flow Hydrographs
3/22/2021 to 3/29/2021



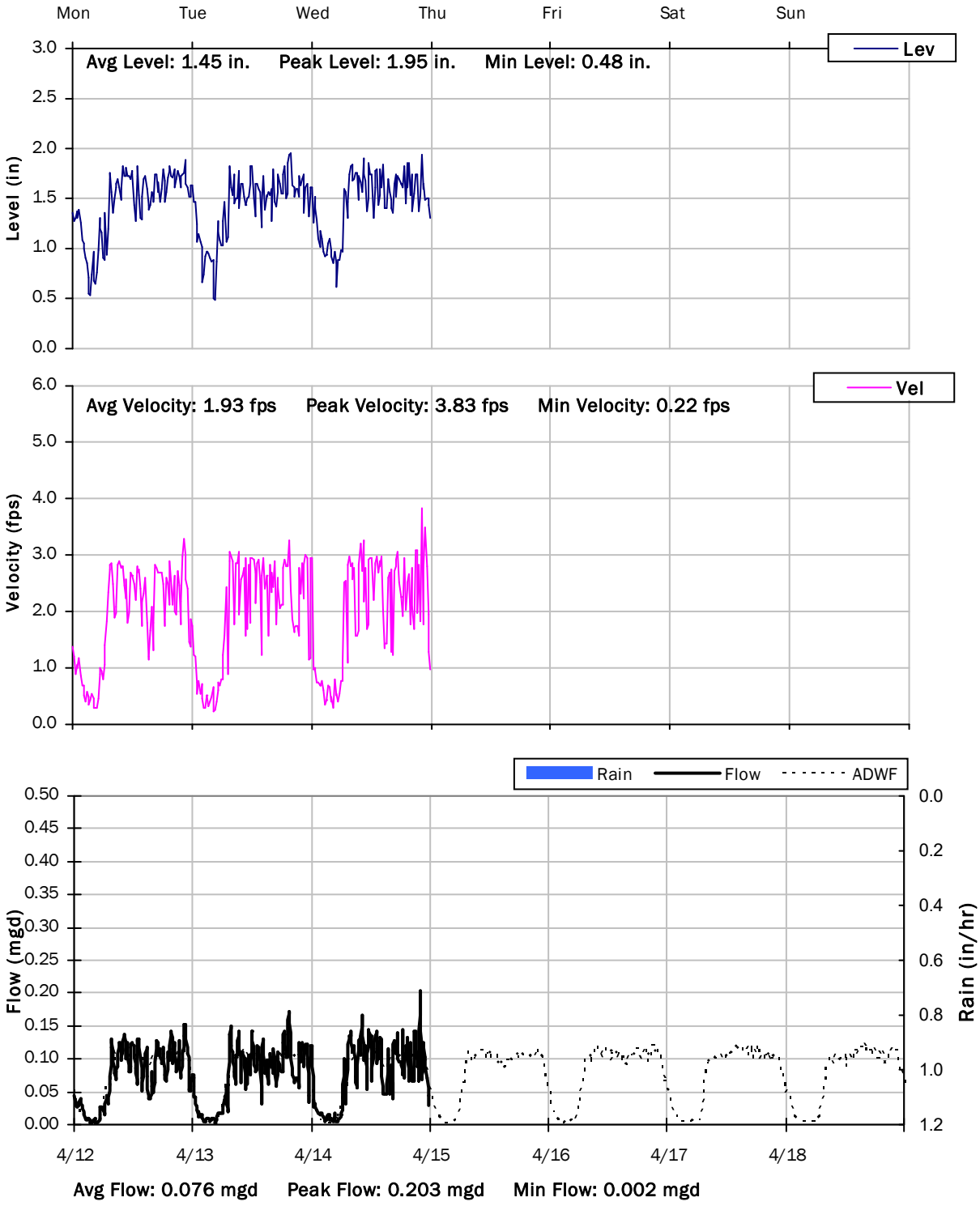
FM 6-5
Weekly Level, Velocity and Flow Hydrographs
3/29/2021 to 4/5/2021



FM 6-5
Weekly Level, Velocity and Flow Hydrographs
4/5/2021 to 4/12/2021



FM 6-5
Weekly Level, Velocity and Flow Hydrographs
4/12/2021 to 4/19/2021



South San Francisco, CA

Sanitary Sewer Flow Monitoring
January 4 - April 14, 2021

Monitoring Site: FM 6-6

Location: Arroyo Drive and Indio Drive

Data Summary Report

Vicinity Map: FM 6-6

FM 6-6

Site Information

Location: Arroyo Drive and Indio Drive

Coordinates: 122.4401° W, 37.6543° N

Rim Elevation (Earth): 69 feet

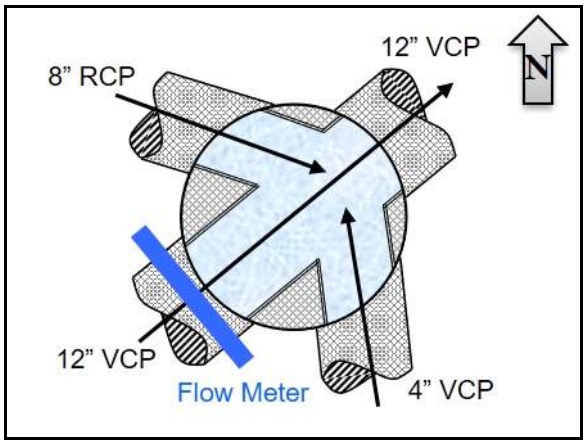
Pipe Diameter: 12 inches

ADWF: 0.160 mgd

Peak Measured Flow: 1.051 mgd

Satellite Map

Sanitary Map



Flow Sketch

Street View

Plan View

FM 6-6

Additional Site Photos

Effluent Pipe

Monitored Southwest Influent Pipe

FM 6-6

Additional Site Photos

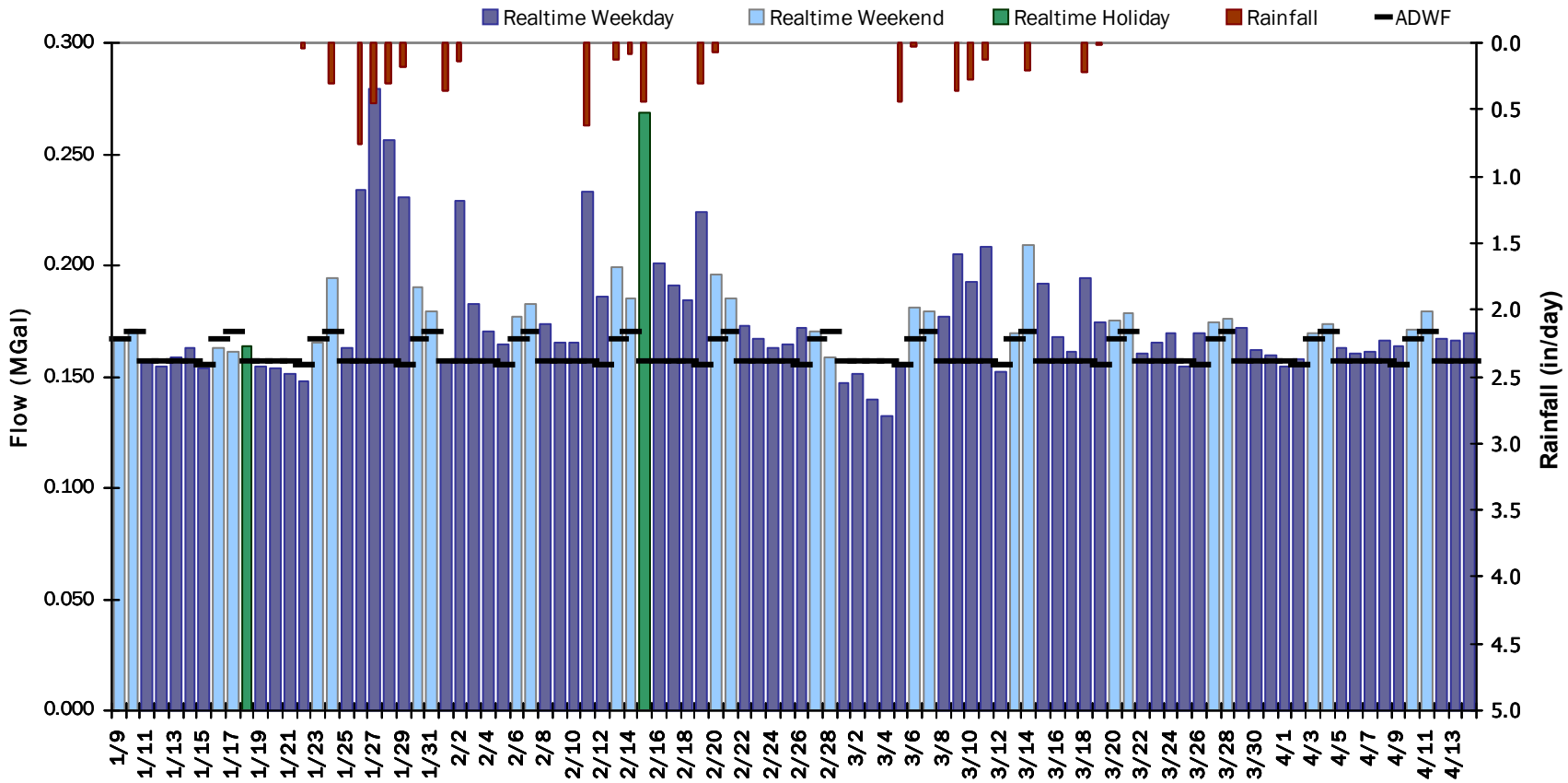
Northwest Influent Pipe

Southeast Influent Pipe

FM 6-6
Period Flow Summary: Daily Flow Totals

Avg Period Flow: 0.176 MGal Peak Daily Flow: 0.280 MGal Min Daily Flow: 0.132 MGal

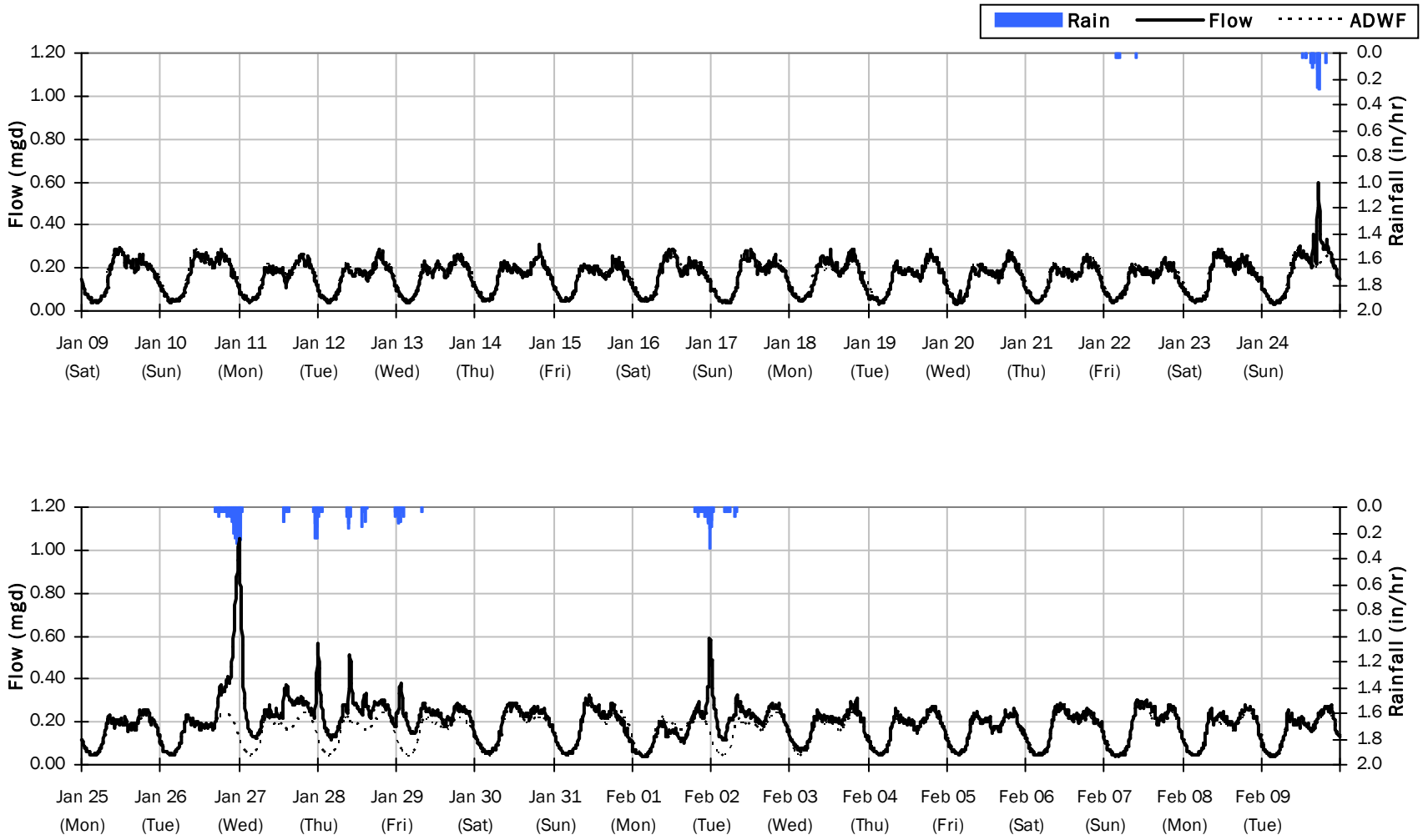
Total Period Rainfall: 5.85 inches



FM 6-6

Flow Summary: 1/9/2021 to 2/9/2021

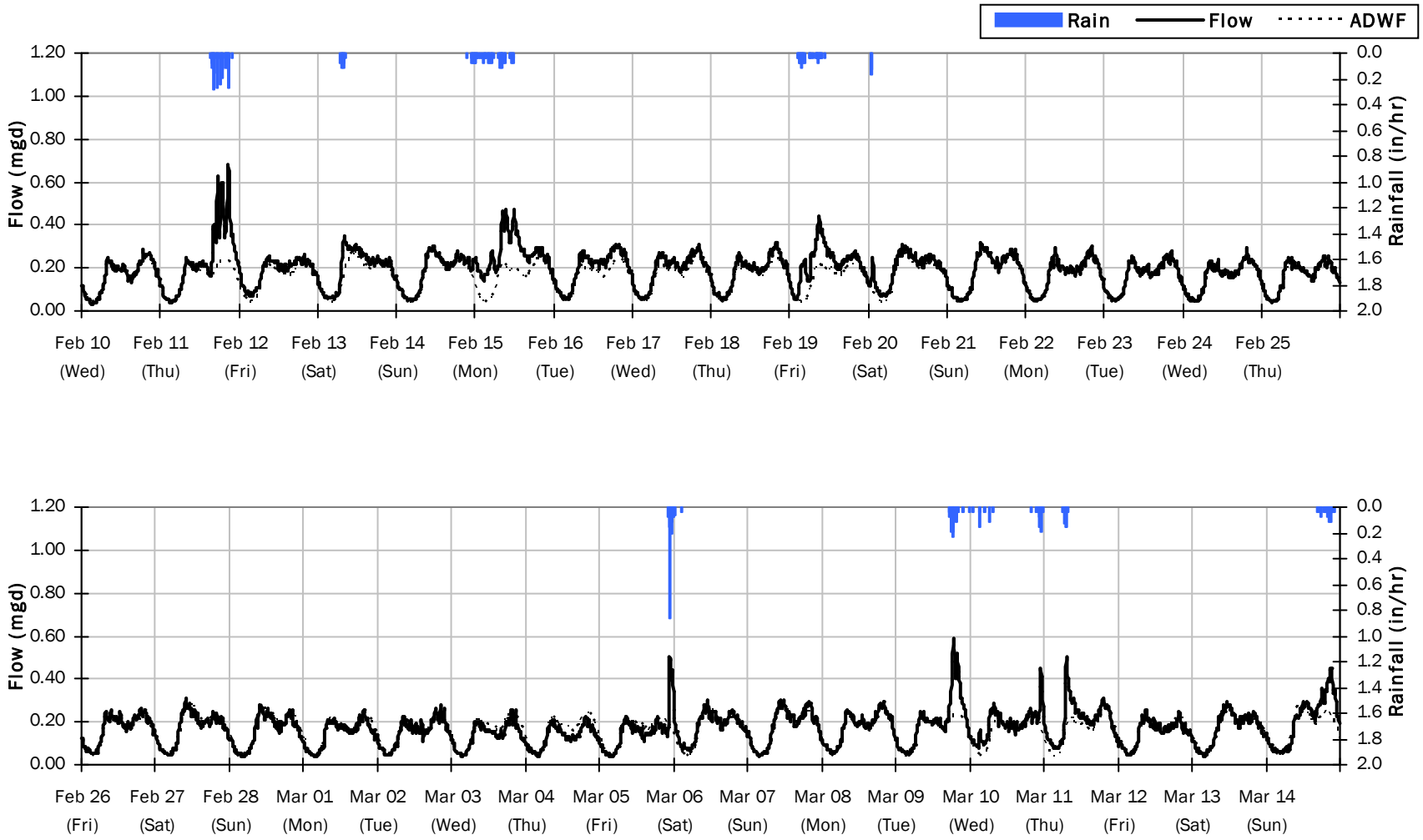
Total Period Rainfall: 2.53 inches Avg Flow: 0.179 mgd Peak Flow: 1.051 mgd Min Flow: 0.033 mgd



FM 6-6

Flow Summary: 2/10/2021 to 3/14/2021

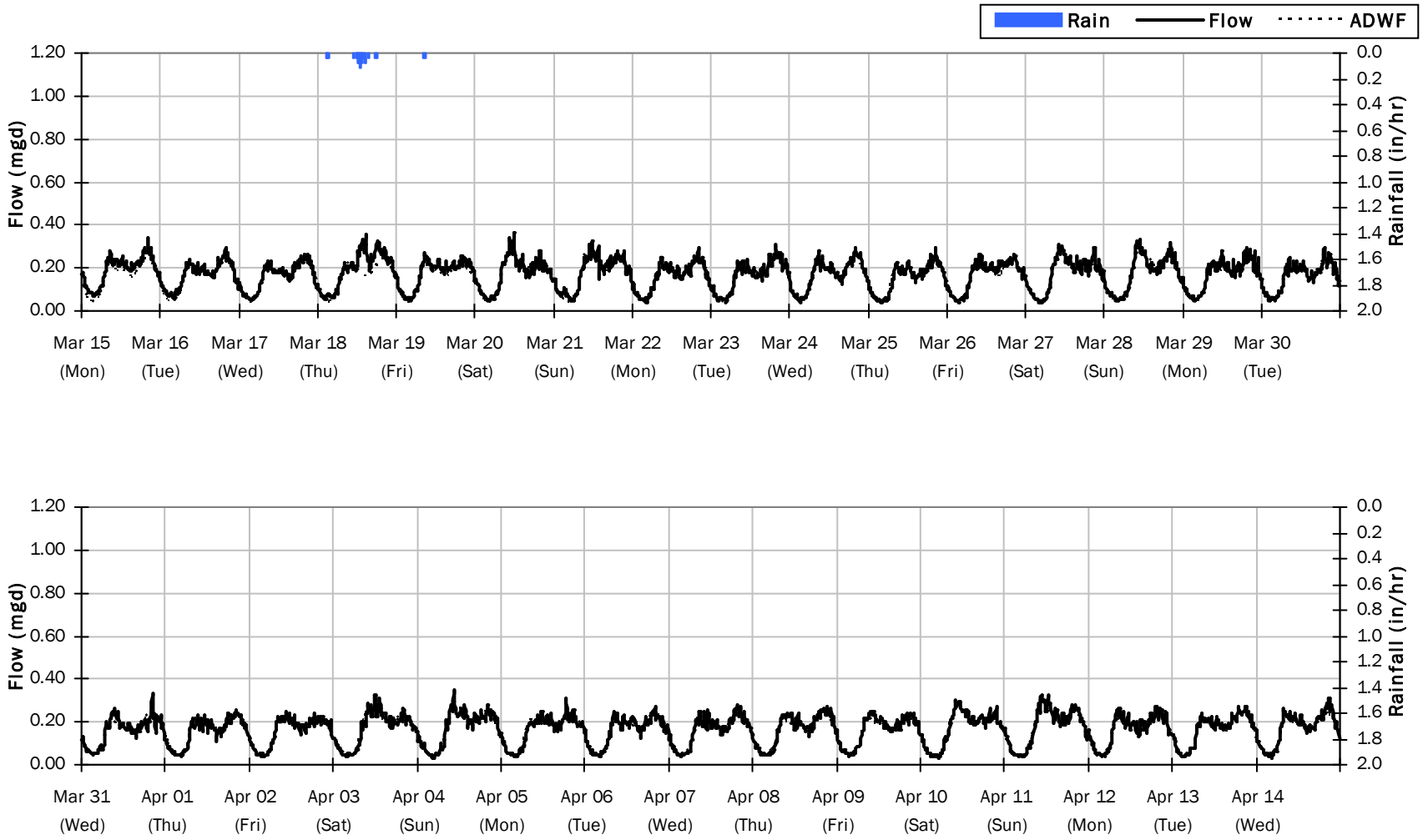
Total Period Rainfall: 3.07 inches Avg Flow: 0.181 mgd Peak Flow: 0.685 mgd Min Flow: 0.031 mgd



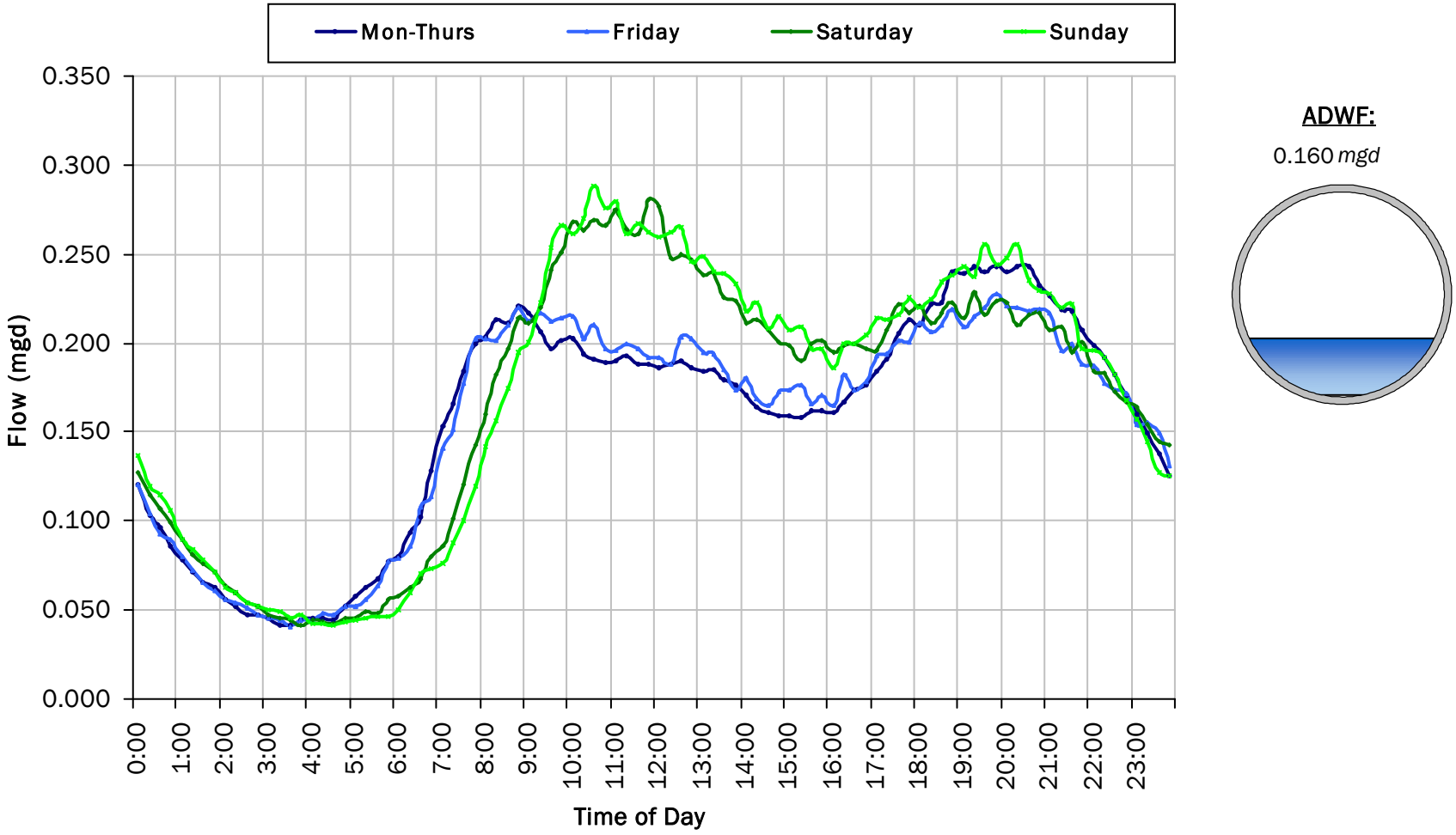
FM 6-6

Flow Summary: 3/15/2021 to 4/14/2021

Total Period Rainfall: 0.24 inches Avg Flow: 0.169 mgd Peak Flow: 0.367 mgd Min Flow: 0.031 mgd



FM 6-6
Average Dry Weather Flow Hydrographs



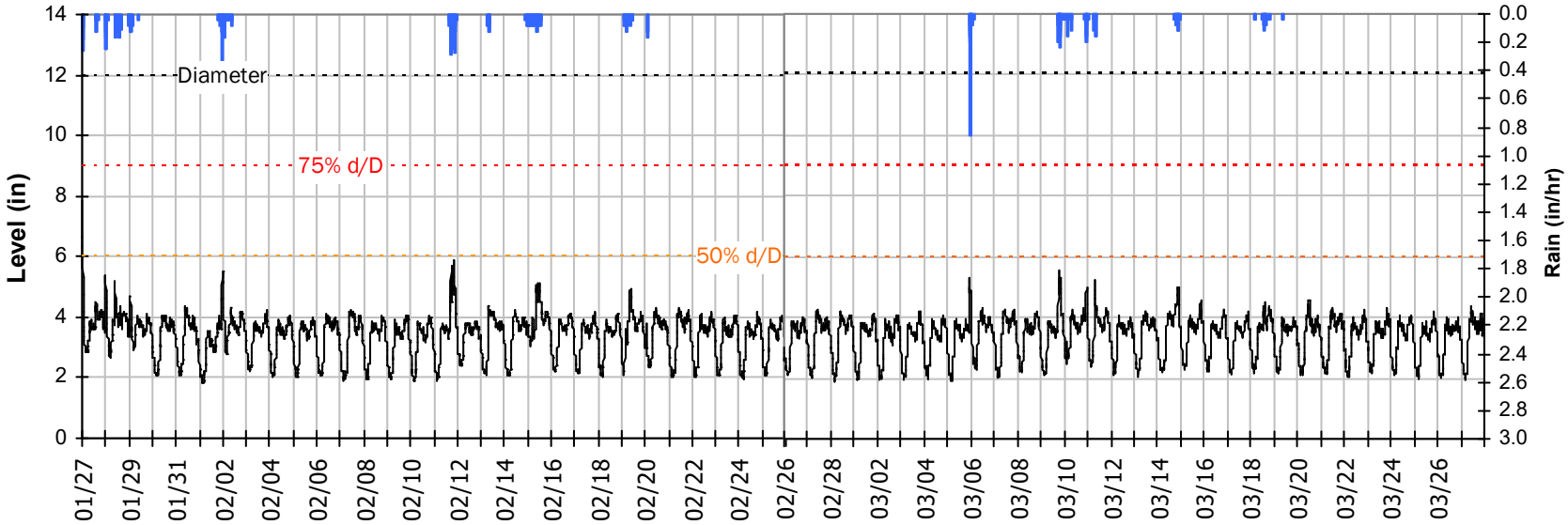
ADWF:

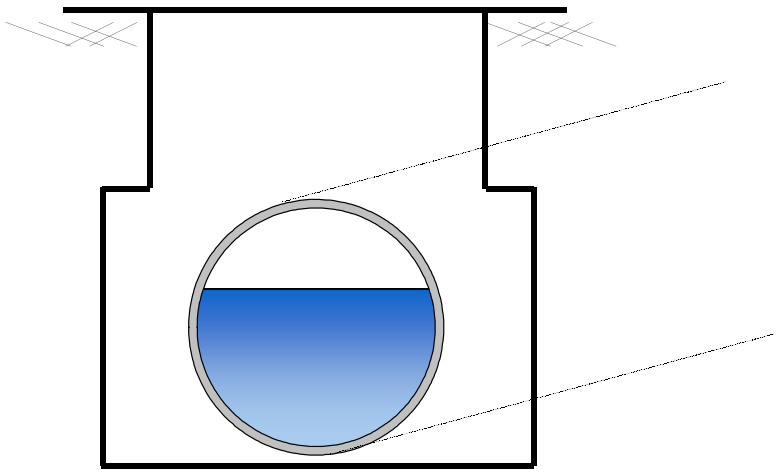
0.160 *mgd*

FM 6-6

Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Monitoring Period

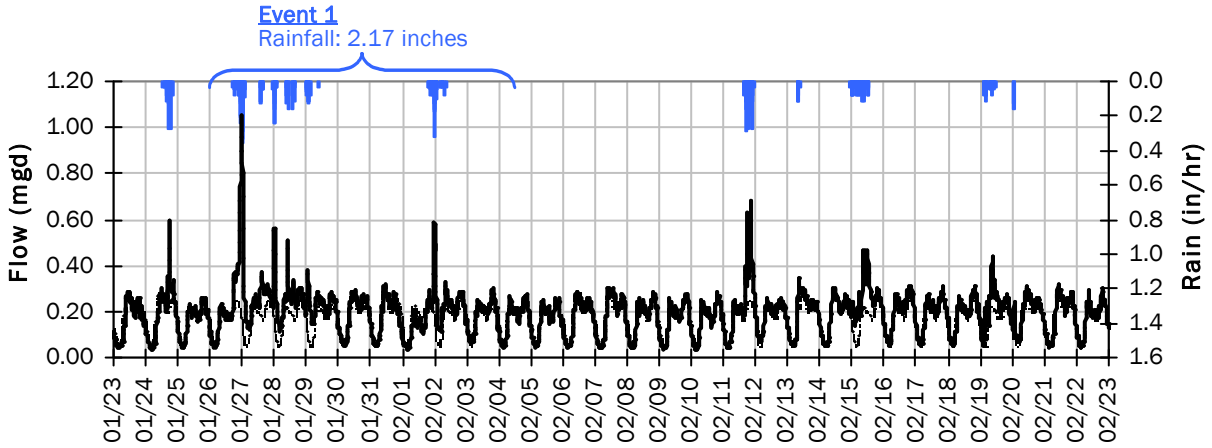




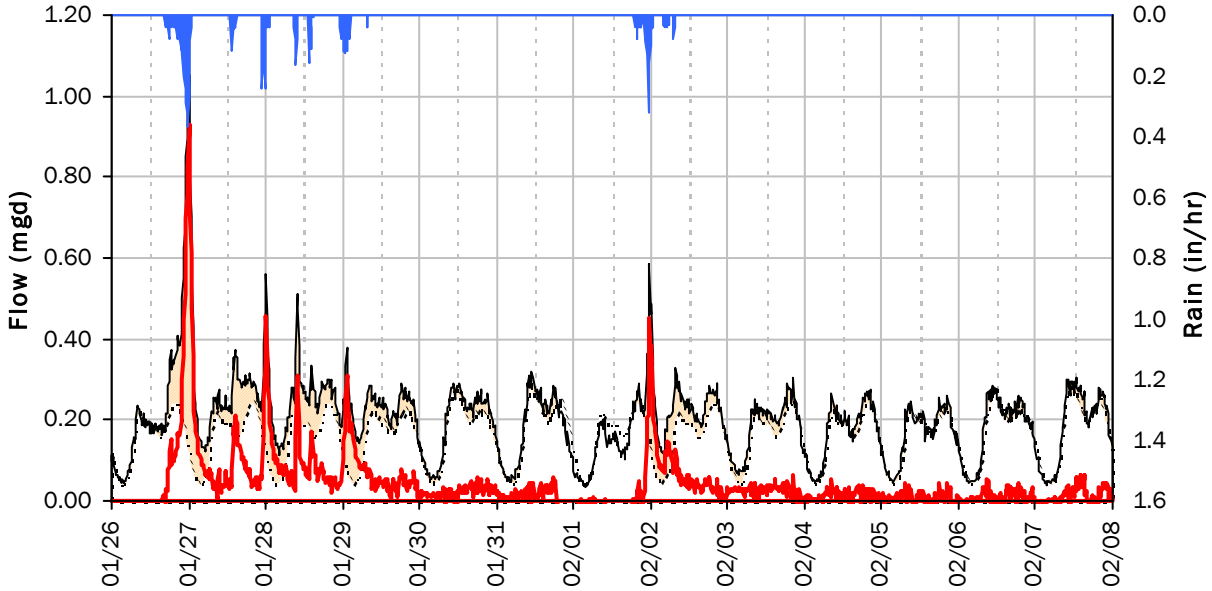
Pipe Diameter:	12	*inches*
Peak Measured Level:	7.88	*inches*
Peak d/D Ratio:	0.66	

FM 6-6
I/I Summary: Event 1

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



Event 1 Detail Graph

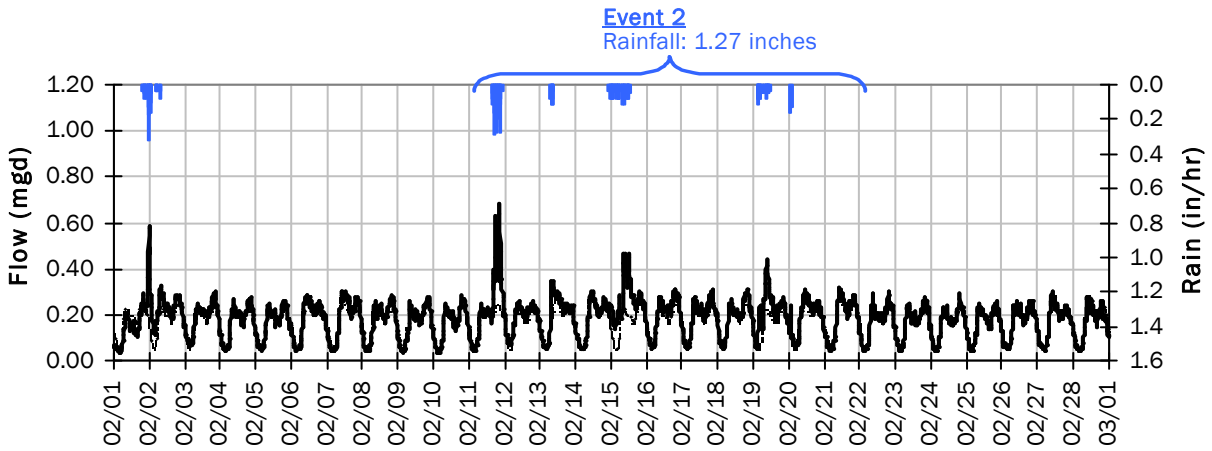


Storm Event I/I Analysis (Rain = 2.17 inches)

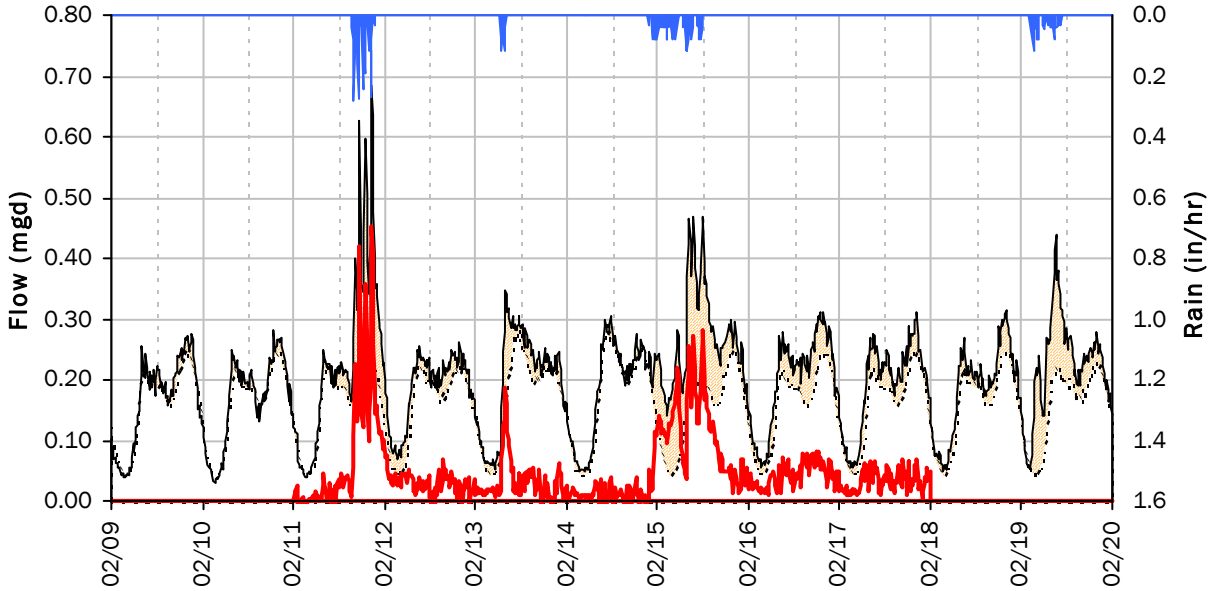
Capacity		Inflow / Infiltration	
Peak Flow:	1.05 *mgd*	**Peak I/I Rate:**	0.93 *mgd*
PF:	6.56	**Total I/I:**	545,000 *gallons*
Peak Level:	7.88 *in*		
d/D Ratio:	0.66		

FM 6-6
I/I Summary: Event 2

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



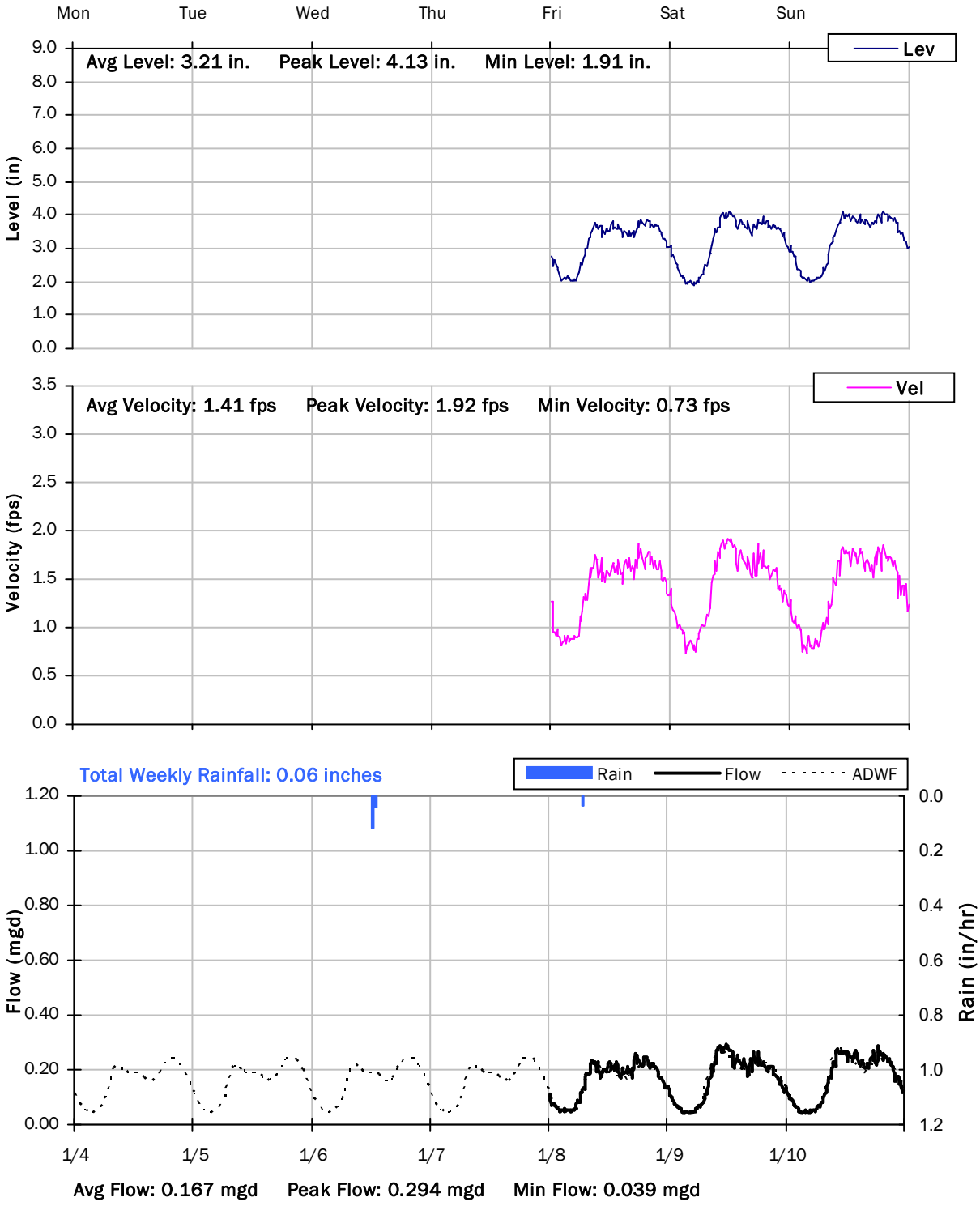
Event 2 Detail Graph



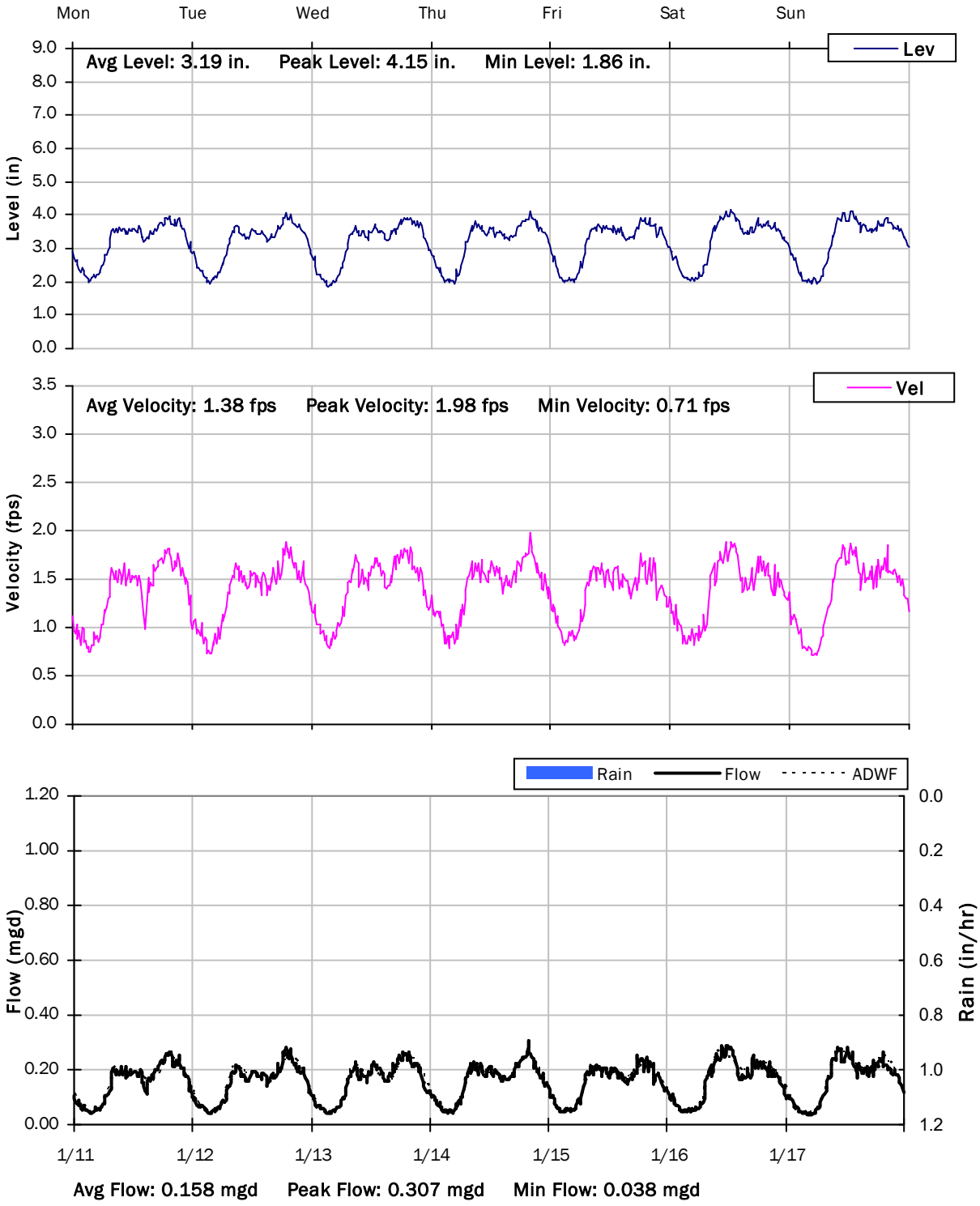
Storm Event I/I Analysis (Rain = 1.27 inches)

Capacity		Inflow / Infiltration	
Peak Flow:	0.69 *mgd*	**Peak I/I Rate:**	0.45 *mgd*
PF:	4.28	**Total I/I:**	343,000 *gallons*
Peak Level:	5.91 *in*		
d/D Ratio:	0.49		

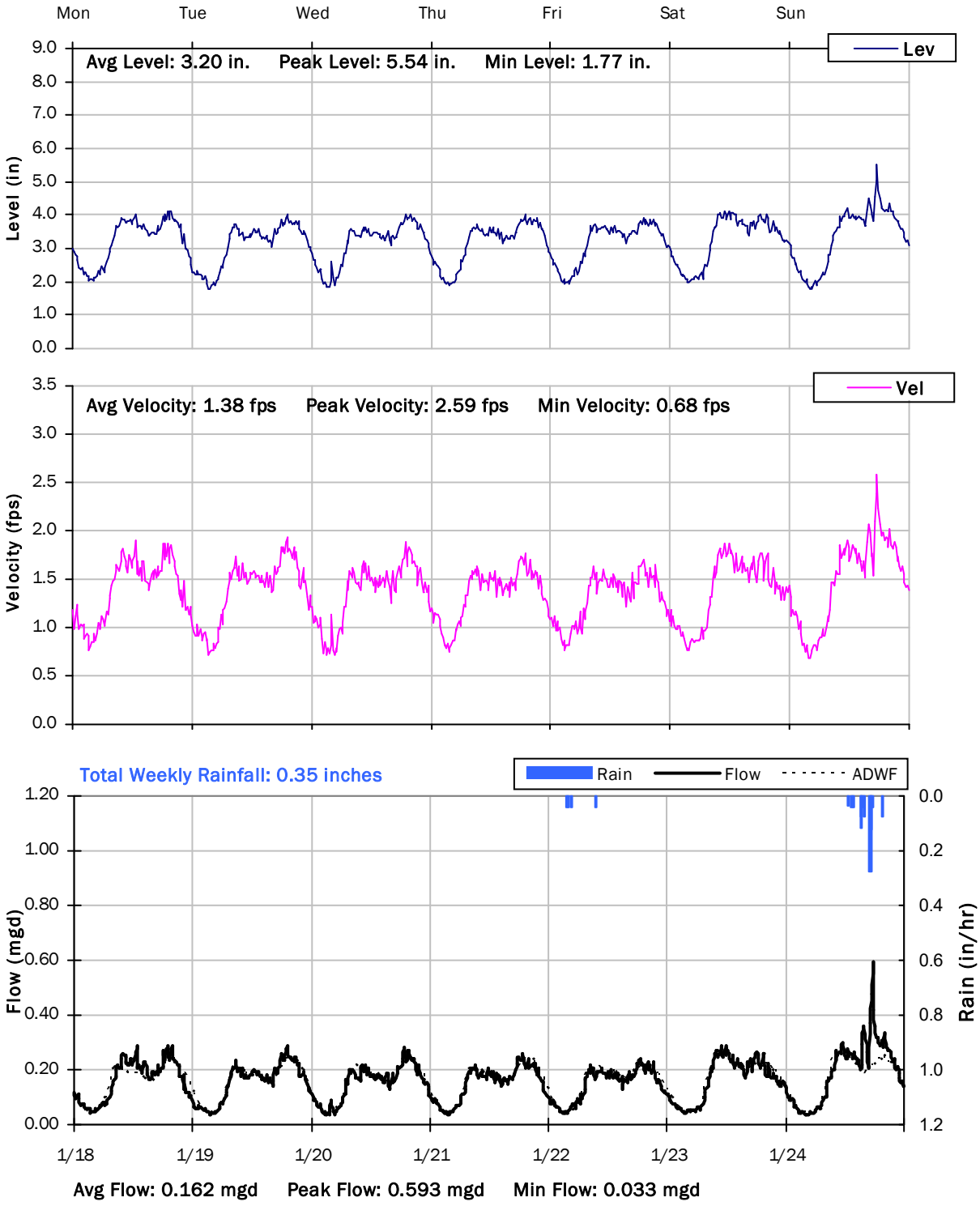
FM 6-6
Weekly Level, Velocity and Flow Hydrographs
1/4/2021 to 1/11/2021



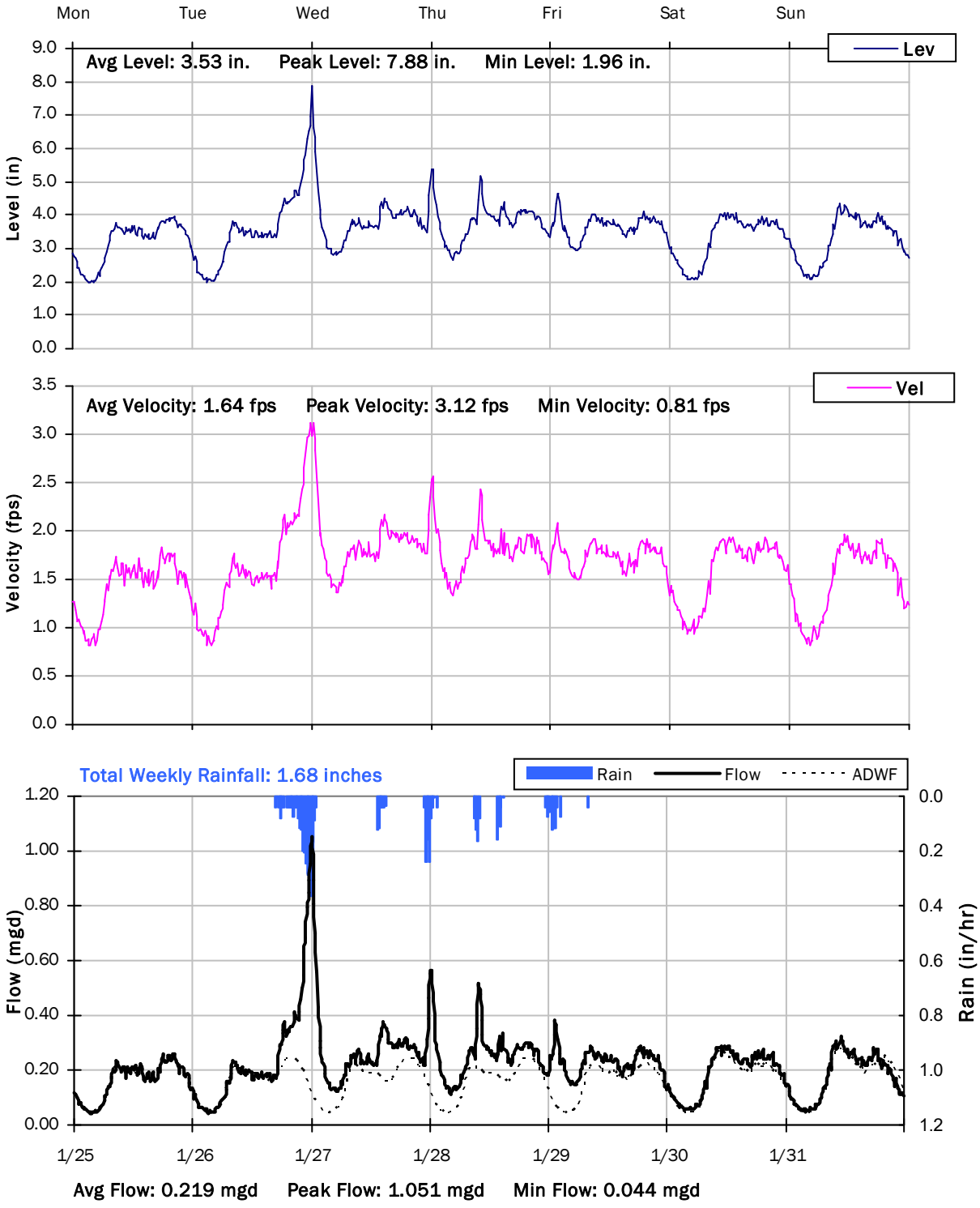
FM 6-6
Weekly Level, Velocity and Flow Hydrographs
1/11/2021 to 1/18/2021



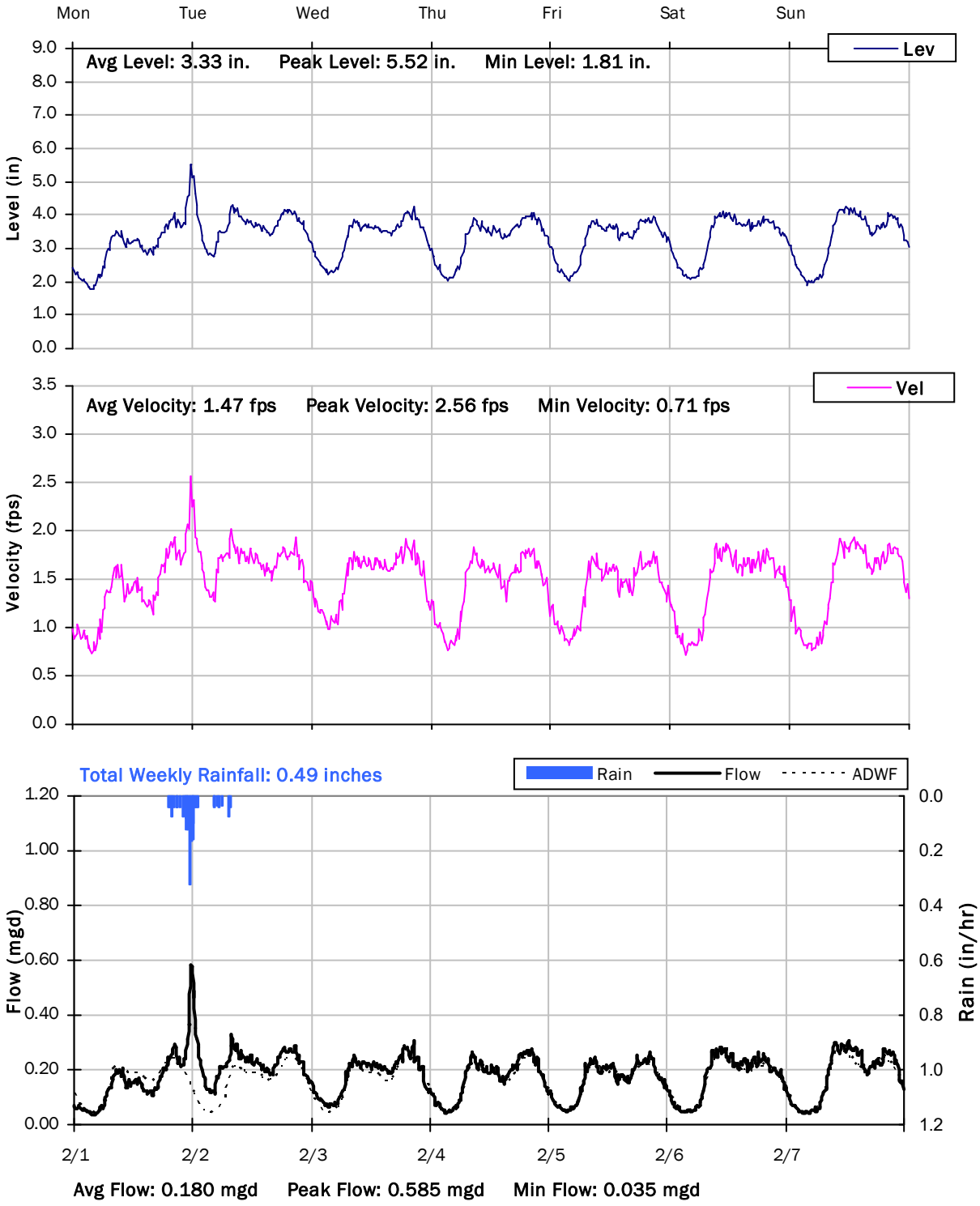
FM 6-6
Weekly Level, Velocity and Flow Hydrographs
1/18/2021 to 1/25/2021



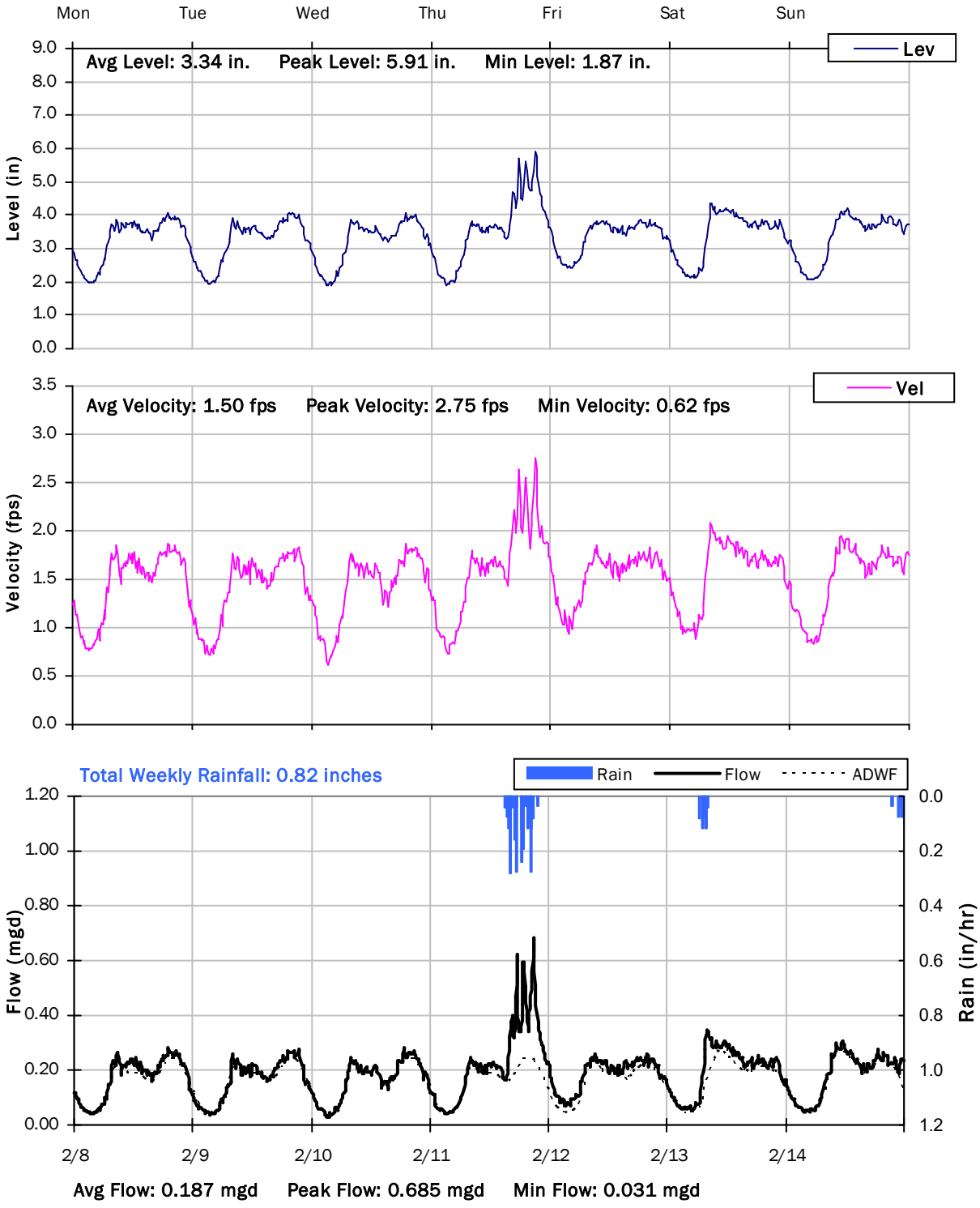
FM 6-6
Weekly Level, Velocity and Flow Hydrographs
1/25/2021 to 2/1/2021



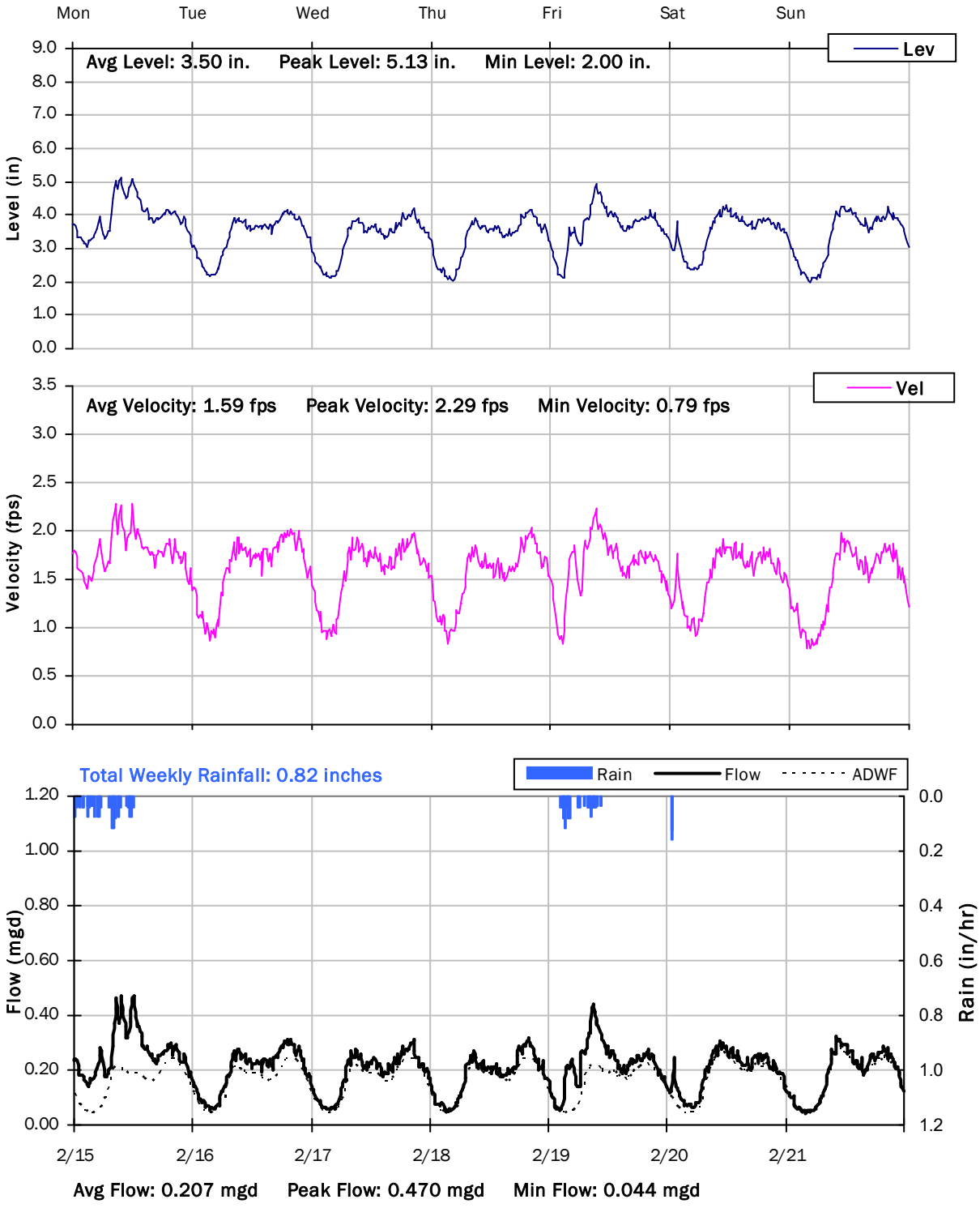
FM 6-6
Weekly Level, Velocity and Flow Hydrographs
2/1/2021 to 2/8/2021



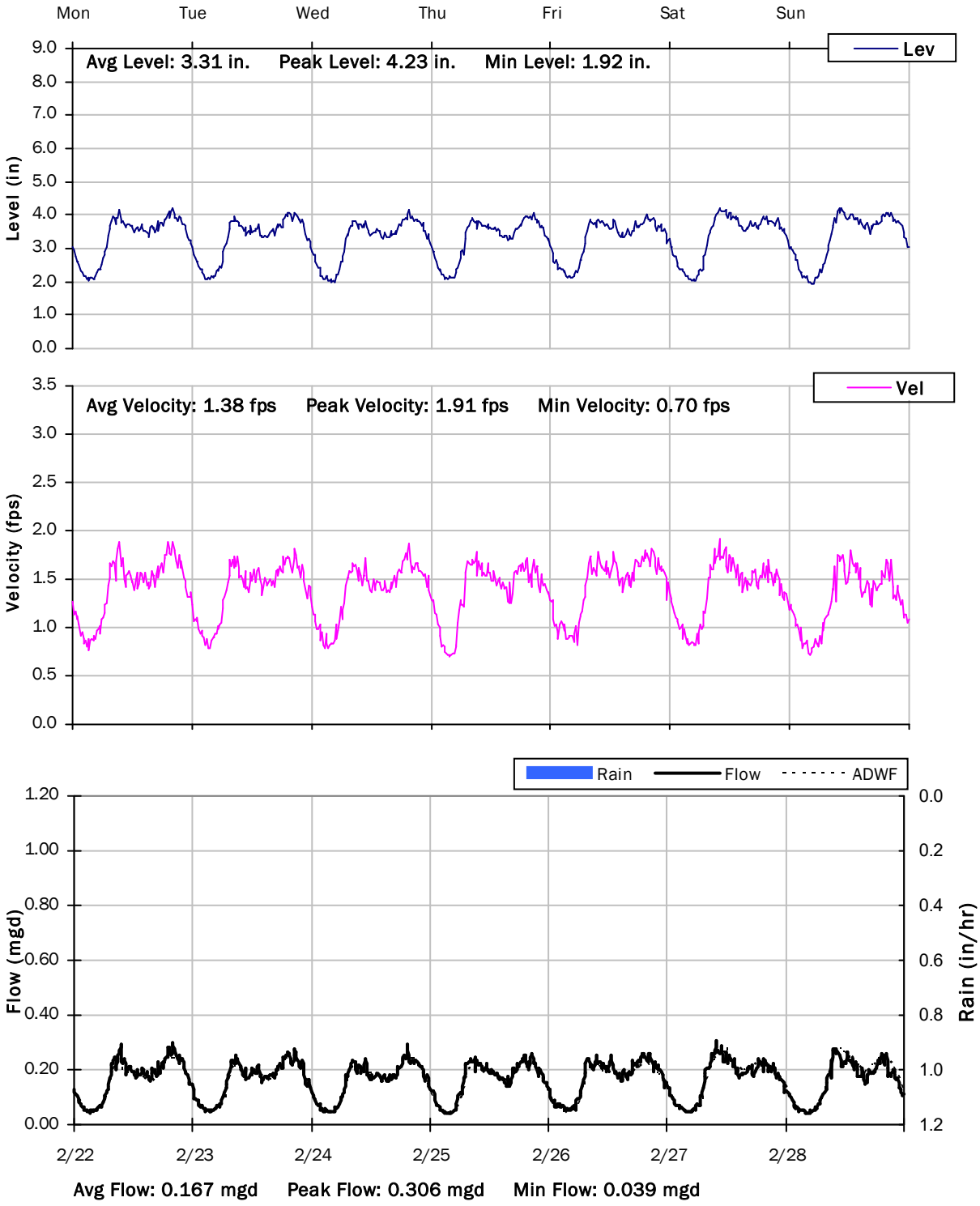
FM 6-6
Weekly Level, Velocity and Flow Hydrographs
2/8/2021 to 2/15/2021



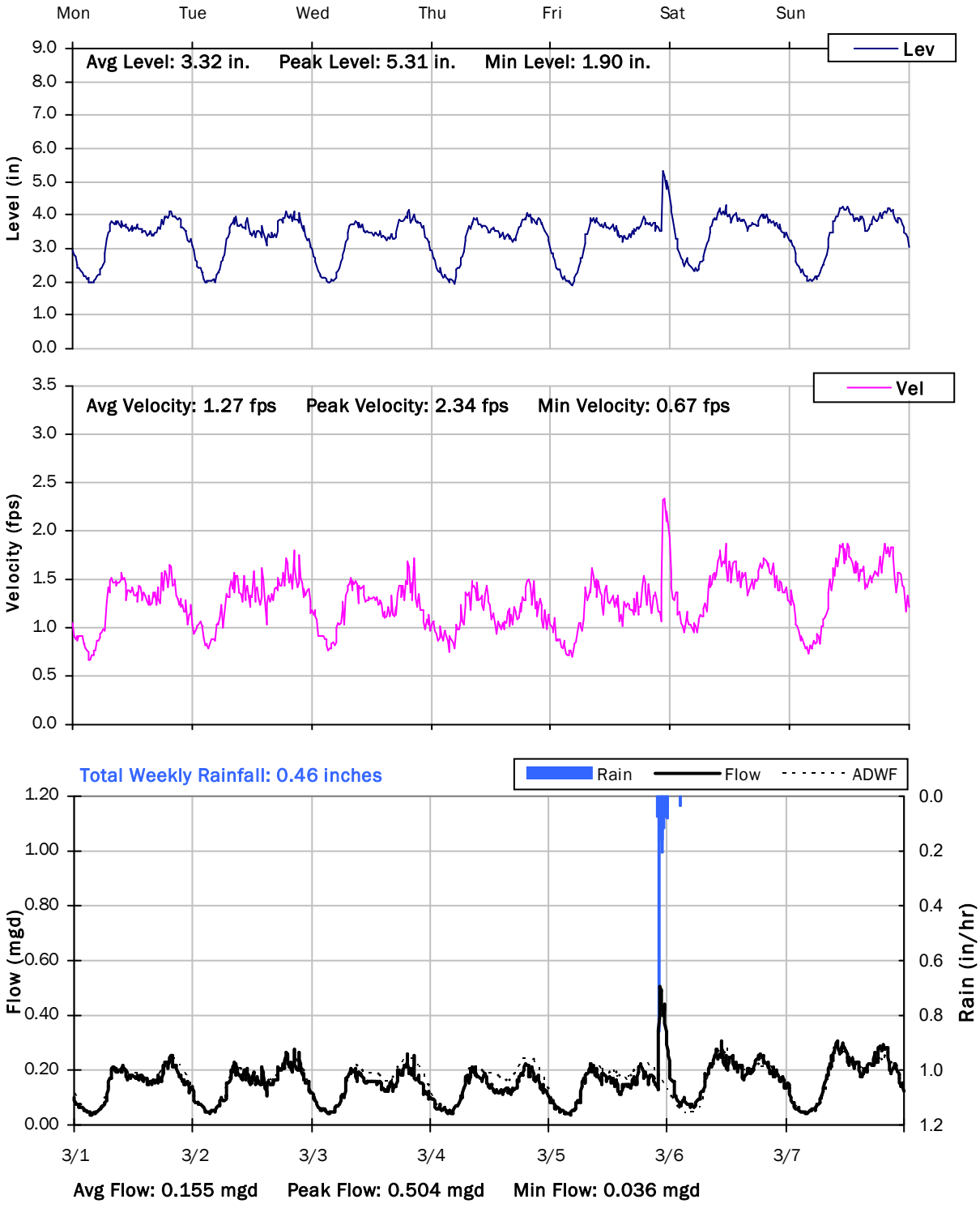
FM 6-6
Weekly Level, Velocity and Flow Hydrographs
2/15/2021 to 2/22/2021



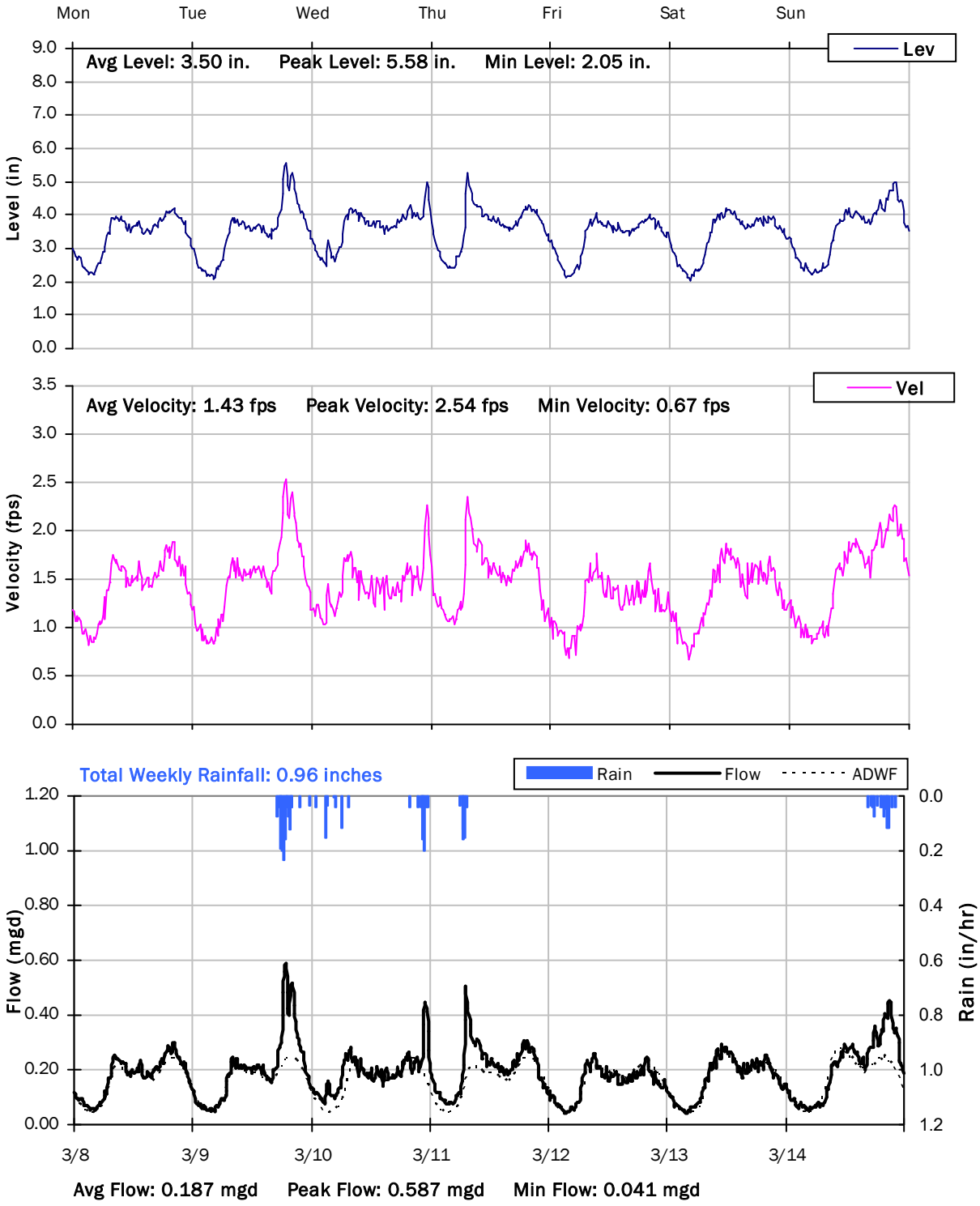
FM 6-6
Weekly Level, Velocity and Flow Hydrographs
2/22/2021 to 3/1/2021



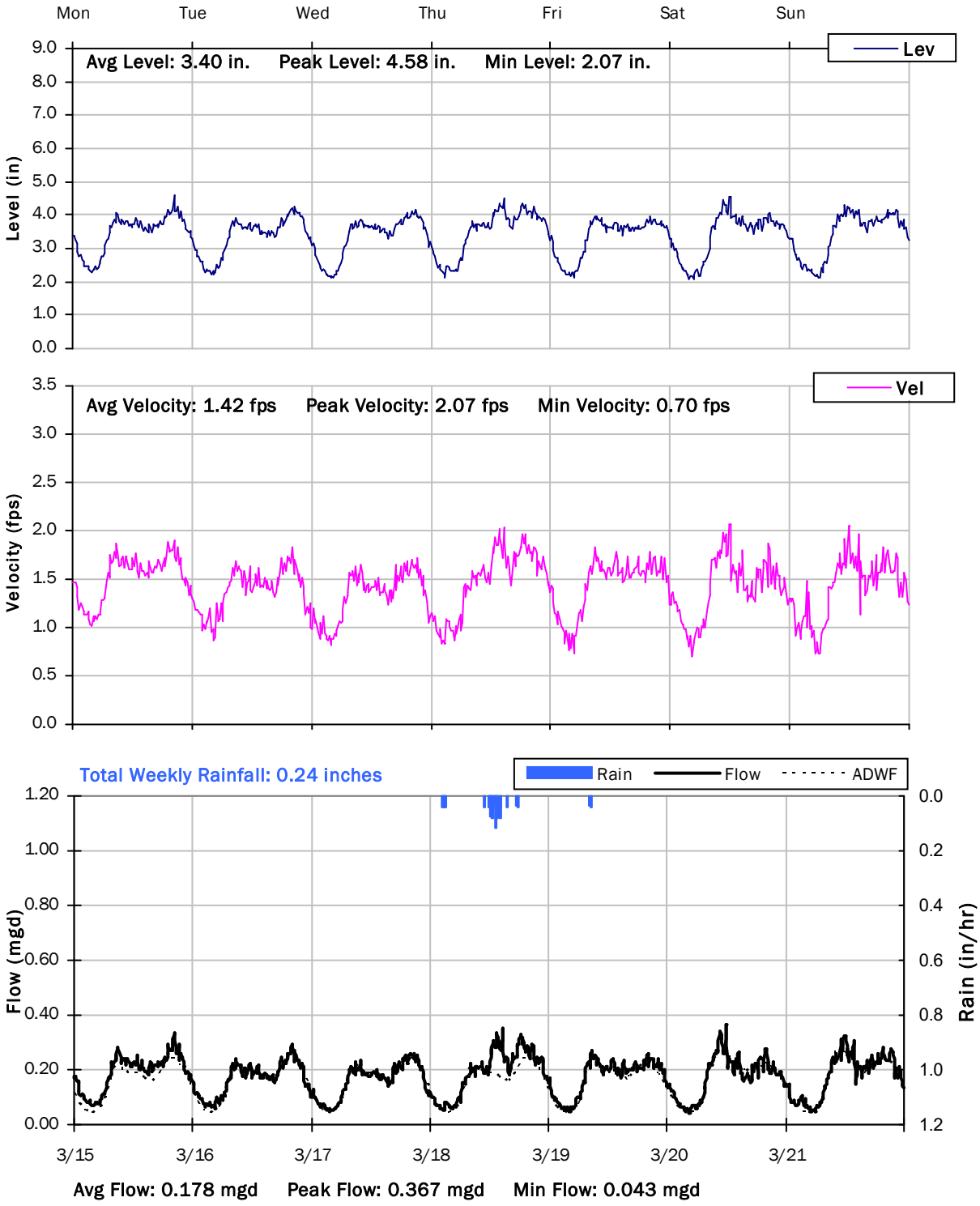
FM 6-6
Weekly Level, Velocity and Flow Hydrographs
3/1/2021 to 3/8/2021



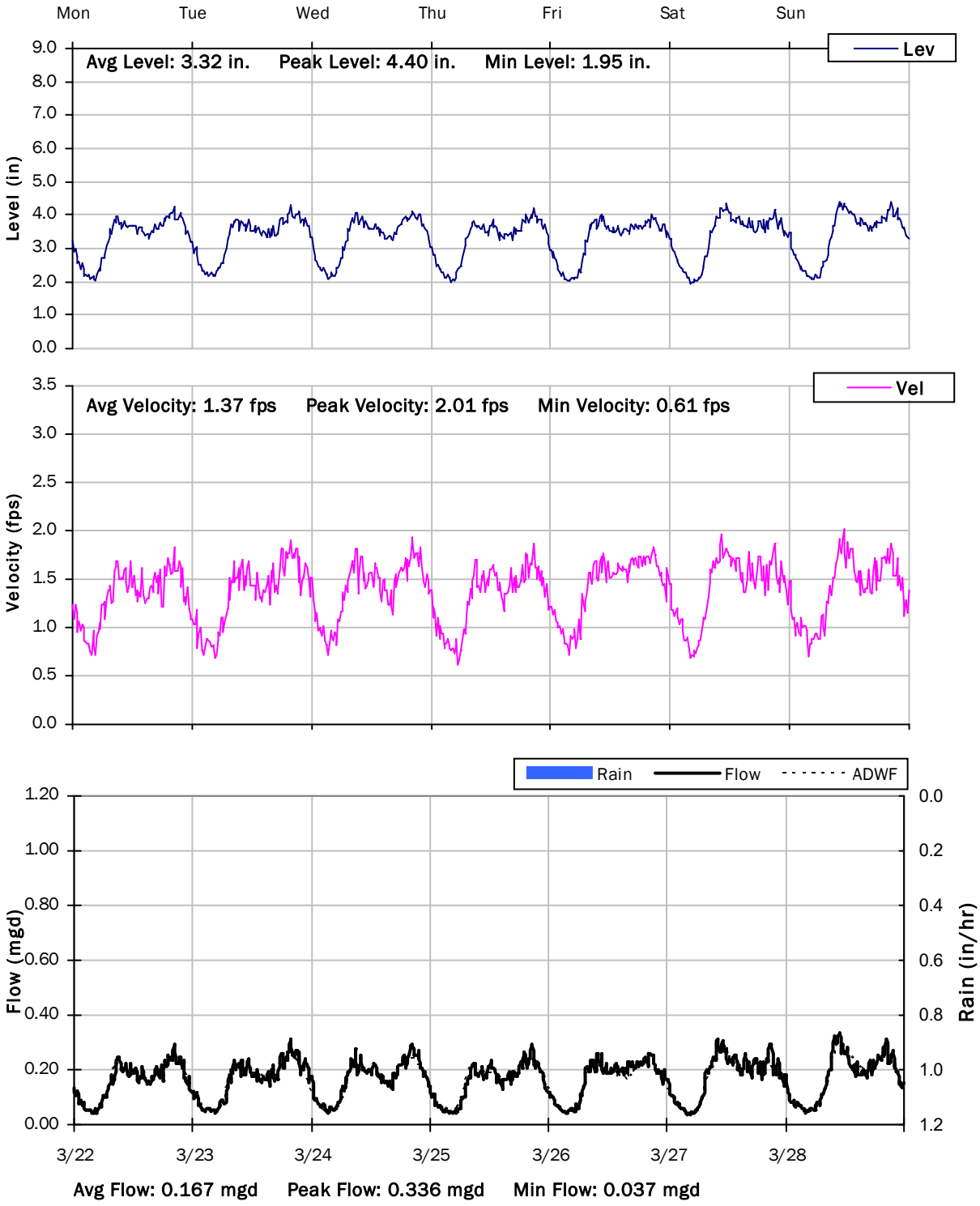
FM 6-6
Weekly Level, Velocity and Flow Hydrographs
3/8/2021 to 3/15/2021



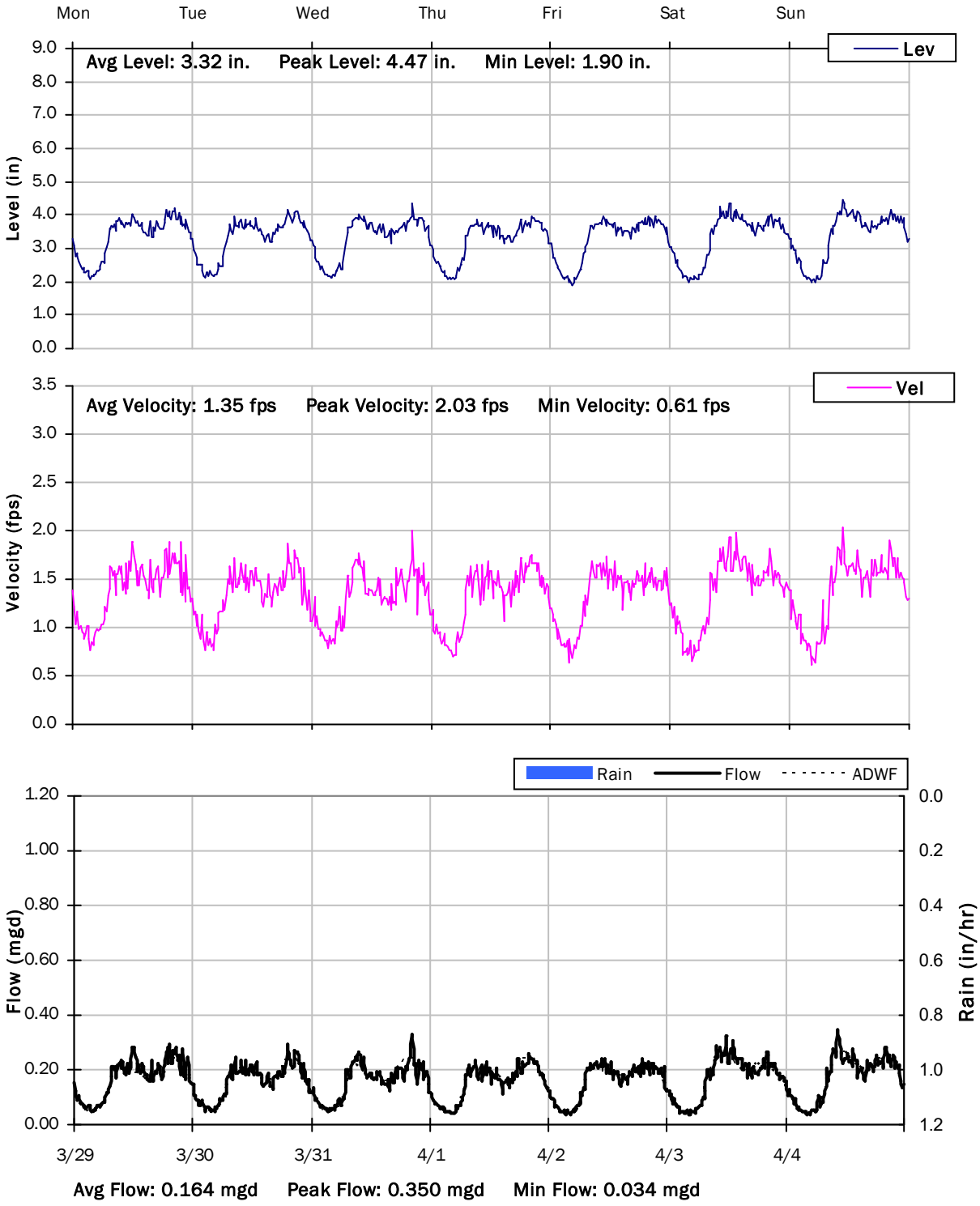
FM 6-6
Weekly Level, Velocity and Flow Hydrographs
3/15/2021 to 3/22/2021



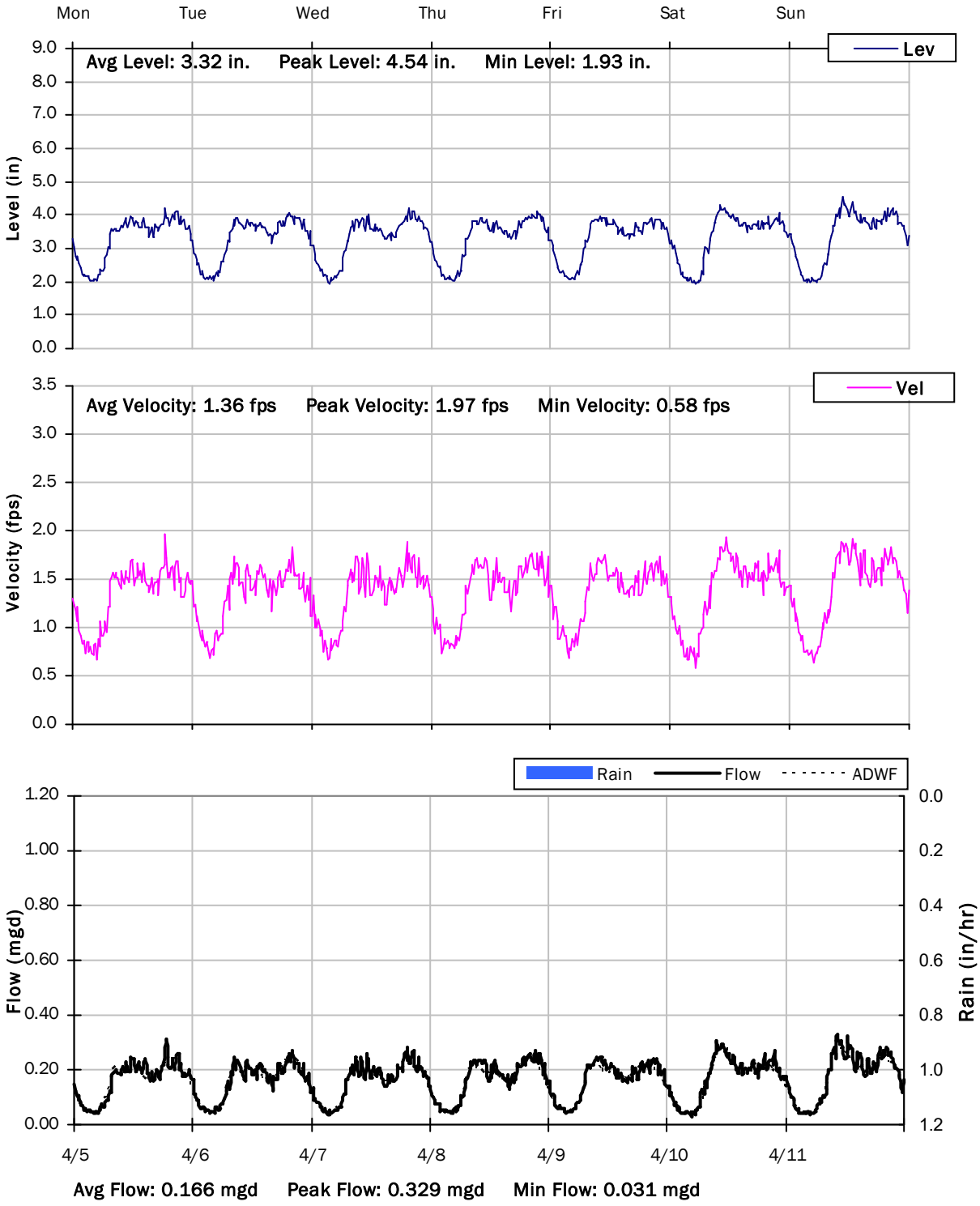
FM 6-6
Weekly Level, Velocity and Flow Hydrographs
3/22/2021 to 3/29/2021



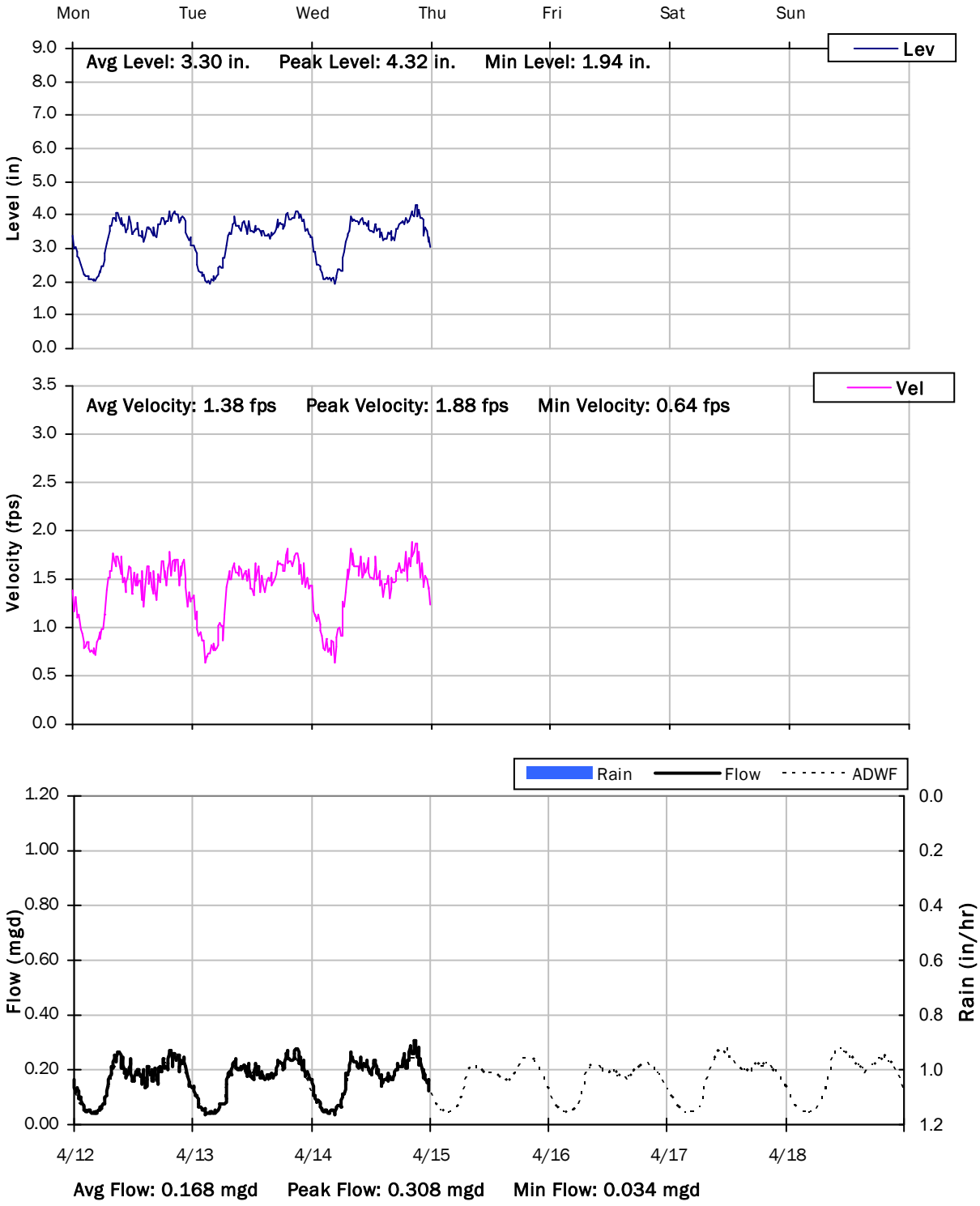
FM 6-6
Weekly Level, Velocity and Flow Hydrographs
3/29/2021 to 4/5/2021



FM 6-6
Weekly Level, Velocity and Flow Hydrographs
4/5/2021 to 4/12/2021



FM 6-6
Weekly Level, Velocity and Flow Hydrographs
4/12/2021 to 4/19/2021



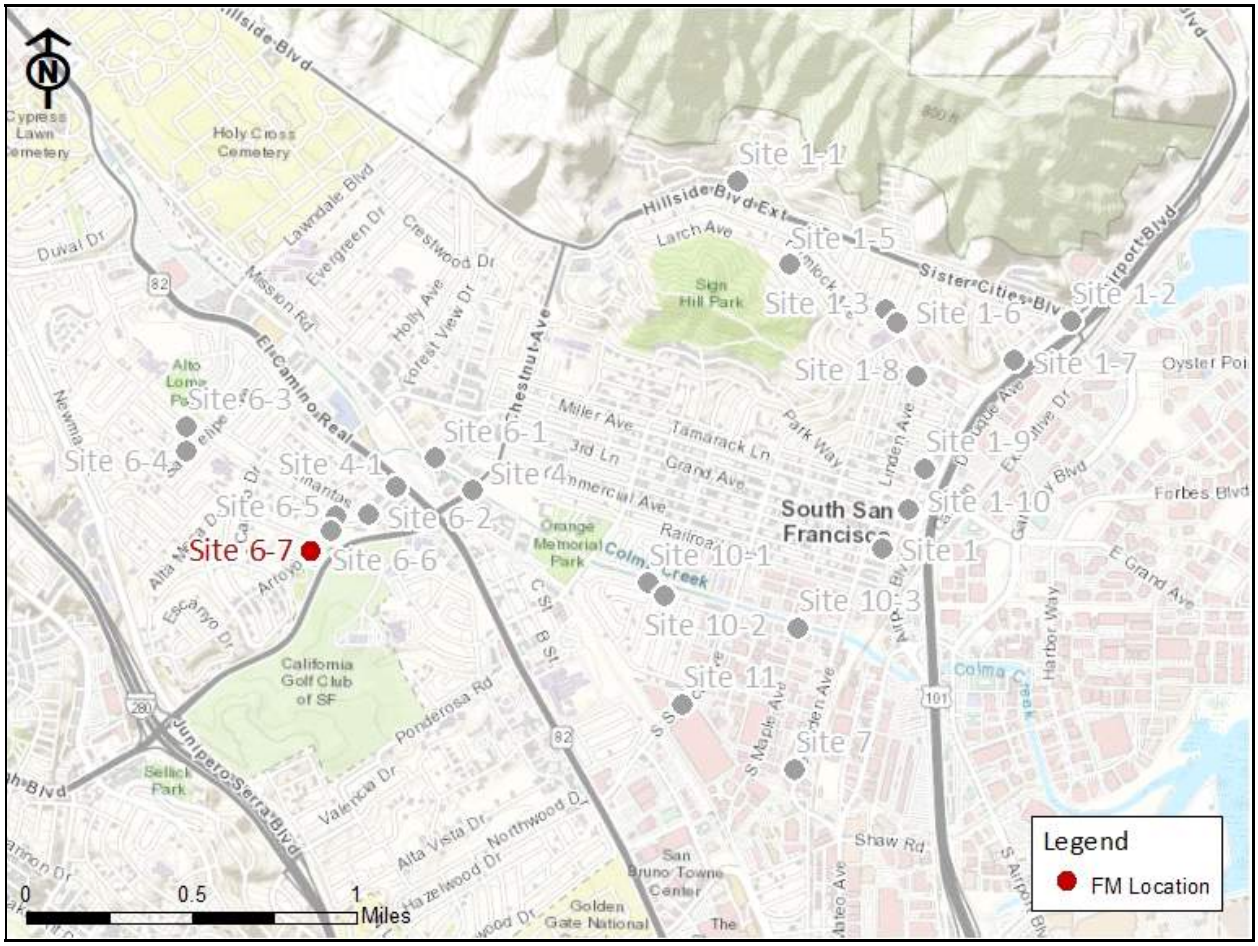
South San Francisco, CA

Sanitary Sewer Flow Monitoring
January 4 - April 14, 2021

Monitoring Site: FM 6-7

Location: 205 Arroyo Drive

Data Summary Report



Vicinity Map: FM 6-7

FM 6-7

Site Information

Location: 205 Arroyo Drive

Coordinates: 122.4411° W, 37.6534° N

Rim Elevation (Earth): 82 feet

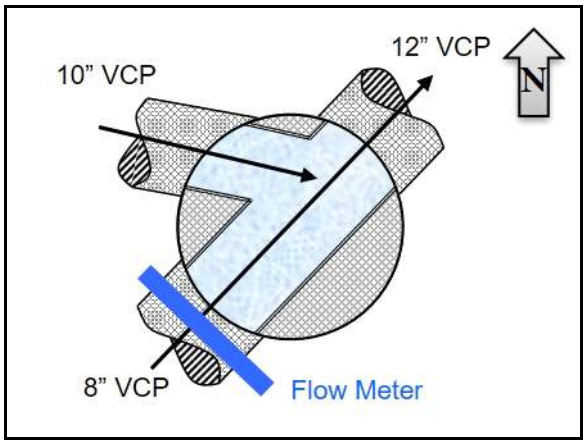
Pipe Diameter: 8 inches

ADWF: 0.058 mgd

Peak Measured Flow: 0.386 mgd

Satellite Map

Sanitary Map



Flow Sketch

Street View

Plan View

FM 6-7

Additional Site Photos

Effluent Pipe

Southwest Monitored Influent Pipe

FM 6-7

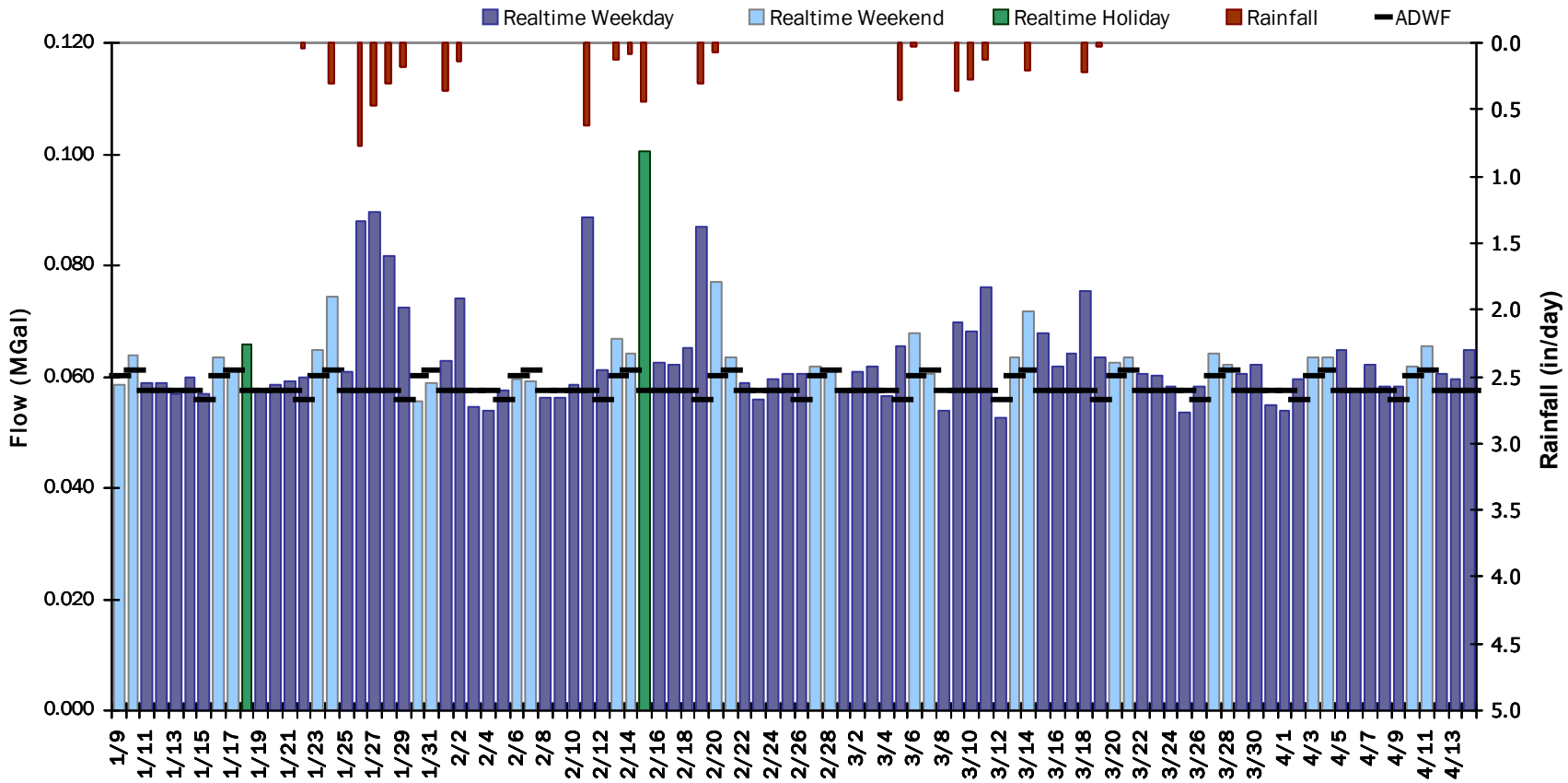
Additional Site Photos

Northwest Influent Pipe

FM 6-7
Period Flow Summary: Daily Flow Totals

Avg Period Flow: 0.063 MGal Peak Daily Flow: 0.100 MGal Min Daily Flow: 0.052 MGal

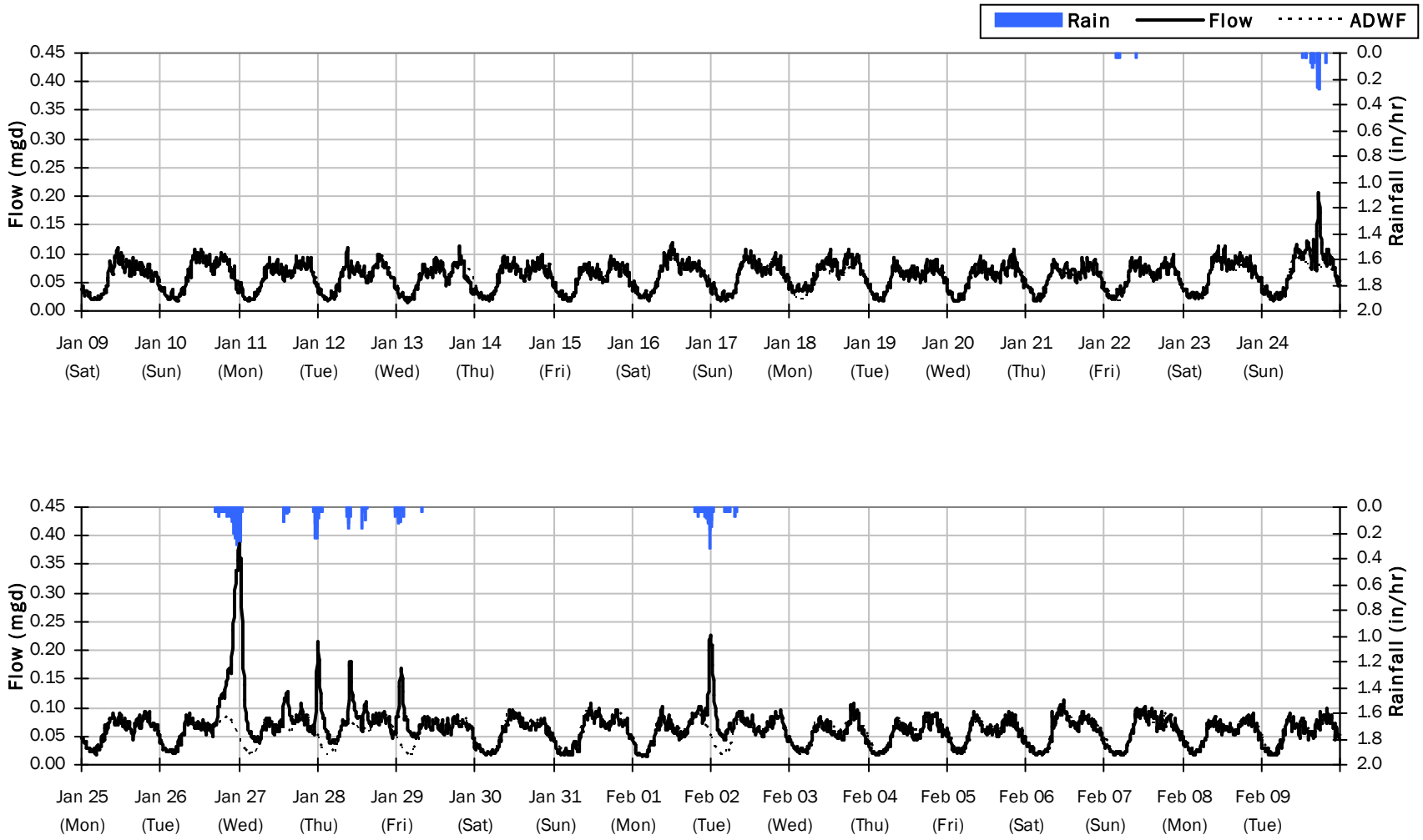
Total Period Rainfall: 5.87 inches



FM 6-7

Flow Summary: 1/9/2021 to 2/9/2021

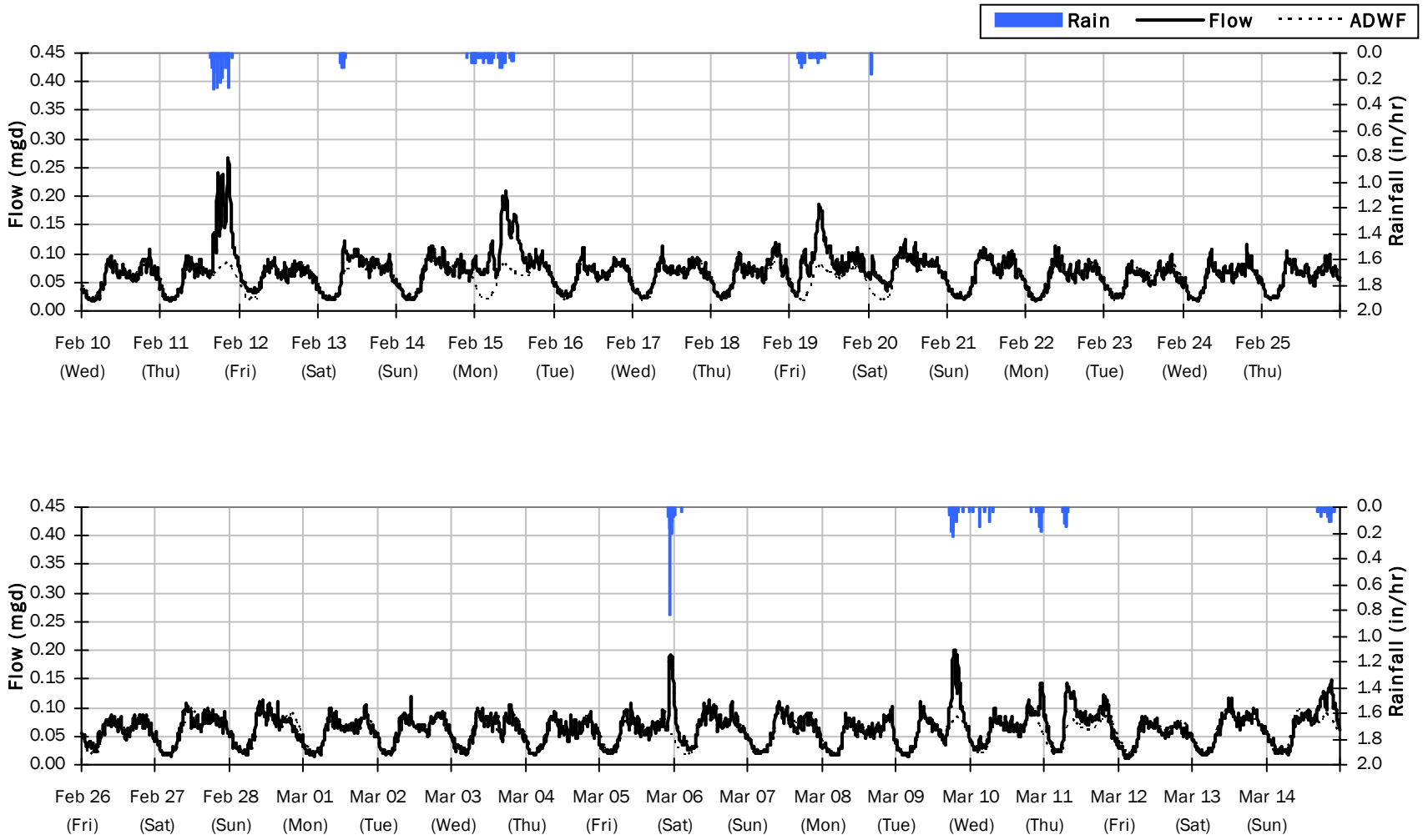
Total Period Rainfall: 2.57 inches Avg Flow: 0.063 mgd Peak Flow: 0.386 mgd Min Flow: 0.015 mgd



FM 6-7

Flow Summary: 2/10/2021 to 3/14/2021

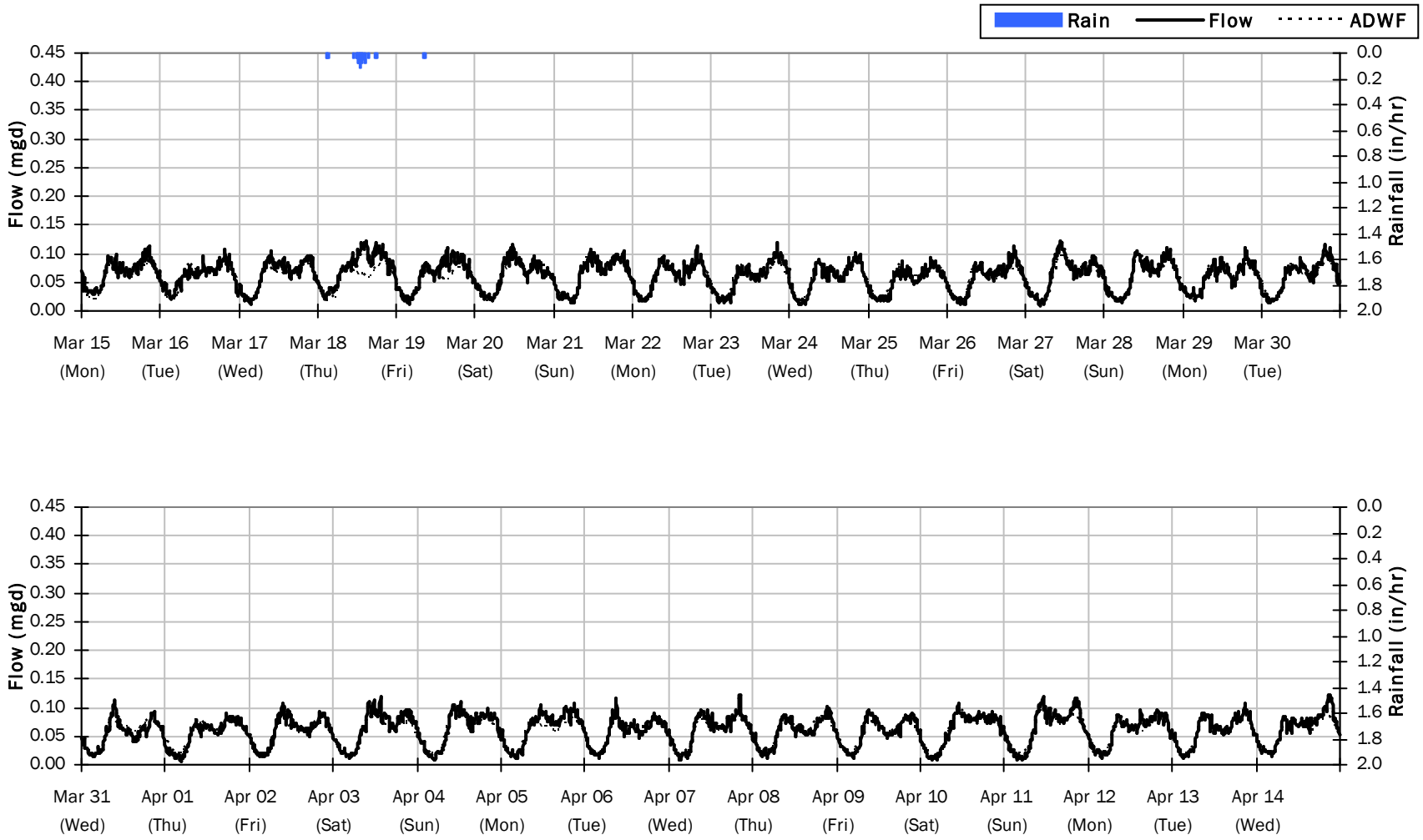
Total Period Rainfall: 3.05 inches Avg Flow: 0.065 mgd Peak Flow: 0.267 mgd Min Flow: 0.012 mgd



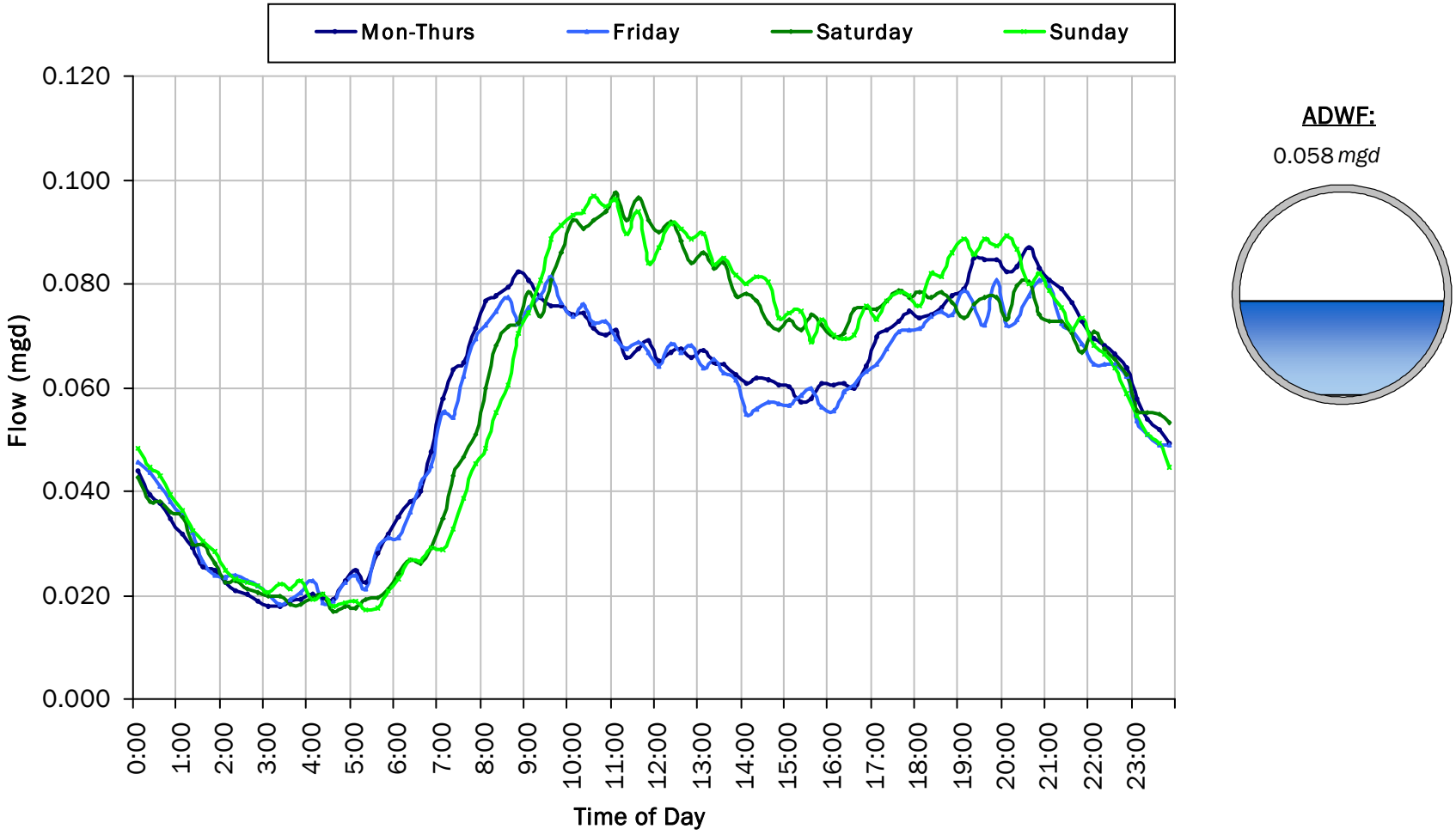
FM 6-7

Flow Summary: 3/15/2021 to 4/14/2021

Total Period Rainfall: 0.24 inches Avg Flow: 0.061 mgd Peak Flow: 0.123 mgd Min Flow: 0.006 mgd



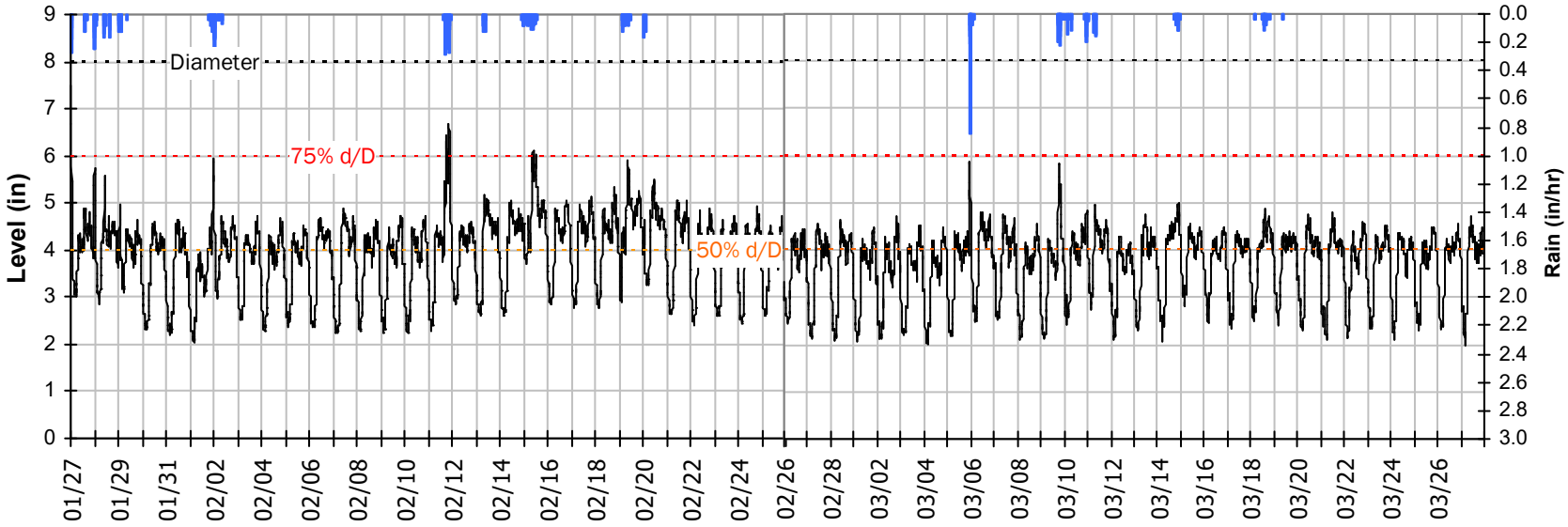
FM 6-7
Average Dry Weather Flow Hydrographs

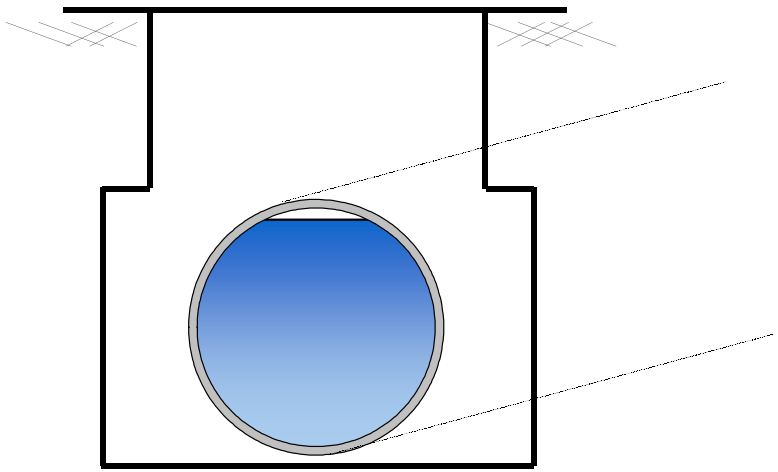


FM 6-7

Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Monitoring Period

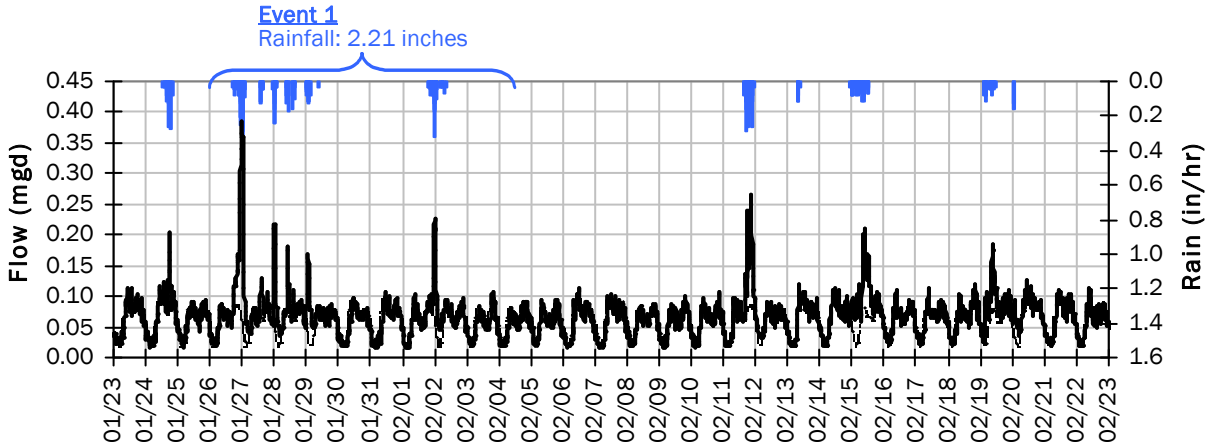




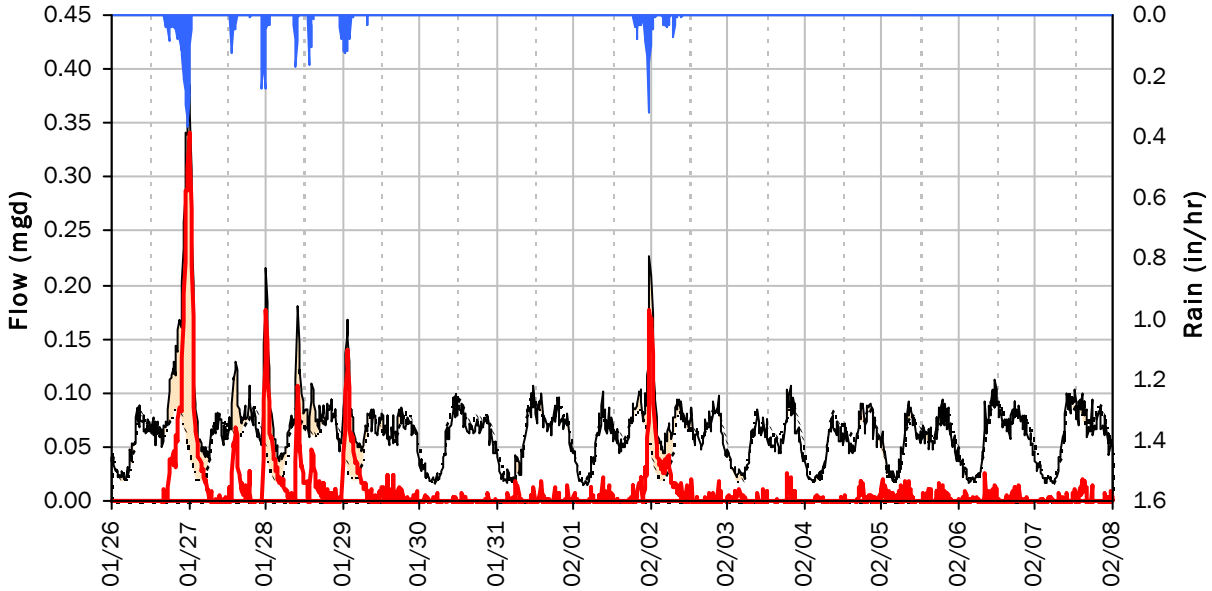
Pipe Diameter:	8	*inches*
Peak Measured Level:	7.51	*inches*
Peak d/D Ratio:	0.94	

FM 6-7
I/I Summary: Event 1

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



Event 1 Detail Graph

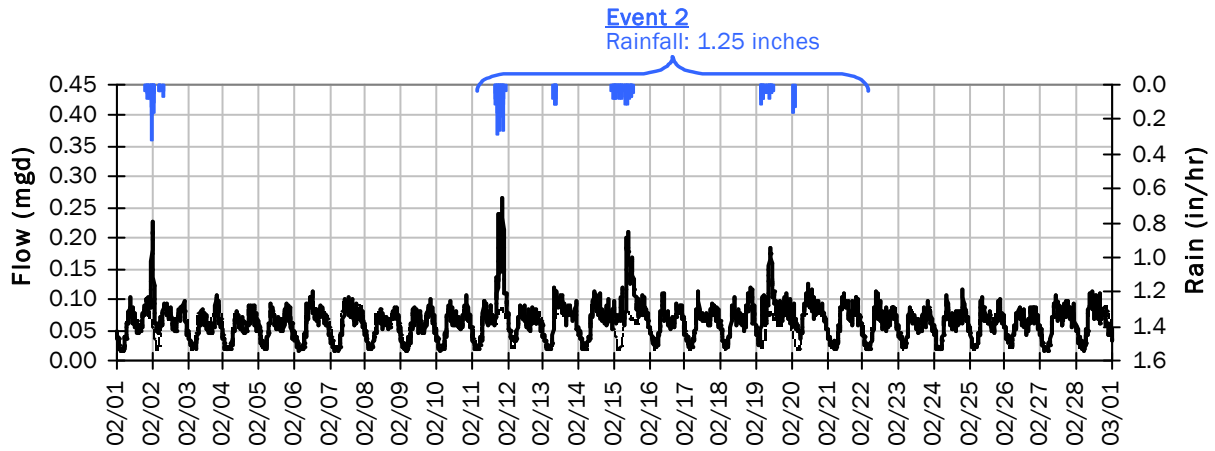


Storm Event I/I Analysis (Rain = 2.21 inches)

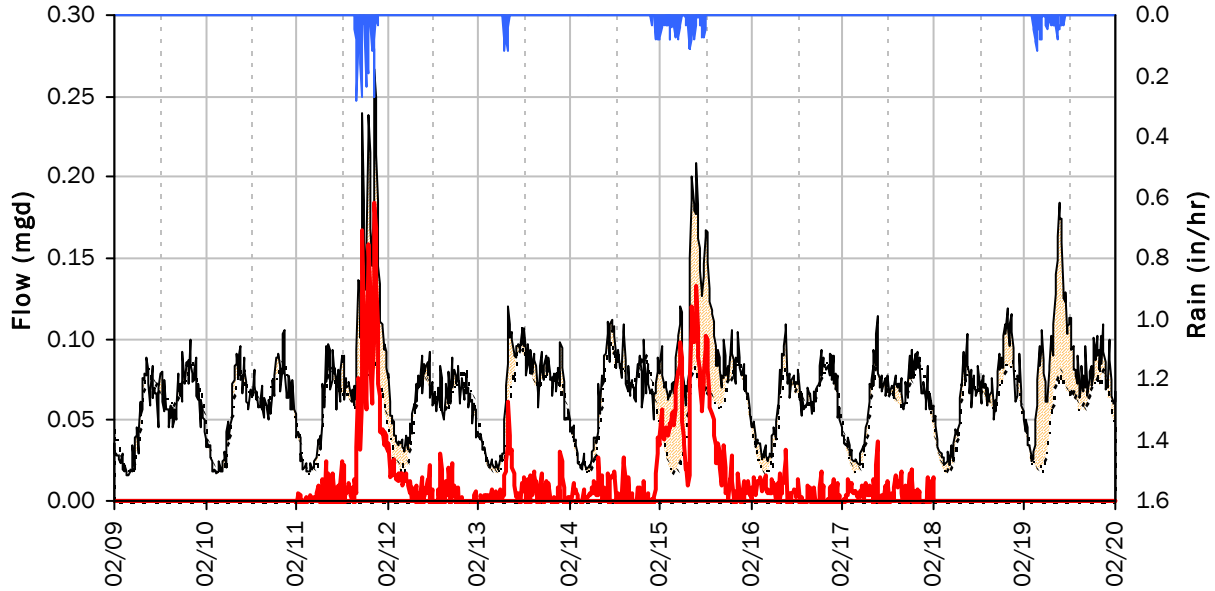
Capacity		Inflow / Infiltration	
Peak Flow:	0.39 *mgd*	**Peak I/I Rate:**	0.34 *mgd*
PF:	6.64	**Total I/I:**	111,000 *gallons*
Peak Level:	7.51 *in*		
d/D Ratio:	0.94		

FM 6-7
I/I Summary: Event 2

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



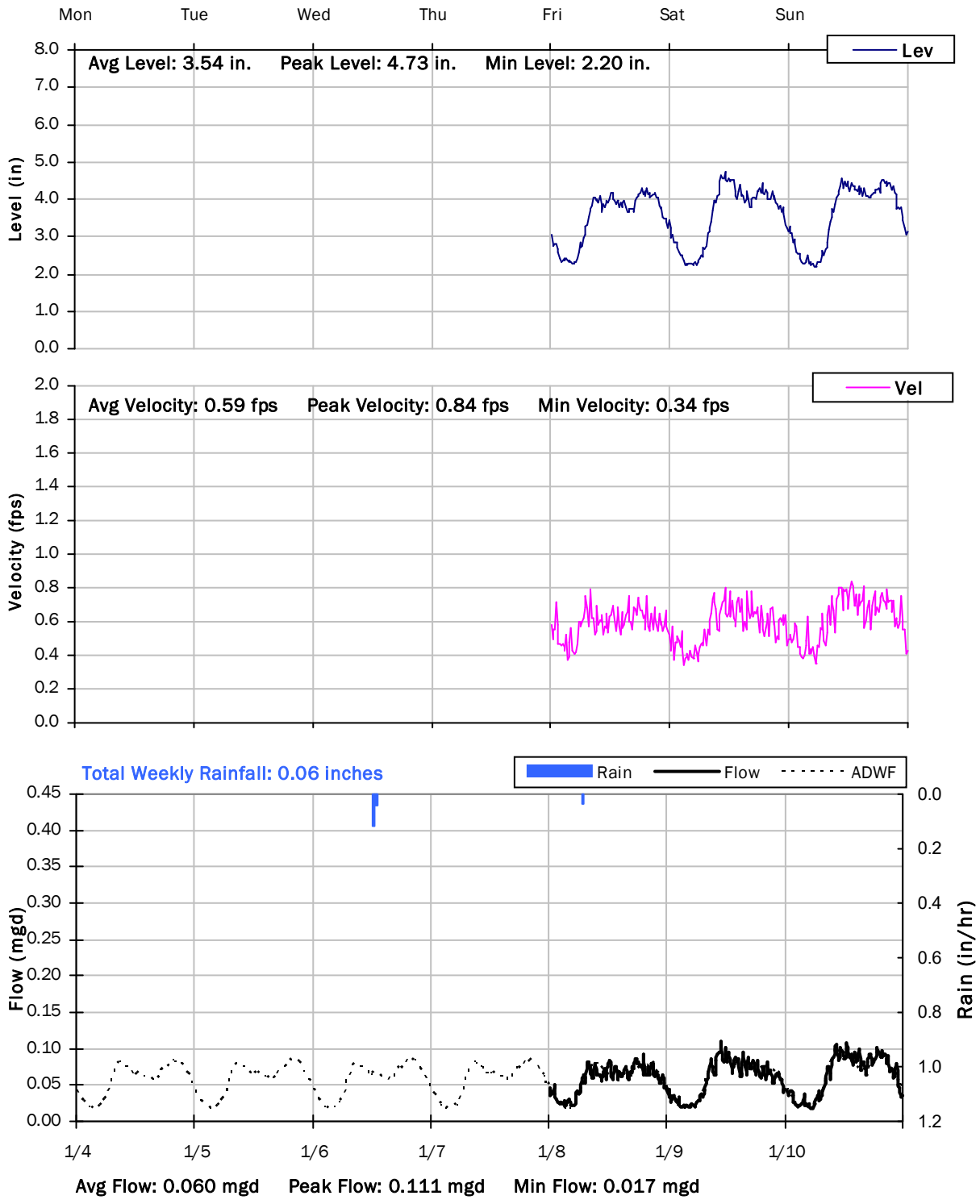
Event 2 Detail Graph



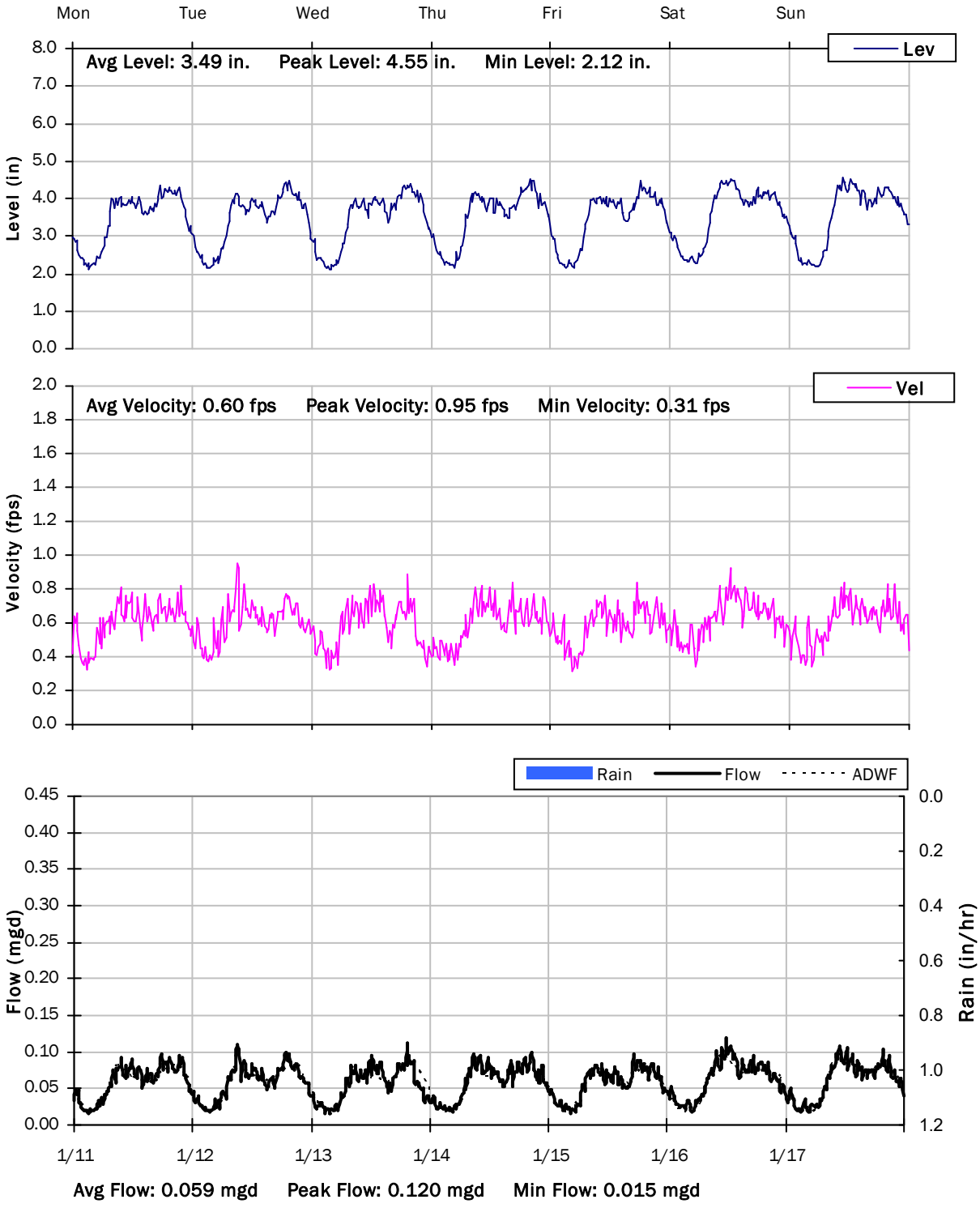
Storm Event I/I Analysis (Rain = 1.25 inches)

Capacity		Inflow / Infiltration	
Peak Flow:	0.27 *mgd*	**Peak I/I Rate:**	0.18 *mgd*
PF:	4.60	**Total I/I:**	99,000 *gallons*
Peak Level:	6.69 *in*		
d/D Ratio:	0.84		

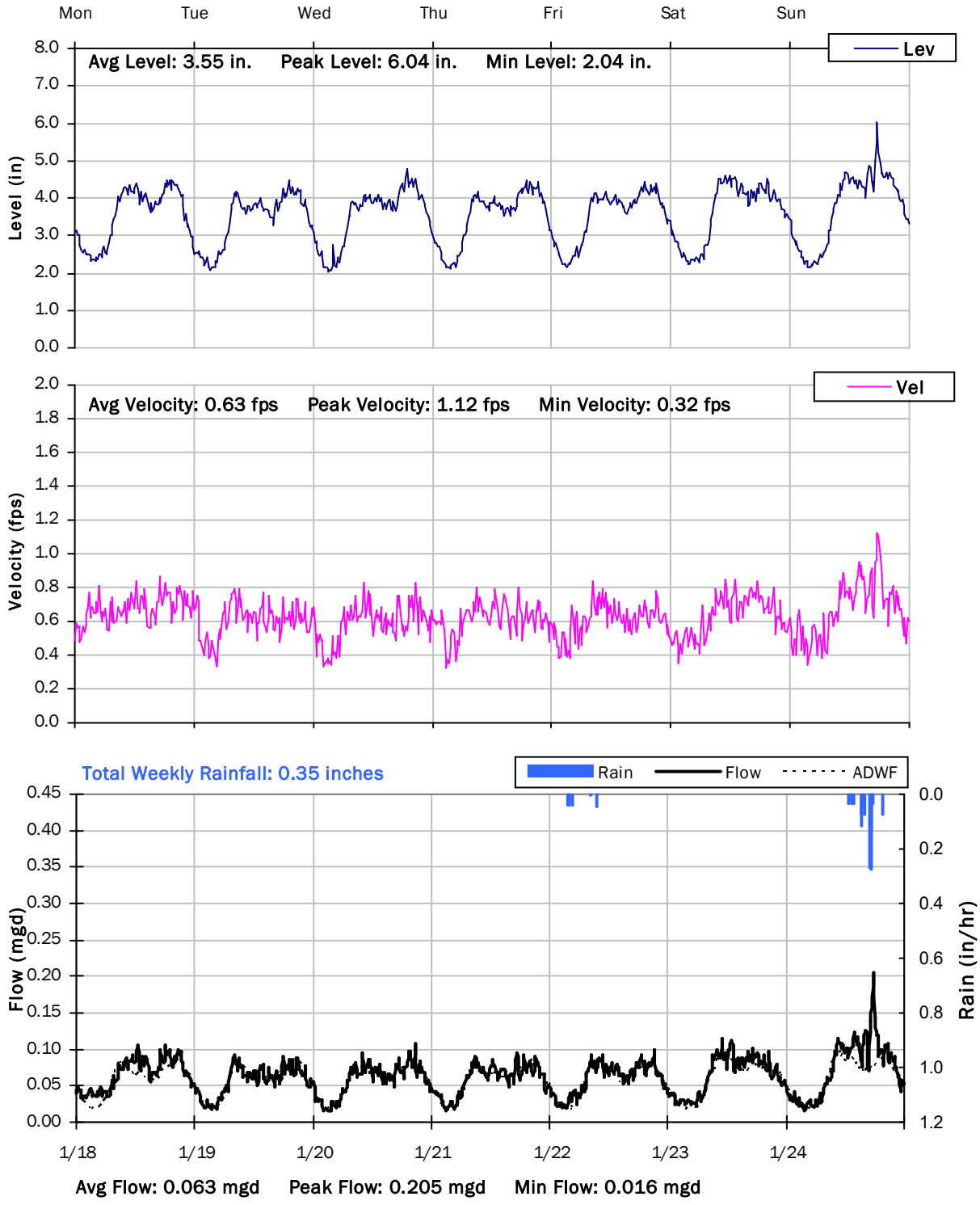
FM 6-7
Weekly Level, Velocity and Flow Hydrographs
1/4/2021 to 1/11/2021



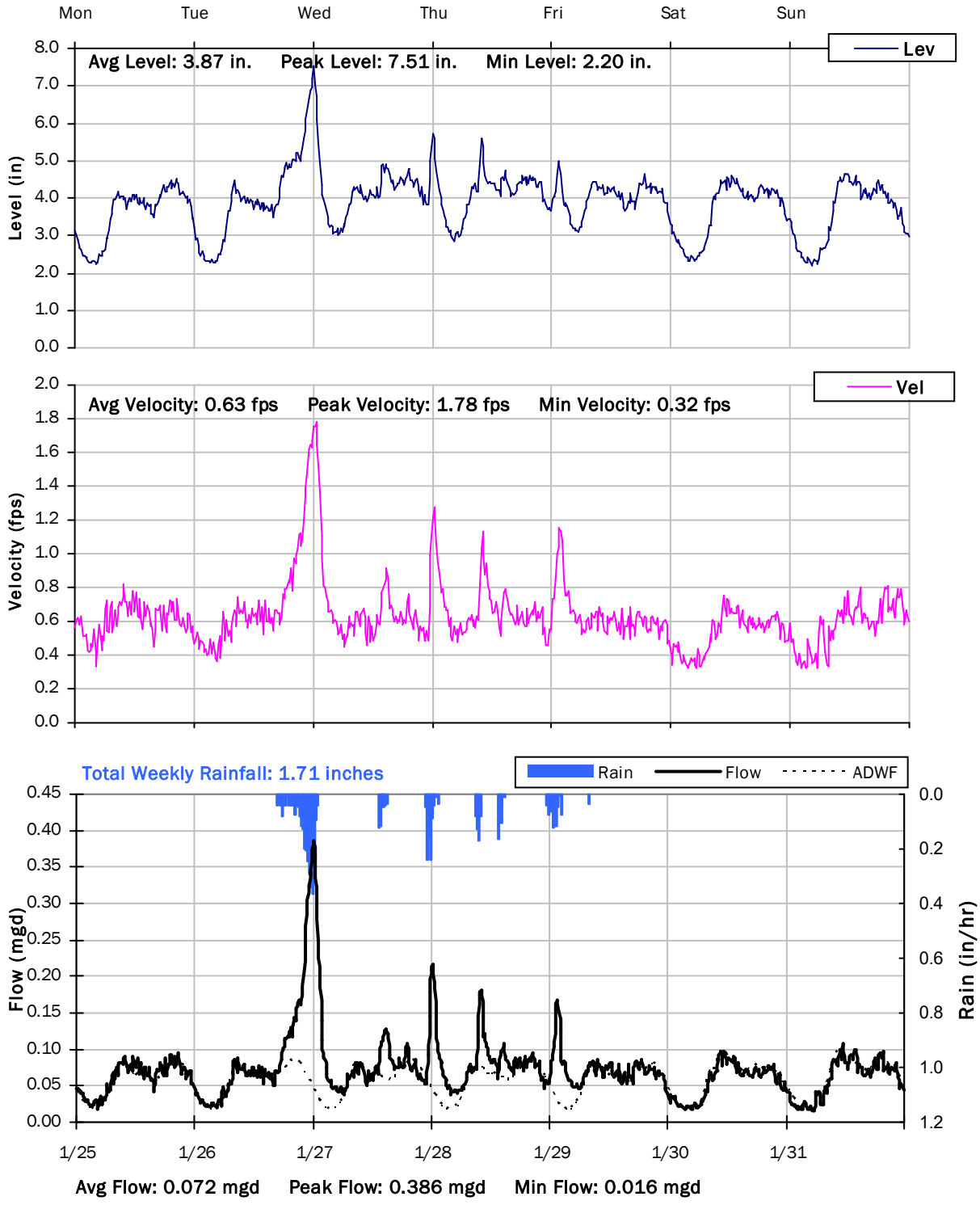
FM 6-7
Weekly Level, Velocity and Flow Hydrographs
1/11/2021 to 1/18/2021



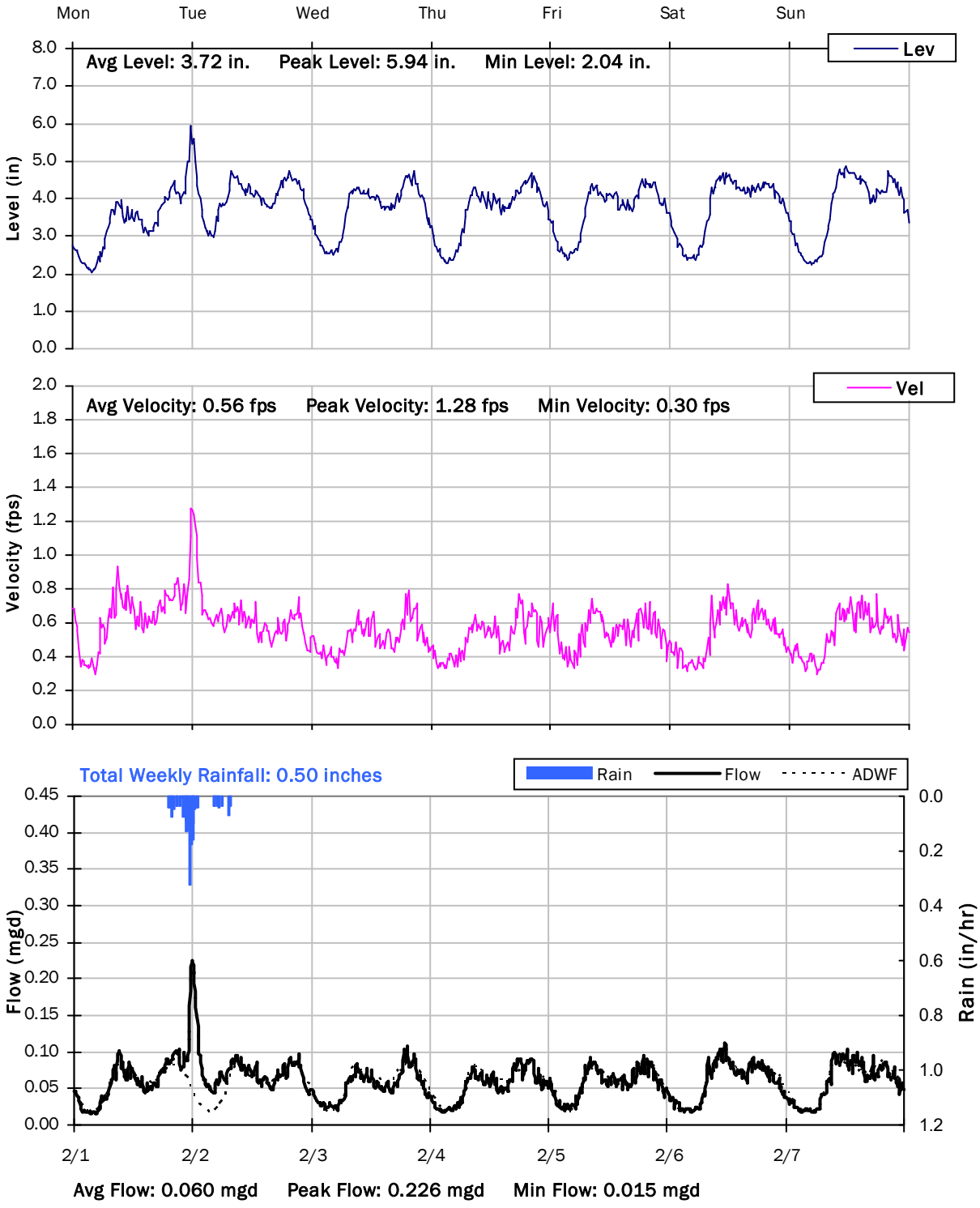
FM 6-7
Weekly Level, Velocity and Flow Hydrographs
1/18/2021 to 1/25/2021



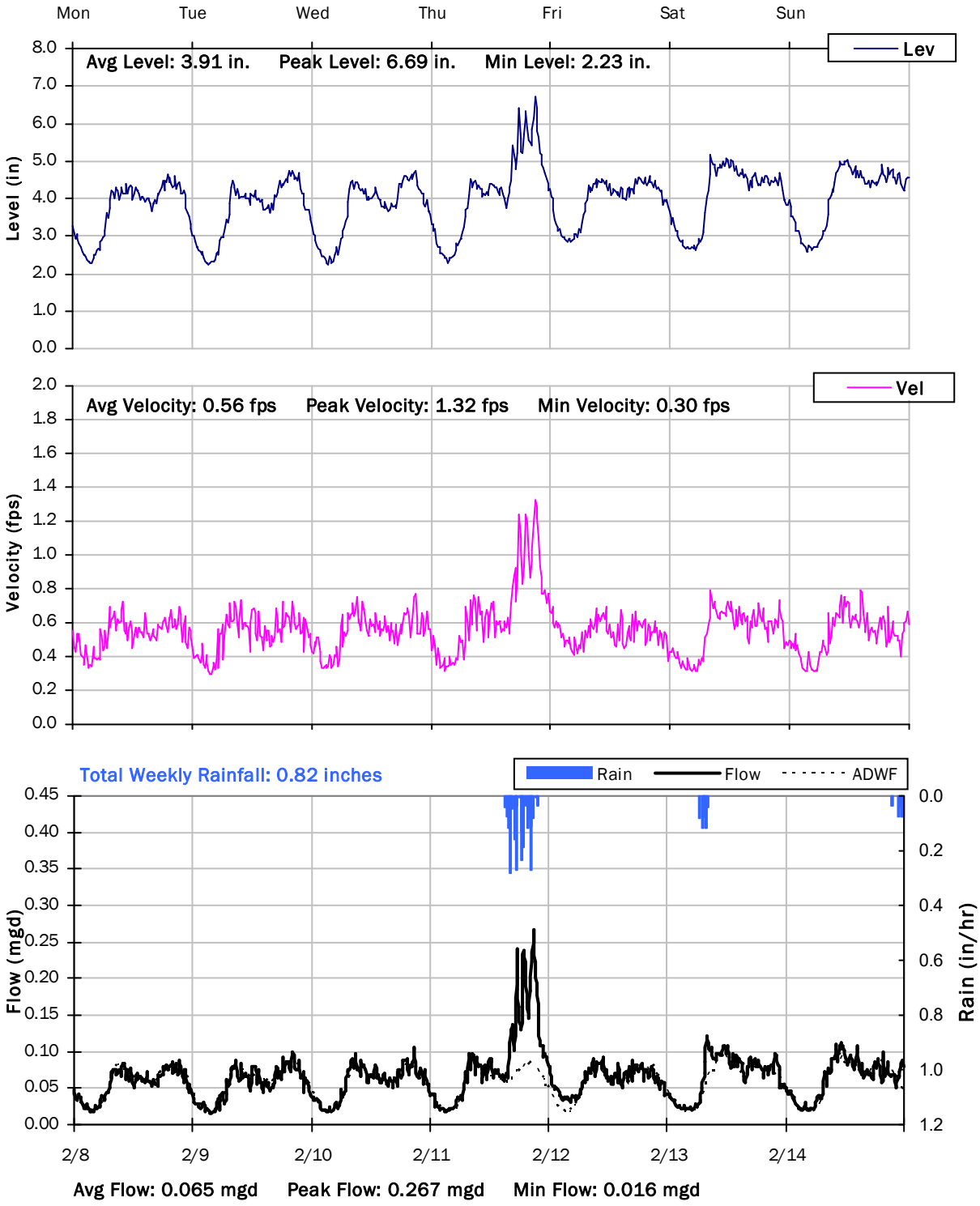
FM 6-7
Weekly Level, Velocity and Flow Hydrographs
1/25/2021 to 2/1/2021



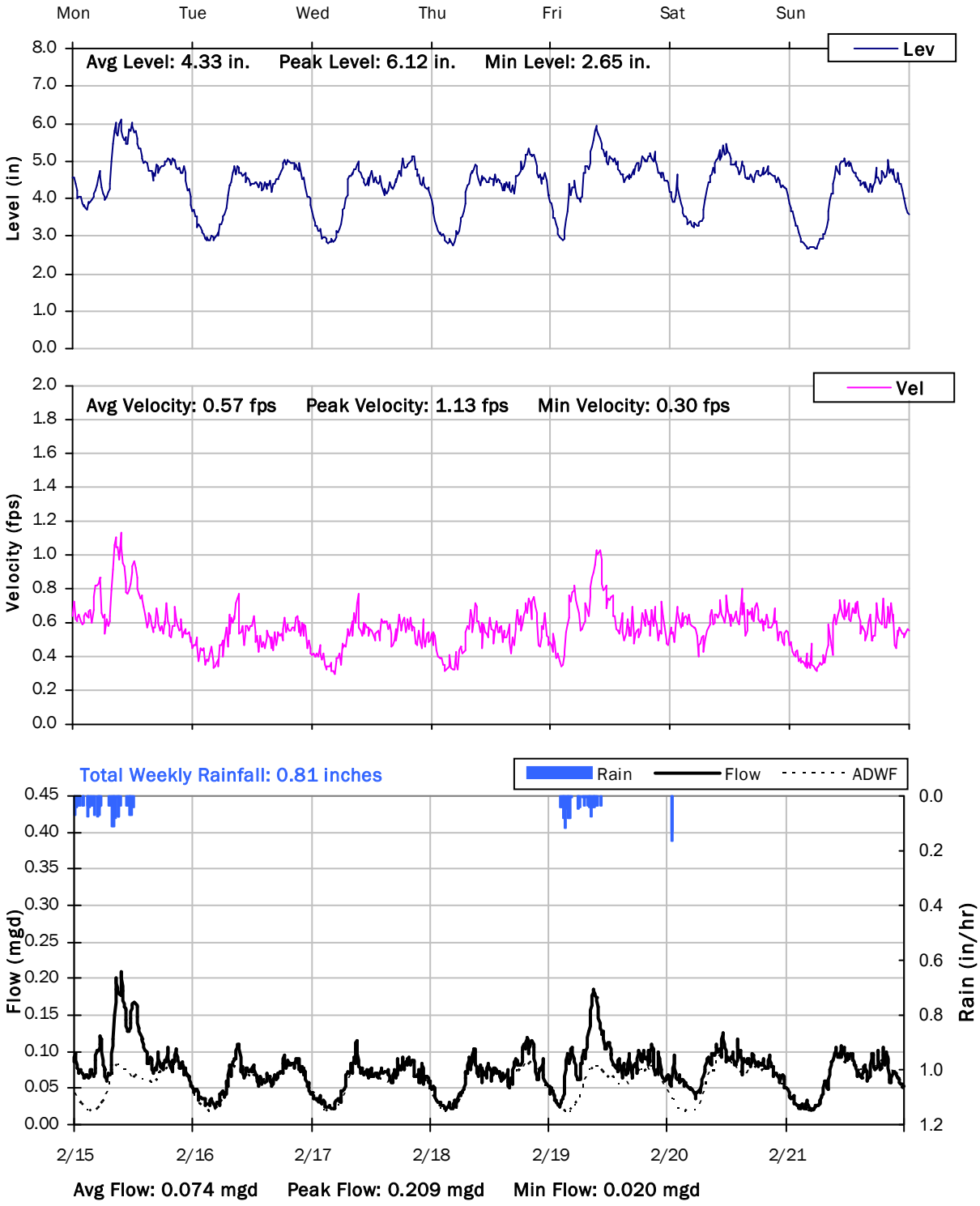
FM 6-7
Weekly Level, Velocity and Flow Hydrographs
2/1/2021 to 2/8/2021



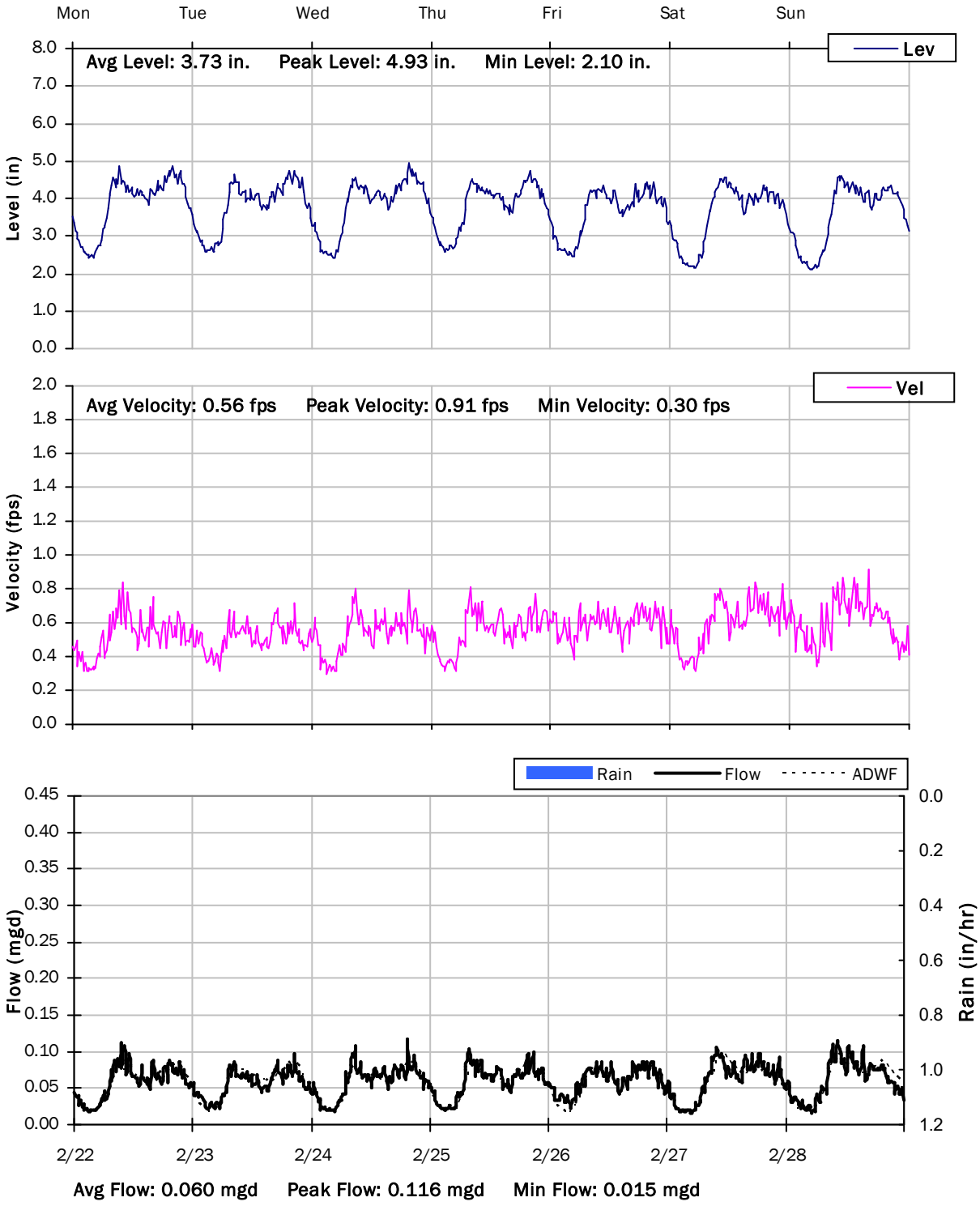
FM 6-7
Weekly Level, Velocity and Flow Hydrographs
2/8/2021 to 2/15/2021



FM 6-7
Weekly Level, Velocity and Flow Hydrographs
2/15/2021 to 2/22/2021



FM 6-7
Weekly Level, Velocity and Flow Hydrographs
2/22/2021 to 3/1/2021



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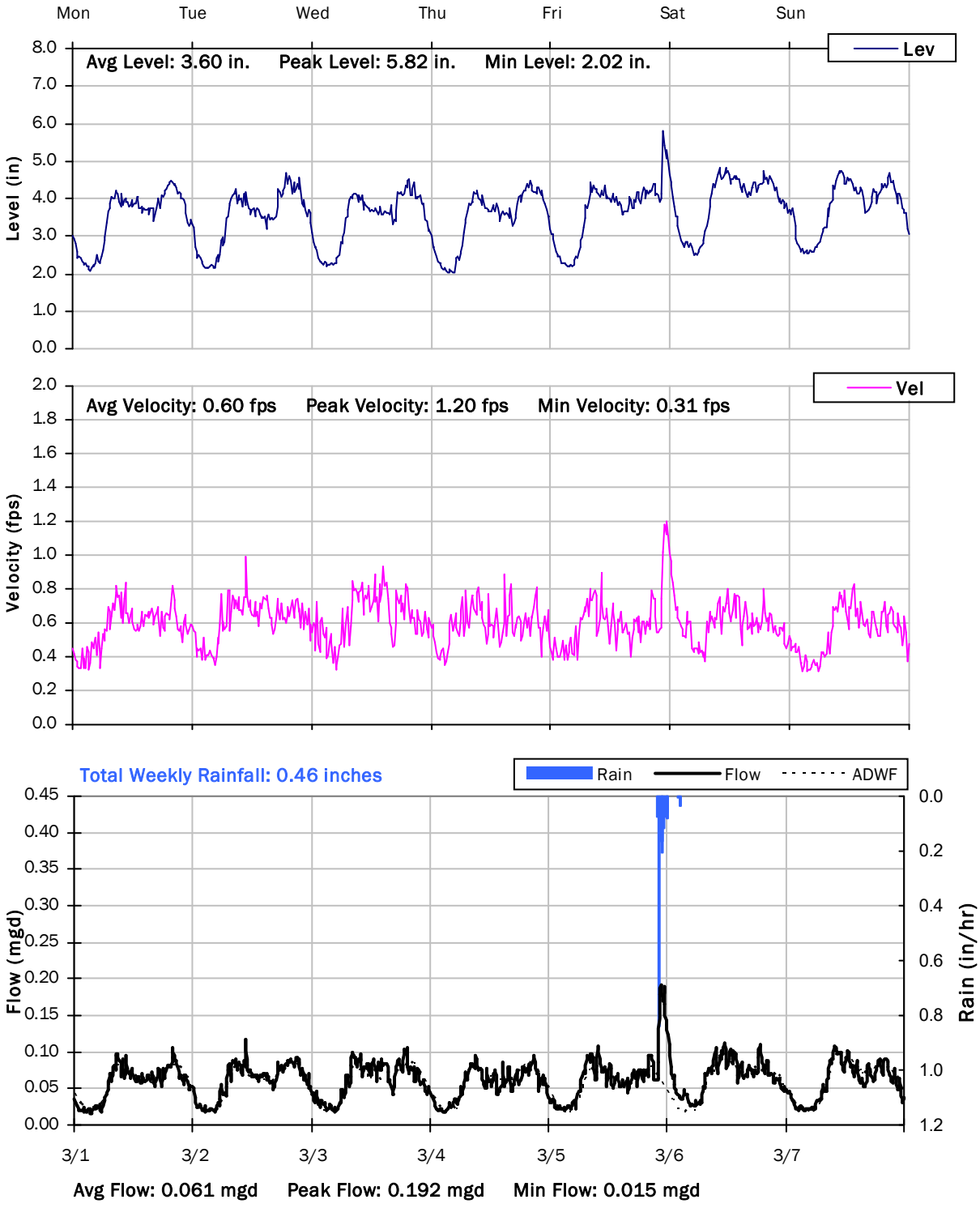
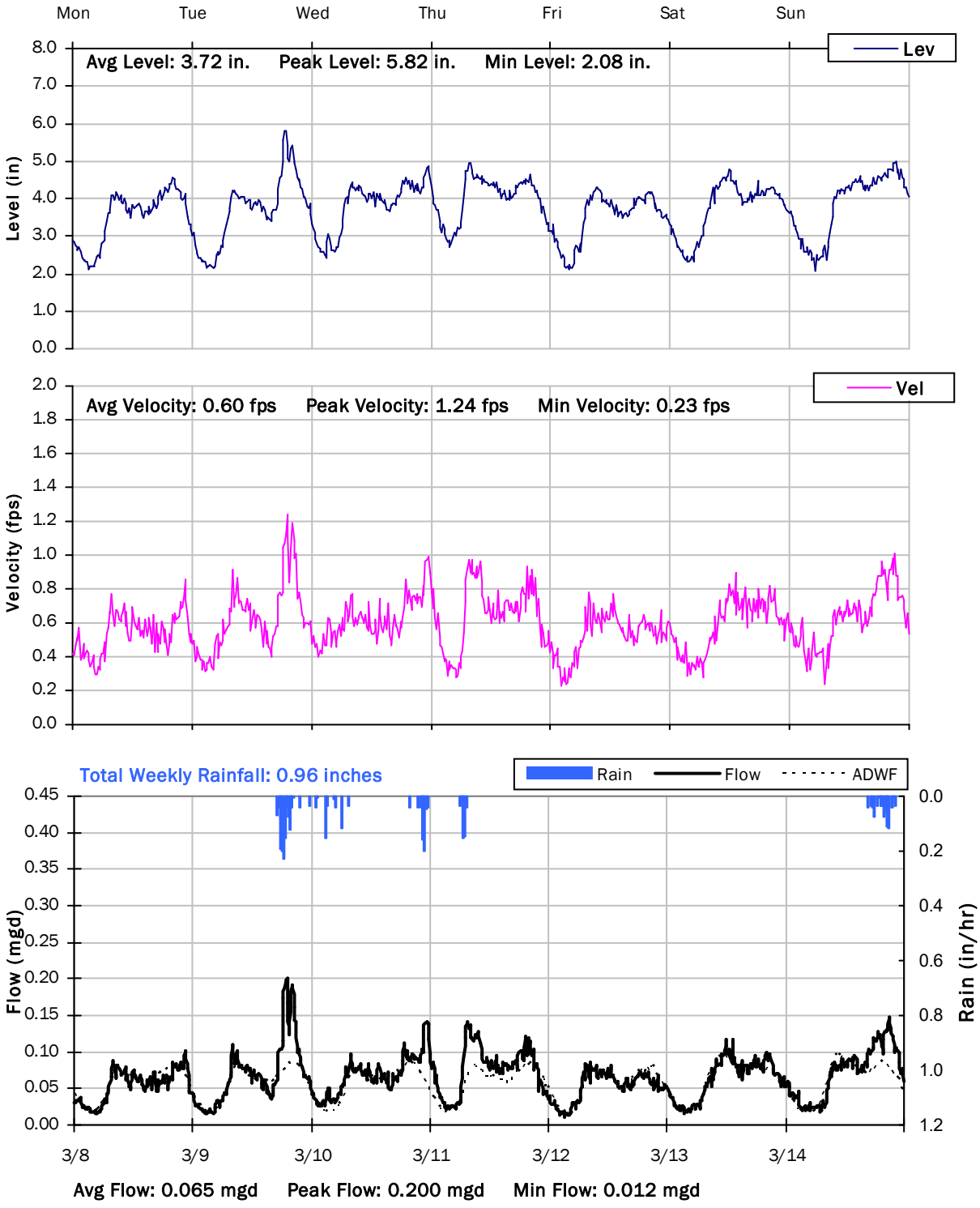
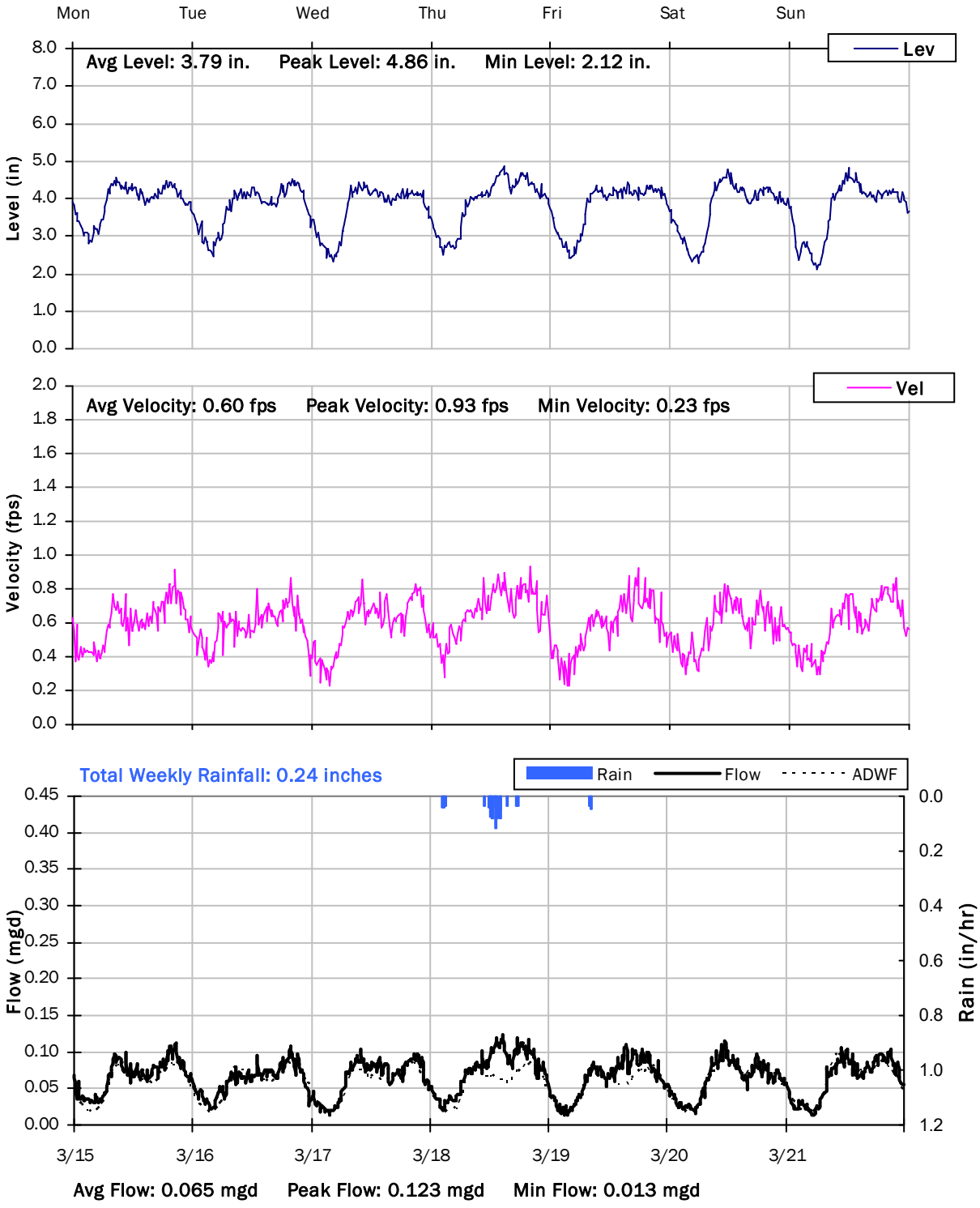
Weekly Level, Velocity and Flow Hydrographs
3/1/2021 to 3/8/2021



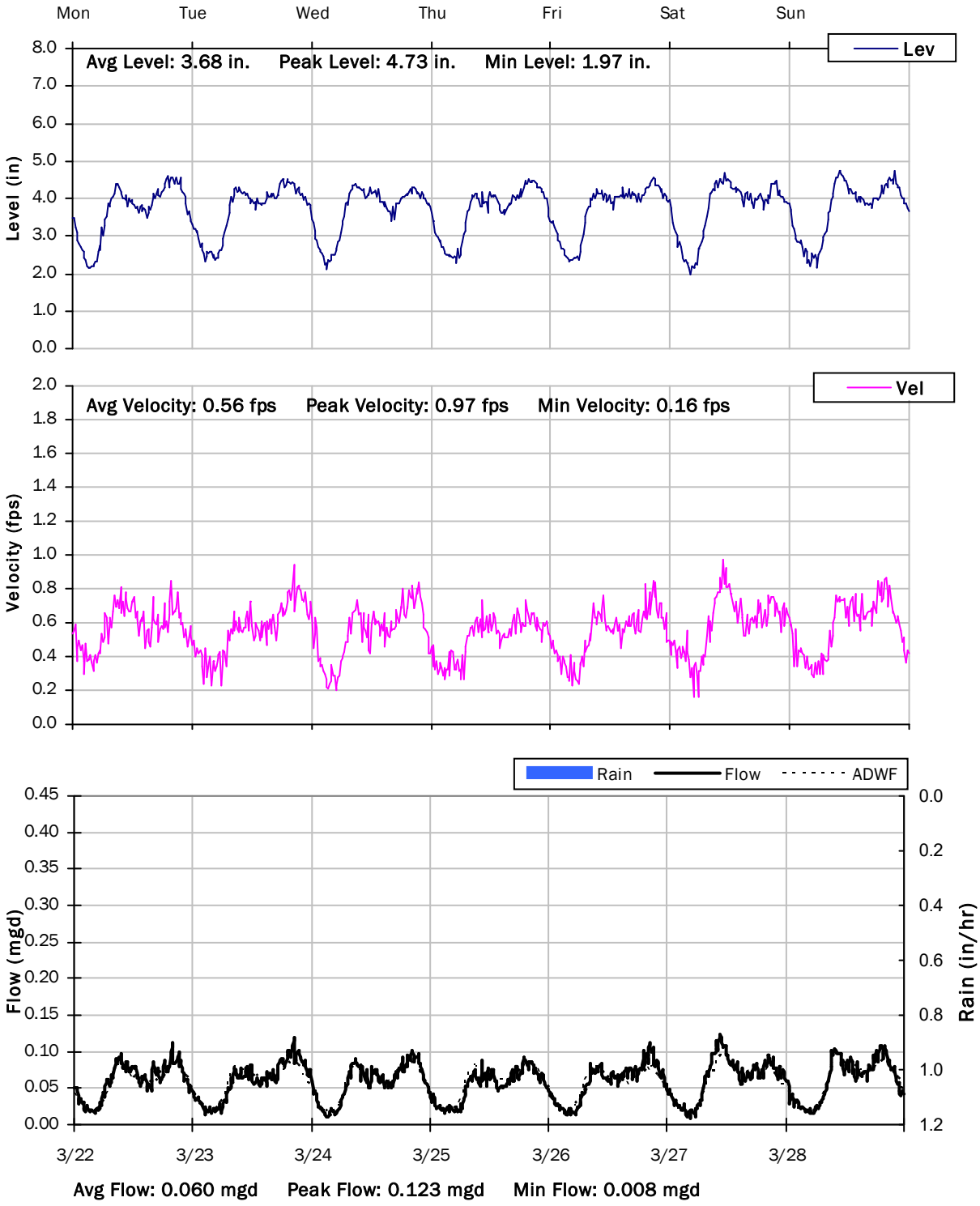
FM 6-7
Weekly Level, Velocity and Flow Hydrographs
3/8/2021 to 3/15/2021



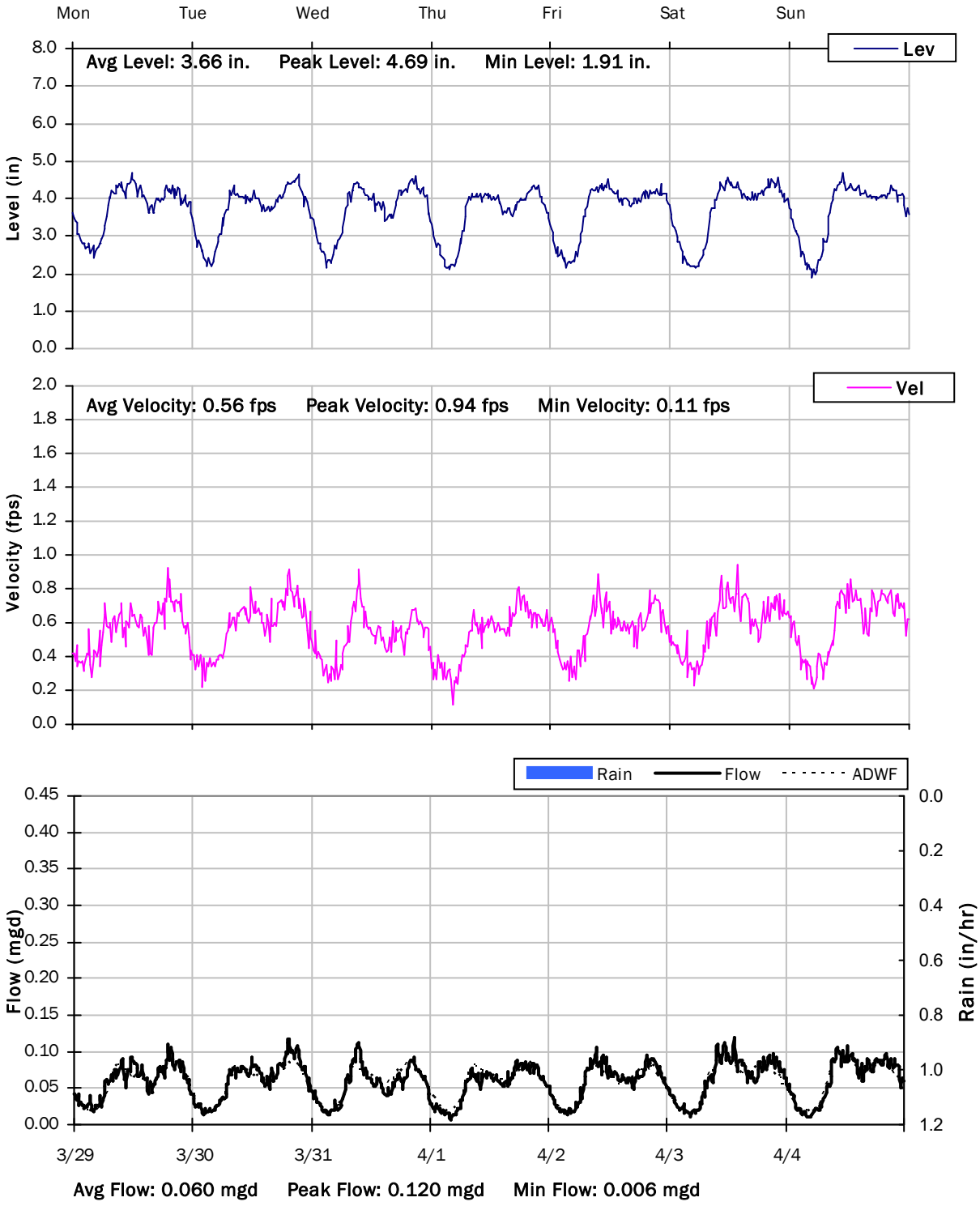
FM 6-7
Weekly Level, Velocity and Flow Hydrographs
3/15/2021 to 3/22/2021



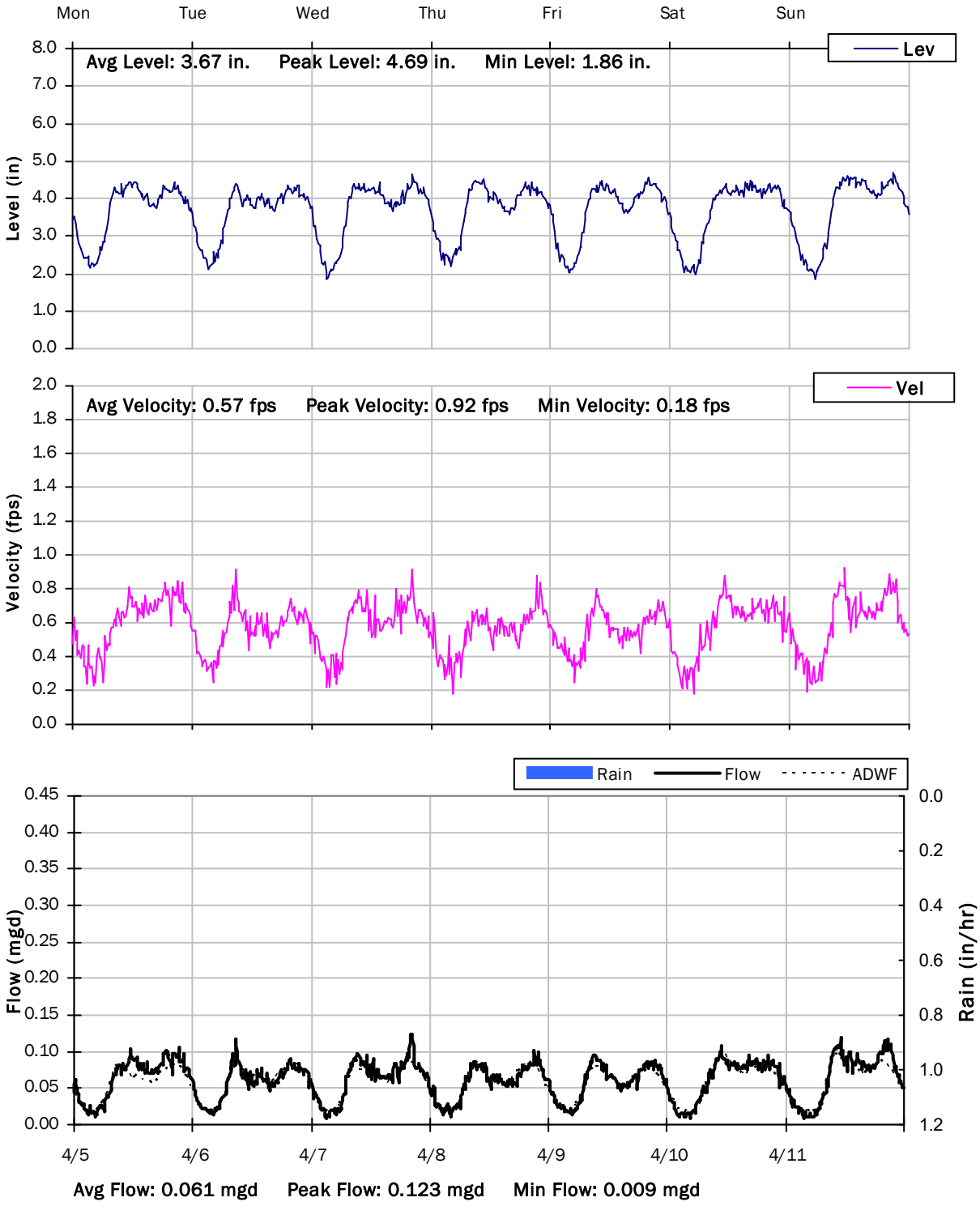
FM 6-7
Weekly Level, Velocity and Flow Hydrographs
3/22/2021 to 3/29/2021



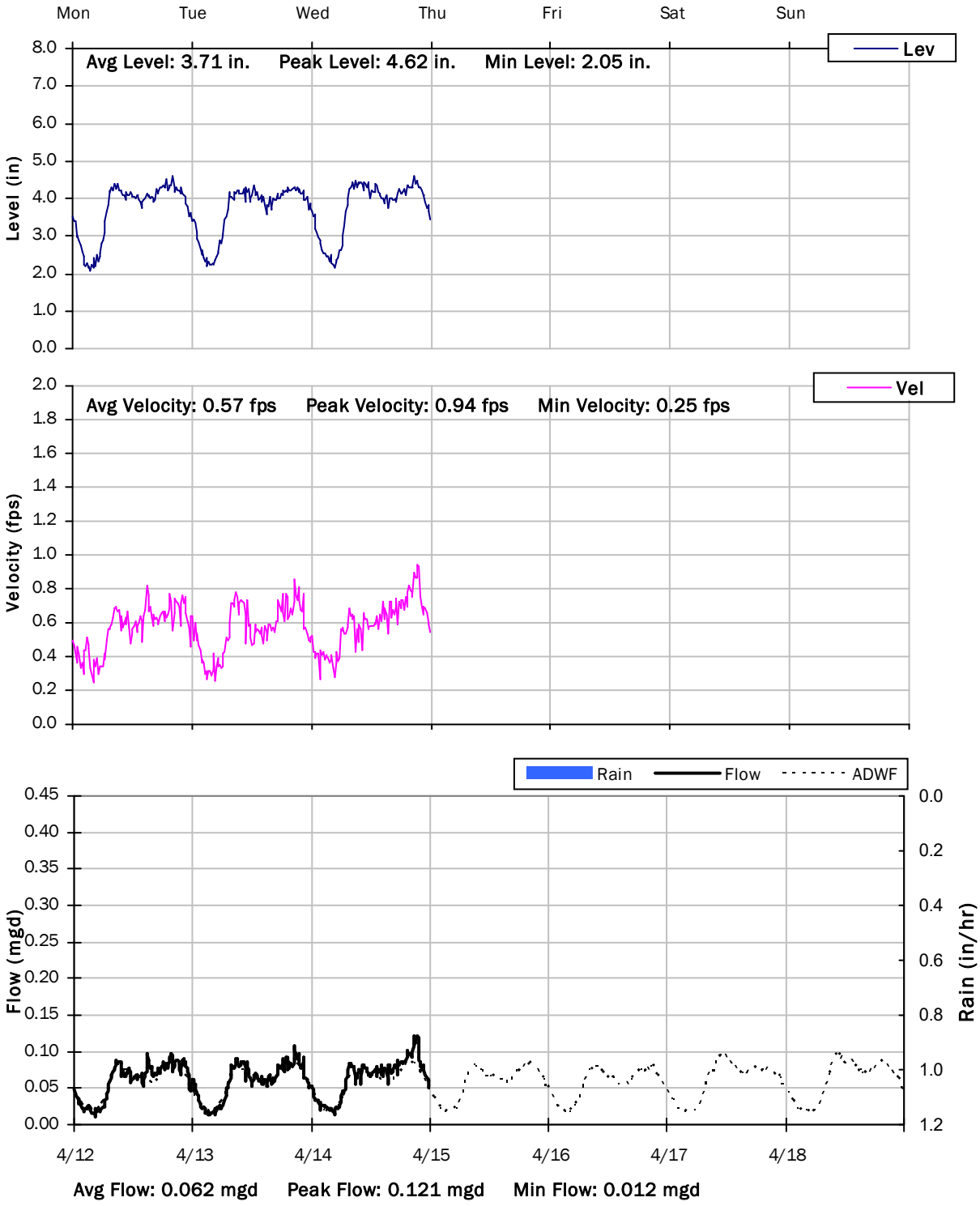
FM 6-7
Weekly Level, Velocity and Flow Hydrographs
3/29/2021 to 4/5/2021



FM 6-7
Weekly Level, Velocity and Flow Hydrographs
4/5/2021 to 4/12/2021



FM 6-7
Weekly Level, Velocity and Flow Hydrographs
4/12/2021 to 4/19/2021



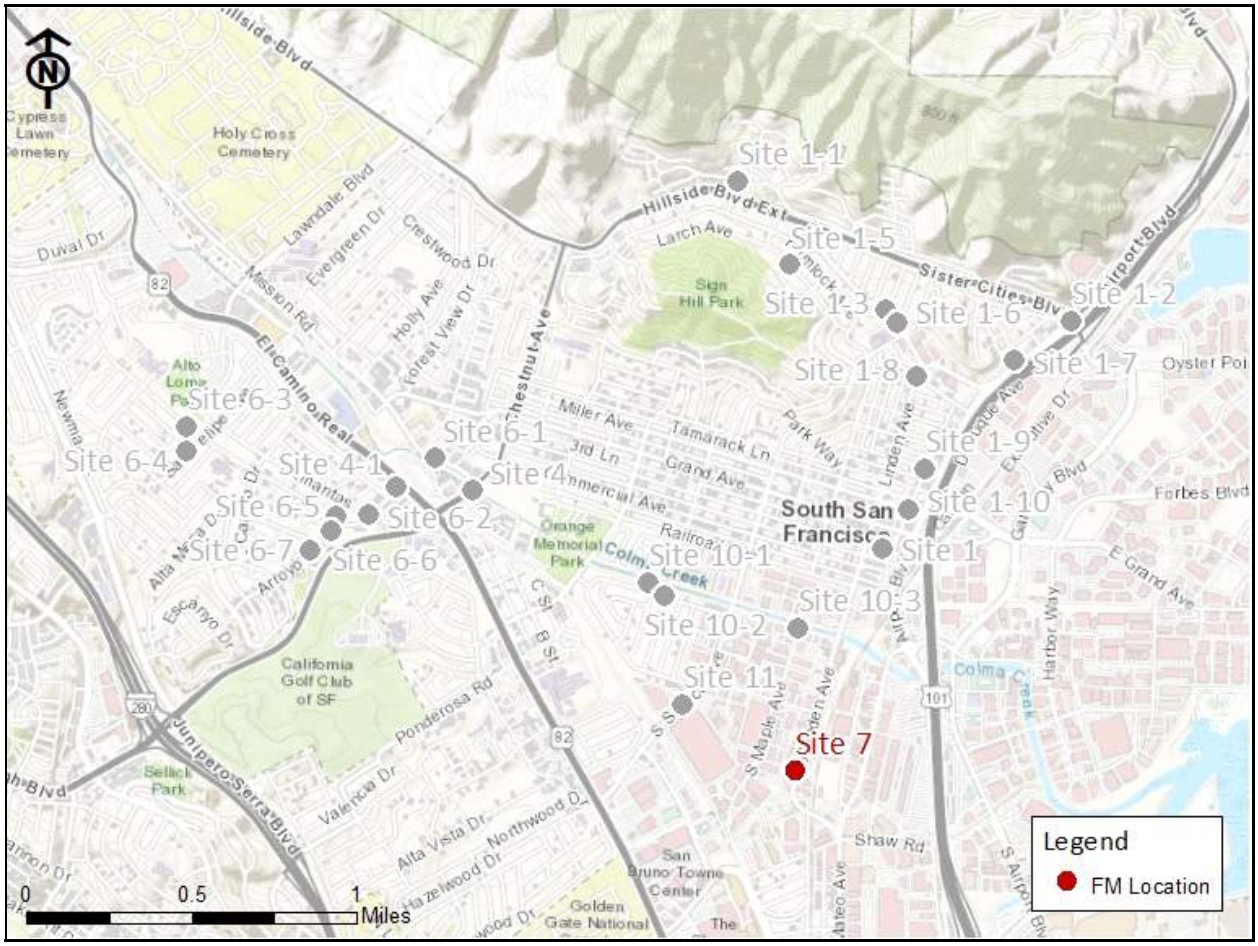
South San Francisco, CA

Sanitary Sewer Flow Monitoring
January 4 - April 14, 2021

Monitoring Site: FM 7

Location: Exit Driveway at 150 S Linden Avenue

Data Summary Report



Vicinity Map: FM 7

FM 7

Site Information

Location: Exit Driveway at 150 S Linden Avenue

Coordinates: 122.4141° W, 37.6442° N

Rim Elevation (Earth): 33 feet

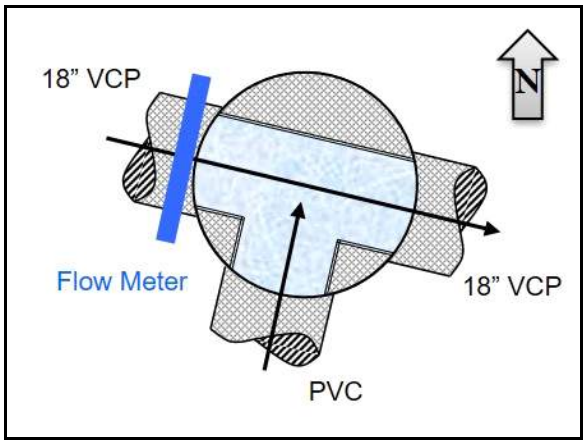
Pipe Diameter: 18 inches

ADWF: 0.457 mgd

Peak Measured Flow: 2.551 mgd

Satellite Map

Sanitary Map



Flow Sketch

Street View

Plan View

FM 7

Additional Site Photos

Effluent Pipe

Monitored West Influent Pipe

FM 7

Additional Site Photos

South Influent Pipe

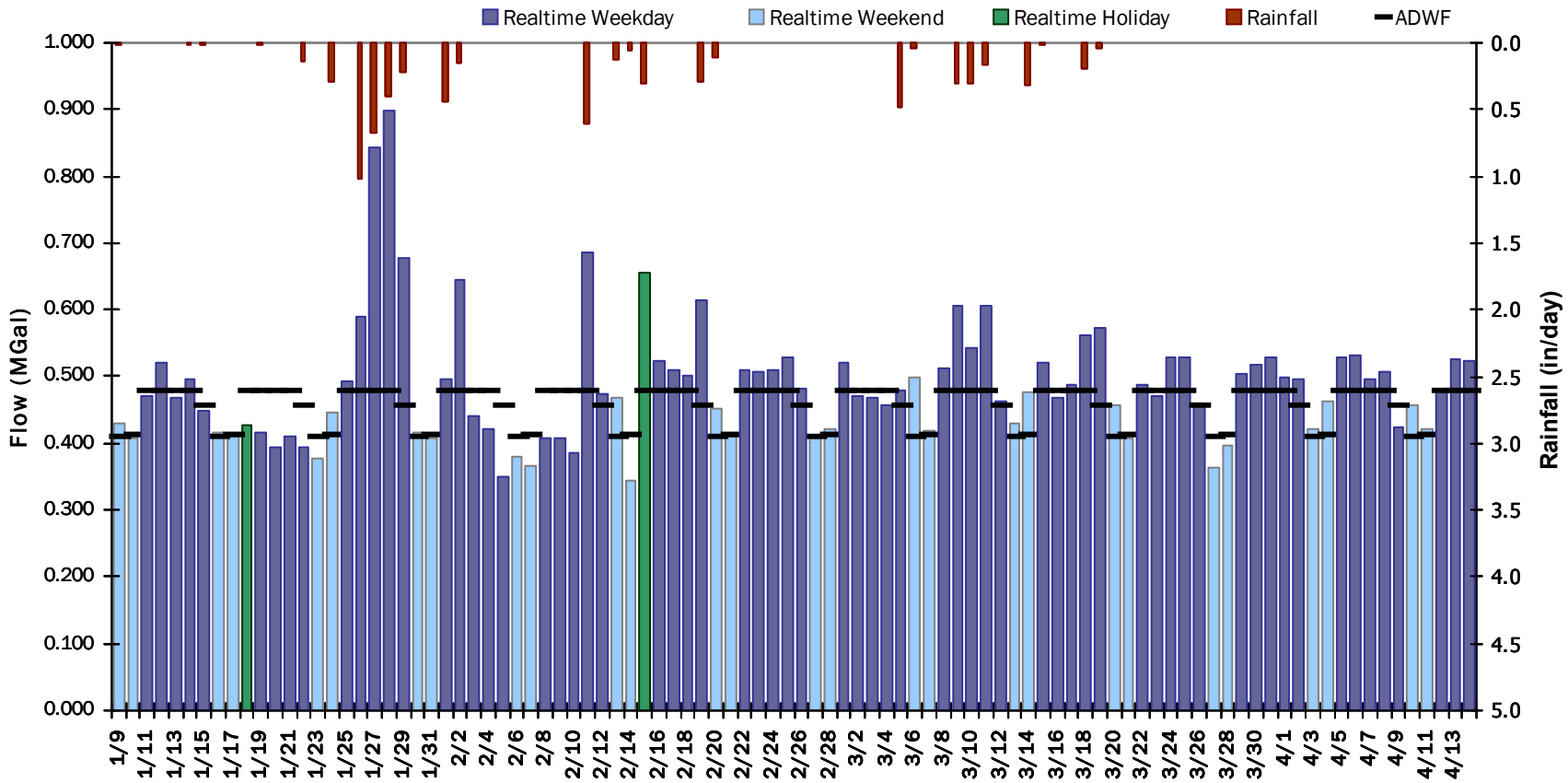
Hole, Void Visible

FM 7

Period Flow Summary: Daily Flow Totals

Avg Period Flow: 0.485 MGal Peak Daily Flow: 0.897 MGal Min Daily Flow: 0.345 MGal

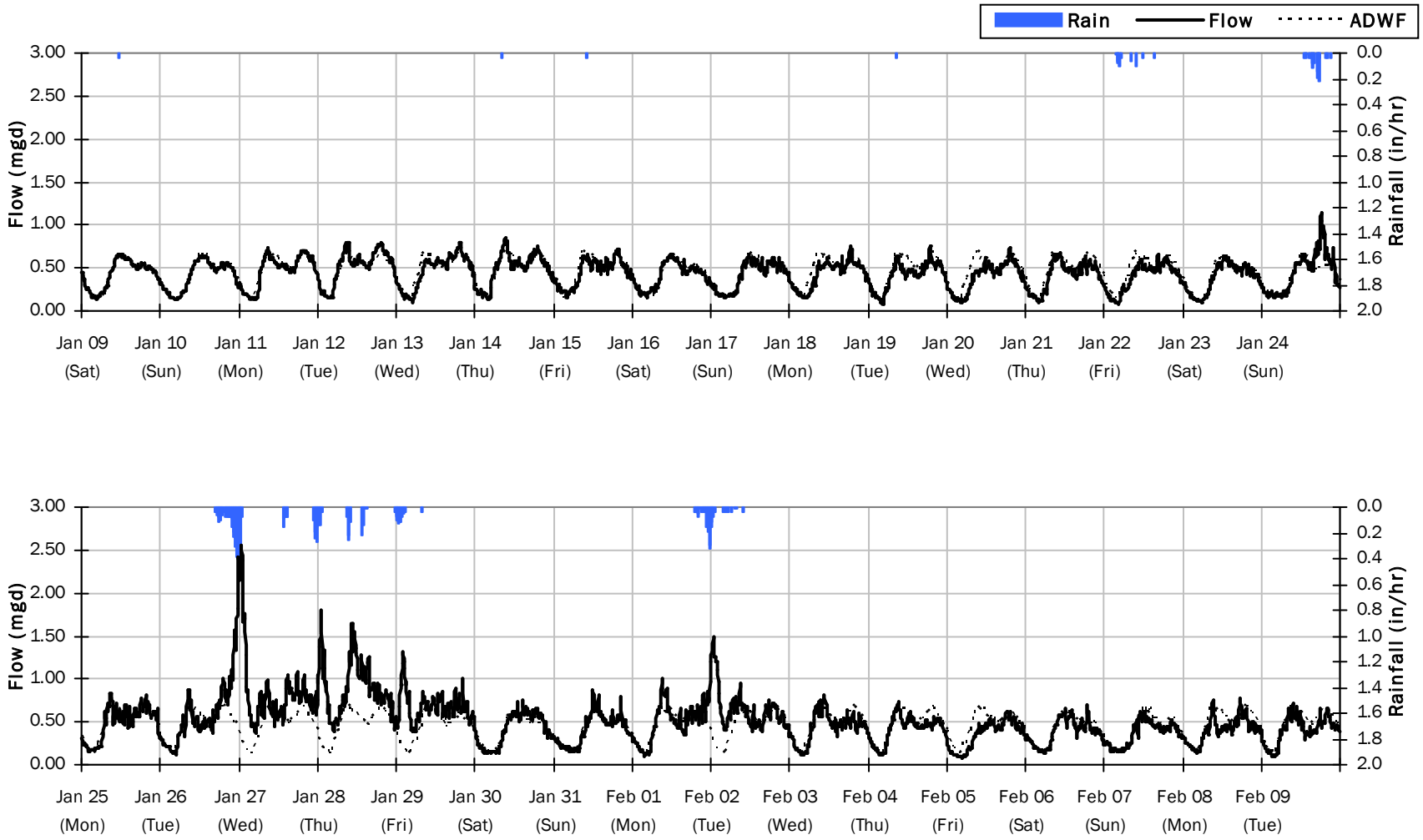
Total Period Rainfall: 6.68 inches



FM 7

Flow Summary: 1/9/2021 to 2/9/2021

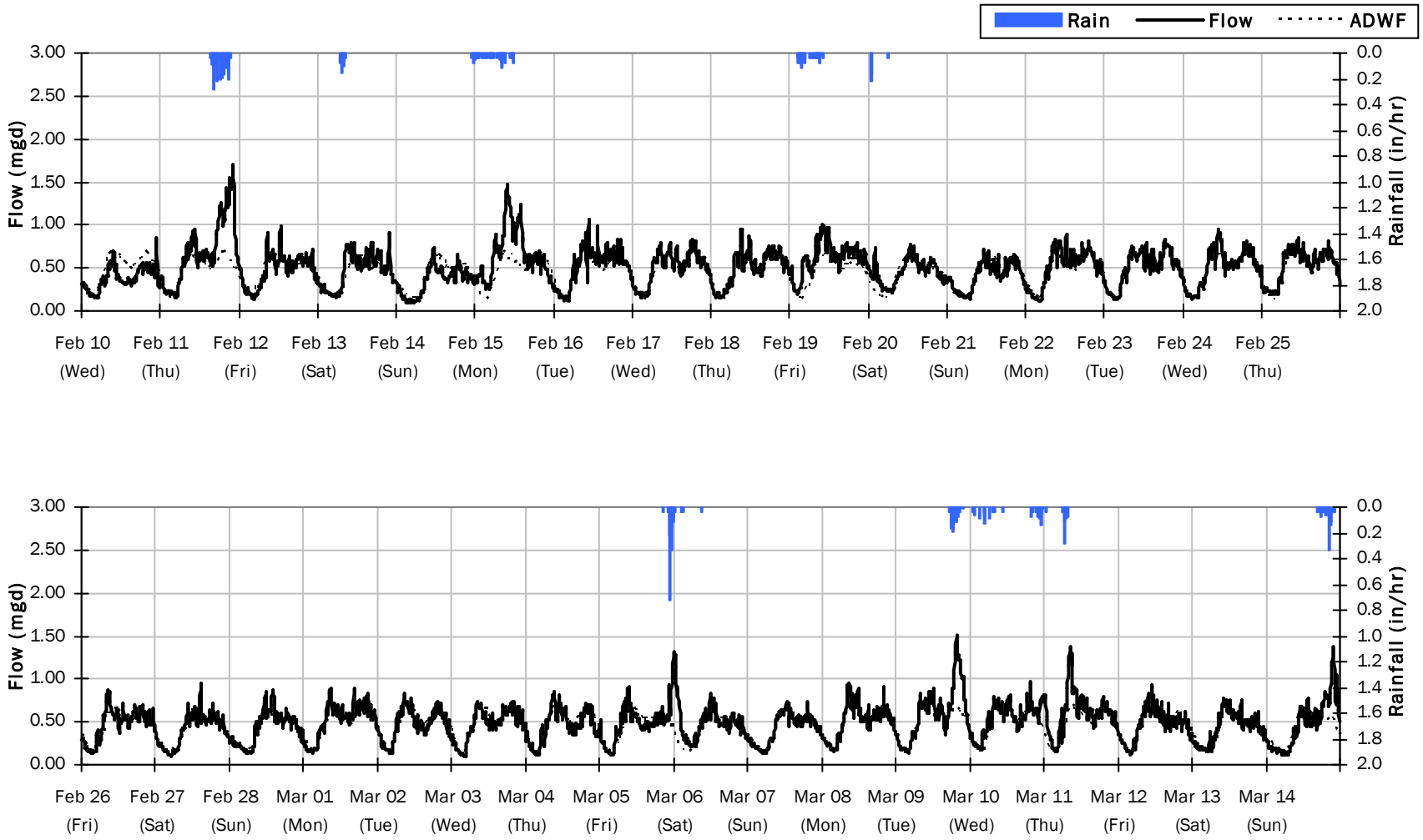
Total Period Rainfall: 3.35 inches Avg Flow: 0.474 mgd Peak Flow: 2.551 mgd Min Flow: 0.080 mgd



FM 7

Flow Summary: 2/10/2021 to 3/14/2021

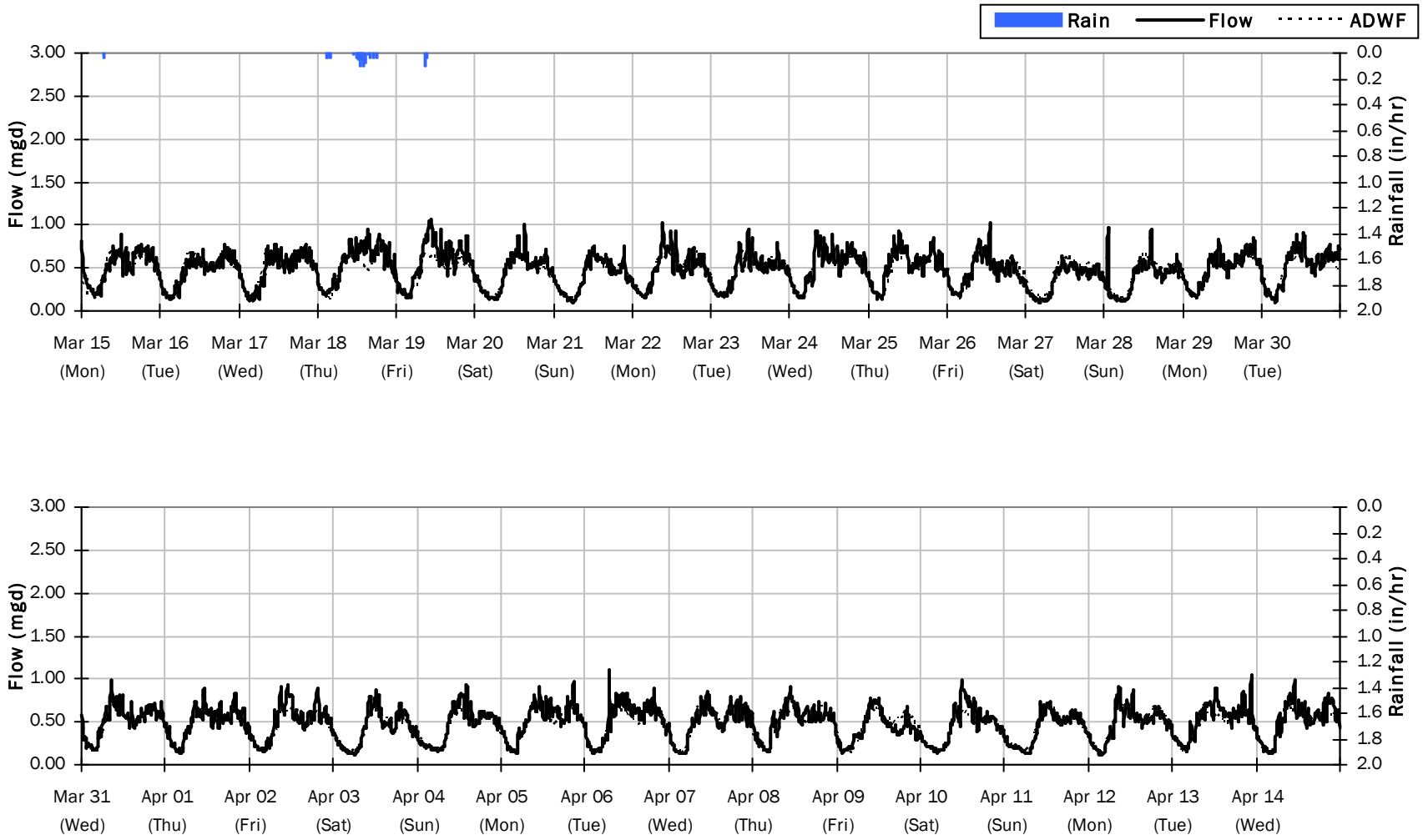
Total Period Rainfall: 3.08 inches Avg Flow: 0.495 mgd Peak Flow: 1.710 mgd Min Flow: 0.088 mgd



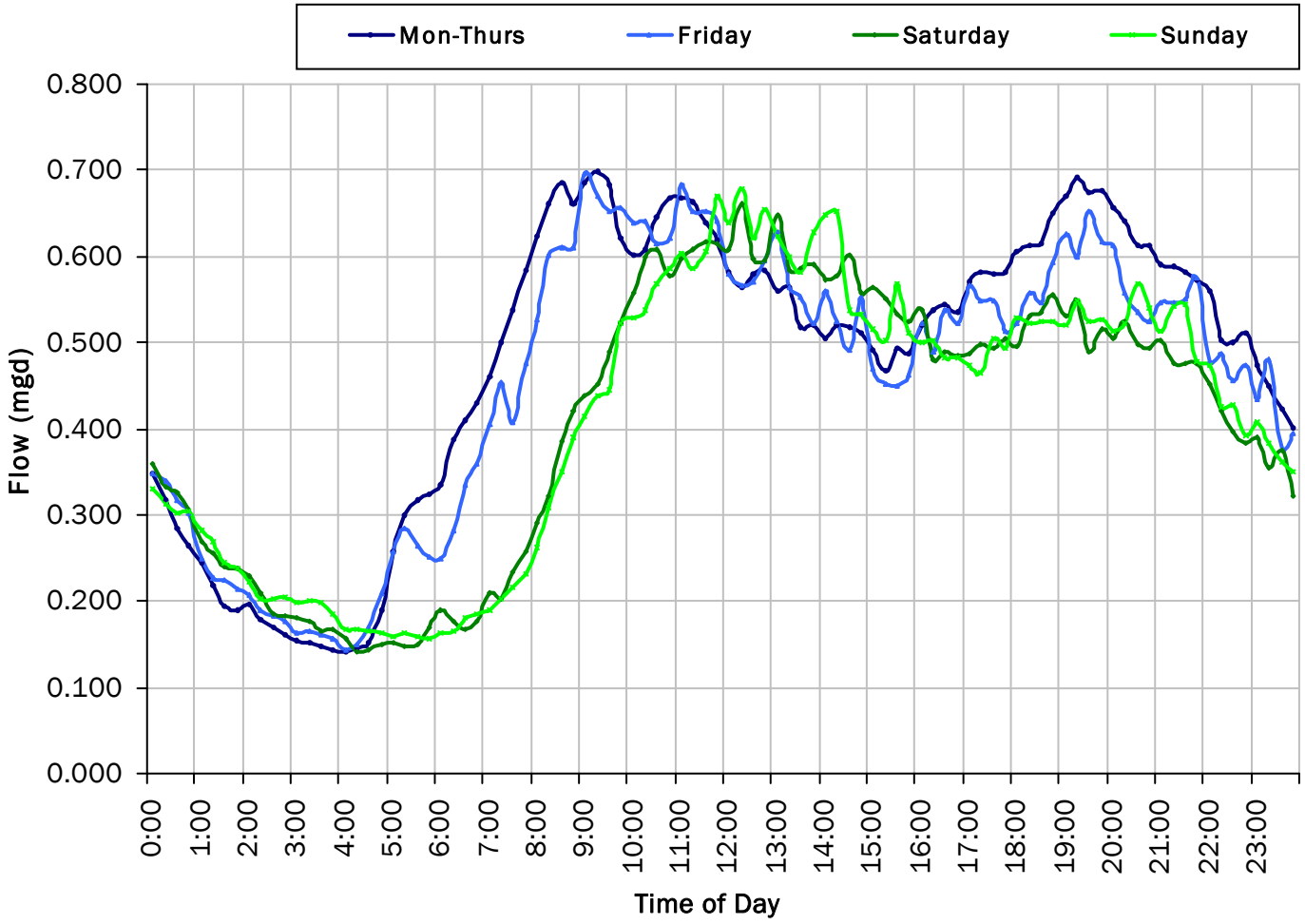
FM 7

Flow Summary: 3/15/2021 to 4/14/2021

Total Period Rainfall: 0.24 inches Avg Flow: 0.485 mgd Peak Flow: 1.099 mgd Min Flow: 0.088 mgd

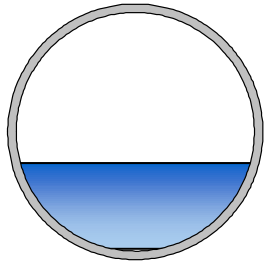


FM 7
Average Dry Weather Flow Hydrographs



ADWF:

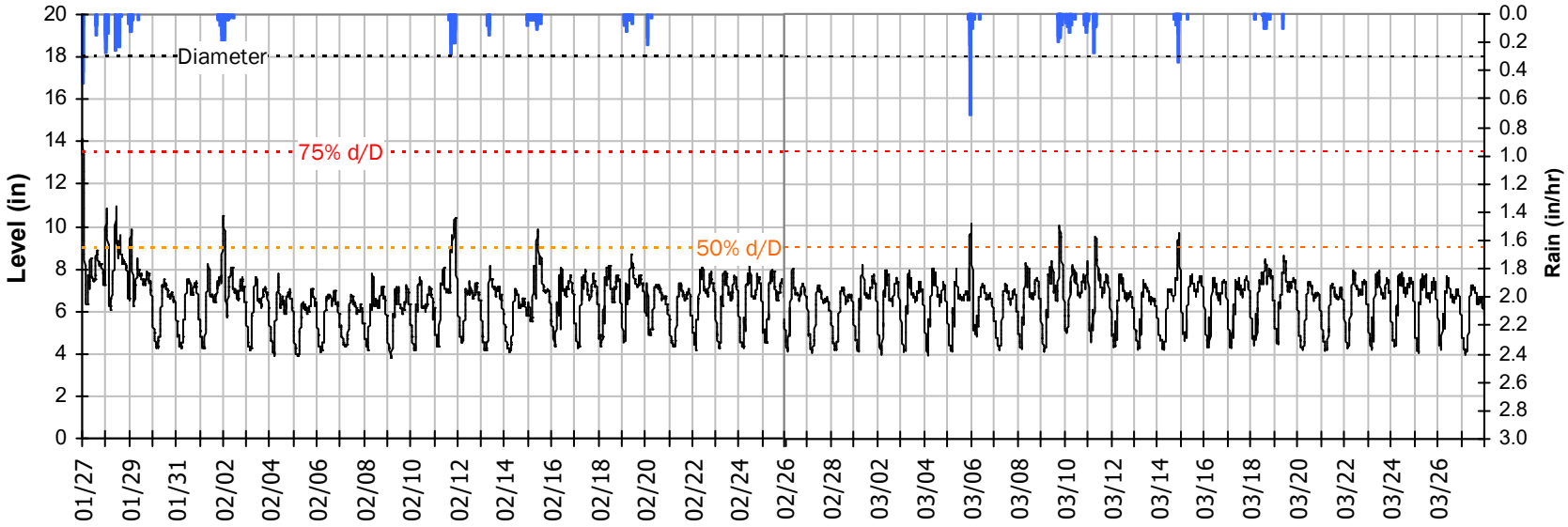
0.457 *mgd*

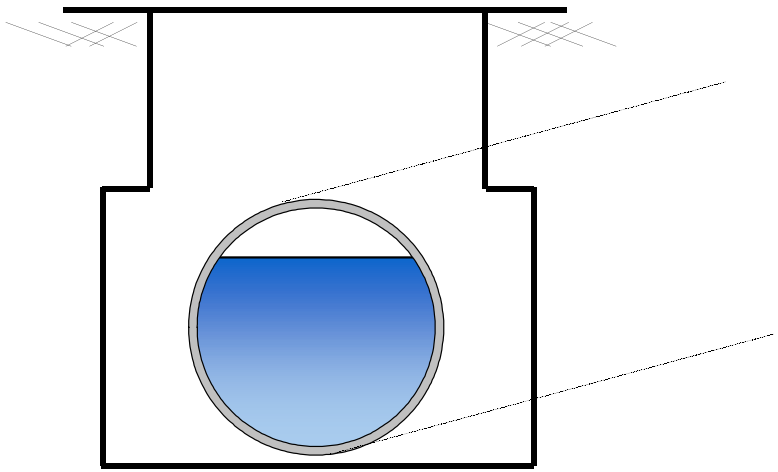


FM 7

Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Monitoring Period

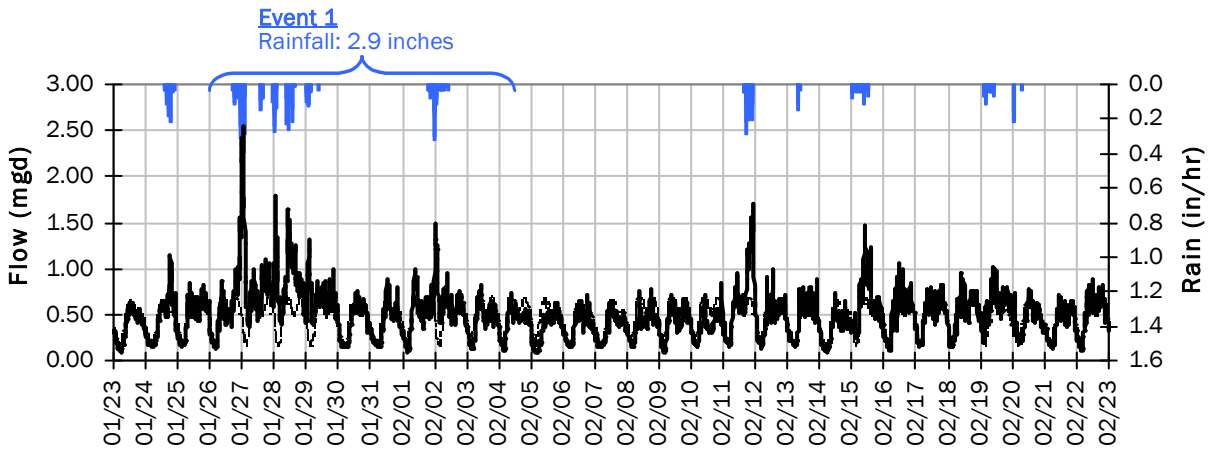




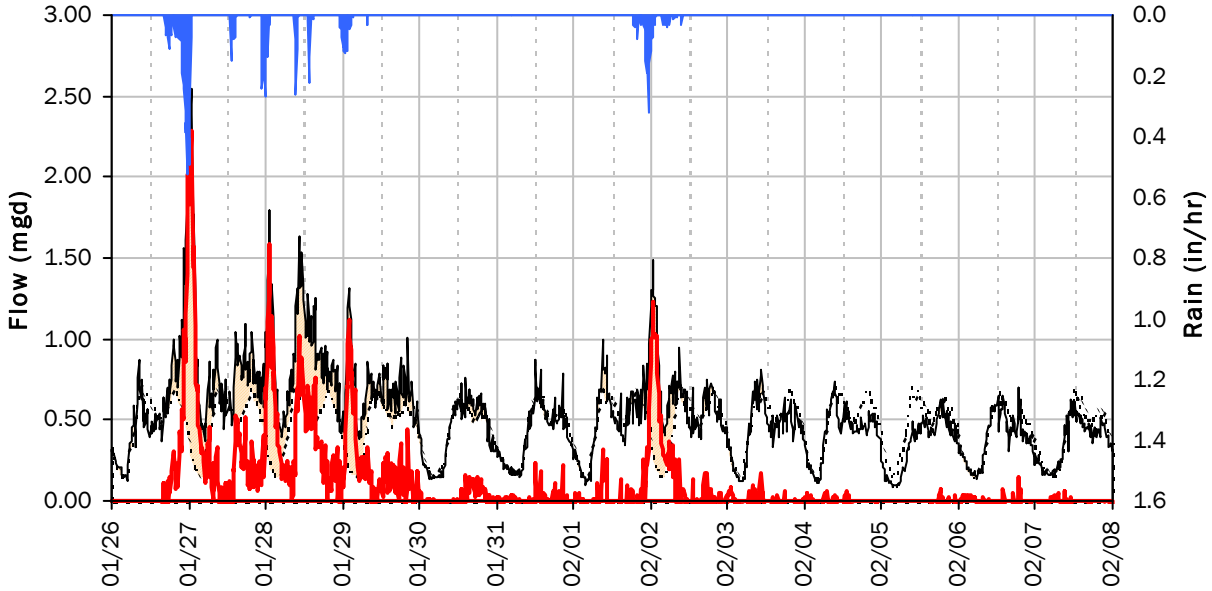
Pipe Diameter:	18	*inches*
Peak Measured Level:	14.1	*inches*
Peak d/D Ratio:	0.78	

FM 7
I/I Summary: Event 1

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



Event 1 Detail Graph

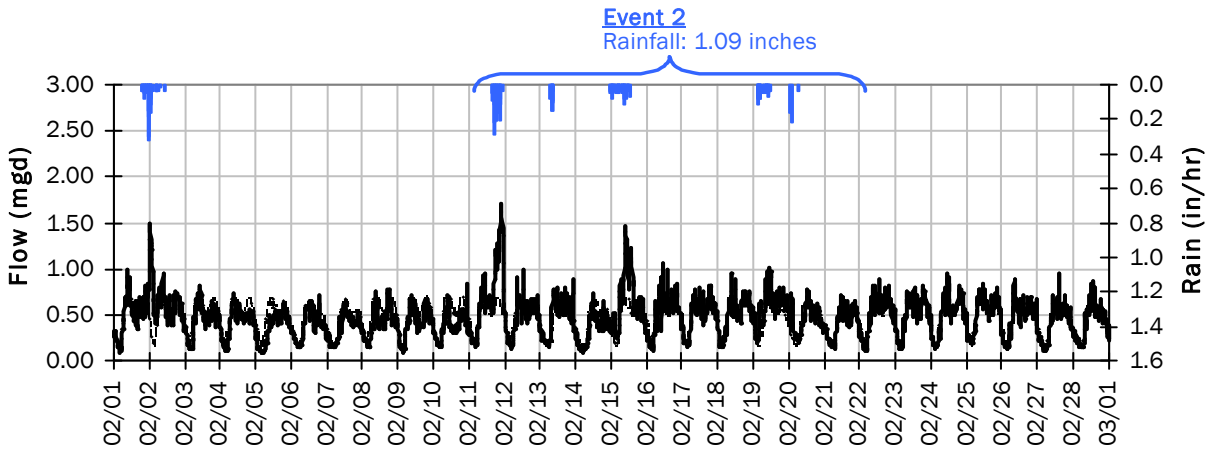


Storm Event I/I Analysis (Rain = 2.90 inches)

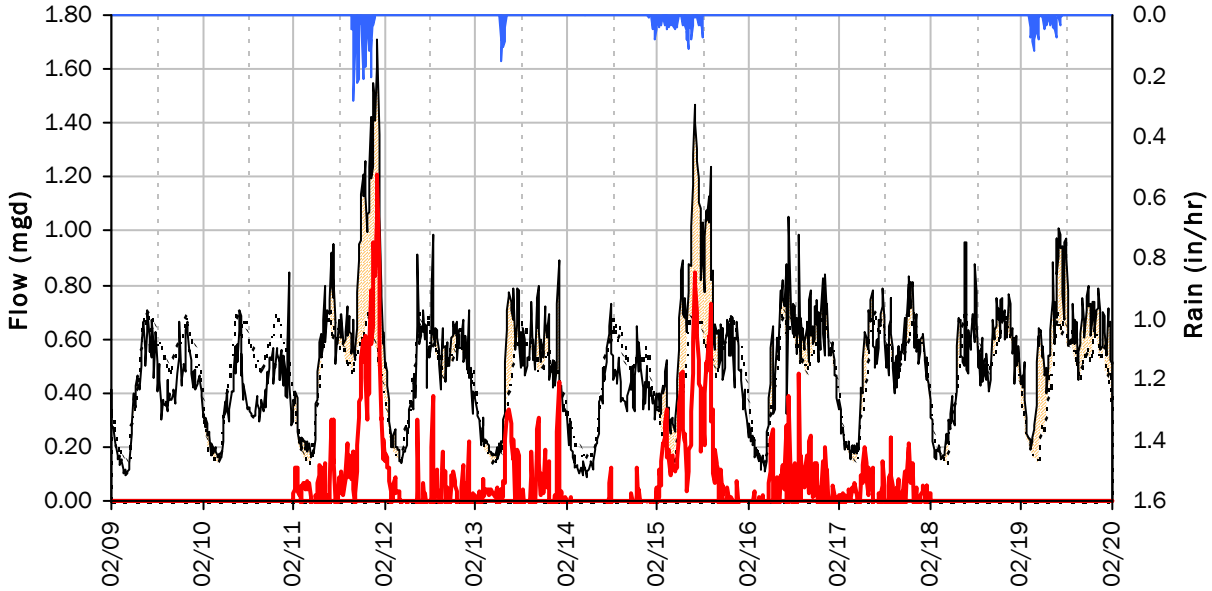
Capacity		Inflow / Infiltration	
Peak Flow:	2.55 *mgd*	**Peak I/I Rate:**	2.29 *mgd*
PF:	5.58	**Total I/I:**	1,027,000 *gallons*
Peak Level:	14.12 *in*		
d/D Ratio:	0.78		

FM 7
I/I Summary: Event 2

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



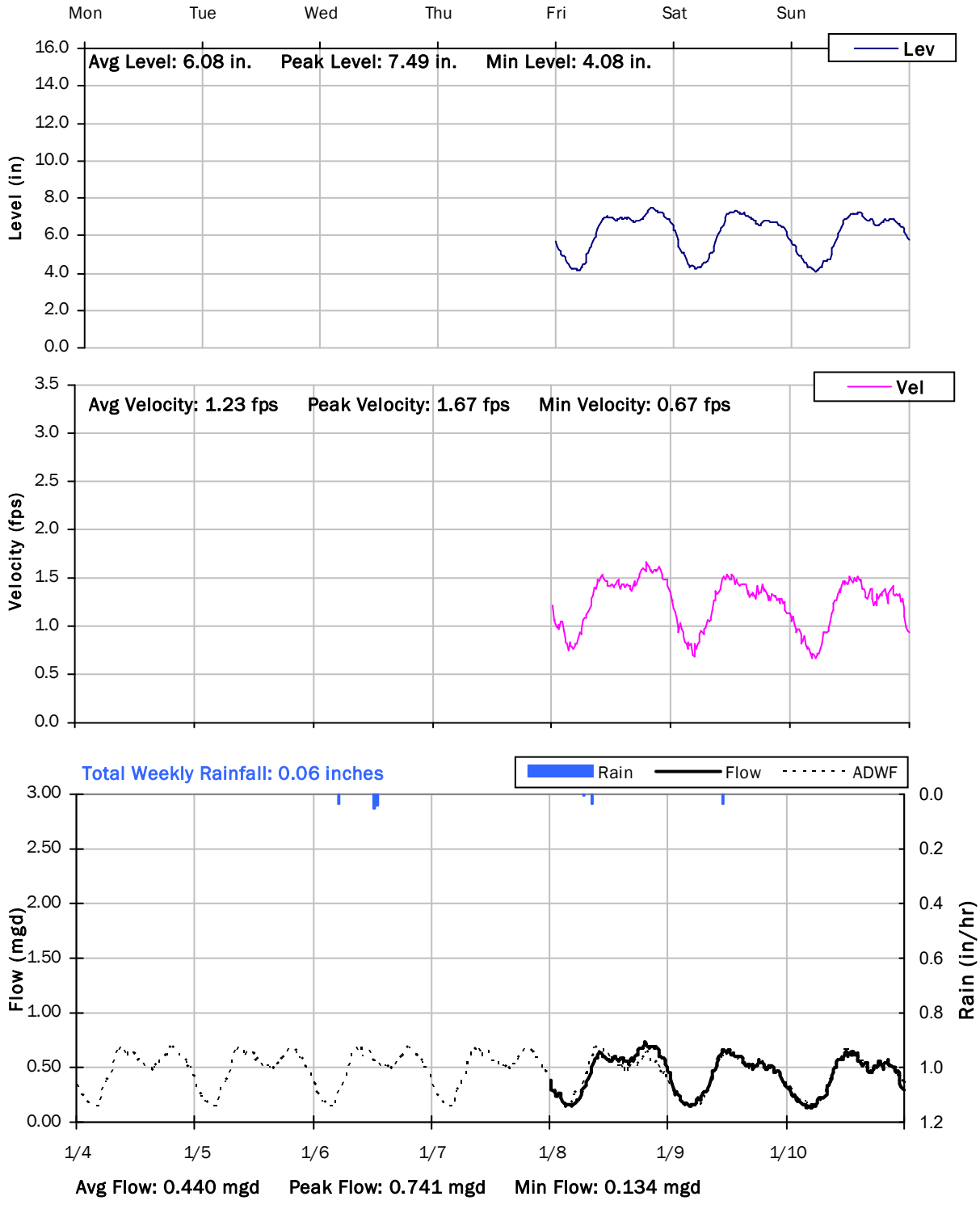
Event 2 Detail Graph



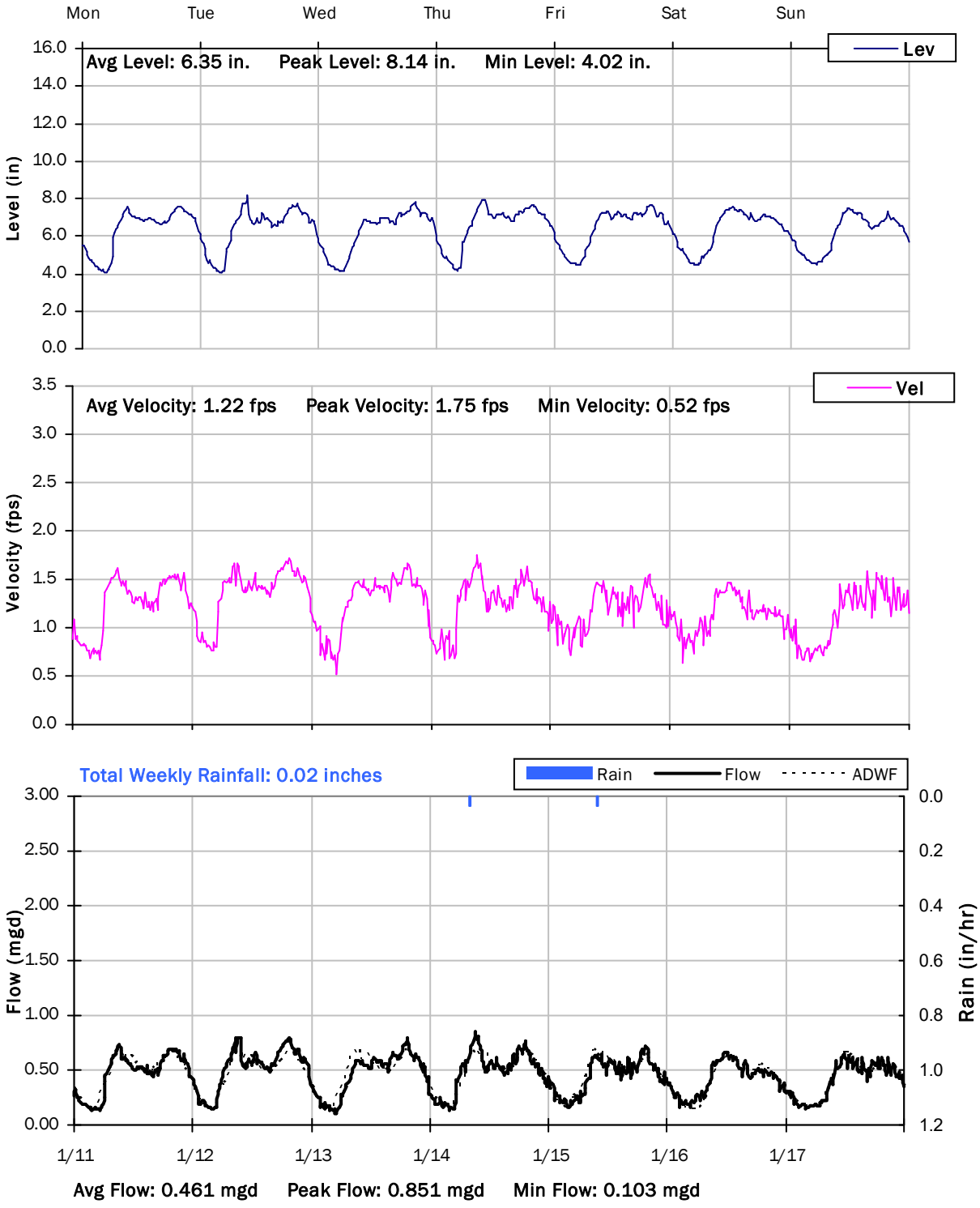
Storm Event I/I Analysis (Rain = 1.09 inches)

Capacity		Inflow / Infiltration	
Peak Flow:	1.71 *mgd*	**Peak I/I Rate:**	1.21 *mgd*
PF:	3.74	**Total I/I:**	465,000 *gallons*
Peak Level:	10.43 *in*		
d/D Ratio:	0.58		

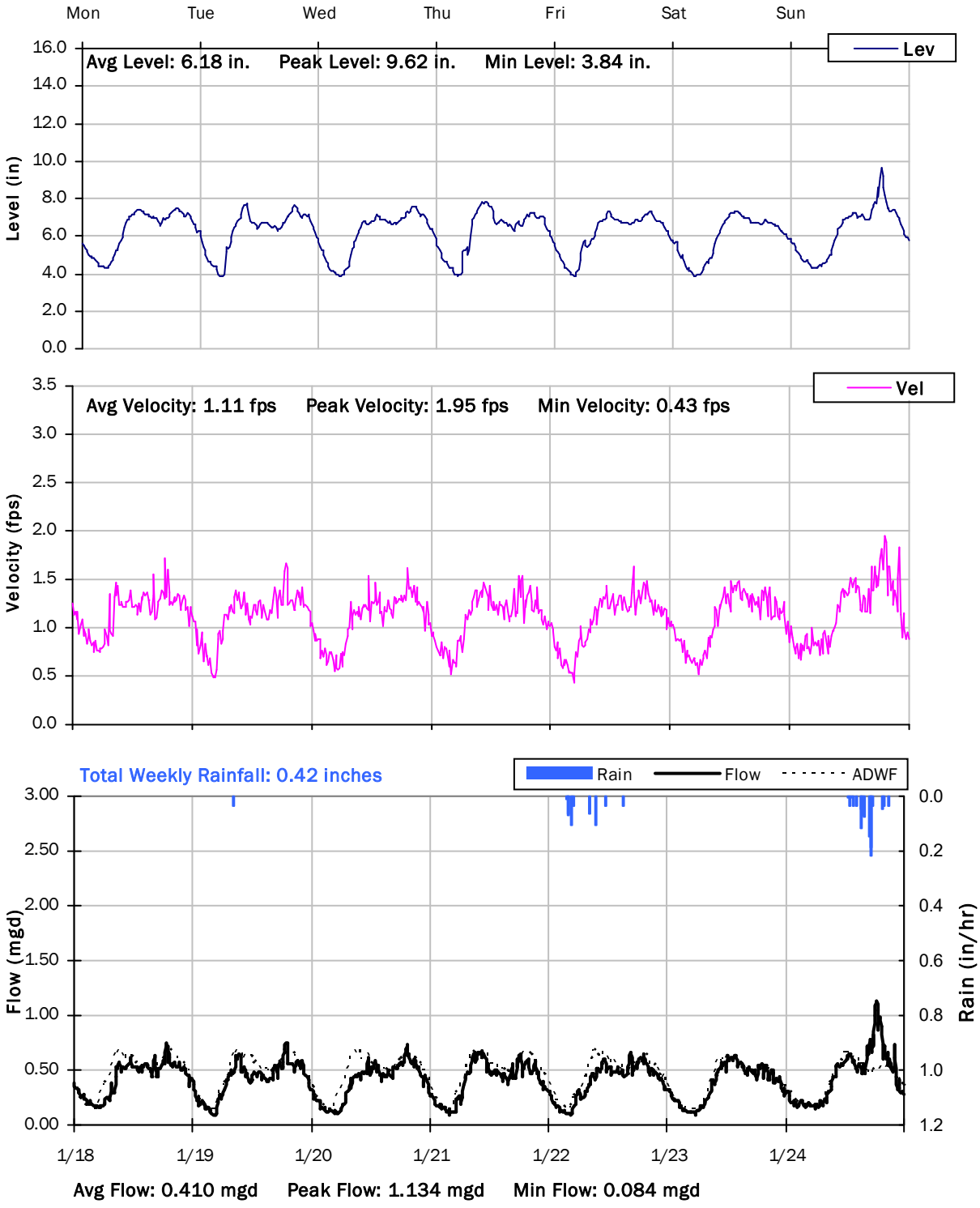
FM 7
Weekly Level, Velocity and Flow Hydrographs
1/4/2021 to 1/11/2021



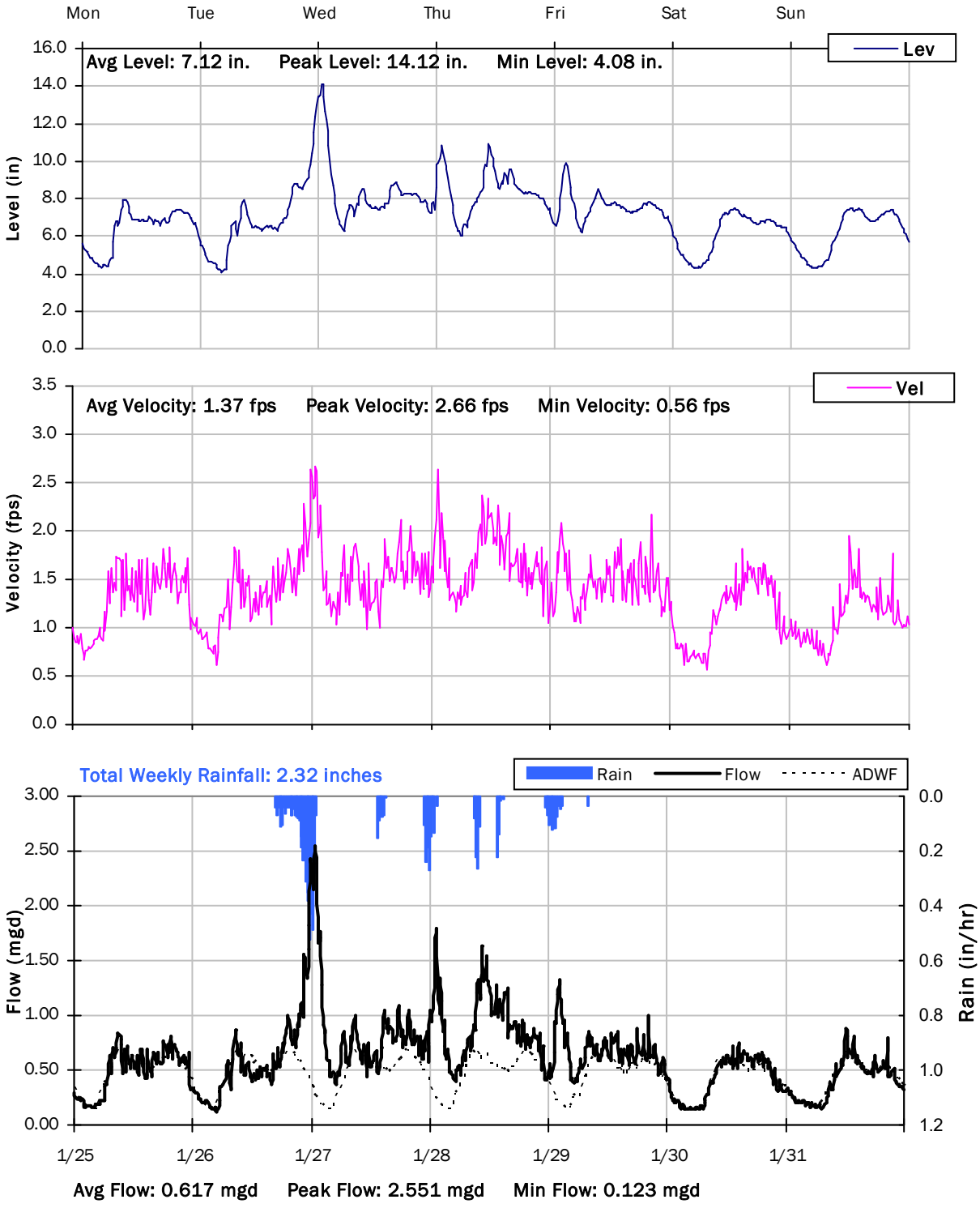
FM 7
Weekly Level, Velocity and Flow Hydrographs
1/11/2021 to 1/18/2021



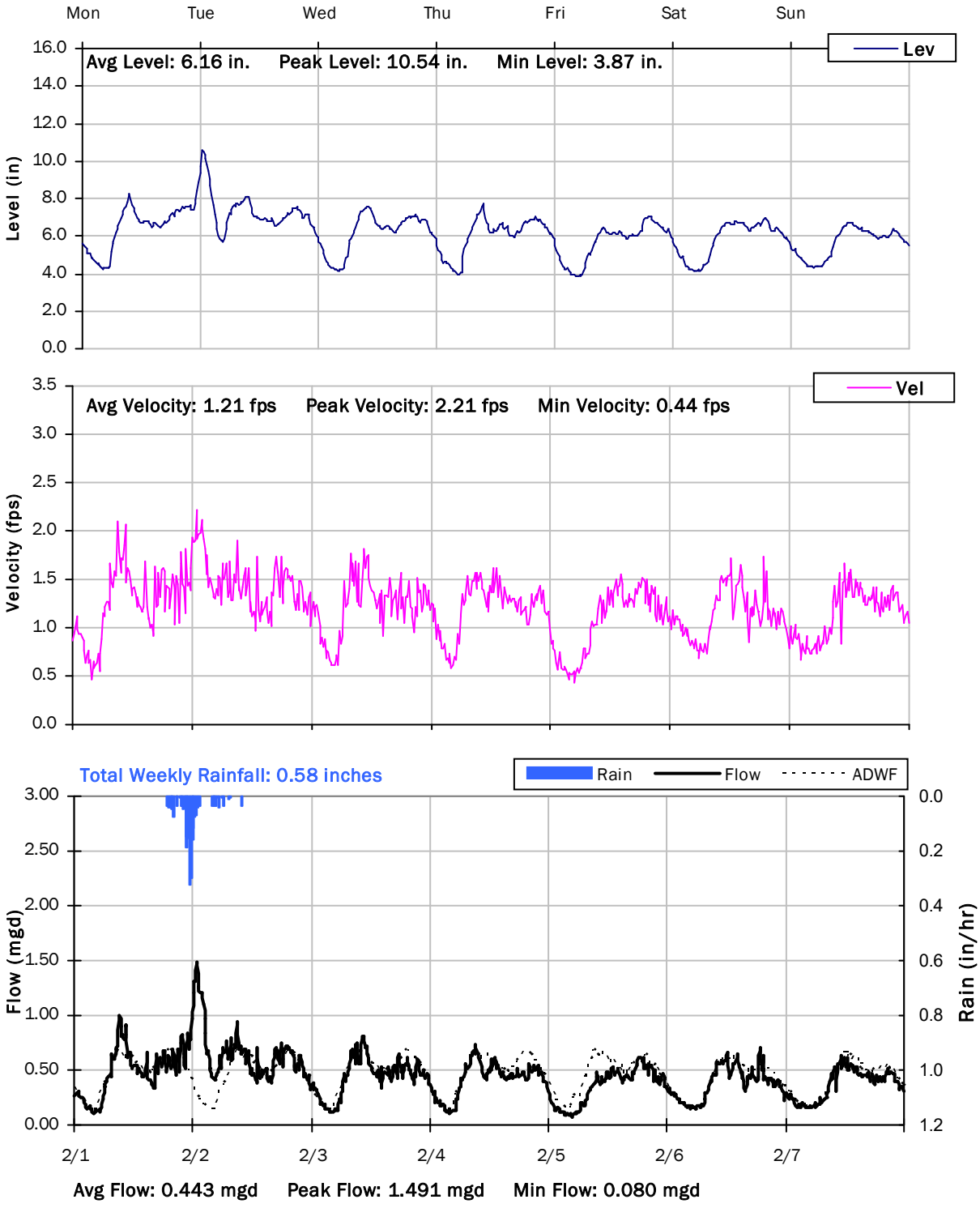
FM 7
Weekly Level, Velocity and Flow Hydrographs
1/18/2021 to 1/25/2021



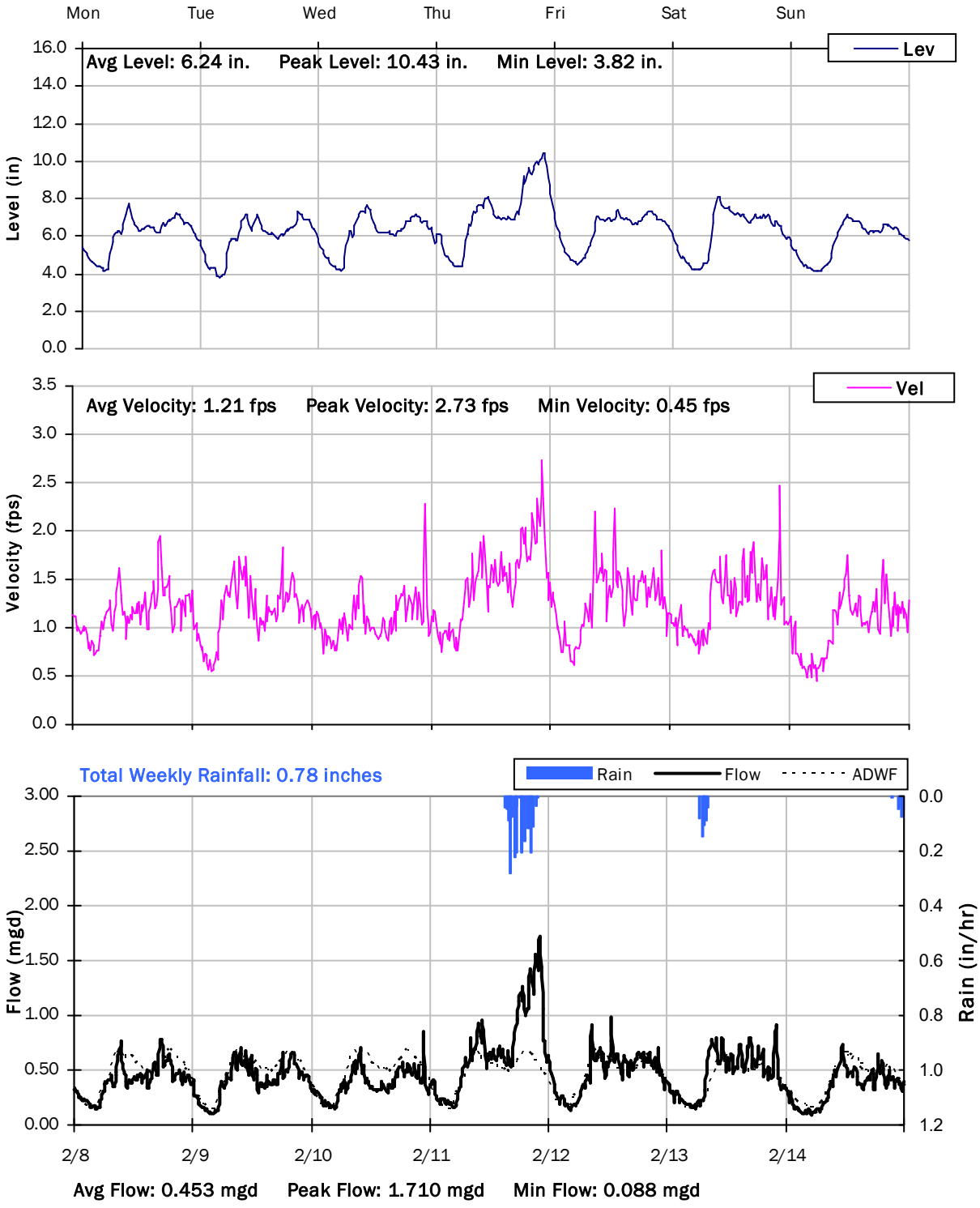
FM 7
Weekly Level, Velocity and Flow Hydrographs
1/25/2021 to 2/1/2021



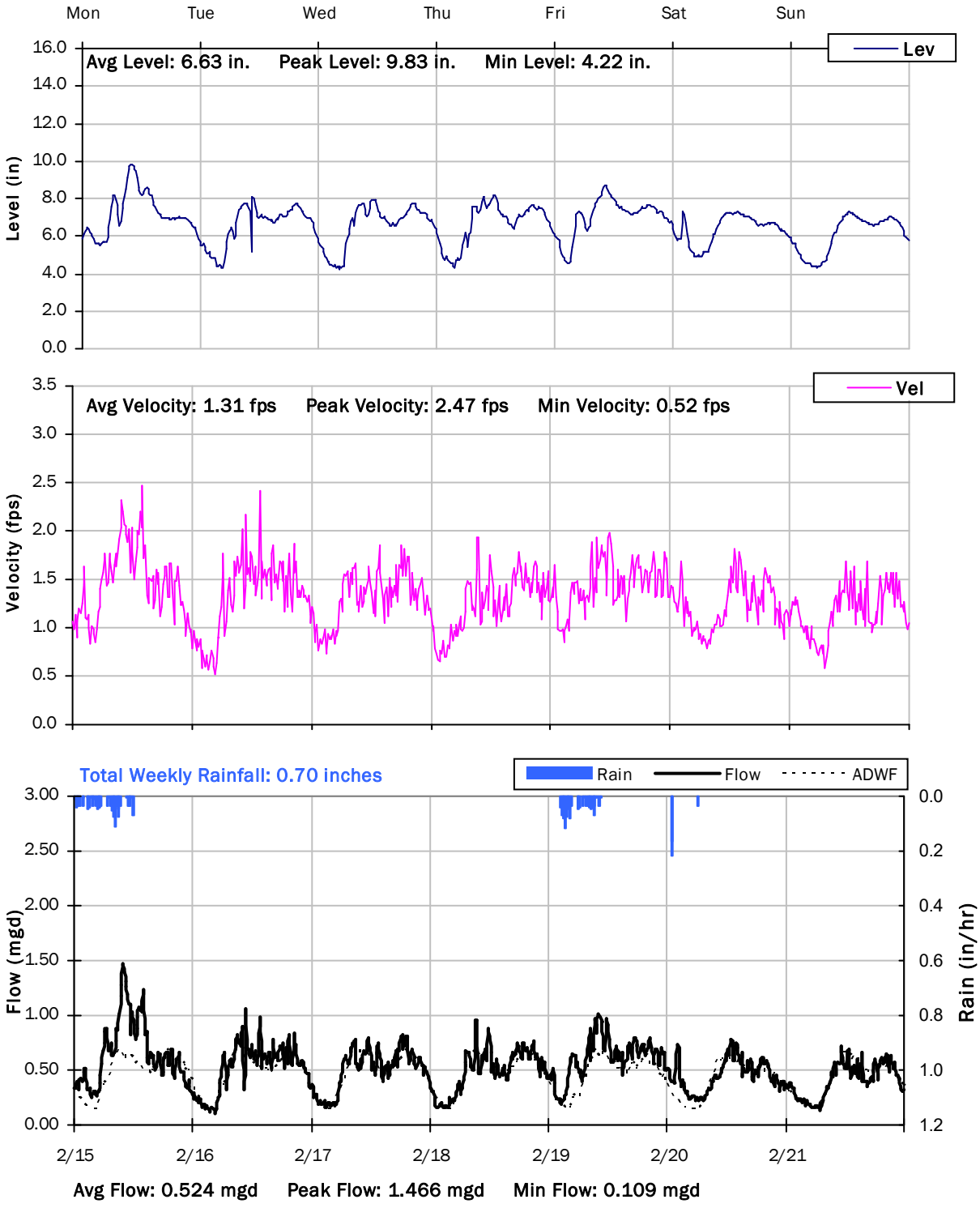
FM 7
Weekly Level, Velocity and Flow Hydrographs
2/1/2021 to 2/8/2021



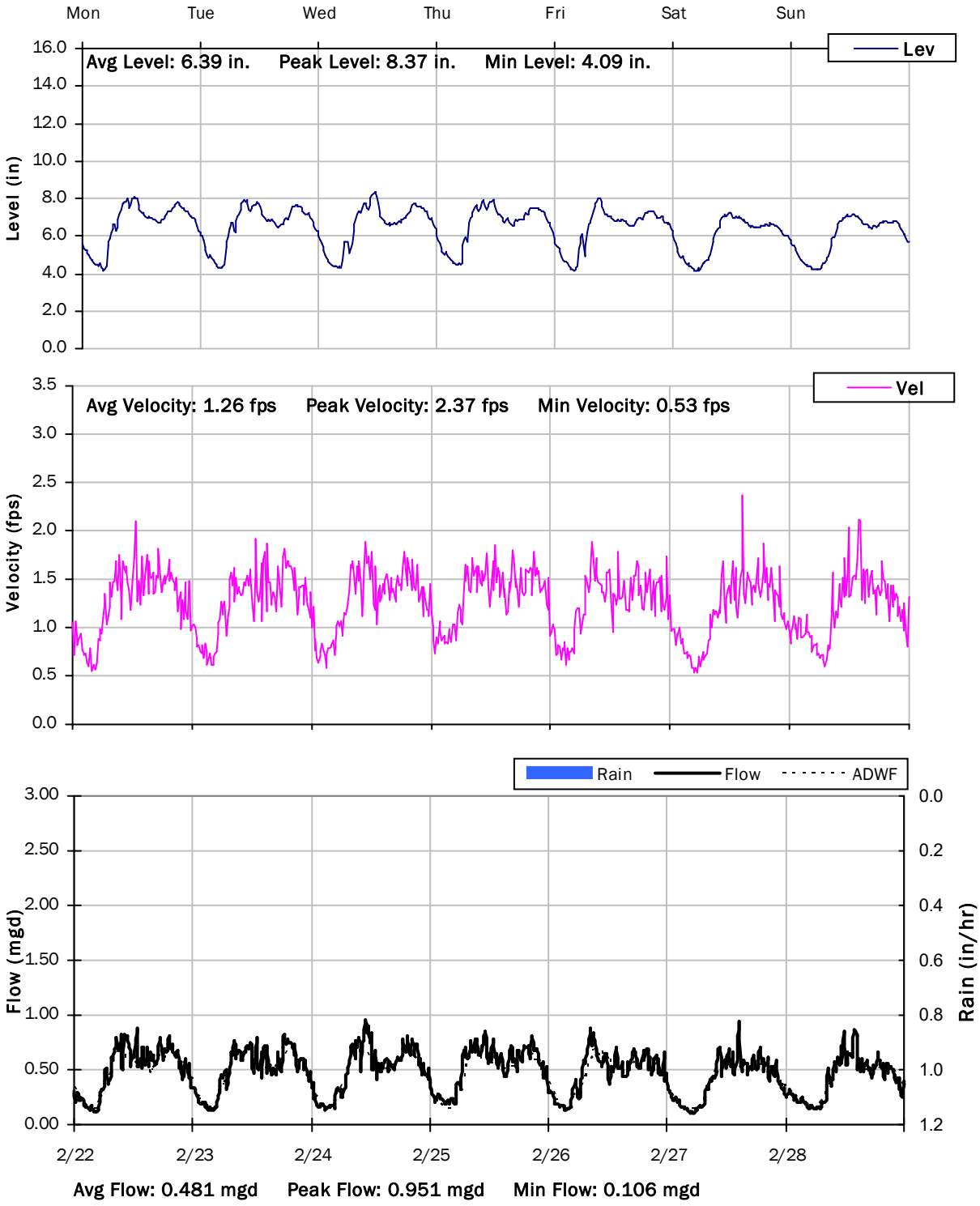
FM 7
Weekly Level, Velocity and Flow Hydrographs
2/8/2021 to 2/15/2021



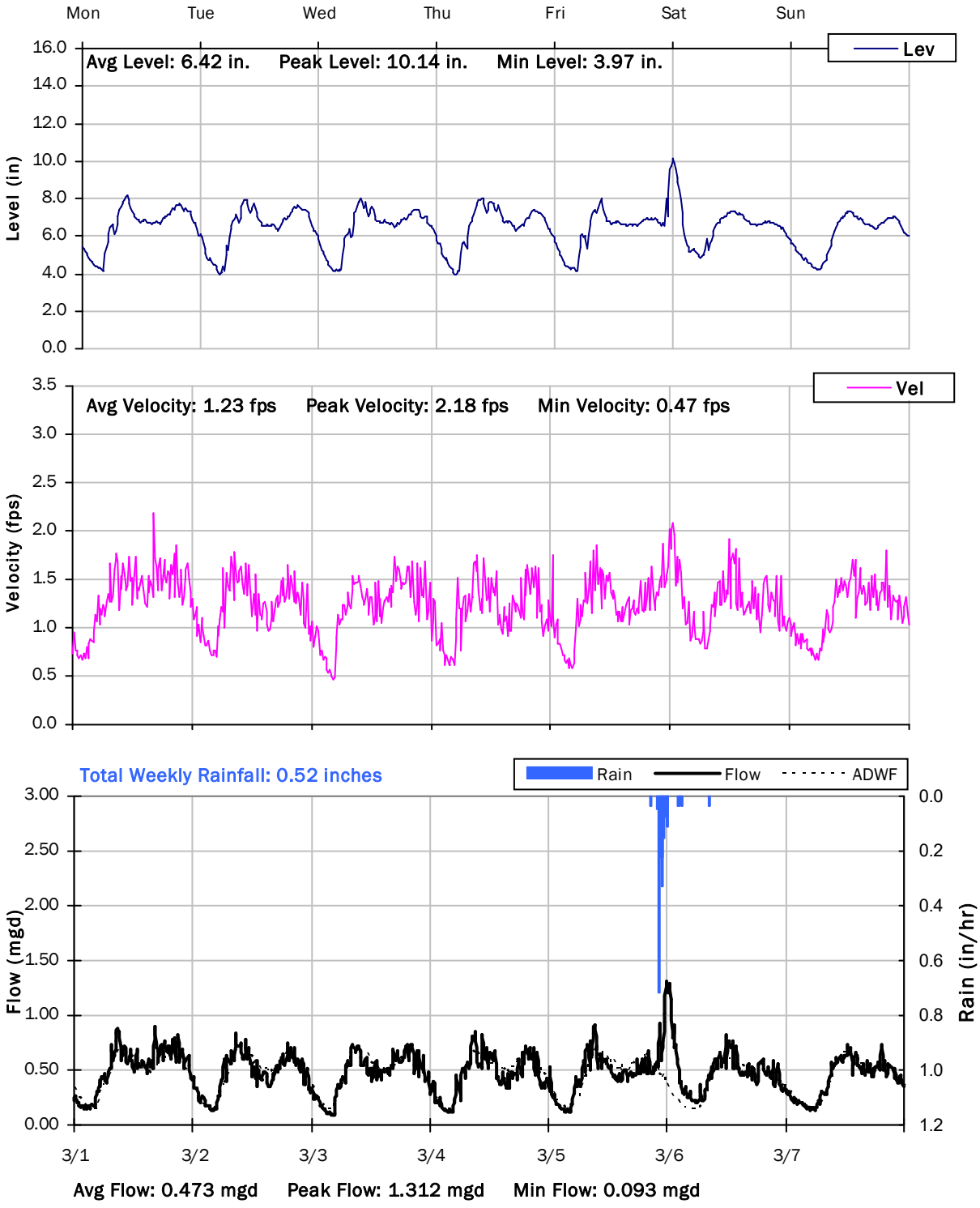
FM 7
Weekly Level, Velocity and Flow Hydrographs
2/15/2021 to 2/22/2021



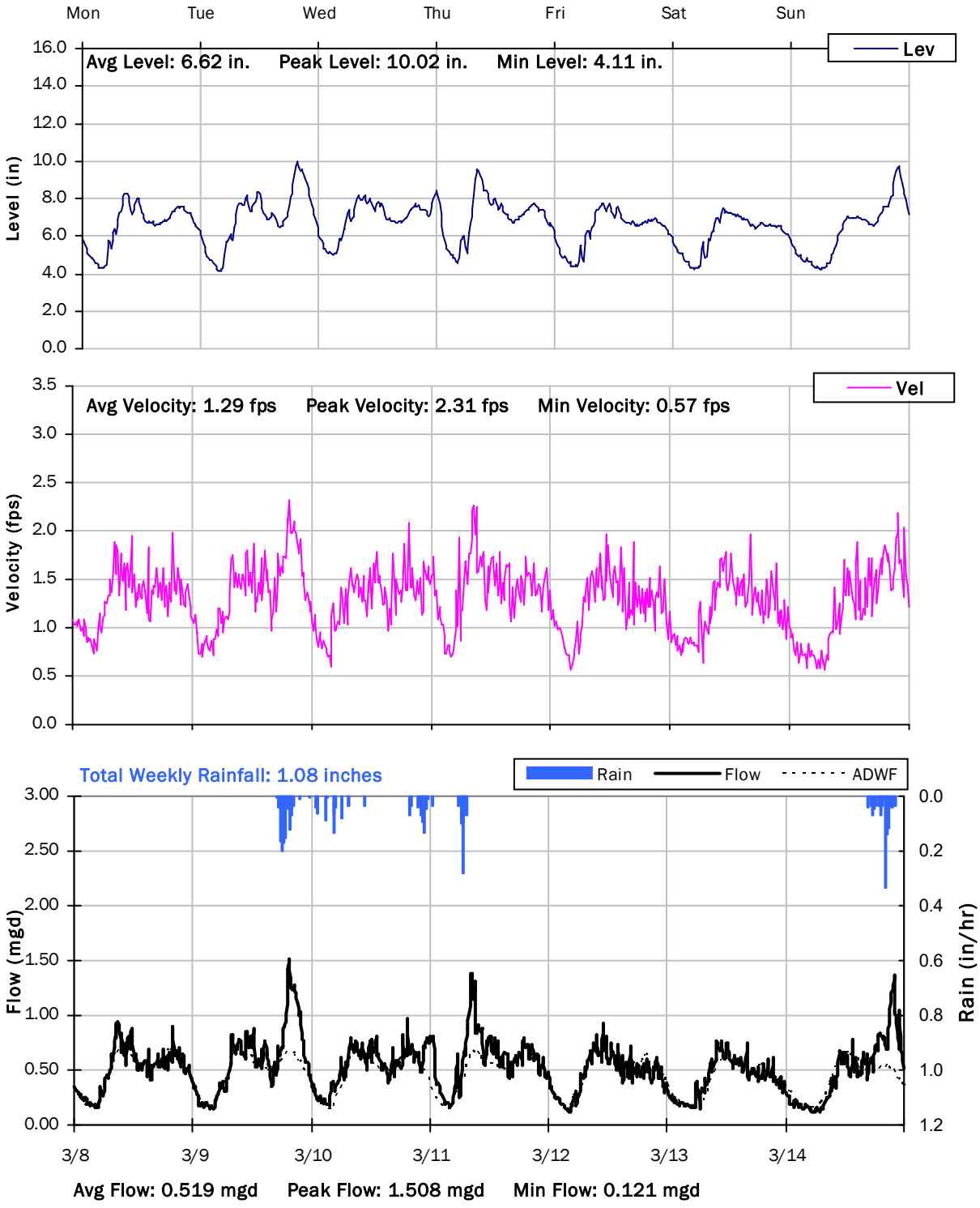
FM 7
Weekly Level, Velocity and Flow Hydrographs
2/22/2021 to 3/1/2021



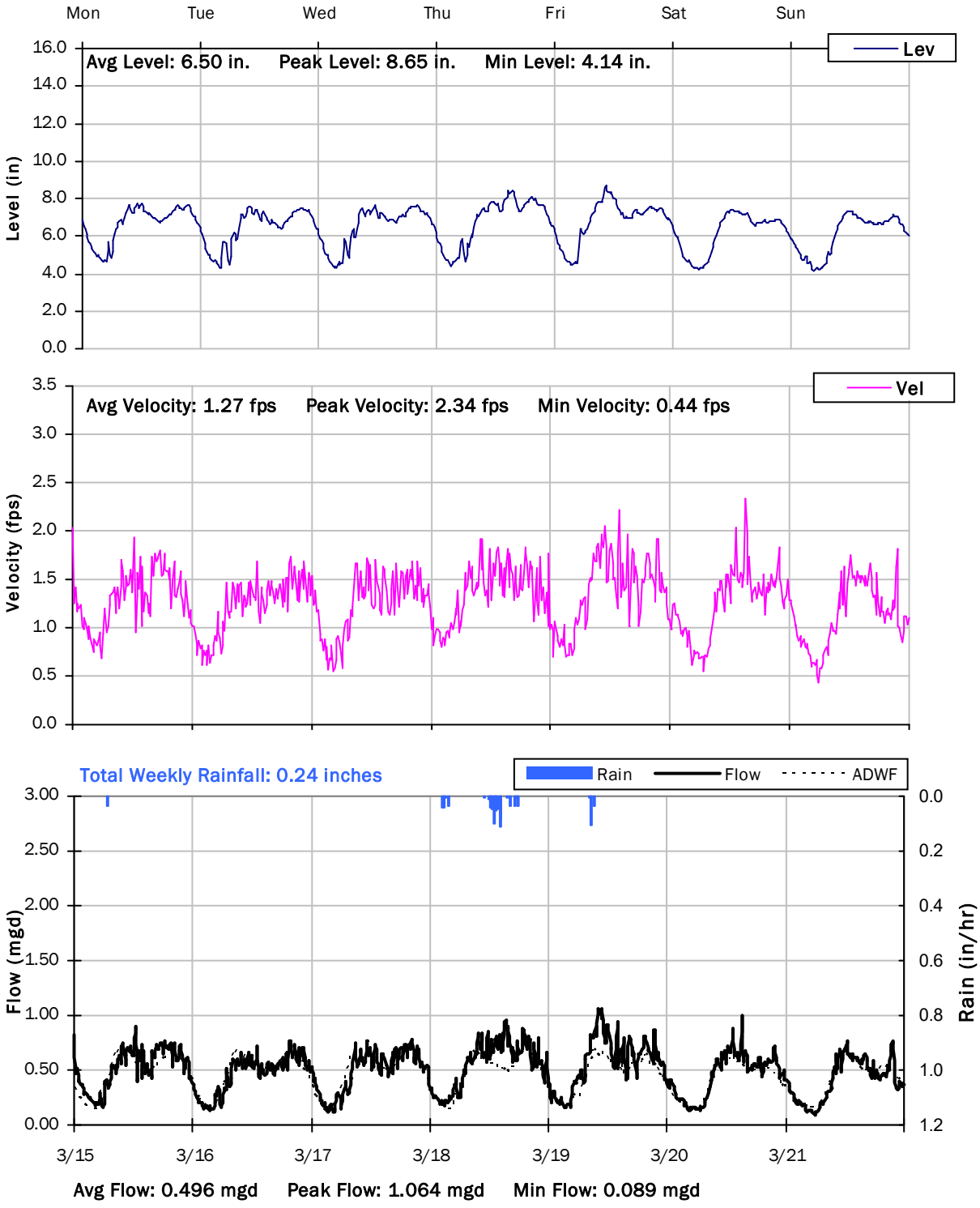
FM 7
Weekly Level, Velocity and Flow Hydrographs
3/1/2021 to 3/8/2021



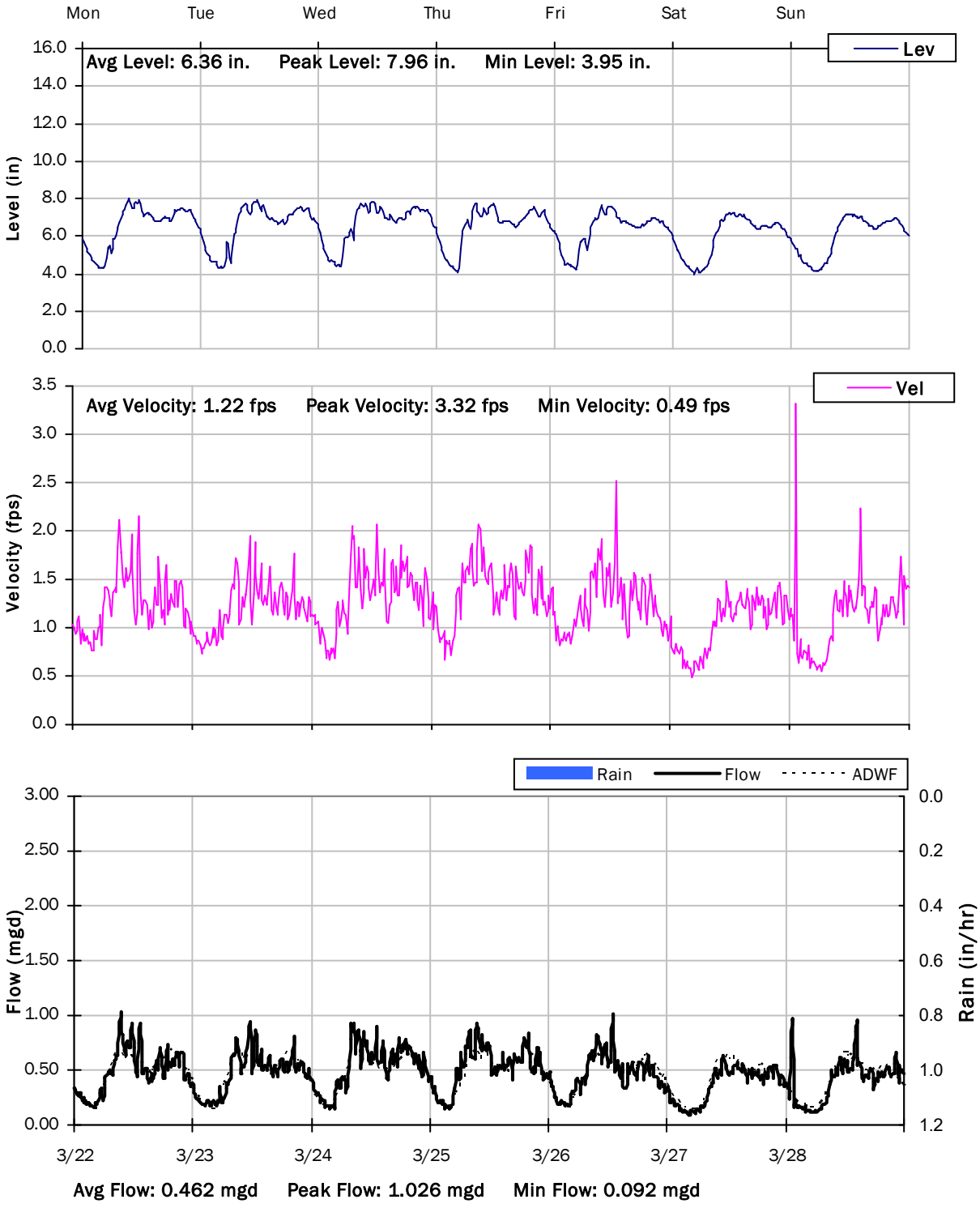
FM 7
Weekly Level, Velocity and Flow Hydrographs
3/8/2021 to 3/15/2021



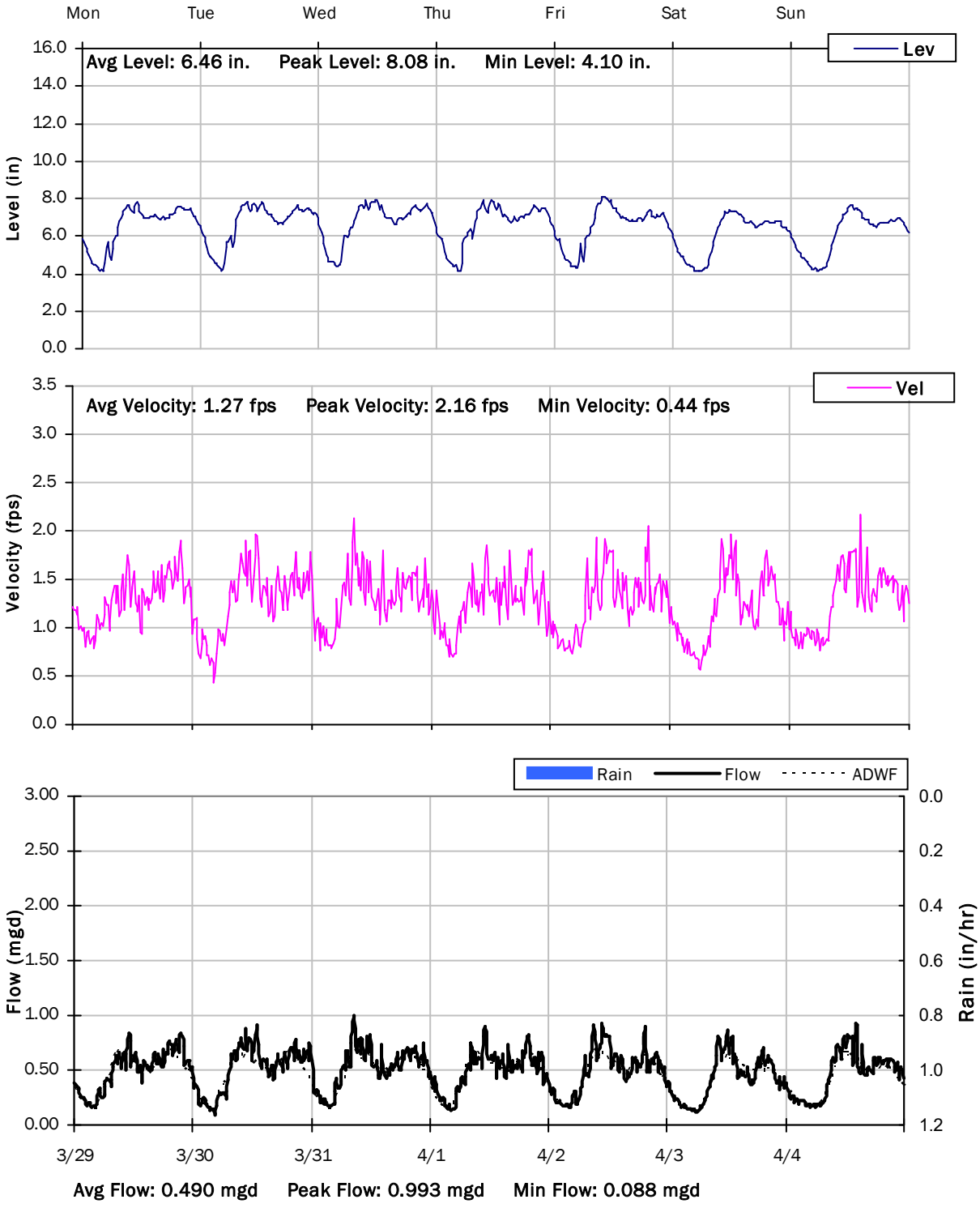
FM 7
Weekly Level, Velocity and Flow Hydrographs
3/15/2021 to 3/22/2021



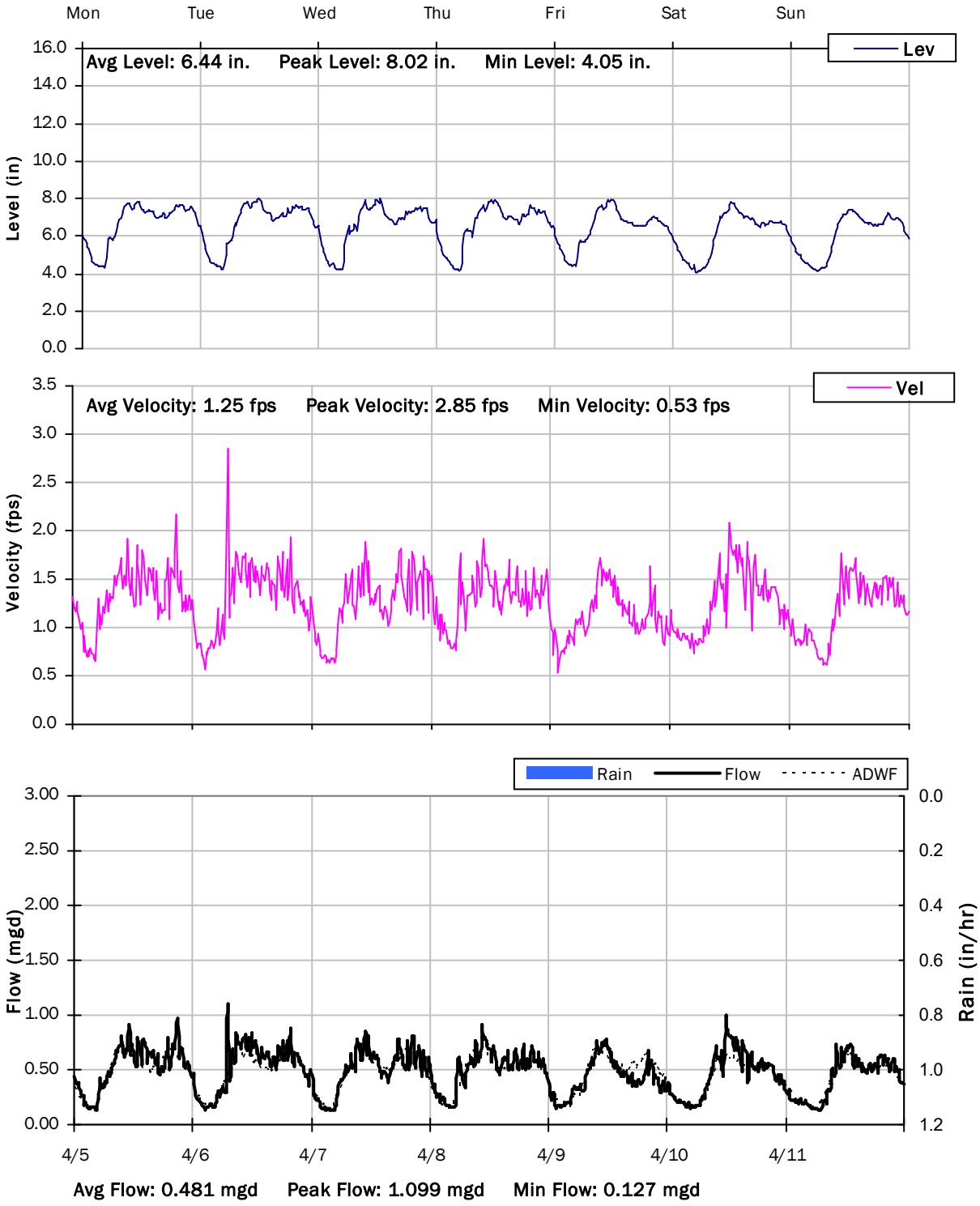
FM 7
Weekly Level, Velocity and Flow Hydrographs
3/22/2021 to 3/29/2021



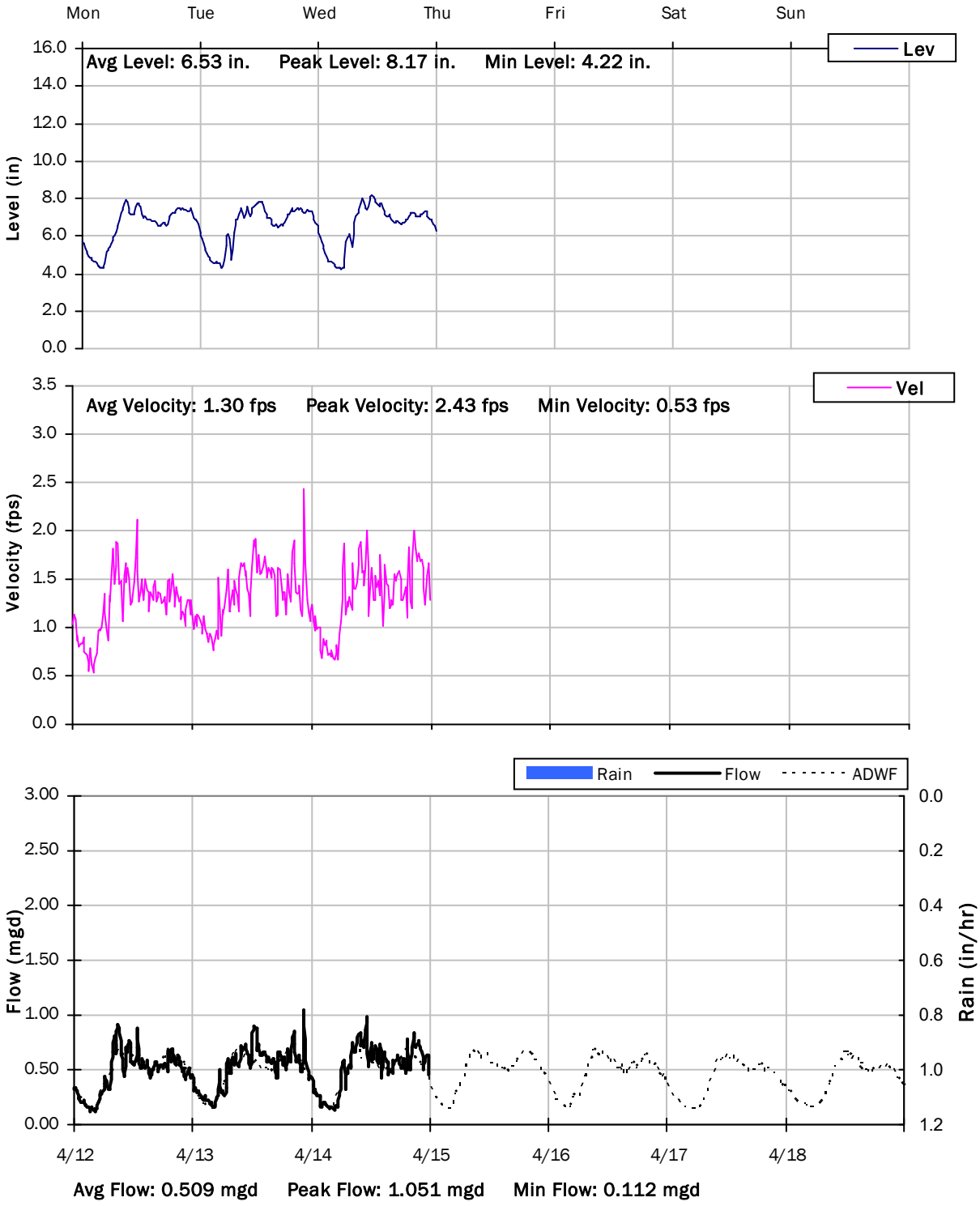
FM 7
Weekly Level, Velocity and Flow Hydrographs
3/29/2021 to 4/5/2021



FM 7
Weekly Level, Velocity and Flow Hydrographs
4/5/2021 to 4/12/2021



FM 7
Weekly Level, Velocity and Flow Hydrographs
4/12/2021 to 4/19/2021



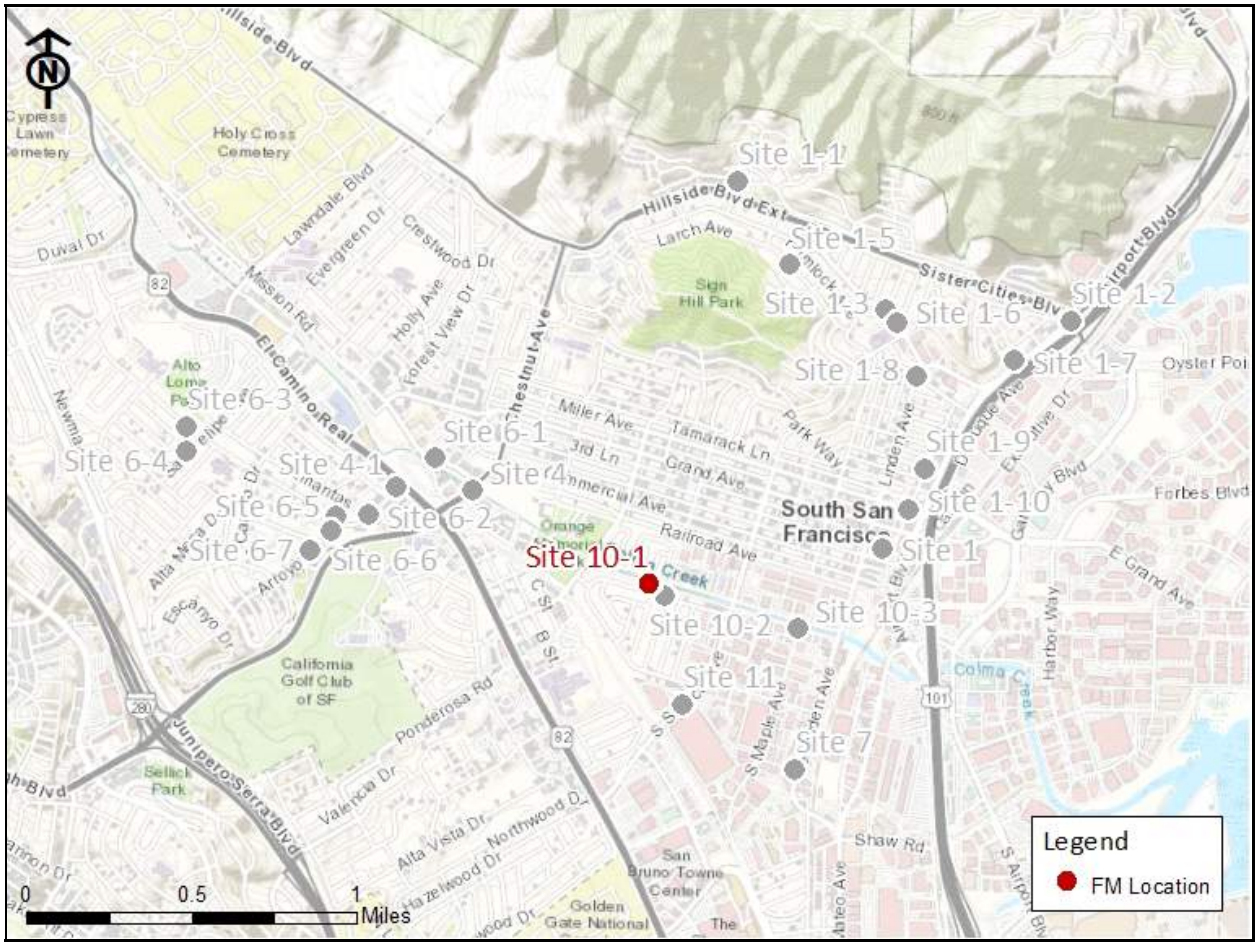
South San Francisco, CA

Sanitary Sewer Flow Monitoring
January 4 - April 14, 2021

Monitoring Site: FM 10-1

Location: Path behind 612 Mayfair Avenue

Data Summary Report



Vicinity Map: FM 10-1

FM 10-1

Site Information

Location: Path behind 612 Mayfair Avenue

Coordinates: 122.4224° W, 37.6523° N

Rim Elevation (Earth): 19 feet

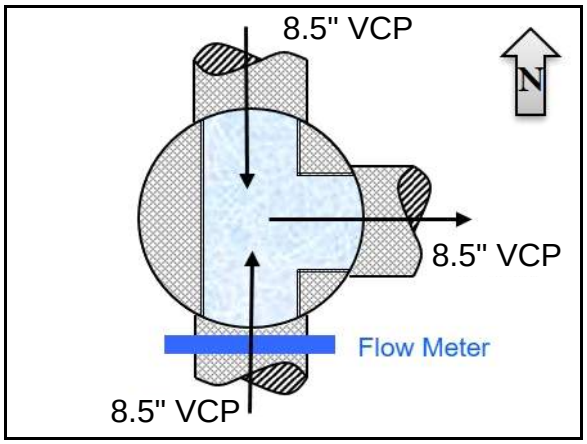
Pipe Diameter: 8.5 inches

ADWF: 0.023 mgd

Peak Measured Flow: 0.232 mgd

Satellite Map

Sanitary Map



Flow Sketch

Street View

Plan View

FM 10-1

Additional Site Photos

Effluent Pipe

Monitored South Influent Pipe

FM 10-1

Additional Site Photos

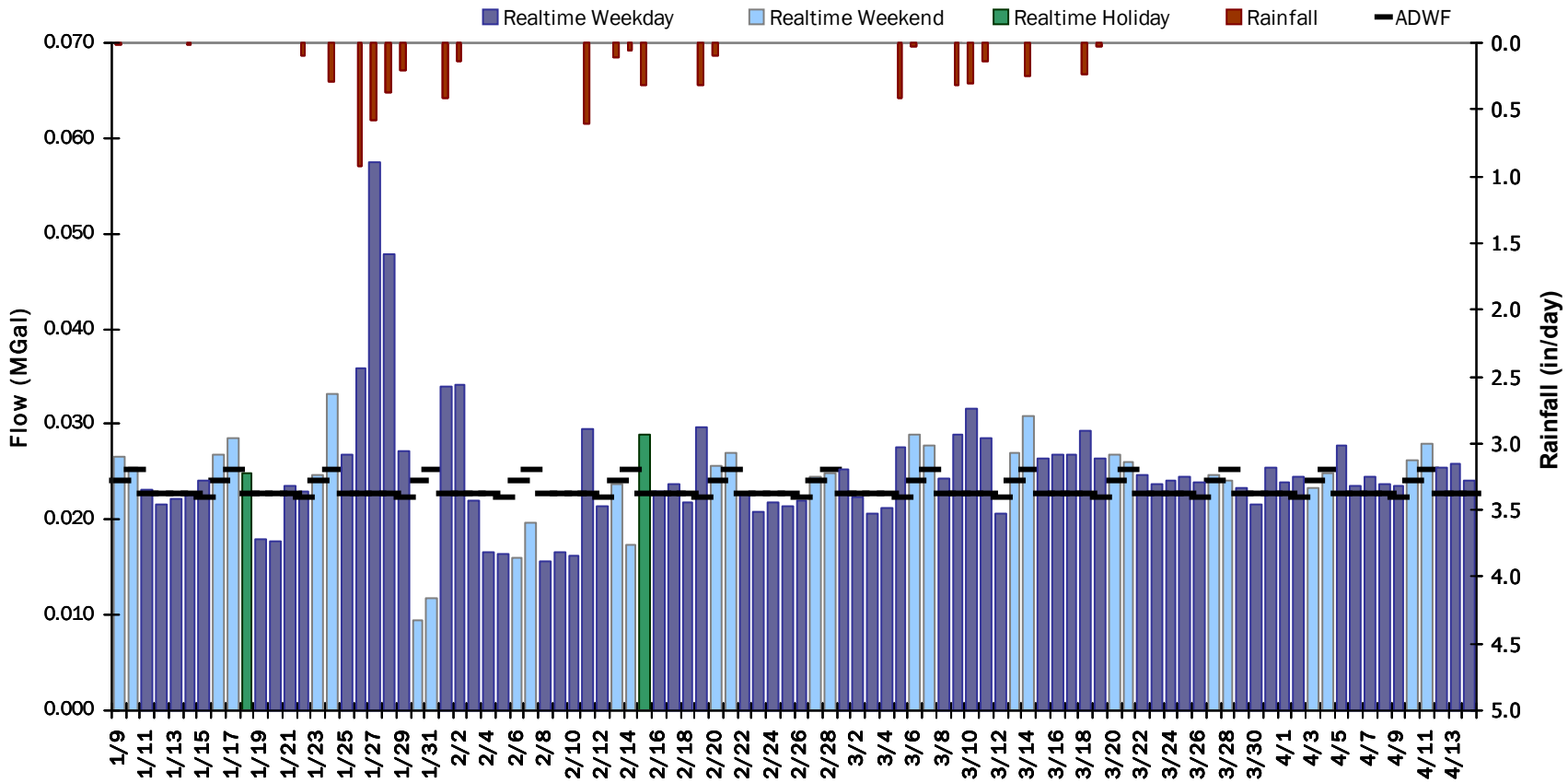
North Influent Pipe

FM 10-1

Period Flow Summary: Daily Flow Totals

Avg Period Flow: 0.025 MGal Peak Daily Flow: 0.058 MGal Min Daily Flow: 0.010 MGal

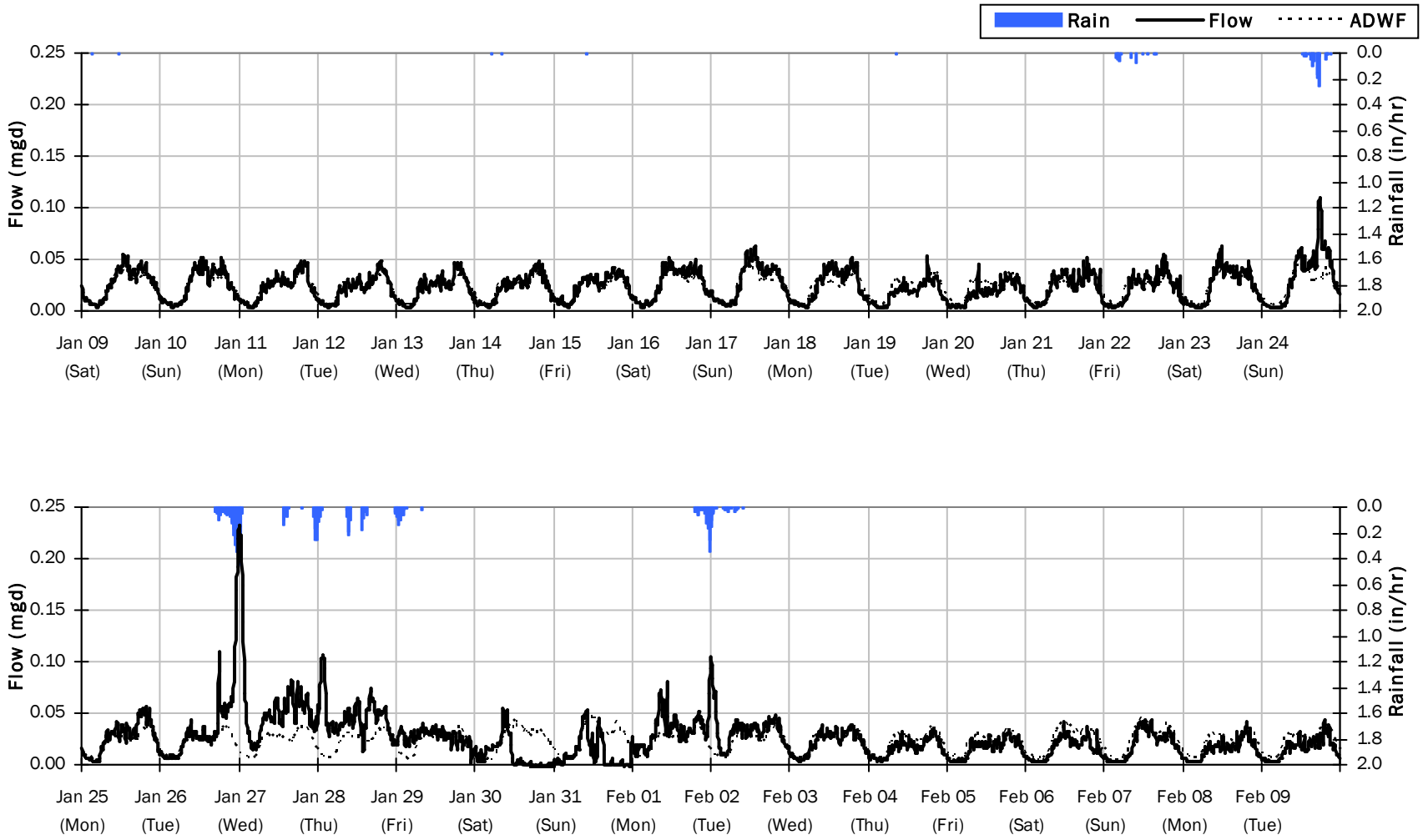
Total Period Rainfall: 6.20 inches



FM 10-1

Flow Summary: 1/9/2021 to 2/9/2021

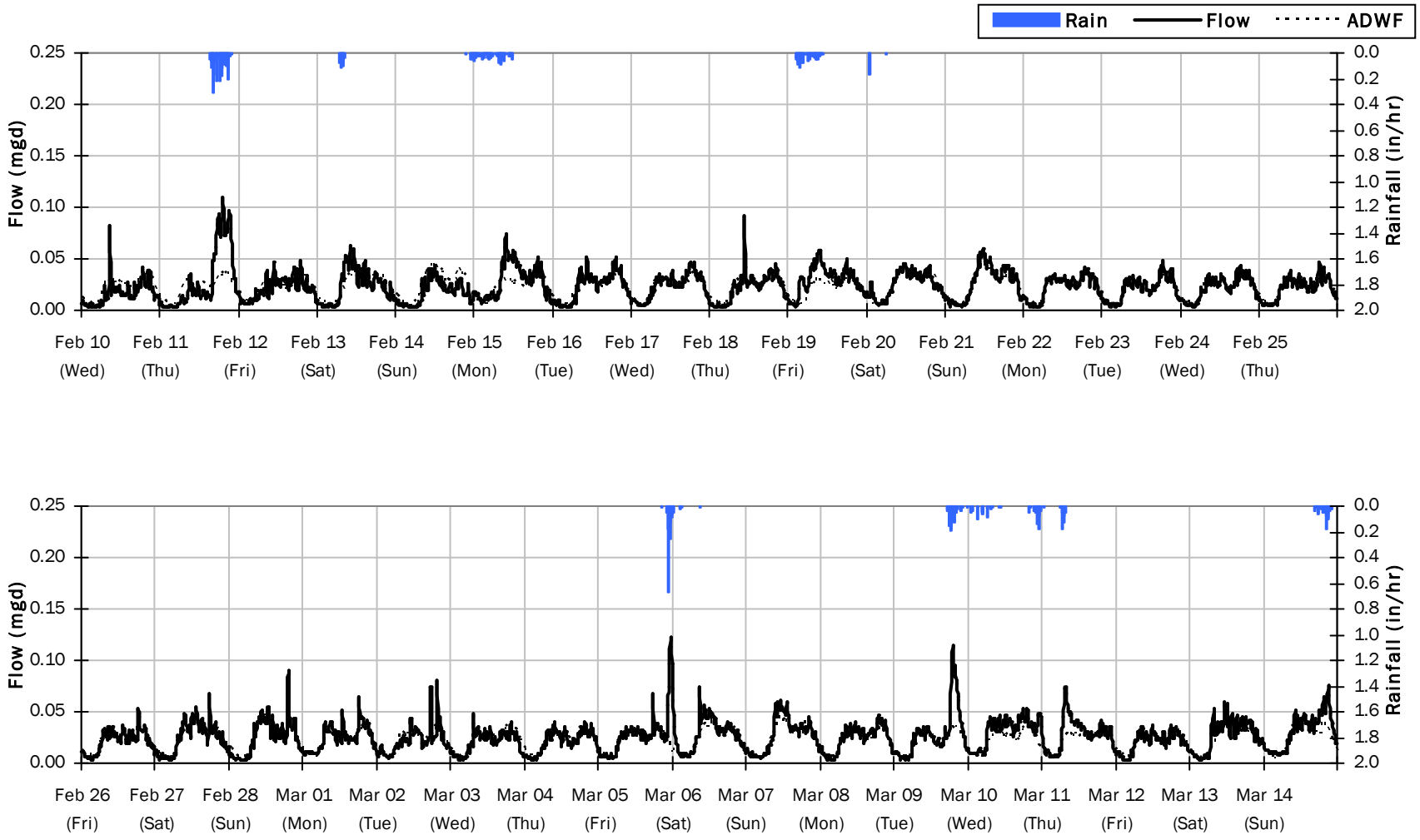
Total Period Rainfall: 3.02 inches Avg Flow: 0.025 mgd Peak Flow: 0.232 mgd Min Flow: -0.006 mgd



FM 10-1

Flow Summary: 2/10/2021 to 3/14/2021

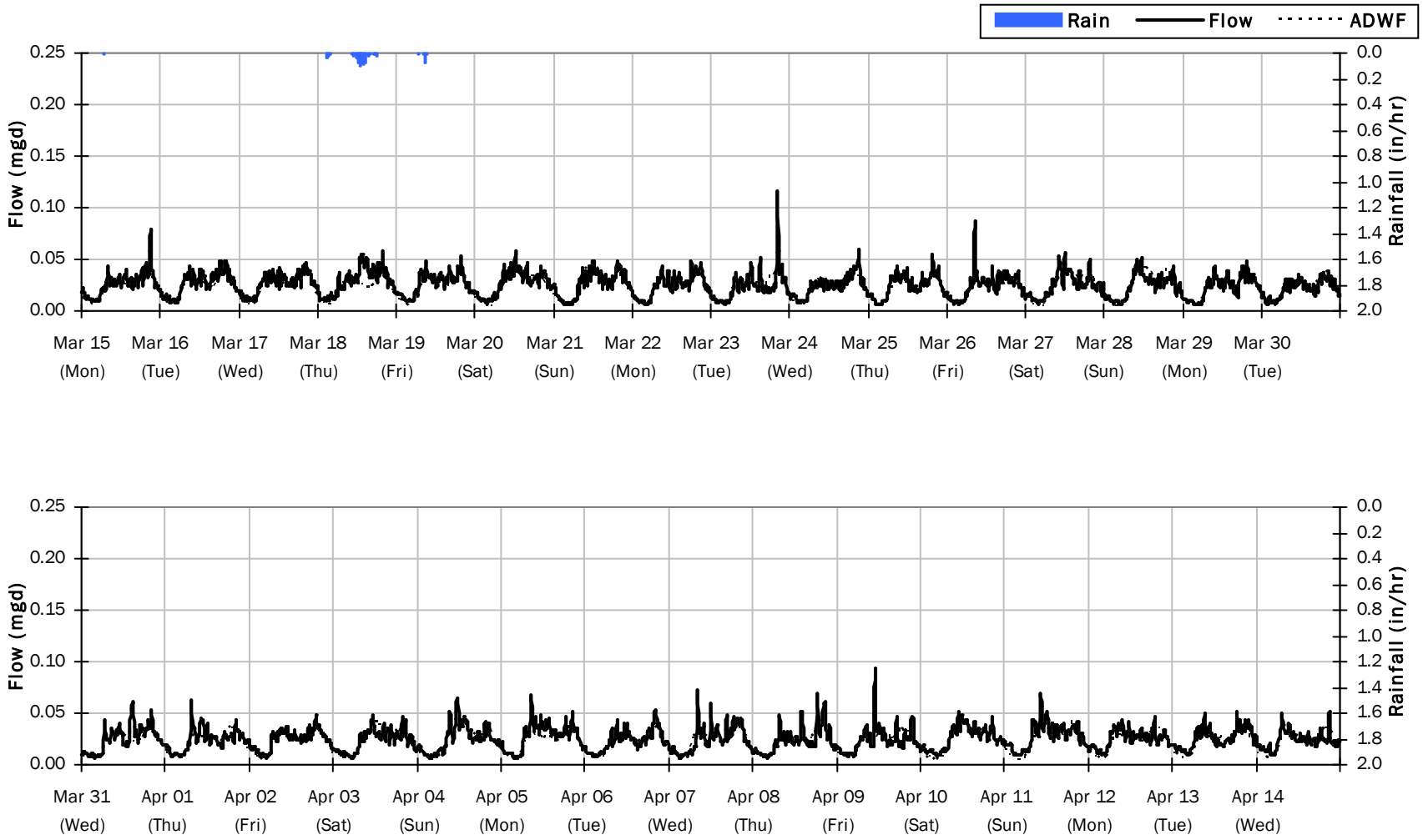
Total Period Rainfall: 2.92 inches Avg Flow: 0.025 mgd Peak Flow: 0.123 mgd Min Flow: 0.003 mgd



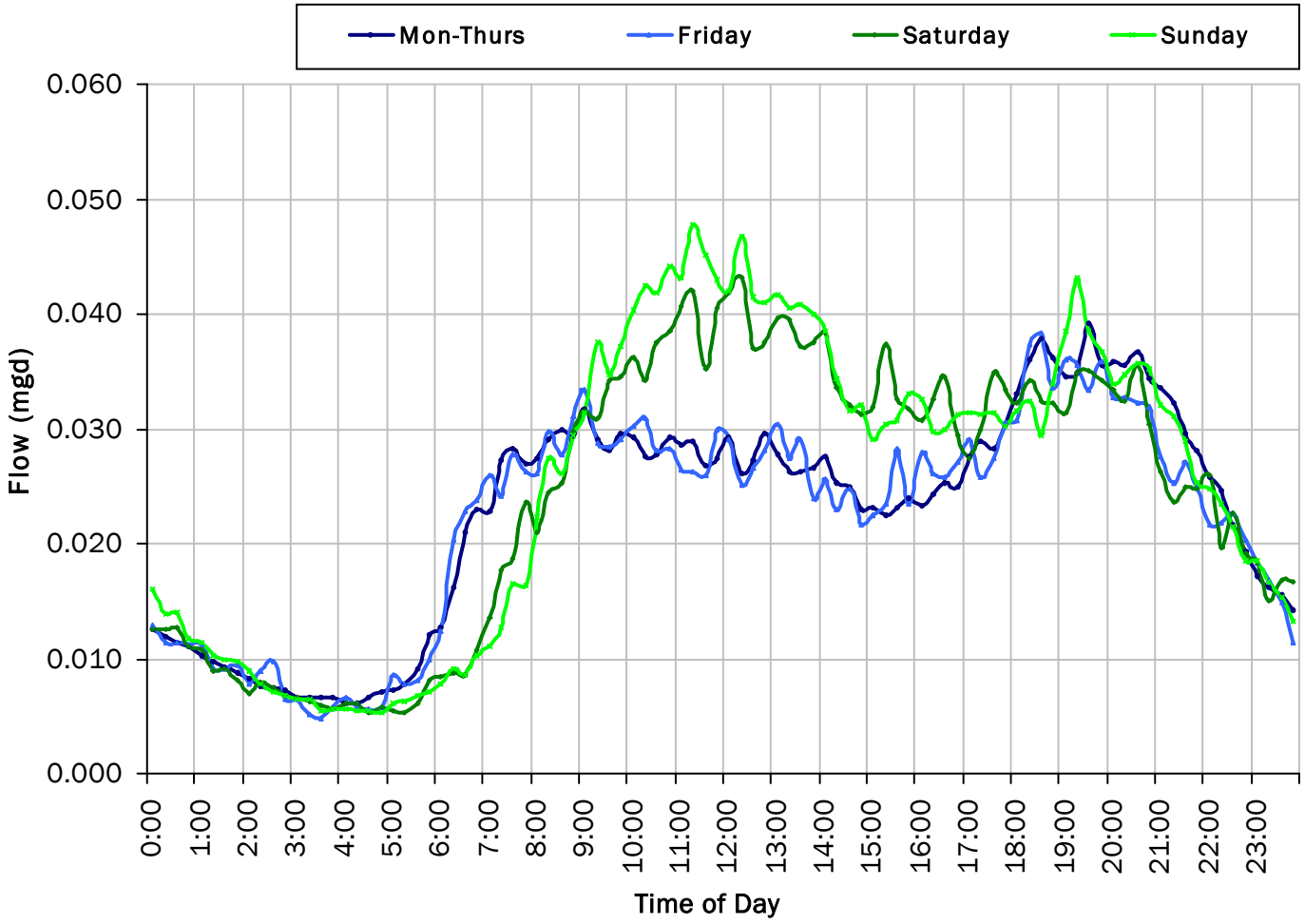
FM 10-1

Flow Summary: 3/15/2021 to 4/14/2021

Total Period Rainfall: 0.26 inches Avg Flow: 0.025 mgd Peak Flow: 0.116 mgd Min Flow: 0.006 mgd

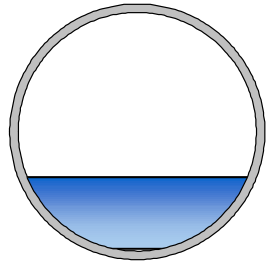


FM 10-1
Average Dry Weather Flow Hydrographs



ADWF:

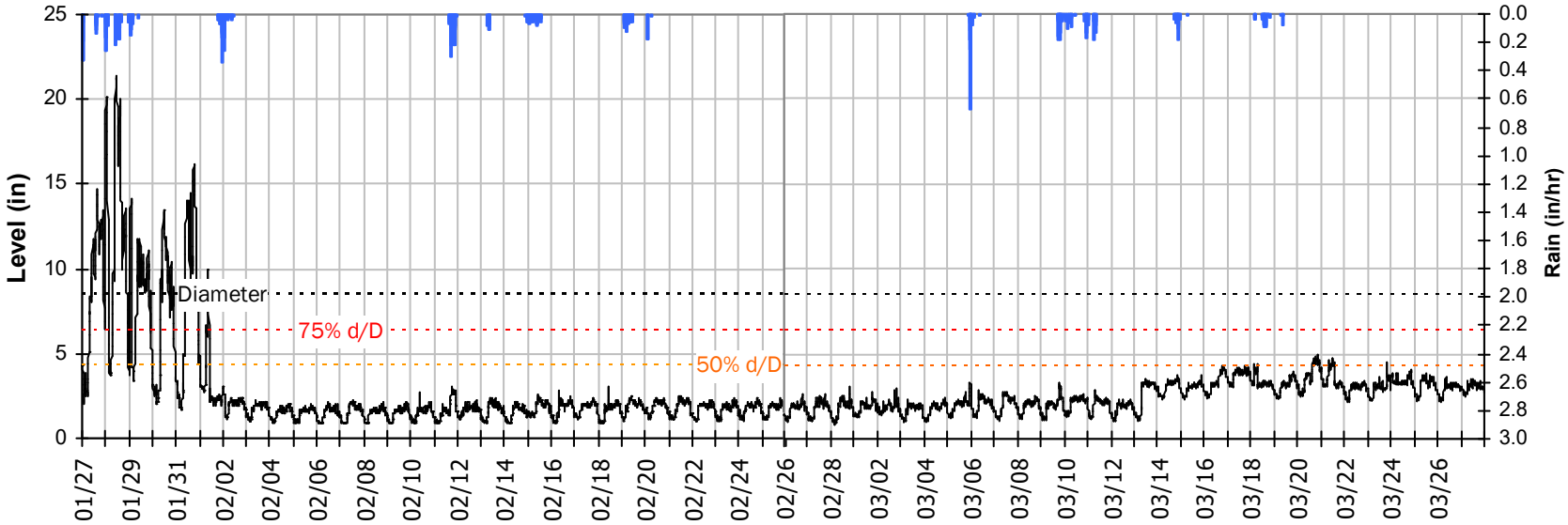
0.023 *mgd*

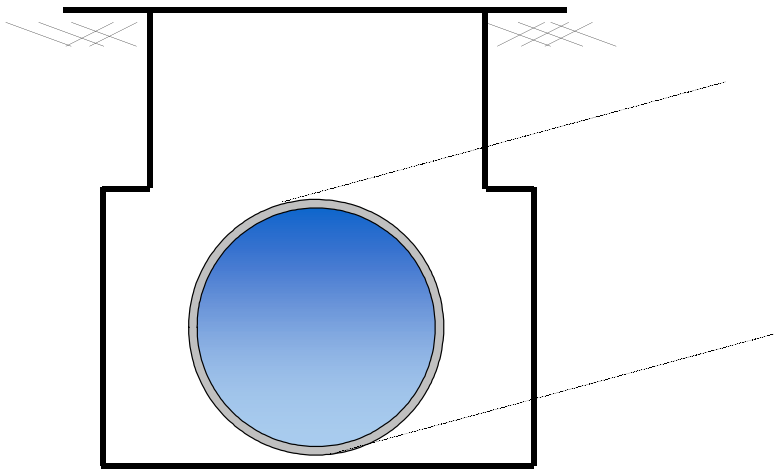


FM 10-1

Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Monitoring Period



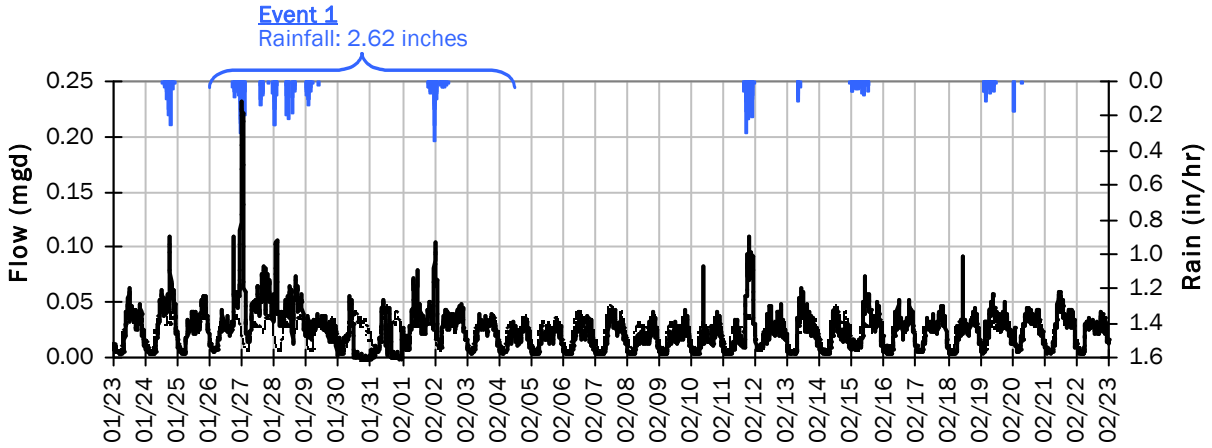


Pipe Diameter:	8.5	*inches*
Peak Measured Level:	21.4	*inches*
Peak d/D Ratio:	2.51	

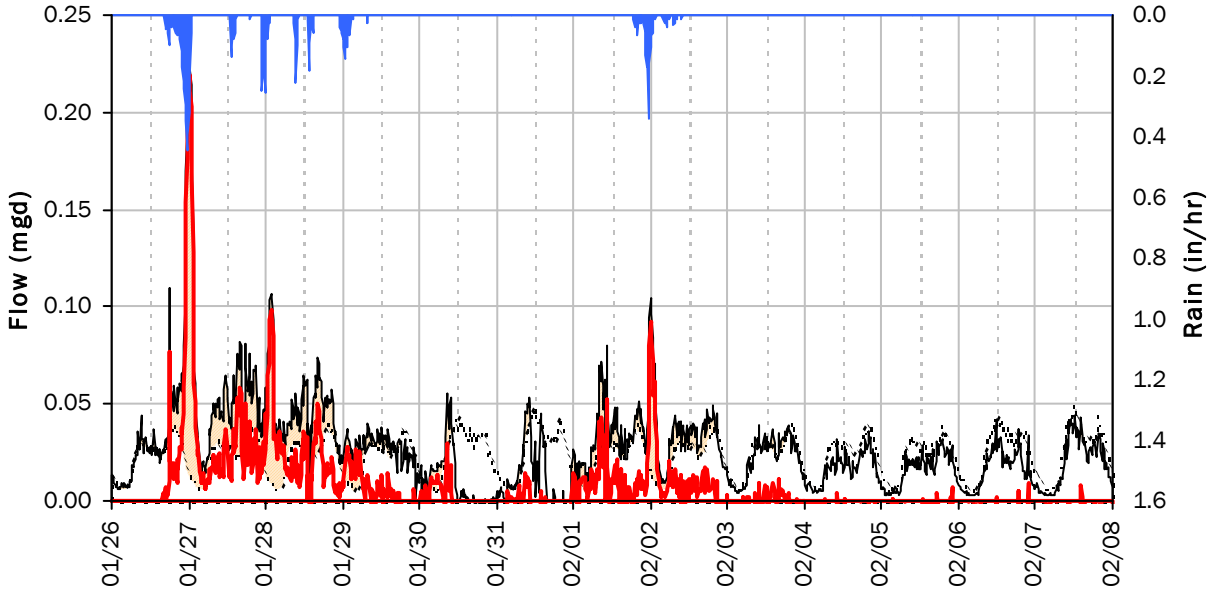
Surcharged 12.9 inches over crown

FM 10-1
I/I Summary: Event 1

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



Event 1 Detail Graph



Storm Event I/I Analysis (Rain = 2.62 inches)

Capacity

Peak Flow: 0.23 *mgd*
PF: 10.01

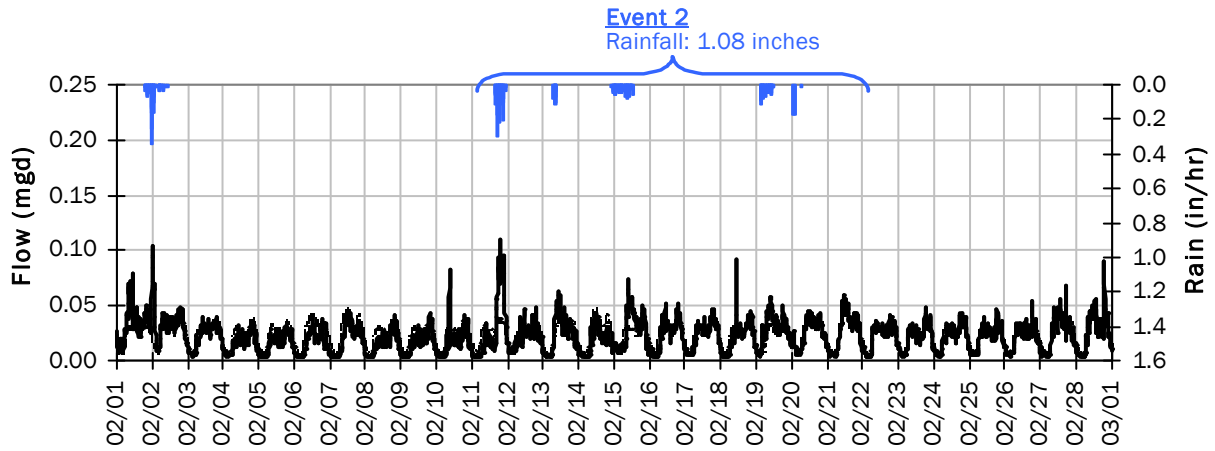
Peak Level: 21.37 *in*
d/D Ratio: 2.51

Inflow / Infiltration

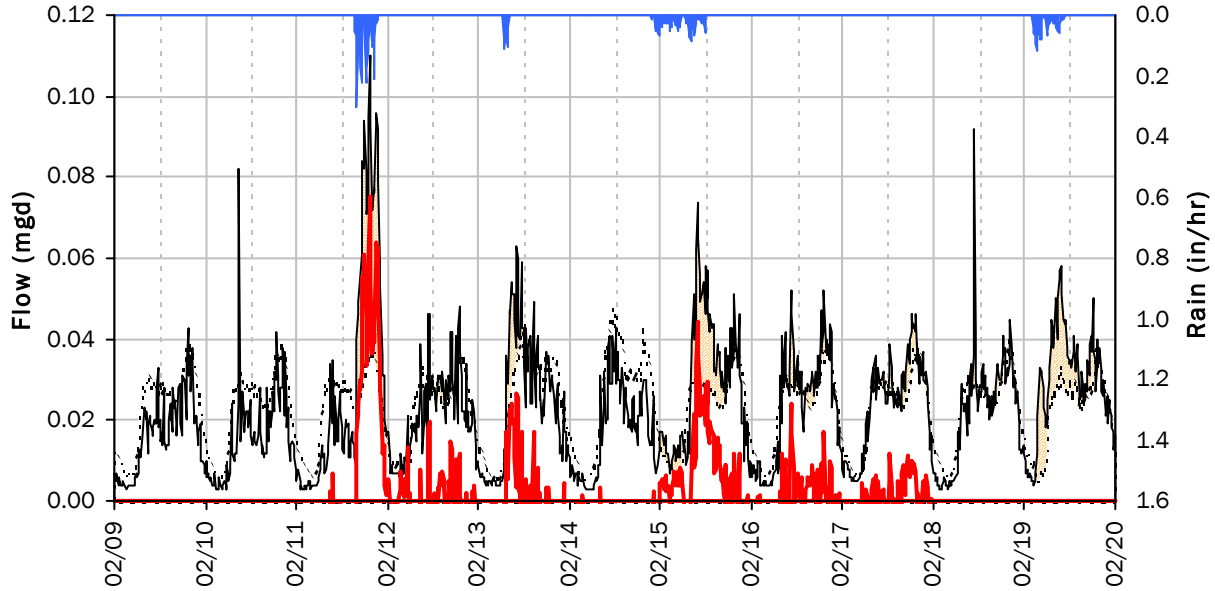
Peak I/I Rate: 0.22 *mgd*
Total I/I: 46,000 *gallons*

FM 10-1
I/I Summary: Event 2

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



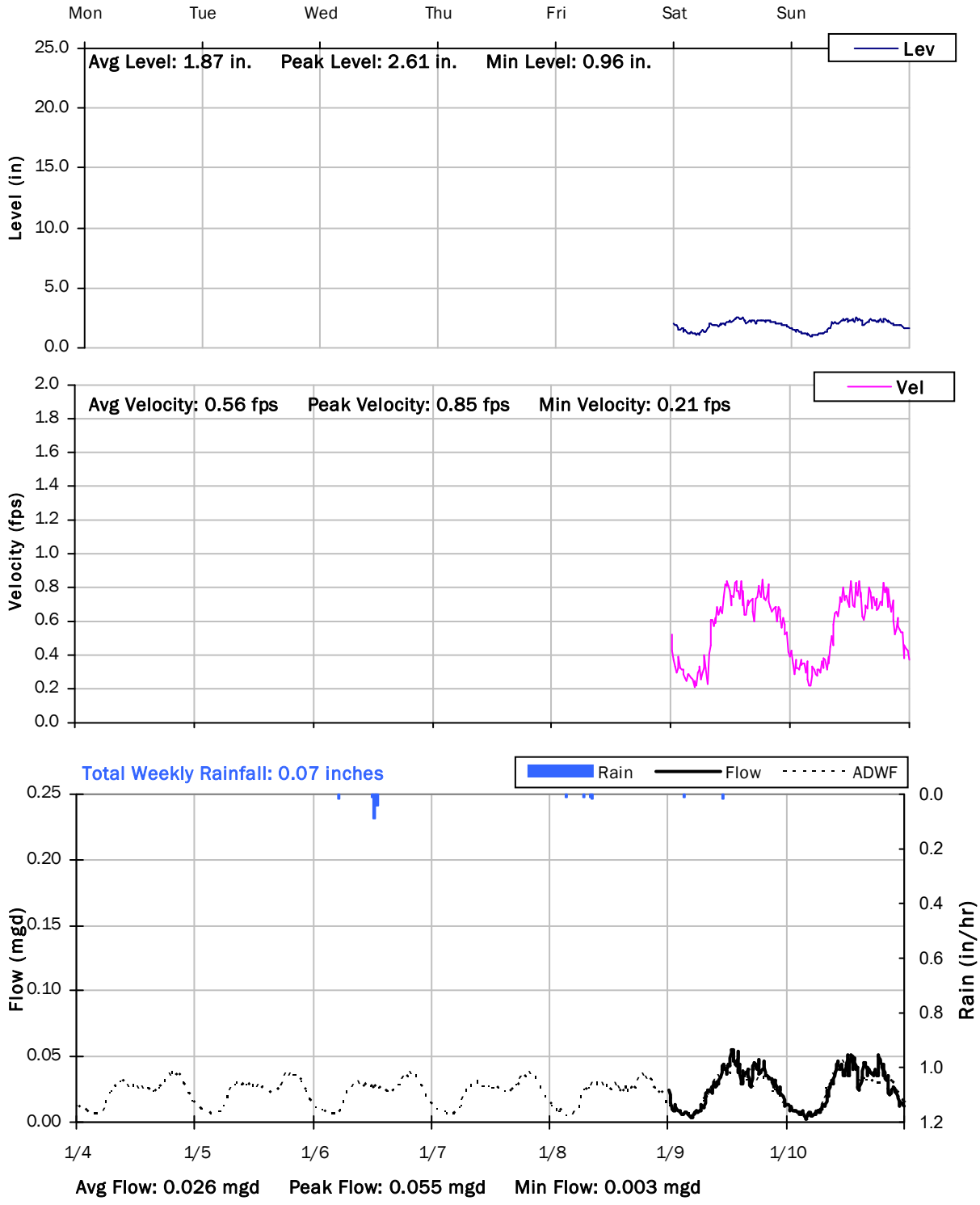
Event 2 Detail Graph



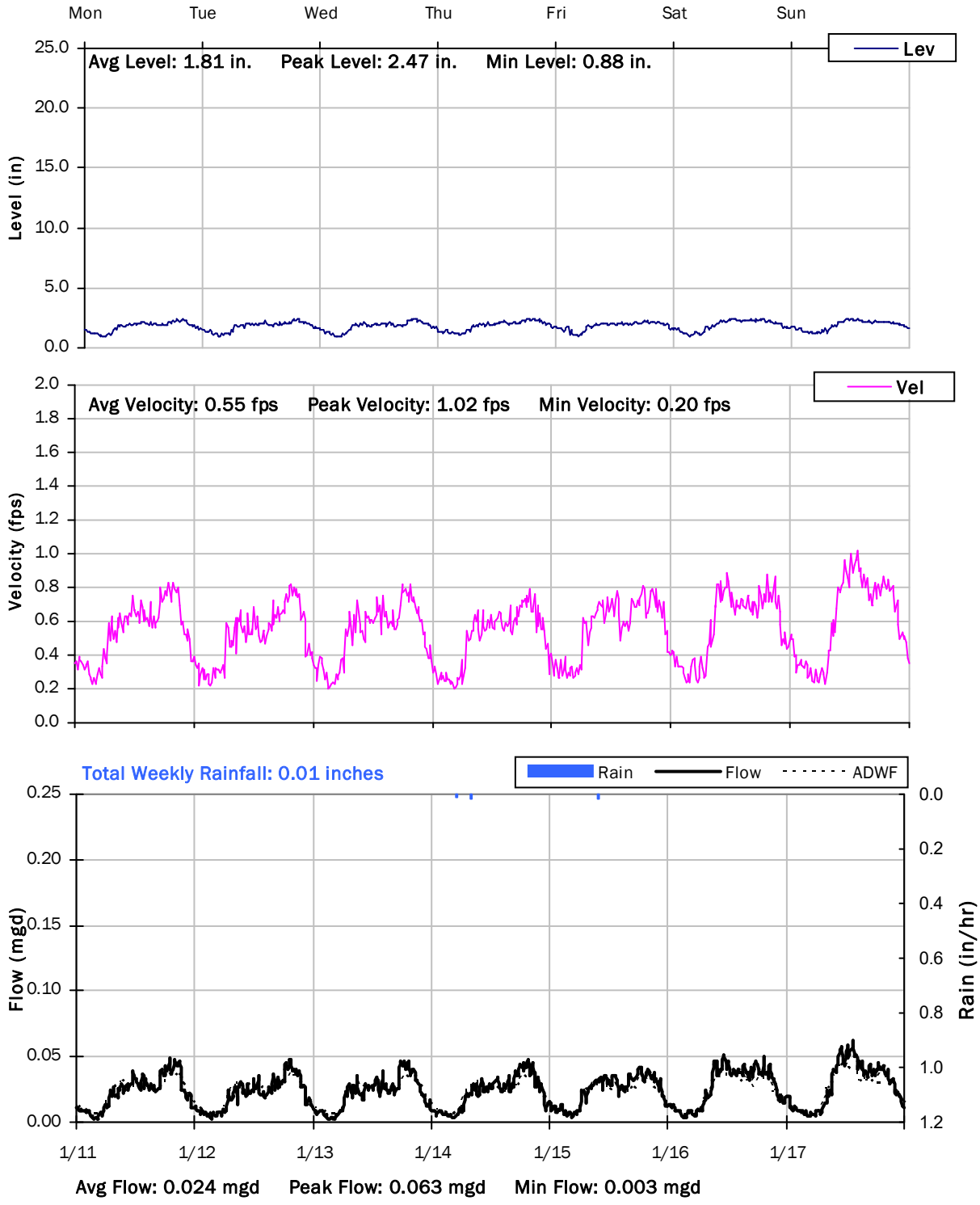
Storm Event I/I Analysis (Rain = 1.08 inches)

Capacity		Inflow / Infiltration	
Peak Flow:	0.11 *mgd*	**Peak I/I Rate:**	0.08 *mgd*
PF:	4.74	**Total I/I:**	5,000 *gallons*
Peak Level:	3.02 *in*		
d/D Ratio:	0.36		

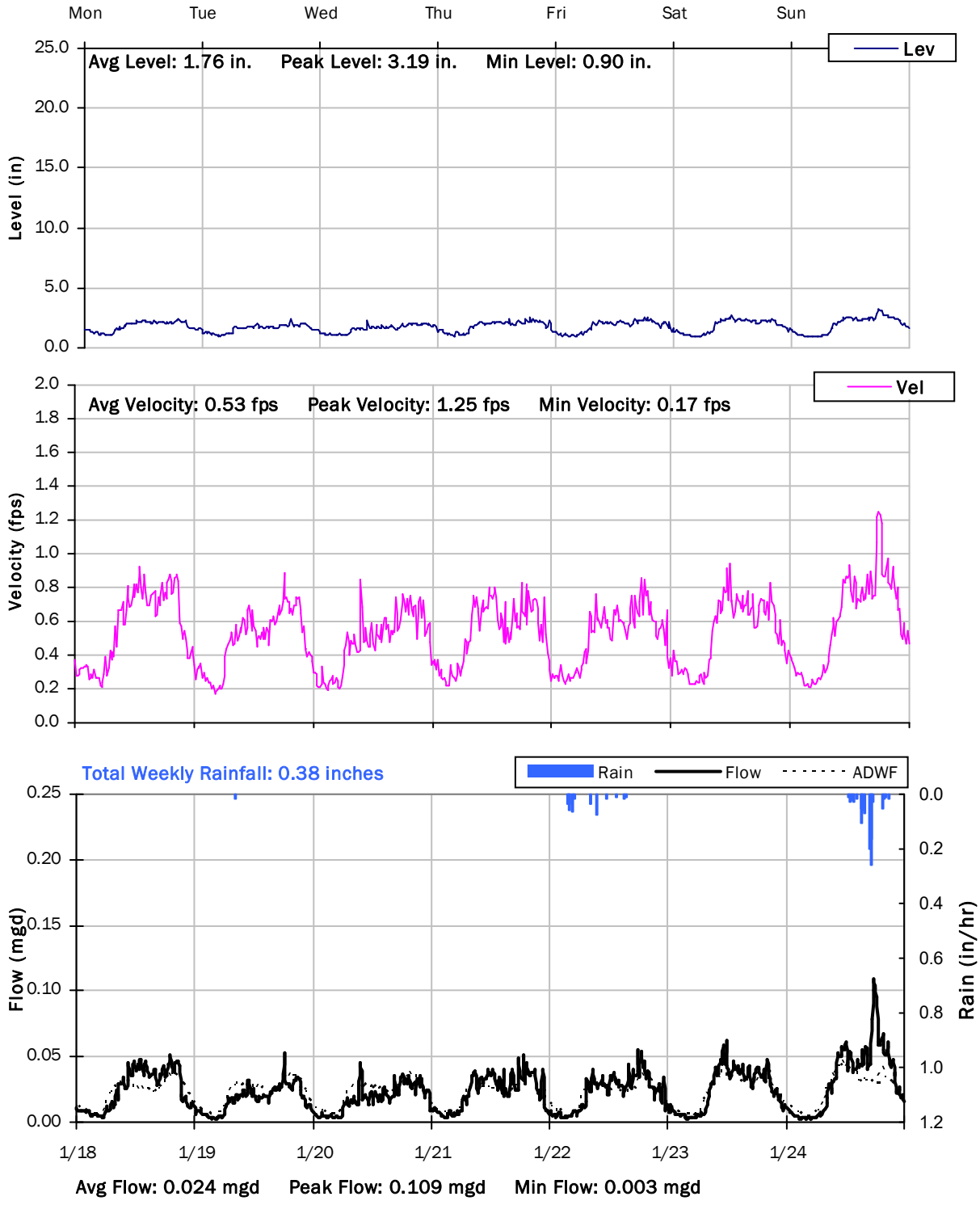
FM 10-1
Weekly Level, Velocity and Flow Hydrographs
1/4/2021 to 1/11/2021



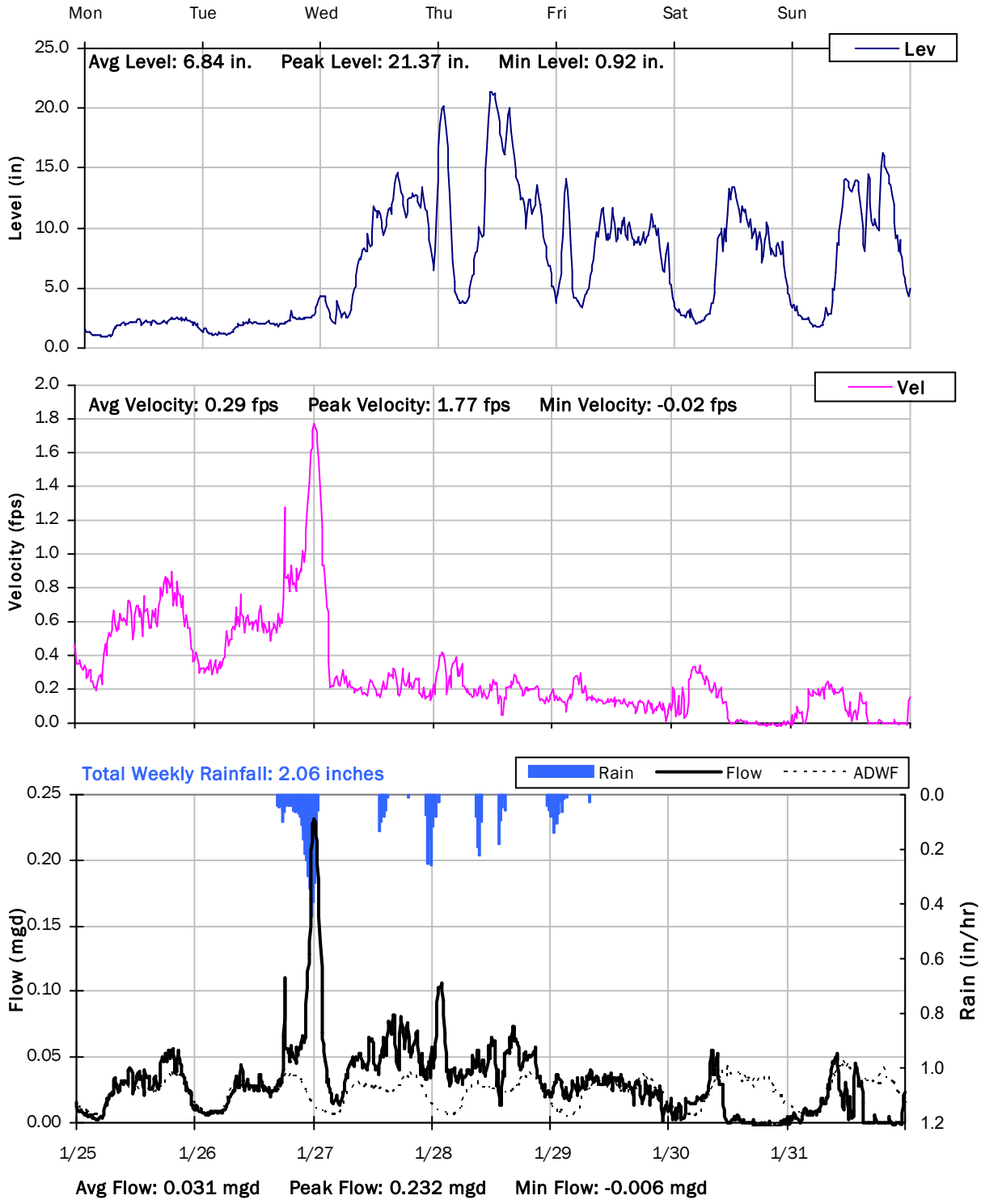
FM 10-1
Weekly Level, Velocity and Flow Hydrographs
1/11/2021 to 1/18/2021



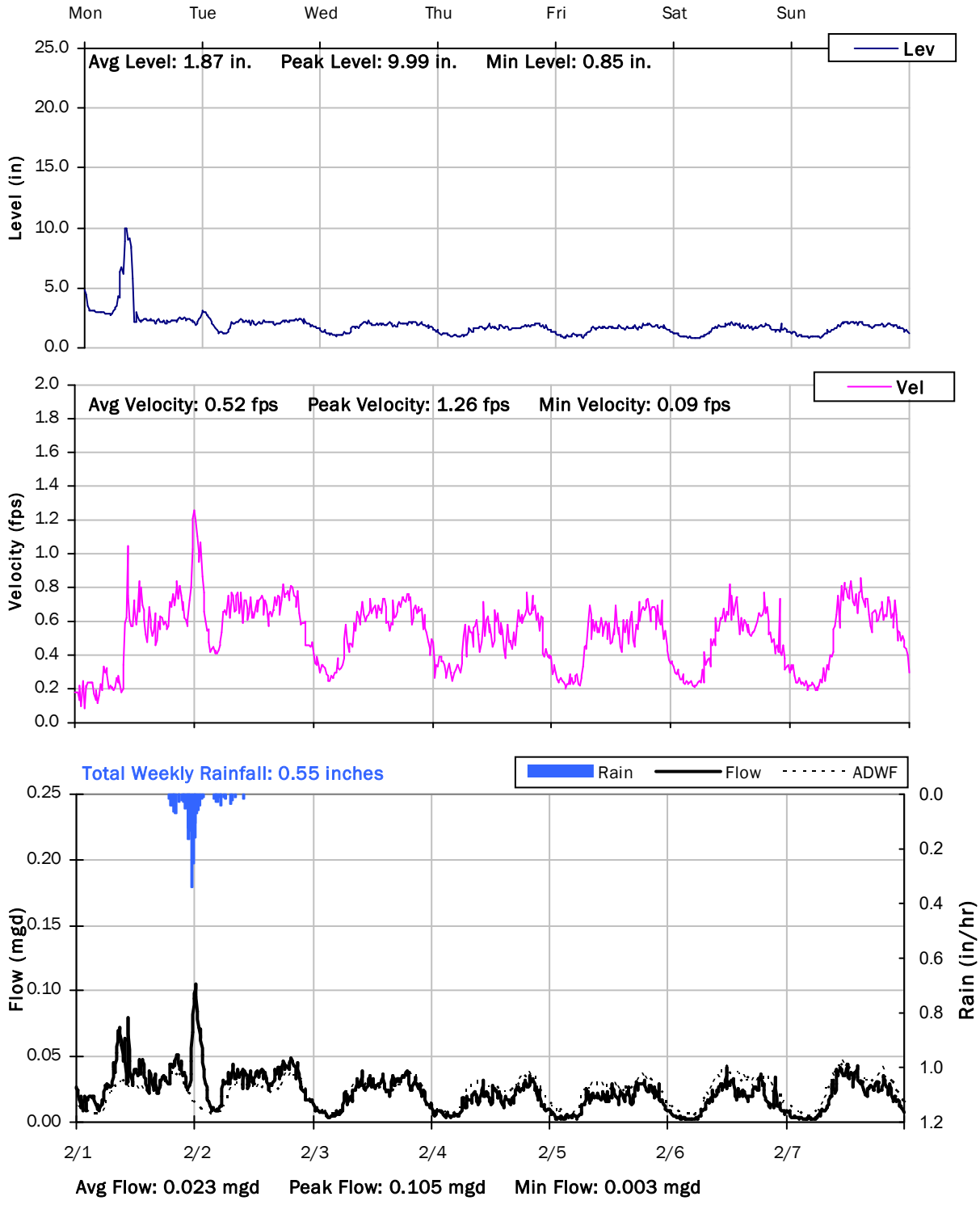
FM 10-1
Weekly Level, Velocity and Flow Hydrographs
1/18/2021 to 1/25/2021



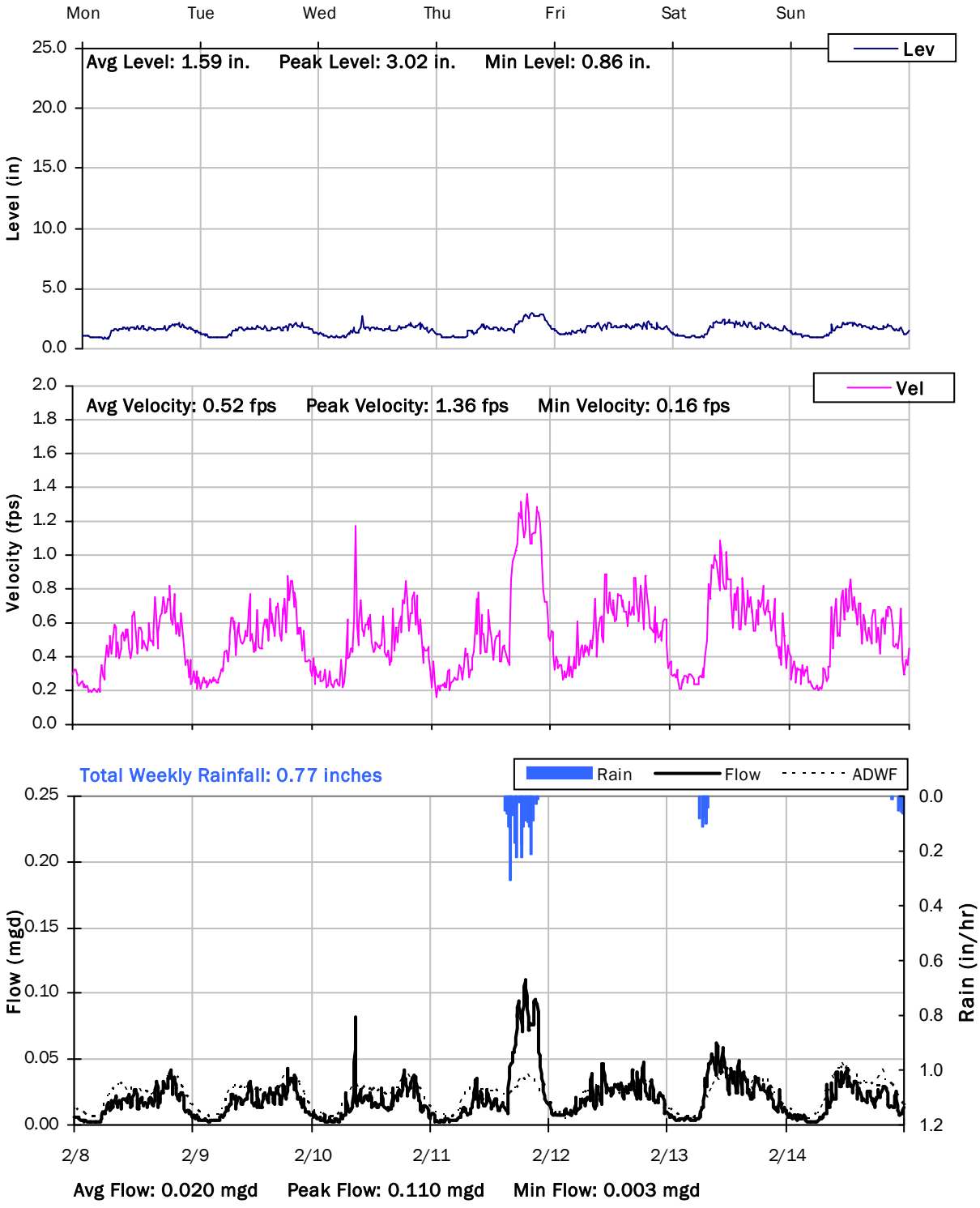
FM 10-1
Weekly Level, Velocity and Flow Hydrographs
1/25/2021 to 2/1/2021



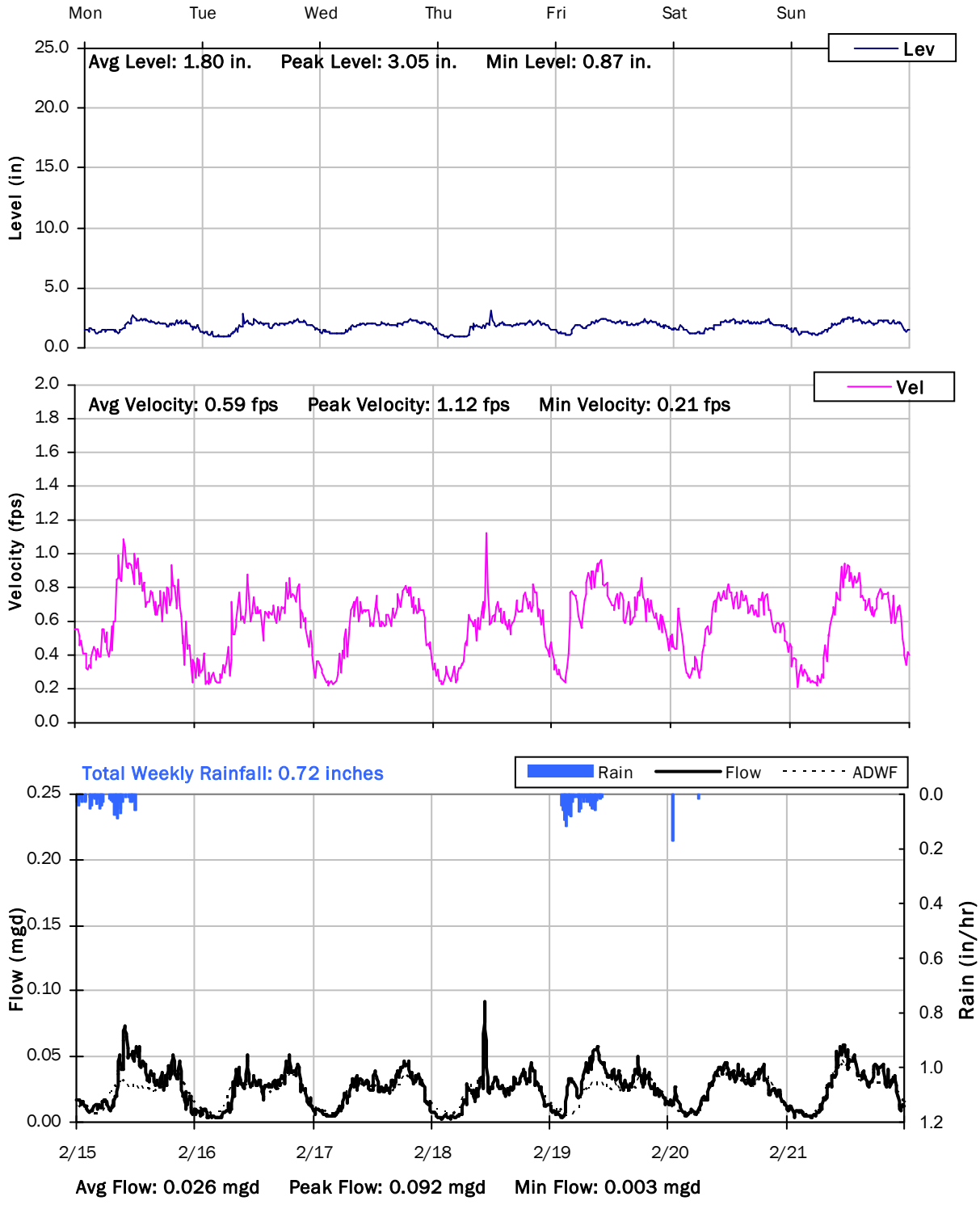
FM 10-1
Weekly Level, Velocity and Flow Hydrographs
2/1/2021 to 2/8/2021



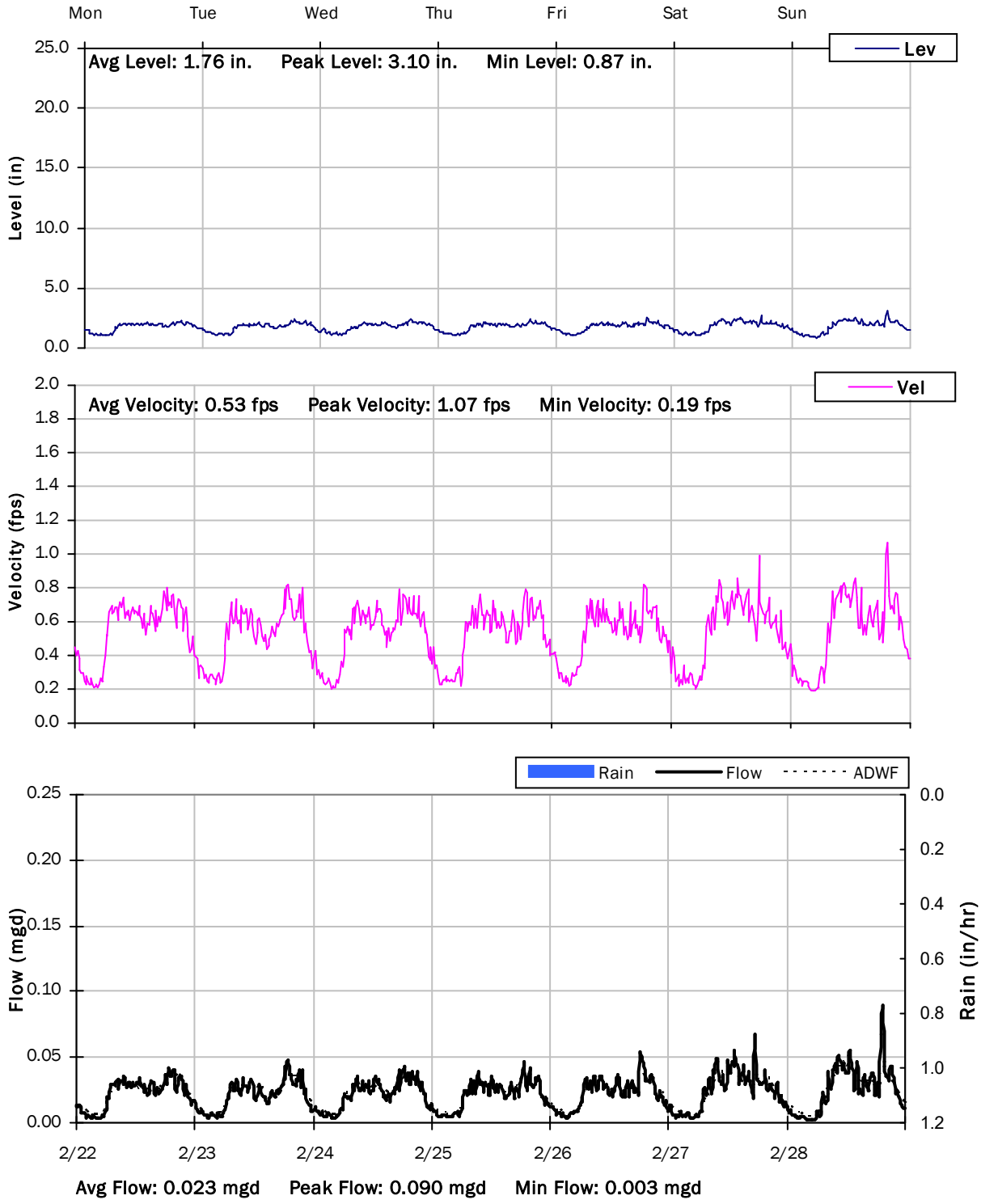
FM 10-1
Weekly Level, Velocity and Flow Hydrographs
2/8/2021 to 2/15/2021



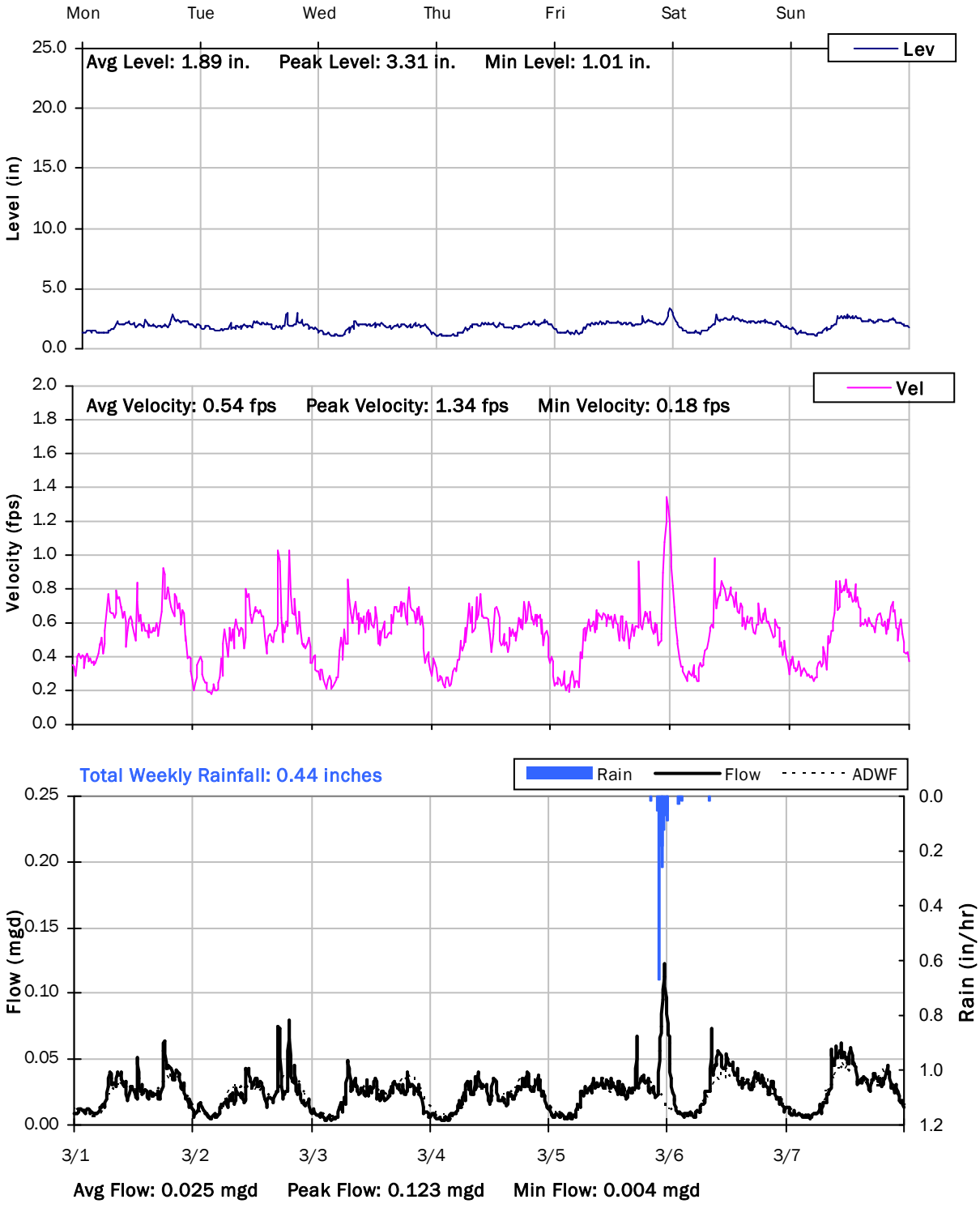
FM 10-1
Weekly Level, Velocity and Flow Hydrographs
2/15/2021 to 2/22/2021



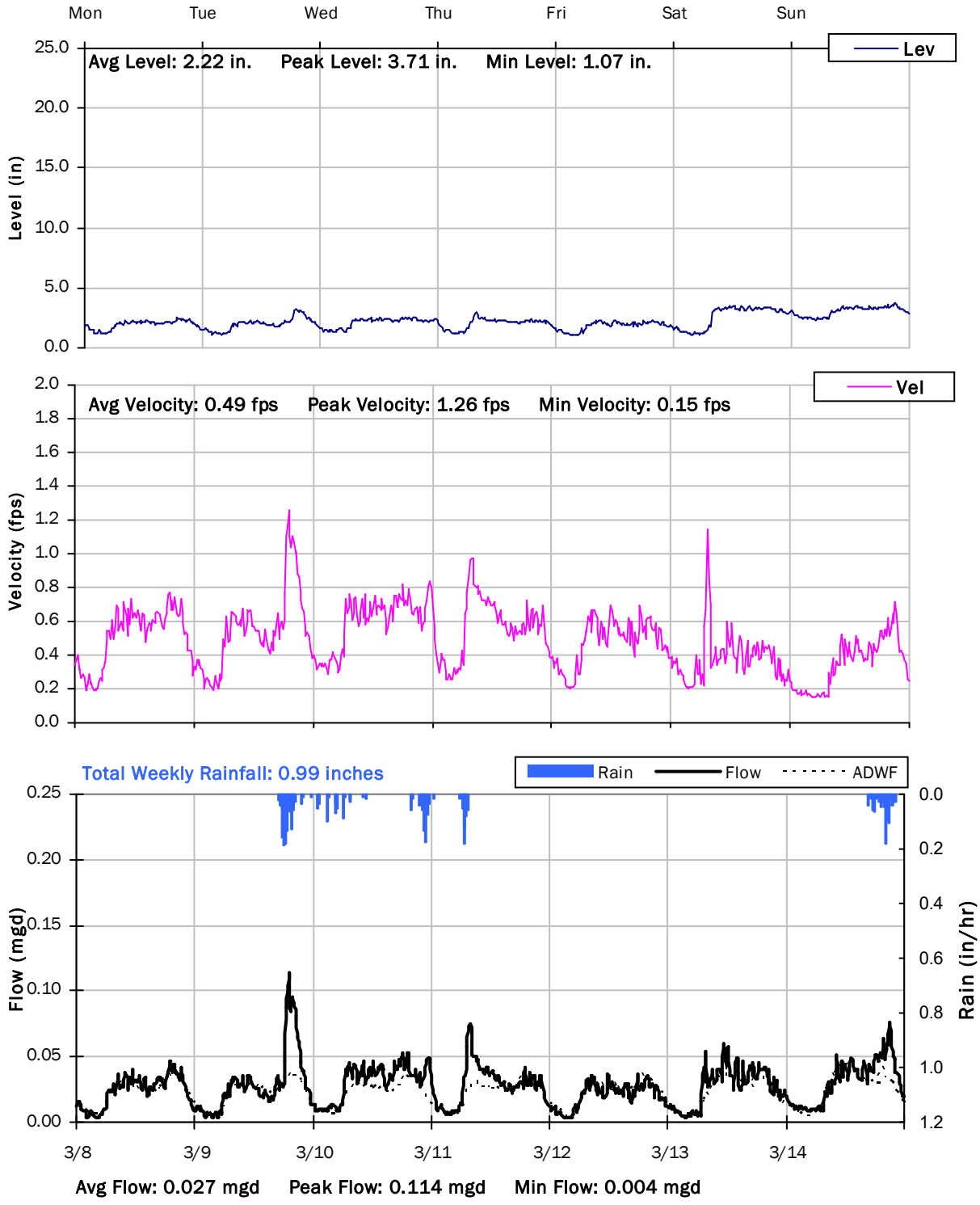
FM 10-1
Weekly Level, Velocity and Flow Hydrographs
2/22/2021 to 3/1/2021



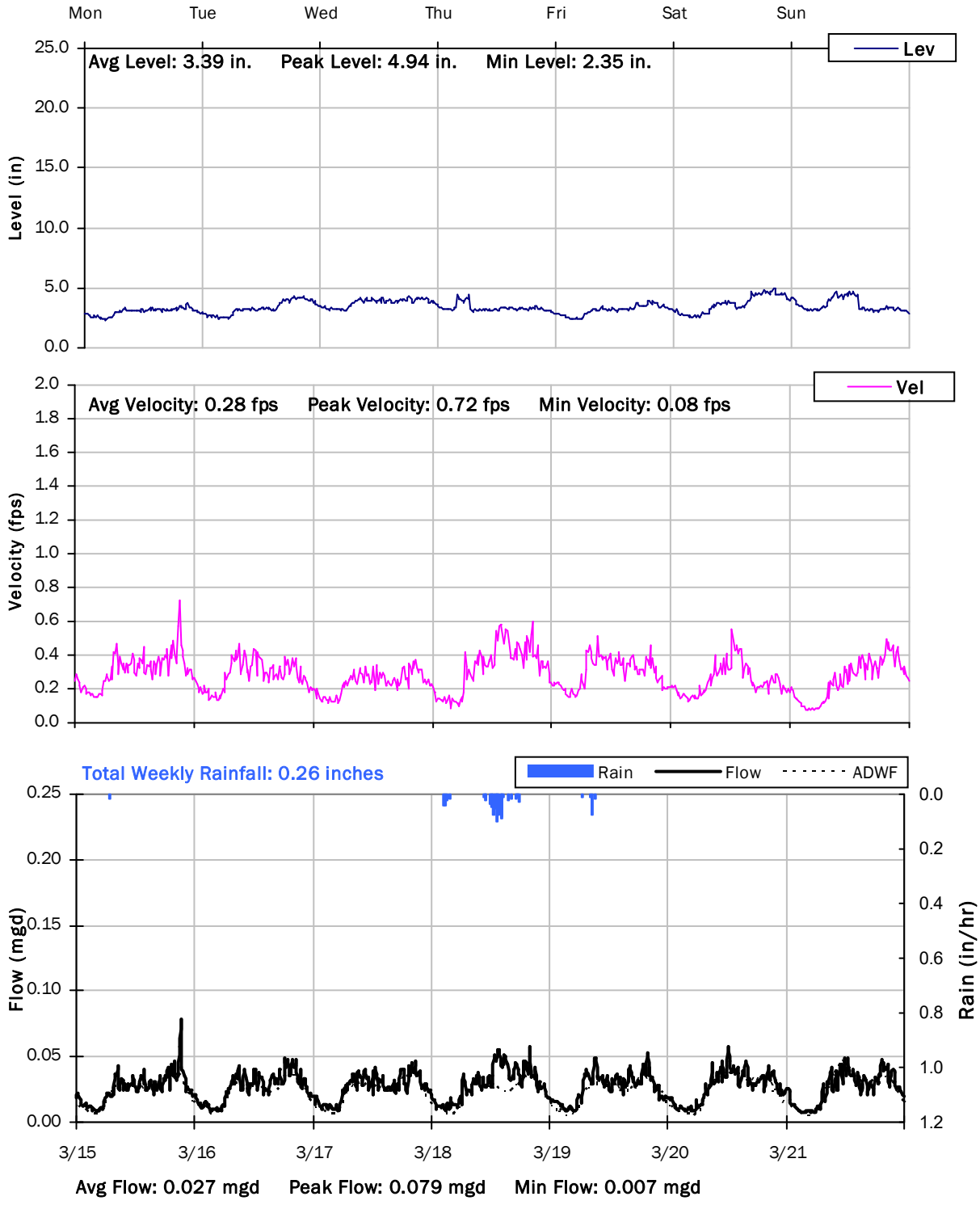
FM 10-1
Weekly Level, Velocity and Flow Hydrographs
3/1/2021 to 3/8/2021



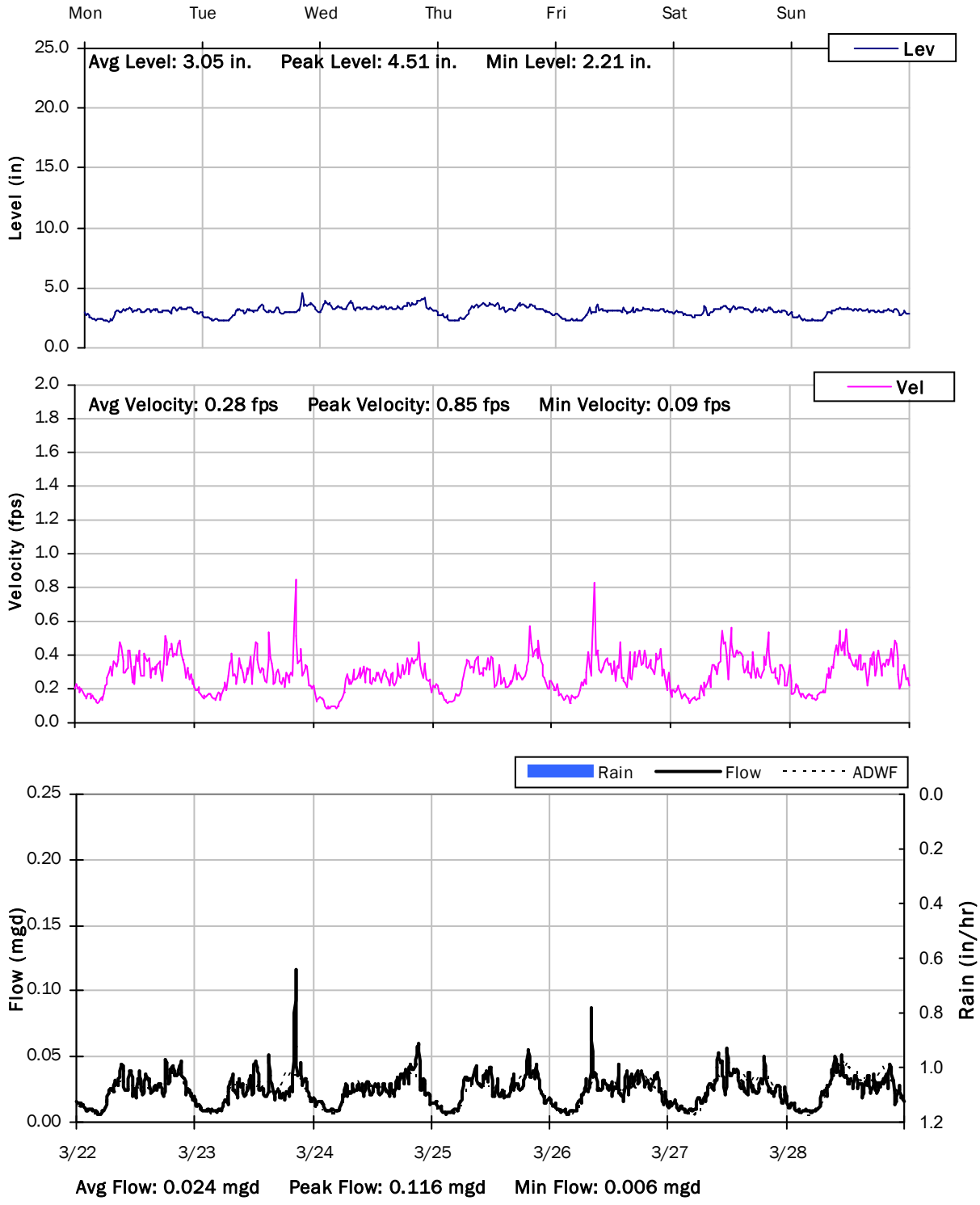
FM 10-1
Weekly Level, Velocity and Flow Hydrographs
3/8/2021 to 3/15/2021



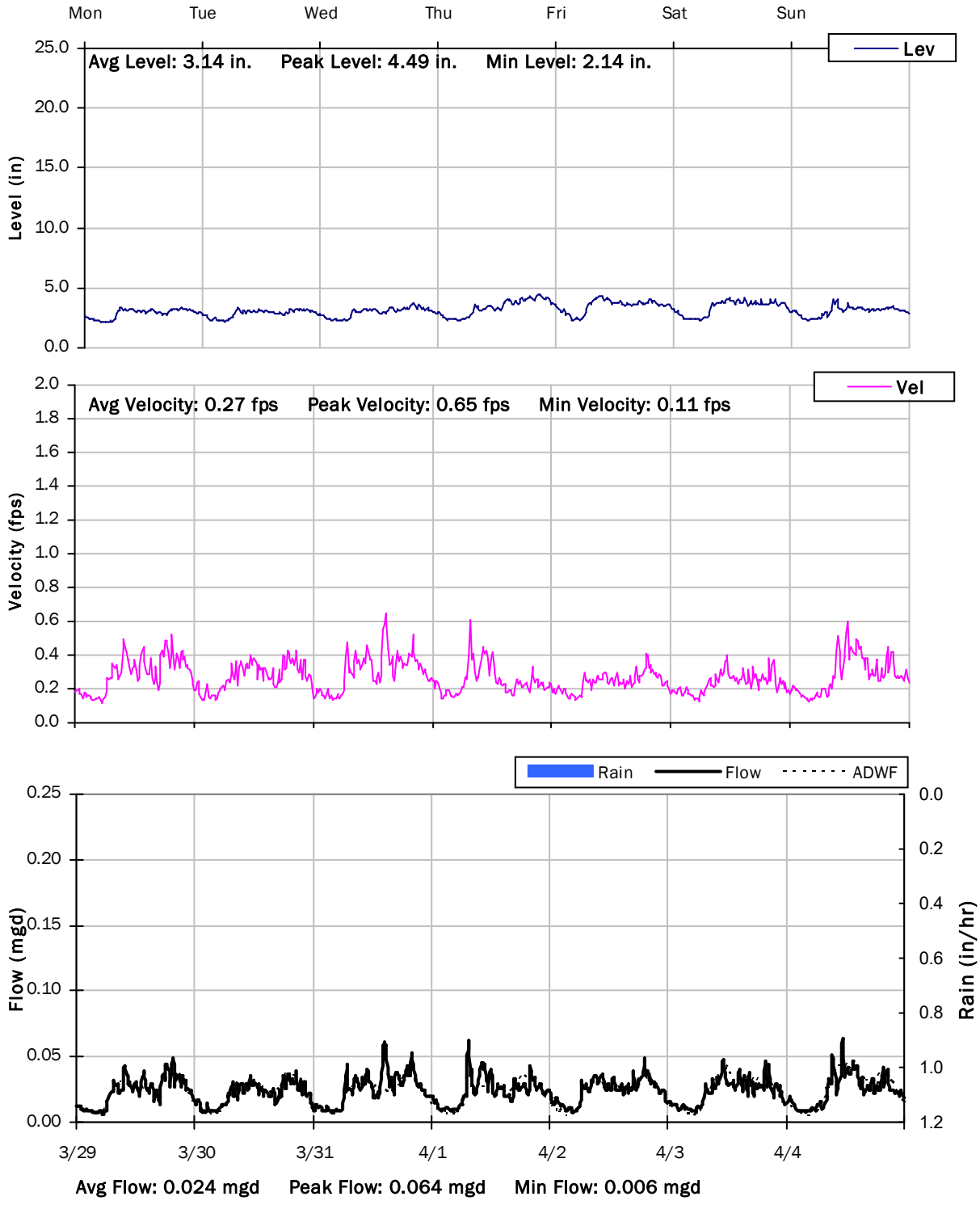
FM 10-1
Weekly Level, Velocity and Flow Hydrographs
3/15/2021 to 3/22/2021



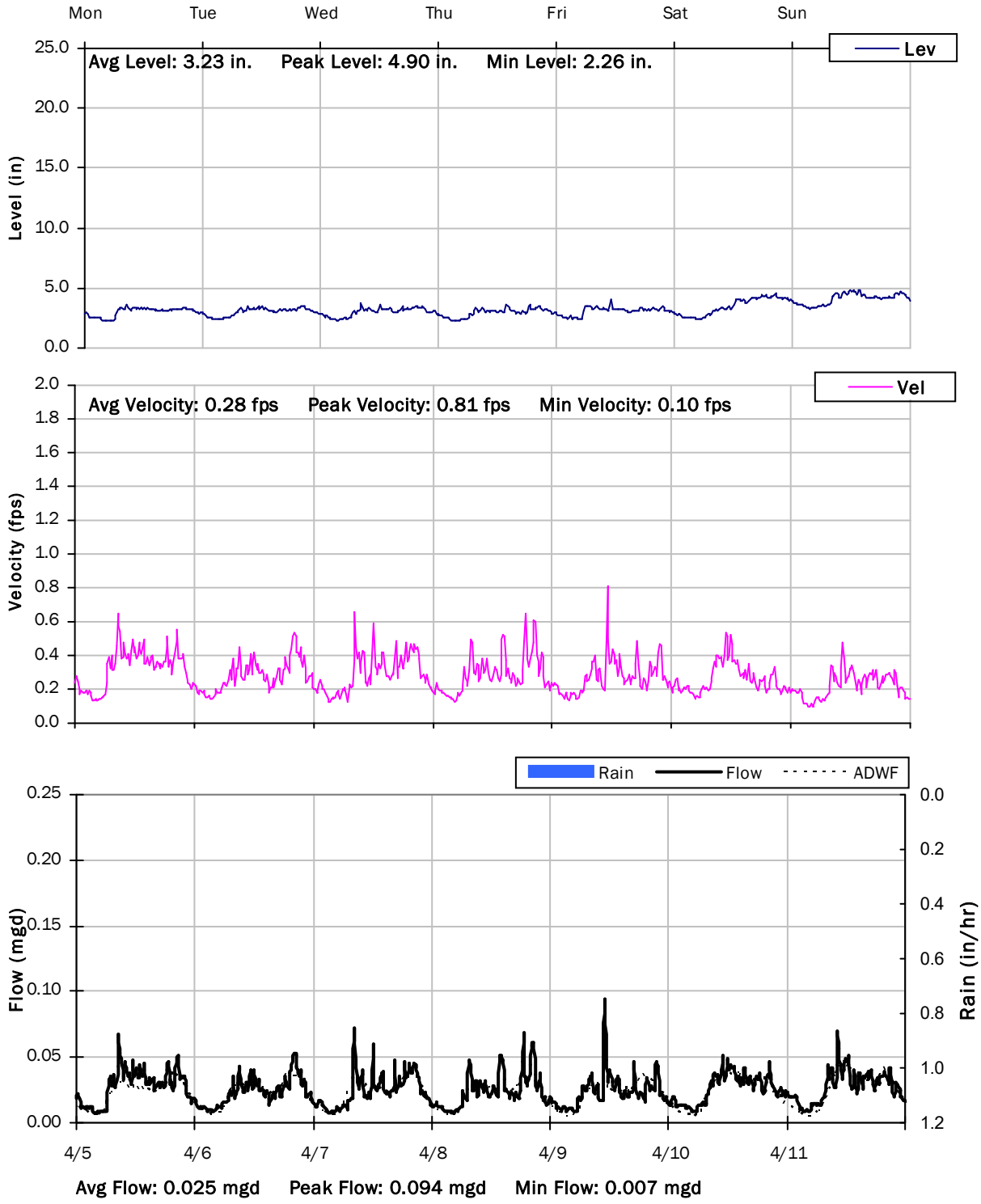
FM 10-1
Weekly Level, Velocity and Flow Hydrographs
3/22/2021 to 3/29/2021



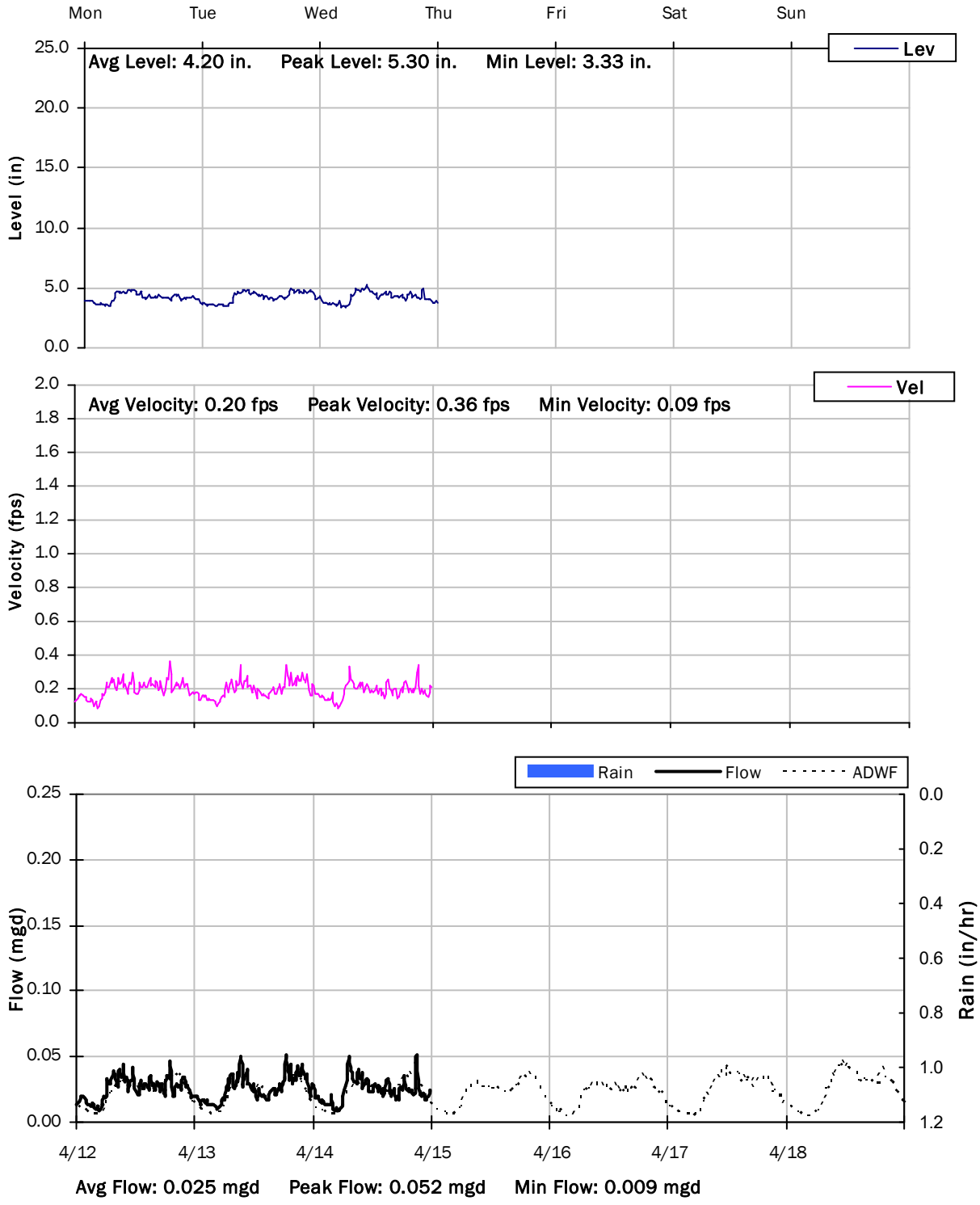
FM 10-1
Weekly Level, Velocity and Flow Hydrographs
3/29/2021 to 4/5/2021



FM 10-1
Weekly Level, Velocity and Flow Hydrographs
4/5/2021 to 4/12/2021



FM 10-1
Weekly Level, Velocity and Flow Hydrographs
4/12/2021 to 4/19/2021



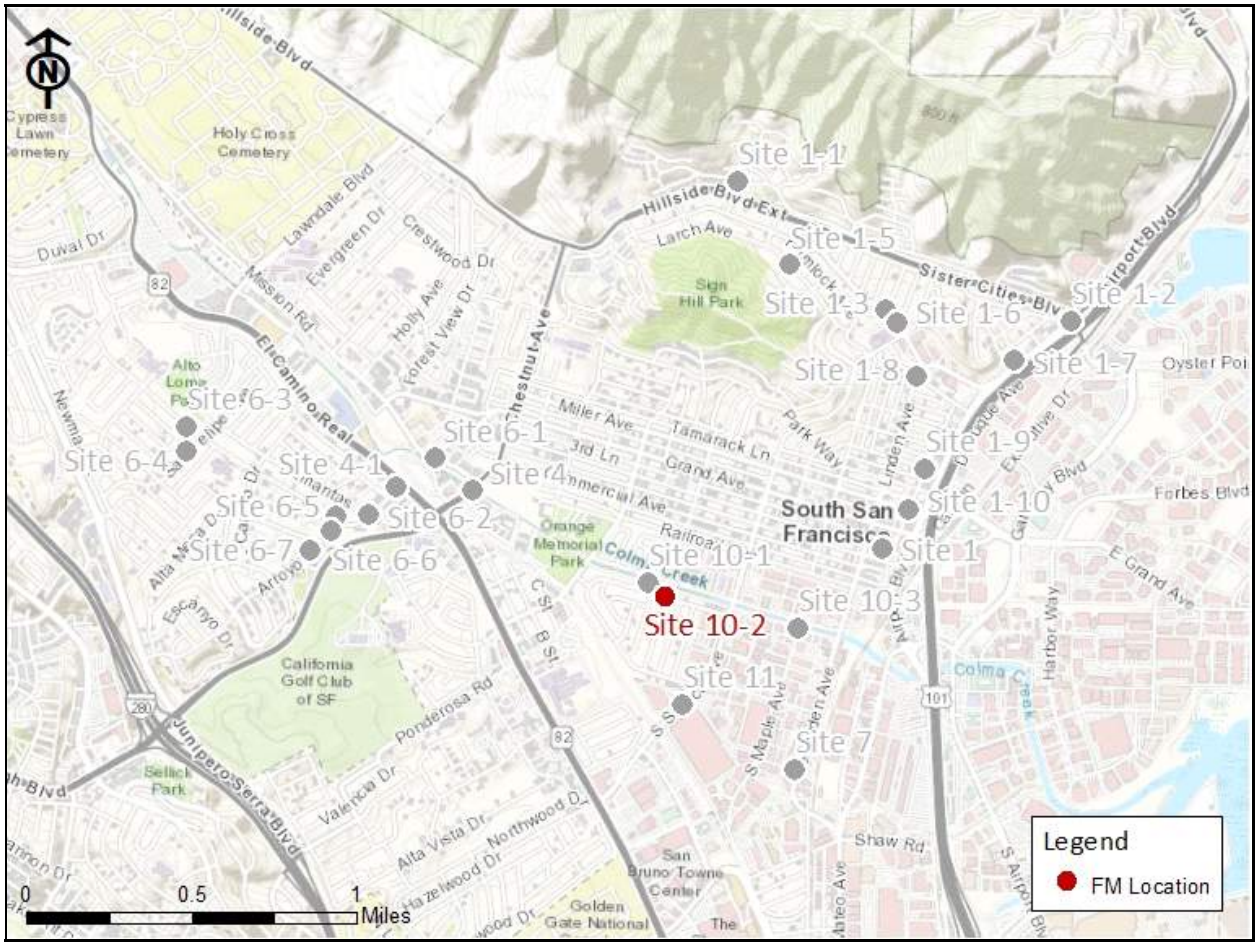
South San Francisco, CA

Sanitary Sewer Flow Monitoring
January 4 - April 14, 2021

Monitoring Site: FM 10-2

Location: Mayfair Avenue and S Magnolia Avenue

Data Summary Report



Vicinity Map: FM 10-2

FM 10-2

Site Information

Location: Mayfair Avenue and S Magnolia Avenue

Coordinates: 122.4215° W, 37.6517° N

Rim Elevation (Earth): 18 feet

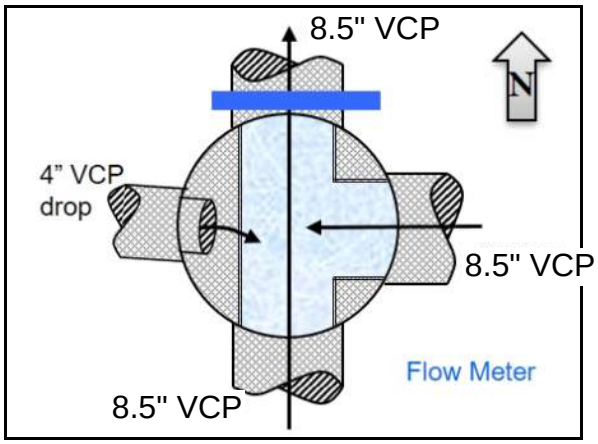
Pipe Diameter: 8.5 inches

ADWF: 0.020 mgd

Peak Measured Flow: 0.098 mgd

Satellite Map

Sanitary Map



Flow Sketch

Street View

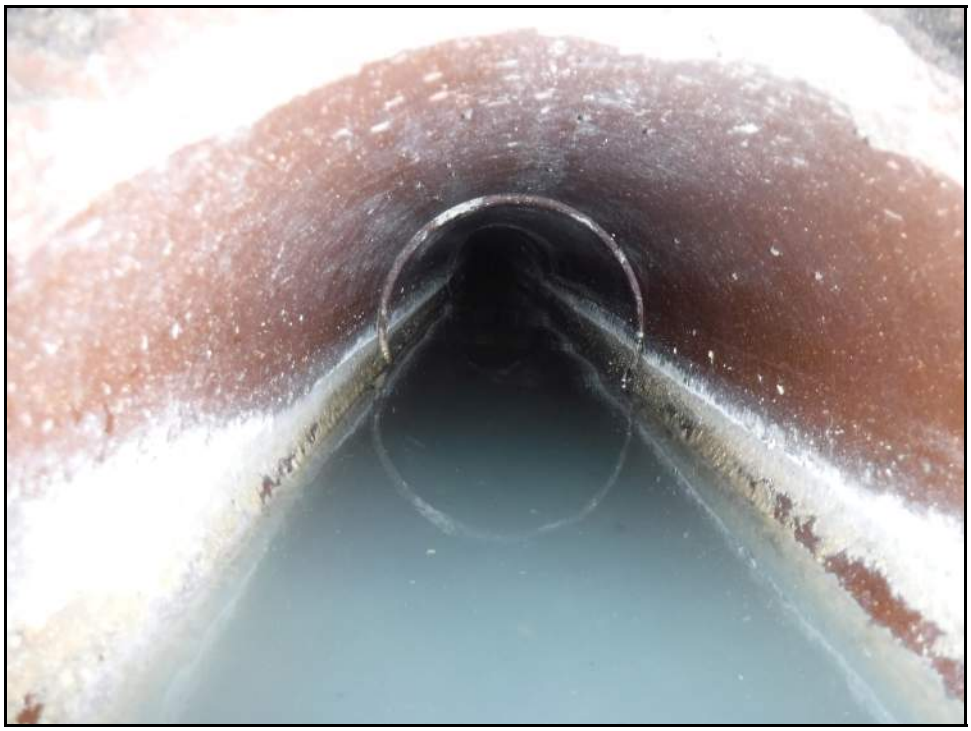
Plan View

FM 10-2

Additional Site Photos

Monitored Effluent Pipe

South Influent Pipe



FM 10-2

Additional Site Photos

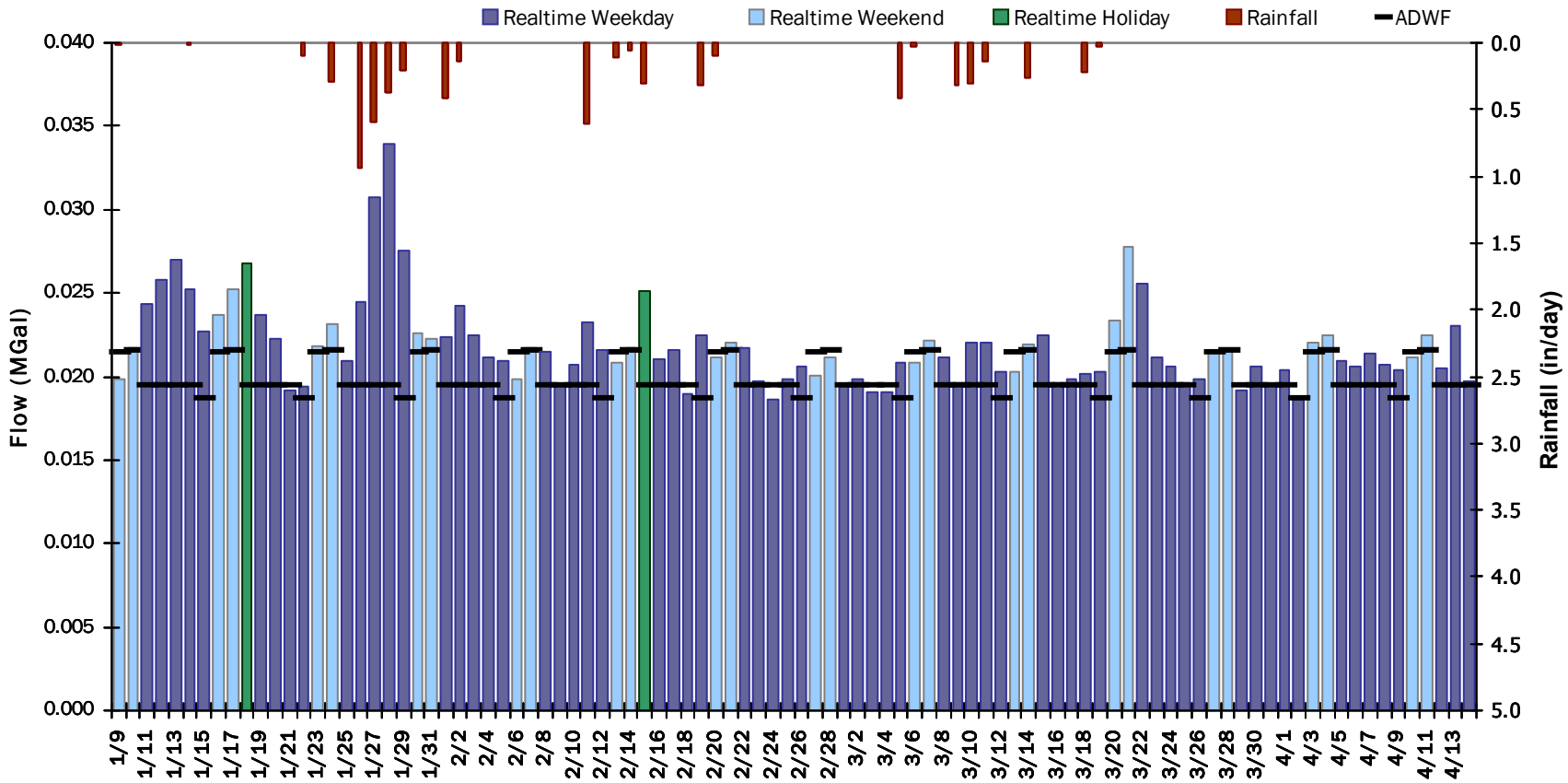
West Influent Pipe

East Influent Pipe

FM 10-2
Period Flow Summary: Daily Flow Totals

Avg Period Flow: 0.022 MGal Peak Daily Flow: 0.034 MGal Min Daily Flow: 0.019 MGal

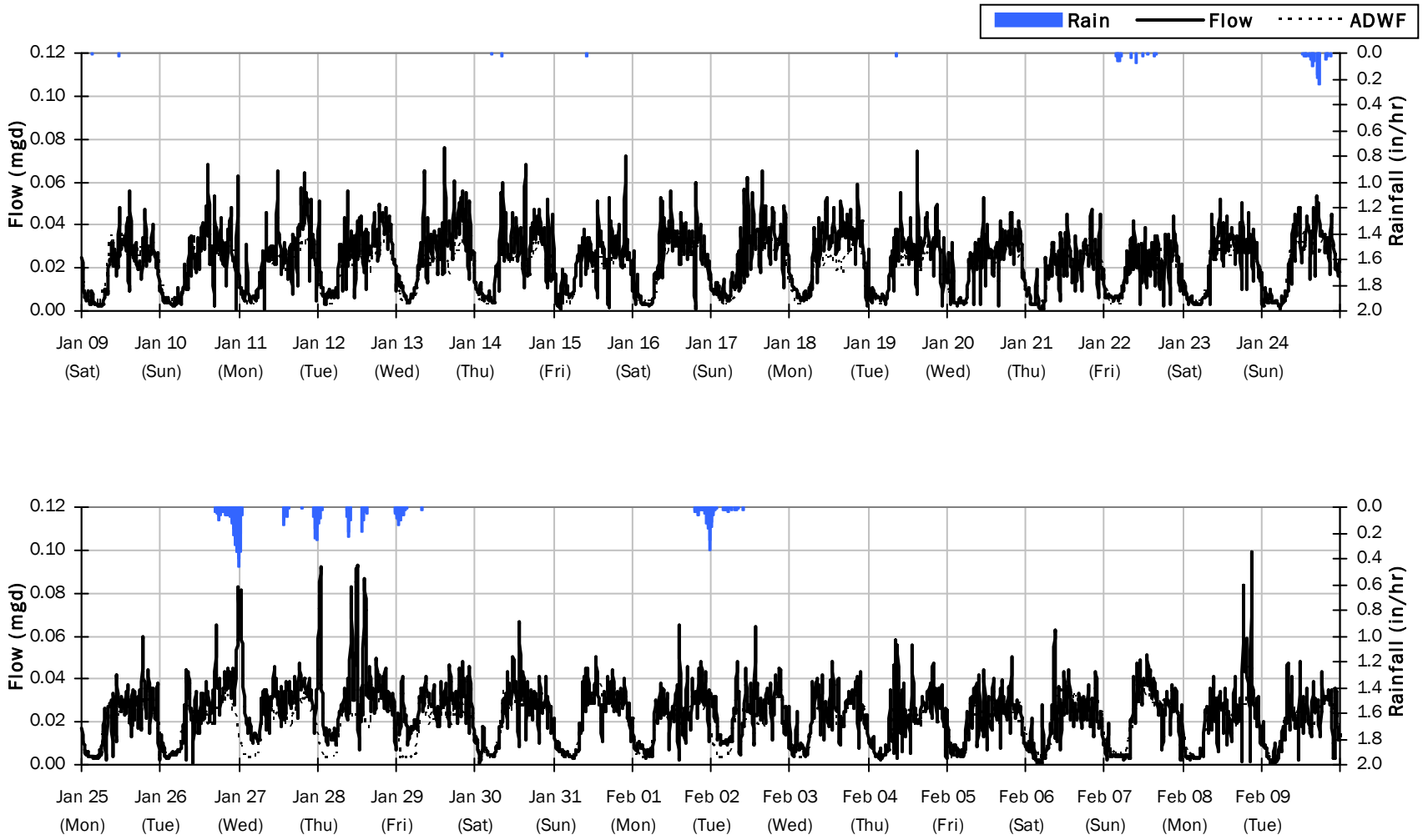
Total Period Rainfall: 6.28 inches



FM 10-2

Flow Summary: 1/9/2021 to 2/9/2021

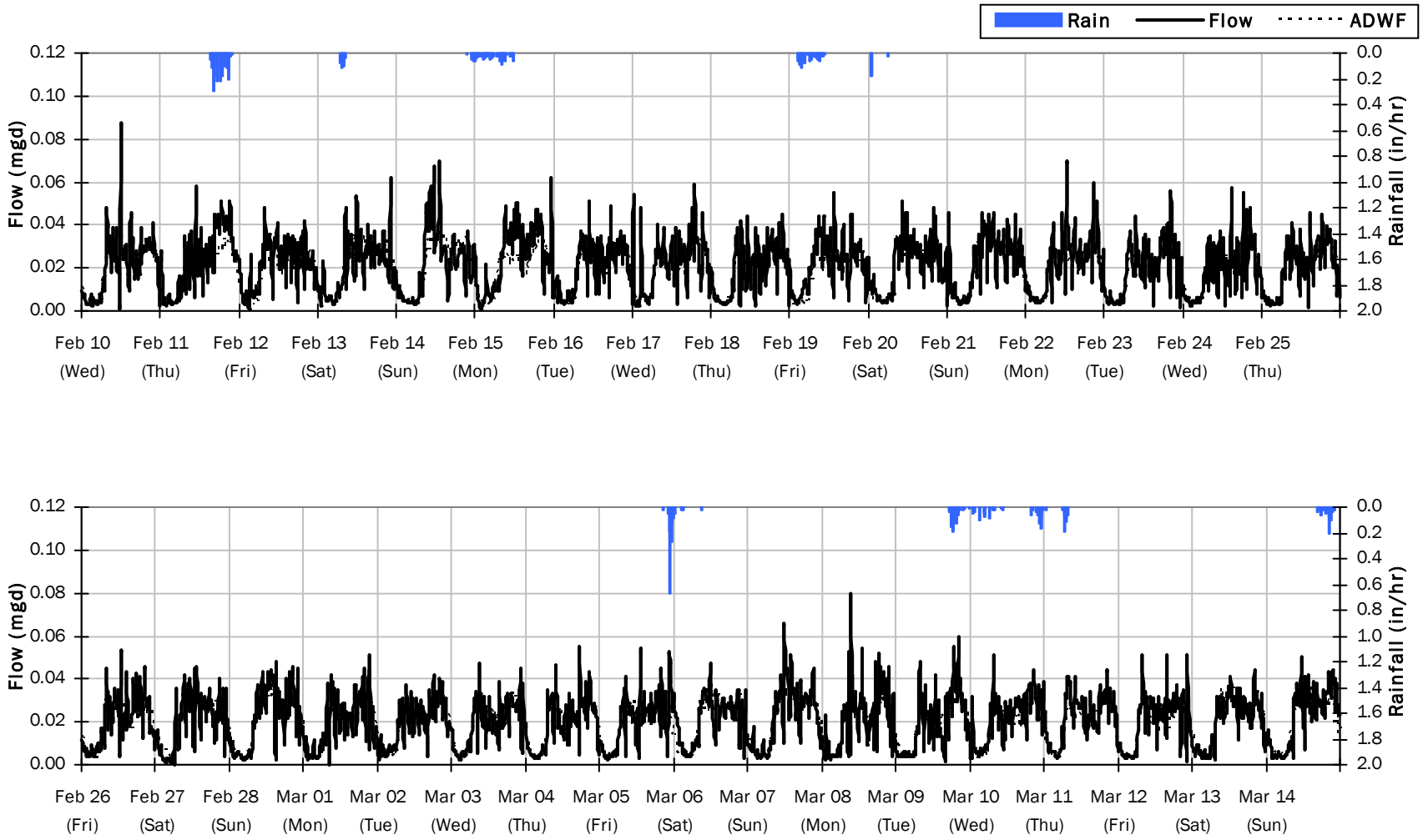
Total Period Rainfall: 3.07 inches Avg Flow: 0.023 mgd Peak Flow: 0.098 mgd Min Flow: 0.001 mgd



FM 10-2

Flow Summary: 2/10/2021 to 3/14/2021

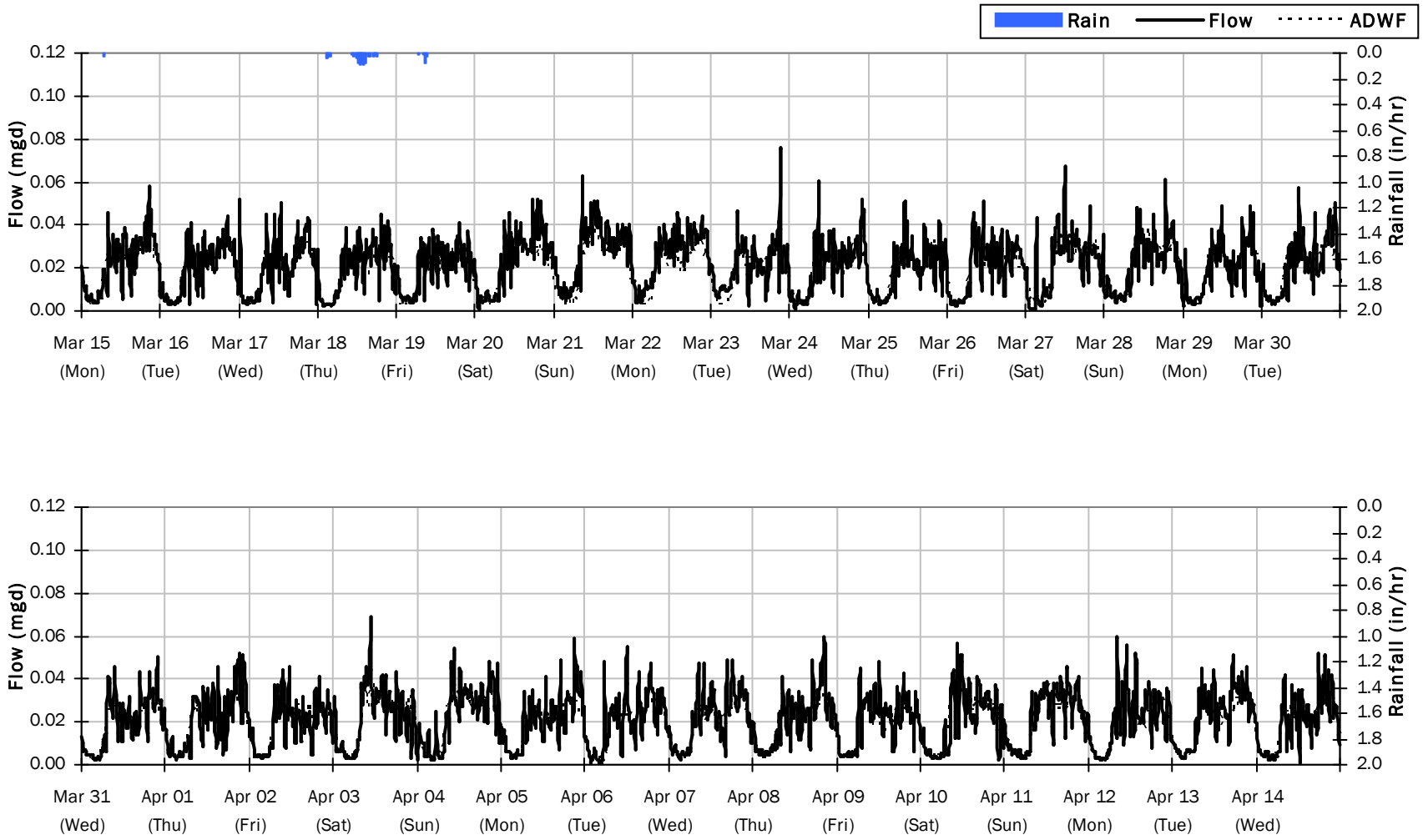
Total Period Rainfall: 2.94 inches Avg Flow: 0.021 mgd Peak Flow: 0.087 mgd Min Flow: 0.001 mgd



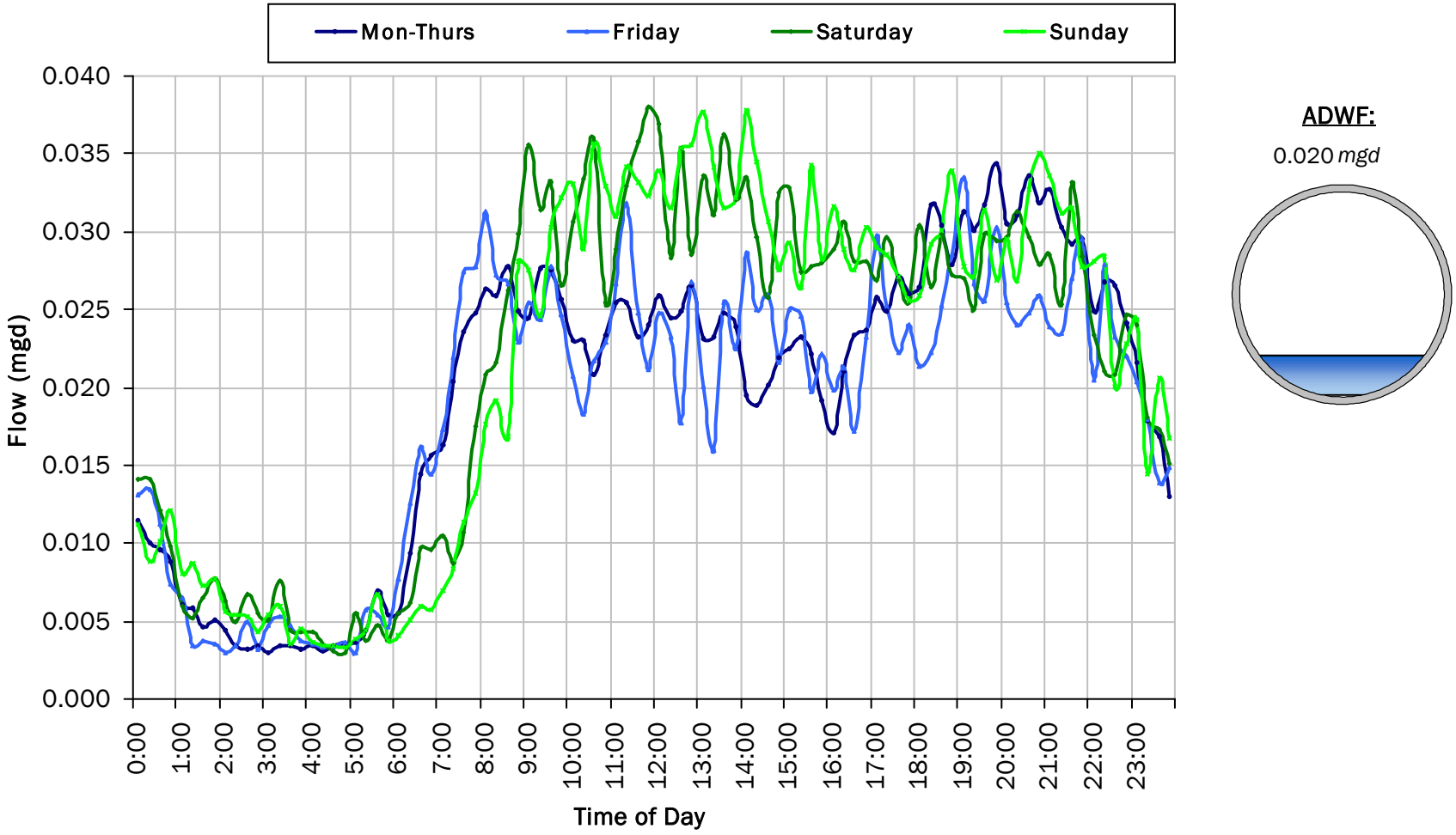
FM 10-2

Flow Summary: 3/15/2021 to 4/14/2021

Total Period Rainfall: 0.26 inches Avg Flow: 0.021 mgd Peak Flow: 0.075 mgd Min Flow: 0.001 mgd



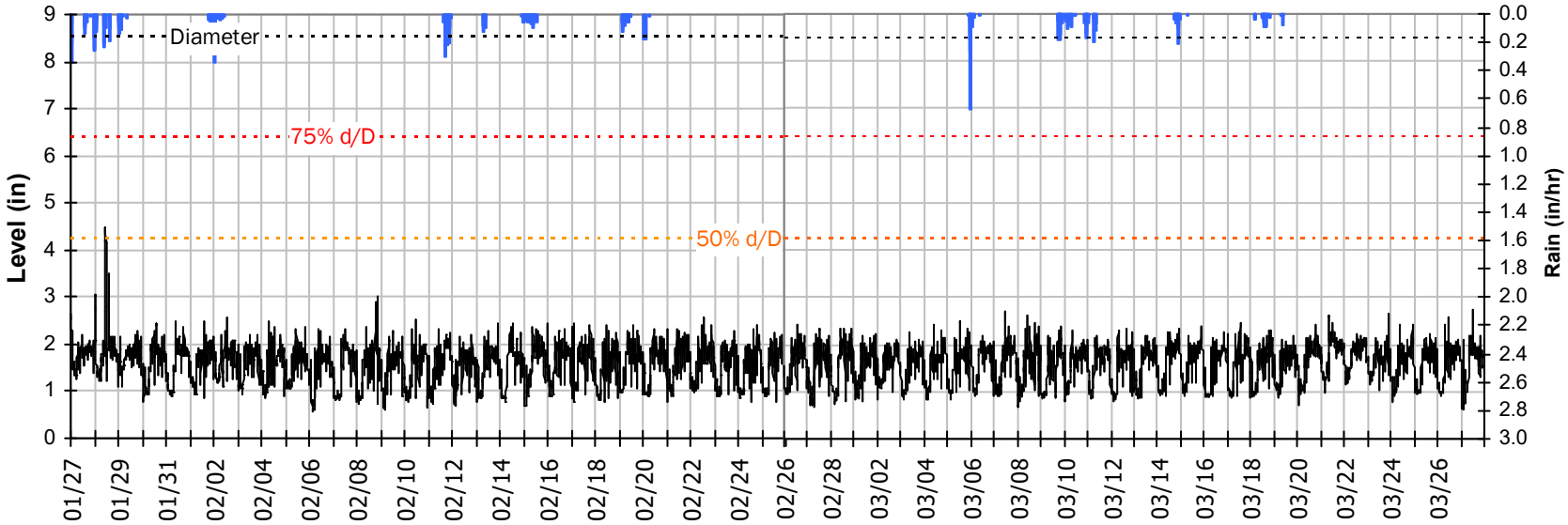
FM 10-2
Average Dry Weather Flow Hydrographs

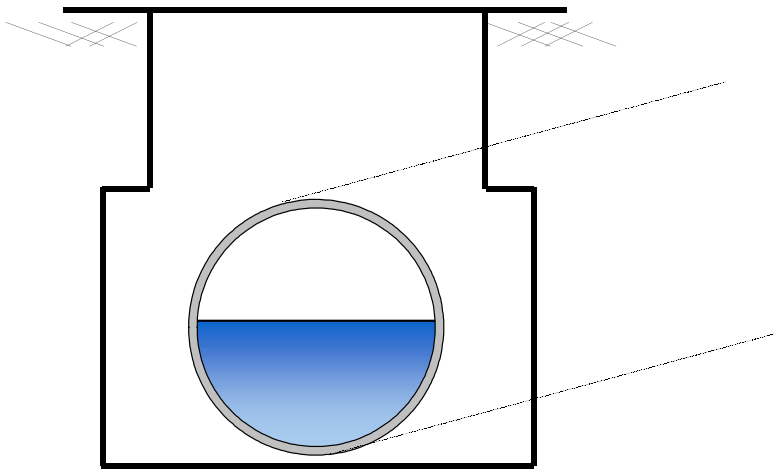


FM 10-2

Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Monitoring Period

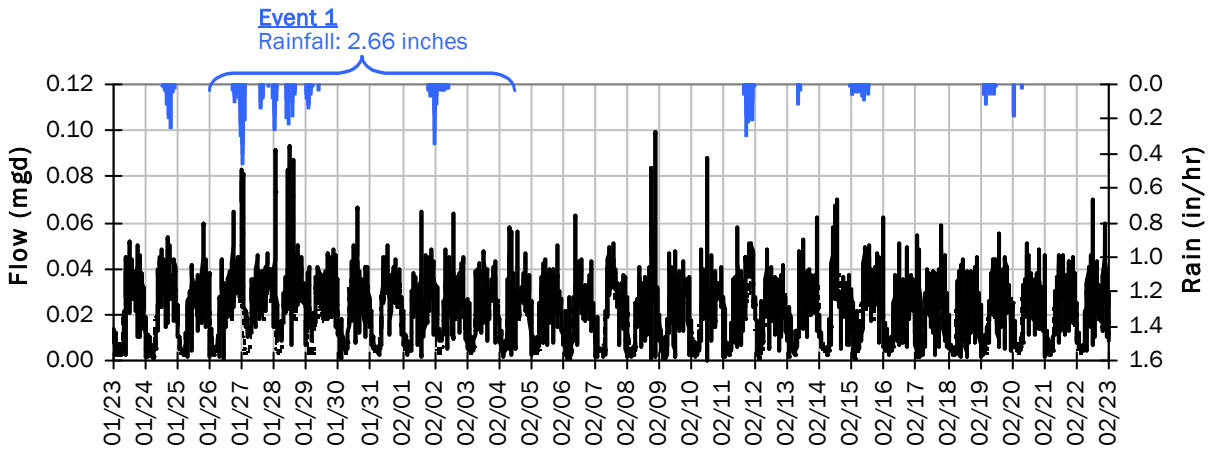




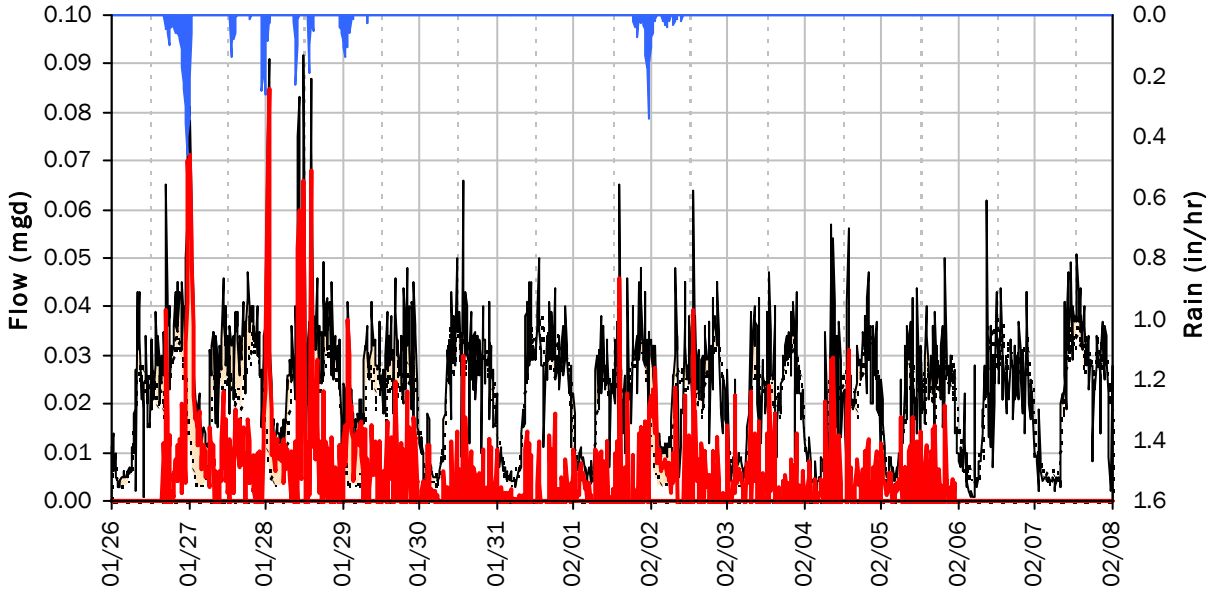
Pipe Diameter:	8.5	*inches*
Peak Measured Level:	4.47	*inches*
Peak d/D Ratio:	0.53	

FM 10-2
I/I Summary: Event 1

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



Event 1 Detail Graph

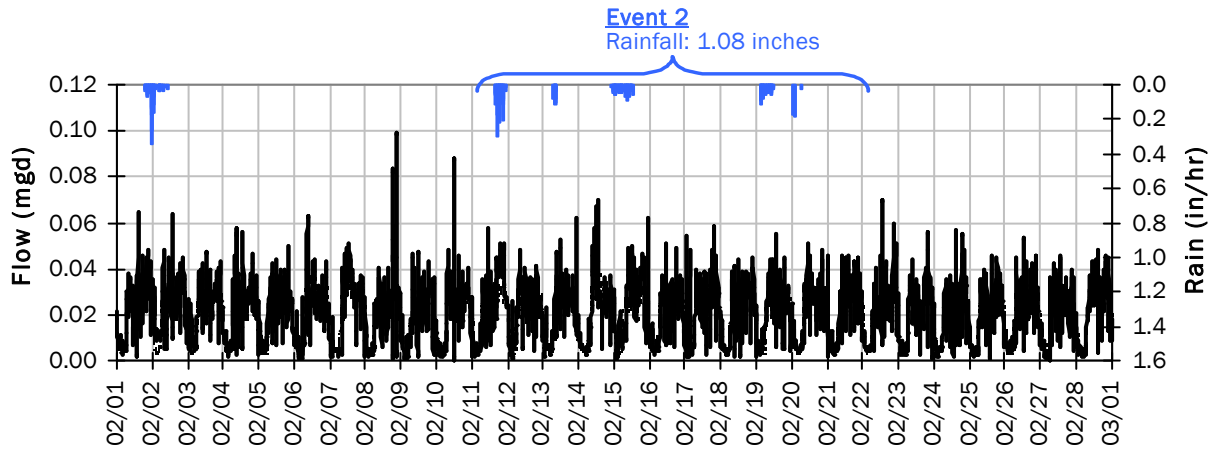


Storm Event I/I Analysis (Rain = 2.66 inches)

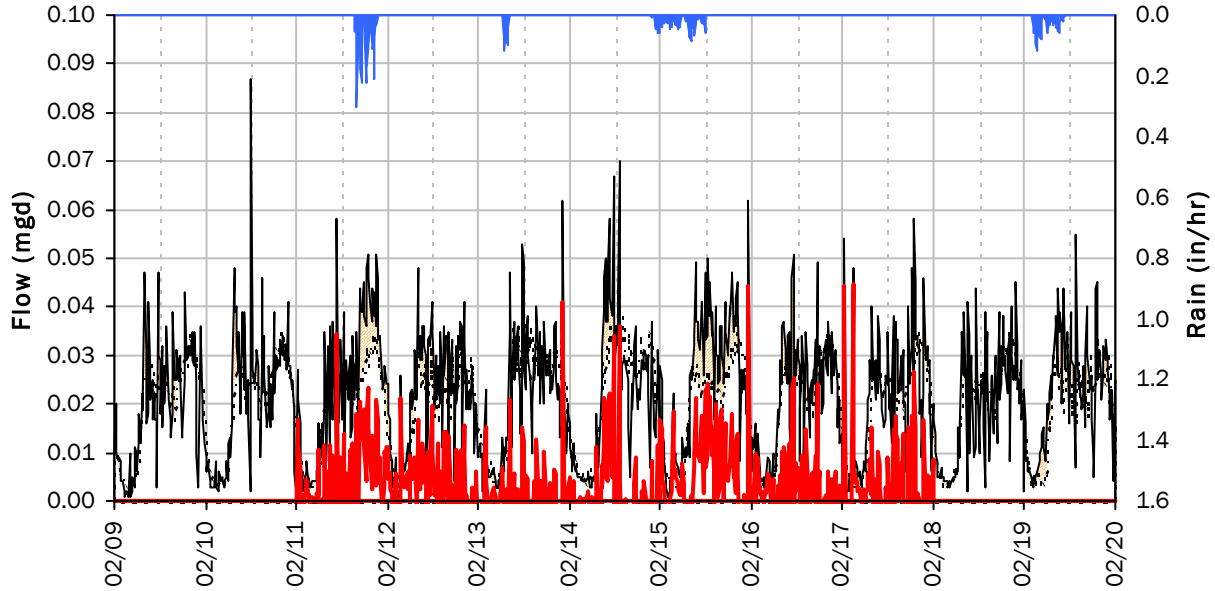
Capacity		Inflow / Infiltration	
Peak Flow:	0.09 *mgd*	**Peak I/I Rate:**	0.08 *mgd*
PF:	4.61	**Total I/I:**	55,000 *gallons*
Peak Level:	4.47 *in*		
d/D Ratio:	0.53		

FM 10-2
I/I Summary: Event 2

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



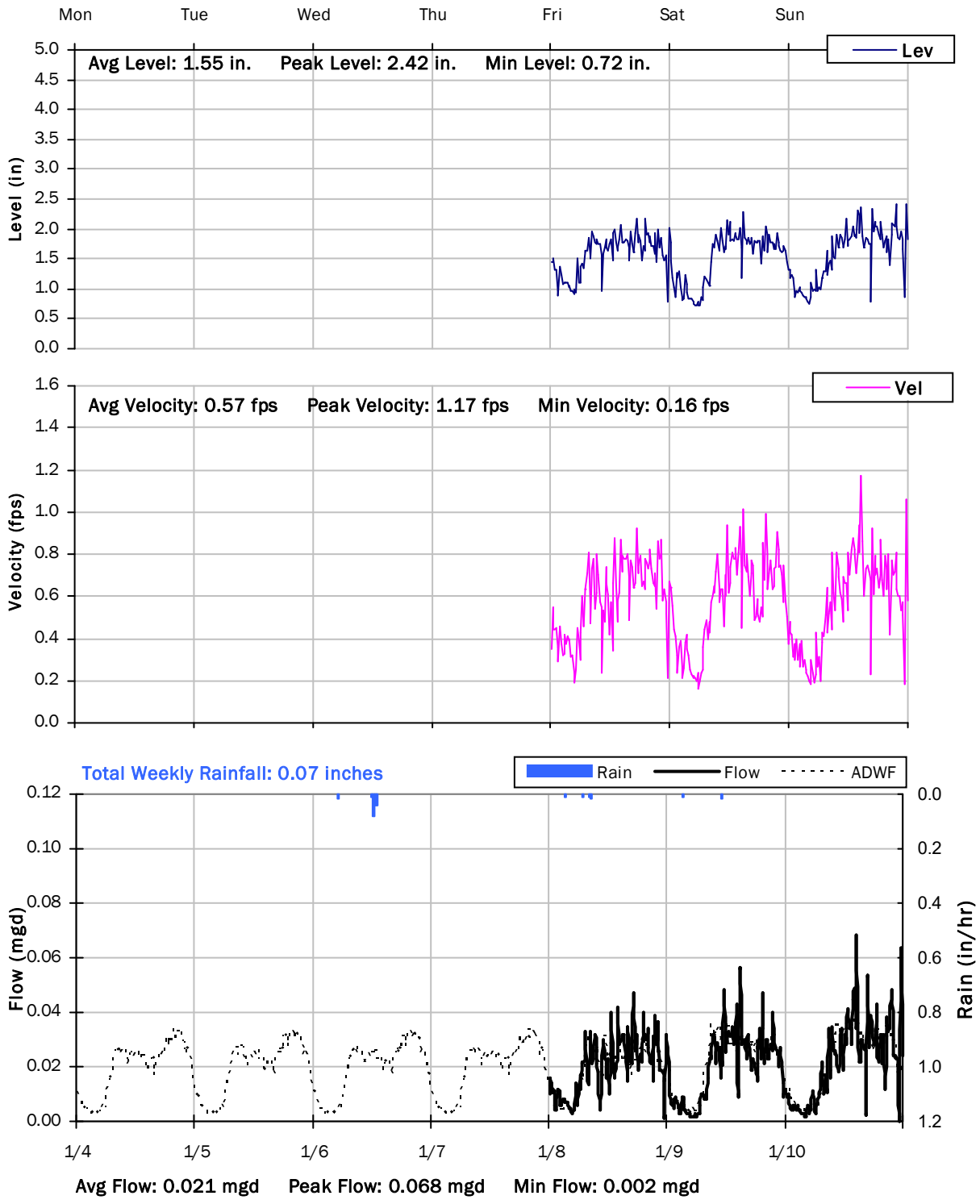
Event 2 Detail Graph



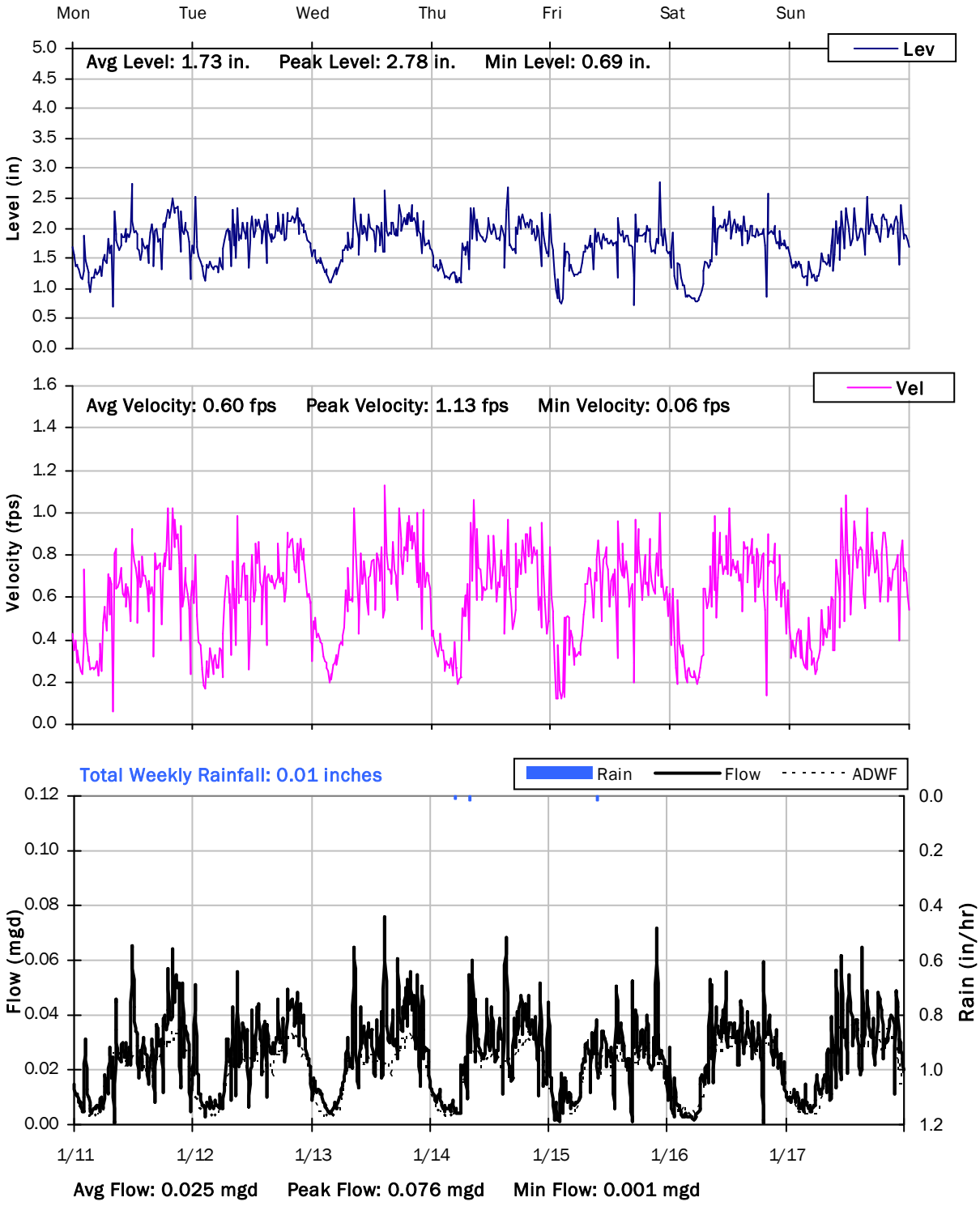
Storm Event I/I Analysis (Rain = 1.08 inches)

Capacity		Inflow / Infiltration	
Peak Flow:	0.07 *mgd*	**Peak I/I Rate:**	0.04 *mgd*
PF:	3.51	**Total I/I:**	16,000 *gallons*
Peak Level:	2.45 *in*		
d/D Ratio:	0.29		

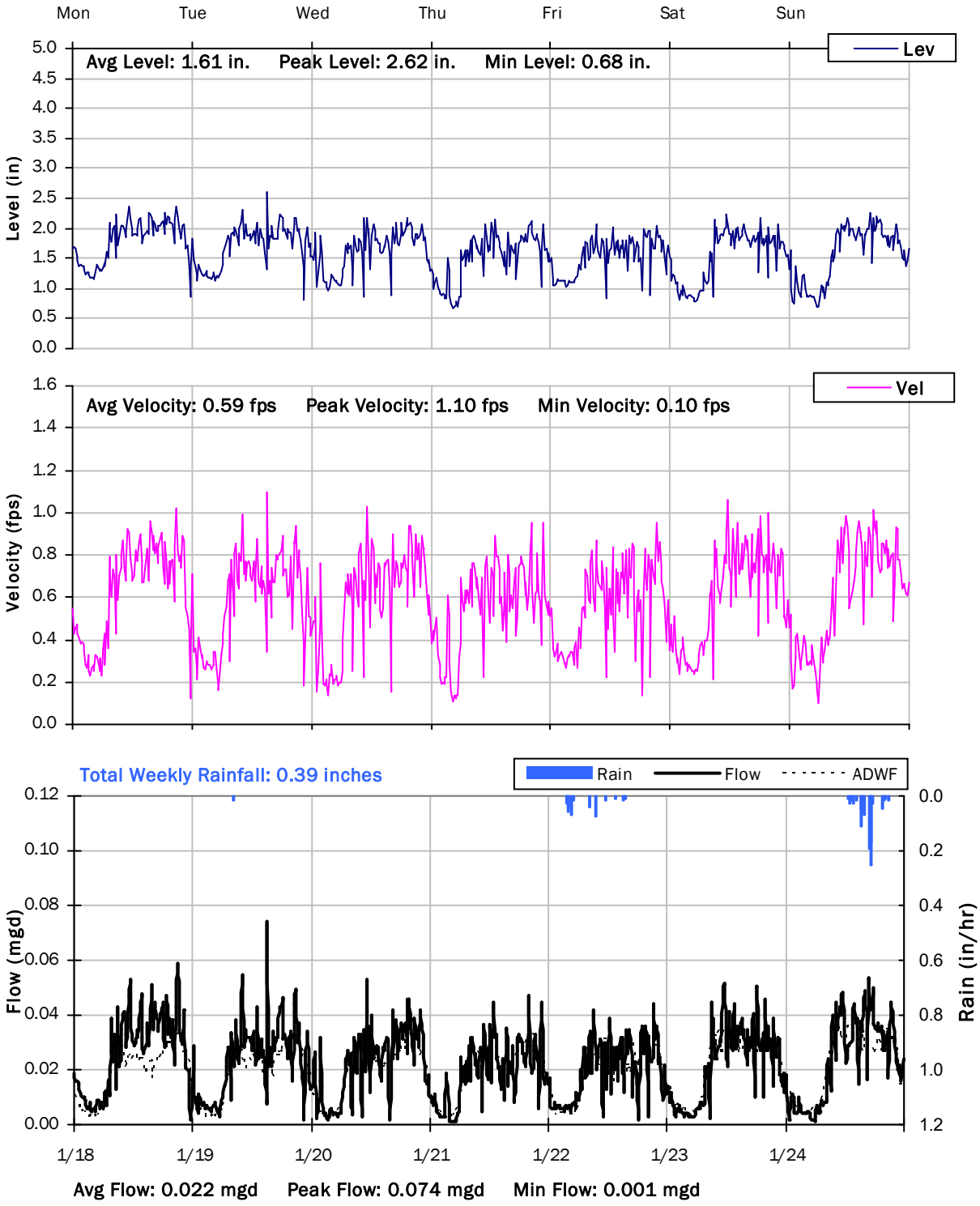
FM 10-2
Weekly Level, Velocity and Flow Hydrographs
1/4/2021 to 1/11/2021



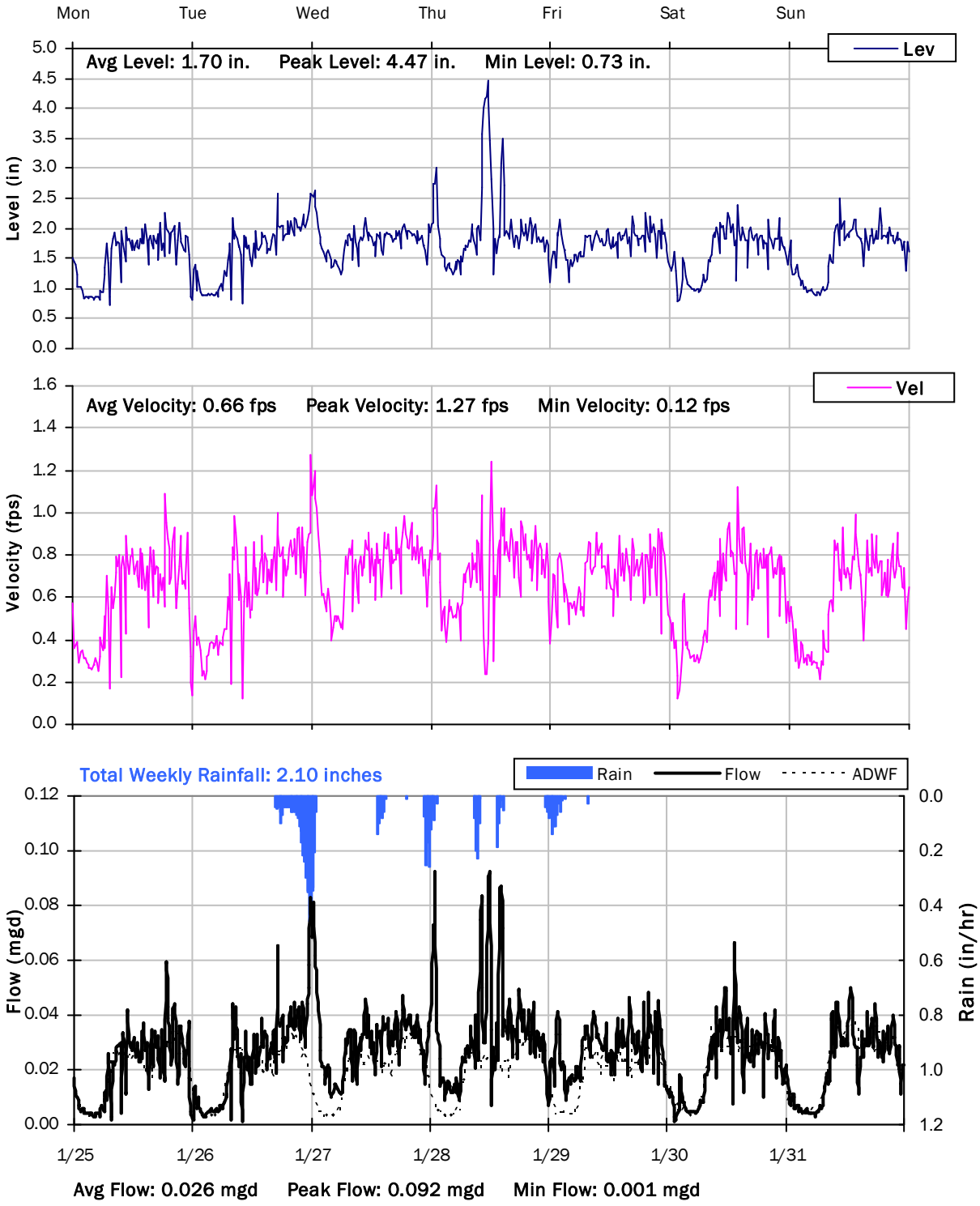
FM 10-2
Weekly Level, Velocity and Flow Hydrographs
1/11/2021 to 1/18/2021



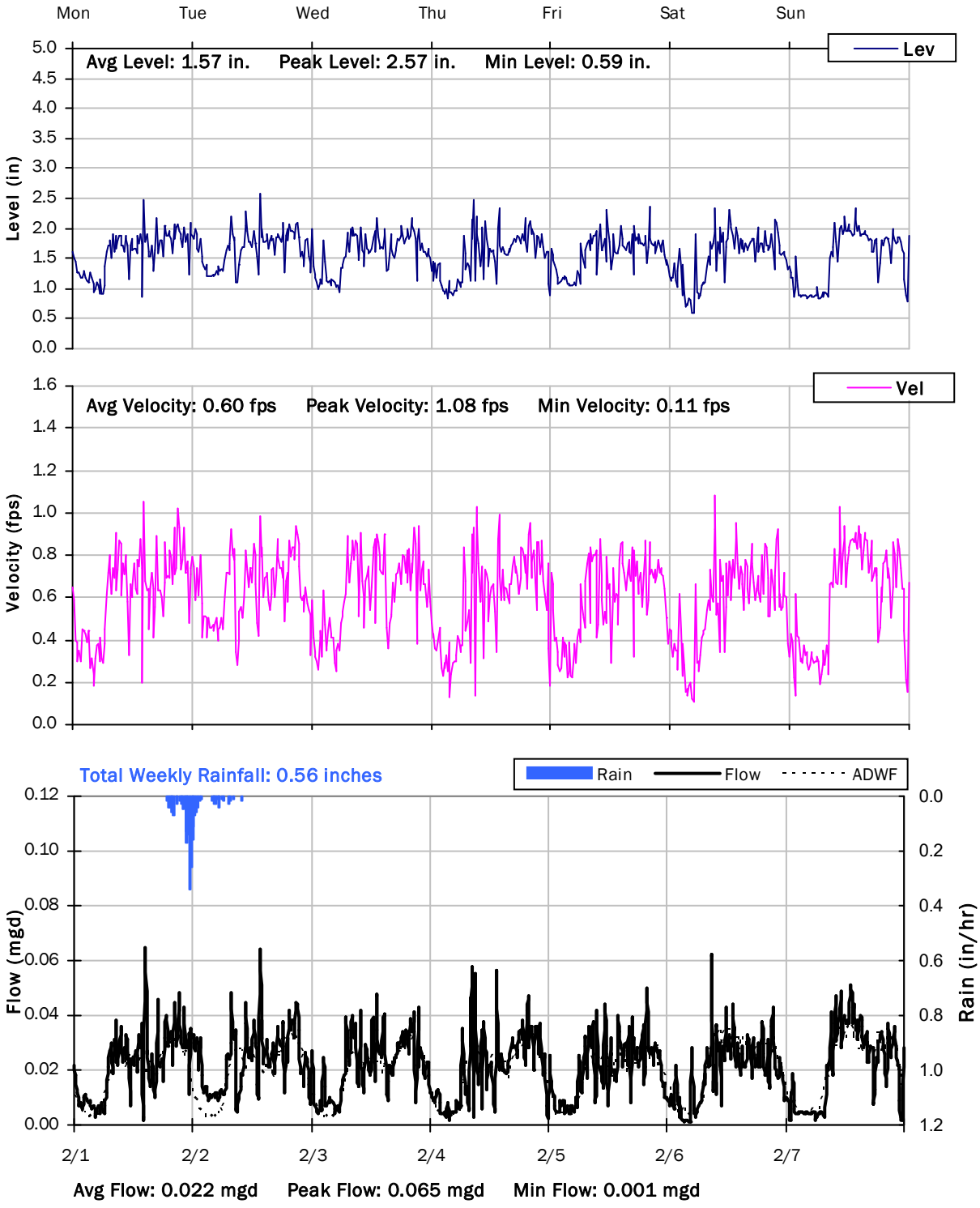
FM 10-2
Weekly Level, Velocity and Flow Hydrographs
1/18/2021 to 1/25/2021



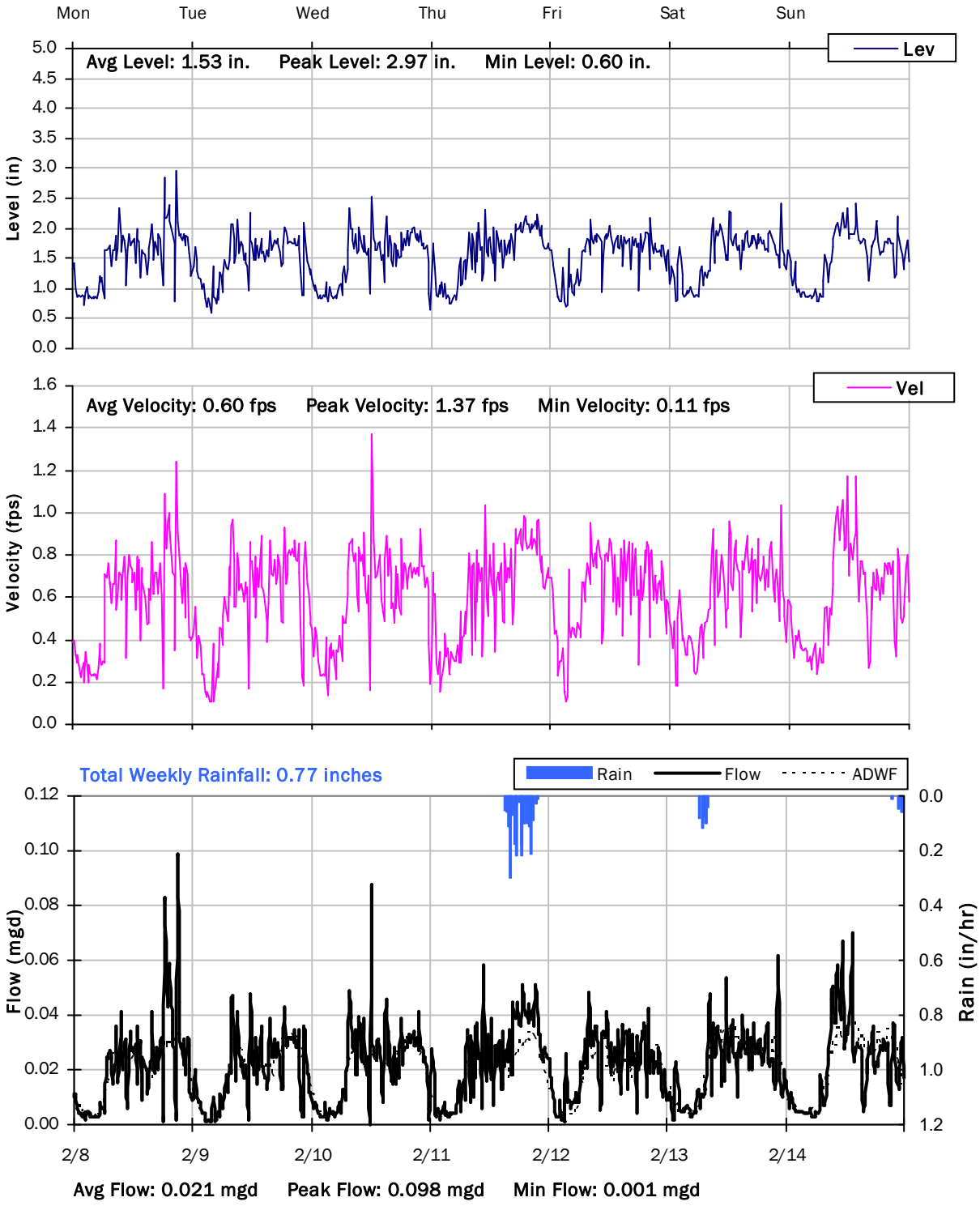
FM 10-2
Weekly Level, Velocity and Flow Hydrographs
1/25/2021 to 2/1/2021



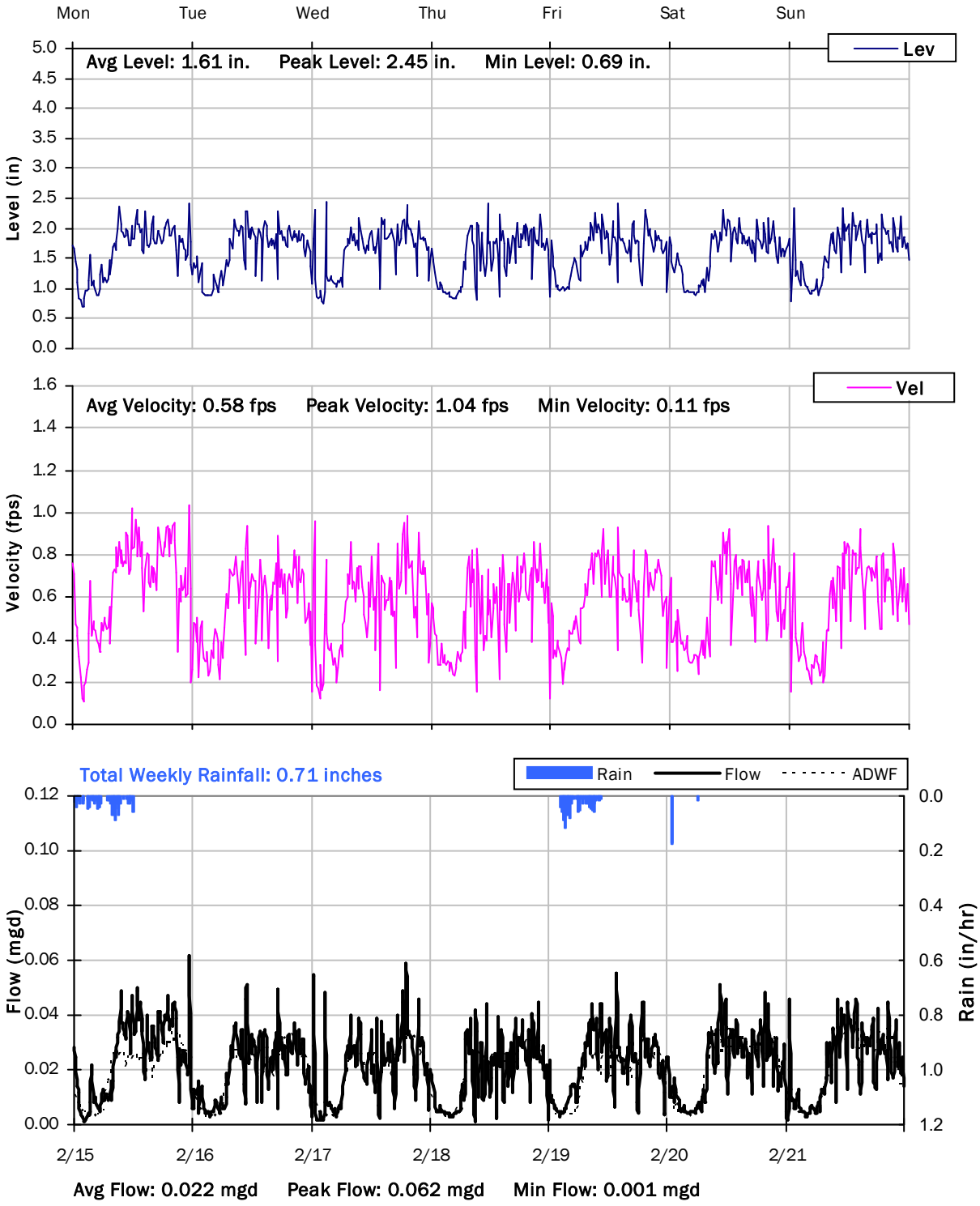
FM 10-2
Weekly Level, Velocity and Flow Hydrographs
2/1/2021 to 2/8/2021



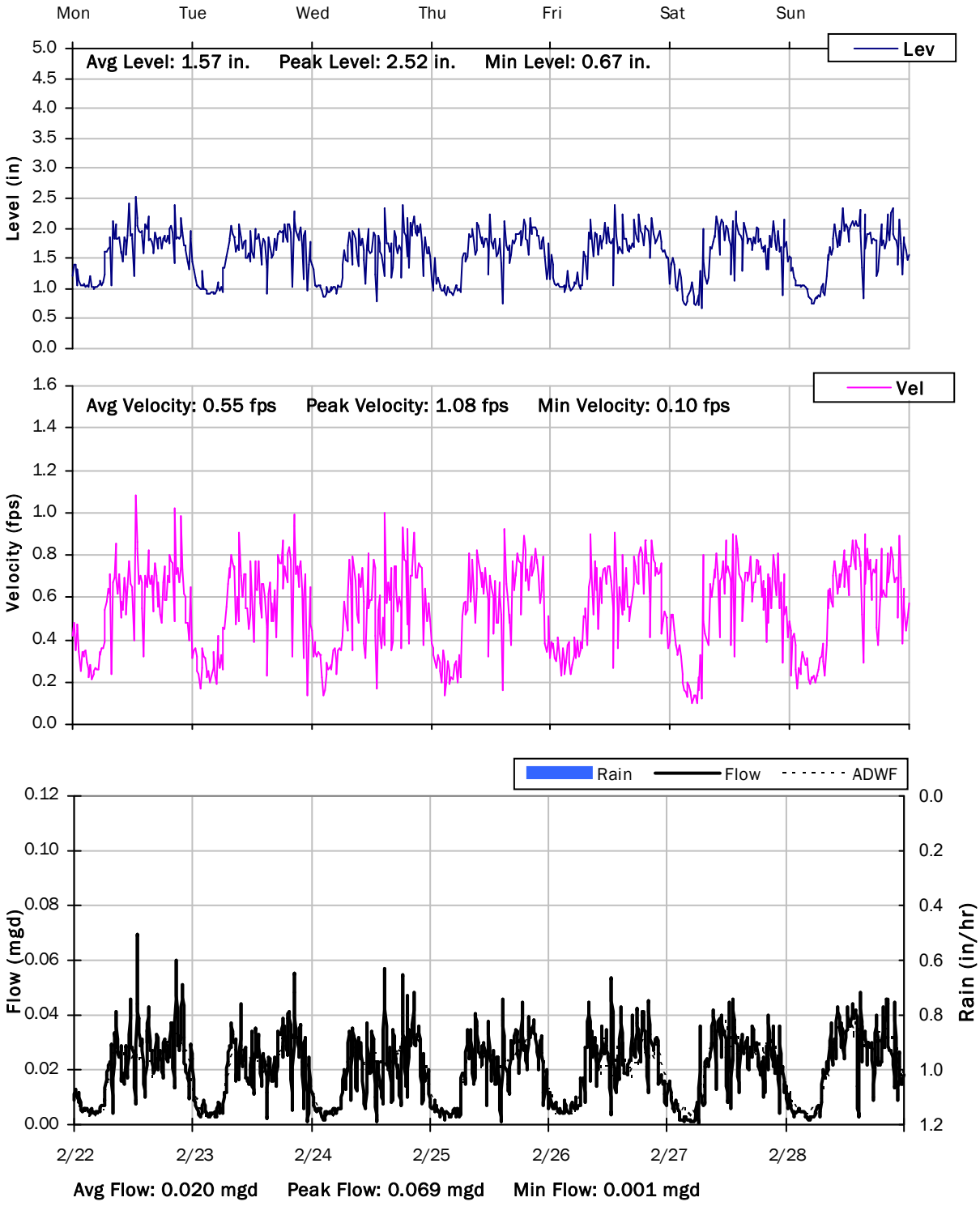
FM 10-2
Weekly Level, Velocity and Flow Hydrographs
2/8/2021 to 2/15/2021



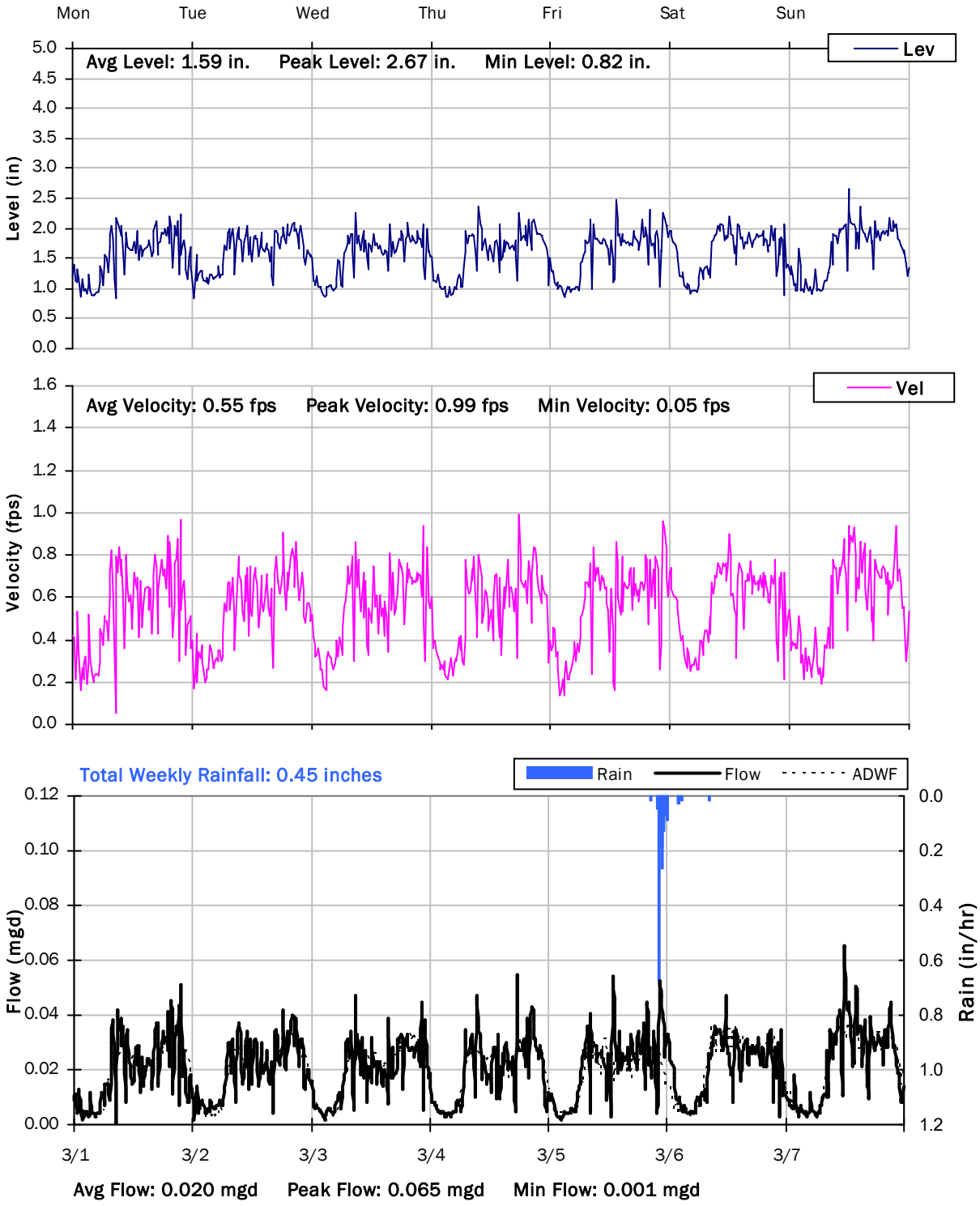
FM 10-2
Weekly Level, Velocity and Flow Hydrographs
2/15/2021 to 2/22/2021



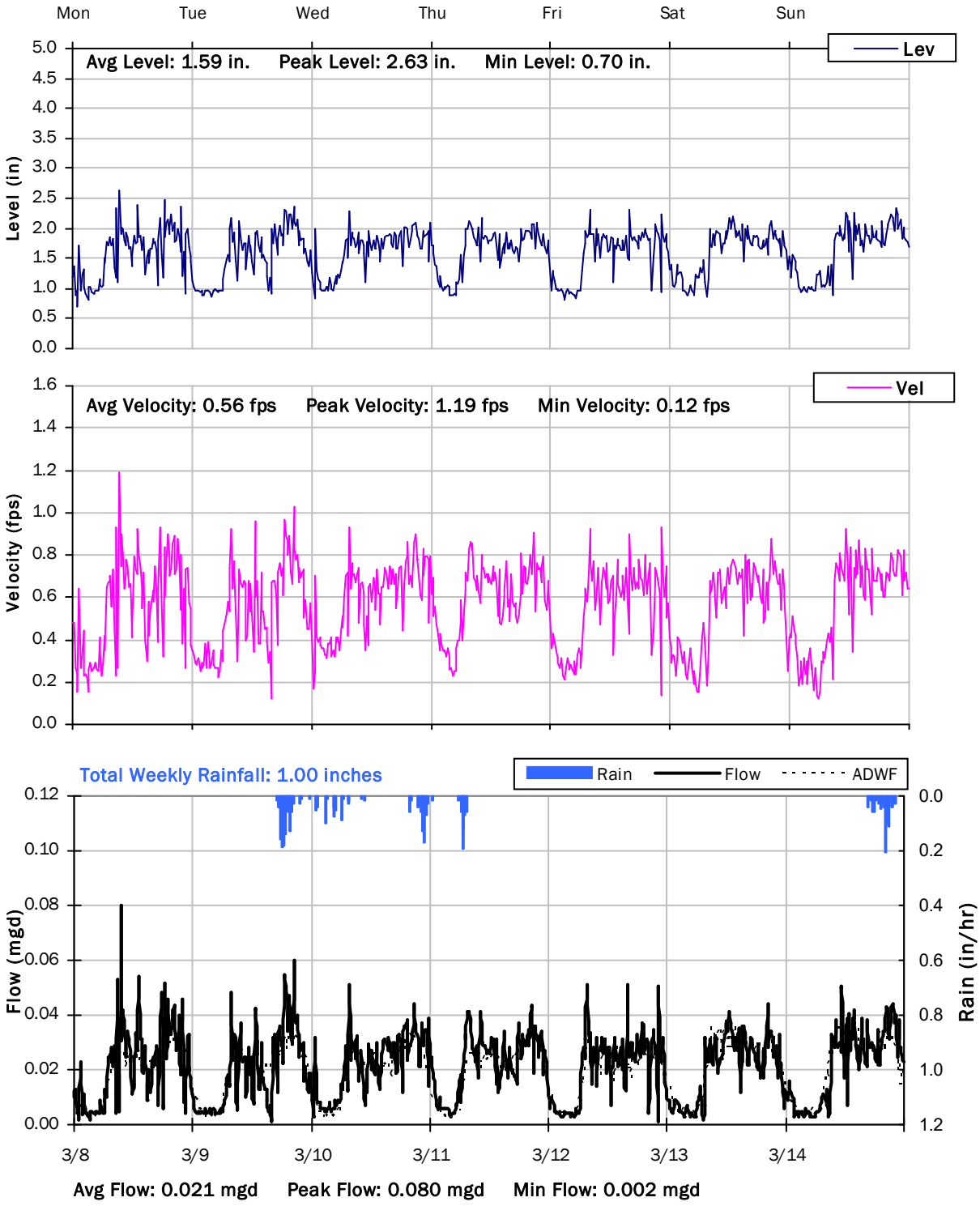
FM 10-2
Weekly Level, Velocity and Flow Hydrographs
2/22/2021 to 3/1/2021



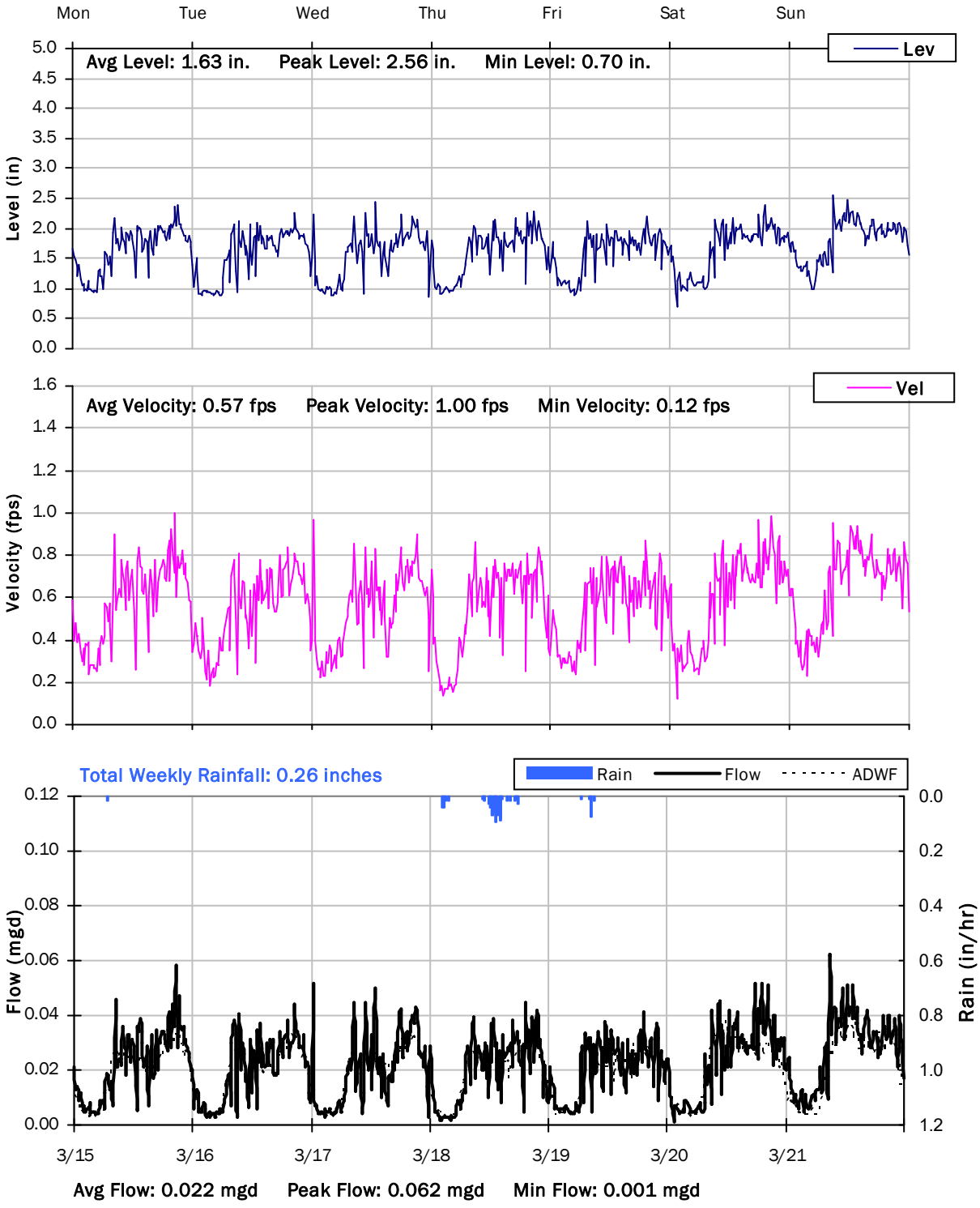
FM 10-2
Weekly Level, Velocity and Flow Hydrographs
3/1/2021 to 3/8/2021



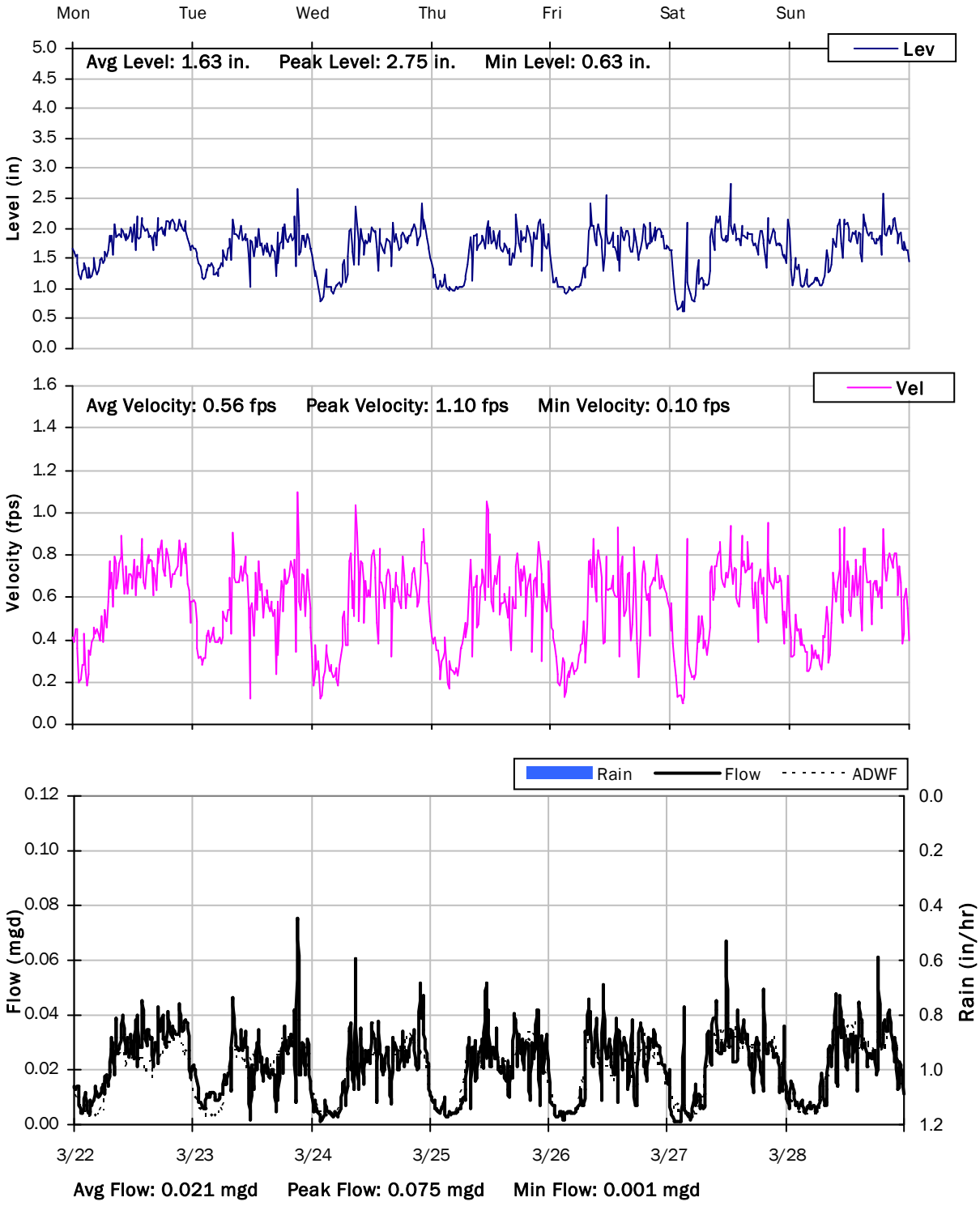
FM 10-2
Weekly Level, Velocity and Flow Hydrographs
3/8/2021 to 3/15/2021



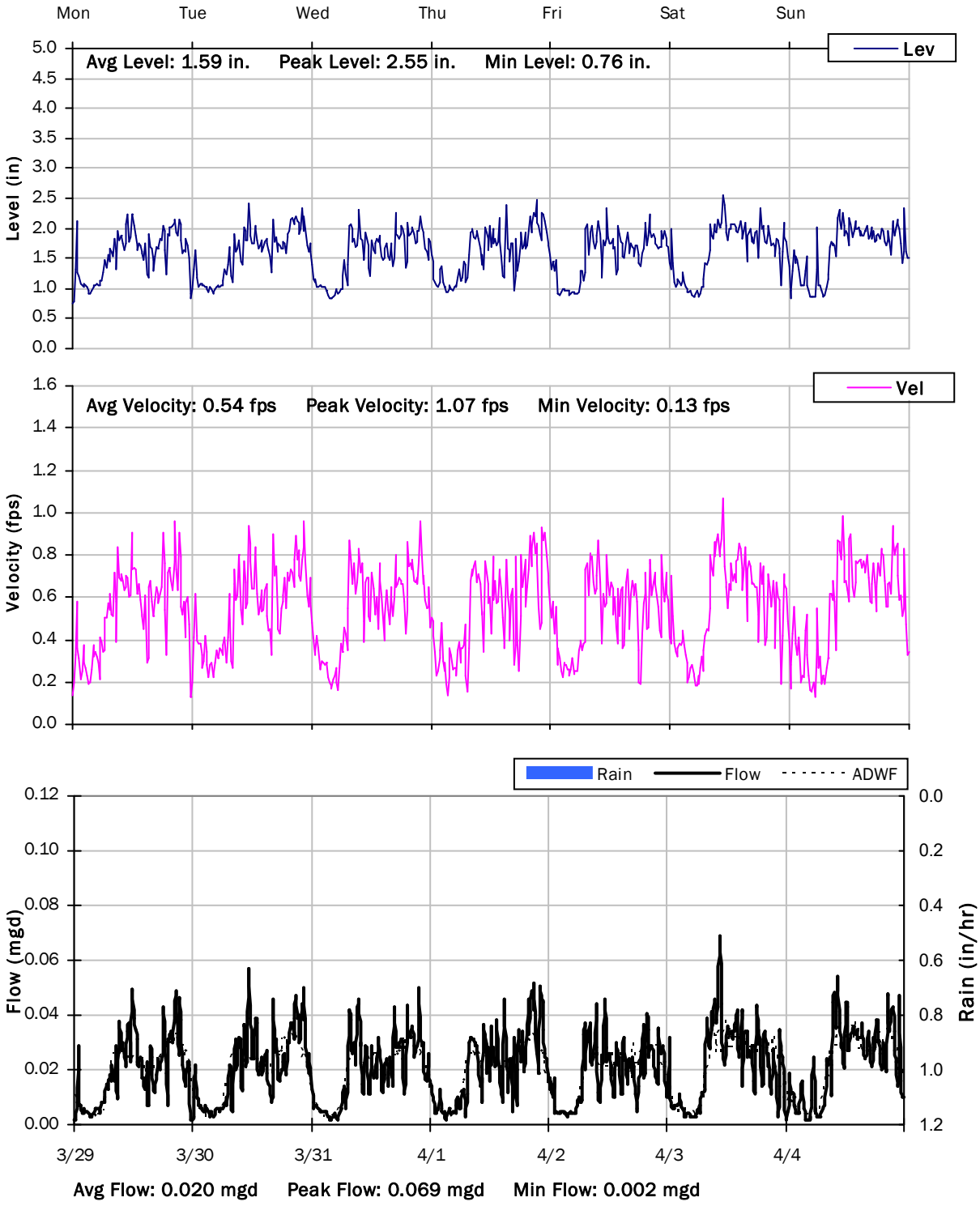
FM 10-2
Weekly Level, Velocity and Flow Hydrographs
3/15/2021 to 3/22/2021



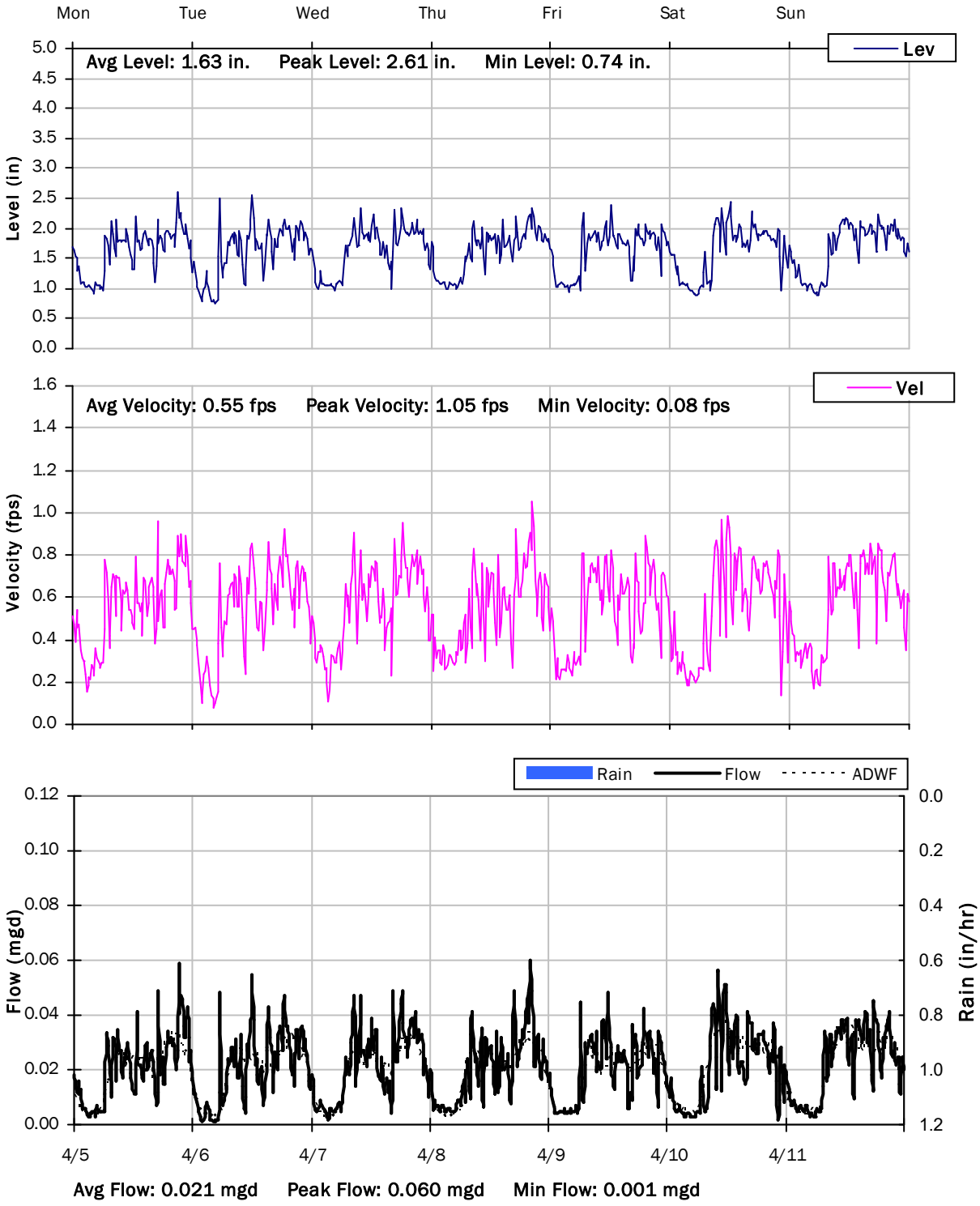
FM 10-2
Weekly Level, Velocity and Flow Hydrographs
3/22/2021 to 3/29/2021



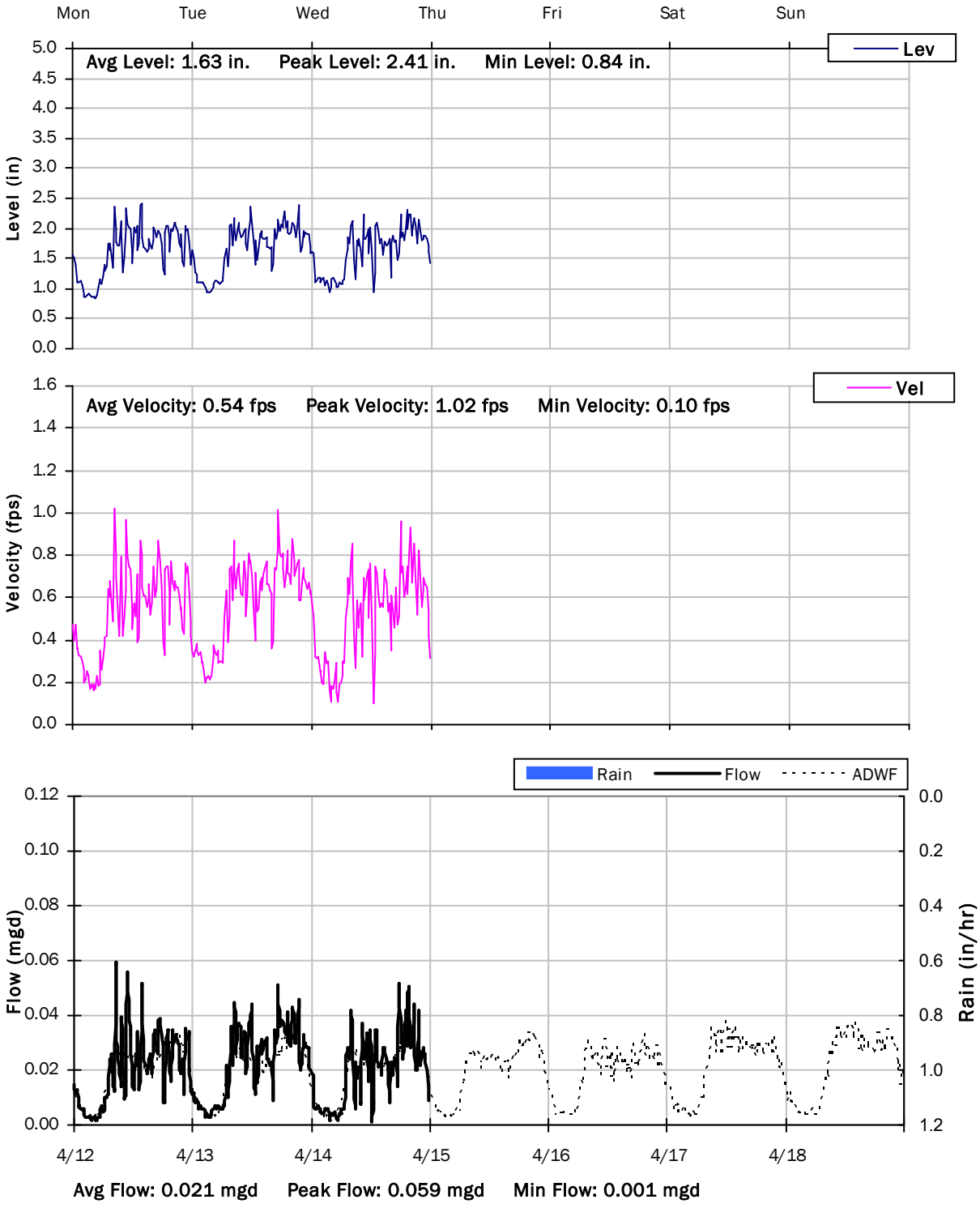
FM 10-2
Weekly Level, Velocity and Flow Hydrographs
3/29/2021 to 4/5/2021



FM 10-2
Weekly Level, Velocity and Flow Hydrographs
4/5/2021 to 4/12/2021



FM 10-2
Weekly Level, Velocity and Flow Hydrographs
4/12/2021 to 4/19/2021



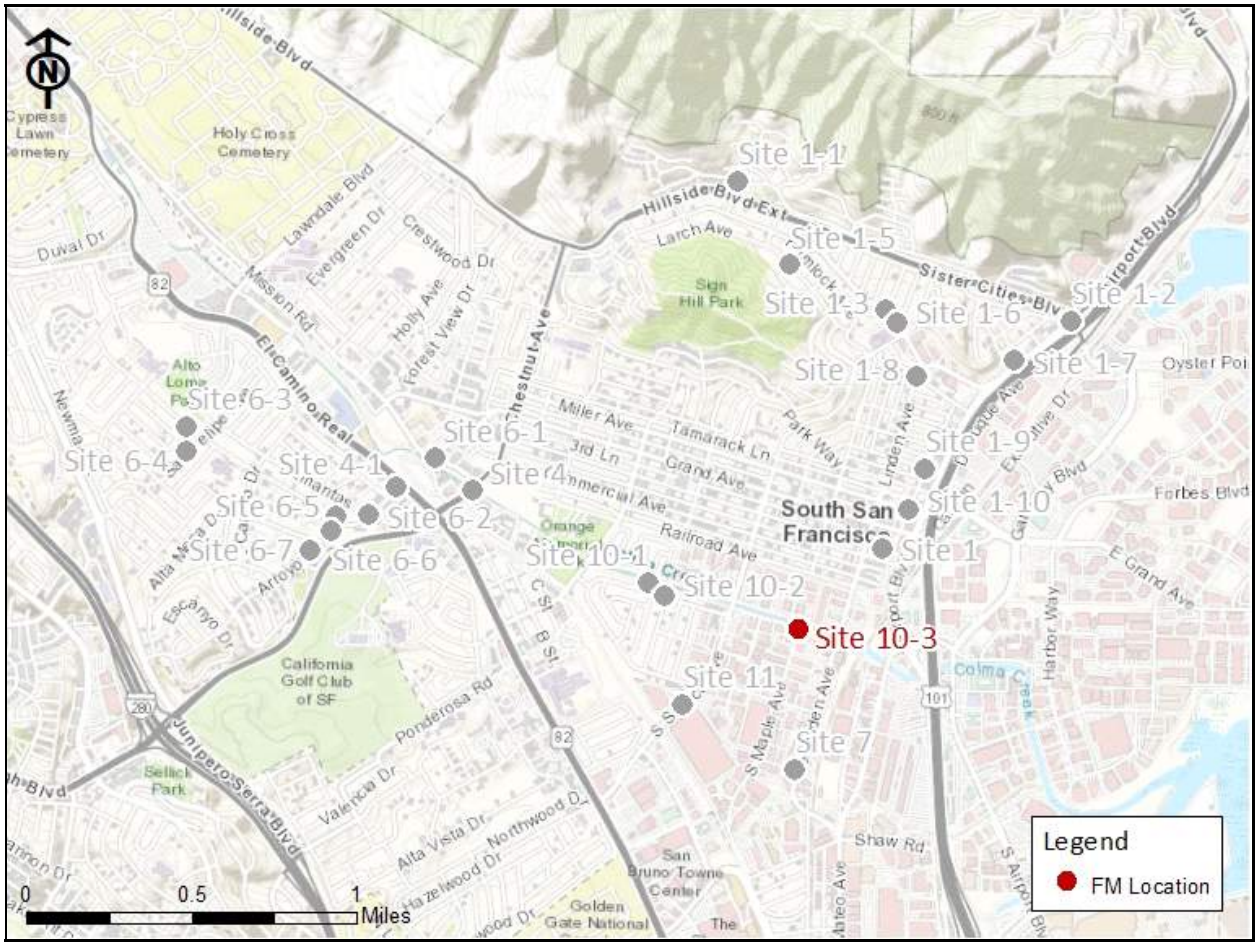
South San Francisco, CA

Sanitary Sewer Flow Monitoring
January 4 - April 14, 2021

Monitoring Site: FM 10-3

Location: S Canal Street and S Maple Avenue

Data Summary Report



Vicinity Map: FM 10-3

FM 10-3

Site Information

Location: S Canal Street and S Maple Avenue

Coordinates: 122.4141° W, 37.6504° N

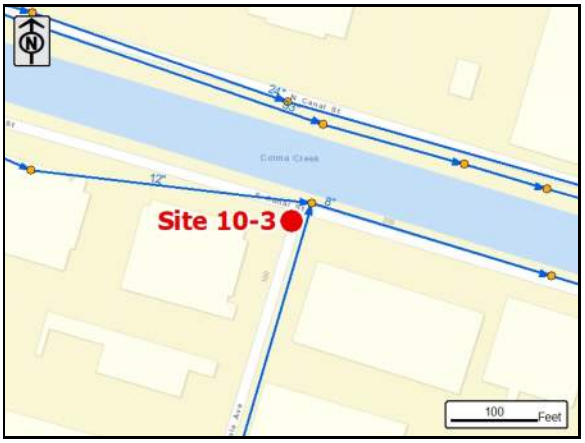
Rim Elevation (Earth): 10 feet

Pipe Diameter: 12 inches

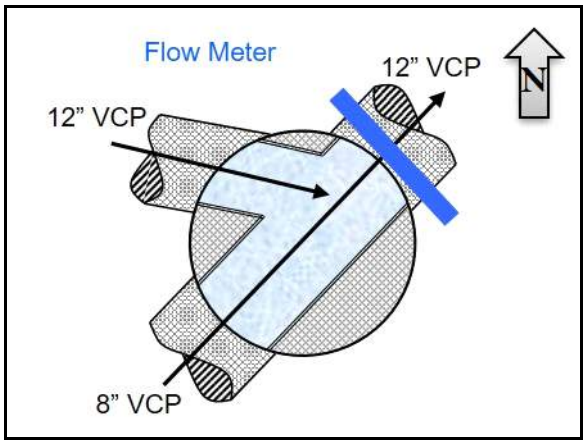
ADWF: 0.166 mgd

Peak Measured Flow: 1.326 mgd

Satellite Map



Sanitary Map



Flow Sketch

Street View

Plan View

FM 10-3

Additional Site Photos

Monitored Effluent Pipe

South Influent Pipe

FM 10-3

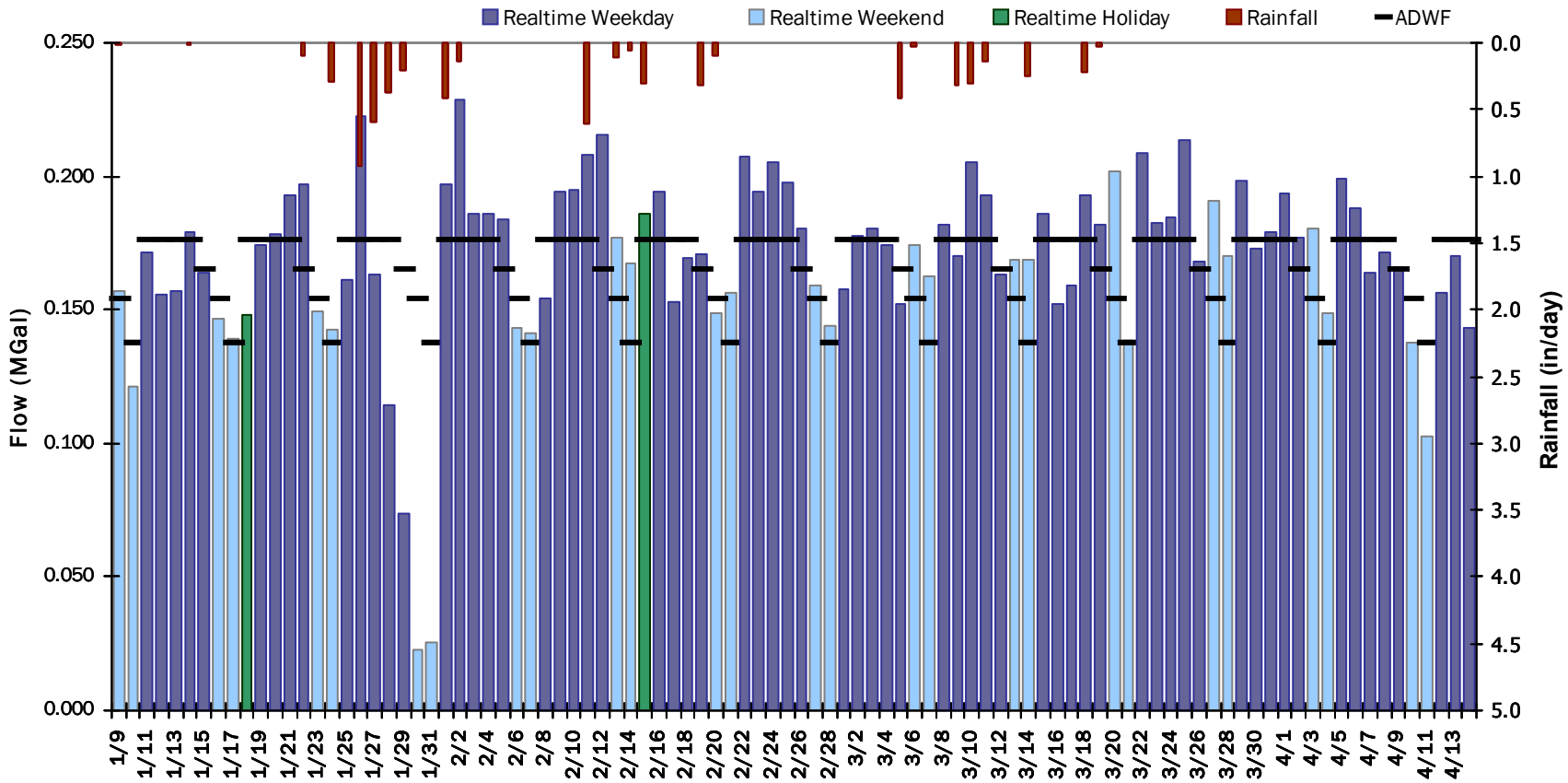
Additional Site Photos

West Influent Pipe

FM 10-3
Period Flow Summary: Daily Flow Totals

Avg Period Flow: 0.169 MGal Peak Daily Flow: 0.229 MGal Min Daily Flow: 0.023 MGal

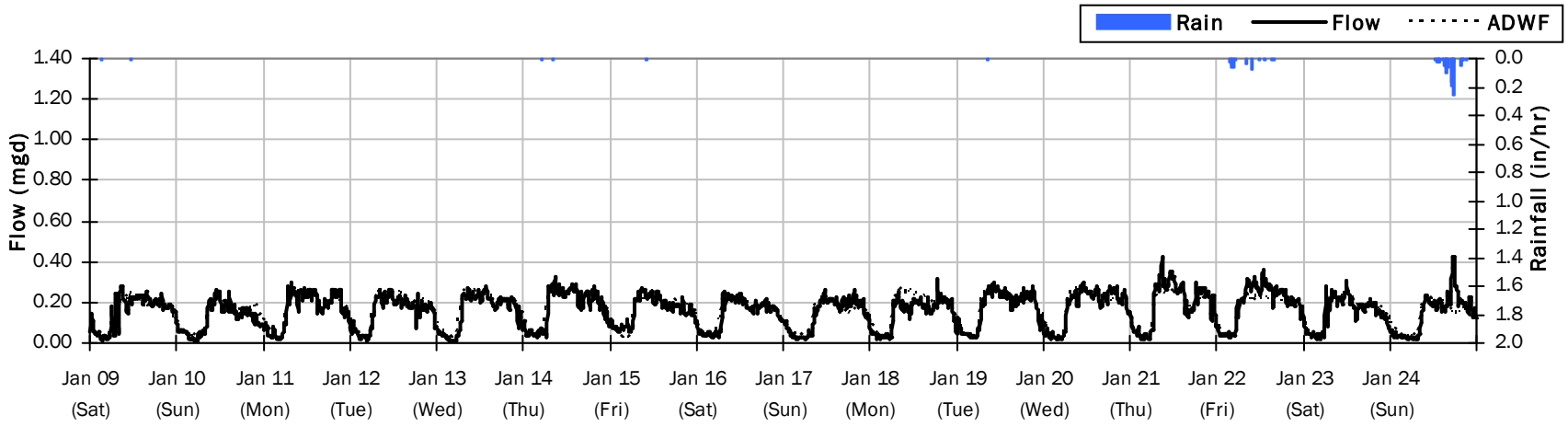
Total Period Rainfall: 6.26 inches

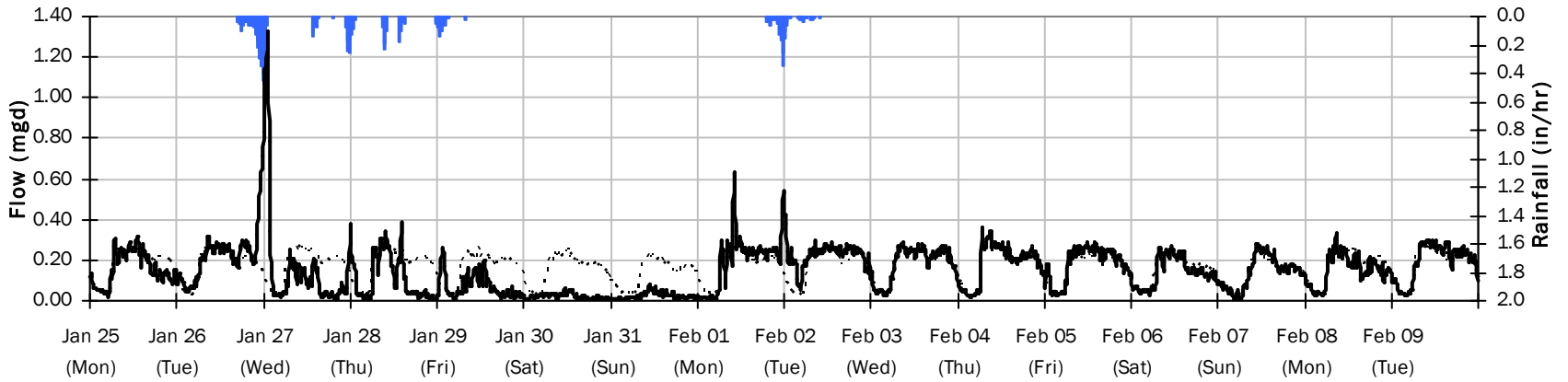


FM 10-3

Flow Summary: 1/9/2021 to 2/9/2021

Total Period Rainfall: 3.05 inches Avg Flow: 0.155 mgd Peak Flow: 1.326 mgd Min Flow: 0.005 mgd

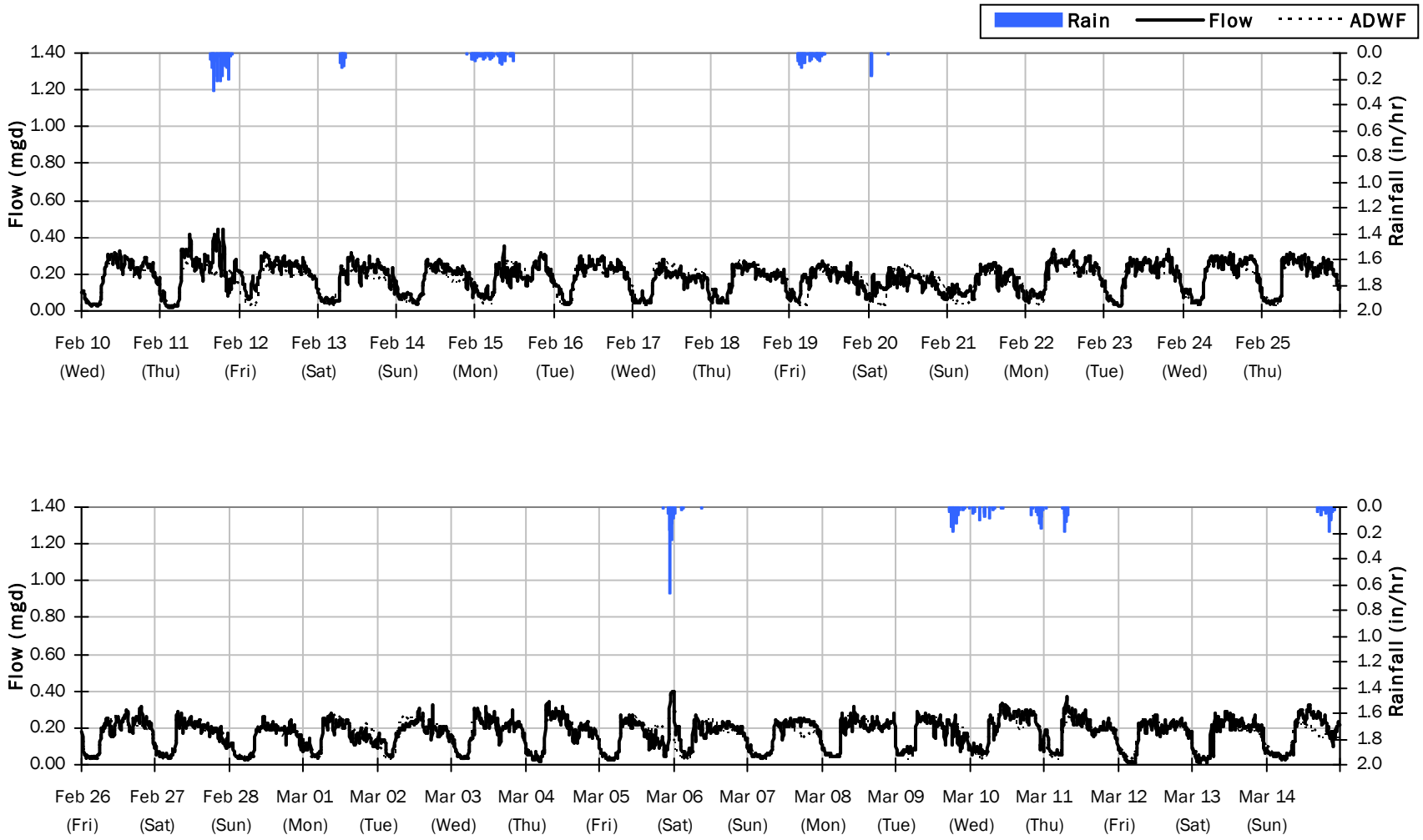




FM 10-3

Flow Summary: 2/10/2021 to 3/14/2021

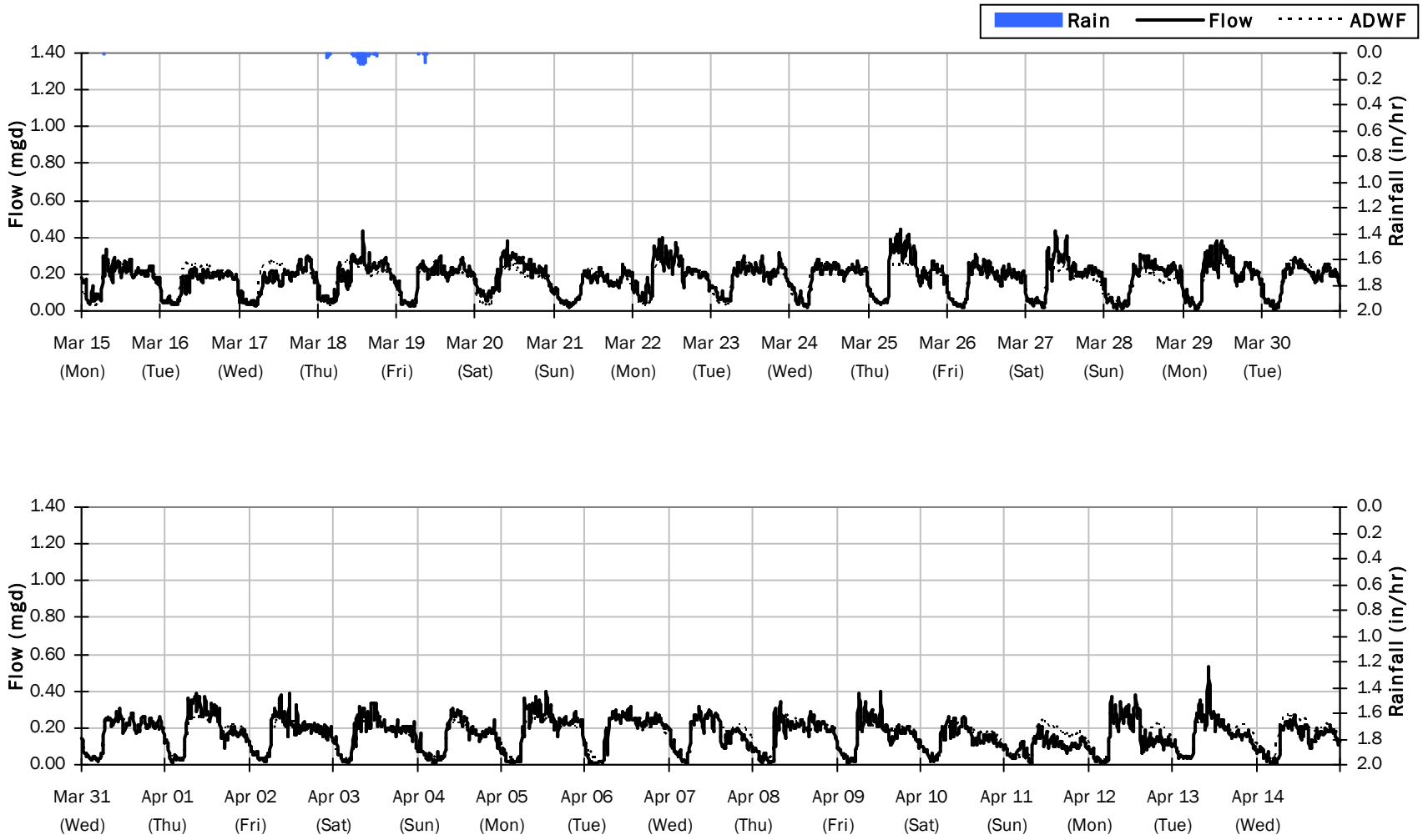
Total Period Rainfall: 2.93 inches Avg Flow: 0.177 mgd Peak Flow: 0.447 mgd Min Flow: 0.008 mgd



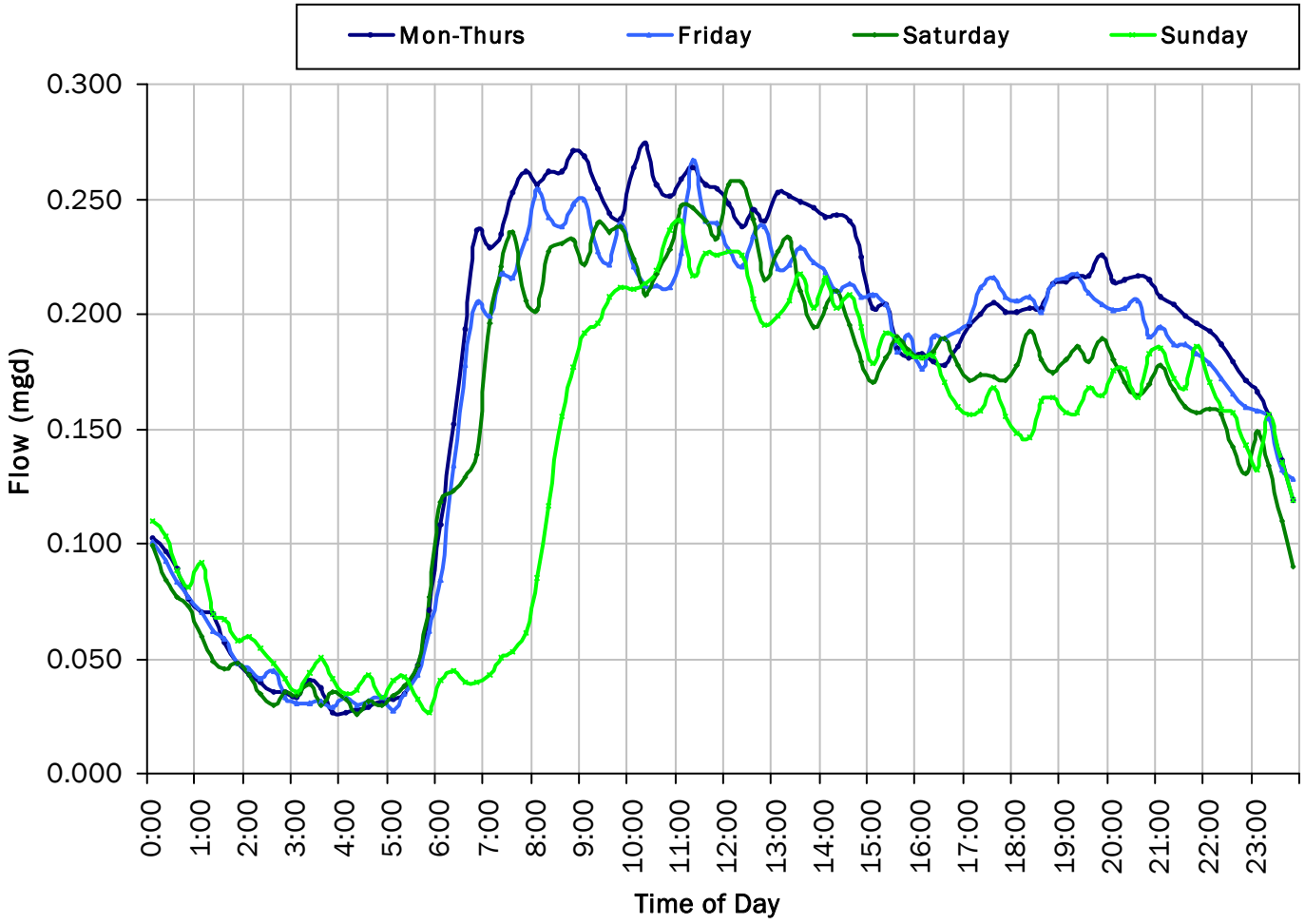
FM 10-3

Flow Summary: 3/15/2021 to 4/14/2021

Total Period Rainfall: 0.26 inches Avg Flow: 0.174 mgd Peak Flow: 0.537 mgd Min Flow: 0.007 mgd

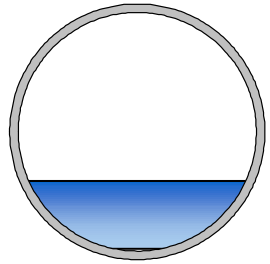


FM 10-3
Average Dry Weather Flow Hydrographs



ADWF:

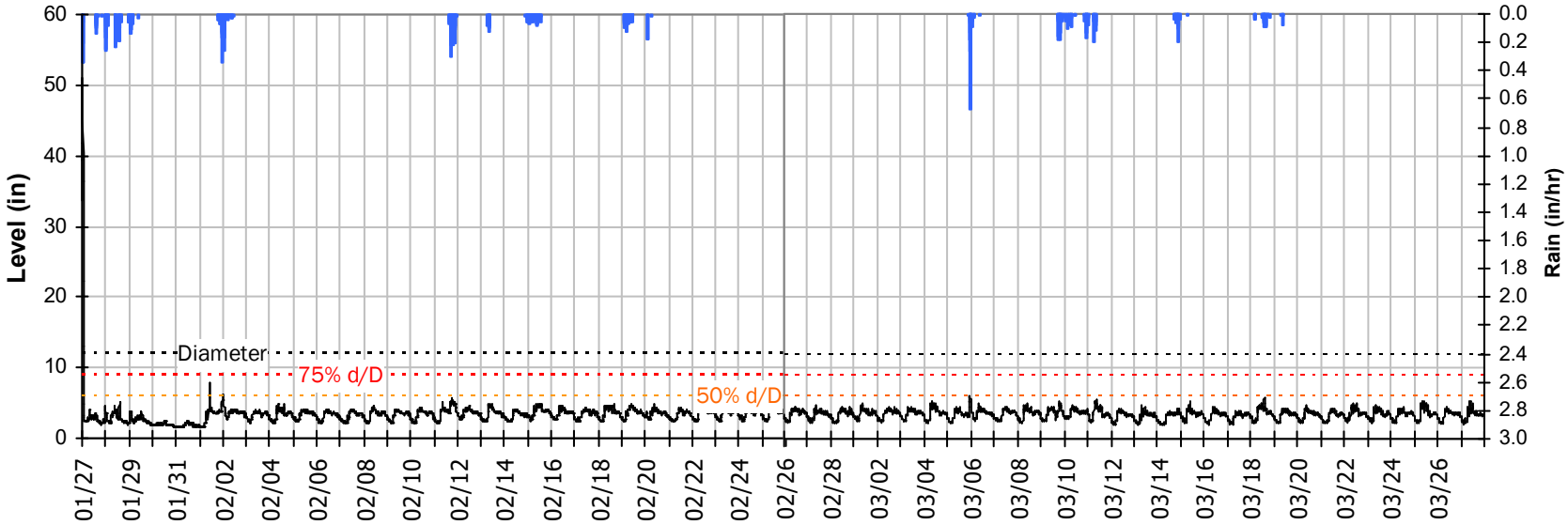
0.166 *mgd*

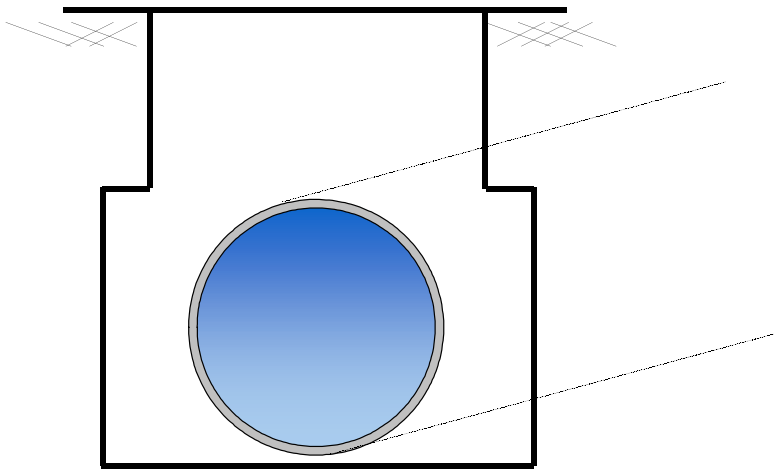


FM 10-3

Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Monitoring Period



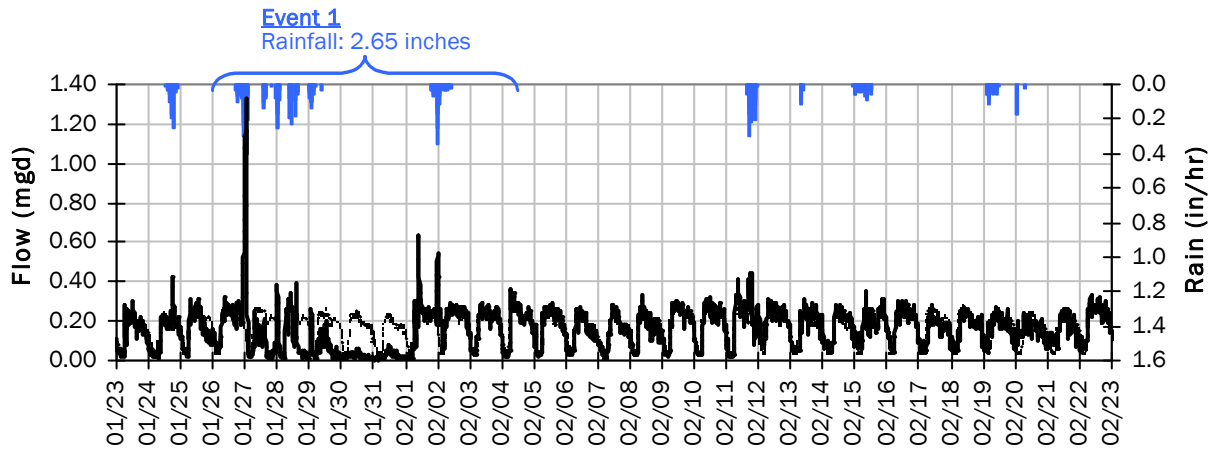


Pipe Diameter:	12	*inches*
Peak Measured Level:	51.0	*inches*
Peak d/D Ratio:	4.25	

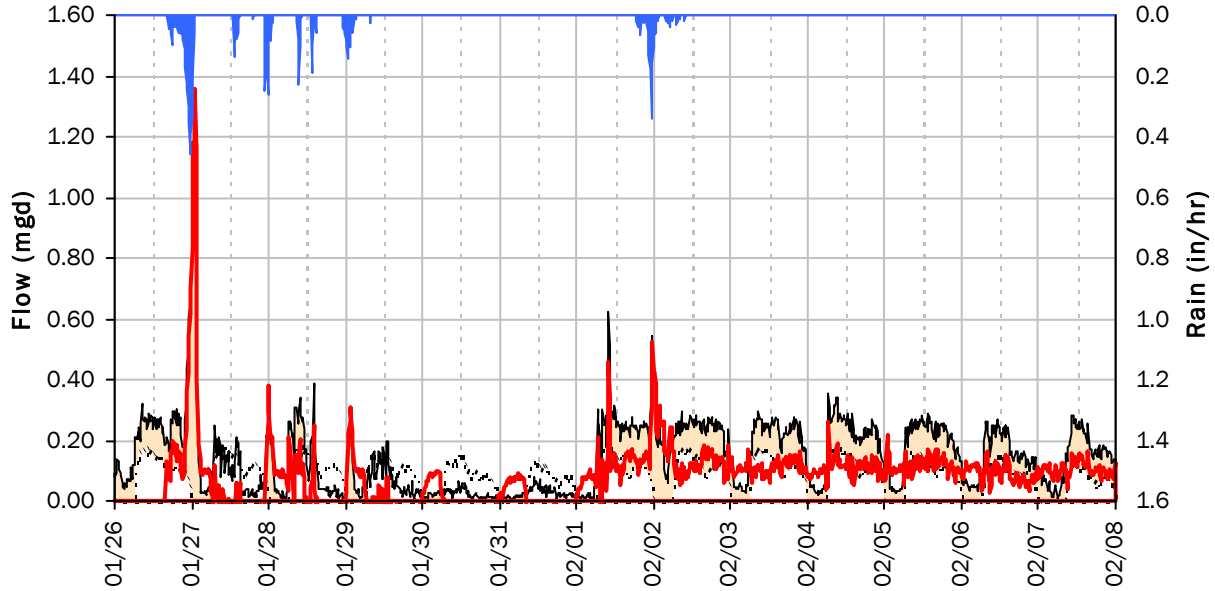
Surcharged 39.0 inches over crown

FM 10-3
I/I Summary: Event 1

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



Event 1 Detail Graph

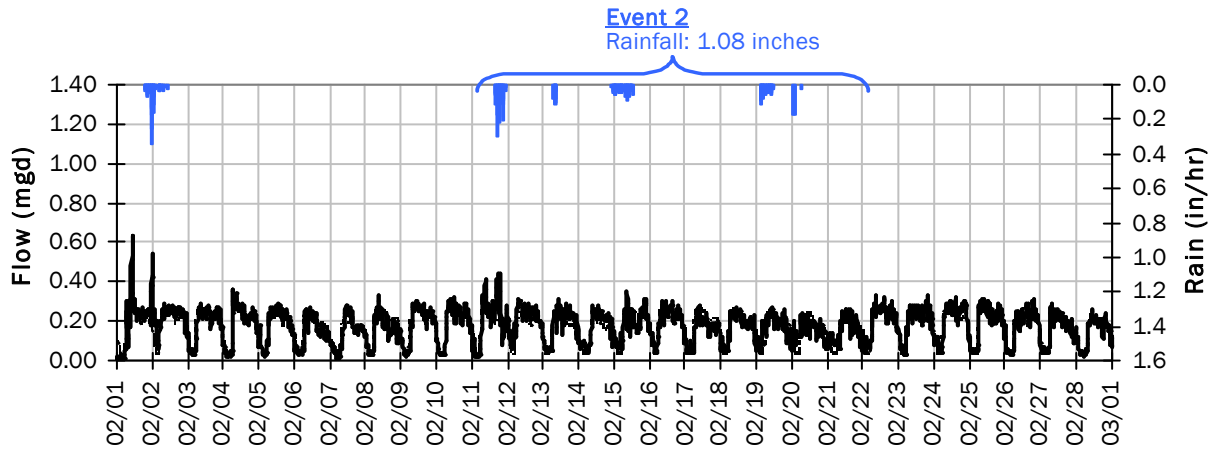


Storm Event I/I Analysis (Rain = 2.65 inches)

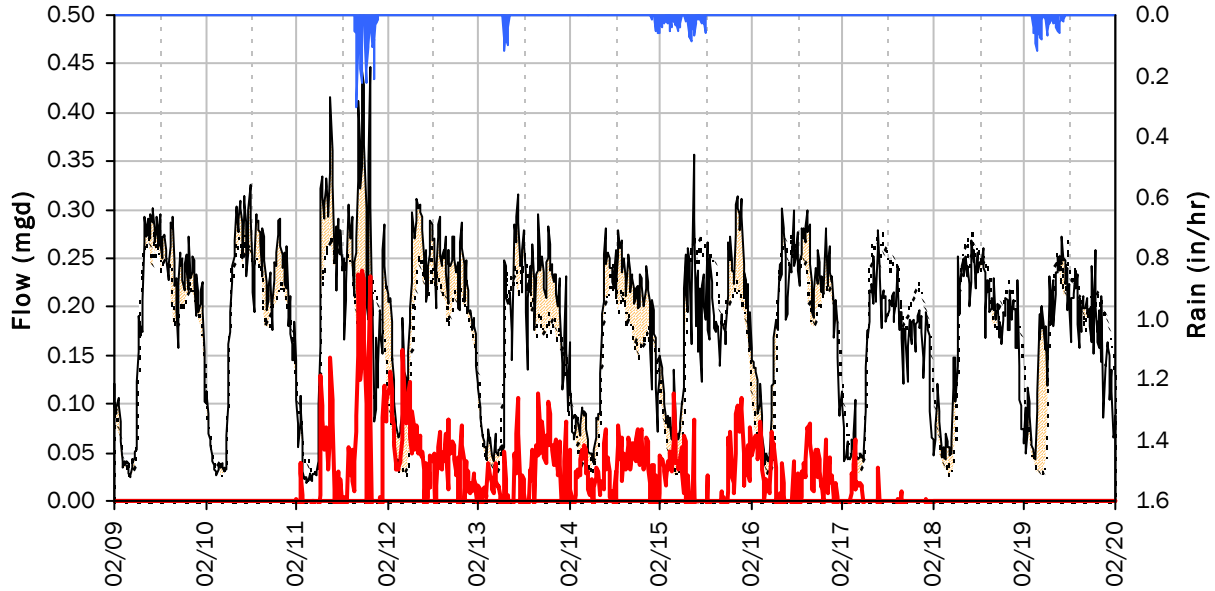
Capacity		Inflow / Infiltration	
Peak Flow:	1.33 *mgd*	**Peak I/I Rate:**	1.36 *mgd*
PF:	7.99	**Total I/I:**	963,000 *gallons*
Peak Level:	51.03 *in*		
d/D Ratio:	4.25		

FM 10-3
I/I Summary: Event 2

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



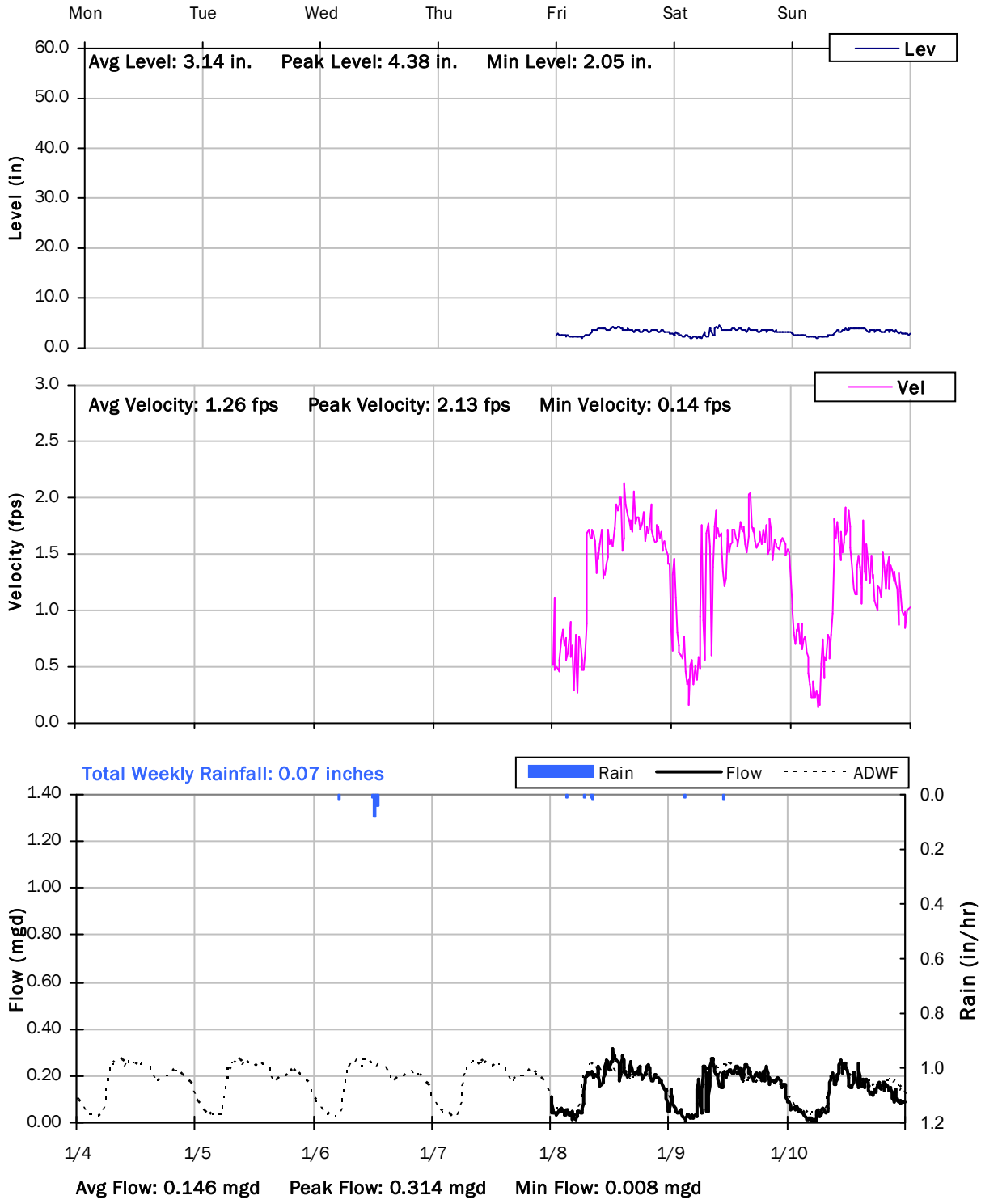
Event 2 Detail Graph



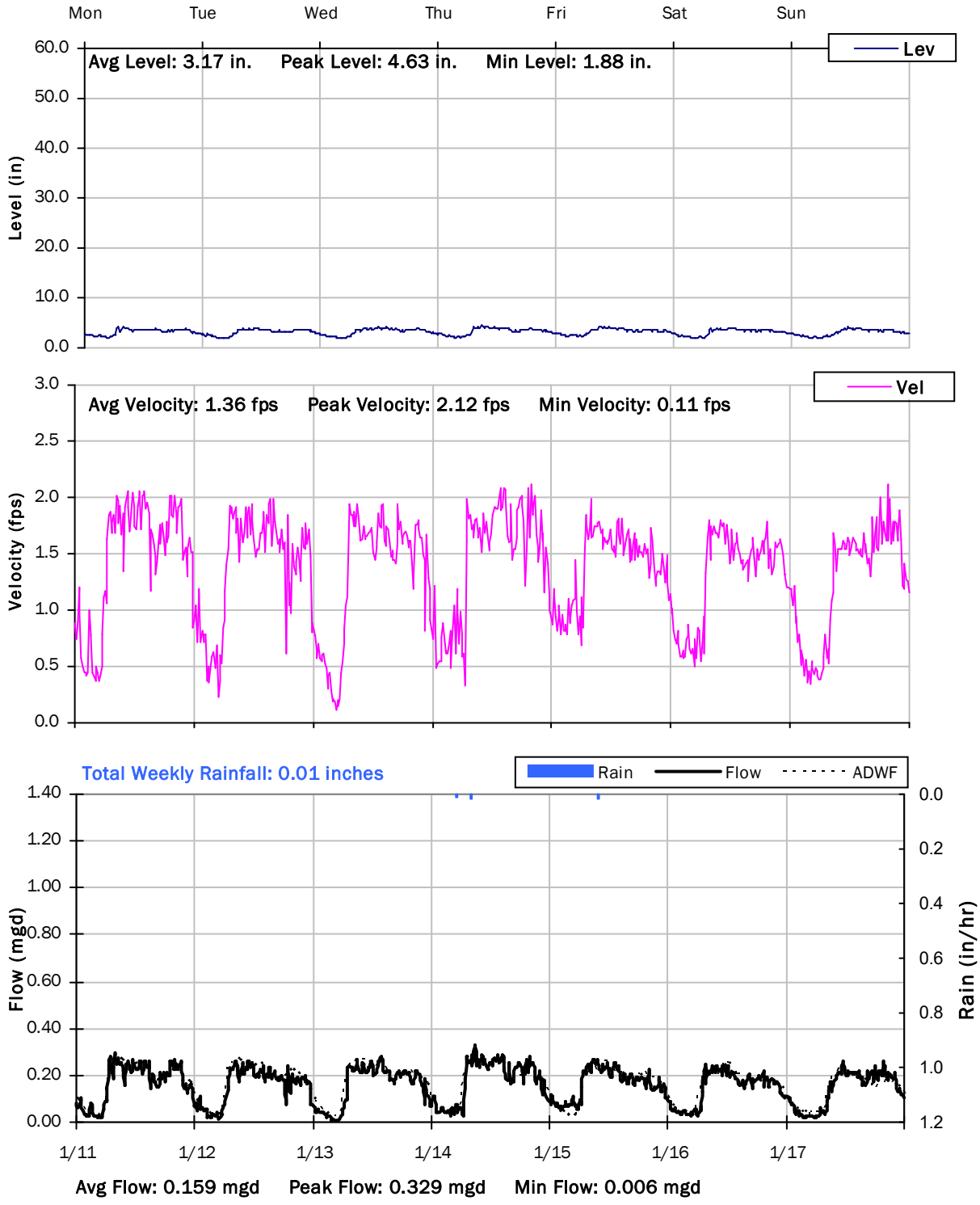
Storm Event I/I Analysis (Rain = 1.08 inches)

Capacity		Inflow / Infiltration	
Peak Flow:	0.45 *mgd*	**Peak I/I Rate:**	0.24 *mgd*
PF:	2.69	**Total I/I:**	138,000 *gallons*
Peak Level:	5.59 *in*		
d/D Ratio:	0.47		

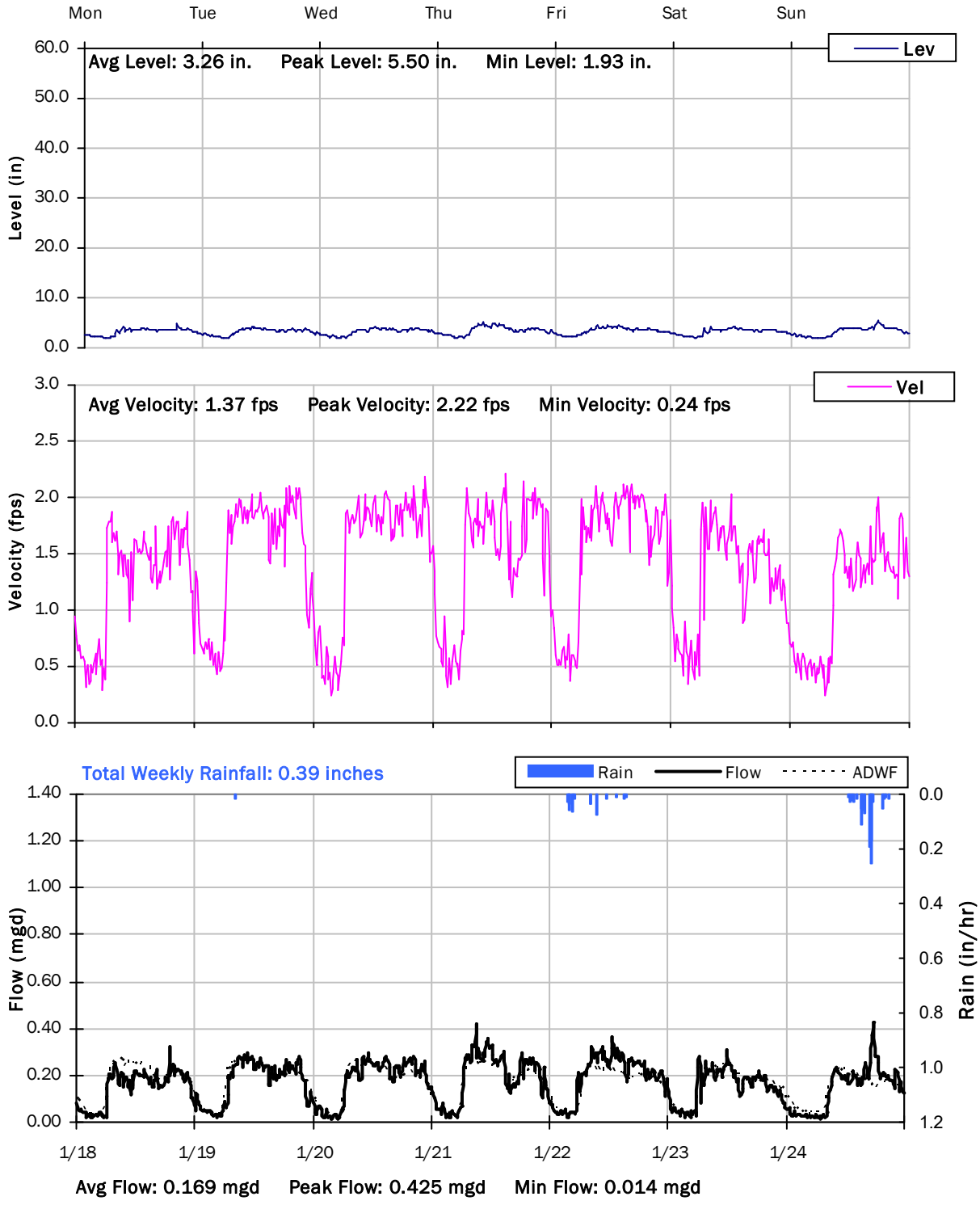
FM 10-3
Weekly Level, Velocity and Flow Hydrographs
1/4/2021 to 1/11/2021



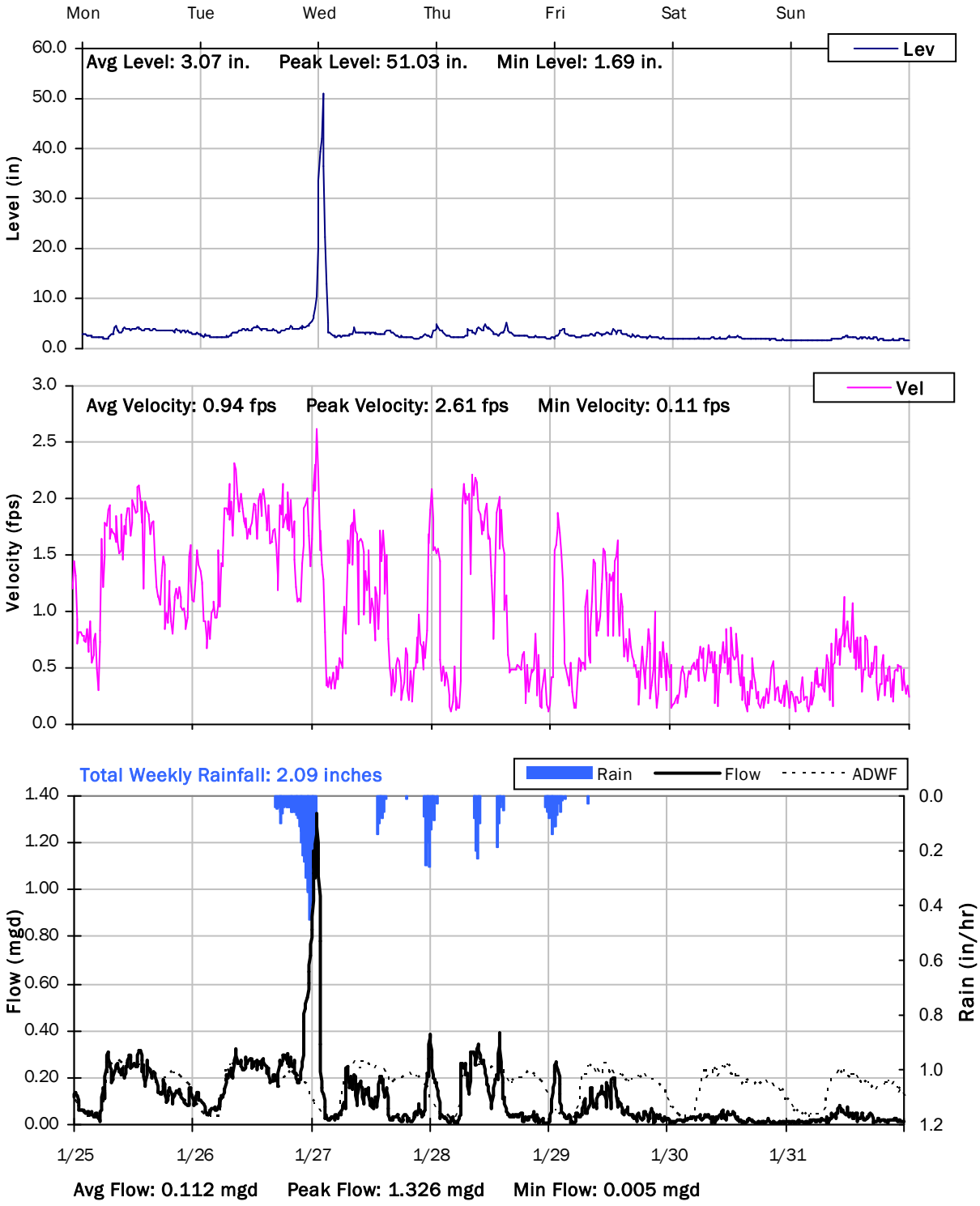
FM 10-3
Weekly Level, Velocity and Flow Hydrographs
1/11/2021 to 1/18/2021



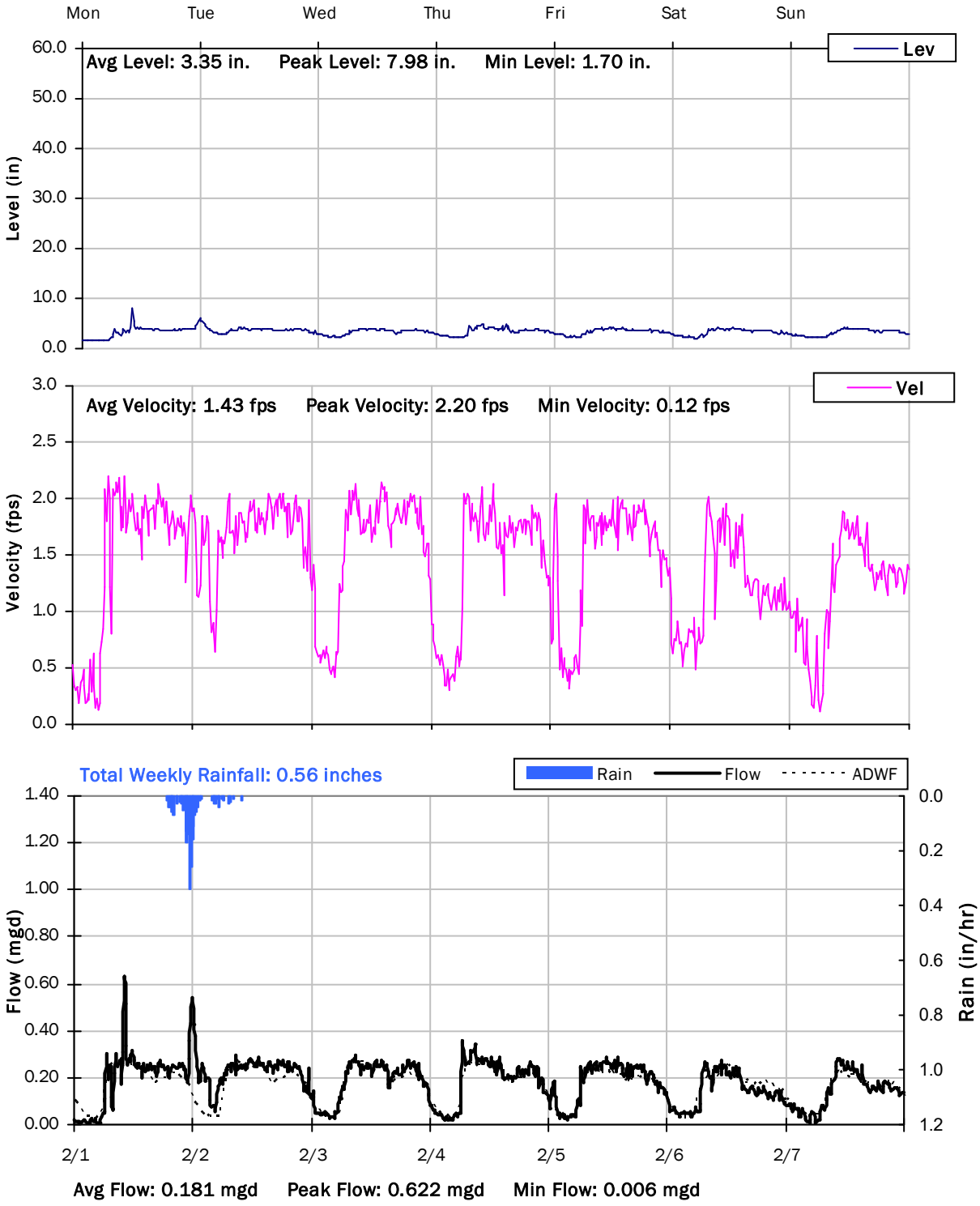
FM 10-3
Weekly Level, Velocity and Flow Hydrographs
1/18/2021 to 1/25/2021



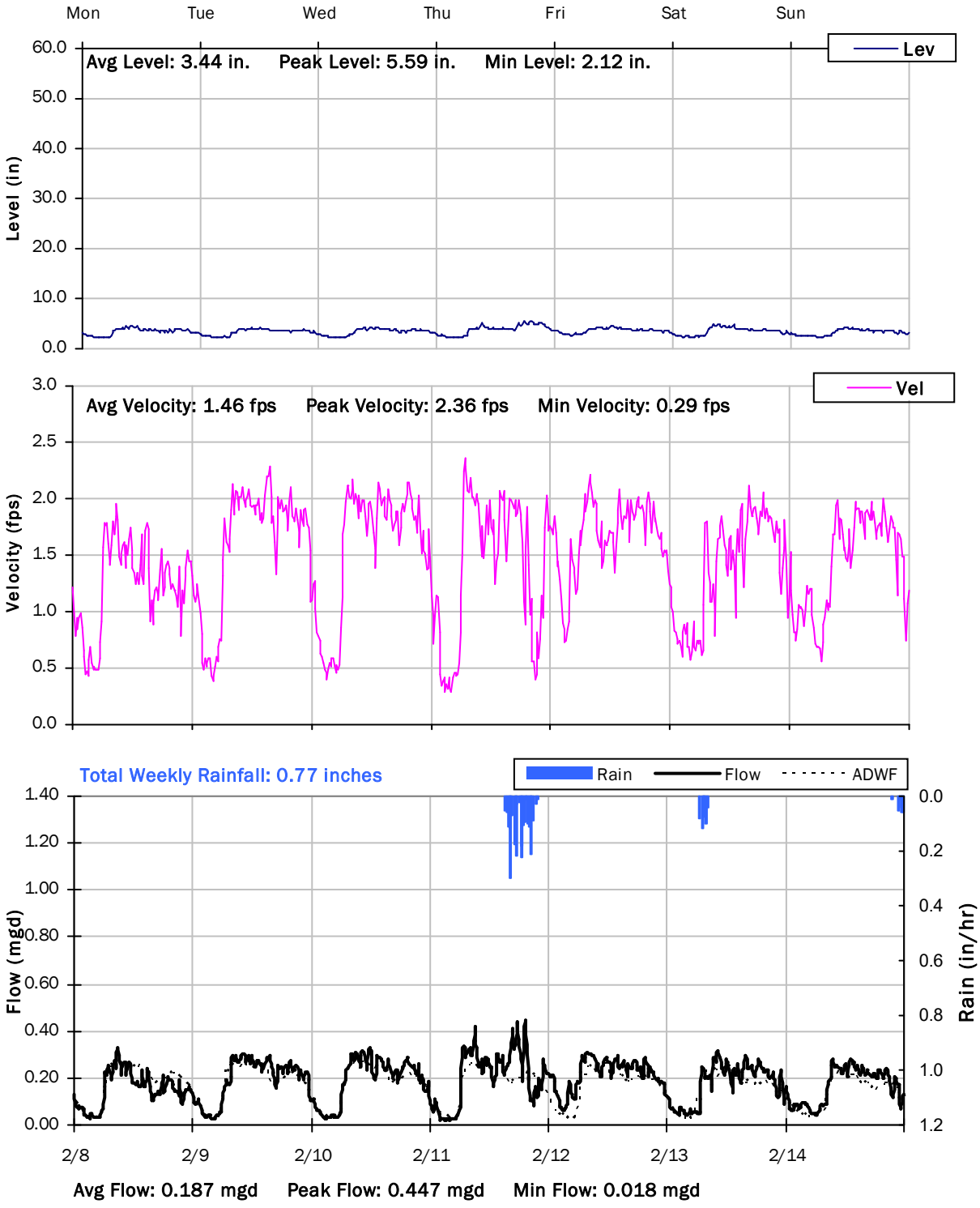
FM 10-3
Weekly Level, Velocity and Flow Hydrographs
1/25/2021 to 2/1/2021



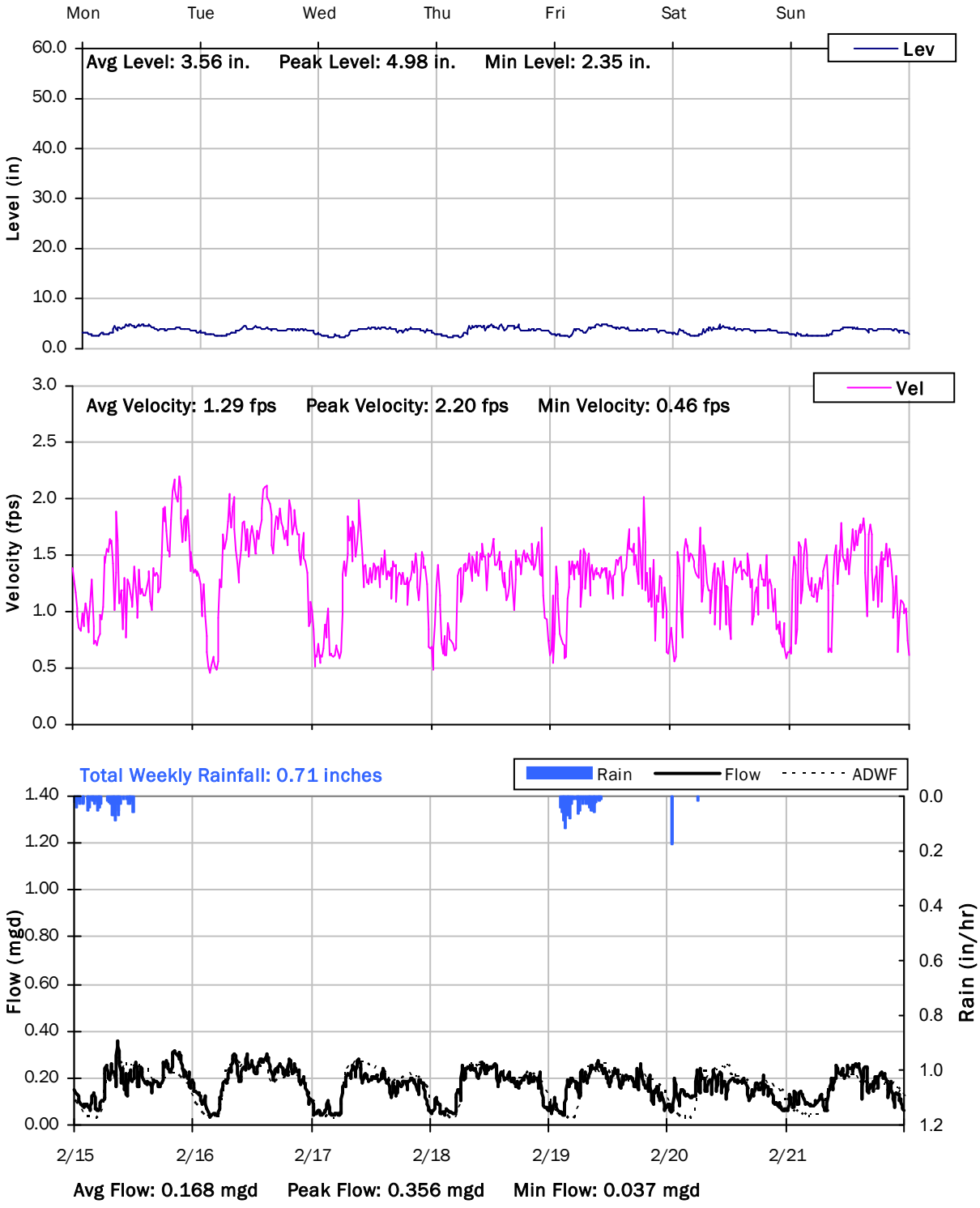
FM 10-3
Weekly Level, Velocity and Flow Hydrographs
2/1/2021 to 2/8/2021



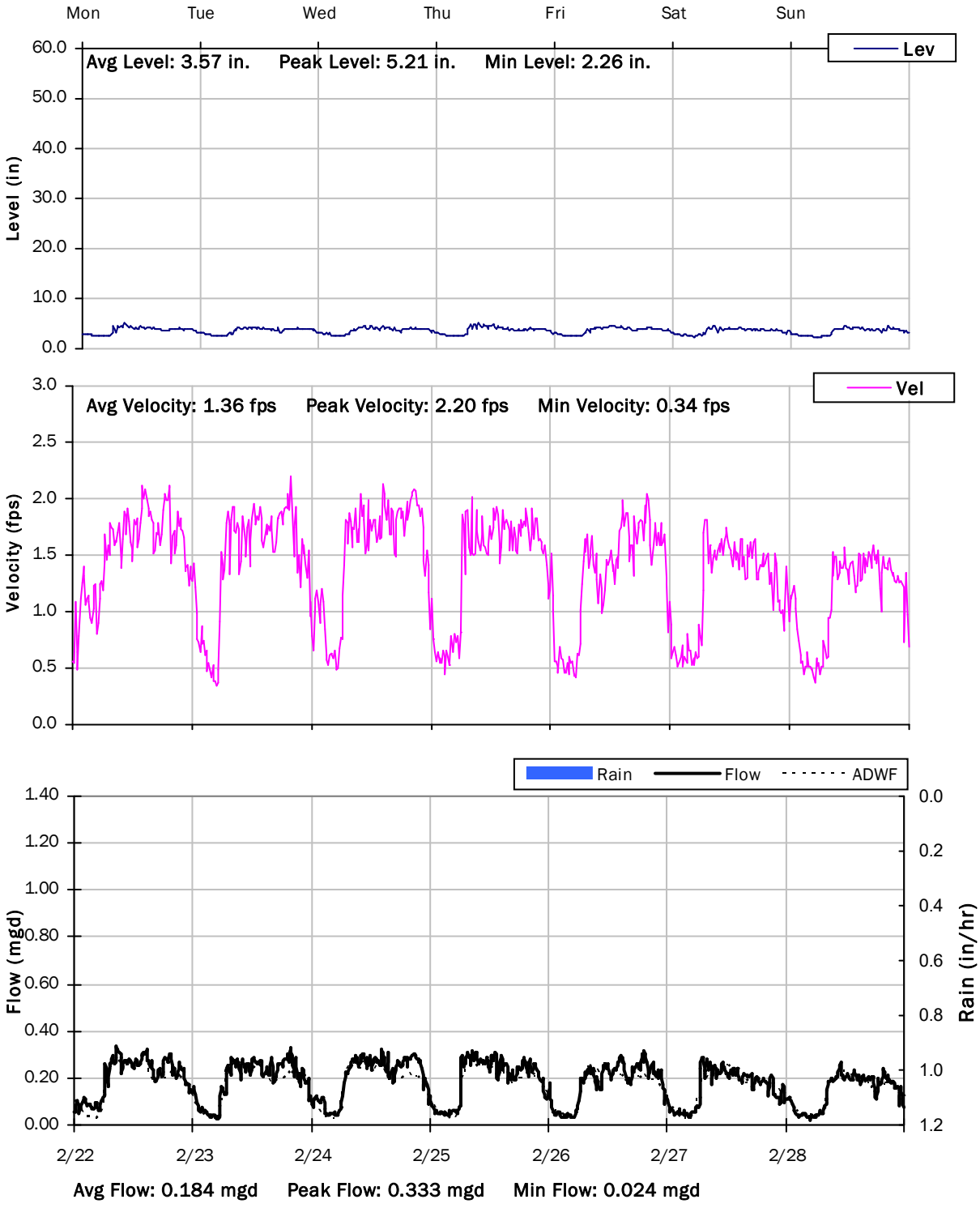
FM 10-3
Weekly Level, Velocity and Flow Hydrographs
2/8/2021 to 2/15/2021



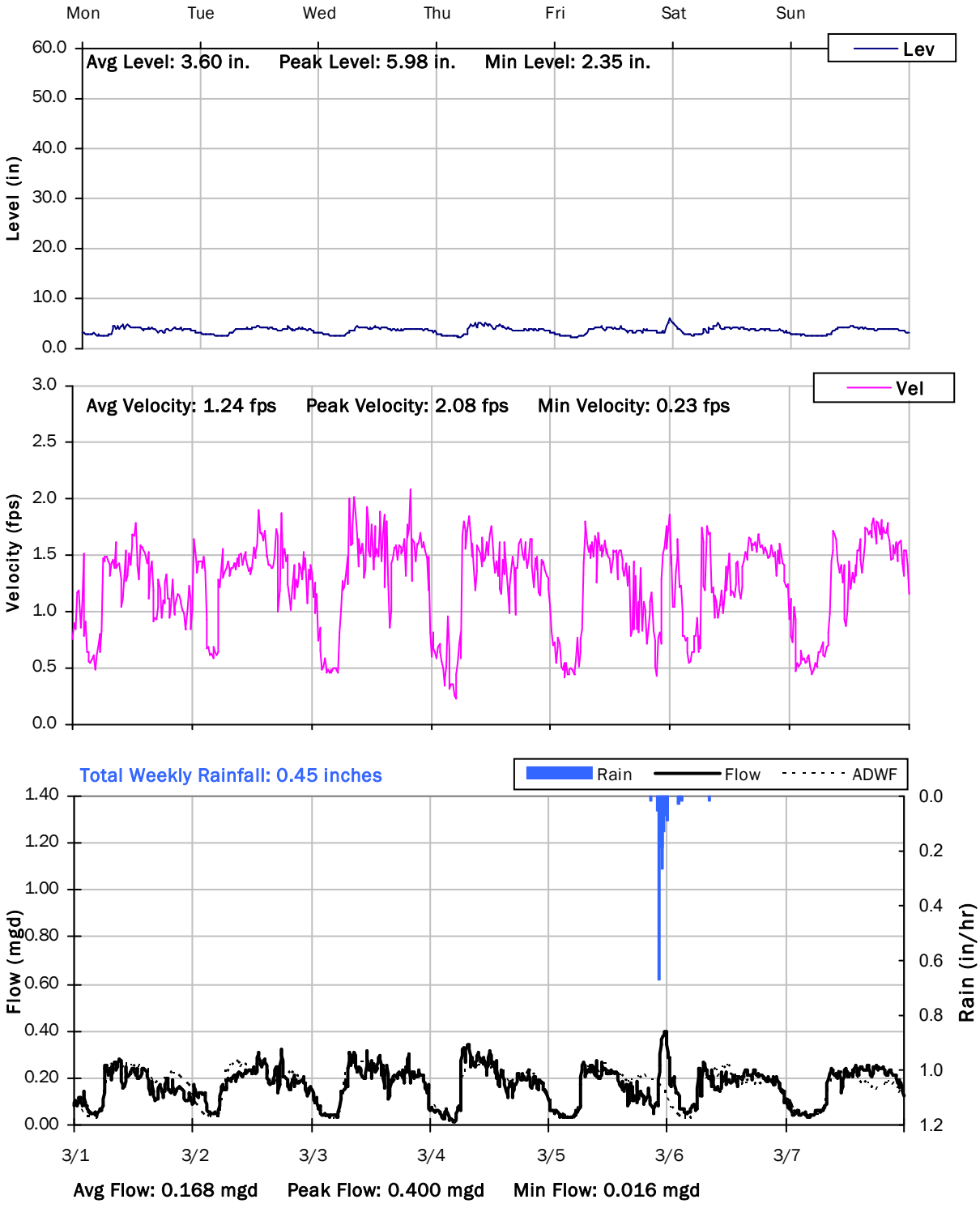
FM 10-3
Weekly Level, Velocity and Flow Hydrographs
2/15/2021 to 2/22/2021



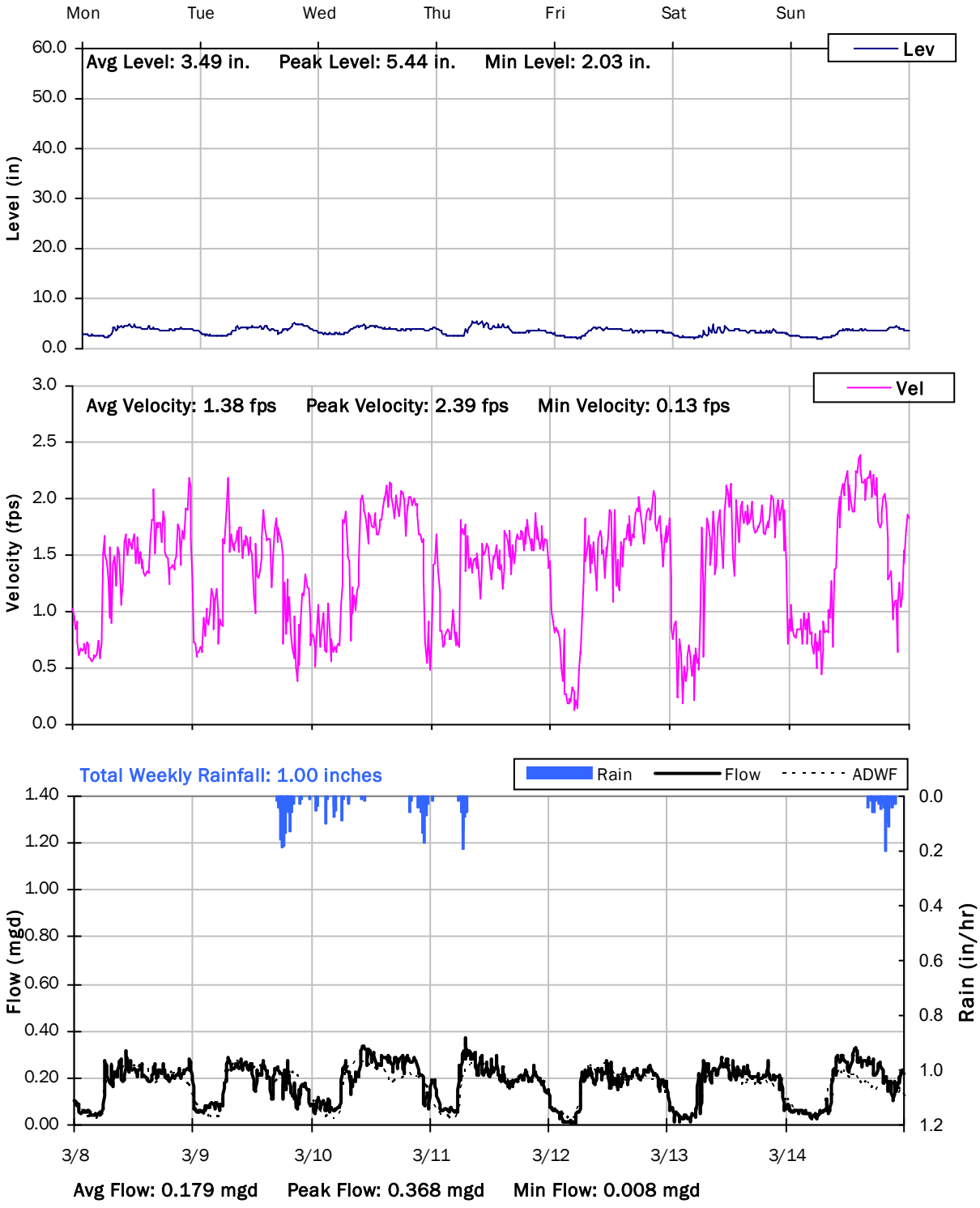
FM 10-3
Weekly Level, Velocity and Flow Hydrographs
2/22/2021 to 3/1/2021



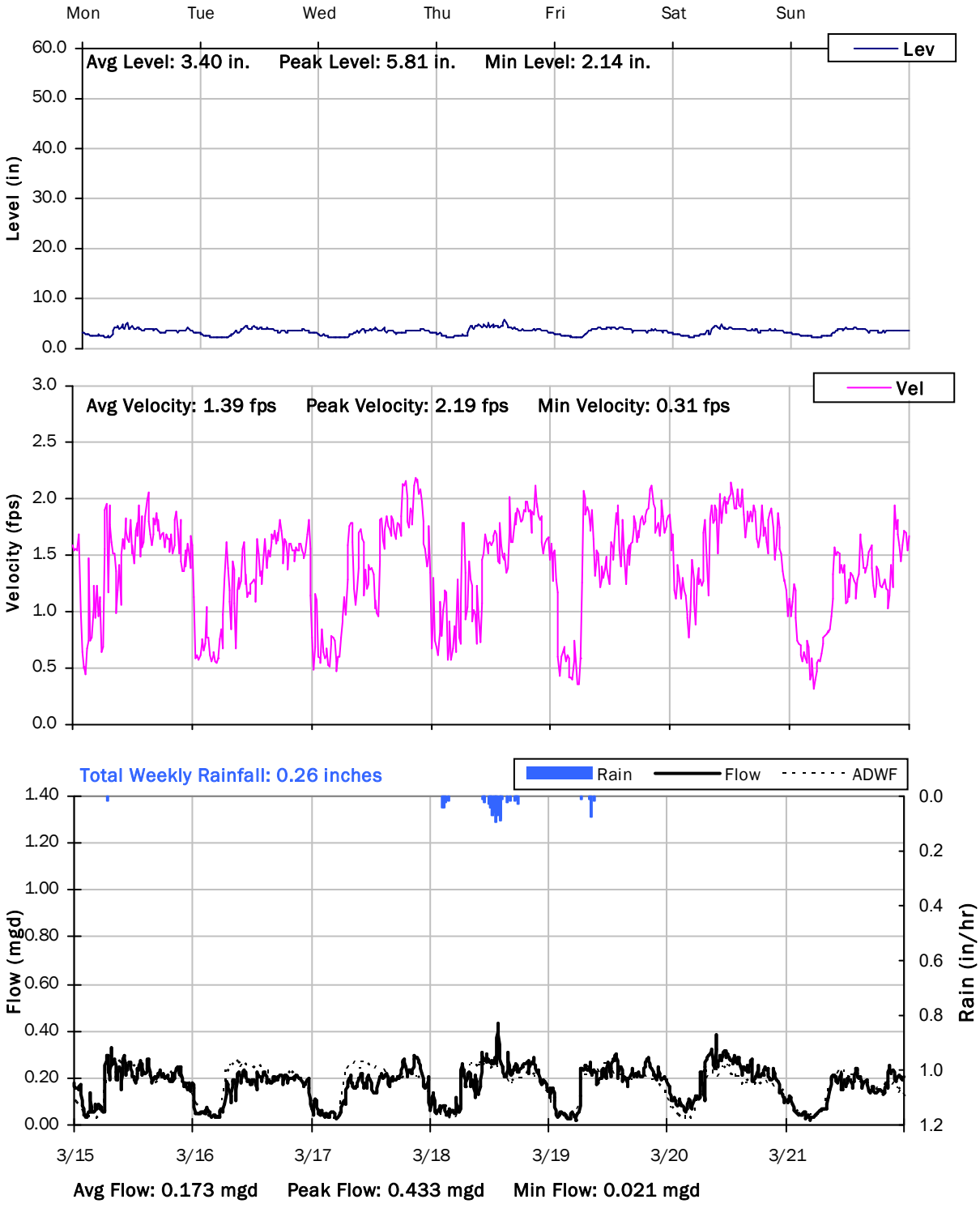
FM 10-3
Weekly Level, Velocity and Flow Hydrographs
3/1/2021 to 3/8/2021



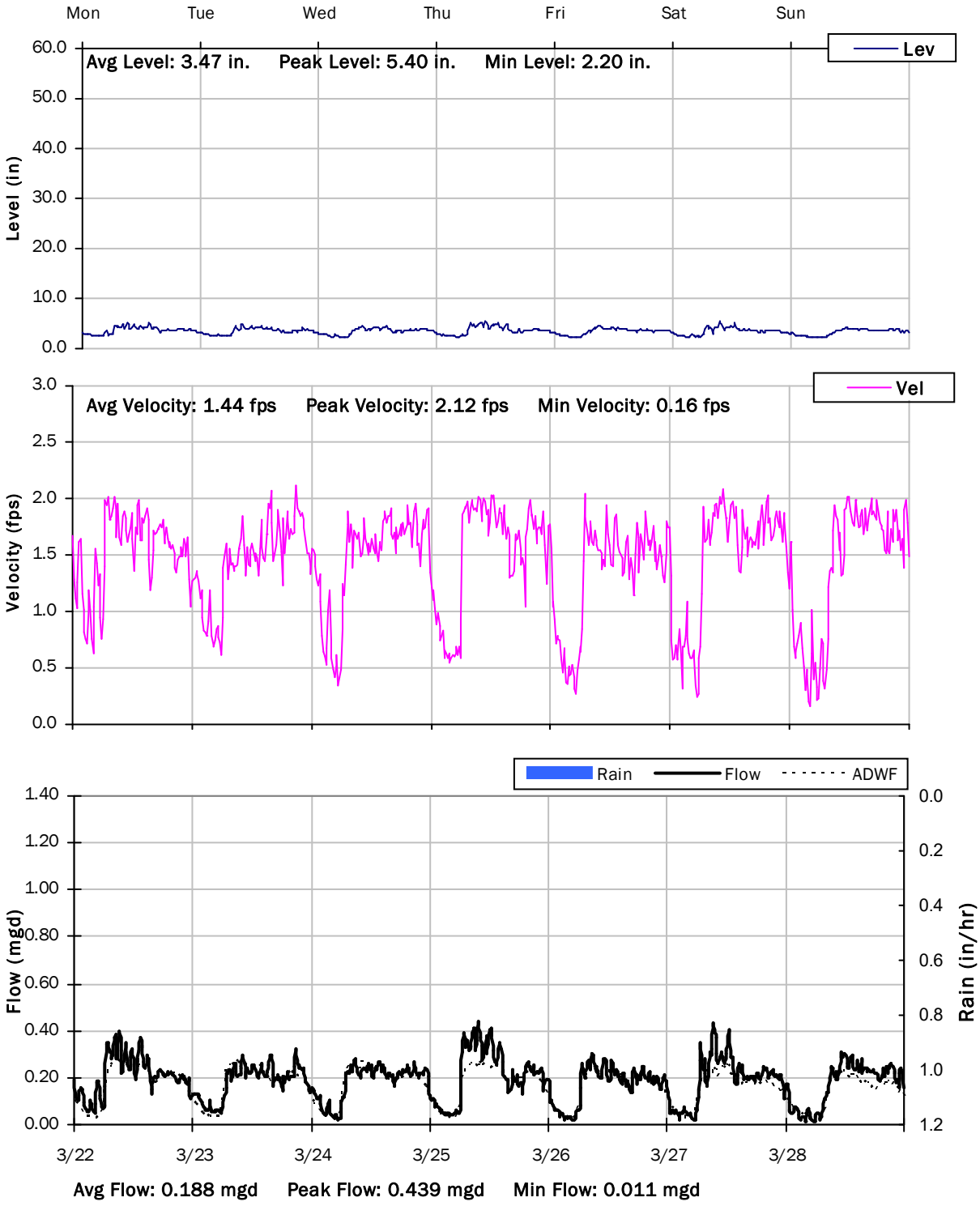
FM 10-3
Weekly Level, Velocity and Flow Hydrographs
3/8/2021 to 3/15/2021



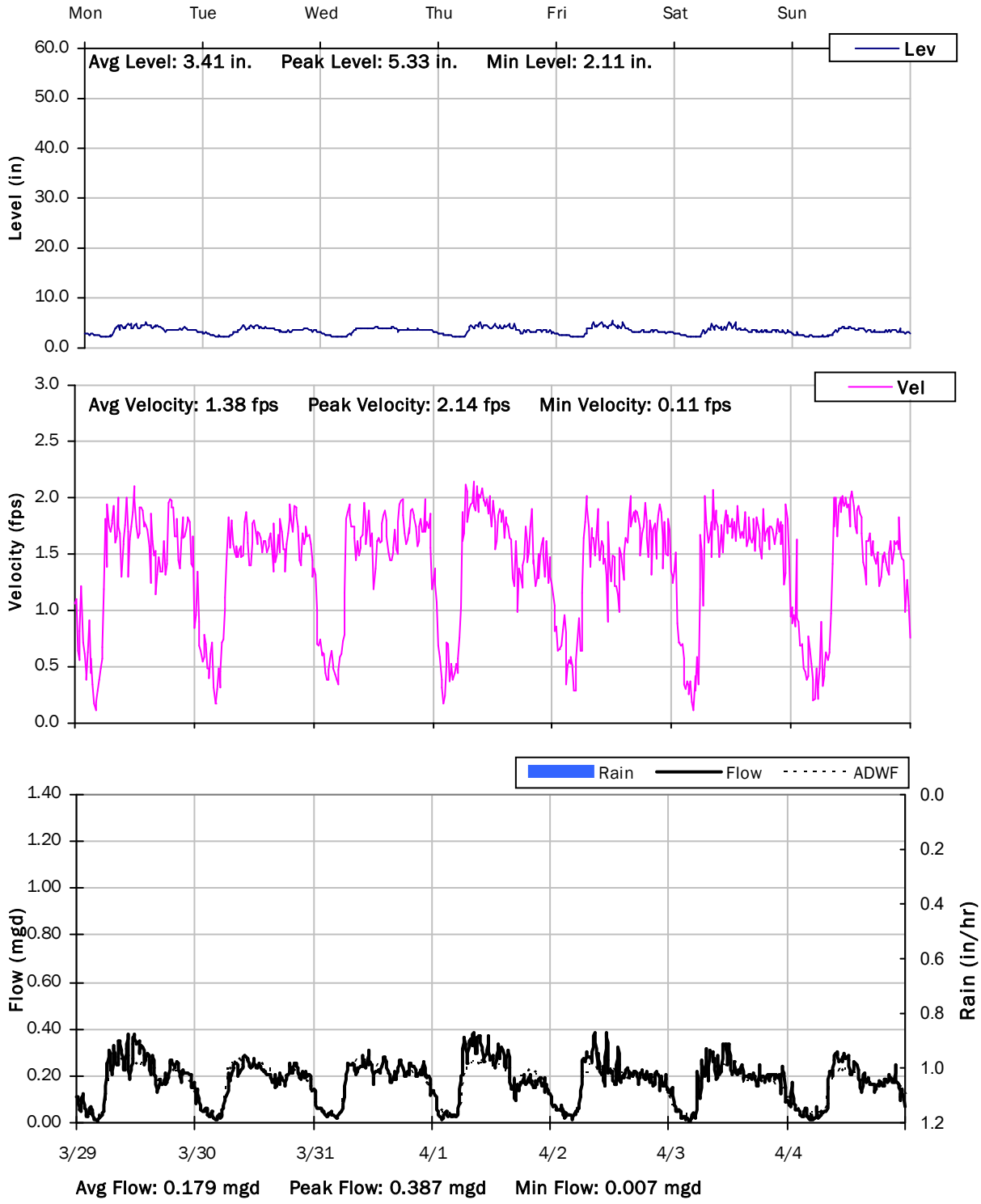
FM 10-3
Weekly Level, Velocity and Flow Hydrographs
3/15/2021 to 3/22/2021



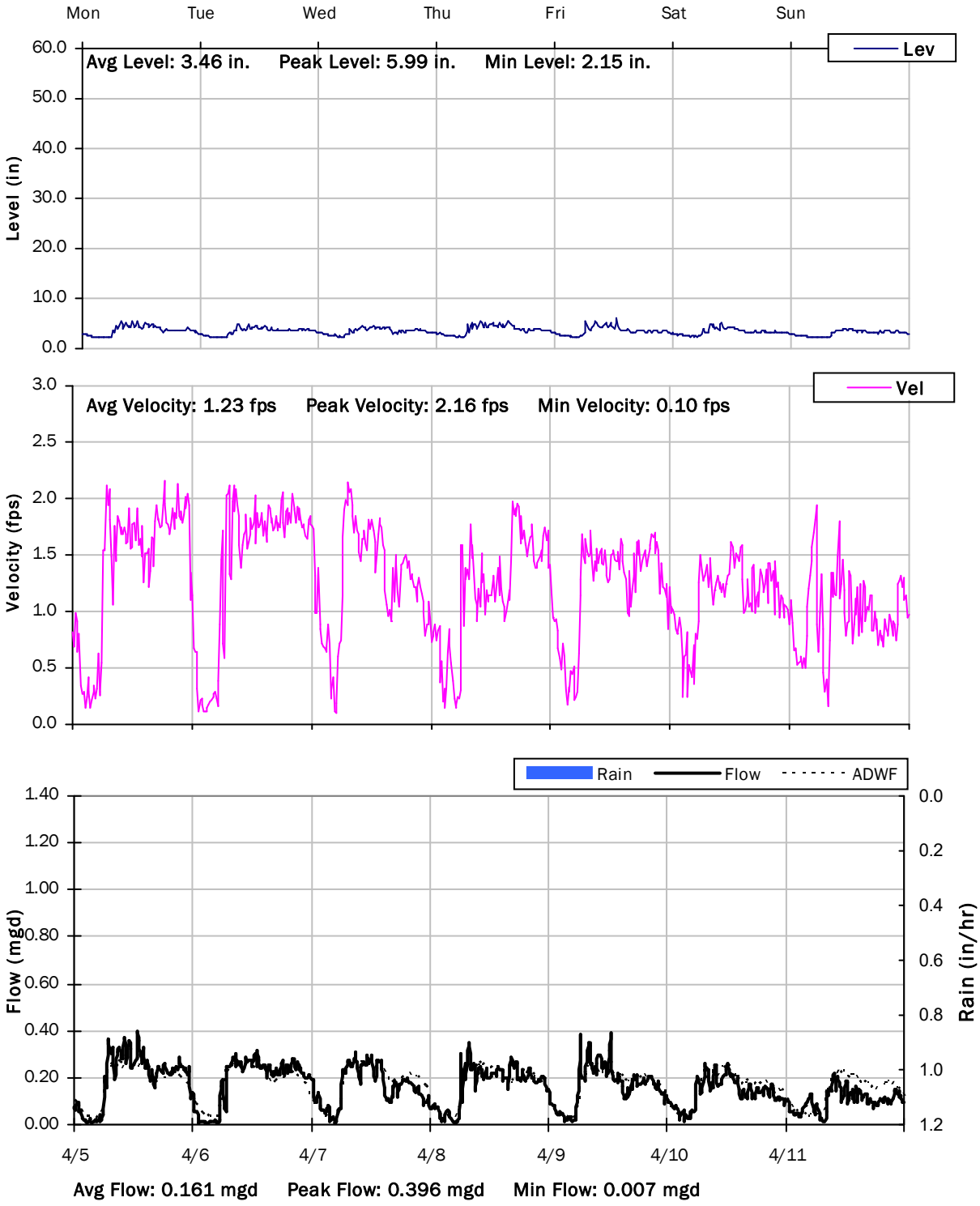
FM 10-3
Weekly Level, Velocity and Flow Hydrographs
3/22/2021 to 3/29/2021



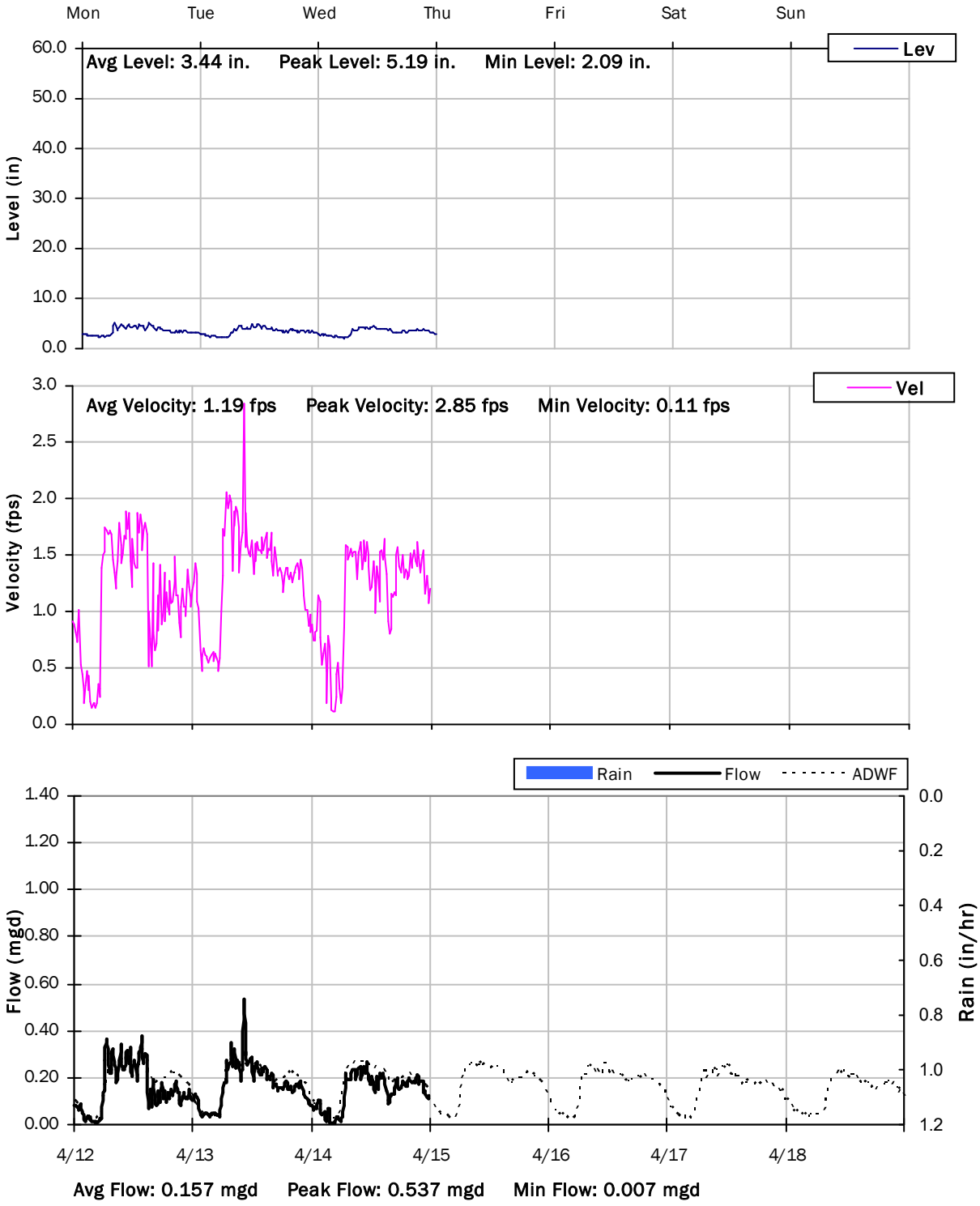
FM 10-3
Weekly Level, Velocity and Flow Hydrographs
3/29/2021 to 4/5/2021



FM 10-3
Weekly Level, Velocity and Flow Hydrographs
4/5/2021 to 4/12/2021



FM 10-3
Weekly Level, Velocity and Flow Hydrographs
4/12/2021 to 4/19/2021



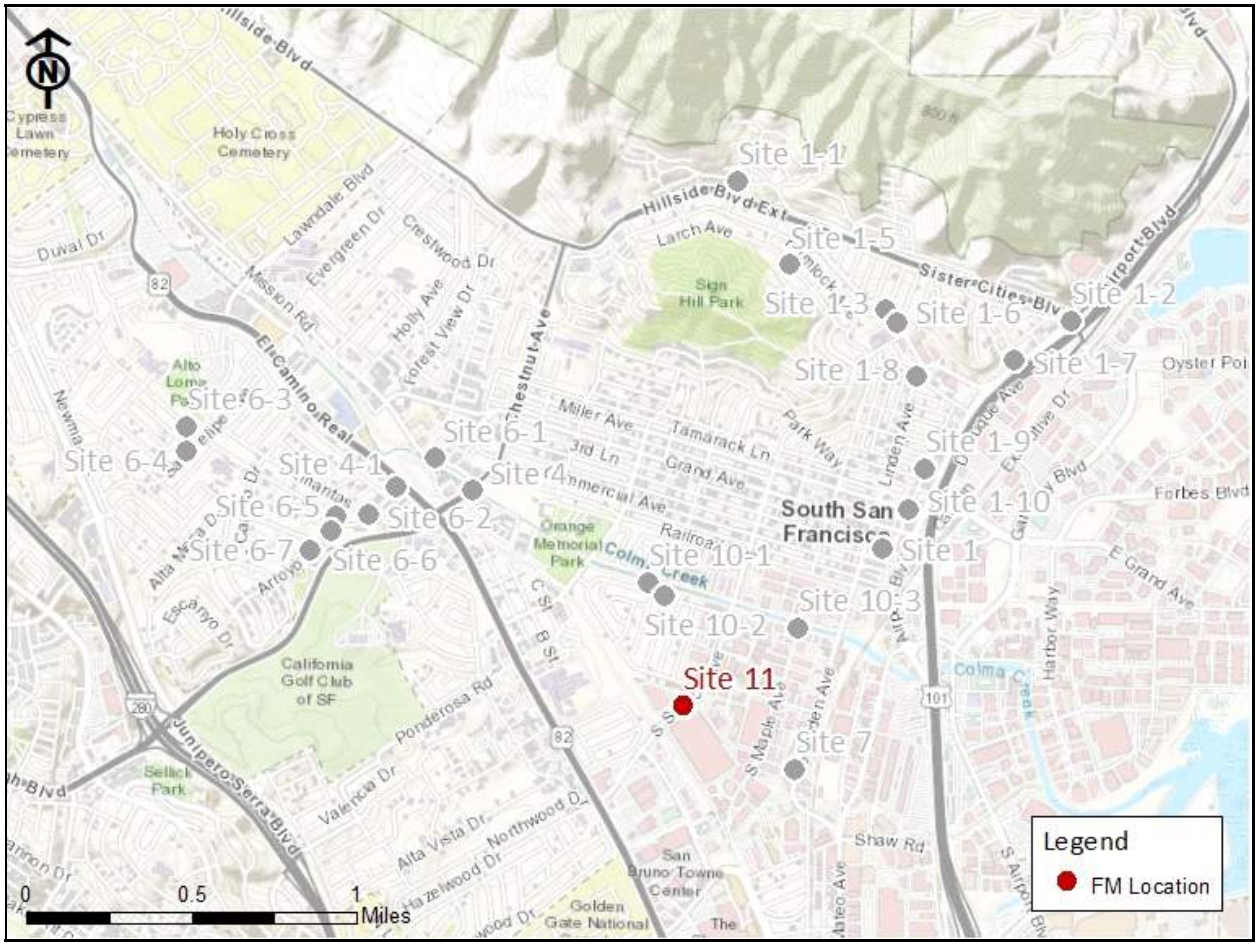
South San Francisco, CA

Sanitary Sewer Flow Monitoring
January 4 - April 14, 2021

Monitoring Site: FM 11

Location: 245 S Spruce Avenue

Data Summary Report



Vicinity Map: FM 11

FM 11

Site Information

Location: 245 S Spruce Avenue

Coordinates: 122.4204° W, 37.6470° N

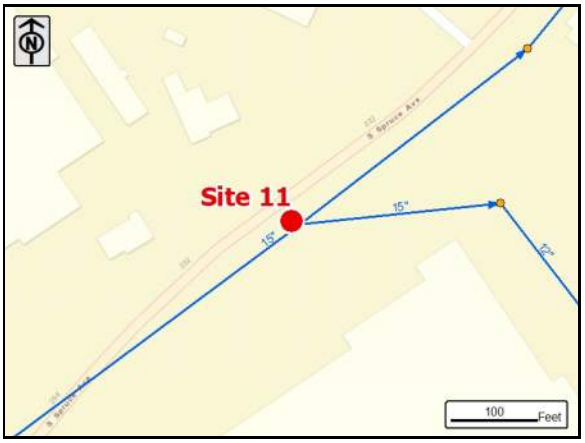
Rim Elevation (Earth): 19 feet

Pipe Diameter: 15 inches

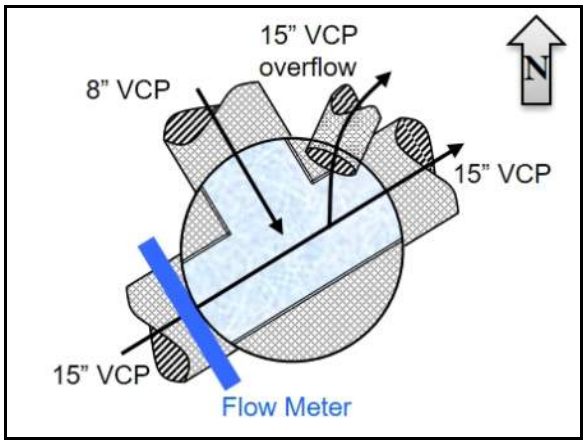
ADWF: 0.334 mgd

Peak Measured Flow: 1.643 mgd

Satellite Map



Sanitary Map



Flow Sketch

Street View

Plan View

FM 11

Additional Site Photos

Effluent Pipe

Monitored Southwest Influent Pipe

FM 11

Additional Site Photos

Northwest Influent Pipe

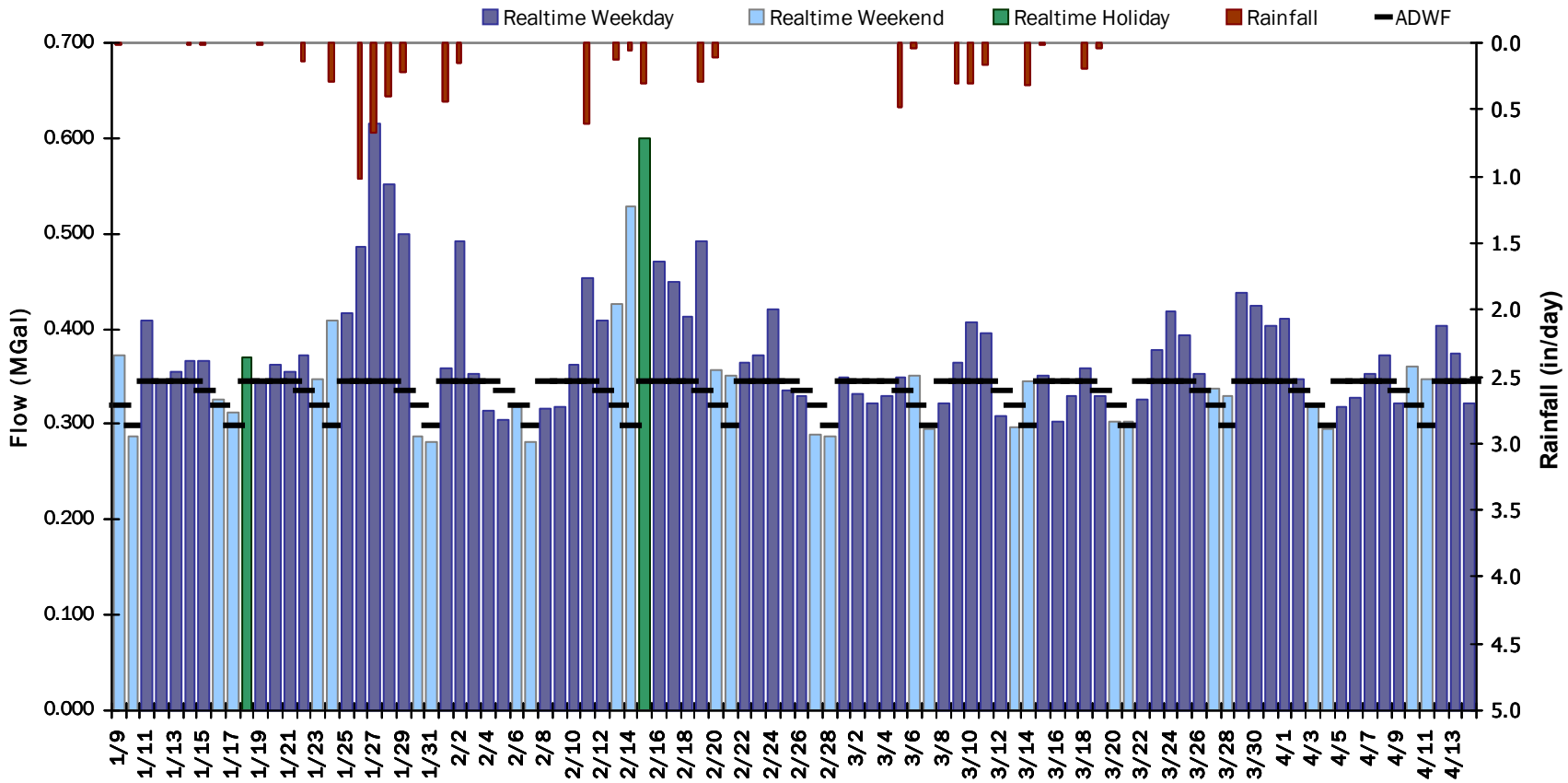
Overflow Pipe

FM 11

Period Flow Summary: Daily Flow Totals

Avg Period Flow: 0.368 MGal Peak Daily Flow: 0.615 MGal Min Daily Flow: 0.282 MGal

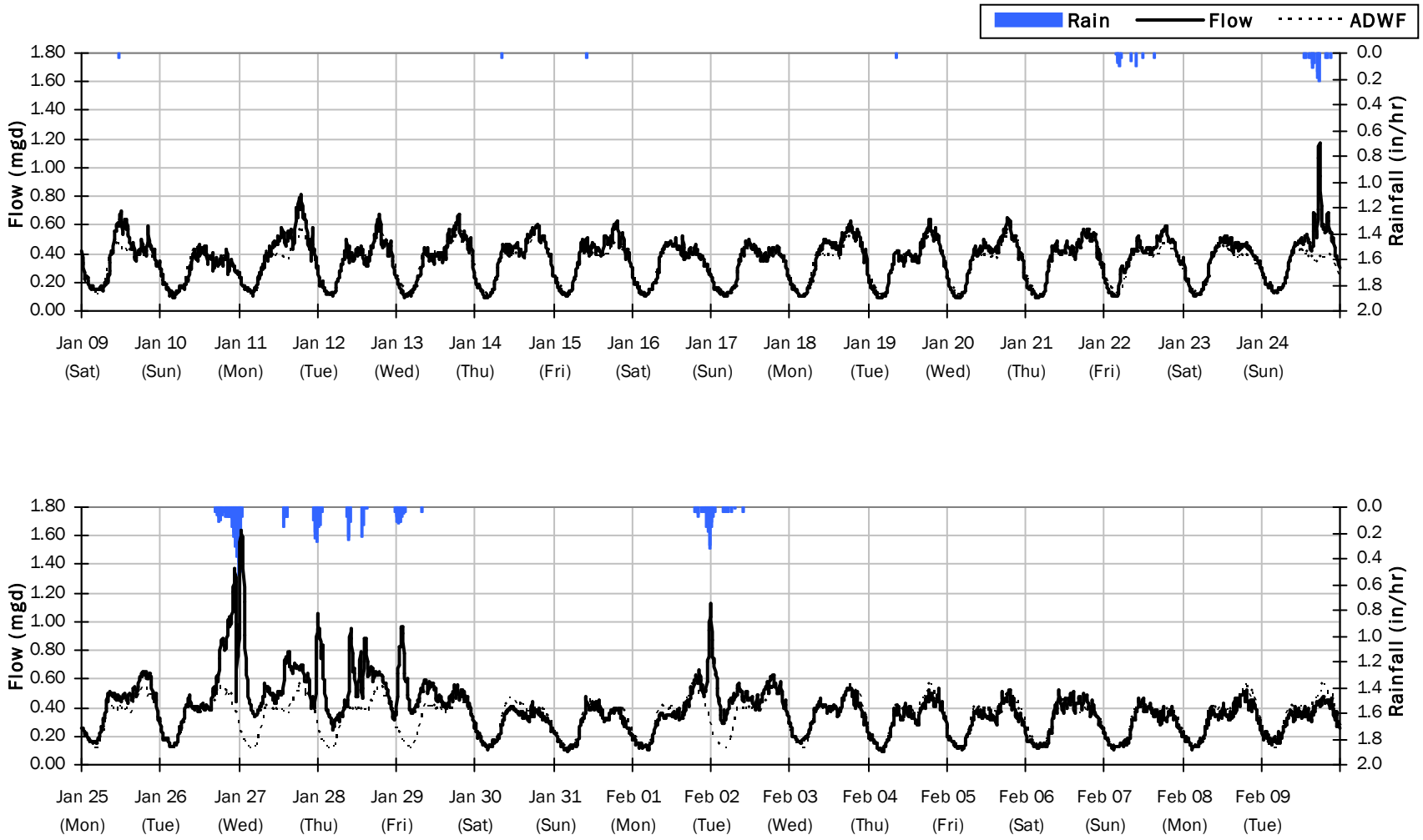
Total Period Rainfall: 6.69 inches



FM 11

Flow Summary: 1/9/2021 to 2/9/2021

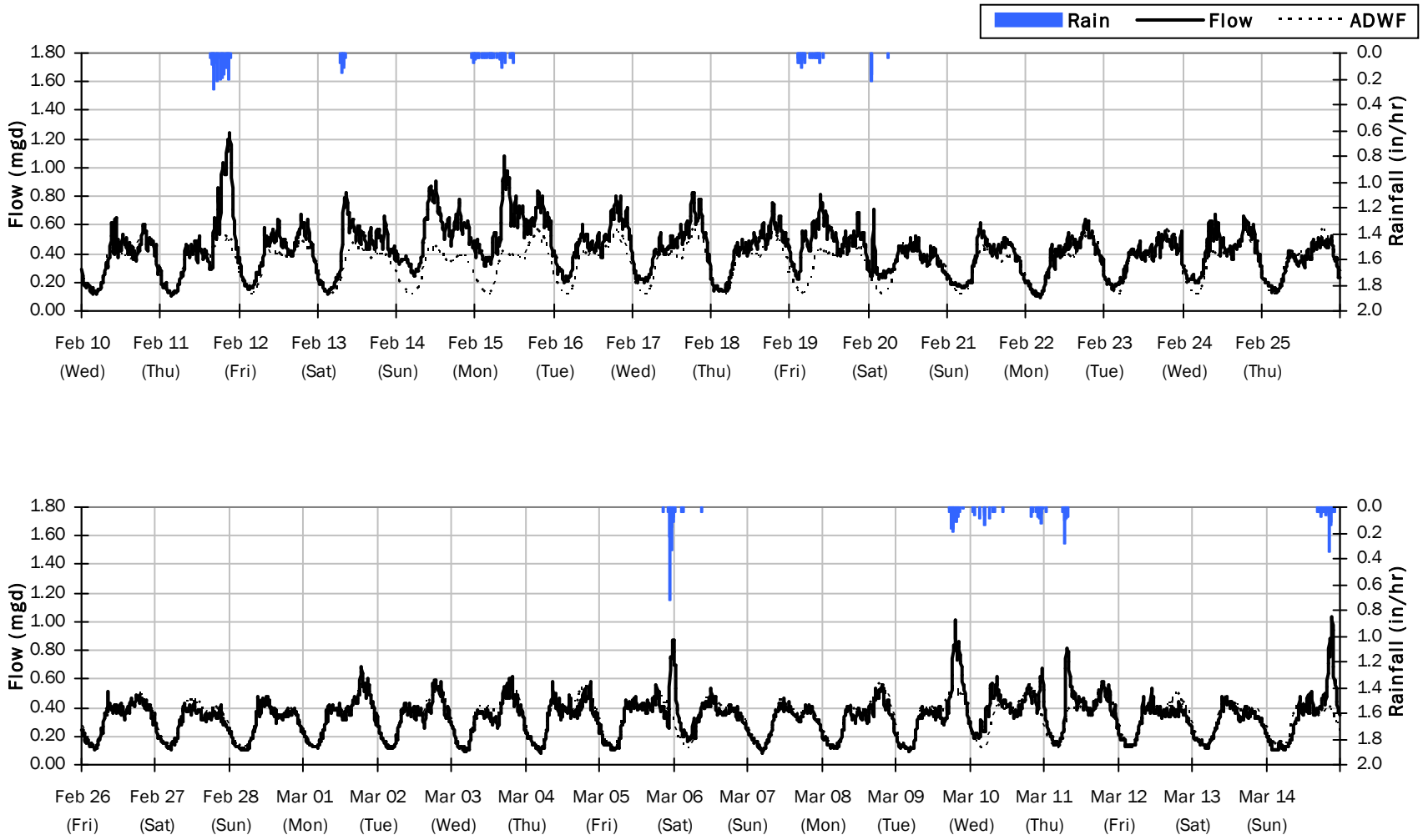
Total Period Rainfall: 3.37 inches Avg Flow: 0.372 mgd Peak Flow: 1.643 mgd Min Flow: 0.089 mgd



FM 11

Flow Summary: 2/10/2021 to 3/14/2021

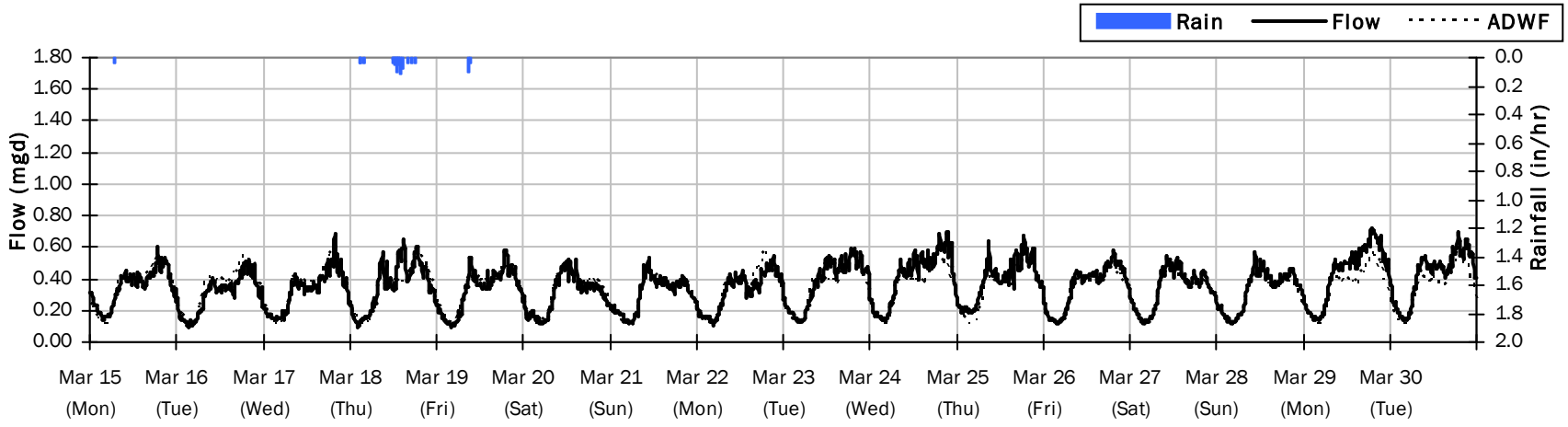
Total Period Rainfall: 3.08 inches Avg Flow: 0.378 mgd Peak Flow: 1.241 mgd Min Flow: 0.084 mgd

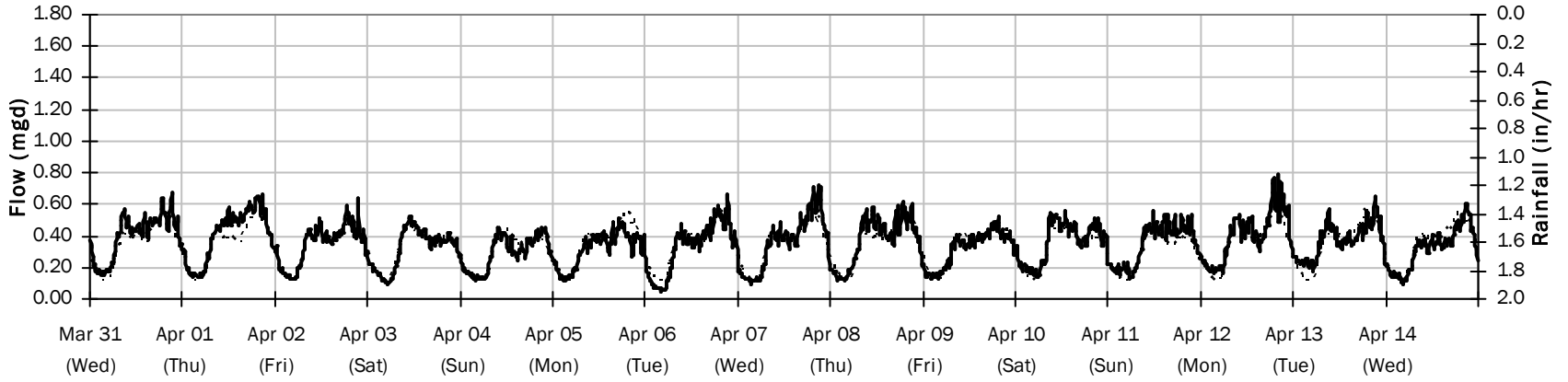


FM 11

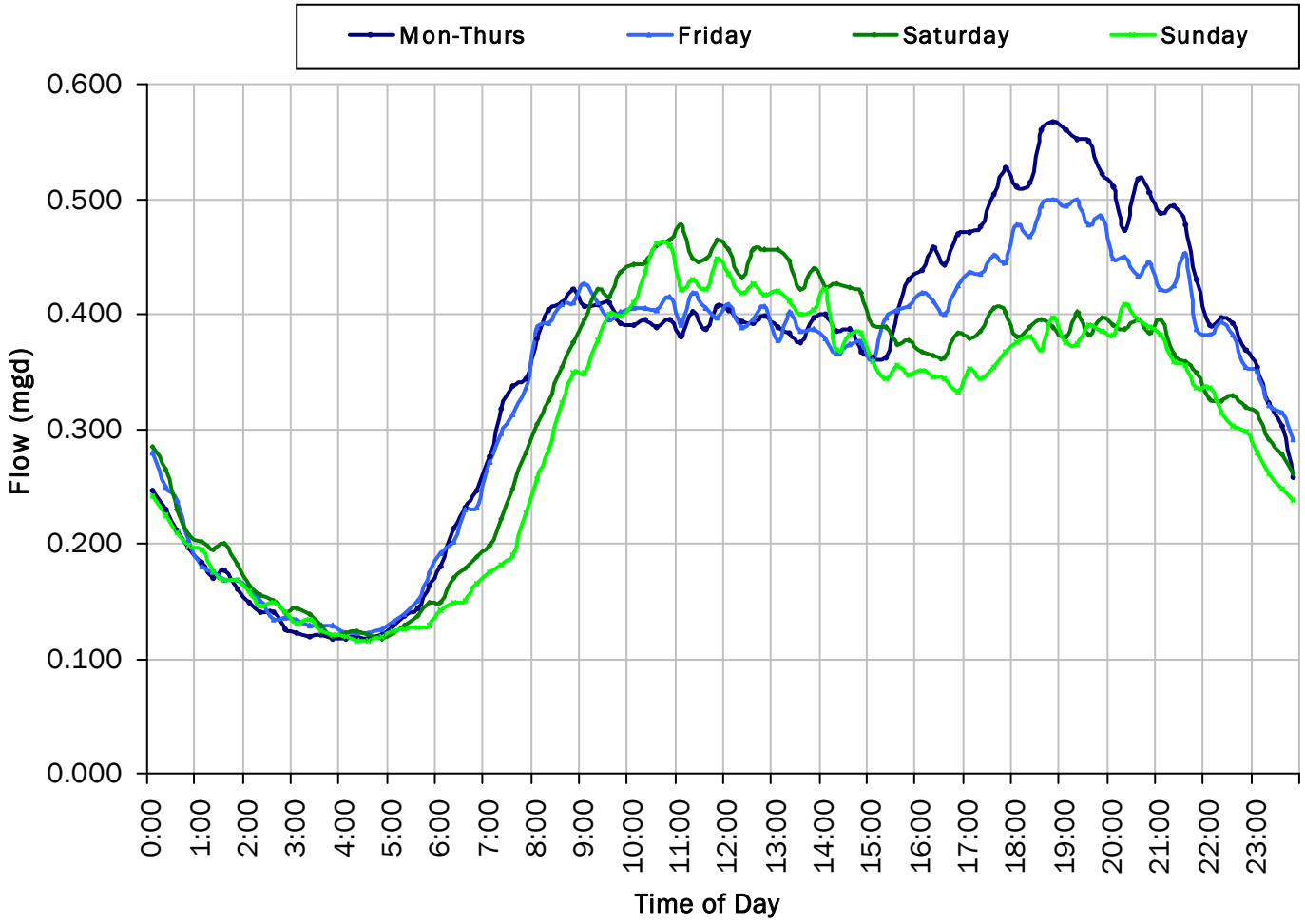
Flow Summary: 3/15/2021 to 4/14/2021

Total Period Rainfall: 0.24 inches Avg Flow: 0.353 mgd Peak Flow: 0.787 mgd Min Flow: 0.049 mgd



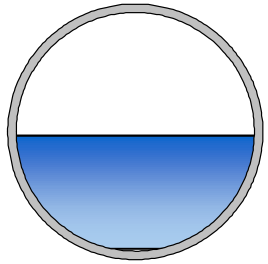


FM 11
Average Dry Weather Flow Hydrographs



ADWF:

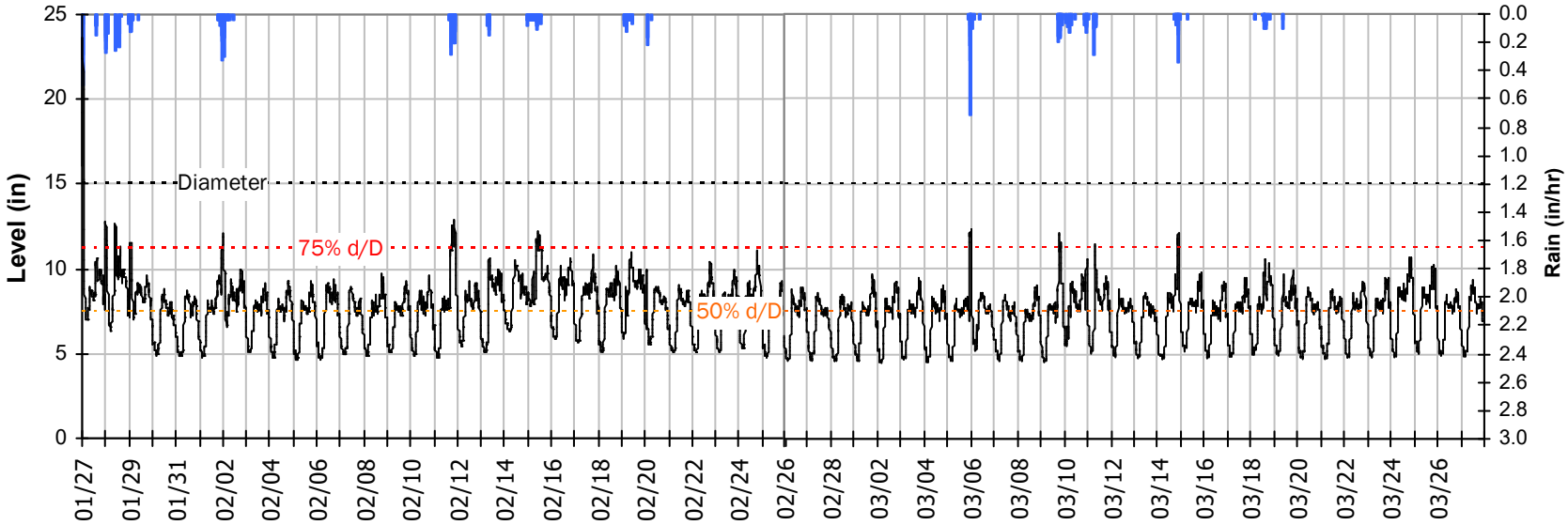
0.334 *mgd*

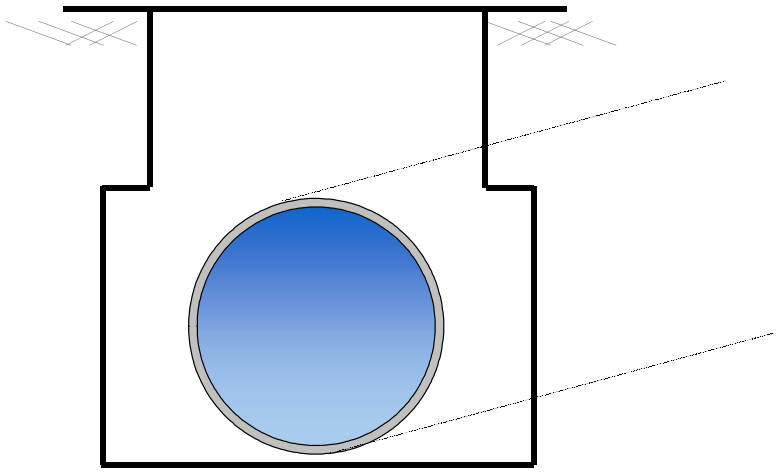


FM 11

Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Monitoring Period



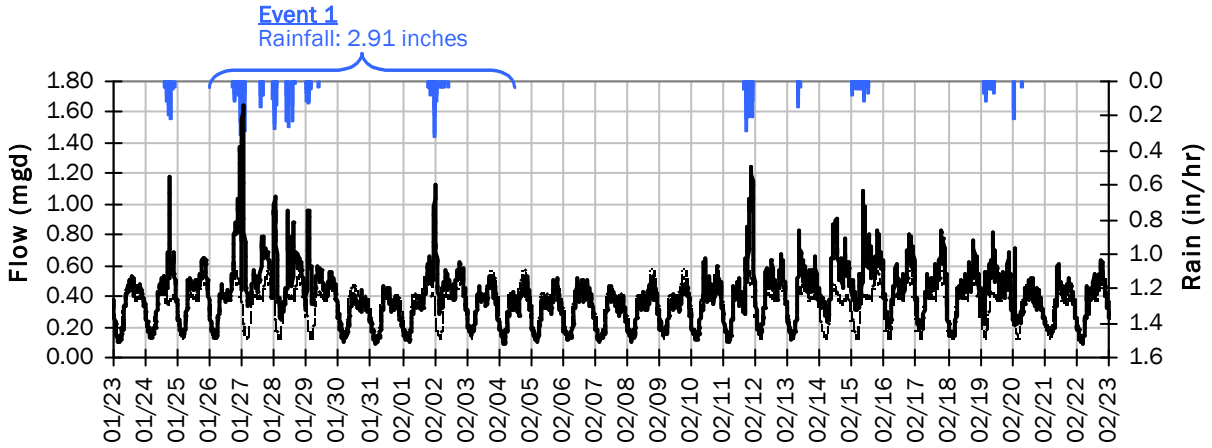


Pipe Diameter:	15	*inches*
Peak Measured Level:	23.6	*inches*
Peak d/D Ratio:	1.57	

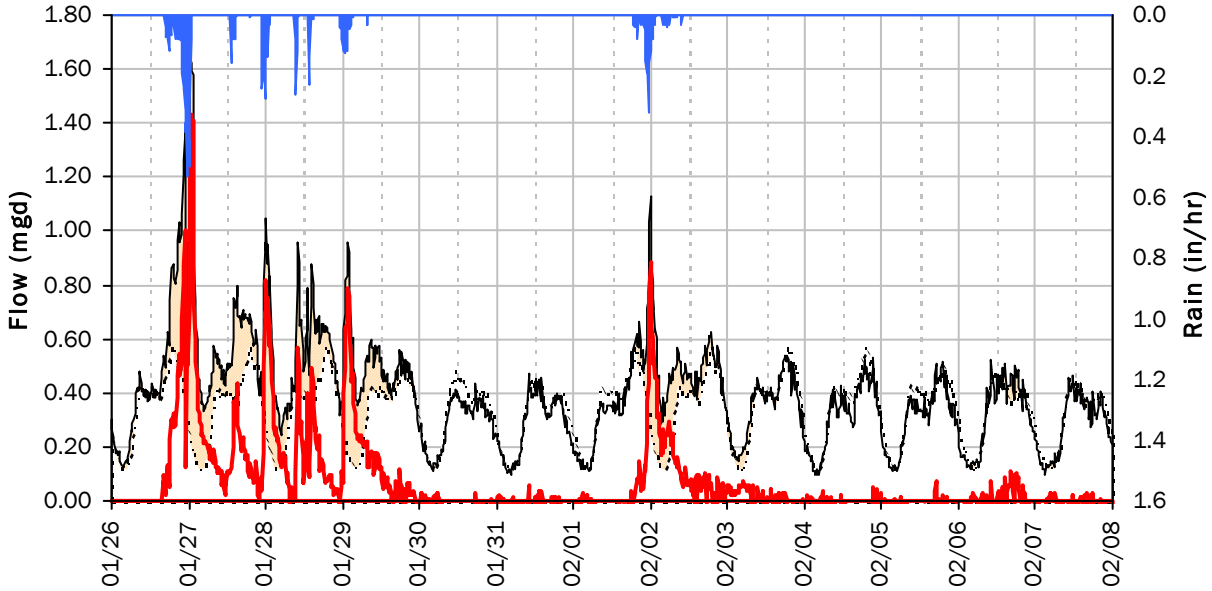
Surcharged 8.6 inches over crown

FM 11
I/I Summary: Event 1

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



Event 1 Detail Graph

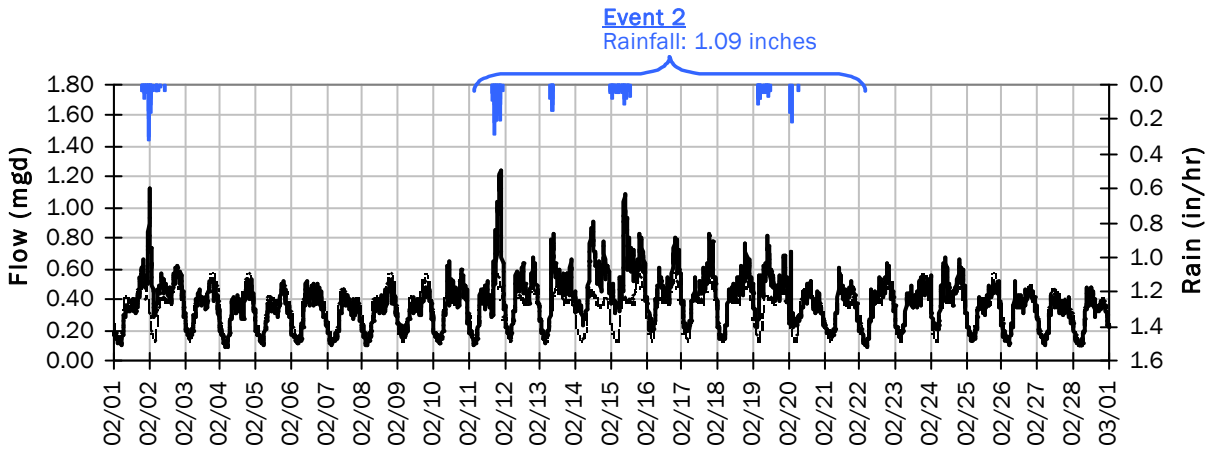


Storm Event I/I Analysis (Rain = 2.91 inches)

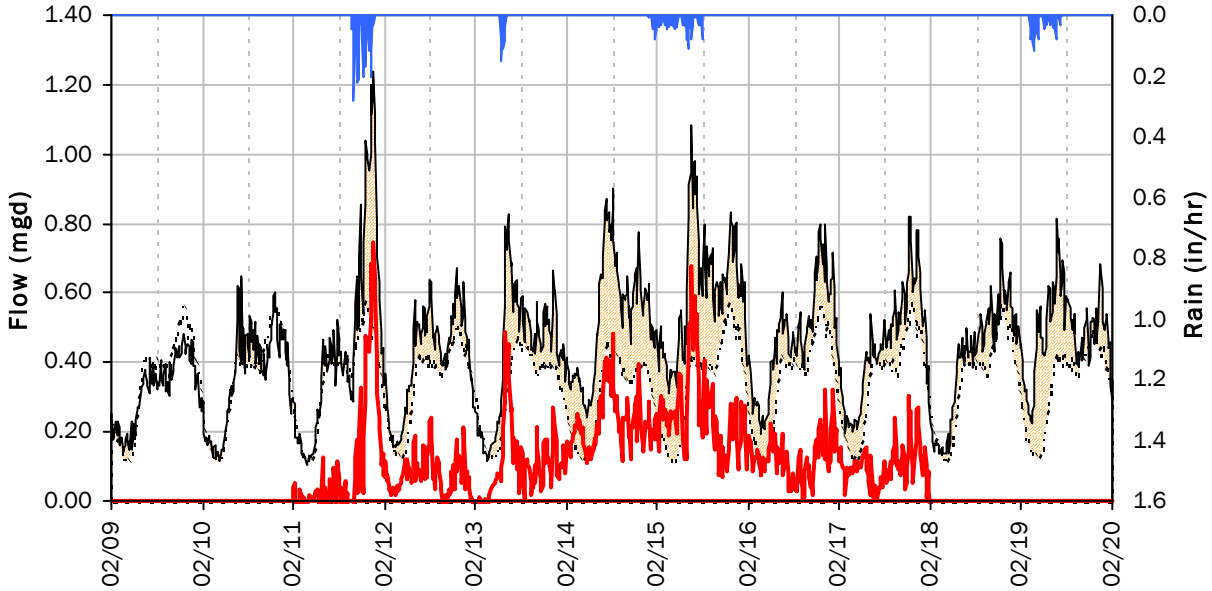
Capacity		Inflow / Infiltration	
Peak Flow:	1.64 *mgd*	**Peak I/I Rate:**	1.43 *mgd*
PF:	4.92	**Total I/I:**	800,000 *gallons*
Peak Level:	23.60 *in*		
d/D Ratio:	1.57		

FM 11
I/I Summary: Event 2

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



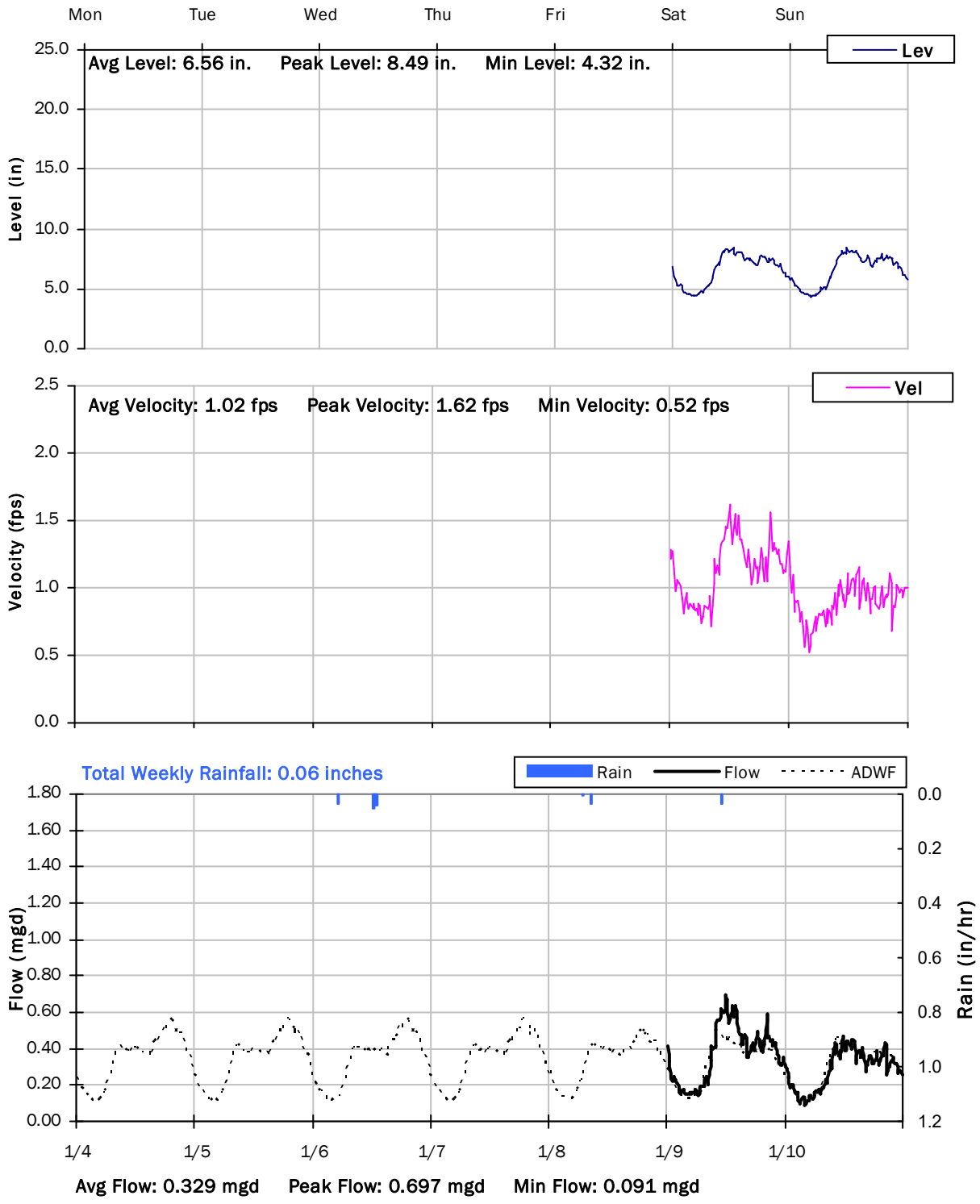
Event 2 Detail Graph



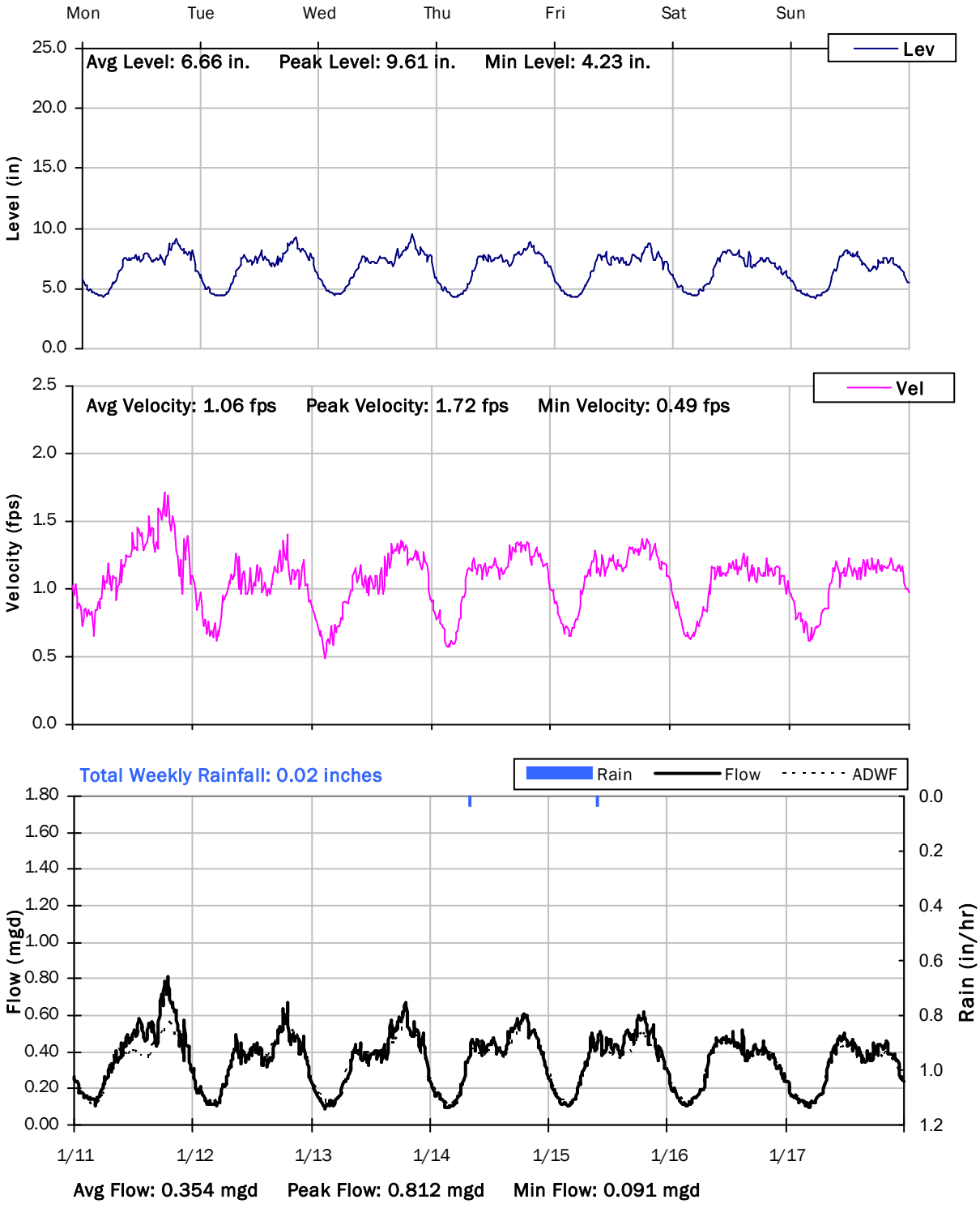
Storm Event I/I Analysis (Rain = 1.09 inches)

Capacity		Inflow / Infiltration	
Peak Flow:	1.24 *mgd*	**Peak I/I Rate:**	0.75 *mgd*
PF:	3.72	**Total I/I:**	1,001,000 *gallons*
Peak Level:	12.90 *in*		
d/D Ratio:	0.86		

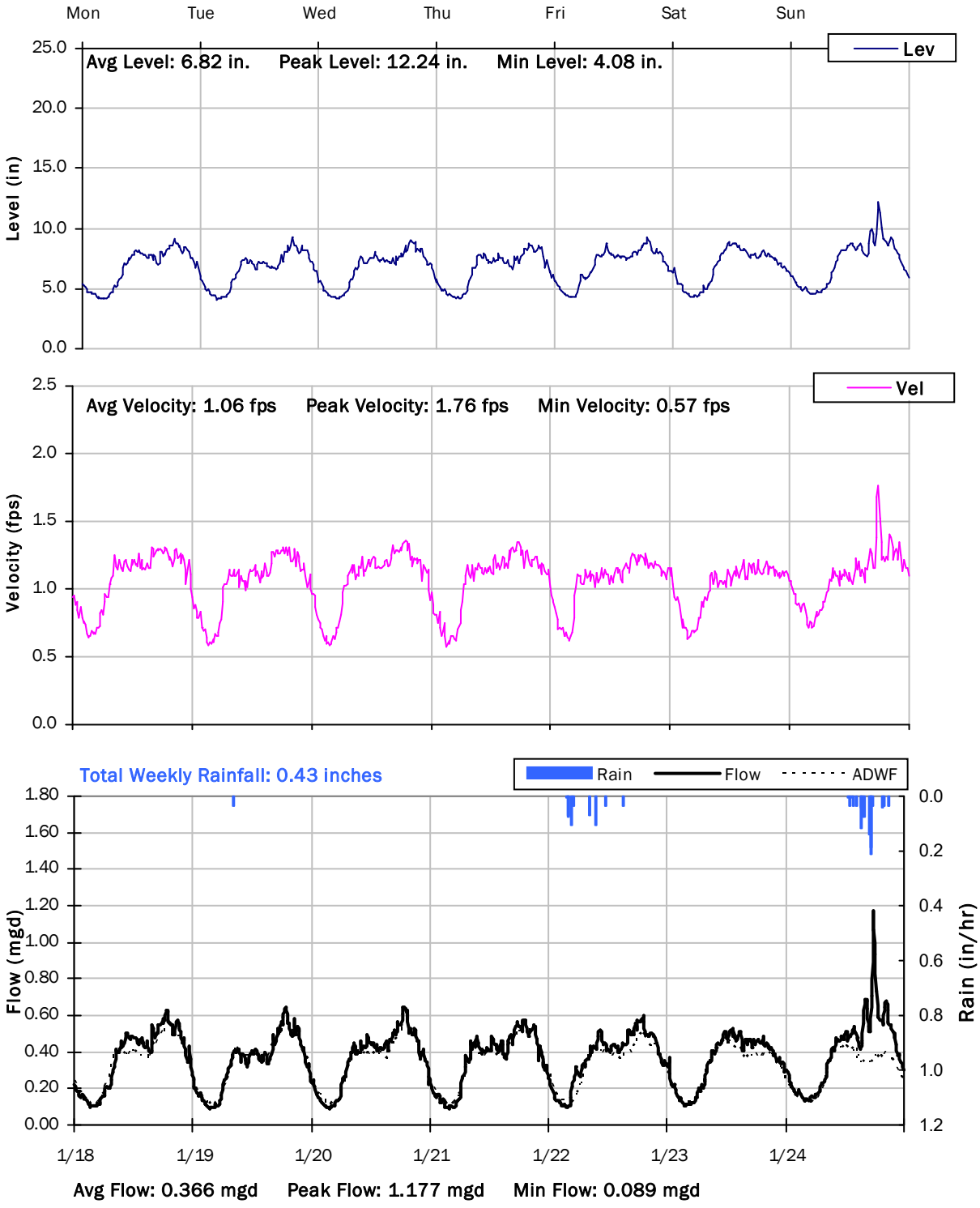
FM 11
Weekly Level, Velocity and Flow Hydrographs
1/4/2021 to 1/11/2021



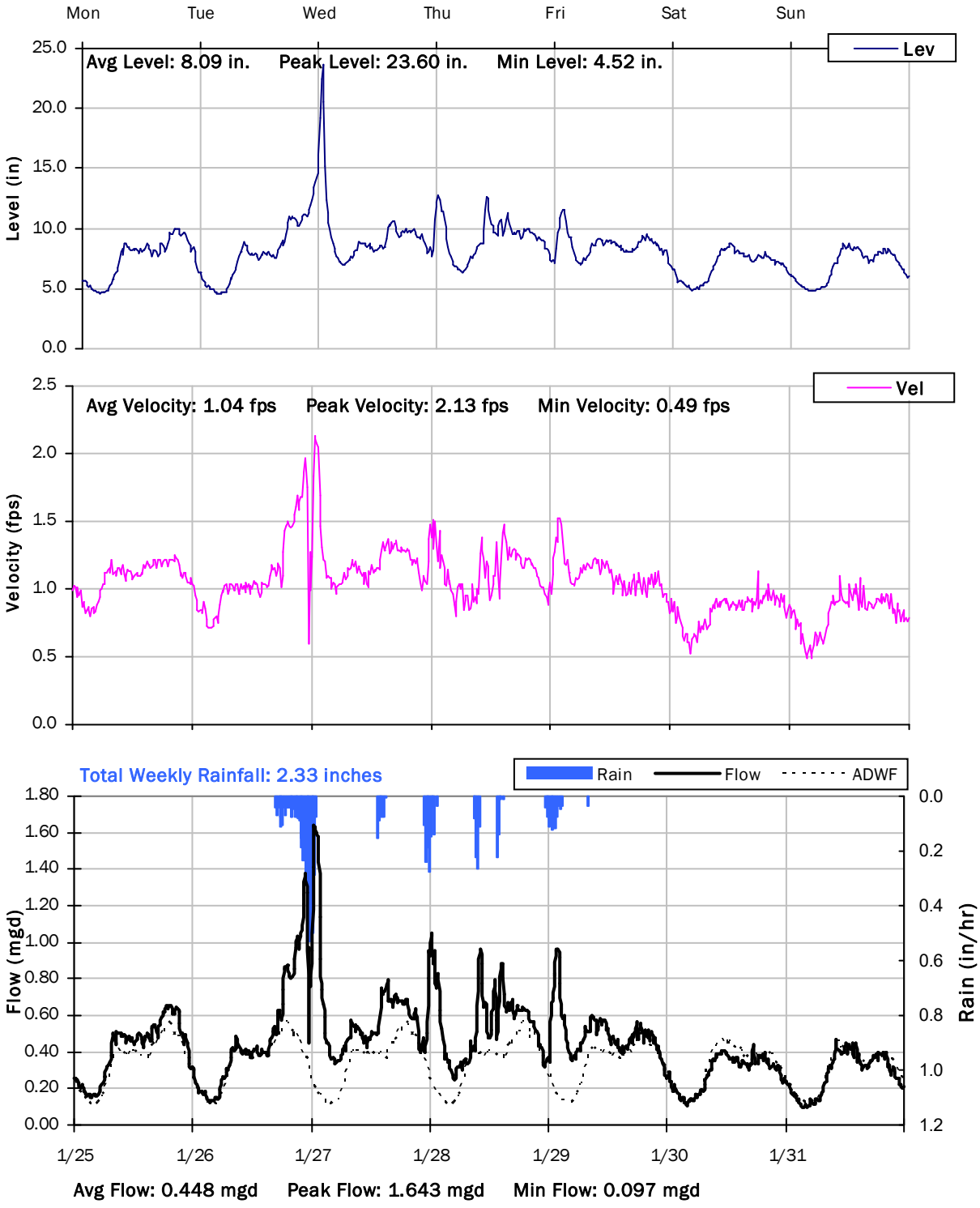
FM 11
Weekly Level, Velocity and Flow Hydrographs
1/11/2021 to 1/18/2021



FM 11
Weekly Level, Velocity and Flow Hydrographs
1/18/2021 to 1/25/2021



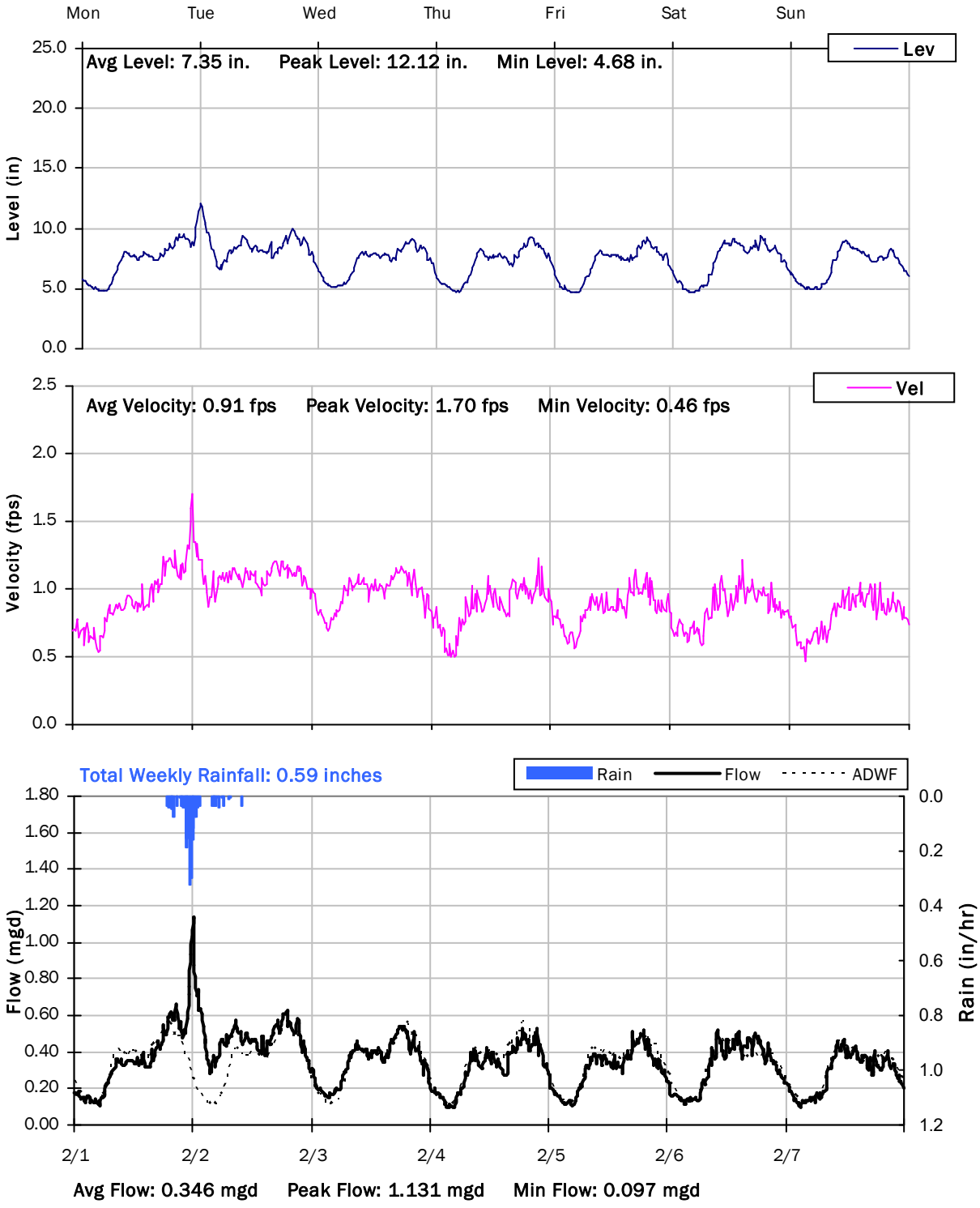
FM 11
Weekly Level, Velocity and Flow Hydrographs
1/25/2021 to 2/1/2021



FM 11

Weekly Level, Velocity and Flow Hydrographs

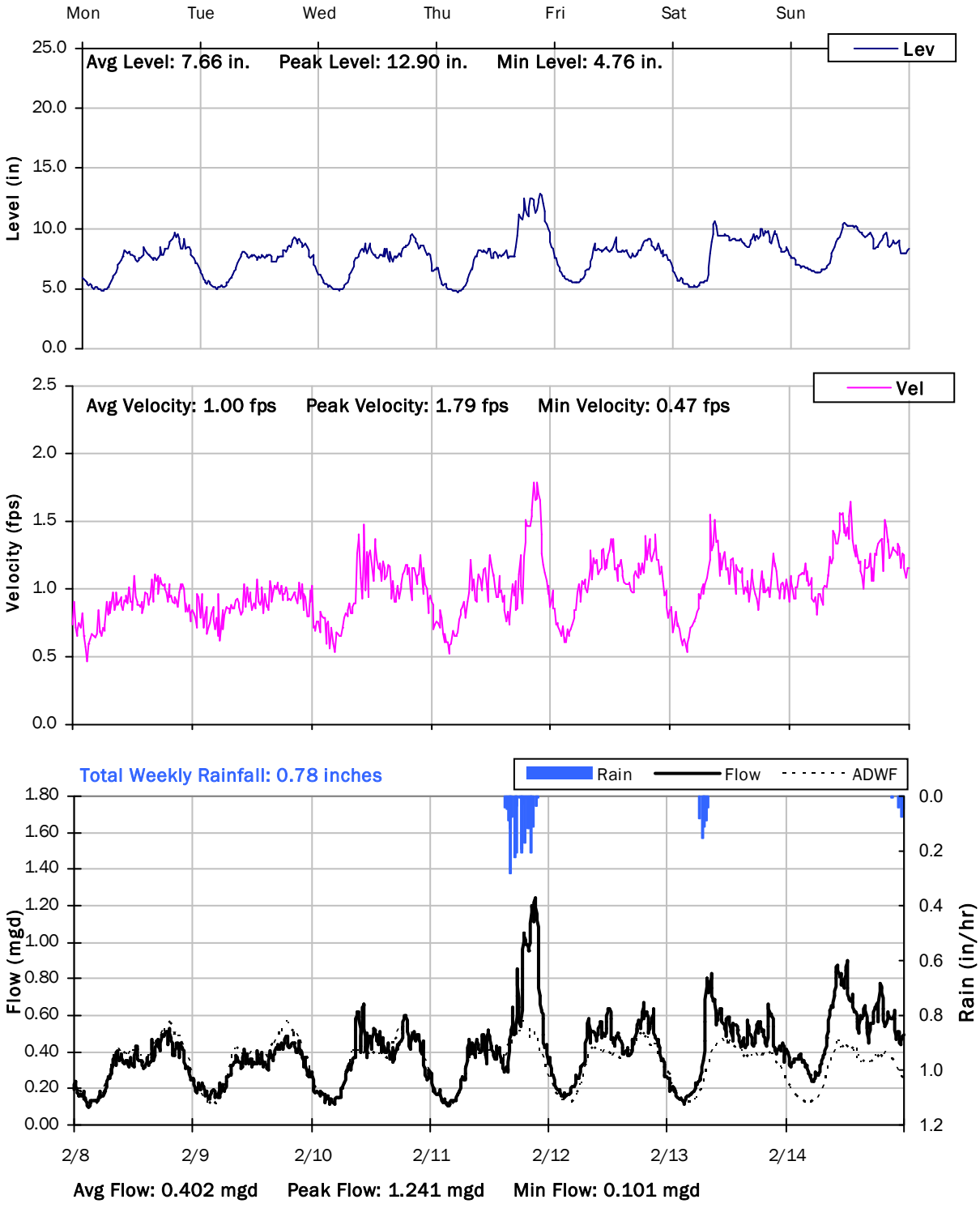
2/1/2021 to 2/8/2021



FM 11

Weekly Level, Velocity and Flow Hydrographs

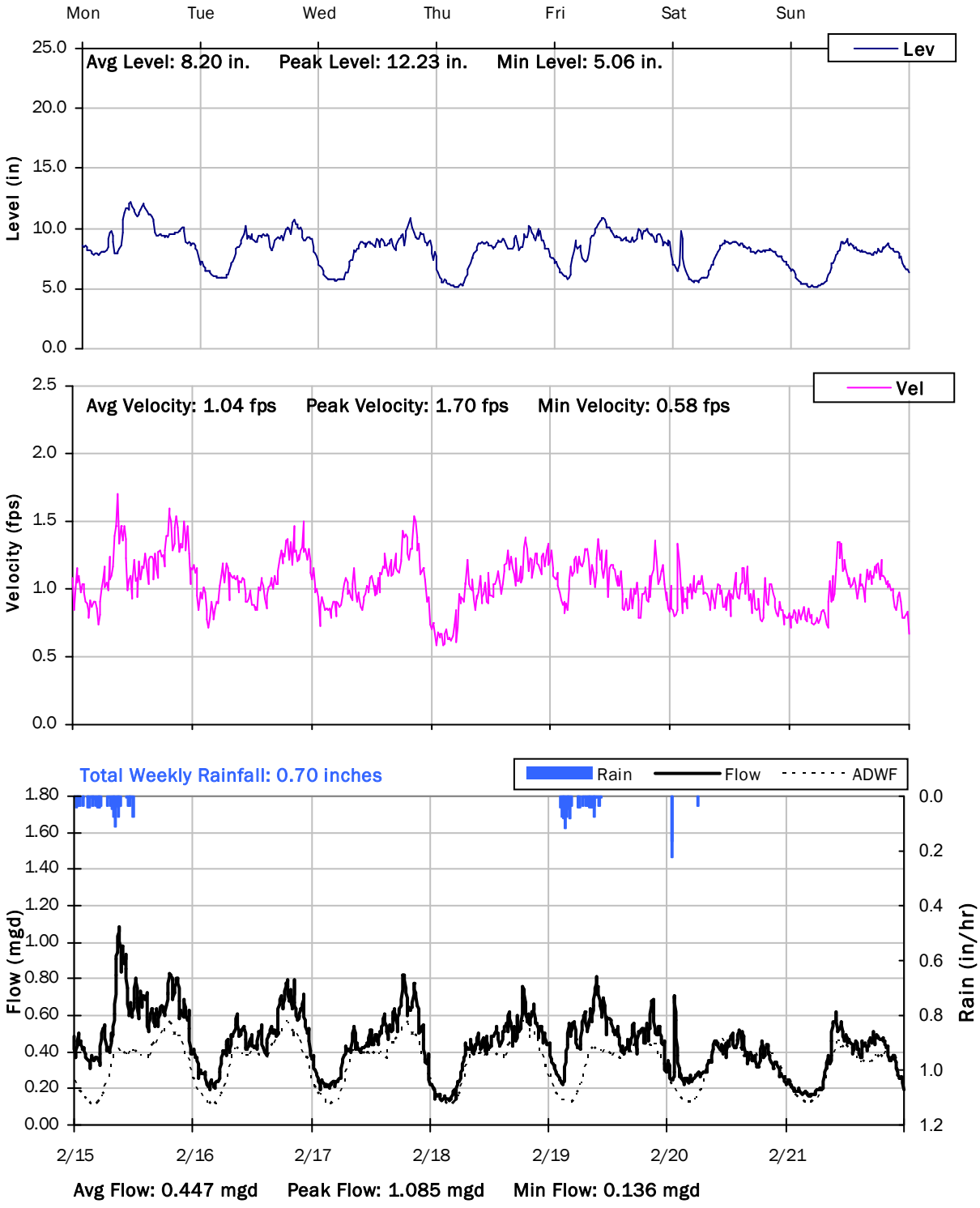
2/8/2021 to 2/15/2021



FM 11

Weekly Level, Velocity and Flow Hydrographs

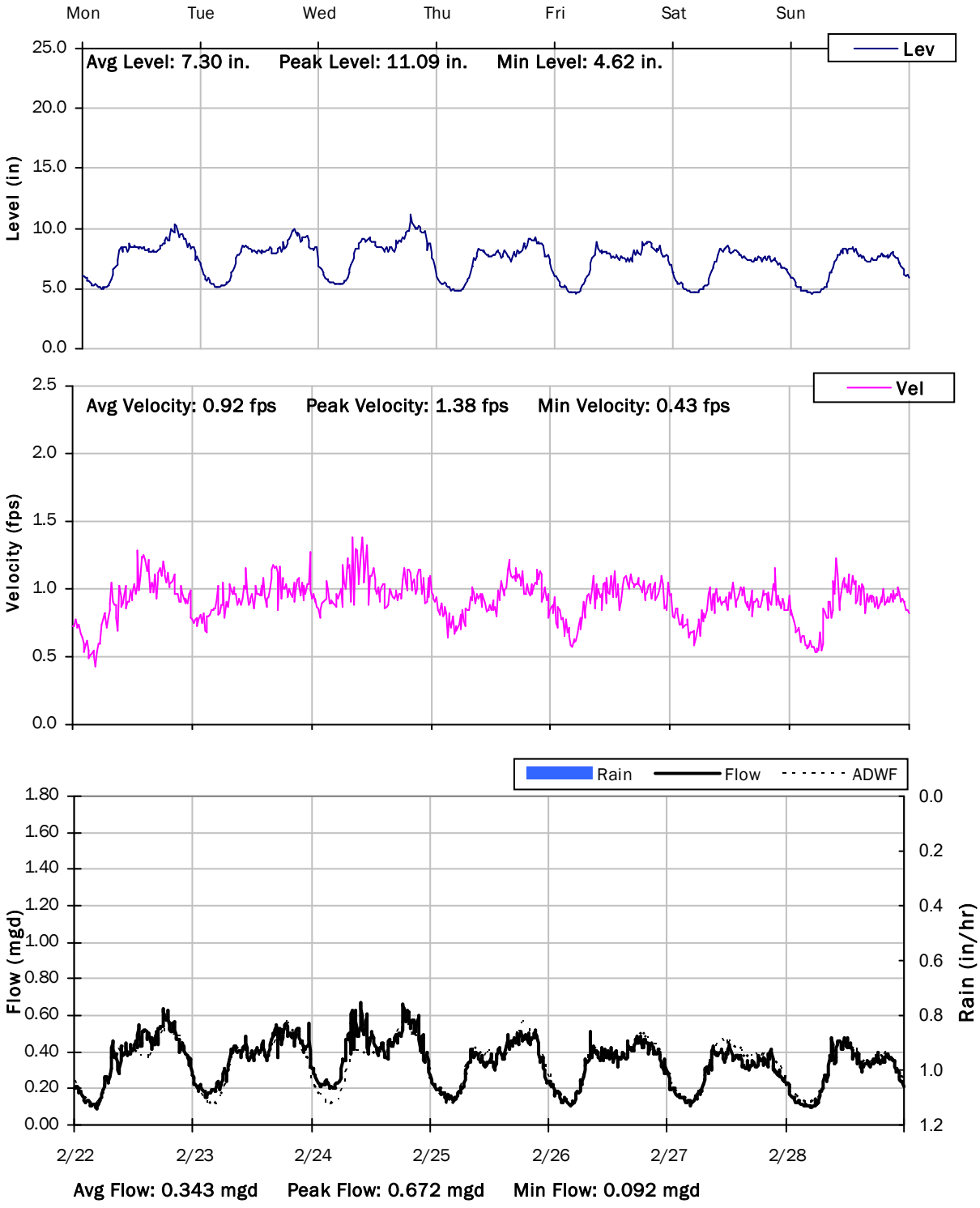
2/15/2021 to 2/22/2021



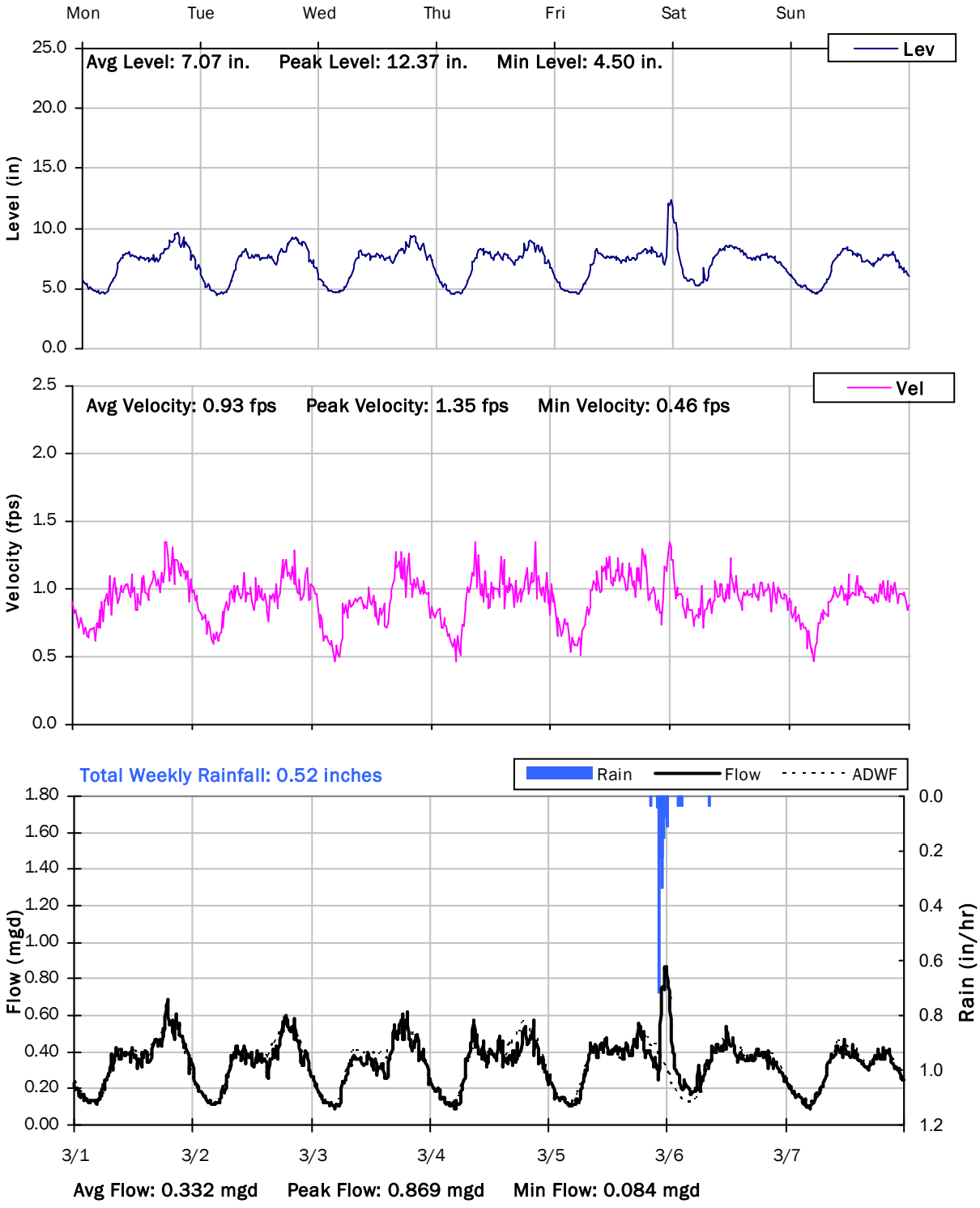
FM 11

Weekly Level, Velocity and Flow Hydrographs

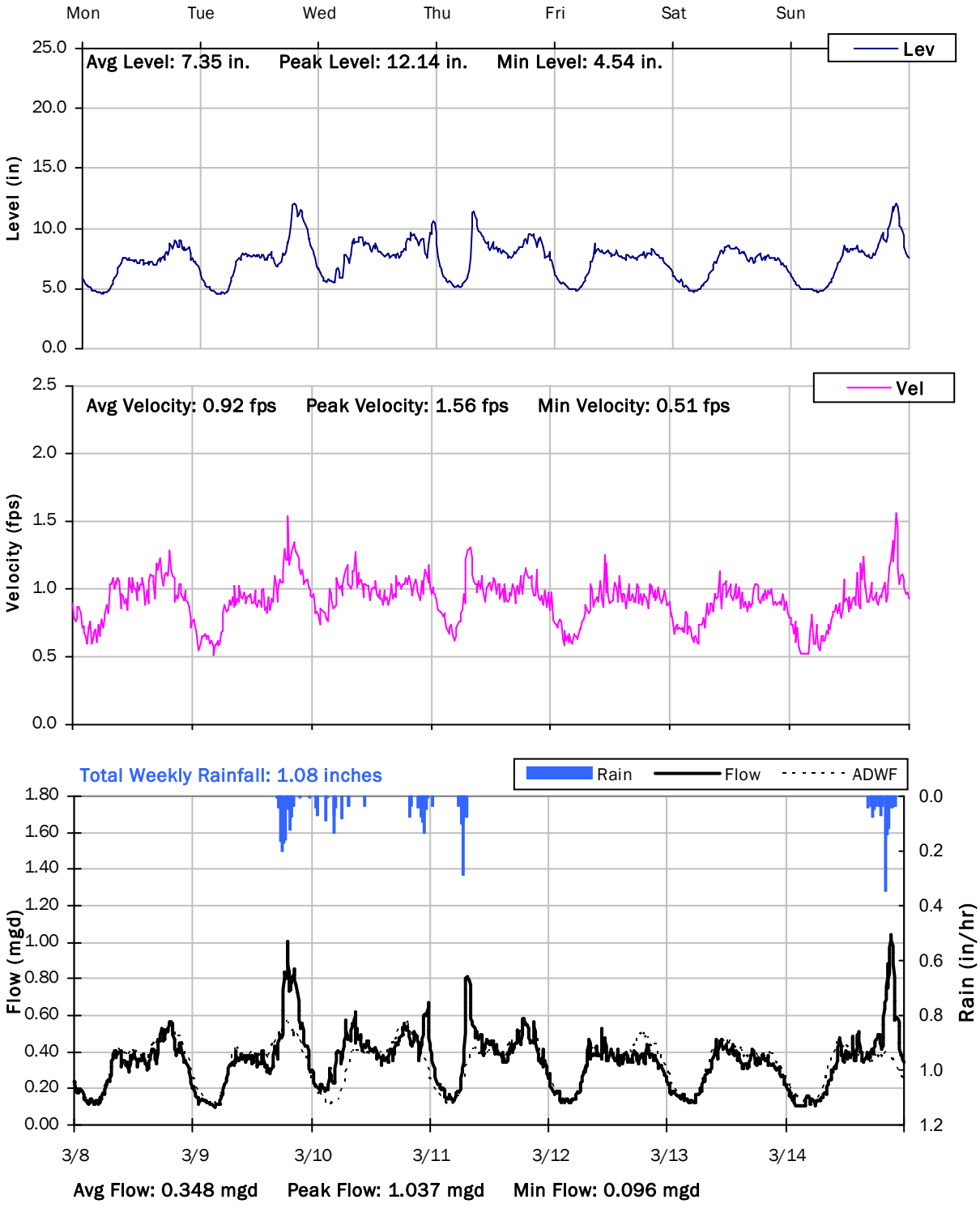
2/22/2021 to 3/1/2021



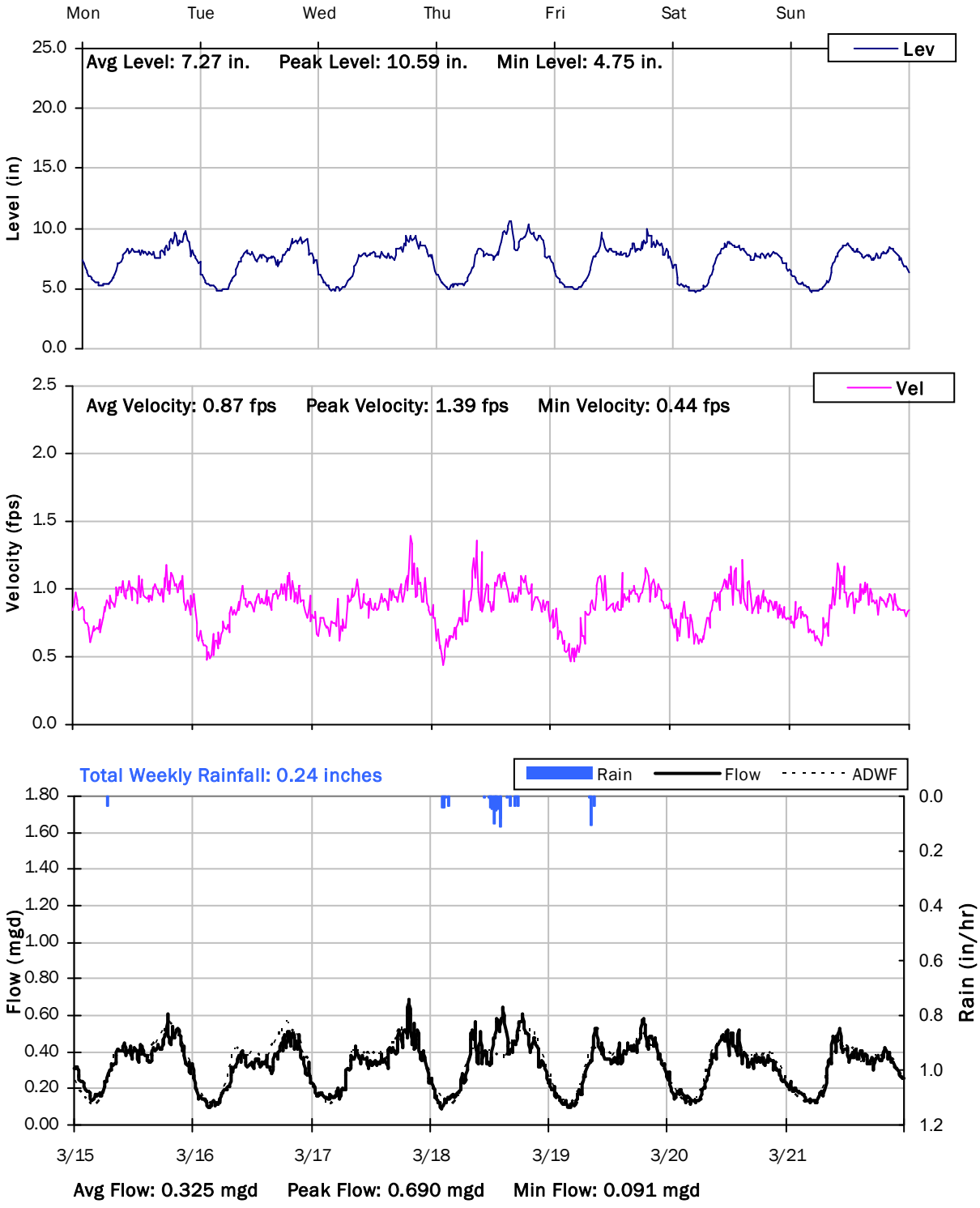
FM 11
Weekly Level, Velocity and Flow Hydrographs
3/1/2021 to 3/8/2021



FM 11
Weekly Level, Velocity and Flow Hydrographs
3/8/2021 to 3/15/2021



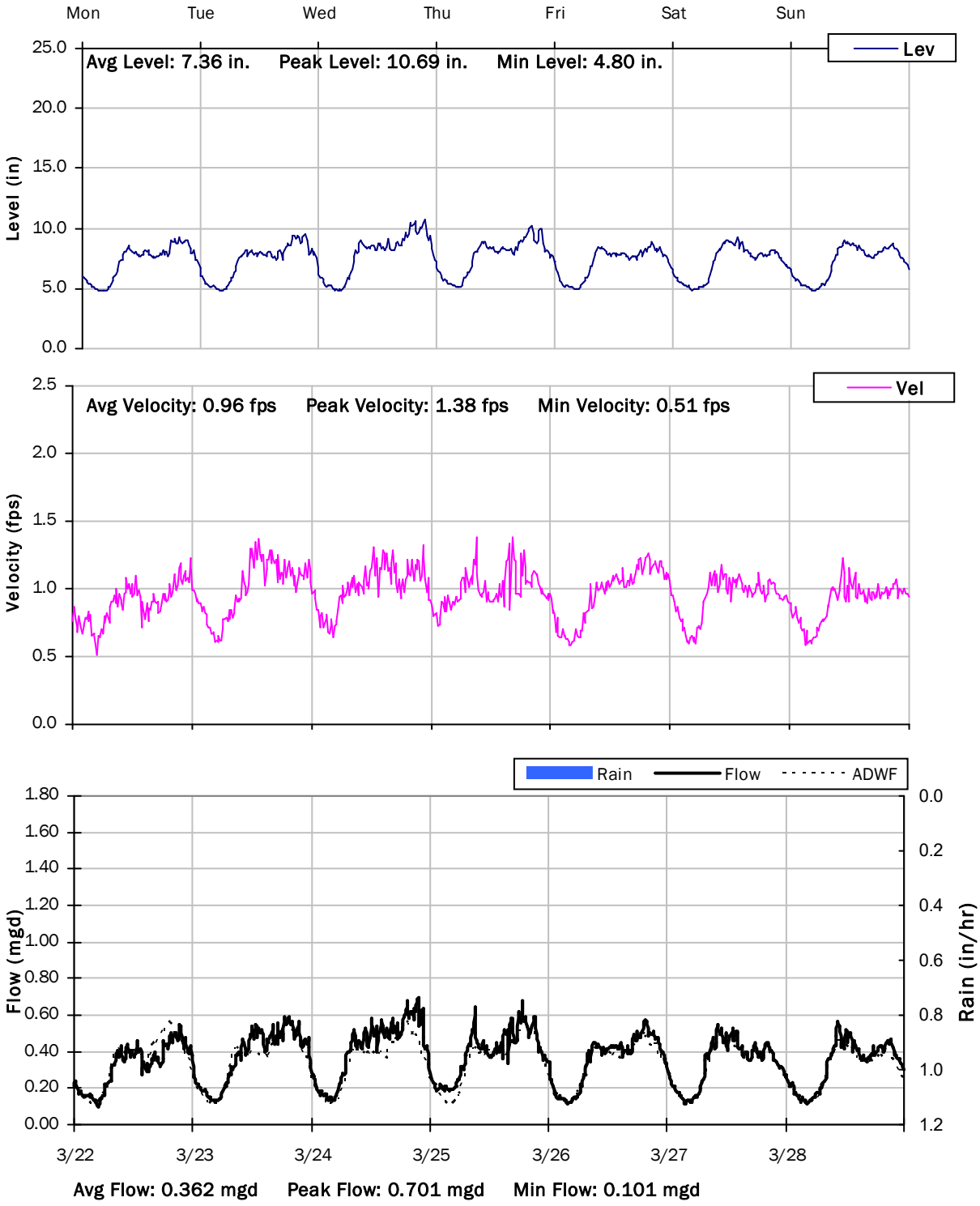
FM 11
Weekly Level, Velocity and Flow Hydrographs
3/15/2021 to 3/22/2021



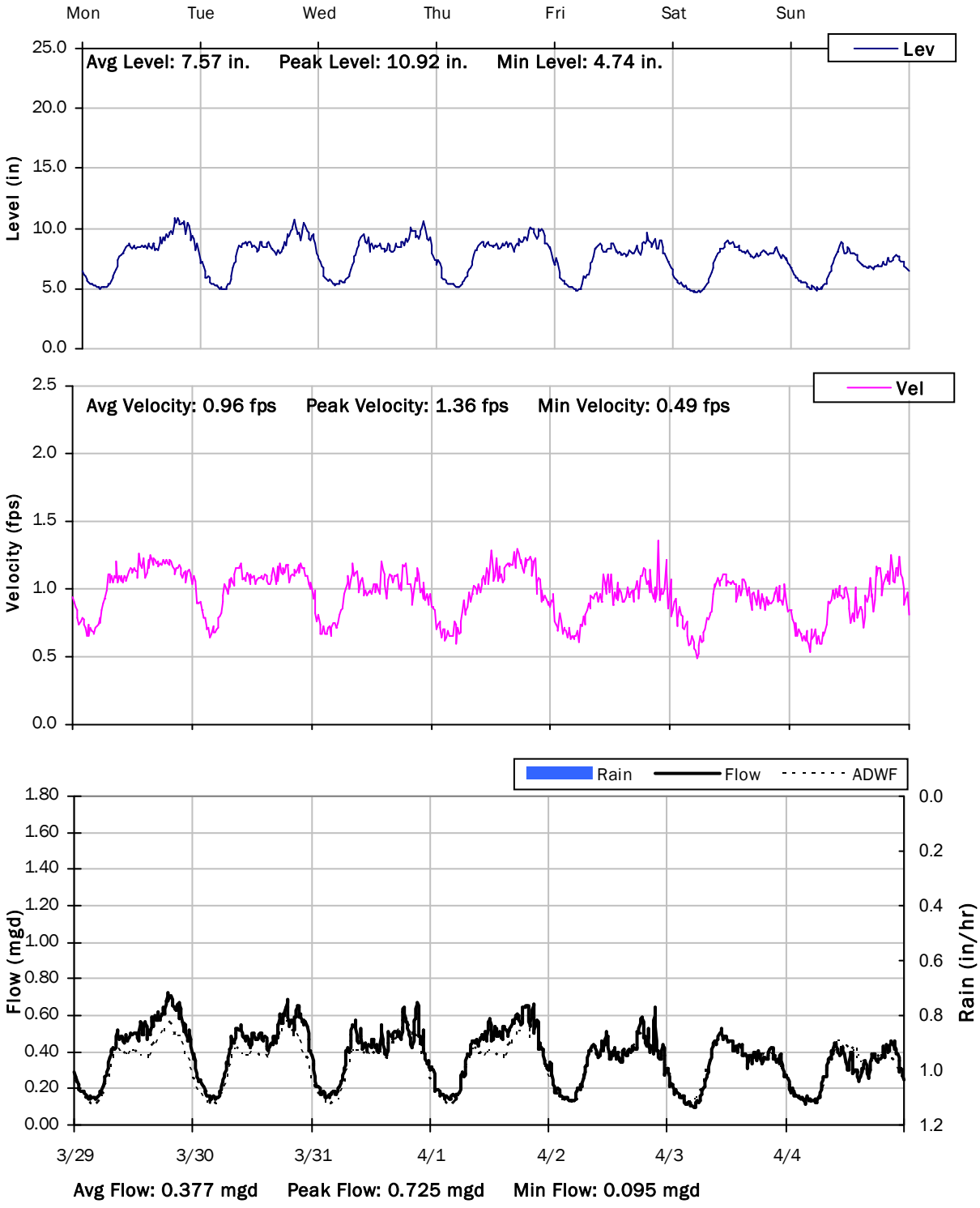
FM 11

Weekly Level, Velocity and Flow Hydrographs

3/22/2021 to 3/29/2021



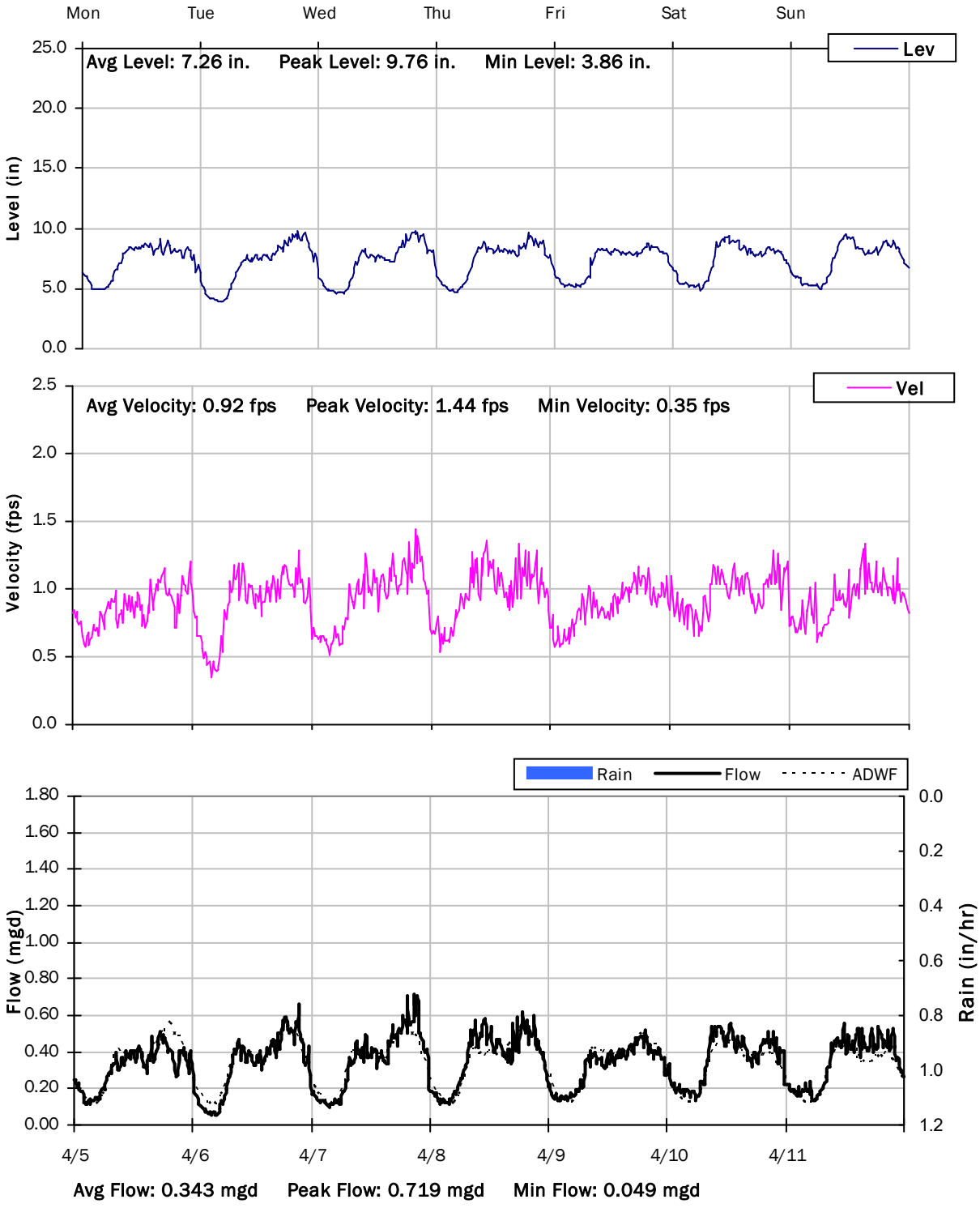
FM 11
Weekly Level, Velocity and Flow Hydrographs
3/29/2021 to 4/5/2021



FM 11

Weekly Level, Velocity and Flow Hydrographs

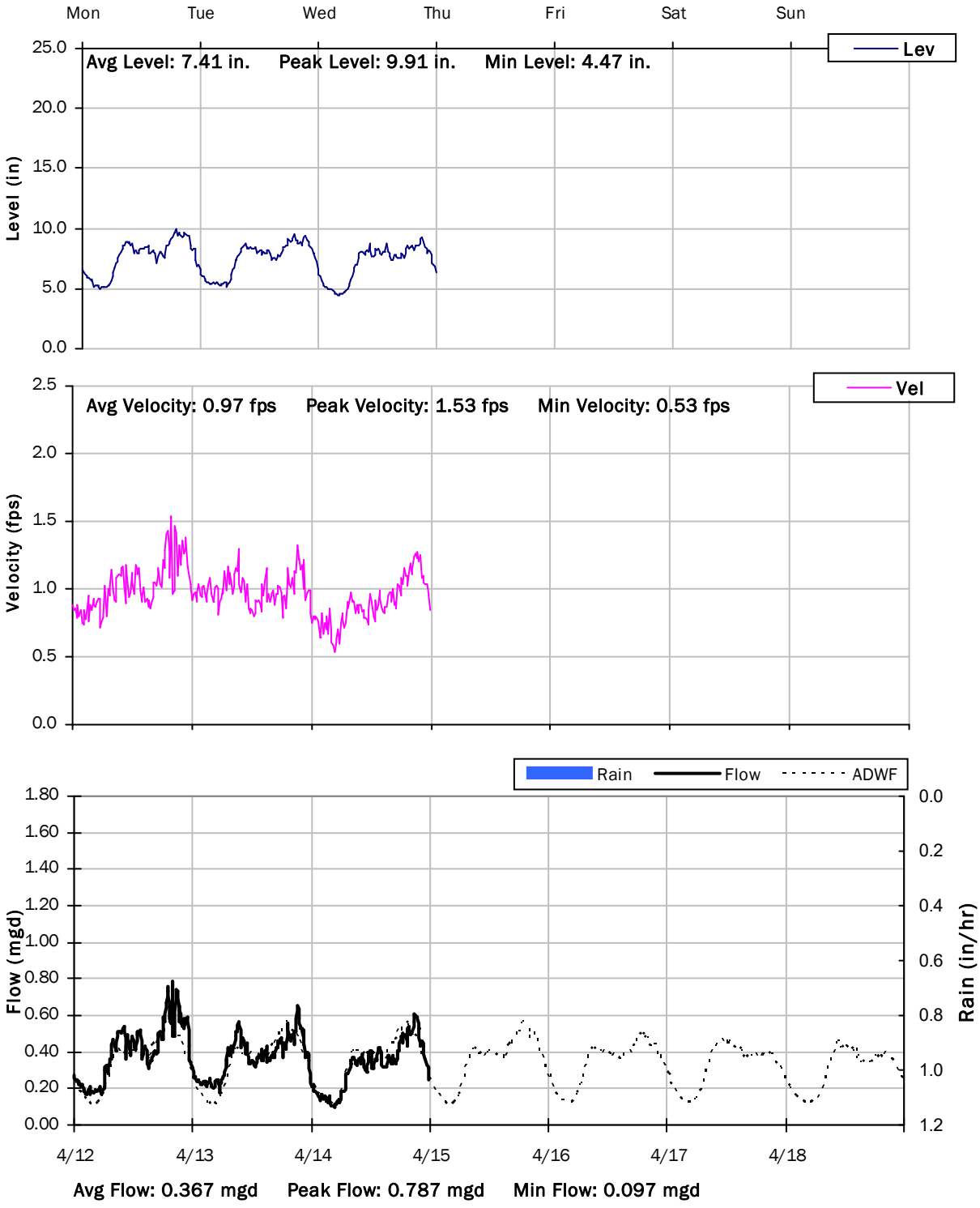
4/5/2021 to 4/12/2021



FM 11

Weekly Level, Velocity and Flow Hydrographs

4/12/2021 to 4/19/2021



APPENDIX E

Oyster Point Hydraulic Analysis

CITY OF SOUTH SAN FRANCISCO

OYSTER POINT REDEVELOPMENT

TABLES AND FIGURES

PRELIMINARY

September 2017

AKEL
ENGINEERING GROUP, INC.

FIGURES

Legend

- Oyster Point Study Area
- WQCP
- Lift Stations
- Manholes

Gravity Pipes

- 8" and Smaller
- 10" and Larger

Force Mains

- 8" and Smaller
- 10" and Larger
- Street Centerlines
- Parcels

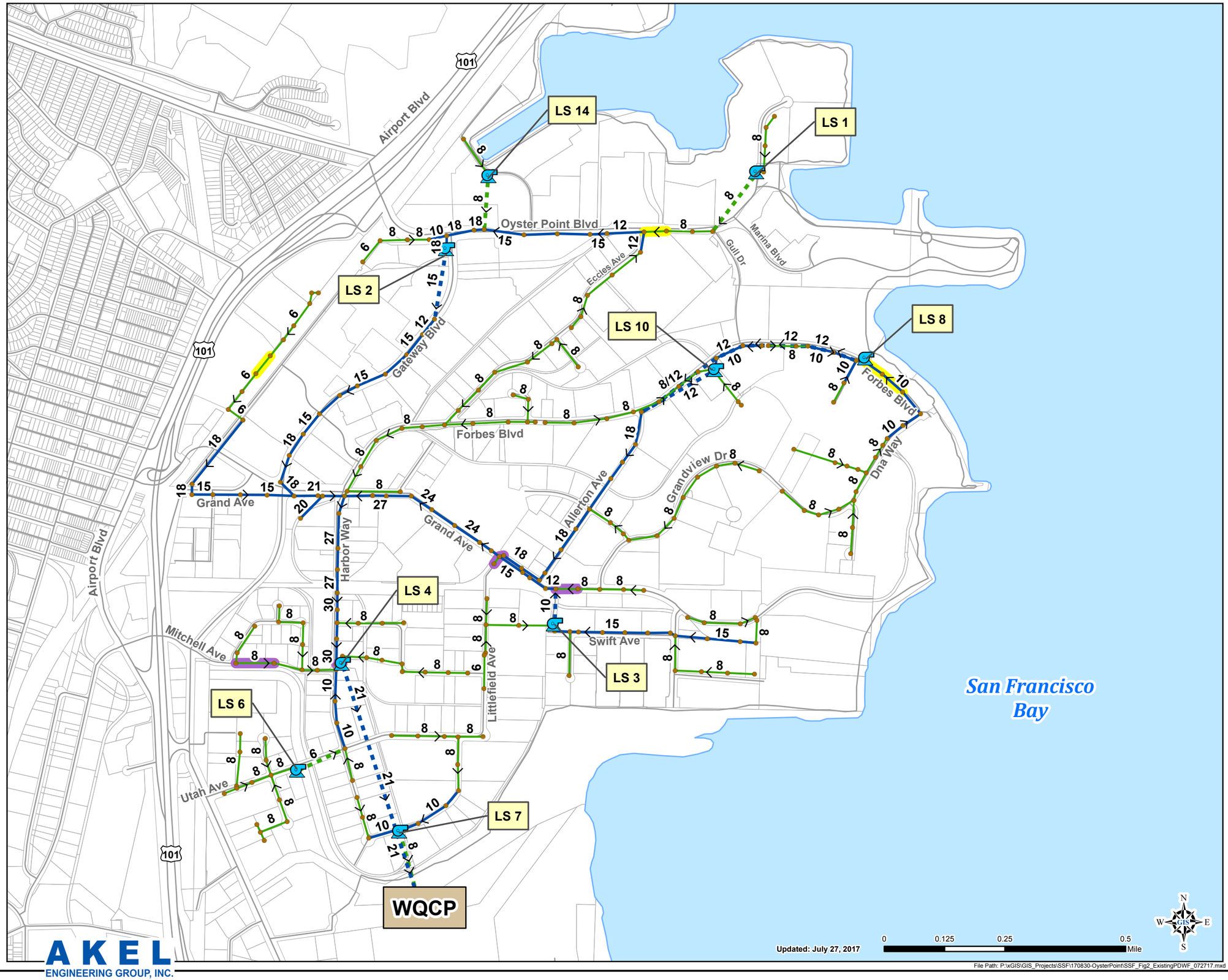
PRELIMINARY

Figure 1
Oyster Point Study Area

Oyster Point Redevelopment
City of South San Francisco

AKEL
ENGINEERING GROUP, INC.

File Path: P:\xGIS\GIS_Projects\SSF\170830-OysterPoint\SSF_Fig1_OysterPoint_083017.mxd



Legend

- WQCP
- Lift Stations
- Manholes
- Slope Deficiencies

Pipe d/D

- d/D > 0.90
- d/D 0.75 - 0.90
- d/D 0.50 - 0.75

Gravity Pipes

- 8" and Smaller
- 10" and Larger

Force Mains

- 8" and Smaller
- 10" and Larger
- Street Centerlines
- Parcels

PRELIMINARY

Figure 2
Existing Modeled System Analysis for PDWF - Before Oyster Point Redevelopment

Oyster Point Redevelopment
City of South San Francisco

AKEL ENGINEERING GROUP, INC.

File Path: P:\xGIS\GIS_Projects\SSF\170830-OysterPoint\SSF_Fig2_ExistingPDWF_072717.mxd

Legend

Oyster Point Redevelopment

- Lift Station
- Gravity Pipes
- Force Mains

To be Abandoned

- Lift Station
- Force Mains

Existing

- WQCP
- Lift Stations
- Manholes
- Slope Deficiencies

Pipe d/D

- d/D > 0.90
- d/D 0.75 - 0.90
- d/D 0.50 - 0.75

Gravity Pipes

- 8" and Smaller
- 10" and Larger

Force Mains

- 8" and Smaller
- 10" and Larger

- Street Centerlines
- Parcels

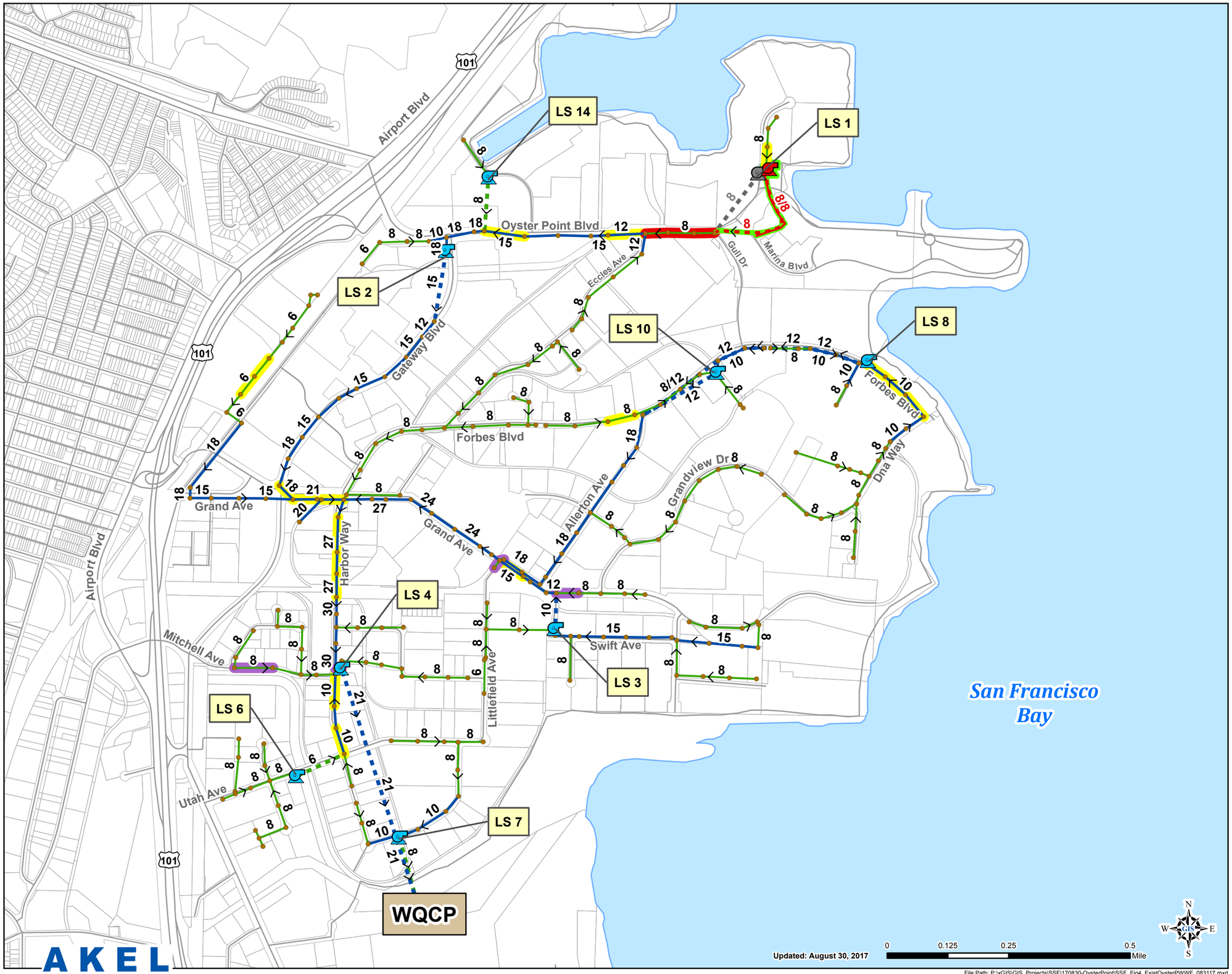
PRELIMINARY

Figure 3
Existing Modeled System Analysis for PDWF - After Oyster Point Redevelopment

Oyster Point Redevelopment
City of South San Francisco

AKEL ENGINEERING GROUP, INC.

File Path: P:\xGIS\GIS_Projects\SSF\170830-OysterPoint\SSF_Fig3_ExistOysterPDWF_083017.mxd



Legend

Oyster Point Redevelopment

- Lift Station
- Gravity Pipes
- Force Mains

To be Abandoned

- Lift Station
- Force Mains

Existing

- WQCP
- Lift Stations
- Manholes
- Slope Deficiencies

Pipe d/D

- d/D > 0.90
- d/D 0.75 - 0.90
- d/D 0.50 - 0.75

Gravity Pipes

- 8" and Smaller
- 10" and Larger

Force Mains

- 8" and Smaller
- 10" and Larger
- Street Centerlines
- Parcels

PRELIMINARY

Figure 4
Existing Modeled System Analysis for PWWF - After Oyster Point Redevelopment

Oyster Point Redevelopment
City of South San Francisco

AKEL
ENGINEERING GROUP, INC.

Legend

Recommended Improvements

- Gravity Pipes

Oyster Point Redevelopment

- Lift Station
- Gravity Pipes
- Force Mains

To be Abandoned

- Lift Station
- Gravity Pipes
- Force Mains

Existing

- WQCP
- Lift Stations
- Manholes

Gravity Pipes

- 8" and Smaller
- 10" and Larger

Force Mains

- 8" and Smaller
- 10" and Larger

- Street Centerlines
- Parcels

PRELIMINARY

Figure 5
Oyster Plan Revelopment Recommended Improvements

Oyster Point Redevelopment
City of South San Francisco

AKEL ENGINEERING GROUP, INC.

File Path: P:\xGIS\GIS_Projects\SSF\170830-OysterPoint\SSF_Fig5_OysterImp_090117.mxd

Legend

Recommended Improvements

- Lift Station
- Gravity Pipes

Oyster Point Redevelopment

- Lift Station
- Gravity Pipes
- Force Mains

To be Abandoned

- Lift Station
- Gravity Pipes
- Force Mains

Existing

- WQCP
- Lift Stations
- Manholes

Gravity Pipes

- 8" and Smaller
- 10" and Larger

Force Mains

- 8" and Smaller
- 10" and Larger
- Street Centerlines
- Parcels

PRELIMINARY

Figure 6
Master Plan
Recommended Improvements

Oyster Point Redevelopment
City of South San Francisco

AKEL
ENGINEERING GROUP, INC.

File Path: P:\xGIS\GIS_Projects\SSF\170830-OysterPoint\SSF_Fig6_MasterPlanImp_090117.mxd

TABLES

Table 1 2012 and 2017 Factors Comparison

Oyster Point Redevelopment

City of South San Francisco

PRELIMINARY

Landuse Designation	Unit	2012 SSMP Recommended Factors [1] (gpd/ unit)	2017 SSMP Recommended Factors [2] (gpd/ unit)
Office	1,000 sf	53	50
Hotel	Number of rooms	117	60
Retail	1,000 sf	14	170
R&D	1,000 sf	201	50
Residential	Dwelling Unit	252	200 [3]
Office/ R&D	1,000 sf	113	50

Notes: 8/23/2017

1. Factors extracted from 2012 SSMP.
2. Unless noted otherwise, recommended sewer factors extracted from preliminary 2017 Sewer System Master Plan.
3. Residential Factors extracted from UWMP (103 gpdc per capita) assuming 3 person per dwelling unit, and a return to sewer equal to 0.65.

Table 2 Flows Generated by the Oyster Point Redevelopment

Oyster Point Redevelopment

City of South San Francisco

PRELIMINARY

Landuse Designation	LU Type	Unit	Number of Units	2012 ADWF Recommended Factor (gpd/ 1,000 sqft)[1]	2017 ADWF Recommended Factor (gpd/ 1,000 sqft)[1]	2012 ADWF Sewer Flows (gpd)	2017 ADWF Sewer Flows (gpd)
Remaining Existing Infrastructure at Buildout							
Harbor Master Office	Office	gross square feet	1,620	53	50	86	81
Oyster Point Yacht Club	Office	gross square feet	6,780	53	50	359	339
Harbor Patrol Warehouse	Office	gross square feet	2,544	53	50	135	127
Bait Shop (modular)	Office	gross square feet	720	53	50	38	36
Ferry Terminal	Office	gross square feet	3,774	53	50	200	189
Ex North Oyster Point Boulevard Building	Office	gross square feet	429,000	53	50	22,737	21,450
Total Existing ADWF						**23,555**	**22,222**
Proposed Future Infrastructure at Buildout							
Phase IC	Hotel [1]	Rooms	350	117	60	40,950	21,000
	Retail	gross square feet	40,000	14	170	560	6,800
Phase ID	Office/ R&D	gross square feet	505000	113	50	57,065	25,250
	Retail	gross square feet	2,500	14	170	35	425
Phase IID	Office/ R&D	gross square feet	1,042,000	113	50	117,746	52,100
	Retail	gross square feet	28,000	14	170	392	4,760
Phase IIID&IVD	Residential	Dwelling Unit	1,191	252	200	300,132	238,200
	Retail	gross square feet	22,000	14	170	308	3,740
Total Future ADWF						**517,188**	**352,275**
Grand Total ADWF- Remaining Existing Infrastructure + Proposed Future Infrastructure						**540,743**	**374,497**

8/29/2017

Notes:

1. For Hotel Developments, the recommended sewer factor is expressed in gpd/ hotel room.
2. For Residential developments, the recommended sewer factor is expressed in gpd/ dwelling unit.

Table 3 Existing Lift Stations and Capacity Analysis

Oyster Point Redevelopment

City of South San Francisco

PRELIMINARY

Pump Station No.	Location	Firm Capacity (Exclude Standby)	Total Capacity (Include Standby)	Existing Peak Flows including Oyster Point Revelopment				2040 Peak Flows				Surplus/ Deficiency	Adequate Capacity	Capacity Upgrade
				Dry Weather		Wet Weather		Dry Weather		Wet Weather				
		(gpm)	(gpm)	(gpm)	(mgd)	(gpm)	(mgd)	(gpm)	(mgd)	(gpm)	(mgd)	(gpm)		(gpm)
LS-1	383 Oyster Pt. Blvd	700	1,050	414	0.597	530	0.763	881	1.269	996	1.434	-296	Replace	2 @ 1,000 gpm
LS-2	955 Gateway Blvd	1,000	2,000	752	1.083	981	1.413	988	1.423	1,384	1.994	-384	Replace	2 @ 1,400 gpm
LS-3	195 Kimball Way	1,600	2,400	124	0.179	313	0.450	402	0.579	568	0.819	1,032	Yes	
LS-4	249 Harbor Way	9,000	12,000	2,610	3.759	3,454	4.973	5,007	7.209	5,622	8.095	3,378	Yes	
LS-6	160 Utah Ave	600	1,200	134	0.193	155	0.224	129	0.186	150	0.216	450	Yes	
LS-7	220 Littlefield Ave	425	1,025	49	0.071	150	0.216	47	0.068	149	0.214	276	Yes	
LS-8	701 Forbes Blvd	2,800	4,200	752	1.083	859	1.238	722	1.040	829	1.194	1,971	Yes	
LS-10	572 Forbes Blvd	1,097	2,194	49	0.070	114	0.164	455	0.656	491	0.706	606	Yes	
LS-14	Bay West Cove	2,000	4,000	34	0.049	36	0.052	57	0.081	59	0.085	1,941	Yes	

Notes:

1. Lift Station Capacity Information provided per City Staff.

8/31/2017

Table 4 Unit Costs

Oyster Point Redevelopment
City of South San Francisco

PRELIMINARY

Pipe Size (in)	($/Lineal Foot)
8	$217
10	$253
12	$289
15	$361
18	$433
21	$506
24	$542
27	$578
30	$671
36	$797
42	$923
48	$1,049
Lift Station	
Estimated Lift Station Project Cost = 8,764*Q^2 + 224,811*Q + 331,618 where Q is in mgd	

Notes:

1. Units Costs are based on an ENR CCI Index Value of 10,692 (05/2017).

6/29/2017

Table 5 Capacity Improvement Costs

Oyster Point Redevelopment
City of South San Francisco

PRELIMINARY

Improv. No.	Improv. Type	Alignment	Limits	Pipeline Improvements				Baseline Constr. Consts	Estimated Constr. Costs [2]	Capital Improv. Costs [3]
				Existing Diameter (in)	New/Parallel/Replace	Diameter (in)	Length (ft)	($)	($)	($)
Oyster Point Recommended Improvements										
Pipeline Capacity Improvements										
Basin 2										
2-P1	Gravity Main	Oyster Point Blvd	From Gull Dr to Eccles Ave	8	Replace	12	800	231,182	300,537	450,805
Master Plan Recommended Improvements (2040 Buildout)										0
Pipeline Capacity Improvements										
Basin 1										
1-P1	Gravity Main	Oyster Point Blvd	From 750 ft n/o Lift Station to Lift Station 1	8	Replace	12	750	216,733	281,753	422,630
Basin 4										
4-P1	Gravity Main	Harbor Way	From Harbor Way to 350 ft n/o Harris Ave	27	Replace	30	1,075	721,325	937,723	1,406,584
4-P2	Gravity Main	E Grand Avenue	From Gateway Blvd to Forbes Blvd	21	Replace	24	625	338,646	440,239	660,359
Lift Station Improvement						**Total Capacity**				
FUT-LS1	Lift Station	Oyster Point Boulevard			Capacity Upgrade	2 @ 1,000 gpm		673,519	875,575	1,313,362
FUT-LS2	Lift Station	955 Gateway Boulevard			Capacity Upgrade	2 @1,400 gpm		820,456	1,066,593	1,599,889
						Pipeline Capacity Improvement Costs		1,507,886	1,960,252	2,940,377
						Lift Station Improvement Costs		1,493,975	1,942,167	2,913,251
						Total Improvement Costs		**3,001,861**	**3,902,419**	**5,853,629**

AKEL ENGINEERING GROUP, INC.

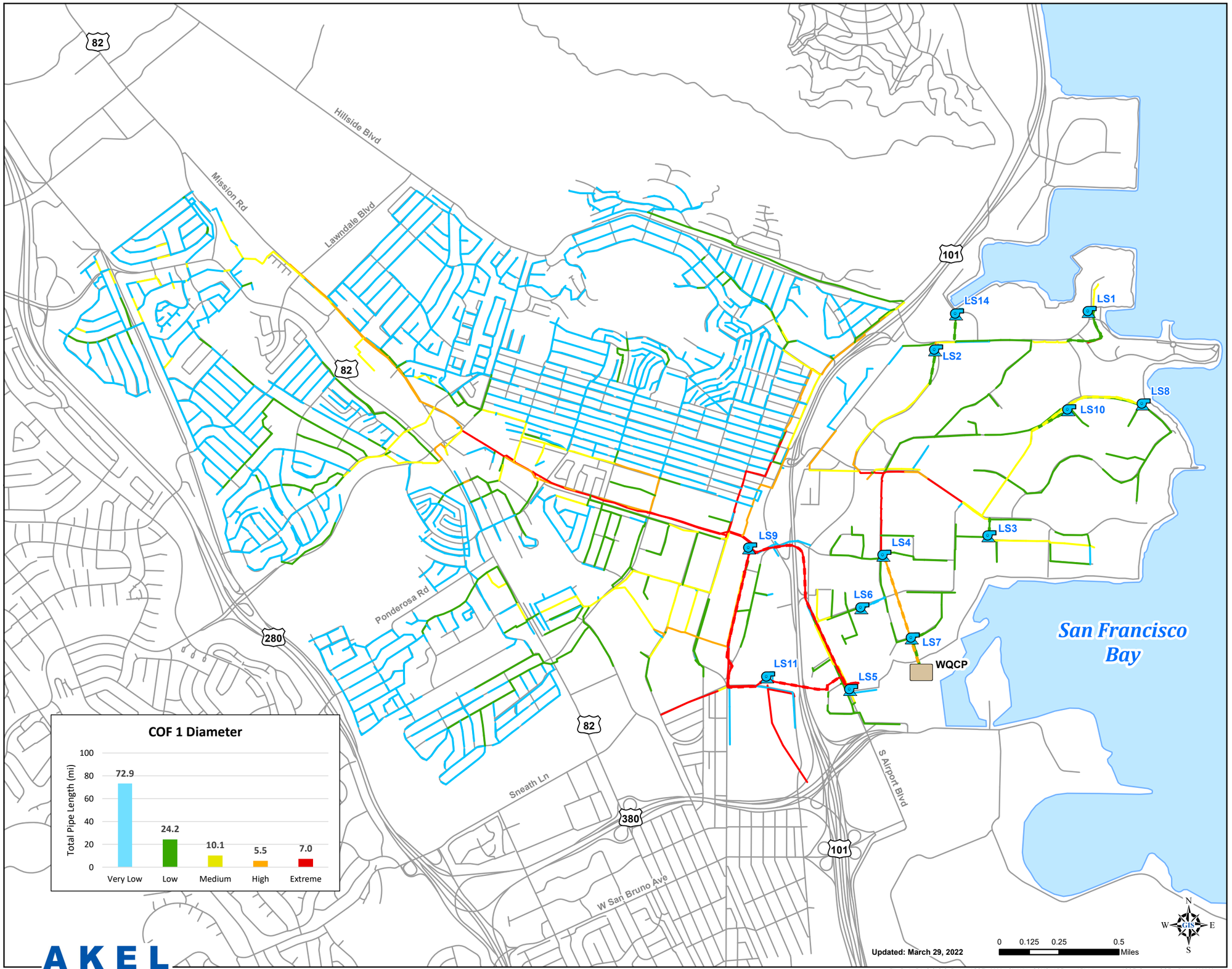
9/1/2017

Notes:

1. Unit costs based on a May 2017 ENR CCI of 10,672.
2. Baseline construction costs plus 30% to account for unforeseen events and unknown conditions.
3. Estimated construction cost plus 50 % to cover other costs including: engineering design, project administration (developer and City staff), construction management and inspection, and legal costs.

APPENDIX F

Risk Assessment – COF & LOF Results



Legend

- WQCP
- Lift Stations

Consequence of Failure

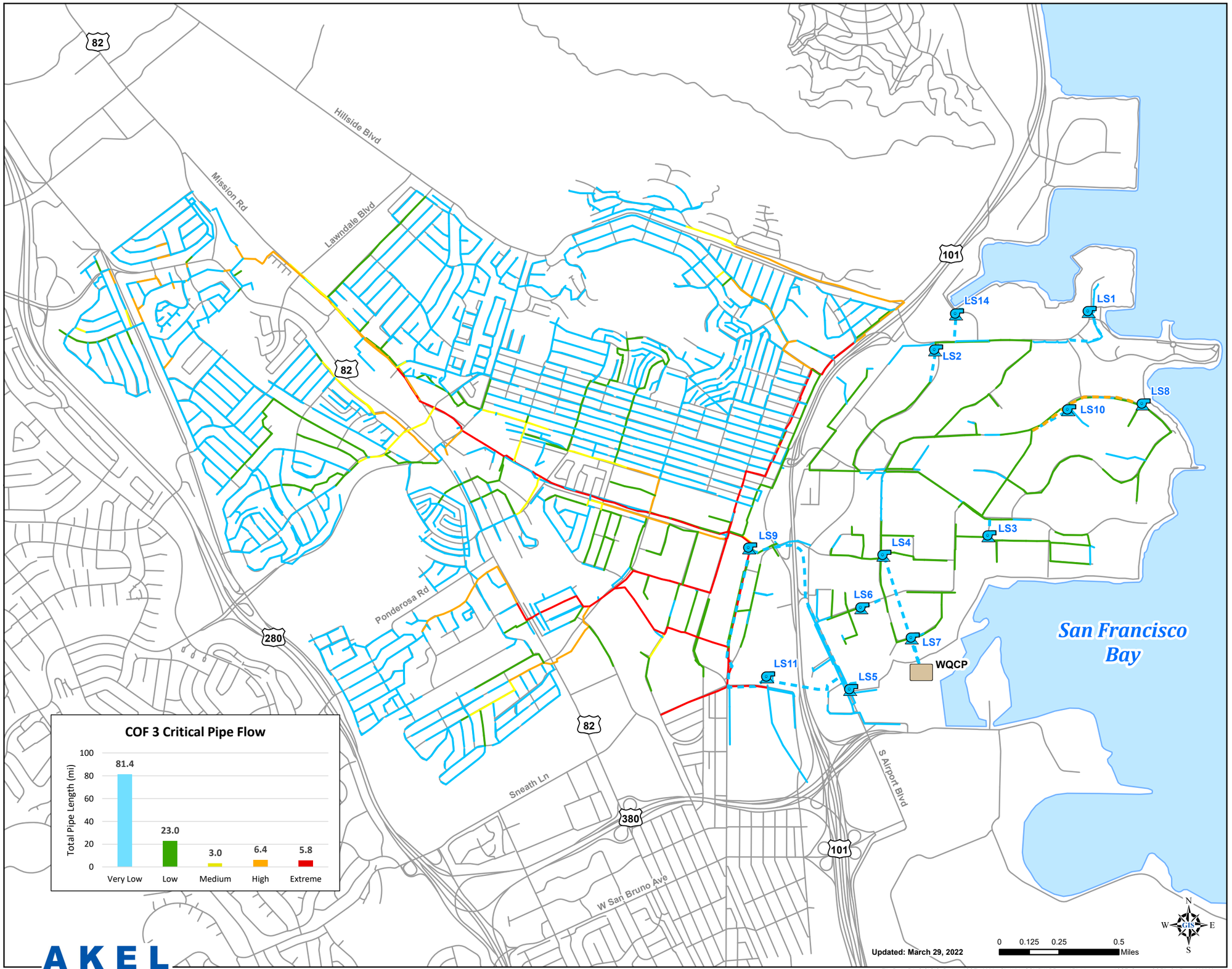
- Very Low (6" or Smaller) (72.9 Miles, 60.9%)
- Low (8" - 10") (24.2 Miles, 20.2%)
- Moderate (12" - 15") (10.1 Miles, 8.4%)
- High (18" - 21") (5.5 Miles, 4.6%)
- Extreme (Larger than 21") (7.0 Miles, 5.9%)
- Street Centerlines

PRELIMINARY

COF 1
Pipeline Diameter

Condition Assessment
Existing Sewer System
City of South San Francisco

AKEL ENGINEERING GROUP, INC.



Legend

- WQCP
- Lift Stations

Consequence of Failure

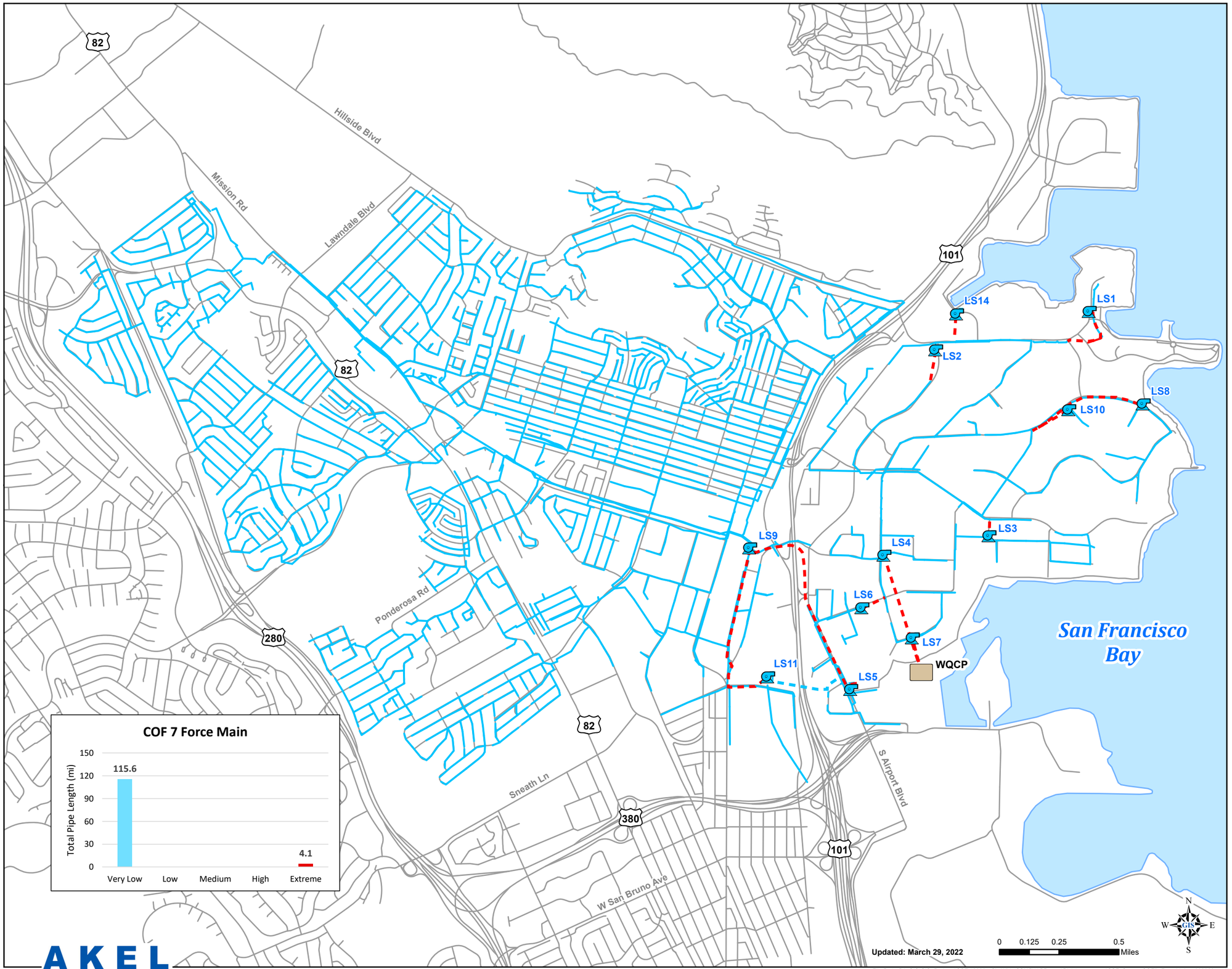
- Very Low (Unknown) (81.4 Miles, 67.5%)
- Low (500 gpm or Less) (23.0 Miles, 19.3%)
- Moderate (500 - 1,000 gpm) (3.0 Miles, 2.5%)
- High (1,000 - 2,500 gpm) (6.4 Miles, 5.4%)
- Extreme (2,500 gpm or More) (5.8 Miles, 4.8%)
- Street Centerlines

PRELIMINARY

COF 2
Critical Pipe Flow

Condition Assessment
Existing Sewer System
City of South San Francisco

AKEL ENGINEERING GROUP, INC.



Legend

- WQCP
- Lift Stations

Consequence of Failure

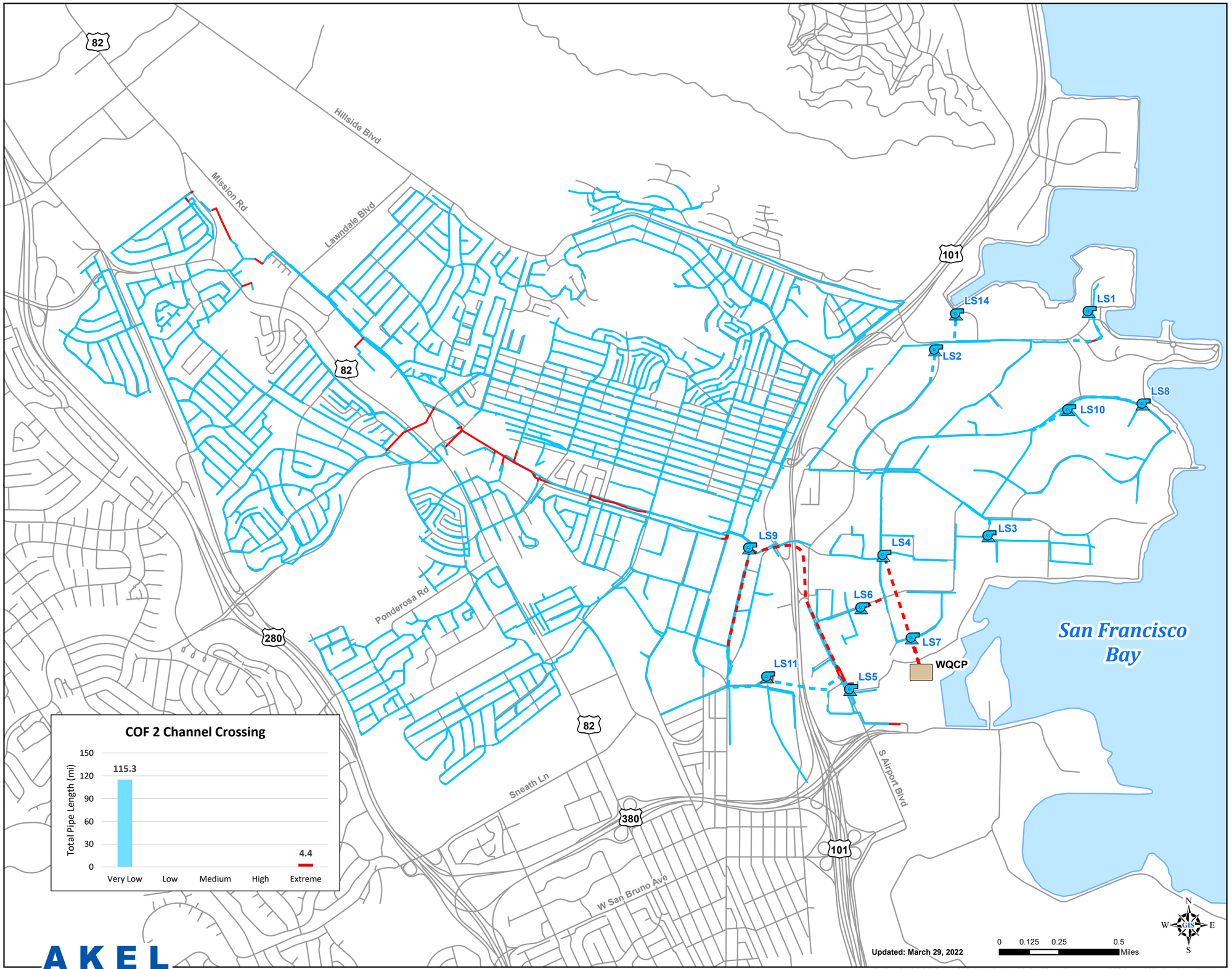
- Very Low (Gravity Main) (115.6 Miles, 96.6%)
- Extreme (Force Main) (4.1 Miles, 3.4%)
- Street Centerlines

PRELIMINARY

COF 3
Force Mains

Condition Assessment
Existing Sewer System
City of South San Francisco

AKEL ENGINEERING GROUP, INC.



Legend

- WQCP
- Lift Stations

Consequence of Failure

- Very Low (Other Mains) (115.3 Miles, 96.3%)
- Extreme (Channel Crossing) (4.4 Miles, 3.7%)
- Street Centerlines

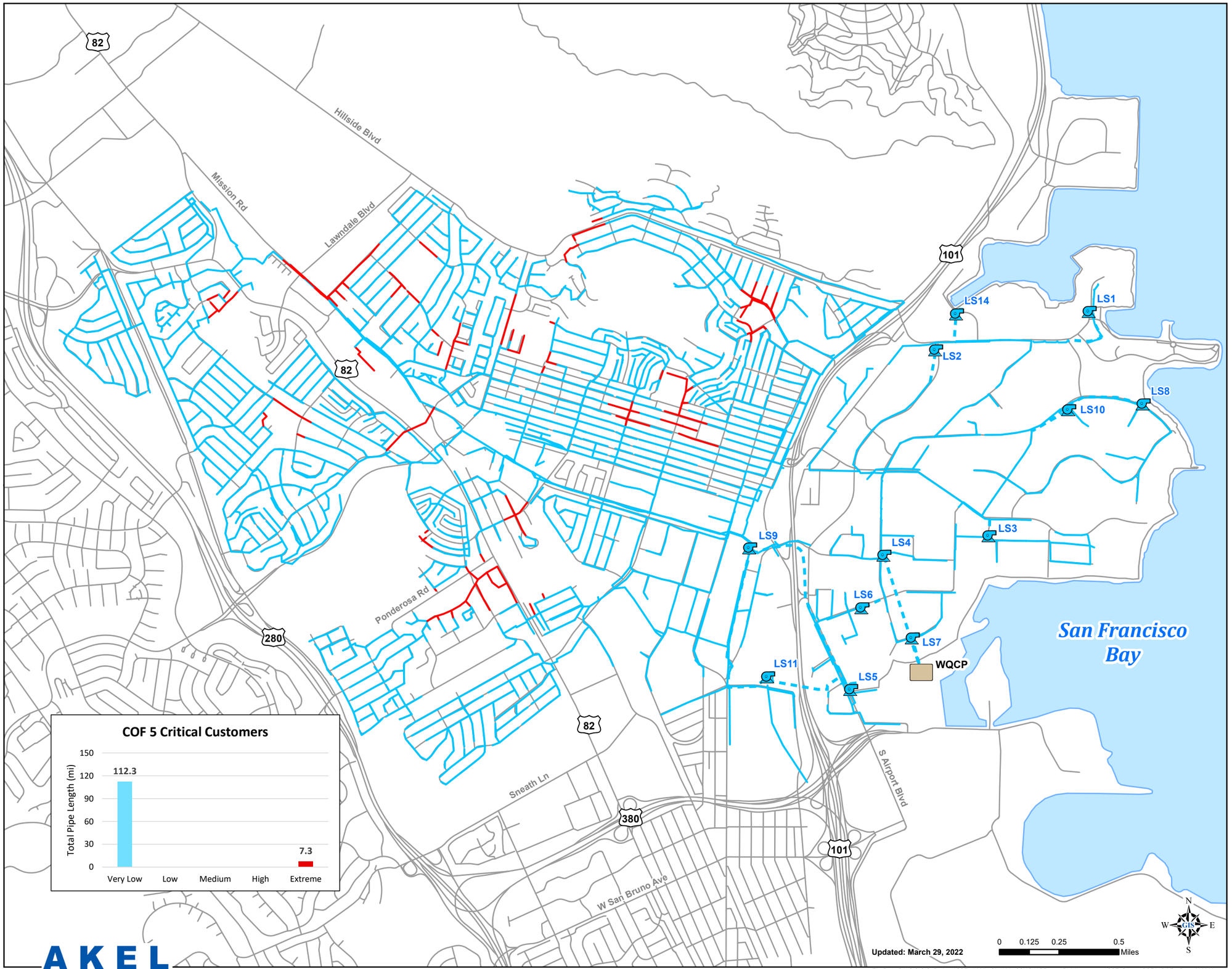
PRELIMINARY

COF 4
Channel Crossing

Condition Assessment
Existing Sewer System
City of South San Francisco

AKEL ENGINEERING GROUP, INC.

File Path: P:\xGIS\GIS_Projects\SSF\180201-CityWide SSMP\IAPReport\RiskAssessment\SSF_Sewer_COF2_ChanCross_032922.mxd



File Path: P:\xGIS\GIS_Projects\SSF\180201-CityWide SSMP\IAPReport\RiskAssessment\SSF_Sewer_COF5_CritFacProx_032922.mxd

Legend

- WQCP
- Lift Stations

Consequence of Failure

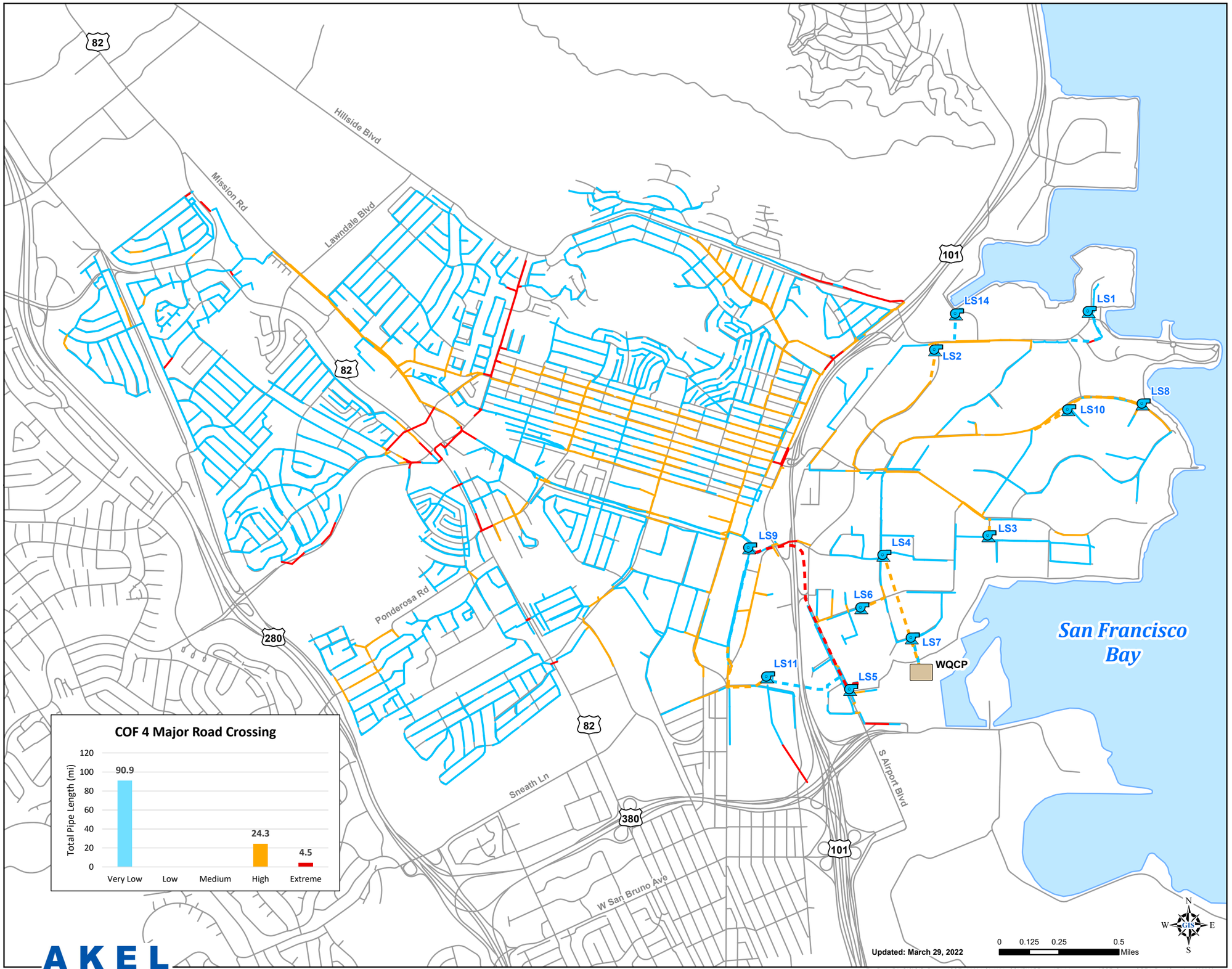
- Very Low (Other Mains) (112.3 Miles, 93.9%)
- Extreme (Critical Customers) (7.3 Miles, 6.1%)
- Street Centerlines

PRELIMINARY

COF 5
Critical Facility Proximity

Condition Assessment
Existing Sewer System
City of South San Francisco

AKEL ENGINEERING GROUP, INC.



Legend

- WQCP
- Lift Stations

Consequence of Failure

- Very Low (Other Mains) (90.9 Miles, 75.9%)
- High (Within Arterials) (24.3 Miles, 20.3%)
- Extreme (Within Highways) (4.5 Miles, 3.8%)
- Street Centerlines

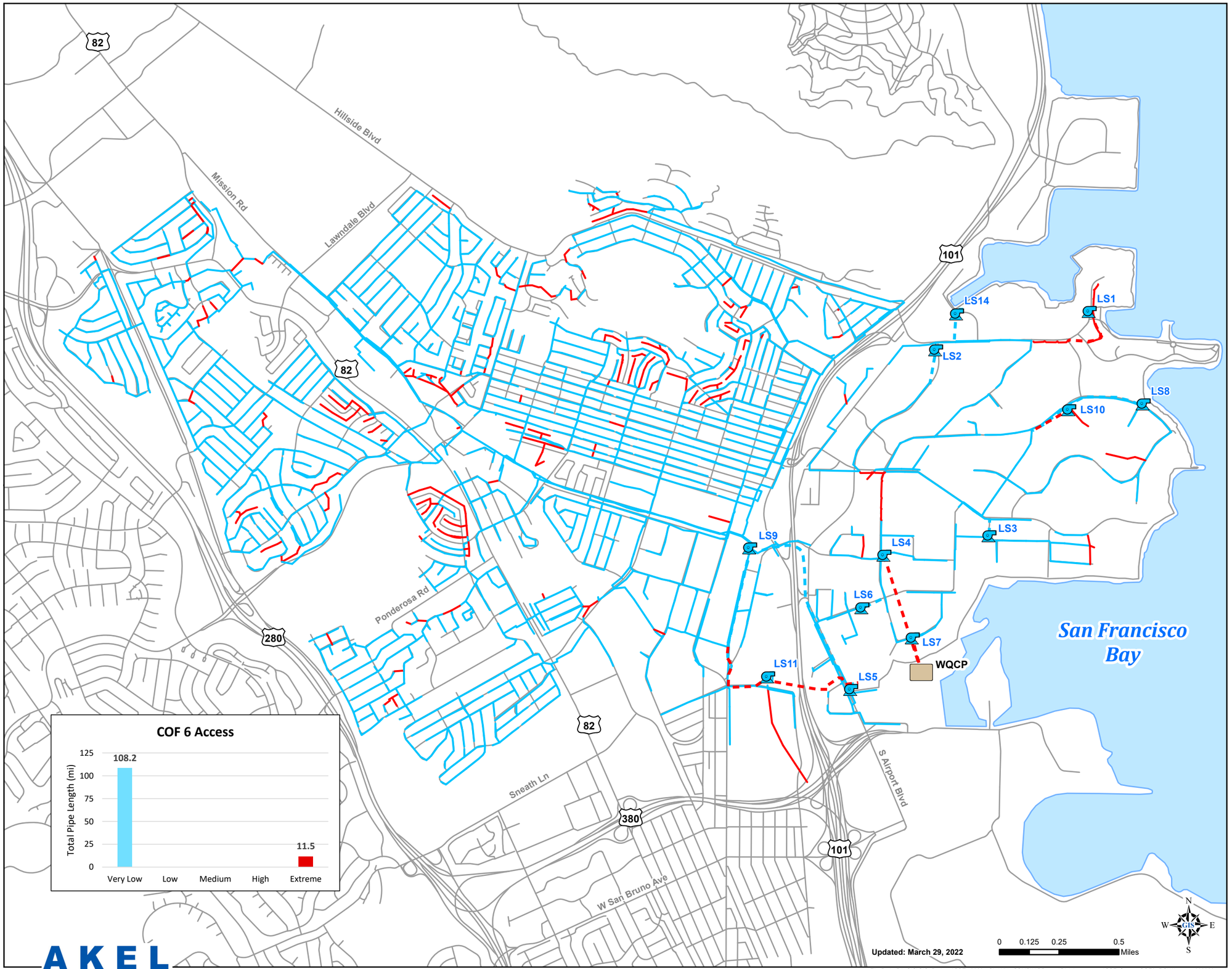
PRELIMINARY

COF 6
Major Road Crossing

Condition Assessment
Existing Sewer System
City of South San Francisco

AKEL ENGINEERING GROUP, INC.

File Path: P:\xGIS\GIS_Projects\SSF\180201-CityWide SSMP\IAPReport\RiskAssessment\SSF_Sewer_COF4_RoadCrossing_032922.mxd



Legend

- WQCP
- Lift Stations

Consequence of Failure

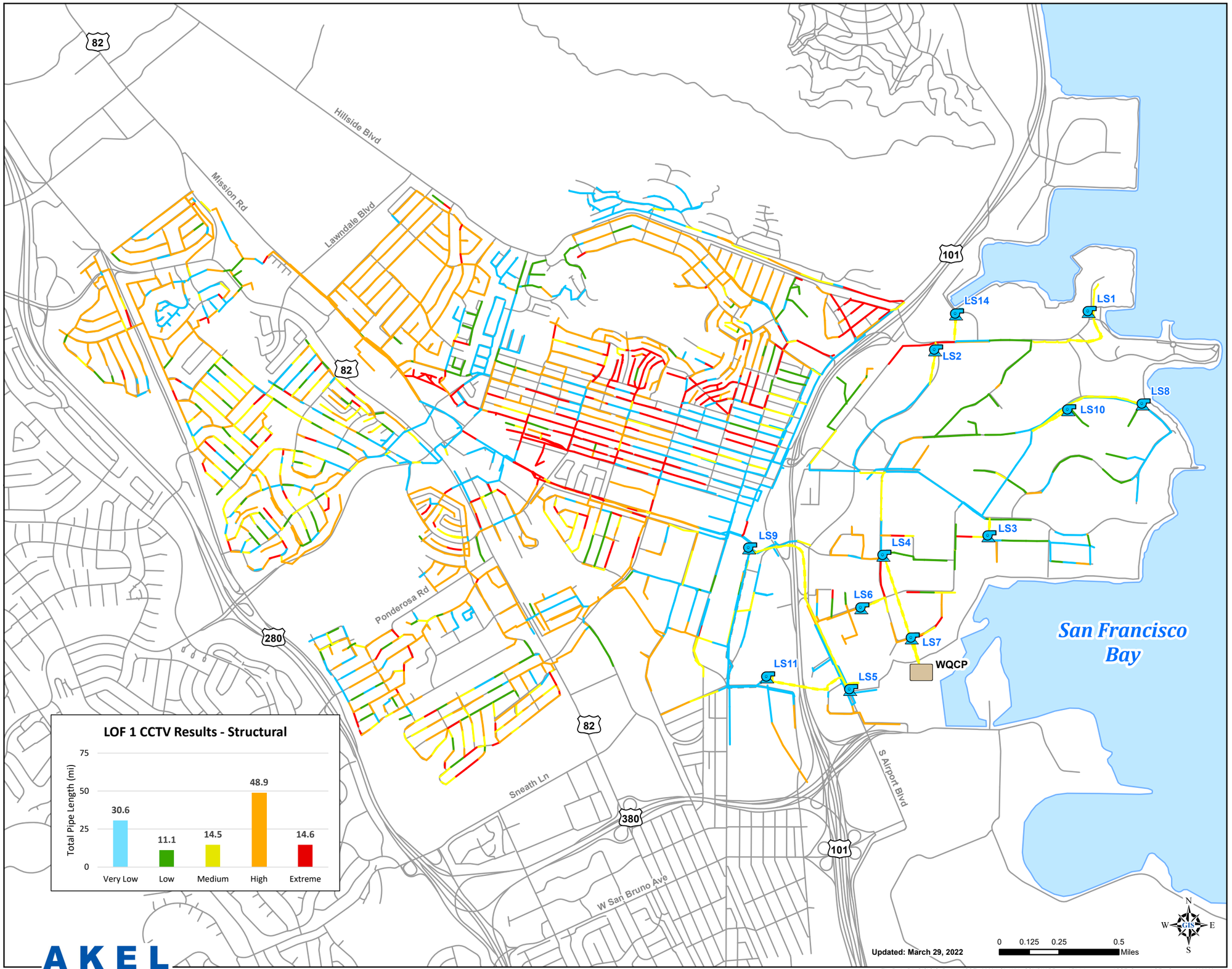
- Very Low (Other Mains) (108.2 Miles, 90.4%)
- Extreme (Outside ROW) (11.5 Miles, 9.6%)
- Street Centerlines

PRELIMINARY

COF 7
ROW Access

Condition Assessment
Existing Sewer System
City of South San Francisco

AKEL ENGINEERING GROUP, INC.



Legend

- WQCP
- Lift Stations

Likelihood of Failure

- Very Low (Peak Score = 1) (30.6 Miles, 25.6%)
- Low (Peak Score = 2) (11.1 Miles, 9.3%)
- Moderate (Peak Score = 3) (14.5 Miles, 12.1%)
- High (Peak Score = 4) (48.9 Miles, 40.8%)
- Extreme (Peak Score = 5) (14.6 Miles, 12.2%)
- Street Centerlines

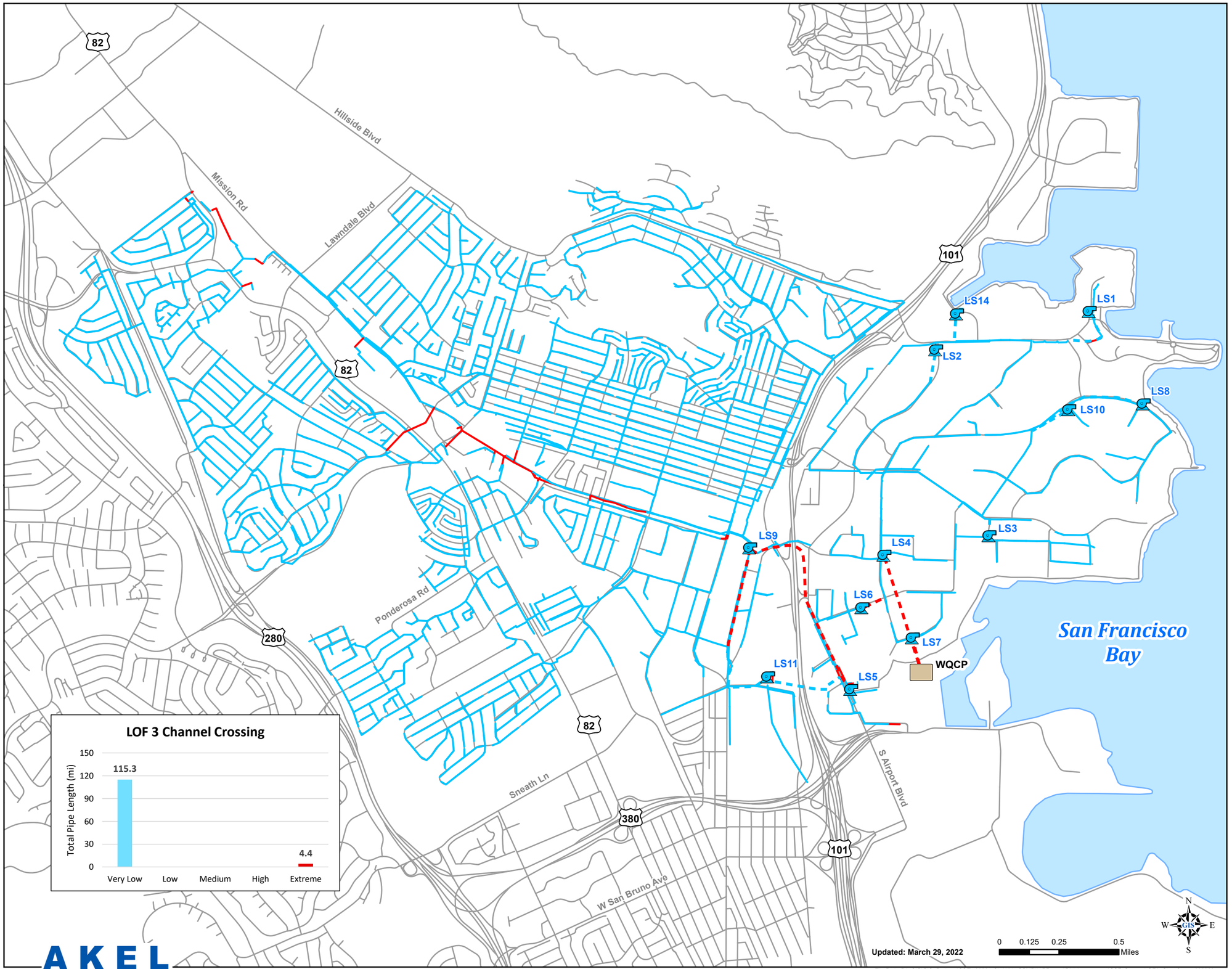
PRELIMINARY

LOF 1
CCTV Results - Structural

Condition Assessment
Existing Sewer System
City of South San Francisco

AKEL ENGINEERING GROUP, INC.

File Path: P:\xGIS\GIS_Projects\SSF\180201-CityWide SSMP\IAPReport\RiskAssessment\SSF_Sewer_LOF1_Structual_032922.mxd



Legend

- WQCP
- Lift Stations

Likelihood of Failure

- Very Low (Other Mains) (115.3 Miles, 96.3%)
- Extreme (Channel Crossing) (4.4 Miles, 3.7%)
- Street Centerlines

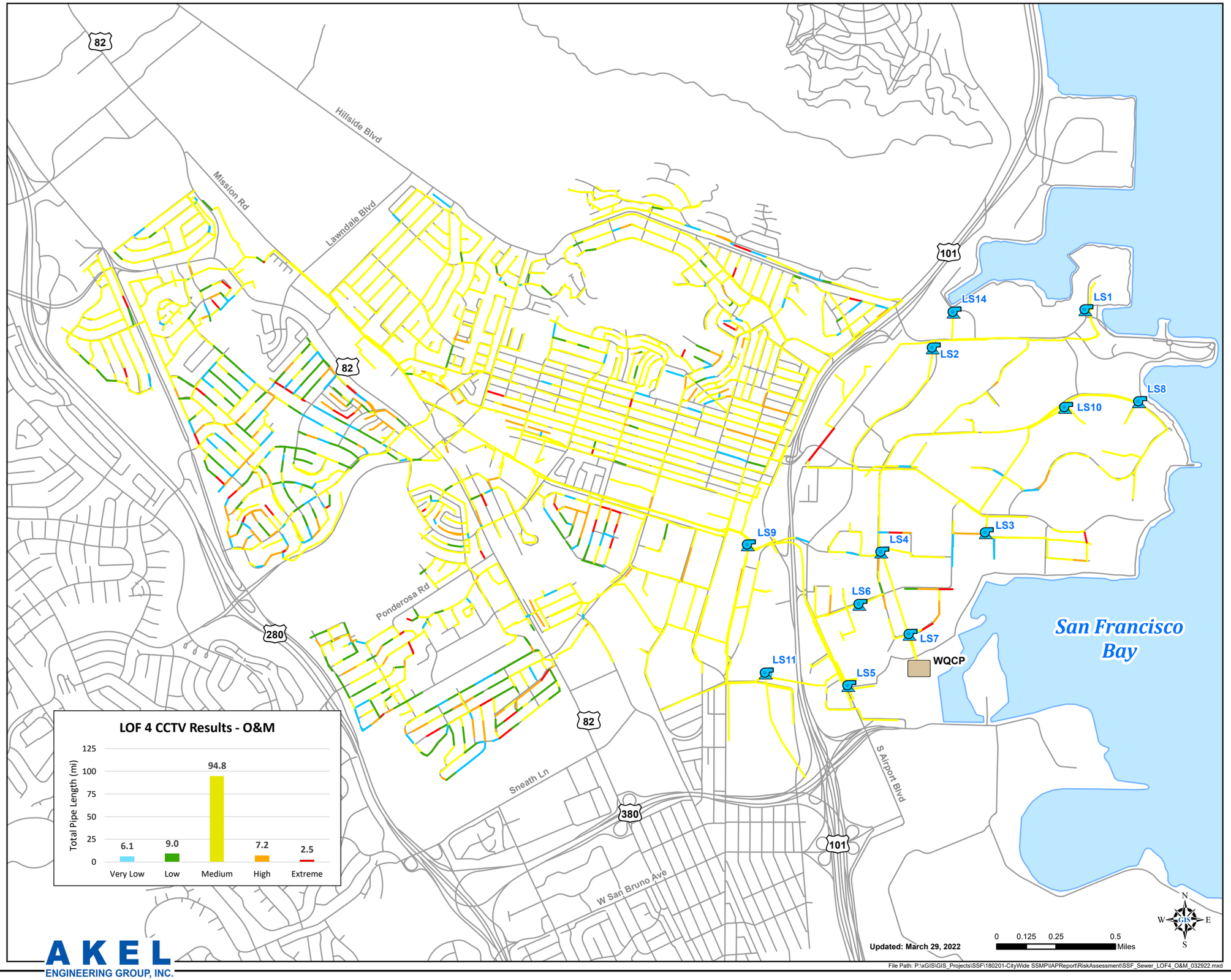
PRELIMINARY

LOF 3
Channel Crossing

Condition Assessment
Existing Sewer System
City of South San Francisco

AKEL ENGINEERING GROUP, INC.

File Path: P:\xGIS\GIS_Projects\SSF\180201-CityWide SSMP\IAPReport\RiskAssessment\SSF_Sewer_LOF3_ChanCross_032922.mxd



Legend

- WQCP
- Lift Stations

Likelihood of Failure

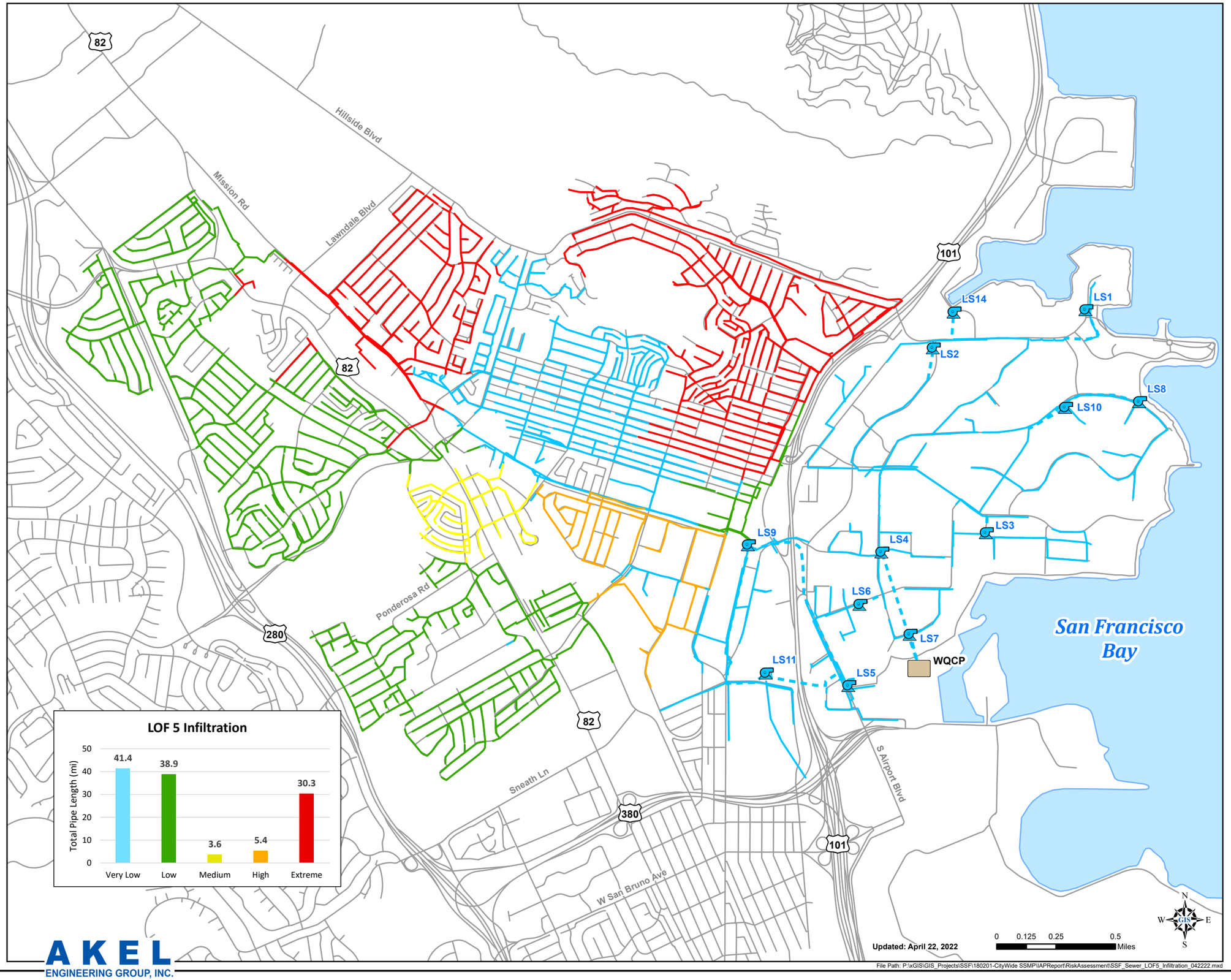
- Very Low (Peak Score = 1) (6.1 Miles, 5.1%)
- Low (Peak Score = 2) (9.0 Miles, 7.6%)
- Moderate (Peak Score = 3) (94.8 Miles, 79.2%)
- High (Peak Score = 4) (7.2 Miles, 6.0%)
- Extreme (Peak Score = 5) (2.5 Miles, 2.1%)
- Street Centerlines

PRELIMINARY

LOF 4
CCTV Results - O&M

Condition Assessment
Existing Sewer System
City of South San Francisco

AKEL ENGINEERING GROUP, INC.



Legend

- WQCP
- Lift Stations

Likelihood of Failure

- Very Low (41.4 Miles, 34.6%)
- Low (38.9 Miles, 32.5%)
- Moderate (3.6 Miles, 3.0%)
- High (5.4 Miles, 4.5%)
- Extreme (30.3 Miles, 25.3%)
- Street Centerlines

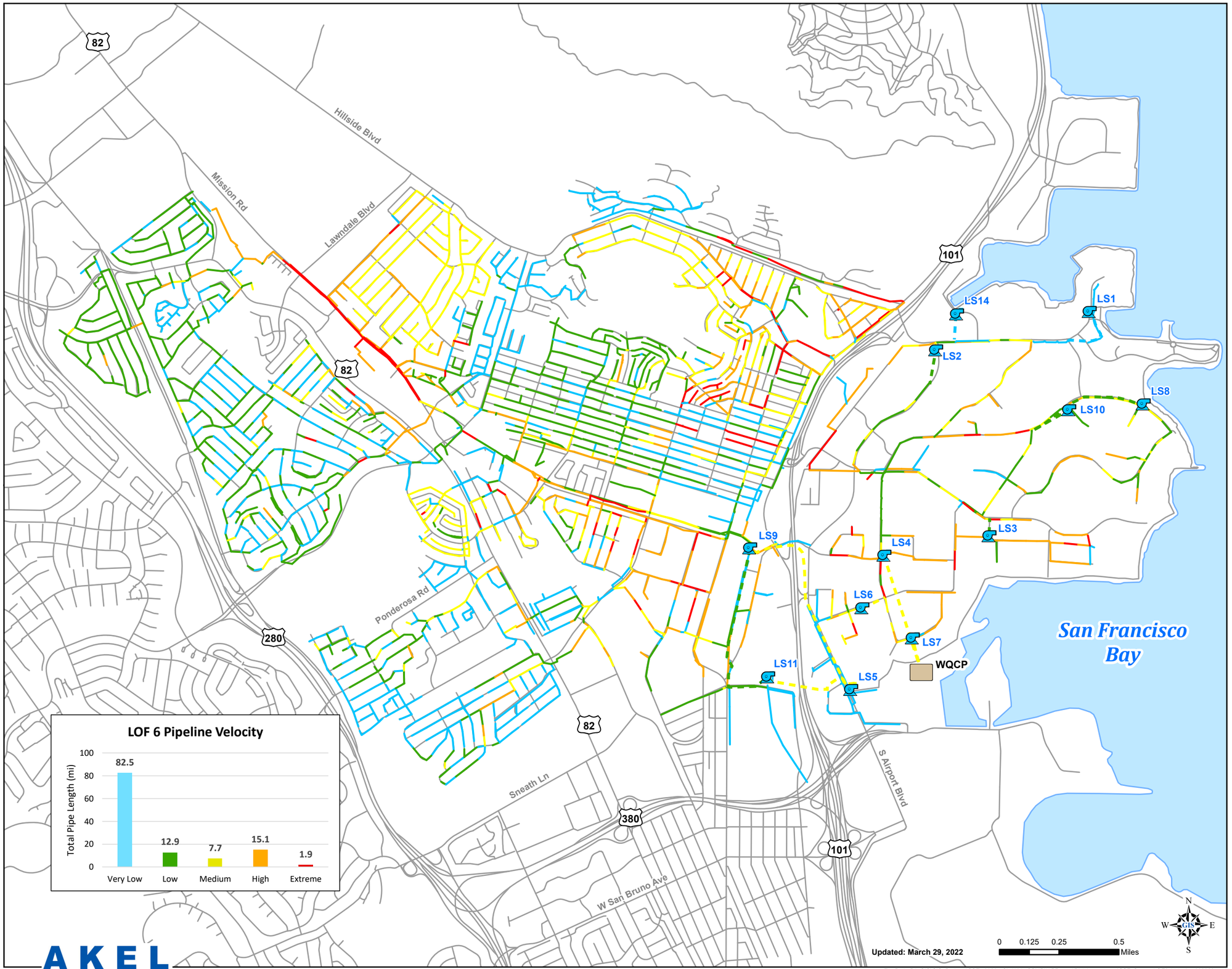
PRELIMINARY

LOF 5
Infiltration Per Meter Basin

Condition Assessment
Existing Sewer System
City of South San Francisco

AKEL ENGINEERING GROUP, INC.

File Path: P:\xGIS\GIS_Projects\SSF\180201-CityWide SSMP\IAPReport\RiskAssessment\SSF_Sewer_LOF5_Infiltration_042222.mxd



Legend

- WQCP
- Lift Stations

Likelihood of Failure

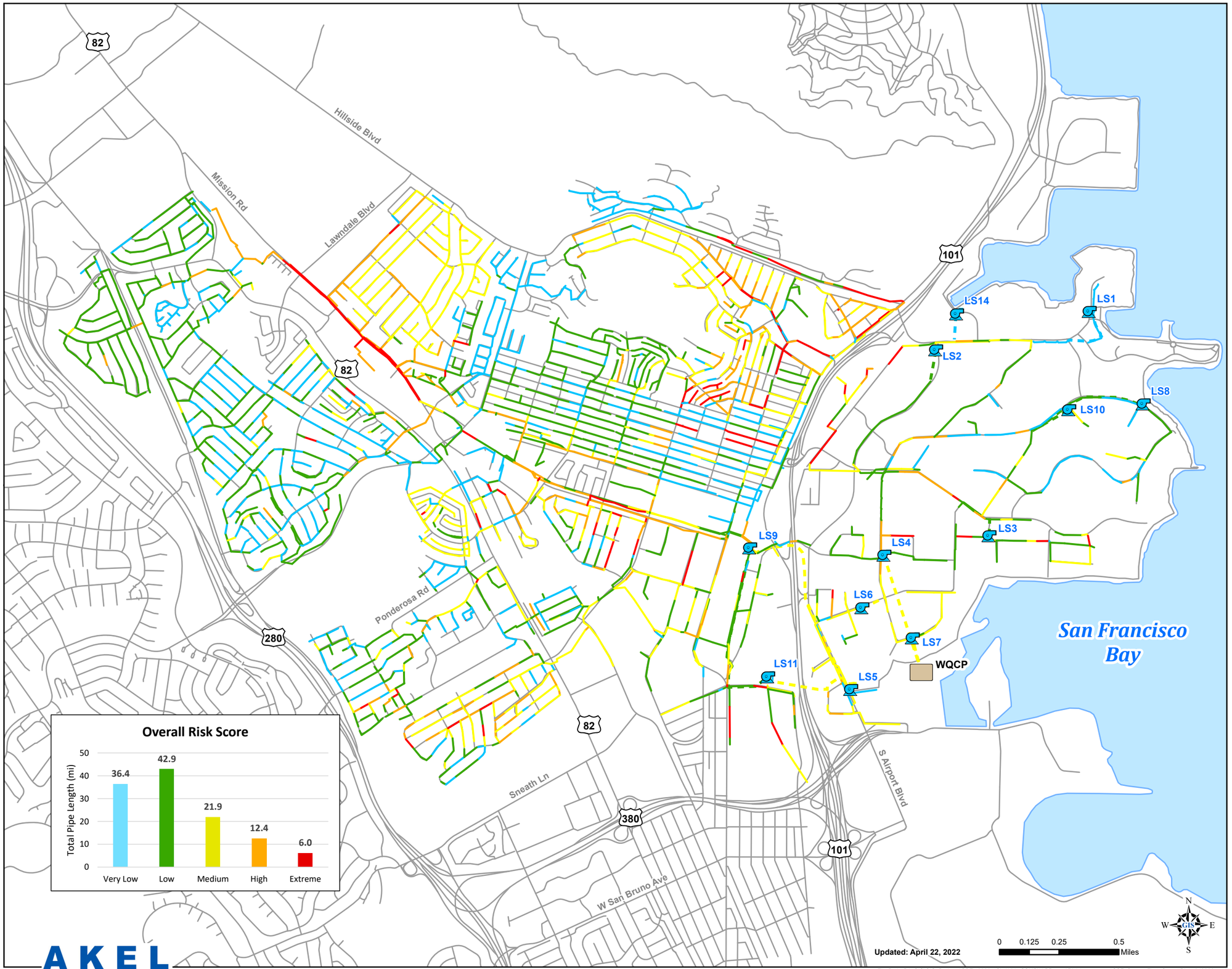
- Very Low (Unknown) (82.5 Miles, 68.9%)
- Low (Greater than 5 ft/s) (12.9 Miles, 10.7%)
- Moderate (3.5 - 5 ft/s) (7.7 Miles, 6.5%)
- High (2 - 3.5 ft/s) (15.1 Miles, 12.2%)
- Extreme (2 ft/s or Less) (1.9 Miles, 1.6%)
- Street Centerlines

PRELIMINARY

LOF 6
Pipeline Velocity

Condition Assessment
Existing Sewer System
City of South San Francisco

AKEL ENGINEERING GROUP, INC.



Legend

- WQCP
- Lift Stations

Overall Risk

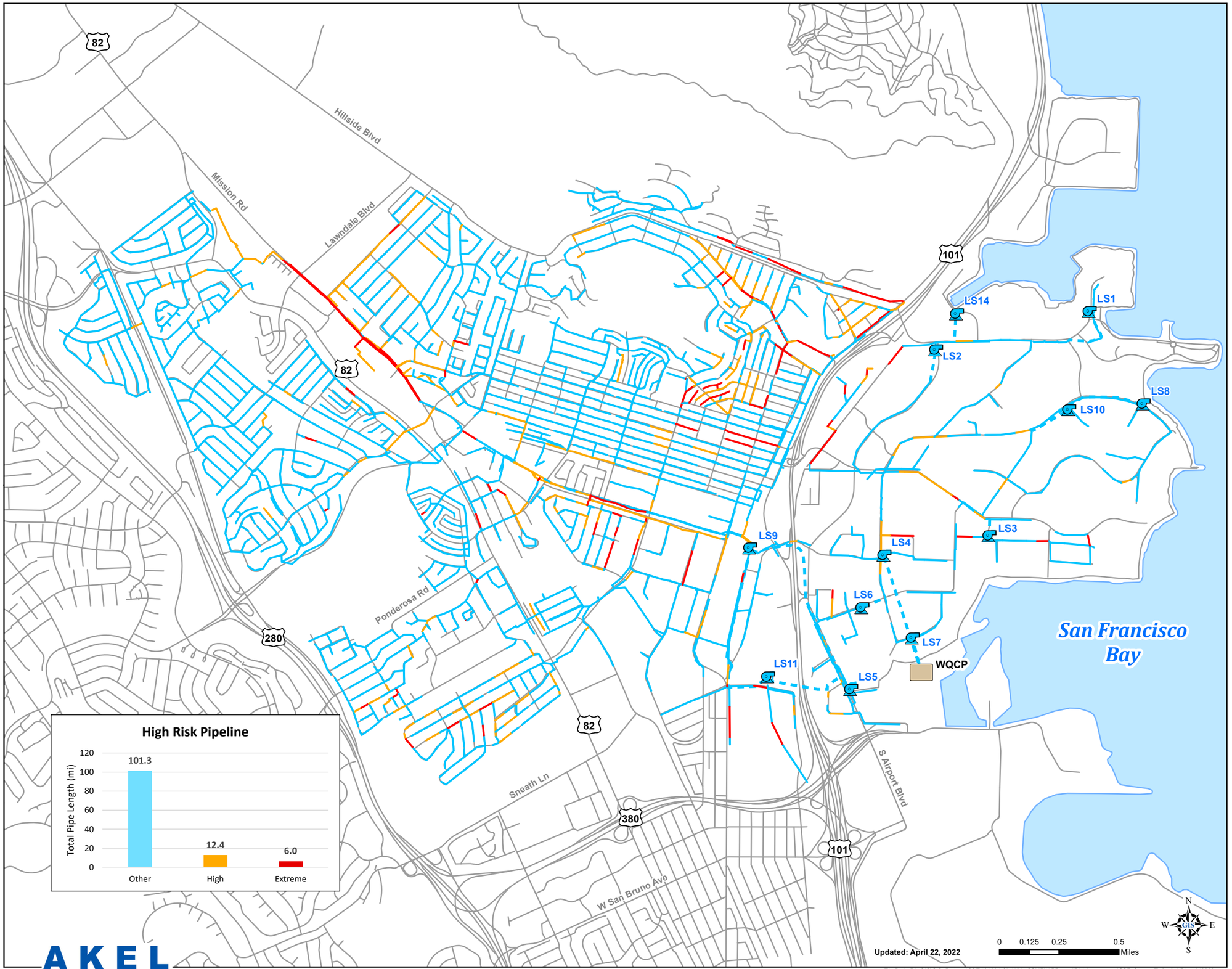
- Very Low (36.4 Miles, 30.4%)
- Low (42.9 Miles, 35.9%)
- Moderate (21.9 Miles, 18.3%)
- High (12.4 Miles, 10.4%)
- Extreme (6.0 Miles, 5.0%)
- Street Centerlines

PRELIMINARY

Figure 1
Overall Pipeline Risk

Condition Assessment
Existing Sewer System
City of South San Francisco

AKEL ENGINEERING GROUP, INC.



Legend

- WQCP
- Lift Stations

High Risk

- Other (101.3 Miles, 84.6%)
- High (12.4 Miles, 10.4%)
- Extreme (6.0 Miles, 5.0%)
- Street Centerlines

PRELIMINARY

Figure 2
High Pipeline Risk

Condition Assessment
Existing Sewer System
City of South San Francisco

AKEL ENGINEERING GROUP, INC.

File Path: P:\xGIS\GIS_Projects\SSF\180201-CityWide SSMP\IAPReport\RiskAssessment\SSF_Sewer_Fig2_HighRisk_042222.mxd