FINAL REPORT • JUNE 2013

comprehensive WASTEWATER MASTER PLAN

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Rodeo Sanitary District

COMPREHENSIVE WASTEWATER MASTER PLAN

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RODEO SANITARY DISTRICT

COMPREHENSIVE WASTEWATER MASTER PLAN

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EXECUTIVE SUMMARY

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1.0 PURPOSE

This report is an executive summary of the Comprehensive Wastewater Master Plan (CWWMP) prepared for the Rodeo Sanitary District (District). The primary objectives of the CWWMP are to assess the ability of existing facilities to provide reliable wastewater collection and treatment, plan for future regulations, and ultimately develop a prioritized and comprehensive 20-year Capital Improvement Program (CIP) that address the District's current and future needs.

Included in this report is a brief summary of the content and key findings and recommendations from nine (9) technical memoranda (TMs) prepared for the CWWMP. For more information in any subject area, the reader is directed to the individual TMs. The CWWMP is organized as follows:

- Executive Summary
- TM No. 1 – CWWMP Introduction
- TM No. 2 – Regulatory Requirements
- TM No. 3 – Assessment of Existing Collection System Conditions
- TM No. 4 – Wastewater Collection System Model and Collection System Performance
- TM No. 5 – Wastewater Treatment Plant Assessment
- TM No. 6 – Collection System and Treatment Plant Alternatives
- TM No. 7 – Recommended Collection System and Treatment Plant Improvement Plan
- TM No. 8 – Capital Improvement Program
- TM No. 9 – CIP Implementation and Financial Analysis

2.0 CWWMP INTRODUCTION

TM No. 1 includes a description of the District's service area and basic planning parameters for the CWWMP which include service area growth projections, the District's goals and objectives, target levels of service, and alternative evaluation criteria. The key findings and recommendations are:

- The District's service area is located in Rodeo in Contra Costa County and encompass approximately 1.4 square miles.

- The District provides sewer service to approximately 2,500 residential and commercial customers, which corresponds to an estimated population of 6,974 in 2010. The current average dry weather flow (ADWF) is 0.58 million gallons per day (mgd).

- The population within the service area is expected to increase by 15 percent within the 20-year planning period of the CWWMP, which results in a population projection of 7,990 in 2035. The corresponding flow projection in 2035 is 0.67 mgd, which is significantly less than the wastewater treatment plant's (WWTP)'s rated National Pollutant Discharge Elimination System (NPDES) permit capacity of 1.14 mgd. This means that growth will not be a key driver for the District.

- For projects identified in the CWWMP, cost estimates are developed following the Association for the Advancement of Cost Engineering (AACE) International Recommended Practice No. 18R-97 estimate class 4. Class 4 estimates are expected to have an accuracy ranging from -30% to +50%. Capital costs will be presented based on an engineering news record (ENR) construction cost index of 10355, which reflects current (2013) conditions in the San Francisco Bay Area.

- The District's mission is "To safely provide the highest level of wastewater collection and treatment as economically possible for the people of Rodeo while protecting the sensitive ecosystem of the San Pablo Bay and the overall environment." To be consistent with the District's mission, level of service (LOS) goals and criteria were established so that alternatives could be quantitatively evaluated with respect to these goals. The four (4) general LOS categories include:
  - Environmental/Regulatory Compliance
  - Operational/ System Reliability
  - Financial Management
  - Social/Customer Impact

3.0 REGULATORY REQUIREMENTS

TM No. 2 provides an overview of the current, pending, and future regulatory requirements that influence operation, maintenance, and capital improvement needs for the District's treatment and collection system. The following types of regulations are expected to be seen in the CWWMP planning period:

- Nutrient Removal - If the United States Environmental Protection Agency (US EPA) modifies the definition of secondary treatment to include nutrient removal, the WWTP will be required to remove nitrogen and phosphorus.

- Microconstituents and Bioaccumulative Constituents - The current trend of increasing regulation on these constituents will likely result in future monitoring requirements and ultimately new effluent limits. The District may start seeing these requirements as early as the next ten (10) to fifteen (15) years.

- Biosolids - Landfilling and land application of biosolids are becoming increasingly restricted and fewer landfills are accepting biosolids. This trend is requiring diversification of biosolids disposal options and production of Class A material.

- Air Emissions - Recently amended air emissions regulations for new internal combustion engines may require emission control equipment.

- On-Site Stormwater Management - Application of industrial stormwater management requirements to stormwater at wastewater treatment facilities may require collection and treatment of all on-site stormwater.

- Collection System - Increased monitoring and reporting of all types of sanitary sewer overflows (SSO) will require increased operation and maintenance (O&M).

4.0 ASSESSMENT OF EXISTING COLLECTION SYSTEM CONDITIONS

TM No. 3 provides an overview of the existing collection system and its condition. The key findings and recommendations are:

- At the time the collection system assessment was performed, approximately 70 percent of the sewers had undergone video inspections (i.e. closed circuit television or CCTV). The CCTV data available at that time was used to identify and prioritize rehabilitation and replacement needs in the sewers.

- The available CCTV data showed that more than 50 percent of the sewers inspected have segments with structural condition rankings of 4 or 5 based on the National Association of Sewer Services Companies (NASSCO) Pipeline Assessment and Certification Program (PACP) scoring system. Pipeline segments with structural condition rankings of 4 of 5 are considered to be in poor condition and were recommended for rehabilitation or replacement.

- District staff has indicated that since the collection system assessment was performed, the District has continued its CCTV inspection program. To date, almost 95 percent of the entire system has been inspected. The more recently completed inspections were in newer areas of the collection system, which the District has generally found to be in better condition than the rest of the system.

- A comparison of sewer slopes and diameters against the minimum velocity required for scouring showed a number of areas where insufficient slope was available, making the system in those areas particularly susceptible to sedimentation. It is recommended that pipe segments with operations and maintenance (O&M) condition rankings of 4 or 5 and slopes less than scouring velocity be regularly cleaned and that the slope be checked when pipe segments are replaced as part of the capital improvements project.

- A complete condition assessment of manhole structures is recommended by a Manhole Assessment and Certification Program (MACP) certified inspector.
- The collection system has extremely high rates of infiltration and inflow (I&I), particularly in the older sections of the District service area. The influent pump station has a firm capacity (one pump in standby mode) of 3.5 million gallons per day (mgd) and a total capacity of 4.6 mgd with all pumps in operation. The collection system hydraulic capacity without overflows is estimated at 5.1 mgd.
- It is recommended that the wastewater treatment plant's computerized maintenance management system be expanded to include the sewer collection system.

5.0 WASTEWATER COLLECTION SYSTEM MODEL AND COLLECTION SYSTEM PERFORMANCE

TM No. 4 summarizes the criteria and assumptions for evaluating the hydraulic capacity and performance of the District's collection system. The key findings and recommendations are:

- A four-month flow monitoring program was implemented between November 22, 2011 and March 29, 2012 in twelve (12) locations in the collection system. Four (4) storm events were captured and the data was used to update and calibrate a hydraulic model used by Advanced Hydro Engineering.
- Key assumptions in the analysis include:
  - A manning's number (i.e. friction factor) of n = 0.013.
  - During a 5-year 24-hour design storm, it is acceptable for the sewers to be up to 80 percent full (i.e. d/D of 0.8).
  - During a 10-year 24-hour design storm, it is acceptable for the water levels to rise to within 3 feet of the top of the manhole rims.
- The modeled peak wet weather flow (PWWF) in the collection system capacity is estimated to be 6.9 and 7.9 mgd during a 5-year and a 10-year 24-hour design storm, respectively. The current system capacity is less than this, which means that during these extreme wet weather periods, some of the flow will be stored in the collection system causing the sewers to be surcharged. It is recommended that expansions be implemented at the pump station and the 10-inch sewer downstream of manhole (MH) 100.

- An economical approach to alleviate capacity limitations in the system is to divert sewer flows from undersized sewers to the existing Parker Avenue 21-inch trunk sewer to the extent possible, upsize a small number of segments, and then replace any remaining pipe that is undersized.

- Drainage basins 406 and 408 serve approximately 11 acres of residential area in the eastern part of the service area adjacent to California Street. Although these are small basins, the sewers have the highest I&I rate in the service area. It is estimated that approximately 79.3 and 47.6 percent of the rain falling in these basins enters the sewers during design storms. Rehabilitation in these two areas is recommended as a first priority.

6.0 WASTEWATER TREATMENT PLANT ASSESSMENT

TM No. 5 provides an overview of the WWTP's condition, process performance, and its hydraulic and treatment capacity. The key findings and recommendations are:

- A condition assessment of the WWTP was performed to identify rehabilitation and replacement needs and projects. The projects are categorized as near term (i.e recommended for implementation within the next five years) or long term (i.e. recommended for implementation within five to twenty years) projects.

- The WWTP has sufficient hydraulic capacity for the NPDES permitted average dry weather flow ADWF of 1.14 mgd and the PWWF of 3.4 mgd without overtopping structures. However, at PWWFs up to 4.6 mgd, some unit processes operate at higher than recommended loadings and less than recommended freeboard. In addition, the headworks is at risk of overtopping.

- Most of the unit processes have performed well and have sufficient carbonaceous biochemical oxygen demand (BOD_5) treatment capacity to handle flows up to the rated NPDES permit capacity of the WWTP. As flows approach the rated NPDES permit capacity, capital projects will be needed to increase the capacity of the primary clarifiers and return activated sludge pumping system. In addition, operational changes may be needed for the rotary drum thickener and anaerobic digesters.

7.0 COLLECTION SYSTEM AND TREATMENT PLANT ALTERNATIVES

TM No. 6 develops three (3) system-wide alternatives for the collection, treatment, and disposal of wastewater in the District. The alternatives were developed to address capacity and rehabilitation and replacement needs as described in TMs No. 3 through 5. A description of the three alternatives and key findings and recommendations are:

- The three alternatives are:
  - Alternative 1 - Low I&I Reduction - For this alternative, the two drainage basins (406 and 408) that have the highest amount of infiltration and inflow (I&I) are rehabilitated, effectively reducing the PWWF to 5.9 mgd during the 5-year, 24-hour design storm. Various rehabilitation and capacity improvements are also needed within the collection system and WWTP. The total project cost of this alternative is estimated at $39.8 million in 2013 dollars.
  - Alternative 2 - Medium I&I Reduction - For this alternative, three drainage basins (406, 408, and 324) are rehabilitated to achieve more I&I reduction, which reduces the PWWF to 5.1 mgd. Some rehabilitation and capacity improvements within the system are still needed. The total project cost of this alternative is estimated at $41.9 million in 2013 dollars.
  - Alternative 3 - High I&I Reduction - For this alternative, several drainage basins (406, 408, 324, 54, 83, 98, 61, 368, 59, and 477) are rehabilitated, potentially reducing the PWWF to 3.8 mgd. With such a significant reduction in the PWWF, few capacity improvements are needed within the collection system or WWTP. The total project cost of this alternative is estimated at $67.2 million in 2013 dollars.
- Implementing an improvement program based on Alternative 1 or 2 appears to be more cost-effective when compared to Alternative 3. Based on these findings, the District should proceed with I&I reduction projects in Basins 406 and 408 as soon as possible and closely monitor the resultant reductions in PWWF. Alternative 2 also has the benefit that additional land is not needed to construct the WWTP improvements.
- Note that the total project costs do not include the improvements anticipated at the WWTP for future nutrient regulations as those costs would be the same for each of the alternatives. The recommended CIP will include those costs along with the preferred alternative.

8.0 RECOMMENDED COLLECTION SYSTEM AND TREATMENT PLANT IMPROVEMENT PLAN

TM No. 7 includes an evaluation of the three alternatives developed in TM No. 6. The evaluation not only considers cost, but other factors as measured by the LOS criteria developed in TM No. 1. The key findings and recommendations are:

- Alternative 2 - Medium I&I Reduction is the recommended alternative, and best meets the District’s overall vision, goals, and objectives as measured by the LOS criteria. It is recommended that the District should move forward with developing a CIP based on this alternative.

- While Alternative 3 - High I&I Reduction has the same overall score and received higher scores with the regulatory compliance, system reliability, and social impacts LOS categories, those benefits did not outweigh the significantly higher cost.

9.0 CAPITAL IMPROVEMENT PROGRAM

TM No. 8 summarizes the recommended CIP. The CIP is an estimate of the District's capital expenses over the next 20 years to address limitations, rehabilitation needs, and recommended improvements to the WWTP, influent pump station, and collection system. The CIP is intended to assist the District in planning future budgets and making financial decisions. The key findings and recommendations are:

- The District should budget approximately $46.3 million dollars to fund projects over the next 20 years. Costs are total project costs and include construction, engineering, legal, administrative, and permitting costs.

- The CIP budget is based on implementing Alternative 2, which includes various hydraulic improvements at the WWTP, I&I reduction projects for collection system basins 406, 408, and 324, and extensive sewer replacement in the northern portion of the service area to address rehabilitation and replacement needs.

- The CIP budget also includes a project to address anticipated regulatory changes for effluent nitrogen from the WWTP. It is assumed those regulations will take effect in approximately 10 years.

10.0 CIP IMPLEMENTATION AND FINANCIAL ANALYSIS

TM No. 9 summarizes the financial analysis. The financial analysis includes developing a financial model, a customer rate analysis showing the impact of implementing the CIP, a discussion of potential funding alternatives, and an overall financial plan that integrates viable sources of revenue. The key findings and recommendations are:

- The District's CIP will need to be financed primarily through the use of debt in the near term. It is recommended the District seek Clean Water State Revolving Fund (CWSRF) loans in order to minimize the long-term cost of borrow, but also consider traditional municipal bonds as necessary. For the purpose of developing the financial forecast, capital expenditures from FY 2013/14 through FY 2015/16 are assumed to be funded using CWSRF loans, followed by the issuance of traditional municipal bonds for other future capital needs.

- Substantial user rate increases must be implemented to provide revenues sufficient to fund annual debt service obligations based on the projected debt issuances. Based on the recommended CIP in TM No. 8, the District would be required to increase rates 23 percent per year in FY 2013/14 through FY 2015/16.

- After initial review of the projected rate increases, the District concluded that the fiscal impacts are not sustainable for the community. Furthermore, while attempting to complete the majority of the sewer system improvements in the first few years may lower the risk of system failures, it does not allow for much opportunity to evaluate and fine tune the effectiveness of the I&I reduction projects. As a result, the District directed Carollo to revise the CIP by adjusting the project timing, and even deferring some of the low priority projects to beyond the 20-year planning period (e.g. hydraulic WWTP Hydraulic Improvements and lateral and manhole replacement from Basin 324). The District's revised 20-year CIP budget totals approximately $37.2 million dollars. See Appendix A in TM No. 9 for the revised 20-year CIP budget.

- With these revisions to the CIP, the District plans to initiate a Proposition 218 process to increase rates by 14.38 percent in FY 2013/14, followed by 10 percent increases in both FY 2014/15 and FY 2015/16. Annual rate increases will still be needed after this initial increase, but at more modest levels to keep up with inflation.

- The District Board recommended a review of the success and cost-effectiveness of the I&I reduction and sewer replacement and rehabilitation projects after the third year of CIP implementation. This will allow the District to better prioritize the remaining CIP projects, including those that have been deferred.

- It is recommended that the District initiate the CWSRF loan application process and the revised CIP as soon as feasible.

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RODEO SANITARY DISTRICT
COMPREHENSIVE WASTEWATER MASTER PLAN

TECHNICAL MEMORANDUM NO. 1
CWWMP INTRODUCTION

FINAL
June 2013

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RODEO SANITARY DISTRICT
COMPREHENSIVE WASTEWATER MASTER PLAN

TECHNICAL MEMORANDUM
NO. 1
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CWWMP INTRODUCTION

1.0 PURPOSE

The purpose of this technical memorandum (TM) is to provide an introduction to the Rodeo Sanitary District (District) Comprehensive Wastewater Master Plan (CWWMP). This TM outlines the District goals and objectives, target levels of service, and evaluation criteria to be used in alternative comparison. The TM also summarizes the cost estimating methodology employed in the CWWMP.

2.0 SUMMARY OF KEY FINDINGS

The District is embarking upon a 20-year CWWMP to identify collection system and wastewater treatment plant (WWTP) needs to provide reliable treatment, meet current and future regulations, and develop a prioritized capital improvement program (CIP).

The District has established the following level of service (LOS) goals as part of the CWWMP and developed corresponding alternative evaluation criteria for comparison and selection of preferred alternatives:

- Environmental/Regulatory Compliance:
  - Full compliance with National Pollutant Discharge Elimination System (NPDES) and state permits.
  - Develop a wastewater master plan update at least once every 10 years.
- Operational/ System Reliability:
  - Limit Sanitary Sewer Overflows (SSOs) to once per year.
  - Respond to sewer backups within two hours.
  - No injuries or adverse health effects at WWTP.
  - Evaluate energy efficient alternatives and best practices outlined in the Pacific Gas and Electric (PG&E) Energy Baseline Study for Municipal Wastewater Treatment Plants when replacing plant infrastructure.
  - Enhance facility security and reduce operator nuisance call-outs to no more than five per year.
- Financial Management:
  - Implement at least consumer price index (CPI) pegged adjustment of sewer rates for all customers annually.

- Maintain emergency reserve funds to meet unplanned challenges at 50 percent of annual operating budget.

- Social/Customer Impact:
  - No reactive media coverage (i.e., any media coverage is a result of proactive announcements by the utility).
  - No negative social or economic impact on the community.
  - Provides sufficient wastewater capacity to meet all planned uses in the County General Plan.
  - Engage in discussion with neighboring service providers to identify efficiencies that may result from collaboration.

The WWTP has a rated average dry weather flow (ADWF) capacity of 1.14 millions gallons per day (mgd). The current ADWF observed at the WWTP is approximately 0.58 mgd. Analysis of District population projections suggests that growth will likely not be a key driver of the CWWMP. However, regional solutions to wastewater management may result in diversion of an additional 0.5 mgd ADWF to the WWTP in the future, requiring potential increases in rated treatment capacity at the WWTP.

All costs developed for the CWWMP will be estimated to an Association for the Advancement of Cost Engineering International (AACE International) level 4. Base construction costs will be developed using a 2013 San Francisco Engineering News Record Construction Cost Index (ENRCCI) of 10,355 and appropriate contingencies and markups will be applied to develop project costs. Operations and maintenance costs will be based on the District's current unit costs and alternative life-cycle costs will be developed assuming a capital inflation rate of 5 percent, O&M inflation of 3 percent, interest rate of 5 percent, discount rate of 6 percent, and loan term of 20 years.

3.0 BACKGROUND

The District is embarking upon the CWWMP for its treatment and collection system to develop a prioritized long-term plan for its wastewater facilities. The primary objectives of this endeavor are to:

1. Provide reliable treatment now and in the future,
2. Plan for facilities that are in compliance with current and future regulations, and
3. Develop a comprehensive prioritized 20-year CIP that phases projects and results in reasonable customer rate impacts.

Through treatment plant assessments and studies conducted over the last several years, the District has identified facility needs that must be prioritized and phased appropriately to maximize use of District resources. In planning for these needs, the District must keep in mind both current and future requirements so that current and future investments will address immediate needs and position the District to tackle future challenges.

3.1 Study Area

The District is located in Rodeo in Contra Costa County, on the shore of San Pablo Bay, just across the water from Marin County, Vallejo, and Benicia. The District's boundaries encompass approximately 1.4 square miles. The District provides wastewater collection, treatment, and disposal services, and contracts for solid waste collection services for Rodeo with the Richmond Sanitary Service. The District owns and operates the sewer collection system and a WWTP with a rated ADWF capacity of 1.14 mgd. The District provides sewer service to approximately 2,500 residential and commercial customers in the District service area.

Figure 1.1 provides a map of the District service area. The District serves three non-contiguous service areas: an area of medium density single family residential, north of Willow Avenue; a small area designated for public use west of San Pablo Avenue; and an area primarily designated for heavy industrial use west of Crockett. The District is also providing wastewater collection and treatment services to a large apartment complex located southeast of San Pablo Avenue and the Conoco Refinery. Also being serviced by the District is a number of single family homes located north of the District's eastern boundary along Viewpoint Avenue. Adjacent wastewater service providers include the City of Hercules to the south and the Crockett Community Services District to the east. The area between the District's north and south service areas is the Conoco Phillips Refinery, which operates its own private wastewater system.

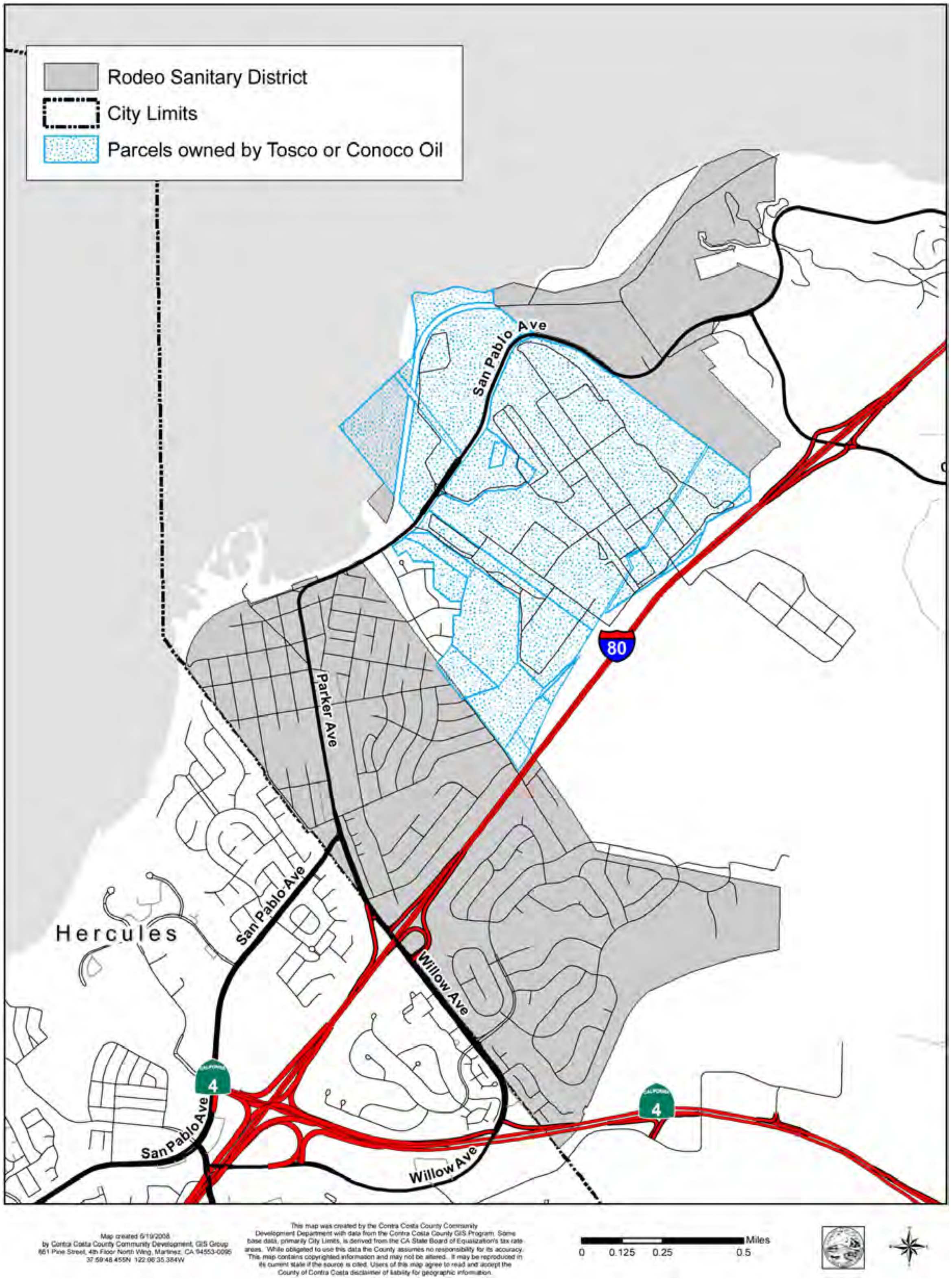
4.0 PLANNING PARAMETERS

4.1 Master Planning Vision, Goals, and Levels of Service

The District's mission is *'To safely provide the highest level of wastewater collection and treatment as economically possible for the people of Rodeo while protecting the sensitive ecosystem of the San Pablo Bay and the overall environment'.*

In keeping with this mission, the District must develop a CWWMP that complies with increasingly stringent regulatory requirements, meets community demands to provide affordable improvements and operations, maintains a commitment to the environment, and protects public health.

In order to achieve this, the CWWMP established goals and LOS for its wastewater system. LOS defines performance measures and should describe characteristics such as how much?, what nature?, how frequently?, etc. LOS provides a framework for wastewater operations by specifying measurable standards to be attained by the wastewater system.



Source: Contra Costa LAFCO: Water and Wastewater Municipal Services Review for West Contra Costa County

Figure 1.1
SERVICE AREA MAP
COMPREHENSIVE WASTEWATER MASTER PLAN
RODEO SANITARY DISTRICT

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Establishing LOS allows the District to focus its efforts and resources by setting service expectations and determining priorities. LOS further facilitates District management by providing a framework to prioritize and phase capital projects and establish annual budgets.

LOS goals often span several categories. There are several that are applicable for wastewater master planning, namely:

- Environmental/Regulatory Compliance.
- Operational/ System Reliability.
- Financial Management.
- Social/Customer Impact.

The District staff and Board developed LOS goals for the CWWMP. These are summarized in Table 1.1.

4.2 Population Projections

The Local Agency Formation Commission (LAFCO) population served by the District was estimated to total 6,833 residents in 2007. LAFCO projects that the District service area will increase to 7,990 by 2030 at an annual average growth rate of 0.7 percent. Assuming the average residents per household of 3.0 for Rodeo and a wastewater flow rate of 250 gallons per day per residence, the estimated WWTP influent ADWF in 2010 is 0.58 mgd. This estimated ADWF corresponds with the observed ADWF at the WWTP for this period. Using the LAFCO projected growth rate, the WWTP influent flow is expected to increase from 0.58 mgd ADWF in 2010 to 0.67 mgd in 2035. Table 1.2 summarizes the projected population and flows for the WWTP.

In addition to the anticipated growth in the District service area, the District has dry weather capacity that could be utilized to provide a regional solution to the area's wastewater needs. In 2006, a study (see Appendix) was conducted to evaluate potential diversion of flow from the Fox Boro and Victoria by the Bay developments to reduce capacity constraints at the Pinole-Hercules wastewater treatment facility. If implemented, these diversions could add approximately 0.5 mgd ADWF to the WWTP. The analysis conducted in this CWWMP does not include flows from these potential diversions.

Table 1.1	**Level of Service Goals Comprehensive Wastewater Master Plan Rodeo Sanitary District**
Level of Service Category	**Level of Service Goal(1)**
Environmental/ Regulatory Compliance	• Full compliance with National Pollutant Discharge Elimination System (NPDES) and state permits. • Develop a wastewater master plan update at least once every 10 years.
Operational/System Reliability/Efficiency	• Limit SSOs to once per year. • Respond to sewer backups within two hours. • No injuries or adverse health effects at WWTP. • Evaluate energy efficient alternatives and best practices outlined in the PG&E Energy Baseline Study for Municipal Wastewater Treatment Plants when replacing plant infrastructure. • Enhance facility security and reduce operator nuisance call-outs to no more than five per year.
Financial Management	• Implement at least CPI pegged adjustment of sewer rates for all customers annually. • Maintain emergency reserve funds to meet unplanned challenges at 50 percent of annual operating budget.
Social/Customer Impact	• No reactive media coverage (i.e., any media coverage is a result of proactive announcements by the utility). • No negative social or economic impact on the community. • Provides sufficient wastewater capacity to meet all planned uses in the County General Plan. • Engage in discussion with neighboring service providers to identify efficiencies that may result from collaboration.

Note:
(1) LOS goals were developed with direction from the District management and board.

Table 1.2 Average Dry Weather Flow and Load Projections
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Year	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**
Population(1)	6,974	7,215	7,465	7,723	7,990	7,990
ADWF(2), mgd	0.58	0.60	0.62	0.64	0.67	0.67

Notes:
(1) Population projections were developed using the LAFCO estimated growth rate of 0.7 percent for the District service area.
(2) ADWF projected assuming three residents per household and 250 galloons per day of wastewater flow per residence.

4.3 Alternative Evaluation Criteria

Evaluation of CWWMP alternatives must be consistent with the LOS objectives set for the CWWMP and the District's overall mission. The evaluation criteria to be used for the CWWMP are presented below in Table 1.3. These criteria will be used to compare and select appropriate alternative during the development of the CWWMP CIP.

4.4 Cost Estimating Methodology

Cost estimates are often prepared at various stages during project planning and design. The cost estimate is one of the most sensitive products prepared for a project. The level of accuracy that can be expected is directly proportional to the level of engineering effort completed at the time of estimate. Typically, as a project progresses from the conceptual phase to the study phase, preliminary design and final design, the quantity and quality of information increases, thereby providing data for development of a progressively more accurate cost estimate.

The Association for the Advancement of Cost Engineering International (AACE International, formally known as the American Association of Cost Engineers) has suggested levels of accuracy for five estimate classes based on level of project development. These five estimate classes are presented in the AACE International Recommended Practice No. 18R-97 (Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Process Industries) and are summarized in Table 1.4. For the projects developed as a part of the CWWMP, cost estimates are developed following the AACE International Recommended Practice No. 18R-97 estimate class 4.

4.4.1 <u>Capital Costs</u>

Capital costs for construction of facilities are estimated from unit costs developed from past Bay Area construction contracts, estimating guides, unit prices, and construction costs of similar facilities and configurations at other locations. The capital costs presented in the CWWMP are in 2013 dollars with an ENRCCI for San Francisco of 10,355.

The capital costs presented in the CWWMP are Class 4 estimates. While the estimated construction costs represent the average bidding conditions for many projects, variations in bidding climate at the time the facilities are constructed can affect actual construction costs. Further, the size of the facilities may be refined during preliminary design based on the most current operational information available. For these reasons, the actual construction costs may be lower or higher than originally estimated.

Table 1.3 CWWMP Alternative Evaluation Criteria
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Level of Service Category	Level of Service Goal	Criteria (favors alternatives that…)
Environmental/ Regulatory Compliance	• Full compliance with National Pollutant Discharge Elimination System (NPDES) and state permits.	• Meets current regulations and positions the District to cost-effectively meet future regulations.
Operational/ System Reliability	• Limit SSOs to once per year. • Respond to sewer backups within two hours. • No injuries or adverse health effects at WWTP. • Evaluate energy efficient alternatives and best practices outlined in the PG&E Energy Baseline Study for Municipal Wastewater Treatment Plants when replacing plant infrastructure. • Enhance facility security and reduce operator nuisance call-outs to no more than five per year.	• Cause less sewer overflows per year. • Provides safer working conditions. • Reduce overall energy use and replace infrastructure with more energy efficient assets. • Increases security and integrates the SCADA system to the plant security system.
Financial Management	• Implement at least CPI pegged adjustment of sewer rates for all customers, annually. • Maintain emergency reserve funds to meet unplanned challenges at 50 percent of annual operating budget.	• Requires lower capital expenditures. • Have lower life-cycle costs relative to benefits. • Does not require significant drawdown of reserves.
Social/Customer Impact	• No reactive media coverage (i.e., any media coverage is a result of proactive announcements by the utility). • No negative social or economic impact on the community. • Provides sufficient capacity to meet all planned uses in the County General Plan. • Engage in discussion with neighboring service providers to identify efficiencies that may result from collaboration.	• Minimize backups/flooding from sewer system. • Reduces system risk and increases redundancy. • Expands/maintains capacity as needed. • Minimizes idle WWTP and collection system capacity.

Table 1.4 Classes of Cost Estimates
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Estimate Class	**Primary Characteristic**	**Secondary Characteristic**			
	Level of Project Definition Expressed as % of complete definition	**End Usage** Typical purpose of estimate	**Methodology** Typical estimating method	**Expected Accuracy Range** Typical variation in low and high ranges (2)	**Preparation Effort** Typical degree of effort relative to least cost index of 1 (3)
Class 5	0% to 2%	Concept Screening	Capacity Factored, Parametric Models, Judgment, or Analogy	L: -20% to -50% H: +30% to +100%	1
Class 4	1% to 15%	Study or Feasibility	Equipment Factored or Parametric Models	L: - 15% to -30% H: +20% to +50%	2 to 4
Class 3	10% to 40%	Budget, Authorization, or Control	Semi-Detailed Unit Costs with Assembly Level Line Items	L: - 10% to -20% H: +10% to +30%	3 to 10
Class 2	30% to 70%	Control or Bid/Tender	Detailed Unit Cost with Forced Detailed Take-Off	L: - 5% to -15% H: +5% to +20%	4 to 20
Class 1	50% to 100%	Check Estimate or Bid/Tender	Detailed Unit Cost with Detailed Take-Off	L: - 3% to -10% H: +3% to +15%	5 to 100

Notes:
(1) Table is based on the AACE International Recommended Practices, No. 18R-97.
(2) The state of process technology and availability of applicable reference cost data affect the range markedly. The +/- value represents typical percentage variation of actual costs from the cost estimate after application of contingency (typically at a 50% level of confidence) for a given scope.
(3) If the range index value of “1” represents 0.005% of project costs, then an index value of 100 represents 0.5%. Estimate preparation effort is highly dependent upon the size of the project and the quality of estimating data and tools.

The construction costs presented include contractor's overhead and profit, and construction contingencies. Costs to the owner, such as engineering, legal, administrative, project contingencies, and construction management costs are added to the construction costs. The general basis for estimating capital costs is presented in Table 1.5.

Table 1.5 **Basis of Estimating Capital Costs**
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Item		Estimated Cost
Direct Cost(1)		"A"
Estimating Contingency		+ 30% of "A"
	Subtotal Direct Cost	**"B"**
General Conditions, Contractor Overhead, and Profit		+ 25% of "B"
Sales Tax (Applied to ½ the Direct Cost)		+ 8.5% of "B"/2
	Total Estimated Construction Cost	**"C"**
Engineering, Legal, Administrative Fees, Permitting, and Construction Management		+ 30% of "C"
	Total Project Cost (2)	**"D"**

Notes:
(1) Based on preliminary quantity takeoffs, estimating guides, and construction costs of similar facilities.
(2) Includes project contingencies, construction management, administrative, engineering, and legal costs.

4.4.2 Operations and Maintenance Cost

The O&M costs are based on historical and estimated operating costs, estimated manpower needs, resource requirements, and equipment replacement and maintenance needs. The O&M costs summarized in Table 1.6 were used in the development of the CWWMP.

Table 1.6 **Unit Operations and Maintenance Costs**
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Item	Unit Cost(1)
Labor	$65 per person per hour
Power	$0.12 per kilowatt hour
Chemicals	
• Sodium Hypochlorite	$0.68 per gallon
• Sodium Bisulfite	$0.81 per gallon
• WAS Polymer	$10.27 per gallon
• Centrifuge Polymer	$1.81 per lb

Note:
(1) Unit costs are based on District provided information.

4.4.3 Life Cycle Cost and Economic Analysis

In the evaluation of project alternatives, total annual costs and life-cycle (present worth) costs are based on the following:

- **Annual Cost.** Annual cost represents the combined capital and O&M costs on an annual basis. Capital costs are amortized over a 30-year period using an interest rate of 5.5 percent for bonds and over a 20-year period using an interest rate of 2.0 percent for Clean Water State Revolving Fund (CWSRF) loans. Total annual cost is the sum of the amortized capital cost and the annual O&M cost.

- **Life-Cycle (Present Worth) Costs.** Present worth cost represents the value in current dollars of the total cash flow occurring over the life of a project. It includes both capital and O&M costs. As a result, present worth cost represents the life cycle cost of a project alternative.

The economic criteria used in the development of annual and life-cycle costs are summarized in Table 1.7.

Table 1.7 Economic Criteria Used in Development of Costs
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Item	Assumption
Costs in Time and Place	Costs are based on 2013 costs in San Francisco, California
Escalation in Construction Cost	Annual cost escalation is assumed to be 5 percent
Inflation Rate	Annual inflation rate is assumed to be 3.0 percent
Interest Rate	5.5 percent for amortization purpose for bonds 2.0 percent for amortization purpose for CWSRF loans
Discount Factor	6 percent for present worth purpose
Amortization Period	30 years for bonds 20 years for CWSRF loans

APPENDIX - REGIONAL SOLUTION FOR DISPOSAL OF TREATED SEWAGE

MEMORANDUM

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March 23, 2006

To: Rodeo Sanitary District Board of Directors
Hercules City Council
Pinole City Council

Subject: Regional Solution for Disposal of Treated Sewage.

Background

At the request the Hercules City Council and the Rodeo Sanitary District Board of Directors, the following is a concise memorandum addressing the subject issue, including a preliminary financial analysis to serve the communities discussed herein.

The cities of Hercules and Pinole and the Town of Rodeo are all part of the San Pablo Bay community; all three dispose of treated sewage into the San Pablo Bay via a common deep water outfall.

During the 1950s and again in the 1970s, the City of Pinole invested large sums of public funds into constructing a sewage treatment plant. Since 2001, Hercules has sent 100 percent of its sewage to this plant, now called the Pinole-Hercules Water Pollution Control Plant.

The Rodeo Sanitary District, formed in the 1920s, spent large sums of public funds on a sewage treatment plant in the 1950s and 1970s, and during its reconstruction from 1999-2005. The plant is called the Rodeo Sanitary District Water Pollution Control Plant. Both treatment plants produce the same quality of water discharged to the San Pablo Bay.

Currently, the Pinole-Hercules Plant is investigating building an advanced sewage treatment plant, at a potential of $40 million or more. It does not address average daily dry Weather flow capacity issues, or wet weather flow issues. This memo intends to identify other lower-cost options that meet the goals of the all three communities to preserve San Pablo Bay.

There will be many acronyms used in the memo. They are listed below:

- Pinole-Hercules Plant – Pinole-Hercules Water Pollution Control Plant
- RSD Plant – Rodeo Sanitary District Water Pollution Control Plant
- RSD – Rodeo Sanitary District
- ADDWF – Average Daily Dry Weather Flow
- WWF –Wet Weather Flow
- MGD – Millions of Gallons per Day
- RWQCB – Regional Water Quality Control Board
- NPDES – National Pollution Discharge Elimination System
- I&I – Inflow and Infiltration

Existing Conditions

Pinole-Hercules Plant

The following summarizes the flows and capacities for the Pinole-Hercules Plant.

Criteria	Flow (mgd)
NPDES Permitted Capacity – ADDWF	4.09
Current ADDWF (3 consecutive lowest monthly averages)	3.20
WWF – Peak Daily Average	13.27 (December 31, 2005)
WWF – Peak Monthly Average	4.73 (December 2005)

Currently, the Pinole-Hercules Plant discharges treated sewage through a 24-inch 20,172 foot long reinforced concrete land outfall pipe. This land outfall runs from the Pinole-Hercules Plant to the RSD Plant to the shared deep water outfall. Due to the Parker Avenue Restoration Project, Pinole and Hercules are being required to replace 3,620 feet of this line at a cost of at least $1.4 million.

The magnitude of the wet weather flows (WWF) occasionally cause the Pinole-Hercules Plant to discharge to the shallow water outfall located at the Pinole-Hercules Plant. This is a result of hydraulic limitations of the land outfall between the Pinole-Hercules and the RSD Plants. This discharge can potentially result in fines from the RWQCB.

RSD Plant

The following summarizes the flows and capacities for the RSD Plant.

Criteria	Flow (mgd)
NPDES Permitted Capacity – ADDWF	1.14
Proposed Capacity – ADDWF	1.50
Current ADDWF	0.63
WWF – Peak Daily Average	2.52 (December 31, 2005)
WWF – Peak Monthly Average	1.30 (December 2005)

RSD is currently negotiating with the RWQCB for renewal of the NPDES Permit for the District. The District has conducted a study (March 2006) that clearly identifies the ADDWF capacity of the RSD Plant to be at least 1.5 mgd. This study is available upon request.

Potential for Expansion

Pinole-Hercules Plant

Currently, the Pinole-Hercules Plant does not have room to expand the ADDWF of the plant: There are homes to the south and east, the bay is on the west, and a city park is to the north.

To expand, or provide additional sewage treatment, the Pinole-Hercules Plant must demolish existing structures and/or the City Park, requiring the City to remove valuable pieces of public property that the residents of Pinole and Hercules have already invested millions of dollars into.

The ability of the Pinole-Hercules Plant to increase flows to the shared deep water outfall would mandate rehabilitation of the remaining 16,552 feet of the 24-inch concrete land outfall pipe.

RSD Plant

The RSD plant has sufficient acreage to expand the plant to at least three (3) mgd.

Regional Solution

This section of this memo will identify potential solutions for treatment capacities, flow diversions, wet weather flow reduction, and recycling projects that could solve many current issues.

This section will be organized into projects with brief descriptions. Cost estimates will be included as well as flow information for each agency.

Flow Diversion

The major benefit from diverting flow is reducing ADDWF for the Pinole-Hercules Plant. Currently, the Pinole-Hercules Plant is at 78.2 percent of ADDWF capacity. Once it reaches 85 percent capacity, the RWQCB requires the discharger to plan for future expansion. Flow diversion allows for time to either develop a plan for expansion and funding, or utilize new technologies on existing processes that would allow re-rating of the ADDWF for the Pinole-Hercules plant (similar to what RSD has done).

Diverting ADDWF flows to the RSD Plant has trickle down effects. An increase in flows results in an increase in operations and maintenance costs. An increase in ADDWF flows above the 1.0 mgd barrier requires the District to comply with additional regulatory requirements that are currently not required.

Assumptions used for this section are as follows:

Flow per capita per day (gallons)	125
Persons per single family home	3.0
Persons per apartment/town home	2.4

Divert Fox Boro to the RSD Plant.

Number of connections	638(1)
ADDWF of diversion	0.225 mgd(2)
Capital cost for interconnecting piping to RSD collection system	$100,000
Connection fee due RSD	$1,276,000-$3,190,000(3)
Agency responsible for Capital Cost and connection fee	City of Hercules
RSD Plant ADDWF	0.86 mgd after diversion
Pinole-Hercules Plant ADDWF	2.98 mgd after diversion

Divert Victoria by the Bay to the RSD Plant.

Number of connections	880(4)
ADDWF of diversion	0.320 mgd(5)
Capital cost for interconnecting piping to RSD collection system	$500,000 (assumes 3000 feet of 12 inch pipe)
Connection fee due RSD	$1,760,000-$4,400,000(3)
Agency responsible for Capital Cost and connection fee	City of Hercules
RSD Plant ADDWF	1.18 mgd after diversion
Pinole-Hercules Plant ADDWF	2.66 mgd after diversion
Special projects needed	RSD influent pump station and force main upgrade, new headworks and primary clarifier
Capital cost for special project	$3,500,000(6)
Agency responsible for Capital Cost	RSD
Source of funding	Connection fees

(1) 276 apartments, 113 town homes, 233 single family homes, 16 commercial
(2) Assumes 1632 residents plus commercial flow
(3) Hercules connection fee ($2,000) – RSD connection fee ($5,000)
(4) 750 single family homes, 130 apartment
(5) Assumes 2562 residents
(6) Source – RSD Strategic Plan 2004 updated to 2006 costs

Divert FUTURE Hill Town to the RSD Plant.

Number of connections	1000 single family homes
ADDWF of diversion	0.375 mgd[7]
Capital cost for interconnecting piping to RSD collection system	$0 – Connection for Victoria by the Bay to RSD can be used.
Connection fee due RSD	$2,000,000 - $5,000,000[3]
Agency responsible for Capital Cost and connection fee	City of Hercules
RSD Plant ADDWF	1.56 mgd after diversion
Pinole-Hercules Plant ADDWF	2.66 mgd after diversion
Special projects needed	RSD Third process train (Aeration and secondary clarification).
Agency responsible for Capital Cost	RSD
Capital cost for special project	TBD (~$3,000,000)
Source of funding	Connection fees

(7) Assumes 3000 residents

Divert future growth in Hercules to RSD Plant or Pinole-Hercules Plant.

This potential future project will have the ability to divert flow to either the Pinole-Hercules plant or the RSD Plant. Since ADDWF was diverted from the Pinole-Hercules plant to the RSD from previously discussed projects, there is available capacity for these connections. The determining factor would likely be conveyance-related. The question would be to pump or not to pump. Obviously, flowing by gravity is more economical then pumping.

Wet Weather Flow Control

A major issue that all agencies face is continued aging and deterioration of sewer systems, which creates infiltration of rain water through cracks in the deteriorated pipe. There is also a secondary mode of rain water intrusion into the sewer system; inflow. Inflow is either a direct connection to a storm drain or inflow into the manhole covers from run-off. All agencies are required by the new Sanitary Sewer Overflow regulations by the RWQCB to create a Sanitary Sewer Management Plan. One major component of this Sanitary Sewer Management Plan is to identify Inflow & Infiltration (I&I) and begin measures for control and/or reduction.

There are several practical approaches to I&I control:

- Rehabilitate the sewer lines.
- Remove any direct connections to storm drains
- Rehabilitate private laterals

Rehabilitate Sewer Lines

This method of control simply replaces the deteriorated sewer line with a new line. There are several methods for sewer line rehabilitation. The most popular methods used are:

1. Open trench excavation – This involves digging up the pipe and replacing it in place.
2. Pipe bursting – The desired pipe is pulled through the deteriorated line, expanding and thereby breaking the deteriorated pipe and leaving a same size or larger pipe in its place. Laterals penetrations then need to be cut out and tied into the new pipe.
3. Slip lining – This process is similar to pipe bursting and simply sends a smaller diameter pipe into the deteriorated pipe. However, the pipe retains its original flow capacity.

Remove Direct Connections to Storm Drain

This method involves smoke testing the sewer system to identify where, if any, roof drains, floor drains, etc are directly connected to the sewer line. The corrective action is simple - disconnect the drain connection to the sanitary sewer and re-connect to the storm drain system, and RSD has been doing this for years.

Rehabilitate Private Laterals

Many agencies have or are adopting new ordinances that require private laterals to be inspected and certified. There have been many studies that show that infiltration from laterals can account for 50 to 80 percent of I&I for wet weather flow. Sample provisions for a new ordinance are as follows:

- Inspect the lateral during the sale of a home.
- Inspect the lateral when any building permits are pulled for the property.
- Inspect the laterals when any sewer system work is done.

The ordinance will then require the property owner to repair or replace the lateral to meet certain pre-determined specifications. Some agencies have elected to provide financial assistance under certain conditions.

Inflow and Infiltration Control

This section is subjective to the actual amount of control for the listed expenditures. A conservative approach would assume that the City of Pinole, with an older collection system (like RSD), would have a higher percentage of I&I to correct. Since the extent of I&I for each community is not known, the values listed are assumed and only to represent a magnitude estimate of reduction of the Peak Daily Wet Weather Flow.

Develop and Implement I&I Control Program for Pinole-Hercules Plant

Capital Cost for program	$5,000,000 (assumes $500k for study, design, ordinance and 30,000 feet of pipe rehabilitated.)
Pinole-Hercules Plant WWF Reduction	3.5 mgd
Agency responsible for Capital Cost	City of Pinole

Develop and Implement I&I Control Program for Pinole-Hercules Plant

Capital Cost for program	$2,000,000 (assumes $250k for study, design, ordinance and 11,600 feet of pipe rehabilitated.)
Pinole-Hercules Plant WWF Reduction	1.5 mgd
Agency responsible for Capital Cost	City of Hercules

Develop and Implement I&I Control Program for RSD Plant

Capital Cost for program	$1,500,000 (assumes $250k for study, design, ordinance and 8,300 feet of pipe rehabilitated.
Pinole-Hercules Plant WWF Reduction	1.0 mgd
Agency responsible for Capital Cost	RSD

If all I&I programs gain the assumed reduction in peak daily wet weather flows (WWF), a reduction of 5 mgd for the Pinole-Hercules Plant and a 1 mgd reduction for the RSD Plant could be realized.

If the I&I is controlled for the Cities of Pinole and Hercules, it is possible that expensive advanced sewage treatment systems will not be required. Additionally, the land outfall would then have sufficient capacity to send all flows to the shared deep water outfall.

Recycled Water Facility for Conoco Phillips Refinery

Capital Cost for program	$10,000,000
Agency responsible for Capital Cost	EBMUD
Party responsible for O&M Costs	Conoco Phillips
Recycled Water Capacity	2.0 mgd
RSD effluent used	All
Additional Supply	Pinole-Hercules Plant Effluent
Benefit	Environment – Reduced potable water use

Tertiary Facility at Pinole-Hercules Plant (Optional for stream restoration)

Capital Cost for program	$4,000,000 (assumes traditional tertiary treatment scheme; sand filters and UV disinfection, 1997 design for City of Scotts Valley 1.0 MGD Tertiary Plant with updated 2006 costs)
Agency responsible for Capital Cost	City of Pinole
Agency responsible for O&M Costs	City of Pinole
Recycled Water Capacity	1.0 mgd
Benefit	Environment – Pinole Creek Restoration

Summary

The following table summarizes the costs associated with the aforementioned projects broken down by agency:

Agency	City of Hercules	City of Pinole	RSD	EBMUD
Capital Expenditures	$2,600,000	$5,000,000	$1,500,000	$10,000,000
Optional Projects		$4,000,000		
Connection Fees (8)	$3,036,000 - $7,590,000			
Projects funded by connection fees (7)			$3,500,000	
Total	$5,363,000 - $10,190,000	$9,000,000	$5,000,000	$10,000,000

(8) Hill Town not included as this is future project

As indicated in the table above, the total potential cost for this regional solution ranges depending on what the goal is and which diversions, if any, take place. As a minimum, a regional project should include I&I control and rehabilitation, the diversion of Fox Boro and Victoria by the Bay to RSD, and the EBMUD funded recycled water project. As a result, the total costs to the three communities (Hercules, Pinole, and Rodeo) for this regional project would be $15,636,000 - $20,196,000. Responsibilities for each of these costs are also outlined in the table.

This type of project would address wet weather capacity issues at the Pinole-Hercules Plant, the RSD Plant and the land outfall. Dry weather capacity issues at the Pinole-Hercules Plant will also be addressed. It would also generate a significant project for water recycling and potable water conservation, thereby showcasing how the three communities worked together to reach a regional solution.

Recommendation

The Rodeo Sanitary District recommends that this regional solution be explored in greater detail. As public servants, we have an obligation to protect the environment. However, as public servants, we also have a greater fiduciary responsibility to the people we serve. The approach presented in this memo illustrates an opportunity to provide this service for the lowest possible cost.

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RODEO SANITARY DISTRICT
COMPREHENSIVE WASTEWATER MASTER PLAN

TECHNICAL MEMORANDUM NO. 2
REGULATORY REQUIREMENTS

FINAL
June 2013

RODEO SANITARY DISTRICT
COMPREHENSIVE WASTEWATER MASTER PLAN

TECHNICAL MEMORANDUM
NO. 2
REGULATORY REQUIREMENTS

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1.0 PURPOSE

The purpose of this technical memorandum (TM) is to provide an overview of the current, pending, and future regulatory requirements that influence operation, maintenance, and capital improvement needs for the Rodeo Sanitary District (District) treatment and collection system facilities. This TM reviews the regulatory framework for the current District effluent management system, lists current limitations for effluent discharges, and presents anticipated changes developed for the District as part of the Comprehensive Wastewater Master Plan (CWWMP).

2.0 SUMMARY OF KEY FINDINGS

The District's wastewater treatment plant (WWTP) is governed by the San Francisco Regional Water Quality Control Board (RWQCB) that issued National Pollutant Discharge System (NPDES) permit No. CA0037826, Order No. R2-2012-0027, effective June 1, 2012. This permit establishes effluent water quality limits for the 5-day carbonaceous biochemical oxygen demand ($CBOD_5$), total suspended solids (TSS), total ammonia, oil and grease, pH, chlorine residual, total coliform and Enterococcus bacteria, copper, cyanide, and dioxin-TEQ. The District's prior permit, Order No. R2-2006-0062 which expired in 2011, was replaced by the current permit. The current permit presents the District with more stringent effluent quality restrictions than the prior permit as discussed in the following sections. As the District renews its waste discharge permit over the master planning horizon, it is likely that the District will observe more stringent waste discharge, biosolids management, and air emission regulations, as well as increased regulation in collection system operation and management.

The most probable regulatory scenario for the District includes the need to address the following regulatory considerations in the CWWMP capital improvement program (CIP):

- **Nutrient Removal -** If the United States Environmental Protection Agency (US EPA) modifies the definition of secondary treatment to include nutrient removal, the WWTP will be required to remove nitrogen and phosphorus.
- **Microconstituents and Bioaccumulative Constituents -** The current trend of increasing regulation on these constituents will likely result in new effluent limits being required in permits in the next ten (10) to fifteen (15) years.
- **Biosolids -** Landfilling and land application of biosolids are becoming increasingly restricted and fewer landfills are accepting biosolids. This trend is requiring diversification of biosolids disposal options and production of Class A material.

- **Air Emissions -** Recently amended air emissions regulations for new internal combustion engines may require emission control equipment.
- **On-Site Stormwater Management -** Application of industrial stormwater management requirements to stormwater at wastewater treatment facilities may require collection and treatment of all on-site stormwater.
- **Collection System -** Increased monitoring and reporting of all types of sanitary sewer overflows (SSO) will require increased operation and maintenance (O&M).

3.0 BACKGROUND

In 1969, the California State Legislature adopted the Porter-Cologne Water Quality Act and established the California State Water Resources Control Board (SWRCB), the primary state agency responsible for protecting California's surface water quality and groundwater supplies.

In adopting the Clean Water Act (CWA) in 1972, Congress established the NPDES and provided program administration authority to the USEPA. NPDES is the primary federal program that regulates point- and non-point source discharges to surface waters of the United States. In California, the USEPA has delegated authority in administering and enforcing provisions of the Clean Water Act (Section 303) for the NPDES program to the SWRCB, except for biosolids that are administered by USEPA. The SWRCB divided the state into nine (9) regional basins with a RWQCB for each basin. Each RWQCB issues NPDES discharge permits that establish waste discharge requirements for entities within its jurisdiction.

State law requires that each RWQCB adopt a Water Quality Control Plan (Basin Plan) to identify beneficial uses of the State's water resources, establish water quality objectives, and develop an implementation program that includes waste discharge requirements. Pursuant to Section 303 of the Clean Water Act, each RWQCB must review and update its Basin Plan every three (3) years. Each RWQCB also must renew NPDES permits every five (5) years. If a RWQCB adopts more stringent water quality standards, each RWQCB will revise and modify existing NPDES permits within its region in accordance with the new standards during permit review.

The District is within the San Francisco Bay Basin – Region 2, overseen by San Francisco RWQCB. The San Francisco RWQCB periodically updates the San Francisco Bay Basin Plan through the adoption of Basin Plan Amendments. The most recent Basin Plan was approved in December 2010.

4.0 TREATMENT SYSTEM REGULATIONS

The District's WWTP is subject to regulations for effluent disposal, biosolids management and disposal, air emissions, and management of stormwater generated on-site. This section summarizes key current regulations as well as potential future scenarios that would affect the District's WWTP.

4.1 NPDES Requirements

The District's WWTP is governed by the San Francisco RWQCB issued NPDES permit No. CA0037826, Order No. R2-2012-0027. The District owns and operates the WWTP and is the discharger subject to the waste requirements set forth in the permit. The District's NPDES last permit expired on November 30, 2011 and was replaced by the current permit effective June 1, 2012. The current permit will expire on May 31, 2017 and the District is required to file a report of waste discharge in accordance with Title 23 for re-issuance of the permit by December 2, 2016.

The District is permitted to discharge up to 1.14 million gallons per day (mgd) of treated average dry weather flow (ADWF) effluent. The effluent is secondary treated and chlorine disinfected prior to discharge to the San Pablo Bay through an outfall shared with the Pinole-Hercules WWTP. The District is required to achieve an initial dilution of least 33:1 and is prohibited from contributing excessive flows, which triggers discharge of effluent to shallow waters.

4.1.1 <u>Effluent and Receiving Water Limitations</u>

Table 2.1 summarizes the current NPDES permit effluent limitations. In addition to the limits in the table, the average monthly removal for biochemical oxygen demand (BOD) and total suspended solids (TSS) must be at least 85 percent (85%) by concentration.

For acute toxicity bioassay, the 11-sample median value must be greater than or equal to 90 percent (90%) survival, and any single sample must not be less than 70 percent (70%) survival. In addition, several receiving water limitations specify that the District must not cause adverse conditions in the receiving water resulting from the discharge, including the following:

- The effluent shall not cause the dissolved oxygen concentration of the receiving waters to fall below a minimum of 5.0 milligrams per liter (mg/L) within one (1) foot of the water surface.
- The maximum dissolved sulfide shall not exceed natural background levels.
- The pH shall not vary by the normal ambient pH by more than 0.5 pH units.
- The effluent shall be free of biostimulatory substances in concentrations that promote aquatic growth to the extent that it adversely affects beneficial uses.

Table 2.1 Effluent Limits in 2012 NPDES Permit[1] Comprehensive Wastewater Master Plan Rodeo Sanitary District						
Constituent	Units[2]	Average Monthly (AM)	Average Weekly	Maximum Daily (MD)	Instantaneous Min	Instantaneous Max
5-day Carbonaceous Biochemical Oxygen Demand (CBOD) @ 20°C	mg/L	25	40	---	---	---
Total Suspended Solids (TSS)	mg/L	30	45	---	---	---
pH	standard units	---	---	---	6.0	9.0
Oil and Grease	mg/L	10	---	20	---	---
Chlorine, Total Residual	mg/L	---		---	---	0.0
Total Coliform Bacteria[3]	MPN/100 mL	240	---	---	---	10,000
Enterococcus Bacterial[4]	MPN/100 mL	35	---	---	---	---
Copper	µg/L	74	---	120	---	---
Mercury[5]	µg/L	0.021	---	0.041	---	---
Cyanide[6]	µg/L	20	---	43	---	---
Dioxin-TEQ	µg/L	1.4×10^{-8}	---	4.5×10^{-8}	---	---
Polychlorinated Biphenyls (PCBs)[7]	µg/L	0.012	---	0.017	---	---

Notes:
(1) Limits included in Waste Discharge Requirements Order No. R2-2012-0027, NPDES Permit No. CA0037826.
(2) Abbreviations: mg/L = milligrams per liter; µg/L = micrograms per liter; MPN = most probable number; NTU = nephelometric turbidity units.
(3) The moving median of five consecutive samples analyzed for total coliform bacteria shall not exceed 240 colonies per 100 mL; any single sample shall not exceed 10,000 colonies per 100 mL.
(4) Geometric mean in at least five samples collected within a calendar month shall not exceed 35 MPN/100 mL.
(5) Mercury limits presented are updated limits per Order No. R2-2007-077.
(6) Cyanide limits presented are updated limits per Order No. R2-2010-0056.
(7) PCB limits presented are updated limits per Order No. R2-2011-012.

4.1.2 Other Permit Provisions

Other provisions in the permit include the following:

- Monitoring and reporting of selected constituents.

- Participating in an ambient background receiving water study.
- Best management practices and pollutant minimization program.
- Pollution prevention/minimization program and reporting.
- Alternative bacteria limitations and receiving water beneficial use study.
- Evaluation and status reports for the wastewater facilities, the operations and maintenance manual, the reliability of the wastewater facilities, and the facility contingency plan.
- Appropriate management of all biosolids.
- Copper action plan.
- Cyanide action plan.
- Implementation of a sewer system management plan for operation and maintenance of the collection system and mitigation of sanitary sewer overflows.

4.1.3 Updates In Order No, 2012-0027

While RWQCB Order No. 2012-0027, which replaces Order No. 2006-0062, retained many of the effluent limits, standard provisions, and reporting requirements of the previous permit, it also introduced several updates. The primary updates and the potential District impacts are as summarized in Table 2.2 and are discussed in the sections that follow.

4.1.3.1 Water Quality

The updates to effluent limits in Order No. 2012-0027 are based on ambient and effluent water quality data, and technology based and water quality based effluent limits. The technology based limits include those for CBOD, TSS, oil and grease, pH, total coliform, and Enterococcus bacteria. The water quality based limits are based on water quality objectives in the Basin Plan and regulations established by the EPA. The Basin Plan and EPA guidelines used in the establishment of the District water quality based effluent limits are summarized below:

- The Basin Plan specifies numeric objectives for arsenic, cadmium, chromium (VI), copper, lead, mercury, nickel, silver, zinc, and cyanide. Effluent limits in the District's permit are designed to implement water quality objectives for applicable substances.
- EPA 40 CFR 131.38 establishes numeric aquatic life criteria for 23 priority toxic pollutants and human health criteria for 57 priority toxic pollutants. Because the receiving waters of the District effluent are not designated for municipal beneficial use, only criteria applicable for 'organisms' apply in the reasonable potential analysis.

Table 2.2 Updates and Impacts of Order No. 2012-0027
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Order 2012-0027(1)	Potential Impact
Design Flow – Introduction of Peak Wet Weather Flow Limit of 3.4 mgd	Influent flows exceeding 3.4 mgd would require storage
Enterococcus Bacterial Limit of 35 MPN/100 mL	Sampling and reporting of Enterococcus Bacteria
New Copper, Dioxin TEQ, and Total Ammonia Limits: **Parameter / Units / AM Limit / MD Limit** Copper / μg/L / 74 / 120 Dioxin TEQ / μg/L / 1.4×10^{-8} / 4.5×10^{-8} Total Ammonia / mg/L / 54 / 140	No major operational changes required as a result of new effluent limits for copper, dioxin, and ammonia
Dissolved sulfides limit equivalent to natural levels instead of 0.1 mg/L	No major impacts
Special provisions requiring copper and cyanide action plans	Pretreatment, source control, and pollution prevention for copper and cyanide in accordance with mandated timeline
Influent cyanide monitoring requirement on a bi-annual basis	Increased monitoring
Reduction in oil and grease monitoring requirement from once per every 2 weeks to once per quarter	Reduced monitoring and reporting
Acute and chronic toxicity, and Enterococcus Bacteria monitoring requirements	Increased monitoring and reporting
Change in minimum initial dilution credit to 33:1 from 45:1 for treated effluent	Higher removal efficiency for water quality based effluent limits
Reasonable potential for 2,3,7,8-TDDD, ammonia, and copper with removal of reasonable potential for zinc	No major impact anticipated from required removal of ammonia or copper

Note:
(1) Limits presented are based on Order No. R2-2012-0027. NPDES Permit No. CA0037826.

- EPA 40 CFR 131.36 establishes numerical aquatic life criteria for selenium, cyanide, and 33 other toxic organic pollutants for waters of the San Francisco Bay and upstream, including the San Pablo Bay. The District effluent limits reflect these limits.

- The Basin Plan Salinity Policy requires consideration of salinity characteristics of the receiving water when setting water quality based objectives. The San Pablo Bay is classified as estuarine, and as such, the District limits are based on the more stringent of the fresh and saltwater water quality objectives.

Using applicable water quality objectives, reasonable potential was determined for copper, cyanide, 2,3,7.8-TCDD, Dioxin-TEQ, and total ammonia. Based on pollutant concentrations in aquatic organisms, sediment, and water column of the receiving water, dilution credit for dioxin-TEQ was denied. In setting effluent limits, a dilution credit of 10:1 was provided for non-bioaccumulative pollutants. Additionally, a mixing zone was not established for the San Francisco Bay due to the complex hydrology of the bay waters.

4.1.3.2 Monitoring and Reporting

In addition to updates to effluent limits, Order No. 2012-0027 provided update to effluent monitoring requirements. These updates are summarized below:

- Monitoring for Enterococcus bacteria established pursuant to Basin Plan.
- Monitoring for copper established pursuant to Basin Plan.
- Monitoring of mercury eliminated as it is now regulated under order No. R2-2007-077.
- Monitoring of zinc eliminated as no reasonable potential was determined for zinc.
- Monitoring for turbidity eliminated as no effluent limit is established.

4.1.3.3 Biosolids Standards

Order No. 2012-0027 provided update to biosolids disposal standards. The order notes that all biosolids must be disposed of, managed, or reused, in a municipal solid waste landfill, through land application, as a Class A compost, through a waste to energy facility, or other recognized and approved technology, or disposed of in a sludge-only landfill in accordance with 40 CFR Part 503. This language provides further standard clarification than Order No. 2006-0062, which did not require disposal of a Class A compost.

4.2 Biosolids

Biosolids are defined as treated organic solid residuals resulting from the treatment of domestic sewage at a wastewater treatment facility. Biosolids are a product with a high carbon content and other beneficial use properties. Sludge generated by a wastewater treatment facility is defined as biosolids once beneficial use criteria, as determined by compliance with the EPA’s 40 CFR 503 regulations, have been achieved through stabilization processes. Stabilization processes are described as those that help reduce pathogens and reduce vector attraction. Federal, State, and local regulations govern the management and use of biosolids.

At the federal level, biosolids are regulated under the CWA. Under CWA regulations, biosolids applied to the land must meet risk-based pollutant limits, and technologically based controls for pathogens and vector attraction. Their use is also subject to application, monitoring, management, reporting, and recordkeeping requirements designed to protect public health and the environment. US EPA Region 9 oversees biosolids management in California.

At the State level, Water Quality Order No 2004-0012-DWQ established additional regulatory requirements for the application of biosolids to land for use as a soil amendment in agricultural, silvicultural, horticultural, and land-reclamation activities. Numerous other State regulatory agencies, including the Department of Health Services, State and Regional Water Quality Control Boards, the California Integrated Waste Management Board (CIWMB), the California Air Resources Board, and local Air Districts also regulate certain aspects of treatment, use, and disposition of biosolids.

Biosolids are classified by the 40 CFR 503 regulations as Class B or Class A, according to the level of treatment to reduce pathogens and must meet vector attraction and metal concentration limits. All biosolids must also meet the Ceiling Concentration Limits for pollutants. Class A biosolids that meet vector attraction criteria and the more stringent pollutant concentration limits for heavy metals are called exceptional quality (EQ) biosolids.

4.3 Air Emissions

The federal Clean Air Act (CAA) requires EPA to set national air quality standards to protect human health and welfare. The California Air Resources Board (ARB) is the agency responsible for coordination and oversight of State and local air pollution control programs in California and for implementing the CAA. The ARB has developed State air quality standards that are generally more stringent than federal standards. Other ARB duties include monitoring air quality in conjunction with local air districts, setting emissions standards for new motor vehicles, and reviewing air quality district input or the State Implementation Plan (SIP). The SIP consists of emission standards for vehicles and consumer related sources set by ARB, and attainment plans and rules adopted by local air districts.

The Bay Area Air Quality Management District (BAAQMD) is responsible for the administration of state and federal air regulations that apply to the District. The following sections provide summaries of the relevant state and local air quality standards.

4.3.1.1 State Regulations

The District operates one standby diesel powered generator at the WWTP and two standby diesel generators at its pump stations. Replacement engines will need to comply with the Airborne Toxic Control Measure (ATCM) for Stationary Compression-Ignition (CI) Engines. The ARB originally approved the stationary ATCM in 2004. Subsequent to the adoption of the 2004 ATCM, the U.S. EPA promulgated new federal “Standards of Performance for

Stationary Compression-Ignition Internal Combustion Engines" (referred to as "NSPS"). In October 2010, ARB approved amendments to the ATCM to align California's requirements with those in the federal NSPS. The amended ATCM for stationary engines became effective May 19, 2011.

The District permitted to operate three different emergency standby diesel engines with three different permit conditions related to testing and maintenance:

- a 500 hp portable at the plant with 20 hours allowed for testing and maintenance;
- a 99 hp stationary at the Tormey pump station with 50 hours allowed for testing and maintenance; and
- a 285 hp stationary at the Main pump station with 20 hours allowed for testing and maintenance

The stationary ATCM requires a 0.15 gram per boiler horsepower-hour (g/bhp-hr) particulate matter (PM) emission limit for all new emergency standby stationary compression ignition engines greater than or equal to 50 hp. Annual maintenance and testing hours are limited to 50 hours per calendar year. There is a provision for 100 hours for maintenance and testing purposes on a site-specific basis, if the diesel PM emission rate is less than or equal to 0.01 g/bhp-hr. New emergency standby engines are required to meet the applicable non-methane hydrocarbon plus nitrogen oxides (NMHC+NOx), hydrocarbon (HC), and carbon monoxide (CO) tier 2 or tier 3 non-road CI engine emission standards, and tier 4 standards that do not require add-on controls. Table 2.3 shows emission limits for engine sizes comparable to those currently in use at the District.

Table 2.3 ATCM Emission Standards for New Stationary Emergency Standby Diesel-Fueled Compression Ignition Engines in g/bhp-hr (g/kW-hr)(1)
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Maximum Engine Power	Particulate Matter	Non-Methane Hydrocarbon plus Nitrogen Oxides	Carbon Monoxide
75 < HP < 100	0.15	3.5	3.7
(56 < kW < 75)	(0.20)	(4.7)	(5.0)
100 ≤ HP < 175	0.15	3.0	3.7
(75 ≤ kW < 130)	(0.20)	(4.0)	(5.0)
175 ≤ HP < 600	0.15	3.0	2.6
(130 ≤ kW < 450)	(0.20)	(4.0)	(3.5)

Note:
(1) May be subject to additional emission limitations as specified in current applicable District rules, regulations or policies. Applicable to model years 2008 and later.

4.3.1.2 Bay Area Air Quality Management District Regulations

The District is subject to the regulations of the BAAQMD. The BAAQMD implements regulatory compliance programs and ensures compliance with Federal, State, and BAAQMD regulations which are designed to achieve and maintain air quality standards to protect public health and improve air quality. As part of the permitting process, the BAAQMD sets source specific conditions which may establish emissions levels, operating conditions, and monitoring and record- keeping requirements.

Emissions limitations throughout the state have gotten more stringent through the last decade. In the past, the BAAQMD has tightened emission regulations to follow the lead of the South Coast Air Quality Management District (SCAQMD) in southern California. Historically, regulations adopted in SCAQMD become adopted by BAAQMD in subsequent years. In 2010, SCAQMD amended Rule 1110.2 - Emissions from Gaseous and Liquid-Fueled Engines. The Rule was amended to ensure emission compliance and provide documentation for internal combustion engines, through use of continuous emission monitoring systems (CEMS) or inspection and monitoring programs. The amended rule also established new long-term emission requirements.

In the event that the District considers alternative fuel sources, such as digester gas, additional regulatory impacts should be considers as part of the engineering evaluation. In addition to evolving regulations, such as changes to Regulation 9, Rule 8 for Stationary Internal Combustion Engines, the BAAQMD requires that new equipment meet Best Available Control Technology (BACT). BACT requirements for specific types of equipment and sources are modified as advancements are made in technology and emissions controls. BAAQMD has recently revised the 2008 BACT determination for lean burn digester gas engines in order to make the BACT determination more consistent with the BACT determination for landfill gas fired engines. Based on discussions with local WWTPs and intensive monitoring, the BAAQMD is not recommending paired standards for NOx and CO. Currently, the BACT standards include initial/post maintenance emission standards, action level standards, and not to exceed emissions limits. This would result in permit conditions outlining emission limits, maintenance and testing requirements, as well as record keeping requirements. “Technologically Feasible” BACT limits are somewhat lower; however, with the exception of SO2 emissions, the BAAQMD does not identify an appropriate technology to meet the emission limit.

Generally, any new or modified sources necessitate obtaining an Authority to Construct, followed by a Permit to Operate. Regulation 2, Rule 2, New Source review present the permitting requirements for new and modified sources operating in the BAAQMD. Additional regulations for specific types of sources can be found in Regulation 9. For example, Regulation 9, Rule 7 summarizes the regulations pertaining to industrial boilers. Depending on boiler size and fuel, this rule lays out emission limits for NOx and CO. For digester gas fueled boilers, greater than 1 million BTU/hr, emissions are limited to 30 ppm NOx and 400 ppm CO. For multi-fuel boilers, the NOx emissions are to be calculated on a heat input weighted average. Based on Regulation 2, Rule 1, General Requirements, boilers with heat inputs of less than 1 million BTUs/hr are exempt from permitting requirements as long as the boiler emits only combustion by-products.

Fuel cell emissions are currently significantly lower than State requirements and as such, there are no limits on emissions in any air district; nor are any limits expected in the planning time frame for this project.

4.3.1.3 Greenhouse Gas Emissions

The ARB adopted the Global Warming Solutions Act (also referred to as Assembly Bill 32, AB 32) in September 2006. This Act was the first regulatory program in the U.S. to require public and private agencies statewide to reduce greenhouse gas (GHG) emissions. The GHGs regulated under AB 32 are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and fluorinated gases. The Act does not affect wastewater treatment process emissions, but it does cover cogeneration facilities and onsite general stationary combustion sources. ARB's Proposed Scoping Plan (released October 2008) listed two thresholds by which agencies are to check if they are required to report. The reporting thresholds shown in Table 2.4 include combustion emissions from both fossil fuel (i.e., natural gas and diesel) and non-fossil fuel (i.e., biogas) sources.

Table 2.4 Greenhouse Gas Emissions Thresholds
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Facilities	Threshold
Cogeneration	≥ 10,000 mt $CO_2e^{(1,2)}$ per year report as "electricity generating unit" facilities with emission below 10,000 mt can drop from program
General Stationary Combustion	≥ 10,000 mt CO_2e per year (includes both biomass and fossil fuel combustion emissions) facilities with emissions between 10,000 and 25,000 mt can file an abbreviated report

Notes:
(1) mt: metric tons.
(2) CO_2e: carbon dioxide equivalent emissions.

In addition, the U.S. EPA's Mandatory GHG Reporting Rule (Reporting Rule) was adopted October 30, 2009. The Reporting Rule explicitly states that centralized domestic wastewater treatment systems are not required to report emissions; however, any stationary combustion of fossil or non-fossil fuels taking place at a wastewater treatment facility may be considered a "large" source of GHGs if they emit a total of 25,000 metric tons or more of CO_2 equivalent (CO_2e) emissions per year.

The District is not expected to exceed the thresholds for State or Federal mandatory reporting.

4.4 Onsite Stormwater Management

In the 1990s, the USEPA promulgated several regulations for permitting storm water discharges from industrial sites (including construction sites) and from municipal separate storm sewer systems (MS4s). MS4s are categorized into traditional and non-traditional discharges. For industrial discharges, the USEPA developed a four-tier permit issuance strategy associated with industrial activity as follows:

- Tier I, Baseline Permitting. One or more general permits will be developed to initially cover the majority of storm water discharges associated with industrial activity.
- Tier II, Watershed Permitting. Facilities within watersheds shown to be adversely impacted by storm water discharges associated with industrial activity will be targeted for individual or watershed-specific general permits.
- Tier III, Industry-Specific Permitting. Specific industry categories will be targeted for individual or Industry-specific general permits.
- Tier IV, Facility-Specific Permitting. A variety of factors will be used to target specific facilities for individual permits.

Sewer discharges are defined under Category 9 of the Tier III, Industry-Specific Permitting requirements and is governed by the Industrial Stormwater General Permit (Order 97-03-DWQ). This requirement states that “Facilities used in the storage, treatment, recycling, and reclamation of municipal or domestic sewage, including land dedicated to the disposal of sewage sludge, that are located within the confines of the facility with a design flow of one million gallons per day or more or required to have an approved pretreatment program under 40 CFR Part 403.”

As discussed, the Industrial Stormwater General Permit applies to specific categories of industrial activities, including publically owned treatment works (POTWs). However, because the District collects and treats all on-site stormwater flows, the District is exempt from the requirements in the Industrial Stormwater General Permit for developing a stormwater pollution prevention plan (SWPPP) and implementing best management practices (BMPs) to comply with water quality standards.

If District projects disturb one or more acres of soil or disturb less than one acre but are part of a larger common plan of development, the District may be subject to stormwater management for on-site construction projects. The District will be required to obtain coverage under the Construction Activities Storm Water General Permit [Order 2009-0009-DWQ or Construction General Permit (CGP)]. To ensure that the preparation and implementation of the SWPPP is sufficient for effective pollution prevention, it must be developed by a Qualified SWPPP Developer (QSD) and implemented by a Qualified SWPPP Practitioner (QSP).

4.5 Future Treatment Plant Regulatory Considerations

Potential regulatory scenarios for the WWTP include increased regulation of the following:

- Nutrients
- Microconstituents and Bioaccumulative Compounds
- Land Application of Biosolids
- Air Emissions

4.5.1 Nutrient Removal

Nutrients, including nitrogen (N) and phosphorus (P), are the leading cause of impairments to the nation's surface waters and as a result are receiving greater regulatory scrutiny regarding their contribution to the overall quality of the nation's receiving waters. Although appropriate amounts of nutrients are vital for the health and proper functioning of water bodies, excessive nutrient concentrations can cause water quality degradation.

In November 2007, the National Resources Defense Council (NRDC) filed a petition with the EPA to require that nutrient removal be included in the definition of secondary treatment. The petition stated that "there are many [biological processes] which can achieve total phosphorus levels of 1.0 mg/L as a monthly average, and a total nitrogen of 6 to 8 mg/L as an annual average" (National Resources Defense Council, 2007).

The State of Florida has become the initial focus of efforts by environmental groups to force development by EPA of federal numeric nutrient criteria, to be imposed on the states. EPA has agreed to a consent decree in the environmental suit, and has made a determination that numeric nutrient standards are necessary in Florida. Proposed criteria for total nitrogen and total phosphorus were released in January 2010. This action is possibly precedential, and may result in environmental groups suing the EPA to impose nutrient criteria in other areas of the country.

There is ongoing controversy concerning the impact of nutrient loadings to the San Francisco Bay. Although the impact of nutrient loadings to San Francisco Bay, including those from wastewater treatment plant discharges, are not fully characterized or understood, it is known that nutrients do play a key role in the phytoplankton ecology of the Bay. Currently, there are information gaps about how the productivity rates of phytoplankton affect the higher organisms in the San Francisco Bay food webs, and how nitrogen and phosphorus loadings affect the Bay's beneficial uses. Additionally, there is some evidence that the Bay, which has been historically light-limited (i.e., sun-limited), is becoming nutrient-limited, and is therefore at risk of algal blooms. If future research shows that nutrient loadings need to be reduced in San Francisco Bay, water quality standards may be developed.

In the current NPDES permit, the District does not have ammonia, total nitrogen or phosphorus limits. If the EPA changes the definition of secondary treatment or imposes nutrient criteria in California, the District may need to implement nutrient removal. Initial issuance of nutrient criteria in the San Francisco Bay Region is expected to require nitrogen removal only. Currently, the District operates its WWTP in nitrification/denitrification (NDN) mode and total nitrogen limits are not anticipated to require additional facility modifications at average day dry weather flow (ADDWF) rates. Issuance of phosphorus removal criteria is possible but is expected to be much less imminent. If phosphorous removal were required, the District would be well served by a meaningful discussion with the RWQCB over the lack of nutrient impairment in the receiving waters, and the fact that phosphorus removal can have substantial impacts on energy consumption, greenhouse gas emissions, and production of sludge from chemical co-precipitation.

4.5.2 Microconstituents and Bioaccumulative Constituents

There is a trend towards increasing regulation of some inorganic constituents (e.g., ammonia), emerging microconstituents, and bioaccumulative pollutants (e.g., mercury, polychlorinated biphenyls (PCBs), and dioxins) in treated effluent discharges.

Microconstituent, also referred to as “contaminants of emerging concern” (CECs) by the EPA Office of Water, are substances that have been detected in surface waters and the environment and may potentially cause deleterious effects on aquatic life and the environment at relevant concentrations. CECs include:

- Persistent organic pollutants (POPs) such as polybrominated biphenyl ethers (PBDEs; used in flame retardants, furniture foam, plastics, etc.) and other organic contaminants.
- Pharmaceuticals and personal care products (PPCPs), including a wide suite of human prescribed drugs, over-the-counter medications, bactericides, sunscreens, and synthetic musks.
- Veterinary medicines such as antimicrobials, antibiotics, anti-fungals, growth promoters, and hormones.
- Endocrine-disrupting chemicals (EDCs), including synthetic estrogens and androgens, naturally occurring estrogens, as well as many other compounds capable of modulating normal hormonal functions and steroidal synthesis in aquatic organisms;
- Nanomaterials such as carbon nanotubes or nano-scale particulate titanium dioxide.

Bioaccumulative constituents are substances that are taken up by organisms at faster rates than the organisms can remove them. As a result, these constituents accumulate in the organism, the food chain, and therefore in the environment and can remain there for long periods of time. Mercury, PCBs, and dioxins are some bioaccumulative constituents that are being increasingly regulated.

Monitoring requirements for these trace pollutants are increasing, including requirements to analyze constituents at lower detection limits. Over the longer horizon, it is likely that water quality criteria followed by new effluent limits will be added to permits. End-of-pipe requirements, with no dilution allowance, will likely continue to be required for bioaccumulative pollutants to the San Francisco Bay. Implementation of CEC standards is not expected to be imminent as the EPA is currently focused on assessing the potential impact CECs have on the environment and human health.

The District should consider options and alternatives that minimize the sources of these pollutants and remove them from the influent wastewater through increased source control and pollution prevention programs, where practicable. However, many of these compounds of emerging concern are ubiquitous, such as those found in PPCPs, and will be difficult to control at the source. The District should work with legislature and industry representatives to reduce or restrict the use of certain products where feasible, and continue public outreach efforts to discourage improper disposal of consumer products.

Current pollution prevention efforts for mercury, PCBs, and dioxins may be close to the maximum extent practicable (MEP) for the service area. The District is a participant in the Bay Area Clean Water Agencies (BACWA) Mercury Watershed Permit Group. Based on the Group Report published in 2011, the District currently implements the following source control programs: battery and fluorescent light recycling, public outreach/ education, and thermometer and/or thermostat exchange.

4.5.3 Land Application and Beneficial Use/Disposal of Biosolids

Use or disposal of biosolids is becoming progressively more difficult in California. Land application of biosolids is being restricted by many California counties, and fewer landfills are accepting biosolids.

Numerous counties in California have developed or are currently developing ordinances for biosolids land application. Figure 2.1 summarizes the current status of County ordinances that affect land application of biosolids.

To comply with possible future restrictions, the planning process will need to consider alternative biosolids use and/or disposal scenarios that are cost effective. Upon expiration of the existing biosolids landfill agreement and/or closure of the landfill, the District will be required to produce a class A product for disposal. The District may be able to accomplish on-site Class A biosolids production through capital projects. Alternately, the District may be able to meet future biosolids requirements through participation in the Bay Area regional biosolids program.

Figure 2.1 Status of Biosolids Land Application Ordinances by County

4.5.4 Air Emissions

Emissions limitations throughout the state have gotten more stringent through the last decade. In the past, the BAAQMD has tightened emission regulations similarly to follow the lead of the SCAQMD. As discussed in Section 4.3, in 2010, SCAQMD amended Rule 1110.2 - Emissions from Gaseous and Liquid-Fueled Engines. The District should expect that these amended regulations will be adopted by BAAQMD in the near-term, requiring compliance with more stringent NOx, VOC, and CO emissions limits and BACT requirements.

Additionally, as the District considers installation of equipment, current pertinent BAAQMD regulations should be consulted. Generally, new or modified sources necessitate obtaining an Authority to Construct and a Permit to Operate. Regulation 2, Rule 2, New Source review present the permitting requirements for new and modified sources operating in the BAAQMD. Additional regulations for specific types of sources are found in Regulation 9.

4.6 Cross-Media Impacts

The interconnection of regulations between various areas related to wastewater is an important consideration. Recently representatives from various air districts, RWQCBs, Caltrans, and the EPA came to an agreement to develop a cross-media checklist for use during the development of regulations. To discuss cross-media issues and solutions, the California Association of Sanitation Agencies (CASA) along with other Clean Water Summit Partners organized a Biosolids Cross-Media Roundtable for a wide range of state and federal officials on May 16, 2008. As a result of the roundtable, CASA has coordinated efforts to develop the cross-media checklist. Components of the cross-media checklist include biosolids, compost processing, recycled water, California’s AB 32 (regulating GHG emissions), California Environmental Quality Act (CEQA), regulatory processes, development of Water Quality Control Plans (Basin Plans) and water quality standards/regulations, and impact assessments to air, water, and land media. The process of getting the checklist implemented by the various California air, water, and waste control boards is still underway.

Figure 2.2 shows the key wastewater components and their corresponding regulatory issues.

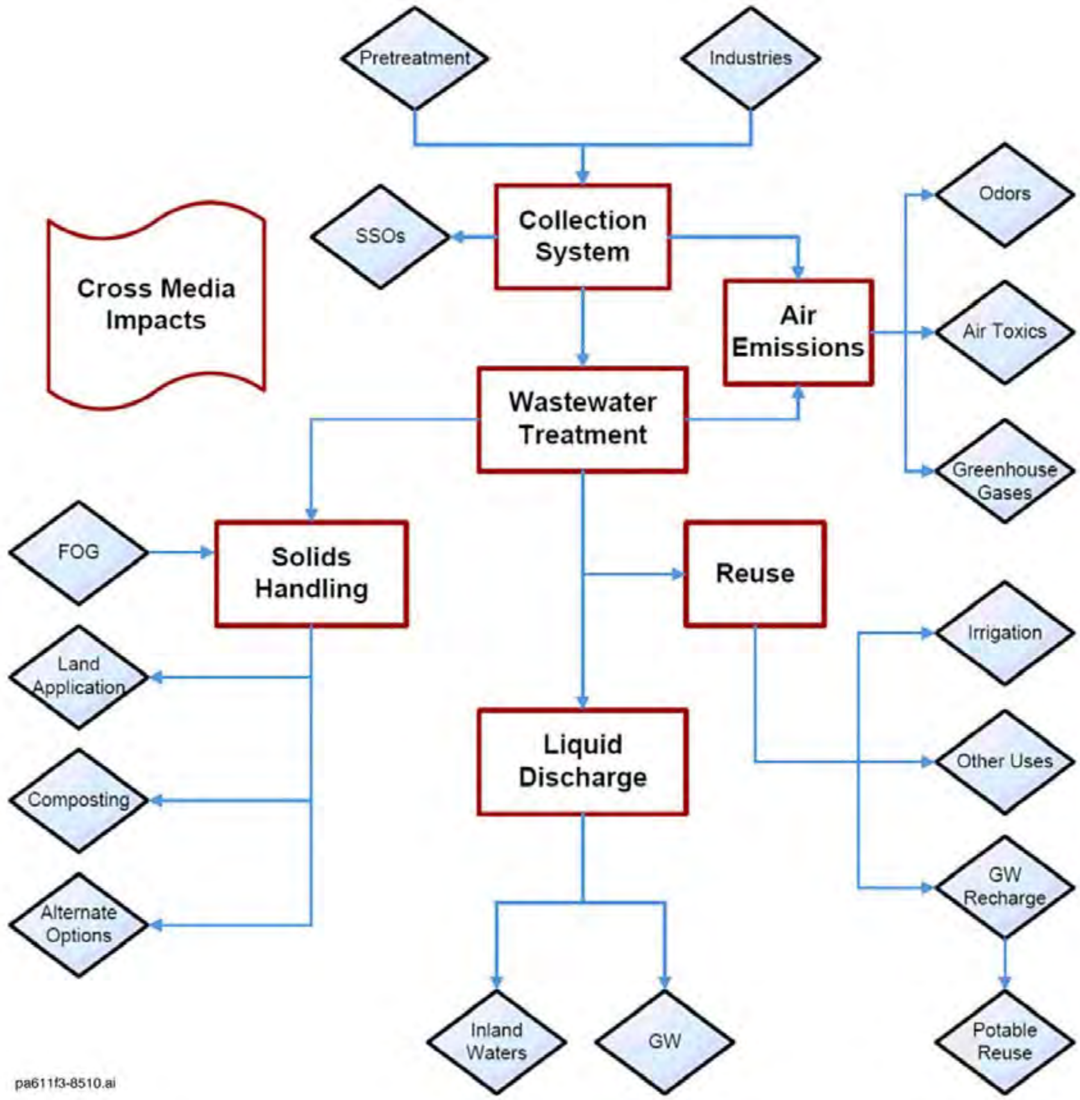

Figure 2.2 Cross-Media Impacts: Key Wastewater Regulatory Issues

5.0 COLLECTION SYSTEM

A sewer system overflow (SSO) is defined as any overflow, release, discharge, or diversion of untreated or partially treated wastewater from a sanitary sewer system. SSOs can contain high levels of suspended solids, pathogenic organisms, toxic pollutants, nutrients, oil, and grease. SSOs have the potential to pollute surface and ground waters, threaten public health, adversely affect aquatic life, and impair the recreational use and aesthetic enjoyment of surface waters.

In California, all public agencies that own or operate a sanitary sewer system that is comprised of more than one mile of pipelines or sewer lines that convey wastewater to a publicly owned treatment facility must comply with regulations related to SSOs.

In 1995, the EPA formed the Sanitary Sewer Overflow Federal Advisory Subcommittee (SSO Subcommittee) which established basic principals requiring the following:

- Capacity, management, operation, and maintenance (CMOM) programs for municipal sanitary sewer collection systems;
- A prohibition on SSOs, which includes a closely circumscribed framework for raising a defense for unavoidable discharges;
- Reporting, public notification, and record-keeping requirements for municipal sanitary sewer collection systems and SSOs.

In 2004, the San Francisco Bay Area RWQCB implemented new monitoring and reporting requirements related to SSOs. Subsequently, in 2005, the RWQCB issued a letter requiring the development of a Sewer System Management Plan (SSMP). The new requirements were in response to a growing emphasis on the reduction of overflows and applied only to agencies within its region.

5.1 Sanitary Sewer Overflow Regulations

In May 2006, the California SWRCB adopted the General Waste Discharge Requirements (GWDRs) as Water Quality Order No. 2006-0003-DWQ, establishing new monitoring and reporting requirements, and SSMP development requirements for all agencies that own or operate a collection system with more than one mile of pipe. The purpose of the GWDRs is to provide consistent statewide requirements for quantifying and reducing both the number of SSOs and the volume of wastewater spilled in the state. The GWDRs are currently being updated and revisions are expected to be adopted in summer 2013.

The draft four categories of SSOs, as established by the 2013 GWDRs, are:

1. Category 1

2. Category 2

3. Category 3

4. Private Lateral Sewage Dischargers

Each of these is further described in Table 2.5.

Table 2.5 SSO Definition
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

SSO Category	Definition
Category 1	Discharges of untreated or partially treated wastewater of any volume resulting from a sanitary sewer system failure or flow condition that: • Reaches a surface water and/or reaches a drainage channel; or • Reach a municipal separate storm sewer system and are not fully captured and returned to the sanitary sewer system or not otherwise captured and disposed of properly.
Category 2	This category includes all discharges of sewage resulting from a failure in the District's sanitary sewer system that: • Equal or exceed 1,000 gallons that does not result in a discharge to a drainage channel and/or surface water or storm drain pipe that was not fully captured and returned to the sanitary sewer system.
Category 3	This category includes all other discharges of sewage resulting from a failure in the District's sanitary sewer system.
Private Lateral Sewage Discharges	Sewage discharges that are caused by blockages or other problems within a privately owned lateral.

For these four categories, there are four main types of spills where specific reporting time frames are required. These are as summarized, in order of severity, below:

- **Category 1 - SSOs that Reach Surface Waters.** This SSO type includes, regardless of volume, spills that result in a discharge to a drainage channel and/or surface water or discharges to a storm drain pipe that are not fully captured and returned to the sanitary sewer system.

- **Category 2 - SSOs that Do Not Reach Surface Waters.** This SSO type includes spills greater than 1,000 gallons that do not result in a discharge to a drainage channel and/or surface water or discharges to a storm drain pipe that are not fully captured and returned to the sanitary sewer system.

- **Category 3 - SSOs.** All other types of SSOs that includes spills less than 1,000 gallons that do not result in a discharge to a drainage channel and/or surface water or discharges to a storm drain pipe that are not fully captured and returned to the sanitary sewer system.
- **Private Lateral Sewage Discharges.** This SSO type includes discharges that are caused by blockages or other problems within a lateral sewer that is not owned by the wastewater collection system agency. Privately owned laterals typically service residential, commercial, and industrial customers and extend from either the sewer main connection or the publicly owned right-of-way to the building connection.

5.2 Sewer System Management Plans

The SSMP is a general compilation of information about the management, operation, and maintenance of the District's sanitary sewer collection system. The SWRCB SSMP requirements are similar to the RWQCB SSMP requirements, but differ in organization and some details. The SSMP must address the following eleven components: 1) Program goals; 2) Organization; 3) Legal authority; 4) Operation and maintenance program; 5) Design and performance provisions; 6) Overflow emergency response plan; 7) Fats, oil and grease (FOG) control program; 8) System evaluation and capacity assurance plan (SECAP); 9) Monitoring, measurement, and program modifications; 10) SSMP audits; 11) Communication plan and final certification.

5.3 SSMP Implementation Schedule

The GWDRs have established an SSMP implementation schedule based on the size of the agency. It is estimated that the District currently serves a population of roughly 8,000. The District's implementation schedule is therefore governed by the schedule established for agencies ranging in size from 2,500 to 10,000 persons. Table 2.6 contains the implementation schedule that is required for the District in the development of a SSMP.

The District submitted all eleven sections of the SSMP for approval in 2008. The last audit was completed in 2010.

The District has done an excellent job maintaining and operating its sanitary sewer collection system. Ongoing operation and maintenance activities are a priority for collection system staff. After reviewing the 2009 to 2010 audit and collection system performance assessment forms, a checklist was developed for overall SSMP element compliance. The checklist is presented in Table 2.7 and illustrates the programs that the District currently has in-place (or are on-going), programs that are currently being developed (or in progress), and programs that the District does not currently have but are required for SSMP compliance.

The District has many of the SSMP elements either in-place or these programs are currently being developed. However, a few program elements have been identified that the

District may need to develop for compliance with the pending SSO regulations. These program elements are:

1. Wastewater Quality Monitoring Program – the District is currently not obligated to perform wastewater quality monitoring on their collection system or overflow events. If this changes in the future, the District will be required to implement a wastewater quality-monitoring program.

Table 2.6 Sewer System Master Plan Implementation Schedule
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Task	RWQCB Dates	SWRCB Certification Date[1]
Plan and Schedule	August 31, 2006	February 2, 2008
Goals and Organization	August 31, 2006	May 2, 2008
Legal Authority	Not Required	November 2, 2009
Measures and Activities (O&M Plan)	August 31, 2007	November 2, 2009
Overflow Emergency Response Plan	August 31, 2006	November 2, 2009
FOG Plan	August 31, 2006	November 2, 2009
Design and Construction Standards (Design and Performance Provisions)	August 31, 2007	May 2, 2010
System Capacity Assurance Plan	Not Required	May 2, 2010
Monitoring, Measurements, and Prog. Modifications	August 31, 2008	May 2, 2010
Program Audits	Not Required	May 2, 2010
Communication Program	N/A	May 2, 2010
Final SSMP and Certification	August 31, 2008	May 2, 2010

Note:
(1) Required Certification Date based on GWDR Order No. 2006-0003 for Population of 2,500 to 10,000.

2. Flow Monitoring Program – the District does not currently have a formalized flow-monitoring program. However, the District is currently conducting temporary flow monitoring as part of their collection system master plan that is underway, and also has a permanent flow meter at the headworks at the WWTP.

3. Manhole and Pipeline Inspection – the District routinely inspects manholes and conducts inspections concurrently with Closed Circuit Television (CCTV) of District pipelines. The District targets CCTV inspection of approximately 1/5 of the collection system each year.

Table 2.7 SSMP Checklist
Comprehensive Wastewater System Master Plan
Rodeo Sanitary District

Program Element	Completed or On-going Program in Place	Program In-Progress	Program Needed
1. Management(1)			
a. Program Goals	X		
b. Organizational Structure	X		
c. Formal Training Program	X		
d. Communication	X		
e. Customer Service	X		
f. Management Information Systems	X		
g. SSO Notification Programs	X		
h. Legal Authority	X		
2. Operation(1)			
a. Operational Budgeting	X		
b. Compliance	X		
c. Water Quality Monitoring			N/R(2)
d. Hydrogen Sulfide Monitoring & Control	X		
e. Safety	X		
f. Emergency Preparedness & Response	X		
g. Modeling	X		
h. Engineering	X		
i. Pump Stations	X		
3. Maintenance(1)			
a. Maintenance Budgeting		X	
b. Maintenance Activities	X		
c. Sewer Cleaning	X		
d. Parts & Equipment Inventory	X		
e. Flow Monitoring(3)	X		
f. Manhole & Pipeline Inspection	X	X	
g. Smoke Testing, Building Inspections & Dyed Water Testing	X		
h. Closed Circuit Televised Inspection	X		
i. Rehabilitation	X		
4. System Evaluation & Capacity Assurance	X		X
5. Overflow Emergency Response Plan	X		
6. SSMP Audit Forms	X		

Notes:
(1) The Management, Operation and Maintenance elements encompass the SSMP Summary.
(2) Water Quality Monitoring is currently not required.
(3) Flow Monitoring performed as part of SSMP.

6.0 COMPLIANCE STRATEGIES

The District is in compliance with its existing treatment and collection system regulations. As the District develops the CWWMP, it is prudent to evaluate future regulatory scenarios and include compliance strategies to meet future regulations in its long-term CIP. The potential regulatory scenario for the District was developed based on several factors, including:

- Other waste discharge requirements issued to dischargers in the San Francisco Bay area and California.
- Pending regulations.
- Discussions with regulators.
- Examination of growth and other non-regulatory developments that may affect areas where the WWTP is currently in compliance.

The potential regulatory impacts and potential solutions to address these requirements are summarized in Table 2.8.

Table 2.8 Summary of Potential Regulatory Issues and Solutions Comprehensive Wastewater Master Plan Rodeo Sanitary District

Topic	Issue	Potential Solution
Nutrient Removal	If EPA modifies the definition of secondary treatment to include nutrient removal, the WWTP will need to remove nitrogen and phosphorus.	Add processes and/or capacity to remove nutrients. The WWTP currently operates in NDN mode but may require addition of anaerobic selectors or process change for phosphorus removal.
Microconstituents and Bioaccumulative Constituents	There is a trend of increasing regulation and it is likely that new effluent limits will be added to permits.	Maximize removal from the influent wastewater through increased source control and pollution prevention programs. Consider advanced oxidation. For ubiquitous compounds, work with legislature to restrict their use and improper disposal.
Biosolids	Landfilling of and land application of biosolids is becoming increasingly restricted and fewer landfills are accepting biosolids.	Consider diversifying biosolids use/disposal alternatives and prepare to produce a Class A product with closure of landfill.
Air Emissions	EPA and ARB recently amended its air emissions regulations for new standby CI engines.	Plan for increasingly stringent emissions requirements. Consult applicable regulations with installation of new equipment that may trigger new sources.
Collection System	2013 Draft regulation amendments require voluntary reporting of private lateral sewerage discharges; additional SSMP sections covering “Risk and Threat Analysis” and “Staff Performance Assessment Program”; three tiered WDRs and NPDES permitting of SSOs; 5-year board re-certification requirement.	Compile database and mapping of private sewer laterals. Increase monitoring and reporting of all SSOs. Increase sewer system maintenance and cleaning/inspection programs to prevent SSOs. Increase audit frequency to develop annual audits.

6/3/13

6/3/13

RODEO SANITARY DISTRICT

COMPREHENSIVE WASTEWATER MASTER PLAN

TECHNICAL MEMORANDUM NO. 3
ASSESSMENT OF EXISTING COLLECTION SYSTEM CONDITIONS

FINAL
June 2013

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RODEO SANITARY DISTRICT

COMPREHENSIVE WASTEWATER MASTER PLAN

TECHNICAL MEMORANDUM
NO. 3
ASSESSMENT OF EXISTING COLLECTION SYSTEM CONDITIONS

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ASSESSMENT OF EXISTING COLLECTION SYSTEM CONDITIONS

1.0 PURPOSE

The purpose of this technical memorandum (TM) is to provide an overview of the existing condition of the Rodeo Sanitary District (District) collection system. This TM describes the collection system and evaluates the condition of the sewer pipelines and manholes as part of the Comprehensive Wastewater Master Plan (CWWMP).

2.0 SUMMARY OF KEY FINDINGS AND RECOMMENDATIONS

- A review of the closed circuit television (CCTV) data, system maps, and model information was performed to identify rehabilitation and replacement needs and projects. While approximately sixty seven (67) percent of the existing collection system has CCTV data available, more than fifty (50) percent of the area inspected received a condition ranking of 4 or 5 as shown in the table in Section 5.3. Pipeline segments with structural condition rankings of 5 and segments beyond there useful life were determined to require rehabilitation or replacement and were divided into capital improvements programs for Year 1, Year 2, Year 3, 3 to 10 Years, and 11 to 20 Years. See Section 5.3 of this TM for a description of the condition assessment and Section 5.7 for findings and recommendations.

- A comparison of sewer slopes and diameters vs. the minimum velocity required for scouring showed a number of areas where insufficient slope was available making the system in those areas particularly susceptible to blockage. Pipe segments with operations and maintenance (O&M) condition rankings of 4 or 5 and slopes less than scouring velocity should be regularly cleaned and considered as part of the capital improvements project. These pipe segments are shown in Figure 3.7.

- Sewer manholes can be a source of inflow and a complete condition assessment of manhole structures is recommended by a Manhole Assessment and Certification Program (MACP) certified inspector.

- The collection system has extremely high rates of infiltration and inflow (I&I), particularly in the older sections of the District service area. The influent pump station has a firm capacity (one pump in standby mode) of 3.5 million gallons per day (mgd) and a total capacity of 4.6 mgd with all pumps in operation. The collection system hydraulic capacity without overflows is estimated at 5.1 mgd. There is insufficient hydraulic capacity for peak wet weather flow (PWWF) larger than a 5-year storm. See

Section 5.5 of this TM for a description of the hydraulic capacity evaluation and findings.

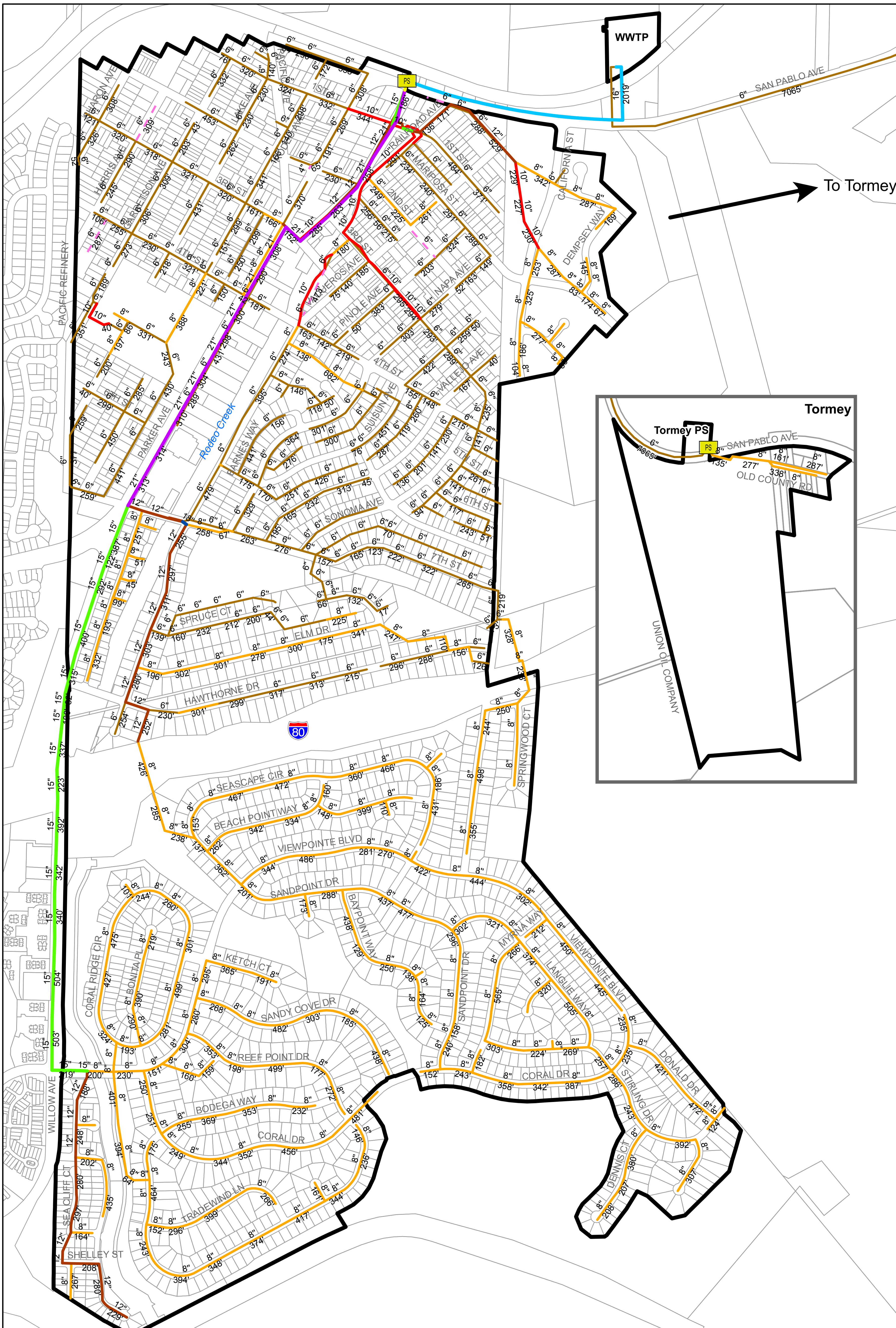
- The wastewater treatment plant's computerized maintenance management system should be expanded to include the sewer collection system.

3.0 BACKGROUND

The District is responsible for operation and maintenance of the sanitary sewer collection system in the Town of Rodeo and the Village of Tormey in Western Contra Costa County, California. Wastewater flows are collected from these two areas at separate pump stations and are then conveyed to the District's wastewater treatment plant (WWTP) located at 800 San Pablo Avenue located in Rodeo, California. The collection system service area is approximately one square mile in size and services approximately 2,500 connections. The Rodeo Influent Pump Station is located along San Pablo Avenue adjacent to and west of Rodeo Creek. The wastewater is pumped east through a 16-inch diameter force main along San Pablo Avenue to the WWTP. The current average dry weather flow rate from the District service area in Rodeo is approximately 0.58 mgd with a maximum dry weather permitted flow of 1.14 mgd. During wet weather, the District experiences a peaking factor at or above 3. The Tormey pump station serves a very small area with 19 service connections located approximately two miles northeast of the WWTP along San Pablo Avenue. The average daily Tormey flows of approximately 5,000 gallons per day are pumped south through a 6-inch diameter force main to the WWTP.

The collection system in the Town of Rodeo consists of approximately 27 miles of primarily gravity flow sewers. The pipelines are constructed of vitrified clay pipe (VCP), cast iron, ductile iron pipe (DIP), asbestos cement pipe (ACP), steel pipe, polyvinyl chloride (PVC) pipe and high density polyethylene (HDPE) pipe. The collection system in the Viewpoint subdivision (Southeast of Hwy 80) was constructed in the 1970's, while the collection system northwest of Hwy 80 and east of Rodeo Creek was constructed in the 1940's. The oldest part of the system is West of Rodeo Creek and has pipe from the early 1900's.

The approximate lengths of each size of sewer are presented on Figure 3.1, and are listed in Table 3.1. As shown in Figure 3.2, approximately 85 percent of the collection system is made up of VCP and only six (6) percent is plastic pipe. The majority of the ductile iron and steel pipe are made up of the Influent and Tormey force mains. There are a number of private laterals as well as individual homeowner pump stations that were built as part of housing developments that feed into the collection system. The private laterals are only partially mapped in the collection system maps and are not shown on Figure 3.1. The collection system also consists of 512 sanitary sewer manholes.



Legend

Pump Station	8"	16"	Private Lateral
Pipeline Diameter	10"	18"	Rodeo Sanitary District Boundary
4"	12"	21"	Parcels
6"	15"	24"	

Feet
0 400 800

Figure 3.1
District Collection System
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

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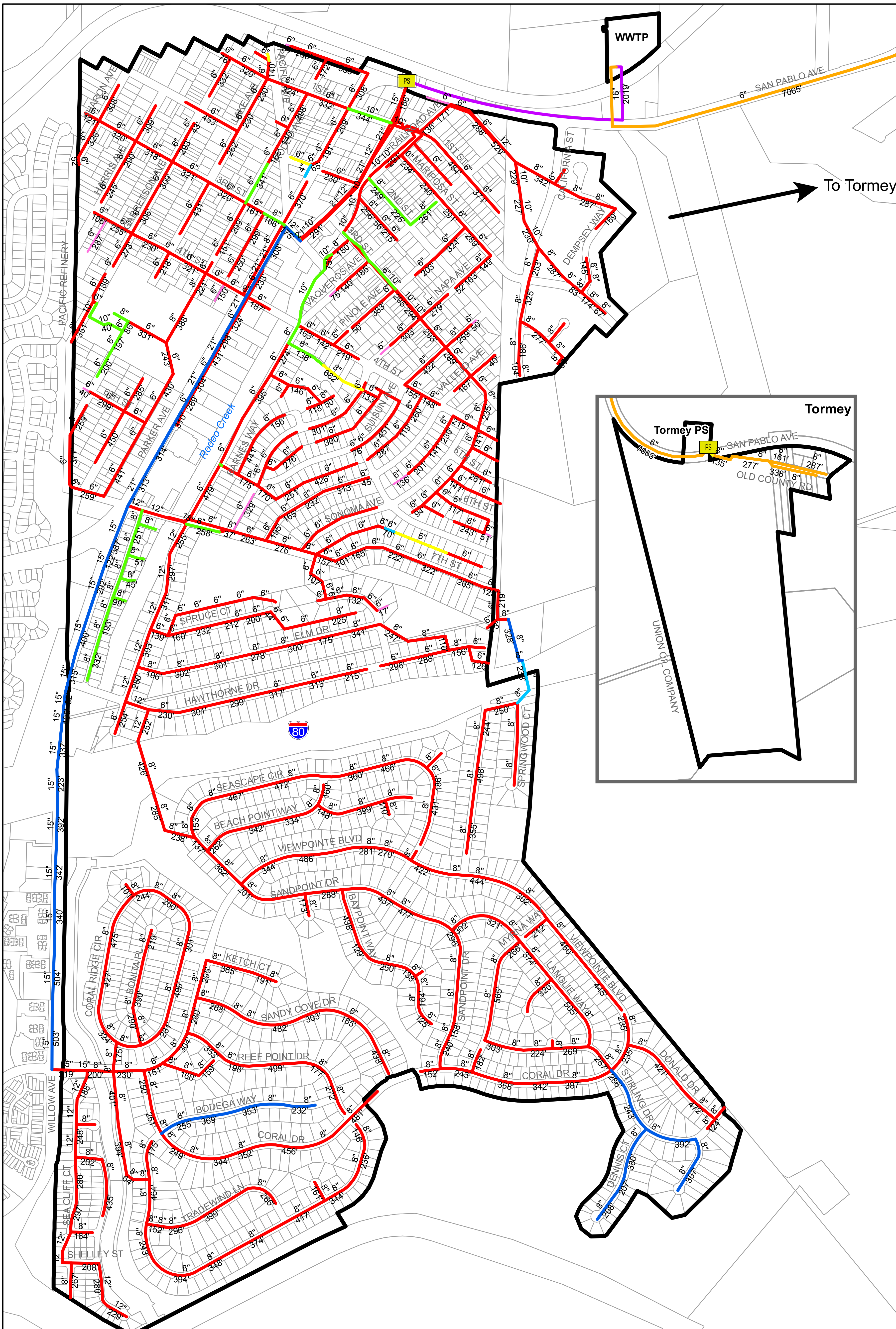


Legend

PS Pump Station

Pipeline Material

- ACP
- CI
- DI
- HDPE
- PVC
- STL
- VCP
- Unknown

Rodeo Sanitary District Boundary

Parcels

Feet
0 400 800

Figure 3.2
Pipeline Material
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

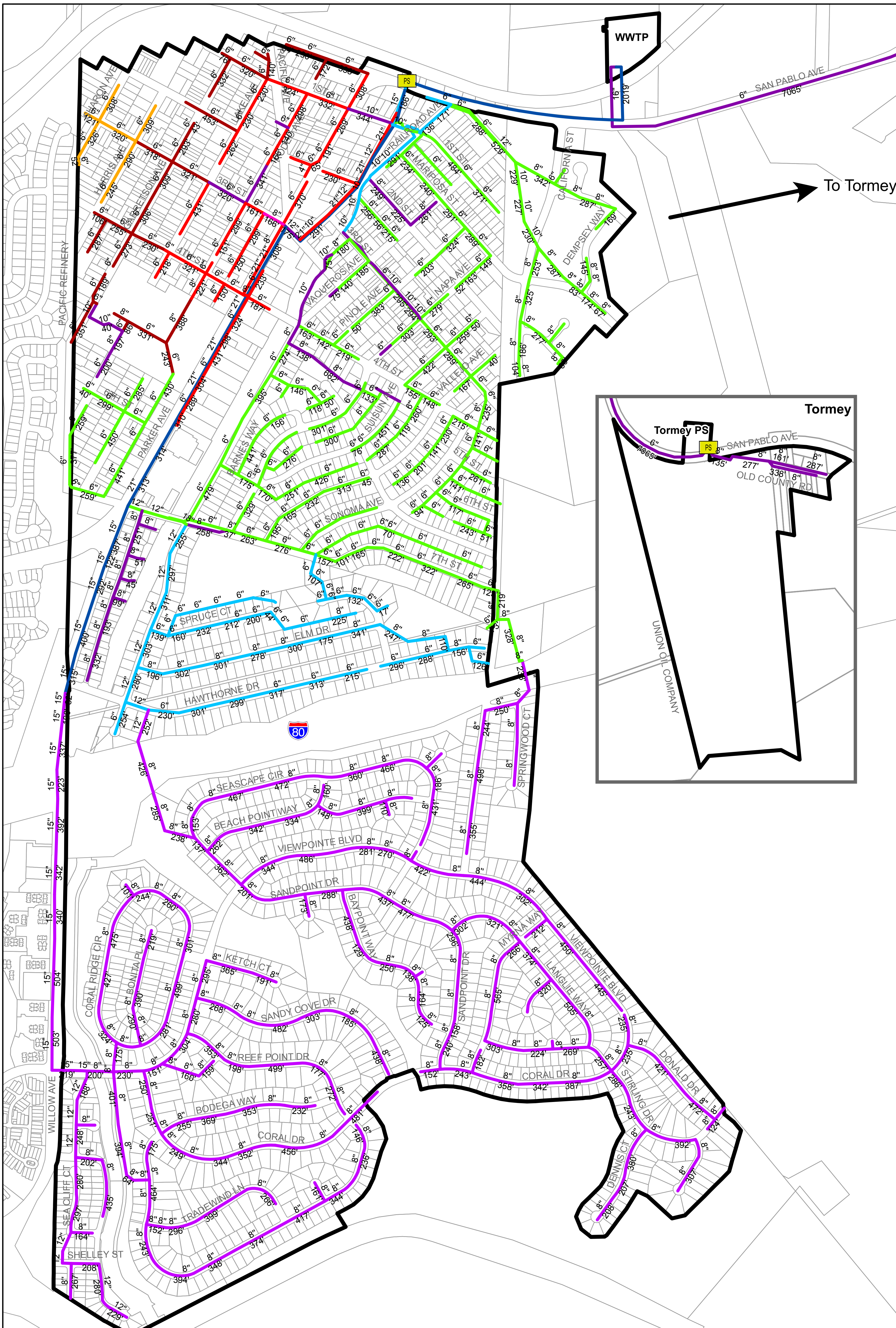
Table 3.1 Existing Collection System Length by Size Comprehensive Wastewater Master Plan Rodeo Sanitary District	
Sewer Diameter (inches)	**Approximate Length (feet)**
4-inch	111
6-inch	61,930
8-inch	60,784
10-inch	4,416
12-inch	7,323
15-inch	4,778
16-inch	2,019
18-inch	34
21-inch	4,005
24-inch	120
Total Length	**145,520**

Note:
(1) Sewer lengths are based on the 2006 RSD Modeling Report by Advanced Hydro Engineering as amended by CCTV data and later survey information. Total length includes Influent Force Main and Tormey Force Main.

4.0 COLLECTION SYSTEM VERIFICATION

The District data on the sanitary sewer pipelines and manholes was obtained from the District's collection system maps as well as spreadsheets developed during the CCTV inspection work and previous modeling conducted by the District. For pipelines, the attributes of diameter, material, and age are the most useful for a desktop analysis of pipeline condition, so wherever possible, this information was populated using the information available from the District. Unfortunately, the District no longer has design drawings available for the majority of the sewer collection system. Therefore, approximate pipeline age by decade was assigned based on geographical location and when development occurred in that area as described by the District. A summary of existing sewer pipeline information by installation year is presented on Figure 3.3.

Several data gaps still exist in pipe elevations, diameters, material types, and installation years that will continue to be refined and updated by District staff over time.



Legend

- PS Pump Station
- Rodeo Sanitary District Boundary
- Parcels

Pipeline Install Decade

- 1900
- 1910
- 1920
- 1940
- 1950
- 1960
- 1970
- 2000
- 2010

Feet: 0, 400, 800

Figure 3.3
Pipeline Installation Date
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

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5.0 PIPELINE CONDITION ASSESSMENT

This section describes the methodology used to perform the condition assessment of the existing sanitary sewer system. A condition rating was calculated for each segment of sewer pipeline separated by manholes to facilitate comparison to other segments when CCTV data was available.

5.1 Historical CCTV Inspections

For sewer pipelines, the condition assessment is usually performed with CCTV cameras that inspect the interior of the pipes and rate structural and O&M defects based on the National Association of Sewer Service Companies (NASSCO) Pipeline Assessment and Certification Program (PACP) rating system. L.R. Paulsell Inc. performed a series of CCTV investigations between October 2008 and September 2012 that covered approximately 67% of the District's collection system. The District is on a five year cycle with the goal to CCTV the entire system by the end of 2013. This will provide the District with a base line as to determine the rate of change of the condition of the system over time. Once the entire system has been CCTV'd, it is anticipated that the District will change to a 10 year cycle where 10 percent of the system is CCTV'd annually.

5.2 Condition Rating Development using PACP

Condition ratings were developed by L.R. Paulsell for each pipe segment using the PACP Structural Pipe Rating and the PACP O&M Pipe Rating during the CCTV efforts. Table 3.2 presents the descriptions and categories used in the PACP Condition Rating Scale for structural defects. Defect severity is graded based on defect observations during CCTV inspection according to this scale.

5.3 Condition Assessment

Overall, approximately 88,700 linear feet (LF) of the sanitary sewer collection system has been inspected to date. The CCTV inspections revealed numerous pipe segments that have structural failures and problems with partial blockage due to root intrusion, insufficient slopes, and lack of prior cleaning. Fifty (50) percent of the sewer pipelines inspected were found to be in poor to very poor condition as presented in Table 3.3, and a large portion of the system is in need of rehabilitation or replacement in the near term.

Figure 3.4 presents a visual of the structural condition ratings and how they relate to their location in the overall sewer system. It should be noted that even a pipe with a score of 3 could contain defects that may require immediate attention. Segments containing one or more Grade 5 structural defects are presented in Table 3.4:

Figure 3.5 provides an overview of the O&M condition scores. These scores are useful in determining a recommended sewer cleaning schedule.

Table 3.2 PACP Condition Rating Scale
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Structural Condition Rating	Pipe Grade Importance(1)	Likelihood of Failure Estimate(1)
5 - Very Poor	Defects requiring immediate attention	Pipe has failed or will likely fail within the next 5 years
4 – Poor	Severe defects that will become Grade 5 defects within the foreseeable future	Pipe will probably fail in 5 to 10 years
3 – Fair	Moderate defects that will continue to deteriorate	Pipe may fail in 10 to 20 years
2 – Good	Defects that have not begun to deteriorate	Pipe unlikely to fail for at least 20 years
1 – Excellent	Minor defects	Failure is unlikely in the foreseeable future

Note:
(1) The PACP Condition Grading System only considers internal pipe conditions obtained from CCTV inspection. While other factors such as pipe material, depth, soils, and surface conditions also affect pipe survivability and the likelihood of failure, those factors have not been incorporated into the PACP Condition Grading System

Table 3.3 Overview of Collection System Structural Condition
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Structural Condition Ranking	Description	Approximate % of Collection System
0 or 1	Excellent	21.8%
2	Good	7.1%
3	Fair	4.9%
4	Poor	12.3%
5	Very Poor	21.0%
No CCTV Available	Unknown	32.9%

Legend

PS Pump Station

PACP Structural Rating

- Very Poor Condition
- Poor Condition
- Fair Condition
- Good Condition
- Excellent Condition
- Unknown

Rodeo Sanitary District Boundary

Parcels

Feet
0 400 800

Figure 3.4
PACP Structural Rating
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

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Table 3.4 Pipe Segments Containing Grade 5 Structural Defects
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Upstream MH	Downstream MH	CCTV Length (LF)	Diameter (in)	Location	Pipe Material	Approximate Installation Year
496	10	76	6	1st Street	VCP	1900
20	29	327	6	1st Street	VCP	1910
29	318	334	6	1st Street	VCP	1910
471	22	458	6	2nd Street	VCP	1900
503	504	68	6	2nd Street	VCP	1910
532	107	283	6	2nd Street	VCP	1910
13	24	322	6	3rd Street	VCP	1900
24	33	322	6	3rd Street	VCP	1910
1	6	324	6	3rd Street	VCP	1920
6	13	321	6	3rd Street	VCP	1920
90	86	294	6	3rd Street	VCP	1940
96	98	296	6	3rd Street	VCP	1940
98	90	296	6	3rd Street	VCP	1940
80	100	227	6	3rd Street	VCP	1940
408	97A	234	6	3rd Street Ease.	VCP	1940
92A	111	219	6	4th Street	VCP	1940
93	92	157	6	4th Street	VCP	1940
111	110	145	6	4th Street	VCP	1940
179	408	215	6	4th Street	VCP	1940
176	523	165	6	4th Street Ease.	VCP	1940

Table 3.4 Pipe Segments Containing Grade 5 Structural Defects
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Upstream MH	Downstream MH	CCTV Length (LF)	Diameter (in)	Location	Pipe Material	Approximate Installation Year
407	523	221	6	4th Street Ease.	VCP	1940
523	408	145	6	4th Street Ease.	VCP	1940
177	176	265	6	5th Street	VCP	1940
178	406A	293	6	5th Street Ease.	VCP	1940
406	176	125	6	5th Street Ease.	VCP	1940
361	363	304	6	6th Street	VCP	1940
361A	361	40	6	6th Street	VCP	1940
174	175	134	6	6th Street	VCP	1940
402	493	105	6	6th Street Ease.	VCP	1940
405	529	94	6	6th Street Ease.	VCP	1940
529	175	144	6	6th Street Ease.	VCP	1940
157	158	324	6	7th Street	VCP	1940
181	182	279	6	7th Street	VCP	1940
398	475	259	6	7th Street	VCP	1940
169	509	438	6	Barnes Way	VCP	1940
36	37	104	8	California Street	VCP	1940
39	451	256	8	California Street	VCP	1940
450	47	131	6	California Street	VCP	1940
310	309	139	8	Claeys Court	AC	1970
43	588	32	8	Dempsey Way	VCP	1940

Table 3.4 Pipe Segments Containing Grade 5 Structural Defects
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Upstream MH	Downstream MH	CCTV Length (LF)	Diameter (in)	Location	Pipe Material	Approximate Installation Year
44	43	147	8	Dempsey Way	VCP	1940
45	541	171	8	Dempsey Way	VCP	1940
45A	45	45	8	Dempsey Way	VCP	1940
138	142	344	8	Elm Drive	VCP	1960
143	144	302	8	Elm Drive	VCP	1960
144	145	282	8	Elm Drive	VCP	1960
147	118	198	8	Elm Drive	VCP	1960
556	64	450	6	First Street Ease.	VCP	1940
396	397	380	6	Garreston Avenue	VCP	1900
445	516	331	6	Garreston Avenue	VCP	1900
516	17	32	6	Garreston Avenue	VCP	1900
517	19	196	6	Garreston Avenue	VCP	1900
12	13	297	6	Garretson Avenue	VCP	1900
12A	12	43	6	Garretson Avenue	VCP	1900
132	395	303	6	Hawthorne Drive	VCP	1960
133	132	322	6	Hawthorne Drive	VCP	1960
135	136	292	6	Hawthorne Drive	VCP	1960
434	138	249	8	Hawthorne Easement	VCP	1960
188	428	135	8	I-80 Easement	VCP	1970
21	20	231	6	Lake Avenue	VCP	1910

Table 3.4 Pipe Segments Containing Grade 5 Structural Defects
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Upstream MH	Downstream MH	CCTV Length (LF)	Diameter (in)	Location	Pipe Material	Approximate Installation Year
22	21	232	6	Lake Avenue	VCP	1910
23	22	264	6	Lake Avenue	VCP	1910
25	24	424	6	Lake Avenue	VCP	1910
446	396	259	6	Lake Avenue	VCP	1910
518	362	200	6	Lake Avenue	VCP	1910
27	26	218	6	Lake Street	VCP	1910
462	141	68	6	Laurel Court	VCP	1960
444	448	331	6	Lefty Gomez Fld.	VCP	1900
401	400	290	6	Mahoney Ease.	VCP	1940
70	68	291	6	Mariposa Street	VCP	1940
73	70	289	6	Mariposa Street	VCP	1940
530B	530	118	6	Napa Ave Easement	VCP	1940
88	89	164	6	Napa Avenue	VCP	1940
89	73	149	6	Napa Avenue	VCP	1940
91	90	306	6	Napa Avenue	VCP	1940
91A	91	101	6	Napa Avenue	VCP	1940
419	88	52	6	Napa Avenue	VCP	1940
168	167	156	6	Napa Avenue	VCP	1940
170	553	220	6	Napa Avenue	VCP	1940
507	170	301	6	Napa Avenue	VCP	1940

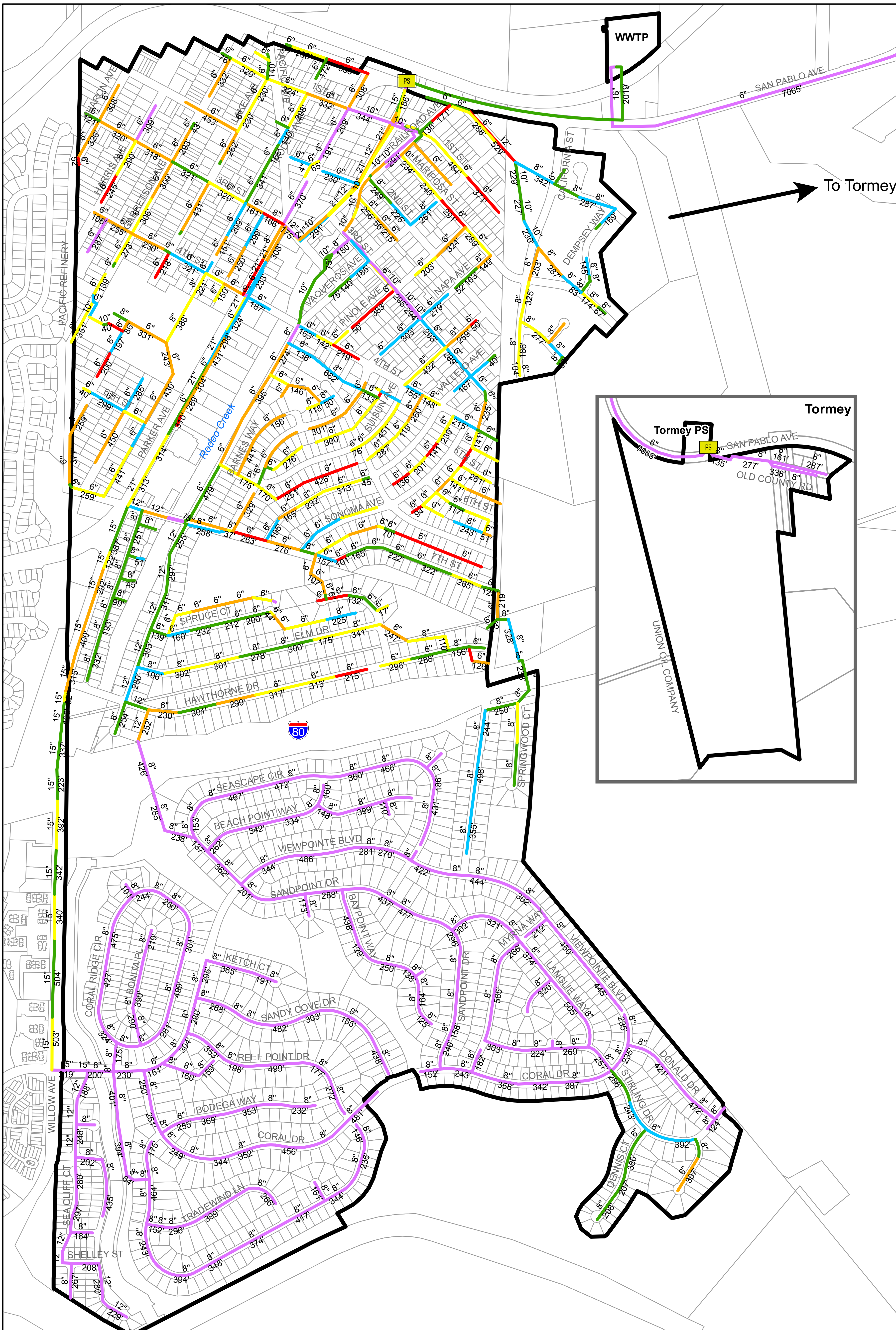
Table 3.4 Pipe Segments Containing Grade 5 Structural Defects
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Upstream MH	Downstream MH	CCTV Length (LF)	Diameter (in)	Location	Pipe Material	Approximate Installation Year
554	166	329	6	Napa Avenue	VCP	1940
171	412	307	6	Napa Ease.	VCP	1940
460	171	305	6	Napa Ease.	VCP	1940
499	20	141	6	Pacific Avenue	VCP	1900
365	447	432	6	Parker Alley	VCP	1910
317	318	311	6	Parker Avenue	VCP	1910
71	70	328	6	Pinole Ave.	VCP	1940
72	71	204	6	Pinole Ave.	VCP	1940
87	86	383	6	Pinole Avenue	VCP	1940
421	111	154	6	Pinole Avenue	VCP	1940
30	29	300	6	Rodeo Avenue	VCP	1910
364	363	285	6	Rodeo Avenue	VCP	1910
538	30	140	6	Rodeo Avenue	VCP	1910
476	363	453	6	Rodeo Avenue	VCP	1940
83	557	127	6	Rodeo Creek Ease.	VCP	1940
441	443	121	6	Rodeo Hills Sch.	CI	1900
28	317	335	6	San Pablo Avenue	VCP	1900
62A	62	191	6	San Pablo Avenue	VCP	1900
498	28	292	6	San Pablo Avenue	VCP	1900
49	62	145	12	San Pablo Avenue	VCP	1940

Table 3.4 Pipe Segments Containing Grade 5 Structural Defects
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Upstream MH	Downstream MH	CCTV Length (LF)	Diameter (in)	Location	Pipe Material	Approximate Installation Year
48	63	160	6	San Pablo Avenue	VCP	1940
548	48	288	6	San Pablo Avenue	VCP	1940
4	1	312	6	Sharon Avenue	VCP	1920
180	422	219	6	Sonoma Avenue	VCP	1940
427	180	284	6	Sonoma Avenue	VCP	1940
526	527	60	6	Sonoma Ease.	VCP	1940
149	117	140	6	Spruce Court	VCP	1960
150	148	237	6	Spruce Court	VCP	1960
437	436	178	6	Spruce Easement	VCP	1960
438	149	166	6	Spruce Easement	VCP	1960
438A	438	137	6	Spruce Easement	VCP	1960
92	98	426	6	Suisun Avenue	VCP	1940
172	411	455	6	Suisun Avenue	VCP	1940
414	172	76	6	Suisun Avenue	VCP	1940
410	410A	119	6	Suisun Ease.	VCP	1940
410A	93	260	6	Suisun Ease.	VCP	1940
435	522	251	6	Suisun Ease.	VCP	1940
521	435	430	6	Suisun Ease.	VCP	1940
456	85	221	6	Tormey Avenue	VCP	1940
46	47	217	8	Trigger Road	VCP	1940

Table 3.4	Pipe Segments Containing Grade 5 Structural Defects Comprehensive Wastewater Master Plan Rodeo Sanitary District					
Upstream MH	**Downstream MH**	**CCTV Length (LF)**	**Diameter (in)**	**Location**	**Pipe Material**	**Approximate Installation Year**
38	543	277	8	Tullibee Court	VCP	1940
543	542	277	8	Tullibee Road	VCP	1940
544	543	152	8	Tullibee Road	VCP	1940
95	96	169	6	Vallejo Avenue	VCP	1940
183	182	198	6	Vallejo Avenue	VCP	1940
185	184	237	6	Vallejo Avenue	VCP	1940
186	185	316	6	Vallejo Avenue	VCP	1940
186A	186	15	6	Vallejo Avenue	VCP	1940
179B	179	230	6	Vallejo Ease.	VCP	1940
409	179A	201	6	Vallejo Ease.	VCP	1940
409A	409	156	6	Vallelo Ease.	VCP	1940
81	80	187	6	Vaqueros Avenue	VCP	1940
385	368	400	6	Vaqueros Avenue	VCP	1940
520	84	162	8	Vaqueros Avenue	PVC	2000
Total Length of Pipe		**9,133**	**LF**			



Legend

Pump Station	Fair Condition	Rodeo Sanitary District Boundary
PACP O & M Rating	Good Condition	Parcels
Very Poor Condition	Excellent Condition	
Poor Condition	Unknown	

Feet
0 400 800

Figure 3.5
PACP O & M Rating
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

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To date, the District has performed an inspection and condition assessment of nearly 17 miles out of 27 miles of the existing sanitary sewer pipelines. The remainder of the gravity sewer pipelines are scheduled to be analyzed in the next two years. The District's current practice of regularly cleaning and providing CCTV of 20% of its sanitary sewer pipelines annually (10% annually after 2013), provides valuable condition assessment information that can be utilized in the future for updating and refining the asset condition ratings. In order to further develop the condition assessment of the system condition ratings should be further refined based on the available repair and failure history that should be tracked in a computerized maintenance management system (CMMS). The WWTP currently uses the COGZ CMMS system, which could be expanded to include the collection system.

5.4 Useful Life of Sewer Mains

Table 3.5 lists the useful life and replacement period for the material types of sewer pipelines in the District's system based on industry-reported estimated life expectancies and the District's experience. The useful life is a measure of the number of years expected until a failure may occur and the pipe needs to be rehabilitated or replaced. Generally, the useful life indicates a timeframe in which 50 percent of pipelines may need to be rehabilitated or replaced prior to this length of time and 50 percent would need rehabilitation afterwards. Typically, steel pipe is considered to have a useful life of 50 years. However, based on the very good condition that was observed during the June 2007 Influent Force Main Condition Assessment performed by HydroScience Engineers and L.R. Paulsell, the useful life of steel pipe was increased from 50 years to 75 years. This is the only location steel is used in the collection system. Remaining useful life for each pipe segment was calculated and used to prioritize pipeline rehabilitation/replacement.

Table 3.5 Expected Useful Life for Sewer Pipelines and Manholes
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Pipe Material	Useful Life (Years)
Asbestos Cement Pipe (ACP)	70
Cast Iron Pipe (CIP)	40
Ductile Iron Pipe (DIP)	75
High Density Polyethylene (HDPE)	70
Polyvinyl Chloride Plastic (PVC)	70
Steel Pipe (Steel)	75
Vitrified Clay Pipe (VCP)	75
Manholes	75

Based on collection system maps, there are 509 manholes in the system and only 71 of them have been replaced or are new manholes. It appears that a sewer manhole rehabilitation program occurred in the past where brick manholes were lined with fiberglass, but data was not available for which manholes were rehabilitated. Sewer manholes can be a source of inflow and a condition assessment of manhole structures is recommended.

5.5 Flow Data

Base flow in the collection system comes primarily from two areas: the older northern section and the newer southern section, and is approximately equal in flow. Each area produces approximately 0.3 mgd of flow during the dry weather season. The collection system maximum flow to the Influent Pump Station (without overtopping MH 100) was determined by Advanced Hydro Engineering to be 5.1 mgd based on preliminary model data. It was also determined that the 10-inch sewer downstream of MH 100 (located in Third Street near Rodeo Creek) is undersized and restricts the hydraulic capacity of the system flow to the pump station. Further modeling runs indicated that without the MH 100 restriction, the collection system capacity is 6.9 mgd based on a 5-year storm and 7.9 mgd using a 10-year storm.

Based on available pipe diameter and invert elevations, approximately 19,000 LF of gravity sewer pipelines were installed with slopes less than the minimum required for scouring velocity. This leads to loss of capacity and eventual blockage that can lead to overflows in the collection system. Appendix A lists the locations of sewers with inadequate slopes to meet scouring velocity.

5.6 Infiltration and Inflow

Flow meters were installed by V&A Consulting Engineers Inc. (V&A) at 12 different locations during the 2011 to 2012 rainy season. Two flow monitoring devices were located in the field at MH 477 (15 inch) and MH 57 (21 inch) to determine infiltration and inflow in the Southern and Northern parts of the system. Flow from these two manholes covers all flow to the WWTP with the exception of the Tormey area. Infiltration and inflow data are available based on three storm events that are summarized in Table 3.6.

Table 3.6	Field Infiltration and Inflow Results Comprehensive Wastewater Master Plan Rodeo Sanitary District			
Location	**Base Flow (mgd)**	**Measured I/I Flow (mgd)**	**Total Flow (mgd)**	**Peaking Factor**
North West Area (MH 477: oldest area in District)	0.326	2.194	2.520	7.7
Newer Southern Area (MH 57)	0.250	0.825	1.075	4.3
Total Flow	**0.576**	**3.019**	**3.595**	6.2

5.7 Current Collection System Maintenance and Replacement Program

Weekly meetings are held regarding the collection system maintnenance to prioritize cleaning and repairs. In general, the program is based on areas where sanitary sewer overflows (SSOs) have occurred in the past. The District has a monthly sewer check-off list of 23 sewer segments (3,100 feet) that are cleaned monthly, and an additional list of 18 sewer segments (2,000 feet) that are cleaned quarterly. These lists were generated based on historical problem areas after storms. Immediately following a storm evernt, the maintenance crew inspects 37 manholes located in problem areas. If the manhole is surcharged, the sewer segment is cleaned from manhole to manhole by hydrojetting and using perforated screens to catch the debris downstream. After a storm, the 1st Street and 7th Street siphons are also monitored to prevent SSOs.

Sewer replacement was previously based on SSOs, but now CCTV reports determine areas that need immediate replacement or repairs. In addition, the District has been replacing five to six old, brick manholes per year. There are only two capital improvement projects planned for 2012: replacement of sewer between MH 28 to MH 317 in San Pablo Avenue and replacement of sewer in the Lefty Gomez ball fields. All other capital improvements occur on a reactive basis with an annual budget of approximately $80,000 for manholes, spot repairs, and line replacement.

5.8 Sewer Lateral Program

The District adopted a mandatory lateral replacement program in 2008 under a District ordinance. Owners are required to inspect the sewer lateral during the sale of their home. The District offers a grant of $1500 per lateral with a budget of up to $30,000 per year on a first come first serve basis. Since 2010, there is now a voluntary (no penalty) program for people selling their house to replace their lateral. Close to 10% of all laterals, or 250 houses, have a certificate of compliance. There is less than 50% compliance for home sales.

5.9 Recommendation

Due to the age of the collection system and infiltration and inflow seen in the older parts of the system, an extensive sanitary sewer replacement and rehabilitation capital improvements program is required. In addition, a complete condition assessment of manhole structures is also recommended.

Figure 3.6 proposes a rehabilitation/replacement schedule based on a combination of pipe condition and pipe age. Pipes that received a structural condition rating of 5 and were beyond their useful life were grouped in Year 1. Pipes that received a structural condition rating of 5, but still had useful life were grouped in Year 2. Table 3.7 summarizes the decision criteria for determining schedule. Table 3.8 quantifies the pipe segments that will require rehabilitation or replacement by year. Information by pipe segment is presented in Appendix B.

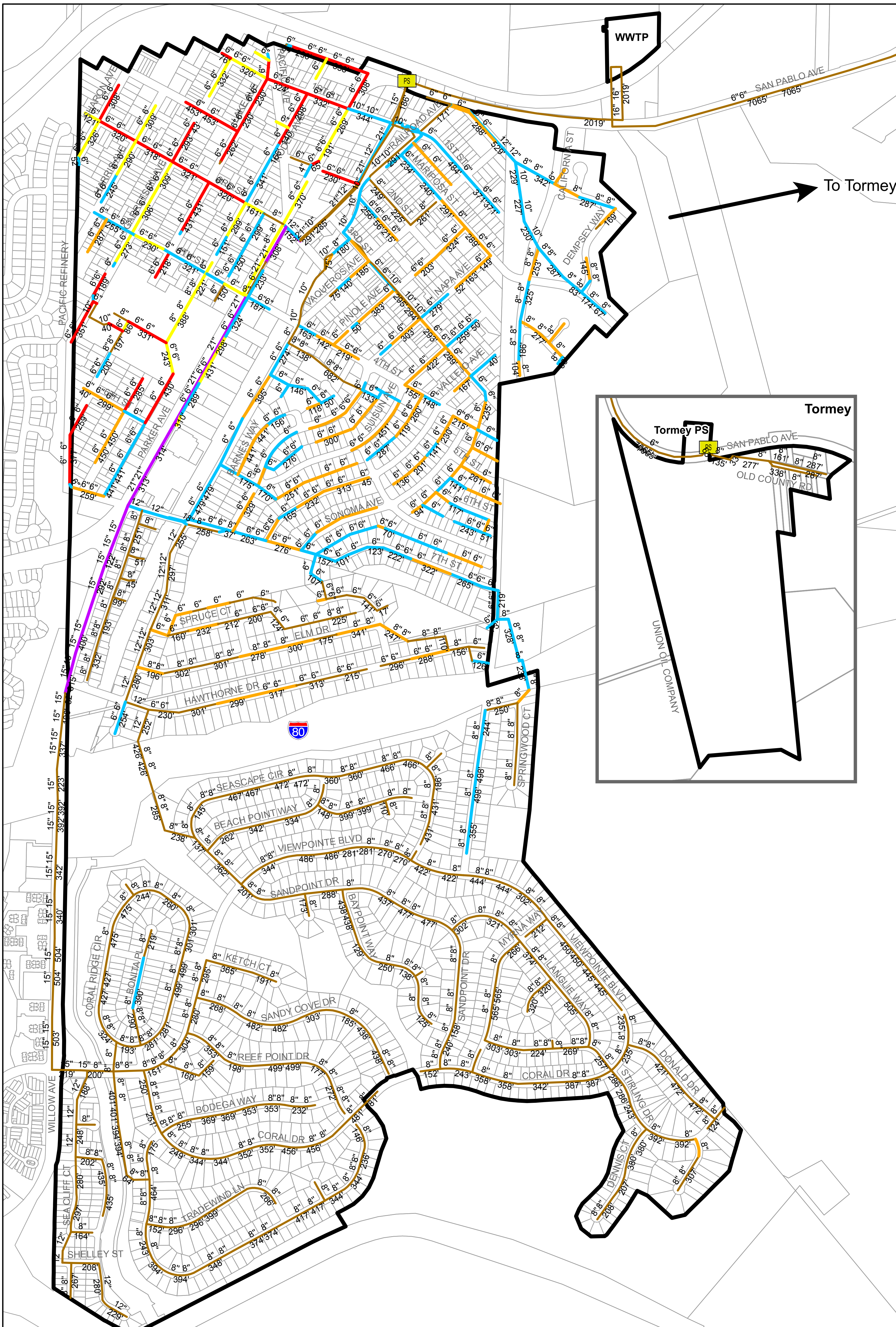
Table 3.7 Decision Criteria for Rehabiliation/Replacement Schedule
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

PACP Structural Code	Remaining Useful Life (Years)	Schedule
5	Useful Life Over	Year 1
5	Time Remaining	Year 2
4 or Unknown	Useful Life Over	Year 3
	Useful Life Over with next 5 years	Years 3 to 10
	Useful Life Over within next 6 to 10 years	Years 11 to 20

Table 3.8 Overview of Rehabiliation/Replacement Schedule
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Year	Approximate Length of Pipe (LF)
1	8,935
2	21,627
3	6,790
3 to 10	27,148
11 to 20	4,109

Note: The majority of the pipes listed are 6 or 8 inches in diameter. The 15 and 21 inch trunk sewer will require replacement within the next 20 years.



Legend

PS Pump Station	Year 3	Rodeo Sanitary District Boundary	
Rehabilitation/ Replacement Schedule	Within 10 Years	Parcels	
Year 1	Within 20 Years		
Year 2	All Other Pipelines		

Feet
0 400 800

Figure 3.6
Recommended Sewer Rehabilitation/ Replacement Schedule
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

RODEO RSD SANITARY DISTRICT

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Figure 3.7 proposes a sewer cleaning schedule based on a combination of historical problem areas, pipe O&M condition, pipe slope, material and age. Pipes that received an O&M condition rating of 4 or 5 and were already on the District's monthly or quarterly cleaning list or experienced an SSO in the past 5 years were placed on a monthly cleaning cycle. Pipes that were already on the District's monthly or quarterly cleaning list with O&M condition ratings less than 3 were placed on a 3 month cleaning cycle. Pipes that received an O&M condition rating of 4 or 5 and have historically been a problem (as shown on the collection system maps), and were VCP older than 50 years, and had slopes less than the minimum required for scouring velocity were grouped in a 6 month cleaning cycle. Table 3.9 summarizes the decision criteria for determining cleaning schedule. Table 3.10 quantifies the pipe segments that will require more frequent cleaning and monitoring. Since wastewater agencies on average clean approximately 30 percent of their system annually (ASCE, 1998), it was assumed that an additional 10 percent of all pipes would be cleaned each year so that all pipes in the collection system will be cleaned every 10 years. Information by pipe segment is presented in Appendix C.

Table 3.9 Decision Criteria for Cleaning Schedule
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Currently on Monthly or Quarterly Cleaning List?	Experienced SSO since 2007?	Historical Problem Area?	PACP O&M Code	Slope Greater than Minimum for Scouring Velocity?	Pipe Age and Material	Cleaning Schedule
Yes	Yes		4 or 5			Monthly
Yes	Yes		<4			Every 3 months
		Yes	4 or 5	No	VCP >50 years old	Every 6 months
					10% of All Pipes	Annually

Table 3.10 Overview of Cleaning Schedule
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Cleaning Frequency	Approximate Length of Pipe (LF)
Monthly	8,935
Every 3 months	7,725
Every 6 months	6,400
Annually	14,600
Total Cleaned per Year	**37,660**

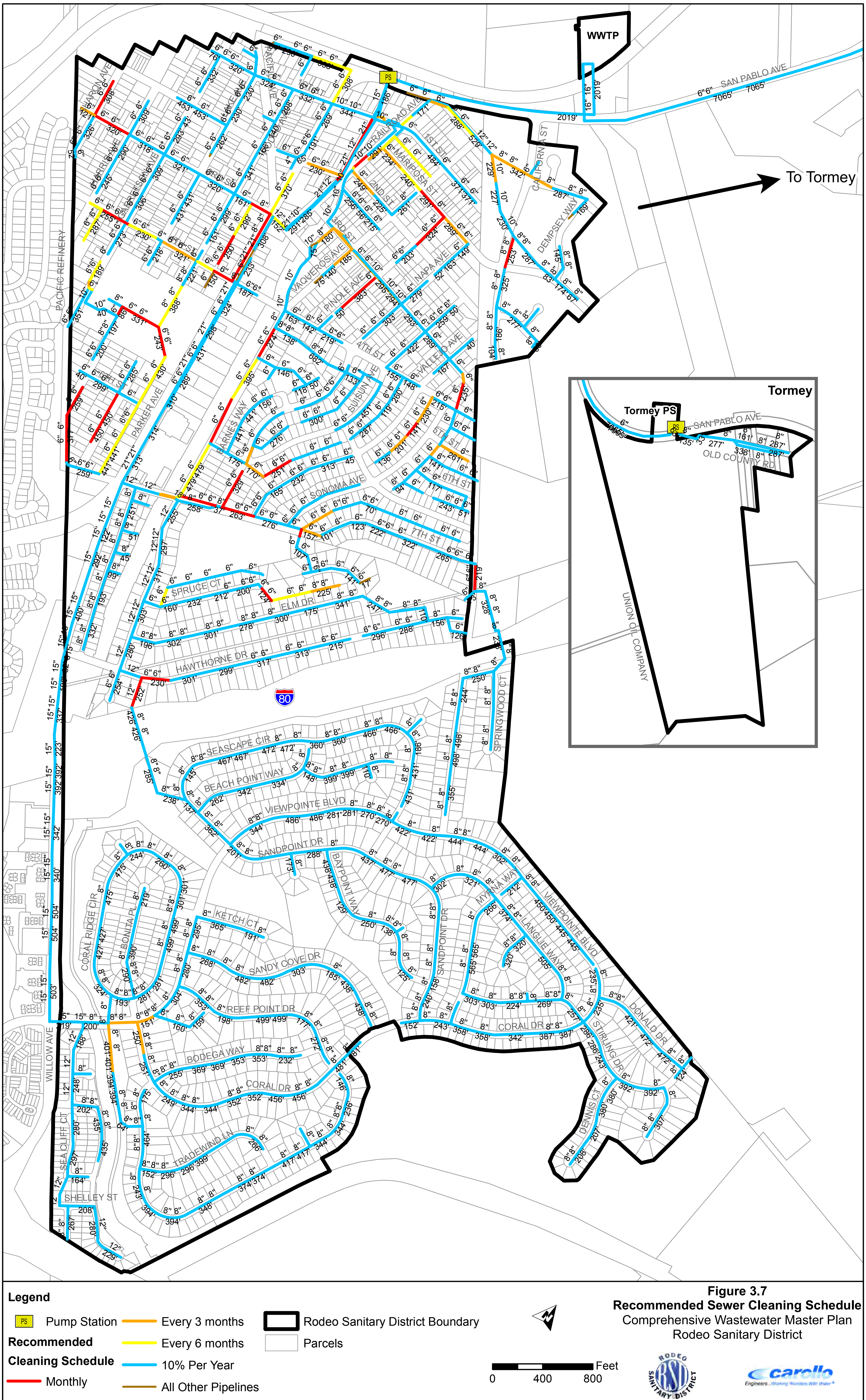

Figure 3.7
Recommended Sewer Cleaning Schedule
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

6.0 PUMP STATION CONDITION ASSESSMENT

All of the wastewater in the District's service area (with the exception of the Tormey area) is collected at the Influent Pump Station and pumped through a 2,100-foot long 16-inch diameter force main to the headworks at the WWTP. The condition of the Influent Pump Station was evaluated as part of TM No. 5 Wastewater Treatment Plant Assessment and will not be covered further in this TM. The Tormey Pump Station was built in 2006 and was not part of the condition assessment since the entire system in that area is relatively new.

APPENDIX A – SEWER PIPELINES WITH INADEQUATE SLOPE

APPENDIX A – SEWER PIPELINES WITH INADEQUATE SLOPE

Sewer Pipelines with Inadequate Slope Comprehensive Wastewater Master Plan Rodeo Sanitary District			
Upstream MH	**Downstream MH**	**Length**	**DIAMETER (inches)**
1	6	324	6
3	1	121	6
4	1	312	6
5	6	309	6
6	13	321	6
8	7	247	6
9	549	106	6
16	15	275	6
16A	16	27	6
17	18	117	10
19	516	44	6
27	26	218	6
28	317	335	6
30	29	300	6
31	32	167	6
35	547	163	6
52	54	60	12
56	60	86	10
56	60	86	12
60	58	93	15
65	64	130	6
67	65	234	6
68	67	240	6
70	68	291	6
74	61	291	10
75	65	150	6
76	74	153	10
77	76	26	10
83	557	127	6

Sewer Pipelines with Inadequate Slope
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Upstream MH	Downstream MH	Length	DIAMETER (inches)
102	106	304	21
103	108	266	12
107	59	529	12
108	107	62	12
110	84	164	6
112	385	394	6
113	112	484	6
113	164	52	6
120	119	251	6
154A	154	73	6
163	114	260	8
165	163	306	8
165	163	67	8
182	166	266	6
214	215	160	8
223	222	387	8
317	318	311	6
319	318	269	6
320	321	370	6
321	104	175	12
363	365	185	6
365	447	432	6
368	520	274	6
375	M2	135	8
385	368	400	6
417	417A	40	6
438	149	166	6
447	448	245	6
448	448A	300	6
456	85	221	6
461	463	337	6
468	469	234	6
470	2	52	6

Sewer Pipelines with Inadequate Slope Comprehensive Wastewater Master Plan Rodeo Sanitary District			
Upstream MH	**Downstream MH**	**Length**	**DIAMETER (inches)**
472	473	250	6
473	551	299	6
474	365	203	6
475	474	441	6
478	479	289	6
479	479A	431	6
484	482	49	12
487	308	124	8
492	174	118	6
496	10	76	6
500	499	51	6
504	319	191	6
505	480	184	6
506	480	231	6
513	226	152	8
514	249	65	8
516	17	32	6
517	19	196	6
519	478	72	6
528	461	222	6
538	30	140	6
545	34	152	6
546	35	97	6
547	324	164	6
548	48	288	6
549	468	257	6
556	64	450	6
559	52	139	12
	Total Length	**18,887**	

APPENDIX B – SEWER REMAINING USEFUL LIFE AND REHABILITATION/REPLACEMENT SCHEDULE

APPENDIX B – SEWER REMAINING USEFUL LIFE AND REHABILITATION/REPLACEMENT SCHEDULE

Sewer Remaining Useful Life and Rehabilitation/Replacement Schedule
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Upstream Manhole	Downstream Manhole	Length (feet)	Diameter (inches)	Location	Pipe Material	PACP Structural Code	Pipe Installation Year	Useful Life	Remaining Useful Life	Rehabilitation/ Replacement Schedule
20	29	327	6	1st Street	VCP	5	1910	75	-27	Year 1
29	318	334	6	1st Street	VCP	5	1910	75	-27	Year 1
496	10	76	6	1st Street	VCP	5	1900	75	-37	Year 1
471	22	458	6	2nd Street	VCP	5	1900	75	-37	Year 1
503	504	68	6	2nd Street	VCP	5	1910	75	-27	Year 1
532	107	283	6	2nd Street	VCP	5	1910	75	-27	Year 1
1	6	324	6	3rd Street	VCP	5	1920	75	-17	Year 1
6	13	321	6	3rd Street	VCP	5	1920	75	-17	Year 1
13	24	322	6	3rd Street	VCP	5	1900	75	-37	Year 1
24	33	322	6	3rd Street	VCP	5	1910	75	-27	Year 1
396	397	380	6	Garreston Avenue	VCP	5	1900	75	-37	Year 1
445	516	331	6	Garreston Avenue	VCP	5	1900	75	-37	Year 1
516	17	32	6	Garreston Avenue	VCP	5	1900	75	-37	Year 1
517	19	196	6	Garreston Avenue	VCP	5	1900	75	-37	Year 1
12	13	297	6	Garretson Avenue	VCP	5	1900	75	-37	Year 1
12A	12	43	6	Garretson Avenue	VCP	5	1900	75	-37	Year 1
21	20	231	6	Lake Avenue	VCP	5	1910	75	-27	Year 1
22	21	232	6	Lake Avenue	VCP	5	1910	75	-27	Year 1
23	22	264	6	Lake Avenue	VCP	5	1910	75	-27	Year 1
25	24	424	6	Lake Avenue	VCP	5	1910	75	-27	Year 1
446	396	259	6	Lake Avenue	VCP	5	1910	75	-27	Year 1
27	26	220	6	Lake Street	VCP	5	1910	75	-27	Year 1
444	448	331	6	Lefty Gomez Fld.	VCP	5	1900	75	-37	Year 1
499	20	141	6	Pacific Avenue	VCP	5	1900	75	-37	Year 1
365	447	432	6	Parker Alley	VCP	5	1910	75	-27	Year 1
317	318	311	6	Parker Avenue	VCP	5	1910	75	-27	Year 1

Sewer Remaining Useful Life and Rehabilitation/Replacement Schedule
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Upstream Manhole	Downstream Manhole	Length (feet)	Diameter (inches)	Location	Pipe Material	PACP Structural Code	Pipe Installation Year	Useful Life	Remaining Useful Life	Rehabilitation/ Replacement Schedule
30	29	300	6	Rodeo Avenue	VCP	5	1910	75	-27	Year 1
364	363	285	6	Rodeo Avenue	VCP	5	1910	75	-27	Year 1
538	30	140	6	Rodeo Avenue	VCP	5	1910	75	-27	Year 1
441	443	121	6	Rodeo Hills Sch.	CI	5	1900	40	-72	Year 1
28	317	335	6	San Pablo Avenue	VCP	5	1900	75	-37	Year 1
		191	6	San Pablo Avenue	VCP	5	1900	75	-37	Year 1
498	28	292	6	San Pablo Avenue	VCP	5	1900	75	-37	Year 1
4	1	312	6	Sharon Avenue	VCP	5	1920	75	-17	Year 1
90	86	294	6	3rd Street	VCP	5	1940	75	3	Year 2
96	98	296	6	3rd Street	VCP	5	1940	75	3	Year 2
98	90	296	6	3rd Street	VCP	5	1940	75	3	Year 2
80	100	227	6	3rd Street	VCP	5	1940	75	3	Year 2
408	97A	234	6	3rd Street Ease.	VCP	5	1940	75	3	Year 2
92A	111	219	6	4th Street	VCP	5	1940	75	3	Year 2
93	92	157	6	4th Street	VCP	5	1940	75	3	Year 2
111	110	145	6	4th Street	VCP	5	1940	75	3	Year 2
179	408	215	6	4th Street	VCP	5	1940	75	3	Year 2
176	523	165	6	4th Street Ease.	VCP	5	1940	75	3	Year 2
407	523	221	6	4th Street Ease.	VCP	5	1940	75	3	Year 2
523	408	145	6	4th Street Ease.	VCP	5	1940	75	3	Year 2
177	176	265	6	5th Street	VCP	5	1940	75	3	Year 2
178	406A	293	6	5th Street Ease.	VCP	5	1940	75	3	Year 2
406	176	125	6	5th Street Ease.	VCP	5	1940	75	3	Year 2
361	363	304	6	6th Street	VCP	5	1940	75	3	Year 2
361A	361	40	6	6th Street	VCP	5	1940	75	3	Year 2
174	175	134	6	6th Street	VCP	5	1940	75	3	Year 2
402	493	105	6	6th Street Ease.	VCP	5	1940	75	3	Year 2
405	529	94	6	6th Street Ease.	VCP	5	1940	75	3	Year 2
529	175	144	6	6th Street Ease.	VCP	5	1940	75	3	Year 2
157	158	324	6	7th Street	VCP	5	1940	75	3	Year 2
181	182	279	6	7th Street	VCP	5	1940	75	3	Year 2
398	475	259	6	7th Street	VCP	5	1940	75	3	Year 2
169	509	438	6	Barnes Way	VCP	5	1940	75	3	Year 2
450	47	131	6	California Street	VCP	5	1940	75	3	Year 2

Sewer Remaining Useful Life and Rehabilitation/Replacement Schedule
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Upstream Manhole	Downstream Manhole	Length (feet)	Diameter (inches)	Location	Pipe Material	PACP Structural Code	Pipe Installation Year	Useful Life	Remaining Useful Life	Rehabilitation/ Replacement Schedule
36	37	104	8	California Street	VCP	5	1940	75	3	Year 2
39	451	256	8	California Street	VCP	5	1940	75	3	Year 2
310	309	139	8	Claeys Court	AC	5	1970	70	28	Year 2
43A	42	106	8	Dempsey Way	VCP	5	1940	75	3	Year 2
44	43	147	8	Dempsey Way	VCP	5	1940	75	3	Year 2
45	541	171	8	Dempsey Way	VCP	5	1940	75	3	Year 2
138	142	344	8	Elm Drive	VCP	5	1960	75	23	Year 2
143	144	302	8	Elm Drive	VCP	5	1960	75	23	Year 2
144	145	282	8	Elm Drive	VCP	5	1960	75	23	Year 2
147	118	198	8	Elm Drive	VCP	5	1960	75	23	Year 2
556	64	450	6	First Street Ease.	VCP	5	1940	75	3	Year 2
132	395	303	6	Hawthorne Drive	VCP	5	1960	75	23	Year 2
133	132	322	6	Hawthorne Drive	VCP	5	1960	75	23	Year 2
135	136	292	6	Hawthorne Drive	VCP	5	1960	75	23	Year 2
434	138	249	8	Hawthorne Easement	VCP	5	1960	75	23	Year 2
188	428	135	8	I-80 Easement	VCP	5	1970	75	33	Year 2
462	141	68	6	Laurel Court	VCP	5	1960	75	23	Year 2
401	400	290	6	Mahoney Ease.	VCP	5	1940	75	3	Year 2
70	68	291	6	Mariposa Street	VCP	5	1940	75	3	Year 2
73	70	289	6	Mariposa Street	VCP	5	1940	75	3	Year 2
530B	530	118	6	Napa Ave Easement	VCP	5	1940	75	3	Year 2
88	89	164	6	Napa Avenue	VCP	5	1940	75	3	Year 2
89	73	149	6	Napa Avenue	VCP	5	1940	75	3	Year 2
91	90	306	6	Napa Avenue	VCP	5	1940	75	3	Year 2
419	88	52	6	Napa Avenue	VCP	5	1940	75	3	Year 2
168	167	156	6	Napa Avenue	VCP	5	1940	75	3	Year 2
170	553	220	6	Napa Avenue	VCP	5	1940	75	3	Year 2
507	170	301	6	Napa Avenue	VCP	5	1940	75	3	Year 2
554	166	329	6	Napa Avenue	VCP	5	1940	75	3	Year 2
171	412	307	6	Napa Ease.	VCP	5	1940	75	3	Year 2
460	171	305	6	Napa Ease.	VCP	5	1940	75	3	Year 2
71	70	328	6	Pinole Ave.	VCP	5	1940	75	3	Year 2
72	71	204	6	Pinole Ave.	VCP	5	1940	75	3	Year 2
87	86	383	6	Pinole Avenue	VCP	5	1940	75	3	Year 2

Sewer Remaining Useful Life and Rehabilitation/Replacement Schedule Comprehensive Wastewater Master Plan Rodeo Sanitary District										
Upstream Manhole	Downstream Manhole	Length (feet)	Diameter (inches)	Location	Pipe Material	PACP Structural Code	Pipe Installation Year	Useful Life	Remaining Useful Life	Rehabilitation/ Replacement Schedule
421	111	154	6	Pinole Avenue	VCP	5	1940	75	3	Year 2
476	363	453	6	Rodeo Avenue	VCP	5	1940	75	3	Year 2
83	557	127	6	Rodeo Creek Ease.	VCP	5	1940	75	3	Year 2
48	63	160	6	San Pablo Avenue	VCP	5	1940	75	3	Year 2
548	48	288	6	San Pablo Avenue	VCP	5	1940	75	3	Year 2
49	62	145	12	San Pablo Avenue	VCP	5	1940	75	3	Year 2
180	422	219	6	Sonoma Avenue	VCP	5	1940	75	3	Year 2
427	180	284	6	Sonoma Avenue	VCP	5	1940	75	3	Year 2
526	527	60	6	Sonoma Ease.	VCP	5	1940	75	3	Year 2
149	117	140	6	Spruce Court	VCP	5	1960	75	23	Year 2
150	148	237	6	Spruce Court	VCP	5	1960	75	23	Year 2
437	436	178	6	Spruce Easement	VCP	5	1960	75	23	Year 2
438	149	166	6	Spruce Easement	VCP	5	1960	75	23	Year 2
438A	438	137	6	Spruce Easement	VCP	5	1960	75	23	Year 2
92	98	426	6	Suisun Avenue	VCP	5	1940	75	3	Year 2
172	411	455	6	Suisun Avenue	VCP	5	1940	75	3	Year 2
414	172	76	6	Suisun Avenue	VCP	5	1940	75	3	Year 2
410	410A	119	6	Suisun Ease.	VCP	5	1940	75	3	Year 2
410A	93	260	6	Suisun Ease.	VCP	5	1940	75	3	Year 2
435	522	251	6	Suisun Ease.	VCP	5	1940	75	3	Year 2
521	435	430	6	Suisun Ease.	VCP	5	1940	75	3	Year 2
456	85	221	6	Tormey Avenue	VCP	5	1940	75	3	Year 2
46	47	217	8	Trigger Road	VCP	5	1940	75	3	Year 2
38	543	277	8	Tullibee Court	VCP	5	1940	75	3	Year 2
543	542	277	8	Tullibee Road	VCP	5	1940	75	3	Year 2
544	543	152	8	Tullibee Road	VCP	5	1940	75	3	Year 2
95	96	169	6	Vallejo Avenue	VCP	5	1940	75	3	Year 2
183	182	198	6	Vallejo Avenue	VCP	5	1940	75	3	Year 2
185	184	237	6	Vallejo Avenue	VCP	5	1940	75	3	Year 2
186	185	316	6	Vallejo Avenue	VCP	5	1940	75	3	Year 2
186A	186	15	6	Vallejo Avenue	VCP	5	1940	75	3	Year 2

Sewer Remaining Useful Life and Rehabilitation/Replacement Schedule
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Upstream Manhole	Downstream Manhole	Length (feet)	Diameter (inches)	Location	Pipe Material	PACP Structural Code	Pipe Installation Year	Useful Life	Remaining Useful Life	Rehabilitation/ Replacement Schedule
179B	179	230	6	Vallejo Ease.	VCP	5	1940	75	3	Year 2
409	179A	201	6	Vallejo Ease.	VCP	5	1940	75	3	Year 2
409A	409	156	6	Vallelo Ease.	VCP	5	1940	75	3	Year 2
81	80	187	6	Vaqueros Avenue	VCP	5	1940	75	3	Year 2
385	368	400	6	Vaqueros Avenue	VCP	5	1940	75	3	Year 2
10	20	320	6	1st Street	VCP	4	1900	75	-37	Year 3
3	1	121	6	3rd Street	VCP	4	1920	75	-17	Year 3
33	551	162	6	3rd Street	VCP	4	1910	75	-27	Year 3
468	469	234	6	4th Street	VCP	4	1900	75	-37	Year 3
547	324	164	6	4th Street	VCP	4	1910	75	-27	Year 3
11	10	335	6	Garretson Avenue	VCP	4	1900	75	-37	Year 3
14	13	311	6	Garretson Avenue	VCP	4	1900	75	-37	Year 3
15	14	311	6	Garretson Avenue	VCP	4	1900	75	-37	Year 3
16	15	275	6	Garretson Avenue	VCP	4	1900	75	-37	Year 3
7	6	293	6	Harris Avenue	VCP	4	1920	75	-17	Year 3
447	448	245	6	Lefty Gomez Fld.	VCP	4	1900	75	-37	Year 3
448	448A	300	6	Lefty Gomez Fld.	VCP	4	1900	75	-37	Year 3
537	499	123	6	Pacific Avenue	VCP	4	1900	75	-37	Year 3
539	30	99	6	Pacific Avenue	VCP	4	1900	75	-37	Year 3
479	479A	431	6	Parker Avenue	VCP	4	1910	75	-27	Year 3
519	478	72	6	Parker Avenue	VCP	4	1910	75	-27	Year 3
321A	321	317	8	Parker Avenue	VCP	4	1910	75	-27	Year 3
324	321A	303	8	Parker Avenue	VCP	4	1910	75	-27	Year 3
34	33	299	6	Rodeo Avenue	VCP	4	1910	75	-27	Year 3
448A	35	226	6	Rodeo Avenue	VCP	4	1910	75	-27	Year 3
497	28	172	6	Rodeo Avenue	VCP	4	1910	75	-27	Year 3
546	35	97	6	Rodeo Avenue	VCP	4	1910	75	-27	Year 3
443	444	86	6	Rodeo Hills Sch.	VCP	4	1900	75	-37	Year 3
2	1	325	6	Sharon Avenue	VCP	4	1920	75	-17	Year 3
5	6	309	6	Harris Avenue	VCP	Unknown	1920	75	-17	Year 3
319	318	269	6	Parker Avenue	VCP	Unknown	1910	75	-27	Year 3

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Upstream Manhole	Downstream Manhole	Length (feet)	Diameter (inches)	Location	Pipe Material	PACP Structural Code	Pipe Installation Year	Useful Life	Remaining Useful Life	Rehabilitation/ Replacement Schedule
320	321	370	6	Parker Avenue	VCP	Unknown	1910	75	-27	Year 3
504	319	191	6	Parker Avenue	VCP	Unknown	1910	75	-27	Year 3
324	5333	30	8	Parker Avenue	PVC	Unknown	1910	70	-32	Year 3
86	80	293	6	3rd Street	VCP	4	1940	75	3	Within 10 Years
35	547	163	6	4th Street	VCP	4	1940	75	3	Within 10 Years
94	93	149	6	4th Street	VCP	4	1940	75	3	Within 10 Years
110	84	164	6	4th Street	VCP	4	1940	75	3	Within 10 Years
175	406	159	6	5th Street Ease.	VCP	4	1940	75	3	Within 10 Years
363	365	185	6	6th Street	VCP	4	1940	75	3	Within 10 Years
492	174	118	6	6th Street	VCP	4	1940	75	3	Within 10 Years
493	492	210	6	6th Street	VCP	4	1940	75	3	Within 10 Years
403	402	248	6	6th Street Ease.	VCP	4	1940	75	3	Within 10 Years
404	529	175	6	6th Street Ease.	VCP	4	1940	75	3	Within 10 Years
156	157	268	6	7th Street	VCP	4	1940	75	3	Within 10 Years
182	166	266	6	7th Street	VCP	4	1940	75	3	Within 10 Years
423	181	117	6	7th Street	VCP	4	1940	75	3	Within 10 Years
386	129	207	12	7th Street	VCP	4	1940	75	3	Within 10 Years
510	423	58	6	7th Street	VCP	4	1940	75	3	Within 10 Years
467	169	160	6	Barnes Way	VCP	4	1940	75	3	Within 10 Years
429	154	71	8	California Easement	VCP	4	1940	75	3	Within 10 Years
51	53	484	6	First Street	VCP	4	1940	75	3	Within 10 Years
400	399	430	6	Mahoney Ease.	VCP	4	1940	75	3	Within 10 Years
67	65	234	6	Mariposa Street	VCP	4	1940	75	3	Within 10 Years
420	90	279	6	Napa Avenue	VCP	4	1940	75	3	Within 10 Years
415	553	62	6	Napa Avenue	VCP	4	1940	75	3	Within 10 Years
412	553	134	6	Napa Ease.	VCP	4	1940	75	3	Within 10 Years
413	412	55	6	Napa Ease.	VCP	4	1940	75	3	Within 10 Years
474	365	203	6	Parker Alley	VCP	4	1940	75	3	Within 10 Years
475	474	441	6	Parker Alley	VCP	4	1940	75	3	Within 10 Years
62	63	12	12	Railroad Avenue	VCP	4	1940	75	3	Within 10 Years
452	49	534	12	San Pablo Avenue	VCP	4	1940	75	3	Within 10 Years
451	454	233	10	San Pablo Easement	VCP	4	1940	75	3	Within 10 Years
422	181	184	6	Sonoma Avenue	VCP	4	1940	75	3	Within 10 Years
426	423	304	6	Sonoma Ease.	VCP	4	1940	75	3	Within 10 Years

Sewer Remaining Useful Life and Rehabilitation/Replacement Schedule Comprehensive Wastewater Master Plan Rodeo Sanitary District										
Upstream Manhole	**Downstream Manhole**	**Length (feet)**	**Diameter (inches)**	**Location**	**Pipe Material**	**PACP Structural Code**	**Pipe Installation Year**	**Useful Life**	**Remaining Useful Life**	**Rehabilitation/ Replacement Schedule**
173	410	287	6	Suisun Ease.	VCP	4	1940	75	3	Within 10 Years
167	509	175	6	Suisun Easement	VCP	4	1940	75	3	Within 10 Years
509	112	159	6	Suisun Easement	VCP	4	1940	75	3	Within 10 Years
85A	457	159	6	Tormey Avenue	VCP	4	1940	75	3	Within 10 Years
586	544	60	8	Tullibee Road	VCP	4	1940	75	3	Within 10 Years
184	183	168	6	Vallejo Avenue	VCP	4	1940	75	3	Within 10 Years
179A	179B	141	6	Vallejo Ease.	VCP	4	1940	75	3	Within 10 Years
112	385	394	6	Vaqueros Avenue	VCP	4	1940	75	3	Within 10 Years
113	112	484	6	Vaqueros Avenue	VCP	4	1940	75	3	Within 10 Years
120	119	251	6	Vaqueros Avenue	VCP	4	1940	75	3	Within 10 Years
368	520	274	6	Vaqueros Avenue	VCP	4	1940	75	3	Within 10 Years
530	536	150	6	Vaqueros Ease.	VCP	4	1940	75	3	Within 10 Years
536	535	146	6	Vaqueros Ease.	VCP	4	1940	75	3	Within 10 Years
97A	97	62	6	3rd Street Ease.	VCP	3	1940	75	3	Within 10 Years
9	549	106	6	4th Street	VCP	3	1900	75	-37	Within 10 Years
129	325	116	12	7th Street	VCP	3	1940	75	3	Within 10 Years
113	164	52	12	7th Street	VCP	3	1940	75	3	Within 10 Years
154	155	222	6	California Street	VCP	3	1940	75	3	Within 10 Years
37	542	313	8	California Street	VCP	3	1940	75	3	Within 10 Years
542	39	328	8	California Street	VCP	3	1940	75	3	Within 10 Years
8	7	247	6	Harris Avenue	VCP	3	1920	75	-17	Within 10 Years
428	431	236	8	I-80 Crossing	CI	3	1970	40	-2	Within 10 Years
107	59	529	12	John Street	VCP	3	1920	75	-17	Within 10 Years
555	451	290	8	Mariposa Easement	VCP	3	1940	75	3	Within 10 Years
40	41	67	8	Mariposa Street	VCP	3	1940	75	3	Within 10 Years
		153	6	Parker Alley	VCP	3	1940	75	3	Within 10 Years
478	479	289	6	Parker Avenue	VCP	3	1910	75	-27	Within 10 Years
101	101A	140	10	Rodeo Creek Easement	VCP	3	1940	75	3	Within 10 Years
457	77	165	10	Rodeo Creek Easement	VCP	3	1940	75	3	Within 10 Years
522	167	173	6	Suisun Ease.	VCP	3	1940	75	3	Within 10 Years

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Upstream Manhole	Downstream Manhole	Length (feet)	Diameter (inches)	Location	Pipe Material	PACP Structural Code	Pipe Installation Year	Useful Life	Remaining Useful Life	Rehabilitation/ Replacement Schedule
505	480	184	6	4th Street	VCP	2	1910	75	-27	Within 10 Years
549	468	257	6	4th Street	VCP	2	1900	75	-37	Within 10 Years
432	433	132	6	California Easement	VCP	2	1940	75	3	Within 10 Years
430	429	331	8	California Easement	AC	2	1940	70	-2	Within 10 Years
431	430	22	8	California Easement	AC	2	1940	70	-2	Within 10 Years
397	398	23	6	Garreston Avenue	VCP	2	1900	75	-37	Within 10 Years
387	284	390	8	Garreston Avenue	VCP	2	1900	75	-37	Within 10 Years
399	526	72	6	Mahoney Ease.	CI	2	1940	40	-32	Within 10 Years
530A	530	50	6	Napa Ave Easement	VCP	2	1940	75	3	Within 10 Years
508	168	364	6	Napa Avenue	VCP	2	1940	75	3	Within 10 Years
500	499	51	6	Pacific Avenue	HDPE	2	1900	70	-42	Within 10 Years
473	551	299	6	Parker Alley	VCP	2	1940	75	3	Within 10 Years
31	32	167	6	Rodeo Avenue	VCP	2	1910	75	-27	Within 10 Years
545	34	152	6	Rodeo Avenue	VCP	2	1910	75	-27	Within 10 Years
101A	101B	72	10	Rodeo Creek Easement	VCP	2	1940	75	3	Within 10 Years
101B	457	71	10	Rodeo Creek Easement	VCP	2	1940	75	3	Within 10 Years
453	452	231	10	San Pablo Easement	VCP	2	1940	75	3	Within 10 Years
454	453	230	10	San Pablo Easement	VCP	2	1940	75	3	Within 10 Years
470	2	52	6	Sharon Avenue	VCP	2	1920	75	-17	Within 10 Years
418	98	263	6	Suisun Avenue	VCP	2	1940	75	3	Within 10 Years
85	85A	56	6	Tormey Avenue	VCP	2	1940	75	3	Within 10 Years
47	452	345	8	Trigger Easement	VCP	2	1940	75	3	Within 10 Years
531	535	162	6	Vaqueros Ease.	VCP	2	1940	75	3	Within 10 Years
469	26	55	6	4th Street	VCP	1	1900	75	-37	Within 10 Years
550	408	169	6	4th Street	VCP	1	1940	75	3	Within 10 Years
161	162	96	6	7th Street	VCP	1	1940	75	3	Within 10 Years
191	190	504	8	California Street	VCP	1	1940	75	3	Within 10 Years
192	191	362	8	California Street	VCP	1	1940	75	3	Within 10 Years
455	51	371	6	First Street	VCP	1	1940	75	3	Within 10 Years

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Upstream Manhole	Downstream Manhole	Length (feet)	Diameter (inches)	Location	Pipe Material	PACP Structural Code	Pipe Installation Year	Useful Life	Remaining Useful Life	Rehabilitation/ Replacement Schedule
68	67	240	6	Mariposa Street	VCP	1	1940	75	3	Within 10 Years
87A	87	50	6	Pinole Avenue	VCP	1	1940	75	3	Within 10 Years
65	64	130	6	Railroad Avenue.	VCP	1	1940	75	3	Within 10 Years
417A	96	163	6	Vallejo Avenue	VCP	1	1940	75	3	Within 10 Years
82	81	140	6	Vaqueros Avenue	VCP	1	1940	75	3	Within 10 Years
97	96	157	6	3rd Street	VCP	0	1940	75	3	Within 10 Years
26	35	321	6	4th Street	VCP	0	1910	75	-27	Within 10 Years
480	324	42	6	4th Street	VCP	0	1910	75	-27	Within 10 Years
406A	406	141	6	5th Street Ease.	VCP	0	1940	75	3	Within 10 Years
402A	402	51	6	6th Street Ease.	VCP	0	1940	75	3	Within 10 Years
155	156	125	6	7th Street	VCP	0	1940	75	3	Within 10 Years
158	159	223	6	7th Street	VCP	0	1940	75	3	Within 10 Years
159	160	125	6	7th Street	VCP	0	1940	75	3	Within 10 Years
160	161	168	6	7th Street	VCP	0	1940	75	3	Within 10 Years
162	423	157	6	7th Street	VCP	0	1940	75	3	Within 10 Years
165	163	306	8	7th Street	PVC	0	1940	70	-2	Within 10 Years
166	165	37	8	7th Street	VCP	0	1940	75	3	Within 10 Years
165	163	67	8	7th Street	PVC	0	1940	70	-2	Within 10 Years
114	164	34	18	7th Street	VCP	0	1940	75	3	Within 10 Years
154A	154	73	6	California Street	VCP	0	1940	75	3	Within 10 Years
190	189	247	8	California Street	VCP	0	1940	75	3	Within 10 Years
		45	8	Dempsey Way	VCP	0	1940	75	3	Within 10 Years
52	501	15	10	First Street	VCP	0	1940	75	3	Within 10 Years
53	52	9	10	First Street	VCP	0	1940	75	3	Within 10 Years
55	56	32	10	First Street	VCP	0	1940	75	3	Within 10 Years
501	55	77	10	First Street	VCP	0	1940	75	3	Within 10 Years
19	516	44	6	Garreston Avenue	VCP	0	1900	75	-37	Within 10 Years
16A	16	27	6	Garretson Avenue	VCP	0	1900	75	-37	Within 10 Years
25A	25	19	6	Lake Avenue	VCP	0	1910	75	-27	Within 10 Years
518	362	200	6	Lake Avenue	VCP	0	1910	75	-27	Within 10 Years
424	510	96	6	Laurel Ct./Ease.	VCP	0	1940	75	3	Within 10 Years
425	424	107	6	Laurel Ct./Ease.	VCP	0	1940	75	3	Within 10 Years
42A	555	102	8	Mariposa	VCP	0	1940	75	3	Within 10 Years

Sewer Remaining Useful Life and Rehabilitation/Replacement Schedule Comprehensive Wastewater Master Plan Rodeo Sanitary District										
Upstream Manhole	**Downstream Manhole**	**Length (feet)**	**Diameter (inches)**	**Location**	**Pipe Material**	**PACP Structural Code**	**Pipe Installation Year**	**Useful Life**	**Remaining Useful Life**	**Rehabilitation/ Replacement Schedule**
				Easement						
41	42	176	8	Mariposa Street	VCP	0	1940	75	3	Within 10 Years
42	42A	85	8	Mariposa Street	VCP	0	1940	75	3	Within 10 Years
91A	91	101	6	Napa Avenue	VCP	0	1940	75	3	Within 10 Years
458	168	68	6	Napa Avenue	VCP	0	1940	75	3	Within 10 Years
411	413	153	6	Napa Ease.	VCP	0	1940	75	3	Within 10 Years
413A	413	18	6	Napa Ease.	VCP	0	1940	75	3	Within 10 Years
459	458	280	6	Napa Ease.	VCP	0	1940	75	3	Within 10 Years
472	473	250	6	Parker Alley	VCP	0	1940	75	3	Within 10 Years
552	503	111	4	Parker Avenue	CI	0	1910	40	-62	Within 10 Years
479A	480	324	6	Parker Avenue	VCP	0	1910	75	-27	Within 10 Years
506	480	231	6	Parker Avenue	VCP	0	1910	75	-27	Within 10 Years
318	59	344	10	Parker Avenue	PVC	0	1910	70	-32	Within 10 Years
321	104	175	12	Parker Avenue	VCP	0	1910	75	-27	Within 10 Years
333A	334	290	21	Parker Avenue	AC	0	1910	70	-32	Within 10 Years
64	53	92	10	Railroad Avenue.	VCP	0	1940	75	3	Within 10 Years
32	33	342	8	Rodeo Avenue	PVC	0	1910	70	-32	Within 10 Years
498A	498	54	6	San Pablo Avenue	VCP	0	1900	75	-37	Within 10 Years
527	426	226	6	Sonoma Ease.	VCP	0	1940	75	3	Within 10 Years
418A	418	40	6	Suisun Avenue	VCP	0	1940	75	3	Within 10 Years
541	46	292	8	Trigger Road	VCP	0	1940	75	3	Within 10 Years
417	417A	40	6	Vallejo Avenue	VCP	0	1940	75	3	Within 10 Years
535	368	162	6	Vaqueros Ease.	VCP	0	1940	75	3	Within 10 Years
56	60	86	12	1st Street	VCP	Unknown	1940	75	3	Within 10 Years
100	101	76	10	3rd Street	VCP	Unknown	1940	75	3	Within 10 Years
164	386	114	12	7th Street	VCP	Unknown	1940	75	3	Within 10 Years
164	386	114	12	7th Street	VCP	Unknown	1940	75	3	Within 10 Years
588	42	107	8	Dempsey Way	VCP	Unknown	1940	75	3	Within 10 Years
43	43A	32	8	Dempsey Way	VCP	Unknown	1940	75	3	Within 10 Years
56	60	86	10	First Street	VCP	Unknown	1940	75	3	Within 10 Years
52	54	60	12	First Street	VCP	Unknown	1940	75	3	Within 10 Years
75	65	150	6	Railroad Avenue	VCP	Unknown	1940	75	3	Within 10 Years
557	100	178	8	Rodeo Creek Ease.	VCP	Unknown	1940	75	3	Within 10 Years
113	164	52	6	Vaqueros	VCP	Unknown	1940	75	3	Within 10 Years

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Upstream Manhole	Downstream Manhole	Length (feet)	Diameter (inches)	Location	Pipe Material	PACP Structural Code	Pipe Installation Year	Useful Life	Remaining Useful Life	Rehabilitation/ Replacement Schedule
				Avenue						
346	346A	122	15	Willow Avenue	AC	3	1950	70	8	Within 20 Years
346A	325	387	15	Willow Avenue	AC	2	1950	70	8	Within 20 Years
349A	349B	190	15	Willow Avenue	AC	2	1950	70	8	Within 20 Years
323	105	150	21	Investment Street	AC	0	1950	70	8	Within 20 Years
325	327	313	21	Parker Avenue	AC	0	1950	70	8	Within 20 Years
327	345	319	21	Parker Avenue	AC	0	1950	70	8	Within 20 Years
330	331	307	21	Parker Avenue	AC	0	1950	70	8	Within 20 Years
331	333	301	21	Parker Avenue	AC	0	1950	70	8	Within 20 Years
333	333A	303	21	Parker Avenue	AC	0	1950	70	8	Within 20 Years
334	323	310	21	Parker Avenue	AC	0	1950	70	8	Within 20 Years
345	330	311	21	Parker Avenue	AC	0	1950	70	8	Within 20 Years
347	346	292	15	Willow Avenue	AC	0	1950	70	8	Within 20 Years
348	347	405	15	Willow Avenue	AC	0	1950	70	8	Within 20 Years
349	348	317	15	Willow Avenue	AC	0	1950	70	8	Within 20 Years
349B	349	82	15	Willow Avenue	AC	0	1950	70	8	Within 20 Years
134	133	317	6	Hawthorne Drive	VCP	4	1960	75	23	
395	131	304	6	Hawthorne Drive	VCP	4	1960	75	23	
137	136	156	8	Hawthorne Drive	VCP	4	1960	75	23	
130	119	187	12	Hawthorne Drive	VCP	4	1960	75	23	
139	140	132	6	Laurel Court	VCP	4	1960	75	23	
140	141	162	6	Laurel Court	VCP	4	1960	75	23	
141	494	31	6	Laurel Court	VCP	4	1960	75	23	
558	139	141	6	Laurel Court	VCP	4	1960	75	23	
104	103	288	10	Railroad Avenue	VCP	4	1960	75	23	
103	108	266	12	Railroad Avenue	VCP	4	1960	75	23	
559	52	139	12	Railroad Avenue	VCP	4	1960	75	23	
189	188	252	8	Springwood Street	VCP	4	1970	75	33	
148	149	162	6	Spruce Court	VCP	4	1960	75	23	
152	151	202	6	Spruce Court	VCP	4	1960	75	23	
439A	439	142	6	Spruce Easement	VCP	4	1960	75	23	
142	143	177	8	Elm Drive	VCP	3	1960	75	23	
528	461	222	6	Elm Easement	VCP	3	1960	75	23	
134B	134	215	6	Hawthorne Drive	VCP	3	1960	75	23	

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Upstream Manhole	Downstream Manhole	Length (feet)	Diameter (inches)	Location	Pipe Material	PACP Structural Code	Pipe Installation Year	Useful Life	Remaining Useful Life	Rehabilitation/ Replacement Schedule
449	434	287	8	Hawthorne Easement	VCP	3	1960	75	23	
525	130	256	12	Hawthorne Easement	VCP	3	1960	75	23	
106	109	258	21	John Street	VCP	3	1960	75	23	
77	76	26	10	Railroad Avenue	VCP	3	1960	75	23	
108	107	62	12	Railroad Avenue	VCP	3	1960	75	23	
102	106	271	21	Railroad Avenue	VCP	3	1960	75	23	
362	443	197	6	Rodeo Hills Sch.	PVC	3	2000	70	58	
477	5000	120	24	San Pablo Avenue	VCP	3	1960	75	23	
394	188	303	8	Springwood Court	VCP	3	1970	75	33	
151	150	214	6	Spruce Court	VCP	3	1960	75	23	
58	477	186	15	Troy's Club Parking	VCP	3	1960	75	23	
57	477	236	21	Troy's Parking Lot	VCP	3	1950	75	13	
520	84	162	8	Vaqueros Avenue	PVC	3	2000	70	58	
115	114	256	12	Vaqueros Avenue	VCP	3	1960	75	23	
78	77	249	8	2nd Street	PVC	2	2000	70	58	
79	78	225	8	2nd Street	PVC	2	2000	70	58	
313	312	381	8	Dennis Court	AC	2	1970	70	28	
486	313	207	8	Dennis Court	AC	2	1970	70	28	
461	463	337	6	Elm Easement	VCP	2	1960	75	23	
463	495	124	6	Elm Easement	VCP	2	1960	75	23	
109	57	342	21	John Street	VCP	2	1950	75	13	
74	61	291	10	Railroad Avenue	VCP	2	1960	75	23	
76	74	156	10	Railroad Avenue	VCP	2	1960	75	23	
63	559	173	12	Railroad Avenue	VCP	2	1960	75	23	
5000	WWTP	2019	16	San Pablo Ave	Steel	2	1957	75	20	
312	315	246	8	Stirling Drive	AC	2	1970	70	28	
315	222	286	8	Stirling Drive	AC	2	1970	70	28	
59	58	86	12	Troy's Club Parking	VCP	2	1960	75	23	
69	79	261	8	Vaqueros Avenue	PVC	2	2000	70	58	
359A	360	392	15	Willow Avenue	AC	2	1970	70	28	

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Upstream Manhole	Downstream Manhole	Length (feet)	Diameter (inches)	Location	Pipe Material	PACP Structural Code	Pipe Installation Year	Useful Life	Remaining Useful Life	Rehabilitation/ Replacement Schedule
502	503	163	6	2nd Street	HDPE	1	2000	70	58	
360	350	225	15	I-80 Esmt	AC	1	1970	70	28	
558A	558	17	6	Laurel Court	VCP	1	1960	75	23	
494	425	107	6	Laurel Ct./Ease.	VCP	1	1960	75	23	
442	444	125	8	Rodeo Hills Sch.	PVC	1	2000	70	58	
439	437	186	6	Spruce Easement	VCP	1	1960	75	23	
551	321	165	8	3rd Street	PVC	0	2012	70	70	
80	99	124	10	3rd Street	PVC	0	2000	70	58	
99	100	102	10	3rd Street	PVC	0	2000	70	58	
90	561	295	10	3rd Street	PVC	0	2000	70	58	
561	80	293	10	3rd Street	PVC	0	2000	70	58	
553	520	682	8	4th Street Ease.	HDPE	0	2000	70	58	
553	520	138	8	4th Street Ease.	PVC	0	2000	70	58	
163	114	260	8	7th Street	PVC	0	2000	70	58	
M2	Tormey PS	63	8	A Street	HDPE	0	2006	70	64	
		16	6	California Easement	VCP	0				
311	310	309	8	Claeys Court	AC	0	1970	70	28	
383	126	67	8	Cool Creak Ct.	PVC	0	2000	70	58	
384	383	46	8	Cool Creak Ct.	PVC	0	2000	70	58	
314	486	210	8	Dennis Court	AC	0	1970	70	28	
121	122	334	8	Edwerth Drive	PVC	0	1970	70	28	
122	123	195	8	Edwerth Drive	PVC	0	1970	70	28	
123	124	139	8	Edwerth Drive	PVC	0	1970	70	28	
124	126	159	8	Edwerth Drive	PVC	0	1970	70	28	
126	127	187	8	Edwerth Drive	PVC	0	1970	70	28	
127	128	253	8	Edwerth Drive	PVC	0	1970	70	28	
128	129	105	8	Edwerth Drive	PVC	0	1970	70	28	
145	146	304	8	Elm Drive	VCP	0	1960	75	23	
146	147	308	8	Elm Drive	VCP	0	1960	75	23	
366	128	140	8	Fallen Leaf Ct.	PVC	0	2000	70	58	
17	18	117	10	Garreston Avenue	PVC	0	2000	70	58	
131	130	231	6	Hawthorne Drive	VCP	0	1960	75	23	
134A	135	296	6	Hawthorne Drive	VCP	0	1960	75	23	
137A	137	70	6	Hawthorne Drive	VCP	0	1960	75	23	

Sewer Remaining Useful Life and Rehabilitation/Replacement Schedule
Comprehensive Wastewater Master Plan
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Upstream Manhole	Downstream Manhole	Length (feet)	Diameter (inches)	Location	Pipe Material	PACP Structural Code	Pipe Installation Year	Useful Life	Remaining Useful Life	Rehabilitation/ Replacement Schedule
136	449	110	8	Hawthorne Easement	VCP	0	1960	75	23	
433	137	110	8	Hawthorne Easement	VCP	0	1960	75	23	
105	102	294	21	Railroad Avenue	VCP	0	1960	75	23	
560	557	67	10	Rodeo Creek Ease.	PVC	0	2000	70	58	
83	560	80	10	Rodeo Creek Ease.	PVC	0	2000	70	58	
18	440	127	10	Rodeo Hills Sch.	PVC	0	2000	70	58	
440	441	40	10	Rodeo Hills Sch.	PVC	0	2000	70	58	
Tormey PS	WWTP	7065	6	San Pablo Ave	DI	0	2006	75	69	
187	394	331	8	Springwood Court	VCP	0	1970	75	33	
495	152	45	6	Spruce Court	VCP	0	1960	75	23	
436	438A	120	6	Spruce Easement	VCP	0	1960	75	23	
439B	439A	5	6	Spruce Easement	VCP	0	1960	75	23	
309	312	400	8	Stirling Drive	AC	0	1970	70	28	
367	127	76	8	Summer Breeze Ct.	PVC	0	2000	70	58	
382	367	51	8	Summer Breeze Ct.	PVC	0	2000	70	58	
84	83	488	10	Vaqueros Avenue	PVC	0	2000	70	58	
116	115	301	12	Vaqueros Avenue	VCP	0	1960	75	23	
117	116	311	12	Vaqueros Avenue	VCP	0	1960	75	23	
118	117	304	12	Vaqueros Avenue	VCP	0	1960	75	23	
119	118	284	12	Vaqueros Avenue	VCP	0	1960	75	23	
125	124	98	8	Whispering Trees Ct.	PVC	0	1970	70	28	
350	349A	337	15	Willow Avenue	AC	0	1970	70	28	
353	359	340	15	Willow Avenue	AC	0	1970	70	28	
356	353	599	15	Willow Avenue	AC	0	1970	70	28	
358	356	402	15	Willow Avenue	AC	0	1970	70	28	
359	359A	342	15	Willow Avenue	AC	0	1970	70	28	
246	247	125	8	Baypoint Way	VCP	Unknown	1970	75	33	

Sewer Remaining Useful Life and Rehabilitation/Replacement Schedule
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Upstream Manhole	Downstream Manhole	Length (feet)	Diameter (inches)	Location	Pipe Material	PACP Structural Code	Pipe Installation Year	Useful Life	Remaining Useful Life	Rehabilitation/ Replacement Schedule
247	248	164	8	Baypoint Way	VCP	Unknown	1970	75	33	
248	249	114	8	Baypoint Way	VCP	Unknown	1970	75	33	
249	250	138	8	Baypoint Way	VCP	Unknown	1970	75	33	
250	251	250	8	Baypoint Way	VCP	Unknown	1970	75	33	
251	490	129	8	Baypoint Way	VCP	Unknown	1970	75	33	
490	240	438	8	Baypoint Way	VCP	Unknown	1970	75	33	
514	249	65	8	Baypoint Way	VCP	Unknown	1970	75	33	
214	215	160	8	Beachpoint Way	VCP	Unknown	1970	75	33	
215	216	334	8	Beachpoint Way	VCP	Unknown	1970	75	33	
216	217	342	8	Beachpoint Way	VCP	Unknown	1970	75	33	
217	198	262	8	Beachpoint Way	VCP	Unknown	1970	75	33	
286	287	232	8	Bodega Way	AC	Unknown	1970	70	28	
287	288	353	8	Bodega Way	AC	Unknown	1970	70	28	
288	289	369	8	Bodega Way	AC	Unknown	1970	70	28	
289	231	255	8	Bodega Way	AC	Unknown	1970	70	28	
283	387	219	8	Bonita Point	VCP	Unknown	1970	75	33	
284	389	290	8	Bonita Point Esmt	VCP	Unknown	1970	75	33	
223	222	387	8	Coral Drive	VCP	Unknown	1970	75	33	
224	225	358	8	Coral Drive	VCP	Unknown	1970	75	33	
224	223	342	8	Coral Drive	VCP	Unknown	1970	75	33	
225	226	243	8	Coral Drive	VCP	Unknown	1970	75	33	
227	228	481	8	Coral Drive	VCP	Unknown	1970	75	33	
228	229	456	8	Coral Drive	VCP	Unknown	1970	75	33	
229	392	352	8	Coral Drive	VCP	Unknown	1970	75	33	
230	231	249	8	Coral Drive	VCP	Unknown	1970	75	33	
231	232	251	8	Coral Drive	VCP	Unknown	1970	75	33	
232	233	250	8	Coral Drive	VCP	Unknown	1970	75	33	
392	230	344	8	Coral Drive	VCP	Unknown	1970	75	33	
513	226	152	8	Coral Drive	VCP	Unknown	1970	75	33	
278	279	260	8	Coral Ridge Circle	VCP	Unknown	1970	75	33	
279	281	244	8	Coral Ridge Circle	VCP	Unknown	1970	75	33	
280	281	101	8	Coral Ridge Circle	VCP	Unknown	1970	75	33	
281	282	475	8	Coral Ridge	VCP	Unknown	1970	75	33	

Sewer Remaining Useful Life and Rehabilitation/Replacement Schedule
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Upstream Manhole	Downstream Manhole	Length (feet)	Diameter (inches)	Location	Pipe Material	PACP Structural Code	Pipe Installation Year	Useful Life	Remaining Useful Life	Rehabilitation/ Replacement Schedule
				Circle						
282	391	427	8	Coral Ridge Circle	VCP	Unknown	1970	75	33	
285	388	499	8	Coral Ridge Circle	VCP	Unknown	1970	75	33	
285	278	301	8	Coral Ridge Circle	VCP	Unknown	1970	75	33	
307	221	421	8	Donald Drive	VCP	Unknown	1970	75	33	
61	54	49	10	First Street	VCP	Unknown	1960	75	23	
54	56	67	15	First Street	VCP	Unknown	1950	75	13	
211	212	110	8	Harbor Court??	VCP	Unknown	1970	75	33	
210	212	204	8	Harbor Way	VCP	Unknown	1970	75	33	
212	213	399	8	Harbor Way	VCP	Unknown	1970	75	33	
213	215	148	8	Harbor Way	VCP	Unknown	1970	75	33	
199	464	238	8	I-80 Crossing	VCP	Unknown	1970	75	33	
464	491	285	8	I-80 Crossing	VCP	Unknown	1970	75	33	
491	525	426	8	I-80 Crossing	VCP	Unknown	1970	75	33	
269	270	191	8	Ketch Court	VCP	Unknown	1970	75	33	
270	236	365	8	Ketch Court	VCP	Unknown	1970	75	33	
262	261	320	8	Langlie Court	VCP	Unknown	1970	75	33	
252	242	302	8	Langlie Way	VCP	Unknown	1970	75	33	
253	252	321	8	Langlie Way	VCP	Unknown	1970	75	33	
260	511	505	8	Langlie Way	VCP	Unknown	1970	75	33	
261	253	374	8	Langlie Way	VCP	Unknown	1970	75	33	
511	261	111	8	Langlie Way	VCP	Unknown	1970	75	33	
341	340	202	8	Mariner's Pointe Court	VCP	Unknown	1970	75	33	
342	341	435	8	Mariner's Pointe Court	VCP	Unknown	1970	75	33	
343	371	208	12	Mariner's Pointe Court	VCP	Unknown	1970	75	33	
344	343	280	12	Mariner's Pointe Court	VCP	Unknown	1970	75	33	
393	344	229	12	Mariner's Pointe Court	VCP	Unknown	1970	75	33	
254	253	266	8	Myrna Way	VCP	Unknown	1970	75	33	
255	254	565	8	Myrna Way	VCP	Unknown	1970	75	33	
256	225	182	8	Myrna Way	VCP	Unknown	1970	75	33	
512	219	212	8	Myrna Way	VCP	Unknown	1970	75	33	

Sewer Remaining Useful Life and Rehabilitation/Replacement Schedule
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Upstream Manhole	Downstream Manhole	Length (feet)	Diameter (inches)	Location	Pipe Material	PACP Structural Code	Pipe Installation Year	Useful Life	Remaining Useful Life	Rehabilitation/ Replacement Schedule
378	377	161	8	Old County Road	DI	Unknown	2006	75	69	
379	378	287	8	Old County Road	DI	Unknown	2006	75	69	
380	381	338	8	Old County Road	DI	Unknown	2006	75	69	
381	377	49	8	Old County Road	DI	Unknown	2006	75	69	
375	M2	135	8	Old County Road Esmt	DI	Unknown	2006	75	69	
376	375	33	8	Old County Road Esmt	DI	Unknown	2006	75	69	
377	375	277	8	Old County Road Esmt	DI	Unknown	2006	75	69	
271	272	272	8	Reef Point Drive	VCP	Unknown	1970	75	33	
272	273	177	8	Reef Point Drive	VCP	Unknown	1970	75	33	
273	274	499	8	Reef Point Drive	VCP	Unknown	1970	75	33	
274	275	198	8	Reef Point Drive	VCP	Unknown	1970	75	33	
275	234	353	8	Reef Point Drive	VCP	Unknown	1970	75	33	
276	277	159	8	Reef Point Drive	VCP	Unknown	1970	75	33	
277	1556	160	8	Reef Point Drive	VCP	Unknown	1970	75	33	
485	466	401	8	Rodeo Creek Esmt	VCP	Unknown	1970	75	33	
533	485	394	8	Rodeo Creek Esmt	VCP	Unknown	1970	75	33	
534	533	64	8	Rodeo Creek Esmt	VCP	Unknown	1970	75	33	
238	239	173	8	Sandpoint Court??	VCP	Unknown	1970	75	33	
226	245	240	8	Sandpoint Drive	VCP	Unknown	1970	75	33	
237	197	201	8	Sandpoint Drive	VCP	Unknown	1970	75	33	
239	237	326	8	Sandpoint Drive	VCP	Unknown	1970	75	33	
240	239	288	8	Sandpoint Drive	VCP	Unknown	1970	75	33	
241	240	437	8	Sandpoint Drive	VCP	Unknown	1970	75	33	
242	241	477	8	Sandpoint Drive	VCP	Unknown	1970	75	33	
243	242	296	8	Sandpoint Drive	VCP	Unknown	1970	75	33	
244	243	400	8	Sandpoint Drive	VCP	Unknown	1970	75	33	
245	244	158	8	Sandpoint Drive	VCP	Unknown	1970	75	33	
338	339	142	8	Sandy Brook Court	VCP	Unknown	1970	75	33	

Sewer Remaining Useful Life and Rehabilitation/Replacement Schedule Comprehensive Wastewater Master Plan Rodeo Sanitary District										
Upstream Manhole	Downstream Manhole	Length (feet)	Diameter (inches)	Location	Pipe Material	PACP Structural Code	Pipe Installation Year	Useful Life	Remaining Useful Life	Rehabilitation/ Replacement Schedule
337	484	188	12	Sandy Brook Court	VCP	Unknown	1970	75	33	
339	337	189	12	Sandy Brook Court	VCP	Unknown	1970	75	33	
340	339	248	12	Sandy Brook Court	VCP	Unknown	1970	75	33	
263	264	438	8	Sandy Cove Drive	VCP	Unknown	1970	75	33	
264	265	185	8	Sandy Cove Drive	VCP	Unknown	1970	75	33	
265	266	303	8	Sandy Cove Drive	VCP	Unknown	1970	75	33	
266	267	482	8	Sandy Cove Drive	VCP	Unknown	1970	75	33	
267	268	268	8	Sandy Cove Drive	VCP	Unknown	1970	75	33	
268	235	100	8	Sandy Cove Drive	VCP	Unknown	1970	75	33	
372	373	164	8	Seacliff Court	VCP	Unknown	1970	75	33	
373	374	297	12	Seacliff Court	VCP	Unknown	1970	75	33	
374	340	280	12	Seacliff Court	VCP	Unknown	1970	75	33	
197	198	362	8	Seascape Circle	VCP	Unknown	1970	75	33	
198	199	137	8	Seascape Circle	VCP	Unknown	1970	75	33	
200	199	153	8	Seascape Circle	VCP	Unknown	1970	75	33	
201	200	145	8	Seascape Circle	VCP	Unknown	1970	75	33	
202	201	467	8	Seascape Circle	VCP	Unknown	1970	75	33	
203	202	472	8	Seascape Circle	VCP	Unknown	1970	75	33	
204	203	360	8	Seascape Circle	VCP	Unknown	1970	75	33	
206	204	466	8	Seascape Circle	VCP	Unknown	1970	75	33	
207	206	186	8	Seascape Circle	VCP	Unknown	1970	75	33	
208	209	81	8	Seascape Circle	VCP	Unknown	1970	75	33	
388	389	281	8	Seascape Circle	VCP	Unknown	1970	75	33	
389	390	193	8	Seascape Circle	VCP	Unknown	1970	75	33	
391	390	324	8	Seascape Circle	VCP	Unknown	1970	75	33	
465	207	431	8	Seascape Circle	VCP	Unknown	1970	75	33	
390	515	175	8	Seascape Circle Esmt	VCP	Unknown	1970	75	33	
205	206	158	8	Seascape Court?	VCP	Unknown	1970	75	33	
369	371	267	8	Shelley Court	VCP	Unknown	1970	75	33	

Sewer Remaining Useful Life and Rehabilitation/Replacement Schedule
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Upstream Manhole	Downstream Manhole	Length (feet)	Diameter (inches)	Location	Pipe Material	PACP Structural Code	Pipe Installation Year	Useful Life	Remaining Useful Life	Rehabilitation/ Replacement Schedule
370	540	90	12	Shelley Street	VCP	Unknown	1970	75	33	
371	370	68	12	Shelley Street	VCP	Unknown	1970	75	33	
540	373	158	12	Shelley Street Esmt	VCP	Unknown	1970	75	33	
222	260	257	8	Stirling Drive	VCP	Unknown	1970	75	33	
257	255	303	8	Stirling Drive	VCP	Unknown	1970	75	33	
258	257	224	8	Stirling Drive	VCP	Unknown	1970	75	33	
258	260	269	8	Stirling Drive	VCP	Unknown	1970	75	33	
259	258	60	8	Stirling Drive	VCP	Unknown	1970	75	33	
308	307	472	8	Stirling Drive	VCP	Unknown	1970	75	33	
487	308	124	8	Stirling Drive	VCP	Unknown	1970	75	33	
524	308	113	8	Stirling Drive	VCP	Unknown	1970	75	33	
303	304	266	8	Tradewind Lane	VCP	Unknown	1970	75	33	
304	305	399	8	Tradewind Lane	VCP	Unknown	1970	75	33	
305	306	296	8	Tradewind Lane	VCP	Unknown	1970	75	33	
306	293	152	8	Tradewind Lane	VCP	Unknown	1970	75	33	
60	58	93	15	Troy's Club Parking	VCP	Unknown	1960	75	23	
520	84	162	8	Vaqueros Avenue	PVC	Unknown	2000	70	58	
193	209	422	8	Viewpoint Blvd	VCP	Unknown	1970	75	33	
194	195	281	8	Viewpoint Blvd	VCP	Unknown	1970	75	33	
195	196	486	8	Viewpoint Blvd	VCP	Unknown	1970	75	33	
196	197	344	8	Viewpoint Blvd	VCP	Unknown	1970	75	33	
209	194	270	8	Viewpoint Blvd	VCP	Unknown	1970	75	33	
218	193	444	8	Viewpoint Blvd	VCP	Unknown	1970	75	33	
219	218	302	8	Viewpoint Blvd	VCP	Unknown	1970	75	33	
220	219	450	8	Viewpoint Blvd	VCP	Unknown	1970	75	33	
221	222	235	8	Viewpoint Blvd	VCP	Unknown	1970	75	33	
233	466	230	8	Viewpoint Blvd	VCP	Unknown	1970	75	33	
234	481	304	8	Viewpoint Blvd	VCP	Unknown	1970	75	33	
235	234	280	8	Viewpoint Blvd	VCP	Unknown	1970	75	33	
236	235	295	8	Viewpoint Blvd	VCP	Unknown	1970	75	33	
466	482	200	8	Viewpoint Blvd	VCP	Unknown	1970	75	33	
481	233	151	8	Viewpoint Blvd	VCP	Unknown	1970	75	33	
488	221	235	8	Viewpoint Blvd	VCP	Unknown	1970	75	33	
489	220	445	8	Viewpoint Blvd	VCP	Unknown	1970	75	33	

Sewer Remaining Useful Life and Rehabilitation/Replacement Schedule Comprehensive Wastewater Master Plan Rodeo Sanitary District										
Upstream Manhole	**Downstream Manhole**	**Length (feet)**	**Diameter (inches)**	**Location**	**Pipe Material**	**PACP Structural Code**	**Pipe Installation Year**	**Useful Life**	**Remaining Useful Life**	**Rehabilitation/ Replacement Schedule**
515	466	49	8	Viewpoint Blvd	VCP	Unknown	1970	75	33	
482	483	51	12	Viewpoint Blvd	VCP	Unknown	1970	75	33	
483	358	219	12	Viewpoint Blvd	VCP	Unknown	1970	75	33	
484	482	49	12	Viewpoint Blvd	VCP	Unknown	1970	75	33	
1556	481	134	8	Viewpoint Blvd Ease.	VCP	Unknown	1970	75	33	
290	291	175	8	Windward Drive	VCP	Unknown	1970	75	33	
291	292	123	8	Windward Drive	VCP	Unknown	1970	75	33	
293	292	464	8	Windward Drive	VCP	Unknown	1970	75	33	
294	293	243	8	Windward Drive	VCP	Unknown	1970	75	33	
295	294	394	8	Windward Drive	VCP	Unknown	1970	75	33	
296	295	348	8	Windward Drive	VCP	Unknown	1970	75	33	
297	296	374	8	Windward Drive	VCP	Unknown	1970	75	33	
298	297	417	8	Windward Drive	VCP	Unknown	1970	75	33	
299	298	161	8	Windward Drive	VCP	Unknown	1970	75	33	
300	299	344	8	Windward Drive	VCP	Unknown	1970	75	33	
301	300	236	8	Windward Drive	VCP	Unknown	1970	75	33	
302	301	146	8	Windward Drive	VCP	Unknown	1970	75	33	
292	534	121	8	Windward Drive Esmt	VCP	Unknown	1970	75	33	

APPENDIX C – RECOMMENDED SEWER CLEANING SCHEDULE

Recommended Sewer Cleaning Schedule
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Upstream Manhole	Downstream Manhole	Length (feet)	Diameter (inches)	Location	O&M Code	Problem Area/Siphon/MH List on District Drawings	Monthly Sewer Check-off Sheet	Quarterly Sewer Check-off Sheet	SSO since 2007	Slope Greater than Minimum for Scouring Velocity?	Recommended Cleaning Frequency
1	6	324	6	3rd Street	4			YES		No	Monthly
4	1	312	6	Sharon Avenue	4			YES		No	Monthly
39	451	256	8	California Street	4	YES	YES			Yes	Monthly
70	68	291	6	Mariposa Street	5	YES	YES		YES	No	Monthly
71	70	328	6	Pinole Ave.	4		YES			Yes	Monthly
76	74	156	10	Railroad Avenue	4				YES	No	Monthly
87	86	383	6	Pinole Avenue	5	YES	YES			Yes	Monthly
107	59	529	12	John Street	4	YES	YES			No	Monthly
108	107	62	12	Railroad Avenue	4		YES			No	Monthly
112	385	394	6	Vaqueros Avenue	4				YES	No	Monthly
131	130	231	6	Hawthorne Drive	4		YES			Yes	Monthly
154	155	222	6	California Street	4	YES			YES	Yes	Monthly
165	113	306	8	7th Street	4		YES		YES	No	Monthly
182	166	266	6	7th Street	5	YES		YES		No	Monthly
324	321A	303	8	Parker Avenue	5	YES		YES		Yes	Monthly
368	520	274	6	Vaqueros Avenue	4	YES	YES			No	Monthly
396	397	380	6	Garreston Avenue	4	YES		YES		Yes	Monthly
408	97A	234	6	3rd Street Ease.	4		YES			Unknown	Monthly
435	522	251	6	Suisun Ease.	5	YES			YES	Yes	Monthly
443	444	86	6	Rodeo Hills Sch.	4	YES			YES	Yes	Monthly
444	448	331	6	Lefty Gomez Fld.	4	YES		YES		Yes	Monthly
446	396	259	6	Lake Avenue	4	YES		YES		Yes	Monthly
447	448	245	6	Lefty Gomez Fld.	4	YES		YES		No	Monthly
463	495	124	6	Elm Easement	4	YES		YES		Yes	Monthly
472	473	250	6	Parker Alley	4			YES		No	Monthly
476	363	453	6	Rodeo Avenue	4				YES	Yes	Monthly
510	423	58	6	7th Street	4	YES		YES		Yes	Monthly
525	130	256	12	Hawthorne Easement	4	YES	YES			Yes	Monthly
547	324	164	6	4th Street	4	YES	YES			No	Monthly
549	468	257	6	4th Street	4	YES	YES			No	Monthly

Recommended Sewer Cleaning Schedule
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Upstream Manhole	Downstream Manhole	Length (feet)	Diameter (inches)	Location	O&M Code	Problem Area/Siphon/MH List on District Drawings	Monthly Sewer Check-off Sheet	Quarterly Sewer Check-off Sheet	SSO since 2007	Slope Greater than Minimum for Scouring Velocity?	Recommended Cleaning Frequency
551	321	165	8	3rd Street	5	YES		YES		Yes	Monthly
554	166	329	6	Napa Avenue	4	YES		YES		Unknown	Monthly
179A	179B	141	6	Vallejo Ease.	5	YES	YES			Unknown	Monthly
321A	321	317	8	Parker Avenue	4	YES		YES		Unknown	Monthly
3	1	121	6	3rd Street	0			YES		No	Every 3 months
19	516	44	6	Garreston Avenue	2	YES		YES		No	Every 3 months
26	35	321	6	4th Street	2		YES			Yes	Every 3 months
46	47	217	8	Trigger Road	0	YES	YES		YES	Yes	Every 3 months
47	452	345	8	Trigger Easement	2	YES	YES			Yes	Every 3 months
48	63	160	6	San Pablo Avenue	3	YES		YES		Yes	Every 3 months
56	60	86	12	1st Street	Unknown	YES	YES			No	Every 3 months
56	60	86	10	First Street	Unknown	YES	YES			No	Every 3 months
67	65	234	6	Mariposa Street	3	YES		YES		No	Every 3 months
73	70	289	6	Mariposa Street	3		YES			Yes	Every 3 months
75	65	150	6	Railroad Avenue	Unknown	YES		YES		No	Every 3 months
78	77	249	8	2nd Street	0			YES		Yes	Every 3 months
80	100	227	6	3rd Street	2	YES	YES			Yes	Every 3 months
81	80	187	6	Vaqueros Avenue	2		YES			Yes	Every 3 months
86	80	293	6	3rd Street	3	YES	YES			Yes	Every 3 months
90	86	294	6	3rd Street	3	YES	YES			Yes	Every 3 months
99	100	102	10	3rd Street	Unknown		YES		YES	Yes	Every 3 months
162	423	157	6	7th Street	2			YES		Yes	Every 3 months
164	386	114	12	7th Street	Unknown	YES	YES		YES	Yes	Every 3 months
164	386	114	12	7th Street	Unknown	YES	YES			Yes	Every 3 months
168	167	156	6	Napa Avenue	0	YES	YES			Yes	Every 3 months
177	176	265	6	5th Street	3	YES		YES		Yes	Every 3 months
232	233	250	8	Coral Drive	Unknown	YES		YES		Yes	Every 3 months
233	466	230	8	Viewpoint Blvd	Unknown		YES			Yes	Every 3 months
406	176	125	6	5th Street Ease.	3	YES		YES		Yes	Every 3 months
409	179A	201	6	Vallejo Ease.	3	YES	YES			Yes	Every 3 months
426	423	304	6	Sonoma Ease.	3	YES		YES		Yes	Every 3 months
453	452	231	10	San Pablo Easement	0	YES	YES			Yes	Every 3 months
481	233	151	8	Viewpoint Blvd	Unknown			YES		Yes	Every 3 months
485	466	401	8	Rodeo Creek Esmt	Unknown	YES	YES			Yes	Every 3 months

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522	167	173	6	Suisun Ease.	3	YES	YES			Yes	Every 3 months
528	461	222	6	Elm Easement	2	YES		YES		No	Every 3 months
532	107	283	6	2nd Street	2	YES	YES			Yes	Every 3 months
557	100	178	8	Rodeo Creek Ease.	Unknown		YES			Yes	Every 3 months
179B	179	230	6	Vallejo Ease.	3	YES	YES		YES	Unknown	Every 3 months
83A	83	473	6	Vaqueros Easement	3		YES			Unknown	Every 3 months
97A	97	62	6	3rd Street Ease.	1		YES			Unknown	Every 3 months
9	549	106	6	4th Street	4	YES				No	Every 6 months
28	317	335	6	San Pablo Avenue	5	YES				No	Every 6 months
35	547	163	6	4th Street	3	YES			YES	No	Every 6 months
60	58	93	15	Troy's Club Parking	Unknown	YES				No	Every 6 months
65	64	130	6	Railroad Avenue.	4	YES				No	Every 6 months
68	67	240	6	Mariposa Street	3	YES				No	Every 6 months
77	76	26	10	Railroad Avenue	0	YES			YES	No	Every 6 months
113	112	484	6	Vaqueros Avenue	1	YES				No	Every 6 months
113	164	52	6	Vaqueros Avenue	Unknown	YES				No	Every 6 months
317	318	311	6	Parker Avenue	4	YES				No	Every 6 months
320	321	370	6	Parker Avenue	Unknown	YES				No	Every 6 months
321	104	175	12	Parker Avenue	Unknown	YES				No	Every 6 months
365	447	432	6	Parker Alley	4	YES				No	Every 6 months
385	368	400	6	Vaqueros Avenue	4	YES				No	Every 6 months
438	149	166	6	Spruce Easement	3	YES				No	Every 6 months
448	448A	300	6	Lefty Gomez Fld.	3	YES				No	Every 6 months
461	463	337	6	Elm Easement	3	YES				No	Every 6 months
468	469	234	6	4th Street	4	YES				No	Every 6 months
473	551	299	6	Parker Alley	2	YES				No	Every 6 months
474	365	203	6	Parker Alley	2	YES				No	Every 6 months
475	474	441	6	Parker Alley	3	YES				No	Every 6 months
516	17	32	6	Garreston Avenue	2	YES				No	Every 6 months
517	19	196	6	Garreston Avenue	3	YES				No	Every 6 months
548	48	288	6	San Pablo Avenue	3	YES				No	Every 6 months
556	64	450	6	First Street Ease.	4	YES				No	Every 6 months
559	52	139	12	Railroad Avenue	0	YES				No	Every 6 months
2	1	325	6	Sharon Avenue	4					Yes	10% per Year

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5	6	309	6	Harris Avenue	Unknown					No	10% per Year
6	13	321	6	3rd Street	4					No	10% per Year
7	6	293	6	Harris Avenue	3					Yes	10% per Year
8	7	247	6	Harris Avenue	5					No	10% per Year
10	20	320	6	1st Street	3					Yes	10% per Year
11	10	335	6	Garretson Avenue	4					Yes	10% per Year
12	13	297	6	Garretson Avenue	4					Yes	10% per Year
13	24	322	6	3rd Street	0					Yes	10% per Year
14	13	311	6	Garretson Avenue	4					Yes	10% per Year
15	14	311	6	Garretson Avenue	3					Yes	10% per Year
16	15	275	6	Garretson Avenue	3					No	10% per Year
17	18	117	10	Garreston Avenue	2					No	10% per Year
18	440	127	10	Rodeo Hills Sch.	3					Yes	10% per Year
20	29	327	6	1st Street	3					Yes	10% per Year
21	20	231	6	Lake Avenue	3					Yes	10% per Year
22	21	232	6	Lake Avenue	3					Yes	10% per Year
23	22	264	6	Lake Avenue	4					Yes	10% per Year
24	33	322	6	3rd Street	3					Yes	10% per Year
25	24	424	6	Lake Avenue	4					Yes	10% per Year
27	26	220	6	Lake Street	5					No	10% per Year
29	318	334	6	1st Street	4					Yes	10% per Year
30	29	300	6	Rodeo Avenue	3					No	10% per Year
31	32	167	6	Rodeo Avenue	0					No	10% per Year
32	33	342	8	Rodeo Avenue	0					Yes	10% per Year
33	551	162	6	3rd Street	4	YES				Yes	10% per Year
34	33	299	6	Rodeo Avenue	2					Yes	10% per Year
36	37	104	8	California Street	3					Yes	10% per Year
37	542	313	8	California Street	3					Yes	10% per Year
38	543	277	8	Tullibee Court	4					Yes	10% per Year
40	41	67	8	Mariposa Street	0					Yes	10% per Year
41	42	176	8	Mariposa Street	3					Yes	10% per Year
42	42A	85	8	Mariposa Street	0					Yes	10% per Year
43	43A	32	8	Dempsey Way	Unknown					Yes	10% per Year
44	43	147	8	Dempsey Way	2					Yes	10% per Year

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45	541	171	8	Dempsey Way	2					Yes	10% per Year
49	62	145	12	San Pablo Avenue	0	YES				Yes	10% per Year
51	53	484	6	First Street	3					Yes	10% per Year
52	501	15	10	First Street	0	YES				Unknown	10% per Year
52	54	60	12	First Street	Unknown					No	10% per Year
53	52	9	10	First Street	0	YES				Yes	10% per Year
54	56	67	15	First Street	Unknown	YES				Yes	10% per Year
55	56	32	10	First Street	0	YES				Yes	10% per Year
57	477	236	21	Troy's Parking Lot	3					Yes	10% per Year
58	477	186	15	Troy's Club Parking	0					Yes	10% per Year
59	58	86	12	Troy's Club Parking	4	YES				Yes	10% per Year
61	54	49	10	First Street	Unknown	YES				Yes	10% per Year
62	63	12	12	Railroad Avenue	0					Yes	10% per Year
63	559	173	12	Railroad Avenue	5	YES				Yes	10% per Year
64	53	92	10	Railroad Avenue.	0					Yes	10% per Year
69	79	261	8	Vaqueros Avenue	0					Yes	10% per Year
72	71	204	6	Pinole Ave.	3					Yes	10% per Year
74	61	291	10	Railroad Avenue	3					No	10% per Year
79	78	225	8	2nd Street	2					Yes	10% per Year
80	99	124	10	3rd Street	Unknown				YES	Yes	10% per Year
82	81	140	6	Vaqueros Avenue	0					Yes	10% per Year
83	557	127	6	Rodeo Creek Ease.	0					No	10% per Year
83	560	80	10	Rodeo Creek Ease.	0					Unknown	10% per Year
84	83	488	10	Vaqueros Avenue	0	YES				Yes	10% per Year
85	85A	56	6	Tormey Avenue	0					Yes	10% per Year
88	89	164	6	Napa Avenue	0					Yes	10% per Year
89	73	149	6	Napa Avenue	4					Yes	10% per Year
90	561	295	10	3rd Street	3					Yes	10% per Year
91	90	306	6	Napa Avenue	2					Yes	10% per Year
92	98	426	6	Suisun Avenue	3					Yes	10% per Year
93	92	157	6	4th Street	2					Yes	10% per Year
94	93	149	6	4th Street	3					Yes	10% per Year
95	96	169	6	Vallejo Avenue	2					Yes	10% per Year
96	98	296	6	3rd Street	2					Yes	10% per Year

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97	96	157	6	3rd Street	2					Yes	10% per Year
98	90	296	6	3rd Street	2				YES	Yes	10% per Year
100	101	76	10	3rd Street	Unknown	YES			YES	Yes	10% per Year
101	101A	140	10	Rodeo Creek Easement	4					Unknown	10% per Year
102	106	271	21	Railroad Avenue	3					No	10% per Year
103	108	266	12	Railroad Avenue	3					No	10% per Year
104	103	288	10	Railroad Avenue	4					Yes	10% per Year
105	102	294	21	Railroad Avenue	2					Yes	10% per Year
106	109	258	21	John Street	3					Yes	10% per Year
109	57	342	21	John Street	3					Yes	10% per Year
110	84	164	6	4th Street	2					No	10% per Year
111	110	145	6	4th Street	3					Yes	10% per Year
113	164	52	12	7th Street	0					Yes	10% per Year
114	164	34	18	7th Street	0	YES			YES	Yes	10% per Year
115	114	256	12	Vaqueros Avenue	0					Yes	10% per Year
116	115	301	12	Vaqueros Avenue	0					Yes	10% per Year
117	116	311	12	Vaqueros Avenue	0					Yes	10% per Year
118	117	304	12	Vaqueros Avenue	0					Yes	10% per Year
119	118	284	12	Vaqueros Avenue	2					Yes	10% per Year
120	119	251	6	Vaqueros Avenue	0					No	10% per Year
121	122	334	8	Edwerth Drive	0					Yes	10% per Year
122	123	195	8	Edwerth Drive	0					Yes	10% per Year
123	124	139	8	Edwerth Drive	0					Yes	10% per Year
124	126	159	8	Edwerth Drive	0					Yes	10% per Year
125	124	98	8	Whispering Trees Ct.	0					Yes	10% per Year
126	127	187	8	Edwerth Drive	0					Yes	10% per Year
127	128	253	8	Edwerth Drive	0					Yes	10% per Year
128	129	105	8	Edwerth Drive	0					Yes	10% per Year
129	325	116	12	7th Street	2	YES				Yes	10% per Year
130	119	187	12	Hawthorne Drive	0	YES				Yes	10% per Year
132	395	303	6	Hawthorne Drive	4					Yes	10% per Year
133	132	322	6	Hawthorne Drive	3					Yes	10% per Year
134	133	317	6	Hawthorne Drive	3					Yes	10% per Year
135	136	292	6	Hawthorne Drive	0					Yes	10% per Year

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136	449	110	8	Hawthorne Easement	3					Yes	10% per Year
137	136	156	8	Hawthorne Drive	1					Yes	10% per Year
138	142	344	8	Elm Drive	3					Yes	10% per Year
139	140	132	6	Laurel Court	0					Yes	10% per Year
140	141	162	6	Laurel Court	5					Yes	10% per Year
141	494	31	6	Laurel Court	1					Yes	10% per Year
142	143	177	8	Elm Drive	3					Yes	10% per Year
143	144	302	8	Elm Drive	0					Yes	10% per Year
144	145	282	8	Elm Drive	0					Yes	10% per Year
145	146	304	8	Elm Drive	3					Yes	10% per Year
146	147	308	8	Elm Drive	3					Yes	10% per Year
147	118	198	8	Elm Drive	2					Yes	10% per Year
148	149	162	6	Spruce Court	2					Yes	10% per Year
149	117	140	6	Spruce Court	0					Yes	10% per Year
150	148	237	6	Spruce Court	0					Yes	10% per Year
151	150	214	6	Spruce Court	1					Yes	10% per Year
152	151	202	6	Spruce Court	1					Yes	10% per Year
155	156	125	6	7th Street	0					Yes	10% per Year
156	157	268	6	7th Street	3					Yes	10% per Year
157	158	324	6	7th Street	0					Yes	10% per Year
158	159	223	6	7th Street	0					Yes	10% per Year
159	160	125	6	7th Street	0					Yes	10% per Year
160	161	168	6	7th Street	0					Yes	10% per Year
161	162	96	6	7th Street	5					Yes	10% per Year
163	114	260	8	7th Street	2					No	10% per Year
165	163	67	8	7th Street	2					No	10% per Year
166	165	37	8	7th Street	3	YES				Yes	10% per Year
167	509	175	6	Suisun Easement	3	YES				Yes	10% per Year
169	509	438	6	Barnes Way	4					Yes	10% per Year
170	553	220	6	Napa Avenue	4	YES				Yes	10% per Year
171	412	307	6	Napa Ease.	3					Yes	10% per Year
172	411	455	6	Suisun Avenue	3	YES				Yes	10% per Year
173	410	287	6	Suisun Ease.	3					Yes	10% per Year
174	175	134	6	6th Street	3					Yes	10% per Year

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175	406	159	6	5th Street Ease.	4					Yes	10% per Year
176	523	165	6	4th Street Ease.	5					Yes	10% per Year
178	406A	293	6	5th Street Ease.	4					Unknown	10% per Year
179	408	215	6	4th Street	2	YES			YES	Yes	10% per Year
180	422	219	6	Sonoma Avenue	2					Yes	10% per Year
181	182	279	6	7th Street	4					Yes	10% per Year
183	182	198	6	Vallejo Avenue	2					Yes	10% per Year
184	183	168	6	Vallejo Avenue	4					Yes	10% per Year
185	184	237	6	Vallejo Avenue	3					Yes	10% per Year
186	185	316	6	Vallejo Avenue	3					Yes	10% per Year
187	394	331	8	Springwood Court	0					Yes	10% per Year
188	428	135	8	I-80 Easement	0					Yes	10% per Year
189	188	252	8	Springwood Street	0					Yes	10% per Year
190	189	247	8	California Street	2					Yes	10% per Year
191	190	504	8	California Street	2					Yes	10% per Year
192	191	362	8	California Street	2					Yes	10% per Year
193	209	422	8	Viewpoint Blvd	Unknown					Yes	10% per Year
194	195	281	8	Viewpoint Blvd	Unknown					Yes	10% per Year
195	196	486	8	Viewpoint Blvd	Unknown					Yes	10% per Year
196	197	344	8	Viewpoint Blvd	Unknown					Yes	10% per Year
197	198	362	8	Seascape Circle	Unknown					Yes	10% per Year
198	199	137	8	Seascape Circle	Unknown					Yes	10% per Year
199	464	238	8	I-80 Crossing	Unknown					Yes	10% per Year
200	199	153	8	Seascape Circle	Unknown					Yes	10% per Year
201	200	145	8	Seascape Circle	Unknown					Yes	10% per Year
202	201	467	8	Seascape Circle	Unknown					Yes	10% per Year
203	202	472	8	Seascape Circle	Unknown					Yes	10% per Year
204	203	360	8	Seascape Circle	Unknown					Yes	10% per Year
205	206	158	8	Seascape Court?	Unknown					Yes	10% per Year
206	204	466	8	Seascape Circle	Unknown					Yes	10% per Year
207	206	186	8	Seascape Circle	Unknown					Yes	10% per Year
208	209	81	8	Seascape Circle	Unknown					Yes	10% per Year
209	194	270	8	Viewpoint Blvd	Unknown					Yes	10% per Year
210	212	204	8	Harbor Way	Unknown					Yes	10% per Year

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211	212	110	8	Harbor Court??	Unknown					Yes	10% per Year
212	213	399	8	Harbor Way	Unknown					Yes	10% per Year
213	215	148	8	Harbor Way	Unknown					Yes	10% per Year
214	215	160	8	Beachpoint Way	Unknown					No	10% per Year
215	216	334	8	Beachpoint Way	Unknown					Yes	10% per Year
216	217	342	8	Beachpoint Way	Unknown					Yes	10% per Year
217	198	262	8	Beachpoint Way	Unknown					Yes	10% per Year
218	193	444	8	Viewpoint Blvd	Unknown					Yes	10% per Year
219	218	302	8	Viewpoint Blvd	Unknown					Yes	10% per Year
220	219	450	8	Viewpoint Blvd	Unknown					Yes	10% per Year
221	222	235	8	Viewpoint Blvd	Unknown					Yes	10% per Year
222	260	257	8	Stirling Drive	Unknown	YES				Yes	10% per Year
223	222	387	8	Coral Drive	Unknown					No	10% per Year
224	225	358	8	Coral Drive	Unknown					Yes	10% per Year
224	223	342	8	Coral Drive	Unknown					Yes	10% per Year
225	226	243	8	Coral Drive	Unknown					Yes	10% per Year
226	245	240	8	Sandpoint Drive	Unknown					Yes	10% per Year
227	228	481	8	Coral Drive	Unknown					Yes	10% per Year
228	229	456	8	Coral Drive	Unknown					Yes	10% per Year
229	392	352	8	Coral Drive	Unknown					Yes	10% per Year
230	231	249	8	Coral Drive	Unknown					Yes	10% per Year
231	232	251	8	Coral Drive	Unknown					Yes	10% per Year
234	481	304	8	Viewpoint Blvd	Unknown					Yes	10% per Year
235	234	280	8	Viewpoint Blvd	Unknown					Yes	10% per Year
236	235	295	8	Viewpoint Blvd	Unknown					Yes	10% per Year
237	197	201	8	Sandpoint Drive	Unknown					Yes	10% per Year
238	239	173	8	Sandpoint Court??	Unknown					Yes	10% per Year
239	237	326	8	Sandpoint Drive	Unknown					Yes	10% per Year
240	239	288	8	Sandpoint Drive	Unknown					Yes	10% per Year
241	240	437	8	Sandpoint Drive	Unknown					Yes	10% per Year
242	241	477	8	Sandpoint Drive	Unknown					Yes	10% per Year
243	242	296	8	Sandpoint Drive	Unknown					Yes	10% per Year
244	243	400	8	Sandpoint Drive	Unknown					Yes	10% per Year
245	244	158	8	Sandpoint Drive	Unknown					Yes	10% per Year

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246	247	125	8	Baypoint Way	Unknown					Yes	10% per Year
247	248	164	8	Baypoint Way	Unknown					Yes	10% per Year
248	249	114	8	Baypoint Way	Unknown					Yes	10% per Year
249	250	138	8	Baypoint Way	Unknown					Yes	10% per Year
250	251	250	8	Baypoint Way	Unknown					Yes	10% per Year
251	490	129	8	Baypoint Way	Unknown					Yes	10% per Year
252	242	302	8	Langlie Way	Unknown					Yes	10% per Year
253	252	321	8	Langlie Way	Unknown					Yes	10% per Year
254	253	266	8	Myrna Way	Unknown					Yes	10% per Year
255	254	565	8	Myrna Way	Unknown					Yes	10% per Year
256	225	182	8	Myrna Way	Unknown					Yes	10% per Year
257	255	303	8	Stirling Drive	Unknown					Yes	10% per Year
258	257	224	8	Stirling Drive	Unknown					Yes	10% per Year
258	260	269	8	Stirling Drive	Unknown					Yes	10% per Year
259	258	60	8	Stirling Drive	Unknown					Yes	10% per Year
260	511	505	8	Langlie Way	Unknown					Yes	10% per Year
261	253	374	8	Langlie Way	Unknown					Yes	10% per Year
262	261	320	8	Langlie Court	Unknown					Yes	10% per Year
263	264	438	8	Sandy Cove Drive	Unknown					Yes	10% per Year
264	265	185	8	Sandy Cove Drive	Unknown					Yes	10% per Year
265	266	303	8	Sandy Cove Drive	Unknown					Yes	10% per Year
266	267	482	8	Sandy Cove Drive	Unknown					Yes	10% per Year
267	268	268	8	Sandy Cove Drive	Unknown					Yes	10% per Year
268	235	100	8	Sandy Cove Drive	Unknown					Yes	10% per Year
269	270	191	8	Ketch Court	Unknown					Yes	10% per Year
270	236	365	8	Ketch Court	Unknown					Yes	10% per Year
271	272	272	8	Reef Point Drive	Unknown					Yes	10% per Year
272	273	177	8	Reef Point Drive	Unknown					Yes	10% per Year
273	274	499	8	Reef Point Drive	Unknown					Yes	10% per Year
274	275	198	8	Reef Point Drive	Unknown					Yes	10% per Year
275	234	353	8	Reef Point Drive	Unknown					Yes	10% per Year
276	277	159	8	Reef Point Drive	Unknown					Unknown	10% per Year
277	1556	160	8	Reef Point Drive	Unknown	YES				Yes	10% per Year
278	279	260	8	Coral Ridge Circle	Unknown					Yes	10% per Year

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279	281	244	8	Coral Ridge Circle	Unknown					Yes	10% per Year
280	281	101	8	Coral Ridge Circle	Unknown					Yes	10% per Year
281	282	475	8	Coral Ridge Circle	Unknown					Yes	10% per Year
282	391	427	8	Coral Ridge Circle	Unknown					Yes	10% per Year
283	387	219	8	Bonita Point	Unknown					Yes	10% per Year
284	389	290	8	Bonita Point Esmt	Unknown					Yes	10% per Year
285	388	499	8	Coral Ridge Circle	Unknown					Yes	10% per Year
285	278	301	8	Coral Ridge Circle	Unknown					Yes	10% per Year
286	287	232	8	Bodega Way	Unknown					Yes	10% per Year
287	288	353	8	Bodega Way	Unknown					Yes	10% per Year
288	289	369	8	Bodega Way	Unknown					Yes	10% per Year
289	231	255	8	Bodega Way	Unknown					Yes	10% per Year
290	291	175	8	Windward Drive	Unknown					Unknown	10% per Year
291	292	123	8	Windward Drive	Unknown					Yes	10% per Year
292	534	121	8	Windward Drive Esmt	Unknown					Yes	10% per Year
293	292	464	8	Windward Drive	Unknown					Yes	10% per Year
294	293	243	8	Windward Drive	Unknown					Yes	10% per Year
295	294	394	8	Windward Drive	Unknown					Yes	10% per Year
296	295	348	8	Windward Drive	Unknown					Yes	10% per Year
297	296	374	8	Windward Drive	Unknown					Yes	10% per Year
298	297	417	8	Windward Drive	Unknown					Yes	10% per Year
299	298	161	8	Windward Drive	Unknown					Unknown	10% per Year
300	299	344	8	Windward Drive	Unknown					Yes	10% per Year
301	300	236	8	Windward Drive	Unknown					Yes	10% per Year
302	301	146	8	Windward Drive	Unknown					Yes	10% per Year
303	304	266	8	Tradewind Lane	Unknown					Yes	10% per Year
304	305	399	8	Tradewind Lane	Unknown					Yes	10% per Year
305	306	296	8	Tradewind Lane	Unknown					Yes	10% per Year
306	293	152	8	Tradewind Lane	Unknown					Yes	10% per Year
307	221	421	8	Donald Drive	Unknown					Yes	10% per Year
308	307	472	8	Stirling Drive	Unknown					Yes	10% per Year
309	312	400	8	Stirling Drive	2					Yes	10% per Year
310	309	139	8	Claeys Court	0					Yes	10% per Year
311	310	309	8	Claeys Court	4					Yes	10% per Year

Recommended Sewer Cleaning Schedule
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Upstream Manhole	Downstream Manhole	Length (feet)	Diameter (inches)	Location	O&M Code	Problem Area/Siphon/MH List on District Drawings	Monthly Sewer Check-off Sheet	Quarterly Sewer Check-off Sheet	SSO since 2007	Slope Greater than Minimum for Scouring Velocity?	Recommended Cleaning Frequency
312	315	246	8	Stirling Drive	2					Yes	10% per Year
313	312	381	8	Dennis Court	0					Yes	10% per Year
314	486	210	8	Dennis Court	0					Yes	10% per Year
315	222	286	8	Stirling Drive	0					Yes	10% per Year
318	59	344	10	Parker Avenue	Unknown	YES				Yes	10% per Year
319	318	269	6	Parker Avenue	Unknown					No	10% per Year
323	105	150	21	Investment Street	3					Yes	10% per Year
324	5333	30	8	Parker Avenue	5	YES				Yes	10% per Year
325	327	313	21	Parker Avenue	3					Yes	10% per Year
327	345	319	21	Parker Avenue	3					Yes	10% per Year
330	331	307	21	Parker Avenue	0					Yes	10% per Year
331	333	301	21	Parker Avenue	2					Yes	10% per Year
333	333A	303	21	Parker Avenue	3					Yes	10% per Year
334	323	310	21	Parker Avenue	4					Yes	10% per Year
337	484	188	12	Sandy Brook Court	Unknown	YES				Yes	10% per Year
338	339	142	8	Sandy Brook Court	Unknown					Yes	10% per Year
339	337	189	12	Sandy Brook Court	Unknown					Yes	10% per Year
340	339	248	12	Sandy Brook Court	Unknown					Yes	10% per Year
341	340	202	8	Mariner's Pointe Court	Unknown					Yes	10% per Year
342	341	435	8	Mariner's Pointe Court	Unknown					Yes	10% per Year
343	371	208	12	Mariner's Pointe Court	Unknown					Yes	10% per Year
344	343	280	12	Mariner's Pointe Court	Unknown					Yes	10% per Year
345	330	311	21	Parker Avenue	0					Yes	10% per Year
346	346A	122	15	Willow Avenue	3					Yes	10% per Year
347	346	292	15	Willow Avenue	4					Yes	10% per Year
348	347	405	15	Willow Avenue	4					Yes	10% per Year
349	348	317	15	Willow Avenue	4					Yes	10% per Year
350	349A	337	15	Willow Avenue	0					Yes	10% per Year
353	359	340	15	Willow Avenue	3					Yes	10% per Year
356	353	599	15	Willow Avenue	0					Yes	10% per Year
358	356	402	15	Willow Avenue	3					Yes	10% per Year
359	359A	342	15	Willow Avenue	0					Yes	10% per Year
360	350	225	15	I-80 Esmt	0					Yes	10% per Year
361	363	304	6	6th Street	2					Yes	10% per Year

Recommended Sewer Cleaning Schedule Comprehensive Wastewater Master Plan Rodeo Sanitary District											
Upstream Manhole	**Downstream Manhole**	**Length (feet)**	**Diameter (inches)**	**Location**	**O&M Code**	**Problem Area/Siphon/MH List on District Drawings**	**Monthly Sewer Check-off Sheet**	**Quarterly Sewer Check-off Sheet**	**SSO since 2007**	**Slope Greater than Minimum for Scouring Velocity?**	**Recommended Cleaning Frequency**
362	443	197	6	Rodeo Hills Sch.	2					Yes	10% per Year
363	365	185	6	6th Street	3					No	10% per Year
364	363	285	6	Rodeo Avenue	2					Yes	10% per Year
366	128	140	8	Fallen Leaf Ct.	0					Yes	10% per Year
367	127	76	8	Summer Breeze Ct.	0					Yes	10% per Year
369	371	267	8	Shelley Court	Unknown					Yes	10% per Year
370	540	90	12	Shelley Street	Unknown					Unknown	10% per Year
371	370	68	12	Shelley Street	Unknown					Yes	10% per Year
372	373	164	8	Seacliff Court	Unknown					Unknown	10% per Year
373	374	297	12	Seacliff Court	Unknown					Yes	10% per Year
374	340	280	12	Seacliff Court	Unknown					Yes	10% per Year
375	M2	135	8	Old County Road Esmt	Unknown					No	10% per Year
376	375	33	8	Old County Road Esmt	Unknown					Unknown	10% per Year
377	375	277	8	Old County Road Esmt	Unknown					Yes	10% per Year
378	377	161	8	Old County Road	Unknown					Yes	10% per Year
379	378	287	8	Old County Road	Unknown					Yes	10% per Year
380	381	338	8	Old County Road	Unknown					Yes	10% per Year
381	377	49	8	Old County Road	Unknown					Yes	10% per Year
382	367	51	8	Summer Breeze Ct.	2					Yes	10% per Year
383	126	67	8	Cool Creak Ct.	0					Yes	10% per Year
384	383	46	8	Cool Creak Ct.	0					Yes	10% per Year
386	129	207	12	7th Street	4	YES				Yes	10% per Year
387	284	390	8	Garreston Avenue	0					Yes	10% per Year
388	389	281	8	Seascape Circle	Unknown					Yes	10% per Year
389	390	193	8	Seascape Circle	Unknown					Yes	10% per Year
390	515	175	8	Seascape Circle Esmt	Unknown					Yes	10% per Year
391	390	324	8	Seascape Circle	Unknown					Yes	10% per Year
392	230	344	8	Coral Drive	Unknown					Yes	10% per Year
393	344	229	12	Mariner's Pointe Court	Unknown					Yes	10% per Year
394	188	303	8	Springwood Court	3					Yes	10% per Year
395	131	304	6	Hawthorne Drive	1					Yes	10% per Year
397	398	23	6	Garreston Avenue	0	YES				Yes	10% per Year
398	475	259	6	7th Street	3	YES				Yes	10% per Year
399	526	72	6	Mahoney Ease.	0	YES				Yes	10% per Year

Recommended Sewer Cleaning Schedule Comprehensive Wastewater Master Plan Rodeo Sanitary District											
Upstream Manhole	Downstream Manhole	Length (feet)	Diameter (inches)	Location	O&M Code	Problem Area/Siphon/MH List on District Drawings	Monthly Sewer Check-off Sheet	Quarterly Sewer Check-off Sheet	SSO since 2007	Slope Greater than Minimum for Scouring Velocity?	Recommended Cleaning Frequency
400	399	430	6	Mahoney Ease.	5	YES				Yes	10% per Year
401	400	290	6	Mahoney Ease.	5	YES				Yes	10% per Year
402	493	105	6	6th Street Ease.	3					Yes	10% per Year
403	402	248	6	6th Street Ease.	2	YES				Yes	10% per Year
404	529	175	6	6th Street Ease.	3	YES				Yes	10% per Year
405	529	94	6	6th Street Ease.	5					Yes	10% per Year
407	523	221	6	4th Street Ease.	3					Yes	10% per Year
410	410A	119	6	Suisun Ease.	3					Yes	10% per Year
411	413	153	6	Napa Ease.	2					Yes	10% per Year
412	553	134	6	Napa Ease.	0					Yes	10% per Year
413	412	55	6	Napa Ease.	5	YES				Yes	10% per Year
414	172	76	6	Suisun Avenue	3					Yes	10% per Year
415	553	62	6	Napa Avenue	4	YES				Yes	10% per Year
417	417A	40	6	Vallejo Avenue	0					No	10% per Year
418	98	263	6	Suisun Avenue	4					Yes	10% per Year
419	88	52	6	Napa Avenue	0					Yes	10% per Year
420	90	279	6	Napa Avenue	2					Yes	10% per Year
421	111	154	6	Pinole Avenue	3					Yes	10% per Year
422	181	184	6	Sonoma Avenue	2					Yes	10% per Year
423	181	117	6	7th Street	0					Yes	10% per Year
424	510	96	6	Laurel Ct./Ease.	4	YES				Yes	10% per Year
425	424	107	6	Laurel Ct./Ease.	4					Yes	10% per Year
427	180	284	6	Sonoma Avenue	3					Yes	10% per Year
428	431	236	8	I-80 Crossing	0	YES				Yes	10% per Year
429	154	71	8	California Easement	0					Yes	10% per Year
430	429	331	8	California Easement	2					Yes	10% per Year
431	430	22	8	California Easement	0					Yes	10% per Year
432	433	132	6	California Easement	4	YES				Yes	10% per Year
433	137	110	8	Hawthorne Easement	5	YES				Yes	10% per Year
434	138	249	8	Hawthorne Easement	4					Yes	10% per Year
436	438A	120	6	Spruce Easement	3					Unknown	10% per Year
437	436	178	6	Spruce Easement	4					Yes	10% per Year
439	437	186	6	Spruce Easement	4					Yes	10% per Year
440	441	40	10	Rodeo Hills Sch.	0					Yes	10% per Year

Recommended Sewer Cleaning Schedule
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Upstream Manhole	Downstream Manhole	Length (feet)	Diameter (inches)	Location	O&M Code	Problem Area/Siphon/MH List on District Drawings	Monthly Sewer Check-off Sheet	Quarterly Sewer Check-off Sheet	SSO since 2007	Slope Greater than Minimum for Scouring Velocity?	Recommended Cleaning Frequency
441	443	121	6	Rodeo Hills Sch.	5	YES				Yes	10% per Year
442	444	125	8	Rodeo Hills Sch.	0					Yes	10% per Year
445	516	331	6	Garreston Avenue	3	YES				Yes	10% per Year
449	434	287	8	Hawthorne Easement	3					Yes	10% per Year
450	47	131	6	California Street	0					Yes	10% per Year
451	454	233	10	San Pablo Easement	2					Yes	10% per Year
452	49	534	12	San Pablo Avenue	5	YES				Yes	10% per Year
454	453	230	10	San Pablo Easement	0	YES				Yes	10% per Year
455	51	371	6	First Street	5					Yes	10% per Year
456	85	221	6	Tormey Avenue	4					No	10% per Year
457	77	165	10	Rodeo Creek Easement	4					Yes	10% per Year
458	168	68	6	Napa Avenue	1	YES				Yes	10% per Year
459	458	280	6	Napa Ease.	3					Yes	10% per Year
460	171	305	6	Napa Ease.	3					Yes	10% per Year
462	141	68	6	Laurel Court	5					Yes	10% per Year
464	491	285	8	I-80 Crossing	Unknown					Yes	10% per Year
465	207	431	8	Seascape Circle	Unknown					Yes	10% per Year
466	482	200	8	Viewpoint Blvd	Unknown	YES				Yes	10% per Year
467	169	160	6	Barnes Way	4					Yes	10% per Year
469	26	55	6	4th Street	1	YES				Yes	10% per Year
470	2	52	6	Sharon Avenue	5					No	10% per Year
471	22	458	6	2nd Street	4					Yes	10% per Year
477	5000	120	24	San Pablo Avenue	4					Yes	10% per Year
478	479	289	6	Parker Avenue	4					No	10% per Year
479	479A	431	6	Parker Avenue	4					No	10% per Year
480	324	42	6	4th Street	2					Yes	10% per Year
482	483	51	15	Viewpoint Blvd	Unknown	YES				Yes	10% per Year
483	358	219	15	Viewpoint Blvd	Unknown	YES				Yes	10% per Year
484	482	49	12	Viewpoint Blvd	Unknown	YES				No	10% per Year
486	313	207	8	Dennis Court	0					Yes	10% per Year
487	308	124	8	Stirling Drive	Unknown					No	10% per Year
488	221	235	8	Viewpoint Blvd	Unknown					Yes	10% per Year
489	220	445	8	Viewpoint Blvd	Unknown					Yes	10% per Year
490	240	438	8	Baypoint Way	Unknown					Yes	10% per Year

Recommended Sewer Cleaning Schedule Comprehensive Wastewater Master Plan Rodeo Sanitary District											
Upstream Manhole	Downstream Manhole	Length (feet)	Diameter (inches)	Location	O&M Code	Problem Area/Siphon/MH List on District Drawings	Monthly Sewer Check-off Sheet	Quarterly Sewer Check-off Sheet	SSO since 2007	Slope Greater than Minimum for Scouring Velocity?	Recommended Cleaning Frequency
491	525	426	8	I-80 Crossing	Unknown					Yes	10% per Year
492	174	118	6	6th Street	0					No	10% per Year
493	492	210	6	6th Street	3					Yes	10% per Year
494	425	107	6	Laurel Ct./Ease.	4					Yes	10% per Year
495	152	45	6	Spruce Court	3	YES				Yes	10% per Year
496	10	76	6	1st Street	0					No	10% per Year
497	28	172	6	Rodeo Avenue	0	YES				Yes	10% per Year
498	28	292	6	San Pablo Avenue	3	YES				Yes	10% per Year
499	20	141	6	Pacific Avenue	1					Yes	10% per Year
500	499	51	6	Pacific Avenue	0					No	10% per Year
501	55	77	10	First Street	3	YES				Yes	10% per Year
502	503	163	6	2nd Street	2					Yes	10% per Year
503	504	68	6	2nd Street	3	YES				Yes	10% per Year
504	319	191	6	Parker Avenue	Unknown					No	10% per Year
505	480	184	6	4th Street	2					No	10% per Year
506	480	231	6	Parker Avenue	2					No	10% per Year
507	170	301	6	Napa Avenue	4	YES				Yes	10% per Year
508	168	364	6	Napa Avenue	4					Yes	10% per Year
509	112	159	6	Suisun Easement	3	YES				Yes	10% per Year
511	261	111	8	Langlie Way	Unknown					Yes	10% per Year
512	219	212	8	Myrna Way	Unknown					Yes	10% per Year
513	226	152	8	Coral Drive	Unknown					No	10% per Year
514	249	65	8	Baypoint Way	Unknown					No	10% per Year
515	466	49	8	Viewpoint Blvd	Unknown					Yes	10% per Year
518	362	200	6	Lake Avenue	5					Yes	10% per Year
519	478	72	6	Parker Avenue	5					No	10% per Year
520	84	162	8	Vaqueros Avenue	4					Yes	10% per Year
520	84	162	8	Vaqueros Avenue	4					Unknown	10% per Year
521	435	430	6	Suisun Ease.	5					Yes	10% per Year
523	408	145	6	4th Street Ease.	3					Yes	10% per Year
524	308	113	8	Stirling Drive	Unknown					Yes	10% per Year
526	527	60	6	Sonoma Ease.	3	YES				Yes	10% per Year
527	426	226	6	Sonoma Ease.	4	YES				Yes	10% per Year
529	175	144	6	6th Street Ease.	3					Yes	10% per Year

Recommended Sewer Cleaning Schedule
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Upstream Manhole	Downstream Manhole	Length (feet)	Diameter (inches)	Location	O&M Code	Problem Area/Siphon/MH List on District Drawings	Monthly Sewer Check-off Sheet	Quarterly Sewer Check-off Sheet	SSO since 2007	Slope Greater than Minimum for Scouring Velocity?	Recommended Cleaning Frequency
530	536	150	6	Vaqueros Ease.	4					Yes	10% per Year
531	535	162	6	Vaqueros Ease.	4					Yes	10% per Year
533	485	394	8	Rodeo Creek Esmt	Unknown					Yes	10% per Year
534	533	64	8	Rodeo Creek Esmt	Unknown					Yes	10% per Year
535	368	162	6	Vaqueros Ease.	3					Yes	10% per Year
536	535	146	6	Vaqueros Ease.	4					Yes	10% per Year
537	499	123	6	Pacific Avenue	3					Yes	10% per Year
538	30	140	6	Rodeo Avenue	2					No	10% per Year
539	30	99	6	Pacific Avenue	1					Yes	10% per Year
540	373	158	12	Shelley Street Esmt	Unknown					Unknown	10% per Year
541	46	292	8	Trigger Road	2					Yes	10% per Year
542	39	328	8	California Street	3	YES				Yes	10% per Year
543	542	277	8	Tullibee Road	3					Yes	10% per Year
544	543	152	8	Tullibee Road	2					Yes	10% per Year
545	34	152	6	Rodeo Avenue	4					No	10% per Year
546	35	97	6	Rodeo Avenue	2					No	10% per Year
550	408	169	6	4th Street	0					Yes	10% per Year
552	503	111	4	Parker Avenue	3					Unknown	10% per Year
553	520	682	8	4th Street Ease.	2					Yes	10% per Year
555	451	290	8	Mariposa Easement	4					Unknown	10% per Year
558	139	141	6	Laurel Court	1					Yes	10% per Year
560	557	67	10	Rodeo Creek Ease.	Unknown	YES				Yes	10% per Year
561	80	293	10	3rd Street	Unknown					Yes	10% per Year
586	544	60	8	Tullibee Road	0					Yes	10% per Year
588	42	107	8	Dempsey Way	Unknown					Yes	10% per Year
1556	481	134	8	Viewpoint Blvd Ease.	Unknown	YES				Yes	10% per Year
5000	WWTP	2019	16	San Pablo Ave	1					Yes	10% per Year
101A	101B	72	10	Rodeo Creek Easement	3					Unknown	10% per Year
101B	457	71	10	Rodeo Creek Easement	4					Unknown	10% per Year
12A	12	43	6	Garretson Avenue	0					No	10% per Year
134A	135	296	6	Hawthorne Drive	3					Unknown	10% per Year
134B	134	215	6	Hawthorne Drive	5					Unknown	10% per Year
137A	137	70	6	Hawthorne Drive	0					Unknown	10% per Year
154A	154	73	6	California Street	0					No	10% per Year

Recommended Sewer Cleaning Schedule
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Upstream Manhole	Downstream Manhole	Length (feet)	Diameter (inches)	Location	O&M Code	Problem Area/Siphon/MH List on District Drawings	Monthly Sewer Check-off Sheet	Quarterly Sewer Check-off Sheet	SSO since 2007	Slope Greater than Minimum for Scouring Velocity?	Recommended Cleaning Frequency
16A	16	27	6	Garretson Avenue	0				YES	No	10% per Year
186A	186	15	6	Vallejo Avenue	0					Unknown	10% per Year
25A	25	19	6	Lake Avenue	0					Unknown	10% per Year
333A	334	290	21	Parker Avenue	2					Yes	10% per Year
346A	325	387	15	Willow Avenue	0					Yes	10% per Year
349A	349B	190	15	Willow Avenue	0					Yes	10% per Year
349B	349	82	15	Willow Avenue	0					Yes	10% per Year
359A	360	392	15	Willow Avenue	3					Yes	10% per Year
361A	361	40	6	6th Street	3					Unknown	10% per Year
402A	402	51	6	6th Street Ease.	4					Unknown	10% per Year
406A	406	141	6	5th Street Ease.	3					Unknown	10% per Year
409A	409	156	6	Vallelo Ease.	5					Unknown	10% per Year
410A	93	260	6	Suisun Ease.	4					Unknown	10% per Year
413A	413	18	6	Napa Ease.	3					Unknown	10% per Year
417A	96	163	6	Vallejo Avenue	2					Unknown	10% per Year
418A	418	40	6	Suisun Avenue	5					Unknown	10% per Year
42A	555	102	8	Mariposa Easement	3					Yes	10% per Year
438A	438	137	6	Spruce Easement	2					Unknown	10% per Year
439A	439	142	6	Spruce Easement	3					Unknown	10% per Year
439B	439A	5	6	Spruce Easement	0					Unknown	10% per Year
43A	42	106	8	Dempsey Way	4					Yes	10% per Year
448A	35	226	6	Rodeo Avenue	3	YES			YES	Unknown	10% per Year
479A	480	324	6	Parker Avenue	2					Unknown	10% per Year
498A	498	54	6	San Pablo Avenue	0					Unknown	10% per Year
530A	530	50	6	Napa Ave Easement	2					Unknown	10% per Year
530B	530	118	6	Napa Ave Easement	3				YES	Unknown	10% per Year
558A	558	17	6	Laurel Court	3					Unknown	10% per Year
85A	457	159	6	Tormey Avenue	3					Unknown	10% per Year
87A	87	50	6	Pinole Avenue	5					Unknown	10% per Year
91A	91	101	6	Napa Avenue	2					Unknown	10% per Year
92A	111	219	6	4th Street	5					Unknown	10% per Year
END	62	191	6	San Pablo Avenue	1	YES				Unknown	10% per Year
M2	Tormey PS	63	8	A Street	0					Yes	10% per Year
Tormey PS	WWTP	7065	6	San Pablo Ave	0					Unknown	10% per Year

6/3/13

6/3/13

RODEO SANITARY DISTRICT

COMPREHENSIVE WASTEWATER MASTER PLAN

TECHNICAL MEMORANDUM NO. 4

WASTEWATER COLLECTION SYSTEM MODEL AND COLLECTION SYSTEM PERFORMANCE

FINAL
June 2013

RODEO SANITARY DISTRICT

COMPREHENSIVE WASTEWATER MASTER PLAN

WASTEWATER COLLECTION SYSTEM MODEL AND COLLECTION SYSTEM PERFORMANCE

TECHNICAL MEMORANDUM NO. 4

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WASTEWATER COLLECTION SYSTEM MODEL AND COLLECTION SYSTEM PERFORMANCE

1.0 PURPOSE

The purpose of this technical memorandum (TM) is to summarize the criteria and assumptions that were used to evaluate the Rodeo Sanitary District's (District's) wastewater collection system; provide the results of the dry weather and wet weather calibration of the District's sewer system hydraulic model; and to evaluate the performance of the existing collection system facilities.

2.0 SUMMARY OF KEY FINDINGS AND RECOMMENDATIONS

Using a 5-year design storm as the basis for evaluating collection system capacity, some key findings and recommended improvements of the District's wastewater collection system include:

- Key assumptions for the modeling analysis included using a maximum flow depth to pipe diameter ratio (d/D) of 0.8 with a manning's number of 0.013.
- The 5-year storm was used as the design storm. Recommended improvements were based on the 5-year storm, while additional modification required for a 10-year storm would only be made if water level rises to within 3-feet of the top of a manhole during this event.
- The modeled collection system capacity is approximately 6.9 mgd during a 5-year storm event and approximately 7.9 mgd during a 10-year storm event with no pump station limitations and upsizing of the 10-inch sewer near manhole (MH) 100 in 3rd Street near Railroad Avenue to 18-inches.
- Increase the capacity of the influent pump station from 4.6 mgd to have a firm capacity of 5 mgd. It is recommended that 5 mgd be used to determine improvements required in the collection system.
- Basins 406 and 408 have the highest infiltration and inflow (I/I) (with the percent of rainfall entering the collection system at 79.3 percent and 47.6 percent respectively) and cover small areas. Rehabilitation in these two areas is recommended as first priority.
- The most economical approach to reducing I/I and preventing surcharging of the system is to divert sewer flows to the existing Parker Avenue 21-inch trunk sewer to the extent possible, upsize a small number of segments, and then replace any remaining pipe that is undersized (d/D < 0.8) for the 5-year storm.
- Recommended projects to meet these goals are described in Section 9.0.

3.0 BACKGROUND

The fundamental definition of a model is "a representation of a physical entity." A collection system model is thus a simplified representation of the existing collection system facilities. The amount of simplification will define the applicability of the model in a given situation. The collection system model can define the current level of performance of the collection system as well as perform "what If" scenarios to project the future performance.

The hydraulic model chosen for the District's 2006 hydraulic modeling work was the H_2OMAP Sewer software. The H_2OMAP Sewer model routes flows through the collection system to examine the capacity of existing pipes and identify where flow restrictions occur. H_2OMAP Sewer is a stand-alone GIS-based computer program for use in the planning, design, analysis, and expansion of sanitary sewer collection systems. The program can be effectively used to model both dry-weather and wet-weather flows and determine the most cost-effective and reliable method of wastewater collection. Through the use of scenario management functionality, the program is also capable of analyzing existing and proposed sewage collection systems.

Advanced Hydro Engineering (AHE) constructed the original model using the H_2OMAP Sewer software in 2006. The existing model was updated in 2012 by AHE to incorporate new information provided during the CCTV investigation, additional field survey information, recent collection system modifications, and to calibrate the model based on information gathered during the most recent flow monitoring program.

4.0 FLOW MONITORING PROGRAM

The District contracted with V&A Consulting Engineers Inc. (V&A) to conduct a four-month flow monitoring program at twelve (12) sewer metering sites coupled with a rain gauge located at the District's Wastewater Treatment Plant (WWTP) (Figure 4.1). The flow monitoring was conducted between November 22, 2011 and March 29, 2012 and included four storm events. V&A's flow monitoring report is included in Appendix A with a summary of monitoring locations shown in Table 4.1. Two flow monitoring devices were located in the field at MH 477 (15 inch) and MH 57 (21 inch) to determine infiltration and inflow in the Southern and Northern parts of the system. Flow from these two manholes covers all flow to the WWTP with the exception of the Tormey area. Additional meters were installed upstream of MH 477 and MH 57 and moved during the season to try to pin point high infiltration and inflow areas. "Preliminary Flow Results for High I/I Areas" by AHE is provided in Appendix B that describes these efforts.

Figure 4.1
FLOW MONITORING PROGRAM
COMPREHENSIVE WASTEWATER MASTER PLAN
RODEO SANITARY DISTRICT

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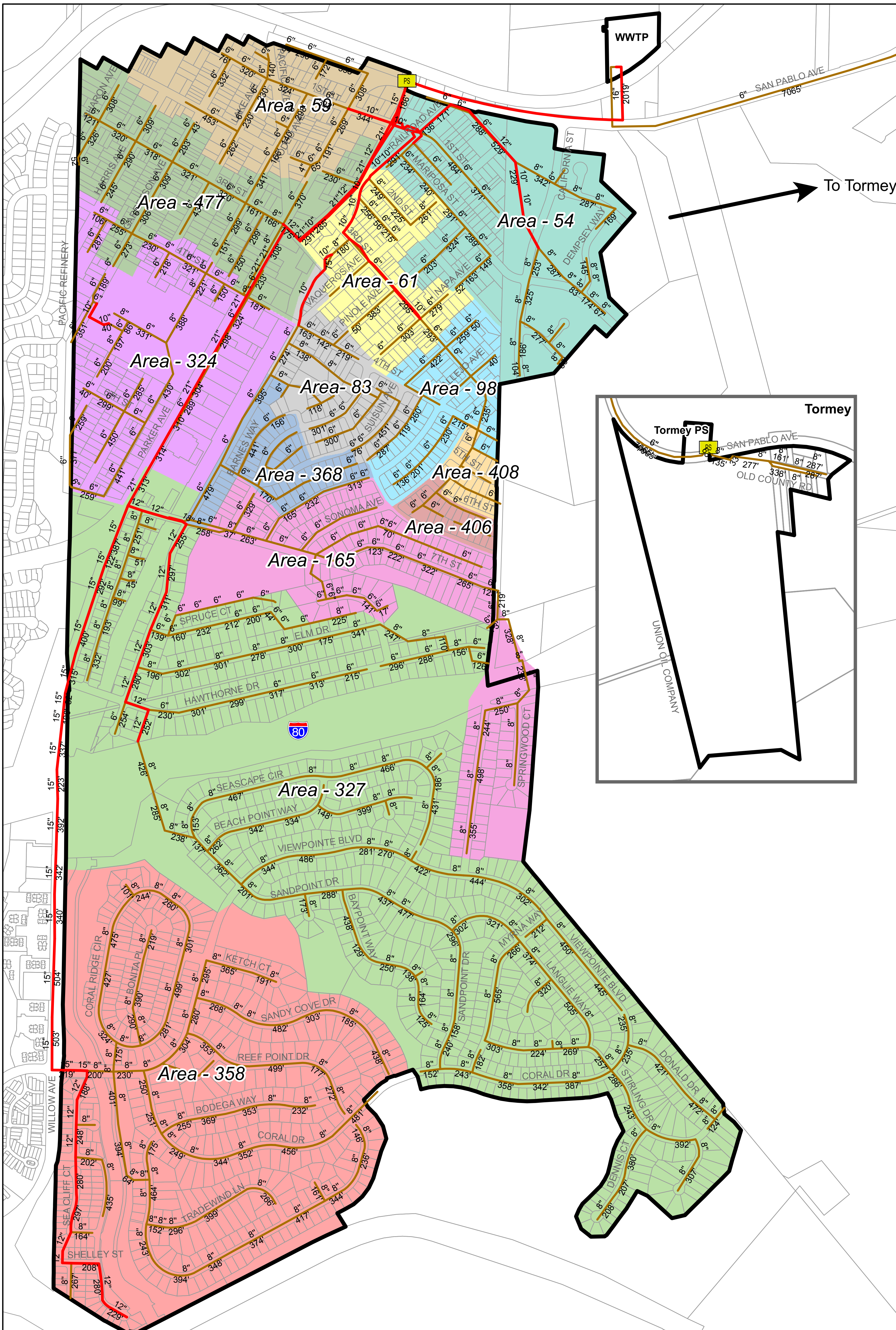
Table 4.1	Flow Meter Location and Period Comprehensive Wastewater Master Plan Rodeo Sanitary District	
Flow Meter Location	**Captured Basins**	**Period Flow Meter was in Place**
MH 54	Basin 54	February 4 to March 29, 2012
MH 57	Total Flow from Southern Basins 165,324,327,358	January 19 to March 29, 2012
MH 59	Basin 59	February 7 to March 29, 2012
MH 61	Basin 61	November 22, 2011 to March 29, 2012
MH 98	Basin 98	January 19 to March 29, 2012
MH 165	Basin 165	January 19 to February 6, 2012
MH 327	Basin 327	January 19 to March 29, 2012
MH 368	Basin 368	February 22 to March 29, 2012
MH 406	Basin 406	March 26 to April 2, 2012
MH 408	Basin 408	February 7 to March 29, 2012
MH 477	Total Flow from Northern Basins 54, 59,61, 83, 98, 406, 408, 477	November 22, 2011 to March 29, 2012

5.0 SEWER COLLECTION SYSTEM BASINS

The District's sanitary sewer collection system consists of approximately twenty-seven (27) miles of active sewer pipelines ranging in size from 4-inches to 24-inches in diameter, as well as two sewer pump stations and associated force mains (Figure 4.2). All wastewater generated within the District limits is ultimately conveyed through a 16-inch force main or 6-inch force main to the District's WWTP for treatment. For the purposes of the District's Comprehensive Wastewater Master Plan, the District's sewer collection system has been divided into thirteen (13) distinct basins. These basins were originally delineated during the 2006 flow monitoring effort. Twelve (12) flow monitoring locations were selected to cover eleven (11) of these basins corresponding to the flow monitoring locations discussed in Section 7.0. The sewer basins are delineated on Figure 4.2.

The Parker Avenue Sanitary Sewer Interceptor is a main artery of the District's sewer collection system. All wastewater flow generated from the Southern portion of the District is conveyed through this 21-inch diameter interceptor, which flows in a northeasterly direction from 7th Street along Parker Avenue and Rodeo Creek to MH 477. The Northern portion of the District flows from the East through a 12" interceptor in John Street to MH 59 and from the West through a 10"/12" interceptor in Railroad Avenue to MH 60 where they combine at



Legend

PS Pump Station

Pipeline Diameter

8" and Smaller

10" and Larger

Sewer Basins

54, 59, 61, 83, 98, 165, 324, 327, 358, 368, 406, 408, 477

Rodeo Sanitary District Boundary

Parcels

Feet 0 400 800

Figure 4.2
Existing Sewer Collection System and Sewer Basins
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

MH 58. With the exception of Tormey area, all flow in the District is ultimately conveyed through manhole 477 and the 24-inch influent line to the Rodeo Pump Station.

5.1.1 Basin 59

Basin 59 is one of the oldest areas of the District and covers approximately 38.1 acres. It services a mix of commercial/industrial/residential land use areas in the northwest portion of the District, west of Rodeo Creek and north of Parker Avenue. The major facilities within Basin 59 include a portion of the 21-inch Parker Avenue Sanitary Sewer Interceptor, the Rodeo Pump Station and its associated 16-inch diameter force main. The Rodeo Pump Station was constructed in 1957 to redirect flows from the 12-inch and 15-inch outfalls to the San Pablo Avenue Force Main. Previously, flows from the 12 and 15-inch diameter outfalls were combined flows from the communities of Rodeo and Bayo Vista that were conveyed to the San Pablo Bay.

5.1.2 Basin 477

Basin 477 covers approximately 46.8 acres and services a mixture of commercial and residential land use areas west of Rodeo Creek in the northwestern area of the District. The major facilities within Basin 477 include a portion of the 21-diameter trunk sewer that extends from Highway 80 north along Parker Avenue, where it extends to the Rodeo Pump Station.

5.1.3 Basin 54

Basin 54 covers approximately 59.9 acres and services a large area consisting of residential land use areas in the northeast area of the District. The major facility within Basin 54 includes a portion of the 10-inch diameter trunk sewer that extends from 4th Street north along the east bank of Rodeo Creek to join the 21-inch trunk sewer near the Rodeo Pump Station.

5.1.4 Basin 61

Basin 61 covers approximately 23.3 acres and services a residential land use area located east of Rodeo Creek and north of 4th Street. The major facility within Basin 61 includes the southern portion of the 10-inch diameter trunk sewer that extends from 4th Street north along the east bank of Rodeo Creek to join the 21-inch trunk sewer near the Rodeo Pump Station.

5.1.5 Basin 98

Basin 98 covers approximately 19.1 acres and services the central part of Rodeo centered on 4th street at the eastern boundary of the District. Land use designations within Basin 98 include only residential areas. There are no major trunk sewers (10-inches or larger) located within Basin 98.

5.1.6 Basin 83

Basin 83 covers approximately 20.0 acres and services residential use areas located in the central potion of the District. The major facility within Basin 83 includes the southernmost portion of the 10-inch diameter trunk sewer that extends from 4th Street north along the east bank of Rodeo Creek to join the 21-inch trunk sewer near the Rodeo Pump Station.

5.1.7 Basin 368

Basin 368 covers approximately 15.1 acres and services primarily residential land use areas located in the central area of the District bounded by Rodeo Creek to the west and 7th Street to the south. There are no major trunk sewers (10-inches or larger) located within Basin 368.

5.1.8 Basin 324

Basin 324 covers approximately 57.5 acres and services primarily commercial, public park and residential land use areas located in the central area of the District. It is bounded by the District western boundary, 7th Street to the South, and 4th Street to the north. The major facility within Basin 324 includes the 21-inch diameter trunk sewer that extends from Highway 80 north along Parker Avenue to the Rodeo Pump Station. A separate meter was not used for this basin during the flow monitoring program, but the combined flow for basins 358, 327, and 324 were metered through MH 327.

5.1.9 Basin 406

Basin 406 covers approximately 5.7 acres and services residential land use areas located in the eastern area of the District adjacent to California Street. There are no major trunk sewers (10-inches or larger) in Basin 406.

5.1.10 Basin 408

Basin 408 covers approximately 5.3 acres and services residential land use areas located in the eastern area of the District adjacent to California Street and north of Basin 406. All sewers within this basin are 6-inch sewers.

5.1.11 Basin 165

Basin 165 covers approximately 60.1 acres and services primarily school/residential land use areas located in the eastern area of the District north of Highway 80. All sewers within this basin are 6-inch sewers.

5.1.12 Basin 327

Basin 327 covers approximately 278.0 acres and services primarily newer residential land use areas located in the south eastern area of the District between Highway 80 and Highway 4. The major facilities within Basin 327 include two 8-inch diameter trunk sewers that cross under Highway 80 to the older area of the District. This basin was used to determine “R” values for Basins 358 and 324.

5.1.13 Basin 358

Basin 358 covers approximately 166.4 acres and services primarily newer residential land use areas located in the southernmost area of the District in the vicinity of Highway 4. The major facilities within Basin 358 include a 15-inch diameter trunk sewer that extends from Viewpoint Boulevard north along Willow Avenue to the Highway 80. A separate meter was not used for this basin during the flow monitoring program, but the combined flow for basins 358, 327, and 324 were metered through MH 327.

6.0 HYDRAULIC MODEL DEVELOPMENT

The H_2OMAP Sewer Model was developed based on 2006 surveyed manhole data by Cunha Engineering, Inc. that located the center of the manhole, provided rim elevation, influent and effluent invert elevations, and sewer diameters. The survey data was drafted in AutoCad and imported into the model. The collection system model includes pipes with a diameter of 6-inches or greater and all associated manholes. Due to a maximum node limitation of 500 in the model, the Viewpoint neighborhood (See Basin 358 on Figure 4.2) flow was included, but the actual collection system was not modeled. As the District has performed closed circuit television inspection and cleaning of their sewers, the collection system maps have been updated and revised. The current model incorporated these revisions into the previous modeling effort.

6.1 Gravity Sewers

Gravity sewer pipe capacities are dependent on many factors, including roughness of the pipe, the maximum allowable depth of flow, minimum velocity, diameter, and slope of pipe.

6.1.1 Manning Coefficient (n)

The Manning coefficient (n) is a friction coefficient and varies with respect to pipe material, size of pipe, depth of flow, smoothness of pipe and joints, and extent of root intrusion. For sewer pipes, the Manning coefficient typically ranges between 0.011 and 0.017, with 0.013 being a typical value used for sewer system planning.

6.1.2 Flow Depth Criteria (d/D)

The primary criterion used to identify capacity deficient sewers or to size new improvements is the maximum flow depth to pipe diameter ratio (d/D). The d/D value is defined as the depth (d) of flow in a pipe during peak flow conditions divided by the pipe’s diameter (D).

Using a conservative d/D ratio when evaluating existing sewers may lead to unnecessary replacement of existing pipelines. Therefore, a d/D ratio of 0.8 (pipe flowing at maximum capacity) was used to evaluate the District’s existing trunk sewer system during peak wet weather flow (PWWF) for a 5-year storm. During PWWF for a 10-year storm, water levels were allowed to rise to within three feet of the manhole rim. Sewers were allowed to surcharge (i.e. the sewer is flowing full, and no longer has gravity flow) under these maximum flow conditions. These criteria are summarized in Table 4.2. If the flow depth was greater than the maximum allowed, then the sewer was deemed deficient and a larger sewer was proposed to provide greater flow capacity.

Table 4.2 Maximum Flow Depth Criteria
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Maximum Flow Depth Criteria for Existing Sewers	
5-Year Wet Weather Flow:	Max d/D = 0.8
10-Year Wet Weather Flow:	Surcharge to 3 feet Below Manhole Rim

6.1.3 Design Velocities and Minimum Slopes

In order to minimize the settlement of sewage solids, sewer velocity should be equal to or greater than 2 feet per second (fps), based on roughness coefficient of 0.013. At this velocity, the sewer flow will typically provide self-cleaning for the pipe. Table 4.3 lists the recommended minimum slopes and their corresponding maximum flows when the pipe is flowing at its maximum depth.

Table 4.3 Minimum Slope for New Sewer Pipes
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Pipe Diameter (inches)	Minimum Slope(1),(2) (feet/feet)	Calculated Flow at Maximum d/D(2),(3)	
		d/D	Maximum Flow (mgd)
4	0.0145	0.80	0.145
6	0.0084	0.80	0.327
8	0.0026	0.80	0.387
10	0.0019	0.80	0.604
12	0.0015	0.80	0.871
15	0.0011	0.80	1.360
18	0.0009	0.80	1.957
21	0.0009	0.80	2.665
24	0.0008	0.80	3.481

Notes:
(1) Recommended minimum slope for flows at a velocity greater than or equal to 2 feet/second for pipes greater than or equal to 8-inches and 3 fps for pipes smaller than 8 inches.
(2) Manning's n = 0.013.
(3) Calculated flow is determined using the minimum slope and the maximum allowable d/D presented in Table 4.2.

6.1.4 Changes in Pipe Size

In accordance with the District's standard practice, when a smaller sewer joins a large one, the inlet crown, or inside top of pipe, will be at least as high as the outlet crown.

6.2 Design Storm

Design storms are rainfall events used to analyze the performance of a collection system under peak flows and volumes, and have specific recurrence intervals and rainfall durations. Based on the Contra Costa County Flood Control and Water Conservation District (CCCFCD) data, a 5-year, 24-hour design storm for Rodeo has 2.942 inches of rainfall. This design storm has a twenty percent chance (20 %) that 2.942 inches of rain will fall in any 24-hour period in a given year. A 5-year, 24-hour design storm is typically used when modeling WWF in collection systems. In addition, a 10-year, 24-hour design storm of 3.535 inches of rainfall was used to check surcharge in the collection system.

The Natural Resources Conservation Service (NRCS), formally known as the Soil Conservation Service (SCS), developed normalized rainfall hyetograph distribution curves based on the storm's geographical location. The distribution curves are applied to total storm event volumes in order to develop hourly storm event hyetographs. There are four types of rainfall distributions used to represent various regions throughout the United States (Type I, IA, II, and III). Types I and IA represent the Pacific maritime climate with wet winters and dry summers. Type III represents Gulf of Mexico and Atlantic coastal areas where tropical storms bring large 24-hour rainfall amounts. Type II represents the rest of the country. Based on the geographical location of the District, the Type IA distribution is recommended. The design storm developed using the NRCS method is shown in Figure 4.3. The NRCS method will be used to develop synthetic rainfall hyetographs in order to simulate the peak wet weather flows (PWWF) in the collection system during a design storm event.

The Regional Water Quality Control Board (RWQCB) has no written standard for sewer collection system design storm selection at this time. It is conservative to use a 5-year storm with no surcharge in the system, but to also check for sewage levels during a 10-year storm to ensure no sanitary sewer overflows during this event.

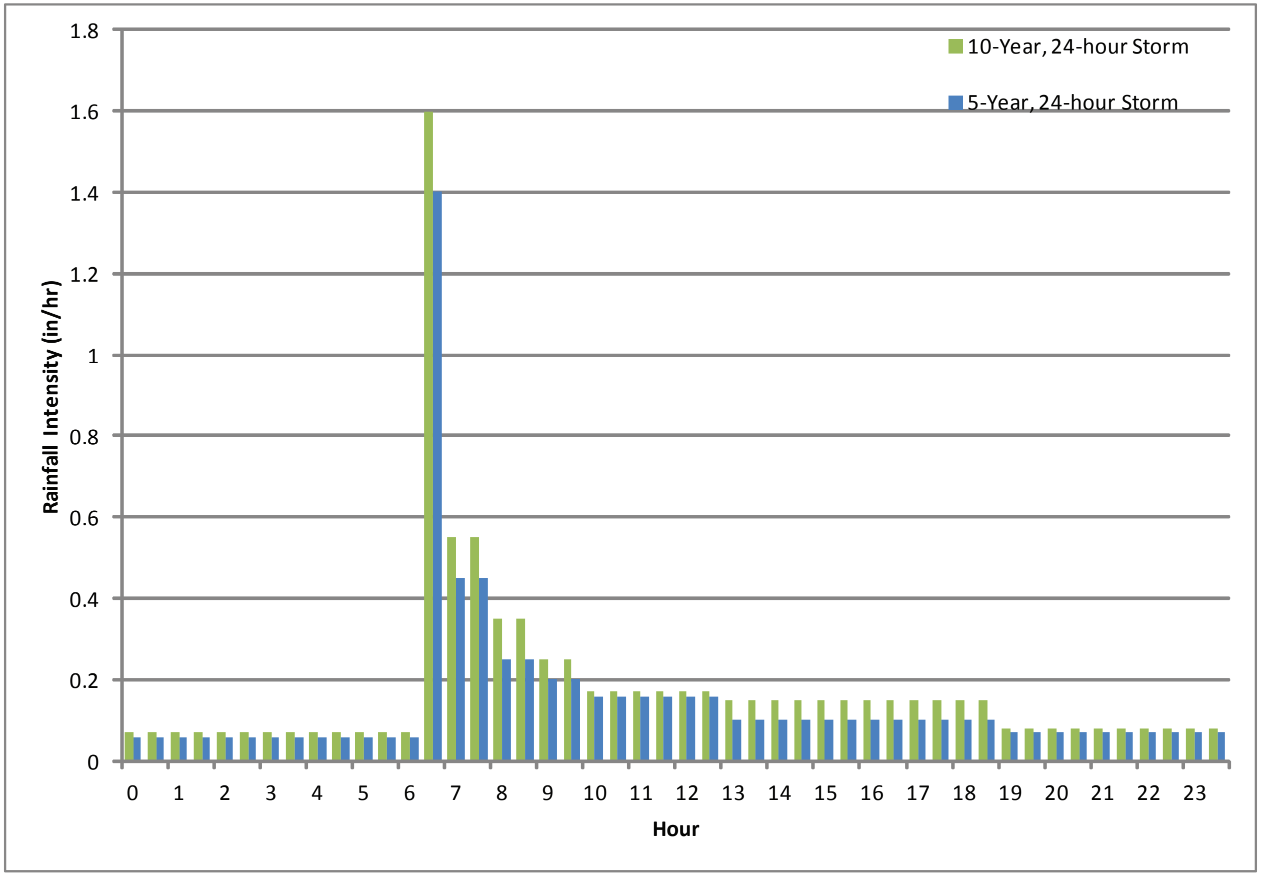


Figure 4.3
5-YEAR AND 10-YEAR 24-HOUR DESIGN STORMS
COMPREHENSIVE WASTEWATER MASTER PLAN
RODEO SANITARY DISTRICT

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6.3 Hydraulic Model

This section summarizes the process used to develop the District's hydraulic computer model of the sewer system, including a summary of the previous model, modeling software selection, the hydraulic model elements, and the model creation process.

6.3.1 Previous Hydraulic Computer Model

The District's previous sewer system hydraulic model was developed using the H_2OMAP Sewer hydraulic modeling software package, developed by Innovyze. The hydraulic model contains the physical attributes of the collection system facilities (e.g., pipe size, inverts, manhole rim elevations, etc.), base wastewater flows, and infiltration and inflow (I/I) flows. It should be noted that while the physical attributes of the District's previous hydraulic model were used in the development of the updated hydraulic model for this project, the base wastewater and I/I flows are outdated. For this reason, base wastewater and I/I flows were reallocated during the development and calibration of the updated hydraulic model.

6.3.2 Elements of the Hydraulic Model

The following provides a brief overview of the various elements of the hydraulic model and the required input parameters associated with each:

- **Junctions.** Sewer manholes, cleanouts, as well as other locations where pipe sizes change or where pipelines intersect are represented by junctions in the hydraulic model. Required inputs for junctions include rim elevation, invert elevation, and surcharge depth (used to represent pressurized systems).

- **Pipes.** Gravity sewers and force mains are represented as pipes in the hydraulic model. Input parameters for pipes include length, friction factor (e.g., Manning's n for gravity mains), invert elevations, and diameter.

- **Storage Nodes.** For sewer system modeling, storage nodes typically are used to represent lift station wet wells (although other storage basins, etc. can be modeled as storage nodes). Input parameters for storage nodes include invert elevation, wet well depth, and wet well cross sectional area.

- **Outfalls.** Outfalls represent areas where flow leaves the system. For sewer system modeling, an outfall typically represents the connection to the influent pump station at a WWTP.

- **Rain Gauges.** Rain gauges are input into the hydraulic model to simulate historical or theoretical hourly rainfall events.

- **Inflows.** The following are the three types of inflow sources that can be injected into individual model junctions (and storage nodes):
  - External: External inflows can represent any number of flows into the collection system, such as metered flow data or groundwater inflow. External inflows are

applied to a specific model junction by applying a baseline flow value and a pattern that varies the flow by hour, day, or month of the year.

– Dry Weather: Dry weather inflows simulate base sanitary wastewater flows and represent the average flow. The dry weather flows can be multiplied by up to four patterns that vary the flow by month, day, hour, and day of the week (e.g., weekday or weekend). The dry weather diurnal patterns are adjusted during the dry weather calibration process (see Section 7.1).

– RDII: Rainfall Derived Infiltration and Inflows (RDII) are applied in the model by assigning a unit hydrograph and a corresponding tributary area to a given junction. The unit hydrographs consists of several parameters that are used to adjust the volume of RDII that enters the system at a given location. These parameters are adjusted during the wet weather calibration process (see Section 7.2).

6.3.3 Hydraulic Model Construction

The District's hydraulic model combines information on the physical and operational characteristics of the wastewater collection system, and performs calculations to solve a series of mathematical equations to simulate flows in pipes.

The model creation process consisted of five steps, as described below:

- Step 1 - The hydraulic model elements from the District's previous hydraulic (developed in H_2OMAP) were exported into geographic information system (GIS) format for review against existing systems maps and CCTV data;

- Step 2 - The GIS data was reviewed and the model updated;

- Step 3 - Certain physical and operational data for the District's wastewater collection facilities was not available from the GIS data. This type of data, such as wet well dimensions, pump controls, and pump curves, were input manually into the model based on information provided by District staff.

  Once all the relevant data was input into the hydraulic model, the model was reviewed to verify that the model data was input correctly and that the flow direction and size of the modeled pipelines were consistent with the actual system. Additionally, the modeled influent pump station was also checked to verify that it operated correctly.

- Step 4 - The existing dry weather wastewater flows were divided evenly over nodes in a given basin. These flows were adjusted to match the dry weather flows recorded during the flow monitoring period.

- Step 5 - The hydraulic model contains certain run parameters that need to be set by the user at the beginning of the project. These include run dates, time steps, reporting parameters, output units, and flow routing method. Once the run parameters were established, the model was debugged to ensure that it ran without errors or warnings.

7.0 HYDRAULIC MODEL CALIBRATION

Model calibration is a crucial component of the hydraulic modeling effort. Calibrating the model to match data collected during the flow-monitoring period ensures the most accurate results possible. The calibration process consists of calibrating to both dry and wet weather conditions. For this project, both dry and wet weather flow monitoring were conducted. Dry weather flow (DWF) calibration ensures an accurate depiction of base wastewater flow generated within the study area. The wet weather flow (WWF) calibration consists of calibrating the hydraulic model to a specific storm event or events to accurately simulate the peak and volume of infiltration/inflow (I/I) into the sewer system. The amount of I/I is essentially the difference between the WWF and DWF components.

7.1 Dry Weather Flow Calibration

The first step in the calibration process was to divide the District service area into flow meter tributary areas. Twelve (12) tributary areas were created, one for each flow meter. The next step was to define the flow volumes within each area, which was accomplished by distributing the average baseline flow evenly across all the manholes within the monitored basin. The diurnal curve is a pattern of 15-minute increment multipliers that are applied to the average dry weather flow to simulate the variation in flow that occurs throughout the day for average weekday and weekend flow. Two diurnal curves based on the flow monitoring data were created for nodes tributary to a specific flow meter, one representing weekday flows and the other representing weekend flows. Figure 4.4 displays the weekday and weekend diurnal curves for the area tributary to Manhole 406. Similar diurnal curves were developed for each of the meters and its tributary area.

The calibration process compared the meter data with the model output. Comparisons were made for average, maximum and minimum flows as well as the temporal distribution of flow. Table 4.4 summarizes the DWF calibration using average, maximum, and minimum dry weather flow results. Flow meter data for MH 477 and MH 57 were not included in this table since they do not monitor individual basins. In addition, the flow meter data at MH 98 was not used because downstream flows were discovered to be smaller than upstream flows in Basins 406 and 408. Instead, it was decided to use flow monitoring data from Basins 406 and 408, and group Basin 98 with Basin 61.

It is industry standard practice to consider a hydraulic model to be satisfactorily calibrated when the model simulated values are within to ten-percent (10%±) of the field measured data. All of the meter sites were within 10%± of the field measured data for the daily average, maximum and minimum flows, except for meters 83 and 406. Both of these

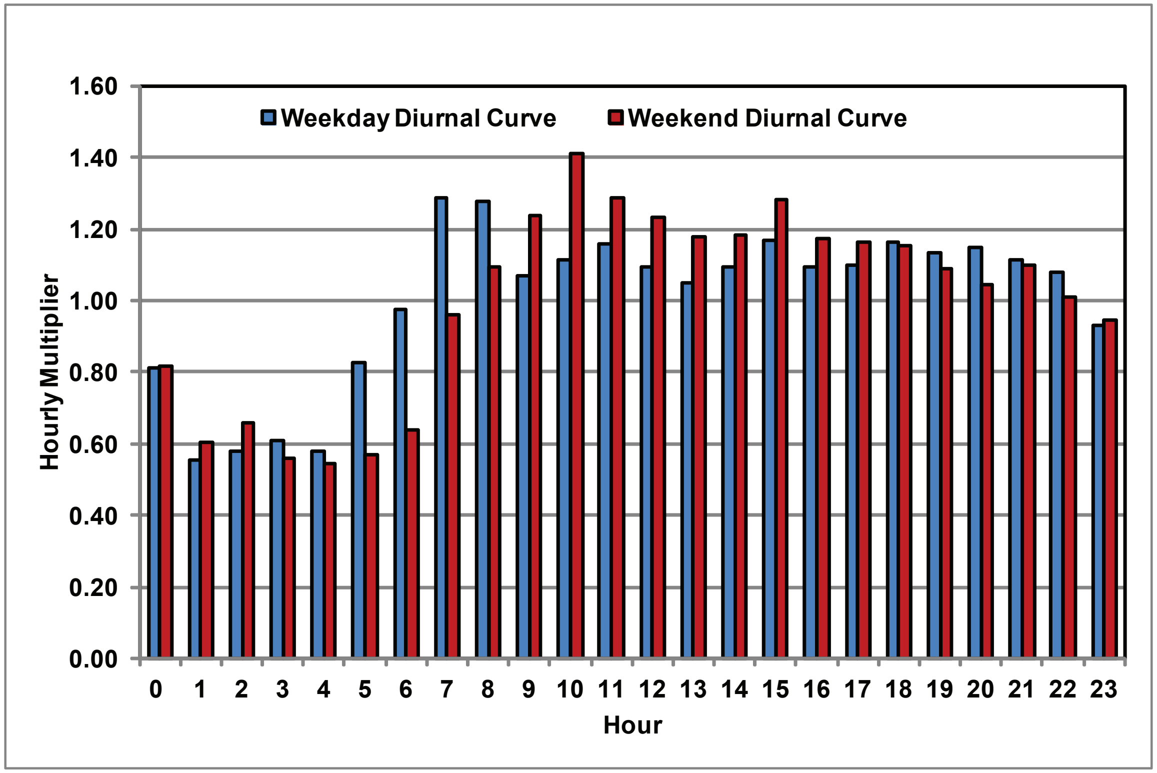

Figure 4.4
MANHOLE 406 DIURNAL PATTERNS
COMPREHENSIVE WASTEWATER MASTER PLAN
RODEO SANITARY DISTRICT

Table 4.4 Dry Weather Flow Calibration Summary
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Basin Number	Field Measured ADWF[1]: Field Measured Baseline Flow (mgd)	Field Measured ADWF[1]: Maximum Flow (mgd)	Field Measured ADWF[1]: Minimum Flow (mgd)	Modeled Simulated ADWF: Average Model Baseline Flow (mgd)	Modeled Simulated ADWF: Maximum Flow (mgd)	Modeled Simulated ADWF: Minimum Flow (mgd)	Percent Difference: Average (%)	Percent Difference: Maximum (%)	Percent Difference: Minimum (%)
54	0.107	0.141	0.074	0.107	0.140	0.074	0.0%	-0.5%	0.4%
59	0.035	0.045	0.021	0.035	0.045	0.021	0.1%	0.0%	0.5%
61	0.085	0.125	0.036	0.085	0.124	0.036	0.9%	-1.3%	1.9%
83	0.009	0.013	0.003	0.034	0.050	0.014	287.1%	270.3%	357.1%
327	0.220	0.383	0.056	0.220	0.378	0.057	0.0%	-1.2%	1.2%
406	0.005	0.006	0.004	0.009	0.013	0.004	81.0%	105.6%	37.1%
408	0.016	0.021	0.009	0.014	0.021	0.006	-9.5%	2.9%	-31.4%

Note:
(1) ADWF= average dry weather flow

meters had very low baseline flows. It was not possible to develop diurnal flow patterns from the data at the low flow meters, since there was a twenty percent (20%) error of measurement with the significant digits available, so diurnal peaking factors from downstream basins with the average base flow allocated to the basins were used in lieu of these.

A sample of the DWF calibration for the meter at MH 61 is presented in Figure 4.5. This figure shows the measured flow at the meter versus the model predicted flows for both weekday and weekend periods. The remaining DWF calibration plots are provided in Appendix B. As shown in Appendix B and Figure 4.5, the model showed good correlation between the measured flow and simulated flow for all sites.

7.2 Wet Weather Flow Calibration

The WWF calibration enables the hydraulic model to accurately simulate I/I entering a sewer system during a storm event. WWF calibration consists of two steps: 1) determining a rainfall event that characterizes the most significant impact on the sewer system facilities, preferably during wet antecedent soil moisture conditions; and 2) creating a database of I/I parameters for this rainfall event.

For the WWF calibration, the March 28 through 29, 2012 rainfall event was initially used to calibrate the model. The hydraulic model was calibrated to this rainfall event since this was the only event that occurred with metering in place at MH 406 and MH 408. The March 13 to 15, March 16 to 17, and March 24-25, 2012 rainfall events were then used to back check the calibration results, as more than one storm should be used for any WWF calibration effort. For example, model parameters for I/I are adjusted for one event so that projected flows align with measured flows. These same parameters are then used to project flows for a second measured event. If both events provide an accurate and precise estimate of the independent measured flow events, the model is considered to be adequately calibrated.

The wet weather calibration process involves creating custom unit hydrographs for each flow meter tributary. That is, based on 1-inch of rain falling uniformly over a given sewer collection system basin, a direct runoff quantity can be calculated. The hydrographs utilize the R-Values (percent of rainfall that enters collection system) to simulate I/I. The R-Values are input into the model and the parameters are adjusted until the peak I/I rate measured during the flow monitoring program are simulated for each of the series of rainfall events. Figure 4.6 illustrates the results for the wet weather calibration for the flow meter at MH 61 for the March 28 – 29th, 2012 event. The remaining WWF calibration plots are provided in Appendix D. As shown in Appendix D and Figure 4.6, the model shows acceptable correlation between the measured flow and simulated flow for all sites.

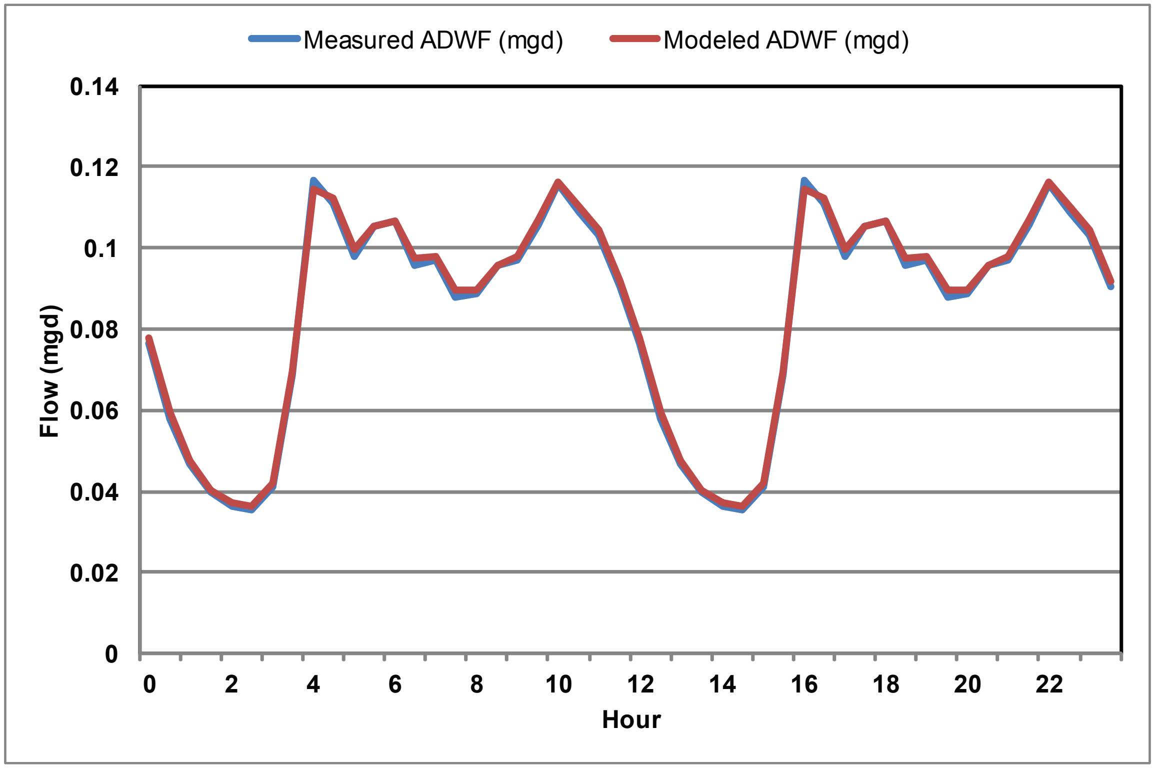

Figure 4.5
FLOW METER 61 DRY WEATHER CALIBRATION
COMPREHENSIVE WASTEWATER MASTER PLAN
RODEO SANITARY DISTRICT

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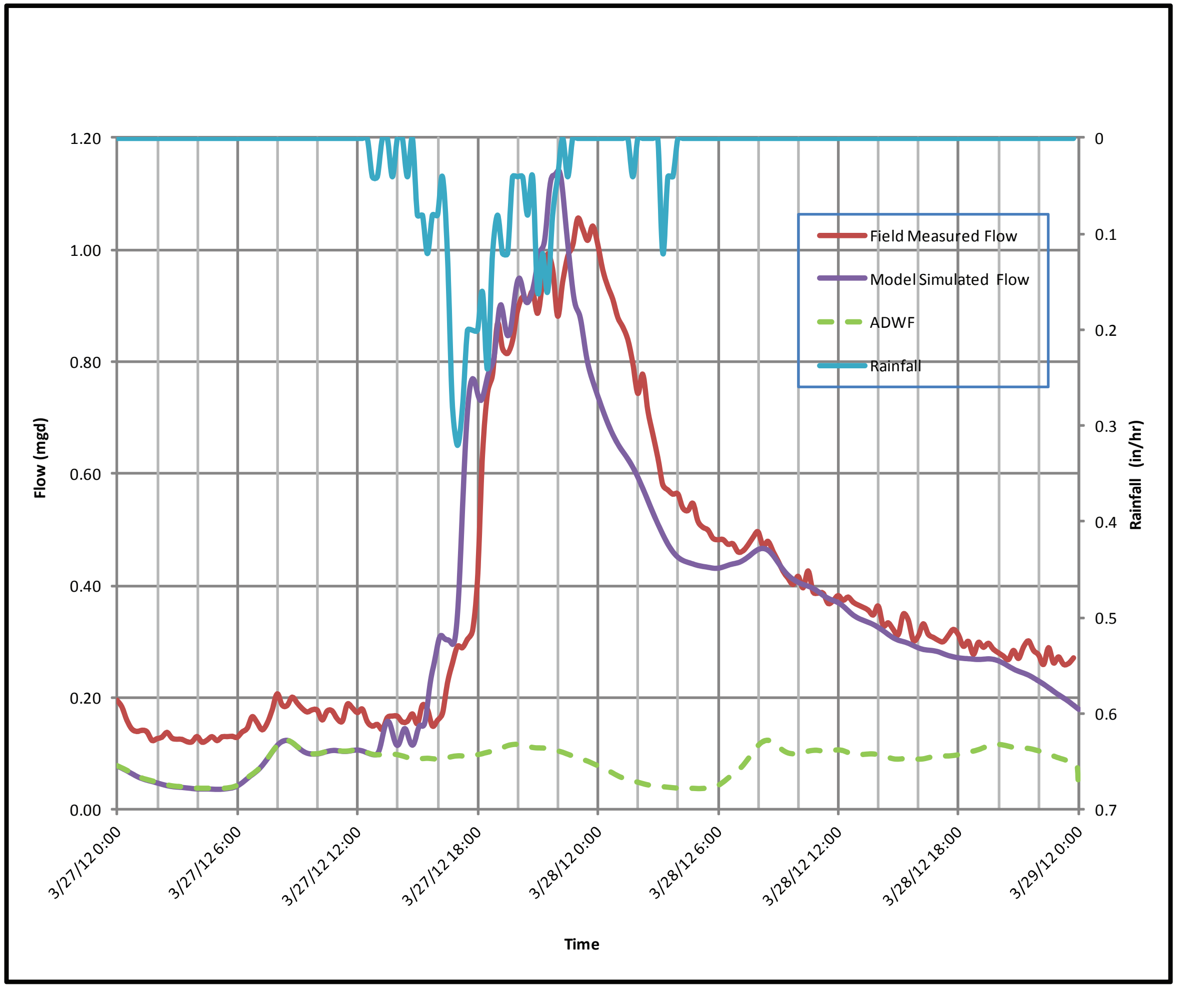

Figure 4.6
FLOW METER AT MH 61 WET WEATHER CALIBRATION
(MARCH 28 - 29, 2012)
COMPREHENSIVE WASTEWATER MASTER PLAN
RODEO SANITARY DISTRICT

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In addition, comparisons were made for maximum and average flows as well as the temporal distribution of flow. Table 4.5 summarizes the WWF calibration using maximum and average flow results. As shown in Table 4.5, most of the meter sites were within 10-percent of the field measured data for the daily average and maximum flows. Flow meters at MH 477 and 57 were not used to calibrate the model since they do not represent flows from individual basins, but were checked against the overall flow for other storm events.

The District conducted the temporary flow monitoring period during the months of November 2011 to March 2012. These months are ideal for conducting wet weather flow monitoring, because the ground tends to be saturated in the spring. Examination of the 2012 flow data indicated that during the period of January 20 - 24, 2012, the District experienced a significant increase in flows that is directly attributable to I/I at MH 98. With a peaking factor of 25, this was one of the highest peaking factors at an individual metering location. During that period, roughly 1.37 inches of rain fell within the District's service area.

Consequently, flow meters were moved upstream to track the location of the I/I which was found to be extremely high in Basins 406 and 408.

8.0 EXISTING SYSTEM DEFICIENCIES

Based on the results of the flow monitoring program and the hydraulic modeling, several key system deficiencies were identified in the existing collection system. These deficiencies can be categorized into two groups: those related to insufficient capacity during a 5-year storm and those related to high I/I.

8.1 Infiltration & Inflow

The District's collection system is comprised mainly of small diameter, vitrified clay pipe (VCP) constructed in the early to mid 1900s. Sewer pipe consisting of VCP material installed prior to 1955 used oakum and cement mortar, tar or hot sulfur to seal the pipe joints, which slowly deteriorates over time resulting in high I/I.

Infiltration and inflow (I/I) for each basin can be described by an R-value that is calculated based on rain volume and basin surface area. R-values for each basin are presented in Table 4.6. Basins 406 and 408 exhibit the highest R-values in the collection system with 79.3 percent and 47.6 percent respectively. The combined 5-year design flow for basins 406 and 408 is estimated at 2.2 mgd, while ADWF is estimated to be 0.2 mgd. By reducing I/I in these two basins through an aggressive rehabilitation program to 5 percent, the flow to the pump station can be reduced by 1.3 mgd. Since these basins are relatively small, replacement of sewers within these basins should be a priority in the capital improvement program. Alternatively, while Basin 54 has an R-value of 35%, the basin area of nearly 60 acres, makes the cost prohibitive to replace all sewer segment within the basin.

Table 4.5 Wet Weather Flow Calibration Summary
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

		Field Measured Flow[(1),(2)]		Model Simulated Flow[(2)]		Percent Difference[(3)]	
Basin Number	**Wet Weather Event**	**Average (mgd)**	**Peak (mgd)**	**Average (mgd)**	**Peak (mgd)**	**Average (%)**	**Peak (%)**
54	March 27 – 28, 2012	0.348	0.594	0.275	0.529	-21%	-11%
59	March 27 – 28, 2012	0.103	0.217	0.092	0.220	-11%	1%
61	March 27 – 28, 2012	0.393	1.057	0.352	1.141	-10%	8%
83	March 27 – 28, 2012	0.112	0.366	0.118	0.346	6%	-6%
327	March 27 – 28, 2012	0.480	0.901	0.441	0.915	-8%	2%
406	March 27 – 28, 2012	0.099	0.434	0.097	0.434	-2%	0%
408	March 27 – 28, 2012	0.162	0.732	0.150	0.688	-7%	-6%
477 +57	March 13-15, 2012 March 16-17, 2012 March 24-25, 2012	1.304 1.799 1.604	2.758 3.537 2.663	1.778 1.465 1.427	3.663 3.420 2.651	36% -19% -11%	33% -3% -1%

Notes:
(1) Source: V&A Flow Monitoring Report
(2) Average flows are measured over the duration of the storm event. Peak flows represent hourly average peak flows.
(3) Percent difference between meter collected and model derived results.

Table 4.6 Collection System Infiltration and Inflow Overview
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Basin	Area (acres)	R Value	Basin	Area (acres)	R Value
54	59.9	35.0%	327	278.0	3.7%
59	38.1	12.5%	358	166.4	3.7%
61	23.3	17.6%	368	15.1	15.9%
83	20.0	24.9%	406	5.7	79.3%
98	19.1	17.6%	408	5.3	47.6%
165	60.1	3.7%	477	46.8	8.0%
324	57.5	8.0%			

8.2 System Capacity Restraints

8.2.1 Pipelines

The District has historically experienced overflows near MH 100 in 3rd Street near Railroad Avenue. Collection system modeling shows that by upsizing the existing 10-inch pipeline to 18-inches from MH 100 to MH 61 along Railroad Avenue, sanitary sewer overflows can be avoided in this area.Table 4.7 summarizes the pipeline segments that were found to be undersized, exhibiting a d/D greater than 0.8, during the 5-year storm event.

Alternatively, since there is excess capacity in the existing 21-inch Parker Avenue trunk sewer, it is possible to divert flow from capacity limited areas to the 21-inch sewer. AHE modeled diverting flows to the extent possible to this pipeline and identified an alternative project summarized in Table 4.8. There is an overlap between these two alternative projects of approximately 4,800 feet of pipe that will require replacement in either scenario.

8.2.2 Pump Station

The existing pump station is currently undersized for the overall collection system capacity. There is no pump station influent meter, so the model results were compared to the total of the two Basin flow meters at manholes 477 and 57, which comprise the total flow from the District (excluding Tormey). With no pump station restriction, the collection system capacity is 6.9 mgd during a 5-year design storm event and 7.9 mgd during a 10-year design storm event with no I/I reduction measures in place. The firm capacity of the pump station is 3.5 mgd (2 pumps in service), while the existing total capacity of the pump station is 4.6 mgd with all pumps in service. The comminutor capacity (2 units in service with no restrictions) is 6.7 mgd. In addition, the pump station structure is limiting as well. Based on discussions with the District and AHE, it is recommended that flow to the pump station be limited to

Table 4.7 **Undersized Sewers in Collection System (d/D<0.8)**
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Upstream Manhole	Length (feet)	Existing Pipe Diameter (inches)	Proposed Pipe Size (inches)	Upstream Manhole	Length (feet)	Existing Pipe Diameter (inches)	Proposed Pipe Size (inches)
6	318	6	8	365	430	6	10
13	321	6	8	447	243	6	10
24	320	6	8	551	167	6	10
112	390	6	8	448	609	6	12
175	154	6	8	35	163	6	15
176	162	6	8	59	86	12	15
368	274	6	8	103	263	12	15
385	395	6	8	107	529	12	15
406	124	6	8	108	62	12	15
1665	15	NA	8	547	164	6	15
33	160	6	10	1324	30	8	15
86	293	6	10	54	69	15	18
90	294	6	10	61	49	10	18
96	289	6	10	74	140	10	18
97	159	6	10	76	155	10	18
98	293	6	10	77	26	10	18
408	296	6	10	100	70	10	18
523	141	6	10	101	294	10	18
557	180	8	10	457	165	10	18
1080	223	6	10	665	151	10	18
474	200	6	8	1061	55	NA	18
475	441	6	8				
Total	**9,362**	**LF**					

Table 4.8	Improvements Required to Divert Flow to 21-inch Trunk Sewer Comprehensive Wastewater Master Plan Rodeo Sanitary District		
Upstream Manhole	**Length (feet)**	**Existing Pipe Diameter (inches)**	**Proposed Pipe Diameter (inches)**
6	318	6	8
13	321	6	8
24	320	6	8
112	390	6	8
175	154	6	8
176	162	6	8
368	274	6	8
385	395	6	8
406	124	6	8
1665	15	NA	8
33	160	6	10
86	293	6	10
90	294	6	10
96	289	6	10
97	159	6	10
98	293	6	10
408	296	6	10
523	141	6	10
557	180	8	10
1080	223	6	10
35	163	6	8
547	164	6	8
1448	360	NA	8
1450	193	NA	8
1475	195	NA	8
1551	198	NA	10
100	70	10	15
1101	170	NA	10/12 Siphon
Total	**6,314**	**LF**	

approximately 5 mgd. This flow was thought to be achievable with I/I improvements in place for Basins 406 and 408. However, based on follow up modeling, additional flow reductions will be required from the northwest area (north of Seventh Street – Basins 59, 107 and 324) to drop the peak flow below 5 mgd. Modeling indicates that with an R-value of 5% in Basins 324, 107 and 59 in addition to Basins 406 and 408, the peak flow will be approximately 4.75 mgd, which is below the 5 mgd goal. With no change in Basin 59, the resulting peak flow to the pump station is approximately 5.11 mgd.

9.0 RECOMMENDED PROJECTS

Based on the modeling results of the District's wastewater collection system, the following collection system rehabilitation projects are recommended:

- Upsize the 10-inch sewer near manhole (MH) 100 in 3rd Street near Railroad Avenue to 18-inches.
- Increase the capacity of the influent pump station from 4.6 mgd to have a firm capacity of 5 mgd. It is recommended that 5 mgd be used to determine improvements required in the collection system.
- The 5-year storm was used as the design storm. Recommended improvements were based on the 5-year storm, while additional modification required for a 10-year storm would only be made if water level rises to within 3-feet of the top of a manhole during this event.
- Replace all pipe segments and lateral connections in Basins 406 and 408 to reduce I/I flows to the pump station and WWTP.
- The most economical approach to reducing I/I and preventing surcharging of the system is to divert sewer flows to the existing 21-inch trunk sewer to the extent possible, upsize a small number of 6" and 8" segments to 8" and 10" diameter and then replace any remaining pipe that is undersized (d/D < 0.8) for the 5-year storm.

It should be noted that collection system pipeline rehabilitation and replacement and pump station improvements must be balanced against the cost to treat the sewage. These costs and trade offs will be evaluated in TM No. 6.

APPENDIX A – FLOW MONITORING RESULTS

Rodeo Sanitary District

Master Plan Sanitary Sewer Flow Monitoring

Year 2011/2012

Monitoring Site: MH 61

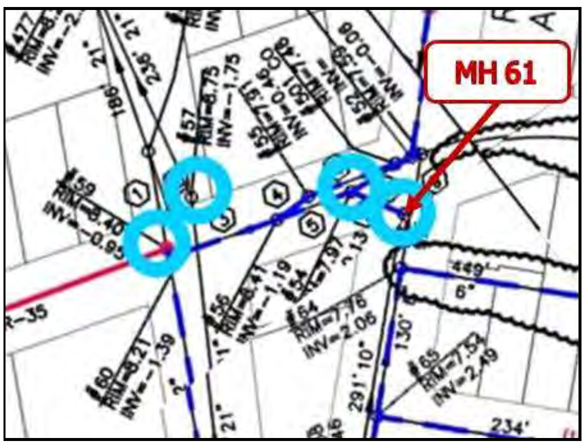
Location: Railroad Avenue, just south of intersection with 1st Street

Data Summary Report

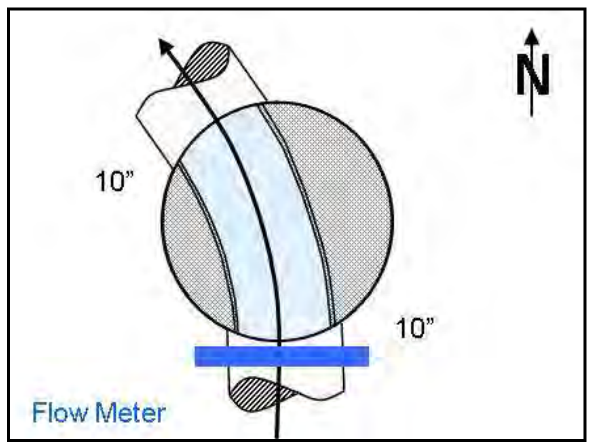
MH 61
Site Information Report

Location:	Railroad Avenue, just south of intersection with 1st Street
Coordinates:	122.2663° W, 38.0378° N
Rim Elevation:	10 feet
Diameter:	10 inches
Baseline Flow:	0.086 mgd
Peak Measured Flow:	1.23 mgd

Satellite Map



Sanitary Map



Flow Sketch


Street View Photo

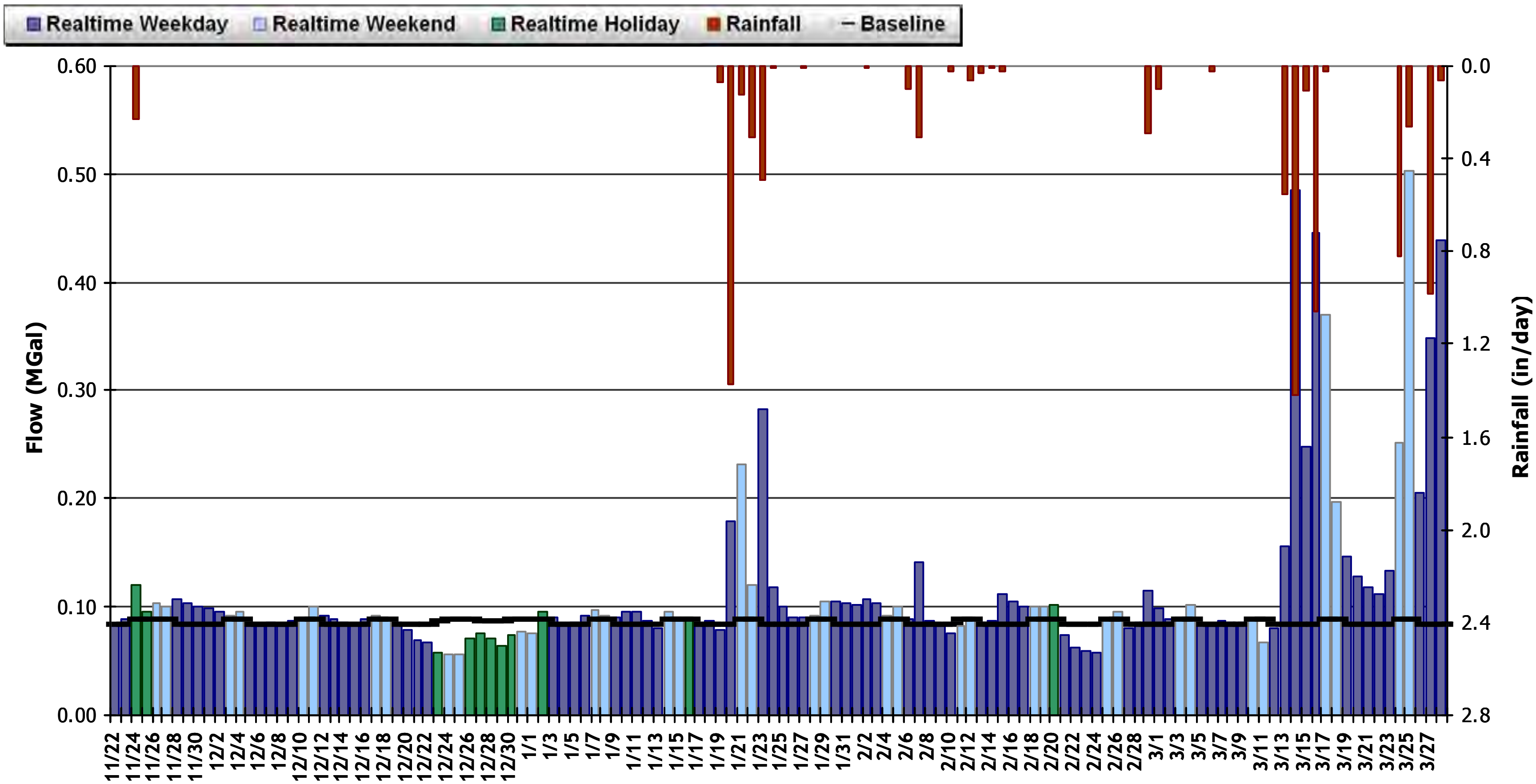

Plan View Photo

MH 61

Period Flow Summary: Daily Flow Totals

Avg Daily Flow: 0.115 MGal   Peak Daily Flow: 0.503 MGal   Min Daily Flow: 0.056 MGal

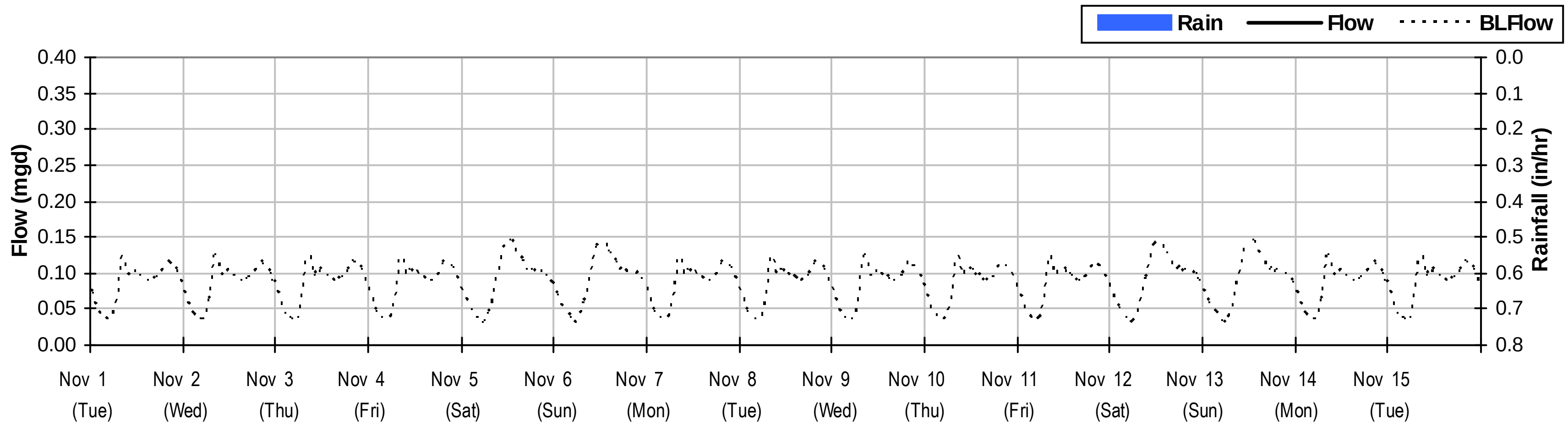
Total Period Rainfall: 8.86 inches

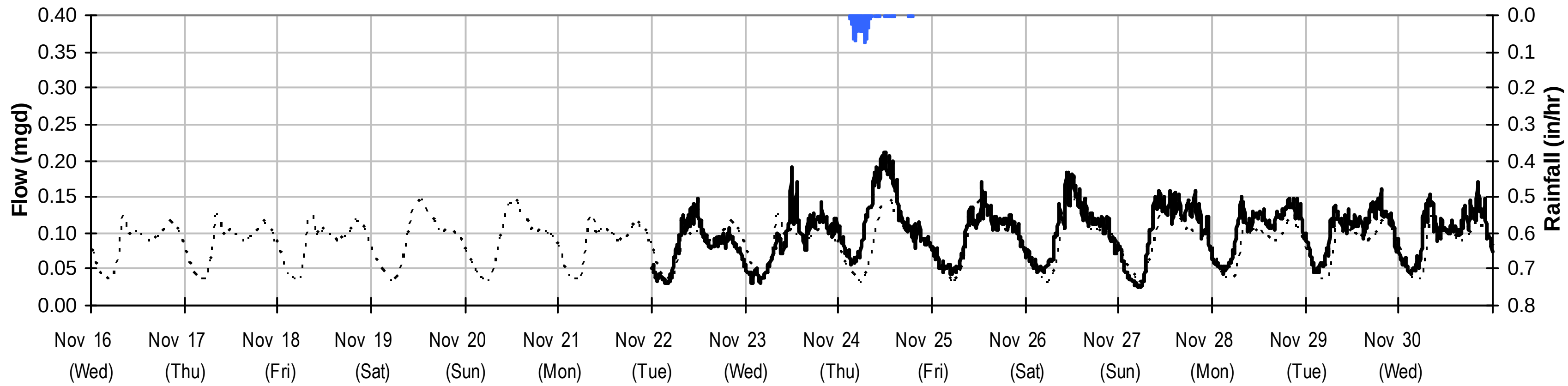


MH 61

Monthly Flow Summary: November, 2011

Total Monthly Rainfall: 0.23 inches **Avg Flow: 0.100 mgd** **Peak Flow: 0.212 mgd** **Min Flow: 0.025 mgd**

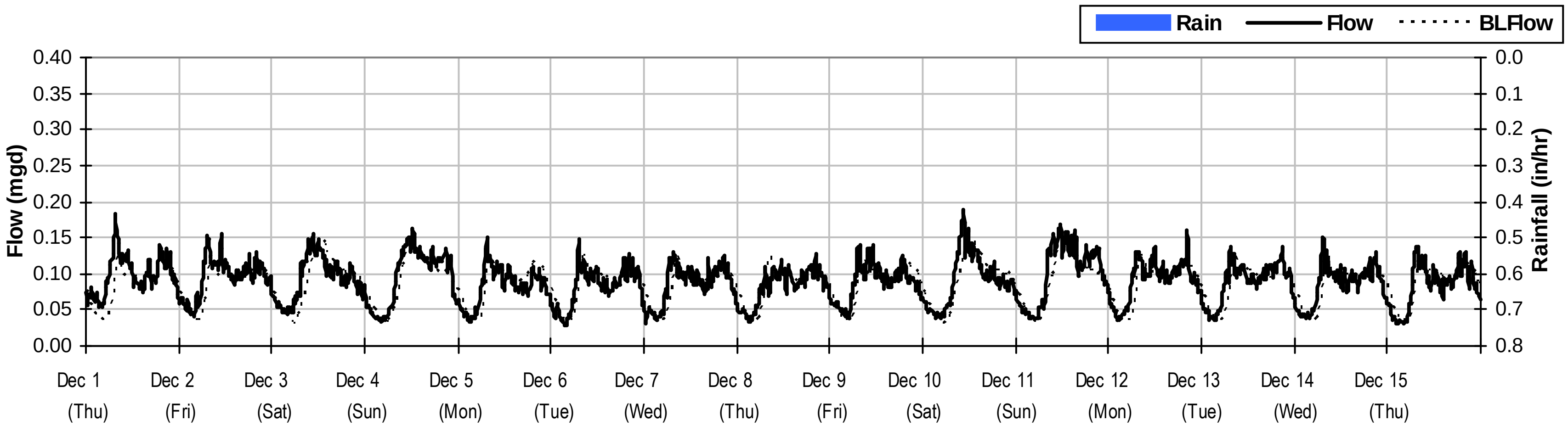


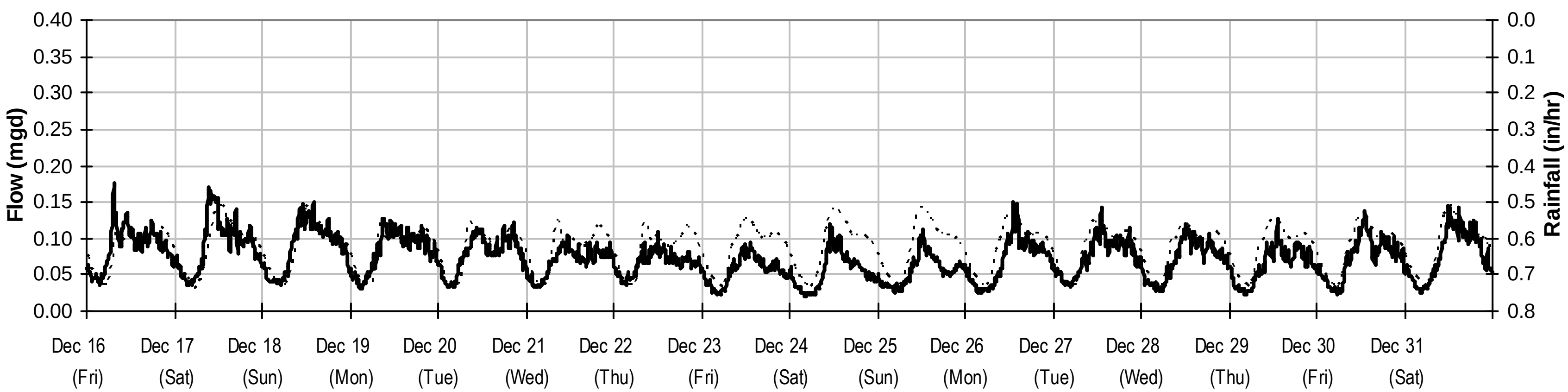


MH 61

Monthly Flow Summary: December, 2011

Total Monthly Rainfall: 0.00 inches   **Avg Flow: 0.081 mgd**   **Peak Flow: 0.189 mgd**   **Min Flow: 0.021 mgd**

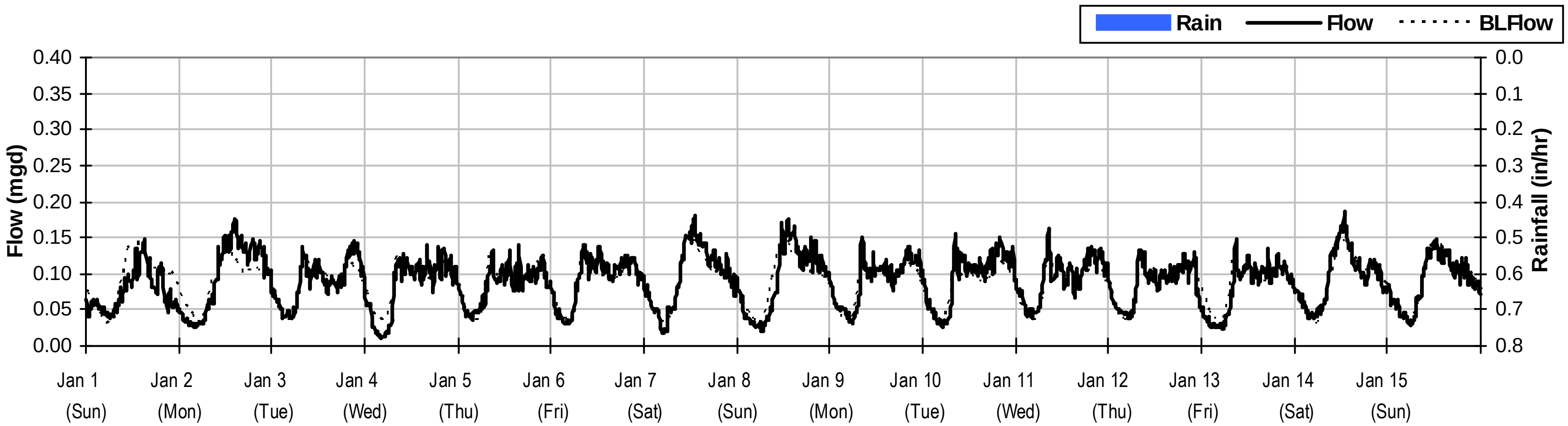


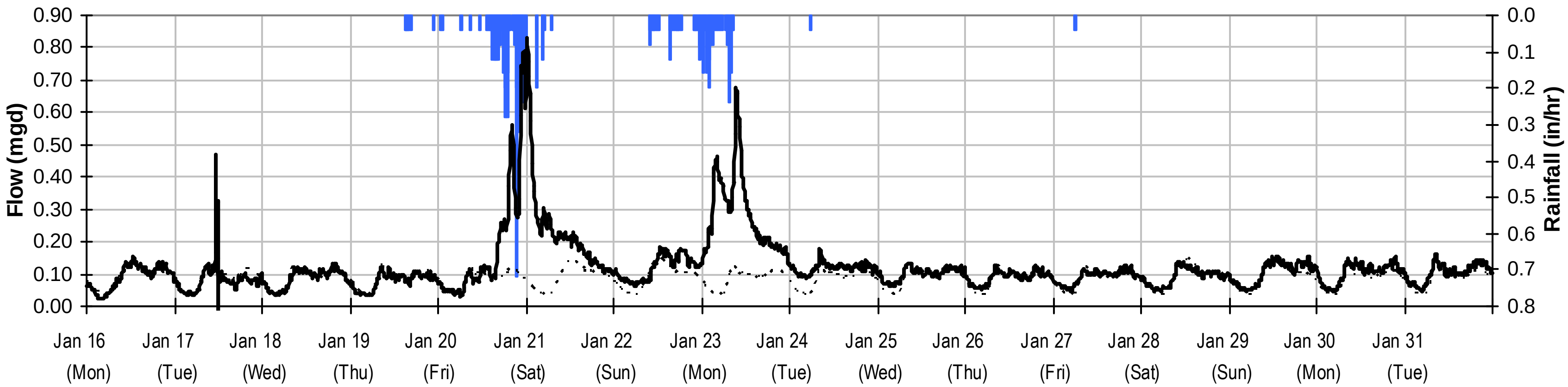


MH 61

Monthly Flow Summary: January, 2012

Total Monthly Rainfall: 2.38 inches   **Avg Flow: 0.107 mgd**   **Peak Flow: 0.830 mgd**   **Min Flow: -0.083 mgd**

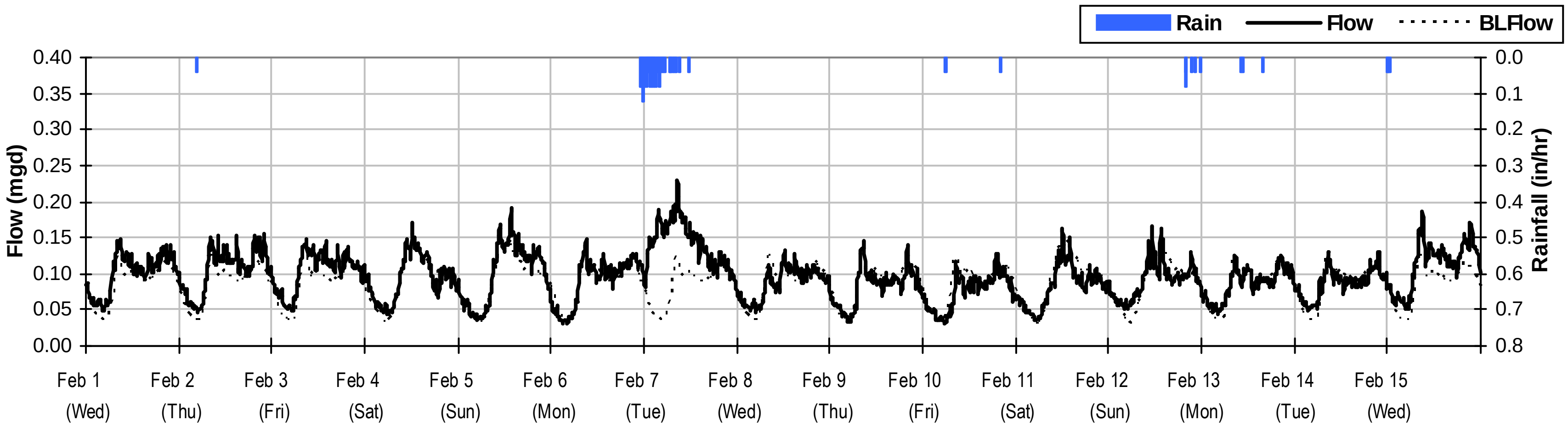


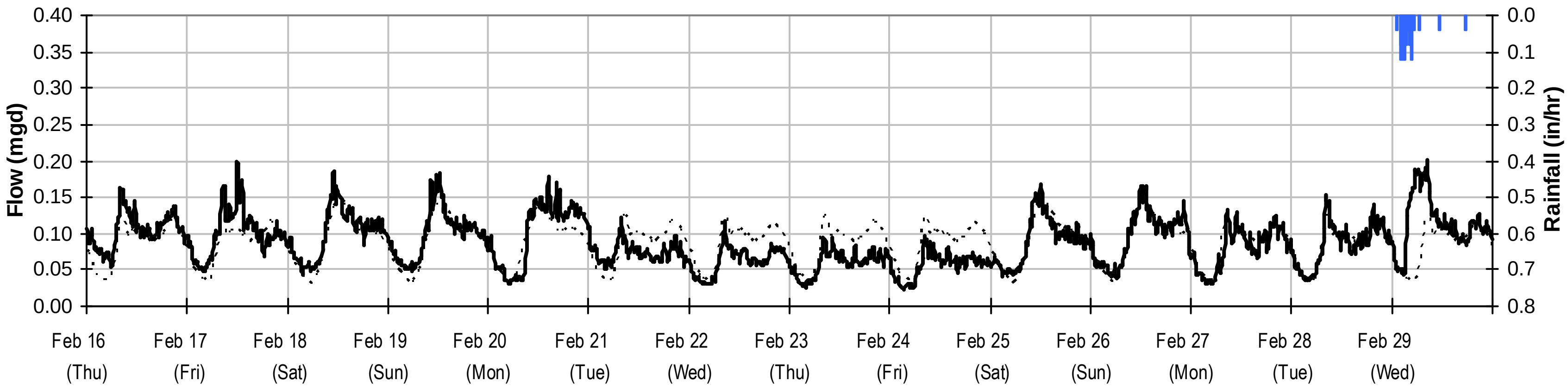


MH 61

Monthly Flow Summary: February, 2012

Total Monthly Rainfall: 0.85 inches   **Avg Flow: 0.092 mgd**   **Peak Flow: 0.230 mgd**   **Min Flow: 0.023 mgd**

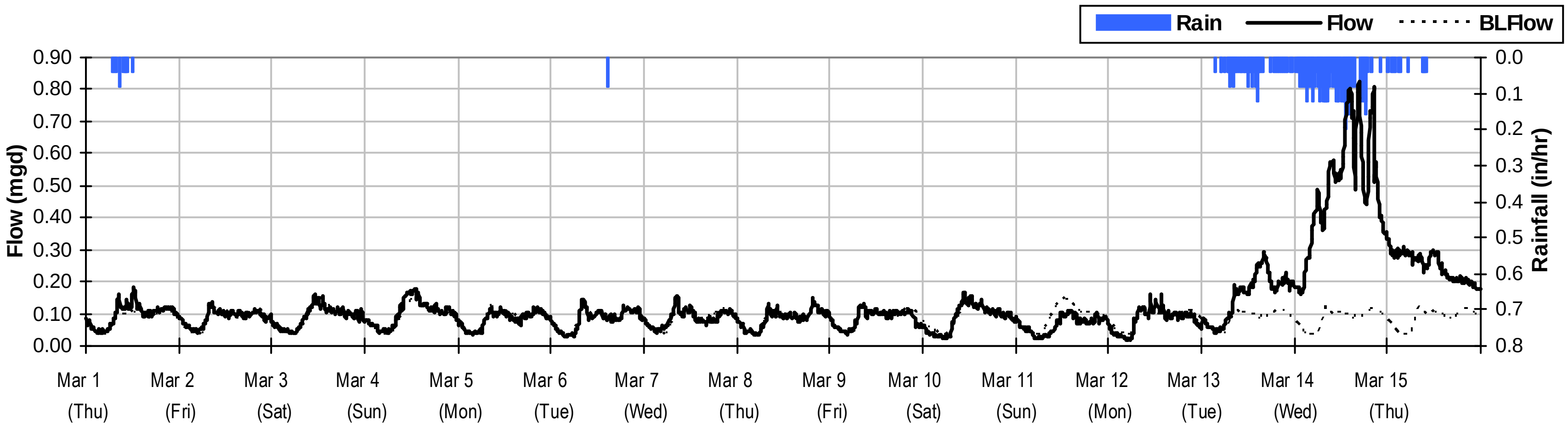


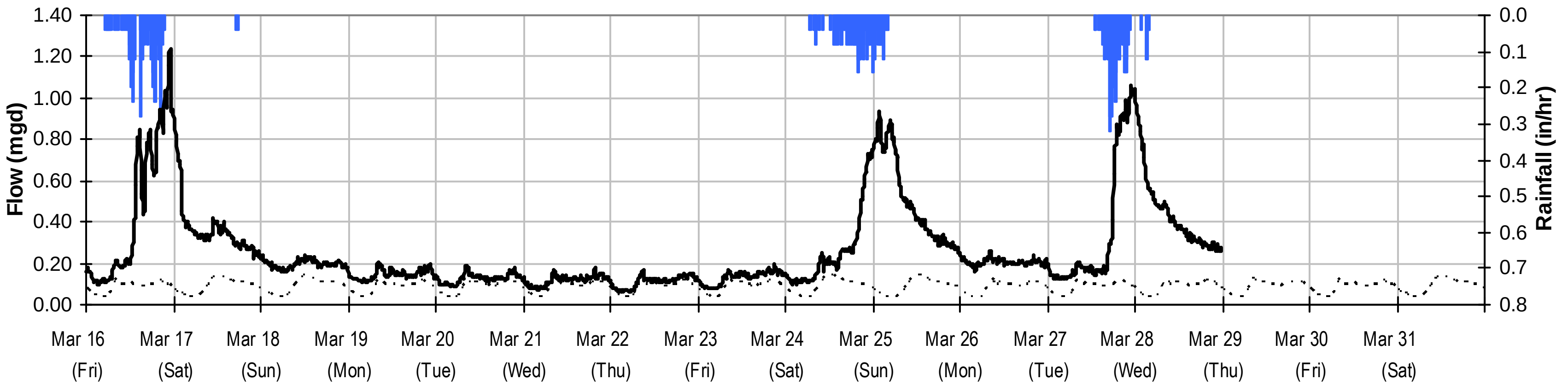


MH 61

Monthly Flow Summary: March, 2012

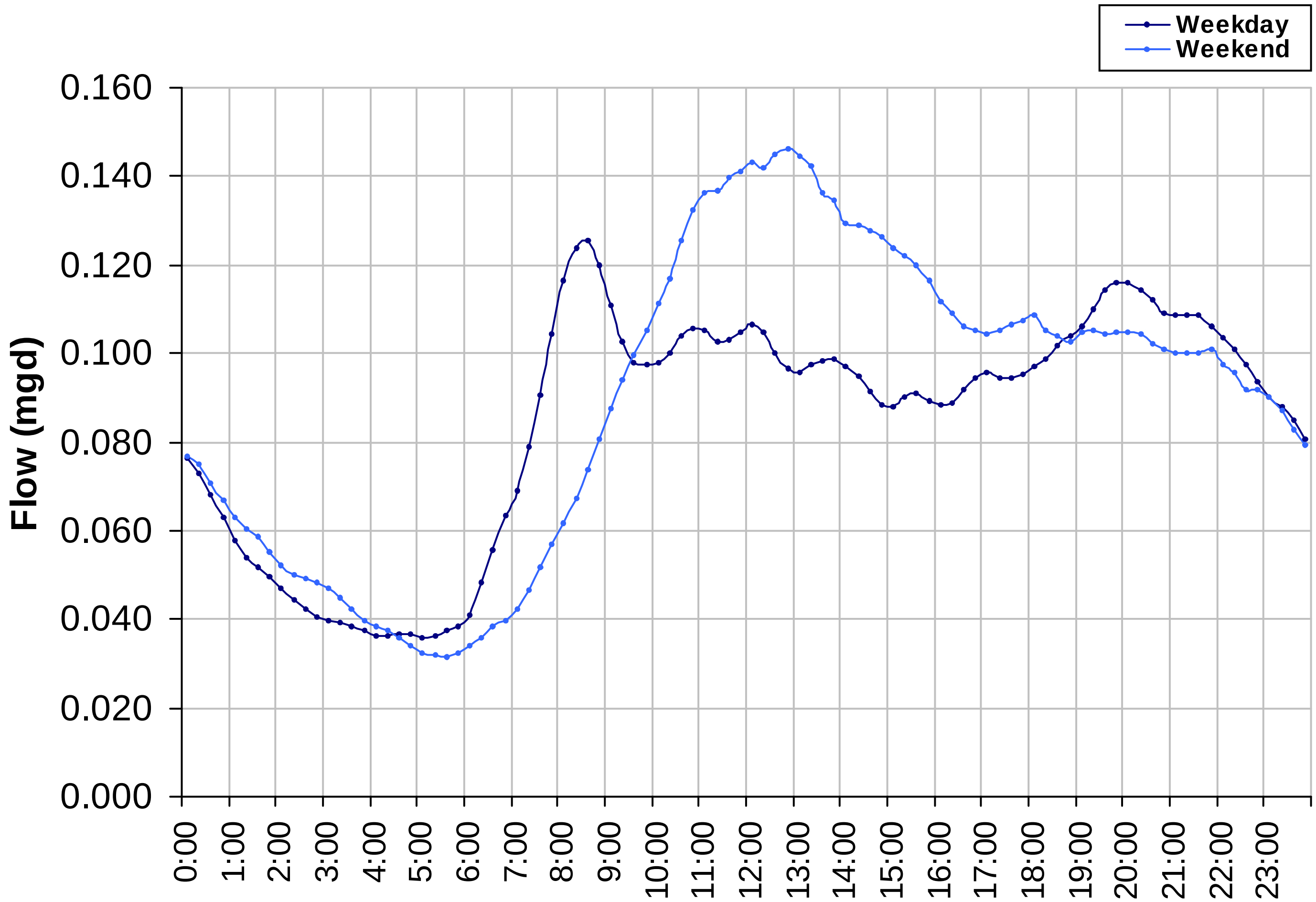
Total Monthly Rainfall: 5.4 inches   **Avg Flow: 0.190 mgd**   **Peak Flow: 1.230 mgd**   **Min Flow: 0.020 mgd**

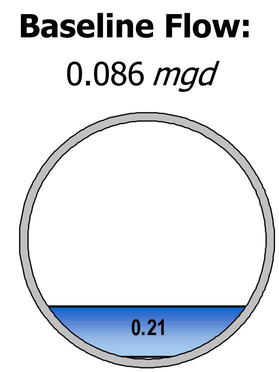




MH 61

Baseline Flow Hydrographs

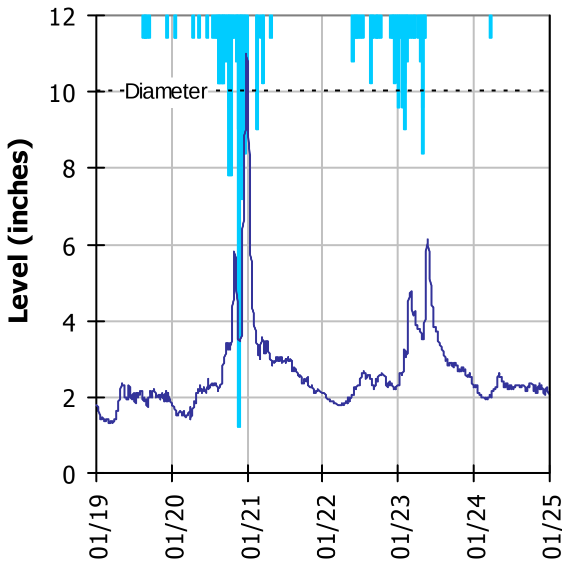


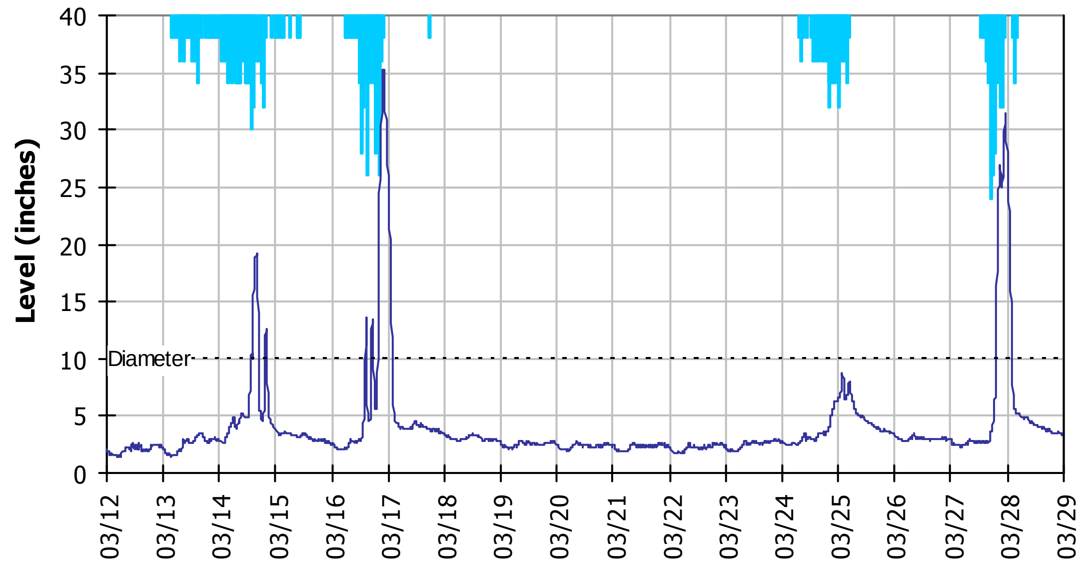


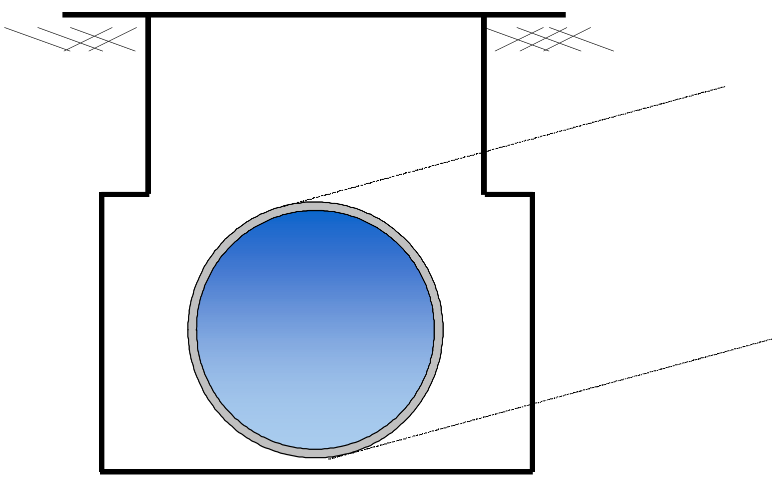
MH 61

Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Monitoring Period







Pipe Diameter: 10 *inches*

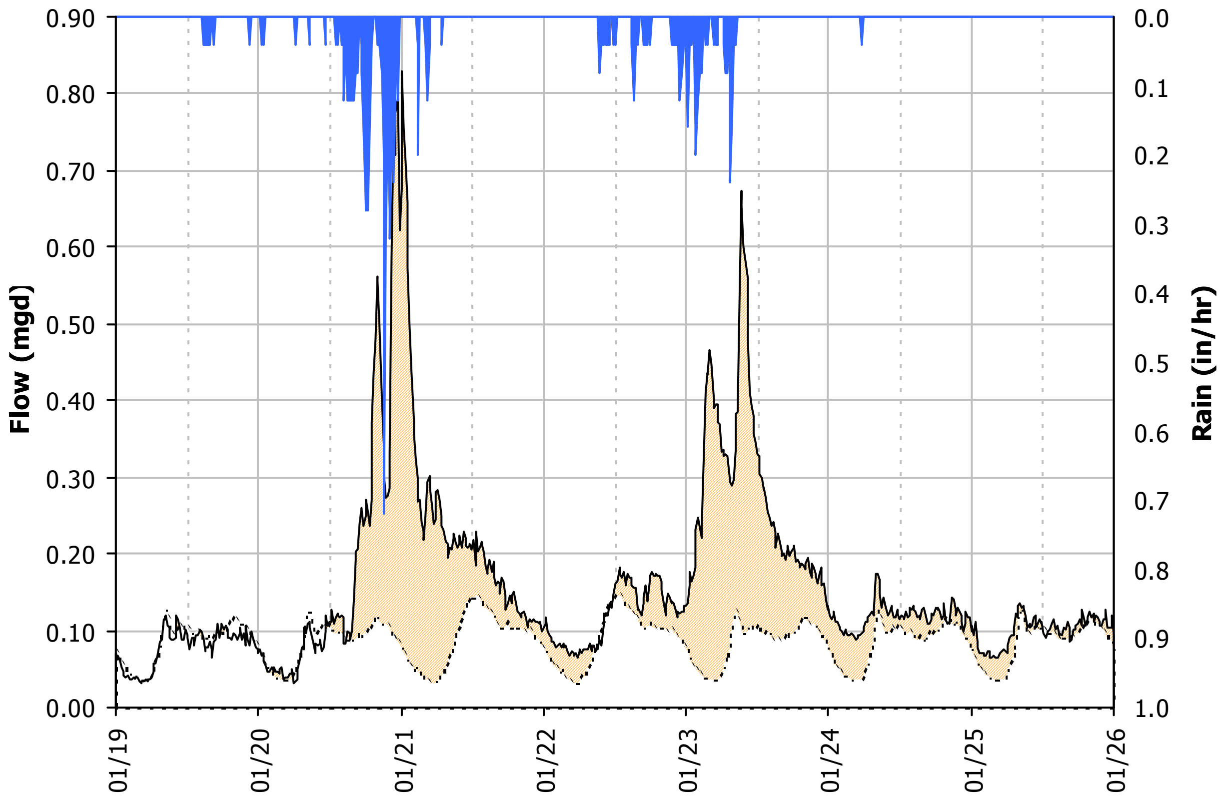
Peak Measured Level: 35.3 *inches*

Peak d/D Ratio: 3.53

Surcharged 25.2 inches over crown

MH 61
I/I Summary: Event 1

Event 1 Detail Graph



Storm Event I/I Analysis (Rain = 2.37 inches)

Inflow

Peak I/I Rate: 0.76 *mgd*

Pk I/I:ADWF: 8.78

Combined I/I

Total I/I: 511,000 *gallons*

Total I/I:ADWF: 2.50 *per in-rain*

RDI (infiltration)

Infiltration Rate: 0.016 *mgd*
(1/25/2012)

RDI (% of BL): 19%

Capacity

Peak Flow: 0.83 *mgd*

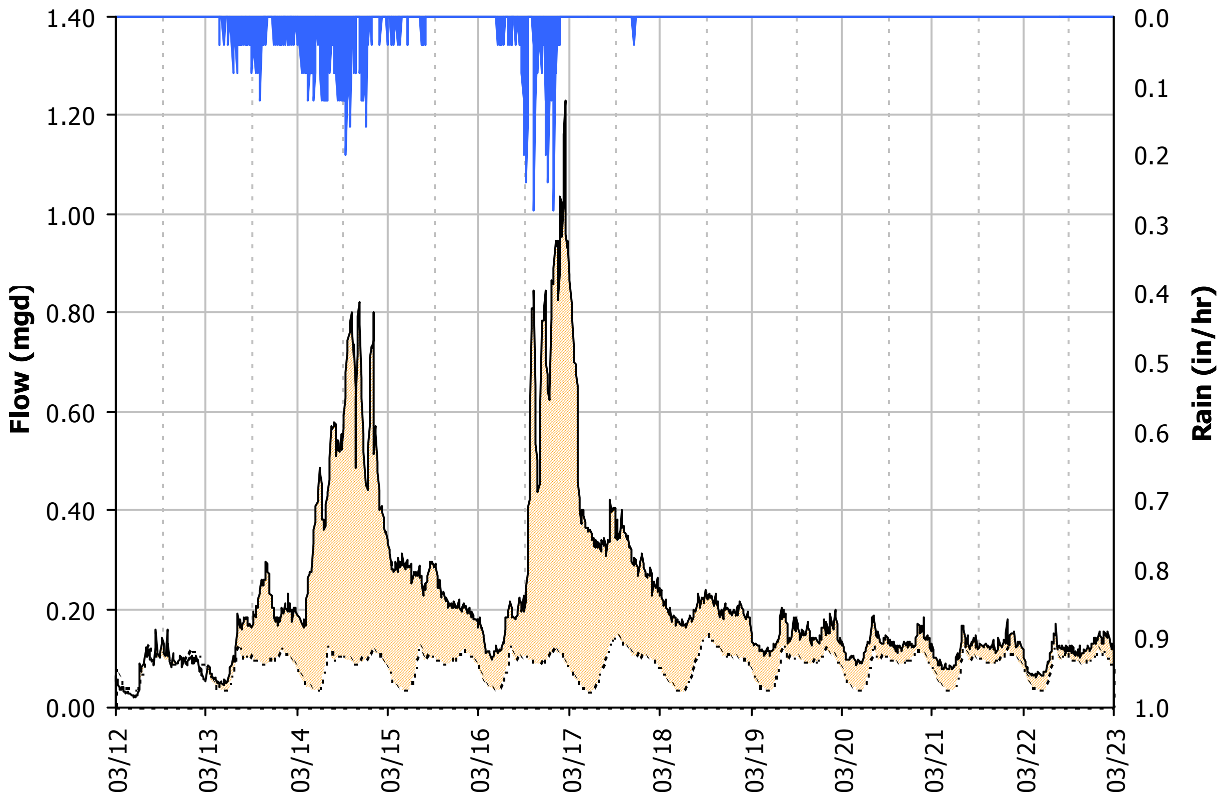
PF: 9.65

Peak Level: 11.01 *in*

d/D Ratio: 1.10

MH 61
I/I Summary: Event 2

Event 2 Detail Graph



Storm Event I/I Analysis (Rain = 3.16 inches)

Inflow

Peak I/I Rate: 1.14 *mgd*

Pk I/I:ADWF: 13.26

Combined I/I

Total I/I: 1,544,000 *gallons*

Total I/I:ADWF: 5.68 *per in-rain*

RDI (infiltration)

Infiltration Rate: 0.026 *mgd*
(3/22/2012)

RDI (% of BL): 31%

Capacity

Peak Flow: 1.23 *mgd*

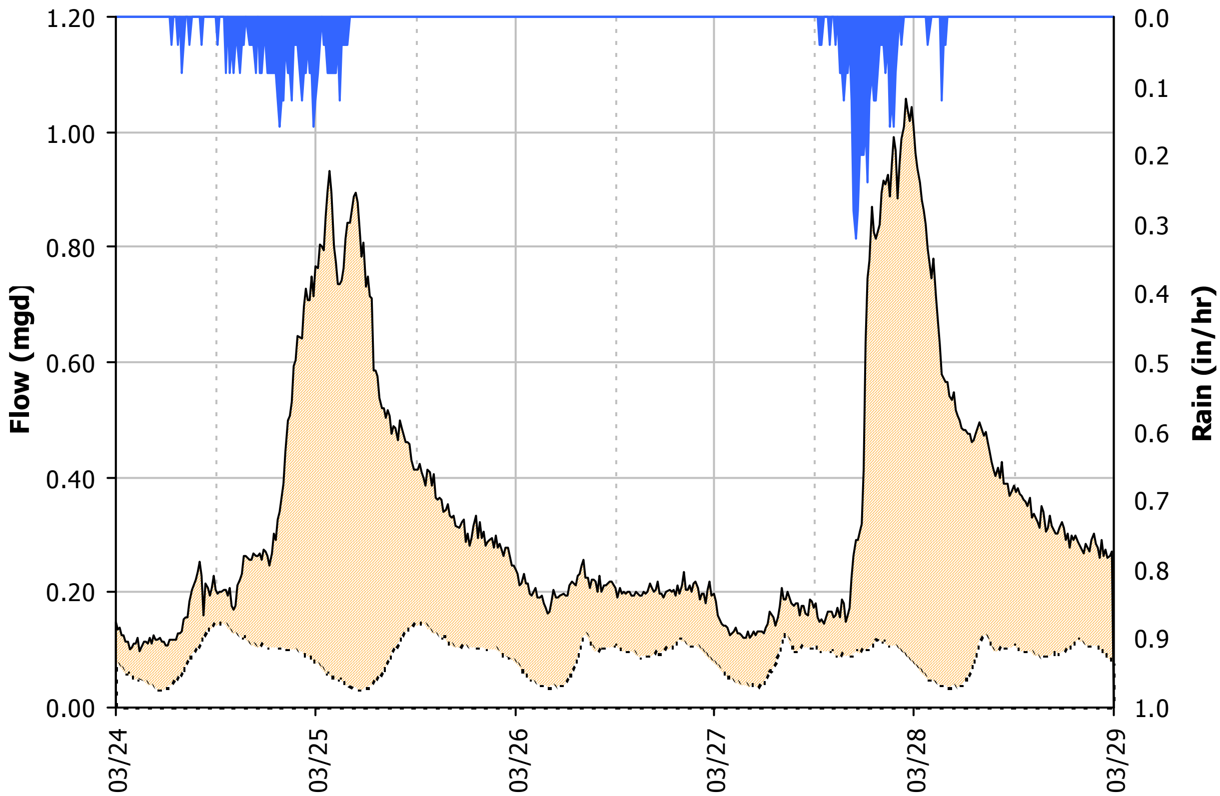
PF: 14.31

Peak Level: 35.25 *in*

d/D Ratio: 3.53

MH 61
I/I Summary: Event 3

Event 3 Detail Graph



Storm Event I/I Analysis (Rain = 2.12 inches)

Inflow

Peak I/I Rate: 0.97 *mgd*

Pk I/I:ADWF: 11.24

Combined I/I

Total I/I: 1,314,000 *gallons*

Total I/I:ADWF: 7.21 *per in-rain*

RDI (infiltration)

Infiltration Rate: 0.211 *mgd*
(3/28/2012 12:00:00 PM)

RDI (% of BL): 215%

Capacity

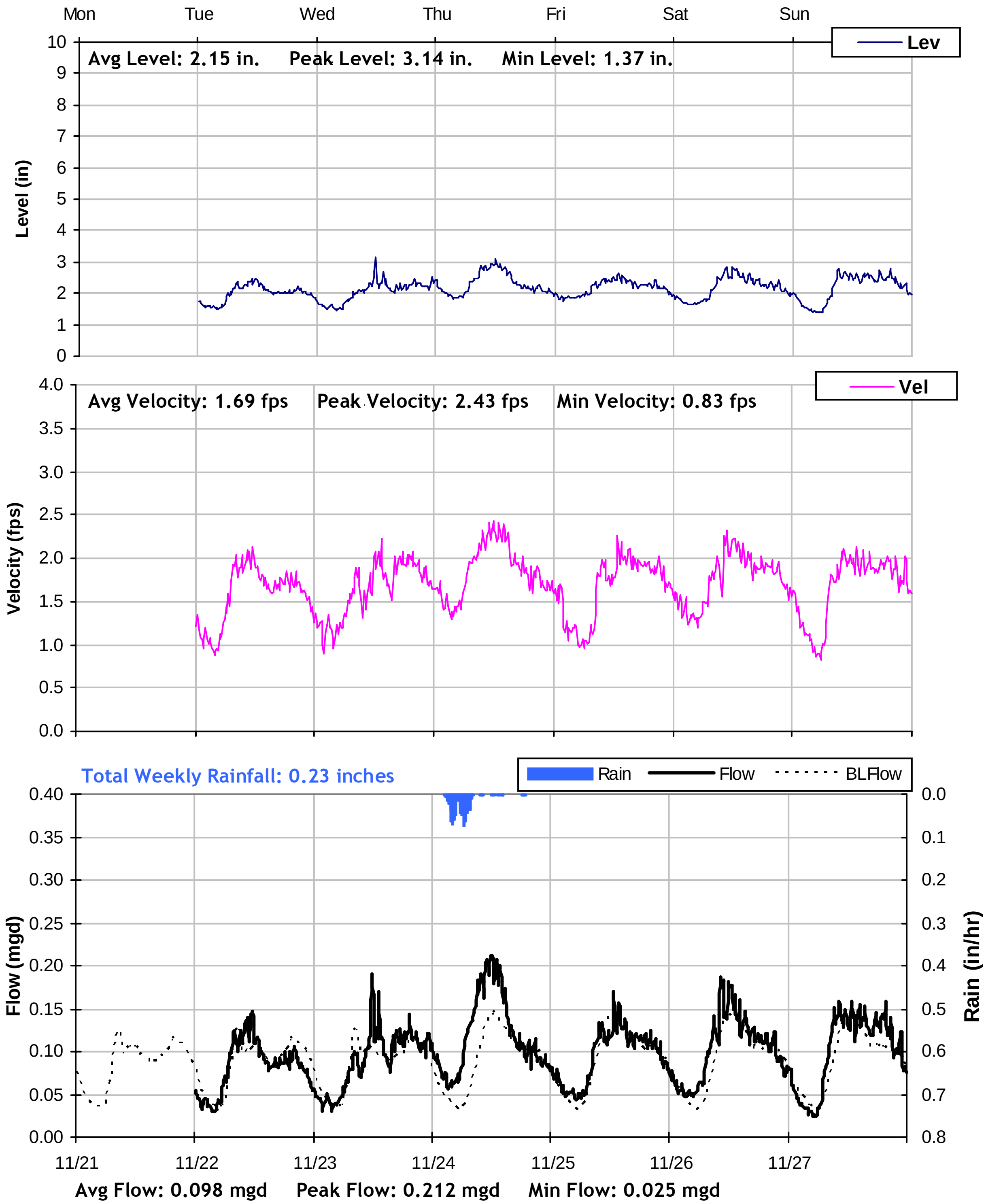
Peak Flow: 1.06 *mgd*

PF: 12.29

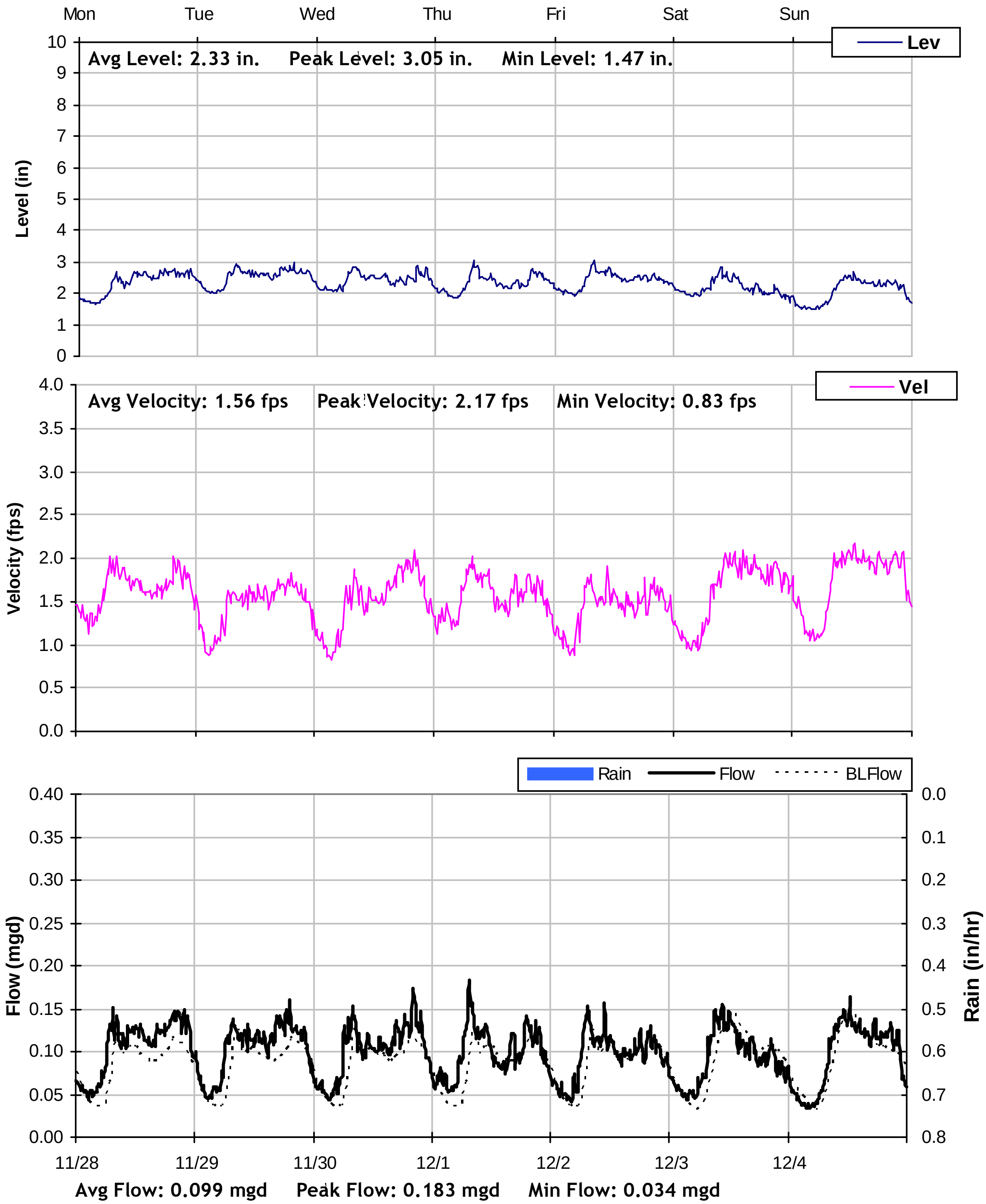
Peak Level: 31.38 *in*

d/D Ratio: 3.14

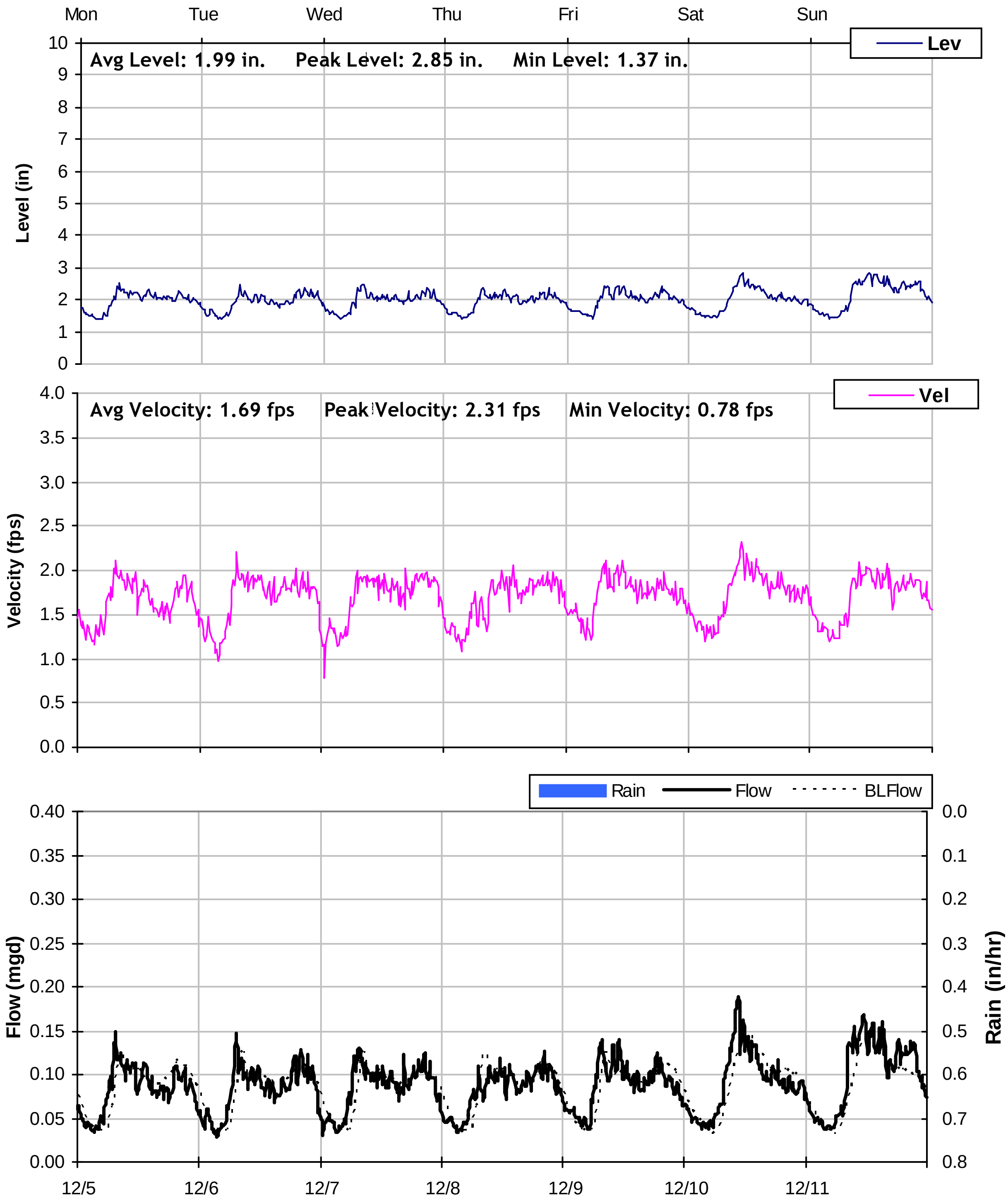
MH 61
Weekly Level, Velocity and Flow Hydrographs
11/21/2011 to 11/28/2011



MH 61
Weekly Level, Velocity and Flow Hydrographs
11/28/2011 to 12/5/2011

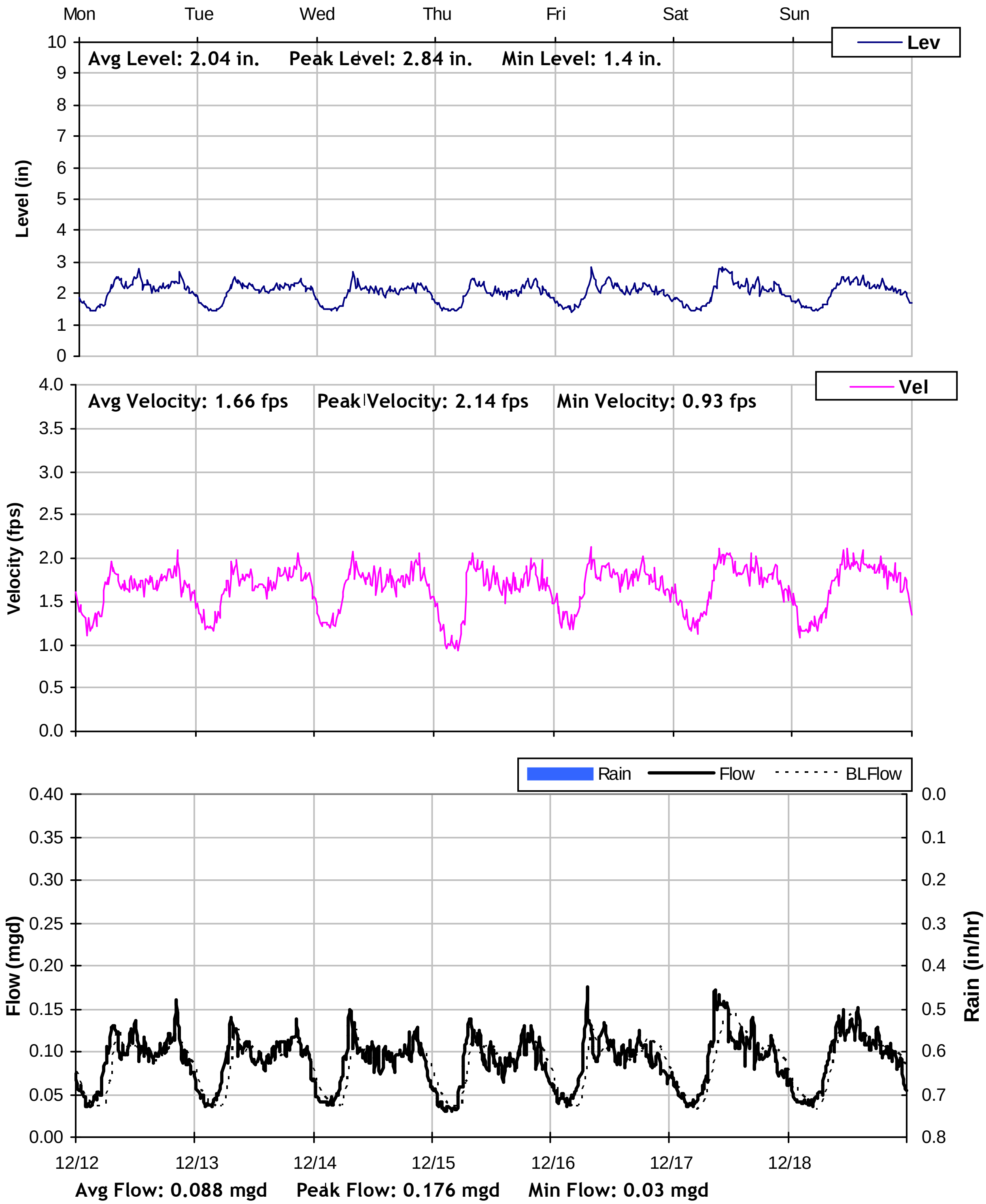


MH 61
Weekly Level, Velocity and Flow Hydrographs
12/5/2011 to 12/12/2011

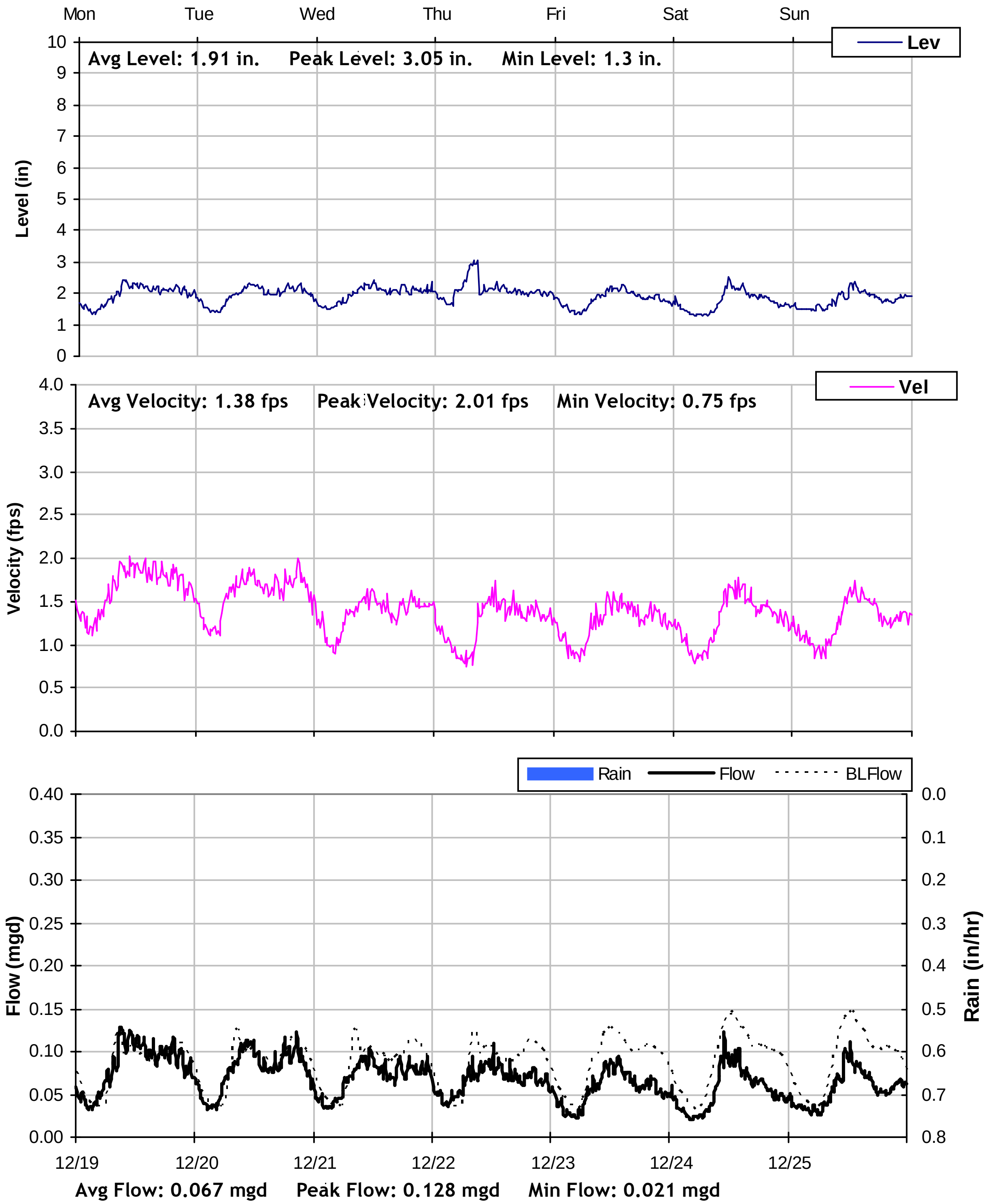


Avg Flow: 0.087 mgd Peak Flow: 0.189 mgd Min Flow: 0.029 mgd

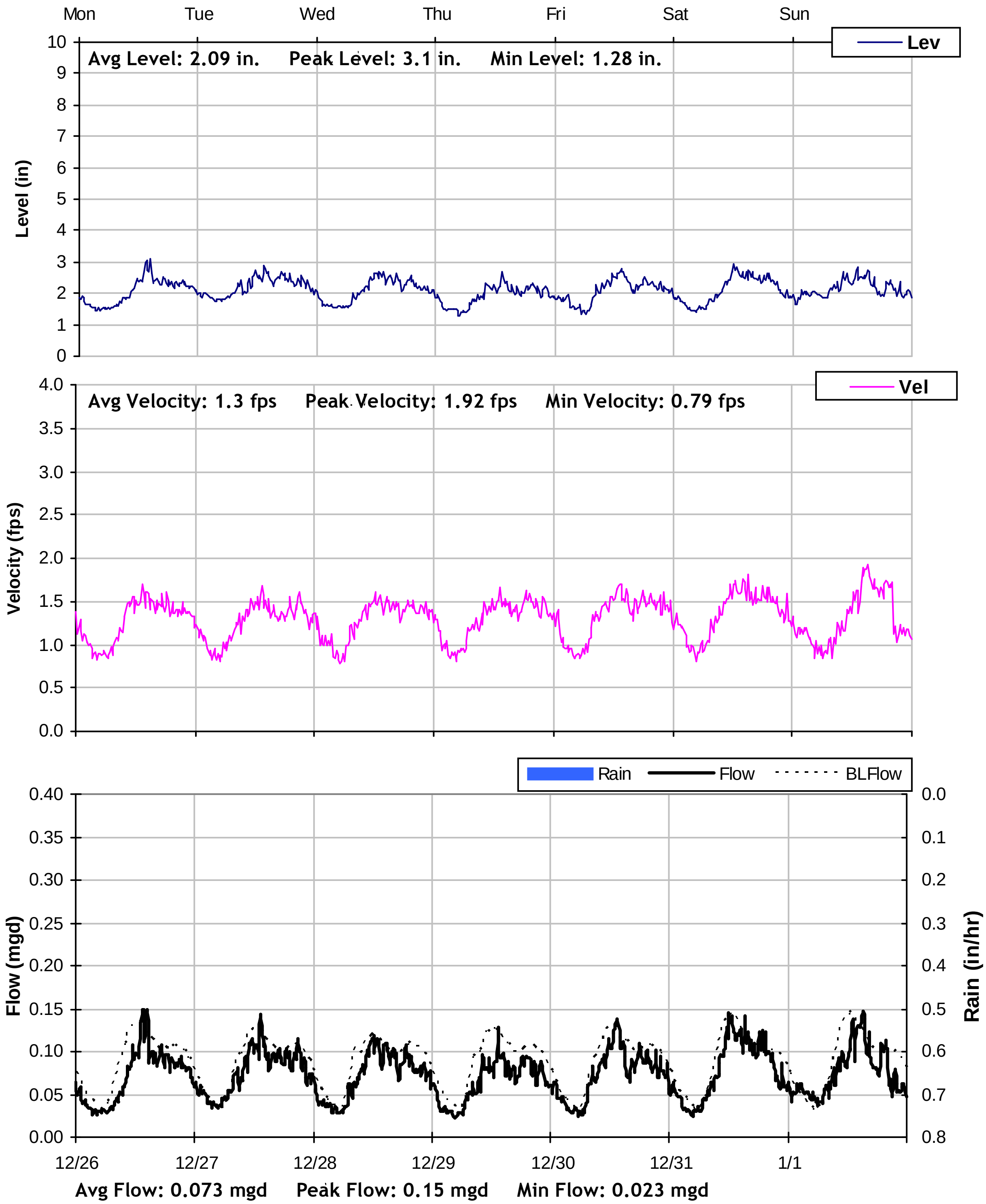
MH 61
Weekly Level, Velocity and Flow Hydrographs
12/12/2011 to 12/19/2011



MH 61
Weekly Level, Velocity and Flow Hydrographs
12/19/2011 to 12/26/2011



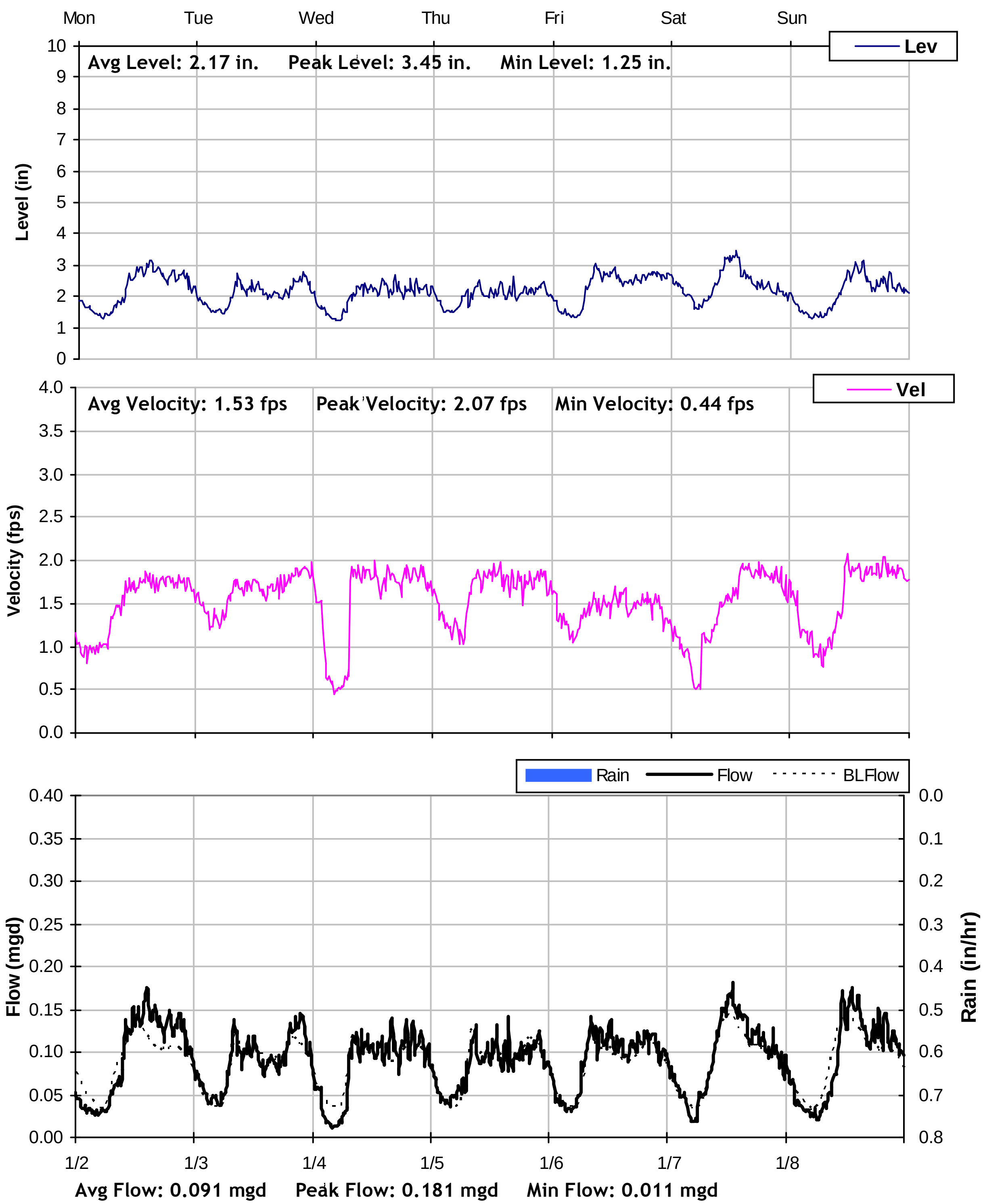
MH 61
Weekly Level, Velocity and Flow Hydrographs
12/26/2011 to 1/2/2012



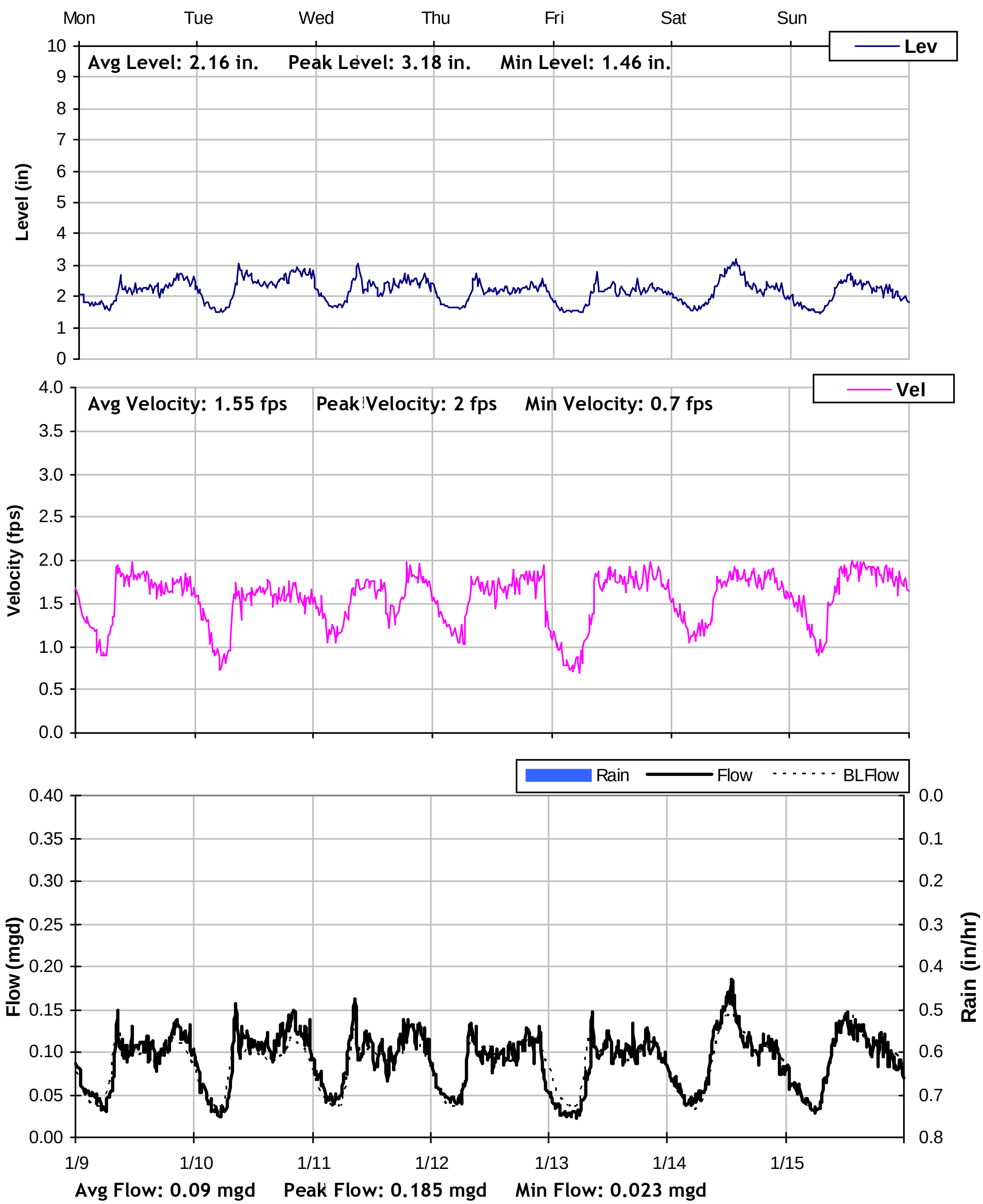
MH 61

Weekly Level, Velocity and Flow Hydrographs

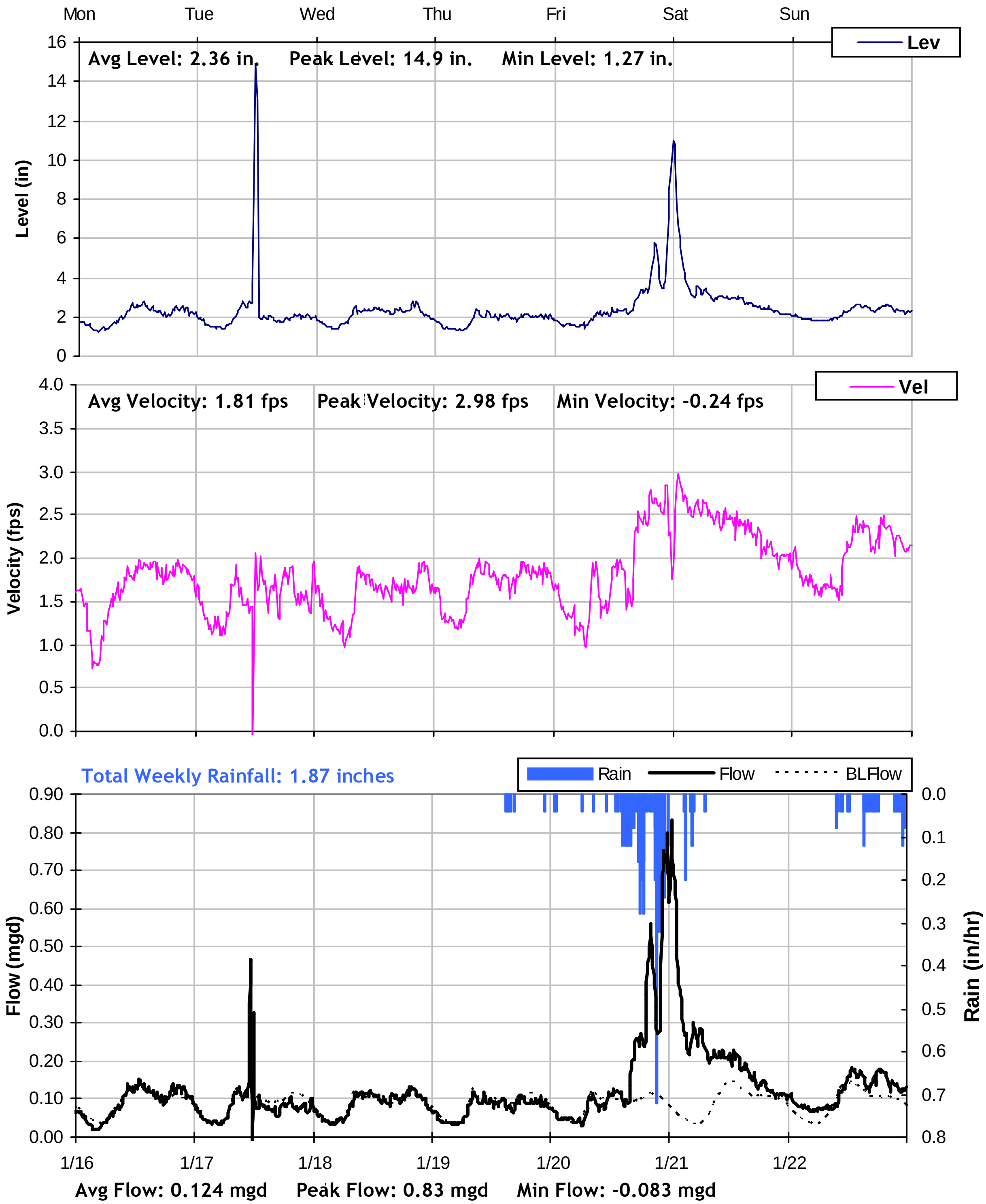
1/2/2012 to 1/9/2012



MH 61
Weekly Level, Velocity and Flow Hydrographs
1/9/2012 to 1/16/2012



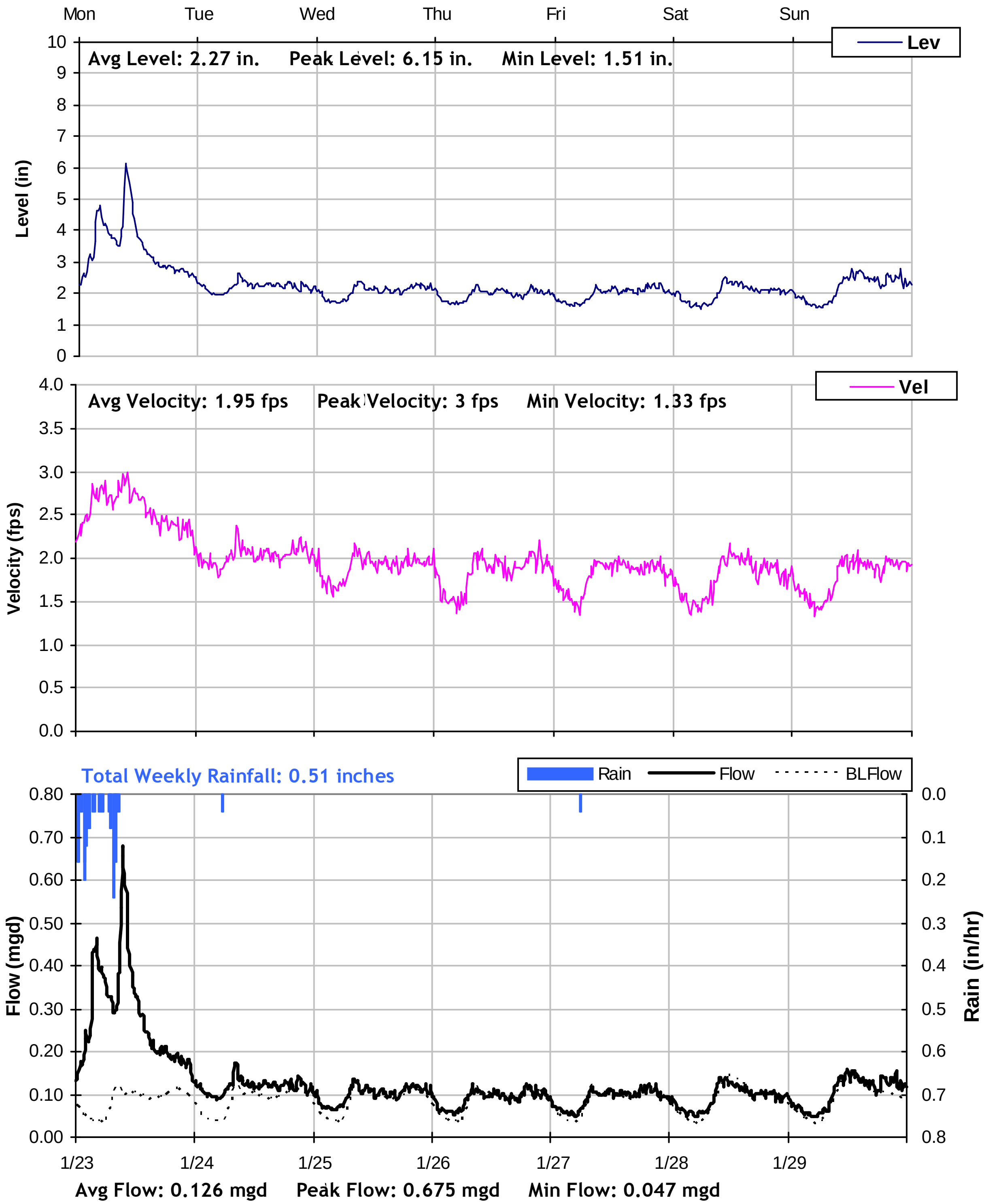
MH 61
Weekly Level, Velocity and Flow Hydrographs
1/16/2012 to 1/23/2012



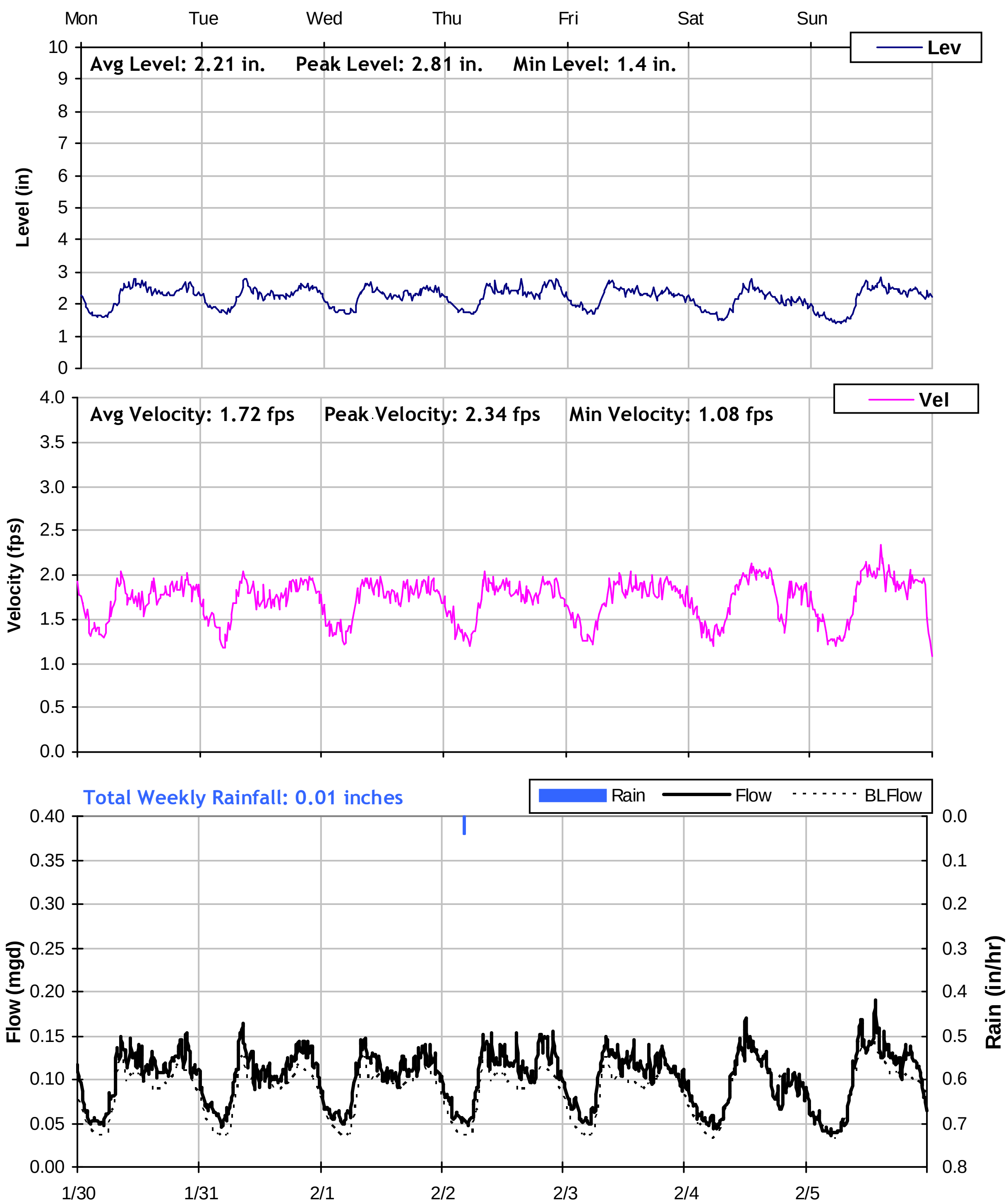
MH 61

Weekly Level, Velocity and Flow Hydrographs

1/23/2012 to 1/30/2012

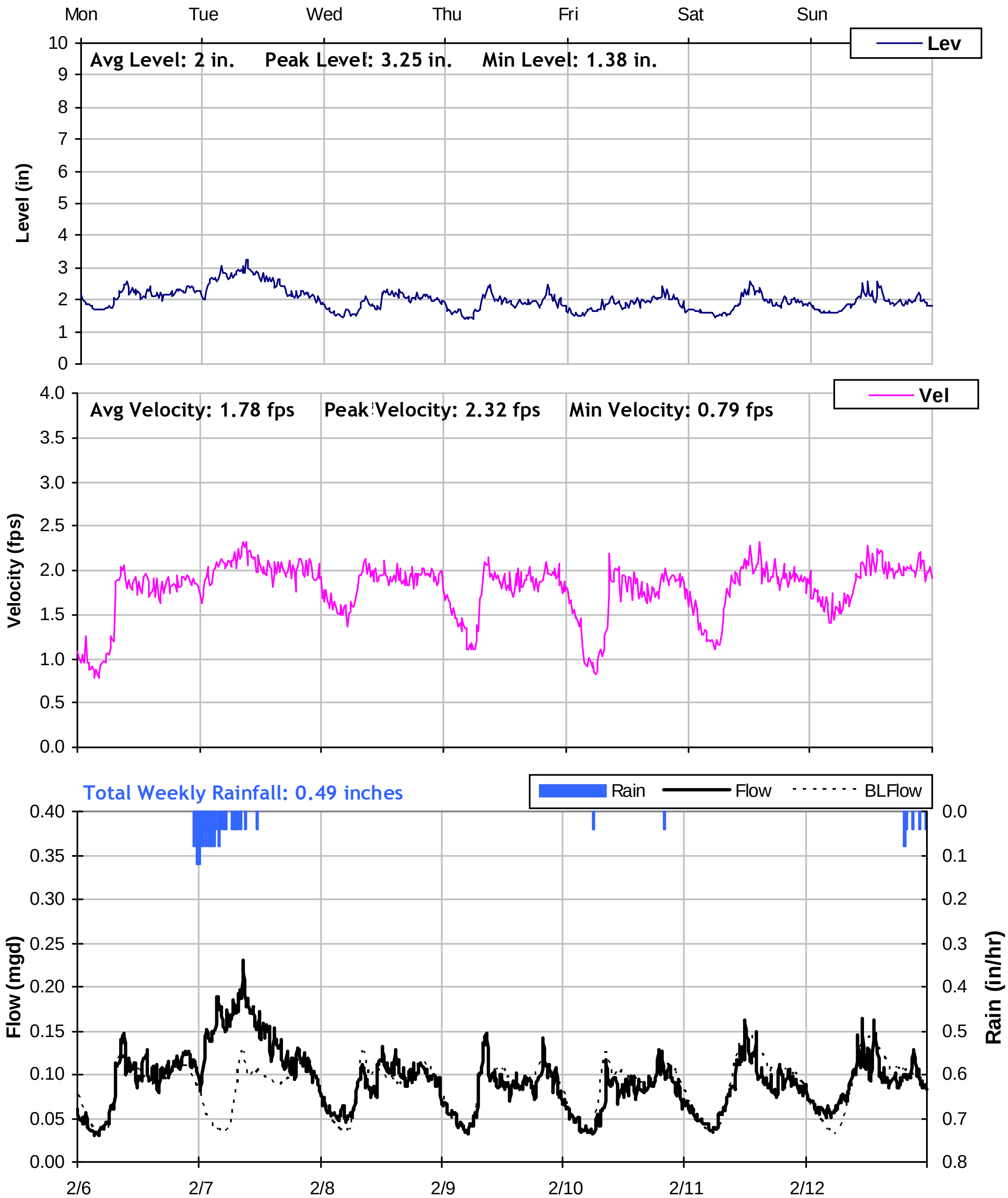


MH 61
Weekly Level, Velocity and Flow Hydrographs
1/30/2012 to 2/6/2012



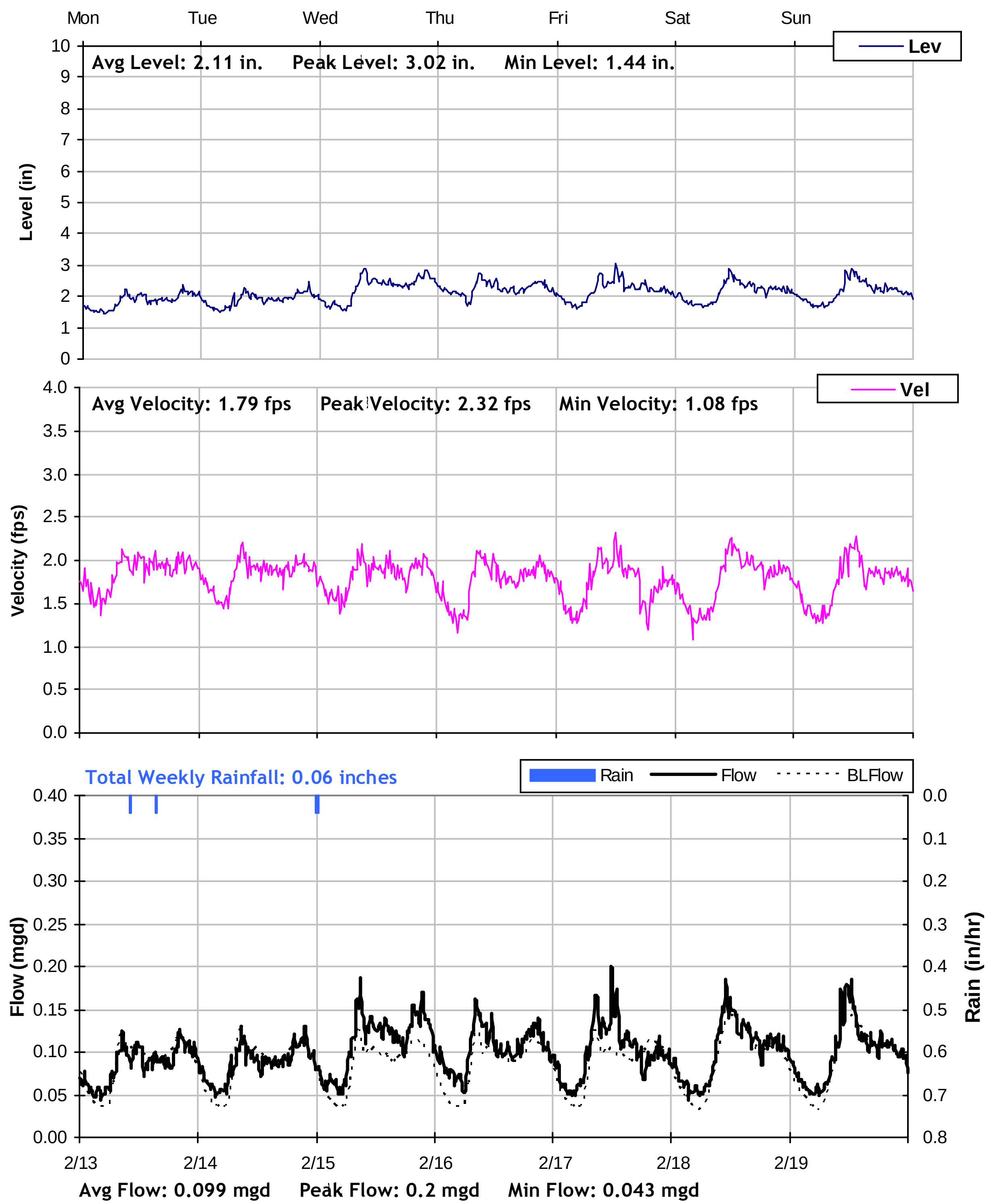
Avg Flow: 0.102 mgd **Peak Flow: 0.19 mgd** **Min Flow: 0.036 mgd**

MH 61
Weekly Level, Velocity and Flow Hydrographs
2/6/2012 to 2/13/2012

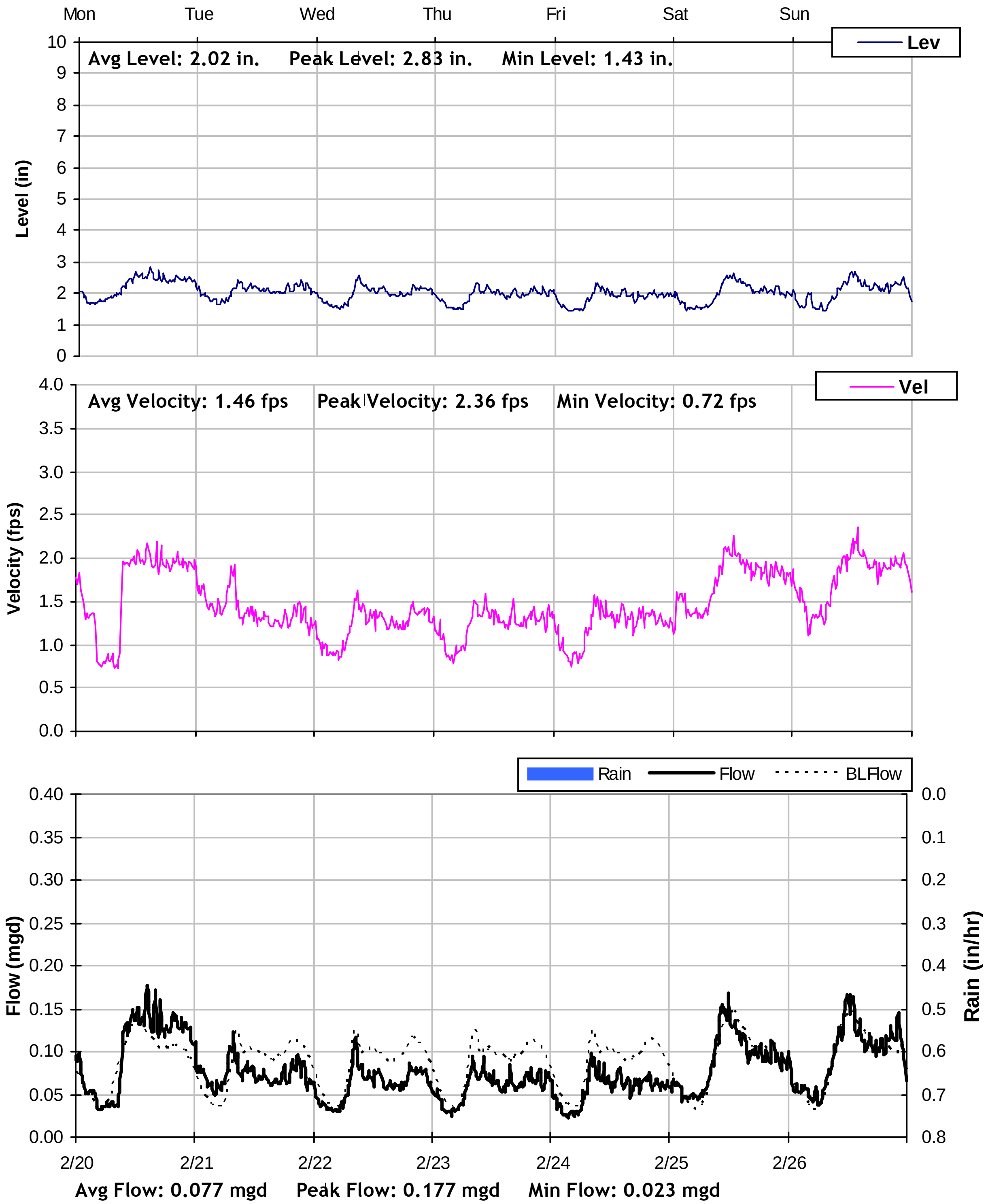


Avg Flow: 0.093 mgd Peak Flow: 0.23 mgd Min Flow: 0.031 mgd

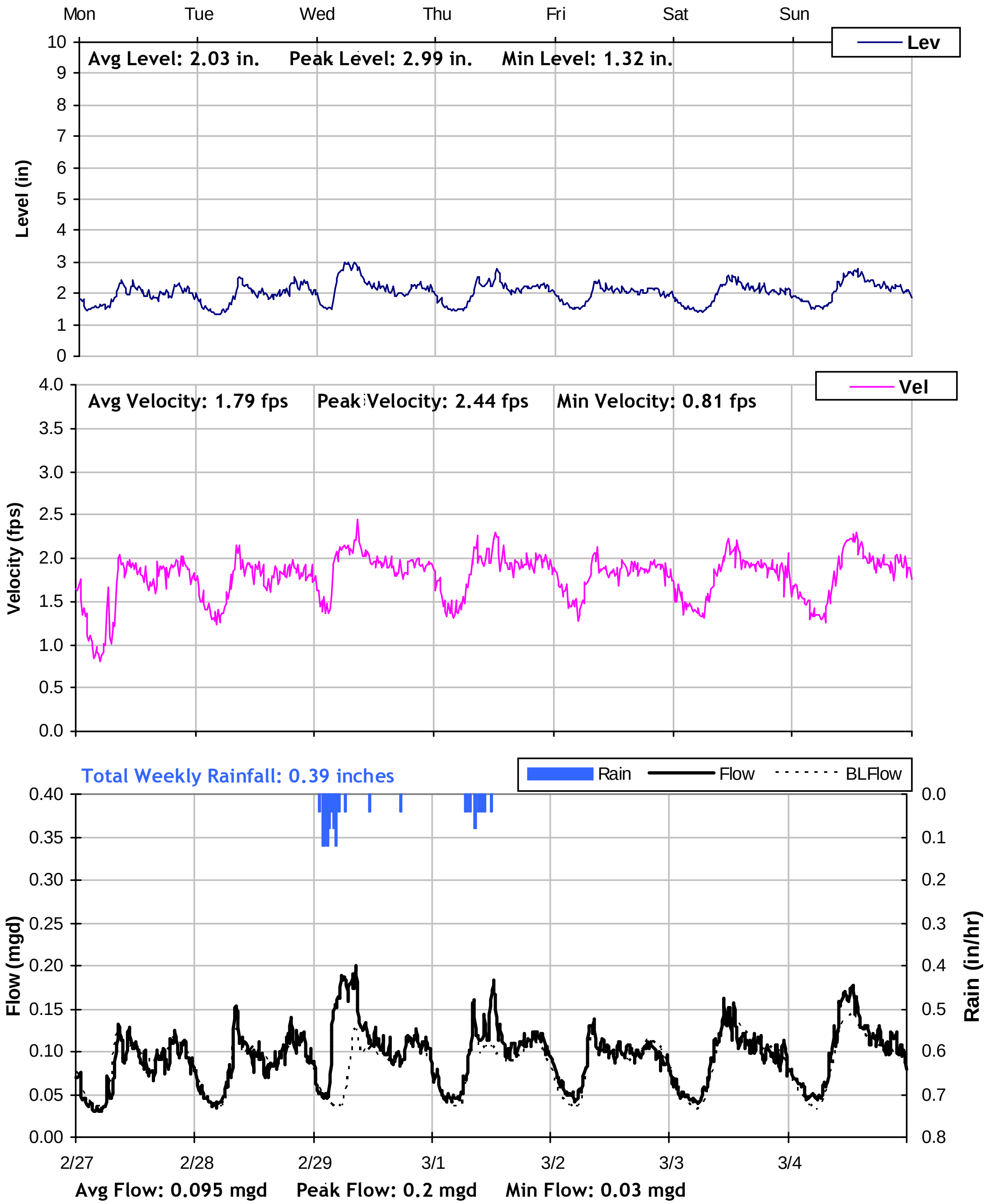
MH 61
Weekly Level, Velocity and Flow Hydrographs
2/13/2012 to 2/20/2012



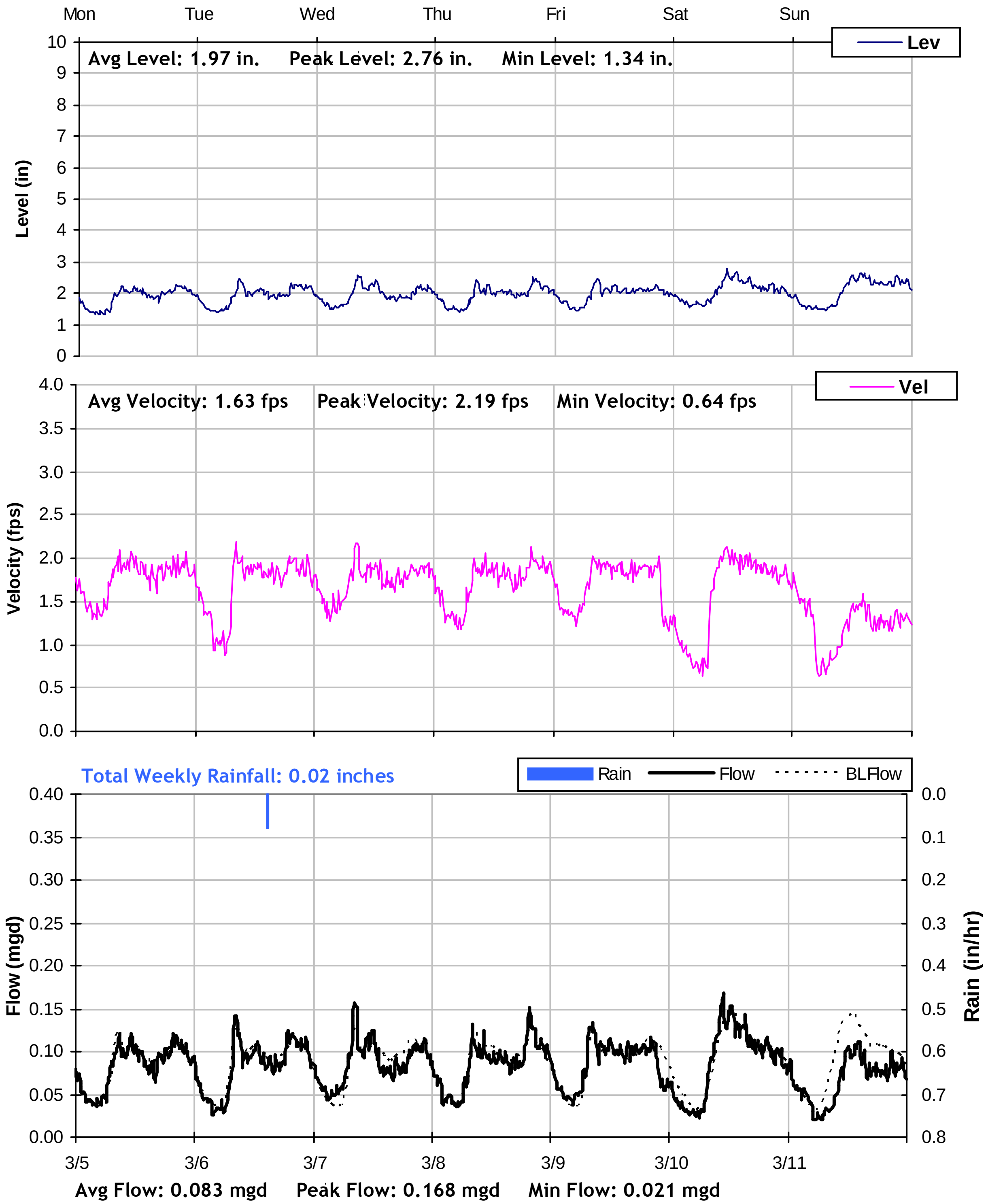
MH 61
Weekly Level, Velocity and Flow Hydrographs
2/20/2012 to 2/27/2012



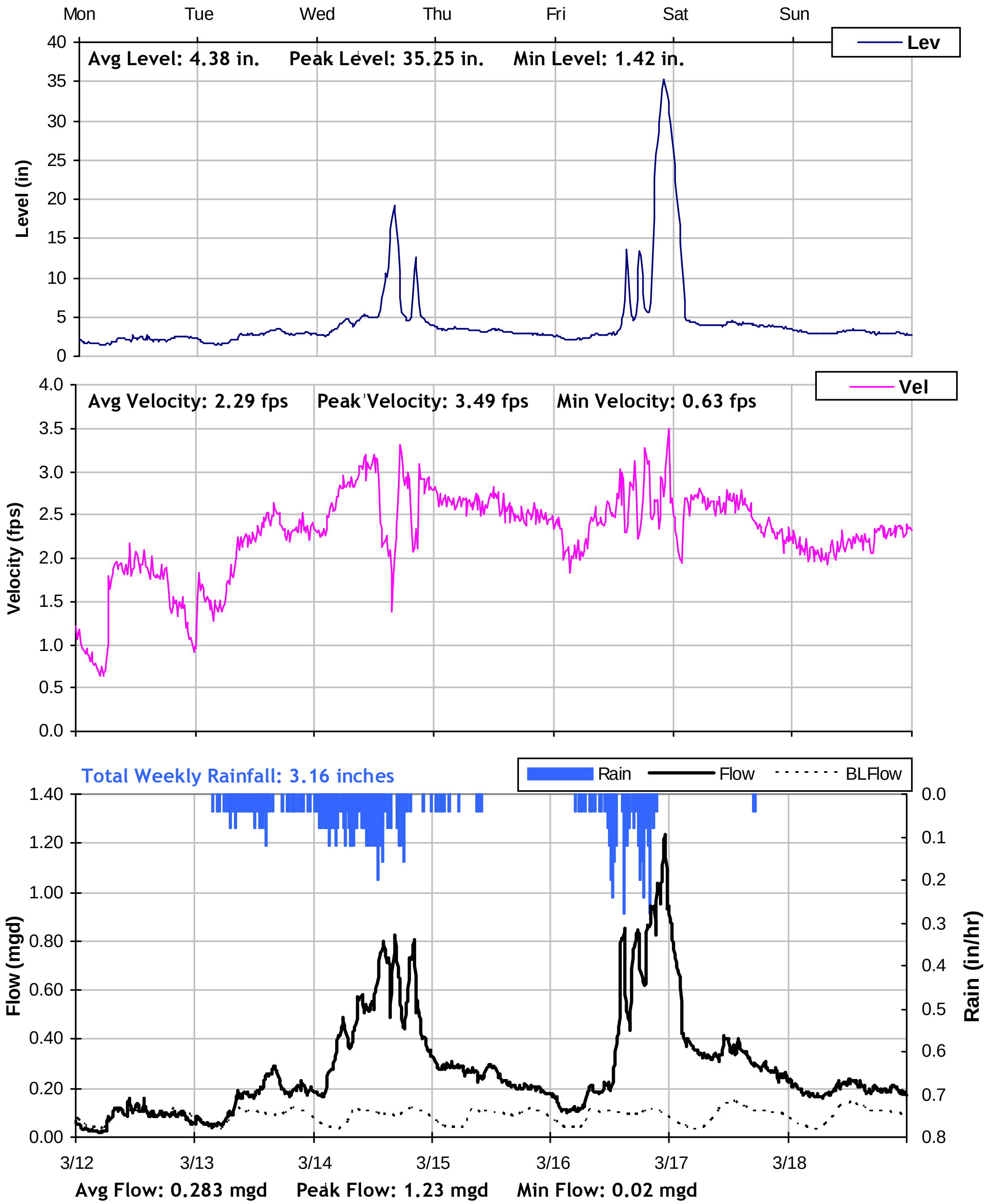
MH 61
Weekly Level, Velocity and Flow Hydrographs
2/27/2012 to 3/5/2012



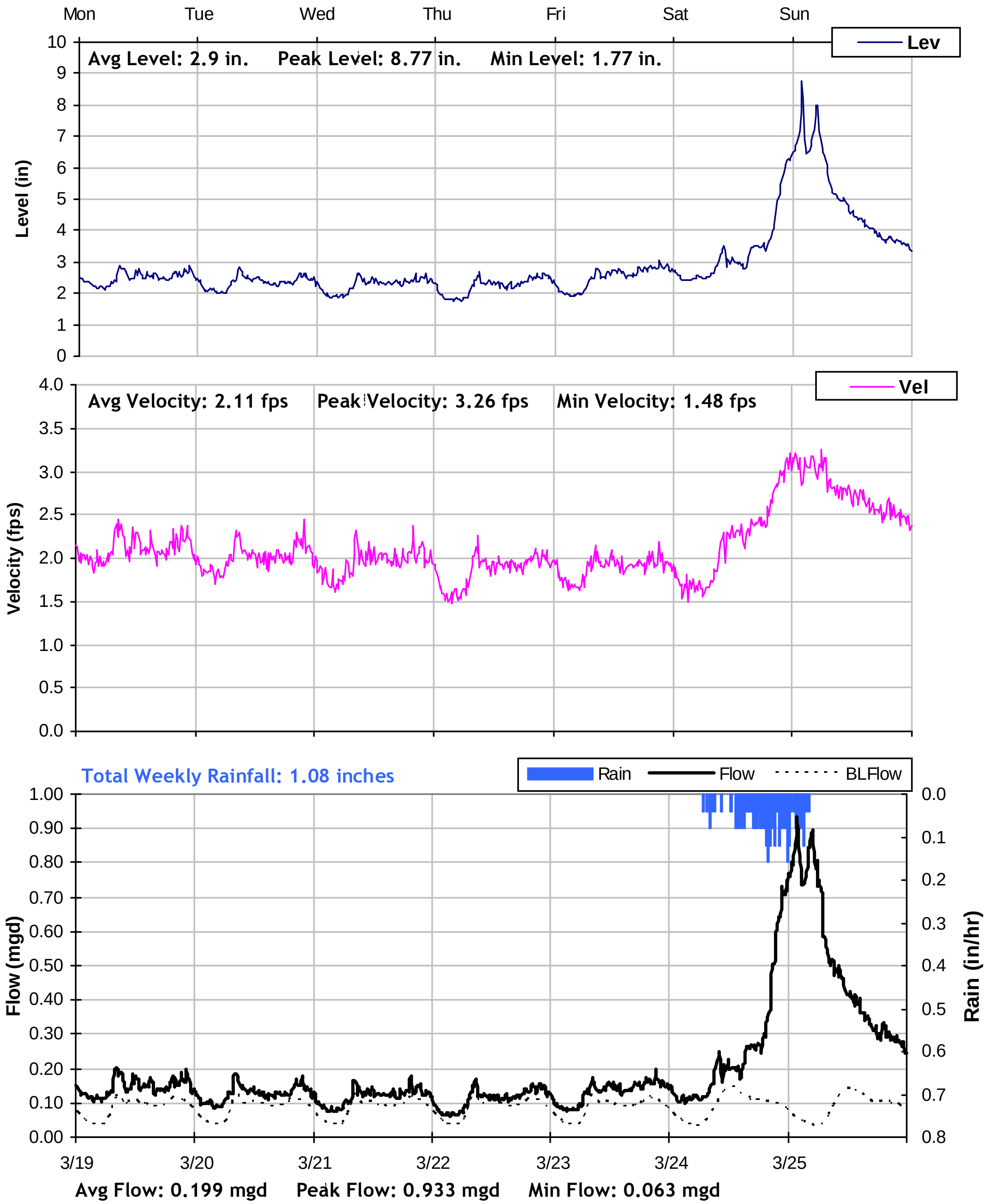
MH 61
Weekly Level, Velocity and Flow Hydrographs
3/5/2012 to 3/12/2012



MH 61
Weekly Level, Velocity and Flow Hydrographs
3/12/2012 to 3/19/2012



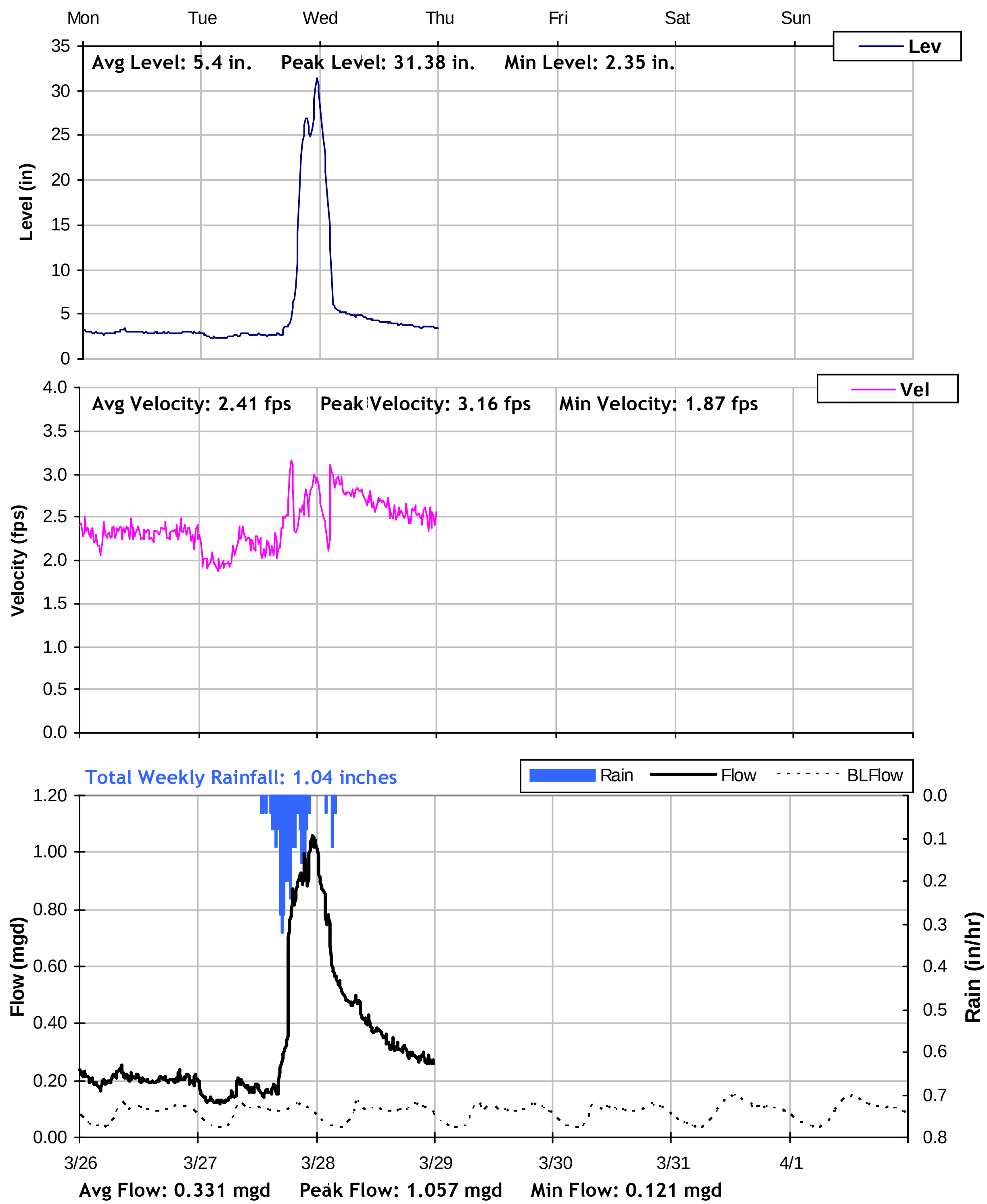
MH 61
Weekly Level, Velocity and Flow Hydrographs
3/19/2012 to 3/26/2012



MH 61

Weekly Level, Velocity and Flow Hydrographs

3/26/2012 to 4/2/2012



Rodeo Sanitary District

Master Plan Sanitary Sewer Flow Monitoring

Year 2011/2012

Monitoring Site: MH 477

Location: Northeast corner of the property on 603 San Pablo Avenue, west of river, south of sidewalk

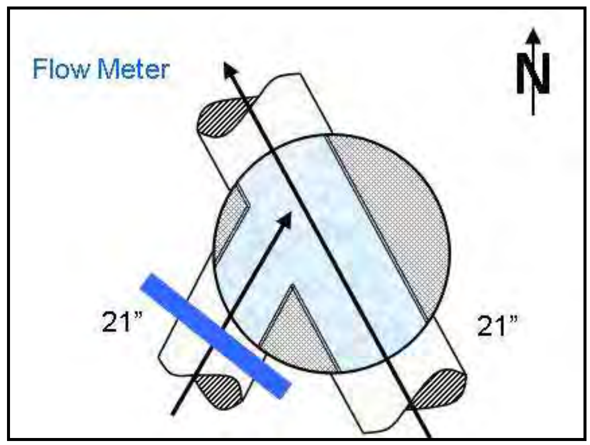
Data Summary Report

MH 477
Site Information Report

Location:	Northeast corner of the property on 603 San Pablo Avenue, west of river, south of sidewalk
Coordinates:	122.2673° W, 38.0384° N
Rim Elevation:	11 feet
Diameter:	15 inches
Baseline Flow:	0.326 mgd
Peak Measured Flow:	2.52 mgd

Satellite Map

Sanitary Map



Flow Sketch

Street View Photo

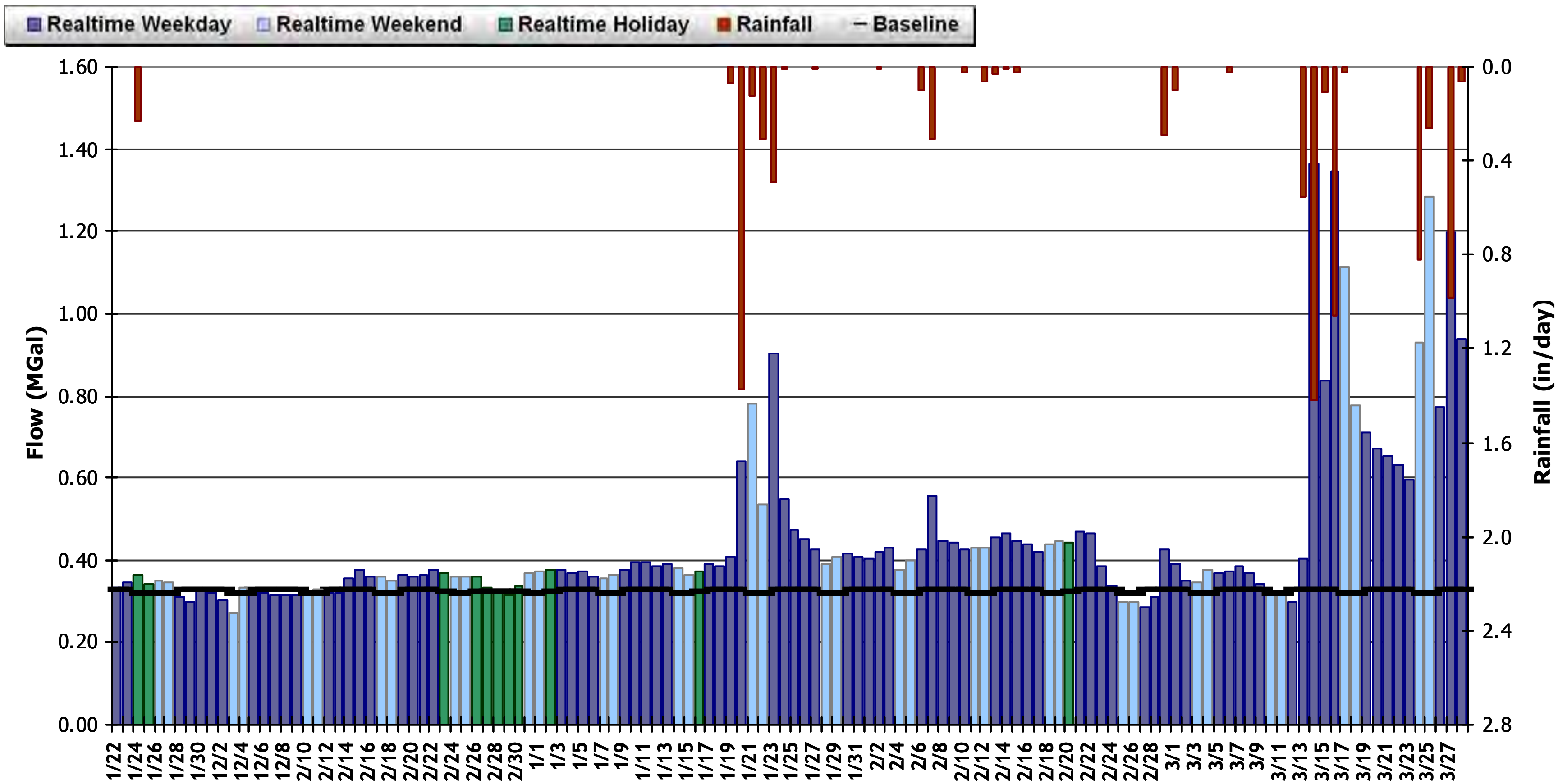

Plan View Photo

MH 477

Period Flow Summary: Daily Flow Totals

Avg Daily Flow: 0.45 MGal **Peak Daily Flow: 1.362 MGal** **Min Daily Flow: 0.271 MGal**

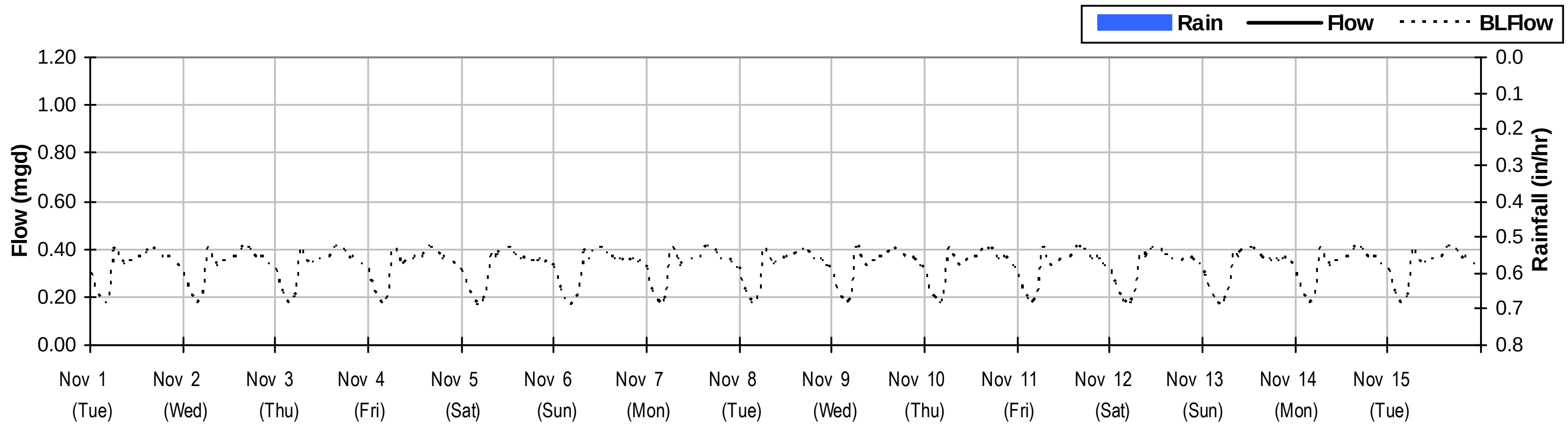
Total Period Rainfall: 8.86 inches

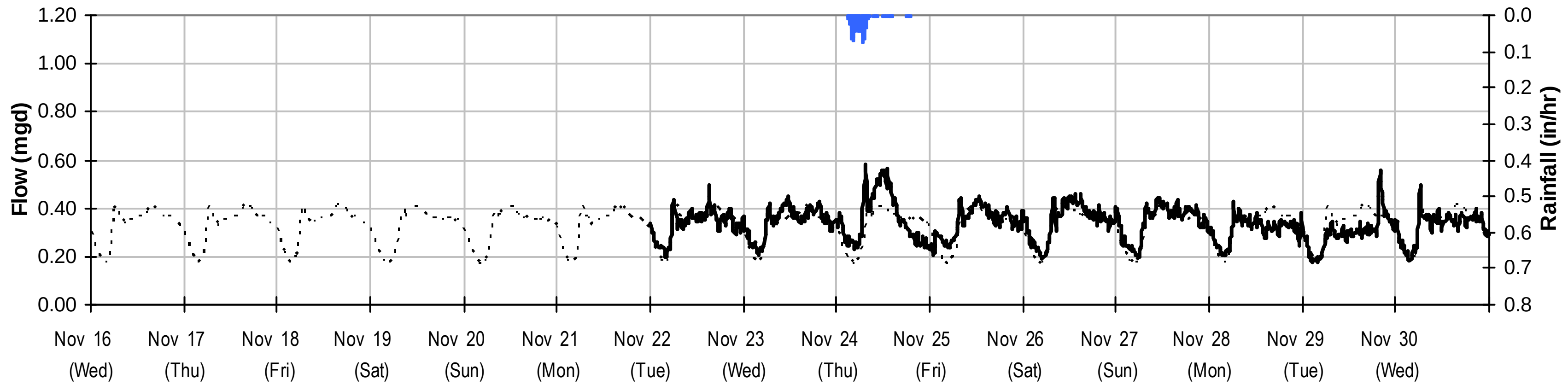


MH 477

Monthly Flow Summary: November, 2011

Total Monthly Rainfall: 0.23 inches   Avg Flow: 0.335 mgd   Peak Flow: 0.583 mgd   Min Flow: 0.176 mgd

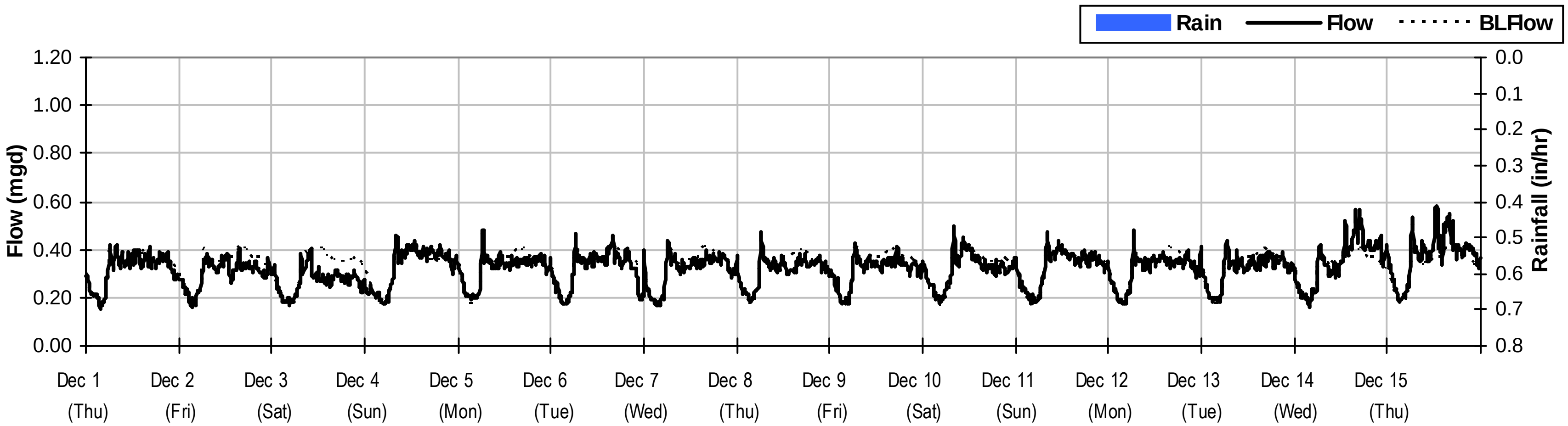


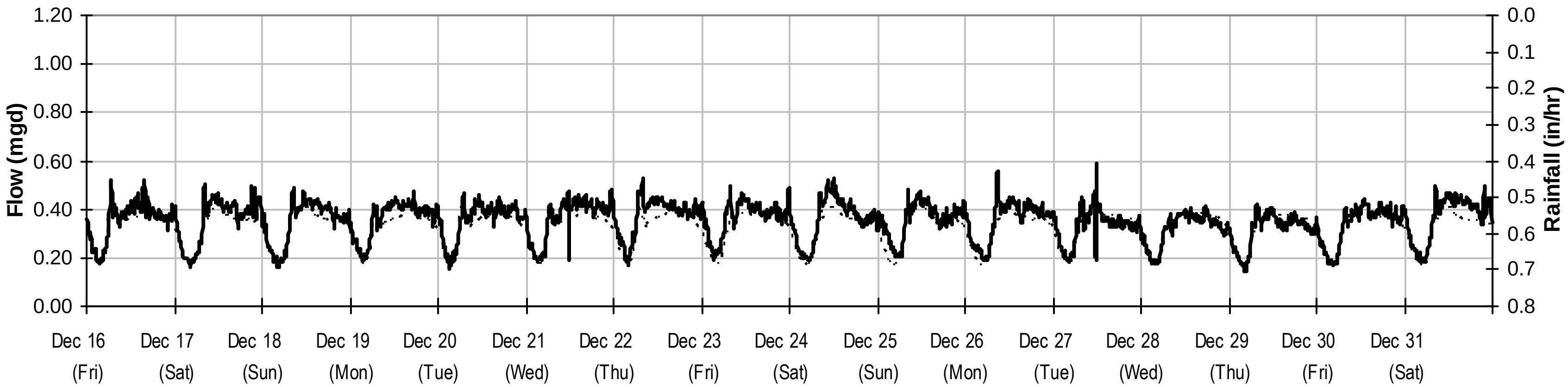


MH 477

Monthly Flow Summary: December, 2011

Total Monthly Rainfall: 0.00 inches   **Avg Flow: 0.338 mgd**   **Peak Flow: 0.584 mgd**   **Min Flow: 0.142 mgd**

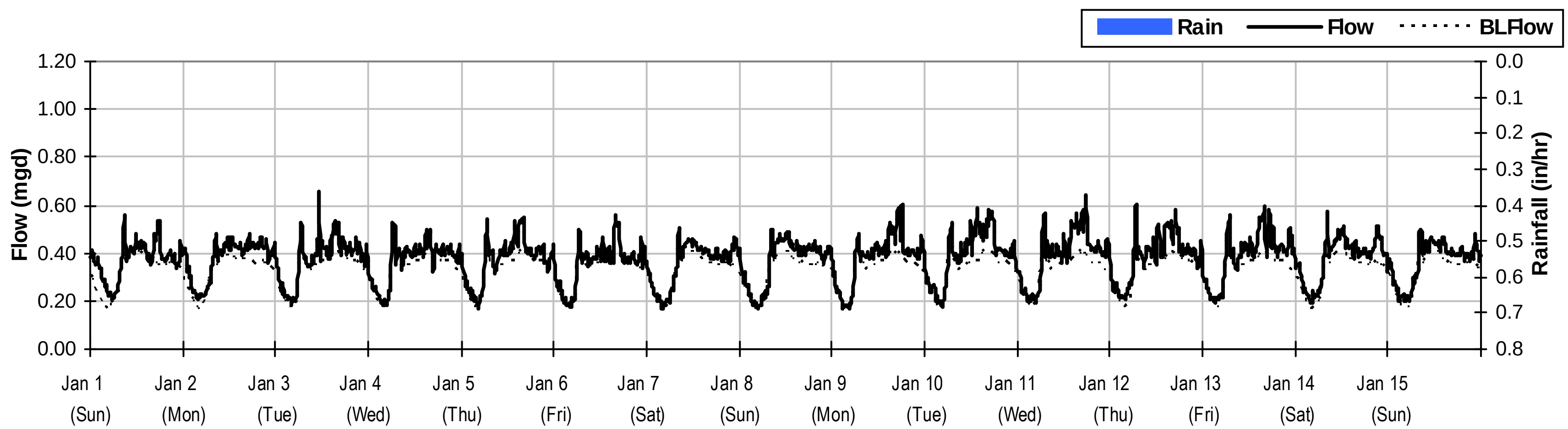


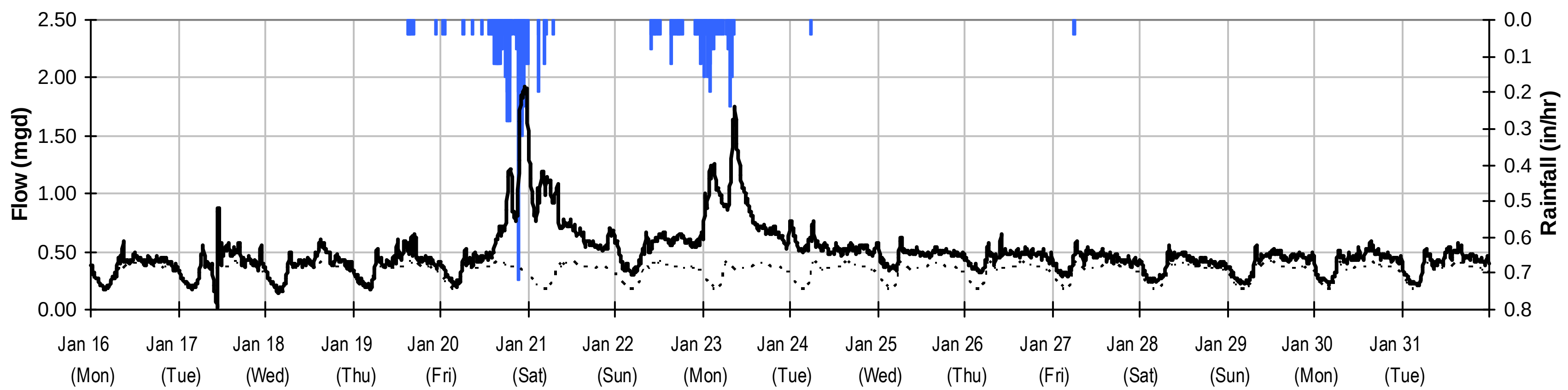


MH 477

Monthly Flow Summary: January, 2012

Total Monthly Rainfall: 2.38 inches **Avg Flow: 0.438 mgd** **Peak Flow: 1.933 mgd** **Min Flow: 0.040 mgd**

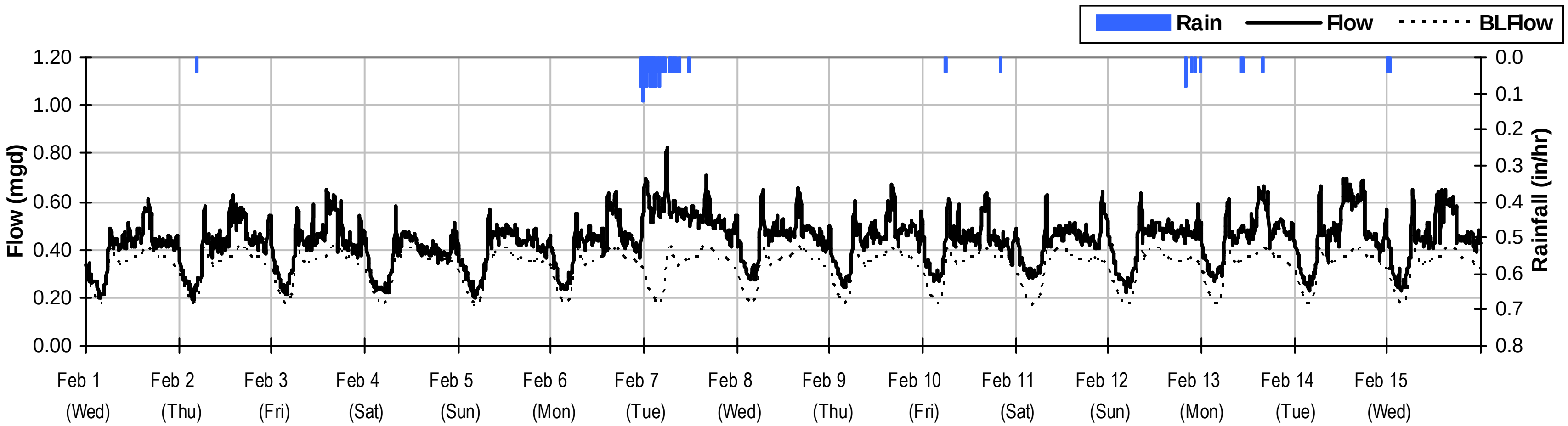


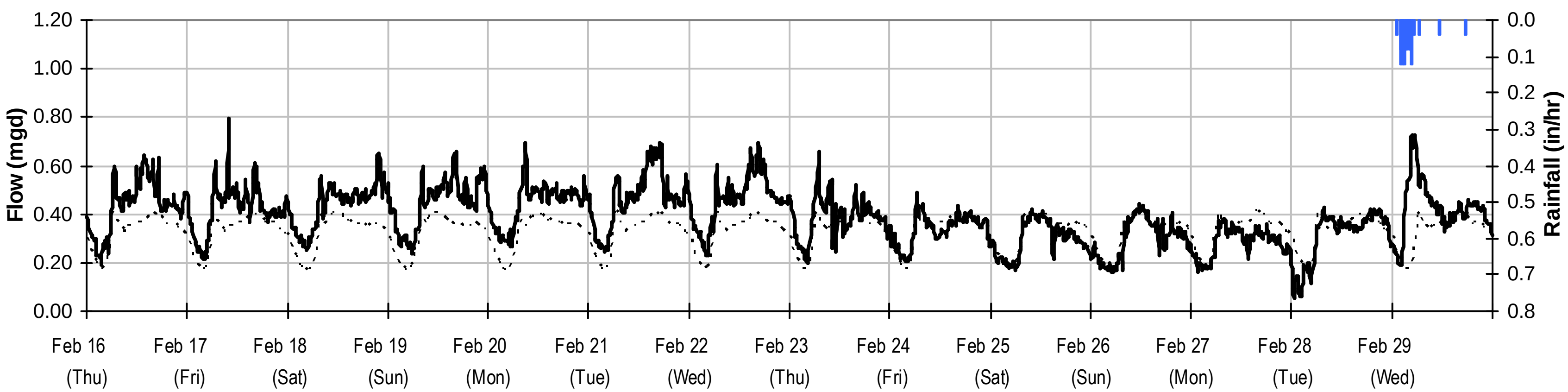


MH 477

Monthly Flow Summary: February, 2012

Total Monthly Rainfall: 0.85 inches   Avg Flow: 0.415 mgd   Peak Flow: 0.829 mgd   Min Flow: 0.052 mgd

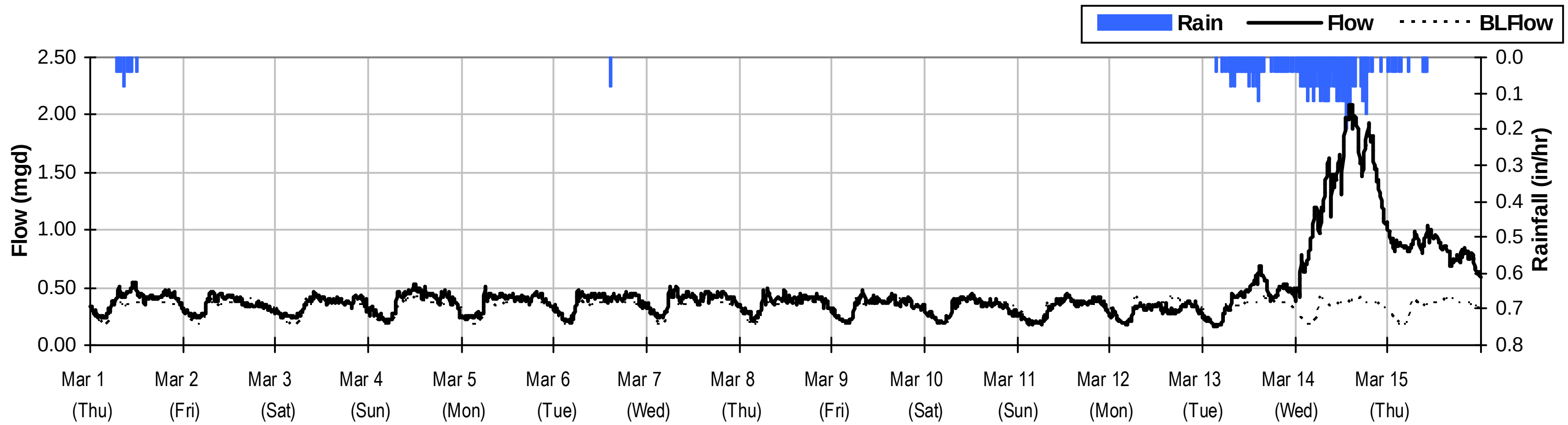


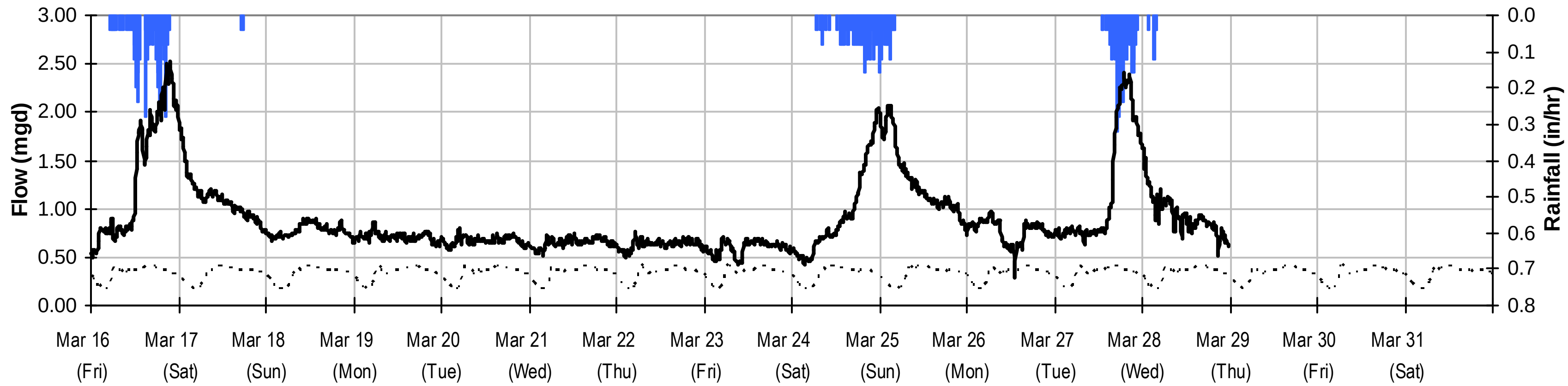


MH 477

Monthly Flow Summary: March, 2012

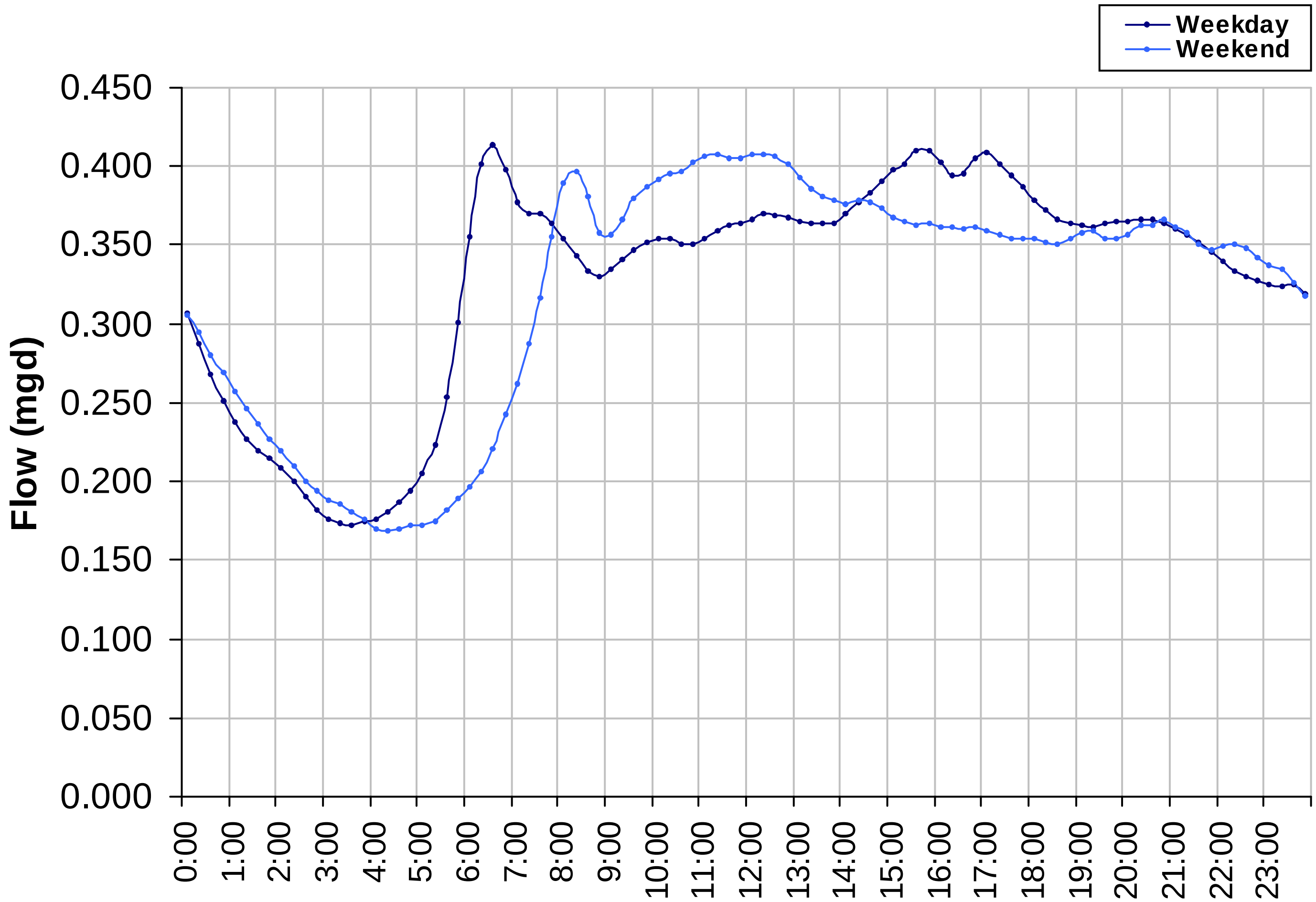
Total Monthly Rainfall: 5.4 inches **Avg Flow: 0.659 mgd** **Peak Flow: 2.520 mgd** **Min Flow: 0.155 mgd**





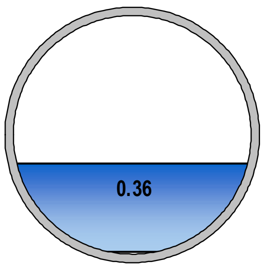
MH 477

Baseline Flow Hydrographs



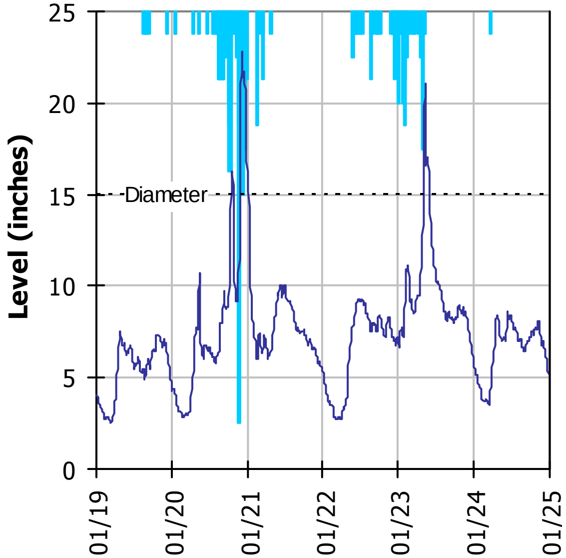
Baseline Flow:

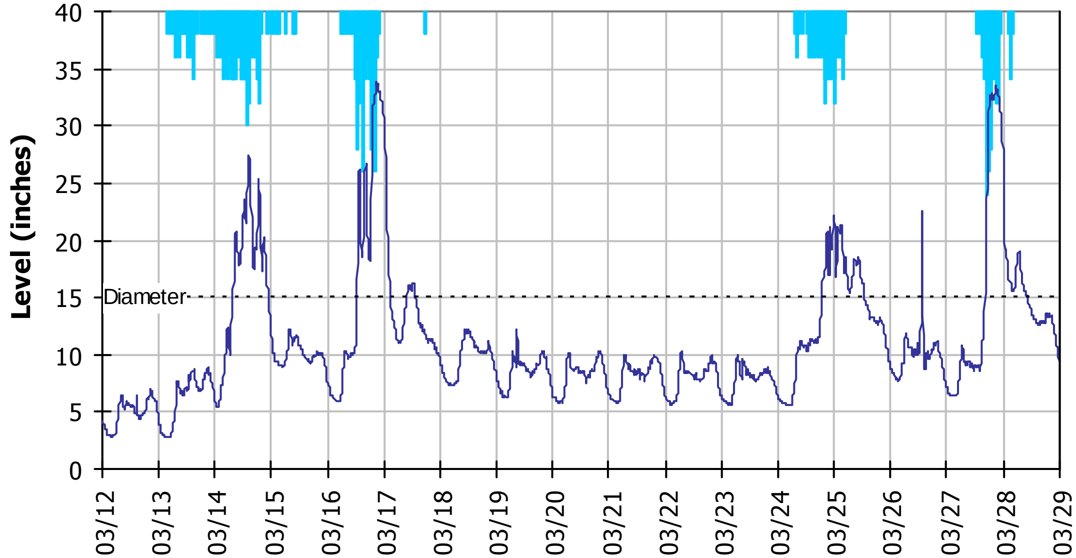
0.326 *mgd*

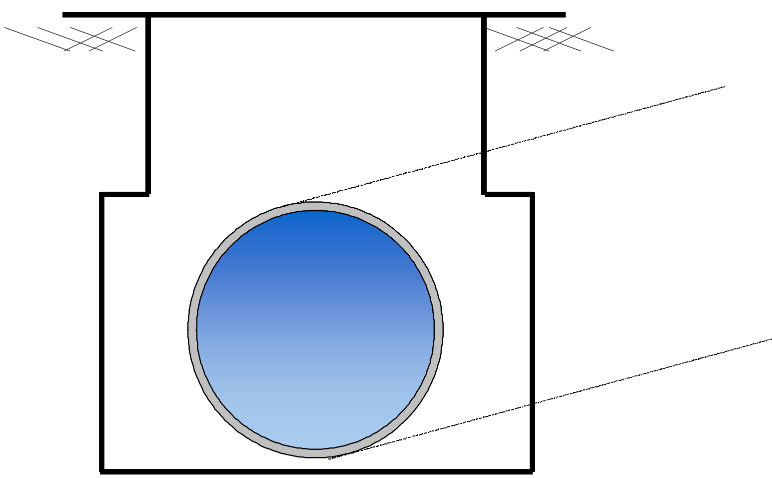


MH 477
Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Monitoring Period







Pipe Diameter: 15 *inches*

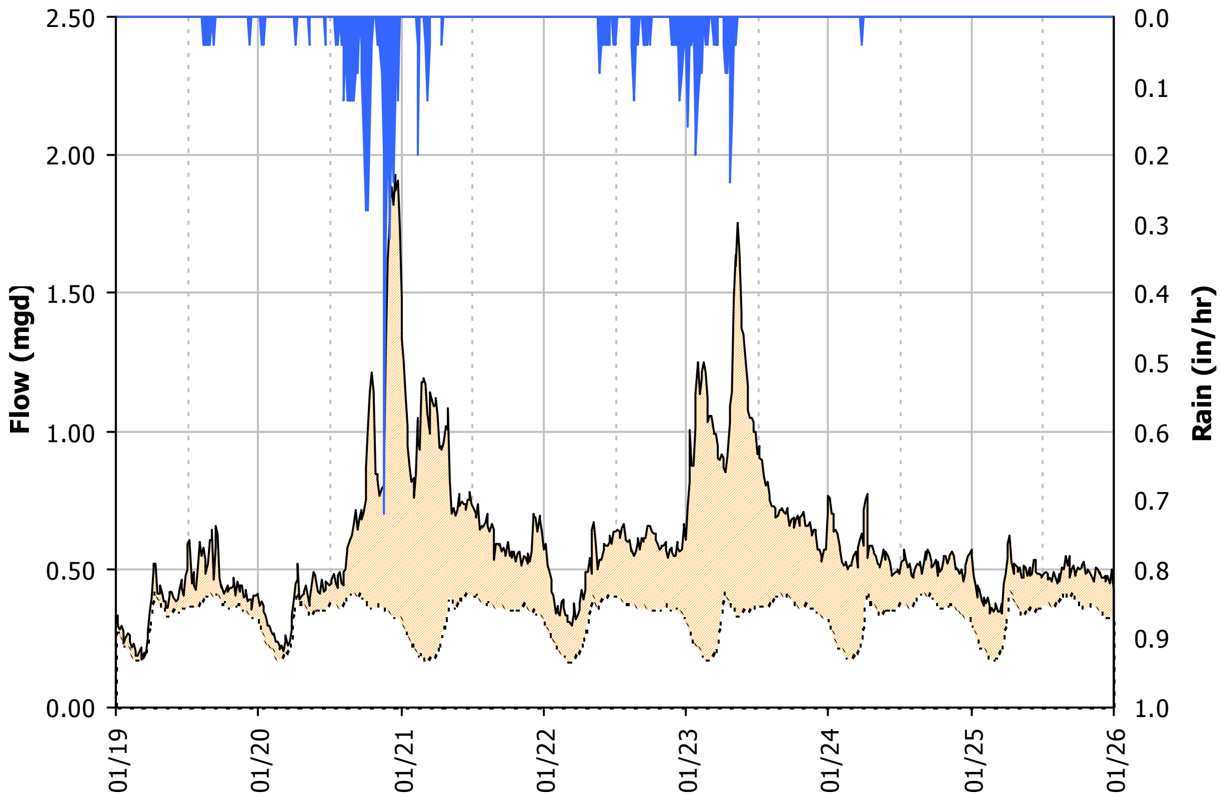
Peak Measured Level: 33.8 *inches*

Peak d/D Ratio: 2.25

Surcharged 18.8 inches over crown

MH 477
I/I Summary: Event 1

Event 1 Detail Graph



Storm Event I/I Analysis (Rain = 2.37 inches)

Inflow

Peak I/I Rate: 1.61 *mgd*

Pk I/I:ADWF: 4.93

Combined I/I

Total I/I: 1,997,000 *gallons*

Total I/I:ADWF: 2.58 *per in-rain*

RDI (infiltration)

Infiltration Rate: 0.143 *mgd*
(1/25/2012)

RDI (% of BL): 44%

Capacity

Peak Flow: 1.93 *mgd*

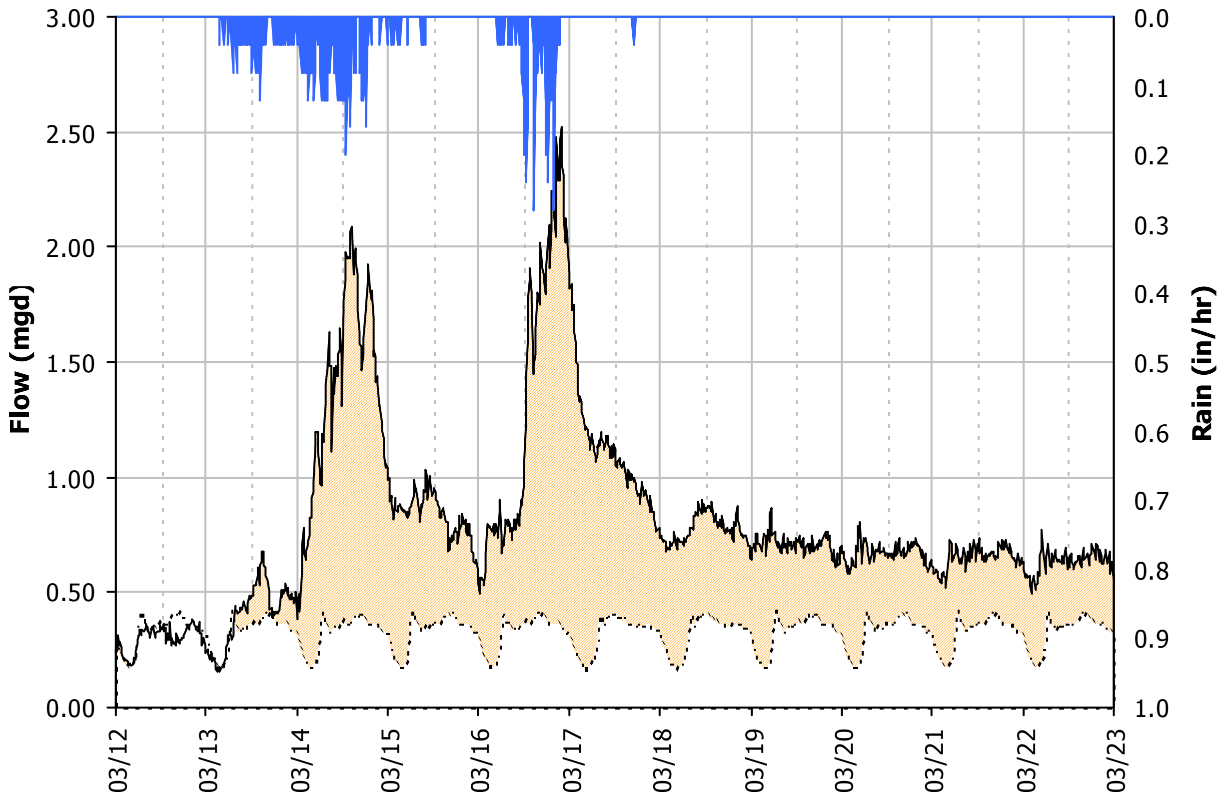
PF: 5.92

Peak Level: 22.69 *in*

d/D Ratio: 1.51

MH 477
I/I Summary: Event 2

Event 2 Detail Graph



Storm Event I/I Analysis (Rain = 3.16 inches)

Inflow

Peak I/I Rate: 2.17 *mgd*

Pk I/I:ADWF: 6.66

Combined I/I

Total I/I: 5,207,000 *gallons*

Total I/I:ADWF: 5.05 *per in-rain*

RDI (infiltration)

Infiltration Rate: 0.304 *mgd*
(3/22/2012)

RDI (% of BL): 93%

Capacity

Peak Flow: 2.52 *mgd*

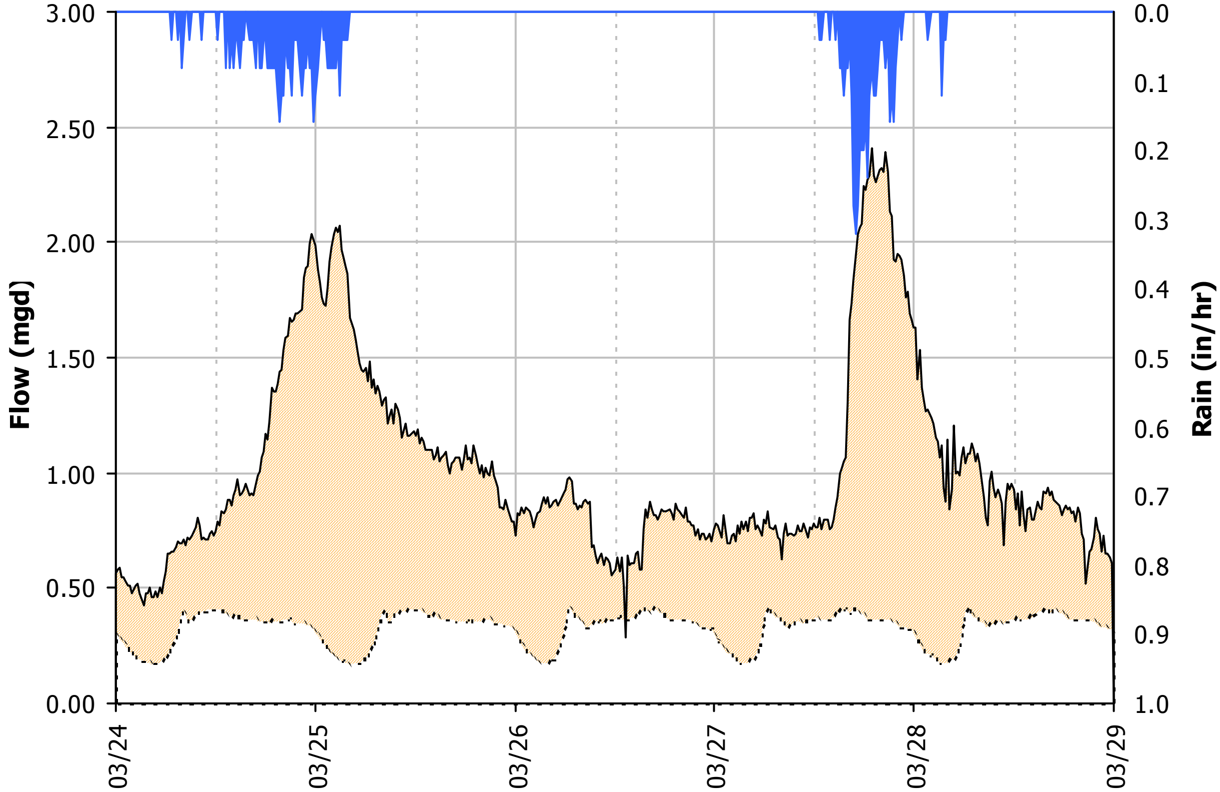
PF: 7.72

Peak Level: 33.81 *in*

d/D Ratio: 2.25

MH 477
I/I Summary: Event 3

Event 3 Detail Graph



Storm Event I/I Analysis (Rain = 2.12 inches)

Inflow

Peak I/I Rate: 2.05 *mgd*

Pk I/I:ADWF: 6.29

Combined I/I

Total I/I: 3,490,000 *gallons*

Total I/I:ADWF: 5.04 *per in-rain*

RDI (infiltration)

Infiltration Rate: 0.433 *mgd*
(3/28/2012 12:00:00 PM)

RDI (% of BL): 118%

Capacity

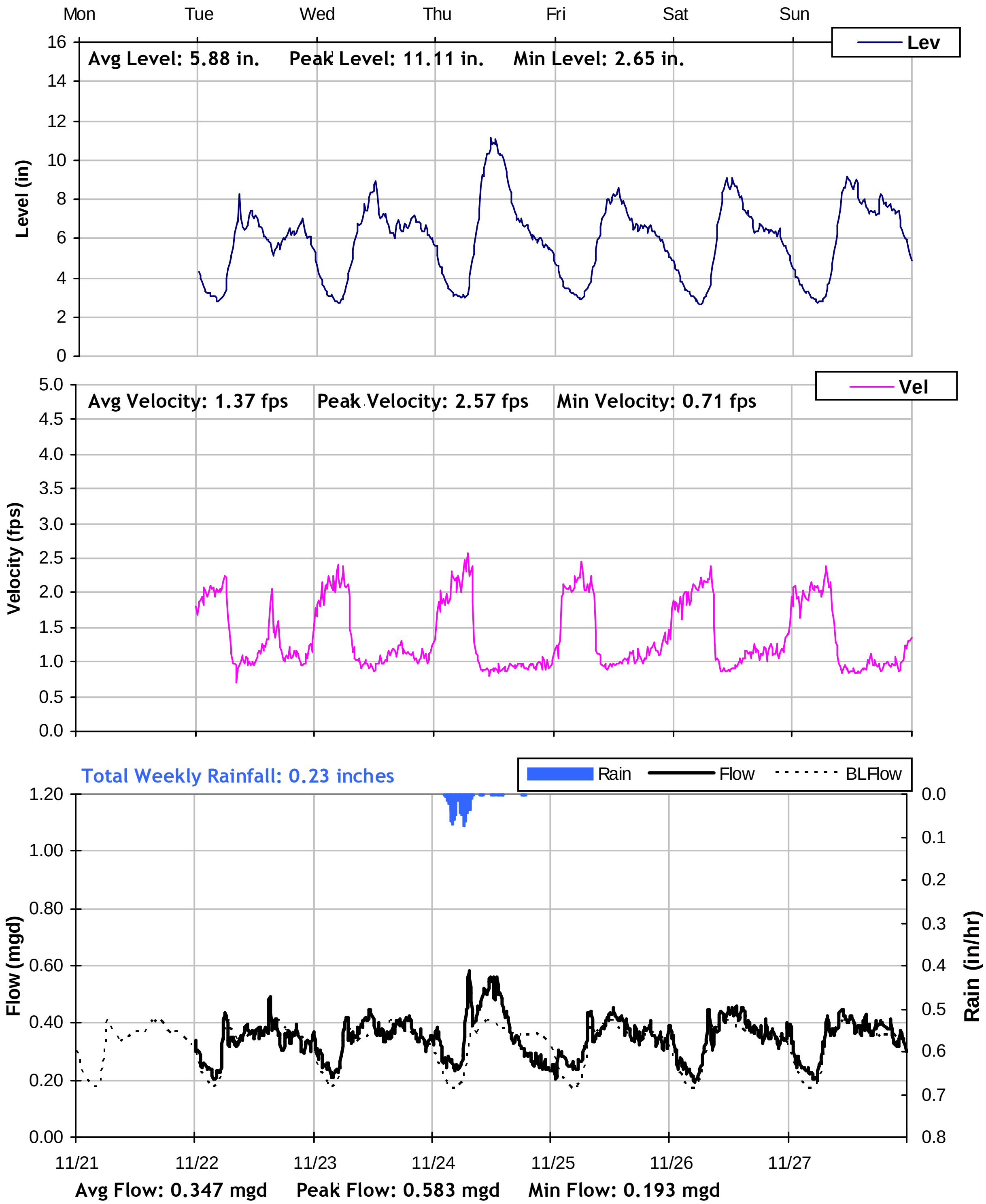
Peak Flow: 2.41 *mgd*

PF: 7.40

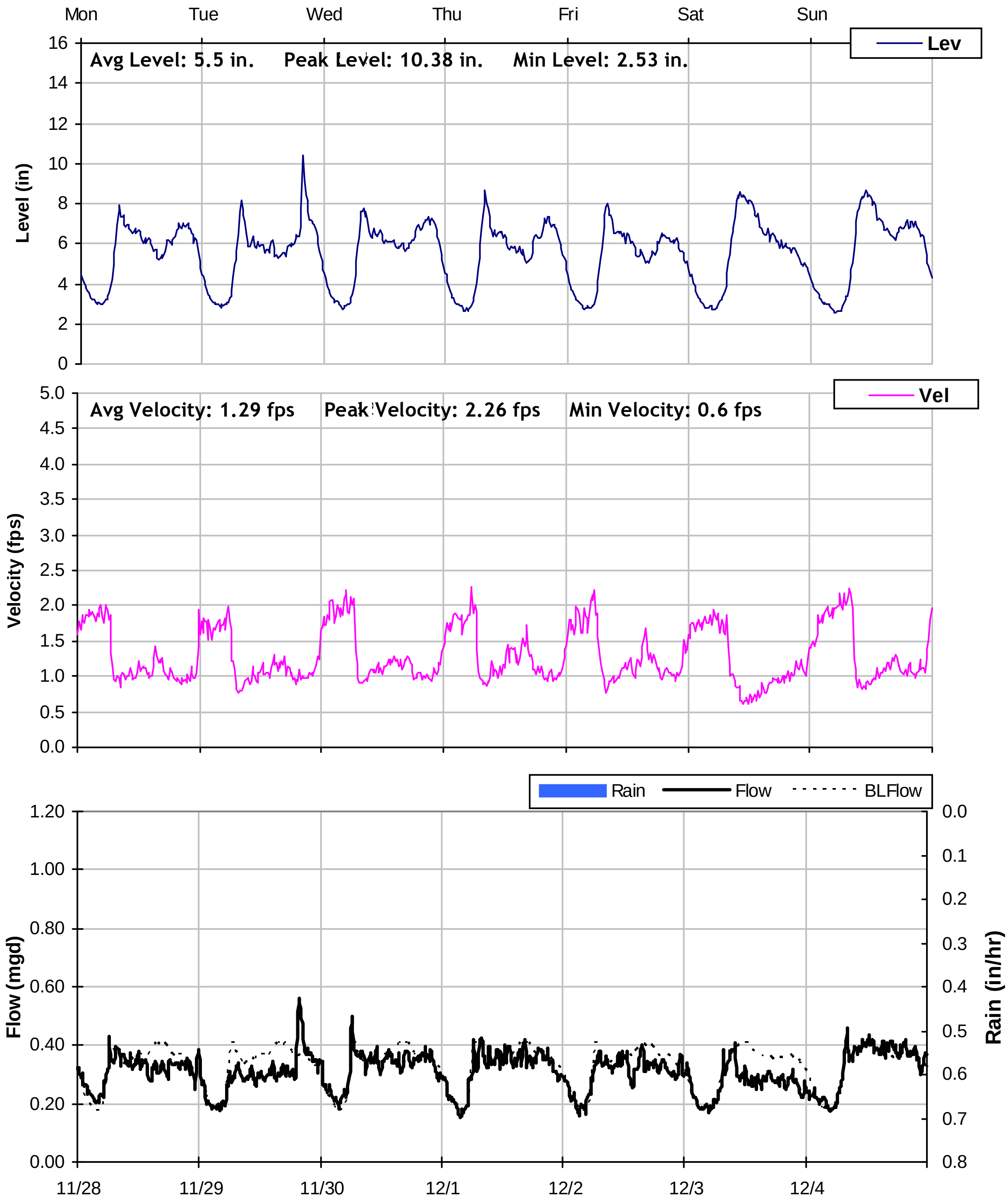
Peak Level: 33.61 *in*

d/D Ratio: 2.24

MH 477
Weekly Level, Velocity and Flow Hydrographs
11/21/2011 to 11/28/2011



MH 477
Weekly Level, Velocity and Flow Hydrographs
11/28/2011 to 12/5/2011

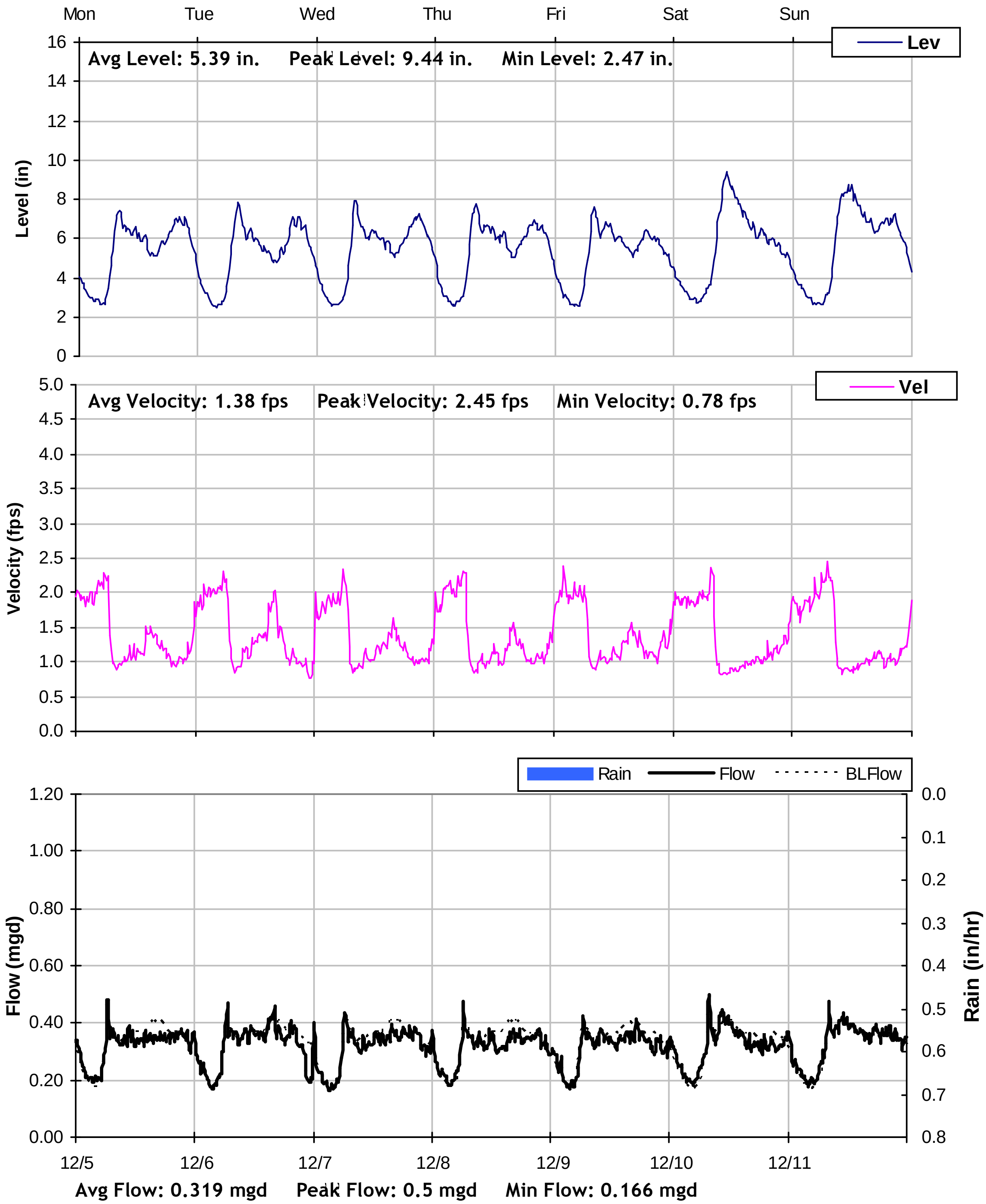


Avg Flow: 0.309 mgd Peak Flow: 0.558 mgd Min Flow: 0.153 mgd

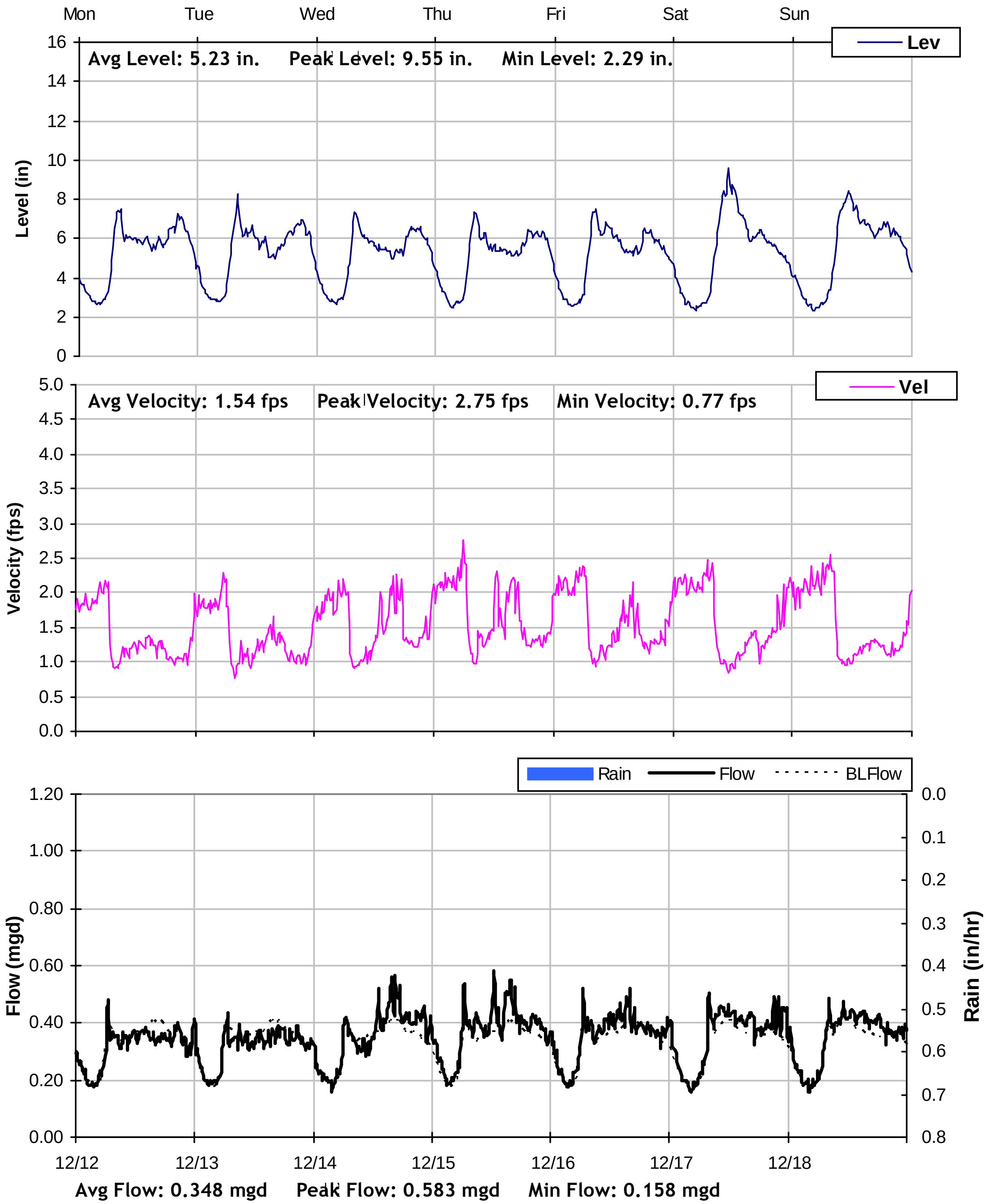
MH 477

Weekly Level, Velocity and Flow Hydrographs

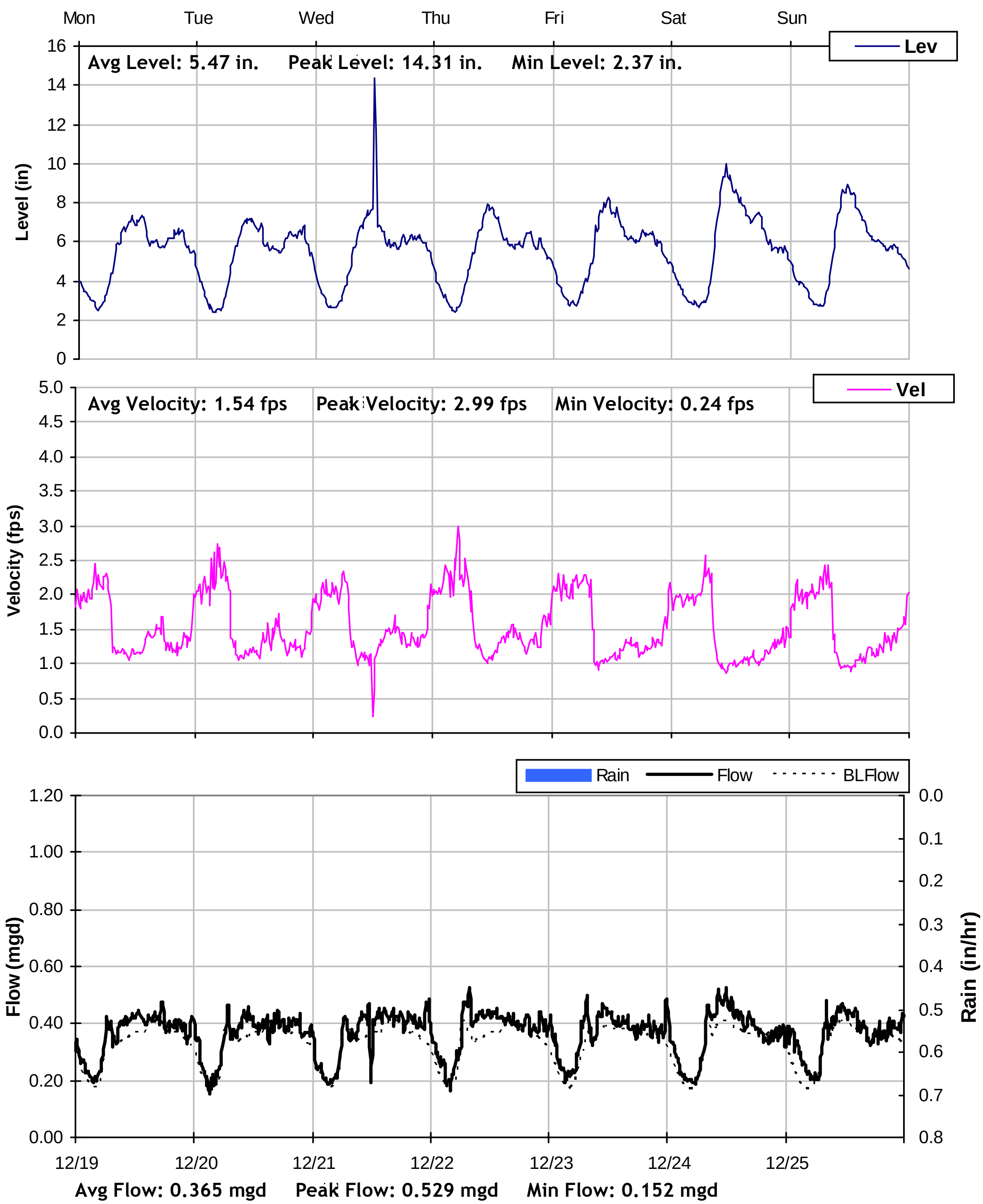
12/5/2011 to 12/12/2011



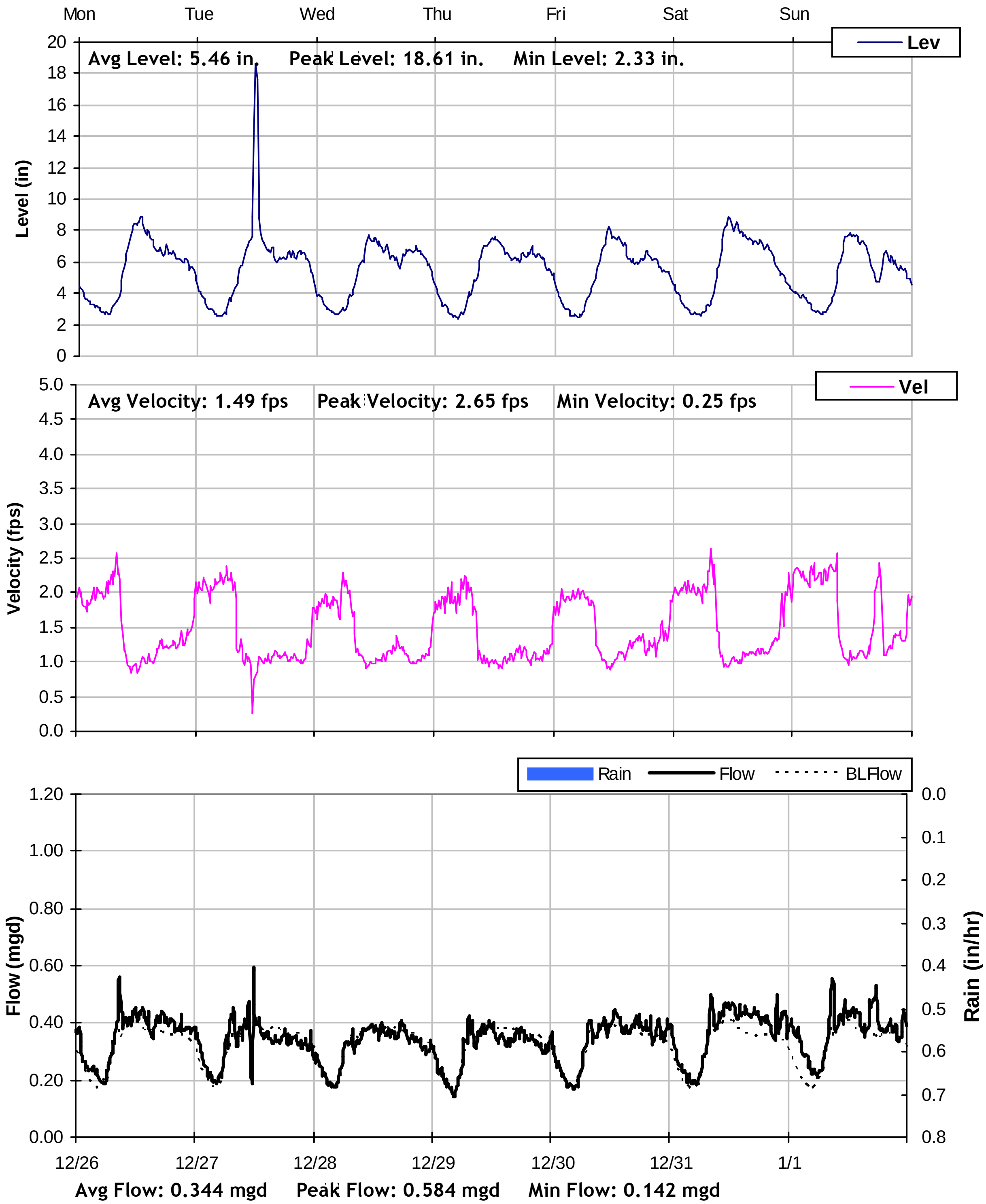
MH 477
Weekly Level, Velocity and Flow Hydrographs
12/12/2011 to 12/19/2011



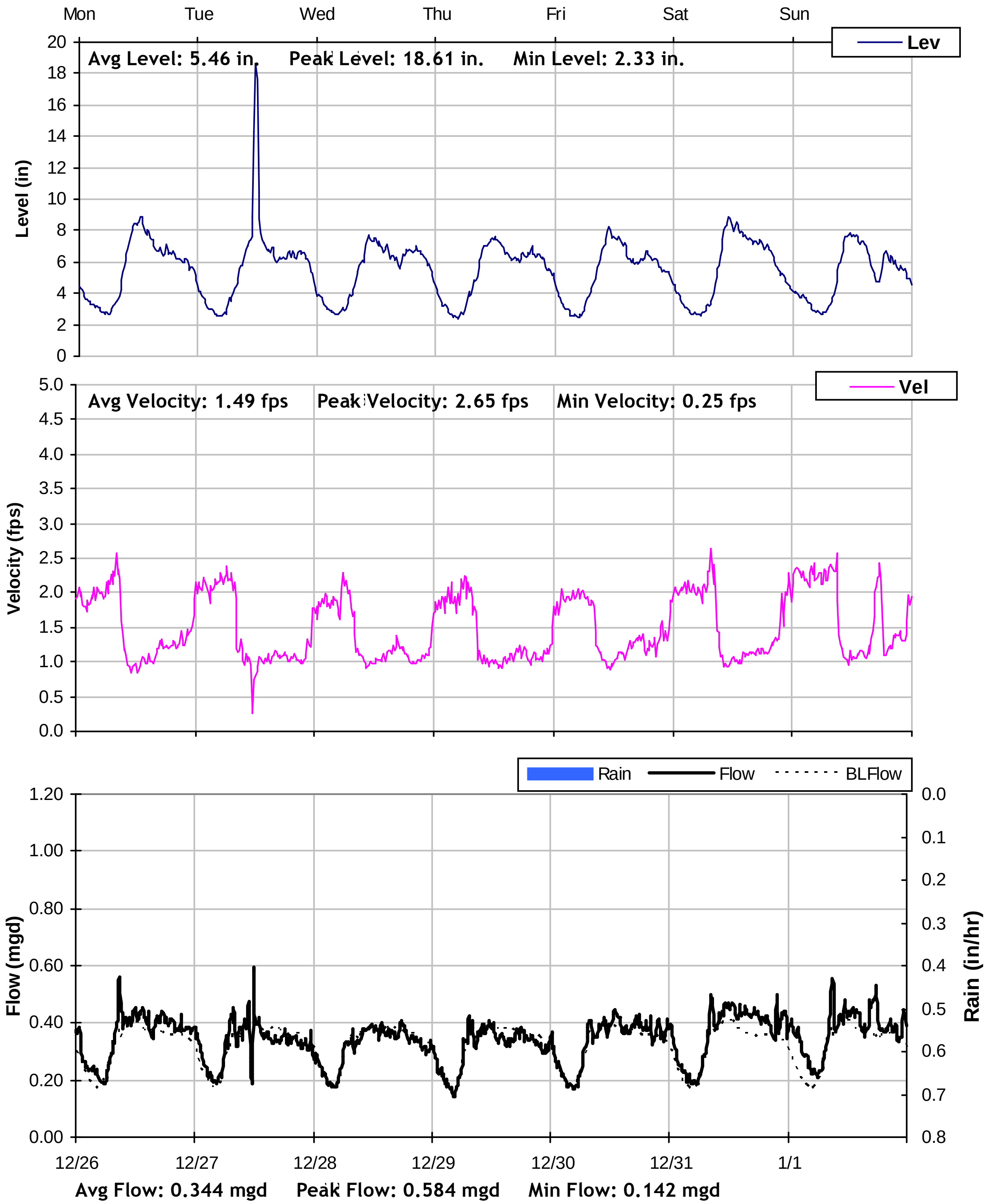
MH 477
Weekly Level, Velocity and Flow Hydrographs
12/19/2011 to 12/26/2011



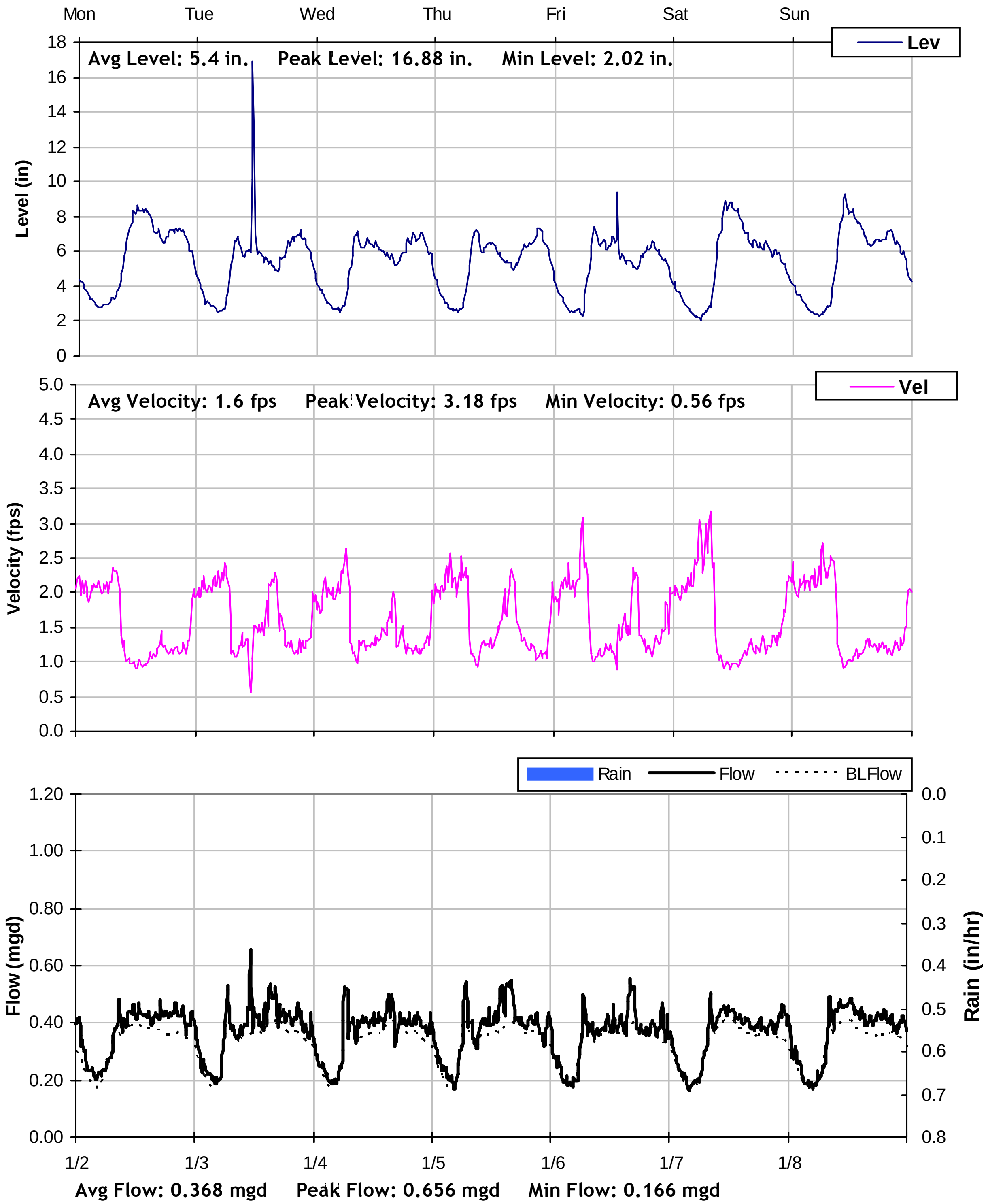
MH 477
Weekly Level, Velocity and Flow Hydrographs
12/26/2011 to 1/2/2012



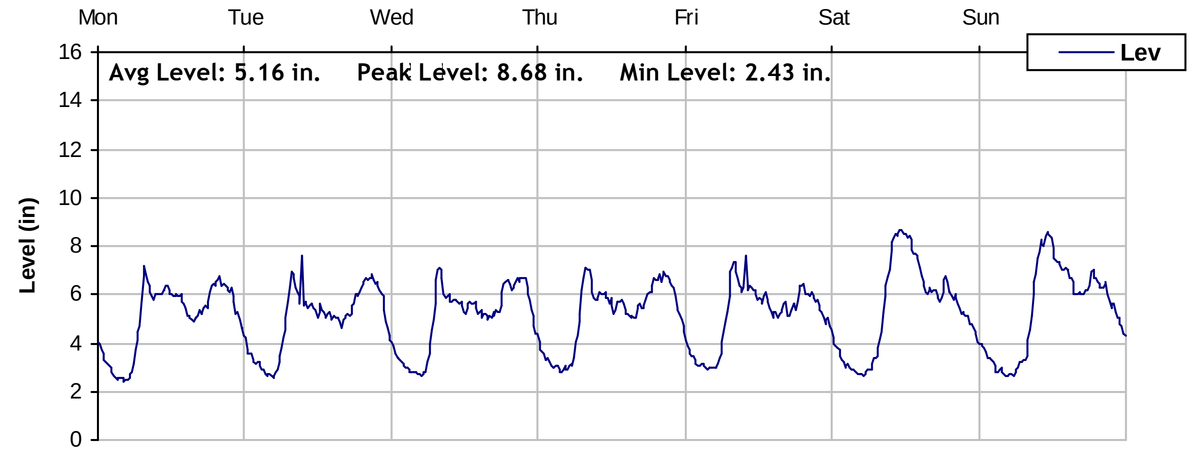
MH 477
Weekly Level, Velocity and Flow Hydrographs
12/26/2011 to 1/2/2012

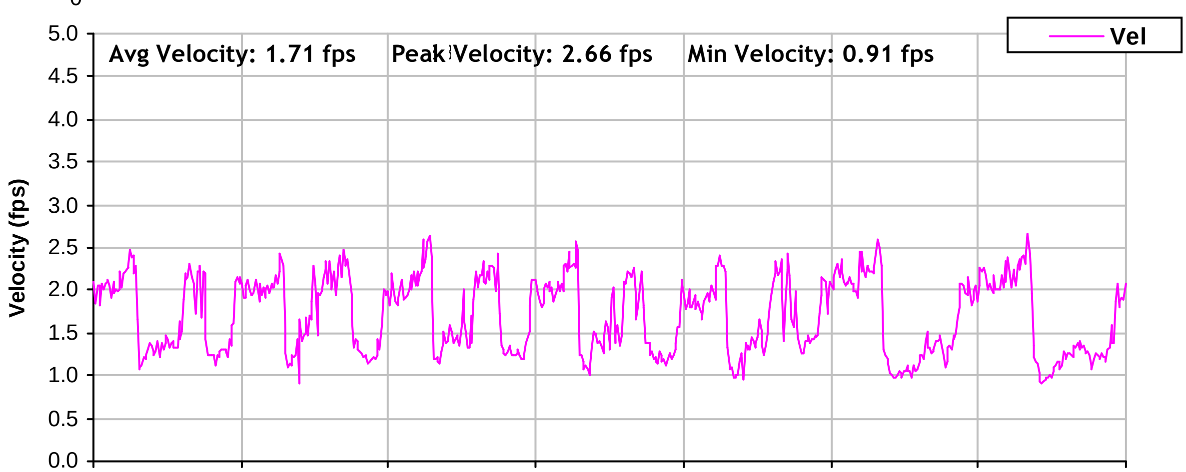


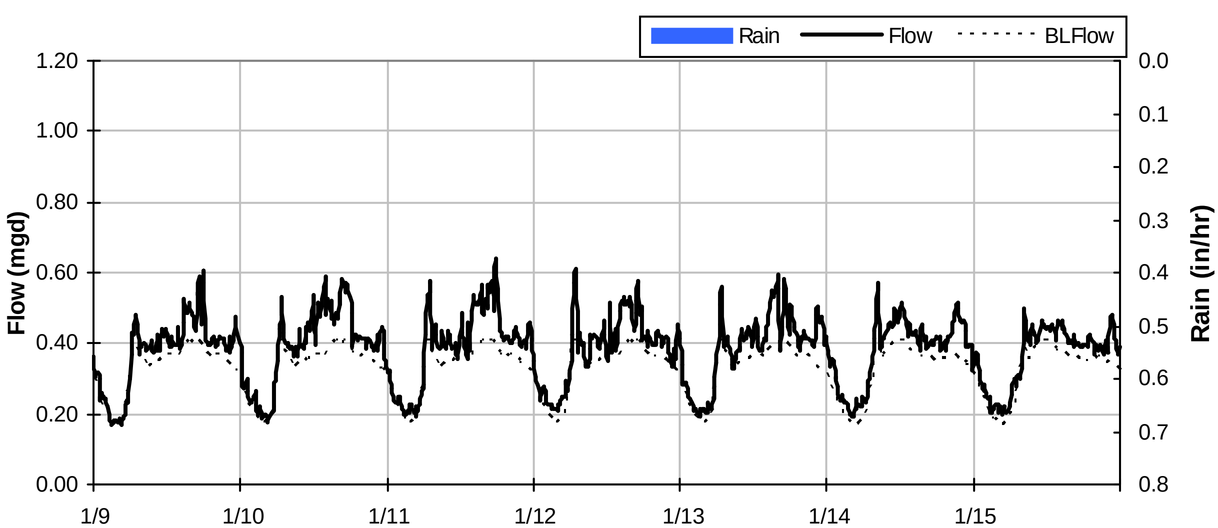
MH 477
Weekly Level, Velocity and Flow Hydrographs
1/2/2012 to 1/9/2012



MH 477
Weekly Level, Velocity and Flow Hydrographs
1/9/2012 to 1/16/2012

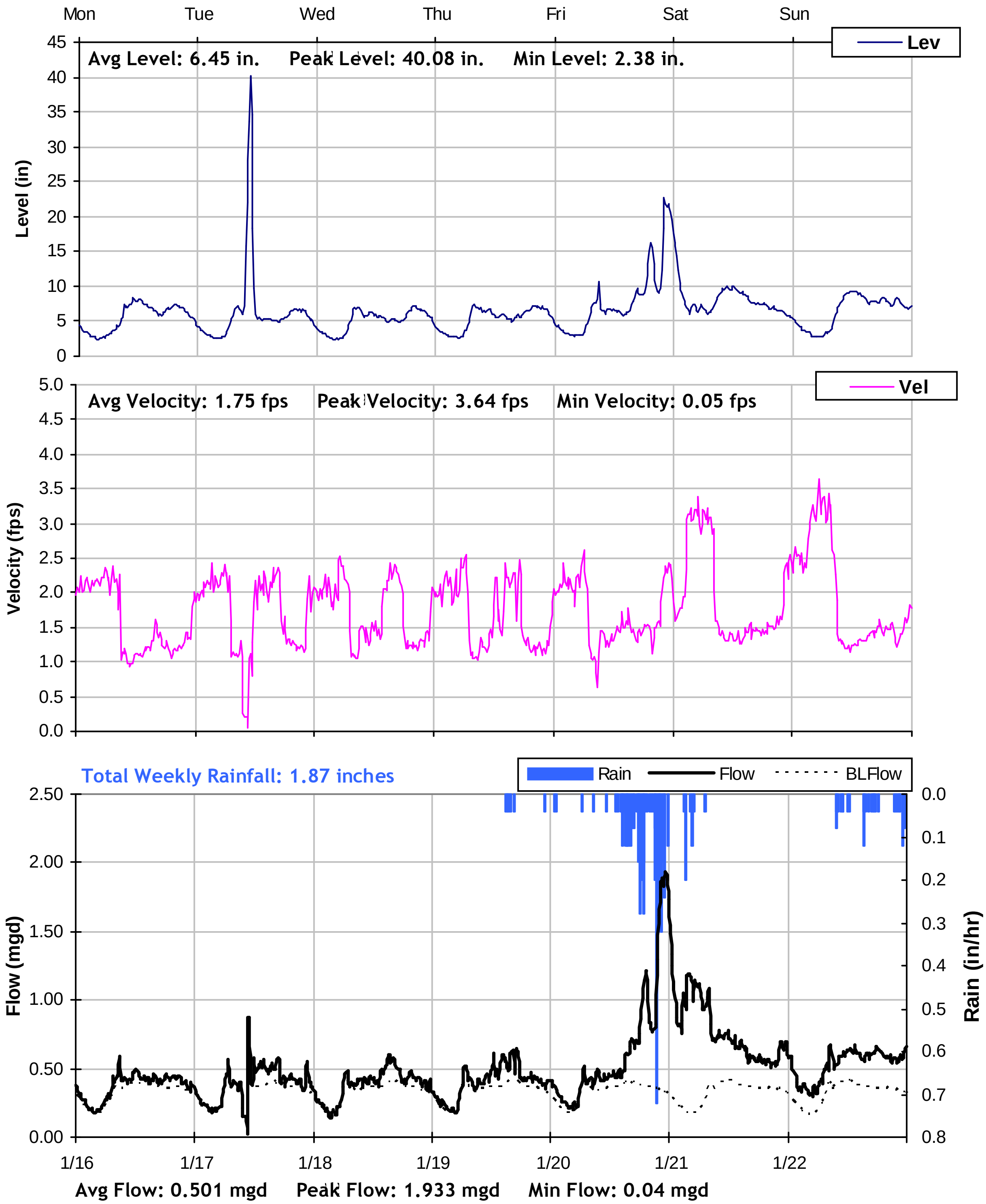






Avg Flow: 0.384 mgd Peak Flow: 0.642 mgd Min Flow: 0.171 mgd

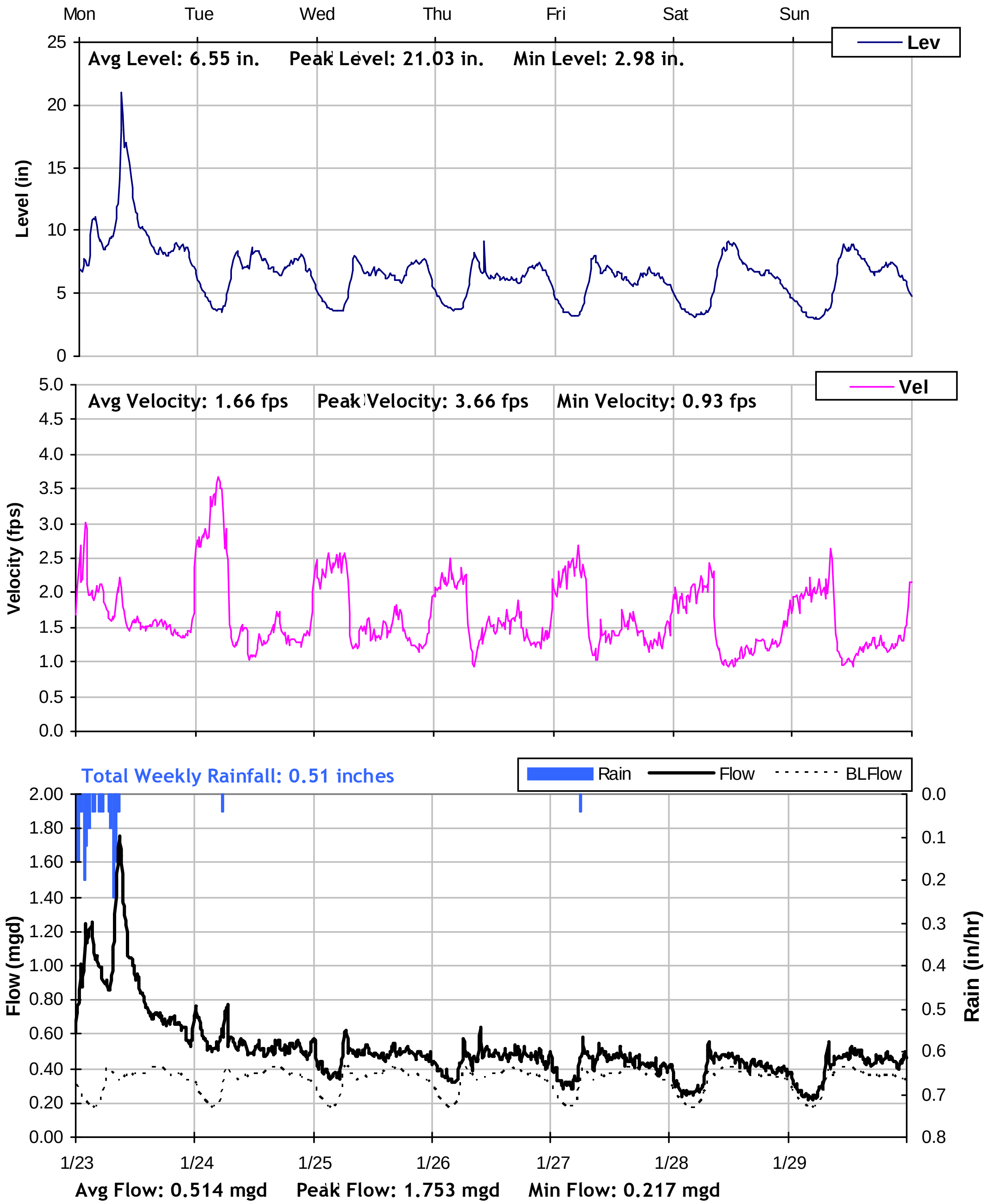
MH 477
Weekly Level, Velocity and Flow Hydrographs
1/16/2012 to 1/23/2012



MH 477

Weekly Level, Velocity and Flow Hydrographs

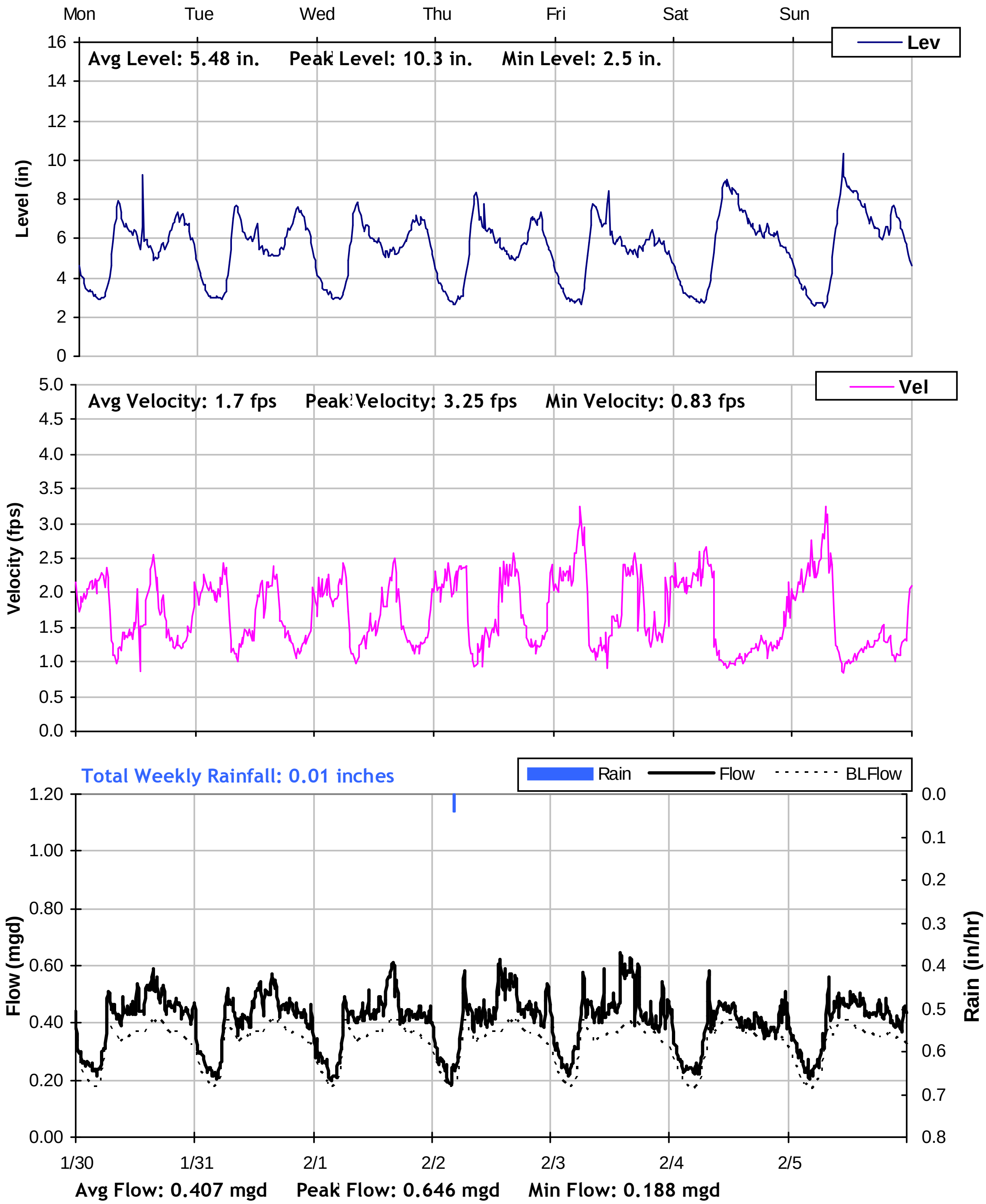
1/23/2012 to 1/30/2012



MH 477

Weekly Level, Velocity and Flow Hydrographs

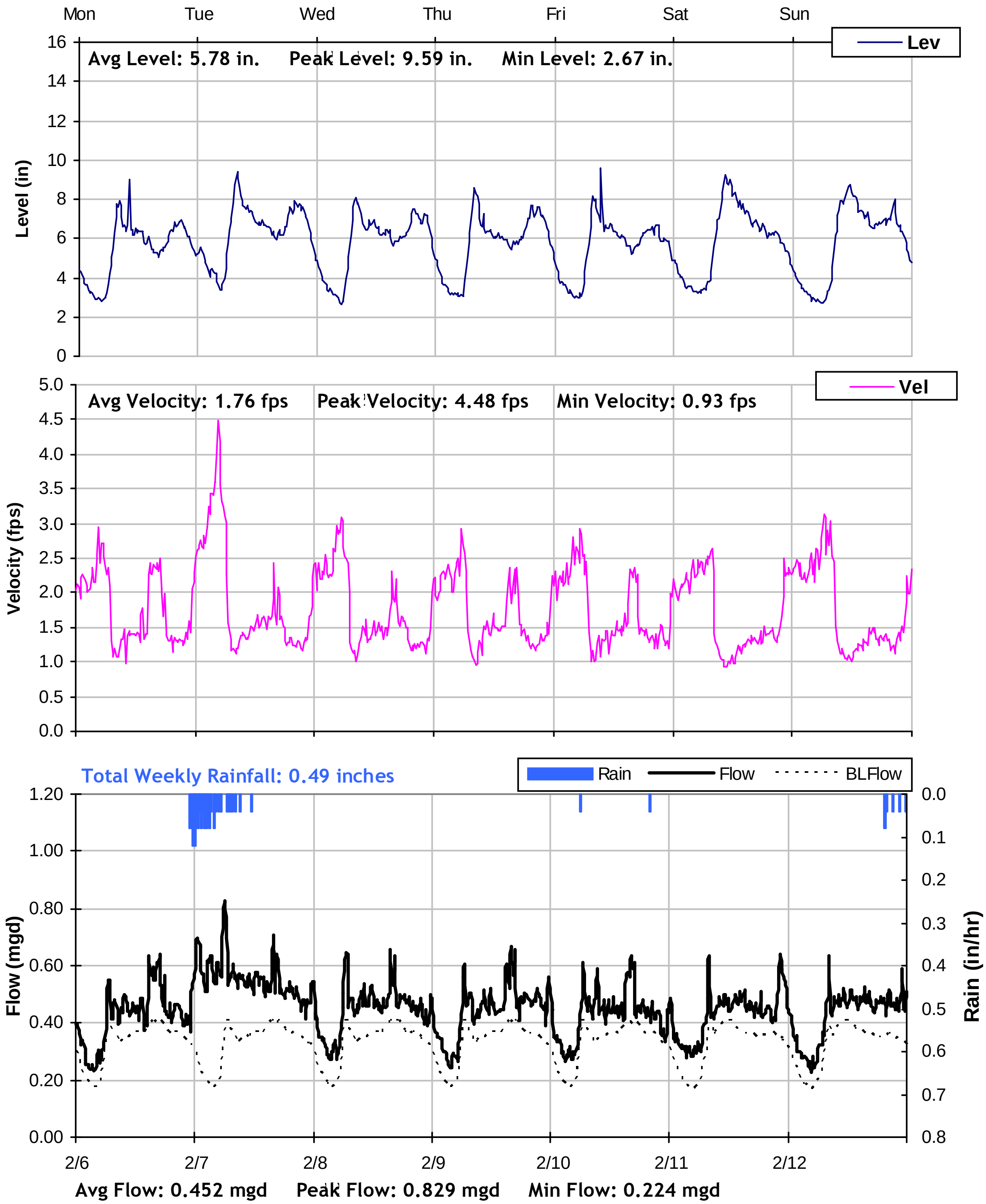
1/30/2012 to 2/6/2012



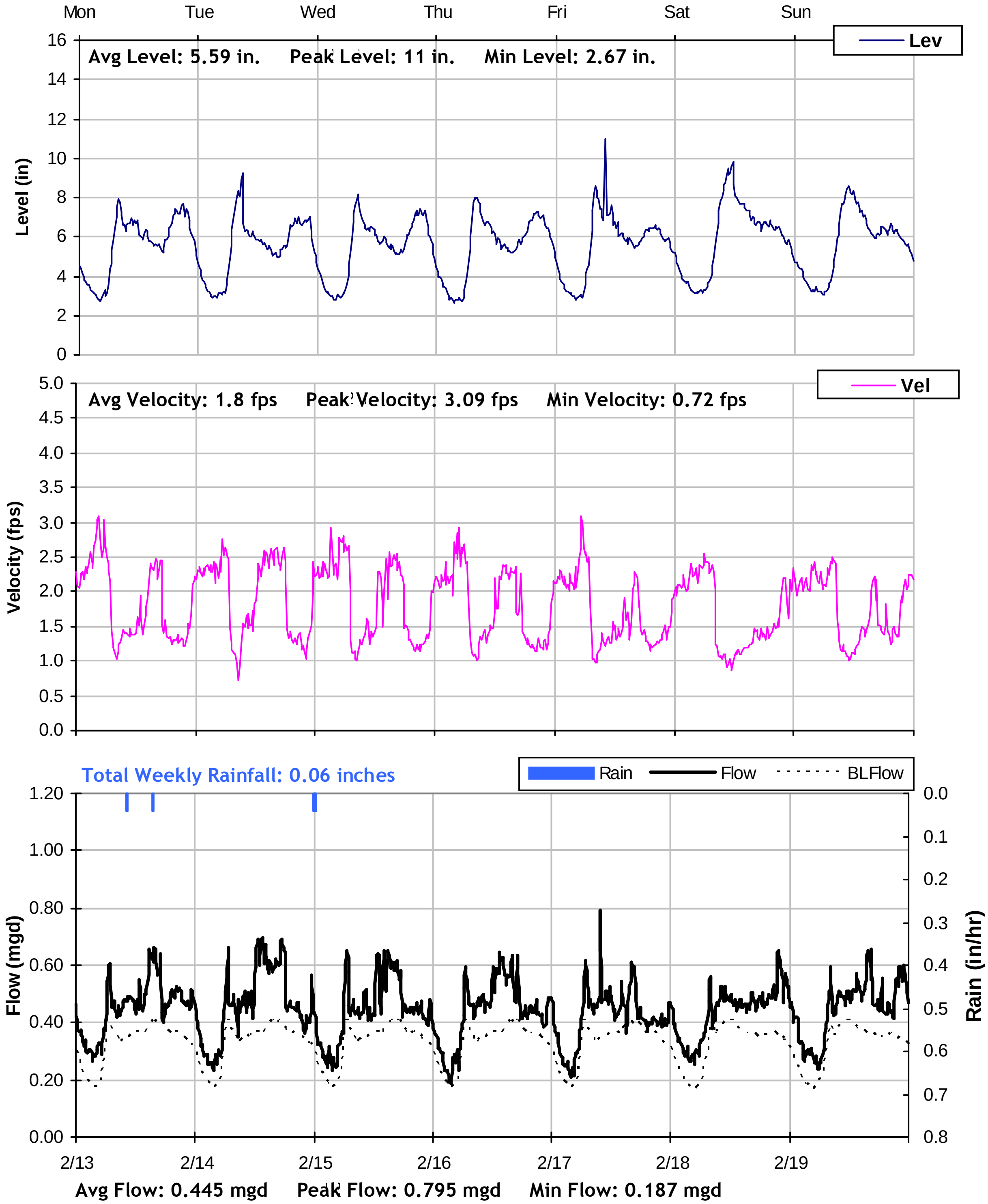
MH 477

Weekly Level, Velocity and Flow Hydrographs

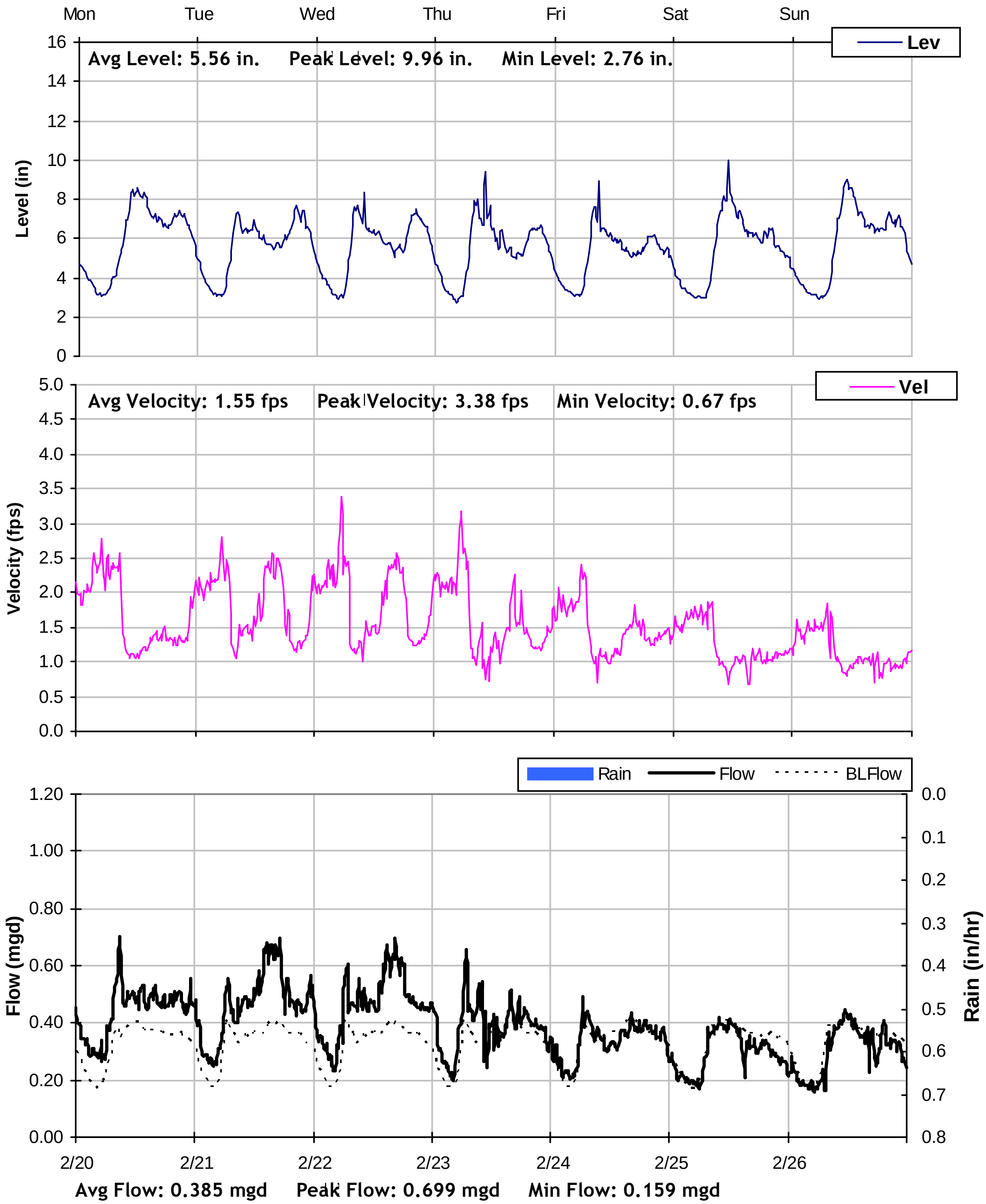
2/6/2012 to 2/13/2012



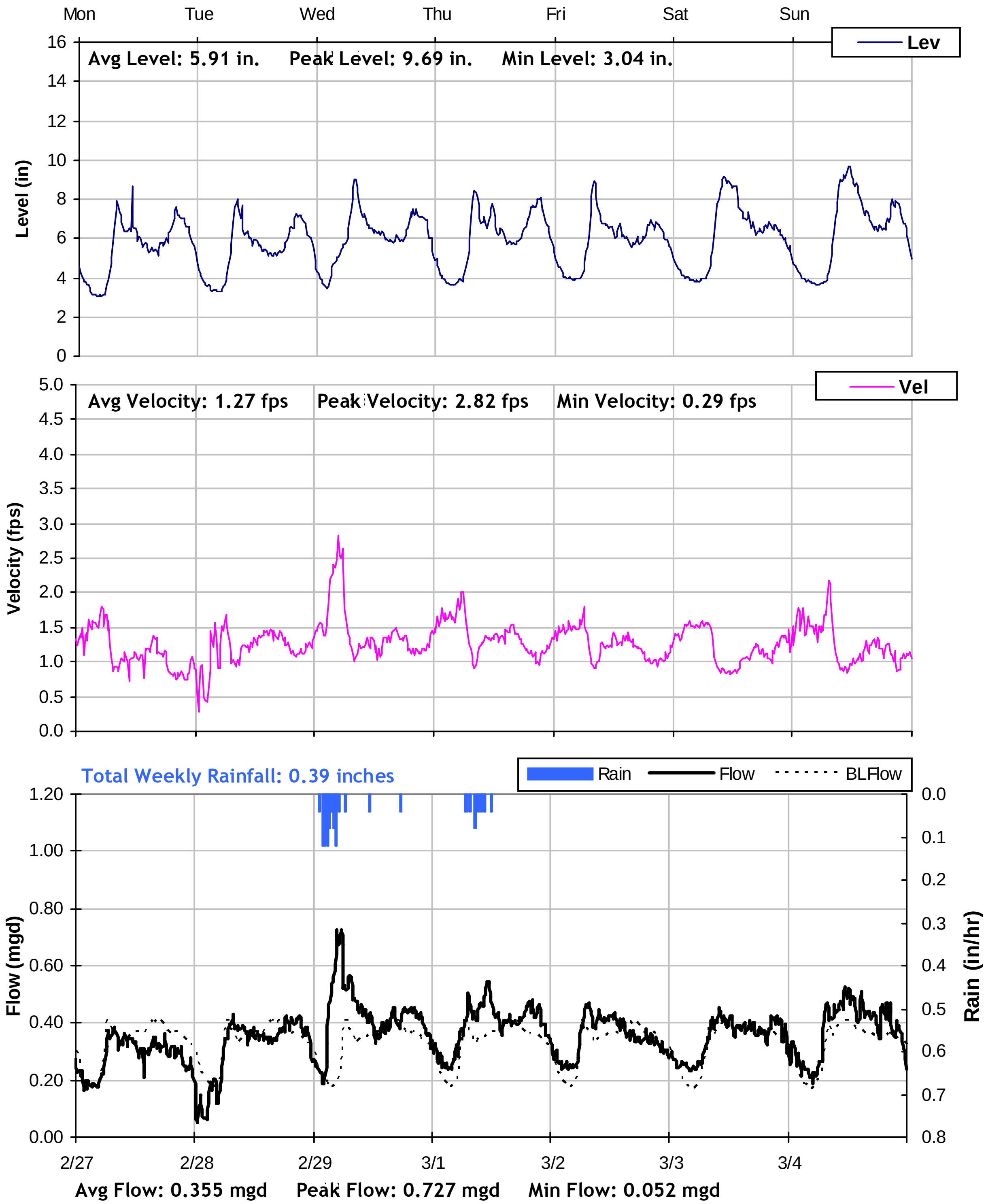
MH 477
Weekly Level, Velocity and Flow Hydrographs
2/13/2012 to 2/20/2012



MH 477
Weekly Level, Velocity and Flow Hydrographs
2/20/2012 to 2/27/2012



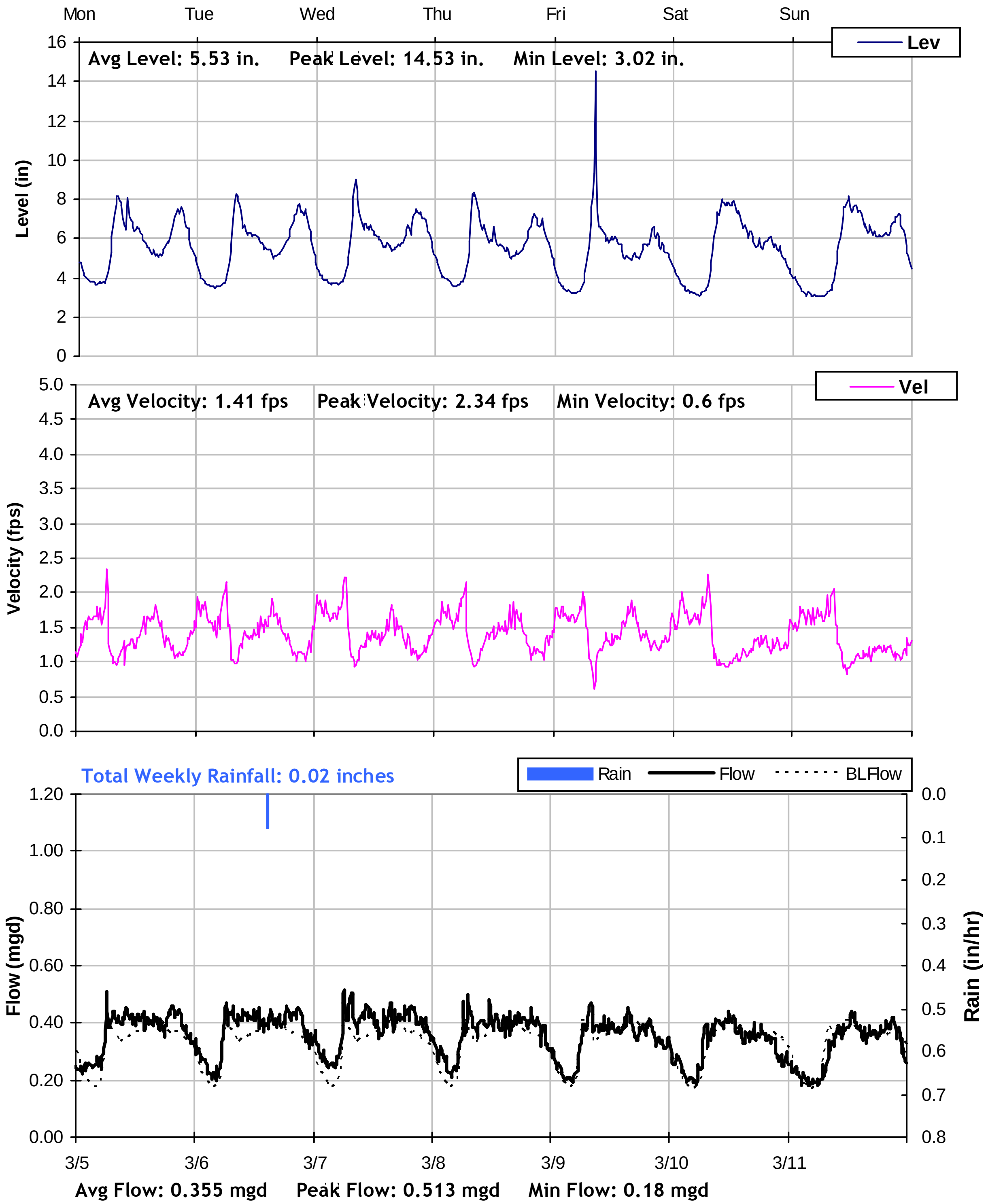
MH 477
Weekly Level, Velocity and Flow Hydrographs
2/27/2012 to 3/5/2012



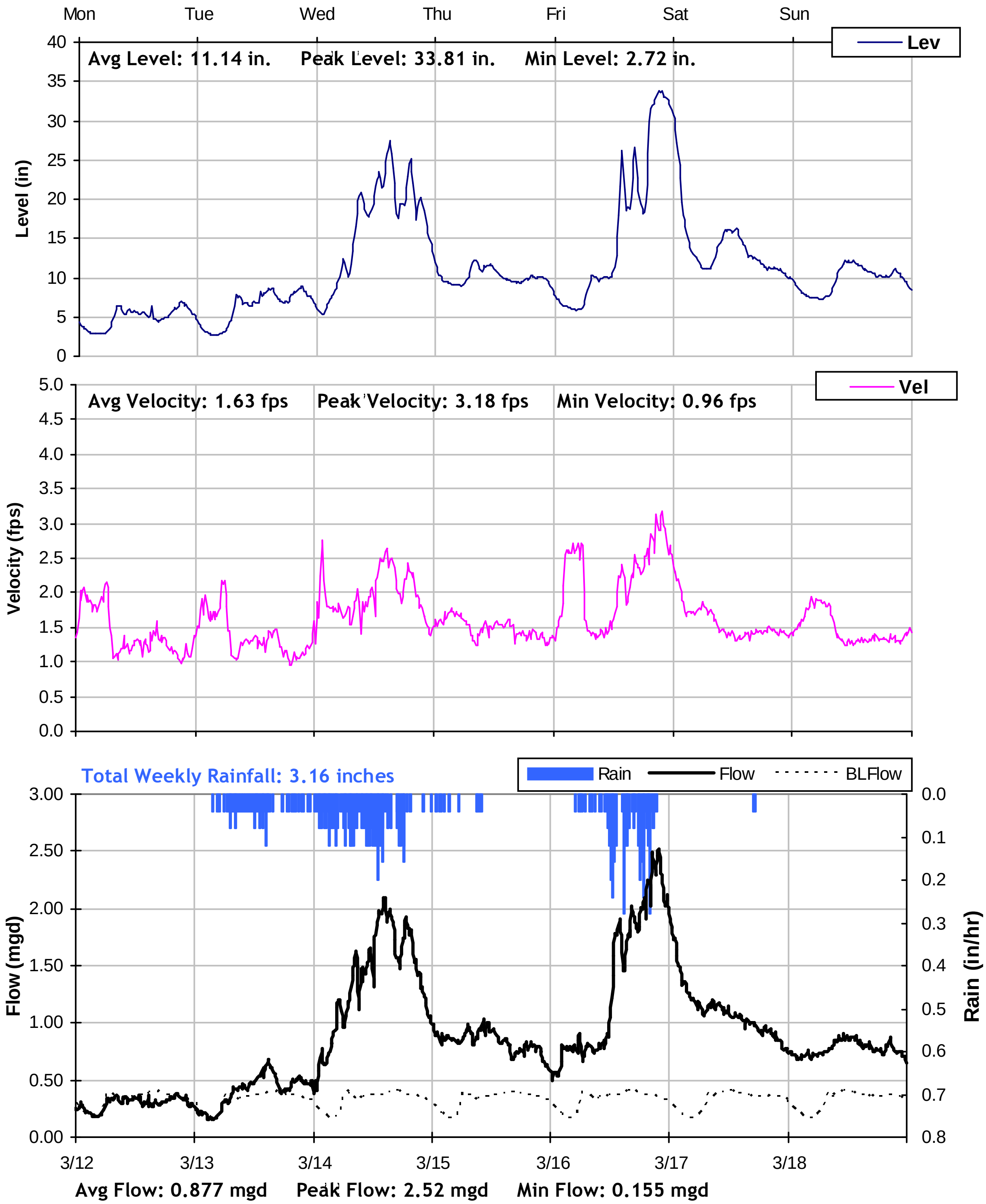
MH 477

Weekly Level, Velocity and Flow Hydrographs

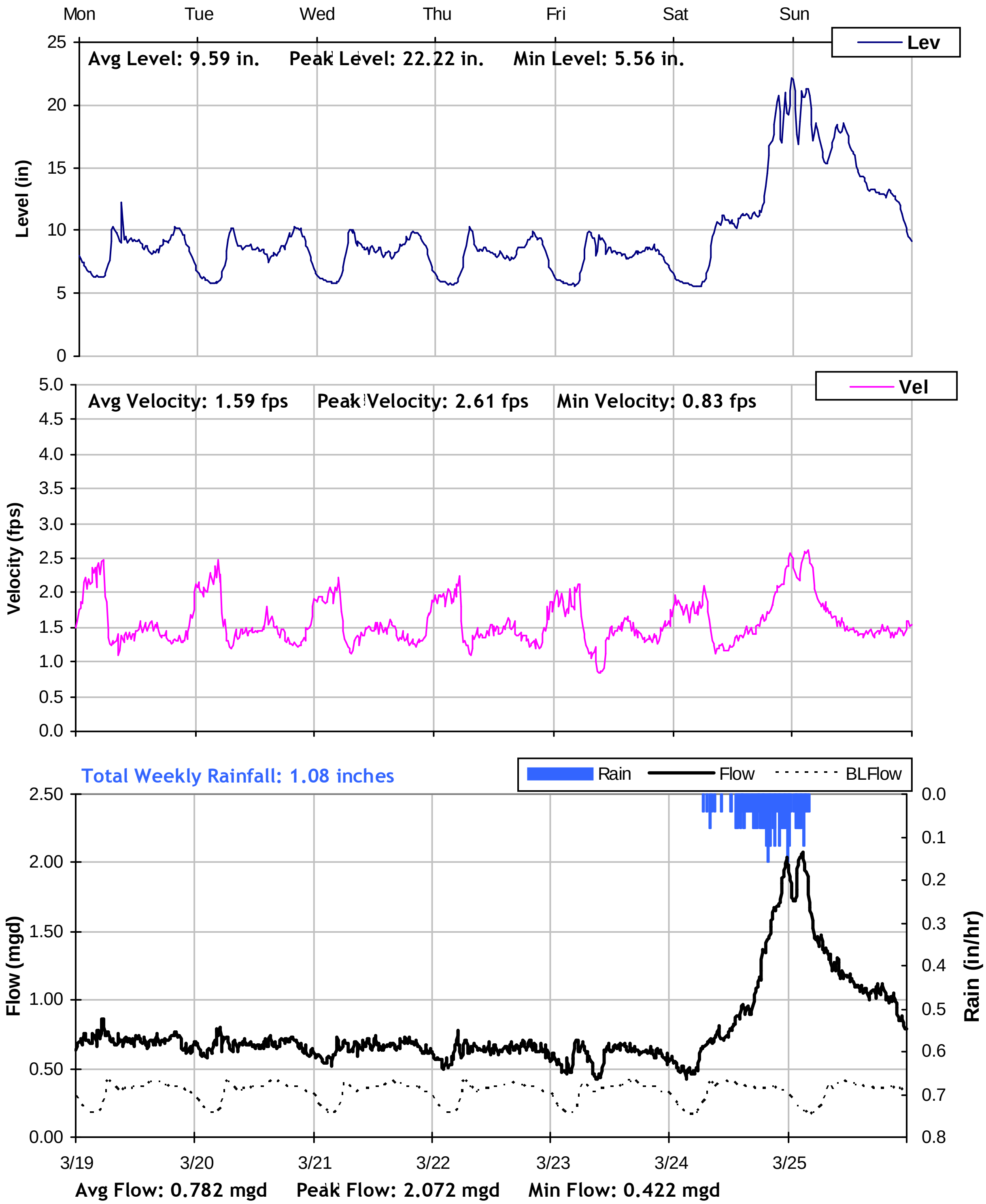
3/5/2012 to 3/12/2012



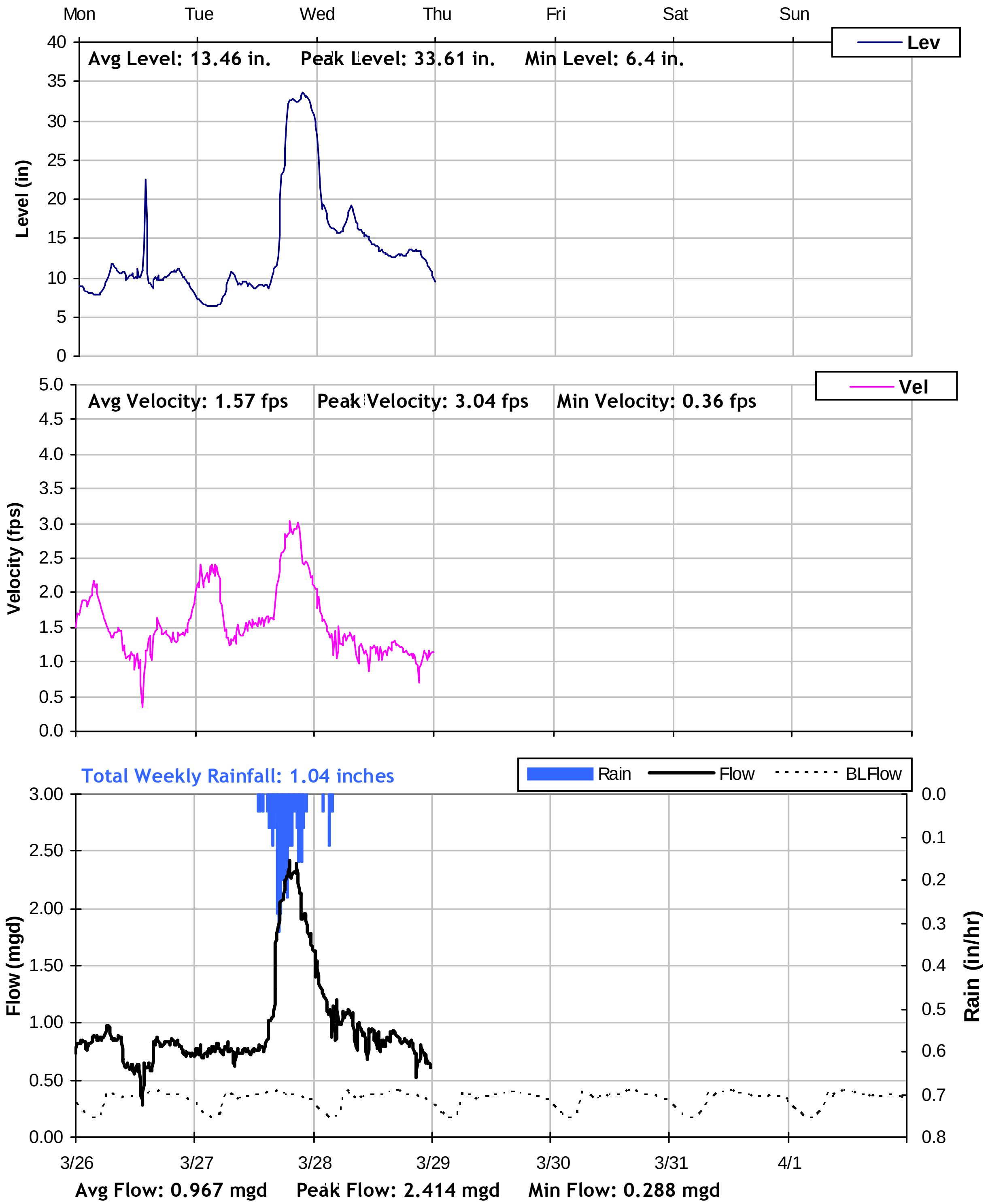
MH 477
Weekly Level, Velocity and Flow Hydrographs
3/12/2012 to 3/19/2012



MH 477
Weekly Level, Velocity and Flow Hydrographs
3/19/2012 to 3/26/2012



MH 477
Weekly Level, Velocity and Flow Hydrographs
3/26/2012 to 4/2/2012



Rodeo Sanitary District

Master Plan Sanitary Sewer Flow Monitoring

Year 2011/2012

Monitoring Site: MH 57

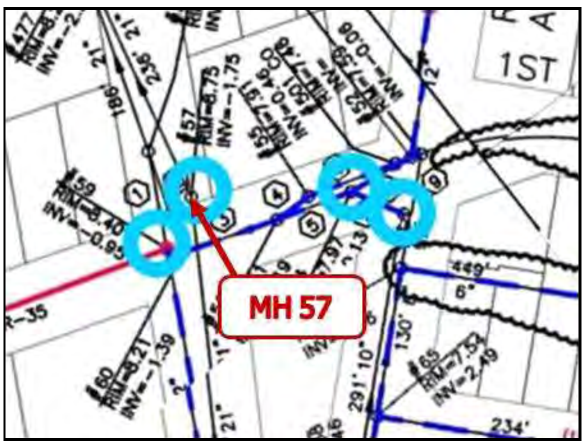
Location: In the parking lot just north of the intersection of John Street and 1st Street

Data Summary Report

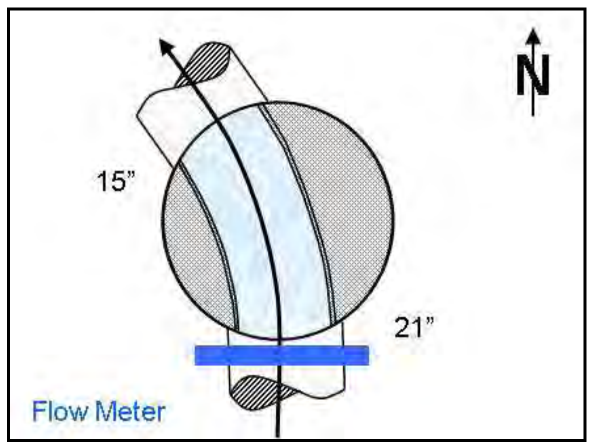
MH 57
Site Information Report

Location:	In the parking lot just north of the intersection of John Street and 1st Street
Coordinates:	122.2669° W, 38.0378° N
Rim Elevation:	11 feet
Diameter:	21 inches
Baseline Flow:	0.25 mgd
Peak Measured Flow:	1.075 mgd

Satellite Map



Sanitary Map



Flow Sketch


Street View Photo

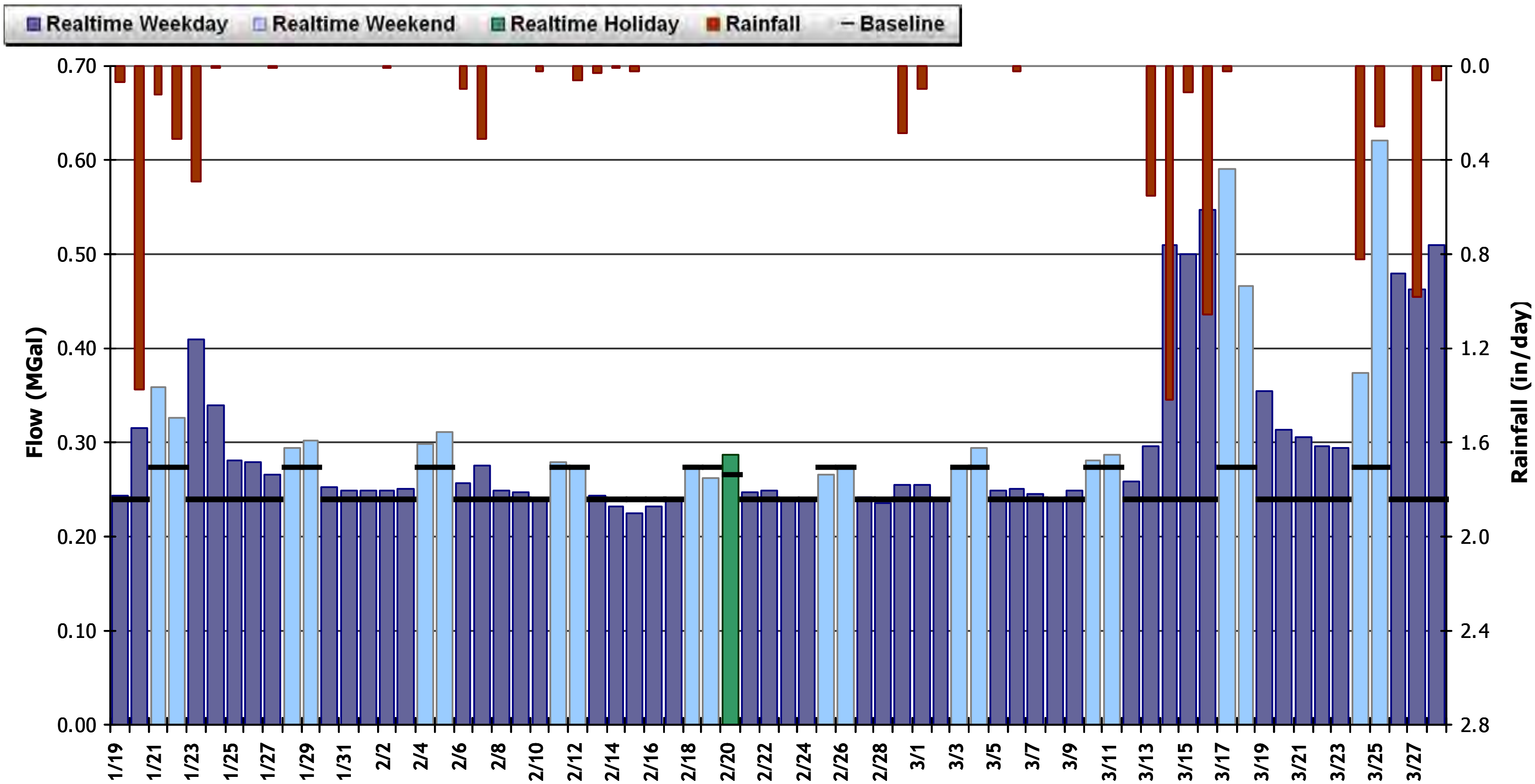

Plan View Photo

MH 57

Period Flow Summary: Daily Flow Totals

Avg Daily Flow: 0.305 MGal **Peak Daily Flow: 0.62 MGal** **Min Daily Flow: 0.224 MGal**

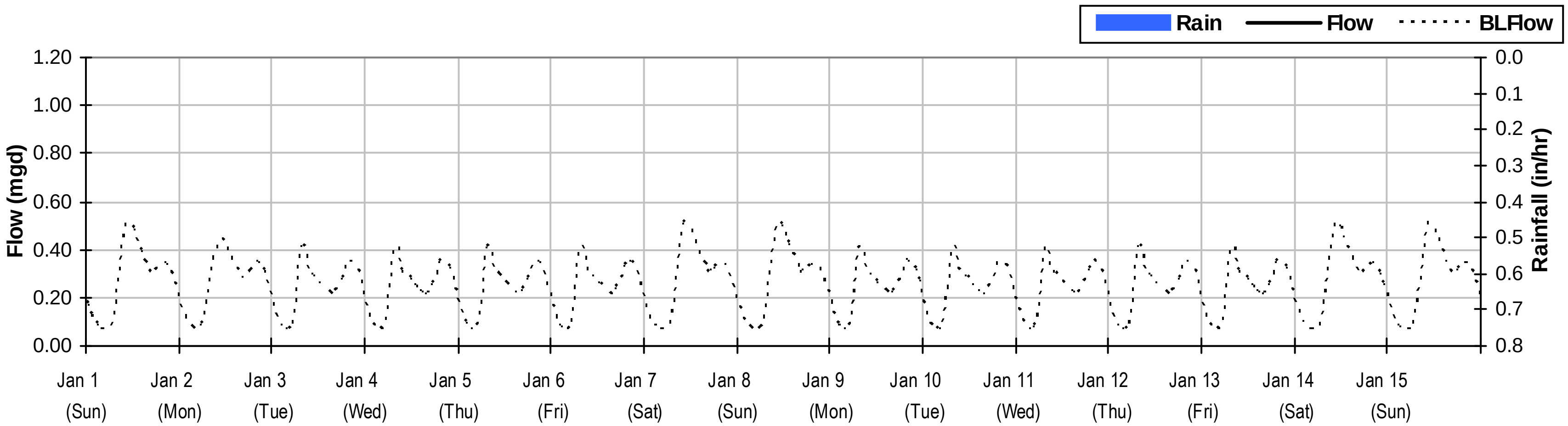
Total Period Rainfall: 8.63 inches

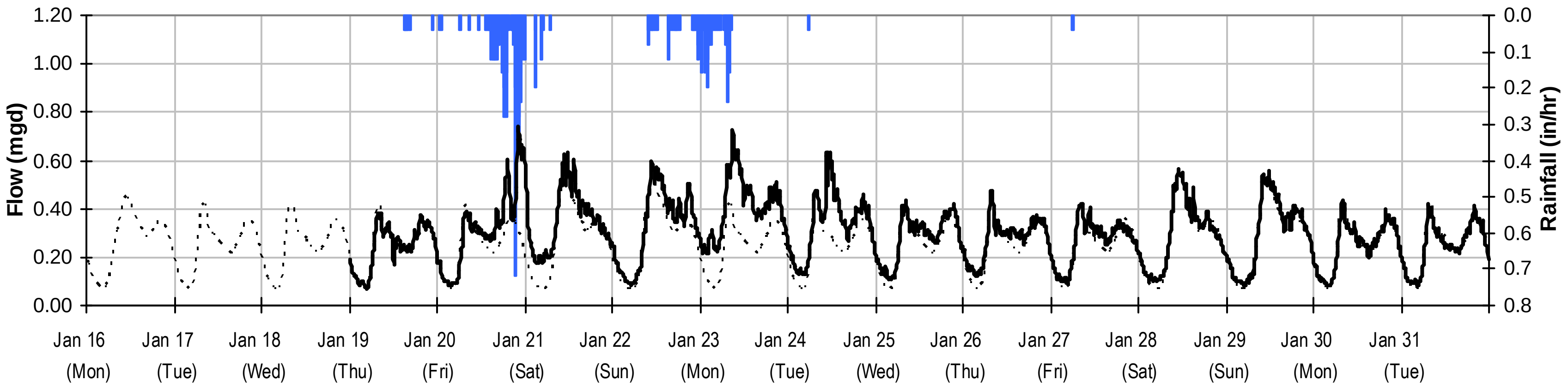


MH 57

Monthly Flow Summary: January, 2012

Total Monthly Rainfall: 2.38 inches   Avg Flow: 0.302 mgd   Peak Flow: 0.745 mgd   Min Flow: 0.073 mgd

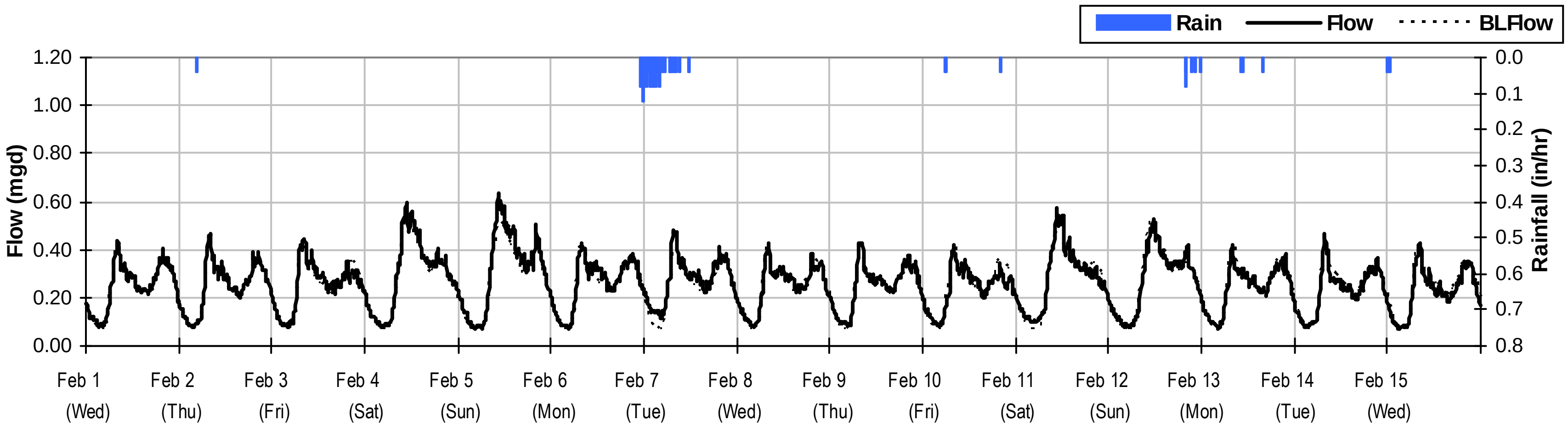


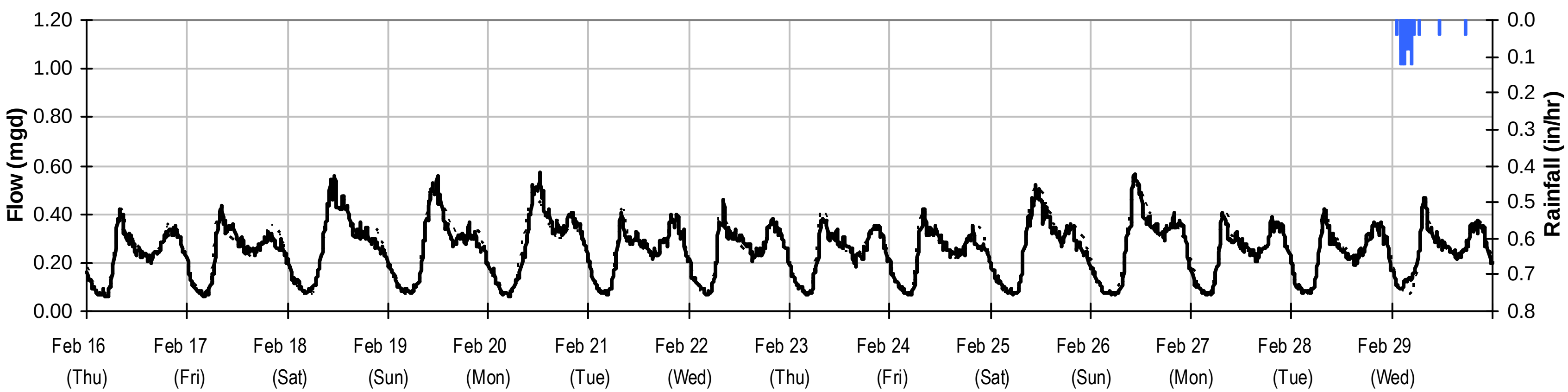


MH 57

Monthly Flow Summary: February, 2012

Total Monthly Rainfall: 0.85 inches   Avg Flow: 0.256 mgd   Peak Flow: 0.635 mgd   Min Flow: 0.061 mgd

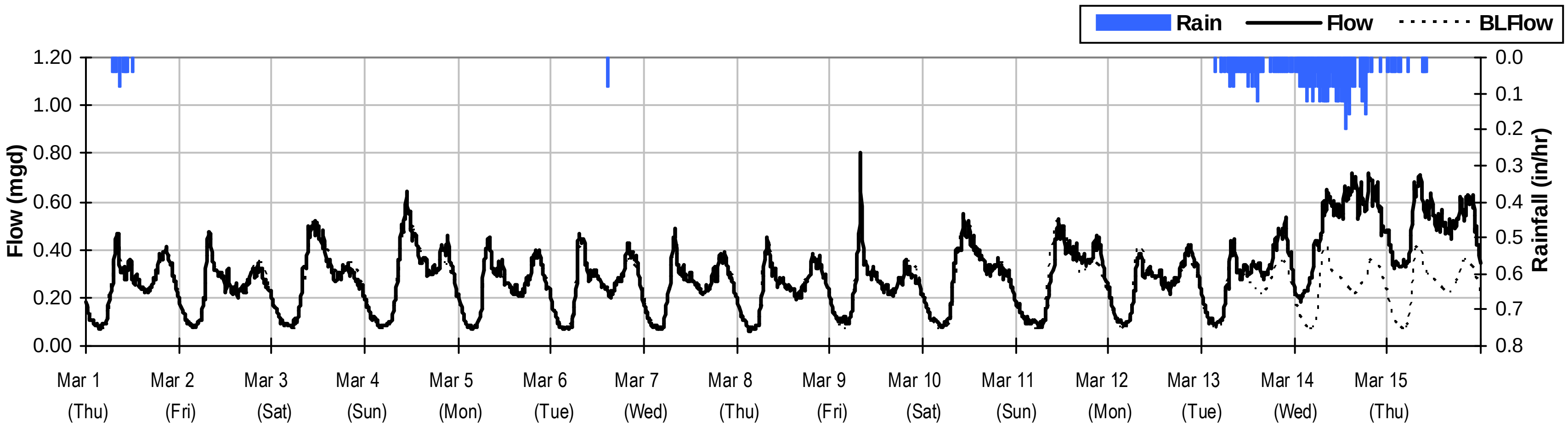


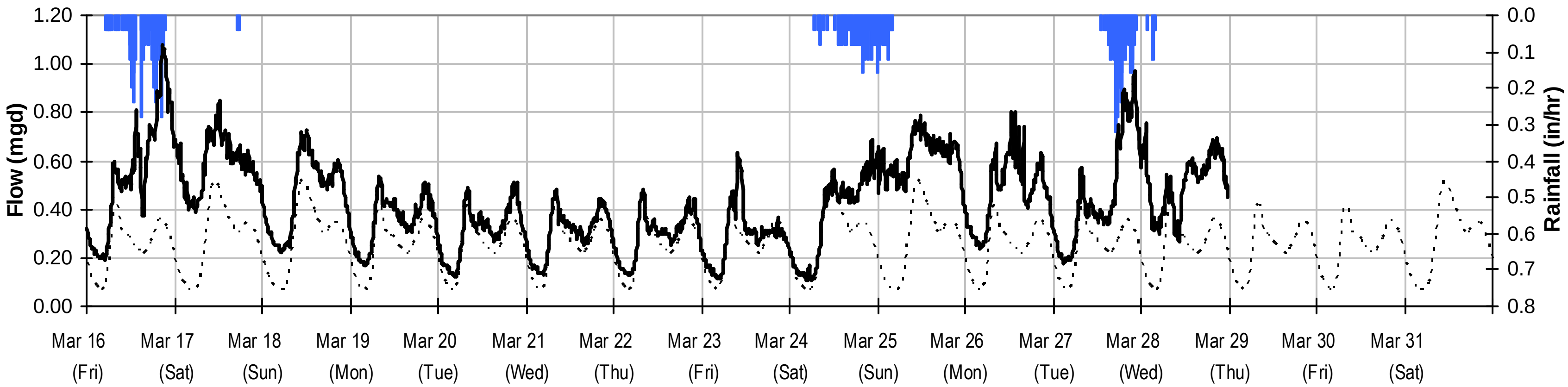


MH 57

Monthly Flow Summary: March, 2012

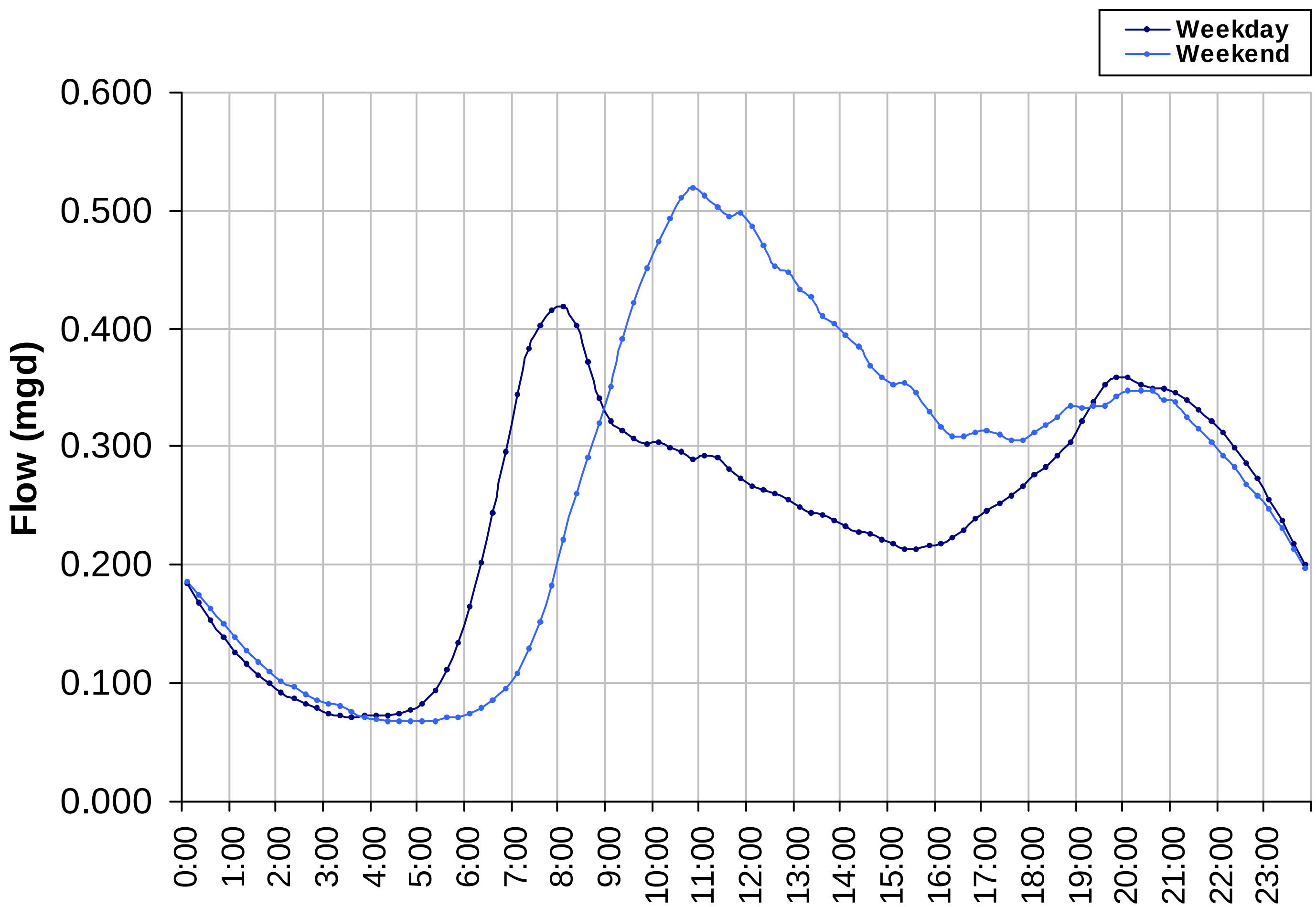
Total Monthly Rainfall: 5.4 inches   Avg Flow: 0.359 mgd   Peak Flow: 1.075 mgd   Min Flow: 0.063 mgd





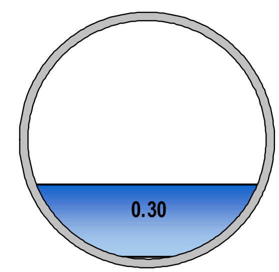
MH 57

Baseline Flow Hydrographs



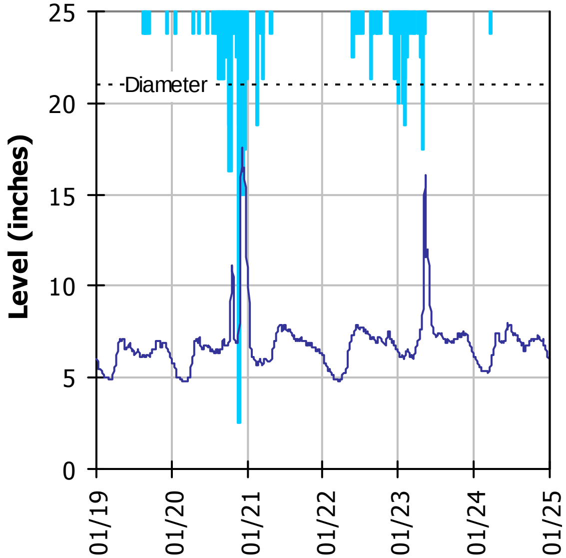
Baseline Flow:

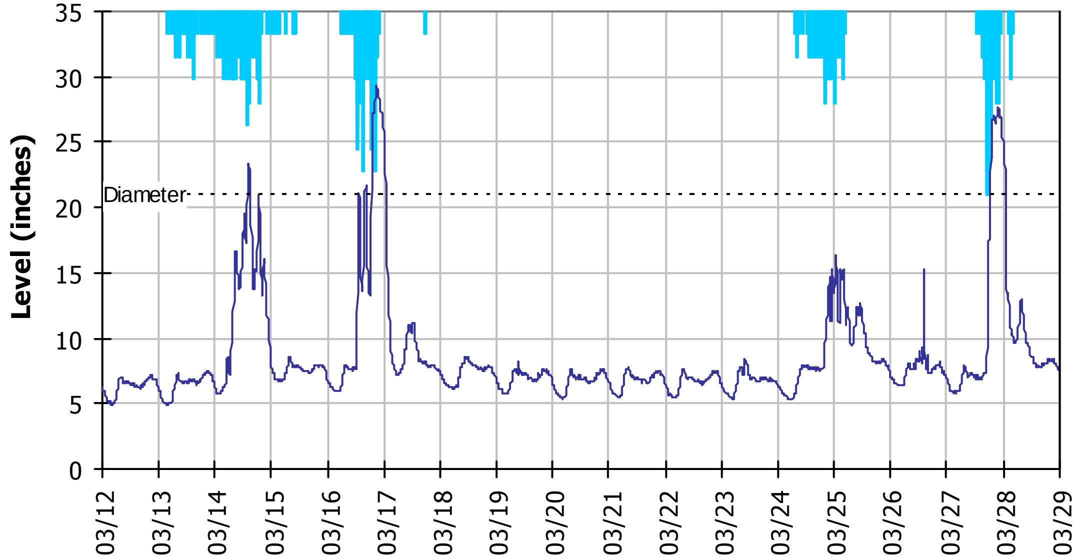
0.250 *mgd*

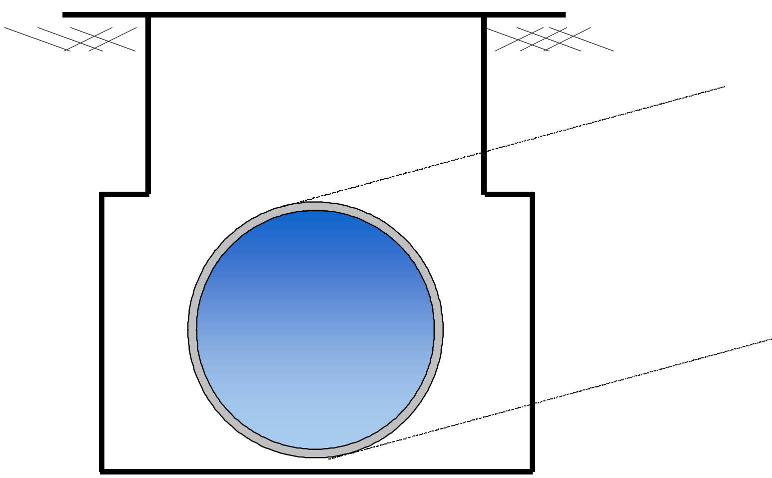


MH 57
Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Monitoring Period







Pipe Diameter: 21 *inches*

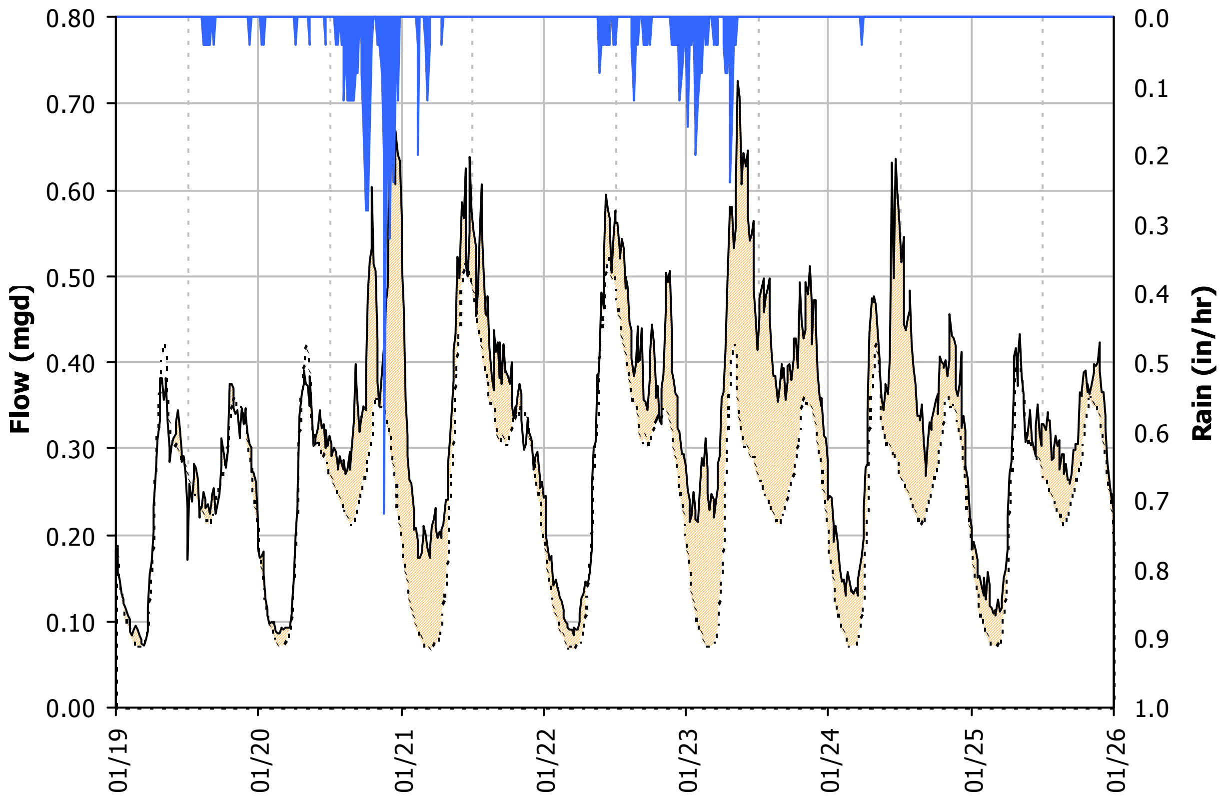
Peak Measured Level: 29.3 *inches*

Peak d/D Ratio: 1.40

Surcharged 8.3 inches over crown

MH 57
I/I Summary: Event 1

Event 1 Detail Graph



Storm Event I/I Analysis (Rain = 2.37 inches)

Inflow

Peak I/I Rate: 0.45 *mgd*

Pk I/I:ADWF: 1.78

Combined I/I

Total I/I: 528,000 *gallons*

Total I/I:ADWF: 0.89 *per in-rain*

RDI (infiltration)

Infiltration Rate: 0.041 *mgd*
(1/25/2012)

RDI (% of BL): 17%

Capacity

Peak Flow: 0.75 *mgd*

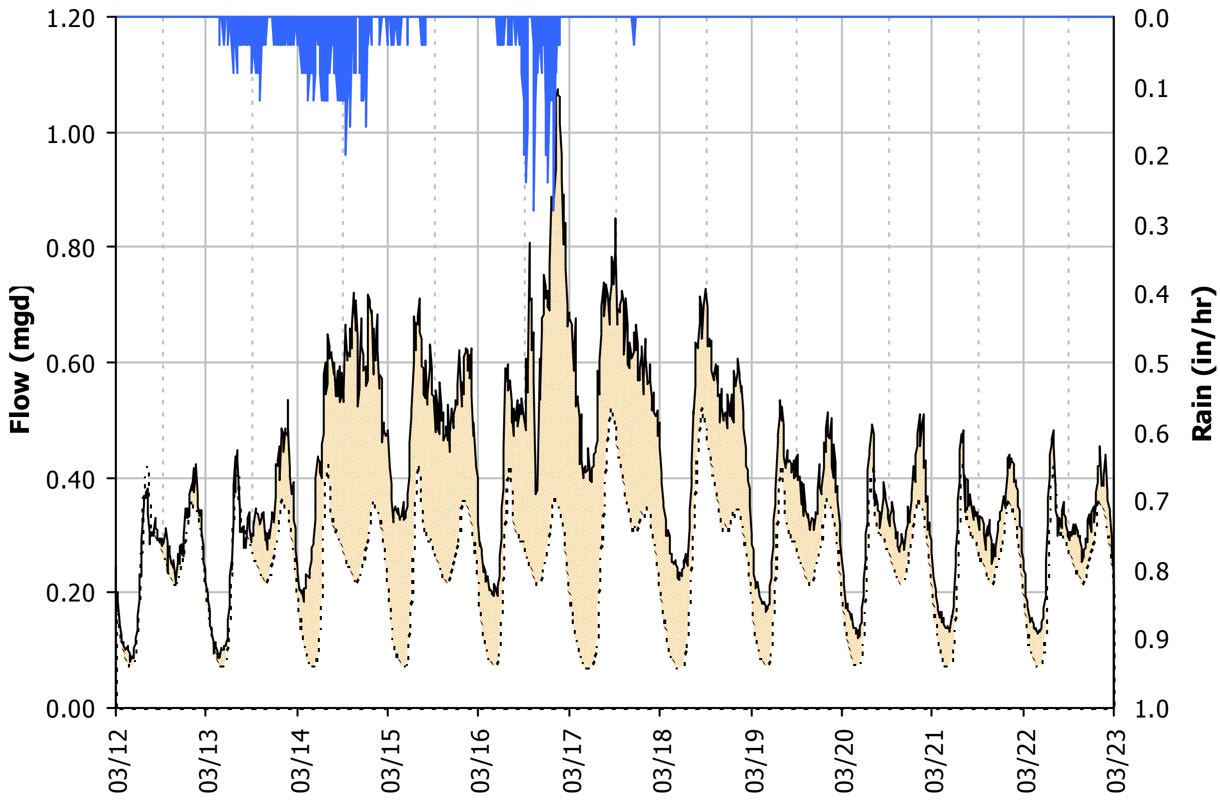
PF: 2.98

Peak Level: 17.47 *in*

d/D Ratio: 0.83

MH 57
I/I Summary: Event 2

Event 2 Detail Graph



Storm Event I/I Analysis (Rain = 3.16 inches)

Inflow

Peak I/I Rate: 0.73 *mgd*

Pk I/I:ADWF: 2.91

Combined I/I

Total I/I: 1,725,000 *gallons*

Total I/I:ADWF: 2.18 *per in-rain*

RDI (infiltration)

Infiltration Rate: 0.055 *mgd*
(3/22/2012)

RDI (% of BL): 23%

Capacity

Peak Flow: 1.08 *mgd*

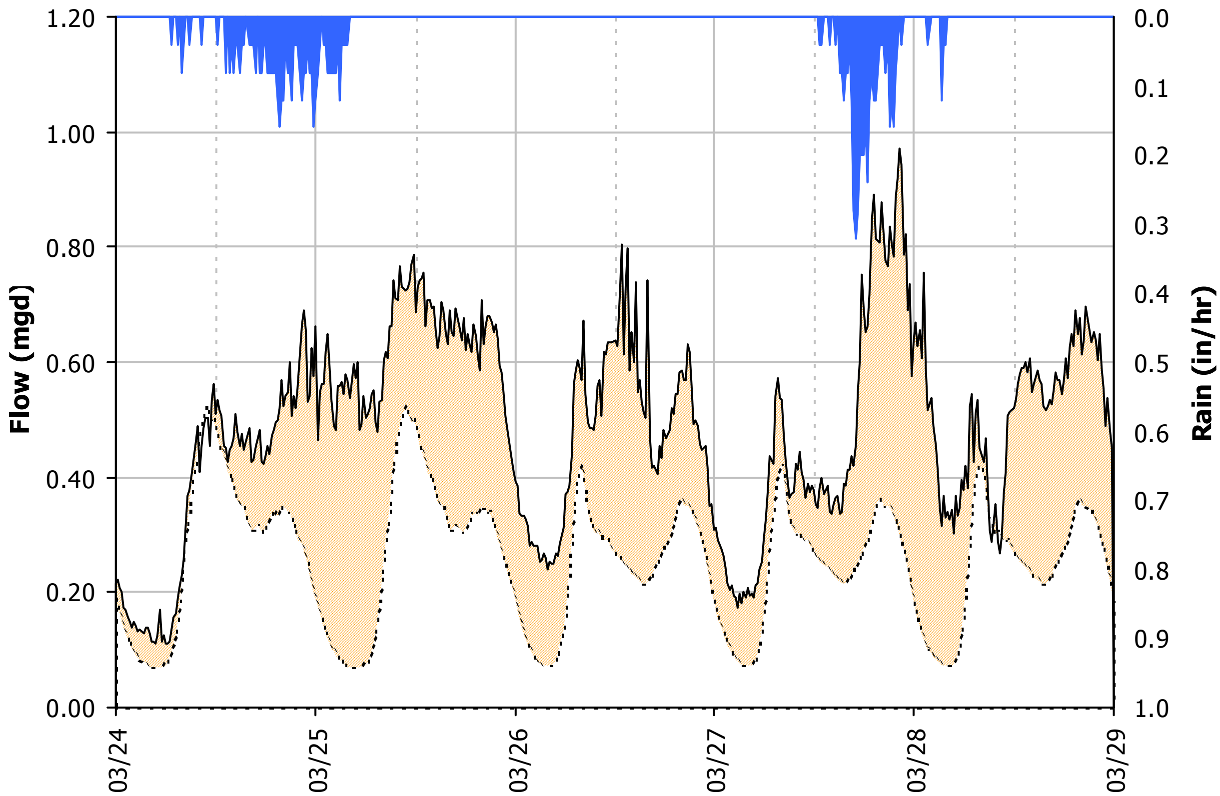
PF: 4.30

Peak Level: 29.30 *in*

d/D Ratio: 1.40

MH 57
I/I Summary: Event 3

Event 3 Detail Graph



Storm Event I/I Analysis (Rain = 2.12 inches)

Inflow

Peak I/I Rate: 0.67 *mgd*

Pk I/I:ADWF: 2.68

Combined I/I

Total I/I: 1,175,000 *gallons*

Total I/I:ADWF: 2.22 *per in-rain*

RDI (infiltration)

Infiltration Rate: 0.310 *mgd*
(3/28/2012 12:00:00 PM)

RDI (% of BL): 115%

Capacity

Peak Flow: 0.97 *mgd*

PF: 3.88

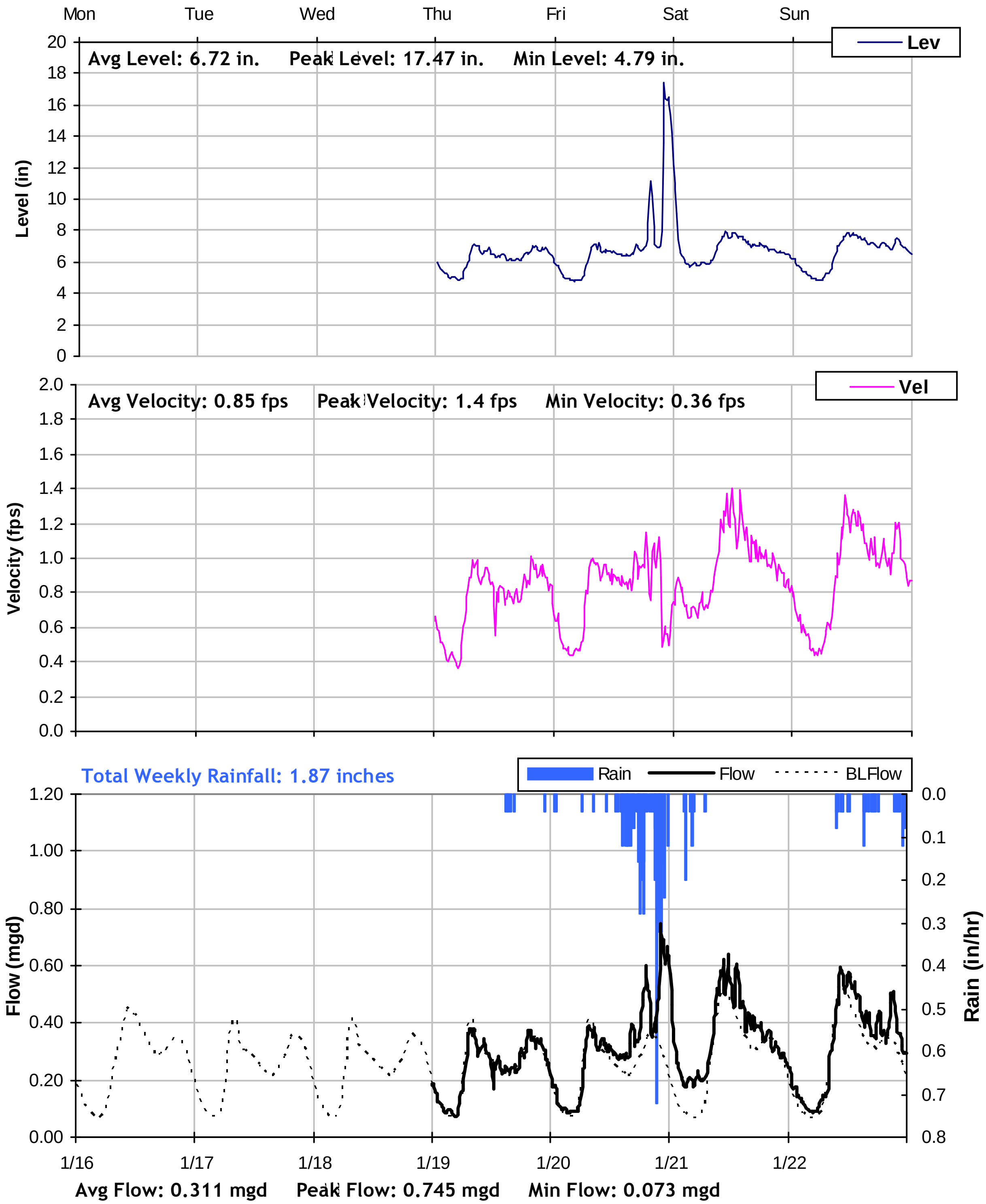
Peak Level: 27.74 *in*

d/D Ratio: 1.32

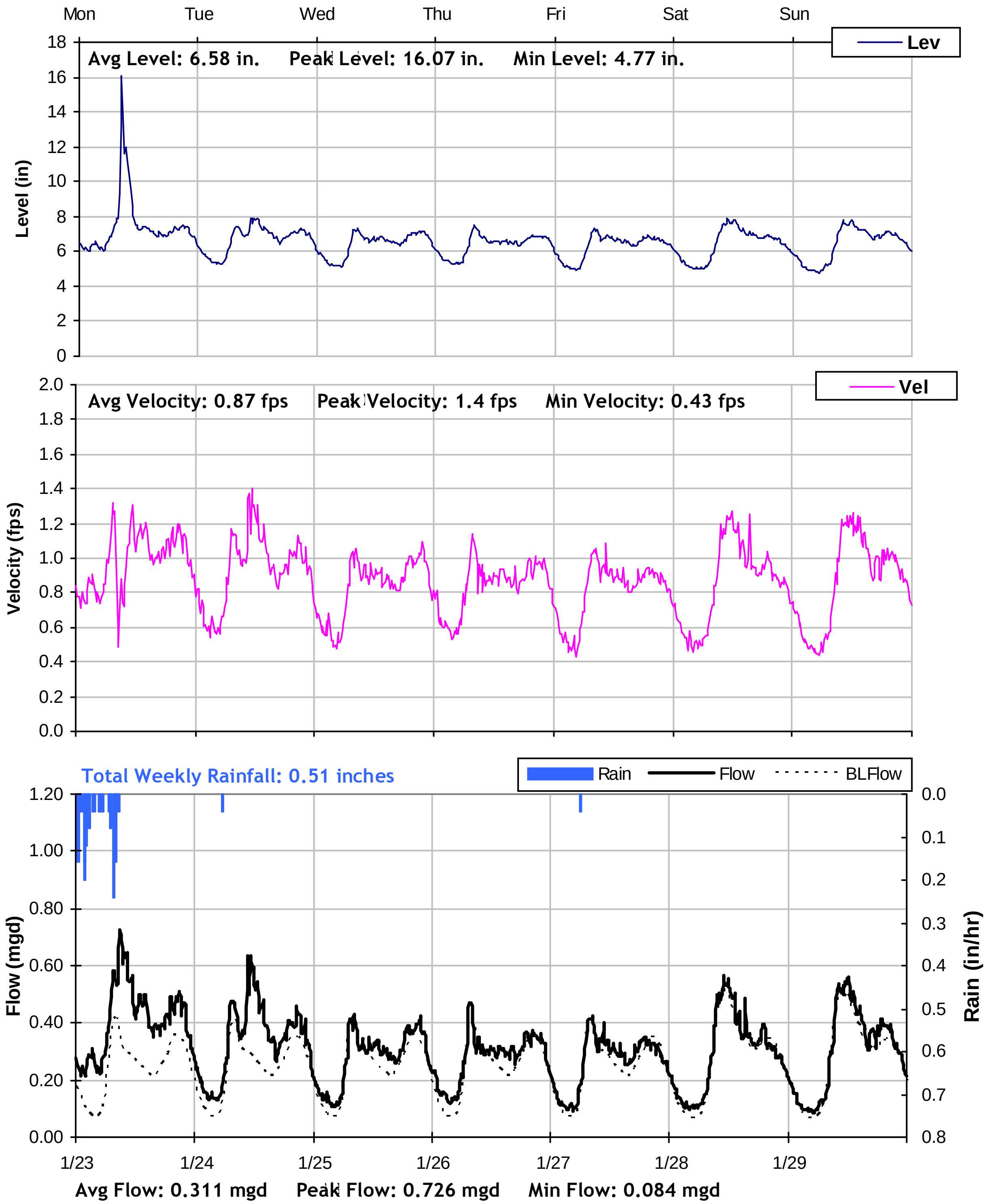
MH 57

Weekly Level, Velocity and Flow Hydrographs

1/16/2012 to 1/23/2012



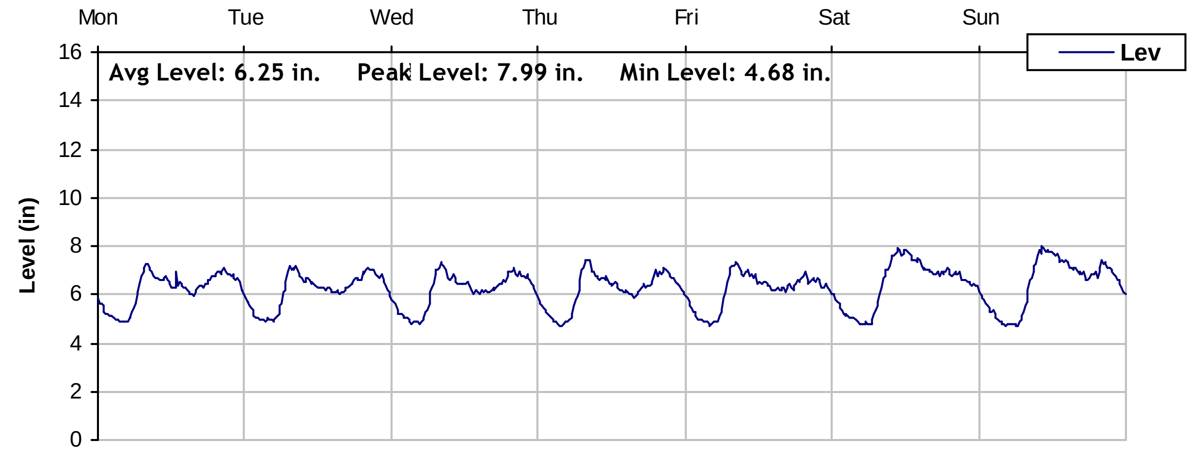
MH 57
Weekly Level, Velocity and Flow Hydrographs
1/23/2012 to 1/30/2012

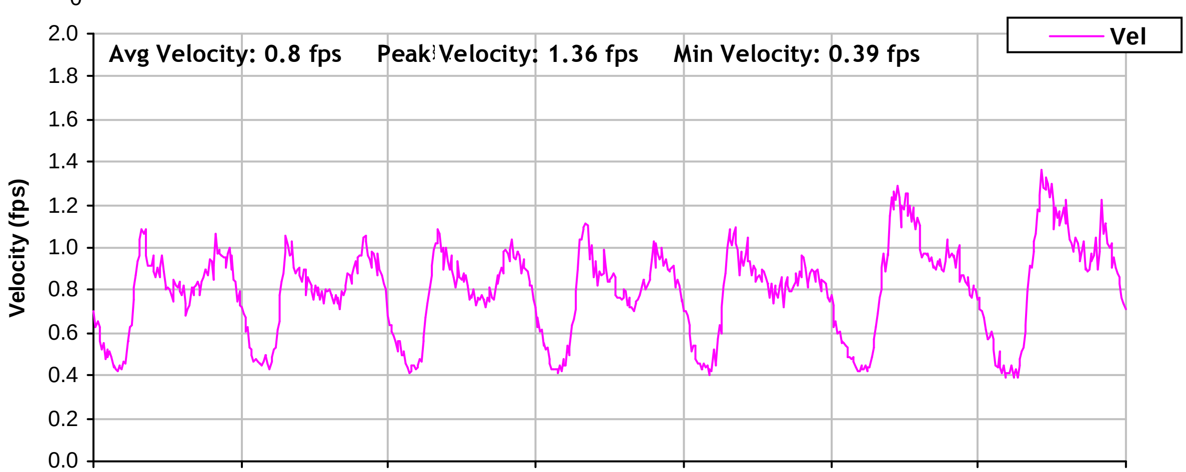


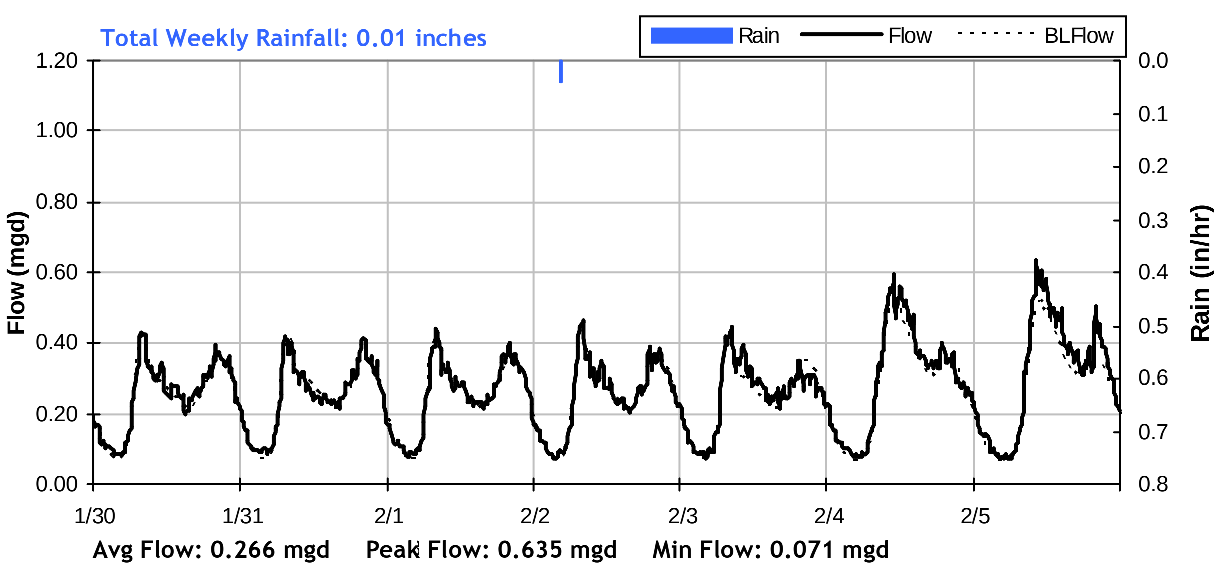
MH 57

Weekly Level, Velocity and Flow Hydrographs

1/30/2012 to 2/6/2012

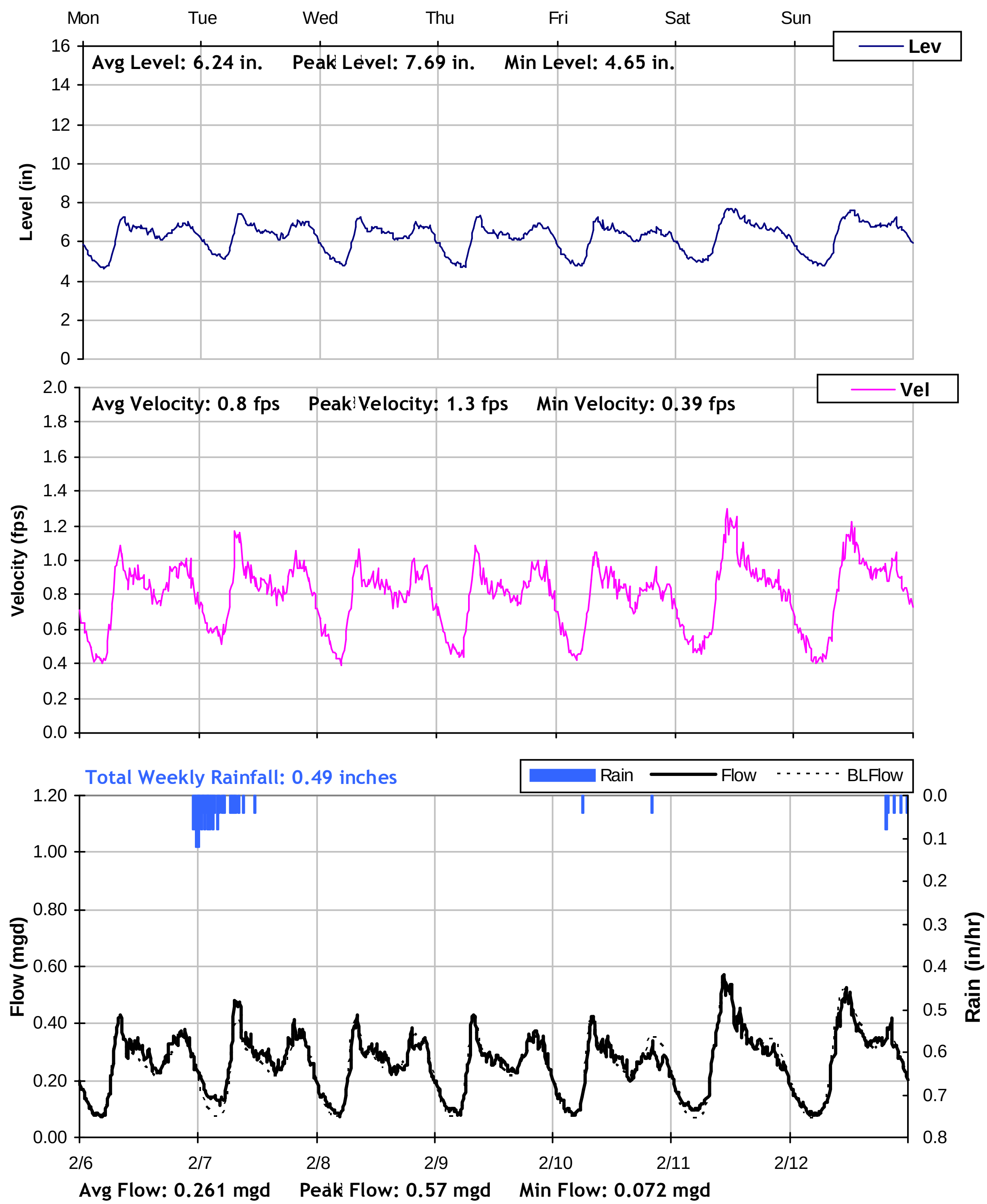




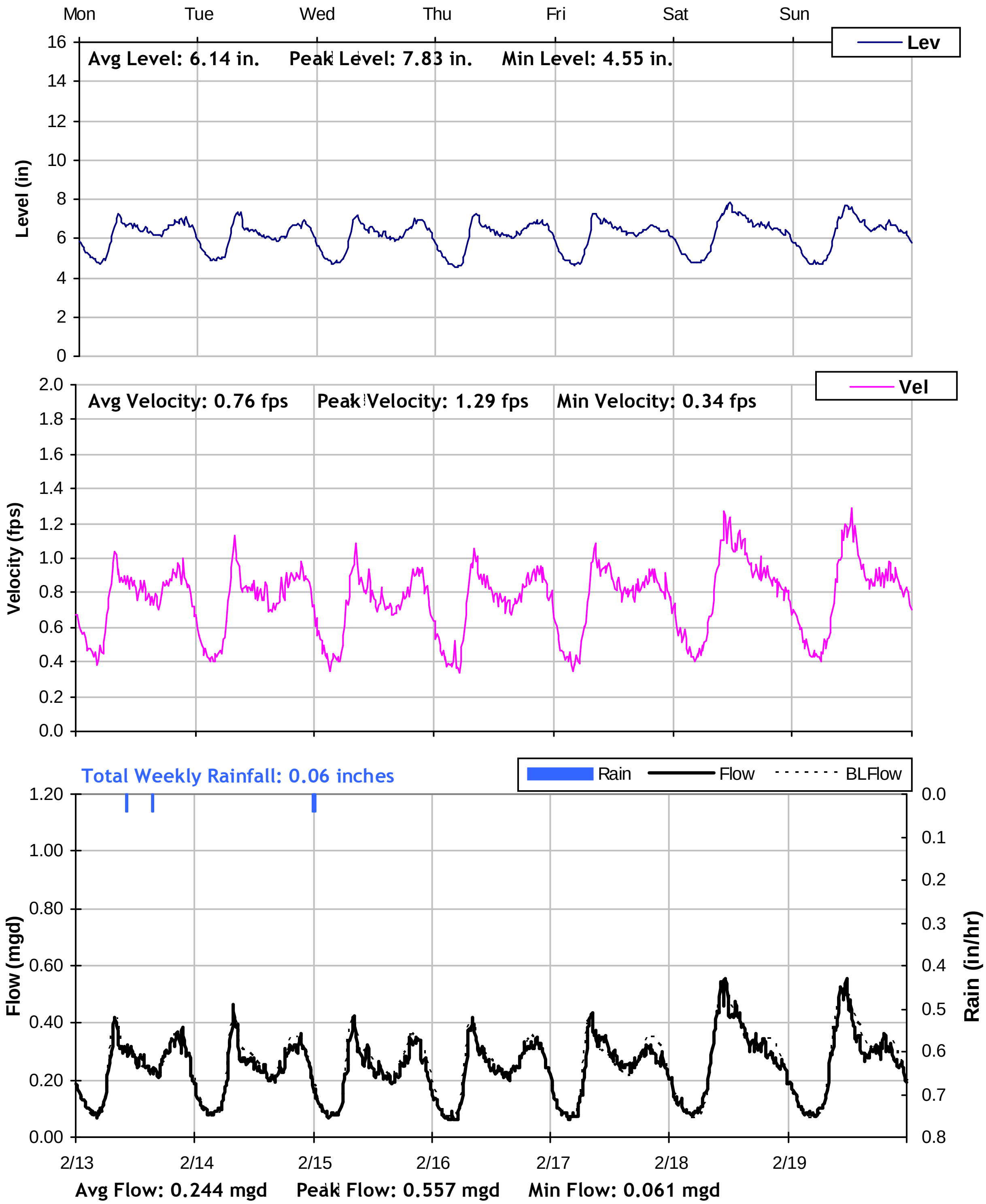


MH 57

Weekly Level, Velocity and Flow Hydrographs
2/6/2012 to 2/13/2012



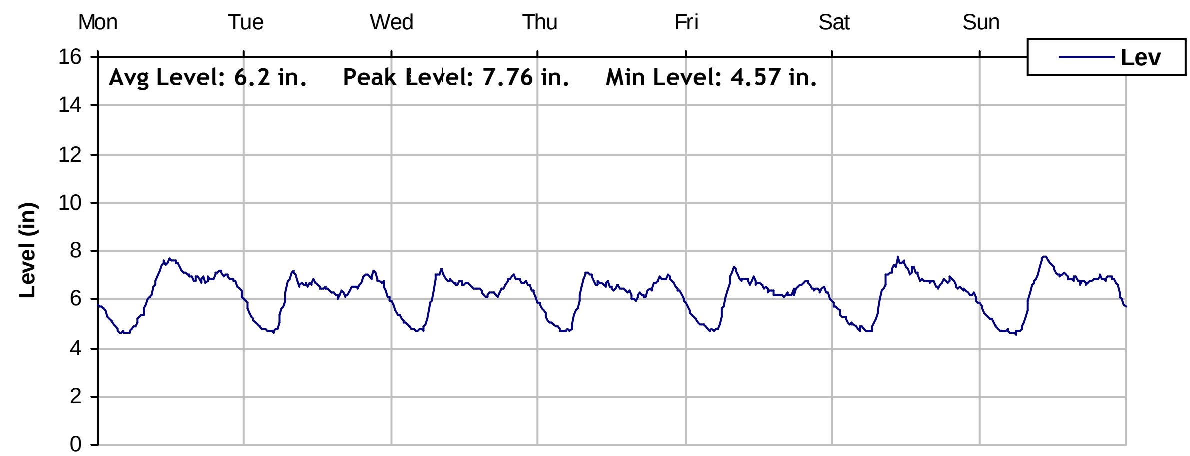
MH 57
Weekly Level, Velocity and Flow Hydrographs
2/13/2012 to 2/20/2012

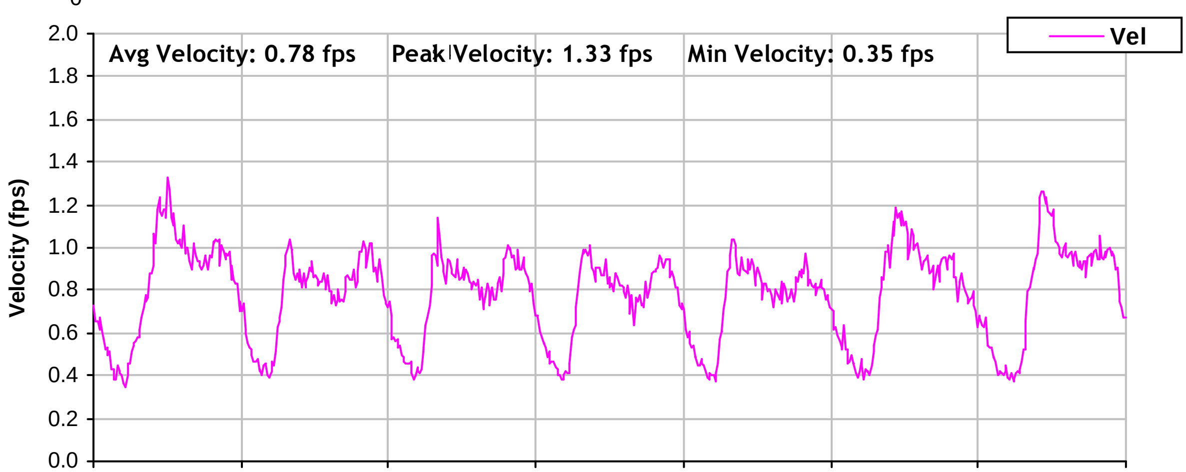


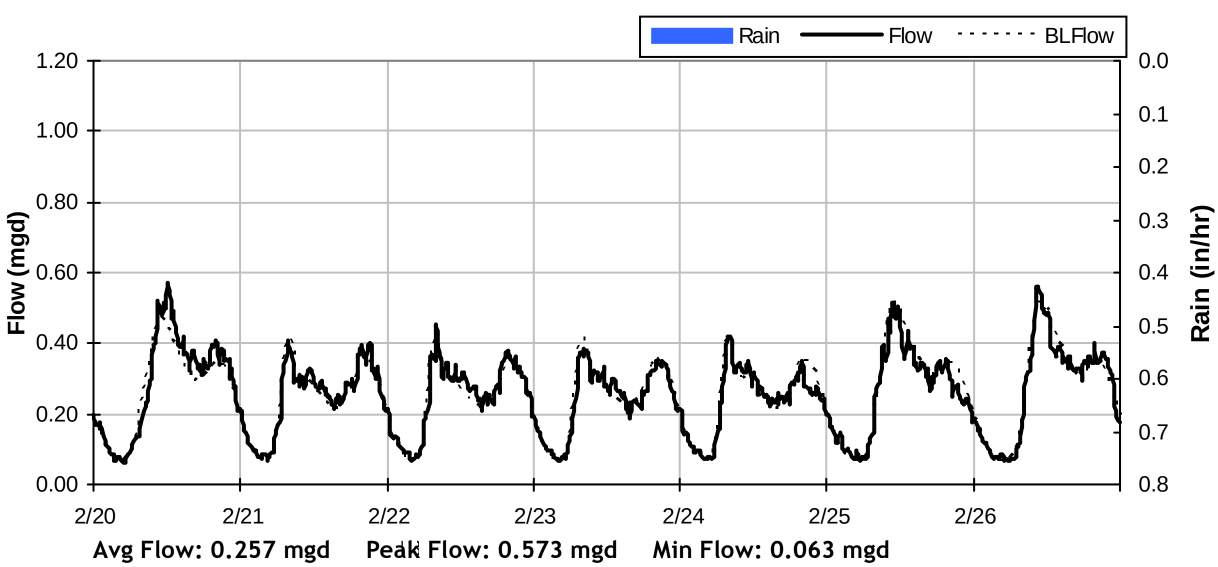
MH 57

Weekly Level, Velocity and Flow Hydrographs

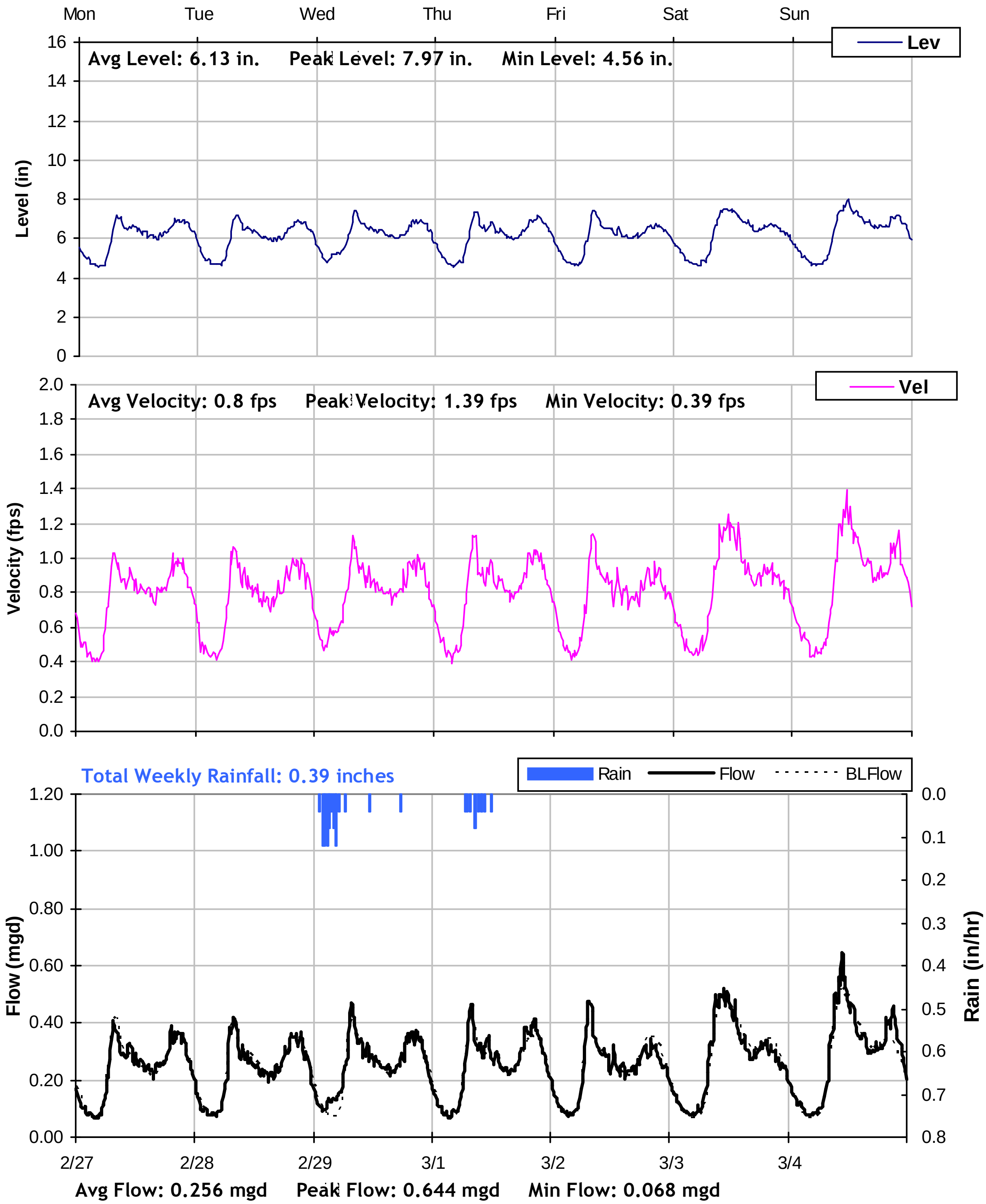
2/20/2012 to 2/27/2012





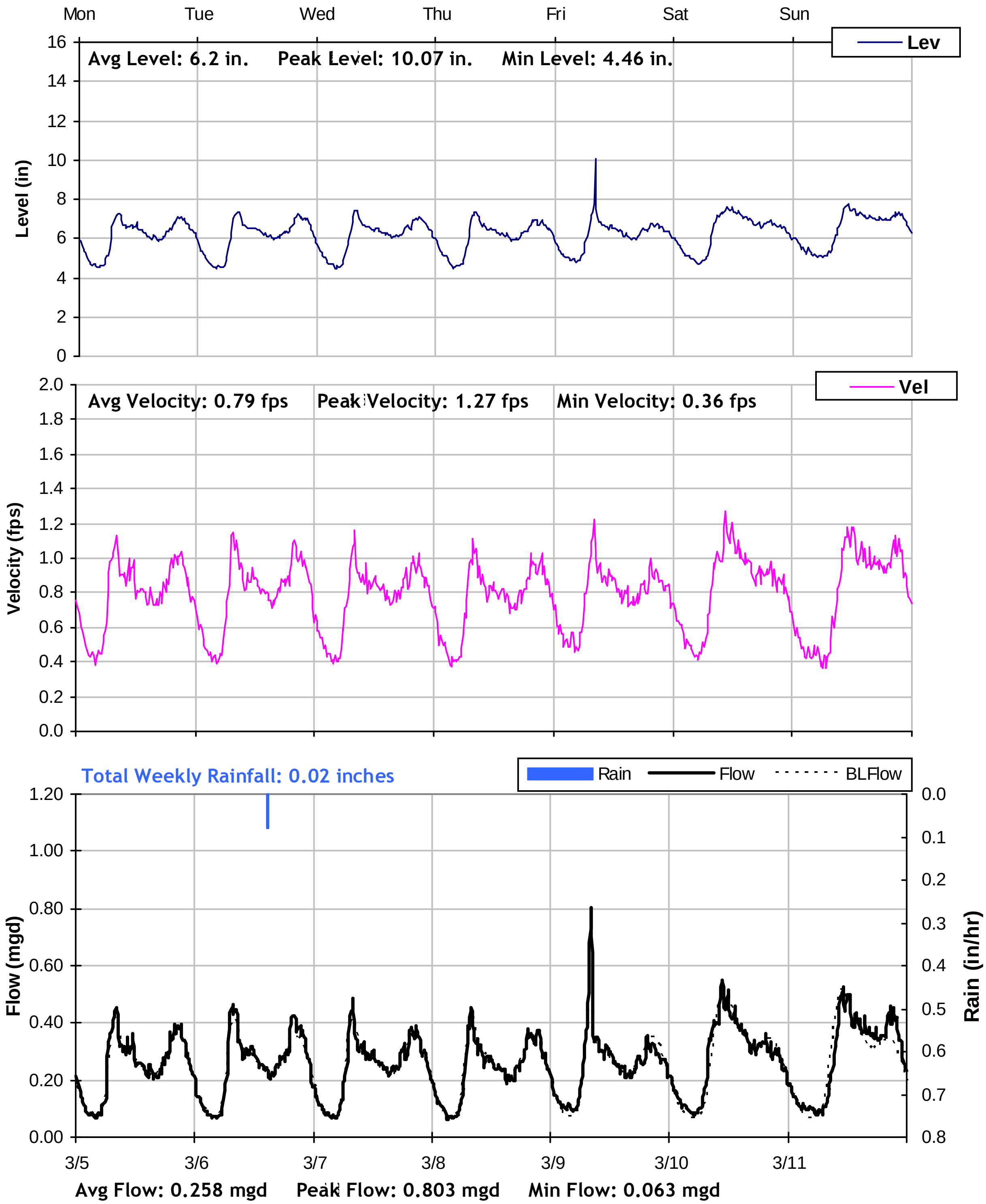


MH 57
Weekly Level, Velocity and Flow Hydrographs
2/27/2012 to 3/5/2012

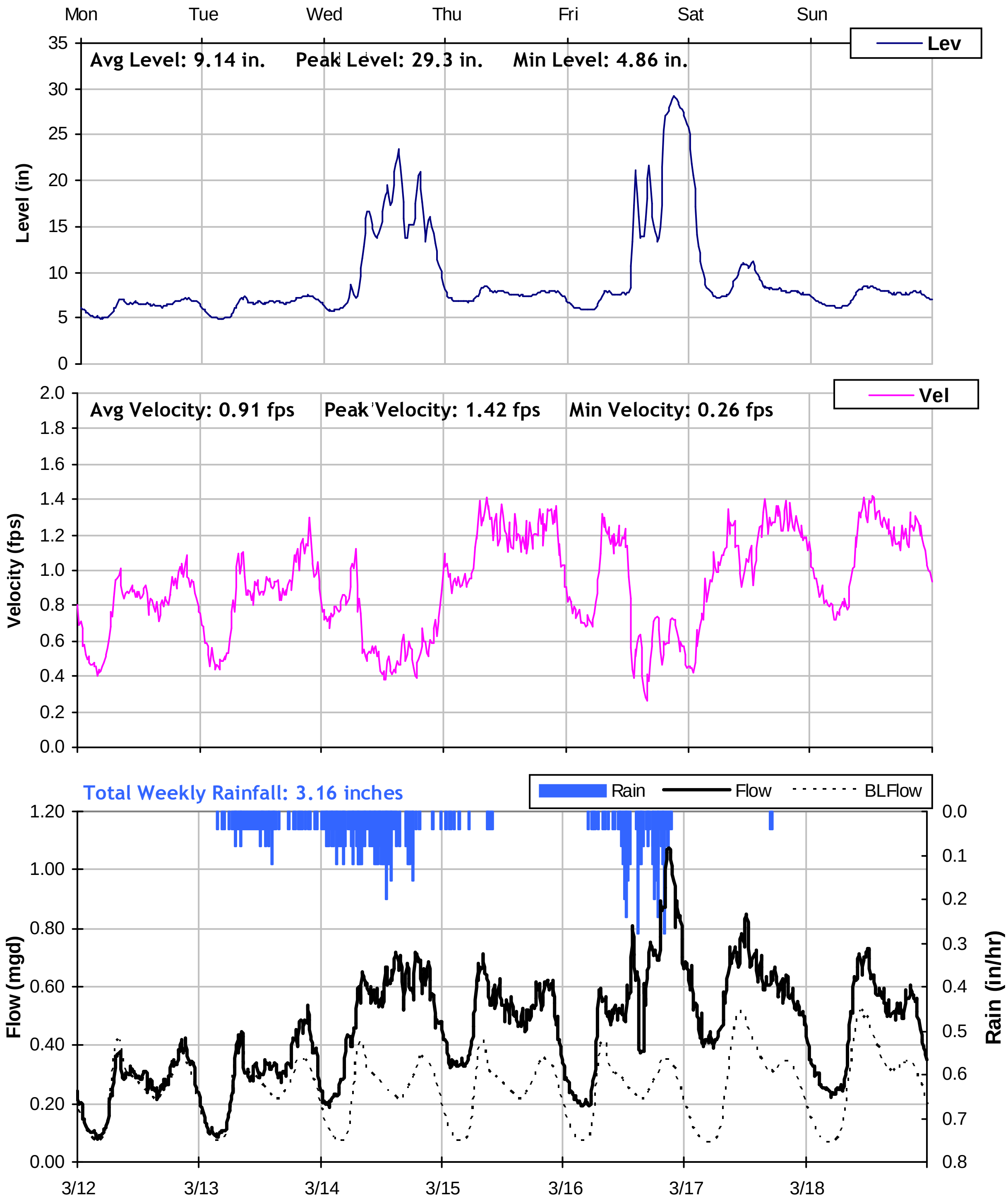


MH 57

Weekly Level, Velocity and Flow Hydrographs
3/5/2012 to 3/12/2012

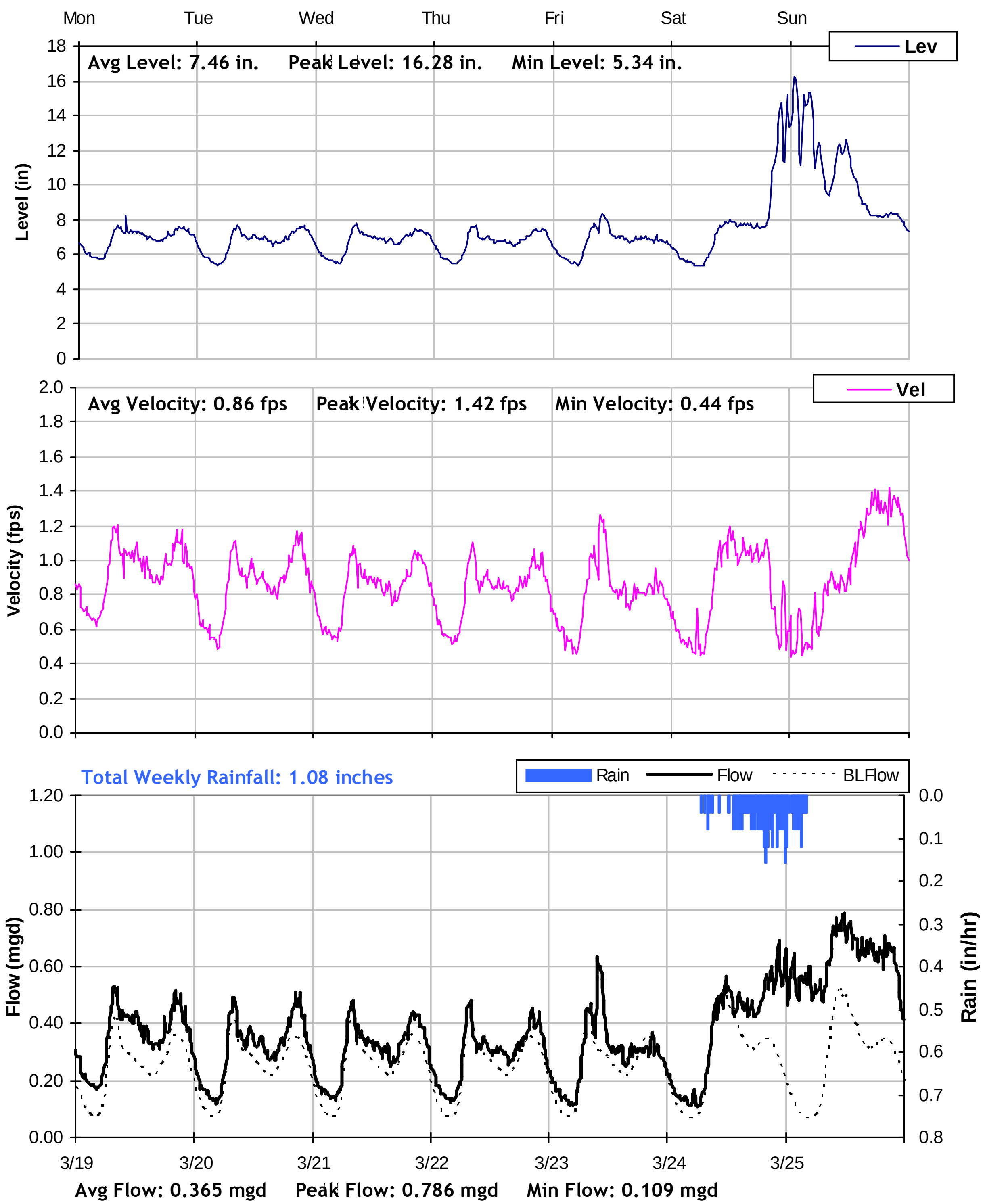


MH 57
Weekly Level, Velocity and Flow Hydrographs
3/12/2012 to 3/19/2012

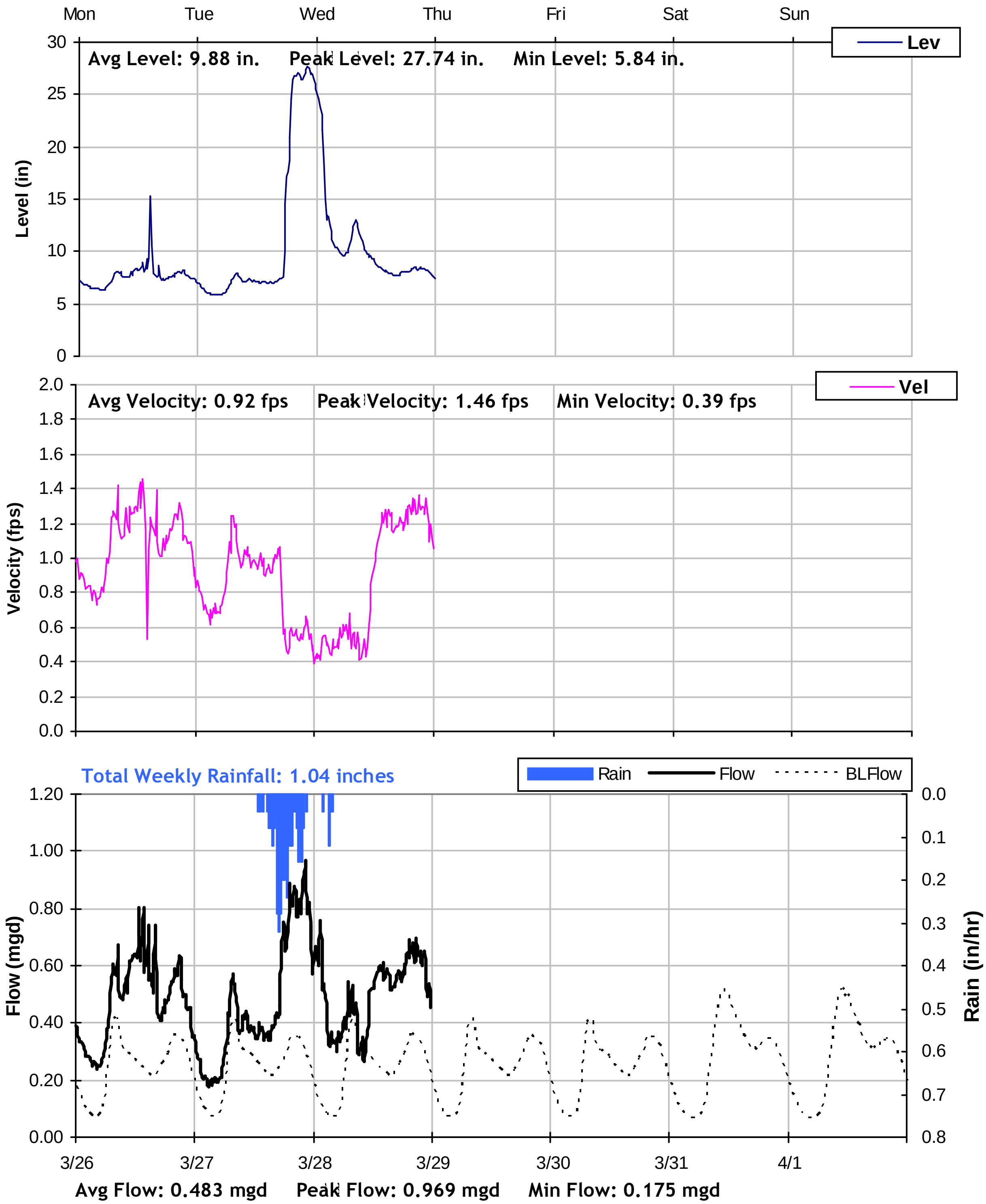


Avg Flow: 0.453 mgd **Peak Flow: 1.075 mgd** **Min Flow: 0.081 mgd**

MH 57
Weekly Level, Velocity and Flow Hydrographs
3/19/2012 to 3/26/2012



MH 57
Weekly Level, Velocity and Flow Hydrographs
3/26/2012 to 4/2/2012



Rodeo Sanitary District

Master Plan Sanitary Sewer Flow Monitoring
Year 2011/2012

Monitoring Site: MH 83

Location: West deadend of Investment Street, west of Vaqueros Avenue

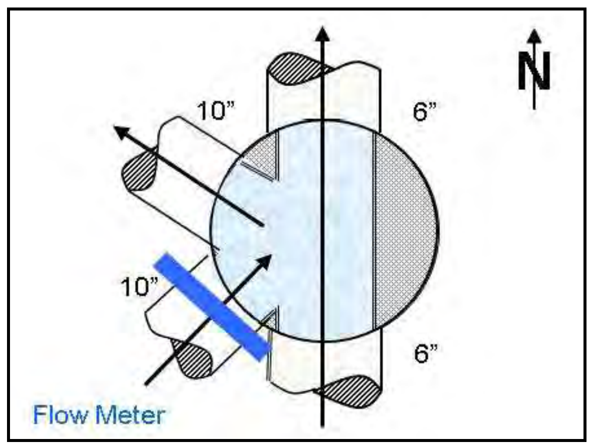
Data Summary Report

MH 83
Site Information Report

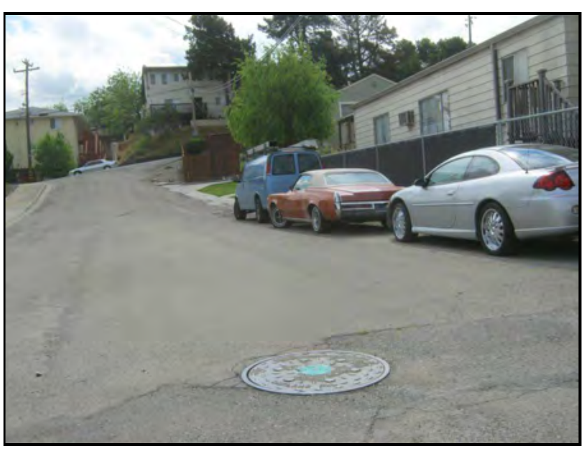
Location:	West deadend of Investment Street, west of Vaqueros Avenue
Coordinates:	122.2665°W, 38.0378°N
Rim Elevation:	10 feet
Diameter:	9.75 inches
Baseline Flow:	0.009 mgd
Peak Measured Flow:	0.418 mgd

Satellite Map

Sanitary Map



Flow Sketch



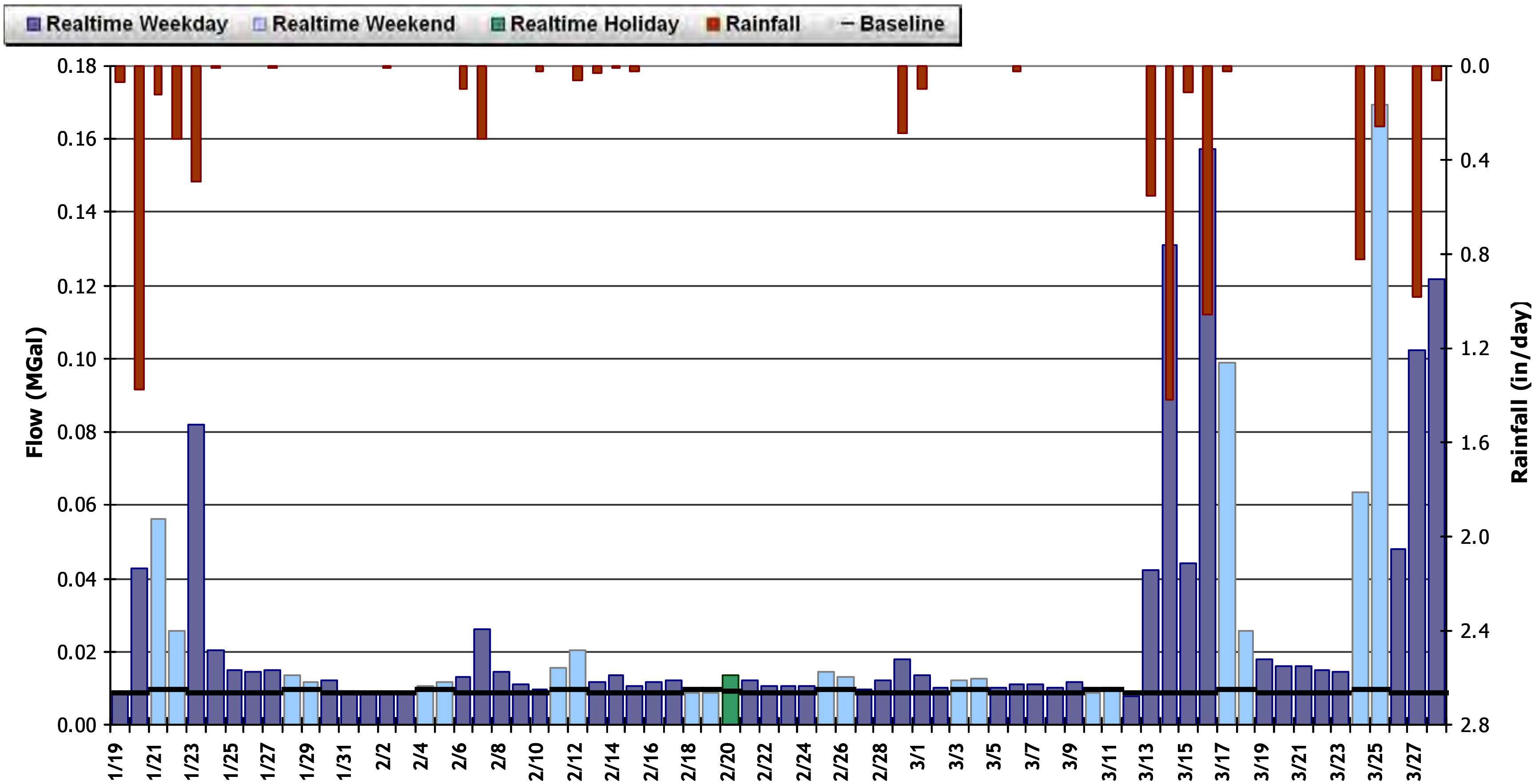
Street View Photo

Plan View Photo

MH 83
Period Flow Summary: Daily Flow Totals

Avg Daily Flow: 0.027 MGal **Peak Daily Flow: 0.169 MGal** **Min Daily Flow: 0.008 MGal**

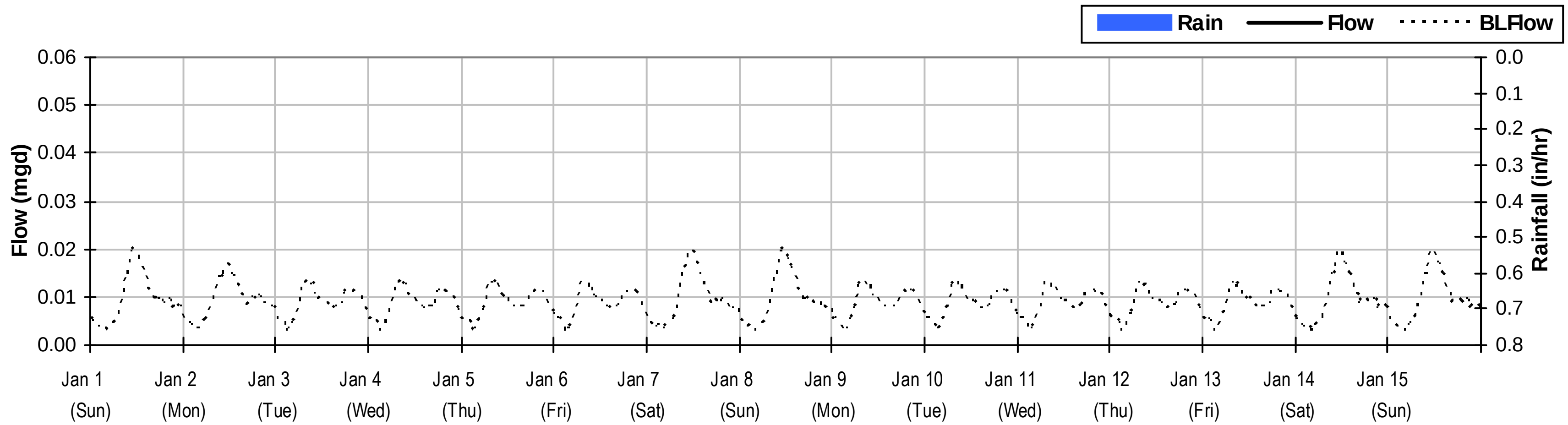
Total Period Rainfall: 8.63 inches

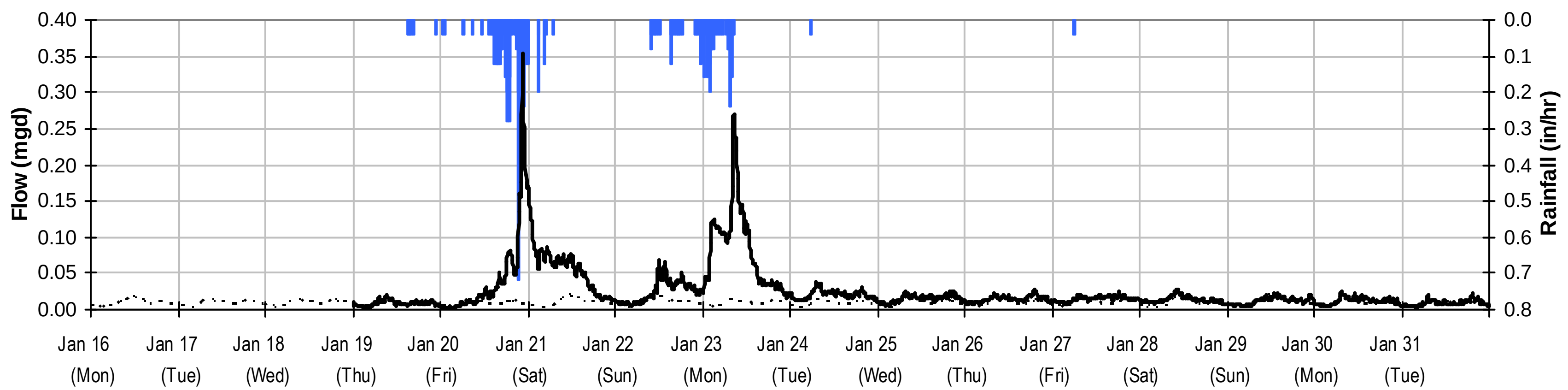


MH 83

Monthly Flow Summary: January, 2012

Total Monthly Rainfall: 2.38 inches **Avg Flow: 0.025 mgd** **Peak Flow: 0.351 mgd** **Min Flow: 0.003 mgd**

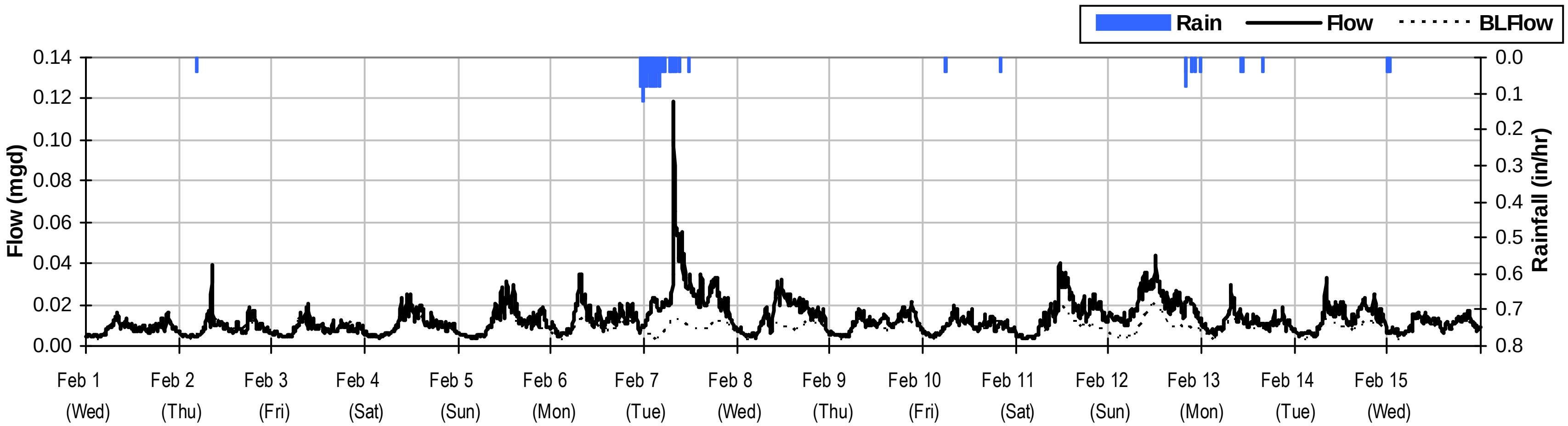


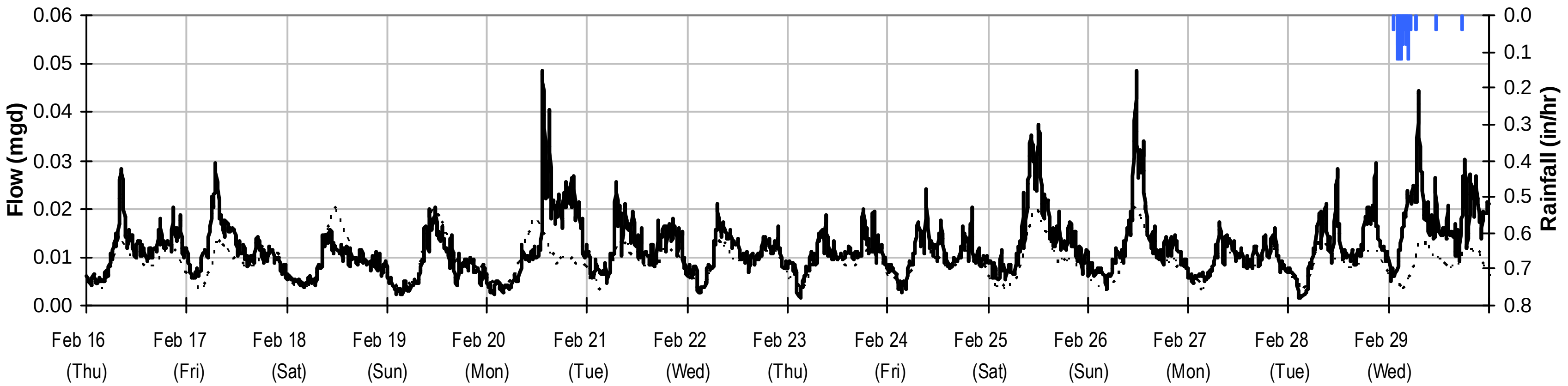


MH 83

Monthly Flow Summary: February, 2012

Total Monthly Rainfall: 0.85 inches   **Avg Flow: 0.012 mgd**   **Peak Flow: 0.119 mgd**   **Min Flow: 0.001 mgd**

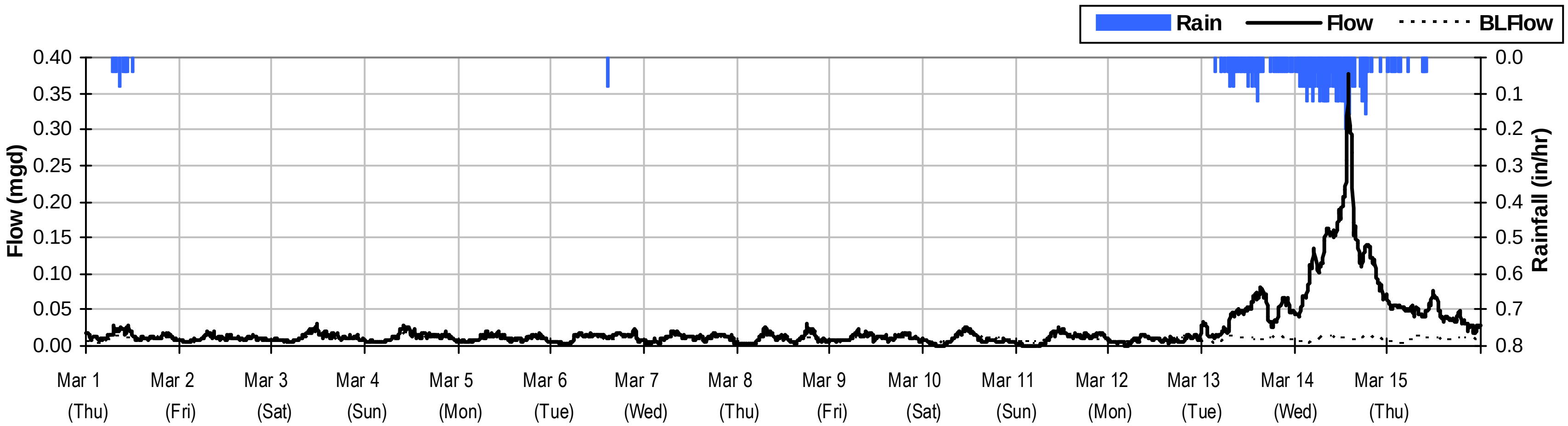


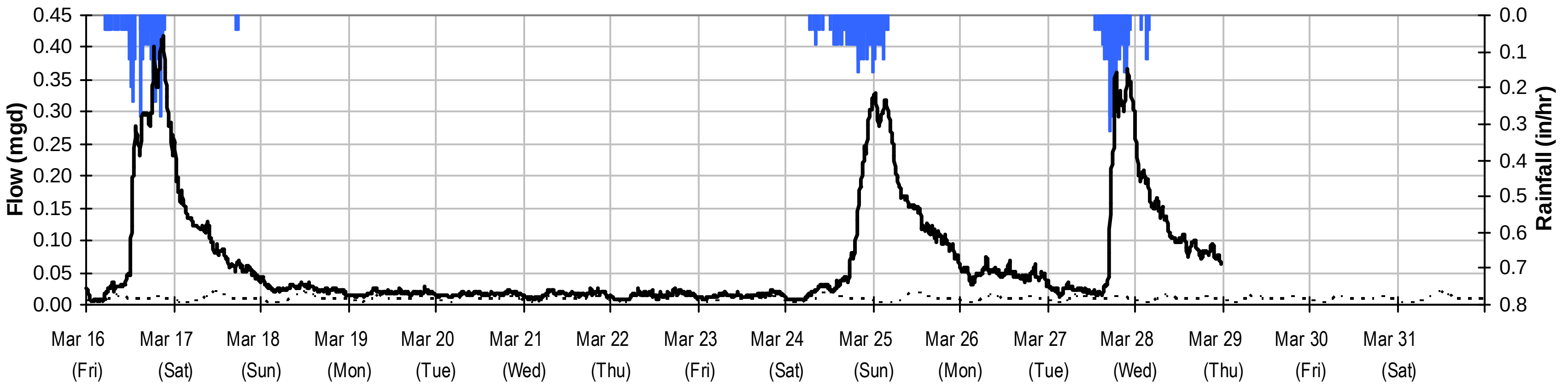


MH 83

Monthly Flow Summary: March, 2012

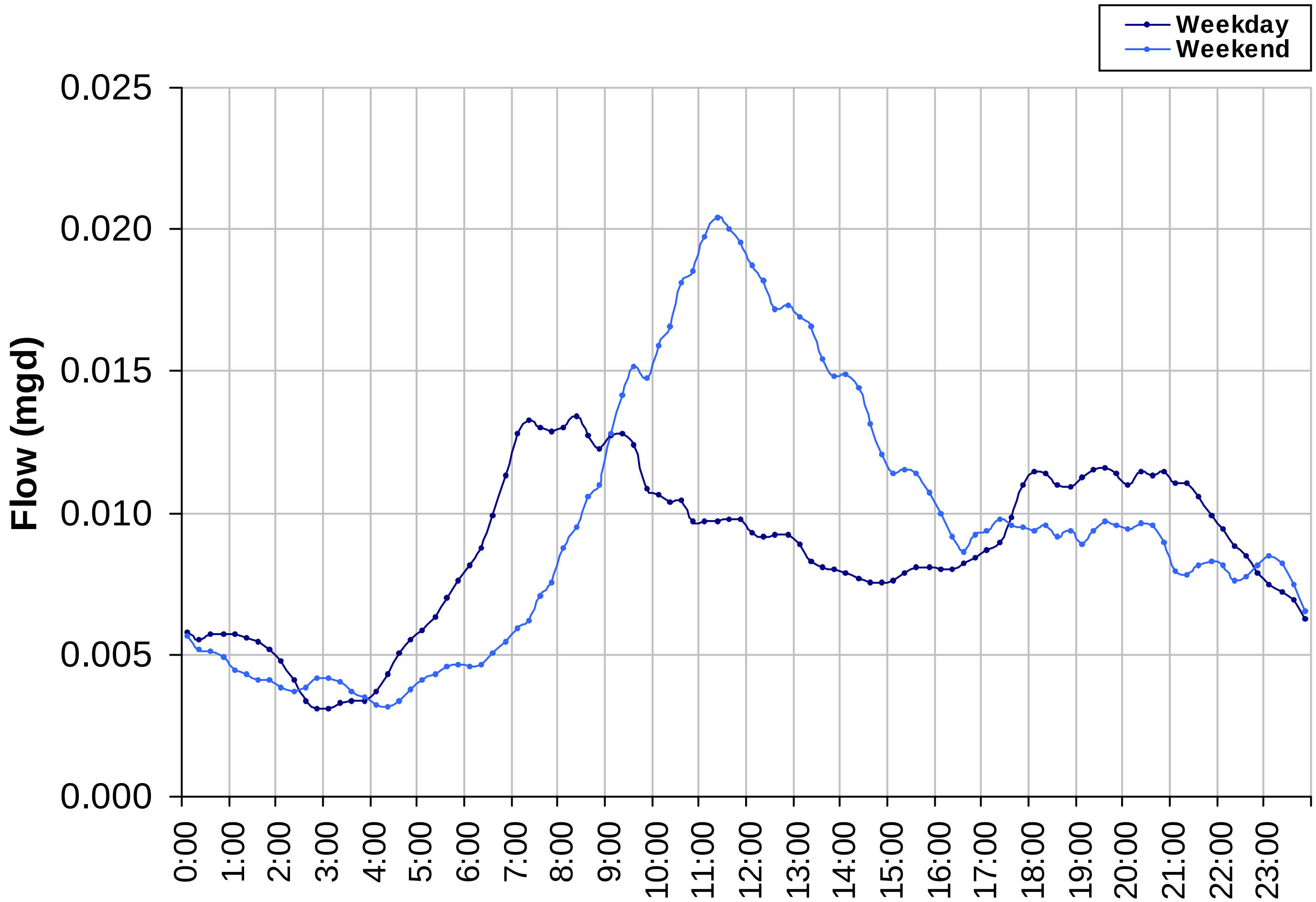
Total Monthly Rainfall: 5.4 inches **Avg Flow: 0.043 mgd** **Peak Flow: 0.418 mgd** **Min Flow: 0.001 mgd**





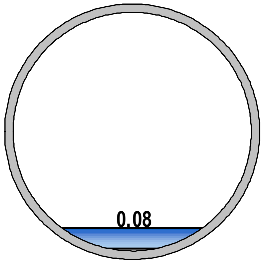
MH 83

Baseline Flow Hydrographs



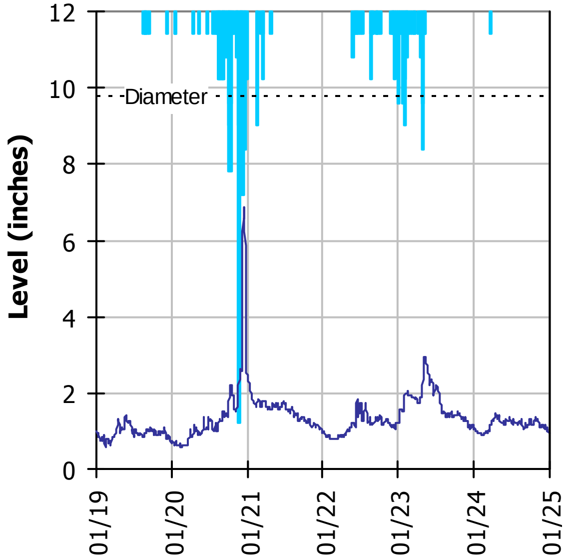
Baseline Flow:

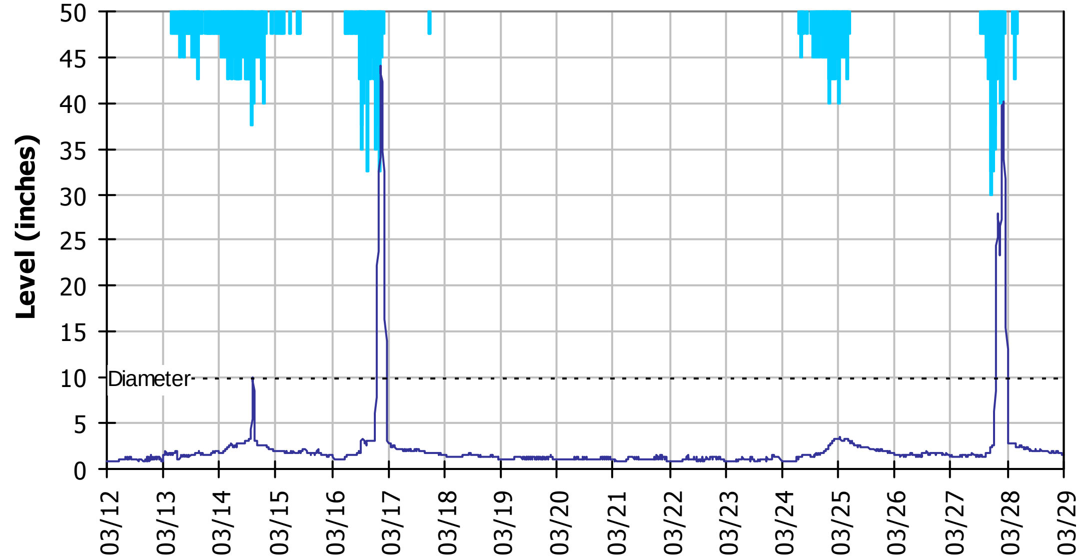
0.009 *mgd*

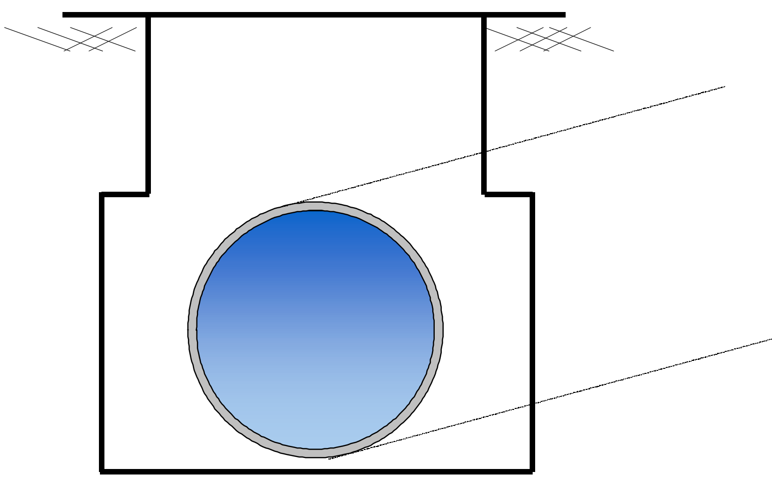


MH 83
Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Monitoring Period







Pipe Diameter: 9.75 *inches*

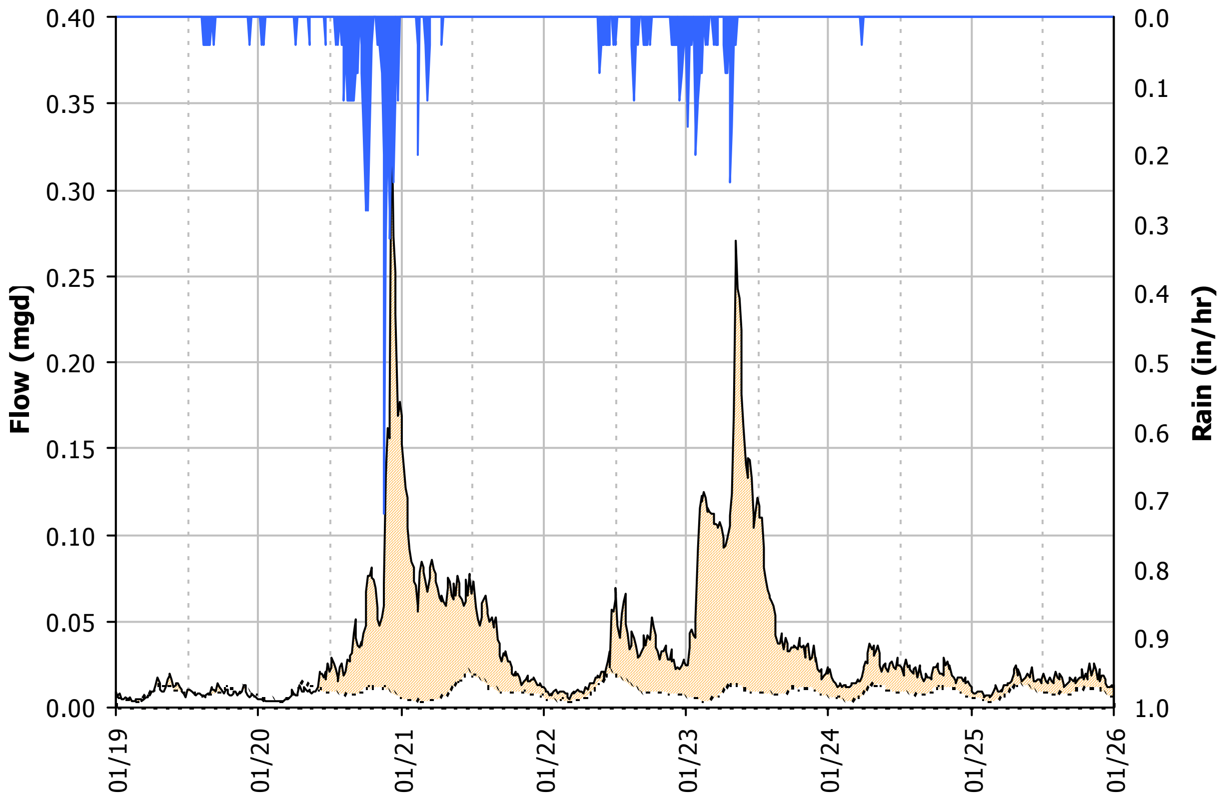
Peak Measured Level: 44.2 *inches*

Peak d/D Ratio: 4.53

Surcharged 34.4 inches over crown

MH 83
I/I Summary: Event 1

Event 1 Detail Graph



Storm Event I/I Analysis (Rain = 2.37 inches)

Inflow

Peak I/I Rate: 0.34 *mgd*

Pk I/I:ADWF: 38.43

Combined I/I

Total I/I: 188,000 *gallons*

Total I/I:ADWF: 8.92 *per in-rain*

RDI (infiltration)

Infiltration Rate: 0.006 *mgd*
(1/25/2012)

RDI (% of BL): 73%

Capacity

Peak Flow: 0.35 *mgd*

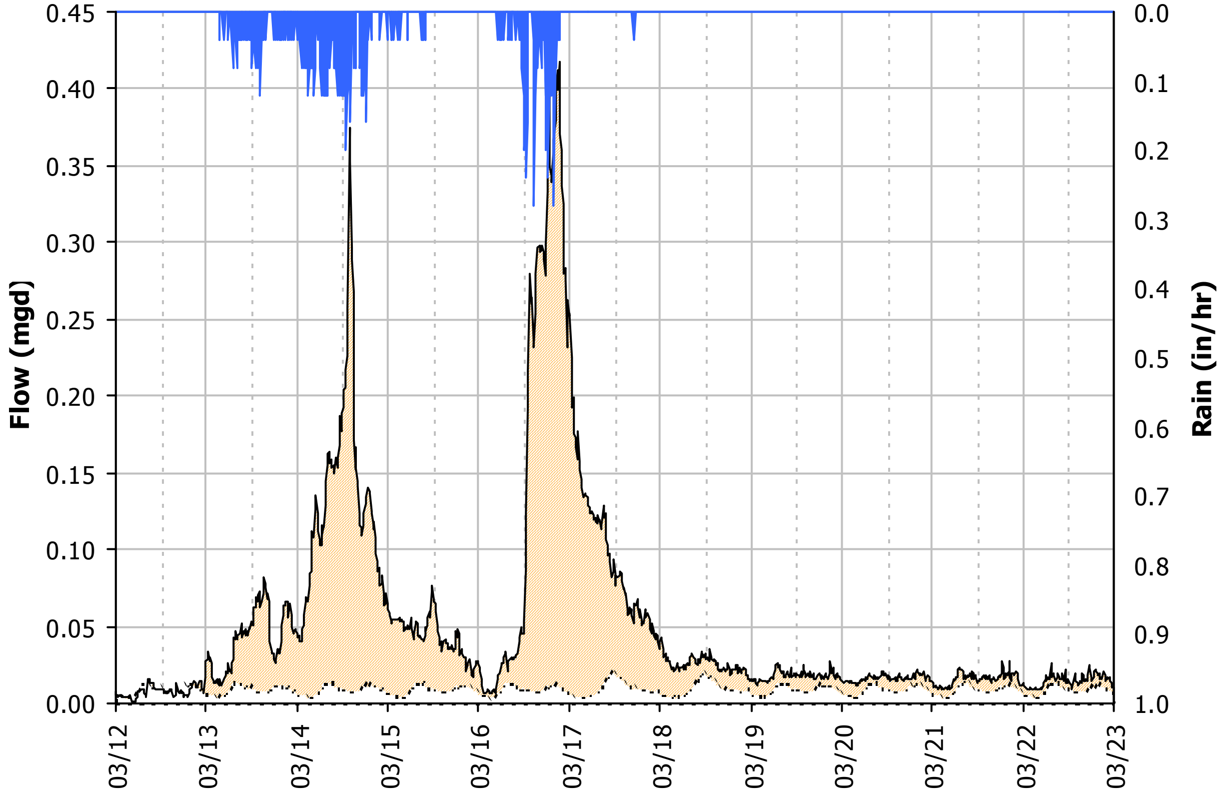
PF: 39.38

Peak Level: 6.86 *in*

d/D Ratio: 0.70

MH 83
I/I Summary: Event 2

Event 2 Detail Graph



Storm Event I/I Analysis (Rain = 3.16 inches)

Inflow

Peak I/I Rate: 0.41 *mgd*

Pk I/I:ADWF: 45.68

Combined I/I

Total I/I: 475,000 *gallons*

Total I/I:ADWF: 16.87 *per in-rain*

RDI (infiltration)

Infiltration Rate: 0.006 *mgd*
(3/22/2012)

RDI (% of BL): 71%

Capacity

Peak Flow: 0.42 *mgd*

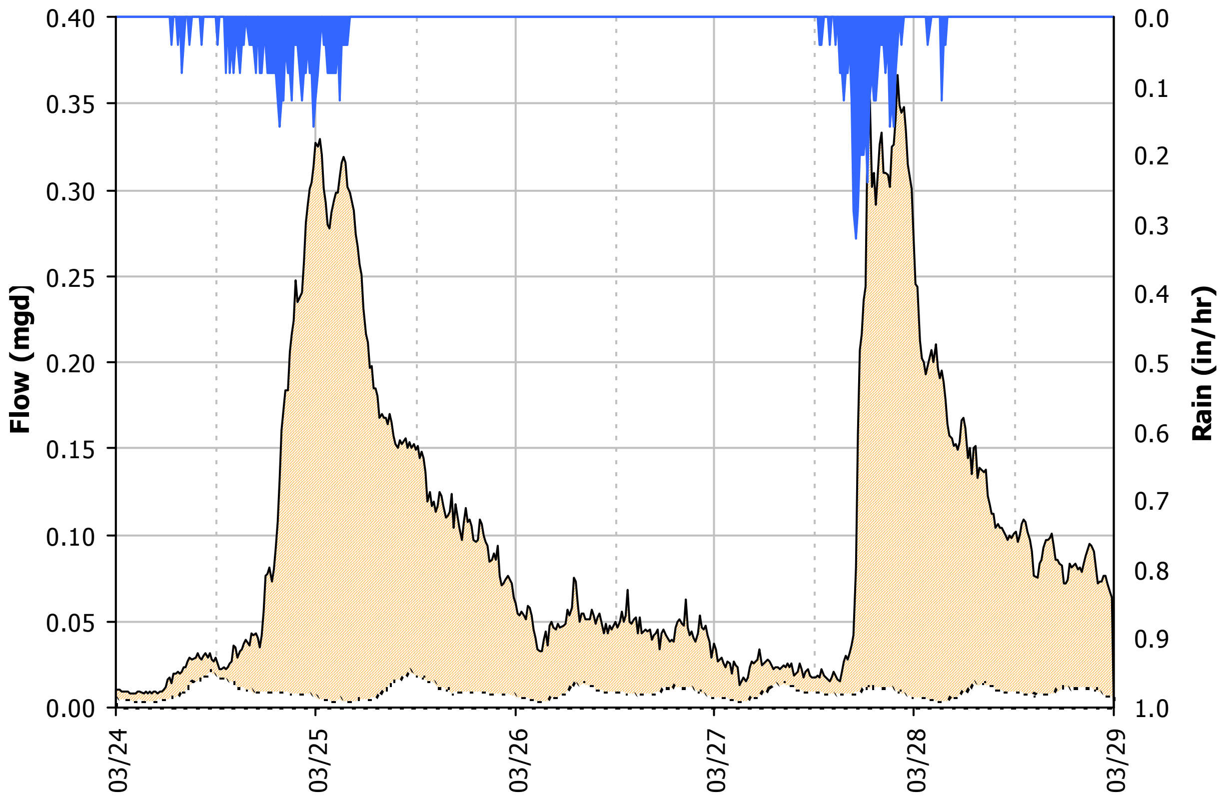
PF: 46.92

Peak Level: 44.19 *in*

d/D Ratio: 4.53

MH 83
I/I Summary: Event 3

Event 3 Detail Graph



Storm Event I/I Analysis (Rain = 2.12 inches)

Inflow

Peak I/I Rate: 0.36 *mgd*

Pk I/I:ADWF: 40.09

Combined I/I

Total I/I: 461,000 *gallons*

Total I/I:ADWF: 24.39 *per in-rain*

RDI (infiltration)

Infiltration Rate: 0.077 *mgd*
(3/28/2012 12:00:00 PM)

RDI (% of BL): 836%

Capacity

Peak Flow: 0.37 *mgd*

PF: 41.14

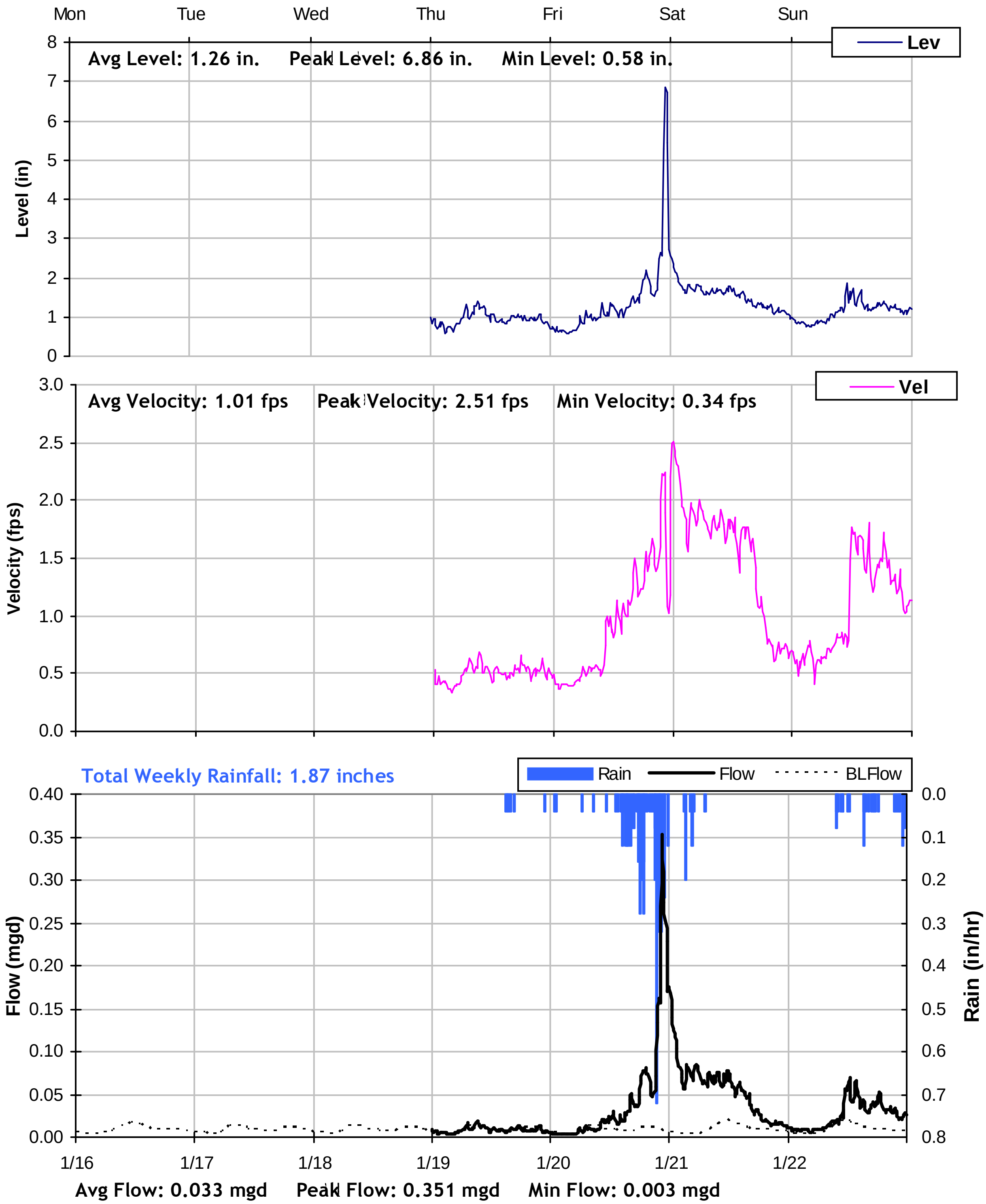
Peak Level: 40.13 *in*

d/D Ratio: 4.12

MH 83

Weekly Level, Velocity and Flow Hydrographs

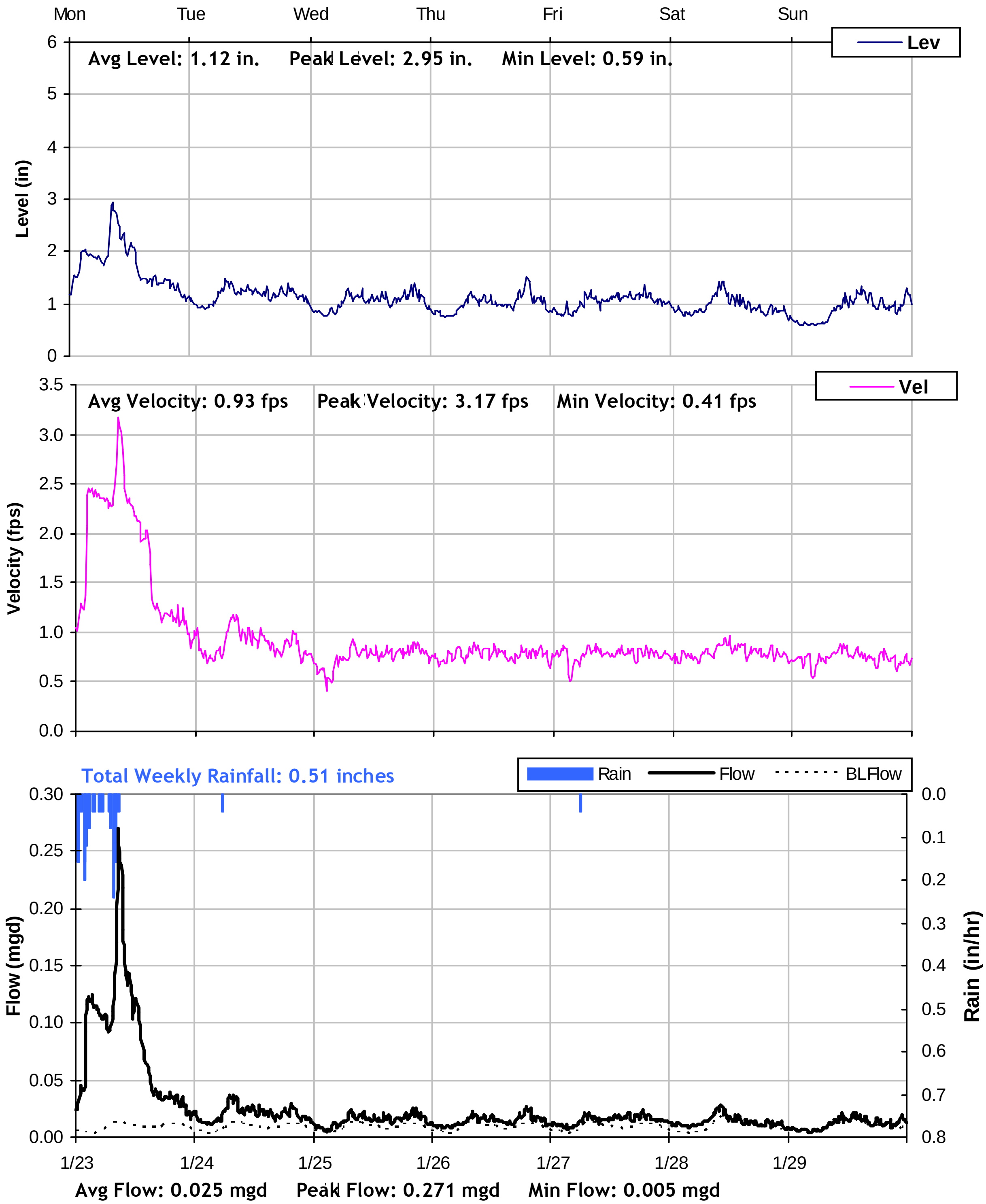
1/16/2012 to 1/23/2012



MH 83

Weekly Level, Velocity and Flow Hydrographs

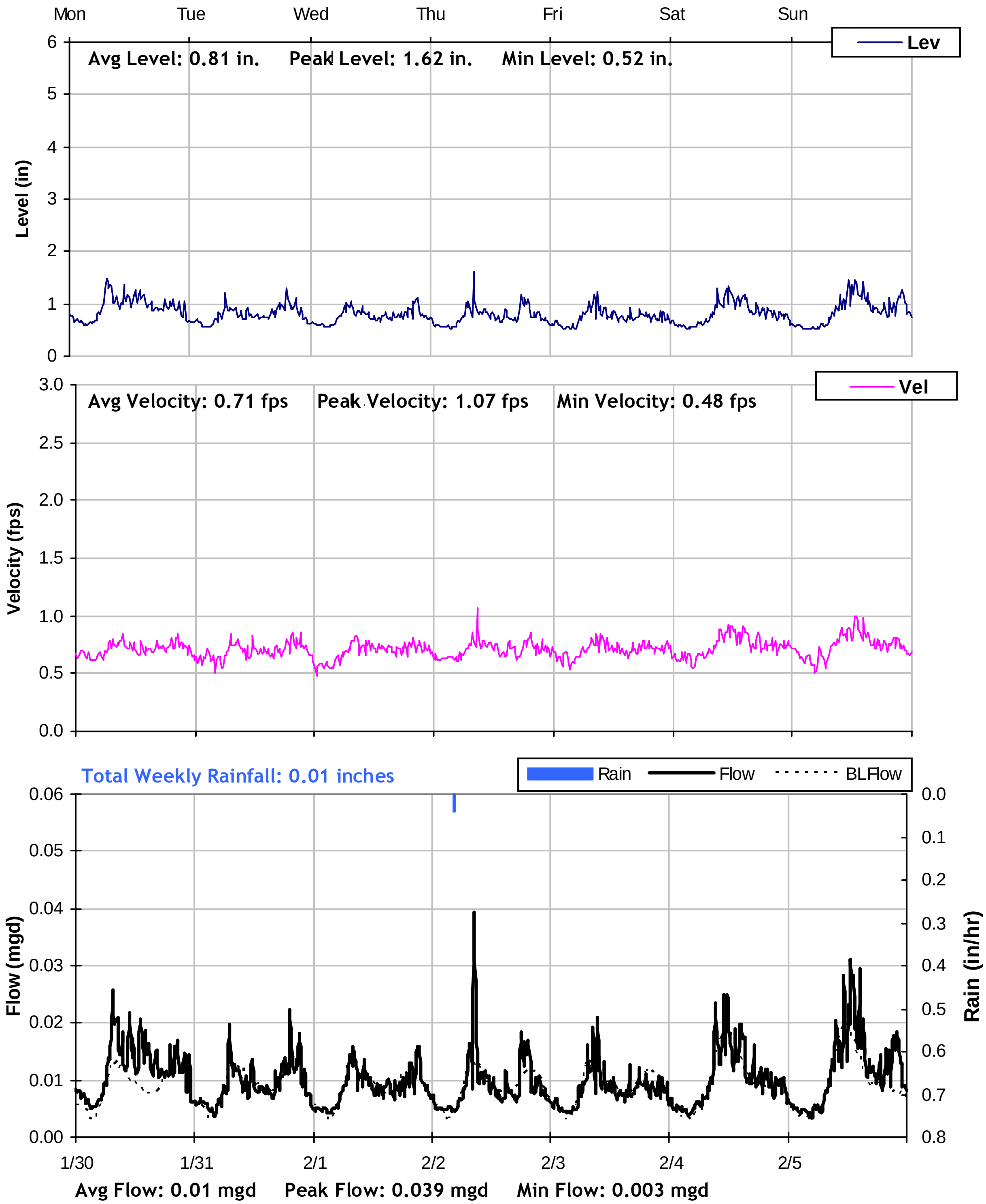
1/23/2012 to 1/30/2012



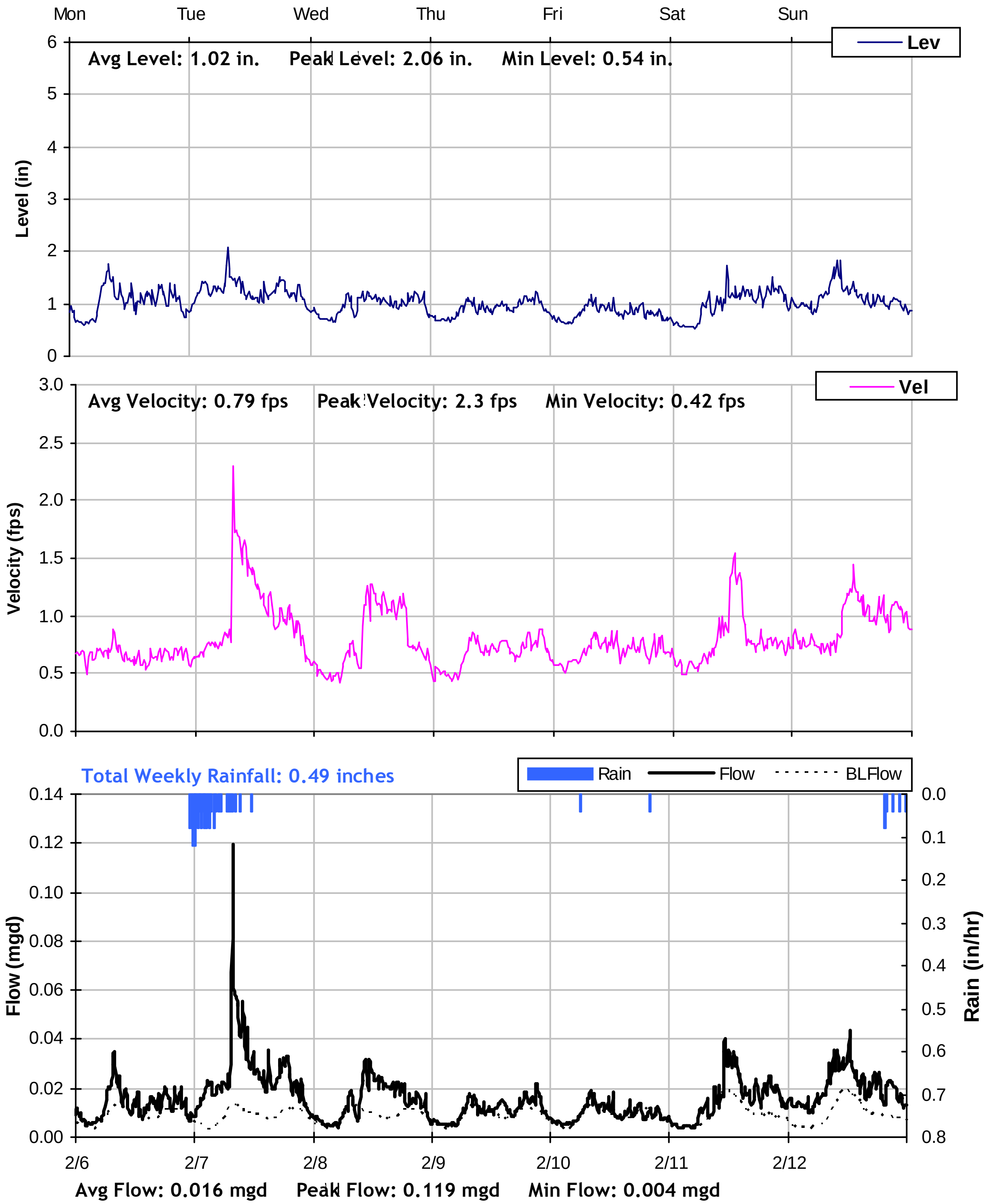
MH 83

Weekly Level, Velocity and Flow Hydrographs

1/30/2012 to 2/6/2012



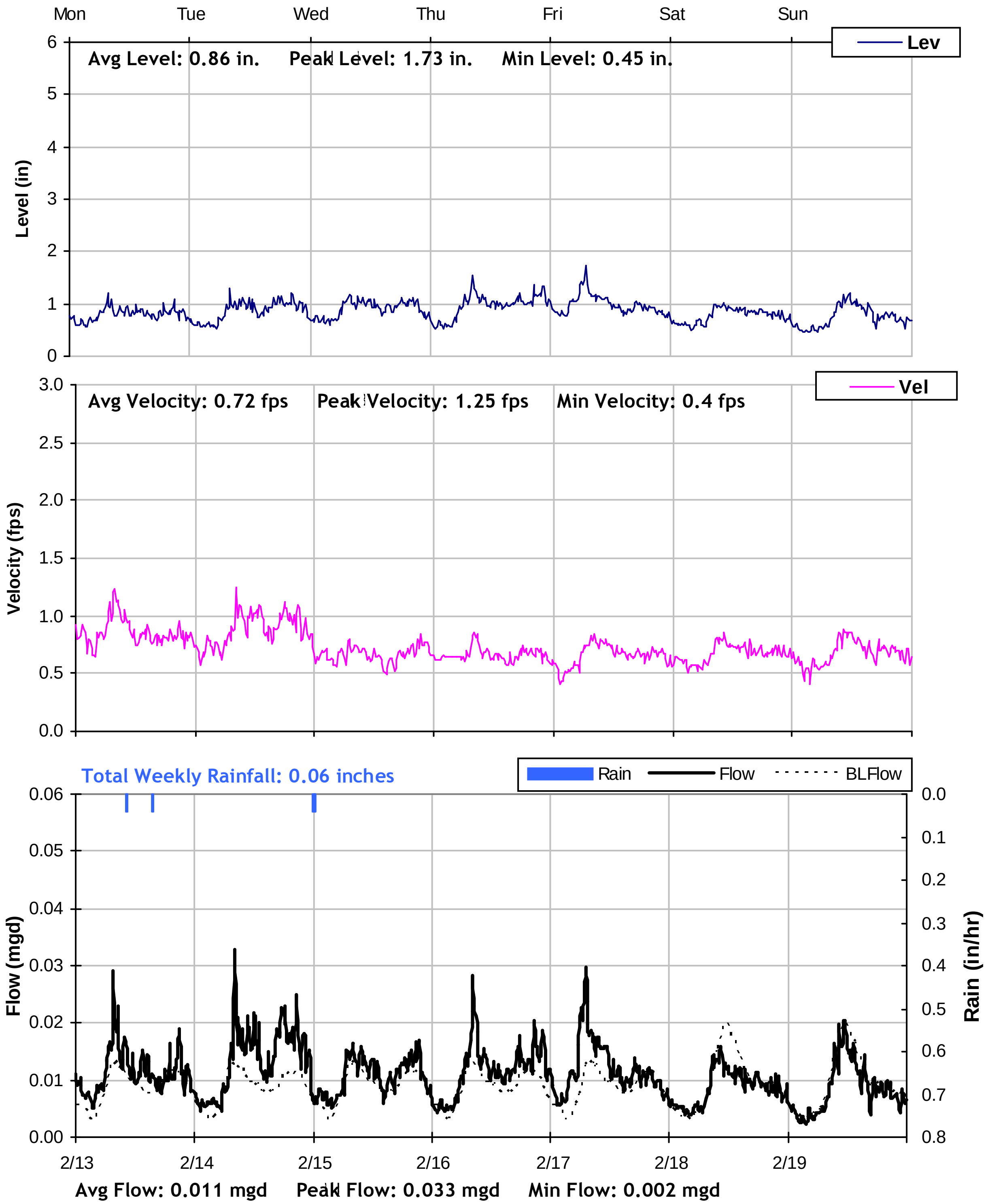
MH 83
Weekly Level, Velocity and Flow Hydrographs
2/6/2012 to 2/13/2012



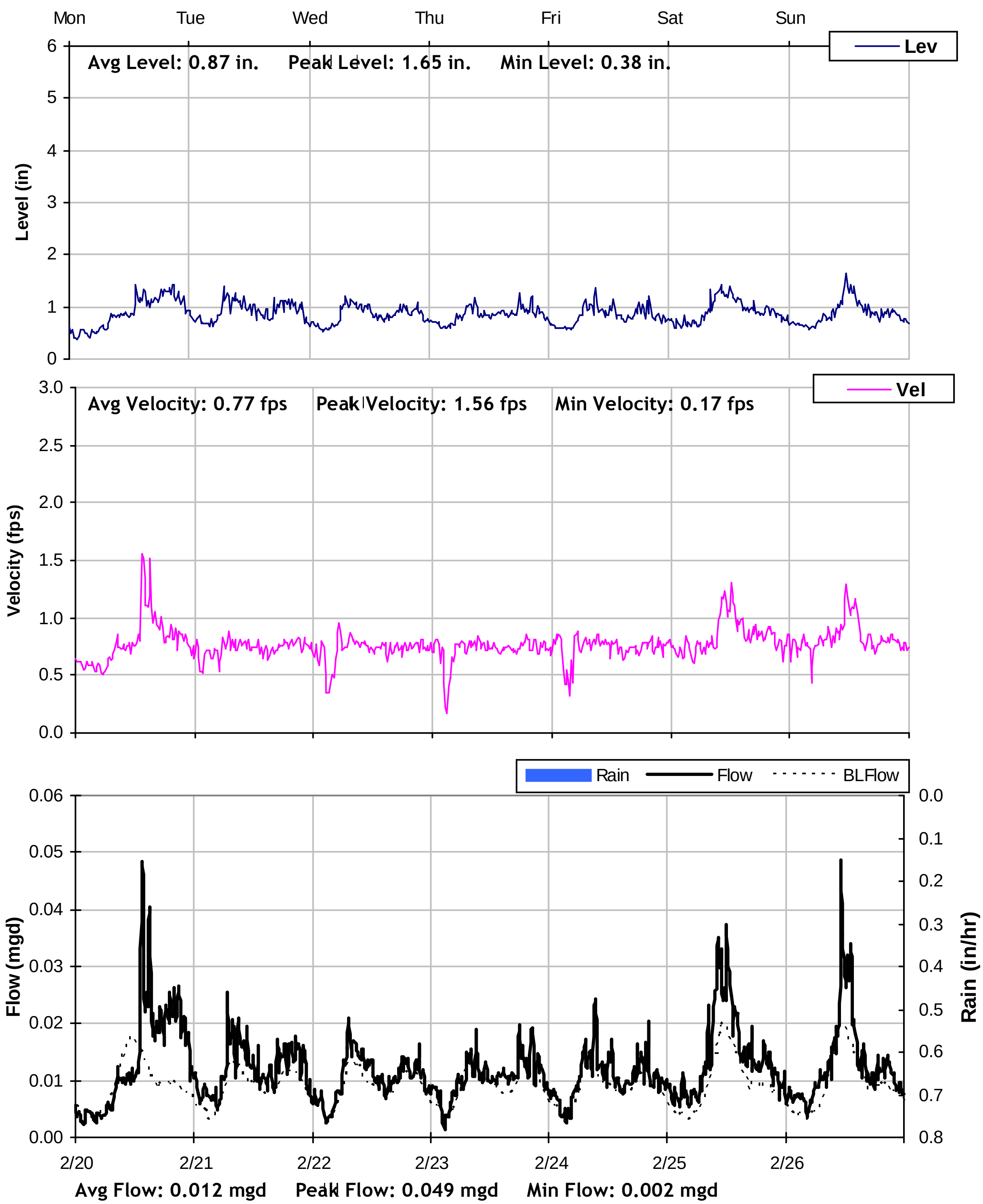
MH 83

Weekly Level, Velocity and Flow Hydrographs

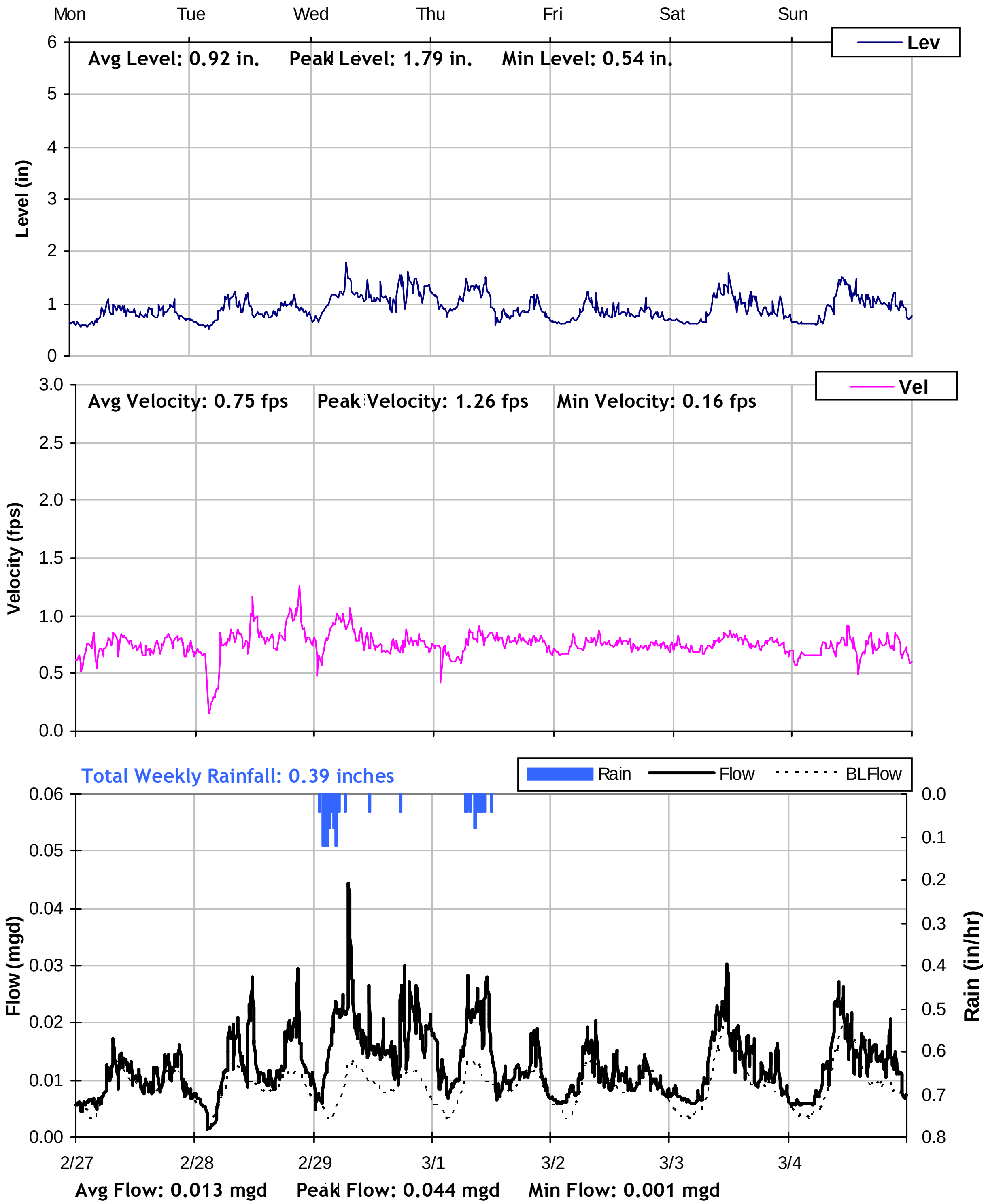
2/13/2012 to 2/20/2012



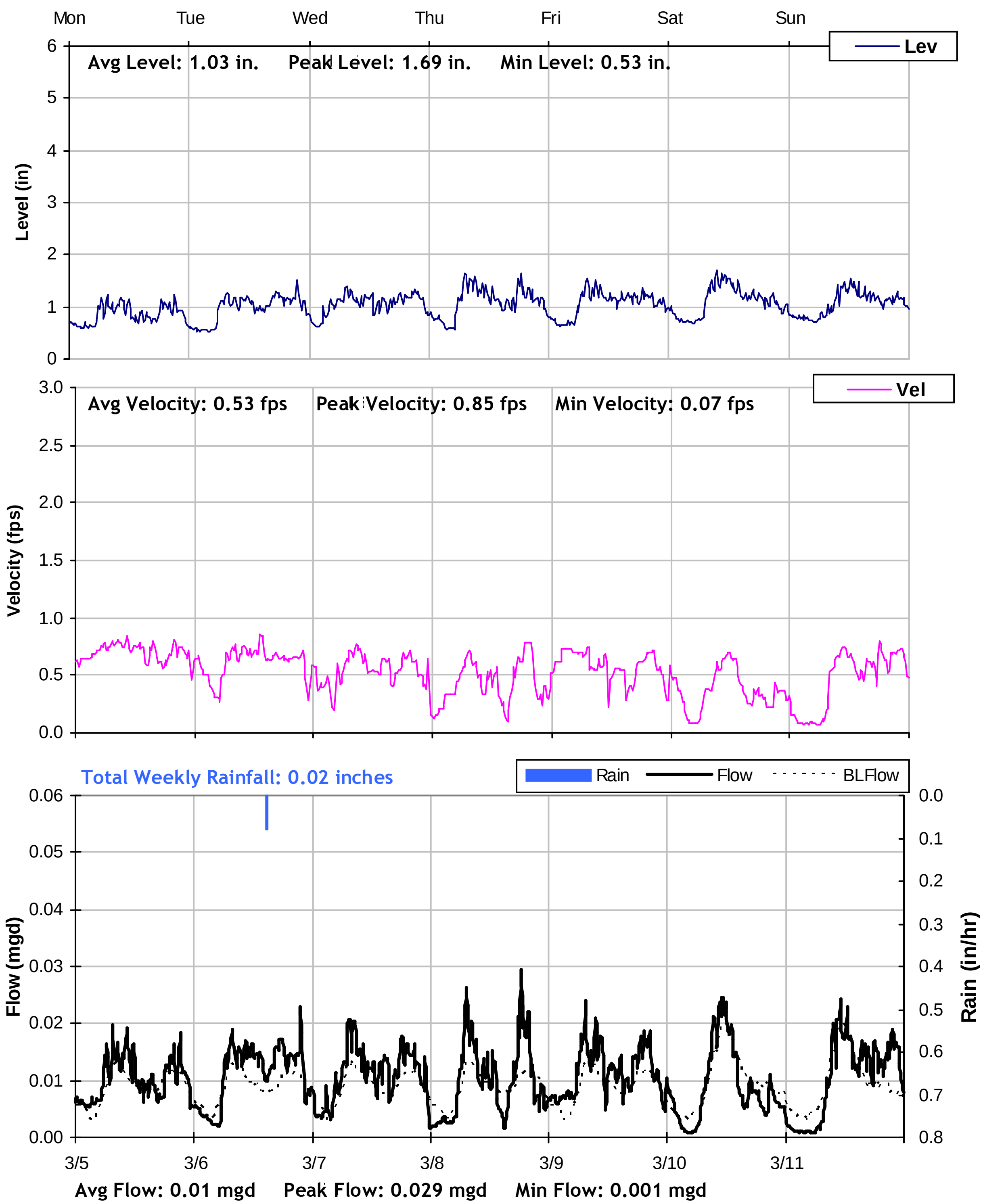
MH 83
Weekly Level, Velocity and Flow Hydrographs
2/20/2012 to 2/27/2012



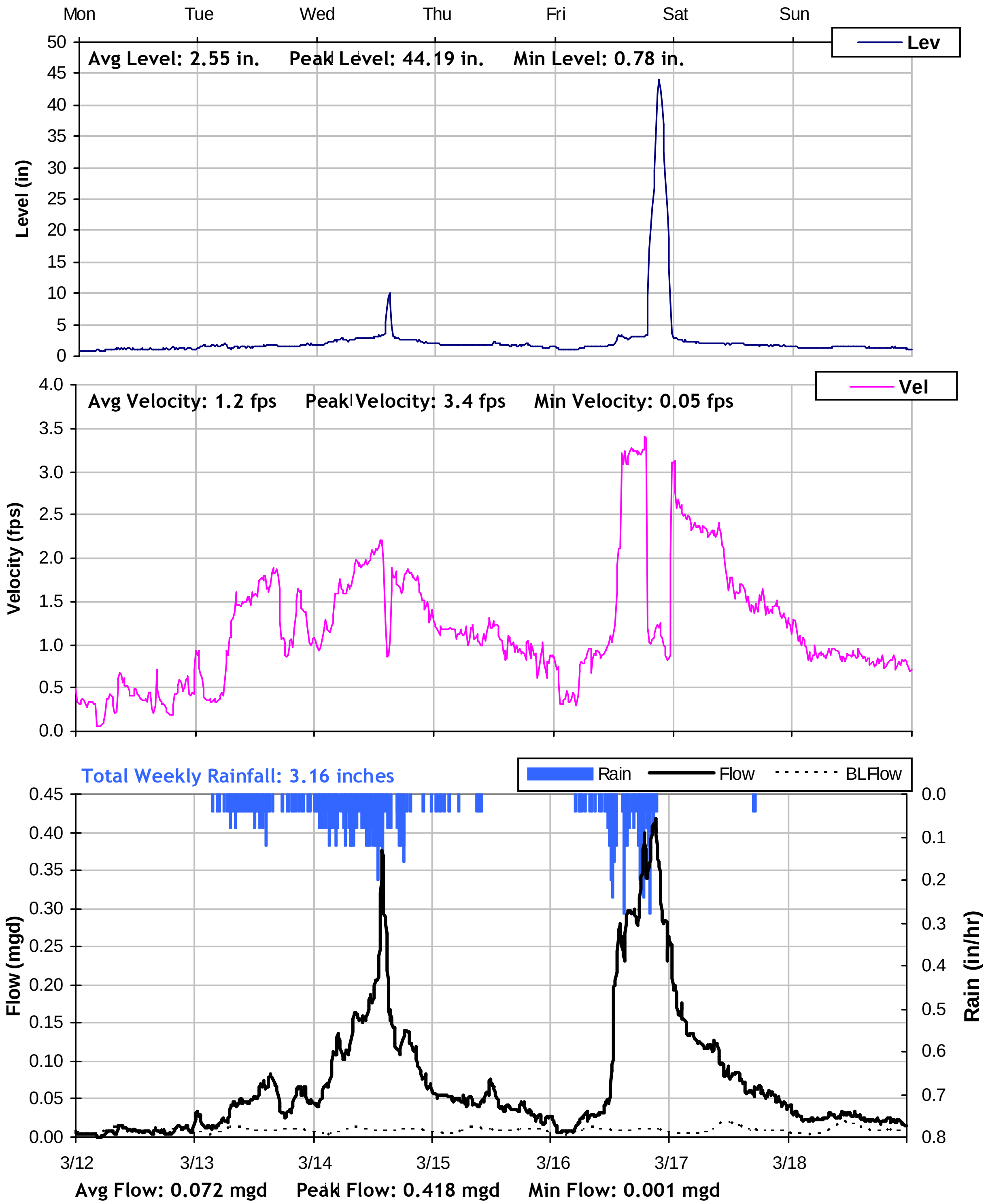
MH 83
Weekly Level, Velocity and Flow Hydrographs
2/27/2012 to 3/5/2012



MH 83
Weekly Level, Velocity and Flow Hydrographs
3/5/2012 to 3/12/2012



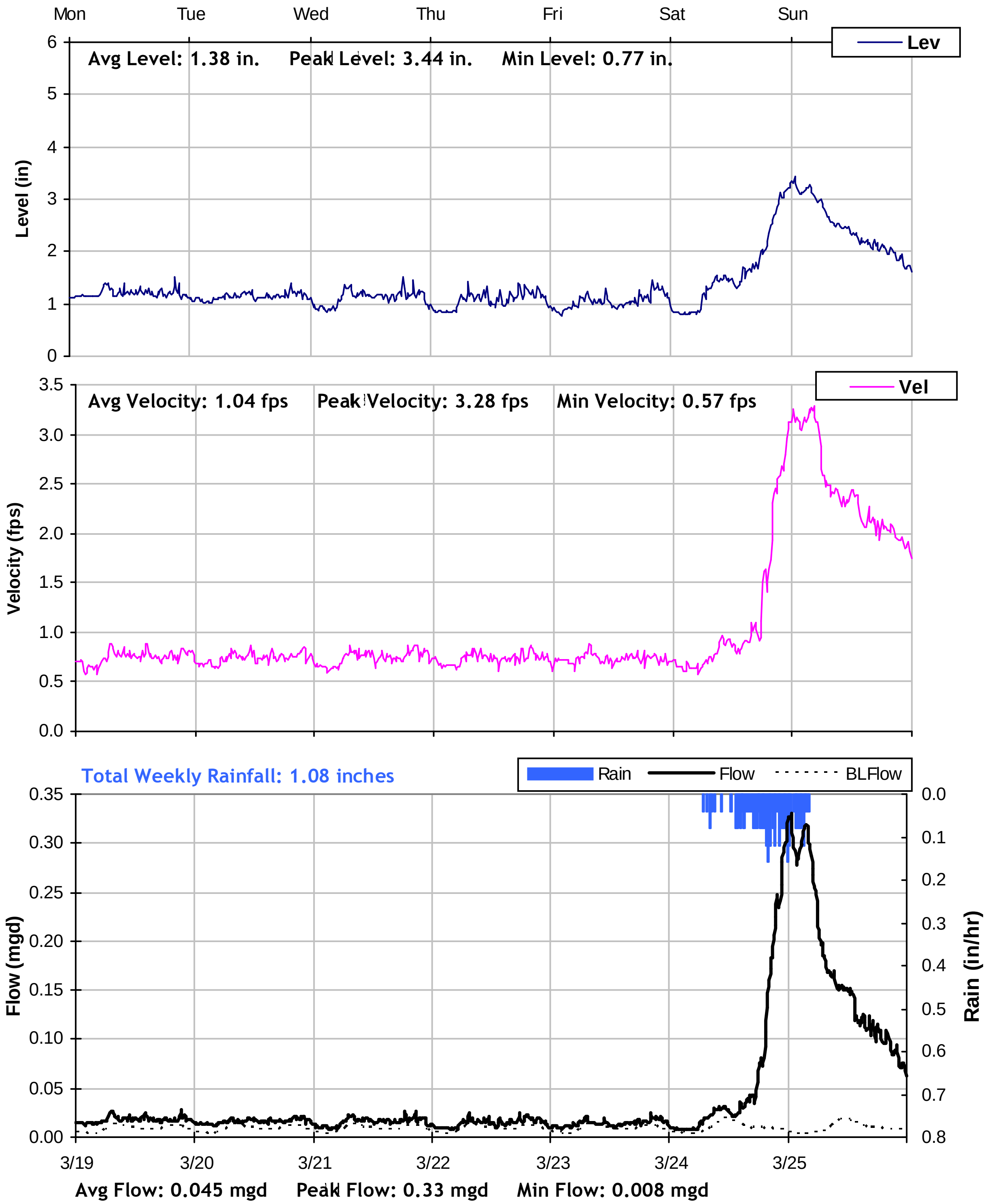
MH 83
Weekly Level, Velocity and Flow Hydrographs
3/12/2012 to 3/19/2012



MH 83

Weekly Level, Velocity and Flow Hydrographs

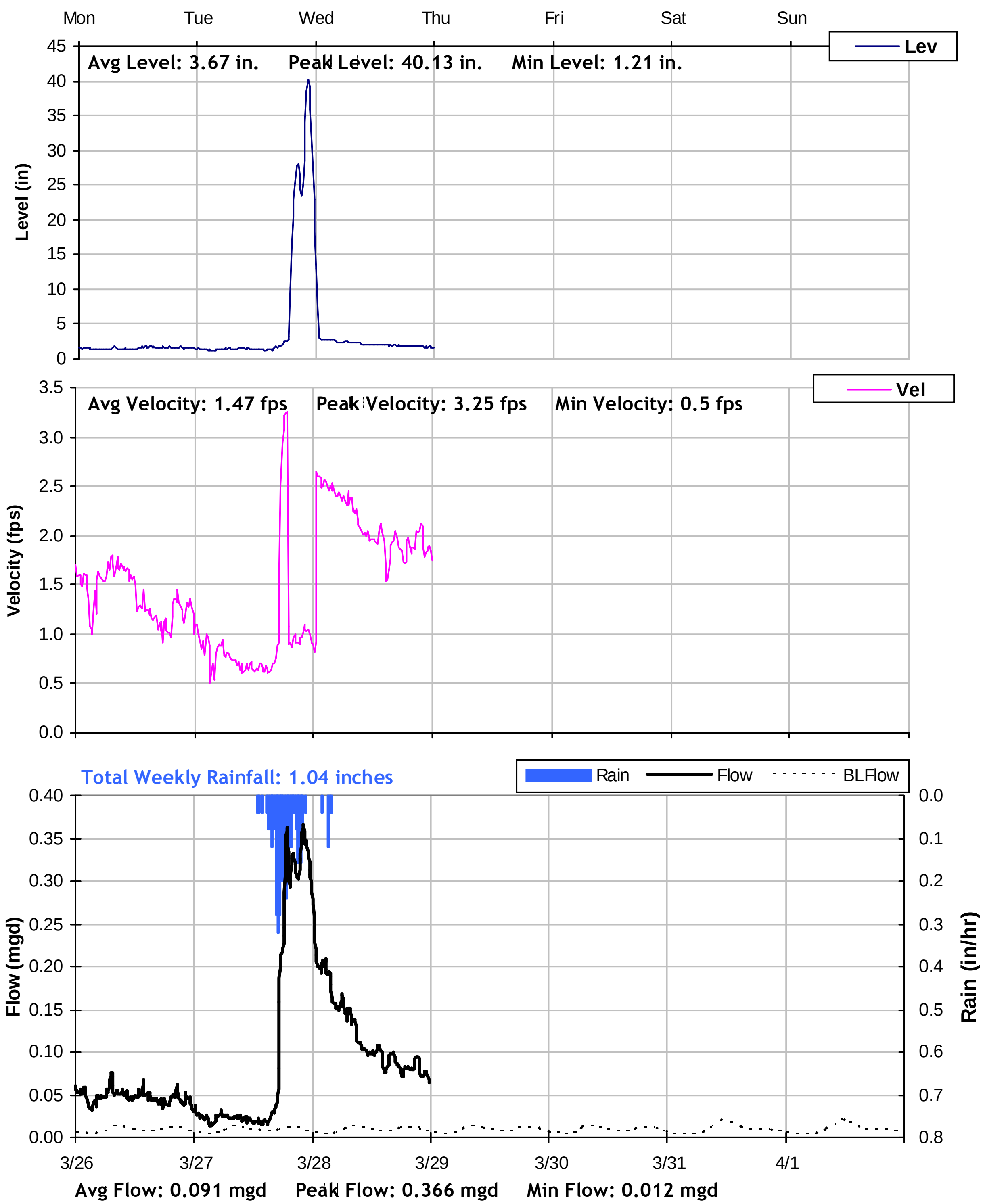
3/19/2012 to 3/26/2012



MH 83

Weekly Level, Velocity and Flow Hydrographs

3/26/2012 to 4/2/2012



Rodeo Sanitary District

Master Plan Sanitary Sewer Flow Monitoring
Year 2011/2012

Monitoring Site: MH 98

Location: 3rd Street at intersection of Suisun Avenue

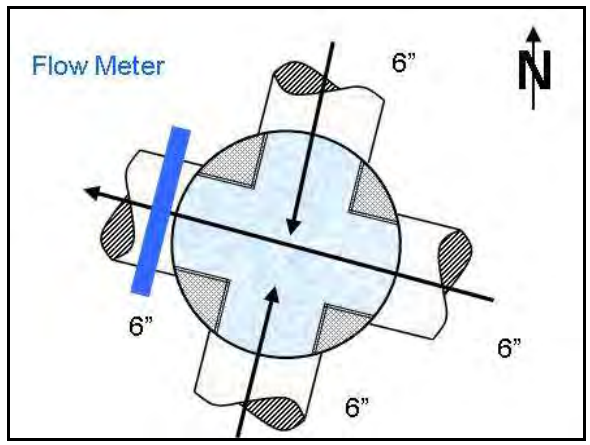
Data Summary Report

MH 98
Site Information Report

Location:	3rd Street at intersection of Suisun Avenue
Coordinates:	122.2621°W, 38.0348°N
Rim Elevation:	38 feet
Diameter:	6 inches
Baseline Flow:	0.015 mgd
Peak Measured Flow:	0.377 mgd

Satellite Map

Sanitary Map



Flow Sketch


Street View Photo

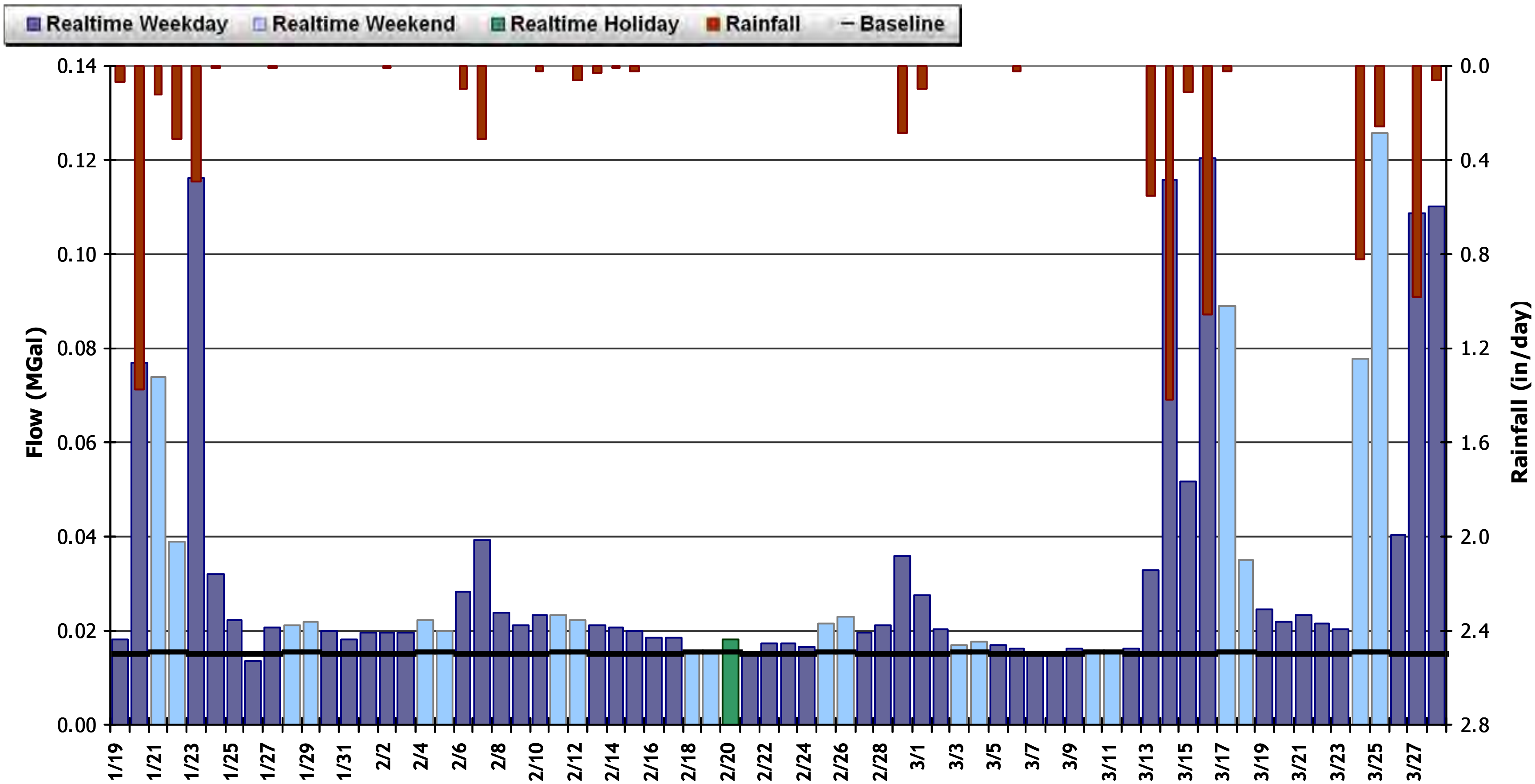

Plan View Photo

MH 98

Period Flow Summary: Daily Flow Totals

Avg Daily Flow: 0.033 MGal **Peak Daily Flow: 0.126 MGal** **Min Daily Flow: 0.014 MGal**

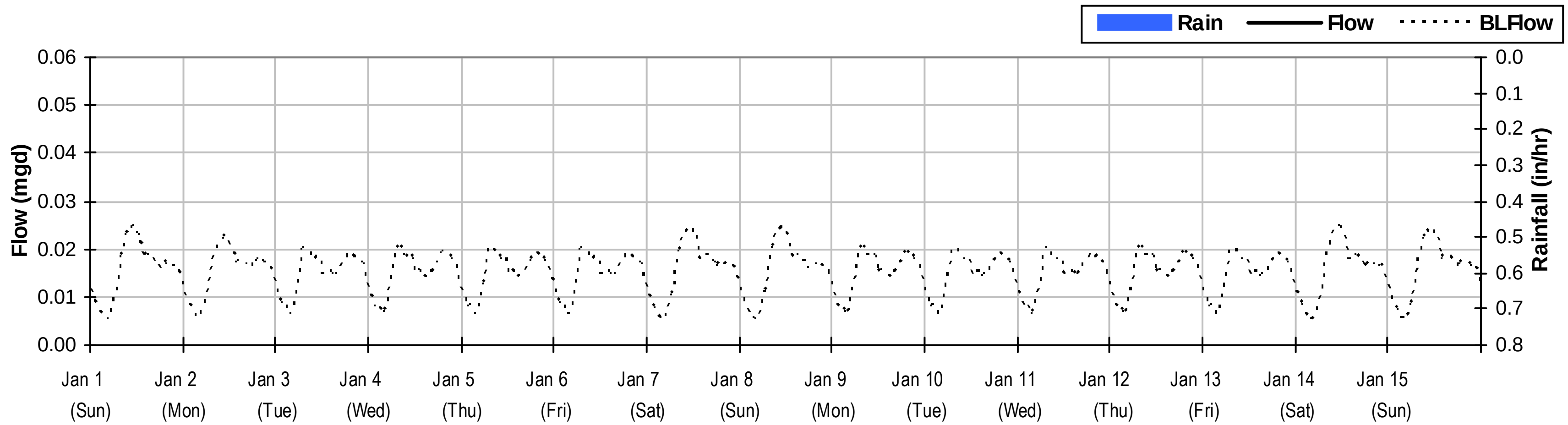
Total Period Rainfall: 8.63 inches

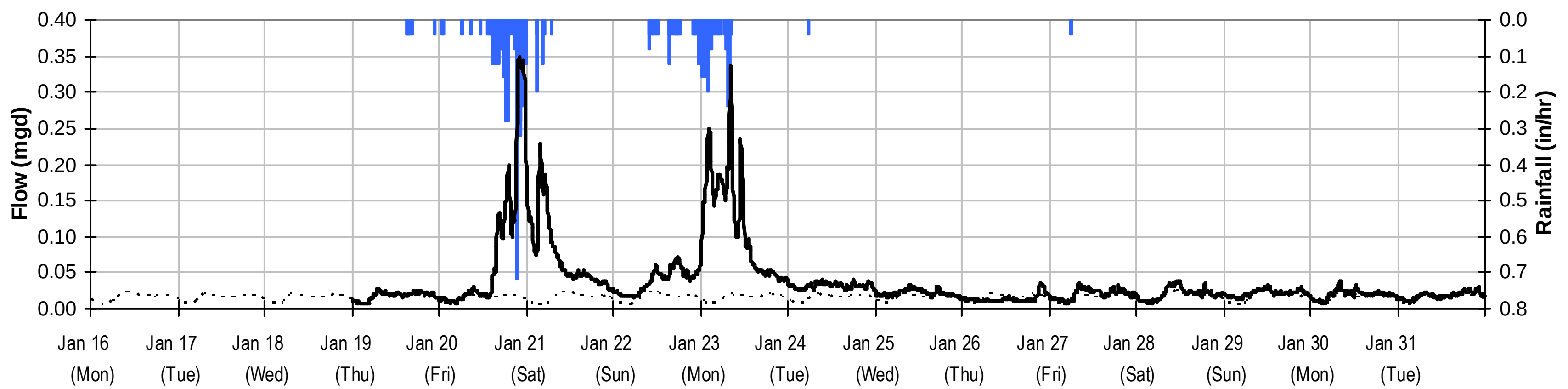


MH 98

Monthly Flow Summary: January, 2012

Total Monthly Rainfall: 2.38 inches   Avg Flow: 0.038 mgd   Peak Flow: 0.350 mgd   Min Flow: 0.007 mgd

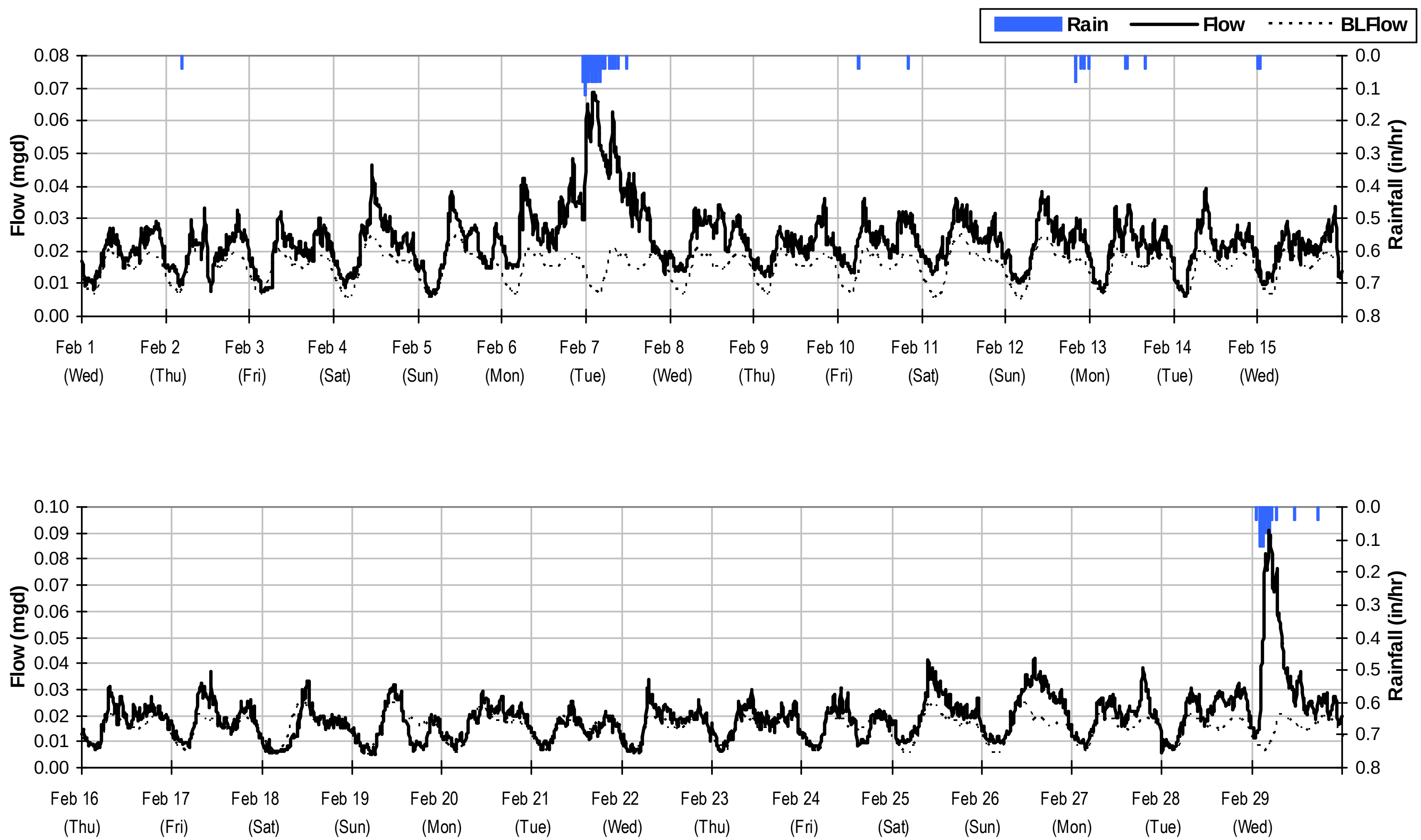




MH 98

Monthly Flow Summary: February, 2012

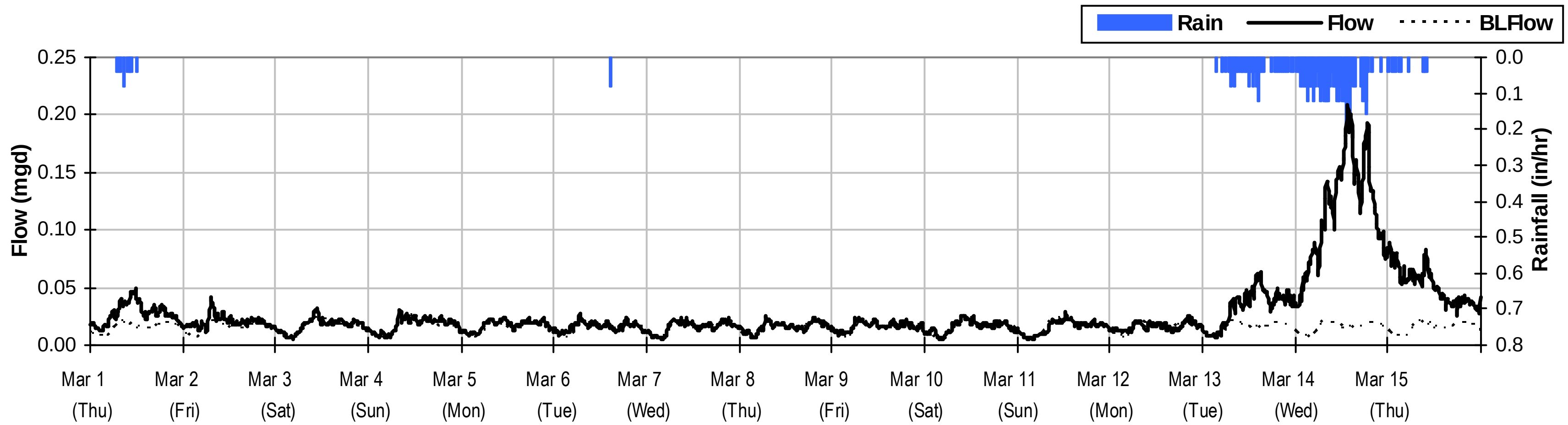
Total Monthly Rainfall: 0.85 inches   **Avg Flow: 0.021 mgd**   **Peak Flow: 0.091 mgd**   **Min Flow: 0.005 mgd**

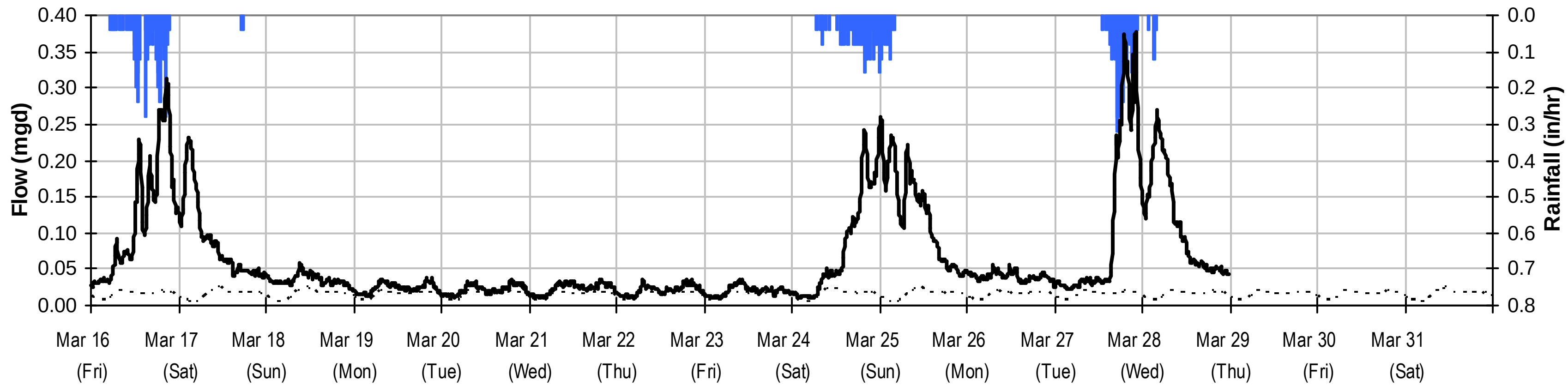


MH 98

Monthly Flow Summary: March, 2012

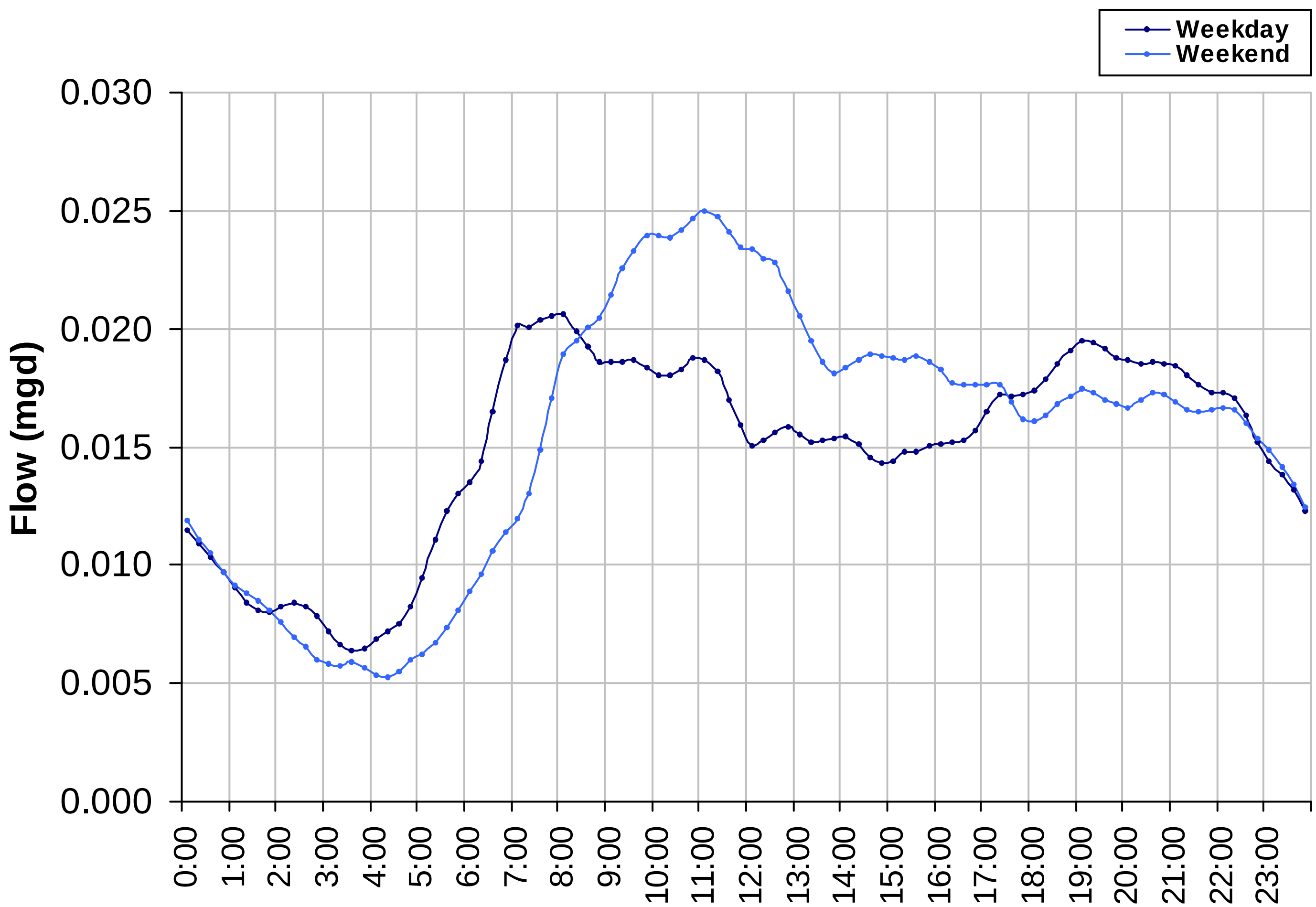
Total Monthly Rainfall: 5.4 inches Avg Flow: 0.044 mgd Peak Flow: 0.377 mgd Min Flow: 0.005 mgd





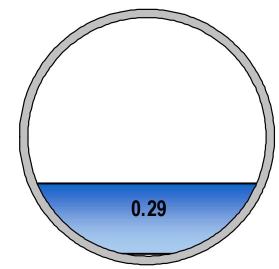
MH 98

Baseline Flow Hydrographs



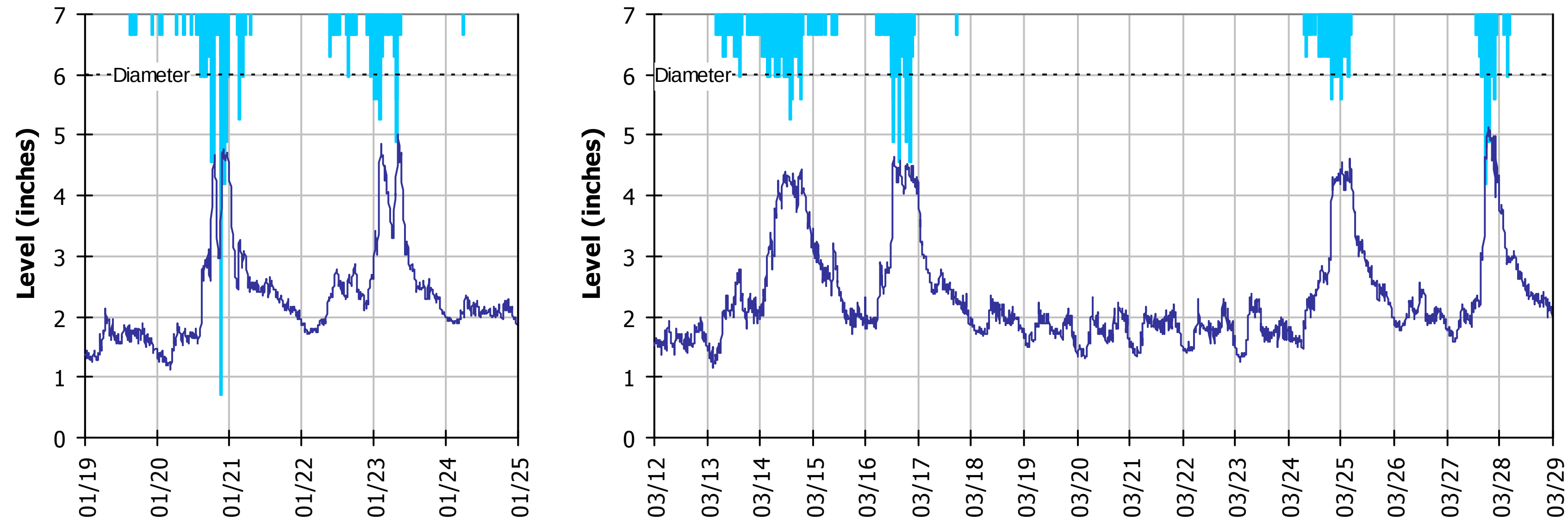
Baseline Flow:

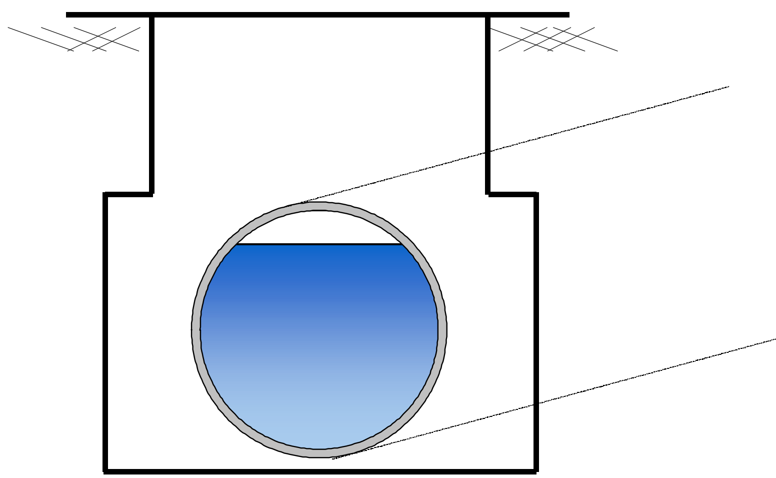
0.015 *mgd*



MH 98
Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Monitoring Period

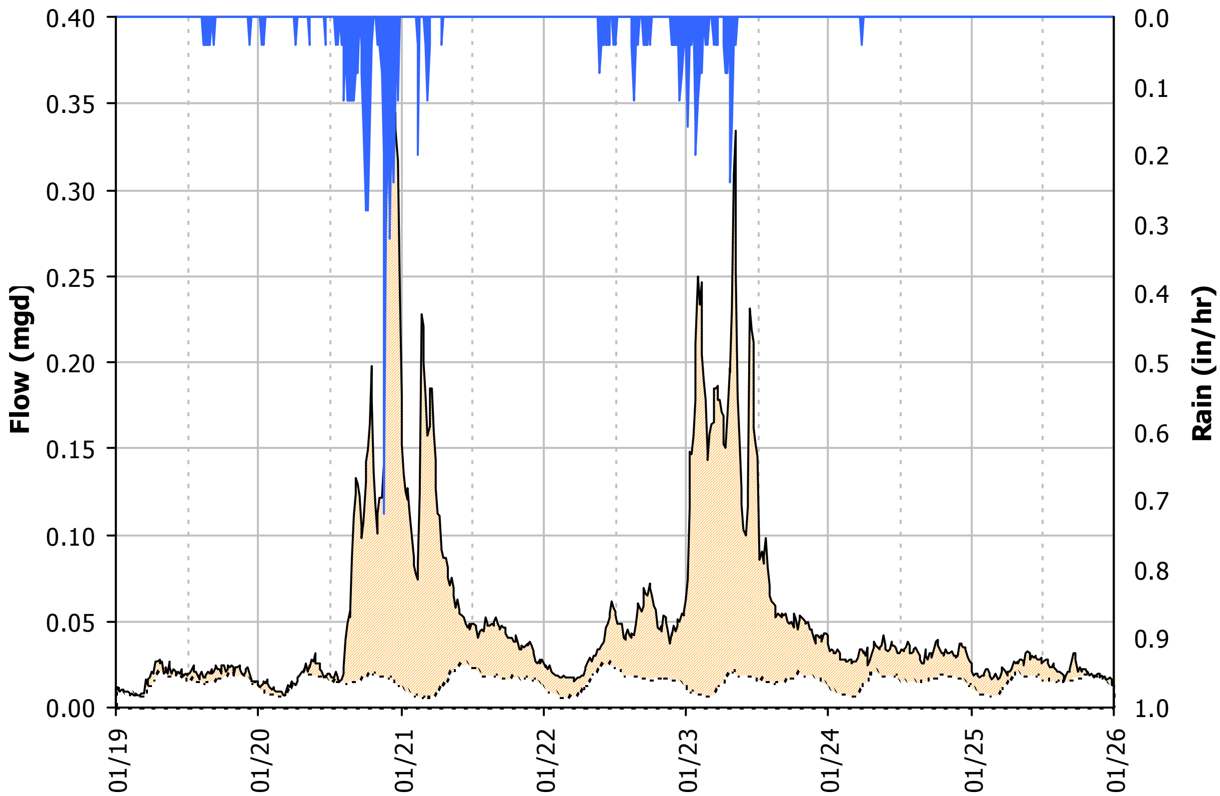




Pipe Diameter:	6	*inches*
Peak Measured Level:	5.15	*inches*
Peak d/D Ratio:	0.86	

MH 98
I/I Summary: Event 1

Event 1 Detail Graph



Storm Event I/I Analysis (Rain = 2.37 inches)

Inflow

Peak I/I Rate: 0.33 *mgd*

Pk I/I:ADWF: 22.03

Combined I/I

Total I/I: 273,000 *gallons*

Total I/I:ADWF: 7.61 *per in-rain*

RDI (infiltration)

Infiltration Rate: 0.007 *mgd*
(1/25/2012)

RDI (% of BL): 48%

Capacity

Peak Flow: 0.35 *mgd*

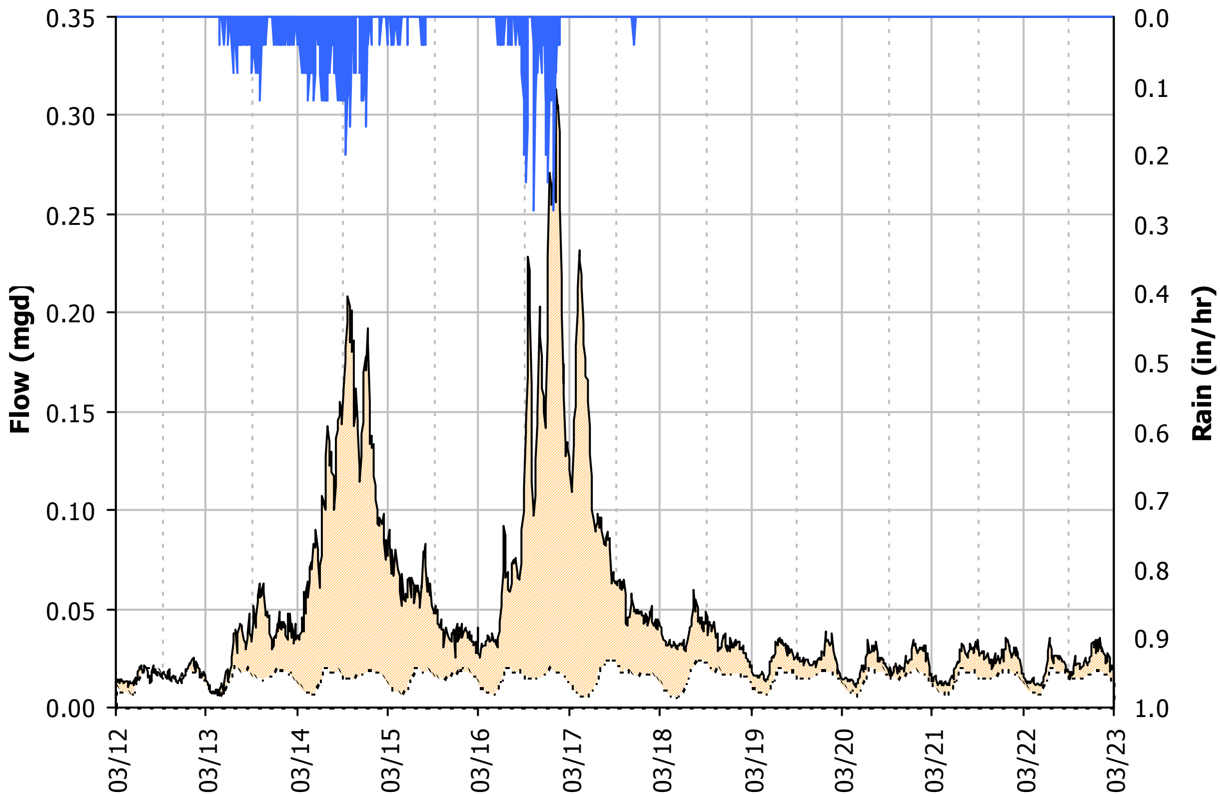
PF: 23.18

Peak Level: 5.02 *in*

d/D Ratio: 0.84

MH 98
I/I Summary: Event 2

Event 2 Detail Graph



Storm Event I/I Analysis (Rain = 3.16 inches)

Inflow

Peak I/I Rate: 0.29 *mgd*

Pk I/I:ADWF: 19.49

Combined I/I

Total I/I: 387,000 *gallons*

Total I/I:ADWF: 8.11 *per in-rain*

RDI (infiltration)

Infiltration Rate: 0.007 *mgd*
(3/22/2012)

RDI (% of BL): 44%

Capacity

Peak Flow: 0.31 *mgd*

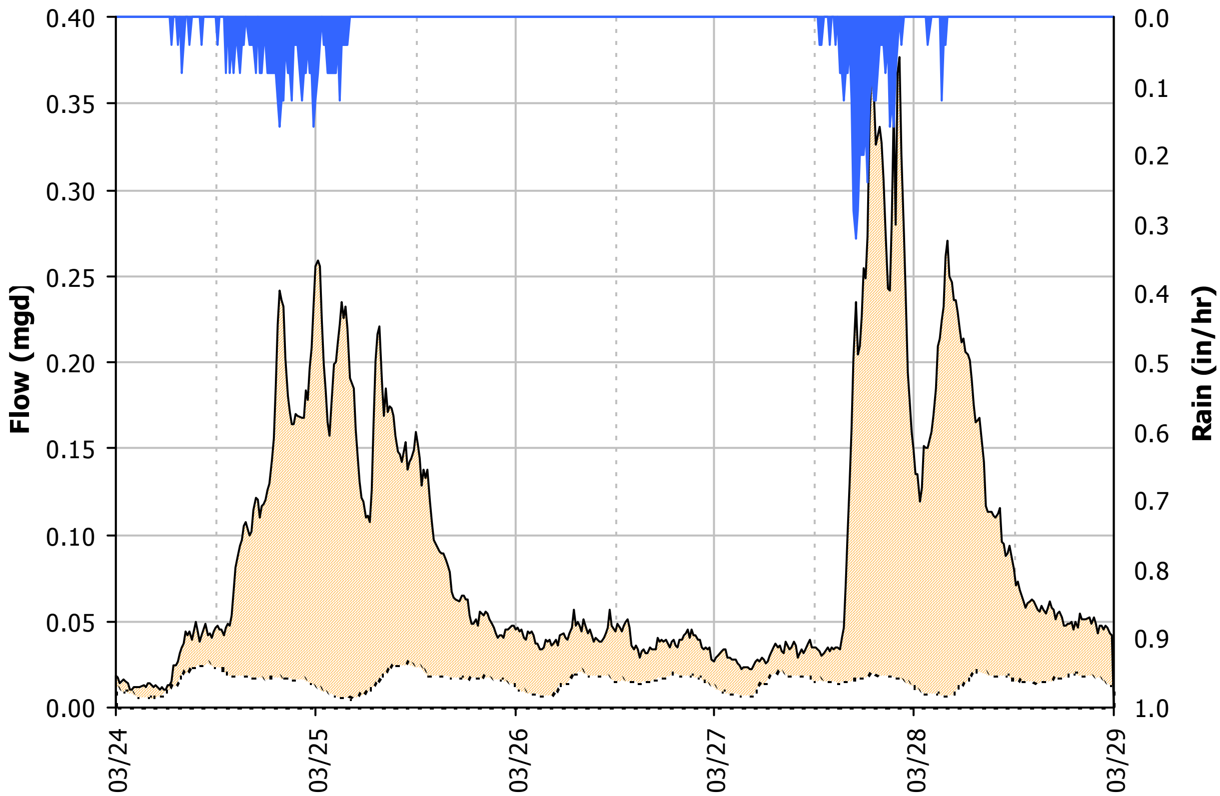
PF: 20.72

Peak Level: 4.65 *in*

d/D Ratio: 0.78

MH 98
I/I Summary: Event 3

Event 3 Detail Graph



Storm Event I/I Analysis (Rain = 2.12 inches)

Inflow

Peak I/I Rate: 0.36 *mgd*

Pk I/I:ADWF: 23.81

Combined I/I

Total I/I: 386,000 *gallons*

Total I/I:ADWF: 12.06 *per in-rain*

RDI (infiltration)

Infiltration Rate: 0.038 *mgd*
(3/28/2012 12:00:00 PM)

RDI (% of BL): 233%

Capacity

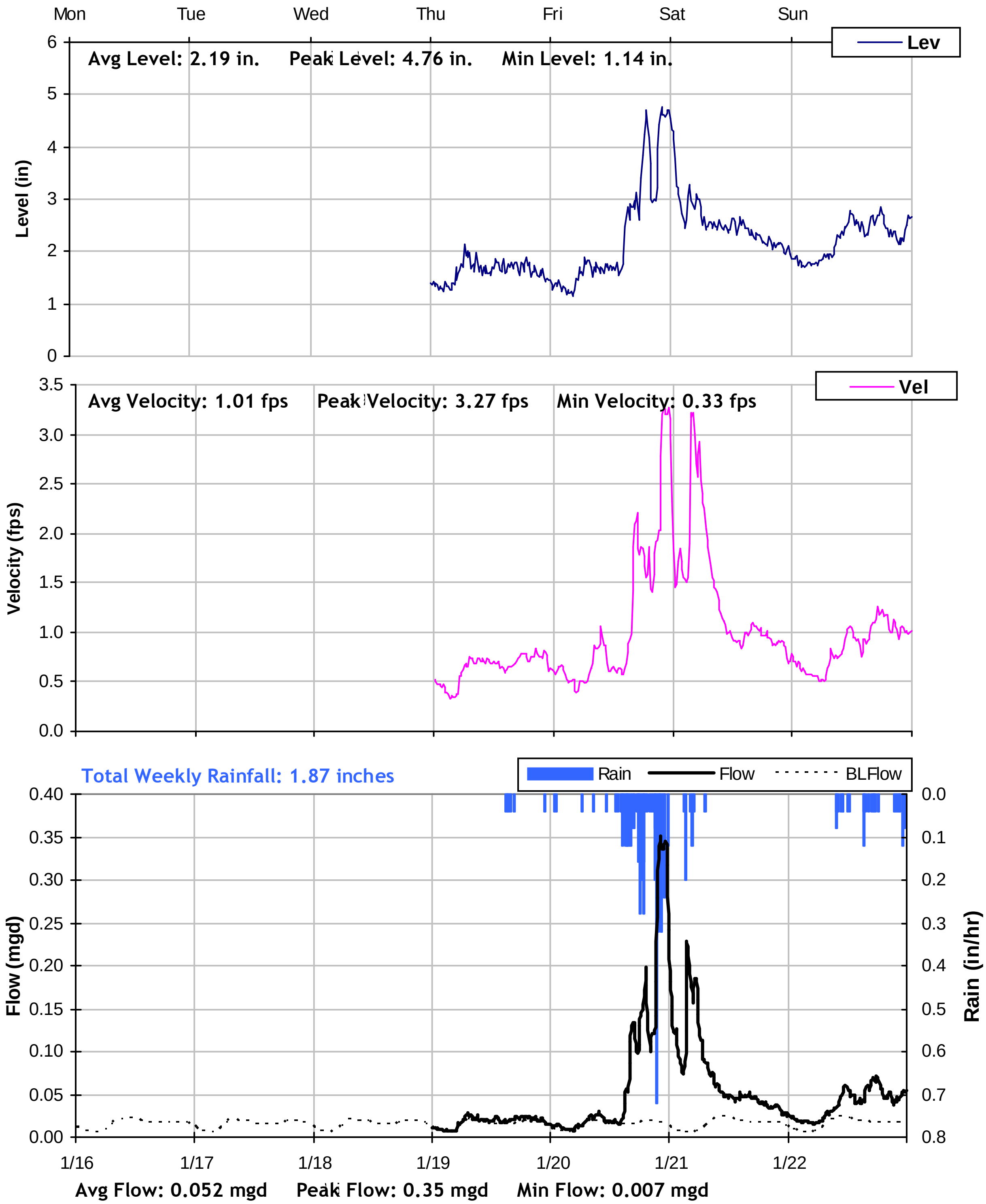
Peak Flow: 0.38 *mgd*

PF: 24.94

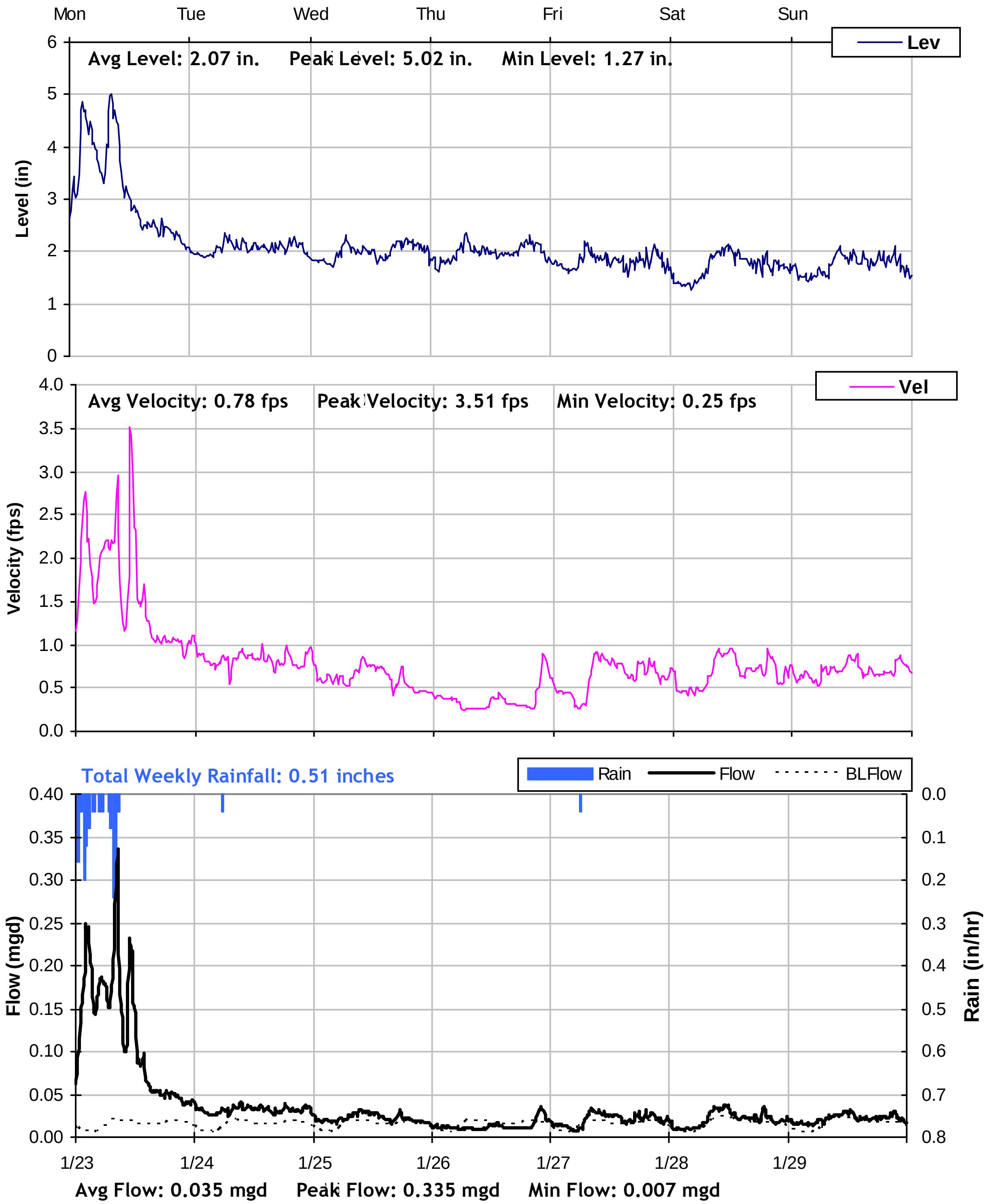
Peak Level: 5.15 *in*

d/D Ratio: 0.86

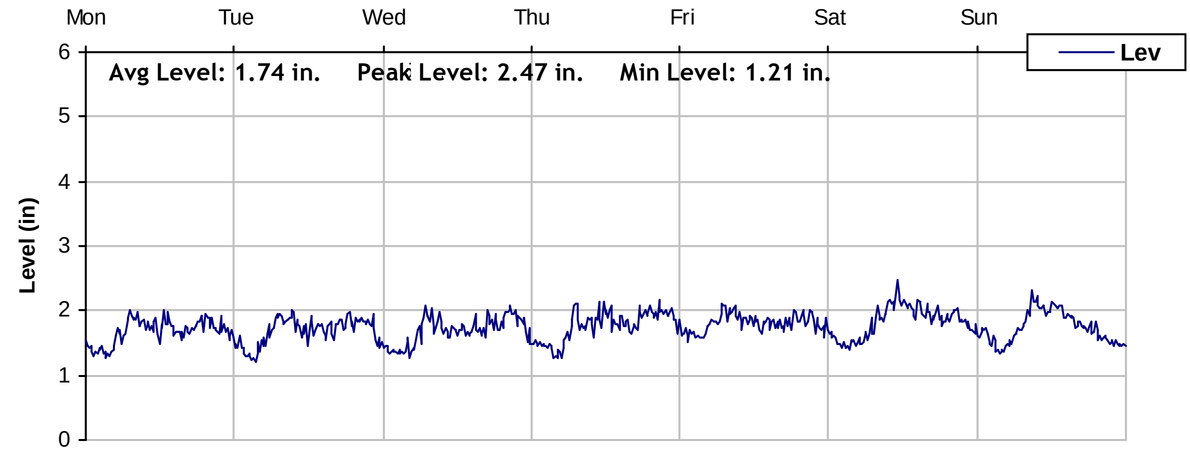
MH 98
Weekly Level, Velocity and Flow Hydrographs
1/16/2012 to 1/23/2012

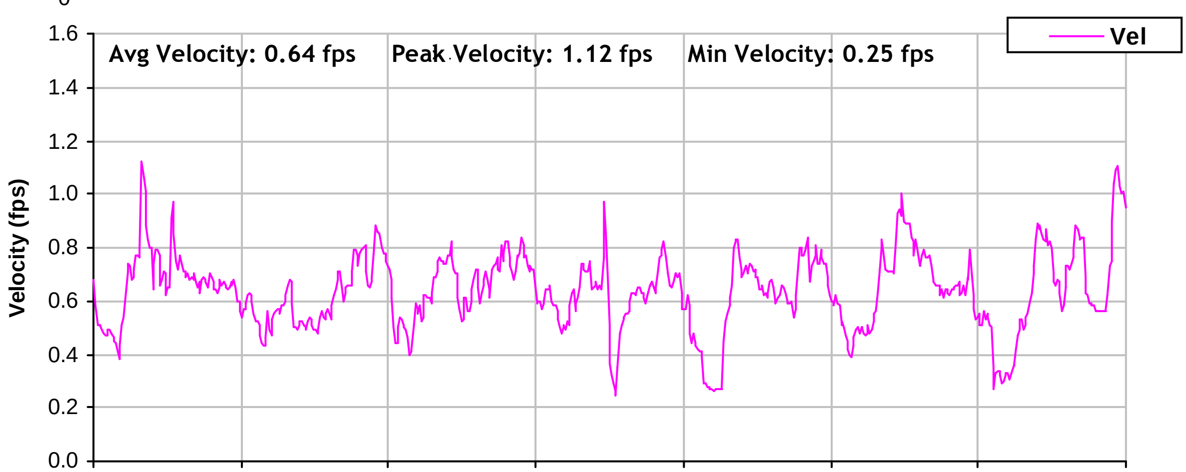


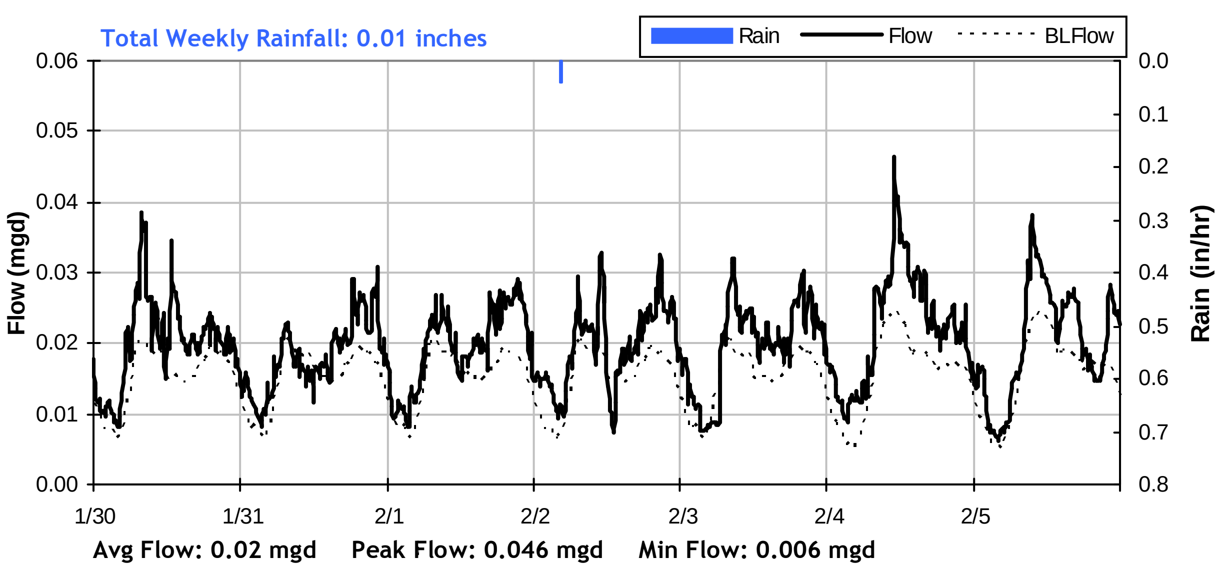
MH 98
Weekly Level, Velocity and Flow Hydrographs
1/23/2012 to 1/30/2012



MH 98
Weekly Level, Velocity and Flow Hydrographs
1/30/2012 to 2/6/2012



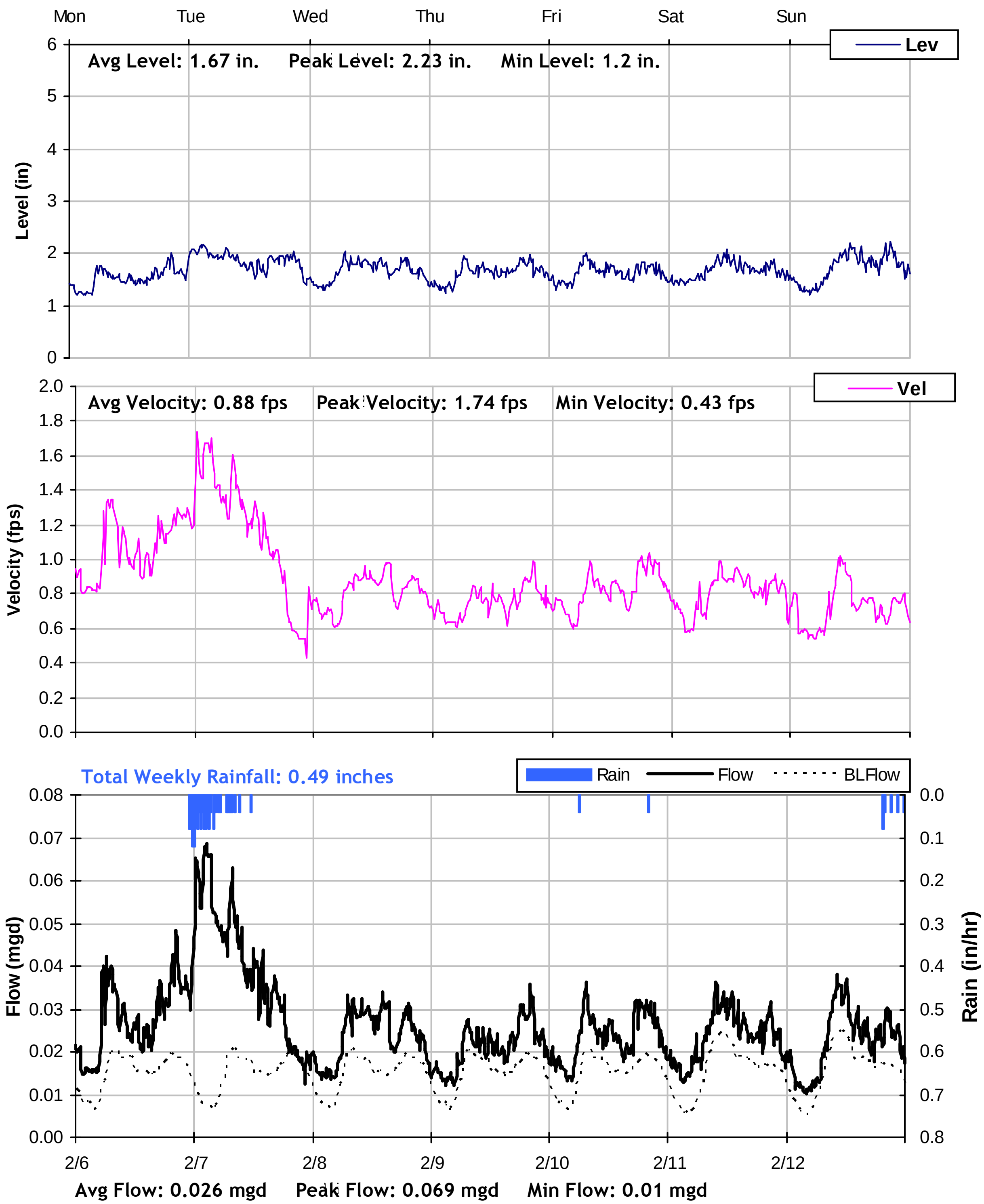




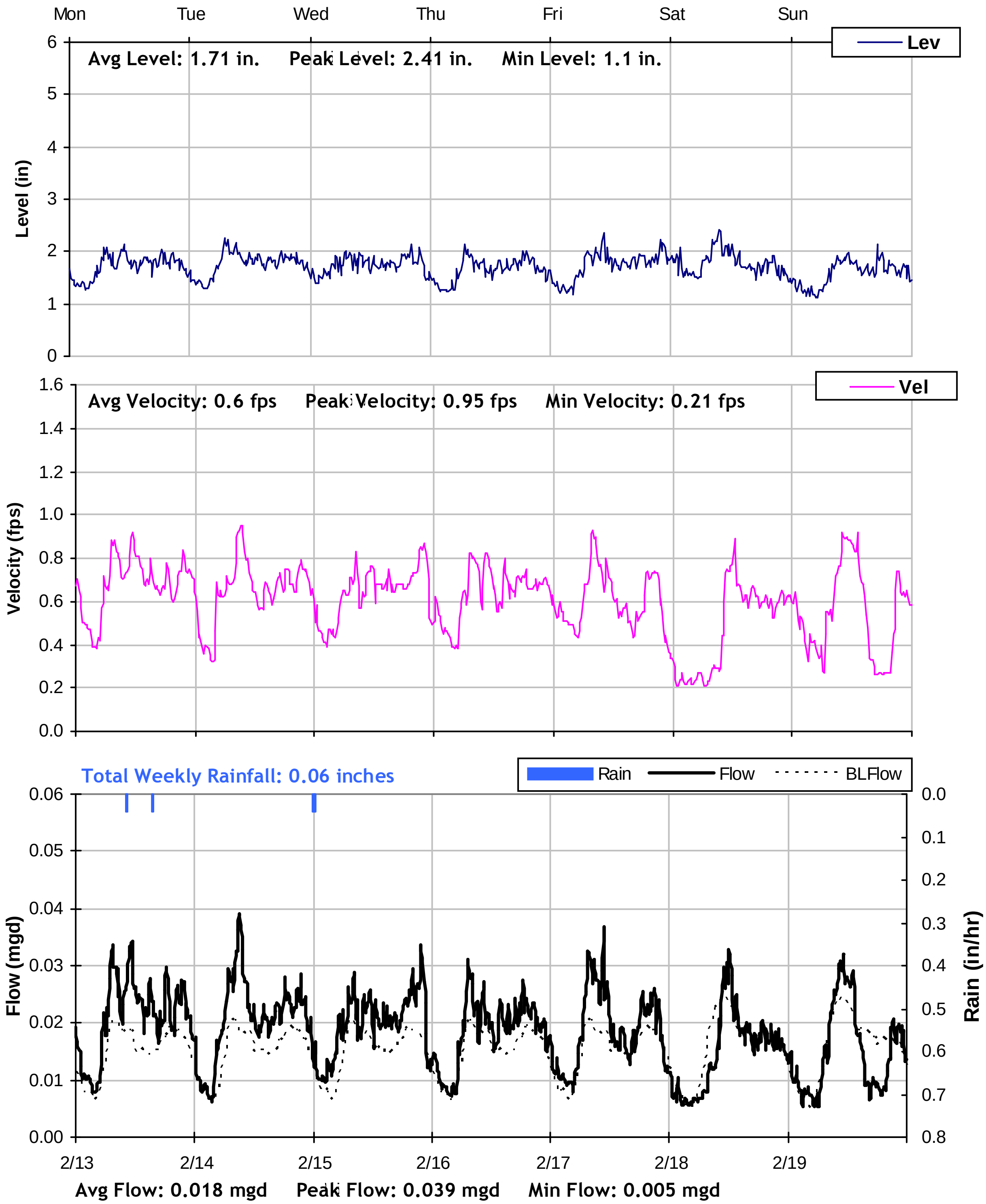
MH 98

Weekly Level, Velocity and Flow Hydrographs

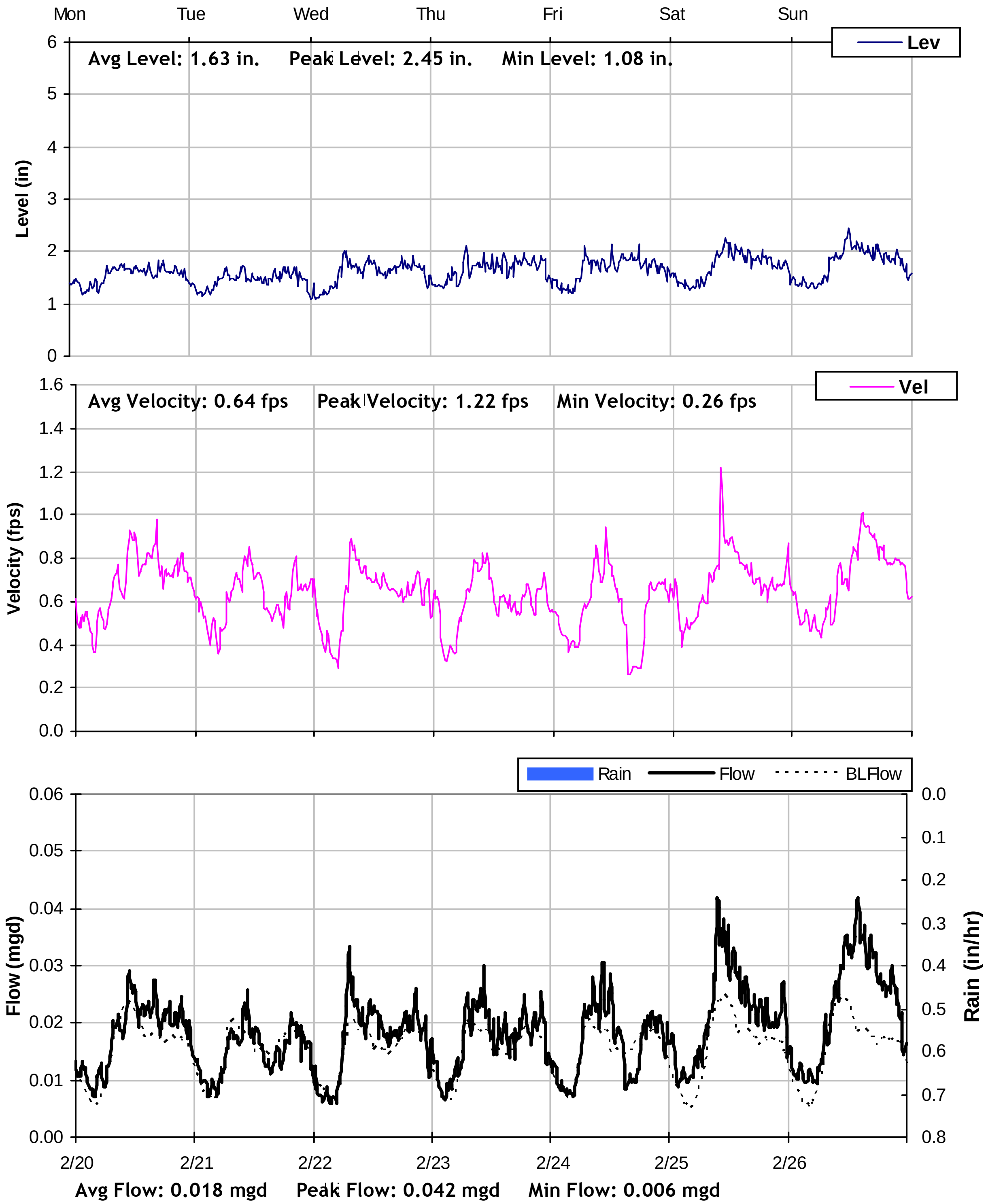
2/6/2012 to 2/13/2012



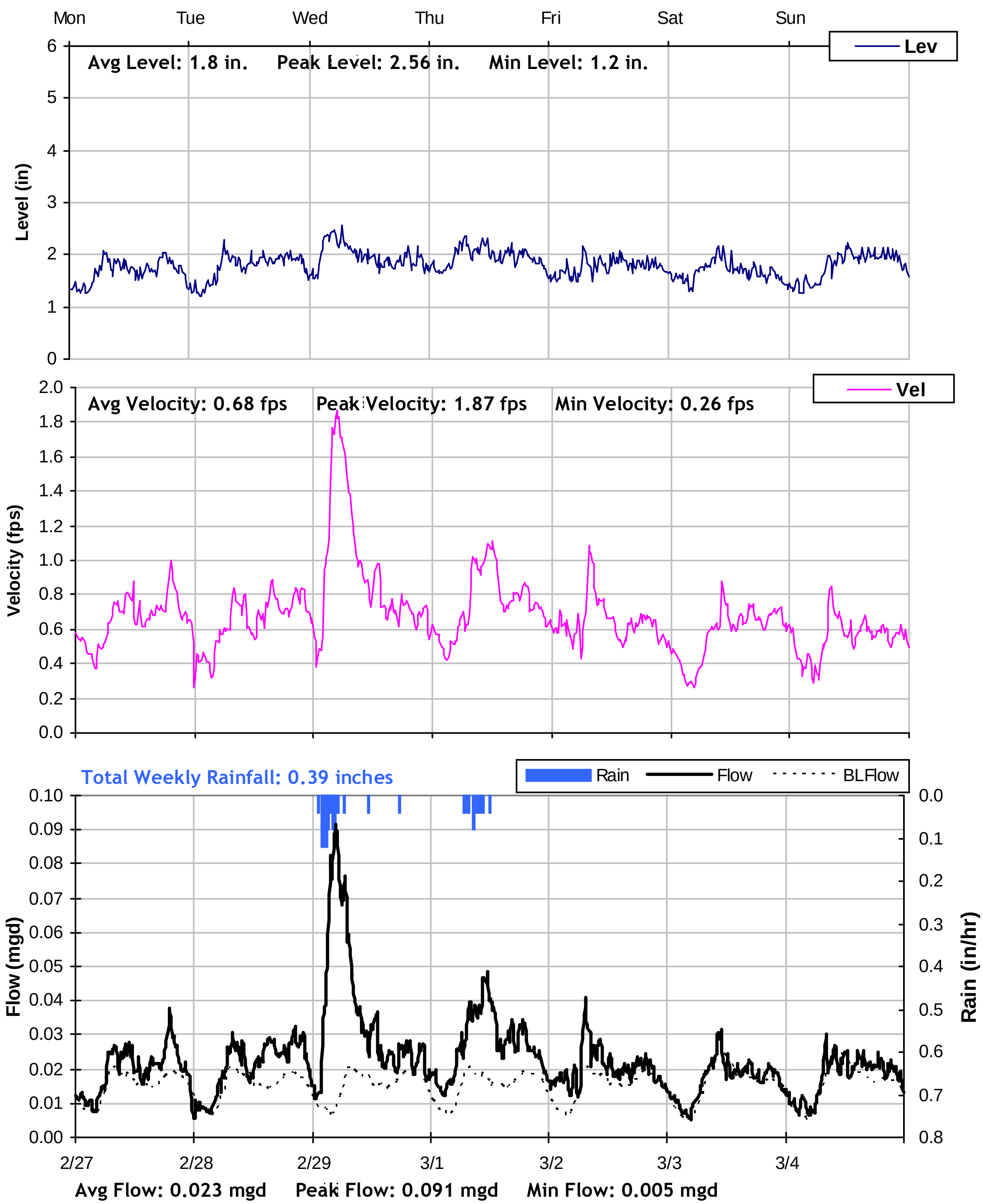
MH 98
Weekly Level, Velocity and Flow Hydrographs
2/13/2012 to 2/20/2012



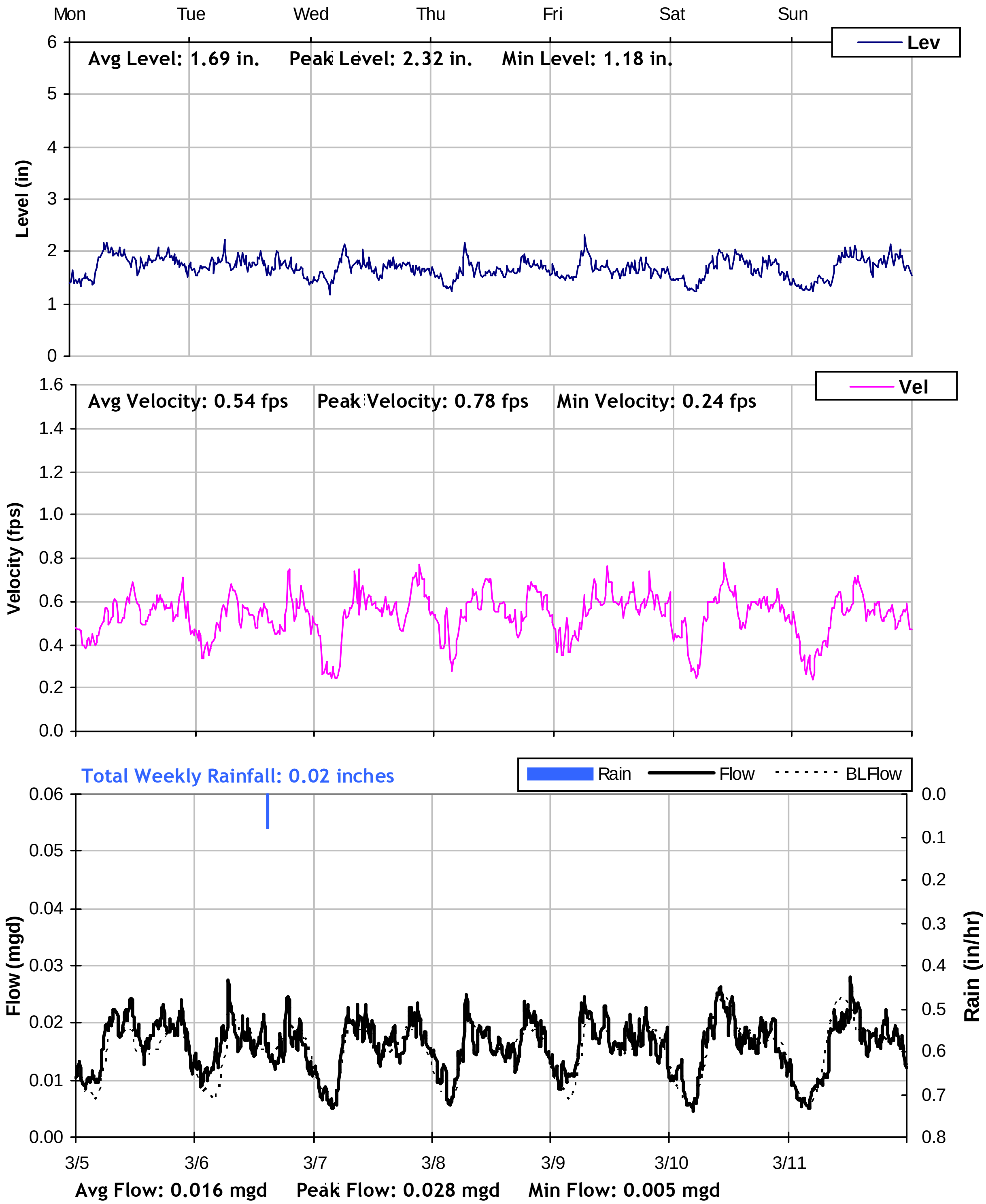
MH 98
Weekly Level, Velocity and Flow Hydrographs
2/20/2012 to 2/27/2012



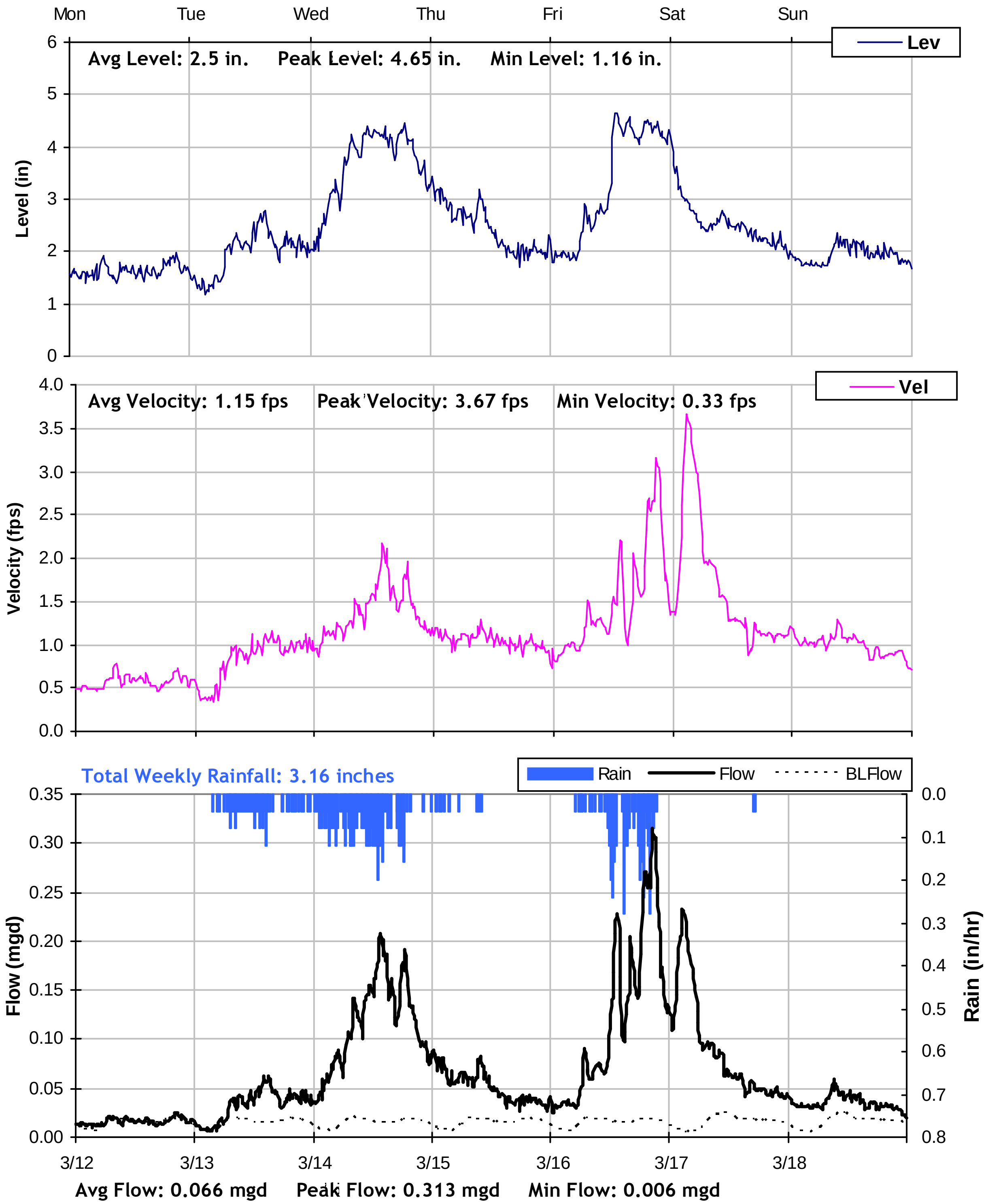
MH 98
Weekly Level, Velocity and Flow Hydrographs
2/27/2012 to 3/5/2012



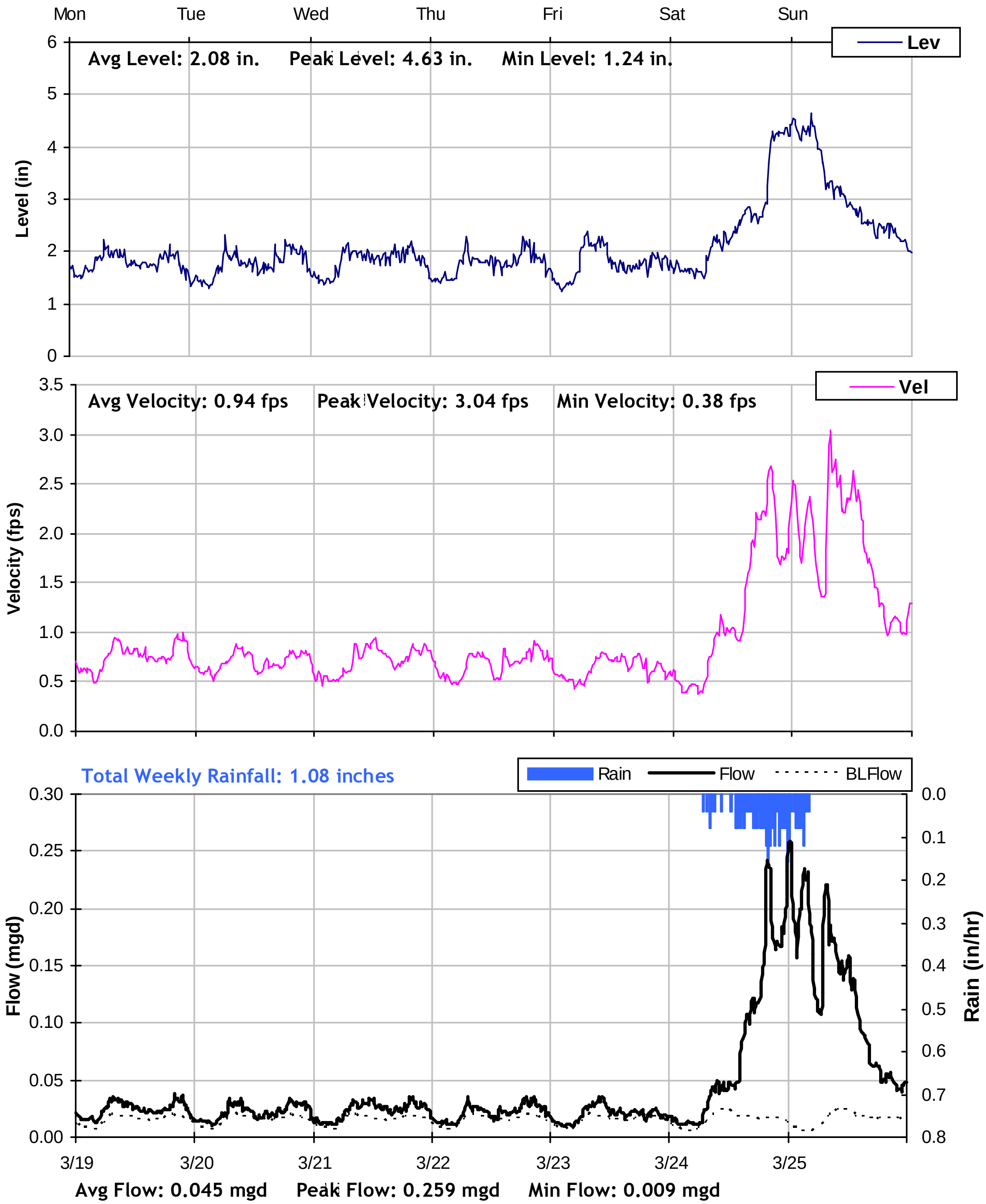
MH 98
Weekly Level, Velocity and Flow Hydrographs
3/5/2012 to 3/12/2012



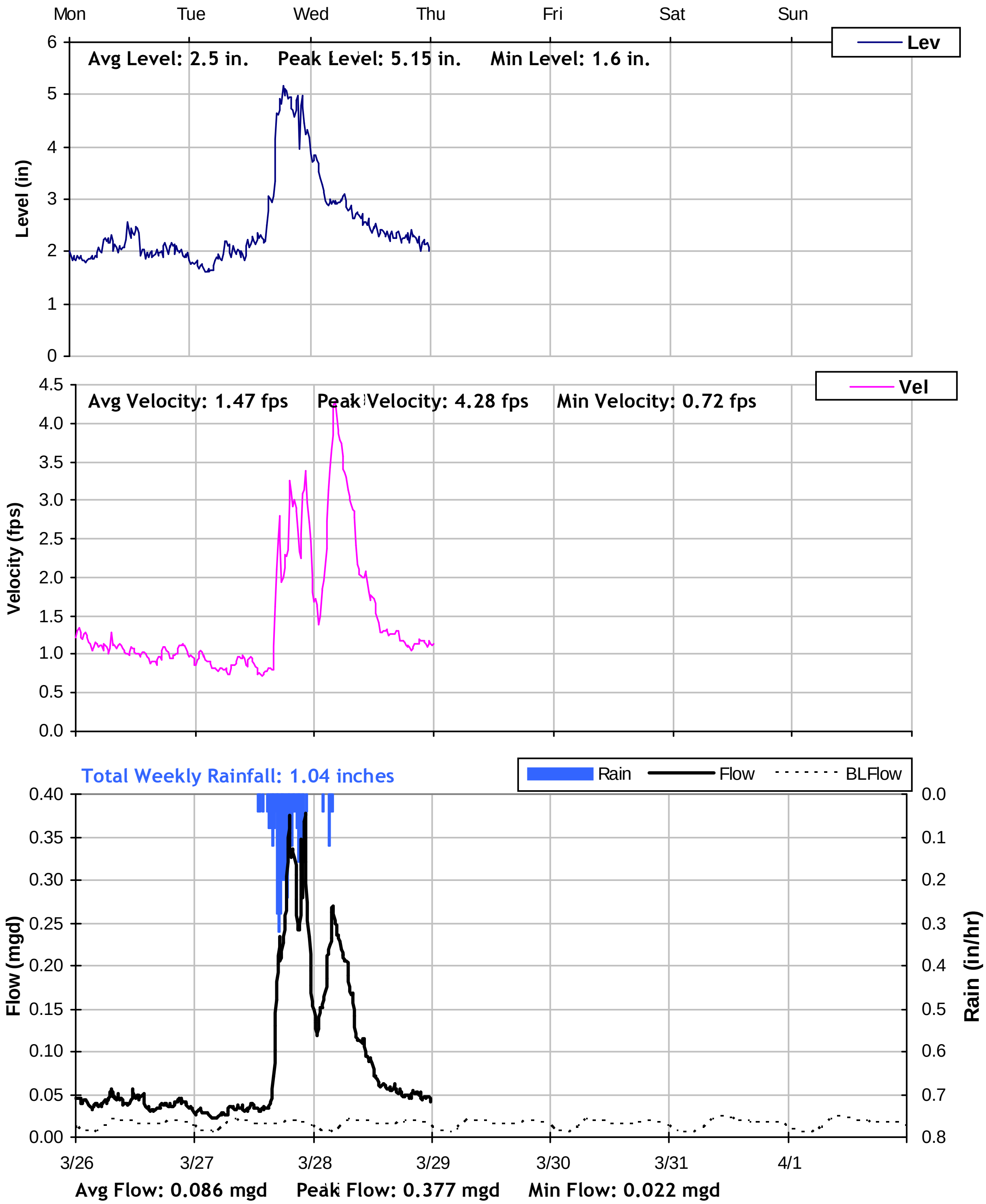
MH 98
Weekly Level, Velocity and Flow Hydrographs
3/12/2012 to 3/19/2012



MH 98
Weekly Level, Velocity and Flow Hydrographs
3/19/2012 to 3/26/2012



MH 98
Weekly Level, Velocity and Flow Hydrographs
3/26/2012 to 4/2/2012



Rodeo Sanitary District

Master Plan Sanitary Sewer Flow Monitoring
Year 2011/2012

Monitoring Site: MH 165

Location: Intersection of 7th Street and Napa Street, northwest corner

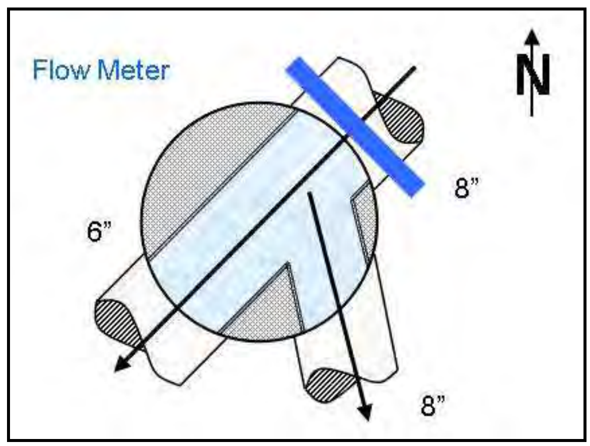
Data Summary Report

MH 165
Site Information Report

Location:	Intersection of 7th Street and Napa Street, northwest corner
Coordinates:	122.2633° W, 38.0290° N
Rim Elevation:	22 feet
Diameter:	8 inches
Baseline Flow:	0.041 mgd
Peak Measured Flow:	0.186 mgd

Satellite Map

Sanitary Map



Flow Sketch

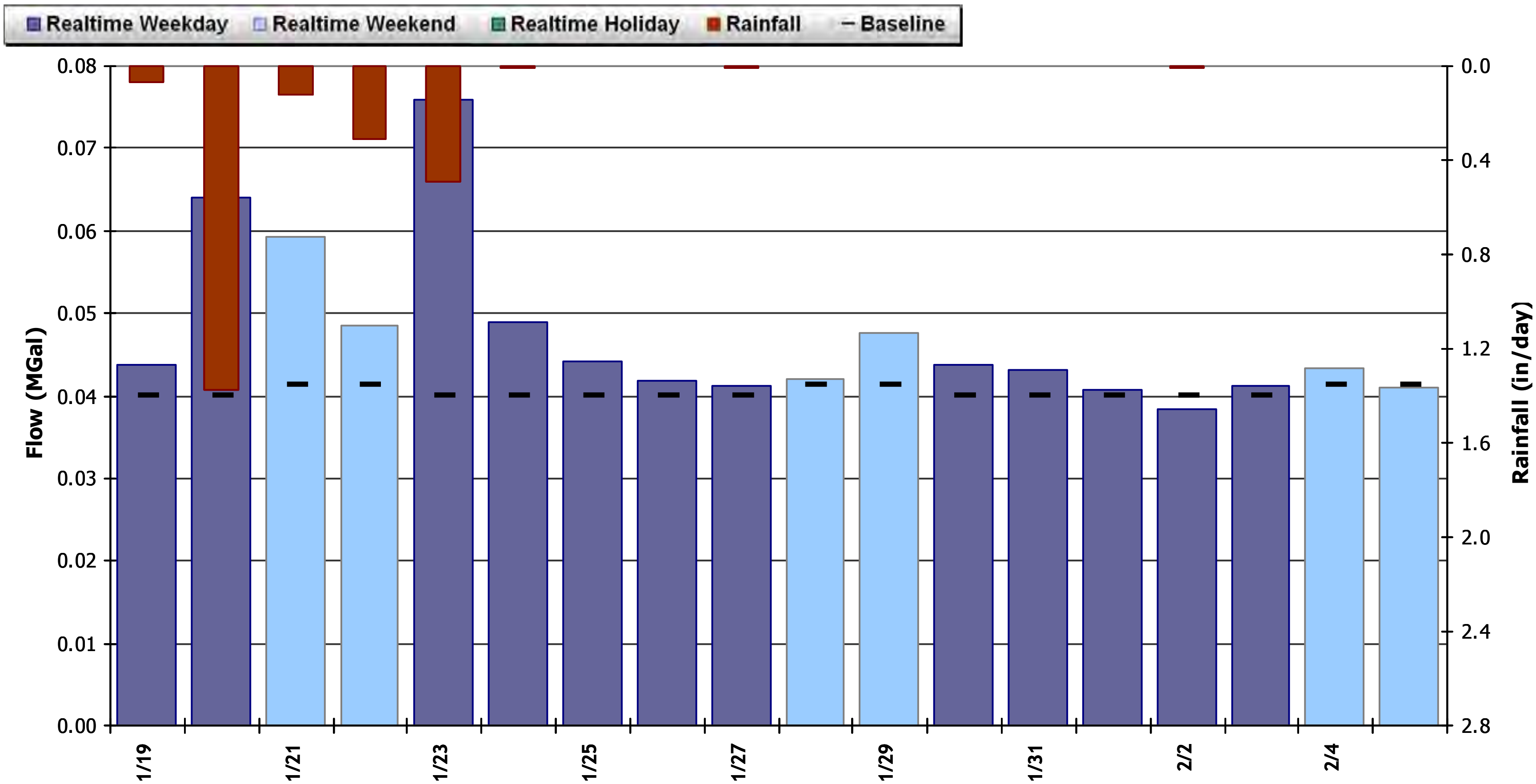
Street View Photo

Plan View Photo

MH 165
Period Flow Summary: Daily Flow Totals

Avg Daily Flow: 0.047 MGal   Peak Daily Flow: 0.076 MGal   Min Daily Flow: 0.038 MGal

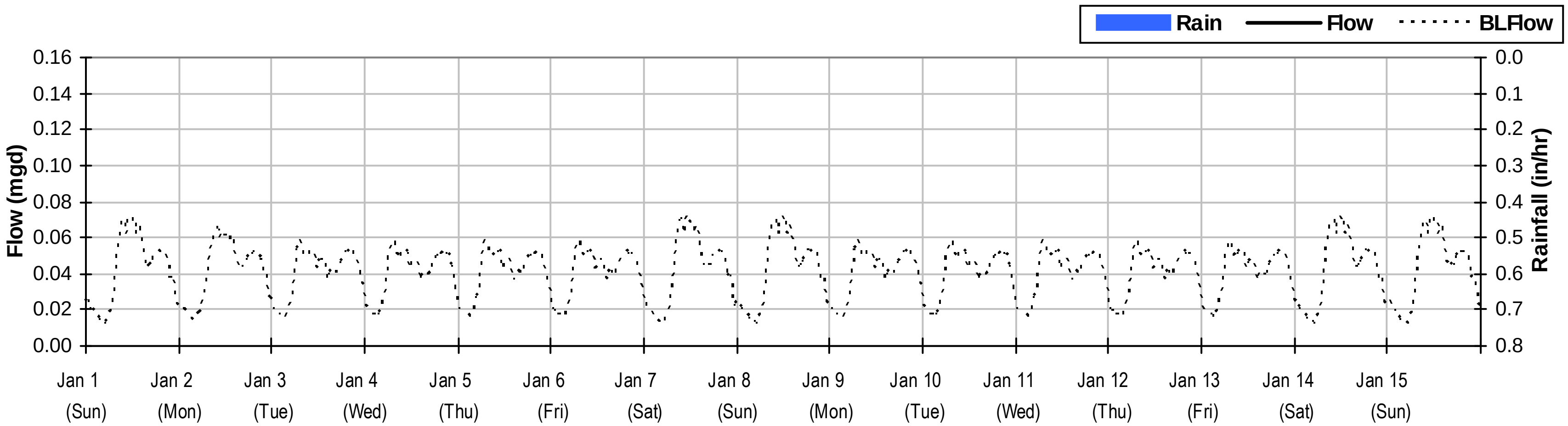
Total Period Rainfall: 2.39 inches

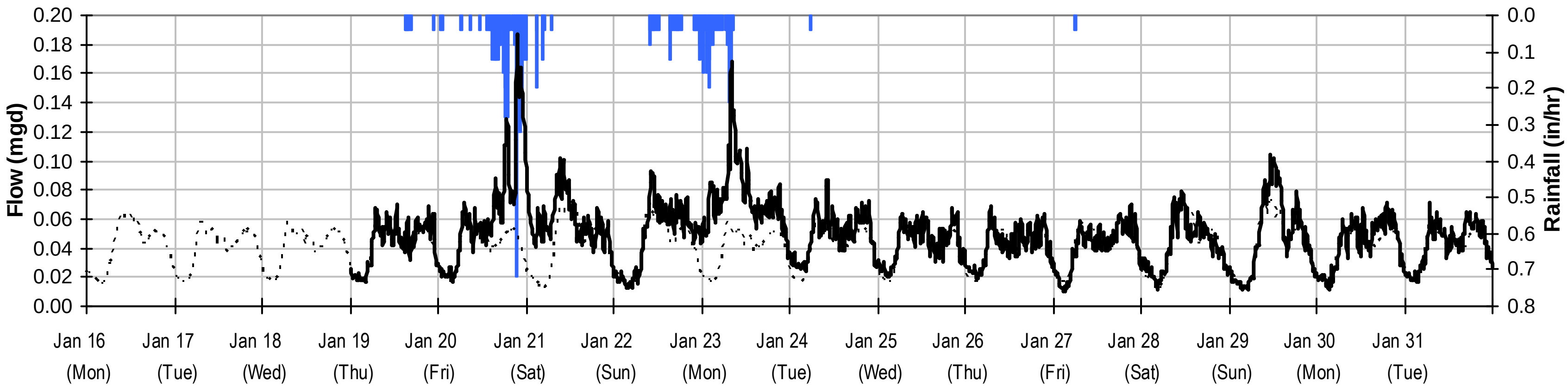


MH 165

Monthly Flow Summary: January, 2012

Total Monthly Rainfall: 2.38 inches   Avg Flow: 0.050 mgd   Peak Flow: 0.186 mgd   Min Flow: 0.011 mgd

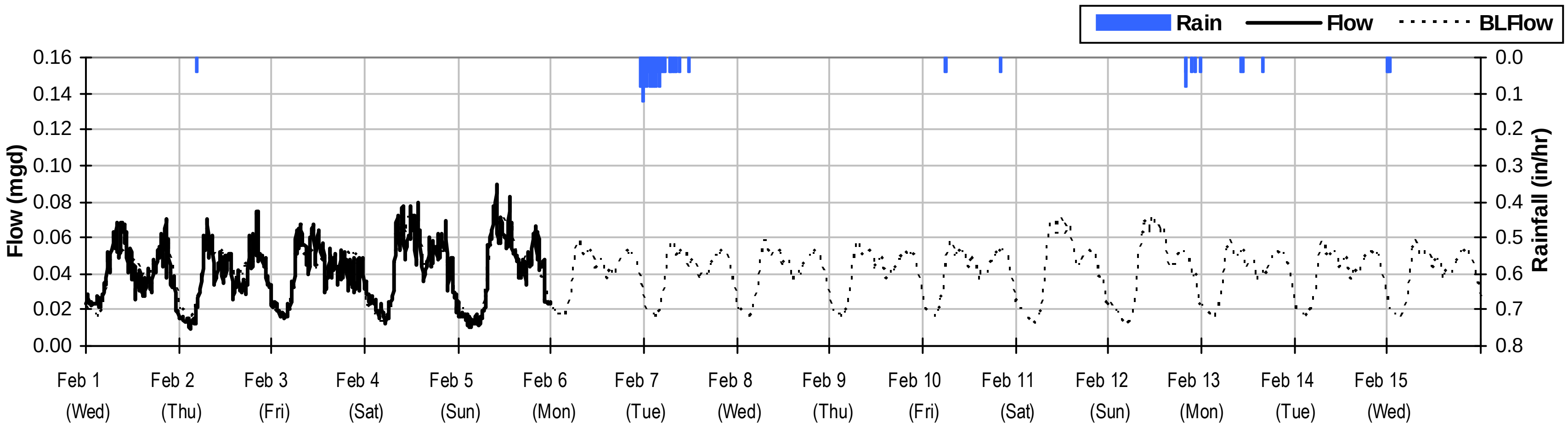


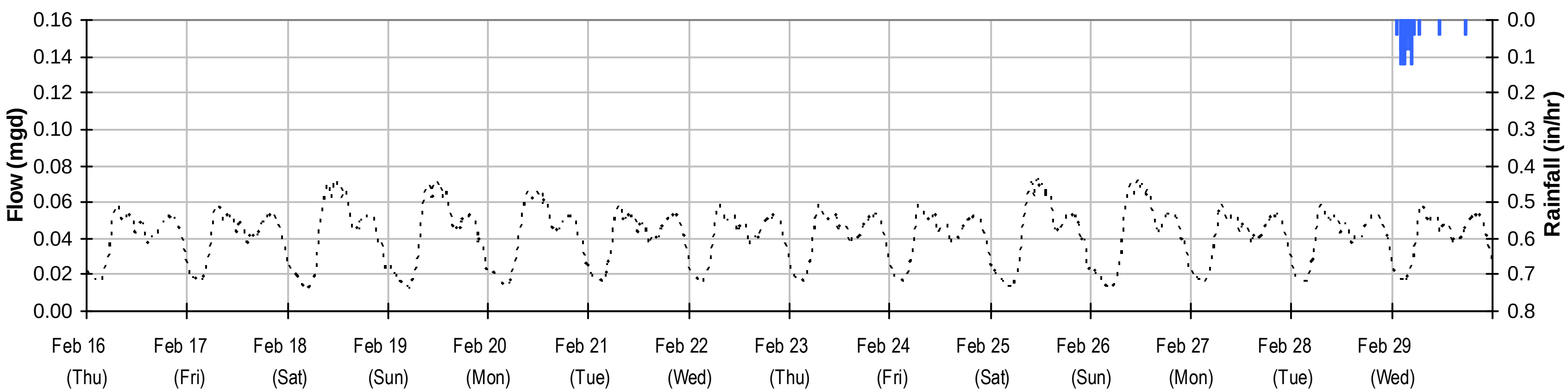


MH 165

Monthly Flow Summary: February, 2012

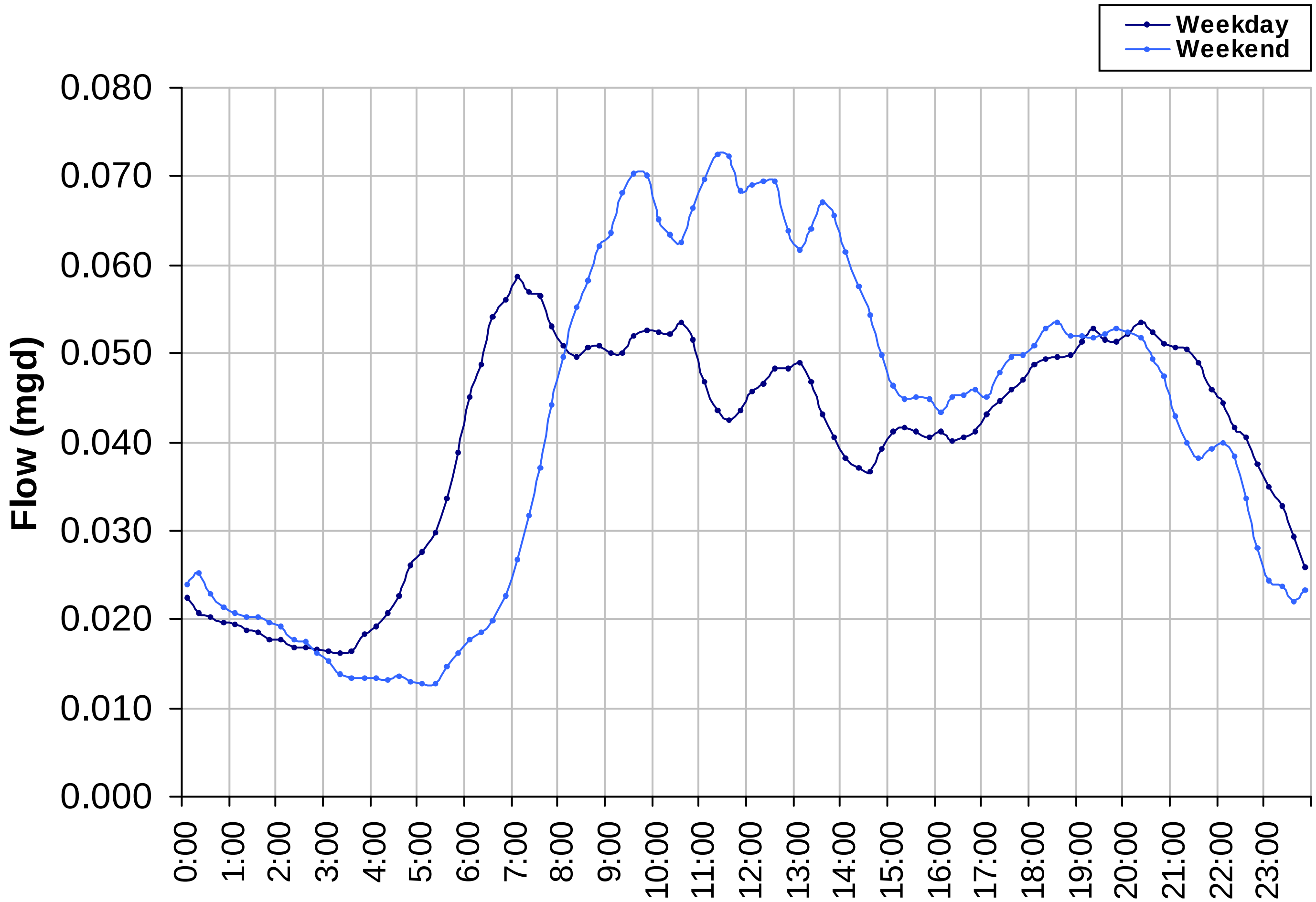
Total Monthly Rainfall: 0.85 inches   Avg Flow: 0.041 mgd   Peak Flow: 0.090 mgd   Min Flow: 0.010 mgd





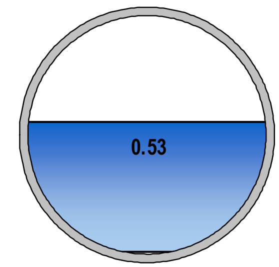
MH 165

Baseline Flow Hydrographs



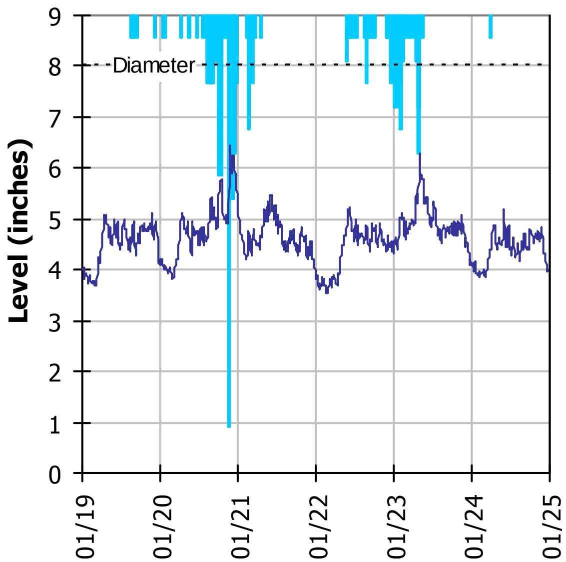
Baseline Flow:

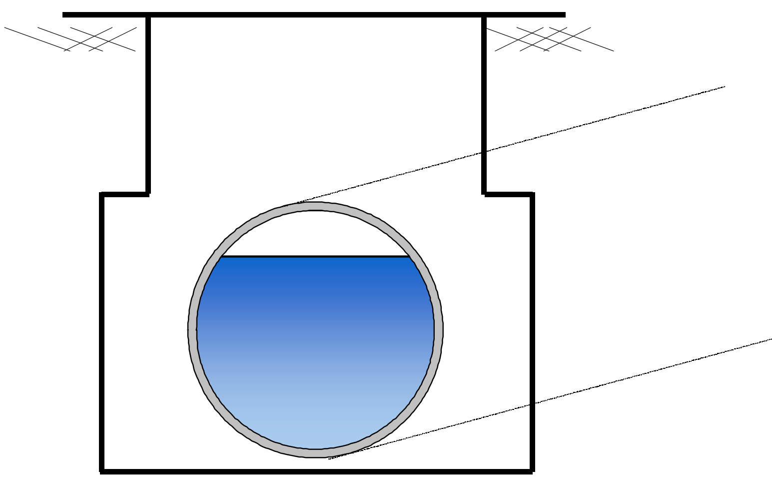
0.041 *mgd*



MH 165
Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Monitoring Period





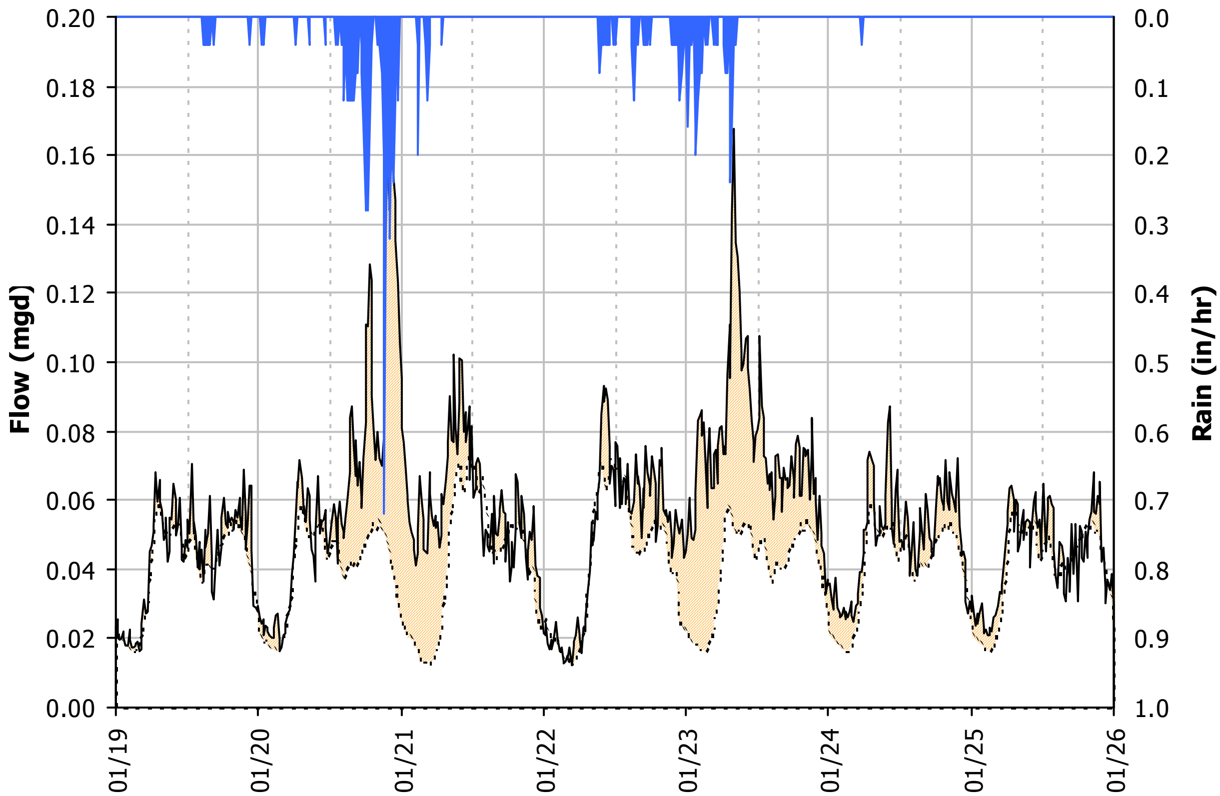
Pipe Diameter: 8 *inches*

Peak Measured Level: 6.46 *inches*

Peak d/D Ratio: 0.81

MH 165
I/I Summary: Event 1

Event 1 Detail Graph



Storm Event I/I Analysis (Rain = 2.37 inches)

Inflow

Peak I/I Rate: 0.14 *mgd*

Pk I/I:ADWF: 3.38

Combined I/I

Total I/I: 101,000 *gallons*

Total I/I:ADWF: 1.05 *per in-rain*

RDI (infiltration)

Infiltration Rate: 0.004 *mgd*
(1/25/2012)

RDI (% of BL): 10%

Capacity

Peak Flow: 0.19 *mgd*

PF: 4.58

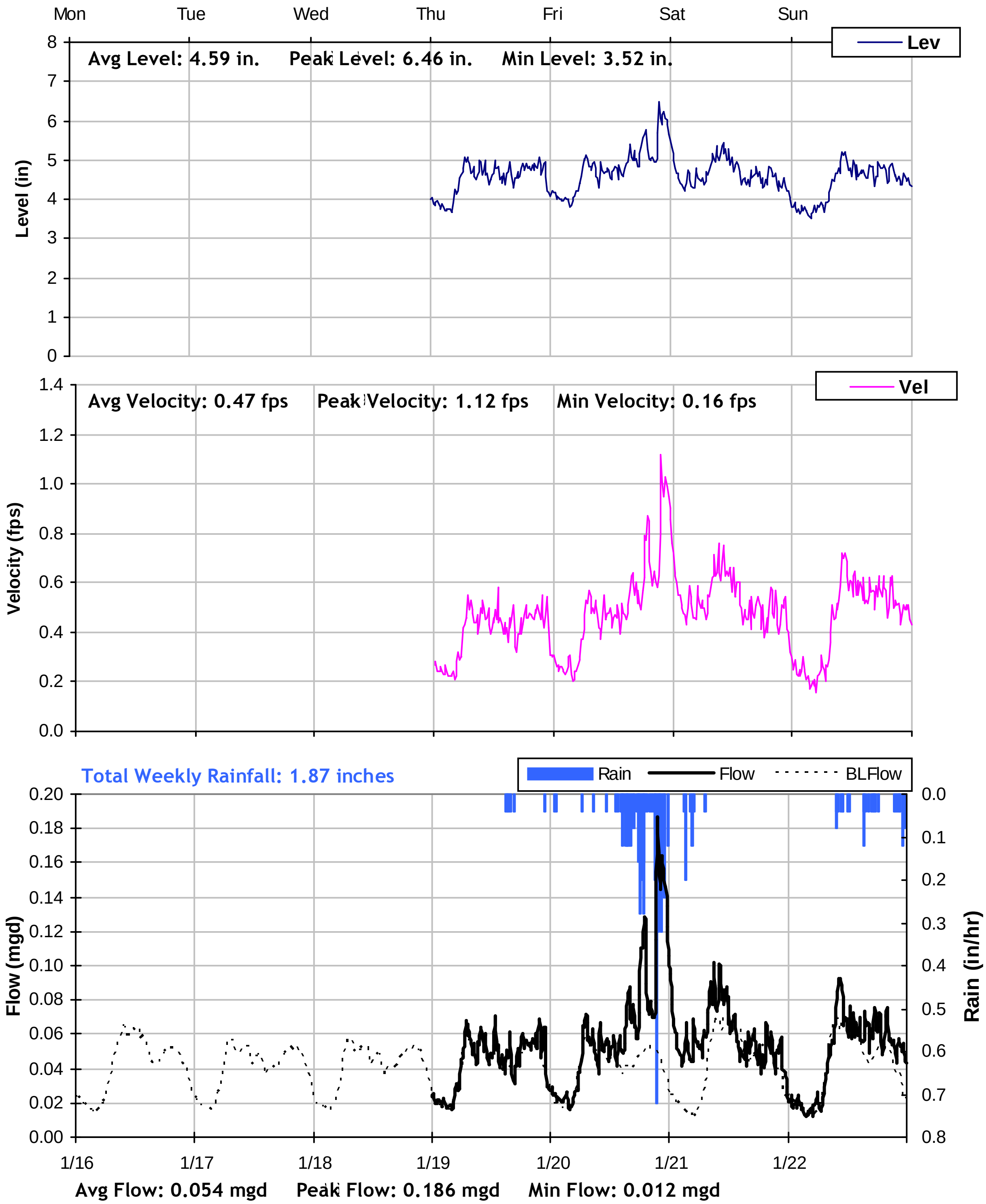
Peak Level: 6.46 *in*

d/D Ratio: 0.81

MH 165

Weekly Level, Velocity and Flow Hydrographs

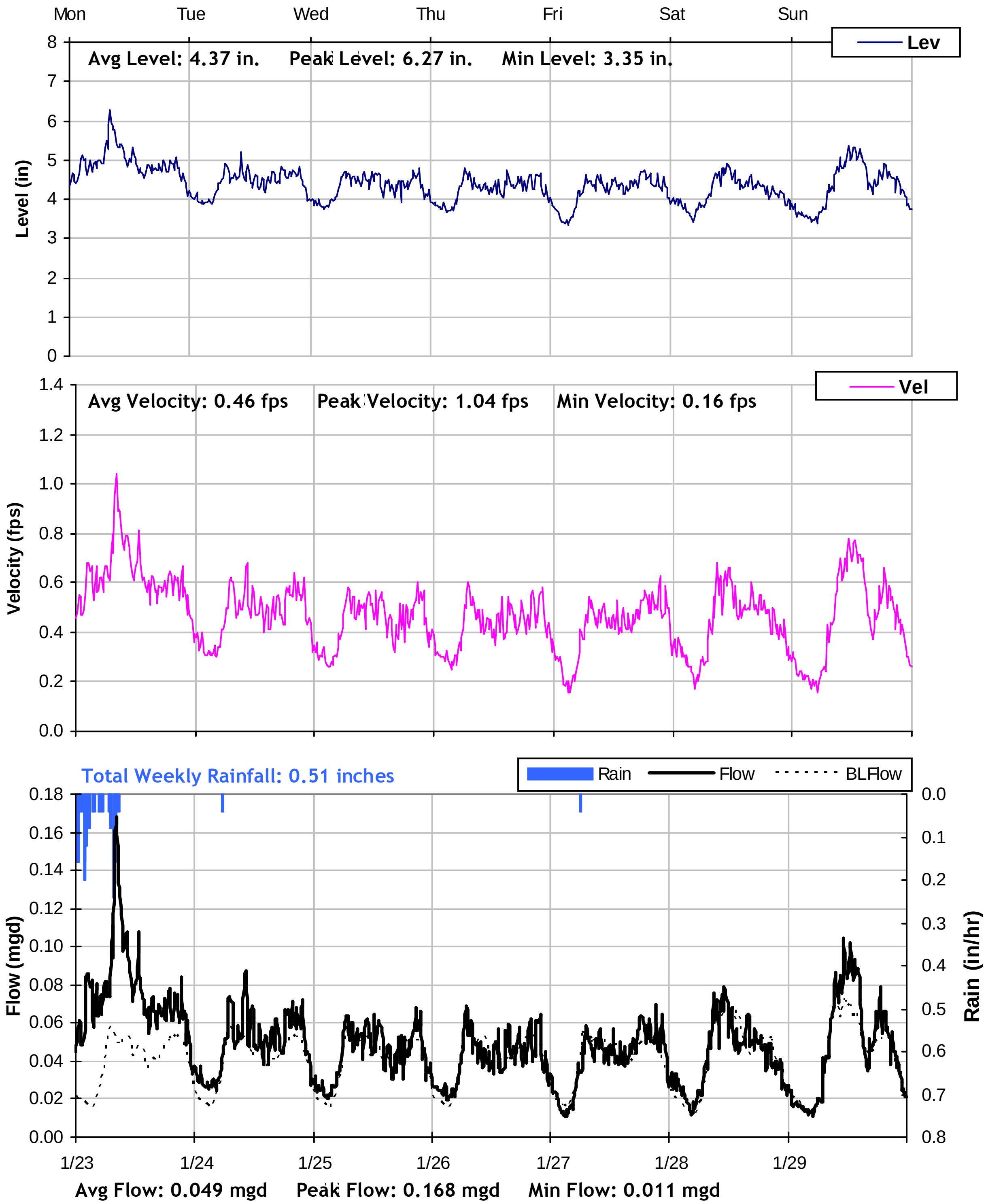
1/16/2012 to 1/23/2012



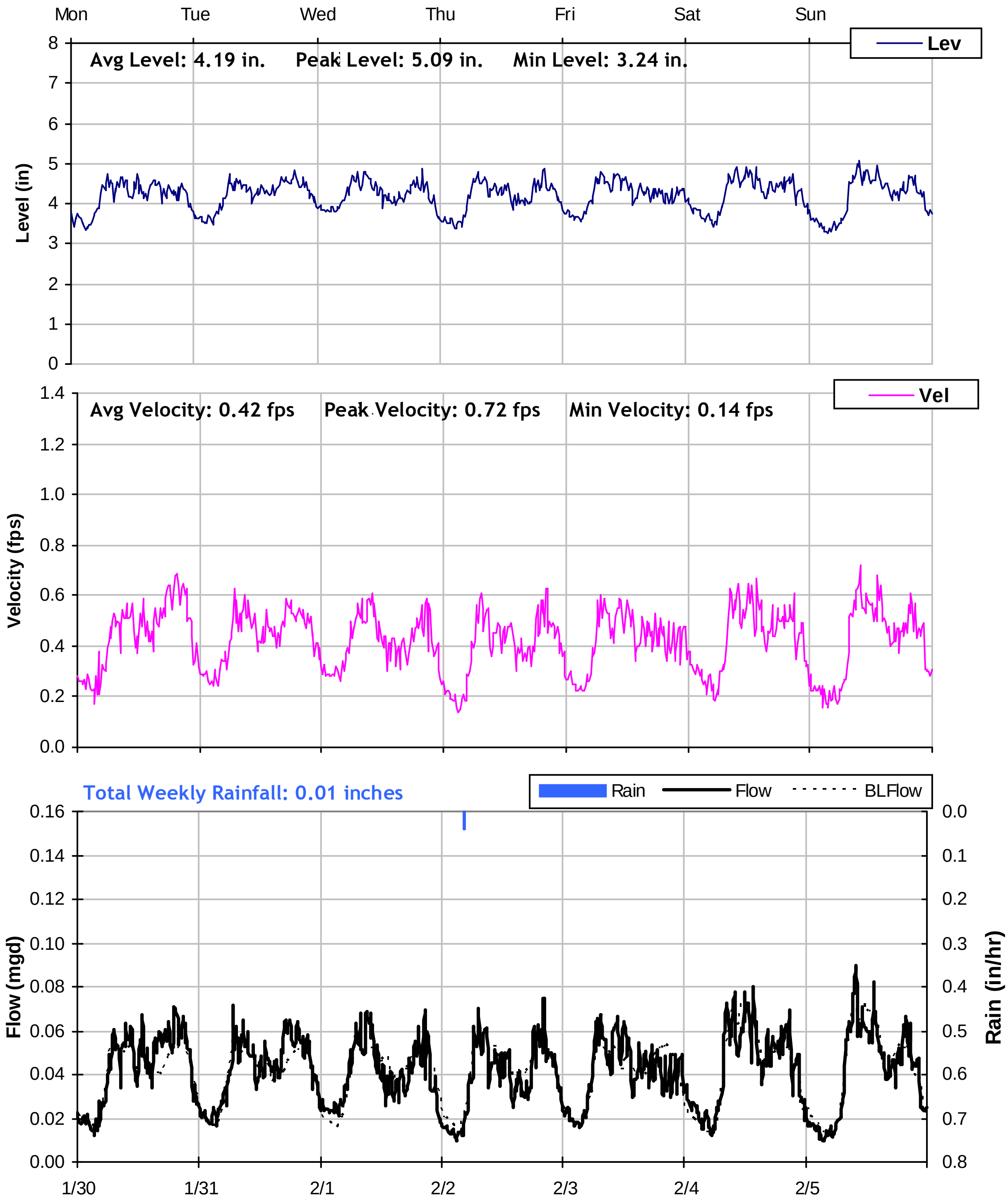
MH 165

Weekly Level, Velocity and Flow Hydrographs

1/23/2012 to 1/30/2012



MH 165
Weekly Level, Velocity and Flow Hydrographs
1/30/2012 to 2/6/2012



Avg Flow: 0.042 mgd Peak Flow: 0.09 mgd Min Flow: 0.01 mgd

Rodeo Sanitary District

Master Plan Sanitary Sewer Flow Monitoring
Year 2011/2012

Monitoring Site: MH 327

Location: 640 Parker Avenue, north of 7th Street

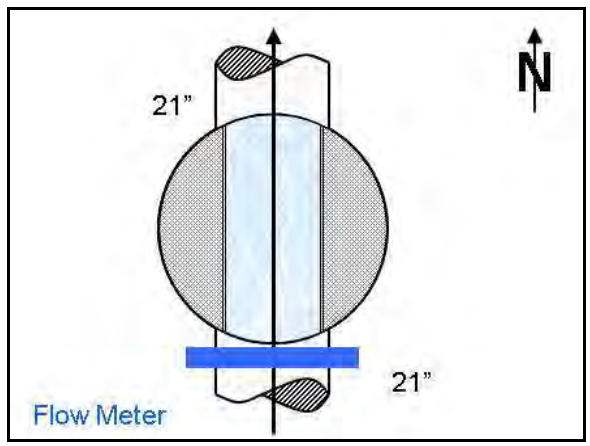
Data Summary Report

MH 327
Site Information Report

Location:	640 Parker Avenue, north of 7th Street
Coordinates:	122.2660°W, 38.0289°N
Rim Elevation:	21 feet
Diameter:	21 inches
Baseline Flow:	0.226 mgd
Peak Measured Flow:	0.901 mgd

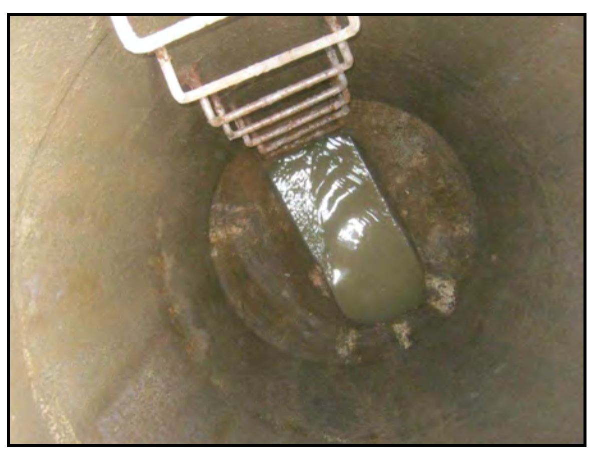
Satellite Map

Sanitary Map



Flow Sketch

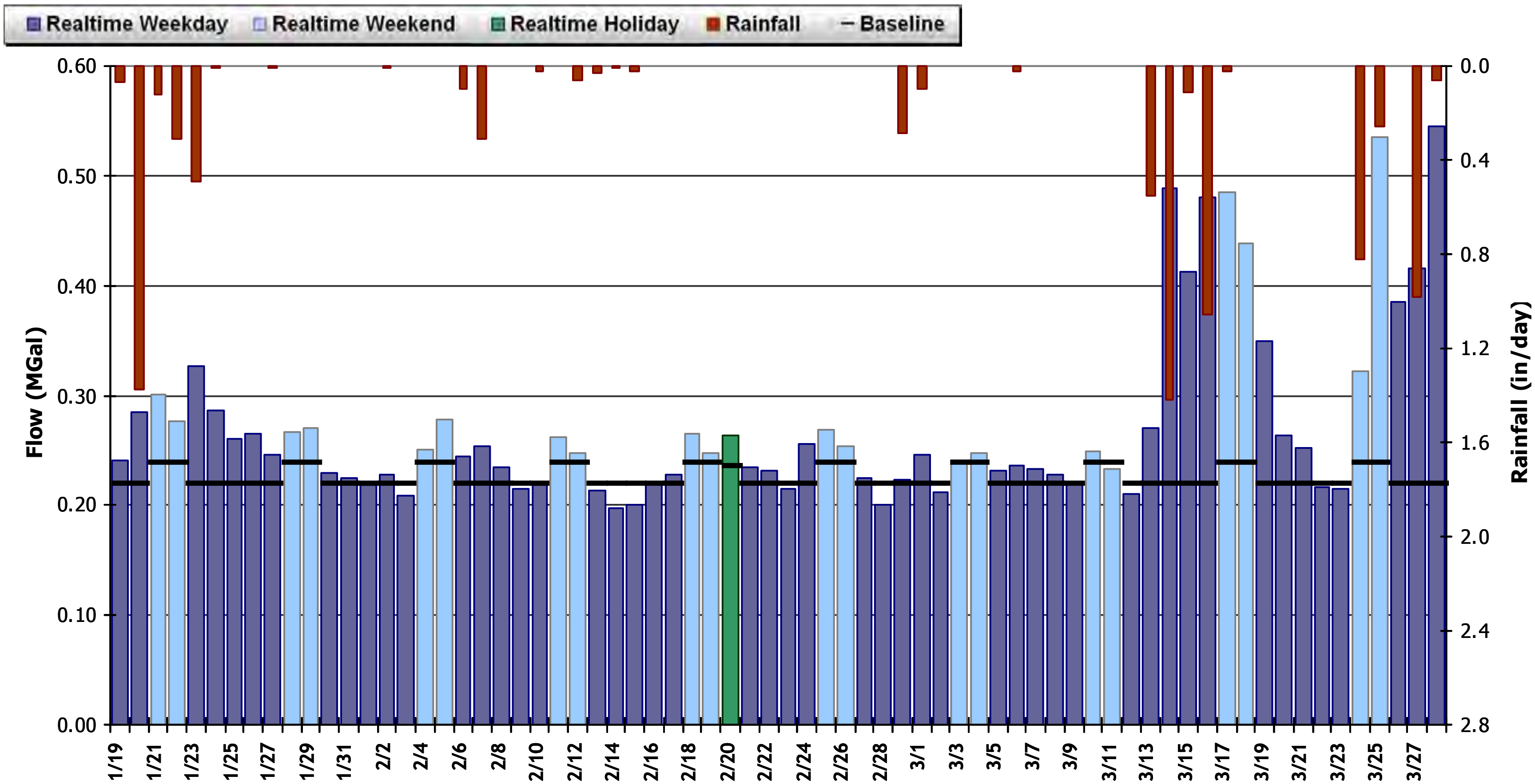

Street View Photo


Plan View Photo

MH 327
Period Flow Summary: Daily Flow Totals

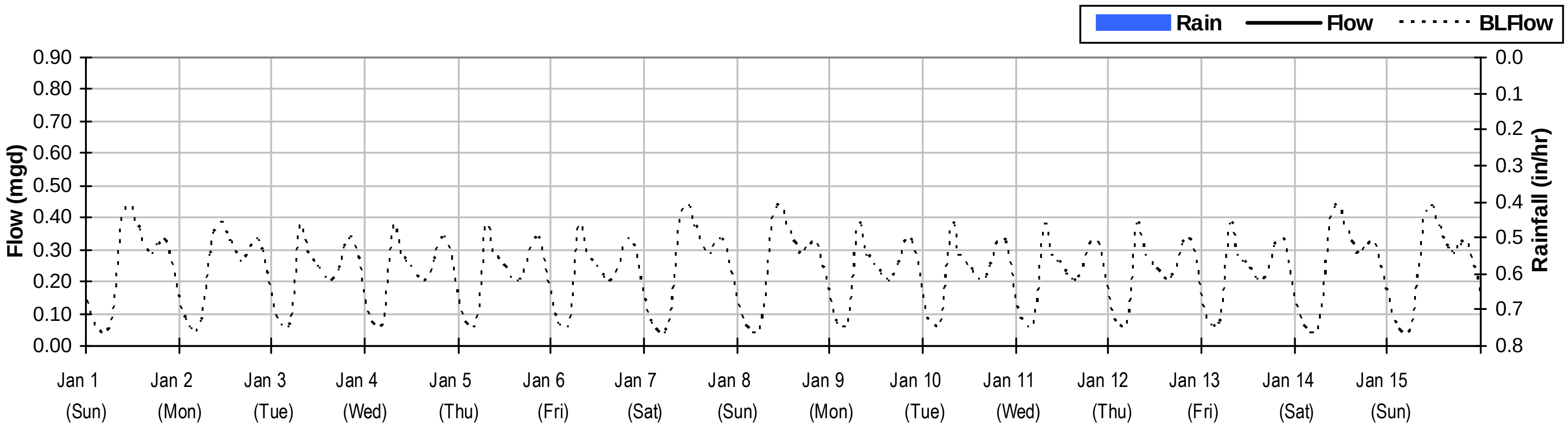
Avg Daily Flow: 0.274 MGal Peak Daily Flow: 0.545 MGal Min Daily Flow: 0.197 MGal

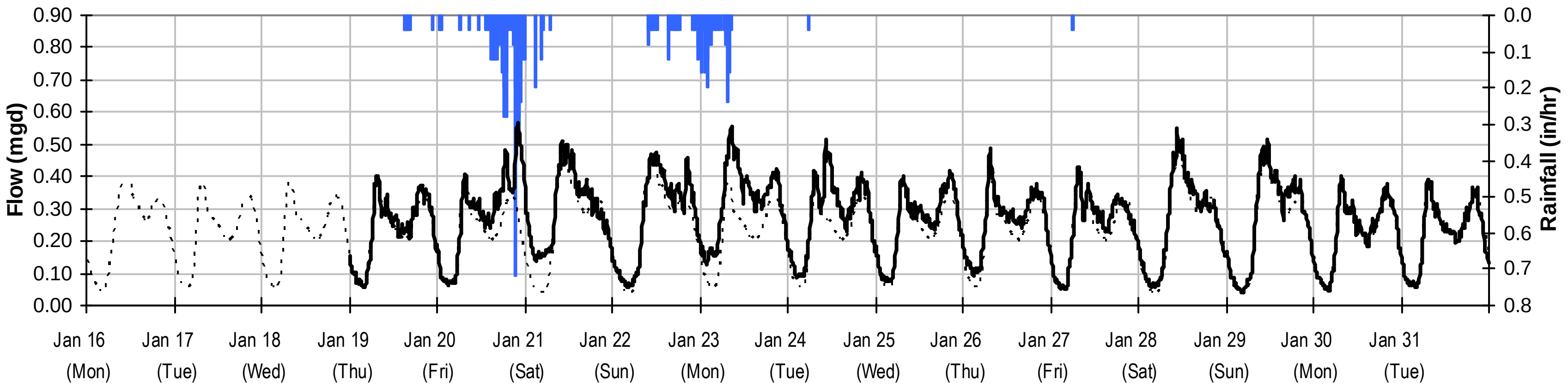
Total Period Rainfall: 8.63 inches



MH 327
Monthly Flow Summary: January, 2012

Total Monthly Rainfall: 2.38 inches   **Avg Flow: 0.268 mgd**   **Peak Flow: 0.570 mgd**   **Min Flow: 0.041 mgd**

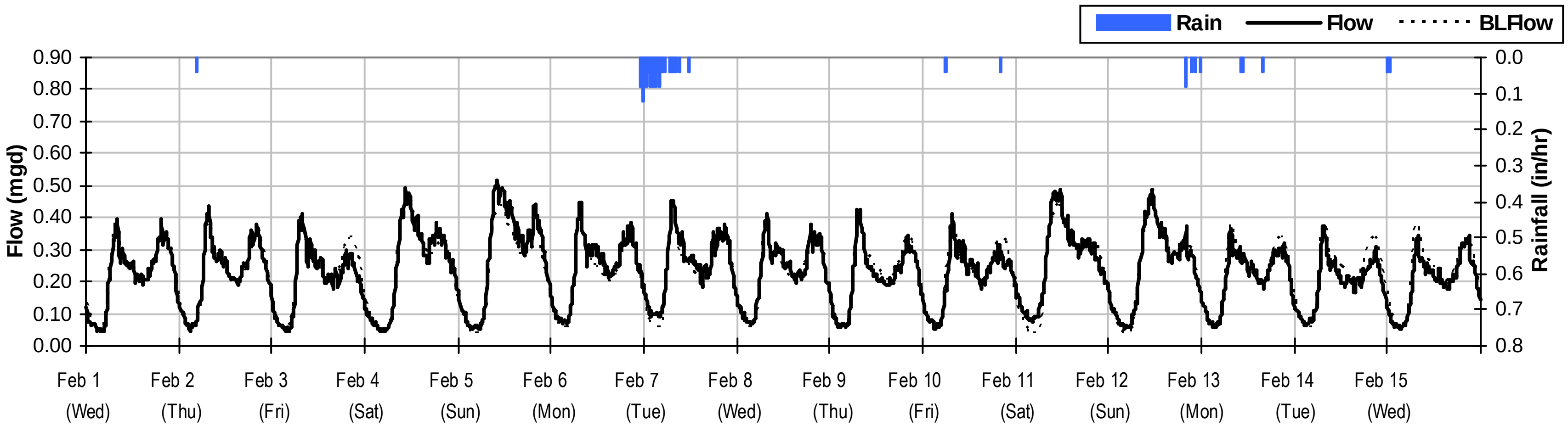


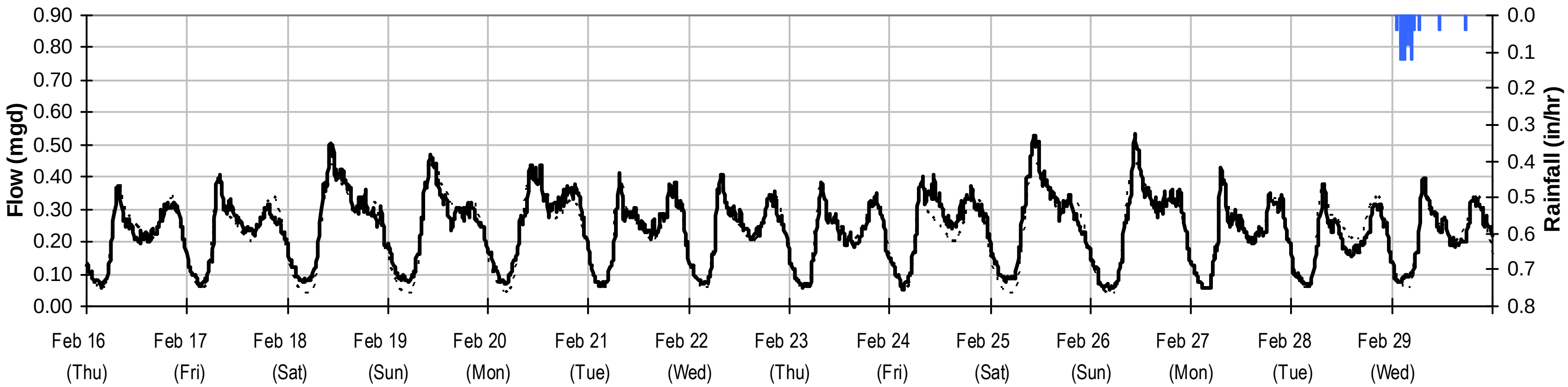


MH 327

Monthly Flow Summary: February, 2012

Total Monthly Rainfall: 0.85 inches   Avg Flow: 0.235 mgd   Peak Flow: 0.534 mgd   Min Flow: 0.044 mgd

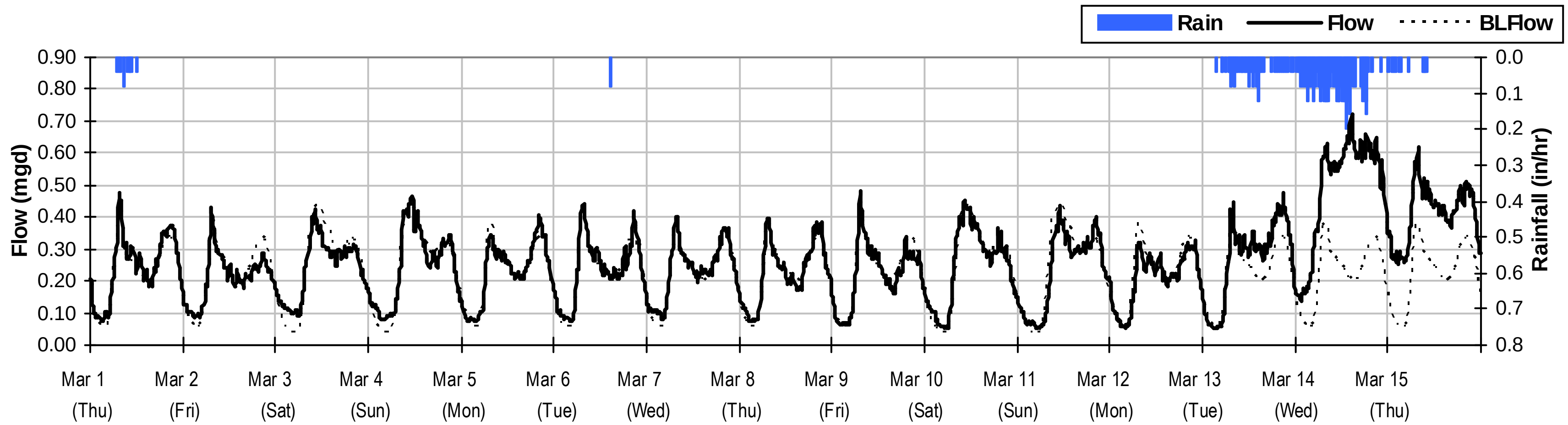


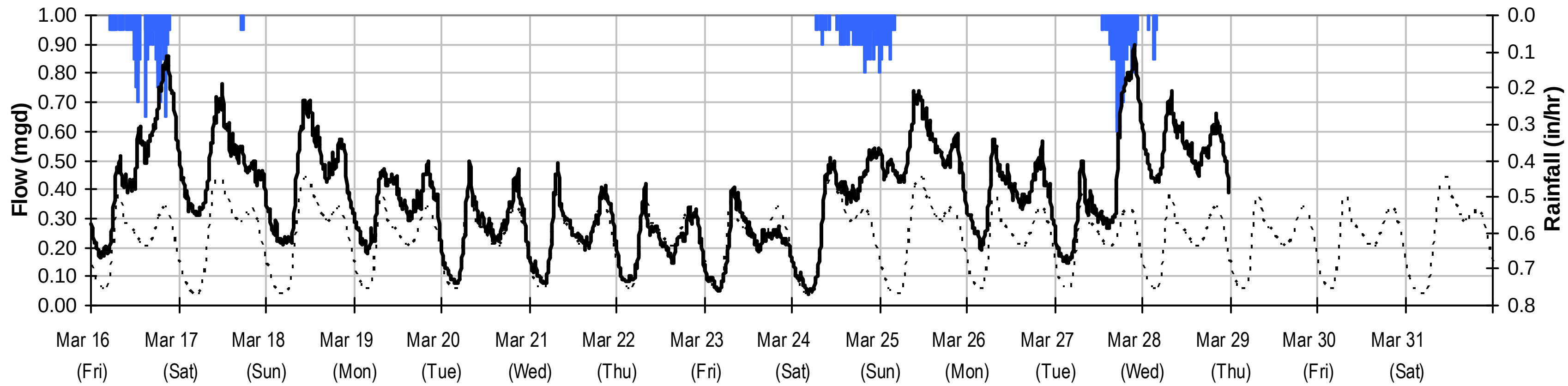


MH 327

Monthly Flow Summary: March, 2012

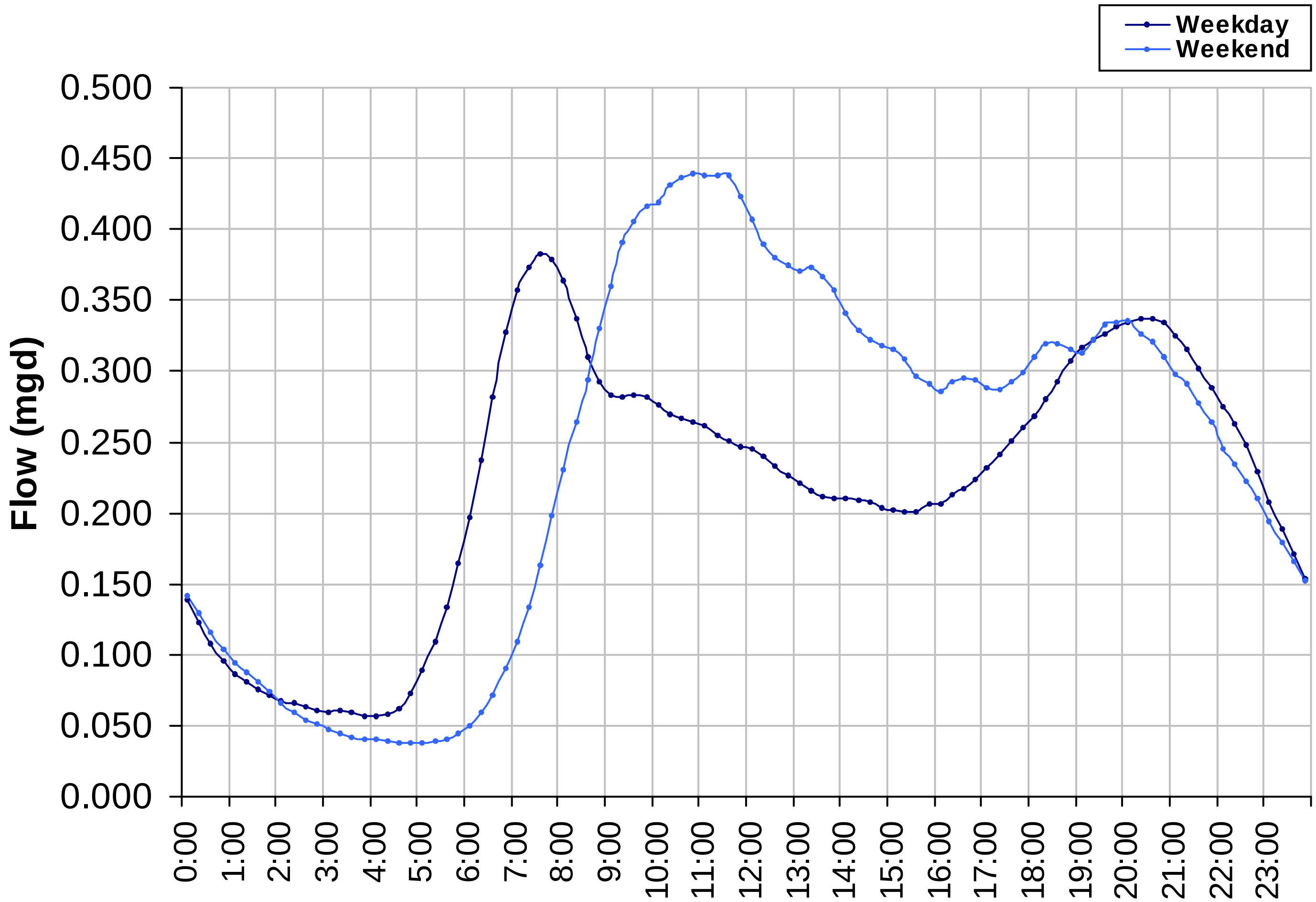
Total Monthly Rainfall: 5.4 inches **Avg Flow: 0.317 mgd** **Peak Flow: 0.901 mgd** **Min Flow: 0.041 mgd**





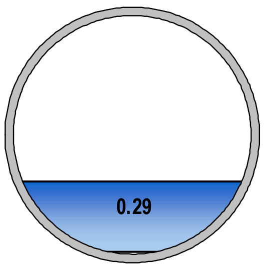
MH 327

Baseline Flow Hydrographs



Baseline Flow:

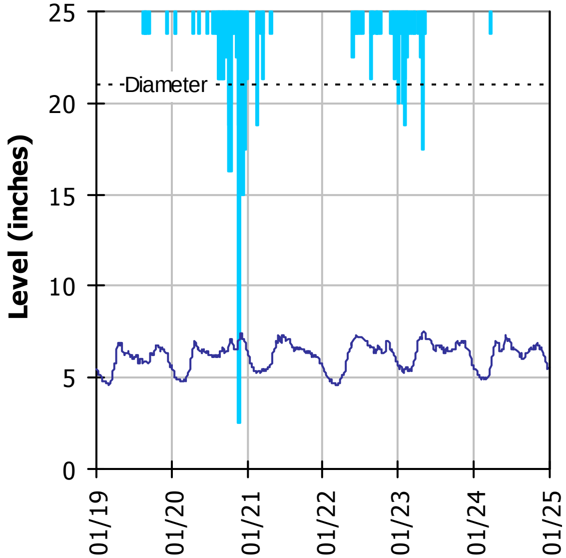
0.226 *mgd*

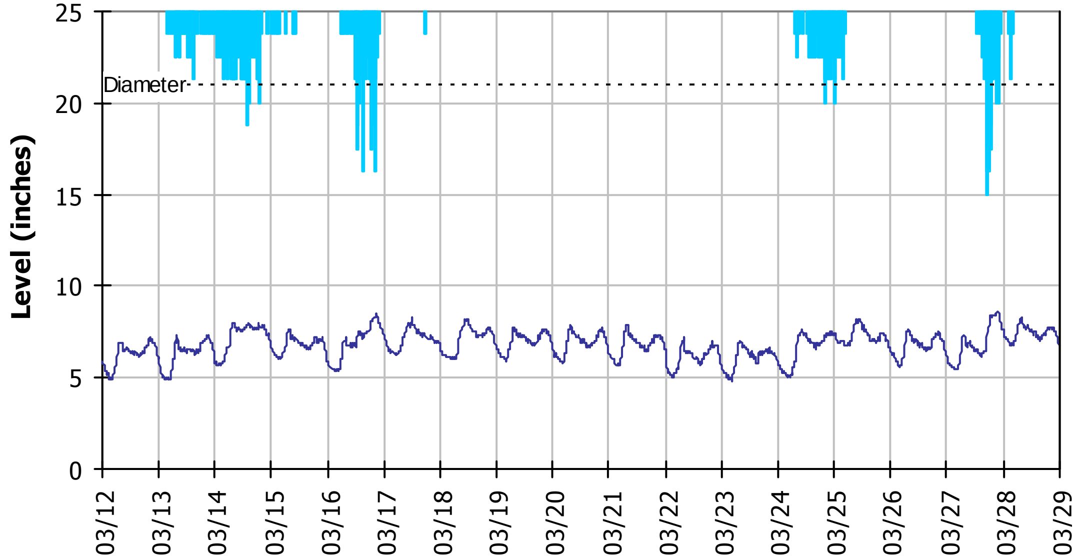


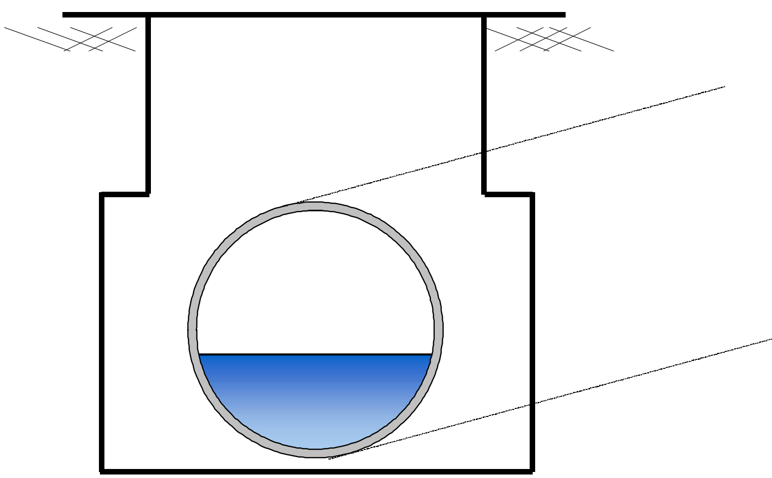
MH 327

Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Monitoring Period







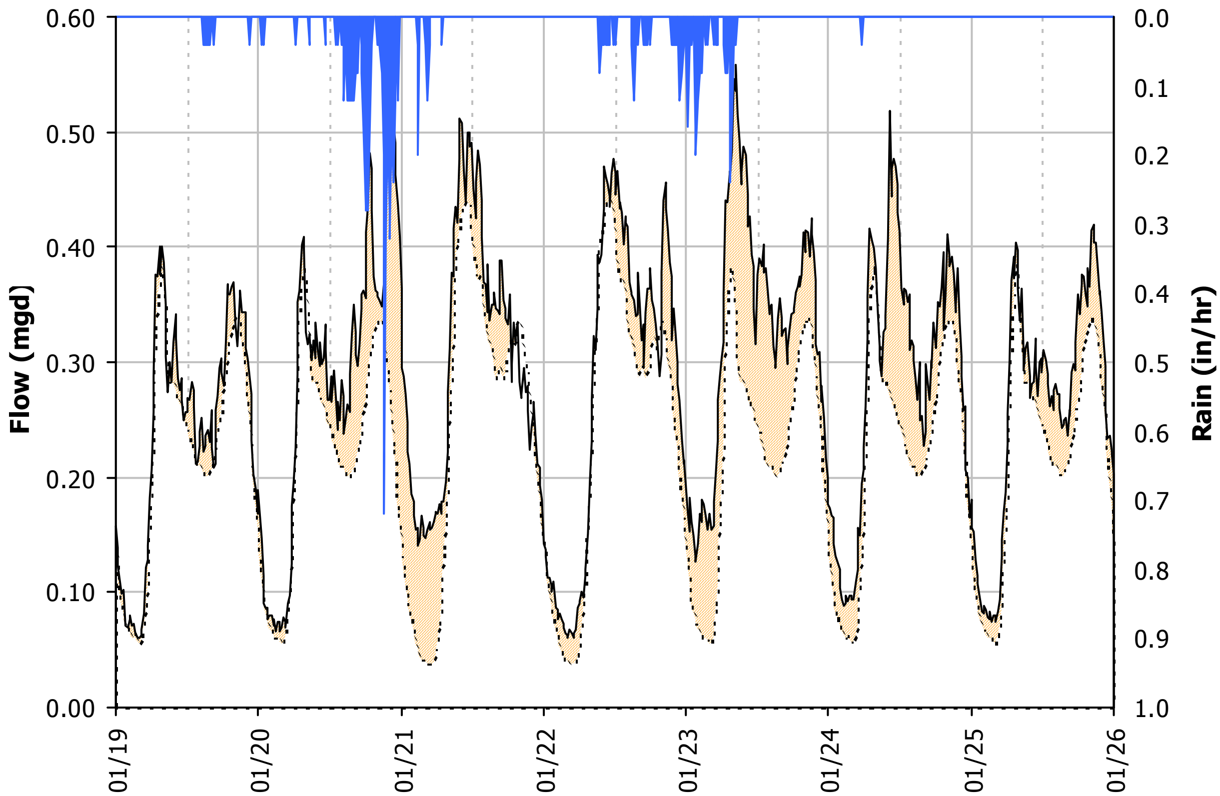
Pipe Diameter: 21 *inches*

Peak Measured Level: 8.67 *inches*

Peak d/D Ratio: 0.41

MH 327
I/I Summary: Event 1

Event 1 Detail Graph



Storm Event I/I Analysis (Rain = 2.37 inches)

Inflow

Peak I/I Rate: 0.31 *mgd*

Pk I/I:ADWF: 1.36

Combined I/I

Total I/I: 398,000 *gallons*

Total I/I:ADWF: 0.74 *per in-rain*

RDI (infiltration)

Infiltration Rate: 0.040 *mgd*
(1/25/2012)

RDI (% of BL): 18%

Capacity

Peak Flow: 0.57 *mgd*

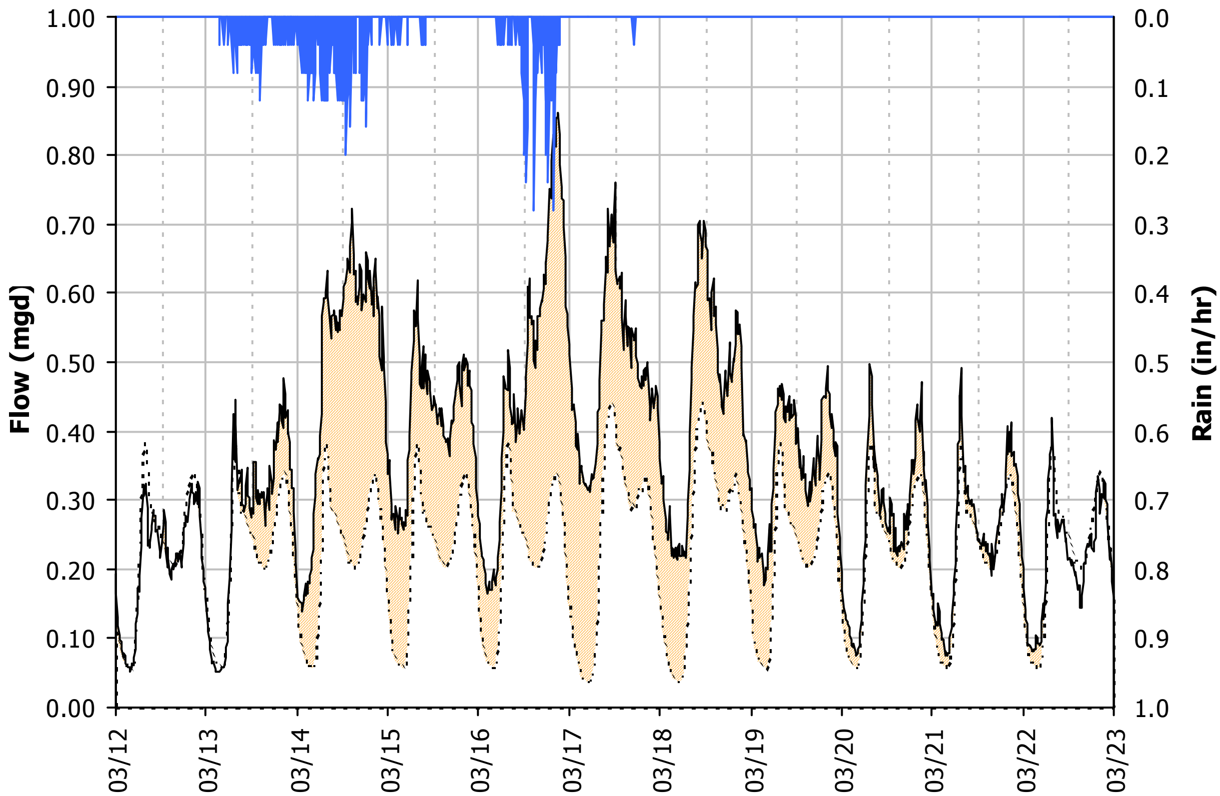
PF: 2.52

Peak Level: 7.55 *in*

d/D Ratio: 0.36

MH 327
I/I Summary: Event 2

Event 2 Detail Graph



Storm Event I/I Analysis (Rain = 3.16 inches)

Inflow

Peak I/I Rate: 0.54 *mgd*

Pk I/I:ADWF: 2.38

Combined I/I

Total I/I: 1,409,000 *gallons*

Total I/I:ADWF: 1.98 *per in-rain*

RDI (infiltration)

Infiltration Rate: 0.000 *mgd*
(3/22/2012)

RDI (% of BL): 0%

Capacity

Peak Flow: 0.86 *mgd*

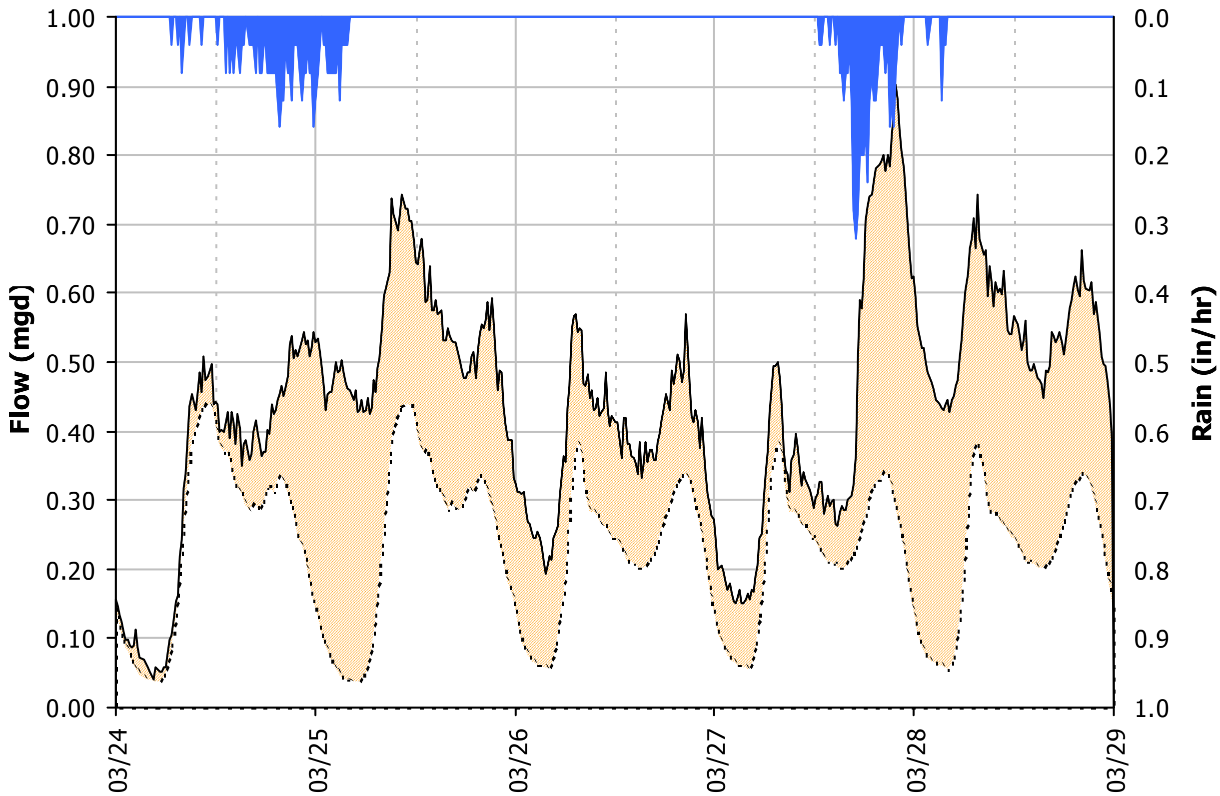
PF: 3.82

Peak Level: 8.55 *in*

d/D Ratio: 0.41

MH 327
I/I Summary: Event 3

Event 3 Detail Graph



Storm Event I/I Analysis (Rain = 2.12 inches)

Inflow

Peak I/I Rate: 0.61 *mgd*

Pk I/I:ADWF: 2.71

Combined I/I

Total I/I: 1,063,000 *gallons*

Total I/I:ADWF: 2.22 *per in-rain*

RDI (infiltration)

Infiltration Rate: 0.285 *mgd*
(3/28/2012 12:00:00 PM)

RDI (% of BL): 115%

Capacity

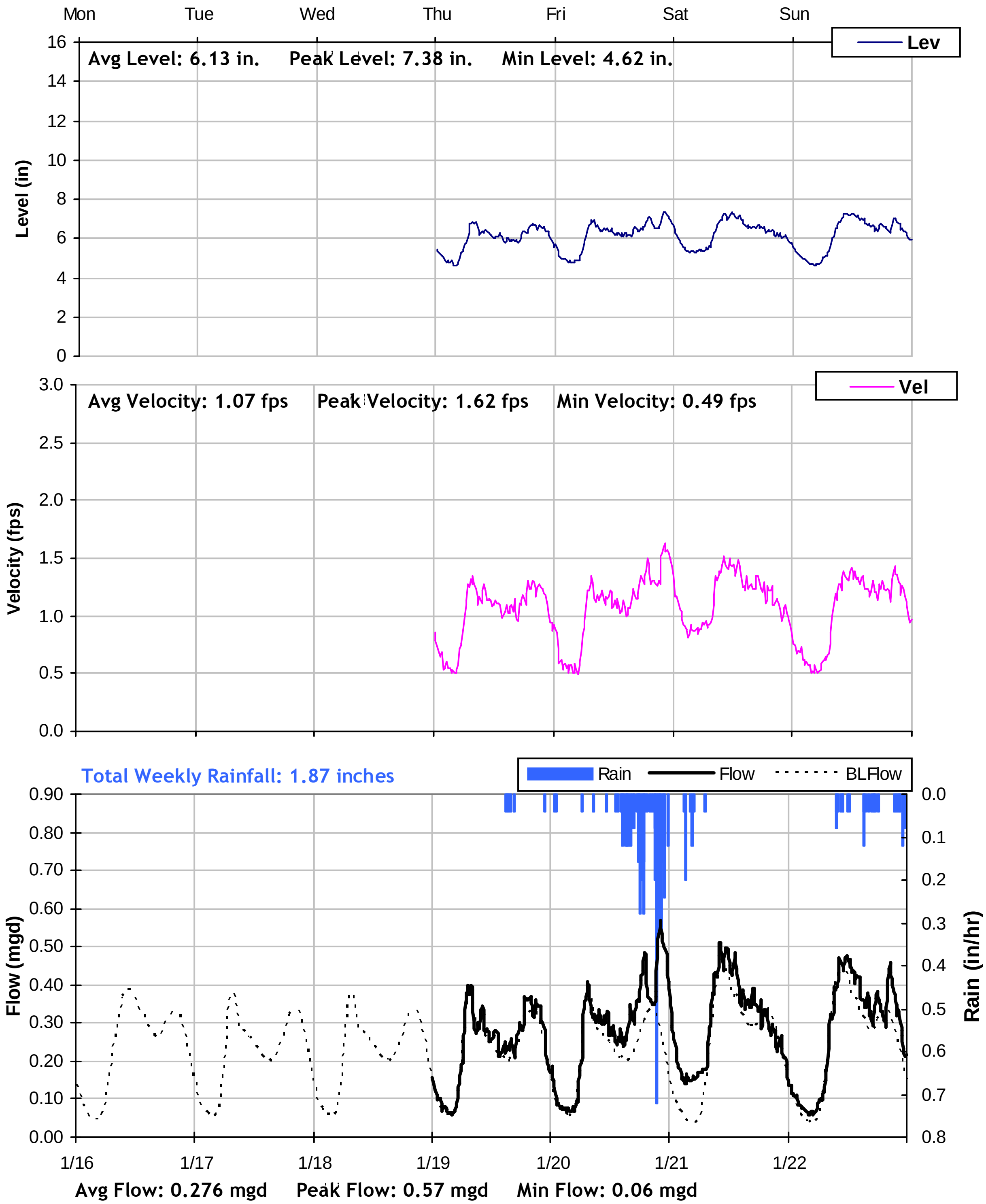
Peak Flow: 0.90 *mgd*

PF: 3.99

Peak Level: 8.67 *in*

d/D Ratio: 0.41

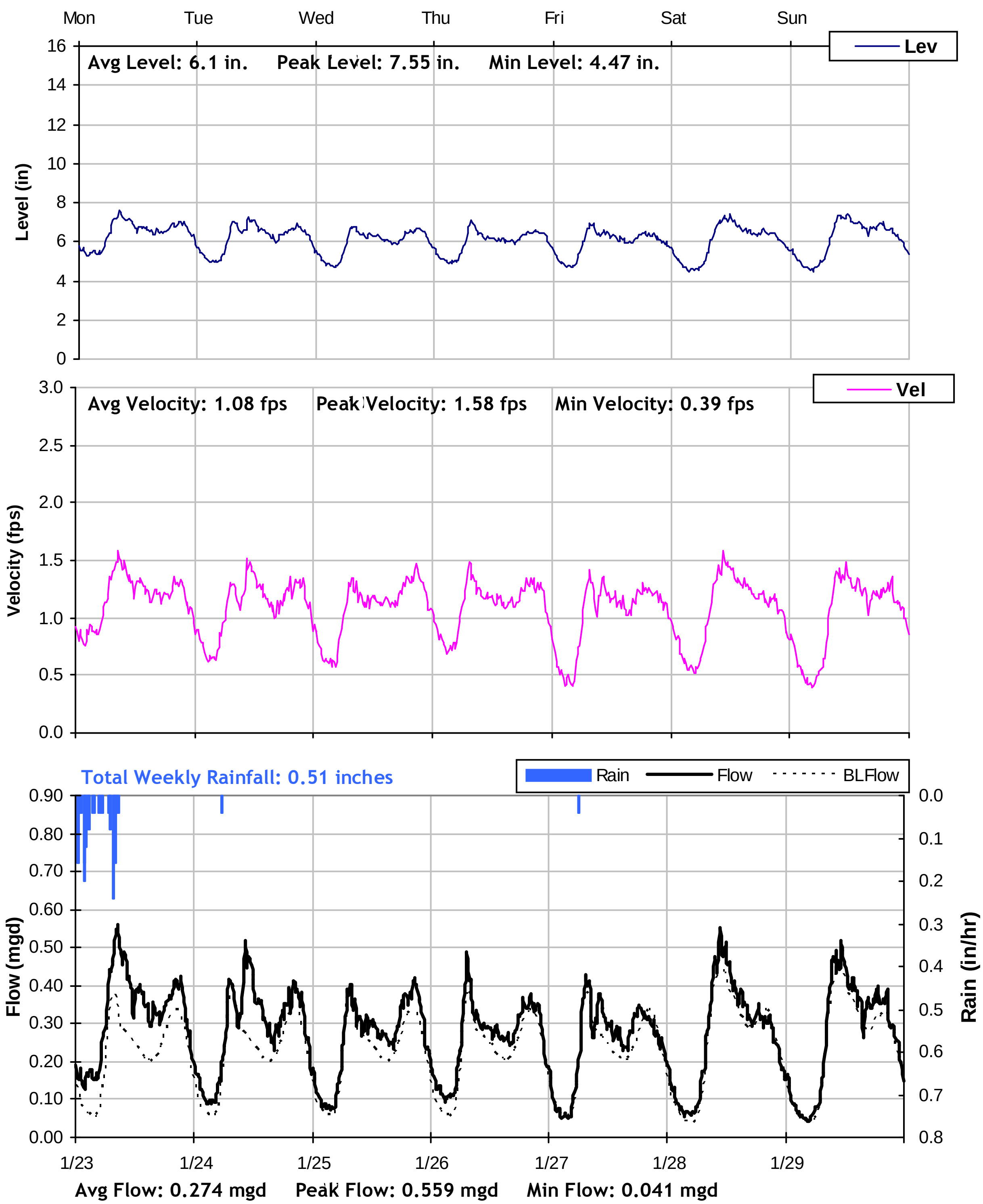
MH 327
Weekly Level, Velocity and Flow Hydrographs
1/16/2012 to 1/23/2012



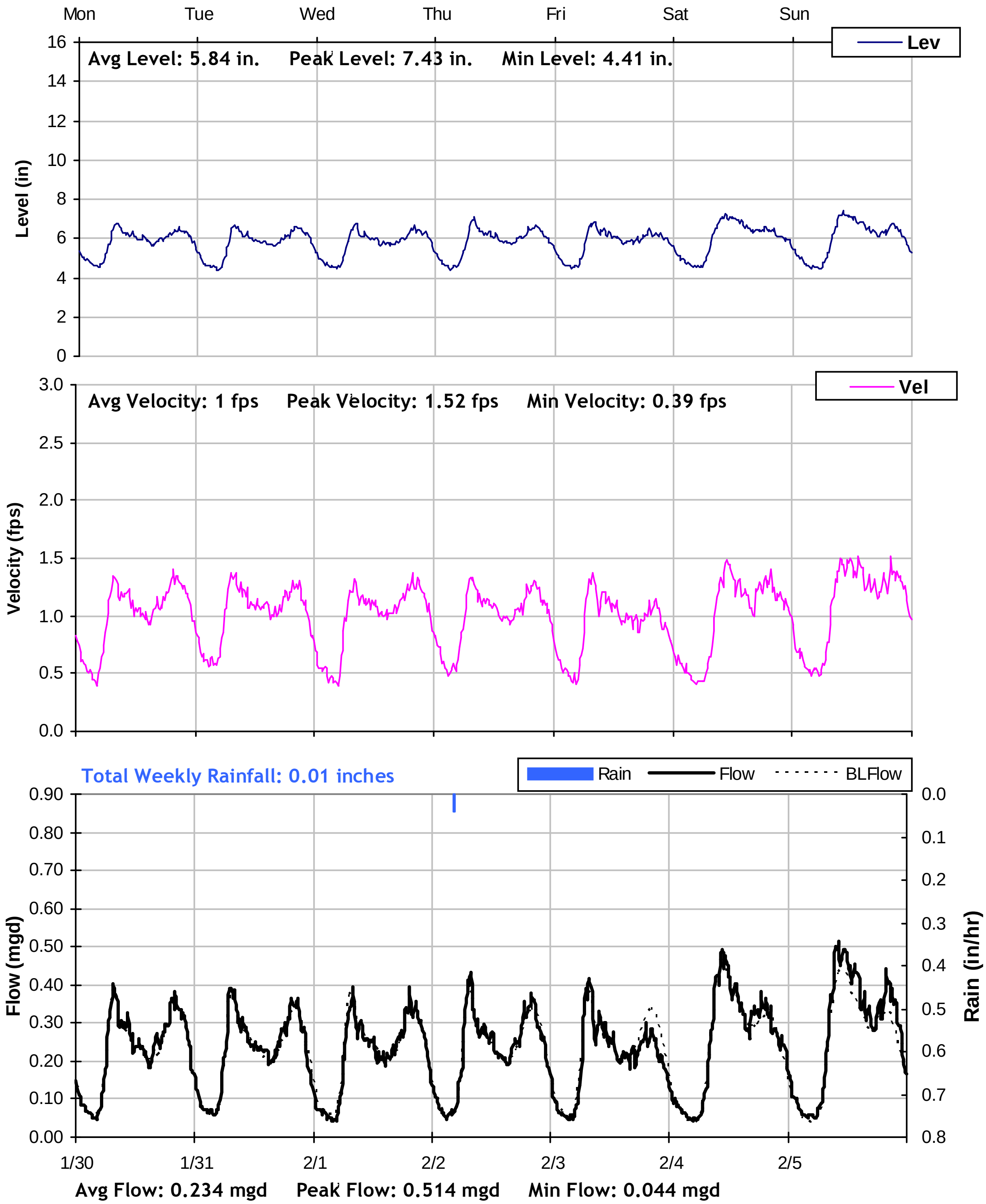
MH 327

Weekly Level, Velocity and Flow Hydrographs

1/23/2012 to 1/30/2012



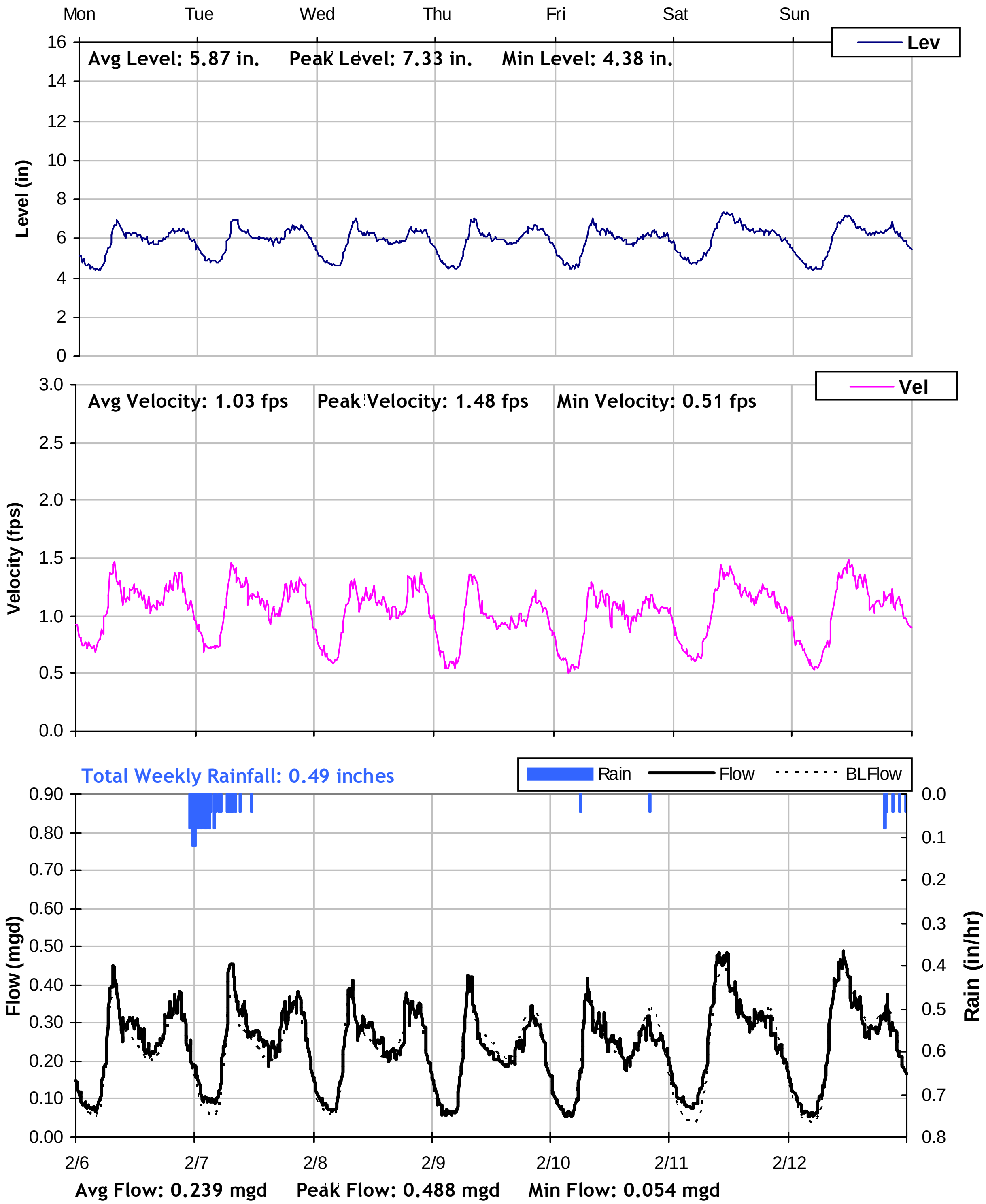
MH 327
Weekly Level, Velocity and Flow Hydrographs
1/30/2012 to 2/6/2012



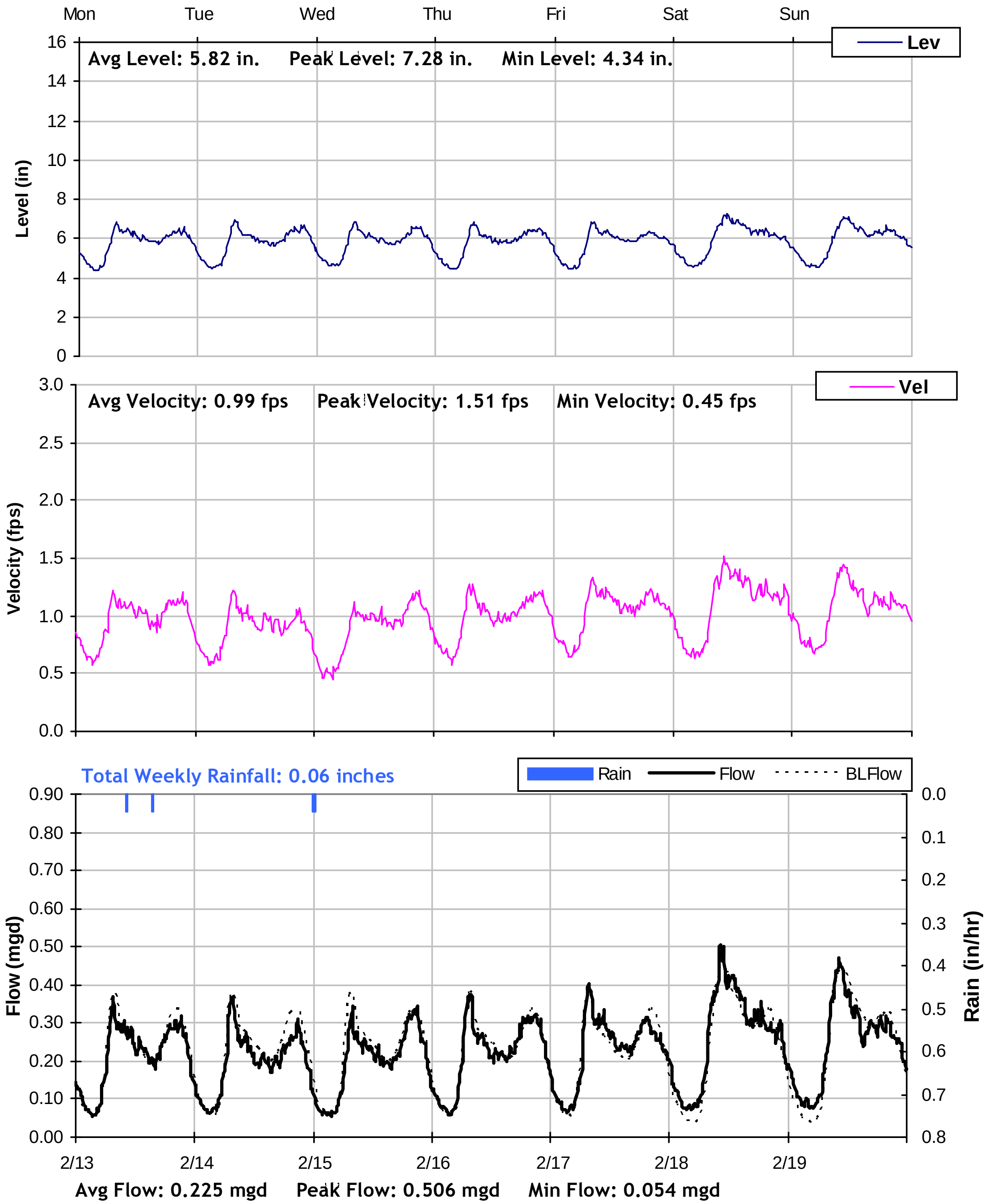
MH 327

Weekly Level, Velocity and Flow Hydrographs

2/6/2012 to 2/13/2012



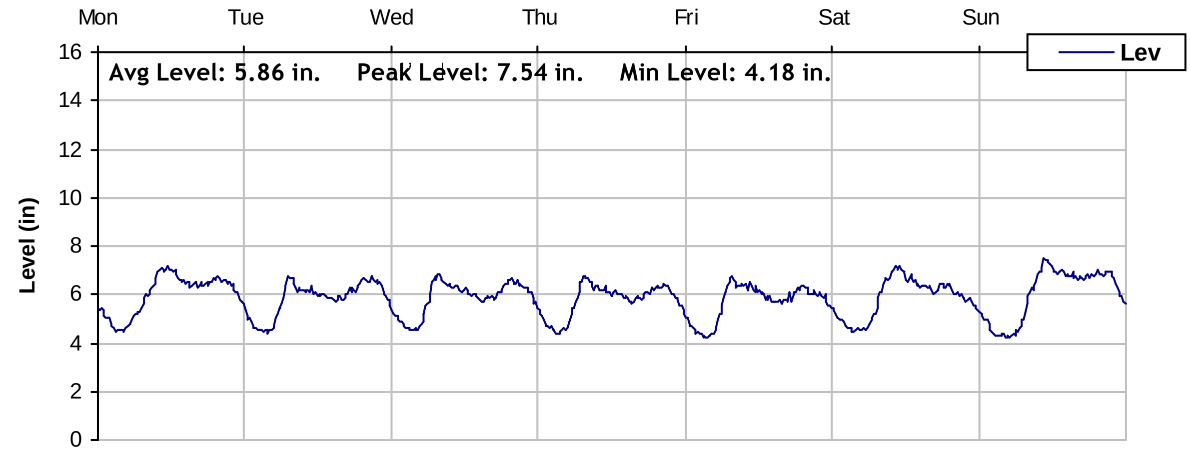
MH 327
Weekly Level, Velocity and Flow Hydrographs
2/13/2012 to 2/20/2012

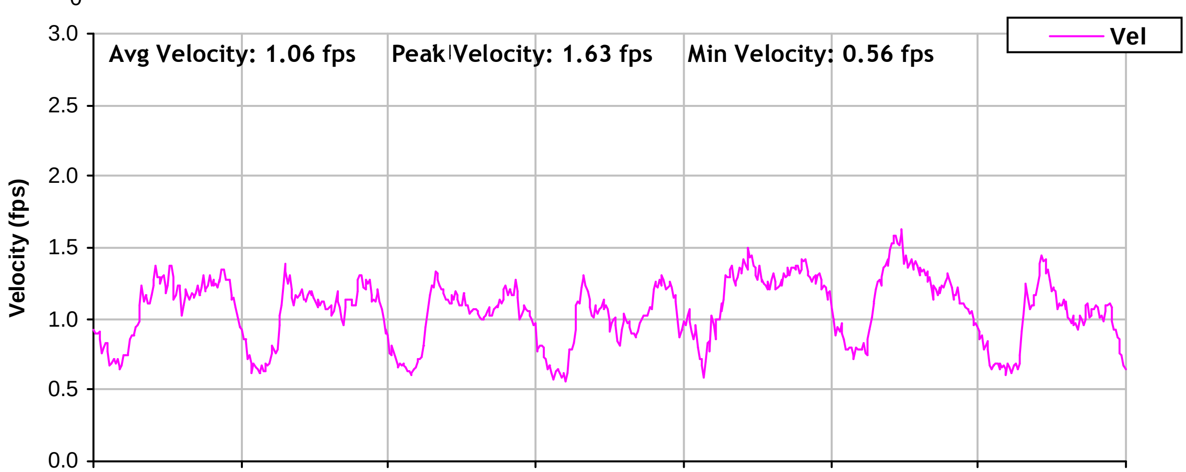


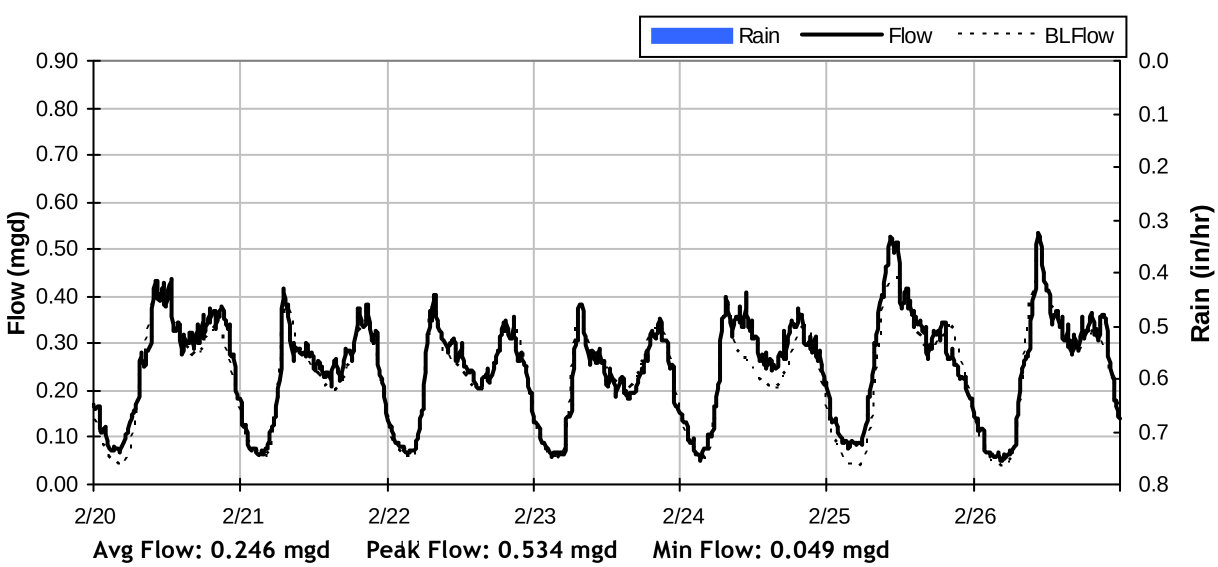
MH 327

Weekly Level, Velocity and Flow Hydrographs

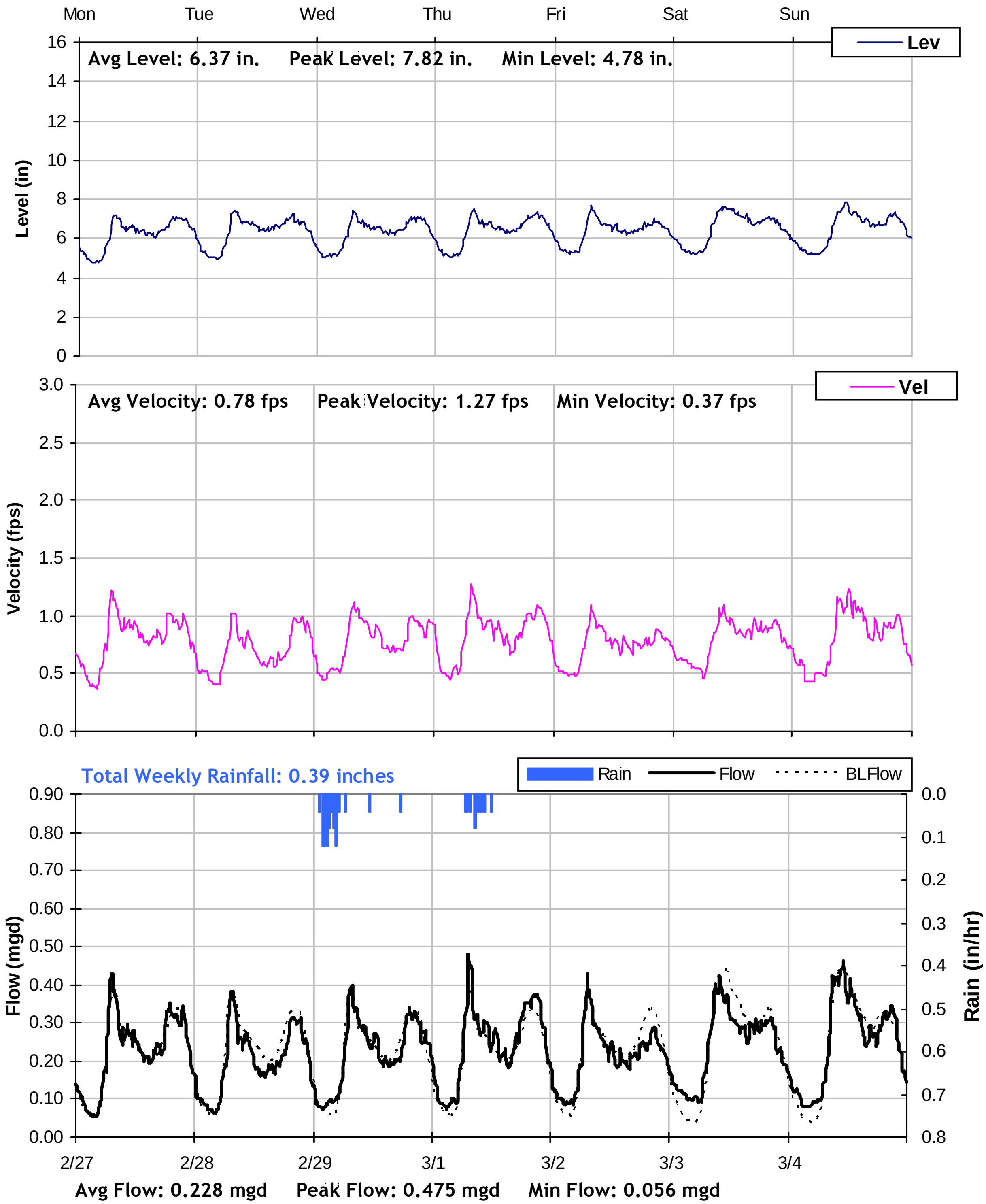
2/20/2012 to 2/27/2012



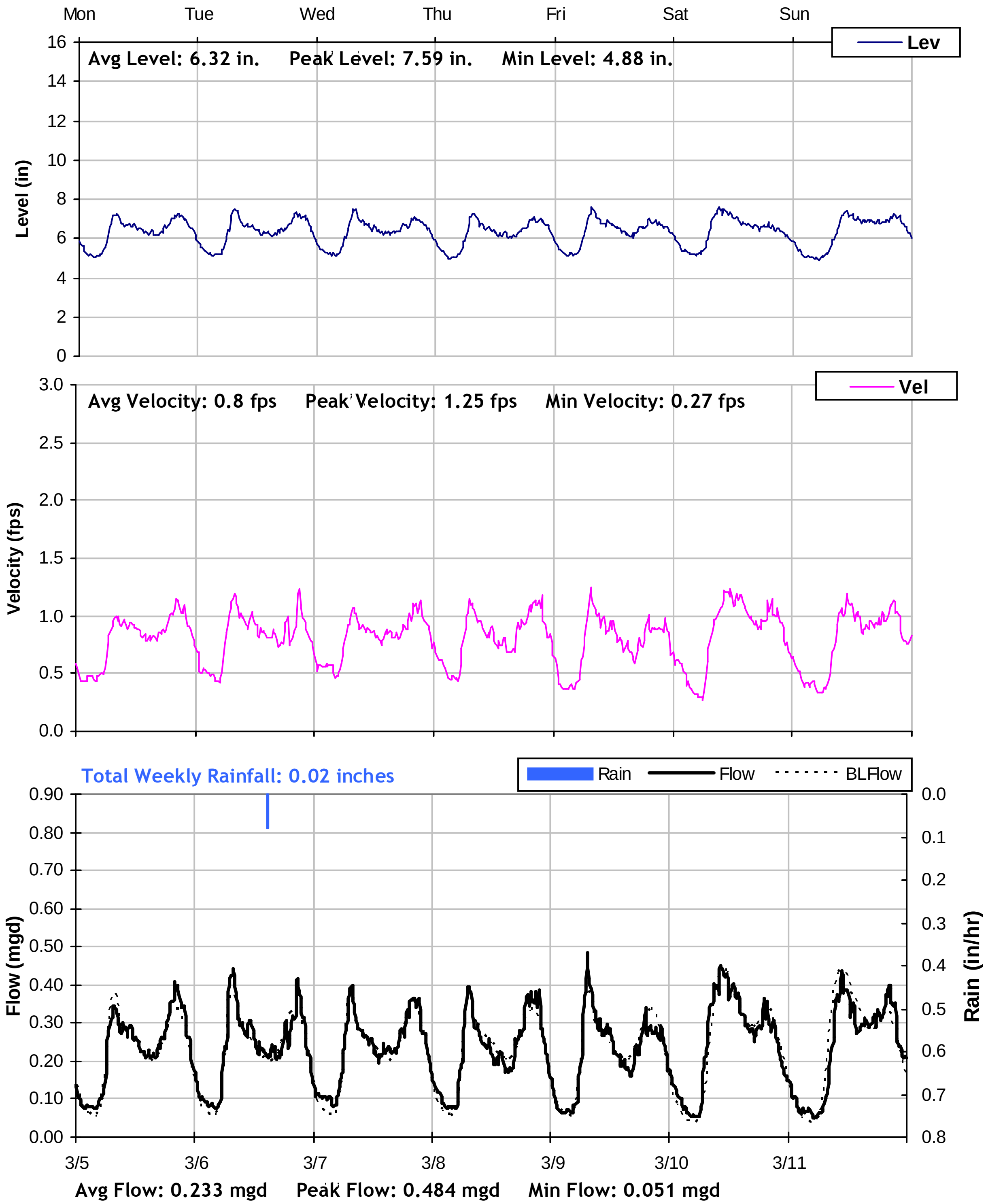




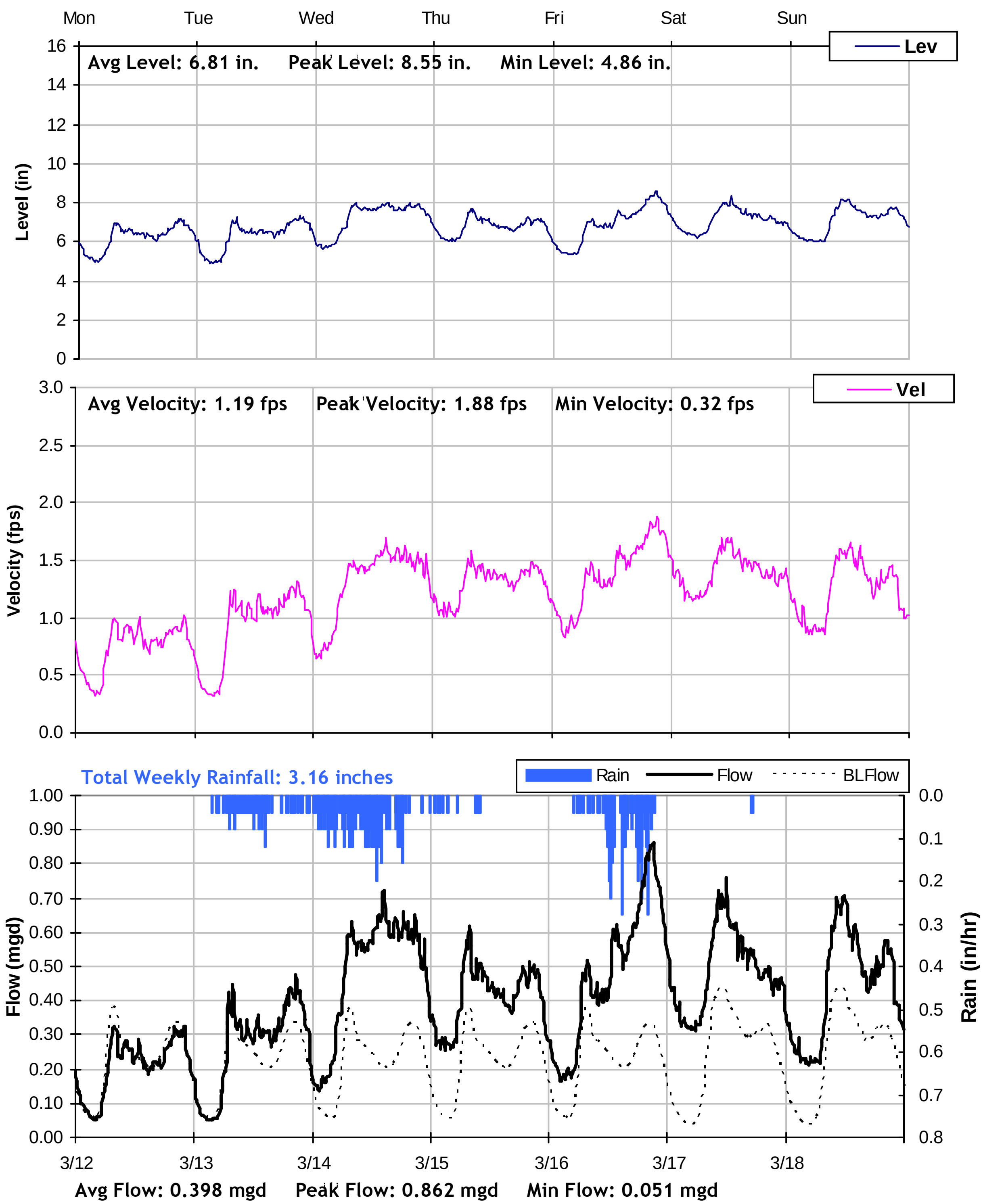
MH 327
Weekly Level, Velocity and Flow Hydrographs
2/27/2012 to 3/5/2012



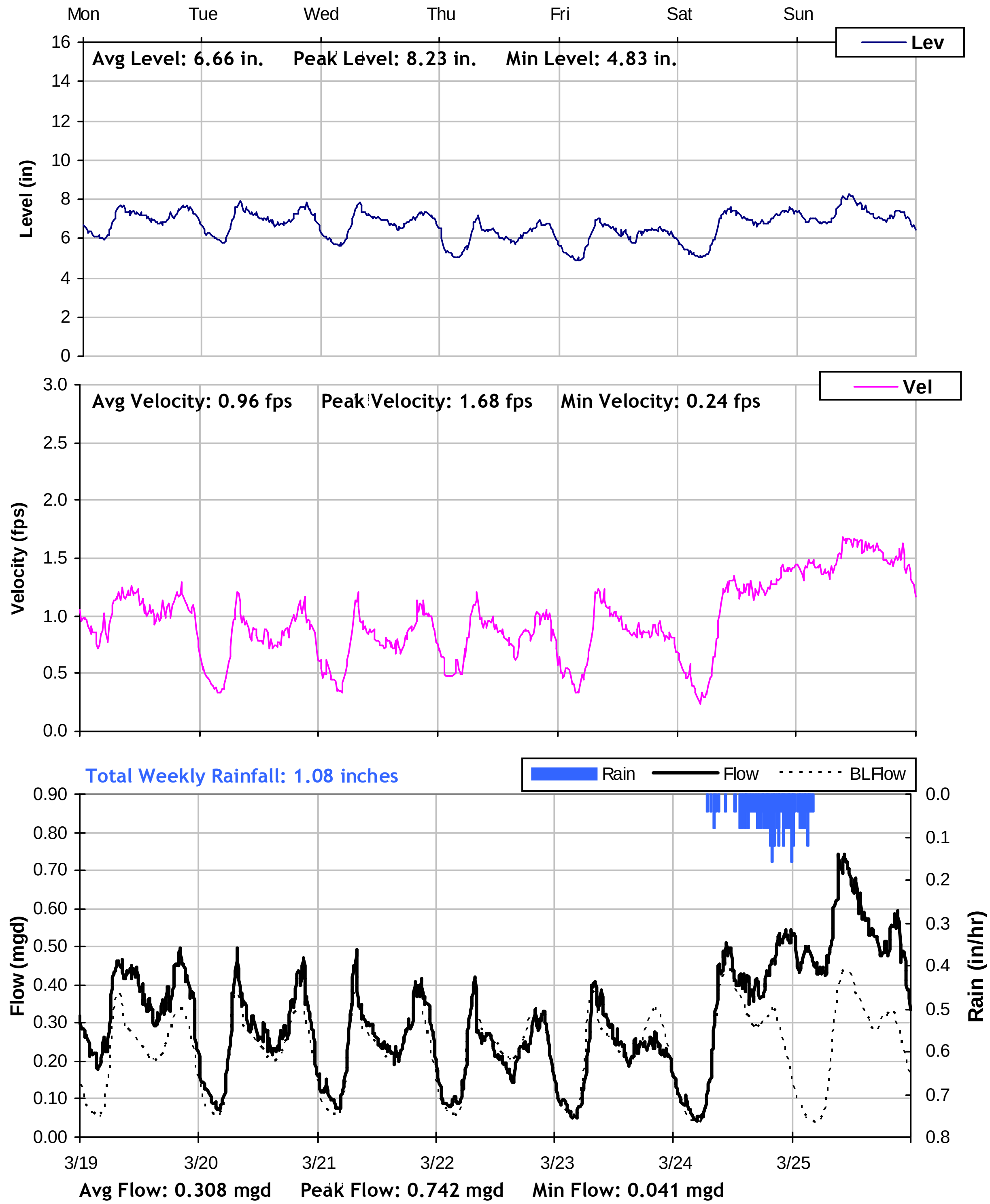
MH 327
Weekly Level, Velocity and Flow Hydrographs
3/5/2012 to 3/12/2012



MH 327
Weekly Level, Velocity and Flow Hydrographs
3/12/2012 to 3/19/2012



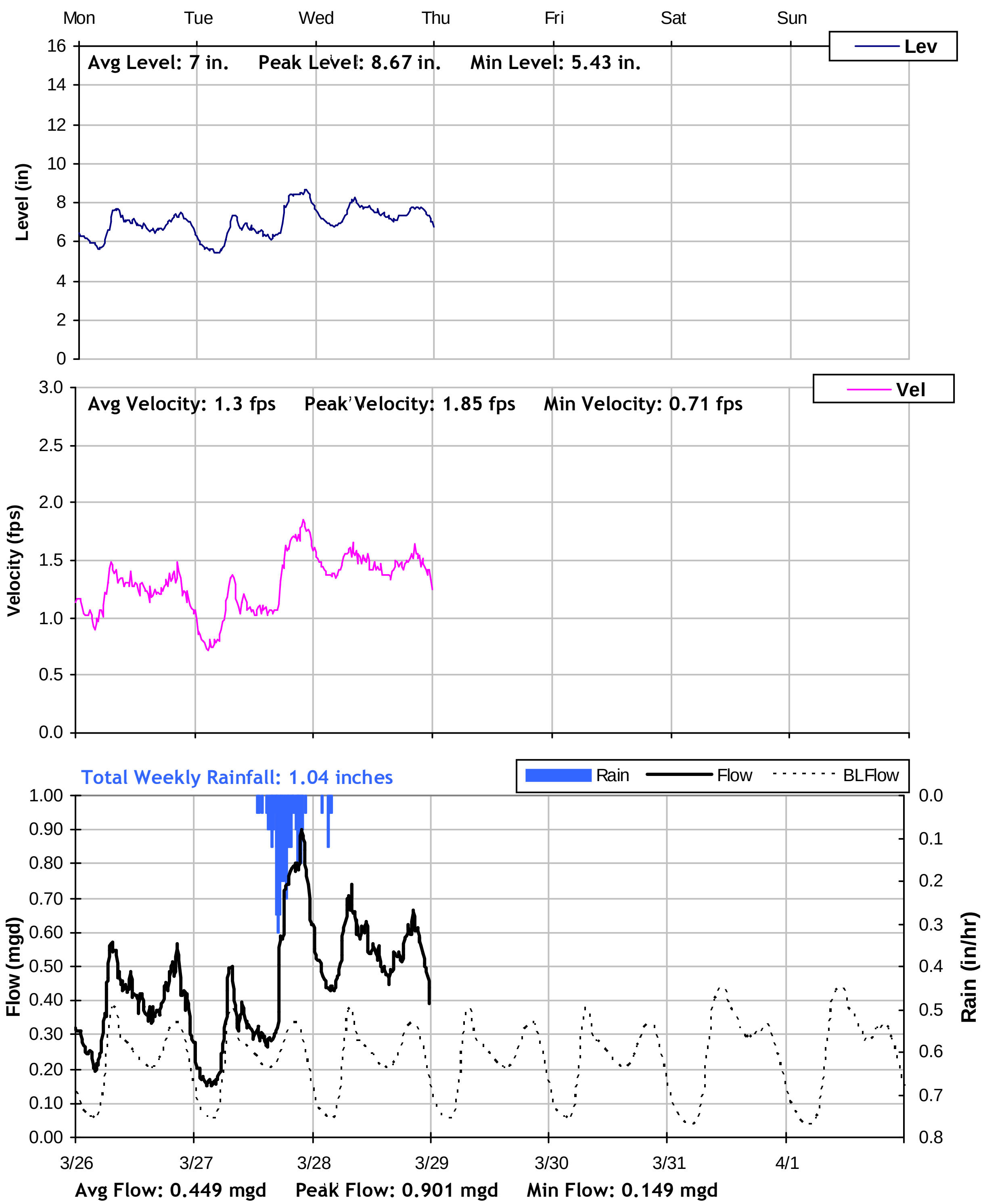
MH 327
Weekly Level, Velocity and Flow Hydrographs
3/19/2012 to 3/26/2012



MH 327

Weekly Level, Velocity and Flow Hydrographs

3/26/2012 to 4/2/2012



Rodeo Sanitary District

Master Plan Sanitary Sewer Flow Monitoring
Year 2011/2012

Monitoring Site: MH 54

Location: 1st Street, just west of Railroad Avenue

Data Summary Report

MH 54
Site Information Report

Location: 1st Street, just west of Railroad Avenue

Coordinates: 122.2665° W, 38.0378° N

Rim Elevation: 10 feet

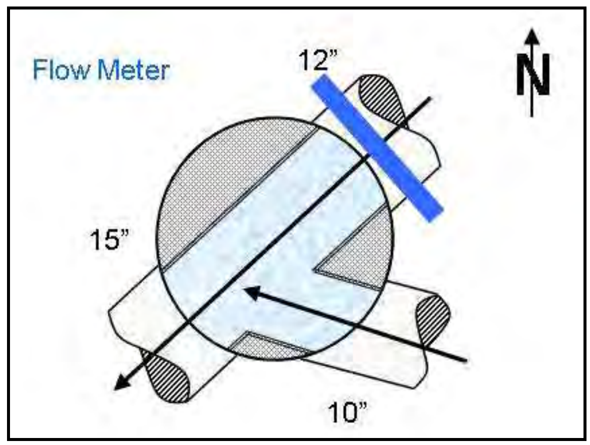
Diameter: 12 inches

Baseline Flow: 0.108 mgd

Peak Measured Flow: 0.606 mgd

Satellite Map

Sanitary Map



Flow Sketch

Street View Photo

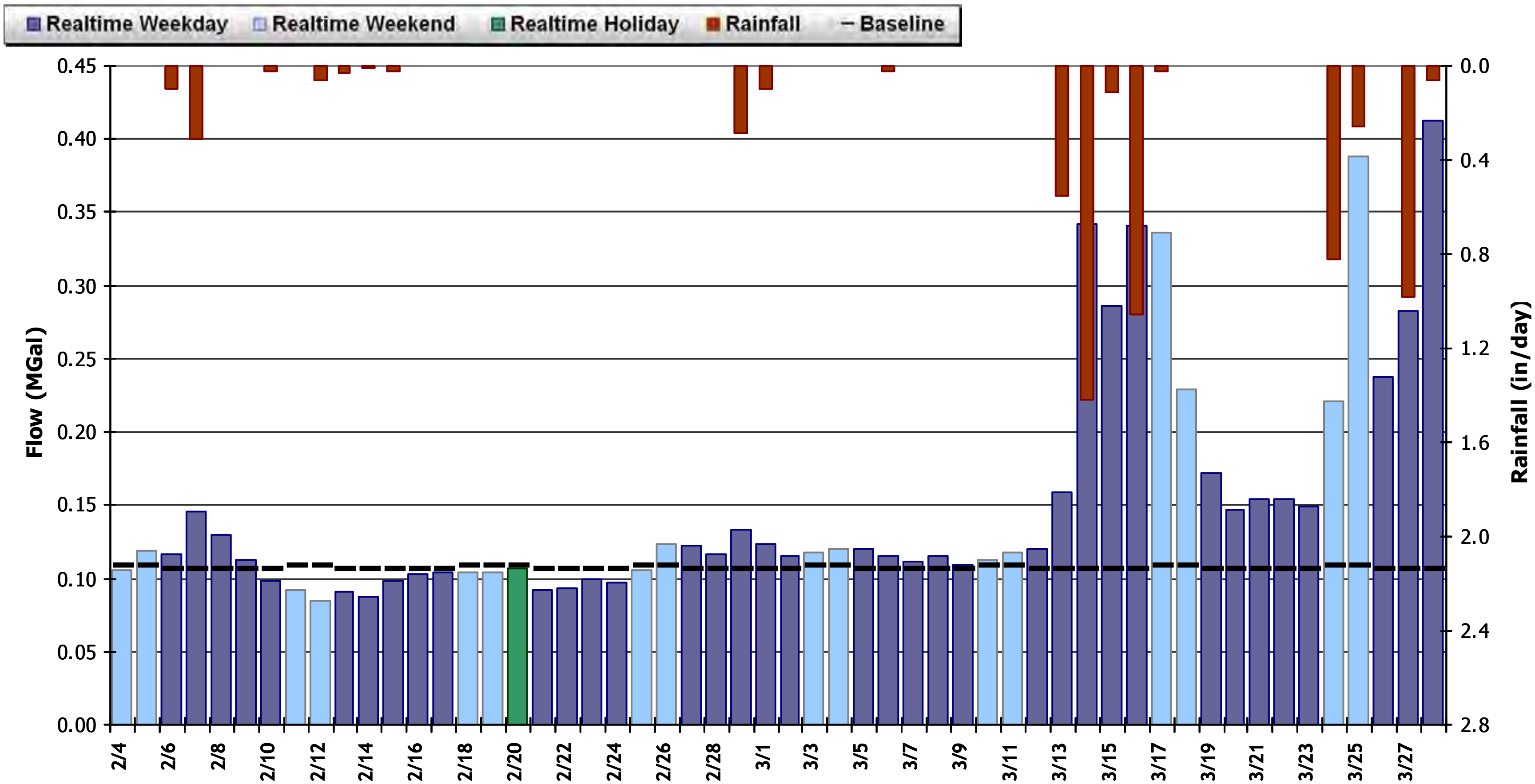
Plan View Photo

MH 54

Period Flow Summary: Daily Flow Totals

Avg Daily Flow: 0.152 MGal **Peak Daily Flow: 0.412 MGal** **Min Daily Flow: 0.085 MGal**

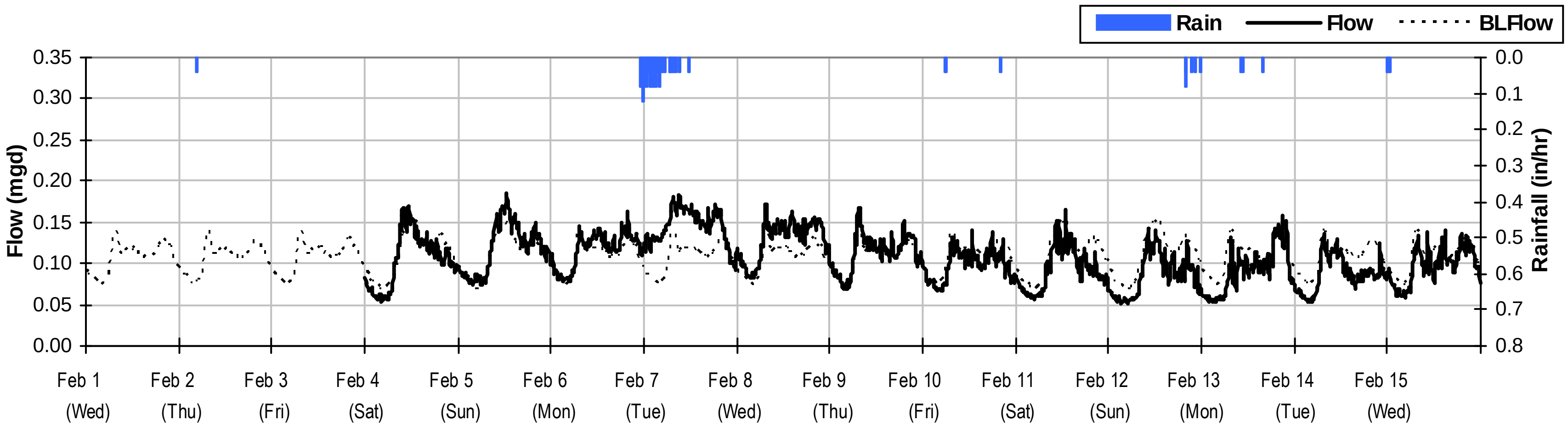
Total Period Rainfall: 6.25 inches

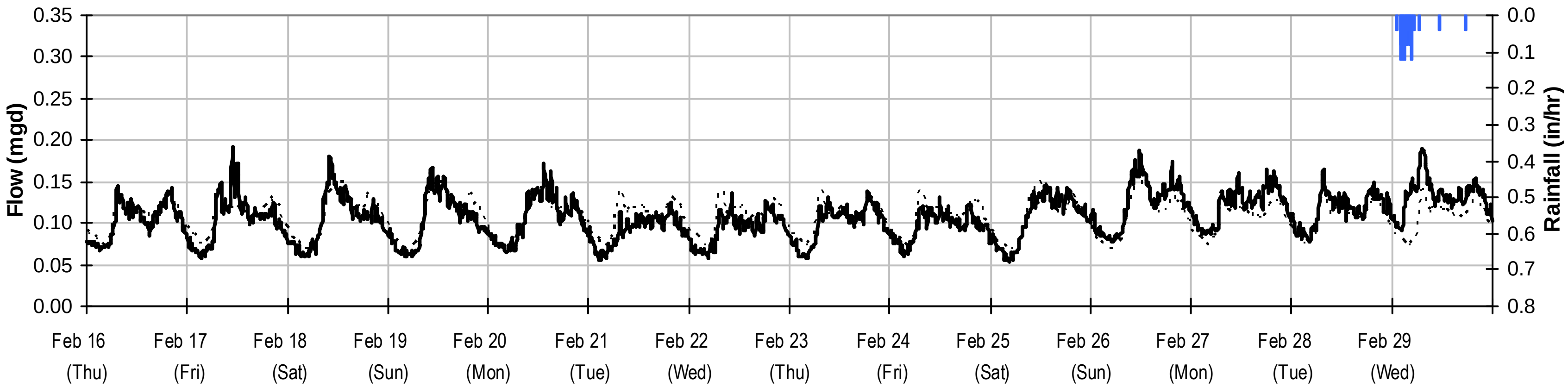


MH 54

Monthly Flow Summary: February, 2012

Total Monthly Rainfall: 0.85 inches   Avg Flow: 0.107 mgd   Peak Flow: 0.191 mgd   Min Flow: 0.050 mgd

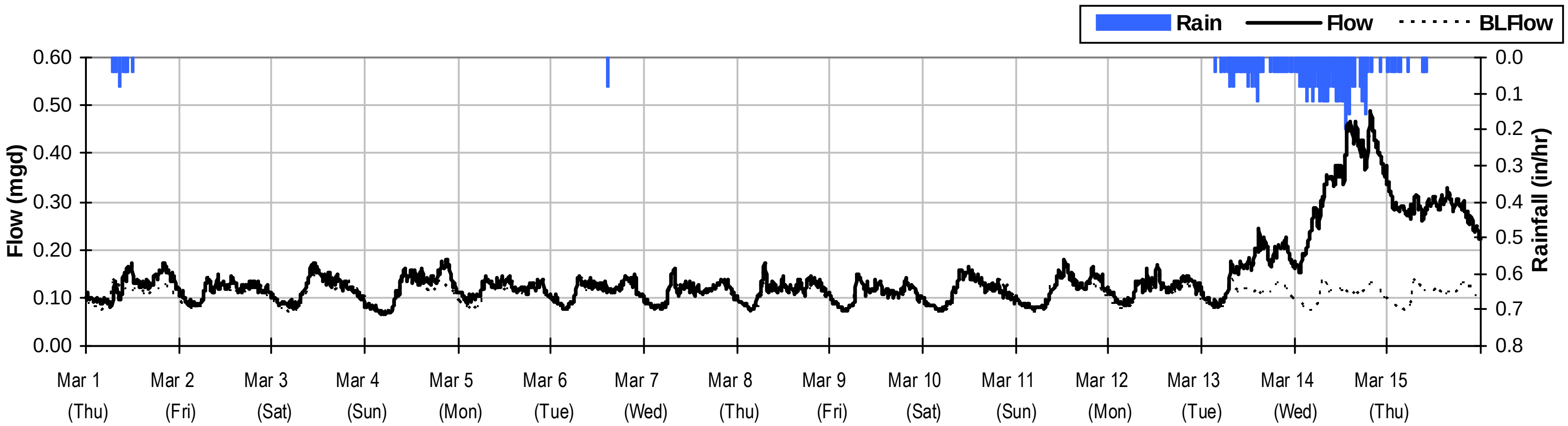


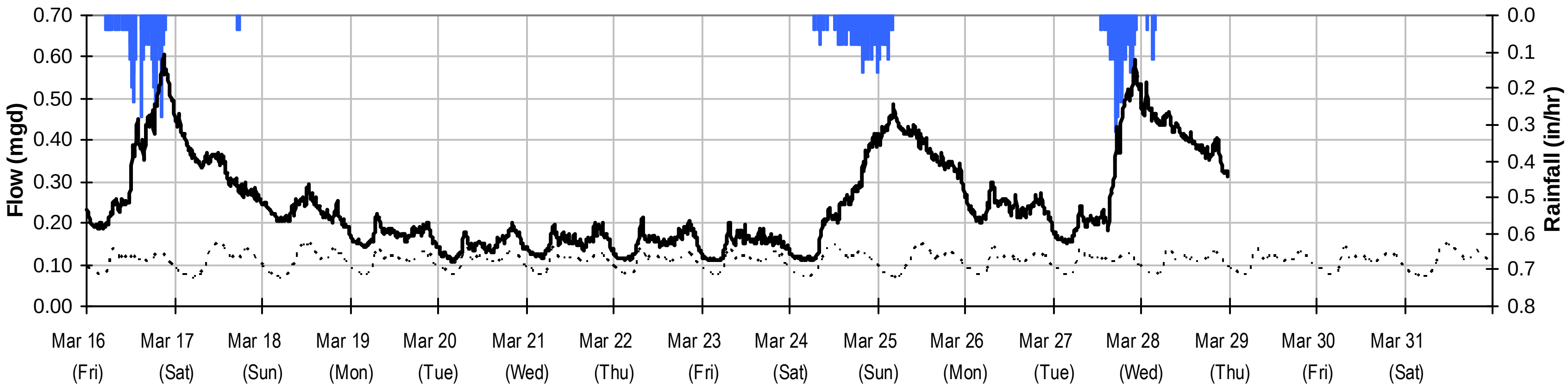


MH 54

Monthly Flow Summary: March, 2012

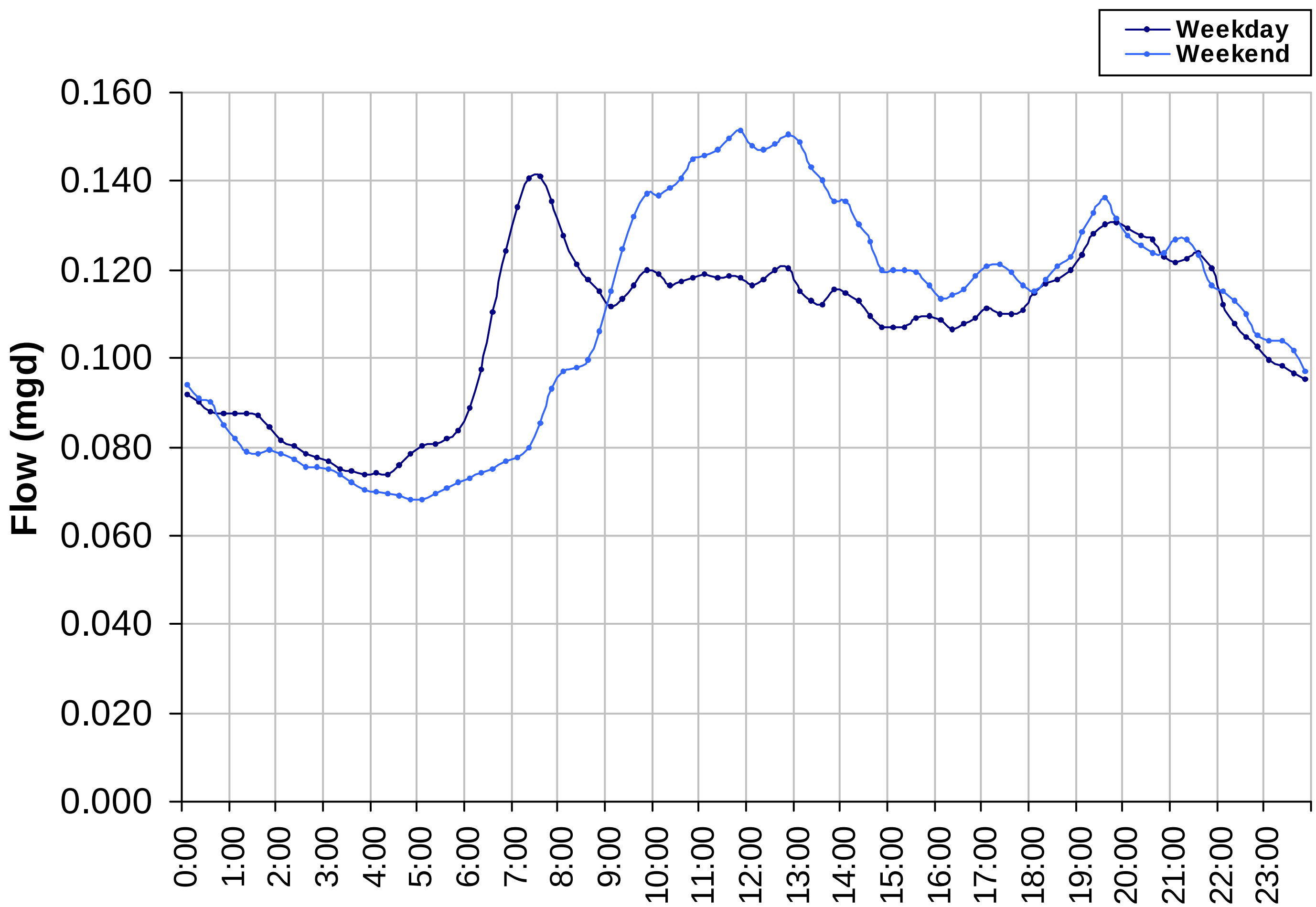
Total Monthly Rainfall: 5.4 inches   Avg Flow: 0.193 mgd   Peak Flow: 0.606 mgd   Min Flow: 0.066 mgd





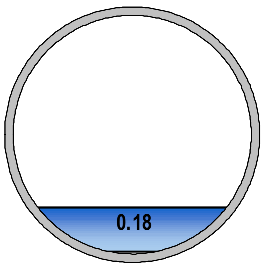
MH 54

Baseline Flow Hydrographs



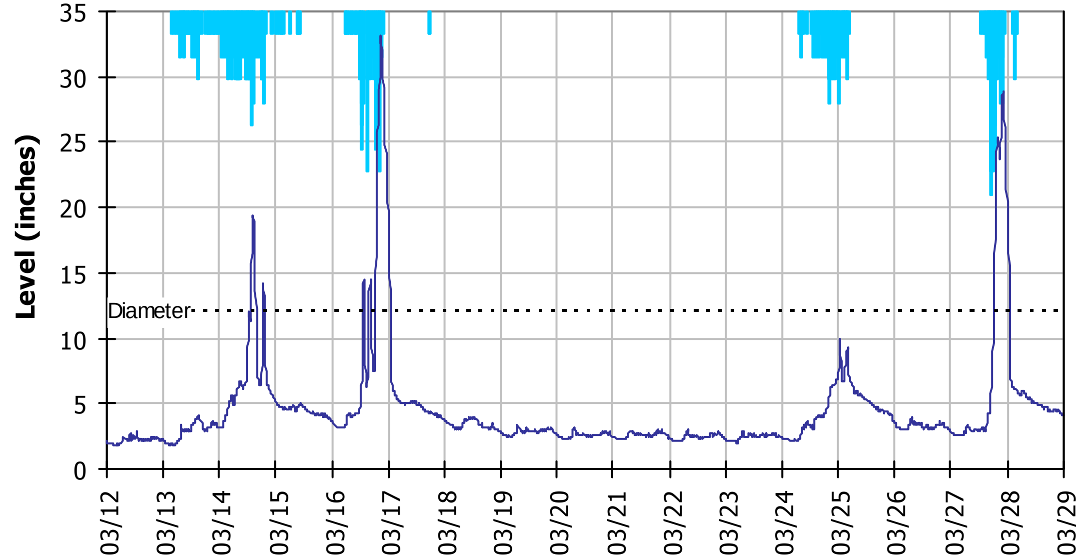
Baseline Flow:

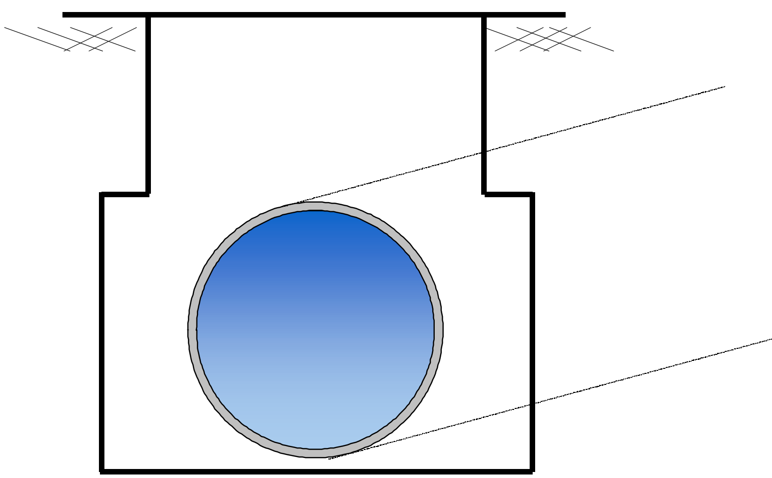
0.108 *mgd*



MH 54
Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Monitoring Period





Pipe Diameter: 12 *inches*

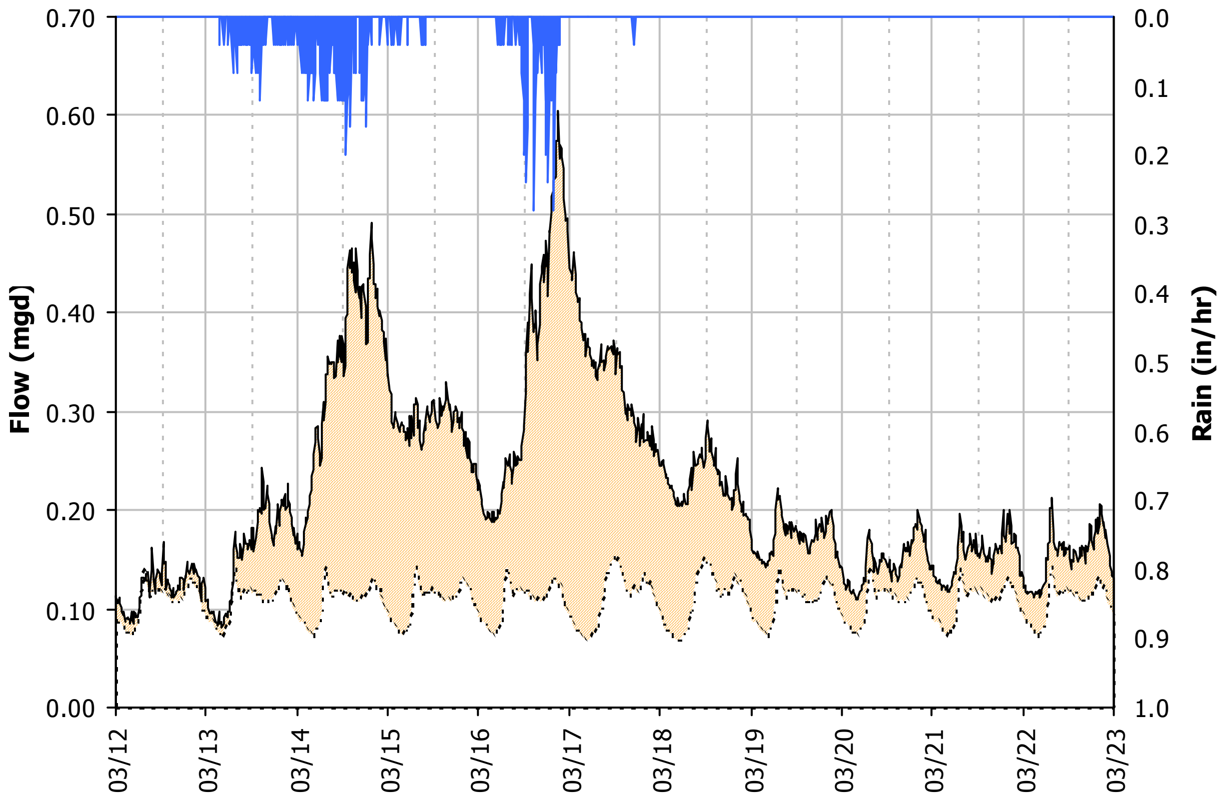
Peak Measured Level: 33.1 *inches*

Peak d/D Ratio: 2.76

Surcharged 21.1 inches over crown

MH 54
I/I Summary: Event 2

Event 2 Detail Graph



Storm Event I/I Analysis (Rain = 3.16 inches)

Inflow

Peak I/I Rate: 0.48 *mgd*

Pk I/I:ADWF: 4.50

Combined I/I

Total I/I: 1,258,000 *gallons*

Total I/I:ADWF: 3.70 *per in-rain*

RDI (infiltration)

Infiltration Rate: 0.046 *mgd*
(3/22/2012)

RDI (% of BL): 43%

Capacity

Peak Flow: 0.61 *mgd*

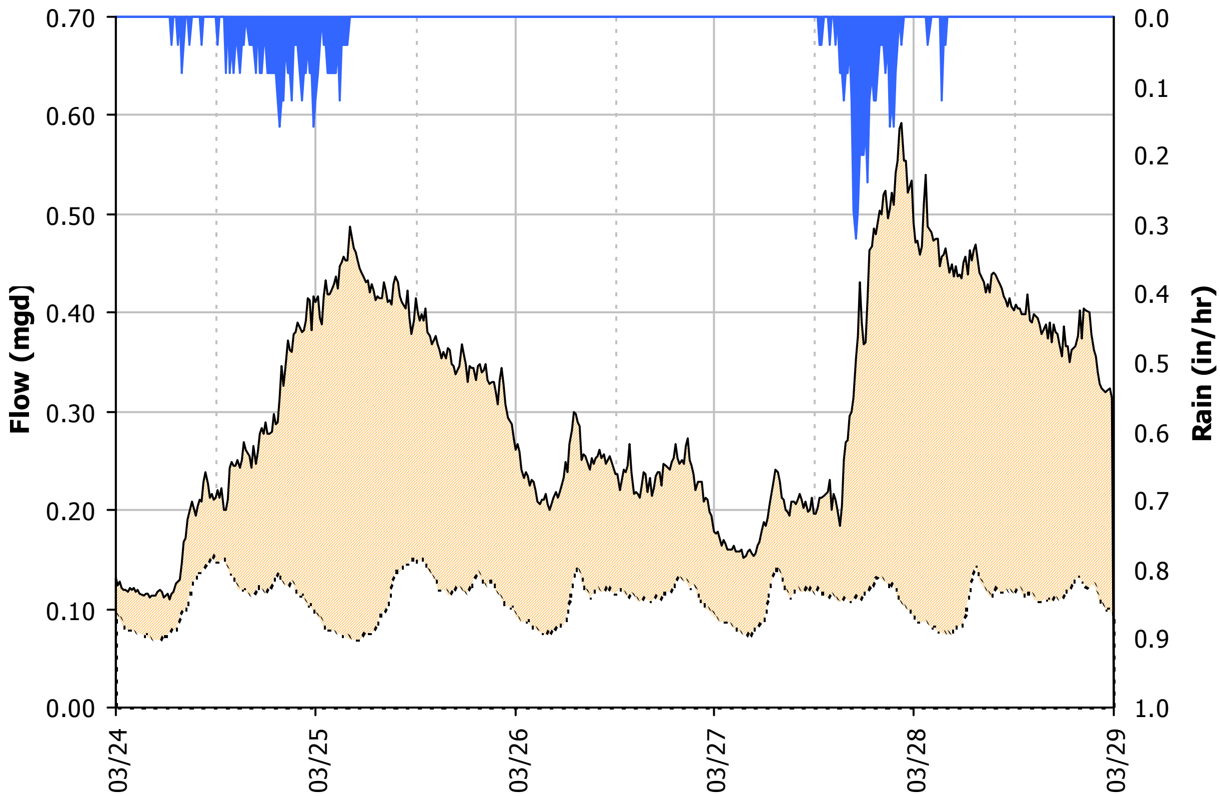
PF: 5.63

Peak Level: 33.09 *in*

d/D Ratio: 2.76

MH 54
I/I Summary: Event 3

Event 3 Detail Graph



Storm Event I/I Analysis (Rain = 2.12 inches)

Inflow

Peak I/I Rate: 0.49 *mgd*

Pk I/I:ADWF: 4.54

Combined I/I

Total I/I: 1,003,000 *gallons*

Total I/I:ADWF: 4.39 *per in-rain*

RDI (infiltration)

Infiltration Rate: 0.260 *mgd*
(3/28/2012 12:00:00 PM)

RDI (% of BL): 229%

Capacity

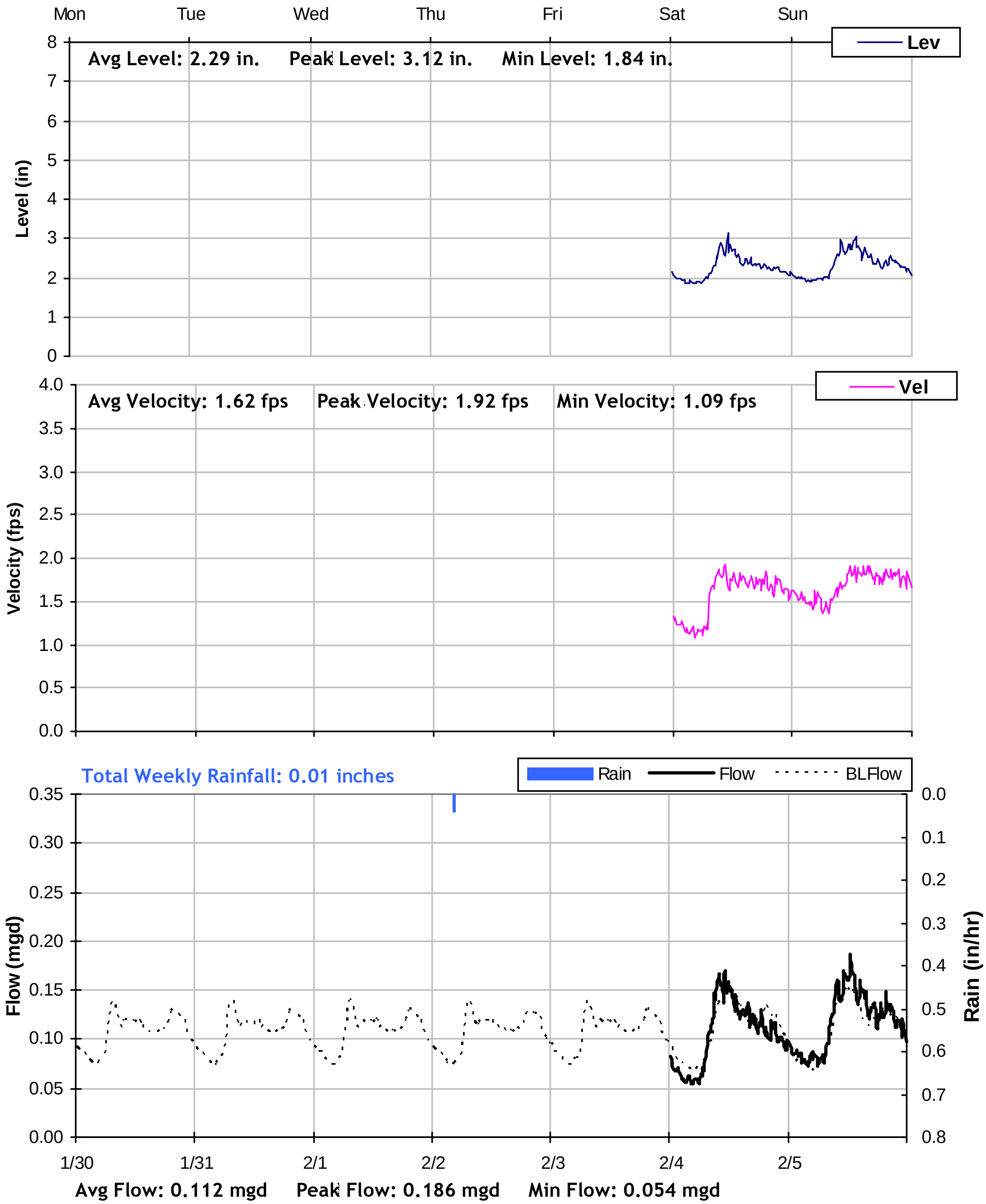
Peak Flow: 0.59 *mgd*

PF: 5.51

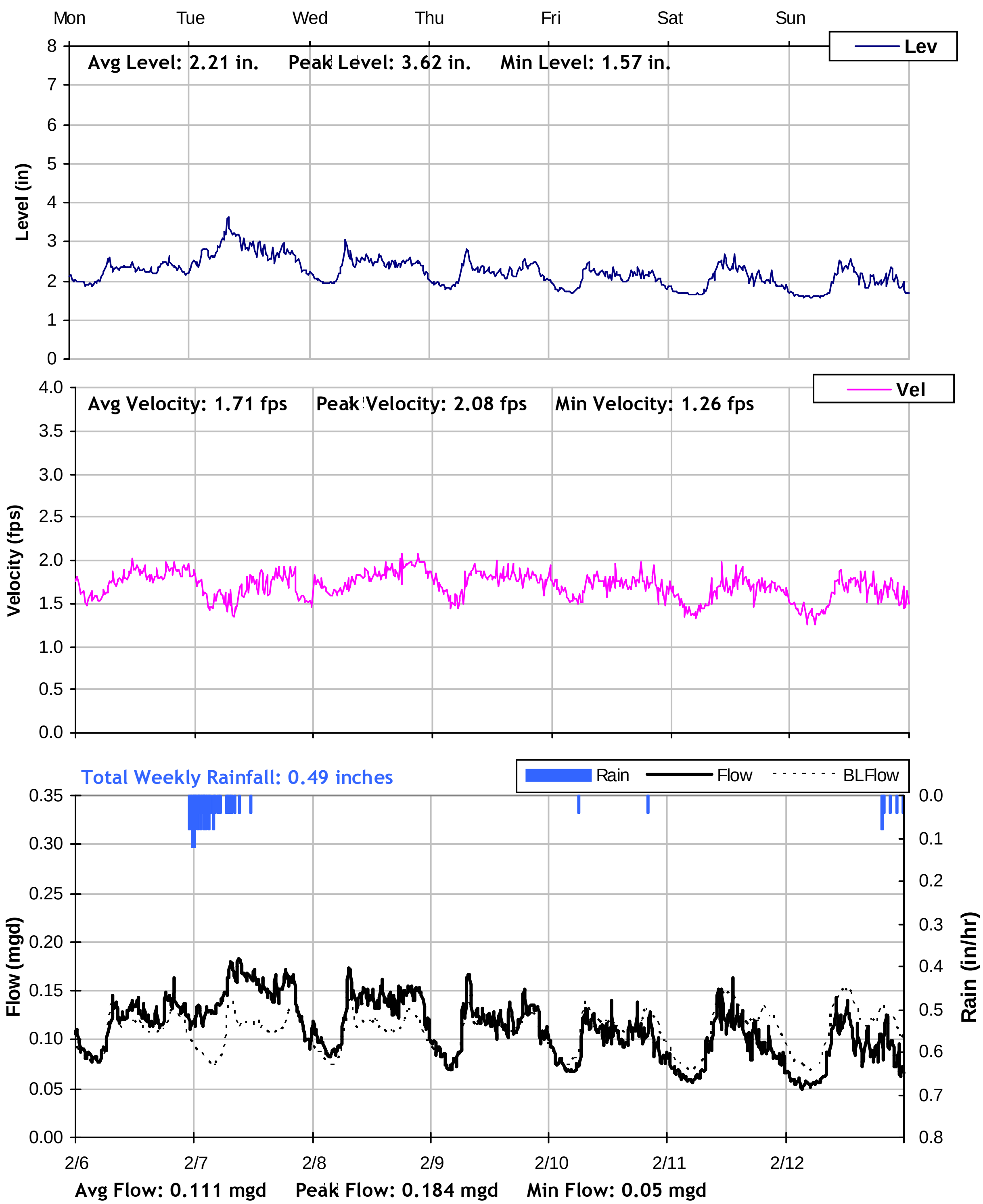
Peak Level: 28.84 *in*

d/D Ratio: 2.40

MH 54
Weekly Level, Velocity and Flow Hydrographs
1/30/2012 to 2/6/2012



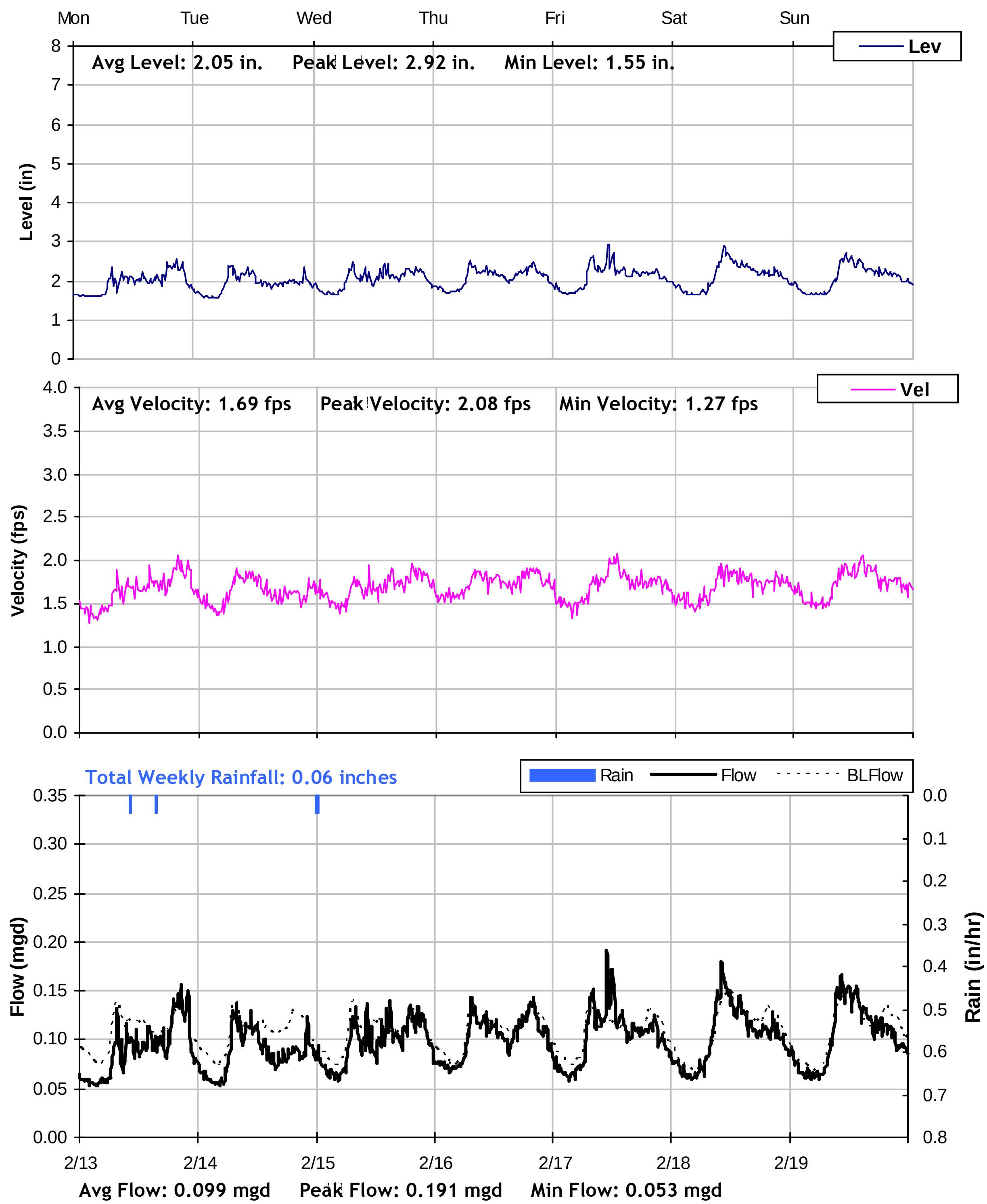
MH 54
Weekly Level, Velocity and Flow Hydrographs
2/6/2012 to 2/13/2012



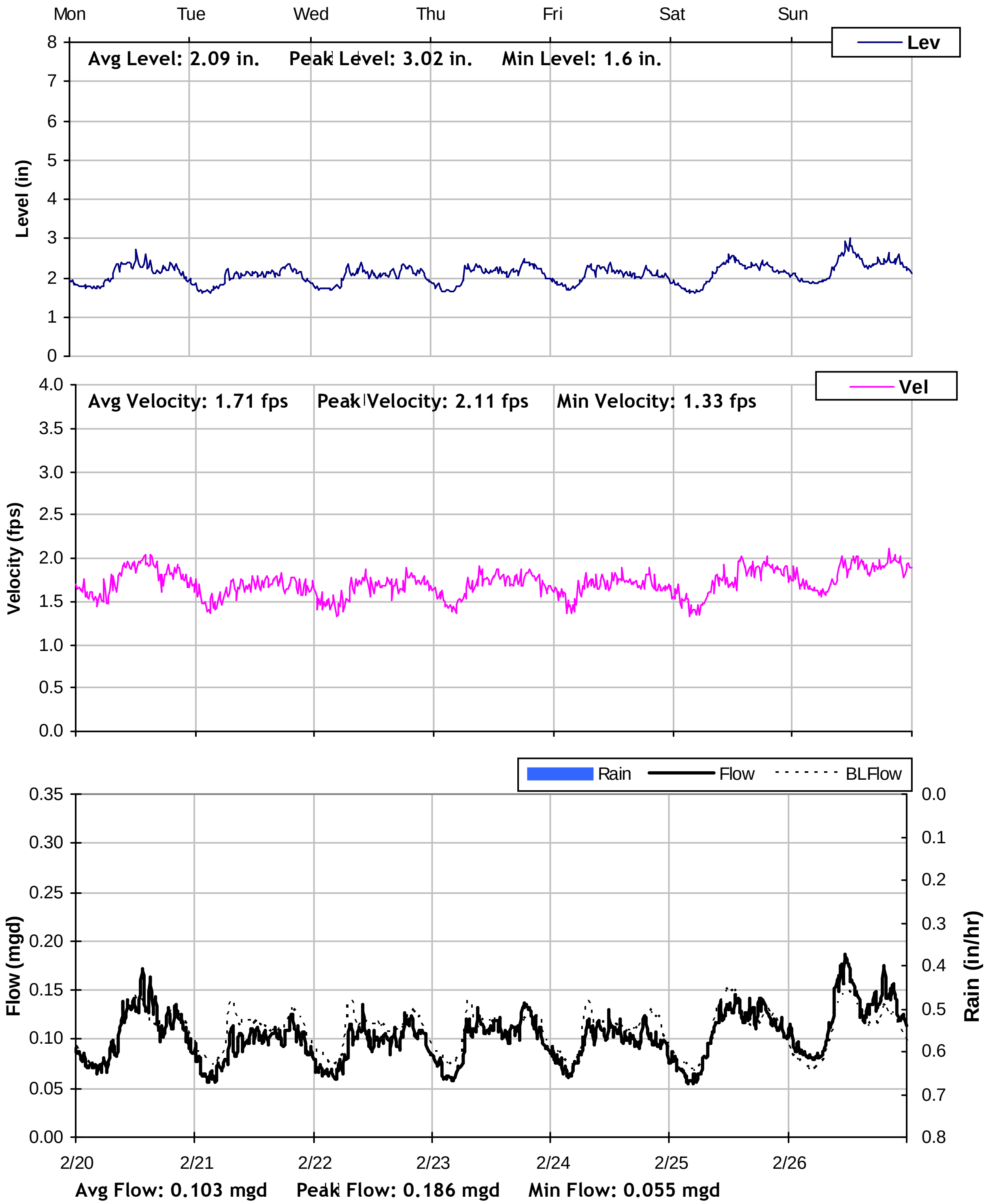
MH 54

Weekly Level, Velocity and Flow Hydrographs

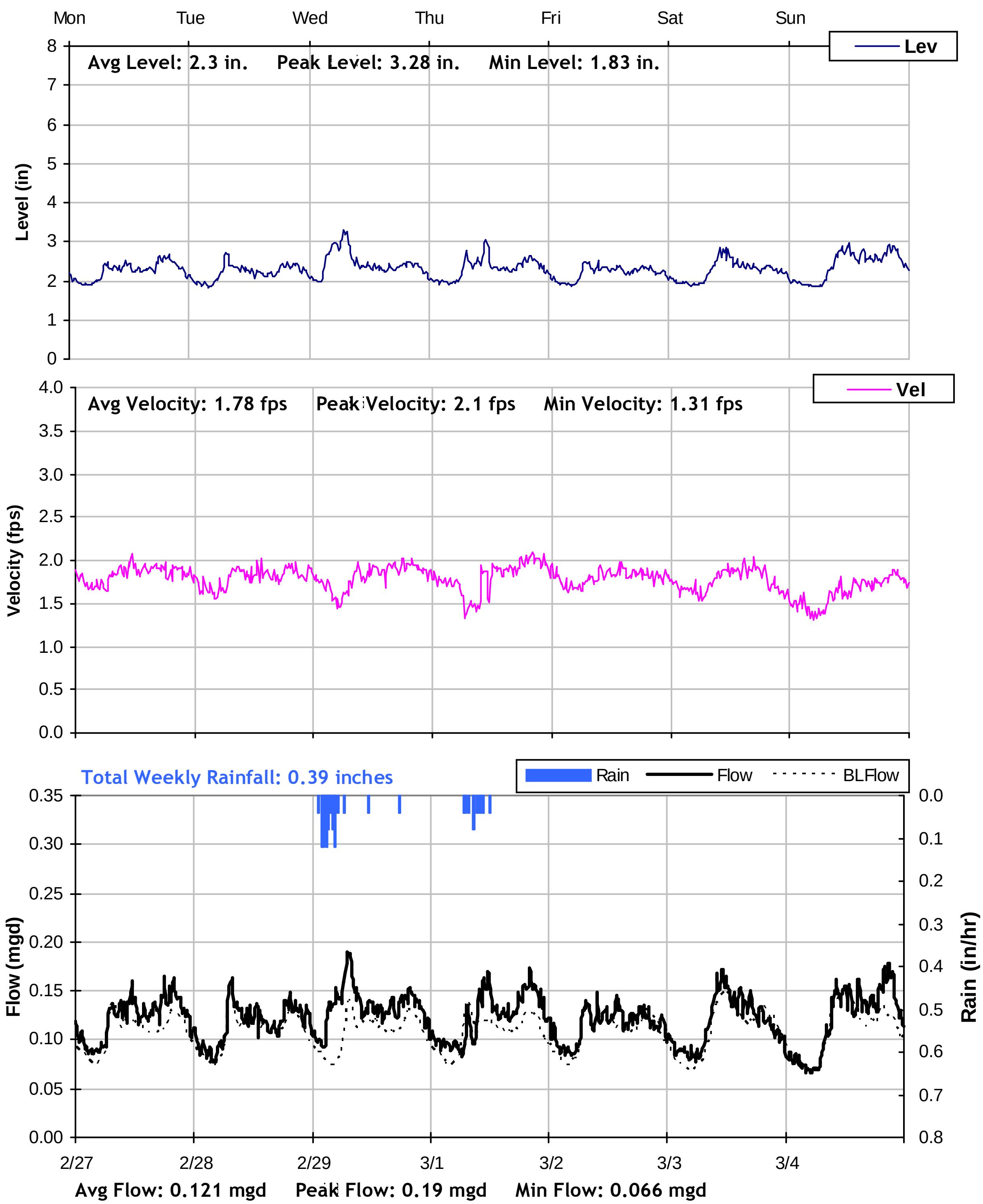
2/13/2012 to 2/20/2012



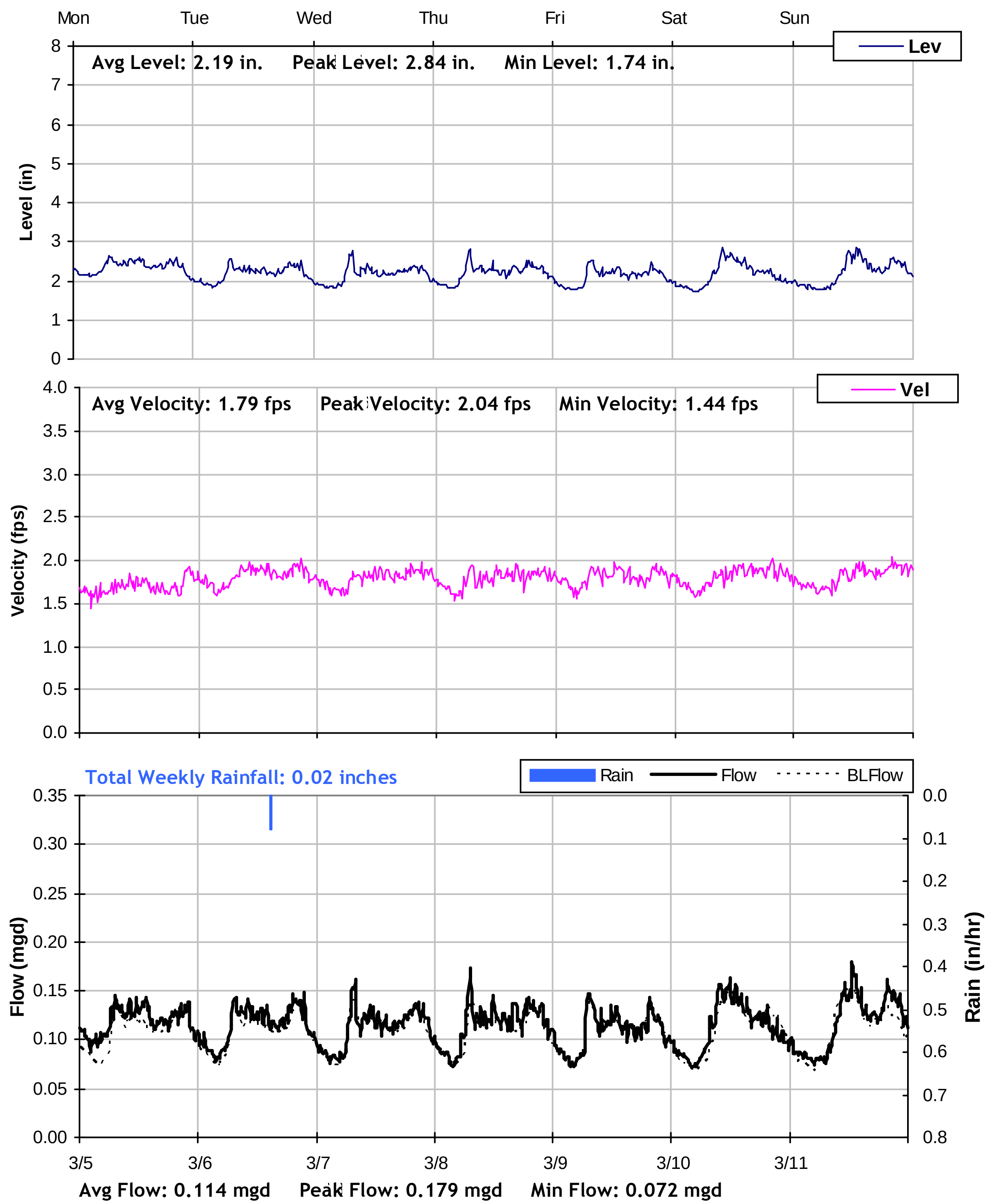
MH 54
Weekly Level, Velocity and Flow Hydrographs
2/20/2012 to 2/27/2012



MH 54
Weekly Level, Velocity and Flow Hydrographs
2/27/2012 to 3/5/2012



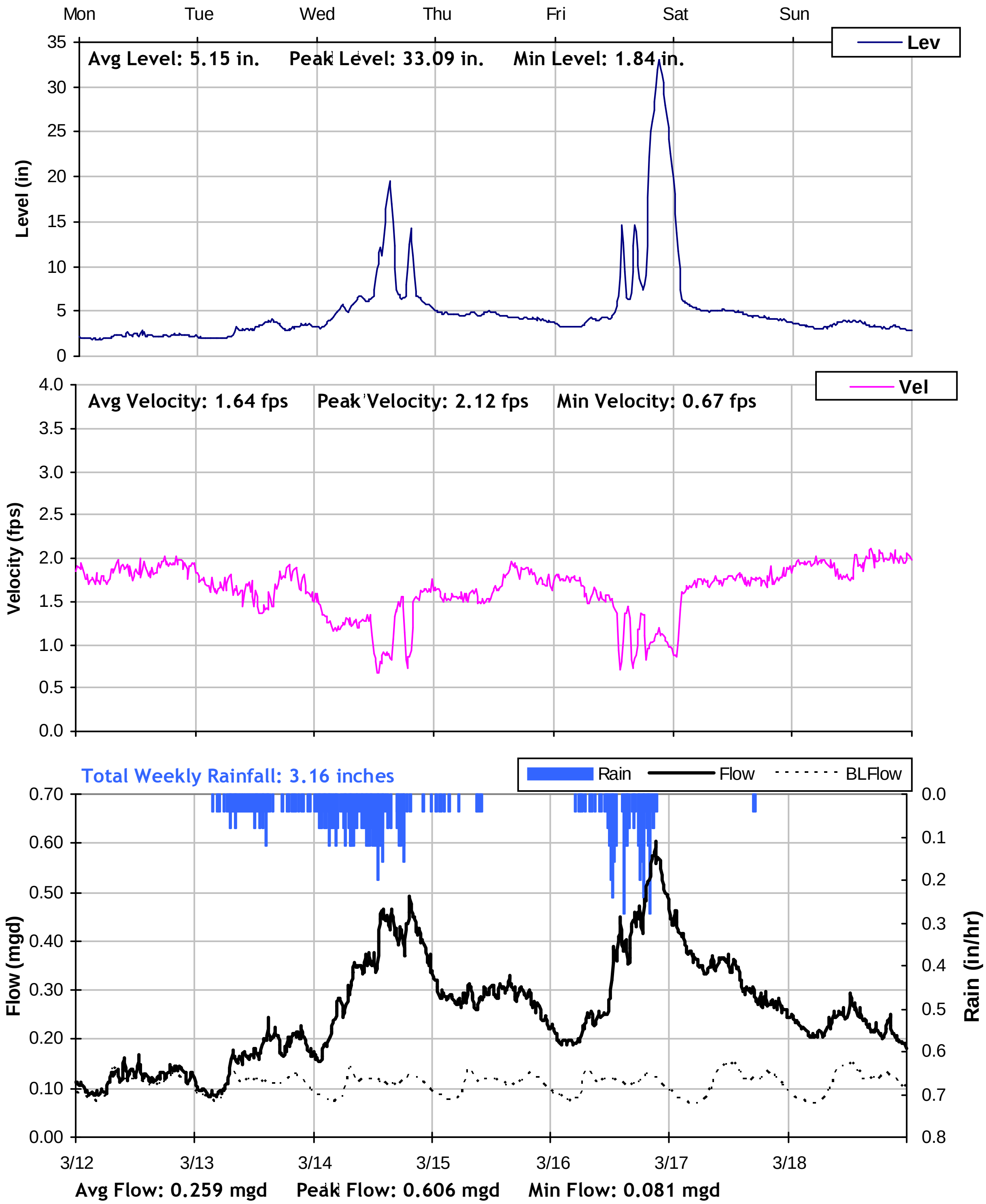
MH 54
Weekly Level, Velocity and Flow Hydrographs
3/5/2012 to 3/12/2012



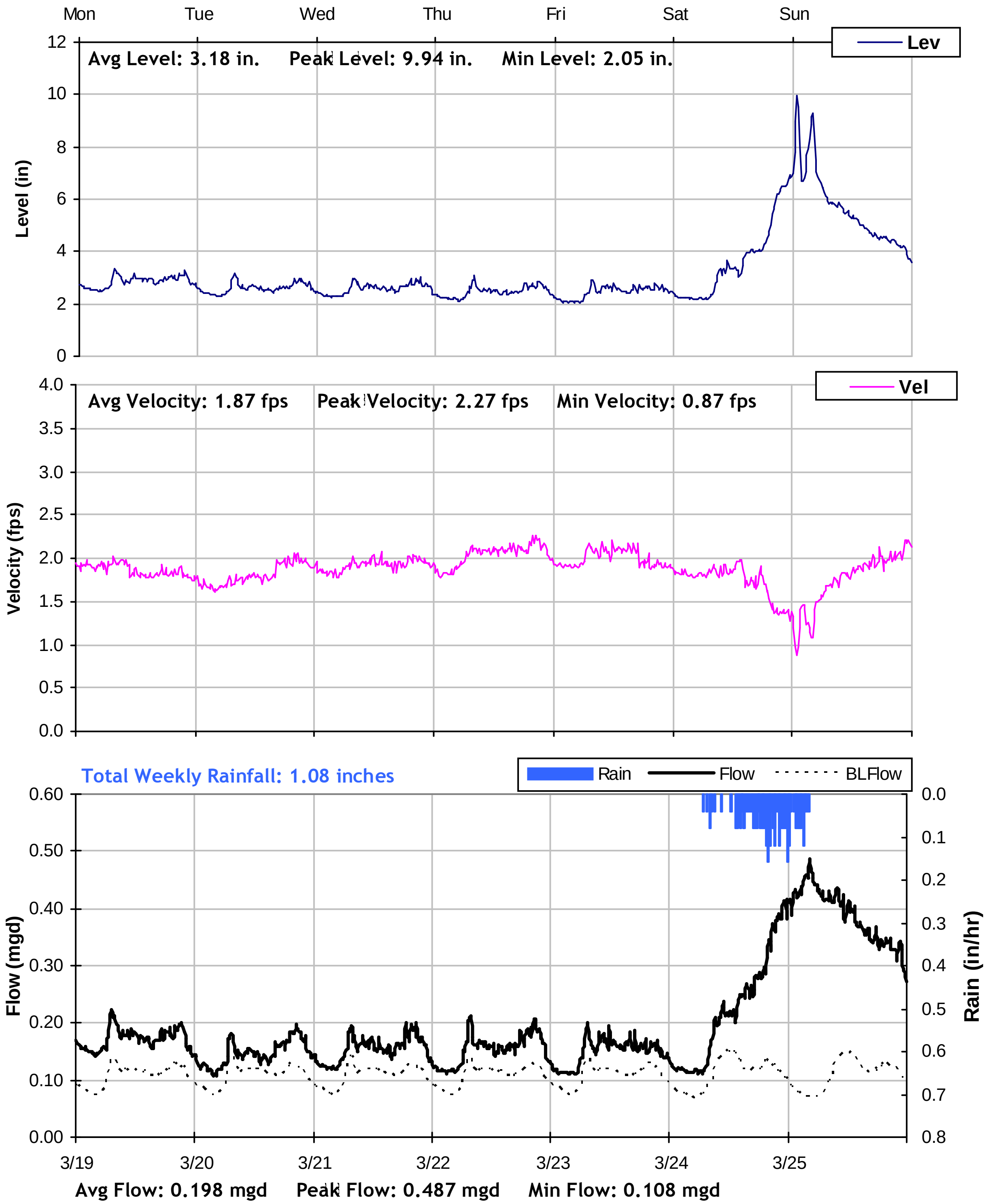
MH 54

Weekly Level, Velocity and Flow Hydrographs

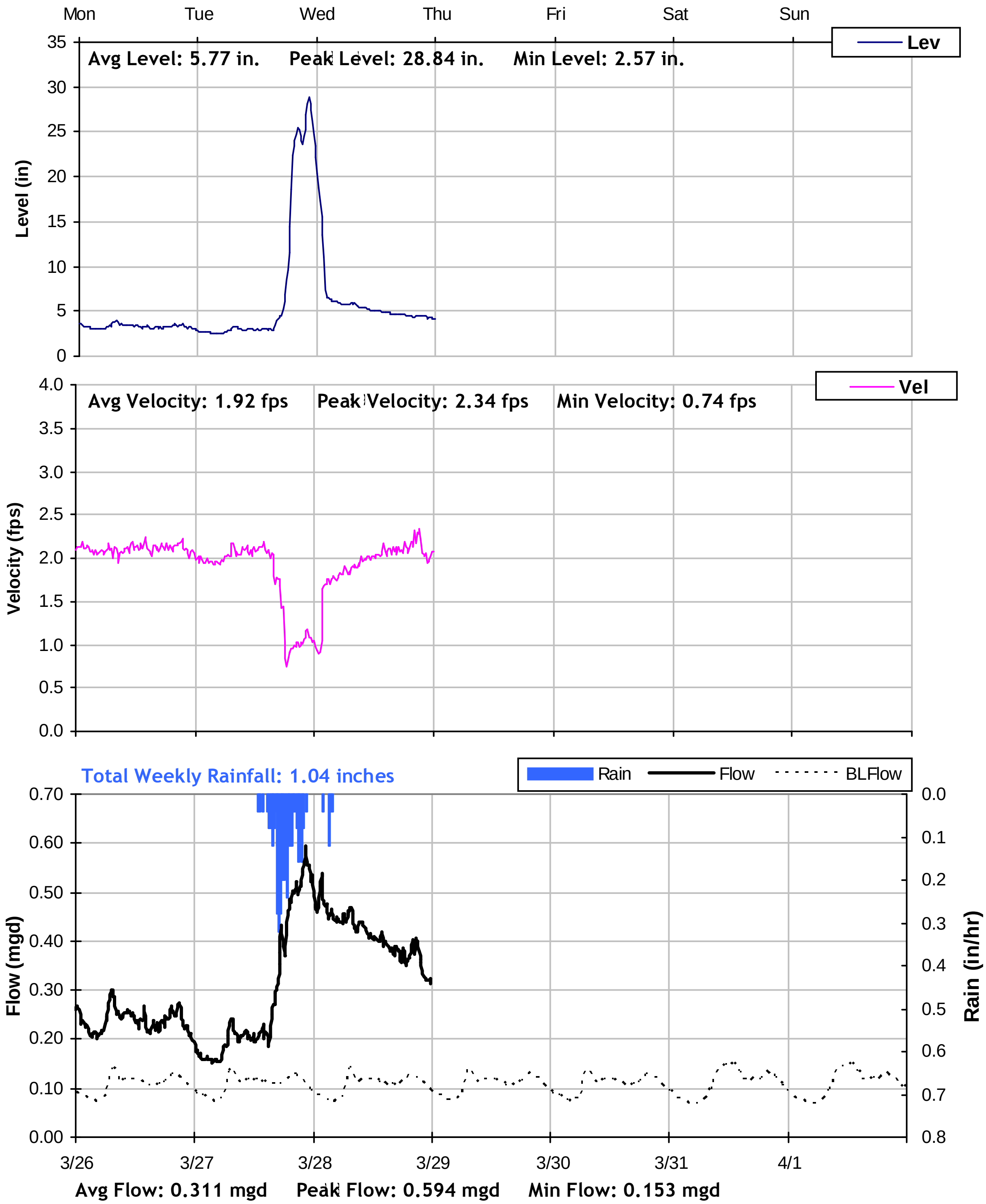
3/12/2012 to 3/19/2012



MH 54
Weekly Level, Velocity and Flow Hydrographs
3/19/2012 to 3/26/2012



MH 54
Weekly Level, Velocity and Flow Hydrographs
3/26/2012 to 4/2/2012



Rodeo Sanitary District

Master Plan Sanitary Sewer Flow Monitoring
Year 2011/2012

Monitoring Site: MH 59

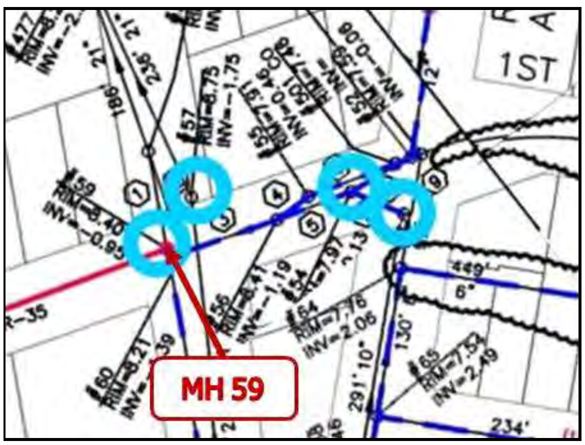
Location: Intersection of 1st Street and John Street

Data Summary Report

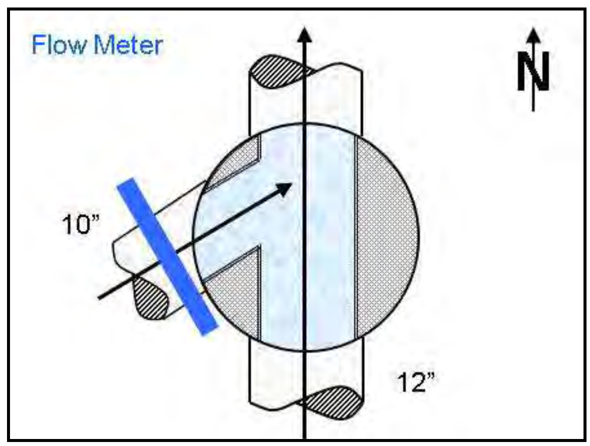
MH 59
Site Information Report

Location:	Intersection of 1st Street and John Street
Coordinates:	122.2670° W, 38.0377° N
Rim Elevation:	11 feet
Diameter:	9.5 inches
Baseline Flow:	0.035 mgd
Peak Measured Flow:	0.241 mgd

Satellite Map



Sanitary Map



Flow Sketch

Street View Photo

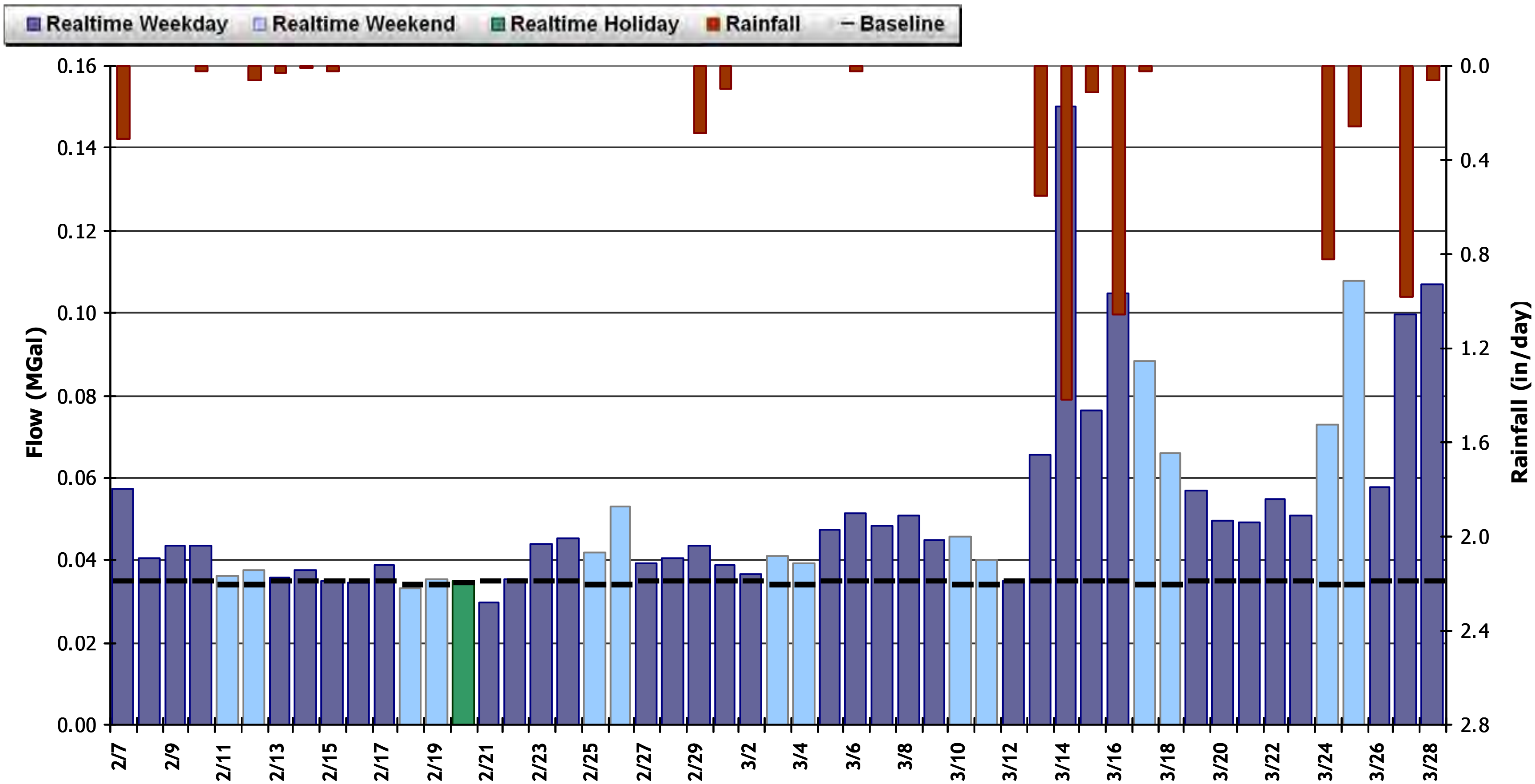

Plan View Photo

MH 59

Period Flow Summary: Daily Flow Totals

Avg Daily Flow: 0.053 MGal **Peak Daily Flow: 0.15 MGal** **Min Daily Flow: 0.03 MGal**

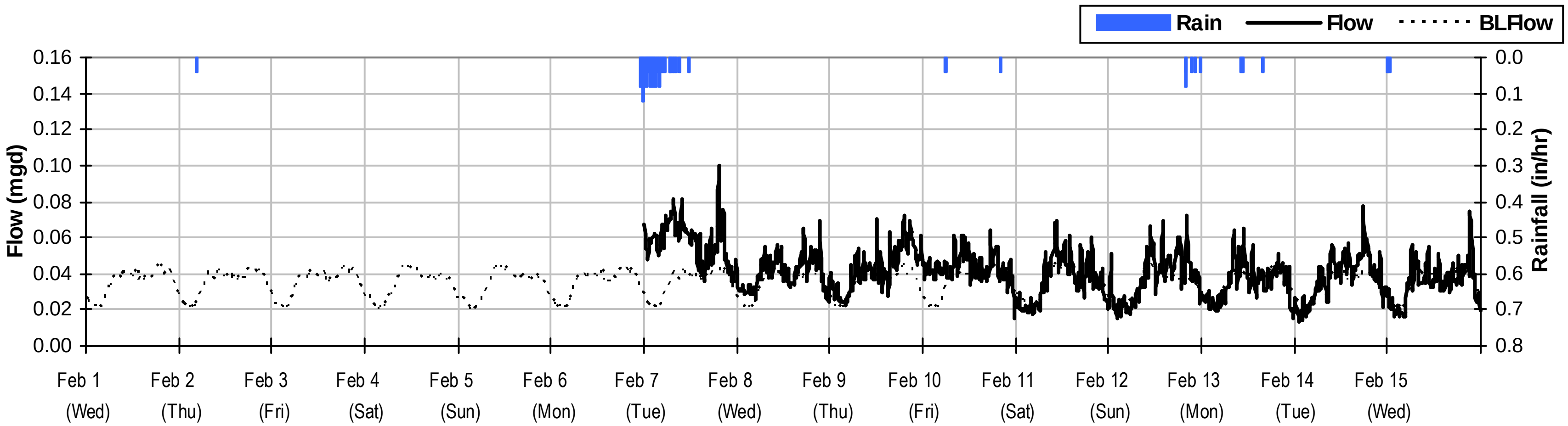
Total Period Rainfall: 6.24 inches

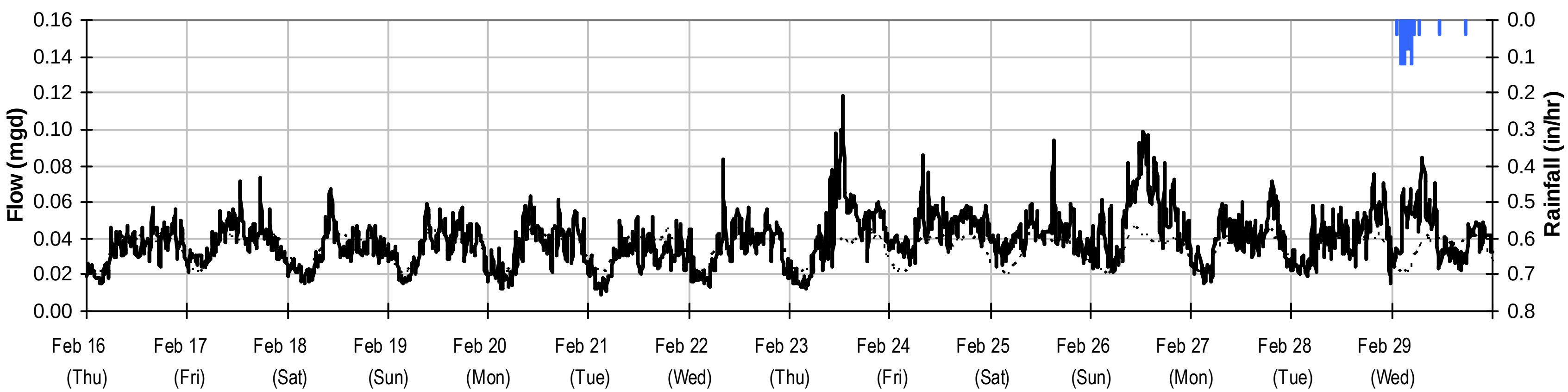


MH 59

Monthly Flow Summary: February, 2012

Total Monthly Rainfall: 0.85 inches Avg Flow: 0.040 mgd Peak Flow: 0.118 mgd Min Flow: 0.010 mgd

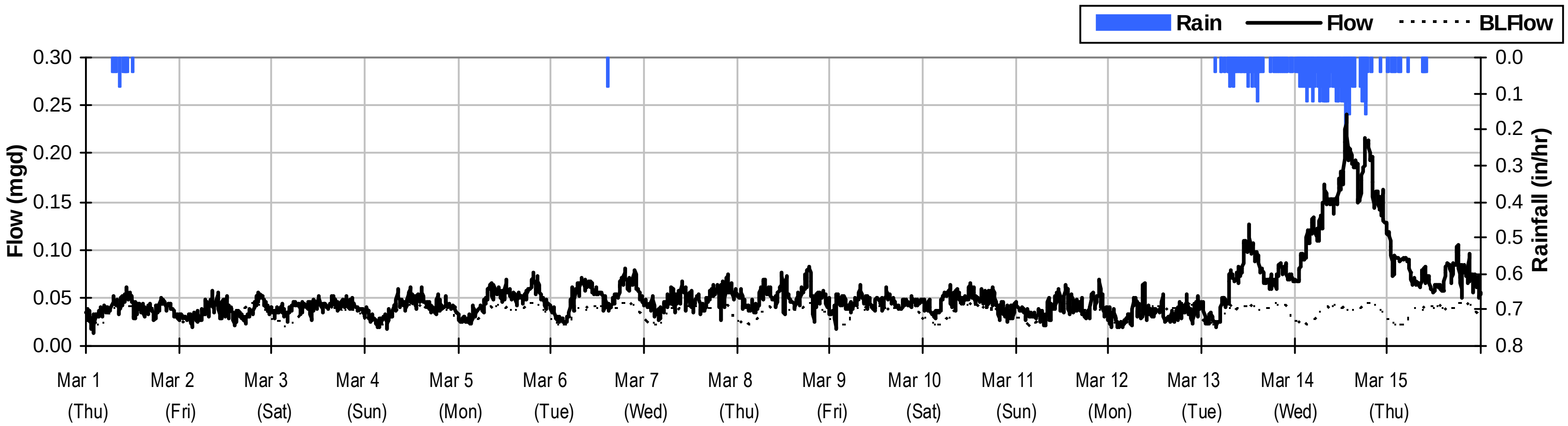


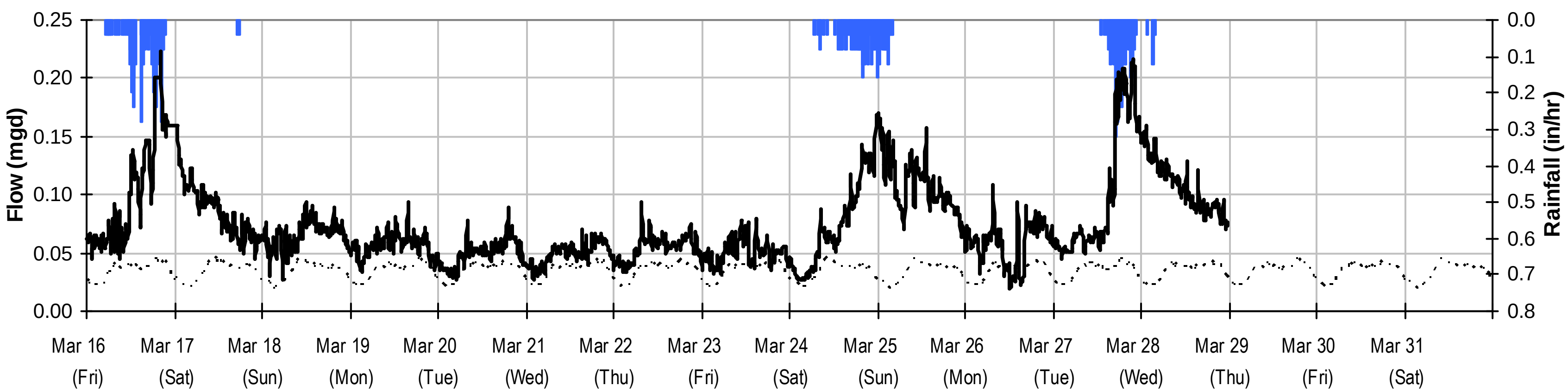


MH 59

Monthly Flow Summary: March, 2012

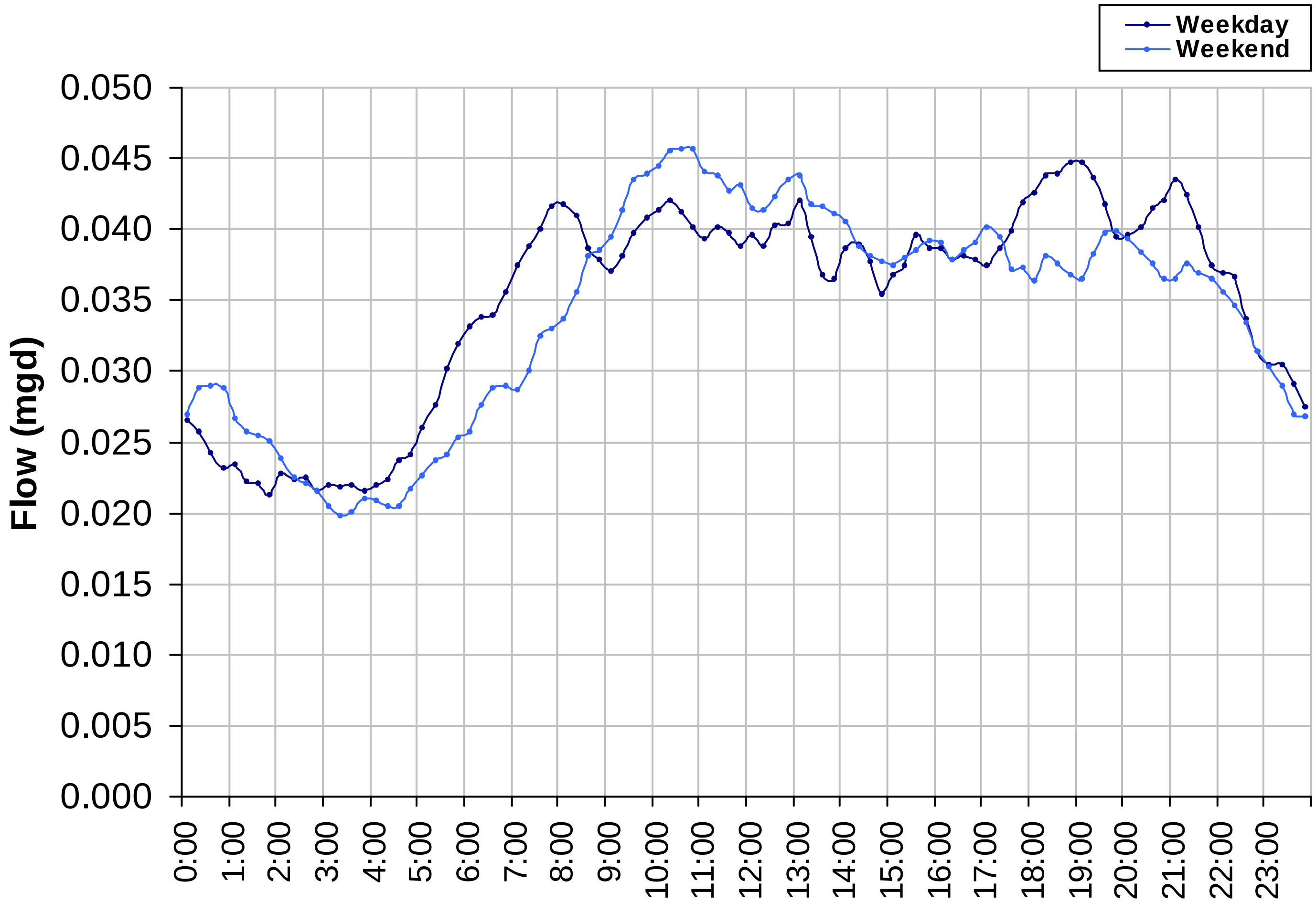
Total Monthly Rainfall: 5.4 inches   **Avg Flow: 0.063 mgd**   **Peak Flow: 0.241 mgd**   **Min Flow: 0.014 mgd**





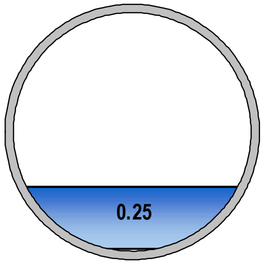
MH 59

Baseline Flow Hydrographs



Baseline Flow:

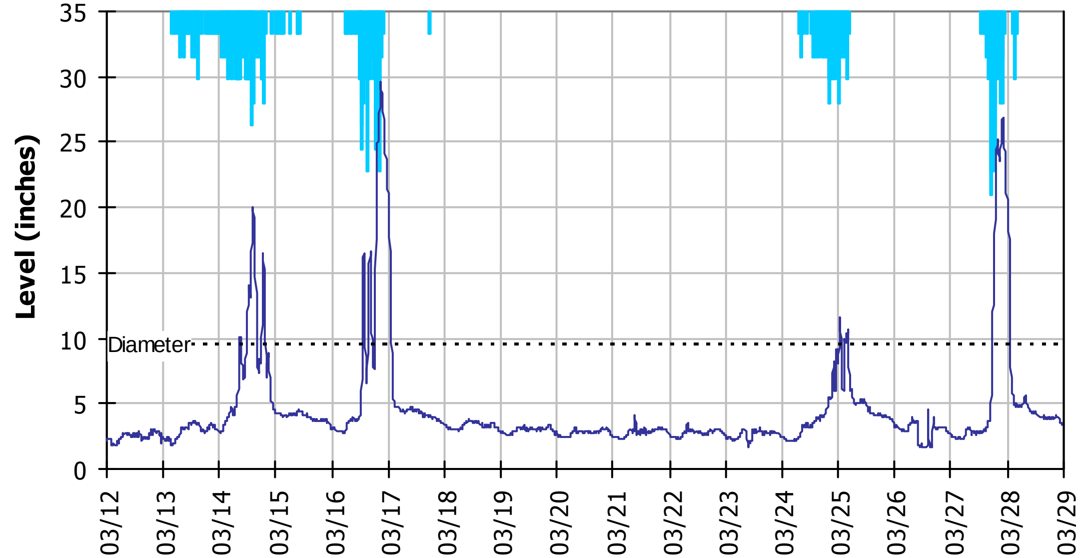
0.035 *mgd*

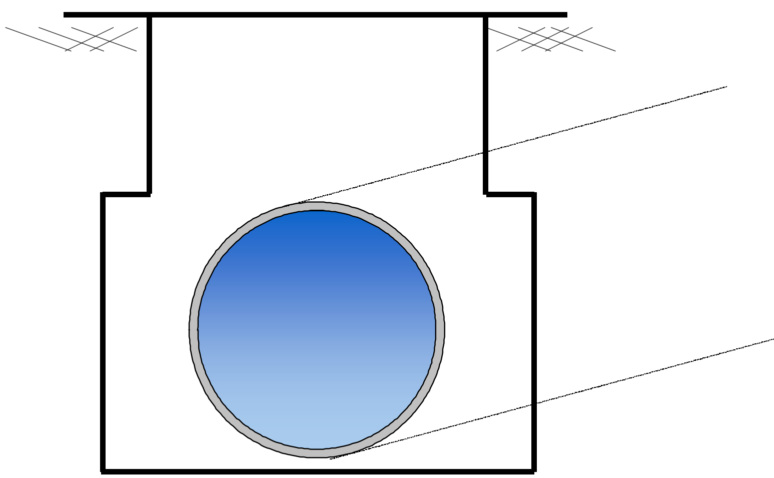


MH 59

Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Monitoring Period





Pipe Diameter: 9.5 *inches*

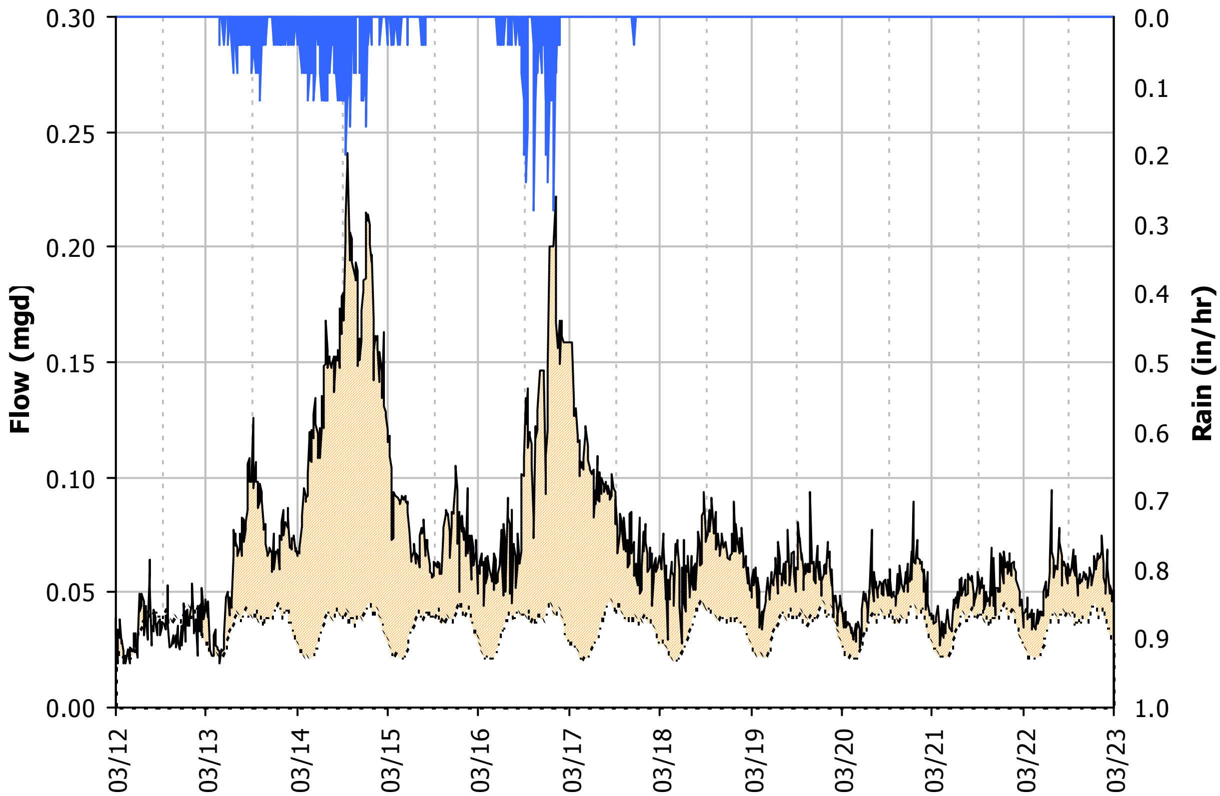
Peak Measured Level: 29.6 *inches*

Peak d/D Ratio: 3.12

Surcharged 20.1 inches over crown

MH 59
I/I Summary: Event 2

Event 2 Detail Graph



Storm Event I/I Analysis (Rain = 3.16 inches)

Inflow

Peak I/I Rate: 0.20 *mgd*

Pk I/I:ADWF: 5.88

Combined I/I

Total I/I: 413,000 *gallons*

Total I/I:ADWF: 3.76 *per in-rain*

RDI (infiltration)

Infiltration Rate: 0.020 *mgd*
(3/22/2012)

RDI (% of BL): 56%

Capacity

Peak Flow: 0.24 *mgd*

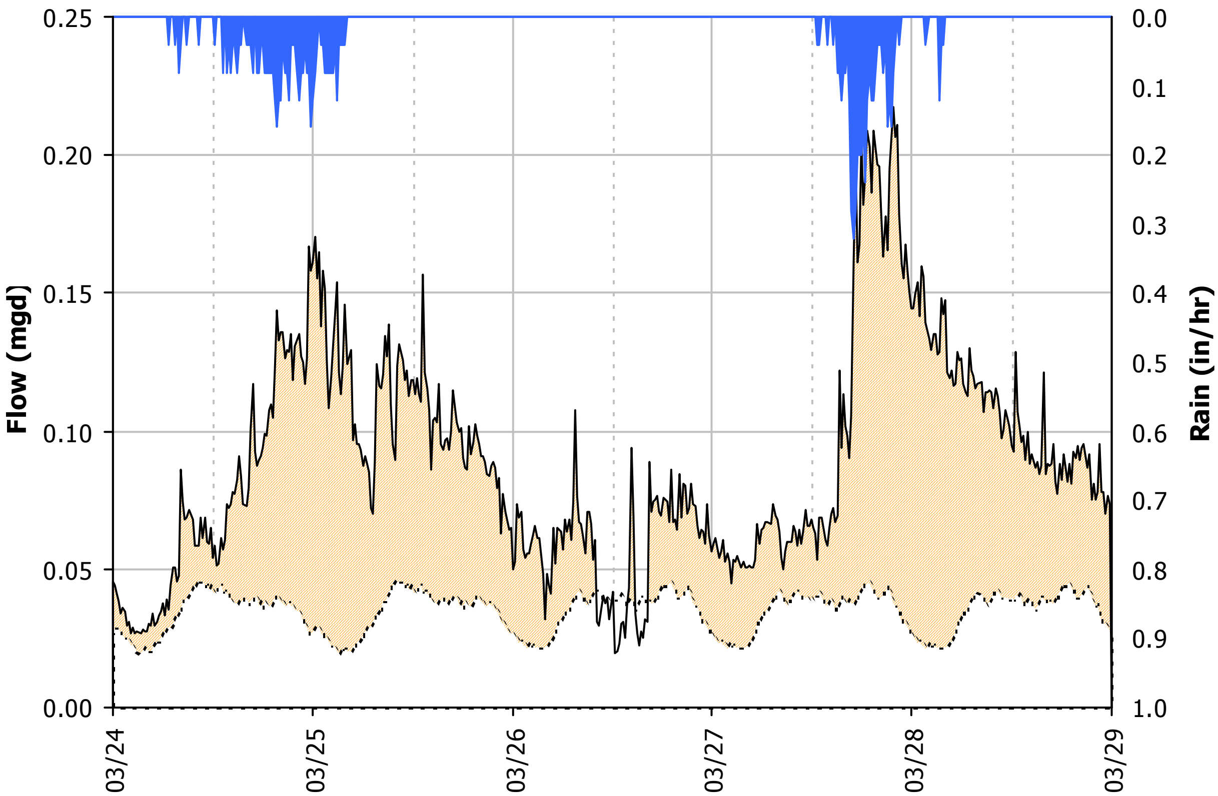
PF: 6.94

Peak Level: 29.62 *in*

d/D Ratio: 3.12

MH 59
I/I Summary: Event 3

Event 3 Detail Graph



Storm Event I/I Analysis (Rain = 2.12 inches)

Inflow

Peak I/I Rate: 0.18 *mgd*

Pk I/I:ADWF: 5.17

Combined I/I

Total I/I: 272,000 *gallons*

Total I/I:ADWF: 3.69 *per in-rain*

RDI (infiltration)

Infiltration Rate: 0.050 *mgd*
(3/28/2012 12:00:00 PM)

RDI (% of BL): 131%

Capacity

Peak Flow: 0.22 *mgd*

PF: 6.25

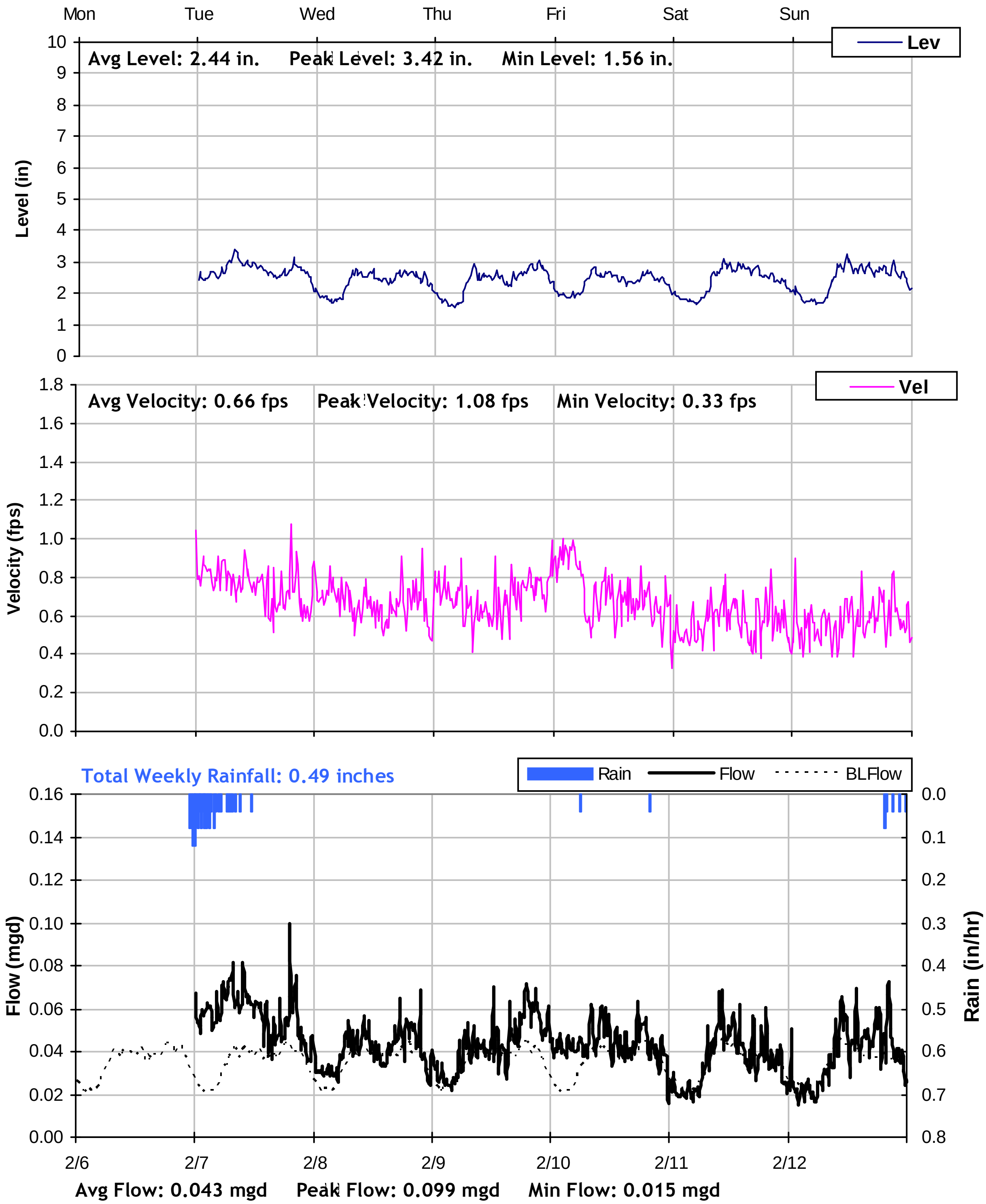
Peak Level: 26.95 *in*

d/D Ratio: 2.84

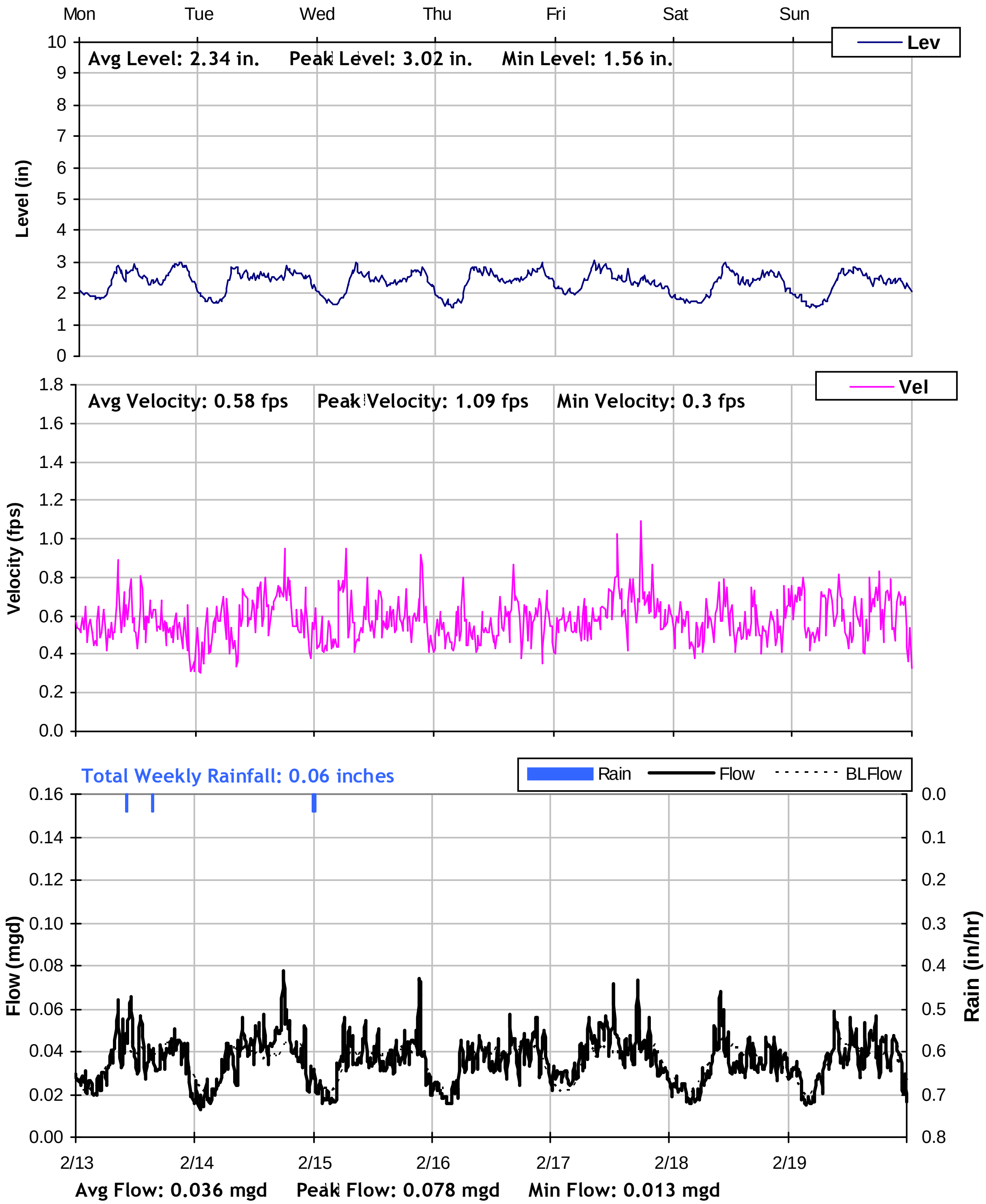
MH 59

Weekly Level, Velocity and Flow Hydrographs

2/6/2012 to 2/13/2012

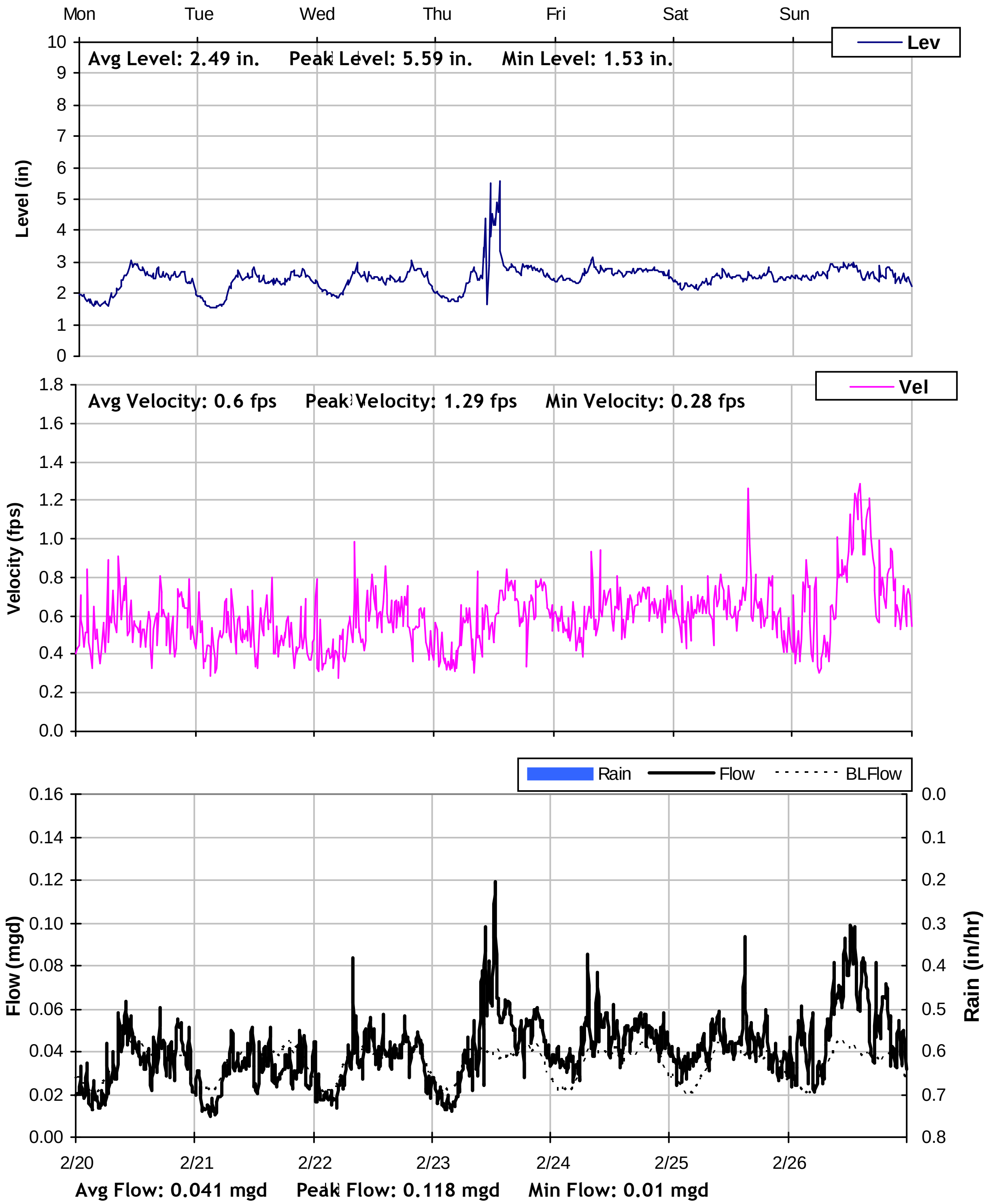


MH 59
Weekly Level, Velocity and Flow Hydrographs
2/13/2012 to 2/20/2012



MH 59

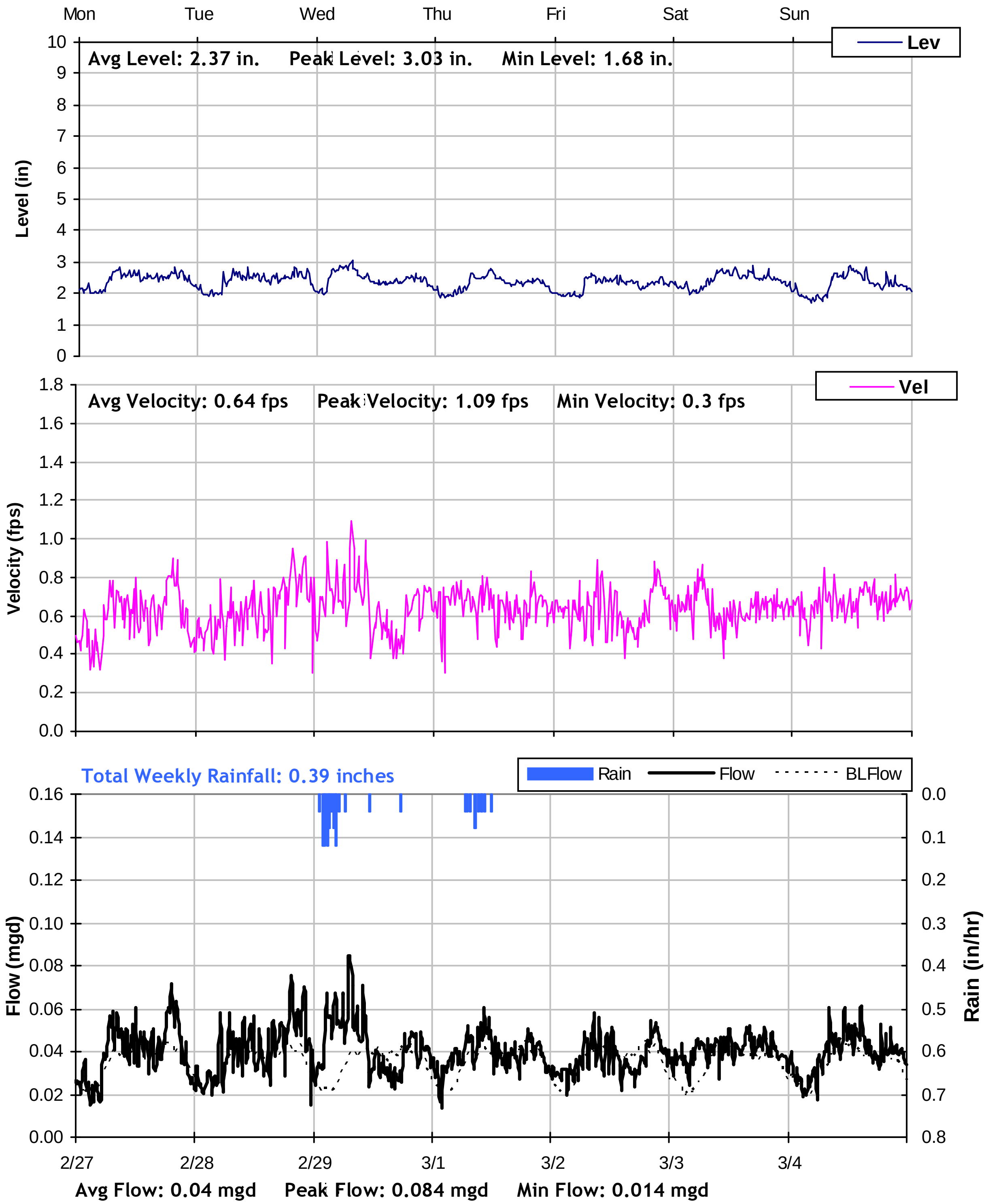
Weekly Level, Velocity and Flow Hydrographs
2/20/2012 to 2/27/2012



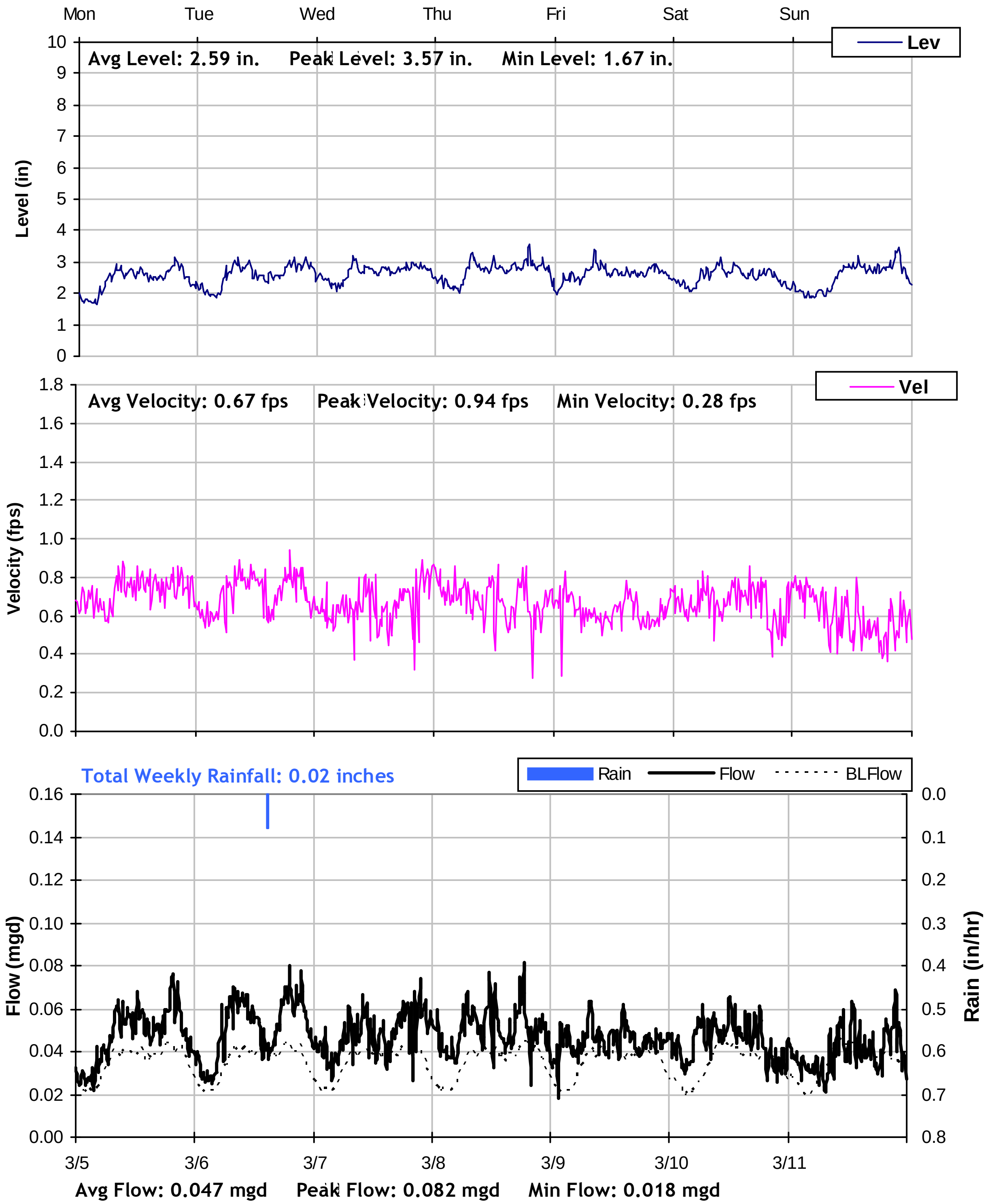
MH 59

Weekly Level, Velocity and Flow Hydrographs

2/27/2012 to 3/5/2012



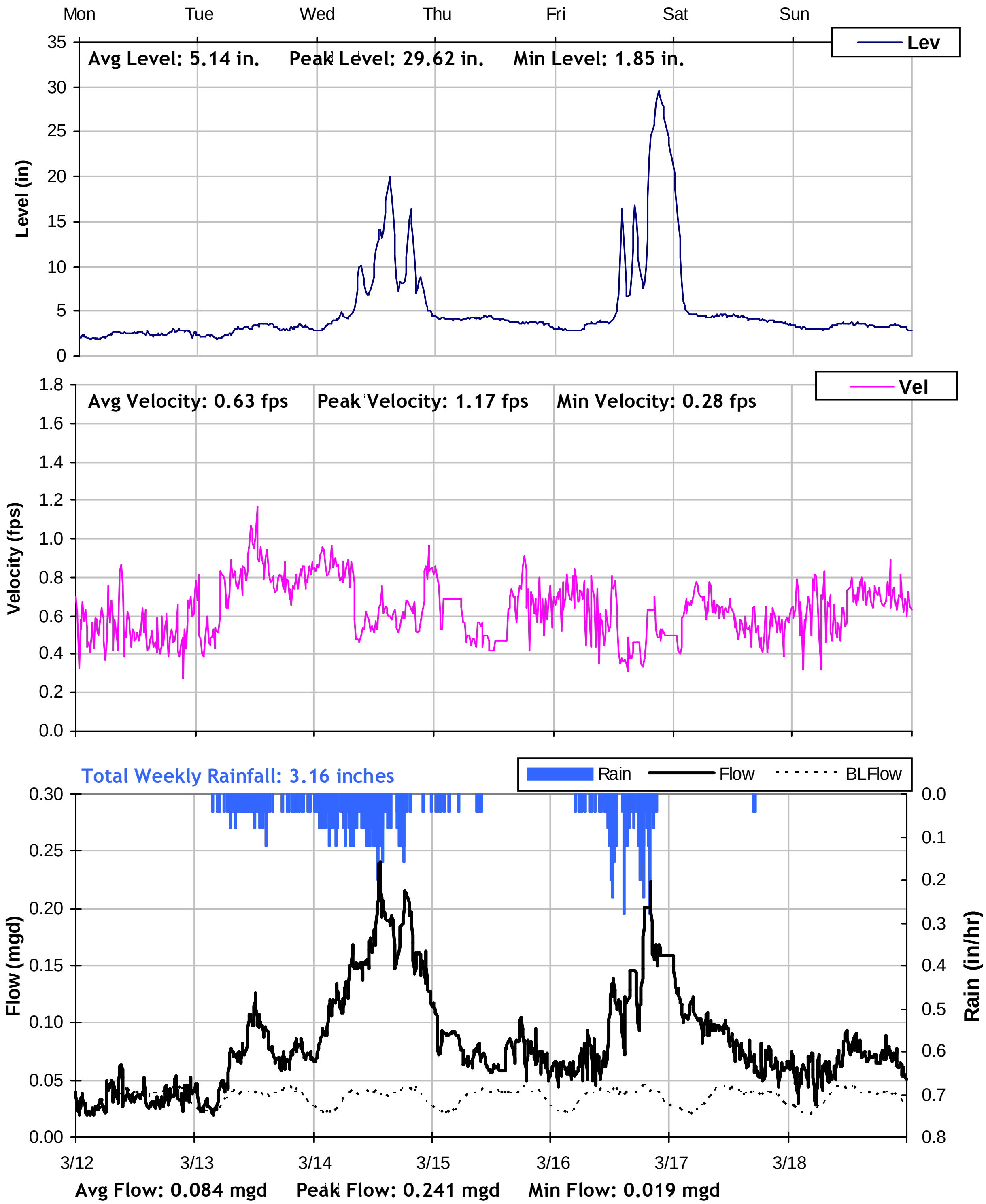
MH 59
Weekly Level, Velocity and Flow Hydrographs
3/5/2012 to 3/12/2012



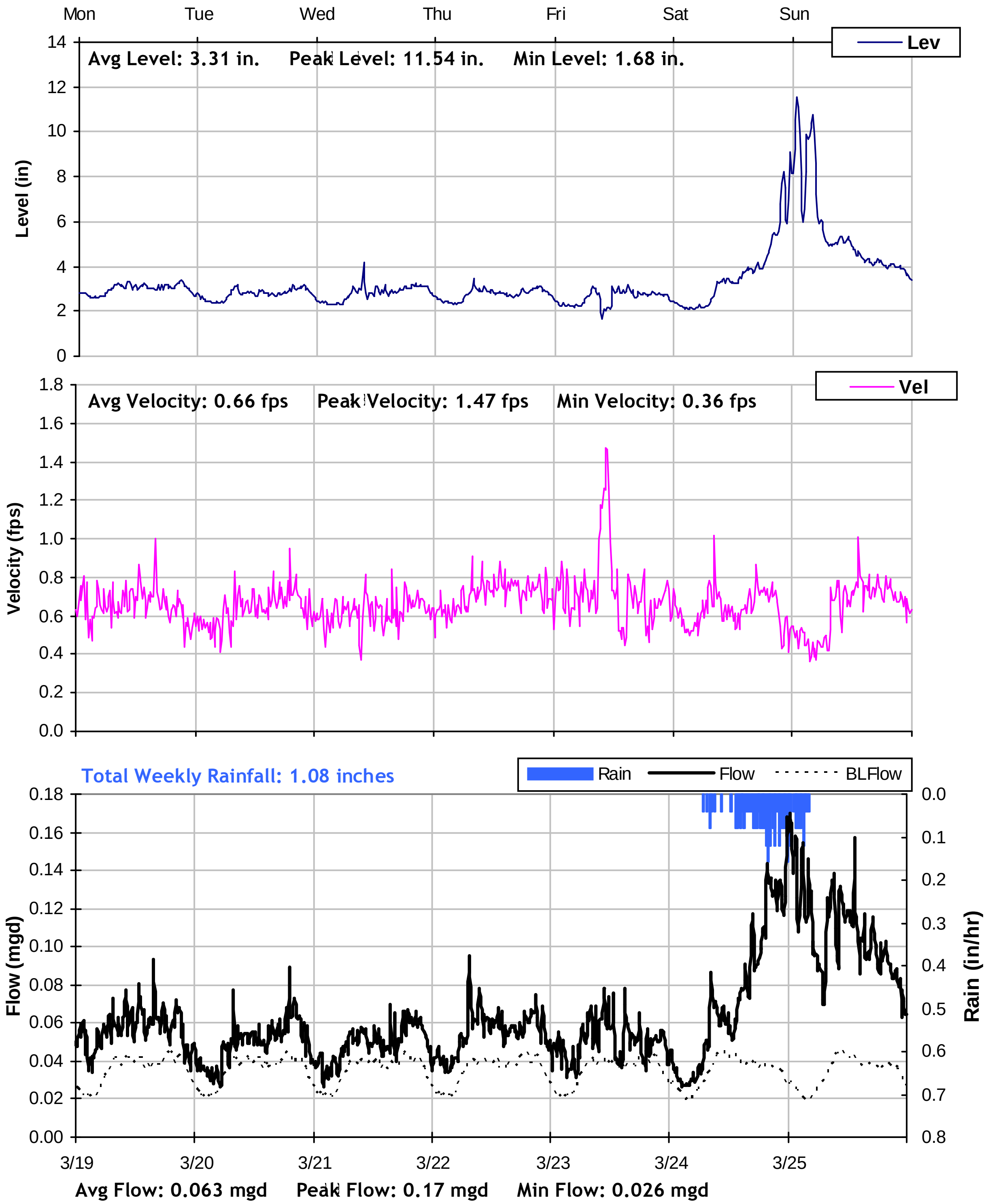
MH 59

Weekly Level, Velocity and Flow Hydrographs

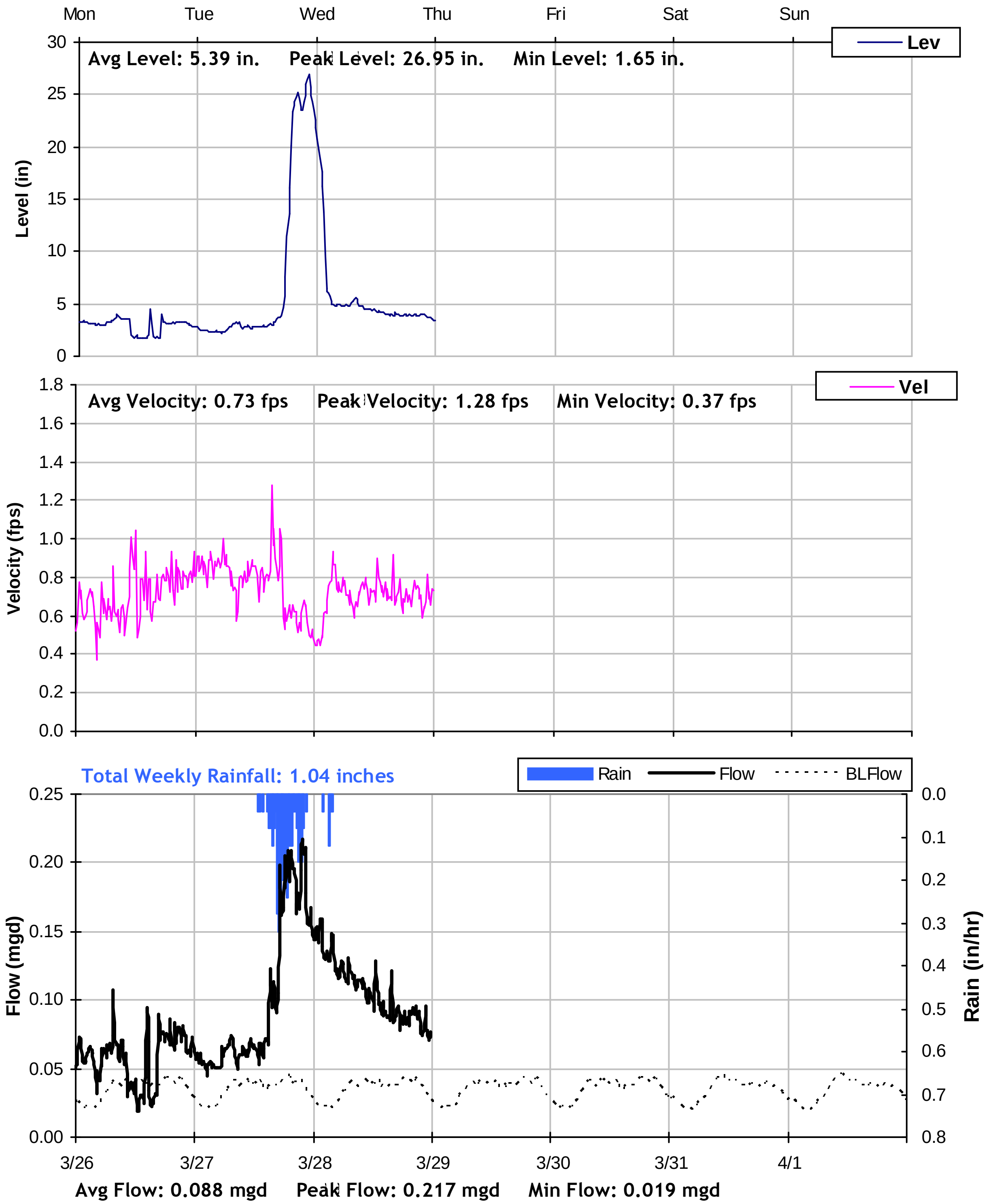
3/12/2012 to 3/19/2012



MH 59
Weekly Level, Velocity and Flow Hydrographs
3/19/2012 to 3/26/2012



MH 59
Weekly Level, Velocity and Flow Hydrographs
3/26/2012 to 4/2/2012



Rodeo Sanitary District

Master Plan Sanitary Sewer Flow Monitoring
Year 2011/2012

Monitoring Site: MH 368

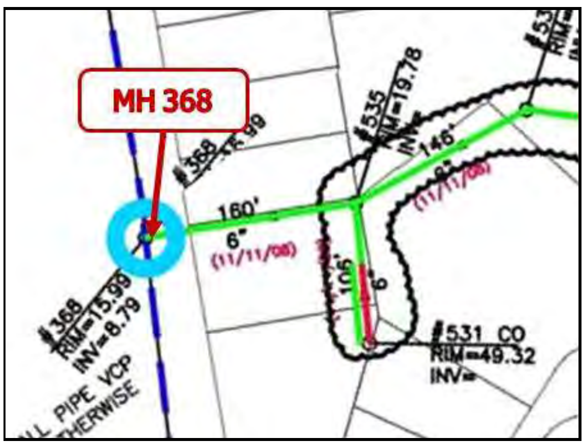
Location: 523 Vaqueros Avenue, south of 4th Street

Data Summary Report

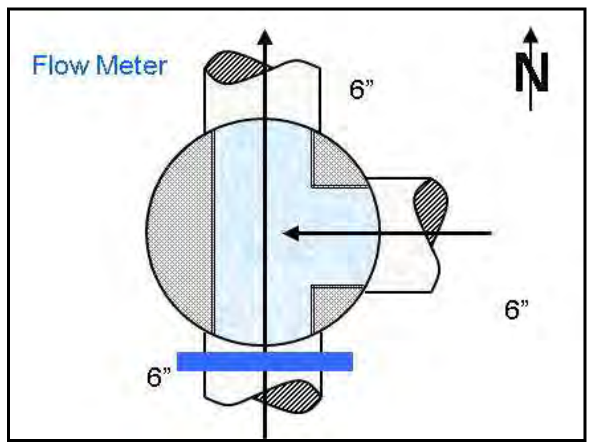
MH 368
Site Information Report

Location:	523 Vaqueros Avenue, south of 4th Street
Coordinates:	122.2651° W, 38.0322° N
Rim Elevation:	17 feet
Diameter:	6 inches
Baseline Flow:	0.009 mgd
Peak Measured Flow:	0.172 mgd

Satellite Map



Sanitary Map



Flow Sketch

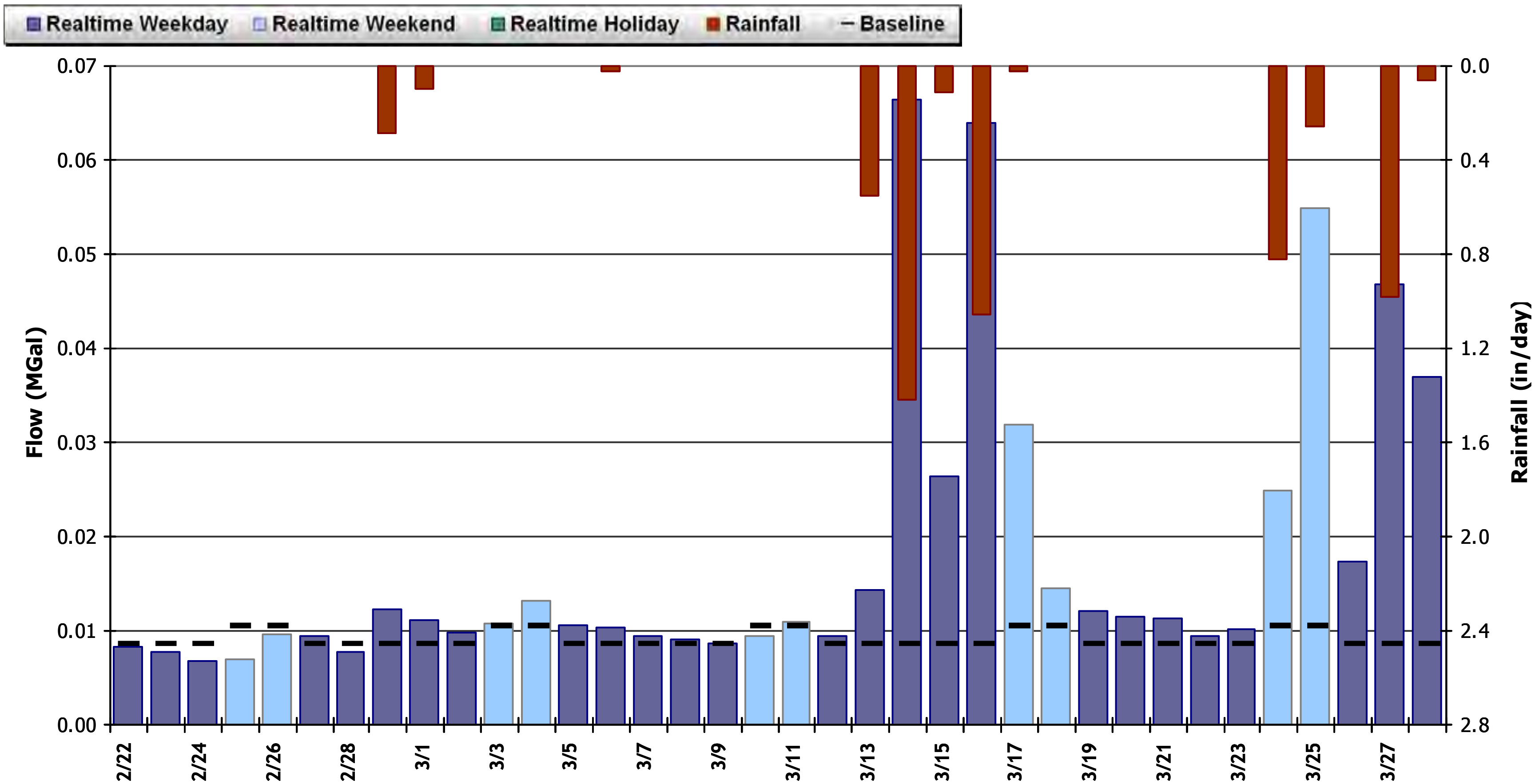
Street View Photo

Plan View Photo

MH 368
Period Flow Summary: Daily Flow Totals

Avg Daily Flow: 0.018 MGal **Peak Daily Flow: 0.066 MGal** **Min Daily Flow: 0.007 MGal**

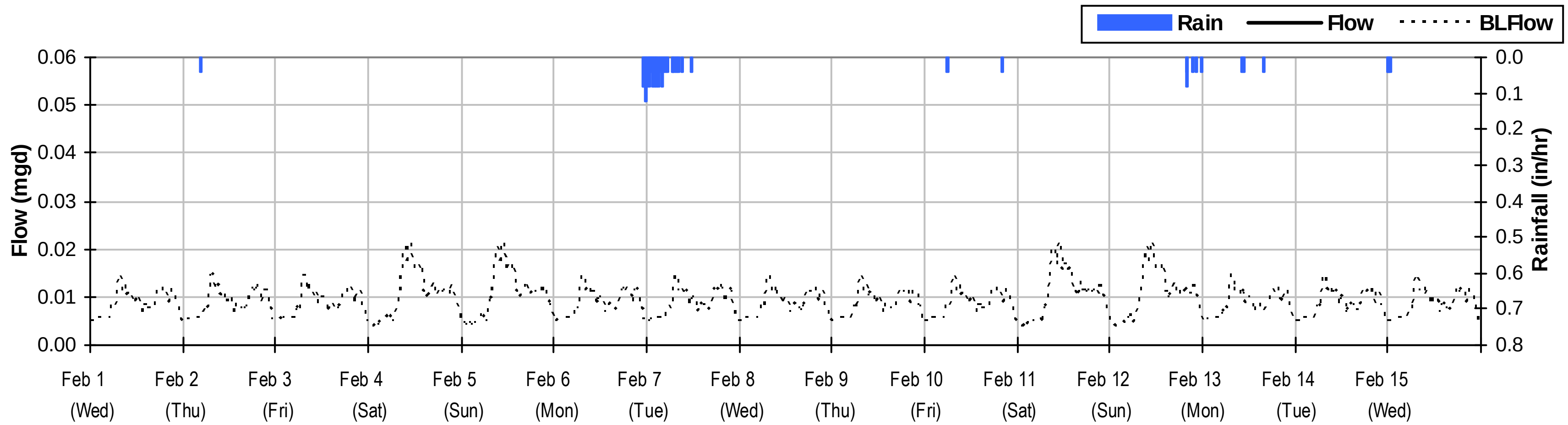
Total Period Rainfall: 5.69 inches

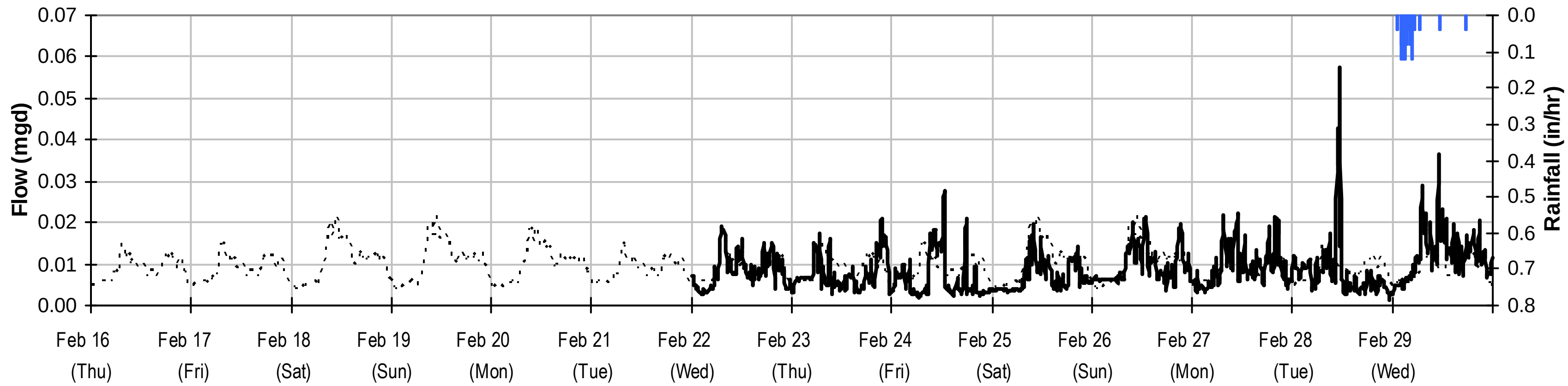


MH 368

Monthly Flow Summary: February, 2012

Total Monthly Rainfall: 0.85 inches   **Avg Flow: 0.009 mgd**   **Peak Flow: 0.057 mgd**   **Min Flow: 0.001 mgd**

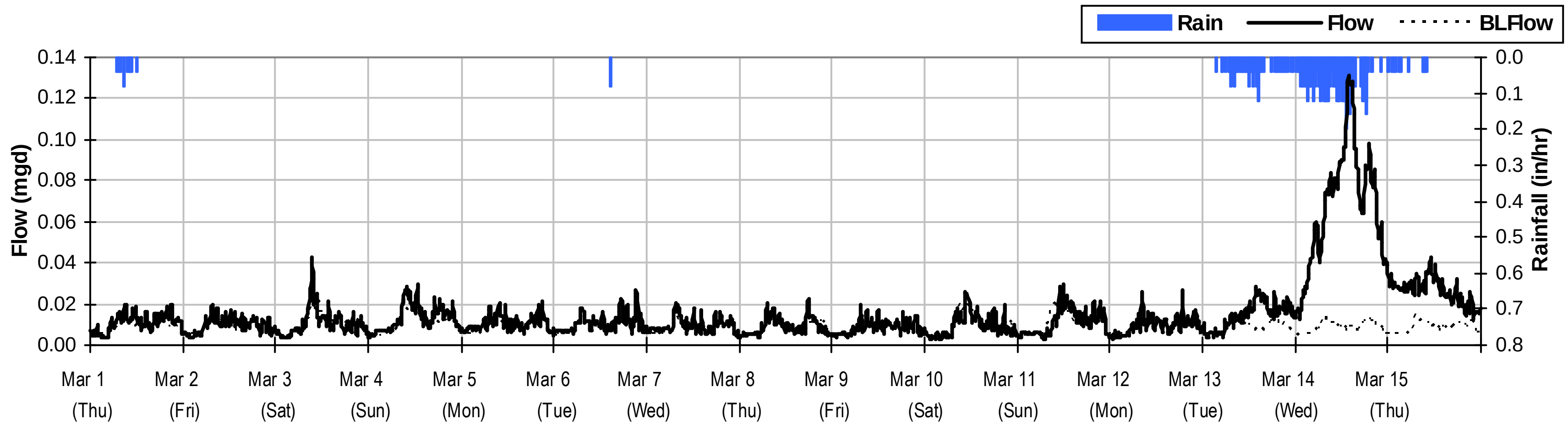


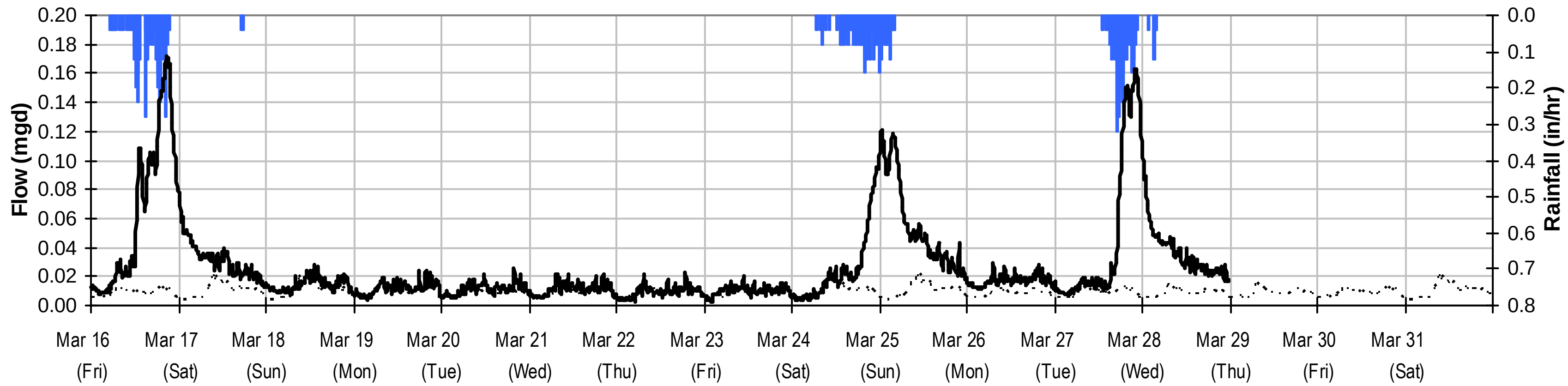


MH 368

Monthly Flow Summary: March, 2012

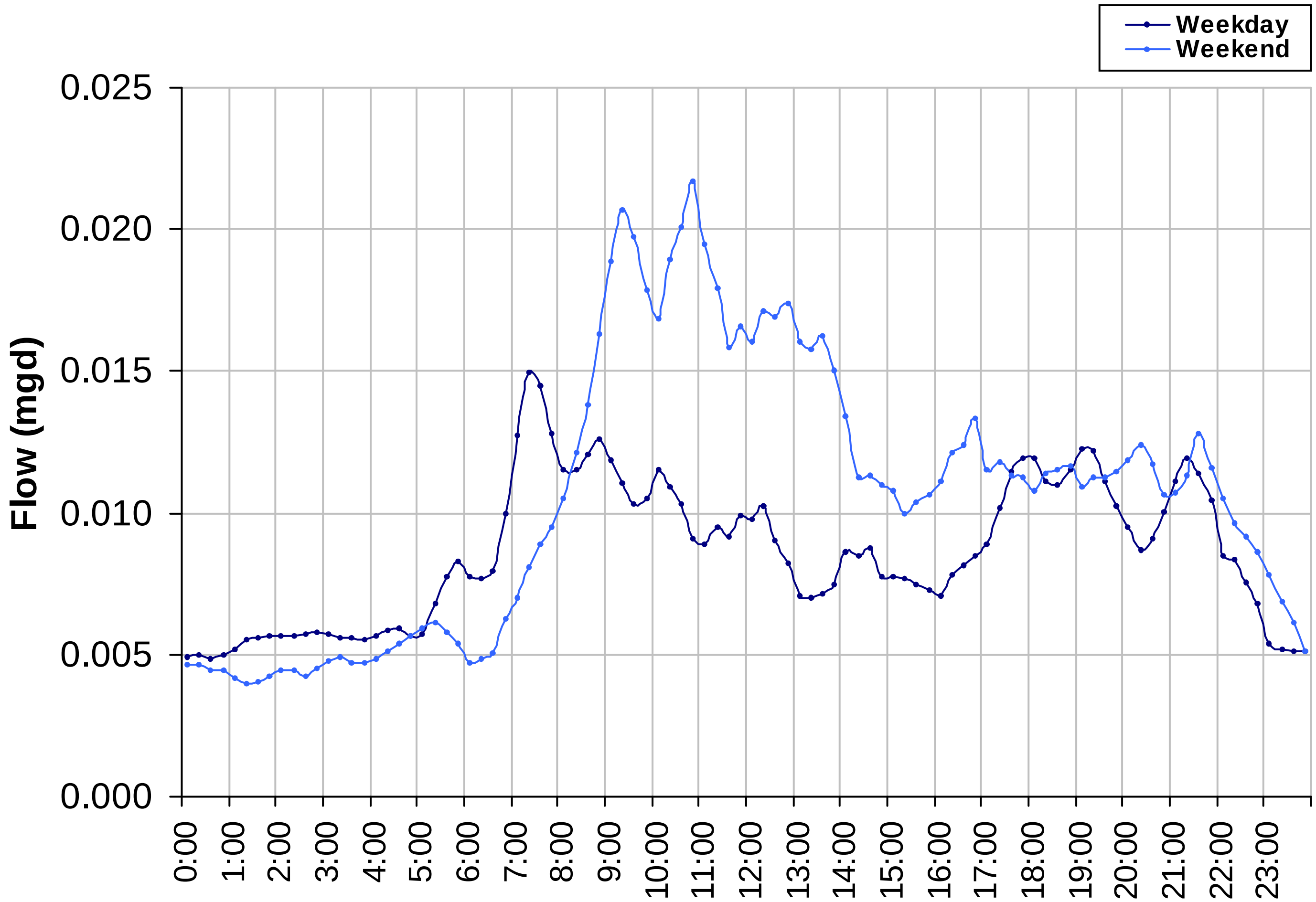
Total Monthly Rainfall: 5.4 inches   **Avg Flow: 0.021 mgd**   **Peak Flow: 0.172 mgd**   **Min Flow: 0.003 mgd**





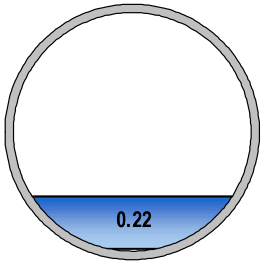
MH 368

Baseline Flow Hydrographs



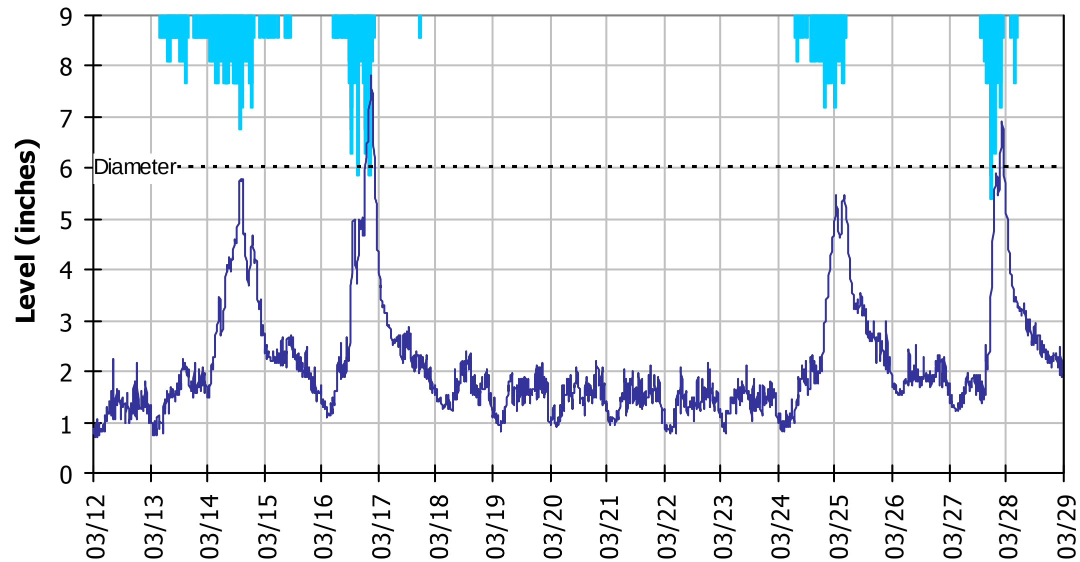
Baseline Flow:

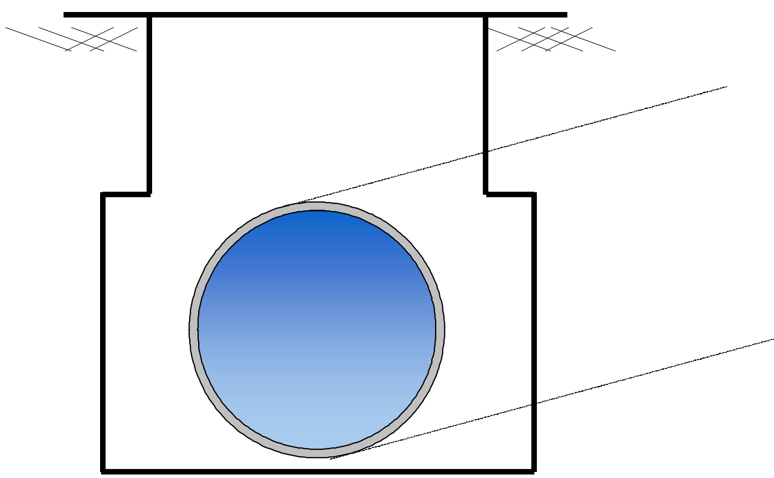
0.009 *mgd*



MH 368
Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Monitoring Period





Pipe Diameter: 6 *inches*

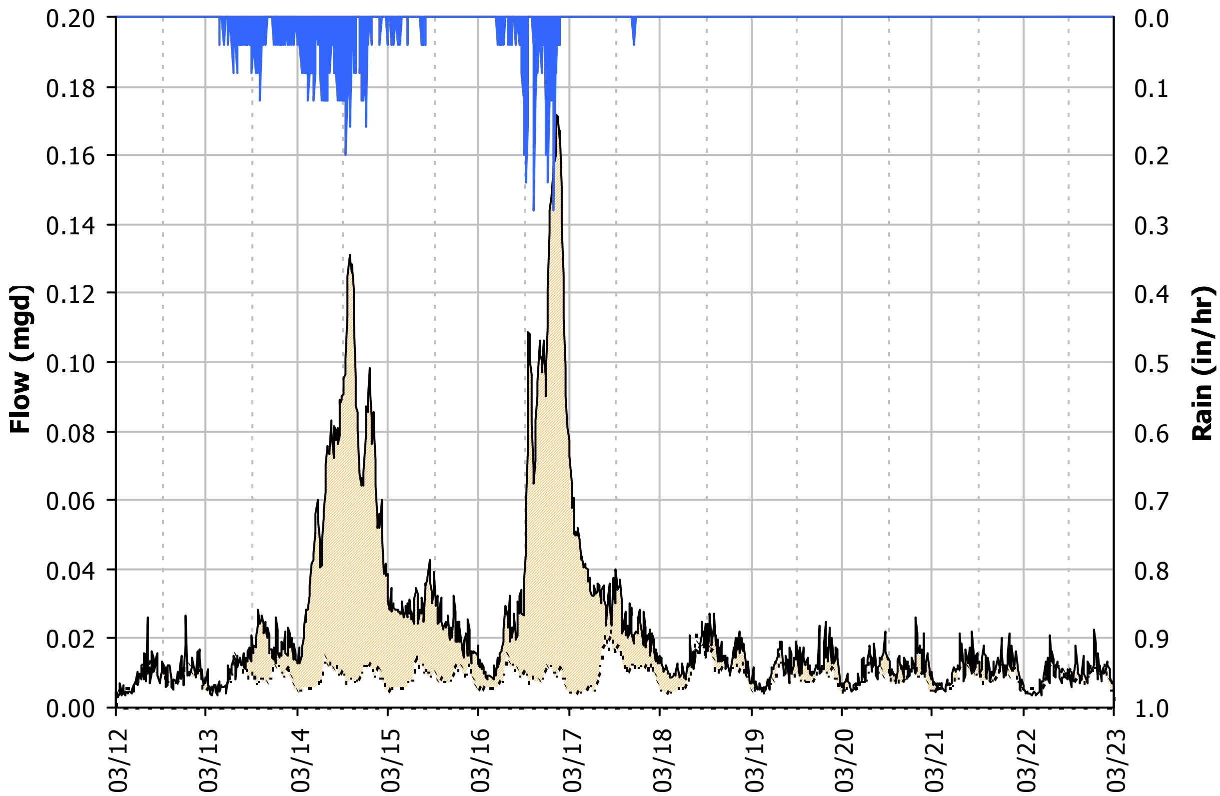
Peak Measured Level: 7.82 *inches*

Peak d/D Ratio: 1.30

Surcharged 1.8 inches over crown

MH 368
I/I Summary: Event 2

Event 2 Detail Graph



Storm Event I/I Analysis (Rain = 3.16 inches)

Inflow

Peak I/I Rate: 0.16 *mgd*

Pk I/I:ADWF: 17.77

Combined I/I

Total I/I: 172,000 *gallons*

Total I/I:ADWF: 5.96 *per in-rain*

RDI (infiltration)

Infiltration Rate: 0.001 *mgd*
(3/22/2012)

RDI (% of BL): 9%

Capacity

Peak Flow: 0.17 *mgd*

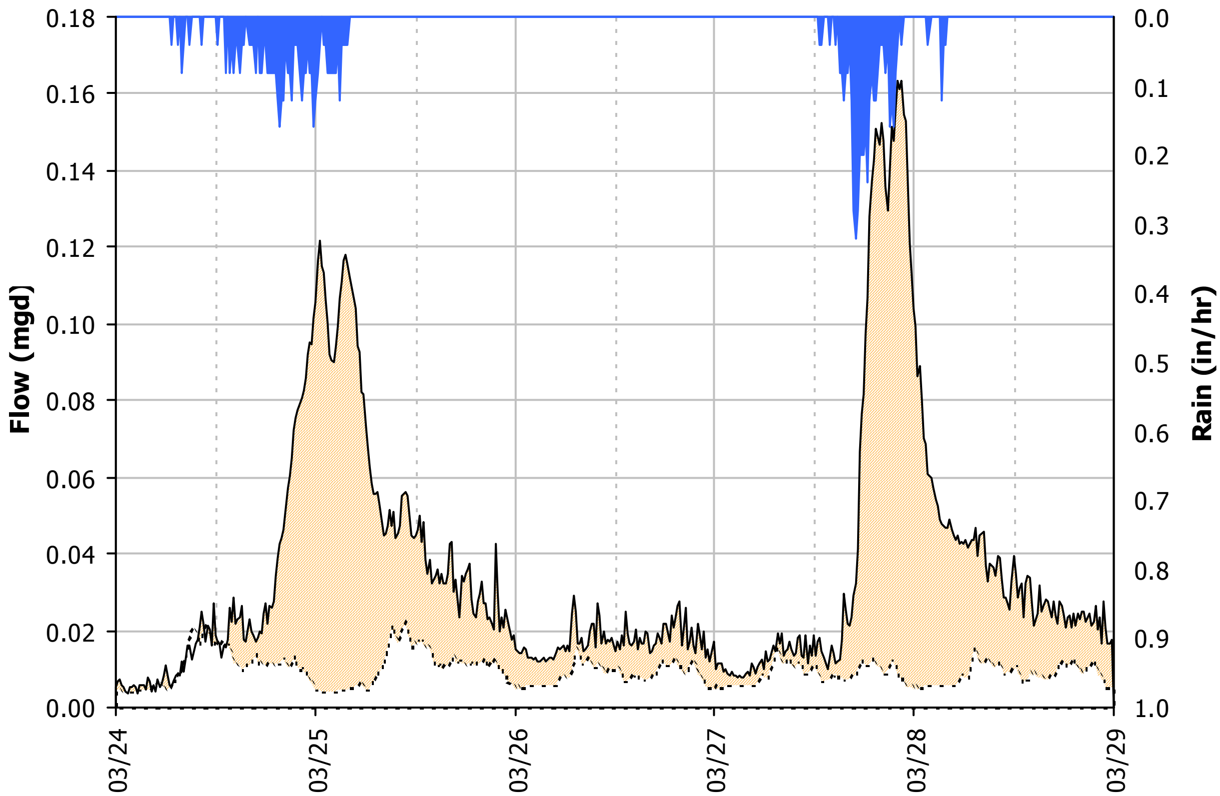
PF: 18.76

Peak Level: 7.82 *in*

d/D Ratio: 1.30

MH 368
I/I Summary: Event 3

Event 3 Detail Graph



Storm Event I/I Analysis (Rain = 2.12 inches)

Inflow

Peak I/I Rate: 0.16 *mgd*

Pk I/I:ADWF: 17.04

Combined I/I

Total I/I: 134,000 *gallons*

Total I/I:ADWF: 6.90 *per in-rain*

RDI (infiltration)

Infiltration Rate: 0.016 *mgd*
(3/28/2012 12:00:00 PM)

RDI (% of BL): 184%

Capacity

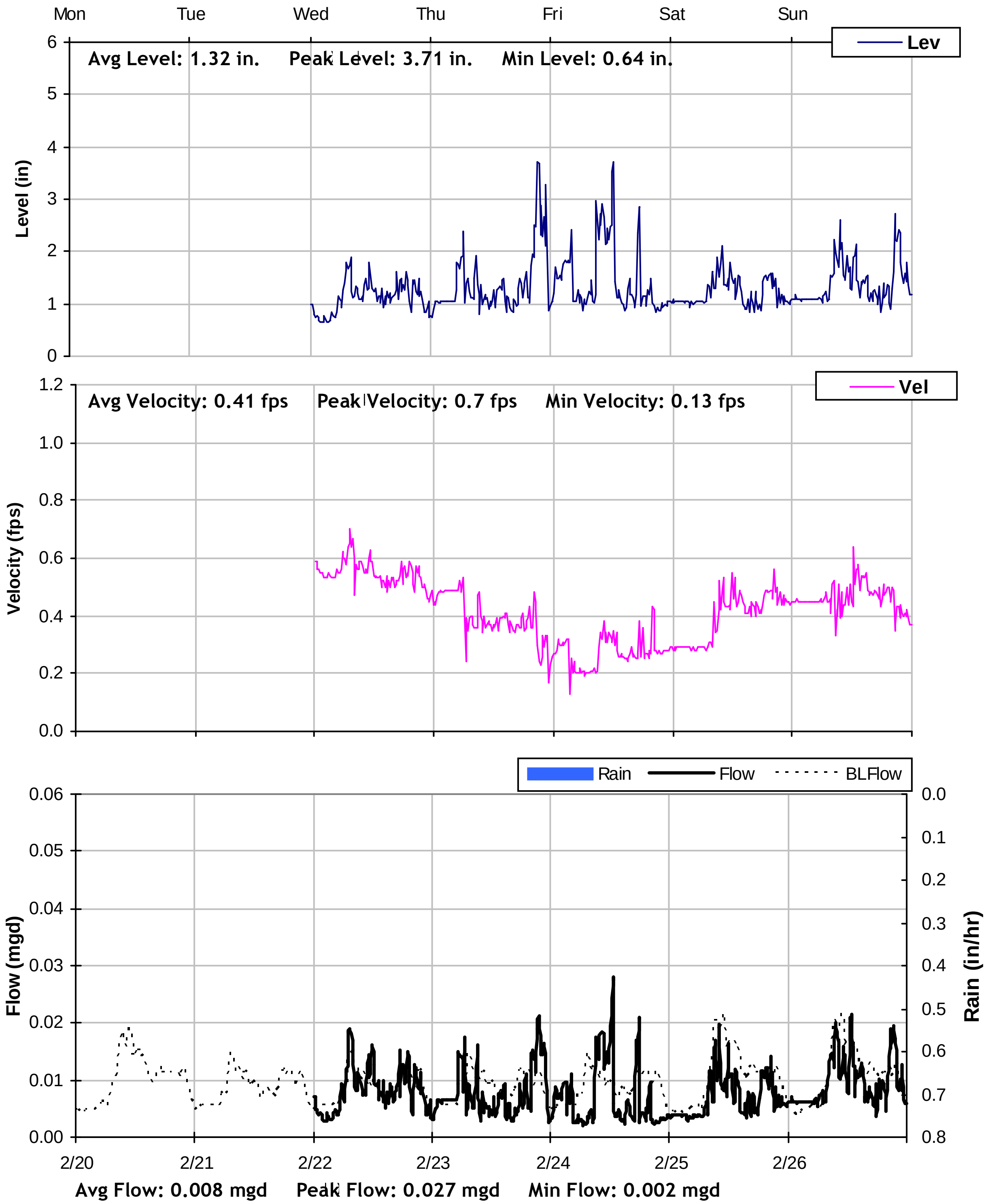
Peak Flow: 0.16 *mgd*

PF: 17.85

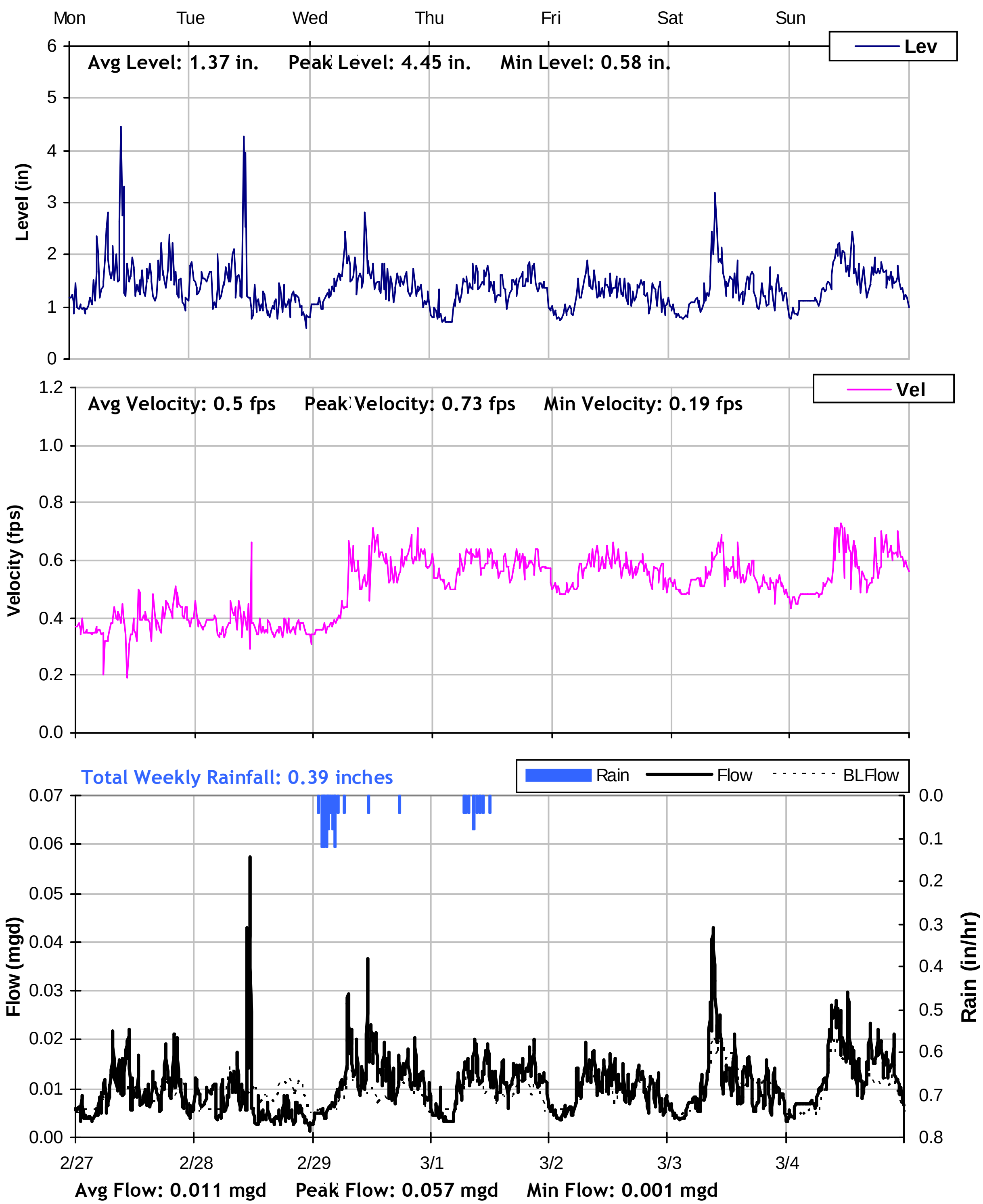
Peak Level: 6.92 *in*

d/D Ratio: 1.15

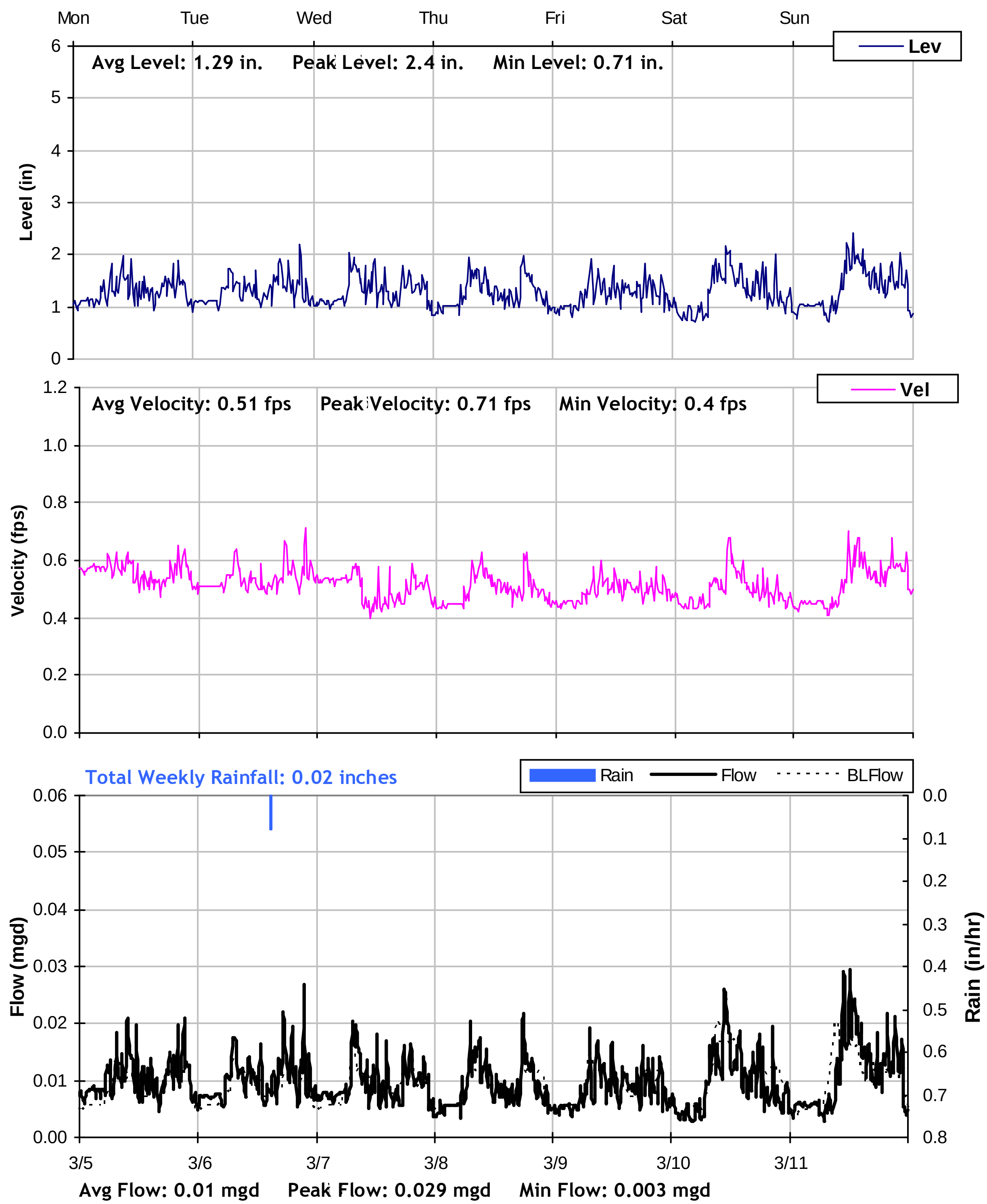
MH 368
Weekly Level, Velocity and Flow Hydrographs
2/20/2012 to 2/27/2012



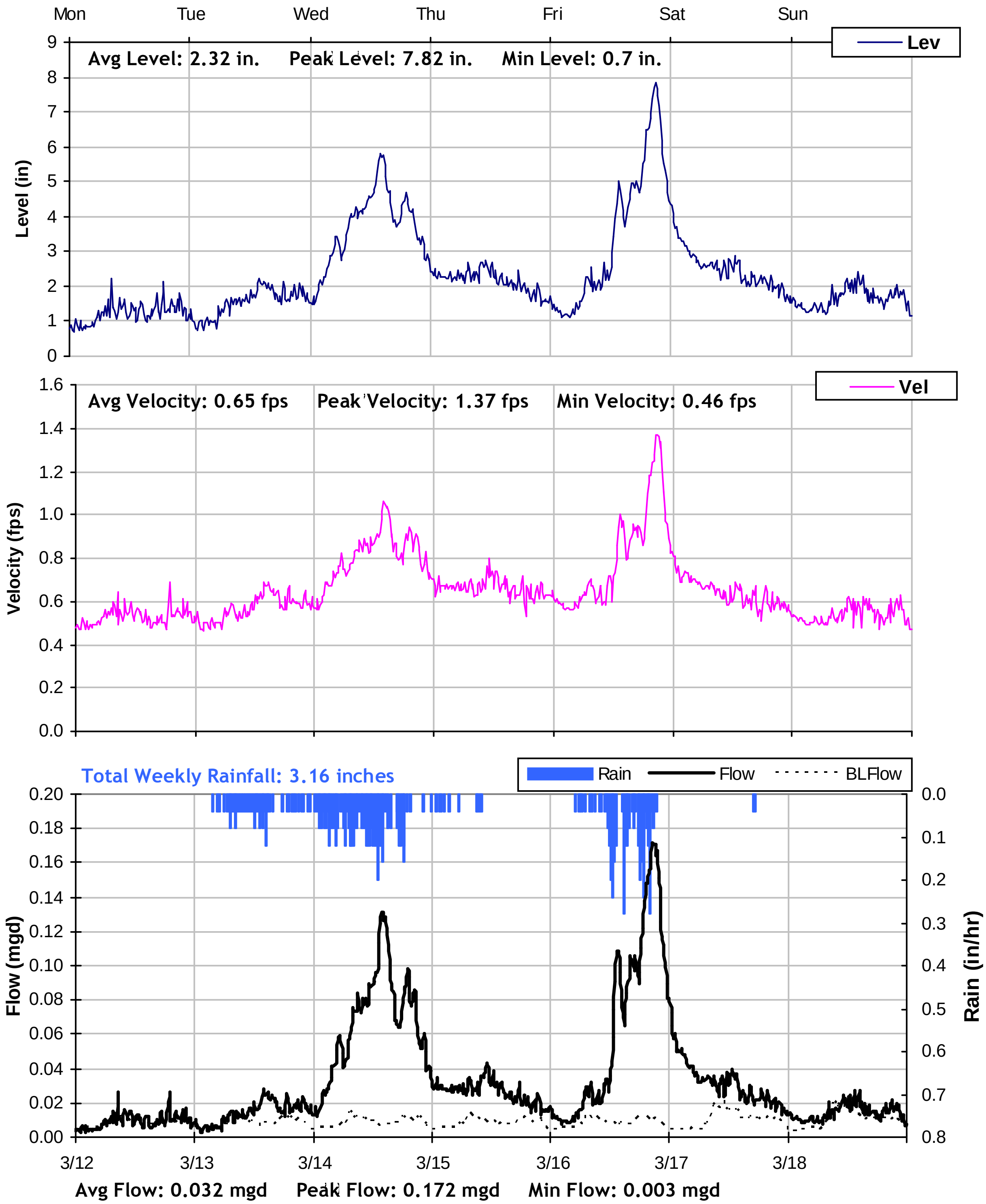
MH 368
Weekly Level, Velocity and Flow Hydrographs
2/27/2012 to 3/5/2012



MH 368
Weekly Level, Velocity and Flow Hydrographs
3/5/2012 to 3/12/2012



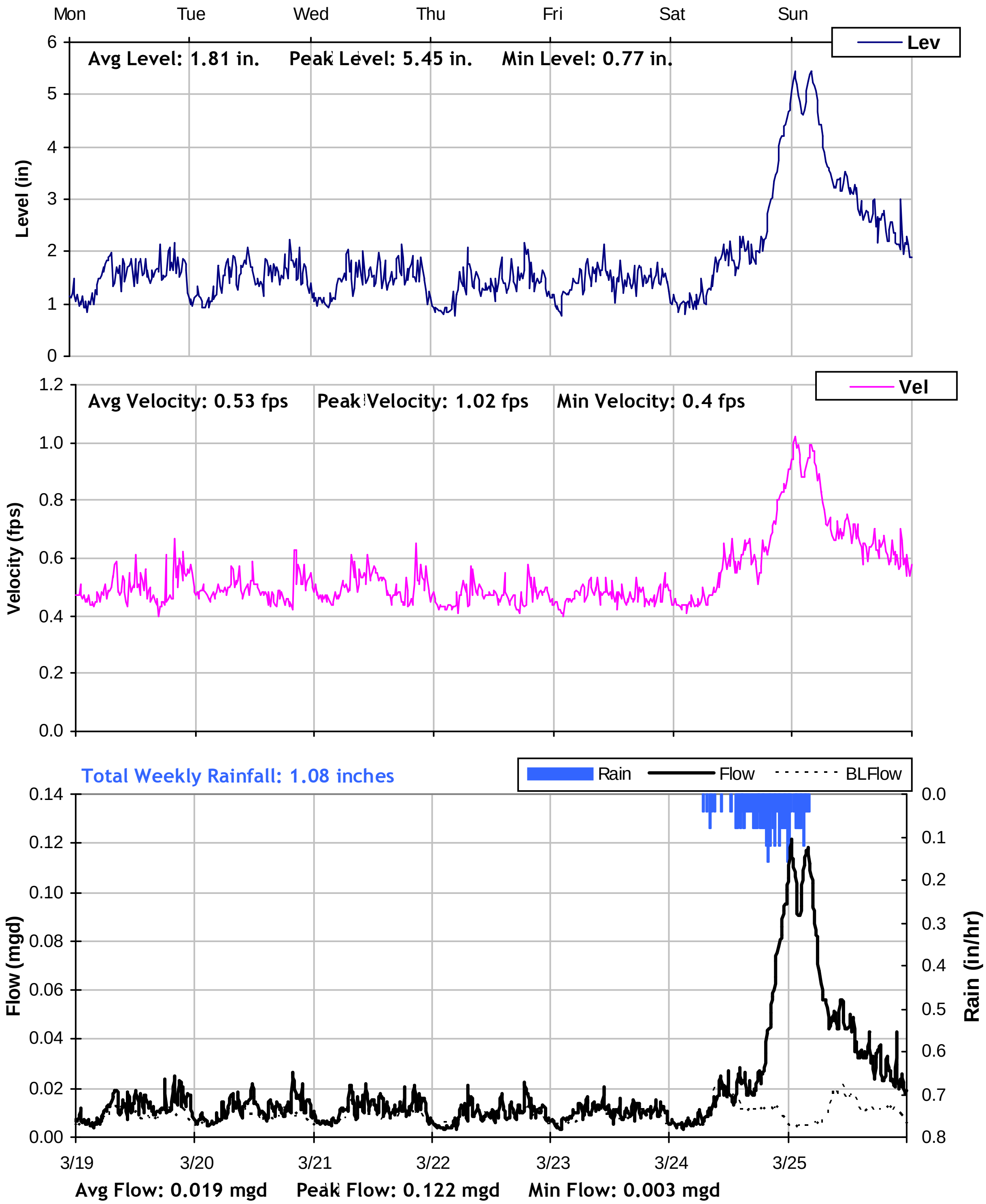
MH 368
Weekly Level, Velocity and Flow Hydrographs
3/12/2012 to 3/19/2012



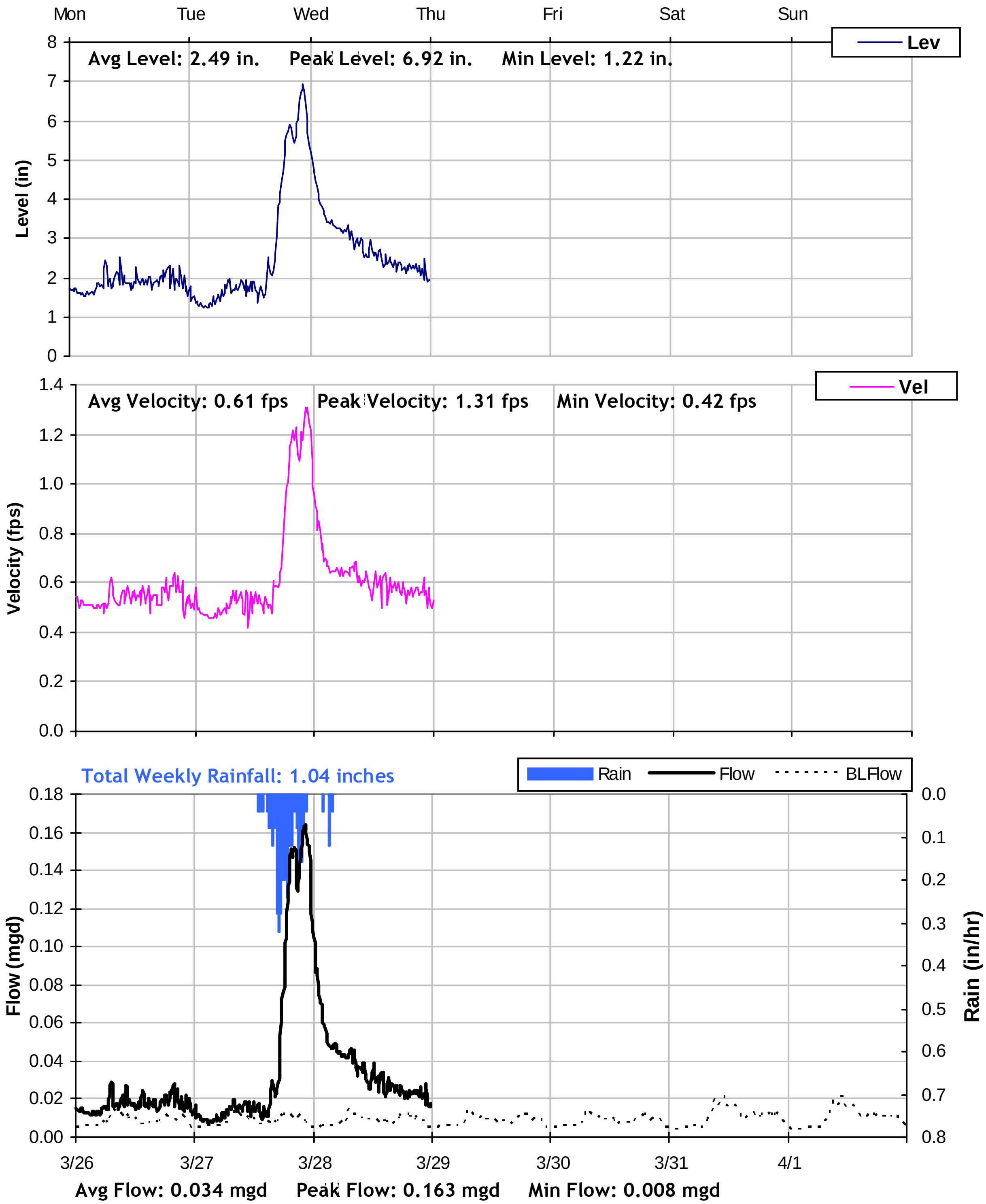
MH 368

Weekly Level, Velocity and Flow Hydrographs

3/19/2012 to 3/26/2012



MH 368
Weekly Level, Velocity and Flow Hydrographs
3/26/2012 to 4/2/2012



Rodeo Sanitary District

Master Plan Sanitary Sewer Flow Monitoring

Year 2011/2012

Monitoring Site: MH 408

Location: 4th Street between Sonoma Avenue and California Street

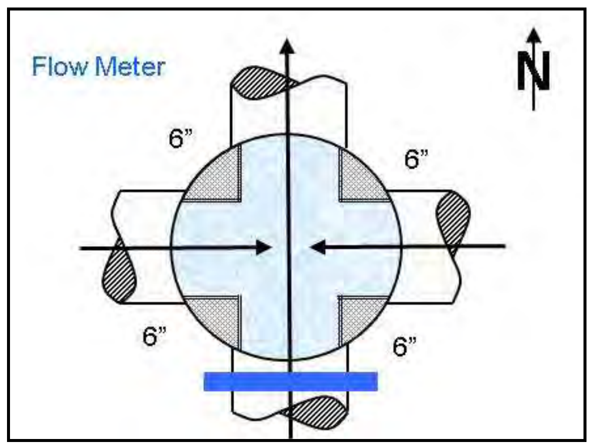
Data Summary Report

MH 408
Site Information Report

Location:	4th Street between Sonoma Avenue and California Street
Coordinates:	122.2601°W, 38.0340°N
Rim Elevation:	75 feet
Diameter:	6 inches
Baseline Flow:	0.016 mgd
Peak Measured Flow:	0.827 mgd

Satellite Map

Sanitary Map



Flow Sketch

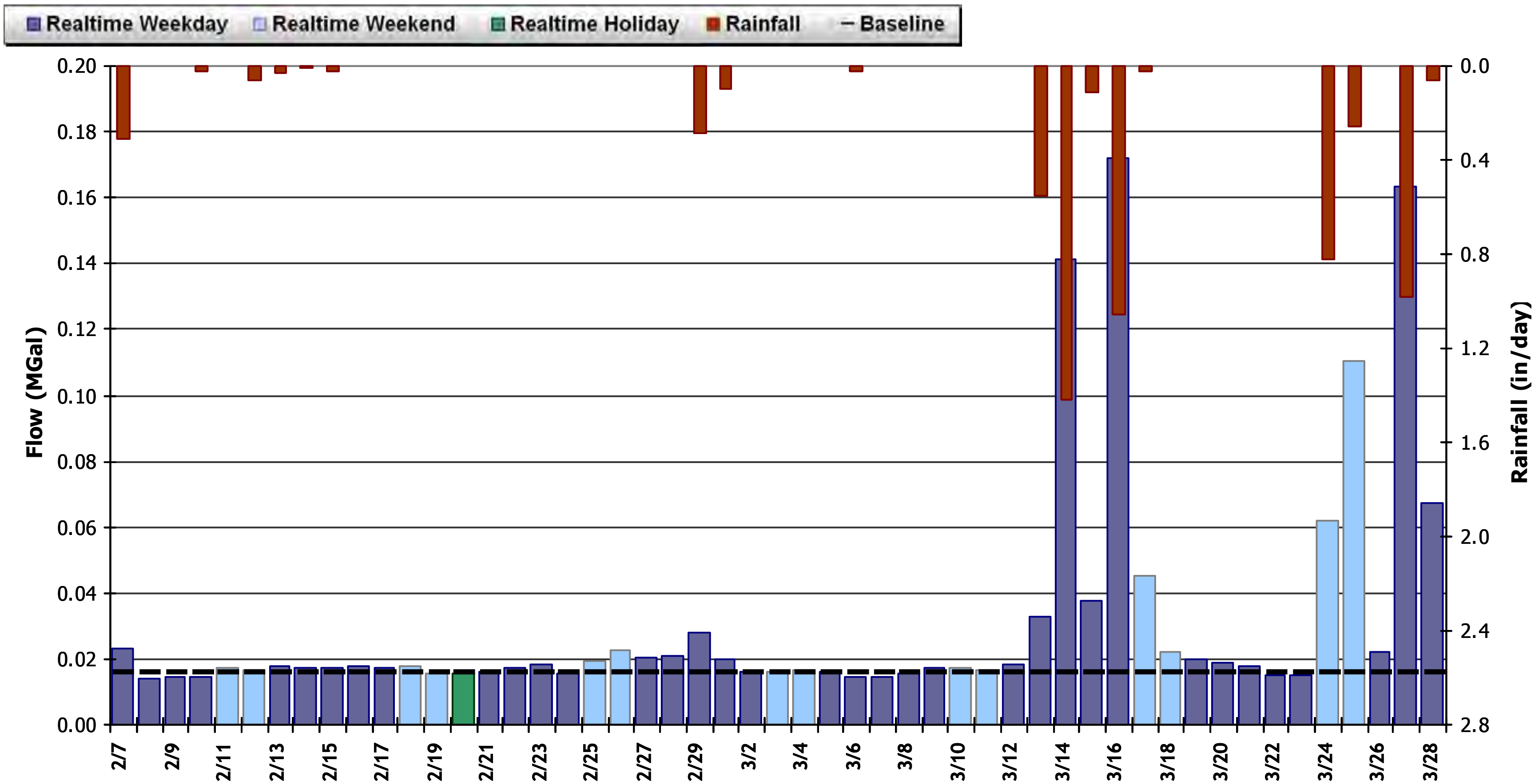
Street View Photo

Plan View Photo

MH 408
Period Flow Summary: Daily Flow Totals

Avg Daily Flow: 0.031 MGal   Peak Daily Flow: 0.172 MGal   Min Daily Flow: 0.014 MGal

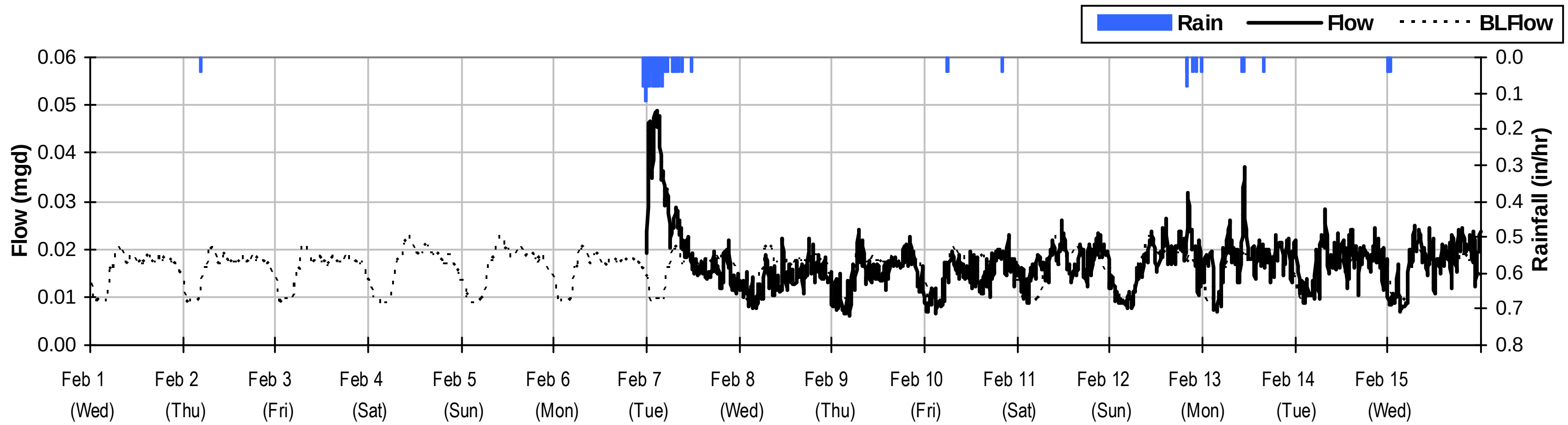
Total Period Rainfall: 6.24 inches

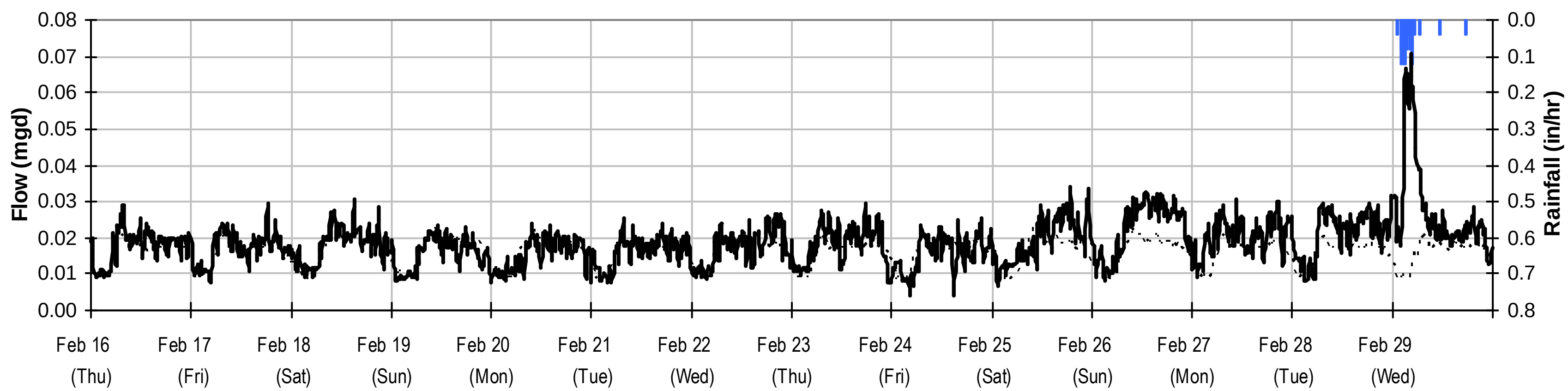


MH 408

Monthly Flow Summary: February, 2012

Total Monthly Rainfall: 0.85 inches   Avg Flow: 0.018 mgd   Peak Flow: 0.071 mgd   Min Flow: 0.004 mgd

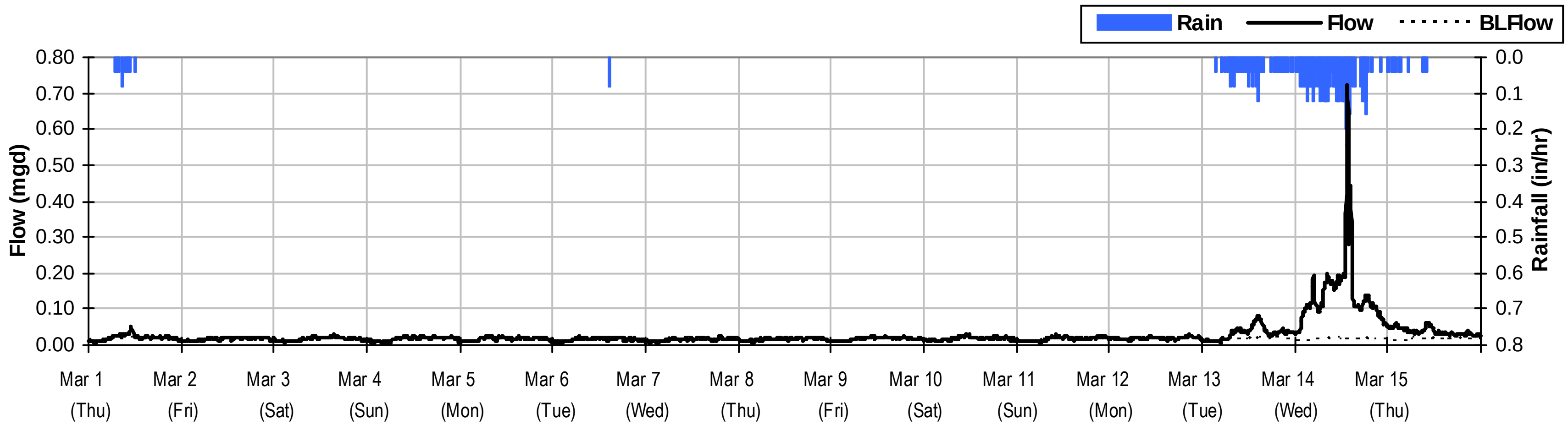


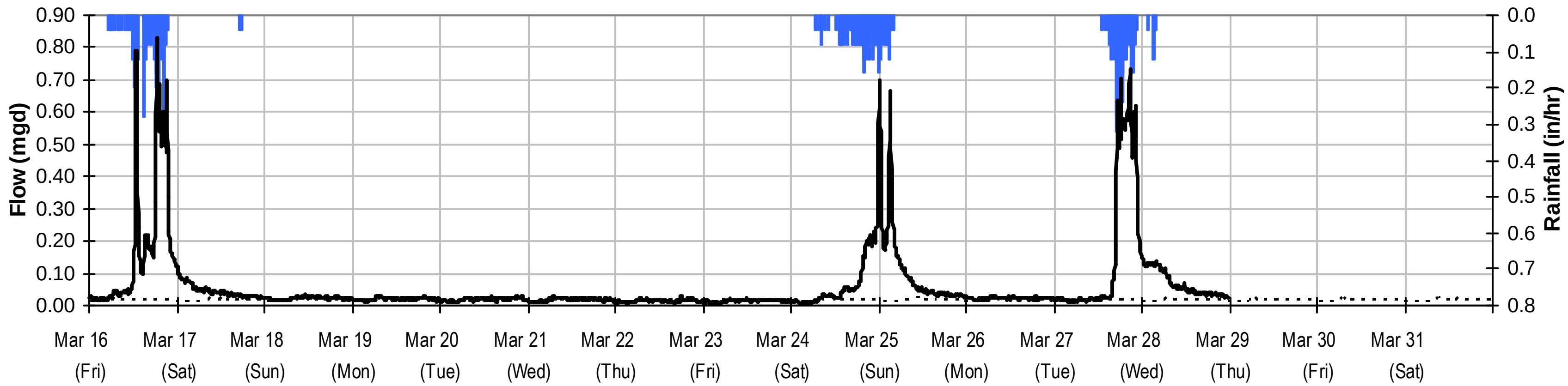


MH 408

Monthly Flow Summary: March, 2012

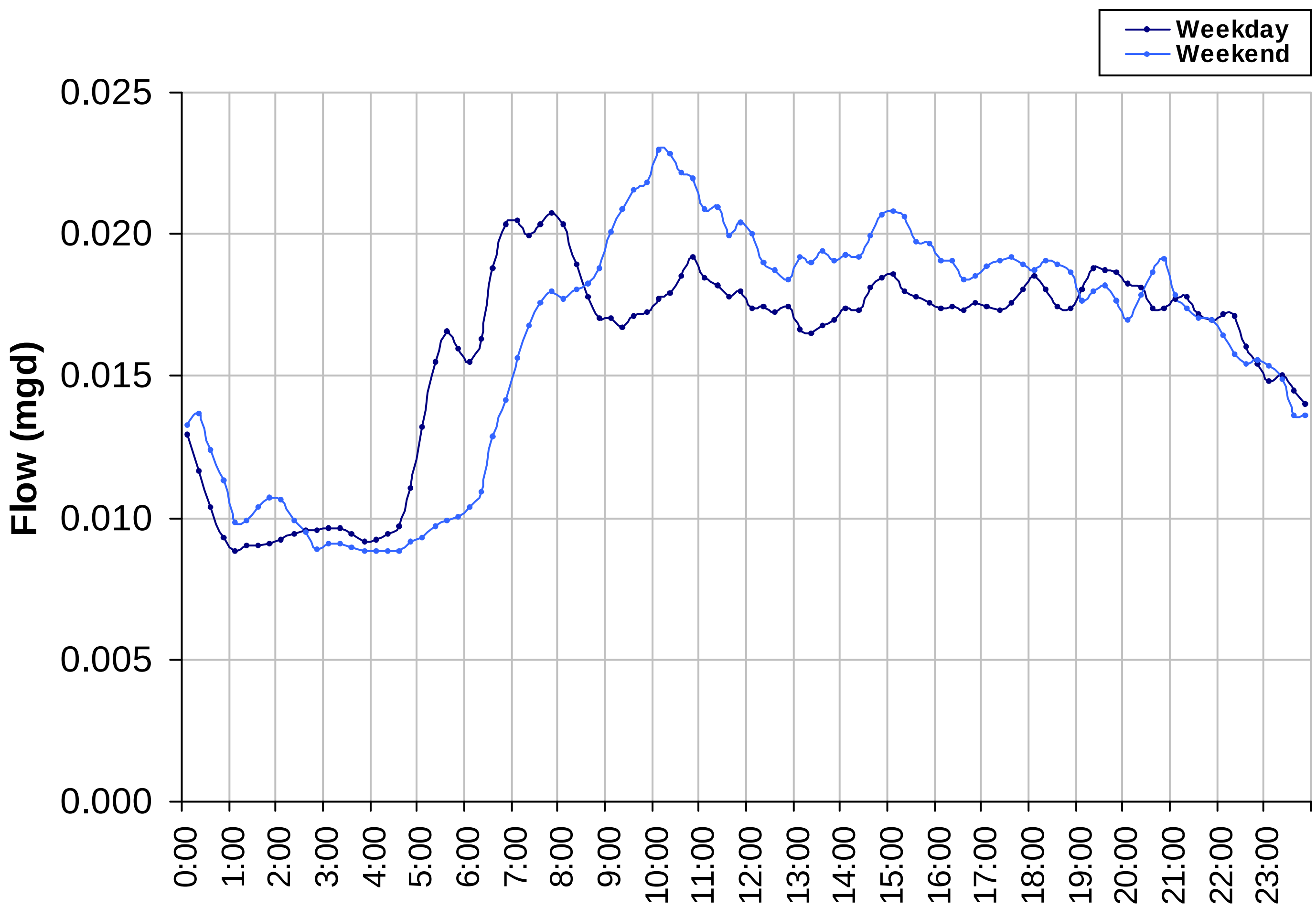
Total Monthly Rainfall: 5.4 inches   **Avg Flow: 0.042 mgd**   **Peak Flow: 0.827 mgd**   **Min Flow: 0.006 mgd**

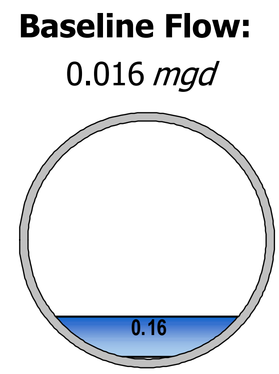




MH 408

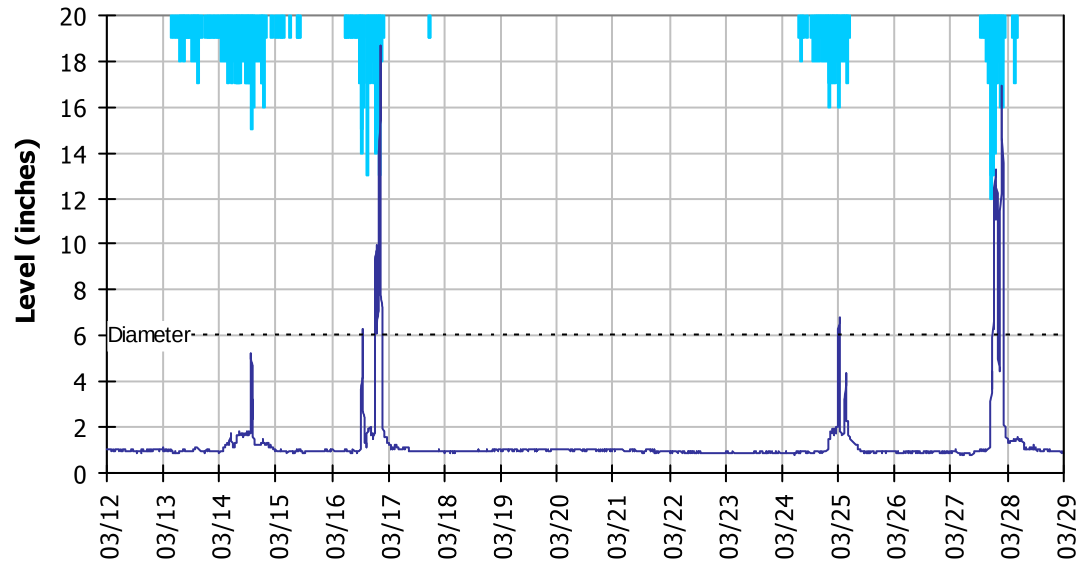
Baseline Flow Hydrographs

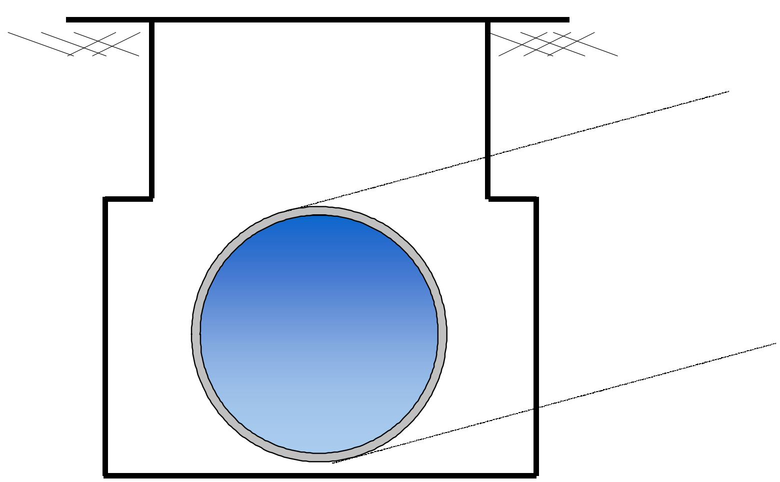




MH 408
Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Monitoring Period





Pipe Diameter: 6 *inches*

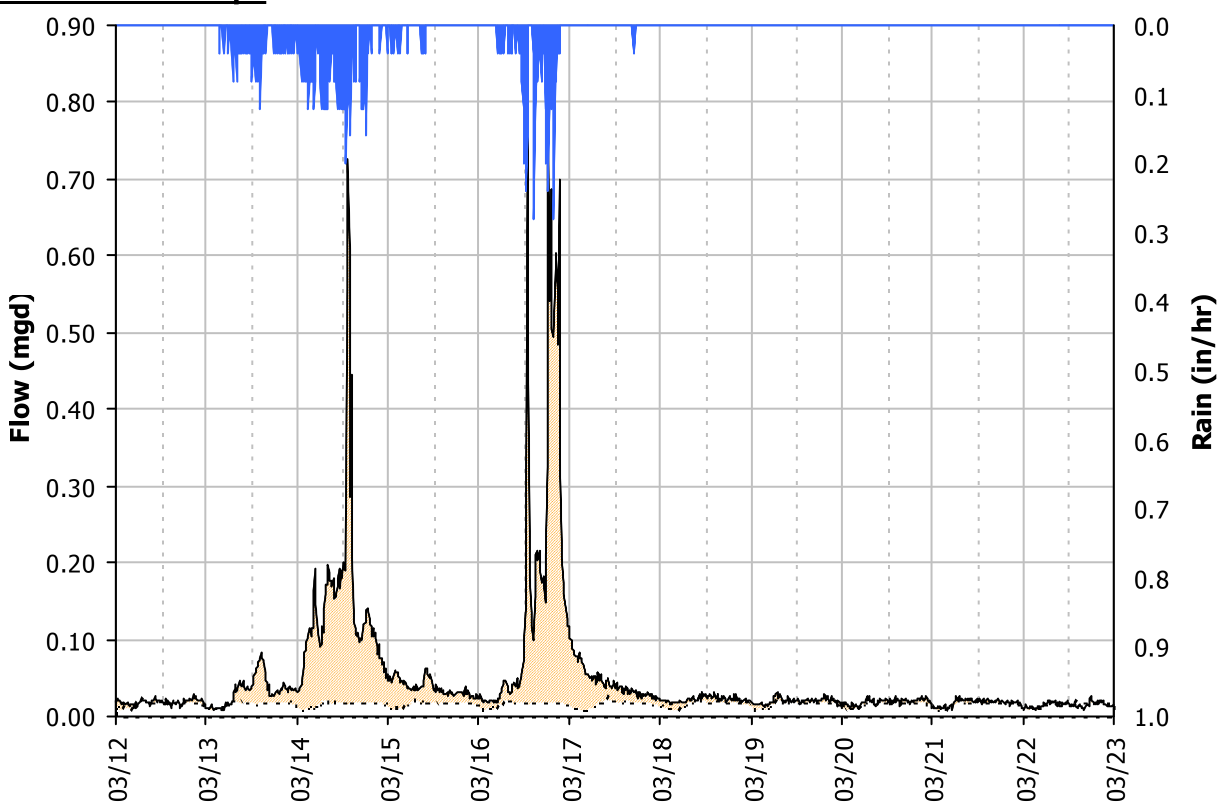
Peak Measured Level: 18.6 *inches*

Peak d/D Ratio: 3.09

Surcharged 12.6 inches over crown

MH 408
I/I Summary: Event 2

Event 2 Detail Graph



Storm Event I/I Analysis (Rain = 3.16 inches)

Inflow

Peak I/I Rate: 0.81 *mgd*

Pk I/I:ADWF: 50.58

Combined I/I

Total I/I: 366,000 *gallons*

Total I/I:ADWF: 7.24 *per in-rain*

RDI (infiltration)

Infiltration Rate: 0.000 *mgd*
(3/22/2012)

RDI (% of BL): 0%

Capacity

Peak Flow: 0.83 *mgd*

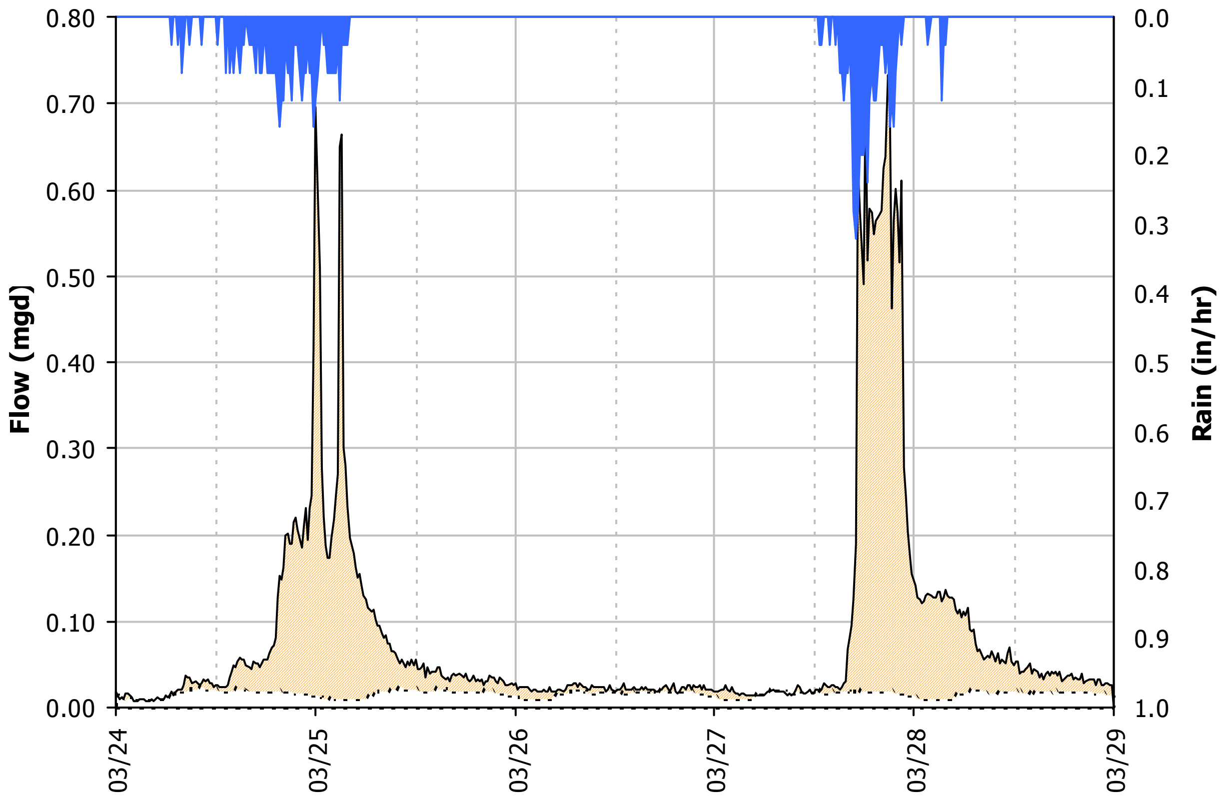
PF: 51.68

Peak Level: 18.56 *in*

d/D Ratio: 3.09

MH 408
I/I Summary: Event 3

Event 3 Detail Graph



Storm Event I/I Analysis (Rain = 2.12 inches)

Inflow

Peak I/I Rate: 0.71 *mgd*

Pk I/I:ADWF: 44.64

Combined I/I

Total I/I: 345,000 *gallons*

Total I/I:ADWF: 10.16 *per in-rain*

RDI (infiltration)

Infiltration Rate: 0.019 *mgd*
(3/28/2012 12:00:00 PM)

RDI (% of BL): 112%

Capacity

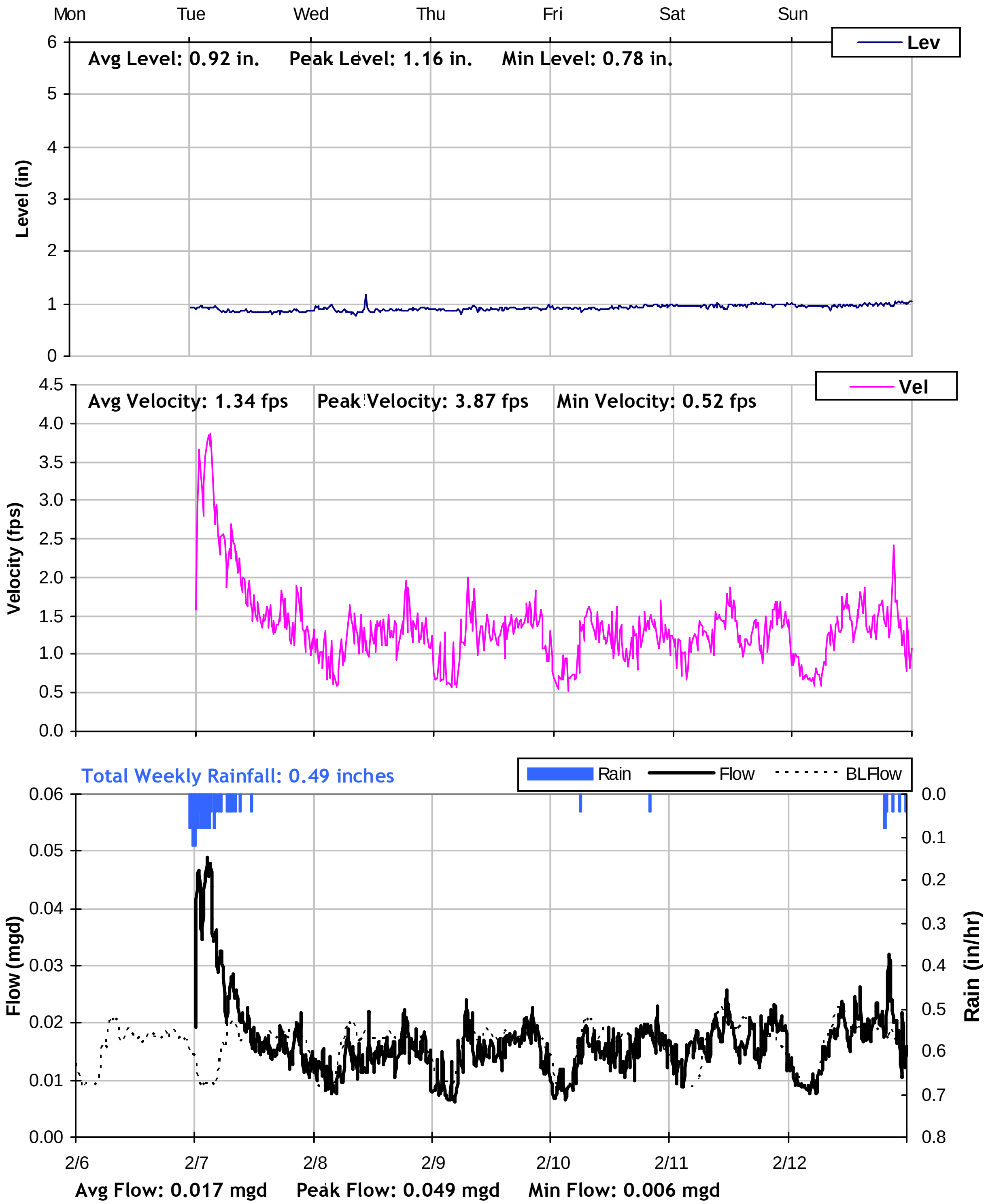
Peak Flow: 0.73 *mgd*

PF: 45.72

Peak Level: 16.94 *in*

d/D Ratio: 2.82

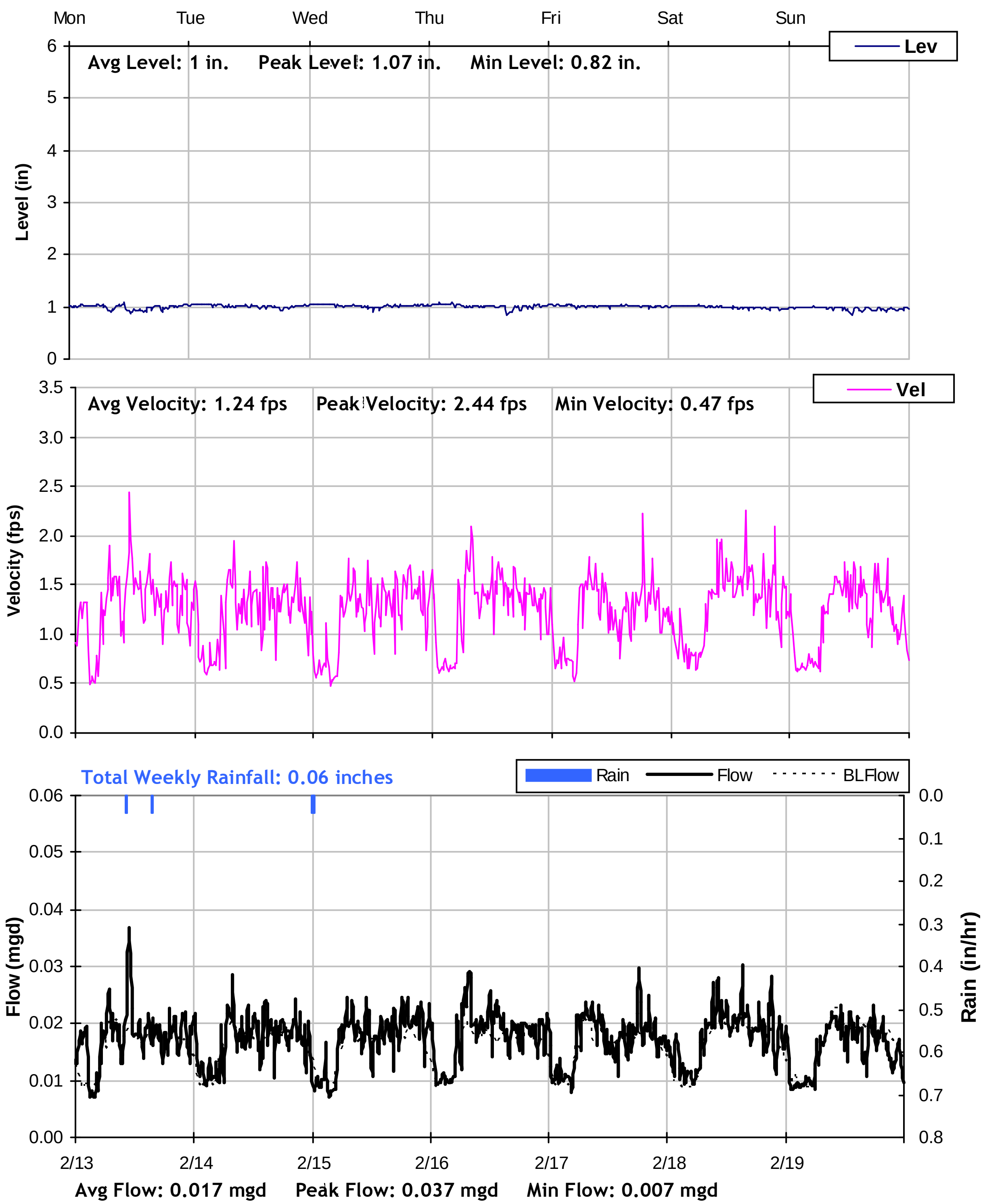
MH 408
Weekly Level, Velocity and Flow Hydrographs
2/6/2012 to 2/13/2012



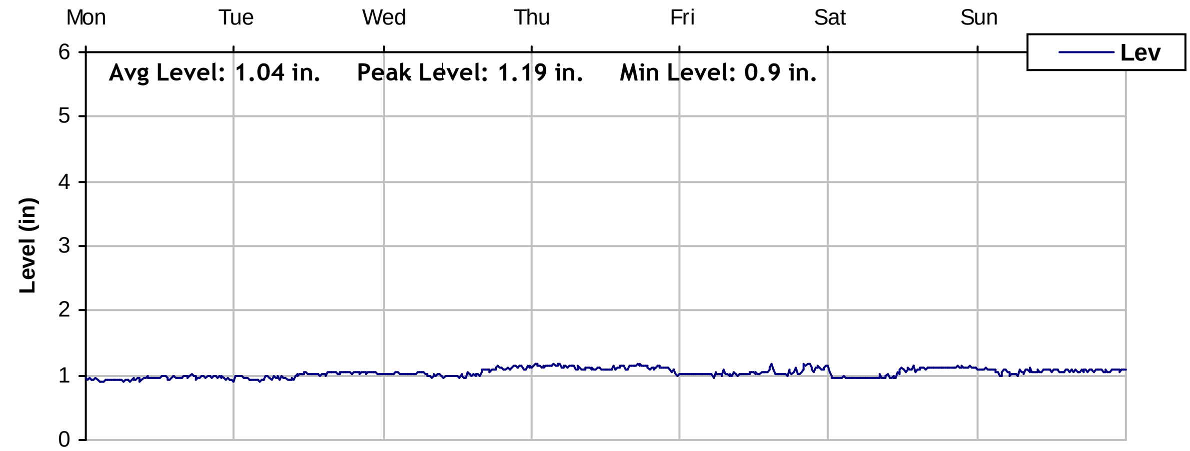
MH 408

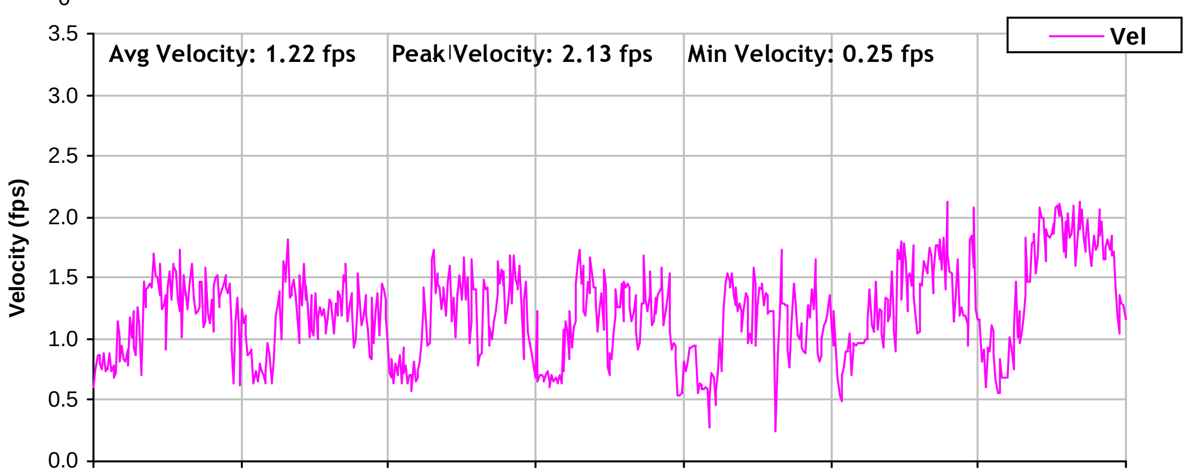
Weekly Level, Velocity and Flow Hydrographs

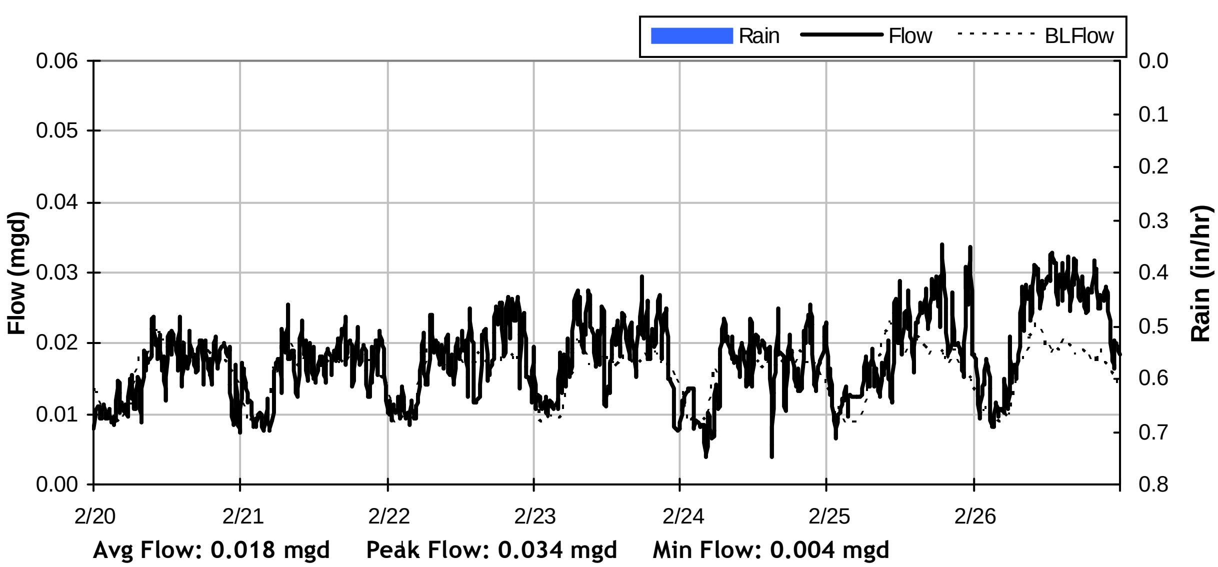
2/13/2012 to 2/20/2012



MH 408
Weekly Level, Velocity and Flow Hydrographs
2/20/2012 to 2/27/2012



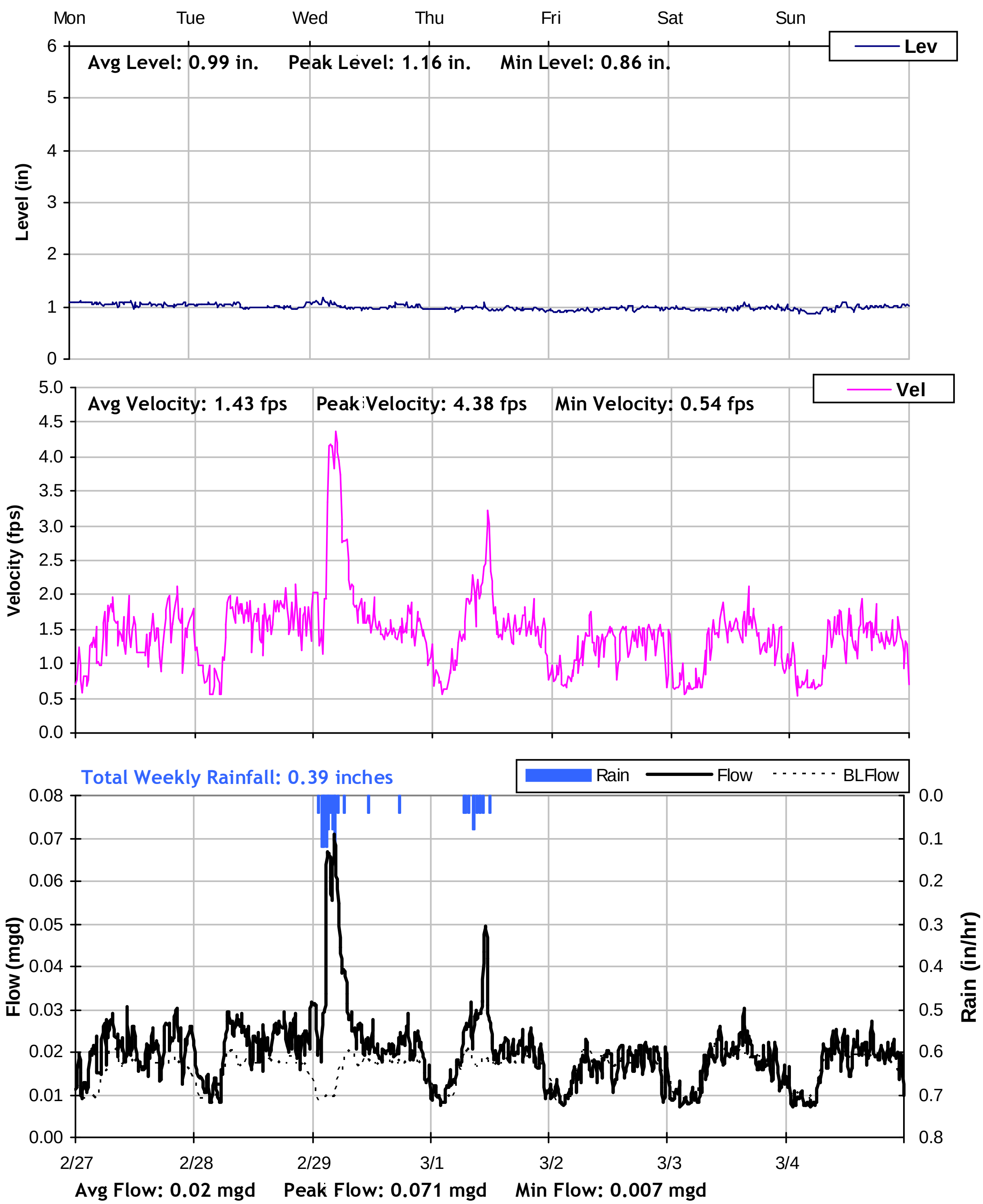




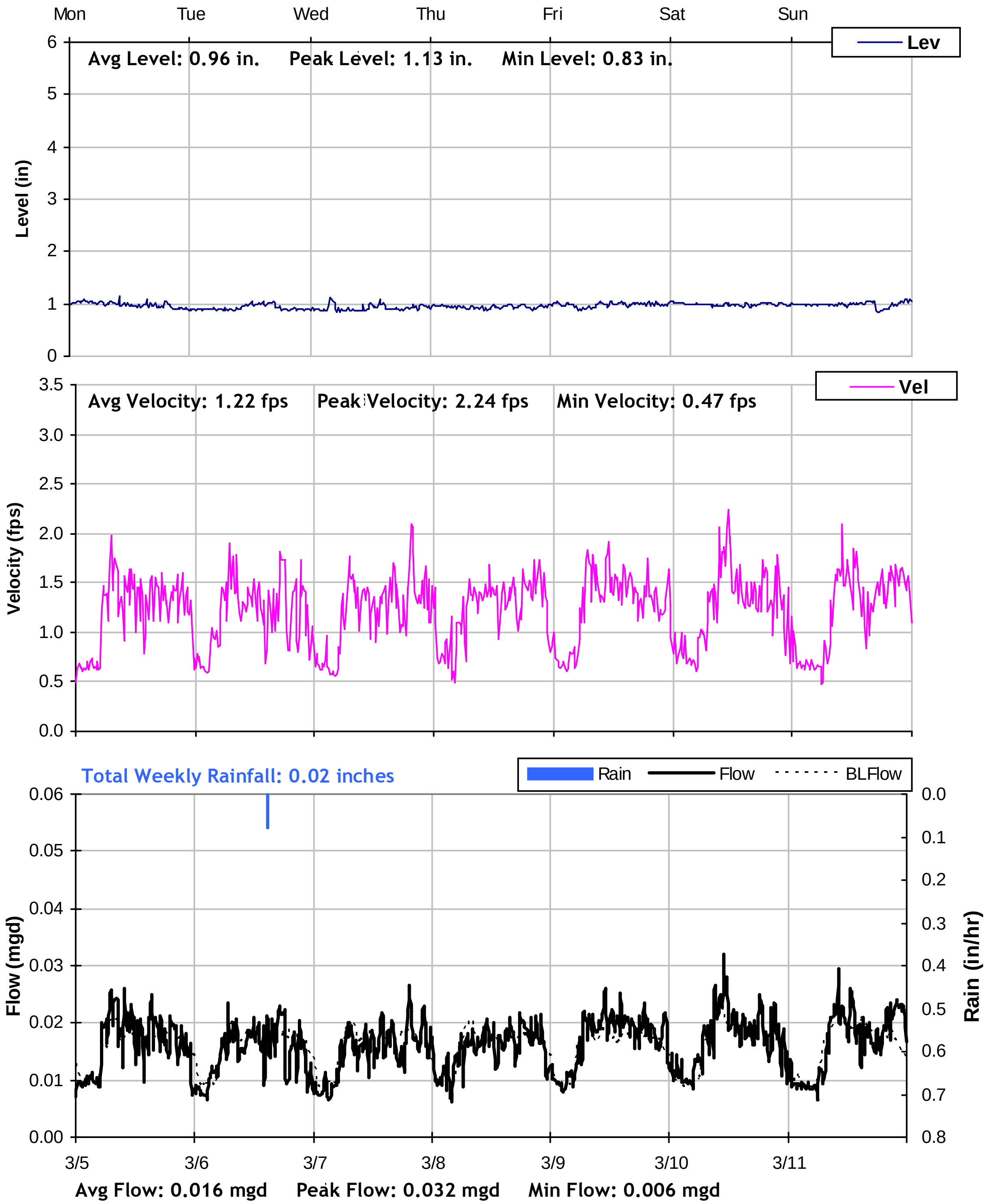
MH 408

Weekly Level, Velocity and Flow Hydrographs

2/27/2012 to 3/5/2012



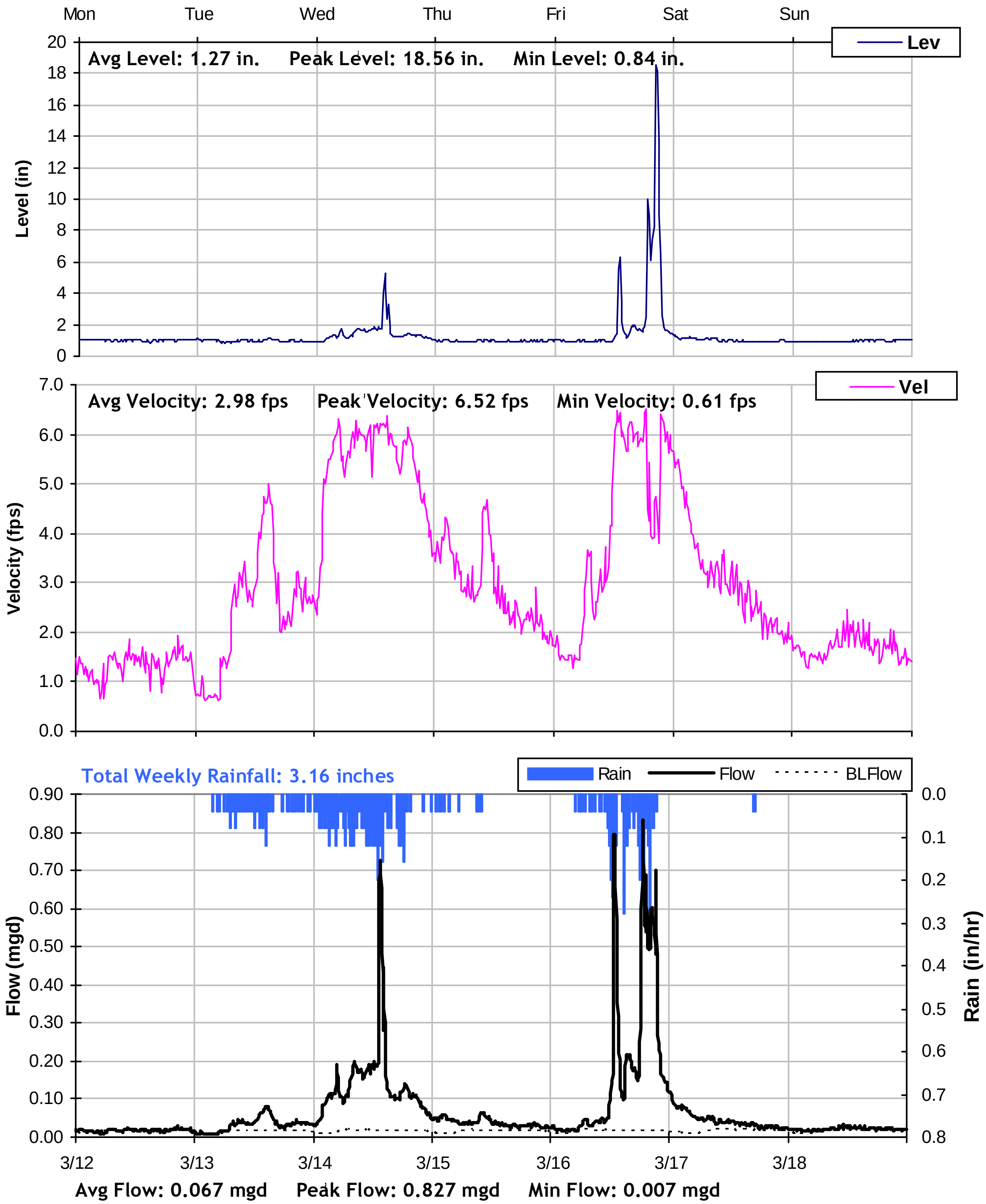
MH 408
Weekly Level, Velocity and Flow Hydrographs
3/5/2012 to 3/12/2012



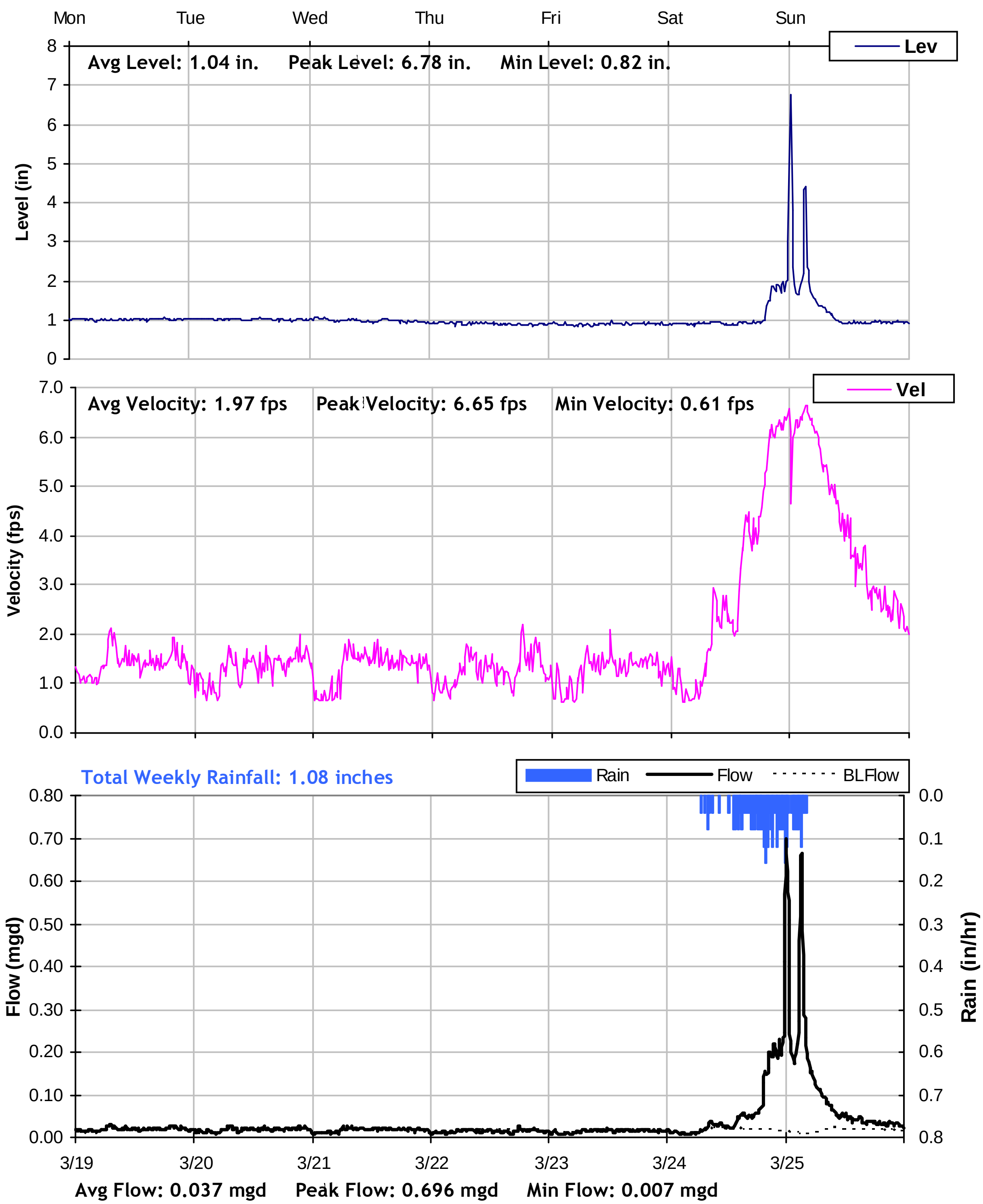
MH 408

Weekly Level, Velocity and Flow Hydrographs

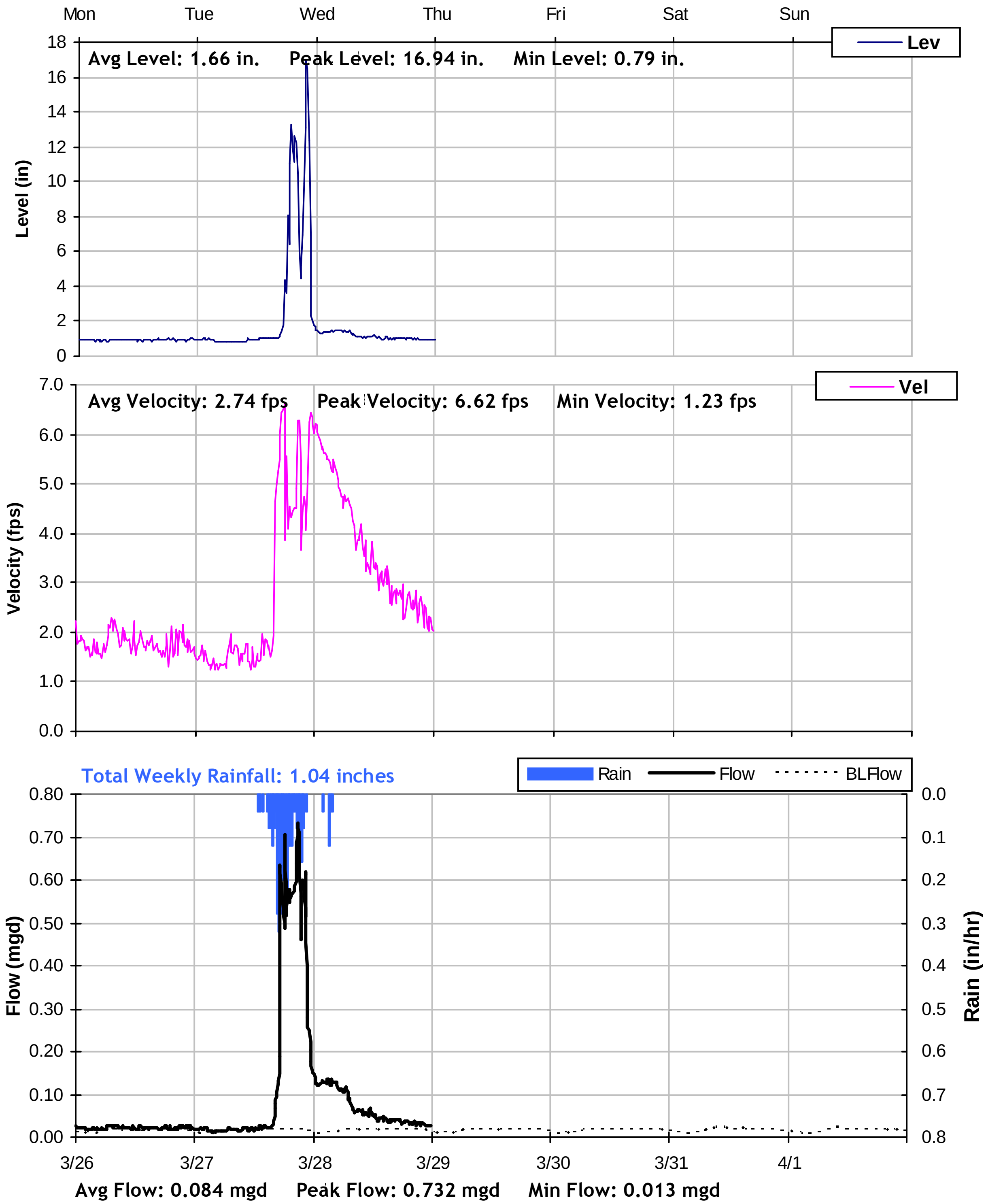
3/12/2012 to 3/19/2012



MH 408
Weekly Level, Velocity and Flow Hydrographs
3/19/2012 to 3/26/2012



MH 408
Weekly Level, Velocity and Flow Hydrographs
3/26/2012 to 4/2/2012



Rodeo Sanitary District

Master Plan Sanitary Sewer Flow Monitoring
Year 2011/2012

Monitoring Site: MH 406

Location: 505 Sonoma Avenue, northeast corner of property

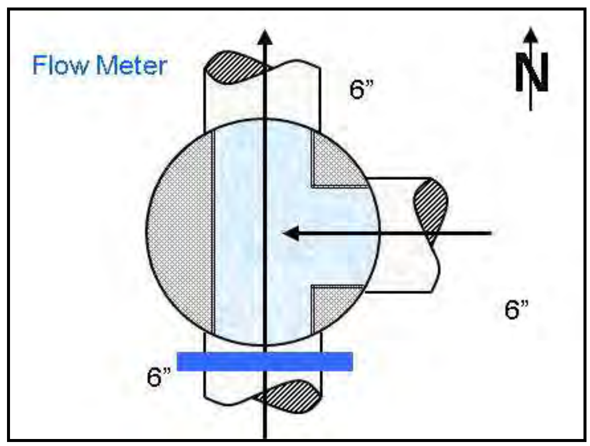
Data Summary Report

MH 406
Site Information Report

Location:	505 Sonoma Avenue, northeast corner of property
Coordinates:	122.2598° W, 38.0328° N
Rim Elevation:	103 feet
Diameter:	6 inches
Baseline Flow:	0.005 mgd
Peak Measured Flow:	0.434 mgd

Satellite Map

Sanitary Map



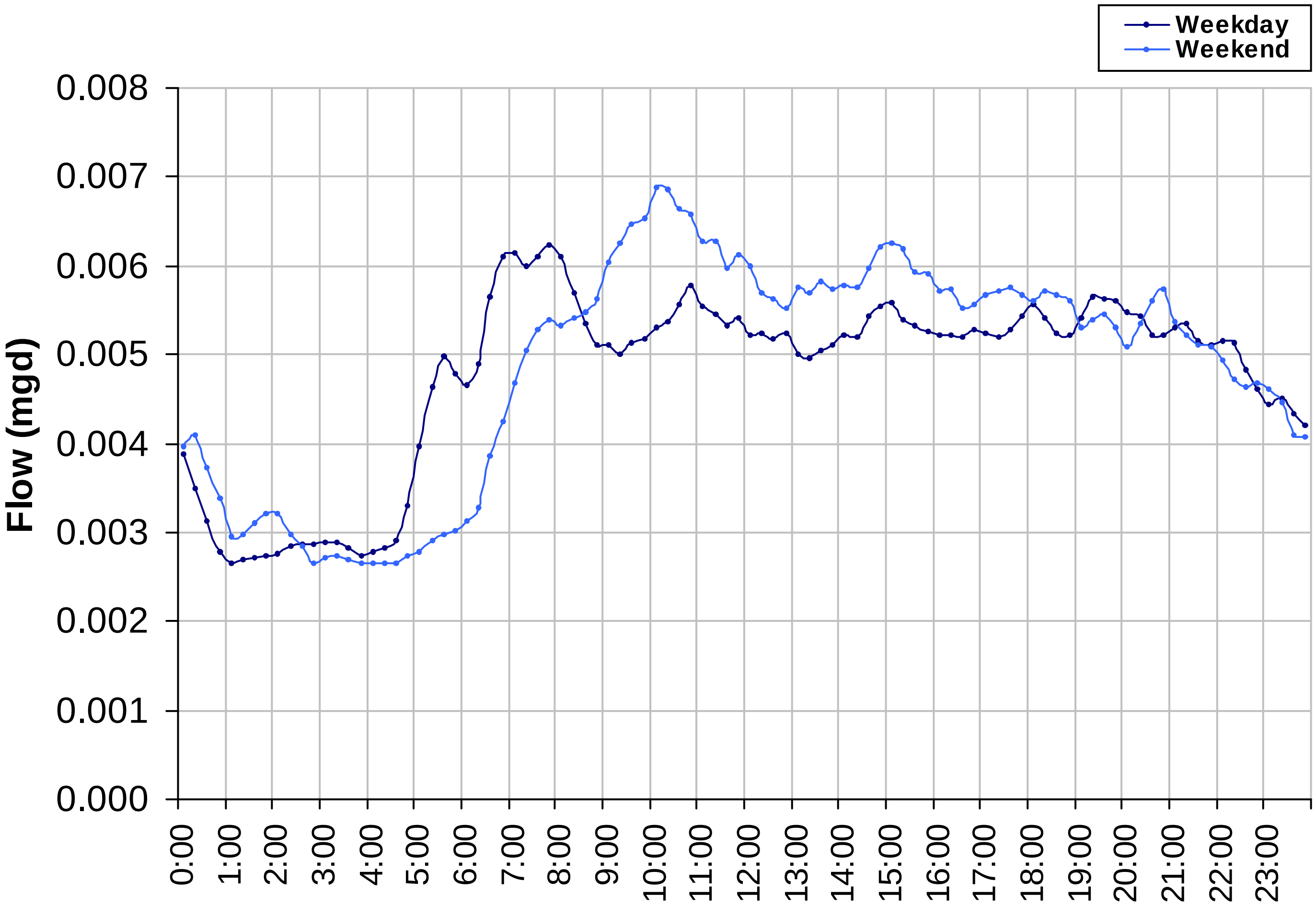
Flow Sketch

No Street View Photo

No Plan View Photo

MH 406

Baseline Flow Hydrographs

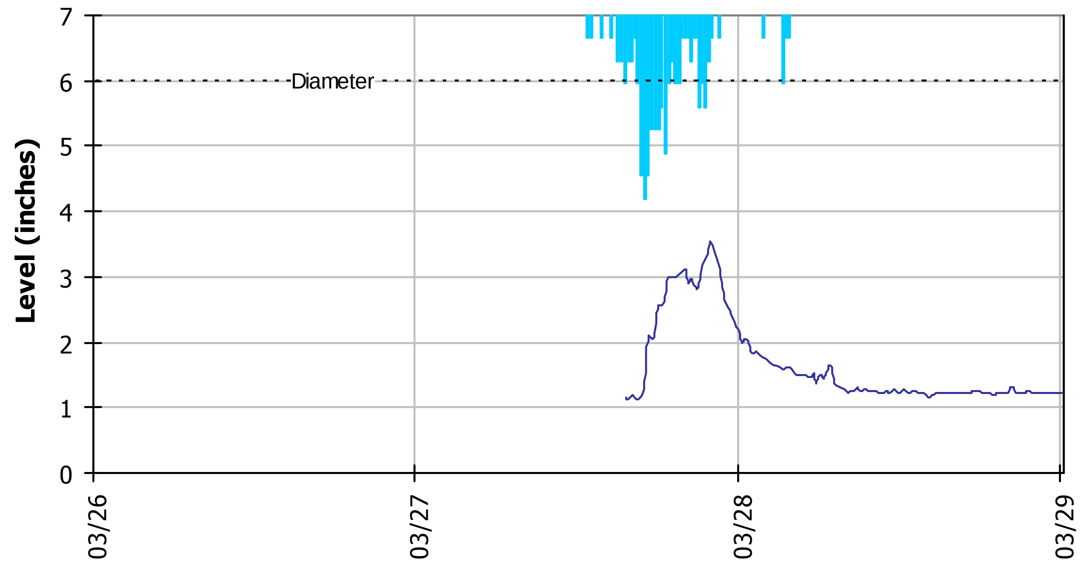


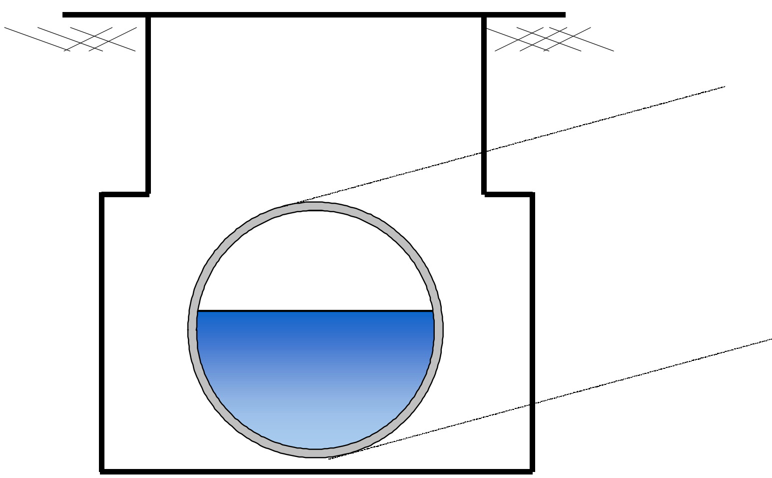
Baseline Flow:

0.005 *mgd*

MH 406
Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Monitoring Period





Pipe Diameter: 6 *inches*

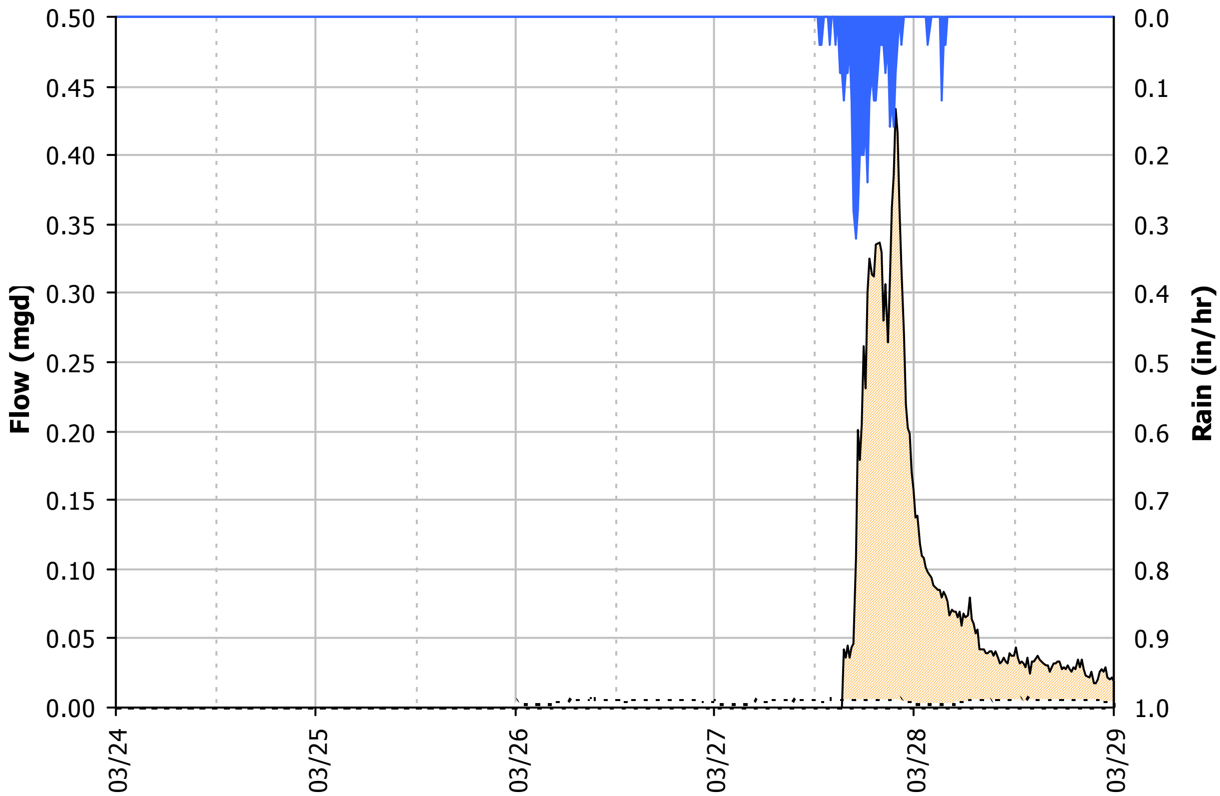
Peak Measured Level: 3.54 *inches*

Peak d/D Ratio: 0.59

MH 406

I/I Summary: Event 3

Event 3 Detail Graph



Storm Event I/I Analysis (Rain = 2.12 inches)

Inflow

Peak I/I Rate: 0.43 *mgd*

Pk I/I:ADWF: 89.23

Combined I/I

Total I/I: 128,000 *gallons*

Total I/I:ADWF: 12.56 *per in-rain*

RDI (infiltration)

Infiltration Rate: 0.024 *mgd*
(3/28/2012 12:00:00 PM)

RDI (% of BL): 461%

Capacity

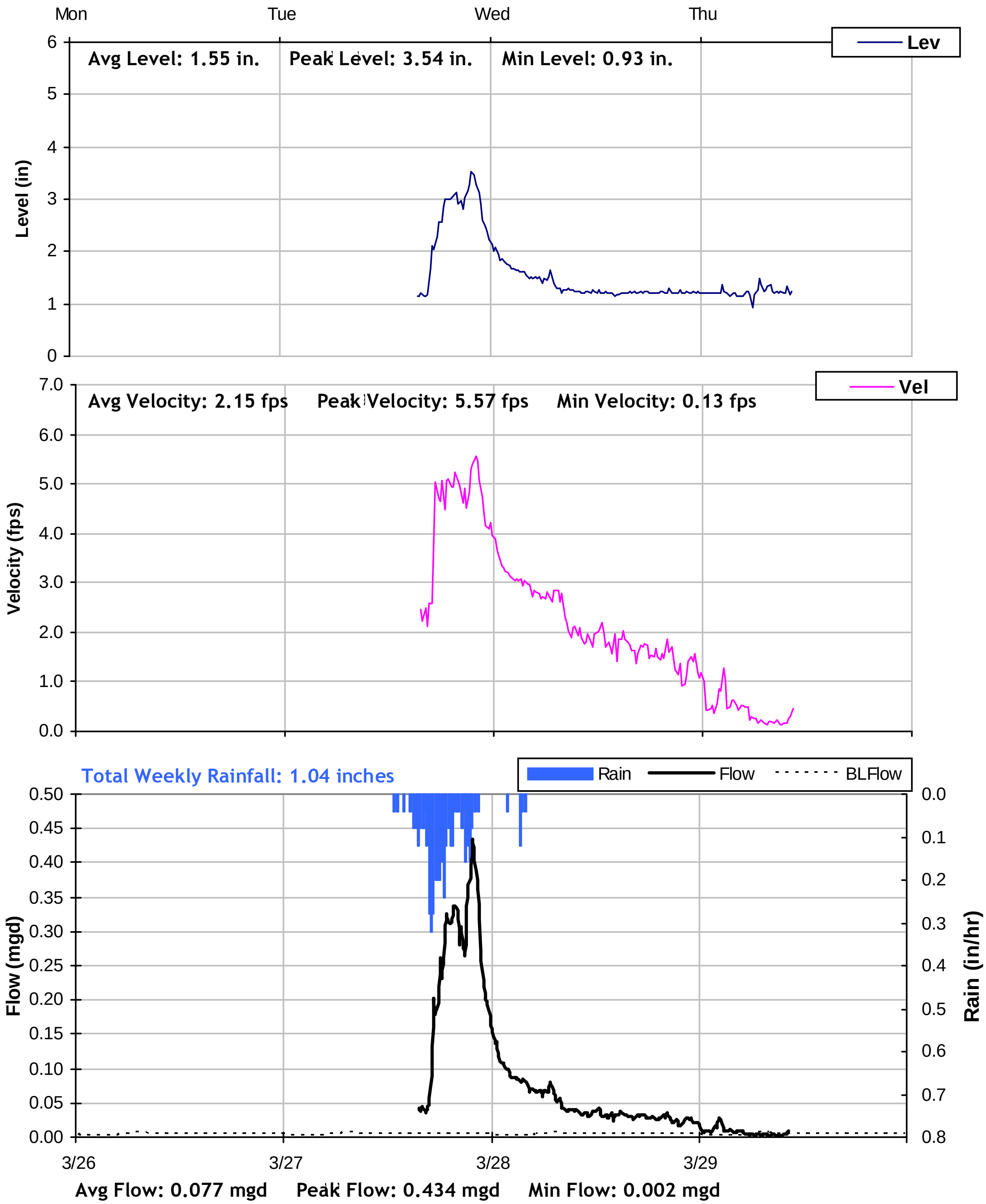
Peak Flow: 0.43 *mgd*

PF: 90.29

Peak Level: 3.54 *in*

d/D Ratio: 0.59

MH 406
Weekly Level, Velocity and Flow Hydrographs
3/26/2012 to 4/2/2012



APPENDIX B – PRELIMINARY FLOW METER RESULTS FOR HIGH I/I AREAS

RODEO SANITARY DISTRICT
PRELIMINARY FLOW METER RESULTS FOR HIGH I/I AREAS

DATE: June 6, 2012
TO: Steve Beall, District Manager, Rodeo Sanitary District
FROM: Dr. Jeff Lewandowski, P.E. C52503
SUBJECT: Preliminary I/I Results from Area Upstream of Sixth Street and Sonoma Avenue (Manhole 406)

Purpose

The purpose of this memo is to summarize flow results from the tracking of an inflow/infiltration (I/I) peak within one of the subbasins that discharges to Manhole 100. Manhole 100 has experienced overflows during peak wet weather conditions.

Project Approach

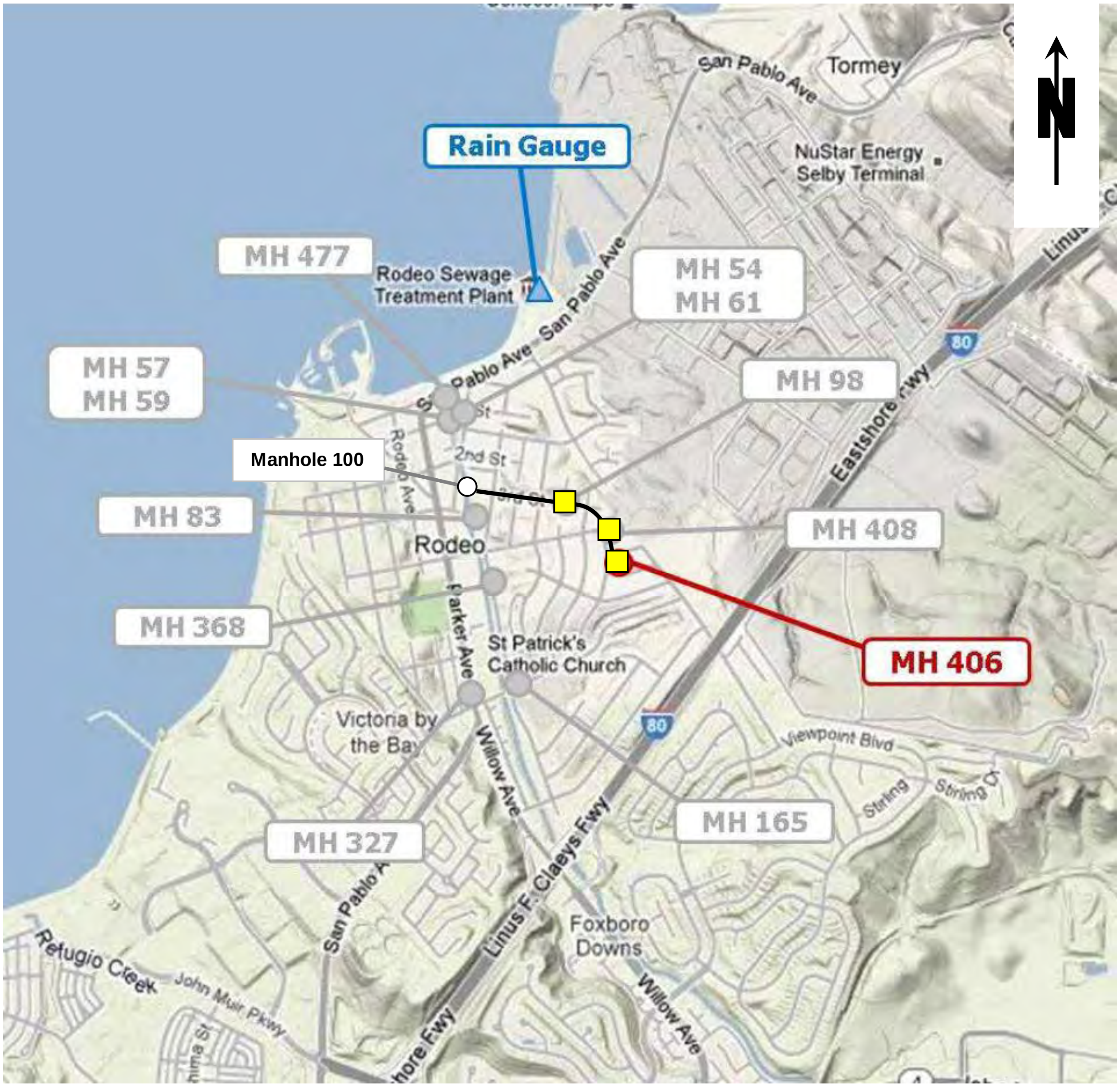
A manhole flow metering strategy for the 2011-2012 rainy season was developed based on model results and information obtained during previous storm and overflow events. Flow meters were installed at 12 locations different at various times during the period. The locations of the meters are shown on Figure 1. During the initial monitoring period, extremely high peak flows were recorded at Manhole 98 during the January 20-24, 2012 storm event. Peak flows of 0.35 mgd (estimated peak I/I rate of 0.33 mgd) occurred. The peaking factor for this event was 25. This was one of the highest peaks identified at the individual monitoring sites.

On February 7, 2012, an additional flow meter was installed at Manhole 408, upstream of Manhole 98 to attempt to track the peak flows to the upstream point of origin. Storm event peak flows at Manhole 408 were nearly identical to Manhole 98 for lower storm flows (less than 0.1 mgd) in February 2012. For higher storm flow events in March 2012, the upstream Manhole 408 flows had instantaneous peaks that were nearly double the downstream peaks at Manhole 98. This peak reduction may be a result of attenuation in the intermediate sewers between the manholes due to surcharging. Surcharging is observed in Manhole 408 at peak flow events. Peak flows during the March events were 0.7 to 0.8 mgd at Manhole 408 and 0.25 to 0.38 mgd at downstream Manhole 98. The flow peaking factor was 46 at Manhole 408.

On March 27, 2012, an additional flow meter was installed at Manhole 406, upstream of Manhole 408 to further track peak flows to the upstream origin. A storm event peak of about 0.45 mgd occurred that day at Manhole 406. Corresponding peak flows of 0.73 mgd and 0.38 mgd occurred at Manholes 408 and 98, respectively. The flow peaking factor was 91 at Manhole 406.

Summary of Results

The results from the V&A flow metering study are listed on Figure 1. A significant source of I/I during peak wet weather events was tracked upstream from Manhole 98. The subbasin upstream of Manhole 408 appears to be the origin of peak wet weather flows measured at Manhole 98. The subbasin upstream of Manhole 406 appears to be the origin of nearly 60 percent of the flow measured



RESULTS FROM MARCH 27, 2012 STORM EVENT

Manhole Number	Diameter	Peak Depth	Baseline Flow	Peak Flow	Peaking Factor
98	6 inch	5.15 inch	0.015 mgd	0.38 mgd	25
408	6 inch	18.6 inch	0.016 mgd	0.73 mgd	46
406	6 inch	3.54 inch	0.005 mgd	0.43 mgd	91

Base figure and results from V&A Flow Monitoring Report (2012)

ADVANCED HYDRO ENGINEERING

Rodeo Sanitary District	Figure
Flow Meter Locations	1

at Manhole 408. Some attenuation is likely occurring within the sewers due to routing and surcharge, which would reduce and broaden the peak measured at the downstream Manhole 98. Peaking factors during rainfall are very large in these sewers, ranging from 25 for Manhole 98 to a maximum of 91 at the upstream Manhole 406. Selected portions of the V&A flow meter reports for these three locations are included in the appendix.

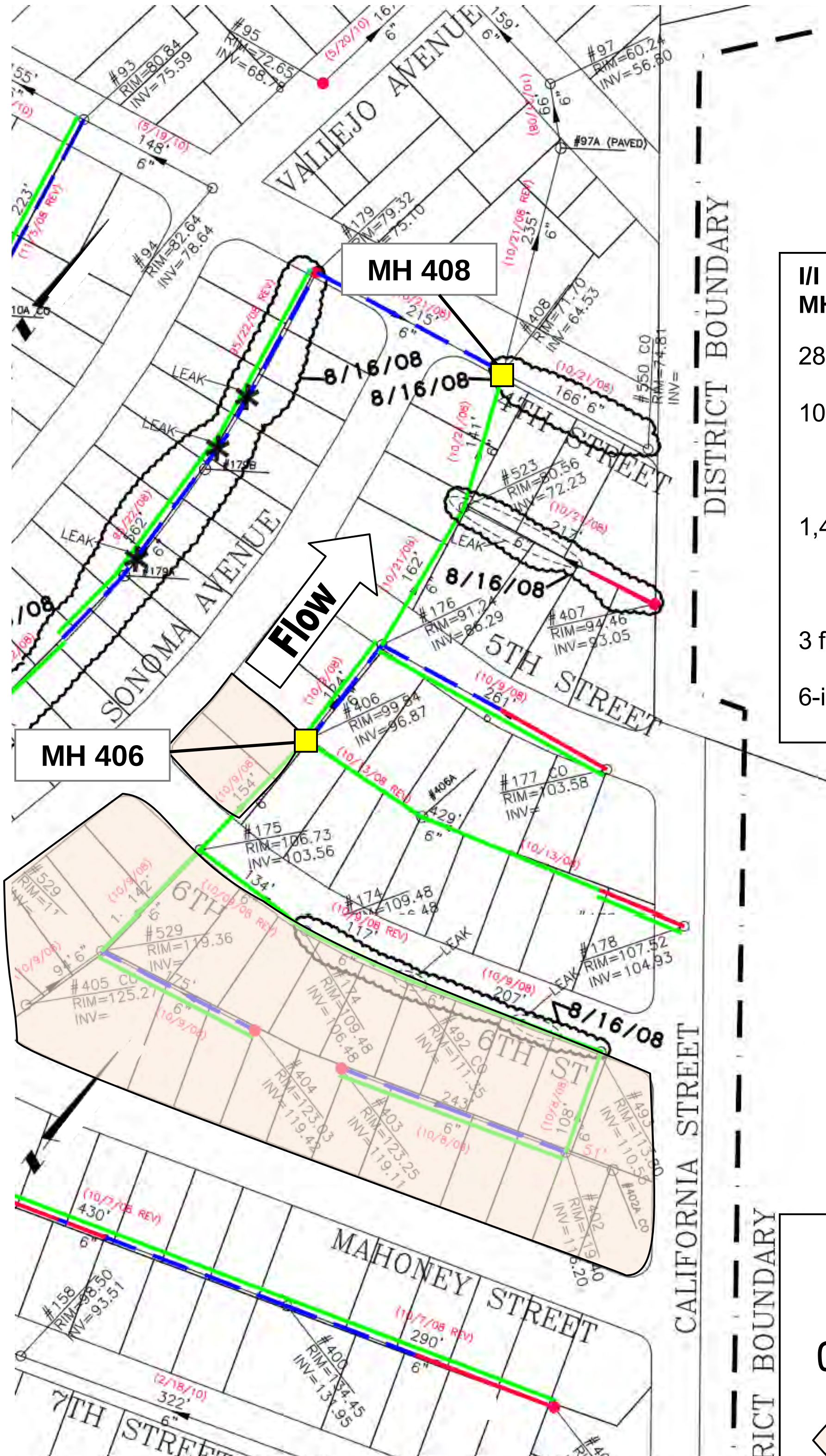
There is some anomalous baseline flow data associated with the three flow metering sites. The baseline flow is an average flow that should increase with downstream distance due to reduction in sewer service area. Instead, the baseline flow decreases slightly from Manhole 408 to the downstream Manhole 98.

The collection system in the location upstream of Manhole 408 is shown on Figure 2. The 28 homes/lot presumed to discharge to the sewer upstream of Manhole 406 are highlighted. There is approximately 1,425 feet of 6-inch diameter sewer in this area, with 500 feet within the street and 925 feet within easements. Most of the sewers have had video inspection completed. The exceptions are two short stubs connected to cleanouts in the rear side of lots. A few sewers have undergone smoke testing, and some leaks have been identified.

As requested by the District, the model calibration will incorporate these peak flow events at Manhole 408 and 406. As discussed, the peak storm condition I/I rates will be distributed to the 10 structures in the Manhole 406 subbasin. A similar process will be performed for peak flows associated with Manhole 408. The current model will use the peaking factors from these storms with the higher intensity design rainfall events, further increasing flows for design conditions. It is anticipated that these large storm flows will require large diameter trunk improvements downstream due to the extreme amount of storm water conveyed during wet weather events.

The District should consider options and costs to reduce the I/I within these basins for comparison with costs for increased size of the trunk sewer, pump station and treatment plant. Some of these options could be further smoke testing and video inspections to confirm or identify sources of I/I. These could include field investigations for surface drainage or roof leader connections to the sanitary system.

A capital project for complete replacement of a small section of the collection system, such as the Manhole 406 subbasin, could also be performed. This could include replacement of all sewers and laterals to the building. After the replacement is completed, flow monitoring would again be performed to determine effectiveness. The peak wet weather flows from the 2011 -2012 study could be compared with the new peak wet weather flows after replacement to determine the effectiveness of the system replacement. This pilot study could be used for development of potential flow reduction factors for the further update of the wastewater system master plan in the future. Design of the capital project should be started immediately, to allow for construction to be completed before the 2012-2013 wet weather season.



I/I Study Area Upstream of MH 406 Characteristics

28 homes/lots

10 sewer structures
- 7 manholes
- 3 cleanouts

1,425 feet Sewer Length
- 500 ft street
- 925 ft easement

3 feet depth to sewer invert

6-inch diameter sewers

Legend

- Flow meter location
- Smoke Testing Area and Date
- Lots upstream of MH 406 meter

ADVANCED HYDRO ENGINEERING

Rodeo Sanitary District

Collection System Map

Figure 2

APPENDIX

Rodeo Sanitary District

Master Plan Sanitary Sewer Flow Monitoring
Year 2011/2012

Monitoring Site: MH 98

Location: 3rd Street at intersection of Suisun Avenue

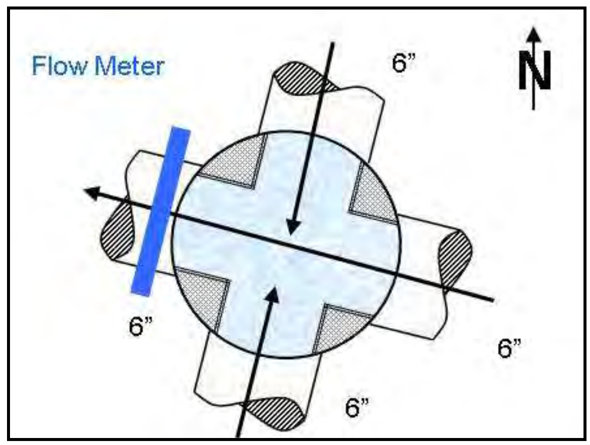
Data Summary Report

MH 98
Site Information Report

Location:	3rd Street at intersection of Suisun Avenue
Coordinates:	122.2621°W, 38.0348°N
Rim Elevation:	38 feet
Diameter:	6 inches
Baseline Flow:	0.015 mgd
Peak Measured Flow:	0.377 mgd

Satellite Map

Sanitary Map



Flow Sketch

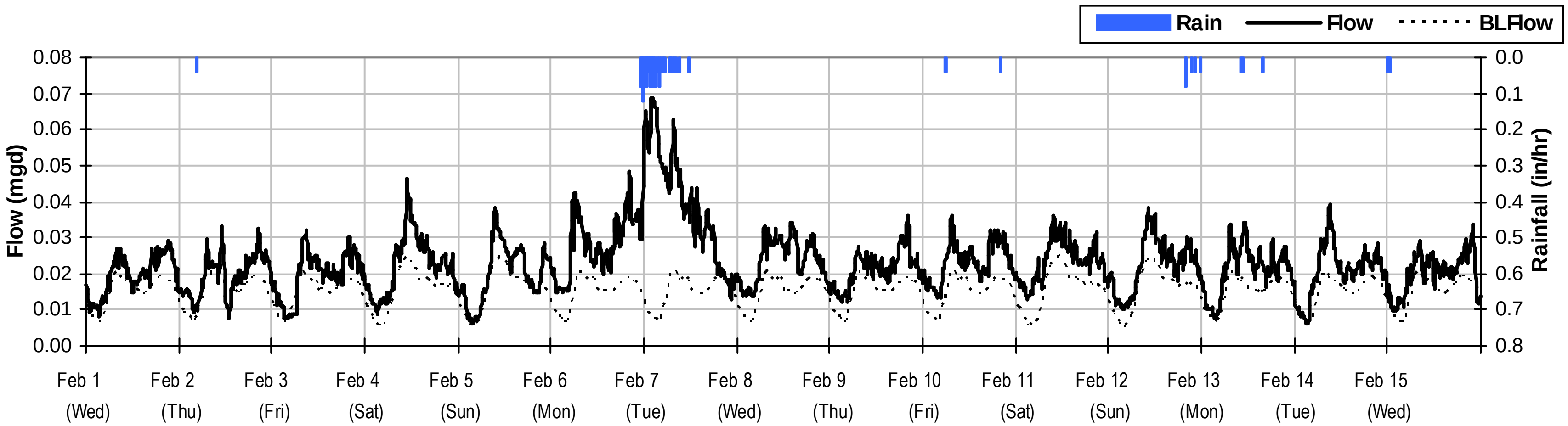

Street View Photo

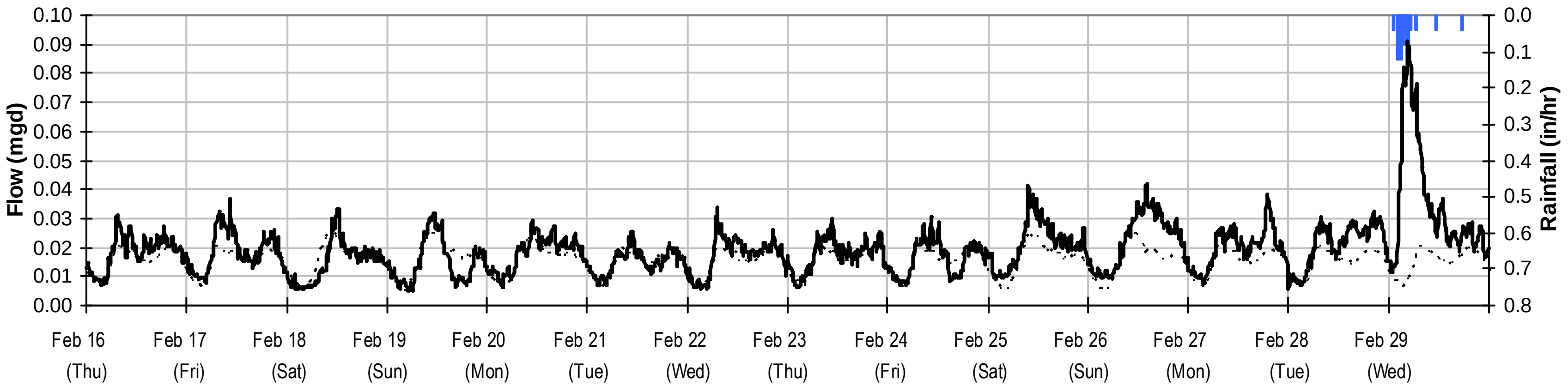

Plan View Photo

MH 98

Monthly Flow Summary: February, 2012

Total Monthly Rainfall: 0.85 inches   Avg Flow: 0.021 mgd   Peak Flow: 0.091 mgd   Min Flow: 0.005 mgd

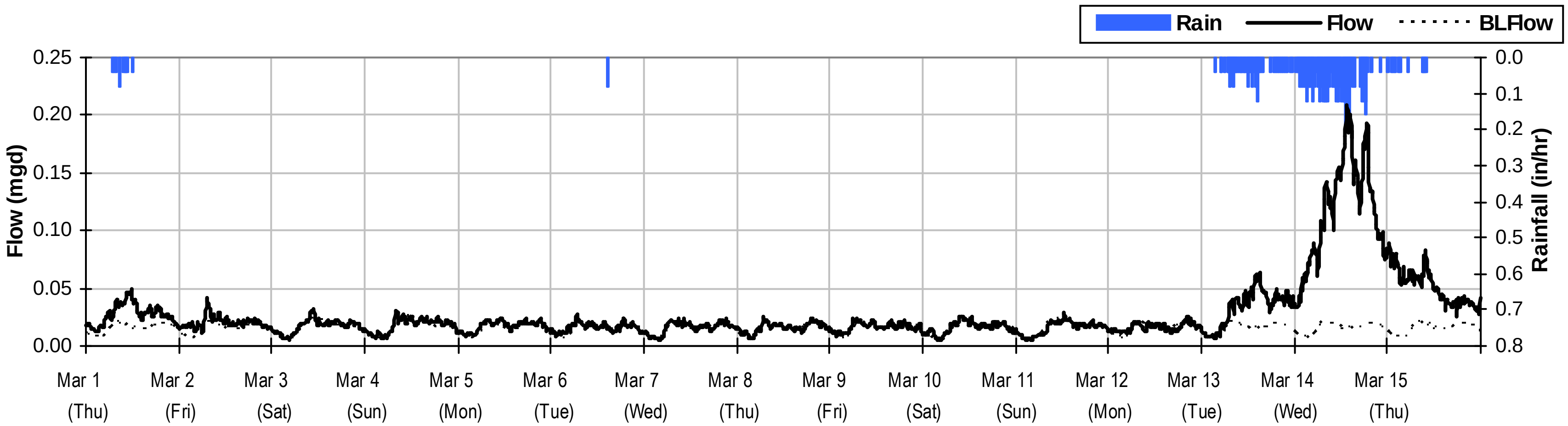


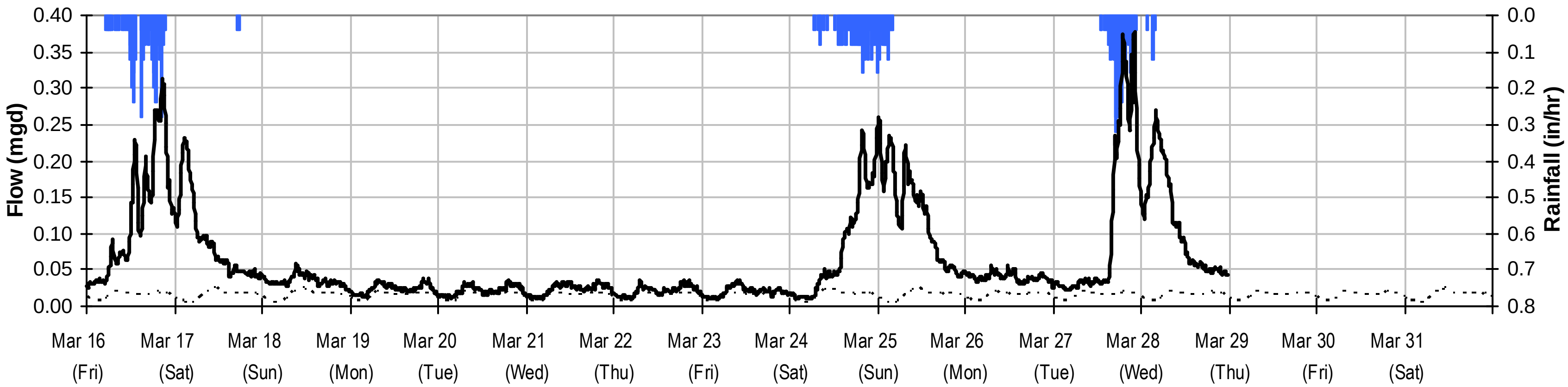


MH 98

Monthly Flow Summary: March, 2012

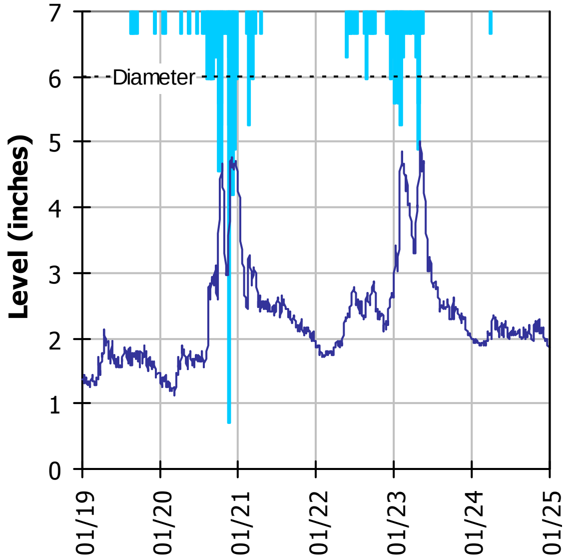
Total Monthly Rainfall: 5.4 inches   Avg Flow: 0.044 mgd   Peak Flow: 0.377 mgd   Min Flow: 0.005 mgd

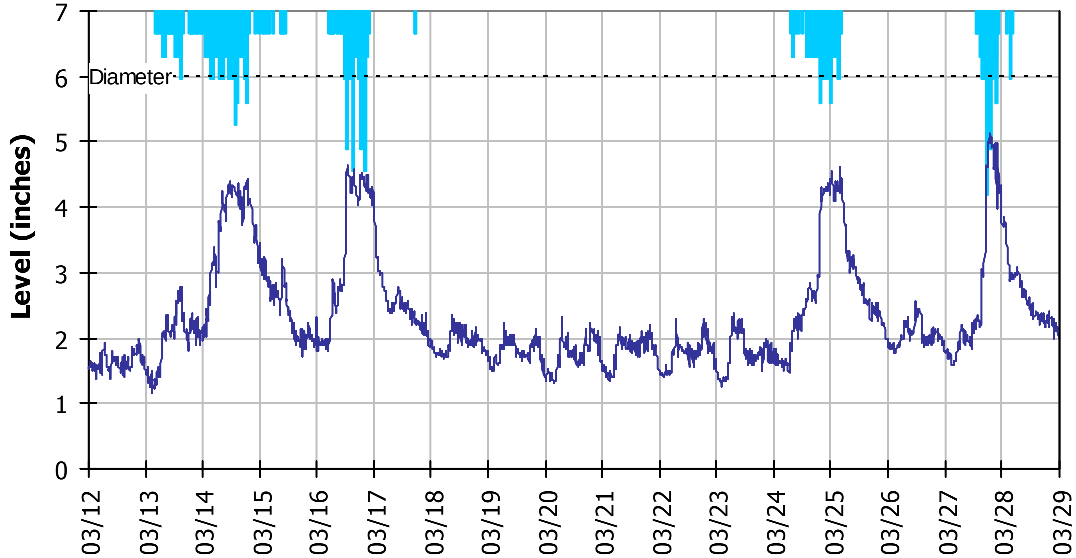


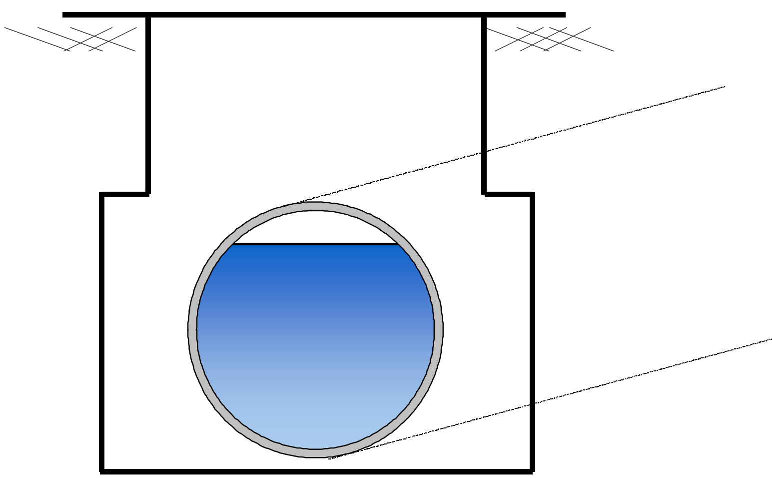


MH 98
Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Monitoring Period







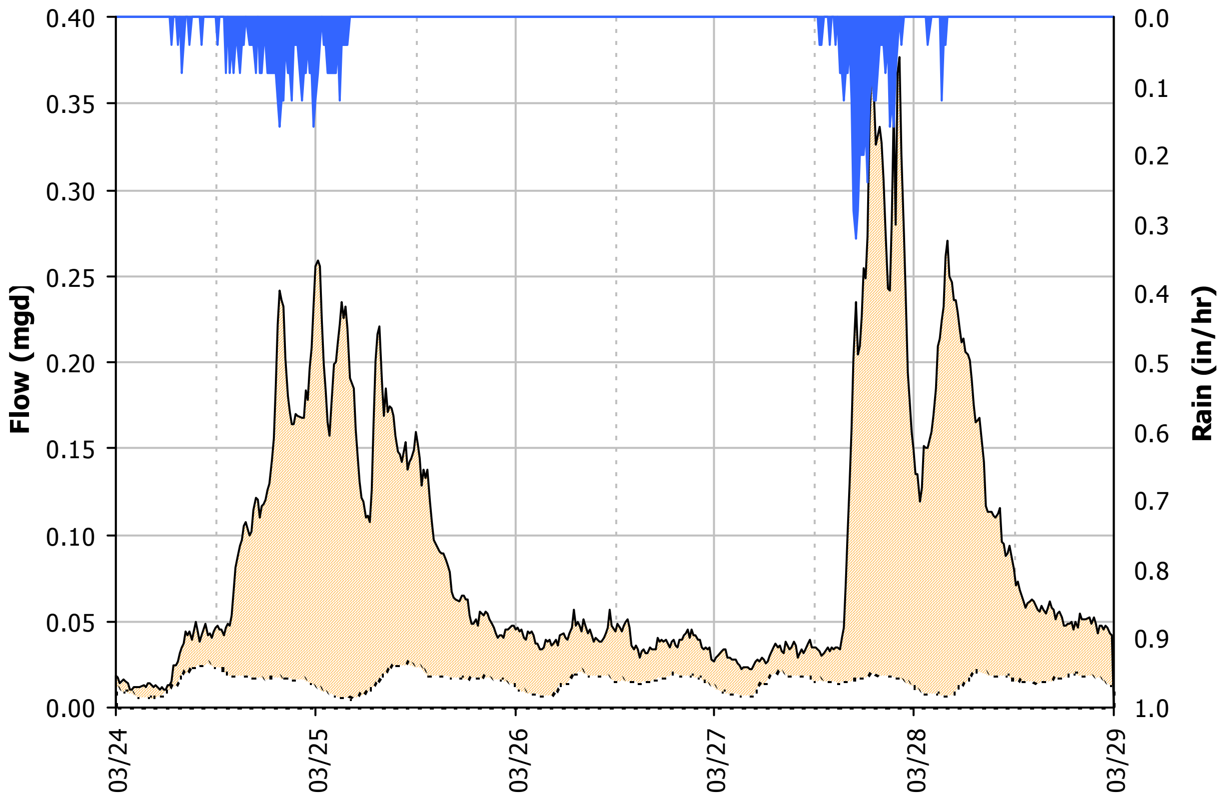
Pipe Diameter: 6 *inches*

Peak Measured Level: 5.15 *inches*

Peak d/D Ratio: 0.86

MH 98
I/I Summary: Event 3

Event 3 Detail Graph



Storm Event I/I Analysis (Rain = 2.12 inches)

Inflow

Peak I/I Rate: 0.36 *mgd*

Pk I/I:ADWF: 23.81

Combined I/I

Total I/I: 386,000 *gallons*

Total I/I:ADWF: 12.06 *per in-rain*

RDI (infiltration)

Infiltration Rate: 0.038 *mgd*
(3/28/2012 12:00:00 PM)

RDI (% of BL): 233%

Capacity

Peak Flow: 0.38 *mgd*

PF: 24.94

Peak Level: 5.15 *in*

d/D Ratio: 0.86

Rodeo Sanitary District

Master Plan Sanitary Sewer Flow Monitoring

Year 2011/2012

Monitoring Site: MH 408

Location: 4th Street between Sonoma Avenue and California Street

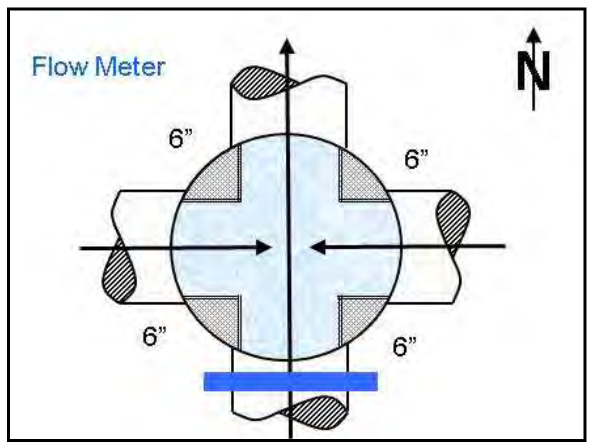
Data Summary Report

MH 408
Site Information Report

Location:	4th Street between Sonoma Avenue and California Street
Coordinates:	122.2601°W, 38.0340°N
Rim Elevation:	75 feet
Diameter:	6 inches
Baseline Flow:	0.016 mgd
Peak Measured Flow:	0.827 mgd

Satellite Map

Sanitary Map



Flow Sketch

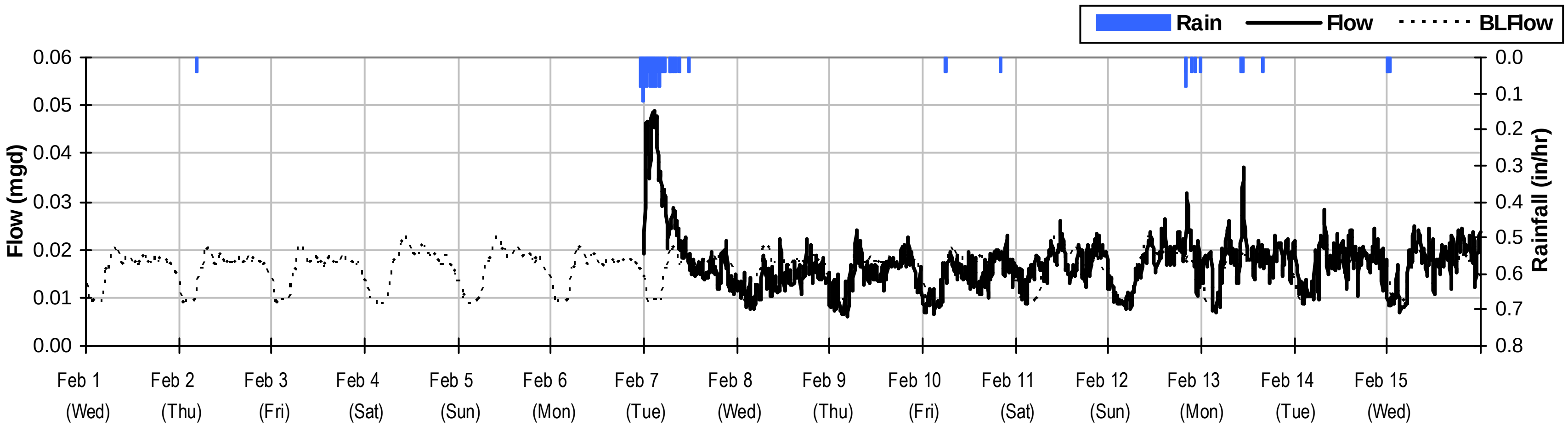
Street View Photo

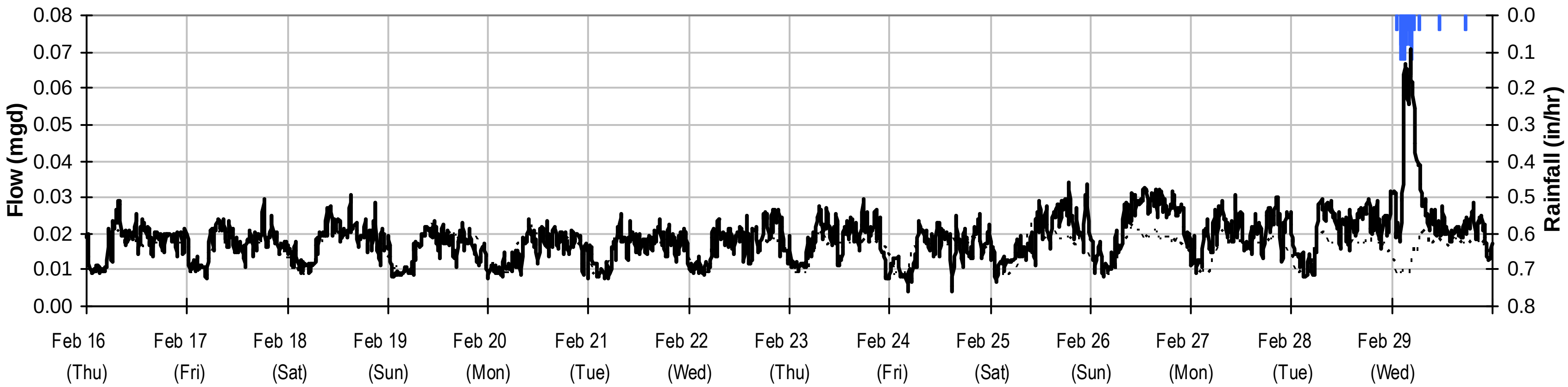
Plan View Photo

MH 408

Monthly Flow Summary: February, 2012

Total Monthly Rainfall: 0.85 inches   **Avg Flow: 0.018 mgd**   **Peak Flow: 0.071 mgd**   **Min Flow: 0.004 mgd**

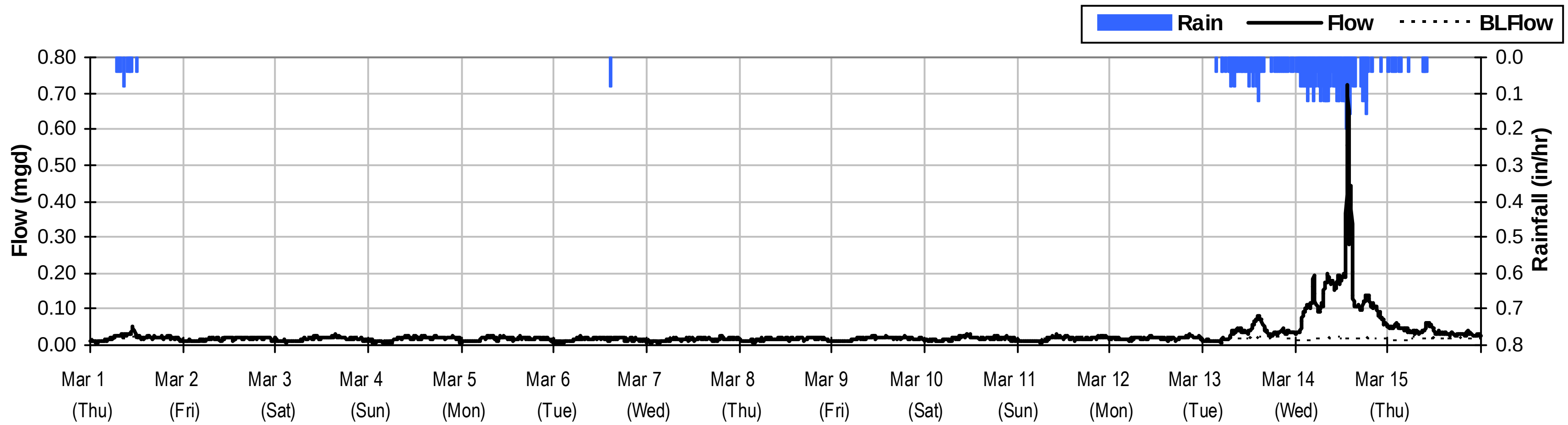


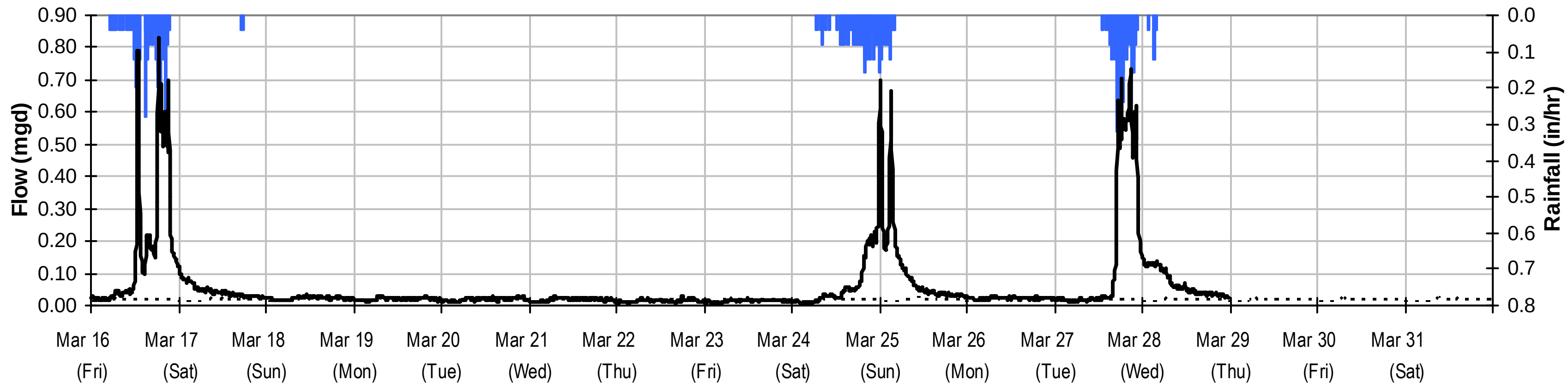


MH 408

Monthly Flow Summary: March, 2012

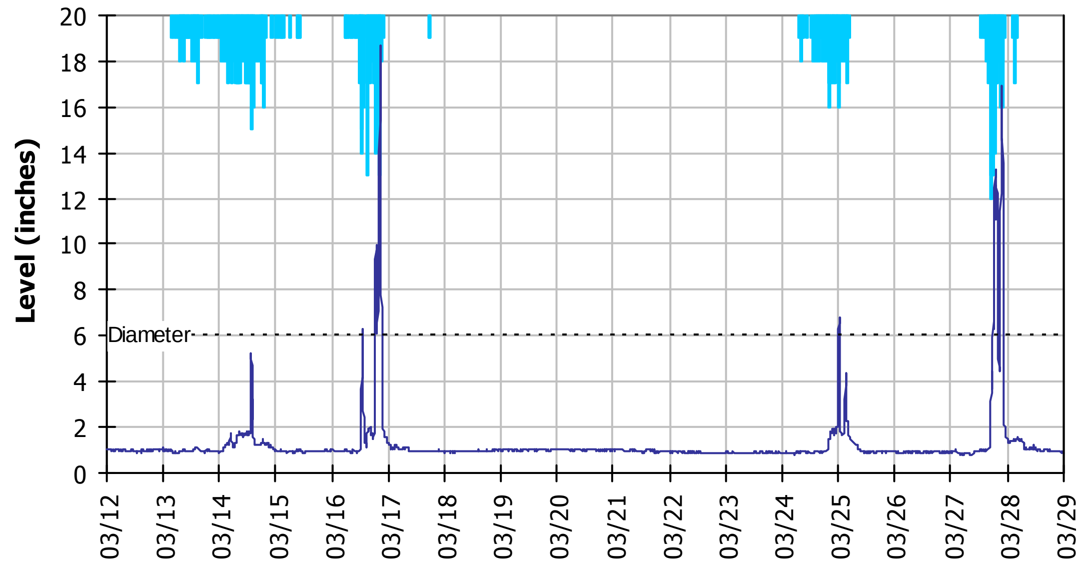
Total Monthly Rainfall: 5.4 inches   Avg Flow: 0.042 mgd   Peak Flow: 0.827 mgd   Min Flow: 0.006 mgd

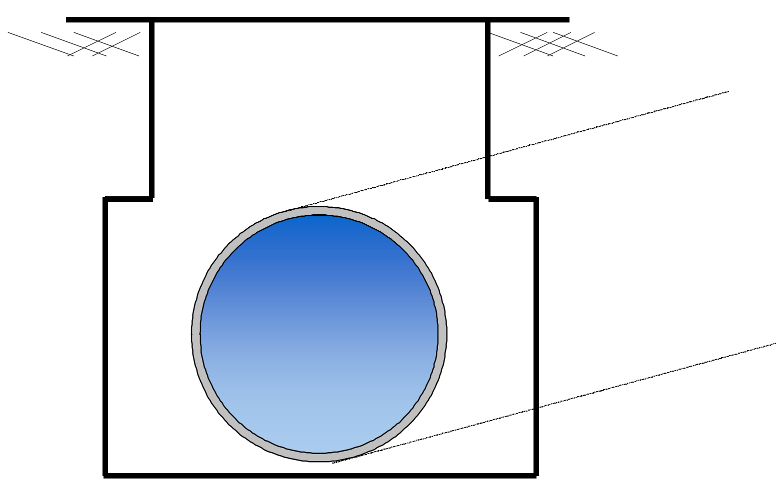




MH 408
Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Monitoring Period





Pipe Diameter: 6 *inches*

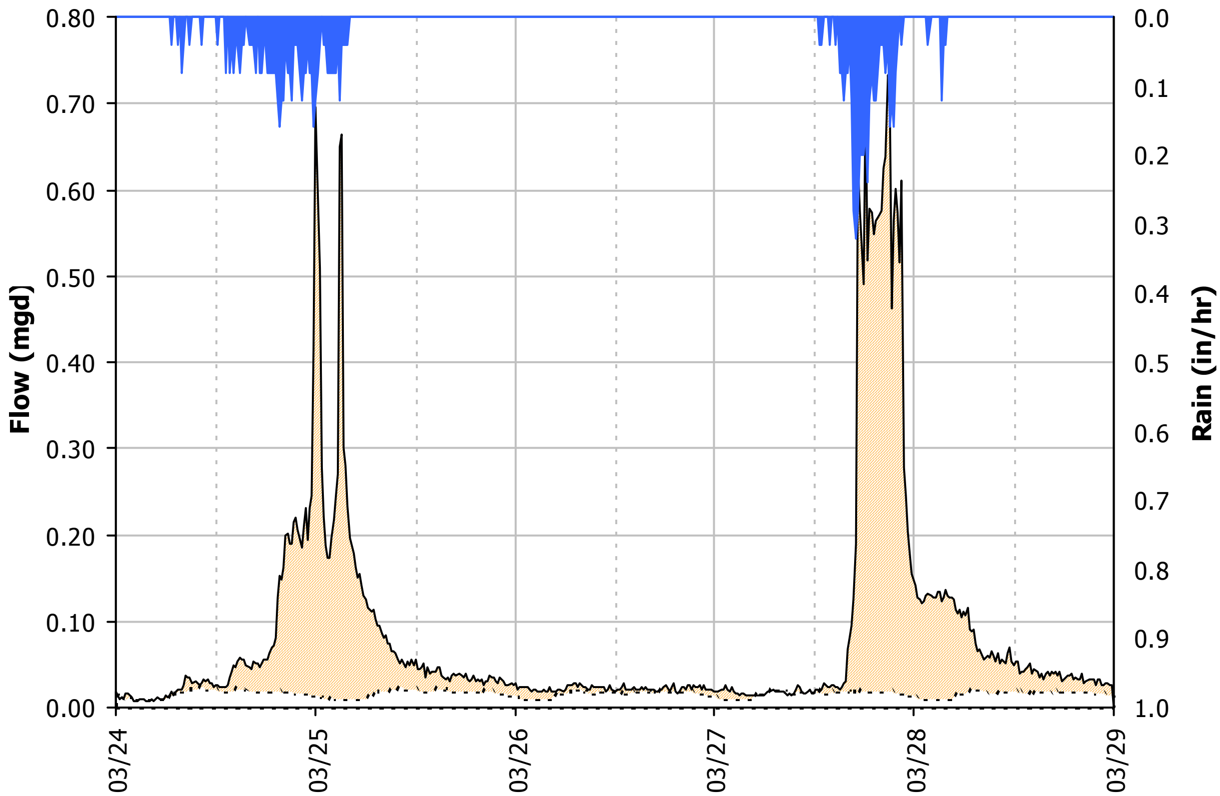
Peak Measured Level: 18.6 *inches*

Peak d/D Ratio: 3.09

Surcharged 12.6 inches over crown

MH 408
I/I Summary: Event 3

Event 3 Detail Graph



Storm Event I/I Analysis (Rain = 2.12 inches)

Inflow

Peak I/I Rate: 0.71 *mgd*

Pk I/I:ADWF: 44.64

Combined I/I

Total I/I: 345,000 *gallons*

Total I/I:ADWF: 10.16 *per in-rain*

RDI (infiltration)

Infiltration Rate: 0.019 *mgd*
(3/28/2012 12:00:00 PM)

RDI (% of BL): 112%

Capacity

Peak Flow: 0.73 *mgd*

PF: 45.72

Peak Level: 16.94 *in*

d/D Ratio: 2.82

Rodeo Sanitary District

Master Plan Sanitary Sewer Flow Monitoring

Year 2011/2012

Monitoring Site: MH 406

Location: 505 Sonoma Avenue, northeast corner of property

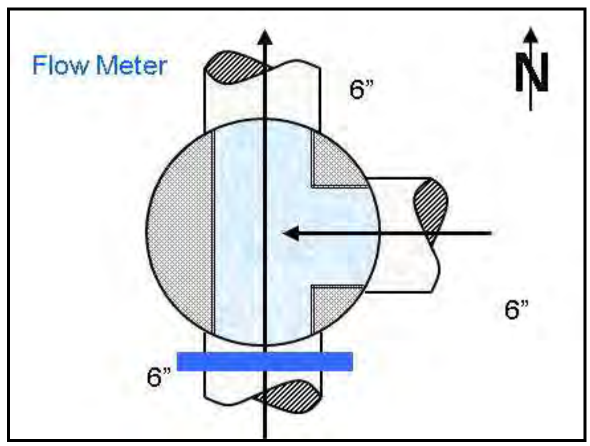
Data Summary Report

MH 406
Site Information Report

Location:	505 Sonoma Avenue, northeast corner of property
Coordinates:	122.2598° W, 38.0328° N
Rim Elevation:	103 feet
Diameter:	6 inches
Baseline Flow:	0.005 mgd
Peak Measured Flow:	0.434 mgd

Satellite Map

Sanitary Map



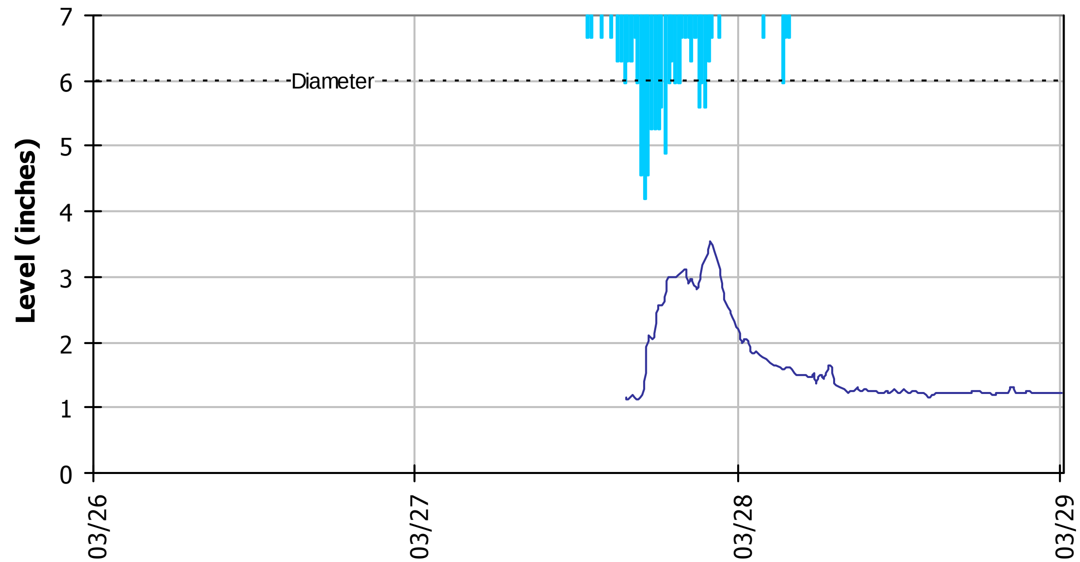
Flow Sketch

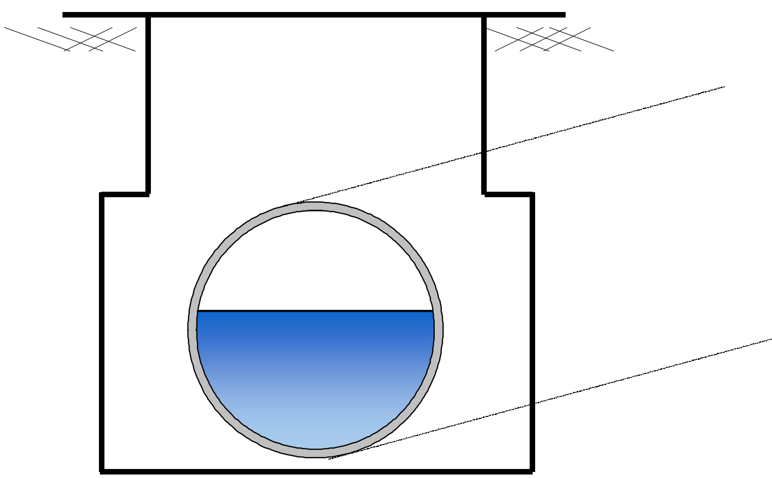
No Street View Photo

No Plan View Photo

MH 406
Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Monitoring Period





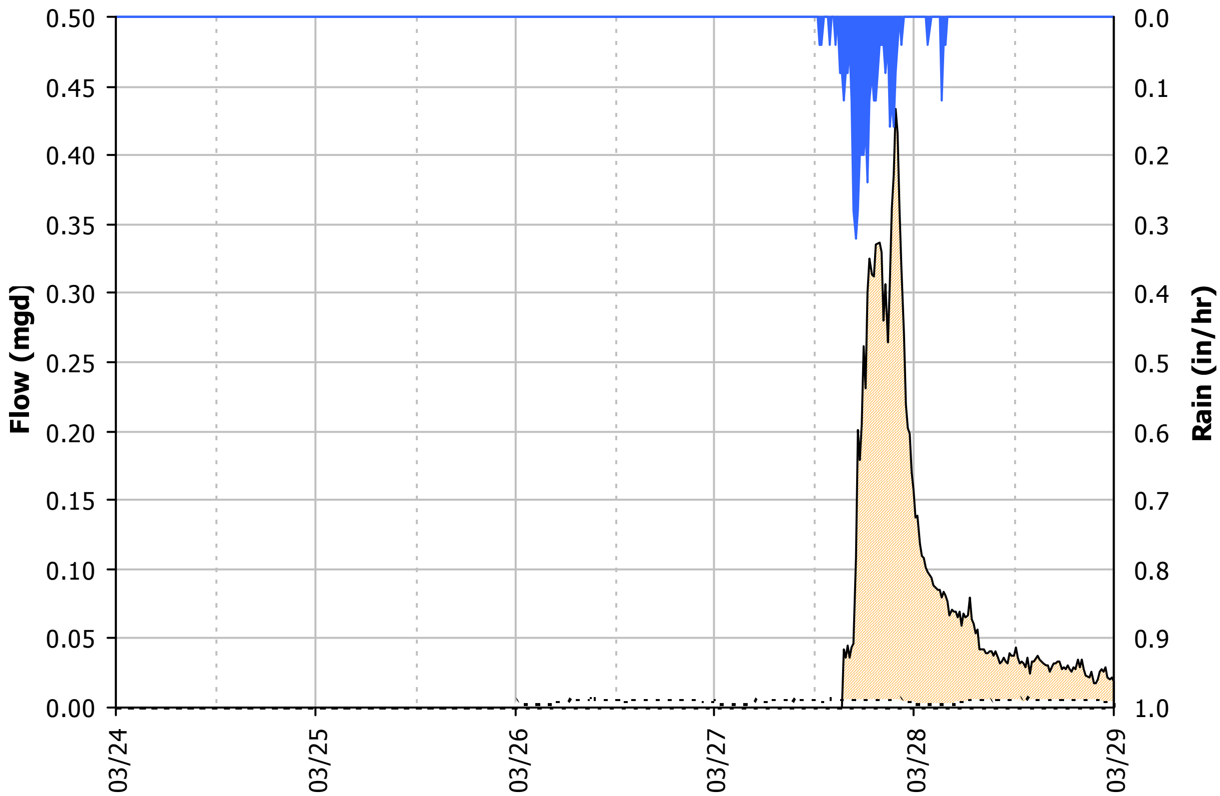
Pipe Diameter: 6 *inches*

Peak Measured Level: 3.54 *inches*

Peak d/D Ratio: 0.59

MH 406
I/I Summary: Event 3

Event 3 Detail Graph



Storm Event I/I Analysis (Rain = 2.12 inches)

Inflow

Peak I/I Rate: 0.43 *mgd*

Pk I/I:ADWF: 89.23

Combined I/I

Total I/I: 128,000 *gallons*

Total I/I:ADWF: 12.56 *per in-rain*

RDI (infiltration)

Infiltration Rate: 0.024 *mgd*
(3/28/2012 12:00:00 PM)

RDI (% of BL): 461%

Capacity

Peak Flow: 0.43 *mgd*

PF: 90.29

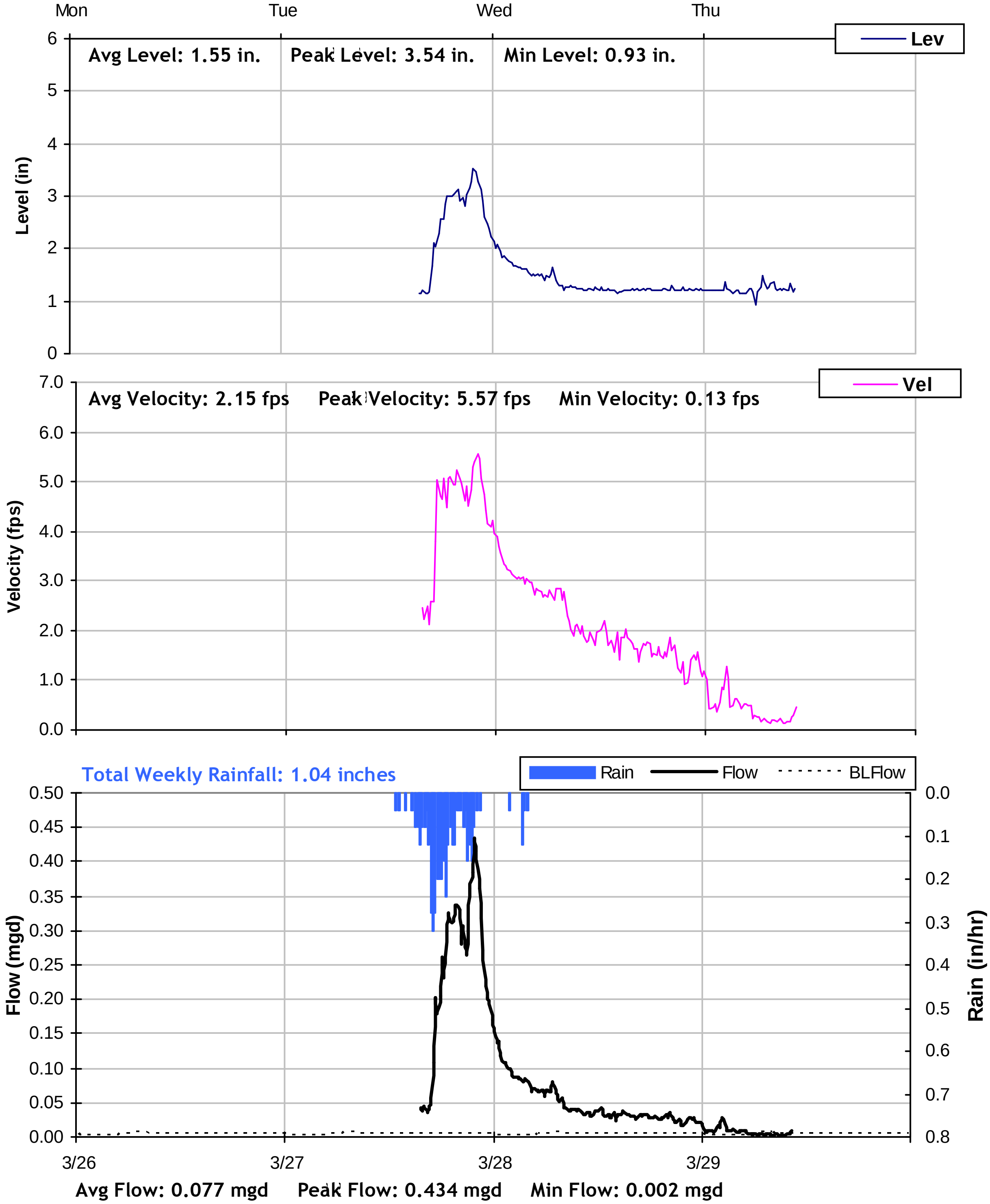
Peak Level: 3.54 *in*

d/D Ratio: 0.59

MH 406

Weekly Level, Velocity and Flow Hydrographs

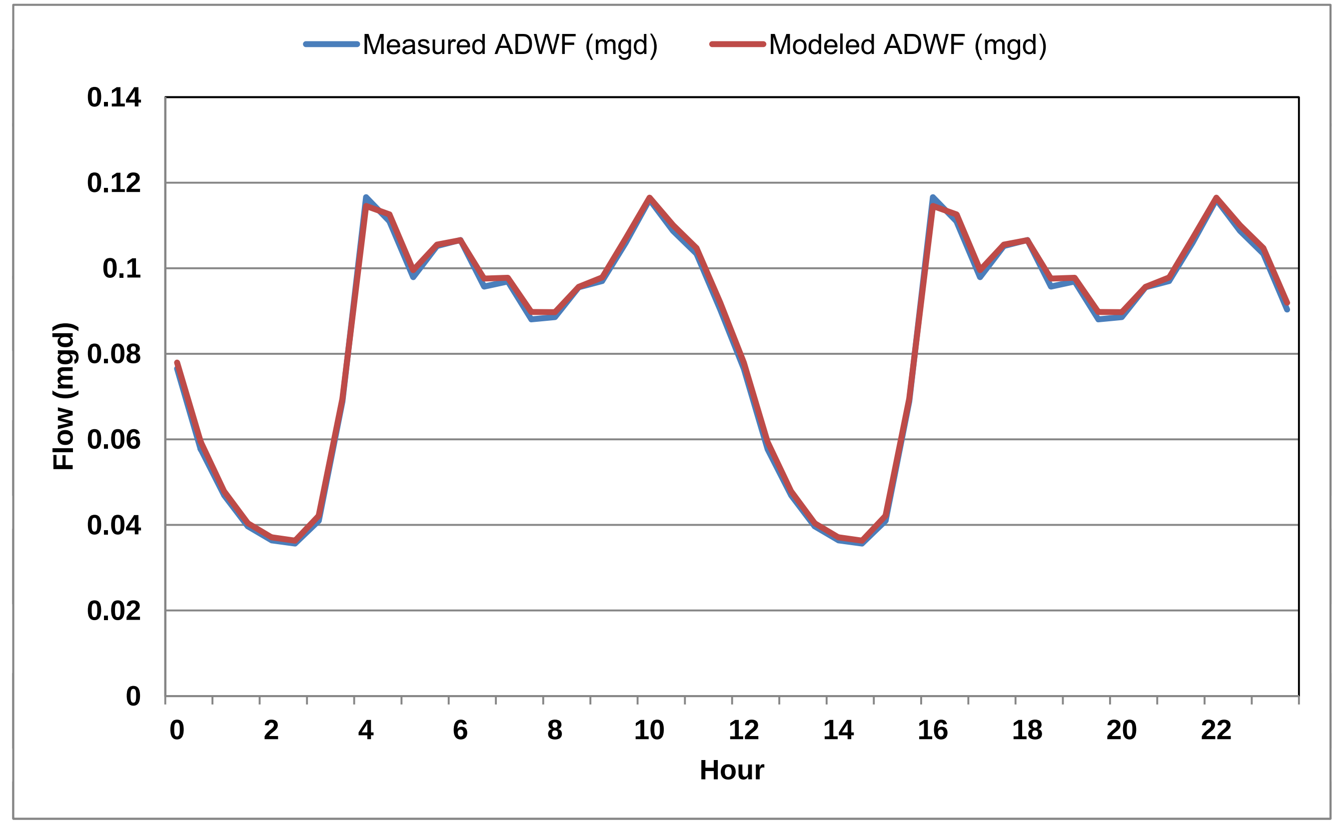
3/26/2012 to 4/2/2012

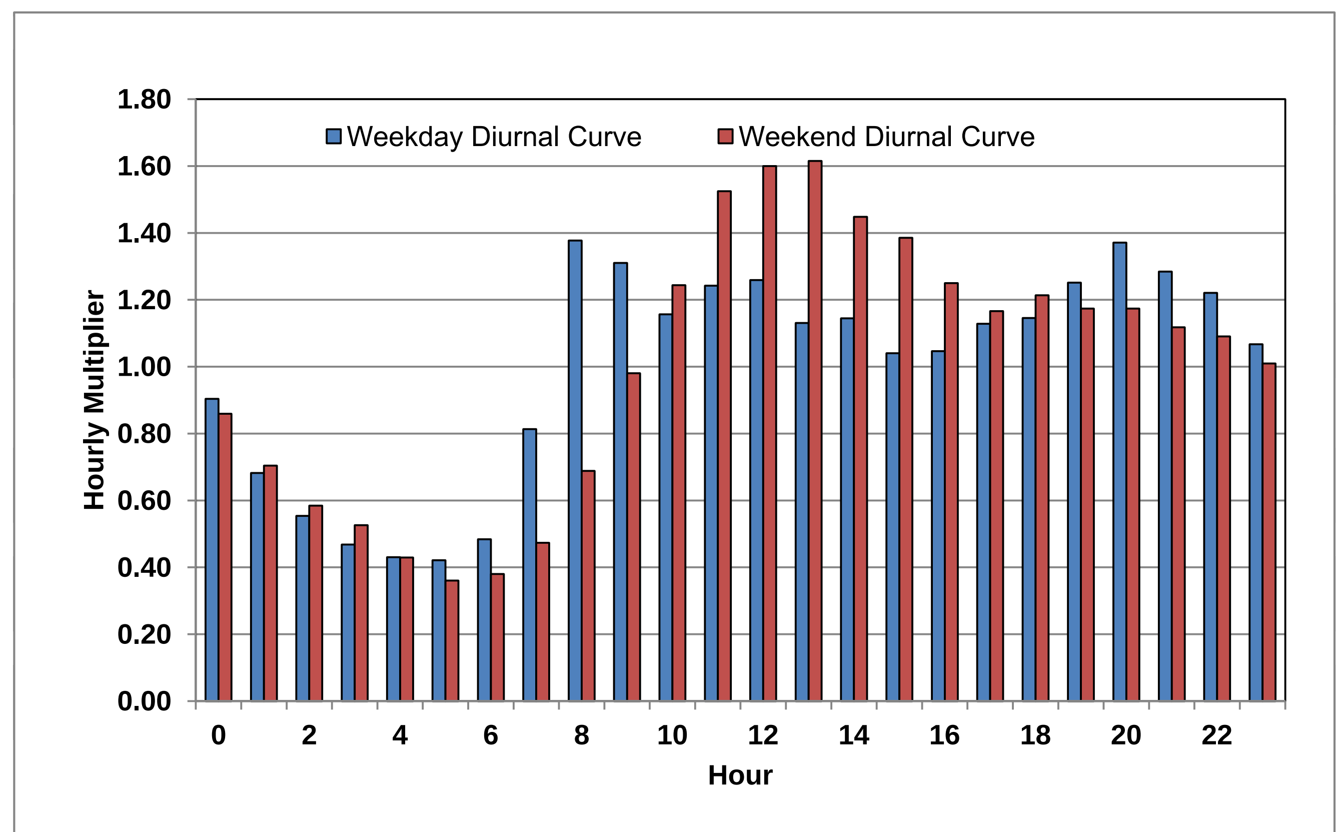


APPENDIX C – DRY WEATHER FLOW CALIBRATION PLOTS

FLOW METER 61 ADWF CALIBRATION SUMMARY

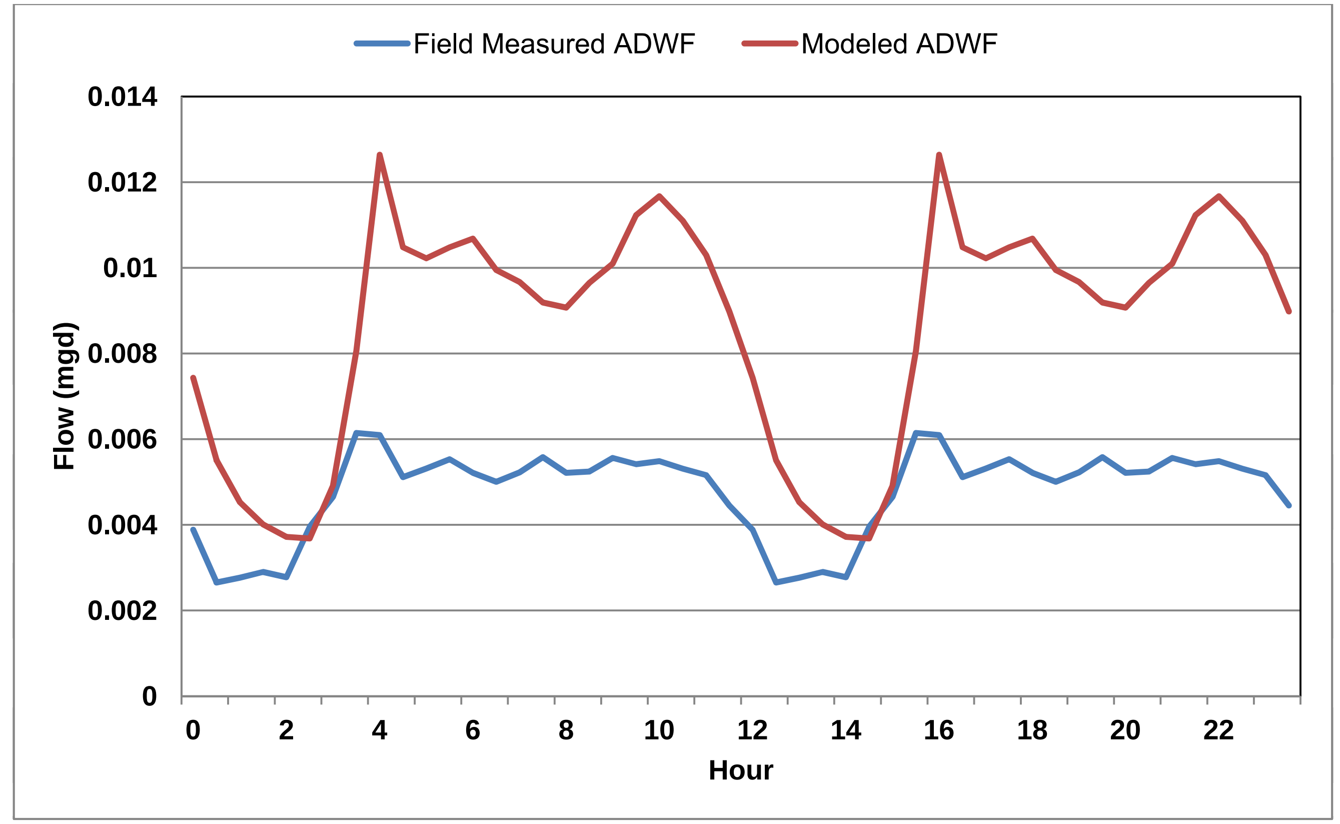
ADWF Calibration Details				
			Diurnal Curve Details	
Hour	Measured ADWF (mgd)	Modeled ADWF (mgd)	Weekday	Weekend
0	0.077	0.078	0.90	0.86
1	0.058	0.059	0.68	0.70
2	0.047	0.048	0.55	0.58
3	0.040	0.040	0.47	0.53
4	0.036	0.037	0.43	0.43
5	0.036	0.036	0.42	0.36
6	0.041	0.042	0.48	0.38
7	0.069	0.069	0.81	0.47
8	0.117	0.115	1.38	0.69
9	0.111	0.113	1.31	0.98
10	0.098	0.100	1.16	1.24
11	0.105	0.105	1.24	1.52
12	0.107	0.107	1.26	1.60
13	0.096	0.098	1.13	1.62
14	0.097	0.098	1.14	1.45
15	0.088	0.090	1.04	1.39
16	0.089	0.090	1.05	1.25
17	0.096	0.096	1.13	1.17
18	0.097	0.098	1.15	1.21
19	0.106	0.107	1.25	1.17
20	0.116	0.116	1.37	1.17
21	0.109	0.110	1.28	1.12
22	0.103	0.105	1.22	1.09
23	0.090	0.092	1.07	1.01
Average	0.084	0.085	1.00	1.00
%Error		1.1%		

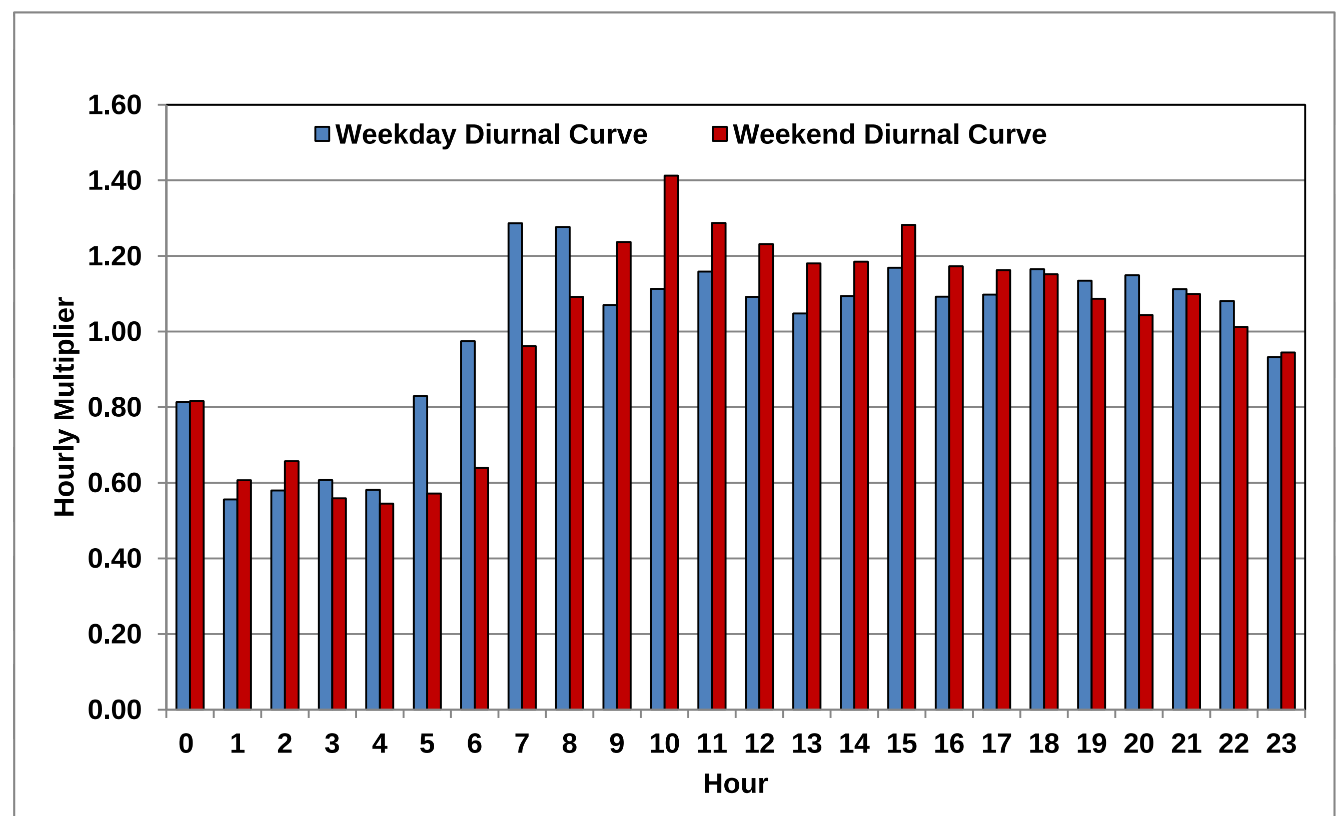




FLOW METER 406 ADWF CALIBRATION SUMMARY

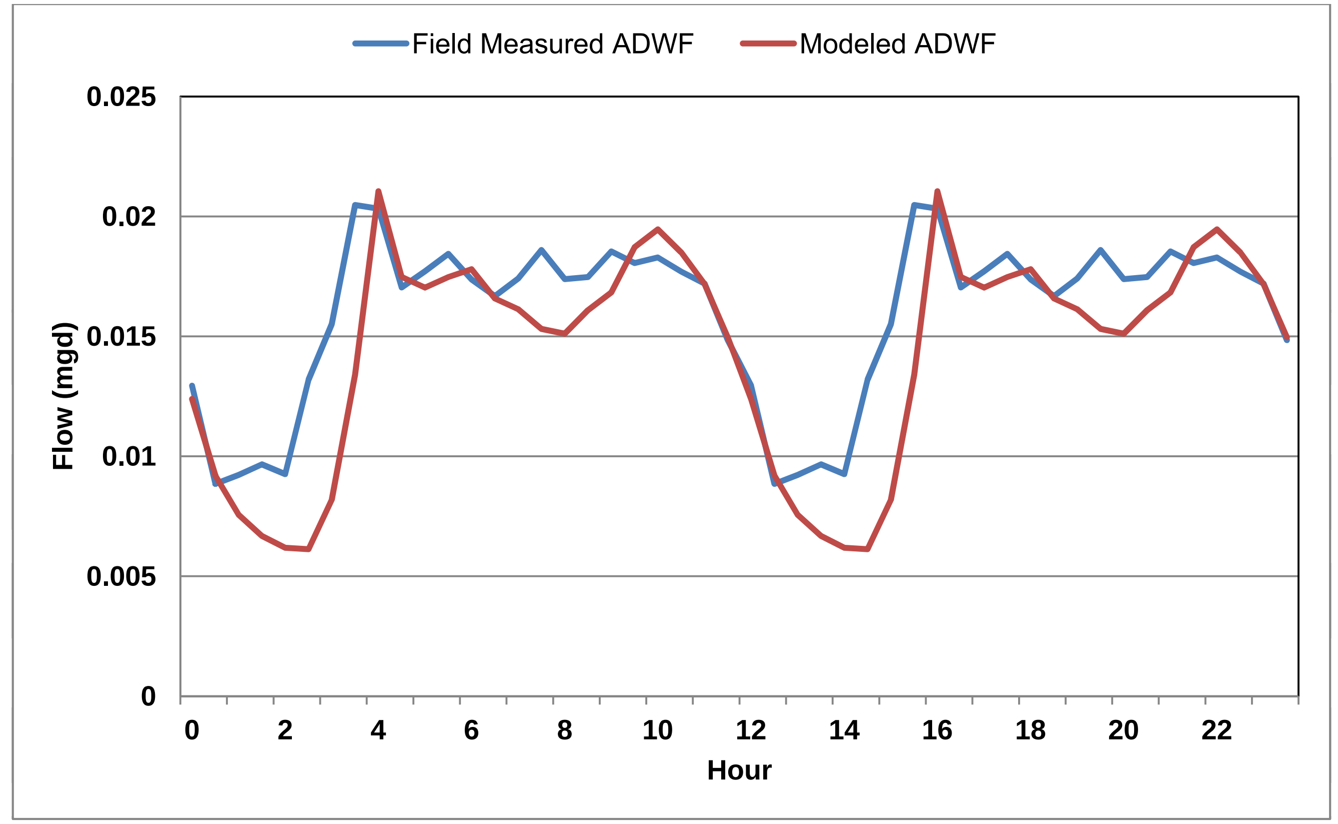
ADWF Calibration Details				
			Diurnal Curve Details	
Hour	Measured ADWF (mgd)	Modeled ADWF (mgd)	Weekday	Weekend
0	0.004	0.007	0.81	0.82
1	0.003	0.006	0.56	0.61
2	0.003	0.005	0.58	0.66
3	0.003	0.004	0.61	0.56
4	0.003	0.004	0.58	0.55
5	0.004	0.004	0.83	0.57
6	0.005	0.005	0.97	0.64
7	0.006	0.008	1.29	0.96
8	0.006	0.013	1.28	1.09
9	0.005	0.010	1.07	1.24
10	0.005	0.010	1.11	1.41
11	0.006	0.010	1.16	1.29
12	0.005	0.011	1.09	1.23
13	0.005	0.010	1.05	1.18
14	0.005	0.010	1.09	1.19
15	0.006	0.009	1.17	1.28
16	0.005	0.009	1.09	1.17
17	0.005	0.010	1.10	1.16
18	0.006	0.010	1.16	1.15
19	0.005	0.011	1.13	1.09
20	0.005	0.012	1.15	1.04
21	0.005	0.011	1.11	1.10
22	0.005	0.010	1.08	1.01
23	0.004	0.009	0.93	0.94
Average	0.005	0.009	1.00	1.00
%Error		80.8%		

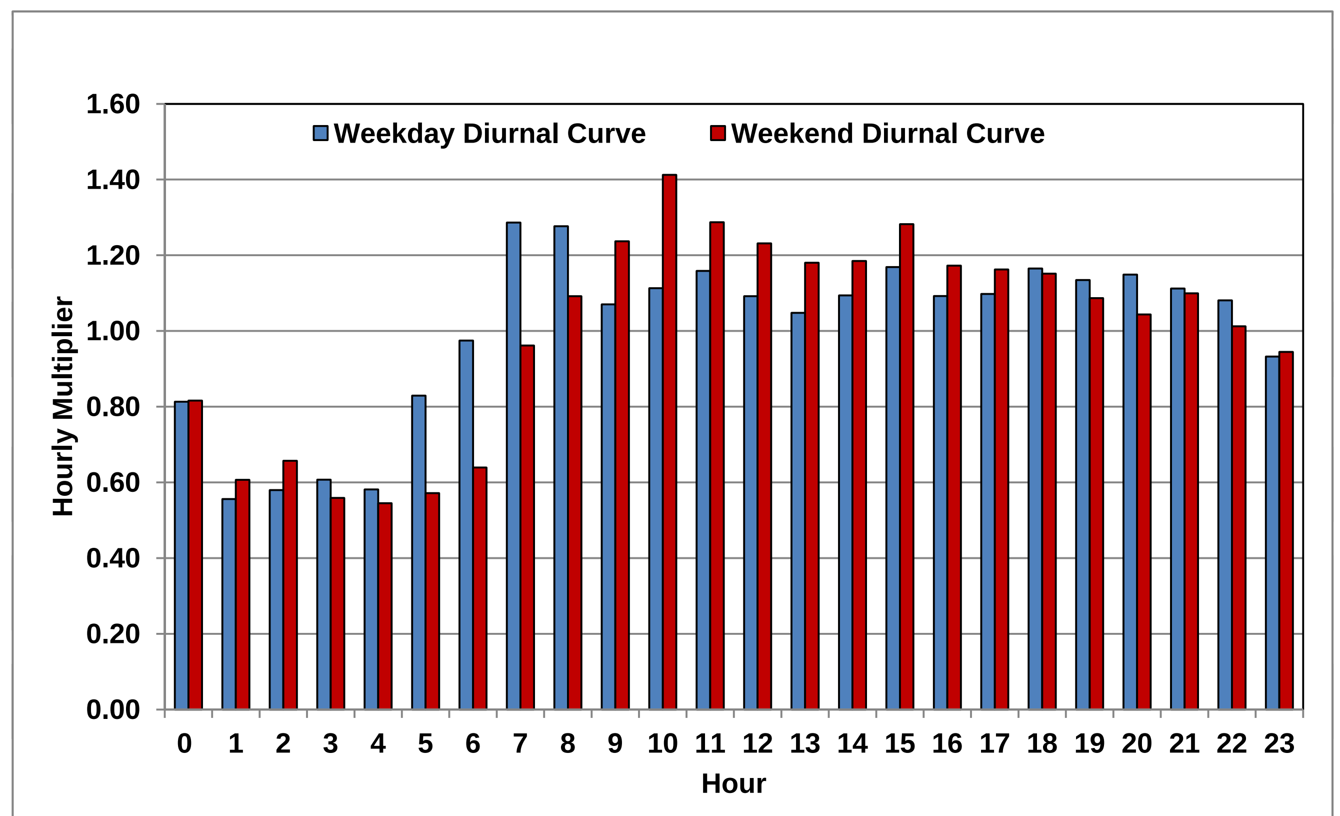




FLOW METER 408 ADWF CALIBRATION SUMMARY

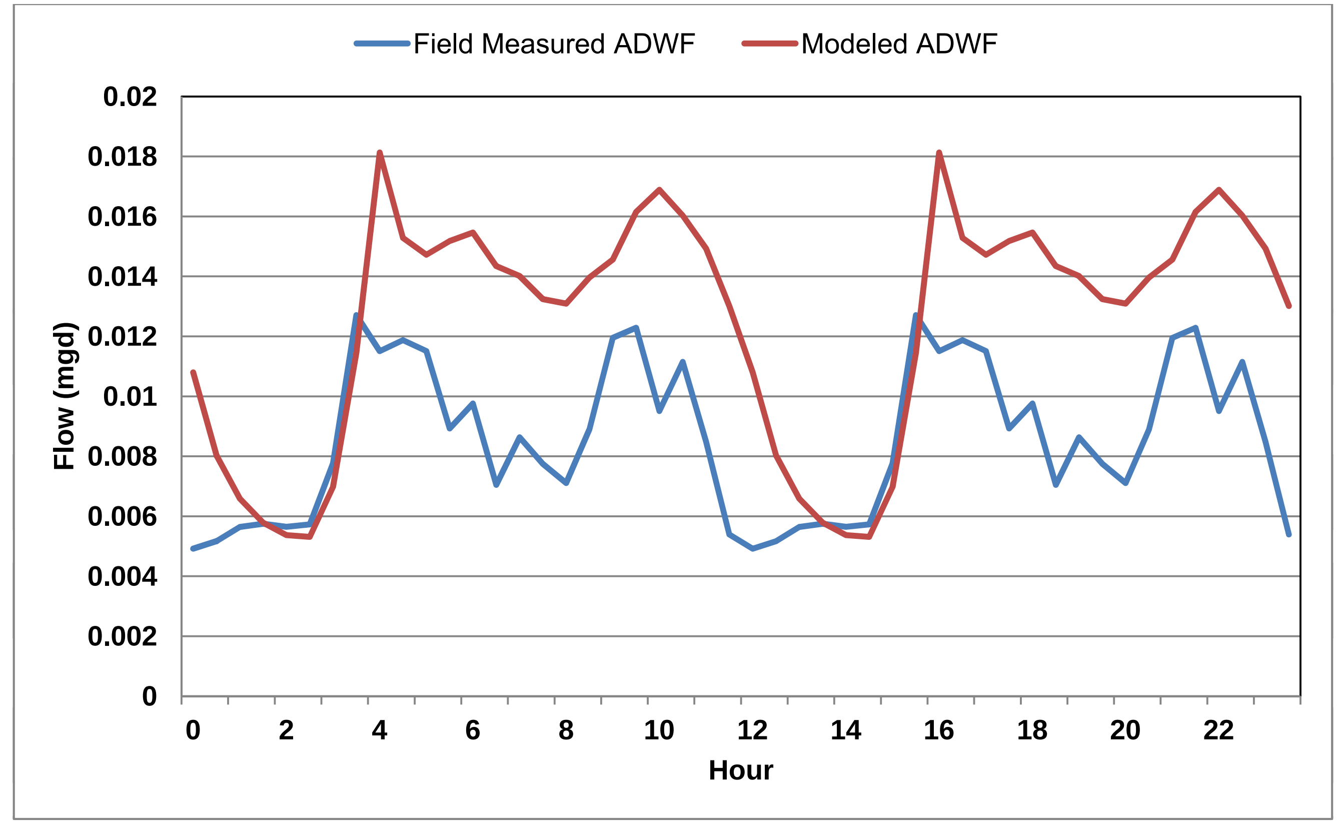
ADWF Calibration Details				
			Diurnal Curve Details	
Hour	Measured ADWF (mgd)	Modeled ADWF (mgd)	Weekday	Weekend
0	0.013	0.012	0.81	0.82
1	0.009	0.009	0.56	0.61
2	0.009	0.008	0.58	0.66
3	0.010	0.007	0.61	0.56
4	0.009	0.006	0.58	0.55
5	0.013	0.006	0.83	0.57
6	0.016	0.008	0.97	0.64
7	0.020	0.013	1.29	0.96
8	0.020	0.021	1.28	1.09
9	0.017	0.017	1.07	1.24
10	0.018	0.017	1.11	1.41
11	0.018	0.017	1.16	1.29
12	0.017	0.018	1.09	1.23
13	0.017	0.017	1.05	1.18
14	0.017	0.016	1.09	1.19
15	0.019	0.015	1.17	1.28
16	0.017	0.015	1.09	1.17
17	0.017	0.016	1.10	1.16
18	0.019	0.017	1.16	1.15
19	0.018	0.019	1.13	1.09
20	0.018	0.019	1.15	1.04
21	0.018	0.019	1.11	1.10
22	0.017	0.017	1.08	1.01
23	0.015	0.015	0.93	0.94
Average	0.016	0.014	1.00	1.00
%Error		-9.6%		

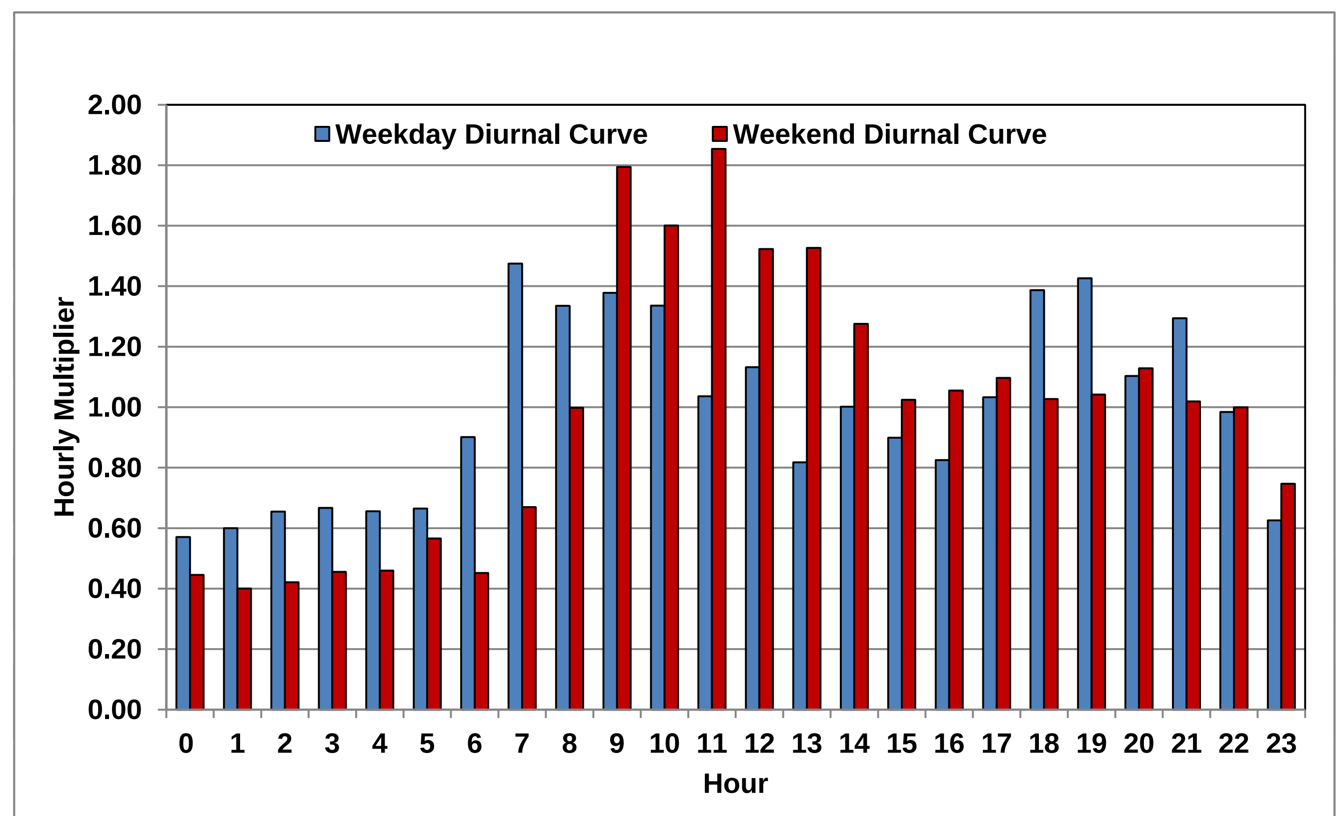




FLOW METER 368 ADWF CALIBRATION SUMMARY

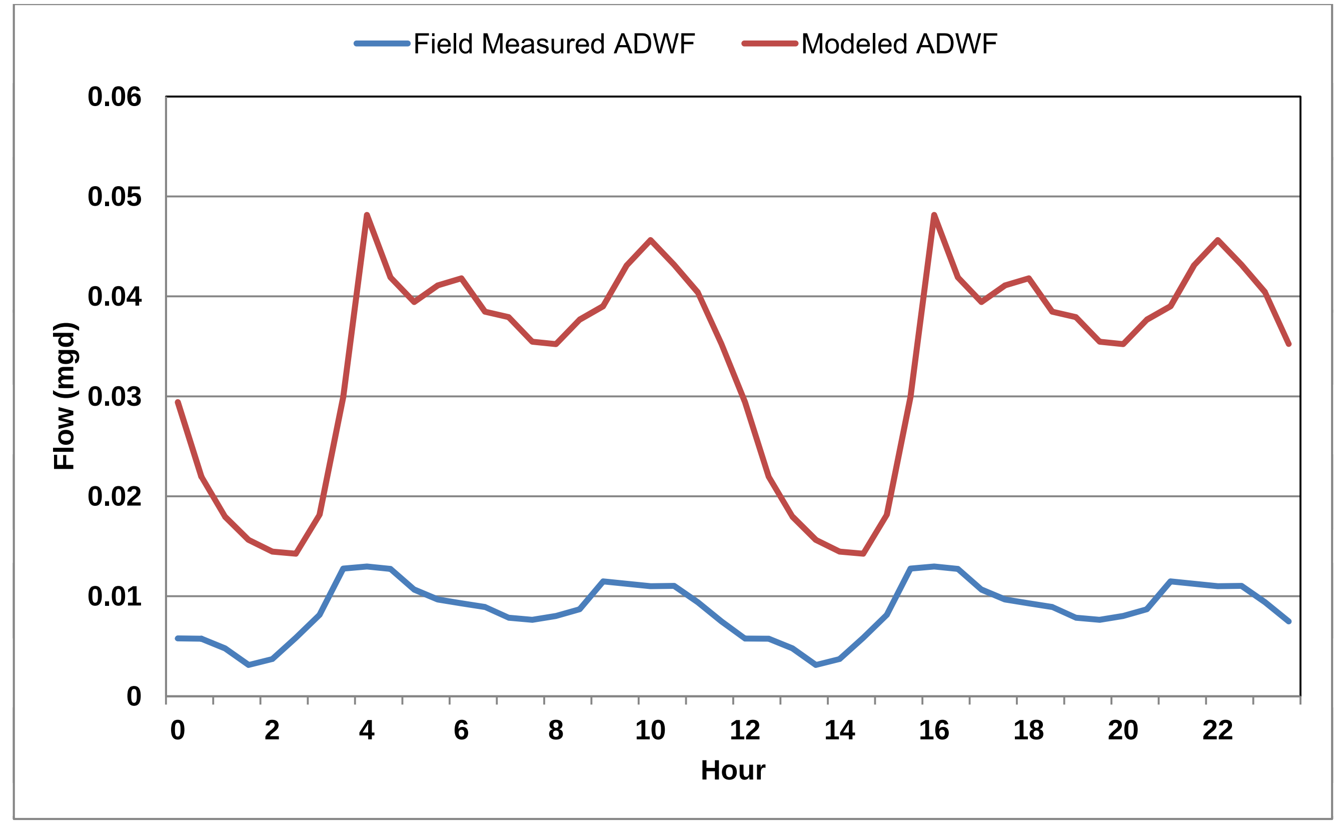
ADWF Calibration Details				
			Diurnal Curve Details	
Hour	Measured ADWF (mgd)	Modeled ADWF (mgd)	Weekday	Weekend
0	0.005	0.011	0.57	0.45
1	0.005	0.008	0.60	0.40
2	0.006	0.007	0.65	0.42
3	0.006	0.006	0.67	0.46
4	0.006	0.005	0.66	0.46
5	0.006	0.005	0.67	0.57
6	0.008	0.007	0.90	0.45
7	0.013	0.011	1.47	0.67
8	0.012	0.018	1.34	1.00
9	0.012	0.015	1.38	1.79
10	0.012	0.015	1.34	1.60
11	0.009	0.015	1.04	1.85
12	0.010	0.015	1.13	1.52
13	0.007	0.014	0.82	1.53
14	0.009	0.014	1.00	1.28
15	0.008	0.013	0.90	1.02
16	0.007	0.013	0.82	1.06
17	0.009	0.014	1.03	1.10
18	0.012	0.015	1.39	1.03
19	0.012	0.016	1.43	1.04
20	0.010	0.017	1.10	1.13
21	0.011	0.016	1.29	1.02
22	0.008	0.015	0.98	1.00
23	0.005	0.013	0.63	0.75
Average	0.009	0.012	0.99	0.98
%Error		45.9%		

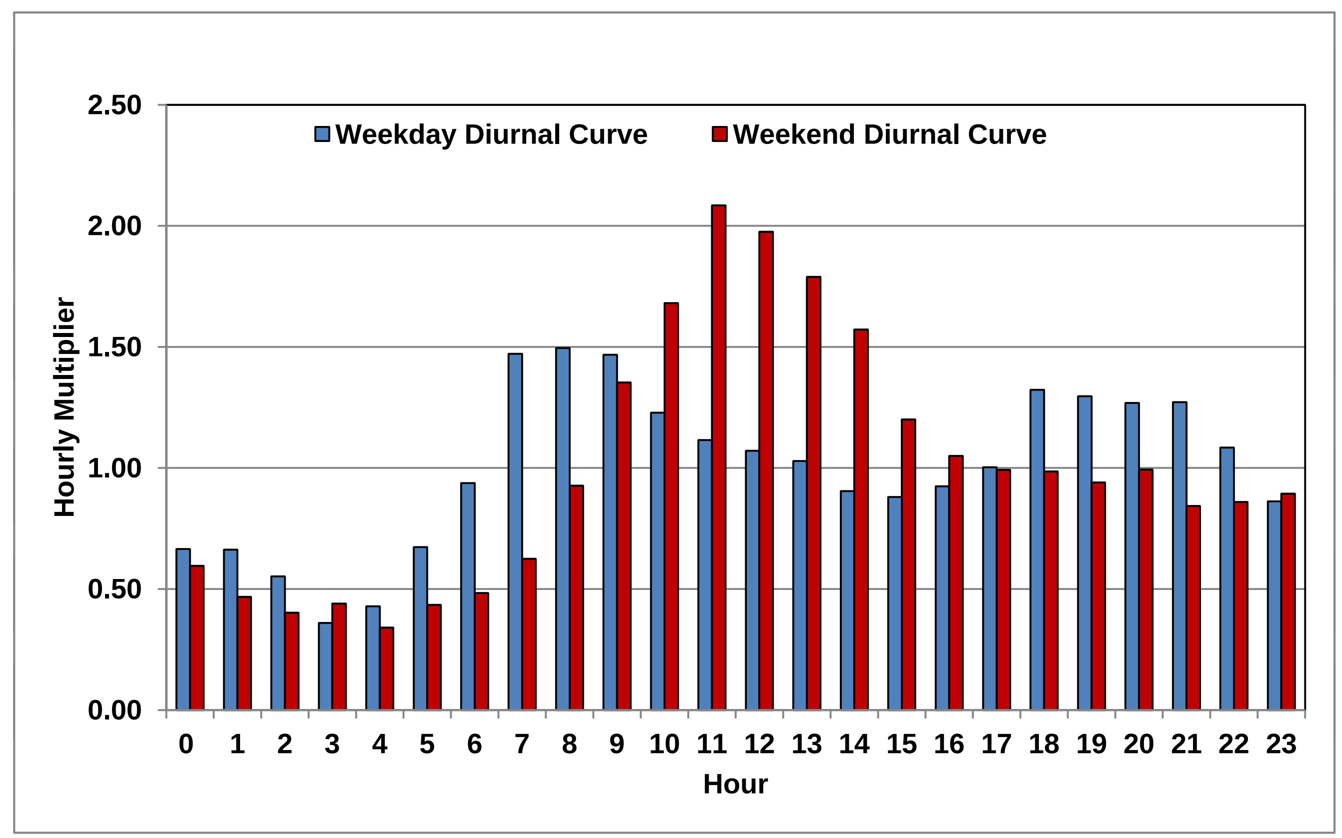




FLOW METER 83 ADWF CALIBRATION SUMMARY

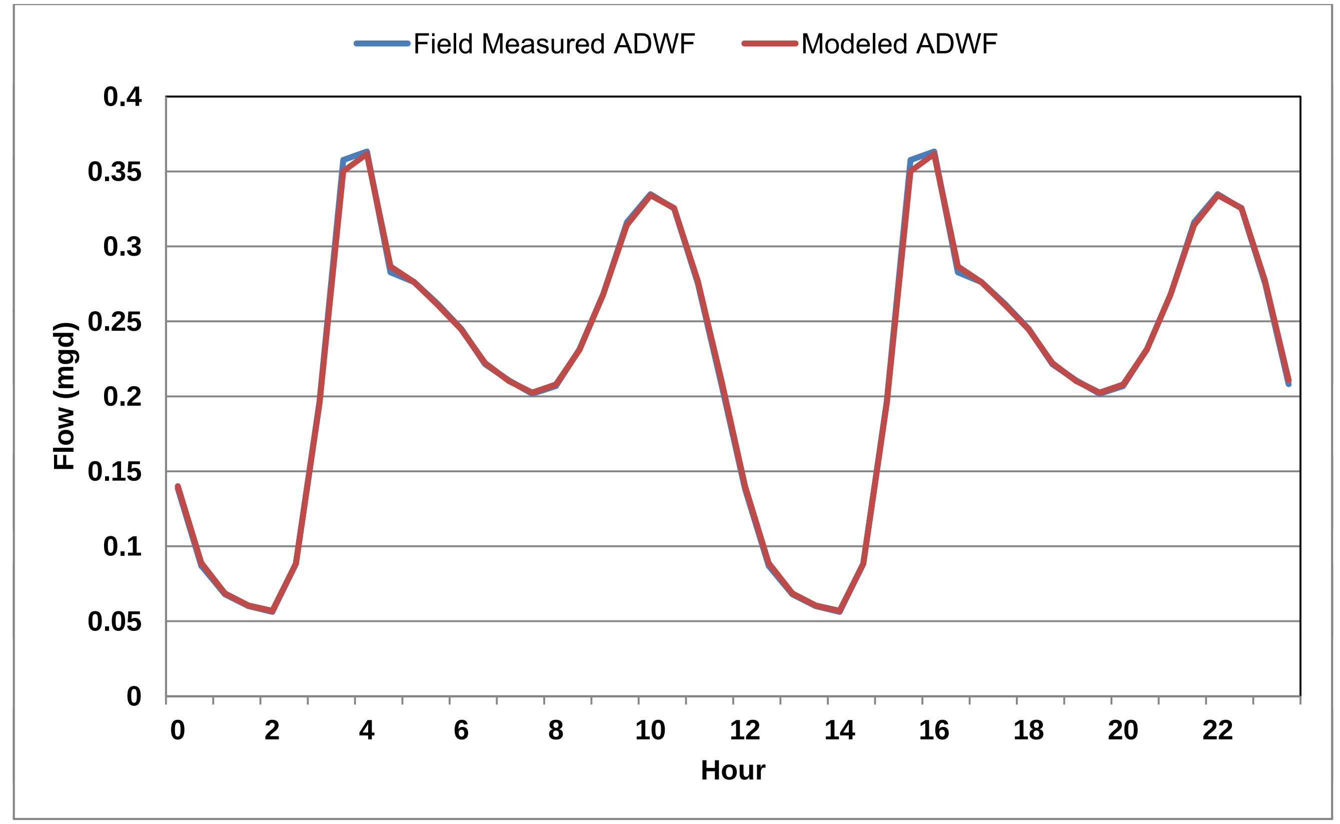
ADWF Calibration Details				
			Diurnal Curve Details	
Hour	Measured ADWF (mgd)	Modeled ADWF (mgd)	Weekday	Weekend
0	0.006	0.029	0.66	0.60
1	0.006	0.022	0.66	0.47
2	0.005	0.018	0.55	0.40
3	0.003	0.016	0.36	0.44
4	0.004	0.014	0.43	0.34
5	0.006	0.014	0.67	0.43
6	0.008	0.018	0.94	0.48
7	0.013	0.030	1.47	0.62
8	0.013	0.048	1.49	0.93
9	0.013	0.042	1.47	1.35
10	0.011	0.039	1.23	1.68
11	0.010	0.041	1.12	2.08
12	0.009	0.042	1.07	1.98
13	0.009	0.038	1.03	1.79
14	0.008	0.038	0.90	1.57
15	0.008	0.035	0.88	1.20
16	0.008	0.035	0.92	1.05
17	0.009	0.038	1.00	0.99
18	0.011	0.039	1.32	0.99
19	0.011	0.043	1.30	0.94
20	0.011	0.046	1.27	0.99
21	0.011	0.043	1.27	0.84
22	0.009	0.040	1.08	0.86
23	0.007	0.035	0.86	0.89
Average	0.009	0.034	1.00	1.00
%Error		287.1%		

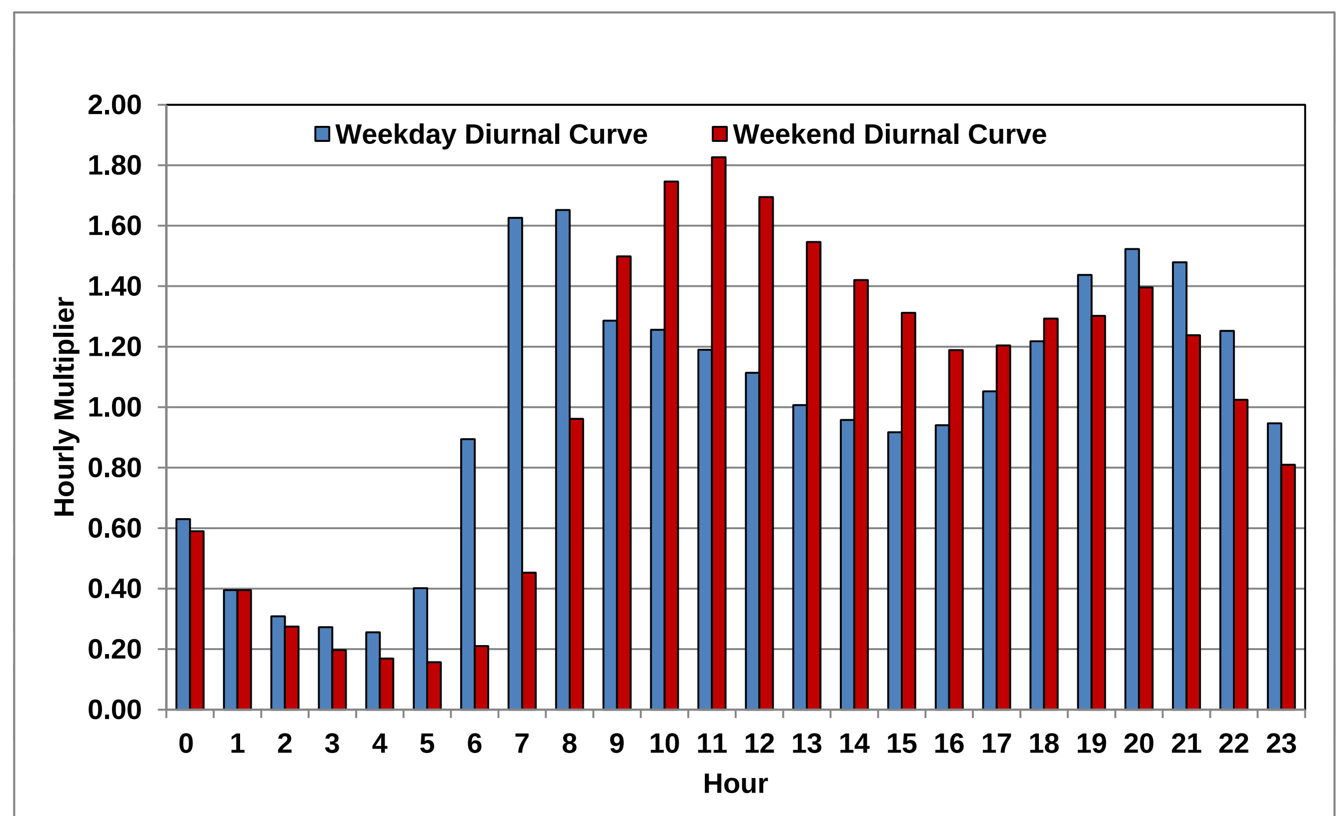




FLOW METER 327 ADWF CALIBRATION SUMMARY

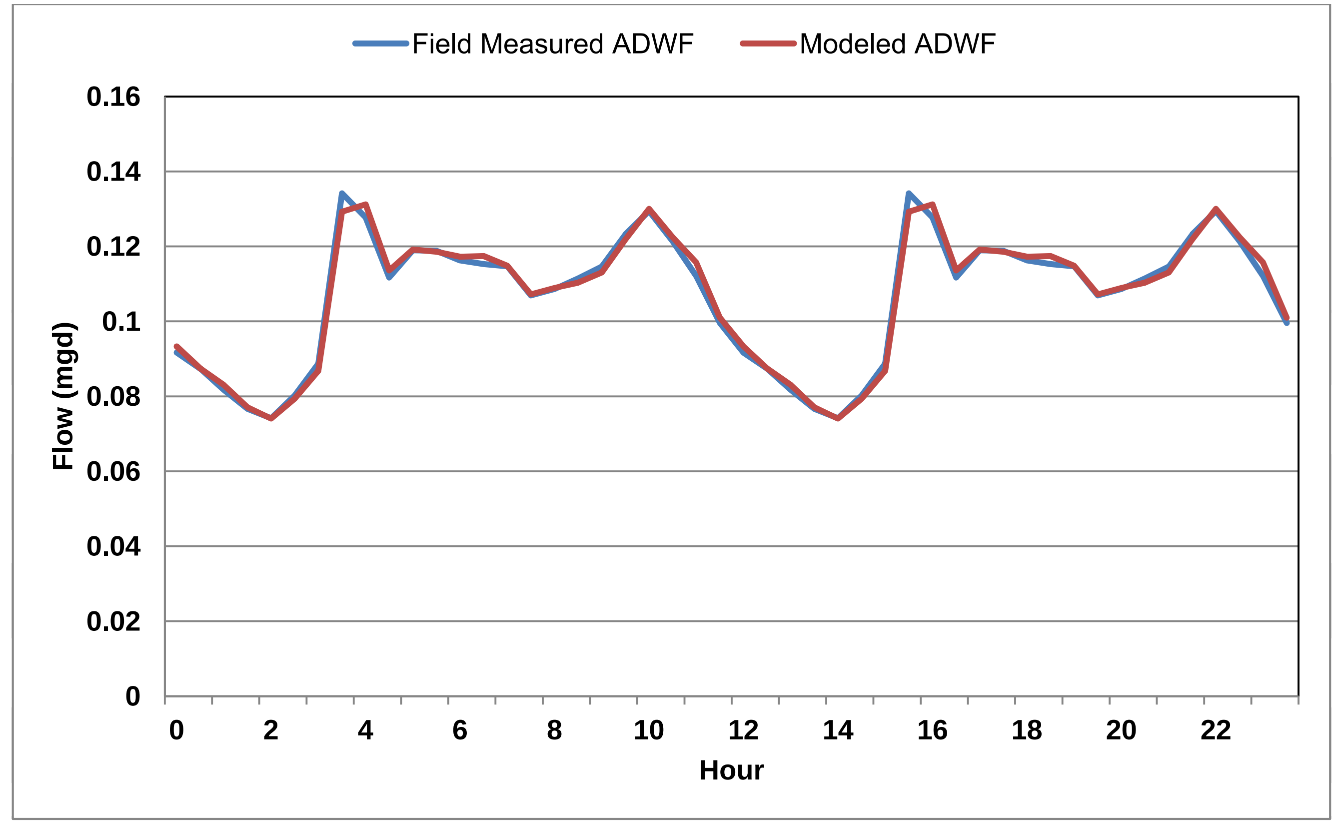
ADWF Calibration Details				
			Diurnal Curve Details	
Hour	Measured ADWF (mgd)	Modeled ADWF (mgd)	Weekday	Weekend
0	0.139	0.140	0.63	0.59
1	0.087	0.089	0.40	0.40
2	0.068	0.069	0.31	0.27
3	0.060	0.060	0.27	0.20
4	0.056	0.057	0.26	0.17
5	0.088	0.088	0.40	0.16
6	0.197	0.196	0.89	0.21
7	0.358	0.350	1.63	0.45
8	0.363	0.362	1.65	0.96
9	0.283	0.287	1.29	1.50
10	0.276	0.276	1.26	1.75
11	0.262	0.261	1.19	1.83
12	0.245	0.245	1.11	1.69
13	0.221	0.222	1.01	1.55
14	0.211	0.210	0.96	1.42
15	0.202	0.202	0.92	1.31
16	0.207	0.208	0.94	1.19
17	0.231	0.231	1.05	1.20
18	0.268	0.268	1.22	1.29
19	0.316	0.314	1.44	1.30
20	0.335	0.334	1.52	1.40
21	0.325	0.326	1.48	1.24
22	0.275	0.277	1.25	1.02
23	0.208	0.211	0.95	0.81
Average	0.220	0.220	1.00	1.00
%Error		0.0%		

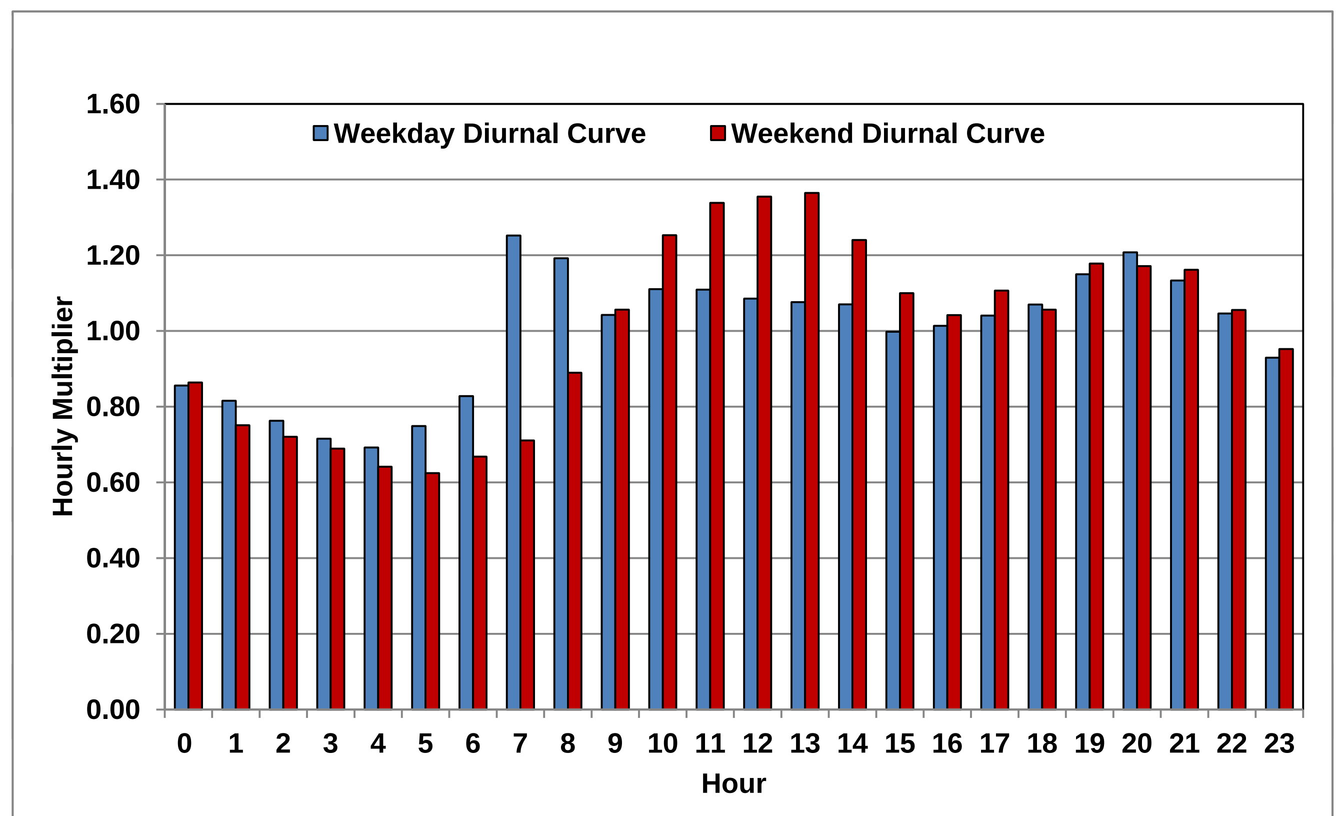




FLOW METER 54 ADWF CALIBRATION SUMMARY

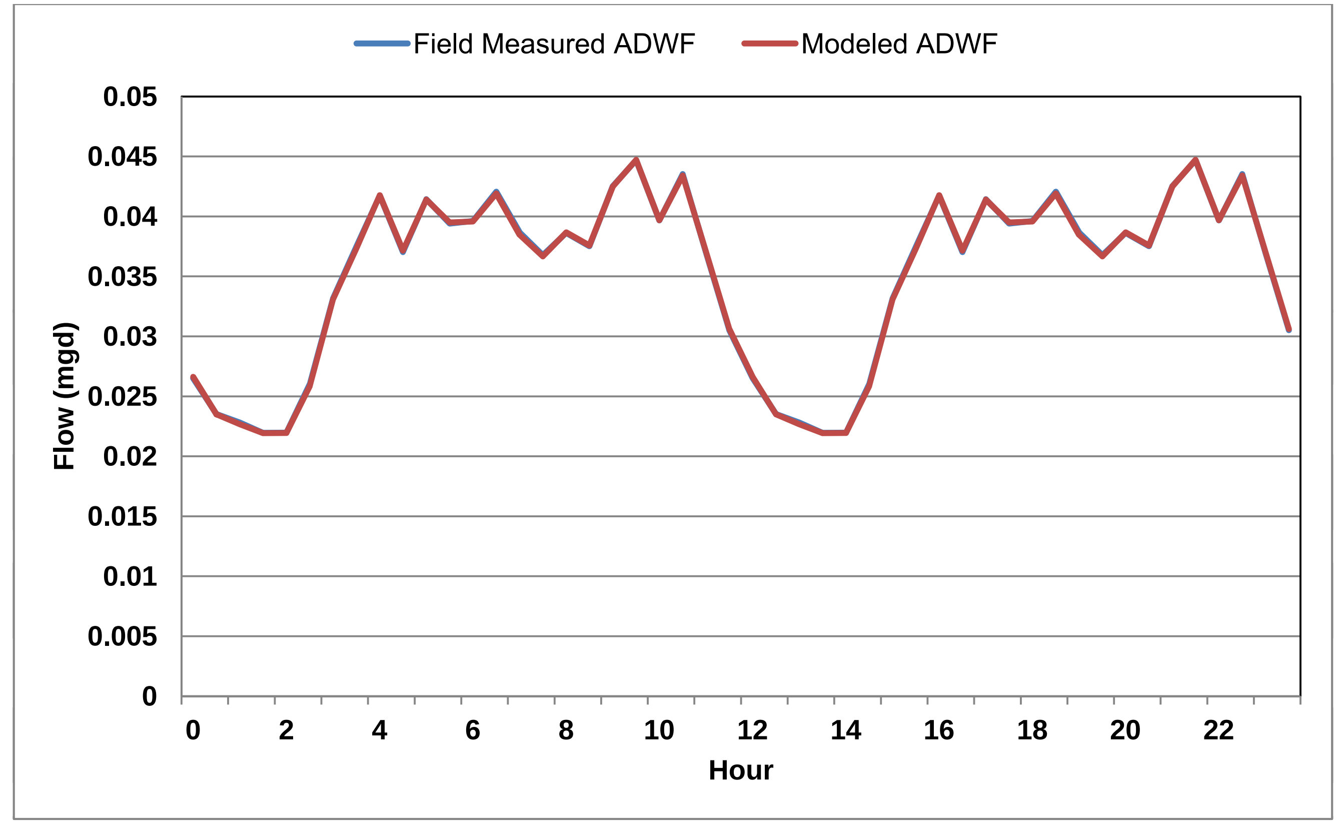
ADWF Calibration Details				
			Diurnal Curve Details	
Hour	Measured ADWF (mgd)	Modeled ADWF (mgd)	Weekday	Weekend
0	0.092	0.093	0.86	0.86
1	0.087	0.087	0.82	0.75
2	0.082	0.083	0.76	0.72
3	0.077	0.077	0.72	0.69
4	0.074	0.074	0.69	0.64
5	0.080	0.079	0.75	0.62
6	0.089	0.087	0.83	0.67
7	0.134	0.129	1.25	0.71
8	0.128	0.131	1.19	0.89
9	0.112	0.114	1.04	1.06
10	0.119	0.119	1.11	1.25
11	0.119	0.119	1.11	1.34
12	0.116	0.117	1.09	1.36
13	0.115	0.117	1.08	1.36
14	0.115	0.115	1.07	1.24
15	0.107	0.107	1.00	1.10
16	0.109	0.109	1.01	1.04
17	0.111	0.110	1.04	1.11
18	0.115	0.113	1.07	1.06
19	0.123	0.122	1.15	1.18
20	0.129	0.130	1.21	1.17
21	0.121	0.122	1.13	1.16
22	0.112	0.116	1.05	1.06
23	0.100	0.101	0.93	0.95
Average	0.107	0.107	1.00	1.00
%Error		0.3%		

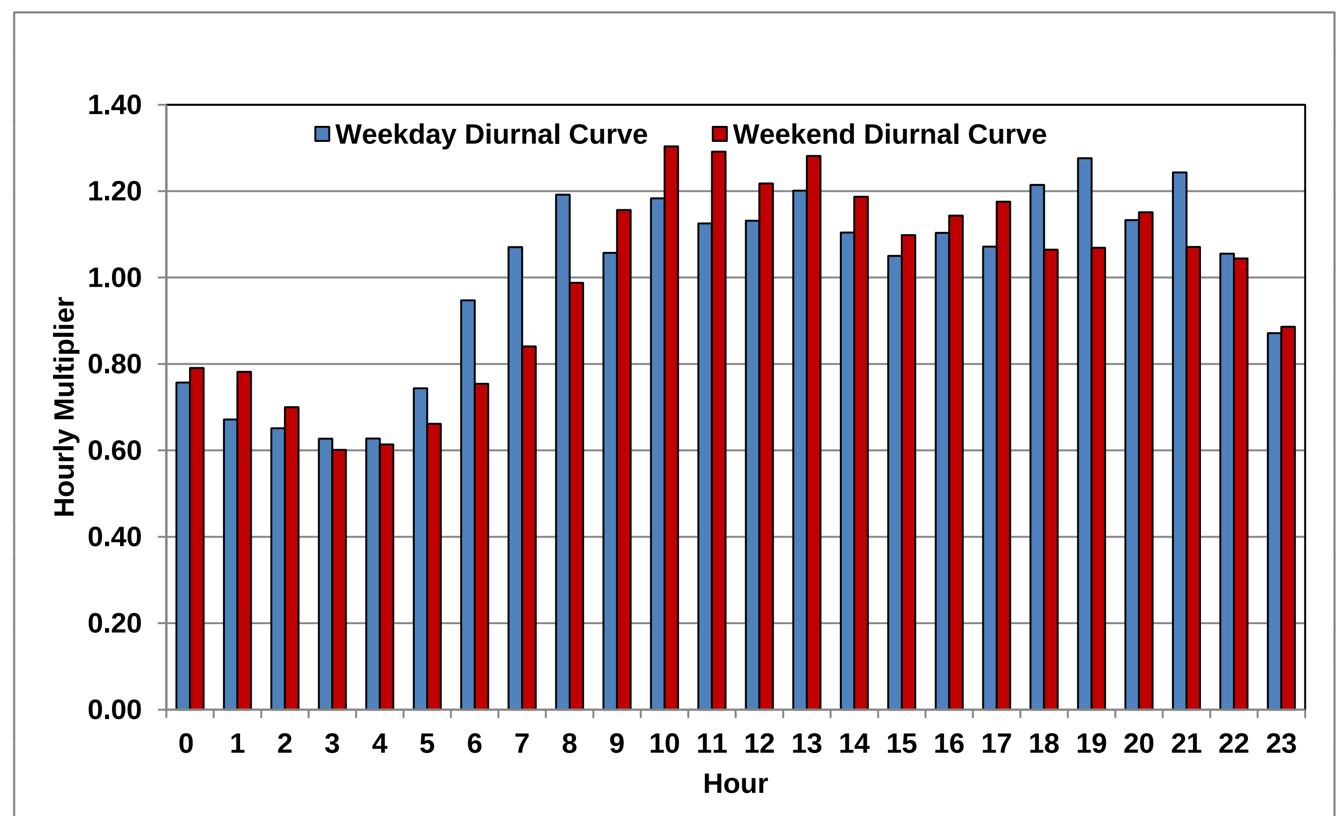




FLOW METER 59 ADWF CALIBRATION SUMMARY

ADWF Calibration Details				
			Diurnal Curve Details	
Hour	Measured ADWF (mgd)	Modeled ADWF (mgd)	Weekday	Weekend
0	0.027	0.027	0.76	0.79
1	0.024	0.023	0.67	0.78
2	0.023	0.023	0.65	0.70
3	0.022	0.022	0.63	0.60
4	0.022	0.022	0.63	0.61
5	0.026	0.026	0.74	0.66
6	0.033	0.033	0.95	0.75
7	0.037	0.037	1.07	0.84
8	0.042	0.042	1.19	0.99
9	0.037	0.037	1.06	1.16
10	0.041	0.041	1.18	1.30
11	0.039	0.040	1.13	1.29
12	0.040	0.040	1.13	1.22
13	0.042	0.042	1.20	1.28
14	0.039	0.038	1.10	1.19
15	0.037	0.037	1.05	1.10
16	0.039	0.039	1.10	1.14
17	0.038	0.038	1.07	1.18
18	0.043	0.042	1.21	1.06
19	0.045	0.045	1.28	1.07
20	0.040	0.040	1.13	1.15
21	0.044	0.043	1.24	1.07
22	0.037	0.037	1.06	1.04
23	0.031	0.031	0.87	0.89
Average	0.035	0.035	1.00	0.99
%Error		-0.1%		

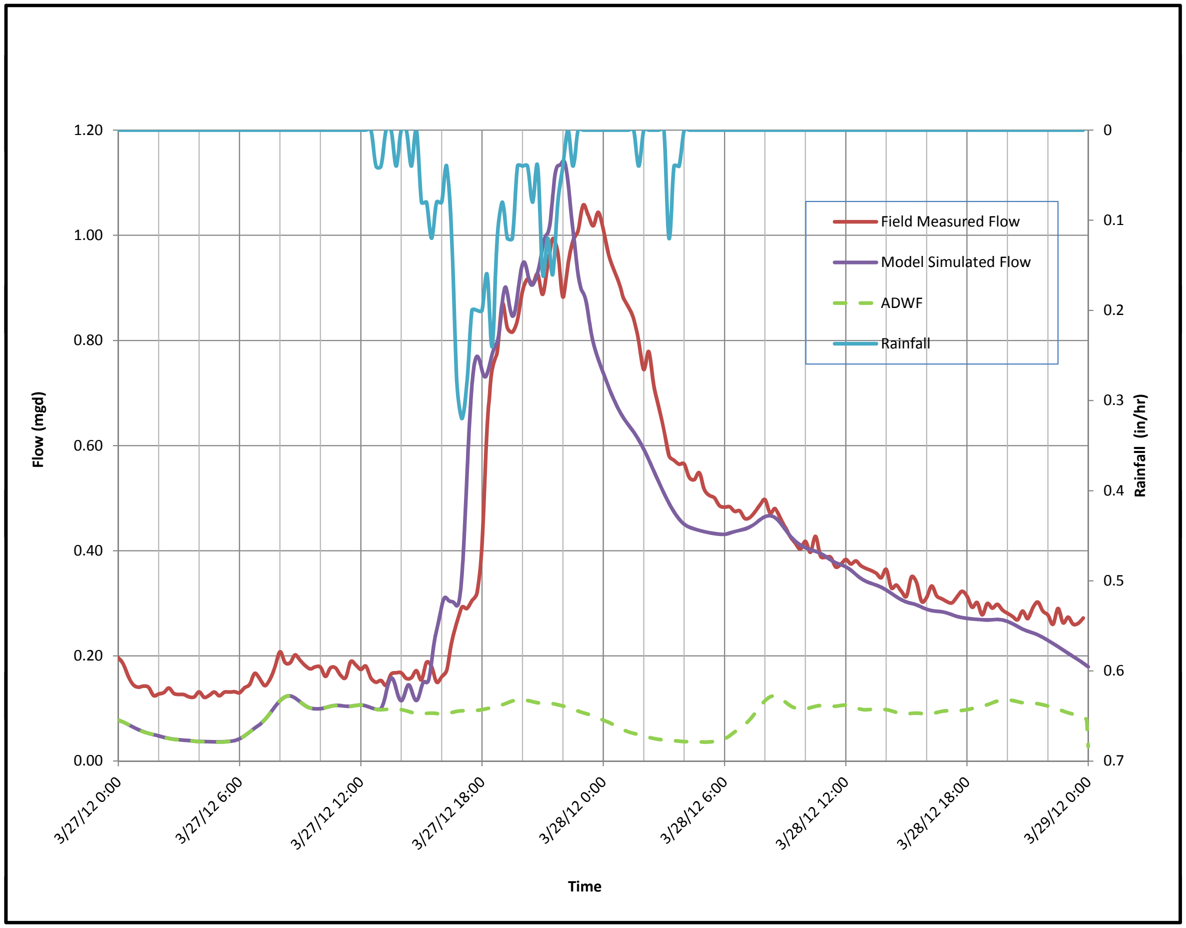




APPENDIX D – WET WEATHER FLOW CALIBRATION PLOTS

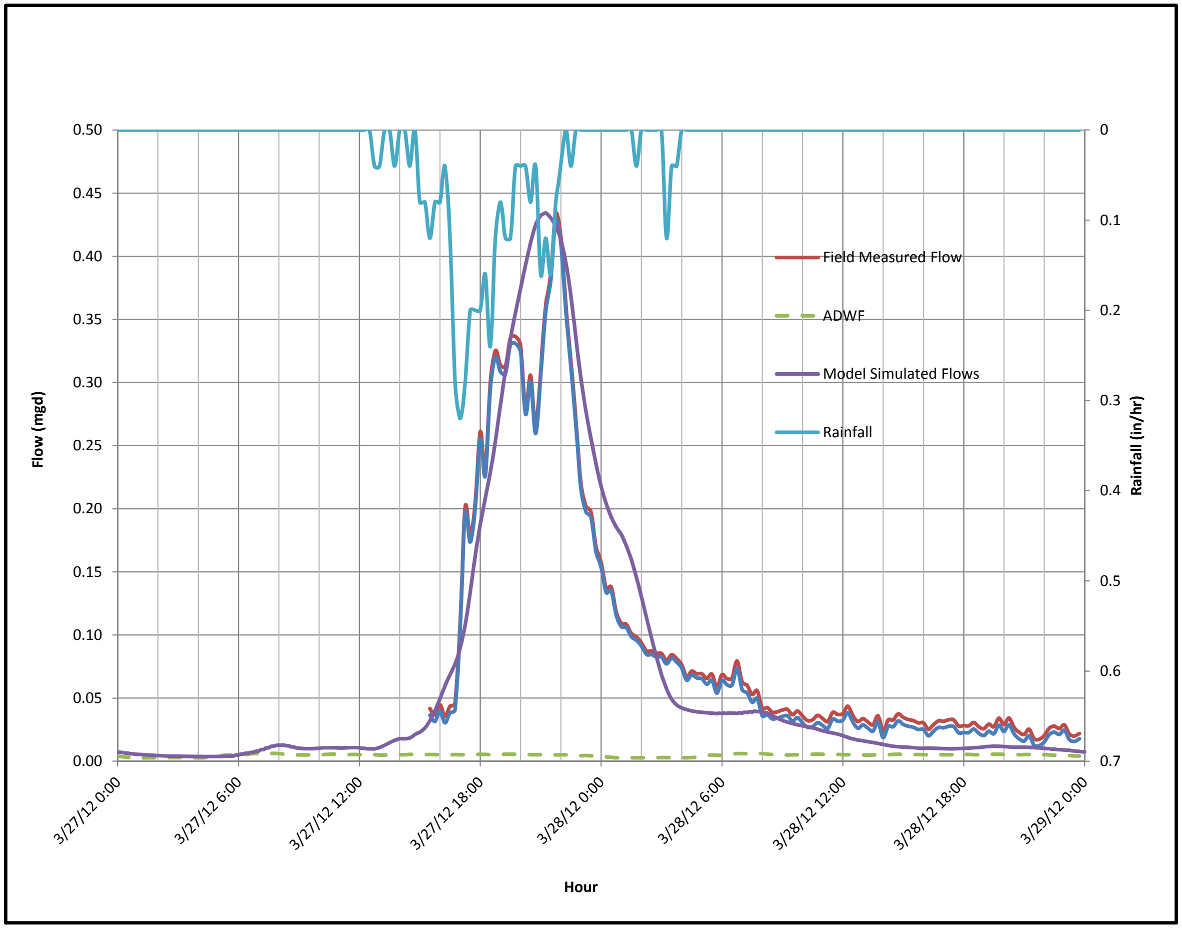
FLOW METER 61 WET WEATHER CALIBRATION SUMMARY

WWF Calibration Details				
March 27-28 Event				
Time	ADWF (mgd)	Rainfall (in/hr)	Measured Flow (mgd)	Modeled Flow (mgd)
3/27/2012 0:00	0.077	0.00	0.197	0.078
3/27/2012 1:00	0.058	0.00	0.141	0.059
3/27/2012 2:00	0.047	0.00	0.128	0.048
3/27/2012 3:00	0.040	0.00	0.127	0.040
3/27/2012 4:00	0.036	0.00	0.132	0.037
3/27/2012 5:00	0.036	0.00	0.124	0.036
3/27/2012 6:00	0.041	0.00	0.130	0.042
3/27/2012 7:00	0.069	0.00	0.156	0.069
3/27/2012 8:00	0.117	0.00	0.208	0.115
3/27/2012 9:00	0.111	0.00	0.191	0.113
3/27/2012 10:00	0.098	0.00	0.179	0.100
3/27/2012 11:00	0.105	0.00	0.163	0.105
3/27/2012 12:00	0.107	0.00	0.174	0.107
3/27/2012 13:00	0.096	0.04	0.153	0.100
3/27/2012 14:00	0.097	0.00	0.168	0.115
3/27/2012 15:00	0.088	0.08	0.154	0.140
3/27/2012 16:00	0.089	0.08	0.160	0.294
3/27/2012 17:00	0.096	0.32	0.293	0.351
3/27/2012 18:00	0.097	0.20	0.412	0.743
3/27/2012 19:00	0.106	0.08	0.870	0.870
3/27/2012 20:00	0.116	0.04	0.894	0.945
3/27/2012 21:00	0.109	0.16	0.888	0.979
3/27/2012 22:00	0.103	0.04	0.883	1.141
3/27/2012 23:00	0.090	0.00	1.057	0.891
3/28/2012 0:00	0.077	0.00	1.011	0.738
3/28/2012 1:00	0.058	0.00	0.880	0.653
3/28/2012 2:00	0.047	0.00	0.745	0.593
3/28/2012 3:00	0.040	0.00	0.630	0.510
3/28/2012 4:00	0.036	0.00	0.565	0.451
3/28/2012 5:00	0.036	0.00	0.516	0.436
3/28/2012 6:00	0.041	0.00	0.483	0.431
3/28/2012 7:00	0.069	0.00	0.461	0.441
3/28/2012 8:00	0.117	0.00	0.497	0.465
3/28/2012 9:00	0.111	0.00	0.445	0.441
3/28/2012 10:00	0.098	0.00	0.418	0.406
3/28/2012 11:00	0.105	0.00	0.388	0.389
3/28/2012 12:00	0.107	0.00	0.383	0.370
3/28/2012 13:00	0.096	0.00	0.366	0.342
3/28/2012 14:00	0.097	0.00	0.365	0.325
3/28/2012 15:00	0.088	0.00	0.313	0.303
3/28/2012 16:00	0.089	0.00	0.311	0.289
3/28/2012 17:00	0.096	0.00	0.303	0.282
3/28/2012 18:00	0.097	0.00	0.313	0.271
3/28/2012 19:00	0.106	0.00	0.300	0.268
3/28/2012 20:00	0.116	0.00	0.281	0.266
3/28/2012 21:00	0.109	0.00	0.271	0.247
3/28/2012 22:00	0.103	0.00	0.278	0.230
3/28/2012 23:00	0.090	0.00	0.274	0.205



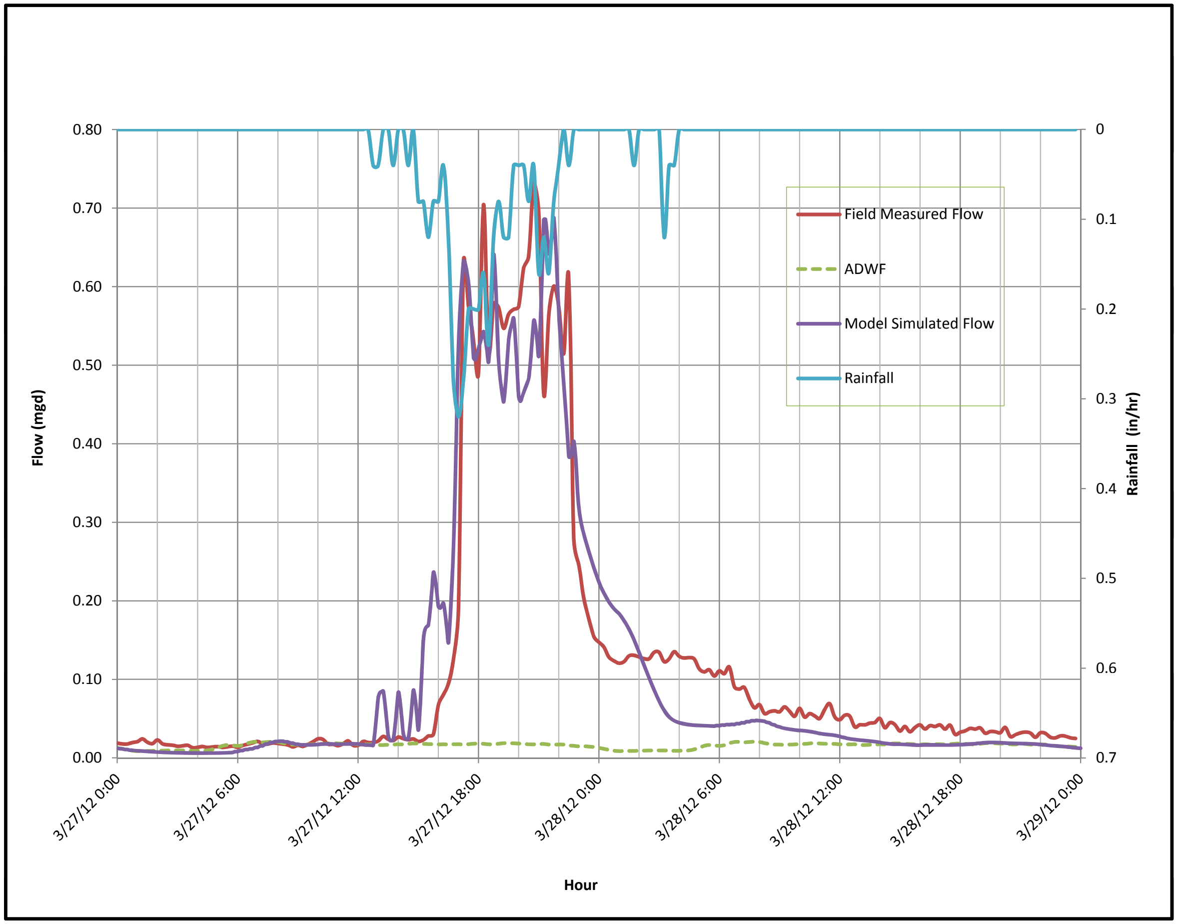
FLOW METER 406 WET WEATHER CALIBRATION SUMMARY

WWF Calibration Details				
March 27-28 Event				
Time	ADWF (mgd)	Rainfall (in/hr)	Measured Flow (mgd)	Modeled Flow (mgd)
3/27/2012 0:00	0.004	0.00	0.000	0.007
3/27/2012 1:00	0.003	0.00	0.000	0.006
3/27/2012 2:00	0.003	0.00	0.000	0.005
3/27/2012 3:00	0.003	0.00	0.000	0.004
3/27/2012 4:00	0.003	0.00	0.000	0.004
3/27/2012 5:00	0.004	0.00	0.000	0.004
3/27/2012 6:00	0.005	0.00	0.000	0.005
3/27/2012 7:00	0.006	0.00	0.000	0.008
3/27/2012 8:00	0.006	0.00	0.000	0.013
3/27/2012 9:00	0.005	0.00	0.000	0.010
3/27/2012 10:00	0.005	0.00	0.000	0.010
3/27/2012 11:00	0.006	0.00	0.000	0.010
3/27/2012 12:00	0.005	0.00	0.000	0.011
3/27/2012 13:00	0.005	0.04	0.000	0.011
3/27/2012 14:00	0.005	0.00	0.000	0.018
3/27/2012 15:00	0.006	0.08	0.000	0.023
3/27/2012 16:00	0.005	0.08	0.045	0.050
3/27/2012 17:00	0.005	0.32	0.109	0.089
3/27/2012 18:00	0.006	0.20	0.261	0.188
3/27/2012 19:00	0.005	0.08	0.314	0.282
3/27/2012 20:00	0.005	0.04	0.330	0.374
3/27/2012 21:00	0.005	0.16	0.309	0.432
3/27/2012 22:00	0.005	0.04	0.416	0.413
3/27/2012 23:00	0.004	0.00	0.220	0.303
3/28/2012 0:00	0.004	0.00	0.158	0.218
3/28/2012 1:00	0.003	0.00	0.109	0.180
3/28/2012 2:00	0.003	0.00	0.094	0.130
3/28/2012 3:00	0.003	0.00	0.085	0.068
3/28/2012 4:00	0.003	0.00	0.077	0.042
3/28/2012 5:00	0.004	0.00	0.069	0.039
3/28/2012 6:00	0.005	0.00	0.069	0.038
3/28/2012 7:00	0.006	0.00	0.063	0.038
3/28/2012 8:00	0.006	0.00	0.042	0.039
3/28/2012 9:00	0.005	0.00	0.041	0.033
3/28/2012 10:00	0.005	0.00	0.036	0.028
3/28/2012 11:00	0.006	0.00	0.034	0.024
3/28/2012 12:00	0.005	0.00	0.038	0.020
3/28/2012 13:00	0.005	0.00	0.034	0.016
3/28/2012 14:00	0.005	0.00	0.024	0.013
3/28/2012 15:00	0.006	0.00	0.035	0.011
3/28/2012 16:00	0.005	0.00	0.031	0.010
3/28/2012 17:00	0.005	0.00	0.032	0.010
3/28/2012 18:00	0.006	0.00	0.028	0.010
3/28/2012 19:00	0.005	0.00	0.026	0.011
3/28/2012 20:00	0.005	0.00	0.029	0.012
3/28/2012 21:00	0.005	0.00	0.021	0.011
3/28/2012 22:00	0.005	0.00	0.020	0.010
3/28/2012 23:00	0.004	0.00	0.029	0.009



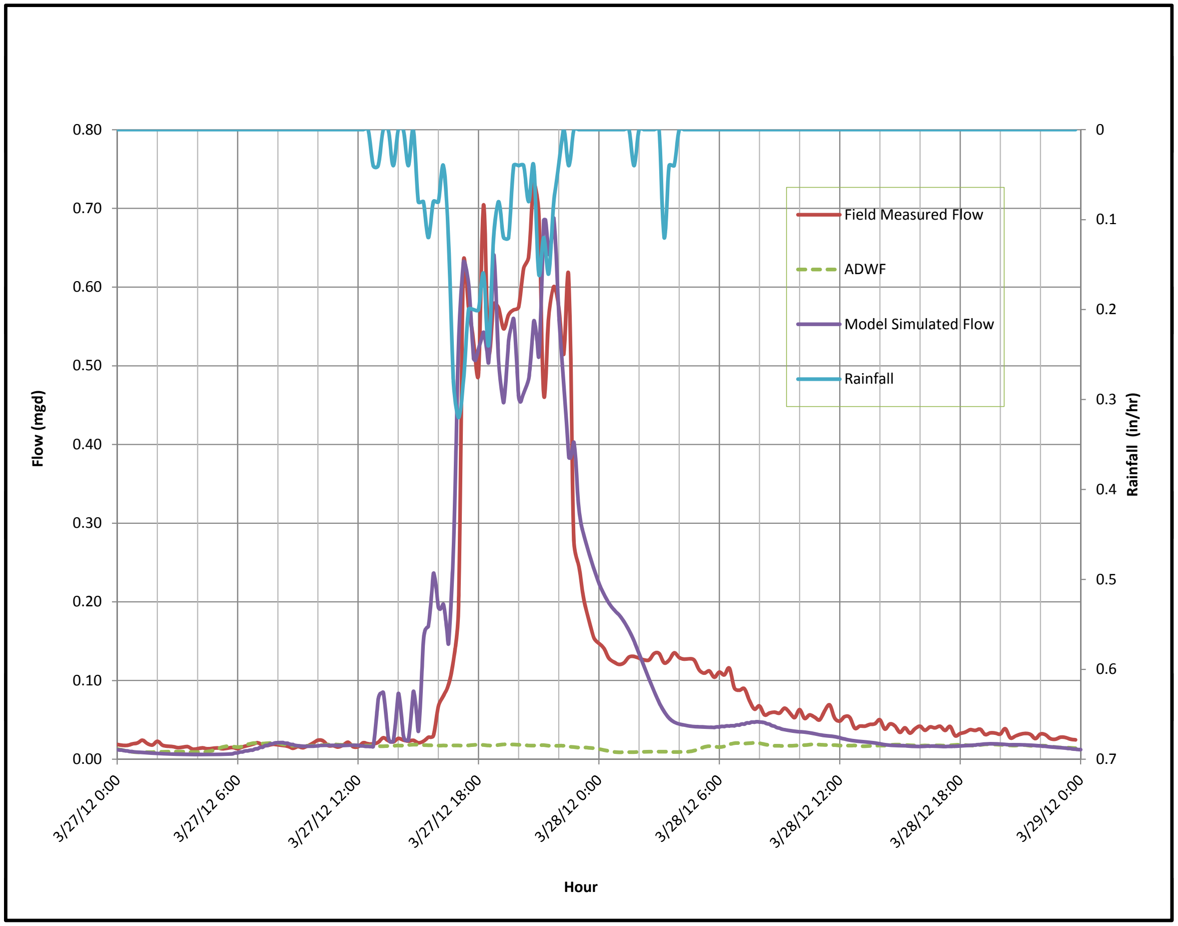
FLOW METER 408 WET WEATHER CALIBRATION SUMMARY

WWF Calibration Details March 27-28 Event				
Time	ADWF (mgd)	Rainfall (in/hr)	Measured Flow (mgd)	Modeled Flow (mgd)
3/27/2012 0:00	0.013	0.00	0.019	0.012
3/27/2012 1:00	0.009	0.00	0.021	0.009
3/27/2012 2:00	0.009	0.00	0.023	0.008
3/27/2012 3:00	0.010	0.00	0.015	0.007
3/27/2012 4:00	0.009	0.00	0.014	0.006
3/27/2012 5:00	0.013	0.00	0.014	0.006
3/27/2012 6:00	0.016	0.00	0.014	0.008
3/27/2012 7:00	0.020	0.00	0.021	0.013
3/27/2012 8:00	0.020	0.00	0.018	0.021
3/27/2012 9:00	0.017	0.00	0.016	0.017
3/27/2012 10:00	0.018	0.00	0.024	0.017
3/27/2012 11:00	0.018	0.00	0.016	0.017
3/27/2012 12:00	0.017	0.00	0.016	0.018
3/27/2012 13:00	0.017	0.04	0.022	0.077
3/27/2012 14:00	0.017	0.00	0.027	0.084
3/27/2012 15:00	0.019	0.08	0.021	0.035
3/27/2012 16:00	0.017	0.08	0.068	0.193
3/27/2012 17:00	0.017	0.32	0.190	0.529
3/27/2012 18:00	0.019	0.20	0.490	0.522
3/27/2012 19:00	0.018	0.08	0.573	0.504
3/27/2012 20:00	0.018	0.04	0.575	0.460
3/27/2012 21:00	0.018	0.16	0.694	0.512
3/27/2012 22:00	0.017	0.04	0.574	0.566
3/27/2012 23:00	0.015	0.00	0.246	0.317
3/28/2012 0:00	0.013	0.00	0.147	0.224
3/28/2012 1:00	0.009	0.00	0.121	0.184
3/28/2012 2:00	0.009	0.00	0.128	0.134
3/28/2012 3:00	0.010	0.00	0.134	0.072
3/28/2012 4:00	0.009	0.00	0.129	0.045
3/28/2012 5:00	0.013	0.00	0.113	0.041
3/28/2012 6:00	0.016	0.00	0.111	0.041
3/28/2012 7:00	0.020	0.00	0.088	0.043
3/28/2012 8:00	0.020	0.00	0.068	0.047
3/28/2012 9:00	0.017	0.00	0.059	0.040
3/28/2012 10:00	0.018	0.00	0.063	0.035
3/28/2012 11:00	0.018	0.00	0.050	0.031
3/28/2012 12:00	0.017	0.00	0.049	0.028
3/28/2012 13:00	0.017	0.00	0.042	0.023
3/28/2012 14:00	0.017	0.00	0.050	0.020
3/28/2012 15:00	0.019	0.00	0.034	0.017
3/28/2012 16:00	0.017	0.00	0.042	0.016
3/28/2012 17:00	0.017	0.00	0.042	0.016
3/28/2012 18:00	0.019	0.00	0.033	0.017
3/28/2012 19:00	0.018	0.00	0.038	0.019
3/28/2012 20:00	0.018	0.00	0.032	0.019
3/28/2012 21:00	0.018	0.00	0.032	0.019
3/28/2012 22:00	0.017	0.00	0.032	0.017
3/28/2012 23:00	0.015	0.00	0.028	0.015



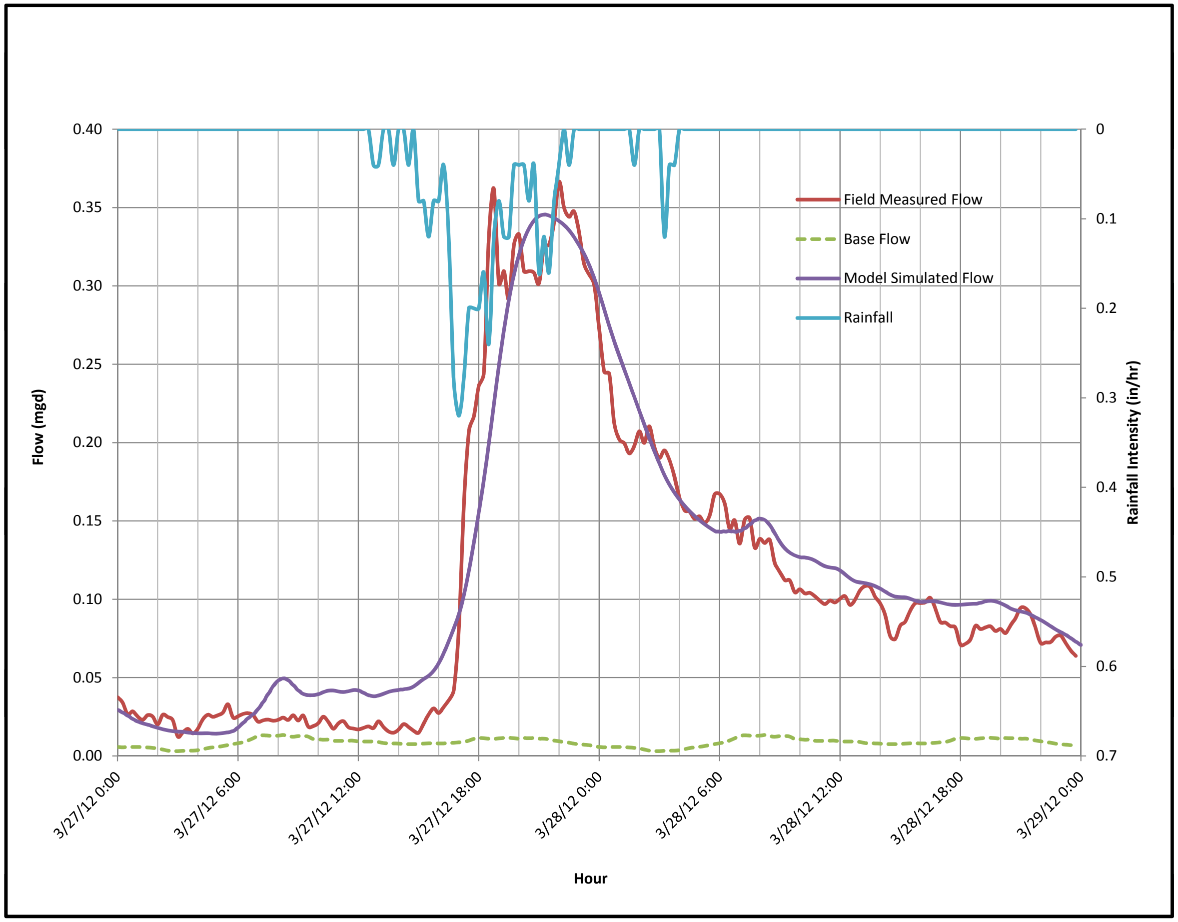
FLOW METER 368 WET WEATHER CALIBRATION SUMMARY

WWF Calibration Details March 27-28 Event				
Time	ADWF (mgd)	Rainfall (in/hr)	Measured Flow (mgd)	Modeled Flow (mgd)
3/27/2012 0:00	0.005	0.00	0.017	0.011
3/27/2012 1:00	0.005	0.00	0.010	0.008
3/27/2012 2:00	0.006	0.00	0.009	0.007
3/27/2012 3:00	0.006	0.00	0.008	0.006
3/27/2012 4:00	0.006	0.00	0.010	0.005
3/27/2012 5:00	0.006	0.00	0.009	0.005
3/27/2012 6:00	0.008	0.00	0.010	0.007
3/27/2012 7:00	0.013	0.00	0.016	0.011
3/27/2012 8:00	0.012	0.00	0.019	0.018
3/27/2012 9:00	0.012	0.00	0.017	0.015
3/27/2012 10:00	0.012	0.00	0.018	0.015
3/27/2012 11:00	0.009	0.00	0.019	0.015
3/27/2012 12:00	0.010	0.00	0.019	0.015
3/27/2012 13:00	0.007	0.04	0.015	0.014
3/27/2012 14:00	0.009	0.00	0.016	0.016
3/27/2012 15:00	0.008	0.08	0.012	0.019
3/27/2012 16:00	0.007	0.08	0.022	0.026
3/27/2012 17:00	0.009	0.32	0.032	0.041
3/27/2012 18:00	0.012	0.20	0.082	0.074
3/27/2012 19:00	0.012	0.08	0.138	0.121
3/27/2012 20:00	0.010	0.04	0.152	0.155
3/27/2012 21:00	0.011	0.16	0.140	0.167
3/27/2012 22:00	0.008	0.04	0.163	0.163
3/27/2012 23:00	0.005	0.00	0.153	0.152
3/28/2012 0:00	0.005	0.00	0.104	0.133
3/28/2012 1:00	0.005	0.00	0.080	0.109
3/28/2012 2:00	0.006	0.00	0.060	0.087
3/28/2012 3:00	0.006	0.00	0.049	0.065
3/28/2012 4:00	0.006	0.00	0.047	0.050
3/28/2012 5:00	0.006	0.00	0.044	0.042
3/28/2012 6:00	0.008	0.00	0.043	0.039
3/28/2012 7:00	0.013	0.00	0.044	0.039
3/28/2012 8:00	0.012	0.00	0.045	0.043
3/28/2012 9:00	0.012	0.00	0.038	0.038
3/28/2012 10:00	0.012	0.00	0.039	0.036
3/28/2012 11:00	0.009	0.00	0.029	0.035
3/28/2012 12:00	0.010	0.00	0.039	0.034
3/28/2012 13:00	0.007	0.00	0.032	0.031
3/28/2012 14:00	0.009	0.00	0.034	0.029
3/28/2012 15:00	0.008	0.00	0.032	0.027
3/28/2012 16:00	0.007	0.00	0.028	0.025
3/28/2012 17:00	0.009	0.00	0.024	0.025
3/28/2012 18:00	0.012	0.00	0.024	0.024
3/28/2012 19:00	0.012	0.00	0.021	0.024
3/28/2012 20:00	0.010	0.00	0.023	0.023
3/28/2012 21:00	0.011	0.00	0.025	0.021
3/28/2012 22:00	0.008	0.00	0.020	0.018
3/28/2012 23:00	0.005	0.00	0.021	0.015



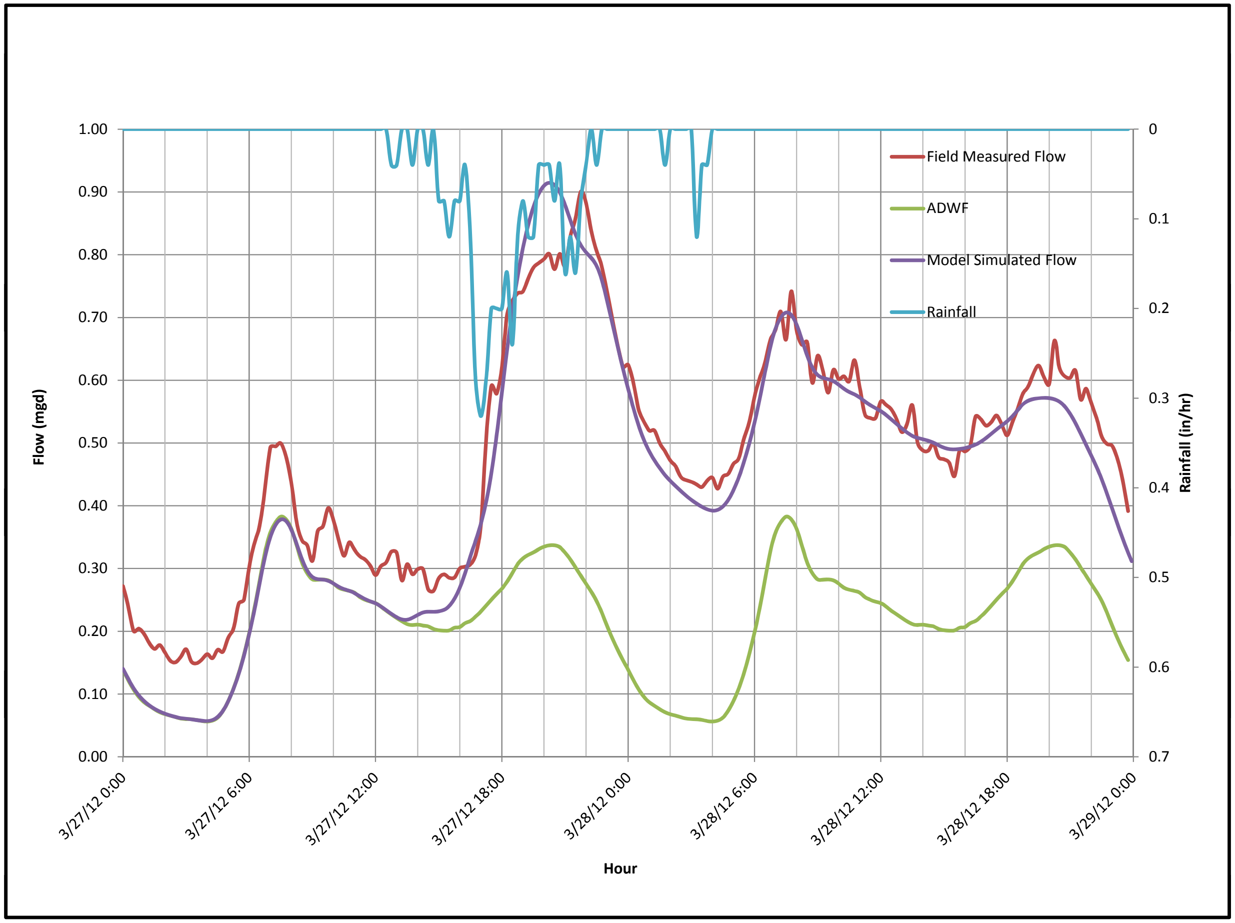
FLOW METER 83 WET WEATHER CALIBRATION SUMMARY

WWF Calibration Details				
March 27-28 Event				
Time	ADWF (mgd)	Rainfall (in/hr)	Measured Flow (mgd)	Modeled Flow (mgd)
3/27/2012 0:00	0.006	0.00	0.037	0.029
3/27/2012 1:00	0.006	0.00	0.025	0.022
3/27/2012 2:00	0.005	0.00	0.020	0.018
3/27/2012 3:00	0.003	0.00	0.012	0.016
3/27/2012 4:00	0.004	0.00	0.017	0.014
3/27/2012 5:00	0.006	0.00	0.026	0.014
3/27/2012 6:00	0.008	0.00	0.025	0.018
3/27/2012 7:00	0.013	0.00	0.022	0.030
3/27/2012 8:00	0.013	0.00	0.023	0.048
3/27/2012 9:00	0.013	0.00	0.023	0.042
3/27/2012 10:00	0.011	0.00	0.021	0.039
3/27/2012 11:00	0.010	0.00	0.021	0.041
3/27/2012 12:00	0.009	0.00	0.017	0.042
3/27/2012 13:00	0.009	0.04	0.022	0.039
3/27/2012 14:00	0.008	0.00	0.017	0.042
3/27/2012 15:00	0.008	0.08	0.015	0.047
3/27/2012 16:00	0.008	0.08	0.027	0.059
3/27/2012 17:00	0.009	0.32	0.081	0.090
3/27/2012 18:00	0.011	0.20	0.236	0.156
3/27/2012 19:00	0.011	0.08	0.302	0.249
3/27/2012 20:00	0.011	0.04	0.333	0.320
3/27/2012 21:00	0.011	0.16	0.302	0.345
3/27/2012 22:00	0.009	0.04	0.366	0.341
3/27/2012 23:00	0.007	0.00	0.334	0.326
3/28/2012 0:00	0.006	0.00	0.273	0.295
3/28/2012 1:00	0.006	0.00	0.202	0.255
3/28/2012 2:00	0.005	0.00	0.207	0.220
3/28/2012 3:00	0.003	0.00	0.190	0.187
3/28/2012 4:00	0.004	0.00	0.165	0.163
3/28/2012 5:00	0.006	0.00	0.153	0.150
3/28/2012 6:00	0.008	0.00	0.167	0.143
3/28/2012 7:00	0.013	0.00	0.136	0.144
3/28/2012 8:00	0.013	0.00	0.139	0.152
3/28/2012 9:00	0.013	0.00	0.118	0.137
3/28/2012 10:00	0.011	0.00	0.106	0.127
3/28/2012 11:00	0.010	0.00	0.099	0.123
3/28/2012 12:00	0.009	0.00	0.100	0.118
3/28/2012 13:00	0.009	0.00	0.106	0.111
3/28/2012 14:00	0.008	0.00	0.097	0.107
3/28/2012 15:00	0.008	0.00	0.083	0.101
3/28/2012 16:00	0.008	0.00	0.098	0.098
3/28/2012 17:00	0.009	0.00	0.085	0.098
3/28/2012 18:00	0.011	0.00	0.071	0.096
3/28/2012 19:00	0.011	0.00	0.081	0.098
3/28/2012 20:00	0.011	0.00	0.081	0.097
3/28/2012 21:00	0.011	0.00	0.094	0.092
3/28/2012 22:00	0.009	0.00	0.072	0.087
3/28/2012 23:00	0.007	0.00	0.077	0.079



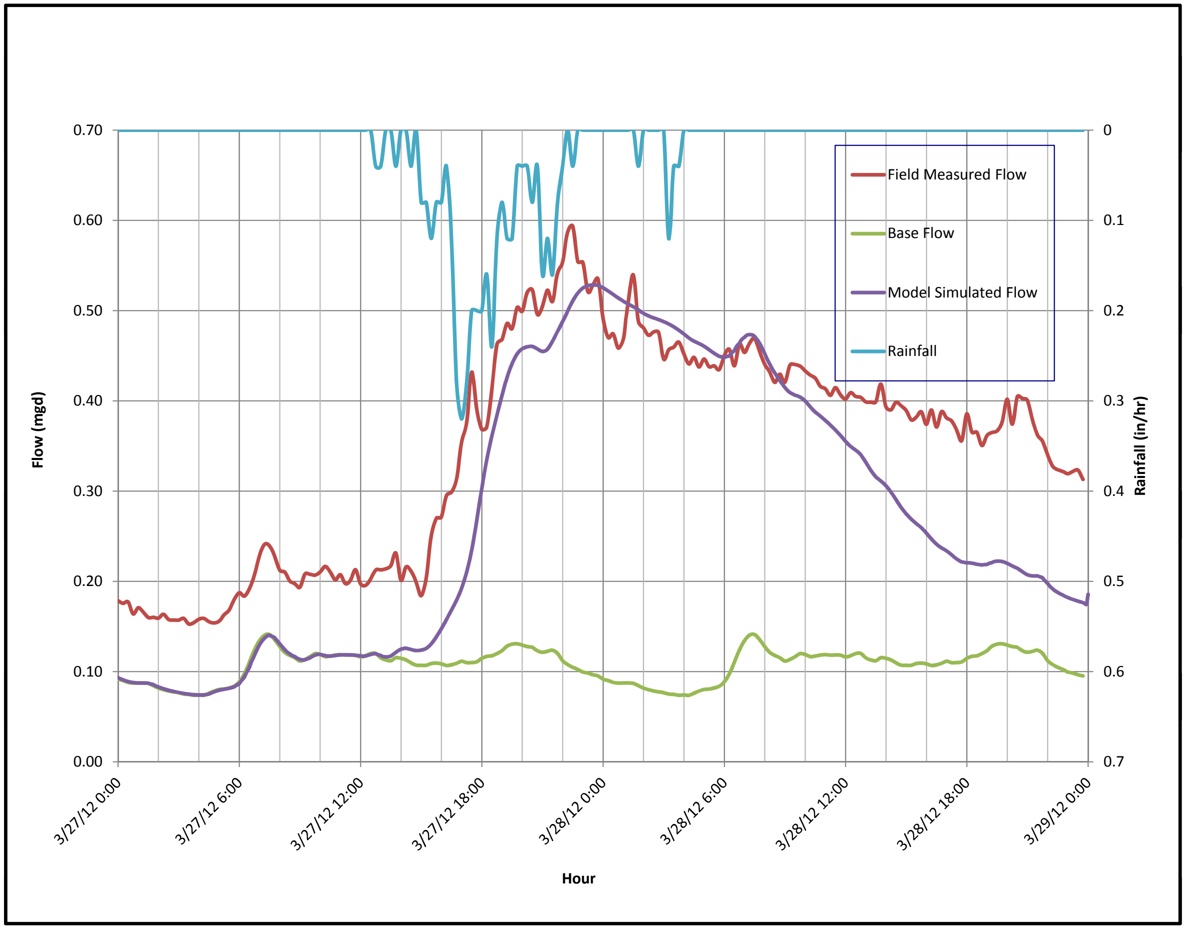
FLOW METER 327 WET WEATHER CALIBRATION SUMMARY

WWF Calibration Details March 27-28 Event				
Time	ADWF (mgd)	Rainfall (in/hr)	Measured Flow (mgd)	Modeled Flow (mgd)
3/27/2012 0:00	0.139	0.00	0.272	0.140
3/27/2012 1:00	0.122	0.00	0.196	0.089
3/27/2012 2:00	0.107	0.00	0.166	0.069
3/27/2012 3:00	0.095	0.00	0.171	0.060
3/27/2012 4:00	0.087	0.00	0.164	0.057
3/27/2012 5:00	0.081	0.00	0.190	0.088
3/27/2012 6:00	0.076	0.00	0.304	0.196
3/27/2012 7:00	0.071	0.00	0.493	0.350
3/27/2012 8:00	0.068	0.00	0.436	0.362
3/27/2012 9:00	0.066	0.00	0.312	0.287
3/27/2012 10:00	0.063	0.00	0.377	0.276
3/27/2012 11:00	0.061	0.00	0.330	0.261
3/27/2012 12:00	0.060	0.00	0.290	0.245
3/27/2012 13:00	0.060	0.04	0.325	0.222
3/27/2012 14:00	0.059	0.00	0.299	0.226
3/27/2012 15:00	0.057	0.08	0.284	0.232
3/27/2012 16:00	0.056	0.08	0.300	0.270
3/27/2012 17:00	0.058	0.32	0.368	0.371
3/27/2012 18:00	0.062	0.20	0.620	0.581
3/27/2012 19:00	0.073	0.08	0.741	0.811
3/27/2012 20:00	0.088	0.04	0.793	0.910
3/27/2012 21:00	0.109	0.16	0.782	0.879
3/27/2012 22:00	0.133	0.04	0.882	0.804
3/27/2012 23:00	0.164	0.00	0.741	0.727
3/28/2012 0:00	0.197	0.00	0.624	0.586
3/28/2012 1:00	0.238	0.00	0.520	0.487
3/28/2012 2:00	0.282	0.00	0.472	0.440
3/28/2012 3:00	0.327	0.00	0.438	0.409
3/28/2012 4:00	0.358	0.00	0.445	0.392
3/28/2012 5:00	0.374	0.00	0.467	0.425
3/28/2012 6:00	0.383	0.00	0.573	0.532
3/28/2012 7:00	0.378	0.00	0.681	0.682
3/28/2012 8:00	0.363	0.00	0.679	0.689
3/28/2012 9:00	0.337	0.00	0.639	0.609
3/28/2012 10:00	0.310	0.00	0.602	0.593
3/28/2012 11:00	0.293	0.00	0.589	0.573
3/28/2012 12:00	0.283	0.00	0.566	0.551
3/28/2012 13:00	0.282	0.00	0.517	0.523
3/28/2012 14:00	0.283	0.00	0.488	0.506
3/28/2012 15:00	0.281	0.00	0.474	0.493
3/28/2012 16:00	0.276	0.00	0.487	0.492
3/28/2012 17:00	0.269	0.00	0.528	0.508
3/28/2012 18:00	0.266	0.00	0.512	0.535
3/28/2012 19:00	0.264	0.00	0.590	0.568
3/28/2012 20:00	0.262	0.00	0.594	0.572
3/28/2012 21:00	0.254	0.00	0.604	0.546
3/28/2012 22:00	0.250	0.00	0.563	0.480
3/28/2012 23:00	0.247	0.00	0.495	0.395



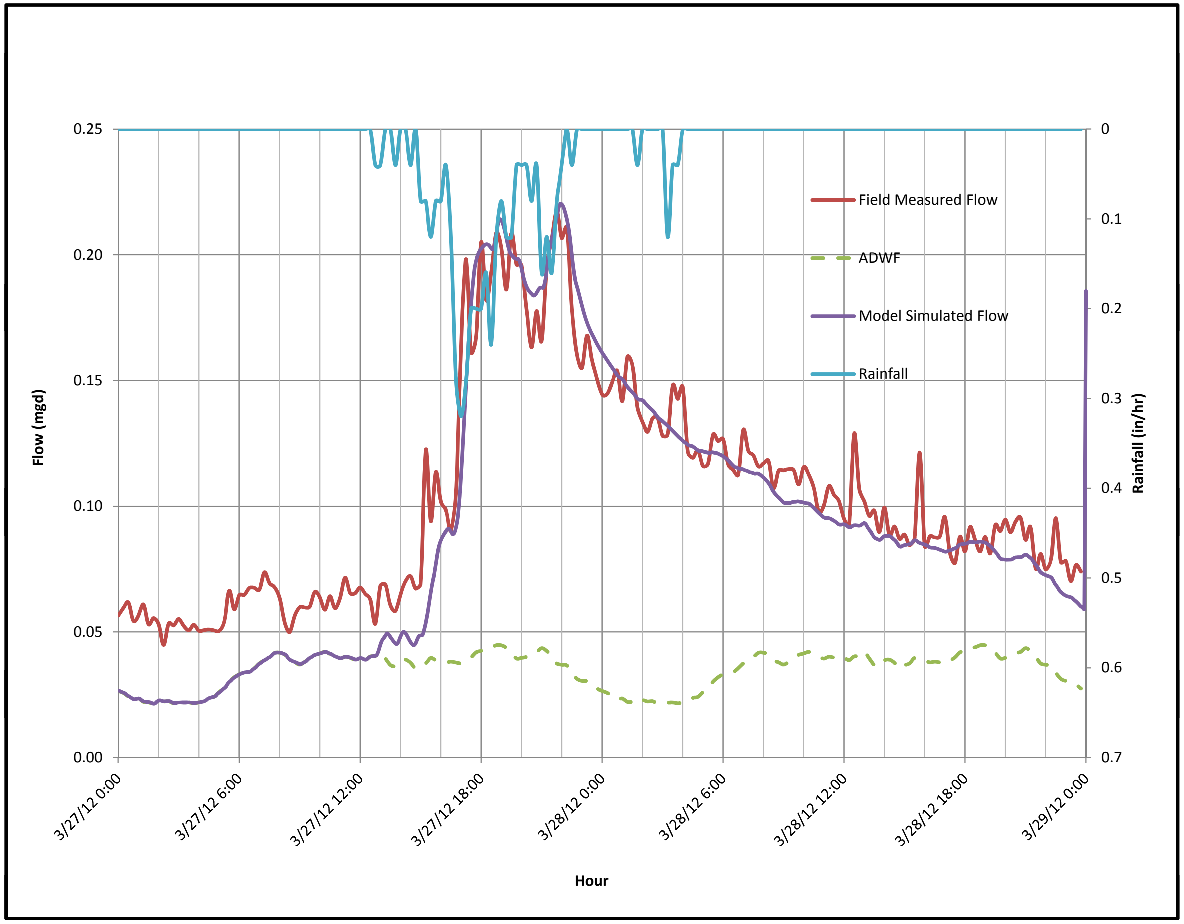
FLOW METER 54 WET WEATHER CALIBRATION SUMMARY

WWF Calibration Details				
March 27-28 Event				
Time	ADWF (mgd)	Rainfall (in/hr)	Measured Flow (mgd)	Modeled Flow (mgd)
3/27/2012 0:00	0.092	0.00	0.179	0.093
3/27/2012 1:00	0.087	0.00	0.171	0.087
3/27/2012 2:00	0.082	0.00	0.159	0.083
3/27/2012 3:00	0.077	0.00	0.157	0.077
3/27/2012 4:00	0.074	0.00	0.158	0.074
3/27/2012 5:00	0.080	0.00	0.156	0.079
3/27/2012 6:00	0.089	0.00	0.187	0.087
3/27/2012 7:00	0.134	0.00	0.229	0.129
3/27/2012 8:00	0.128	0.00	0.212	0.131
3/27/2012 9:00	0.112	0.00	0.193	0.114
3/27/2012 10:00	0.119	0.00	0.210	0.119
3/27/2012 11:00	0.119	0.00	0.207	0.119
3/27/2012 12:00	0.116	0.00	0.197	0.117
3/27/2012 13:00	0.115	0.04	0.213	0.118
3/27/2012 14:00	0.115	0.00	0.201	0.125
3/27/2012 15:00	0.107	0.08	0.184	0.124
3/27/2012 16:00	0.109	0.08	0.271	0.148
3/27/2012 17:00	0.111	0.32	0.354	0.192
3/27/2012 18:00	0.115	0.20	0.368	0.303
3/27/2012 19:00	0.123	0.08	0.468	0.406
3/27/2012 20:00	0.129	0.04	0.500	0.458
3/27/2012 21:00	0.121	0.16	0.505	0.455
3/27/2012 22:00	0.112	0.04	0.554	0.488
3/27/2012 23:00	0.100	0.00	0.553	0.525
3/28/2012 0:00	0.092	0.00	0.492	0.525
3/28/2012 1:00	0.087	0.00	0.468	0.510
3/28/2012 2:00	0.082	0.00	0.481	0.497
3/28/2012 3:00	0.077	0.00	0.446	0.488
3/28/2012 4:00	0.074	0.00	0.452	0.474
3/28/2012 5:00	0.080	0.00	0.446	0.460
3/28/2012 6:00	0.089	0.00	0.450	0.448
3/28/2012 7:00	0.134	0.00	0.454	0.471
3/28/2012 8:00	0.128	0.00	0.441	0.452
3/28/2012 9:00	0.112	0.00	0.421	0.415
3/28/2012 10:00	0.119	0.00	0.433	0.400
3/28/2012 11:00	0.119	0.00	0.413	0.378
3/28/2012 12:00	0.116	0.00	0.402	0.355
3/28/2012 13:00	0.115	0.00	0.399	0.332
3/28/2012 14:00	0.115	0.00	0.393	0.306
3/28/2012 15:00	0.107	0.00	0.389	0.275
3/28/2012 16:00	0.109	0.00	0.374	0.254
3/28/2012 17:00	0.111	0.00	0.381	0.234
3/28/2012 18:00	0.115	0.00	0.386	0.221
3/28/2012 19:00	0.123	0.00	0.362	0.219
3/28/2012 20:00	0.129	0.00	0.402	0.220
3/28/2012 21:00	0.121	0.00	0.401	0.207
3/28/2012 22:00	0.112	0.00	0.340	0.198
3/28/2012 23:00	0.100	0.00	0.319	0.182



FLOW METER 59 WET WEATHER CALIBRATION SUMMARY

WWF Calibration Details March 27-28 Event				
Time	ADWF (mgd)	Rainfall (in/hr)	Measured Flow (mgd)	Modeled Flow (mgd)
3/27/2012 0:00	0.027	0.00	0.056	0.027
3/27/2012 1:00	0.024	0.00	0.056	0.023
3/27/2012 2:00	0.023	0.00	0.053	0.023
3/27/2012 3:00	0.022	0.00	0.055	0.022
3/27/2012 4:00	0.022	0.00	0.050	0.022
3/27/2012 5:00	0.026	0.00	0.050	0.026
3/27/2012 6:00	0.033	0.00	0.065	0.033
3/27/2012 7:00	0.037	0.00	0.067	0.037
3/27/2012 8:00	0.042	0.00	0.064	0.042
3/27/2012 9:00	0.037	0.00	0.060	0.037
3/27/2012 10:00	0.041	0.00	0.064	0.041
3/27/2012 11:00	0.039	0.00	0.064	0.040
3/27/2012 12:00	0.040	0.00	0.068	0.040
3/27/2012 13:00	0.042	0.04	0.068	0.045
3/27/2012 14:00	0.039	0.00	0.065	0.048
3/27/2012 15:00	0.037	0.08	0.069	0.049
3/27/2012 16:00	0.039	0.08	0.102	0.086
3/27/2012 17:00	0.038	0.32	0.163	0.112
3/27/2012 18:00	0.043	0.20	0.205	0.202
3/27/2012 19:00	0.045	0.08	0.203	0.214
3/27/2012 20:00	0.040	0.04	0.196	0.195
3/27/2012 21:00	0.044	0.16	0.166	0.187
3/27/2012 22:00	0.037	0.04	0.207	0.220
3/27/2012 23:00	0.031	0.00	0.155	0.180
3/28/2012 0:00	0.027	0.00	0.144	0.161
3/28/2012 1:00	0.024	0.00	0.142	0.151
3/28/2012 2:00	0.023	0.00	0.134	0.142
3/28/2012 3:00	0.022	0.00	0.128	0.134
3/28/2012 4:00	0.022	0.00	0.147	0.126
3/28/2012 5:00	0.026	0.00	0.116	0.122
3/28/2012 6:00	0.033	0.00	0.127	0.120
3/28/2012 7:00	0.037	0.00	0.130	0.115
3/28/2012 8:00	0.042	0.00	0.117	0.111
3/28/2012 9:00	0.037	0.00	0.114	0.101
3/28/2012 10:00	0.041	0.00	0.116	0.101
3/28/2012 11:00	0.039	0.00	0.100	0.096
3/28/2012 12:00	0.040	0.00	0.095	0.093
3/28/2012 13:00	0.042	0.00	0.102	0.093
3/28/2012 14:00	0.039	0.00	0.099	0.088
3/28/2012 15:00	0.037	0.00	0.089	0.085
3/28/2012 16:00	0.039	0.00	0.084	0.085
3/28/2012 17:00	0.038	0.00	0.096	0.082
3/28/2012 18:00	0.043	0.00	0.082	0.085
3/28/2012 19:00	0.045	0.00	0.088	0.086
3/28/2012 20:00	0.040	0.00	0.095	0.079
3/28/2012 21:00	0.044	0.00	0.087	0.081
3/28/2012 22:00	0.037	0.00	0.075	0.073
3/28/2012 23:00	0.031	0.00	0.078	0.064



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6/3/13

RODEO SANITARY DISTRICT
COMPREHENSIVE WASTEWATER MASTER PLAN

TECHNICAL MEMORANDUM NO. 5
WASTEWATER TREATMENT PLANT ASSESSMENT

FINAL
June 2013

2700 YGNACIO VALLEY ROAD, SUITE 300 • WALNUT CREEK, CALIFORNIA 94598 • P. 925.932.1710 • F. 925.930.0208

RODEO SANITARY DISTRICT
COMPREHENSIVE WASTEWATER MASTER PLAN

TECHNICAL MEMORANDUM
NO. 5
WASTEWATER TREATMENT PLANT ASSESSMENT

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WASTEWATER TREATMENT PLANT ASSESSMENT

1.0 PURPOSE

The purpose of this technical memorandum (TM) is to provide an assessment of the Rodeo Sanitary District (District) wastewater treatment plant (WWTP) facilities as part of the Comprehensive Wastewater Master Plan (CWWMP). This TM summarizes the District's existing wastewater treatment facilities and includes a condition assessment, hydraulic capacity evaluation, and a process capacity evaluation.

2.0 SUMMARY OF FINDINGS AND RECOMMENDATIONS

The key findings and recommendations of this TM are summarized below:

- A condition assessment of the WWTP was performed to identify rehabilitation and replacement needs and projects. The projects are categorized as near term (within the next five years) or long term (within five to twenty years). See Section 4 of this TM for a description of the condition assessment and findings.
- The WWTP has sufficient hydraulic capacity for the National Pollutant Discharge Elimination System (NPDES) permitted average dry weather flow (ADWF) of 1.14 million gallons per day (mgd) and the peak wet weather flow (PWWF) of 3.4 mgd without overtopping structures. However, at higher PWWFs, the WWTP operates with little to no freeboard. See Section 5 of this TM for a description of the hydraulic capacity evaluation and findings.
- Most of the unit processes have performed well and have sufficient carbonaceous biochemical oxygen demand (BOD_5) treatment capacity to handle flows up to the rated NPDES permit capacity of the WWTP. As flows approach the rated NPDES permit capacity, capital projects will be needed to increase the capacity of the primary clarifiers and return activated sludge pumping system. In addition, operational changes may be needed for the rotary drum thickener and anaerobic digesters. See Section 6 of this TM for a description of the process capacity evaluation and findings.

3.0 BACKGROUND

Rodeo Sanitary District collects raw wastewater from the unincorporated communities of Rodeo and Tormey. The District's WWTP is located at 800 San Pablo Avenue in Rodeo, California and was originally commissioned as a primary treatment plant in 1957. As a result of the Clean Water Act in 1972, an expansion and upgrade was completed in 1973 to achieve secondary treatment at a permitted capacity of 1.14 mgd.

The District is responsible for operation and maintenance of two pump stations – the Rodeo Influent Pump Station and the Tormey Pump Station. Wastewater flows collected from these two pump stations are conveyed to the District's WWTP. The Rodeo Influent Pump Station has comminutors, which grind up rags and large debris prior to pumping the majority of the District's influent wastewater through a 2,100-foot long 16-inch diameter force main to the headworks at the WWTP. The WWTP liquid stream unit processes include an aerated grit chamber, a primary clarifier, an aeration basin, two secondary clarifiers, a chlorine contact basin, and dechlorination. The aerated grit chamber and primary clarifier remove grit and readily settleable solids from the wastewater. The aeration basin removes soluble organics and flocculate the remaining solids so that they settle well in the secondary clarifiers. The secondary effluent is disinfected in the chlorine contact basin using sodium hypochlorite. Prior to discharge, the final effluent is dechlorinated with sodium bisulfite and combined with the final effluent from the Cities of Pinole and Hercules to a shared deep-water outfall in San Pablo Bay. Typically, the District's effluent flows by gravity through the outfall system; however, in 2003, the District constructed an effluent pump station to increase its discharge capacity during periods of high tide and flow.

Primary sludge and excess sludge generated in the secondary process (waste activated sludge or WAS) is removed daily from the primary and secondary clarifiers, respectively. WAS is thickened with a rotary drum thickener and combined with primary sludge in the anaerobic digesters. The digesters stabilize and reduce the quantity of sludge by converting most of the volatile solids to digester gas, which is burned to the atmosphere in a flare. The volume of sludge is further reduced as digested sludge is dewatered with a centrifuge and hauled to the District's drying beds for storage and additional dewatering. Final dewatered cake is hauled off-site to Potrero Hills Landfill in Fairfield, California. Appendix A includes design criteria for the District's liquid, solids handling, and support facilities. Figures 5.1 and 5.2 include an aerial view of the District's WWTP and a process flow schematic, respectively.

4.0 CONDITION ASSESSMENT

Carollo conducted a visual condition assessment of the Influent Pump Station and WWTP on February 15, 2012. The assessment team consisted of specialists in the structural, mechanical, electrical, and process disciplines. Plant staff provided information on asset age and maintenance history. The findings of the visual condition assessment are presented below in order of unit process. Recommendations for replacement were categorized as near term, meaning within the next five years, or long term, indicating the five to twenty year timeframe. Many assets were found in good condition but will still need rehabilitation or replacement within the long term, given their age and expected service life. Photos supporting the condition assessment findings can be found in Appendix B. Recommended projects are summarized in Section 4.13.

LEGEND

1 Headworks/Sludge Pump Building
2 Primary Clarifier
3 Aeration Basin
4 Secondary Clarifiers
5 Chlorine Contact Basin
6 Effluent Pump Station
7 Blowers and RAS/WAS Pump Building
8 Chemical Support Facilities
9 Sludge Thickener
10 Anaerobic Digesters
11 Digester Control Building
12 Sludge Drying Beds
13 Operations Building
14 Shop Building
15 Eductor Station

Figure 5.1
SITE PLAN
COMPREHENSIVE WASTEWATER MASTER PLAN
RODEO SANITARY DISTRICT

rsd512f2-7540.ai

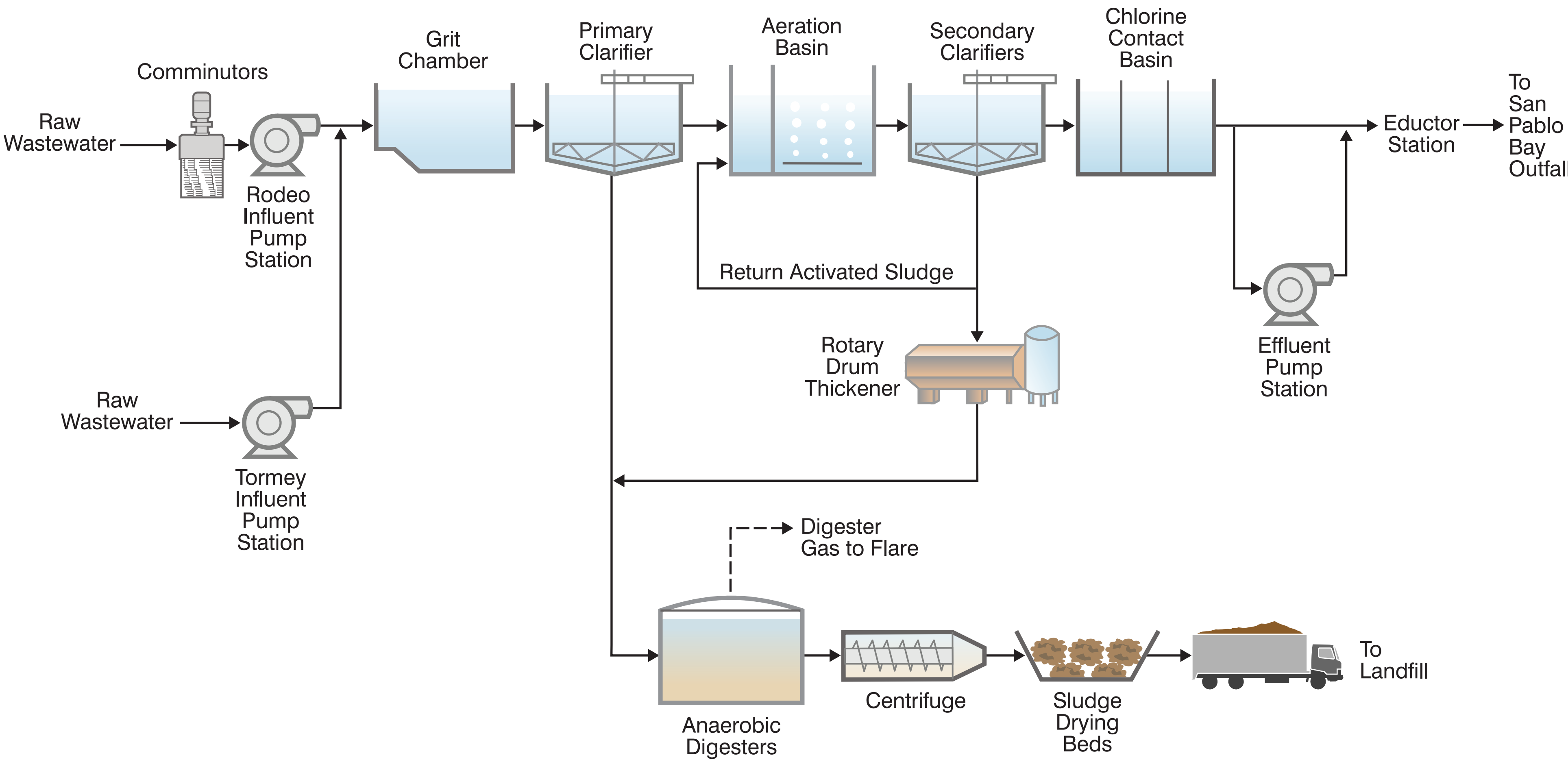

Figure 5.2
PROCESS FLOW SCHEMATIC
COMPREHENSIVE WASTEWATER MASTER PLAN
RODEO SANITARY DISTRICT

rsd512f1-7540.ai

4.1 Influent Pump Station

4.1.1 Structural

The Influent Pump Station buried structure, containing a wet well and dry well, exhibited typical corrosion found in such harsh environments. The concrete cover has deteriorated in the wet well area and needs to be repaired and recoated in the near term. Carollo recommends that concrete tests be conducted during the cleaning and coating effort to provide information on the extent of damage and remaining useful life of the structure. The grating inside the wet well area is corroded and lacks adequate stiffness. Near-term replacement of the grating is recommended.

Pumps and pump supports show heavy signs of corrosion. Reconditioning and recoating of the pumps and replacement of pump supports is recommended in the near term. Re-roofing of the Influent Pump Station is also recommended for the near term.

4.1.2 Mechanical

The diesel tank for the emergency generator exhibited severe corrosion and is recommended for near-term replacement. The comminutors were installed in the mid-1990s and are nearing the end of their reliable service life. Long-term replacement of these is recommended, as well as replacement of the Influent pumps, drives, and gate.

4.1.3 Electrical

No major issues were noted. The Influent Pump Station MCC will likely need replacement in the long term.

4.1.4 Recommended Projects

Near Term:

- Recoat wet well concrete, pumps, and piping.
- Replace deteriorated pump supports.
- Replace diesel tank.
- Replace roofing (included in plant-wide Roofing Project).

Long Term:

- Replace comminutors, pumps, drives, and gate.
- Replace MCC.

4.2 Grit Removal

4.2.1 Structural

The Headworks/Sludge Pump Building (Headworks Structure) exhibits concrete damage at many locations, including areas of exposed reinforcement, mostly on the deck and at locations of the weir gates. This structure is to be dewatered in May or June 2012 for cleaning and regular maintenance purposes. A detailed inspection and testing of concrete walls and foundation is recommended to occur during that event. The findings of these tests will indicate the extent of deterioration of concrete and whether the structure can be kept in service for at least ten more years, in which case a thorough coating effort will be recommended. The coating will extend the useful life of the structure by approximately ten years, after which complete replacement is recommended. Regardless of the test results, a near-term project to repair the areas of damaged concrete surfaces is recommended.

Some cracking was observed in the masonry parapet wall of the Headworks Structure. The significance and corrective action for this should be evaluated during a Tier 1 seismic evaluation of masonry structures, also recommended for the near term.

4.2.2 Mechanical

The influent gates consist of manual slide gates that are original to the structure. These are extremely difficult to operate, and the rail guides are an area of increased corrosion. Replacement is recommended for the near term, to occur during the Grit Removal Structure coating project. No issues were noted with the mechanical grit classifier.

4.2.3 Electrical

The electrical conduit and pull boxes near the Influent Channel do not meet the requirements for a Class I, Division 2 hazardous location. Since the construction of these facilities, this process area has been assigned an area classification by National Fire Protection Association (NFPA) 820 – Standard for Fire Protection in Wastewater Treatment and Collection Facilities. While not enforced retroactively on existing facilities, the code does reflect a safety measure that is not being met.

4.2.4 Recommended Projects

Near Term:

- Pretreatment Structure and Grit Channel repair and recoating.
- Influent slide gate replacements.
- Tier 1 Seismic Evaluation of masonry structures.

Long Term:

- Replace entire structure with new Headworks process that will include mechanical screening.
- Replace Aerated Grit Blower and Classifier.

4.3 Primary Clarification

The Primary Clarifier structure exhibits regular shrinkage cracks. It is reported to have a coal-tar epoxy coating on the bottom but has not been recoated at least since 2002. As with the Headworks Structure, dewatering and cleaning is scheduled for May or June 2012. A thorough inspection that includes concrete testing is recommended. The findings of these tests will indicate whether the concrete structure can support at least ten more years of service, in which case recoating will be recommended. The useful life of the structure can be extended by approximately ten years as a result of recoating, after which complete replacement is recommended.

Considerable corrosion was observed on guardrails of the primary clarifier walkway. Regular cleaning and recoating is recommended for increased useful life.

Primary effluent regularly flows through the weir box in the Primary Clarifier area; however, this weir box no longer functions as intended. To reduce the frequent cleaning it requires, Carollo recommends that the weir box be removed and the primary effluent pipes be directly connected.

4.3.1 Mechanical

The Primary Clarifier mechanism drive was replaced in 1995, and the mechanism was replaced in 2006 with galvanized steel. Plant staff has had issues with the diaphragm sludge pumps, and these are commonly problematic for sludge applications. Carollo recommends that these be replaced with progressing cavity pumps in the near term. The sludge flow metering system is not reliable, therefore Carollo recommends including costs for new sludge flow meters in the project to replace the sludge pumps. The exact corrective measure for the sludge flow metering problem can be refined in a pre-design stage for the project.

4.3.2 Electrical

Similar to the grit removal structure, the electrical conduit and pull boxes near the Influent Channel do not meet the requirements for a Class I, Division 2 hazardous location. Since the construction of these facilities, this process area has been assigned an area classification by National Fire Protection Association (NFPA) 820 – Standard for Fire Protection in Wastewater Treatment and Collection Facilities. While not enforced retroactively on existing facilities, the code does reflect a safety measure that is not being met.

4.3.3 Recommended Projects

Near Term:

- Primary Clarifier repair and recoating.
- Weir Box closure.
- Replacement of primary sludge pumps.

Long Term:

- Replace Primary Clarifier and mechanism.

4.4 Aeration Basins

4.4.1 Structural

A section of the sidewalk around the basins has settled due to poor compaction of backfill. This defect can be corrected by reconditioning the base layer under the sidewalk using Controlled Low Strength Material (CLSM) or by placing a well-compacted layer of crushed rock under the sidewalk. This can be addressed as a maintenance project and is not included in the capital outlay presented in Section 4.13.

Corrosion was observed on weir gates and weir gate covers, as well as some pipe and instrument supports. Carollo recommends recoating these items as part of routine maintenance to increase their useful life.

Concrete cracking and spalling has occurred on the Aeration Basin walkways in several places at corners of access openings. The spalling as well as exposure of reinforcement is a result of some corrosion in the concrete reinforcement or the grating support inserts. A project is recommended to repair damaged areas by removing the deteriorated concrete cover, repairing, and coating the corroded insert or rebar, and patching the concrete surface. Leaving these cracks unattended will result in continued corrosion and more critical cracking as corrosion progresses.

The air pipes in the Blower Building are not braced against lateral movement, making them susceptible to damage during a seismic event. The anchorage of the air intake towers in the Blower Building could not be determined visually. Carollo suspects that the anchorage of the towers may not be compliant with current seismic requirements of the building code. Concrete cracking and possibility of leaks was observed in the roof of the Blower Building. Addressing bracing and anchorage issues can be done at little cost to the District and it is Carollo's recommendation that these seismic bracing issues are addressed in the near term. The blower pumps and their supports need to be coated as part of ongoing maintenance efforts to protect them against corrosion, as do the RAS pumps, piping, and bracing.

Pipe supports in the RAS pump room were only designed to bear gravity loads and are not equipped to protect the pipes against seismic loads. This issue can be addressed by tying down the RAS line, using standard U-bolts, to the existing pipe support brackets installed on the wall. The WAS line can be anchored to the building wall using preformed channel straps.

4.4.2 Mechanical

The membrane diffusers were installed in 2005 and typically have a ten-year useful life. They are reported by District staff to be in good condition. During an inspection in 2011, the District determined that only six of the 29 membranes needed repair, and these were due to mechanical tears, as opposed to material wear. All aeration basin gates were replaced in 2000 and are in good operating condition.

The mixer in the anoxic zone of the aeration basin is inoperable. Staff was waiting for recommendations from the CWWMP before replacing this equipment. Based on the capacity and performance analyses conducted to date, a replacement submersible anoxic mixer is recommended.

The existing centrifugal blowers are inefficient and are recommended for replacement with high speed turbo blowers. This recommendation is consistent with the findings of the District's 2011 CalPOP Facility Audit Report. The blower replacement costs presented in this TM are based on replacing the three existing blowers with three 30 HP high speed turbo blowers and include all of the related mechanical, electrical, and instrumentation support costs associated with a blower replacement project. The blower replacement costs may change depending on the equipment installed as part of the District's current Aeration Blower Replacement Project. The intake filters for the existing centrifugal blowers are not maintained, and the type of media is unknown. If any existing centrifugal blowers are to remain in service as duty or standby units, Carollo recommends that the intake filter media be evaluated and replaced if necessary.

4.4.3 Electrical

MCC-P, which feeds the blowers, is obsolete. Given the increasing difficulty finding parts for this equipment, a complete replacement is recommended when the blowers are replaced. If it cannot be replaced due to funding limitations, the MCC should be replaced within the long-term planning timeframe, possibly in conjunction with an automation upgrade.

The aeration basins do not have dissolved oxygen meters, and air flows and other data are not reported to SCADA. The Blower Replacement Project will include a master control panel tied to SCADA, but an automation upgrade will likely be needed in the long term, as discussed below.

4.4.4 Recommended Projects

Near Term:

- Aeration Basins concrete repair.
- Replace blowers.
- Install anoxic mixer.
- Install lateral pipe bracing in Blower Building and RAS Room (as part of larger Piping Supports and Flexible Couplings Project).

Long Term:

- Aeration Basins coating.
- Blower Building coating.
- Replace Blower Room MCC.
- Replace HiOx membrane diffusers.

4.5 Secondary Clarification

4.5.1 Structural

No major issues were noted.

4.5.2 Mechanical

The secondary clarifier mechanisms were replaced in 2009 after the mechanical support in the center column failed. This is now working well. Drain valves have been replaced in Clarifier A in 2008 and Clarifier B in 2004.

4.5.3 Electrical

No major issues were noted.

4.5.4 Recommended Projects

Near Term:

- None.

Long Term:

- Secondary Clarifiers A and B coating.
- Replace Secondary Clarifier mechanisms.
- Replace drain valves.

4.6 Chlorine Contact Tank

4.6.1 Structural

Some corrosion was observed on weir gate operator supports pump skid plates. Routine recoating is recommended as part of ongoing maintenance efforts. No other major issues were noted.

4.6.2 Mechanical

No major issues were noted.

4.6.3 Electrical

No major issues were noted.

4.6.4 Recommended Projects

Near Term:

- None.

Long Term:

- Replace chemical equipment.

4.7 Effluent Pumping

4.7.1 Structural

No major issues were noted.

4.7.2 Mechanical

The plant outfall, which is jointly owned by the Joint Powers Authority and the District had an exterior inspection in summer 2011. The pipe was found to be in good condition, but the cathodic protection system was nearing the end of its useful life.

There is minimal run-time on the effluent pumps due to the District being able to gravity feed to the outfall during dry weather. The pumps are run every month for maintenance, and the PLC controls run the pumps through their lead/lag cycle.

4.7.3 Electrical

No major issues were noted.

4.7.4 Recommended Projects

Near Term:

- Replace Plant Outfall Cathodic Protection System.

Long Term:

- Replace Effluent Pump Station equipment.

4.8 Sludge Thickening

4.8.1 Structural

The Thickener Structure gravel-tar roofing has deteriorated and as a result leaking through the roof was observed. Installing new roofing material is recommended. Also, the roof access hatch is heavily corroded and needs immediate replacement.

The connections of the roof joists to the ledger block could not be verified. All roofs of the masonry structures shall be connected to the adjacent walls such that they provide a complete load path for lateral loads (Seismic loads). A Tier 1 seismic evaluation is recommended which may result in recommendations to strengthen the above connection.

The grating support beams for the mezzanine installed in the rotary grit basin are corroded. Some corrosion and damage to the coating was observed in the steel monorail beams at the roof level. Carollo recommends sandblasting and recoating these structural elements.

After reviewing the design drawings, the connection of the monorail beams to the walls were identified to be very rigid. Rigid connections are more prone to damage during a seismic event and therefore may fail and cause safety concerns, Carollo recommends a detailed analysis performed on these beams and that the possibility of their removal be assessed.

4.8.2 Mechanical

No major issues were noted.

4.8.3 Electrical

No major issues were noted.

4.8.4 Recommended Projects

Near Term:

- Rehabilitate Sludge Thickener Building, including hatch and roofing.
- Tier 1 Seismic Evaluation.

Long Term:

- Replace sludge pumping equipment.
- Replace Rotary Drum Thickener.

4.9 Anaerobic Digestion

4.9.1 Structural

The Digester Control Building is built with concrete masonry units. After reviewing the design drawings, all the masonry walls are only grouted in alternating columns, where vertical reinforcement is installed. The amount and spacing of wall reinforcement cannot be verified. Recent research has led to code requirements for fully grouting all masonry walls in high seismic regions. In order to bring the masonry building in the plant up to the current codes, Carollo recommends fully grouting all masonry walls to minimize damage during a significant seismic event. Lateral support to brace some piping inside the digester control building is needed.

The pipe penetrations on the digester walls have rigid connection to the walls. In order to avoid damage to the tank walls or the pipes penetrating the digesters, some means of flexibility is required. Flexible couplings, flexible stainless steel braided pipes, or other flexible connections can be used to address this issue.

The roofing on the structure connecting the digesters has deteriorated. The flashing on the edges of the roof have been separated from the walls, which may result in leaking. Carollo recommends replacing the roofing in near term.

4.9.2 Mechanical

The digester heating and recirculation equipment was installed in 1973 and has exceeded its useful life. The sludge recirculation pumps can also transfer sludge directly to the drying beds if necessary. The mechanical pumping system was installed in 2003 and upgraded in 2009.

4.9.3 Electrical

MCC-P1 is located in the Digester Control Building and controls the digester equipment, as well as other areas of the plant. This MCC is discussed in Section 4.12 below.

4.9.4 Recommended Projects

Near Term:

- Digester Control Building repair and coating.
- Reroof structure connecting the digesters.
- Replace digestion equipment.

Long Term:

- Coat Digesters.
- Reroof Digester Control Building.
- Replace Waste Gas Flare.

4.10 Dewatering

4.10.1 Structural

The centrifuge is located in the Headworks Structure. The portion of the structure supporting the centrifuge was observed to be in good condition. However, minor corrosion was observed on some uncoated pipe and equipment support. Coating is recommended to address this issue.

4.10.2 Mechanical

No major issues were noted, but the useful life of the centrifuge will likely end within the long-term planning timeframe.

4.10.3 Electrical

Because the centrifuge is located in the Headworks Structure, the issue stated in the Grit Removal section regarding code compliance also applies in this unit process.

4.10.4 Recommended Projects

Near Term:

- None.

Long Term:

- Replace dewatering equipment.

4.11 Sludge Drying

The sludge drying process consists of paved areas on which the dewatered cake is spread. All of the assets in this process are considered Civil, and therefore are not separated in this report by Structural or Mechanical Disciplines. The piping and paving in this area is deteriorated. Due to pavement issues in one of the drying beds, the truck used to haul dried cake from the site must make difficult maneuvers for loading. It is recommended that this drying bed be repaired in the short-term and that all drying beds and piping be rehabilitated or replaced in the long-term.

4.11.1 Recommended Projects

Near Term:

- Repair Sludge Drying Bed No. 3.

Long Term:

- Rehabilitate or replace piping and pavement.

4.12 Electrical, Instrumentation and Controls

The PG&E transformer is ungrounded, which is very uncommon at modern WWTPs. Furthermore, the plant does not have the ground fault detection equipment required by current code for this type of system. Failure to detect and address a ground fault stresses the system and can reduce electrical equipment life or cause premature failure. Most VFD manufacturers recommend against the use of VFDs on an ungrounded service without isolation transformers, which most of the existing VFDs at the plant do not have. This presents safety and reliability concerns, and the plant has already experienced catastrophic failure. Replacement with a solidly grounded system should be considered. This would require replacement of the PG&E transformer, the plant's main switchboard, and possibly the ductbank between the two.

MCC-P1, located in the Digester Control Building, is nearly 40 years old and has experienced frequent breaker failures. Near-term replacement is recommended. A combined project to replace the aging MCCs and install new controls would benefit from simultaneous implementation, but the project sequencing would need to be carefully evaluated. At a minimum, it is recommended that the aging motor controls be replaced with associated equipment.

The standby generator is also nearly 40 years old but is adequate for plant load and is exercised regularly, including an annual full load test. While the generator is reliable for the near term, replacement will likely be necessary within the long-term planning timeframe.

The electrical and control cabinets located in the Control Building have control wires that run very close to an exposed transformer. Carollo recommends that a licensed electrician re-route the control wiring outside of exposed transformer compartment to avoid heating or inadvertent energization of control wiring not associated with the transformer itself.

The WWTP does not have an arc flash hazard plan / procedures required by OSHA 29 CFR 1910 (Subpart S) and NFPA 70E. An arc flash study is recommended to identify hazard levels and provide appropriate labeling throughout the plant. This will help to establish that proper training, personal protective equipment, and procedures are used for conducting all electrical work.

The plant has minimal remote control and monitoring – there are large portions of that are not in the SCADA system at all, and there are some that allow monitoring only with no control. When upgrading a process area (e.g. aeration), controls for all equipment in the associated MCC should be upgraded to have PLC/SCADA control to allow for labor saving opportunities and to enhance basic reliability. These controls are standard features at wastewater treatment plants.

The existing SCADA alarm system is very limited – it currently sends a general alarm to the same company monitoring site security, who then contacts plant staff. No information as to the nature of the alarm is available. Furthermore, the system does not have any redundancy – if the telephone lines go out, the auto-dialer will not work (the plant has previously experienced telephone system failures). There are simple alarm packages available that can dial out or with detailed alarm messages, ensuring that the appropriate information is transmitted to the right plant staff members, who can respond accordingly. Also, while telephone lines rarely fail, the use of cell modems or other technologies could improve reliability for the alarming system. A project is recommended to upgrade the security system and the SCADA alarming system at the same time.

Additionally, plant staff currently has to gather data and manually enter it into reports, both for internal use and compliance reporting. Software is available that can auto-generate reports from data logged in SCADA, an enhancement that would save staff time.

The telephone system is reported by plant staff to have intermittent static, and troubleshooting is difficult due to excess and unorganized wiring. A project is recommended for a telecommunications technician to rewire the telephone system.

4.12.1 Recommended Projects

Near Term:

- Conduct Arc Flash Study.
- Replace ungrounded electrical service.
- Replace MCC-P1.

- Upgrade security system and reporting software, reroute control wiring in Control Building cabinets, and rewire telephone system.

Long Term:

- Conduct SCADA Improvements Project.
- Replace Standby Generator and diesel tank.

4.13 Recommended Rehabilitation and Replacement Projects

Tables 5.1 and 5.2 summarize the recommended rehabilitation and replacement projects based on the condition assessment findings for the near term and long term, respectively. Planning level cost estimates are shown for each project. The projects are categorized as near term (within the next five years) or long term (within five to twenty years). Within each timeframe, projects are presented in order of the treatment train.

These recommendations will be reviewed with respect to capacity, regulatory, and other enhancement-driven projects developed in the CWWMP. Recommended alternatives may include projects that eliminate or otherwise alter the need for the projects presented here. Additionally, the timing of these projects will be further specified in conjunction with the CWWMP alternatives.

5.0 HYDRAULIC CAPACITY EVALUATION

A hydraulic capacity evaluation was performed for the liquid stream facilities using Carollo's steady state *Hydraulix*™ modeling software. The modeling approach and assumptions, descriptions of hydraulic breaks and hydraulic segments, and the modeling results are discussed in this section.

5.1 Hydraulic Model Setup and Assumptions

The hydraulic model was constructed based on available design and/or record drawings for the liquid stream facilities. Drawings used include the 1957 Sewage Treatment Facilities Drawings, 1973 Water Pollution Control Facilities Drawings, and the 2003 Effluent Pump Station Drawings. The following assumptions were made in constructing the model:

- Steady-state flow conditions.
- Weirs were considered as hydraulic break points, with the exception of the aeration basin influent weir gates, which have normally operated under submerged conditions.
- Both firm and total pumping capacities are presented. Firm pumping capacity is defined as the pumping capacity with the largest pump out of service. Total pumping capacity is with all pumps operating.

Table 5.1 Recommended Near-Term Rehabilitation and Replacement Projects Comprehensive Wastewater Master Plan Rodeo Sanitary District

Project	Estimated Construction Cost[1,2]	Estimated Project Cost[1,3]
Influent Pump Station Structural Rehab and Tank Replacement	$172,000	$225,000
Grit Area Structural Repair and Coating	$160,000	$209,000
Primary Clarifier Coating	$82,000	$107,000
Weir Box Closure	$20,000	$26,000
Primary Sludge Pumps	$84,000	$110,000
Anoxic Mixer	$42,000	$55,000
Blower Project	$82,000	$107,000
Aeration Basins Concrete Repair	$38,000	$49,000
Outfall Cathodic Protection	$8,000	$10,000
Sludge Thickener Building Repair	$60,000	$78,000
Piping Supports and Flexible Couplings	$27,000	$35,000
Digester Control Building Coating	$33,000	$43,000
Tier 1 Seismic Evaluation[4]	$50,000	$50,000
Digestion Equipment	$323,000	$420,000
MCC-P1 Replacement	$181,000	$235,000
Ungrounded Electrical Service Replacement	$180,000	$234,000
ArcFlash Study	$40,000	$40,000
Security System, Reporting Software, and Telecom and Control Wiring	$47,000	$62,000
Roofing[5]	$173,000	$224,000
Repair Sludge Drying Bed 3	$14,000	$18,000
Total Near-Term Projects	**$1,816,000**	**$2,337,000**

Notes:

(1) Costs are planning level estimates shown in September 2012 dollars. All costs should be reviewed in a preliminary design phase for each project prior to commencement.

(2) Construction costs include estimating contingency (30%), sales tax on materials (8.5% on 50% of the direct cost), general conditions, contractor overhead and profit (25%).

(3) Project costs include engineering, legal, and administrative costs (30%).

(4) Tier 1 Seismic Evaluation is a study so it has the same construction and project costs.

(5) Roofing for Influent Pump Station, Blower Building, Administration Building, and Maintenance Shop.

Table 5.2 Recommended Long-Term Rehabilitation and Replacement Projects
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Project	Estimated Construction Cost(1,2)	Estimated Project Cost(1,3)
Influent Pump Station Mechanical and Electrical	$477,000	$621,000
Grit Blower and Cyclone	$161,000	$209,000
Pretreatment Structure Replacement	$2,221,000	$2,887,000
Primary Clarifier Replacement	$731,000	$951,000
Aeration Basin Concrete Coating	$272,000	$354,000
Blower Building Repair and Coating	$39,000	$51,000
Membrane Diffusers	$141,000	$183,000
Blower MCC Replacement	$151,000	$196,000
Secondary Clarifier Mech. and Struc. Rehab	$650,000	$844,000
Chemical Equipment	$327,000	$426,000
Effluent Pump Station Equipment	$280,000	$364,000
Sludge Pumping Equipment	$129,000	$168,000
Rotary Drum Thickener	$133,000	$173,000
Digester Coating and Roofing	$465,000	$604,000
Rehab Sludge Drying Beds and Piping	$139,000	$180,000
Waste Gas Flare	$261,000	$339,000
Dewatering Equipment	$287,000	$373,000
SCADA Improvements	$84,000	$109,000
Surge Tank and Diesel Tank	$78,000	$102,000
Standby Generator	$420,000	$546,000
Total Long-Term Projects	**$7,446,000**	**$9,680,000**
Total R&R Based CIP(4)	**$9,262,000**	**$12,017,000**

Notes:
(1) Costs are planning level estimates shown in September 2012 dollars. All costs should be reviewed in a preliminary design phase for each project prior to commencement.
(2) Construction costs include estimating contingency (30%), sales tax on materials (8.5% on 50% of the direct cost), general conditions, contractor overhead and profit (25%).
(3) Project costs include engineering, legal, and administrative costs (30%).
(4) Total near-term plus long-term projects.

- Flow distribution was assumed equal between the secondary clarifiers. Plant staff has indicated there may be unequal flow split between the two clarifiers; however, for planning purposes, it should be assumed that the flow split can be corrected with re-leveling of the secondary clarifier weirs.
- RAS flow rate was set at a constant flow of 300 gpm based on the existing capacity.
- Aeration basin effluent weir gates were assumed to be at approximately EL 112.50. No elevations for aeration basin weir gates are provided in the District's contract drawings.
- Outfall hydraulic capacity for gravity flow conditions was not evaluated because the effluent pump station is used to discharge plant effluent when the gravity outfall capacity is limited.

5.2 Hydraulic Breaks and Hydraulic Segments

The hydraulic capacity for the WWTP was determined by estimating the capacity in several independent hydraulic segments. Each hydraulic segment is defined by downstream and upstream hydraulic breaks. Hydraulic breaks are design elements in liquid stream facilities that control the hydraulic grade. For example, free-discharging weirs and wet well set points for pump stations are hydraulic breaks.

Five independent hydraulic breaks were identified within the existing liquid stream for the hydraulic capacity evaluation. Capacities for the influent and effluent pump stations are based on the installed firm pumping capacities; therefore, no hydraulic modeling was conducted for those segments. Table 5.3 identifies the facilities included in each hydraulic segment and the corresponding upstream and downstream hydraulic breaks.

Table 5.3 Hydraulic Breaks and Segments
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Segment	Segment Name	Upstream Hydraulic Break	Downstream Hydraulic Break
1	Influent Pump Station	Influent Pump Station Wet Well	Grit Chamber
2	Grit Chamber	Grit Chamber	Grit Chamber Weir
3	Primary Clarifier	Grit Chamber Weir	Primary Clarifier Weir
4	Aeration Basins	Primary Clarifier Weir	Aeration Basin Effluent Weir Gates
5	Secondary Clarifier	Aeration Basin Effluent Weir Gates	Secondary Clarifier Weirs
6	Chlorine Contact Basin	Secondary Clarifier Weirs	CCB Effluent Weir
7	Effluent Pump Station	Effluent Pump Station Wet Well	San Pablo Bay

5.3 Hydraulic Capacity Summary

Two scenarios were evaluated to estimate the hydraulic capacity for each hydraulic segment:

- Scenario 1: Zero (0) inches of freefall at upstream weirs.
- Scenario 2: Zero (0) inches of freeboard in structures.

Table 5.4 summarizes the hydraulic modeling results based on the above scenarios. The Scenario 1 hydraulic capacities are based on using firm pumping capacity for the influent and effluent pump stations and reflect the maximum amount of flow before effluent or flow-splitting weirs are submerged for each hydraulic segment. The hydraulic capacities for Scenario 2 are based on using total pumping capacity for the influent and effluent pump stations and reflect the maximum amount of flow before water begins overtopping the top of wall for hydraulic structures (i.e. no freeboard). Figure 5.3 illustrates the hydraulic capacities for each segment for the two scenarios.

The estimated hydraulic capacity of the treatment plant for operating under Scenario 1 (zero inches freefall at weirs) is 2.7 mgd and is limited due to the grit chamber weir becoming submerged. The next limitation is at a flow of approximately 3.0 mgd when the aeration basin effluent weir becomes submerged. Although it is ideal to maintain free discharging weirs to prevent short-circuiting, the grit chamber and aeration basin effluent weirs are not critical and are not needed to provide an even flow split to downstream processes; therefore, weir submergence is acceptable. The next limiting hydraulic capacity is approximately 3.9 mgd when the primary clarifier effluent weir becomes submerged.

The estimated hydraulic capacity for operating under Scenario 2 is 4.6 mgd, the total pumping capacity of the Influent Pump Station. If additional pumping capacity is provided, the next hydraulic limitation is approximately 5.5 mgd due to the risk of overtopping the aeration basin walls.

The results are generally consistent with observations made by plant staff:

- The estimated hydraulic capacity for the grit chambers is 11.9 mgd before overtopping of structures; however, plant staff have reported that the water level in the grit chamber is a few inches from the top of concrete wall at an influent flow of approximately 4.6 mgd. This observation is explained by the capacity of the primary clarifiers (Segment 3), which includes the grit chamber effluent pipe downstream of the grit chamber effluent weir. The water level in the grit chamber backs up as a result of a hydraulic limitation with the grit chamber effluent pipe. At a flow of 6 mgd (as shown in Table 5.4 for Segment 3), the water level in the grit chamber is at the top of concrete wall elevation.

Table 5.4 Hydraulic Breaks and Segments
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Segment	Segment Name	*Scenario 1 – Zero Inches of Freefall at Weirs*		*Scenario 2 – Zero Inches of Freeboard at Structures*	
		Hydraulic Capacity, mgd	**Limiting Factors/ Comments**	**Hydraulic Capacity, mgd**	**Limiting Factors/ Comments**
1	Influent Pump Station	3.5	Firm Pumping Capacity	4.6	Total Pumping Capacity
2	Grit Chamber	N/A(1)	N/A(1)	11.9	Overflow Grit Chamber Top of Wall
3	Primary Clarifier	2.7	WSE(2) backed up to 0 inches downstream of Grit Chamber Weir	6.0	Overflow Grit Chamber Effluent Box Top of Wall
4	Aeration Basin	3.9	WSE backed up to 0 inches downstream of Primary Clarifier Weir	5.8	Overflow Primary Effluent Weir Box Top of Wall
5	Secondary Clarifiers	3.0	WSE backed up to 0 inches downstream of Aeration Basin Effluent Weir	5.5	Overflow Aeration Basins Top of Wall
6	Chlorine Contact Basin	4.2	WSE backed up to 0 inches downstream of Secondary Clarifier Weir	5.8(3)	Overflow Secondary Scum Box Top of Wall
7	Effluent Pump Station	5.0	Firm Pumping Capacity	10.0	Total Pumping Capacity

Notes:
(1) N/A = Not Applicable.
(2) WSE = Water Surface Elevation.
(3) Chlorine contact basin capacity based on field measurement of adjustable effluent weir by plant staff (approx. EL 109.11).

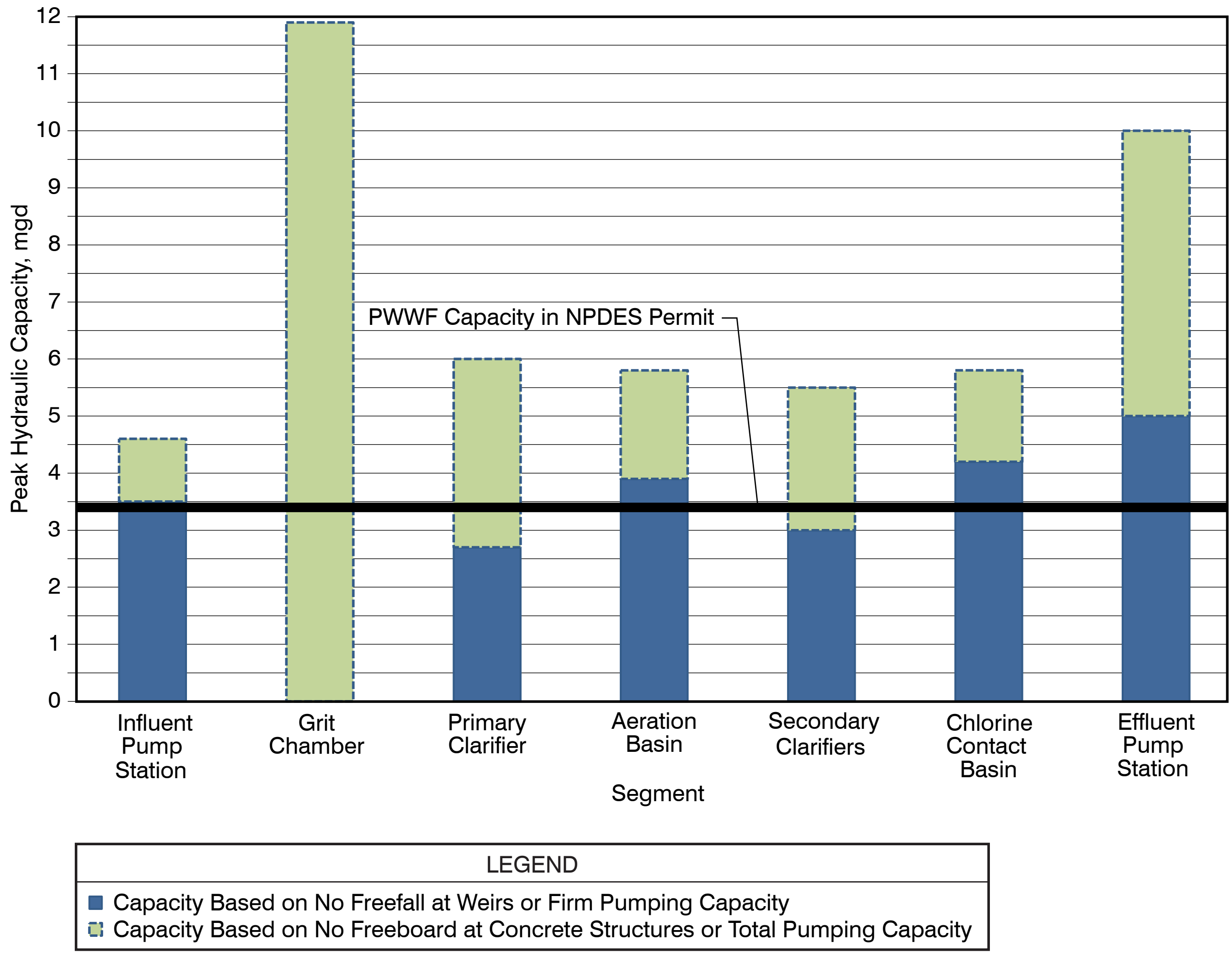

Figure 5.3
UNIT PROCESS HYDRAULIC CAPACITY SUMMARY
COMPREHENSIVE WASTEWATER MASTER PLAN
RODEO SANITARY DISTRICT

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- Based on a field measurement of the CCB effluent weir elevation by District staff, the estimated hydraulic capacity for the CCB is 5.8 mgd before overtopping of structures and the CCB baffles become submerged at approximately 6.7 mgd. However, plant staff has reported that the CCB baffles become submerged at peak flows less than 5 mgd. Baffle submergence in the CCB will depend on both the CCB adjustable effluent weir elevation and the water level in the effluent pump station wet well. If the pump station is operating with a higher water level than the effluent weir elevation during a peak flow event, then the CCB water level will be controlled by the effluent wet well level and the CCB baffles may submerge at flows less than 6.7 mgd.
- The treatment plant has sufficient hydraulic capacity for the permitted ADWF of 1.14 mgd and can handle the peak permitted flow of 3.4 mgd without overtopping structures. However, as peak flows increase to approximately 5 mgd, the treatment plant operates with little to no freeboard.

The estimated hydraulic capacities are based on current operations and available contract drawings for past District projects. To provide a better estimation of hydraulic capacities and to confirm the accuracy of the assumptions presented herein, it is recommended that weirs and tops of structures be surveyed to calibrate the hydraulic model.

6.0 PROCESS CAPACITY EVALUATION

This section summarizes the performance and capacity assessment of the WWTP. The overall performance of the WWTP is evaluated with respect to the removal of conventional pollutants regulated in the NPDES permit. In addition, the performance and capacity of each unit process is also evaluated. The general approach and results are described further below.

6.1 Overall WWTP Performance

During the review period between January 1, 2010 and December 31, 2011, the WWTP had excellent performance and achieved total compliance with all conventional pollutants in the District's NPDES permit. Conventional pollutants regulated in the NPDES permit include the 5-day carbonaceous biochemical oxygen demand ($CBOD_5$), total suspended solids (TSS), pH, total coliform bacteria, total residual chlorine, and oil and grease. Table 5.5 summarizes the overall performance of the WWTP with respect to conventional pollutants in the NPDES permit.

Table 5.5 Overall WWTP Performance for Conventional Pollutants Comprehensive Wastewater Master Plan Rodeo Sanitary District				
Effluent Water Quality Parameter	**Units**	**Limit[1]**	**2010 - 2011 Average**	**Number of Exceedances**
$CBOD_5$	mg/L	Average Monthly = 25	5.6	0
	mg/L	Average Weekly = 40		0
TSS	mg/L	Average Monthly = 25	6.4	0
	mg/L	Average Weekly = 40		0
pH	---	Minimum = 6	6.75	0
	---	Maximum = 9	7.43	0
Total Coliforms	MPN/ 100 mL	Maximum Daily = 10,000	17.3	0
	MPN/ 100 mL	Five-Sample Median = 240		0
Total Residual Chlorine	mg/L	Instantaneous Maximum = 0.0	0	0
Oil and Grease	mg/L	Average Monthly = 10	3.7	0
	mg/L	Maximum Daily = 20		0

6.2 Unit Process Evaluation and Capacity

6.2.1 Approach

The performance of a unit process provides a benchmark for assessing its capacity and the planning of new facilities. Therefore, the first step of the process capacity evaluation was to review historical loading and treatment performance and compare them to the original design criteria and typical, or industry accepted criteria. Based on historical performance, recommended criteria and the estimated capacity were determined for each major unit process. Capacities were determined for average dry weather flow (ADWF) and peak wet weather flow (PWWF) conditions.

6.2.1.1 Average Dry Weather Flow

The ADWF capacity was estimated for major unit processes at the WWTP. In some cases, such as for the primary clarifier and chlorine contact basin, the capacity was identified based on a recommended flow-based criteria such as an overflow rate, or detention time during ADWF conditions.

However, the capacity for many facilities are actually based on the influent BOD_5 and TSS loading. These processes include the aeration basins, rotary drum thickener, anaerobic digesters, and the centrifuge. To estimate the capacity for these facilities, a plant process model was developed and calibrated to historical operating data from 2010 - 2011.

Using the calibrated process model to simulate maximum month conditions, the influent flow and load was increased until the recommended design criteria were exceeded for each particular unit. This influent flow was taken as the maximum month capacity limit for that particular unit. The maximum month capacity was converted to an equivalent ADWF. The historical influent flows and loads as well as the wastewater concentration and peaking factors used in the capacity assessment is summarized in Table 5.6.

The wastewater concentrations and peaking factors presented in Table 5.6 are generally consistent with experience from other nearby facilities in western Contra Costa County. However, the reported influent TSS concentrations were significantly higher than the $CBOD_5$ concentrations, with individual days having values up to 2,000 mg/L. In addition, the average maximum month TSS load peaking factor was 1.82. These values are unusually high, especially when compared to the $CBOD_5$ and NH_3-N concentrations and peaking factors. The cause of the high TSS concentrations is not known, and the reportedly high data is not believed to be realistic. So that the District's future planning is not based on potentially erroneously high concentration data, influent TSS concentration values greater than 500 mg/L were excluded from the analysis. In addition, since the $CBOD_5$ and NH_3-N load peaking factors were closer to 1.5, a TSS load peaking factor of 1.5 was used.

An ADWF capacity was not developed for pump stations or for the aerated grit chambers as the sizing and capacity of those facilities are entirely dependent on the PWWF and assigning an ADWF capacity is not very meaningful.

6.2.1.2 Peak Wet Weather Flow

The Peak Wet Weather Flow (PWWF) process capacity was estimated for all liquid stream facilities. Capacities for process units are based on all units being in service, while capacities for pump stations are based on the largest pump being out of service.

6.2.2 Influent Pump Station

The influent pump station is equipped with two comminutors and three influent pumps. Although the comminutors have a firm capacity of 3.3 mgd with a total installed capacity of 6.7 mgd, the influent pumps only have a firm capacity of 3.5 mgd and a total installed capacity of 4.6 mgd. The pump station has performed well, however, during extreme wet weather periods, there is insufficient capacity, which causes surcharging in the District's collection system. Table 5.7 summarizes the PWWF capacity of the influent pump station.

6.2.3 Grit Chamber

The key design parameters for aerated grit chambers is the hydraulic detention time. Aerated grit chambers are designed to provide a minimum amount of detention time at peak

Table 5.6 Historical Influent Flow and Load
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Item	2010	2011	Average	Value Used for Capacity Assessment
Average Dry Weather (ADW)				
Flow, mgd	0.57	0.59	0.58	
$CBOD_5$, ppd	860	1,036	948	
$CBOD_5$, mg/L (1)	182	210	196	196
TSS, ppd (2)	1,246	1,450	1,348	
TSS, mg/L (1)	264	294	279	279
NH_3-N, ppd	148	179	163	
NH_3-N, mg/L (1)	31	36	34	34
Average Day Maximum Month (ADMM)				
Flow, mgd	1.09	1.30	1.19 (3)	
Flow peaking factor (3)	1.92	2.20	2.06	2.06
$CBOD_5$, ppd	1,377	1,321	1,349	
$CBOD_5$ peaking factor (4)	1.60	1.27	1.44	1.44
$CBOD_5$, mg/L (1)	152	122	136	136
TSS, ppd	2,305	2,583	2,444	
TSS peaking factor (4)	1.85	1.78	1.82	1.50 (5)
TSS, mg/L (1)	254	238	246	203
NH_3-N, ppd	236	267	251	
NH_3-N peaking factor (4)	1.59	1.50	1.55	1.55
NH_3-N, mg/L (1)	26	25	25	25

Notes:
(1) Calculated as follows: Concentration (mg/L) = Load (lb/d)/Flow (mgd)/8.34.
(2) Reported TSS data with concentration greater than 500 mg/L excluded from analysis.
(3) Peaking factor = ADMM Flow / ADW Flow.
(4) Peaking factor = ADMM Load / ADW Load.
(5) Peaking factor of 1.5 used as historical value of 1.82 believed to be erroneously high.

Table 5.7 Influent Pump Station Capacity Comprehensive Wastewater Master Plan Rodeo Sanitary District	
Item	**Value**
Comminutors	
Firm, mgd	3.3
Total, mgd	6.7
Influent Pumps	
Firm, mgd	3.5
Total, mgd	4.6
Overall Capacity(1)	3.3

Note:
(1) Based on the equipment with limiting capacity.

wet weather flows. The grit chambers were originally designed for a detention time of 3.3 minutes during PWWF, which results in a PWWF capacity of 3.4 mgd. However, they have been operated at shorter detention times as low as 2.5 minutes without any evidence of excessive grit accumulation in the aeration basins of digesters. Therefore, it is recommended that a detention time of 2.5 minutes be used to assess capacity, which results in a PWWF capacity of 4.6 mgd. Table 5.8 summarizes the capacity criteria and resulting PWWF capacity of the grit chamber.

Table 5.8 Grit Chamber Assessment
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Parameter	Original Design Criteria	2010 – 2011 Average	Capacity Criteria		PWWF Capacity, mgd
			MOP 8 (1)	Recommended	
Detention Time at PWWF, min	3.3	2.5	3 to 10	2.5	4.6

Note:
(1) Design of Municipal Wastewater Treatment Plants Fifth Edition, Water Environment Federation/America Society of Civil Engineers, 2010.

6.2.4 Primary Clarifier

Historical TSS and BOD_5 removal from 2010 through 2011 has averaged 38 percent and -3 percent, respectively. This is very unusual and is well below the industry standards of 50 to 70 percent for TSS removal and 25 to 40 percent for BOD_5 removal. When reviewing the daily data, it appears that the performance has been highly variable, ranging from a typical performance of 60 percent TSS removal, to very poor with little or no TSS removal. The cause of the poor performance is not known; although higher overflow rates (i.e., approaching 1,000 gpd/sf) generally seem to result in reduced performance. Performance is sometimes compromised during dry weather periods operating at lower overflow rates as well. One possible explanation for the poor performance could be that the primary clarifier is operating with a thick sludge blanket. A thick blanket could cause the settled sludge to be re-suspended during periods of high flow. In addition, operating with a thick blanket could result in anaerobic activity in the sludge before it is removed from the clarifier, thereby solubilizing some of the particulate BOD back into the liquid stream. Figure 5.4 illustrates the overflow rate and TSS removal during the review period.

Poor primary clarifier performance results in an increased load to the downstream secondary and solids handling processes. Although the cause of the poor performance is not known, it is assumed that necessary improvements would be performed so that the primary clarifier achieves a minimum TSS removal of 50 percent. To improve performance, the District may need to perform modifications to improve hydraulics, improve its primary sludge pumping operation to eliminate sludge buildup, or possibly implement enhanced primary treatment.

Since the performance has not been very good at the current ADWF overflow rate of approximately 600, the recommended maximum overflow rate at ADWF is 600 gpd/sf. This criteria can be modified, of course if some of the performance issues become identified and corrected. Although the District has operated the primary clarifier at PWWF overflow rates approaching 4,000 gpd/sf, it is recommended that the clarifier be operated at a more typical rate of 2,500 gpd/sf. It should be noted that the District can still provide reliable treatment while operating above the recommended overflow rate as long as the downstream secondary process can accommodate the higher loads. Table 5.9 summarizes the performance and capacity criteria and the resulting capacity of the primary clarifier.

6.2.5 Aeration Basin

As discussed previously, the aeration basin has done an excellent job of removing $CBOD_5$ and TSS. During most of the year, the District operates the aeration basin so that they partially nitrify (i.e., oxidize ammonia). Figure 5.5 illustrates the effluent ammonia during the review period. The fact that the WWTP is not able to achieve complete nitrification is not surprising as 2011 data indicate the secondary process was operated at a solids retention time (SRT) ranging from 0.4 to 3.8 days with an average of 1.7 days. Typically, to reliably nitrify with the wastewater temperatures seen in the San Francisco Bay Area, an SRT of 6 days or greater is needed. For reliable process performance when operating in carbonaceous BOD5 removal only, it is recommended that a minimum SRT of 2.5 days is maintained during maximum month loading conditions. Figure 5.6 illustrates the calculated SRT during the review period. Limited influent alkalinity data also suggest there is insufficient alkalinity to support the nitrification process all the time. Nitrification consumes alkalinity, and insufficient alkalinity can suppress the process. Table 5.10 summarizes the performance and capacity criteria and the resulting ADWF capacity of the aeration basin.

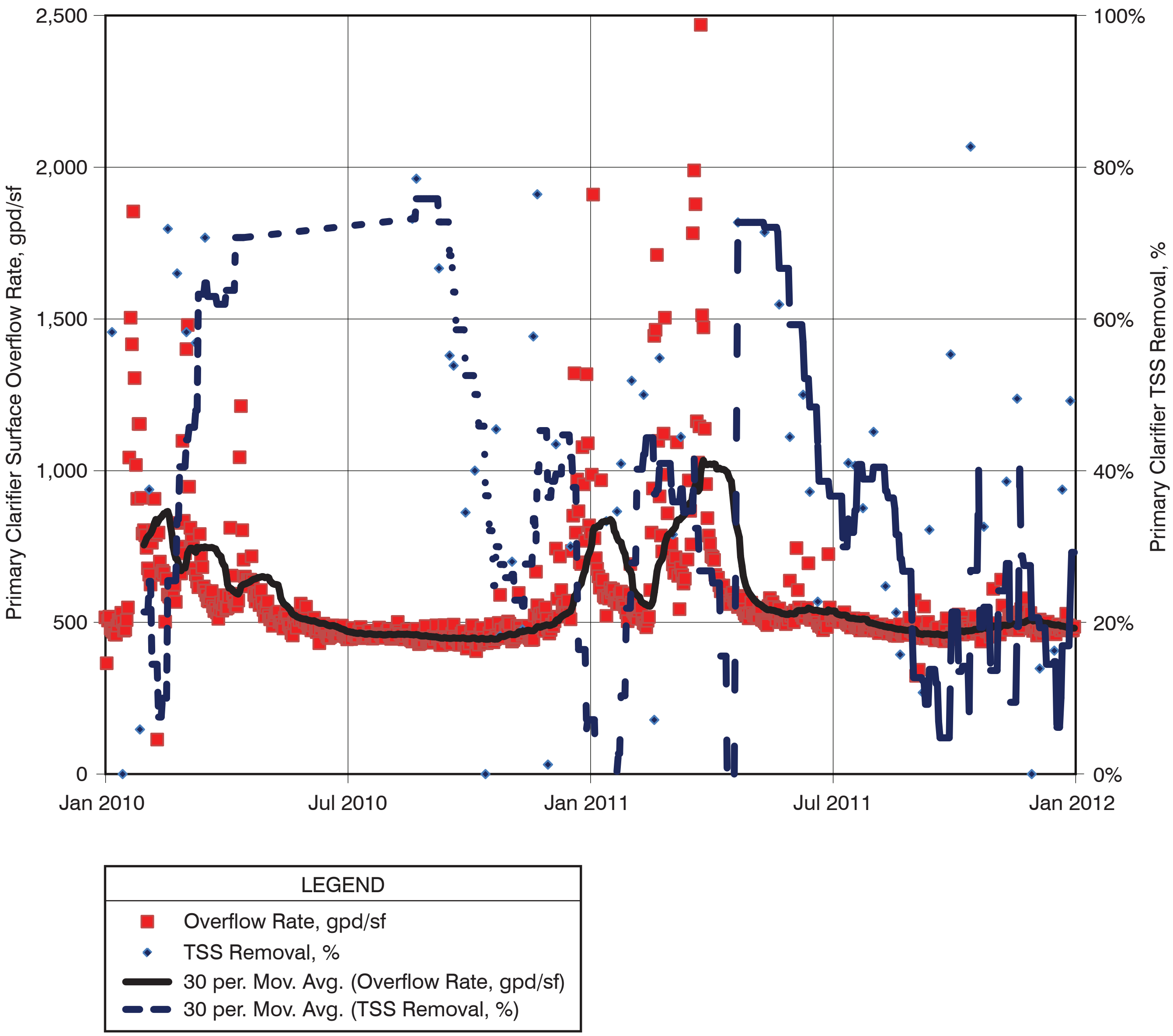

Figure 5.4
PRIMARY CLARIFIER OVERFLOW RATE AND PERFORMANCE
COMPREHENSIVE WASTEWATER MASTER PLAN
RODEO SANITARY DISTRICT

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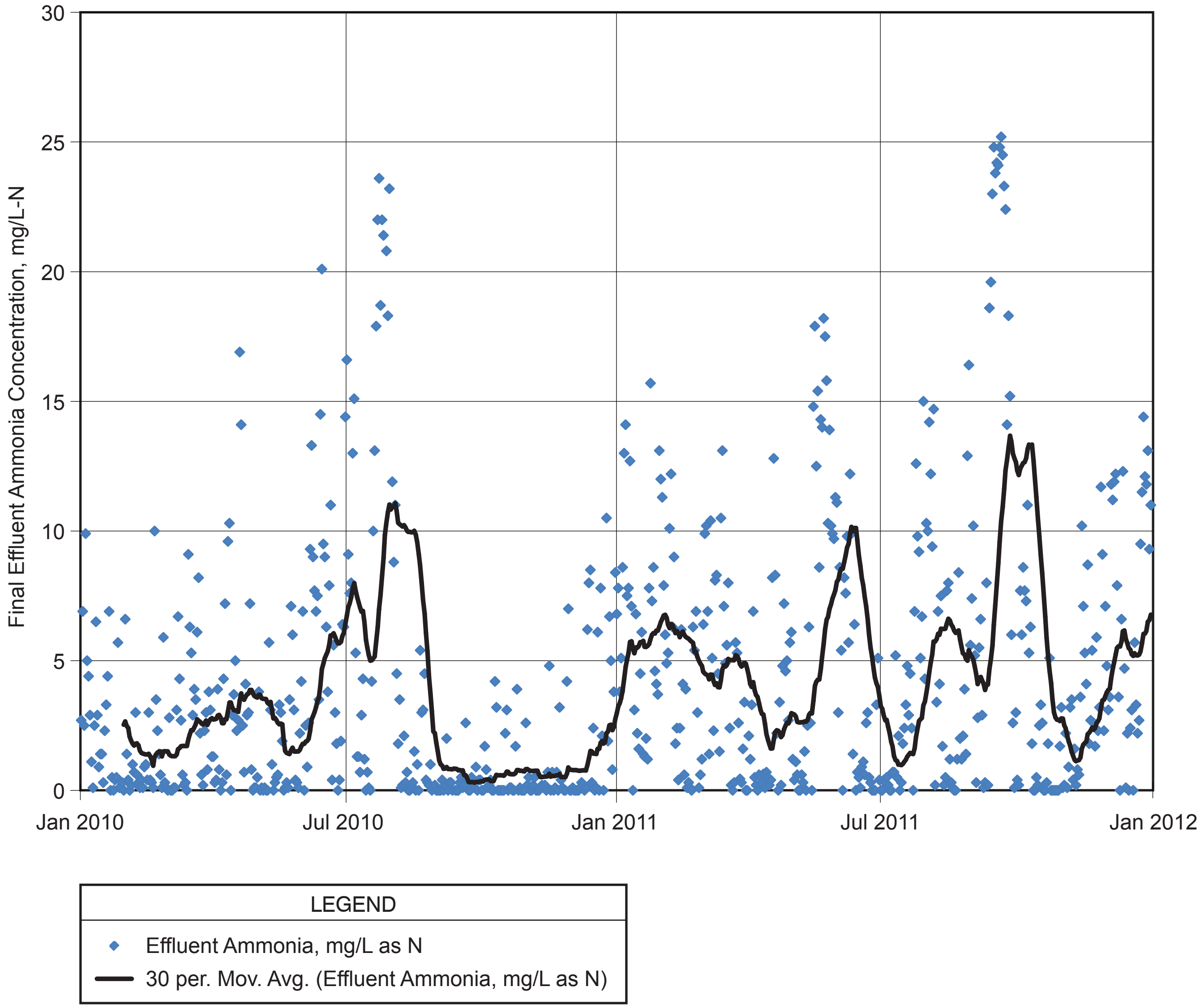

Figure 5.5
EFFLUENT AMMONIA
COMPREHENSIVE WASTEWATER MASTER PLAN
RODEO SANITARY DISTRICT

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Table 5.9 Primary Clarifier Assessment
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Item	Original Design(2)	2010 – 2011 Average	Capacity Criteria MOP 8(1)	Capacity Criteria Recommended	Capacity, mgd
Surface Overflow Rate					
ADWF, gpd/sf	670	576	800 to 1,20	600	0.75 ADWF
PWWF, gpd/sf	1,590	3,662 (3)	---	2,500	3.2 PWWF
Average TSS Removal, %	50	38	50 to 70	50	---
Average BOD_5 Removal, %	35	-3	25 to 40	25	---
Primary Sludge, % TS	---	4.0%	3 to 6%	4.0%	---

Notes:
(1) Design of Municipal Wastewater Treatment Plants Fifth Edition, Water Environment Federation/America Society of Civil Engineers, 2010.
(2) Original design criteria from the 1957 Sewage Treatment Works Project based on an original design flow rate of 0.84 mgd and a peak flow rate of 2.00 mgd.
(3) Overflow rate based on 4.6 mgd, the peak hour flow according to past reports. No data available.

Table 5.10 Aeration Basin Assessment
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Item	Original Design Criteria	2011 Average	Capacity Criteria MOP 8(1)	Capacity Criteria Recommended	ADWF Capacity, mgd
SRT, Carbonaceous BOD_5 Removal Only, days	12	1.7	Variable	2.5 at max month loading	1.14
SRT, Ammonia Removal, days	---	1.7	Variable	6.0 at max month loading	0.63
MLSS Concentration, mg/L	2,500	1,000 (2)	1,000 to 4,000	2,500	--
Temperature, deg C	---	Avg = 21.0 10%ile = 17.4	Variable	17.4 minimum month	--

Notes:
(1) Design of Municipal Wastewater Treatment Plants Fifth Edition, Water Environment Federation/America Society of Civil Engineers, 2010.
(2) Based on anecdotal information from plant staff.

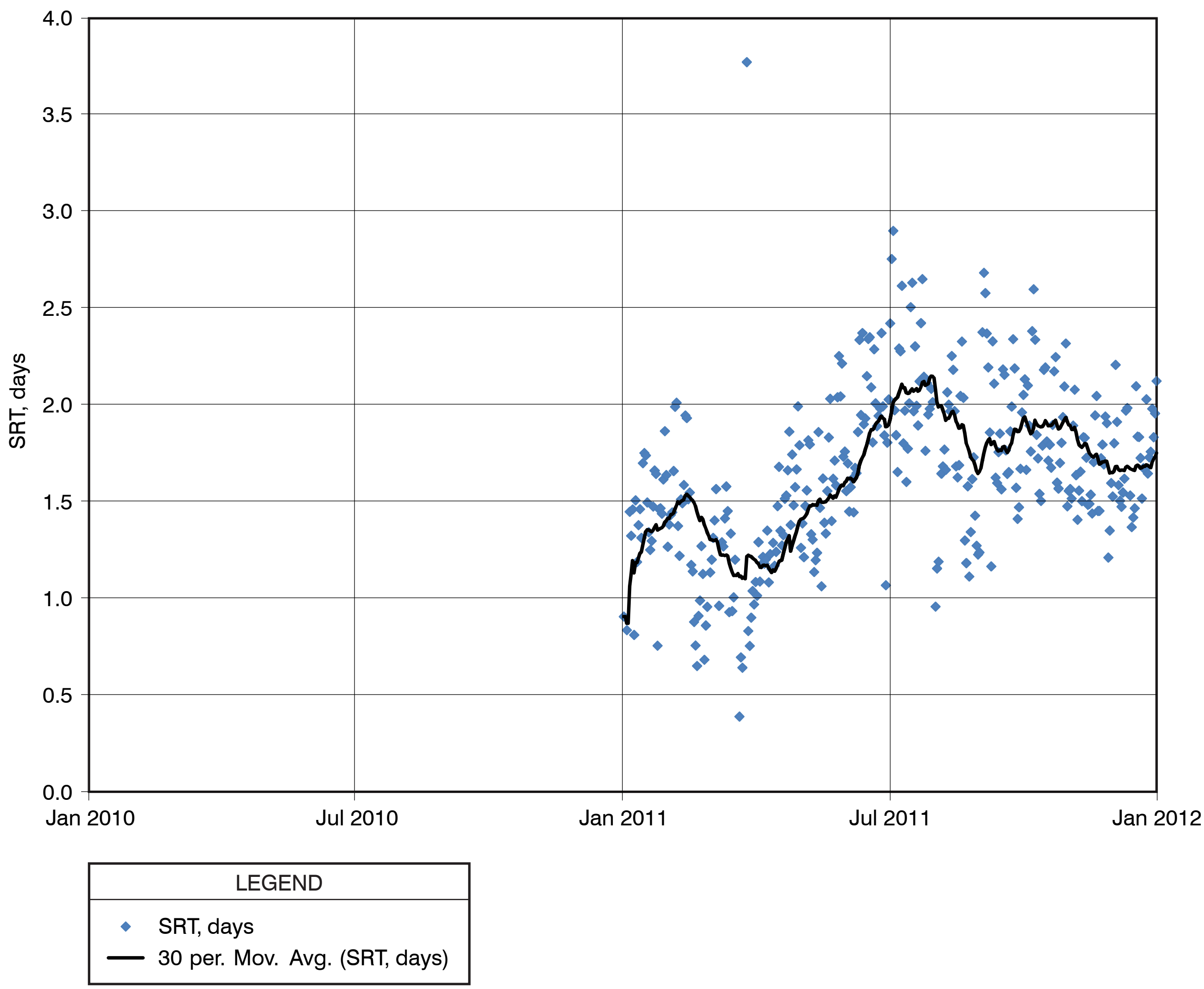

Figure 5.6
SECONDARY PROCESS SRT
COMPREHENSIVE WASTEWATER MASTER PLAN
RODEO SANITARY DISTRICT

6.2.6 Secondary Clarifiers

The PWWF capacity of the secondary clarifiers is based on its ability to settle sludge at peak flows, which is largely dependent on the mixed liquor suspended solids (MLSS) settleability and concentration. MLSS settleability is quantified by the sludge volume index (SVI), which measures the volume of sludge occupied by a mixed liquor sample after allowing it to settle for 30 minutes. The lower the sludge volume index, the better the settleability. Therefore, the peak flow capacity of the secondary clarifiers increases as the SVI and MLSS concentration are decreased. Because of this, the rated capacity of the secondary clarifiers can vary widely depending on the assumptions for SVI and MLSS concentration. The secondary clarifiers capacity was estimated based on a reasonable worst-case SVI of 225 mL/g, which represented the 90th percentile value seen in 2010 through 2011. A target SVI for a well-functioning aeration basin is 150 mL/g. Anoxic selectors such as the one already in place at the WWTP are commonly used to improve an aeration basin's settleability. In an effort to improve settleability, the District may consider doing some nutrient profiling (i.e. ammonia, nitrate, and phosphorus) in the aeration basins to determine how well the selector is functioning. Figure 5.7 is an illustration of the SVI during the review period.

During wet weather periods, the WWTP can modify the operation of the aeration basins to reduce the MLSS concentration being applied to the clarifiers. One strategy can be to temporarily turn off the diffusers so that most of the sludge will settle in the aeration basin. An alternate strategy is contact stabilization. This approach requires that the primary effluent be introduced into the second pass of the aeration basin instead of the first pass where RAS is introduced. The WWTP has experienced very high overflow rates during wet weather flows and has been able to survive by employing temporary operational changes such as those described to prevent overloading the secondary clarifiers. Table 5.11 summarizes the performance and capacity criteria and the resulting PWWF capacity of the secondary clarifiers with the current operating mode and with contact stabilization.

6.2.7 Chlorine Contact Basin

A chlorine contact basin is typically rated based on minimum contact time criteria. During the review period, the basin has performed well and met the required coliform limits at all times. Table 5.12 summarizes the performance and capacity criteria and the resulting capacity of the chlorine contact basin.

6.2.8 Effluent Pump Station and Outfall

The District discharges effluent from the chlorine contact basin to the outfall system by gravity until the water level in the chlorine contact basin effluent box increases to the effluent pump station setpoint that turns on the effluent pumps. There are two lower

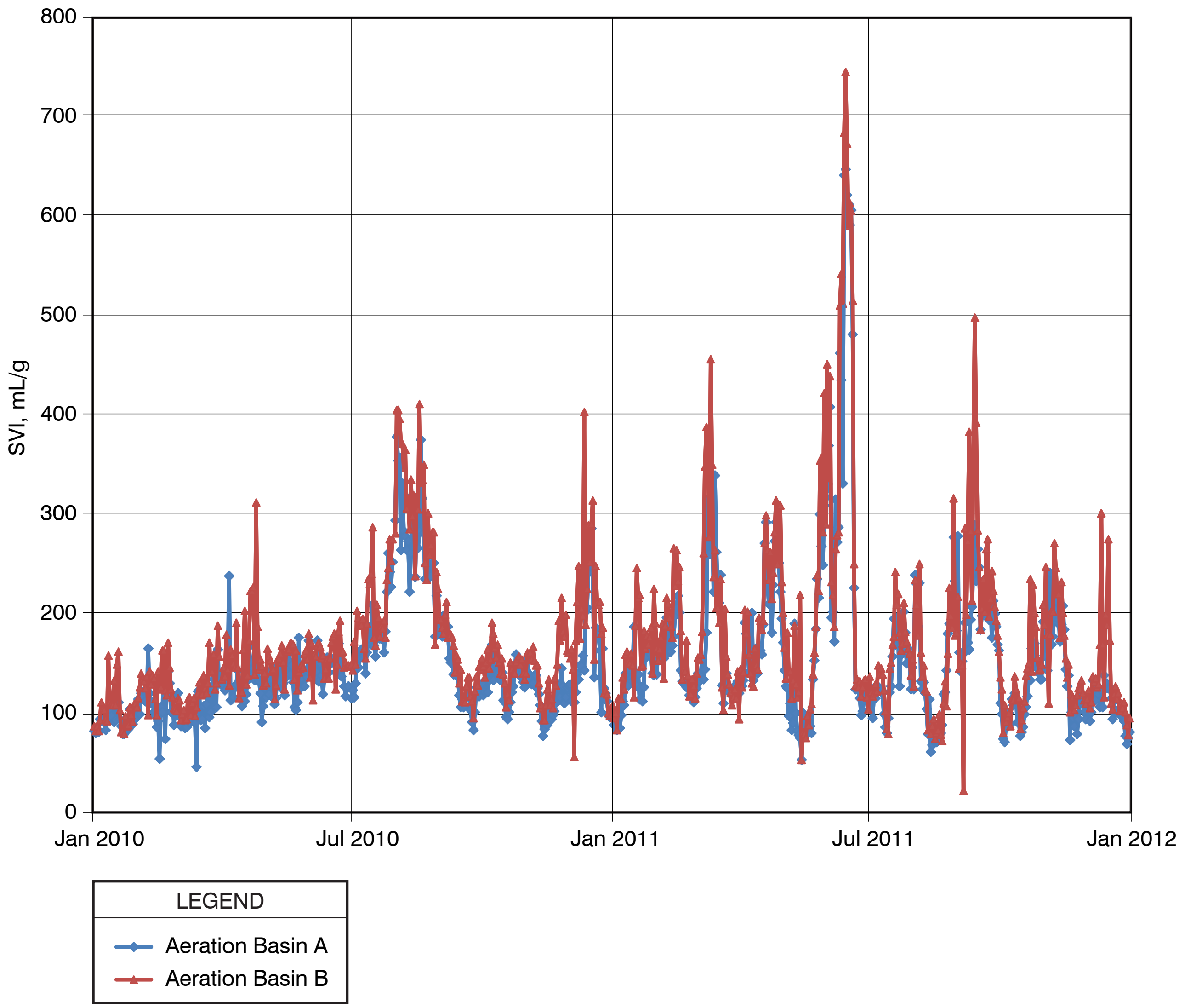

Figure 5.7
MLSS SLUDGE VOLUME INDEX (SVI)
COMPREHENSIVE WASTEWATER MASTER PLAN
RODEO SANITARY DISTRICT

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**Table 5.11 Secondary Clarifier Assessment
Comprehensive Wastewater Master Plan
Rodeo Sanitary District**

Item	Original Design Criteria	2011 Average	Capacity Criteria: MOP 8[1]	Capacity Criteria: Recommended	PWWF Capacity, mgd[2]
PWWF Overflow Rate assuming plug flow operation, gpd/sf	---	1,831	1,000 to 1,600	800	2.1
PWWF Overflow Rate assuming contact stabilization, gpd/sf [3]	---	---	1,000 to 1,600	1,600	4.0

Notes:

(1) Design of Municipal Wastewater Treatment Plants Fifth Edition, Water Environment Federation/America Society of Civil Engineers, 2010.

(2) Based on 90th percentile SVI of 225 mL/g and operating MLSS concentration of 2,500 mg/L. To realize the PWWF capacity, it is also recommended to increase the RAS capacity to a minimum capacity of 2.0 mgd.

(3) Based on primary effluent feed to second aeration pass, or employing an alternate method to 1,250 mg/L.

**Table 5.12 Chlorine Contact Basin Assessment
Comprehensive Wastewater Master Plan
Rodeo Sanitary District**

Item	Original Design Criteria	2010 - 2011 Average	Capacity Criteria: MOP 8 [1]	Capacity Criteria: Recommended	Capacity, mgd
Contact Time at ADWF, minutes	46	76	30	30	1.7 ADWF
Contact Time at PWWF, minutes	---	11	15	15	3.4 PWWF

Note:

(1) Design of Municipal Wastewater Treatment Plants Fifth Edition, Water Environment Federation/America Society of Civil Engineers, 2010.

capacity effluent pumps and two higher capacity effluent pumps. Since the low and high capacity pumps do not operate simultaneously, the pump station capacity was determined using the larger pump capacities only. Although the pump station is not currently operated with both the low and high capacity pumps running simultaneously, performing necessary modifications to allow doing so would increase the capacity, if needed. Table 5.13 summarizes the effluent pump station capacity.

Table 5.13 Effluent Pump Station Capacity Comprehensive Wastewater Master Plan Rodeo Sanitary District	
Item	**Value**
Firm Capacity, mgd	5
Total Installed Capacity, mgd	10

6.2.9 Rotary Drum Thickener

Rotary drum thickener capacities are based on a maximum solids loading rate. The District's rotary drum thickener is specified and rated for a maximum solids loading rate of 250 lbs per hour. This is based on a maximum feed rate of 200 gpm and a feed concentration of 2,500 mg/L. Different combinations of feed flow and concentration may allow for a higher solids loading capacity, although, this has not been confirmed. Based on the current operation of up to 6 hours per day, this amounts to a maximum capacity of 1,750 lb/day. The District can increase the daily thickening capacity by increasing the daily run times. The RDTs have performed well achieving an average thickened solids concentration of 4.3 percent. Table 5.14 summarizes the performance and capacity criteria and the resulting capacity of the rotary drum thickener.

Table 5.14 Rotary Drum Thickener Assessment
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Item	Original Design Criteria	2010 - 2011 Average	Capacity Criteria		ADWF Capacity, mgd
			MOP 8 (1)	Recommended	
Solids Loading Rate, lb/hr	250 (2)	131	Variable	250	1.01 (3)
Thickened Solids Concentration, % TS	4.0 (2)	4.3	4 to 9	4.0	---
Capture, %	98 (2)	>95(4)	93 to 99	95	---

Notes:

(1) Design of Municipal Wastewater Treatment Plants Fifth Edition, Water Environment Federation/America Society of Civil Engineers, 2010.

(2) Based on 2000 Rotary Drum Thickener Project specified rotary drum requirement of 200 gpm at 2,500 mg/L.

(3) Based on a 7-hour daily run time. Capacity can be increased to 1.14 mgd ADWF by increasing run time to 8 hours daily.

(4) Inadequate TWAS flow data to calculate capture; however, approximate capture was provided anecdotally from Rodeo Sanitary District.

6.2.10 Anaerobic Digesters

In 2010, the reported volatile solids destruction was 69 percent, which is excellent performance considering that the hydraulic detention time in the primary digester is less than the typical criteria of 15 days. Table 5.15 summarizes the performance and capacity criteria and the resulting capacity of the anaerobic digester. The capacity is calculated based on the volume in the primary digester being heated and mixed only as is the current operation. The volume is also calculated based on the primary and secondary digester being mixed and heated as well.

Table 5.15 Anaerobic Digesters Capacity Evaluation
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Item	Original Design Criteria	2010 - 2011 Average	Capacity Criteria		ADWF Capacity, mgd
			MOP 8[1]	Recommended	
Hydraulic Retention Time (primary only), days[2]	13	12.8	15	15	0.51[3]
Hydraulic Retention Time (primary and secondary), days[2]	26	25.5			1.02[3]
Volatile Solids Loading Rate (primary only), lbs VS/cf/day[2]	---	0.16	0.12 to 0.16	0.15	0.53
Volatile Solids Loading Rate (primary and secondary), lbs VS/cf/day[2]	---	0.08			1.06
VS Reduction, %	---	69	50 to 65	50 (minimum)	--
Digested Sludge % TS	---	1.33	0.3 – 1.5	1.3	--

Notes:
(1) Design of Municipal Wastewater Treatment Plants Fifth Edition, Water Environment Federation/America Society of Civil Engineers, 2010.
(2) Primary sludge flow data was not available for review, quantities estimated from the calibrated process model to determine 2010 through 2011 performance.
(3) Based on primary sludge TS concentration = 4.0 percent and TWAS concentration = 5.0 percent.

6.2.11 Centrifuge Dewatering

Centrifuge capacities are based on a maximum solids loading rate. The District's centrifuge is rated for a maximum solids loading rate of 700 to 800 lbs per hour (dry basis) and is operated 7 hours per day, 7 days per week. The District can increase the dewatering capacity by increasing the daily run times. The centrifuge has performed well achieving an average cake solids concentration of 16.5 percent. Table 5.16 summarizes the performance and capacity criteria and the resulting capacity of the centrifuge.

Table 5.16 Centrifuge Capacity Evaluation
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Item	Original Design Criteria	2010 - 2011 Average	Capacity Criteria		ADWF Capacity, mgd
			MOP 8 (1)	Recommended	
Solids Loading Rate, lbs/hour (dry)	700 to 800(2)	270(3)	Variable	700	1.80(4)
Dewatered Cake Concentration, %TS	23 to 24(2)	16.5	Variable	16.5	---

Notes:
(1) Design of Municipal Wastewater Treatment Plants Fifth Edition, Water Environment Federation/America Society of Civil Engineers, 2010.
(2) Design criteria from centrifuge data sheets in the District's O&M manuals.
(3) Sludge flow data was not available for review, quantities estimated from the calibrated process model and a daily run time of 4 hours.
(4) Based on a daily run time of 7 hours.

6.3 Summary of Treatment Capacity

Figures 5.8 and 5.9 illustrate the ADWF and PWWF process capacity for each unit process. Most of the unit processes have performed well and have sufficient carbonaceous BOD_5 treatment capacity to handle flows up to the rated NPDES permit capacity for the WWTP, which is 1.14 and 3.4 mgd for ADWF and PWWF. Key performance or capacity issues are summarized below:

- Due to the reduced performance and poor removal efficiency of the primary clarifier, its capacity is estimated to be 0.75 mgd at ADWF. To improve performance, the District should consider providing additional capacity, performing modifications to improve hydraulics or sludge pumping, or possibly implementing enhanced primary treatment.

- During the PWWF, the secondary process should operate in contact stabilization mode or utilize another temporary operational change to reduce the solids loading to the secondary clarifiers. Not doing so during the PWWF could likely cause increased effluent TSS concentrations resulting in a failure to meet the District's permitted effluent discharge requirements.

- There is inadequate return activated sludge pumping capacity to accommodate the PWWF. Additional RAS pumping capacity should be provided.

- The rotary drum thickener may need to be operated at slightly longer run times to have sufficient capacity at the rated NPDES permit capacity of 1.14 mgd ADWF.

- To have sufficient anaerobic digester capacity when the ADWF exceeds 1.02 mgd, the following will need to take place:
  - Provide sufficient mixing and heating for both digesters and operate them in parallel.
  - Increase the primary sludge and thickened WAS feed concentration beyond typical values.
  - During peak month loading conditions, the digesters will need to be operated at higher than recommended volatile solids loading rates.

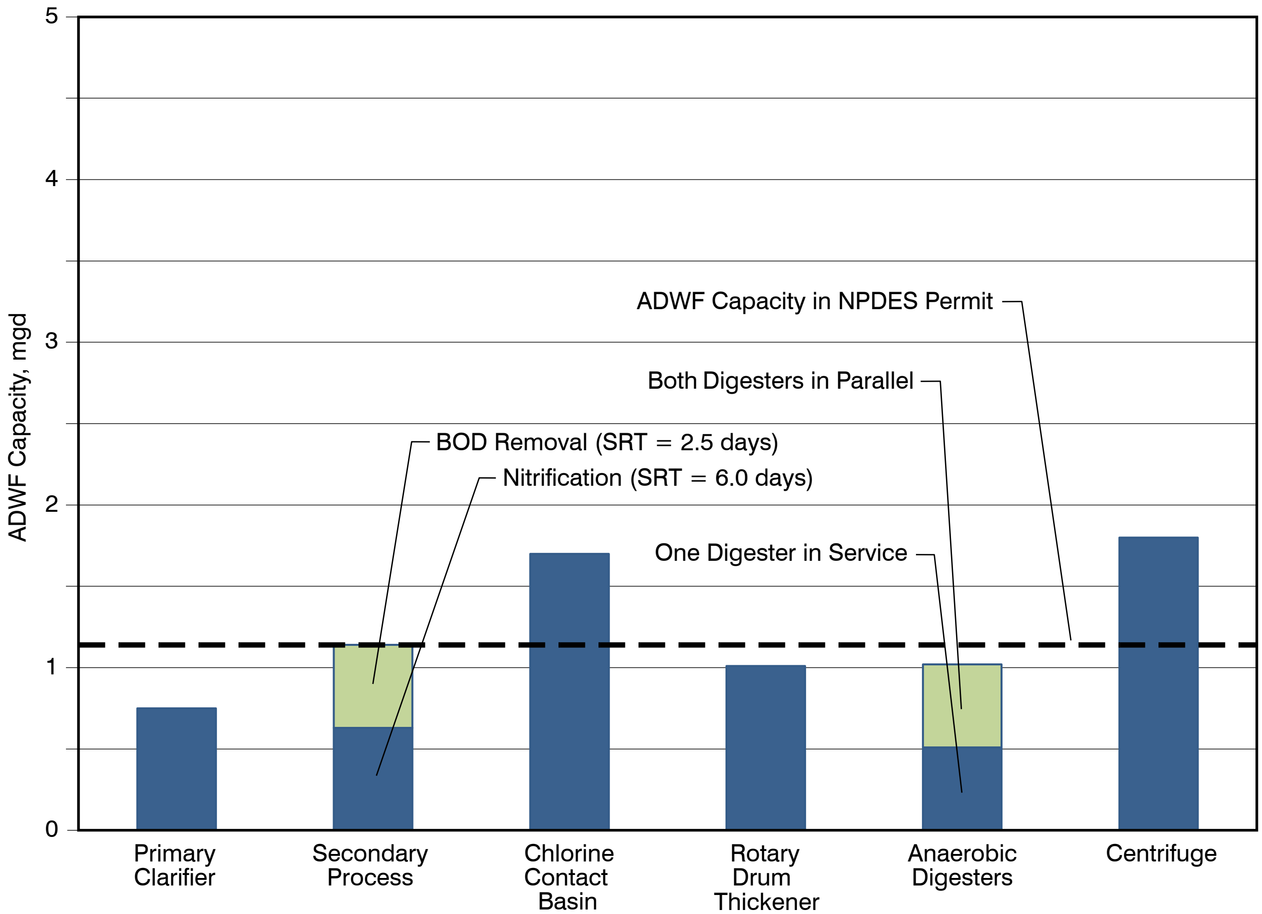

Figure 5.8
SUMMARY OF ADWF PROCESS CAPACITY
COMPREHENSIVE WASTEWATER MASTER PLAN
RODEO SANITARY DISTRICT

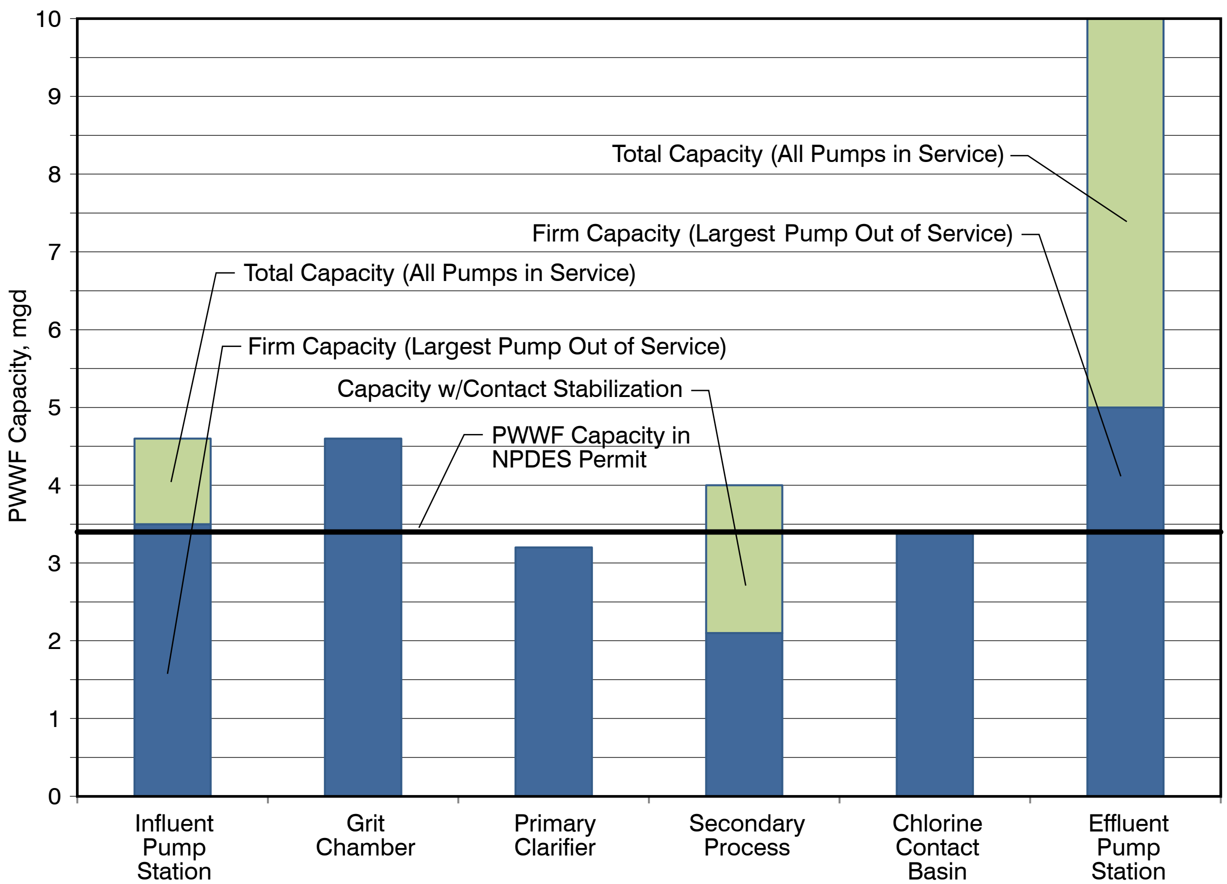

Figure 5.9
SUMMARY OF PWWF PROCESS CAPACITY
COMPREHENSIVE WASTEWATER MASTER PLAN
RODEO SANITARY DISTRICT

APPENDIX A – EXISTING FACILITIES DESIGN CRITERIA

Table A.1 Appendix A - Existing Facilities Design Criteria
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Item	Units	Value
Liquid Stream Facilities		
Influent Pump Station		
Pumps		
Type	-	centrifugal
Number	-	2
Capacity, each	gpm	1,200
TDH	ft	31
Pumps		
Type	-	centrifugal
Number	-	1
Capacity, each	gpm	1,700
TDH	ft	33
Comminutors		
Type	-	in-channel
Number (Duty + Standby)	-	1+1
Capacity, each	gpm	2,300
Grit Chamber		
Tank		
Type	-	aerated
Number	-	1
Width	ft	7
Length	ft	15
Side Water Depth	ft	10
Primary Clarifier		
Tanks		
Type	-	circular
Number	-	1
Diameter	ft	40

Table A.1 Appendix A - Existing Facilities Design Criteria
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Item	Units	Value
Side Water Depth	ft	7.5
Sludge Pump		
Type	-	double disc diaphragm
Number	-	1
Capacity, each	gpm	175
Scum Pump		
Type	-	double disc diaphragm
Number	-	1
Capacity, each	gpm	175
Aeration Basins		
Tanks		
Type	-	complete-mix
Number	-	2 (in series)
Width, each	ft	25
Length, each	ft	60
Volume, each	cf	21,000
Volume of Anoxic Zone	%	15
Diffusers		
Type	-	fine bubble membrane panels
Number of Panels	-	29
Approximate Panel Coverage	sf	1,160
Blowers		
Type	-	multi-stage, centrifugal
Number (Duty + Standby)	-	2+1
Rated Capacity, each (at 7.50 psig)	scfm	1,000
Motor Size, each	HP	75

Table A.1 Appendix A - Existing Facilities Design Criteria
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Item	Units	Value
Secondary Clarifiers		
Tanks		
Type	-	circular
Number	-	2
Diameter	ft	40
Sidewater Depth	ft	10.5
RAS Pump		
Type	-	centrifugal
Number (Duty + RAS/WAS Standby)	-	1+1
Capacity, each	gpm	400
WAS Pumps		
Type	-	centrifugal
Number	-	1
Capacity, each	gpm	325
Disinfection		
Chlorine Contact Basin		
Number	-	1
Volume	cf	4,700
Chlorination		
Type	-	sodium hypochlorite
Number of Tanks	-	1
Volume, each	gals	3,500
Number of Pumps	-	3
Dechlorination		
Type	-	sodium bisulfite
Number of Tanks	-	1
Volume, each	gals	3,500
Number of Pumps	-	2

Table A.1 Appendix A - Existing Facilities Design Criteria
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Item	Units	Value
Effluent Pump Station		
Pumps (Low Capacity)		
Type	-	vertical turbine
Number	-	1+1
Capacity, each	mgd	1,200
TDH	ft	7.5
Pumps (High Capacity)		
Type	-	vertical turbine
Number	-	1+1
Capacity, each	mgd	3,500
TDH	ft	58
Solids Handling Facilities		
WAS Thickener		
Thickening Equipment		
Type	-	rotary drum
Number	-	1
Rated Capacity	gpm	200
Rated Capacity	lb TSS/hr	250
Thickened WAS Pump		
Type	-	double disc diaphragm
Number	-	1
Polymer Feed Pump		
Type	-	diaphragm
Number	-	1
Polymer Type	-	emulsion

Table A.1 Appendix A - Existing Facilities Design Criteria
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Item	Units	Value
Anaerobic Digesters		
Tanks		
Type	-	mesophilic
Number (Primary + Secondary)	-	1+1 (In Series)
Diameter	ft	30
Volume	cf	10,400
Digester Mixing Pumps		
Type	-	chopper centrifugal
Number	-	2
Digester Recirculation Pumps		
Type	-	recessed impeller
Number	-	2
Heat Exchangers		
Type	-	spiral
Number	-	2
Boiler		
Type	-	natural gas
Number	-	1
Hot Water Pump		
Type	-	centrifugal
Number	-	1
Flare		
Type	-	natural gas/digester gas
Number	-	1
Dewatering		
Dewatering Equipment		
Type	-	centrifuge
Number	-	1
Rated Capacity	lb TSS/hr	700 to 800

Table A.1 Appendix A - Existing Facilities Design Criteria
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Item	Units	Value
Digested Sludge Pump		
Type	-	progressing cavity
Number	-	1
Digested Sludge Grinder		
Type	-	inline
Number	-	1
Polymer Feed Pump		
Type	-	progressing cavity
Number	-	1
Polymer Type	-	emulsion
Sludge Drying/Storage Beds		
Number	-	5
Area, total	sf	12,420
Support Facilities		
Emergency Generator		
Type	-	diesel
Number	-	1
Plant Water		
Pumps		
Type	-	centrifugal
Number	-	1+1
Hydropneumatic Tank		
Number	-	1
Volume	gals	2,000

Table A.1 Appendix A - Existing Facilities Design Criteria
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Item	Units	Value
Plant Air Compressor		
Type	-	duplex, reciprocating
Number	-	1
Recycled Water Pump		
Type	-	centrifugal
Number	-	1

APPENDIX B – CONDITION ASSESSMENT PHOTOS

Influent Pump Station - a - generator exhaust connecti...

Influent Pump Station - b - concrete coating needed fo...

Influent Pump Station - c - roof leak and blistering of th...

Influent Pump Station - d - heavily corroded pump sup...

Influent Pump Station - e - concrete spalling at floor op...

Influent Pump Station - f - heavily corroded sump cove...

Influent Pump Station - g - spalled concrete at floor op...

Influent Pump Station - h - acoustic door lining.jpg

Influent Pump Station - i - heavily corroded opening co...

Influent Pump Station - a - generator exhaust connecti...

Influent Pump Station - b - concrete coating needed fo...

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Influent Pump Station - f - heavily corroded sump cove...

Influent Pump Station - g - spalled concrete at floor op...

Influent Pump Station - h - acoustic door lining.jpg

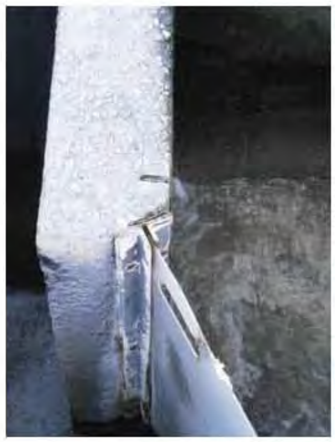
Influent Pump Station - i - heavily corroded opening co...


anchor stubs resulted in cracking.jpg


breaker panel conduit routing on the south face of buil...


breaker panel.jpg


channel filled in concrete.jpg


coating of guide inserts.jpg


corroded unistrut pipe support.jpg


cracking due to corrosion of rebar.jpg


damaged masonry parapet + pipe corrosion.jpg

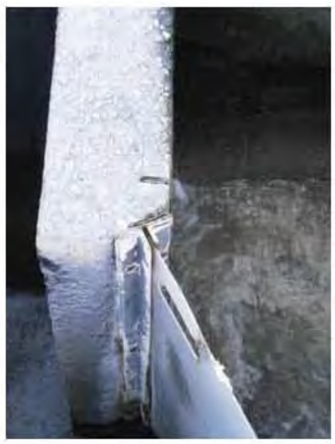

deteriorated concrete cover.jpg


anchor stubs resulted in cracking.jpg


breaker panel conduit routing on the south face of buil...


breaker panel.jpg


channel filled in concrete.jpg


coating of guide inserts.jpg


corroded unistrut pipe support.jpg


cracking due to corrosion of rebar.jpg


damaged masonry parapet + pipe corrosion.jpg


deteriorated concrete cover.jpg

Corroded Guardrail 1.jpg


Corroded Guardrail 2.jpg


Peeling of Coating 1.jpg


Peeling of Coating 2.jpg


Shrinkage Cracking.jpg

Corroded Guardrail.jpg

coverplates corroded with no support 1.jpg

coverplates corroded with no support 2.jpg

coverplates corroded with no support 3.jpg

exposed rebar and spalled concrete at grating rebate.j...

heavily corroded coverplates and instrument support.jpg

slab on grade walkway settlement.jpg

spalled concrete and corroded cover plates.jpg

spalled concrete at grating rebate opening.jpg


spalled concrete at guardrail attachment to concrete.jpg


Wood Baffle Wall 1.jpg


Wood Baffle Wall 2.jpg

RAS Pump OOS.jpg

RAS WAS Ctrls.jpg

RAS WAS Pump Room.jpg

Secondary Clarifier A.jpg

Secondary Clarifier B.jpg

Secondary Diversion Structure.jpg

fiberglass baffle walls 2.jpg

fiberglass baffle walls 3.jpg

fiberglass baffle walls 4.jpg

fiberglass bafflle walls 1.jpg

parshall flume fileld.jpg

pump skid needs coating.jpg

weir gates bent stem.jpg

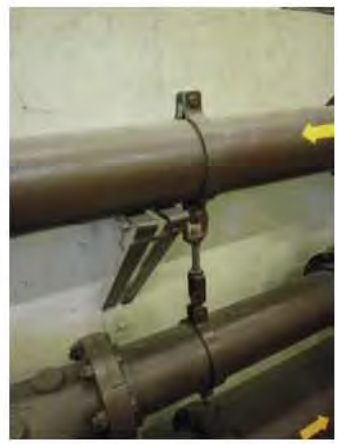

corroded pipe needs coating.jpg


Corroded Pipe Support 1.jpg


Corroded Pipe Support 2.jpg


corroded pump support.jpg


heavily corroded pump skids in effluent pump station.jpg


lateral bracing missing from pipe supports.jpg


platform needs coating.jpg


water surge tank unknown anchorage.jpg


Heavily Corroded Access Hatch.jpg


Heavily Corroded Mezzanine Support Beam 1.jpg


Heavily Corroded Mezzanine Support Beam 2.jpg


Heavily Corroded Pump Skid 1.jpg


Heavily Corroded Pump Skid 2.jpg


Ledger Block Anchorage.jpg


Pipe Coating.jpg


Roof Beam Corroded needs coating 1.jpg


Roof Beam Corroded needs coating 2.jpg


Roof Beam Corroded needs coating 3.jpg


Roofing Deteriorated.jpg


Rotary Drum Thickener a.jpg


Rotary Drum Thickener b.jpg


Site General - - Damaged Masonry.jpg

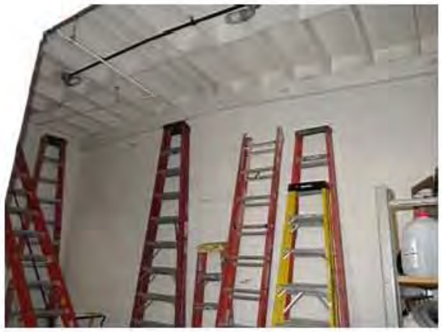

Site General - - Spalling of Curb.jpg


sludge hopper.jpg


sludge recirculation pumps.jpg


Sludge Thickener Bldg a.jpg

Sludge Thickener Bldg beams.jpg



Sludge Thickener Bldg roof connections.jpg

Sludge Thickening Bldg b.jpg


Deteriorated Flashing.jpg


pipe flexibility required 1.jpg


pipe flexibility required 2.jpg


poor detailing for fan mounting curb and corroded flas...


Roofing Deteriorated 1.jpg

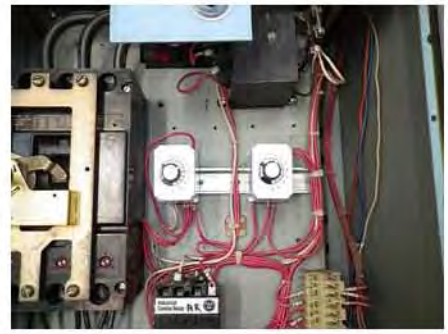

Roofing Deteriorated 2.jpg

Dissimilar Metals Corrosion Unistrut Supports.jpg

Minor Corrosion of canopy support .jpg

Blower Room MCC a.jpg

Blower Room MCC b.jpg



Blower Room MCC c.jpg

Blower Room MCC d.jpg

Blower Room MCC e.jpg

Blower Room MCC f.jpg

Chem Mixing PLC a.jpg

Chem Mixing PLC b.jpg

Effluent PS VFDs.jpg


Electrical Room - a - surface repair.jpg


Electrical Room - b - corrosion on heat exchangers.jpg


Electrical Room - c - corrosion on heat exchangers.jpg


Electrical Room - d - coating of pipes needed.jpg


Electrical Room - e - no isolation for pumps.jpg


Electrical Room - f - large cracks opened in concrete fl...

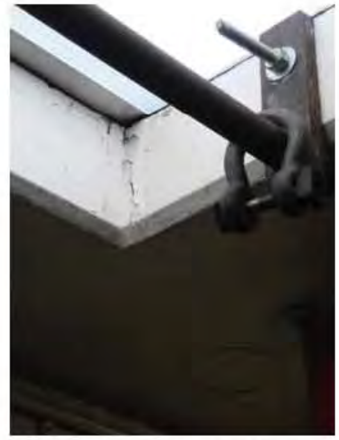

Electrical Room - g - large cracks opened in concrete f...


Electrical Room - h - flexible conduits at the generator....


Electrical Room - h - opening in masonry wall door re...

Electrical Room - i - cracks in floor slab.jpg

Electrical Room - i - slender gravity column generator r...



Electrical Room - j - signs of roof leak at skylight.jpg

Electrical Room - j - slender gravity column generator ...

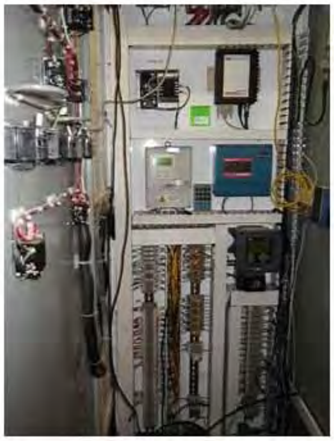
Electrical Room - k - generator exhaust connection.jpg

Electrical Room - l - generator exhaust connection.jpg

Electrical Room - m - New roofing.jpg

IPS compressor and ctrls.jpg

MCC EPS a.jpg



MCC EPS b int.jpg

MCC P1 a.jpg

MCC Room - a - roof joists need blocking.jpg

MCC-P1 b.jpg

APPENDIX C – REPLACEMENT COST ESTIMATES

Project/Components	Construction Cost	Project Cost
Near-Term Projects		
Influent Pump Station Structural Rehab and Tank Replacement		
Equipment Supports	$25,000	$33,000
IPS Diesel Fuel Tank	$55,000	$72,000
IPS Wet Well and Pump Room	$92,000	$120,000
	$172,000	**$225,000**
Grit Area Structural Repair and Coating		
Grit Channel	$90,000	$117,000
Influent Slide Gates	$35,000	$46,000
Pretreatment Structure Rehab	$35,000	$46,000
	$160,000	**$209,000**
Primary Clarifier Coating		
Primary Clarifier Rehab	$82,000	$107,000
	$82,000	**$107,000**
Weir Box Closure		
Old Scum Pit	$20,000	$26,000
	$20,000	**$26,000**
Primary Sludge Pumps		
Primary Sludge Pump 1	$42,000	$55,000
Primary Sludge Pump 2	$42,000	$55,000
	$84,000	**$110,000**
Anoxic Mixer		
Anoxic Mixer	$42,000	$55,000
	$42,000	**$55,000**
Blower Project		
Blower 1 and support equipment	$82,000	$107,000
Blower 2 and support equipment	$0	$0
Blower 3 and support equipment	$0	$0
	$82,000	**$107,000**
Aeration Basins Concrete Repair		
Aeration Basins Concrete Repair	$38,000	$49,000
	$38,000	**$49,000**
Outfall Cathodic Protection		
Plant Outfall Cathodic Protection	$8,000	$10,000
	$8,000	**$10,000**
Sludge Thickener Building Repair		
Sludge Thickener Bldg Roof Hatch	$10,000	$13,000
Sludge Thickener Building Roof	$17,000	$22,000
Sludge Thickener Building	$33,000	$43,000
	$60,000	**$78,000**

Project/Components	Construction Cost	Project Cost
Piping Supports and Flexible Couplings		
Blower Building Lateral Bracing	$7,000	$9,000
Flexible Couplings	$17,000	$22,000
Lateral Supports of Generator Silencer Pip	$3,000	$4,000
	$27,000	**$35,000**
Digester Control Building Coating		
Digester Control Building	$33,000	$43,000
	$33,000	**$43,000**
Tier 1 Seismic Evaluation		
Tier 1 Seismic Evaluation	$50,000	$50,000
	$50,000	**$50,000**
Digestion Equipment		
Boiler	$47,000	$61,000
Digester Feed Pumps	$81,000	$105,000
Sludge Heat Exchanger 1	$52,000	$68,000
Sludge Heat Exchanger 2	$52,000	$68,000
Sludge Recirculation Pumps	$91,000	$118,000
	$323,000	**$420,000**
MCC-P1 Replacement		
MCC P1	$181,000	$235,000
	$181,000	**$235,000**
Ungrounded Electrical Service Replacement		
Ungrounded Electrical Service Replaceme	$180,000	$234,000
	$180,000	**$234,000**
ArcFlash Study		
ArcFlash Study	$40,000	$40,000
	$40,000	**$40,000**
Security System, Reporting Software, and Telecom and Control Wiring		
SCADA Reporting Software	$22,000	$29,000
Security System	$15,000	$20,000
Control Wire Rerouting	$4,000	$5,000
Telecom Work	$6,000	$8,000
	$47,000	**$62,000**
Roofing		
Admin Bldg Roof	$38,000	$49,000
Blower Building Roof	$20,000	$26,000
Digester A Roof	$48,000	$62,000
Digester B Roof	$48,000	$62,000
IPS Generator Bldg Roof	$4,000	$5,000
Maintenance Shop Roof	$15,000	$20,000
	$173,000	**$224,000**
Repair Sludge Drying Bed 3		
Sludge Drying Bed 3	**$14,000**	**$18,000**
	$14,000	**$18,000**
Total Near-Term Projects	**$1,816,000**	**$2,337,000**

Project/Components	Construction Cost	Project Cost
Long-Term Projects		
Influent Pump Station Mechanical and Electrical		
IPS Channel Monster 1	$26,000	$34,000
IPS Channel Monster 2	$26,000	$34,000
Influent Pump Station MCC	$101,000	$131,000
IPS gate	$23,000	$30,000
IPS Influent Pump 1	$96,000	$125,000
IPS Influent Pump 2	$96,000	$125,000
IPS Influent Pump 3	$96,000	$125,000
IPS Influent Pump Drives	$13,000	$17,000
	$477,000	**$621,000**
Grit Blower and Cyclone		
Aerated Grit Blower	$20,000	$26,000
Grit Cyclone	$141,000	$183,000
	$161,000	**$209,000**
Pretreatment Structure Replacement		
Pretreatment Structure Repl	$2,221,000	$2,887,000
	$2,221,000	**$2,887,000**
Primary Clarifier Replacement		
Primary Clarifier Mechanism	$252,000	$328,000
Primary Clarifier Repl	$479,000	$623,000
	$731,000	**$951,000**
Aeration Basin Concrete Coating		
Aeration Basins	$272,000	$354,000
	$272,000	**$354,000**
Blower Building Repair and Coating		
Blower Building	$39,000	$51,000
	$39,000	**$51,000**
Membrane Diffusers		
HiOx Diffusers	$141,000	$183,000
	$141,000	**$183,000**
Blower MCC Replacement		
Blower Room MCC	$151,000	$196,000
	$151,000	**$196,000**
Secondary Clarifier Mechanical and Structural Rehab		
Secondary Clarifier A Coating	$47,000	$61,000
Secondary Clarifier A Drain Valve	$34,000	$44,000
Secondary Clarifier A Mechanism	$244,000	$317,000
Secondary Clarifier B Coating	$47,000	$61,000
Secondary Clarifier B Drain Valve	$34,000	$44,000
Secondary Clarifier B Mechanism	$244,000	$317,000
	$650,000	**$844,000**

Project/Components	Construction Cost	Project Cost
Chemical Equipment		
Bisulfite Pumps 1,2	$24,000	$31,000
Bisulfite Pumps 3,4,5	$35,000	$46,000
CCT Mixing Unit	$55,000	$72,000
Chem Mixing PLC	$84,000	$109,000
Chlorine Meters	$76,000	$99,000
Hypo and Bisulfite Tanks	$53,000	$69,000
	$327,000	**$426,000**
Effluent Pump Station Equipment		
Effluent Blower	$20,000	$26,000
Effluent PS VFDs	$109,000	$142,000
MCC Effluent Pump Station	$151,000	$196,000
	$280,000	**$364,000**
Sludge Pumping Equipment		
RAS Pump 8	$46,000	$60,000
RAS Pump OOS	$46,000	$60,000
WAS Pump 9	$37,000	$48,000
	$129,000	**$168,000**
Rotary Drum Thickener		
TWAS Pump	$42,000	$55,000
Rotary Drum Thickener a	$91,000	$118,000
	$133,000	**$173,000**
Digester Coating and Roofing		
Digester A	$224,000	$291,000
Digester B	$224,000	$291,000
Digester Control Building Roof	$17,000	$22,000
	$465,000	**$604,000**
Rehab Sludge Drying Beds and Piping		
Sludge Drying Bed 1	$11,000	$14,000
Sludge Drying Bed 2	$14,000	$18,000
Sludge Drying Bed 4	$11,000	$14,000
Sludge Drying Bed 5	$14,000	$18,000
Sludge Drying Bed Piping	$89,000	$116,000
	$139,000	**$180,000**
Waste Gas Flare		
Flare	$261,000	$339,000
	$261,000	**$339,000**
Dewatering Equipment		
Centrifuge	$153,000	$199,000
Polymer Feed Pump	$50,000	$65,000
Polymer Makeup Tank	$0	$0
Sludge Hopper	$84,000	$109,000
	$287,000	**$373,000**
SCADA Improvements		
PLC in Admin Bldg	$84,000	$109,000
	$84,000	**$109,000**

Project/Components	Construction Cost	Project Cost
Surge Tank and Diesel Tank		
Diesel Tank	$55,000	$72,000
Surge Tank	$23,000	$30,000
	$78,000	**$102,000**
Standby Generator		
Standby Generator	$420,000	$546,000
	$420,000	**$546,000**
Total Long-Term Projects	**$7,446,000**	**$9,680,000**
Total Near-Term and Long-Term R&R Projects	**$9,262,000**	**$12,017,000**

6/3/13

6/3/13

RODEO SANITARY DISTRICT

COMPREHENSIVE WASTEWATER MASTER PLAN

TECHNICAL MEMORANDUM NO. 6

COLLECTION SYSTEM AND TREATMENT PLANT ALTERNATIVES

FINAL
June 2013

RODEO SANITARY DISTRICT

COMPREHENSIVE WASTEWATER MASTER PLAN

COLLECTION SYSTEM AND TREATMENT PLANT ALTERNATIVES

TECHNICAL MEMORANDUM
NO. 6

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COLLECTION SYSTEM AND TREATMENT PLANT ALTERNATIVES

1.0 PURPOSE

The purpose of this technical memorandum (TM) is to develop three (3) system-wide alternatives for the collection, treatment, and disposal of wastewater in the Rodeo Sanitary District (District). The alternatives were developed to address capacity and rehabilitation and replacement needs as described in TMs No. 3 through 5 of the Comprehensive Wastewater Master Plan (CWWMP). A description and estimated project cost is provided for each alternative.

2.0 SUMMARY OF KEY FINDINGS AND RECOMMENDATIONS

The key findings and recommendations of this TM are summarized below:

- Three (3) alternatives were developed to address the District's wet weather capacity limitations and rehabilitation needs. The three alternatives are:
  - Alternative 1 - Low I&I Reduction. For this alternative, the two drainage basins (406 and 408) that have the highest amount of infiltration and inflow (I&I) will be rehabilitated, effectively reducing the peak wet weather flow (PWWF) to 5.9 million gallons per day (mgd) during the 5-year, 24-hour design storm. Various rehabilitation and capacity improvements are also needed within the collection system and wastewater treatment plant (WWTP). The total project cost of this alternative is estimated at $39.8 million in 2013 dollars.
  - Alternative 2 - Medium I&I Reduction. For this alternative, three drainage basins (406, 408, and 324) are rehabilitated to increase I&I reduction, which reduces the PWWF to 5.1 mgd. Some rehabilitation and capacity improvements within the system are still needed. The total project cost of this alternative is estimated at $41.9 million in 2013 dollars.
  - Alternative 3 - High I&I Reduction. For this alternative, several drainage basins (406, 408, 324, 54, 83, 98, 61, 368, 59, and 477) are rehabilitated, potentially reducing the PWWF to 3.8 mgd. With such a significant reduction in the PWWF, few capacity improvements are needed within the collection system or WWTP. The total project cost of this alternative is estimated at $67.2 million in 2013 dollars.
- Implementing an improvement program based on Alternative 1 or 2 appears to be cost-effective when compared to Alternative 3. Based on these findings, the District should proceed with I&I improvements in Basins 406 and 408 as soon as possible and closely monitor the resultant reductions in PWWF. Alternative 2 also has the benefit that additional land is not needed to construct the WWTP improvements.

3.0 BACKGROUND

Based on anticipated growth within the District's service area, the projected average dry weather flow (ADWF) in the 20-year planning period for the CWWMP is 0.67 mgd (see TM No. 1). This projection would increase to 0.69 mgd if the Marina Development project is also included. The projected ADWF is less than the rated capacities for each major unit process at the wastewater treatment plant (WWTP) as summarized in TM No. 5, and is also less than the National Pollutant Discharge Elimination System (NPDES) permit capacity of 1.14 mgd. Therefore, based on current discharge requirements, the District has sufficient dry weather capacity for the planning period.

Previous TMs have identified the need for various rehabilitation needs within the collection system and the WWTP. In addition, the District experiences wet weather capacity limitations during storm events. During the 5-year, 24-hour design storm, modeling performed by Advanced Hydro Engineering (see TMs No. 3 and 4) projected a peak wet weather flow (PWWF) of 6.9 mgd, which is higher than the system's current capacity. To minimize the risk of sanitary sewer overflows or potential failure of District assets, these deficiencies should be addressed. Alternatives developed in this TM are based on addressing these deficiencies.

4.0 ALTERNATIVES

Three (3) alternatives were developed to address the District's wet weather capacity limitations and rehabilitation needs. Addressing rehabilitation needs generally consists of rehabilitating or replacing assets (i.e., sewers, structures, or equipment). All of the alternatives include rehabilitation or replacement of assets identified in TMs No. 3 and 5.

There are two ways to address wet weather capacity limitations, by implementing capacity improvements and/or achieving a reduction in infiltration and inflow (I&I) in the collection system. Achieving I&I reduction reduces the need for capacity improvements as it reduces the peak wet weather flow (PWWF) in the collection system and to the WWTP.

Accordingly, each alternative includes rehabilitation projects, targeted I&I reduction, and wet weather capacity improvements in the collection system and WWTP. The main difference between the alternatives is the level of I&I reduction that is targeted: low, medium, or high. By evaluating different levels of I&I reduction, the optimal amount of I&I reduction can be identified to address overall capacity and replacement needs for the District collection system and WWTP.

4.1 Alternative 1 – Low I&I Reduction

Based on collection system flow monitoring and modeling, drainage Basins 406 and 408 have significantly more I&I per unit area than the rest of the District's service area. As a minimum, the District should address I&I in the most problematic areas, therefore, this alternative includes replacing all of the sewers, manholes, laterals, and cleanouts in those basins. This is expected to achieve an I&I reduction of approximately 1 mgd, which will result in a projected PWWF of 5.9 mgd. Therefore, the first alternative uses a PWWF of 5.9 mgd as a basis for improvements to the overall wastewater system.

Capacity improvements are needed to the gravity sewers to eliminate surcharging and reduce the risk of overflows during the 5-year, 24-hour design storm. Approximately 3,030 linear feet (lf) of 6 to 8-inch diameter sewers will need to be replaced with larger sewers. The Influent Pump Station does not have sufficient firm capacity to convey the projected PWWF, and there is insufficient space at the pump station property to expand it. Therefore, a new pump station will be required with this alternative. The parcel adjacent to the existing pump station is used for parking, and could potentially be purchased for a new pump station site. The influent force main was determined to be in good condition during the last CCTV inspection, and appears to have sufficient capacity to accommodate the projected PWWF. The Tormey Pump Station and force main are relatively new and are in good condition, therefore, no improvements are needed. See Figure 6.1 for an illustration of the rehabilitation, capacity, and I&I reduction improvements in the collection system for this alternative.

The WWTP does not have sufficient hydraulic capacity to treat a PWWF of 5.9 mgd. Key capacity improvements needed are to add new primary and secondary clarifiers, along with additional RAS and WAS pumping capacity, a new chlorine contact basin and secondary effluent pipeline, aeration basin modifications, and modifications to the Effluent Pump Station to allow a small and large pump to operate simultaneously. The aeration basin modifications consist of installing additional compartments in the aeration basins to improve the selector performance and mixed liquor settleability, and installing necessary piping to allow for operation in contact stabilization mode during wet weather periods. Contact stabilization is a temporary operational mode used for wet weather periods to prevent overloading the secondary clarifiers. See TM No. 5 for more information about contact stabilization. Also described in TM No. 5 are the rehabilitation and replacement needs at the WWTP, which include replacing the headworks and existing primary clarifier, and various other mechanical, electrical, and structural improvements to the existing facilities. See Figure 6.2 for a site plan of the process and capacity improvements in Alternative 1.

4.2 Alternative 2 – Medium I&I Reduction

Similar to Alternative 1, Alternative 2 includes replacing all of the sewers, manholes, laterals, and cleanouts in drainage Basins 406 and 408 to reduce I&I. This alternative achieves additional I&I reduction by replacing all of the infrastructure in Basin 324 as well. It is expected that these improvements will result in an I&I reduction of approximately 1.8 mgd, which results in a projected PWWF of 5.1 mgd.

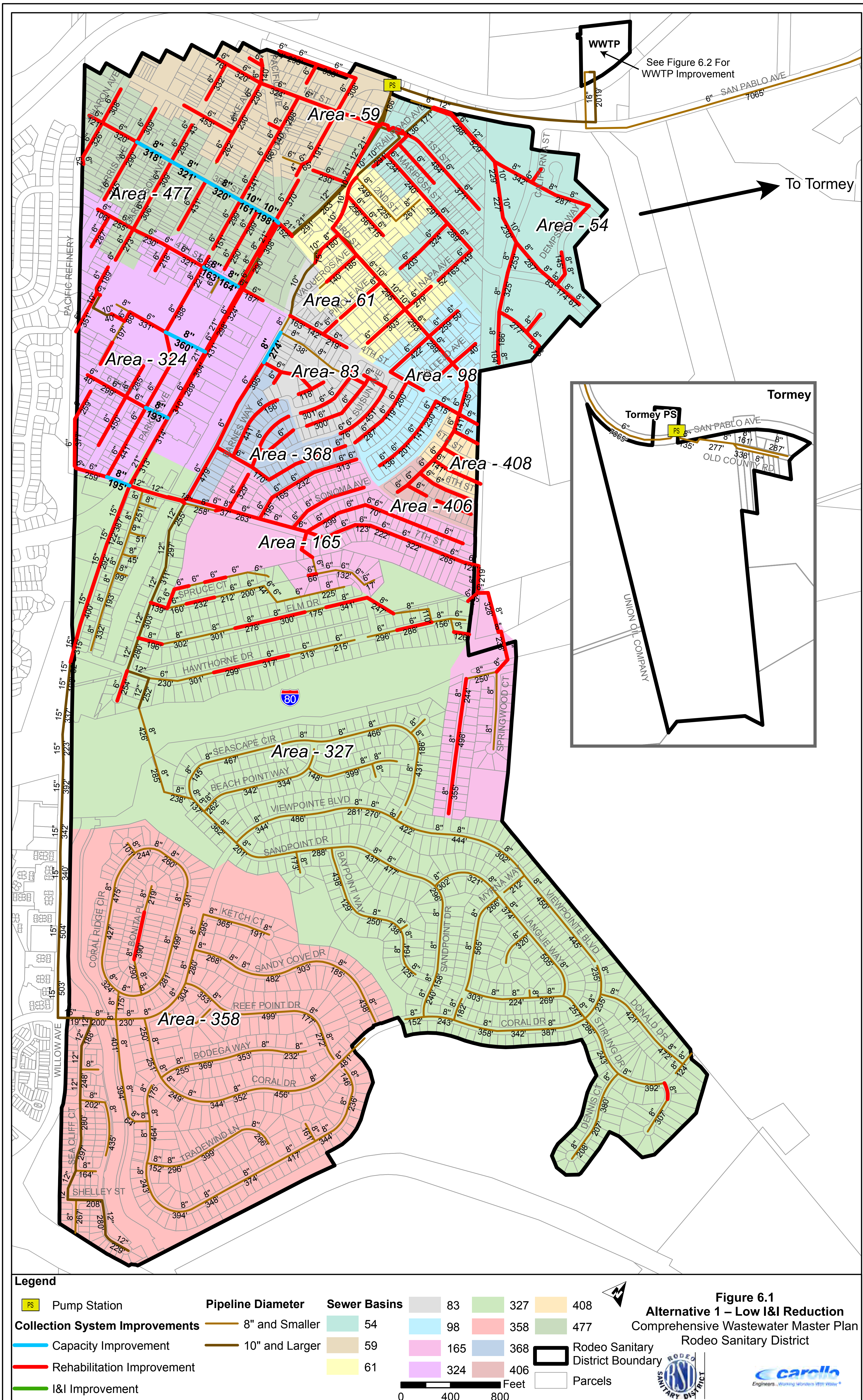

Figure 6.1
Alternative 1 – Low I&I Reduction
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

LEGEND OF PROCESS/CAPACITY IMPROVEMENTS

1. Replace primary clarifier with 2 new 40' clarifiers and make hydraulic improvements
2. Aeration basin selector improvements, contact stabilization, and additional anoxic mixer
3. Add new secondary clarifier (40' ∅)
4. Add new chlorine contact basin (4,700 cf)
5. Effluent pump station modifications to pump operations
6. Add 2 additional RAS pumps and WAS flowmeter

NOTE:
Only process and capacity improvements have been shown. Rehabilitation improvements common to all alternatives have not been shown.

Figure 6.2
ALTERNATIVE 1 - LOW I&I REDUCTION WWTP IMPROVEMENTS
COMPREHENSIVE WASTEWATER MASTER PLAN
RODEO SANITARY DISTRICT

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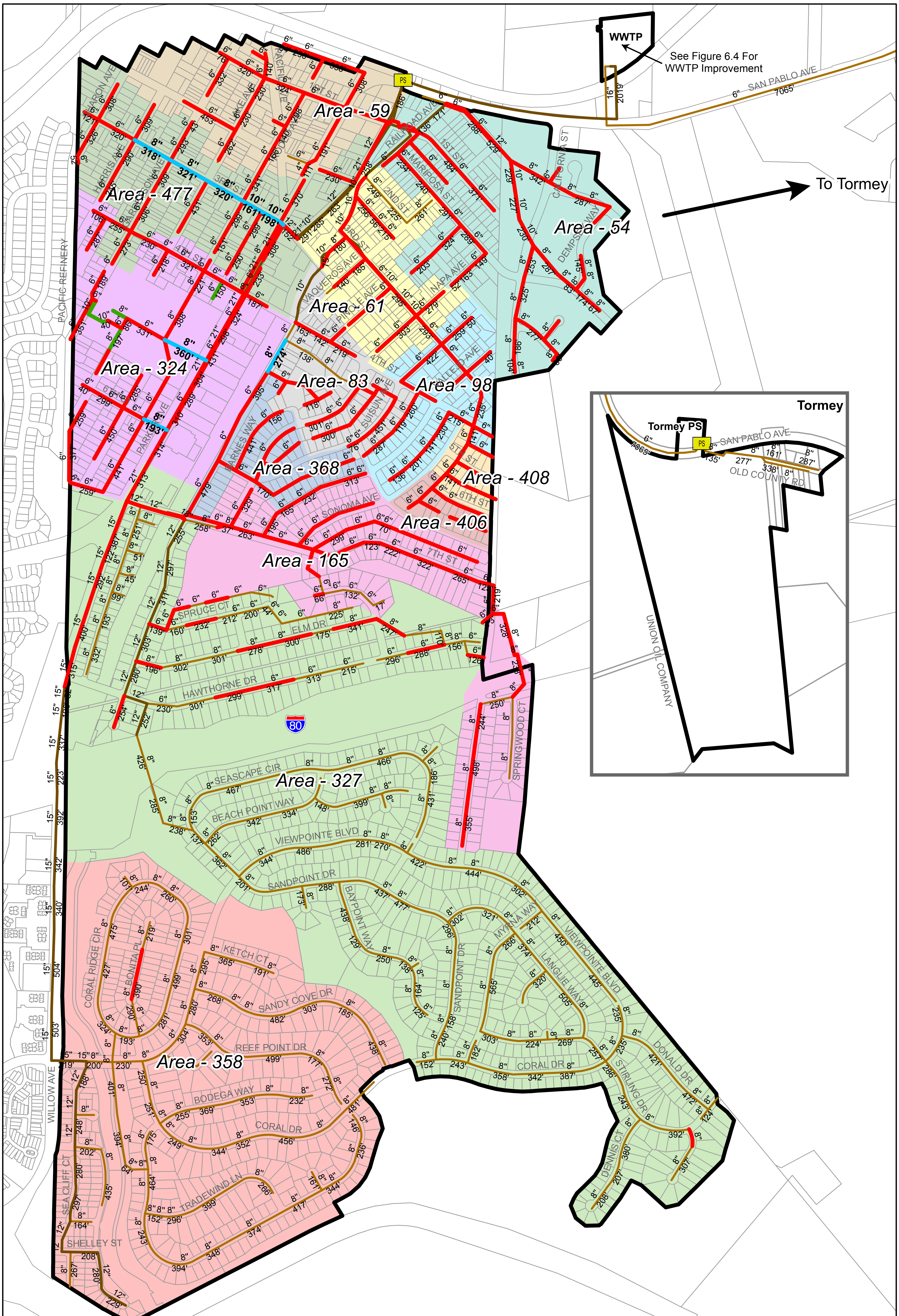
Even with the additional I&I reduction, some capacity improvements are still needed to the gravity sewers to eliminate surcharging and reduce the risk of overflows during the 5-year, 24-hour design storm. Approximately 2,510 lf of 8 to 12-inch diameter sewers will need to be replaced with larger diameter sewers.

Like Alternative 1, the firm capacity of the Influent Pump Station is less than the projected PWWF. However, instead of constructing a new pump station, the capacity can be increased by replacing the existing submersible pumps and comminutors with larger, horizontal chopper pumps. Three new 2.55 mgd pumps would be installed to achieve a firm capacity of 5.1 mgd. See Figure 6.3 for an illustration of the rehabilitation, capacity, and I&I reduction improvements in the collection system for this alternative.

Process and capacity improvements will still be needed at the WWTP similar to what was described for Alternative 1, with the exception that new primary and secondary clarifiers will not be needed. Since the existing primary clarifier has experienced performance issues during wet weather flows, it is recommended that a chemical storage and feed facility be constructed to allow the District to practice chemically enhanced primary treatment (CEPT) during high flow or poor performance periods. CEPT using a combination of metal salts and polymer should improve solids and organic removal performance of the primary clarifier. In addition to these improvements, a parallel pipeline or other modifications to the secondary clarifiers will be needed to alleviate hydraulic limitations. See Figure 6.4 for a site plan of the process and capacity improvements in Alternative 2.

4.3 Alternative 3 – High I&I Reduction

Alternative 3 consists of achieving a high degree of I&I reduction by replacing all the sewers, manholes, laterals, and cleanouts to all of the drainage basins in the northern portion of the District. These include Basins No. 406, 408, 324, 54, 83, 98, 61, 368, 59, and 477. It is expected that these improvements will result in an I&I reduction of approximately 3.1 mgd, which results in a projected PWWF of 3.8 mgd. This is believed to be the maximum attainable amount of I&I reduction in the collection system. No capacity increases would be required at the influent pump station, while the WWTP would only require minor process or capacity changes including the aeration basin modifications and additional RAS pumping capacity. See Figure 6.5 for an illustration of the rehabilitation, capacity, and I&I reduction improvements in the collection system. See Figure 6.6 for a site plan of the process and capacity improvements in Alternative 3.



Legend

PS Pump Station

Collection System Improvements

- Capacity Improvement
- Rehabilitation Improvement
- I&I Improvement

Pipeline Diameter

- 8" and Smaller
- 10" and Larger

Sewer Basins

54, 59, 61, 83, 98, 165, 324, 327, 358, 368, 406, 408, 477

Rodeo Sanitary District Boundary

Parcels

0 400 800 Feet

Figure 6.3
Alternative 2 – Medium I&I Reduction
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

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LEGEND OF PROCESS/CAPACITY IMPROVEMENTS

1. Replace primary clarifier, add CEPT, and make hydraulic improvements
2. Aeration basin selector improvements, contact stabilization, and additional anoxic mixer
3. Add new chlorine contact basin (4,700 cf)
4. Add 2 additional RAS pumps and WAS flowmeter

NOTE:
Only process and capacity improvements have been shown. Rehabilitation improvements common to all alternatives have not been shown.

Figure 6.4
ALTERNATIVE 2 - MEDIUM I&I REDUCTION
WWTP IMPROVEMENTS
COMPREHENSIVE WASTEWATER MASTER PLAN
RODEO SANITARY DISTRICT

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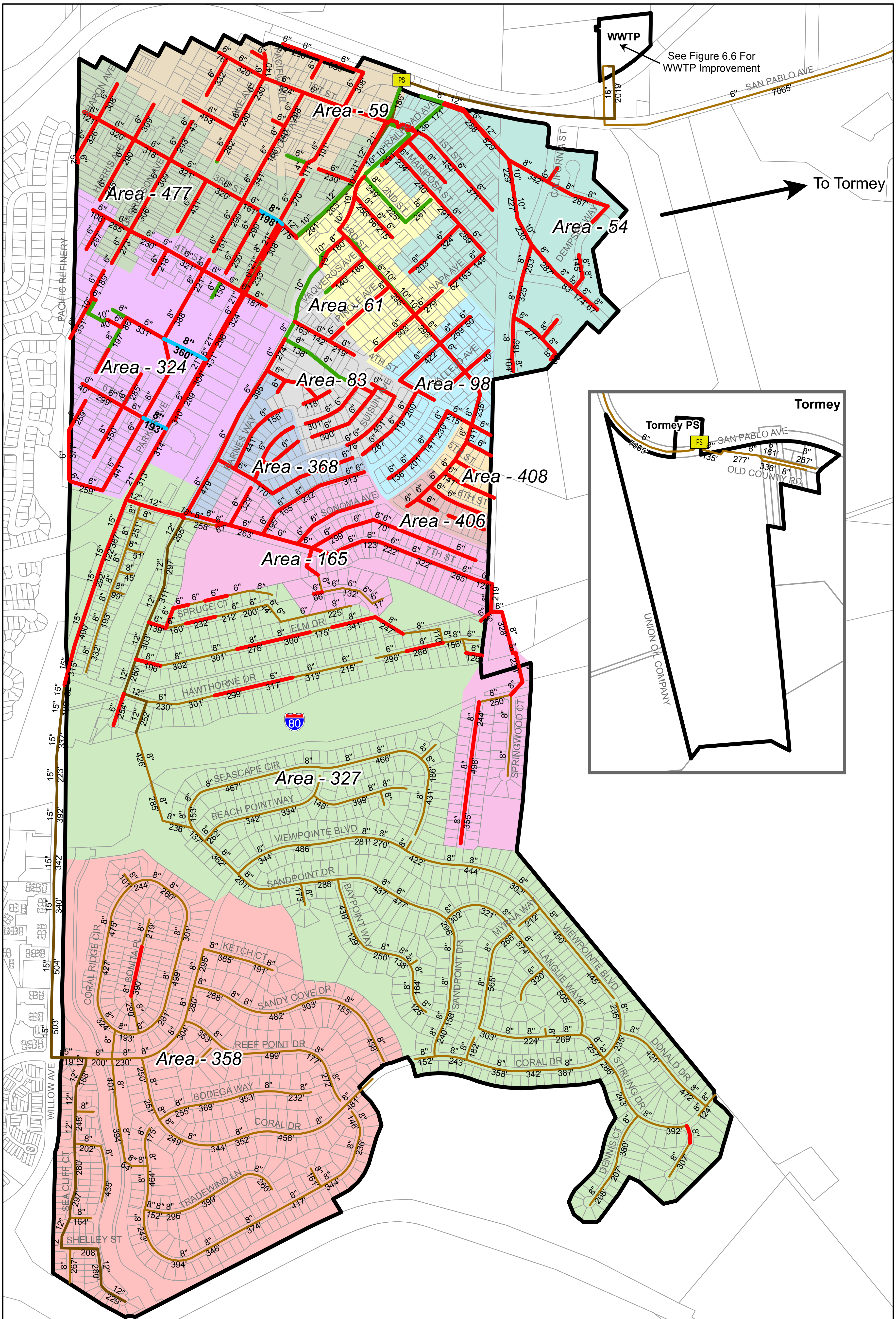

Legend

PS	Pump Station

Collection System Improvements
- Capacity Improvement
- Rehabilitation Improvement
- I&I Improvement

Pipeline Diameter
- 8" and Smaller
- 10" and Larger

Sewer Basins: 54, 59, 61, 83, 98, 165, 324, 327, 358, 368, 406, 408, 477

Rodeo Sanitary District Boundary

Parcels

0 400 800 Feet

Figure 6.5
Alternative 3 – High I&I Reduction
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

LEGEND OF PROCESS/CAPACITY IMPROVEMENTS

1. Replace primary clarifier
2. Aeration basin selector improvements and additional anoxic mixer
3. Add 2 additional RAS pumps and WAS flowmeter

NOTE:
Only process and capacity improvements have been shown. Rehabilitation improvements common to all alternatives have not been shown.

Figure 6.6
ALTERNATIVE 3 - HIGH I&I REDUCTION
WWTP IMPROVEMENTS
COMPREHENSIVE WASTEWATER MASTER PLAN
RODEO SANITARY DISTRICT

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5.0 PROJECT COST SUMMARY

Table 6.1 summarizes the total project cost of the three alternatives. Costs are presented in three components: collection system; pump stations and force mains; and WWTP improvements. Each component has costs for rehabilitation of the existing system and capacity improvements if required. The collection system also has costs for I&I reduction. If a segment was being replaced due to capacity improvements, the near term and long term costs were eliminated from the total segment cost. Due to the poor condition and age of the existing collection system, major rehabilitation work required is common to all alternatives.

The general approach to estimating the total project cost is described in TM No. 1 and includes allowances of 30 percent for estimating contingency, 25 percent for general contractor overhead and profit, bonds and insurance; 8.5 percent for sales tax, and 30 percent for engineering, legal, administration, permitting, and construction management. Operation and maintenance costs were not included in the analysis as only minor differences are expected among the alternatives. Detailed project cost estimates for all elements are provided in the Appendix.

Alternatives 1 and 2 were found to have almost equal total project costs of $39.8 M and $41.9 M, respectively.

Table 6.1 20 Year Total Project Cost Summary Comprehensive Wastewater Master Plan Rodeo Sanitary District			
	Alternative 1 Low I&I Reduction	**Alternative 2 Medium I&I Reduction**	**Alternative 3 High I&I Reduction**
ADWF, mgd	0.69	0.69	0.69
PWWF, mgd	5.9	5.1	3.8
Gravity Sewer Collection System			
Capacity Improvements(1)	\$0.9 M	\$0.7 M	\$0.2 M
Rehabilitation(2)	\$19.2 M	\$19.3 M	\$19.6 M
I&I Improvements(3)	\$1.5 M	\$6.5 M	\$34.2 M
Total Collection System Project Cost(5)	\$21.6 M	\$26.5 M	\$54.0 M
Pump Station and Force Mains			
Capacity Improvements	\$1.7 M	\$0.5 M	\$0 M
Rehabilitation	\$0 M	\$0.4 M	\$0.8 M
Total Pump Station and Force Main Project Cost(5)	\$1.7 M	\$0.9 M	\$0.8 M
WWTP			
Capacity Improvements	\$5.1 M	\$3.1 M	\$1.0 M
Rehabilitation(4)	\$11.4 M	\$11.4 M	\$11.4 M
Total WWTP Project Cost(5)	\$16.5 M	\$14.5 M	\$12.4 M
Total 20-Year Project Cost(5)	\$39.8 M	\$41.9 M	\$67.2 M

Notes:

(1) Collection system capacity improvements include increased pipe size and new flow diversions required to eliminate surcharge in the collection system during a 5-year, 24-hour design storm after Basins 406 and 408 have I&I improvements built based on modeling performed by Advanced Hydro Engineering, January 2013.

(2) Cost includes rehabilitation of sewers required during the next 20 years as described in TM No. 3 after system capacity improvements have been made.

(3) I&I improvements assume replacement of all sewers, manholes, laterals, and cleanouts within the basins. Cost is additional work required after rehabilitation work is complete.

(4) WWTP Rehabilitation costs were taken from TM No. 5 and adjusted using the San Francisco ENR for 2013.

(5) Project cost includes 30% estimating contingency; 25% General Contractor Overhead and Profit, Bonds and Insurance; 8.5% tax on 50% of direct project cost; 30% Engineering, Legal, Administration, Permitting, and Construction Management.

APPENDIX – ALTERNATIVE PROJECT COSTS

Cost Summary	Alternative 1 Low I&I Reduction	Alternative 2 Medium I&I Reduction	Alternative 3 High I&I Reduction
ADWF, mgd[1]	0.69	0.69	0.69
PWWF, mgd[2]	5.9	5.1	3.8
Gravity Sewer Collection System			
Capacity Improvements[3]	$0.9 M	$0.7 M	$0.2 M
Sewer Rehabiliation[4]	$19.2 M	$19.3 M	$19.6 M
I&I Improvements (Basins 406 and 408)[5]	$1.5 M	$6.5 M	$34.2 M
Total Gravity Sewer Collection System	**$21.6 M**	**$26.5 M**	**$54.0 M**
Pump Stations and Force Mains			
Influent Pump Station			
Rehabiliation	$0.0 M	$0.4 M	$0.8 M
Capacity Improvements[6]	$1.7 M	$0.5 M	$0.0 M
Influent Force Main	$0.0 M	$0.0 M	$0.0 M
Tormey Pump Station & Force Main	$0.0 M	$0.0 M	$0.0 M
Total Pump Stations and Force Mains	**$1.7 M**	**$0.9 M**	**$0.8 M**
WWTP[7]			
Grit Chamber & Screens			
Rehabiliation	$3.4 M	$3.4 M	$3.4 M
Capacity Improvements	$0.0 M	$0.0 M	$0.0 M
Primary Clarifier			
Rehabiliation	$1.2 M	$1.2 M	$1.2 M
Capacity Improvements	$1.1 M	$0.4 M	$0.0 M
Aeration Basins			
Rehabiliation	$1.0 M	$1.0 M	$1.0 M
Capacity Improvements	$1.2 M	$1.2 M	$0.9 M
Secondary Clarifier & RAS/WAS Pumping			
Rehabiliation	$1.0 M	$1.0 M	$1.0 M
Capacity Improvements	$1.4 M	$0.1 M	$0.1 M
Chlorine Contact Basin			
Rehabiliation	$0.4 M	$0.4 M	$0.4 M
Capacity Improvements	$1.4 M	$1.4 M	$0.0 M
Sludge Thickening			
Rehabiliation	$0.3 M	$0.3 M	$0.3 M
Capacity Improvements	$0.0 M	$0.0 M	$0.0 M
Anaerobic Digester			
Rehabiliation	$1.6 M	$1.6 M	$1.6 M
Capacity Improvements	$0.0 M	$0.0 M	$0.0 M
Dewatering			
Rehabiliation	$0.4 M	$0.4 M	$0.4 M
Capacity Improvements	$0.0 M	$0.0 M	$0.0 M
Sludge Drying			
Rehabiliation	$0.2 M	$0.2 M	$0.2 M
Capacity Improvements	$0.0 M	$0.0 M	$0.0 M
Electrical/I&C/Generator			
Rehabiliation	$1.3 M	$1.3 M	$1.3 M
Capacity Improvements	$0.0 M	$0.0 M	$0.0 M
Administration & Maintenance Buildings			
Rehabiliation	$0.2 M	$0.2 M	$0.2 M
Capacity Improvements	$0.0 M	$0.0 M	$0.0 M
Effluent Pump Station/Outfall			
Rehabiliation	$0.4 M	$0.4 M	$0.4 M
Capacity Improvements	$0.0 M	$0.0 M	$0.0 M
Total WWTP	**$16.5 M**	**$14.5 M**	**$12.4 M**

Cost Summary	Alternative 1 Low I&I Reduction	Alternative 2 Medium I&I Reduction	Alternative 3 High I&I Reduction
ADWF, mgd[1]	0.69	0.69	0.69
PWWF, mgd[2]	5.9	5.1	3.8
Total Alternative Project Cost[8]	**$39.8 M**	**$41.9 M**	**$67.2 M**

Notes:

1) ADWF shown is the future ADWF of 0.67 mgd plus anticipated Marina Development ADWF of 0.02 mgd.

2) PWWF of 5.9 mgd for the collection system is based on system capacity after upsizing pipes or bypassing flow to prevent surcharge during a 5-year, 24-hour storm event and prevent SSOs during a 10-year, 24-hour storm event with I&I reduction in place for Basins 406 and 408. Similarly, PWWF of 5.1 mgd for the collection system is based on system capacity after upsizing pipes or bypassing flow to prevent surcharge during a 5-year, 24-hour storm event and prevent SSOs during a 10-year, 24-hour storm event with I&I reduction in place for Basins 406, 408, and 324. PWWF of 3.8 mgd for the collection system is based on lowest achievable flows after I&I improvements are in place for all of the older sections of the collection system: Basins 406, 408, 324, 54, 83, 98, 61, 368, 59, and 477.

3) Collection system capacity improvements include increased pipe size and new bypasses required to eliminate surcharge in the collection system during a 5-year design storm after I&I improvements have been built based on modeling performed by Advanced Hydro Engineering, January 2013.

4) Cost includes rehabilitation of sewers required during the next 20 years as described in TM03 after system capacity improvements have been made.

5) I&I improvements assume replacement of all sewers, manholes, laterals, and cleanouts within the basins. Trunk lines replacement was only included in Alternative 3. Cost is additional work required after rehabilitation work is complete.

6) Alternative 1 assumes replacement of the existing influent pump station, so no cost was included for rehabilitation. Cost for extension of the force main and property acquisition adjacent to the existing site was included in the pump station capacity cost. Alternative 2 increases pump station firm capacity by replacing existing submersible pumps and communutors with 3 new horizontal chopper pumps. Alternative 3 replaces the existing pumps with new submersible pumps with a total firm capacity of 3.8 mgd.

7) WWTP Rehabilitation costs were taken from TM No. 5 and adjusted using ENR December 2012 and increased sales tax rate of 8.5%.

8) Project cost includes 30% estimating contingency; 25% General Contractor Overhead and Profit, Bonds and Insurance; 8.5% tax on 50% of direct project cost; 30% Engineering, Legal, Administration, Permitting, and Construction Management.

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MASTER PLAN COST ESTIMATE

Project:	**CWWMP**	**Alternatives:**	1
Client:	**Rodeo Sanitary District**	**SF ENR December 2012:**	10355
		Estimate Preparation Date :	**January 2013**
Location:	**Rodeo, California**	**By :**	**JES**
Element:	**21 Capacity Improv (1)**	**Reviewed:**	**AG/RC**

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Bypass & Upsize Pipes**					
	8" PVC Sewer	2329	LF	$130	$302,770	
	10" PVC Sewer	530	LF	$150	$79,500	
	12" PVC Sewer	170	LF	$150	$25,500	
	Total					$407,800
	Subtotal					$407,800
	Estimating Contingency	30%				$122,300
	Element Direct Cost					$530,100
	General Contractor Overhead and	25%				$132,500
	Sales Tax on 50% of Subtotal Above	8.50%				$22,500
	Element Construction Cost					**$685,100**
	Engineering, Legal, Admin, Permitting,	30%				$205,500
	Element Project Cost					**$890,600**

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MASTER PLAN COST ESTIMATE

Project:	**CWWMP**
Client:	**Rodeo Sanitary District**
Location:	**Rodeo, California**
Element:	**21 Capacity Improv (2)**

Alternatives:	2
SF ENR December 2012:	10355
Estimate Preparation Date :	**January 2013**
By :	**JES**
Reviewed:	**AG/RC**

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Bypass & Upsize Pipes**					
	8" PVC Sewer	1807	LF	$130	$234,910	
	10" PVC Sewer	530	LF	$150	$79,500	
	12" PVC Sewer	170	LF	$150	$25,500	
	Total					$339,900
	Subtotal					$339,900
	Estimating Contingency	30%				$102,000
	Element Direct Cost					$441,900
	General Contractor Overhead and	25%				$110,500
	Sales Tax on 50% of Subtotal Above	8.50%				$18,800
	Element Construction Cost					**$571,200**
	Engineering, Legal, Admin, Permitting,	30%				$171,400
	Element Project Cost					**$742,600**

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MASTER PLAN COST ESTIMATE

Project: CWWMP	**Alternatives:** 3
Client: Rodeo Sanitary District	**SF ENR December 2012:** 10355
Location: Rodeo, California	**Estimate Preparation Date :** January 2013
Element: 21 Capacity Improv (3)	**By :** JES
	Reviewed: AG/RC

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Bypass & Upsize Pipes**					
	8" PVC Sewer	880	LF	$130	$114,400	
	Total					$114,400
	Subtotal					$114,400
	Estimating Contingency	30%				$34,300
	Element Direct Cost					$148,700
	General Contractor Overhead and	25%				$37,200
	Sales Tax on 50% of Subtotal Above	8.50%				$6,300
	Element Construction Cost					**$192,200**
	Engineering, Legal, Admin, Permitting,	30%				$57,700
	Element Project Cost					**$249,900**

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MASTER PLAN COST ESTIMATE

		Alternatives:	1
Project:	CWWMP	SF ENR December 2012:	10355
Client:	Rodeo Sanitary District	Estimate Preparation Date :	January 2013
Location:	Rodeo, California	By :	JES
Element:	20 Sewer Rehab(1)	Reviewed:	AG/RC

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Year 1 - Pipe Replacement**					
	6" PVC Sewer	7,970	LF	$120	$956,400	
	Total					$956,400
2	**Year 2 - Pipe Replacement**					
	6" PVC Sewer	18,126	LF	$120	$2,175,120	
	8" PVC Sewer	3,356	LF	$130	$436,280	
	12" PVC Sewer	145	LF	$150	$21,750	
	Total					$2,633,200
3	**Year 3 - Pipe Replacement**					
	6" PVC Sewer	5,814	LF	$120	$697,680	
	8" PVC Sewer	650	LF	$130	$84,500	
	Total					$782,200
4	**Years 4 to 10 - Pipe Replacement**					
	4" PVC Sewer	111	LF	$110	$12,210	
	6" PVC Sewer	17,558	LF	$120	$2,106,960	
	8" PVC Sewer	5,335	LF	$130	$693,550	
	10" PVC Sewer	1,873	LF	$150	$280,950	
	12" PVC Sewer	1,999	LF	$150	$299,850	
	18" PVC Sewer	34	LF	$180	$6,120	
	21" DI Sewer	290	LF	$270	$78,300	
	Total					$3,477,900
5	**Years 11 to 20 - Pipe Replacement**					
	15" PVC Sewer	1,795	LF	$170	$305,150	
	21" DI Sewer	2,314	LF	$270	$624,780	
	Total					$929,900
	Subtotal					$8,779,600
	Estimating Contingency	30%				$2,633,900
	Element Direct Cost					$11,413,500
	General Contractor Overhead and	25%				$2,853,400
	Sales Tax on 50% of Subtotal Above	8.50%				$485,100
	Element Construction Cost					**$14,752,000**
	Engineering, Legal, Admin, Permitting,	30%				$4,425,600
	Element Project Cost					**$19,177,600**

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MASTER PLAN COST ESTIMATE

Project:	**CWWMP**
Client:	**Rodeo Sanitary District**
Location:	**Rodeo, California**
Element:	**20 Sewer Rehab(2)**

Alternatives:	2
SF ENR December 2012:	10355
Estimate Preparation Date :	**January 2013**
By :	**JES**
Reviewed:	**AG/RC**

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Year 1 - Pipe Replacement**					
	6" PVC Sewer	7,970	LF	$120	$956,400	
	Total					$956,400
2	**Year 2 - Pipe Replacement**					
	6" PVC Sewer	18,126	LF	$120	$2,175,120	
	8" PVC Sewer	3,356	LF	$130	$436,280	
	12" PVC Sewer	145	LF	$150	$21,750	
	Total					$2,633,200
3	**Year 3 - Pipe Replacement**					
	6" PVC Sewer	5,978	LF	$120	$717,360	
	8" PVC Sewer	650	LF	$130	$84,500	
	Total					$801,900
4	**Years 4 to 10 - Pipe Replacement**					
	4" PVC Sewer	111	LF	$110	$12,210	
	6" PVC Sewer	17,721	LF	$120	$2,126,520	
	8" PVC Sewer	5,335	LF	$130	$693,550	
	10" PVC Sewer	1,873	LF	$150	$280,950	
	12" PVC Sewer	1,999	LF	$150	$299,850	
	18" PVC Sewer	34	LF	$180	$6,120	
	21" DI Sewer	290	LF	$270	$78,300	
	Total					$3,497,500
5	**Years 11 to 20 - Pipe Replacement**					
	15" PVC Sewer	1,795	LF	$170	$305,150	
	21" DI Sewer	2,314	LF	$270	$624,780	
	Total					$929,900
	Subtotal					$8,818,900
	Estimating Contingency	30%				$2,645,700
	Element Direct Cost					$11,464,600
	General Contractor Overhead and	25%				$2,866,200
	Sales Tax on 50% of Subtotal Above	8.50%				$487,200
	Element Construction Cost					**$14,818,000**
	Engineering, Legal, Admin, Permitting,	30%				$4,445,400
	Element Project Cost					**$19,263,400**

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MASTER PLAN COST ESTIMATE

Alternatives: 3
SF ENR December 2012: 10355
Estimate Preparation Date : January 2013
By : JES
Reviewed: AG/RC

Project: CWWMP
Client: Rodeo Sanitary District
Location: Rodeo, California
Element: 20 Sewer Rehab(3)

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Year 1 - Pipe Replacement**					
	6" PVC Sewer	8,935	LF	$120	$1,072,200	
	Total					$1,072,200
2	**Year 2 - Pipe Replacement**					
	6" PVC Sewer	18,126	LF	$120	$2,175,120	
	8" PVC Sewer	3,356	LF	$130	$436,280	
	12" PVC Sewer	145	LF	$150	$21,750	
	Total					$2,633,200
3	**Year 3 - Pipe Replacement**					
	6" PVC Sewer	5,978	LF	$120	$717,360	
	8" PVC Sewer	650	LF	$130	$84,500	
	Total					$801,900
4	**Years 4 to 10 - Pipe Replacement**					
	4" PVC Sewer	111	LF	$110	$12,210	
	6" PVC Sewer	17,995	LF	$120	$2,159,400	
	8" PVC Sewer	5,335	LF	$130	$693,550	
	10" PVC Sewer	1,873	LF	$150	$280,950	
	12" PVC Sewer	1,999	LF	$150	$299,850	
	18" PVC Sewer	34	LF	$180	$6,120	
	21" DI Sewer	290	LF	$270	$78,300	
	Total					$3,530,400
5	**Years 11 to 20 - Pipe Replacement**					
	15" PVC Sewer	1,795	LF	$170	$305,150	
	21" DI Sewer	2,314	LF	$270	$624,780	
	Total					$929,900
	Subtotal					$8,967,600
	Estimating Contingency	30%				$2,690,300
	Element Direct Cost					$11,657,900
	General Contractor Overhead and	25%				$2,914,500
	Sales Tax on 50% of Subtotal Above	8.50%				$495,500
	Element Construction Cost					**$15,067,900**
	Engineering, Legal, Admin, Permitting,	30%				$4,520,400
	Element Project Cost					**$19,588,300**

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MASTER PLAN COST ESTIMATE

		Alternatives:	1
Project:	**CWWMP**	**SF ENR December 2012:**	10355
Client:	**Rodeo Sanitary District**	**Estimate Preparation Date :**	**January 2013**
Location:	**Rodeo, California**	**By :**	**JES**
Element:	**22 I&I Improv (1)**	**Reviewed:**	**AG/RC**

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Basin 406**					
	Manholes	5	EA	$12,000	$63,847	
	Lateral w/ cleanout	33	EA	$9,000	$297,666	
	Total					$361,513
2	**Basin 408**					
	Manholes	5	EA	$12,000	$60,162	
	Lateral w/ cleanout	31	EA	$9,000	$280,485	
	Total					$340,647
	Subtotal					$702,200
	Estimating Contingency	30%				$210,700
	Element Direct Cost					$912,900
	General Contractor Overhead and	25%				$228,200
	Sales Tax on 50% of Subtotal Above	8.50%				$38,800
	Element Construction Cost					**$1,179,900**
	Engineering, Legal, Admin, Permitting,	30%				$354,000
	Element Project Cost					**$1,533,900**

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MASTER PLAN COST ESTIMATE

Project:	**CWWMP**	**Alternatives:**	2
Client:	**Rodeo Sanitary District**	**SF ENR December 2012:**	10355
Location:	**Rodeo, California**	**Estimate Preparation Date :**	**January 2013**
Element:	**22 I&I Improv (2)**	**By :**	**JES**
		Reviewed:	**AG/RC**

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Basin 406**					
	Manholes	5	EA	$12,000	$63,847	
	Lateral w/ cleanout	33	EA	$9,000	$297,666	
	Total					$361,500
2	**Basin 408**					
	Manholes	5	EA	$12,000	$60,162	
	Lateral w/ cleanout	31	EA	$9,000	$280,485	
	Total					$340,600
3	**Basin 324**					
	6" PVC Sewer	197	LF	$120	$23,640	
	8" PVC Sewer	125	LF	$130	$16,250	
	10" PVC Sewer	284	LF	$150	$42,600	
	Manholes	32	EA	$12,000	$387,168	
	Lateral w/ cleanout	201	EA	$9,000	$1,805,040	
	Total					$2,274,700
	Subtotal					$2,976,800
	Estimating Contingency	30%				$893,000
	Element Direct Cost					$3,869,800
	General Contractor Overhead and	25%				$967,500
	Sales Tax on 50% of Subtotal Above	8.50%				$164,500
	Element Construction Cost					**$5,001,800**
	Engineering, Legal, Admin, Permitting,	30%				$1,500,500
	Element Project Cost					**$6,502,300**

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MASTER PLAN COST ESTIMATE

		Alternatives:	3
Project:	**CWWMP**	**SF ENR December 2012:**	10355
Client:	**Rodeo Sanitary District**	**Estimate Preparation Date :**	**January 2013**
Location:	**Rodeo, California**	**By :**	**JES**
Element:	**22 I&I Improv (3)**	**Reviewed:**	**AG/RC**

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Basin 406**					
	Manholes	5	EA	$12,000	$63,847	
	Lateral w/ cleanout	33	EA	$9,000	$297,666	
	Total					$361,500
2	**Basin 408**					
	Manholes	5	EA	$12,000	$60,162	
	Lateral w/ cleanout	31	EA	$9,000	$280,485	
	Total					$340,600
3	**Basin 324**					
	6" PVC Sewer	197	LF	$120	$23,640	
	8" PVC Sewer	125	LF	$130	$16,250	
	10" PVC Sewer	284	LF	$150	$42,600	
	Manholes	32	EA	$12,000	$387,168	
	Lateral w/ cleanout	201	EA	$9,000	$1,805,040	
	Total					$2,274,700
4	**Basin 54**					
	10" PVC Sewer	340	LF	$150	$51,000	
	12" PVC Sewer	398	LF	$150	$59,700	
	Manholes	39	EA	$12,000	$468,287	
	Lateral w/ cleanout	243	EA	$9,000	$2,183,229	
	Total					$2,762,200
5	**Basin 83**					
	8" PVC Sewer	1144	LF	$130	$148,720	
	10" PVC Sewer	555	LF	$150	$83,250	
	Manholes	22	EA	$12,000	$266,489	
	Lateral w/ cleanout	138	EA	$9,000	$1,242,414	
	Total					$1,740,900
6	**Basin 98**					
	Manholes	15	EA	$12,000	$174,670	
	Lateral w/ cleanout	90	EA	$9,000	$814,338	
	Total					$989,000
7	**Basin 61**					
	8" PVC Sewer	735	LF	$130	$95,550	
	10" PVC Sewer	1076	LF	$150	$161,400	
	Manholes	21	EA	$12,000	$250,061	
	Lateral w/ cleanout	130	EA	$9,000	$1,165,824	
	Total					$1,672,800
8	**Basin 368**					
	Manholes	15	EA	$12,000	$178,310	
	Lateral w/ cleanout	92	EA	$9,000	$831,312	
	Total					$1,009,600
9	**Basin 59**					
	6" PVC Sewer	163	LF	$120	$19,560	
	15" PVC Sewer	93	LF	$170	$15,810	
	Manholes	22	EA	$12,000	$266,444	
	Lateral w/ cleanout	138	EA	$9,000	$1,242,207	
	Total					$1,544,000

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MASTER PLAN COST ESTIMATE

Project:	CWWMP	Alternatives:	3
Client:	Rodeo Sanitary District	SF ENR December 2012:	10355
Location:	Rodeo, California	Estimate Preparation Date :	January 2013
Element:	22 I&I Improv (3)	By :	JES
		Reviewed:	AG/RC

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
10	**Basin 477**					
	8" PVC Sewer	165	LF	$130	$21,450	
	10" PVC Sewer	288	LF	$150	$43,200	
	12" PVC Sewer	328	LF	$150	$49,200	
	Manholes	28	EA	$12,000	$337,529	
	Lateral w/ cleanout	175	EA	$9,000	$1,573,614	
	Total					$2,025,000
11	**Trunk Sewers**					
	12" PVC Sewer	270	LF	$150	$40,500	
	15" PVC Sewer	2890	LF	$170	$491,300	
	21" DI Sewer	1401	LF	$270	$378,270	
	24" DI Sewer	120	LF	$320	$38,400	
	Total					$948,500
	Subtotal					$15,668,800
	Estimating Contingency	30%				$4,700,600
	Element Direct Cost					$20,369,400
	General Contractor Overhead and	25%				$5,092,400
	Sales Tax on 50% of Subtotal Above	8.50%				$865,700
	Element Construction Cost					**$26,327,500**
	Engineering, Legal, Admin, Permitting,	30%				$7,898,300
	Element Project Cost					**$34,225,800**

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MASTER PLAN COST ESTIMATE

Alternatives:	2
SF ENR December 2012:	10355
Estimate Preparation Date :	January 2013
By :	JES
Reviewed:	AG/RC

Project: CWWMP
Client: Rodeo Sanitary District
Location: Rodeo, California
Element: 17 Influent PS Rehab (2)

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Influent Pump Station Structural Rehab and Tank Replacement**					
	Equipment Supports	3	ea	$5,000	$14,987	
	IPS Diesel Fuel Tank	1	ea	$32,752	$32,724	
	IPS Wet Well and Pump Room	1	LS	$55,000	$54,952	
	Total					$102,700
2	**Influent Pump Station Mechanical and Electrical**					
	MCC (4 sections)	4	ea	$15,000	$59,948	
	IPS gate	1	ea	$13,475	$13,463	
	Total					$73,400
3	**Generator Building Roof**					
	Generator Roof	150	sf	$15	$2,248	
	Total					$2,200
	Subtotal					$178,300
	Estimating Contingency	30%				$53,500
	Element Direct Cost					$231,800
	General Contractor Overhead and Profit, Bonds and Insurance	25%				$58,000
	Sales Tax on 50% of Subtotal Above	8.50%				$9,900
	Element Construction Cost					**$299,700**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%				$89,900
	Element Project Cost					**$389,600**

MASTER PLAN COST ESTIMATE

Project: CWWMP
Client: Rodeo Sanitary District
Location: Rodeo, California
Element: 17 Influent PS Rehab (3)

Alternatives: 3
SF ENR December 2012: 10355
Estimate Preparation Date : January 2013
By : JES
Reviewed: AG/RC

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Influent Pump Station Structural Rehab and Tank Replacement**					
	Equipment Supports	3	ea	$5,000	$14,987	
	IPS Diesel Fuel Tank	1	ea	$32,752	$32,724	
	IPS Wet Well and Pump Room	1	LS	$55,000	$54,952	
	Total					$102,700
2	**Influent Pump Station Mechanical and Electrical**					
	IPS Channel Monster	2	ea	$15,228	$30,430	
	MCC (4 sections)	4	ea	$15,000	$59,948	
	IPS gate	1	ea	$13,475	$13,463	
	Pumps	3	ea	$57,000	$170,852	
	Influent Pump Drives	3	ea	$2,601	$7,795	
	Total					$282,500
3	**Generator Building Roof**					
	Generator Roof	150	sf	$15	$2,248	
	Total					$2,200
	Subtotal					$387,400
	Estimating Contingency	30%				$116,200
	Element Direct Cost					$503,600
	General Contractor Overhead and Profit, Bonds and Insurance	25%				$125,900
	Sales Tax on 50% of Subtotal Above	8.50%				$21,400
	Element Construction Cost					**$650,900**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%				$195,300
	Element Project Cost					**$846,200**

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MASTER PLAN COST ESTIMATE

		Alternatives:	1
Project:	**CWWMP**	**SF ENR December 2012:**	10355
Client:	**Rodeo Sanitary District**	**Estimate Preparation Date :**	**January 2013**
Location:	**Rodeo, California**	**By :**	**JES**
Element:	**18 Influent PS Capacity (1)**	**Reviewed:**	**AG/RC**

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Replace Pump Station**					
	Replace and upsize existing pumps & comminuters with horizontal chopper pumps (3 mgd each)	3	ea	$72,000	$219,175	
	Replace pump drives	3	ea	$2,601	$7,795	
	New pump station structure	1	LS	$306,800	$306,534	
	Sitework (5%)	1	LS	$19,070	$19,053	
	Yard piping (10%)	1	LS	$38,140	$38,107	
	Electrical and Instrumentation (25%)	1	LS	$95,350	$95,267	
	Extend 16" Force Main	200	LF	$170	$33,970	
	Land Acquisition (100' x 100')	10,000	sf	$6.7	$66,600	
	Total					$786,500
	Subtotal					$786,500
	Estimating Contingency	30%				$236,000
	Element Direct Cost					$1,022,500
	General Contractor Overhead and Profit, Bonds and Insurance	25%				$255,600
	Sales Tax on 50% of Subtotal Above	8.50%				$43,500
	Element Construction Cost					**$1,321,600**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%				$396,500
	Element Project Cost					**$1,718,100**

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MASTER PLAN COST ESTIMATE

Alternatives:	2
SF ENR December 2012:	10355
Estimate Preparation Date :	January 2013
By :	JES
Reviewed:	AG/RC

Project: CWWMP
Client: Rodeo Sanitary District
Location: Rodeo, California
Element: 19 Influent PS Capacity (2)

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Increase Pump Station Capacity to 5.1 mgd**					
	Replace and upsize existing pumps & comminuters with horizontal chopper pumps (2.55 mgd each)	3	ea	$61,200	$186,299	
	Replace pump drives	3	ea	$2,601	$7,795	
	Yard piping (10%)	1	LS	$6,380	$6,375	
	Electrical and Instrumentation (25%)	1	LS	$15,950	$15,936	
	Total					$216,400
	Subtotal					$216,400
	Estimating Contingency	30%				$64,900
	Element Direct Cost					$281,300
	General Contractor Overhead and Profit, Bonds and Insurance	25%				$70,300
	Sales Tax on 50% of Subtotal Above	8.50%				$12,000
	Element Construction Cost					**$363,600**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%				$109,100
	Element Project Cost					**$472,700**

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MASTER PLAN COST ESTIMATE

Project:	**CWWMP**	**Alternatives:**	1,2,3
Client:	**Rodeo Sanitary District**	**SF ENR December 2012:**	10355
Location:	**Rodeo, California**	**Estimate Preparation Date :**	**January 2013**
Element:	**1 Grit Chamber Rehab**	**By :**	**JES**
		Reviewed:	**AG/RC**

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Grit Area Structural Repair and**					
	Grit Channel Conc	1240	sf	$25	$30,973	
	Grit Channel Coating	1240	sf	$18	$22,301	
	Grit Walkway Conc (50% of area)	345	sf	$25	$8,618	
	Grit Walkway Coating	690	sf	$18	$12,409	
	Influent Slide Gates	1	ea	$20,900	$20,882	
	Total					$95,200
2	**Grit Blower and Cyclone**					
	Aerated Grit Blower	1	ea	$12,000	$11,990	
	Grit Cyclone	1	ea	$84,178	$84,105	
	Total					$96,100
3	**Pretreatment Structure Replacement**					
	Pretreatment Structure Replacement	1	LS	$1,322,024	$1,320,876	
	Total					$1,320,900
4	**Tier 1 Evaluation**	1	LS	$25,000	$24,978	
	Total					$25,000
	Subtotal					$1,537,200
	Estimating Contingency	30%				$461,200
	Element Direct Cost					$1,998,400
	General Contractor Overhead and Profit, Bonds and Insurance	25%				$499,600
	Sales Tax on 50% of Subtotal Above	8.50%				$84,900
	Element Construction Cost					**$2,582,900**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%				$774,900
	Element Project Cost					**$3,357,800**

MASTER PLAN COST ESTIMATE

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Project: CWWMP
Client: Rodeo Sanitary District
Location: Rodeo, California
Element: 2 Primary Clarifier Rehab

Alternatives: 1,2,3
SF ENR December 2012: 10355
Estimate Preparation Date : January 2013
By : JES
Reviewed: AG/RC

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Primary Clarifier Coating**					
	Primary Clarifier Coating	2700	sf	$18	$48,558	
	Total					$48,600
2	**Weir Box Closure**					
	27" Dia Concrete Pipe	10	LF	$170	$1,699	
	Concrete Fill	18	CY	$300	$5,395	
	Bypass Pumping	1	LS	$5,000	$4,996	
	Total					$12,100
3	**Primary Sludge Pumps**					
	Primary Sludge Pump 1	1	ea	$25,000	$24,978	
	Primary Sludge Pump 2	1	ea	$25,000	$24,978	
	Total					$50,000
4	**Primary Clarifier Replacement**					
	Primary Clarifier Replacement	1	LS	$285,000	$284,753	
	Primary Clarifier Mechanism	1	LS	$150,000	$149,870	
	Total					$434,600
	Subtotal					$545,300
	Estimating Contingency	30%				$163,600
	Element Direct Cost					$708,900
	General Contractor Overhead and Profit, Bonds and Insurance	25%				$177,200
	Sales Tax on 50% of Subtotal Above	8.50%				$30,100
	Element Construction Cost					**$916,200**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%				$274,900
	Element Project Cost					**$1,191,100**

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MASTER PLAN COST ESTIMATE

Project:	**CWWMP**	**Alternatives:**	1
Client:	**Rodeo Sanitary District**	**SF ENR December 2012:**	10355
Location:	**Rodeo, California**	**Estimate Preparation Date :**	**January 2013**
Element:	**3 Primary Clarifier Capacity**	**By :**	**JES**
		Reviewed:	**AG/RC**

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Additional Primary Clarifier**					
	Primary Clarifier Replacement (40-foot dia)	1	LS	$285,000	$284,753	
	Primary Clarifier Mechanism	1	LS	$150,000	$149,870	
	Flowmeter	1	ea	$11,000	$16,125	
	Piping (5%)	1	LS	$22,300	$22,281	
	Land Acquisition	5000	sf	$6.7	$33,300	
	Total					$506,300
	Subtotal					$506,300
	Estimating Contingency	30%				$151,900
	Element Direct Cost					$658,200
	General Contractor Overhead and Profit, Bonds and Insurance	25%				$164,600
	Sales Tax on 50% of Subtotal Above	8.50%				$28,000
	Element Construction Cost					**$850,800**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%				$255,200
	Element Project Cost					**$1,106,000**

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MASTER PLAN COST ESTIMATE

Alternatives: 2
SF ENR December 2012: 10355
Estimate Preparation Date : January 2013
By : JES
Reviewed: AG/RC

Project: CWWMP
Client: Rodeo Sanitary District
Location: Rodeo, California
Element: 03 Primary Clarifier Capacity

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Primary Clarifier Improv**					
	Flowmeter	1	ea	$11,000	$16,125	
	CEPT	1	LS	$150,000	$150,000	
	Total					$166,100
	Subtotal					$166,100
	Estimating Contingency	30%				$49,800
	Element Direct Cost					$215,900
	General Contractor Overhead and Profit, Bonds and Insurance	25%				$54,000
	Sales Tax on 50% of Subtotal Above	8.50%				$9,200
	Element Construction Cost					**$279,100**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%				$83,700
	Element Project Cost					**$362,800**

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MASTER PLAN COST ESTIMATE

		Alternatives:	3
Project:	CWWMP	SF ENR December 2012:	10355
Client:	Rodeo Sanitary District	Estimate Preparation Date :	January 2013
Location:	Rodeo, California	By :	JES
Element:	03 Primary Clarifier Capacity	Reviewed:	AG/RC

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Primary Clarifier Improv**					
	Flowmeter	1	ea	$11,000	$16,125	
	Total					$16,100
	Subtotal					$16,100
	Estimating Contingency	30%				$4,800
	Element Direct Cost					$20,900
	General Contractor Overhead and Profit, Bonds and Insurance	25%				$5,200
	Sales Tax on 50% of Subtotal Above	8.50%				$900
	Element Construction Cost					**$27,000**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%				$8,100
	Element Project Cost					**$35,100**

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MASTER PLAN COST ESTIMATE

		Alternatives:	1,2,3
Project:	CWWMP	SF ENR December 2012:	10355
Client:	Rodeo Sanitary District	Estimate Preparation Date :	January 2013
Location:	Rodeo, California	By :	JES
Element:	4 Aeration Basin Rehab	Reviewed:	AG/RC

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SOURCE ENR	ENR ADJUSTMENT FACTOR	SUBTOTAL	TOTAL
1	**Aeration Basin Concrete Repair**							
	Aeration Basin Repair	9000	sf	$25	10364	1.00	$22,480	
	Total							$22,500
2	**Anoxic Mixer**							
	Anoxic Mixer	1	LF	$25,000	10364	1.00	$24,978	
	Total							$25,000
3	**Blower Project**							
	Blower	1	ea	$40,000	9051	1.14	$45,763	
	Intake Filters	3	ea	$3,000	10364	1.00	$8,992	
	Blower Bldg Lateral Bracing	1	LS	$4,000	10364	1.00	$3,997	
	Blower Bldg Roof	1300	sf	$9	10364	1.00	$11,690	
	Total							$70,400
4	**Aeration Basin Concrete Coating**							
	Aeration Basins	9000	LS	$18	10364	1.00	$161,859	
	Total							$161,900
5	**Blower Bldg Repair and Coating**							
	Blower Building	1300	sf	$18	10364	1.00	$23,380	
	Total							$23,400
6	**Blower MCC Replacement**							
	Blower Room MCC (3 sections)	3	ea	$20,000	10364	1.00	$59,948	
	Conduit	1	LS	$30,000	10364	1.00	$29,974	
	Total							$89,900
7	**Membrane Diffusers**							
	HiOx Diffusers	1	LS	$83,995	10355	1.00	$83,995	
	Total							$84,000
	Subtotal							$477,100
	Estimating Contingency	30%						$143,100
	Element Direct Cost							$620,200
	General Contractor Overhead and Profit, Bonds and Insurance	25%						$155,100
	Sales Tax on 50% of Subtotal Above	8.50%						$26,400
	Element Construction Cost							**$801,700**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%						$240,500
	Element Project Cost							**$1,042,200**

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MASTER PLAN COST ESTIMATE

		Alternatives:	1,2
Project:	CWWMP	SF ENR December 2012:	10355
Client:	Rodeo Sanitary District	Estimate Preparation Date :	January 2013
Location:	Rodeo, California	By :	JES
Element:	5 Aeration Basin Capacity	Reviewed:	AG/RC

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Selector Improvements**					
	Baffle Walls, Columns, Gates, Piping	1	LS	$390,040	$389,701	
	Total					$389,700
2	**Contact Stabilization**					
	16" DI piping in building	50	LF	$244	$12,195	
	Slide Gates	2	ea	$46,000	$91,920	
	Total					$104,100
3	**Additional Anoxic Mixer**					
	Anoxic Mixer	1	ea	$25,000	$25,000	
	Total					$25,000
4	**Hydraulic Improvements to Primary Clarifier**					
	16" Curved Wall,31'-50' Dia, To 8' High	62	CY	$980	$6,073	
	24" Cl 52 Cldi Mj Pipe In Open Trench	50	LF	$134	$6,712	
	24" Cl 52 Cldi Mj Bends & Fittings	4	ea	$3,515	$14,048	
	Total					$26,800
	Subtotal					$545,600
	Estimating Contingency	30%				$163,700
	Element Direct Cost					$709,300
	General Contractor Overhead and Profit, Bonds and Insurance	25%				$177,300
	Sales Tax on 50% of Subtotal Above	8.50%				$30,100
	Element Construction Cost					**$916,700**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%				$275,000
	Element Project Cost					**$1,191,700**

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MASTER PLAN COST ESTIMATE

		Alternatives:	3
Project:	CWWMP	SF ENR December 2012:	10355
Client:	Rodeo Sanitary District	Estimate Preparation Date :	January 2013
Location:	Rodeo, California	By :	JES
Element:	05 Aeration Basin Capacity	Reviewed:	AG/RC

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Selector Improvements**					
	Baffle Walls, Columns, Gates, Piping	1	LS	$390,040	$389,701	
	Total					$389,700
2	**Additional Anoxic Mixer**					
	Anoxic Mixer	1	ea	$25,000	$25,000	
	Total					$25,000
	Subtotal					$414,700
	Estimating Contingency	30%				$124,400
	Element Direct Cost					$539,100
	General Contractor Overhead and Profit, Bonds and Insurance	25%				$134,800
	Sales Tax on 50% of Subtotal Above	8.50%				$22,900
	Element Construction Cost					**$696,800**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%				$209,000
	Element Project Cost					**$905,800**

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MASTER PLAN COST ESTIMATE

Alternatives: 1,2,3
SF ENR December 2012: 10355
Estimate Preparation Date : January 2013
By : JES
Reviewed: AG/RC

Project: CWWMP
Client: Rodeo Sanitary District
Location: Rodeo, California
Element: 6 2nd Clarifer Rehab

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Secondary Clarifier Mechanical and Structural Rehab**					
	Secondary Clarifier Coating	3100	sf	$18	$55,752	
	Drain Valve	2	ea	$20,000	$39,965	
	Mechanism	2	ea	$135,000	$287,668	
	Total					$383,400
2	**Sludge Pumping Equipment**					
	RAS Pump 8	1	ea	$27,500	$27,476	
	RAS Pump OOS	1	ea	$27,500	$27,476	
	WAS Pump 9	1	ea	$22,000	$21,981	
	Total					$76,900
	Subtotal					$460,300
	Estimating Contingency	30%				$138,100
	Element Direct Cost					$598,400
	General Contractor Overhead and Profit, Bonds and Insurance	25%				$149,600
	Sales Tax on 50% of Subtotal Above	8.50%				$25,400
	Element Construction Cost					**$773,400**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%				$232,000
	Element Project Cost					**$1,005,400**

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MASTER PLAN COST ESTIMATE

Project:	**CWWMP**	**Alternatives:**	1
Client:	**Rodeo Sanitary District**	**SF ENR December 2012:**	10355
Location:	**Rodeo, California**	**Estimate Preparation Date :**	**January 2013**
Element:	**7 2nd Clarifer Capacity**	**By :**	**JES**
		Reviewed:	**AG/RC**

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Additional Secondary Clarifier**					
	Secondary Clarifier Replacement (40-foot dia)	1	LS	$340,000	$339,705	
	Drain Valve	1	ea	$20,000	$19,983	
	Mechanism	1	ea	$135,000	$143,834	
	Purchase Land Adjacent to WWTP	2500	sf	$6.7	$16,636	
	Total					$520,200
2	**RAS/WAS Improvements**					
	Additional RAS Pumps (400 gpm ea)	2	ea	$36,300	$82,858	
	WAS Flowmeter	1	ea	$11,000	$16,125	
	Total					$99,000
	Subtotal					$619,200
	Estimating Contingency	30%				$185,800
	Element Direct Cost					$805,000
	General Contractor Overhead and Profit, Bonds and Insurance	25%				$201,300
	Sales Tax on 50% of Subtotal Above	8.50%				$34,200
	Element Construction Cost					**$1,040,500**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%				$312,200
	Element Project Cost					**$1,352,700**

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MASTER PLAN COST ESTIMATE

Alternatives: 2,3
SF ENR December 2012: 10355
Estimate Preparation Date : January 2013
By : JES
Reviewed: AG/RC

Project: CWWMP
Client: Rodeo Sanitary District
Location: Rodeo, California
Element: 7 2nd Clarifer Capacity (2,3)

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**RAS/WAS Improvements**					
	Additional RAS Pumps (400 gpm ea)	1	ea	$36,300	$41,429	
	WAS Flowmeter	1	ea	$11,000	$16,125	
	Total					$57,600
	Subtotal					$57,600
	Estimating Contingency	30%				$17,300
	Element Direct Cost					$74,900
	General Contractor Overhead and Profit, Bonds and Insurance	25%				$18,700
	Sales Tax on 50% of Subtotal Above	8.50%				$3,200
	Element Construction Cost					**$96,800**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%				$29,000
	Element Project Cost					**$125,800**

MASTER PLAN COST ESTIMATE

Project: CWWMP
Client: Rodeo Sanitary District
Location: Rodeo, California
Element: 8 Cl Contact Rehab

Alternatives: 1,2,3
SF ENR December 2012: 10355
Estimate Preparation Date : January 2013
By : JES
Reviewed: AG/RC

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Chemical Equipment**					
	Bisulfite Pumps 1,2	2	ea	$7,000	$14,000	
	Sodium Hypochlorite Pumps 3, 4, 5	3	ea	$7,000	$21,000	
	CCT Mixing Unit	1	ea	$33,000	$32,971	
	Chem Mixing PLC	1	ea	$50,000	$49,957	
	Chlorine Meters	3	ea	$15,000	$44,961	
	Hypo Tank (3500 gal)	1	ea	$15,800	$15,800	
	Bisulfite Tank (3500 gal)	1	ea	$15,800	$15,800	
	Total					$194,500
	Subtotal					$194,500
	Estimating Contingency	30%				$58,400
	Element Direct Cost					$252,900
	General Contractor Overhead and Profit, Bonds and Insurance	25%				$63,200
	Sales Tax on 50% of Subtotal Above	8.50%				$10,700
	Element Construction Cost					**$326,800**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%				$98,000
	Element Project Cost					**$424,800**

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MASTER PLAN COST ESTIMATE

		Alternatives:	1,2
Project:	**CWWMP**	**SF ENR December 2012:**	10355
Client:	**Rodeo Sanitary District**	**Estimate Preparation Date :**	**January 2013**
Location:	**Rodeo, California**	**By :**	**JES**
Element:	**9 Cl Contact Capacity**	**Reviewed:**	**AG/RC**

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Additional Chlorine Contact Basin**					
	Chlorine Contact Basin (4700 cf)	1	cf	$600,000	$600,000	
	Parallel Piping to address hydraulics	1	LS	$30,000	$30,000	
	Total					$630,000
	Subtotal					$630,000
	Estimating Contingency	30%				$189,000
	Element Direct Cost					$819,000
	General Contractor Overhead and Profit, Bonds and Insurance	25%				$204,800
	Sales Tax on 50% of Subtotal Above	8.50%				$34,800
	Element Construction Cost					**$1,058,600**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%				$317,600
	Element Project Cost					**$1,376,200**

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MASTER PLAN COST ESTIMATE

Project:	**CWWMP**
Client:	**Rodeo Sanitary District**
Location:	**Rodeo, California**
Element:	**10 Sludge Thickening Rehab**

Alternatives:	1,2,3
SF ENR December 2012:	10355
Estimate Preparation Date :	**January 2013**
By :	**JES**
Reviewed:	**AG/RC**

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Rehabilitate Sludge Thickening Bldg**					
	Roof Hatches	3	ea	$2,000	$5,995	
	Building Coating	1100	sf	$18	$19,783	
	Building Roof	1100	sf	$9	$9,891	
	Total					$35,700
2	**Tier 1 Seismic Evaluation**					
	Sludge Thickening Bldg	1	LS	$25,000	$24,978	
	Total					$25,000
3	**Rotary Drum Thickener**					
	TWAS Pump	1	ea	$25,000	$24,978	
	Rotary Drum Thickener	1	ea	$53,976	$53,929	
	Total					$78,900
	Subtotal					$139,600
	Estimating Contingency	30%				$41,900
	Element Direct Cost					$181,500
	General Contractor Overhead and Profit, Bonds and Insurance	25%				$45,400
	Sales Tax on 50% of Subtotal Above	8.50%				$7,700
	Element Construction Cost					**$234,600**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%				$70,400
	Element Project Cost					**$305,000**

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MASTER PLAN COST ESTIMATE

		Alternatives:	1,2,3
Project:	**CWWMP**	**SF ENR December 2012:**	10355
Client:	**Rodeo Sanitary District**	**Estimate Preparation Date :**	**January 2013**
Location:	**Rodeo, California**	**By :**	**JES**
Element:	**11 Anaerobic Digesters Rehab**	**Reviewed:**	**AG/RC**

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Digester Control Building Coating**					
	Digester Control Building Coating	1100	sf	$18	$19,783	
	Total					$19,800
2	**Flexible Couplings**					
	Flexible Couplings	1	LS	$10,000	$9,991	
	Total					$10,000
3	**Digestion Equipment**					
	Boiler	1	ea	$28,000	$27,976	
	Digester Feed Pumps	2	ea	$24,107	$48,172	
	Sludge Heat Exchanger 1 & 2	2	ea	$31,000	$61,946	
	Sludge Recirculation Pumps	2	ea	$27,000	$53,953	
	Total					$192,000
4	**Digester Coating and Roofing**					
	Digester A & B Coating	14800	sf	$18	$266,169	
	Digester Control Building Roof	1100	sf	$9	$9,891	
	Digester Roof	6300	sf	$9	$56,651	
	Total					$332,700
5	**Waste Gas Flare**					
	Flare	1	ea	$127,000	$155,301	
	Total					$155,300
	Subtotal					$709,800
	Estimating Contingency	30%				$212,900
	Element Direct Cost					$922,700
	General Contractor Overhead and Profit, Bonds and Insurance	25%				$230,700
	Sales Tax on 50% of Subtotal Above	8.50%				$39,200
	Element Construction Cost					**$1,192,600**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%				$357,800
	Element Project Cost					**$1,550,400**

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MASTER PLAN COST ESTIMATE

		Alternatives:	1,2,3
Project:	**CWWMP**	**SF ENR December 2012:**	10355
Client:	**Rodeo Sanitary District**	**Estimate Preparation Date :**	**January 2013**
Location:	**Rodeo, California**	**By :**	**JES**
Element:	**12 Dewatering Rehab**	**Reviewed:**	**AG/RC**

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Dewatering Equipment**					
	Centrifuge	1	ea	$60,000	$91,140	
	Packaged Polymer System	1	ea	$30,000	$29,974	
	Sludge Hopper	1	ea	$50,000	$49,957	
	Total					$171,100
	Subtotal					$171,100
	Estimating Contingency	30%				$51,300
	Element Direct Cost					$222,400
	General Contractor Overhead and Profit, Bonds and Insurance	25%				$55,600
	Sales Tax on 50% of Subtotal Above	8.50%				$9,500
	Element Construction Cost					**$287,500**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%				$86,300
	Element Project Cost					**$373,800**

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MASTER PLAN COST ESTIMATE

Project:	**CWWMP**
Client:	**Rodeo Sanitary District**
Location:	**Rodeo, California**
Element:	**13 Sludge Drying Rehab**

Alternatives:	1,2,3
SF ENR December 2012:	10355
Estimate Preparation Date :	**January 2013**
By :	**JES**
Reviewed:	**AG/RC**

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Sludge Drying Bed Repair**					
	Repair sludge Drying Bed #3	2700	sf	$3	$8,093	
	Total					$8,100
2	**Sludge Drying Bed Repair**					
	Repair sludge Drying Bed #1	2160	sf	$3	$6,474	
	Repair sludge Drying Bed #2	2700	sf	$3	$8,093	
	Repair sludge Drying Bed #4	2160	sf	$3	$6,474	
	Repair sludge Drying Bed #5	2700	sf	$3	$8,093	
	4" VCP	270	LF	$40	$10,791	
	6" CIP	350	LF	$60	$20,982	
	6" VCP	350	LF	$60	$20,982	
	Total					$81,900
	Subtotal					$90,000
	Estimating Contingency	30%				$27,000
	Element Direct Cost					$117,000
	General Contractor Overhead and Profit, Bonds and Insurance	25%				$29,300
	Sales Tax on 50% of Subtotal Above	8.50%				$5,000
	Element Construction Cost					**$151,300**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%				$45,400
	Element Project Cost					**$196,700**

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MASTER PLAN COST ESTIMATE

Project:	**CWWMP**	**Alternatives:**	1,2,3
Client:	**Rodeo Sanitary District**	**SF ENR December 2012:**	10355
Location:	**Rodeo, California**	**Estimate Preparation Date :**	**January 2013**
Element:	**14 Elec IC Gen Rehab**	**By :**	**JES**
		Reviewed:	**AG/RC**

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Lateral Supports of Generator Silencer**					
	Lateral Supports of Generator Silencer Pipe	1	LS	$2,000	$1,998	
	Total					$2,000
2	**ArcFlash Study**					
	ArcFlash Study	1	LS	$18,300	$18,284	
	Total					$18,300
3	**MCC-P1 Replacement**					
	MCC-P1 Replacement (6 sections)	6	ea	$15,000	$89,922	
	Conduit, conductors, terminators (6 sections)	6	ea	$3,000	$17,984	
	Total					$107,900
4	**Security System, Reporting Software, and Telecom and Control Wiring**					
	SCADA Reporting Software	1	LS	$4,000	$3,997	
	SCADA Software Programming	60	hr	$150	$8,992	
	Security System	1	LS	$1,500	$1,499	
	Security System Setup	40	hr	$150	$5,995	
	Control Wire Rerouting	16	hr	$150	$2,398	
	Telecom Work	24	hr	$150	$3,597	
	Total					$26,500
5	**Ungrounded Electrical Service Replacement**					
	Replace PG&E Transformer	1	ea	$40,000	$39,942	
	Replace Service Entrance Switchboard	1	ea	$35,000	$34,949	
	Replace Service Conductors/Raceways	1	ea	$15,000	$14,978	
	Temporary Power During Construction	1	MO	$12,000	$11,983	
	Demolition Factor	5	%	$5,100	$5,093	
	Total					$106,900
6	**SCADA Improvements**					
	PLC in Admin Bldg	1	LS	$50,000	$49,957	
	Total					$50,000
7	**Surge Tank and Diesel Tank**					
	Diesel Tank (5,000 gal)	1	ea	$32,572	$32,544	
	Surge Tank (2,000 gal)	1	ea	$13,500	$13,488	
	Total					$46,000
8	**Standby Generator**					
	Standby Generator (500 kW)	1	ea	$250,000	$249,783	
	Total					$249,800
	Subtotal					$607,400
	Estimating Contingency	30%				$182,200
	Element Direct Cost					$789,600
	General Contractor Overhead and Profit, Bonds and Insurance	25%				$197,400
	Sales Tax on 50% of Subtotal Above	8.50%				$33,600
	Element Construction Cost					**$1,020,600**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%				$306,200
	Element Project Cost					**$1,326,800**

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MASTER PLAN COST ESTIMATE

Project:	**CWWMP**	**Alternatives:**	1,2,3
Client:	**Rodeo Sanitary District**	**SF ENR December 2012:**	10355
Location:	**Rodeo, California**	**Estimate Preparation Date :**	**January 2013**
Element:	**15 Admin & Maint Rehab**	**By :**	**JES**
		Reviewed:	**AG/RC**

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Roofing**					
	Admin Building Roofing	2500	sf	$9	$22,480	
	Maintenance Shop Roofing	1000	sf	$9	$8,992	
	Total					$31,500
2	**ADA Compliance**					
	Bathroom Remodel/Ramp/Automated Door	1	LS	$60,000	$60,000	
	Total					$60,000
	Subtotal					$91,500
	Estimating Contingency	30%				$27,500
	Element Direct Cost					$119,000
	General Contractor Overhead and Profit, Bonds and Insurance	25%				$29,800
	Sales Tax on 50% of Subtotal Above	8.50%				$5,100
	Element Construction Cost					**$153,900**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%				$46,200
	Element Project Cost					**$200,100**

MASTER PLAN COST ESTIMATE

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Project:	CWWMP
Client:	Rodeo Sanitary District
Location:	Rodeo, California
Element:	16 Effluent PS & Outfall Rehab

Alternatives:	1,2,3
SF ENR December 2012:	10355
Estimate Preparation Date :	January 2013
By :	JES
Reviewed:	AG/RC

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SOURCE ENR	ENR ADJUSTMENT FACTOR	SUBTOTAL	TOTAL
1	**Outfall Cathodic Protection**							
	Plant Outfall Cathodic Protection	1	LS	$5,000	10364	1.00	$4,996	
	Total							$5,000
2	**Effluent Pump Station Equipment**							
	Blower	1	LS	$12,000	10364	1.00	$11,990	
	Pump VFDs	400	hp	$162	10364	1.00	$64,744	
	MCC (6 sections)	6	ea	$15,000	10364	1.00	$89,922	
	Total							$166,700
	Subtotal							$171,700
	Estimating Contingency	30%						$51,500
	Element Direct Cost							$223,200
	General Contractor Overhead and Profit, Bonds and Insurance	25%						$55,800
	Sales Tax on 50% of Subtotal Above	8.50%						$9,500
	Element Construction Cost							**$288,500**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%						$86,600
	Element Project Cost							**$375,100**

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MASTER PLAN COST ESTIMATE

Project: CWWMP
Client: Rodeo Sanitary District
Location: Rodeo, California
Element: 16 Effluent PS & Outfall Capaci

Alternatives: 1
SF ENR December 2012: 10355
Estimate Preparation Date : January 2013
By : JES
Reviewed: AG/RC

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Modifications to Pump Operations**					
	Reprogram PLC to allow large and small pump to operate simultaneously	80	hour	$150	$11,990	
	Total					$12,000
	Subtotal					$12,000
	Estimating Contingency	30%				$3,600
	Element Direct Cost					$15,600
	General Contractor Overhead and Profit, Bonds and Insurance	25%				$3,900
	Sales Tax on 50% of Subtotal Above	8.50%				$700
	Element Construction Cost					**$20,200**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%				$6,100
	Element Project Cost					**$26,300**

Note: Cost assumes MCC bus and power distribution system is adequately sized to run one small and one large pump concurrently.

6/3/13

6/3/13

RODEO SANITARY DISTRICT

COMPREHENSIVE WASTEWATER MASTER PLAN

TECHNICAL MEMORANDUM NO. 7

RECOMMENDED COLLECTION SYSTEM AND TREATMENT PLANT IMPROVEMENT PLAN

FINAL
June 2013

RODEO SANITARY DISTRICT

COMPREHENSIVE WASTEWATER MASTER PLAN

RECOMMENDED COLLECTION SYSTEM AND TREATMENT PLANT IMPROVEMENT PLAN

TECHNICAL MEMORANDUM NO. 7

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RECOMMENDED COLLECTION SYSTEM AND TREATMENT PLANT IMPROVEMENT PLAN

1.0 PURPOSE

The purpose of this technical memorandum (TM) is to evaluate the three (3) system-wide alternatives described in TM No. 6 of the Comprehensive Wastewater Master Plan (CWWMP) for the collection, treatment, and disposal of wastewater in the Rodeo Sanitary District (District). The evaluation will identify which of the alternatives best addresses the District's overall vision, goals, and objectives as described in TM No. 1 of the CWWMP.

2.0 SUMMARY OF KEY FINDINGS AND RECOMMENDATIONS

The key findings and recommendations are:

- Alternative 2 - Medium Infiltration and Inflow (I&I) Reduction is the recommended alternative, and best meets the District's overall vision, goals, and objectives as measured by the levels of service (LOS) criteria in TM No. 1. The District should move forward with developing a Capital Improvement Program (CIP) based on this alternative.
- While Alternative 3 - High I&I Reduction has the same overall score and received higher scores with the regulatory compliance, system reliability, and social impacts LOS categories, those benefits did not outweigh the significantly higher cost.

3.0 BACKGROUND

Previous TMs (Nos. 3, 4, and 5) identified future needs including rehabilitation and replacement of District assets, wet weather capacity improvements, and I&I reduction in the collection system. TM No. 6 included a description and capital cost estimates for three (3) system-wide alternatives to address those needs and deficiencies. Although cost is a major consideration in determining how to best address the District's needs and deficiencies, other factors need to be considered to be consistent with the District's mission statement, "To safely provide the highest level of wastewater collection and treatment as economically as possible for the people of Rodeo while protecting the sensitive ecosystem of the San Pablo and the overall environment." In order to achieve this, the CWWMP has established measurable goals and levels of service (LOS) as described in TM No. 1 that include economic and non-economic factors. The LOS provide a framework for wastewater operation by specifying measurable standards for the system.

4.0 EVALUATION APPROACH

Evaluation criteria were developed to evaluate how well each alternative meets the District's LOS. The evaluation criteria were developed based on Carollo's experience and were reviewed and accepted by District staff. Criteria were developed for each of the broader four LOS categories, which include:

- Protect the environment and achieve regulatory compliance.
- Provide operational and system reliability with working conditions that are safe.
- Have the most affordable capital cost with lower life cycle costs.
- Minimize social and customer impact, while meeting needs of the community.

Each criterion was assigned a relative weighting, or level of importance. For each evaluation criteria, a score of 1 through 5 was assigned to all of the alternatives. A score of 1 means the alternative is least suited to meeting the LOS, while a score of 5 means it is best suited. The scores were then multiplied by their respective weighting factor to determine the weighted score for each criterion. The weighted scores were totaled to determine the total weighted score of each alternative, which was then used to compare the alternatives. Weighted scores that are relatively close to one another, 2.4 versus 2.5, should be considered equal. In contrast, scores that are relatively far apart from one another, e.g., 2.4 vs 3.4 should be considered significantly different, and reflective of the fact that the latter alternative is better suited to meeting the LOS.

Table 7.1 summarizes the evaluation criteria and weighting factors used to evaluate each of the three alternatives. All four LOS categories were given an equal weighting factor of 25 percent.

5.0 OPERATION AND MAINTENANCE COST IMPACTS

Capital costs for the three alternatives were developed in TM No. 6. Operation and maintenance (O&M) costs were also estimated in order to determine the total life cycle cost for each alternative. Power usage associated with influent and effluent pumping and chemical costs associated with disinfection or enhanced primary treatment were the operational cost components used for comparison purposes. It was assumed that all other O&M costs for the WWTP or collection system would have negligible, if any variation between the three alternatives. Table 7.2 summarizes the life cycle costs for each alternative, and shows that the O&M costs have a negligible impact on the total life cycle cost.

Table 7.1	Alternatives Evaluation Criteria Comprehensive Wastewater Master Plan Rodeo Sanitary District	
Levels of Service Category	**Evaluation Criteria**	**Weight Percent**
Environmental/Regulatory Compliance	Meets current regulations and positions the District to cost-effectively meet future regulations	25
Operational/System Reliability	Cause less sewer overflows per year	10
	Provides safer working conditions	5
	Reduce overall energy use and replace infrastructure with more energy efficient assets	5
	Increases security and integrates the SCADA system to the plant security	5
Financial Management	Requires lower capital expenditures	15
	Have lower life-cycle costs relative to benefits	5
	Does not require significant drawdown of reserves	5
Social/Customer Impact	Minimize backups/flooding from sewer system	10
	Reduces system risk and increases redundancy	5
	Expands/maintains capacity as needed	5
	Minimizes idle WWTP and collection system capacity	5
		100

Table 7.2	Alternative Life Cycle Costs Comprehensive Wastewater Master Plan Rodeo Sanitary District		
Cost	**Alternative 1 Low I&I Reduction**	**Alternative 2 Medium I&I Reduction**	**Alternative 3 High I&I Reduction**
Capital Cost(1)	$39.7 M	$41.8 M	$67.3 M
Differential Annual Cost(2,3)	$6,400	$29,700	$4,100
Total Life Cycle Cost (New Present Value) (4,5)	$39.8 M	$42.3 M	$67.4 M

Notes:
(1) Capital cost was taken from TM 6 – Collection System and Treatment Plant Alternatives.
(2) Annual costs were limited to influent and effluent pumping costs and chemical usage for disinfection and enhanced primary treatment, since other annual costs were assumed to remain constant across the alternatives. The following chemical dosing rates were used in determining chemical usage costs: 12% sodium hypochlorite at 10 mg/L; 25% sodium bisulfite at 5 mg/L; and 48% alum at 15 mg/L. Electricity cost was based on $0.12/kwh.
(3) Since the goal was determining the difference in operating costs between alternatives, only the additional cost for chemical and pumping during peak wet weather flows for 2 weeks per year (or 10% of the time) was used.
(4) Annual construction cost escalation is assumed to be 3.5%.
(5) 6% discount factor was used for present worth purposes.

6.0 EVALUATION RESULTS

The results of the alternative evaluation are shown in Figure 7.1. A higher total value indicates an alternative is relatively better in meeting the District's LOS goals. Key results are summarized below.

- All alternatives will meet current regulations. However, Alternatives 2 and 3 have the highest score and are best able to meet all of the LOS criteria.
- Alternative 3 has a slightly higher score than Alternative 2 for improving social and customer impact, environmental and regulatory compliance, and operational and system reliability. By replacing all of the customer laterals, manholes, and sewers in the older portions of the collection system, peak wet weather flows are lower than the other alternatives. This means there is a lower risk of backups into private houses and sanitary sewer overflows (SSOs). In addition, there will be less variation in flows to the WWTP, which will reduce the risk of NPDES violations or process upsets.
- Although Alternative 3 has higher scores than Alternatives 1 and 2 in most categories, Alternative 2 has an equal overall score because its scoring in the financial management LOS category was very high. Alternatives 1 and 2 have a much lower capital and life cycle cost than Alternative 3.

See the Appendix for detailed evaluation scores and justification of the alternatives.

It should be noted that any alternative selected should be checked for effectiveness during the course of the 20-year implementation plan, and mid-course corrections can be made, if necessary. For example, if lateral replacement on private property becomes too expensive, politically unfavorable, or does not reduce the I&I to the levels predicted, more WWTP improvements as described in Alternative 1 may become more cost-effective and desirable. Conversely, if I&I reduction is more effective than what is assumed in the analysis, Alternative 3 may become more favorable. Each of the three alternatives will need to address future requirements for nutrient removal when future regulations are implemented, but this cost was not included in the alternatives evaluation because the impact to each of these alternatives will be the same. While the timing of these regulations is not known, a line item will be included in the CIP.

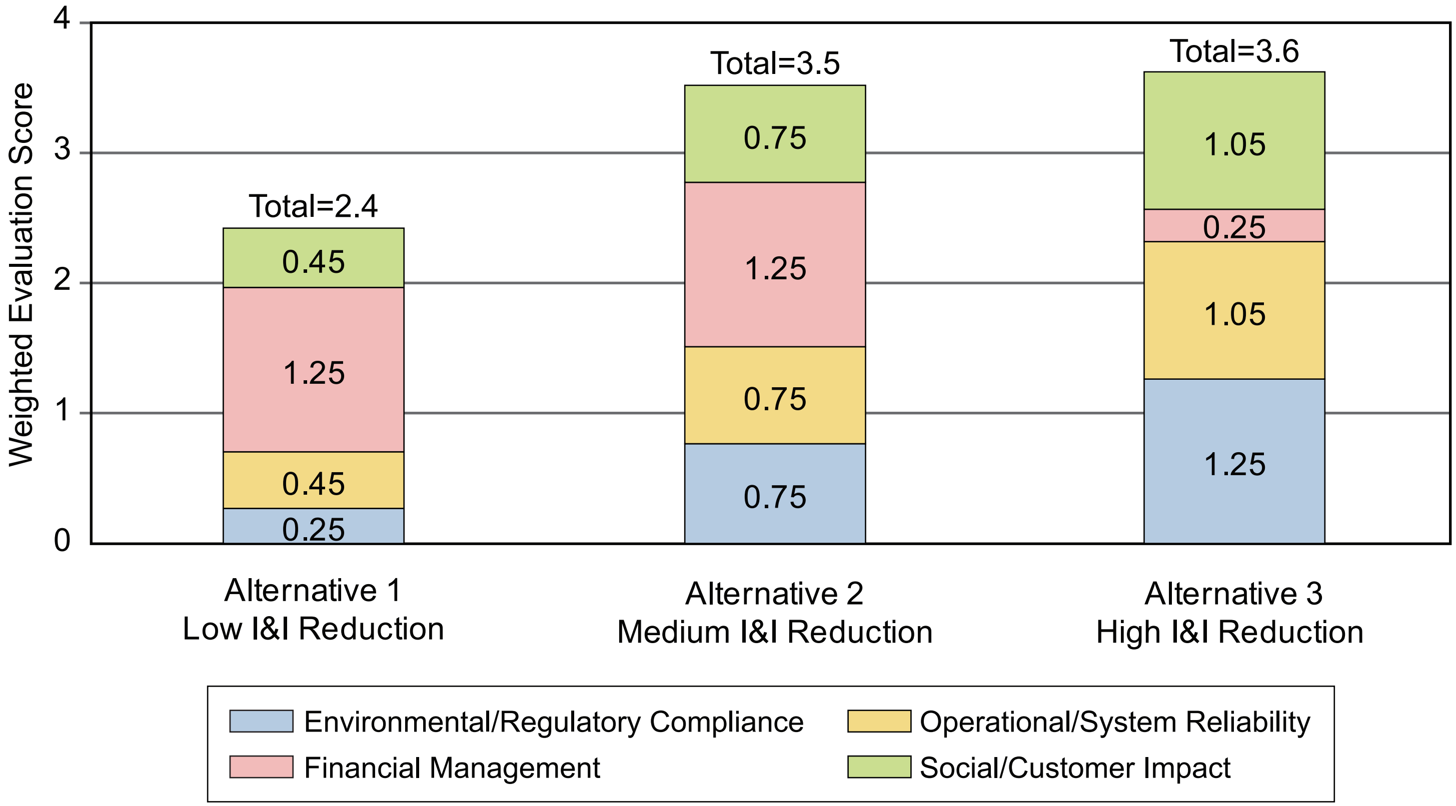

Figure 7.1
DISTRICT ALTERNATIVES EVALUATION RESULTS
COMPREHENSIVE WASTEWATER MASTER PLAN
RODEO SANITARY DISTRICT

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APPENDIX – ALTERNATIVE EVALUATION SUMMARIES

Alternative Evaluation Summary - Alternative 1 - Low I&I Reduction

Levels of Service Category	Evaluation Criteria	Weight Percent	Performance Data (Value/Description)[1]	Performance Score[2]	Weighted Score[3]
Environmental/Regulatory Compliance	Meets current regulations and positions the District to cost-effectively meet future regulations	25	Increased WWTP facilities can better handle peaks during wet weather flow, but fewer infiltration and inflow improvements will cause higher peaks in the flows and greater risk of SSOs.	1	0.25
Operational/System Reliability	Cause less sewer overflows per year	10	Minimal I&I improvements increase the risk of sewer overflows.	1	0.1
	Provides safer working conditions	5	Higher I&I can require more worker time trying to keep sewers clear during wet weather conditions, and is less safe.	2	0.1
	Reduce overall energy use and replace infrastructure with more energy efficient assets	5	Higher PWWF uses more power at the influent and effluent pump stations.	2	0.1
	Increases security and integrates the SCADA system to the plant security	5	Security and SCADA integration occurs under all alternatives.	3	0.15
Financial Management	Requires lower capital expenditures	15	$39.7 M.	5	0.75
	Have lower life-cycle costs relative to benefits	5	Higher flows increase the life-cycle costs and provide fewer benefits.	5	0.25
	Does not require significant drawdown of reserves	5	Lower drawdown of reserves than High I&I reduction alternative.	5	0.25
Social/Customer Impact	Minimize backups/flooding from sewer	10	Highest risk for	1	0.1

Alternative Evaluation Summary - Alternative 1 - Low I&I Reduction					
Levels of Service Category	**Evaluation Criteria**	**Weight Percent**	**Performance Data (Value/Description)(1)**	**Performance Score(2)**	**Weighted Score(3)**
	system		backups/flooding since least I&I improvements.		
	Reduces system risk and increases redundancy	5	Highest risk for SSOs since least I&I improvements. Greatest redundancy at WWTP with infrastructure improvements.	1	0.05
	Expands/maintains capacity as needed	5	Highest PWWFs puts strain on WWTP, but WWTP infrastructure improvements expands capacity.	3	0.15
	Minimizes idle WWTP and collection system capacity	5	No idle WWTP or collection system capacity.	3	0.15
Total		100		32	2.4

Notes:

(1) Performance data is quantitative or qualitative depending on the criteria description. If qualitative, a score of 1 through 5 is assigned; 1 = alternative is least-suited to meet levels of service goal; 5 = alternative best suited to meet levels of service goal.

(2) Performance scores are qualitatively assigned based on performance data. A score of 1 through 5 is assigned; 1 = alternative is least-suited to meet levels of service goal; 5 = alternative best suited to meet level.

(3) Weighted performance score = (Performance score) x (Weight).

Alternative Evaluation Summary - Alternative 2 - Medium I&I Reduction

Levels of Service Category	Evaluation Criteria	Weight Percent	Performance Data (Value/Description) (1)	Performance Score(2)	Weighted Score(3)
Environmental/Regulatory Compliance	Meets current regulations and positions the District to cost-effectively meet future regulations	25	Medium PWWFs will reduce risk of SSOs. Improvements will meet future regulations.	3	0.75
Operational/System Reliability	Cause less sewer overflows per year	10	Medium level I&I improvements decreases the risk of sewer overflows.	3	0.3
	Provides safer working conditions	5	Medium I&I can require some worker time trying to keep sewers clear during wet weather conditions, and is less safe.	3	0.15
	Reduce overall energy use and replace infrastructure with more energy efficient assets	5	Medium PWWF uses more power at the influent and effluent pump stations than lowest PWWF alternative.	3	0.15
	Increases security and integrates the SCADA system to the plant security	5	Security and SCADA integration occurs under all alternatives.	3	0.15
Financial Management	Requires lower capital expenditures	15	$41.8 M	5	0.75
	Have lower life-cycle costs relative to benefits	5	Medium flows increase the life-cycle costs but provide more benefits than higher flows.	5	0.25
	Does not require significant drawdown of reserves	5	Lower drawdown of reserves than High I&I reduction alternative.	5	0.25
Social/Customer Impact	Minimize backups/flooding from sewer system	10	Mid-level risk for backups/flooding since medium I&I improvements.	3	0.3

Alternative Evaluation Summary - Alternative 2 - Medium I&I Reduction					
Levels of Service Category	**Evaluation Criteria**	**Weight Percent**	**Performance Data (Value/Description) (1)**	**Performance Score(2)**	**Weighted Score(3)**
	Reduces system risk and increases redundancy	5	Mid-level risk for SSOs since medium I&I improvements. Less redundancy at WWTP than Alternative 1.	3	0.15
	Expands/maintains capacity as needed	5	Medium PWWFs minimally increases current capacity, but WWTP infrastructure improvements expands capacity in a few processes.	3	0.15
	Minimizes idle WWTP and collection system capacity	5	No idle WWTP or collection system capacity.	3	0.15
Total		**100**		**42**	**3.5**

Notes:

(1) Performance data is quantitative or qualitative depending on the criteria description. If qualitative, a score of 1 through 5 is assigned; 1 = alternative is least suited to meet levels of service goal; 5 = alternative best suited to meet levels of service goal.

(2) Performance scores are qualitatively assigned based on performance data. A score of 1 through 5 is assigned; 1 = alternative is least suited to meet levels of service goal; 5 = alternative best suited to meet level.

(3) Weighted performance score = (Performance score) x (Weight).

Alternative Evaluation Summary - Alternative 3 - High I&I Reduction					
Levels of Service Category	**Evaluation Criteria**	**Weight Percent**	**Performance Data (Value/Description) (1)**	**Performance Score(2)**	**Weighted Score(3)**
Environmental/Regulatory Compliance	Meets current regulations and positions the District to cost-effectively meet future regulations	25	Low PWWFs will reduce risk of SSOs. Improvements will meet future regulations.	5	1.25
Operational/System Reliability	Cause less sewer overflows per year	10	Highest level I&I improvements decreases the risk of sewer overflows.	5	0.5
	Provides safer working conditions	5	Low I&I will reduce worker time trying to keep sewers clear during wet weather conditions, and is more safe.	4	0.2
	Reduce overall energy use and replace infrastructure with more energy efficient assets	5	Low PWWF uses the least power at the influent and effluent pump stations than other alternatives.	4	0.2
	Increases security and integrates the SCADA system to the plant security	5	Security and SCADA integration occurs under all alternatives.	3	0.15
Financial Management	Requires lower capital expenditures	15	$67.3 M.	1	0.15
	Have lower life-cycle costs relative to benefits	5	Low flows increase the life-cycle costs but provide greatest benefits than higher flows.	1	0.05
	Does not require significant drawdown of reserves	5	Highest drawdown of reserves due to high capital cost.	1	0.05
Social/Customer Impact	Minimize backups/flooding from sewer system	10	Lowest risk for backups/flooding since most extensive I&I improvements.	5	0.25
	Reduces system risk and increases redundancy	5	Lowest risk for SSOs since most I&I improvements. Less redundancy at WWTP than Alternative 1.	5	0.25

Alternative Evaluation Summary - Alternative 3 - High I&I Reduction					
Levels of Service Category	**Evaluation Criteria**	**Weight Percent**	**Performance Data (Value/Description) (1)**	**Performance Score(2)**	**Weighted Score(3)**
	Expands/maintains capacity as needed	5	Low PWWFs maintains near current capacity, but WWTP infrastructure improvements expands capacity in a few processes.	3	0.15
	Minimizes idle WWTP and collection system capacity	5	No idle WWTP or collection system capacity.	3	0.15
Total		**100**		**40**	**3.6**

Notes:

(1) Performance data is quantitative or qualitative depending on the criteria description. If qualitative, a score of 1 through 5 is assigned; 1 = alternative is least suited to meet levels of service goal; 5 = alternative best suited to meet levels of service goal.

(2) Performance scores are qualitatively assigned based on performance data. A score of 1 through 5 is assigned; 1 = alternative is least suited to meet levels of service goal; 5 = alternative best suited to meet level.

(3) Weighted performance score = (Performance score) x (Weight).

6/3/13

6/3/13

RODEO SANITARY DISTRICT

COMPREHENSIVE WASTEWATER MASTER PLAN

TECHNICAL MEMORANDUM NO. 8

CAPITAL IMPROVEMENT PROGRAM

FINAL
June 2013

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RODEO SANITARY DISTRICT

COMPREHENSIVE WASTEWATER MASTER PLAN

CAPITAL IMPROVEMENT PROGRAM

TECHNICAL MEMORANDUM
NO. 8

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CAPITAL IMPROVEMENT PROGRAM

1.0 PURPOSE

The purpose of this technical memorandum (TM) is to develop the list of projects to be included in the Capital Improvement Program (CIP) of the Comprehensive Wastewater Master Plan (CWWMP) with associated project cost, timing, and drivers. The CIP is an estimate of the District's capital expenses over the next 20 years to address limitations, rehabilitation needs, and recommended improvements to the wastewater treatment plant (WWTP), influent pump station, and collection system. The CIP is intended to assist the District in planning future budgets and making financial decisions.

2.0 SUMMARY OF KEY FINDINGS AND RECOMMENDATIONS

The key findings and recommendations of this TM are:

- The District should budget approximately $46.3 million dollars to fund District Facilities projects over the next 20 years. Costs presented in this CWWMP are total project costs and include construction, engineering, legal, administrative, and permitting costs. The costs are presented in 2013 dollars and are based on a San Francisco Engineering News Record Construction Cost Index (ENR CCI) of 10,355. Costs are not escalated to future years.
- The CIP budget is based on implementing the recommended alternative (Alternative 2) from TM No. 7, which includes various hydraulic improvements at the WWTP, infiltration and inflow (I&I) improvements for Basins 406, 408, and 324, and extensive sewer replacement in the Northern portion of the collection system to address rehabilitation and replacement needs.
- The CIP budget also includes a project to address anticipated regulatory changes for effluent nitrogen from the WWTP. It is assumed those regulations will take effect in 10 years.

3.0 BACKGROUND

Previous TMs (No. 3 through 5) have identified the need for various rehabilitation and wet weather capacity projects in the collection system and WWTP. TM No. 6 develops various alternatives to address the needs, and TM No. 7 recommends Alternative 2 for implementation in the District's CIP.

4.0 CIP DEVELOPMENT APPROACH

Based on capacity and reliability needs as well as the project priority order developed during the asset inventory, a preferred project schedule was developed to phase the recommended project components over a 20 year period.

The existing collection system varies in age from 50 to more than 100 years old, and all of the Northern portion of the existing gravity collection system will need to be replaced or rehabilitated within the next 20 years. Sewer segment replacement was prioritized based on structural pipeline assessment and certification program (PACP) scores as defined by the National Association of Sewer Service Companies (NASSCO), useful life of pipe, and I&I reduction programs.

WWTP rehabilitation and capacity improvements were combined where cost savings could be achieved. Since the existing collection system capacity is higher than the influent pump station or WWTP peak wet weather flow (PWWF) capacities, reducing the I&I in the collection system was made a priority. In addition, WWTP hydraulic capacity limitations needed to be improved prior to increasing the flow from the influent pump station to the plant. Therefore, Year 1 would include design of WWTP improvements while I&I improvements are made in the collection system, followed by WWTP construction, and finally influent pump station upgrades.

A number of follow-up studies are also included in the CIP that will aid in further developing and refining the District's CIP.

5.0 RESULTS

Figures 8.1 and 8.2 show the near term (5-Year) and long term (20-Year) costs delineated between studies, collection system, influent pump station, and wastewater treatment improvements.

Table 8.1 shows a detailed summary of all recommended CIP projects including total project cost and recommended implementation timing. Appendix A includes additional details for the 5-year and 20-year CIP as well as detailed cost estimates for each project. Appendix B provides the location and the justification for replacement of each pipe segment in the collection system to aid the District in prioritizing segment replacement.

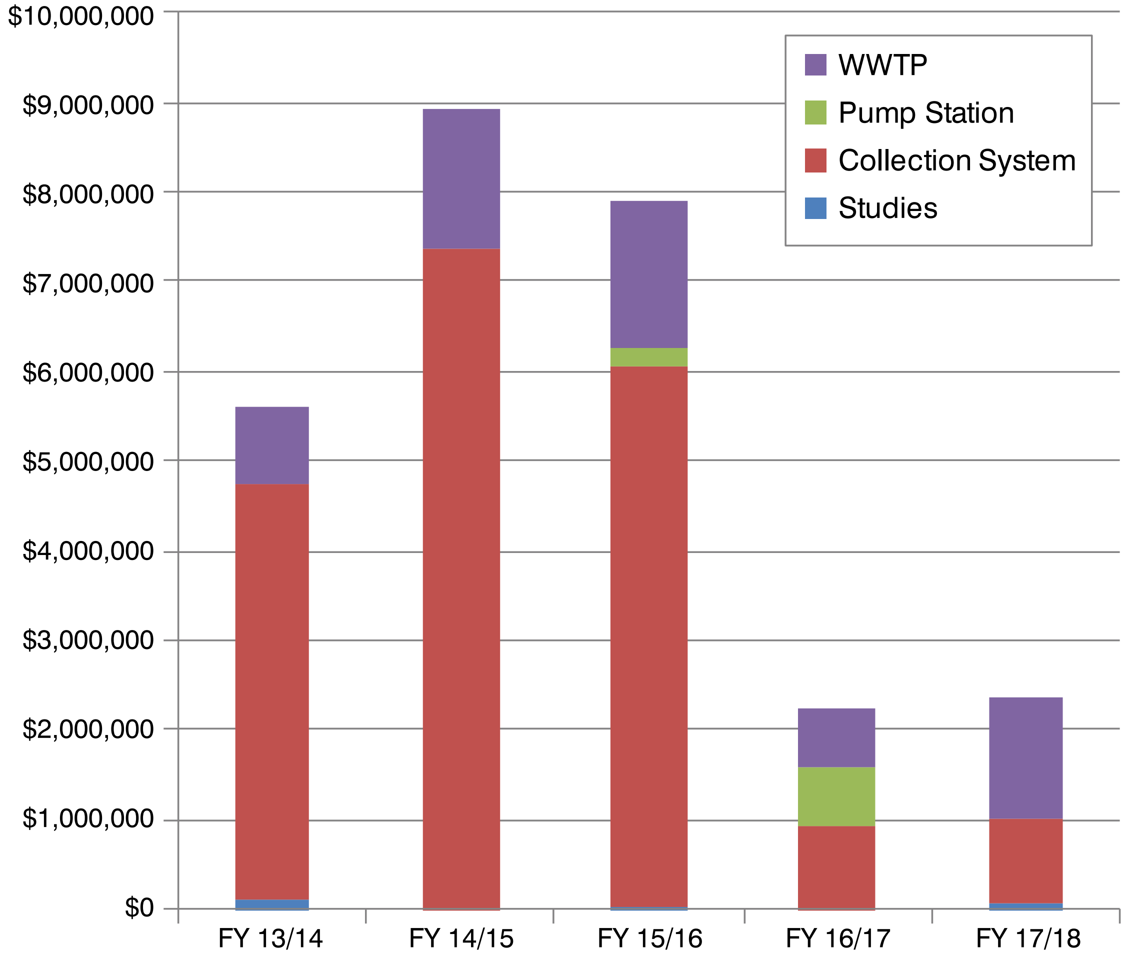

Figure 8.1
5-YEAR CIP CASH FLOW
COMPREHENSIVE WASTEWATER MASTER PLAN
RODEO SANITARY DISTRICT

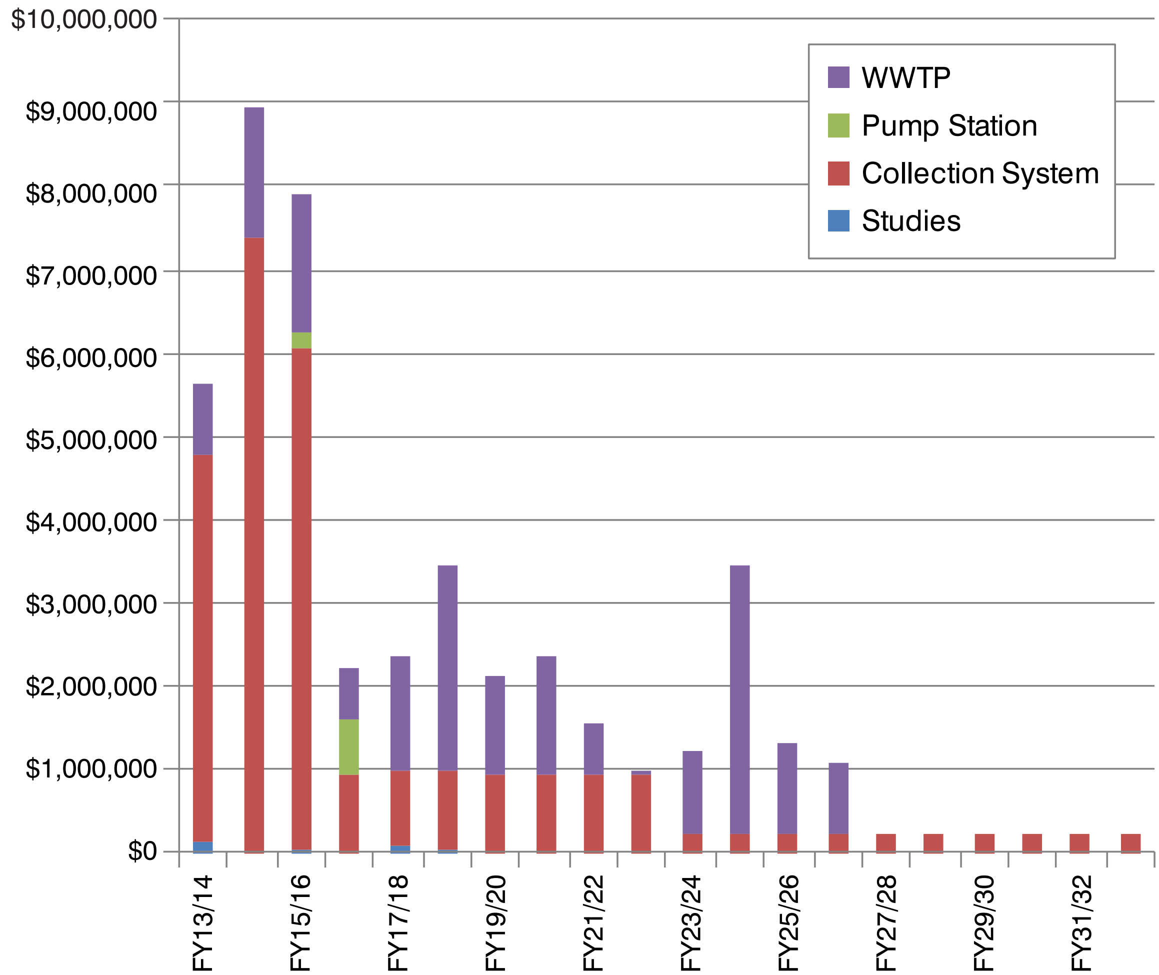

Figure 8.2
20-YEAR CIP CASH FLOW
COMPREHENSIVE WASTEWATER MASTER PLAN
RODEO SANITARY DISTRICT

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Table 8.1 Comprehensive CIP
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Project Name	Description	Purpose	Total Project Costs[1,2]	Fiscal Year Start	Fiscal Year End
Lefty Gomez Project	The Lefty Gomez project has already been designed, and will be constructed in FY2013/14. The project involves upsizing approximately 350 LF of 6” sewer with 10” sewer, and construction of 200 LF of new 10” sewer.	Rehabilitation	$117,700	FY12/13	FY13/14
Temporary Force Main Bridge	The 16-inch force main will be relocated from the existing Rodeo Creek bridge in San Pablo Avenue to behind the pump station temporarily while the Rodeo Creek bridge is being replaced.	County Requirement	$296,400	FY12/13	FY13/14
Permanent Force Main Bridge	A new 16-inch force main will be built on the new Rodeo Creek bridge in San Pablo Avenue as part of the bridge construction.	County Requirement	$250,300	FY12/13	FY14/15
Manhole Condition Assessment	Based on collection system mapping, there are 509 manholes, of which 71 are relatively new. While some rehabilitation of the older brick manholes was implemented in the past, there is no record of where or how many. A manhole assessment and certification program (MACP) should be carried out by a certified inspector. This assessment will provide the District with an accurate idea of the condition of existing manholes and the extent of repairs or replacement that is needed. This study should be carried out this fiscal year so that any repairs or replacement can be made in conjunction with the sewer replacement projects.	Rehabilitation	$101,700	FY13/14	FY13/14

Table 8.1 Comprehensive CIP
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Project Name	Description	Purpose	Total Project Costs[1,2]	Fiscal Year Start	Fiscal Year End
Private Sewer Lateral Mapping	General Waste Discharge Requirements (GDRs) are currently under revision. The current draft GDR requires monitoring of private sewer laterals by District staff for sanitary sewer overflows. If this requirement is adopted, then the sewer collection system maps should be updated to show private laterals.	Regulations	$20,000	FY13/14	FY13/14

Table 8.1 Comprehensive CIP
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Project Name	Description	Purpose	Total Project Costs(1,2)	Fiscal Year Start	Fiscal Year End
Sewer Year 1 (Rehab, Capacity, I&I Basins 406 and 408)	This project will include replacement or rehabilitation of all sewers that received a PACP structural code of 5 during the CCTV inspection that occurred between 2008 and 2012 and were beyond their useful life. These pipes are located in the Northwest portion of the collection system in the oldest area of Rodeo. Appendix A provides the specific pipe segments that will be replaced in the first year and the supporting reasons for replacement. Approximately 11,100 feet of pipe will be either repaired or replaced. Capacity improvements are also included in Year 1 to eliminate bottlenecks in the collection system based on the reduced peak wet weather flows after I&I improvements have been made to Basins 406, 408, and 324. The existing collection system capacity is approximately 6.8 mgd. In order to reduce that flow by approximately 1 mgd, I&I improvements will be made to Basins 406 and 408 in the first year. These improvements include replacement or rehabilitation of all collection system sewers, laterals (from the sewer to the cleanout), and manholes. Pipeline replacement should begin with all sewers within Basins 406 and 408, and then proceed by area to reduce the impact to area businesses and residents.	Rehabilitation	$4,518,900	FY13/14	FY13/14

Table 8.1 Comprehensive CIP
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Project Name	Description	Purpose	Total Project Costs(1,2)	Fiscal Year Start	Fiscal Year End
WWTP Hydraulic Improvements	The primary clarifier coating, chemically enhanced primary treatment (CEPT) and a flow meter will be added to the primary clarifier. Primary sludge pumps 1 and 2 will be replaced. Aeration Basin selector improvements consisting of installation of baffle walls, columns, gates, and piping. Aeration basin contact stabilization involving additional slide gates and ductile iron piping. An additional anoxic mixer will be added to the aeration basin. Hydraulic improvements to increase flow between the aeration basin the primary clarifier will be built under this project. An additional RAS pump and WAS flowmeter will be added at the secondary clarifier. One additional chlorine contact basin (4,700 cubic feet) and new parallel piping to address hydraulic constraints will be added. This project also includes miscellaneous rehabilitation at the headworks.	Capacity	$3,481,700	FY13/14	FY15/16
Grit Chamber Rehab	Concrete and coating repairs will be made to the grit channel and walkway. In addition, influent slide gates will need to be replaced.	Rehabilitation	$208,100	FY13/14	FY14/15
Weir Box Closure	Primary effluent flows through the weir box in the primary clarifier area. However, the weir box no longer functions as intended. To reduce the frequent cleaning it requires, the weir box will be filled with concrete and the primary effluent pipes be directly connected with approximately 10 feet of 27-inch diameter pipe.	Rehabilitation	$26,400	FY13/14	FY14/15

Table 8.1 Comprehensive CIP
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Project Name	Description	Purpose	Total Project Costs[1,2]	Fiscal Year Start	Fiscal Year End
Sewer Year 2 (Rehab and I&I Basin 324 Sewers)	The second year of the CIP will include replacement or rehabilitation of all sewers that received a PACP structural code of 5 during the CCTV inspection that occurred between 2008 and 2012, but still had time remaining on their useful life. The majority of these pipes are located in the Northeast portion of the collection system. Appendix A provides the specific pipe segments that will be replaced in the second year and the supporting reasons for replacement. Approximately 27,700 feet of pipe will be either repaired or replaced. As part of the recommended I&I improvements, Basin 324 will have all sewer collection system laterals repaired or replaced during the second year. Lateral and manhole replacement was postponed until Year 3 to spread out the capital cost. Pipeline replacement should begin with all sewers within Basin 324, and then proceed by area to reduce the impact to area businesses and residents.	Rehabilitation	$7,366,700	FY13/14	FY14/15

Table 8.1 Comprehensive CIP
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Project Name	Description	Purpose	Total Project Costs[1,2]	Fiscal Year Start	Fiscal Year End
Aeration Basin/Conc/ Mixer/Blowers	Approximately 10% of the aeration basin concrete will be repaired under this project to repair concrete cracking and spalling. The anoxic mixer in the aeration basin is currently inoperable, and will be replaced with a new submersible anoxic mixer under this project. Two of the existing blowers were replaced by the District in January 2013. There is one remaining blower that requires replacement in order to achieve the firm capacity required. Provide U-bolts to accommodate seismic loads will be added to the pipes in the RAS pump room. The WAS line will be anchored to the building wall using preformed channel straps.	Rehabilitation	$232,300	FY14/15	FY15/16
Sewer Year 3 (Rehab, I&I Basin 324 MHs & Laterals)	This project will include replacement or rehabilitation of all sewers that received a PACP structural code of 4 during the CCTV inspection that occurred between 2008 and 2012 or had unknown condition, and were beyond their useful life. The majority of these pipes are located in the Northwest portion of the collection system. Appendix A provides the specific pipe segments that will be replaced in the third year and the supporting reasons for replacement. Approximately 4,800 feet of pipe will be either repaired or replaced. Basin 324 I&I improvements will continue in the third year and will include replacement of laterals (from the sewer to the cleanout) and manholes.	Rehabilitation	$6,054,000	FY14/15	FY15/16

Table 8.1 Comprehensive CIP
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Project Name	Description	Purpose	Total Project Costs[1,2]	Fiscal Year Start	Fiscal Year End
I&I Flow Study	A limited scope I&I flow study will allow the District to check the effectiveness of their I&I reduction program. This study should be conducted after the completion of I&I improvements in Basins 406 and 408, during the wet weather period.	Capacity	$10,000	FY15/16	FY15/16
Influent Pump Station	With one pump out of service, the existing IPS has a reliable capacity of 3.5 mgd, which is significantly less than current peak flows from the collection system. The recommended IPS expansion project includes replacing the existing submersible pumps and drivers with horizontal chopper pumps to provide a firm capacity of 5.1 mgd. As part of the same project, near term rehabilitation improvements will be made that include equipment support replacement, a new diesel fuel tank, new grating and coating of the IPS wetwell. The 5.1 mgd PWWF depends on the success of collection system I&I improvements and capacity improvements. Based on the modeling performed by Advanced Hydro Engineering, PWWF could be as high as 6.9 mgd if I&I improvements are not successful and collection system conveyance capacity constraints are addressed so the peak flows from a 5-year, 24-hour storm reaches the WWTP. Since the influent pump station is already operating beyond reliable capacity, the project should begin immediately after the WWTP hydraulic capacity improvements have been built.	Rehabilitation/ Capacity	$857,500	FY15/16	FY16/17

Table 8.1 Comprehensive CIP
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Project Name	Description	Purpose	Total Project Costs(1,2)	Fiscal Year Start	Fiscal Year End
Sludge Thickening Bldg Rehab	The sludge thickening building requires sandblasting and recoating due to corrosion of the grating support beams for the mezzanine and steel monorail beams at roof level. In addition, three new roof hatches will be installed as part of this project	Rehabilitation	$53,300	FY15/16	FY16/17
Digester Bldg Coating & Equip	The digester control building will be recoated under this project. The pipe penetrations on the digester walls have rigid connection to the walls. In order to avoid damage to the tank walls or the pipes, flexible couplings or other flexible connection will be added. The digester heating and recirculation equipment has exceeded its useful life. A boiler, two digester feed pumps, two sludge heat exchangers and a sludge recirculation pump will be installed as part of this effort.	Rehabilitation	$484,500	FY15/16	FY16/17
Generator Lateral Supports	The generator silencer pipe requires lateral supports for restraint in case of seismic events. This project will install those supports.	Rehabilitation	$4,400	FY15/16	FY16/17
Sewer Years 4 to 10 (Rehab)	Years 4 to 10 of the CIP will include replacement or rehabilitation of all sewers that will reach the end of its useful life within the next 5 years. The majority of these pipes are located in the Northern portion of the collection system. Appendix A provides the specific pipe segments that will be replaced in the third year and the supporting reasons for replacement. Approximately 23,300 feet of pipe will be either repaired or replaced. Capital cost was spread evenly over a seven year period.	Rehabilitation	$6,573,000	FY16/17	FY22/23

Table 8.1 Comprehensive CIP
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Project Name	Description	Purpose	Total Project Costs(1,2)	Fiscal Year Start	Fiscal Year End
Sludge Drying Bed 3	Sludge drying bed number three has deteriorated pavement making hauling truck maneuvering difficult. This bed will be repaired under this project.	Rehabilitation	$17,600	FY16/17	FY17/18
Ungrounded Elec & Security	The PG&E transformer is ungrounded, and the WWTP does not have the ground fault detection equipments required by current code for this type of system. Failure to detect and address a ground fault stresses the system and can reduce electrical equipment life or cause premature failure. This project would address those issues by replacing the PG&E transformer, the plant's main switchboard, and a service connector or raceway. In addition, this project will replace the 40-year old MCC-P1, located in the Digester Control Building as well as associated conduit, conductors, and terminators. As part of this effort, the existing SCADA alarm and security system and telephone system will be upgraded to provide automatic reporting ability, reliable alarming with detailed alarm messages, and a more reliable phone system to reduce staff time.	Rehabilitation	$527,000	FY16/17	FY17/18
Roofing	The roofing on many of the WWTP structures is in need of repair and replacement. This project will provide cost savings by combining the roofing projects under one project. The following facilities will be included in this project: generator building, blower building, digesters A & B, sludge thickening building, administration building, and maintenance shop.	Rehabilitation	$244,700	FY16/17	FY17/18

Table 8.1 Comprehensive CIP
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Project Name	Description	Purpose	Total Project Costs[1,2]	Fiscal Year Start	Fiscal Year End
ADA Compliance	This project consists of building a handicapped ramp, installing an automatic door and remodeling the bathroom to be consistent with the American Disabilities Act.	Rehabilitation	$130,900	FY16/17	FY17/18
Tier 1 Seismic Evaluation	A Tier 1 seismic evaluation (American Society of Civil Engineers, ASCE 31-03, Standard Seismic Evaluation of Existing Buildings) is screening process that uses a series of checklists to determine any potential deficiencies that may need to be addressed. Deficiencies can then be implemented as part of other planned projects.	Rehabilitation	$50,000	FY17/18	FY17/18
Replace Headworks	The headworks will reach the end of its useful life in approximately 6 years. This project includes structural replacement of the headworks and the addition of mechanical screening.	Rehabilitation	$2,885,400	FY17/18	FY18/19

Table 8.1 Comprehensive CIP
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Project Name	Description	Purpose	Total Project Costs(1,2)	Fiscal Year Start	Fiscal Year End
Arc Flash Study	An electrical system study is a detailed, system-wide analysis of the available short-circuit current, protective device coordination, and potential for arc flash. Such a study should be performed for new power distribution systems or whenever the design involves substantial changes in existing power distribution, whenever there are significant changes in motor loads or modifications to on-site power generation to verify that major electrical equipment is adequately rated, determine necessary conditions for satisfactory and reliable operation, and set any operational restrictions required for safe operation. An arc flash study will evaluate the safety of the electrical panels, and provides labeling of equipment so that operators are aware of the safety equipment required to work on a given piece of equipment.	Rehabilitation	$40,000	FY18/19	FY18/19
Primary Clarifier Replacement	The primary clarifier will reach the end of its useful life within the 20-year planning period, and require complete replacement of the structure, mechanism, and piping. This will likely require acquisition of property adjacent to the WWTP from the East Bay Regional Parks District, since taking the primary clarifier out of service to rebuild is not feasible.	Rehabilitation	$1,069,800	FY18/19	FY19/20
Aeration Basin Coating/Blower Bldg/Blower MCC/HiOx Diffusers	While the blower building concrete was found to be in good condition, the building will be coated under this project. Three sections of the blower room MCC will be replaced. HiOx diffusers will be installed in the aeration basin to improve efficiency of the basins. Aerations basins will also be coated under this project.	Rehabilitation	$784,700	FY19/20	FY20/21

Table 8.1 Comprehensive CIP
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Project Name	Description	Purpose	Total Project Costs[1,2]	Fiscal Year Start	Fiscal Year End
Secondary Clarifier Rehab	The secondary clarifier will be recoated. The two drain valves and clarifier mechanisms will be replaced since they will reach the end of their useful life within the next 20 years	Rehabilitation	$837,500	FY19/20	FY20/21
Chlorine Contact Basin Chemical Equipment	All chemical feed equipment and tanks will be replaced. This includes the 3,500 gallon sodium hypochlorite and bisulfite tanks. Two bisulfite pumps for dechlorination, three sodium hypochlorite pumps for disinfection, the chlorine contact mixer, chlorine meters, and the chemical mixing PLC will be replaced.	Rehabilitation	$424,800	FY20/21	FY21/22
Effluent PS & Outfall Rehab	The effluent blower, pump VFDs, and MCC for the controls will be replaced under this project.	Rehabilitation	$375,100	FY20/21	FY21/22
Secondary Clarifier Sludge Pump Equip	RAS pump 8, WAS pump 9, and RAS pump OOS will be replaced.	Rehabilitation	$168,100	FY22/23	FY22/23
Sewer Years 11 to 20 (Rehab)	Years 11 to 20 of the CIP will include replacement or rehabilitation of all sewers that who's useful life is over within the next 6 to 10 years. The majority of these pipes are the 15 to 21-inch trunk sewer located in Parker Avenue and Willow Avenue. Appendix A provides the specific pipe segments that will be replaced in the third year and the supporting reasons for replacement. Approximately 4,100 feet of pipe will be either repaired or replaced. Capital cost was spread evenly over the 10 year period.	Rehabilitation	$2,031,000	FY23/24	FY32/33
Rotary Drum Thickener/TWAS Pump	The TWAS pump and rotary drum thickener will be replaced.	Rehabilitation	$172,500	FY24/25	FY24/25

Table 8.1	Comprehensive CIP Comprehensive Wastewater Master Plan Rodeo Sanitary District				
Project Name	**Description**	**Purpose**	**Total Project Costs[1,2]**	**Fiscal Year Start**	**Fiscal Year End**
Nutrient Removal	It is anticipated that effluent nitrogen from WWTPs will be regulated within the next 20 years. This project has been shown in FY23/24 as a placeholder, but would only be implemented when regulations come into effect. A total nitrogen limit would require two additional aeration basins, a packaged caustic feed system, and a packaged methanol feed system. A single nutrient removal project was added that meets both total nitrogen and ammonia removal requirements. Additional land would be required for each of these components since space is limited at the WWTP.	Regulations	$3,673,500	FY23/24	FY24/25
Anaerobic Digester Coating/Roof/ Flare	The digester control building roof will be replaced and the anaerobic digesters A and B recoated under this project. The waste gas flare will also be replaced.	Rehabilitation	$942,200	FY24/25	FY25/26
Sludge Drying Beds 1,2,4,5	Sludge drying beds 1,2,4 and 5 are anticipated to have deteriorated pavement within the next 20 years. These beds will be repaired or replaced under this project. In addition, sludge drying bed piping will be replaced.	Rehabilitation	$178,900	FY24/25	FY25/26
Dewatering Rehab	Although currently in good condition, dewatering equipment will reach the end of it's useful life within the planning period. The following equipment will be installed under this project: a dewatering centrifuge, a packaged polymer feed system, and a new sludge hopper.	Rehabilitation	$373,800	FY25/26	FY26/27

Table 8.1 Comprehensive CIP
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Project Name	Description	Purpose	Total Project Costs[1,2]	Fiscal Year Start	Fiscal Year End
SCADA/Surge Tank/Generator	The PLC in the administration building will be replaced. The 1,000 gallon diesel fuel tank and 1,000 gallon surge tank will be replaced under this project. In addition, the standby engine generator, which is currently 40 years old, will be replaced with a new 500 kW generator with air pollution controls to meet current regulations.	Rehabilitation	$713,800	FY25/26	FY26/27
		Total Cost	**$46,277,600**		

Notes:
(1) Costs are provided as present value in 2013 dollars based on a San Francisco Engineering News Record Construction Cost Index (ENR CCI) of 10,355. Costs are not escalated to future years.
(2) Total project cost is the estimated construction cost plus a 30 percent allowance for engineering, legal, administration, and permitting.

APPENDIX A – CIP PROJECT COST ESTIMATES

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MASTER PLAN COST ESTIMATE

Project: CWWMP
Client: Rodeo Sanitary District
Location: Rodeo, California
Project Name: Lefty Gomez Project

SF ENR: 10355
Estimate Preparation Date : February 2013
By : JES
Reviewed: AG/RC

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Lefty Gomez Phase I**	1	LS	$117,700	$117,700	
	Total					$117,700
	Subtotal					$117,700
	Estimating Contingency	0%				$0
	Element Direct Cost					$117,700
	General Contractor Overhead and Profit, Bonds and Insurance	0%				$0
	Sales Tax on 50% of Subtotal Above	0.00%				$0
	Element Construction Cost					**$117,700**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	0%				$0
	Element Project Cost					**$117,700**

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MASTER PLAN COST ESTIMATE

Project: CWWMP
Client: Rodeo Sanitary District
Location: Rodeo, California
Project Name: Temporary FM Bridge

SF ENR: 10355
Estimate Preparation Date : February 2013
By : JES
Reviewed: AG/RC

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Temporary FM Bridge**	1	LS	$296,400	$296,400	
	Total					$296,400
	Subtotal					$296,400
	Estimating Contingency	0%				$0
	Element Direct Cost					$296,400
	General Contractor Overhead and Profit, Bonds and Insurance	0%				$0
	Sales Tax on 50% of Subtotal Above	0.00%				$0
	Element Construction Cost					**$296,400**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	0%				$0
	Element Project Cost					**$296,400**

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MASTER PLAN COST ESTIMATE

Project: CWWMP
Client: Rodeo Sanitary District
Location: Rodeo, California
Project Name: Permanent FM Bridge

SF ENR: 10355
Estimate Preparation Date : February 2013
By : JES
Reviewed: AG/RC

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Permanent FM Bridge**	1	LS	$250,300	$250,300	
	Total					$250,300
	Subtotal					$250,300
	Estimating Contingency	0%				$0
	Element Direct Cost					$250,300
	General Contractor Overhead and Profit, Bonds and Insurance	0%				$0
	Sales Tax on 50% of Subtotal Above	0.00%				$0
	Element Construction Cost					**$250,300**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	0%				$0
	Element Project Cost					**$250,300**

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MASTER PLAN COST ESTIMATE

Project: CWWMP
Client: Rodeo Sanitary District
Location: Rodeo, California
Project Name: MACP Manhole Inspections

SF ENR: 10355
Estimate Preparation Date : February 2013
By : JES
Reviewed: AG/RC

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SOURCE ENR	ENR ADJUSTMENT FACTOR	SUBTOTAL	TOTAL
1	**MACP Manhole Inspections**	509	ea	$200	10364	1.00	$101,712	
	Total							$101,700
	Subtotal							$101,700
	Estimating Contingency	0%						$0
	Element Direct Cost							$101,700
	General Contractor Overhead and Profit, Bonds and Insurance	0%						$0
	Sales Tax on 50% of Subtotal Above	0.00%						$0
	Element Construction Cost							**$101,700**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	0%						$0
	Element Project Cost							**$101,700**

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MASTER PLAN COST ESTIMATE

Project: CWWMP
Client: Rodeo Sanitary District
Location: Rodeo, California
Project Name: Tier 1 Seismic & Conc Evaluation

SF ENR: 10355
Estimate Preparation Date : February 2013
By : JES
Reviewed: AG/RC

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Tier 1 Seismic and Concrete Evaluation**	1	LS	$50,000	$49,957	
	Total					$50,000
	Subtotal					$50,000
	Estimating Contingency	0%				$0
	Element Direct Cost					$50,000
	General Contractor Overhead and Profit, Bonds and Insurance	0%				$0
	Sales Tax on 50% of Subtotal Above	0.00%				$0
	Element Construction Cost					**$50,000**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	0%				$0
	Element Project Cost					**$50,000**

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MASTER PLAN COST ESTIMATE

Project:	**CWWMP**		
Client:	**Rodeo Sanitary District**	**SF ENR:**	10355
Location:	**Rodeo, California**	**Estimate Preparation Date :**	**February 2013**
Project Name:	**Private Sewer Lateral Mapping**	**By :**	**JES**
		Reviewed:	**AG/RC**

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Private Sewer Lateral Mapping**	1	LS	$20,000	$20,000	
	Total					$20,000
	Subtotal					$20,000
	Estimating Contingency	0%				$0
	Element Direct Cost					$20,000
	General Contractor Overhead and Profit, Bonds and Insurance	0%				$0
	Sales Tax on 50% of Subtotal Above	0.00%				$0
	Element Construction Cost					**$20,000**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	0%				$0
	Element Project Cost					**$20,000**

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MASTER PLAN COST ESTIMATE

Project: CWWMP
Client: Rodeo Sanitary District
Location: Rodeo, California
Project Name: Sewer Year 1 (Rehab,Capacity,I&I Basins 406 and 408)

SF ENR: 10355
Estimate Preparation Date : February 2013
By : JES
Reviewed: AG/RC

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Pipe Replacement (Rehab)**					
	6" PVC Sewer	5,763	LF	$120	$691,560	
	Total					$691,600
2	**Bypass & Upsize Pipes (Capacity)**					
	8" PVC Sewer	1807	LF	$130	$234,910	
	10" PVC Sewer	530	LF	$150	$79,500	
	12" PVC Sewer	170	LF	$150	$25,500	
	Total					$339,900
3	**Basin 406 (I&I)**					
	6" PVC Sewer	1438	LF	$120	$172,560	
	Manholes	5	EA	$12,000	$63,847	
	Lateral w/ cleanout	33	EA	$9,000	$297,666	
	Total					$534,100
4	**Basin 408 (I&I)**					
	6" PVC Sewer	1355	LF	$120	$162,600	
	Manholes	5	EA	$12,000	$60,162	
	Lateral w/ cleanout	31	EA	$9,000	$280,485	
	Total					$503,200
	Subtotal					$2,068,800
	Estimating Contingency	30%				$620,600
	Element Direct Cost					$2,689,400
	General Contractor Overhead and	25%				$672,400
	Sales Tax on 50% of Subtotal Above	8.50%				$114,300
	Element Construction Cost					**$3,476,100**
	Engineering, Legal, Admin, Permitting,	30%				$1,042,800
	Element Project Cost					**$4,518,900**

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MASTER PLAN COST ESTIMATE

Project: CWWMP
Client: Rodeo Sanitary District
Location: Rodeo, California
Project Name: WWTP Hydraulic Improvements

SF ENR: 10355
Estimate Preparation Date : February 2013
By : JES
Reviewed: AG/RC

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Grit Blower and Misc Rehab**					
	Aerated Grit Blower and Misc Rehab	1	ea	$96,178	$96,094	
	Total					$96,100
2	**Primary Clarifier Repl, CEPT, Flowmeter, Sludge Pumps**					
	Primary Clarifier Coating	2700	sf	$18	$48,558	
	Primary Sludge Pump 1	1	ea	$25,000	$24,978	
	Primary Sludge Pump 2	1	ea	$25,000	$24,978	
	Flowmeter	1	ea	$11,000	$16,125	
	CEPT	1	LS	$150,000	$150,000	
	Total					$264,600
3	**Aeration Basin Selector Improvements**					
	Baffle Walls, Columns, Gates, Piping	1	LS	$390,040	$389,701	
	Total					$389,700
4	**Aeration Basin Contact Stabilization**					
	16" DI piping in building	50	LF	$244	$12,195	
	Slide Gates	2	ea	$46,000	$91,920	
	Total					$104,100
5	**Aeration Basin Additional Anoxic Mixer**					
	Anoxic Mixer	1	ea	$25,000	$25,000	
	Total					$25,000
6	**Aeration Basin to Primary Clarifier Hydraulic Improvements**					
	16" Curved Wall,31'-50' Dia, To 8' High	62	CY	$980	$6,073	
	24" Cl 52 Cldi Mj Pipe In Open Trench	50	LF	$134	$6,712	
	24" Cl 52 Cldi Mj Bends & Fittings	4	ea	$3,515	$14,048	
	Total					$26,800
7	**2nd Clarifier RAS/WAS Improvements**					
	Additional RAS Pumps (400 gpm ea)	1	ea	$36,300	$41,429	
	WAS Flowmeter	1	ea	$11,000	$16,125	
	Total					$57,600
8	**Additional Chlorine Contact Basin**					
	Chlorine Contact Basin (4700 cf)	1	cf	$600,000	$600,000	
	Parallel Piping to address hydraulics (5%)	1	LS	$30,000	$30,000	
	Total					$630,000
	Subtotal					$1,593,900
	Estimating Contingency	30%				$478,200
	Element Direct Cost					$2,072,100
	General Contractor Overhead and Profit, Bonds and Insurance	25%				$518,000
	Sales Tax on 50% of Subtotal Above	8.50%				$88,100
	Element Construction Cost					**$2,678,200**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%				$803,500
	Element Project Cost					**$3,481,700**

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MASTER PLAN COST ESTIMATE

Project: CWWMP
Client: Rodeo Sanitary District
Location: Rodeo, California
Project Name: Grit Chamber Rehab

SF ENR: 10355
Estimate Preparation Date : February 2013
By : JES
Reviewed: AG/RC

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Grit Area Structural Repair and Coating**					
	Grit Channel Conc	1240	sf	$25	$30,973	
	Grit Channel Coating	1240	sf	$18	$22,301	
	Grit Walkway Conc	345	sf	$25	$8,618	
	Grit Walkway Coating	690	sf	$18	$12,409	
	Influent Slide Gates	1	ea	$20,900	$20,882	
	Total					$95,200
	Subtotal					$95,200
	Estimating Contingency	30%				$28,600
	Element Direct Cost					$123,800
	General Contractor Overhead and Profit, Bonds and Insurance	25%				$31,000
	Sales Tax on 50% of Subtotal Above	8.50%				$5,300
	Element Construction Cost					**$160,100**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%				$48,000
	Element Project Cost					**$208,100**

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MASTER PLAN COST ESTIMATE

Project: CWWMP
Client: Rodeo Sanitary District
Location: Rodeo, California
Project Name: Weir Box Closure

SF ENR: 10355
Estimate Preparation Date : February 2013
By : JES
Reviewed: AG/RC

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Weir Box Closure**					
	27" Dia Concrete Pipe	10	LF	$170	$1,699	
	Concrete Fill	18	CY	$300	$5,395	
	Bypass Pumping	1	LS	$5,000	$4,996	
	Total					$12,100
	Subtotal					$12,100
	Estimating Contingency	30%				$3,600
	Element Direct Cost					$15,700
	General Contractor Overhead and Profit, Bonds and Insurance	25%				$3,900
	Sales Tax on 50% of Subtotal Above	8.50%				$700
	Element Construction Cost					**$20,300**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%				$6,100
	Element Project Cost					**$26,400**

MASTER PLAN COST ESTIMATE

Project:	**CWWMP**		
Client:	**Rodeo Sanitary District**	**SF ENR:**	10355
Location:	**Rodeo, California**	**Estimate Preparation Date :**	**February 2013**
Project Name:	**Sewer Year 2 (Rehab, I&I Basin 324 Pipes)**	**By :**	**JES**
		Reviewed:	**AG/RC**

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Pipe Replacement (Rehab)**					
	6" PVC Sewer	16435	LF	$120	$1,972,200	
	8" PVC Sewer	3481	LF	$130	$452,530	
	12" PVC Sewer	145	LF	$150	$21,750	
	Total					$2,446,500
2	**Basin 324 (I&I)**					
	6" PVC Sewer	7226	LF	$120	$867,120	
	8" PVC Sewer	125	LF	$130	$16,250	
	10" PVC Sewer	284	LF	$150	$42,600	
	Total					$926,000
	Subtotal					$3,372,500
	Estimating Contingency	30%				$1,011,800
	Element Direct Cost					$4,384,300
	General Contractor Overhead and	25%				$1,096,100
	Sales Tax on 50% of Subtotal Above	8.50%				$186,300
	Element Construction Cost					**$5,666,700**
	Engineering, Legal, Admin, Permitting,	30%				$1,700,000
	Element Project Cost					**$7,366,700**

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MASTER PLAN COST ESTIMATE

Project: CWWMP
Client: Rodeo Sanitary District
Location: Rodeo, California
Project Name: Aeration Basin Conc/Mixer/Blowers

SF ENR: 10355
Estimate Preparation Date : February 2013
By : JES
Reviewed: AG/RC

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Aeration Basin Concrete Repair**					
	Aeration Basin Repair	9000	sf	$25	$22,480	
	Total					$22,500
2	**Anoxic Mixer**					
	Anoxic Mixer	1	LF	$25,000	$24,978	
	Total					$25,000
3	**Blower Project**					
	Blower	1	ea	$40,000	$45,763	
	Intake Filters	3	ea	$3,000	$8,992	
	Blower Bldg Lateral Bracing	1	LS	$4,000	$3,997	
	Total					$58,800
	Subtotal					$106,300
	Estimating Contingency	30%				$31,900
	Element Direct Cost					$138,200
	General Contractor Overhead and Profit, Bonds and Insurance	25%				$34,600
	Sales Tax on 50% of Subtotal Above	8.50%				$5,900
	Element Construction Cost					**$178,700**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%				$53,600
	Element Project Cost					**$232,300**

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MASTER PLAN COST ESTIMATE

Project: CWWMP
Client: Rodeo Sanitary District
Location: Rodeo, California
Project Name: Sewer Year 3 (Rehab, I&I Basin 324 MHs & Laterals)

SF ENR: 10355
Estimate Preparation Date : February 2013
By : JES
Reviewed: AG/RC

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Pipe Replacement (Rehab)**					
	6" PVC Sewer	4,123	LF	$120	$494,760	
	8" PVC Sewer	650	LF	$130	$84,500	
	Total					$579,300
2	**Basin 324 (I&I)**					
	Manholes	32	EA	$12,000	$387,168	
	Lateral w/ cleanout	201	EA	$9,000	$1,805,040	
	Total					$2,192,200
	Subtotal					$2,771,500
	Estimating Contingency	30%				$831,500
	Element Direct Cost					$3,603,000
	General Contractor Overhead and	25%				$900,800
	Sales Tax on 50% of Subtotal Above	8.50%				$153,100
	Element Construction Cost					**$4,656,900**
	Engineering, Legal, Admin, Permitting,	30%				$1,397,100
	Element Project Cost					**$6,054,000**

MASTER PLAN COST ESTIMATE

Project: **CWWMP**
Client: **Rodeo Sanitary District**
Location: **Rodeo, California**
Project Name: **I&I Flow Monitoring**

SF ENR: 10355
Estimate Preparation Date : **February 2013**
By : **JES**
Reviewed: **AG/RC**

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SOURCE ENR	ENR ADJUSTMENT FACTOR	SUBTOTAL	TOTAL
1	**I&I Flow Monitoring**	1	LS	$50,000	10355	1.00	$50,000	
	Total							$50,000
	Subtotal							$50,000
	Estimating Contingency	0%						$0
	Element Direct Cost							$50,000
	General Contractor Overhead and Profit, Bonds and Insurance	0%						$0
	Sales Tax on 50% of Subtotal Above	0.00%						$0
	Element Construction Cost							**$50,000**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	0%						$0
	Element Project Cost							**$50,000**

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MASTER PLAN COST ESTIMATE

Project: CWWMP
Client: Rodeo Sanitary District
Location: Rodeo, California
Project Name: Influent Pump Station

SF ENR: 10355
Estimate Preparation Date : February 2013
By : JES
Reviewed: AG/RC

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Influent Pump Station Structural Rehab and Tank Replacement**					
	Equipment Supports	3	ea	$5,000	$14,987	
	IPS Diesel Fuel Tank	1	ea	$32,752	$32,724	
	IPS Wet Well and Pump Room	1	LS	$55,000	$54,952	
	Total					$102,700
2	**Influent Pump Station Mechanical and Electrical**					
	MCC (4 sections)	4	ea	$15,000	$59,948	
	IPS gate	1	ea	$13,475	$13,463	
	Total					$73,400
3	**Increase Pump Station Capacity to 5.1 mgd**					
	Replace and upsize existing pumps & comminuters with horizontal chopper pumps (2.55 mgd each)	3	ea	$61,200	$186,299	
	Replace pump drives	3	ea	$2,601	$7,795	
	Yard piping (10%)	1	LS	$6,380	$6,375	
	Electrical and Instrumentation (25%)	1	LS	$15,950	$15,936	
	Total					$216,400
	Subtotal					$392,500
	Estimating Contingency	30%				$117,800
	Element Direct Cost					$510,300
	General Contractor Overhead and Profit, Bonds and Insurance	25%				$127,600
	Sales Tax on 50% of Subtotal Above	8.50%				$21,700
	Element Construction Cost					**$659,600**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%				$197,900
	Element Project Cost					**$857,500**

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MASTER PLAN COST ESTIMATE

Project: CWWMP
Client: Rodeo Sanitary District
Location: Rodeo, California
Project Name: Sludge Thickening Bldg Rehab

SF ENR: 10355
Estimate Preparation Date : February 2013
By : JES
Reviewed: AG/RC

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Rehabilitate Sludge Thickening Bldg**					
	Roof Hatches	3	ea	$2,000	$5,995	
	Building Coating	1100	sf	$18	$19,783	
	Total					$25,800
	Subtotal					$25,800
	Estimating Contingency	30%				$7,700
	Element Direct Cost					$33,500
	General Contractor Overhead and Profit, Bonds and Insurance	25%				$8,400
	Sales Tax on 50% of Subtotal Above	8.50%				$1,400
	Element Construction Cost					**$43,300**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%				$13,000
	Element Project Cost					**$56,300**

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MASTER PLAN COST ESTIMATE

Project: CWWMP
Client: Rodeo Sanitary District
Location: Rodeo, California
Project Name: Digester Bldg Coating & Equip

SF ENR: 10355
Estimate Preparation Date : February 2013
By : JES
Reviewed: AG/RC

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Digester Control Building Coating**					
	Digester Control Building Coating	1100	sf	$18	$19,783	
	Total					$19,800
2	**Flexible Couplings**					
	Flexible Couplings	1	LS	$10,000	$9,991	
	Total					$10,000
3	**Digestion Equipment**					
	Boiler	1	ea	$28,000	$27,976	
	Digester Feed Pumps	2	ea	$24,107	$48,172	
	Sludge Heat Exchanger 1 & 2	2	ea	$31,000	$61,946	
	Sludge Recirculation Pumps	2	ea	$27,000	$53,953	
	Total					$192,000
	Subtotal					$221,800
	Estimating Contingency	30%				$66,500
	Element Direct Cost					$288,300
	General Contractor Overhead and Profit, Bonds and Insurance	25%				$72,100
	Sales Tax on 50% of Subtotal Above	8.50%				$12,300
	Element Construction Cost					**$372,700**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%				$111,800
	Element Project Cost					**$484,500**

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MASTER PLAN COST ESTIMATE

Project: CWWMP
Client: Rodeo Sanitary District
Location: Rodeo, California
Project Name: Generator Lateral Supports

SF ENR: 10355
Estimate Preparation Date : February 2013
By : JES
Reviewed: AG/RC

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Lateral Supports of Generator Silencer**					
	Lateral Supports of Generator Silencer Pipe	1	LS	$2,000	$1,998	
	Total					$2,000
	Subtotal					$2,000
	Estimating Contingency	30%				$600
	Element Direct Cost					$2,600
	General Contractor Overhead and Profit, Bonds and Insurance	25%				$700
	Sales Tax on 50% of Subtotal Above	8.50%				$100
	Element Construction Cost					**$3,400**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%				$1,000
	Element Project Cost					**$4,400**

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MASTER PLAN COST ESTIMATE

Project: CWWMP
Client: Rodeo Sanitary District
Location: Rodeo, California
Project Name: Sewer Years 4 to 10 (Rehab)

SF ENR: 10355
Estimate Preparation Date : February 2013
By : JES
Reviewed: AG/RC

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Pipe Replacement (Rehab)**					
	4" PVC Sewer	111	LF	$110	$12,210	
	6" PVC Sewer	13,652	LF	$120	$1,638,240	
	8" PVC Sewer	5,335	LF	$130	$693,550	
	10" PVC Sewer	1,873	LF	$150	$280,950	
	12" PVC Sewer	1,999	LF	$150	$299,850	
	18" PVC Sewer	34	LF	$180	$6,120	
	21" DI Sewer	290	LF	$270	$78,300	
	Total					$3,009,200
	Subtotal					$3,009,200
	Estimating Contingency	30%				$902,800
	Element Direct Cost					$3,912,000
	General Contractor Overhead and	25%				$978,000
	Sales Tax on 50% of Subtotal Above	8.50%				$166,300
	Element Construction Cost					**$5,056,300**
	Engineering, Legal, Admin, Permitting,	30%				$1,516,900
	Element Project Cost					**$6,573,200**

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MASTER PLAN COST ESTIMATE

Project: CWWMP
Client: Rodeo Sanitary District
Location: Rodeo, California
Project Name: Sludge Drying Bed 3

SF ENR: 10355
Estimate Preparation Date : February 2013
By : JES
Reviewed: AG/RC

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Sludge Drying Bed Repair**					
	Repair sludge Drying Bed #3	2700	sf	$3	$8,093	
	Total					$8,100
	Subtotal					$8,100
	Estimating Contingency	30%				$2,400
	Element Direct Cost					$10,500
	General Contractor Overhead and Profit, Bonds and Insurance	25%				$2,600
	Sales Tax on 50% of Subtotal Above	8.50%				$400
	Element Construction Cost					**$13,500**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%				$4,100
	Element Project Cost					**$17,600**

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MASTER PLAN COST ESTIMATE

Project: CWWMP
Client: Rodeo Sanitary District
Location: Rodeo, California
Project Name: Ungrounded Elec & Security

SF ENR: 10355
Estimate Preparation Date : February 2013
By : JES
Reviewed: AG/RC

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**MCC-P1 Replacement**					
	MCC-P1 Replacement (6 sections)	6	ea	$15,000	$89,922	
	Conduit, conductors, terminators (6 sections)	6	ea	$3,000	$17,984	
	Total					$107,900
2	**Security System, Reporting Software, and Telecom and Control Wiring**					
	SCADA Reporting Software	1	LS	$4,000	$3,997	
	SCADA Software Programming	60	hr	$150	$8,992	
	Security System	1	LS	$1,500	$1,499	
	Security System Setup	40	hr	$150	$5,995	
	Control Wire Rerouting	16	hr	$150	$2,398	
	Telecom Work	24	hr	$150	$3,597	
	Total					$26,500
3	**Ungrounded Electrical Service Replacement**					
	Replace PG&E Transformer	1	ea	$40,000	$39,942	
	Replace Service Entrance Switchboard	1	ea	$35,000	$34,949	
	Replace Service Conductors/Raceways	1	ea	$15,000	$14,978	
	Temporary Power During Construction	1	MO	$12,000	$11,983	
	Demolition Factor	5	%	$5,100	$5,093	
	Total					$106,900
	Subtotal					$241,300
	Estimating Contingency	30%				$72,400
	Element Direct Cost					$313,700
	General Contractor Overhead and Profit, Bonds and Insurance	25%				$78,400
	Sales Tax on 50% of Subtotal Above	8.50%				$13,300
	Element Construction Cost					**$405,400**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%				$121,600
	Element Project Cost					**$527,000**

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MASTER PLAN COST ESTIMATE

Project: CWWMP
Client: Rodeo Sanitary District
Location: Rodeo, California
Project Name: Roofing

SF ENR: 10355
Estimate Preparation Date : February 2013
By : JES
Reviewed: AG/RC

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Roofing**					
	Generator Building Roof	150	sf	$15	$2,248	
	Blower Building Roofing	1300	sf	$9	$11,690	
	Digester A & B Roof	6300	sf	$9	$56,651	
	Sludge Thickening Building Roof	1100	sf	$9	$9,891	
	Admin Building Roofing	2500	sf	$9	$22,480	
	Maintenance Shop Roofing	1000	sf	$9	$8,992	
	Total					$112,000
	Subtotal					$112,000
	Estimating Contingency	30%				$33,600
	Element Direct Cost					$145,600
	General Contractor Overhead and Profit, Bonds and Insurance	25%				$36,400
	Sales Tax on 50% of Subtotal Above	8.50%				$6,200
	Element Construction Cost					**$188,200**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%				$56,500
	Element Project Cost					**$244,700**

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MASTER PLAN COST ESTIMATE

Project: CWWMP
Client: Rodeo Sanitary District
Location: Rodeo, California
Project Name: ADA Compliance

SF ENR: 10355
Estimate Preparation Date : February 2013
By : JES
Reviewed: AG/RC

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**ADA Compliance**					
	Bathroom remodel/Ramp/Automated Door	1	LS	$60,000	$59,948	
	Total					$59,900
	Subtotal					$59,900
	Estimating Contingency	30%				$18,000
	Element Direct Cost					$77,900
	General Contractor Overhead and Profit, Bonds and Insurance	25%				$19,500
	Sales Tax on 50% of Subtotal Above	8.50%				$3,300
	Element Construction Cost					**$100,700**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%				$30,200
	Element Project Cost					**$130,900**

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MASTER PLAN COST ESTIMATE

Project: CWWMP
Client: Rodeo Sanitary District
Location: Rodeo, California
Project Name: Replace Headworks

SF ENR: 10355
Estimate Preparation Date : February 2013
By : JES
Reviewed: AG/RC

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Pretreatment Structure Replacement**					
	Pretreatment Structure Replacement	1	LS	$1,322,024	$1,320,876	
	Total					$1,320,900
	Subtotal					$1,320,900
	Estimating Contingency	30%				$396,300
	Element Direct Cost					$1,717,200
	General Contractor Overhead and Profit, Bonds and Insurance	25%				$429,300
	Sales Tax on 50% of Subtotal Above	8.50%				$73,000
	Element Construction Cost					**$2,219,500**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%				$665,900
	Element Project Cost					**$2,885,400**

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MASTER PLAN COST ESTIMATE

Project:	CWWMP
Client:	Rodeo Sanitary District
Location:	Rodeo, California
Project Name:	Arc Flash Study

SF ENR:	10355
Estimate Preparation Date :	February 2013
By :	JES
Reviewed:	AG/RC

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**ArcFlash Study**	1	LS	$40,000	$40,000	
	Total					$40,000
	Subtotal					$40,000
	Estimating Contingency	0%				$0
	Element Direct Cost					$40,000
	General Contractor Overhead and Profit, Bonds and Insurance	0%				$0
	Sales Tax on 50% of Subtotal Above	0.00%				$0
	Element Construction Cost					**$40,000**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	0%				$0
	Element Project Cost					**$40,000**

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MASTER PLAN COST ESTIMATE

Project: CWWMP
Client: Rodeo Sanitary District
Location: Rodeo, California
Project Name: Primary Clarifier Replacement

SF ENR: 10355
Estimate Preparation Date : February 2013
By : JES
Reviewed: AG/RC

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SOURCE ENR	ENR ADJUSTMENT FACTOR	SUBTOTAL	TOTAL
1	**Primary Clarifier Replacement**							
	Primary Clarifier Replacement	1	LS	$285,000	10364	1.00	$284,753	
	Primary Clarifier Mechanism	1	LS	$150,000	10364	1.00	$149,870	
	Piping (5%)	1	LS	$21,731	10355	1.00	$21,731	
	Land Acquisition	5000	sf	$6.7	10355	1.00	$33,300	
	Total							$489,700
	Subtotal							$489,700
	Estimating Contingency	30%						$146,900
	Element Direct Cost							$636,600
	General Contractor Overhead and Profit, Bonds and Insurance	25%						$159,200
	Sales Tax on 50% of Subtotal Above	8.50%						$27,100
	Element Construction Cost							**$822,900**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%						$246,900
	Element Project Cost							**$1,069,800**

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MASTER PLAN COST ESTIMATE

Project: CWWMP
Client: Rodeo Sanitary District
Location: Rodeo, California
Project Name: Aeration Basin Coating/Blower Bldg/ Blower MCC/HiOx Diffusers

SF ENR: 10355
Estimate Preparation Date : February 2013
By : JES
Reviewed: AG/RC

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Blower Bldg Repair and Coating**					
	Blower Building	1300	sf	$18	$23,380	
	Total					$23,400
2	**Blower MCC Replacement**					
	Blower Room MCC (3 sections)	3	ea	$20,000	$59,948	
	Conduit	1	LS	$30,000	$29,974	
	Total					$89,900
3	**Membrane Diffusers**					
	HiOx Diffusers	1	LS	$83,995	$83,995	
	Total					$84,000
4	**Aeration Basin Concrete Coating**					
	Aeration Basins	9000	LS	$18	$161,859	
	Total					$161,900
	Subtotal					$359,200
	Estimating Contingency	30%				$107,800
	Element Direct Cost					$467,000
	General Contractor Overhead and Profit, Bonds and Insurance	25%				$116,800
	Sales Tax on 50% of Subtotal Above	8.50%				$19,800
	Element Construction Cost					**$603,600**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%				$181,100
	Element Project Cost					**$784,700**

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MASTER PLAN COST ESTIMATE

Project: CWWMP
Client: Rodeo Sanitary District
Location: Rodeo, California
Project Name: 2nd Clarifer Rehab

SF ENR: 10355
Estimate Preparation Date : February 2013
By : JES
Reviewed: AG/RC

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Secondary Clarifier Mechanical and Structural Rehab**					
	Secondary Clarifier Coating	3100	sf	$18	$55,752	
	Drain Valve	2	ea	$20,000	$39,965	
	Mechanism	2	ea	$135,000	$287,668	
	Total					$383,400
	Subtotal					$383,400
	Estimating Contingency	30%				$115,000
	Element Direct Cost					$498,400
	General Contractor Overhead and Profit, Bonds and Insurance	25%				$124,600
	Sales Tax on 50% of Subtotal Above	8.50%				$21,200
	Element Construction Cost					**$644,200**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%				$193,300
	Element Project Cost					**$837,500**

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MASTER PLAN COST ESTIMATE

Project: CWWMP
Client: Rodeo Sanitary District
Location: Rodeo, California
Project Name: CCB Chemical Equip

SF ENR: 10355
Estimate Preparation Date : February 2013
By : JES
Reviewed: AG/RC

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Chemical Equipment**					
	Bisulfite Pumps 1,2	2	ea	$7,000	$14,000	
	Sodium Hypochlorite Pumps 3, 4, 5	3	ea	$7,000	$21,000	
	CCT Mixing Unit	1	ea	$33,000	$32,971	
	Chem Mixing PLC	1	ea	$50,000	$49,957	
	Chlorine Meters	3	ea	$15,000	$44,961	
	Hypo Tank (3500 gal)	1	ea	$15,800	$15,800	
	Bisulfite Tank (3500 gal)	1	ea	$15,800	$15,800	
	Total					$194,500
	Subtotal					$194,500
	Estimating Contingency	30%				$58,400
	Element Direct Cost					$252,900
	General Contractor Overhead and Profit, Bonds and Insurance	25%				$63,200
	Sales Tax on 50% of Subtotal Above	8.50%				$10,700
	Element Construction Cost					**$326,800**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%				$98,000
	Element Project Cost					**$424,800**

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MASTER PLAN COST ESTIMATE

Project: CWWMP
Client: Rodeo Sanitary District
Location: Rodeo, California
Project Name: Effluent PS & Outfall Rehab

SF ENR: 10355
Estimate Preparation Date : February 2013
By : JES
Reviewed: AG/RC

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SOURCE ENR	ENR ADJUSTMENT FACTOR	SUBTOTAL	TOTAL
1	**Outfall Cathodic Protection**							
	Plant Outfall Cathodic Protection	1	LS	$5,000	10364	1.00	$4,996	
	Total							$5,000
2	**Effluent Pump Station Equipment**							
	Blower	1	LS	$12,000	10364	1.00	$11,990	
	Pump VFDs	400	hp	$162	10364	1.00	$64,744	
	MCC (6 sections)	6	ea	$15,000	10364	1.00	$89,922	
	Total							$166,700
	Subtotal							$171,700
	Estimating Contingency	30%						$51,500
	Element Direct Cost							$223,200
	General Contractor Overhead and Profit, Bonds and Insurance	25%						$55,800
	Sales Tax on 50% of Subtotal Above	8.50%						$9,500
	Element Construction Cost							**$288,500**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%						$86,600
	Element Project Cost							**$375,100**

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MASTER PLAN COST ESTIMATE

Project: CWWMP
Client: Rodeo Sanitary District
Location: Rodeo, California
Project Name: 2nd Clarifer Sludge Pump Equip

SF ENR: 10355
Estimate Preparation Date : February 2013
By : JES
Reviewed: AG/RC

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Sludge Pumping Equipment**					
	RAS Pump 8	1	ea	$27,500	$27,476	
	RAS Pump OOS	1	ea	$27,500	$27,476	
	WAS Pump 9	1	ea	$22,000	$21,981	
	Total					$76,900
	Subtotal					$76,900
	Estimating Contingency	30%				$23,100
	Element Direct Cost					$100,000
	General Contractor Overhead and Profit, Bonds and Insurance	25%				$25,000
	Sales Tax on 50% of Subtotal Above	8.50%				$4,300
	Element Construction Cost					**$129,300**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%				$38,800
	Element Project Cost					**$168,100**

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MASTER PLAN COST ESTIMATE

Project: CWWMP
Client: Rodeo Sanitary District
Location: Rodeo, California
Project Name: Sewer Years 11 to 20 (Rehab)

SF ENR: 10355
Estimate Preparation Date : February 2013
By : JES
Reviewed: AG/RC

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Pipe Replacement (Rehab)**					
	15" PVC Sewer	1,795	LF	$170	$305,150	
	21" DI Sewer	2,314	LF	$270	$624,780	
	Total					$929,900
	Subtotal					$929,900
	Estimating Contingency	30%				$279,000
	Element Direct Cost					$1,208,900
	General Contractor Overhead and	25%				$302,200
	Sales Tax on 50% of Subtotal Above	8.50%				$51,400
	Element Construction Cost					**$1,562,500**
	Engineering, Legal, Admin, Permitting,	30%				$468,800
	Element Project Cost					**$2,031,300**

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MASTER PLAN COST ESTIMATE

Project: CWWMP
Client: Rodeo Sanitary District
Location: Rodeo, California
Project Name: Rotary Drum Thickener/TWAS Pump

SF ENR: 10355
Estimate Preparation Date : February 2013
By : JES
Reviewed: AG/RC

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Rotary Drum Thickener**					
	TWAS Pump	1	ea	$25,000	$24,978	
	Rotary Drum Thickener	1	ea	$53,976	$53,929	
	Total					$78,900
	Subtotal					$78,900
	Estimating Contingency	30%				$23,700
	Element Direct Cost					$102,600
	General Contractor Overhead and Profit, Bonds and Insurance	25%				$25,700
	Sales Tax on 50% of Subtotal Above	8.50%				$4,400
	Element Construction Cost					**$132,700**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%				$39,800
	Element Project Cost					**$172,500**

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MASTER PLAN COST ESTIMATE

Project: CWWMP
Client: Rodeo Sanitary District
Location: Rodeo, California
Project Name: Nutrient Removal

SF ENR: 10355
Estimate Preparation Date : February 2013
By : JES
Reviewed: AG/RC

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Total Ammonia and Nitrogen Limits**					
	Packaged Caustic Feed System	1	LS	$285,000	$285,000	
	Packaged Methanol Feed System	1	LS	$285,000	$285,000	
	Aeration Basin (42,000 cf) and Mixed Liquor Return Pumping	2	ea	$500,000	$1,000,000	
	Piping (5%)	1	LS	$78,500	$78,500	
	Land Acquisition	5000	sf	$6.7	$33,300	
	Total					$1,681,800
	Subtotal					$1,681,800
	Estimating Contingency	30%				$504,500
	Element Direct Cost					$2,186,300
	General Contractor Overhead and Profit, Bonds and Insurance	25%				$546,600
	Sales Tax on 50% of Subtotal Above	8.50%				$92,900
	Element Construction Cost					**$2,825,800**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%				$847,700
	Element Project Cost					**$3,673,500**

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MASTER PLAN COST ESTIMATE

Project: CWWMP
Client: Rodeo Sanitary District
Location: Rodeo, California
Project Name: Anaerobic Digest Coating/Roof/Flare

SF ENR: 10355
Estimate Preparation Date : February 2013
By : JES
Reviewed: AG/RC

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Digester Coating**					
	Digester A & B Coating	14800	sf	$18	$266,169	
	Digester Control Building Roof	1100	sf	$9	$9,891	
	Total					$276,100
2	**Waste Gas Flare**					
	Flare	1	ea	$127,000	$155,301	
	Total					$155,300
	Subtotal					$431,400
	Estimating Contingency	30%				$129,400
	Element Direct Cost					$560,800
	General Contractor Overhead and Profit, Bonds and Insurance	25%				$140,200
	Sales Tax on 50% of Subtotal Above	8.50%				$23,800
	Element Construction Cost					**$724,800**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%				$217,400
	Element Project Cost					**$942,200**

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MASTER PLAN COST ESTIMATE

Project: CWWMP
Client: Rodeo Sanitary District
Location: Rodeo, California
Project Name: Sludge Drying Beds 1,2,4,5

SF ENR: 10355
Estimate Preparation Date : February 2013
By : JES
Reviewed: AG/RC

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Sludge Drying Bed Repair**					
	Repair sludge Drying Bed #1	2160	sf	$3	$6,474	
	Repair sludge Drying Bed #2	2700	sf	$3	$8,093	
	Repair sludge Drying Bed #4	2160	sf	$3	$6,474	
	Repair sludge Drying Bed #5	2700	sf	$3	$8,093	
	4" VCP	270	LF	$40	$10,791	
	6" CIP	350	LF	$60	$20,982	
	6" VCP	350	LF	$60	$20,982	
	Total					$81,900
	Subtotal					$81,900
	Estimating Contingency	30%				$24,600
	Element Direct Cost					$106,500
	General Contractor Overhead and Profit, Bonds and Insurance	25%				$26,600
	Sales Tax on 50% of Subtotal Above	8.50%				$4,500
	Element Construction Cost					**$137,600**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%				$41,300
	Element Project Cost					**$178,900**

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MASTER PLAN COST ESTIMATE

Project:	**CWWMP**		
Client:	**Rodeo Sanitary District**	**SF ENR:**	10355
Location:	**Rodeo, California**	**Estimate Preparation Date :**	**February 2013**
Project Name:	**Dewatering Rehab**	**By :**	**JES**
		Reviewed:	**AG/RC**

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Dewatering Equipment**					
	Centrifuge	1	ea	$60,000	$91,140	
	Packaged Polymer System	1	ea	$30,000	$29,974	
	Sludge Hopper	1	ea	$50,000	$49,957	
	Total					$171,100
	Subtotal					$171,100
	Estimating Contingency	30%				$51,300
	Element Direct Cost					$222,400
	General Contractor Overhead and Profit, Bonds and Insurance	25%				$55,600
	Sales Tax on 50% of Subtotal Above	8.50%				$9,500
	Element Construction Cost					**$287,500**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%				$86,300
	Element Project Cost					**$373,800**

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MASTER PLAN COST ESTIMATE

Project: CWWMP
Client: Rodeo Sanitary District
Location: Rodeo, California
Project Name: SCADA/SurgeTank/Generator

SF ENR: 10355
Estimate Preparation Date : February 2013
By : JES
Reviewed: AG/RC

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**SCADA Improvements**					
	PLC in Admin Bldg	1	LS	$50,000	$49,957	
	Total					$50,000
2	**Surge Tank and Diesel Tank**					
	Diesel Tank (1,000 gal)	1	ea	$13,500	$13,488	
	Surge Tank (1,000 gal)	1	ea	$13,500	$13,488	
	Total					$27,000
3	**Standby Generator**					
	Standby Generator (500 kW)	1	ea	$250,000	$249,783	
	Total					$249,800
	Subtotal					$326,800
	Estimating Contingency	30%				$98,000
	Element Direct Cost					$424,800
	General Contractor Overhead and Profit, Bonds and Insurance	25%				$106,200
	Sales Tax on 50% of Subtotal Above	8.50%				$18,100
	Element Construction Cost					**$549,100**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%				$164,700
	Element Project Cost					**$713,800**

Engineers...Working Wonders With Water®

MASTER PLAN COST ESTIMATE

Project: CWWMP
Client: Rodeo Sanitary District
Location: Rodeo, California
Project Name: Pinole/Hercules Effluent Pump Station Modifications

SF ENR: 10355
Estimate Preparation Date : February 2013
By : JES
Reviewed: AG/RC

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	**Effluent Pump Station Modifications**					
	Piping	?	LS	TBD		
	Pumps	?	LS	TBD		
	Drivers	?	LS	TBD		
	Total					$0
	Subtotal					$0
	Estimating Contingency	30%				$0
	Element Direct Cost					$0
	General Contractor Overhead and Profit, Bonds and Insurance	25%				$0
	Sales Tax on 50% of Subtotal Above	8.50%				$0
	Element Construction Cost					**$0**
	Engineering, Legal, Admin, Permitting, and Construction Mgmt	30%				$0
	Element Project Cost					**TBD**

RODEO SANITARY DISTRICT
CAPITAL PROJECT SUMMARY
TWENTY YEAR PLAN
FY 13/14 - FY 32/33

Area	Project Total	Incurred Thru FY 12/13	Estimated FY 13/14	Estimated FY 14/15	Estimated FY 15/16	Estimated FY 16/17	Estimated FY 17/18	Estimated FY 18/19 - FY 22/23	Estimated FY 23/24 - FY 27/28	Estimated FY 28/29 - FY 32/33
Studies	$ 261,700	$ -	$ 171,700	$ -	$ 50,000	$ -	$ -	$ 40,000	$ -	$ -
Collection System Projects	$ 27,144,400	$ 63,681	$ 4,897,400	$ 7,589,000	$ 6,054,000	$ 939,000	$ 939,000	$ 4,695,000	$ 1,015,500	$ 1,015,500
Pump Station Projects	$ 857,500	$ -	$ -	$ -	$ 198,100	$ 659,400	$ -	$ -	$ -	$ -
Treatment Plant Projects	$ 18,014,000	$ -	$ 858,500	$ 1,572,700	$ 1,643,200	$ 631,800	$ 1,374,200	$ 5,749,600	$ 6,184,000	$ -
	$ 46,277,600	**$ 63,681**	**$ 5,927,600**	**$ 9,161,700**	**$ 7,945,300**	**$ 2,230,200**	**$ 2,313,200**	**$ 10,484,600**	**$ 7,199,500**	**$ 1,015,500**

Short Term Project Implementation Summary
FY 13/14 - FY 17/18
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Number	Project Name	Project Total	Incurred Thru FY 12/13	Estimated FY 13/14	Estimated FY 14/15	Estimated FY 15/16	Estimated FY 16/17	Estimated FY 17/18	Purpose
Studies									
	Arc Flash Study	$ -	$ -	$ -	$ -	$ -	$ -	$ -	Rehabilitation
	Tier 1 Seismic & Conc Evaluation	$ 50,000	$ -	$ 50,000	$ -	$ -	$ -	$ -	Rehabilitation
	Manhole Condition Assessment	$ 101,700	$ -	$ 101,700	$ -	$ -	$ -	$ -	Rehabilitation
	I&I Flow Monitoring	$ 50,000	$ -	$ -	$ -	$ 50,000	$ -	$ -	Rehabilitation
	Private Lateral Sewer Mapping	$ 20,000	$ -	$ 20,000	$ -	$ -	$ -	$ -	Regulations
	Subtotal Studies	**$ 221,700**	**$ -**	**$ 171,700**	**$ -**	**$ 50,000**	**$ -**	**$ -**	
Collection System Projects									
	Lefty Gomez Project	$ 117,700	$ -	$ 117,700	$ -	$ -	$ -	$ -	Rehabilitation
	Temporary Force Main Project	$ 225,161	$ 35,639	$ 225,161	$ -	$ -	$ -	$ -	County Reqt
	Permanent Force Main Project	$ 194,258	$ 28,042	$ -	$ 194,258	$ -	$ -	$ -	County Reqt
	Sewer Year 1 (Rehab,Capacity,I&I Basins 406 and 408)	$ 4,518,900	$ -	$ 4,518,900	$ -	$ -	$ -	$ -	Rehabilitation
	Sewer Year 2 (Rehab, I&I Basin 324 Pipes)	$ 7,366,700	$ -	$ -	$ 7,366,700	$ -	$ -	$ -	Rehabilitation
	Sewer Year 3 (Rehab, I&I Basin 324 MHs & Laterals)	$ 6,054,000	$ -	$ -	$ -	$ 6,054,000	$ -	$ -	Rehabilitation
	Sewer Years 4 to 10 (Rehab)	$ 939,000	$ -	$ -	$ -	$ -	$ 939,000	$ -	Rehabilitation
	Sewer Years 4 to 10 (Rehab)	$ 939,000	$ -	$ -	$ -	$ -	$ -	$ 939,000	Rehabilitation
	Subtotal Collection System Projects	**$ 20,354,719**	**$ 63,681**	**$ 4,861,761**	**$ 7,560,958**	**$ 6,054,000**	**$ 939,000**	**$ 939,000**	
Pump Station Projects									
	Influent Pump Station	$ 857,500	$ -	$ -	$ -	$ 198,100	$ 659,400	$ -	Rehabilitation
	Subtotal Pump Station Projects	**$ 857,500**	**$ -**	**$ -**	**$ -**	**$ 198,100**	**$ 659,400**	**$ -**	
Treatment Plant Projects									
	WWTP Hydraulic Improvements	$ 3,481,700	$ -	$ 804,300	$ 1,338,700	$ 1,338,700	$ -	$ -	Capacity
	Grit Chamber Rehab	$ 208,100	$ -	$ 48,100	$ 160,000	$ -	$ -	$ -	Rehabilitation
	Replace Headworks	$ 666,500	$ -	$ -	$ -	$ -	$ -	$ 666,500	Rehabilitation
	Weir Box Closure	$ 26,400	$ -	$ 6,100	$ 20,300	$ -	$ -	$ -	Rehabilitation
	Aeration Basin Conc/Mixer/Blowers	$ 232,300	$ -	$ -	$ 53,700	$ 178,600	$ -	$ -	Rehabilitation
	Sludge Thickening Bldg Rehab	$ 56,300	$ -	$ -	$ -	$ 13,000	$ 43,300	$ -	Rehabilitation
	Digester Bldg Coating & Equip	$ 484,500	$ -	$ -	$ -	$ 111,900	$ 372,600	$ -	Rehabilitation
	Sludge Drying Bed 3	$ 17,600	$ -	$ -	$ -	$ -	$ 4,100	$ 13,500	Rehabilitation
	Generator Lateral Supports	$ 4,400	$ -	$ -	$ -	$ 1,000	$ 3,400	$ -	Rehabilitation
	Ungrounded Elec & Security	$ 527,000	$ -	$ -	$ -	$ -	$ 121,700	$ 405,300	Rehabilitation
	Roofing	$ 244,700	$ -	$ -	$ -	$ -	$ 56,500	$ 188,200	Rehabilitation
	ADA Compliance	$ 130,900	$ -	$ -	$ -	$ -	$ 30,200	$ 100,700	Regulations
	Subtotal Treatment Plant Projects	**$ 6,080,400**	**$ -**	**$ 858,500**	**$ 1,572,700**	**$ 1,643,200**	**$ 631,800**	**$ 1,374,200**	
TOTAL ALL PROJECTS		**$ 27,514,319**	**$ 63,681**	**$ 5,891,961**	**$ 9,133,658**	**$ 7,945,300**	**$ 2,230,200**	**$ 2,313,200**	

Long Term Project Implementation Summary
FY 13/14 - FY 32/33
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Number	Project Name	Project Total	Incurred Thru FY 12/13	Estimated FY 13/14	Estimated FY 14/15	Estimated FY 15/16	Estimated FY 16/17	Estimated FY 17/18	Estimated FY 18/19	Estimated FY 19/20	Estimated FY 20/21	Estimated FY 21/22	Estimated FY 22/23	Estimated FY 23/24	Estimated FY 24/25	Estimated FY 25/26	Estimated FY 26/27	Estimated FY 27/28	Estimated FY 28/29	Estimated FY 29/30	Estimated FY 30/31	Estimated FY 31/32	Estimated FY 32/33	Purpose
Studies																								
	Arc Flash Study	40,000	-	-	-	-	-	-	40,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Rehabilitation
	Tier 1 Seismic & Conc Evaluation	50,000	-	50,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Rehabilitation
	Manhole Condition Assessment	101,700	-	101,700	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Rehabilitation
	I&I Flow Monitoring	50,000	-	-	-	50,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Rehabilitation
	Private Lateral Sewer Mapping	20,000	-	20,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Regulations
	Subtotal Studies	**261,700**	**-**	**171,700**	**-**	**50,000**	**-**	**-**	**40,000**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	
Collection System Projects																								
	Lefty Gomez Project	117,700	-	117,700	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Rehabilitation
	Temporary Force Main Project	260,800	35,639	260,800	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	County Reqt
	Permanent Force Main Project	222,300	28,042	-	222,300	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	County Reqt
	Sewer Year 1 (Rehab,Capacity,I&I Basins 406 and 408)	4,518,900	-	4,518,900	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Rehabilitation
	Sewer Year 2 (Rehab, I&I Basin 324 Pipes)	7,366,700	-	-	7,366,700	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Rehabilitation
	Sewer Year 3 (Rehab, I&I Basin 324 MHs & Laterals)	6,054,000	-	-	-	6,054,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Rehabilitation
	Sewer Years 4 to 10 (Rehab)	939,000	-	-	-	-	939,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Rehabilitation
	Sewer Years 4 to 10 (Rehab)	939,000	-	-	-	-	-	939,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Rehabilitation
	Sewer Years 4 to 10 (Rehab)	939,000	-	-	-	-	-	-	939,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Rehabilitation
	Sewer Years 4 to 10 (Rehab)	939,000	-	-	-	-	-	-	-	939,000	-	-	-	-	-	-	-	-	-	-	-	-	-	Rehabilitation
	Sewer Years 4 to 10 (Rehab)	939,000	-	-	-	-	-	-	-	-	939,000	-	-	-	-	-	-	-	-	-	-	-	-	Rehabilitation
	Sewer Years 4 to 10 (Rehab)	939,000	-	-	-	-	-	-	-	-	-	939,000	-	-	-	-	-	-	-	-	-	-	-	Rehabilitation
	Sewer Years 4 to 10 (Rehab)	939,000	-	-	-	-	-	-	-	-	-	-	939,000	-	-	-	-	-	-	-	-	-	-	Rehabilitation
	Sewer Years 11 to 20 (Rehab)	203,100	-	-	-	-	-	-	-	-	-	-	-	203,100	-	-	-	-	-	-	-	-	-	Rehabilitation
	Sewer Years 11 to 20 (Rehab)	203,100	-	-	-	-	-	-	-	-	-	-	-	-	203,100	-	-	-	-	-	-	-	-	Rehabilitation
	Sewer Years 11 to 20 (Rehab)	203,100	-	-	-	-	-	-	-	-	-	-	-	-	-	203,100	-	-	-	-	-	-	-	Rehabilitation
	Sewer Years 11 to 20 (Rehab)	203,100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	203,100	-	-	-	-	-	-	Rehabilitation
	Sewer Years 11 to 20 (Rehab)	203,100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	203,100	-	-	-	-	-	Rehabilitation
	Sewer Years 11 to 20 (Rehab)	203,100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	203,100	-	-	-	-	Rehabilitation
	Sewer Years 11 to 20 (Rehab)	203,100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	203,100	-	-	-	Rehabilitation
	Sewer Years 11 to 20 (Rehab)	203,100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	203,100	-	-	Rehabilitation
	Sewer Years 11 to 20 (Rehab)	203,100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	203,100	-	Rehabilitation
	Sewer Years 11 to 20 (Rehab)	203,100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	203,100	Rehabilitation
	Subtotal Collection System Projects	**27,144,400**	**63,681**	**4,897,400**	**7,589,000**	**6,054,000**	**939,000**	**939,000**	**939,000**	**939,000**	**939,000**	**939,000**	**939,000**	**203,100**	**203,100**	**203,100**	**203,100**	**203,100**	**203,100**	**203,100**	**203,100**	**203,100**	**203,100**	
Pump Station Projects																								
	Influent Pump Station	857,500	-	-	-	198,100	659,400	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Rehabilitation
	Subtotal Pump Station Projects	**857,500**	**-**	**-**	**-**	**198,100**	**659,400**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	
Treatment Plant Projects																								
	WWTP Hydraulic Improvements	3,481,700	-	804,300	1,338,700	1,338,700	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Capacity
	Grit Chamber Rehab	208,100	-	48,100	160,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Rehabilitation
	Replace Headworks	2,885,400	-	-	-	-	-	666,500	2,218,900	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Rehabilitation
	Weir Box Closure	26,400	-	6,100	20,300	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Rehabilitation
	Aeration Basin Conc/Mixer/Blowers	232,300	-	-	53,700	178,600	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Rehabilitation
	Sludge Thickening Bldg Rehab	56,300	-	-	-	13,000	43,300	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Rehabilitation
	Digester Bldg Coating & Equip	484,500	-	-	-	111,900	372,600	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Rehabilitation
	Sludge Drying Bed 3	17,600	-	-	-	-	4,100	13,500	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Rehabilitation
	Generator Lateral Supports	133,700	-	-	-	1,000	3,400	-	-	-	-	-	-	129,300	-	-	-	-	-	-	-	-	-	Rehabilitation
	Ungrounded Elec & Security	527,000	-	-	-	-	121,700	405,300	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Rehabilitation
	Roofing	244,700	-	-	-	-	56,500	188,200	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Rehabilitation
	ADA Compliance	170,700	-	-	-	-	30,200	100,700	-	-	-	-	-	39,800	-	-	-	-	-	-	-	-	-	Regulations
	Primary Clarifier Replacement	1,069,800	-	-	-	-	-	-	247,100	822,700	-	-	-	-	-	-	-	-	-	-	-	-	-	Rehabilitation
	Aeration Basin Coating/Blower Bldg/ Blower MCC/HiOx Diffusers	784,700	-	-	-	-	-	-	-	181,300	603,400	-	-	-	-	-	-	-	-	-	-	-	-	Rehabilitation
	2nd Clarifer Rehab	837,500	-	-	-	-	-	-	-	193,500	644,000	-	-	-	-	-	-	-	-	-	-	-	-	Rehabilitation
	2nd Clarifer Sludge Pump Equip	38,800	-	-	-	-	-	-	-	-	-	-	38,800	-	-	-	-	-	-	-	-	-	-	Rehabilitation
	CCB Chemical Equip	424,800	-	-	-	-	-	-	-	-	98,100	326,700	-	-	-	-	-	-	-	-	-	-	-	Rehabilitation
	Rotary Drum Thickener/TWAS Pump	132,700	-	-	-	-	-	-	-	-	-	-	-	-	132,700	-	-	-	-	-	-	-	-	Rehabilitation
	Anaerobic Digest Coating/Roof/Flare	942,200	-	-	-	-	-	-	-	-	-	-	-	-	217,600	724,600	-	-	-	-	-	-	-	Rehabilitation
	Dewatering Rehab	373,800	-	-	-	-	-	-	-	-	-	-	-	-	-	86,300	287,500	-	-	-	-	-	-	Rehabilitation
	Sludge Drying Beds 1,2,4,5	178,900	-	-	-	-	-	-	-	-	-	-	-	-	41,300	137,600	-	-	-	-	-	-	-	Rehabilitation
	SCADA/SurgeTank/Generator	713,800	-	-	-	-	-	-	-	-	-	-	-	-	-	164,900	548,900	-	-	-	-	-	-	Rehabilitation
	Effluent PS & Outfall Rehab	375,100	-	-	-	-	-	-	-	-	86,600	288,500	-	-	-	-	-	-	-	-	-	-	-	Rehabilitation
	Nutrient Removal	3,673,500	-	-	-	-	-	-	-	-	-	-	-	848,600	2,824,900	-	-	-	-	-	-	-	-	Regulations
	Subtotal Treatment Plant Projects	**18,014,000**	**-**	**858,500**	**1,572,700**	**1,643,200**	**631,800**	**1,374,200**	**2,466,000**	**1,197,500**	**1,432,100**	**615,200**	**38,800**	**1,017,700**	**3,216,500**	**1,113,400**	**836,400**	**-**	**-**	**-**	**-**	**-**	**-**	
TOTAL ALL PROJECTS		**46,277,600**	**63,681**	**5,927,600**	**9,161,700**	**7,945,300**	**2,230,200**	**2,313,200**	**3,445,000**	**2,136,500**	**2,371,100**	**1,554,200**	**977,800**	**1,220,800**	**3,419,600**	**1,316,500**	**1,039,500**	**203,100**	**203,100**	**203,100**	**203,100**	**203,100**	**203,100**	

APPENDIX B – COLLECTION SYSTEM REPLACEMENT BY PIPE SEGMENT

Appendix B
Comprehensive Wastewater Masterplan
Rodeo Sanitary District

CIP Project Name	Upstream Manhole	Downstream Manhole	Length (feet)	Pipe Diameter (inches)	Location	Pipe Material	Reasons for Replacement: PACP Structural Code	Remaining Useful Life	Inadequate Slope	I&I Improvement	Capacity Improvement	CIP Year	Basin #
Sewer Year 1	62A	62	191	6	San Pablo Avenue	VCP	5	-37	Yes			FY13/14	54
	1665	65	15	8	Railroad Ave (665 to 65)	PVC					Yes	FY13/14	54
	20	29	327	6	1st Street	VCP	5	-27				FY13/14	59
	29	318	334	6	1st Street	VCP	5	-27				FY13/14	59
	496	10	76	6	1st Street	VCP	5	-37	Yes			FY13/14	59
	471	22	458	6	2nd Street	VCP	5	-37				FY13/14	59
	503	504	68	6	2nd Street	VCP	5	-27				FY13/14	59
	21	20	231	6	Lake Avenue	VCP	5	-27				FY13/14	59
	22	21	232	6	Lake Avenue	VCP	5	-27				FY13/14	59
	23	22	264	6	Lake Avenue	VCP	5	-27				FY13/14	59
	499	20	141	6	Pacific Avenue	VCP	5	-37				FY13/14	59
	317	318	311	6	Parker Avenue	VCP	5	-27	Yes			FY13/14	59
	30	29	300	6	Rodeo Avenue	VCP	5	-27	Yes			FY13/14	59
	538	30	140	6	Rodeo Avenue	VCP	5	-27	Yes			FY13/14	59
	28	317	335	6	San Pablo Avenue	VCP	5	-37	Yes			FY13/14	59
	498	28	292	6	San Pablo Avenue	VCP	5	-37				FY13/14	59
	1101	102	170	12	3rd Street (101 to 102)	PVC					Yes	FY13/14	61
	1101(Siphons)	102	170	10	3rd Street (101 to 102)	PVC					Yes	FY13/14	61
	368	520	274	8	Vaqueros Avenue	VCP	4	3	Yes		Yes	FY13/14	83
	396	397	380	6	Garreston Avenue	VCP	5	-37				FY13/14	327
	175	406	159	6	5th Street Ease.	VCP	4	3		Yes		FY13/14	406
	174	175	134	6	6th Street	VCP	5	3		Yes		FY13/14	406
	492	174	118	6	6th Street	VCP	4	3	Yes	Yes		FY13/14	406
	493	492	210	6	6th Street	VCP	4	3		Yes		FY13/14	406
	402	493	105	6	6th Street Ease.	VCP	5	3		Yes		FY13/14	406
	405	529	94	6	6th Street Ease.	VCP	5	3		Yes		FY13/14	406
	529	175	144	6	6th Street Ease.	VCP	5	3		Yes		FY13/14	406
	403	402	248	6	6th Street Ease.	VCP	4	3		Yes		FY13/14	406
	404	529	175	6	6th Street Ease.	VCP	4	3		Yes		FY13/14	406
	402A	402	51	6	6th Street Ease.	VCP	0	3		Yes		FY13/14	406
	176	523	165	6	4th Street Ease.	VCP	5	3		Yes		FY13/14	408
	407	523	221	6	4th Street Ease.	VCP	5	3		Yes		FY13/14	408
	523	408	145	6	4th Street Ease.	VCP	5	3		Yes		FY13/14	408
	177	176	265	6	5th Street	VCP	5	3		Yes		FY13/14	408
	178	406A	293	6	5th Street Ease.	VCP	5	3		Yes		FY13/14	408
	406	176	125	6	5th Street Ease.	VCP	5	3		Yes		FY13/14	408
	406A	406	141	6	5th Street Ease.	VCP	0	3		Yes		FY13/14	408
	532	107	283	6	2nd Street	VCP	5	-27				FY13/14	477
	1	6	324	6	3rd Street	VCP	5	-17	Yes			FY13/14	477
	6	13	321	8	3rd Street	VCP	5	-17	Yes		Yes	FY13/14	477
	13	24	322	8	3rd Street	VCP	5	-37			Yes	FY13/14	477
	24	33	322	8	3rd Street	VCP	5	-27			Yes	FY13/14	477
	33	551	162	10	3rd Street	VCP	4	-27			Yes	FY13/14	477
	1551	323	198	10	3rd St (551 to 323)	PVC					Yes	FY13/14	477
	12	13	297	6	Garretson Avenue	VCP	5	-37				FY13/14	477
	12A	12	43	6	Garretson Avenue	VCP	5	-37	Yes			FY13/14	477

Appendix B
Comprehensive Wastewater Masterplan
Rodeo Sanitary District

							Reasons for Replacement						
CIP Project Name	**Upstream Manhole**	**Downstream Manhole**	**Length (feet)**	**Pipe Diameter (inches)**	**Location**	**Pipe Material**	**PACP Structural Code**	**Remaining Useful Life**	**Inadequate Slope**	**I&I Improvement**	**Capacity Improvement**	**CIP Year**	**Basin #**
	25	24	424	6	Lake Avenue	VCP	5	-27				FY13/14	477
	4	1	312	6	Sharon Avenue	VCP	5	-17	Yes			FY13/14	477
553	1450	345	193	8	6th St (365 to 345)	PVC				Yes	Yes	FY13/14	324
	1448	331	360	8	Lefty Gomez (448 to 331	PVC				Yes	Yes	FY13/14	324
Sewer Year 2			27571										
	468	469	234	6	4th Street	VCP	4	-37	Yes	Yes		FY14/15	324
	547	324	164	6	4th Street	VCP	4	-27	Yes	Yes		FY14/15	324
	35	547	163	6	4th Street	VCP	4	3	Yes	Yes		FY14/15	324
	9	549	106	6	4th Street	VCP	3	-37	Yes	Yes		FY14/15	324
	505	480	184	6	4th Street	VCP	2	-27	Yes	Yes		FY14/15	324
	549	468	257	6	4th Street	VCP	2	-37	Yes	Yes		FY14/15	324
	469	26	55	6	4th Street	VCP	1	-37		Yes		FY14/15	324
	26	35	321	6	4th Street	VCP	0	-27		Yes		FY14/15	324
	480	324	42	6	4th Street	VCP	0	-27		Yes		FY14/15	324
	361	363	304	6	6th Street	VCP	5	3		Yes		FY14/15	324
	361A	361	40	6	6th Street	VCP	5	3		Yes		FY14/15	324
	363	365	185	6	6th Street	VCP	4	3	Yes	Yes		FY14/15	324
	445	516	331	6	Garreston Avenue	VCP	5	-37		Yes		FY14/15	324
	516	17	32	6	Garreston Avenue	VCP	5	-37	Yes	Yes		FY14/15	324
	517	19	196	6	Garreston Avenue	VCP	5	-37	Yes	Yes		FY14/15	324
	19	516	44	6	Garreston Avenue	VCP	0	-37	Yes	Yes		FY14/15	324
	17	18	117	10	Garreston Avenue	PVC	0	58	Yes	Yes		FY14/15	324
	446	396	259	6	Lake Avenue	VCP	5	-27		Yes		FY14/15	324
	518	362	200	6	Lake Avenue	VCP	0	-27		Yes		FY14/15	324
	27	26	220	6	Lake Street	VCP	5	-27	Yes	Yes		FY14/15	324
	444	448	331	6	Lefty Gomez Fld.	VCP	5	-37		Yes		FY14/15	324
	447	448	245	6	Lefty Gomez Fld.	VCP	4	-37	Yes	Yes		FY14/15	324
	448	448A	300	6	Lefty Gomez Fld.	VCP	4	-37	Yes	Yes		FY14/15	324
	365	447	432	6	Parker Alley	VCP	5	-27	Yes	Yes		FY14/15	324
	474	365	203	6	Parker Alley	VCP	4	3	Yes	Yes		FY14/15	324
	475	474	441	6	Parker Alley	VCP	4	3	Yes	Yes		FY14/15	324
	547A	547	153	6	Parker Alley	VCP	3	3	Yes	Yes		FY14/15	324
	479	479A	431	6	Parker Avenue	VCP	4	-27	Yes	Yes		FY14/15	324
	519	478	72	6	Parker Avenue	VCP	4	-27	Yes	Yes		FY14/15	324
	478	479	289	6	Parker Avenue	VCP	3	-27	Yes	Yes		FY14/15	324
	479A	480	324	6	Parker Avenue	VCP	0	-27		Yes		FY14/15	324
	364	363	285	6	Rodeo Avenue	VCP	5	-27		Yes		FY14/15	324
	476	363	453	6	Rodeo Avenue	VCP	5	3		Yes		FY14/15	324
	546	35	97	6	Rodeo Avenue	VCP	4	-27	Yes	Yes		FY14/15	324
	448A	35	226	6	Rodeo Avenue	VCP	4	-27		Yes		FY14/15	324
	441	443	121	6	Rodeo Hills Sch.	CI	5	-72		Yes		FY14/15	324
	443	444	86	6	Rodeo Hills Sch.	VCP	4	-37		Yes		FY14/15	324
	362	443	197	6	Rodeo Hills Sch.	PVC	3	58		Yes		FY14/15	324
	442	444	125	8	Rodeo Hills Sch.	PVC	1	58		Yes		FY14/15	324
	18	440	127	10	Rodeo Hills Sch.	PVC	0	58		Yes		FY14/15	324
	440	441	40	10	Rodeo Hills Sch.	PVC	0	58		Yes		FY14/15	324

							Reasons for Replacement						
CIP Project Name	Upstream Manhole	Downstream Manhole	Length (feet)	Pipe Diameter (inches)	Location	Pipe Material	PACP Structural Code	Remaining Useful Life	Inadequate Slope	I&I Improvement	Capacity Improvement	CIP Year	Basin #
	548	48	288	6	San Pablo Avenue	VCP	5	3	Yes	Yes		FY14/15	324
	36	37	104	8	California Street	VCP	5	3				FY14/15	54
	39	451	256	8	California Street	VCP	5	3				FY14/15	54
	450	47	131	6	California Street	VCP	5	3				FY14/15	54
	44	43	147	8	Dempsey Way	VCP	5	3				FY14/15	54
	45	541	171	8	Dempsey Way	VCP	5	3				FY14/15	54
	43A	42	106	8	Dempsey Way	VCP	5	3				FY14/15	54
	556	64	450	6	First Street Ease.	VCP	5	3	Yes			FY14/15	54
	70	68	291	6	Mariposa Street	VCP	5	3	Yes			FY14/15	54
	73	70	289	6	Mariposa Street	VCP	5	3				FY14/15	54
	88	89	164	6	Napa Avenue	VCP	5	3				FY14/15	54
	89	73	149	6	Napa Avenue	VCP	5	3				FY14/15	54
	419	88	52	6	Napa Avenue	VCP	5	3				FY14/15	54
	71	70	328	6	Pinole Ave.	VCP	5	3				FY14/15	54
	72	71	204	6	Pinole Ave.	VCP	5	3				FY14/15	54
	48	63	160	6	San Pablo Avenue	VCP	5	3				FY14/15	54
	49	62	145	12	San Pablo Avenue	VCP	5	3				FY14/15	54
	46	47	217	8	Trigger Road	VCP	5	3				FY14/15	54
	38	543	277	8	Tullibee Court	VCP	5	3				FY14/15	54
	543	542	277	8	Tullibee Road	VCP	5	3				FY14/15	54
	544	543	152	8	Tullibee Road	VCP	5	3				FY14/15	54
	80	100	227	6	3rd Street	VCP	5	3				FY14/15	61
	90	86	294	6	3rd Street	VCP	5	3				FY14/15	61
	98	90	296	6	3rd Street	VCP	5	3				FY14/15	61
	91	90	306	6	Napa Avenue	VCP	5	3				FY14/15	61
	87	86	383	6	Pinole Avenue	VCP	5	3				FY14/15	61
	83	557	127	6	Rodeo Creek Ease.	VCP	5	3	Yes			FY14/15	61
	456	85	221	6	Tormey Avenue	VCP	5	3	Yes			FY14/15	61
	81	80	187	6	Vaqueros Avenue	VCP	5	3				FY14/15	61
	111	110	145	6	4th Street	VCP	5	3				FY14/15	83
	92A	111	219	6	4th Street	VCP	5	3				FY14/15	83
	530B	530	118	6	Napa Ave Easement	VCP	5	3				FY14/15	83
	170	553	220	6	Napa Avenue	VCP	5	3				FY14/15	83
	507	170	301	6	Napa Avenue	VCP	5	3				FY14/15	83
	171	412	307	6	Napa Ease.	VCP	5	3				FY14/15	83
	460	171	305	6	Napa Ease.	VCP	5	3				FY14/15	83
	421	111	154	6	Pinole Avenue	VCP	5	3				FY14/15	83
	172	411	455	6	Suisun Avenue	VCP	5	3				FY14/15	83
	414	172	76	6	Suisun Avenue	VCP	5	3				FY14/15	83
	96	98	296	6	3rd Street	VCP	5	3				FY14/15	98
	408	97A	234	6	3rd Street Ease.	VCP	5	3				FY14/15	98
	93	92	157	6	4th Street	VCP	5	3				FY14/15	98
	179	408	215	6	4th Street	VCP	5	3				FY14/15	98
	92	98	426	6	Suisun Avenue	VCP	5	3				FY14/15	98
	410	410A	119	6	Suisun Ease.	VCP	5	3				FY14/15	98
	410A	93	260	6	Suisun Ease.	VCP	5	3				FY14/15	98

							Reasons for Replacement						
CIP Project Name	**Upstream Manhole**	**Downstream Manhole**	**Length (feet)**	**Pipe Diameter (inches)**	**Location**	**Pipe Material**	**PACP Structural Code**	**Remaining Useful Life**	**Inadequate Slope**	**I&I Improvement**	**Capacity Improvement**	**CIP Year**	**Basin #**
	95	96	169	6	Vallejo Avenue	VCP	5	3				FY14/15	98
	409	179A	201	6	Vallejo Ease.	VCP	5	3				FY14/15	98
	179B	179	230	6	Vallejo Ease.	VCP	5	3				FY14/15	98
	409A	409	156	6	Vallelo Ease.	VCP	5	3				FY14/15	98
	157	158	324	6	7th Street	VCP	5	3				FY14/15	165
	181	182	279	6	7th Street	VCP	5	3				FY14/15	165
	188	428	135	8	I-80 Easement	VCP	5	33				FY14/15	165
	462	141	68	6	Laurel Court	VCP	5	23				FY14/15	165
	401	400	290	6	Mahoney Ease.	VCP	5	3				FY14/15	165
	554	166	329	6	Napa Avenue	VCP	5	3				FY14/15	165
	180	422	219	6	Sonoma Avenue	VCP	5	3				FY14/15	165
	427	180	284	6	Sonoma Avenue	VCP	5	3				FY14/15	165
	526	527	60	6	Sonoma Ease.	VCP	5	3				FY14/15	165
	183	182	198	6	Vallejo Avenue	VCP	5	3				FY14/15	165
	398	475	259	6	7th Street	VCP	5	3				FY14/15	327
	310	309	139	8	Claeys Court	AC	5	28				FY14/15	327
	138	142	344	8	Elm Drive	VCP	5	23				FY14/15	327
	143	144	302	8	Elm Drive	VCP	5	23				FY14/15	327
	144	145	282	8	Elm Drive	VCP	5	23				FY14/15	327
	147	118	198	8	Elm Drive	VCP	5	23				FY14/15	327
	132	395	303	6	Hawthorne Drive	VCP	5	23				FY14/15	327
	133	132	322	6	Hawthorne Drive	VCP	5	23				FY14/15	327
	135	136	292	6	Hawthorne Drive	VCP	5	23				FY14/15	327
	434	138	249	8	Hawthorne Easement	VCP	5	23				FY14/15	327
	149	117	140	6	Spruce Court	VCP	5	23				FY14/15	327
	150	148	237	6	Spruce Court	VCP	5	23				FY14/15	327
	437	436	178	6	Spruce Easement	VCP	5	23				FY14/15	327
	438	149	166	6	Spruce Easement	VCP	5	23	Yes			FY14/15	327
	438A	438	137	6	Spruce Easement	VCP	5	23				FY14/15	327
	169	509	438	6	Barnes Way	VCP	5	3				FY14/15	368
	168	167	156	6	Napa Avenue	VCP	5	3				FY14/15	368
	435	522	251	6	Suisun Ease.	VCP	5	3				FY14/15	368
	521	435	430	6	Suisun Ease.	VCP	5	3				FY14/15	368
	185	184	237	6	Vallejo Avenue	VCP	5	3				FY14/15	368
	186	185	316	6	Vallejo Avenue	VCP	5	3				FY14/15	368
	186A	186	15	6	Vallejo Avenue	VCP	5	3				FY14/15	368
	385	368	400	6	Vaqueros Avenue	VCP	5	3	Yes			FY14/15	368
Sewer Year 3	10	20	320	6	1st Street	VCP	4	-37				FY15/16	59
	11	10	335	6	Garretson Avenue	VCP	4	-37				FY15/16	59
	537	499	123	6	Pacific Avenue	VCP	4	-37				FY15/16	59
	539	30	99	6	Pacific Avenue	VCP	4	-37				FY15/16	59
	319	318	269	6	Parker Avenue	VCP	Unknown	-27	Yes			FY15/16	59
	504	319	191	6	Parker Avenue	VCP	Unknown	-27	Yes			FY15/16	59
	497	28	172	6	Rodeo Avenue	VCP	4	-27				FY15/16	59
	3	1	121	6	3rd Street	VCP	4	-17	Yes			FY15/16	477
	14	13	311	6	Garretson Avenue	VCP	4	-37				FY15/16	477

CIP Project Name	Upstream Manhole	Downstream Manhole	Length (feet)	Pipe Diameter (inches)	Location	Pipe Material	Reasons for Replacement: PACP Structural Code	Remaining Useful Life	Inadequate Slope	I&I Improvement	Capacity Improvement	CIP Year	Basin #
	15	14	311	6	Garretson Avenue	VCP	4	-37				FY15/16	477
	16	15	275	6	Garretson Avenue	VCP	4	-37	Yes			FY15/16	477
	7	6	293	6	Harris Avenue	VCP	4	-17				FY15/16	477
	5	6	309	6	Harris Avenue	VCP	Unknown	-17	Yes			FY15/16	477
	324	321A	303	8	Parker Avenue	VCP	4	-27				FY15/16	477
	321A	321	317	8	Parker Avenue	VCP	4	-27				FY15/16	477
	320	321	370	6	Parker Avenue	VCP	Unknown	-27	Yes			FY15/16	477
	324	5333	30	8	Parker Avenue	PVC	Unknown	-32				FY15/16	477
	34	33	299	6	Rodeo Avenue	VCP	4	-27				FY15/16	477
	2	1	325	6	Sharon Avenue	VCP	4	-17				FY15/16	477
Sewer Years 4 to 10	56	60	86	12	1st Street	VCP	Unknown	3	Yes			FY16/17	54
	37	542	313	8	California Street	VCP	3	3				FY16/17	54
	542	39	328	8	California Street	VCP	3	3				FY16/17	54
	45A	45	45	8	Dempsey Way	VCP	0	3				FY16/17	54
	43	43A	32	8	Dempsey Way	VCP	Unknown	3				FY16/17	54
	588	42	107	8	Dempsey Way	VCP	Unknown	3				FY16/17	54
	51	53	484	6	First Street	VCP	4	3				FY16/17	54
	455	51	371	6	First Street	VCP	1	3				FY16/17	54
	52	501	15	10	First Street	VCP	0	3	Yes			FY16/17	54
	53	52	9	10	First Street	VCP	0	3				FY16/17	54
	55	56	32	10	First Street	VCP	0	3				FY16/17	54
	501	55	77	10	First Street	VCP	0	3				FY16/17	54
	52	54	60	12	First Street	VCP	Unknown	3	Yes			FY16/17	54
	56	60	86	10	First Street	VCP	Unknown	3	Yes			FY16/17	54
	555	451	290	8	Mariposa Easement	VCP	3	3				FY16/17	54
	42A	555	102	8	Mariposa Easement	VCP	0	3				FY16/17	54
	67	65	234	6	Mariposa Street	VCP	4	3	Yes			FY16/17	54
	40	41	67	8	Mariposa Street	VCP	3	3				FY16/17	54
	68	67	240	6	Mariposa Street	VCP	1	3	Yes			FY16/17	54
	41	42	176	8	Mariposa Street	VCP	0	3				FY16/17	54
	42	42A	85	8	Mariposa Street	VCP	0	3				FY16/17	54
	62	63	12	12	Railroad Avenue	VCP	4	3				FY16/17	54
	75	65	150	6	Railroad Avenue	VCP	Unknown	3	Yes			FY17/18	54
	65	64	130	6	Railroad Avenue.	VCP	1	3	Yes			FY17/18	54
	64	53	92	10	Railroad Avenue.	VCP	0	3				FY17/18	54
	452	49	534	12	San Pablo Avenue	VCP	4	3				FY17/18	54
	451	454	233	10	San Pablo Easement	VCP	4	3				FY17/18	54
	453	452	231	10	San Pablo Easement	VCP	2	3				FY17/18	54
	454	453	230	10	San Pablo Easement	VCP	2	3				FY17/18	54
	47	452	345	8	Trigger Easement	VCP	2	3				FY17/18	54
	541	46	292	8	Trigger Road	VCP	0	3				FY17/18	54
	586	544	60	8	Tullibee Road	VCP	4	3				FY17/18	54
	500	499	51	6	Pacific Avenue	HDPE	2	-42	Yes			FY17/18	59
	318	59	344	10	Parker Avenue	PVC	0	-32				FY17/18	59
	552	503	111	4	Parker Avenue	CI	0	-62				FY17/18	59
	31	32	167	6	Rodeo Avenue	VCP	2	-27	Yes			FY17/18	59

CIP Project Name	Upstream Manhole	Downstream Manhole	Length (feet)	Pipe Diameter (inches)	Location	Pipe Material	Reasons for Replacement: PACP Structural Code	Remaining Useful Life	Inadequate Slope	I&I Improvement	Capacity Improvement	CIP Year	Basin #
	498A	498	54	6	San Pablo Avenue	VCP	0	-37				FY17/18	59
	86	80	293	6	3rd Street	VCP	4	3				FY18/19	61
	100	101	76	10	3rd Street	VCP	Unknown	3				FY18/19	61
	420	90	279	6	Napa Avenue	VCP	4	3				FY18/19	61
	91A	91	101	6	Napa Avenue	VCP	0	3				FY18/19	61
	87A	87	50	6	Pinole Avenue	VCP	1	3				FY18/19	61
	557	100	178	8	Rodeo Creek Ease.	VCP	Unknown	3				FY18/19	61
	101	101A	140	10	Rodeo Creek Easement	VCP	3	3				FY18/19	61
	457	77	165	10	Rodeo Creek Easement	VCP	3	3				FY18/19	61
	101A	101B	72	10	Rodeo Creek Easement	VCP	2	3				FY18/19	61
	101B	457	71	10	Rodeo Creek Easement	VCP	2	3				FY18/19	61
	85A	457	159	6	Tormey Avenue	VCP	4	3				FY18/19	61
	85	85A	56	6	Tormey Avenue	VCP	2	3				FY18/19	61
	82	81	140	6	Vaqueros Avenue	VCP	1	3				FY18/19	61
	110	84	164	6	4th Street	VCP	4	3	Yes			FY18/19	83
	530A	530	50	6	Napa Ave Easement	VCP	2	3				FY18/19	83
	415	553	62	6	Napa Avenue	VCP	4	3				FY18/19	83
	412	553	134	6	Napa Ease.	VCP	4	3				FY18/19	83
	413	412	55	6	Napa Ease.	VCP	4	3				FY18/19	83
	411	413	153	6	Napa Ease.	VCP	0	3				FY18/19	83
	413A	413	18	6	Napa Ease.	VCP	0	3				FY18/19	83
	83A	83	473	6	Rodeo Creek Esmt	VCP	Unknown	3				FY18/19	83
	530	536	150	6	Vaqueros Ease.	VCP	4	3				FY18/19	83
	536	535	146	6	Vaqueros Ease.	VCP	4	3				FY18/19	83
	531	535	162	6	Vaqueros Ease.	VCP	2	3				FY18/19	83
	535	368	162	6	Vaqueros Ease.	VCP	0	3				FY18/19	83
	97	96	157	6	3rd Street	VCP	0	3				FY19/20	98
	97A	97	62	6	3rd Street Ease.	VCP	3	3				FY19/20	98
	94	93	149	6	4th Street	VCP	4	3				FY19/20	98
	550	408	169	6	4th Street	VCP	1	3				FY19/20	98
	418	98	263	6	Suisun Avenue	VCP	2	3				FY19/20	98
	418A	418	40	6	Suisun Avenue	VCP	0	3				FY19/20	98
	173	410	287	6	Suisun Ease.	VCP	4	3				FY19/20	98
	417A	96	163	6	Vallejo Avenue	VCP	1	3				FY19/20	98
	417	417A	40	6	Vallejo Avenue	VCP	0	3	Yes			FY19/20	98
	179A	179B	141	6	Vallejo Ease.	VCP	4	3				FY19/20	98
	156	157	268	6	7th Street	VCP	4	3				FY19/20	165
	182	166	266	6	7th Street	VCP	4	3	Yes			FY19/20	165
	423	181	117	6	7th Street	VCP	4	3				FY19/20	165
	161	162	96	6	7th Street	VCP	1	3				FY19/20	165
	155	156	125	6	7th Street	VCP	0	3				FY19/20	165
	158	159	223	6	7th Street	VCP	0	3				FY19/20	165
	159	160	125	6	7th Street	VCP	0	3				FY19/20	165
	160	161	168	6	7th Street	VCP	0	3				FY19/20	165
	162	423	157	6	7th Street	VCP	0	3				FY19/20	165
	165	163	306	8	7th Street	PVC	0	-2	Yes			FY19/20	165

CIP Project Name	Upstream Manhole	Downstream Manhole	Length (feet)	Pipe Diameter (inches)	Location	Pipe Material	Reasons for Replacement					CIP Year	Basin #
							PACP Structural Code	Remaining Useful Life	Inadequate Slope	I&I Improvement	Capacity Improvement		
	165	163	67	8	7th Street	PVC	0	-2	Yes			FY19/20	165
	166	165	37	8	7th Street	VCP	0	3				FY19/20	165
	510	423	58	6	7th Street	VCP	4	3				FY19/20	165
	429	154	71	8	California Easement	VCP	4	3				FY20/21	165
	429	154	16	6	California Easement	VCP	4	3				FY20/21	165
	430	429	331	8	California Easement	AC	2	-2				FY20/21	165
	431	430	22	8	California Easement	AC	2	-2				FY20/21	165
	154	155	222	6	California Street	VCP	3	3				FY20/21	165
	191	190	504	8	California Street	VCP	1	3				FY20/21	165
	192	191	362	8	California Street	VCP	1	3				FY20/21	165
	190	189	247	8	California Street	VCP	0	3				FY20/21	165
	154A	154	73	6	California Street	VCP	0	3	Yes			FY20/21	165
	428	431	236	8	I-80 Crossing	CI	3	-2				FY20/21	165
	424	510	96	6	Laurel Ct./Ease.	VCP	0	3				FY20/21	165
	425	424	107	6	Laurel Ct./Ease.	VCP	0	3				FY20/21	165
	400	399	430	6	Mahoney Ease.	VCP	4	3				FY20/21	165
	399	526	72	6	Mahoney Ease.	CI	2	-32				FY20/21	165
	422	181	184	6	Sonoma Avenue	VCP	4	3				FY20/21	165
	426	423	304	6	Sonoma Ease.	VCP	4	3				FY20/21	165
	527	426	226	6	Sonoma Ease.	VCP	0	3				FY20/21	165
	184	183	168	6	Vallejo Avenue	VCP	4	3				FY20/21	165
	386	129	207	12	7th Street	VCP	4	3				FY21/22	327
	113	164	52	12	7th Street	VCP	3	3	Yes			FY21/22	327
	129	325	116	12	7th Street	VCP	3	3				FY21/22	327
	114	164	34	18	7th Street	VCP	0	3				FY21/22	327
	164	386	114	12	7th Street	VCP	Unknown	3				FY21/22	327
	164	386	114	12	7th Street	VCP	Unknown	3				FY21/22	327
	432	433	132	6	California Easement	VCP	2	3				FY21/22	327
	397	398	23	6	Garreston Avenue	VCP	2	-37				FY21/22	327
	113	112	484	6	Vaqueros Avenue	VCP	4	3	Yes			FY21/22	327
	120	119	251	6	Vaqueros Avenue	VCP	4	3	Yes			FY21/22	327
	113	164	52	6	Vaqueros Avenue	VCP	Unknown	3	Yes			FY21/22	327
	387	284	390	8	Garreston Avenue	VCP	2	-37				FY21/22	358
	467	169	160	6	Barnes Way	VCP	4	3				FY21/22	368
	508	168	364	6	Napa Avenue	VCP	2	3				FY21/22	368
	458	168	68	6	Napa Avenue	VCP	0	3				FY21/22	368
	459	458	280	6	Napa Ease.	VCP	0	3				FY21/22	368
	522	167	173	6	Suisun Ease.	VCP	3	3				FY21/22	368
	167	509	175	6	Suisun Easement	VCP	4	3				FY21/22	368
	509	112	159	6	Suisun Easement	VCP	4	3				FY21/22	368
	112	385	394	6	Vaqueros Avenue	VCP	4	3	Yes			FY21/22	368
	16A	16	27	6	Garretson Avenue	VCP	0	-37	Yes			FY22/23	477
	8	7	247	6	Harris Avenue	VCP	3	-17	Yes			FY22/23	477
	107	59	529	12	John Street	VCP	3	-17	Yes			FY22/23	477
	25A	25	19	6	Lake Avenue	VCP	0	-27	Yes			FY22/23	477
	473	551	299	6	Parker Alley	VCP	2	3	Yes			FY22/23	477

CIP Project Name	Upstream Manhole	Downstream Manhole	Length (feet)	Pipe Diameter (inches)	Location	Pipe Material	Reasons for Replacement					CIP Year	Basin #
							PACP Structural Code	Remaining Useful Life	Inadequate Slope	I&I Improvement	Capacity Improvement		
	472	473	250	6	Parker Alley	VCP	0	3	Yes			FY22/23	477
	321	104	175	12	Parker Avenue	VCP	0	-27	Yes			FY22/23	477
	506	480	231	6	Parker Avenue	VCP	0	-27	Yes			FY22/23	477
	545	34	152	6	Rodeo Avenue	VCP	2	-27	Yes			FY22/23	477
	32	33	342	8	Rodeo Avenue	PVC	0	-32				FY22/23	477
	470	2	52	6	Sharon Avenue	VCP	2	-17	Yes			FY22/23	477
	333A	334	290	21	Parker Avenue	AC	0	-32				FY22/23	N/A
Sewer Years 11 to 20	323	105	150	21	Investment Street	AC	0	8				FY23/24	N/A
	325	327	313	21	Parker Avenue	AC	0	8				FY23/24	N/A
	327	345	319	21	Parker Avenue	AC	0	8				FY24/25	N/A
	330	331	307	21	Parker Avenue	AC	0	8				FY25/26	N/A
	331	333	301	21	Parker Avenue	AC	0	8				FY26/27	N/A
	333	333A	303	21	Parker Avenue	AC	0	8				FY27/28	N/A
	334	323	310	21	Parker Avenue	AC	0	8				FY28/29	N/A
	345	330	311	21	Parker Avenue	AC	0	8				FY29/30	N/A
	346	346A	122	15	Willow Avenue	AC	3	8				FY29/30	N/A
	346A	325	387	15	Willow Avenue	AC	2	8				FY30/31	N/A
	349A	349B	190	15	Willow Avenue	AC	2	8				FY30/31	N/A
	347	346	292	15	Willow Avenue	AC	0	8				FY31/32	N/A
	348	347	405	15	Willow Avenue	AC	0	8				FY31/32	N/A
	349	348	317	15	Willow Avenue	AC	0	8				FY32/33	N/A
	349B	349	82	15	Willow Avenue	AC	0	8				FY32/33	N/A

6/3/13

6/3/13

RODEO SANITARY DISTRICT

COMPREHENSIVE WASTEWATER MASTER PLAN

TECHNICAL MEMORANDUM NO. 9

CIP IMPLEMENTATION AND FINANCIAL ANALYSIS

FINAL
June 2013

RODEO SANITARY DISTRICT

COMPREHENSIVE WASTEWATER MASTER PLAN

CIP IMPLEMENTATION AND FINANCIAL ANALYSIS

TECHNICAL MEMORANDUM
NO. 9

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CIP IMPLEMENTATION AND FINANCIAL ANALYSIS

1.0 PURPOSE

The purpose of this technical memorandum (TM) is to present the findings of the Financial Analysis for the Comprehensive Wastewater Master Plan (CWWMP). The analysis included the following:

- Development of a financial model analyzing past and projected performance and recommending alternative sources of funding for the recommended Capital Improvement Program (CIP).
- A customer rate impact analysis showing the impact of the recommended CIP funding strategy on customer rates.
- Potential alternative funding such as local, state, and federal grants.
- A financial plan that integrates viable sources of revenue.

2.0 SUMMARY OF KEY FINDINGS AND RECOMMENDATIONS

The key findings and recommendations of this TM are:

- The District's CIP will need to be financed primarily through the use of debt in the near term. It is recommended the District seek Clean Water State Revolving Fund (CWSRF) loans in order to minimize the long-term cost of borrow, but also consider traditional municipal bonds as necessary. For the purpose of developing the financial forecast, capital expenditures from FY 2013/14 through FY 2015/16 are assumed to be funded using CWSRF loans, followed by the issuance of traditional municipal bonds for other future capital needs.
- Substantial user rate increases must be implemented to provide revenues sufficient to fund annual debt service obligations based on the projected debt issuances. Based on the recommended CIP in TM No. 8, the District would be required to increase rates 23 percent per year in FY 2013/14 through FY 2015/16. However, after initial review of the projected rate increases, the District has decided to revise the CIP and increase rates by 14.38 percent in FY 2013/14, followed by 10 percent increases in both FY 2014/15 and FY 2015/16.
- The District's revised 20-year CIP budget totals approximately $37.2 million dollars. See Appendix A for the revised 20-year CIP budget.

- The District Board recommended a review of the success and cost-effectiveness of the I&I reduction and sewer replacement and rehabilitation projects after the third year of CIP implementation. This will allow the District to better prioritize the remaining CIP projects, including those that have been deferred.

- It is recommended that the District initiate the CWSRF loan application process and the revised CIP as soon as feasible.

3.0 BACKGROUND

As presented within the CWWMP, Carollo has identified required collection/conveyance and treatment plant capital improvements in order to reduce system I&I and maintain system reliability. TM No. 8 summarizes the results of this work in the recommended 20-year CIP. Based on the recommended CIP, a preliminary rate analysis was performed. The District is projected to need rate increases of 23 percent per year for the first three years, followed by more moderate annual rate increases of four percent in subsequent years. Table 9.1 summarizes the results of the preliminary rate analysis.

Table 9.1 Projected Rate Increases and Resulting Rates Based on Recommended 20-Year CIP in TM No. 8. Comprehensive Wastewater Master Plan Rodeo Sanitary District

Fiscal Year	Projected Rate Increase (%)	Resulting Annual Rate (Residential or Minimum Commercial)
FY 2012/13	N/A	$695.40
FY 2013/14	23.0%	$855.34
FY 2014/15	23.0%	$1,052.07
FY 2015/16	23.0%	$1,294.05
FY 2016/17	4.0%	$1,345.81
FY 2017/18	4.0%	$1,399.64

Note:
(1) FY 2012/13 included for reference, annual rate represents the adopted 1.5% rate increase.

After initial review of the projected rate increases, the District concluded that the fiscal impacts are not sustainable for the community. Furthermore, while attempting to complete the majority of the sewer system improvements in the first few years may lower the risk of system failures, it does not allow for much opportunity to evaluate and fine tune the effectiveness of the I&I reduction projects. As a result, the District directed Carollo to revise the CIP by adjusting the project timing, and even deferring some of the low priority projects to beyond the 20-year planning period (e.g. hydraulic WWTP Hydraulic Improvements and lateral and manhole replacement from Basin 324). The rate analysis and results presented in this TM is based on the revised CIP, which is provided for reference in Appendix A.

4.0 FINANCIAL MODEL

4.1 Assumptions and Data

4.1.1 Capital Improvement Program

The 20-year CIP runs through FY 2032/33. During this period, little growth is anticipated and the majority of the CIP is focused on rehabilitation and replacement of the existing system. Over the next 20 years, the District's CIP will accomplish:

- Major rehabilitation or replacement of the existing headworks, primary treatment, outfall, and solids handling facilities.
- Major rehabilitation of the District's collection system including I&I reduction projects to reduce wet weather flow.
- Rehabilitation of the District's Influent Pump Station.
- Wastewater treatment plant hydraulic improvements designed to increase wet weather capacity.
- Addition of nutrient removal system.

This CIP, as included in this TM, totals approximately $37.2 million in 2013 dollars. CIP expenditures are heavily weighted towards the first five years of the program, totaling $18.7 million. Due to the front-loaded nature of the CIP, implementation of the CIP will be the most significant driver of the District's financial plan.

4.1.2 Operations and Maintenance Expenditures

The revenue requirement analysis uses the District's FY 2012/13 (6 month actual and forecast) budget as the baseline for forecasting future revenue needs. Carollo also met with District staff to validate future projections and highlight known variations between proposed and actual expenditures. Future expenditures are assumed to increase commensurate with cost inflation and projected cost increases associated with increases in wastewater flows due to growth and higher treatment standards.

Revenues and expenses are projected for future fiscal years using the following annual escalation factors:

- General Cost Inflation: 3.0 percent.
- Labor Inflation: 5.0 percent
- Benefits and Workers Comp: 5.0 percent.
- Construction Cost Inflation: 5.0 percent.

- Customer Growth: 0.0 – 1.19 percent.
- Fund Earnings: 2 – 4 percent.

4.1.3 Existing Financial Information

The background financial information supplied by the District included: existing debt service and future payments, current reserve ending fund balance, other future non-treatment alternative-related expenses, other future revenues, future property taxes, and other miscellaneous financial information.

4.2 Revenue Requirement Analysis

4.2.1 Introduction

The revenue requirement analysis determines the amount of rate revenue needed in a given year to meet a utility's expected financial obligations. At least two separate tests must be met in order for rates to be sufficient:

- Cash Flow Test: A utility must generate annual utility revenues adequate to meet general cash needs.
- Bond Coverage Test: Annual rate revenues must satisfy debt coverage obligations on the District's outstanding debt.

The cash-flow test identifies projected cash requirements in each given year. Cash requirements include operation and maintenance (O&M) expenses, debt service payments, policy-driven additions to working capital, miscellaneous capital outlays, replacement funding, and rate-funded capital expenditures. These expenses are compared to total annual projected revenues. Shortfalls are then used to estimate needed rate increases.

The bond coverage test measures the ability of a utility to meet legal and policy-driven revenue obligations. Given the District's existing debt obligations, it is required to collect sufficient funds through rates to meet all ongoing O&M expenses, as well as 1.15 times the total debt-service requirements due in a year. This means that the District is legally obligated to collect rate revenues sufficient to fund annual operation and maintenance expenditures and 115 percent of its annual debt service payments. A higher coverage factor is set by policy at 125 percent in order to provide a minimum safeguard against temporary fluctuations in expenditures and revenues. As legally required coverage increase on future debt, the District will need to revisit the financial model and modify the capital funding strategy as appropriate.

Revenues must be sufficient to satisfy both tests. If revenues are found to be deficient through one or both of the tests, then the greater deficiency (shortfall) drives the rate increase. Due to the high amount of planned debt funded CIP expenditures relative to the

District's annual revenues, debt coverage is expected to be the primary driver of rate increases.

4.2.2 Funding Sources

Over the next 20 years, the CWWMP projects $37.2 million in future wastewater-treatment improvements and future collection-system capital improvements, as stated in 2013 dollars. The District expects to fund these improvements through debt using CWSRF loans and traditional municipal bonds.

4.2.2.1 User Rates

User rate revenue is the primary revenue source of the District. These rates were adjusted in previous years to generate sufficient cash flow to cover operating expenses and for additional capital-improvements. Due to the high amount of capital expenditures required to rehabilitate the system, future rate revenue increases are more than previous years. Over the forecast period with proposed rate increases, the District's annual rate revenues are projected to increase from $2.4 million in FY 2012/13 to $3.7 million in FY 2017/18.

4.2.2.2 Capital Facility Capacity Charges

Capital facility capacity charges (CFCCs) are a one-time charge imposed on new development or expansion of existing users that increase demand on the system. They provide for equitable cost recovery of growth related costs. As the District is almost entirely built out, CFCCs are not expected to provide a consistent source of revenue and are therefore not projected to future years in the model.

4.2.2.3 Tax Revenues

For FY 2012/13 The District expects to receive approximately 10 percent of its total revenue, or $200,000, in ad valorem tax revenue. For model projections, Carollo assumed the same amount of tax revenue for FY 2013/14. This money is deposited exclusively into the District's Capital Fund. Given the current economic climate, this amount is held constant for three years until FY 2016/17, at which point a 3 percent annual increase is assumed. By FY 2032/33, the District is projected to generate $330,000 in property-tax revenue per annum. Should these revenues not materialize, the District would need to adjust future expenditures or possibly revisit the financial analysis.

4.2.2.4 Franchise Fee Revenues

The District receives Franchise Fee Revenues from Richmond Sanitary Services for solid waste collection. These revenues are projected to increase commensurate with District growth and general inflation.

4.2.2.5 Debt Financing

The District is entering a time period of greatly increased CIP expenditures which, if rate funded, would require drastic and abrupt rate increases. Consequently, the District anticipates issuing additional debt during the 20-year forecast period to fund CIP projects. The model assumes that any future debt will require a minimum coverage ratio of 1.25 times. The coverage ratio is calculated as the ratio of net annual revenues available for debt service payments to total annual debt service requirements.

Table 9.2 describes the District's outstanding debt obligations as of January 2013.

Table 9.2 Outstanding Certificates of Participation Debt as of January 2013
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

	Principal Amount	Outstanding Balance	Final Maturity
2003 COP	$1,500,000	$89,003	6/25/2013
2006 Lease Purchase Agreement	$675,000	$270,000	9/28/2016

4.2.2.6 Reserves

The District maintains two separate categories for its reserve funds. Table 9.3 shows a summary of the actual or projected year end balance for each reserve fund.

The Operating Fund receives revenue from sewer service fees, solid waste franchise fees, administration fees, and other miscellaneous income. For the purposes of developing the financial forecast, a minimum fund balance of 45 days and a maximum of 60 days operating cost was established. Past practice at the District has been to keep a reserve balance sufficient for 100 days. However, due to the magnitude of the capital replacement needs and relative predictability of the District's revenues, the District could consider reducing this annual target and cash fund a greater portion of the capital program. The reduction in the Operating Fund balance will provide some needed cash for the Capital Fund as shown in Table 9.3.

The Capital Fund receives revenue from the Ad Valorem tax, residential and commercial connection fees, and transfers from the operating (general) fund. Proceeds from any future bonds or loans will also be deposited to the capital fund. The capital fund is used to fund all CIP projects including those related to rehabilitation and replacement as well as expansion. The model assumes a minimum capital fund balance for each year that is equal to one-fourth the depreciation amount in that year.

4.3 Results of Revenue Requirement Analysis

The results of the revenue requirements are summarized in Table 9.4. Annual rate increases are shown on a percentage basis. The surplus presented in Table 9.4

demonstrates the District's financial health as related to the Cash Flow and Bond Coverage Tests.

Table 9.3 Past and Projected Year End Fund Balances (before transfers out)
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

	FY 2011/12	FY 2012/13	FY 2013/14
	Actual	**District Projection**	**Model Projection [(1)]**
Operating Fund	$519,580	$612,598	$1,038,036
Days in Reserve	82	102	187
Capital Fund	$126,800	($65,596)	$2,200
Total	**$646,380**	**$547,002**	**$1,040,236**

Note:
(1) Assumes Bridge Project is funded through the FY 2013/14 SRF loan, Operating Fund reflects the 14.38% rate increase, Capital Fund projection per 05/09/2013 conversation with Steve Beall.

5.0 CUSTOMER RATE IMPACT ANALYSIS

5.1 Approach to Rate Impact Analysis

Rate development consists of two steps. First, the annual revenue requirement is determined, defining the amount of revenue that must be collected through user rates each year in order to meet the District's cash and bond coverage obligations.

A Customer Audit and Rate Evaluation was completed recently by the District (Carollo, 2011). For the CWWMP analysis, it was assumed that the findings of the rate evaluation remain accurate as the customer base and usage rates have been consistent. The user rate impacts shown in the CWWMP are escalated from rates developed in the 2011 evaluation based on the rate increases determined in the annual revenue requirement.

5.2 User Rate Categories

Under the current rate structure, user rates are assessed in two ways depending upon whether customers are classed as residential or commercial. Residential customers pay a flat rate regardless of their usage amount. Commercial customers pay the greater of the charges based on their water usage, or the minimum charge per year. Unit charges per hundred cubic feet (hcf) of water usage are assigned to each commercial account based on the type of business holding the account. Current and historic sewer service rates are and rate increases are located in Appendix B.

Table 9.4 Cash Flow Summary FY 2013/14 Through FY 2022/23
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Ref	Description	FY 2013/ 2014	FY 2014/ 2015	FY 2015/ 2016	FY 2016/ 2017	FY 2017/ 2018	FY 2018/ 2019	FY 2019/ 2020	FY 2020/ 2021	FY 2021/ 2022	FY 2022/ 2023
Revenues[(1)]											
1	Proposed Rate Increase	14.38%	10.00%	10.00%	8.75%	6.00%	5.00%	3.00%	3.00%	3.00%	4.00%
2	Sewer Service Fees - Residential and Minimum Commercials	$2,329,737	$2,562,711	$2,818,982	$3,065,643	$3,287,859	$3,492,444	$3,638,614	$3,790,411	$3,912,090	$4,076,859
3	Sewer Service Fees - Commercial	$81,267	$89,394	$98,333	$106,937	$114,689	$121,825	$126,924	$132,219	$136,464	$142,211
4	Senior Center	$39,772	$43,750	$48,124	$52,335	$55,475	$58,249	$59,997	$61,797	$63,651	$66,197
5	Sewer Service Fees - Contra Costa County Housing	$198,850	$218,735	$240,609	$261,662	$277,361	$291,230	$299,966	$308,965	$318,234	$330,964
6	Franchise Fee - Richmond Sanitary Service	$52,944	$54,532	$56,168	$57,853	$59,589	$61,377	$63,218	$65,115	$67,068	$69,080
7	Misc Income	$515	$530	$546	$563	$580	$597	$615	$633	$652	$672
8	Donated Capital	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
9	Revenues	$2,703,086	$2,969,652	$3,262,763	$3,544,994	$3,795,554	$4,025,721	$4,189,334	$4,359,141	$4,498,159	$4,685,983
Requirements											
10	O&M Expenditures	$1,959,258	$1,973,095	$2,039,175	$2,107,582	$2,186,925	$2,269,280	$2,354,765	$2,443,501	$2,527,774	$2,615,087
11	Debt Service	$67,500	$276,894	$633,853	$1,147,184	$1,113,434	$1,181,155	$1,387,672	$1,387,672	$1,462,420	$1,590,682
12	Coverage-Driven Requirements	$16,875	$69,224	$158,463	$286,796	$334,030	$338,314	$416,302	$416,302	$438,726	$477,205
13	Policy Expenditures	$0	$0	$0	$0	$0	$0	$0	$0	$0	0
14	Other Requirements	$0	$0	$0	$0	$0	$0	$0	$0	$0	0
15	Requirements	$2,043,633	$2,319,213	$2,831,492	$3,541,562	$3,634,389	$3,788,749	$4,158,739	$4,247,475	$4,428,919	$4,682,974
16	Revenues - Requirements	$659,453	$650,439	$431,271	$3,432	$161,165	$236,972	$30,595	$111,665	$69,240	$3,009
Accumulated Funds											
17	Operating Fund	$333,166	$369,861	$439,402	$401,313	$542,579	$567,252	$461,443	$472,384	$491,991	$518,571
18	Capital Fund[(2)]	$933,941	$732,967	$571,694	$994,810	$621,968	$603,653	$3,800,089	$3,613,839	$546,711	$2,344,969
19	Consolidated Funds	$1,350,963	$1,599,692	$1,861,311	$7,108,883	$5,186,532	$1,612,724	$5,505,453	$3,071,790	$1,747,702	$6,201,332

Notes:
(1) All user rate based revenues are post rate increase.
(2) Note that bonds which are each issued to cover three years of CIP costs are shown as being deposited into the Capital Fund.

5.3 Impact on User Rates

Though debt funding of the CIP will minimize its impact to customers, significant user rate increases will still be required as debt service and debt coverage become the strongest drivers of the District's revenue requirements.

In order to provide a smooth increase in the rates rather than a drastic jump, the District will start to increase rates prior to the first rounds of new debt service coming due in 2014/15. The largest rate increases will be implemented in the next three fiscal years (2013/14 through 2015/16). User rates will be increased 14.38 percent in the first year, followed by 10 percent increases in years two and three, a cumulative rate increase of 49 percent. As an example, the annual rate for a single family dwelling will increase from $695.40 in FY 2012/13 to $963.44 in FY 2015/16. After the initial ramp up, rate increases will still need to be implemented, but a much lower annual level.

Yearly rate increase percentages and resulting user rates for residential and minimum commercial accounts are shown in Table 9.5. A full table of rates can be seen in Appendix B.

Table 9.5 Rate Impacts and Resulting Rates
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Fiscal Year	Rate Impact Increase (%)	Resulting Annual Rate (Residential or Min Commercial)
FY 2012/13[1]	N/A	$695.40
FY 2013/14	14.38%	795.40
FY 2014/15	10.0%	874.94
FY 2015/16	10.0%	962.43
FY 2016/17	8.75%	1046.65
FY 2017/18	6.0%	1109.45

Note:
(1) FY 2012/13 included for reference, annual rate represents the adopted 1.5% rate increase.

6.0 GRANT AND LOAN ANALYSIS

The District has identified a series of projects that involve sewer, lateral, and cleanout and replacement rehabilitation work. Grant programs throughout the State are primarily used to incentivize collaboration between interested parties, to increase efficiencies, or to promote the advancement of new technologies and research. There are some grants that are issued based on financial need or ratepayer hardship. These can be identified for limited types of city or community development or enhancement projects.

The state determines financial need and ratepayer hardship by determining the Median Household Income (MHI) of the affected ratepayers and service area compared to the MHI of the entire State of California. Should the affected parties' MHI be at or below 80 percent of the state MHI, they qualify for any state endorsed grant programs that assist projects based on financial need.

Given that the District has identified projects that are primarily rehabilitation work, there are a limited number of grant resources available to assist with the implementation of those projects. The District has identified one project that may allow it to participate in the Proposition 84 Integrated Regional Water Management (IRWM) Program. Although this project is not included in the recommended CIP, teaming with City of Pinole for the Pinole Tertiary Treatment 1 mgd Expansion project has the potential to qualify the District for the millions of dollars still available to the San Francisco Bay Area Region for Round 3. The timing of the availability of these grant funds may pose constraints on the project's development.

With respect to available assistance programs, the District's projects are best suited for the Clean Water State Revolving Fund (CWSRF) loan. Within the program, there may be opportunities for reduced interest rates and extended term financing. Additionally, when capitalization funds allow, there is an opportunity to apply for a CWSRF principal forgiveness grant which is available for disadvantaged communities. When obtained, the grant will provide principal forgiveness on the executed loan contract to assist with keeping the loan repayment at or below 1.1 percent of the disadvantaged area's MHI. The current standard terms for the CWSRF loan as of March 15, 2013 are 1.7 percent interest rate over 20 years. It should be noted that these terms are subject to change throughout the year. For modeling purposes we assume a 2.0 percent interest rate over 20 years.

7.0 FINANCIAL PLAN

The CIP will be the most significant driver of the District's financial planning for the next 10 years. The relatively small size of the District's Customer base coupled with drastically increased debt funded CIP expenditures in coming years combine to make significant user rate increases unavoidable. Using the financial model, a financial strategy was developed which provides sufficient funding for operations and capital improvements while minimizing the impact to District customers. A detailed description of the financial plan follows below.

7.1 CIP Funding

The 20-year CIP program totals approximately $37.2 million in 2013 dollars weighted heavily in years 1 through 5. In the past, capital improvements have been funded through debt, user rates, connection and capital improvement fees, developer contributions, and the District's ad valorem tax. As the District is almost entirely built out, connection and capital improvement fees and developer contributions cannot be relied upon as significant sources of future revenue. Nor does the District expect to receive grant funding for any capital projects. Therefore, all funding for the CIP program will need to be generated through user rates, the ad valorem tax, and the issuance of debt.

In order to minimize user rate increases, funding of the majority of the CIP program will require the issuance of new debt particularly in the first half of the 20-year period. A table detailing all required debt issuances is included in Appendix C. After FY 2026/27 most of the larger and more expensive improvement projects will be completed. At this time, the District will be able to fund CIP projects solely through the use of the capital fund, requiring no new debt issuances. Figure 9.1 details the capital funding strategy.

7.2 User Rate Revenues

User rates will continue to be the District's main source of operating revenue. Projected user rate revenues for FY 2013/14 through FY 2022/23 are shown in lines two through five of Table 9.4. The primary factor influencing user rate revenue increases are the proposed rate increases shown in line one of Table 9.4.

7.3 Expenditures

7.3.1 Operating and Maintenance Expenditures

O&M expenditures are assumed to increase as described in previous sections. If the CIP projects will cause significant upward or downward shifts in O&M expenditures, the District will need to adjust the model accordingly.

7.3.2 Debt Service Expenditures

The District's debt service expenditures will increase significantly due to the issuance of new debt to fund the CIP. Annual debt service will begin to increase in FY 2014/15 when the first payment of the FY 2013/14 SRF loan comes due. The increase will continue through the entire projection period as new bonds are issued. After the five years (during FY 2017/18) annual debt service will increase to approximately $1.1 million. Additionally, a coverage factor of 25 percent of that amount will be required. Annual debt service is shown in line 11 of Table 9.4. Figure 9.2 shows debt service and coverage making up a greatly increased portion of the District's required revenue as time progresses.

7.4 Reserve Funds

7.4.1 Operating Fund

The financial plan maintains the Operating Fund with minimum and maximum reserves of 45 and 60 days respectively. Projected fund balances for FY 2012/13 through FY 2032/33

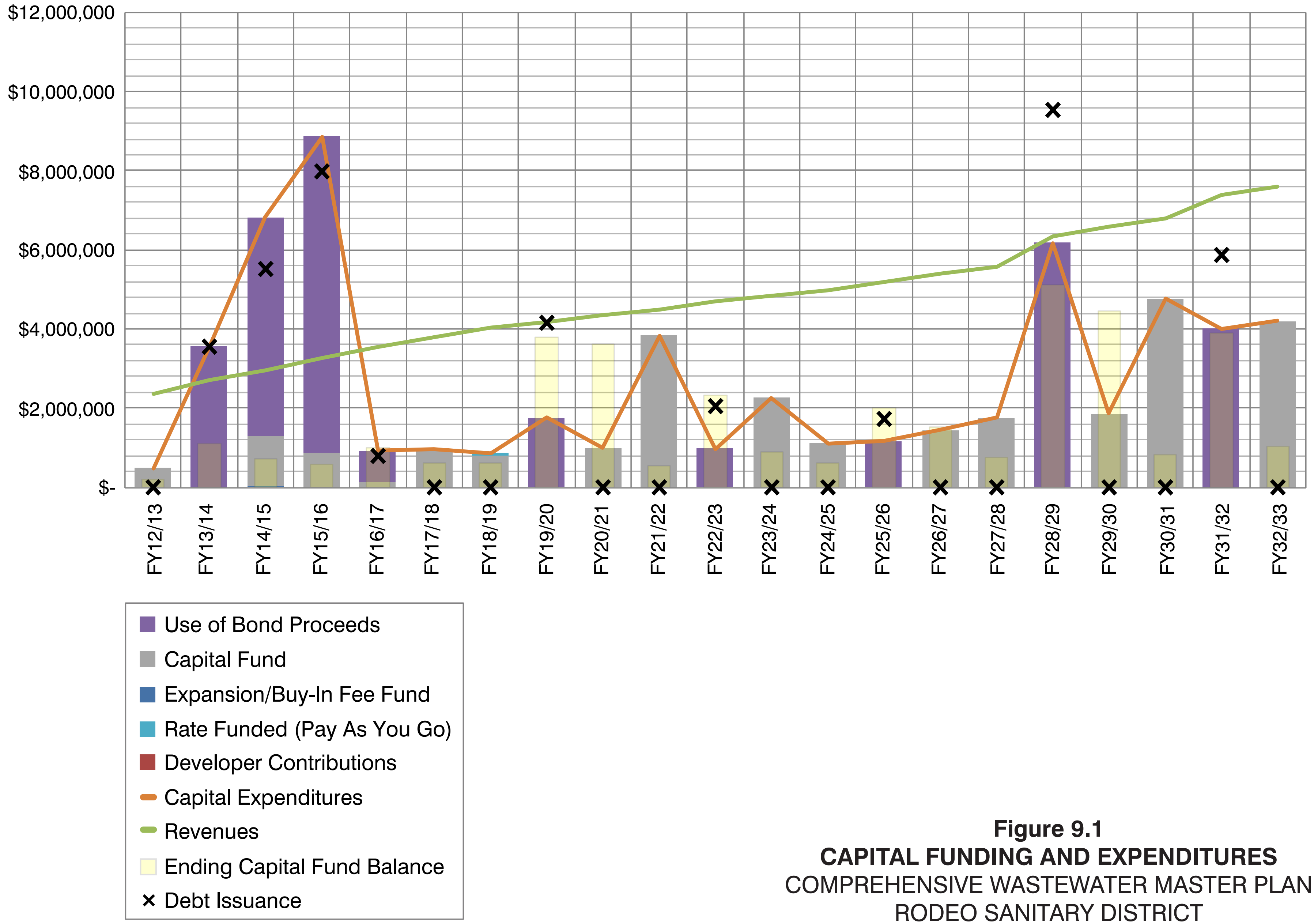

Figure 9.1
CAPITAL FUNDING AND EXPENDITURES
COMPREHENSIVE WASTEWATER MASTER PLAN
RODEO SANITARY DISTRICT

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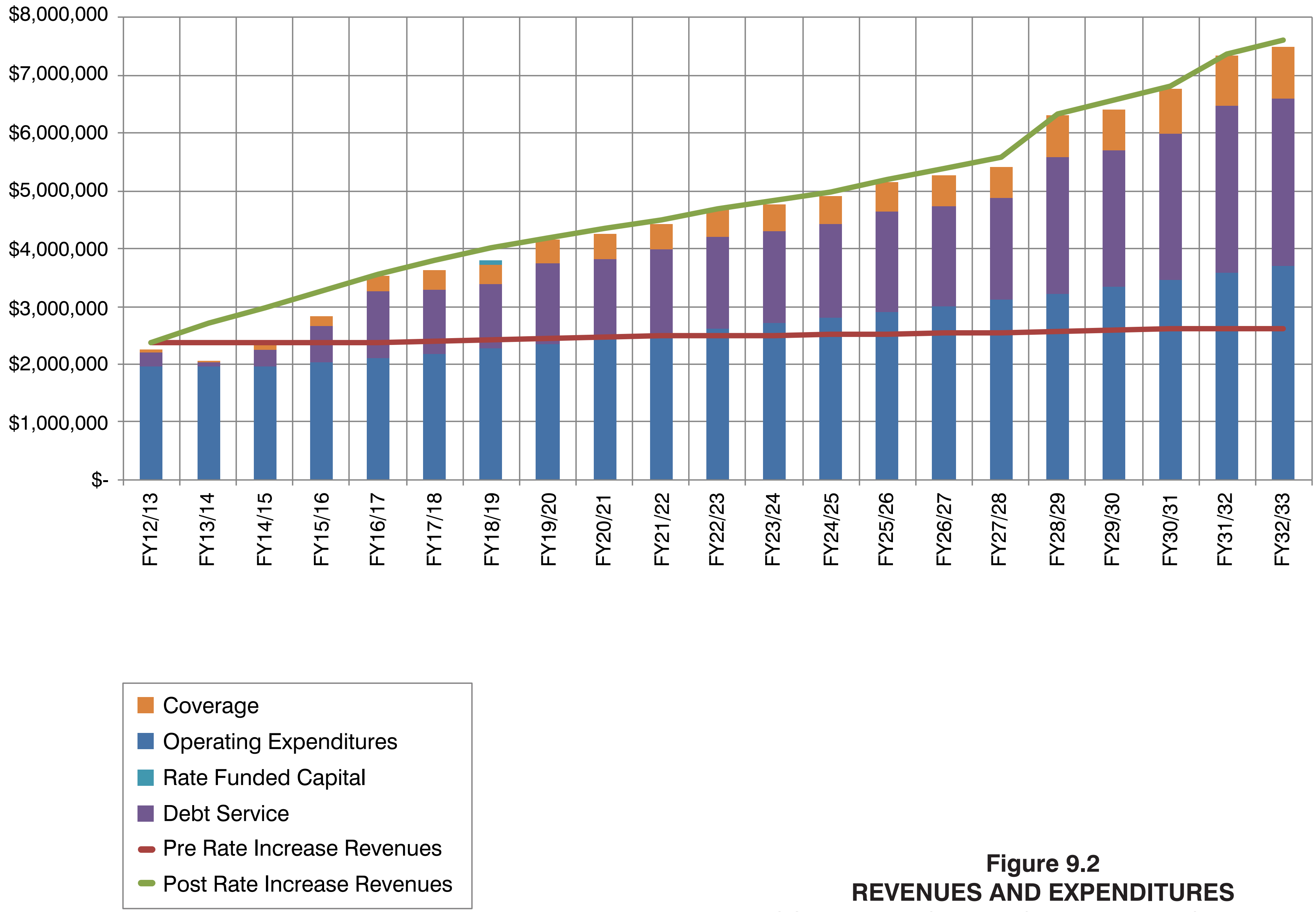

Figure 9.2
REVENUES AND EXPENDITURES
COMPREHENSIVE WASTEWATER MASTER PLAN
RODEO SANITARY DISTRICT

rsd0513f3-7540.ai

are shown in Appendix D. Should the District find the operating fund parameters used in the financial plan be either insufficient or in excess of what is required, the model will need to be revisited.

7.4.2 Capital Fund

The financial plan maintains the Capital Fund with a minimum reserve of one fourth of the annual depreciation amount. Projected fund balances for FY 2012/13 through FY 2032/33 are shown in Appendix D. Use of the capital fund for CIP projects will increase through the projection period as rate revenues increases make more cash available for the capital fund.

APPENDIX A – REVISED CIP

Table A.1 Comprehensive CIP
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Project Name	Description	Purpose	Total Project Costs[1,2]	Fiscal Year Start	Fiscal Year End
Lefty Gomez Project	The Lefty Gomez project has already been designed, and will be constructed in FY2013/14. The project involves upsizing approximately 350 LF of 6" sewer with 10" sewer, and construction of 200 LF of new 10" sewer.	Rehabilitation	$117,700	FY12/13	FY13/14
Temporary Force Main Bridge	The 16-inch force main will be relocated from the existing Rodeo Creek bridge in San Pablo Avenue to behind the pump station temporarily while the Rodeo Creek bridge is being replaced.	County Requirement	$296,400	FY12/13	FY13/14
Permanent Force Main Bridge	A new 16-inch force main will be built on the new Rodeo Creek bridge in San Pablo Avenue as part of the bridge construction.	County Requirement	$222,300	FY12/13	FY14/15
Sewer Year 1 (Capacity, I&I Basins 406 and 408)	Capacity improvements are included in Year 1 to eliminate bottlenecks in the collection system based on the peak wet weather flows. The existing collection system capacity is approximately 6.8 mgd. In order to reduce that flow by approximately 1 mgd, I&I improvements will be made to Basins 406 and 408 in the first year. These improvements include replacement or rehabilitation of all collection system sewers, laterals (from the sewer to the cleanout), and manholes.	Rehabilitation	$2,830,400	FY13/14	FY14/15
Tier 1 Seismic Evaluation	A Tier 1 seismic evaluation (American Society of Civil Engineers, ASCE 31-03, Standard Seismic Evaluation of Existing Buildings) is screening process that uses a series of checklists to determine any potential deficiencies that may need to be addressed. Deficiencies can then be implemented as part of other planned projects.	Rehabilitation	$50,000	FY13/14	FY13/14

Table A.1 Comprehensive CIP
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Project Name	Description	Purpose	Total Project Costs(1,2)	Fiscal Year Start	Fiscal Year End
Sewer Year 2 (Rehab and I&I Basin 324 Sewers)	This project will include replacement or rehabilitation of all sewers that received a PACP structural code of 4 or 5 during the CCTV inspection that occurred between 2008 and 2012 and are located in the Basins 83, south 98, and 165. As part of the recommended I&I improvements, Basin 324 will have all sewer collection system pipes repaired or replaced during the second year. Remaining capacity improvements recommended by the system modeling will also be made in this year.	Rehabilitation	$5,477,400	FY14/15	FY14/15
Influent Pump Station	With one pump out of service, the existing IPS has a reliable capacity of 3.5 mgd, which is significantly less than current peak flows from the collection system. The recommended IPS expansion project includes replacing the existing submersible pumps and drivers with horizontal chopper pumps to provide a firm capacity of 5.1 mgd. As part of the same project, near term rehabilitation improvements will be made that include equipment support replacement, a new diesel fuel tank, new grating and coating of the IPS wetwell. The 5.1 mgd PWWF depends on the success of collection system I&I improvements and capacity improvements. Based on the modeling performed by Advanced Hydro Engineering, PWWF could be as high as 6.9 mgd if I&I improvements are not successful and collection system conveyance capacity constraints are addressed so the peak flows from a 5-year, 24-hour storm reaches the WWTP. Since the influent pump station is already operating beyond reliable capacity, the project should begin immediately after the WWTP hydraulic capacity improvements have been built.	Rehabilitation/Capacity	$857,500	FY14/15	FY15/16

Table A.1 Comprehensive CIP
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Project Name	Description	Purpose	Total Project Costs[1,2]	Fiscal Year Start	Fiscal Year End
Primary Clarifier Coating and Sludge Pumps	The primary clarifier will be recoated. Primary sludge pumps 1 and 2 will be replaced.	Capacity	$82,750	FY14/15	FY14/15
ADA Compliance	This project consists of building a handicapped ramp, installing an automatic door and remodeling the bathroom to be consistent with the American Disabilities Act.	Rehabilitation	$130,900	FY14/15	FY15/16
Grit Chamber Rehab	Concrete and coating repairs will be made to the grit channel and walkway. In addition, influent slide gates will need to be replaced.	Rehabilitation	$208,100	FY14/15	FY15/16
Weir Box Closure	Primary effluent flows through the weir box in the primary clarifier area. However, the weir box no longer functions as intended. To reduce the frequent cleaning it requires, the weir box will be filled with concrete and the primary effluent pipes be directly connected with approximately 10 feet of 27-inch diameter pipe.	Rehabilitation	$26,400	FY14/15	FY15/16
Aeration Basin Conc/ Mixer	Approximately 10% of the aeration basin concrete will be repaired under this project to repair concrete cracking and spalling. The anoxic mixer in the aeration basin is currently inoperable, and will be replaced with a new submersible anoxic mixer under this project.	Rehabilitation	$232,300	FY14/15	FY15/16
Generator Lateral Supports	The generator silencer pipe requires lateral supports for restraint in case of seismic events. This project will install those supports.	Rehabilitation	$4,400	FY14/15	FY15/16
Digester Bldg Equip	The digester heating and recirculation equipment has exceeded its useful life. A boiler, two digester feed pumps, two sludge heat exchangers and a sludge recirculation pump will be installed as part of this effort.	Rehabilitation	$419,400	FY14/15	FY15/16

Table A.1	**Comprehensive CIP Comprehensive Wastewater Master Plan Rodeo Sanitary District**				
Project Name	**Description**	**Purpose**	**Total Project Costs[1,2]**	**Fiscal Year Start**	**Fiscal Year End**
Sewer Year 3 (Rehab)	This project will include replacement or rehabilitation of all sewers that received a PACP structural code of 4 or 5 during the CCTV inspection that occurred between 2008 and 2012 and are located in Basins 59, 368, 358,327, west 54 and 1/2 of 477.	Rehabilitation	$6,275,800	FY15/16	FY15/16
Arc Flash Study	An electrical system study is a detailed, system-wide analysis of the available short-circuit current, protective device coordination, and potential for arc flash. Such a study should be performed for new power distribution systems or whenever the design involves substantial changes in existing power distribution, whenever there are significant changes in motor loads or modifications to on-site power generation to verify that major electrical equipment is adequately rated, determine necessary conditions for satisfactory and reliable operation, and set any operational restrictions required for safe operation. An arc flash study will evaluate the safety of the electrical panels, and provides labeling of equipment so that operators are aware of the safety equipment required to work on a given piece of equipment.	Rehabilitation	$40,000	FY15/16	FY15/16
Sewer Year 4 (Rehab)	This project will include replacement or rehabilitation of all sewers that received a PACP structural code of 4 or 5 during the CCTV inspection that occurred between 2008 and 2012 and are located in Basin 477.	Rehabilitation	$632,500	FY16/17	FY16/17
Sludge Drying Bed 3	Sludge drying bed number three has deteriorated pavement making hauling truck maneuvering difficult. This bed will be repaired under this project.	Rehabilitation	$17,600	FY16/17	FY17/18

Table A.1 Comprehensive CIP
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Project Name	Description	Purpose	Total Project Costs[1,2]	Fiscal Year Start	Fiscal Year End
Ungrounded Elec & Security	The PG&E transformer is ungrounded, and the WWTP does not have the ground fault detection equipments required by current code for this type of system. Failure to detect and address a ground fault stresses the system and can reduce electrical equipment life or cause premature failure. This project would address those issues by replacing the PG&E transformer, the plant's main switchboard, and a service connector or raceway. In addition, this project will replace the 40-year old MCC-P1, located in the Digester Control Building as well as associated conduit, conductors, and terminators. As part of this effort, the existing SCADA alarm and security system and telephone system will be upgraded to provide automatic reporting ability, reliable alarming with detailed alarm messages, and a more reliable phone system to reduce staff time.	Rehabilitation	$527,000	FY16/17	FY17/18
Sewer Years 5 to 20 (Rehab)	Years 5 to 20 of the CIP will include replacement or rehabilitation of 1% of all sewers annually. Capital cost was spread evenly over a 16 year period.	Rehabilitation	$6,225,230	FY17/18	FY32/33
Sludge Thickening Bldg Rehab	The sludge thickening building requires sandblasting and recoating due to corrosion of the grating support beams for the mezzanine and steel monorail beams at roof level. In addition, three new roof hatches will be installed as part of this project	Rehabilitation	$53,300	FY17/18	FY18/19
Secondary Clarifier Rehab	The secondary clarifier will be recoated. The two drain valves and clarifier mechanisms will be replaced since they will reach the end of their useful life within the next 20 years	Rehabilitation	$837,500	FY18/19	FY19/20
Effluent PS & Outfall Rehab	The effluent blower, pump VFDs, and MCC for the controls will be replaced under this project.	Rehabilitation	$375,100	FY18/19	FY19/20
Replace Headworks	The headworks will reach the end of its useful life in approximately 6 years. This project includes structural replacement of the headworks and the addition of mechanical screening.	Rehabilitation	$2,885,400	FY20/21	FY21/22

**Table A.1 Comprehensive CIP
Comprehensive Wastewater Master Plan
Rodeo Sanitary District**

Project Name	Description	Purpose	Total Project Costs[1,2]	Fiscal Year Start	Fiscal Year End
Aeration Basin Coating/Blower Bldg/Blower MCC/HiOx Diffusers	While the blower building concrete was found to be in good condition, the building will be coated under this project. Three sections of the blower room MCC will be replaced. HiOx diffusers will be installed in the aeration basin to improve efficiency of the basins. Aerations basins will also be coated under this project.	Rehabilitation	$784,700	FY22/23	FY23/24
Chlorine Contact Basin Chemical Equipment	All chemical feed equipment and tanks will be replaced. This includes the 3,500 gallon sodium hypochlorite and bisulfite tanks. Two bisulfite pumps for dechlorination, three sodium hypochlorite pumps for disinfection, the chlorine contact mixer, chlorine meters, and the chemical mixing PLC will be replaced.	Rehabilitation	$424,800	FY22/23	FY23/24
Secondary Clarifier Sludge Pump Equip	RAS pump 8, WAS pump 9, and RAS pump OOS will be replaced.	Rehabilitation	$168,100	FY23/24	FY24/25
Rotary Drum Thickener/TWAS Pump	The TWAS pump and rotary drum thickener will be replaced.	Rehabilitation	$172,500	FY23/24	FY24/25
Sludge Drying Beds 1,2,4,5	Sludge drying beds 1,2,4 and 5 are anticipated to have deteriorated pavement within the next 20 years. These beds will be repaired or replaced under this project. In addition, sludge drying bed piping will be replaced.	Rehabilitation	$178,900	FY24/25	FY25/26

Table A.1 Comprehensive CIP
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Project Name	Description	Purpose	Total Project Costs(1,2)	Fiscal Year Start	Fiscal Year End
Anaerobic Digester Coating/Roof/ Flare	The digester control building roof will be replaced and the anaerobic digesters A and B recoated under this project. The waste gas flare will also be replaced.	Rehabilitation	$942,200	FY25/26	FY26/27
Nutrient Removal	It is anticipated that effluent nitrogen from WWTPs will be regulated within the next 20 years. This project has been shown in FY27/28 as a placeholder, but would only be implemented when regulations come into effect. A total nitrogen limit would require two additional aeration basins, a packaged caustic feed system, and a packaged methanol feed system. A single nutrient removal project was added that meets both total nitrogen and ammonia removal requirements. Additional land would be required for each of these components since space is limited at the WWTP.	Regulations	$3,673,500	FY27/28	FY28/29
Primary Clarifier Replacement	The primary clarifier will reach the end of its useful life within the 20-year planning period, and require complete replacement of the structure, mechanism, and piping. This will likely require acquisition of property adjacent to the WWTP from the East Bay Regional Parks District, since taking the primary clarifier out of service to rebuild is not feasible.	Rehabilitation	$1,069,800	FY29/30	FY30/31
Dewatering Rehab	Although currently in good condition, dewatering equipment will reach the end of it's useful life within the planning period. The following equipment will be installed under this project: a dewatering centrifuge, a packaged polymer feed system, and a new sludge hopper.	Rehabilitation	$373,800	FY29/30	FY30/31

Table A.1 Comprehensive CIP
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Project Name	Description	Purpose	Total Project Costs[1,2]	Fiscal Year Start	Fiscal Year End
SCADA/Surge Tank/Generator	The PLC in the administration building will be replaced. The 1,000 gallon diesel fuel tank and 1,000 gallon surge tank will be replaced under this project. In addition, the standby engine generator, which is currently 40 years old, will be replaced with a new 500 kW generator with air pollution controls to meet current regulations.	Rehabilitation	$713,800	FY29/30	FY30/31
		Total Cost	**$37,202,000**		

Notes:

(1) Costs are provided as present value in 2013 dollars based on a San Francisco Engineering News Record Construction Cost Index (ENR CCI) of 10,355. Costs are not escalated to future years.

(2) Total project cost is the estimated construction cost plus a 30 percent allowance for engineering, legal, administration, and permitting.

APPENDIX B – USER RATES AND ANNUAL RATE INCREASES

Table B.1 Historic User Rates and Increases
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

	Percentage Increase	FY 2006/07	FY 2007/08 3.2%	FY 2008/09 15.0%	FY 2009/10 3.8%	FY 2010/11 0.0%	FY 2011/12 2.8%	FY 2012/13 1.5%
Residential	**Billing Unit**							
Single Family Dwelling	Living Unit	$541.00	$558.30	$642.00	$666.40	$666.40	$685.12	$695.40
Multiple Family Units	Living Unit	$541.00	$558.30	$642.00	$666.40	$666.40	$685.12	$695.40
Mobile Homes	Living Unit	$541.00	$558.30	$642.00	$666.40	$666.40	$685.12	$695.40
Work/Live	Living Unit	$541.00	$558.30	$642.00	$666.40	$666.40	$685.12	$695.40
Commercial	**Billing Unit**							
Bars w/o Dining	100 ft3	$5.22	$5.39	$6.20	$6.43	$6.43	$6.61	$6.71
Restaurants/Food Service	100 ft3	$19.70	$20.33	$23.38	$24.27	$16.26	$16.72	$16.97
Commercial/Professional	100 ft3	$4.85	$5.01	$5.76	$5.97	$5.97	$6.14	$6.23
Laundromat	100 ft3	$4.33	$4.47	$5.14	$5.33	$5.33	$5.48	$5.57
Food Markets w/ Bakery/Deli	100 ft3	$17.92	$18.49	$21.27	$22.08	$16.26	$16.72	$16.97
Bakeries	100 ft3	$17.92	$18.49	$21.27	$22.08	$16.26	$16.72	$16.97
Food Markets w/ Bakery/Deli	100 ft3	$4.85	$5.01	$5.76	$5.97	$5.97	$6.14	$6.23
Gasoline/Service/Wrecking	100 ft3	$5.48	$5.66	$6.50	$6.75	$6.75	$6.94	$7.04
Hospitals/Clinics	100 ft3	$5.17	$5.34	$6.14	$6.37	$6.37	$6.55	$6.65
Schools/Daycare/Rec.	100 ft3	$3.57	$3.68	$4.24	$4.40	$4.40	$4.52	$4.59
Churches	100 ft3	$3.36	$3.47	$3.99	$4.14	$4.14	$4.26	$4.32
Commercial Laundries	100 ft3	$9.08	$9.37	$10.78	$11.19	$11.19	$11.50	$11.67
Minimum Charge per Year	Account	$541.00	$558.30	$642.00	$666.40	$666.40	$685.12	$695.40

Table B.2a Projected User Rate Impacts FY 2013/14 through FY 2018/19
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

		FY 2012/13	FY 2013/14	FY 2014/15	FY 2015/16	FY 2016/17	FY 2017/18	FY 2018/19
	Percentage Increase	**1.50%**	**14.38%**	**10.00%**	**10.00%**	**8.75%**	**6.00%**	**5.00%**
Residential	**Billing Unit**							
Single Family Dwelling	Living Unit	$695.40	$795.40	$874.94	$962.43	$1,046.65	$1,109.45	$1,164.92
Multiple Family Units	Living Unit	$695.40	$795.40	$874.94	$962.43	$1,046.65	$1,109.45	$1,164.92
Mobile Homes	Living Unit	$695.40	$795.40	$874.94	$962.43	$1,046.65	$1,109.45	$1,164.92
Work/Live	Living Unit	$695.40	$795.40	$874.94	$962.43	$1,046.65	$1,109.45	$1,164.92
Commercial	**Billing Unit**							
Bars w/o Dining	100 ft3	$6.71	$7.67	$8.44	$9.29	$10.10	$10.71	$11.24
Restaurants/Food Service	100 ft3	$16.97	$19.41	$21.35	$23.49	$25.54	$27.07	$28.43
Commercial/Professional	100 ft3	$6.23	$7.13	$7.84	$8.62	$9.38	$9.94	$10.44
Laundromat	100 ft3	$5.57	$6.37	$7.01	$7.71	$8.38	$8.89	$9.33
Food Markets w/ Bakery/Deli	100 ft3	$16.97	$19.41	$21.35	$23.49	$25.54	$27.07	$28.43
Bakeries	100 ft3	$16.97	$19.41	$21.35	$23.49	$25.54	$27.07	$28.43
Food Markets w/ Bakery/Deli	100 ft3	$6.23	$7.13	$7.84	$8.62	$9.38	$9.94	$10.44
Gasoline/Service/Wrecking	100 ft3	$7.04	$8.05	$8.86	$9.74	$10.60	$11.23	$11.79
Hospitals/Clinics	100 ft3	$6.65	$7.61	$8.37	$9.20	$10.01	$10.61	$11.14
Schools/Daycare/Rec.	100 ft3	$4.59	$5.25	$5.78	$6.35	$6.91	$7.32	$7.69
Churches	100 ft3	$4.32	$4.94	$5.44	$5.98	$6.50	$6.89	$7.24
Commercial Laundries	100 ft3	$11.67	$13.35	$14.68	$16.15	$17.56	$18.62	$19.55
Minimum Charge per Year	Account	$695.40	$795.40	$874.94	$962.43	$1,046.65	$1,109.45	$1,164.92

Table B.2b Projected User Rate Impacts FY 2019/20 through FY 2025/26
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

	Percentage Increase	FY 2019/20	FY 2020/21	FY 2021/22	FY 2022/23	FY 2023/24	FY 2024/25	FY 2025/26
		3.00%	**3.00%**	**3.00%**	**4.00%**	**3.00%**	**3.00%**	**4.00%**
Residential	**Billing Unit**							
Single Family Dwelling	Living Unit	$1,199.87	$1,235.86	$1,272.94	$1,323.85	$1,363.57	$1,404.48	$1,460.66
Multiple Family Units	Living Unit	$1,199.87	$1,235.86	$1,272.94	$1,323.85	$1,363.57	$1,404.48	$1,460.66
Mobile Homes	Living Unit	$1,199.87	$1,235.86	$1,272.94	$1,323.85	$1,363.57	$1,404.48	$1,460.66
Work/Live	Living Unit	$1,199.87	$1,235.86	$1,272.94	$1,323.85	$1,363.57	$1,404.48	$1,460.66
Commercial	**Billing Unit**							
Bars w/o Dining	100 ft3	$11.58	$11.92	$12.28	$12.77	$13.16	$13.55	$14.09
Restaurants/Food Service	100 ft3	$29.28	$30.16	$31.06	$32.31	$33.28	$34.27	$35.64
Commercial/Professional	100 ft3	$10.75	$11.07	$11.40	$11.86	$12.22	$12.58	$13.09
Laundromat	100 ft3	$9.61	$9.90	$10.20	$10.60	$10.92	$11.25	$11.70
Food Markets w/ Bakery/Deli	100 ft3	$29.28	$30.16	$31.06	$32.31	$33.28	$34.27	$35.64
Bakeries	100 ft3	$29.28	$30.16	$31.06	$32.31	$33.28	$34.27	$35.64
Food Markets w/ Bakery/Deli	100 ft3	$10.75	$11.07	$11.40	$11.86	$12.22	$12.58	$13.09
Gasoline/Service/Wrecking	100 ft3	$12.15	$12.51	$12.89	$13.40	$13.80	$14.22	$14.79
Hospitals/Clinics	100 ft3	$11.47	$11.82	$12.17	$12.66	$13.04	$13.43	$13.97
Schools/Daycare/Rec.	100 ft3	$7.92	$8.16	$8.40	$8.74	$9.00	$9.27	$9.64
Churches	100 ft3	$7.45	$7.68	$7.91	$8.22	$8.47	$8.72	$9.07
Commercial Laundries	100 ft3	$20.14	$20.74	$21.36	$22.22	$22.88	$23.57	$24.51
Minimum Charge per Year	Account	$1,199.87	$1,235.86	$1,272.94	$1,323.85	$1,363.57	$1,404.48	$1,460.66

Table B.2c Projected User Rate Impacts FY 2026/27 through FY 2032/33
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

	Percentage Increase	FY 2026/27	FY 2027/28	FY 2028/29	FY 2029/30	FY 2030/31	FY 2031/32	FY 2032/33
		3.00%	3.00%	13.00%	3.00%	3.00%	8.50%	3.00%
Residential	**Billing Unit**							
Single Family Dwelling	Living Unit	$1,504.48	$1,549.61	$1,751.06	$1,803.59	$1,857.70	$2,015.60	$2,076.07
Multiple Family Units	Living Unit	$1,504.48	$1,549.61	$1,751.06	$1,803.59	$1,857.70	$2,015.60	$2,076.07
Mobile Homes	Living Unit	$1,504.48	$1,549.61	$1,751.06	$1,803.59	$1,857.70	$2,015.60	$2,076.07
Work/Live	Living Unit	$1,504.48	$1,549.61	$1,751.06	$1,803.59	$1,857.70	$2,015.60	$2,076.07
Commercial	**Billing Unit**							
Bars w/o Dining	100 ft3	$14.52	$14.95	$16.90	$17.40	$17.93	$19.45	$20.03
Restaurants/Food Service	100 ft3	$36.71	$37.82	$42.73	$44.01	$45.33	$49.19	$50.66
Commercial/Professional	100 ft3	$13.48	$13.88	$15.69	$16.16	$16.64	$18.06	$18.60
Laundromat	100 ft3	$12.05	$12.41	$14.03	$14.45	$14.88	$16.14	$16.63
Food Markets w/ Bakery/Deli	100 ft3	$36.71	$37.82	$42.73	$44.01	$45.33	$49.19	$50.66
Bakeries	100 ft3	$36.71	$37.82	$42.73	$44.01	$45.33	$49.19	$50.66
Food Markets w/ Bakery/Deli	100 ft3	$13.48	$13.88	$15.69	$16.16	$16.64	$18.06	$18.60
Gasoline/Service/Wrecking	100 ft3	$15.23	$15.69	$17.73	$18.26	$18.81	$20.41	$21.02
Hospitals/Clinics	100 ft3	$14.39	$14.82	$16.75	$17.25	$17.76	$19.27	$19.85
Schools/Daycare/Rec.	100 ft3	$9.93	$10.23	$11.56	$11.90	$12.26	$13.30	$13.70
Churches	100 ft3	$9.35	$9.63	$10.88	$11.20	$11.54	$12.52	$12.90
Commercial Laundries	100 ft3	$25.25	$26.01	$29.39	$30.27	$31.18	$33.83	$34.84
Minimum Charge per Year	Account	$1,504.48	$1,549.61	$1,751.06	$1,803.59	$1,857.70	$2,015.60	$2,076.07

APPENDIX C – DEBT ISSUANCES

Table C.1 New Debt Issuances
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Year of Issuance	FY 2013/14	FY 2014/15	FY 2015/16	FY 2016/17	FY 2019/20	FY 2022/23	FY 2025/26	FY 2028/29	FY 2031/32	TOTAL
Type of Debt	**SRF Loan**	**SRF Loan**	**SRF Loan**	**Bond**	**Bond**	**Bond**	**Bond**	**Bond**	**Bond**	N/A
Term	20	20	20	30	30	30	30	30	30	N/A
Interest Rate	2.00%	2.00%	2.00%	5.25%	5.25%	5.25%	5.25%	5.25%	5.25%	N/A
Capital Funding Required	$3,355,420	$5,720,057	$7,970,926	$794,500	$4,159,368	$2,052,195	$1,727,819	$9,539,330	$5,872,702	$41,192,317
Issuance Costs	$68,478	$116,736	$162,672	$18,057	$94,531	$46,641	$39,269	216,803	133,470	$896,657
Reserve Requirement	$0	$0	$0	$90,284	$472,655	$233,204	$196,343	1,084,015	667,352	$42,088,973
PAR Amount	**$3,423,898**	**$5,836,793**	**$8,133,598**	**$902,841**	**$4,726,555**	**$2,332,040**	**$1,963,430**	**$10,840,148**	**$6,673,525**	**$44,832,827**
Total Interest Amount[1]	763,989	1,302,389	1,814,885	$986,628	$5,165,194	$2,548,460	$2,145,643	$11,846,148	$7,292,849	$33,866,186
Total Amortization	**$4,187,887**	**$7,139,182**	**$9,948,483**	**$1,889,469**	**$9,891,749**	**$4,880,500**	**$4,109,074**	**$22,686,296**	**$13,966,374**	**$78,699,014**
Annual Service[2]	$209,394	$356,959	$497,424	$63,934	$334,708	$165,142	$139,039	$767,639	$472,582	
Year of First Payment[3]	FY 2014/15	FY 2015/16	FY 2016/17	FY 2016/17	FY 2019/20	FY 2022/23	FY 2025/26	FY 2028/29	FY 2031/32	
Year of Completion[4]	FY 2033/34	FY 2034/35	FY 2035/36	FY 2045/46	FY 2048/49	FY 2051/52	FY 2054/55	FY 2057/58	FY 2060/61	

Notes:
(1) The amount of interest paid over the entire life of the debt.
(2) Annual service amount once the debt is in full repayment, bonds are expected to have 2 years of interest only payments, SRF loans have one year before payments come due.
(3) First 2 years of bond payments are interest only.

APPENDIX D – FUND BALANCES

Table D.1 Projected Fund Balances
Comprehensive Wastewater Master Plan
Rodeo Sanitary District

Fiscal Year	Operating Fund Year Ending Balance (1)	Funds Available for Capital Year End (2)	Consolidated Year Ending Balance
FY 2012/13	$361,708	$185,294	$547,002
FY 2013/14	$333,166	$933,941	$1,267,106
FY 2014/15	$369,861	$732,967	$1,102,829
FY 2015/16	$439,402	$571,694	$1,011,096
FY 2016/17	$401,313	$994,810	$1,396,123
FY 2017/18	$542,579	$621,968	$1,164,546
FY 2018/19	$567,252	$603,653	$1,170,905
FY 2019/20	$461,443	$3,800,089	$4,261,532
FY 2020/21	$472,384	$3,613,839	$4,086,223
FY 2021/22	$491,991	$546,711	$1,038,702
FY 2022/23	$518,571	$2,344,969	$2,863,541
FY 2023/24	$529,726	$895,213	$1,424,939
FY 2024/25	$545,833	$610,952	$1,156,785
FY 2025/26	$571,127	$2,007,600	$2,578,727
FY 2026/27	$584,143	$1,520,257	$2,104,400
FY 2027/28	$601,477	$758,315	$1,359,792
FY 2028/29	$689,001	$5,111,339	$5,800,341
FY 2029/30	$703,541	$4,461,005	$5,164,546
FY 2030/31	$739,766	$849,472	$1,589,237
FY 2031/32	$799,695	$3,899,950	$4,699,645
FY 2032/33	$814,900	$1,061,006	$1,875,906

Notes:
(1) Assumes an Operating Fund Balance equal to 60 days of operating costs in all years excluding FY 2016/17 where 45 days is assumed.
(2) Note that bonds which are each issued to cover three years of CIP costs are shown as being deposited into the Capital Fund.