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Integrated Long-Term Control Plan Update

Report

City of Springfield, Ohio

February 2024

STRAND ASSOCIATES®

Report for

City of Springfield, Ohio

Integrated Long-Term Control Plan Update

Prepared by:

STRAND ASSOCIATES, INC.®
615 Elsinore Place, Suite 320
Cincinnati, OH 45202
www.strand.com

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SECTION 1
INTRODUCTION

This report constitutes a Long Term Control Plan (LTCP) Update in compliance with the Combined Sewer Overflow (CSO) Control Policy, Section 402(q) of the Clean Water Act (CWA), and the City of Springfield's (City) National Pollutant and Discharge Elimination System (NPDES) Permit 1PE00007. This report has been prepared consistent with the requirements of the United States Environmental Protection Agency's (USEPA) Integrated Planning Framework and Section 402(s) of the CWA.

1.01 BACKGROUND INFORMATION

The City is located in Southwest Ohio, on the banks of the Mad River. The majority of the City is tributary to the Great Miami River, with the eastern portion of the City draining south to the Little Miami Watershed. Once a city with a population of more than 80,000, the City's population has steadily declined over the last several decades and now sits at a population of approximately 58,700. In addition to a decrease in population, the City has faced declining economic conditions with high levels of poverty, unemployment, tax delinquency, aging infrastructure, and other challenges associated with operating utilities for a legacy system.

The City is responsible for providing wastewater collection and treatment services to residents, businesses, and industries throughout its service area. Like many historic river cities, a portion of this service area is a combined system. The City has a combined sewer system (CSS) serving approximately 5,500 acres. Figure 1.01-1 presents a map showing the location of the combined sewer area, along with the City's corporate boundary, receiving streams, combined interceptor sewers, and the wastewater treatment plant (WWTP).

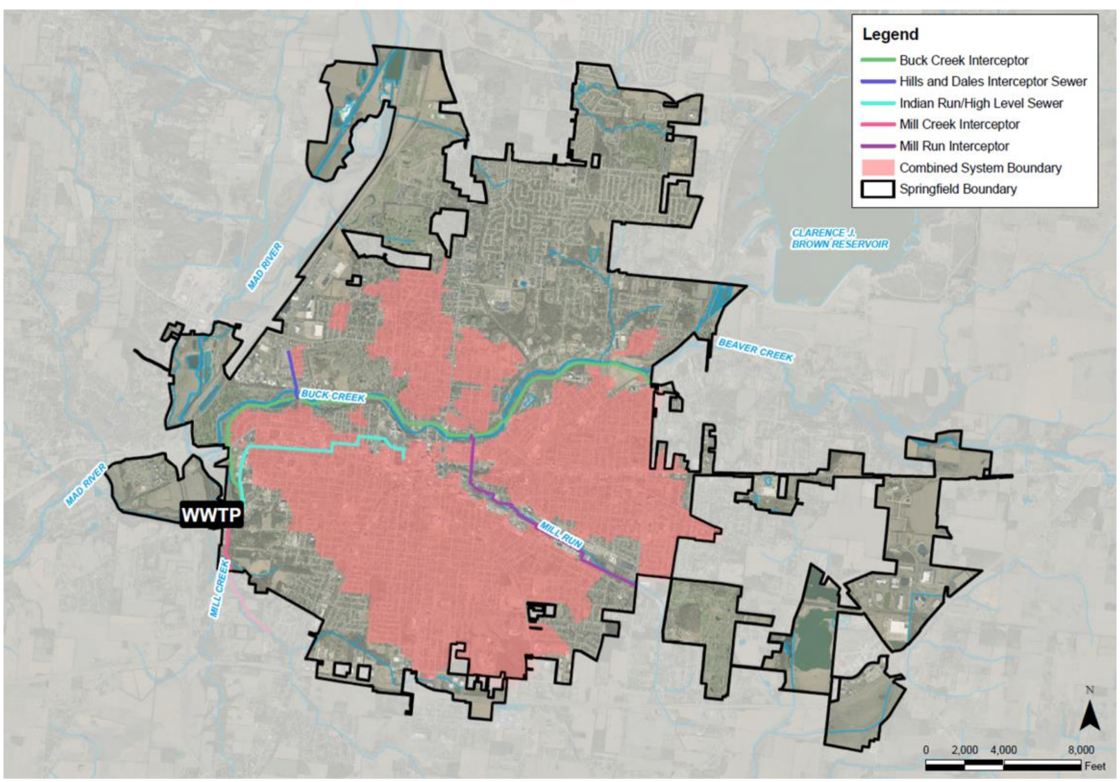


Figure 1.01-1 The City's Combined Sewer Area

The City's interceptor sewer system consists of five branches: Buck Creek, Mill Run, Indian Run and High Level, Mill Creek, and Hills and Dales interceptor branches. The majority of the combined and sanitary systems, and the interceptor sewer areas (e.g., Mill Run) eventually drain to various points on the Buck Creek interceptor, which conveys wastewater flows directly to the WWTP. Today, the City's CSS discharges approximately 455 million gallons (MG) of CSO in the typical year to local receiving streams through 55 permitted combined sewer outfalls. Since the development of the initial CSO LTCP in 2004, the City has implemented several programs and completed several projects to address CSO discharges with the goal of complying with the CSO Policy and the CWA. The following sections provide additional information on the City's completed and planned efforts for CSO compliance.

1.02 CSO CONTROL POLICY

In 1989, the USEPA published the *National Combined Sewer Overflow Control Strategy*, and in 1994, adopted the National *Combined Sewer Overflow Control Policy* (CSO Policy) that outlined an approach for CSO communities to bring CSO discharges into compliance with the requirements of the CWA.

A. Key Principles

The CSO Policy contains four key principles:

1. Provide clear levels of control that would be presumed to meet appropriate health and environmental objectives.

2. Provide sufficient flexibility to municipalities to consider the site-specific nature of CSOs and to determine the most cost-effective means of reducing pollutants and meeting CWA objectives and requirements.

3. Allow a phased approach for implementation of CSO controls considering a community's financial capability.

4. Review and revise, as needed, water quality standards and their implementation procedures when developing a LTCP to reflect the site-specific wet weather impacts of CSOs.

As noted in the CSO Policy, the basis for these key elements is to ensure that CSO controls are cost-effective and meet the objectives and requirements of the CWA.

B. Small System Considerations

In developing the CSO Policy, USEPA recognized the potential challenges for small communities to develop comprehensive LTCPs that comply with all of the elements outlined in Section II.C of the Policy. USEPA acknowledged that a "one size fits all" approach to CSO control planning was not appropriate. To address this issue, USEPA included Section 1.D in the CSO Policy, titled *Small System Considerations,* which provides the opportunity for communities with populations less than 75,000 to develop simplified long term control plans with fewer elements than larger communities.

Section 1.D of the CSO Policy–Small System Considerations states:

> *The scope of the long-term CSO control plan, including the characterization, monitoring and modeling, and evaluation of alternatives portions of this Policy may be difficult for some small CSSs. At the discretion of the NPDES Authority, jurisdictions with populations under 75,000 may not need to complete each of the formal steps outlined in Section II.C. of this Policy, but should be required through their permits or other enforceable mechanisms to comply with the nine minimum controls (II.B), public participation (II.C.2Z), and sensitive areas (II.C.3) portions of this Policy. In addition, the permittee may propose to implement any of the criteria contained in this Policy for evaluation of alternatives described in II.C.4.*

According to the 2020 United States Census, the City has a population of 58,662 and, therefore, is eligible for small system consideration under the provisions of the CSO Policy.

1.03 PREVIOUS CSO CONTROL EFFORTS

The City has undertaken several initiatives over the last two decades in order to comply with the CSO provisions of the City's NPDES permit, to more efficiently and cost-effectively reduce CSO discharges, and achieve conformance with the CSO Policy. A summary of these initiatives is provided in the following.

A. High-Rate Treatment (HRT) Unit at WWTP

The City has designed, constructed, and has been operating a 100 million gallons per day (MGD) HRT compressed media filter at the WWTP since 2015. The filter was approved by USEPA for the City as an innovative technology. To accommodate the additional solids and loading, a new headworks and bar screen, additional secondary clarifier, and primary digester that is piped to serve as a secondary digester when needed, were also designed and constructed as part of this project.

Since the HRT unit has gone online, the City's largest single CSO (001) has not activated. Before the construction of this facility, it was estimated with the 2012 hydraulic model that CSO 001 discharged approximately 177 million gallons per year (MG/year), which represented approximately 22 percent of the City's total annual CSO discharge volume. Additionally, as defined by the CSS and CSO Characterization Report dated January 29, 1999, CSO 001 represented 75 percent of the system-wide biochemical oxygen demand and 55 percent of total suspended solids (TSS) in CSO discharges.

The HRT was designed with the technology to reduce effluent TSS to 30 milligrams per liter (mg/L) (parts per million in dilute solutions). The HRT routinely meets this requirement, with an approximate running average of 15 mg/L. Also, before activation, the HRT provides approximately 1.5 MG of available storage. This feature allows the contained wastewater to return to the WWTP for full treatment after a rain event has concluded. Overall, the HRT is exceeding expectations.

B. Erie Express Sewer

The Erie Express Sewer redirects 1.8 MGD of separate sanitary flow from 21,102 acres of service area, which includes approximately 4,000 homes, 1,400 apartments, 583 manufactured homes, and 280 commercial properties, directly to the WWTP without entering the combined system. A key objective of this project was to virtually eliminate the potential for high strength wastewater to enter the Buck Creek Interceptor and overflow from the CSS and to ensure full secondary treatment for this flow.

The opinion of cost for the Erie Express project, as presented in the 2012 LTCP Addendum, was $10.4 million. However, as a result of necessary changes to the alignment and updated information on the location of bedrock along the alignment, the actual overall project cost was $25.6 million. According to the previous NPDES permit, the City was required to complete this project by October 1, 2019.

Despite the bedrock and alignment issues and increases in cost, the project was successfully completed and operating by August 3, 2018.

C. Stream Intrusion

During rain events, local streams are subject to changes in stage elevations that in some instances cause surface waters to backflow into the CSS. This situation, known as stream intrusion, can consume significant amounts of capacity in the combined sewer interceptors and dramatically impact the frequency, duration, and volume of CSO discharges. Additionally, these clean water contributions consume plant capacity, affect biological efficiencies, and add to overall operating costs.

Table 1.03-1 shows the priority CSO locations that were prone to stream intrusion and where projects have been completed.

CSO No.	Project Type
21	Installed permanent plug
55	Installed flap gate on outfall
14	Installed inline valve
24	Installed inline valve
44	Installed inline valve
56	Installed duckbill on outfall pipe
57A	Installed two inline valves
57B	Installed duckbill check valve
17	Repair headwall and install duck bill check valve
23	Repair headwall and install duck bill check valve
25	Repair headwall and install duck bill check valve
26	Repair headwall and install duck bill check valve
70	Removed outfall gates

Table 1.03-1 Completed Stream Intrusion Elimination Projects

D. Pump Station Upgrades

Historically, the City operated and maintained 13 pump stations throughout the City. The construction of the Erie Express Sewer in 2018 included the construction of the South Erie Lift Station. This new station assumed the flow of four existing stations within the system. In turn, the following four stations were decommissioned in 2018:

1. Skinner Lane Pump Station (1906 First Street)
2. Commerce Circle Pump Station (1962 Commerce Circle)
3. Hometown Pump Station (1006 Hometown Road)
4. Existing South Erie Pump Station (1860 First Street-State Route 41)

E. Line Cleaning and Televising

Table 1.03-2 summarizes the City's line cleaning and televising efforts over the last several years.

Effort	Total Over Last 5 Years (Feet)	Average Per Year (Feet)	Comment
Inspections	289,677	57,935	The City maintains a full-time CCTV crew and has 5 NAASCO certified employees.
Line Cleaning and Washing	1,435,716	287,143	The City has two full-time crews.
Root Sawing	28,301	5,660	With a full-time CCTV crew, the City is identifying more maintenance problems.
Root Treatment	62,843	12,569	The City has continued to increase the budget for this line item annually.
Degreasing	19,907	3,981	With a full-time CCTV crew, the City is identifying more areas.
Acoustic Inspection	474,227	158,076	The City began using SL-Rat Acoustic Inspection techniques in 2019.

Table 1.03-2 Line Cleaning and Televising Efforts

Additionally, the City has focused efforts along key interceptors including:

1. High Level Interceptor–The interceptor was rehabbed from the WWTP to West Main Street, approximately 4,100 feet of pipe rehabilitation, using cured-in-place techniques. Additionally, portions were open cut for point repair or internal host pipe repair. Various manholes were rehabilitated by use of a spray-applied monolithic resin liner. These efforts were completed in 2018.

2. Mill Creek Interceptor–The City recently completed substantial rehabilitation of the Mill Creek Interceptor, which included clearing trees and brush along the easement, cutting roots in pipes, cleaning sewer lines, and CCTV inspection. The initial findings of this effort show significant roots and infiltration and inflow (I/I) issues. Following cleaning and inspection of some sections, portions of this interceptor were lined in 2020.

3. Buck Creek Interceptor–The City initially budgeted $50,000 in 2017 for inspection of the interceptor from the WWTP to Plum Street. However, after significant access and other issues, the City spent nearly $415,000 for the inspection of Buck Creek. The final analysis (received December 2019) showed while the structural condition of the interceptor was in overall good condition given its age, the primary concern was the grit accumulation along the entire alignment and the high I/I issues in the upstream pipe segments. The City anticipates spending over $10 million to address the issues in the Buck Creek Interceptor as part of the planned capital improvement projects in the next 10 years.

F. <u>I/I Reduction and Rehabilitation Efforts</u>

The City currently budgets $450,000 per year for I/I removal efforts throughout the service area. Table 1.03-3 provides a summary of documented I/I reduction activities completed by the City.

Effort	Total Over Last 5 Years	Average Per Year	Comment
Pipe Lining	46,698 Feet	9,340 Feet	
Manhole Lining	1,766 Feet	353 Feet	
Pipe Patching	113	23	In 2016, the City purchased a pipe patching tool to make small sewer repairs and plug inactive sewer laterals. This is a trenchless technology using fiberglass resin-based materials.
Manhole Chimney Seals	154	31	In 2016, the City began applying manhole chimney sealant from the casting to the bottom of the cone (or bottom of adjusting rings when applicable). The product is a two-component spray-applied urethane sealant that provides a flexible seal to eliminate frame-chimney inflow.
Manhole Casting Replacements	262	52	This is an ongoing effort by the City to replace manhole lids that have pick holes with gasketed sealed lids.
Catch Basin Replacements	497	99	This is an ongoing effort to replace an entire basin that has failed or that does not have a trap.

Table 1.03-3 Completed I/I Reduction Efforts

G. <u>Modification to Weirs</u>

1. On May 26, 2016, the City raised the weir at CSO 025 from 4 to 8 inches to capture more flow.

2. On February 24, 2015, the City raised the weir at CSO 004 from 8 inches to 4.8 feet to capture more flow. DC-4 was acting as a system relief for the Buck Creek Interceptor.

1.04 IMPLEMENTATION OF NINE MINIMUM CONTROLS

The City's CSS Operational Plan documents the comprehensive program used to address the Nine Minimum Controls (NMC) for its CSS, consistent with the policies and guidance of both the USEPA and Ohio Environmental Protection Agency (OEPA). The operational plan objectives are primarily to identify opportunities to minimize CSO impacts by means of sewer system operation and maintenance, WWTP operations, and implementation of low-cost structural modifications to the system of interceptor sewers and diversion chambers, which collect wastewater from the CSS. The CSS Operational Plan was updated by the City in response to the OEPA requirements for development of an operational plan to demonstrate implementation of the NMCs.

1.05 INTEGRATED LTCP UPDATE

In order to address the requirements of the CSO Policy and the City's NPDES permit, the City first submitted a Draft CSO LTCP to the OEPA in 2004. Based on a request from OEPA, the City submitted a CSO LTCP Addendum in 2012. The proposed solutions in the Addendum focused on reducing the frequency of typical year CSO activations by constructing solutions such as tunnels, HRT facilities, and consolidation sewers.

Because of the rising costs of the proposed solutions included in the 2012 CSO LTCP Addendum, the City performed a programmatic review in 2016 to assess the efforts the City has completed and the best path forward for the City. The programmatic review included additional flow monitoring, a detailed update of the combined system hydraulic model, and a review of the City's Financial Capability Assessment (FCA).

Based on these modeling results and the City's current FCA, the City explored a range of alternatives for reducing the annual volume of CSO discharges. The objective of this effort was to comprehensively re-evaluate CSO reduction alternatives and to identify the most cost-effective approach to achieving conformance with Section 402(q) of the CWA.

In January 2019, the Water Infrastructure and Improvement Act (WIIA) (H.R. 7279) became law, adding Section 402(s) to the CWA. This purpose of this amendment was to incorporate USEPA's 2012 Integrated Municipal Stormwater and Wastewater Planning Approach Framework into the Regulation.

As stated in USEPA's Fact Sheet titled *Integrated Planning in Action–The Basics*

> *Integrated planning is a process for municipalities to achieve clean water and human health goals while addressing aging wastewater and stormwater infrastructure, changing population and rainfall patterns, and competing priorities for funding.*

The adoption of Integrated Planning principals by USEPA and Congress presented an opportunity for the City to more comprehensively and efficiently address many of the wastewater and stormwater management issues currently facing the City. This led to the development of the City's Integrated Long Term Control Plan Update (Integrated LTCP) that is presented in this document.

The Integrated LTCP incorporates a wide range of projects that reduce CSOs, manage stormwater runoff, address asset management needs of the system and reflects the financial challenges and priorities of the City.

1.06 ABBREVIATIONS AND DEFINITIONS

ACS	American Community Survey
CCTV	closed circuit television
CIP	Capital Improvement Plan
City	City of Springfield
CPH	cost per household
CSO	Combine Sewer Overflow
CSS	Combine Sewer System
CWA	Clean Water Act
DCIA	directly connected impervious area
DNR	Department of Natural Resources
EPA	Environmental Protection Agency
FCA	Financial Capability Analysis
HN	Human Nature, Inc.
HRT	High Rate Treatment
GIS	geographical information system
I/I	infiltration/inflow
LTCP	Long Term Control Plan
MHI	median household income
Mg/L	milligrams per liter
MG	million gallons
MGD	million gallons per day
NMC	Nine Minimum Controls
NPDES	National Pollutant and Discharge Elimination System
O&M	operations and maintenance
OEPA	Ohio Environmental Protection Agency
OWDA	Ohio Water Development Authority
Strand	Strand Associates, Inc.®
TSS	total suspended solids
USEPA	United States Environmental Protection Agency
WIIA	Water Infrastructure and Improvement Act
WWT	wastewater treatment
WWTP	wastewater treatment plant

SECTION 2
FLOW MONITORING AND HYDRAULIC MODELING UPDATE

2.01 INTRODUCTION

The City's collection system model was originally created with USEPA SWMM and later converted and maintained with PCSWMM. Figure 2.01-1 provides a screenshot of the model in PCSWMM. The model was previously updated and calibrated (by the City and its consulting team at the time) in 2011 to 2012 as part of a previous LTCP update. During this current Integrated LTCP update, the 2012 model and calibration was reviewed in 2015 and it was determined the model should be updated and recalibrated. Sewer drawings, geographical information system (GIS), and other supporting information was used during the model update and new monitoring data was collected for model calibration.

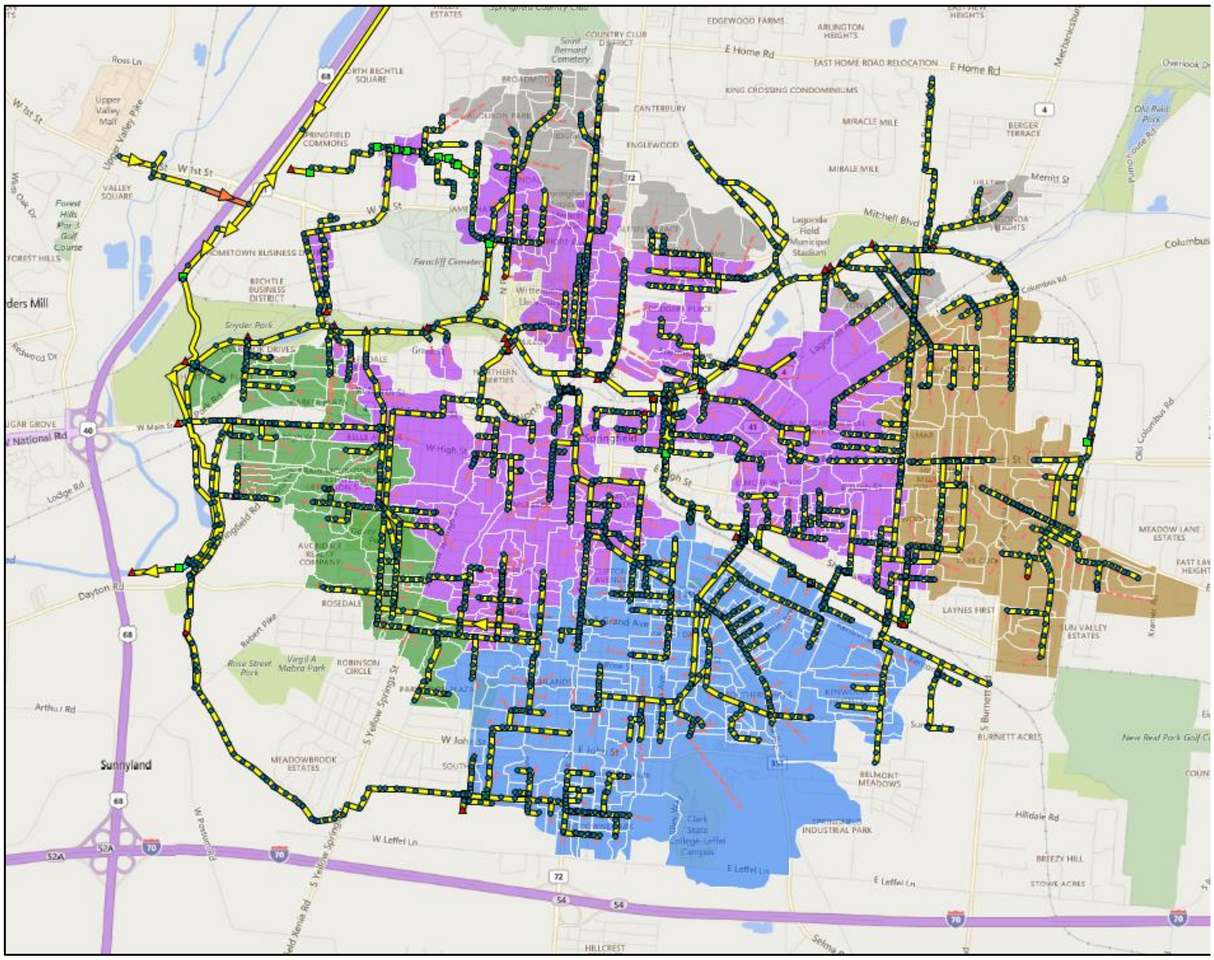


Figure 2.01-1 The City's Collection System Model (2021 Model Version)

2.02 MONITORING

The previous model calibration for the LTCP Addendum in 2012 relied on flow monitoring of the system combined sewer interceptors, which includes the Buck Creek, the Indian Run, the Mill Creek, and the Mill Run Interceptors. In addition, there was a single flow monitor in a combined sewer within the CSO 008 basin. However, as noted during previous model calibration efforts in 2012, the velocity data (and, therefore, the flow data) from this monitor was mostly unreliable. The previous calibration was dependent solely on depth data at this location. Consequently, it was unknown how well the model represented flow from the CSO 008 basin. Further, because no other flow monitors were included in any other CSO basin, it was unknown how well the model represented the CSO basin flows and overflows throughout the City.

The City initiated a substantial flow monitoring effort to better understand flows in the CSO basins, especially the larger CSO basins. In 2015, the City purchased new flow monitors and rain gauges. A total of 21 flow monitors were deployed in several CSO basins and in all the interceptors, with six rain gauges located throughout the City. The flow monitoring locations are summarized in Table 2.02-1 and illustrated in Figure 2.02-1.

FM ID	FM Locations
1	Buck Creek Interceptor near WWTP
2	Buck Creek Interceptor DS of CSO 17/18/70
3	Buck Creek Interceptor DS of CSO 22
4	CSO 41 Influent
5	CSO 42 Influent
6	CSO 70 Influent
7	CSO 08 Influent (2 Meters)
8	
9	CSO 39 Influent
10	CSO 35 Influent
11a	CSO 59 Influent
11b	CSO 82 to Orifice
12	CSO 57 Influent
13	Mill Run Interceptor (Downstream of CSO 40)
14	CSO 05 Influent
15	Sanitary Area to North
16	CSO 56
17	Mill Run Interceptor (Upstream of CSO 40)
18	CSO 12 Influent
19	CSO 82 Influent
20	Indian Run Interceptor
21	Mill Creek Interceptor

Table 2.02-1 Flow Monitoring Locations (2015 to 2016)

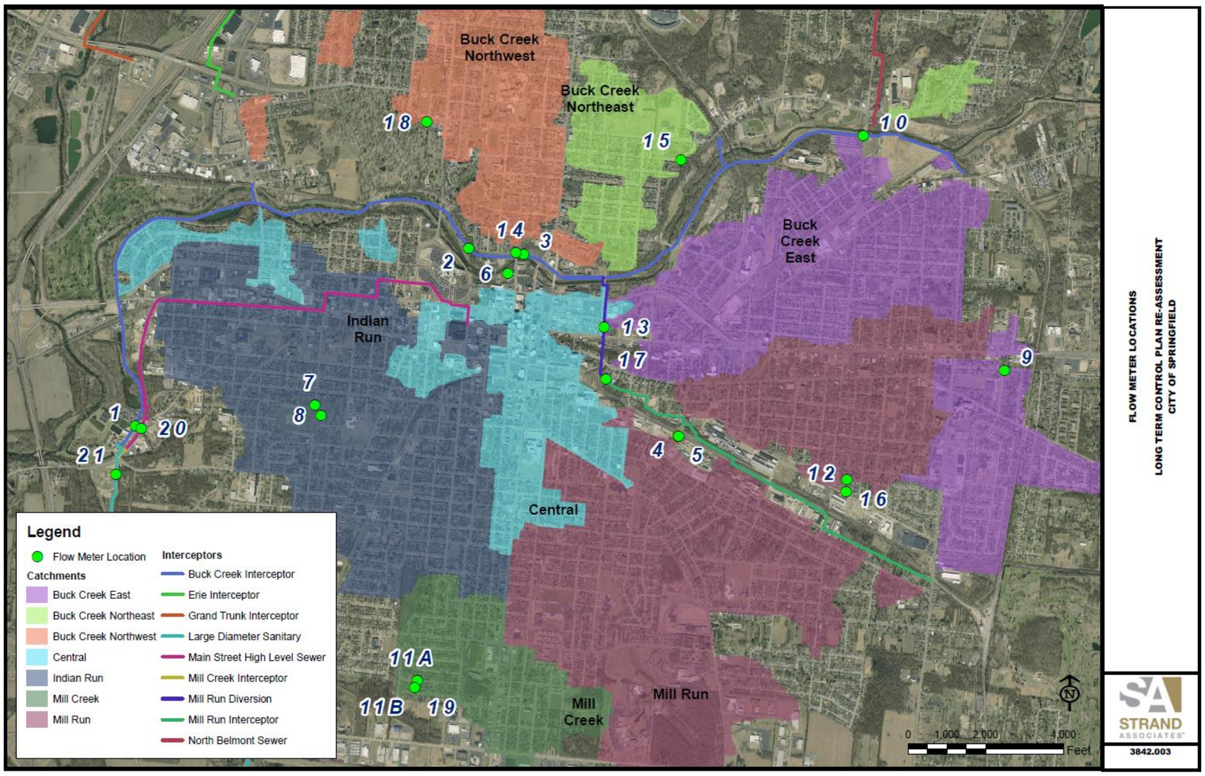


Figure 2.02-1 Flow Monitoring Locations (2015 to 2016)

The monitoring was performed for two periods, fall 2015 (September to November) and spring 2016 (March to June). The flow data from the WWTP and HRT facility was also obtained during these monitoring periods. All this data was reviewed and used to update and calibrate the model.

2.03 MODEL UPDATE AND CALIBRATION

The City's CSO system model is an important tool for evaluating the hydraulic performance of the system during a wide range of storm events. Specifically, the model provides information on peak flow rates and hydraulic grades lines in response to rainfall, and projects the frequency, duration, and volume of CSO discharges to local receiving streams during a typical year.

The model was used to evaluate CSO control alternatives and establish the recommended size of facilities. Therefore, the reliability of the model is a critical element in the development of the City's Integrated LTCP. It is important that the model accurately represents the existing sewer system in terms of pipe size, type, and location, including a reliable depiction of the diversion structures.

The City and its consultants reviewed the existing model and identified several discrepancies and incongruities. These discrepancies were corrected so that the model would better reflect current conditions. Some corrections resulted in significantly different results compared to previous modeling efforts.

A. Model Update

Modifications to the model were made to reflect CSS improvements since the 2012 LTCP Addendum, corrections to the system configuration, and needed corrections to specific hydrologic parameters within the model. A discussion of the current model updates follows:

1. System Updates

Over the past several years, the City has implemented a number of physical improvements to the CSS to improve the system functionality and reduce overflows. Changes include the construction of the HRT facility, reconfiguration of WWTP influent, construction of the Erie Express sewer and pump station, as well as changes to CSO structures (raising overflow weirs). These modifications were incorporated into the model.

2. Model Configuration Updates

Review of the model revealed several locations where a combined sewer pipe size or a regulator size was incorrect. These items were updated in the model with information from drawings, GIS, and field investigations. This included corrections to the model connections identified in the system configuration studies.

3. Model Subcatchments Assignments

Some of the subcatchments in the model were found to be assigned to incorrect outlet nodes or to orphaned nodes that were not connected to the system. In some cases, subcatchments needed to be split into multiple subcatchments, which were assigned to different CSO basins.

4. Model Subcatchments Parameters

The percentage of impervious area (rooftops and roads), directly connected impervious area (DCIA), slope, and width were updated for each subcatchment based on more current information, including LiDAR data. The DCIA and width were further adjusted during model calibration.

B. Model Calibration Update

Modifications to the model were made so that the model better represents the current configuration of the CSS. A recalibration of the model was required to account for all the updates, and a recalibration also allowed for a better understanding and representation of flows from the CSO basins. The 2015 to 2016 flow and rainfall data collected was used to calibrate the updated model. A continuous simulation was performed for the fall 2015 and spring 2016 monitoring periods. Model results were compared to monitored flow data. Several adjustments were made to the model to calibrate to monitored data. These adjustments included subcatchment DCIA and rainfall-derived inflow and infiltration (RDII) parameters to calibrate wet weather flow response. Figure 2.03-1 provides examples of the model calibration results and a comparison to the previous (2012) model. The current model results compare well with monitored flows while, for this example, the previous model overpredicts flows. Appendix A includes calibration plots for all monitoring locations.

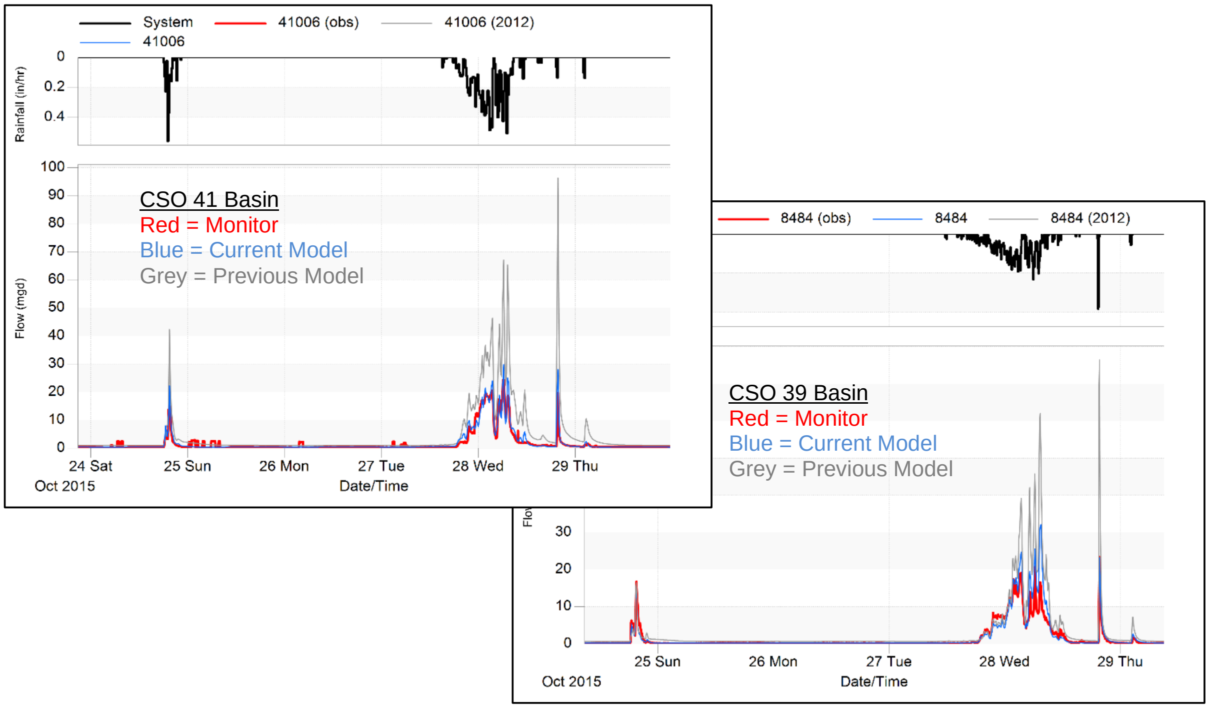


Figure 2.03-1 Example Model Calibration Plots

2.04 CSO STATISTICS

For annual CSO statistics, the City continues to use the 1981 typical year rainfall time series for the City of Columbus, Ohio, which has a comparable average annual precipitation volume and has been previously accepted by the OEPA.

The results of the model update and recalibration provide a better representation of the current overflow volume generated throughout the system. The 2012 version of the model estimated a total annual overflow volume of 789 MG. After completing the model updates and recalibration as described, the current total annual overflow volume has been estimated to be 455 MG, a reduction in annual volume of 42 percent from the 2012 model. This reduction is a result of recent system updates, such as the HRT, as well as model updates and calibration.

In addition to refining the system-wide overflow volume, the model update helped to gain better identification of where the overflow volume is being generated. These refinements better informed the alternatives analysis effort to ensure that CSO controls are properly sized and appropriately located.

Table 2.04-1 shows the changes in total projected annual CSO discharges in the system during a typical year, as well as the benefits of the HRT facility. Refer to Appendix B for individual CSO discharge and activation information. It should be noted, from a regulatory compliance perspective model output showing small volume overflows (10,000 gallons or less) may be unreliable and likely over conservative based on inherent inaccuracies in the hydraulic model.

SWMM Model Version (Year)	Total Annual CSO Volume (MG)	CSO 1 (MG)
2012	789	177
2016	504	118 (through HRT)
2021	455	174 (through HRT)

Table 2.04-1 Results of the Model Update

SECTION 3
DEVELOPMENT AND EVALUATION OF CSO CONTROL ALTERNATIVES

3.01 INTRODUCTION

The City has spent approximately $90 million on system improvements since 2012 in an effort to reduce the frequency and volume of CSOs to local receiving streams. In 2004, it was estimated that annual CSO discharges totaled between 1 and 1.4 billion gallons. Today, after significant investments in the system and controls, recent flow metering and updated modeling indicates that in a typical year, overflows from the City's combined system have been reduced to approximately 455 MG.

3.02 INTEGRATED LTCP APPROACH

USEPA's 1994 CSO Policy, which has been incorporated into the CWA as Section 402(q), requires that LTCPs be developed using a "Presumption" approach or a "Demonstration" as defined in the Policy. After evaluating both approaches and based on discussions with OEPA, it has been determined that a CSO control program based on a percent capture presumption approach represented the most feasible approach for the City. Specifically, as stated in the CSO Policy, the City's CSO control program will be based on the following regulatory metric:

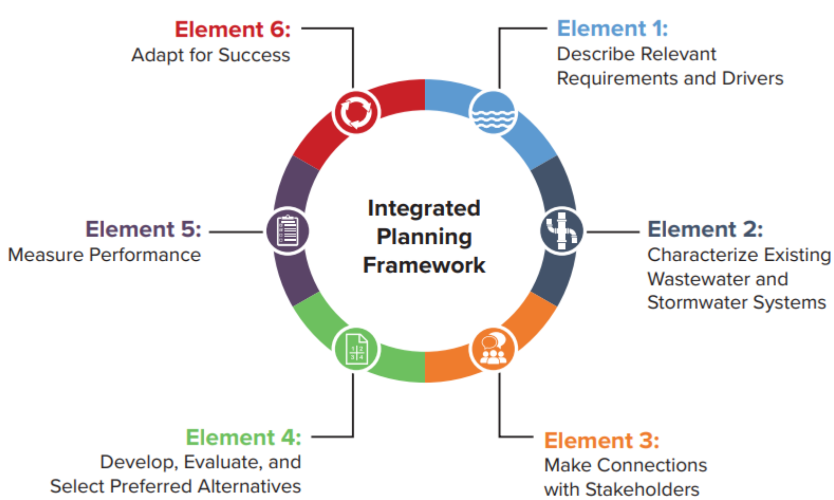
> *The elimination or the capture for treatment of no less than 85% by volume of the combined sewage collected in the CSS during precipitation events on a system-wide annual average basis.*

Integrated Plan

As discussed earlier, both USEPA and OEPA have promoted the use of integrated plans as an effective means to achieving regulatory compliance, while maximizing community benefits. The City is currently facing challenging economic conditions and significant competing demands on the City's limited financial resources including:

- Proposed CSO control projects
- Aging infrastructure requiring significant asset management investment
- Municipal Separate Storm Sewer Systems (MS4) permit requirements
- Substantial debt service for past CSO efforts

In light of these conditions, the City has elected to incorporate many of the integrated planning principles into this Integrated LTCP update. The development of the City's Integrated LTCP aligns with the six elements as presented in the adjacent graphic taken from USEPA's *Integrated Planning In Action* Fact Sheet.



A noteworthy example of the City's integrated approach involves the interaction of the City's drinking water distribution system and the CSS. Typically, these systems are managed and regulated completely independent of each other. However, it is suspected that breaks and leaks in the distribution system in the City are contributing flow into the City's CSS. Clean water flows into the combined system could be limiting the capacity of the combined system to convey wet weather flows.

To address this, the City is currently implementing a very aggressive water loss mitigation program with the hope that improvements in the water system will achieve the secondary benefit of reductions in CSOs.

Recently, the City hired a firm that uses satellite leak detection technology to identify specific locations across the service area where water may be escaping the distribution system. More than 100 potential leaks were identified, and the City is now systematically investigating each location and initiating appropriate repairs.

3.03 EVALUATION OF ALTERNATIVES FOR CSO CONTROL

As part of this update to the City's LTCP, an extensive effort was performed that evaluated a range of CSO reduction techniques including conveyance, storage, and remote treatment. The first step in this process was optimizing the storage and conveyance capacity of the existing system. For the City, the focus of this effort involved adjusting weir elevations at regulator structures and capitalizing on an existing underused large diameter sewer in the system. The second step of the alternative evaluation targeted the reduction of stormwater entering the combined system. The third and final step was to identify the additional controls required to achieve the 85 percent capture metric. A cost per gallon of CSO reduction value was an important aspect of project prioritization and selection.

A. Weir Optimization and Small–Scale Sewer Separation

Once the hydraulic model was updated and calibrated, a system optimization effort was performed that evaluated opportunities to reduce overflow volume and activations through cost-effective adjustments to the weir configurations at the regulator structures. The model provided an efficient mechanism to understand hydraulic grade lines in the system during rain events and identify locations where overflows are occurring even though the adjacent interceptor sewer has available capacity. These instances represent an opportunity to increase the elevation of the overflow weir, which allows more flow to be conveyed to the interceptor before an overflow would occur. In total, 12 weirs were recommended for adjustment. Table 3.03-1 provides a summary of the current conditions CSO activations and volumes along with the proposed conditions following the recommended weir optimizations. The anticipated systemwide benefit from the weir optimizations is approximately 6 MG in CSO reduction annually.

CSO		Current Conditions			Performance Following Optimization	
ID	Basin	Typical Year Activations	Typical Year Volumes (MG)	Potential Adjustments	Typical Year Activations	Typical Year Volumes (MG)
2	Indian Run	18	1.2	Increase regulator pipe to 18 inches and raise weir by 6 inches	4	0.10
7	Buck Creek NW	15	0.1	Raise weir by 6 inches	3	0.05
10	Central	3	0.01	Increase regulator pipe to 10 inches and raise weir by 2 inches	0	0
11	Central	5	0.02	Increase regulator pipe to 10 inches and raise weir by 2 inches	1	<0.01
14	Buck Creek NW	26	2.4	Increase regulator pipe to 18 inches and raise weir by 13 inches	5	0.39
22	Buck Creek NW	6	0.5	Increase regulator pipe to 18 inches and raise weir 2 inches	4	0.24
27	Buck Creek NE	30	1.5	Increase regulator pipe to 15 inches and raise weir 7 inches	4	0.14
37	Buck Creek East	26	0.6	Increase regulator pipe to 12 inches and raise weir 9 inches	3	0.01
46	Mill Run	8	0.4	Increase regulator pipe to 15 inches and raise weir 4 inches	2	<0.01
68	Buck Creek East	8	0.1	Increase regulator pipe to 10 inches and raise weir 2 inches	2	0.01
69	Buck Creek NE	6	0.05	Increase regulator pipe to 10 inches and raise weir 2 inches	1	<0.01
83	Mill Run	5	0.2	Increase regulator pipe to 12 inches and raise weir 4 inches	2	<0.01

Note: From a regulatory compliance perspective model output showing small volume overflows (10,000 gallons or less) may be unreliable and likely over conservative based on inherent inaccuracies in the hydraulic model.

Table 3.03-1 Current and Proposed Conditions Following Weir Optimizations

In addition to optimizing weir configurations, the City routinely evaluates the system to identify small sewer separation projects to offload or redirect stormwater flow before entering the CSS. In the last three years, the City has integrated three of these small-scale projects to completely remove runoff from the combined sewer system and provide overflow reduction:

- North Street Storm Sewer–Completed in 2020
- McCreight Avenue Separation–Completed in 2021
- West Main Street CSO 003 Separation and Elimination–Completed 2020

The benefit for these stormwater removal projects is included with the anticipated CSO reductions associated with the Integrated LTCP. However, the costs for these projects are not included in the proposed program costs because they have already been completed. The anticipated benefit from these small-scale sewer separation efforts is approximately 18 MG in CSO reduction annually.

B. <u>Fountain Avenue Tunnel</u>

A detailed review of the combined sewer system under Fountain Avenue in the vicinity of CSO 070 revealed an underused 9-foot-diameter tunnel system, nearly 2,500 linear feet long. Figure 3.03-1 provides an overview of the tunnel and project area. City staff performed a confined space entry into this segment of the sewer to inspect its condition, verify the record drawings, and confirm that this system was, in fact, a good candidate for a retrofit project to provide storage of wet weather flows in the tunnel.

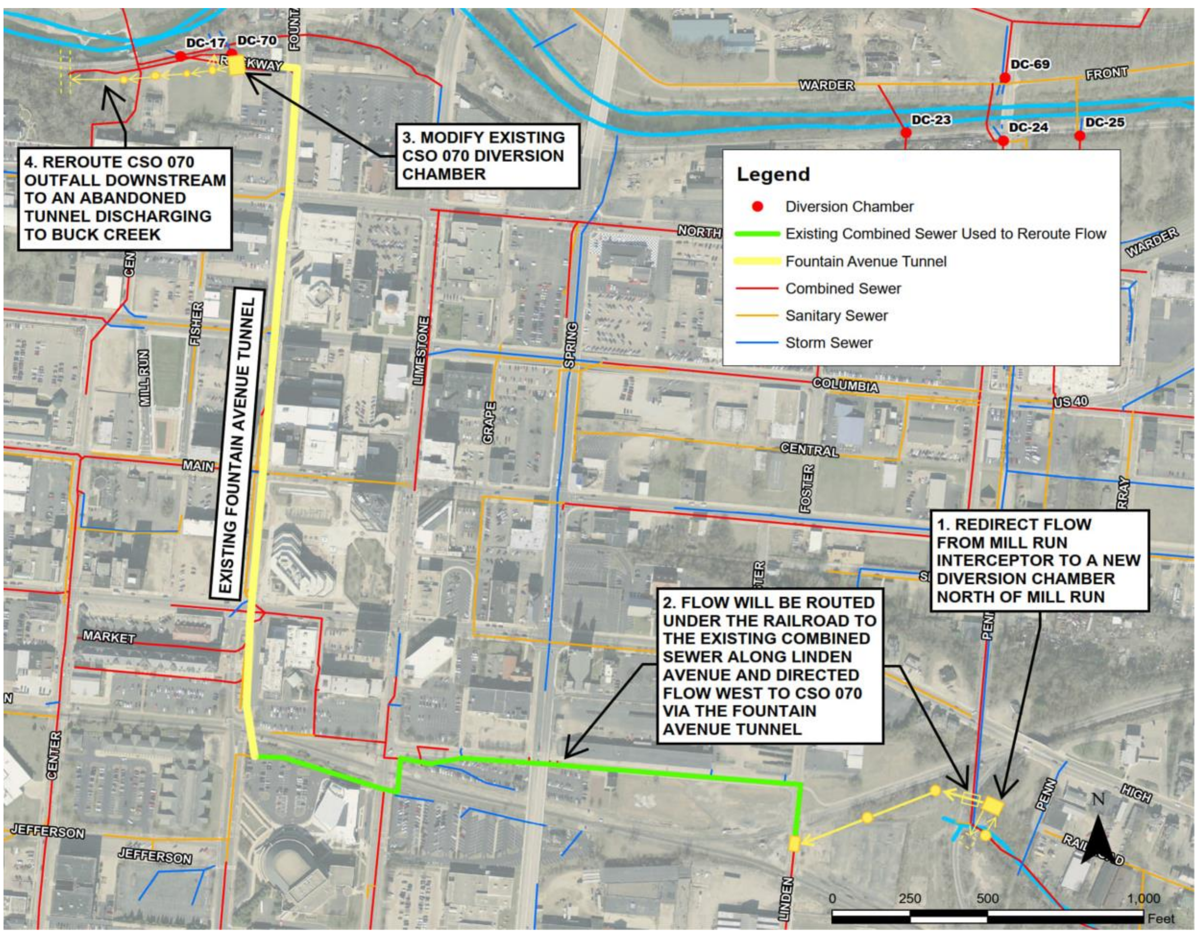


Figure 3.03-1 Fountain Avenue Tunnel Project Area and Overview

Once the field inspection confirmed that there were no unknown connections to the tunnel, a preliminary engineering analysis was performed to evaluate options to capitalize on this storage capacity. As shown in Figure 3.03-1, CSO 040 (which is the City's second largest CSO by volume and discharges approximately 58 MG/year) is located just upstream of the Mill Run tunnel and is located approximately 600 feet away from a 60-inch combined sewer that runs along Washington Street to the west of Mill Run. The 60-inch sewer ultimately connects to CSO 070, which discharges approximately 46 MG/year.

The proposed concept for the tunnel is to divert flow from the Mill Run Interceptor upstream of the CSO 040 diversion structure. This flow will be routed to the 56-inch sewer on Linden Avenue, eventually reaching the 9-foot tunnel sewer along Fountain Avenue. Weir gates will be installed at two locations along the tunnel and a new diversion chamber at CSO 070 will be constructed with screening and a higher weir wall to allow for significant storage of wet weather flow within the system. (See Figures 3.03-1 and 3.03-2). The primary outfall for CSO 070 will be relocated approximately 550 feet downstream in Buck Creek.

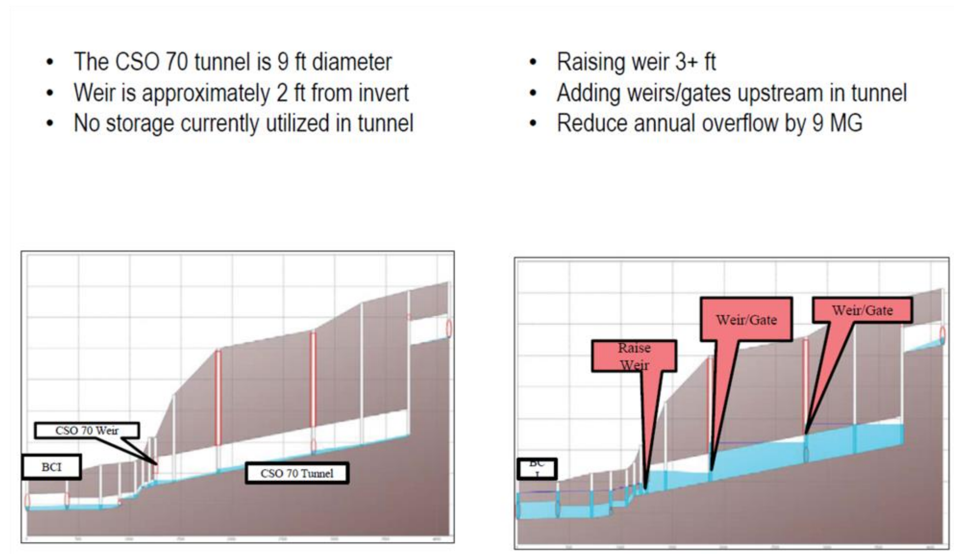


Figure 3.03-2 Inline Storage Created in Existing Tunnel System

Modeling of this proposed alternative indicates a net reduction in CSO discharges of approximately 48 MG in the typical year at a cost of $11.4 million or $0.24 per gallon. Additionally, this concept will reduce discharges from the second largest CSO (CSO 040) in the system to zero in a typical year. It is anticipated a weir or gate structure will remain at CSO 040 to allow relief if needed in larger than typical year events. See Appendix C for a specific Project Fact Sheet.

C. Sustainable Infrastructure

In 2014, the City hired the team of Strand Associates, Inc.® (Strand) and Human Nature, Inc. (HN) to perform a sustainable infrastructure evaluation of its CSS to determine whether there were opportunities to cost-effectively reduce system overflows through the use of green infrastructure, while also providing additional community benefits. The City has long supported efforts to promote green infrastructure and is one of the charter members of Tree City USA, having been a member since 1976. The City currently has nearly 16,000 street trees that intercept rainfall and help to reduce runoff throughout the City. The City of Springfield is committed to implementing additional opportunities to promote sustainable solutions to meet wet weather objectives.

As part of this effort, Strand and HN completed a comprehensive community inventory and analysis. Using available GIS information, previous reports, and information from City staff, the evaluation explored the existing and historic natural and built systems throughout the CSS in the City. Natural systems form the structure of the City's landscape and include various elements associated with hydrology, geology, and soils. Built systems are the products of urbanization and development and include transportation, sewer systems, and land cover.

The Strand and HN team completed a very detailed regional green infrastructure evaluation spanning the entire combined sewer area looking for opportunities to better manage stormwater runoff with the goal of reducing CSOs. The initial high-level assessment identified approximately 100 potential opportunities to implement green infrastructure or sustainable infrastructure practices such as:

- Detention basin retrofits
- Roadway bump-outs
- Parking lot retrofits
- Infiltration features
- Sewer separation

Subsequent screening of these potential green infrastructure projects led to a prioritization of projects based on availability of land, property ownership, neighborhood characteristics, and cost and benefit evaluations. The result of this comprehensive effort was a recommendation to include three projects in the Integrated LTCP. See Table 3.03-2 for more details. Refer to Appendix C for individual fact sheets for each project.

Project	Typical Year CSO Reduction (MG)	Capital Cost (2022$)	Cost Per Gallon
Sunset Ave Strategic Separation and Detention Basin	8	$7,140,000	$0.89
Lincoln Elementary Basin Retrofit	1	$660,000	$0.66
John Street Basin Enhancement	25	$1,480,000	$0.06
Total	**34**	**$9,280,000**	**$0.27**

Table 3.03-2 Proposed Green Infrastructure Projects

Additionally, for the first time in more than 20 years, the City is completing a comprehensive revision to the City's zoning code. A major focus of this effort is to promote the use of sustainable practices across the City. Specific changes that are anticipated include revised parking lot requirements to reduce rarely used impervious surfaces and provisions to allow depressed curbs and medians to promote green infrastructure within the right-of-way. It is anticipated that as future redevelopment occurs, the updated regulations will lead to a reduction in the volume of stormwater entering the combined system when compared to current conditions.

D. Gray Infrastructure

At the initiation of the Integrated LTCP, it was determined that the recommended plan would need to eliminate or capture for treatment an additional 203 MG of overflow in the typical year in order to achieve the desired 85 percent capture. The updated hydraulic model indicated that implementation of the previously recommended projects (weir improvements, CSO 040 and 070 tunnel, small scale separations, and the green infrastructure projects) will reduce annual overflow volumes by 106 MG.

Therefore, in order to achieve the target percent capture metric, proposed gray infrastructure improvements would need to eliminate or capture an additional 97 MG of overflow in the typical year. Additional CSO control options were then evaluated to determine the most effective projects to achieve regulatory compliance.

The gray infrastructure projects were developed and evaluated for their ability to effectively reduce the frequency and volume of CSO discharges. One of the challenges encountered in performing the alternatives analysis was that the available rainfall information collected at the Columbus, Ohio airport for the 1981 typical year was limited to hourly data. Using hourly rainfall data to size CSO control facilities creates the potential to underestimate a peak flow rate in the sewers that could occur in response to a high intensity, short duration (i.e., 5 to 15 minutes) segment of a larger rain event. For example, a rain event that registers one inch of rain in an hour may actually include a peak rainfall intensity of 0.75 inches in 15 minutes which could cause a different peak flow response in the sewer than the 1-inch event over one hour.

In evaluating CSO controls, projects that include increased conveyance or pump stations are sized based on peak flows for specific design conditions. The updated hydraulic model predicts peak CSO discharge flows for each rain event based on the available hourly rainfall data in the typical year. In an effort to address the concern of underestimating peak flows in design storm conditions, a review of more recent and more detailed rainfall information was undertaken to establish a correlation between peak hourly rainfall and peak 15-minute rainfall for a range of storm events including the 6-, 4-, 3-, and 2-month rain events.

The 15-minute peak to hourly peak ratio for each of these four storms were averaged for each CSO to develop CSO basin-specific peaking factors. These basin-specific peaking factors were then used to adjust the baseline modeled (hourly) peak discharges to better reflect an estimated instantaneous (15-minute) discharge. The baseline hydraulic modeling output with the adjusted peak flows was used to develop design criteria for sizing gray infrastructure alternatives.

1. Feasible Alternative Identification

The gray CSO control evaluation considered the following five CSO mitigation techniques.

a. Aboveground Storage

Aboveground storage tanks can be a cost-effective approach to managing wet weather flows. However, factors such as community aesthetics and land development patterns and the need for screening and influent pumping can create challenges to using this technology. Based on input from the City, aboveground storage was not considered feasible in areas that were primarily residential, adjacent to a schools or parks, in identified City gateway locations, and similar unless setbacks and visual aesthetics could be addressed.

b. Belowground Storage

Existing sewer infrastructure and available information on belowground conditions were evaluated when considering the potential of implementing below ground storage. Belowground storage was eliminated as an alternative where rock was known to be close to the grade, where available land and existing sewer depths would result in costly sheeting and excavation, or hazardous material concerns were identified based on a review of the OEPA Brownfield Inventory database and the USEPA Cleanup and Superfund databases.

c. Complete or Partial Separation

Based on City input and an evaluation of the existing infrastructure, CSO basins with strategic separation opportunities were identified. Areas with existing separate storm sewers in the upper reaches of the combined sewer catchment or basin with a logical location to intercept storm flows were evaluated for additional separation or conveyance of the existing stormwater infrastructure to a new storm sewer outfall. Distance to a potential receiving stream was also taken into consideration. Separation alternatives were also pursued for CSOs with small overflow volumes where constructing and maintaining a storage facility would be impractical.

d. Satellite HRT

Satellite HRT was evaluated for select locations based on City input, CSO flows and volumes, and distance to a potential receiving stream. HRT was considered an advantage in some cases to avoid the impact of draining stored flows back to the interceptors following a rain event.

e. Conveyance to the Existing WWTP HRT Facility

Another concept that was explored for CSOs near the WWTP was the option of conveying wet weather flows directly to the existing 100 MGD HRT system, which has available capacity.

The initial analysis also reviewed potential infrastructure siting and constructability issues in developing feasible alternatives for CSO control. Aerial photography, GIS information, and property owner information were reviewed and combined with City input on feasibility and desired development patterns to identify locations for proposed gray infrastructure facilities. Vacant lots available for purchase, City-owned properties, and community blight redevelopment opportunities were prioritized for potential CSO storage locations. This exercise was considered preliminary and was used for cost development. As the City advances any future project, the ability to obtain property may dictate the preferred solution.

2. Infrastructure Sizing

Following the initial analysis and incorporation of City input, the feasible alternatives for each location were identified. Facility sizing and costing for a range of control levels was completed in an effort to identify the most cost-effective combination of projects to achieve the 85 percent capture metric as specified in the CSO Policy. Conveyance infrastructure sizing was based on the adjusted peak flows from the hydraulic model and the assumption that the proposed pipe would be installed at a minimum slope. The storage infrastructure sizing was derived from the baseline hydraulic model overflow volumes associated with various typical year rainfall events.

Aboveground storage alternatives included influent pumping capable of handling the design peak flows with an assumed gravity discharge back to the collection system following a storm event. Belowground storage alternatives typically use gravity flow into the tank with a storage flushing system and effluent pumping station sized to drain the storage tank back to the collection system within a 48-hour period. Where the existing infrastructure and grade allowed, gravity in and gravity out storage solutions were pursued. Static influent screening was common to all storage alternatives.

Satellite HRT infrastructure was sized for the adjusted peak flows with two levels of treatment: complete and staged. Under the complete treatment alternative, the satellite HRT facility would be constructed to screen, filter, and disinfect the full peak flow. Under the staged treatment alternative, the HRT facility would be constructed to screen and disinfect the full peak flow, but the filtering equipment would be sized for 50 percent of the peak flow. Based on discussions with OEPA, the staged treatment alternative was not considered as an approvable alternative.

3. Alternative Cost Analysis and Program Selection

As discussed previously, over the past decade the City has invested approximately $90 million to reduce annual CSO discharge volumes from over 1 billion gallons to approximately 455 MG. The HRT at the WWTP was certainly the single largest contributor to this reduction. Based on an evaluation of existing conditions, the City's updated hydraulic model indicates that in the typical year, the system is currently functioning at a level of control equivalent to a 72 percent capture. It was determined that in order to achieve the desired 85 percent capture, the recommended plan would need to eliminate or capture for treatment an additional 203 million gallons of overflow in the typical year. The updated model indicated that the implementation of the weir modifications, small scale separations, the Fountain Avenue Tunnel project, and the sustainable infrastructure projects will reduce overflow volumes by 106 MG. Therefore, in order to achieve the 85 percent capture target specified in the CWA, proposed gray infrastructure improvements would need to eliminate or capture an additional 97 MG of overflow in the typical year.

Therefore, the alternatives evaluation considered a range of solutions at varying levels of control. The project costs for the different levels of control for each alternative were compared in a knee-of-the-curve analysis and a cost per gallon captured for each alternative was assigned to quantify cost-effectiveness between alternatives and incremental benefits between the different levels of control. The objective of this exercise was to determine the projects that would achieve conformance with the CSO Policy as cost-effectively as possible. Refer to Appendix D for the knee of the curve analysis for these two projects which assisted in selection of the target level of control for each location.

Significant coordination occurred between the City and OEPA throughout the development of the Integrated LTCP approach and the evaluation of alternatives. Factors such as CSO reduction, constructability, and costs were considered. Based on detailed discussions with OEPA the recommended projects to achieve the 85 percent capture metric were selected. See Table 3.03-3.

Type of Facility	Typical Year CSO Reduction (MG)	Capital Cost (2022$)	Cost Per Gallon
Large Diameter Conveyance to WWTP	36	$25,600,000	$0.71
Satellite HRT Facility	61	$43,500,000	$1.21
Total	**97**	**$69,100,000**	**$0.90**

Table 3.03-3 Gray Infrastructure Project Selection

Additionally, the City and OEPA reviewed additional projects from the alternatives evaluation to determine if a higher level of control could be cost effectively achieved. A variety of projects were explored, and it was determined the next most feasible project to consider was a 0.7 MG storage tank at CSO 019. This project would increase the Integrated LTCP's percent capture to approximately 85.3 percent at a cost of $11.3 million (2022$).

Additional discussions with OEPA confirmed that the cost and benefit of this storage facility did not warrant inclusion of this project in the Integrated LTCP at this time. However, the City and OEPA will continue to explore opportunities for additional grant money or outside funding sources to finance additional CSO control efforts. Should outside funds become available, the belowground storage project at CSO 019 would be a likely candidate for implementation.

3.04 RECOMMENDED INTEGRATED LTCP

Following the detailed alternatives evaluation outlined above, the City proposes the following projects as outlined in Table 3.04-1 for the Integrated LTCP. Note, the small-scale separation projects have been performed by the City over the last several years during the development of this plan. Therefore, the benefit of these efforts has been included in Table 3.04-1. However, as this money has already been spent, the costs of these projects are not shown in the proposed program. The City will continue to identify and implement small scale separation projects to improve the performance of their system.

Project	Typical Year CSO Reduction (MG)	Capital Cost (2022$)
Weir Optimization	6	$2,300,000
Small Scale Sewer Separation	18	Previous Expenditure
Fountain Avenue Tunnel	48	$11,400,000
Sunset Ave Strategic Separation and Detention Basin	8	$7,140,000
Lincoln Elementary Basin Retrofit	1	$660,000
John Street Basin Enhancement	25	$1,480,000
Large Diameter Conveyance to WWTP	36	$25,600,000
Satellite HRT Facility	61	$43,500,000
Total	**203**	**$92,080,000**

Table 3.04-1 Recommended Integrated LTCP

SECTION 4
FINANCIAL CAPABILITY

4.01 FINANCIAL BACKGROUND

Since 2012, the City has invested approximately $90 million on projects and activities targeting the reduction of CSOs. The City continuously completes projects and programs such as sewer and manhole lining, impervious area removal, small inlet and sewer separations, and stream intrusion efforts to reduce the amount of runoff or groundwater entering the CSS. In 2015, the City completed the construction of the Wet Weather and Capacity Improvements project at its WWTP, including the HRT, for approximately $60 million, and in 2018 it completed the Erie Express sewer project at a cost of just over $25 million. These projects collectively achieved significant CSO reduction and improved the performance of the City's system. In a period of low inflation however, both of these projects saw significant cost increases compared to the originally anticipated opinions of cost and the combined cost. These two projects, combined with other current loan obligations have left the City with significant debt service payments of approximately $5.6 million per year through 2034 (approximately 25 percent of the annual budget), followed by $1.8 million per year through 2042 (approximately 8 percent of the annual budget). These payments, coupled with other debt service payments for smaller system improvements, along with the overall cost of operating and maintaining the existing system and the current economic conditions in the City, place a significant financial burden on the City. Annual debt service payments are shown later in Figure 4.01-1.

As a result of these major capital expenditures, the City Commission has approved multiple sewer rate increases ranging from 2 to 17 percent since 2012. These increases equate to a 95 percent increase in a sewer rates between 2012 to 2022. Additionally, the Commission approved an increase in stormwater rates from $1.30 to $2.25 per Equivalent Stormwater Unit in 2021, followed by increases to $2.50 in 2022, $2.75 in 2023, and $3.00 in 2024. More recently, the City Commission approved annual sewer rate increases of 2 percent for a three-year period from 2022 through 2024. However, despite these rate increases, total annual sewer revenues continue to decline. Loss of population (i.e., rate payers), loss of industry, decreasing income, high poverty rate, reduced flow technologies, and water conservation efforts by the City's largest customers all contribute to this phenomenon.

The City's community continues to experience significant economic challenges that are impacting all the City's departments and services. The following data and trends illustrate the economic challenges:

- The City's population has continued to decline since 2010, while the State of Ohio population has increased.
- The City continues to see a rise in the need for indigent burials.
- The City accounts for 0.5 percent of Ohio's population, but 3.4 percent of Ohio's homeless population (November 2020).
- The homelessness rate in Ohio is 0.09 percent, but 0.62 percent in the City (November 2020).
- The number of homeless children who lack a regular residence increased from 274 students during the 2018 to 2019 school year to 479 students during the 2020 to 2021.
- The City is the 15th poorest of 612 school districts in the State of Ohio (2019) and every child in the district receives free breakfast and lunch.
- A 2019 Housing Market Analysis in the City found 27 percent of households are cost-burdened, meaning they spend more than 30 percent of their income on housing.

Additionally, based on information from the United States Census Bureau, the City's median household income (MHI) and poverty rates continue to show worse than the state and nationwide trends.

- Current MHI: $42,131 (American Community Survey [ACS] 2021)
    - 32 percent lower than Ohio ($61,938)
    - 39 percent lower than the United States ($69,021)
    - Lowest Quintile (upper limit)–$18,453
    - Second Quintile (upper limit)–$33,985
- Current income per capita: $22,968 (ACS 2021)
    - 33.5 percent lower than Ohio $34,526
    - 39.7 percent lower than the United States $37,638
    - Comparable to Cleveland $23,415 (Second poorest big city in the United States)
- Current poverty rate: 22 percent (2021 ACS)
    - Ohio is 13.4 percent
    - United States is 11.6 percent
    - Approximately 30 percent of the minority population falls below the poverty line
    - Approximately 35 percent of single mother households fall below the poverty line

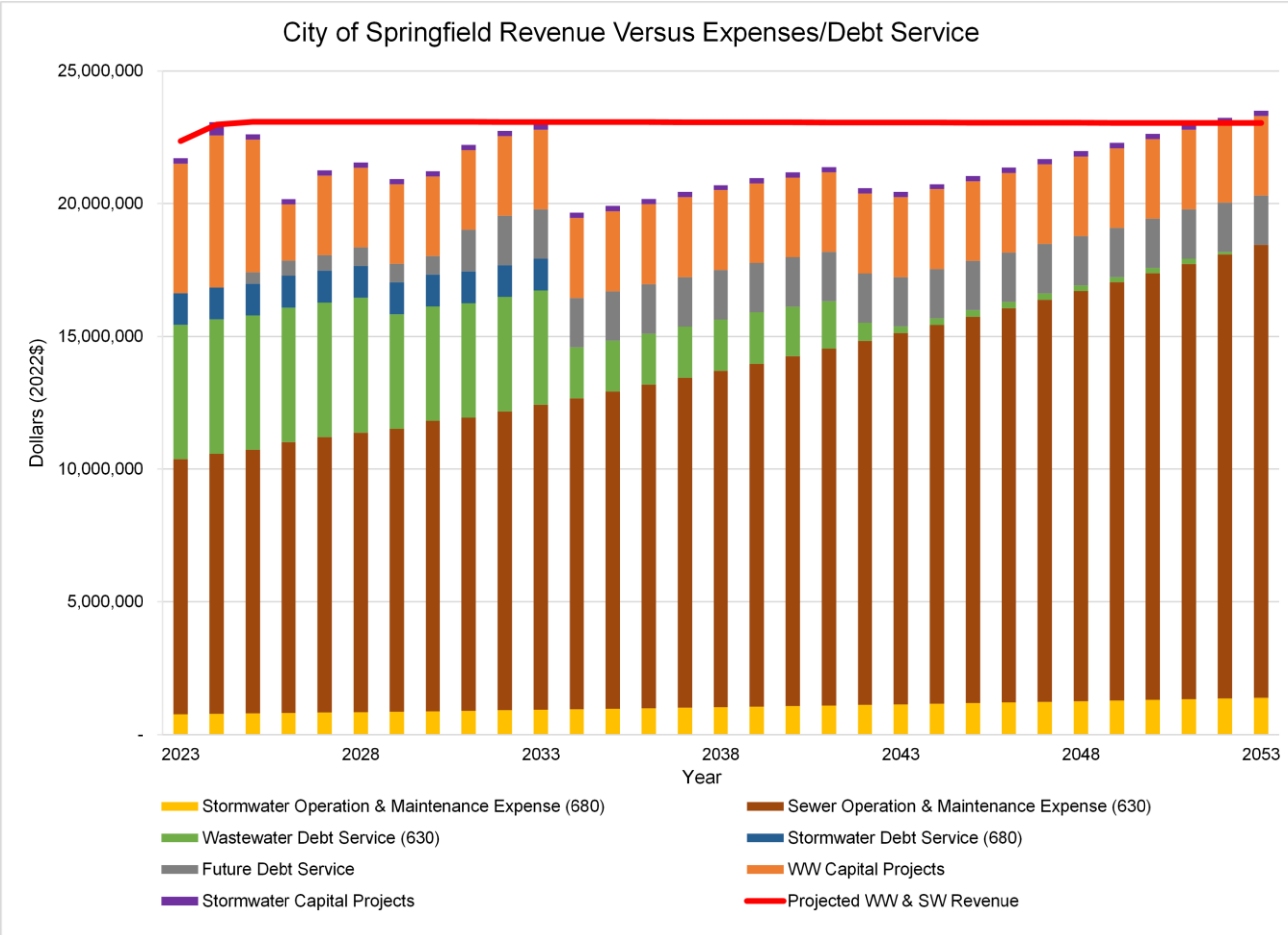
These above-referenced economic conditions of both the City and its residents, all of which are negative, require a high degree of caution in deciding what future financial obligations are within the City's financial capability and the affordability of its residents.

The City performed a detailed analysis of the anticipated revenue versus expenses over a 31-year period, including anticipated wastewater and stormwater costs for staffing, operations and maintenance (O&M), capital costs, and debt service. Budget projections for future years include the following assumptions:

- Sewer operations costs–Increase by 2.0 percent per year*
- Stormwater operations costs–Increase by 2.0 percent per year*
- Wastewater Capital Improvements allowance–Current anticipated cost per year from 2023 through 2031 followed by $3 million per year for wastewater projects starting in 2032
- Stormwater Capital Improvements allowance–Current anticipated cost per year from 2023 through 2031 followed by $200,000 per year for stormwater projects starting in 2032
- Debt Service–Actual current debt service through 2053
- Future Debt Service–Actual Proposed General Obligation and Ohio Water Development Authority (OWDA) Debt
- Rate Adjustments–Legislated rate adjustments of 2 percent per year through 2024, then remains flat

*Current inflation trends could significantly impact this assumption.

The chart in Figure 4.01-1 highlights the City's current anticipated revenue versus expenses based on the above assumptions. A review of this chart shows there is little capacity in the budget for large expenditures and the total available funds over from 2023 through 2053, is just over $50 million (2022$).



Note: The revenue projections after 2024 are depicted in constant dollars.

Figure 4.01-1 Current Revenue Versus Expenses

4.02 PROPOSED INTEGRATED LTCP

The City's Integrated LTCP represents a significant investment by the residents and businesses served by Springfield's sewer system. It will have far-reaching impacts on the finances of the City and its ratepayers. Therefore, as the City moves forward with defining a financial commitment for the Integrated LTCP, its goals include balancing the social, environmental, and economic needs of the City. Related City objectives with economic implications include:

- Maintain costs within the City's financial plan and restraints.
- Organize, plan, and conduct work to produce projects that are cost-effective.
- Integrate stormwater and CSS solutions, where effective.
- Schedule investments that provide maximum tangible benefit to the people of the City.
- Select investments that integrate with other City projects to provide for a higher quality of life and economic development.

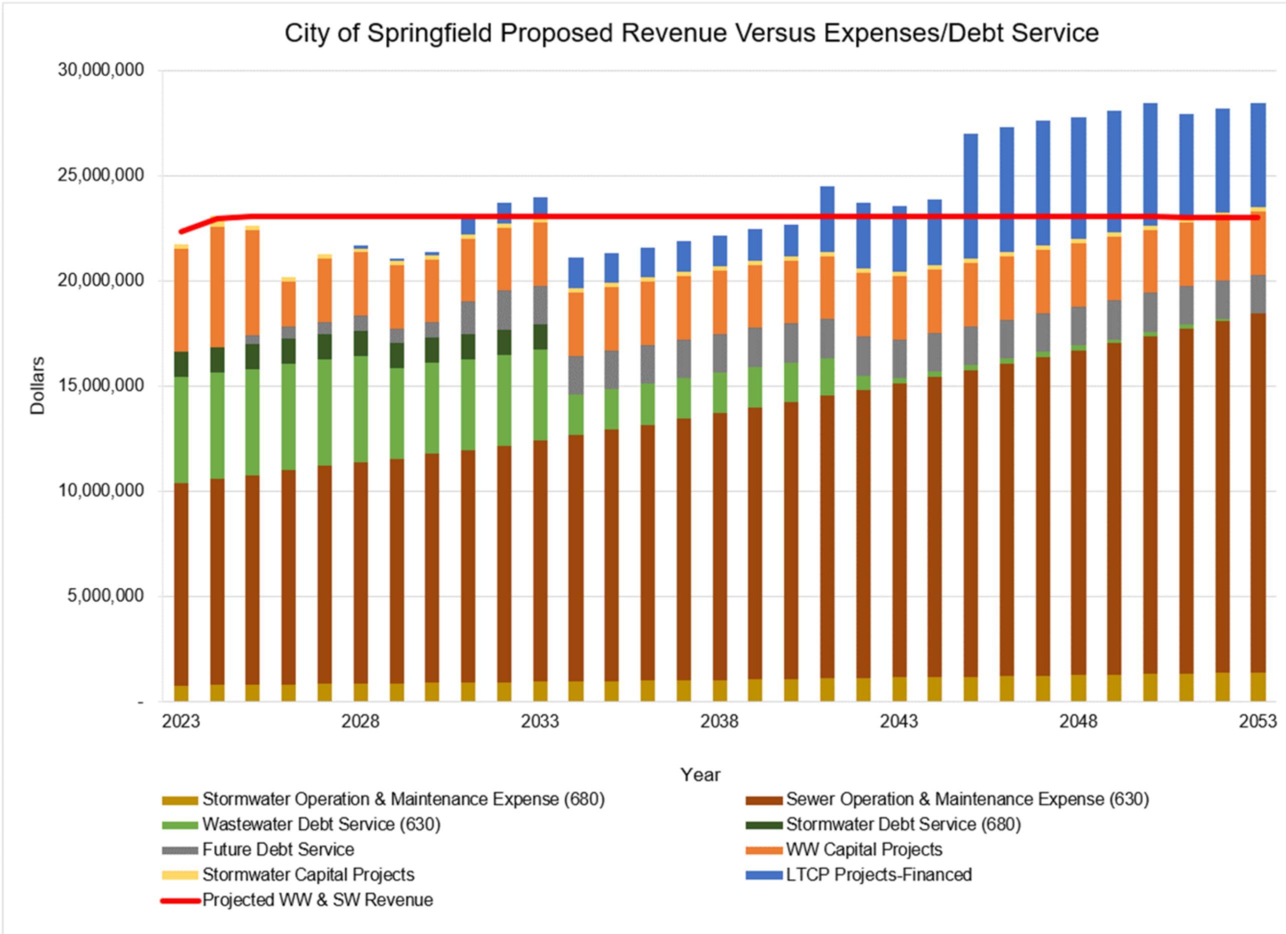
The City's Integrated LTCP includes proposed improvements totaling just over $92 million (2022$) to meet the CSO reduction objectives of the City's permit. Following a review of the current revenue versus expenses of the sewer utility and the City's current financial situation, it is anticipated that the majority of funding to implement the Integrated LTCP will come from state issued loans.

In order to determine the anticipated payback years for each of the proposed projects, the City developed an anticipated implementation schedule for planning, design, and construction for each of the Integrated LTCP Projects. The specific implementation plan can be found in Section 5. For the purposes of including these projects in the City's future financial projections, it has been assumed Year 1 of implementation will be 2025. Table 4.02-1 summarizes the proposed Integrated LTCP projects, the estimated project capital cost, and the anticipated start year of debt service payments for each project. For planning and project implementation purposes, the weir modifications have been grouped into a single project.

Project	Capital Cost (2022$)	Start of Debt Service Payment
Weir Optimization	$2,300,000	2028
Fountain Avenue Tunnel	$11,400,000	2031
John Street Basin Enhancement	$1,480,000	2031
Sunset Avenue Strategic Separation and Basin	$7,140,000	2034
Lincoln Elementary Separation and Basin	$660,000	2037
Large Diameter Conveyance to WWTP	$25,600,000	2041
Satellite HRT Facility	$43,500,000	2045

Table 4.02-1 Anticipated Debt Service Payment Periods for Integrated LTCP Projects

The City updated the revenue versus expenses analysis to include the additional costs of the proposed Integrated LTCP. See Figure 4.02-1. All of the assumptions for projected future costs remained the same other than Integrated LTCP Projects Financed element, shown as the blue bar in the graphic, which assumes a 20-year loan at 4 percent with payments starting 6 months after construction completion for each of the proposed projects.



Note: The revenue projections after 2024 are depicted in constant dollars. For the purposes of including the Integrated LTCP projects in the City's future financial projections it has been assumed Year 1 of implementation will be 2025 and all Integrated LTCP projects will be debt financed.

Figure 4.02-1 Integrated LTCP Implementation Revenue Versus Expenses

Based primarily on affordability and cash flow, but also considering the City resources needed to administer and manage large capital projects, the City initially recommended a 31-year implementation schedule. After discussions with OEPA, the Agency directed the City to develop an Integrated LTCP schedule showing completion of all projects within 20 years.

However, it was agreed that the City's Integrated LTCP should be structured to include an adaptive management provision that will allow the City to revisit the proposed projects and schedules after the first 10 years of program implementation to evaluate the progress of the projects, the costs incurred, and the local economic situation to determine whether the 20-year schedule remains a realistic target. At that time, the City will initiate a dialogue with OEPA and collaborate on any revisions to projects and schedules that are deemed warranted because of changing conditions.

This adaptive management approach is consistent with USEPA's Integrated Planning Framework which includes:

> *A process for identifying, evaluating and selecting proposed new projects or modifications to ongoing or planned projects and implementation schedules based on changing circumstance.*

Additionally, revisiting the Integrated LTCP at the 10-year mark is consistent with the CSO Policy's opportunity for a "phased approach" which states a key principal is:

> *Allowing a phased approach to implementation of CSO controls considering a community's financial capability.*

Based on the current economic conditions and the uncertainty regarding future project costs, equipment availability, labor shortages, and extremely high inflation, committing to a regulatory program with a firm schedule spanning 20 years is challenging at best.

Factors to be considered in this evaluation will include the costs and schedule of projects completed during the first 10-year period, local economic conditions, the construction market, and availability of loan and grant dollars.

Substantial expenditures for significant improvements will still be needed outside of the proposed Integrated LTCP projects. The City's aging infrastructure will continue to be a strain on its financial condition and will need to be considered as the Integrated LTCP projects move forward, and the City's available funding is evaluated on an annual basis to address both sanitary and stormwater infrastructure asset management and capital needs.

4.03 FCA

Conducting a FCA provides insight to the City regarding the overall affordability of the Integrated LTCP and provides a basis for balancing the scope and timing of projects with the financial capabilities of the City and the customers served by the City's sewer system.

The FCA was completed in accordance with applicable EPA Guidance, particularly the 1997 document entitled *CSO Guidance for Financial Capability Assessment and Schedule Development* ("Guidance") EPA's FCA Framework, issued in November 2014, and EPA's more recent document *2021 Financial Capability Assessment Guidance*, issued in January 2021.

While the FCA is certainly not a comprehensive evaluation of the economic burden that implementation of the Integrated LTCP will have on the rate base, it does represent a standardized approach for understanding the financial impact on the average residential user and generally considers the fiscal health of the community as a whole. However, Springfield has numerous unique economic factors that are difficult to incorporate into standardized FCA worksheets.

In an effort to understand the affordability of the proposed Integrated LTCP, the City calculated the cost per household (CPH) and residential indicator for the City consistent with the above referenced guidance.

A. CPH

The City's Service Area encompasses the entire City except a few small undeveloped areas. In addition to serving its own residents, the City provides retail service to some surrounding unincorporated areas that include several apartment complexes and mobile home parks, along with some single-family homes, the airport, and Buck Creek State Park.

Most of the Service Area lies within the City, and nearly all the City is in the Service Area. Consequently, it is generally reasonable to consider all households in the City to be part of the Service Area. According to the 2021 American Community Survey (5-year sample), there are 24,001 households in the City. Of these, 172 parcels are served by septic systems. Additionally, the City's system serves approximately 1,379 households in outlying areas, resulting in a total of 25,208 households that are served by the City.

A review of City population and household trends indicates that the burden of the City's existing and proposed sewer costs has been borne by not only an increasingly impoverished but also a shrinking customer base. Since 1970, the City has lost more than 25 percent of its population, declining from nearly 82,000 then to less than 60,000 in 2020. In recent years, the City's population appears to have stabilized after this decades-long pattern of decline, as shown in Table 4.03-1.

	Population	Annual Change (%)	Households	Annual Change (%)
1970	81,926		27,866	
1980	72,563	-11.43	27,524	-1.23
1990	70,487	-2.86	27,326	-0.72
2000	65,358	-7.28	26,254	-3.92
2010	60,608	-7.27	24,459	-6.84
2015	60,007	-0.99	24,558	0.40
2020	58,662	-2.24	23,868	-2.81

Source: ACS 5-Year Estimates

Table 4.03-1 City Population and Household Trends

The City's CPH is calculated to show the annual amount of the program costs to be paid by residential accounts based on the residential share of the City's annual wastewater treatment costs.

1. Residential Share of Annual Wastewater Treatment Cost

The first step in the process is to determine the Residential Share of Annual Wastewater Treatment Costs. This task begins with computing the portion of the sewer system's wastewater flow that can be attributed to residents. As shown in Table 4.03-2, total wastewater flow can be divided into two components - billed flow and unbilled flow. Unbilled flow can be calculated by subtracting the billed flow from the total flow reaching the WWTP. The residential share of the treated wastewater flow is the sum of the residential billed flow based on user accounts (including apartment complexes) and the amount of unbilled flow associated with residential accounts. To determine the amount of unbilled flow associated with residential accounts, the

City used the following approach, as outlined by the University of Cincinnati Economics Center's FCA, originally prepared in 2015. One third of unbilled flow is allocated according to billed flow, and two thirds of unbilled flow is allocated by number of accounts. Residential accounts make up approximately 90.5 percent of the bills. The Residential Share percentage is then calculated by dividing the total flow that is attributable to residential users by the total wastewater flow. Table 4.03-2 shows the residential share percentage for the City is 71.7 percent based on 2021 information. Appendix E provides further details on the calculations for the residential share value. The residential share factor is used to calculate the portion of the City's wastewater, stormwater, and projects LTCP costs that will be born by residential users in the community and informs the residential indicator score and the burden the planned program will have on the community.

Flow Type	Total	Residential	Residential Share (%)
Billed Flow (ccf)	2,668,707	1,512,585	56.9
Unbilled Flow	5,207,496	4,137,095	79.5
Treated Wastewater Flow	7,876,203	5,649,680	71.7

Table 4.03-2 Residential Share Calculation (2021 Data)

2. Total Annual Program Costs

USEPA defines current wastewater treatment (WWT) costs as the current annual wastewater O&M expenses (including stormwater), the annual capital expenses and the current annual debt service. To determine the impact of the proposed Integrated LTCP on the cost per household for implementation of the proposed projects, the total current and projected annual WWT costs for the City need to be calculated. Table 4.03-3 shows the current and projected WWT costs for the City based on the implementation of the $92 million (2022$) Integrated LTCP over 20 years.

Description	Value
Current Annual Wastewater and Stormwater Costs (2022 Data)	
Sewer Operations Budget	$9,360,000
Stormwater Operations Budget	$752,100
Wastewater Capital	$5,557,060
Stormwater Capital	$1,193,321
Wastewater Debt Service	$3,172,000
Stormwater Debt Service	$600,000
Total Current Annual Wastewater and Stormwater Costs	**$20,634,481**
Total Projected Integrated LTCP Costs (2022$)	**$92,080,000**
O&M as percent of Total WWTP Investments (percent)	5%
Estimated Annual O&M Expenses on Integrated LTCP Projects	$4,604,000
Interest Rate for Debt Service (percent)	4%
Bond Term for Debt Service (years)	20
Annual Debt Service on Integrated LTCP Projects to be Funded	$6,775,408
Total Projected Annual Integrated LTCP Costs (2022$)	**$11,379,408**
Total Current and Projected Wastewater and Stormwater (including Integrated LTCP) Annual Costs	**$32,013,889**

Table 4.03-3 Current and Projected Annual Wastewater and Stormwater Costs

3. CPH

The total annual projected cost can be multiplied by the residential share factor and divided by the number of households served by the City to determine the annual CPH. The CPH calculation for both current and projected conditions is shown in Table 4.03-4. Note the implementation of the proposed projects increases the annual WWT CPH by 55 percent.

Description	Current	Projected
Total Annual WWT and Integrated LTCP Expenditures (2022$)	$20,634,481	$32,013,889
Residential Share:	71.7 percent	71.7 percent
Residential Share of Total Program Costs	$14,794,923	$22,953,958
Residential Customers	25,208	25,208
Annual CPH	**$586.91**	**$910.58**

Table 4.03-4 Current and Projected Annual CPH Calculation

B. Residential Indicator

In determining the City's overall financial capability, USEPA's Guidance uses the CPH along with the City's MHI to calculate a Residential Indicator. The Residential Indicator is a metric used by USEPA to gage a community's ability to afford a proposed LTCP and specifically to determine the impact on the average residential household sewer bill. The City used the 2021 FCA Guidance to calculate the residential indicator, as shown Table 4.03-5.

A limitation of this metric is that it does not account for the impact that the proposed Integrated LTCP will have on the economically disadvantaged population of the community. As shown in Table 4.03-5 below, implementation of the Integrated LTCP will require households in the "upper limit of the lowest income quintile" to spend nearly 5 percent of their annual income to pay for this program. That represents an extreme burden on these residents in Springfield.

Residential Indicator	MHI	Upper Limit of Lowest Income Quintile
City Income (ACS 2017 to 2021)	$42,131	$18,453
Residential Indicator, as percent of:		
Current Wastewater and Stormwater CPH	$586.91	$586.91
CPH as Percent of MHI	**1.39 percent**	**3.18 percent**
Financial Impact:	**Mid-Range**	**High**
Projected Wastewater and Stormwater CPH	$910.58	$910.58
CPH as Percent of MHI	**2.16 percent**	**4.93 percent**
Financial Impact:	**High**	**High**

Table 4.03-5 Residential Indicator Calculations

In addition to the residential indicator, the FCA looks at other financial metrics to gage the community's overall fiscal health including:

- Debt Indicators–Bond rating and net debt as a percent of market property value
- Socioeconomic Indicators–Unemployment and MHI
- Financial Indicators–Property tax revenue collection rate and property tax as a percent of market property value

Table 4.03-6 highlights this information for the City and the current rating and score based on the FCA Guidance. The overall score is based on the average of the six scores added together.

Indicator	Value	Rating	Score
Debt Indicators			
Bond Rating	A2 (2021)	Strong	3
Debt as % of Property Value	2.98 (2021)	Mid-Range	2
Socioeconomic Indicators			
Unemployment Rate	4.6 percent (July 2022)	Weak	1
MHI	$42,131	Weak	1
Financial Management Indicators			
Property Tax as Percent of Property Value	3.96 percent (2021)	Mid-Range	2
Property Tax Collection Rate	86.9 percent (2021)	Weak	1
Overall Score			**1.7**

Table 4.03-6 Financial Capability Summary

The USEPA's Financial Capability Matrix combines the residential indicator and the financial capability indicator as shown in Table 4.03-7. The impact of the City's Integrated LTCP falls into the "High Burden" category.

Financial Capability Score	Low Impact Residential Indicator (Less than 1 Percent)	Mid-Range Impact Residential Indicator	High Impact Residential Indicator (Greater than 2 Percent)
Weak <1.5	Medium Burden	High Burden	High Burden
Mid-Range	Low Burden	Medium Burden	**High Burden**
Strong >2.5	Low Burden	Low Burden	Medium Burden

Table 4.03-7 Financial Capability Matrix

Considering the current economic uncertainty both locally and nationally, rising interest rates, supply chain issues, material costs, and the shortage of contractor labor, completing these proposed projects within the current cost estimates is a challenging proposition. The current project costs presented in the Integrated LTCP are in 2022 dollars. It is unclear if recent inflationary trends will continue. Additionally, it should be acknowledged that despite some of the specific project details included in the Integrated LTCP (such as sizes and costs), the Integrated LTCP represents a relatively high-level planning document that spans two decades of time. However, the City will move forward with a 20-year implementation schedule, with the provision as noted above to allow the City to revisit the proposed projects and schedules after the first 10 years of program implementation to evaluate the progress of the projects, the costs incurred, and the local economic situation.

SECTION 5
IMPLEMENTATION OF THE INTEGRATED LTCP

5.01 PUBLIC PARTICIPATION

The City engaged in a detailed public engagement process with key stakeholders, during the summer of 2020, in conformance with Element 3 of the Integrated Planning Framework. The priorities expressed by the stakeholders shaped the scope and schedule of this Integrated LTCP. During this time, the City held a series of stakeholder meetings to gain input on the anticipated wet weather improvements and potential financial impacts of the City's efforts to update the LTCP. Stakeholders were invited with the goal of representing key groups and demographics throughout the community, including the Chamber of Commerce, parks, trails, and recreational users, neighborhood associations, impoverished and underserved areas, a university professor that is a local water quality expert, City planning, community activists, and others. Meetings were held with the stakeholders and key City representatives on:

- June 22, 2020
- July 13, 2020
- July 22, 2020
- July 29, 2020

Through this series of meetings, the stakeholders were presented with information regarding the combined system, the City's past and current CSO reduction efforts, the regulatory requirements, options for compliance within the CSO Policy, and financial conditions in the City. The City presented a range of approaches including both a presumption-based approach with 85 percent capture of the volume of the combined sewage collected in the system and a detailed analysis of the demonstration approach and proposed controls to meet water quality standards. As a group, the stakeholders and City representatives discussed the regulatory compliance, water quality improvements, and financial impacts of each approach.

While the stakeholders all understood and supported efforts to improve water quality through CSO reduction, the overall consensus was that affordability is the driving factor for Springfield. The economic conditions facing the City necessitate development of a program that achieves compliance as cost effectively as possible while also recognizing the importance of continued investment in the City's existing assets.

The elements of this updated Integrated LTCP and the associated costs and schedule have been vetted with the stakeholder group and the community via a public presentation. While concerns were expressed regarding the potential impact on sewer rates, the feedback received by the City was generally supportive of the proposed approach presented in the updated Integrated LTCP.

5.02 RECOMMENDED INTEGRATED LTCP

As detailed in Section 4 of this report, the City of Springfield has already invested over $90 million toward CSO reduction projects and faces significant financial limitations regarding the funding of additional infrastructure to reduce CSOs. A critical element when considering affordability is the City's ongoing asset management program. The existing wastewater collection and treatment system is old and needs significant investment in order to continue to properly function.

In a USEPA Memorandum dated September 22, 2022, USEPA Assistant Administrator, Radhika Fox acknowledges that:

> *Over the past 30 years, investment in water infrastructure has plummeted, leaving communities with pipes, treatment plants, and pumps at the end of their lifespans. Cities, suburbs, and rural areas desperately need to upgrade and build new infrastructure . . .The country faces unprecedented challenges with aging drinking water distribution systems and wastewater conveyance and treatment plants that have far exceeded their useful life.*

Based on evaluations performed by the City in 2020, there are approximately $88 million in capital needs across the existing system over the next 20 years. This investment in asset management is critical to the long term functionality of the wastewater system and needs to be considered when evaluating the financial impact of additional CSO control projects. Using the current escalations to 2022 dollars, these asset management needs could cost the City closer to $100 million. In the City's financial capability analysis (presented in Section 4) the City has budgeted an average of $3.2 million a year to address these needs.

Consistent with USEPA's Integrated Planning Process, investment in Asset Management, as well as implementation of green infrastructure projects, will continue to be integral parts of the City's long-term capital investment plan. As stated in USEPA's Fact Sheet *Integrated Planning in Action–The Basics:*

> *Integrated planning is a process for municipalities to achieve clean water and human health goals while addressing aging wastewater and stormwater infrastructure, changing population and rainfall patterns, and competing priorities for funding.*

Following completion of the alternatives evaluation, potential project types, costs, benefits, and locations were reviewed with the City. The projects included in the updated Integrated LTCP program were selected based on financial capability, cost effectiveness, high priority areas to the City (such as future growth and public perception), and environmental benefits from a system-wide watershed perspective. The selected projects are outlined in Table 5.02-1. Project Fact Sheets for each project are included in Appendix C.

Project	CSO Reduction (MG)	Capital Cost (2022$)
Weir Optimization	6	$2,200,000
Small Scale Sewer Separation	18	---
Fountain Avenue Tunnel	48	$11,400,000
Sunset Avenue Strategic Separation and Basin	8	$7,140,000
Lincoln Elementary Basin Retrofit	1	$660,000
John Street Basin Enhancement	25	$1,480,000
Large Diameter Conveyance to WWTP	36	$25,600,000
Satellite HRT Facility	61	$43,500,000
Total	**203**	**$92,080,000**

Table 5.02-1 Integrated LTCP Selected Projects

The City has already identified approximately $88 million in asset management needs in the existing wastewater collection and treatment system. These asset management needs are in addition to the CSO reduction projects proposed in this plan, and the previously completed projects required to achieve the 85 percent capture (as indicated by the updated hydraulic model) required by the CSO Policy. Refer to Appendix F for a listing of the City's identified asset management needs for the wastewater collection and treatment systems. This investment in the existing system must occur concurrently with the CSO reduction projects. This creates a substantial challenge for the City in terms of overall affordability. Wastewater and stormwater related asset management projects cover both collection system and treatment needs to keep the City's 24/7 operations functioning to protect water quality.

Specifically, two notable asset management projects the City plans to complete in the first 10-year phase of the Integrated LTCP include:

- Erie Headworks Improvements
- Henry Street Sewer Replacement

The Erie Headworks Improvement project is a $8 million dollar capital improvement project to address operational needs at the headworks. Once constructed, the improvements will provide fat, oil and grease mitigation, grit, trash and rag removal, and address odor control needs. Construction is anticipated to be completed by mid-2026.

The Henry Street Sewer Replacement will replace and reroute approximately 1,600 feet of 24-inch-diameter sewer in poor condition. The existing sewer, which is tributary to CSO 033, cuts through a salvage yard with sections of the sewer located under a warehouse. Therefore, rehabilitation of the sewer in its current location is not feasible. The City has decided to proactively embark on a comprehensive project to realign the sewer around the commercial property, relocate the CSO 033 diversion chamber and separate approximately 9 acres of impervious surface from the combined system. Preliminary modeling indicates that this project will reduces CSO discharge volumes from CSOs 033 and 034 by approximately 2.0 MG per year. This is a good example of how an asset management driven project can lead to CSO reductions.

While these asset management projects are not formally part of the LTCP implementation schedule, OEPA has requested the City to report on the progress of the asset management projects in the Annual CSO Report required by the City's permit. Asset management projects will continue to be prioritized and included in future budget cycles with the development of the annual Capital Improvement Plan (CIP). Specific timing of asset management projects may be determined, in part, by availability of critical state and federal funding, such as principal forgiveness and grants, and the timelines for those programs.

This Integrated LTCP represents a continuation of the City's phased approach to CSO control. As discussed in Section 4, the City will perform a programmatic review after the first 10 years of project implementation to revisit the progress of the projects, the costs incurred, and the local economic situation to determine whether the 20-year schedule remains a realistic target. At that time, the City will initiate a dialogue with OEPA and collaborate on any revisions to projects and schedules that are deemed warranted because of changing conditions.

Additionally, after completion of this plan and consistent with USEPA's CSO Control Policy, the City will perform post construction monitoring "to ascertain the effectiveness of CSO controls". If, at that time, it is determined that additional CSO controls are required to meet the objectives of the CWA, the City will coordinate with OEPA to determine the appropriate projects and schedules needed to augment the City's CSO mitigation program.

5.03 IMPLEMENTATION SCHEDULE

As detailed in Section 4 of this updated Integrated LTCP, the City has significant financial limitations and therefore must implement a very practical approach to CSO compliance. The updated Integrated LTCP prioritizes optimization of the existing system to reduce overflows. This is accomplished through weir optimization at the regulator structures and use of an existing tunnel system to store wet weather flows.

Additionally, this updated Integrated LTCP incorporates many of the principles of Integrated Planning such as:

- CSO control
- Stormwater management
- Green infrastructure
- Community engagement
- Adaptive management
- Asset management

The proposed implementation schedule has been developed considering current and projected revenues and expenses including debt service, implementation of a relatively consistent asset renewal program, and the anticipated costs and resource needs to construct approximately $92 million (2022$) in new capital projects to reduce CSO discharge volume and activations. Figure 5.03-1 shows the proposed sequence and duration of the recommended projects. The schedule is based on a 20-year implementation period, however, as previously discussed in Section 4, this target schedule is included with the caveat that after the first 10 years of program implementation, the City and OEPA will revisit the remaining schedule and determine whether completion of the remaining planned projects within the remaining 10-year time frame is feasible.

The schedule illustrated in Figure 5.03-1, has been carefully developed to account for financial constraints, as well as availability of City staff to administer and manage multiple concurrent projects. In an effort to mitigate resource concerns, the proposed project schedule has been structured to avoid overlap between construction phases of the various projects. Additionally, the Fountain Avenue Tunnel construction duration has been extended to account for anticipated property acquisition needs.

Year 1 of the program implementation will be established based on the timing of OEPA's approval of the City's Integrated LTCP. For planning purposes, it is anticipated that final approval of this plan by OEPA will be received before July 1, 2024. This will allow the City time to incorporate LTCP projects into the 2025 CIP budget. The development of the City's annual budget begins in July of each calendar year and involves reviews by staff, City Commission and the public.

Assuming OEPA provides final approval of this plan in the second quarter of 2024, Year 1 of this plan would be initiated in January 2025. If approval is delayed, the start date of the program will likely be impacted.

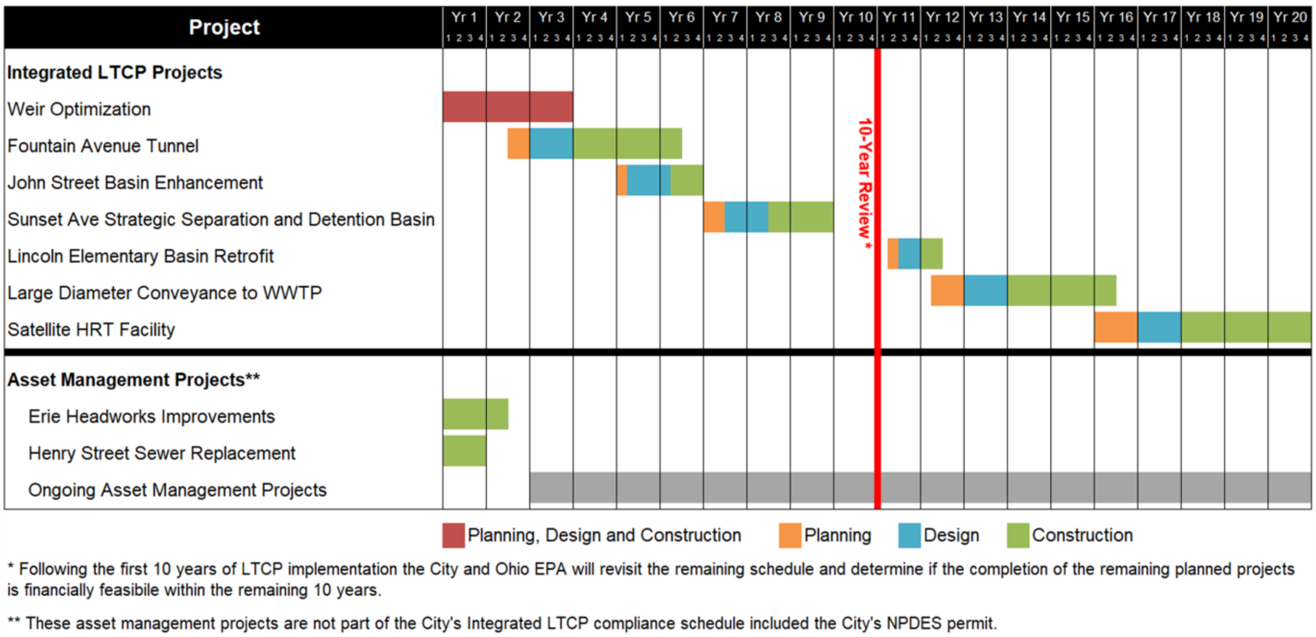


Figure 5.03-1 Anticipated Integrated LTCP Implementation Schedule

SECTION 6
POSTCONSTRUCTION COMPLIANCE MONITORING

6.01 INTRODUCTION

The USEPA CSO Policy, 33 U.S.C. 1342(q), requires permittees to develop a LTCP using either the Presumption or Demonstration approach, as defined in the Policy.

For CSO control plans based on the Presumption approach, the CSO Control Policy acknowledges that:

> *A program that meets any of the criteria listed below would be presumed to provide an adequate level of control to meet the water quality-based requirements of the CWA provided the permitting authority determines that such presumption is reasonable in light of the data and analysis conducted in the characterization, monitoring, and modeling of the system and the consideration of sensitive areas described above.*

The City, in close coordination with OEPA, has developed an Integrated LTCP that will achieve the Presumption criteria specified in section II.C.4.a.ii. of the CSO Control Policy which requires:

> *ii. The elimination or the capture for treatment of no less than 85% by volume of the combined sewage collected in the CSS during precipitation events on a system-wide annual average basis;*

The City has performed flow metering of the collection system and developed an updated, fully calibrated hydrologic and hydraulic model for the combined system. This model was used to evaluate various alternatives and provides the basis for the proposed projects. Most importantly, the model and supporting calculations indicate that full implementation of the Integrated LTCP will achieve the 85 percent “elimination or capture for treatment” threshold specified in the CSO Control Policy for the typical year. In order to achieve this regulatory compliance metric, annual CSO discharges will need to be reduced to 252 MG.

6.02 RAINFALL MONITORING

The City maintains six rain gauges throughout the service area and will continue to do so through the conclusion of the post construction compliance monitoring period. Data is collected in 0.01-inch increments. The locations include:

- WWTP
- Fire Station No. 1
- Fire Station No. 3
- High Street Booster Station
- WTP (outside of the combined system)
- Health Department (outside of the combined system)

6.03 CURRENT CSO FLOW MONITORING

The City currently has five fixed flow monitors with samplers deployed in the system. These monitors are located at CSOs 005, 006, 035, 039, and CSOs 041 and 042 (one location). Data is recorded by the City on the monthly EDMR reports. Additionally, the City also has 14 flow monitors that are rotated to various locations throughout the system. The data from these meters is used to assist in model calibration efforts and to identify subcatchment areas with unusually high inflow and infiltration. Data from each flow monitor is downloaded every two weeks. Figure 6.03-1 shows the City's current flow monitoring locations.

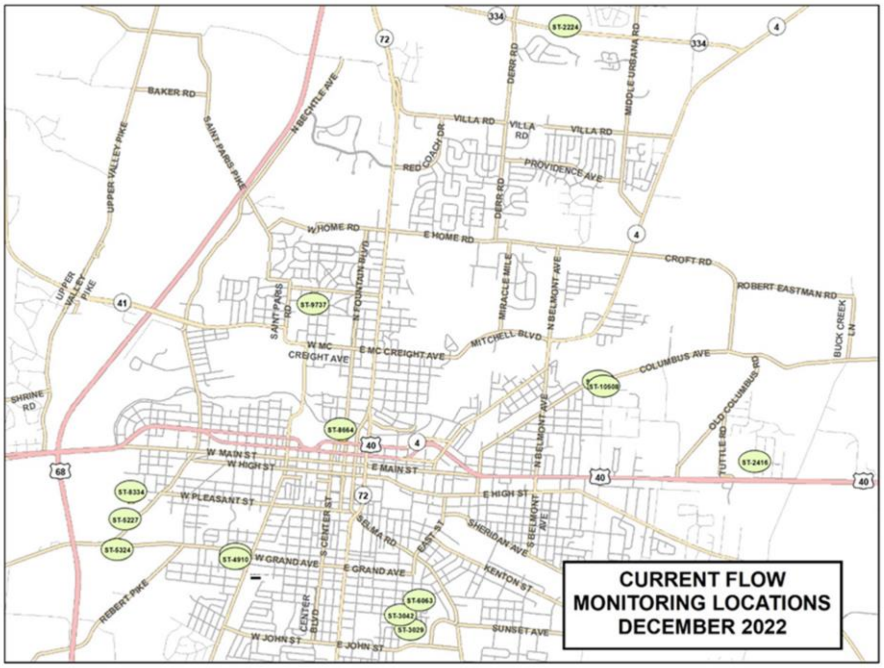


Figure 6.03-1 Current Flow Monitoring Locations

The City is coordinating with OEPA to pursue grants to upgrade existing and install additional flow meters for system monitoring. In an effort to minimize the labor time required to manage the additional meters the City is hoping that the grant monies can be used to purchase the equipment needed to provide the capability to remotely upload data from the flow meters to a cloud server via cellular technology.

The City will continue monitoring CSO outfalls during the implementation of the Integrated LTCP to measure the effectiveness of the projects. Flow to the WWTP will also be monitored to determine the amount of wet weather flow from the combined system that is captured and treated at the plant.

6.04 POSTCONSTRUCTION COMPLIANCE MONITORING

As stated previously, the City's Integrated LTCP has been structured to achieve Presumption criterion ii, which requires "*The elimination or the capture for treatment of no less than 85% by volume of the combined sewage collected in the CSS during precipitation events on a system-wide annual average basis.*"

In 2012, USEPA published a document titled CSO Post Construction Compliance Monitoring Guidance. This document provides insight and perspective on the type of monitoring that CSO communities could perform to evaluate the effectiveness of a fully implemented CSO control program.
The guidance notes that *"evaluating CSO control can be a straightforward evaluation of whether the permittee has met the requirements of the approach they have chosen."* The guidance further explains that:

> *If the Presumption Approach has been selected, the permittee should describe in the CSO control assessment plan how the specific criterion that the permittee has chosen under the Presumption Approach will be verified. Note that when the Presumption Approach is selected, the permittee should define system-wide and annual average conditions in the CSO control assessment plan.*

The "annual average" condition in the context of long term control plans is usually represented by the selection of a "typical year" of rainfall. The Typical Year is intended to represent average conditions based on a review of historical annual rainfall patterns including total rainfall, number of discreet events, and the magnitude of individual events. In the case of Springfield, the analysis identified 1981 as the Typical Year. OEPA has reviewed and approved the City's typical year selection. The significance of this is that the recommended CSO control program presented in this Integrated LTCP was developed to achieve regulatory compliance during typical year conditions.

The guidance states that "*This type of CSO control can be evaluated by collecting and studying CSO volume data."* Additionally, and consistent with the small system provisions of the CSO Control Policy, the Guidance clarifies that "*small CSO communities may only need to monitor the number or volume of overflows from the system to meet the post construction compliance monitoring requirements…"*

The City has invested in the development and calibration of a hydraulic model (SWMM) for the CSS as a means to determine the frequency, duration, and volume of overflows from the combined sewer system.

This model will be used to determine compliance with the CSO policy by calculating the percent of wet weather flow captured or eliminated for treatment in the CSS during precipitation in the typical year. Once all the projects identified in the Integrated LTCP have been constructed and are operational, the City will initiate a post construction compliance monitoring program.

After implementation of the Integrated LTCP projects, the City will conduct post construction flow metering of the collection system, update the model configuration to reflect system improvements and recalibrate the model. Regulatory compliance, defined as achieving the criteria in section II.C.4.a.ii. of the CSO Policy, will be determined by confirming that under post Integrated LTCP conditions, CSO discharges have been reduced to 252 MG or less in the modeled 1981 typical year.

6.05 REPORTING

All collected data will be recorded and reported once a year in conjunction with the CSO Report and NPDES permit requirements. The data collected will be compiled and analyzed to assess the progress and effectiveness of the Integrated LTCP toward meeting the 85 percent capture goal.

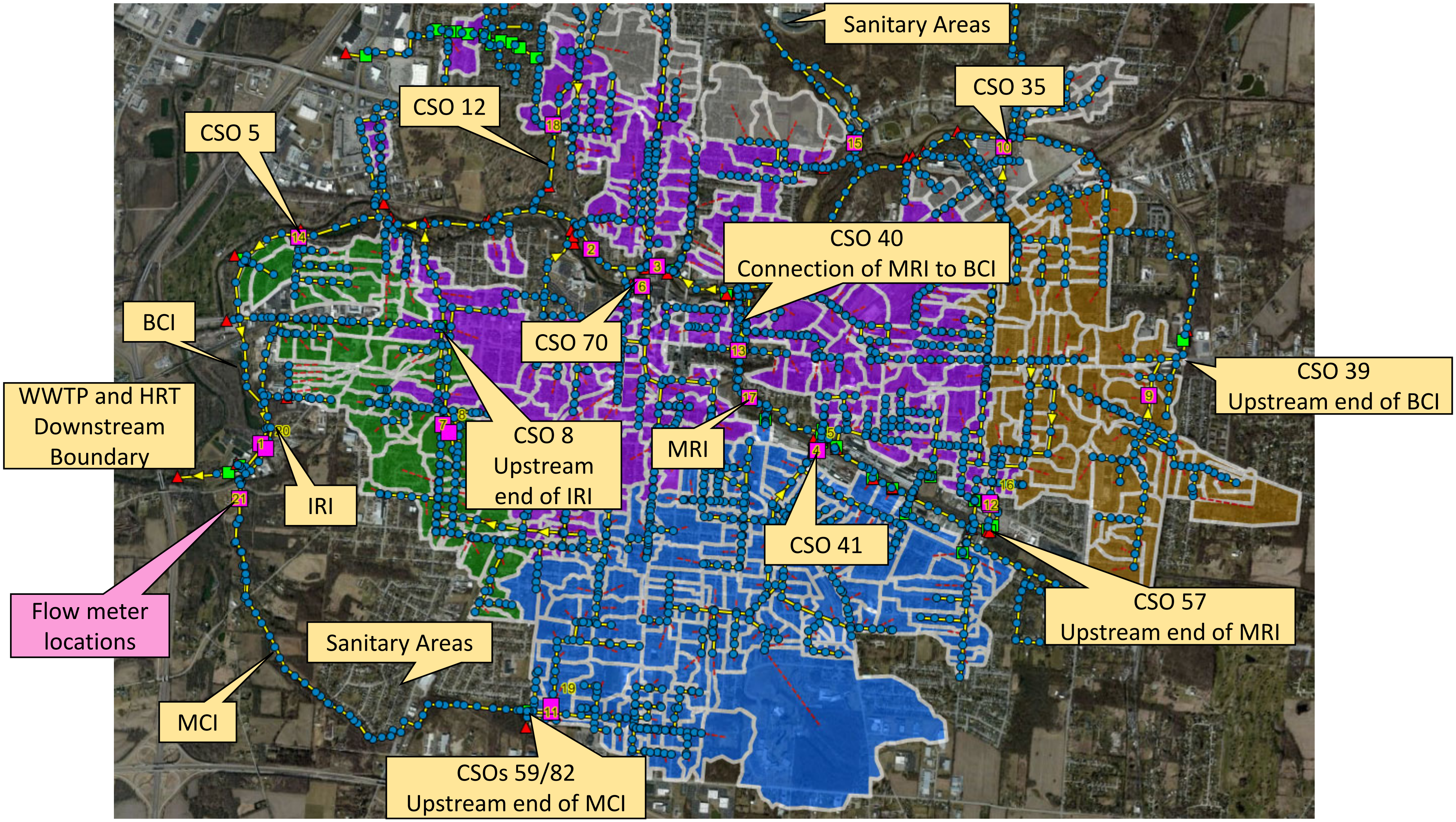
APPENDIX A
MODEL CALIBRATION PLOTS

Springfield, OH
2016 Model Update

2015-2016 Calibration Plots

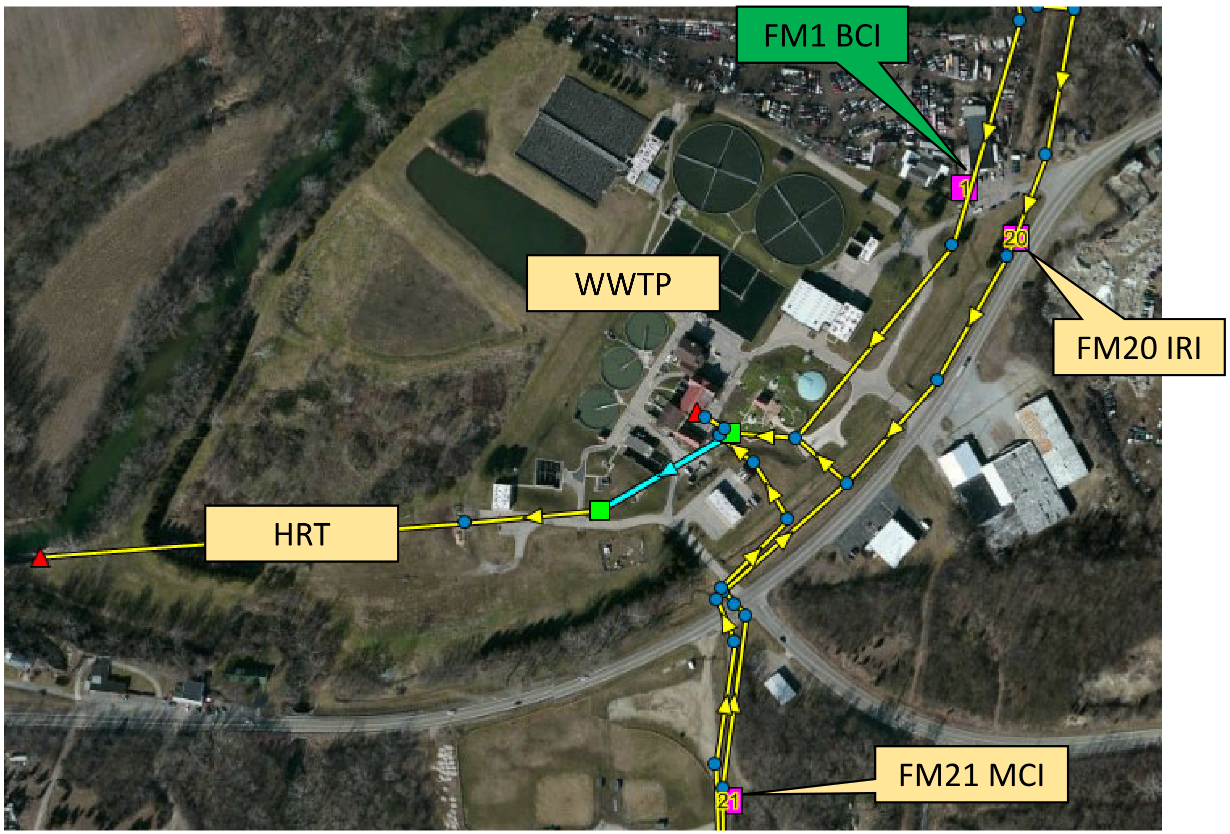
Rain Events for Calibration Plots

	Calibration/validation Events (6 Hour Inter-Event Duration; TY events may have diff IED)															
	Date	Duration (hr)	Intensity (15 min, in/hr)					Volume (inches)					Est. Return Interval	Consistent between gages	Calibration Event	Validation Event
			RG1	RG2	RG3	RG4	RG6	RG1	RG2	RG3	RG4	RG6				
Fall 2015	9/11/2015 13:00	14.75	0.40	0.36	0.36	0.36	0.40	0.67	0.72	0.55	0.70	0.66	< 2-month	Consistent		X
	10/24/2015 17:45	4.75	0.44	1.40	0.52	0.92	1.24	0.42	0.71	0.45	0.55	0.74	2-month	Variable	X	
	10/27/2015 11:30	32.25	0.88	0.88	0.56	0.64	1.02	2.97	3.50	2.76	3.17	3.49	2-yr to 5-yr	Variable	X	
	11/6/2015 1:15	7.25	0.16	0.28	0.24	0.28	0.25	0.27	0.58	0.47	0.53	0.46	< 2-month	Consistent	X	
	11/11/2015 23:15	7	0.36	0.60	0.24	0.48	0.75	0.42	0.40	0.38	0.35	0.44	< 2-month	Consistent	X	
	11/18/2015 14:30	4.25	0.56	0.44	0.44	0.48	0.47	0.65	0.63	0.57	0.63	0.66	2-month	Consistent	X	
	11/27/2015 17:15	27.5	0.12	0.20	0.12	0.12	0.15	0.89	1.06	0.79	0.90	0.92	2-month	Consistent		X
Spring 2016	3/24/2016 14:30	6	0.60	0.75	0.60	0.68	0.69	0.58	0.73	0.58	0.66	0.71	< 2-month	Consistent	X	
	4/10/2016 18:45	24.25	0.35	0.44	0.35	0.40	0.55	0.80	1.00	0.80	0.91	1.05	2-month	Consistent		X
	4/30/2016 11:45	11.75	0.42	0.53	0.42	0.48	0.58	0.44	0.55	0.44	0.50	0.62	< 2-month	Consistent	X	
	5/1/2016 21:30	6.5	1.27	1.58	1.27	1.44	1.02	0.74	0.92	0.74	0.84	0.78	2-month	Consistent	X	
	6/4/2016 8:15	13.75	0.68	0.80	0.60	0.64	1.35	0.53	0.97	0.46	0.67	1.18	2-m to 3-month	Variable		X
	6/15/2016 19:15	1	0.76	0.72	1.52	1.16	1.82	0.21	0.25	0.43	0.33	0.49	2-month	Variable	X	

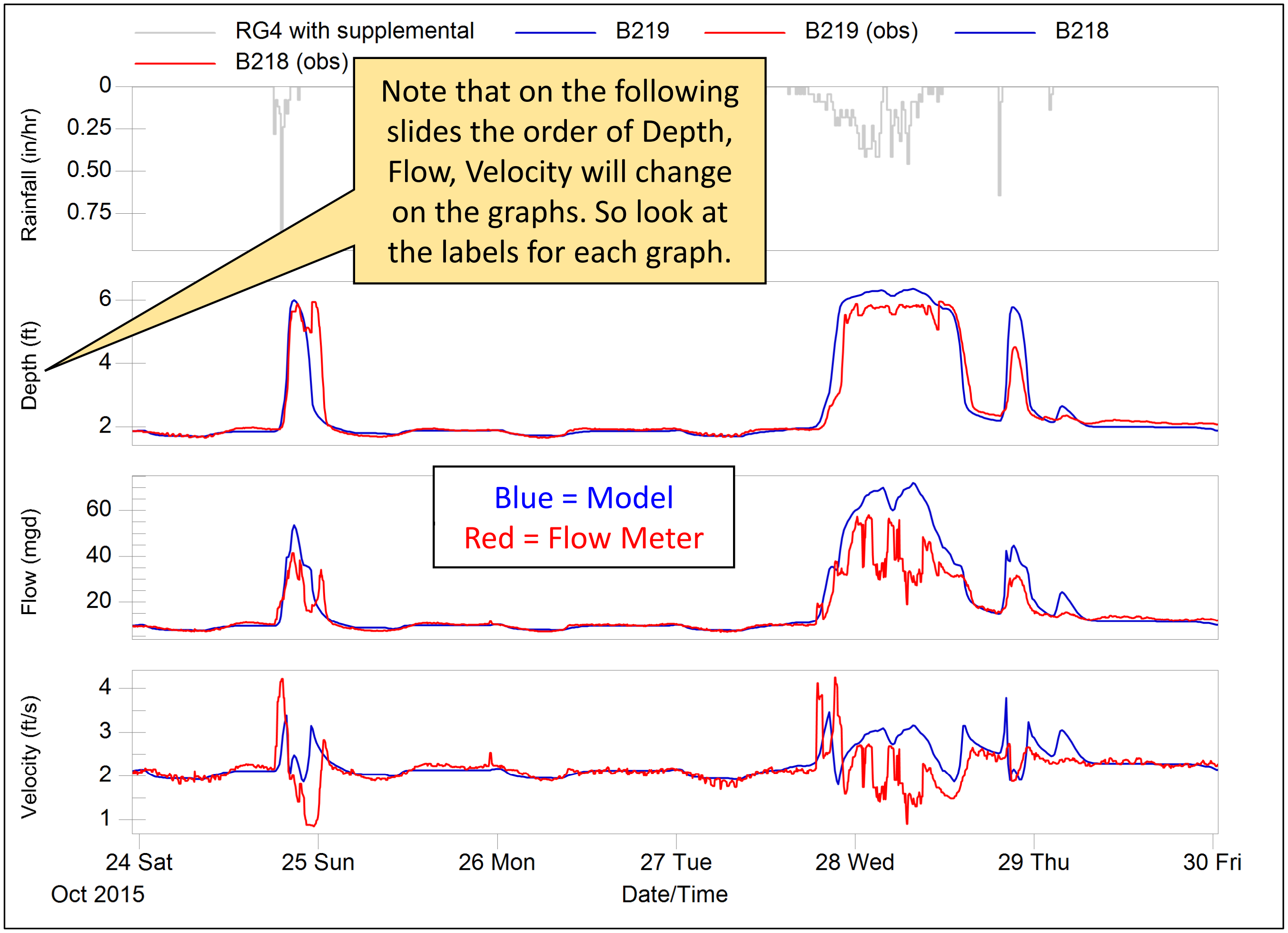


Sanitary Areas
CSO 35
CSO 12
CSO 5
CSO 40
Connection of MRI to BCI
BCI
CSO 70
CSO 39
Upstream end of BCI
WWTP and HRT
Downstream
Boundary
CSO 8
Upstream
end of IRI
MRI
IRI
CSO 41
CSO 57
Upstream end of MRI
Flow meter
locations
Sanitary Areas
MCI
CSOs 59/82
Upstream end of MCI

FM 1
Buck Creek Int. (BCI) - Upstream of WWTP



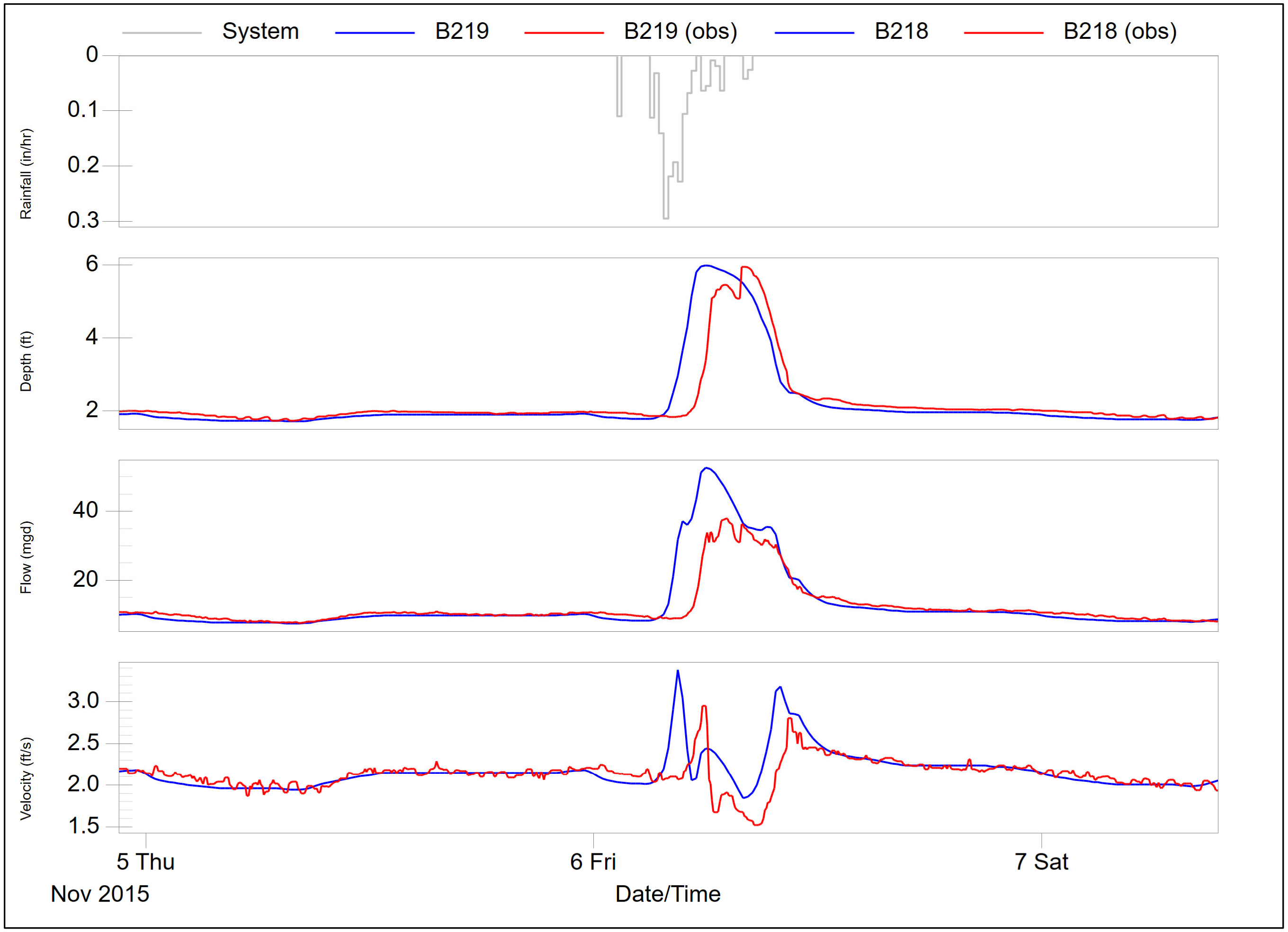
FM 1 - BCI Upstream of WWTP



Calibration Events

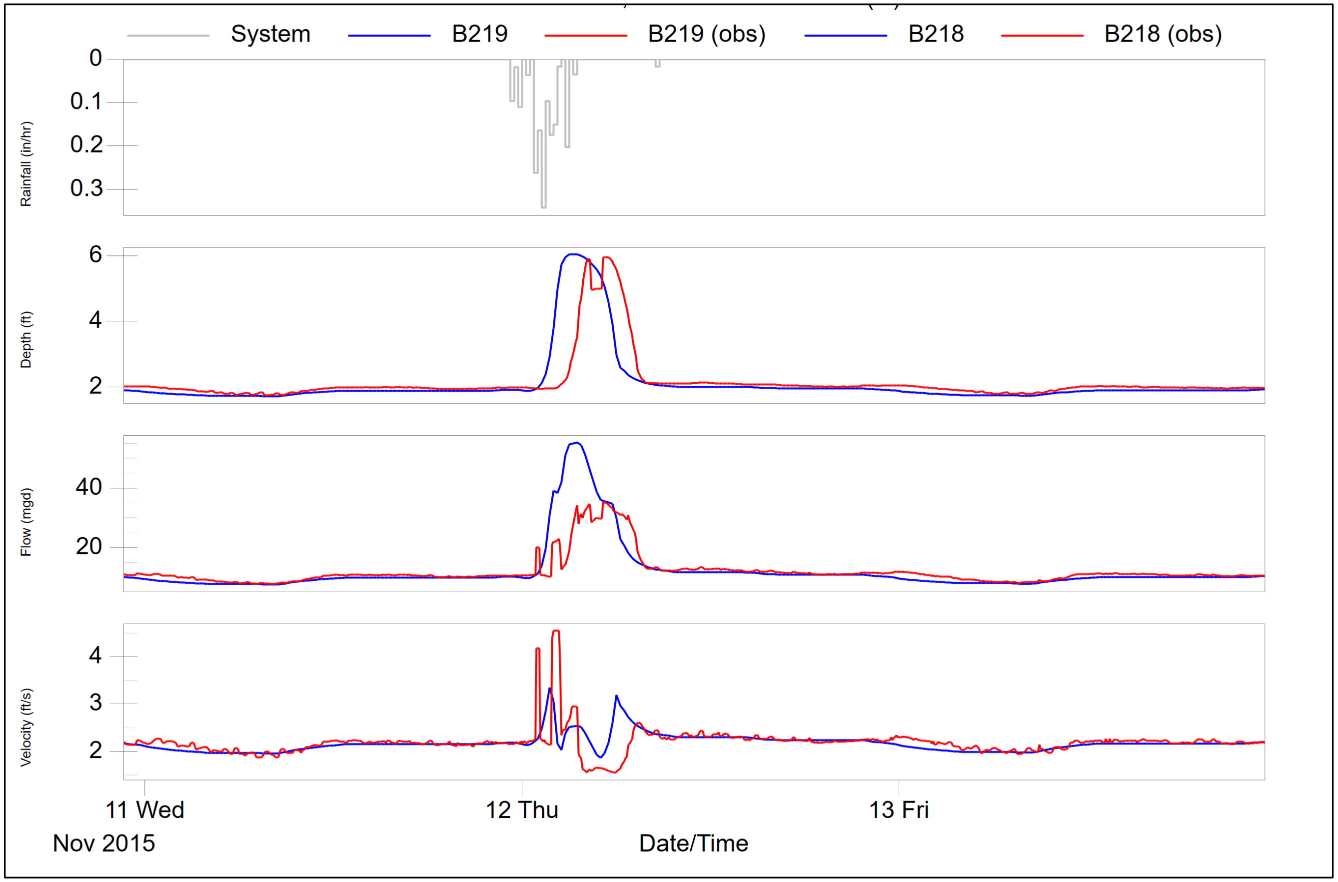
10/24/15, 10/27/15

FM 1 - BCI Upstream of WWTP



Calibration Event
11/6/15

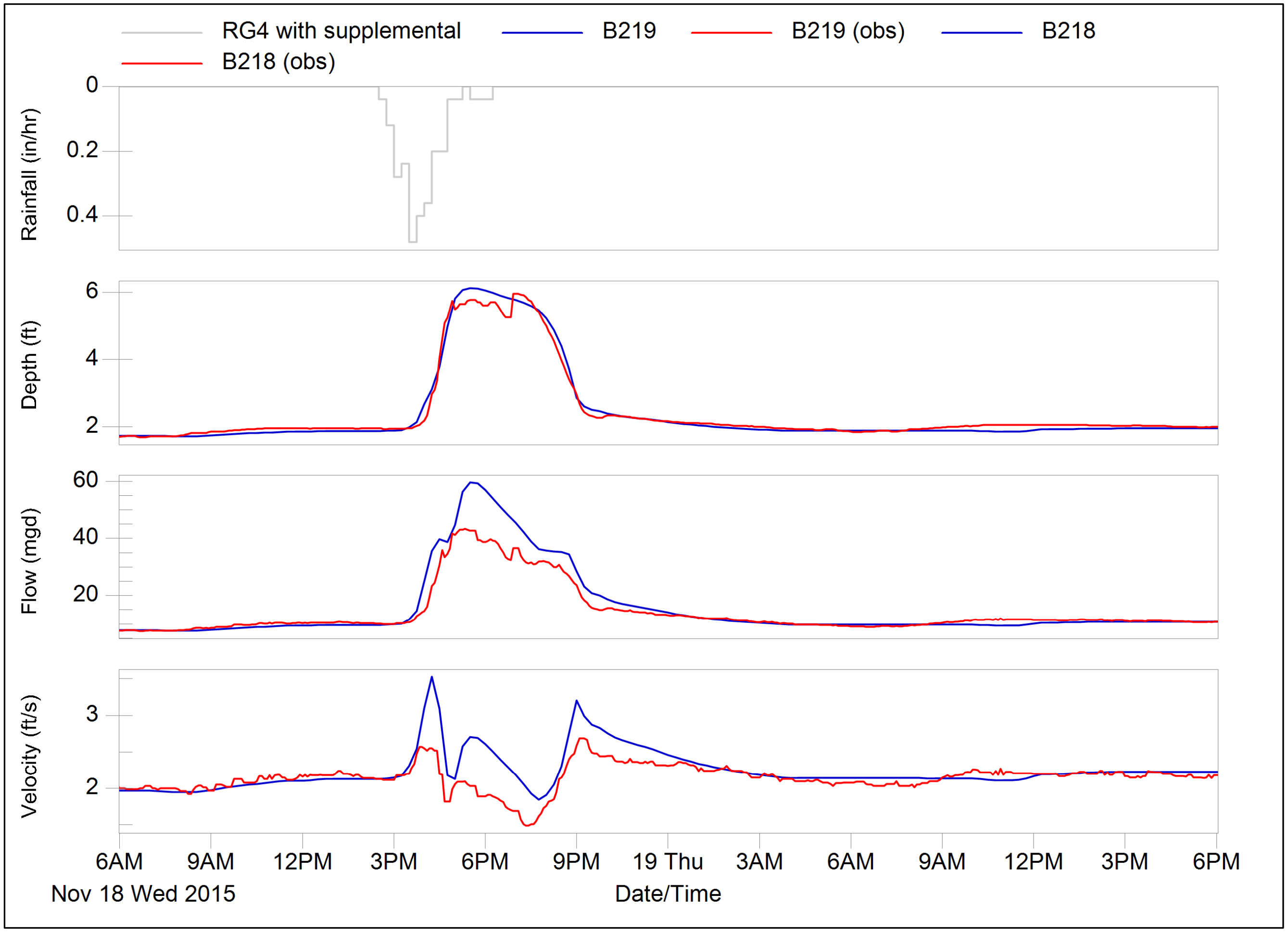
FM 1 - BCI Upstream of WWTP



Calibration Event

11/11/15

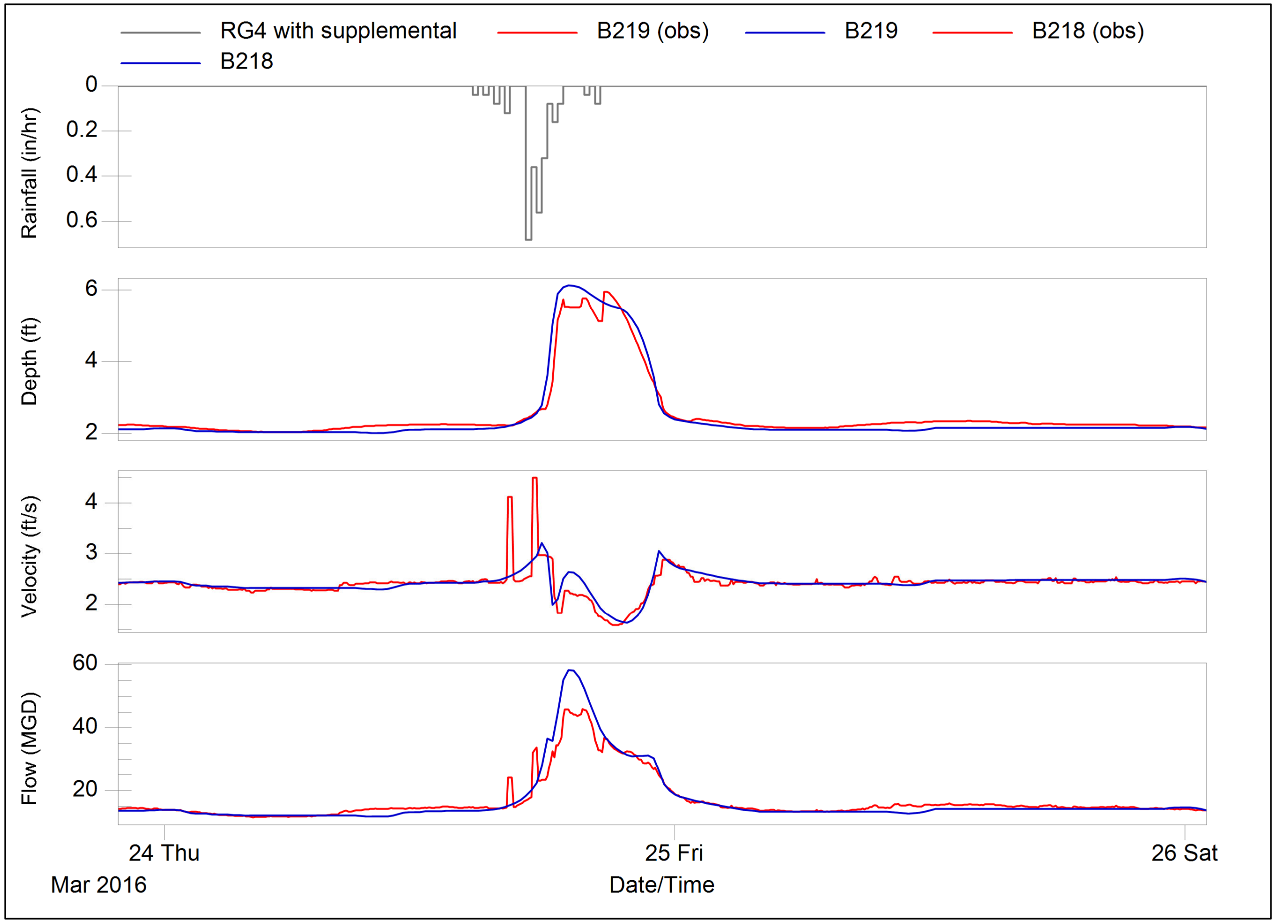
FM 1 - BCI Upstream of WWTP



Calibration Event

11/18/15

FM 1 - BCI Upstream of WWTP



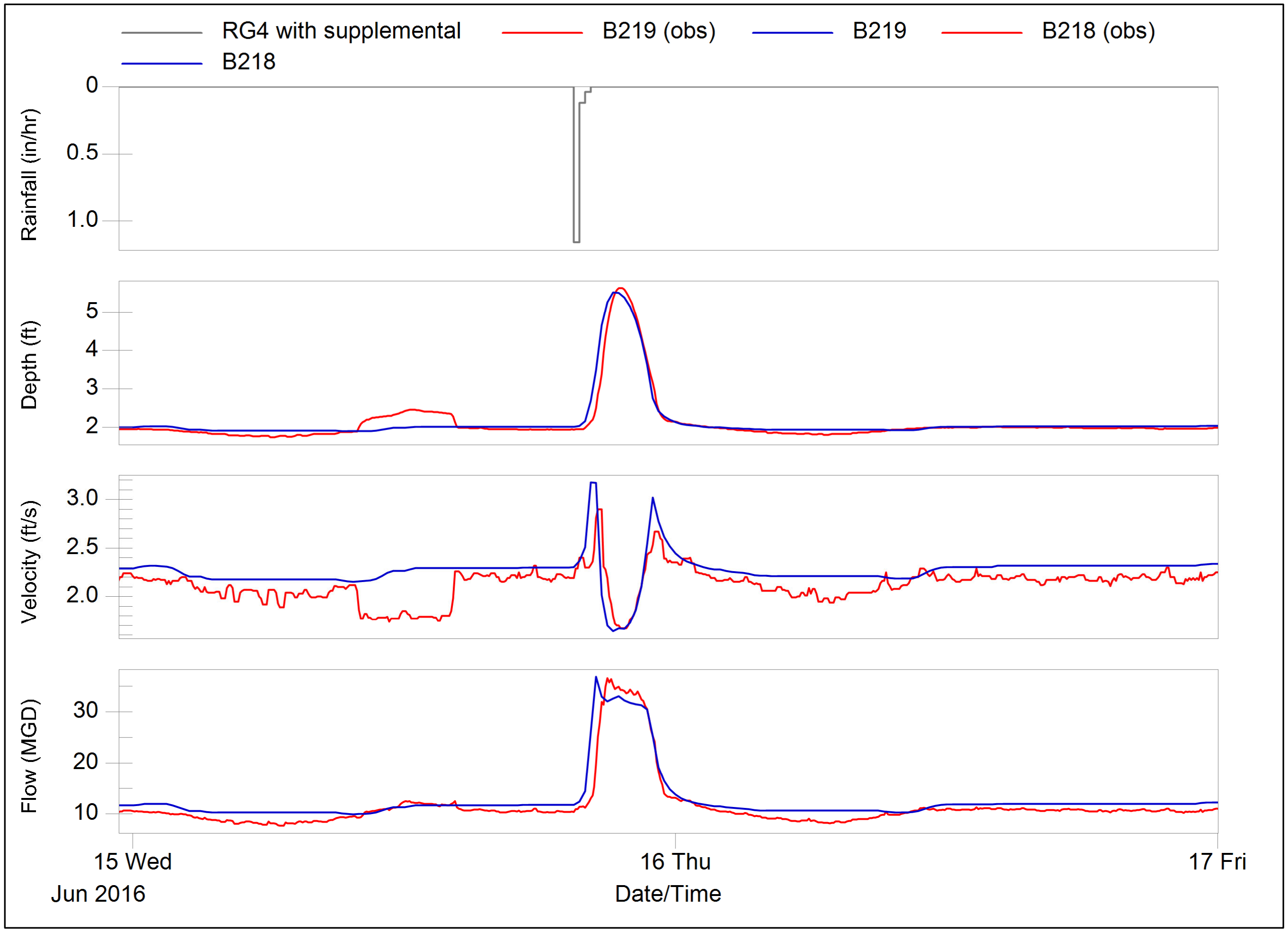
Calibration Event
3/24/16

FM 1 - BCI Upstream of WWTP

Calibration Events

4/30/16, 5/1/16

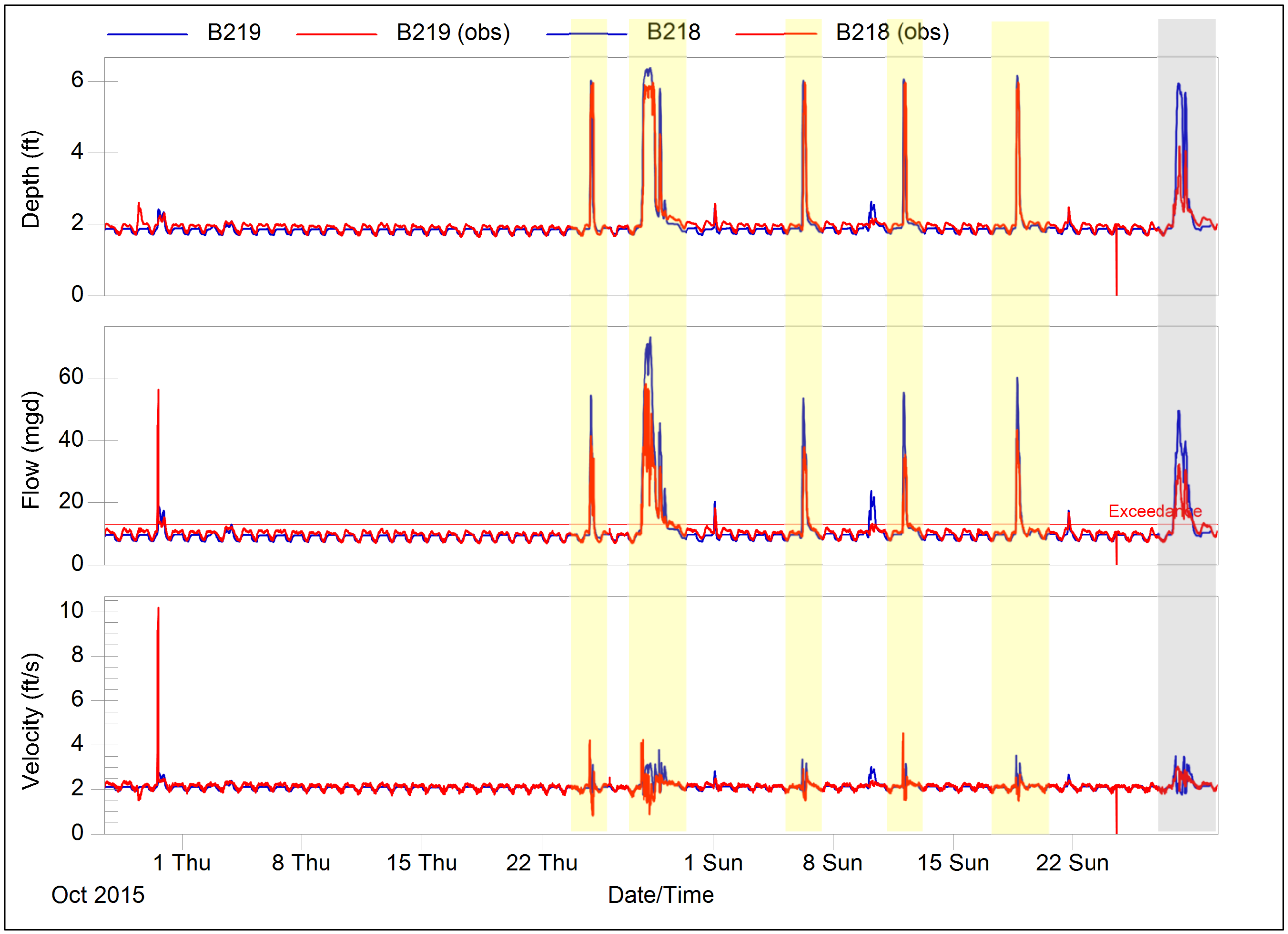
FM 1 - BCI Upstream of WWTP

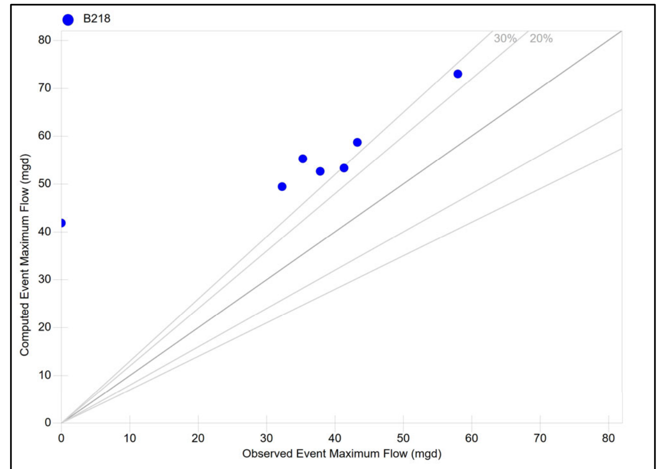


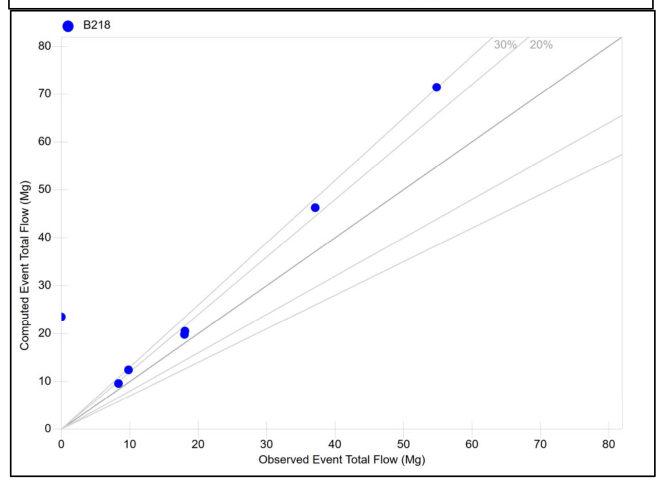
Calibration Events
6/15/16

FM 1 - BCI Upstream of WWTP

Fall 2015

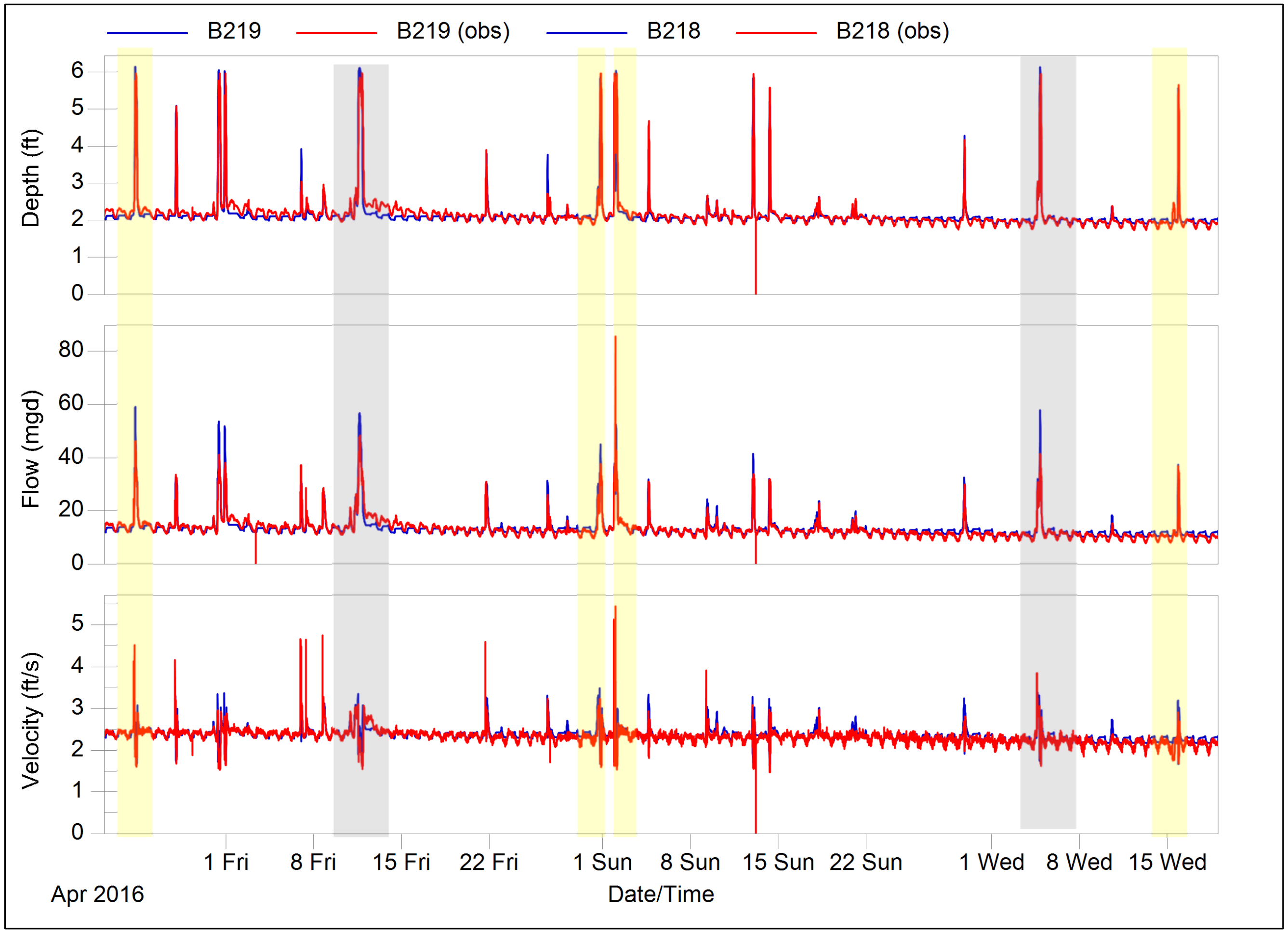


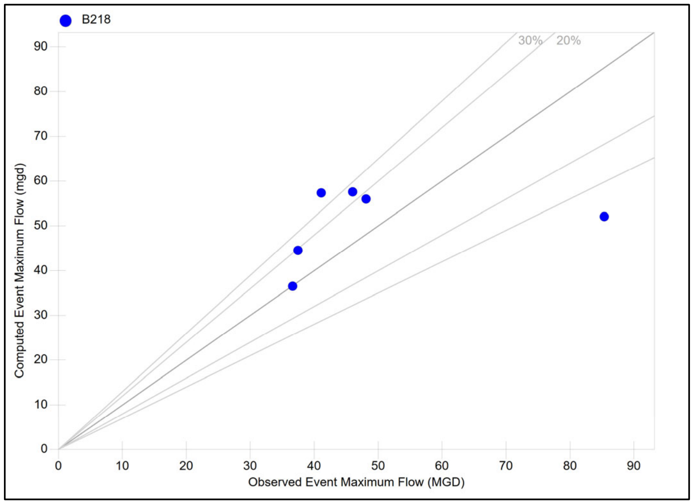


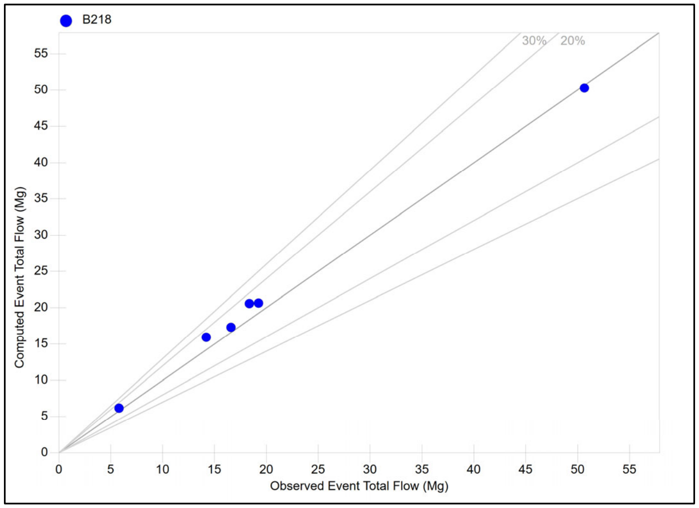


FM 1 - BCI Upstream of WWTP

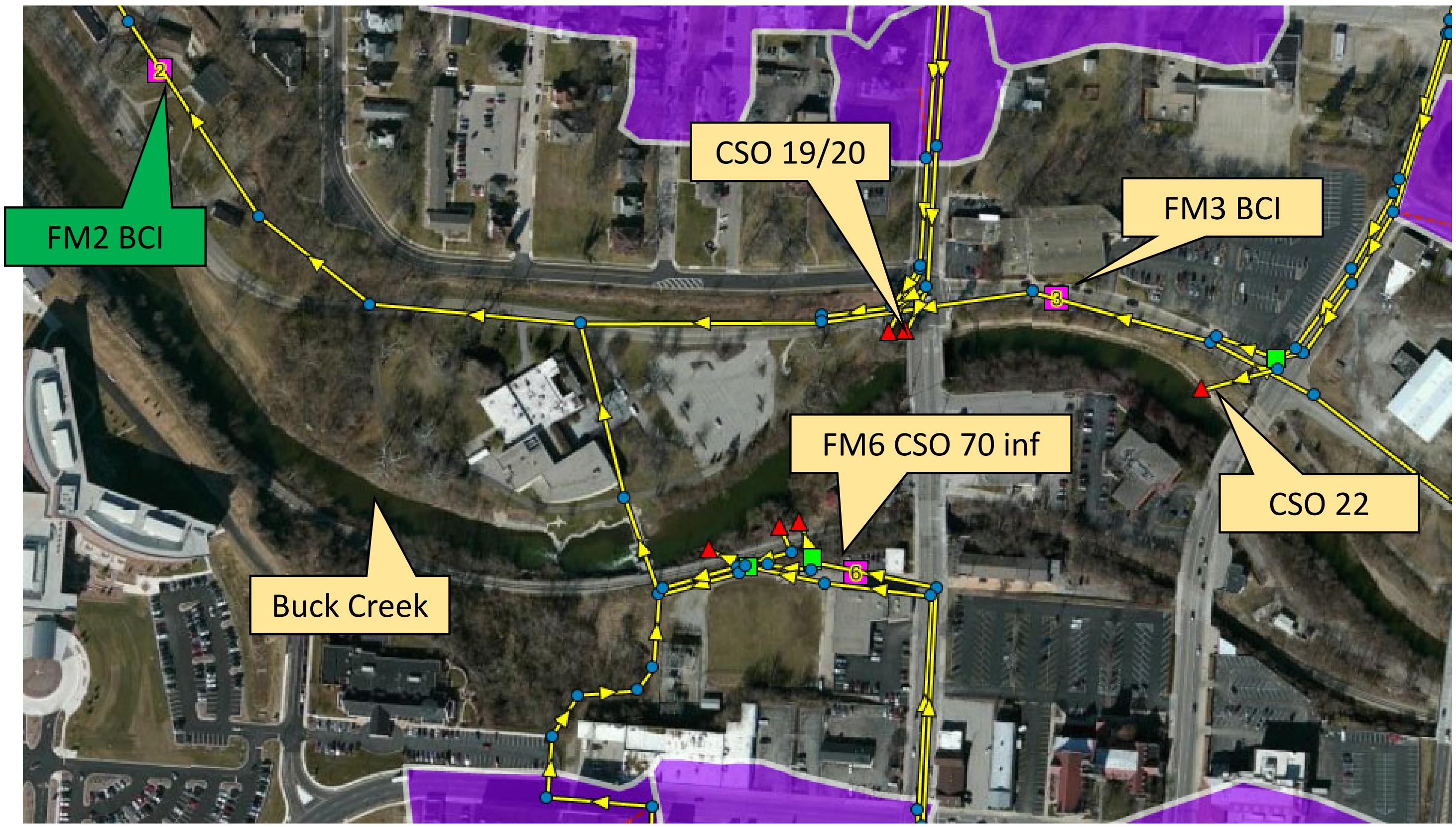
Spring 2016



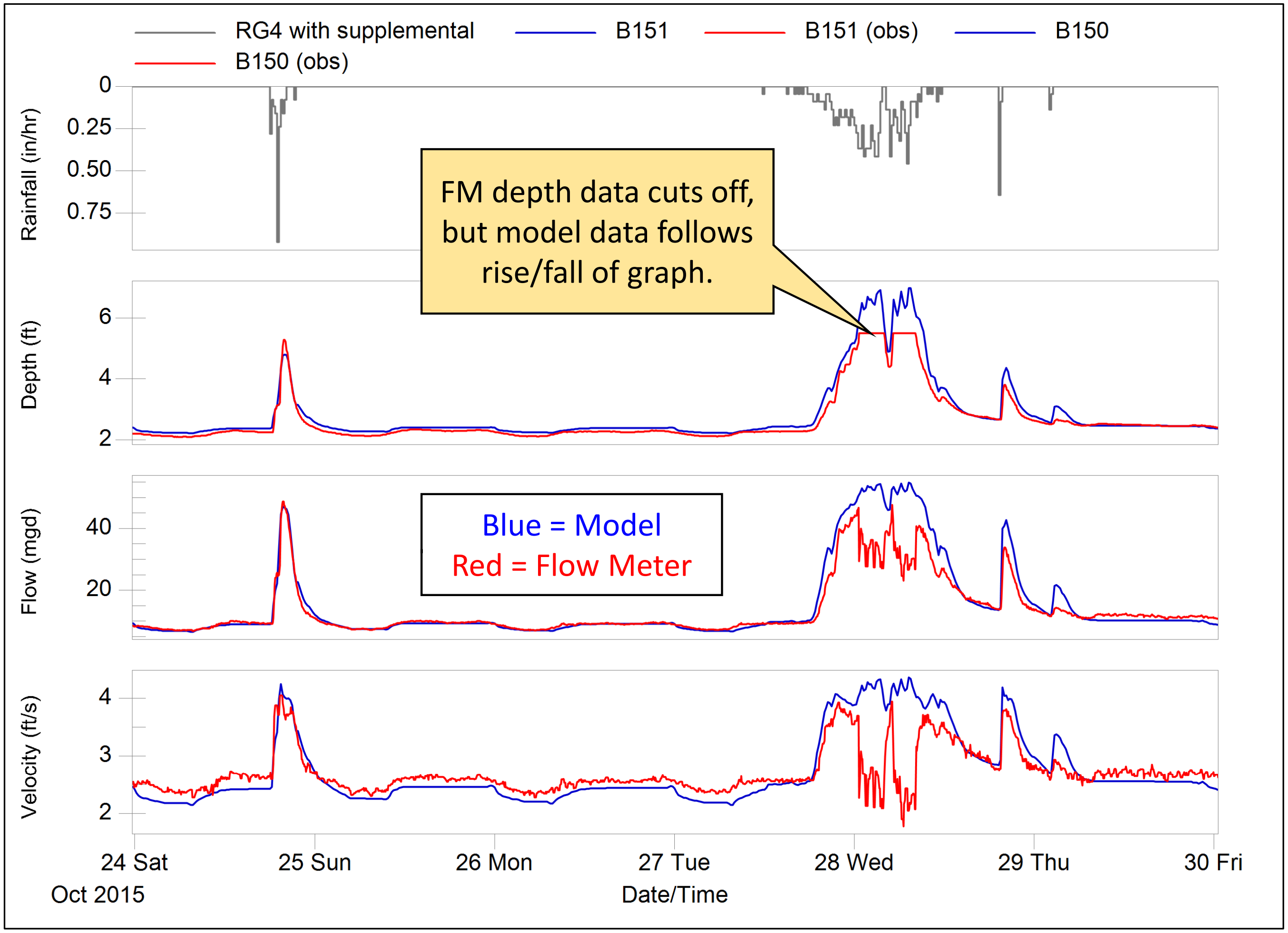




FM 2
BCI – Downstream of CSO 70



FM 2 - BCI Downstream of CSO 70

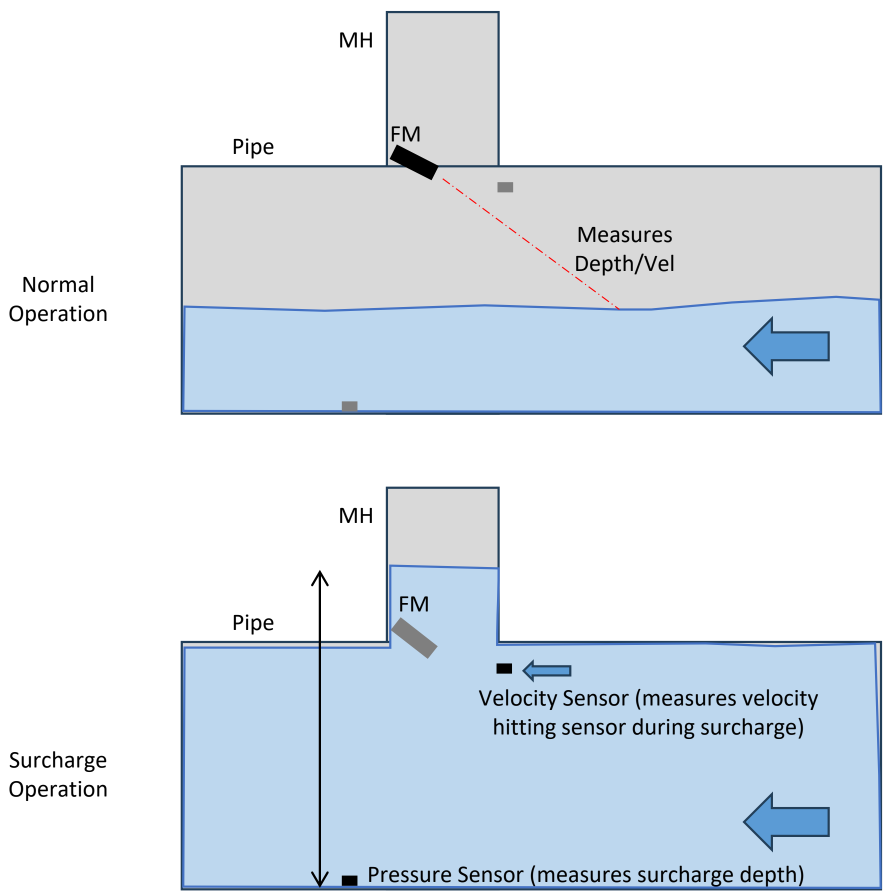


Calibration Events 10/24/15, 10/27/15

Depth data cuts off at pipe crown and velocity data is unreliable.

See next two slides for more information

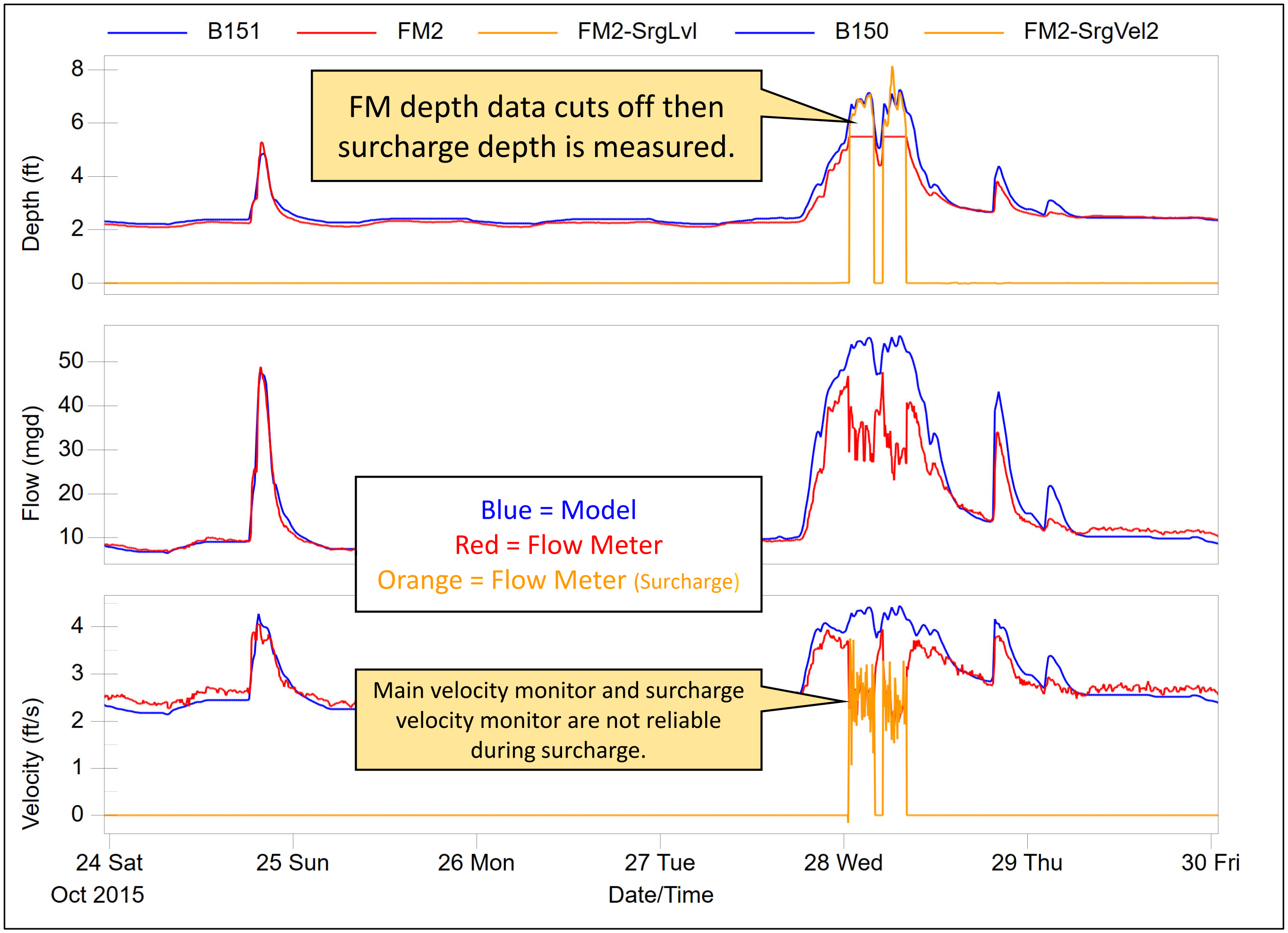
FM 2 - BCI Downstream of CSO 70



Flow monitor includes down-looker which normally measures depth and velocity. But it does not function correctly during surcharge.

There is an additional depth/pressure sensor to measure depth during surcharge which functions ok. There is an additional velocity sensor near crown of pipe to measure velocity during surcharge but is unreliable since it measure velocity near the crown, so velocity is under-reported since velocity near crownis lower than average pipe velocity. Used surcharge depth to compare to model.

FM 2 - BCI Downstream of CSO 70



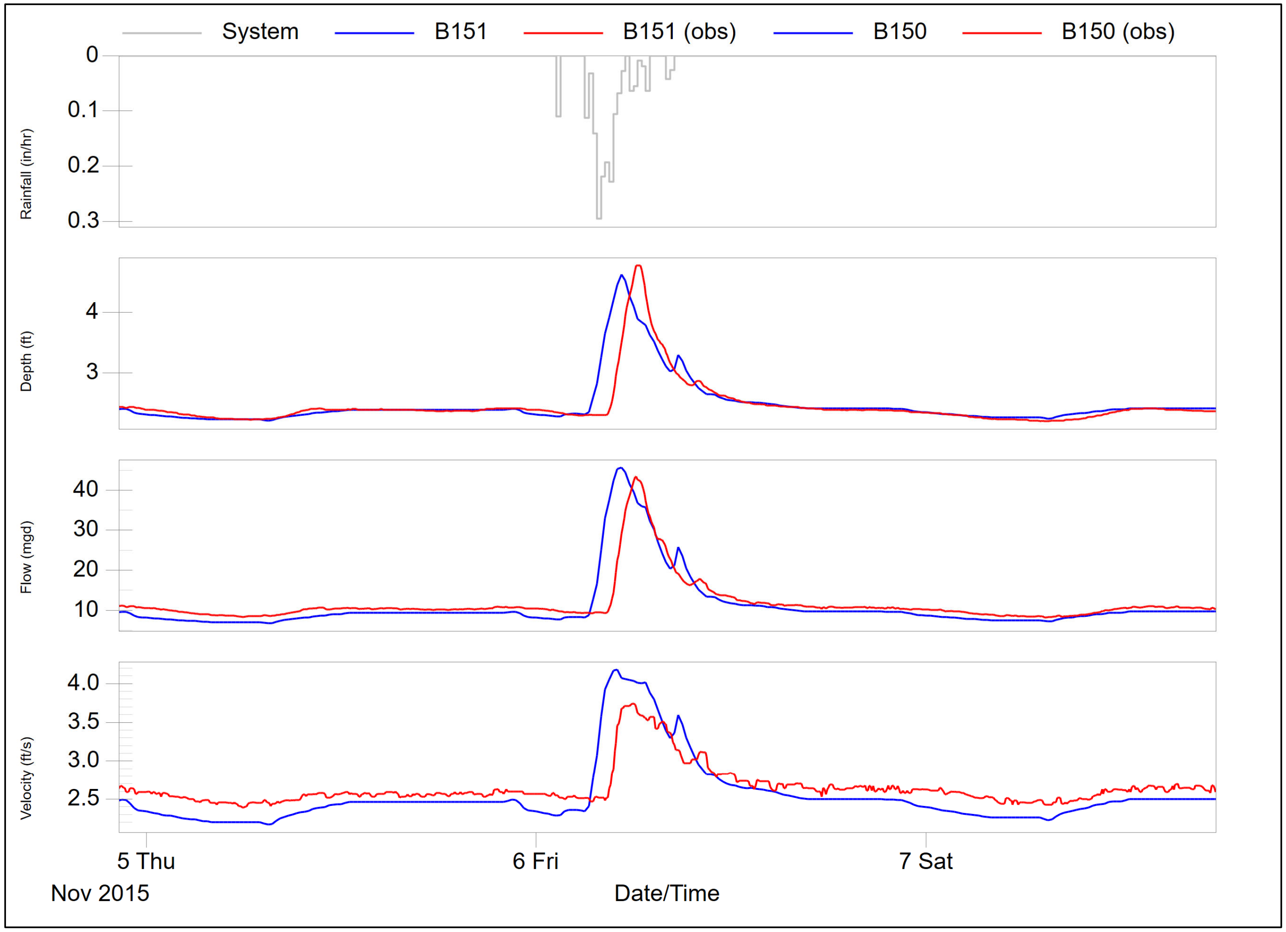
Calibration Events 10/24/15, 10/27/15

Used depth and surcharge depth to compare to model.

Velocity monitor under-reports during surcharge.

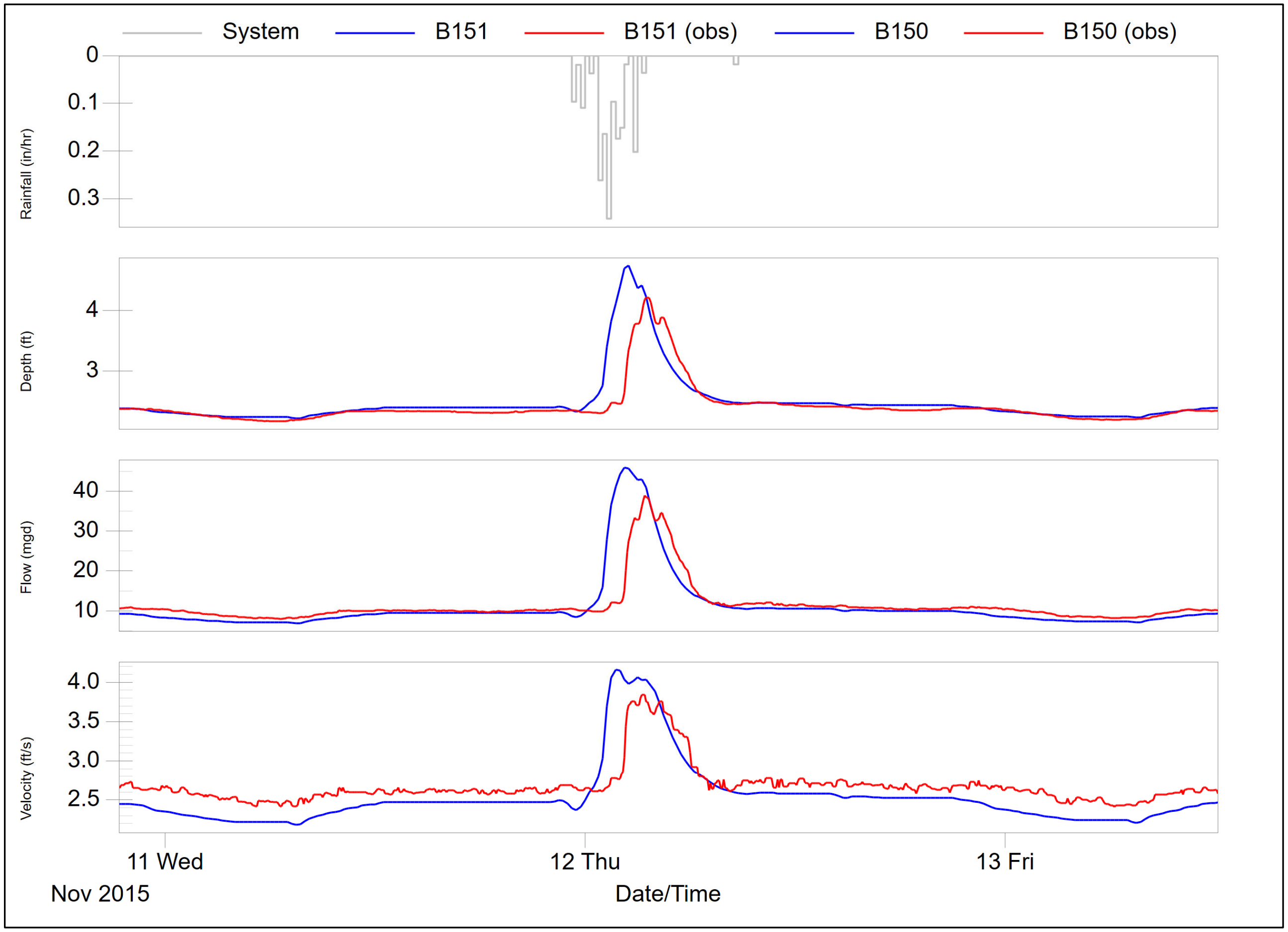
Flow calculated with main velocity sensor, so flow calculation not reliable during surcharge.

FM 2 - BCI Downstream of CSO 70



Calibration Events
11/6/15

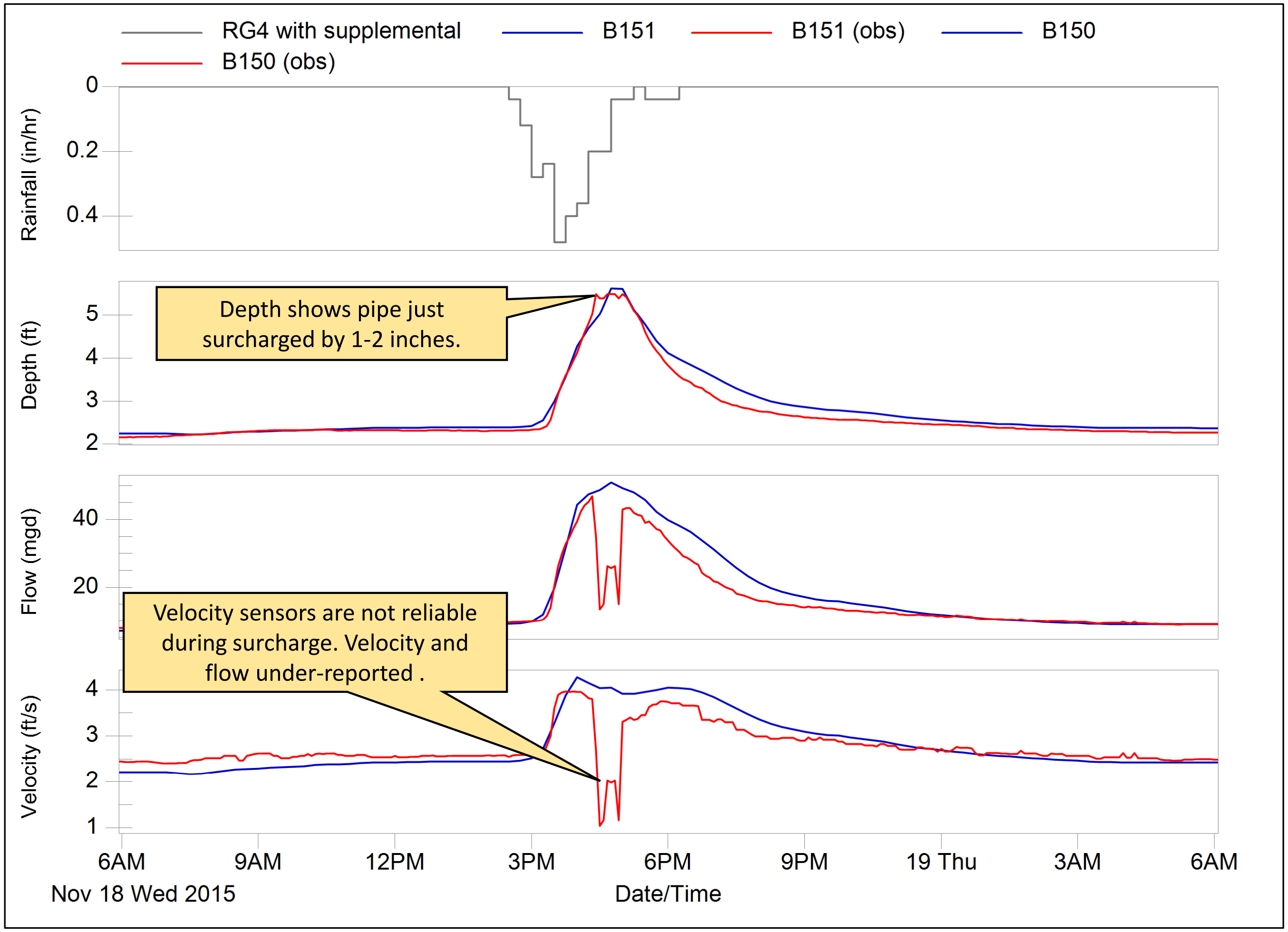
FM 2 - BCI Downstream of CSO 70



Calibration Events

11/11/15

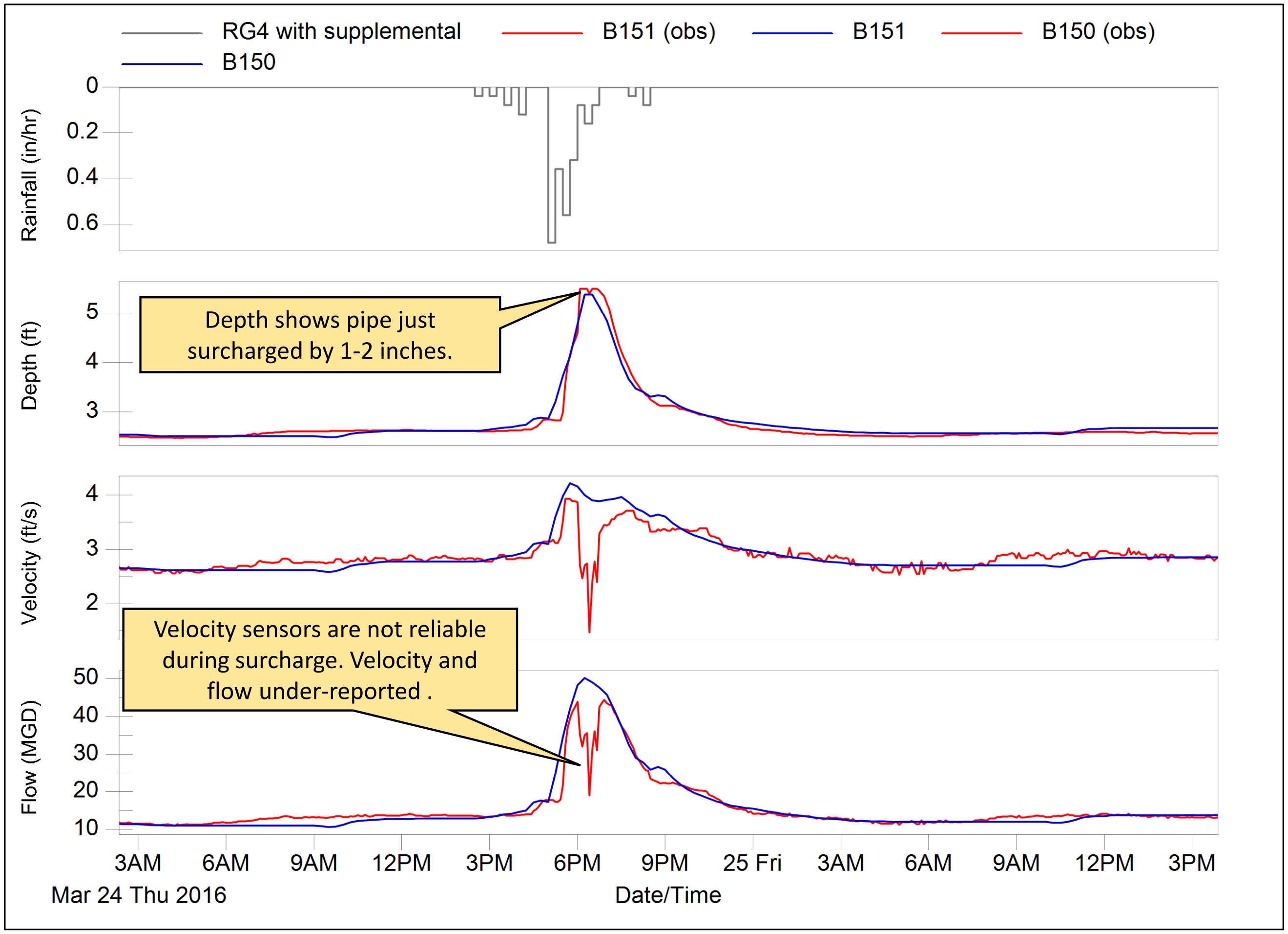
FM 2 - BCI Downstream of CSO 70



Calibration Events

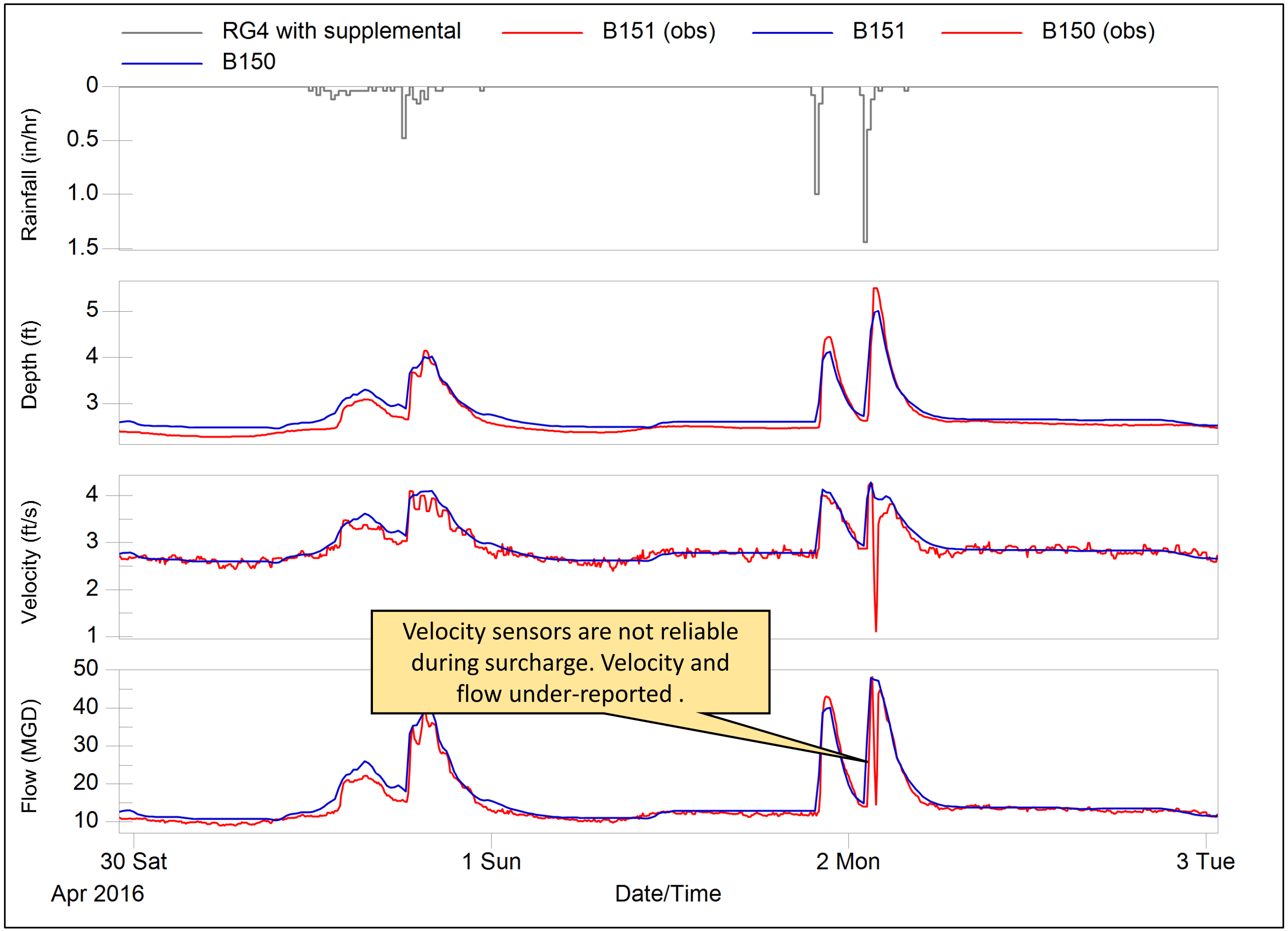
11/18/15

FM 2 - BCI Downstream of CSO 70



Calibration Event
3/24/16

FM 2 - BCI Downstream of CSO 70

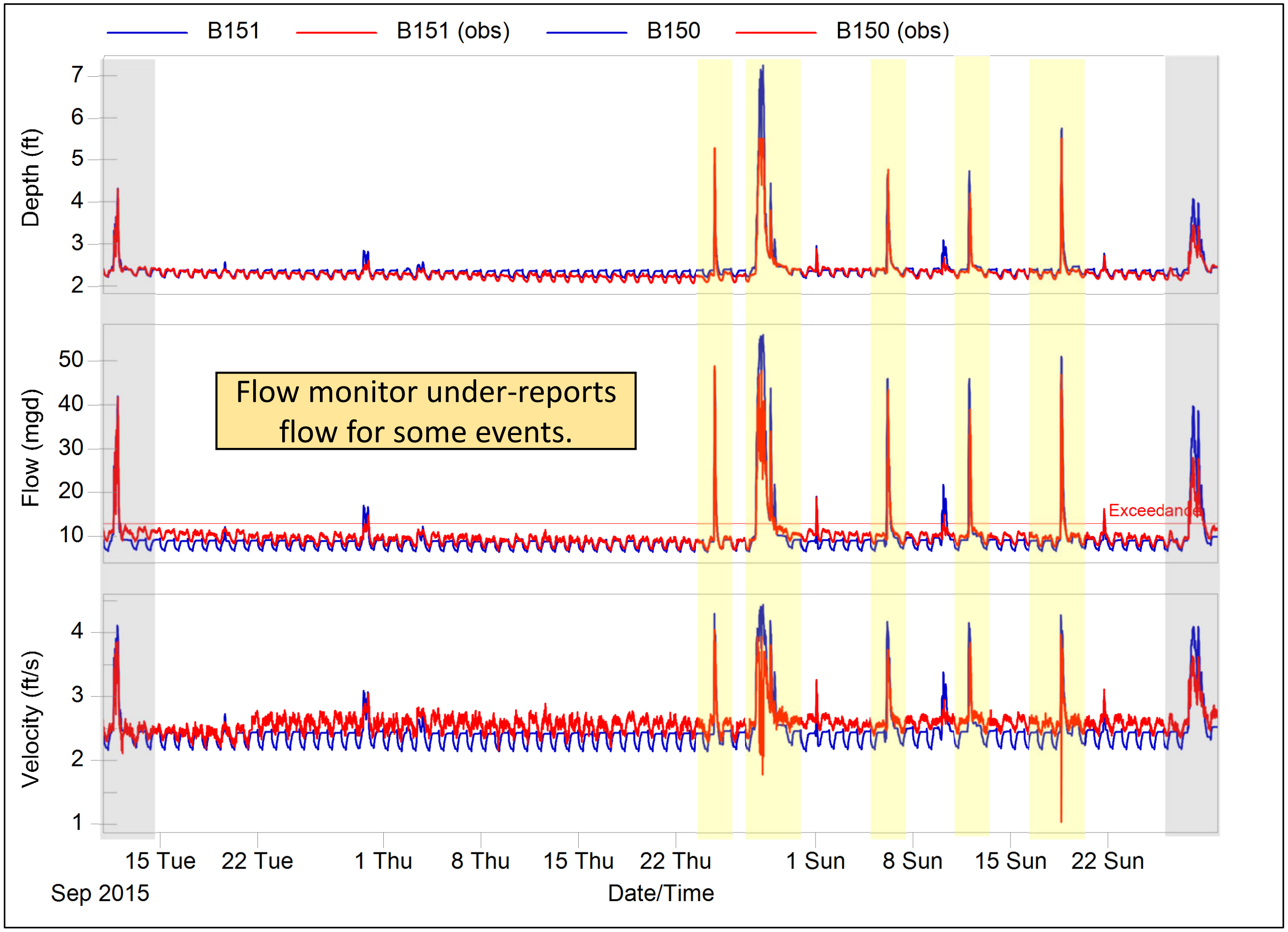


Calibration Events
4/30/16, 5/1/16

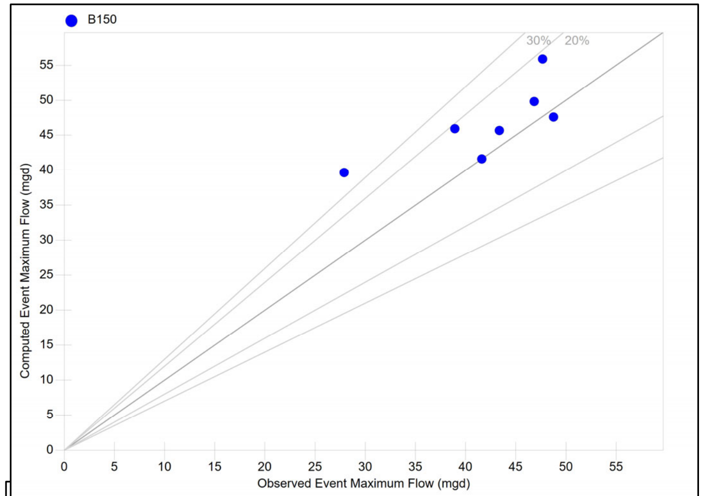
FM 2 - BCI Downstream of CSO 70

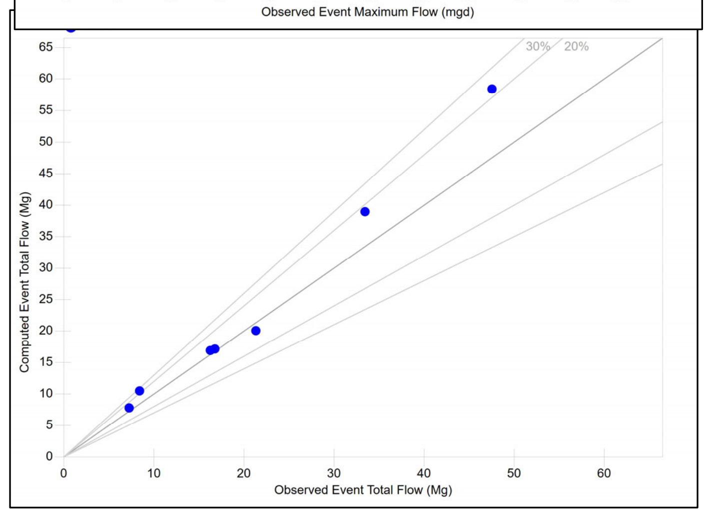
Calibration Events
6/15/16

FM 2 - BCI Downstream of CSO 70

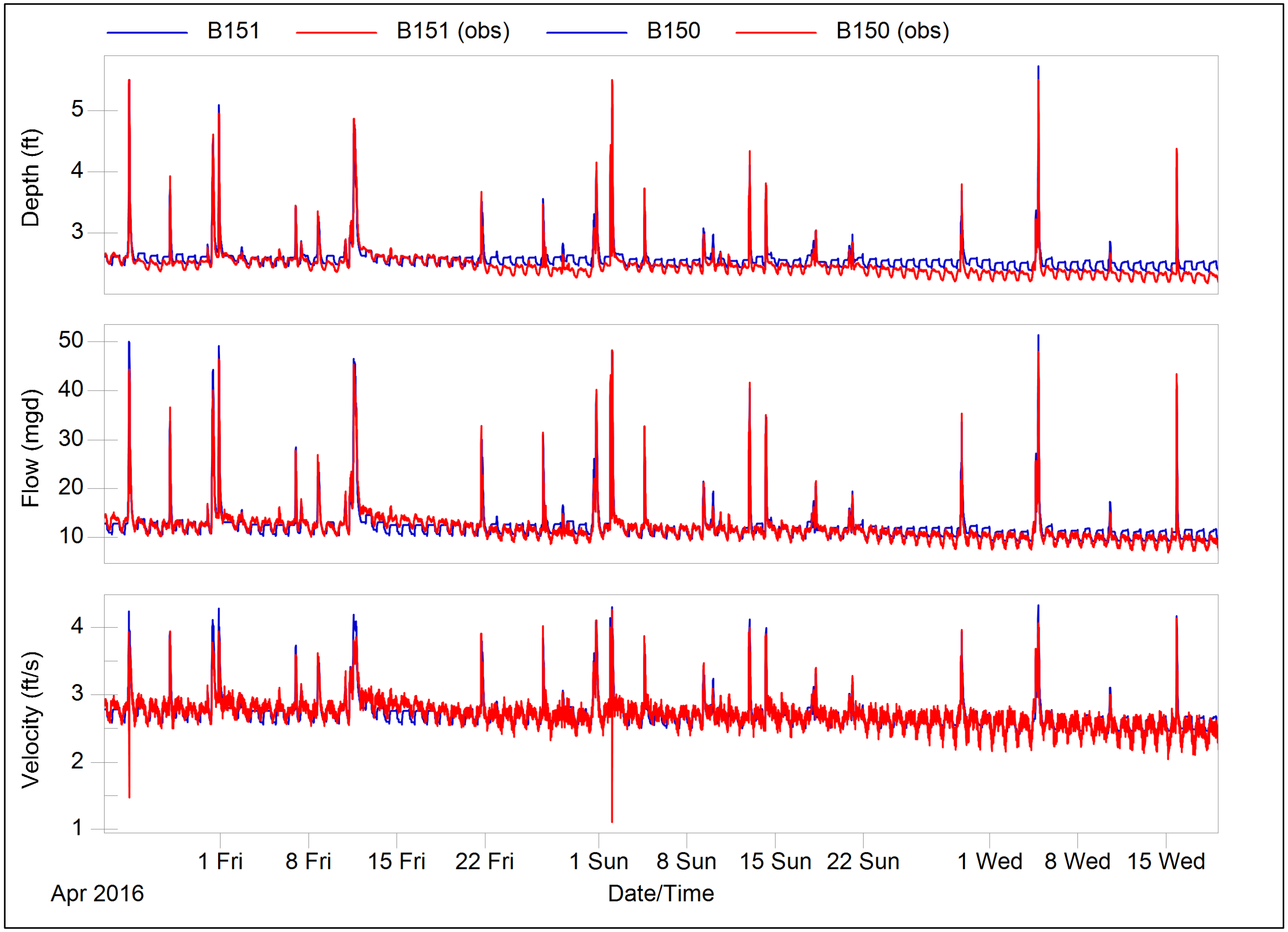


Fall 2015

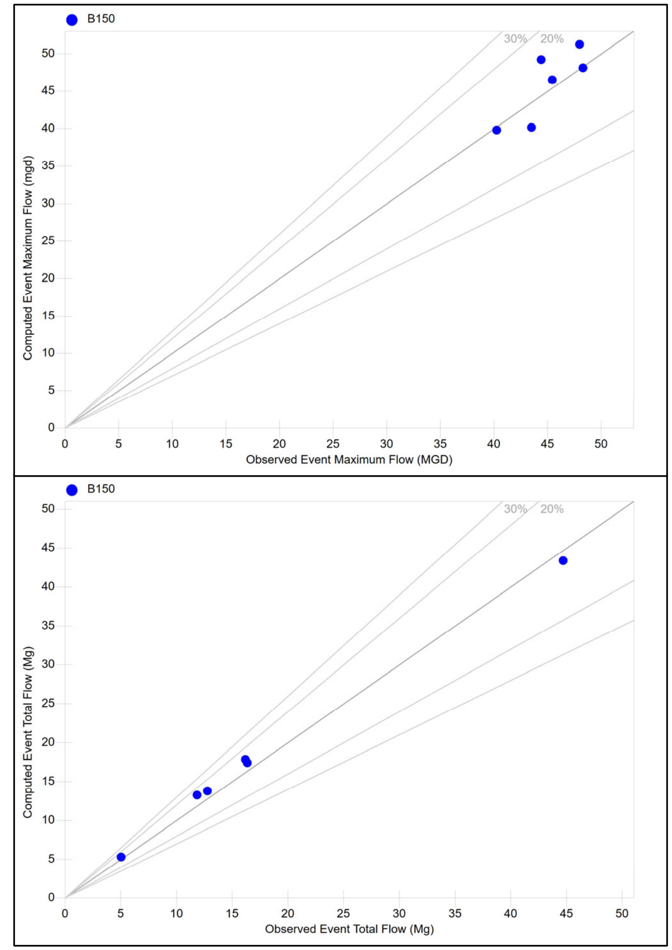




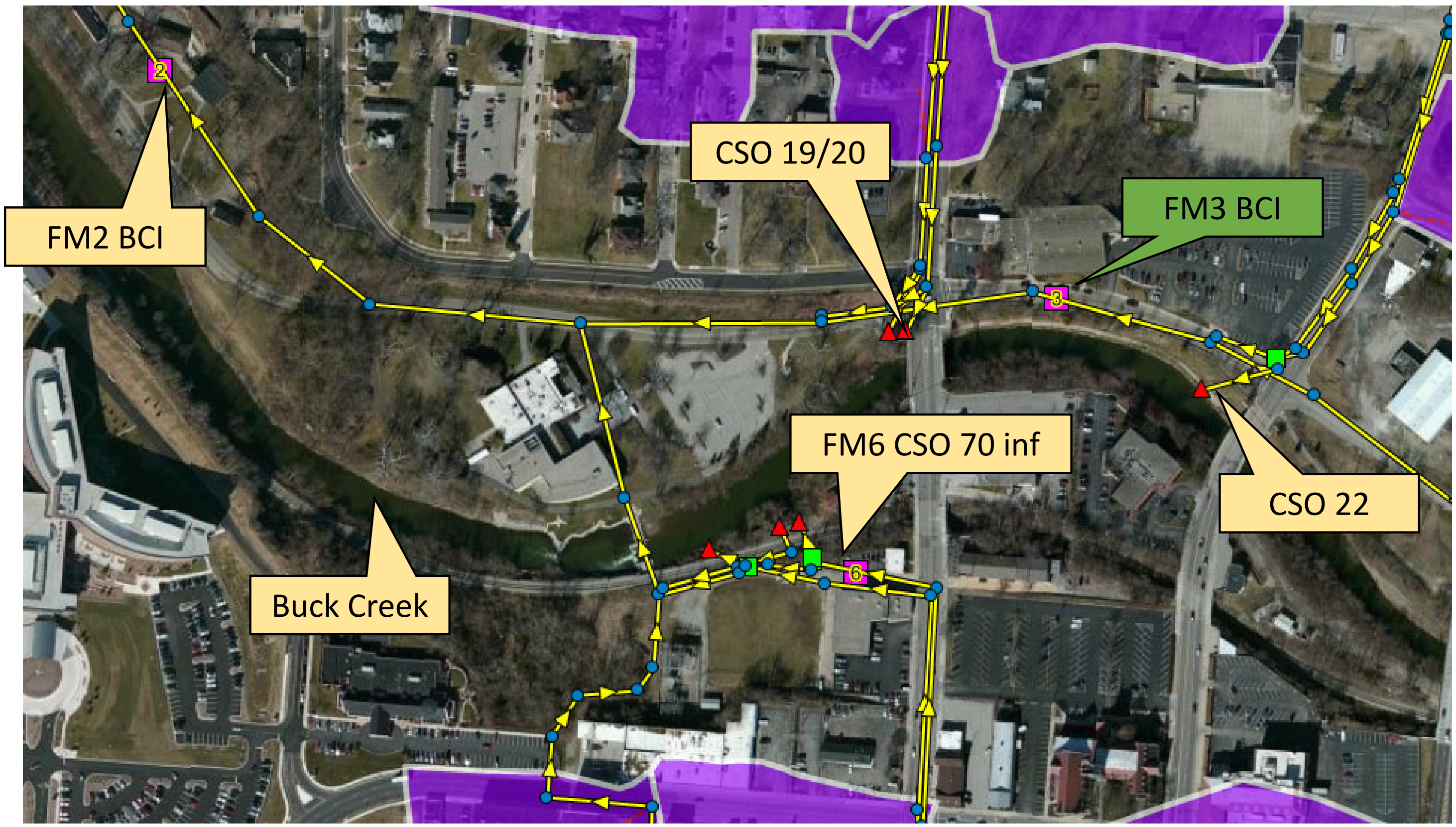
FM 2 - BCI Downstream of CSO 70



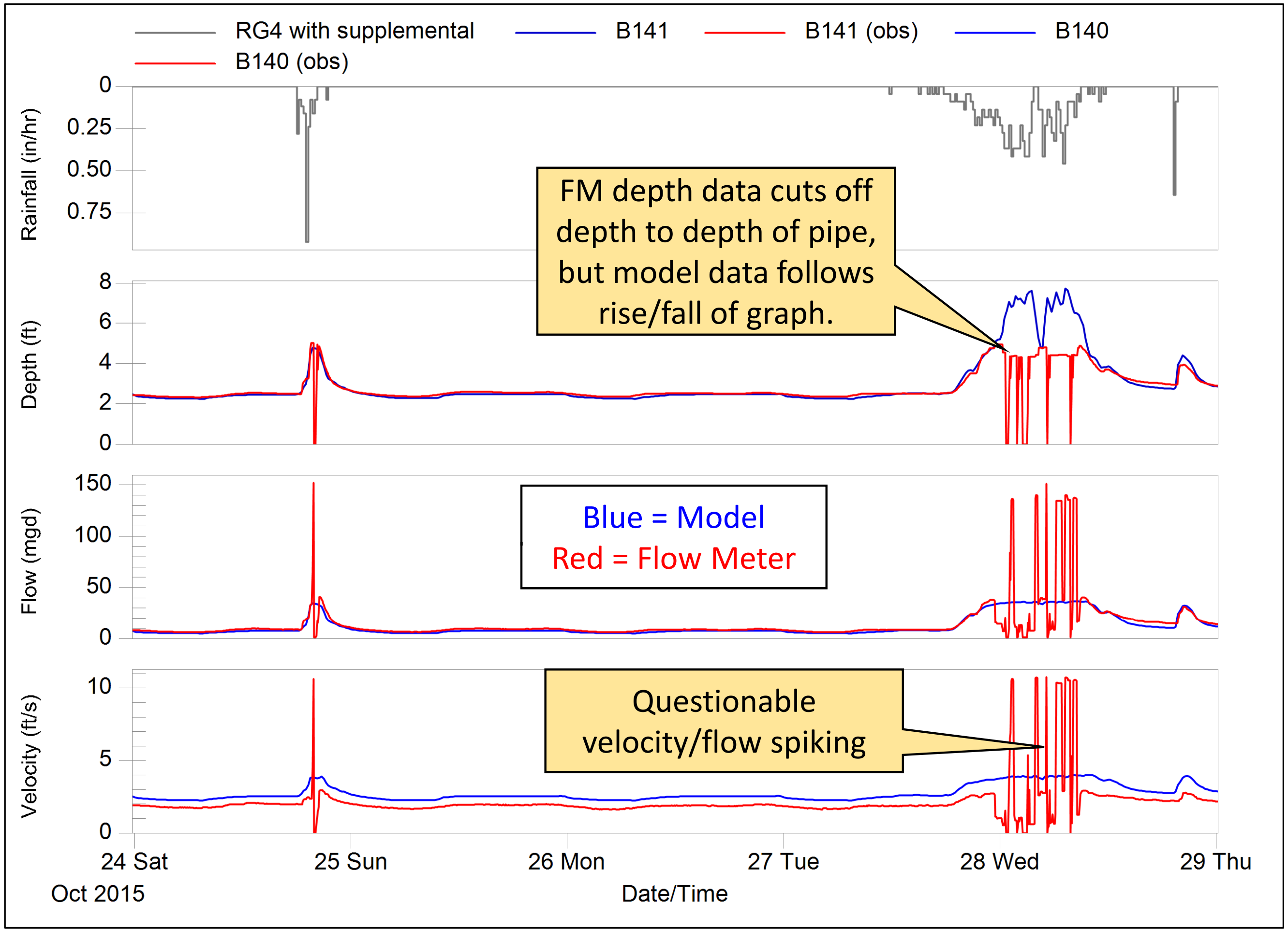
Spring 2016



FM 3
BCI – Upstream of CSO 70



FM 3 - BCI Upstream of CSO 70



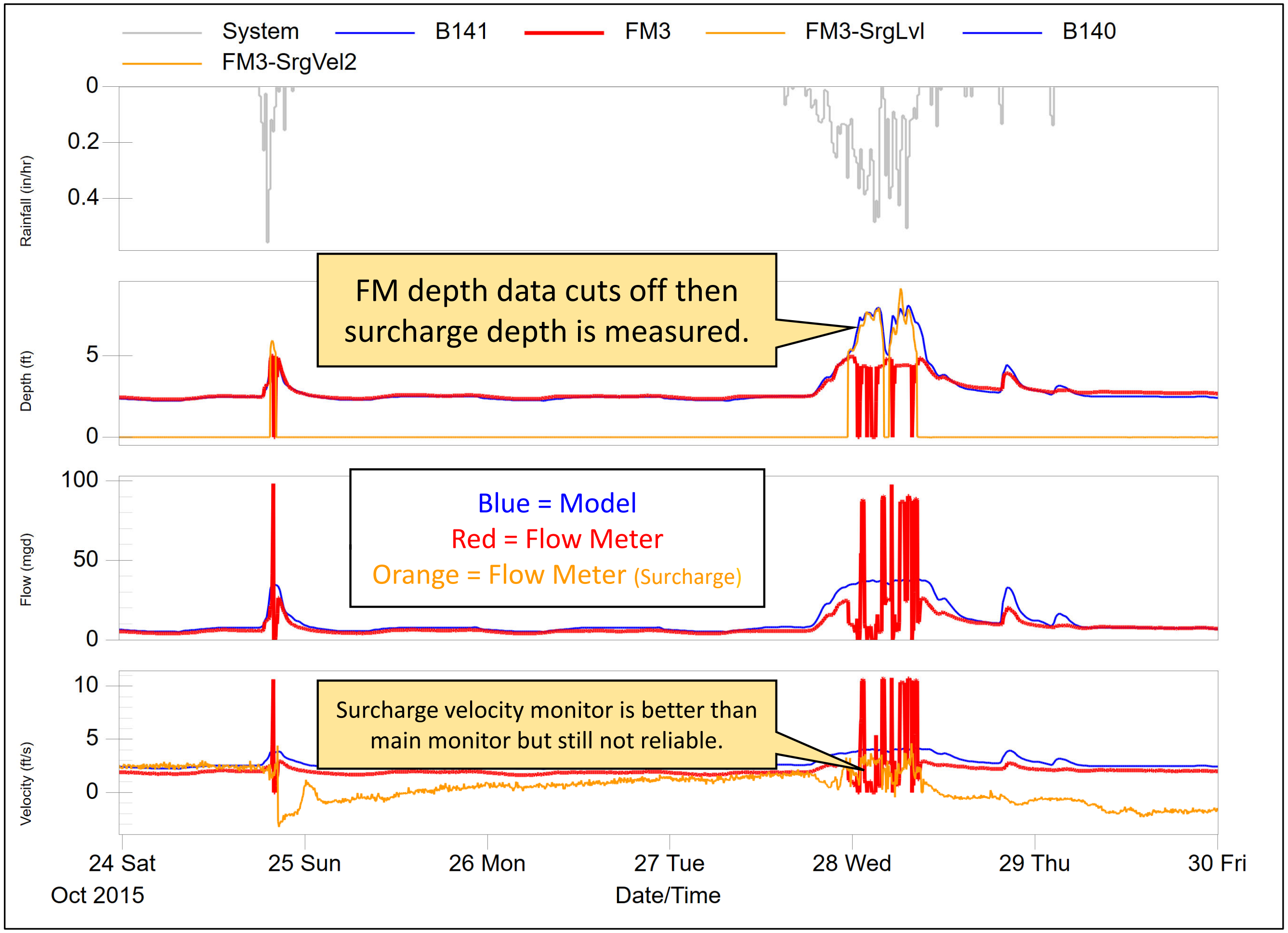
Calibration Events

10/24/15, 10/27/15

Depth data cuts off at pipe crown and velocity data is unreliable.

See next slide for more information.

FM 3 - BCI Upstream of CSO 70



Calibration Events

10/24/15, 10/27/15

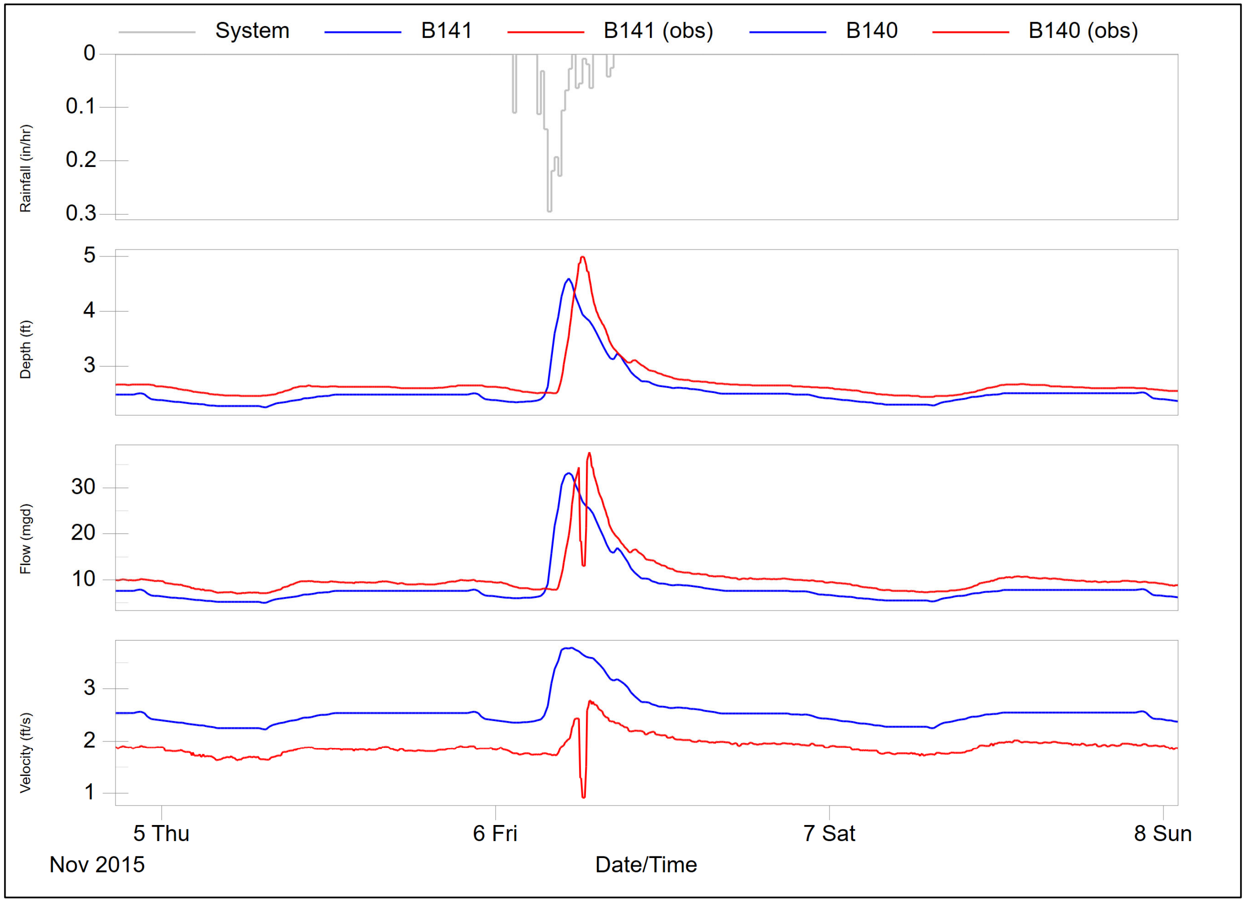
Flow monitor has same setup as FM2 (illustrated previously).

Used depth and surcharge depth to compare to model.

Velocity monitor no good during surcharge and surcharge velocity monitor under-reports during surcharge.

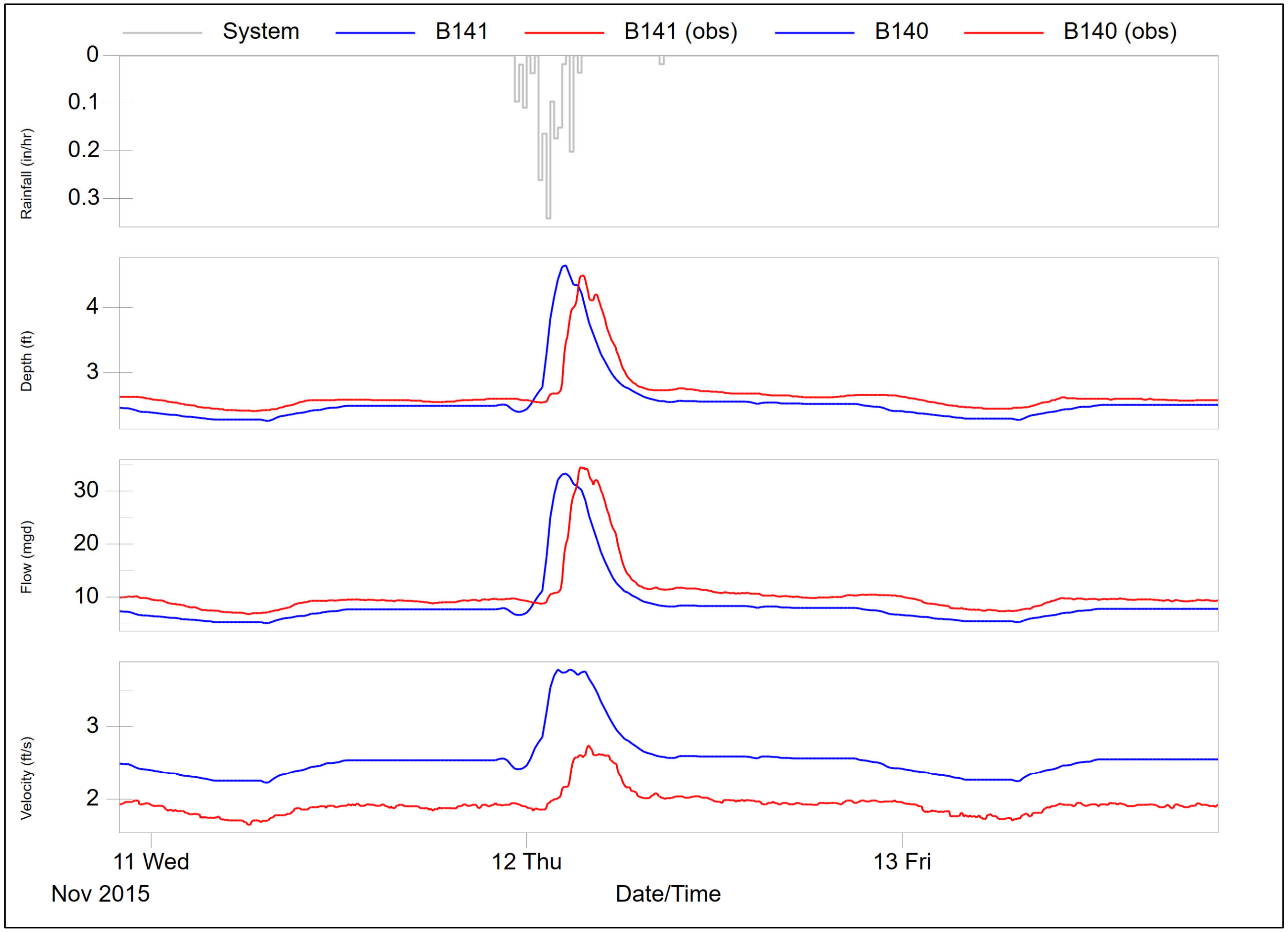
Flow calculation based on main velocity sensor so flow calculation is unreliable.

FM 3 - BCI Upstream of CSO 70



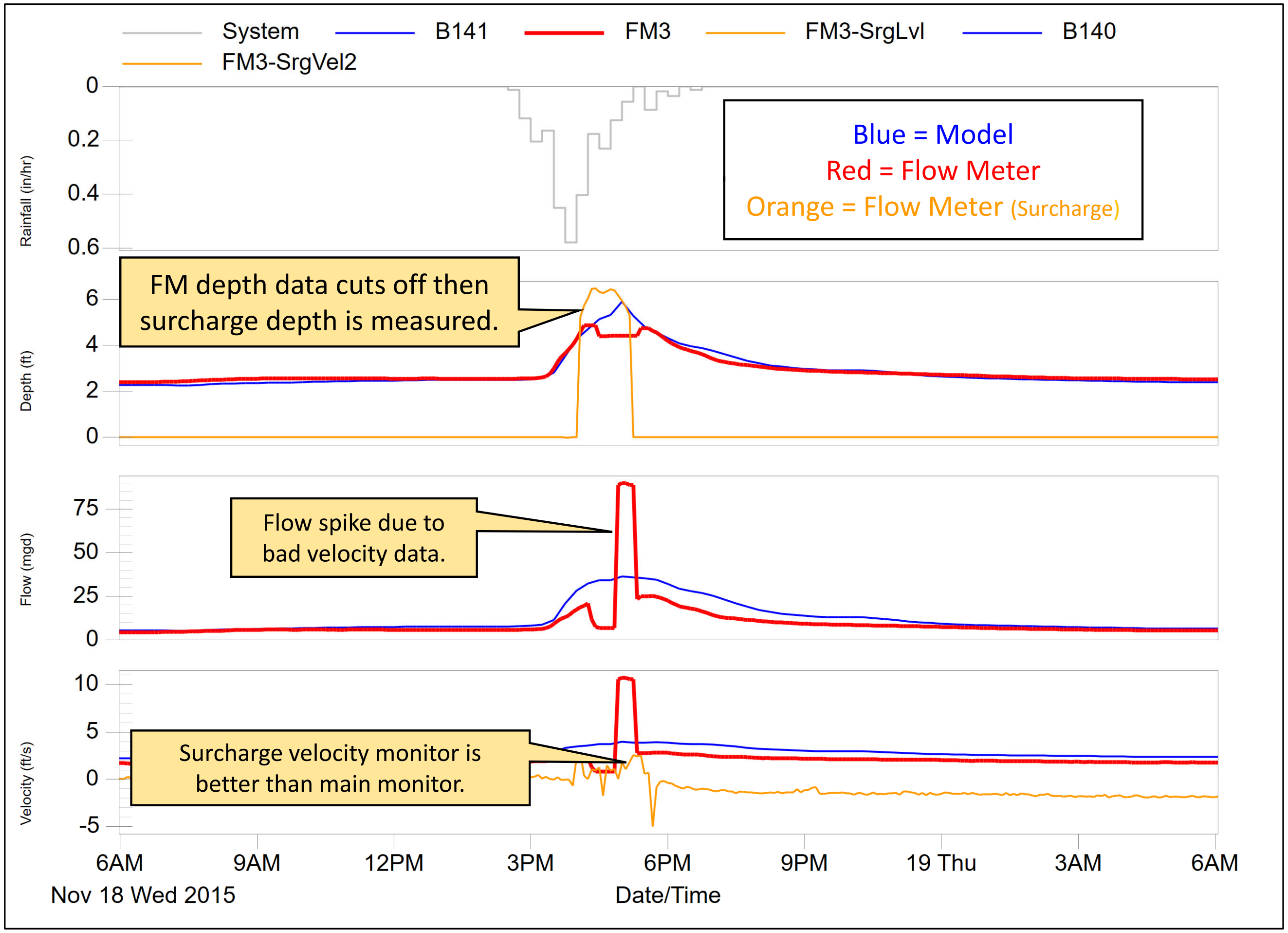
Calibration Events
11/6/15

FM 3 - BCI Upstream of CSO 70



Calibration Events
11/11/15

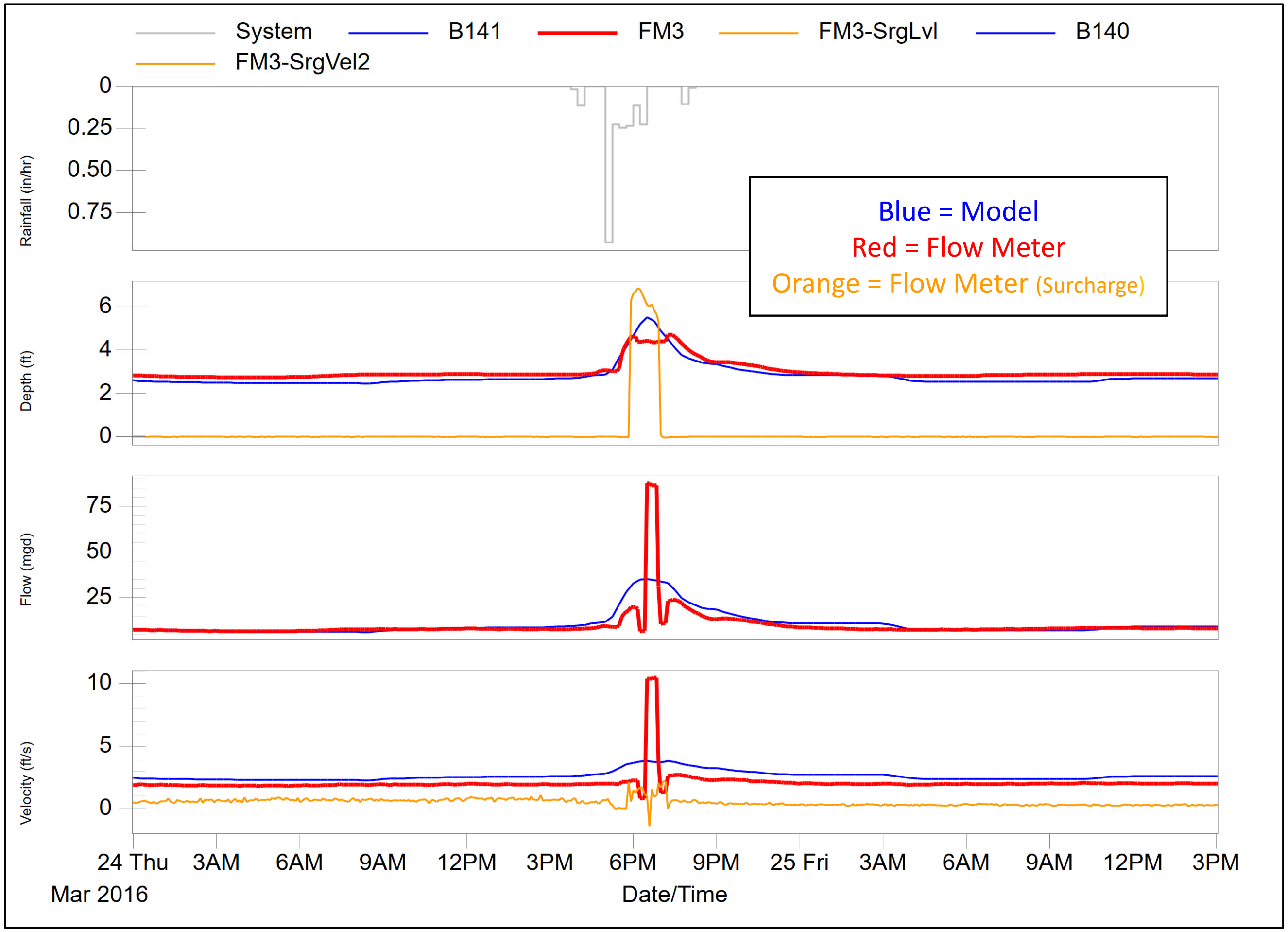
FM 3 - BCI Upstream of CSO 70



Calibration Events

11/18/15

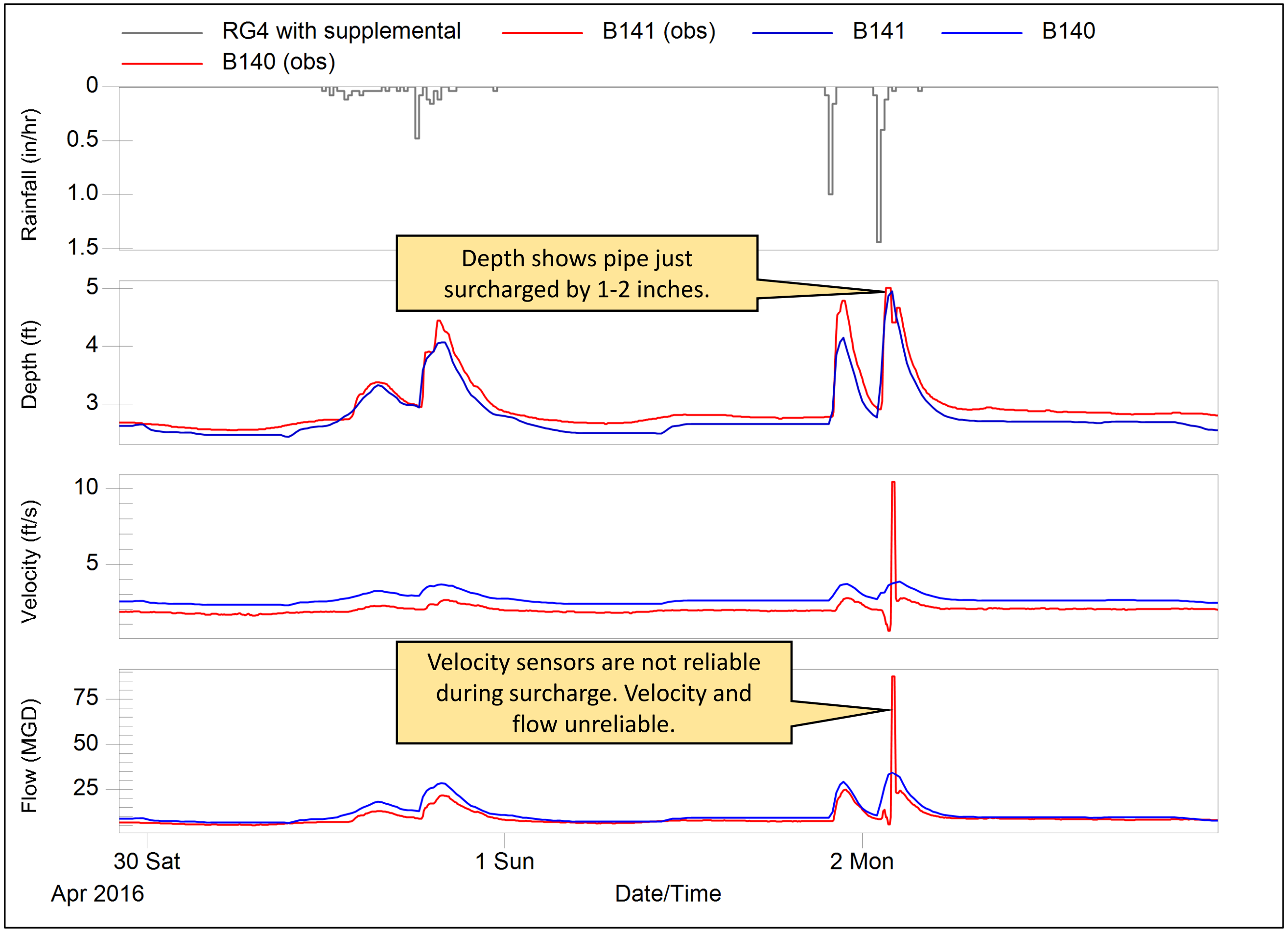
FM 3 - BCI Upstream of CSO 70



Calibration Event

3/24/16

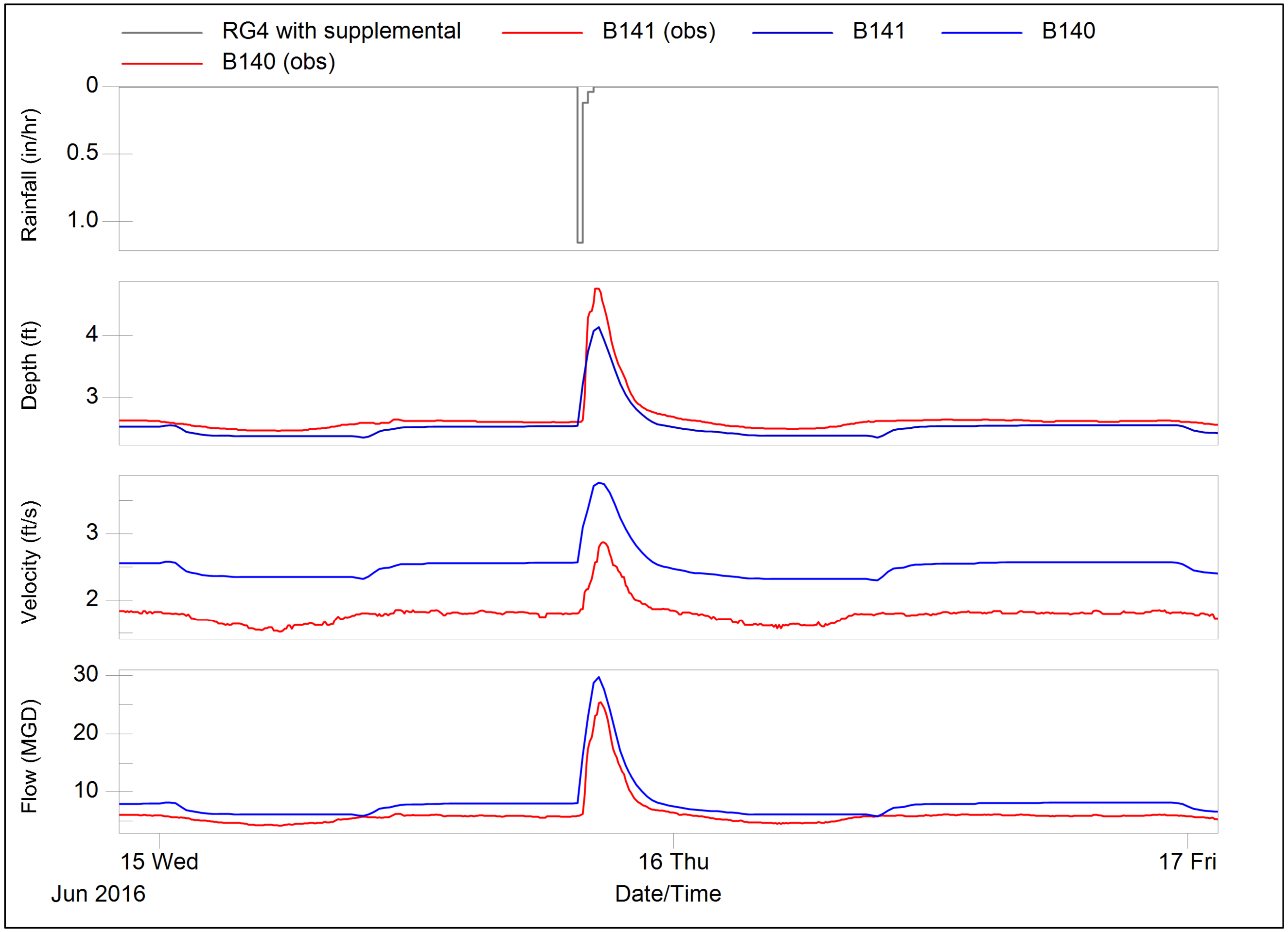
FM 3 - BCI Upstream of CSO 70



Calibration Events

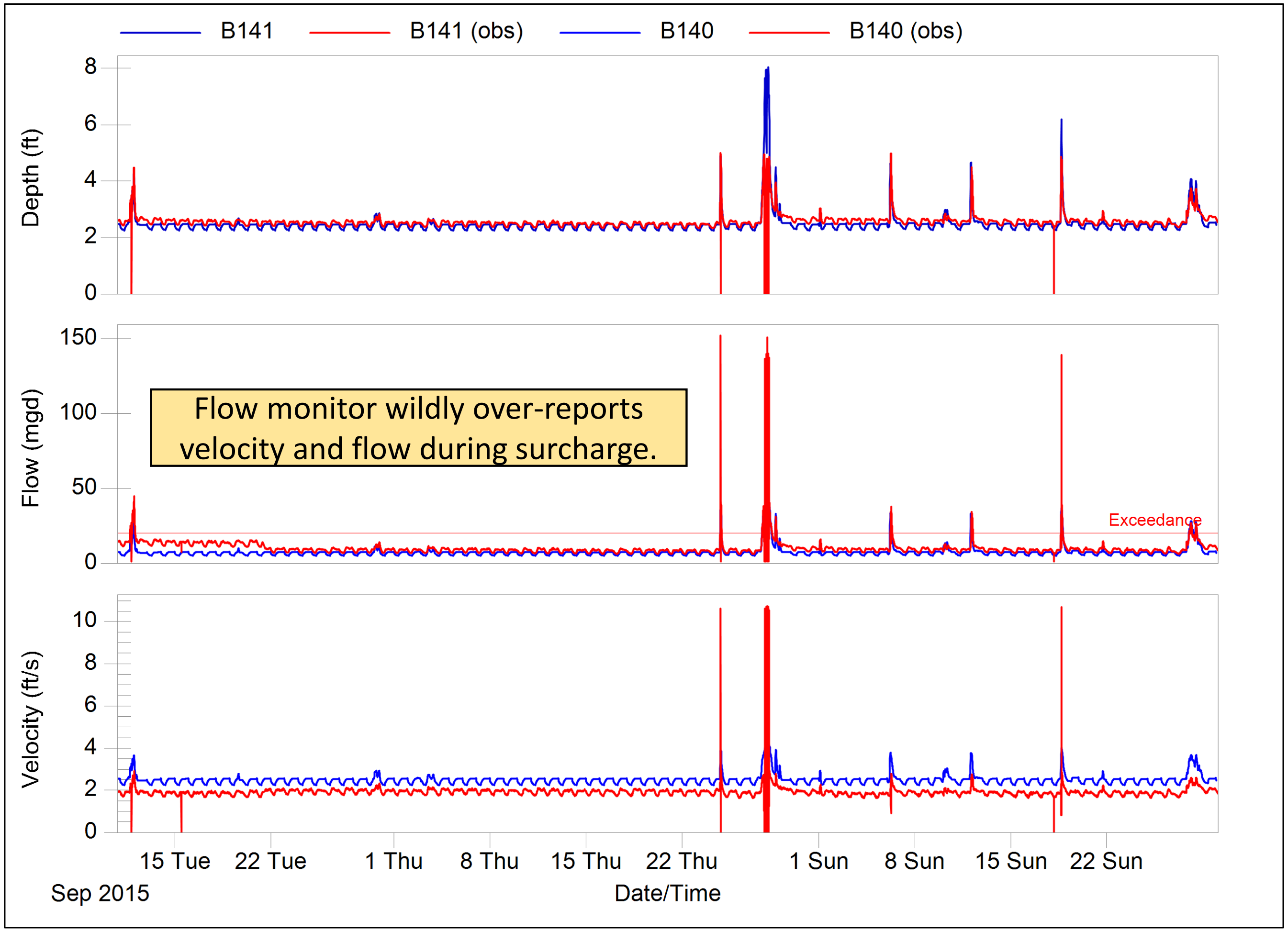
4/30/16, 5/1/16

FM 3 - BCI Upstream of CSO 70

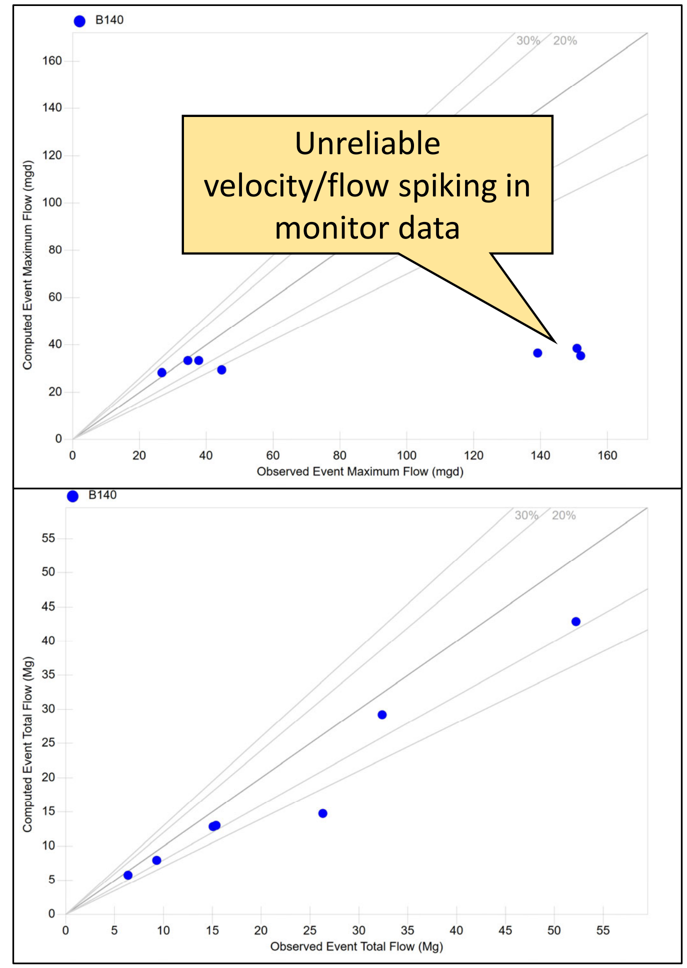


Calibration Events
6/15/16

FM 3 - BCI Upstream of CSO 70

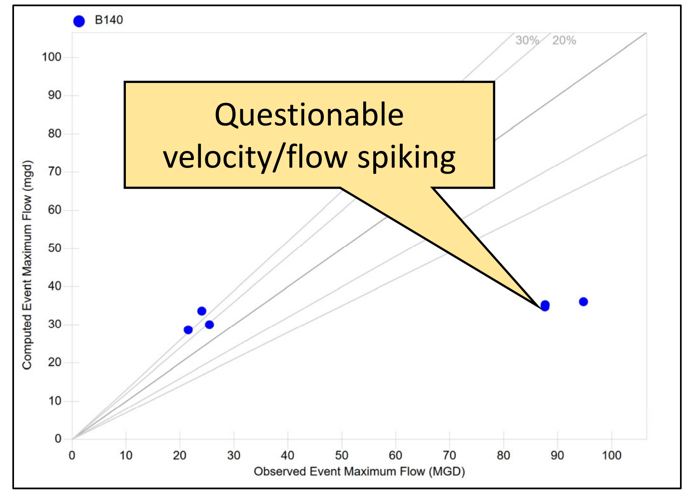


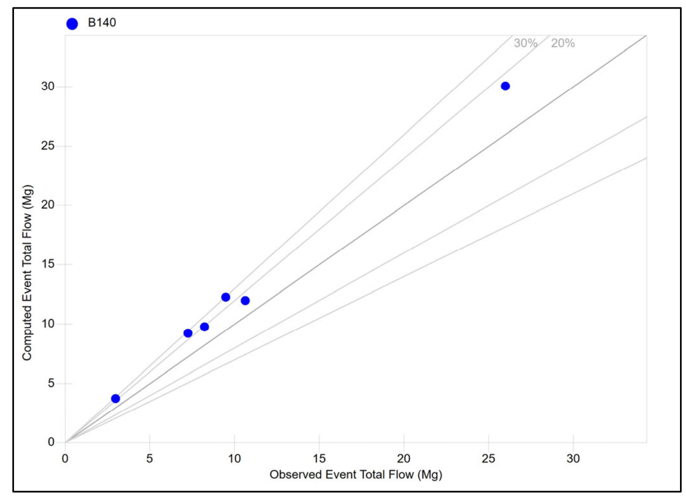
Fall 2015



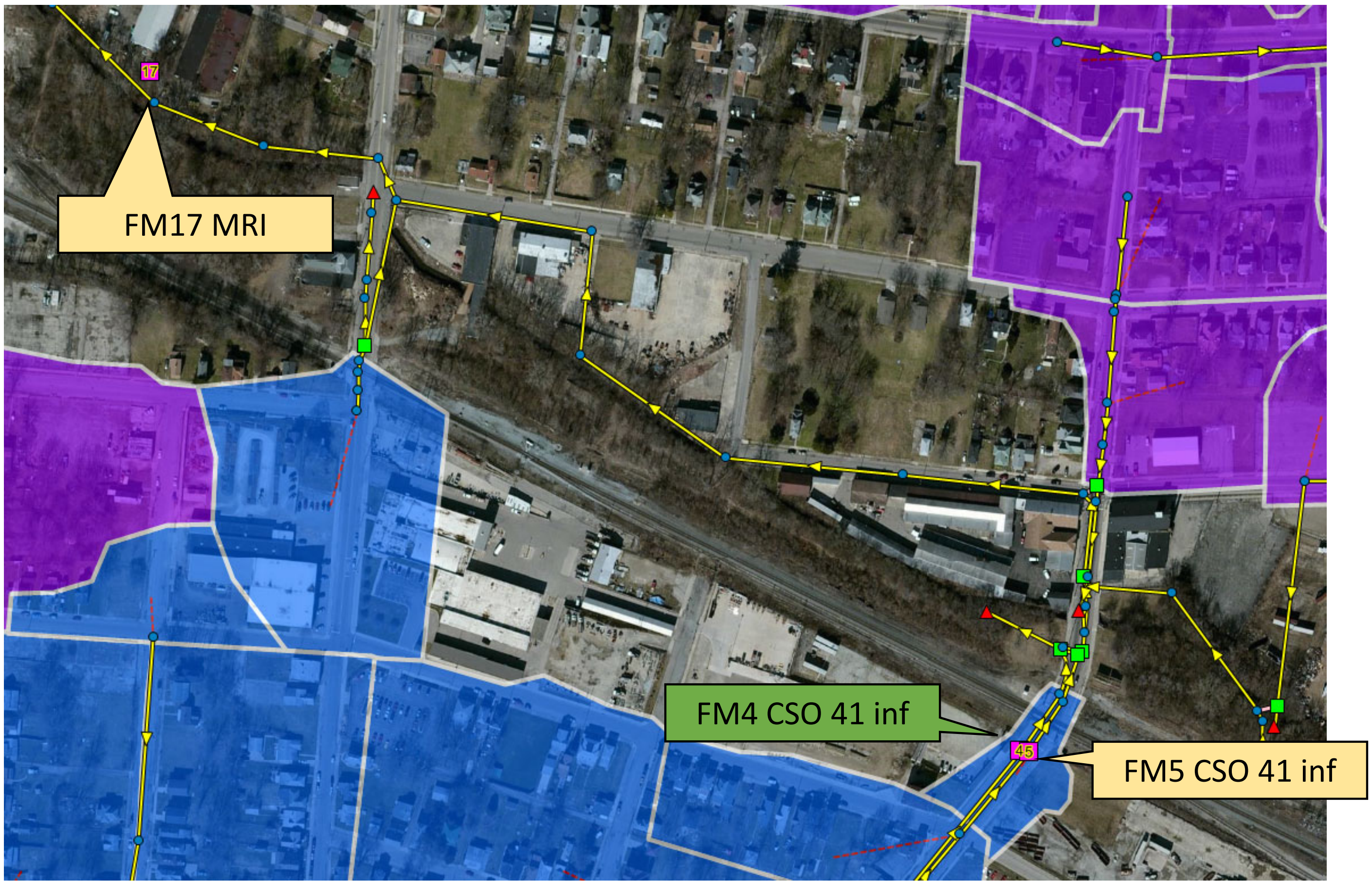
FM 3 - BCI Upstream of CSO 70

Spring 2016

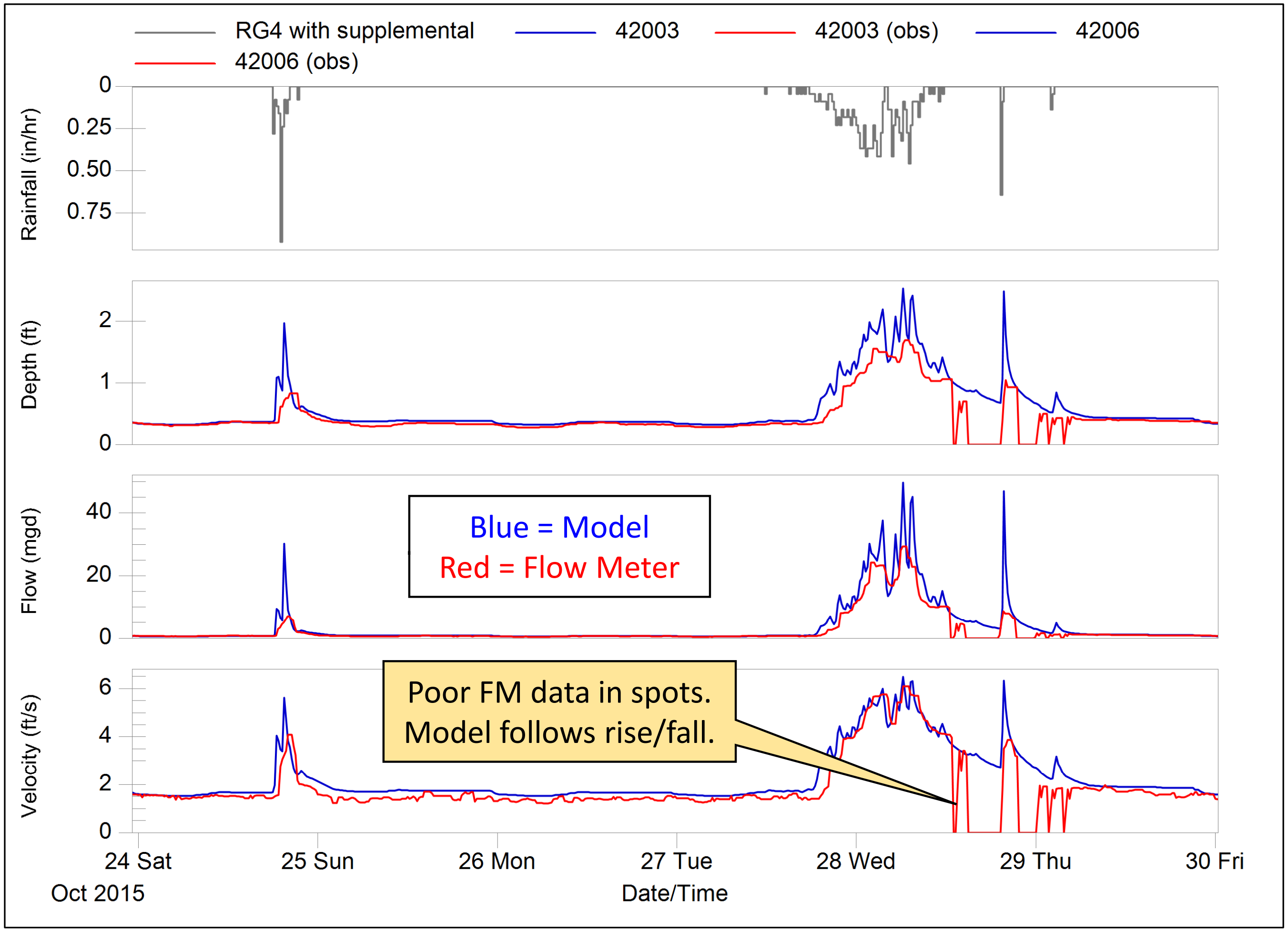




FM 4
CSO 41 - 90” inf pipe

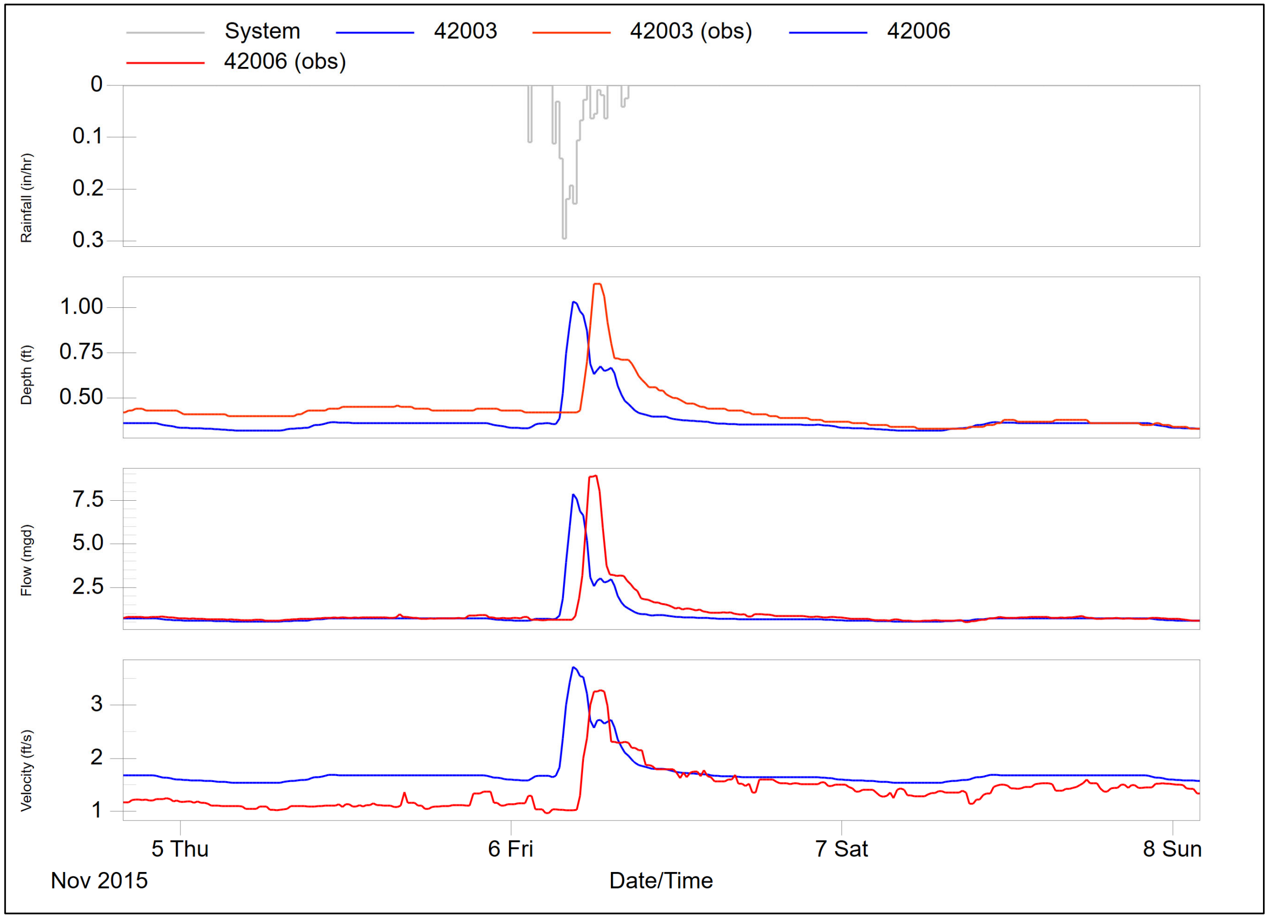


FM 4 – CSO 41 (90" pipe)



Calibration Events
10/24/15, 10/27/15

FM 4 – CSO 41 (90” pipe)

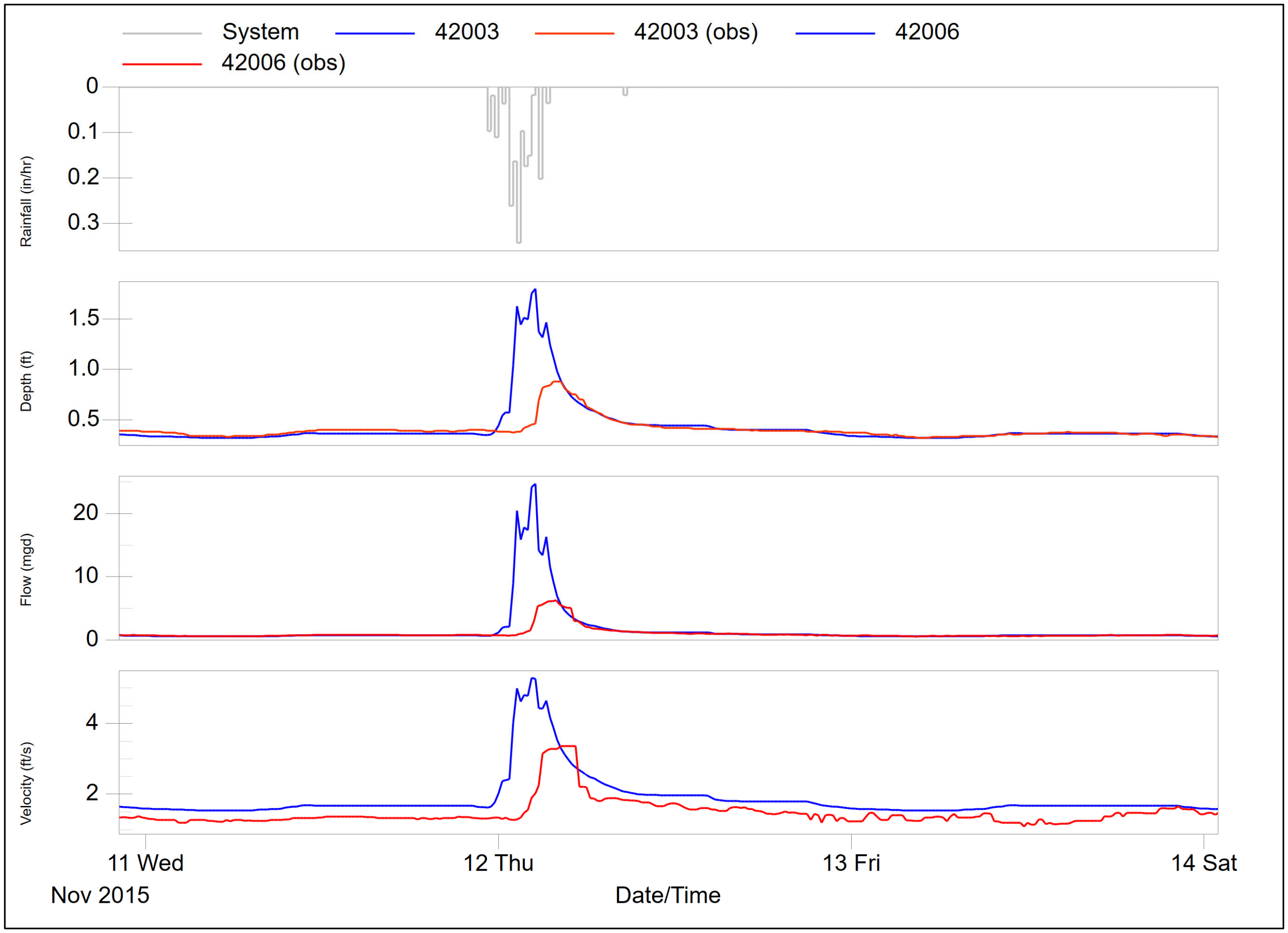


Calibration Events
11/6/15

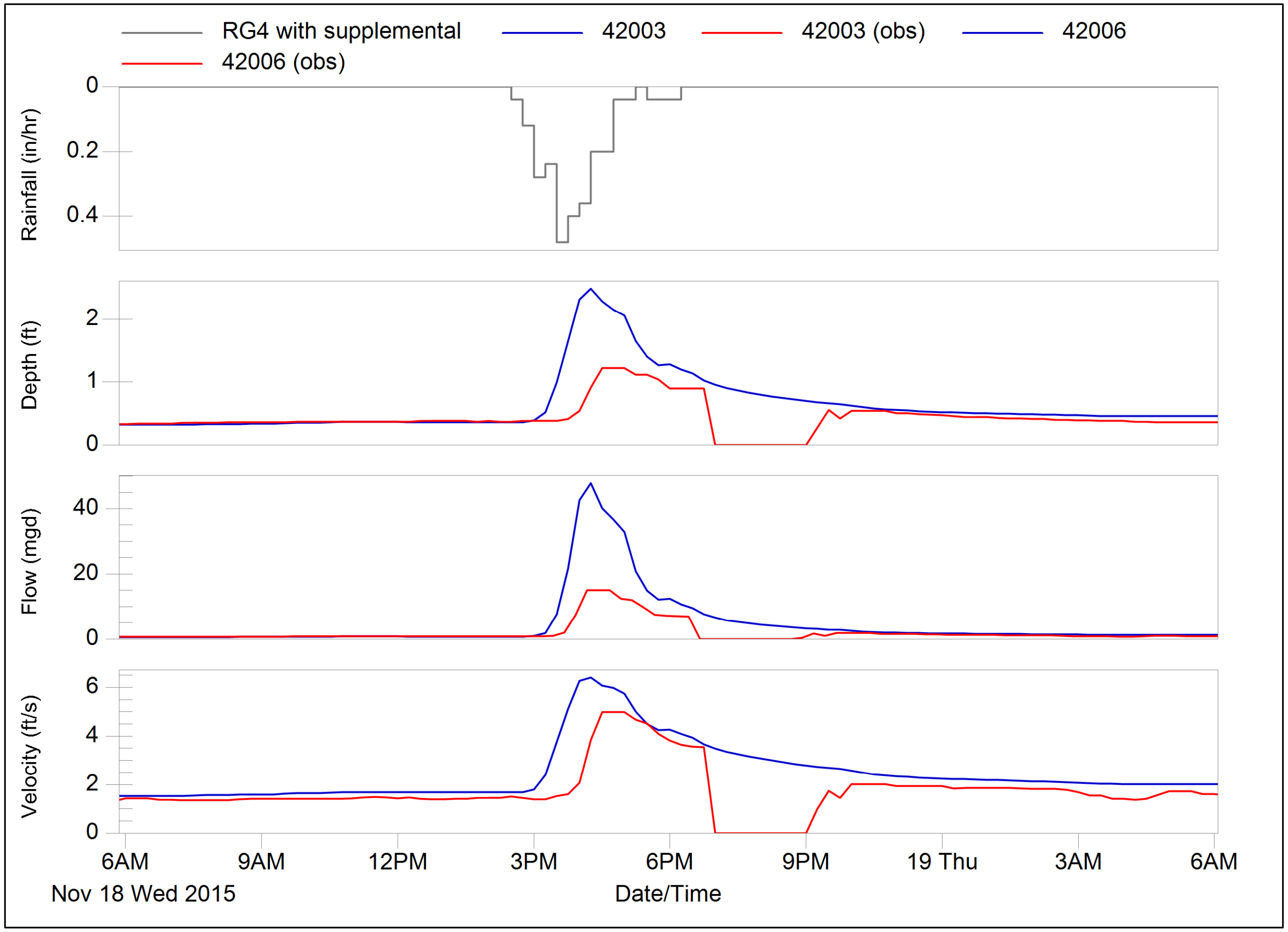
FM 4 – CSO 41 (90” pipe)

Calibration Events

11/11/15



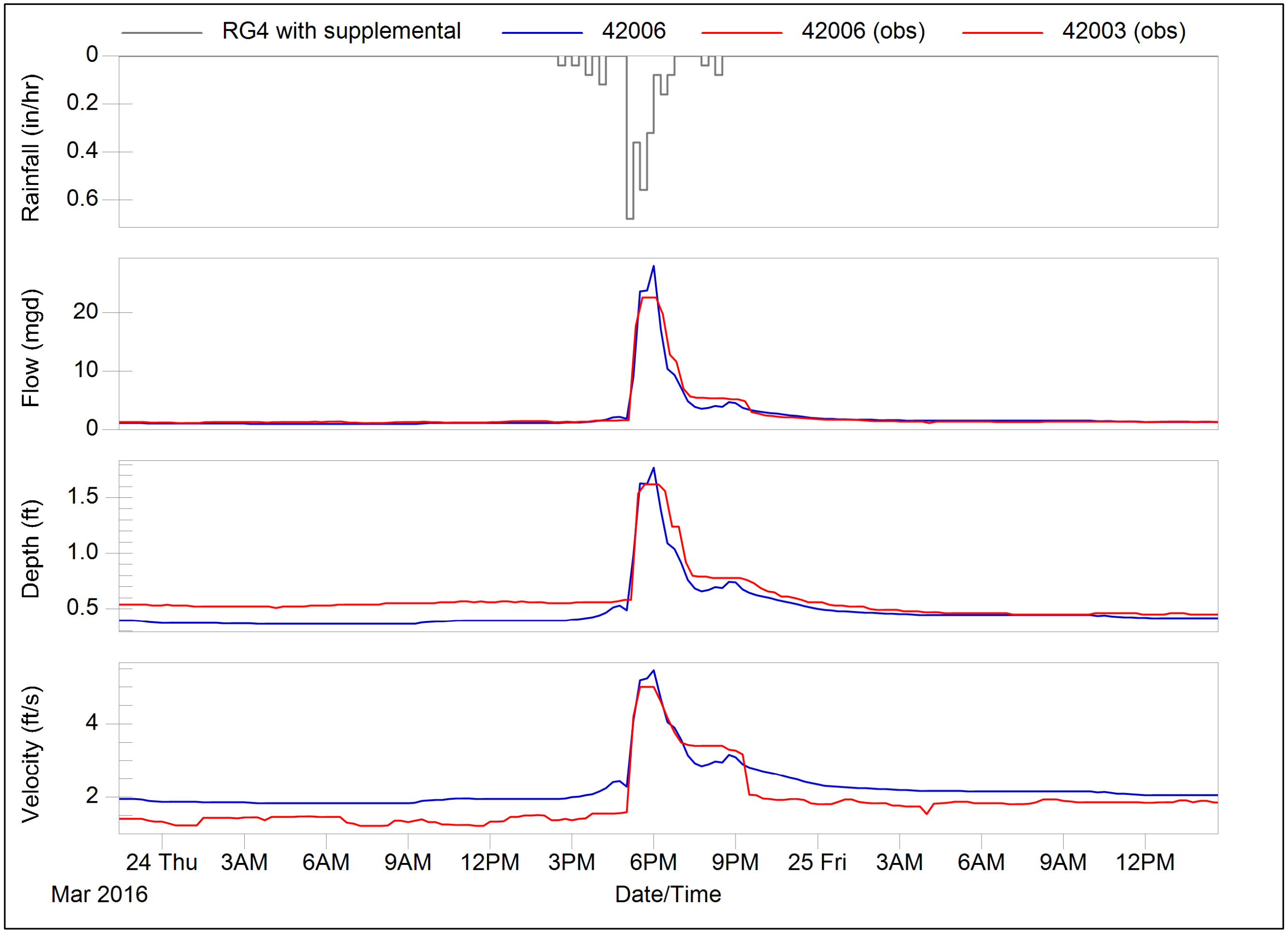
FM 4 – CSO 41 (90” pipe)



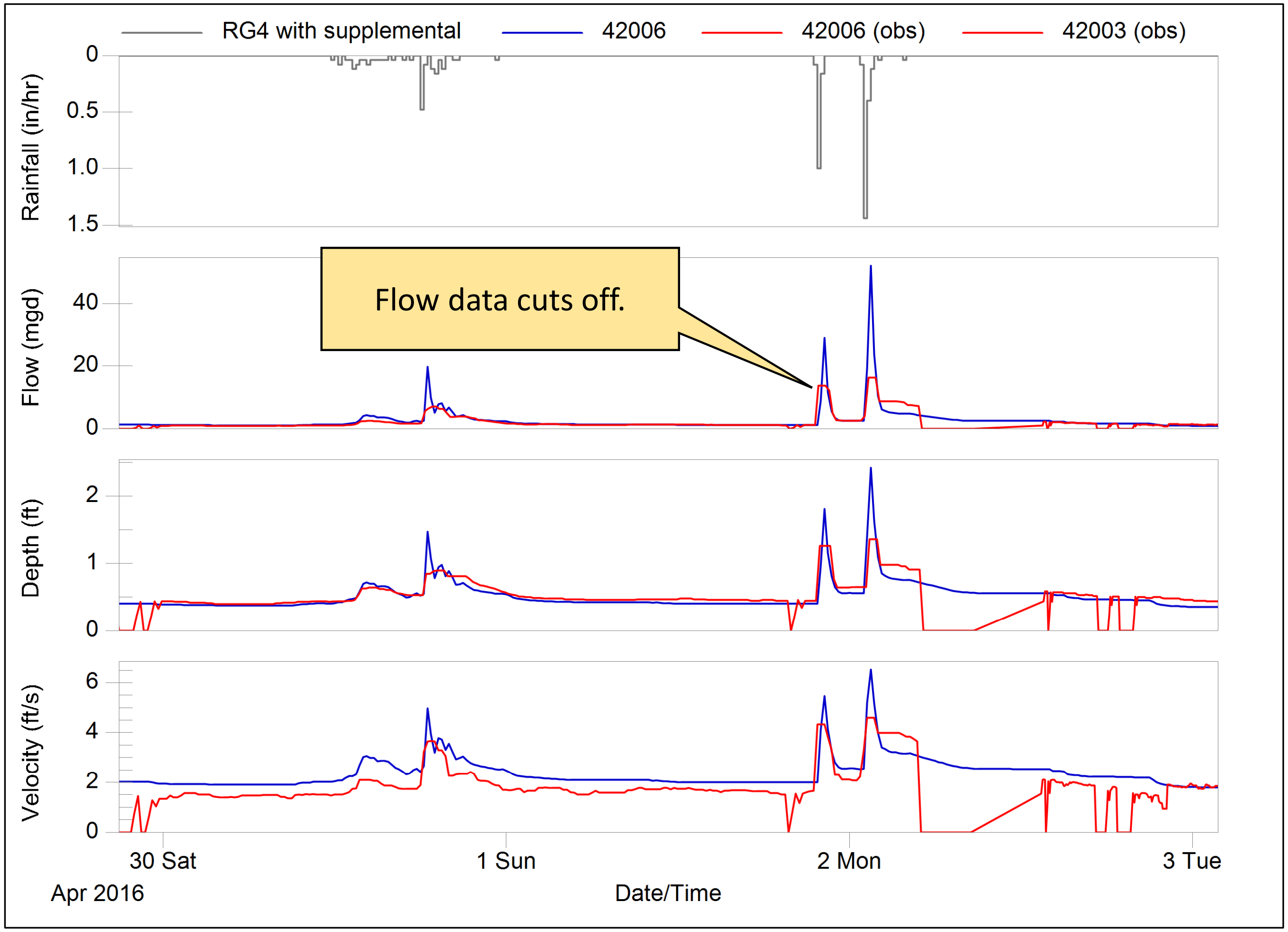
Calibration Events
11/18/15

FM 4 – CSO 41 (90” pipe)

Calibration Event
3/24/16

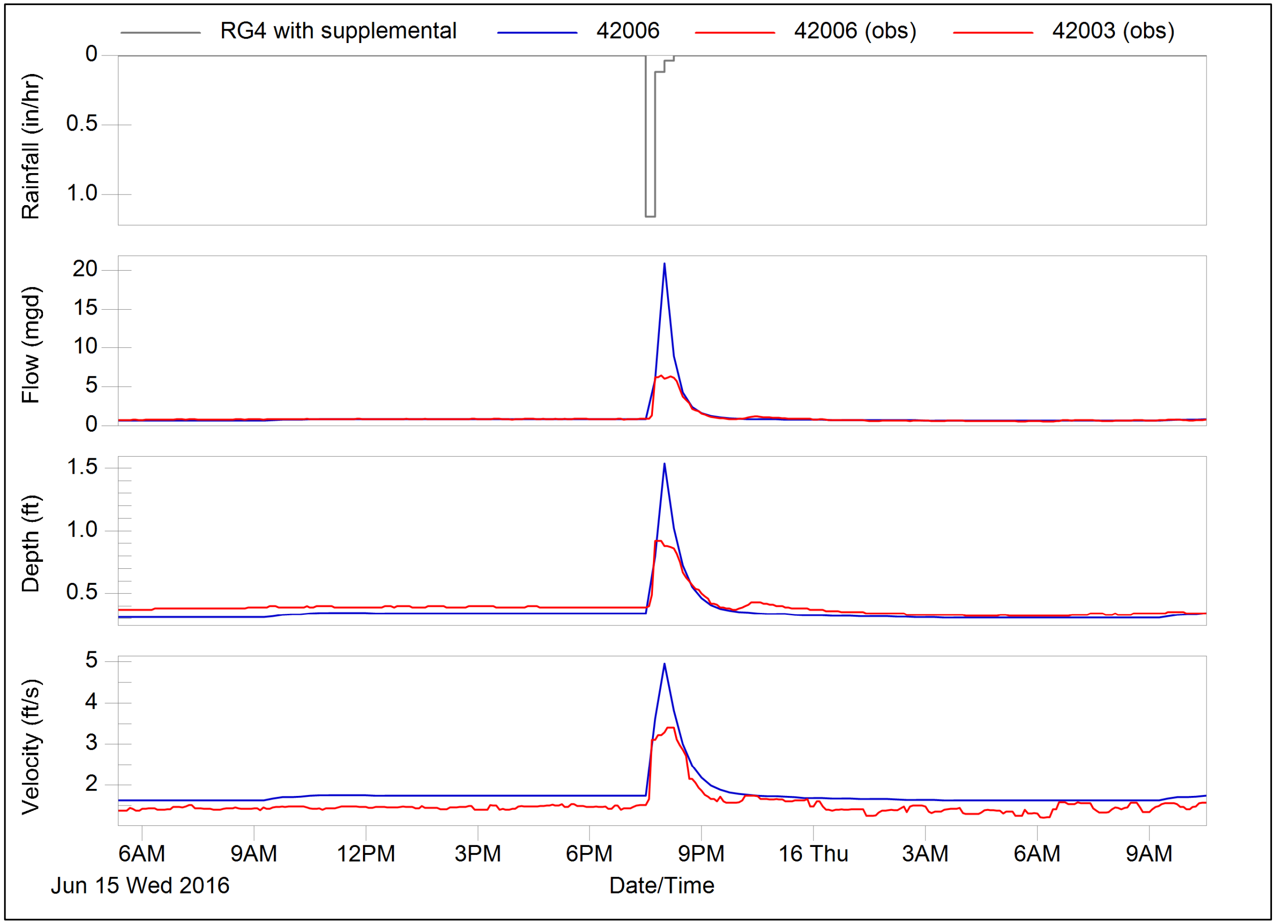


FM 4 – CSO 41 (90” pipe)



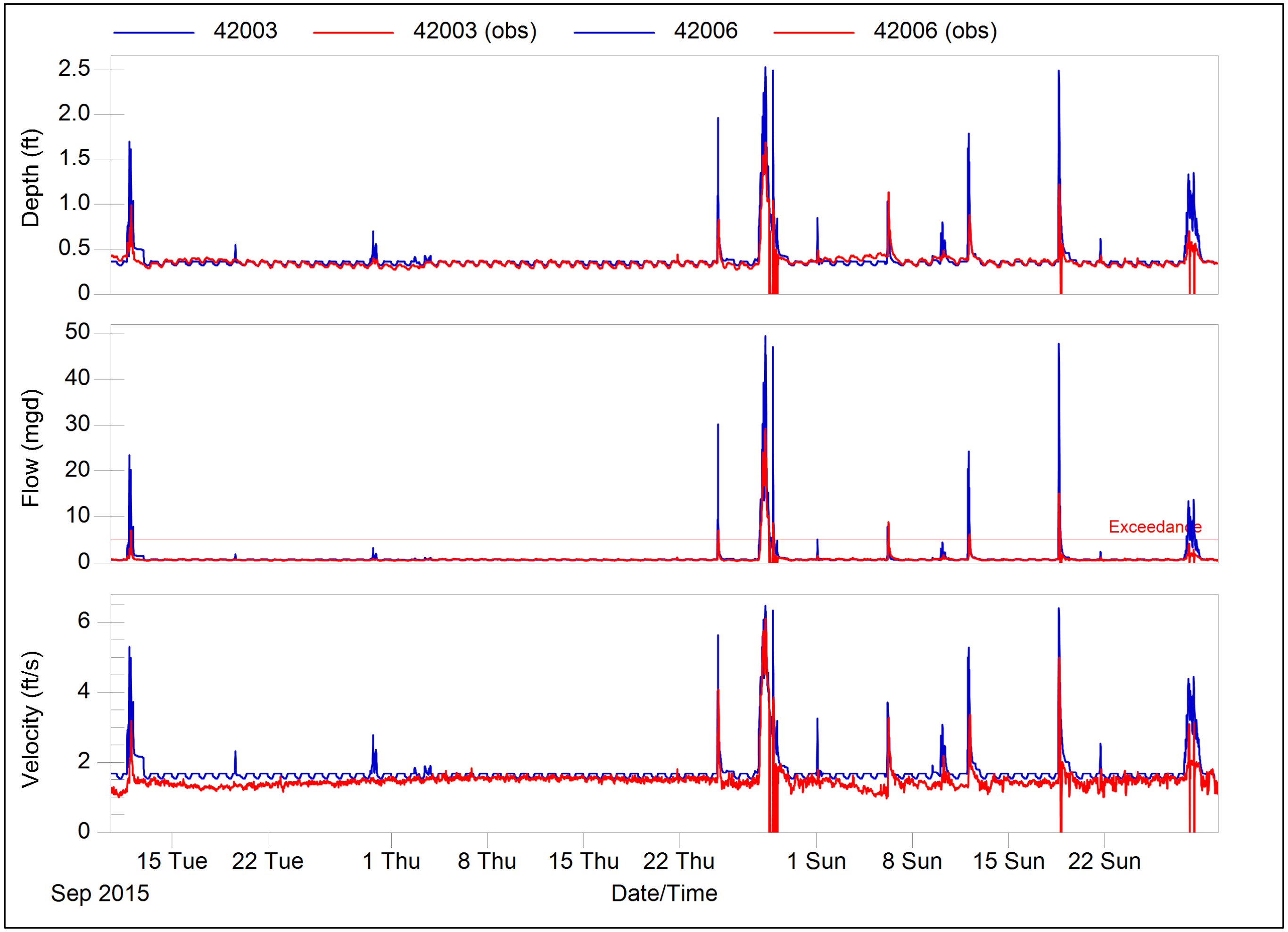
Calibration Events
4/30/16, 5/1/16

FM 4 – CSO 41 (90” pipe)

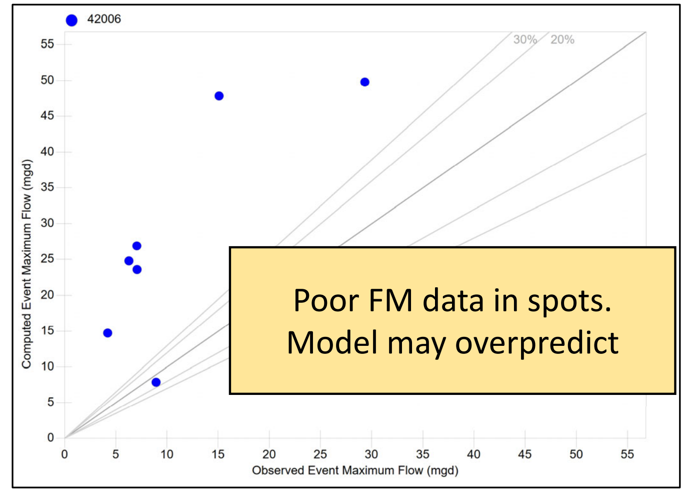


Calibration Events
6/15/16

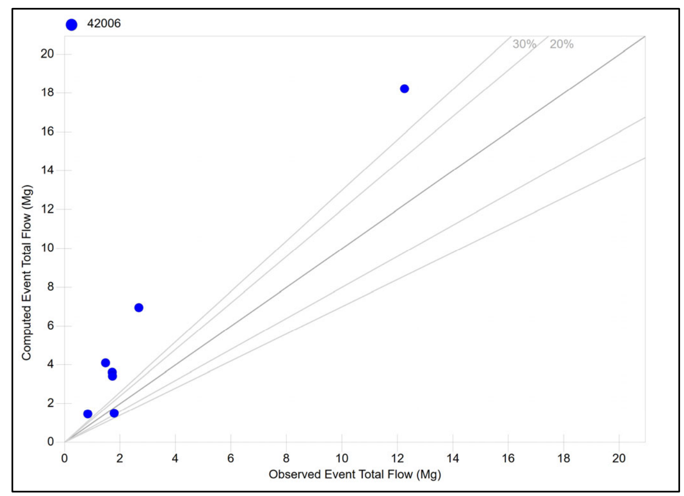
FM 4 – CSO 41 (90” pipe)



Fall 2015

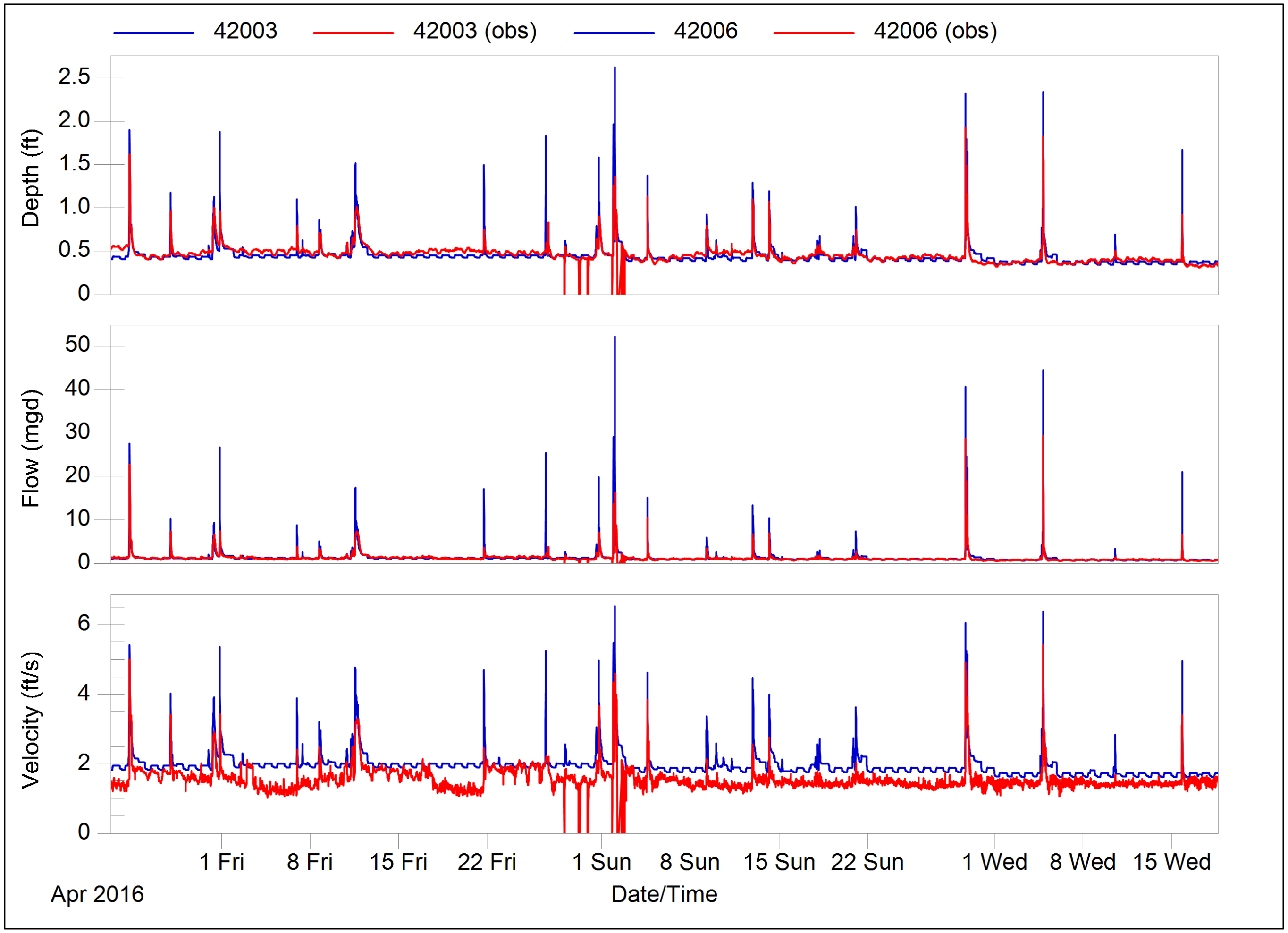


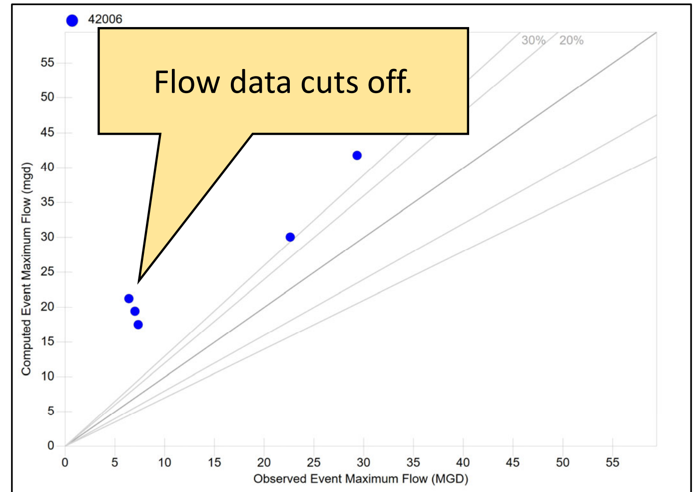
Poor FM data in spots.
Model may overpredict

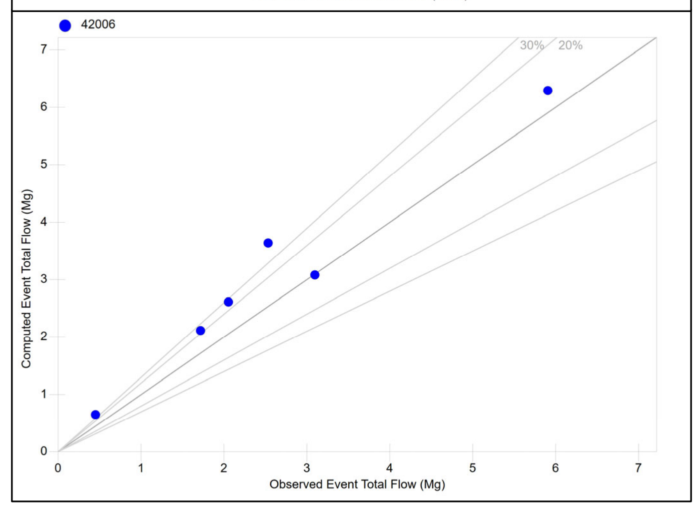


FM 4 – CSO 41 (90" pipe)

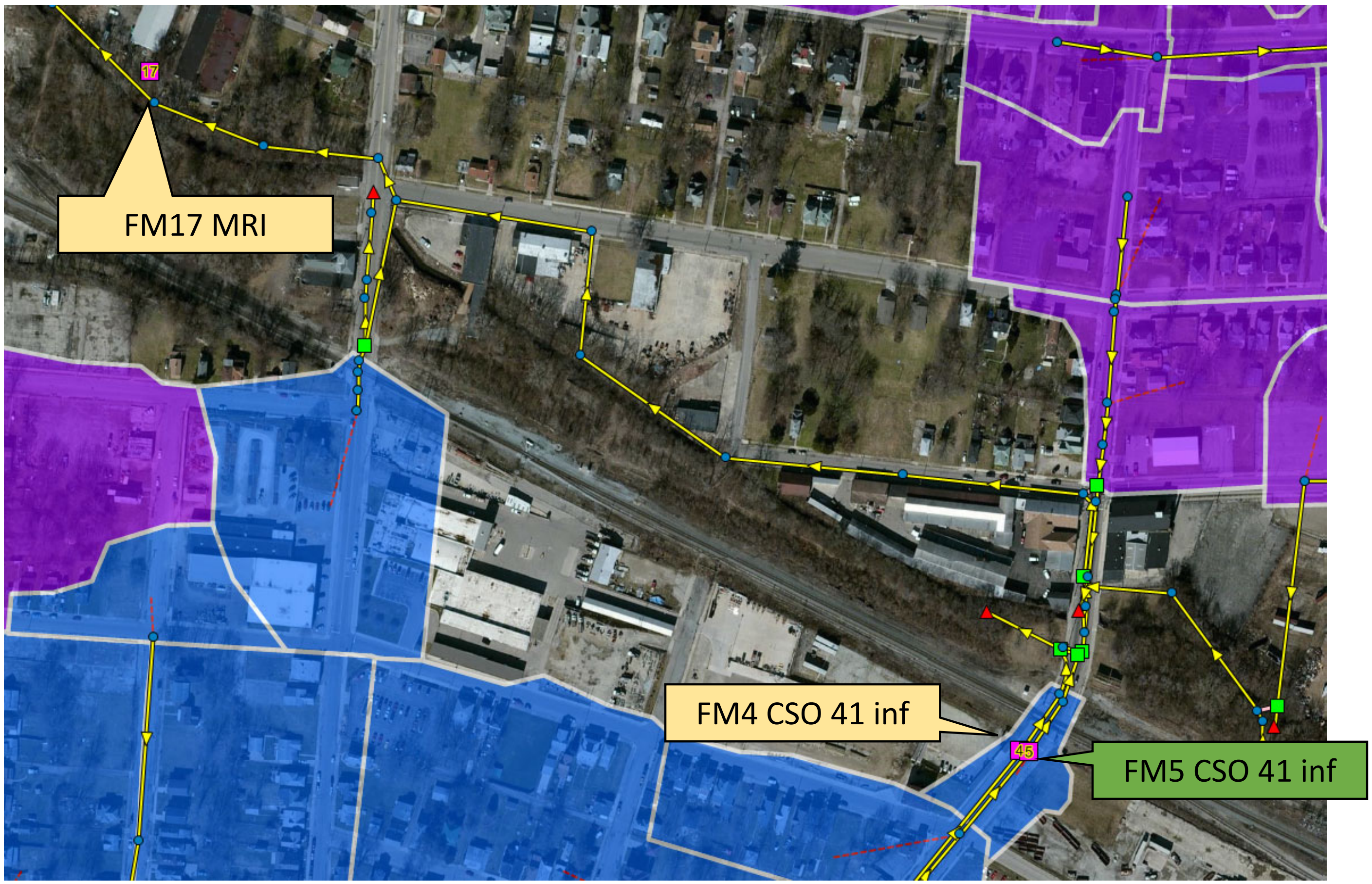
Spring 2016



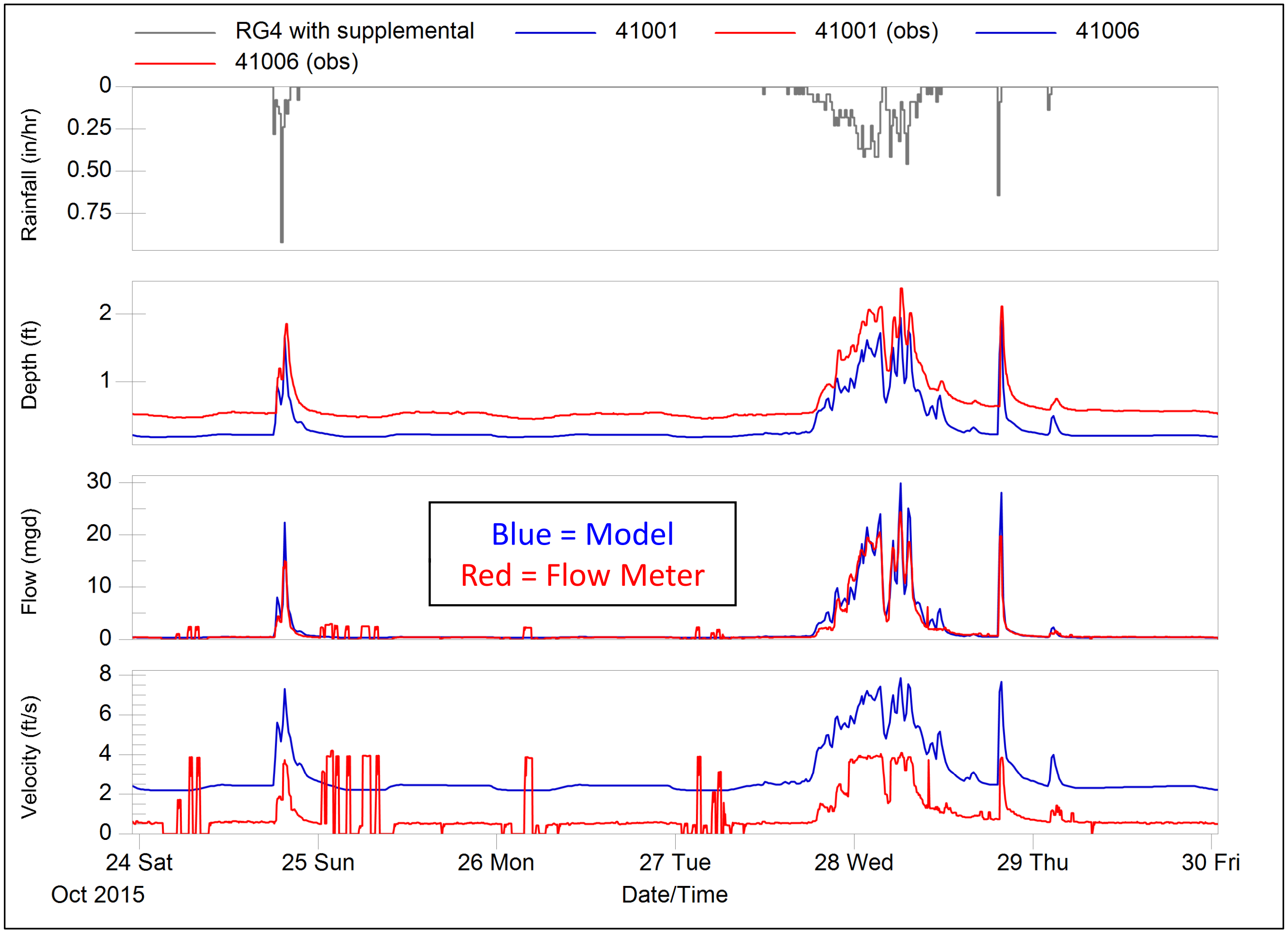




FM 5
CSO 41 - 60” inf pipe



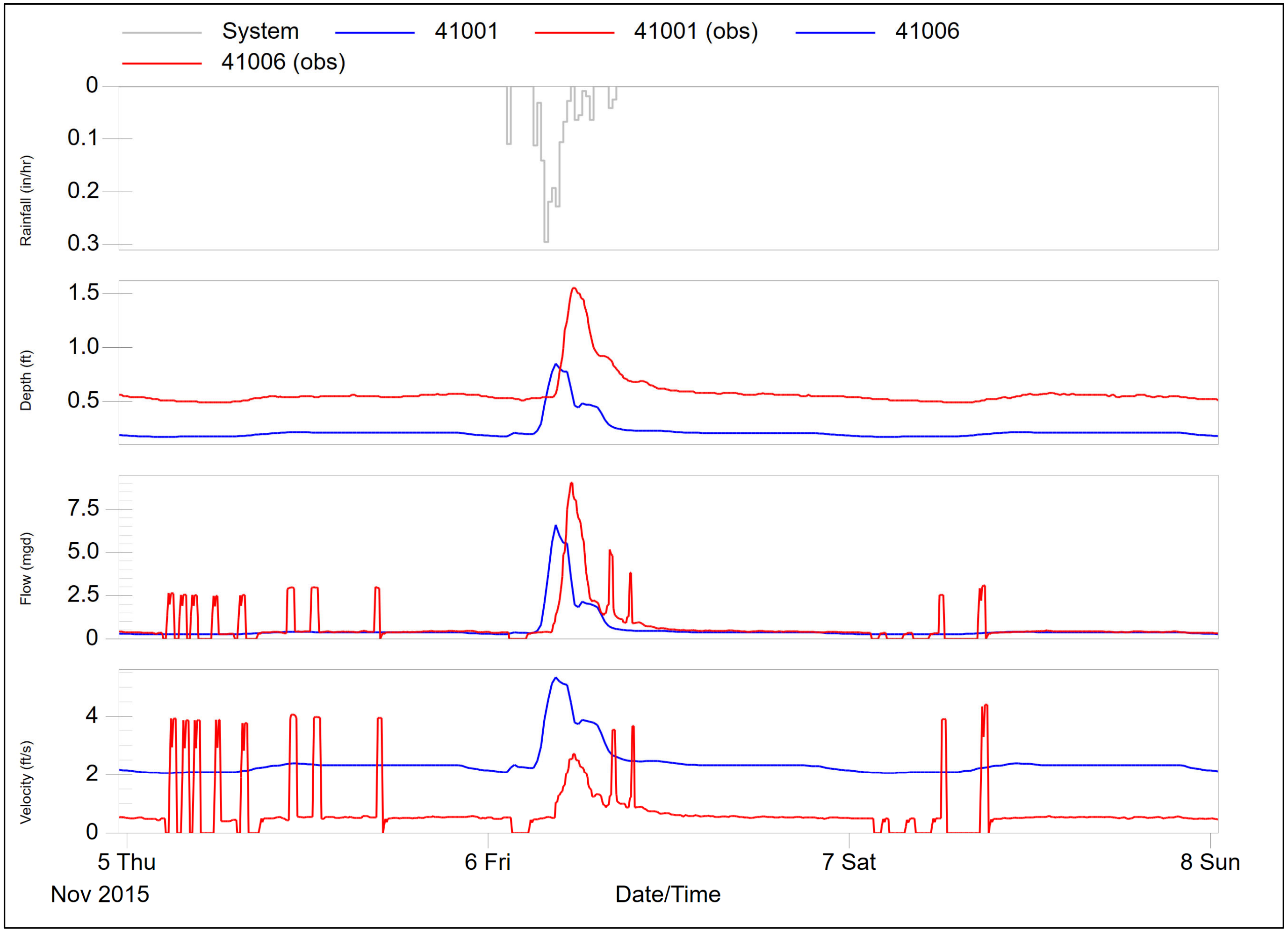
FM 5 – CSO 41 (60" pipe)



Calibration Events

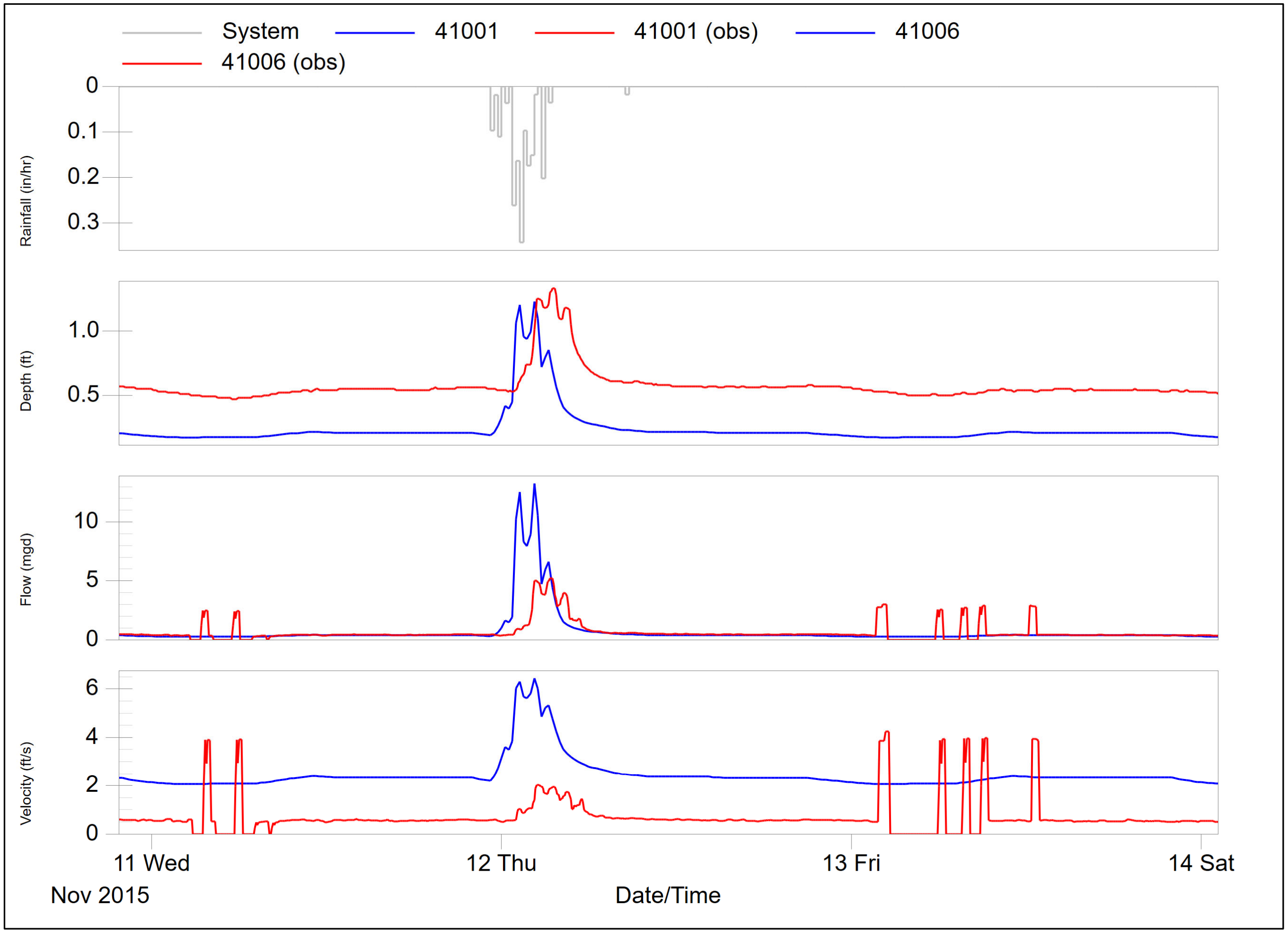
10/24/15, 10/27/15

FM 5 – CSO 41 (60” pipe)



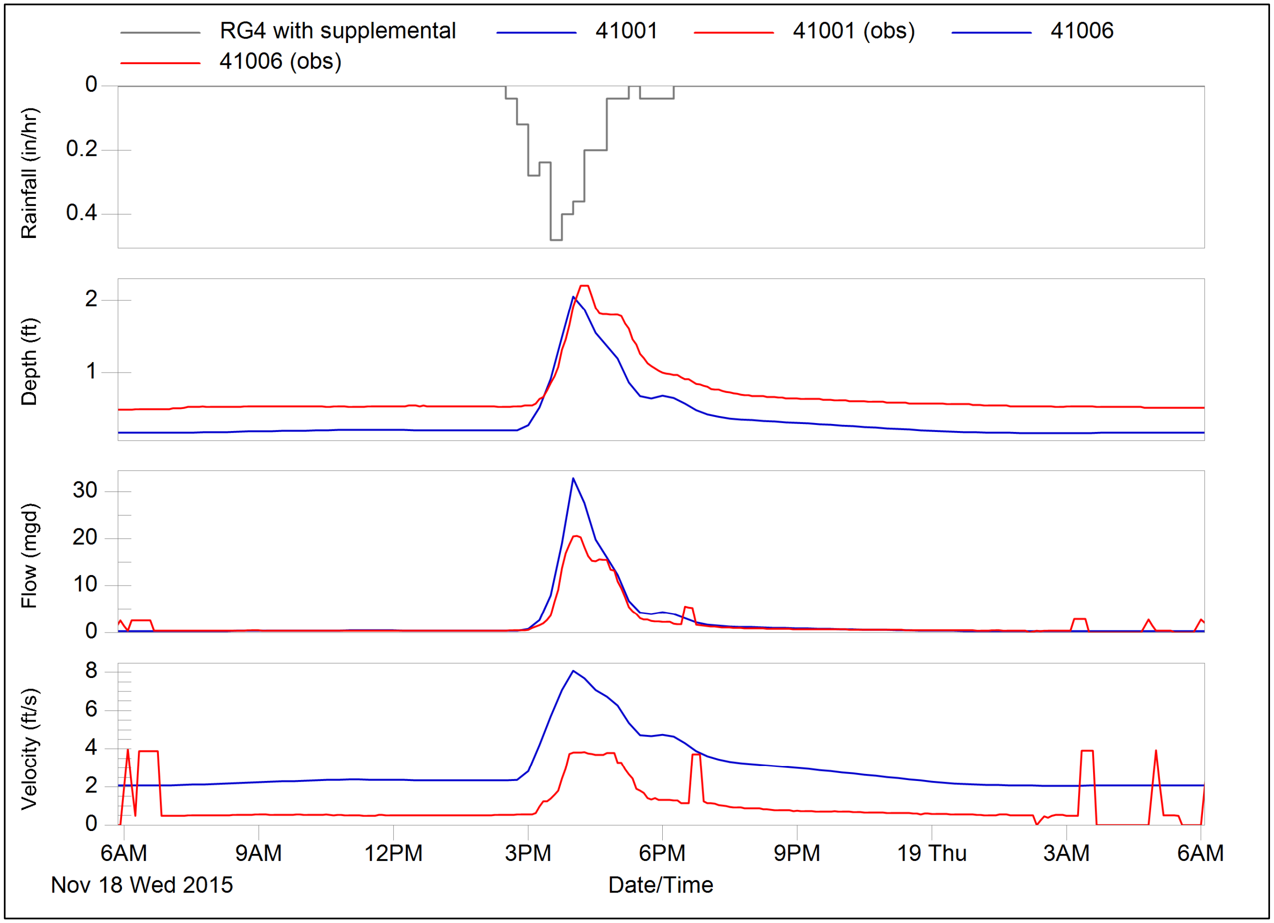
Calibration Events
11/6/15

FM 5 – CSO 41 (60” pipe)



Calibration Events
11/11/15

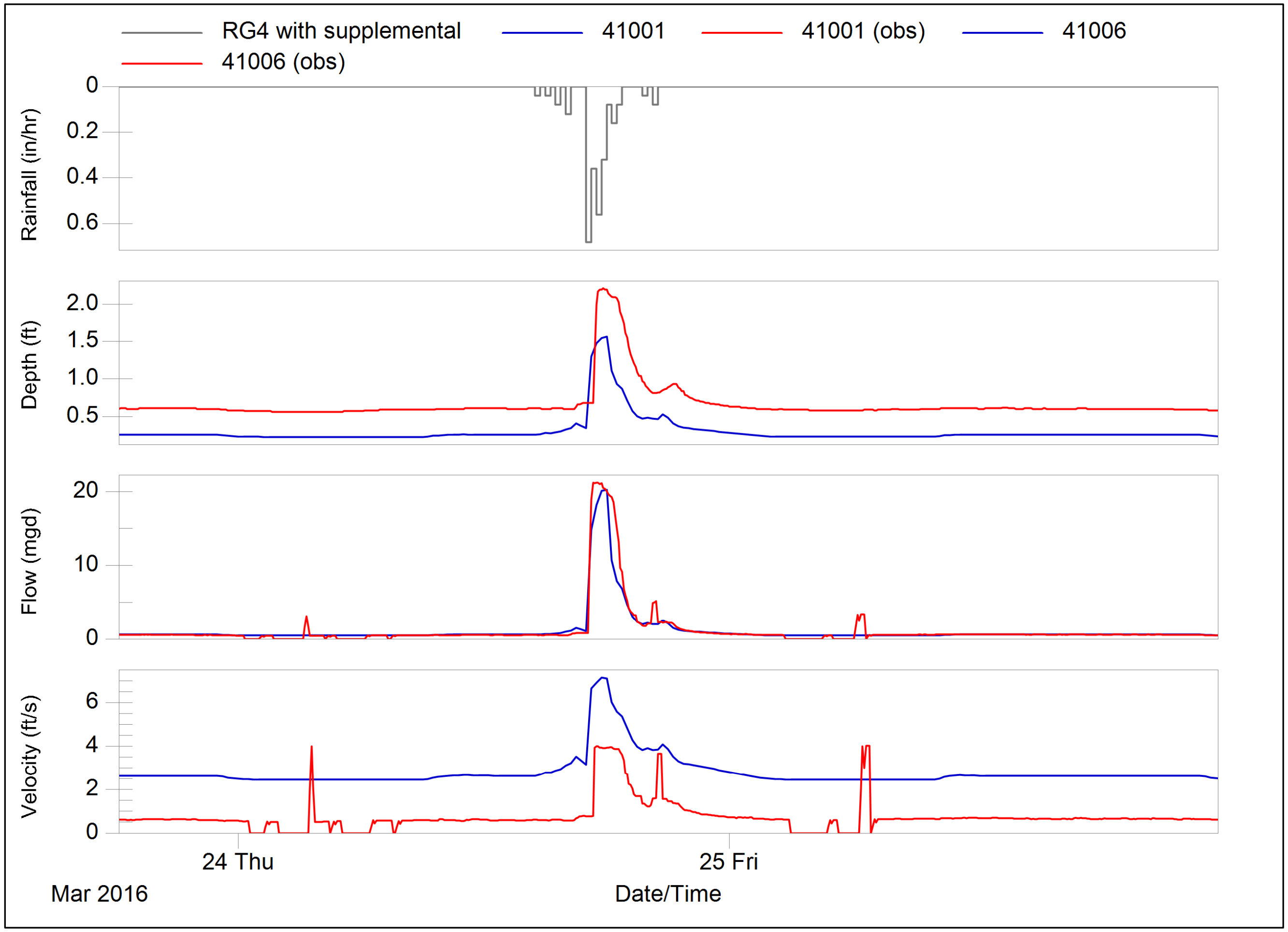
FM 5 – CSO 41 (60” pipe)



Calibration Events

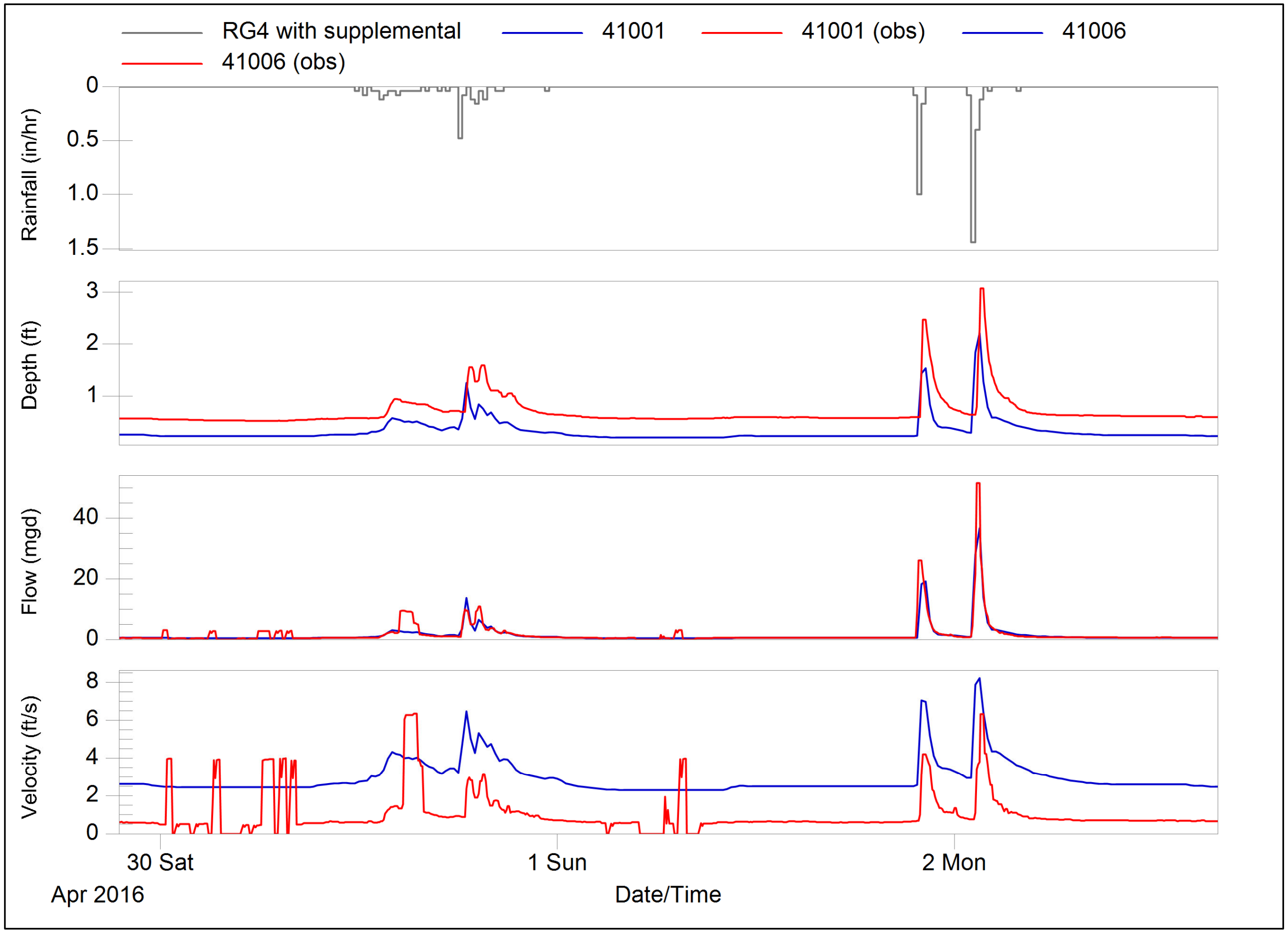
11/18/15

FM 5 – CSO 41 (60” pipe)



Calibration Event
3/24/16

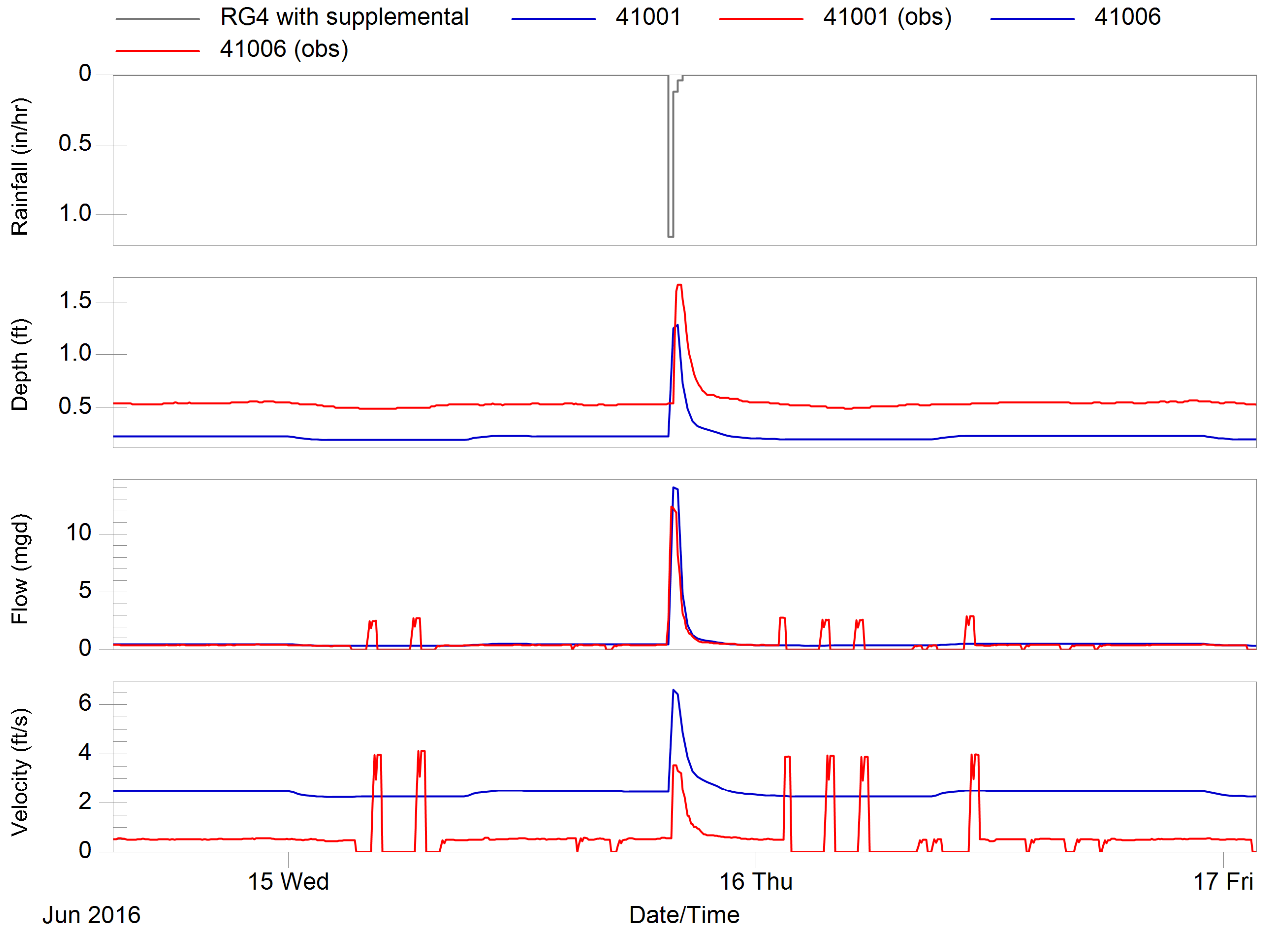
FM 5 – CSO 41 (60” pipe)



Calibration Events

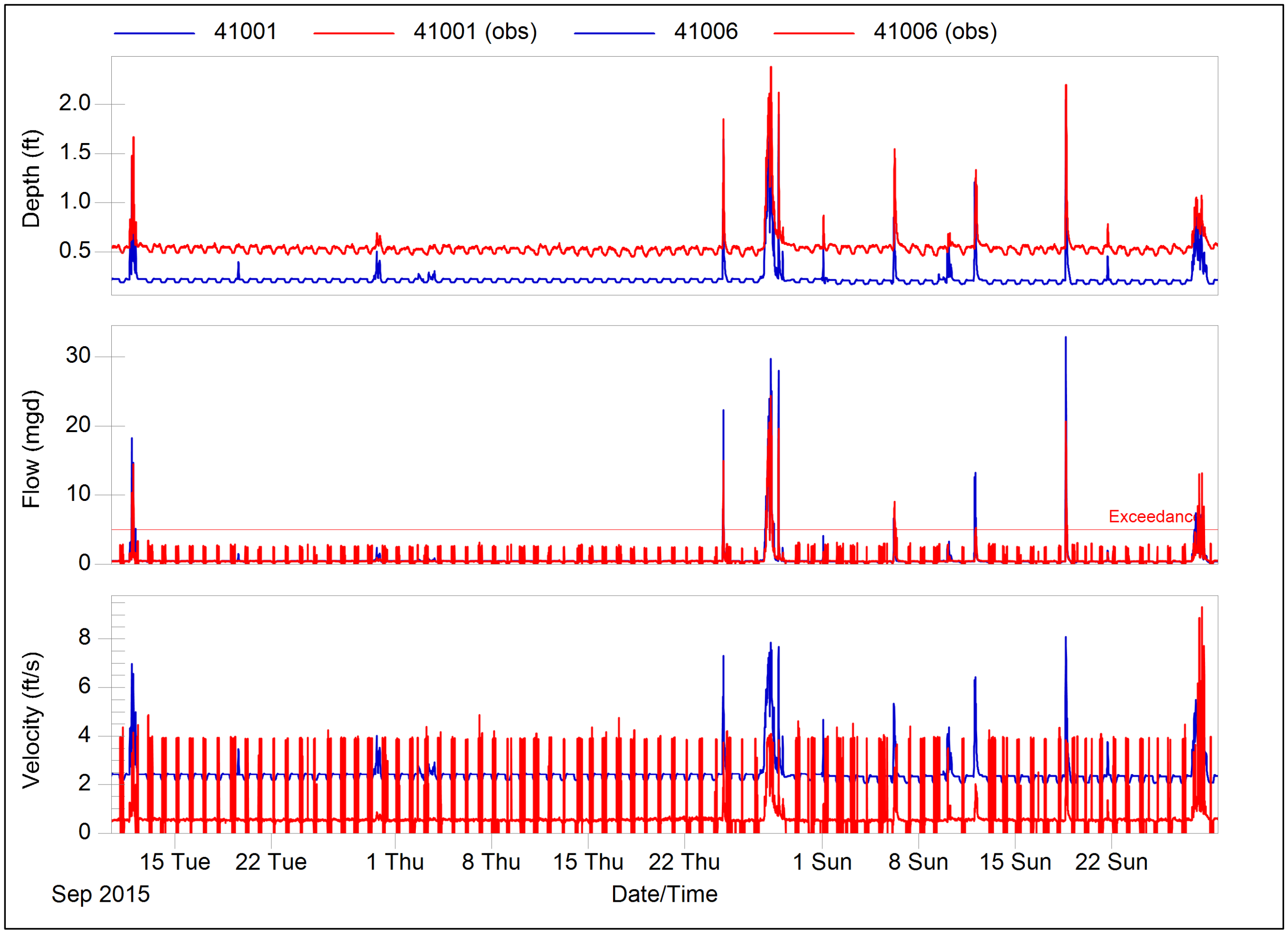
4/30/16, 5/1/16

FM 5 – CSO 41 (60” pipe)

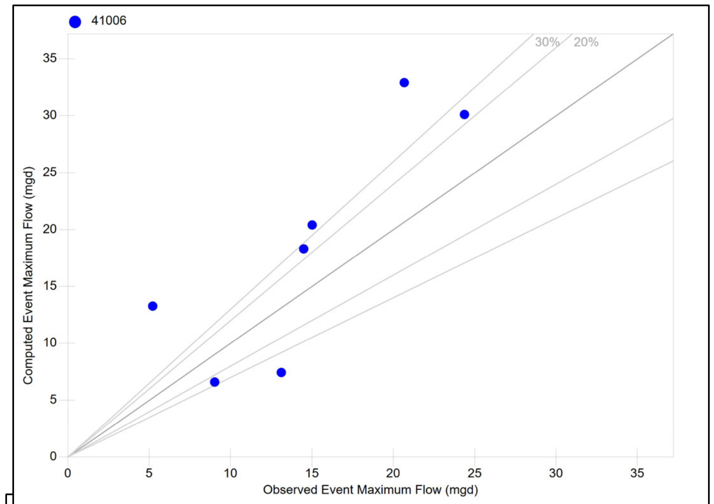


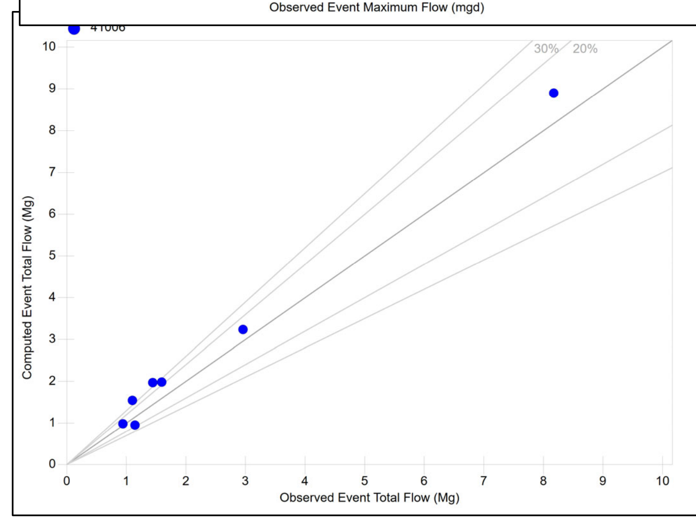
Calibration Events
6/15/16

FM 5 – CSO 41 (60” pipe)



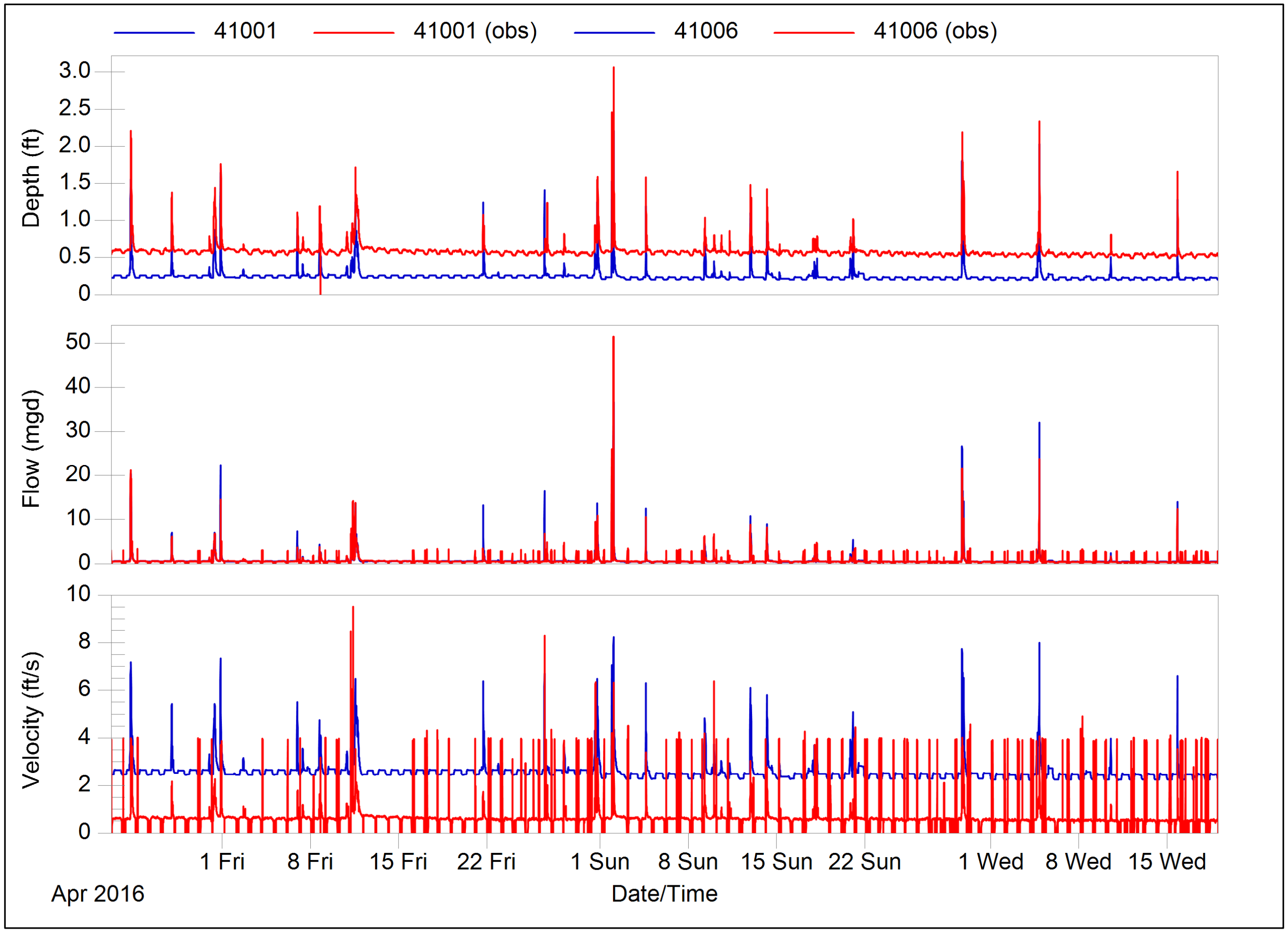
Fall 2015

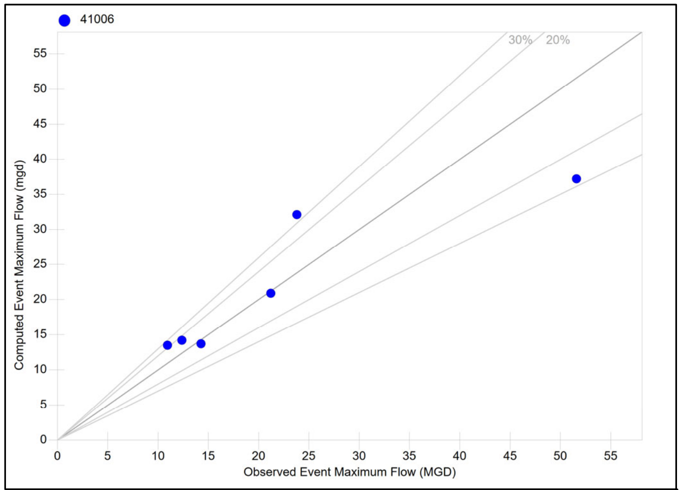


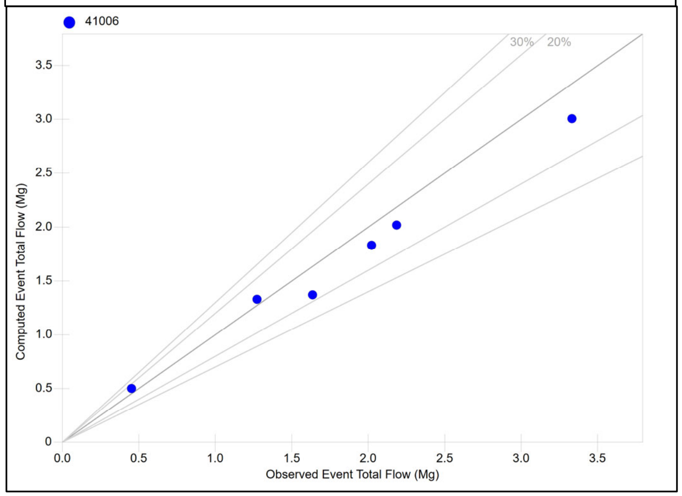


FM 5 – CSO 41 (60” pipe)

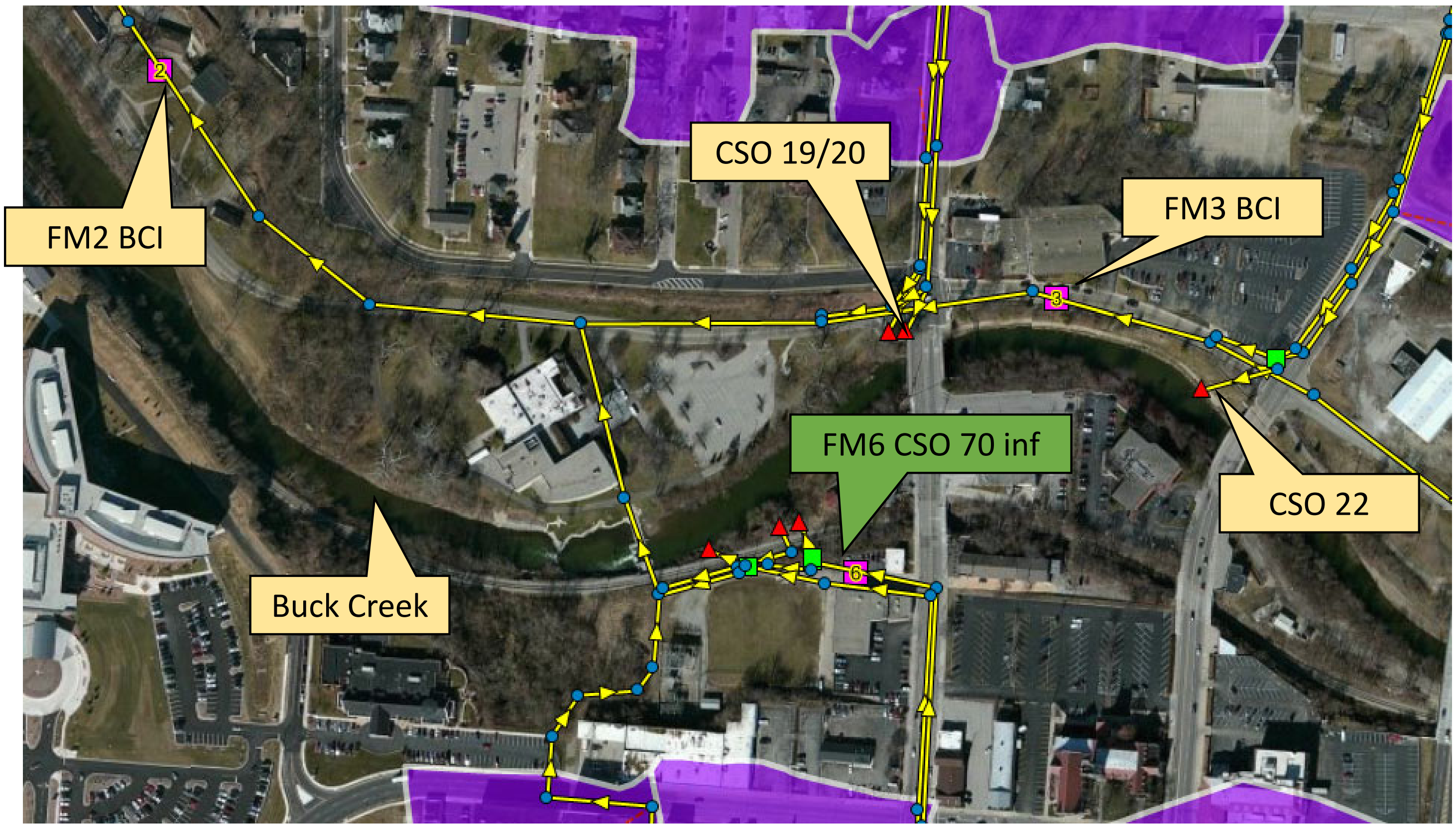
Spring 2016



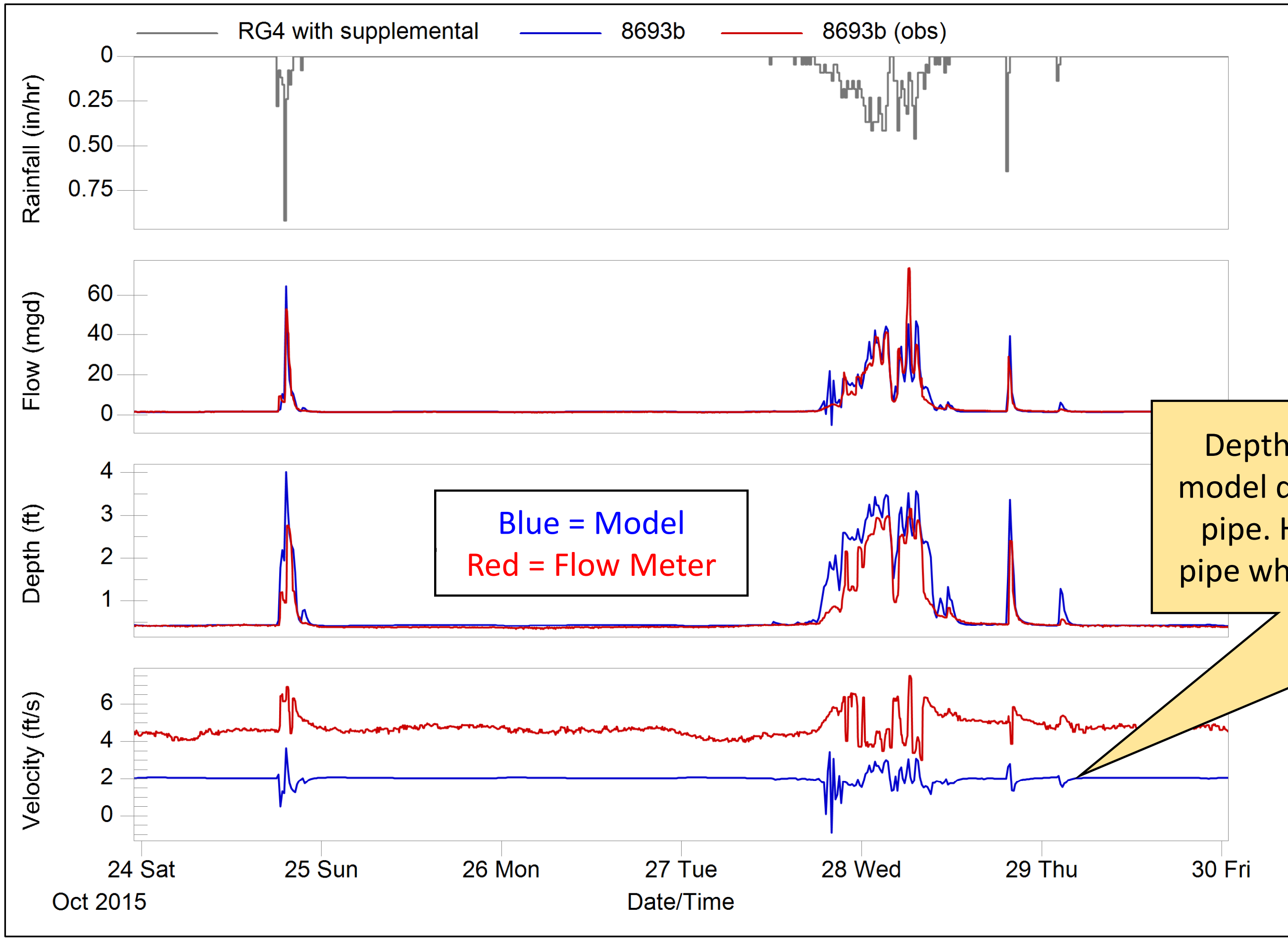




FM 6
CSO 70 (inflow to structure)



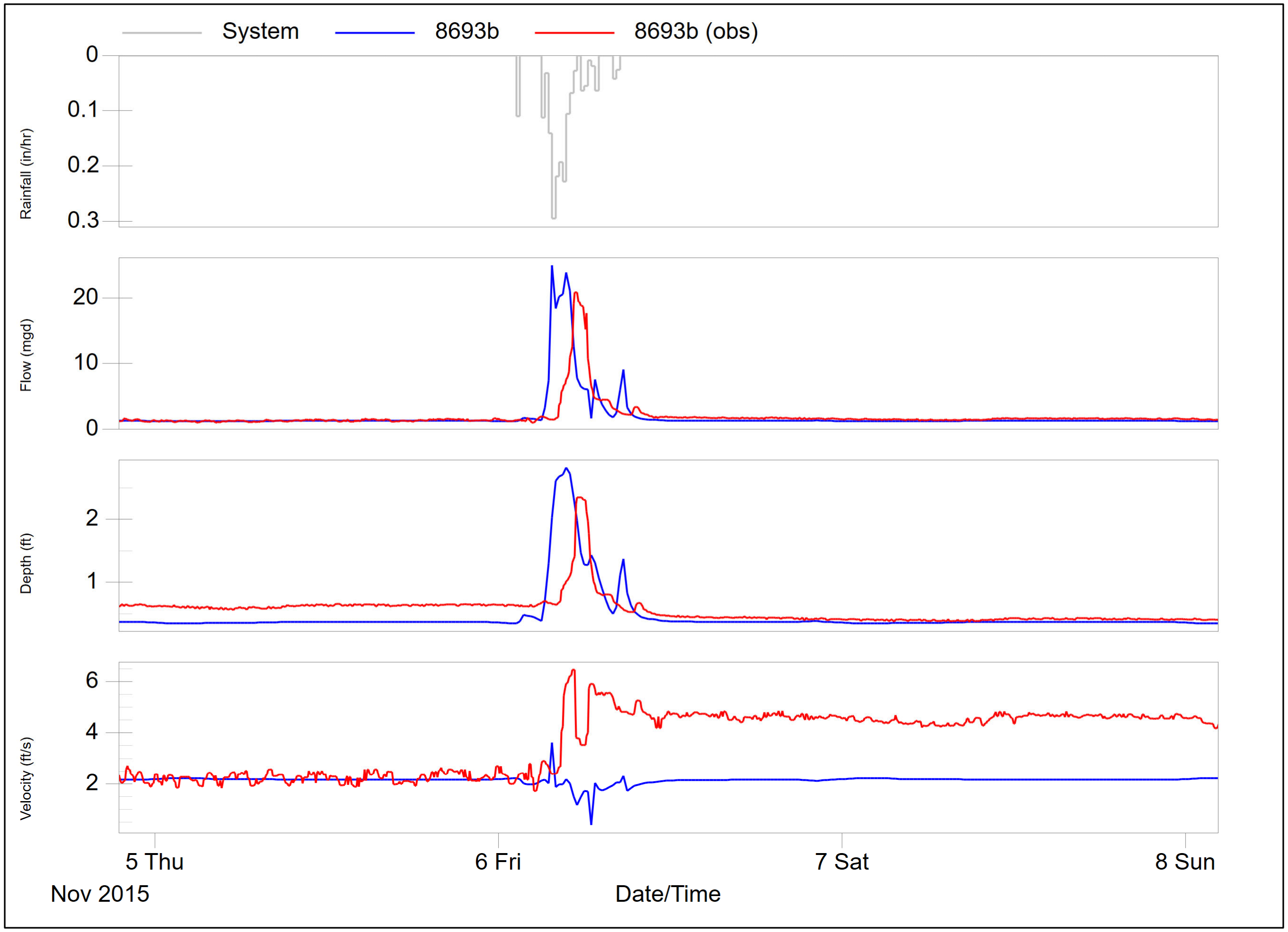
FM 6 – CSO 70 (influent)



Calibration Events
10/24/15, 10/27/15

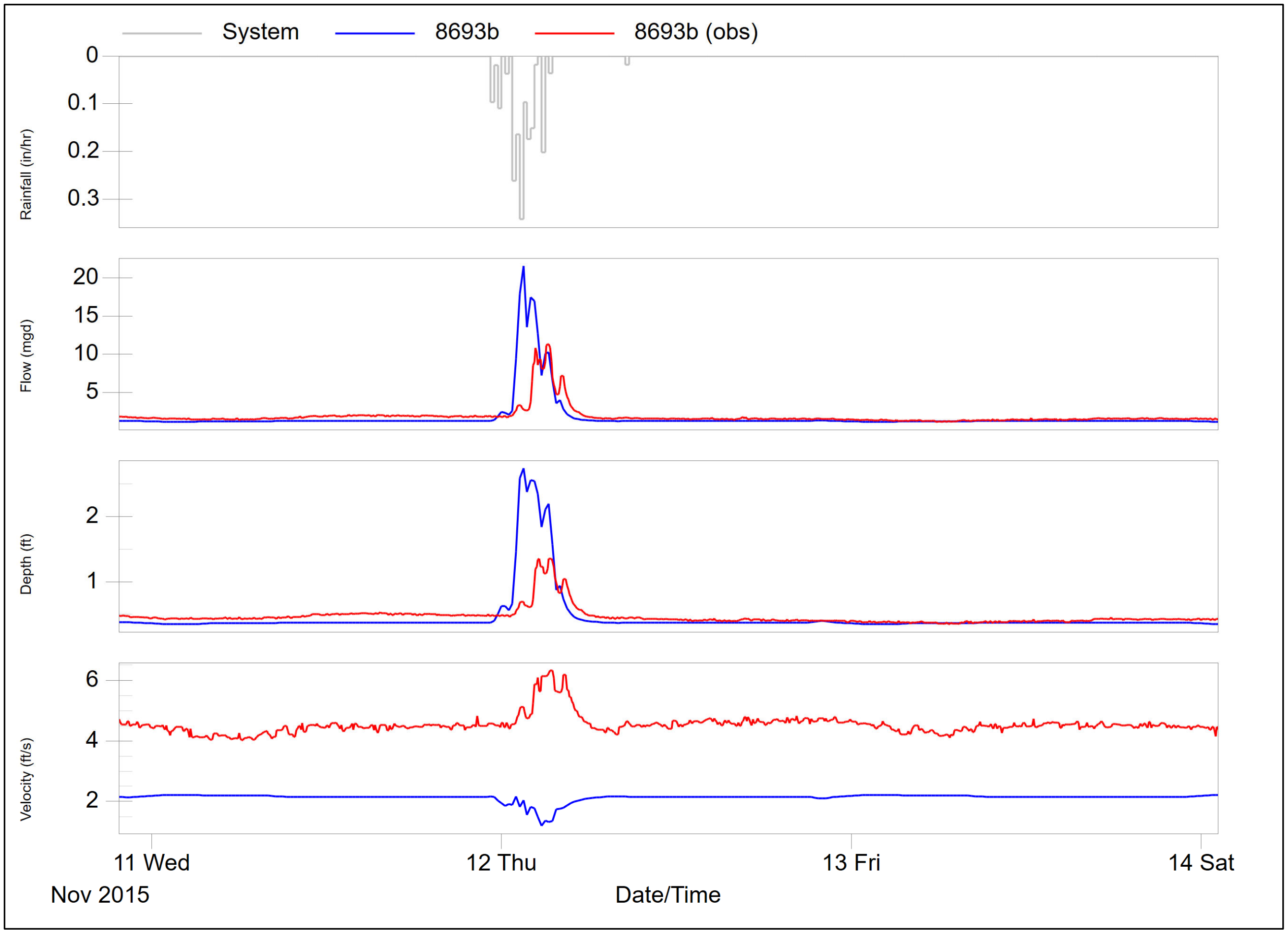
Depth/velocity data not matching model since model data is average depth/vel at center point in pipe. However the monitor is located at end of pipe where velocity is higher and depth is smaller.

FM 6 – CSO 70 (influent)



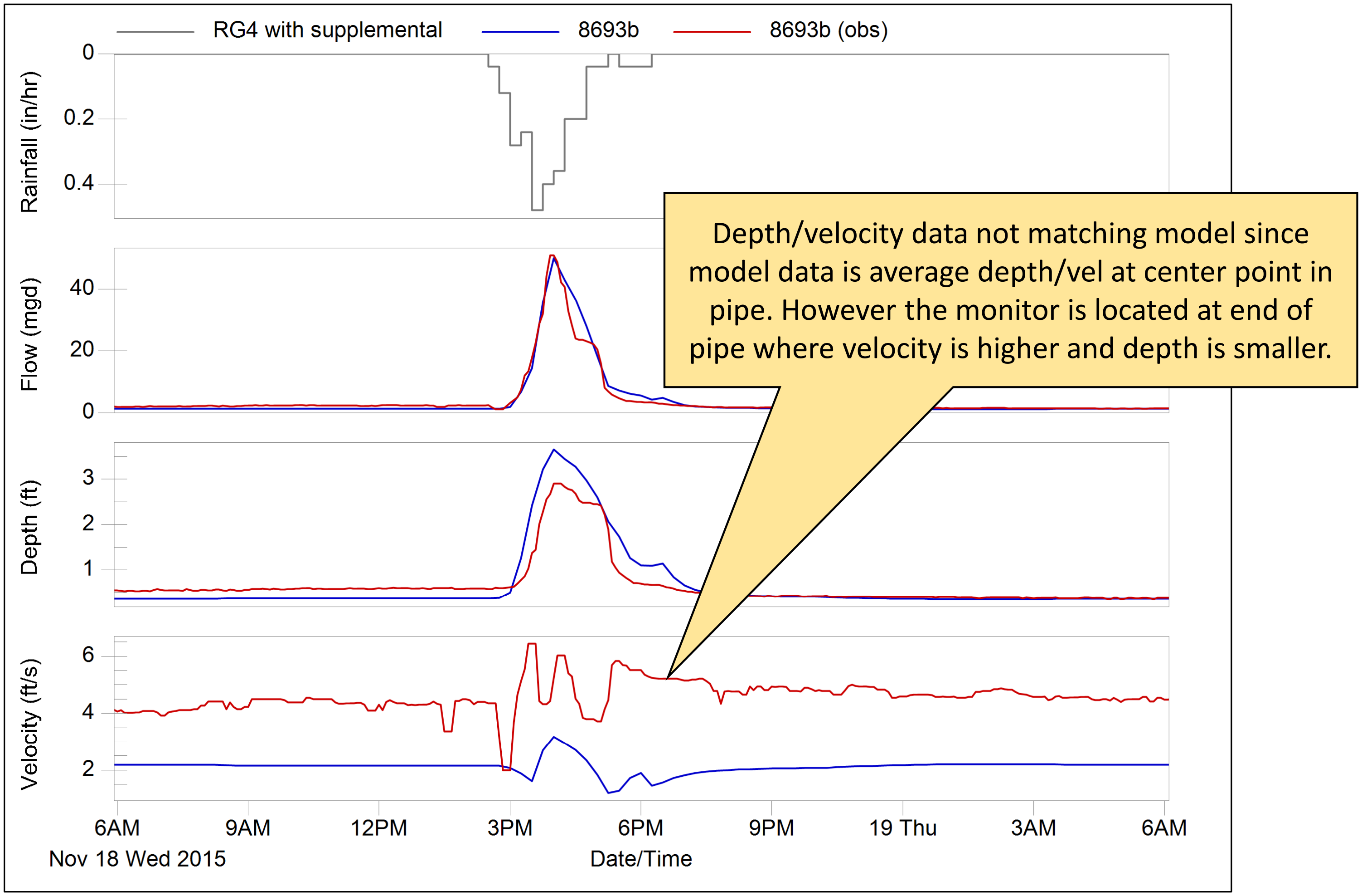
Calibration Events
11/6/15

FM 6 – CSO 70 (influent)



Calibration Events
11/11/15

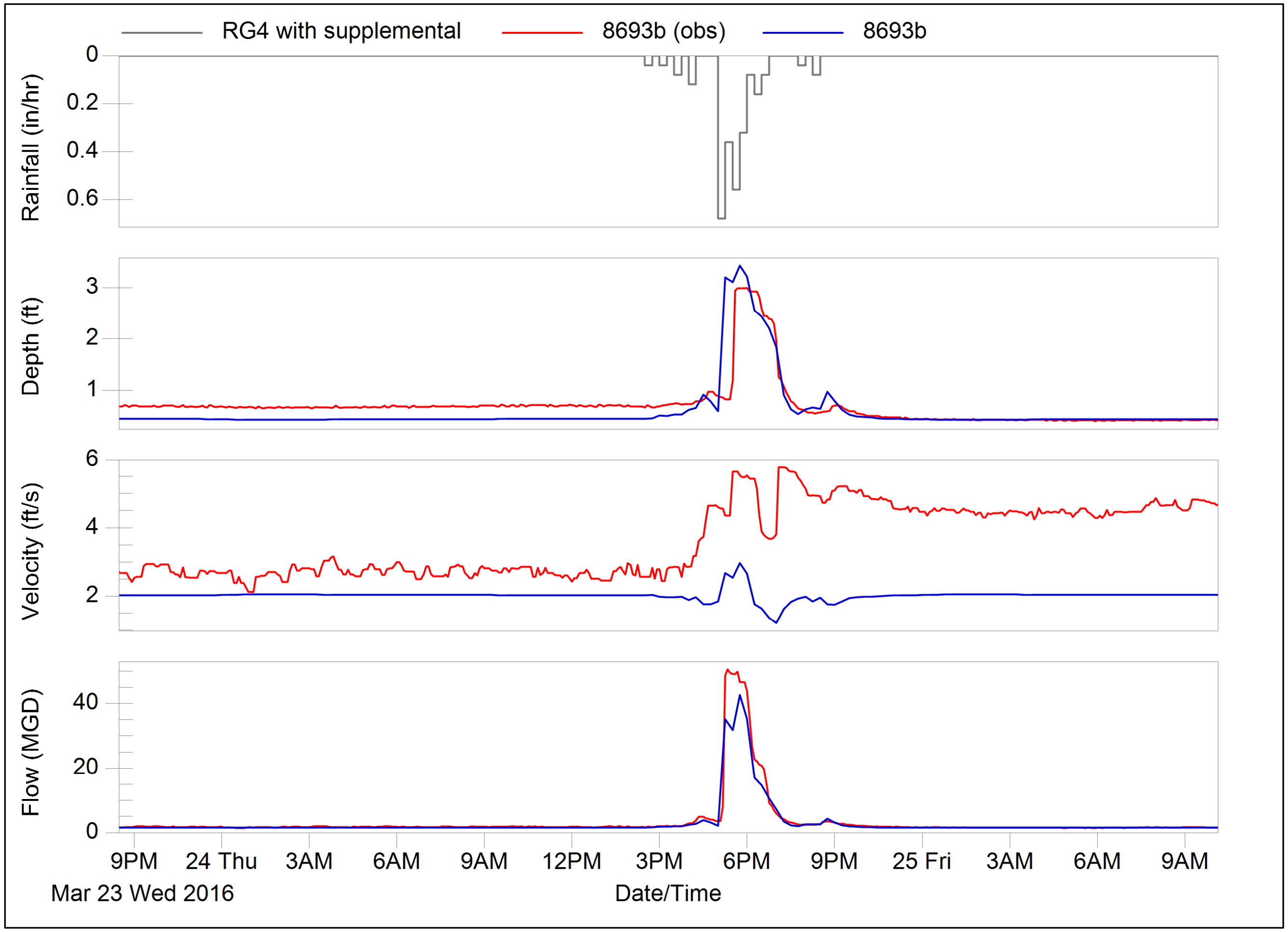
FM 6 – CSO 70 (influent)



Calibration Events

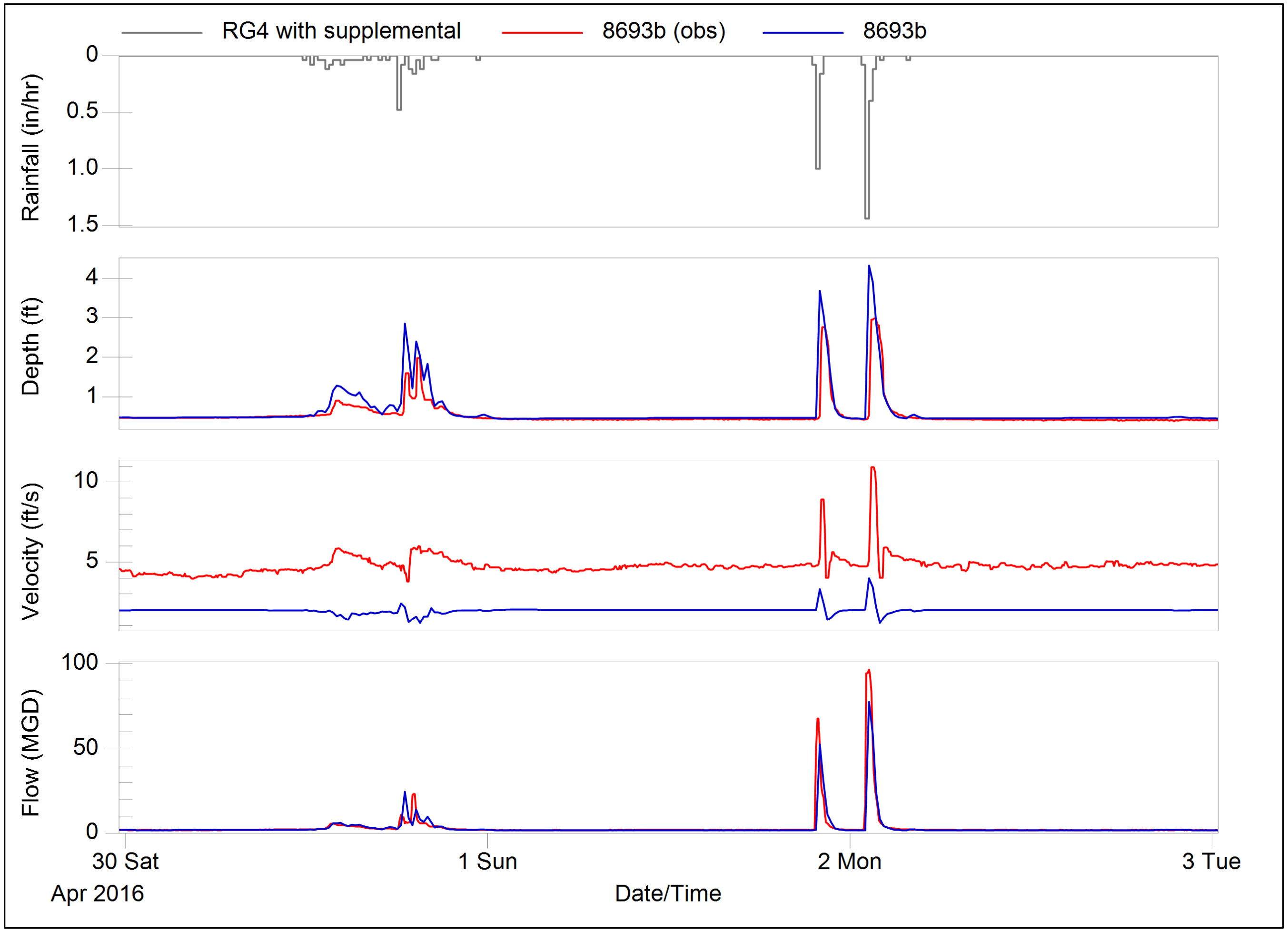
11/18/15

FM 6 – CSO 70 (influent)



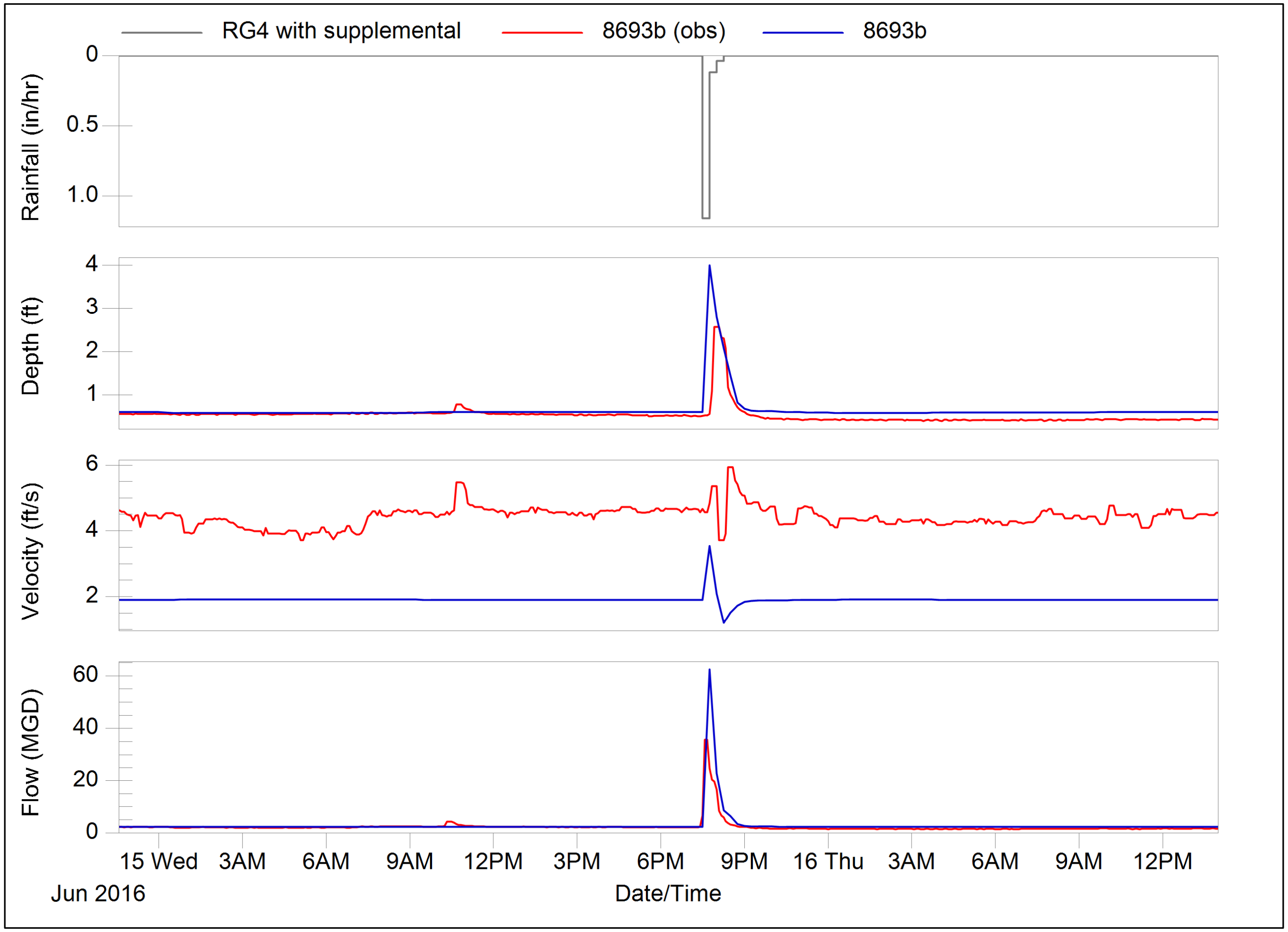
Calibration Event
3/24/16

FM 6 – CSO 70 (influent)



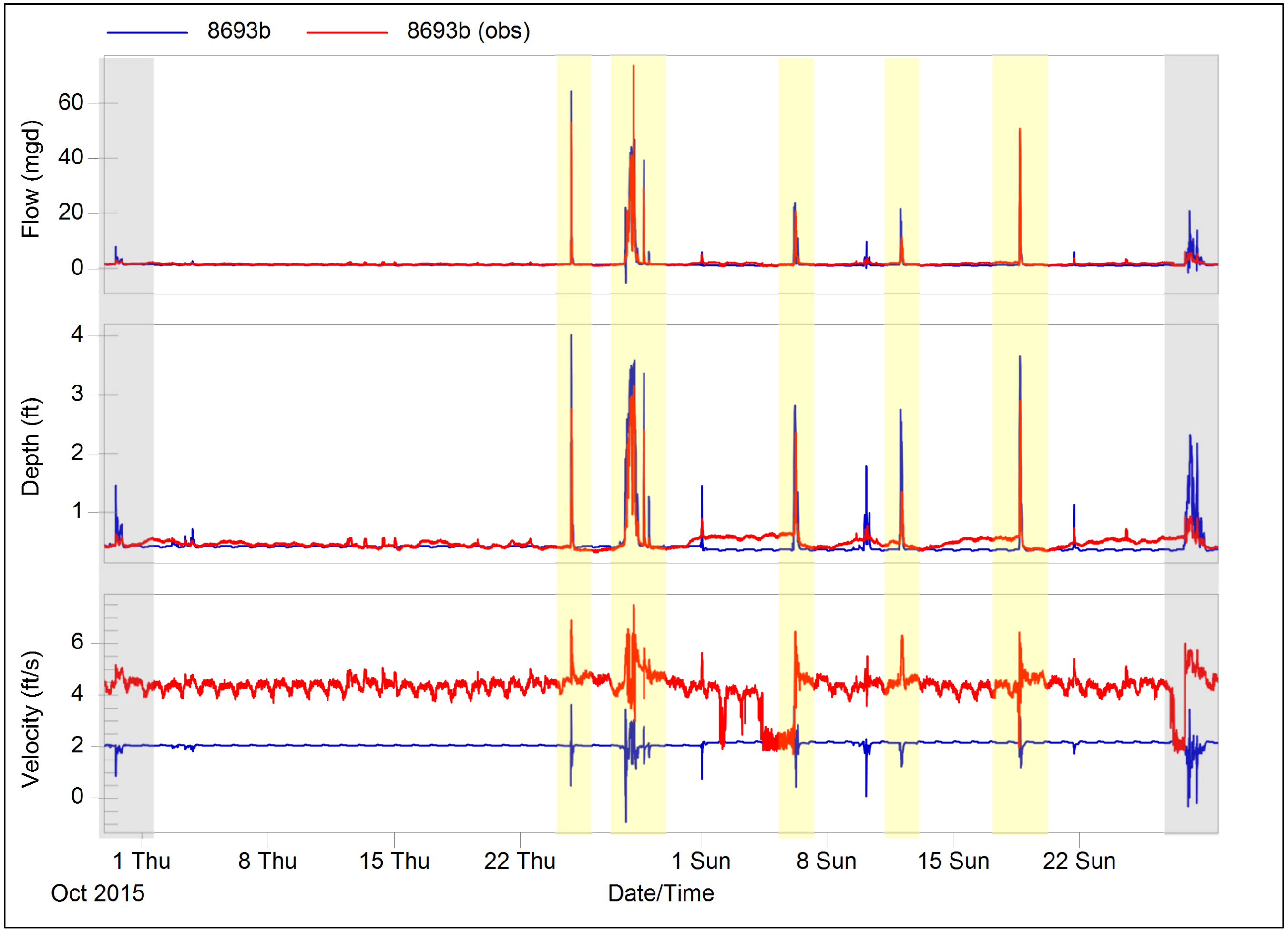
Calibration Events
4/30/16, 5/1/16

FM 6 – CSO 70 (influent)

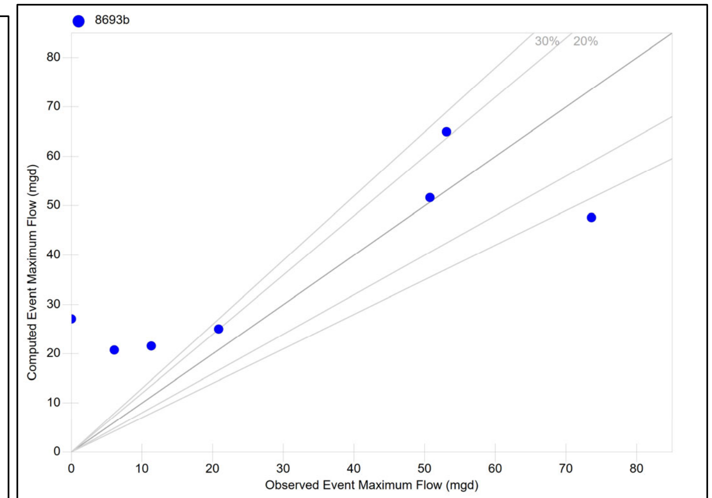


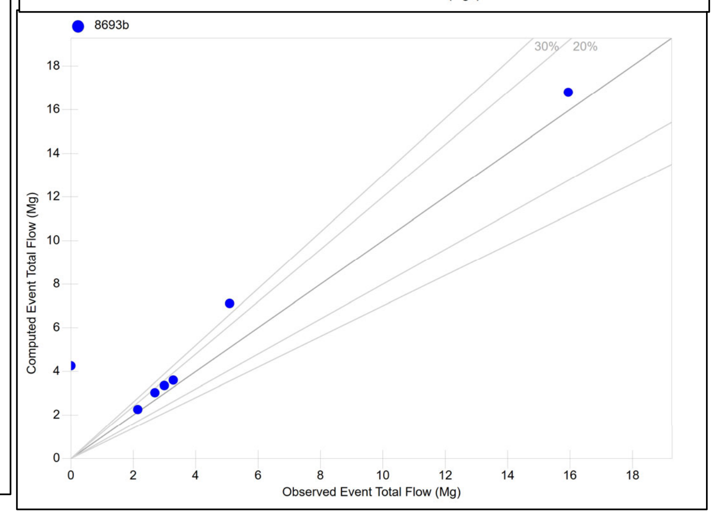
Calibration Events
6/15/16

FM 6 – CSO 70 (influent)

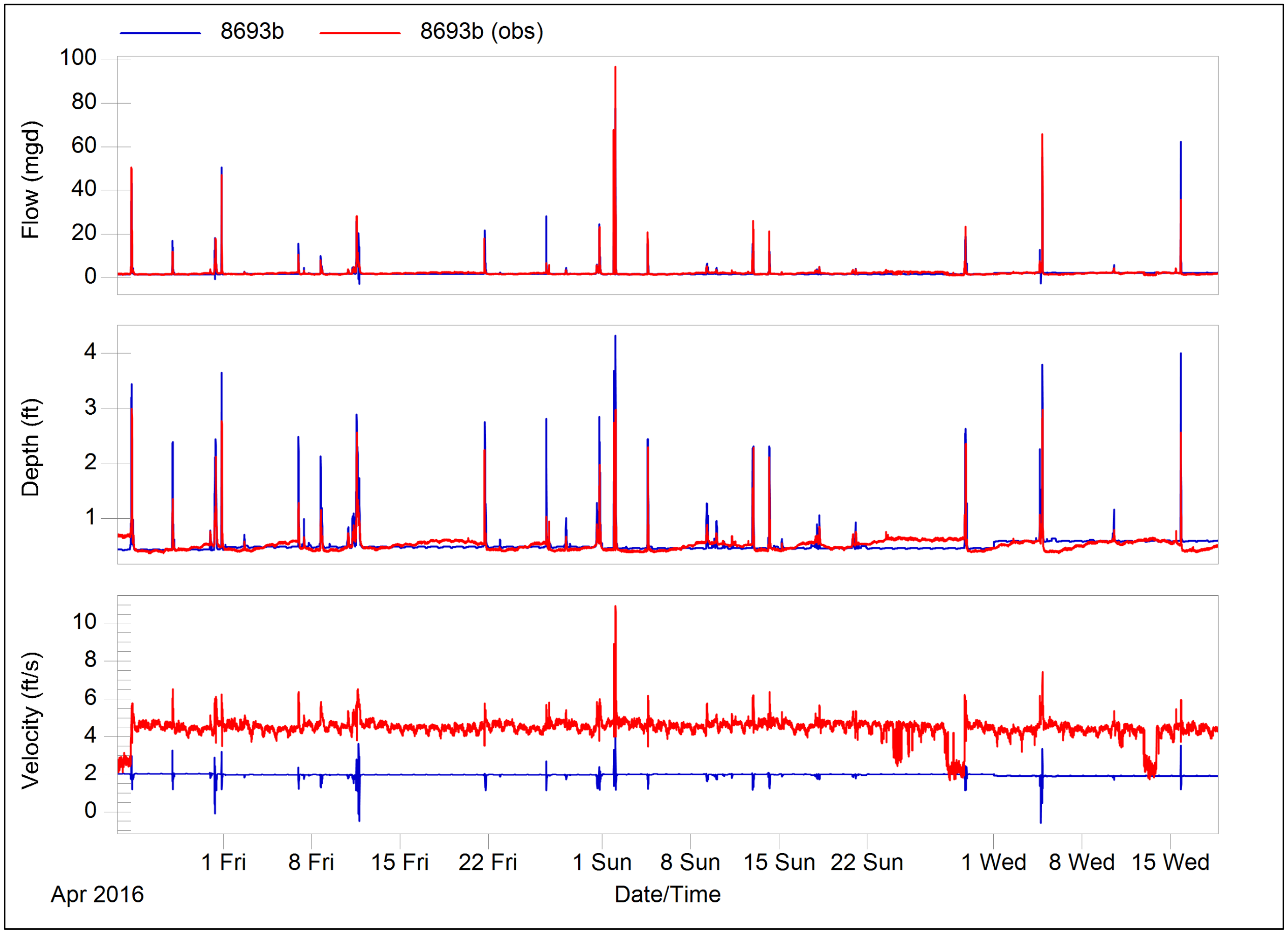


Fall 2015

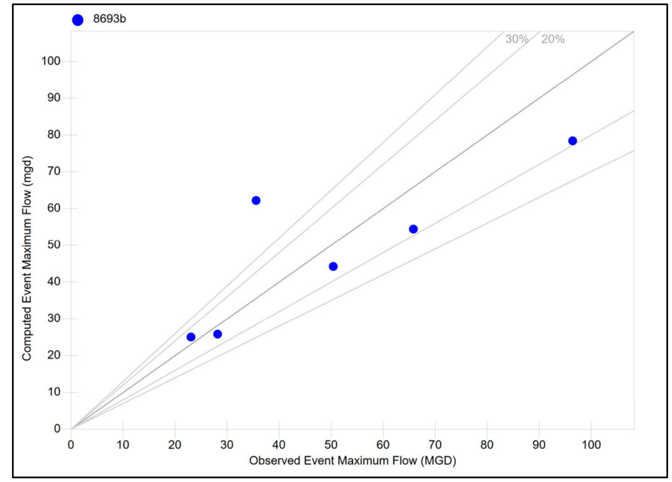


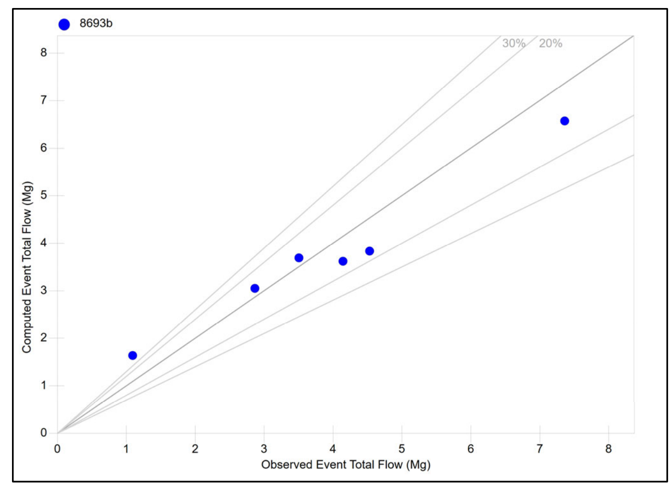


FM 6 – CSO 70 (influent)

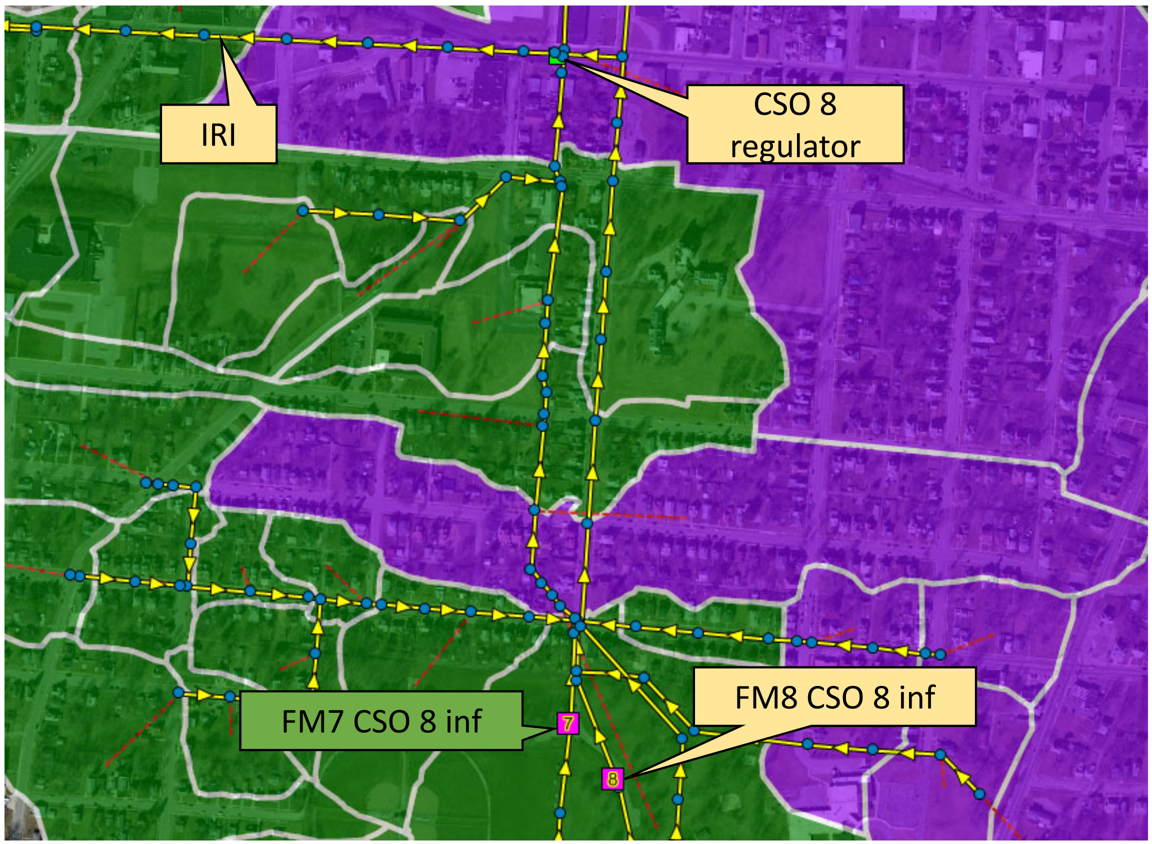


Spring 2016

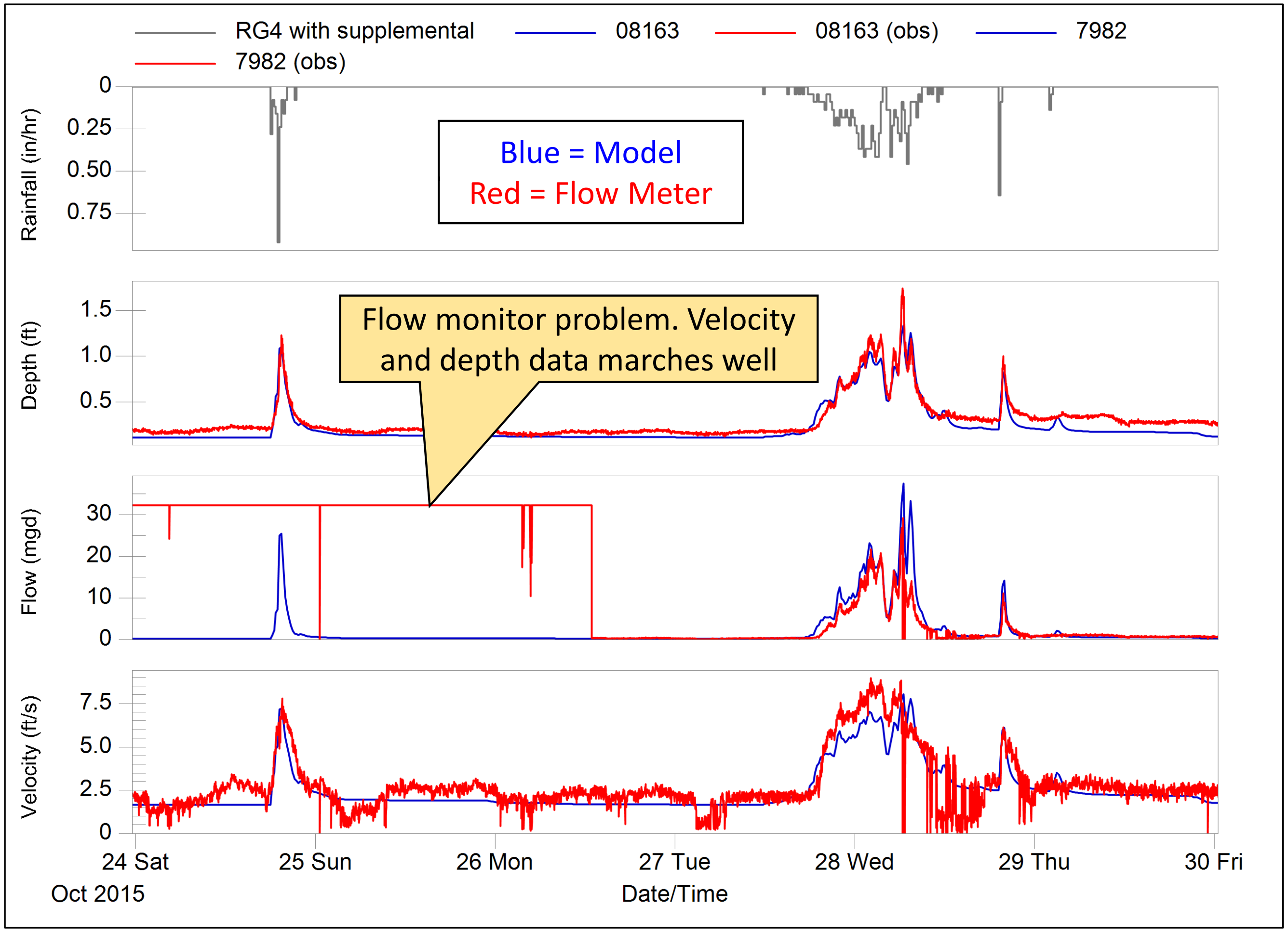




FM 7
CSO 08 - 60” inf (west)



FM 7 – CSO 08

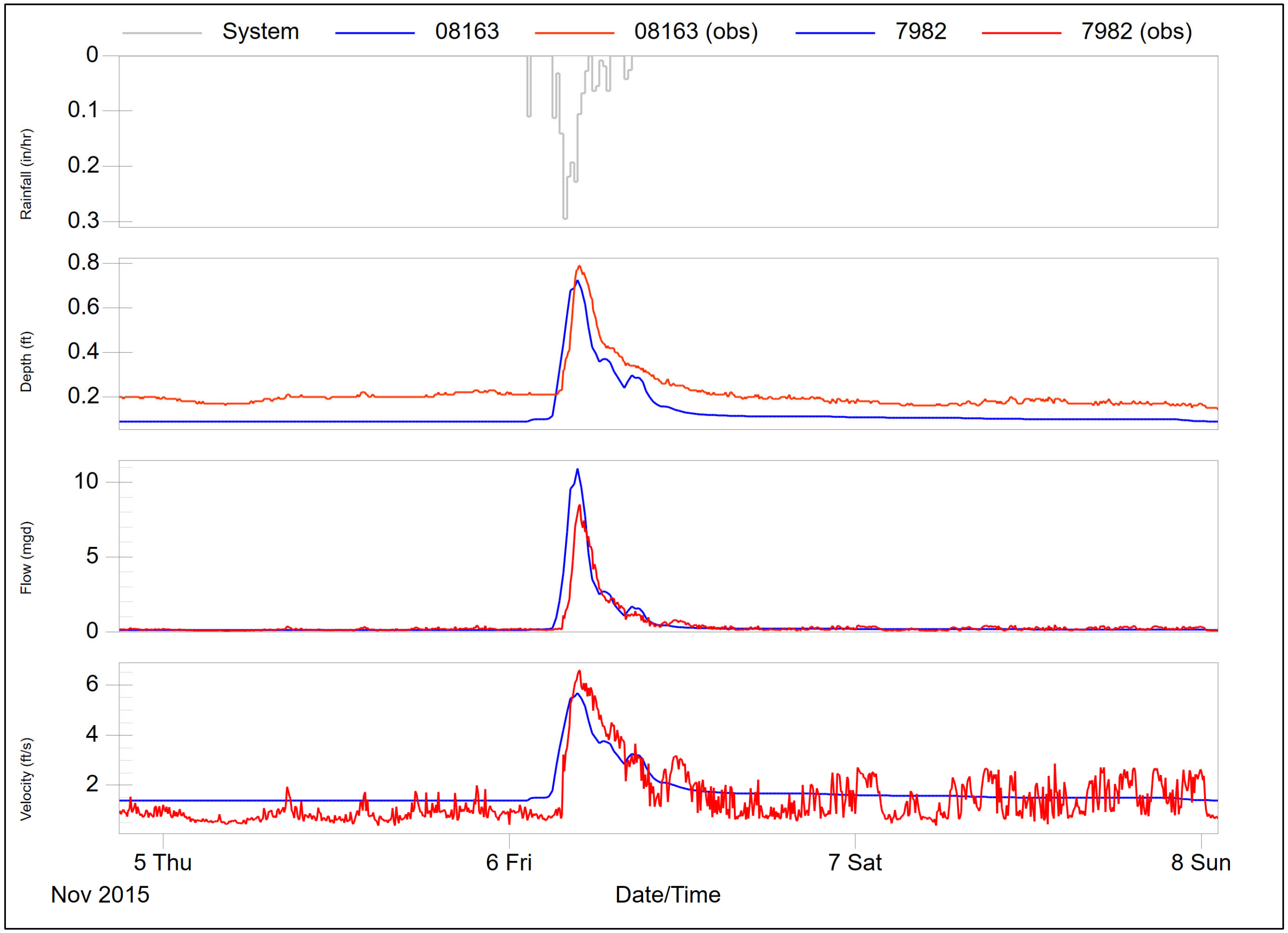


Calibration Events

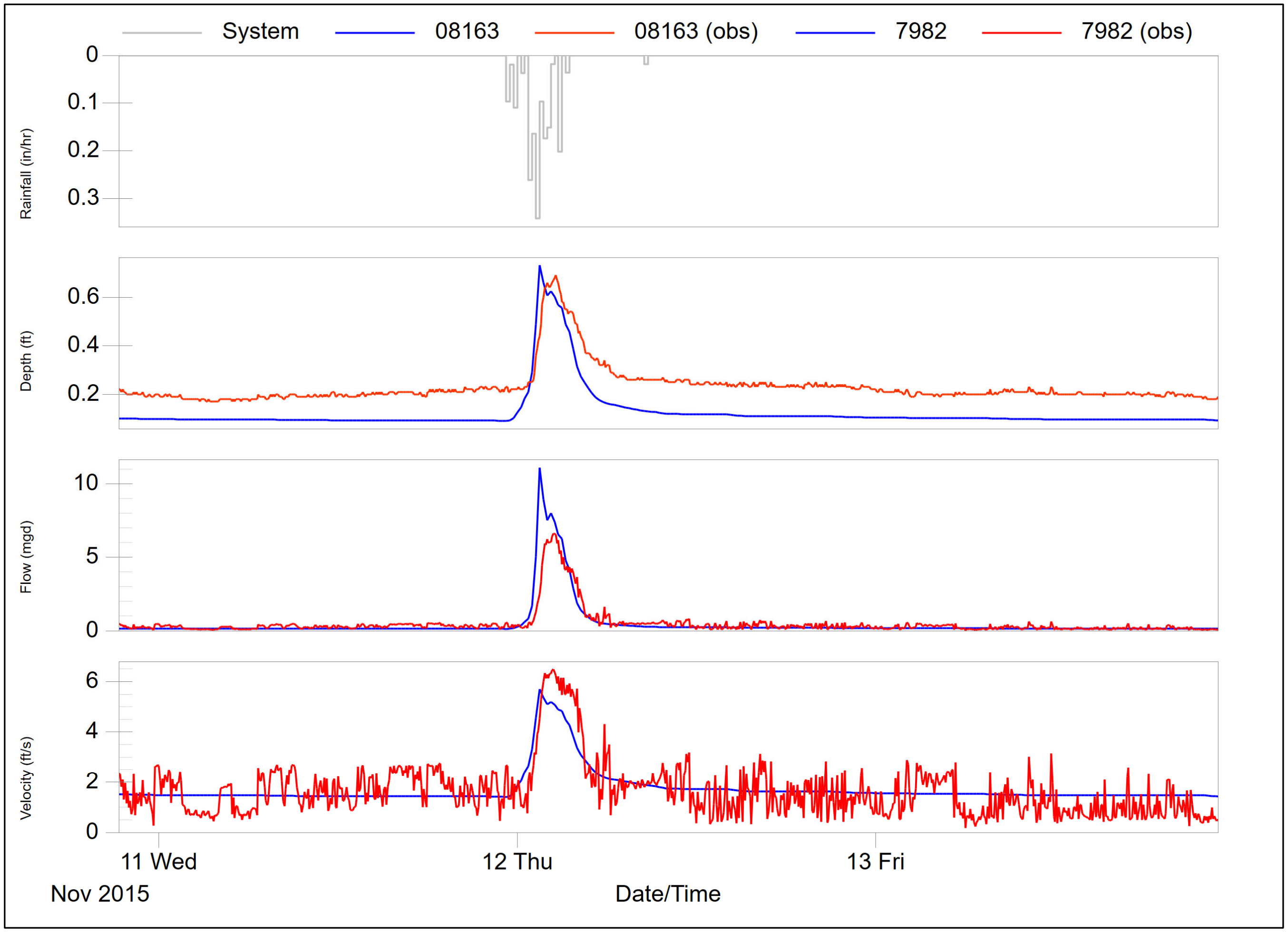
10/24/15, 10/27/15

FM 7 – CSO 08 ()

Calibration Events
11/6/15



FM 7 – CSO 08 ()

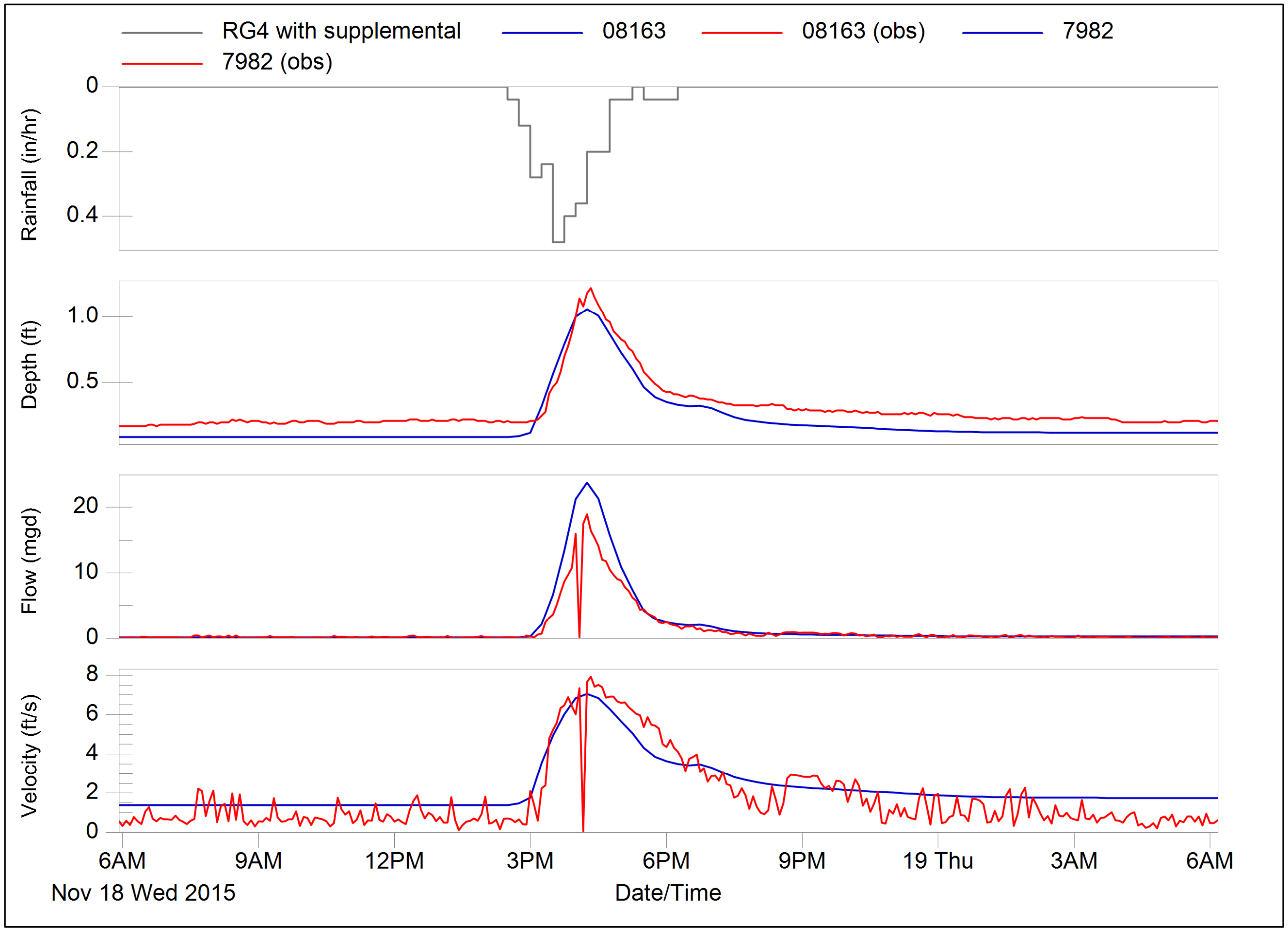


Calibration Events

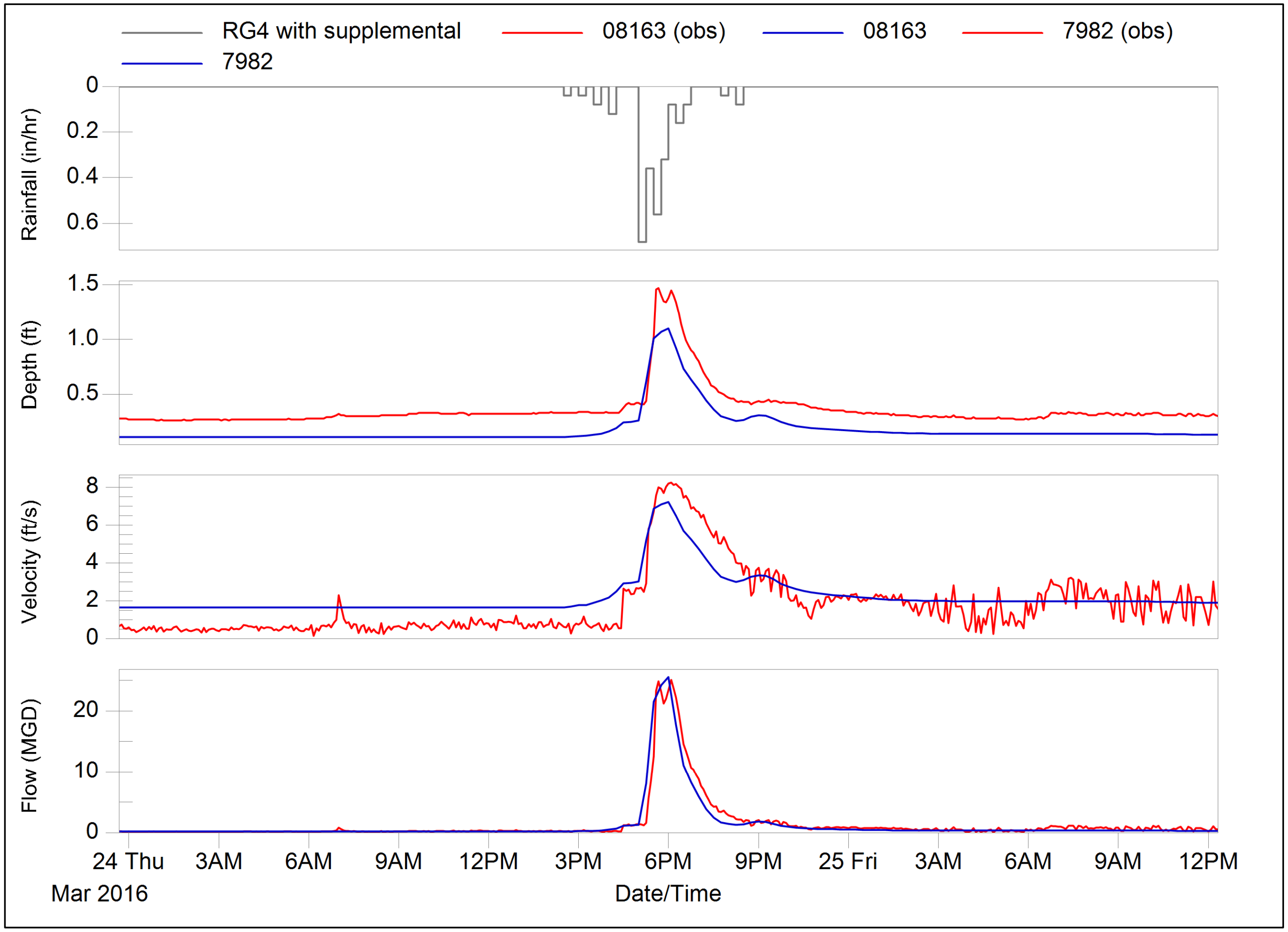
11/11/15

FM 7 – CSO 08 ()

Calibration Events
11/18/15



FM 7 – CSO 08

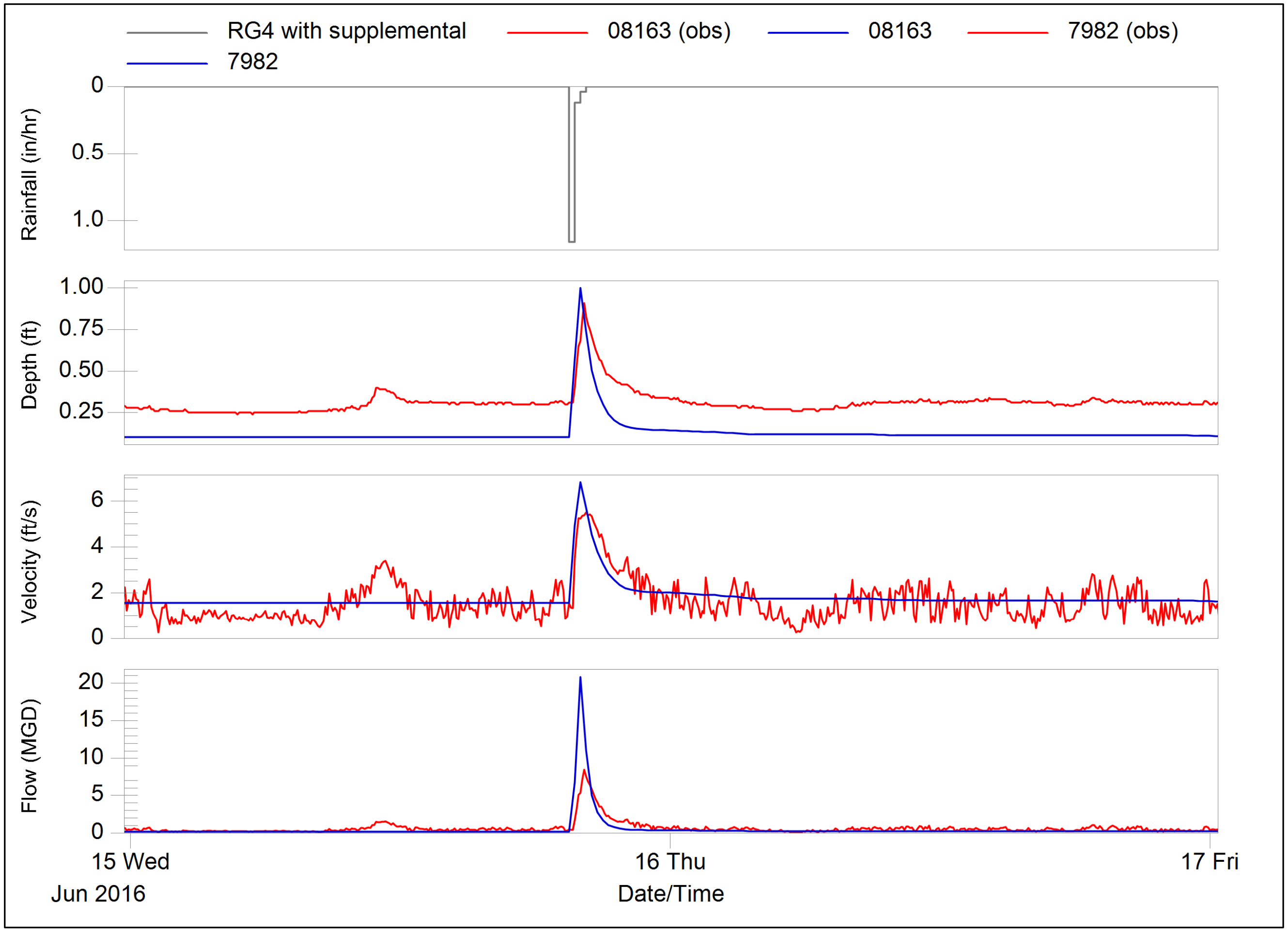


Calibration Event
3/24/16

FM 7 – CSO 08

Calibration Events
4/30/16, 5/1/16

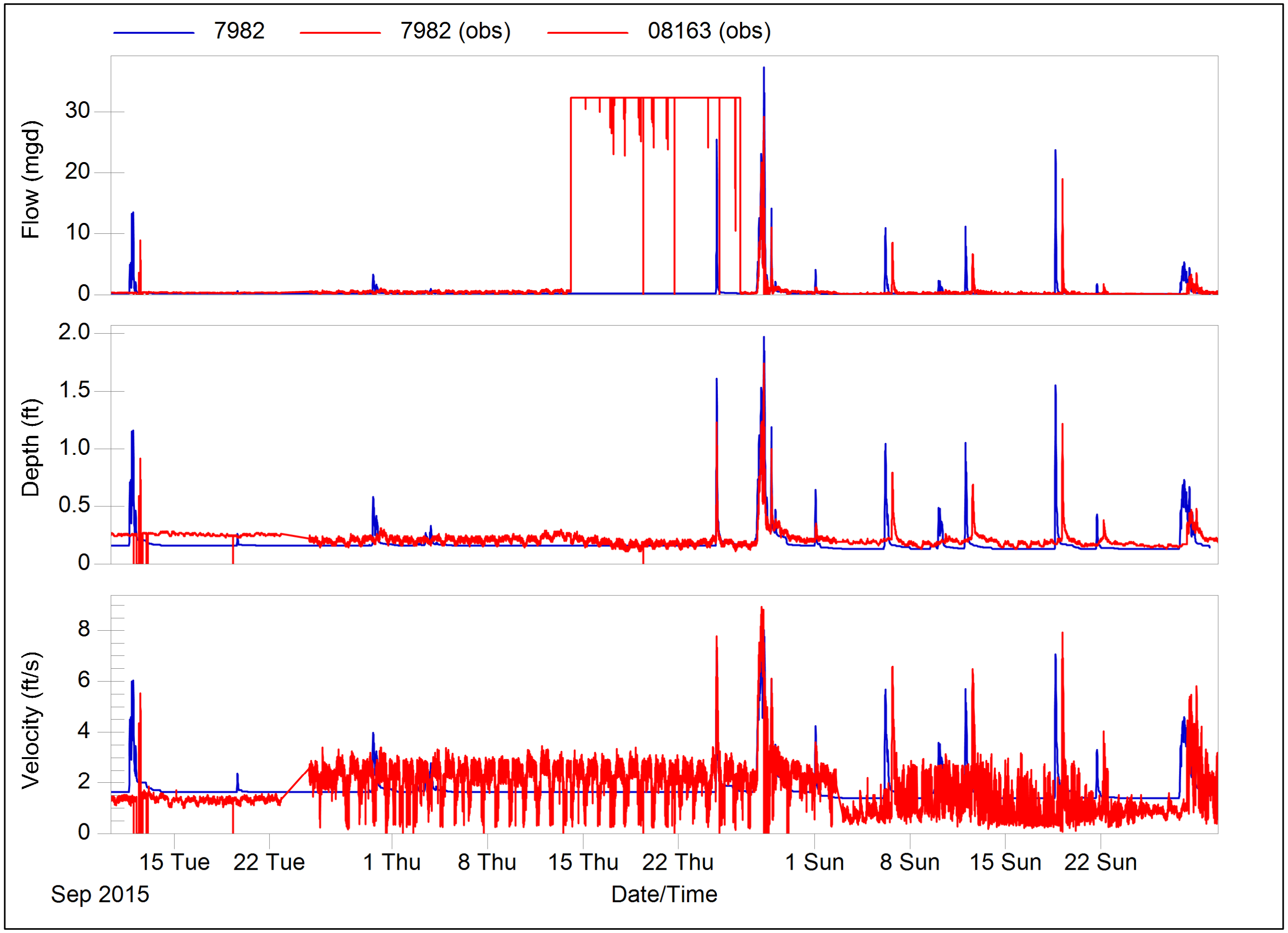
FM 7 – CSO 08

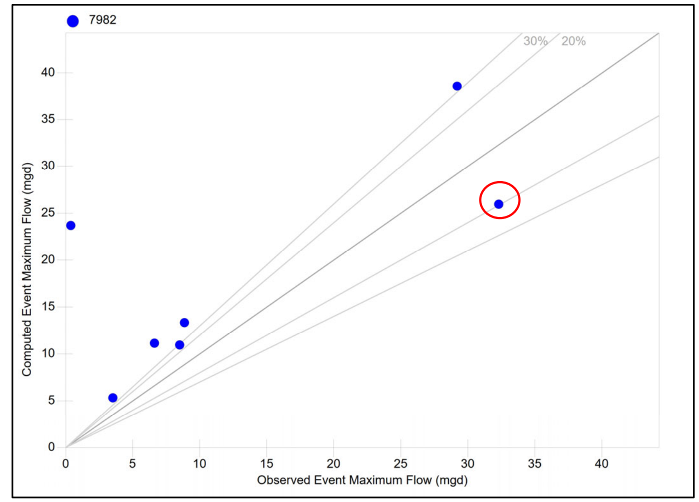


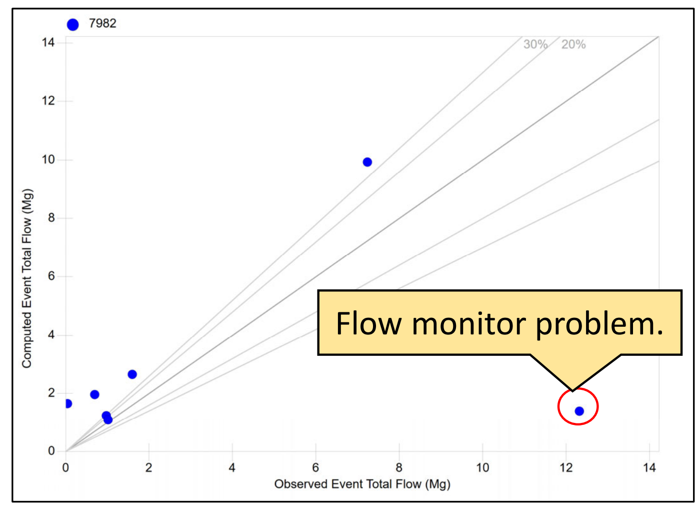
Calibration Events
6/15/16

FM 7 – CSO 08

Fall 2015

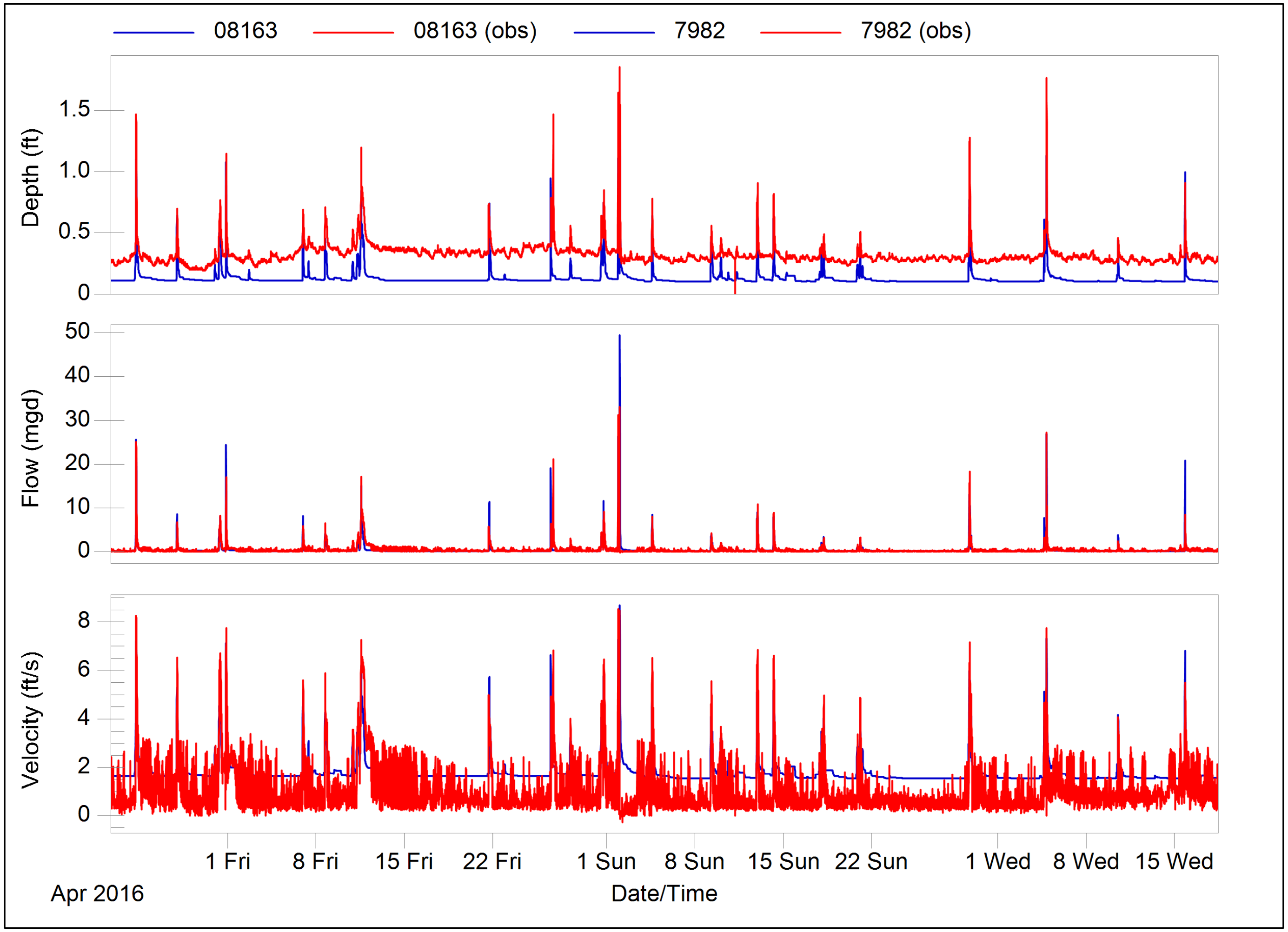


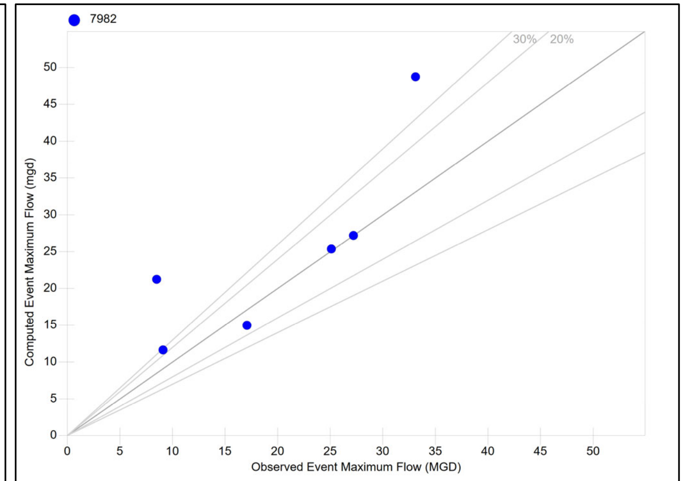


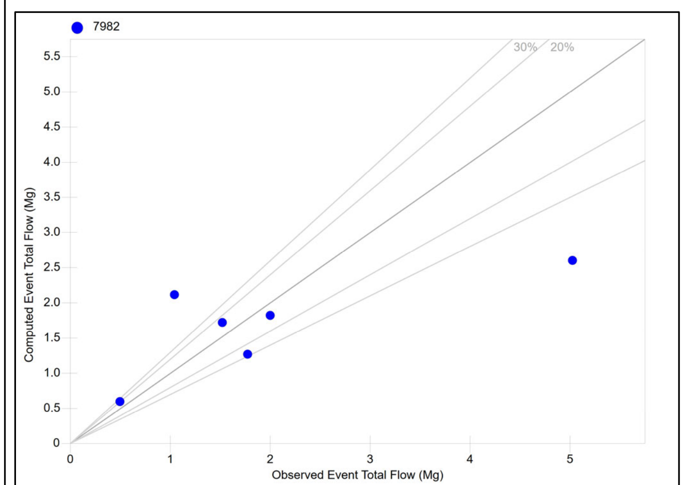


FM 7 – CSO 08

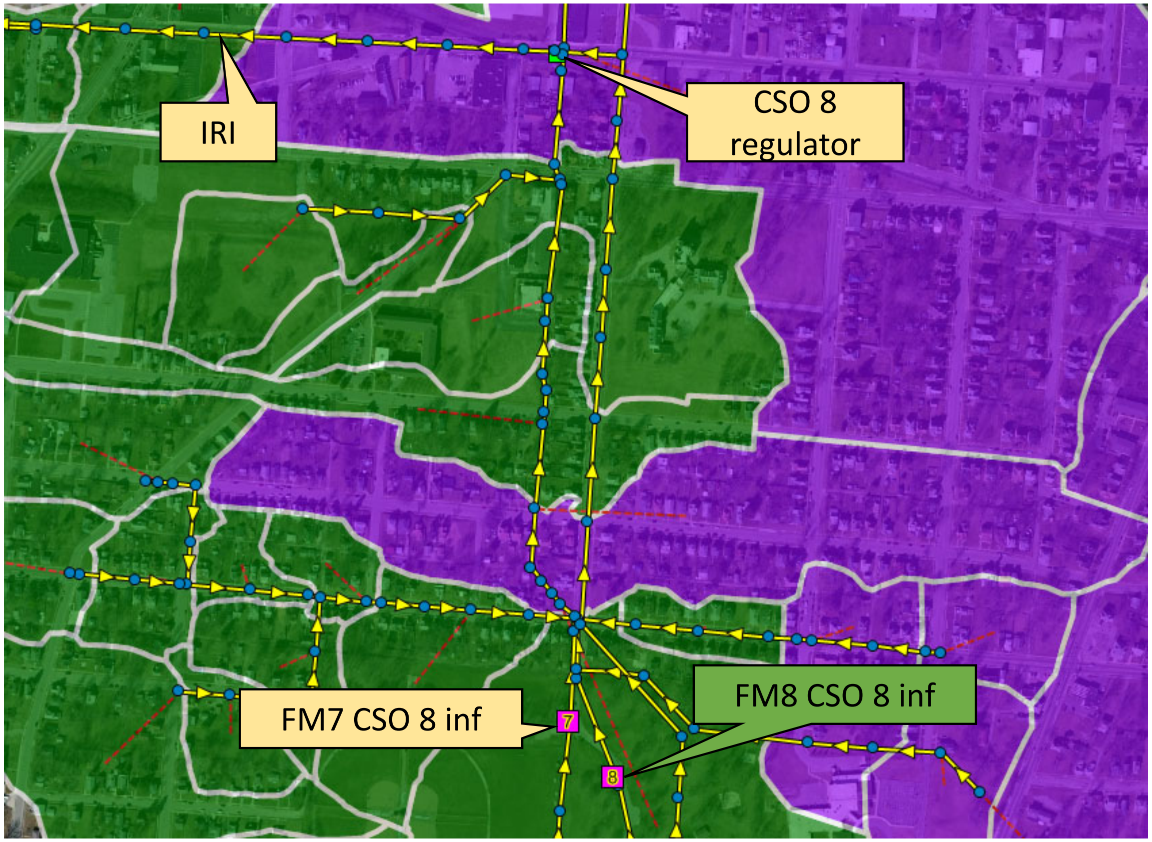
Spring 2016



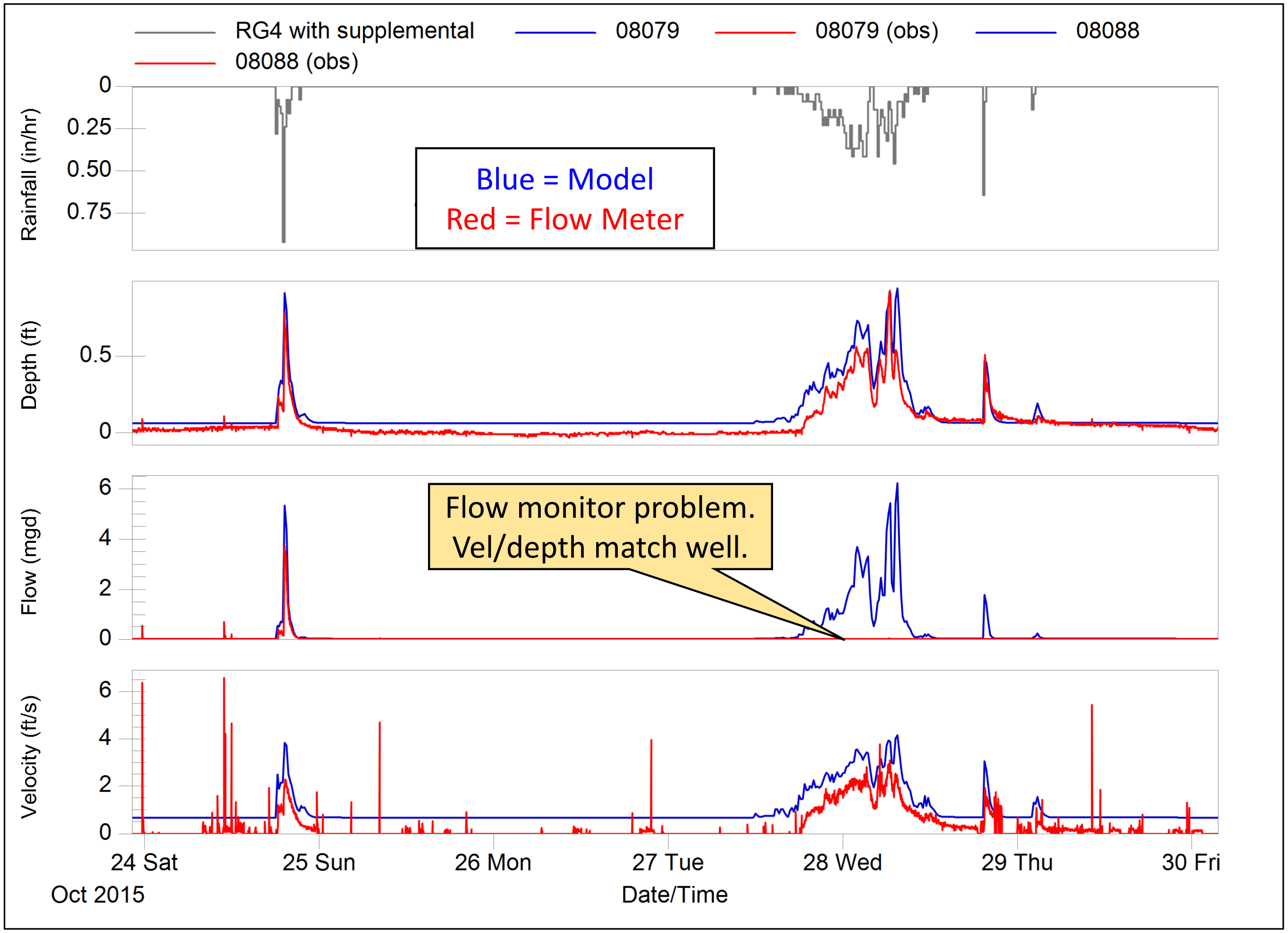




FM 8
CSO 08 - 60” inf (east)

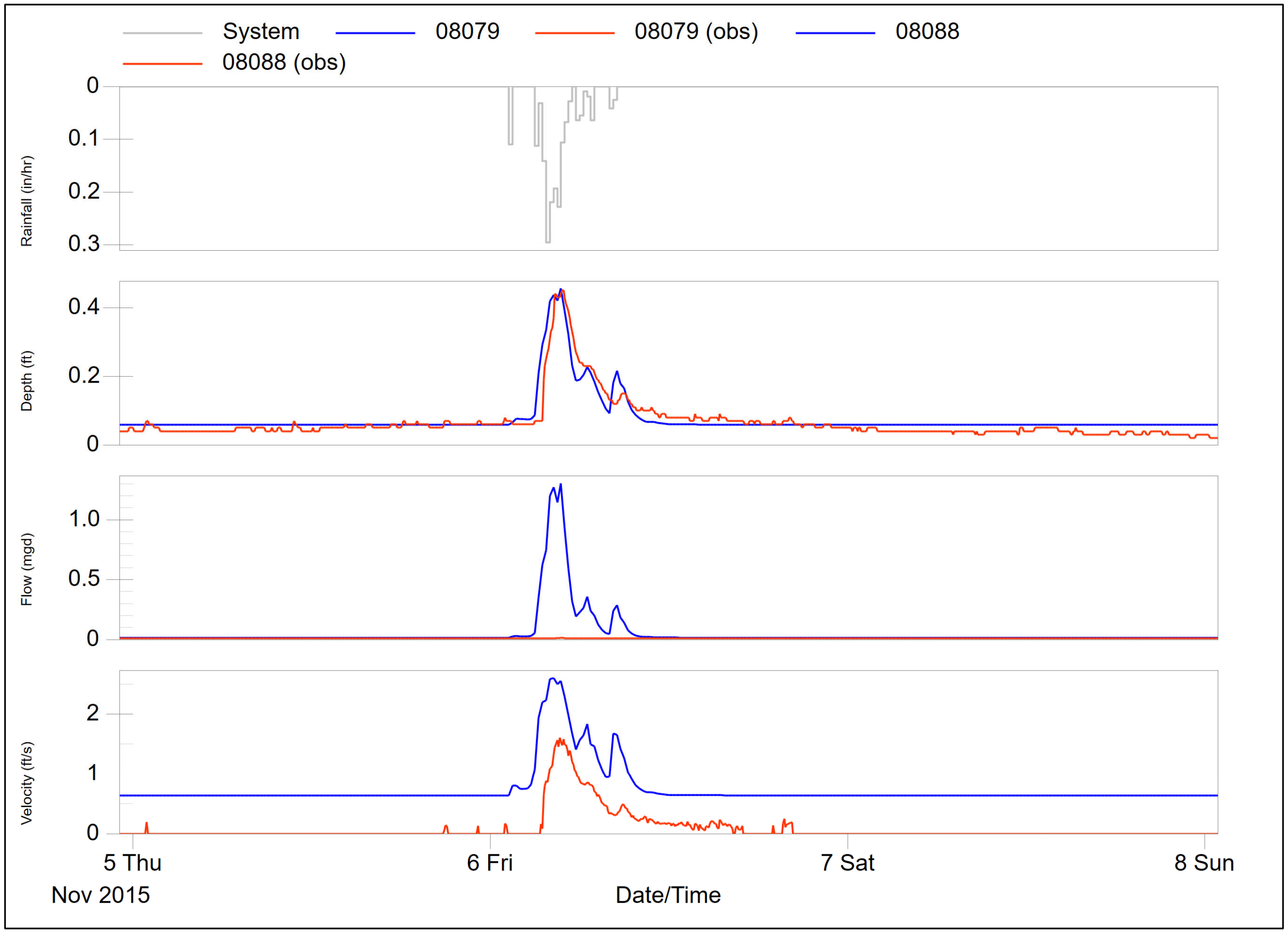


FM 8 – CSO 08



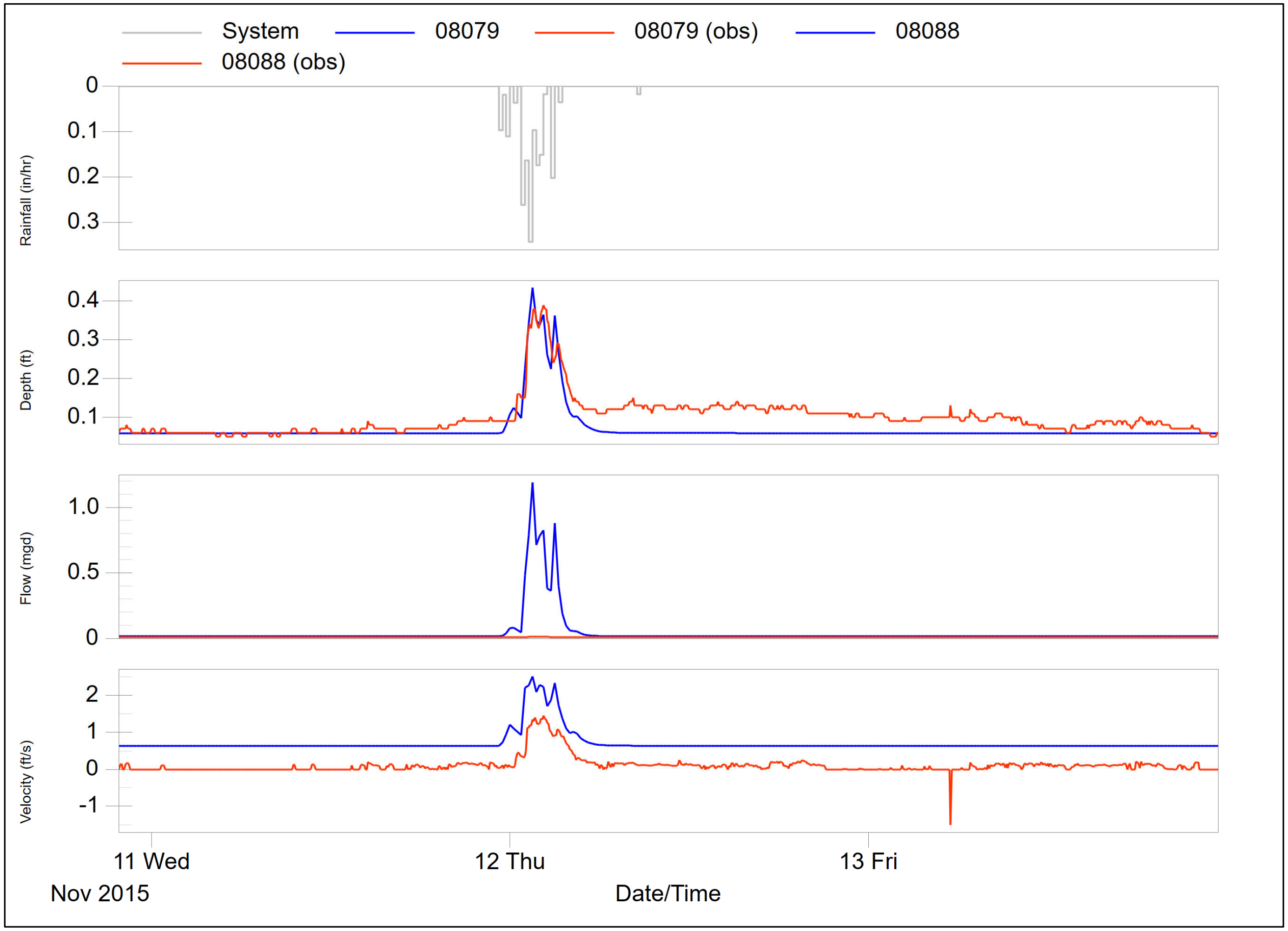
Calibration Events
10/24/15, 10/27/15

FM 8 – CSO 08 ()



Calibration Events
11/6/15

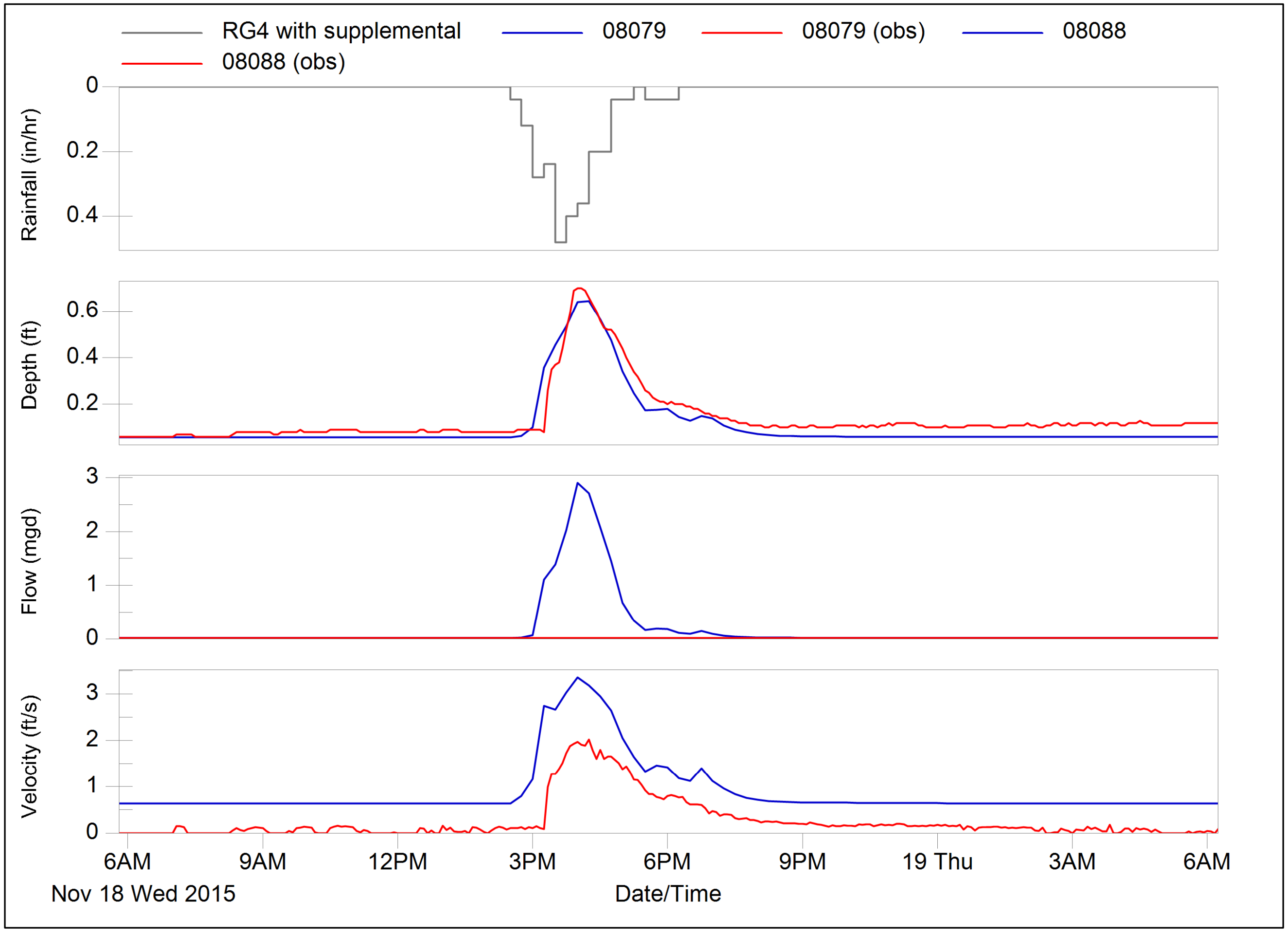
FM 8 – CSO 08 ()



Calibration Events

11/11/15

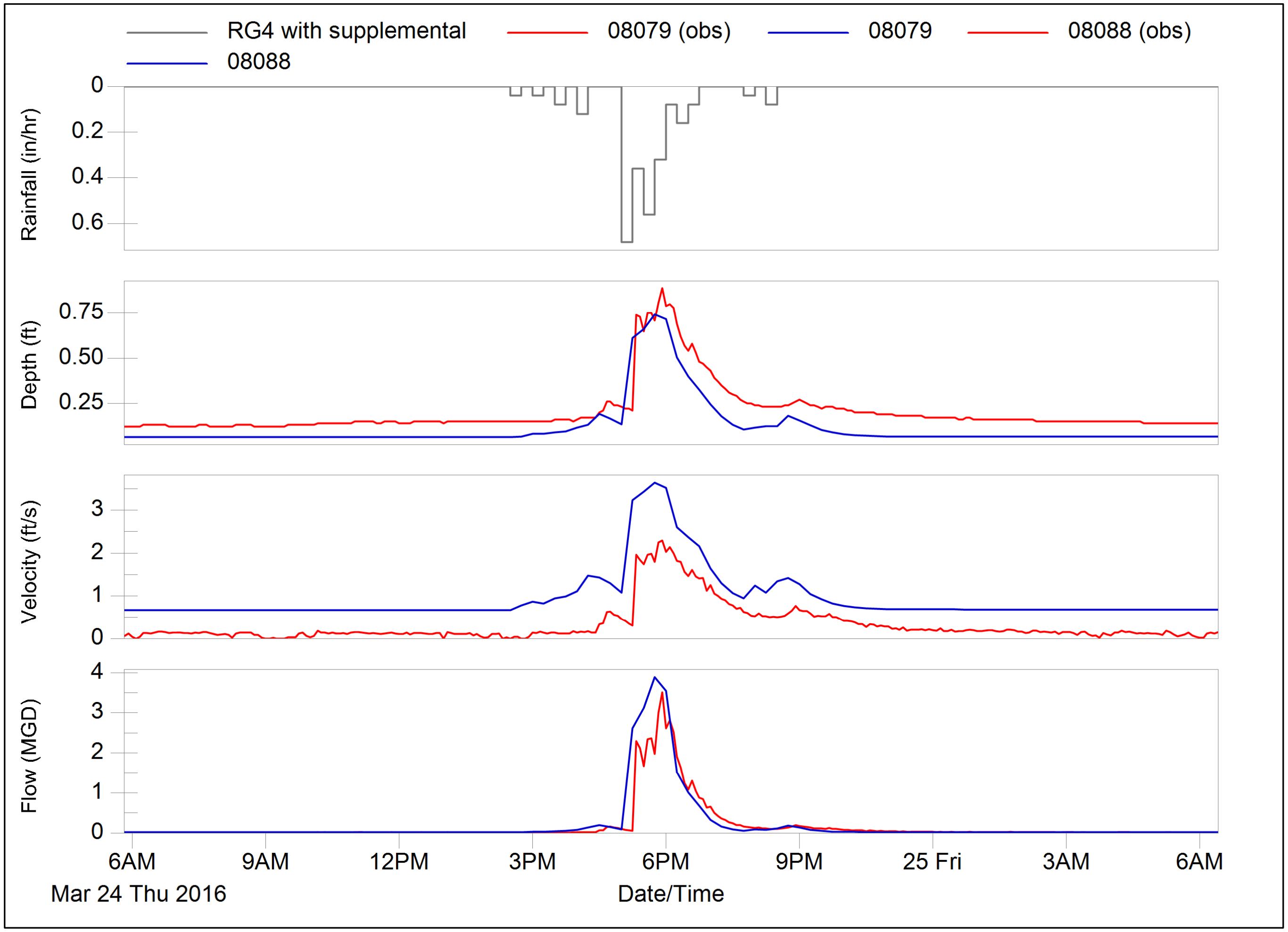
FM 8 – CSO 08 ()



Calibration Events

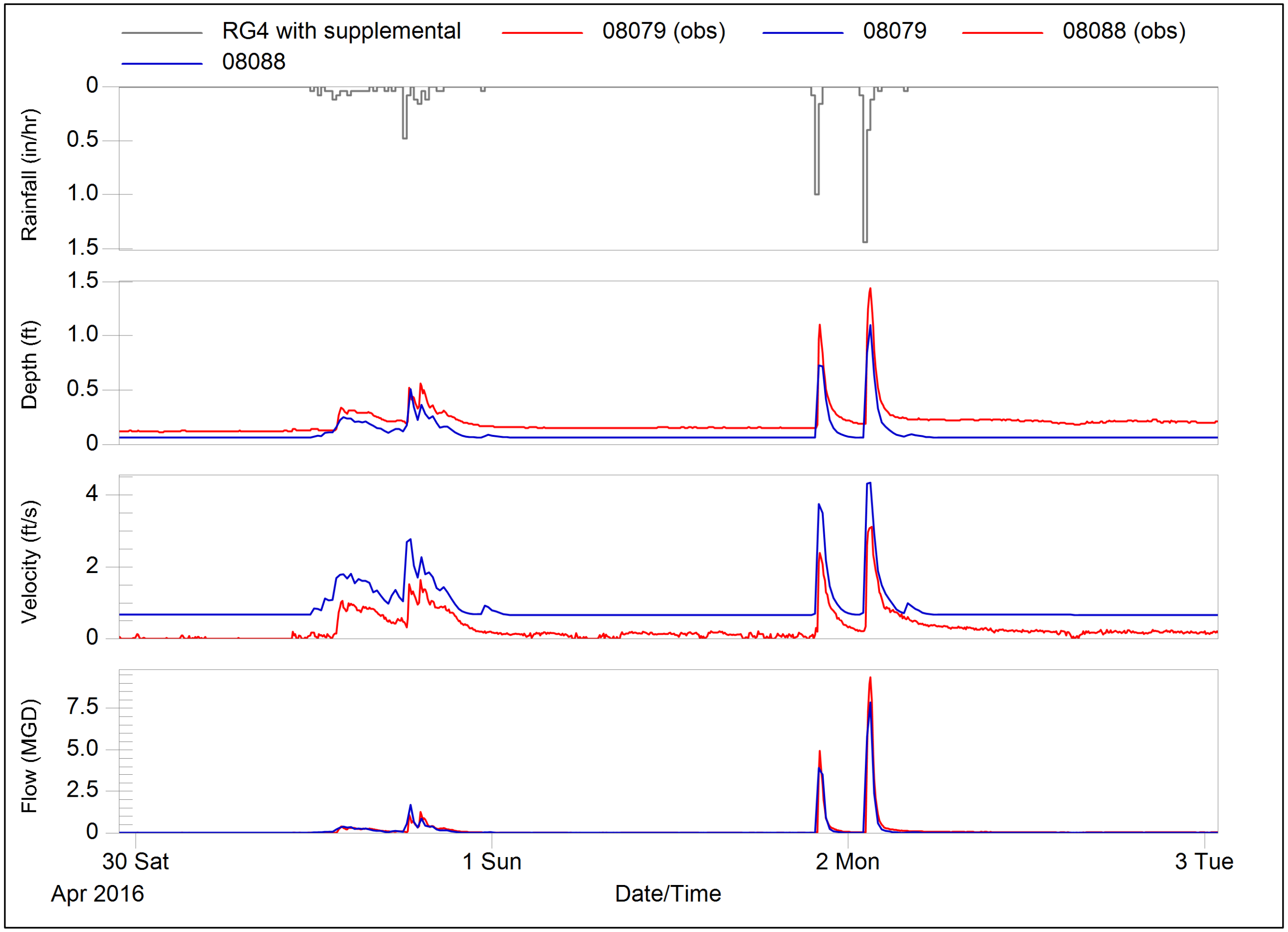
11/18/15

FM 8 – CSO 08



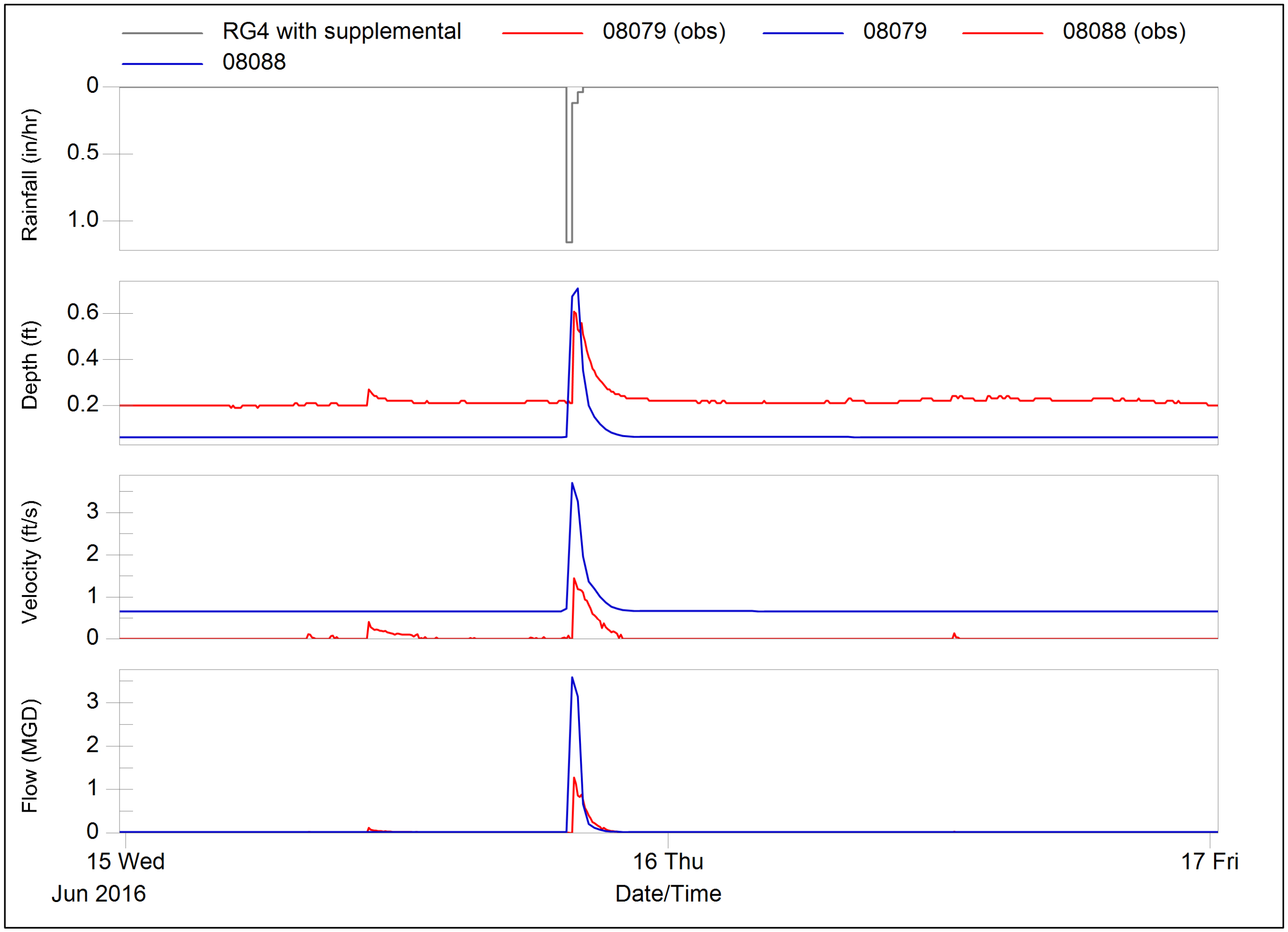
Calibration Event
3/24/16

FM 8 – CSO 08



Calibration Events
4/30/16, 5/1/16

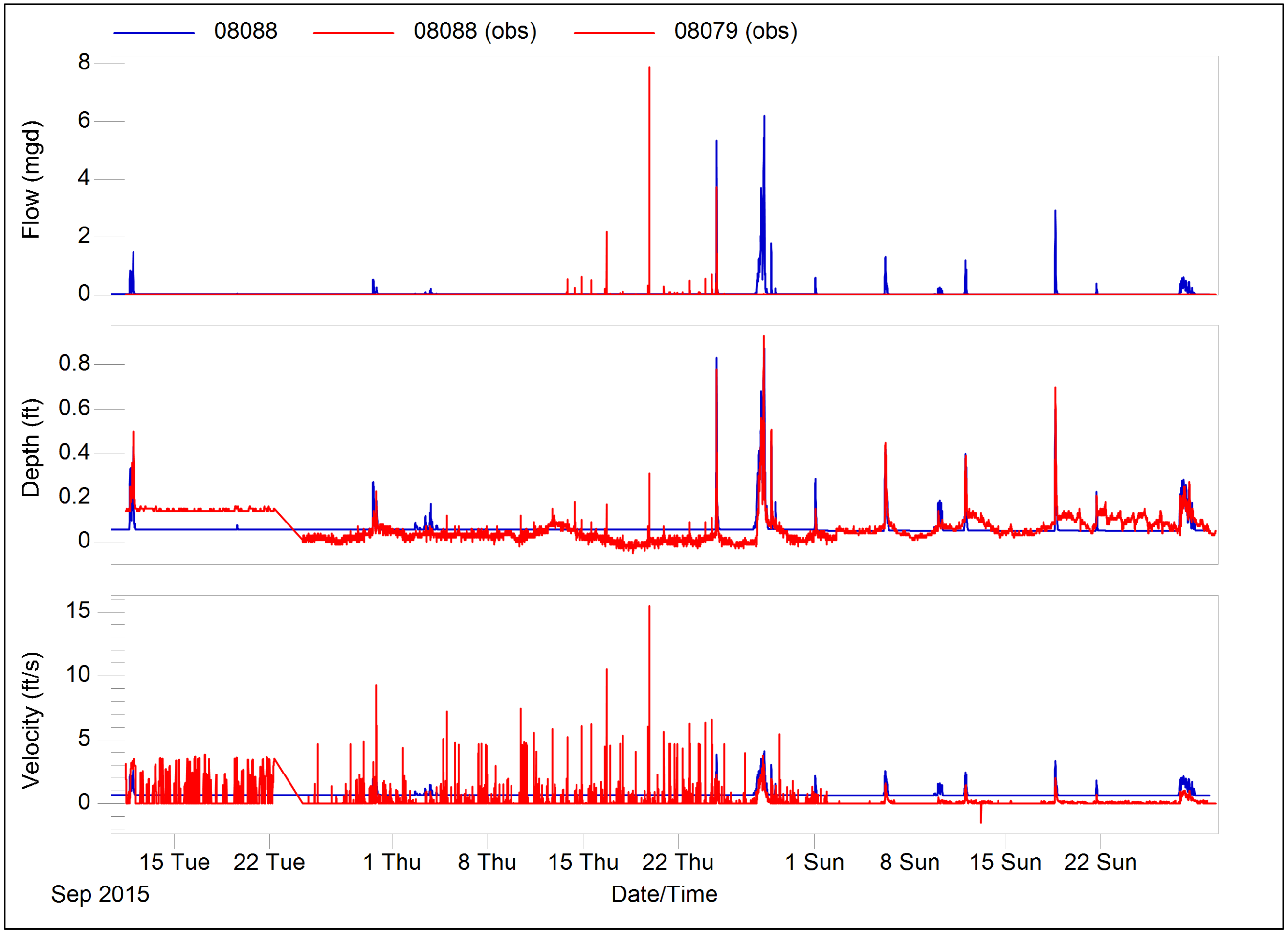
FM 8 – CSO 08

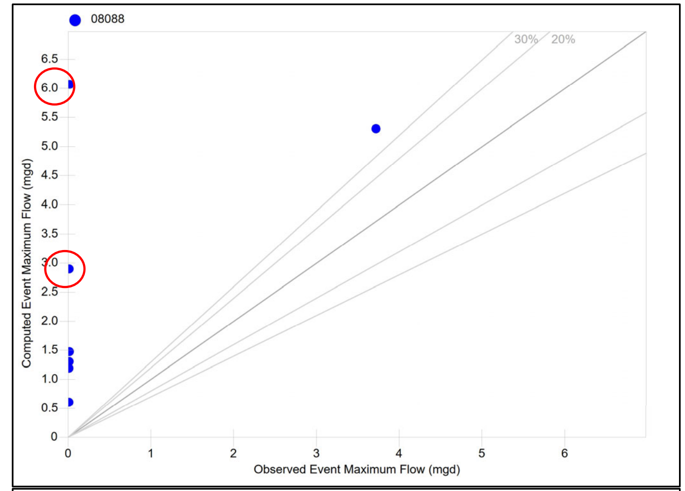


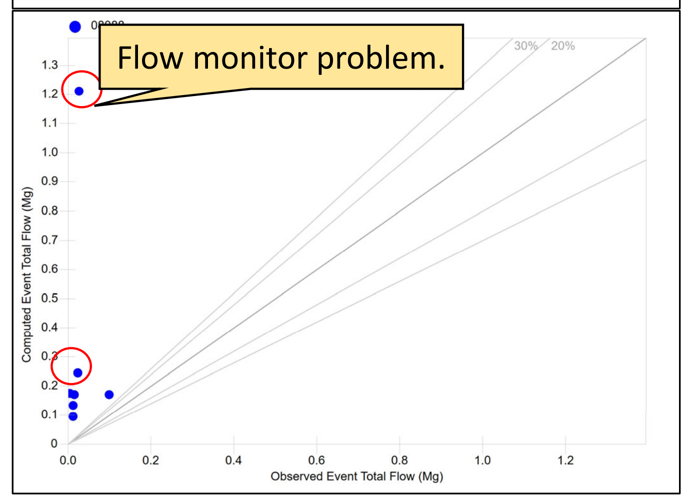
Calibration Events
6/15/16

FM 8 – CSO 08

Fall 2015

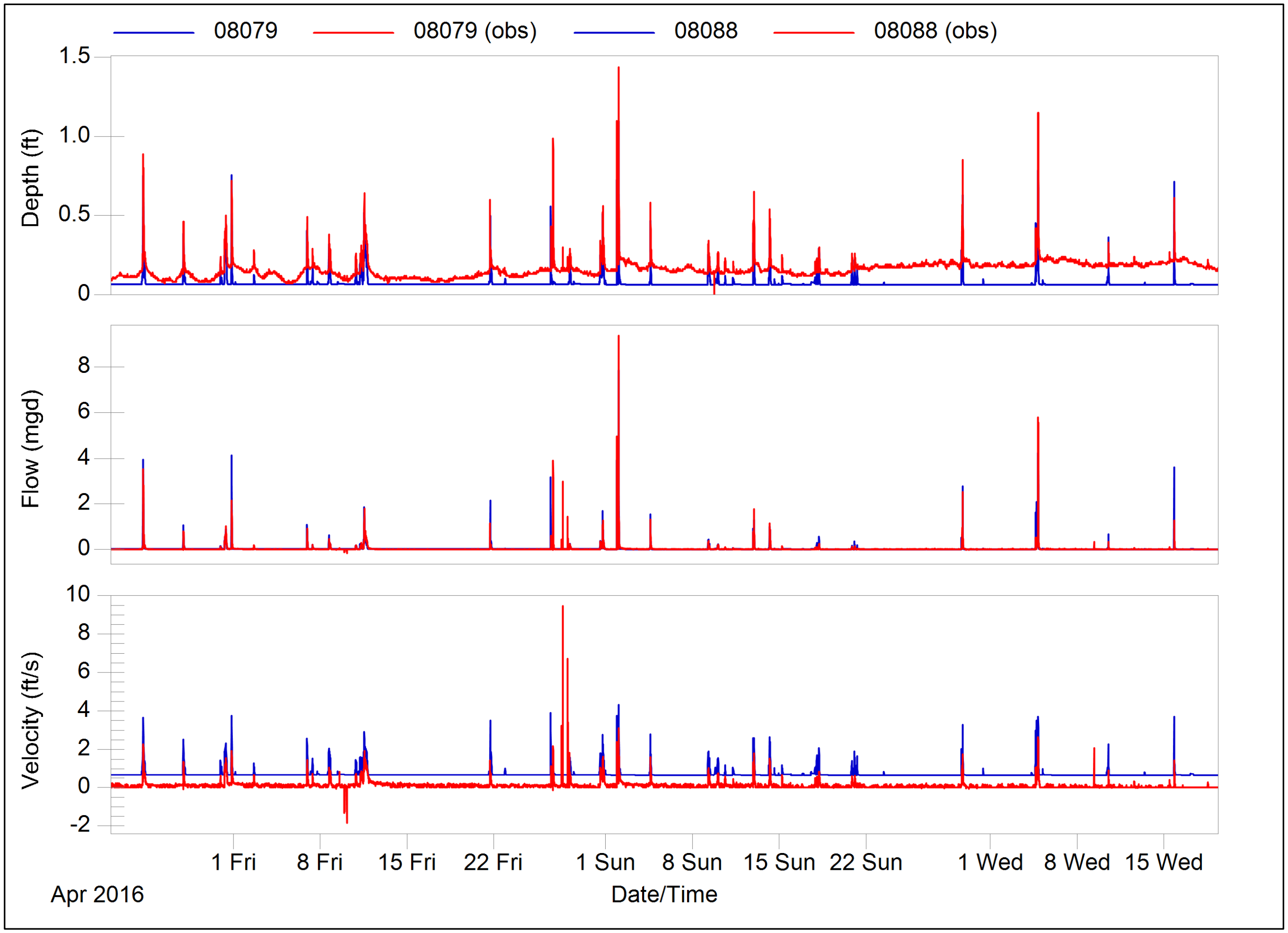


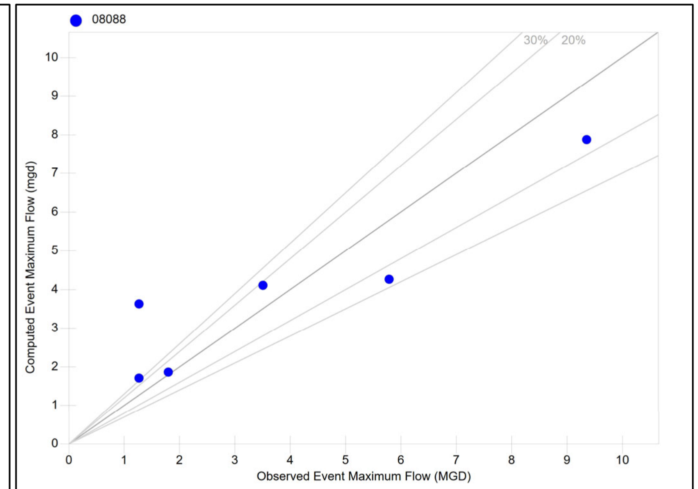


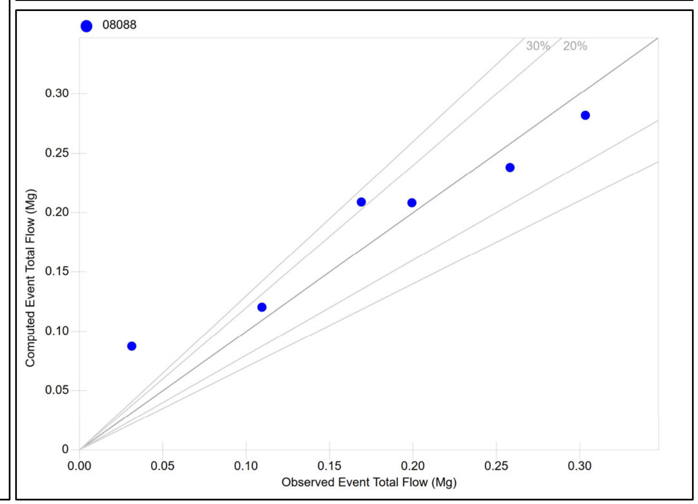


FM 8 – CSO 08

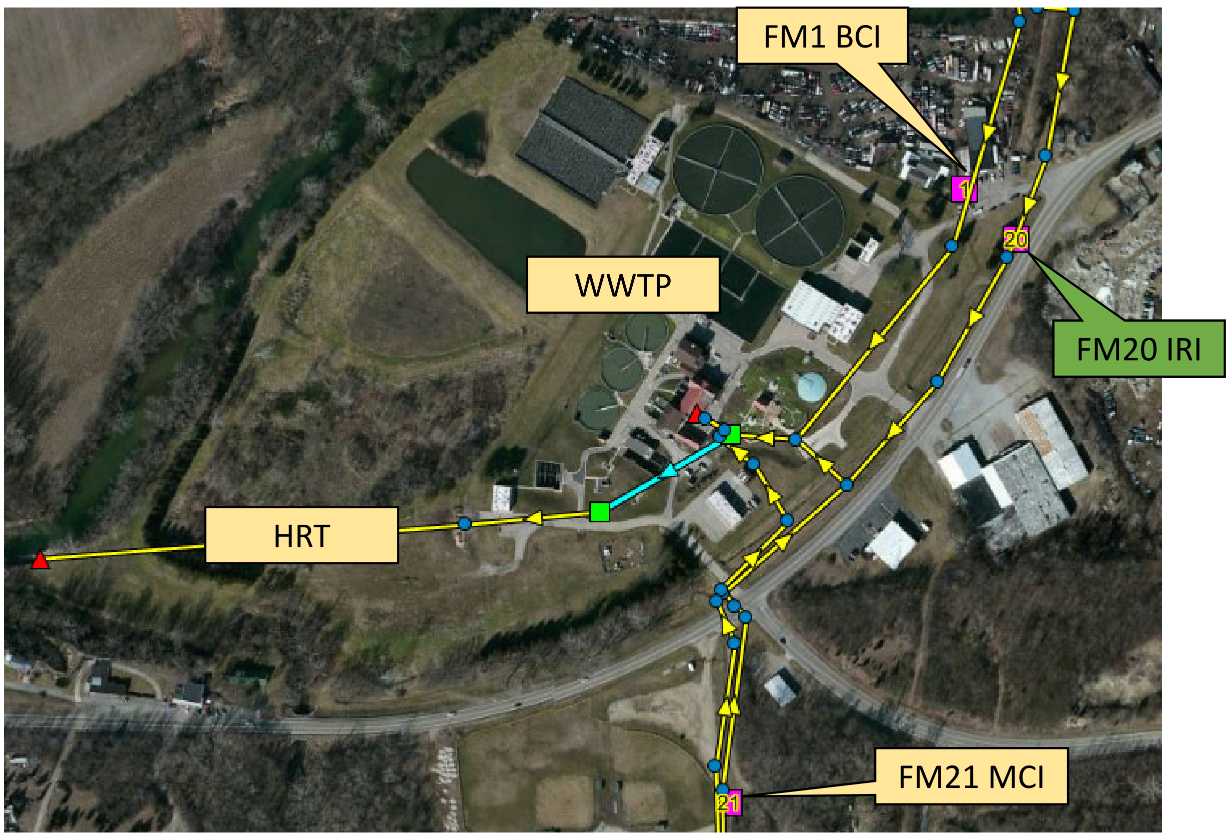
Spring 2016



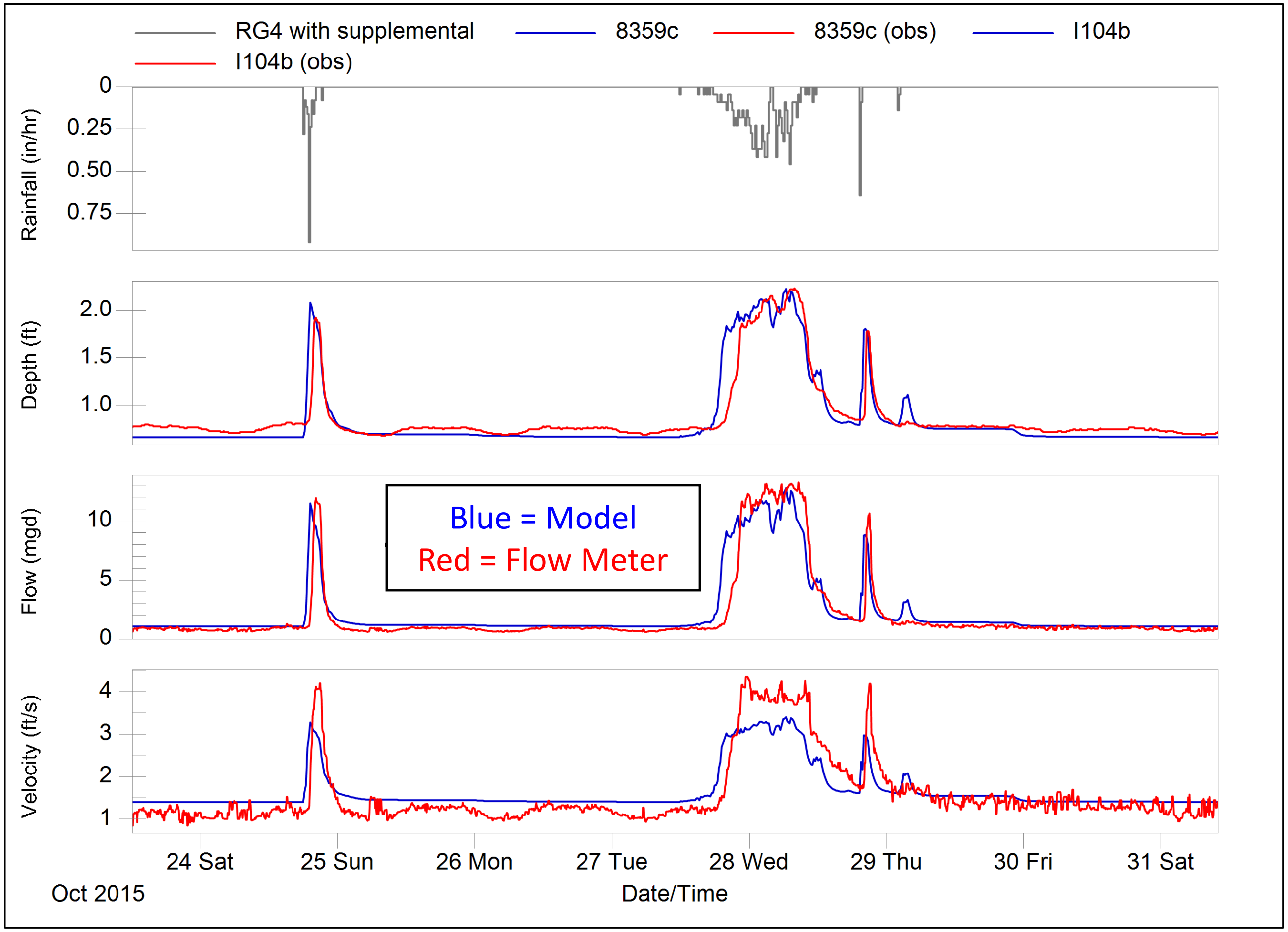




FM 20
Indian Run Int. (IRI) - Near WWTP



IRI



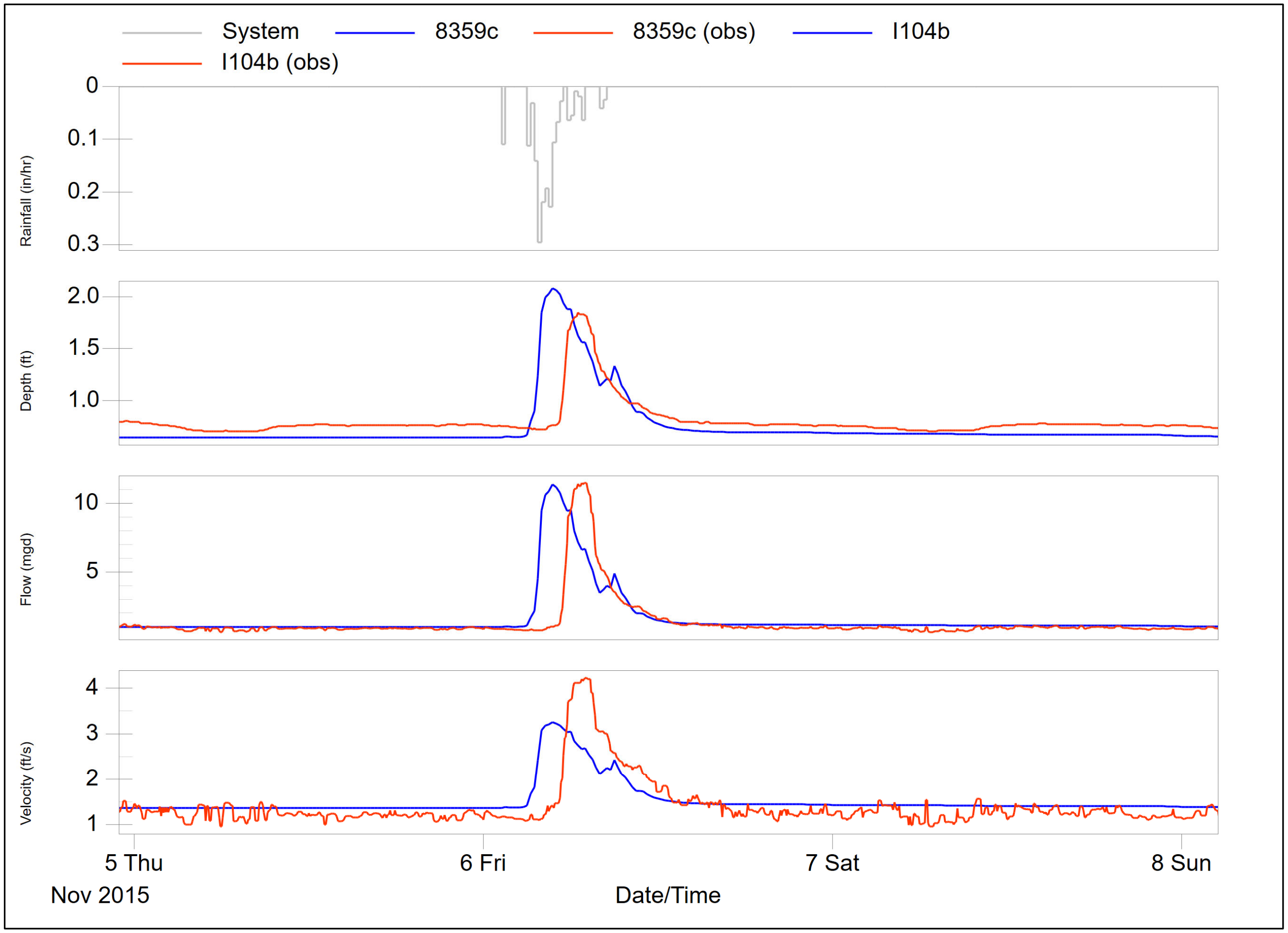
Calibration Events

10/24/15, 10/27/15

IRI

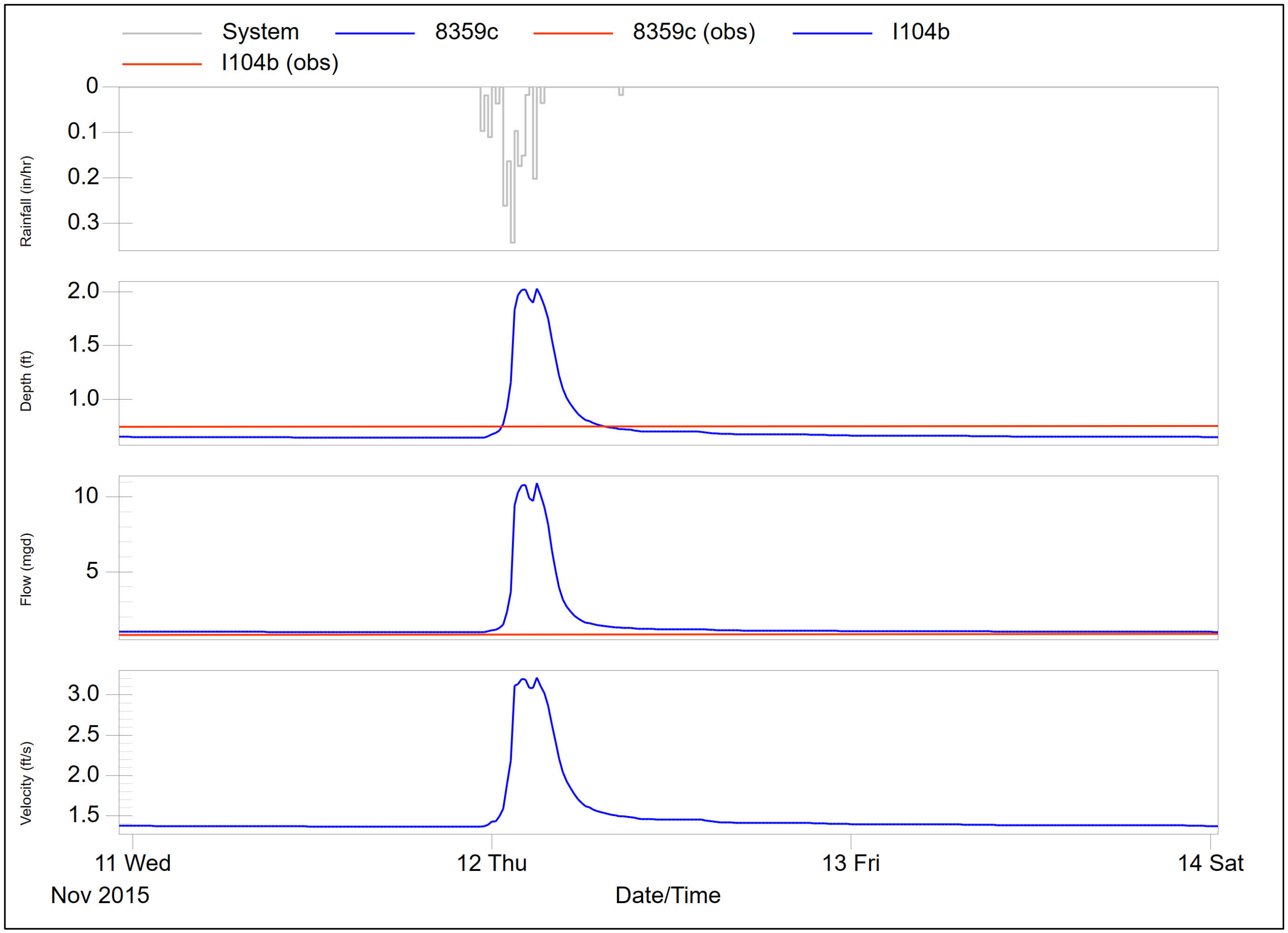
Calibration Events

11/6/15

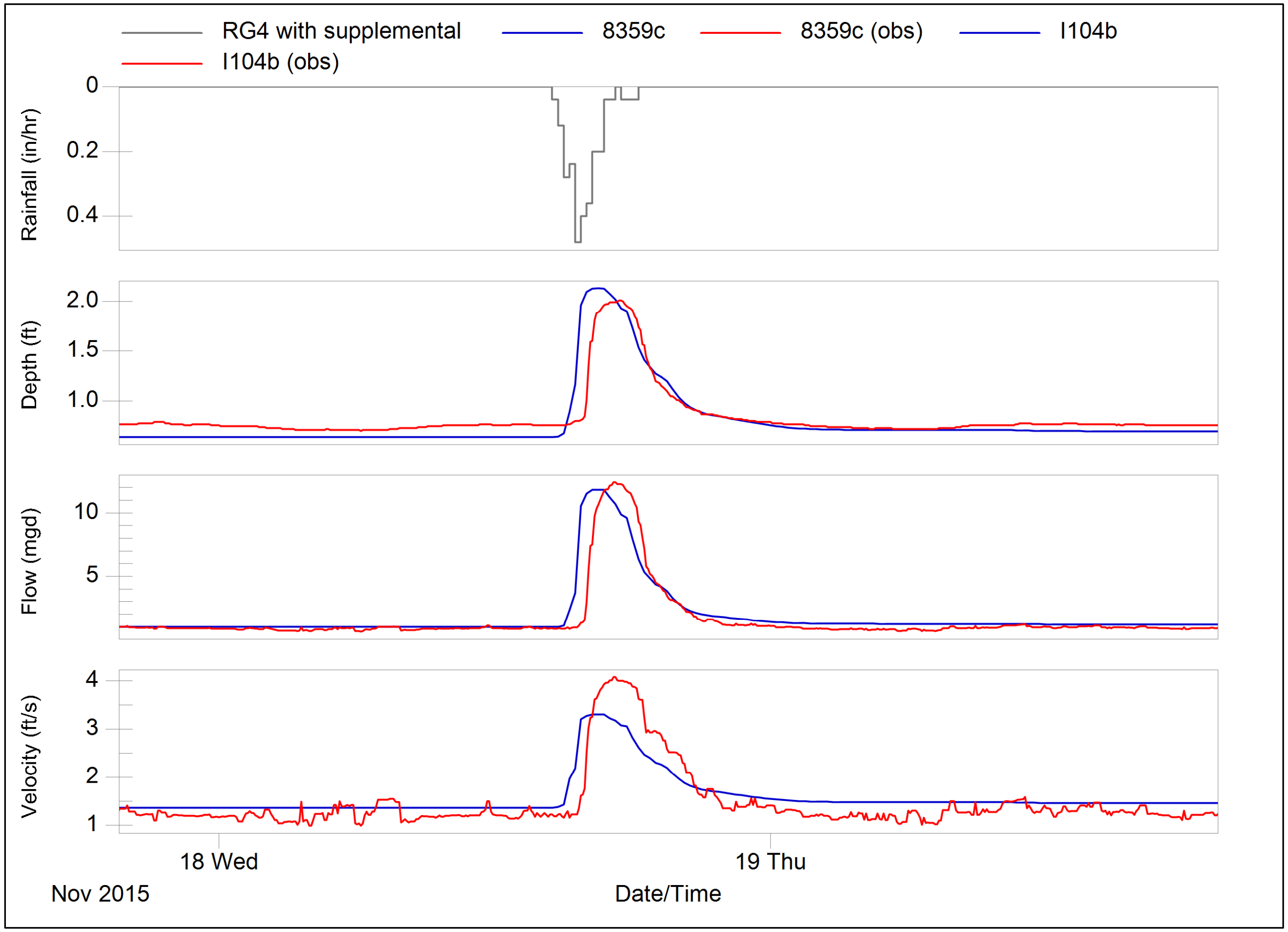


IRI

Calibration Events
11/11/15

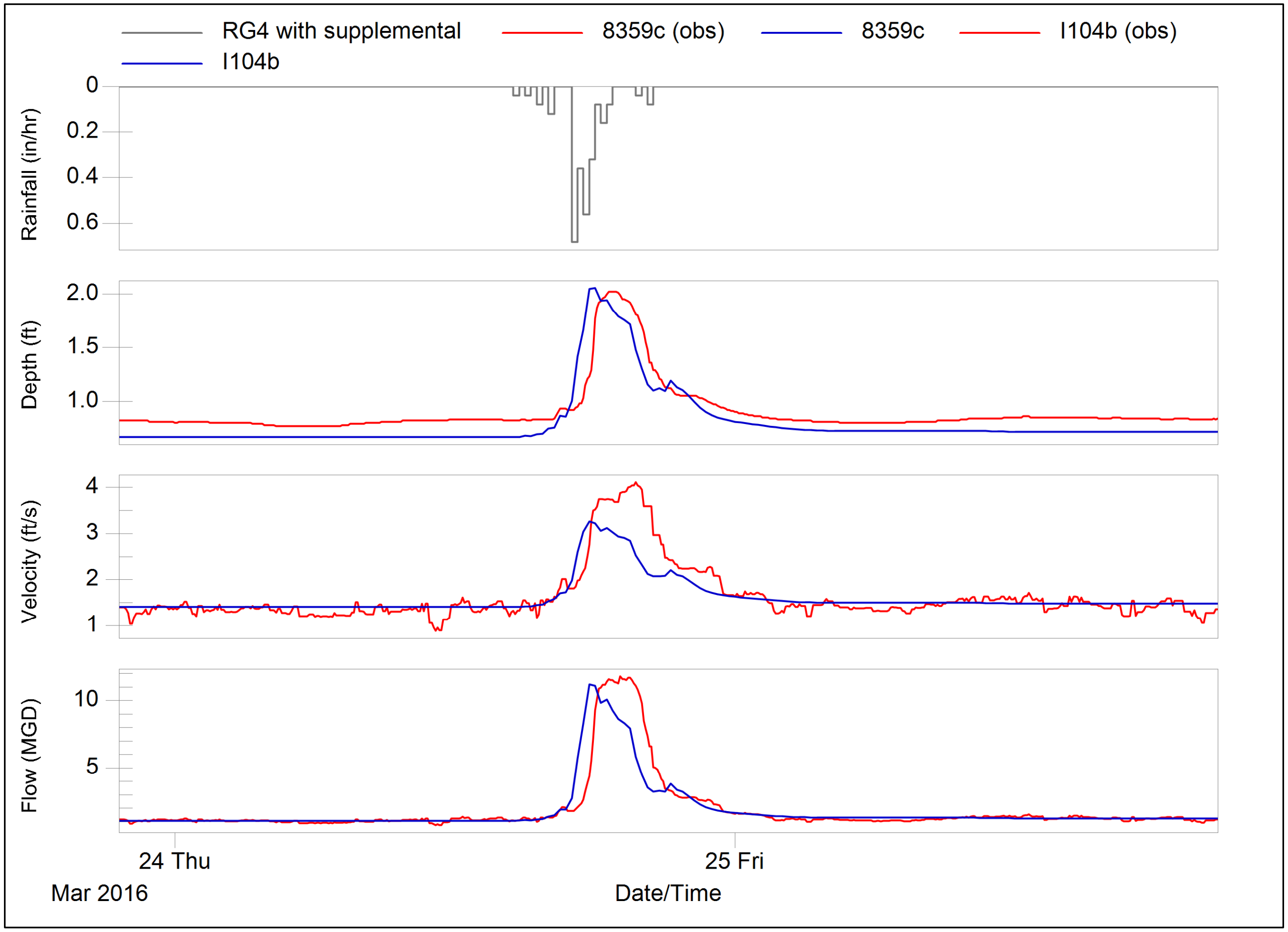


IRI



Calibration Events
11/18/15

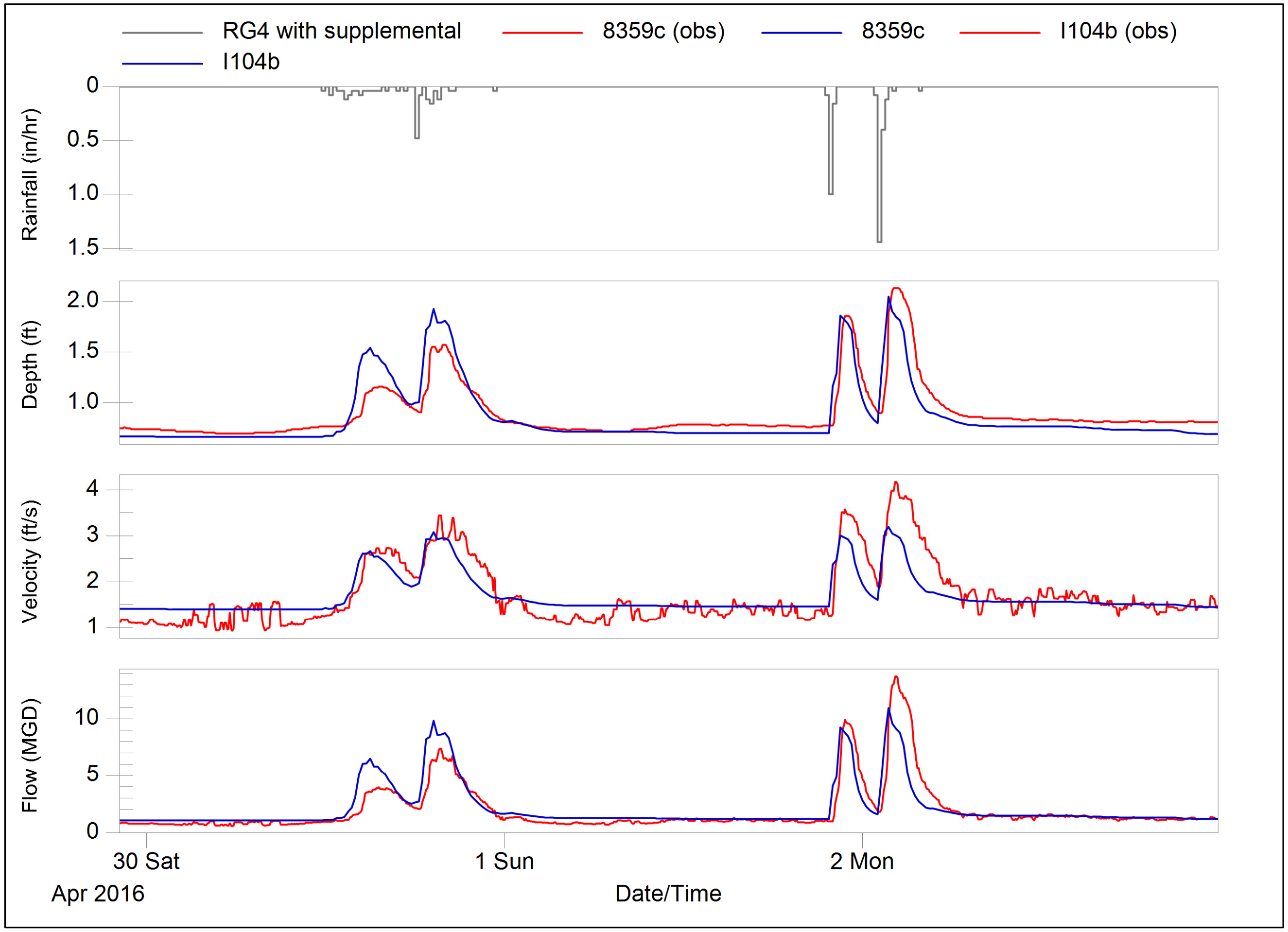
IRI



Calibration Event

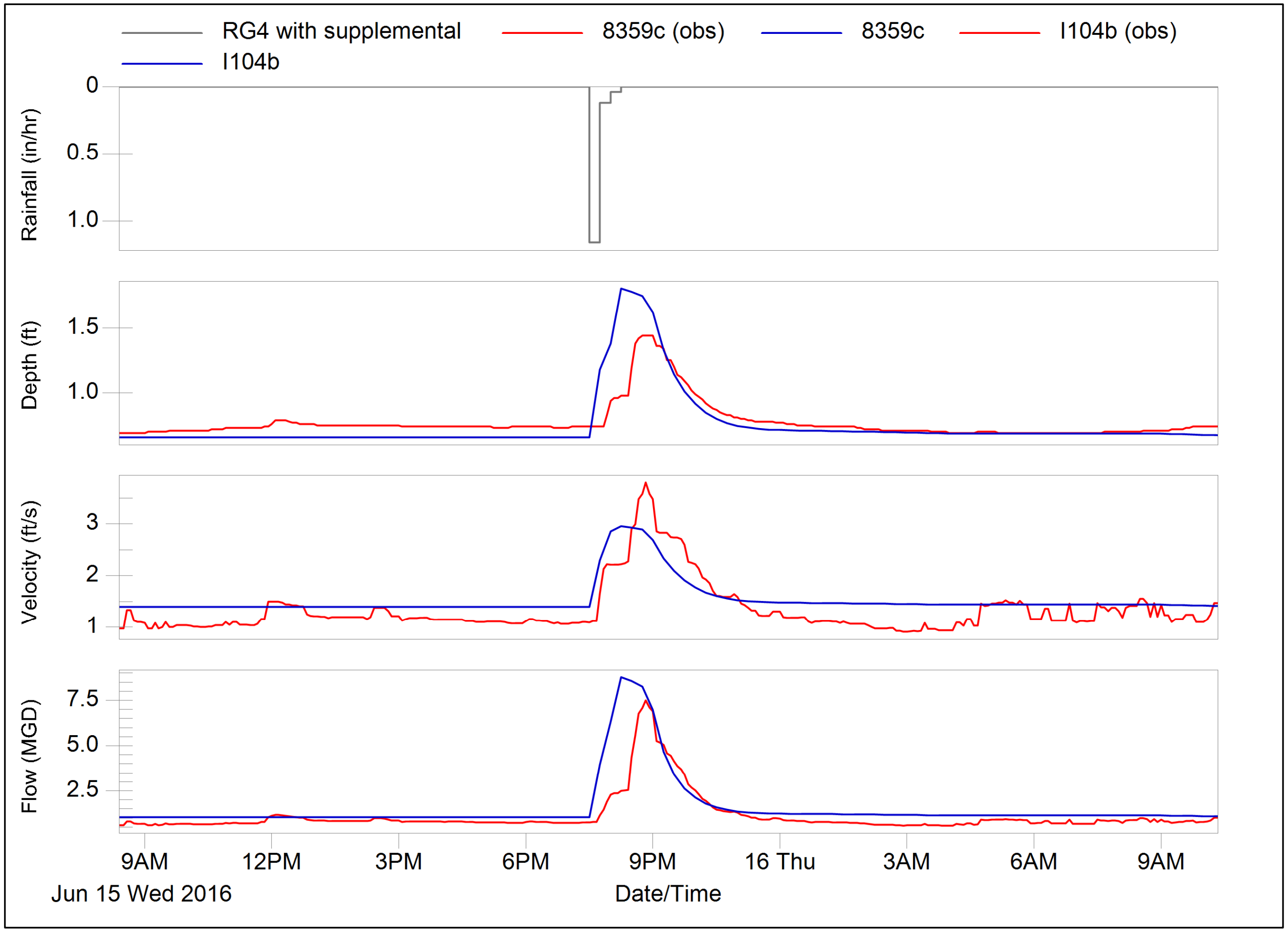
3/24/16

IRI



Calibration Events
4/30/16, 5/1/16

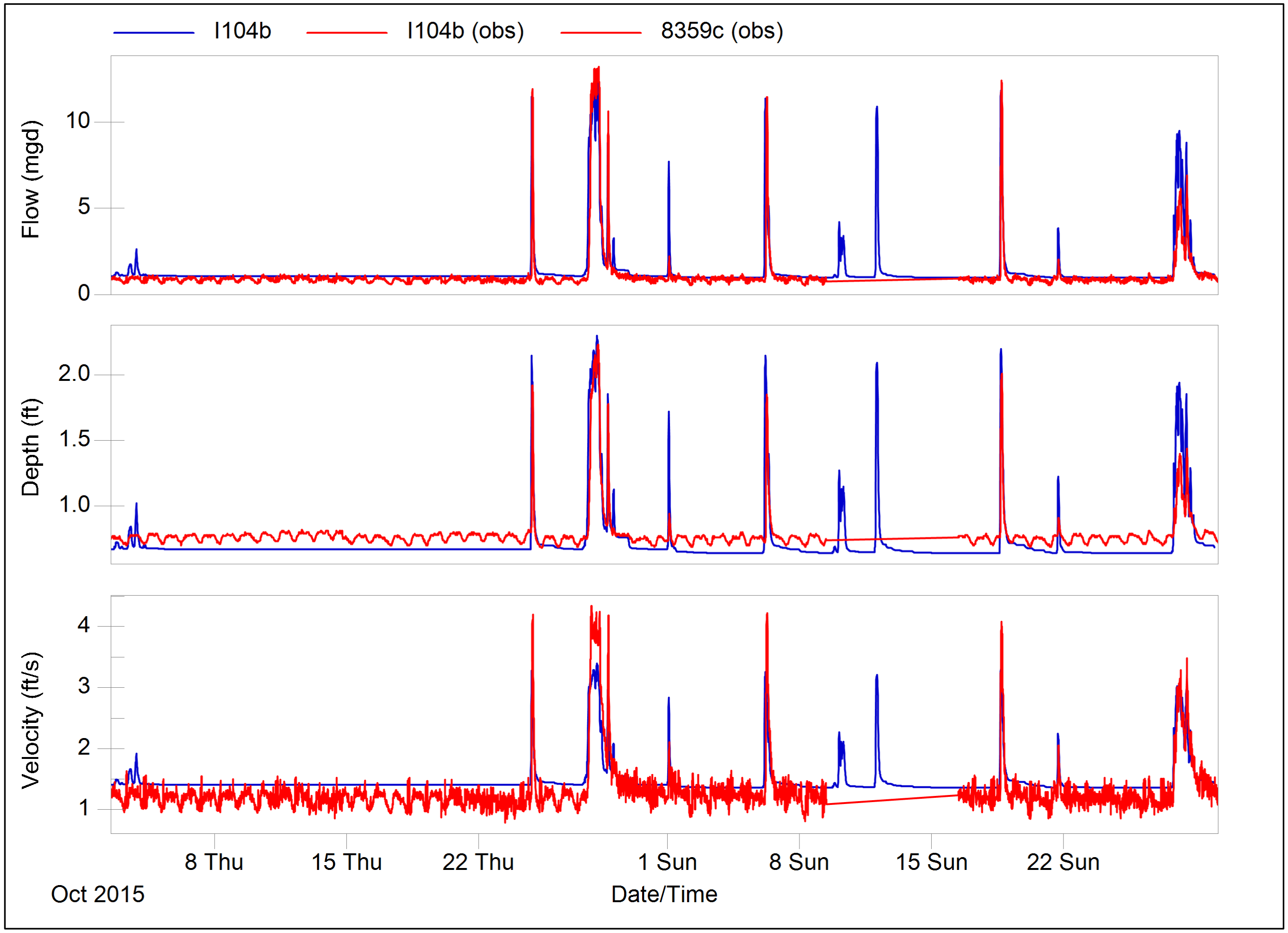
IRI

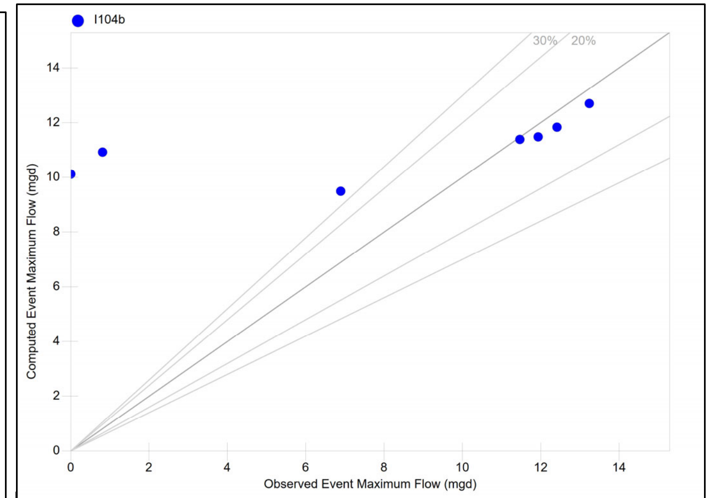


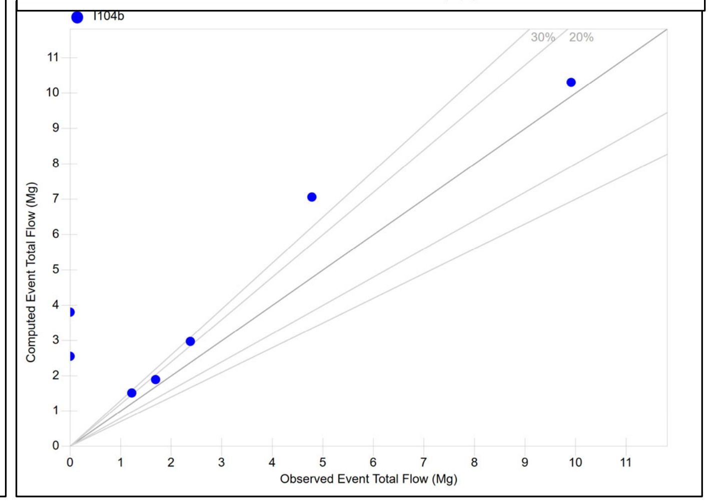
Calibration Events
6/15/16

IRI

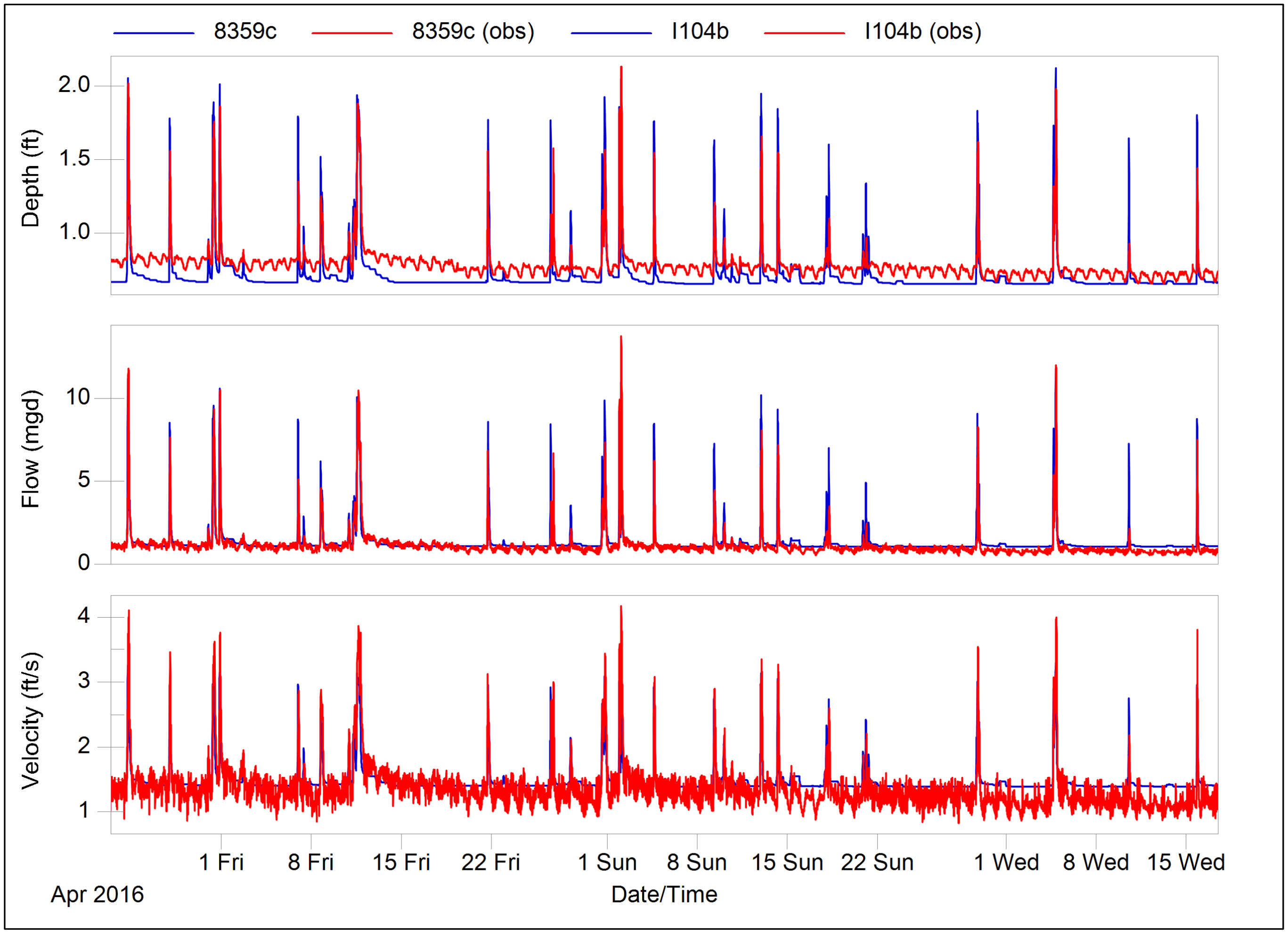
Fall 2015



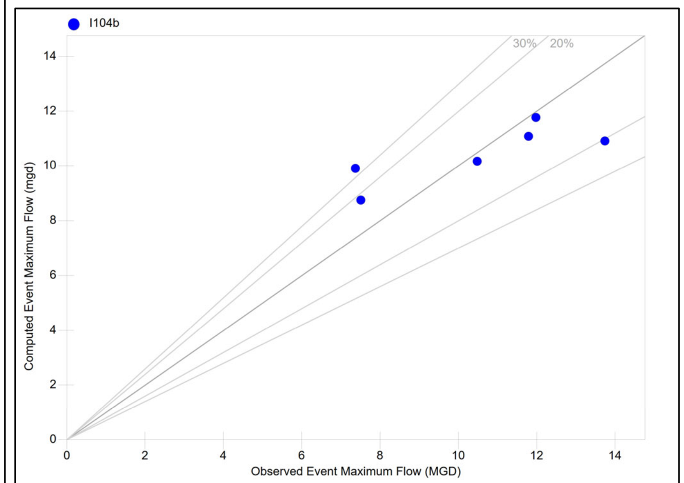


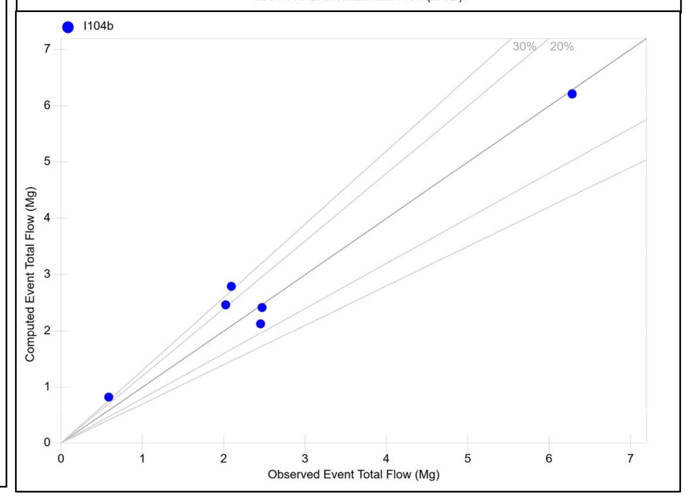


IRI

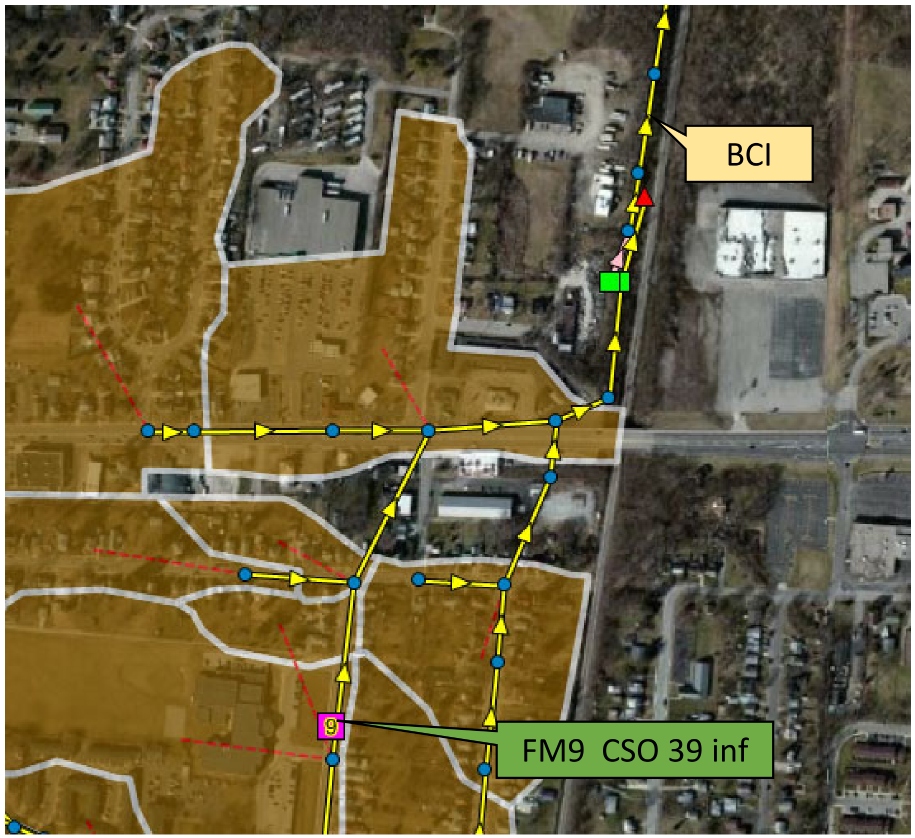


Spring 2016

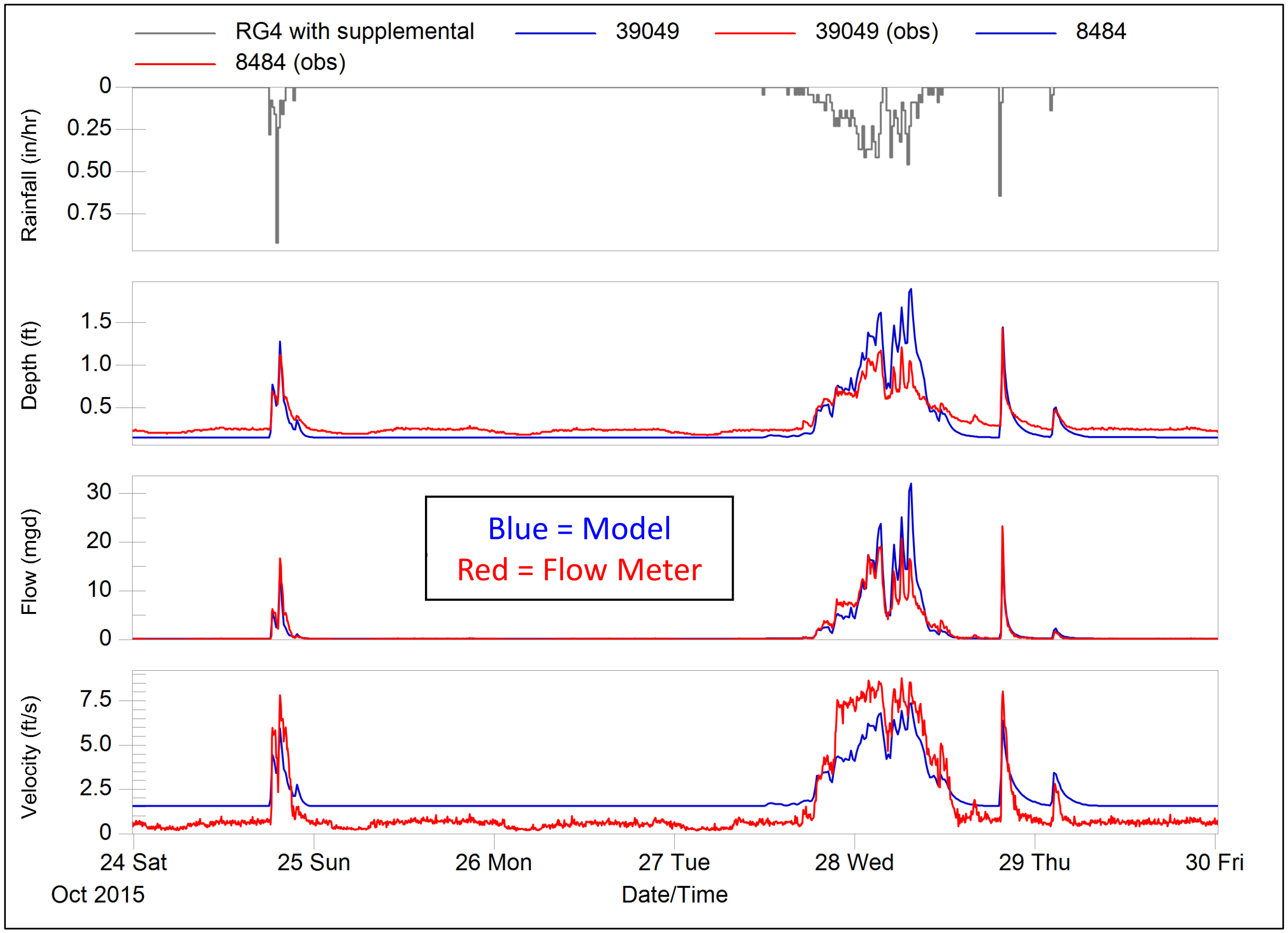




FM 9
CSO 39 inf



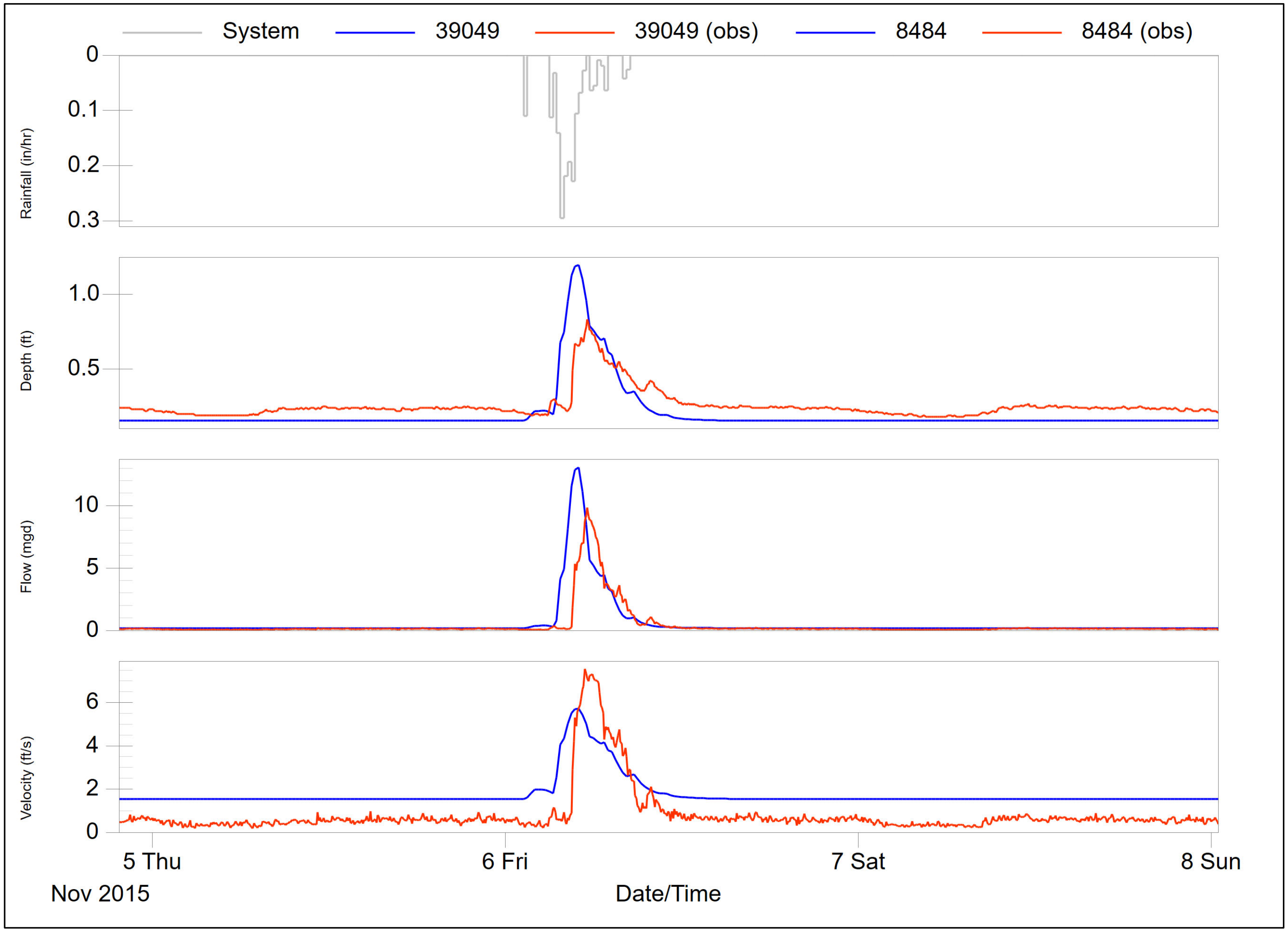
FM 9 – CSO 39 ()



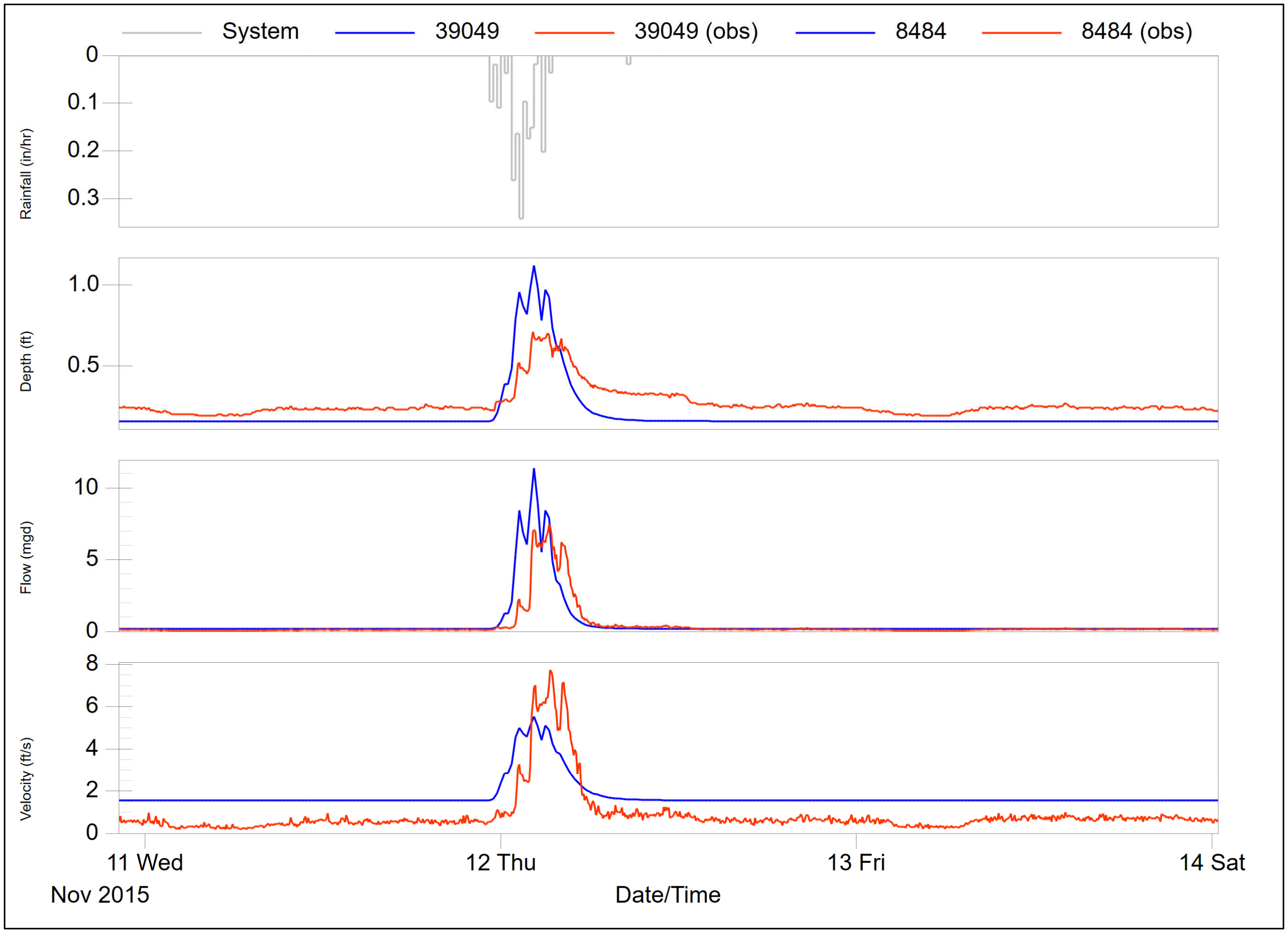
Calibration Events
10/24/15, 10/27/15

FM 9 – CSO 39 ()

Calibration Events
11/6/15



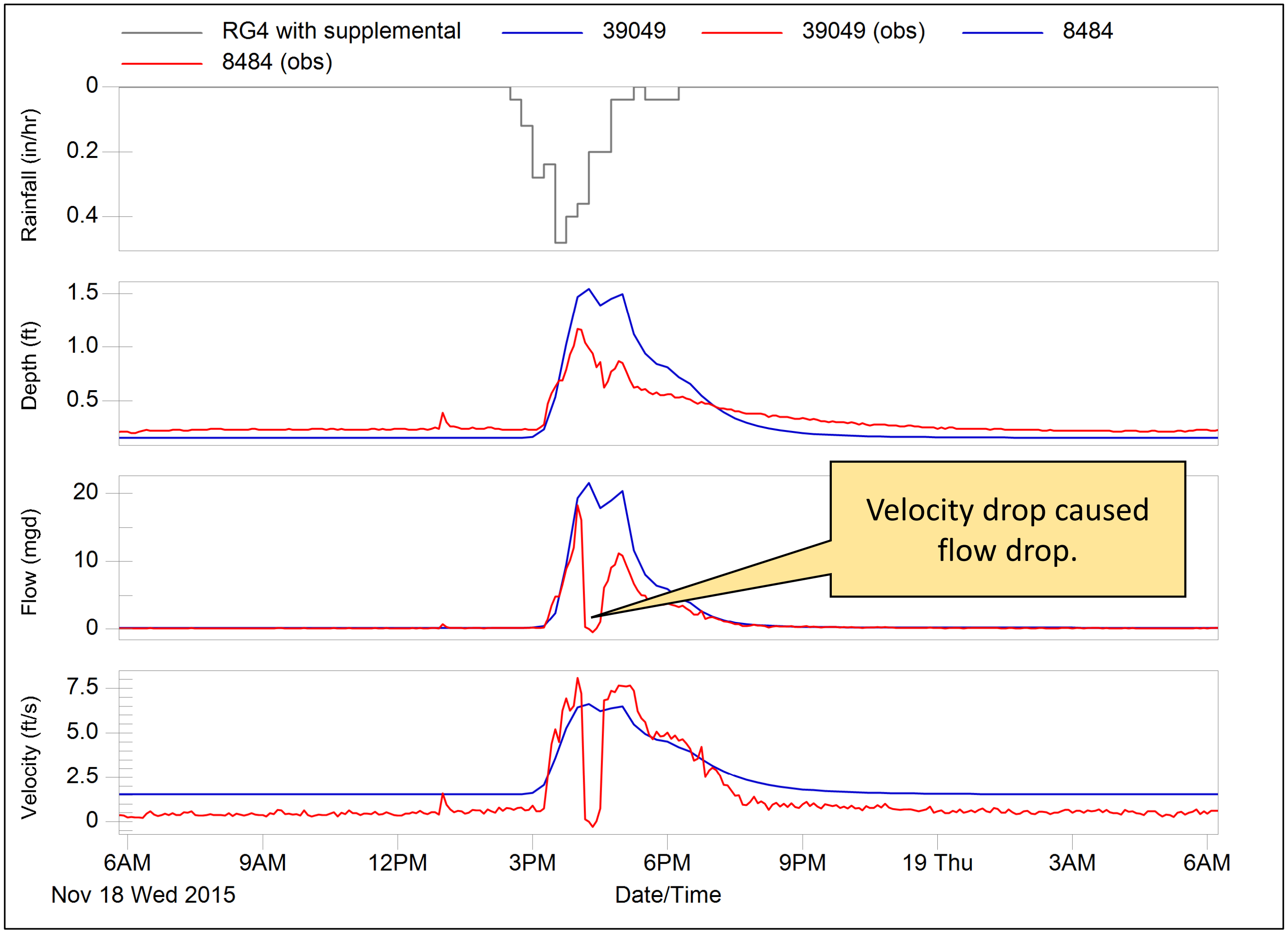
FM 9 – CSO 39 ()



Calibration Events

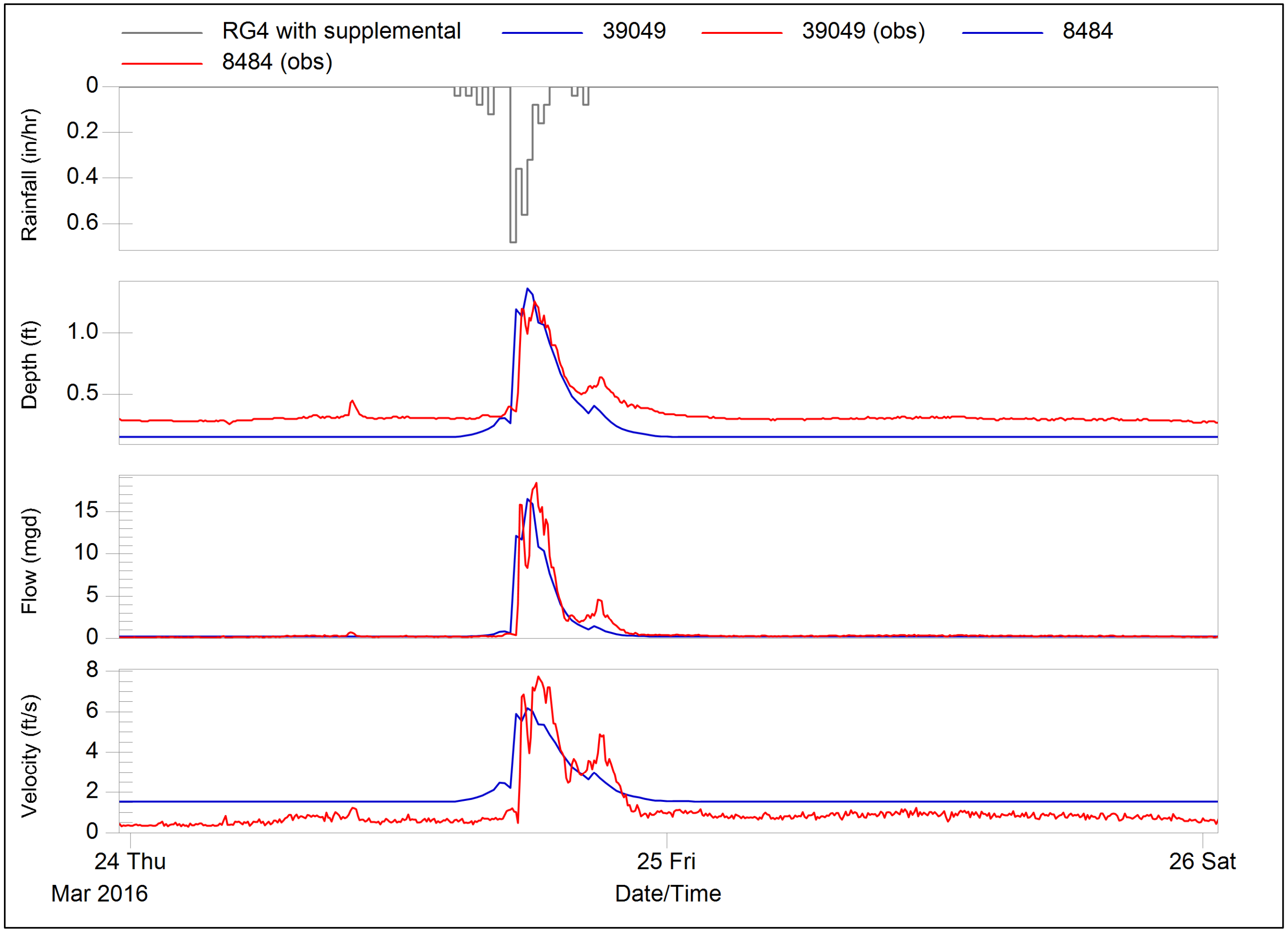
11/11/15

FM 9 – CSO 39 ()



Calibration Events
11/18/15

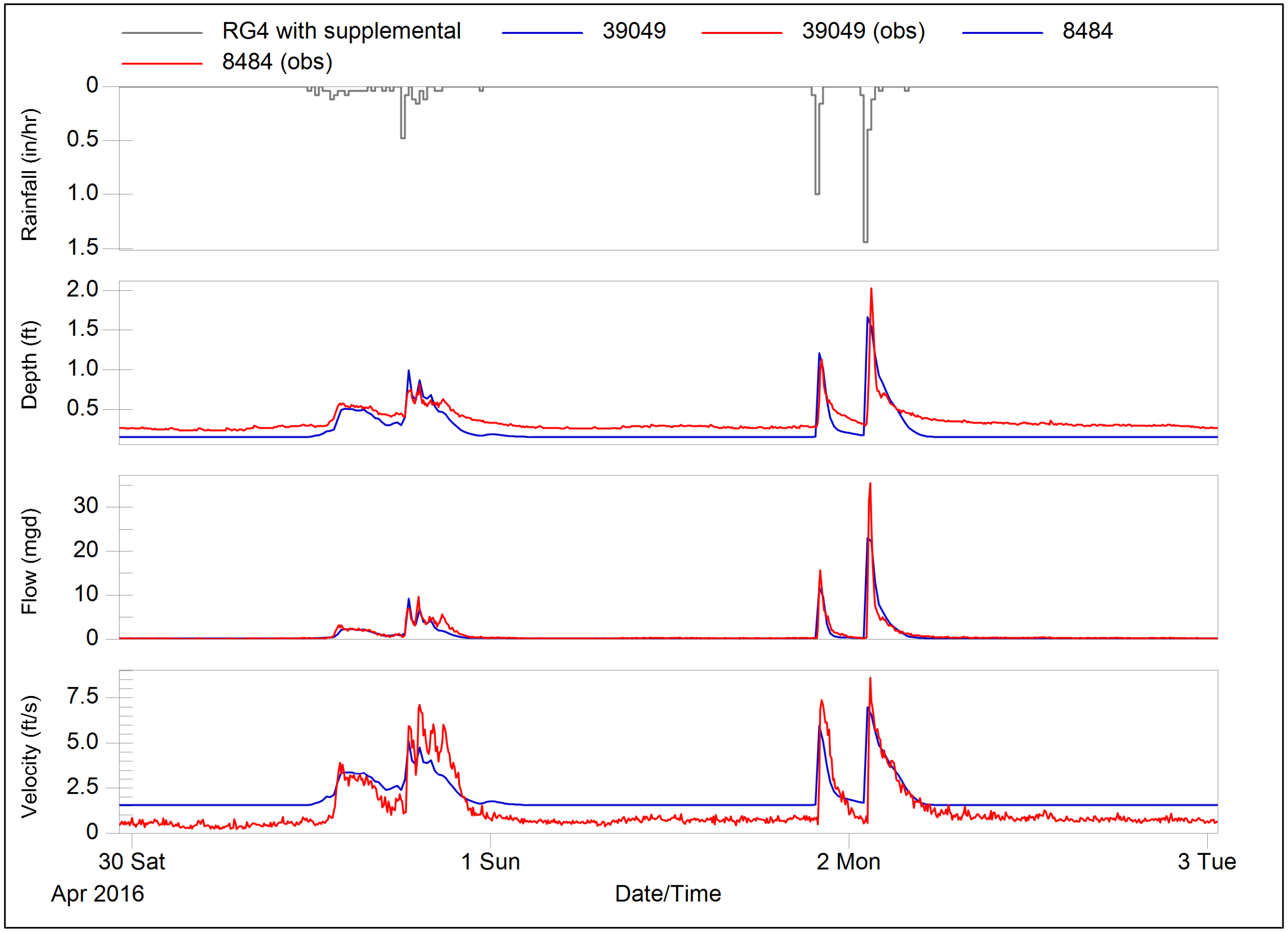
FM 9 – CSO 39 ()



Calibration Event

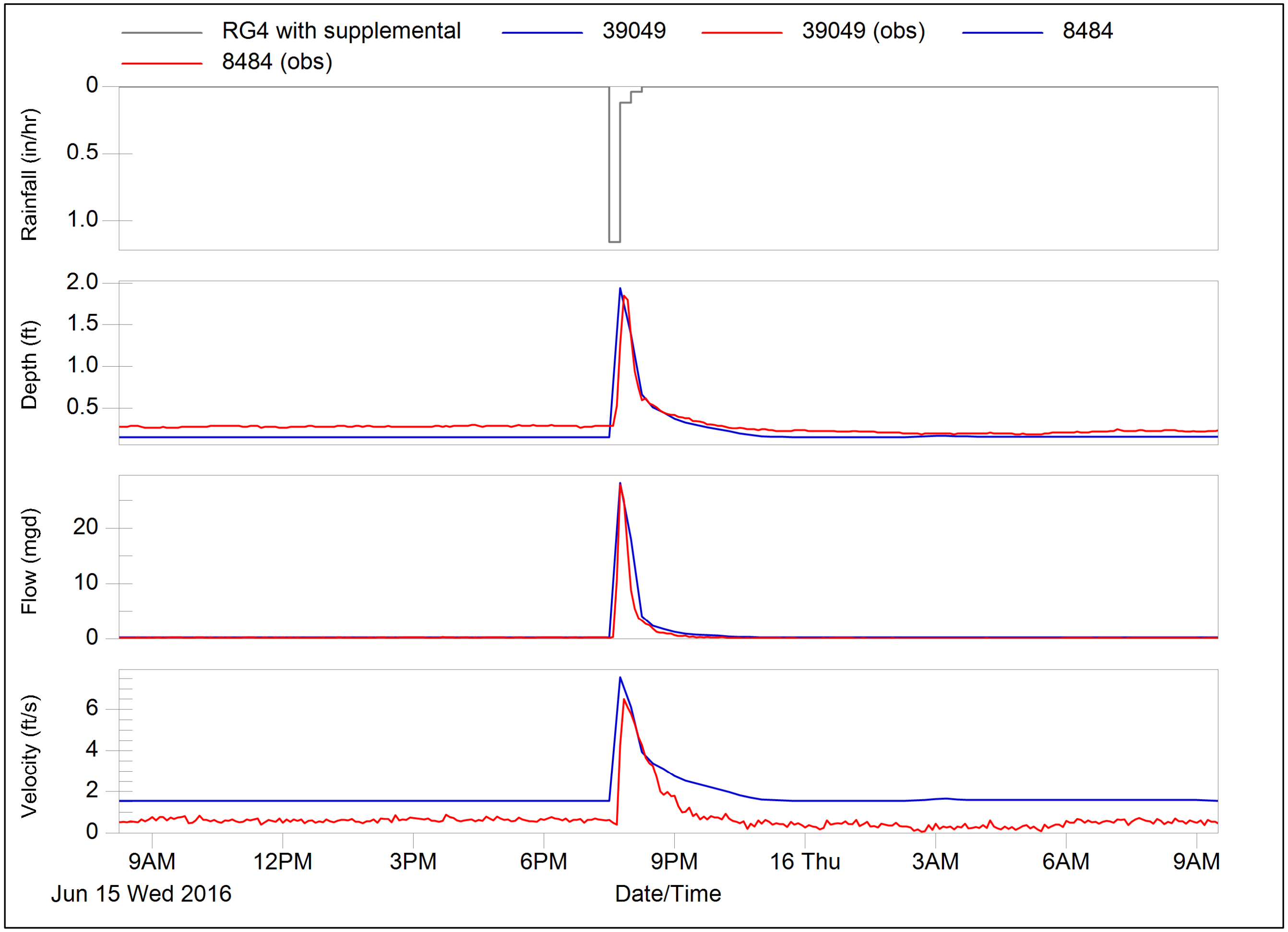
3/24/16

FM 9 – CSO 39 ()



Calibration Events
4/30/16, 5/1/16

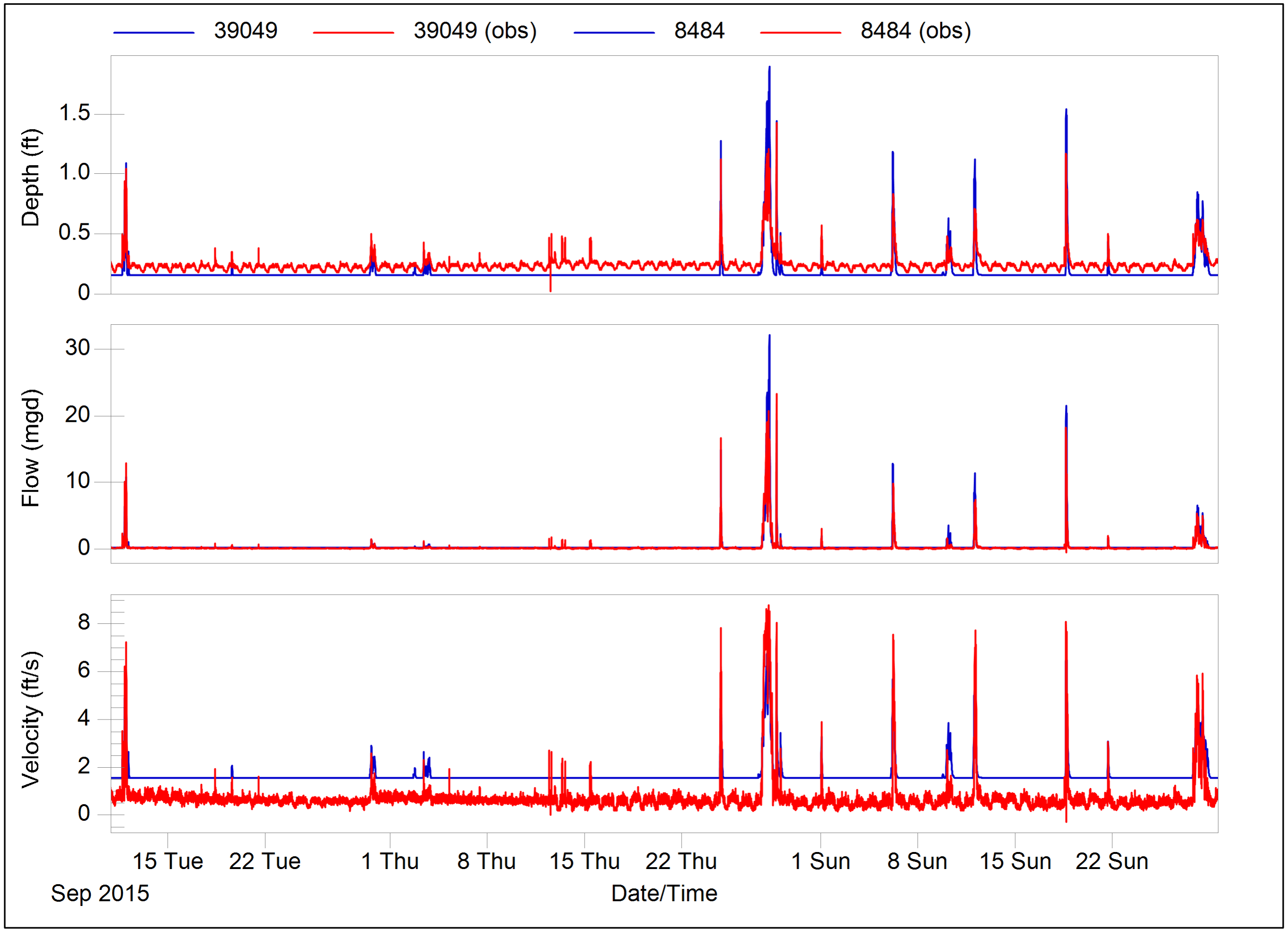
FM 9 – CSO 39 ()

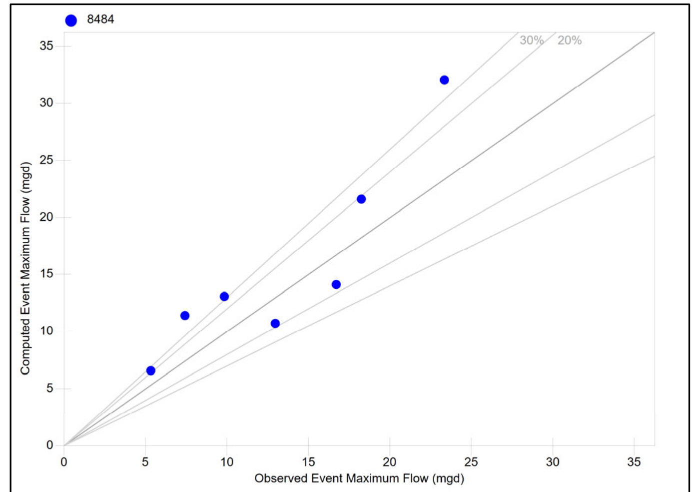


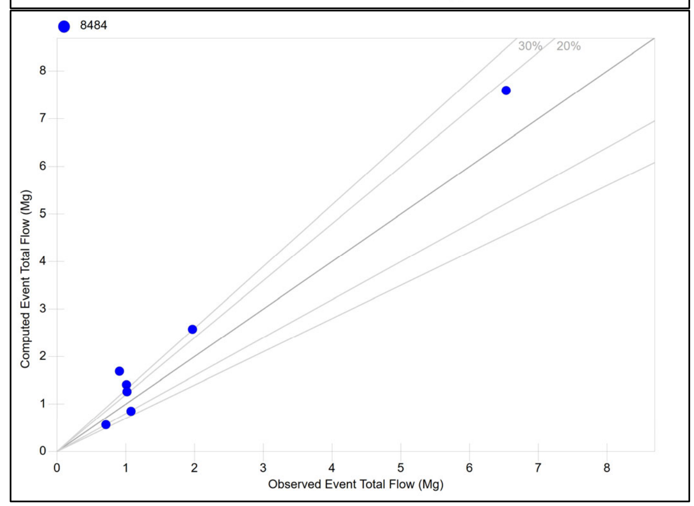
Calibration Events
6/15/16

FM 9 – CSO 39 ()

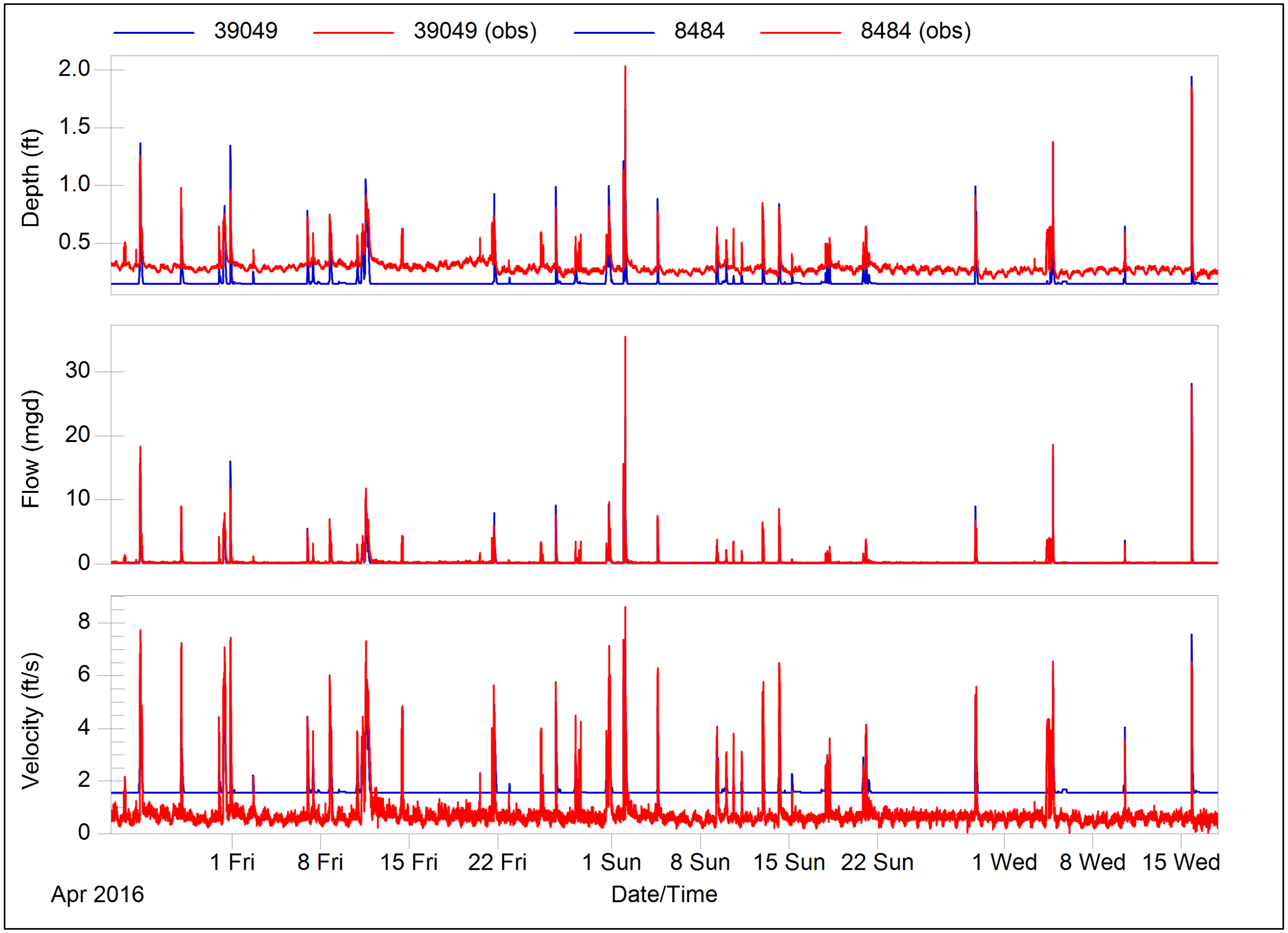
Fall 2015



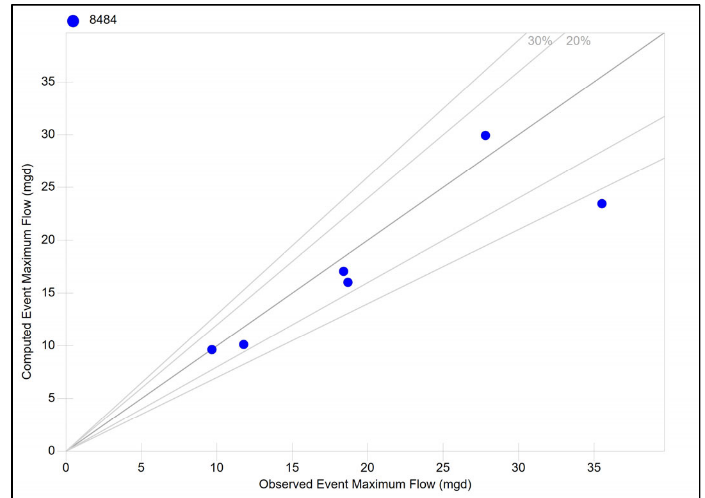


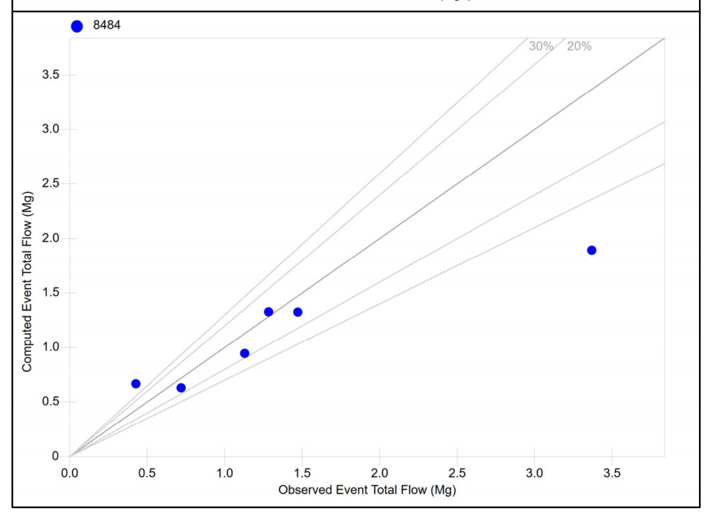


FM 9 – CSO 39 ()

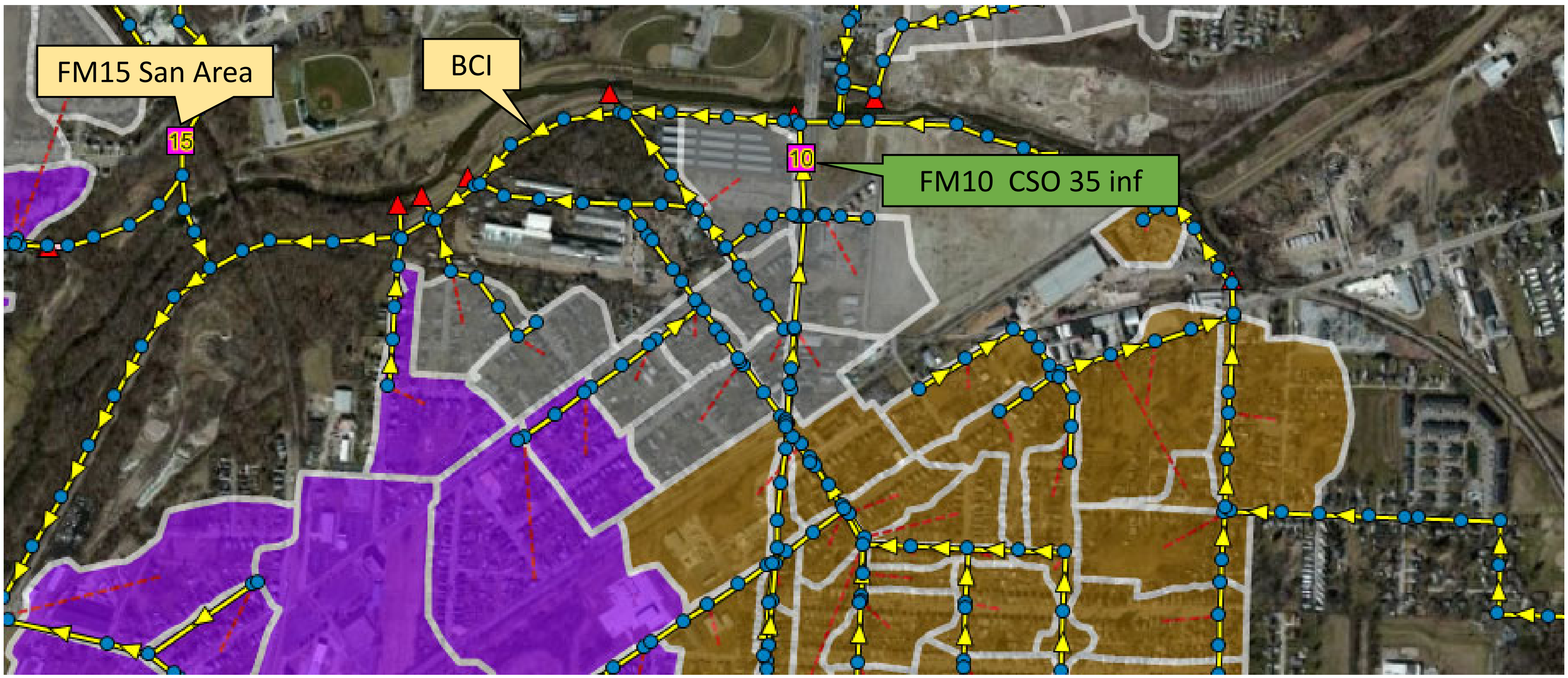


Spring 2016

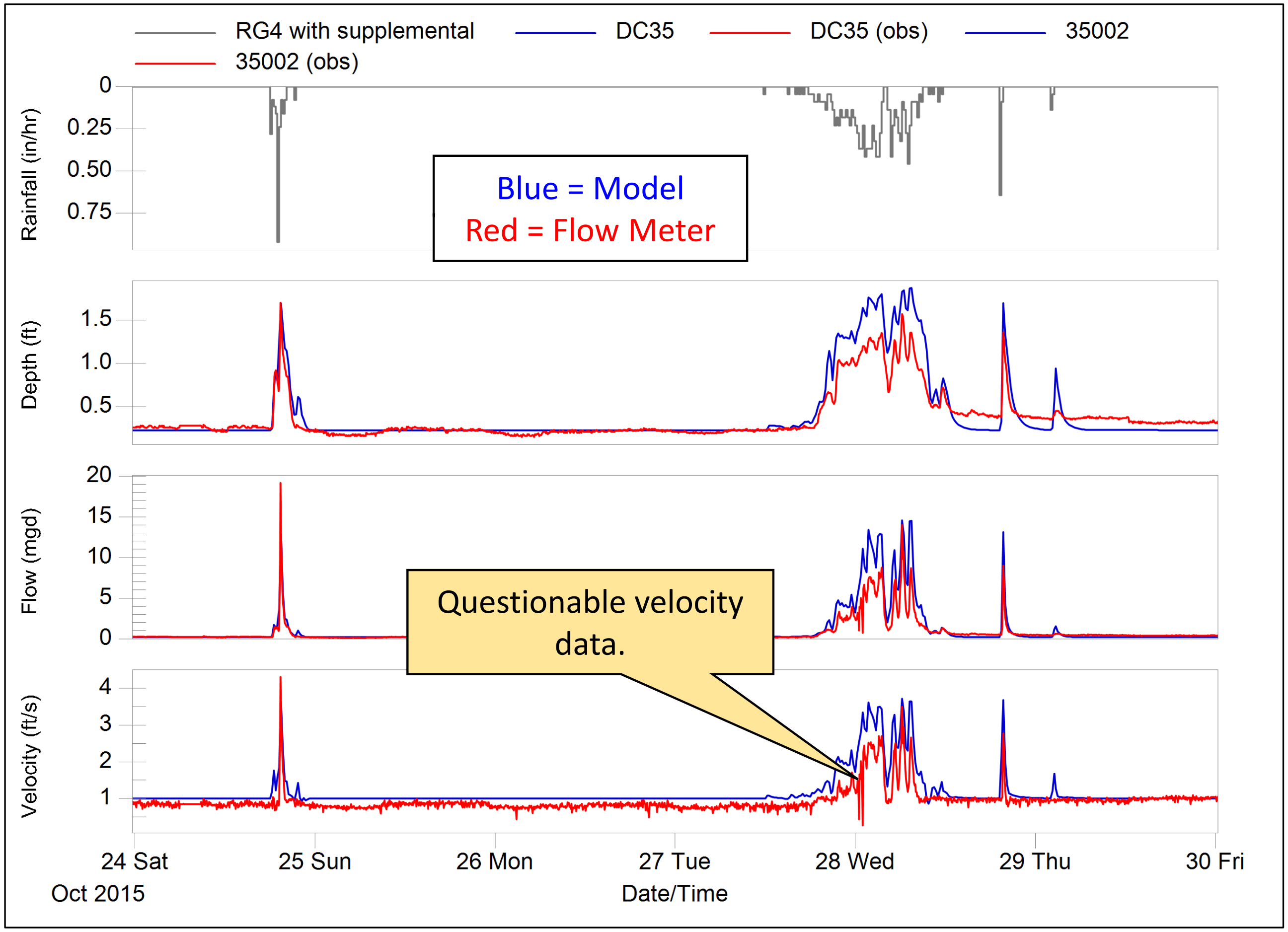




FM 10
CSO 35 inf



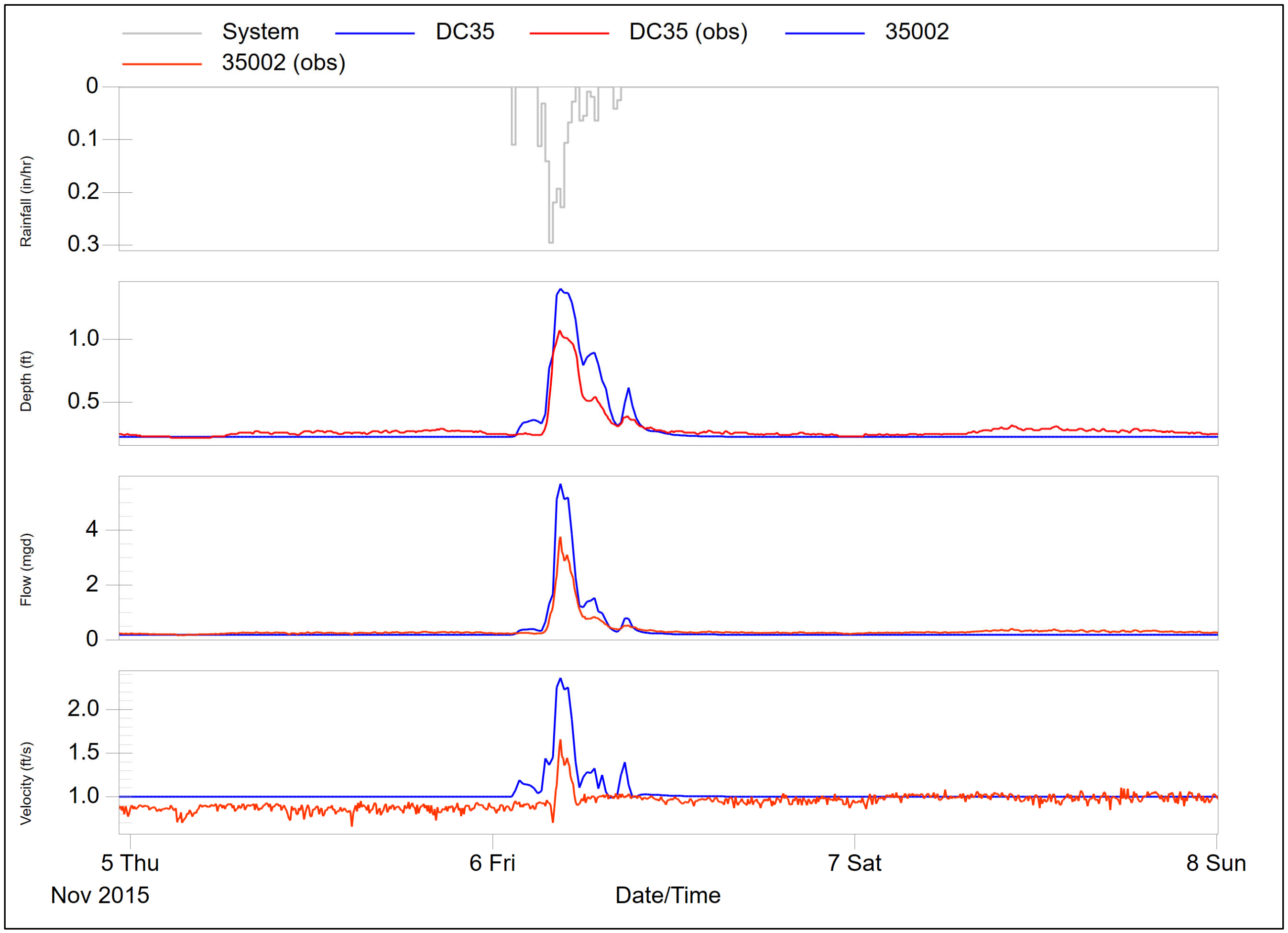
FM 10 – CSO 35 ()



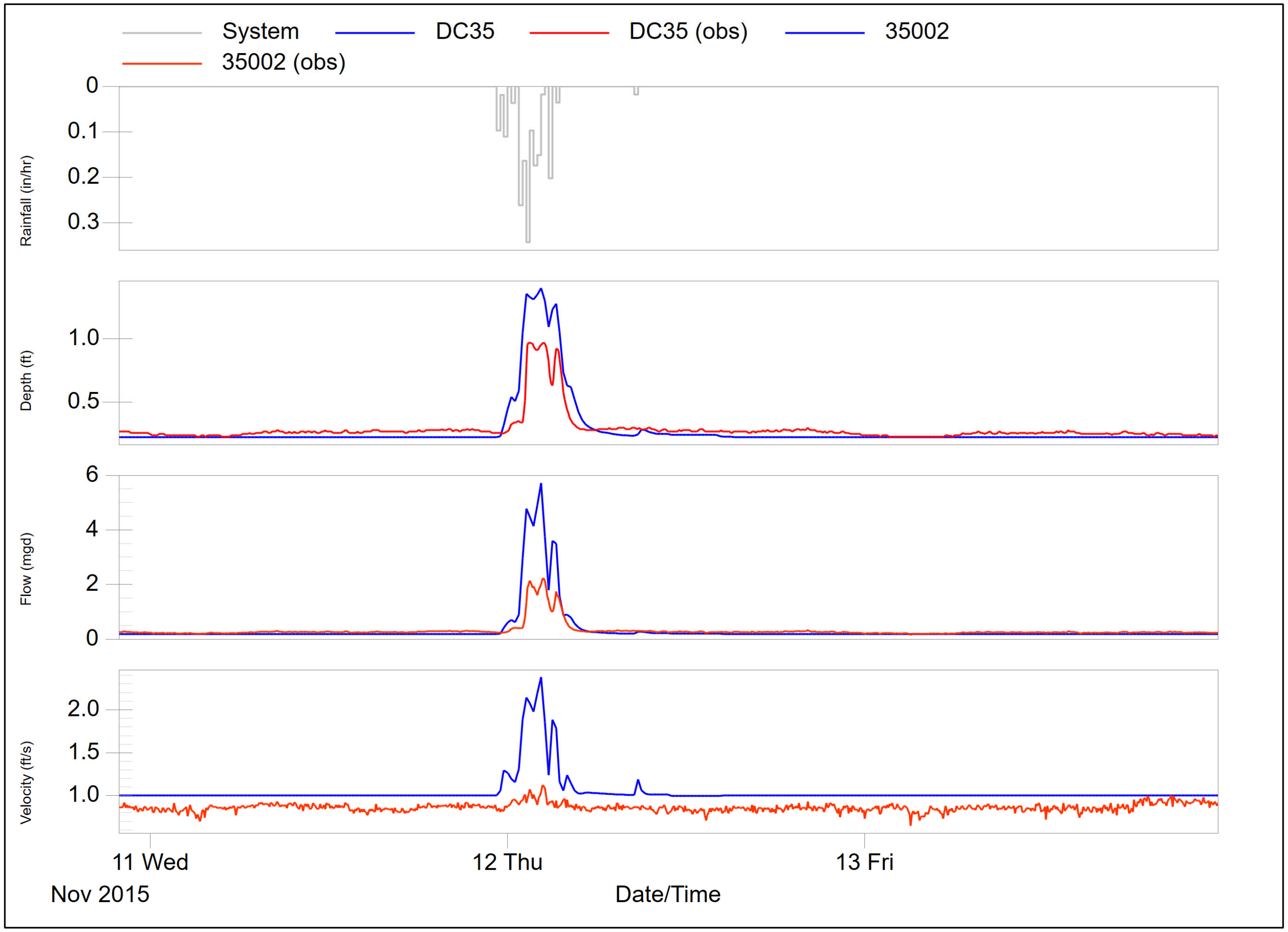
Calibration Events
10/24/15, 10/27/15

FM 10 – CSO 35 ()

Calibration Events
11/6/15



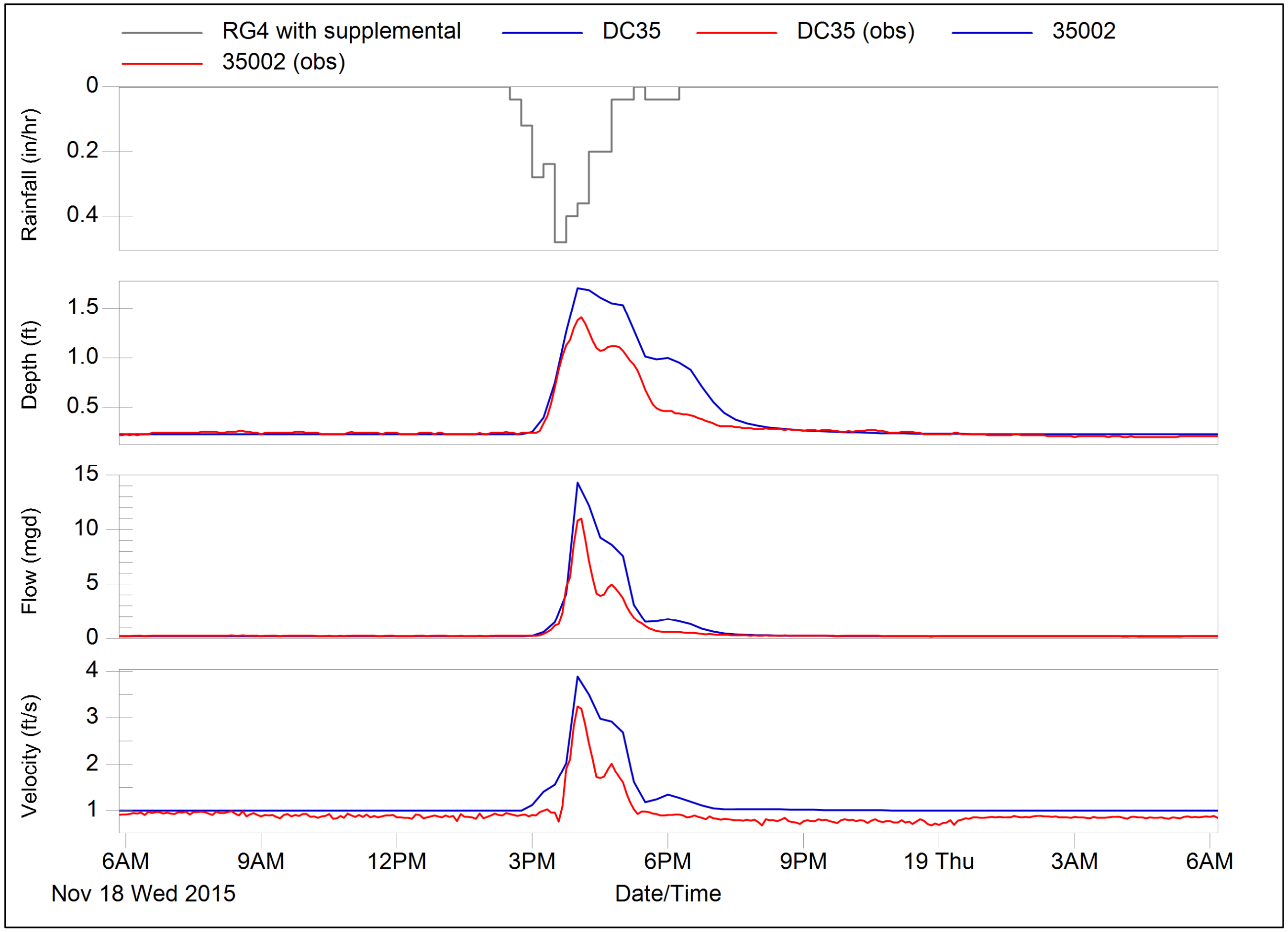
FM 10 – CSO 35 ()



Calibration Events

11/11/15

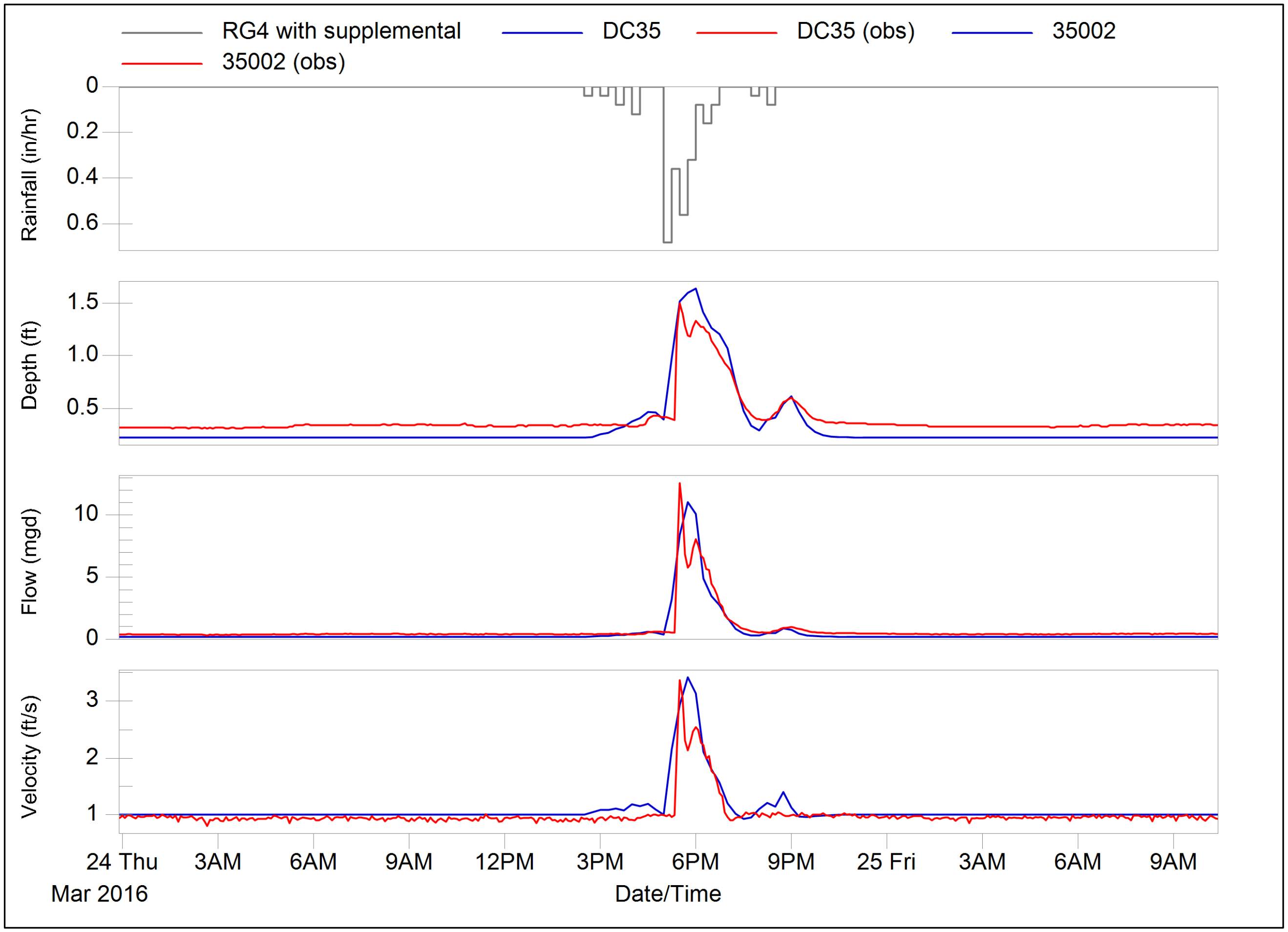
FM 10 – CSO 35 ()



Calibration Events

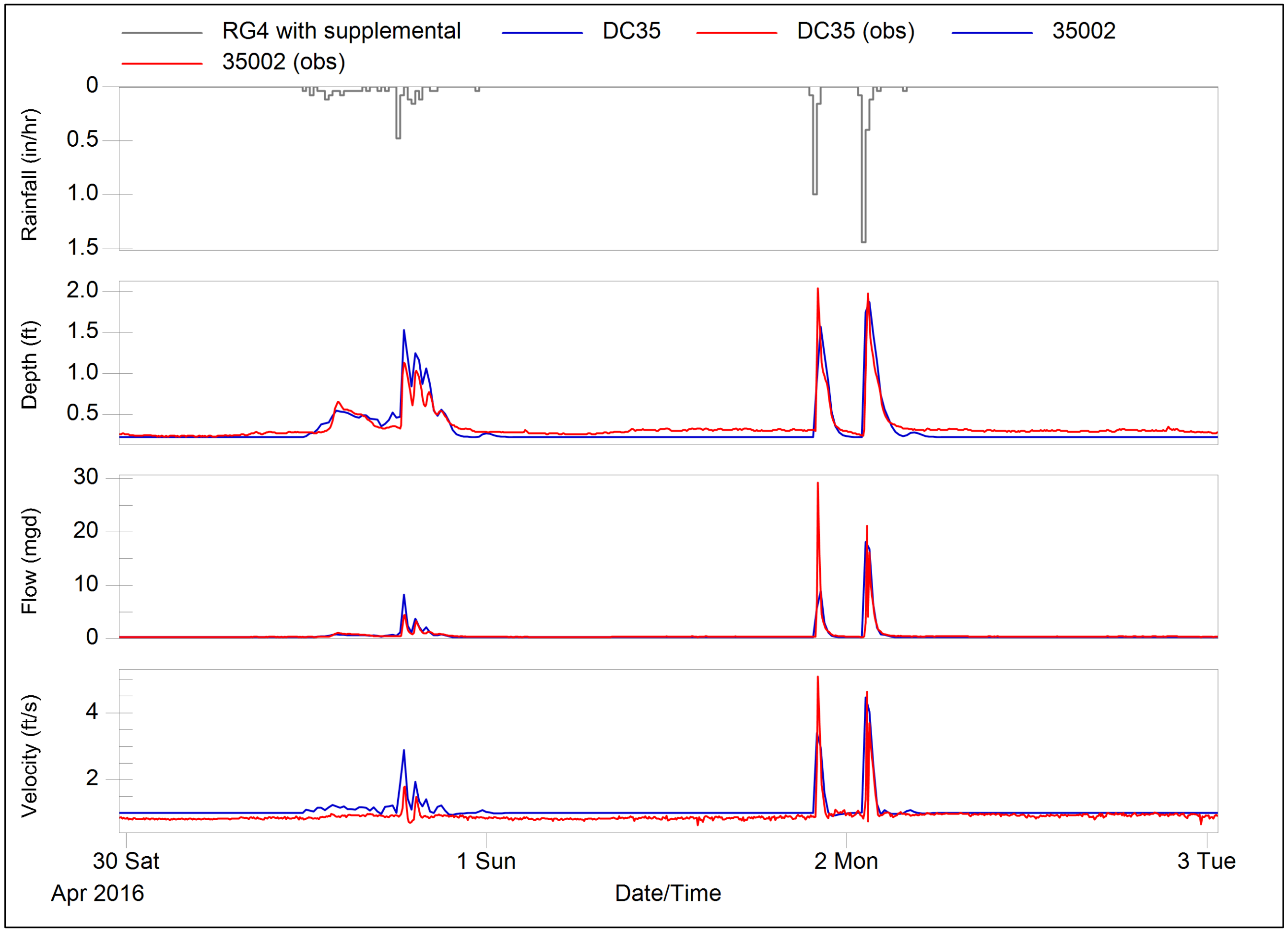
11/18/15

FM 10 – CSO 35



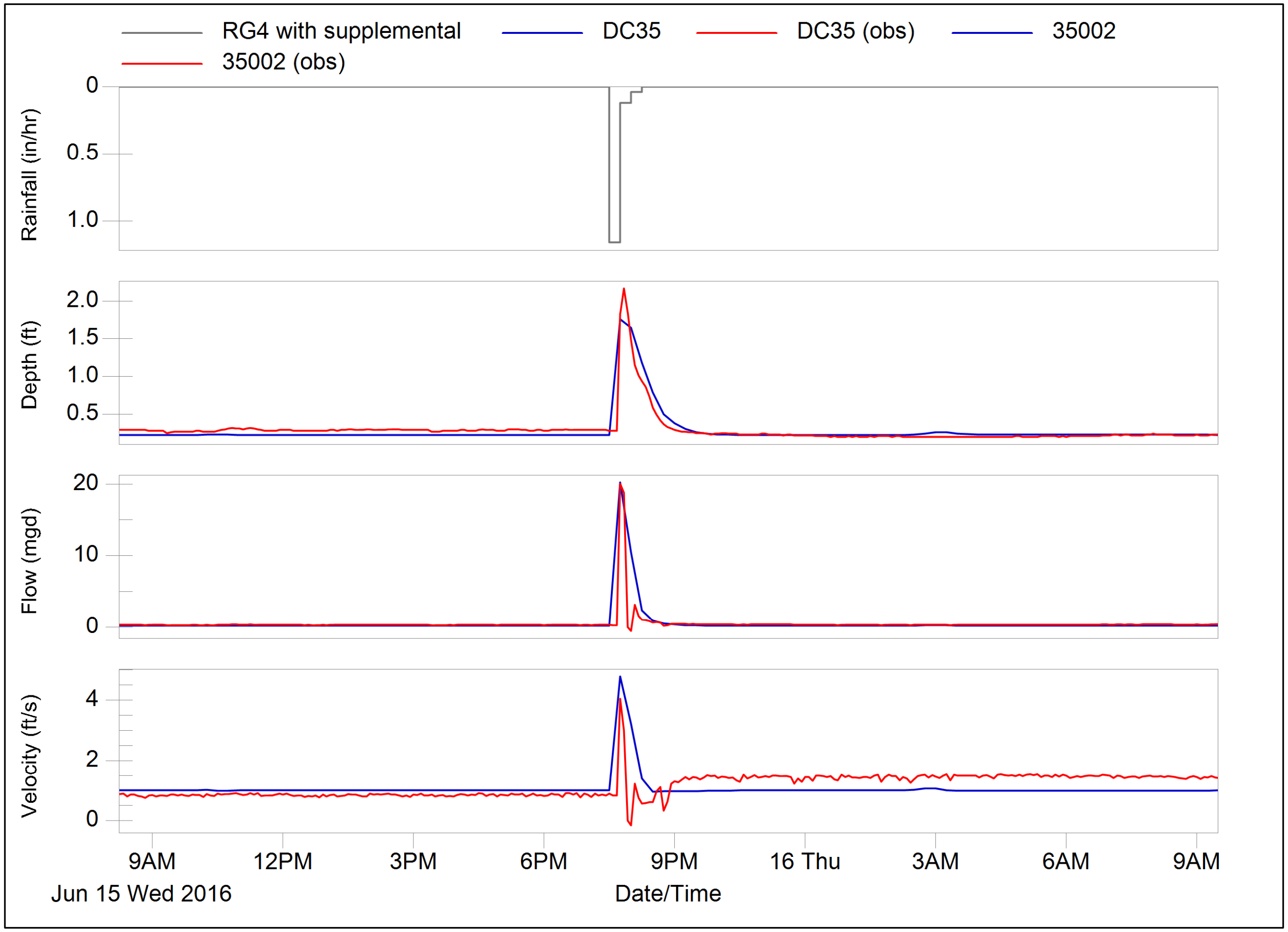
Calibration Event
3/24/16

FM 10 – CSO 35



Calibration Events
4/30/16, 5/1/16

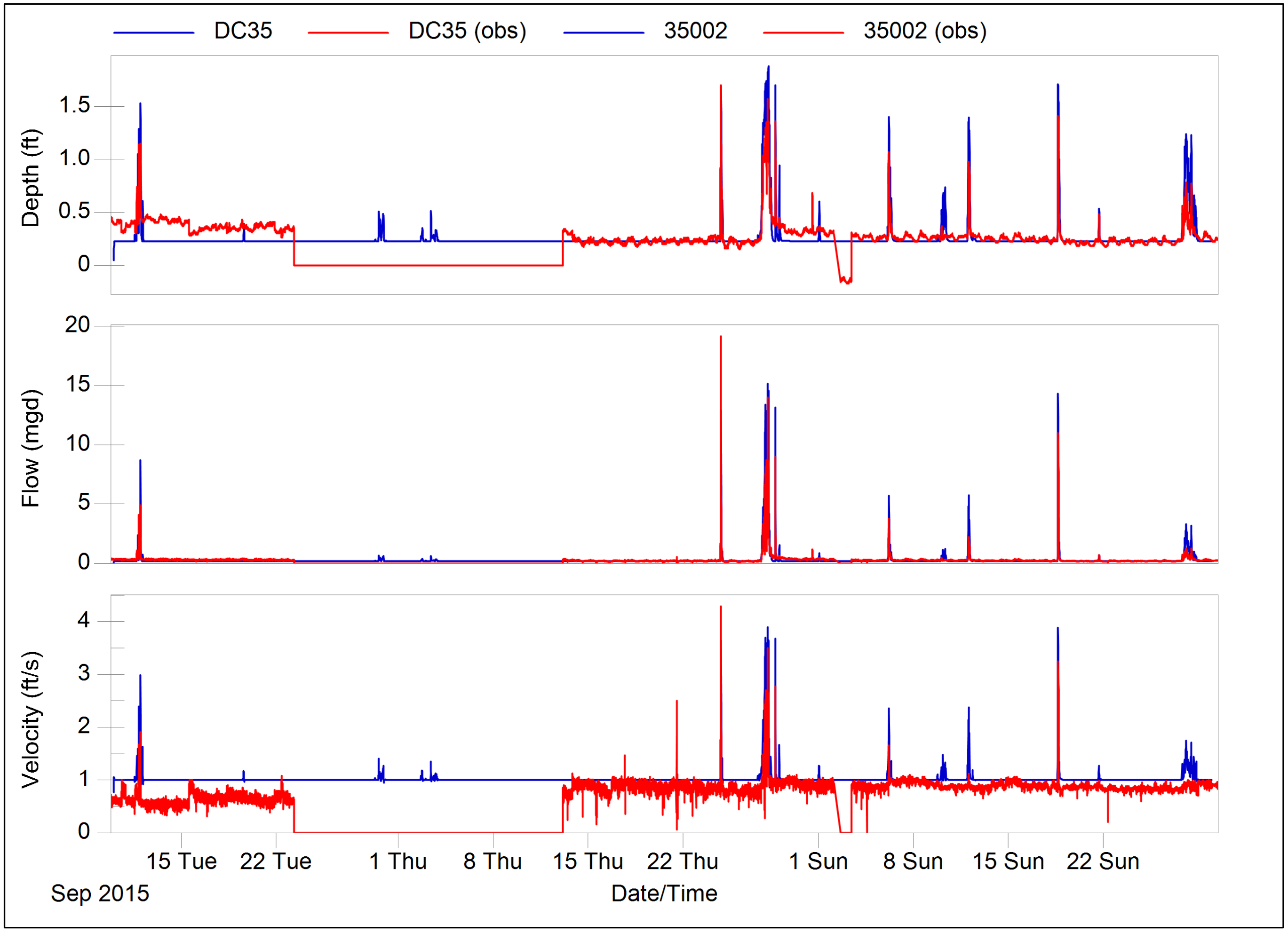
FM 10 – CSO 35



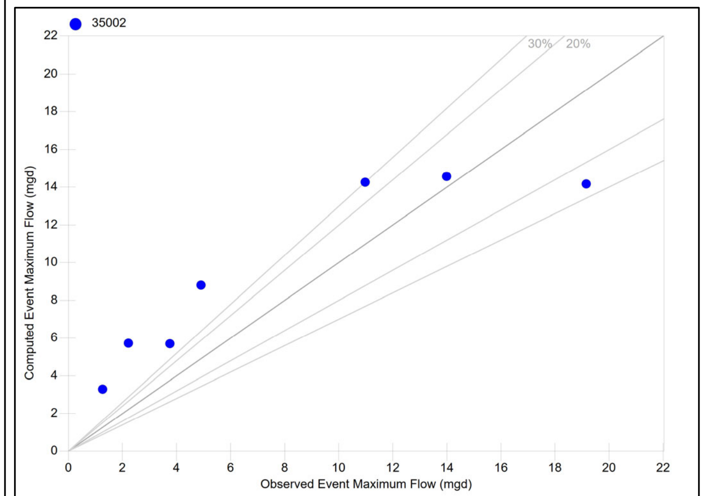
Calibration Events

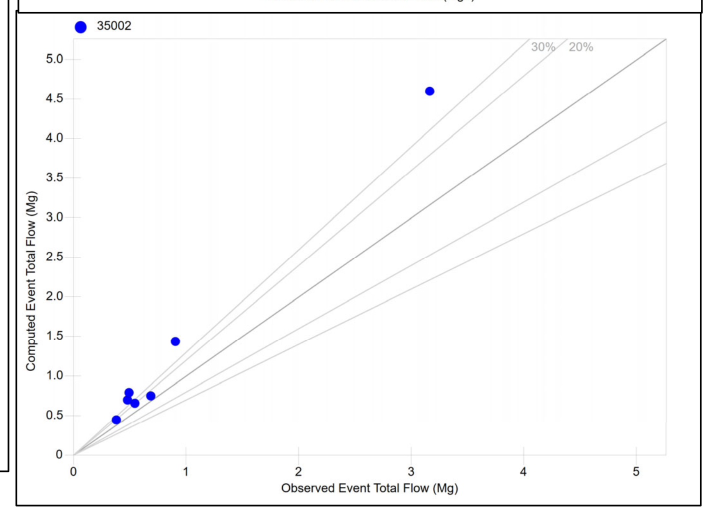
6/15/16

FM 10 – CSO 35



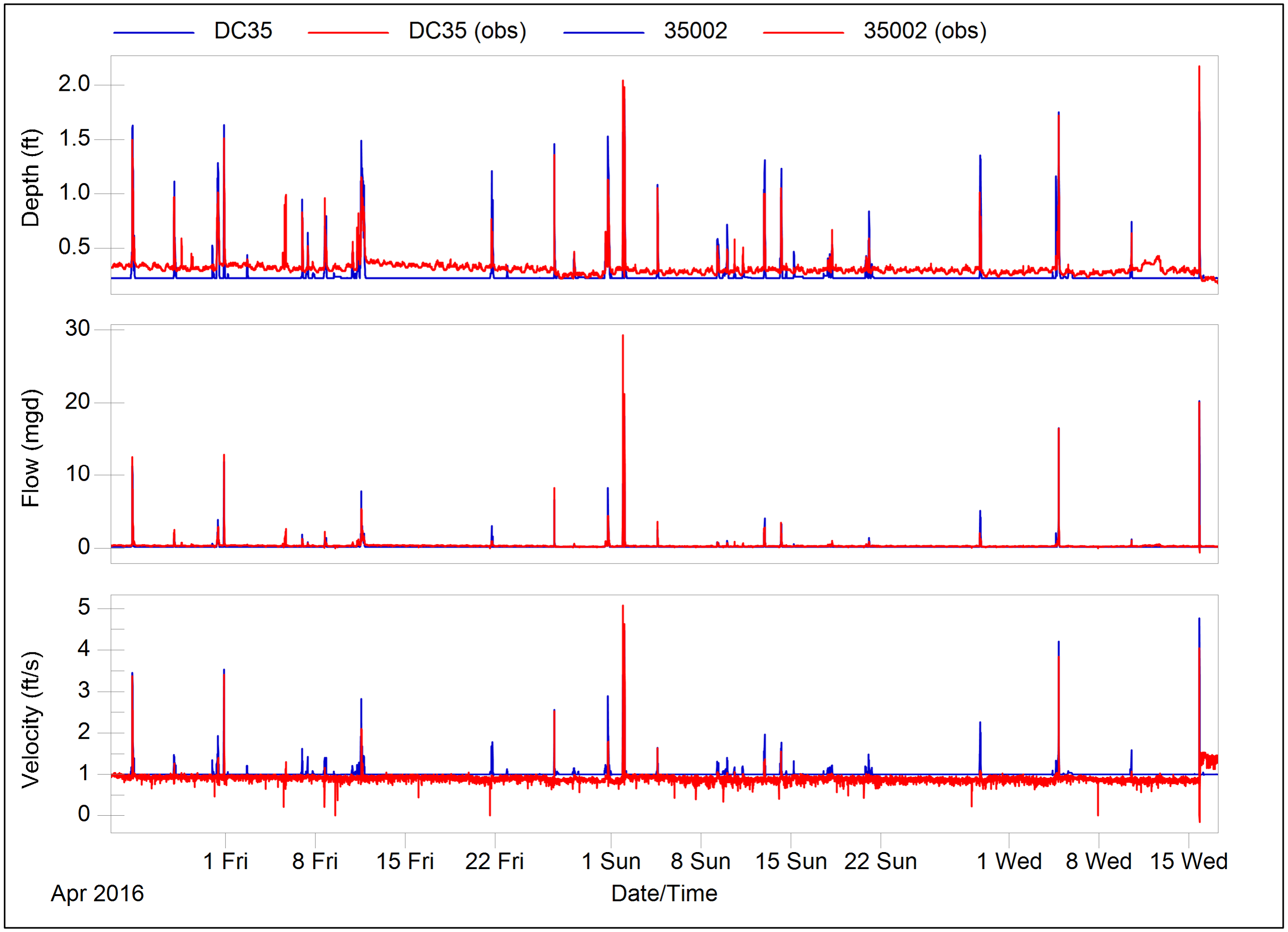
Fall 2015

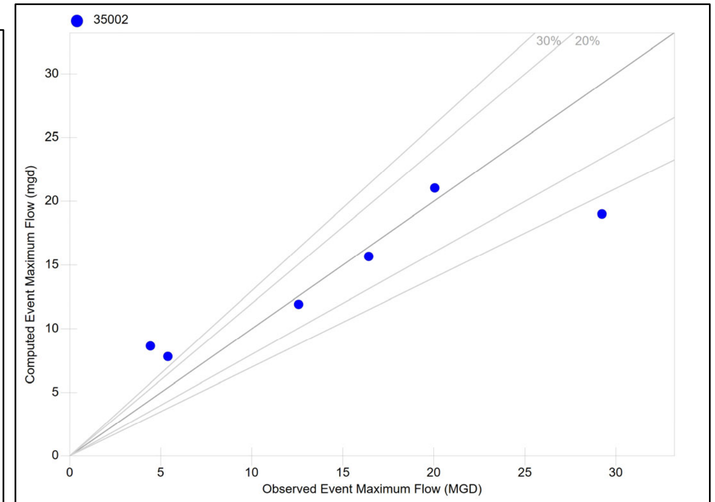


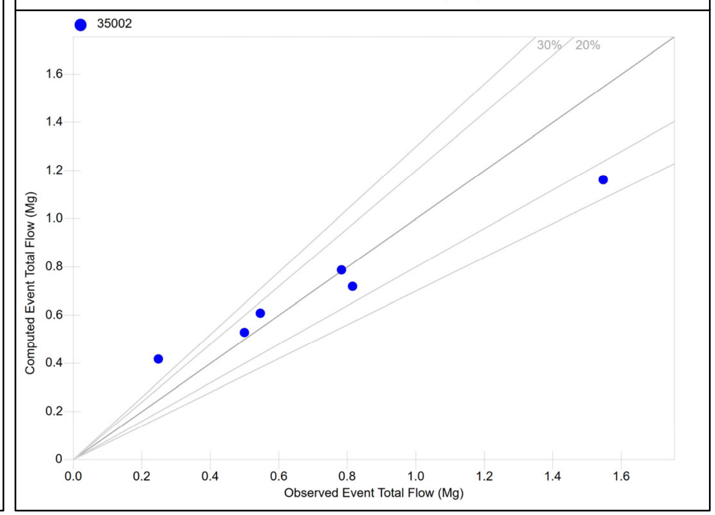


FM 10 – CSO 35

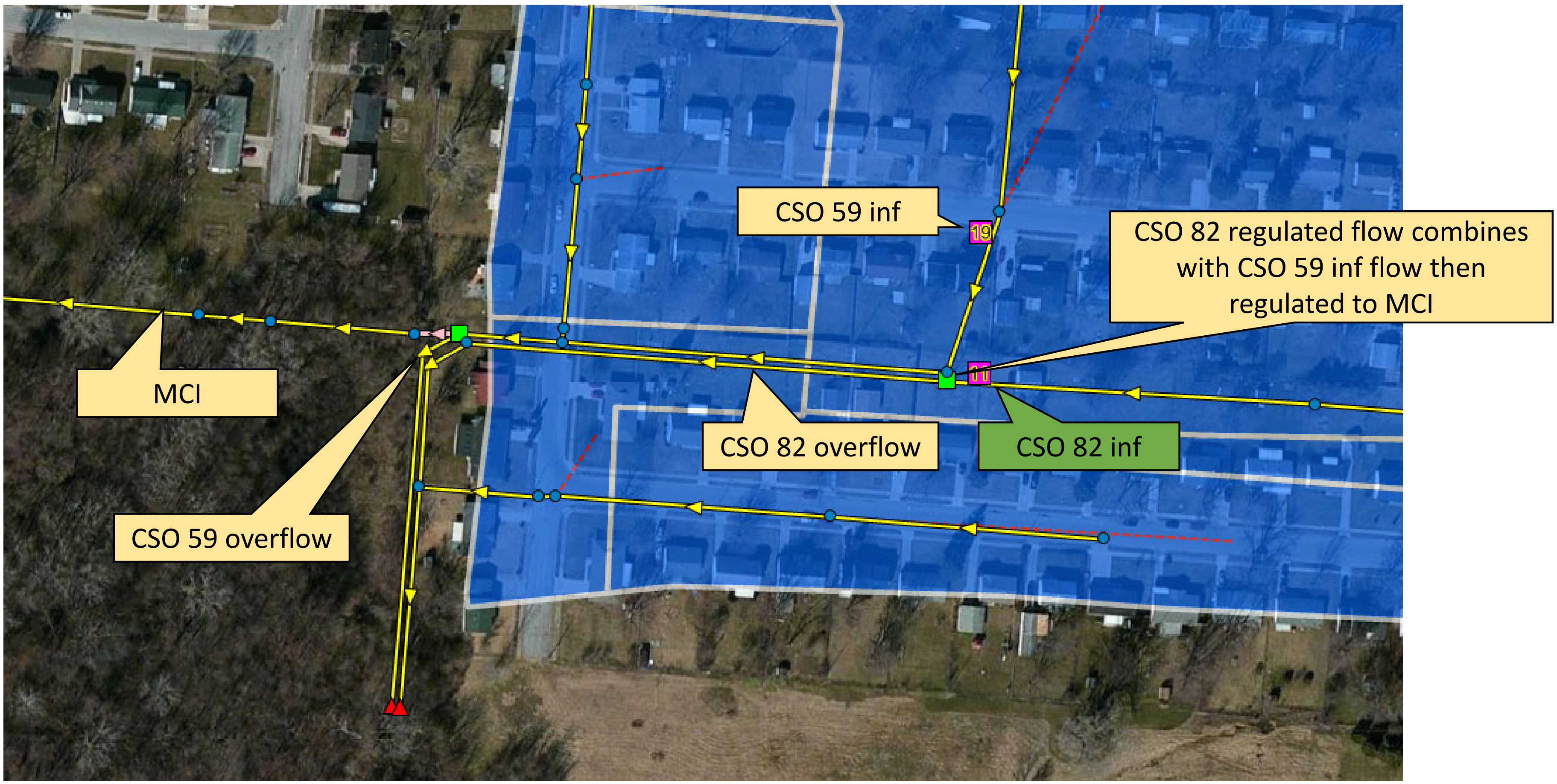
Spring 2016



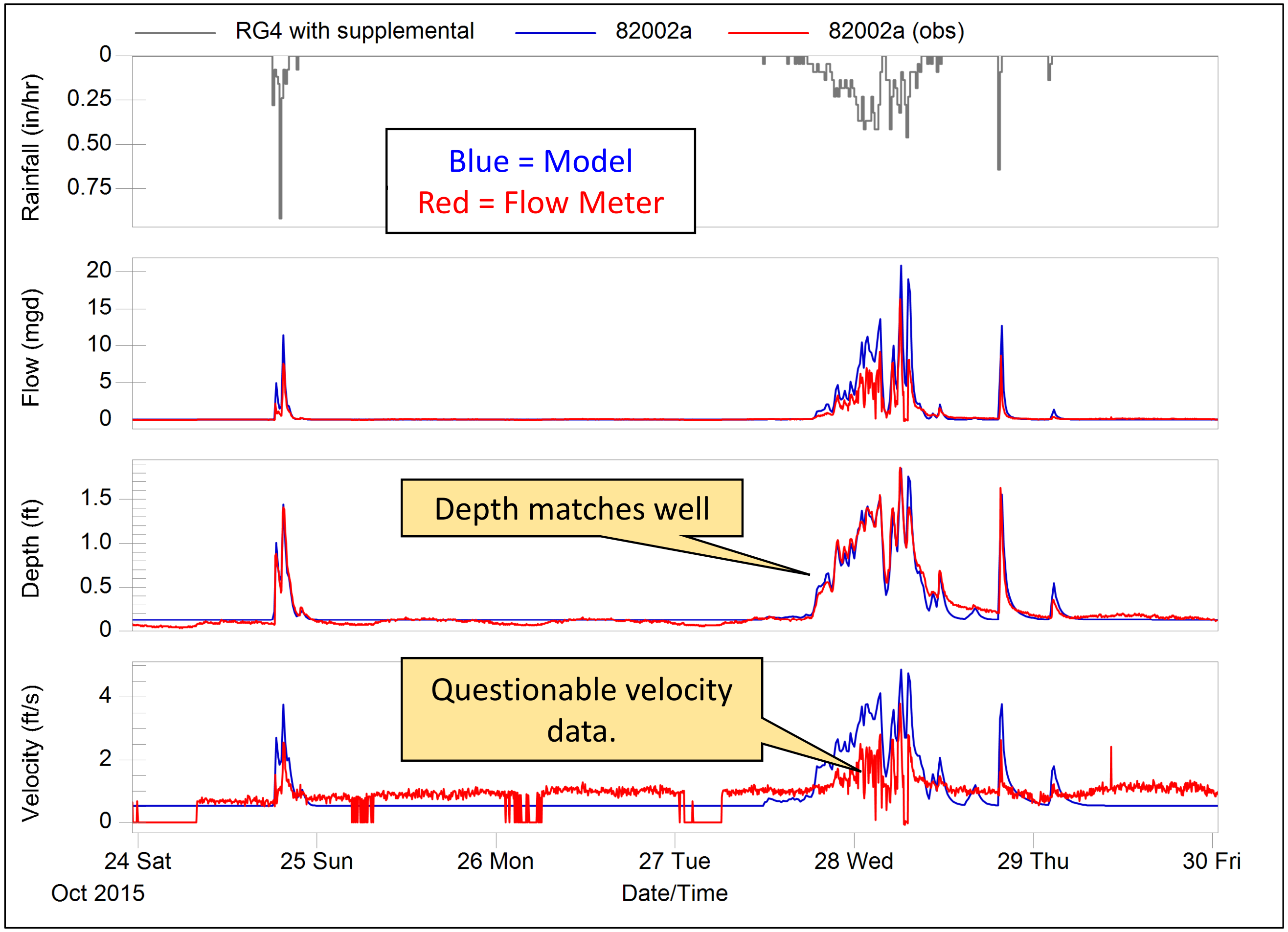




FM 19 (FM 11a in Spring)
CSO 82 (inf)



FM 19 – CSO 82 ()

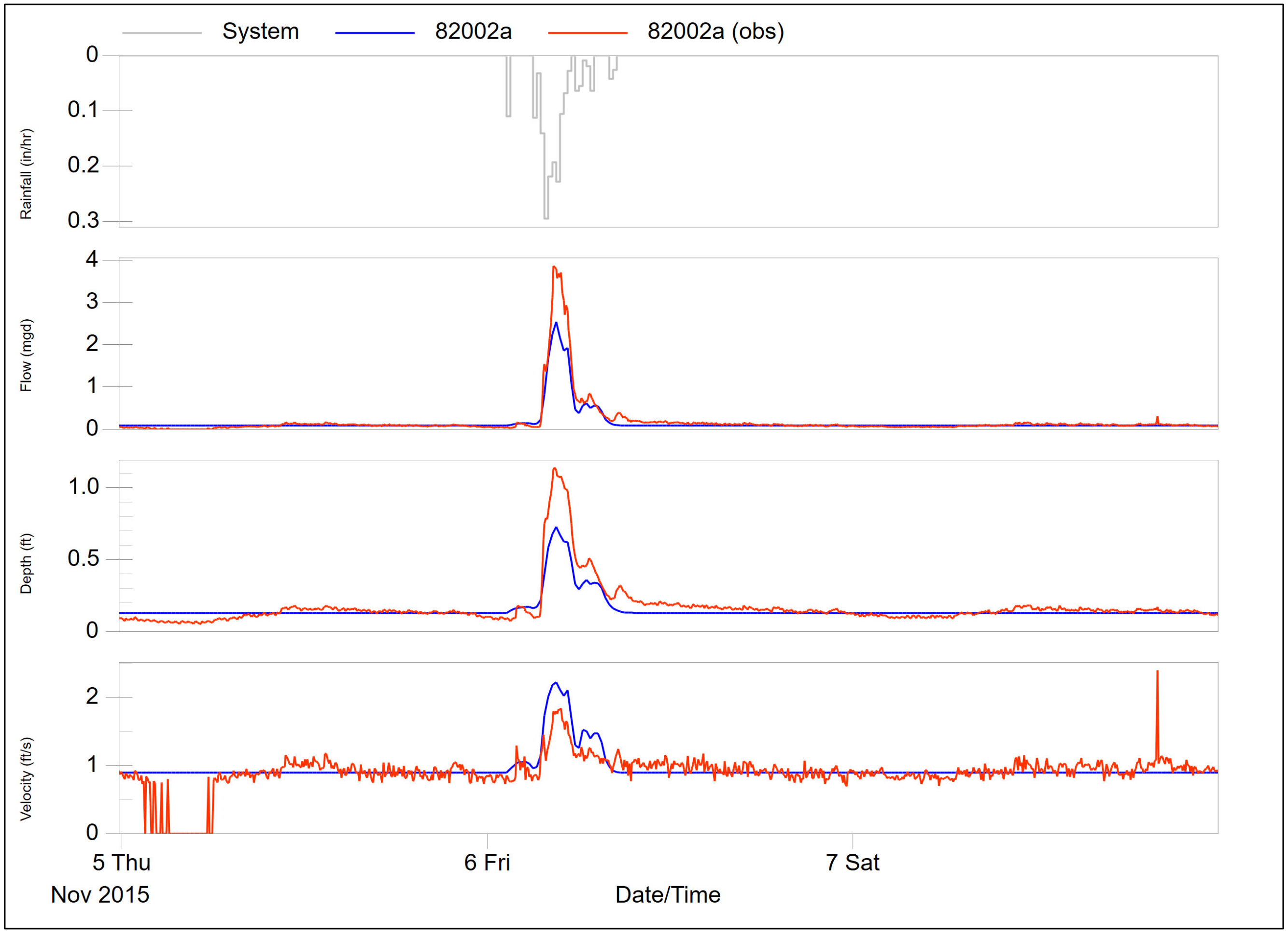


Calibration Events

10/24/15, 10/27/15

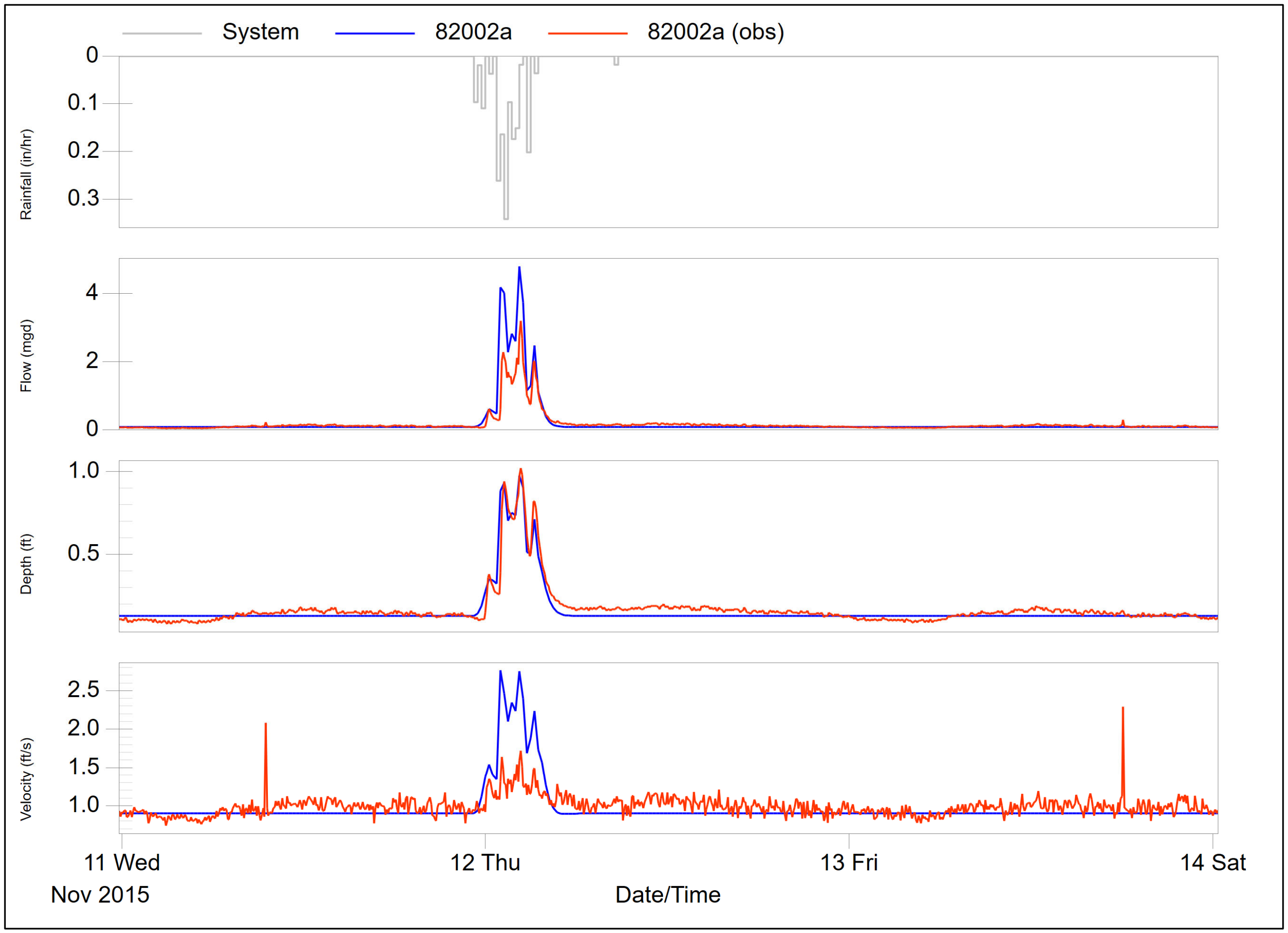
FM 19 – CSO 82 ()

Calibration Events
11/6/15



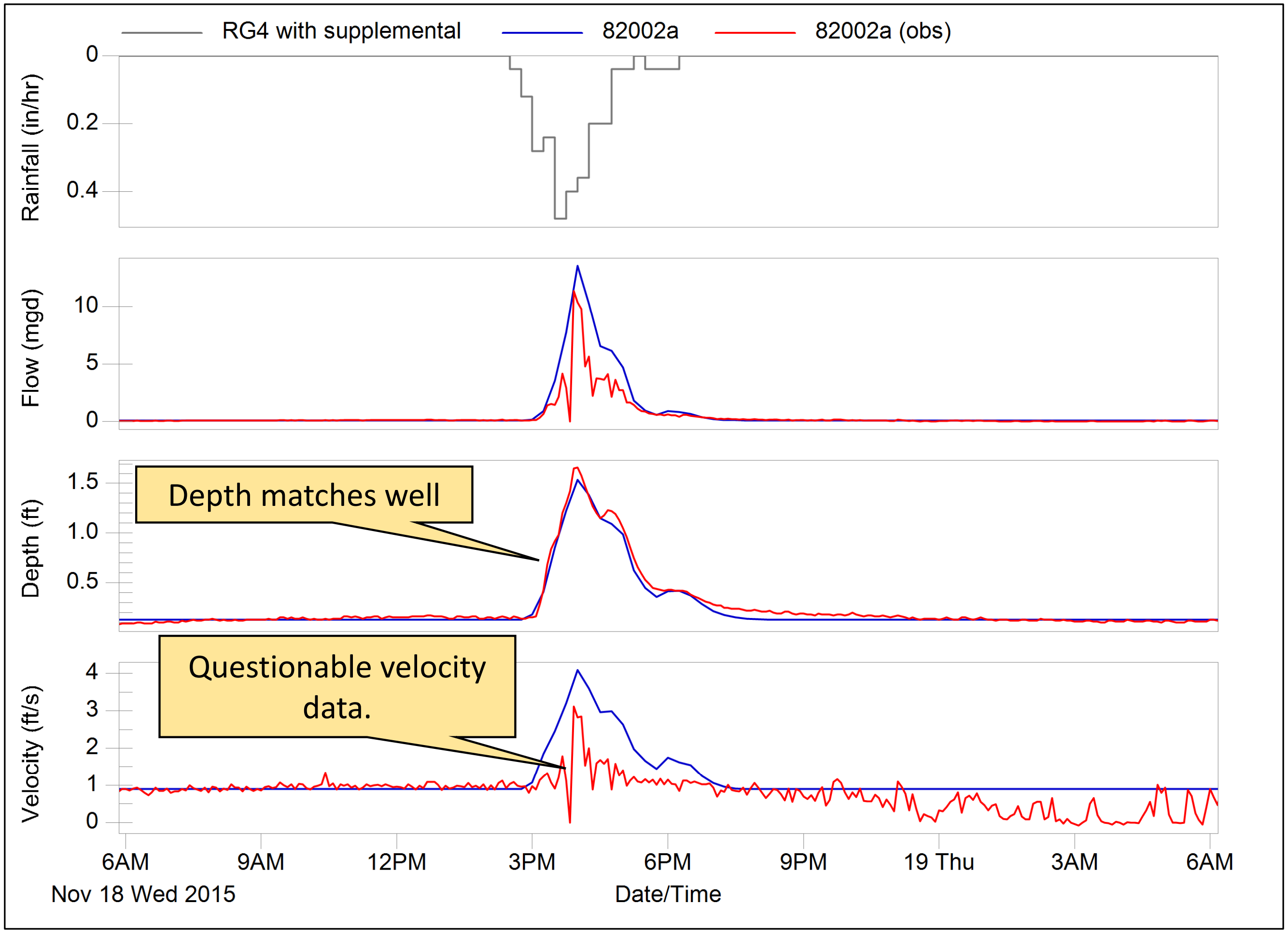
FM 19 – CSO 82 ()

Calibration Events
11/11/15

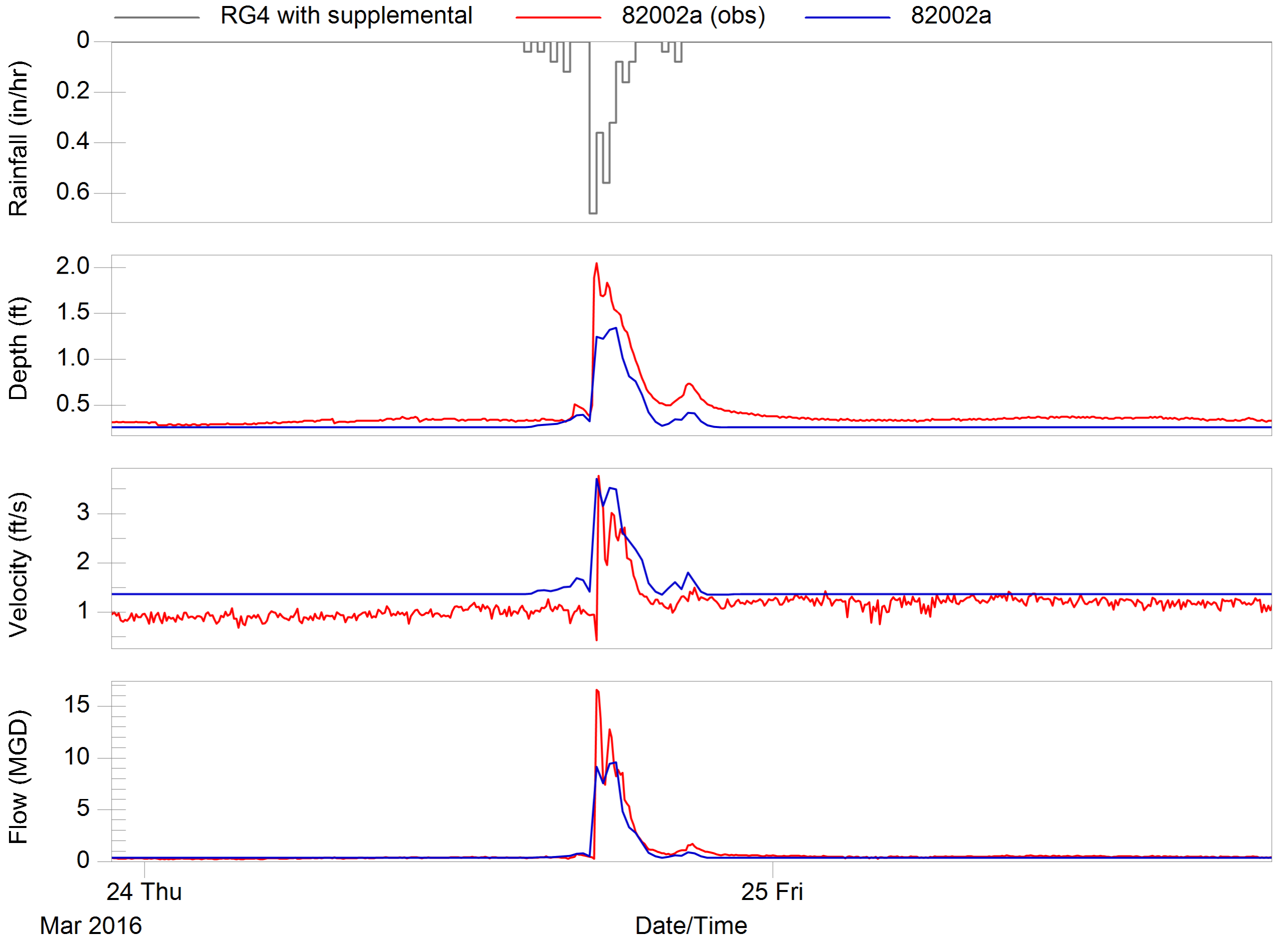


FM 19 – CSO 82 ()

Calibration Events
11/18/15



FM 19 – CSO 82



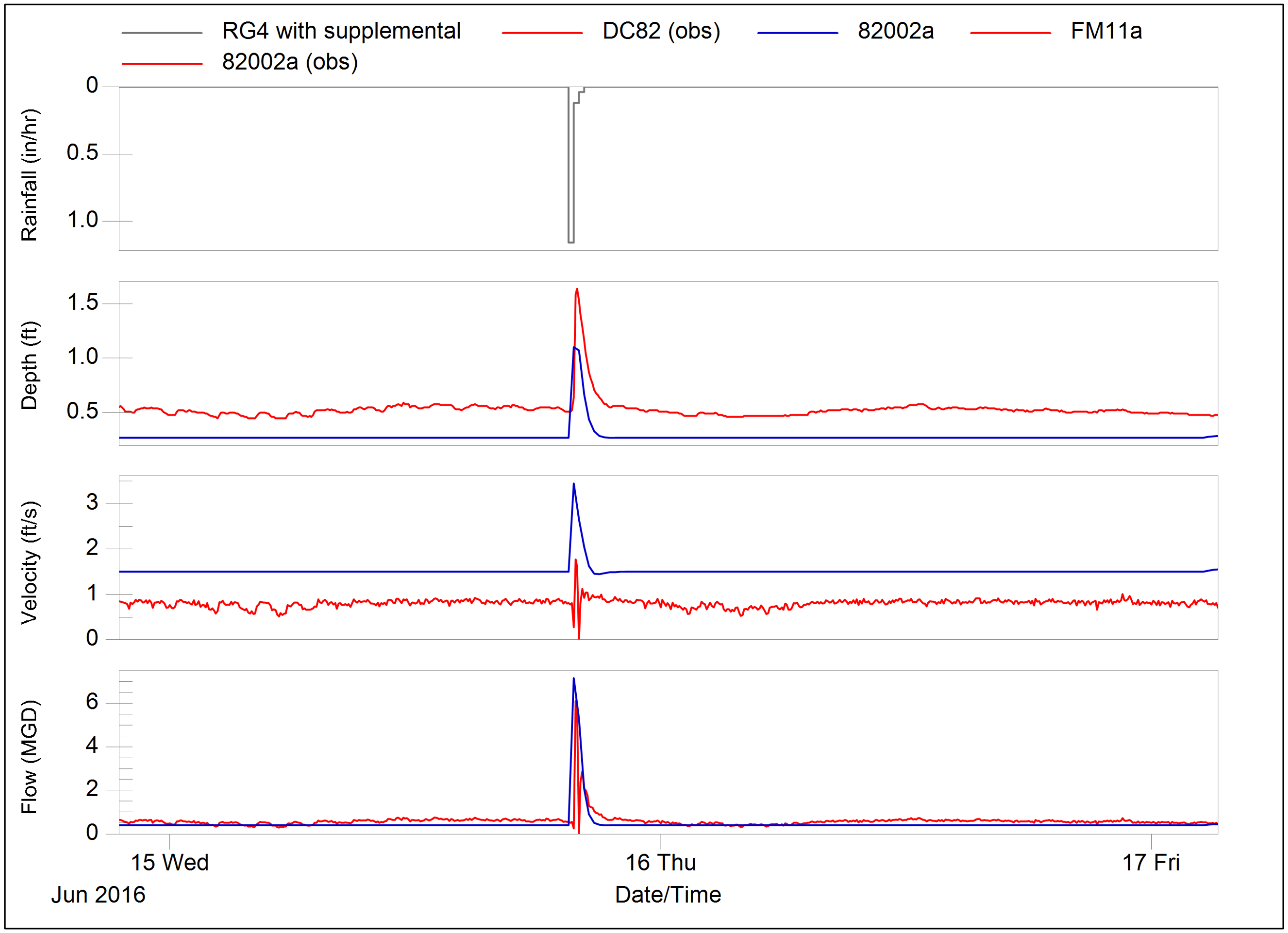
Calibration Event

3/24/16

FM 19 – CSO 82

Calibration Events
4/30/16, 5/1/16

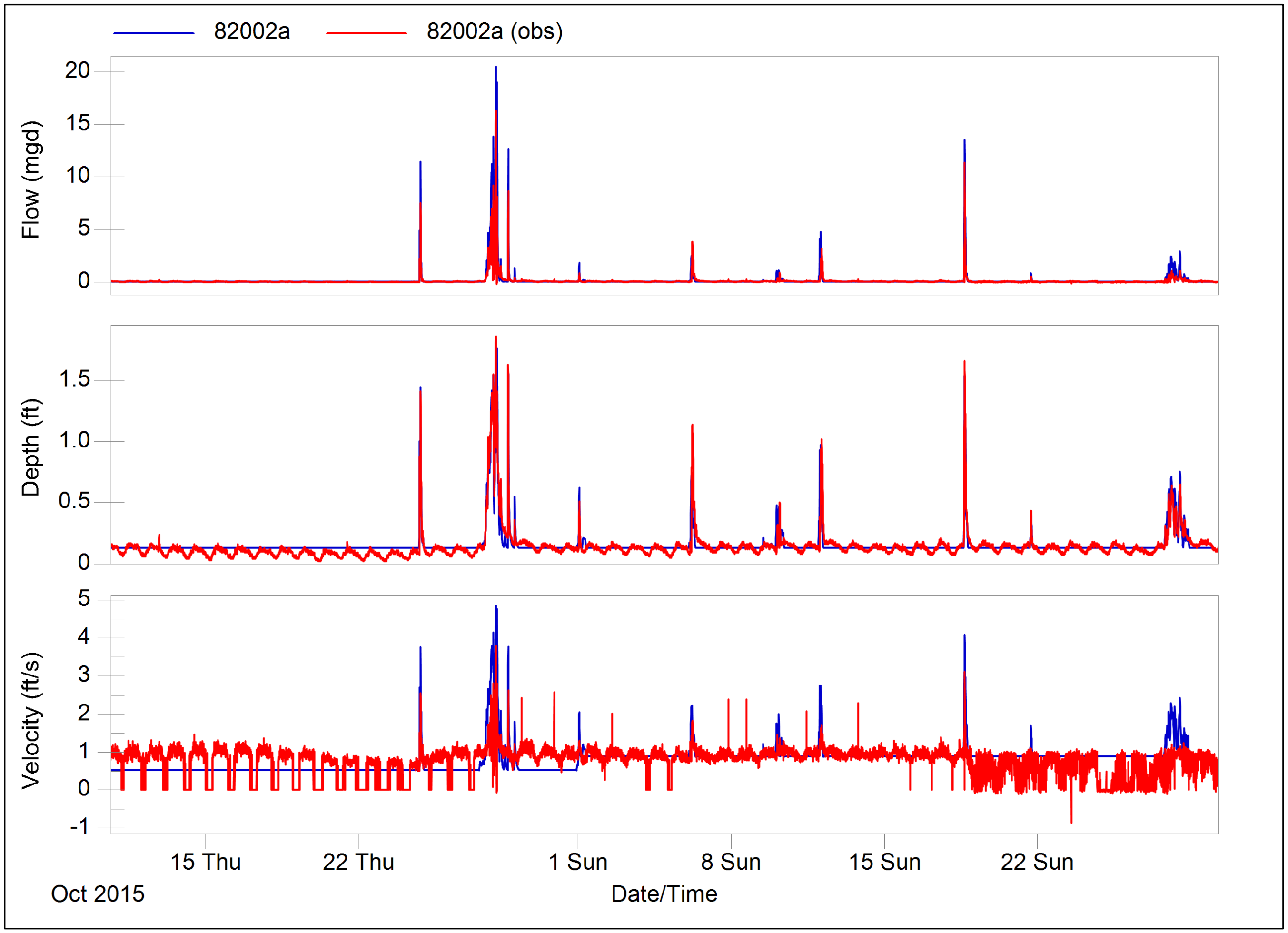
FM 19 – CSO 82

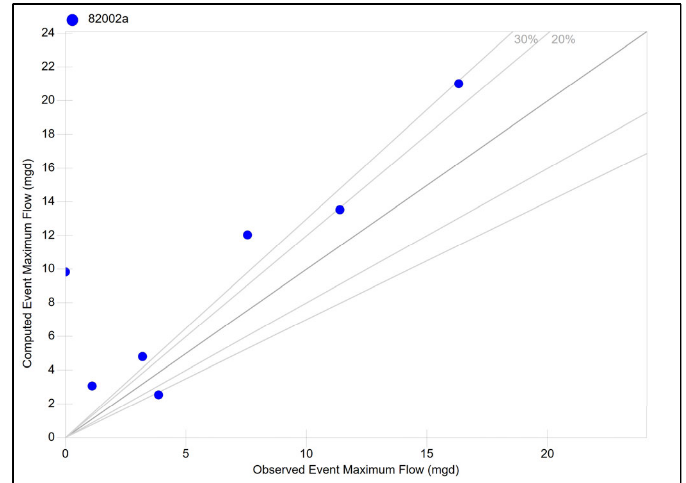


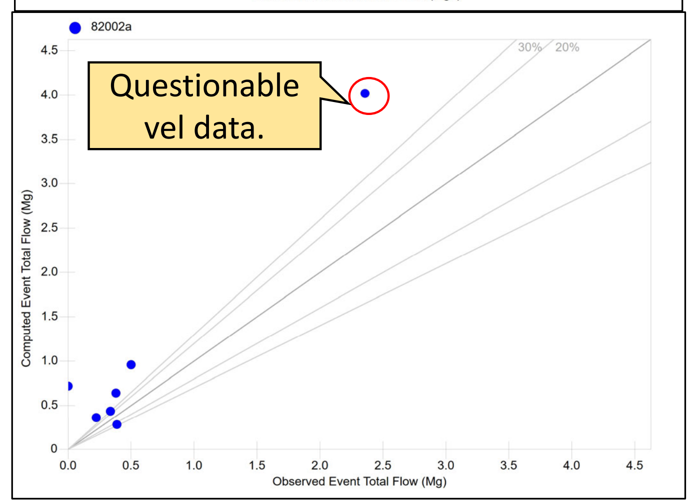
Calibration Events
6/15/16

FM 19 – CSO 82

Fall 2015

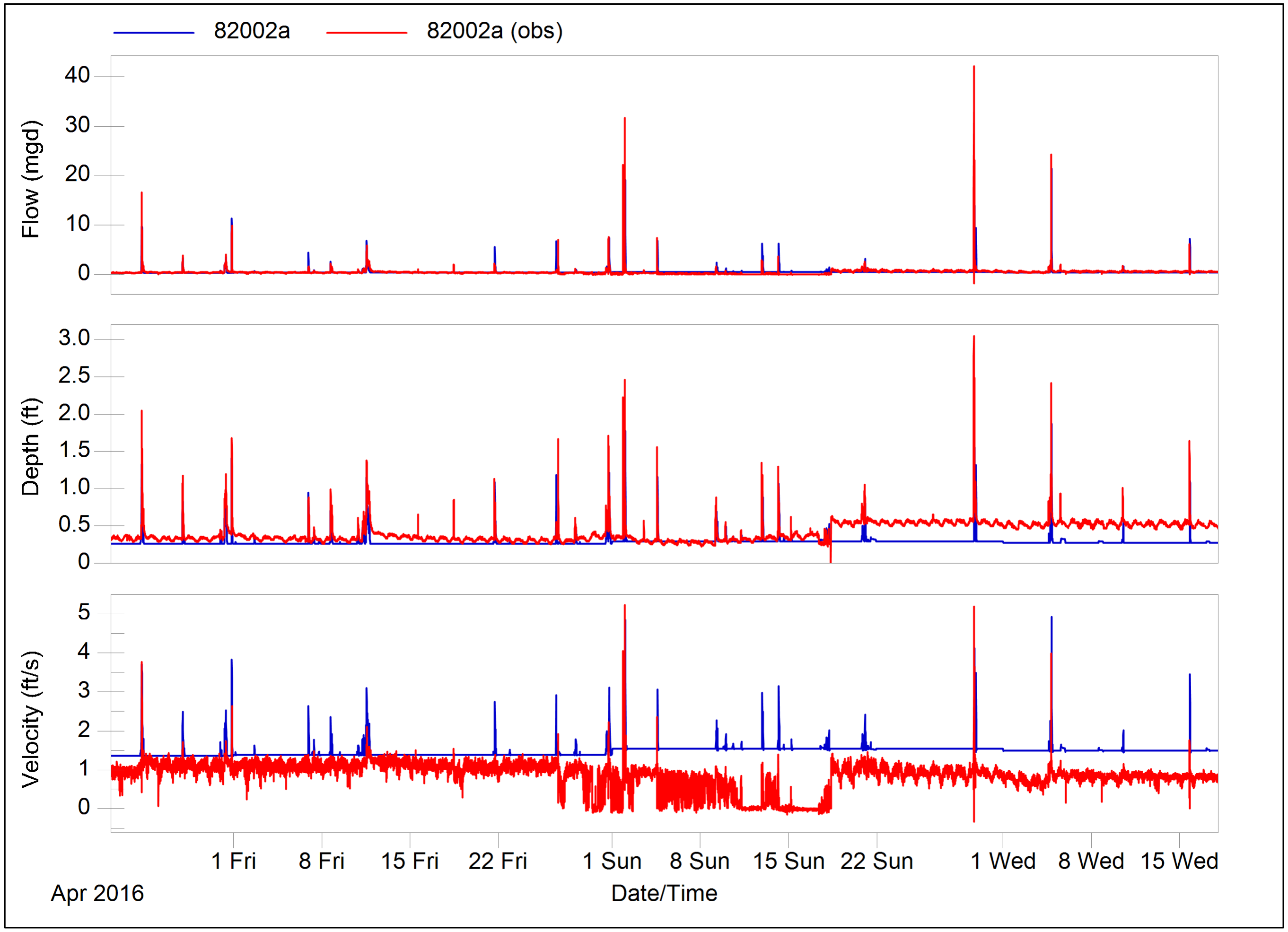


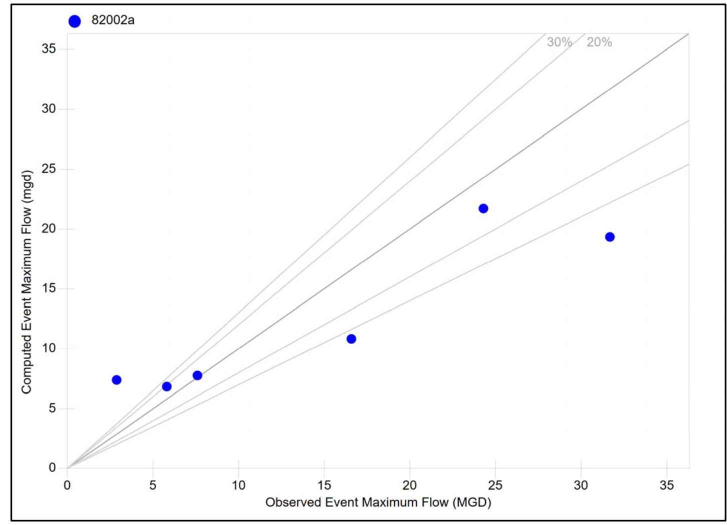


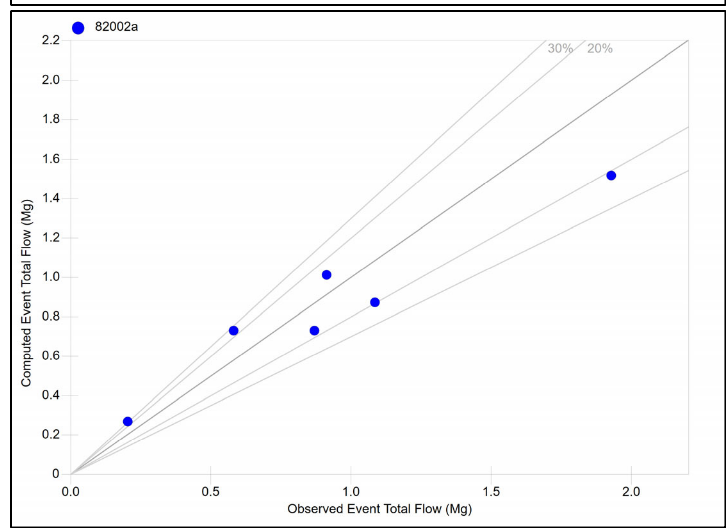


FM 19 – CSO 82

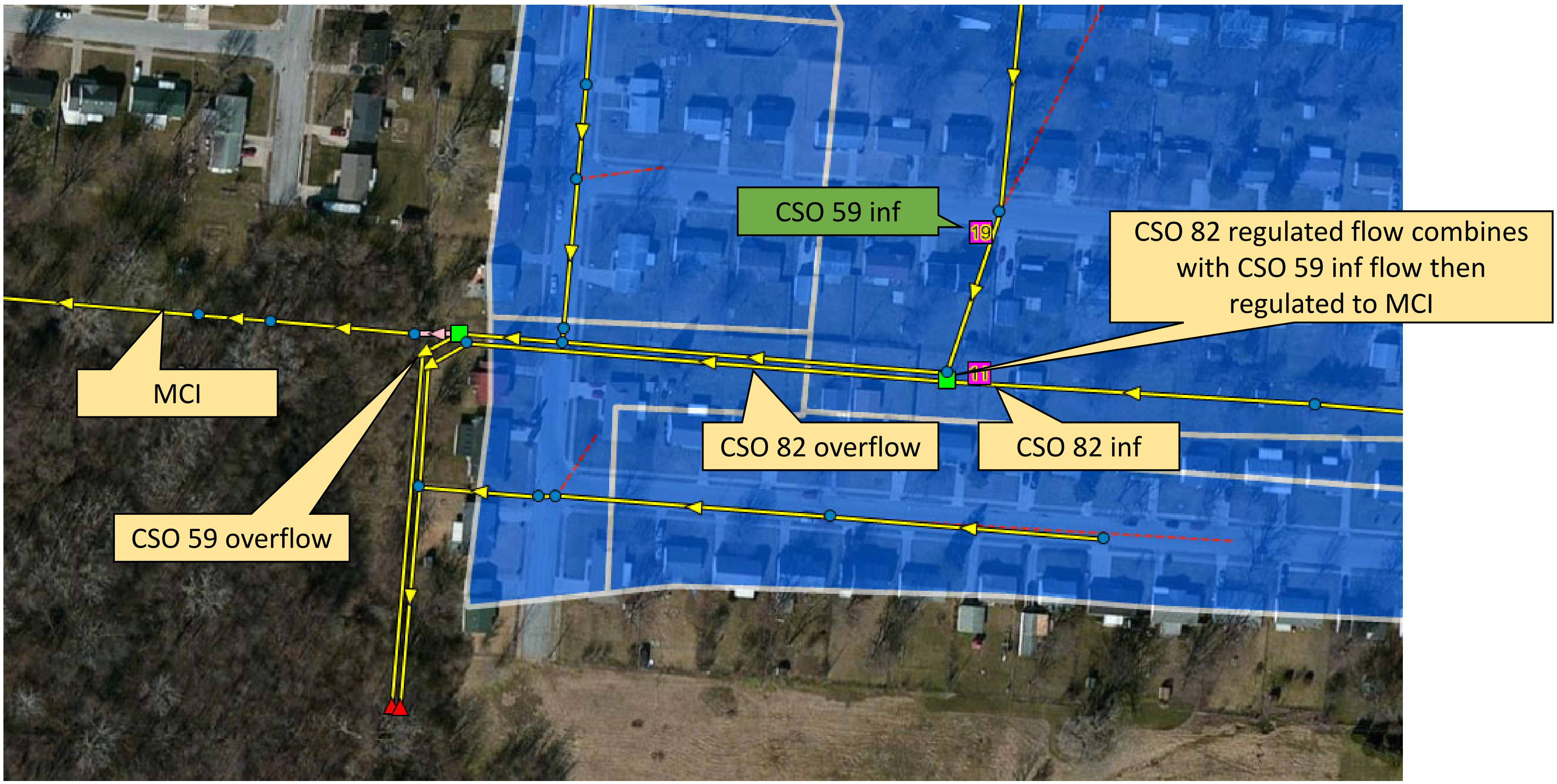
Spring 2016



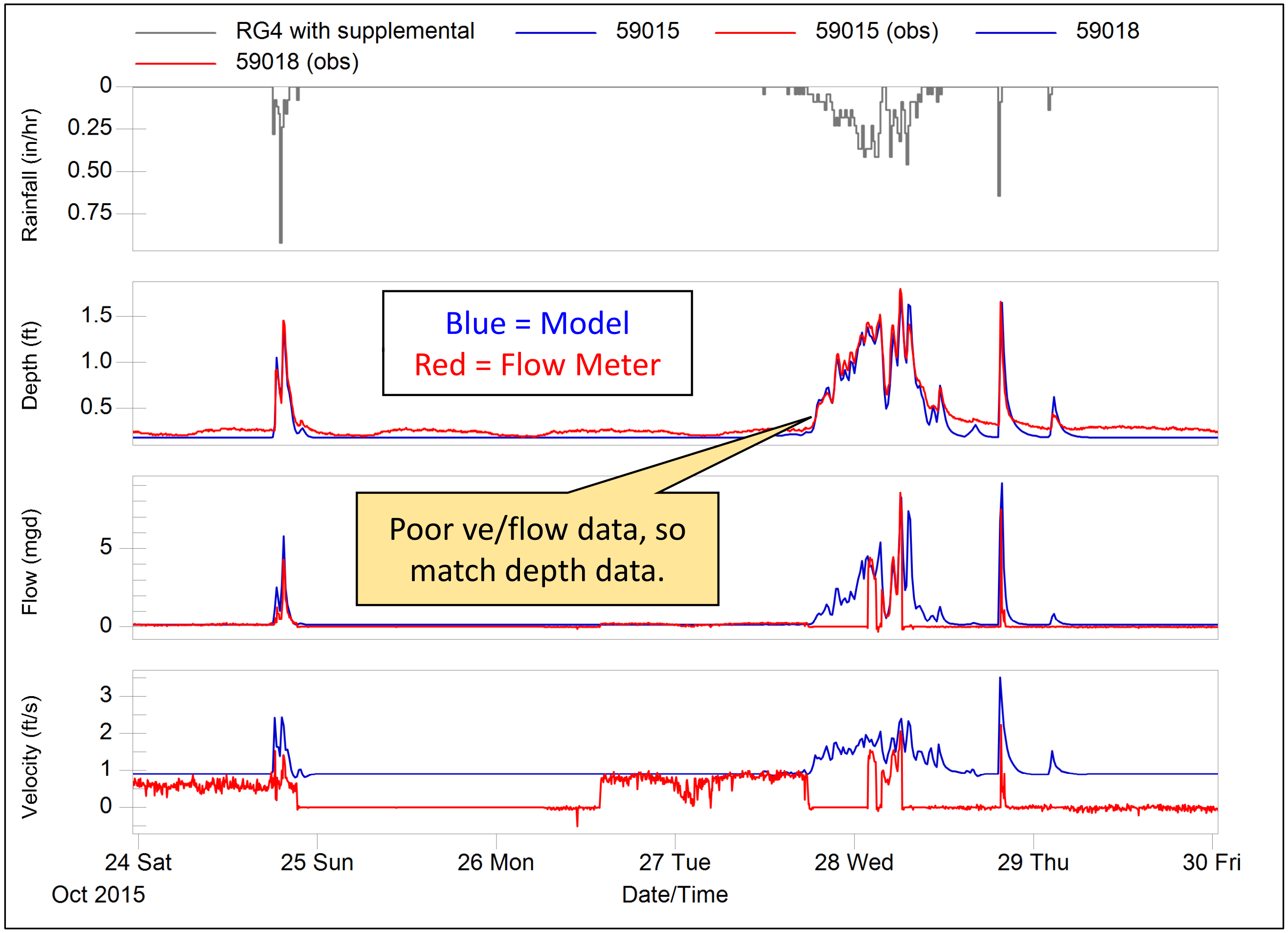




FM 11a (FM 19 in Spring)
CSO 59 (inf)



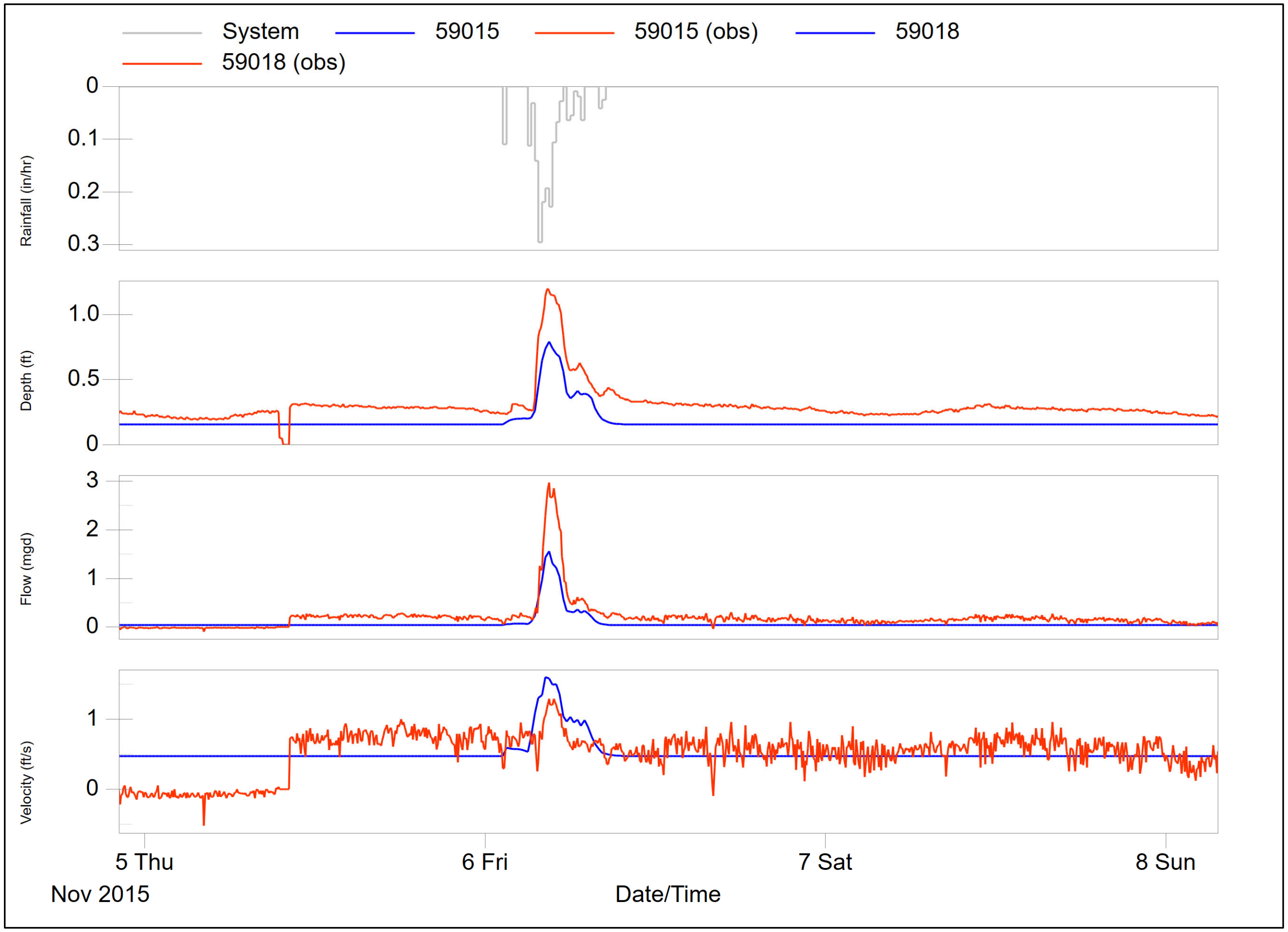
FM 11a – CSO 59 ()



Calibration Events

10/24/15, 10/27/15

FM 11a – CSO 59 ()



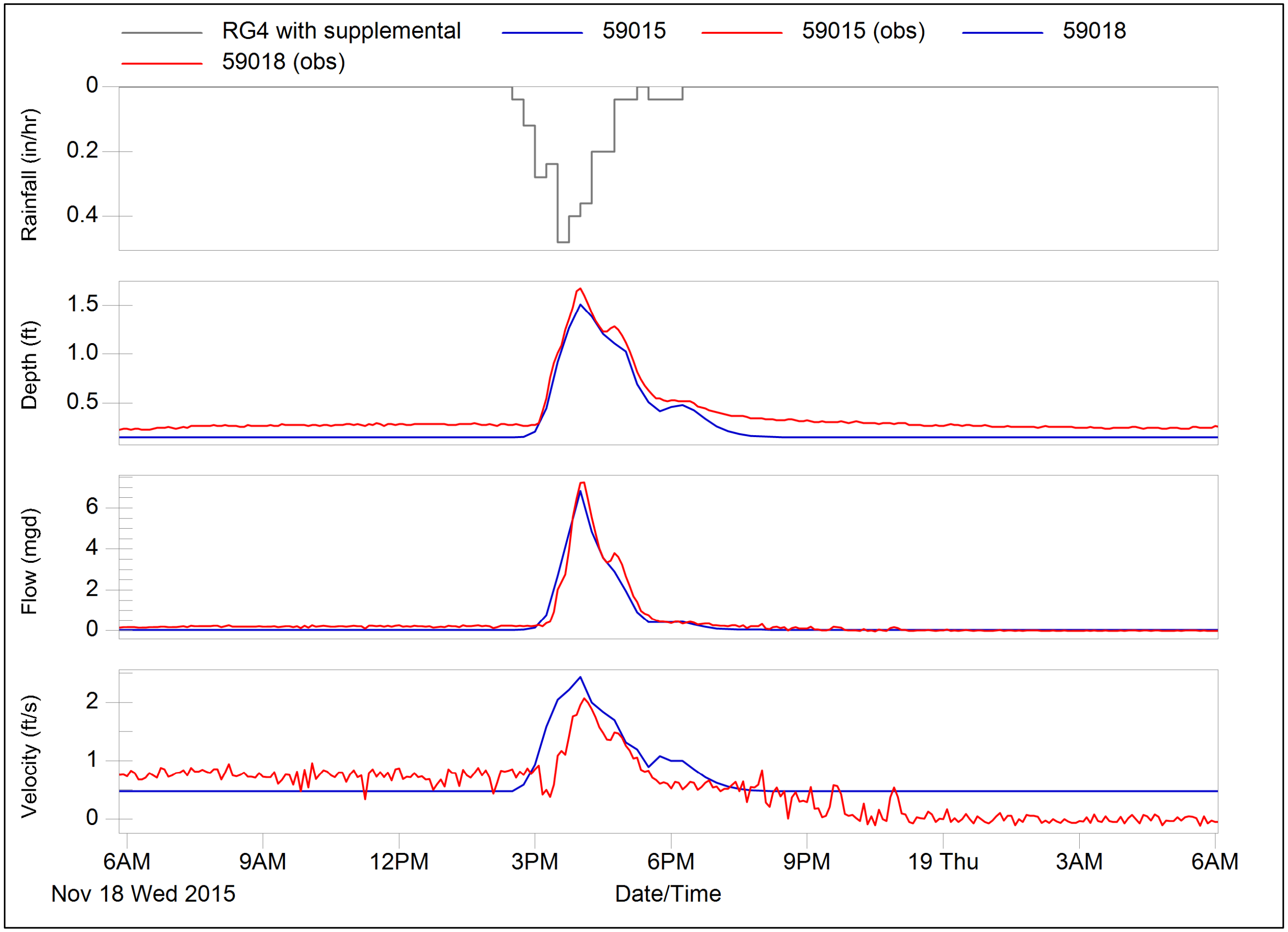
Calibration Events
11/6/15

FM 11a – CSO 59 ()

Calibration Events

11/11/15

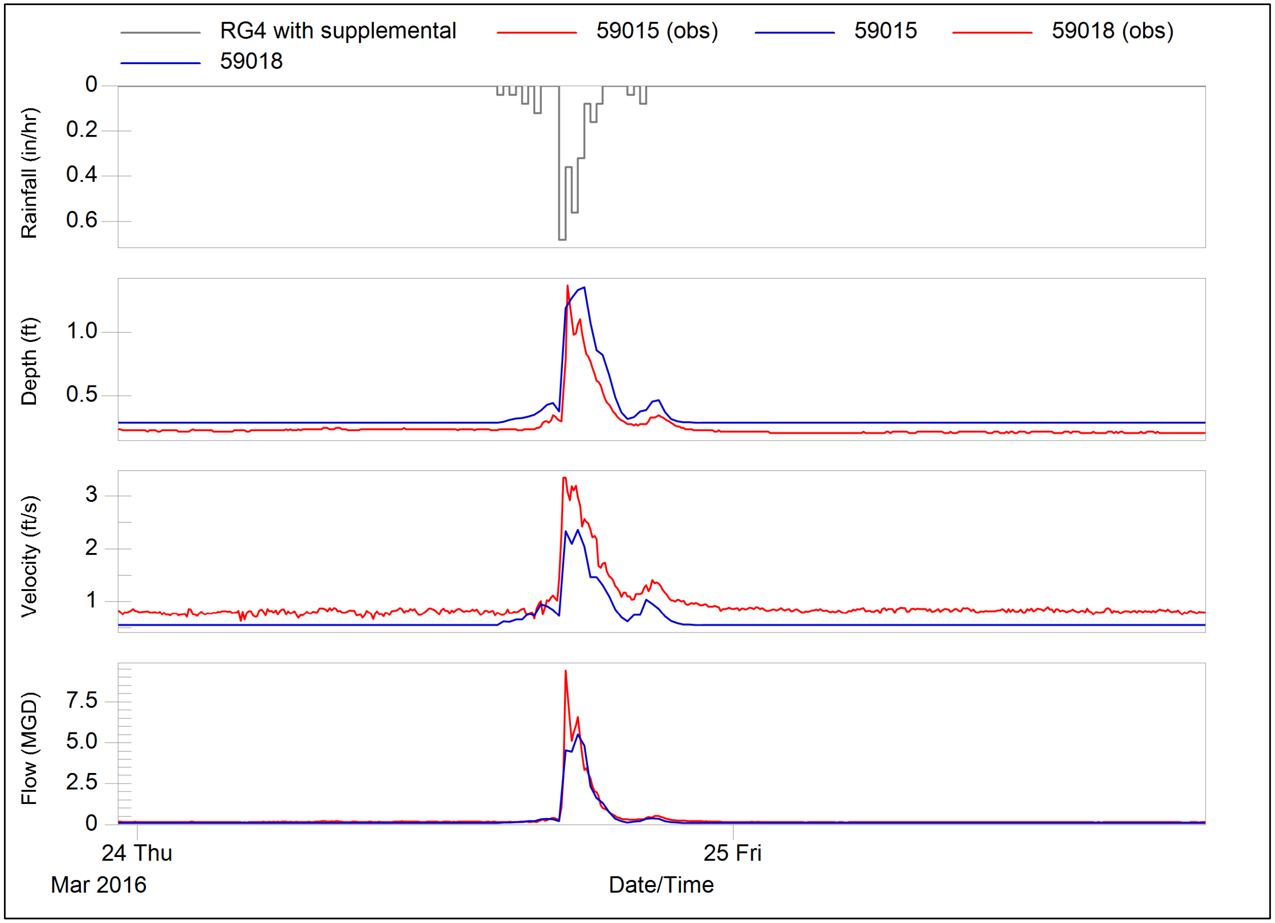
FM 11a – CSO 59 ()



Calibration Events

11/18/15

FM 11a – CSO 59



Calibration Event

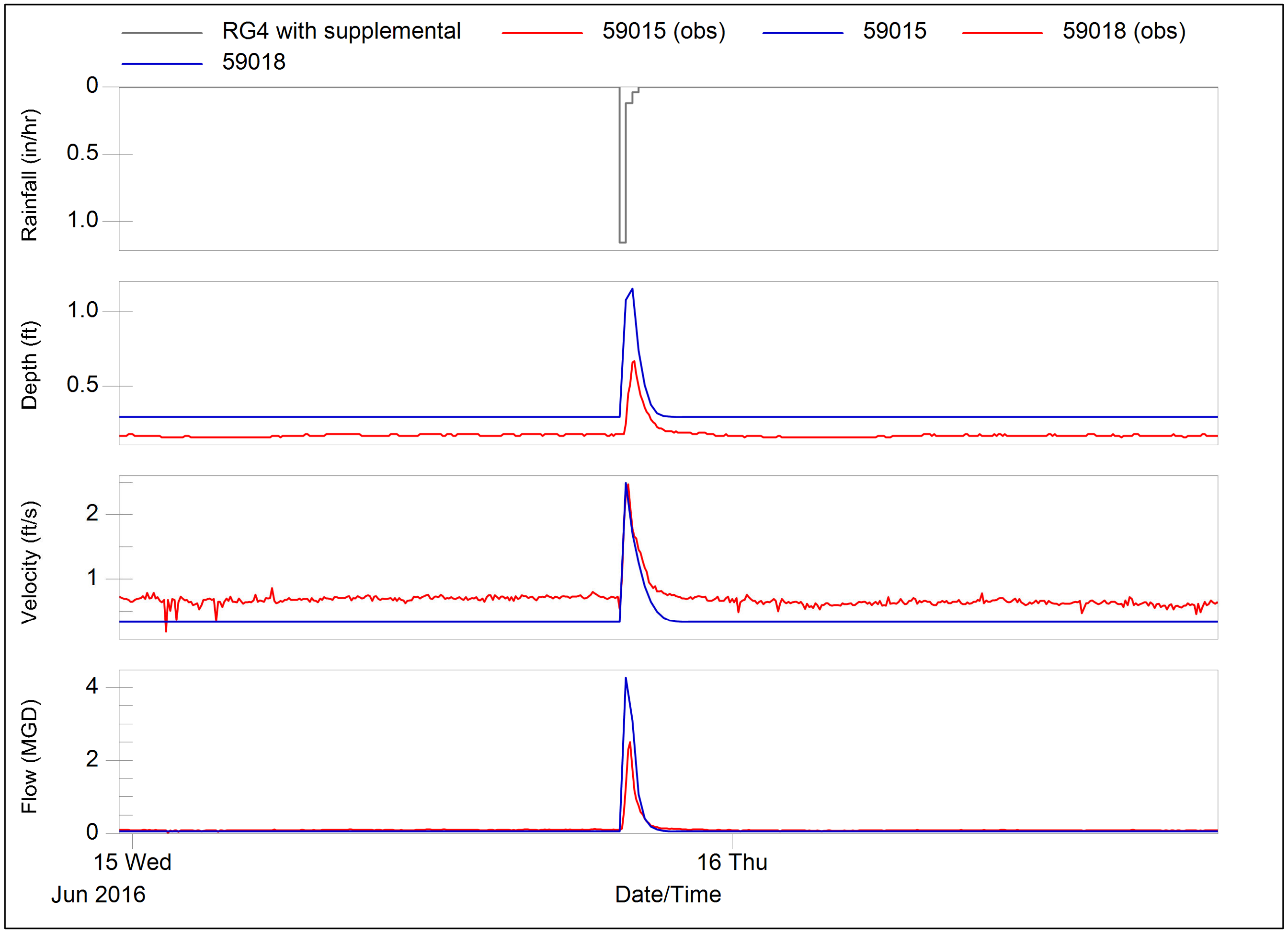
3/24/16

FM 11a – CSO 59

Calibration Events
4/30/16, 5/1/16

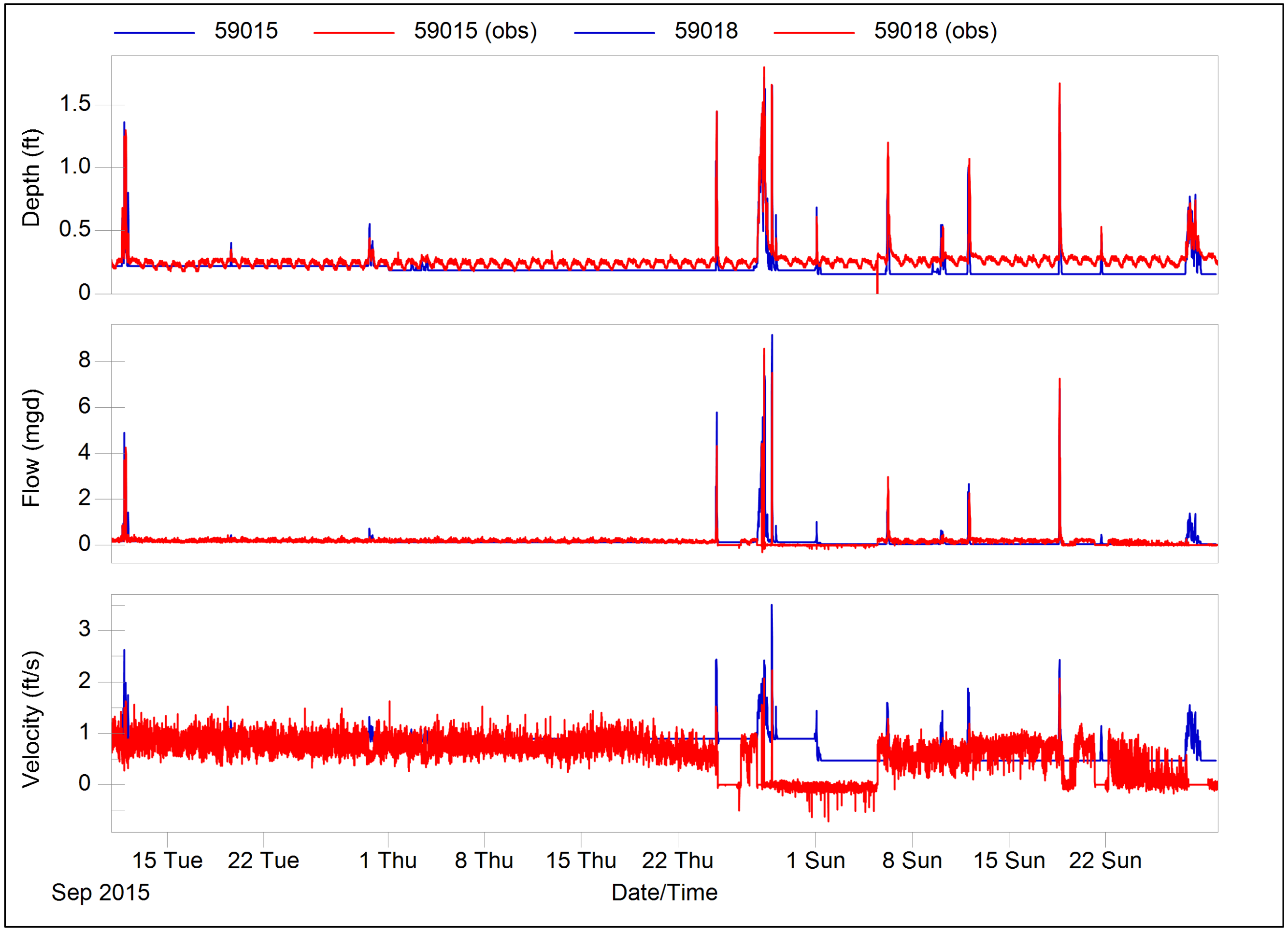
FM 11a – CSO 59

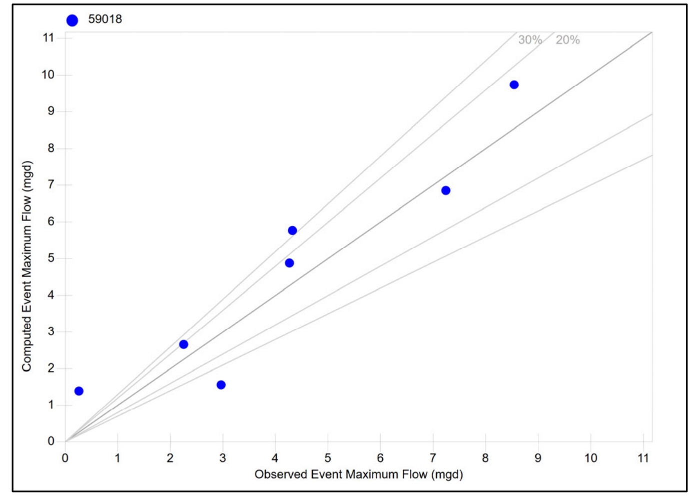
Calibration Events
6/15/16

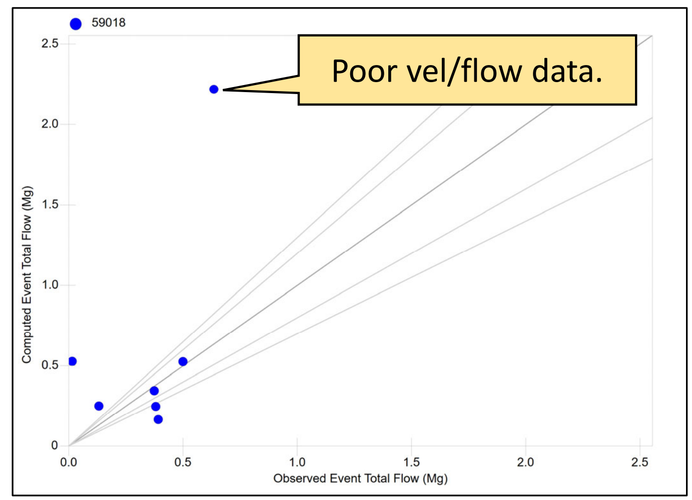


FM 11a – CSO 59

Fall 2015

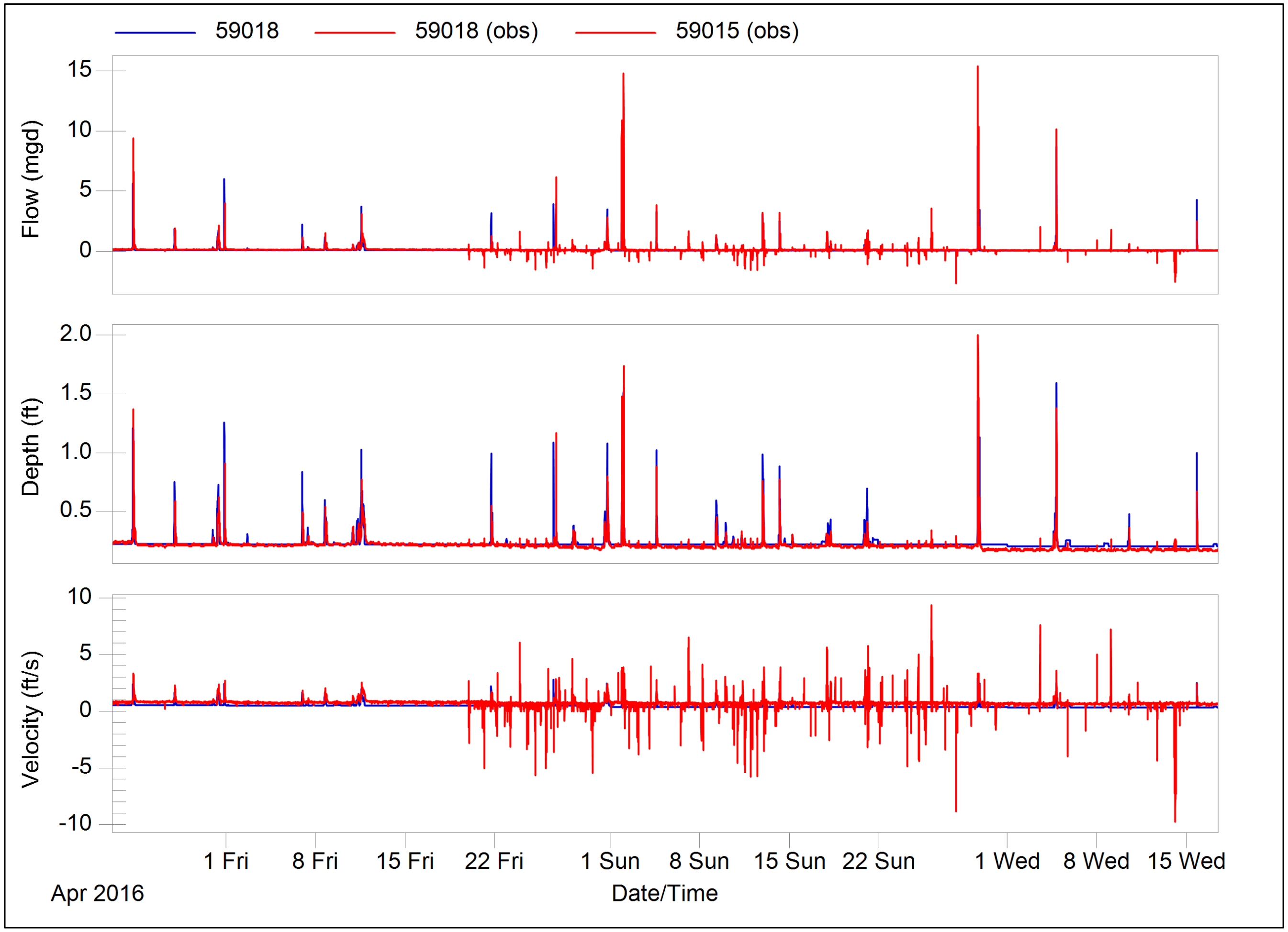


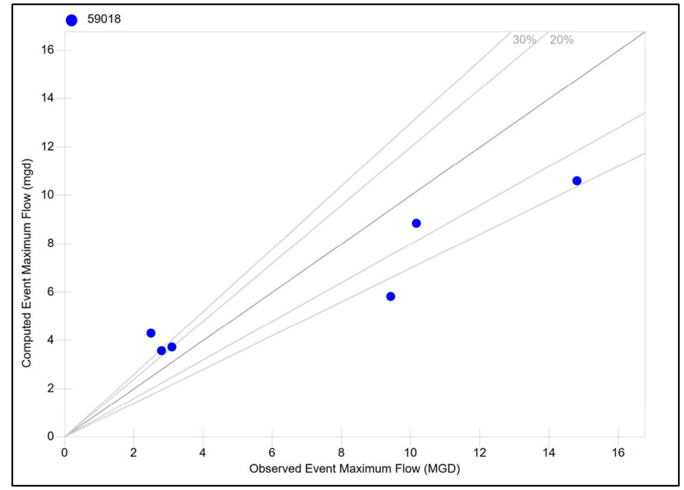


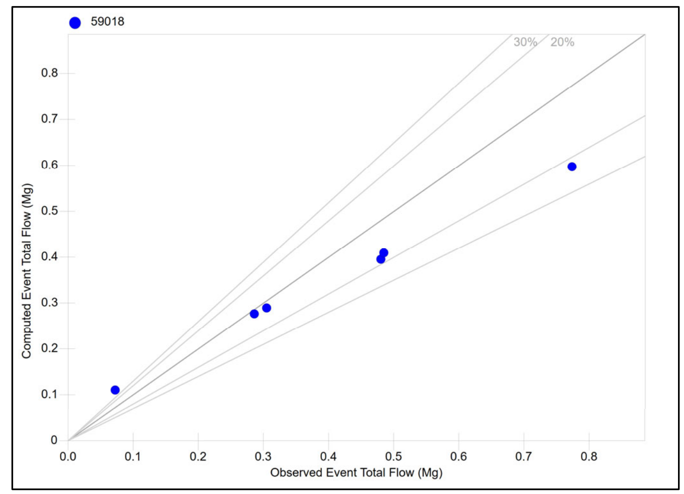


FM 11a – CSO 59

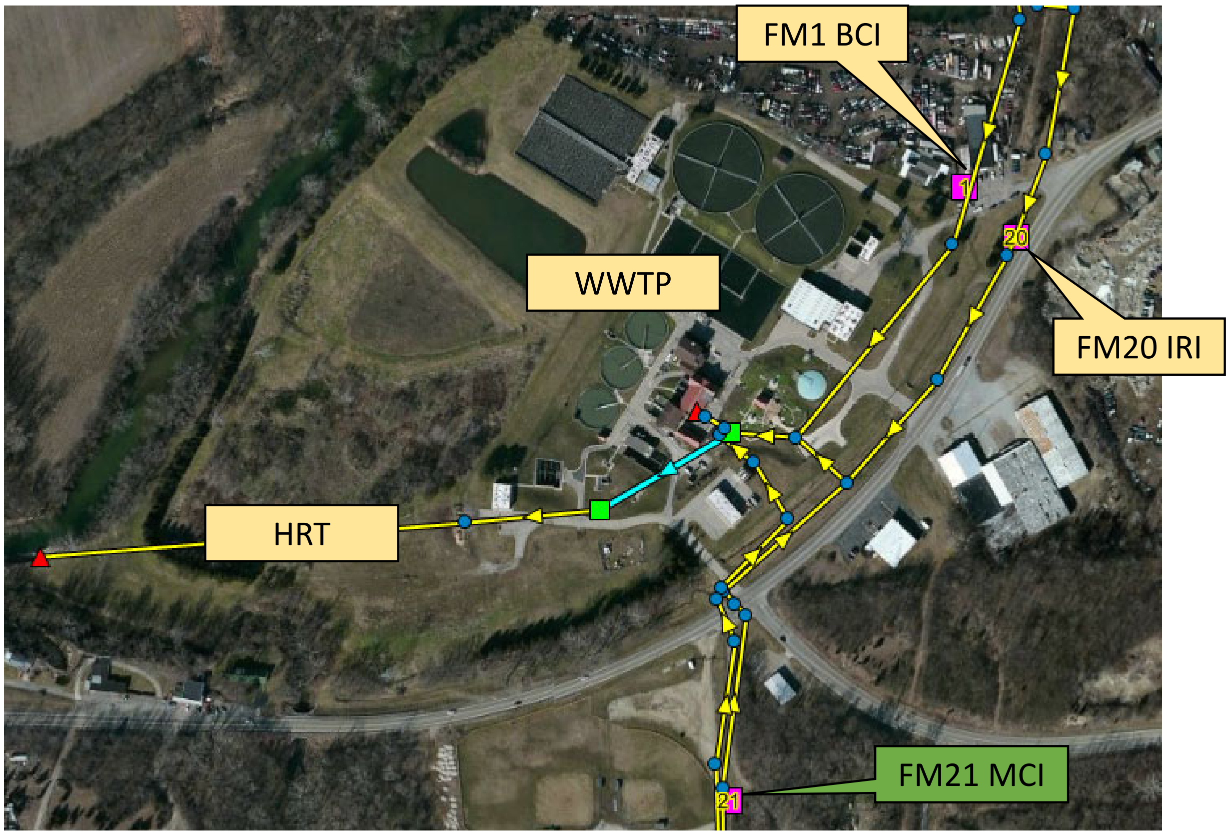
Spring 2016



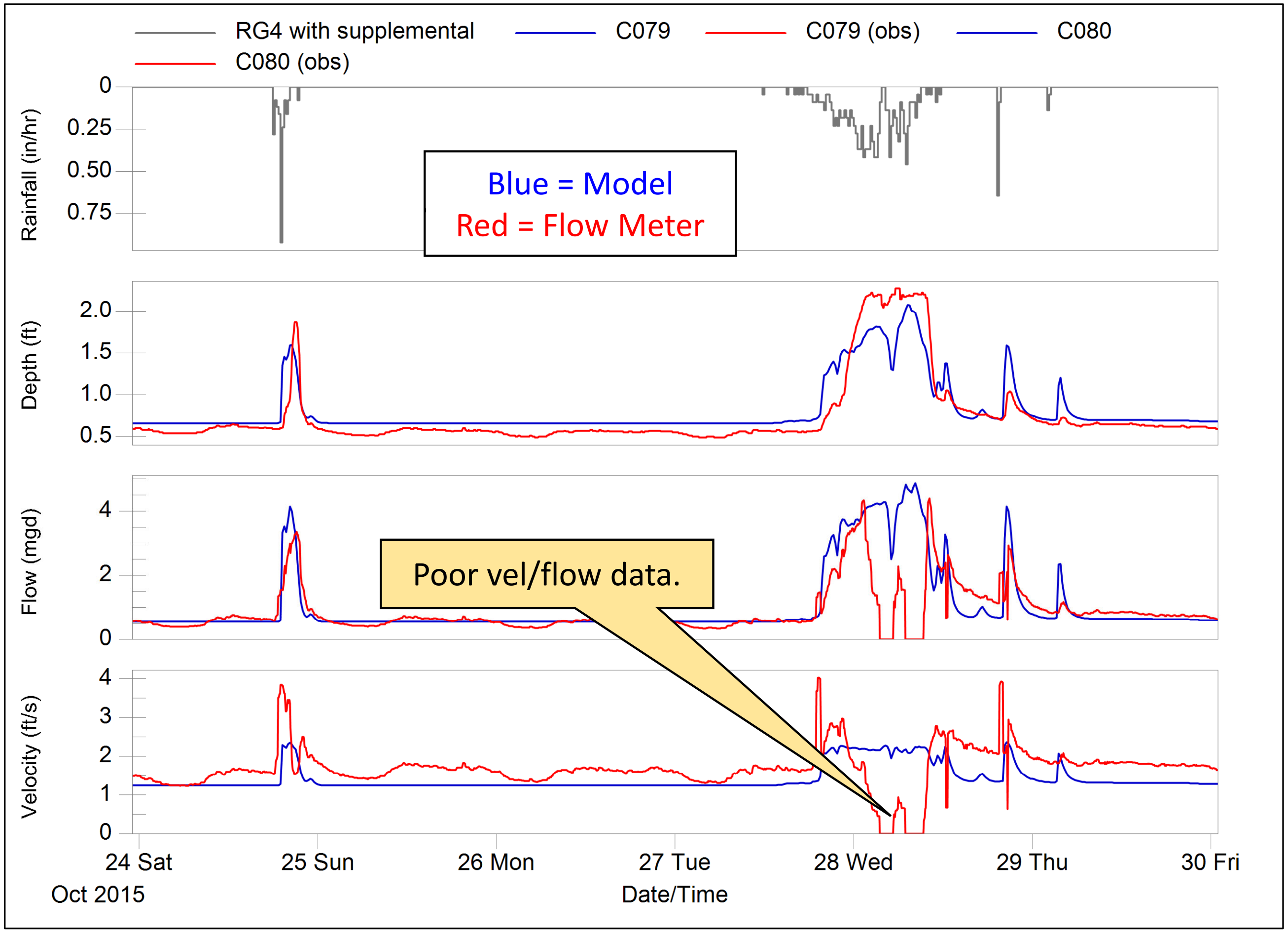




FM 21
Mill Creek Int. (MCI) - Near WWTP



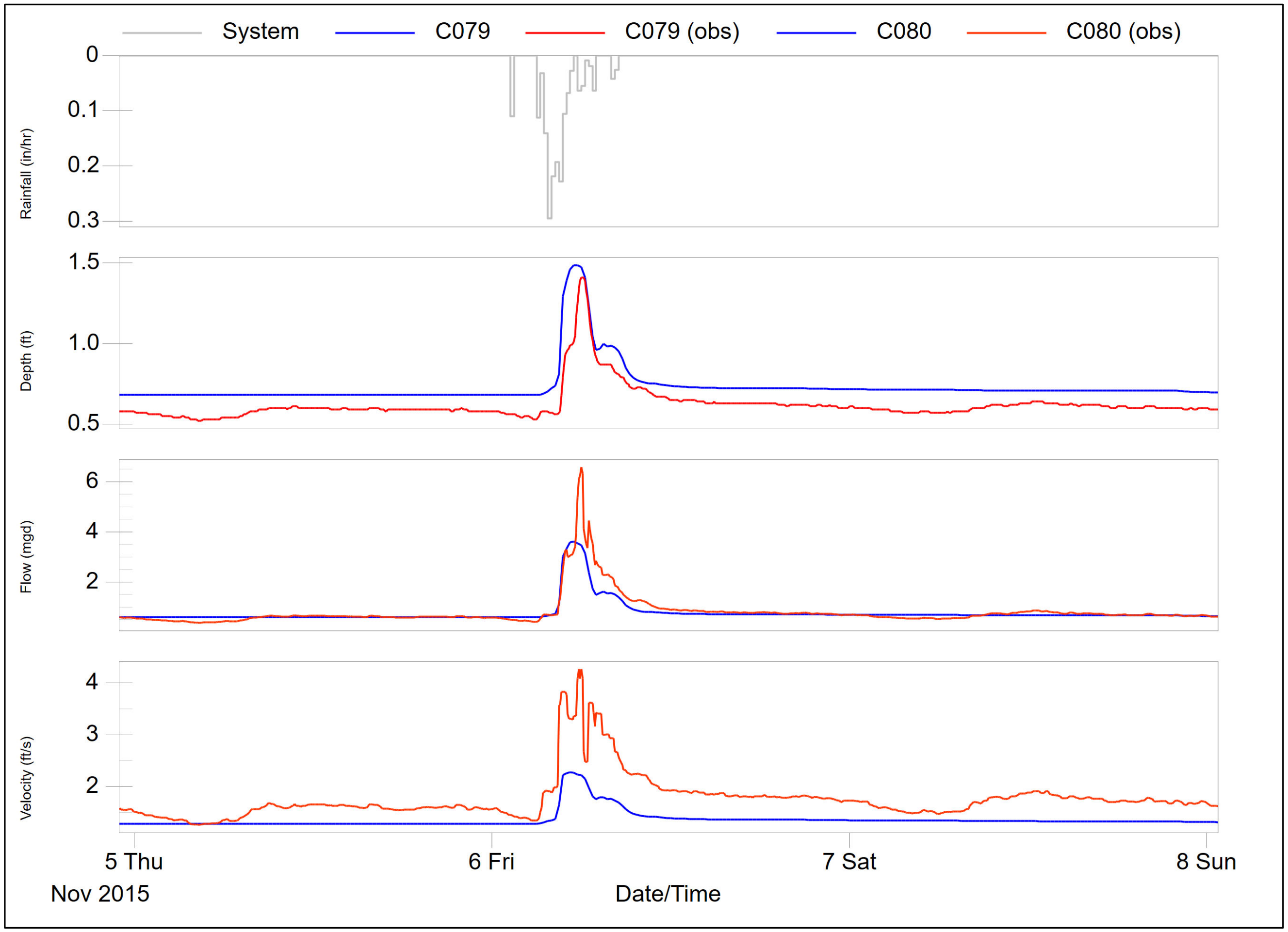
FM 21 – MCI ()



Calibration Events

10/24/15, 10/27/15

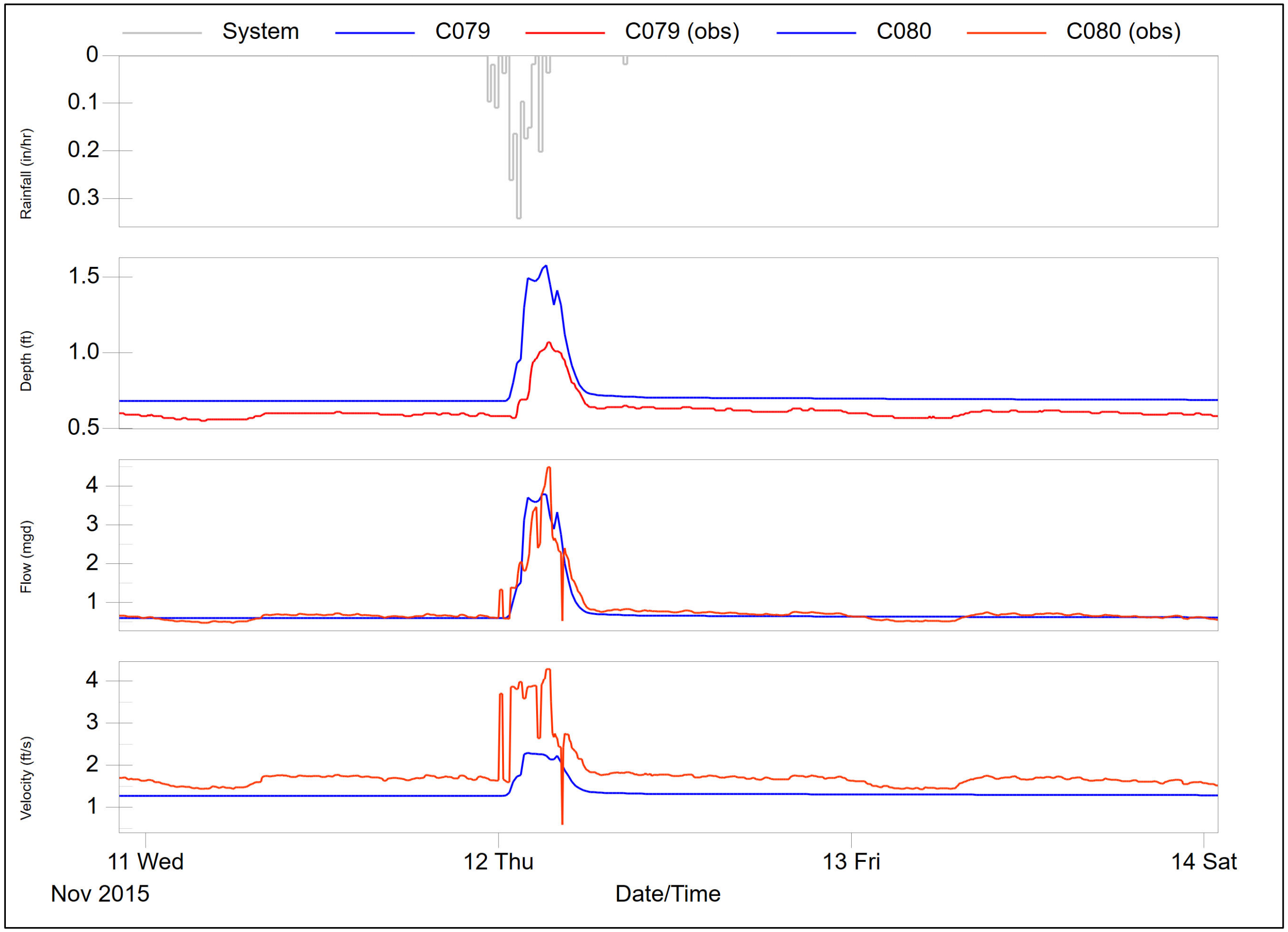
FM 21 – MCI ()



Calibration Events

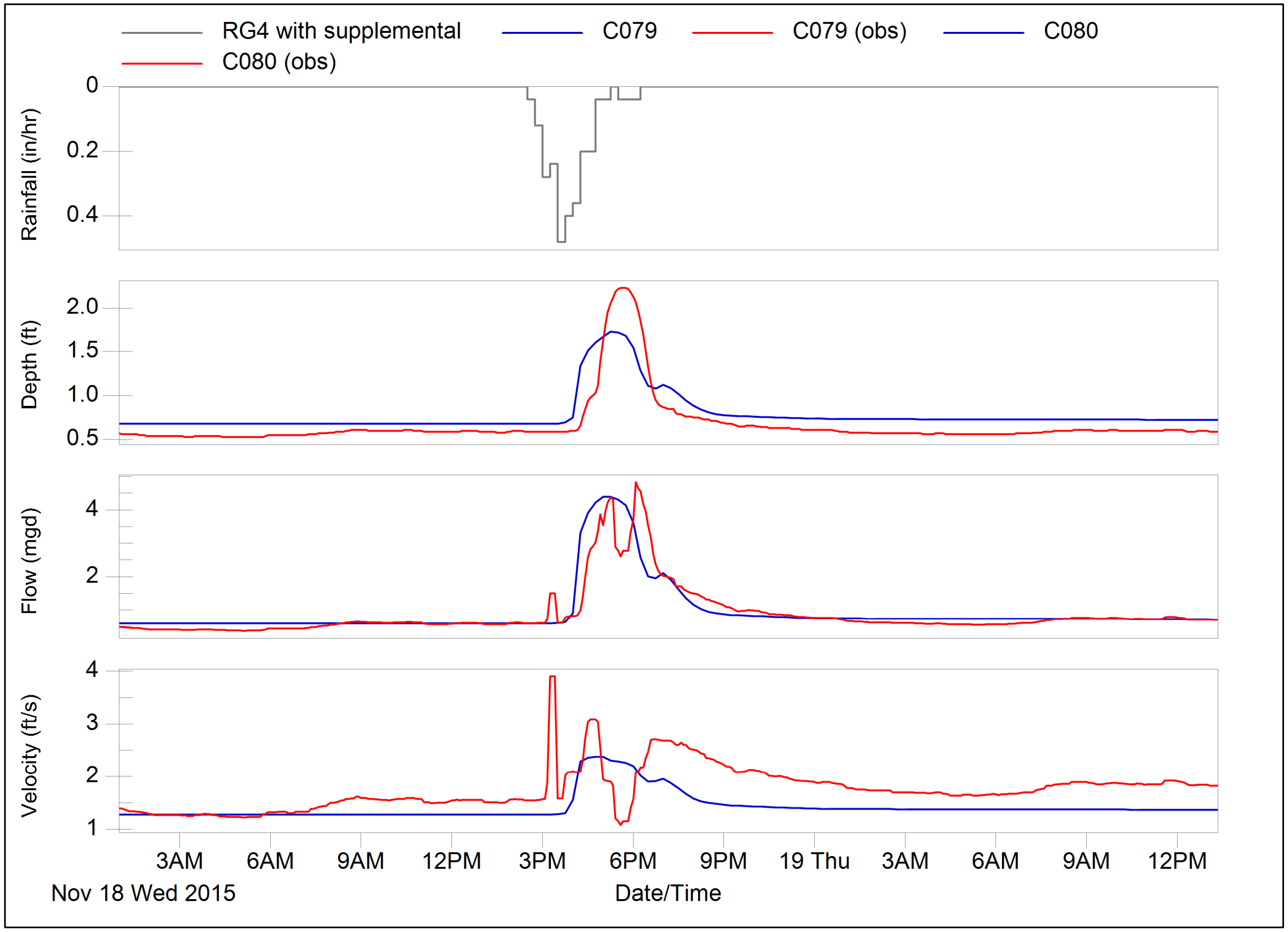
11/6/15

FM 21 – MCI ()



Calibration Events
11/11/15

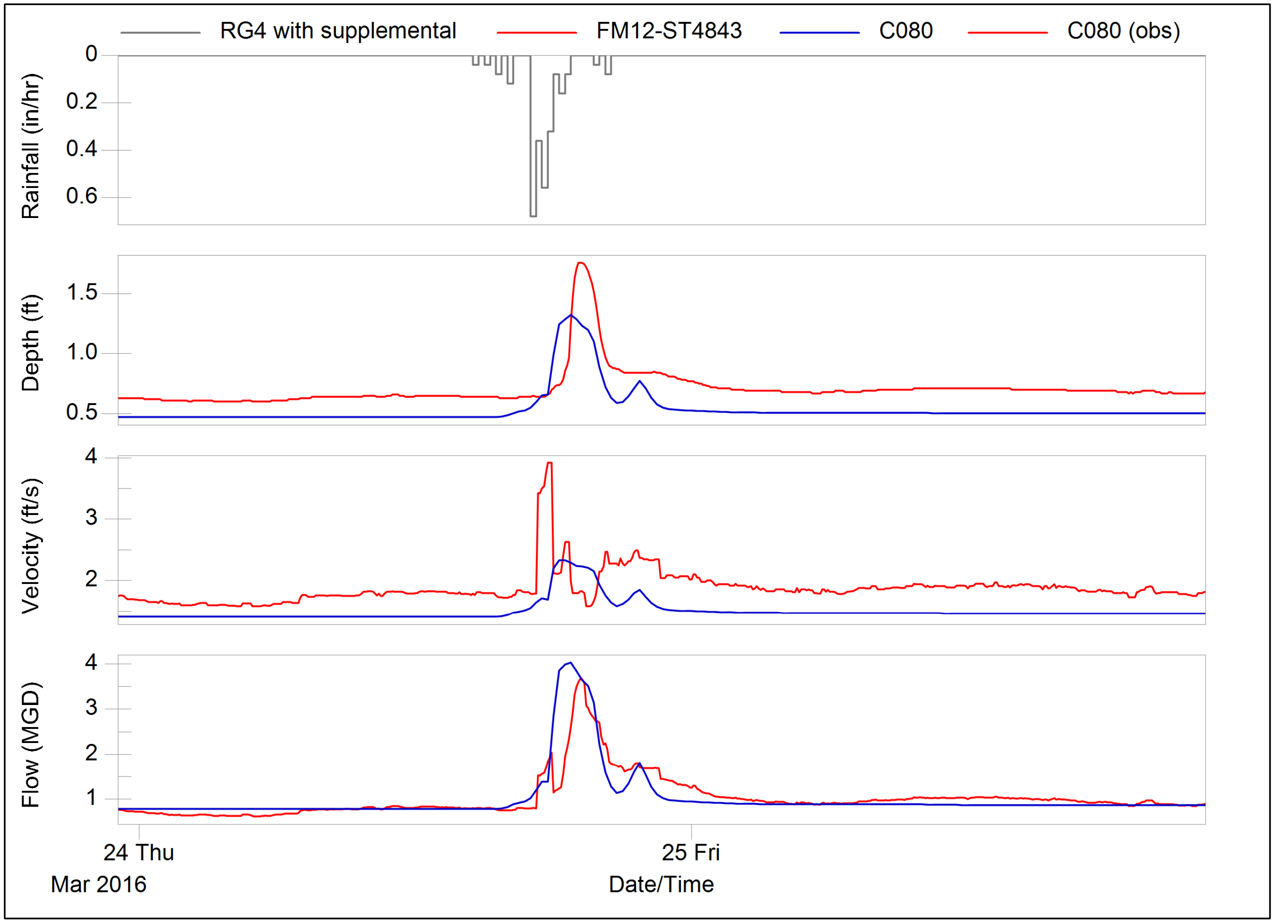
FM 21 – MCI ()



Calibration Events

11/18/15

FM 21 – MCI



Calibration Event
3/24/16

FM 21 – MCI

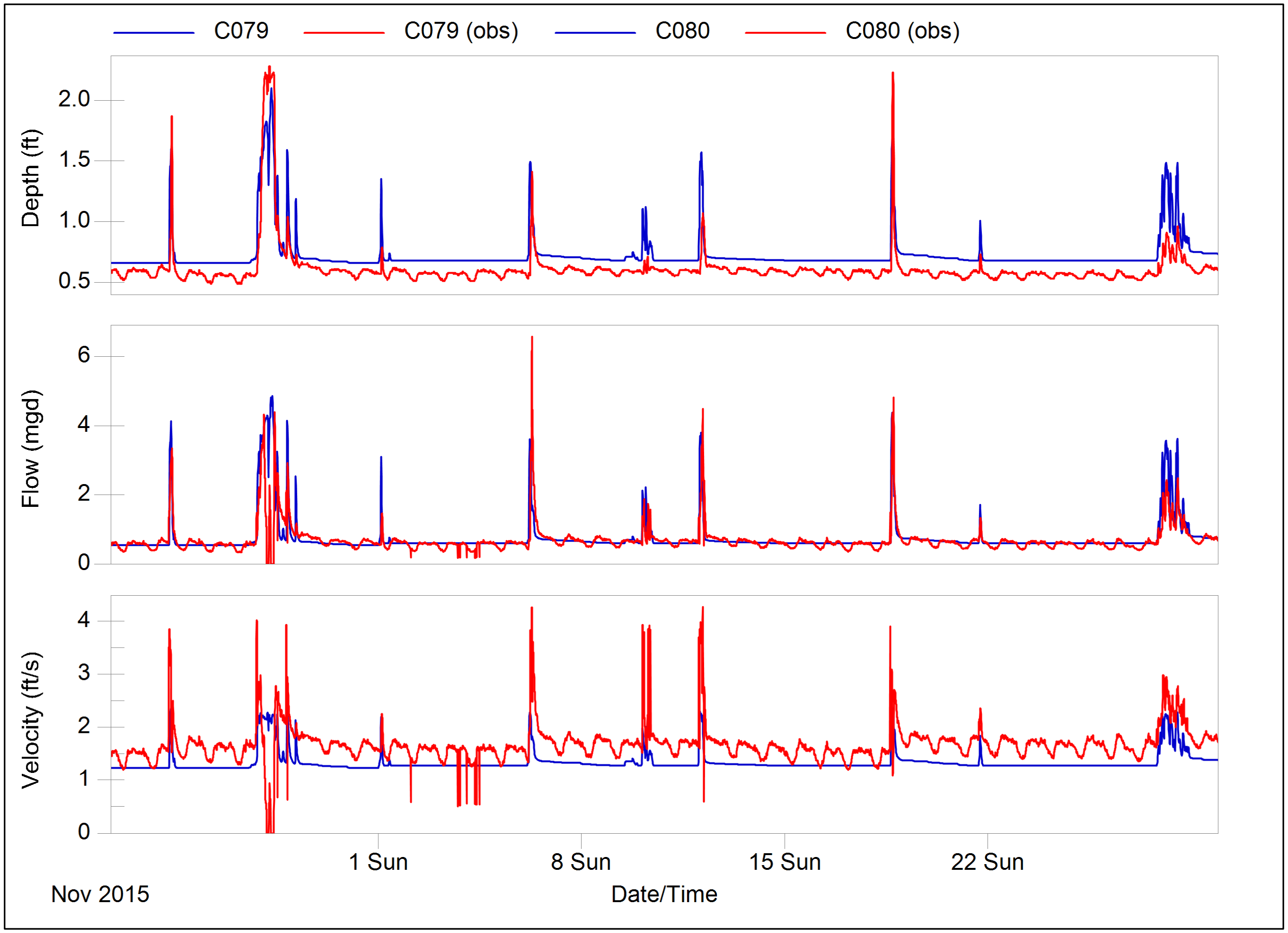
Calibration Events
4/30/16, 5/1/16

FM 21 – MCI

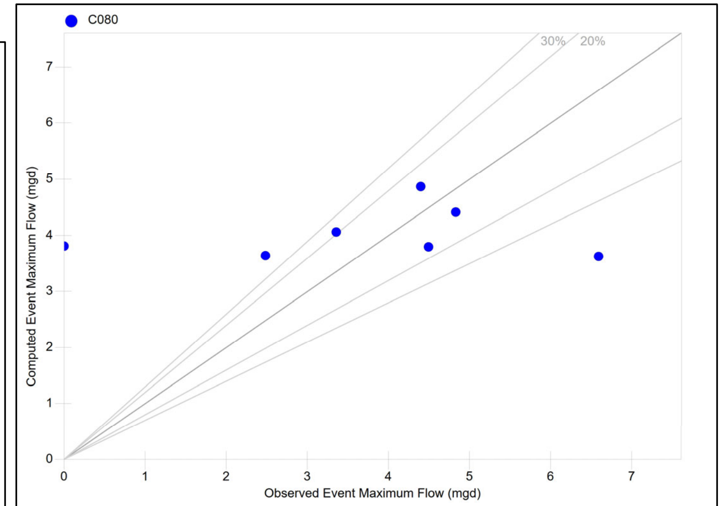
Calibration Events
6/15/16

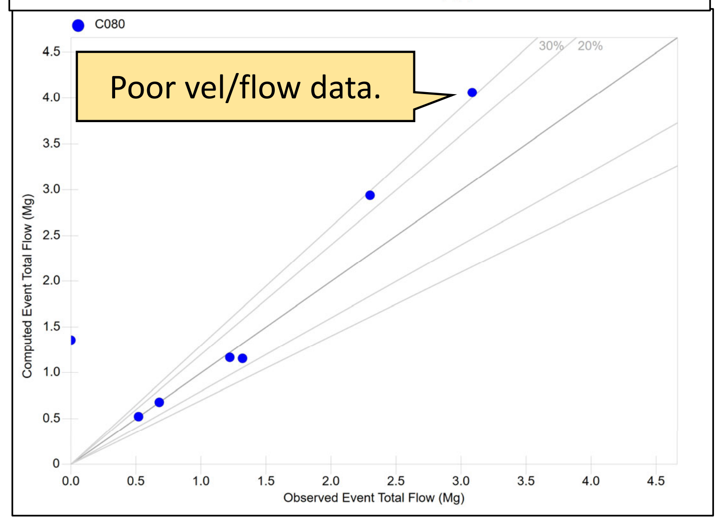
No Monitor Data

FM 21 – MCI



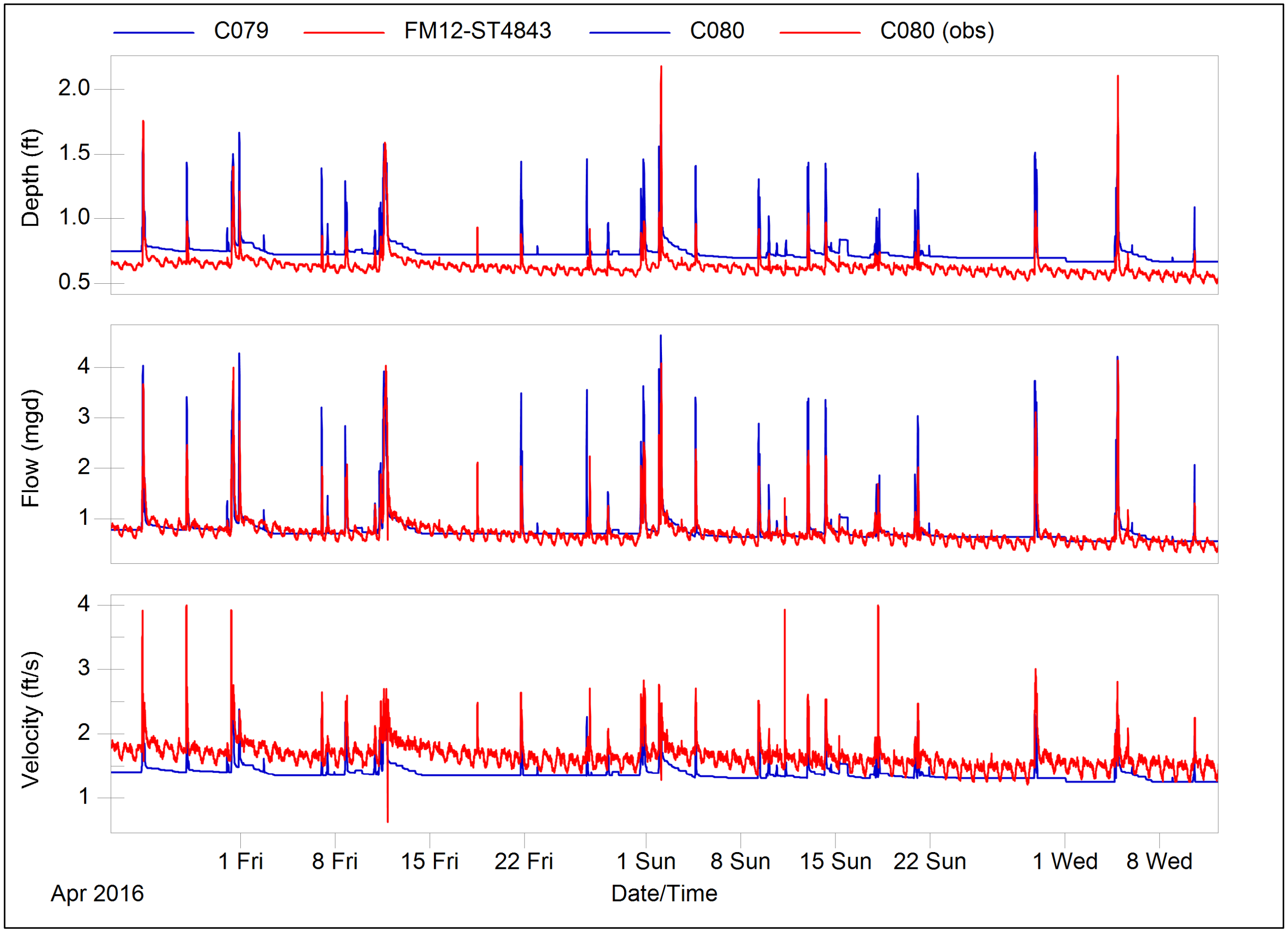
Fall 2015

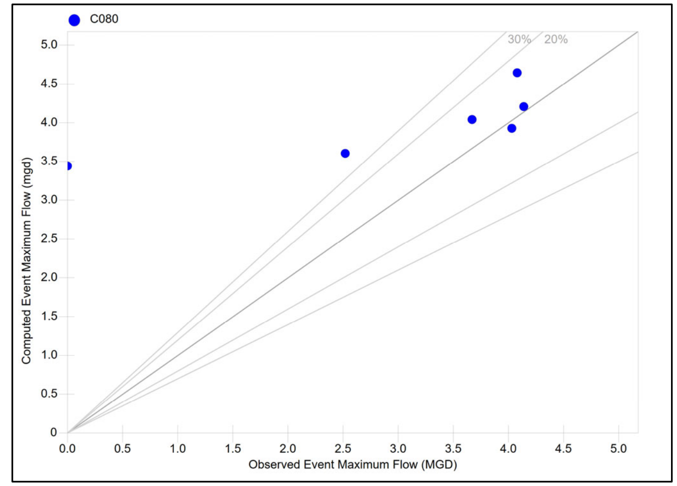


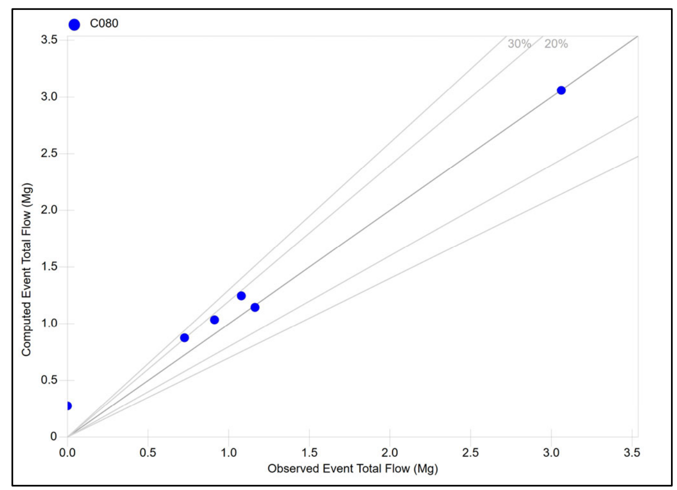


FM 21 – MCI

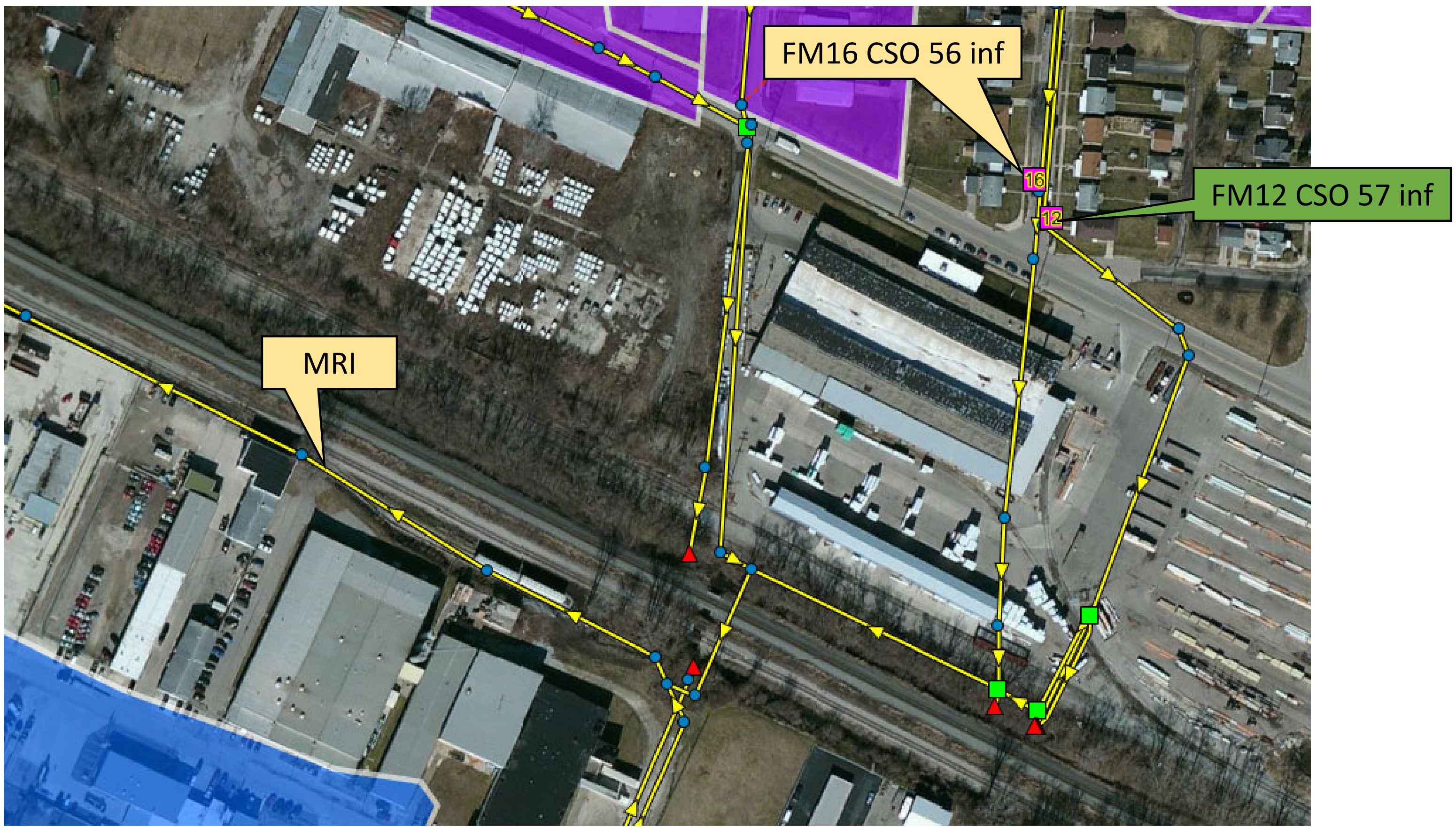
Spring 2016



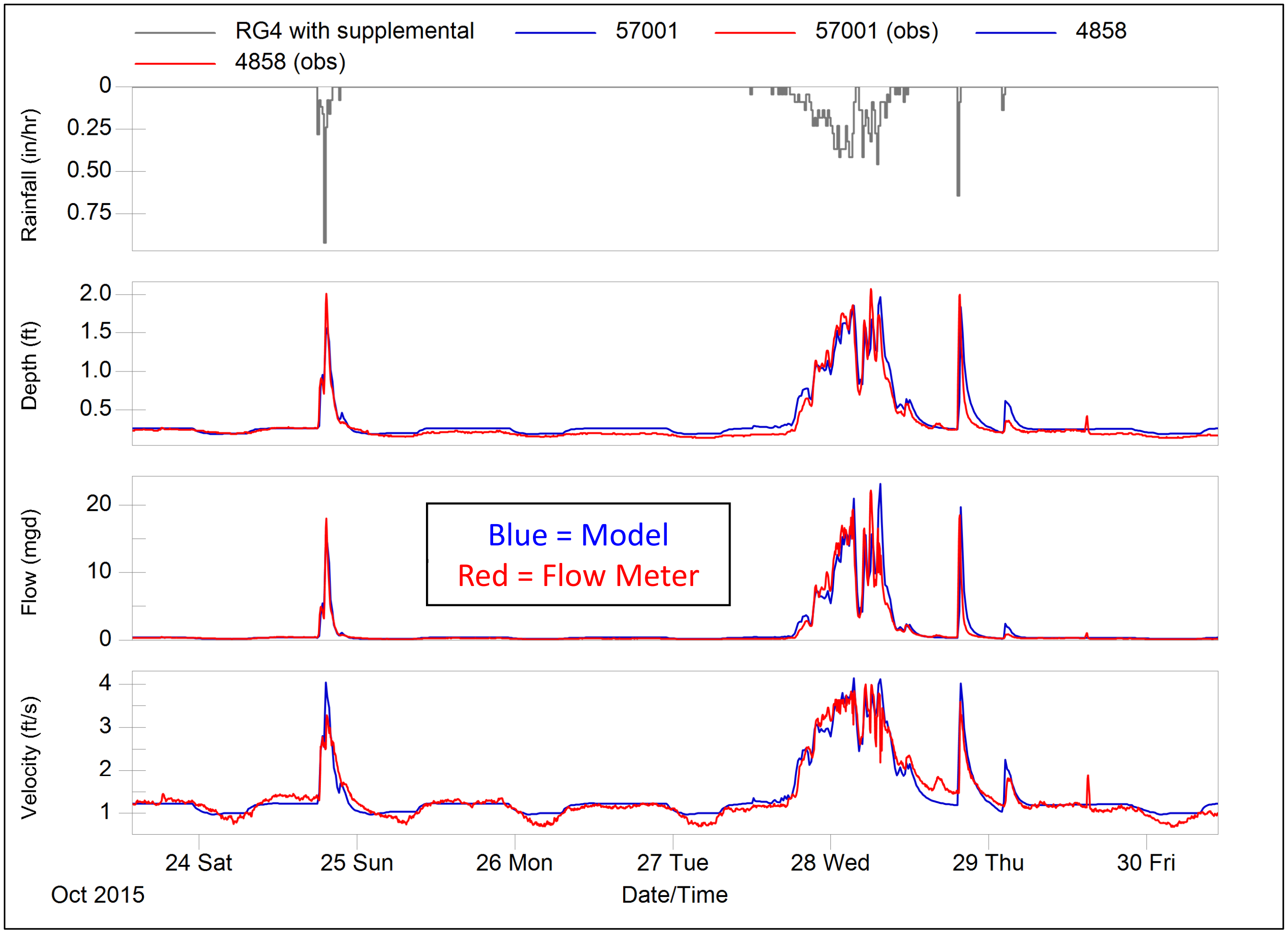




FM 12
CSO 57 inf

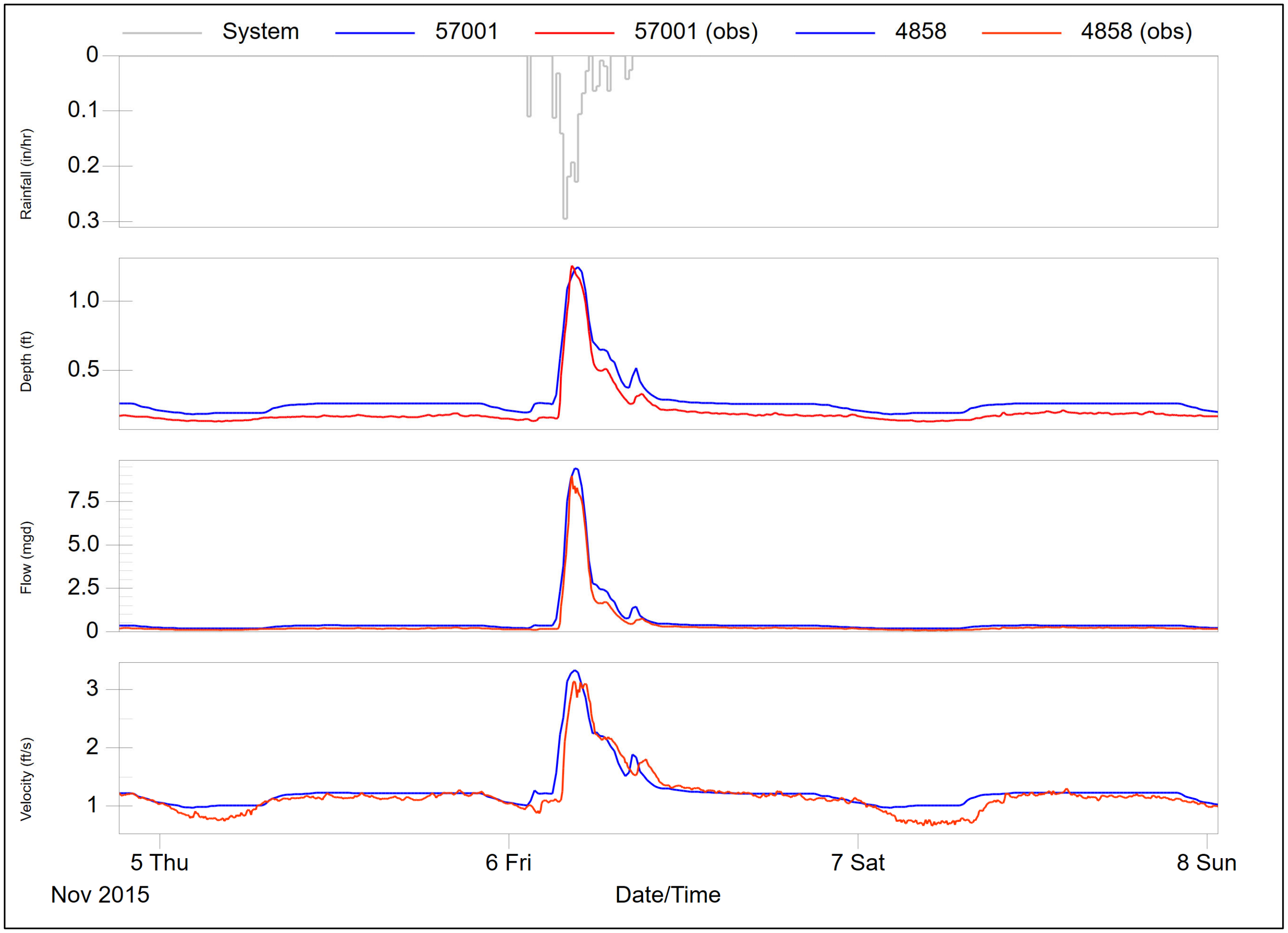


FM12 – CSO 57



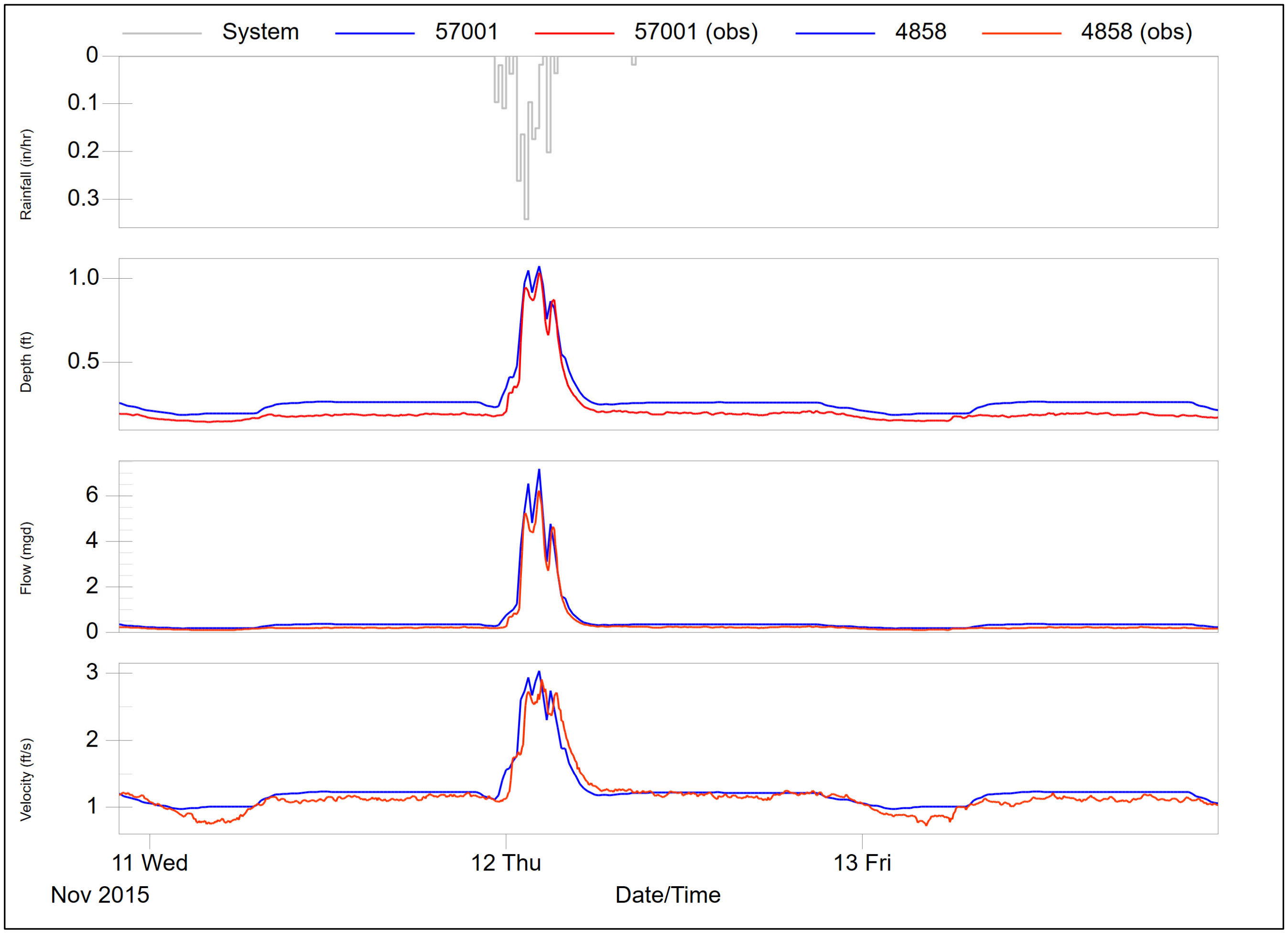
Calibration Events
10/24/15, 10/27/15

FM12 – CSO 57



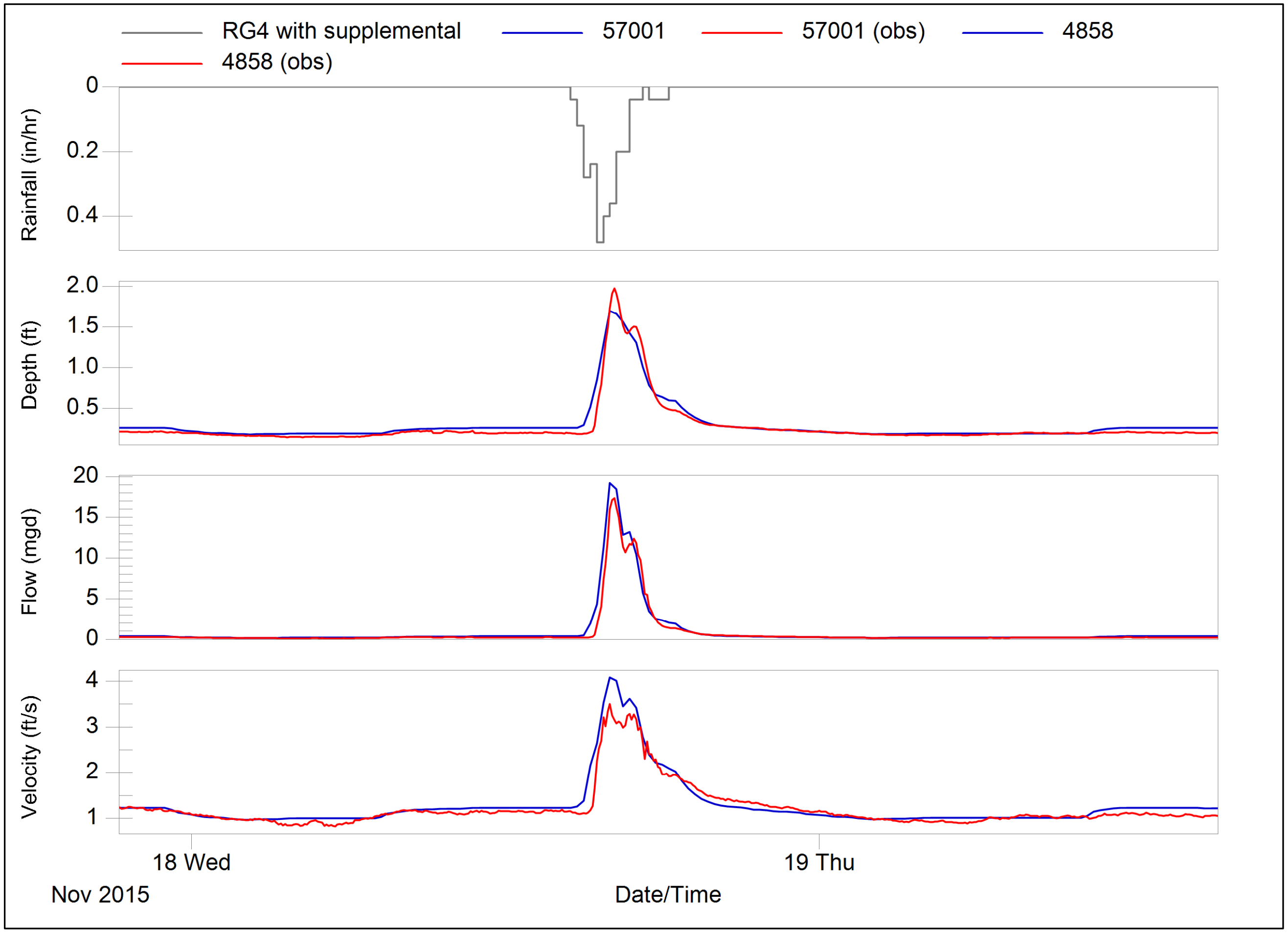
Calibration Events
11/6/15

FM12 – CSO 57



Calibration Events
11/11/15

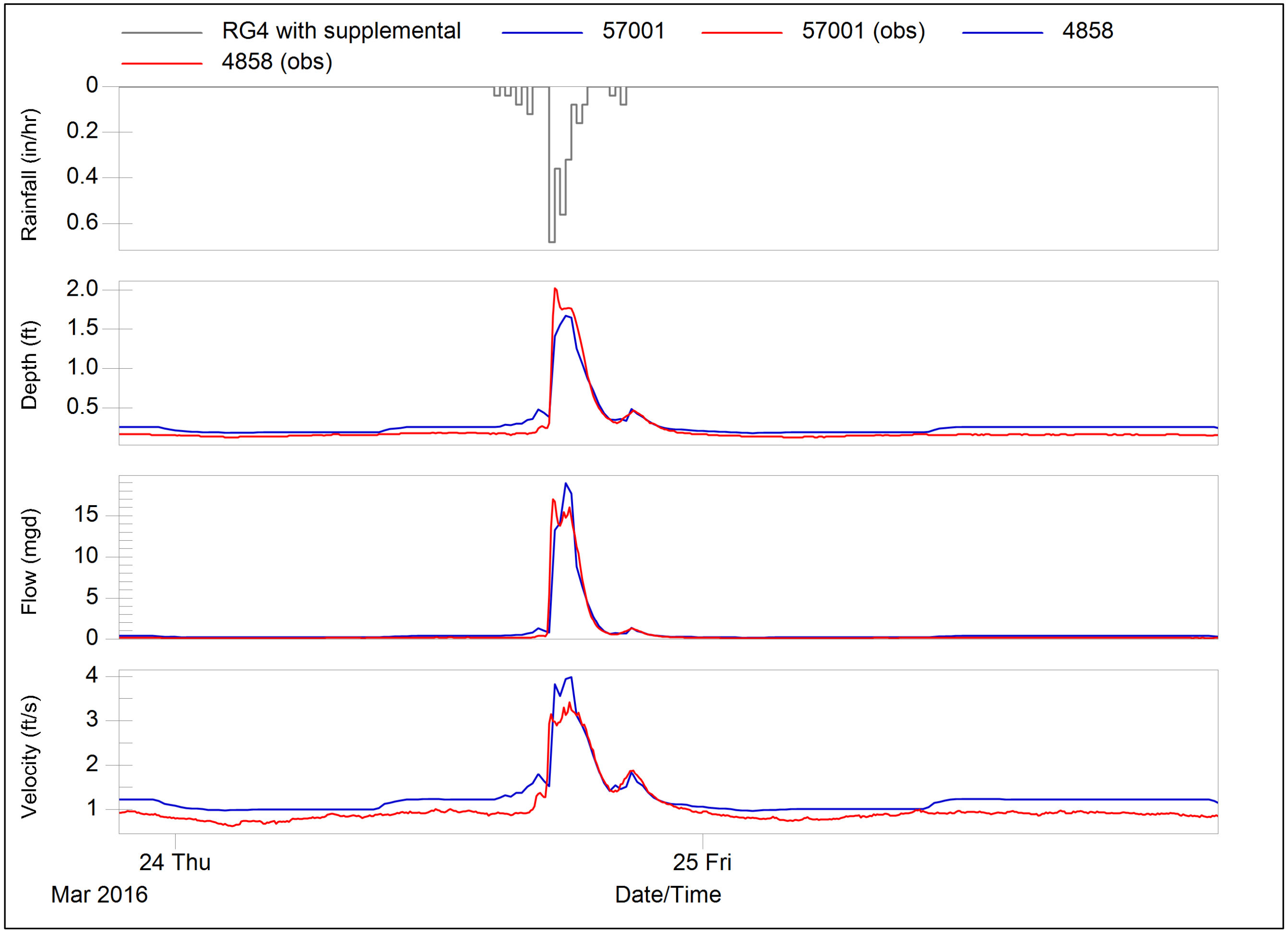
FM12 – CSO 57



Calibration Events

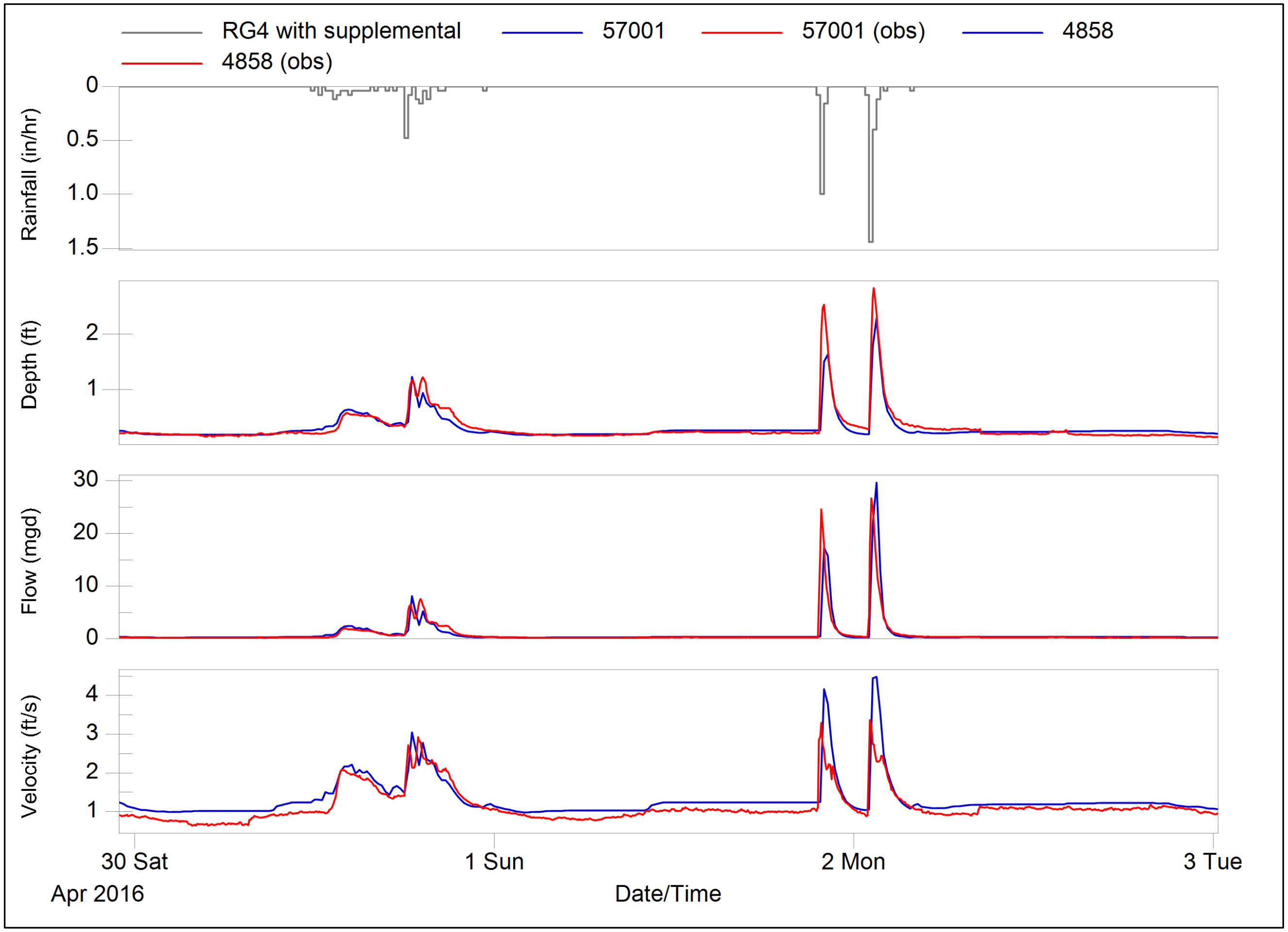
11/18/15

FM12 – CSO 57



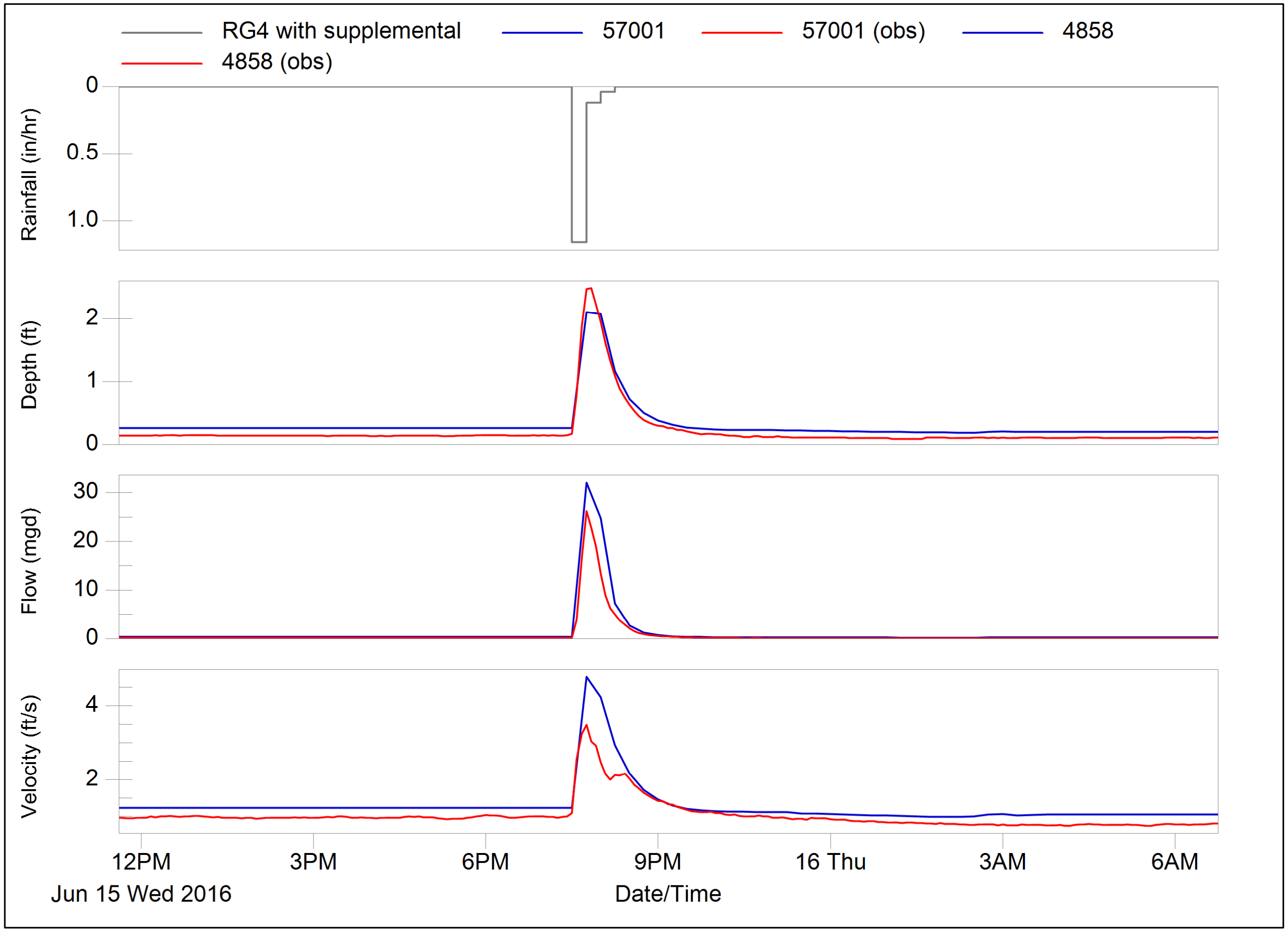
Calibration Event
3/24/16

FM12 – CSO 57



Calibration Events
4/30/16, 5/1/16

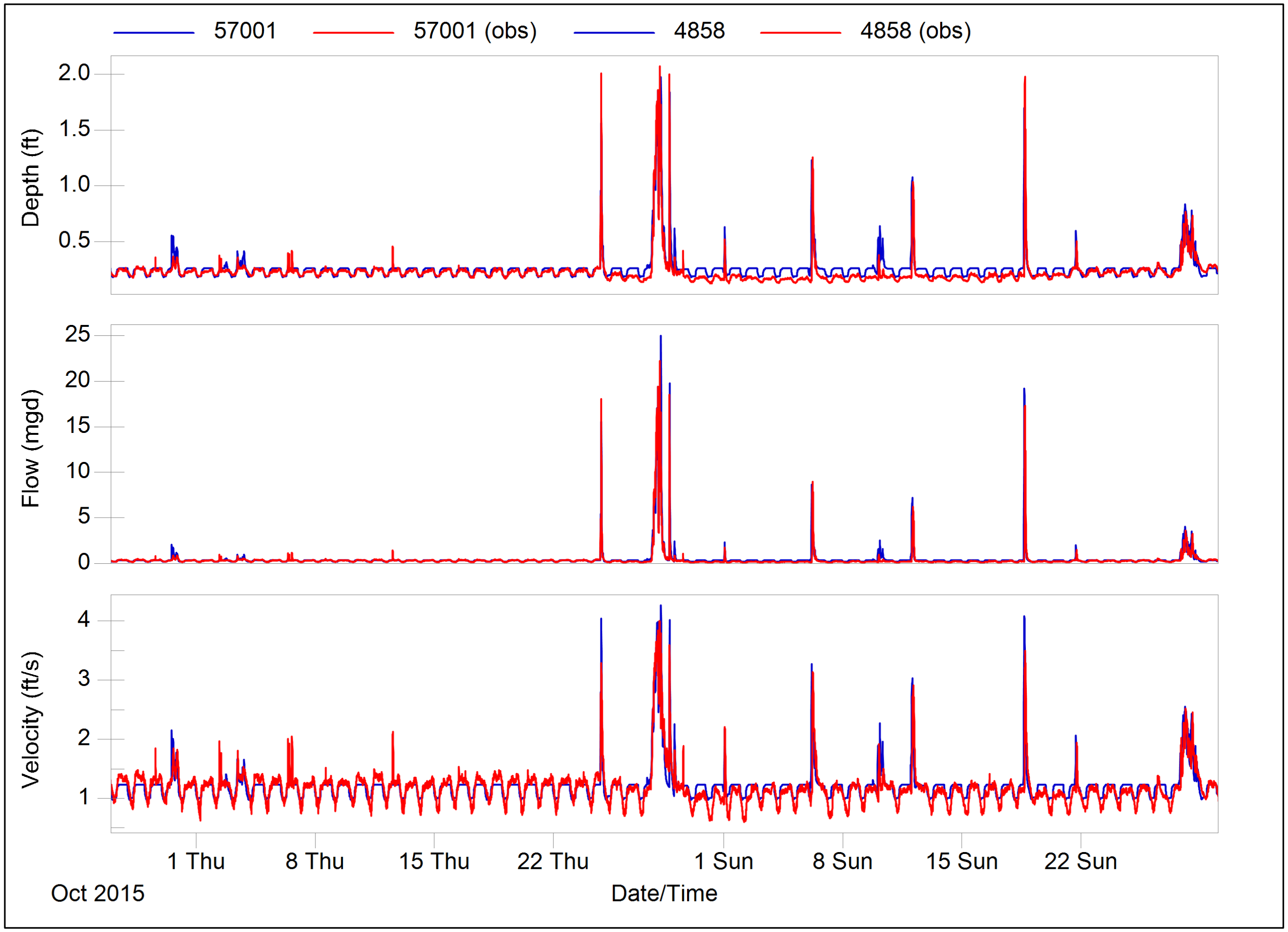
FM12 – CSO 57

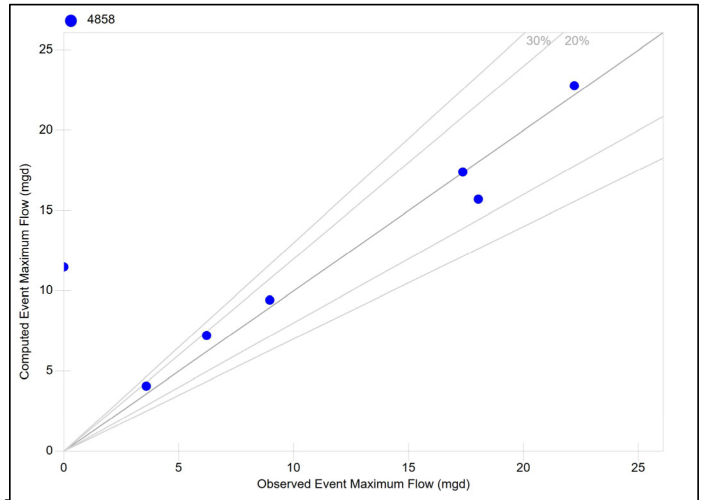


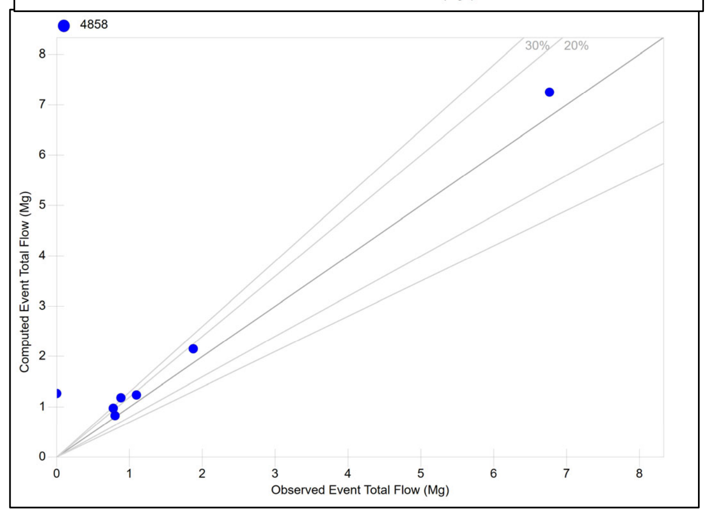
Calibration Events
6/15/16

FM12 – CSO 57

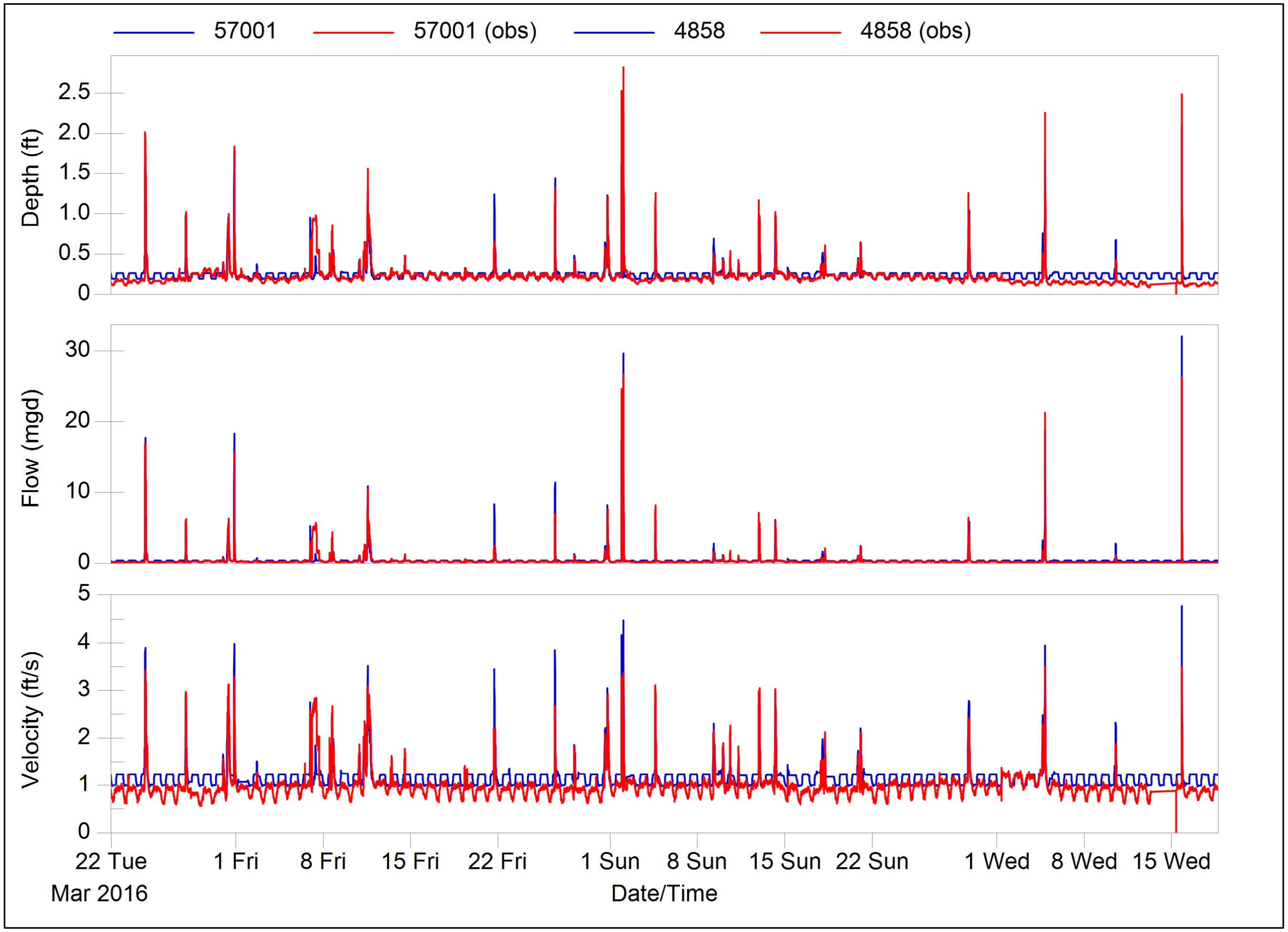
Fall 2015



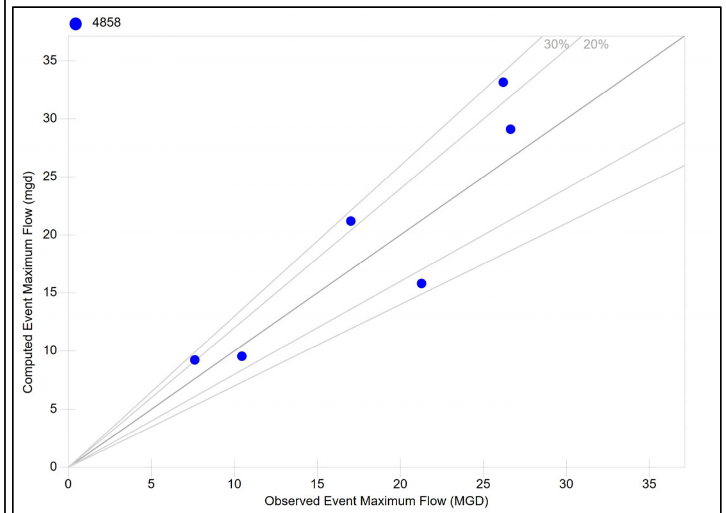


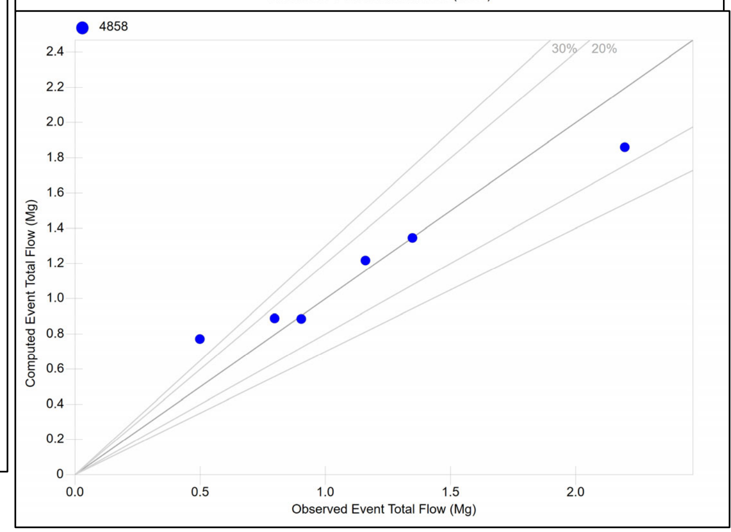


FM12 – CSO 57

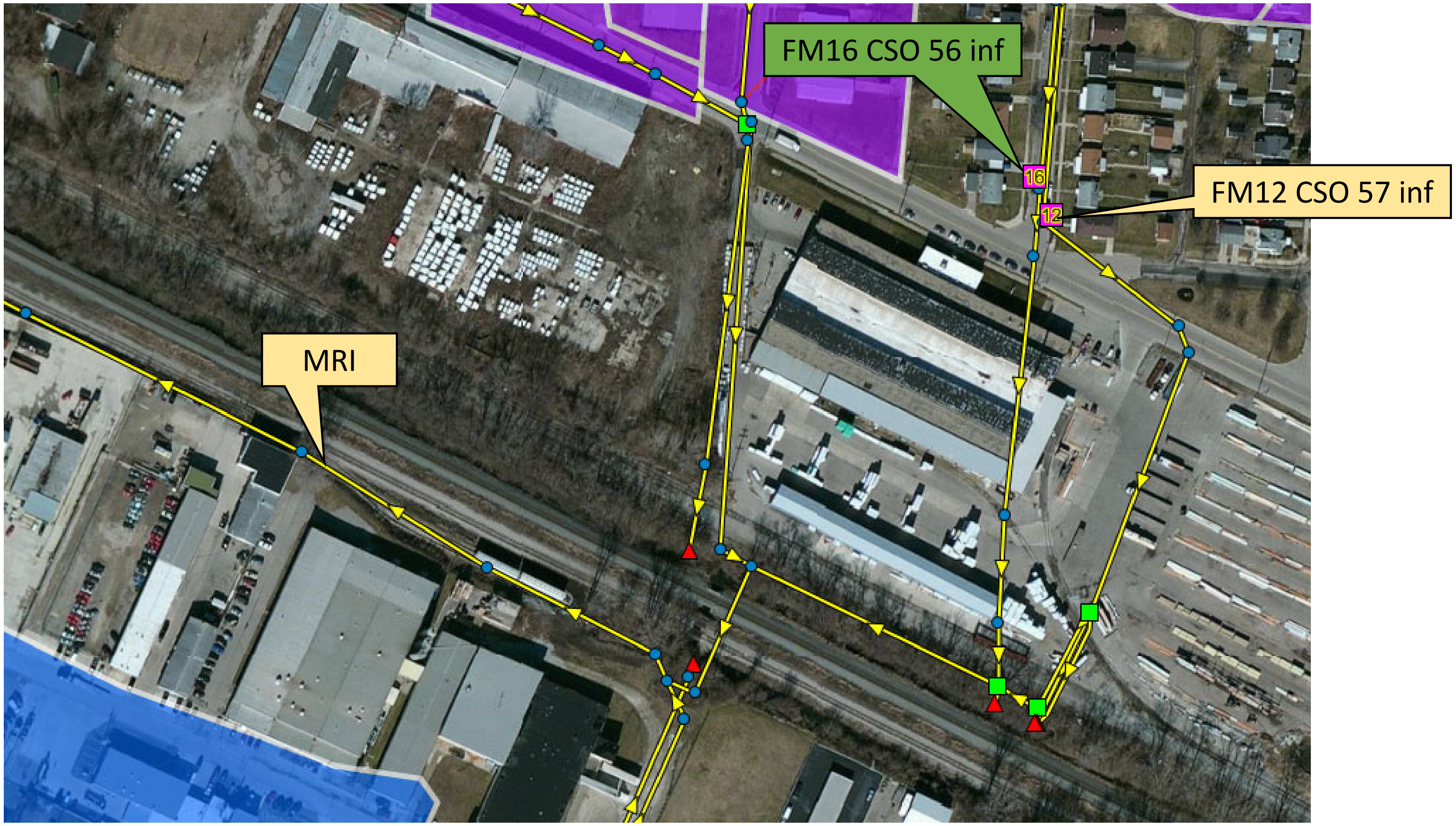


Spring 2016

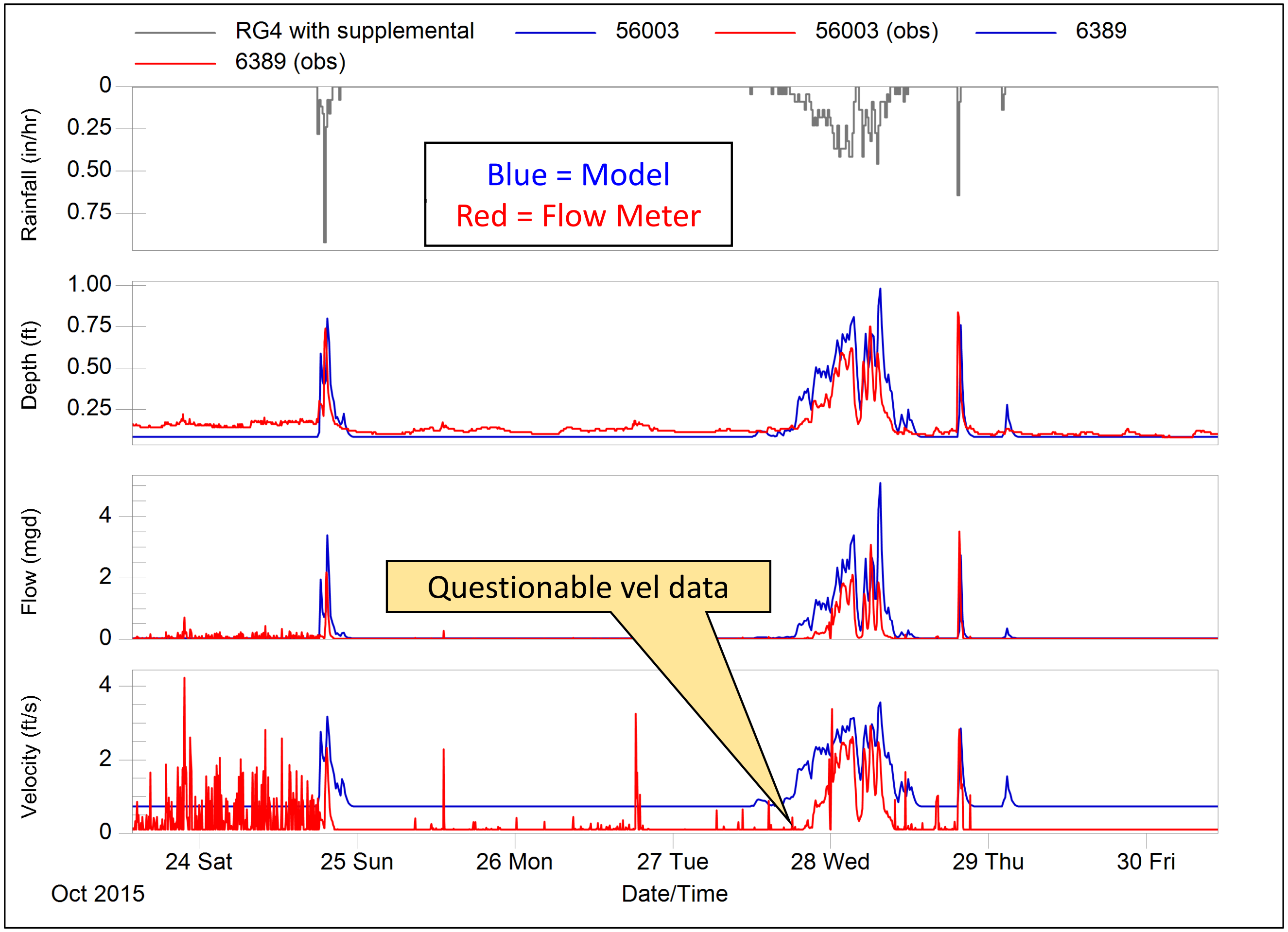




FM 16
CSO 56 inf



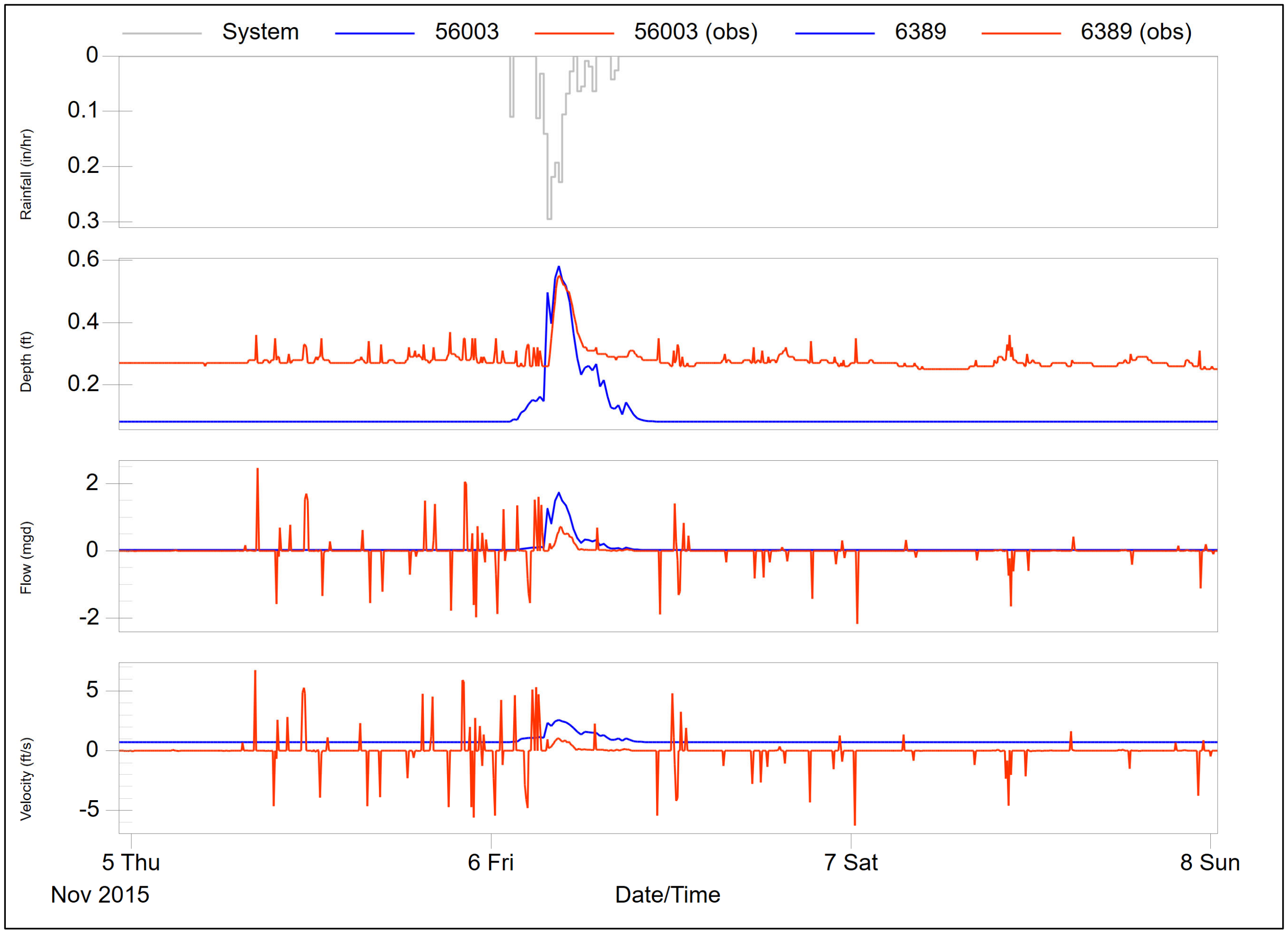
FM16 – CSO 56



Calibration Events

10/24/15, 10/27/15

FM16 – CSO 56



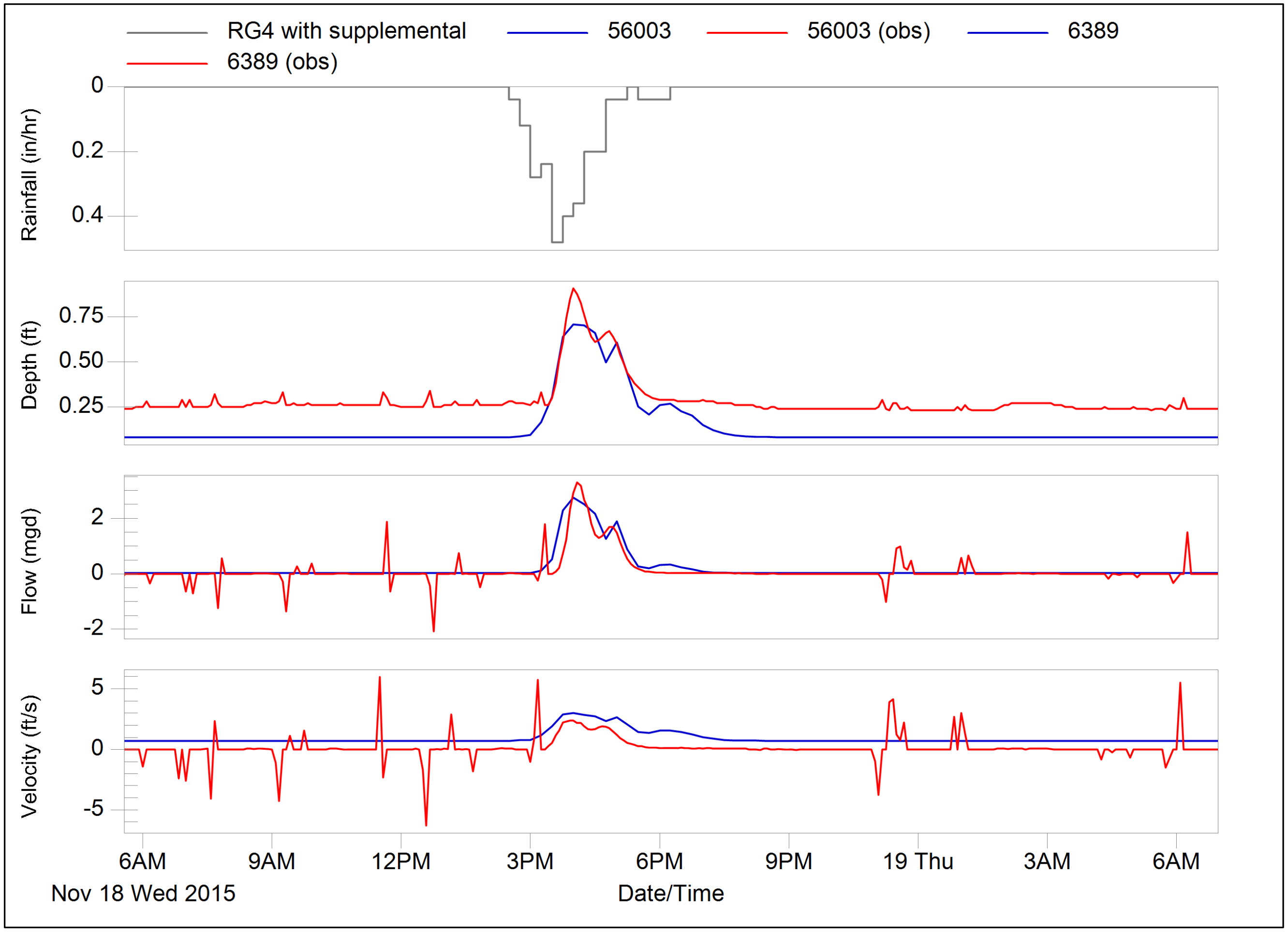
Calibration Events
11/6/15

FM16 – CSO 56

Calibration Events

11/11/15

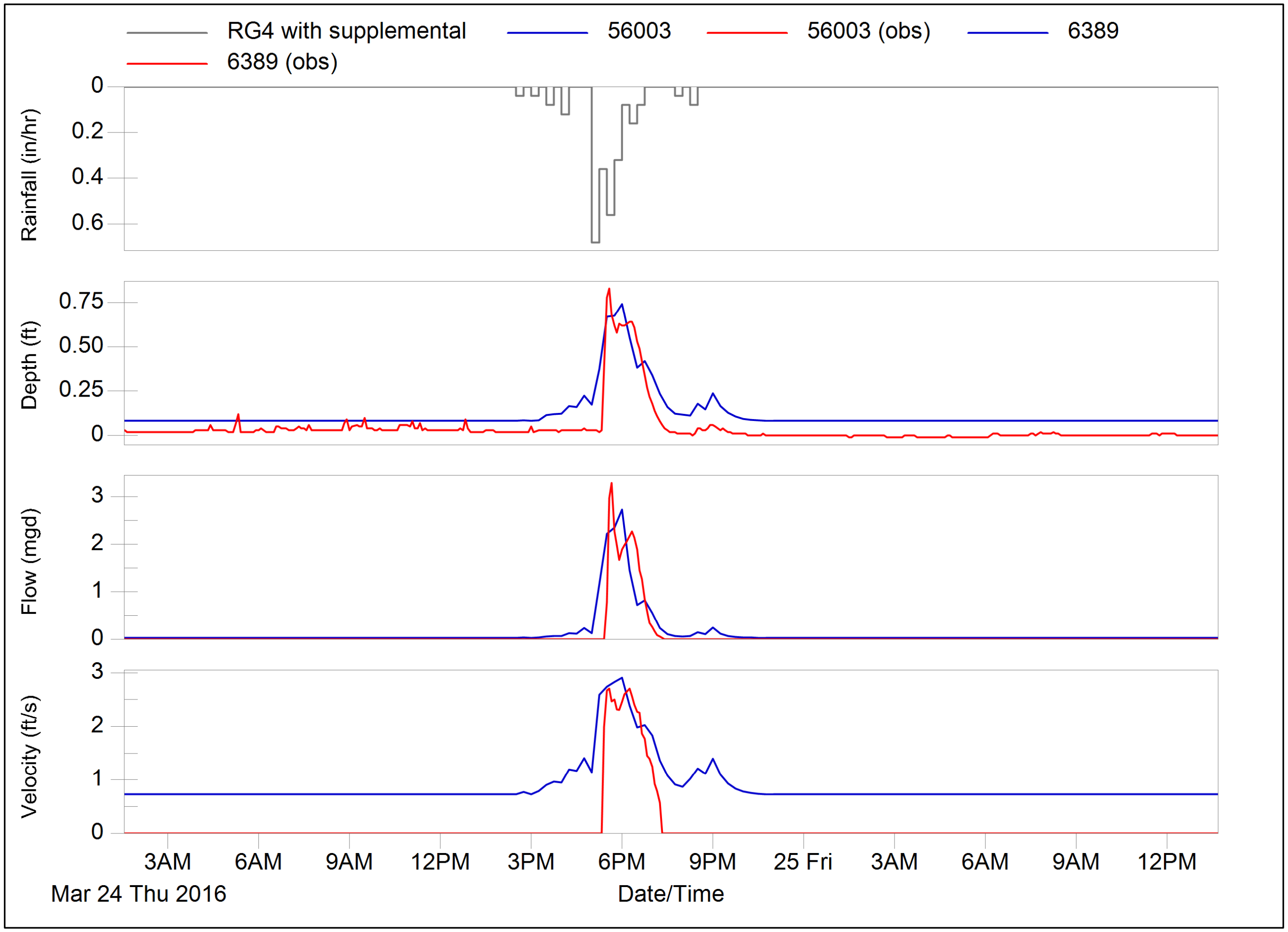
FM16 – CSO 56



Calibration Events

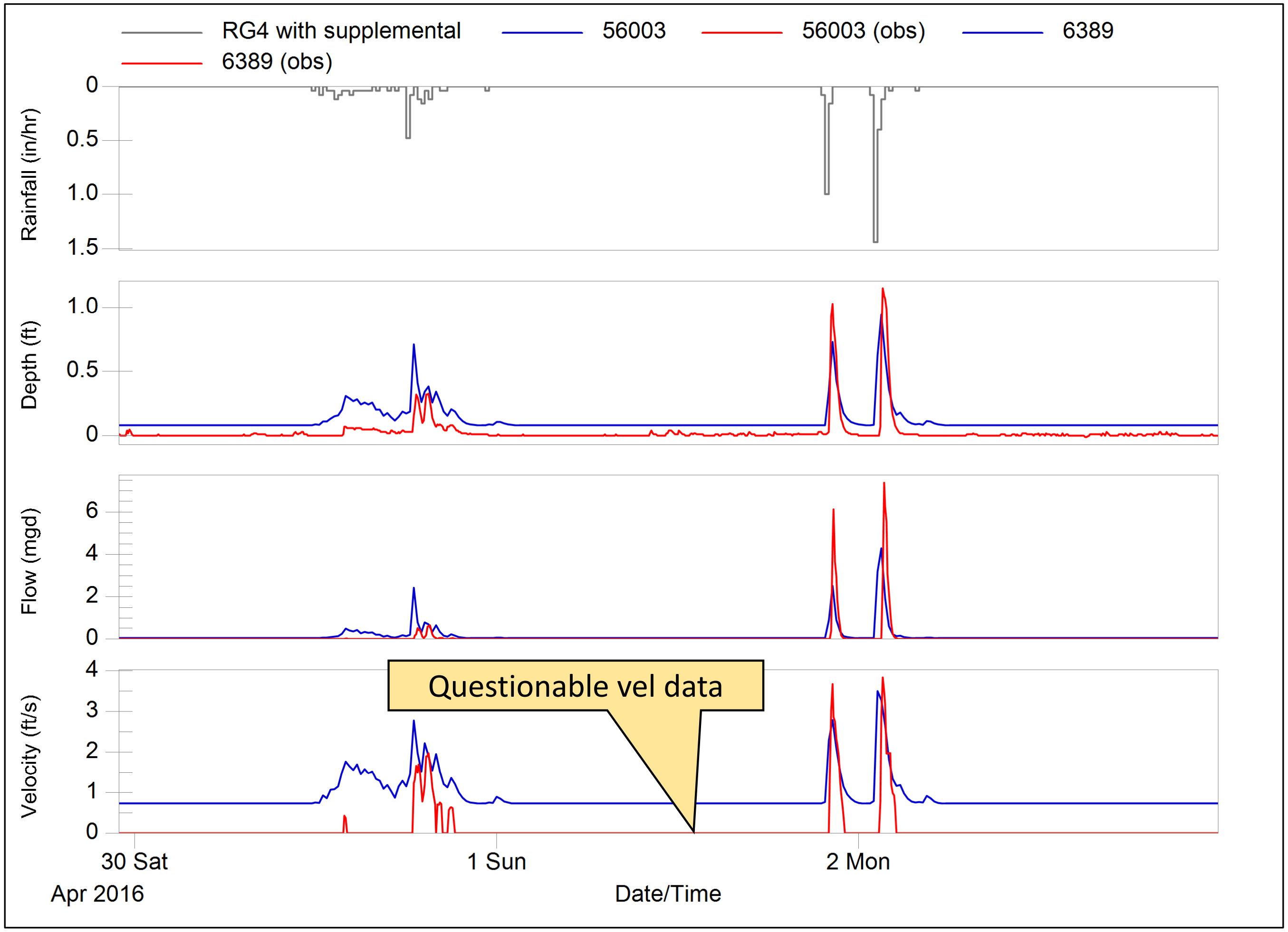
11/18/15

FM16 – CSO 56



Calibration Event
3/24/16

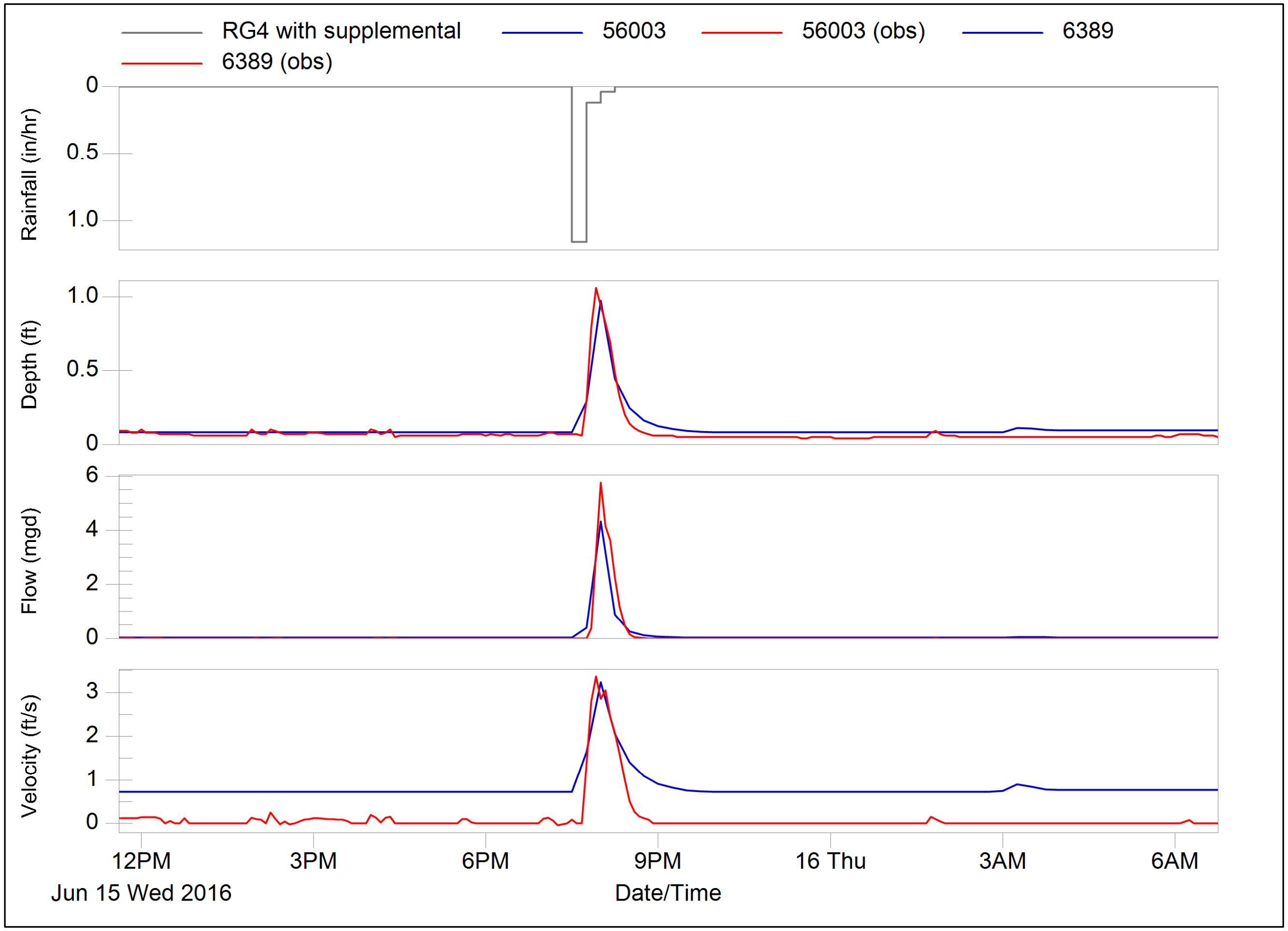
FM16 – CSO 56



Calibration Events

4/30/16, 5/1/16

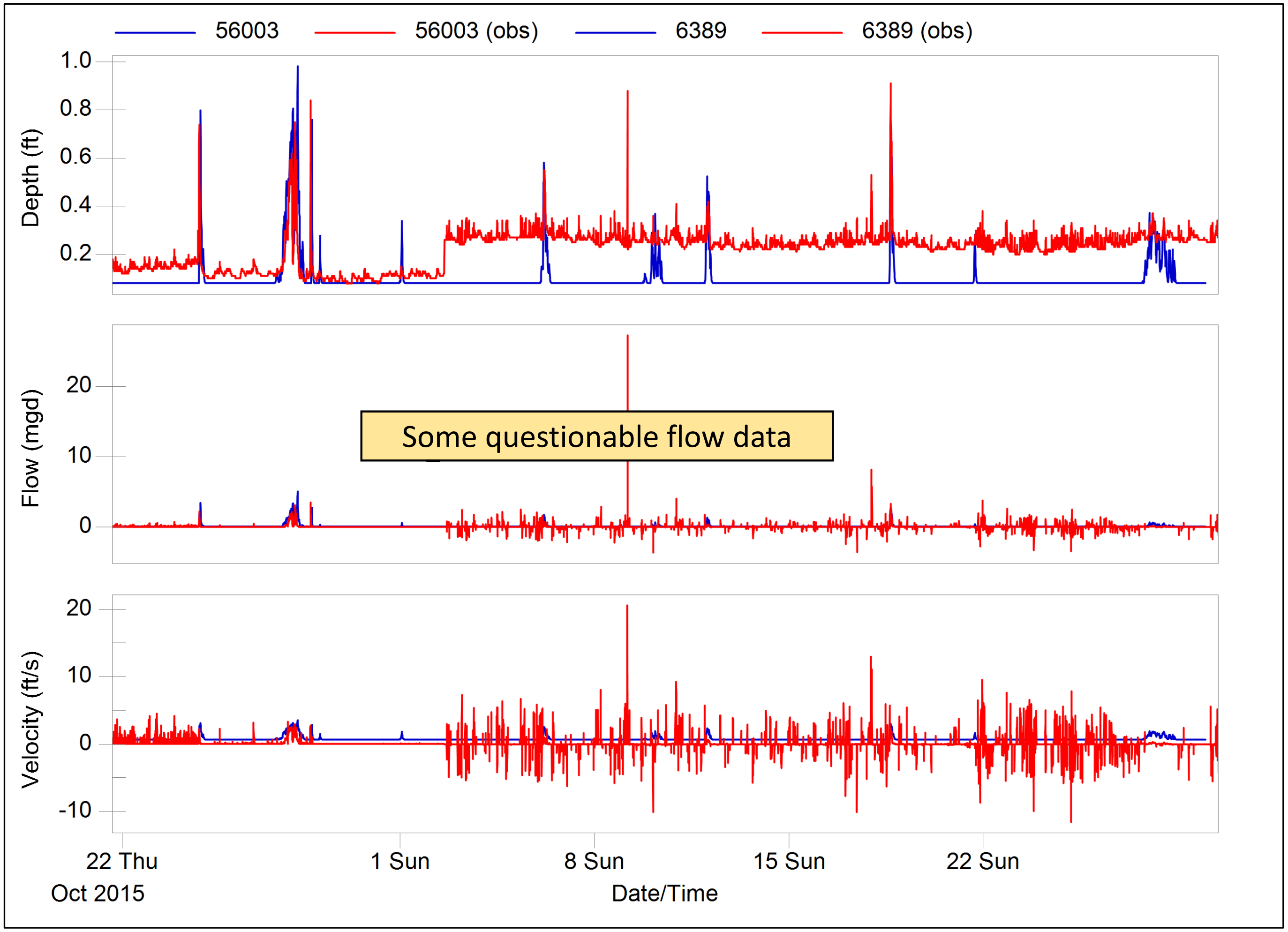
FM16 – CSO 56



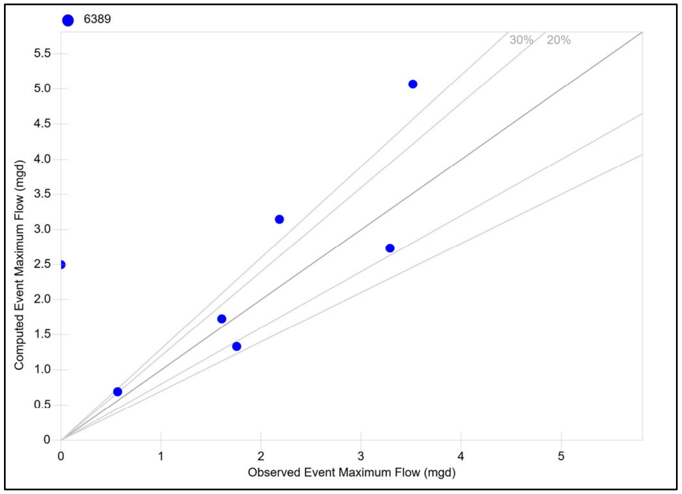
Calibration Events

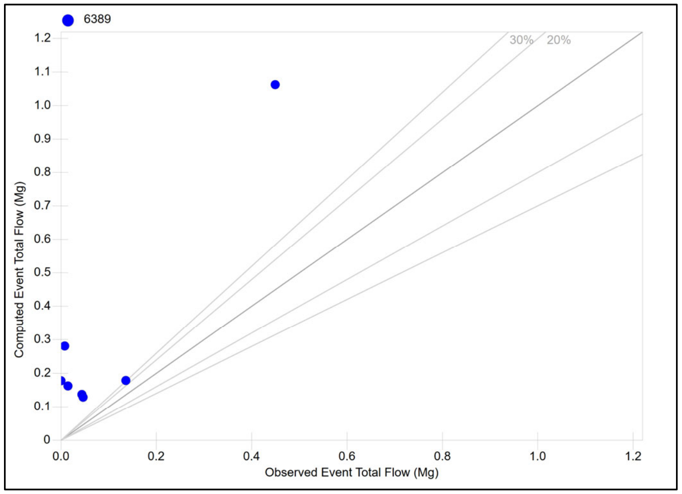
6/15/16

FM16 – CSO 56

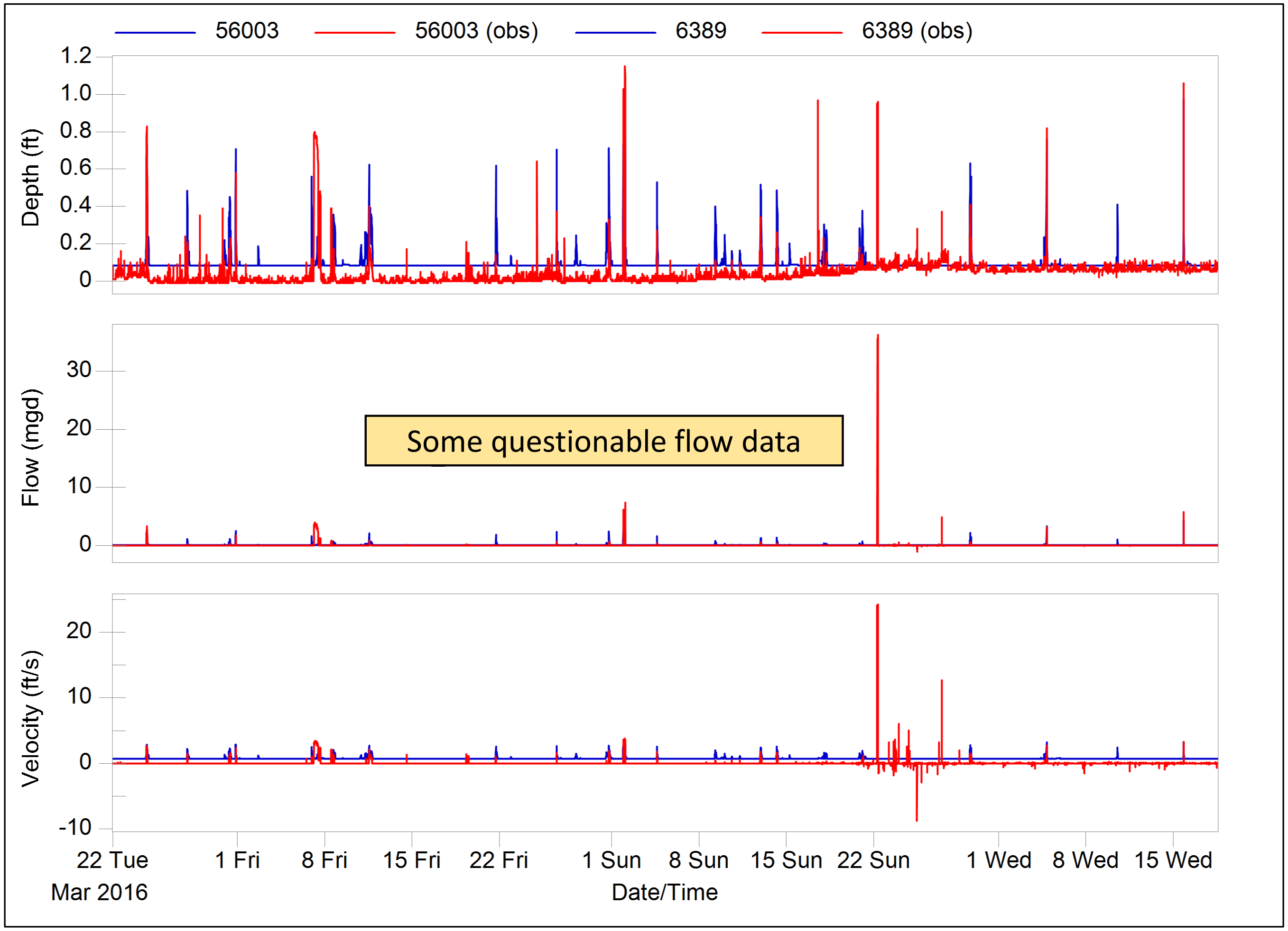


Fall 2015

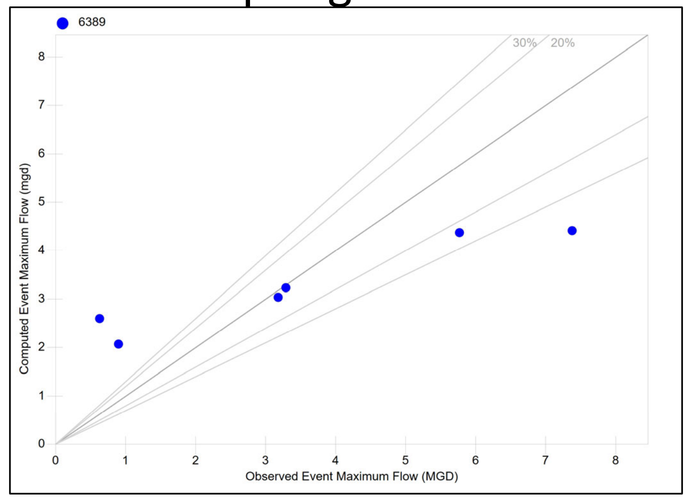


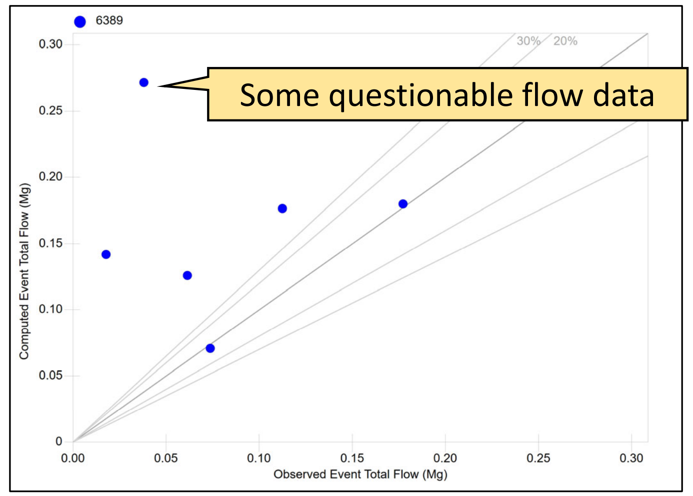


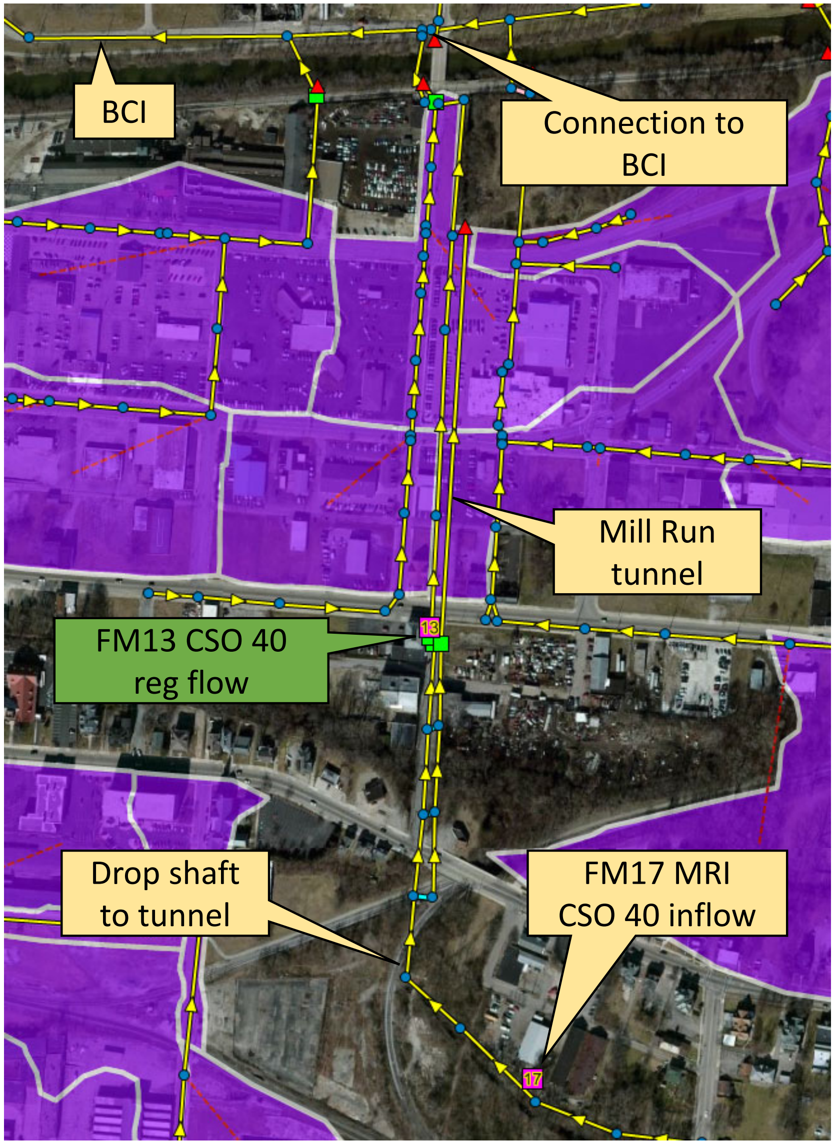
FM16 – CSO 56



Spring 2016

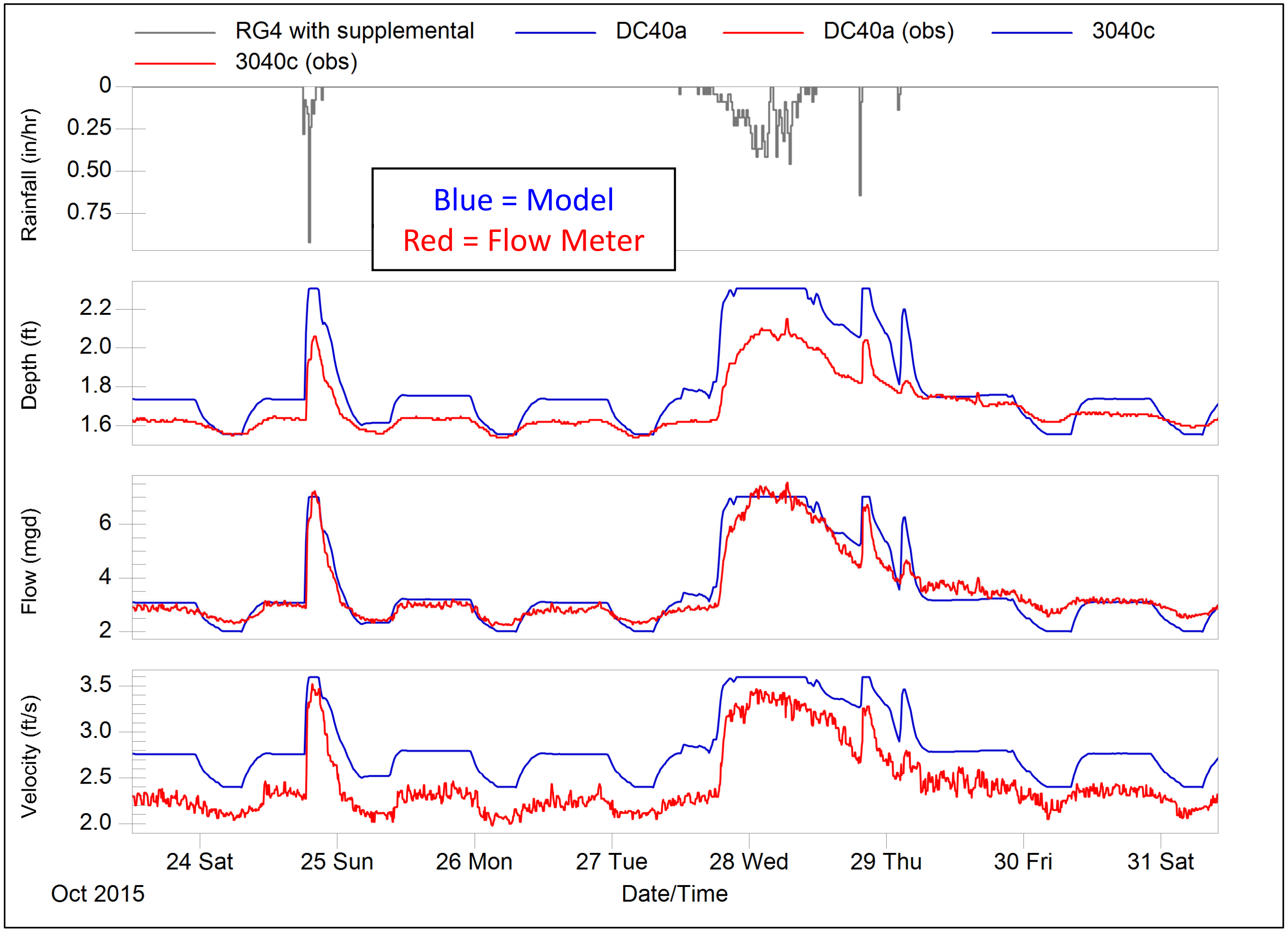






FM 13
CSO 40 (regulator)

FM13 – CSO 40 (regulated flow)



Calibration Events
10/24/15, 10/27/15

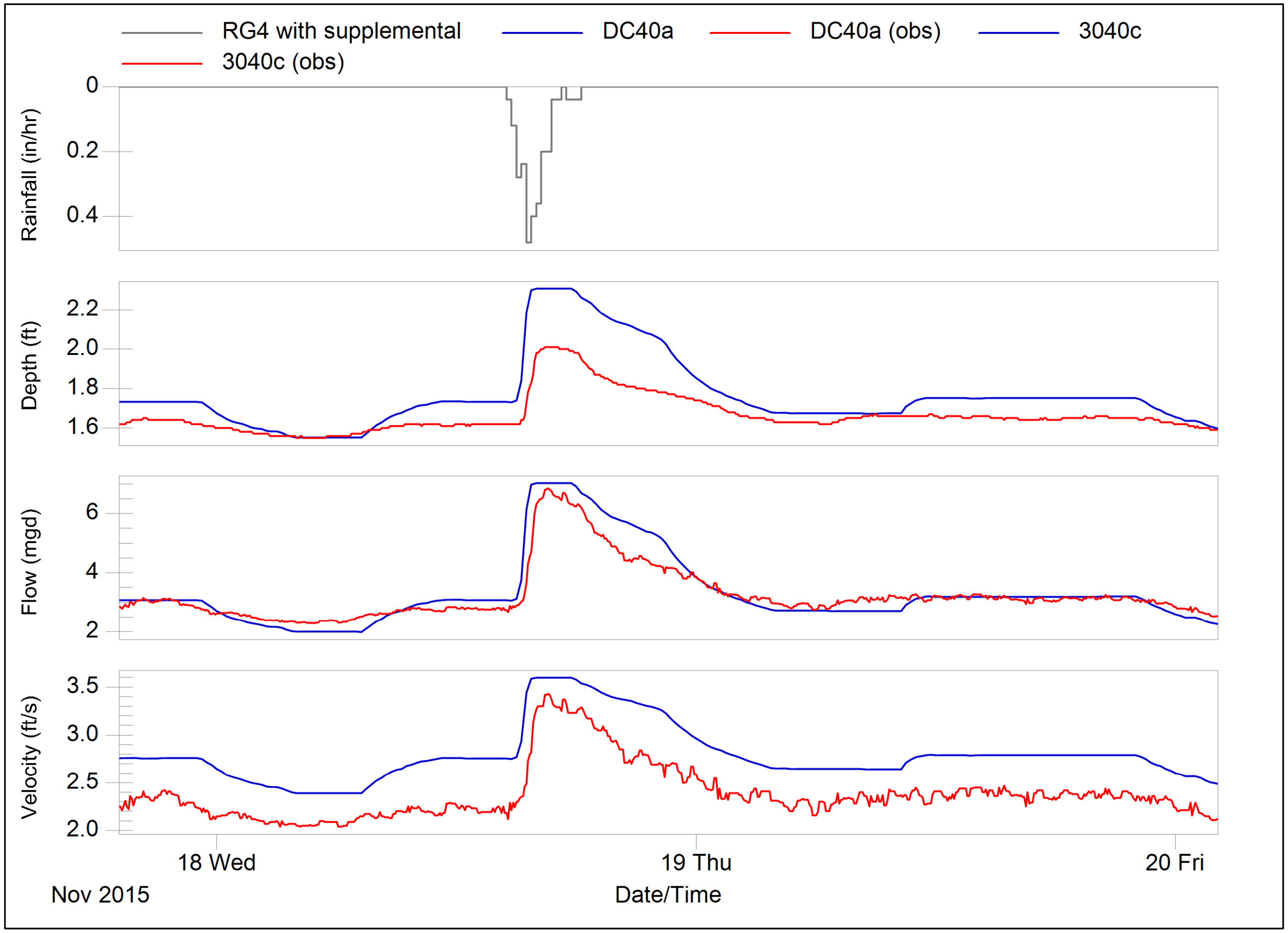
FM13 – CSO 40 (regulated flow)

Calibration Events
11/6/15

FM13 – CSO 40 (regulated flow)

Calibration Events
11/11/15

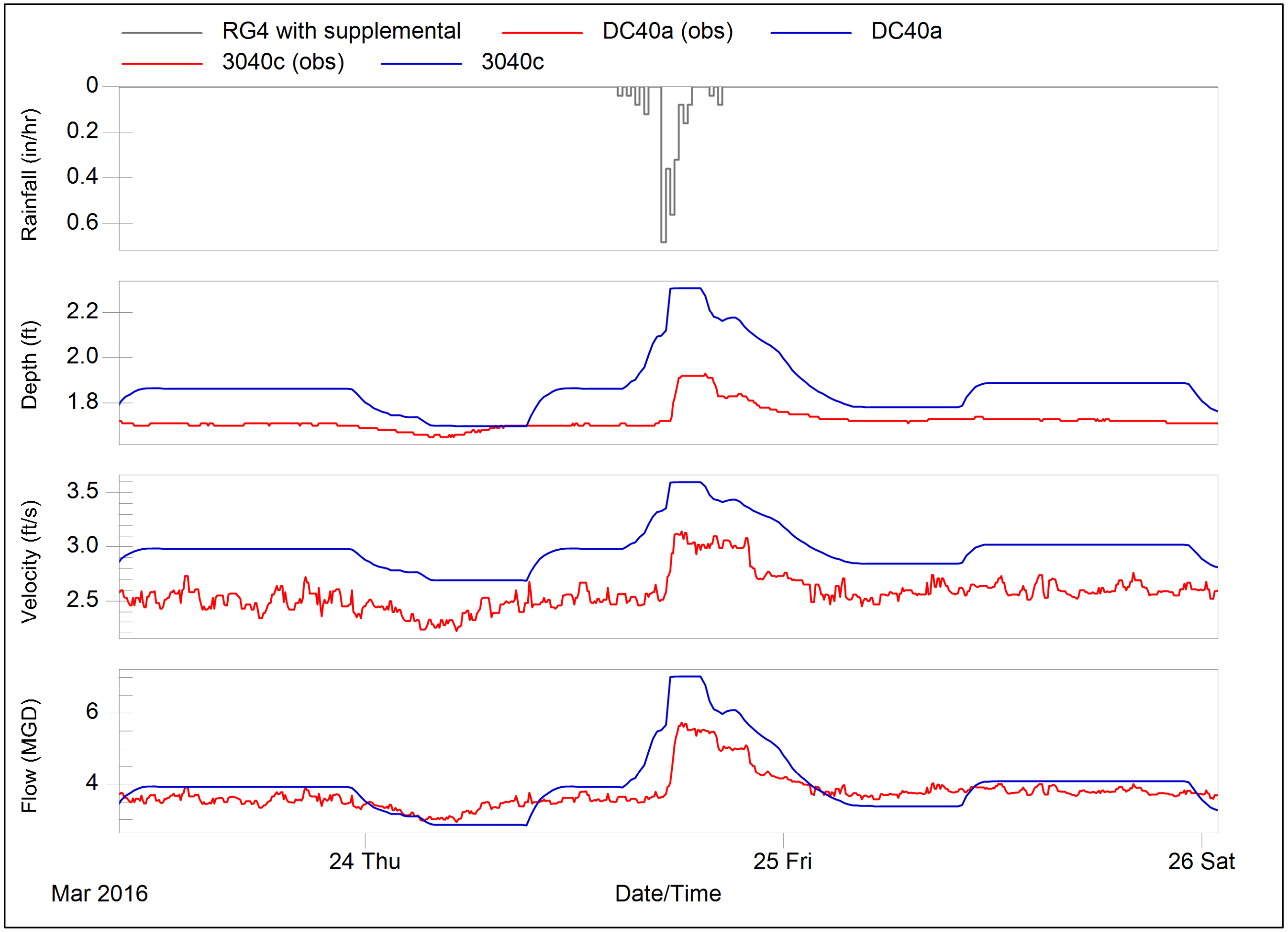
FM13 – CSO 40 (regulated flow)



Calibration Events

11/18/15

FM13 – CSO 40 (regulated flow)



Calibration Event
3/24/16

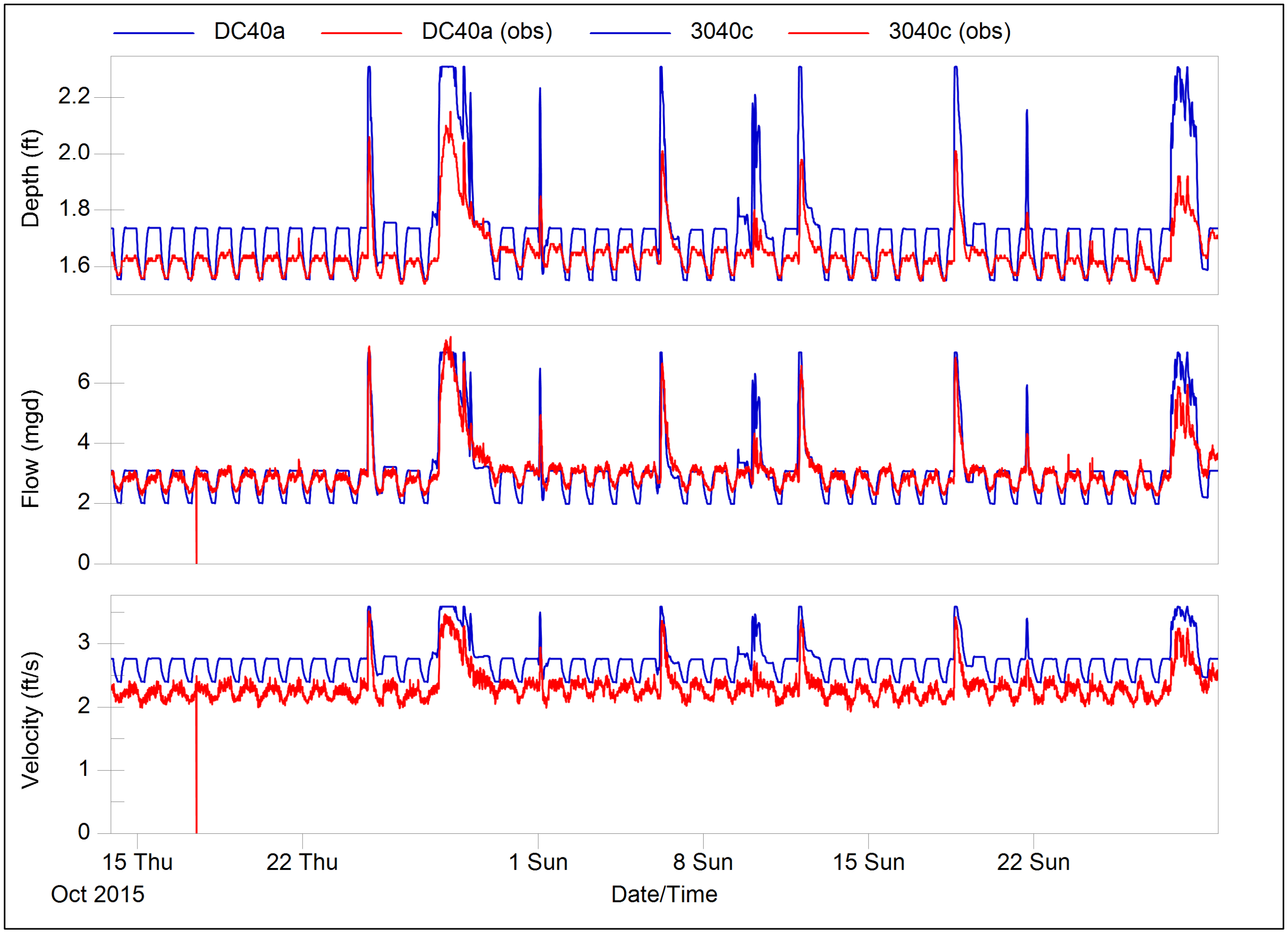
FM13 – CSO 40 (regulated flow)

Calibration Events
4/30/16, 5/1/16

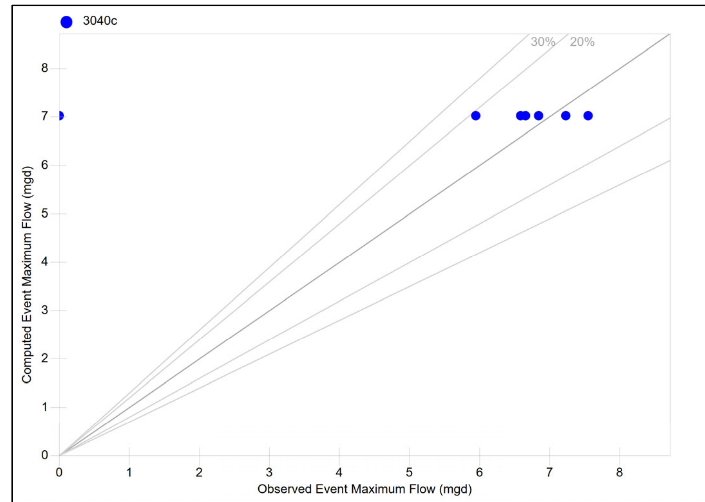
FM13 – CSO 40 (regulated flow)

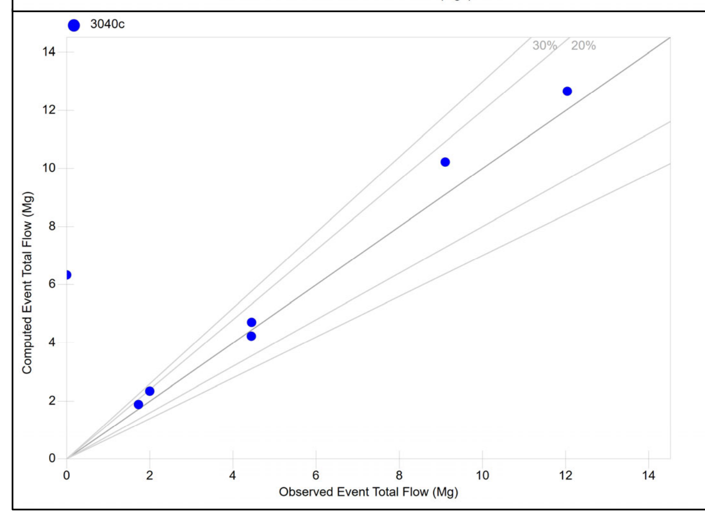
Calibration Events
6/15/16

FM13 – CSO 40 (regulated flow)

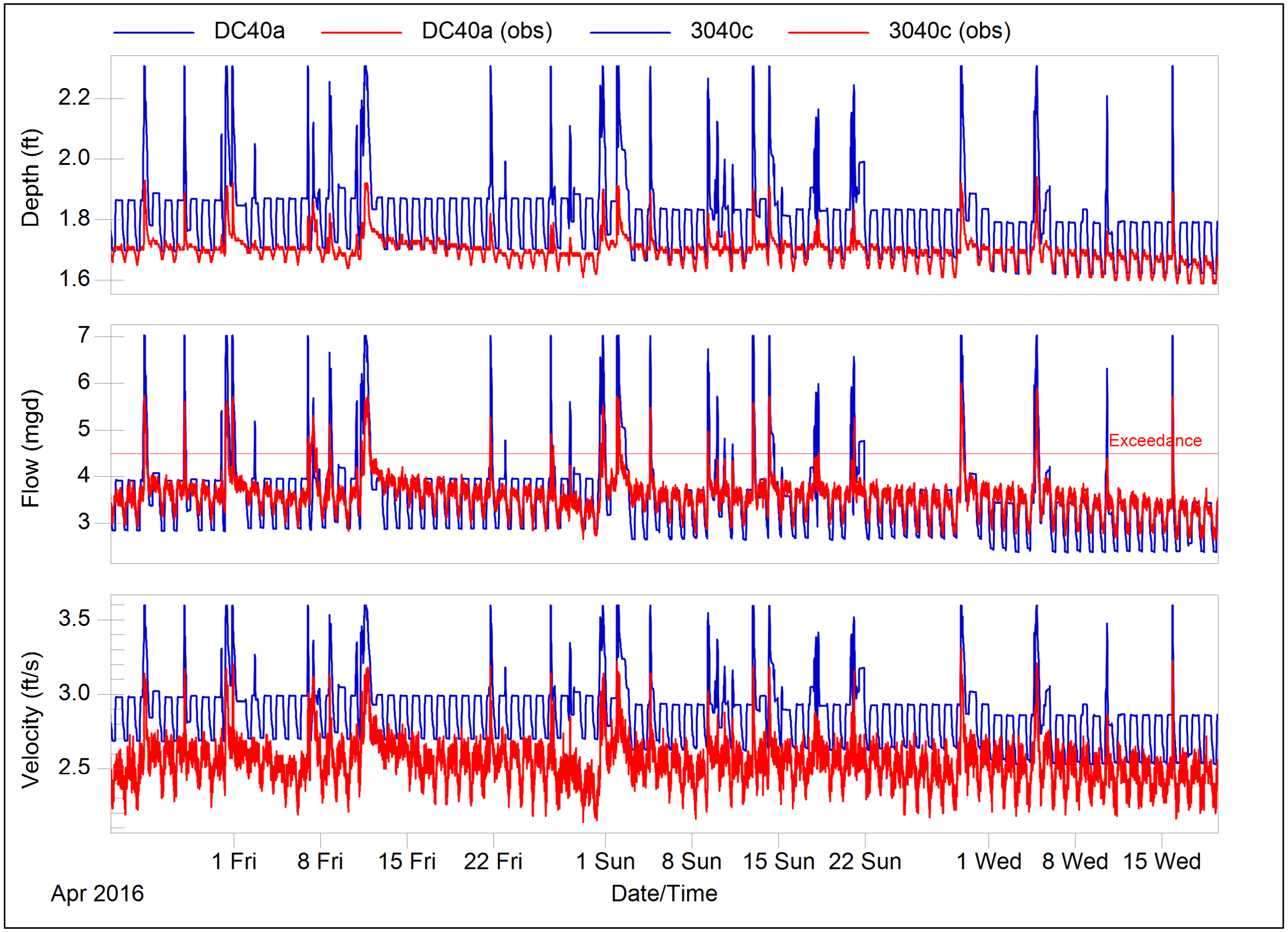


Fall 2015

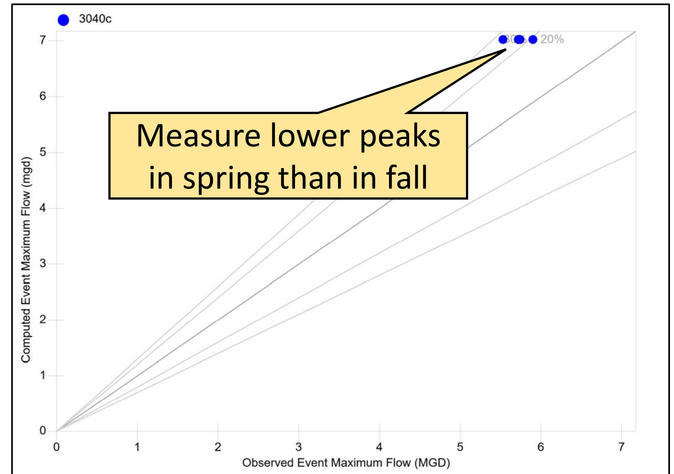


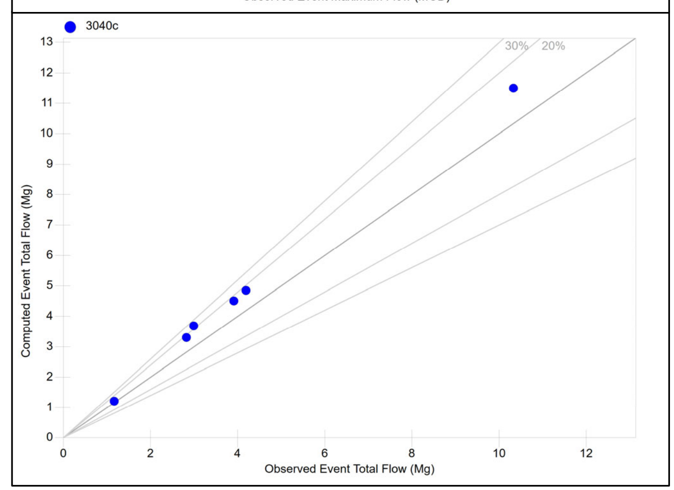


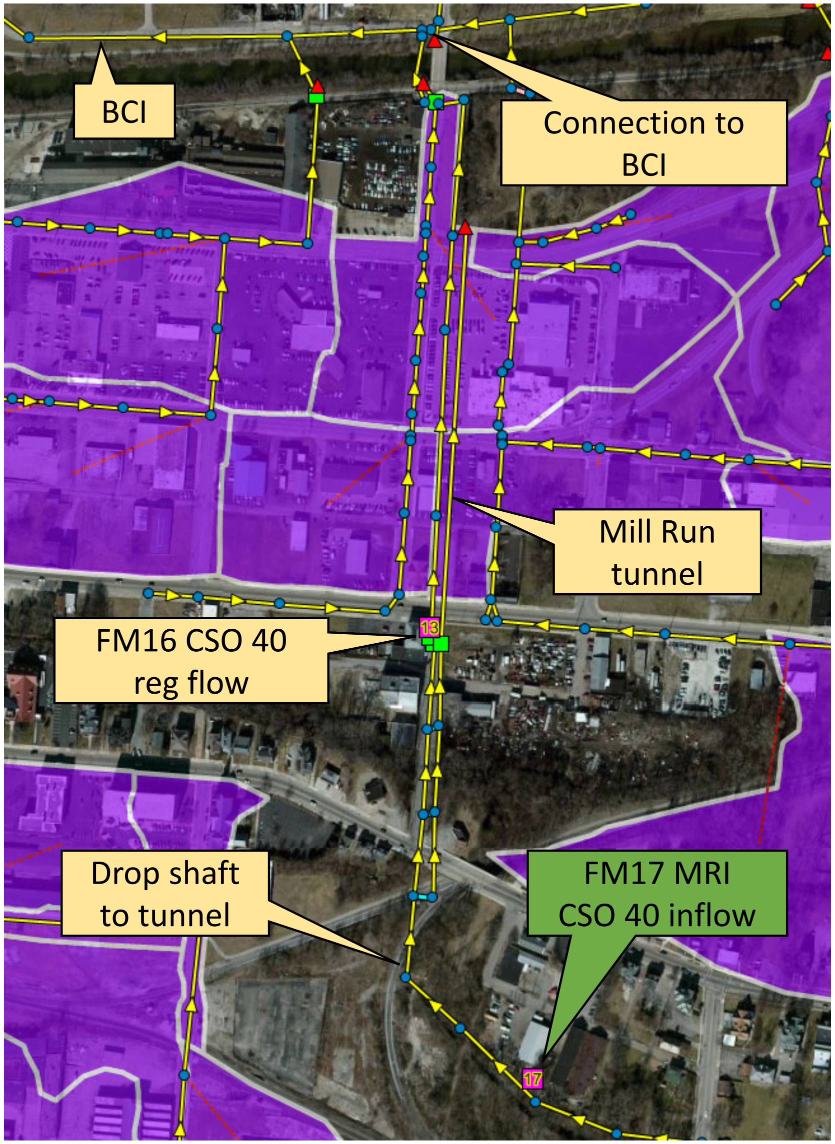
FM13 – CSO 40 (regulated flow)



Spring 2016

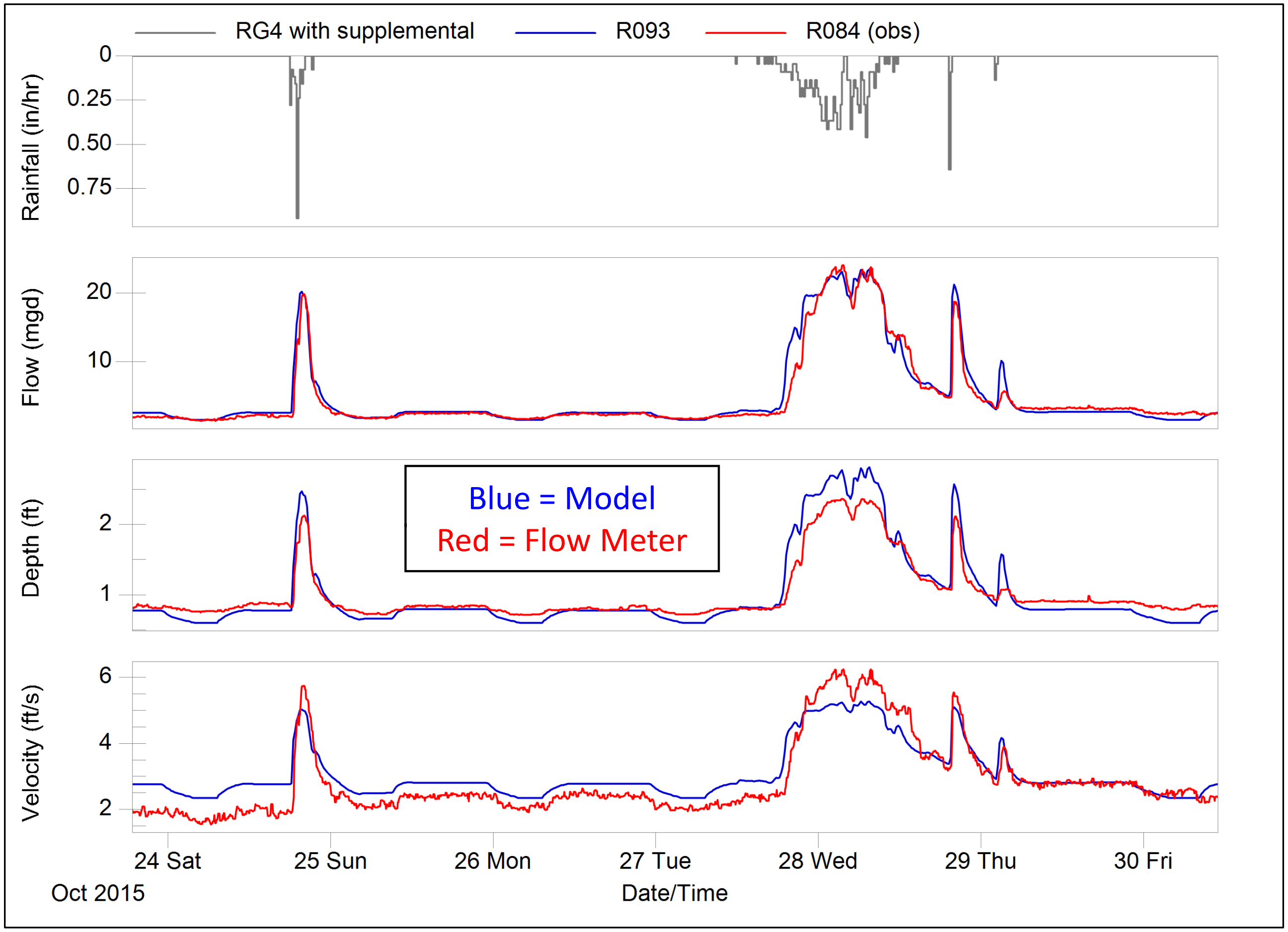






FM 17
MRI (CSO 40 inflow)

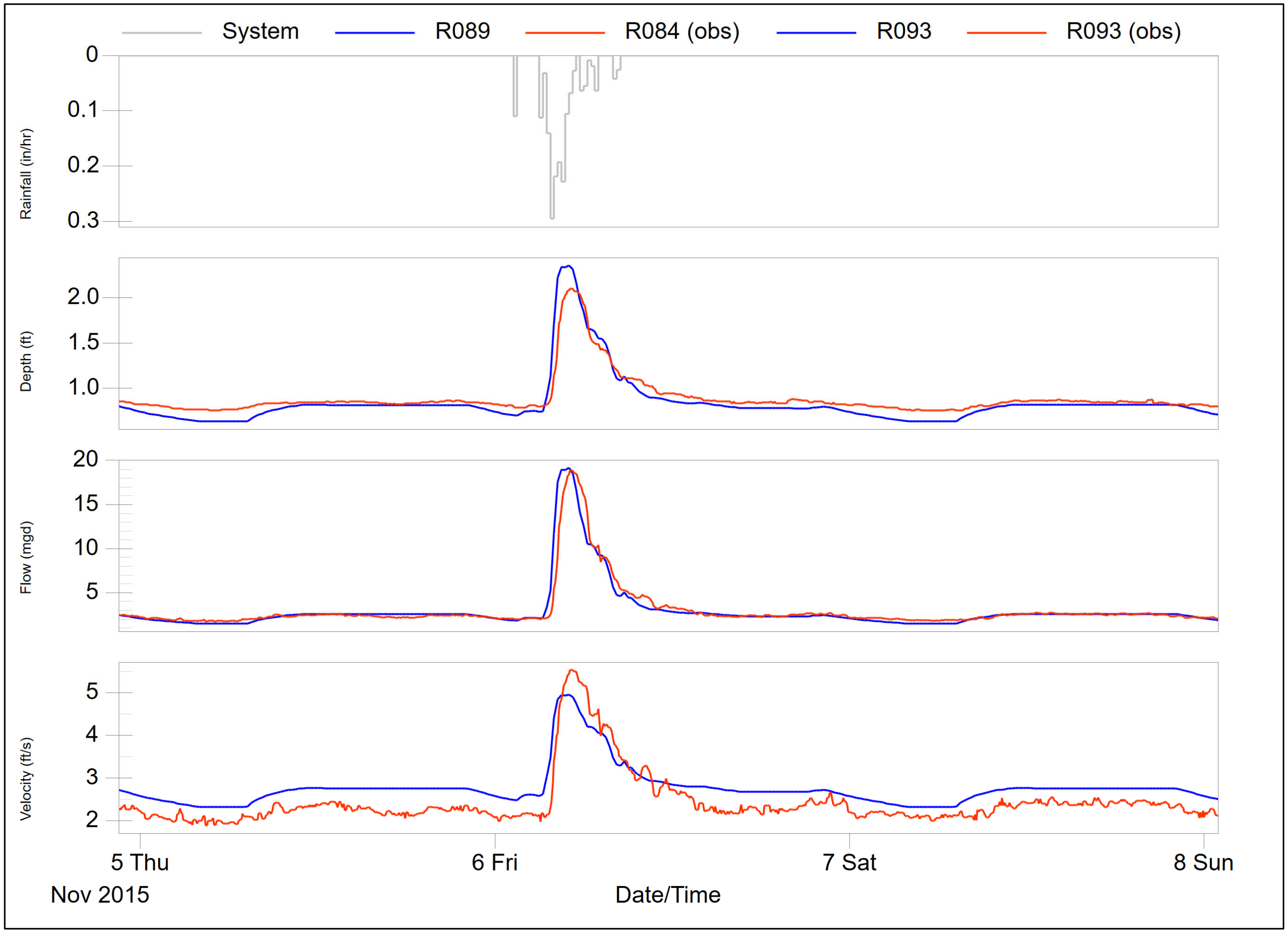
FM17 – MRI (CSO 40 influent flow)



Calibration Events

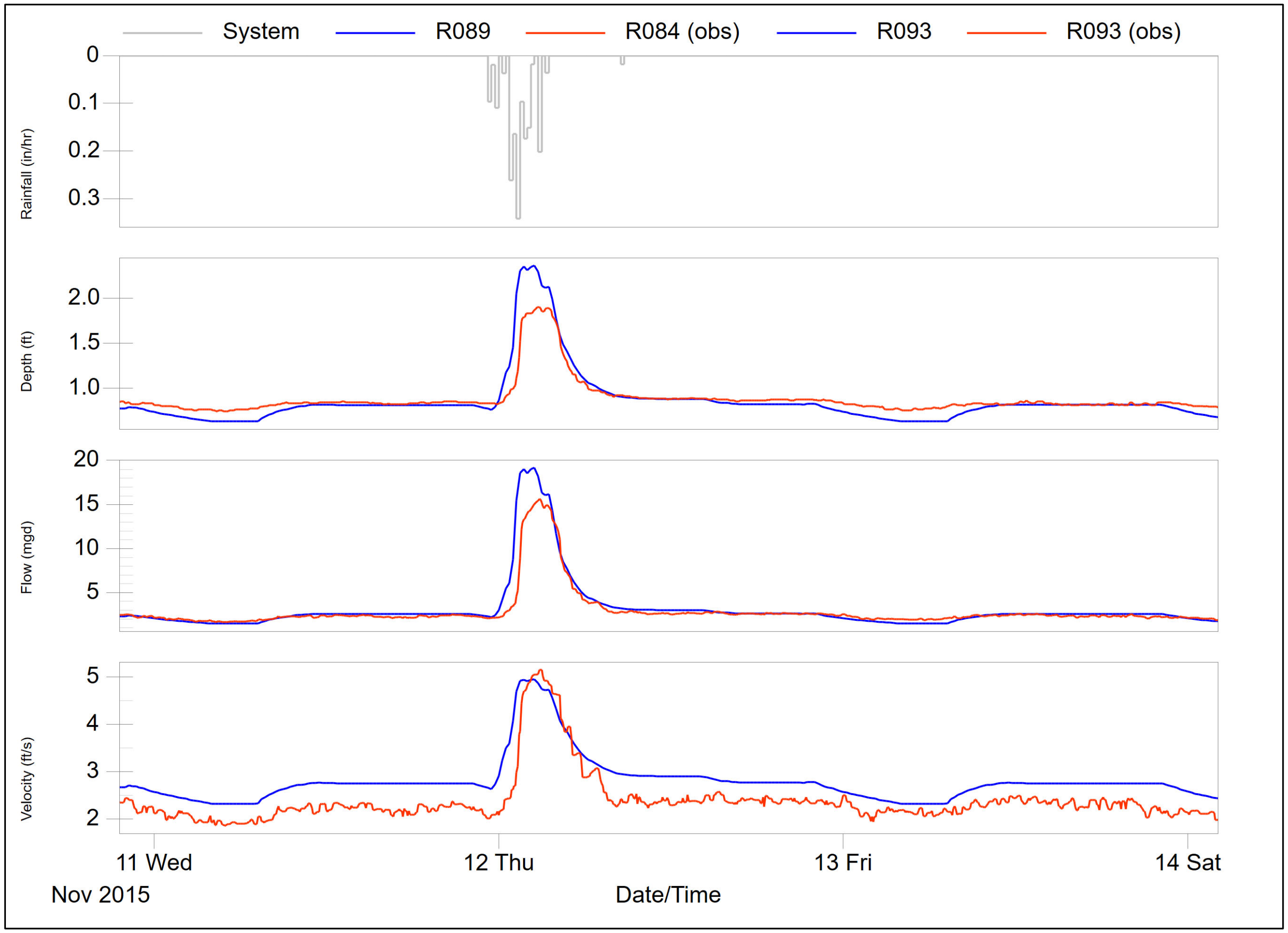
10/24/15, 10/27/15

FM17 – MRI (CSO 40 influent flow)



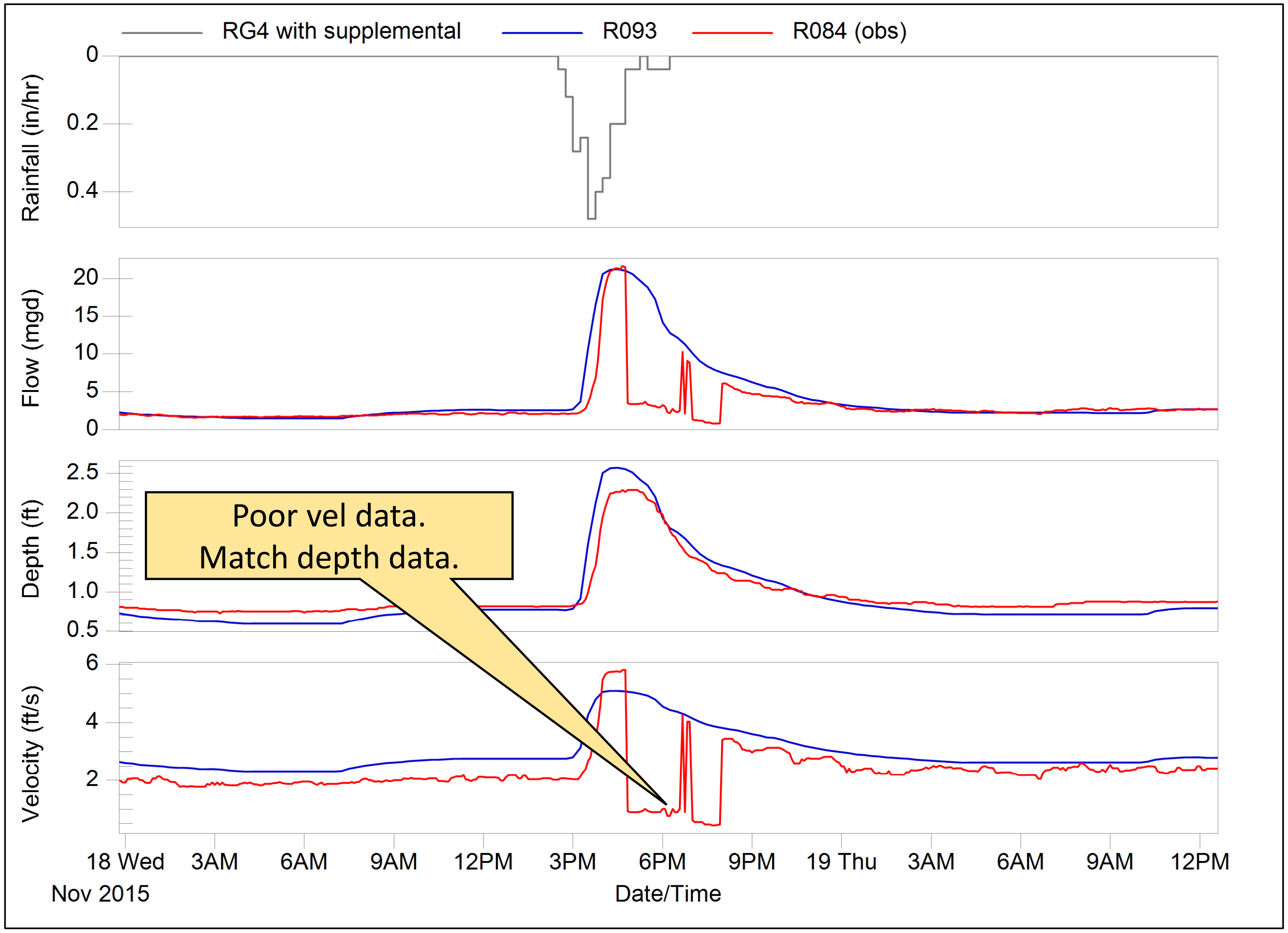
Calibration Events
11/6/15

FM17 – MRI (CSO 40 influent flow)



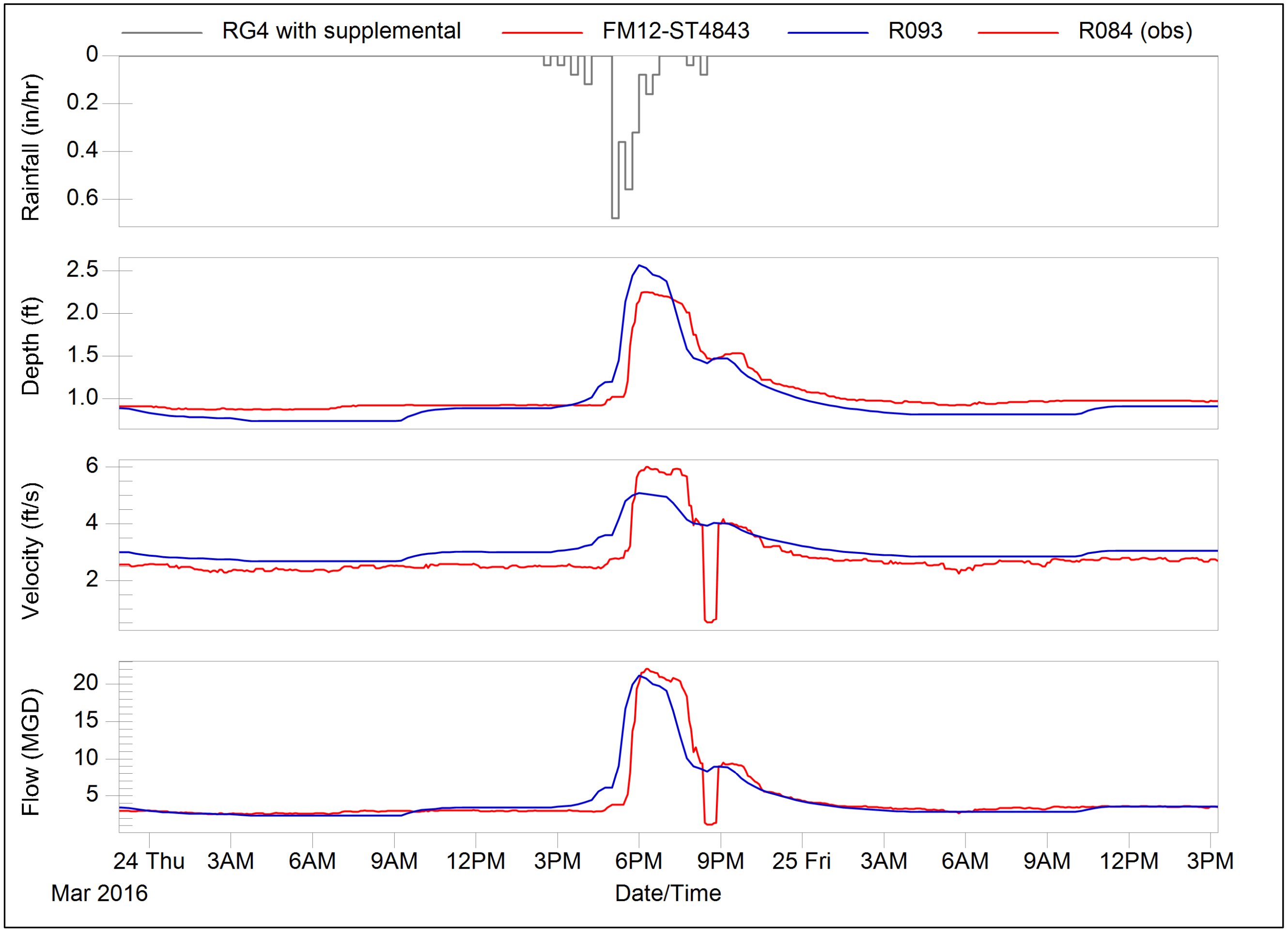
Calibration Events
11/11/15

FM17 – MRI (CSO 40 influent flow)



Calibration Events
11/18/15

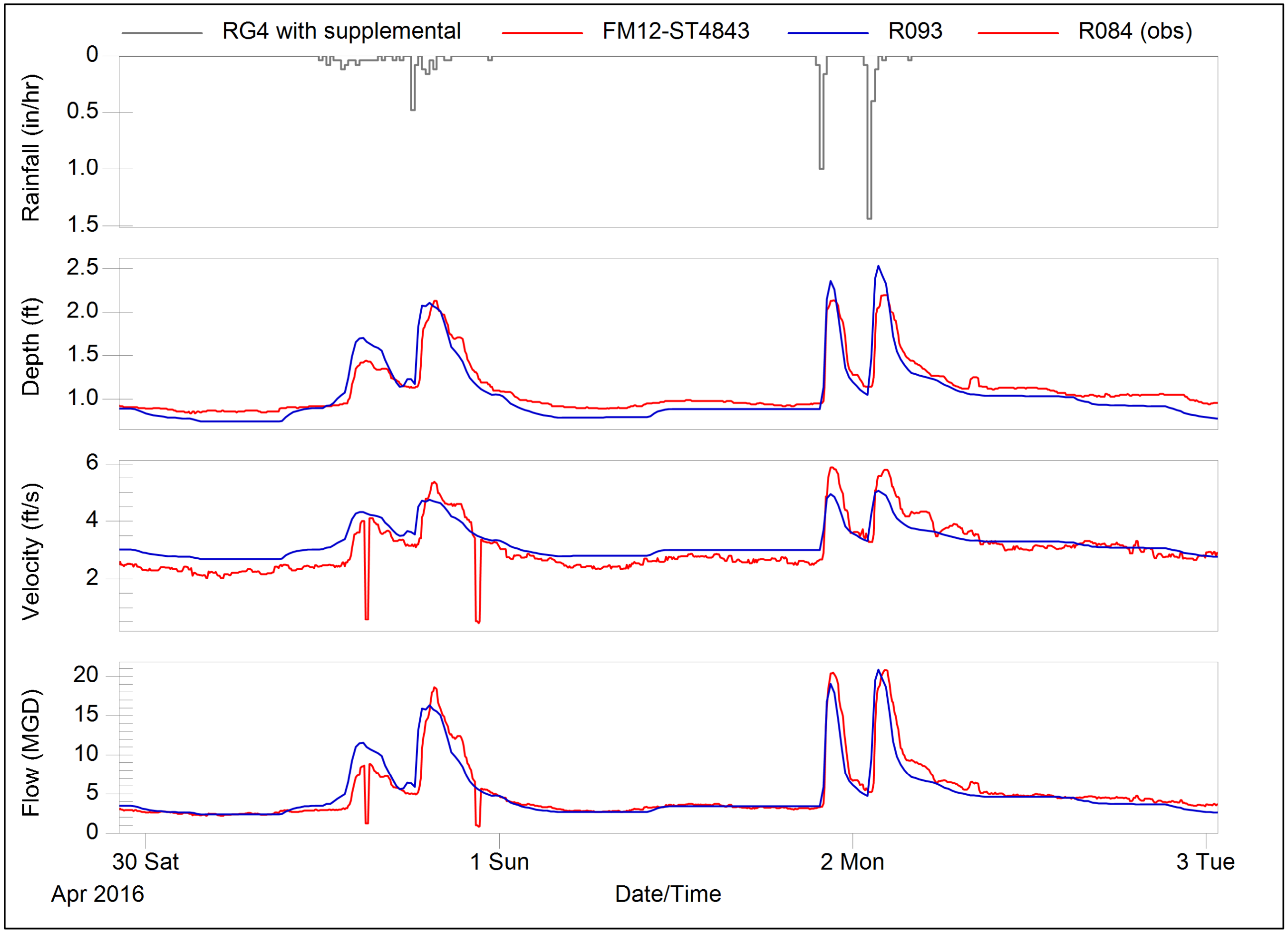
FM17 – MRI (CSO 40 influent flow)



Calibration Event

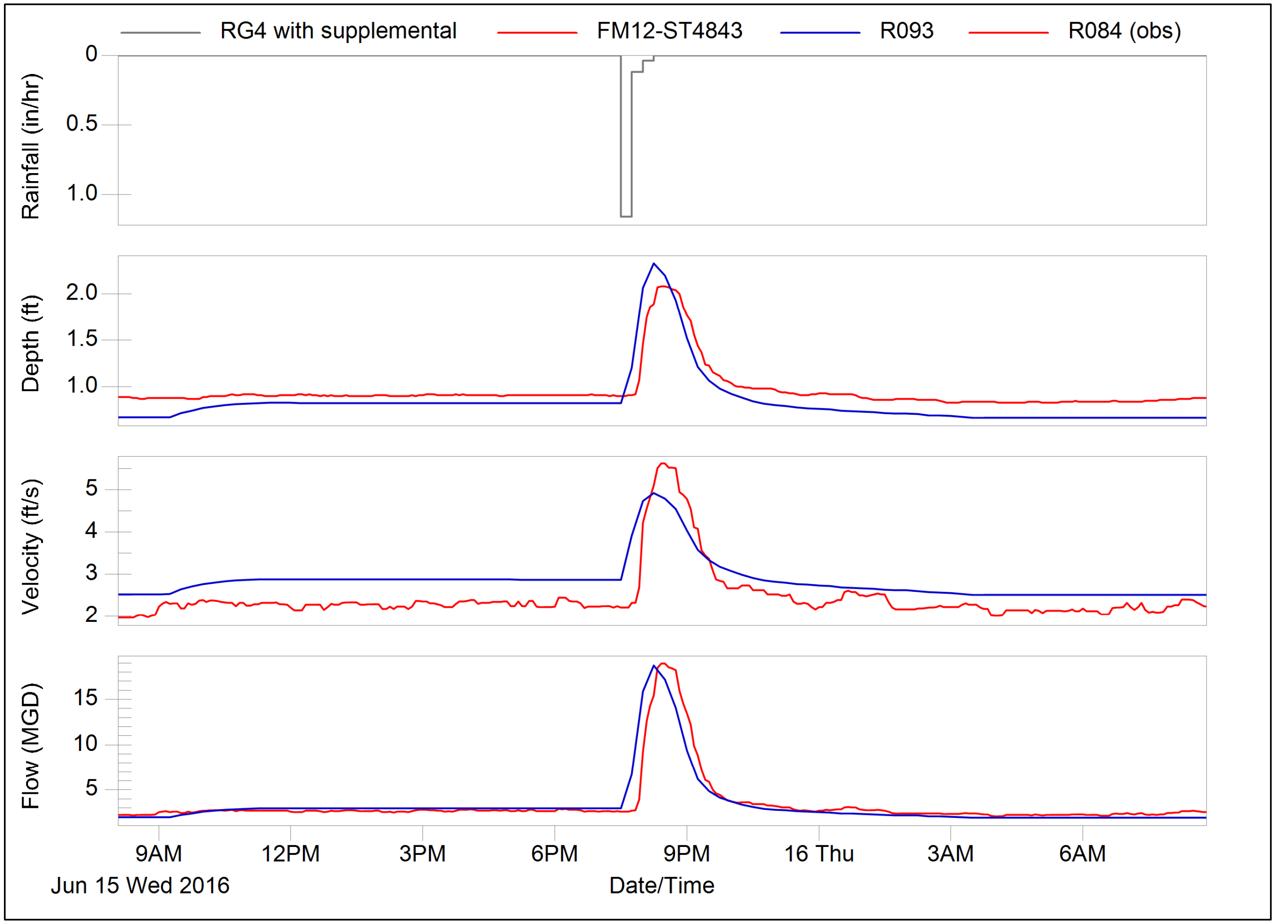
3/24/16

FM17 – MRI (CSO 40 influent flow)



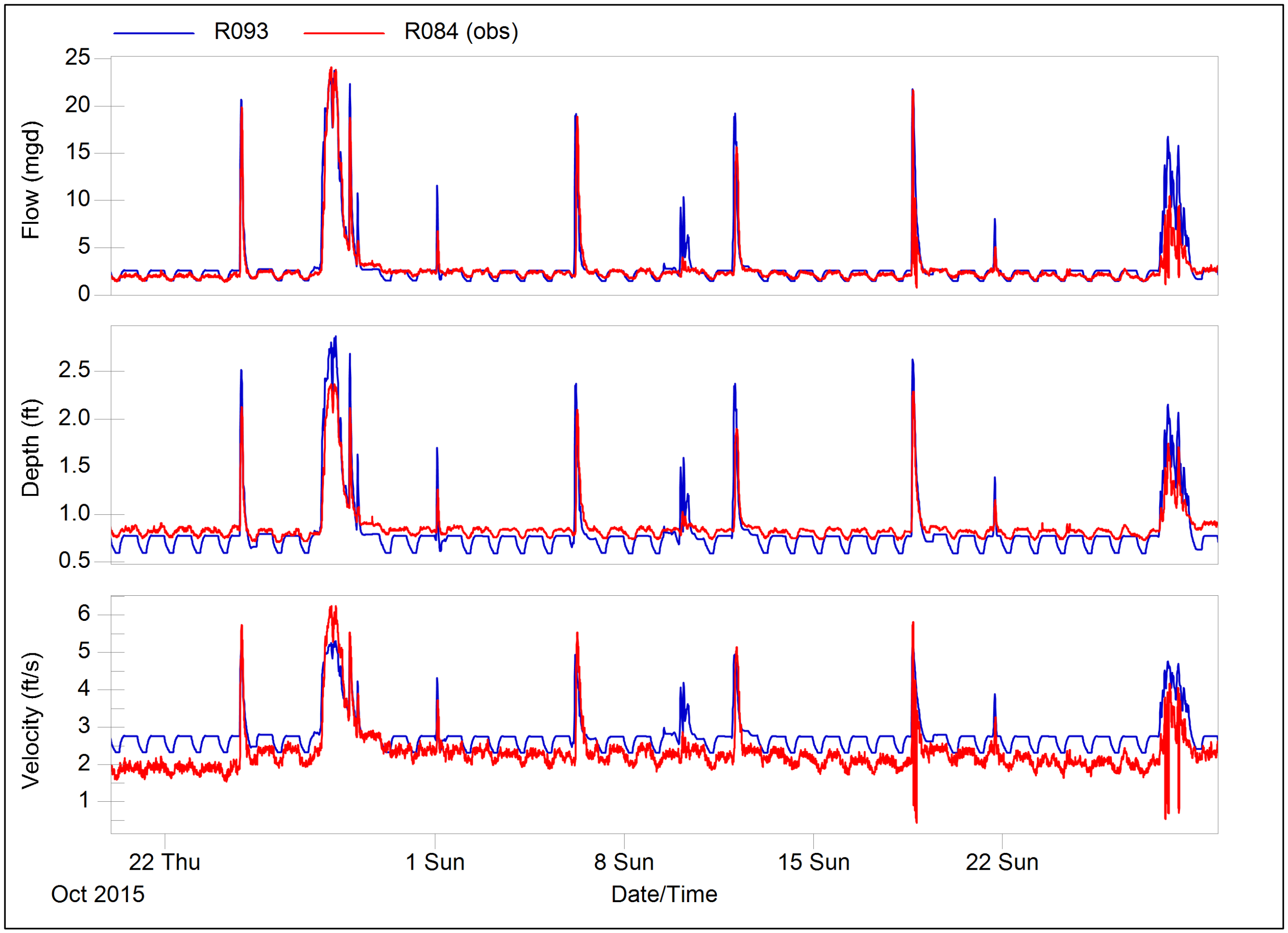
Calibration Events
4/30/16, 5/1/16

FM17 – MRI (CSO 40 influent flow)

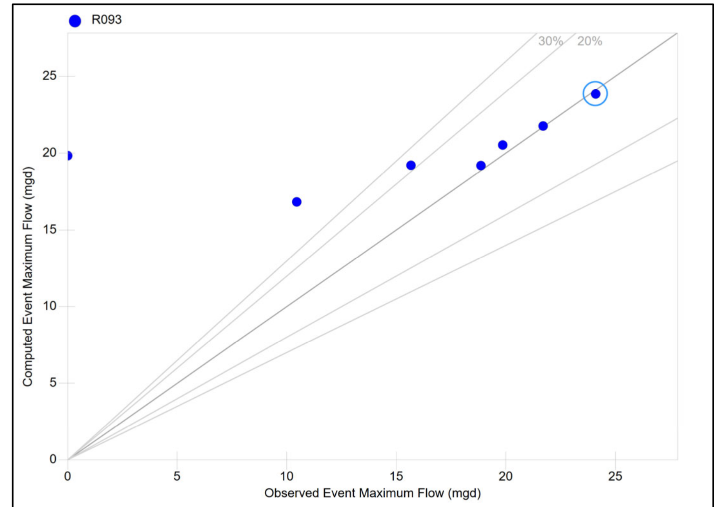


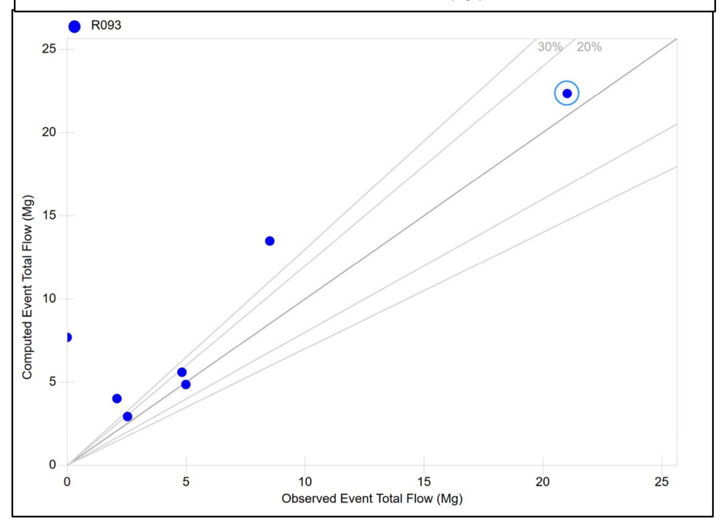
Calibration Events
6/15/16

FM17 – MRI (CSO 40 influent flow)



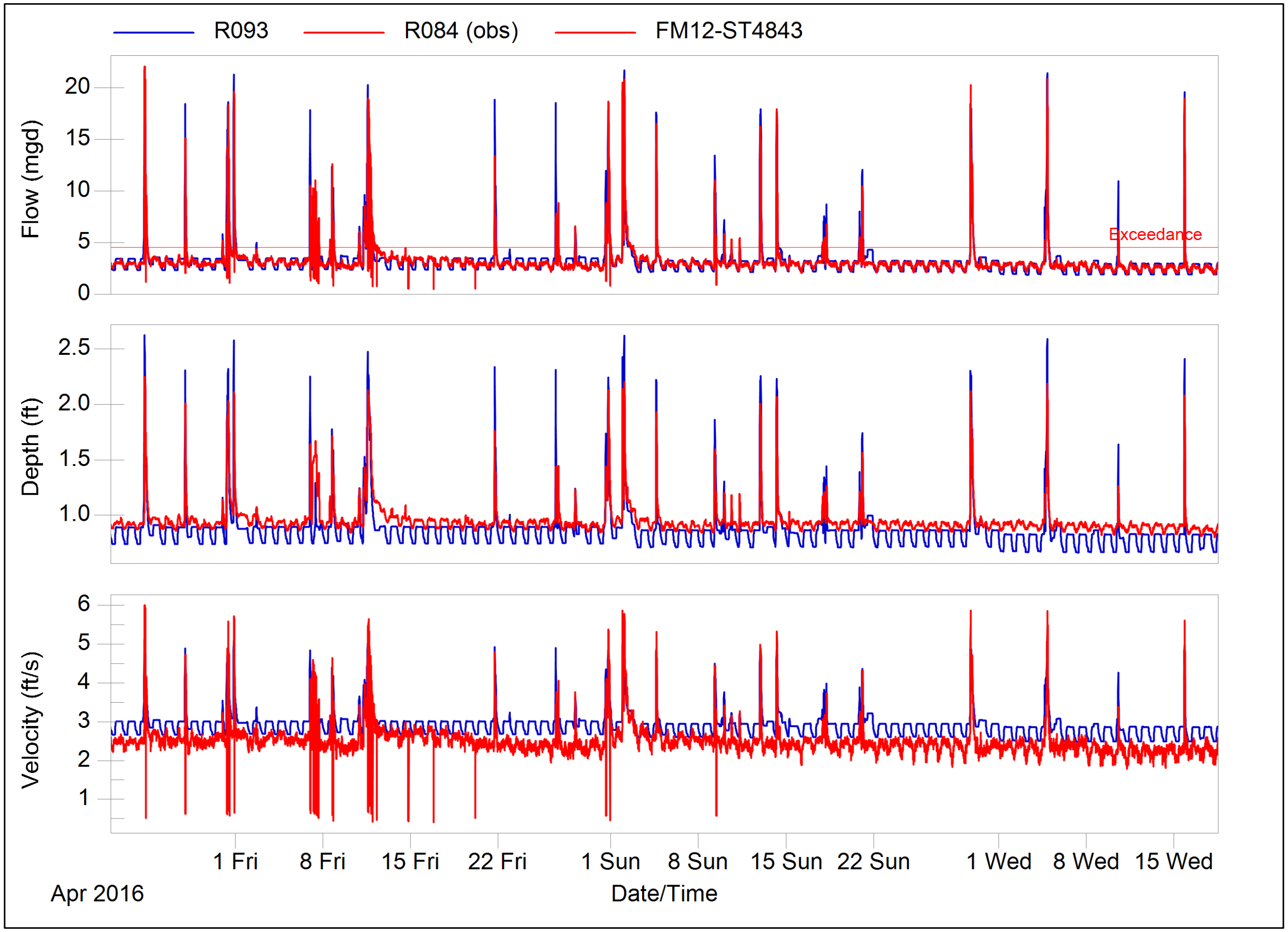
Fall 2015

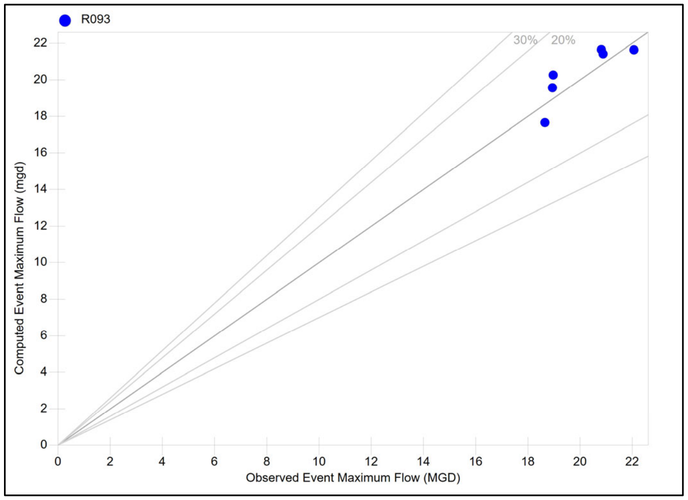


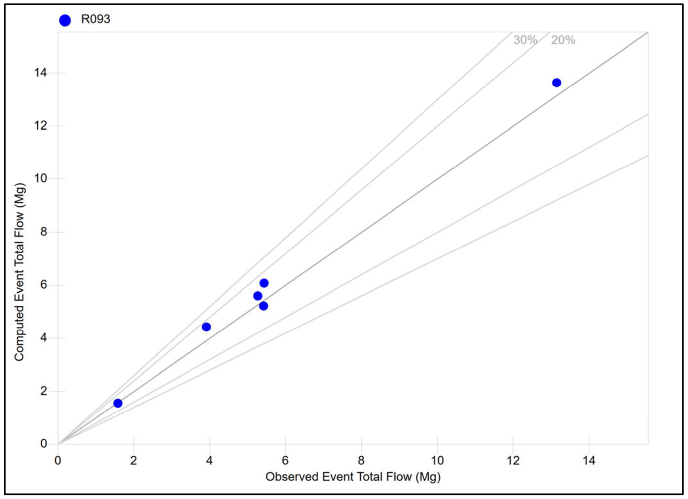


FM17 – MRI (CSO 40 influent flow)

Spring 2016

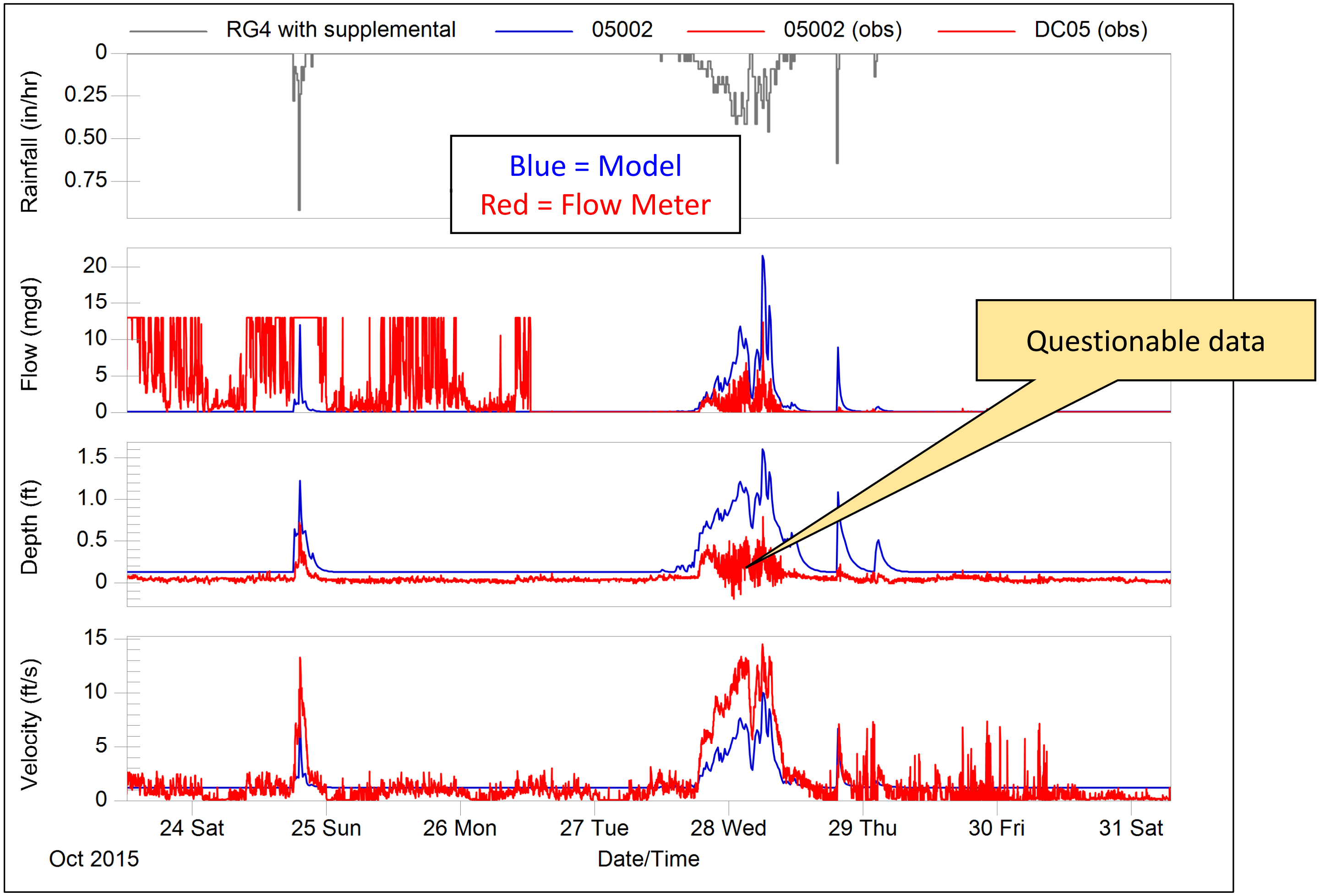






FM 14
CSO 05 Influent (Fall)

FM14 – CSO 5

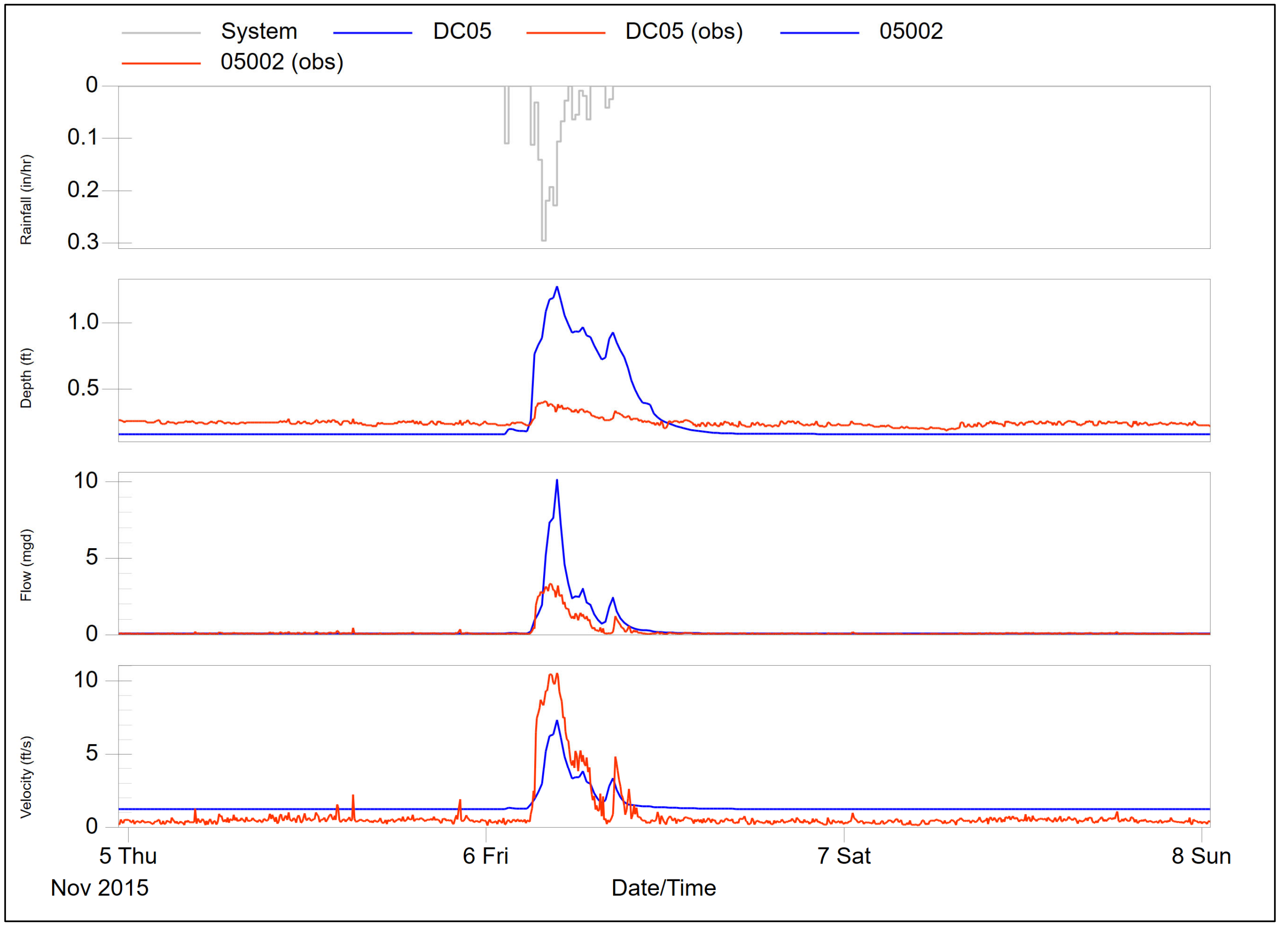


Calibration Events

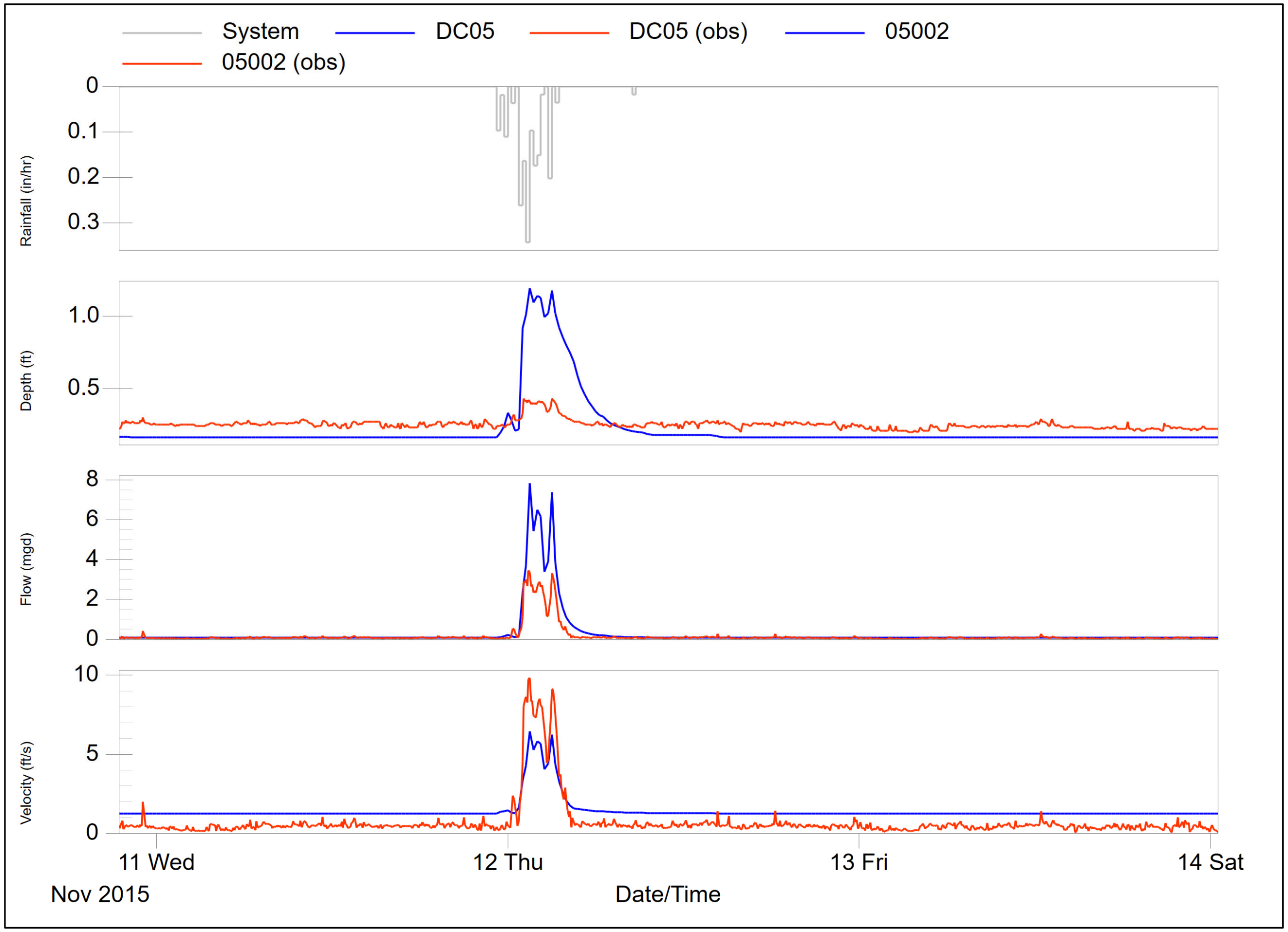
10/24/15, 10/27/15

FM14 – CSO 5

Calibration Events
11/6/15



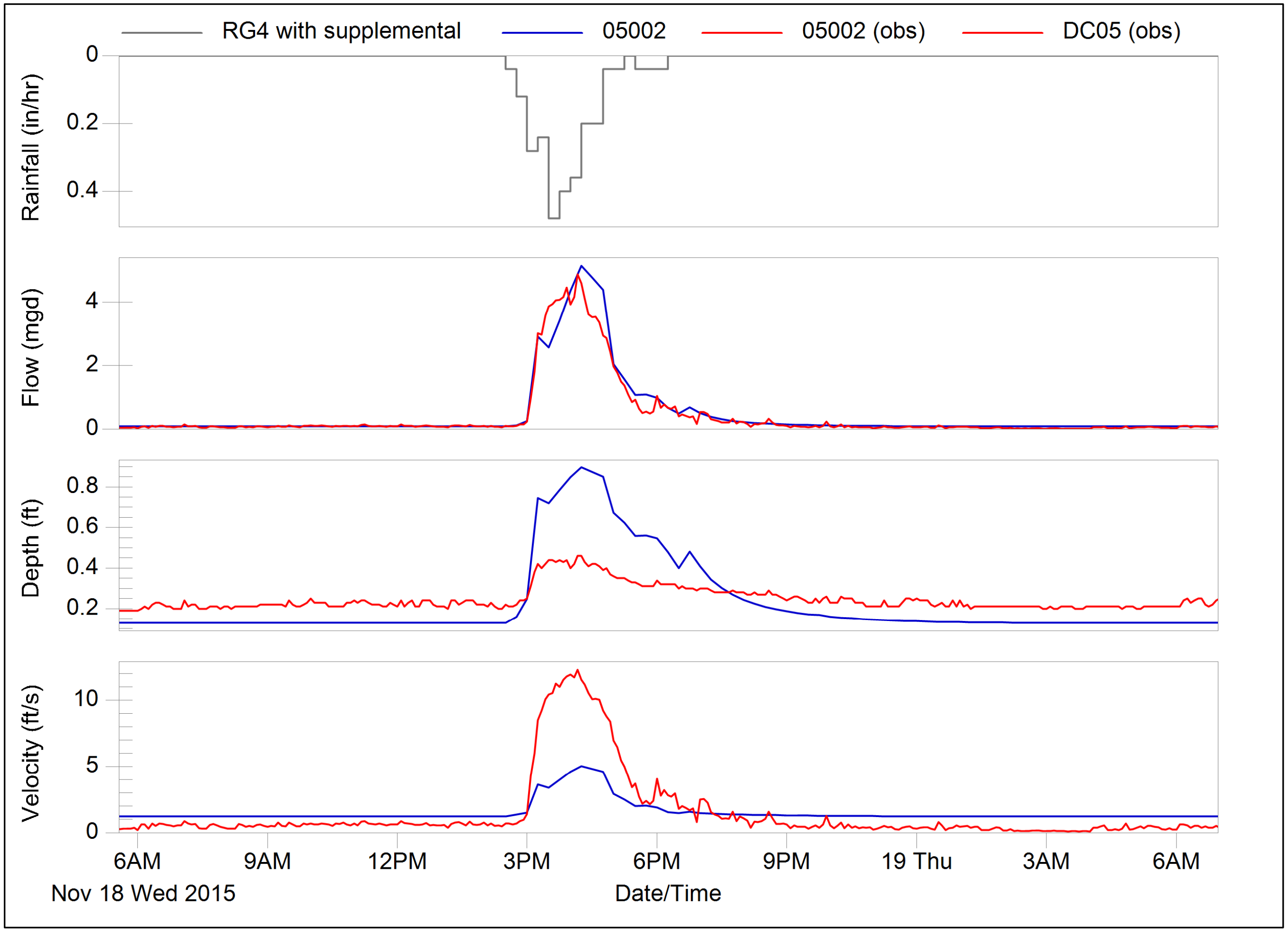
FM14 – CSO 5



Calibration Events

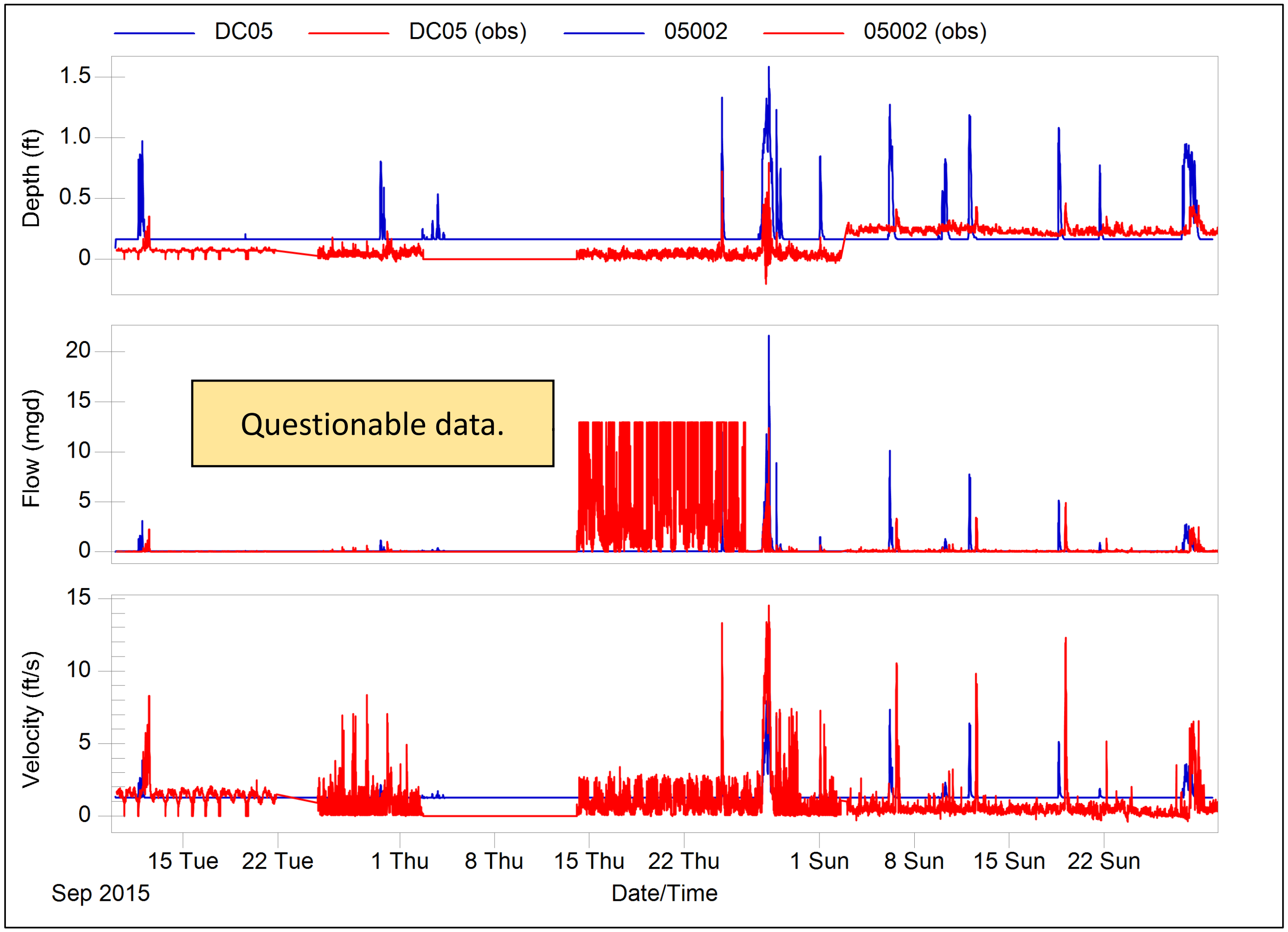
11/11/15

FM14 – CSO 5

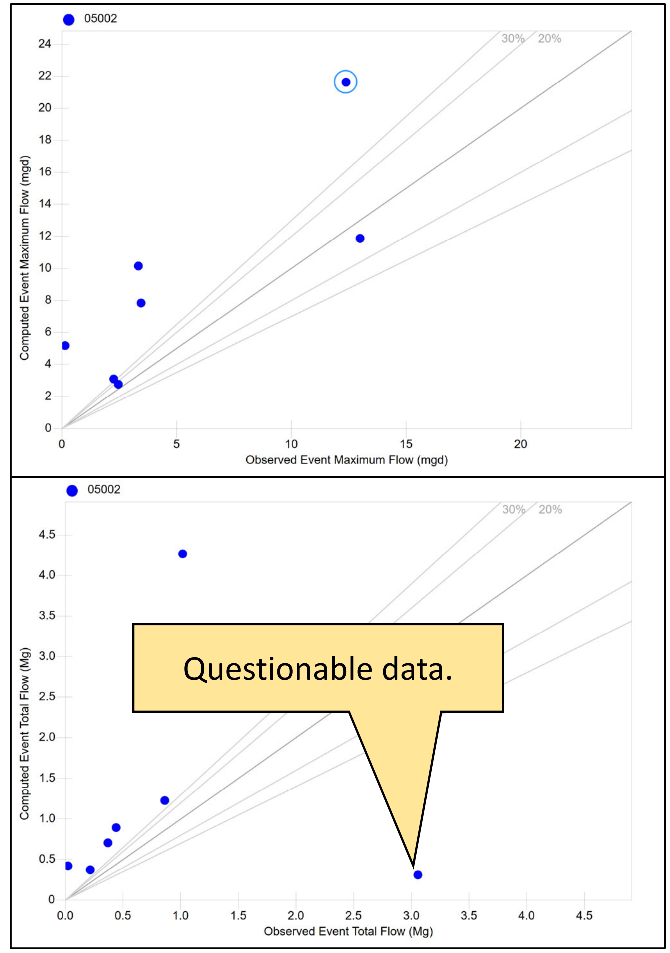


Calibration Events
11/18/15

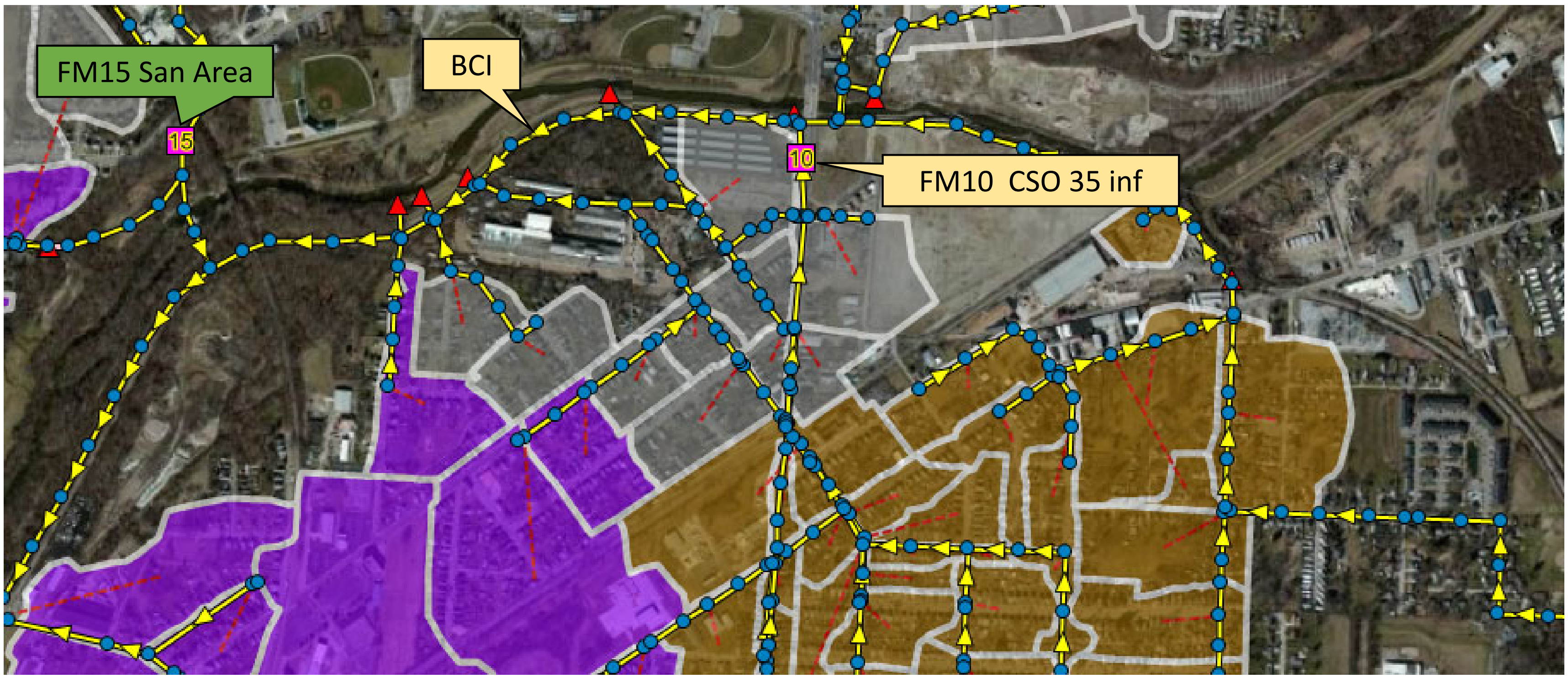
FM14 – CSO 5



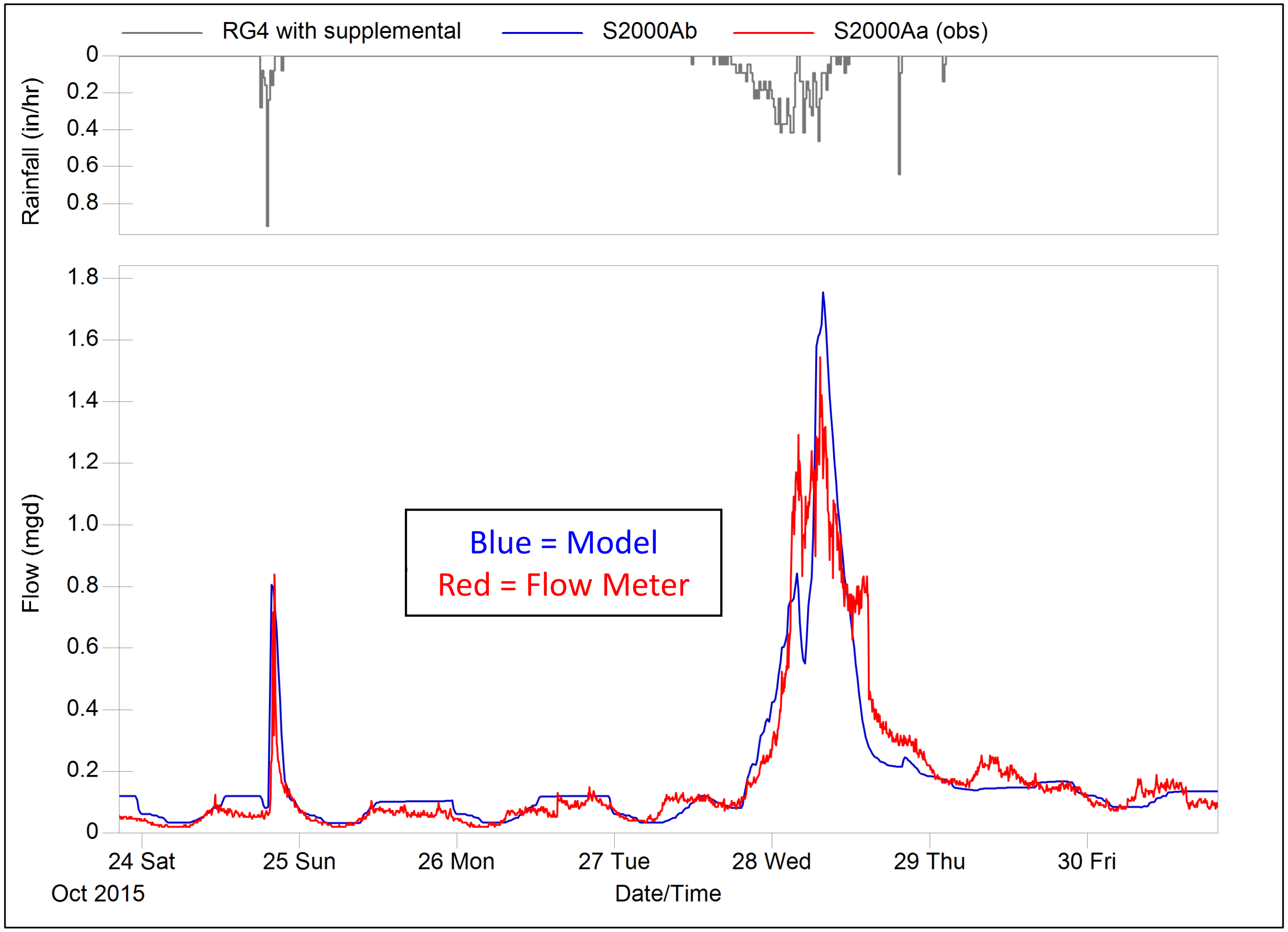
Fall 2015



FM 15
Sanitary Area (Fall)



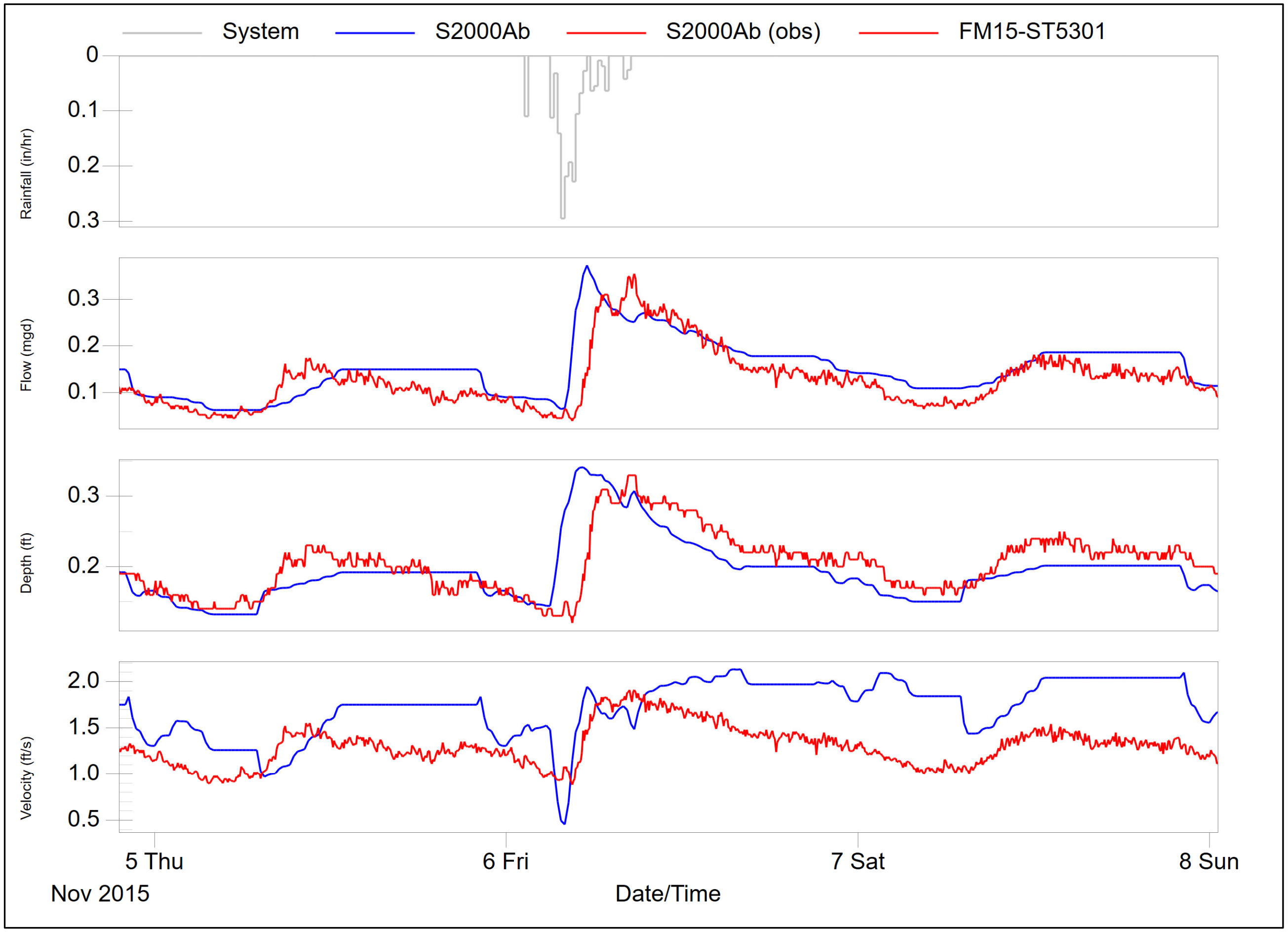
FM15 – Sanitary Area



Calibration Events
10/24/15, 10/27/15

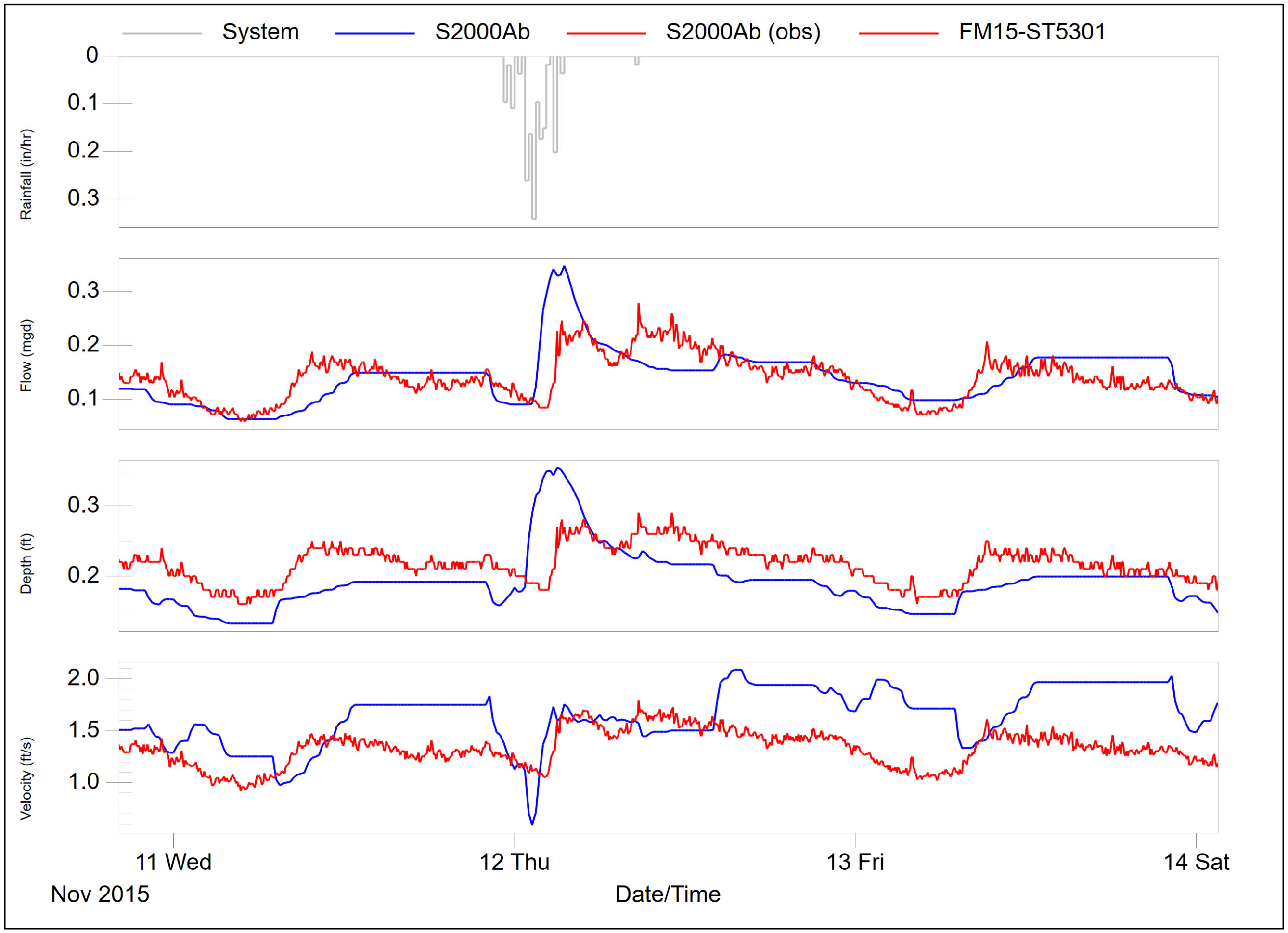
FM15 – Sanitary Area

Calibration Events
11/6/15

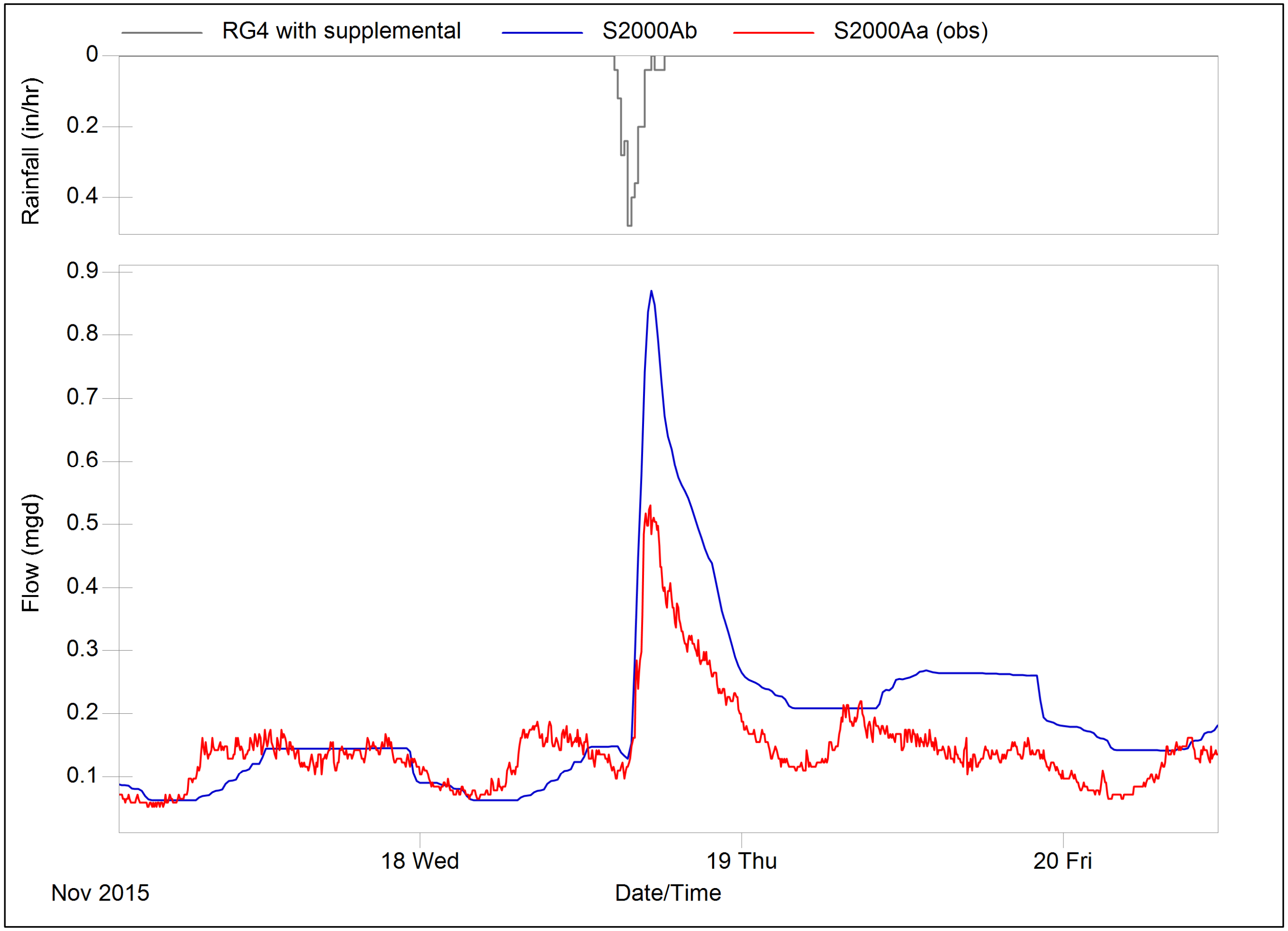


FM15 – Sanitary Area

Calibration Events
11/11/15



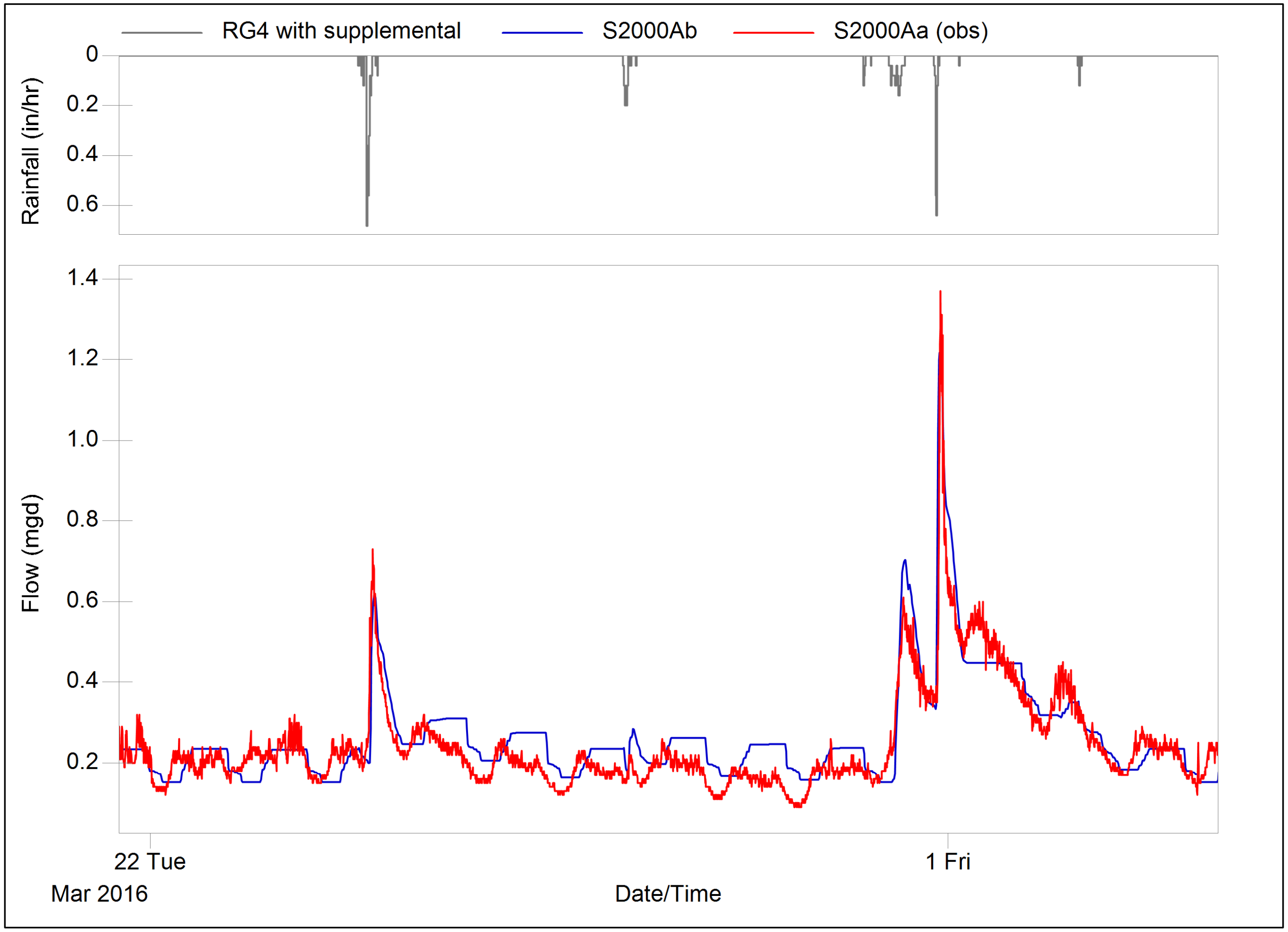
FM15 – Sanitary Area



Calibration Events

11/18/15

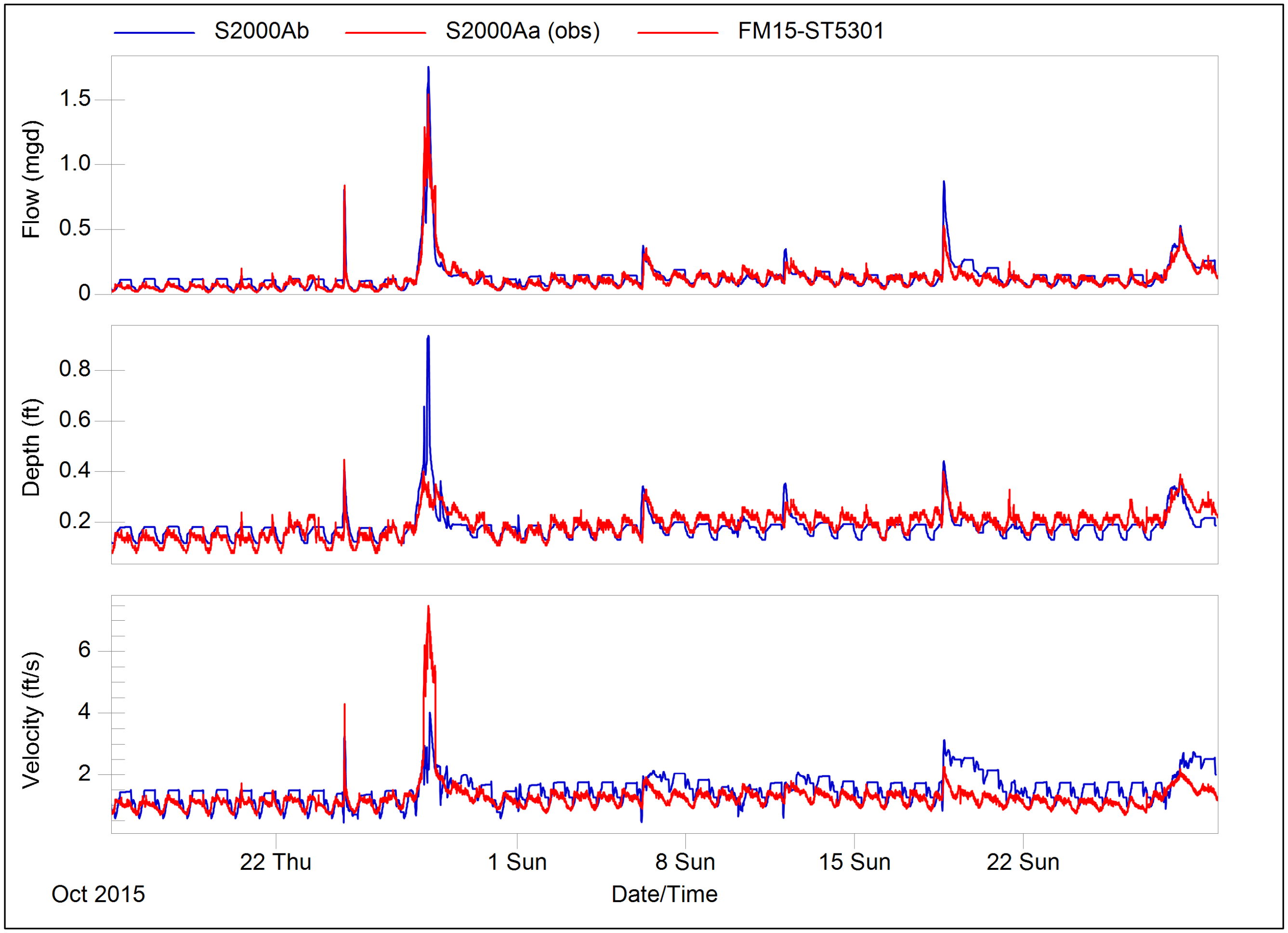
FM15 – Sanitary Area

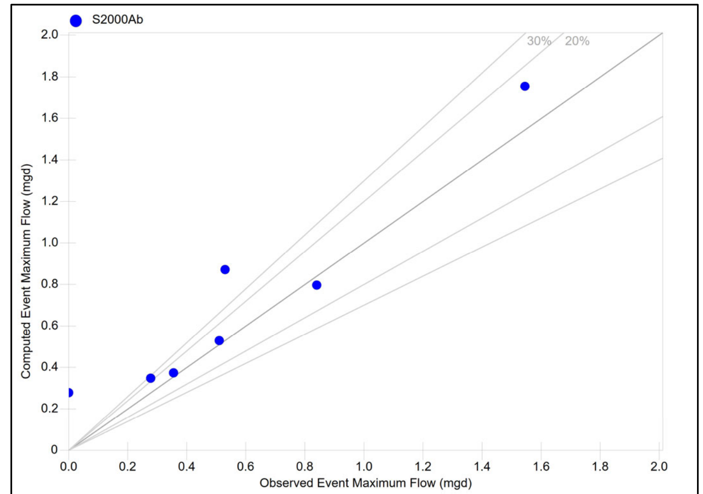


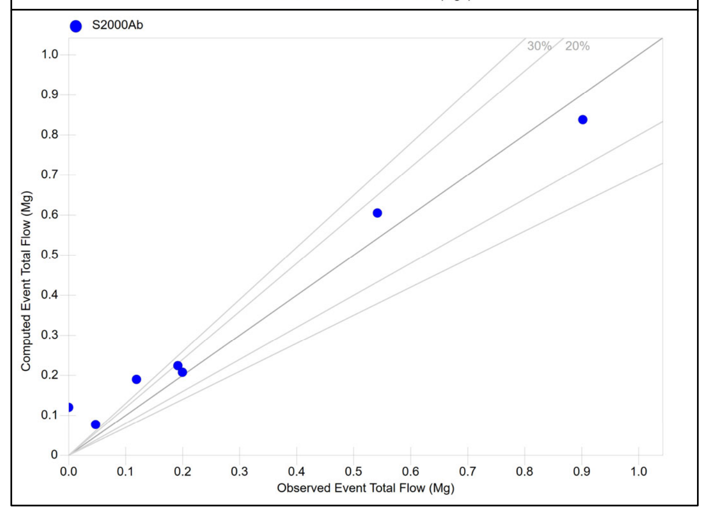
Calibration Event
3/24/16

FM15 – Sanitary Area

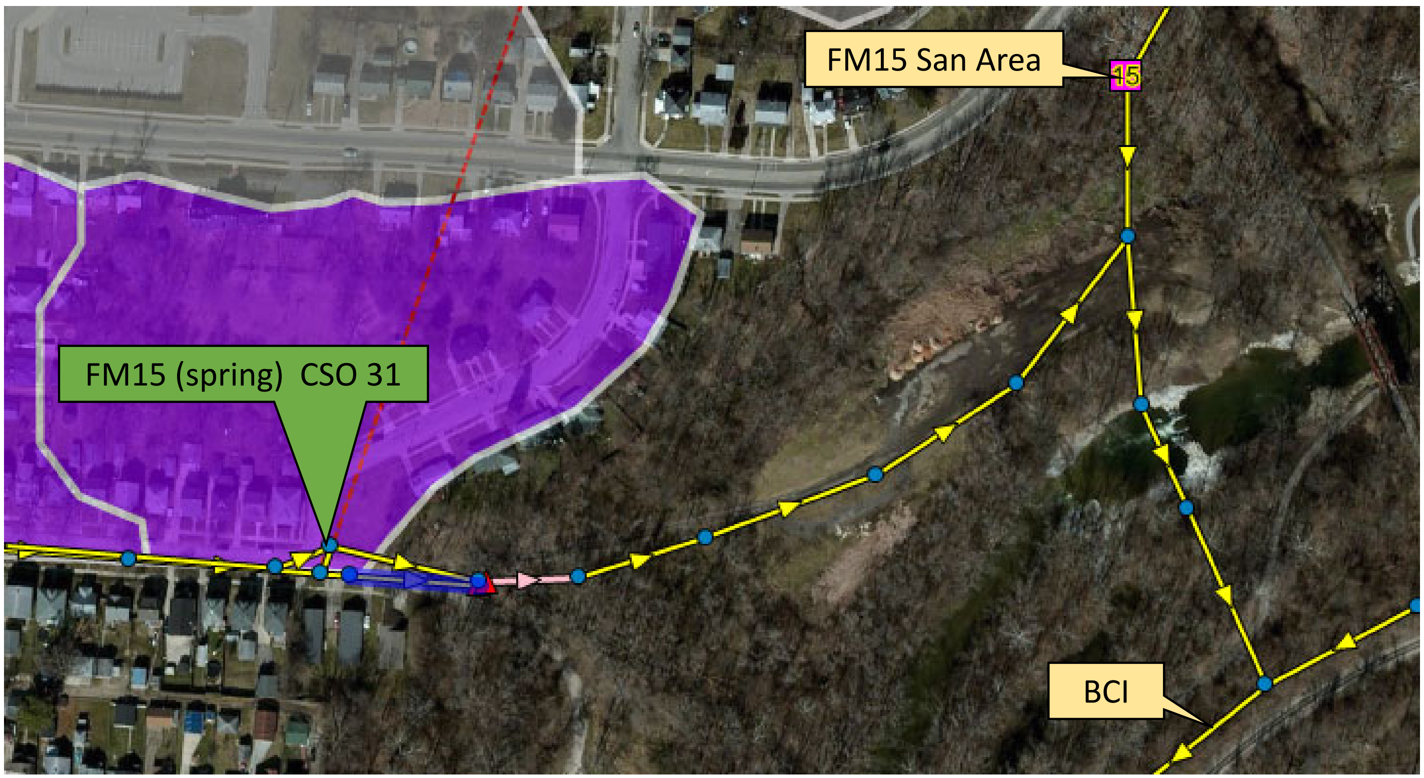
Fall 2015



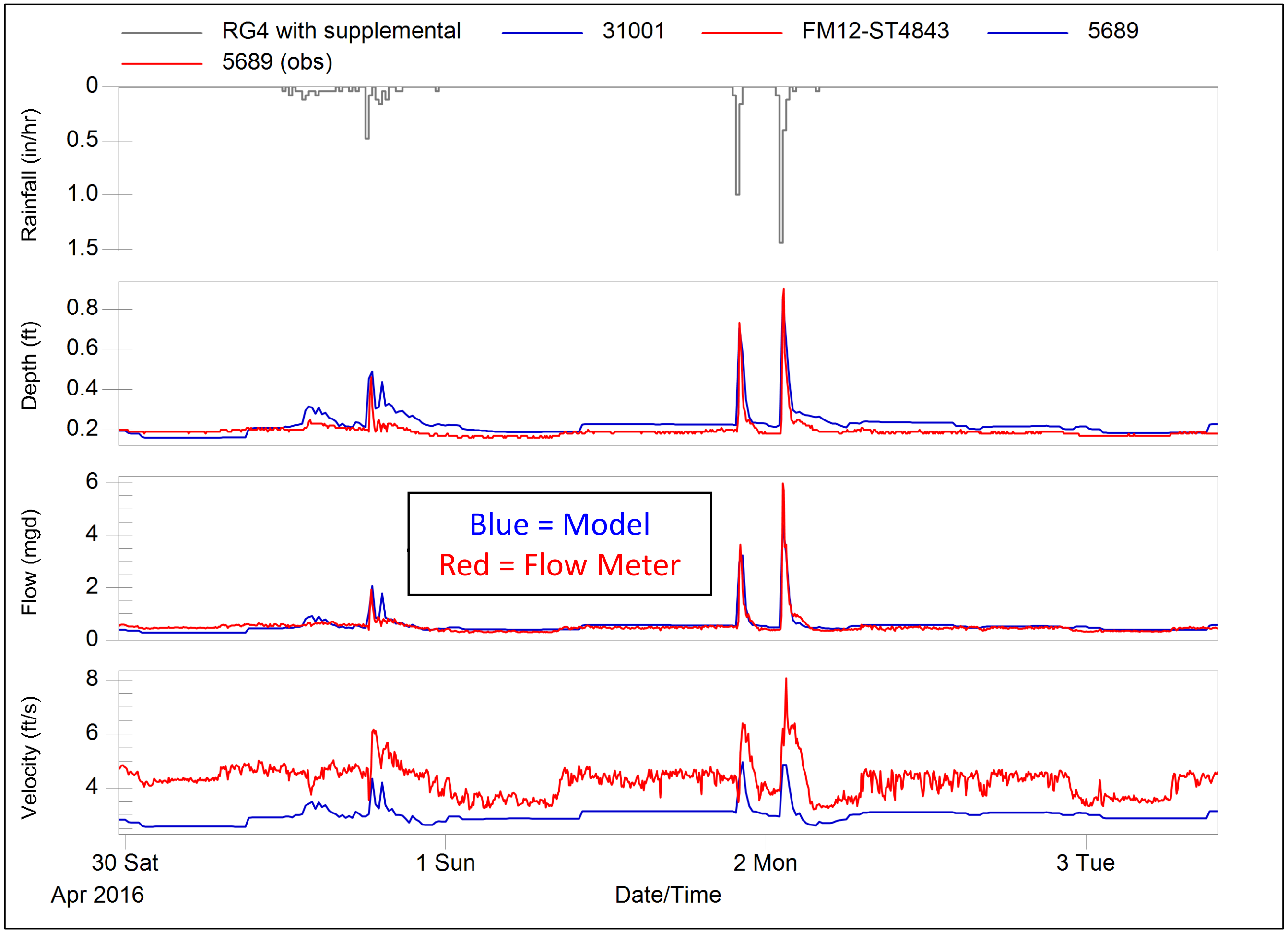




FM 15 (Spring)
CSO 31 Influent



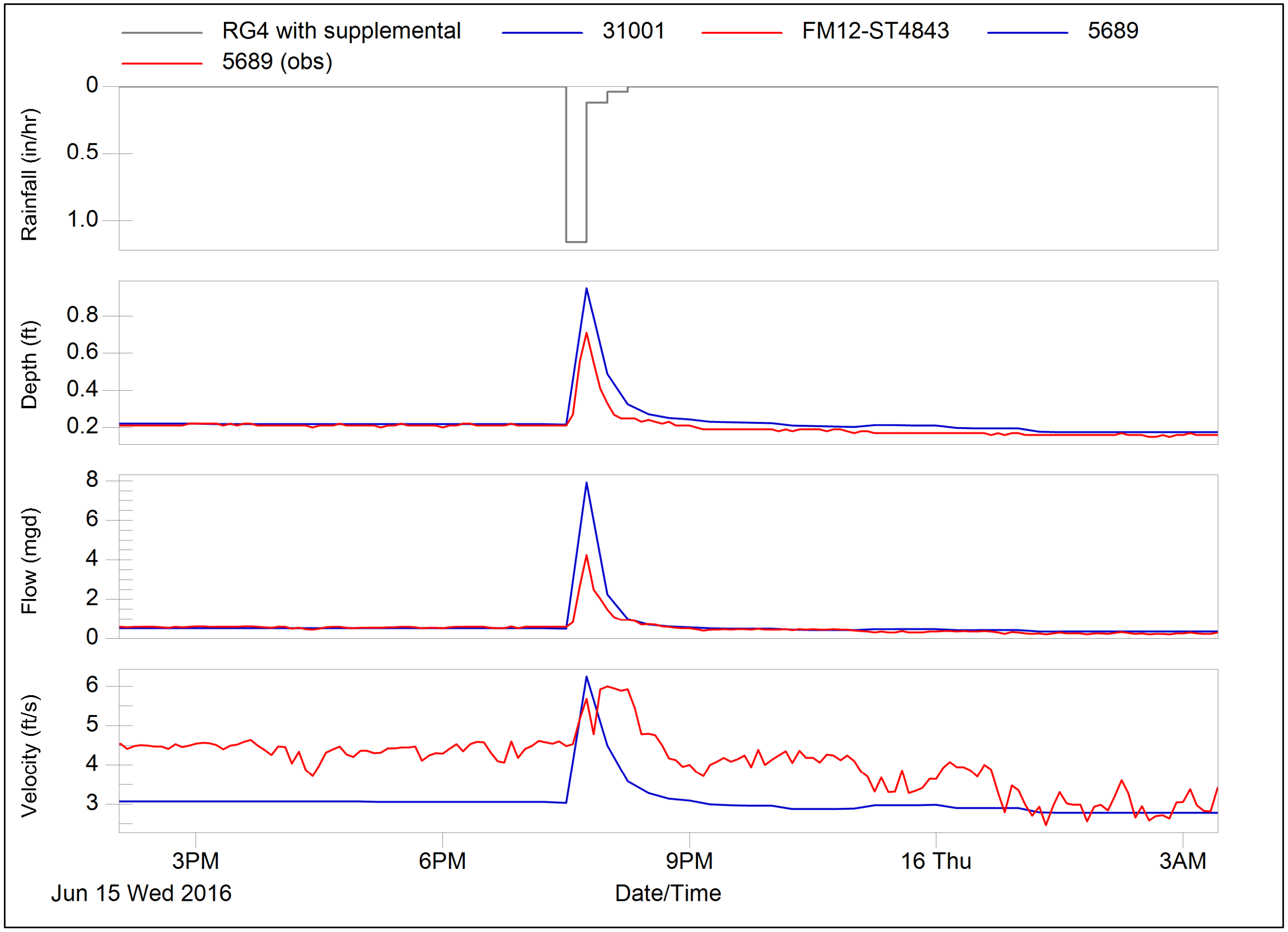
FM15 – CSO 31 (spring)



Calibration Events

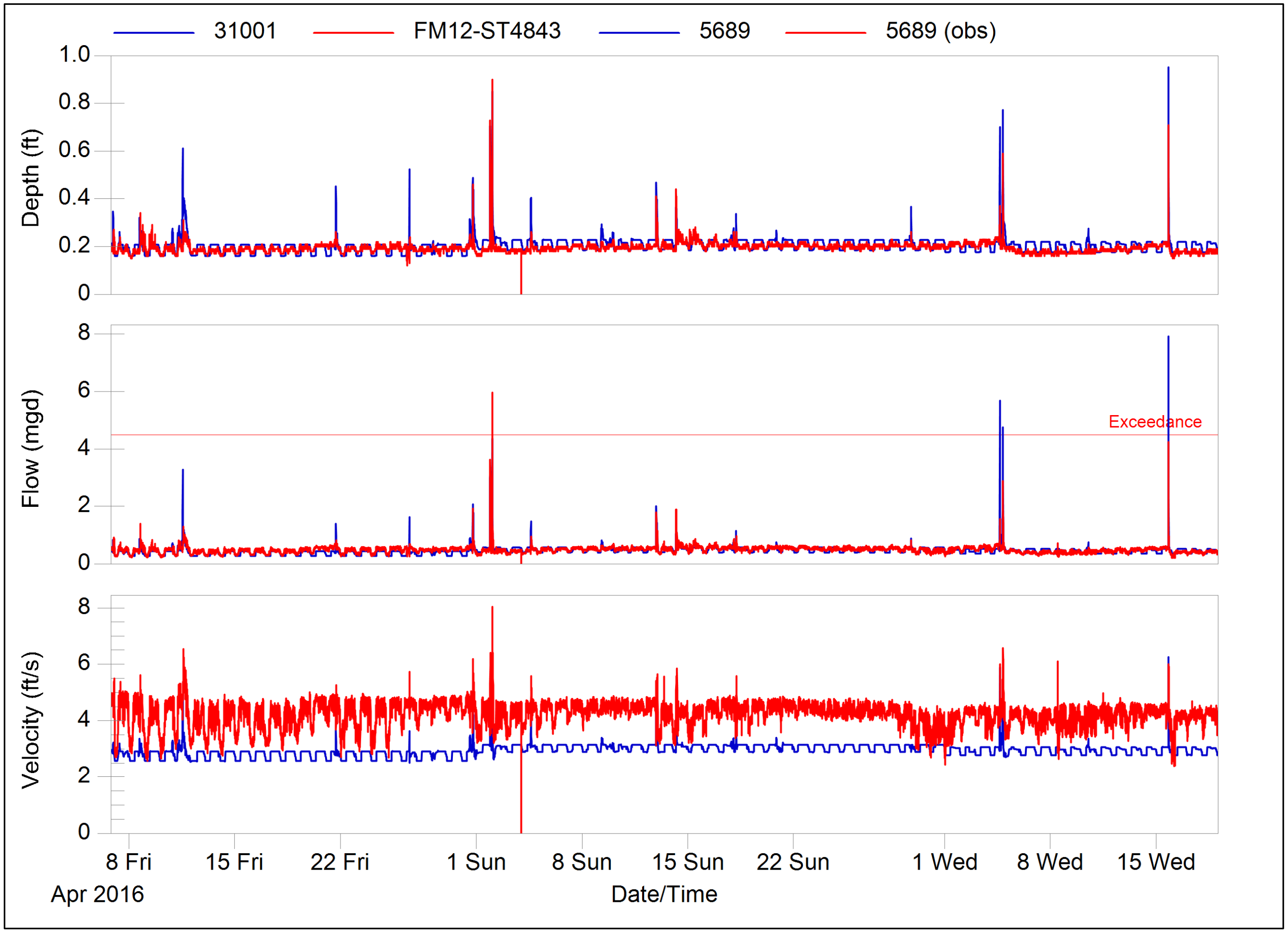
4/30/16, 5/1/16

FM15 – CSO 31 (spring)

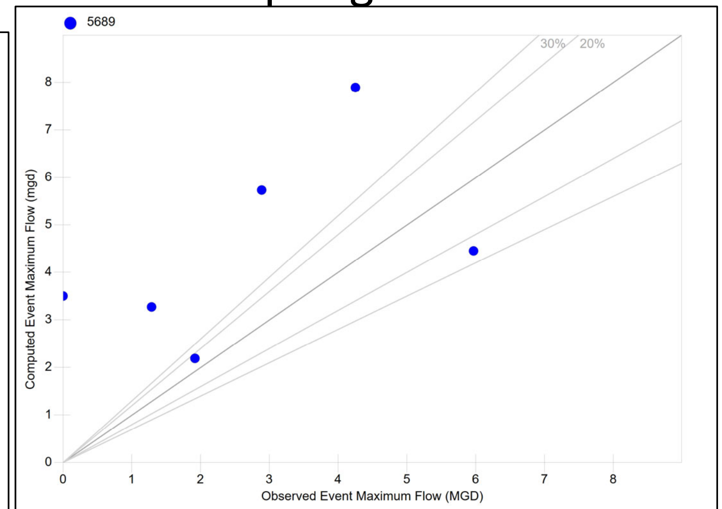


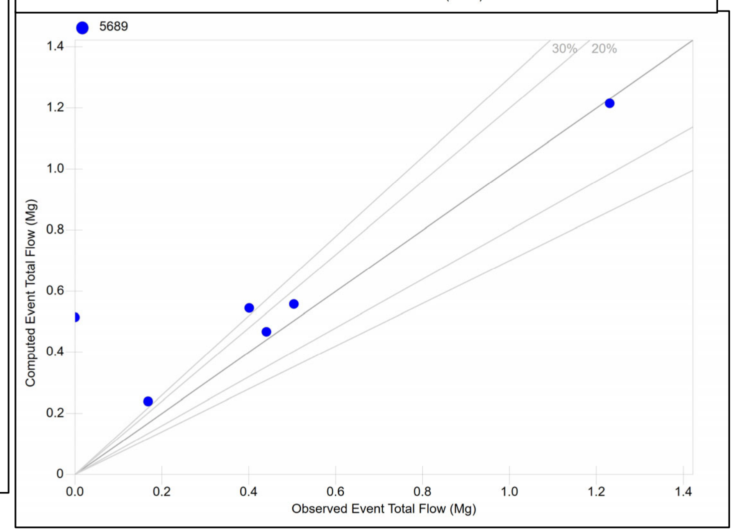
Calibration Events
6/15/16

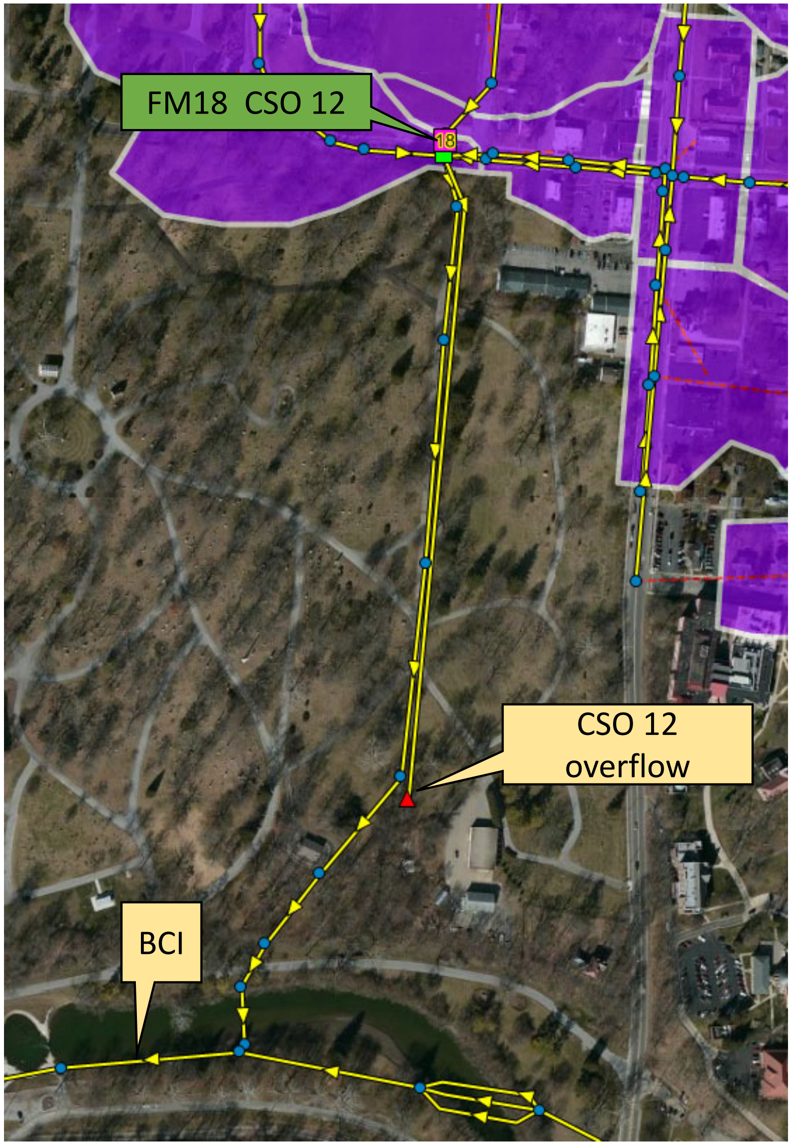
FM15 – CSO 31 (spring)



Spring 2016

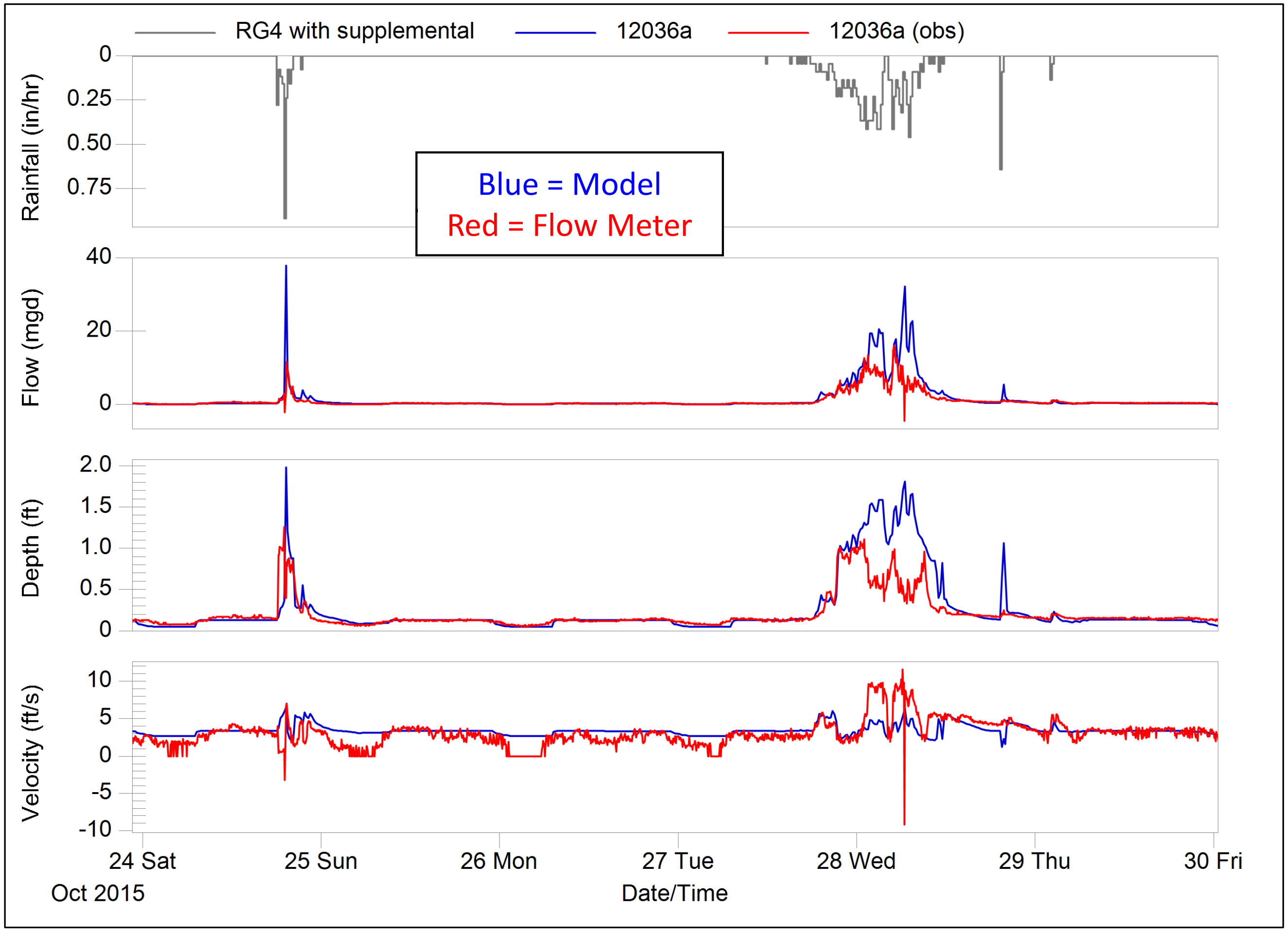






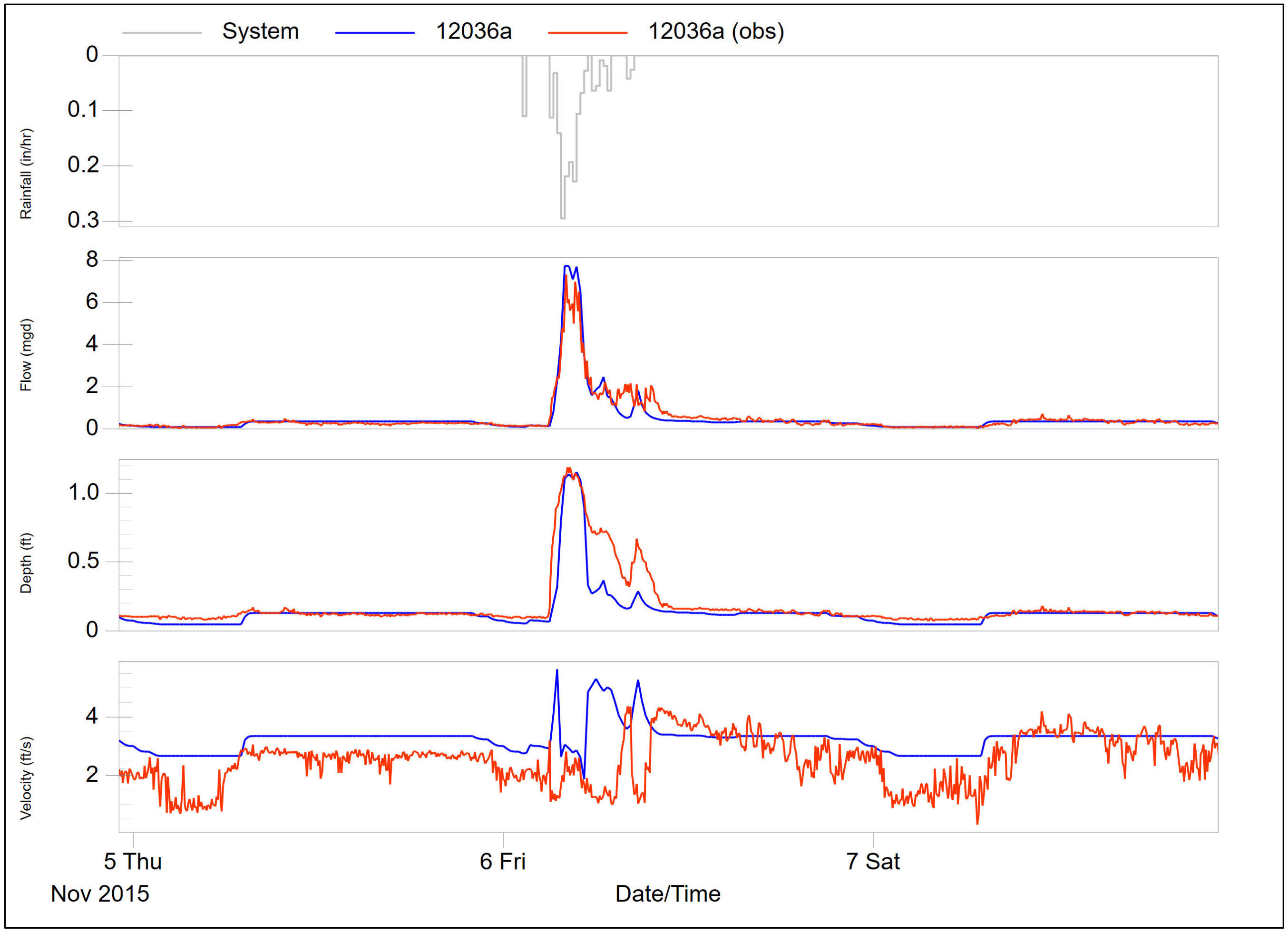
FM 18
CSO 12 inf

FM18 – CSO 12



Calibration Events
10/24/15, 10/27/15

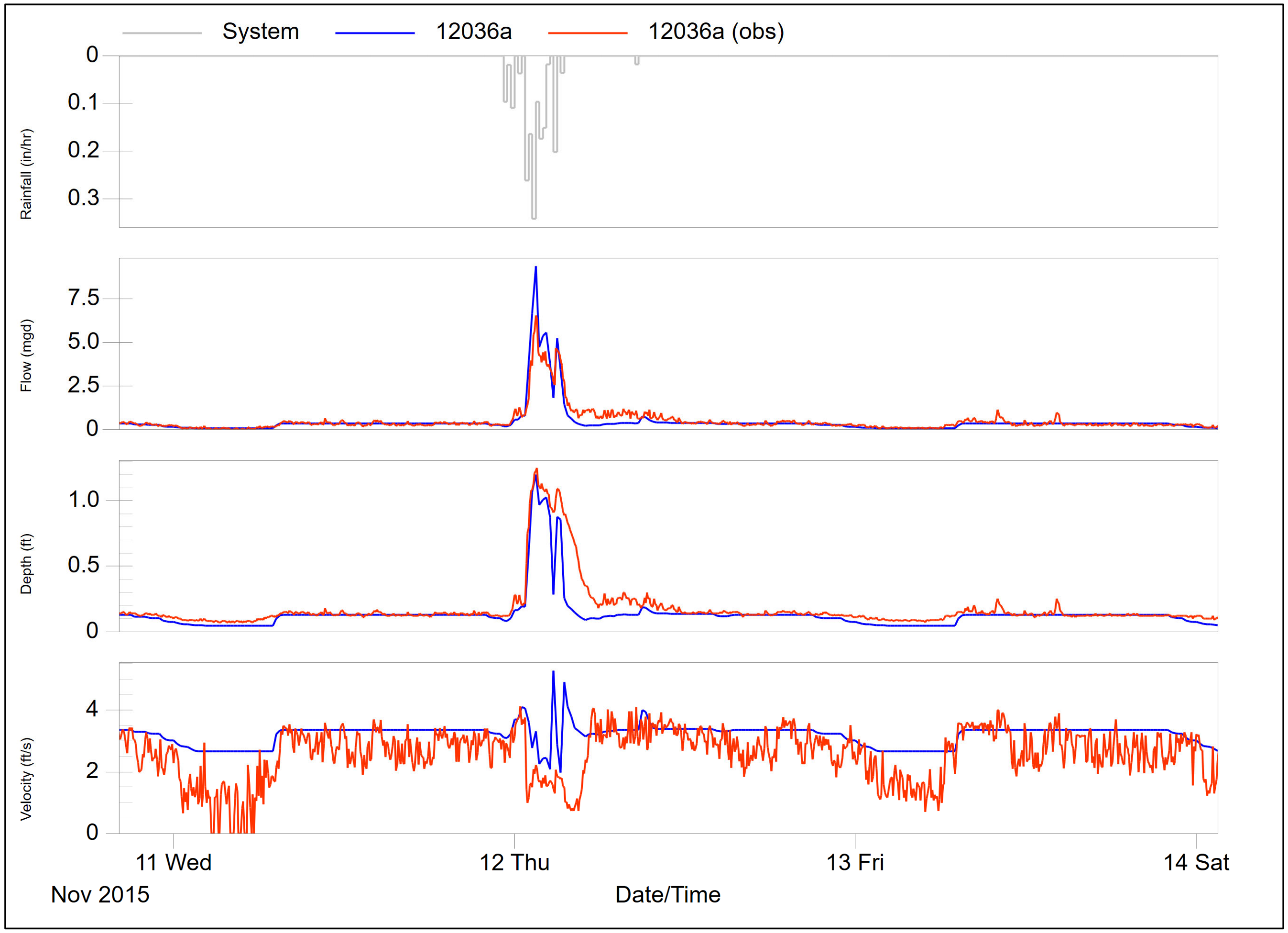
FM18 – CSO 12



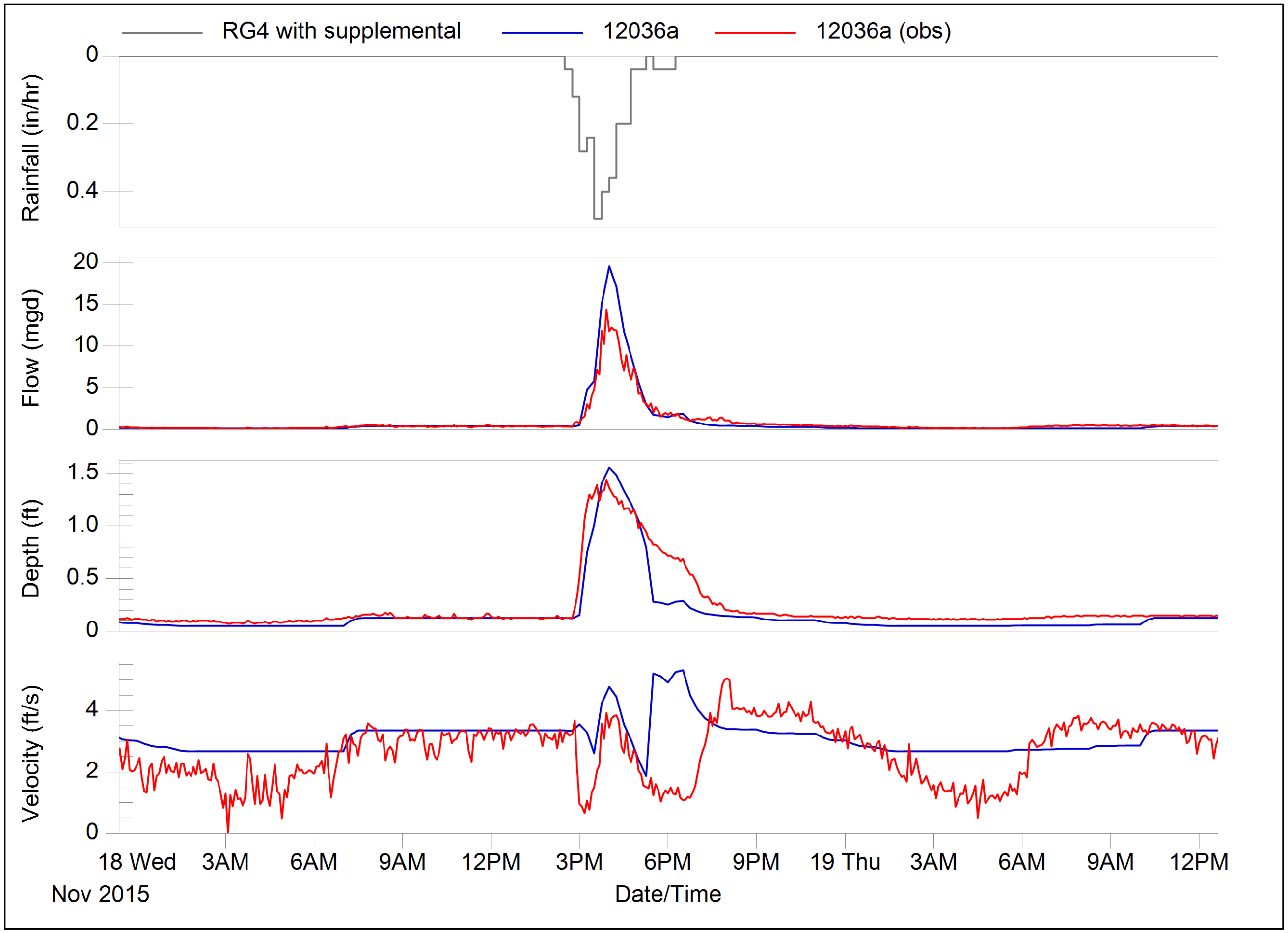
Calibration Events
11/6/15

FM18 – CSO 12

Calibration Events
11/11/15

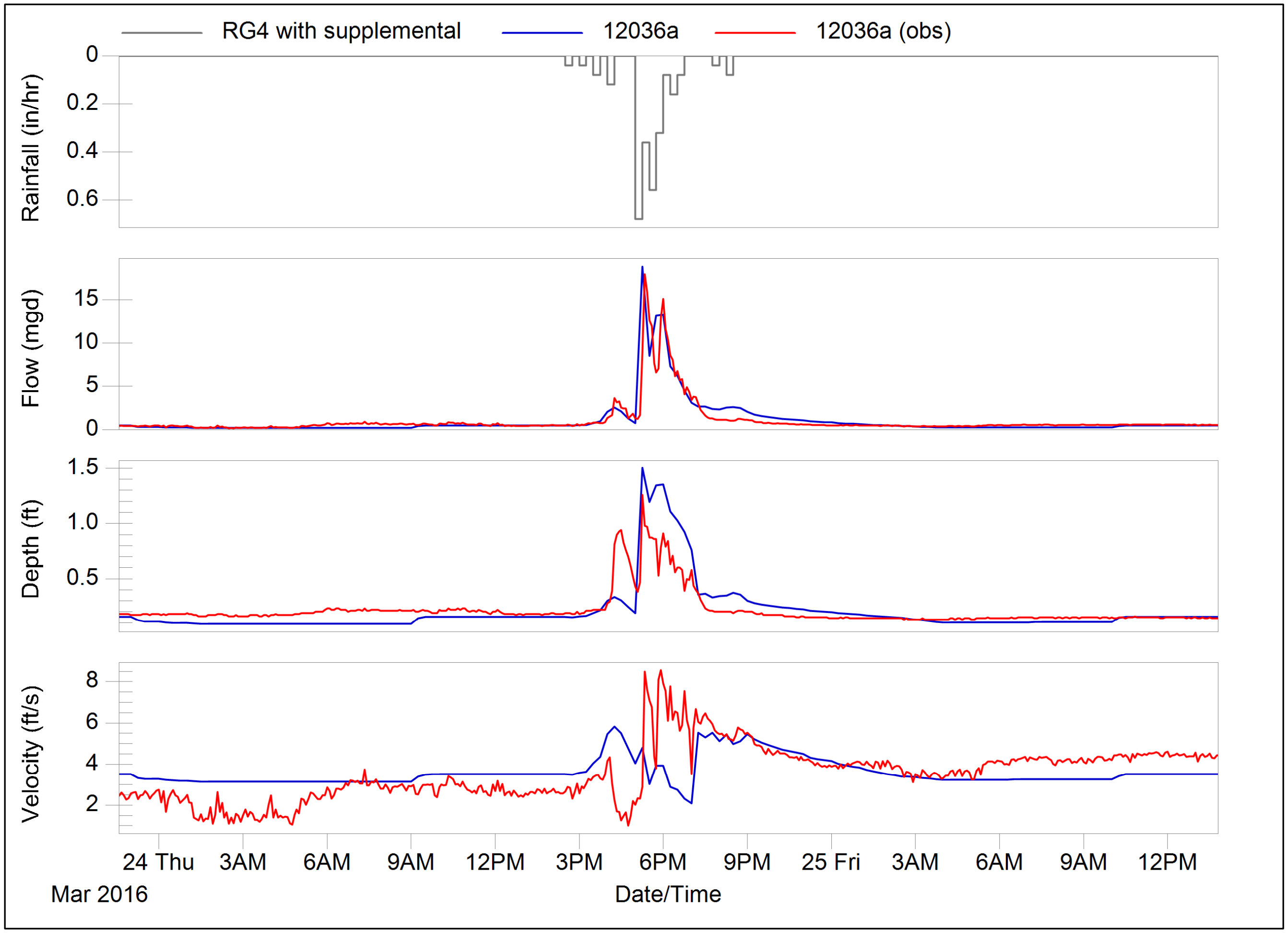


FM18 – CSO 12



Calibration Events
11/18/15

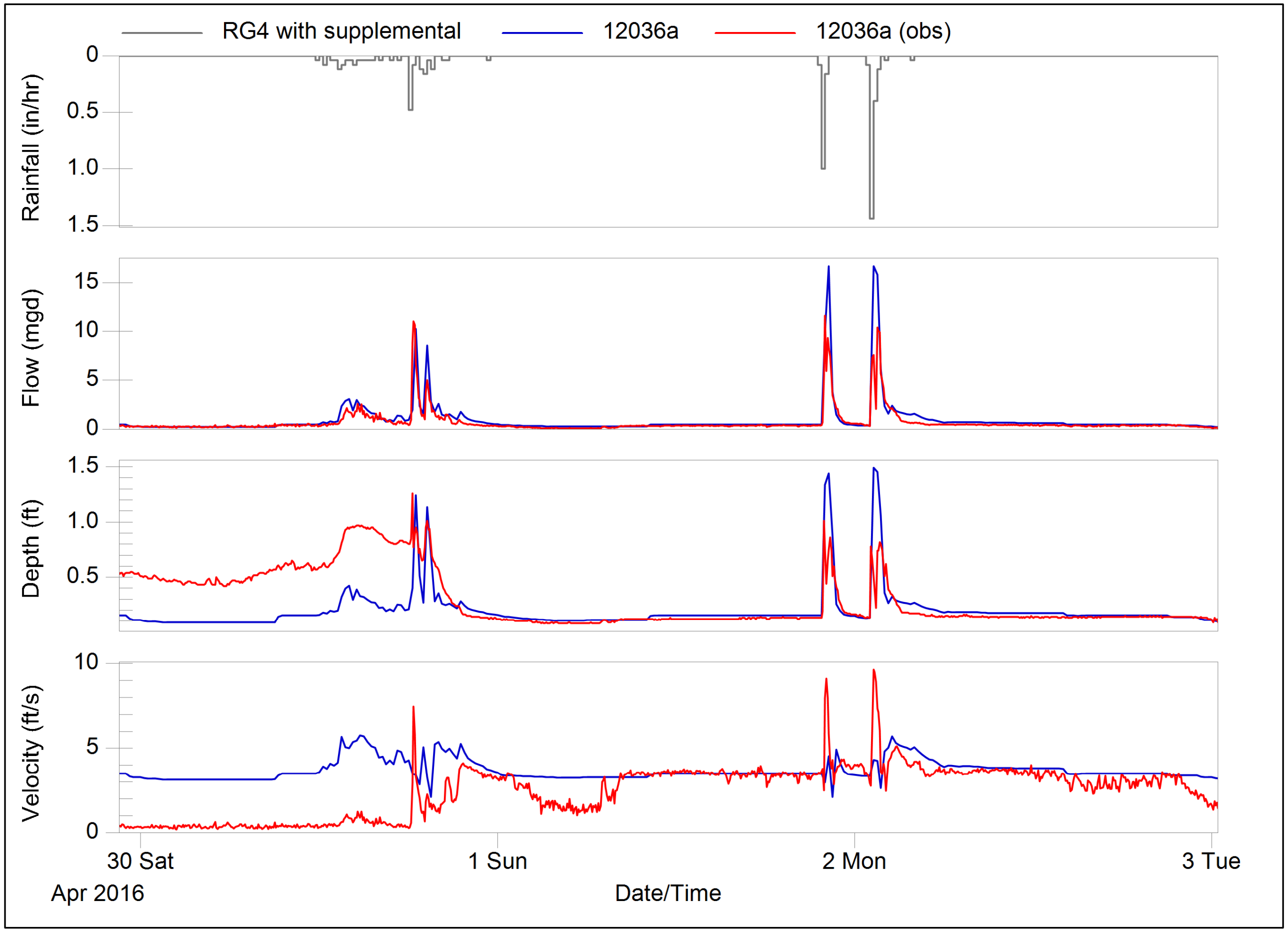
FM18 – CSO 12



Calibration Event

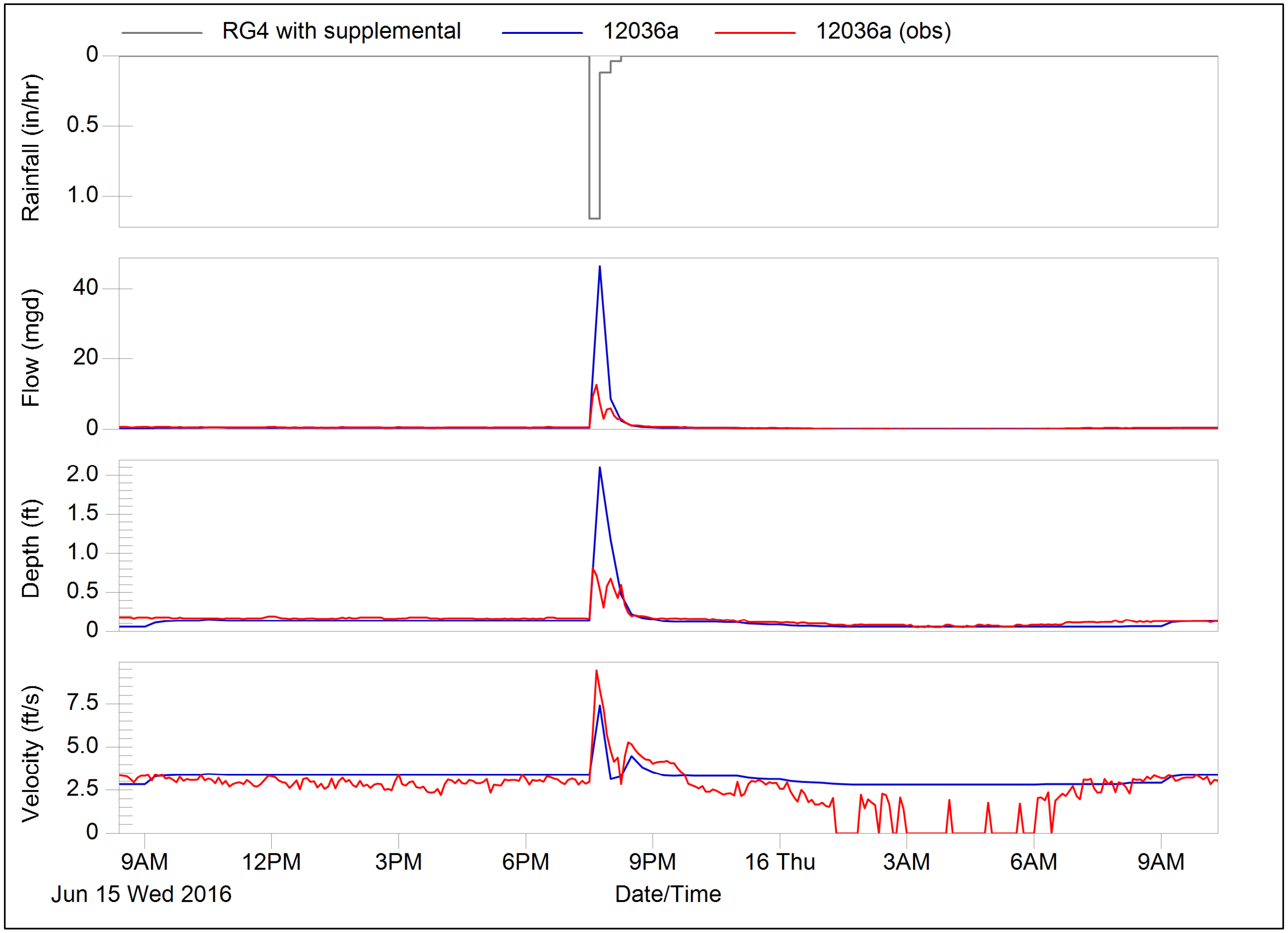
3/24/16

FM18 – CSO 12



Calibration Events
4/30/16, 5/1/16

FM18 – CSO 12

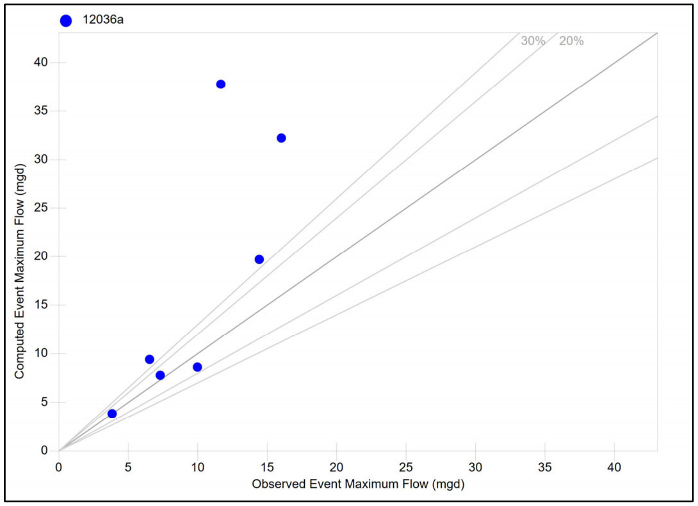


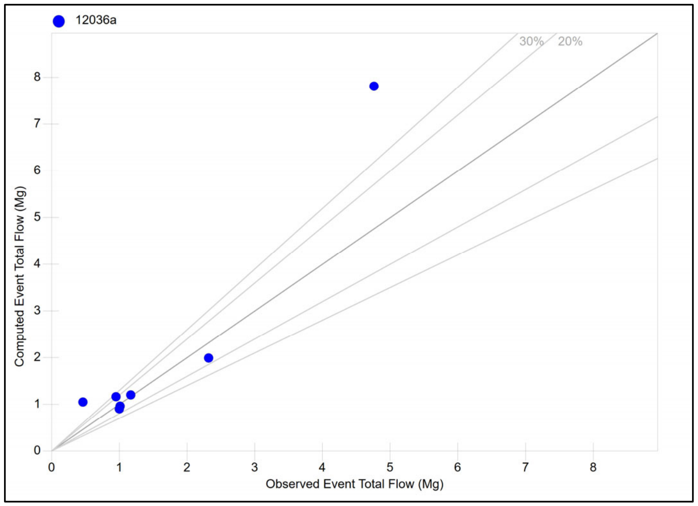
Calibration Events

6/15/16

FM18 – CSO 12

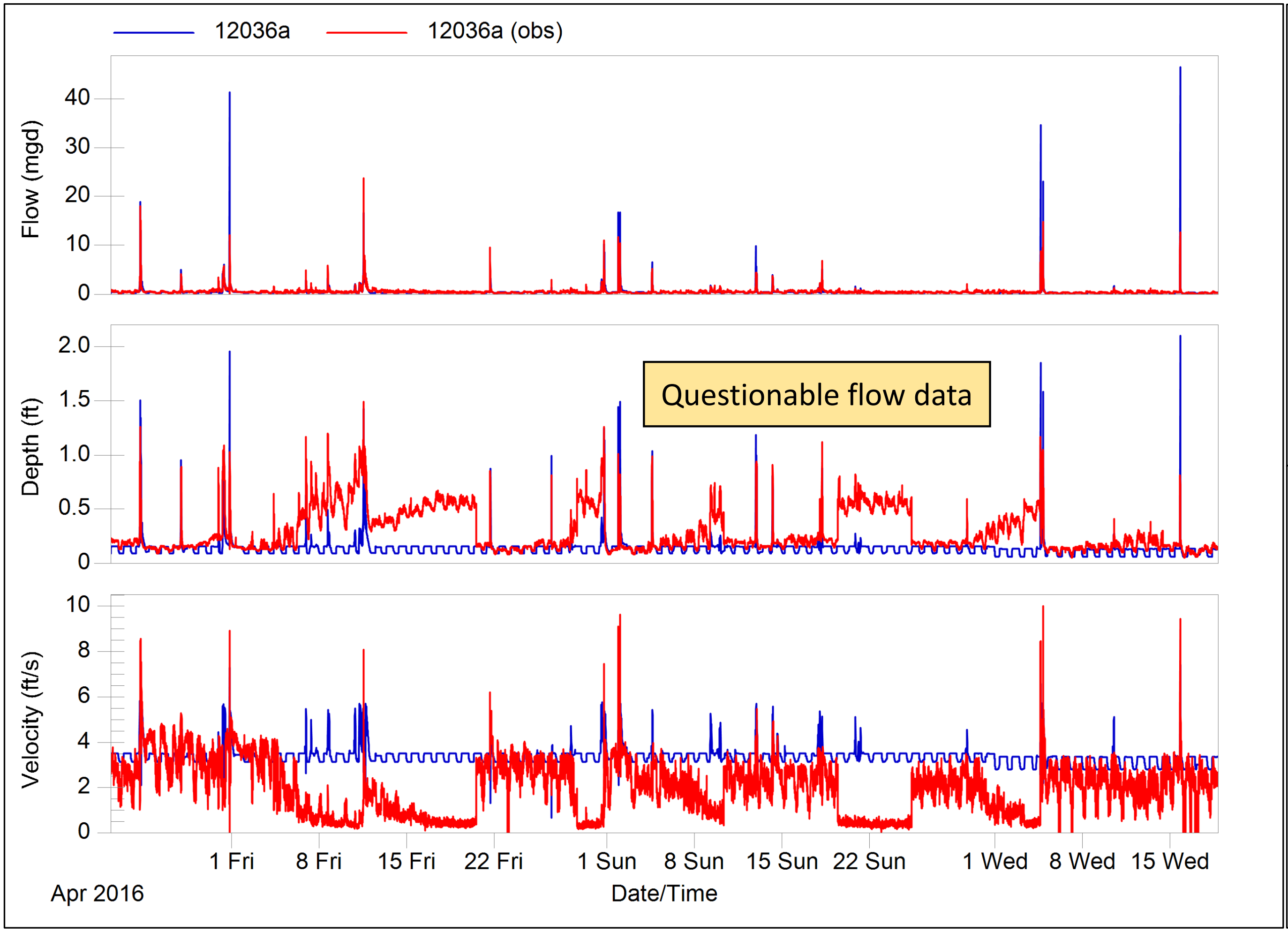
Fall 2015

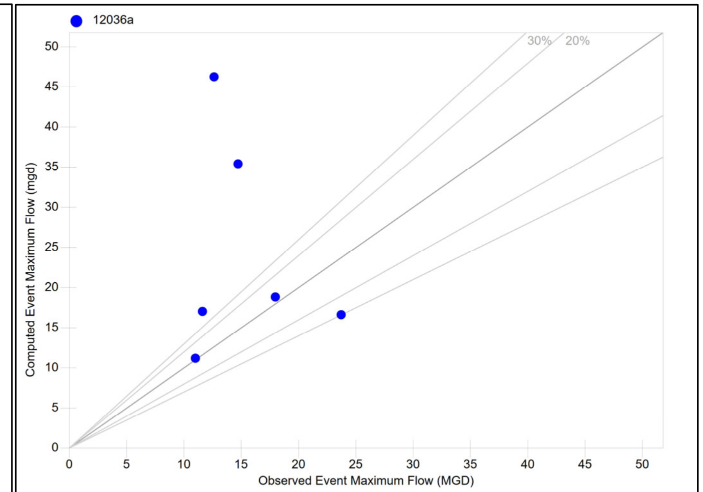


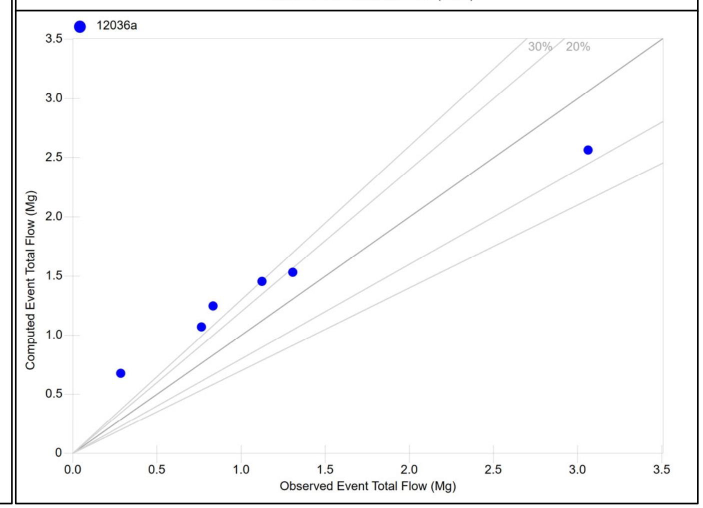


FM18 – CSO 12

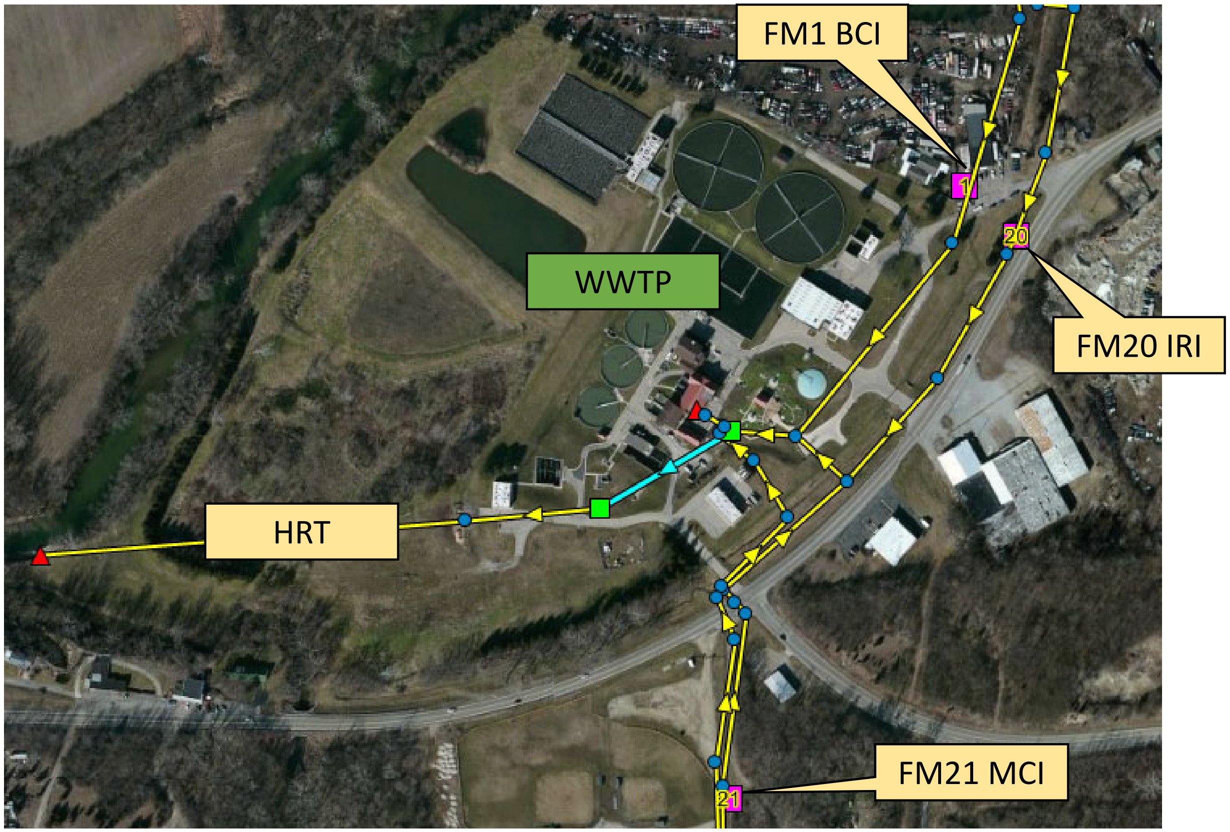
Spring 2016





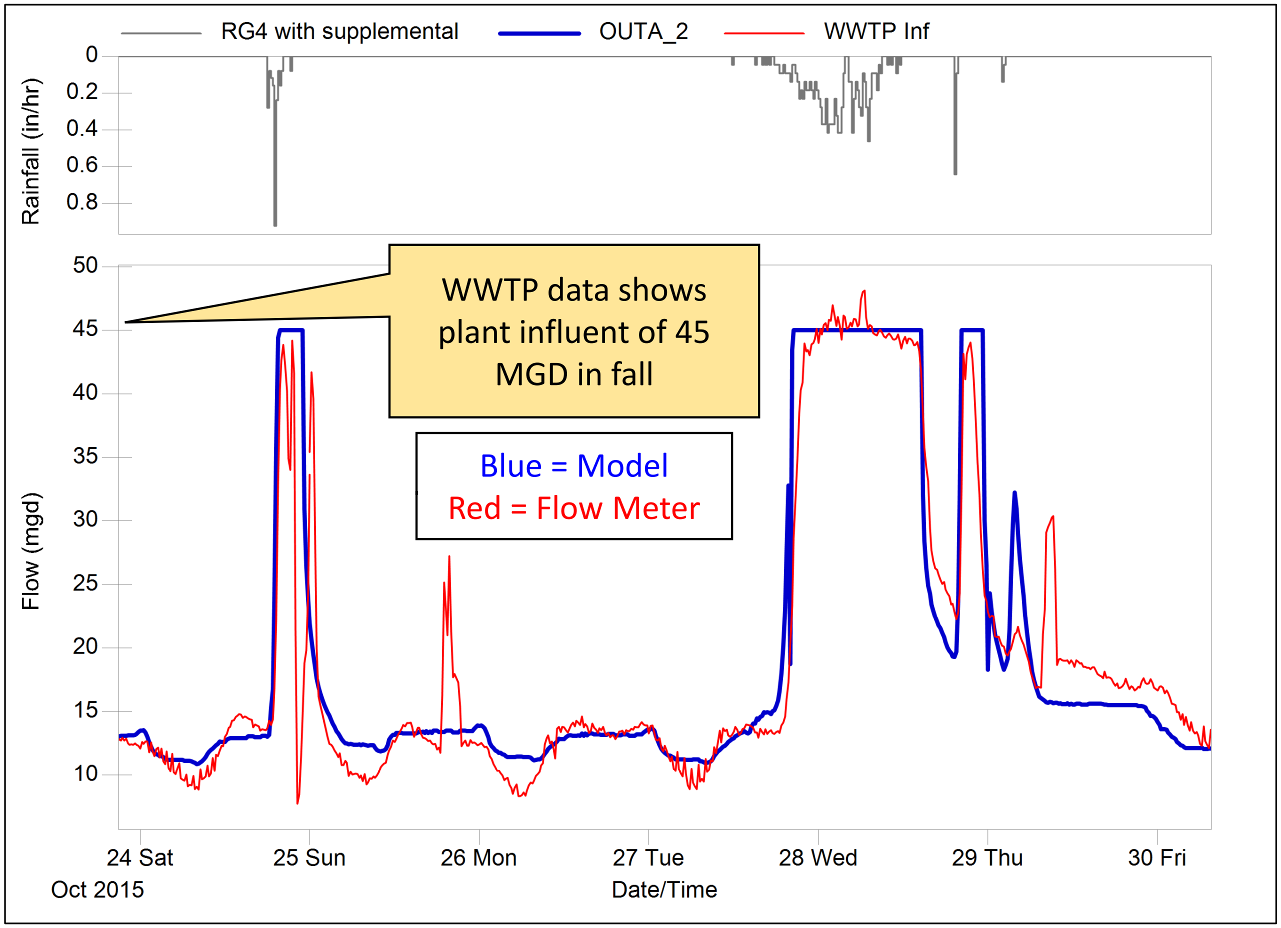


WWTP Influent



WWTP (45 MGD)

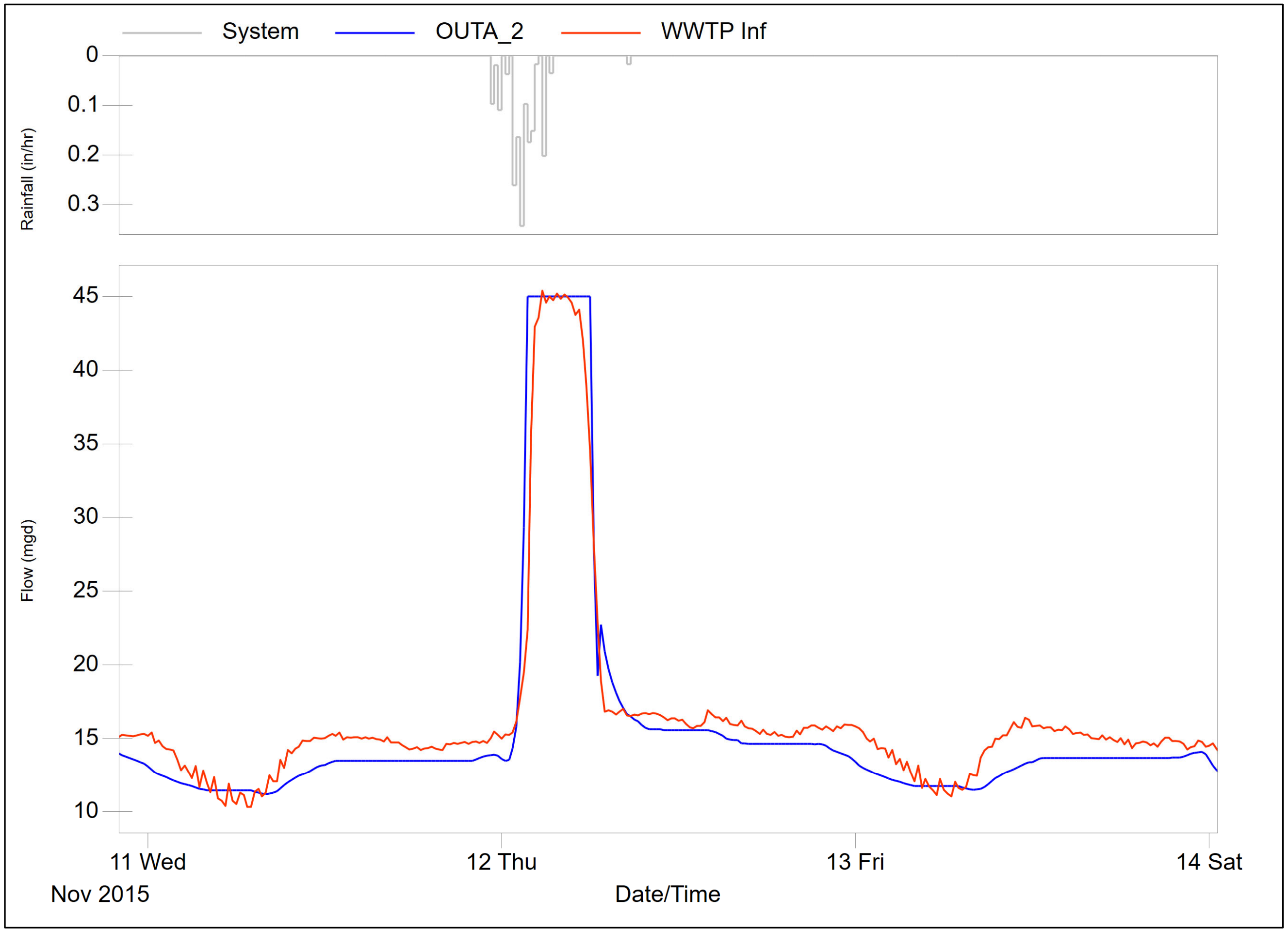
Calibration Events
10/24/15, 10/27/15



WWTP (45 MGD)

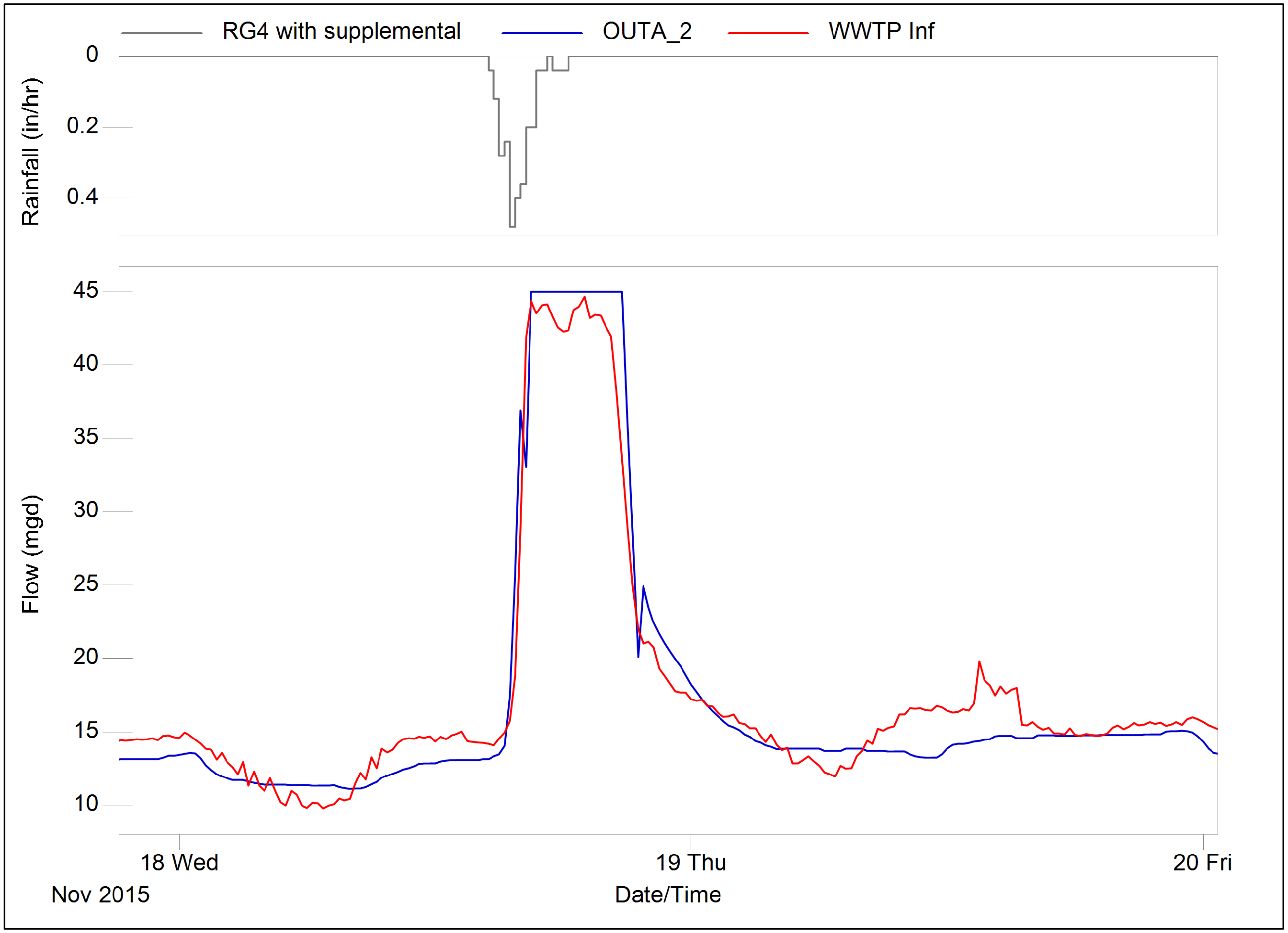
Calibration Events
11/6/15

WWTP (45 MGD)



Calibration Events
11/11/15

WWTP (45 MGD)



Calibration Events

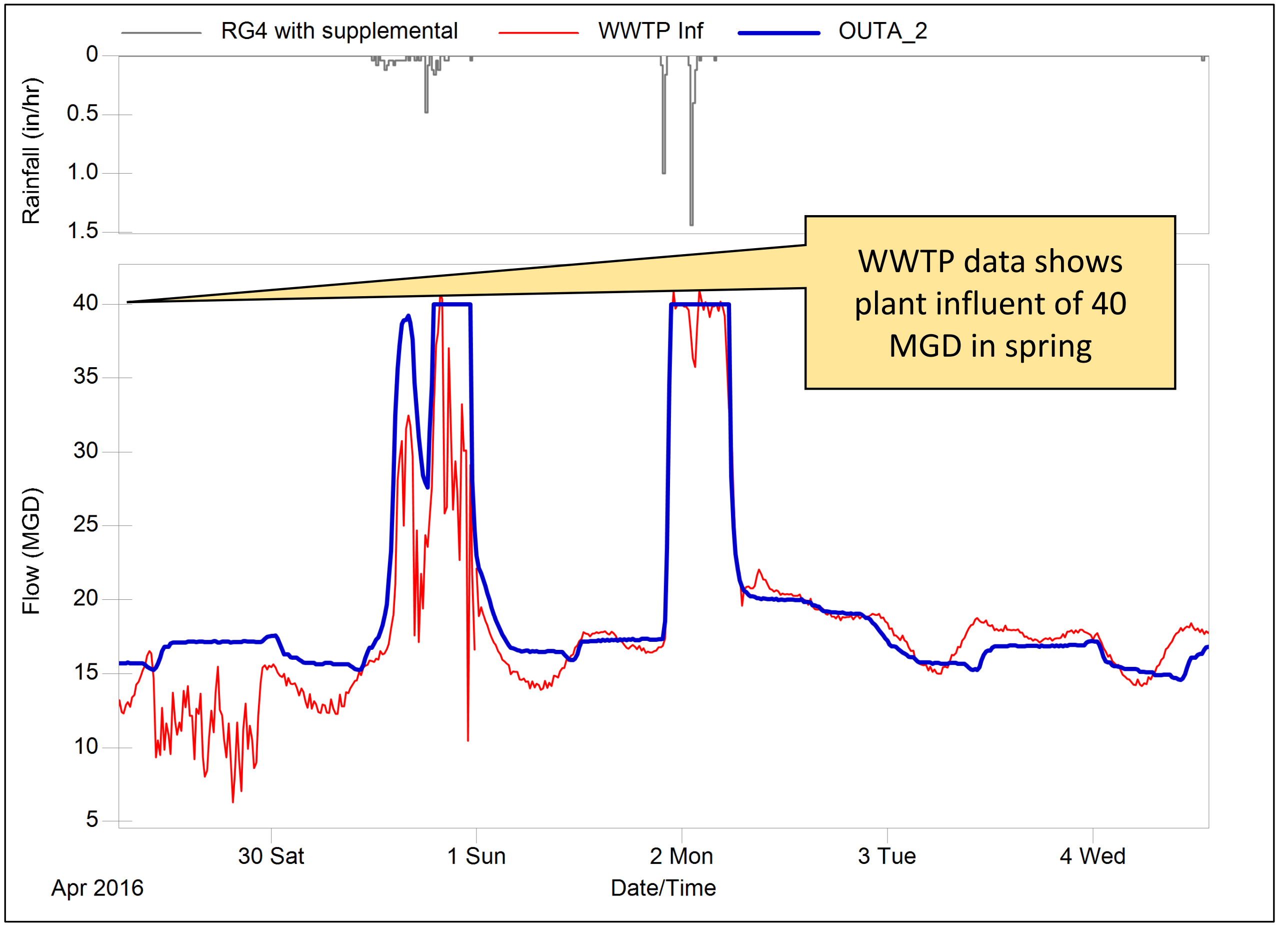
11/18/15

WWTP

Calibration Events
3/24/16

No WWTP data

WWTP (40 MGD)



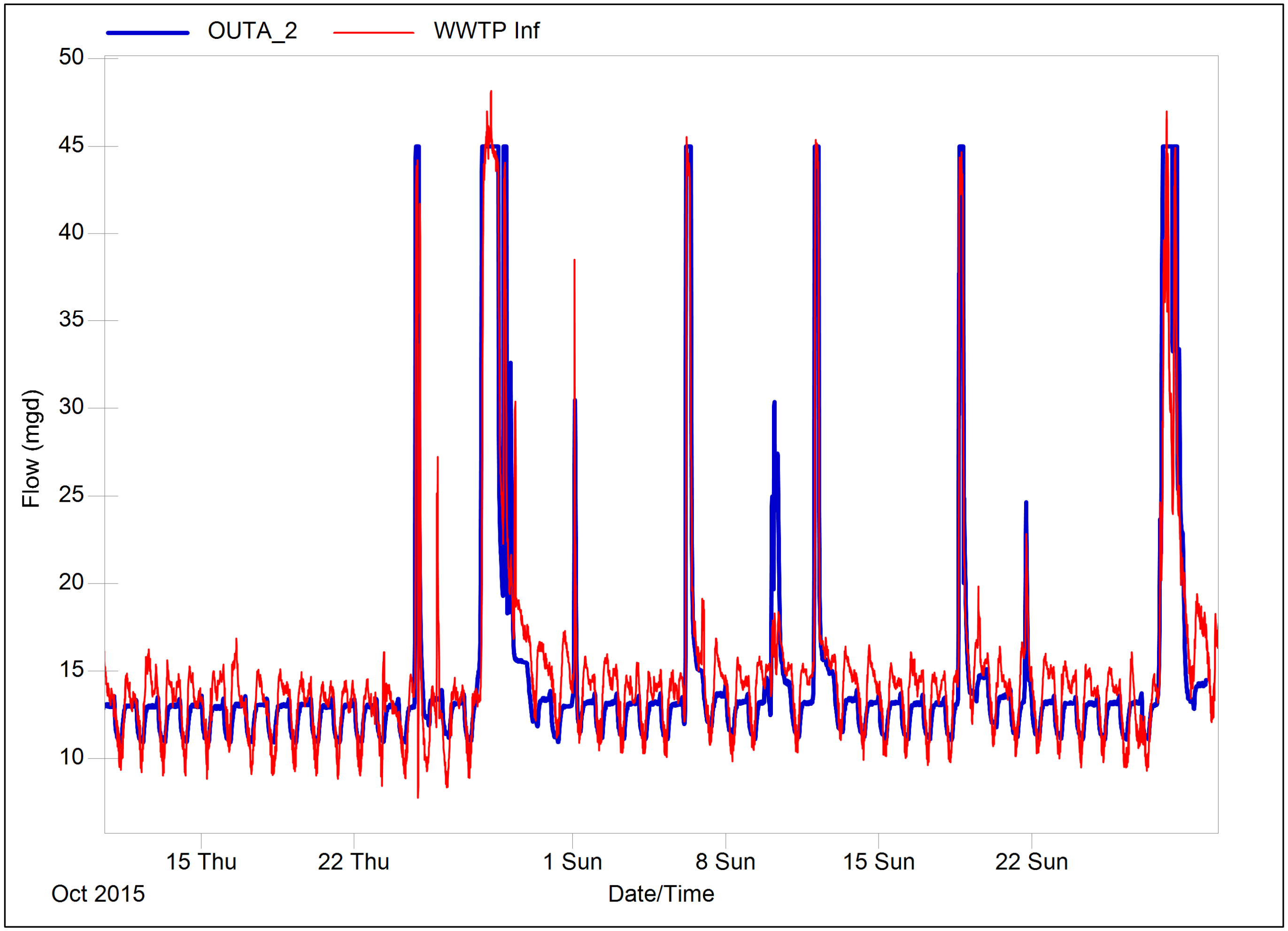
Calibration Events
4/30/16, 5/1/16

WWTP (40 MGD)

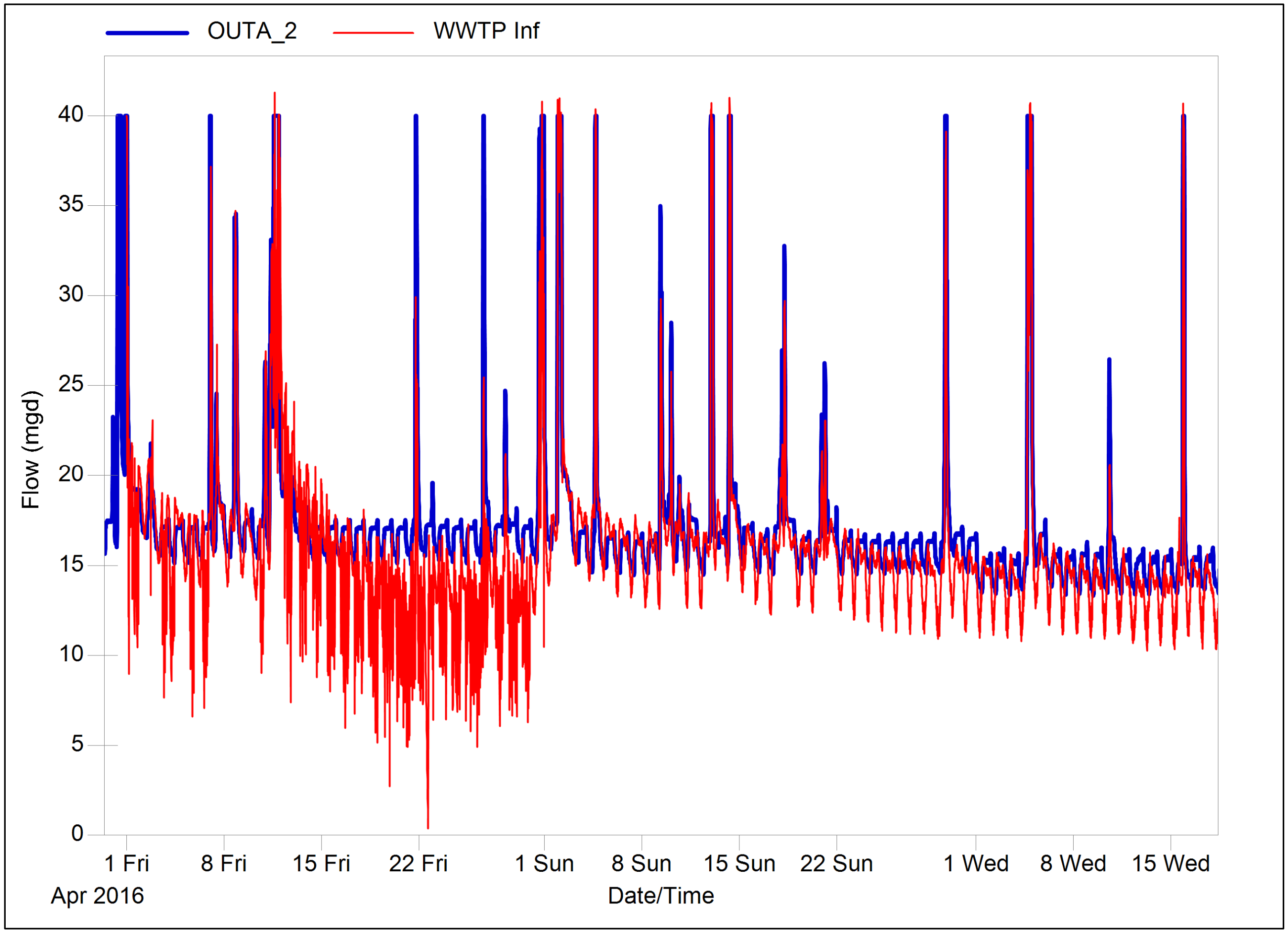
Calibration Events
6/15/16

WWTP (40 MGD)

Fall 2015

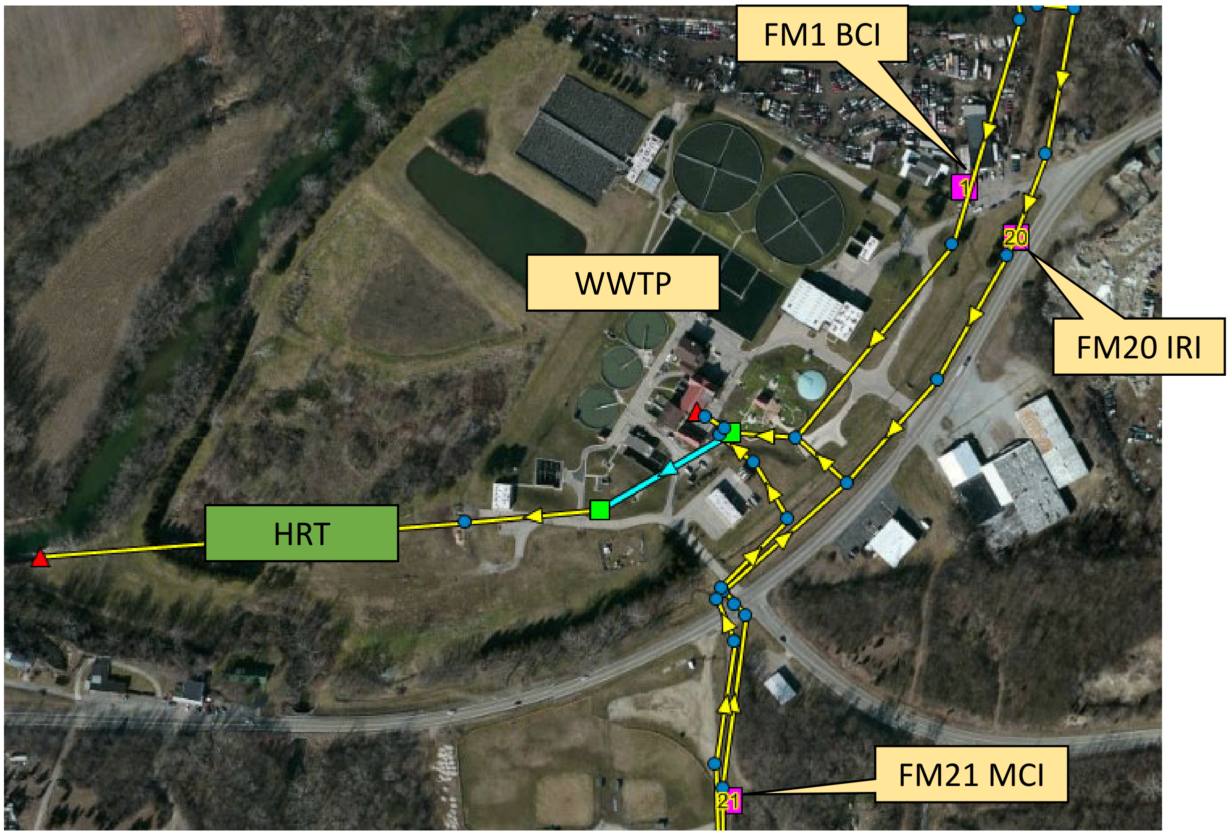


WWTP (40 MGD)

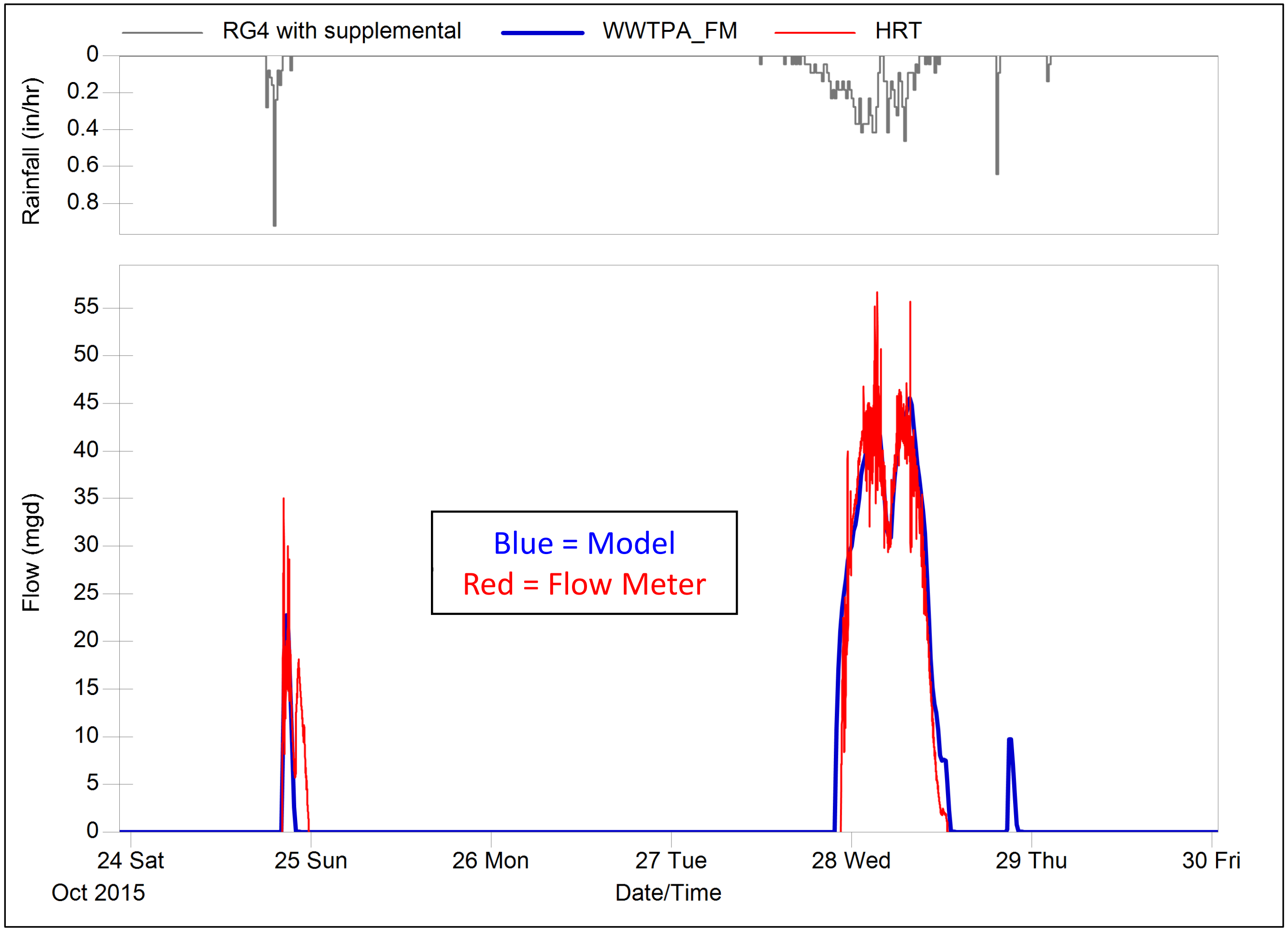


Spring 2016

HRT Influent

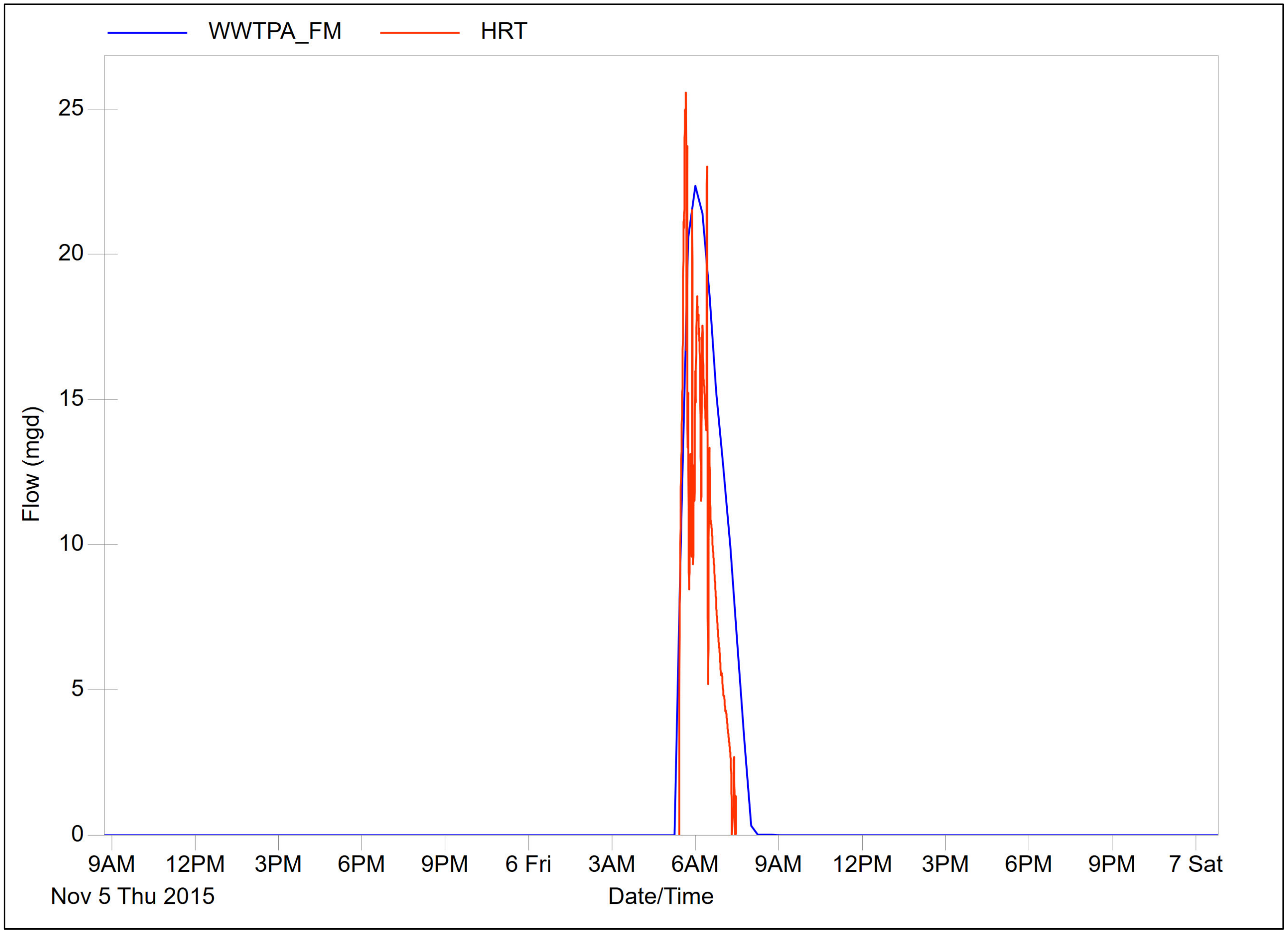


HRT



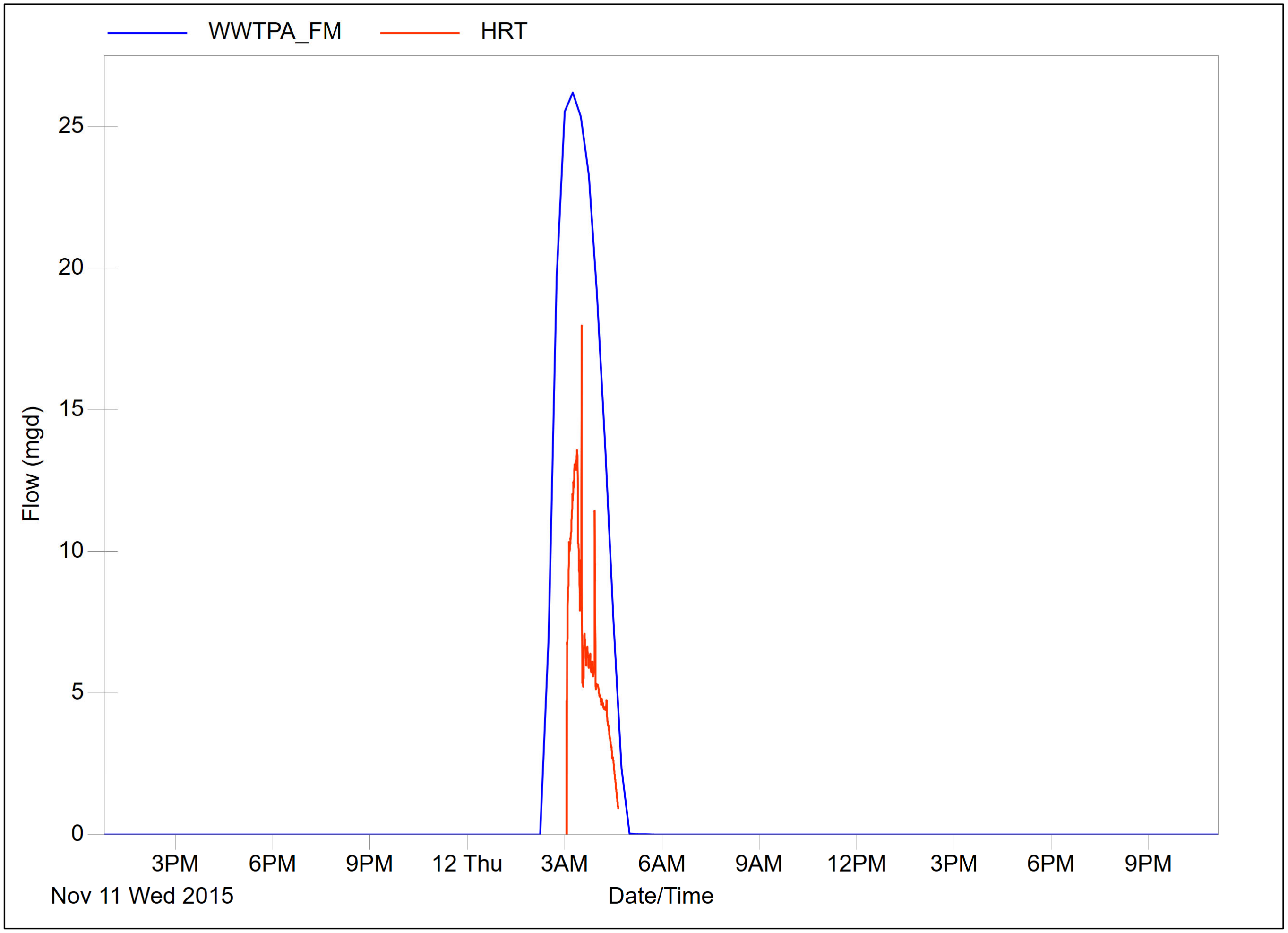
Calibration Events
10/24/15, 10/27/15

HRT



Calibration Events
11/6/15

HRT

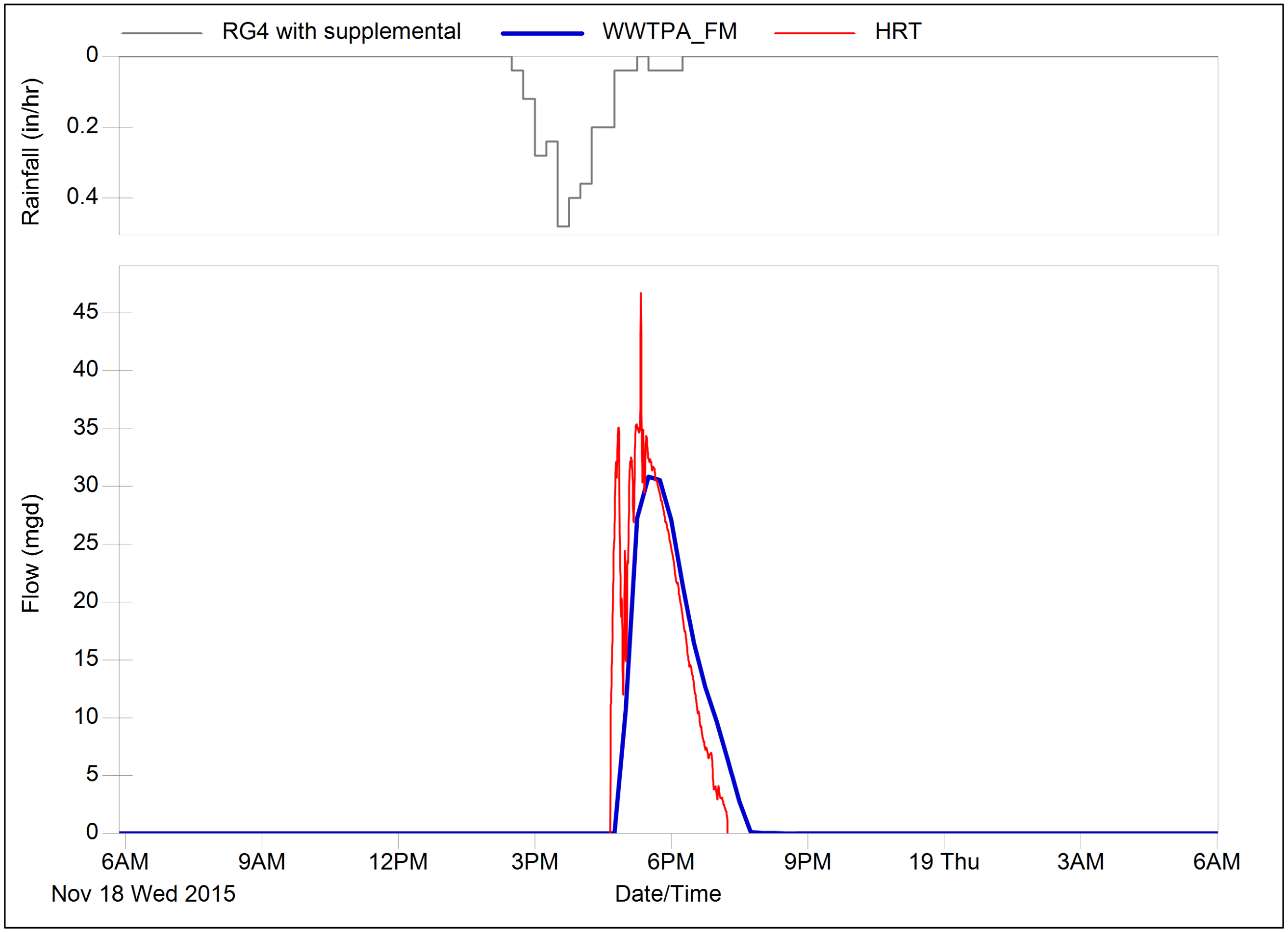


Calibration Events

11/11/15

HRT

Calibration Events
11/18/15

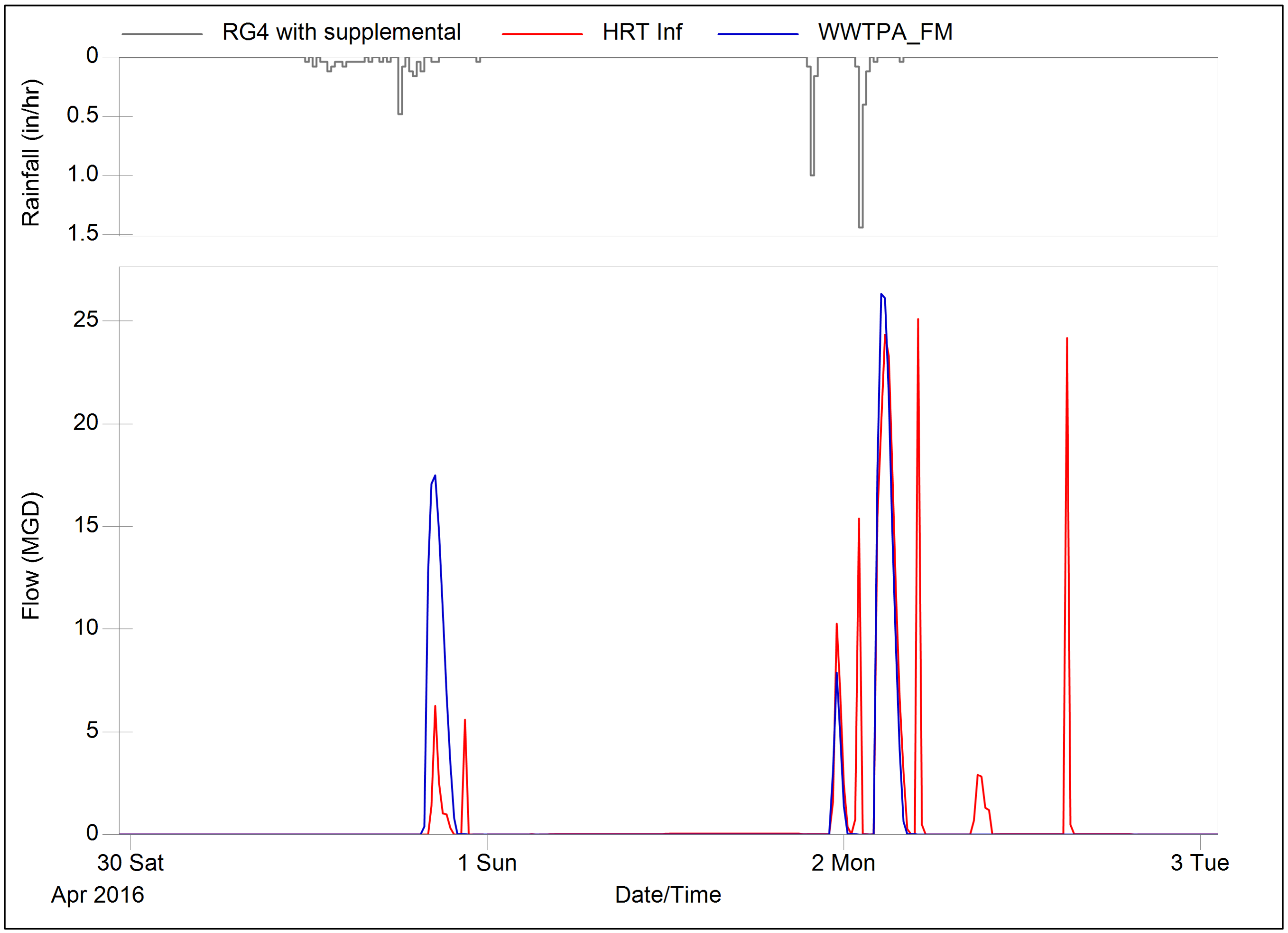


HRT

Calibration Events
3/24/16

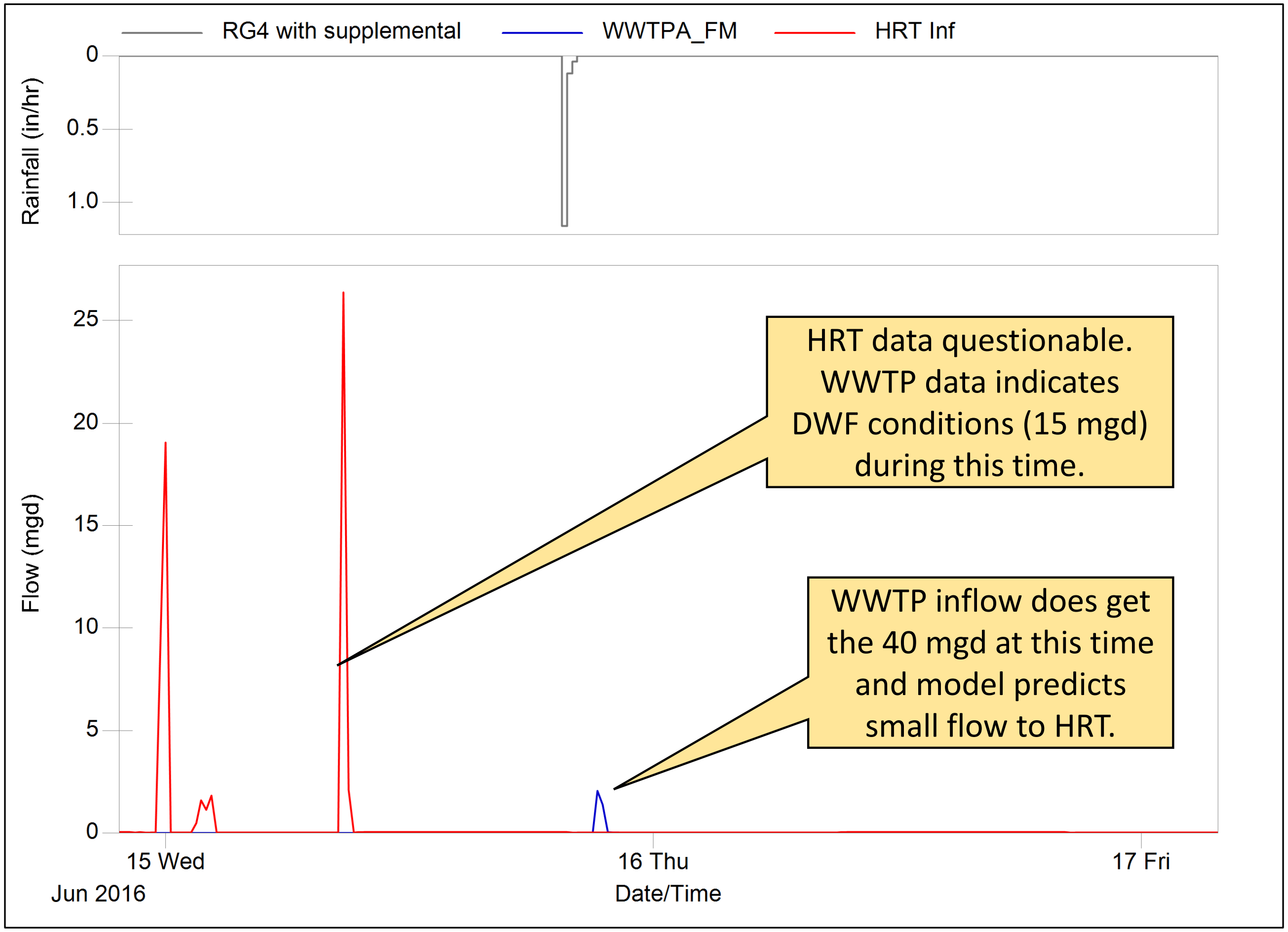
No HRT data

HRT



Calibration Events
4/30/16, 5/1/16

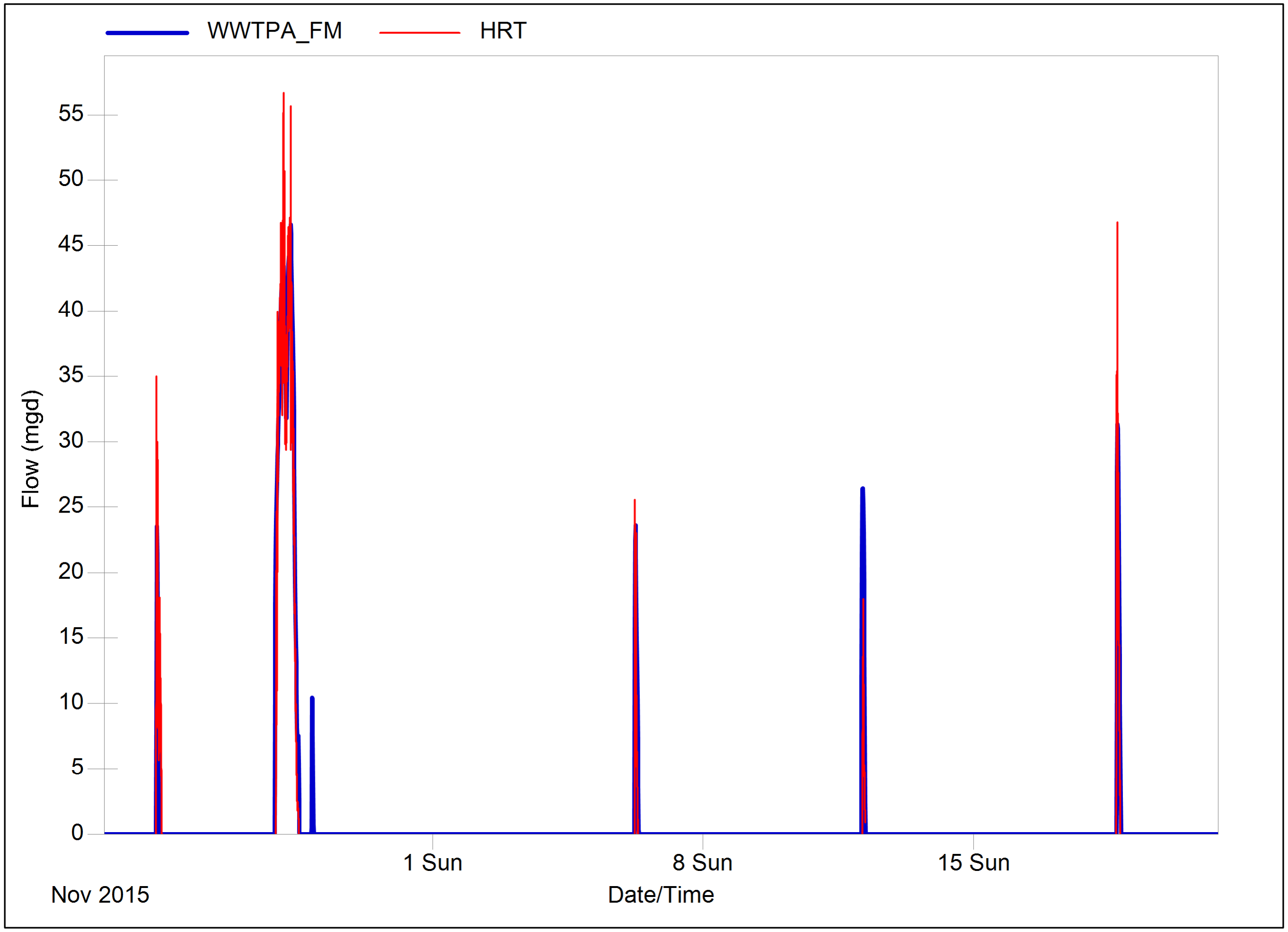
HRT



Calibration Events
6/15/16

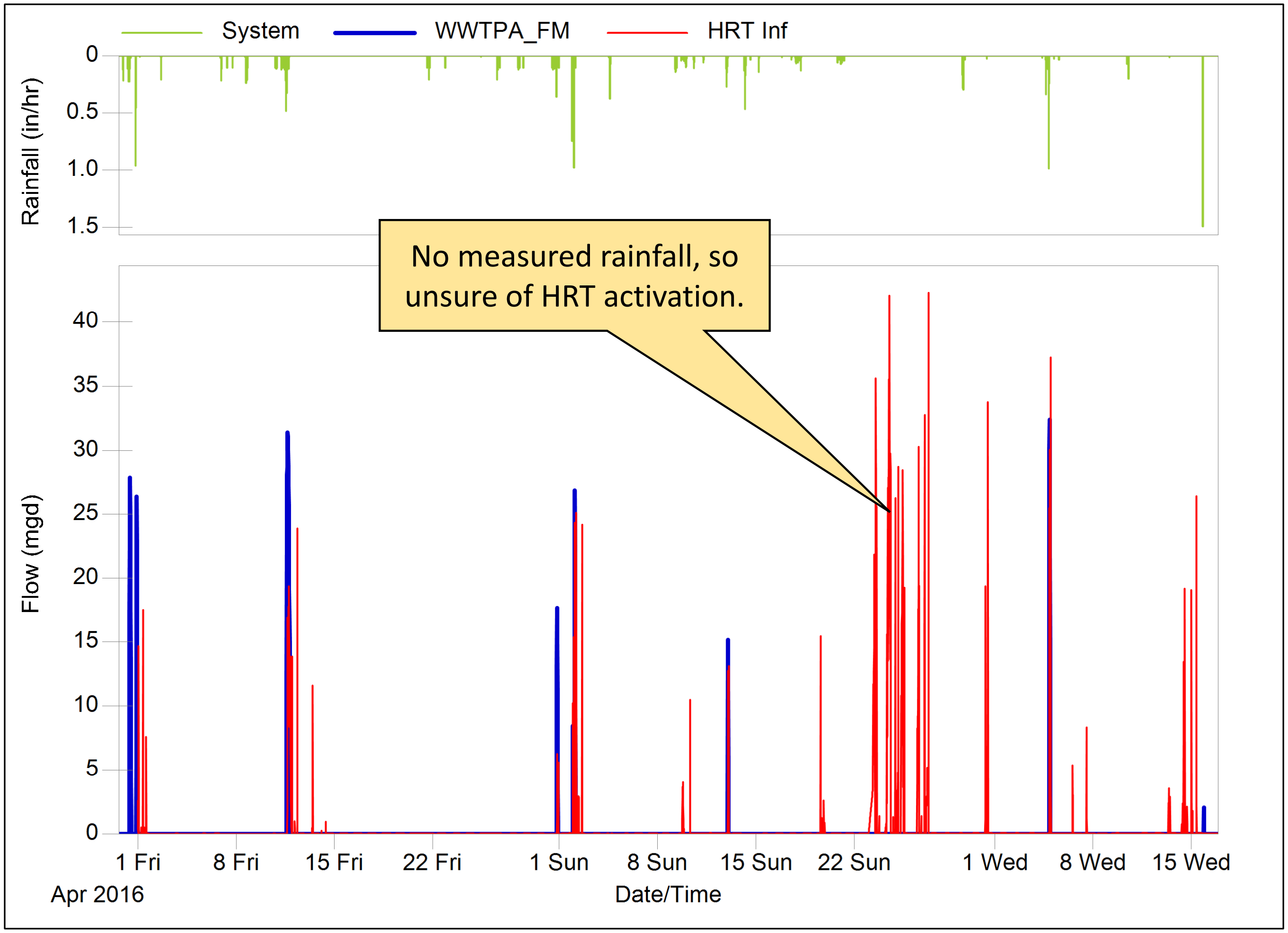
HRT

Fall 2015



HRT

Spring 2016



APPENDIX B
TYPICAL YEAR CSO STATISTICS

City of Springfield Typical Year CSO Activation and Volume Summary [1]

CSO		November 2021 "Current" Conditions [2]			Baseline Conditions [3]			Updated Integrated LTCP [4]		
		Activations	TY Volume (MG)	Comments	Activations	TY Volume (MG)	Comments	Activations	TY Volume (MG)	Comments
2	Indian Run	18	1.2		4	0.10	Weir Optimization	4	0.10	
3	Central	30	1.9		0	0.0	Small Scale Separation	0	0.0	
4	Central	4	0.1		4	0.08		5	0.08	
5	Central	48	12.3		48	12.3		48	12.3	
6	Central	36	9.6		36	9.6		36	9.6	
7	Buck Creek NW	15	0.1		3	0.05	Weir Optimization	3	0.05	
8	Indian Run	37	46.2		37	46.2		14	10.1	Large Diameter WWTP Conveyance
10	Central	3	0.013		0	0.0	Weir Optimization	0	0.0	
11	Central	5	0.02		1	0.00004	Weir Optimization	1	0.00004	
12	Buck Creek NW	26	14.2		26	14.2		26	14.2	
13	Central	24	6.9		24	7.1		24	7.1	
14	Buck Creek NW	26	2.4		5	0.39	Weir Optimization	5	0.40	
15	Buck Creek NW	2	0.008		2	0.008		2	0.008	
17	Central	38	4.0		39	4.1		39	4.1	
19	Buck Creek NW	51	12.2	Fixed an instability at CSO 19 weir node	47	12.3		47	12.3	
20	Buck Creek NW	3	0.1		3	0.1		3	0.1	
22	Buck Creek NW	6	0.5		4	0.23	Weir Optimization	4	0.23	
23	Central	29	13.0		23	5.9	Small Scale Separation	23	5.9	
24	Central	17	3.6		0	0.0	Full Separation	0	0.0	
25	Buck Creek East	38	6.3		37	4.6	Small Scale Separation	37	4.6	
26	Buck Creek East	26	7.7		25	5.6		25	5.6	
27	Buck Creek NE	30	1.5		4	0.11	Weir Optimization	4	0.11	
28	Buck Creek NE	3	0.01		3	0.005		3	0.005	
29	Buck Creek East	14	0.9		10	0.8		10	0.8	
30	Buck Creek NE	5	0.1		0	0.0	Small Scale Separation	0	0.0	
31	Buck Creek NE	36	4.9		23	1.5	Small Scale Separation	23	1.5	
32	Buck Creek East	7	0.05		7	0.05		7	0.05	
33	Buck Creek East	17	1.2		17	1.2		17	1.2	
34	Buck Creek East	13	1.9		13	1.9		13	1.9	
35	Buck Creek East	37	17.0		37	17.1		37	17.1	
36	Buck Creek NE	14	0.7		14	0.8		14	0.8	
37	Buck Creek East	26	0.6		3	0.012	Weir Optimization	3	0.012	
38	Buck Creek East	12	0.6		13	0.8		13	0.8	
39	Buck Creek East	29	26.1		29	26.1		29	26.1	
40	Central	55	57.6	Fixed an instability at CSO 40 weir node	0	0.0	Fountain Avenue Tunnel	0	0.0	
41	Mill Run	54	103.1		47	68.7	Sustainable Infrastructure	11	9.8	Satellite HRT Facility
43	Mill Run	5	0.041		4	0.038		4	0.038	
44	Mill Run	20	2.6		20	2.6		18	1.7	Satellite HRT Facility
45	Mill Run	1	0.003		1	0.003		1	0.003	
46	Mill Run	8	0.4		2	0.0004	Weir Optimization	2	0.0004	
47	Mill Run	9	0.3		9	0.3		9	0.3	
50	Mill Run	8	0.4		8	0.4		8	0.4	
53	Mill Run	24	3.8		24	3.8		24	3.8	
55	Mill Run	36	1.7		36	1.7		36	1.7	
56	Mill Run	35	8.3		35	8.3		35	8.3	
57A	Mill Run	29	4.1		29	4.1		29	4.1	
57B	Mill Run	27	3.4		27	3.4		27	3.4	
57C	Mill Run	29	5.7		29	5.7		29	5.7	
59	Mill Creek	38	14.4		38	14.4		38	14.4	
62	Buck Creek NW	0	0		0	0		0	0	
68	Buck Creek East	8	0.1		2	0.009	Weir Optimization	2	0.009	
69	Buck Creek NE	6	0.05		1	0.002	Weir Optimization	1	0.002	
70	Central	41	46.1		26	57.5	Sustainable Infrastructure, Fountain Avenue Tunnel	26	56.6	Satellite HRT Facility
82	Mill Creek	27	5.1		27	5.1		27	5.1	
83	Mill Run	5	0.2		2	0.004	Weir Optimization	2	0.004	
CSO TOTAL		**1190**	**455.4**	Minor adjustments to model	**908**	**349**	Reductions due to baseline projects	**848**	**252.6**	Reductions due to LTCP projects
HRT		**38**	**174**	Assumes 40 MGD WWTP capacity; increased flow to HRT due to addition of Erie int/Express in model	**37**	**164**	Assumes 40 MGD WWTP capacity	**34**	**187**	Assumes 40 MGD WWTP capacity
TOTAL		**1228**	**629**		**945**	**513**		**882**	**440**	

[1] It is important to note that from a regulatory compliance perspective model output showing small volume overflows (i.e., 10,000 gallons or less) may be unreliable and likely over conservative based on inherent inaccuracies in the hydraulic model

[2] November 2021 "Current" Conditions - Typical year CSO statistics following flow monitoring and model calibration efforts to better represent the current conditions in the combined system.

[3] Baseline Conditions - Typical year CSO statistics following implementation of the weir optimization, sustainable infrastructure, small scale separation projects, and the Fountain Avenue Tunnel project outlined in Section 3.03 of the Updated Integrated LTCP.

[4] Upgraded Integrated LTCP - Typical year CSO statistics building on the Baseline Conditions model and including the implementation of the Large Diameter WWTP Conveyance and Satellite HRT Facility and projects outlined in Section 3.03 of the Updated Integrated LTCP.

APPENDIX C
PROJECT FACT SHEETS

LONG TERM CONTROL PLAN

Project Fact Sheet

Project Name: Sunset Avenue Strategic Separation and Detention Basin

CSO Addressed: 041 & 042

Project Overview

The Sunset Avenue project is located just north of the Southern Village Shopping Center, near the intersection of Sunset Avenue and Selma Road, in the City's largest CSO drainage area, CSO 041 & CSO 042. The outfall for CSO 041 & 042 is located along the Mill Run, activates 54 times annually, and discharges approximately 103 million gallons of CSO during a typical year.

The City currently owns the vacant and undeveloped parcel at the northwest corner of Sunset Avenue and Delta Road. As part of the effort to enhance this area and provide a CSO reduction benefit, construction of 3,500 linear feet of new storm sewer is proposed to offload stormwater runoff from the surrounding areas and direct it to a stormwater storage feature on this City owned property.

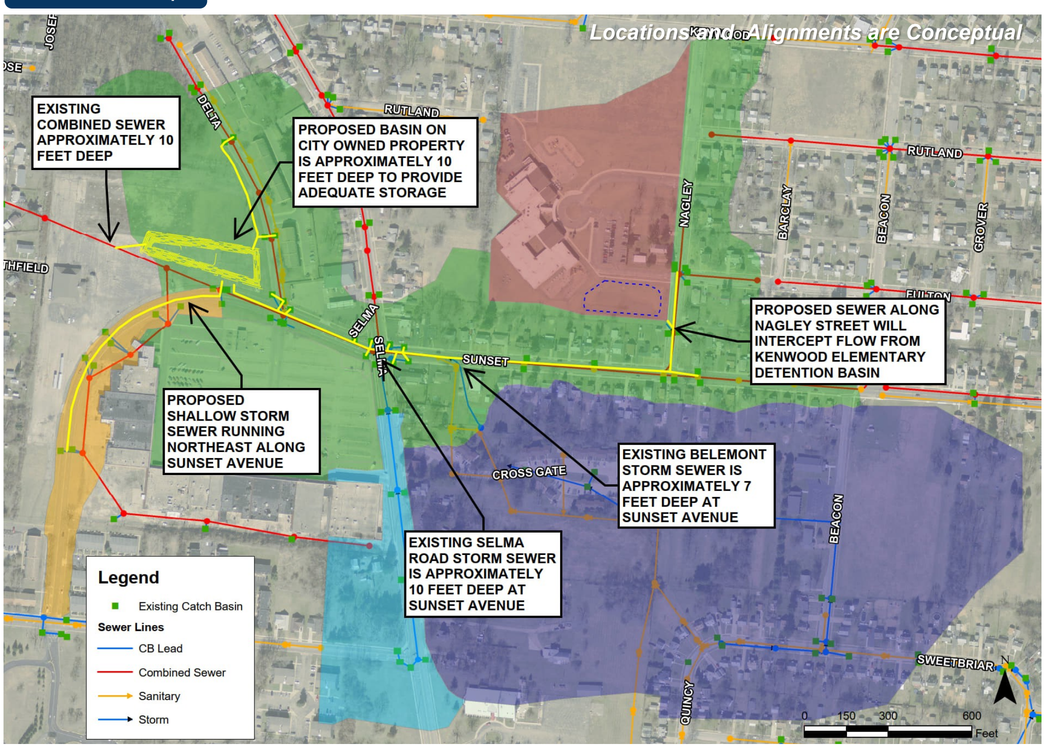
The proposed storm sewer will offload approximately 116 acres, including nearly 50 acres of separated area and an open channel system from the area south of Sunset Avenue (Belmont Meadows Sewer), 7.5 acres draining to the existing storm sewer along Selma Road, and runoff from the shopping center, Kenwood Elementary, and other surrounding areas.

The separated stormwater conveyed in the new storm sewer will be routed to a new surface detention feature with an outlet control structure designed to provide flow attenuation for the largest storm event in a typical year. The basin will then discharge to the existing 54-inch combined sewer running along the southern edge of the City's property.

Preliminary modeling shows the proposed basin will be approximately 10 feet deep in order to provide adequate storage and to allow for the basin to drain to the existing 54-inch combined sewer. Based on the review of available record drawings and information in the City's GIS system other components impacting the depth and size of the proposed storm sewer and basin include:

- The proposed storm sewer along Sunset Avenue east of Selma Road will need to be at least 7 feet deep to pick up the Belmont Meadows sewer.
- The proposed storm sewer along Sunset Avenue at Selma Road will need to be at least 10 feet deep to pick up the existing Selma Avenue storm sewer.
- The proposed storm sewer running northeast along Sunset Avenue will need to be shallow in order to cross over the existing combined sewer.

Overview Map

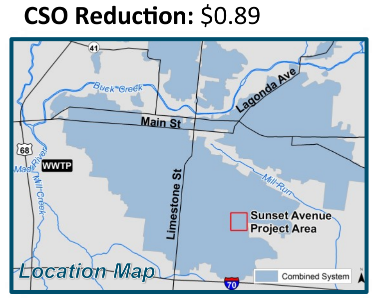


Project Benefits/Costs

This project reduces CSO volumes by approximately 8 million gallons in a typical year by installing new separate storm sewers and storing surface runoff prior to discharge into the combined system.

Capital Cost:
$7,140,000 (2022 Dollars)

Cost Per Gallon of CSO Reduction: $0.89



LONG TERM CONTROL PLAN

Project Fact Sheet

Project Name: Lincoln Elementary Basin Retrofit

CSO Addressed: 041 & 042

Project Overview

Lincoln Elementary is located along Tibbets Avenue, in a Springfield Promise Neighborhood, and within the City's largest CSO drainage area, CSO 041 & CSO 042. The outfall for CSO 041 & 042 is located along the Mill Run, activates 54 times, and discharges approximately 103 million gallons during a typical year.

Lincoln Elementary School was built in the early 2000s. The site covers approximately 14 acres, and has nearly 4 acres of impervious surfaces. As part of the facility construction a separate storm system and detention basin were built onsite. Based on review of the available record drawings approximately 7.8 acres from the existing site drain to the detention basin, including a majority of the impervious surface.

The Lincoln Elementary Basin Retrofit project will route additional street runoff from the surrounding area to the existing detention basin to provide additional capacity in the combined system during wet weather.

This project includes approximately 540 linear feet of new storm sewer to capture a group of existing inlets at the intersection of Tibbets Avenue and Catherine Street. The new storm sewer will route an additional 6.5 acres to the existing detention basin at Lincoln Elementary.

The existing outlet control structure has a 6.75” low flow orifice. Preliminary modeling of the existing detention basin indicates the existing outlet control structure and basin footprint can accommodate this additional drainage area with only minor grading changes to the basin at the outlet location of the new storm sewer.

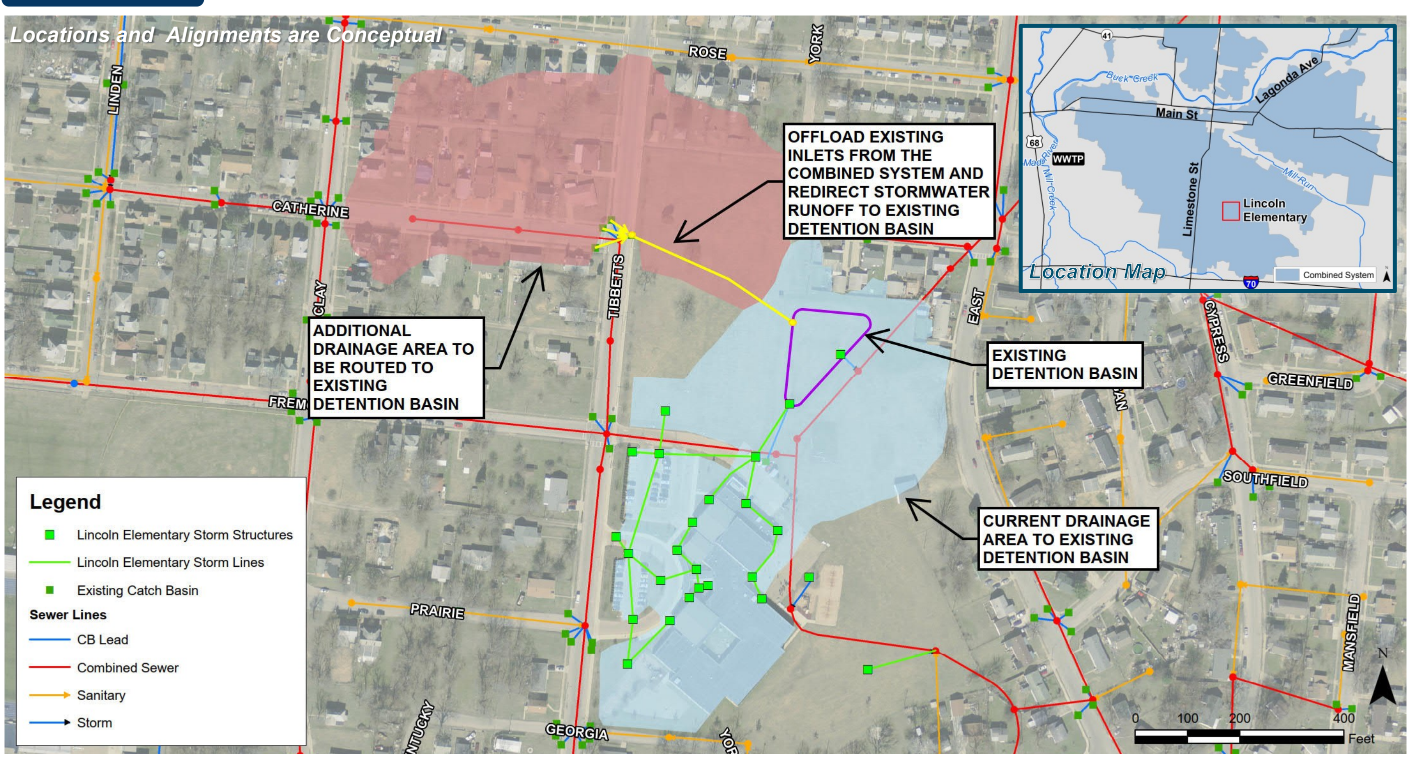
Project Benefits/Costs

This project reduces CSO volumes by approximately 1 million gallons in a typical year by storing additional stormwater runoff within the existing detention basin prior to discharge to the combined system.

Capital Cost:
$660,000 (2022 Dollars)

Cost Per Gallon of CSO Reduction: $0.66

Overview Map



LONG TERM CONTROL PLAN

Project Fact Sheet

Project Name: John Street Basin Enhancement

CSO Addressed: 041 & 042

Project Overview

The John Street Basin Enhancement project is located on City owned property adjacent to the Clark State Community College campus and is within the City's largest CSO drainage area, CSO 041 & CSO 042. The outfall for CSO 041 & 042 is located along the Mill Run, activates 54 times annually, and discharges approximately 103 million gallons of CSO during a typical year.

Currently, separated stormwater runoff from Clark State and some surrounding areas, totaling 305 acres, drains toward the northwest corner of campus where it is collected in a large low lying area prior to discharging under John Street and entering the combined system, near Mansfield Avenue. Due to topography and distance issues, completely offloading this large area from the combined system directly to a surface water is not a feasible option. However, with grading changes to the large low lying area on campus and the addition of a new outlet control structure, this area can provide significant detention for the separated stormwater runoff before it enters the combined system during typical year wet weather events.

The proposed outlet control structure will provide flow attenuation for the largest storm event in a typical year with the goal of maximizing storage and providing additional capacity within the existing downstream combined system. Flows from the larger design storms will also be detained within the basin area.

This project also includes modifications to an additional existing low lying area north of John Street. This feature will provide additional detention for stormwater runoff from existing separate storm sewers along John Street north of campus. Rerouting the existing storm sewer along John Street will require approximately 175 linear feet of new storm sewer. This storm system captures runoff from an additional 34 acres.

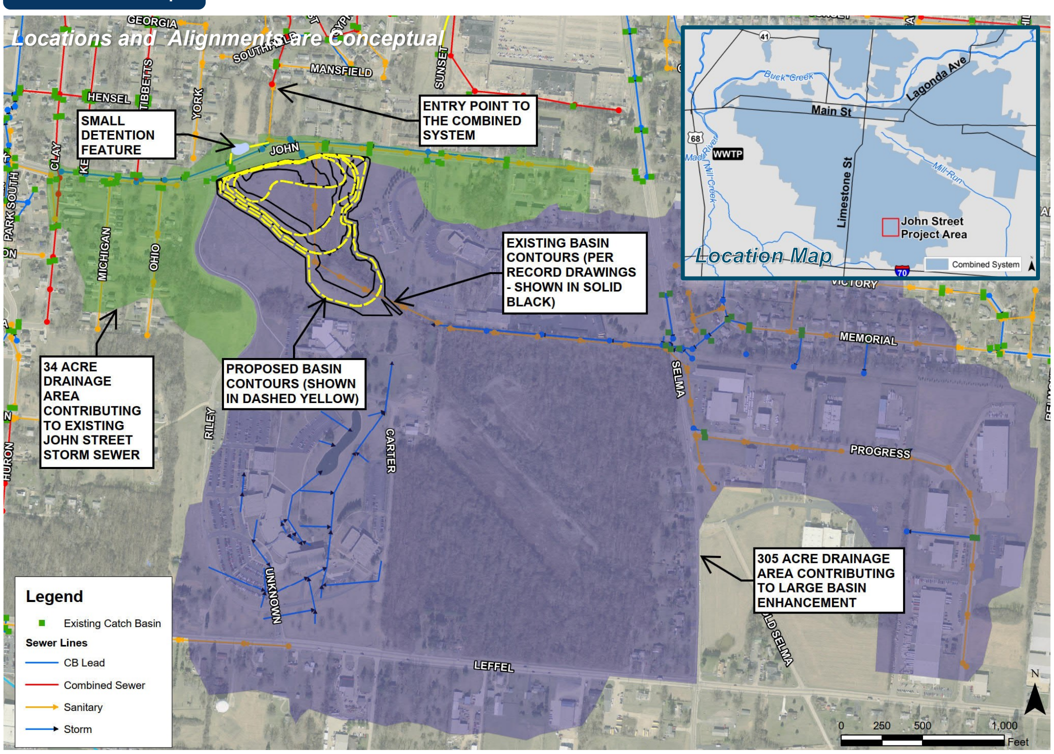
Project Benefits/Costs

This project reduces CSO volumes by approximately 25 million gallons in a typical year by storing surface runoff prior to discharge into the combined system.

Capital Cost:
$1,480,000 (2022 Dollars)

Cost Per Gallon of CSO Reduction: $0.06

Overview Map




Existing Basin Area


Existing Outlet Control Structure

LONG TERM CONTROL PLAN

Project Fact Sheet

Project Name: Fountain Avenue Tunnel

CSOs Addressed: 040 and 070

Project Overview

CSO 040 is located along Buck Creek at the confluence with the Mill Run, near Water Street, and is currently the second largest CSO within the City's system. CSO 040 currently activates 55 time per year and discharges approximately 58 million gallons of overflow annually.

This project will capitalize on the available storage within the nearby Fountain Avenue Tunnel to redirect flow from CSO 040 to CSO 070. This project includes the following major components:

- Flow in the Mill Run Interceptor will be intercepted prior to reaching the current CSO 040 diversion chamber. This flow will then be routed to CSO 070 under the railroad and discharged into the existing combined sewer on Linden Avenue. Emergency bypass to CSO 040 will be provided.
- The flow will eventually reach the existing 108" tunnel sewer along Fountain Avenue, upstream of the CSO 070 diversion chamber. A new CSO 070 diversion chamber with a higher weir wall at the discharge of the Fountain Avenue Tunnel will allow for significant storage of wet weather flow within the system. Emergency bypass of tunnel storage will be provided.
- Anticipated joint, cracking, and invert repairs to the Fountain Avenue Tunnel are included.
- Modifications to the CSO 070 division chamber to include screening and increased weir height. CSO 070 currently discharges approximately 46 million gallons of overflow to Buck Creek annually.
- The primary outfall for CSO 070 will be moved approximately 550 feet downstream to discharge to Buck Creek. Discharge from the existing CSO 070 outfall will also occur during the largest typical year storm event.

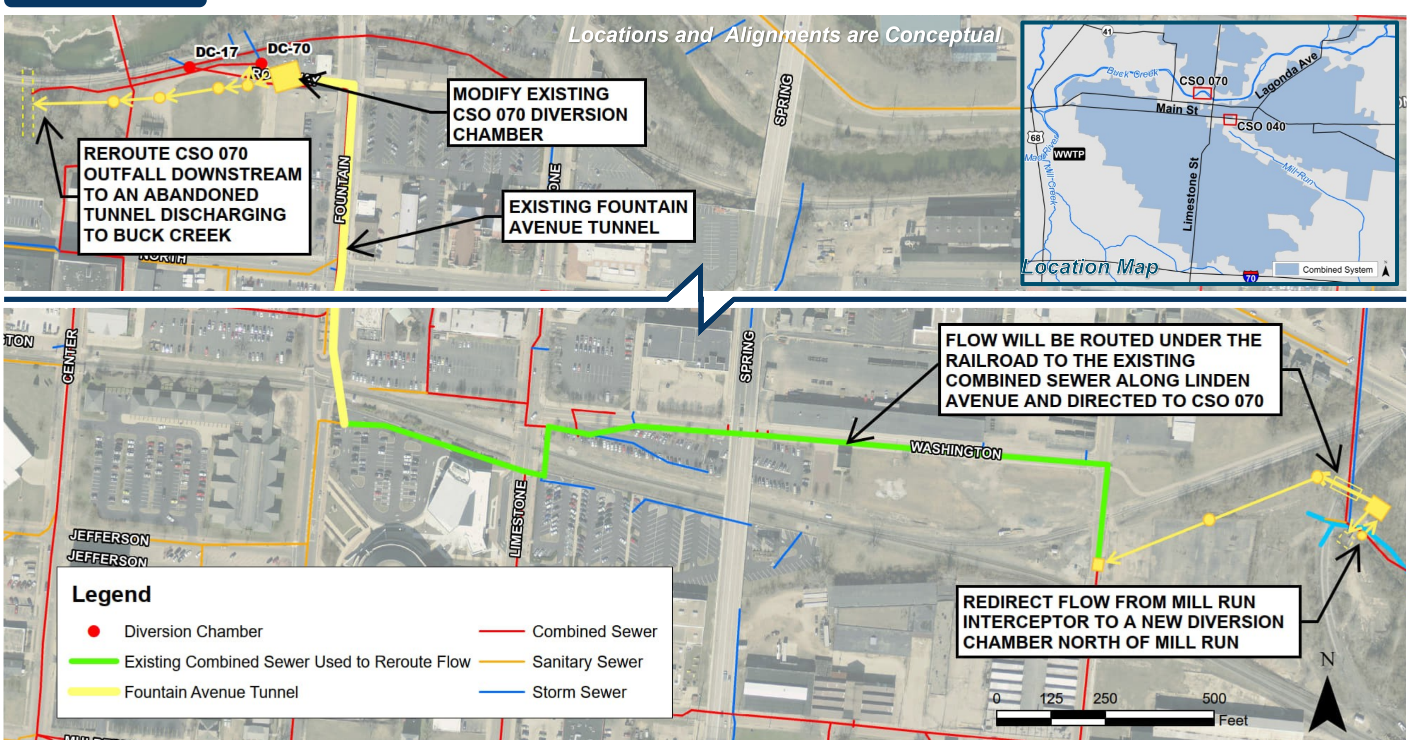
Project Benefits/Costs

This project will remove all CSO discharges (55 activations to 0, 58 million gallons to 0) from CSO 040 in a typical year. By rerouting the flow from CSO 040 to CSO 070, the annual overflow volume at CSO 070 is increased from 46 million gallons to 58 million gallons. Overall this project provides a net decrease in system overflow volume of 48 million gallons.

Capital Cost:
$11,400,000 (2022 Dollars)

Cost Per Gallon of CSO Reduction: $0.24

Overview Map



LONG TERM CONTROL PLAN

Project Fact Sheet

Project Name: Conveyance to Wastewater Treatment Plant

CSO Addressed: 008

Project Overview

CSO 008 is located on the western side of the City's combined system and discharges on the south side of the Buck Creek. This area was historically drained by a surface channel known as Indian Run. Currently, a large diameter combined sewer, collects flow from existing combined, sanitary, and separate storm sewers. CSO 008 is one of Springfield's largest CSOs, activating 37 times annually and discharging 46 million gallons during a typical year.

The proposed Conveyance to Wastewater Treatment Plant project consists of intercepting flows in the existing 72-inch combined sewer, along Western Avenue, upstream of the CSO 008 diversion structure and rerouting the combined sewage to the City's wastewater plant for treatment. This project includes:

- 1 new diversion chamber at Pleasant Street and Western Avenue.
- Approximately 5,375 linear feet of 78-inch sewer.
- Approximately 2,400 linear feet of jack and bore construction under Clark Street. The proposed launching pit is located in David Moore Park. The proposed receiving pit is located south of Pleasant Street along Dayton Avenue.

Other Considerations

Construction for the large conveyance system will require road closures and detour plans. Additionally, considerations for pavement repair, shoring, dewatering and bypass pumping are in the project costing. It is anticipated that temporary easements may also be required.

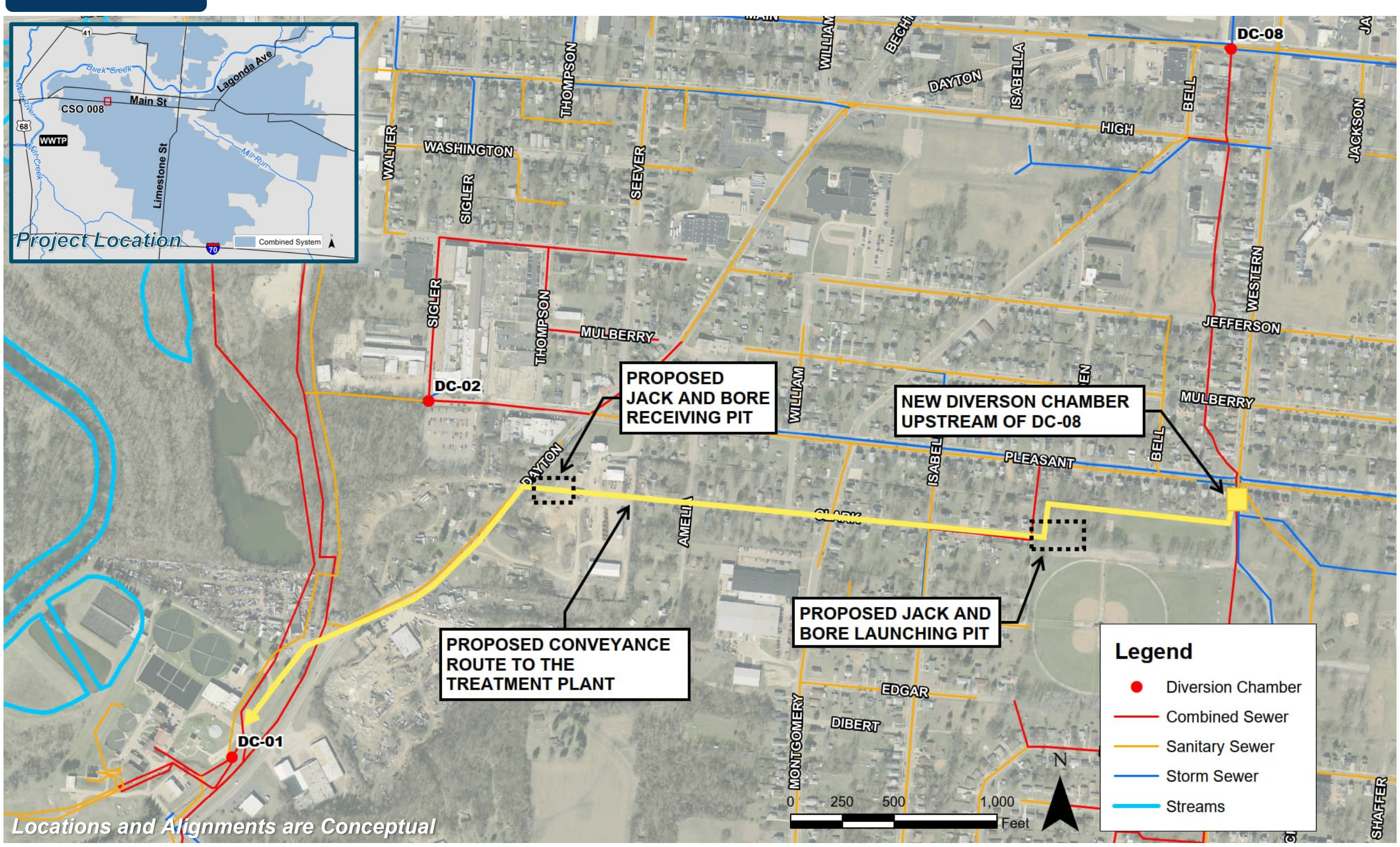
Project Benefits/Costs

This project will reduce CSO discharges by 36 million gallons during a typical year.

Capital Cost:
$25,600,000 (2022 Dollars)

Cost Per Gallon of CSO Reduction: $0.71

Overview Map



LONG TERM CONTROL PLAN

Project Fact Sheet

Project Name: Satellite High Rate Treatment

CSOs Addressed: 041 & 042, 044

CITY OF SPRINGFIELD OHIO FORWARD TOGETHER

Project Overview

The proposed Satellite High Rate Treatment (HRT) project is located on the east side of the City's combined system, in an industrial area, along the Mill Run. The proposed project will provide HRT for CSOs 041 & 042 and 044. The outfall for CSO 041 & 042 discharges on the south side of Mill Run and CSO 044 discharges on the north side of Mill Run, both near East Street. The proposed HRT will be constructed following the implementation of three sustainable infrastructure projects, included in the LTCP, which will reduce CSO discharges from CSO 041 & 042 to 69 million gallons of overflow during 47 activations in a typical year. CSO 044 discharges 20 times annually and discharges 2.6 million gallons in a typical year.

This proposed project includes the following components:

- 1 new diversion chamber with passive screening at CSO 044 to direct flow to a new 2.25 MGD pump station.
- Approximately 700 linear feet of 12-inch force main bringing flow from CSO 044 to the facility.
- 1 new diversion chamber with passive screening at CSO 041 & 042 and approximately 75 linear feet of 72-inch sewer to bring flow to the facility.
- 34 MGD HRT facility with influent pumping and a backwash pump to the sanitary sewer.

Other Considerations

Construction for the HRT facility, pump station, and sewer improvements will require work adjacent to a waterway, railroad, and overhead power lines. Additionally, considerations for rock excavation and sheeting have been included in the project costing. It is anticipated that structure demolition and property acquisition may also be required.

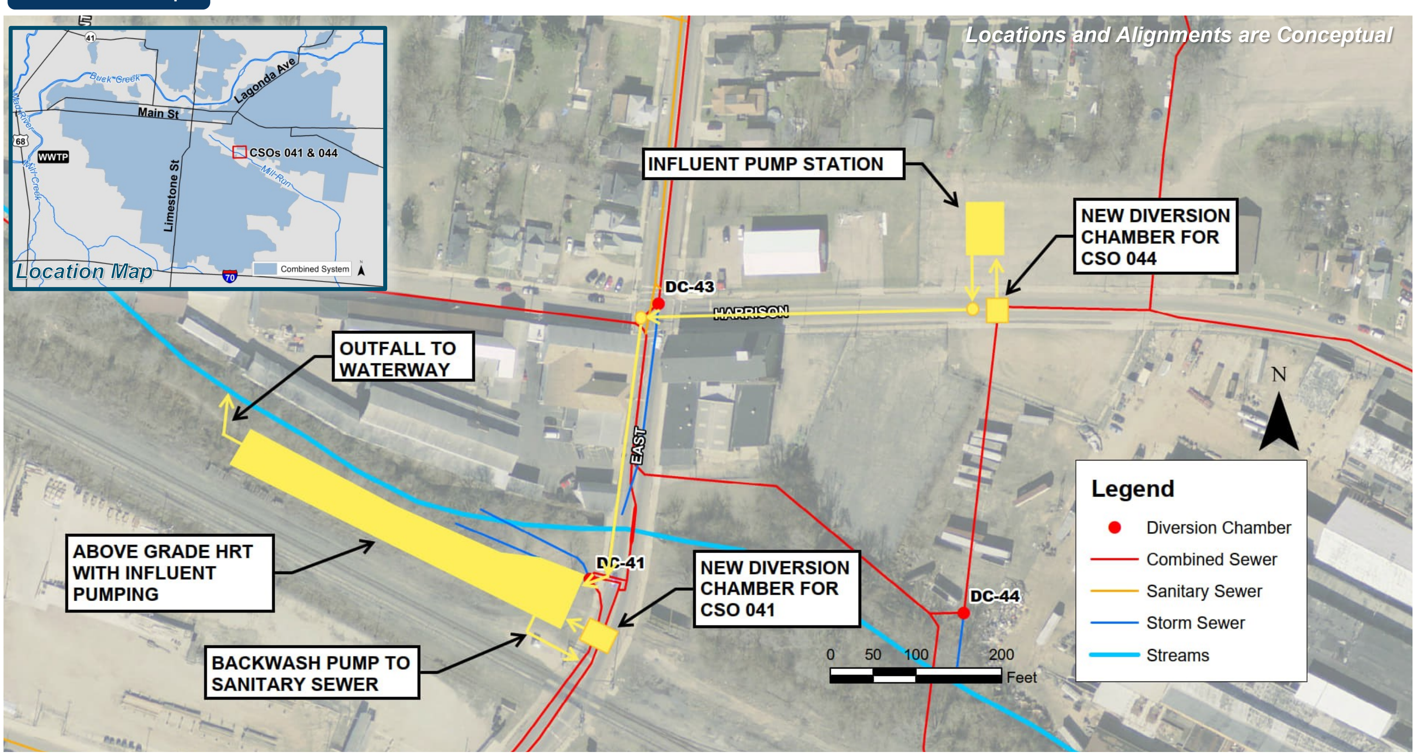
Project Benefits/Costs

This project will reduce CSO discharges by 61 million gallons during a typical year.

Capital Cost:
$43,500,000 (2022 Dollars)

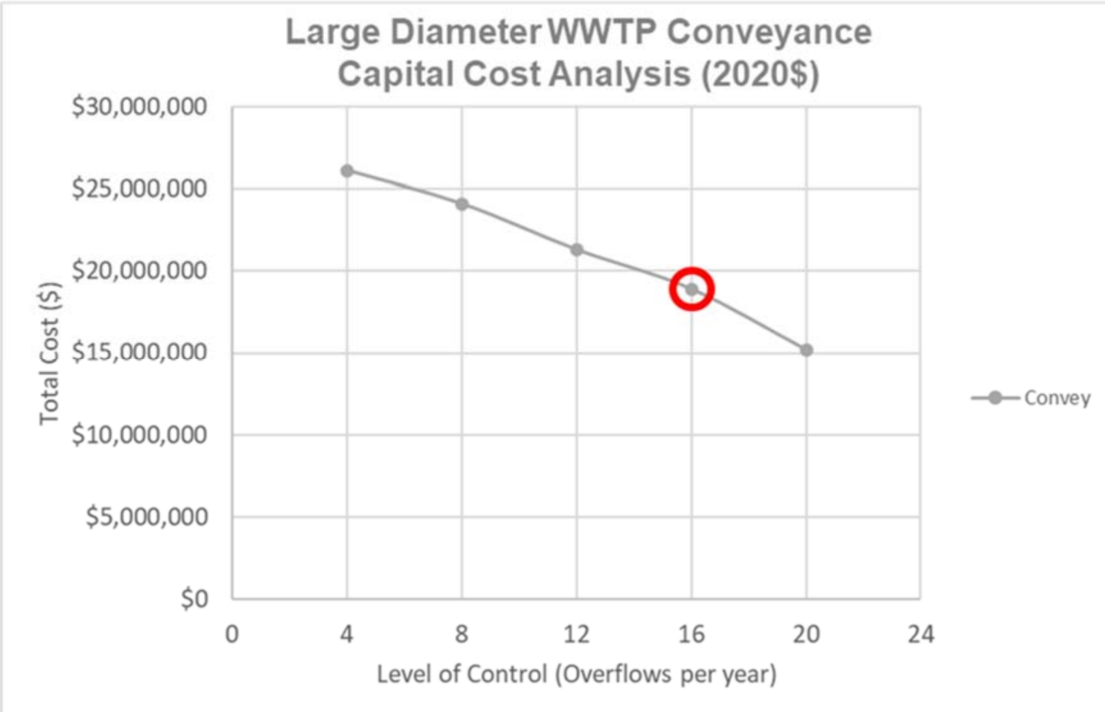
Cost Per Gallon of CSO Reduction: $1.21

Overview Map

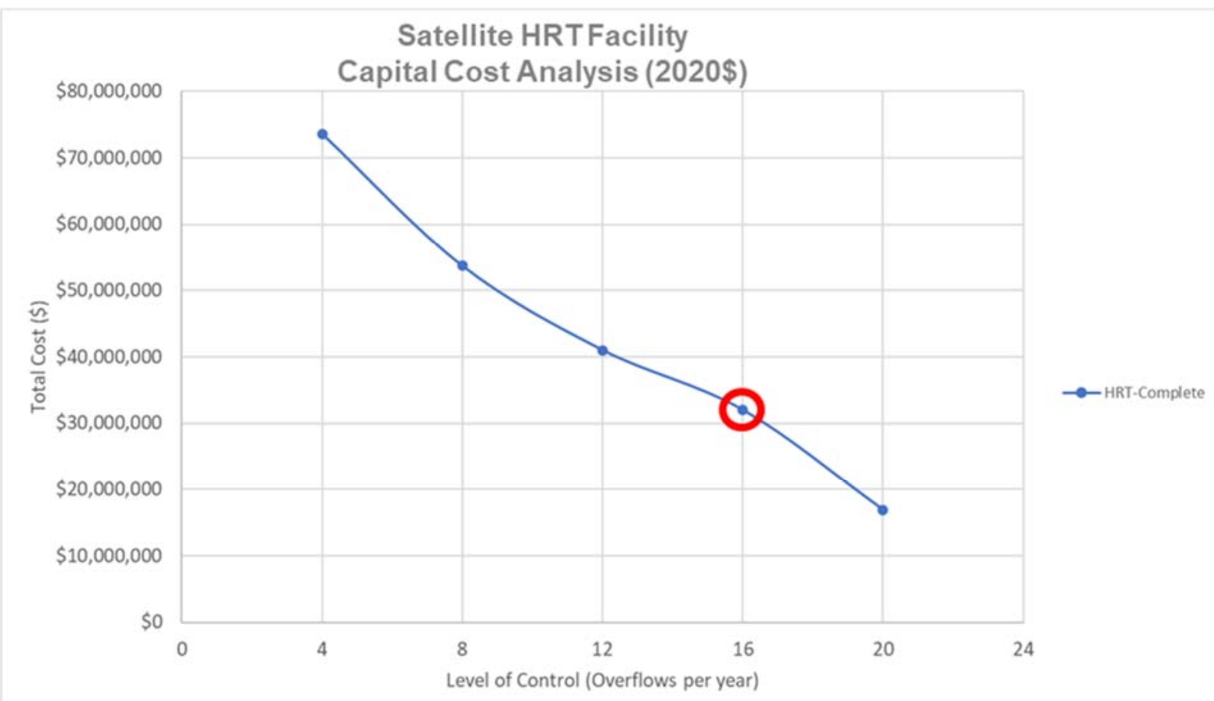


APPENDIX D
KNEE OF THE CURVE ANALYSIS

Large Diameter Conveyance to WWTP



Satellite HRT Facility



Note: Following selection of level of control for each project the preliminary opinion of cost was refined including escalation from 2020 to 2022 dollars.

APPENDIX E
RESIDENTIAL SHARE CALCULATION

City of Springfield Residential Share Calculation

Wastewater Flow	Total	Comment
Treated Wastewater Flow (ccf)	7,876,203	NPDES Data Sheets Influent + HRT Flow
Billed Flow (ccf)	2,668,707	Billed Volume Inside the City + Outside the City
Unbilled Flow (ccf)	5,207,496	Treated Flow - Billed Flow

Billed Flow Allocation	Total	Comment
Residential Billed Flow (ccf)	1,361,650	Residential Accounts
Multi-Unit Housing Billed Flow (ccf)	150,935	Multi Unit Housing Accounts
Total Residential Billed Flow (ccf)	1,512,585	Residential Accounts + Multi Unit Housing Accounts
Residential Percent of Billed Flow	57%	Total Residential Billed Flow / Billed Flow
Non-Residential Billed Flow (ccf)	1,156,122	Billed Flow - Total Residential Billed Flow
Non-Residential Percent of Billed Flow	43%	Total Non-Residential Billed Flow / Billed Flow

Number of Accounts	Total	Comment
Residential Account Bills	22,589	Residential Bills + Northridge Housing Units + Limecrest Addresses
Total Account Bills	24,958	Total Bills + Northridge Housing Units + Limecrest Addresses
Percent Residential Bills	90.5%	Residential Bills / Total Bills
Non-Residential Account Bills	2,369	Total Bills - Residential Bills
Percent Non-Residential Bills	9.5%	Non-Residential Bills / Total Bills

Unbilled Flow Allocation	Total	Comment
1/3 Allocated According to Billed Flow (ccf)	1,718,474	1/3 of Unbilled Flow
Residential Unbilled Flow (ccf)	979,530	1/3 of Unbilled Flow * Residential Percent of Billed Flow
Non-Residential Unbilled Flow (ccf)	738,944	1/3 of Unbilled Flow * Non-Residential Percent of Billed Flow
2/3 Allocated by Number of Accounts (ccf)	3,489,022	2/3 of Unbilled Flow
Residential Unbilled Flow (ccf)	3,157,565	2/3 of Unbilled Flow * Percent Residential Bills
Non-Residential Unbilled Flow (ccf)	331,457	2/3 of Unbilled Flow * Percent Non-Residential Bills
Total Residential Unbilled Flow (ccf)	4,137,095	
Total Non-Residential Unbilled Flow (ccf)	1,070,401	
To determine the amount of unbilled flow associated with residential accounts, the City used the above approach, as outlined by the University of Cincinnati Economics Center's Financial Capability Assessment, originally prepared in 2015.		

Total Wastewater Flow Allocation	Total	Comment
Total Residential Flow (ccf)	5,649,680	Total Residential Billed Flow + Total Residential Unbilled Flow
Total Non-Residential Flow (ccf)	2,226,523	Total Non-Residential Billed Flow + Total Non-Residential Unbilled Flow
Total Treated Wastewater Flow (ccf)	7,876,203	NPDES Data Sheets Influent + HRT Flow
Percent Residential Flow	71.7%	Total Residential Flow / Total Treated Wastewater Flow
Percent Non-Residential Flow	28.3%	Total Non-Residential Flow / Total Treated Wastewater Flow

APPENDIX F
ASSET MANAGEMENT PROJECT LIST

2021-2041 Wastewater Treatment Plant - Long-Term Capital Improvement Plan

2021

Project #		CURRENT REVENUE	DEBT FINANCED PROJECT
1	WWTP Building Brick Repairs	$120,000	
2	WWTP Phase II Primary Effluent Pump (PEP) Project		$3,700,000
3	WWTP Post Aeration Blower Replacement	$300,000	
4	WWTP Raze 932 Dayton Ave (Kova Bldg) and Add Storage Building		$1,000,000
	Total	**$420,000**	**$4,700,000**

2022

		CURRENT REVENUE	DEBT FINANCED PROJECT
5	CMAS Blower Replacement		$200,000
6	Phosporus Removal Expansion, Study		
7	WWTP Surface Water Pump Station	$60,000	
	Total	**$60,000**	**$200,000**

2023

		CURRENT REVENUE	DEBT FINANCED PROJECT
8	Phosporus Removal Expansion, Design		
9	Replace Fuel Pumps (Tanks?)		$250,000
10	Replace Vehicle Scale		$250,000
	Total	**$0**	**$500,000**

2024

		CURRENT	DEBT FINANCED
11	Phosporus Removal Expansion, Construct		
12	Digester #4 Cleaning	$200,000	
13	Digester #4 Mixer Rebuilds	$35,000	
14	Primary Clarifier Turntable Replacements		$1,350,000
	Total	**$235,000**	**$1,350,000**

2021-2041 Wastewater Treatment Plant - Long-Term Capital Improvement Plan

2025-2039

Projected Year		CURRENT REVENUE	DEBT FINANCED PROJECT
2025	Erie Headworks		$2,400,000
2025	New Boiler Building (Digester)		$1,200,000
2025	Replace CMAS Coarse Bubble Diffuser System and Pipeworks		$250,000
2026	Header System for HRT to Capture First Flush		$1,800,000
2027	CMAS Blowers		$800,000
2028	Upgrade Existing Main Boiler Building System (2028)		$200,000
2029	Benjamin Drive Pump Station Replacement and Upsizing		$1,000,000
2030	Replace Final Settling Basins #1 & #2 with 12' min. depth		$15,000,000
2030	Replace Trickling Filters Rotary Distributors		$2,000,000
2031			
2032			
2033			
2034	Replace RAS/WAS Moyno Pumps (2034)		$85,000
2035	Convert Chlorine Contact Basin UV Disinfection (Main Plant and HRT)		$2,000,000
2036			
2037	Replace Belt Filter Presses (2037)		$250,000
2037	Southern Interceptor Sewer Pump Replacement and Upsizing		$1,500,000
2038	Replace CCB Substation & Effluent Pump MCCs, upsize existing Effluent Pumps (2040)		$1,500,000
2039	Brick / Concrete Repairs		$2,000,000
2039	Sugar Grove Pump Station Pump Replacement and Upsizing		$200,000
2039	Mad River Pump Station Pump Replacment and Upsizing		$300,000
2039	Progress Drive Pump Station Replacement		$350,000
	Total	**$0**	**$32,835,000**
	Grand Total	**$715,000**	**$39,585,000**

2021-2041 Sewer Collection System
Long-Term Capital Improvement Plan

2021

Project #		CURRENT REVENUE	DEBT FINANCED PROJECT
1	CSO Compliance Projects		$400,000
2	2021 Sewer Linings/I&I Elimination		$450,000
3	Catherine St Sewer	$150,000	
4	Misc Sewer Projects	$225,000	
	Total	**$375,000**	**$850,000**

2022

		CURRENT REVENUE	DEBT FINANCED PROJECT
5	CSO Compliance Projects	$400,000	
6	2022 I&I Elimination		$450,000
7	W. High & Seever Sewer Replacments	$200,000	
8	Northern, Rodgers, & Stanton Sewer Replacements	$475,000	
9	Misc Sewer Projects	$225,000	
	Total	**$1,300,000**	**$450,000**

2023

		CURRENT REVENUE	DEBT FINANCED PROJECT
10	CSO Compliance Projects	$400,000	
11	2023 Sewer Linings/ I&I Elimination		$450,000
12	Unidentified Sewer Replacements	$250,000	
13	Misc Sewer Projects	$225,000	
	Total	**$875,000**	**$450,000**

2024

		CURRENT	DEBT FINANCED
14	Automated Metering Infrastructure System		$5,000,000
15	CSO Compliance Projects	$400,000	
16	2024 I&I Elimination		$450,000
17	Henry Street Sewer Replacement		$2,100,000
18	Unidentified Sewer Replacements	$250,000	
19	Misc Sewer Projects	$225,000	
	Total	**$875,000**	**$7,550,000**

2021-2041 Sewer Collection System
Long-Term Capital Improvement Plan

2025-2039

Projected Year		CURRENT REVENUE	DEBT FINANCED PROJECT	Annual Projects*
2025	Northern Ave Utility Upgrades (combined sewer replacement, storm sewer separation, waterline and lead service line replacements) - *Multiple funding sources including grants and loans*	$286,000	$4,114,000	
2025	Indian Run Stone Culvert Rehabilitation		$1,000,000	
2025	12" Melrose District Sewer Lining, Rebert Pike to W Rose St (1800 lf @$80 lf)		$144,000	
2025	Remove Ground Water from Wittenberg Student Union	$75,000		
2026	Siphon Inspection & Rehabilitation		$1,000,000	$1,100,000
2027	Buck Creek Interceptor Rehabilitation		$12,000,000	$1,100,000
2028	24"-33" High Level Interceptor Sanitary Sewer Rehabilitation (7500 lf @$150/lf)		$1,125,000	$1,100,000
2029	30" & 36" Mill Run Interceptor Inspection & Cleaning (Lion's Cage to Burnett Rd)		$1,250,000	$1,100,000
2030				$1,100,000
2031	30" & 36" Mill Run Interceptor Lining (11,000 lf @ $200)		$2,000,000	$1,100,000
2032	54" & 60" Wheldon Ditch Sewer Rehabilitation (Cypress to CSO 42)		$1,250,000	$1,100,000
2033	North Erie I&I		$1,000,000	$1,100,000
2034				$1,100,000
2035	18"-24" Mill Creek Sewer Lining (Auburn Ave to Sunnyland) (6000 lf @ $120/lf)		$720,000	$1,100,000
2036				$1,100,000
2037	N. Belmont Ave 24" & 30" Combination from Main St to Edwards Ave (5000 lf @ $150/lf)		$750,000	$1,100,000
2038	S Belmont Ave, Van Buren, Alley, Lexington to Clairmont 24" & 30" Rehabilitation (3000 lf @$150/lf)		$450,000	$1,100,000
2039	East US 40 Sewer (16,000 lf of 12" @ $200/lf & 2 Lift Stations)		$4,200,000	$1,100,000
	Total	**$361,000**	**$31,003,000**	**$15,400,000**
	Grand Total	**$3,786,000**	**$40,303,000**	**$15,400,000**

*Compliance Projects $400k/year
Annual Sewer Rehab & I&I Reduction $475k/year
Miscellaneous Sewer Replacements $250k/year

For more location information
please visit www.strand.com

Office Locations

Ames, Iowa | 515.233.0000

Brenham, Texas | 979.836.7937

Cincinnati, Ohio | 513.861.5600

Columbus, Indiana | 812.372.9911

Columbus, Ohio | 614.835.0460

Joliet, Illinois | 815.744.4200

Lexington, Kentucky | 859.225.8500

Louisville, Kentucky | 502.583.7020

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Milwaukee, Wisconsin | 414.271.0771

Nashville, Tennessee | 615.800.5888

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