FINAL REPORT

DeKalb County Sanitary Sewer System-Wide Hydraulic Model Application Report: Pole Bridge Basin

Prepared for

Department of Watershed Management
DeKalb County, Georgia

Prepared by

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Acronyms and Abbreviations

ADDF	average daily dry weather flow
AWTP	Advanced Wastewater Treatment Plant
BSF	base sanitary flow
CAP	Capacity Assurance Program
CD	Consent Decree
CDPMT	Consent Decree Program Management Team
CIWEM	Chartered Institution of Water and Environmental Management
COA	City of Atlanta
DWF	dry weather flow
DWM	Department of Watershed Management (DeKalb County)
EPA	U.S. Environmental Protection Agency
ft	foot (feet)
GIM	Ground Infiltration Model
GIS	geographic information system
gpm	gallon(s) per minute
GWI	groundwater infiltration
HGL	hydraulic grade line
IGA	Intergovernmental Agreement
ITMC	Intrenchment Creek
in	inch (inches)
LS	lift station
MCD	Modified Consent Decree
mgd	million gallon(s) per day
MMADF	maximum month average day flow
MNGWPD	Metropolitan North Georgia Water Planning District
NOAA	National Oceanic and Atmosphere Administration
NPDES	National Pollutant Discharge Elimination System
PASARP	Priority Area Sewer Assessment and Rehabilitation Program
PR	Percentage Runoff
QA/QC	quality assurance/quality control
RDII	rainfall-derived infiltration and inflow
SCS	Soil Conservation Service
SDE	spatial database engine
SOP	Standard Operating Procedure
SSO	sanitary sewer overflow
SSOAP	Sanitary Sewer Overflow Analysis and Planning
TM	technical memorandum
UDG	Urban Drainage Group
WCTS	wastewater collection and transmission system
WEF	Water Environment Federation
WWF	wet weather flow
WWTF	wastewater treatment facility

Glossary

Term	Meaning	Source
Calibrating	The process of accounting for values representative of the County's wastewater collection and transmission system (WCTS) using actual system data (e.g., flow data).	Consent Decree (CD), Paragraph 28(h)
Calibration	The process of adjusting model parameters so that the model output matches the measured sewer flow for the same time period.	Section 1.5.5.3 of DeKalb County (2015)
Capacity	The design maximum flow, or loading, that a wastewater system and its components can handle in a specified period with predictable and consistent performance. Also, the peak flow is equal to the maximum flow only when the time periods are the same.	Water Environment Federation (WEF) (2013) Glossary
Capacity Assessment (System)	Evaluation of system capacity availability and constraints to identify system improvement and upgrade needs.	inferred from Section 1.5.1 of DeKalb County (2015)
Capacity Assurance Program	Definitions and parameters for determining the adequacy of collection, transmission, and treatment facilities to accommodate additional flow from existing connections or future connections. To be coordinated with regulations permitting additional flow.	inferred from Section 1.5.1 of DeKalb County (2015)
Consent Decree or Decree	Shall mean this Consent Decree, and all appendices attached hereto.	CD p. 12
Conveyance System Capacity	The wastewater conveyance system is commonly composed of gravity sewers, inverted siphons, pumping stations and force mains, storage systems, and flow control devices. Each component has an individual capacity. The system is the network of multiple individual reaches of sewers, pumping stations, and other features that work together to convey flow to a downstream point. The conveyance system capacity is determined by initial design criteria, installation techniques, and accuracies, the extent to which the system has been maintained, and how these individual component capacities interrelate.	WEF (2013), Section 1.1.1.3
Critical	Data, sewers, or locations that require field checking/site visits because they 1) are noted as questionable (or are missing) and 2) are integral to hydraulic routing model performance. See Section 3.5 for details.	Consent Decree Program Management Team (CDPMT)
Dynamic Model	One in which the flows, depths and responses vary over time	CDPMT
Hydrologic and Hydraulic (I/I) Model	Refers to a digital combination of site-specific input with software capable of representing the hydrology (flow generation) and hydraulics (piping, pumps, and flow routing) of a sewer system.	CDPMT
Hydraulic Model	A mathematical model of a fluid introduced into a water/ wastewater sewer/storm sewer system at various rates and pressures.	from Section 1.5.2 of DeKalb (2015)
Hydrology	The processes governing the amount of liquid entering a sewer system from rain events and ground water.	CDPMT

Term	Meaning	Source
Major Gravity Sewer Line	Shall mean Gravity Sewer Lines which are eighteen (18) inches or greater in diameter.	CD, p. 15
Major Lift Station	Shall mean a Lift Station that has at least one (1) pump with greater than ninety-nine (99) horse power and a force main diameter of six (6) inches or greater.	CD, p. 15
Model Application	The process of developing and using a model to support decisions.	CDPMT
Model Development	The process of selecting software, and gathering and inputting data to represent the specific system or application.	CDPMT
Overflow	Shall mean, for purposes of this Consent Decree, a release of wastewater from the WCTS, or from a wastewater treatment facility (WWTF) caused by problems in the WCTS, that does not reach waters of the United States or the State.	CD, p. 15
’R’ Value	Shall mean the fraction (sometimes reported as a percentage) of rainfall falling within a given sewershed area that enters a sanitary sewer collection system as rainfall dependent infiltration and inflow (I/I).	CD, p. 16
Sanitary Sewer Overflow or SSO	Shall mean all Spills, Overflows, and Building Backups.	CD, p. 16
Sensitivity Analysis	How the Model responds to changes in input parameters and variables.	CD, Paragraph 28(h)
Sewershed	Shall mean the subdivisions of the County’s WCTS containing sewers that are primarily hydraulically linked.	CD, p. 17
Spill	Shall mean, for purposes of this Consent Decree, a discharge of wastewater from the WCTS, or from a WWTF caused by problems in the WCTS, which reaches waters of the United States or the State, including a prohibited Bypass, but not including other discharges from a point source that is specified in the NPDES Permits.	CD, p. 17
Steady-state Model	Flows, depths, and response is steady over time.	CDPMT
Subcatchment	A subcatchment on the InfoWorks ICM model network represents the physical area from which a manhole or other inflow node collects water.	Innovyze InfoWorks ICM Help (2017)
Trunk Line Sewer	Trunk line sewer or trunk sewer is the same as major gravity sewer line. See *Major Gravity Sewer Line* above.	CD, p. 15
Update	The process of incorporating system changes, including new building or sewer modification, to better represent the system.	adapted from CIWEM, (2017), Section 3.5
Validation	Involves the process of testing the model against an independent data set.	WEF (2011), p. 208.
Verification	A process of comparing model output to measured values and to system operator observations and determining that the model is adequate to be useful.	adapted from CIWEM (2017), Section 5
Verify	To verify the Model’s performance using actual system data (e.g., flow data).	CD, Paragraph 28(h)

Introduction

1.1 Project Background

The Consent Decree Program Management Team (CDPMT) completed a fully developed steady-state model on December 20, 2017, for each of the seven hydraulic models providing coverage throughout DeKalb County (hereafter, “the County”) using sewer system flows from January 2015 through June 2015. The model reports were developed by CDPMT and submitted to the DeKalb County Department of Watershed Management (DWM); the reports included detailed documentation of the modeling assumptions, findings, and changes to previous documentation or model versions (CDPMT, 2017). The model submitted in December 2017 reflected the following system data changes:

1. Geographic information system (GIS) spatial database engine updates received from the County before August 2017
2. Additional field check results provided by the County before August 2017
3. System-wide lift station updates that would be completed by end of December 2017

Since 2017, CDPMT submitted a Technical Memorandum (TM) to DWM to document the general approach needed to update the steady-state sewer models and to upgrade the steady-state models to fully hydrologic and hydraulic dynamic models (CDPMT, 2018). The approach details were presented to DWM in May 2018. As part of the model update process, CDPMT completed a system-wide model network update based on field survey data provided by DWM prior to February 2018 and submitted the updated steady-state models to DWM in June 2018.

This report documents primarily the two major activities since December 2017 subsequent to the incorporation of several key sewer system network edits or additions:

1. Steady-state hydraulic models updates and upgrades to dynamic hydraulic models including:
    a. The sewer model inputs update after the delivery of DWM’s December 2017 field survey information including the updated steady-state models submitted to DWM in June 2018. The model updates focus on the model network and flow update as discussed in Section 3.
    b. Steady-state hydraulic model upgrades to fully hydrologic and hydraulic dynamic models as explained in the dynamic model approach TM (CDPMT, 2018) (see Section 4).
2. The updated system capacity assessment results based on the dynamic models as discussed in Section 6.
    c. New flow and rainfall data from 2018 and early 2019 were used in the model inputs.
    d. Section 6 evaluation discussion was based on current capacity assurance criteria and may differ from what is used for assessment for capacity requests as well as what is used for long-term planning.

The report herein was developed as the fourth of seven reports as discussed in Section 1.3. Each report will have a similar format and content except where needed to highlight the specific details, analysis, or recommendations for the modeled basin or sewershed.

1.2 Dynamic Hydraulic Model Applications

As provided in the Capacity Assurance Program (CAP) lodged in Federal Court, the dynamic hydraulic model will be used only after EPA/EPD approve this Sub-Model Report and the MCD is entered in Federal Court. (Appendix D to MCD, CAP, Section 1.4.).

As documented in the 2017 model report (CDPMT, 2017), for the first time, the models gave the County the ability to evaluate sewer and lift station capacity-related questions with an understanding of how each sewer or lift station is affected by, or itself affects, other portions of the wastewater collection and transmission system (WCTS).

With a dynamic hydraulic model, the model output provides a more representative understanding of time-based flow impacts, such as rainfall-derived infiltration and inflow (RDII) and its impact on system capacity. However, the model is only as accurate as the data measured, retrieved from existing records, or gathered from field inspections. The CDPMT suggests that DWM consider the recommendations provided in Section 8 to continue improving the quality of DWM data collection and verification.

For capacity request evaluations, the DWM-approved dynamic hydraulic model and results that meet DWM's applicable criteria will replace, upon acceptance, the steady-state model results. The dynamic hydraulic model analysis results for all three basins are based on the latest accepted flow monitor data from April 2018 to February 2019 (per flow monitoring installation schedule, different models have different 6-month periods [see Section 2.4 for details]). In contrast, the steady-state model used the maximum month average day flow from the January to June 2015 period.

The dynamic hydraulic model was developed to meet the U.S. Environmental Protection Agency (EPA) Consent Decree (CD) requirement and assist the ongoing Priority Area Sewer Assessment and Rehabilitation Program (PASARP) needs. Any other applications of this model will need to consider the impact from the assumptions applied during the model development and calibration process as explained herein.

As with any model, engineering judgement should be used when interpreting results and should consider ongoing field verification, system improvements, and assumptions indicated in the model.

1.3 Model Study Area Overview

The County's wastewater collection system is comprised of seven separate models developed based on the hydrological characteristics of the service areas. Model update and upgrade priorities were established by following DWM's priority sequence shown below (CDPMT, 2018):

1. Intrenchment Creek (ITMC)
2. Nancy Creek
3. North Fork Peachtree Creek
4. South Fork Peachtree Creek
5. Snapfinger Basin
6. Pole Bridge Basin
7. Miscellaneous (Misc.) sewersheds in Intergovernmental Basin

This report focuses on the Pole Bridge Basin model.

The Pole Bridge Basin diverts all flows to the Pole Bridge Advanced Wastewater Treatment Plant (AWTP). The Pole Bridge Basin includes the following 11 sewersheds:

- Crooked Creek
- Honey Creek
- Johnson Creek

- Lower Crooked Creek
- Lower Stone Mountain Creek
- Pine Mountain Creek
- Plunket Creek
- Pole Bridge Creek
- Swift Creek
- Upper Crooked Creek
- Yellow River

The Honey Creek Sewershed collects flow from Rockdale County at two locations. Figure 1-1 shows the sewersheds' locations on the system overview map. The above 11 sewersheds were compiled in one hydraulic model and referred as the Pole Bridge Basin model in this report.

The Pole Bridge Basin hydraulic model, as of October 2019, was updated based on the data resources detailed in Section 2.

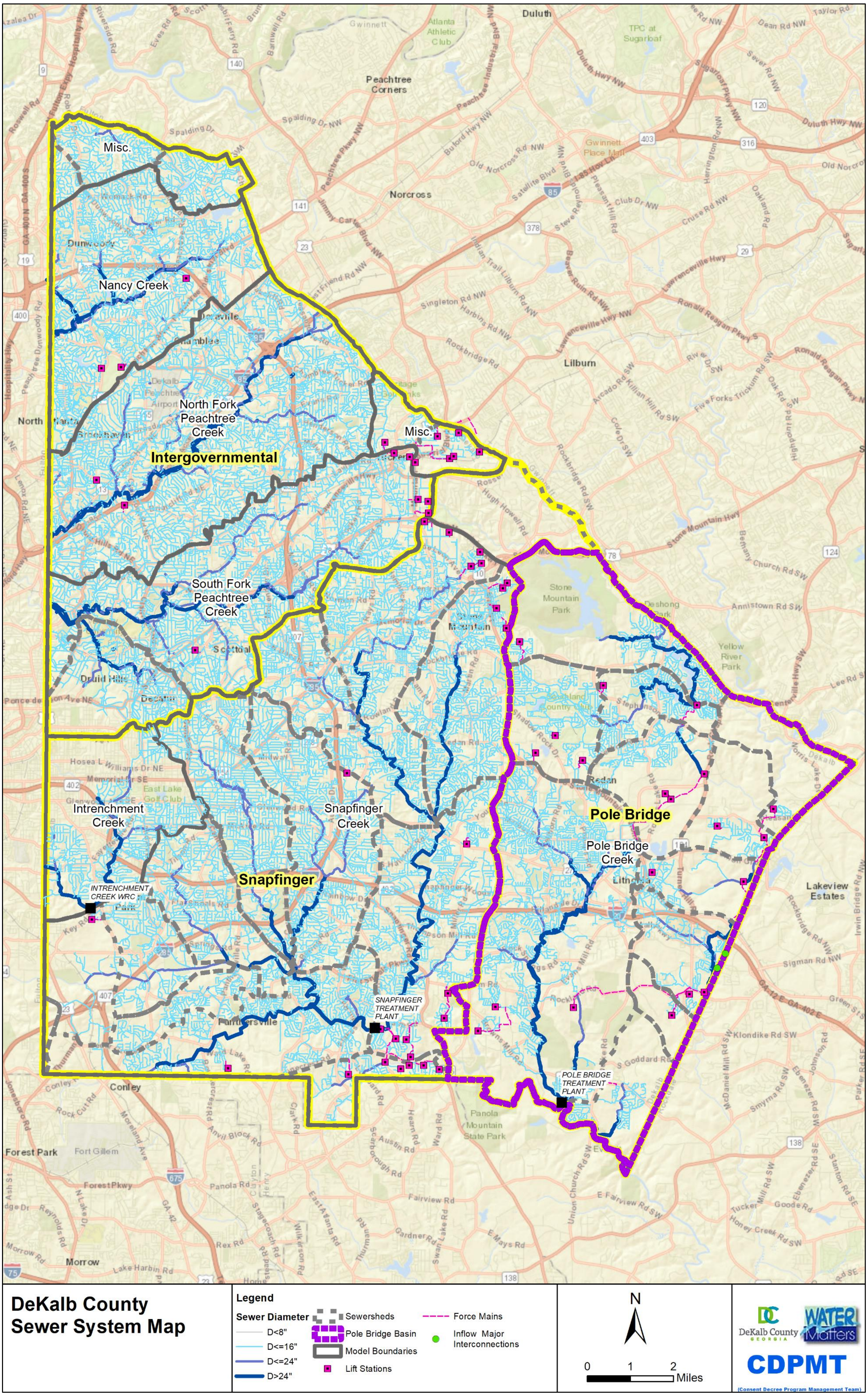

Figure 1-1. System Overview Map

SECTION 2

Data Collection and Review

This section summarizes the data sources used for both steady-state updates and dynamic hydraulic model input and the physical attributes updates after model delivery in December 2017. Steady-state model development updates are discussed in Section 3.

2.1 Physical Attributes Updates

As documented in the 2017 model report, DWM GIS data are one of the major data sources used to build the Pole Bridge Basin model network.

Since the model was completed in December 2017, additional field surveys were conducted at critical locations throughout the system. The field survey records prior to February 2018 were the main data sources used for the model physical attributes updates for all seven models, including the Pole Bridge Basin model.

PASARP closed-circuit television or field-check findings prior to February 2018 were also collected and reviewed to incorporate into the model physical attributes update.

As explained in the dynamic model development approach TM (CDPMT, 2018), only significant system changes were incorporated through the dynamic model development according to the corresponding flow monitoring periods after February 2018. Information related to those significant system changes were provided by the County and reviewed for the model updates accordingly.

The County's GIS was not incorporated in this report because of version control issues revealed in the data review process for the December 2017 model submission. It was assumed that the field survey results provided by the County's GIS department would cover most of the GIS updates once the GIS database version control issue was resolved.

The coordinate and datum used in the County GIS database and GIS data provided by COA was NAD_1983_StatePlane_Georgia_West_FIPS_1002_Feet.

2.2 Ancillary Structure Updates

The following information were provided by DWM for the model pump station and wet well updates:

- 2018 lift station drawdown test records: the pump station on/off levels and wet well areas were used for the model update.
- Pump monthly run time records at each pump station from 2012 to February 2019: the monthly average daily flow records were used to verify the dry weather flow (DWF) loading in the model.

There are 21 County-owned lift stations within the Pole Bridge Basin model extent. Table 2-1 lists the lift stations and the sewersheds in which they are located. Figure 2-1 shows the lift station locations.

Table 2-1. Pole Bridge Lift Stations

Lift Station Name	Sewershed
Klondike Manor	Crooked Creek
Honey Creek	Honey Creek
Moss Stone	Honey Creek
Johnson Creek	Johnson Creek

Table 2-1. Pole Bridge Lift Stations

Lift Station Name	Sewershed
Oak Hills Springs	Johnson Creek
Chester Hills	Lower Crooked Creek
Lower Crooked Creek I	Lower Crooked Creek
Pennybrook	Lower Stone Mountain Creek
Lithonia I	Pine Mountain Creek
Oakleaf Glen	Pine Mountain Creek
Stoney Creek	Plunket Creek
Beechwood Forest	Pole Bridge Creek
Salem Road	Pole Bridge Creek
Serenity Village	Pole Bridge Creek
Lower Crooked Creek II	Swift Creek
Lower Crooked Creek III	Swift Creek
Rogers Lake	Swift Creek
Greenridge	Upper Crooked Creek
Kings Way	Upper Crooked Creek
Windy Ridge	Upper Crooked Creek
Harmony Hills	Yellow River

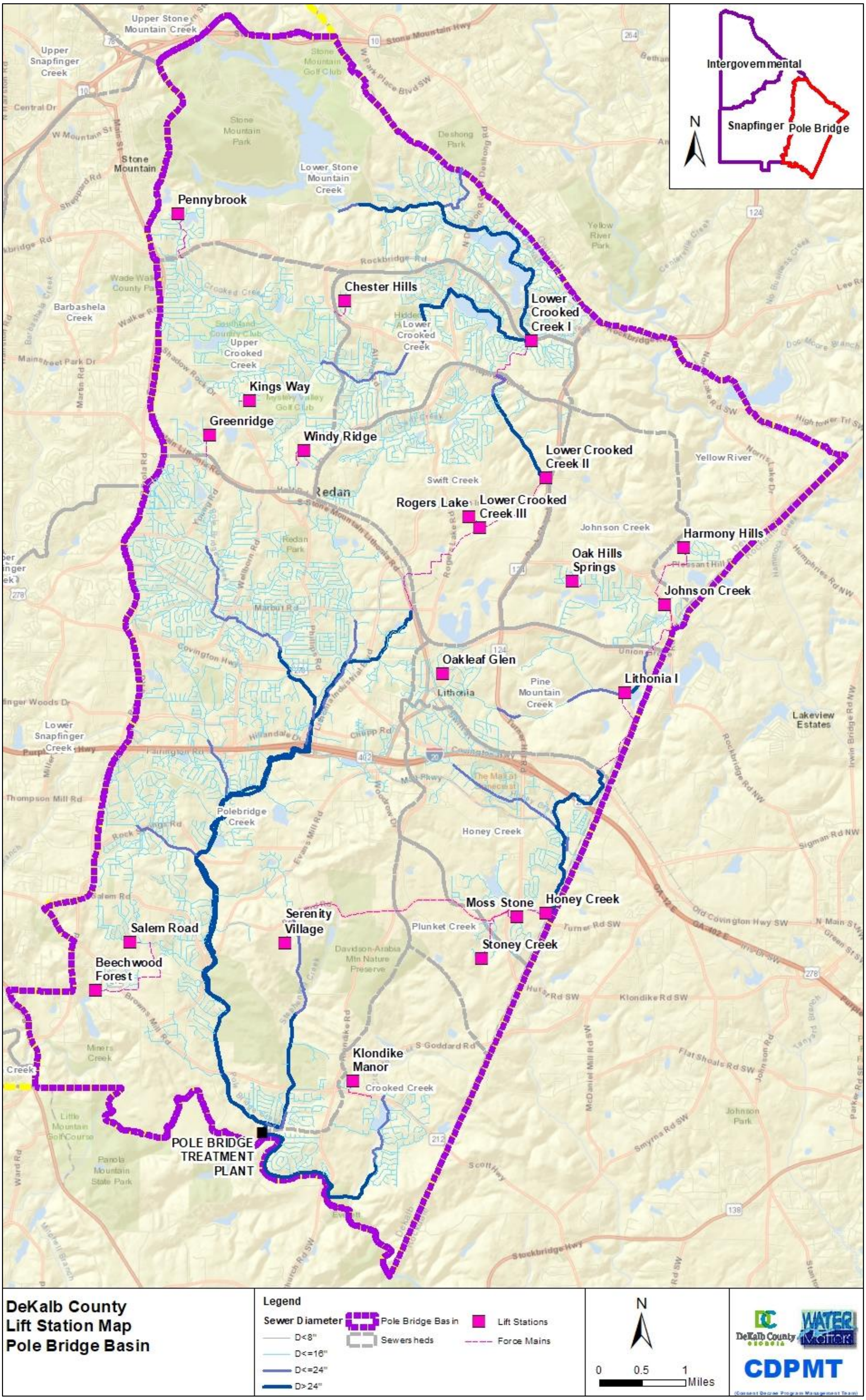

Figure 2-1. Lift Station Location Map

2.3 Boundary Condition Updates

Boundary condition data at both upstream and downstream points of the model areas were collected from the neighboring utilities to define the flow and hydraulic conditions at the interconnections between the County's system and neighboring systems.

For the Pole Bridge Basin, there is no outflow to adjacent systems outside the County boundary, only inflow through two major interconnections from the adjacent Rockdale County system. Figure **2**-**2** shows the two major inflow interconnections. Table 2-2 provides additional information on the County's Intergovernmental Agreement (IGA) associated with the Pole Bridge Basin.

Table 2-2. DWM's Existing Intergovernmental Agreement

Municipality IGA	IGA Expiration Date	Monthly Average Flow Limit into DeKalb (mgd)	Maximum Daily Flow Limit into DeKalb (mgd)
Rockdale County – Honey Creek	01/18/2021	0.375	0.75

Notes:
mgd = million gallons per day

Upstream flow from Rockdale County enters the County's system at two major locations that are measured by two inter-jurisdiction meters at DK10 and DK11. The contributing areas were delineated based on the sewer pipelines provided by Rockdale County.

Pole Bridge Basin flow discharges downstream to the Pole Bridge AWTP. There is no information available at the County's Pole Bridge AWTP to estimate the boundary level for the model setup. As such, the boundary conditions at the AWTP were set as follows:

- For calibration: inferred from measured depth recorded at the most downstream meters (CKC1, PBPLNT1, PBPLNT2, PBPLNT3, and PBPLNT4)
- For capacity assessment: the average minimum depth observed at the most downstream meters

2.4 2018/2019 Flow Meter and Rain Gauge Data

2.4.1 Overview

For the 2018/2019 flow monitoring program, 31 meters were installed by DWM within the Pole Bridge Basin. A total of 2 of the 31 meters measure flow from Rockdale County.

Figure 2-3 shows a flow meter diagram to illustrate the relationship between the 31 meters. Table 2-3 summarizes the flow meters used in this study.

Ten rain gauges were included for the rainfall data review:

- RGPB4 in Crooked Creek Sewershed
- RGHON1 in Honey Creek Sewershed
- RGJSC1 in Johnson Creek Sewershed
- RGLCKC1 in Lower Crooked Creek Sewershed
- RGLCKC2 in Swift Creek Sewershed
- RGUCKC1 in Upper Crooked Creek Sewershed
- RGPINEM1 in Pine Mountain Creek Sewershed
- RGPB1, RGPB2, and RGPB3 in Pole Bridge Creek Sewershed

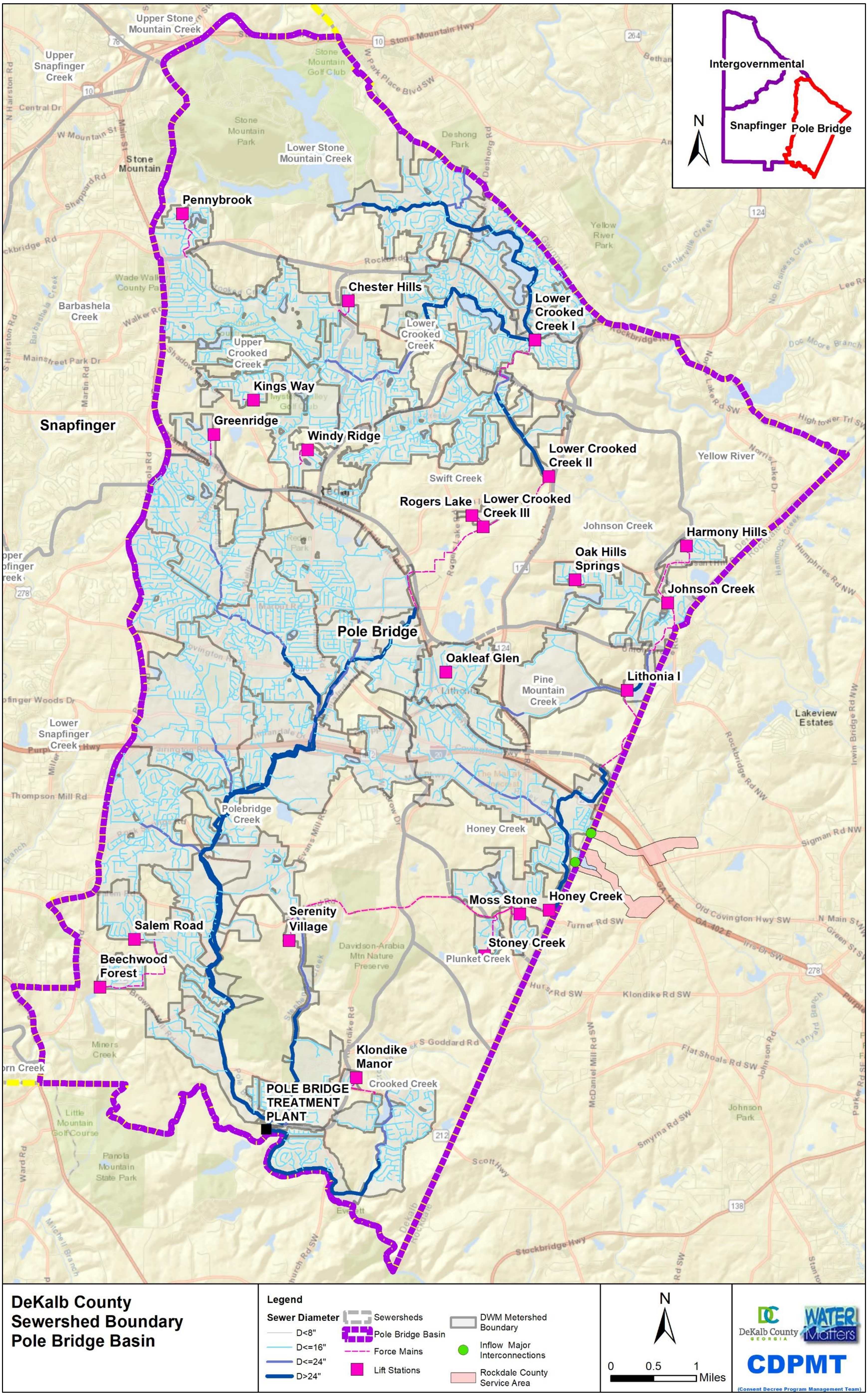

Figure 2-2. Sewershed Boundary

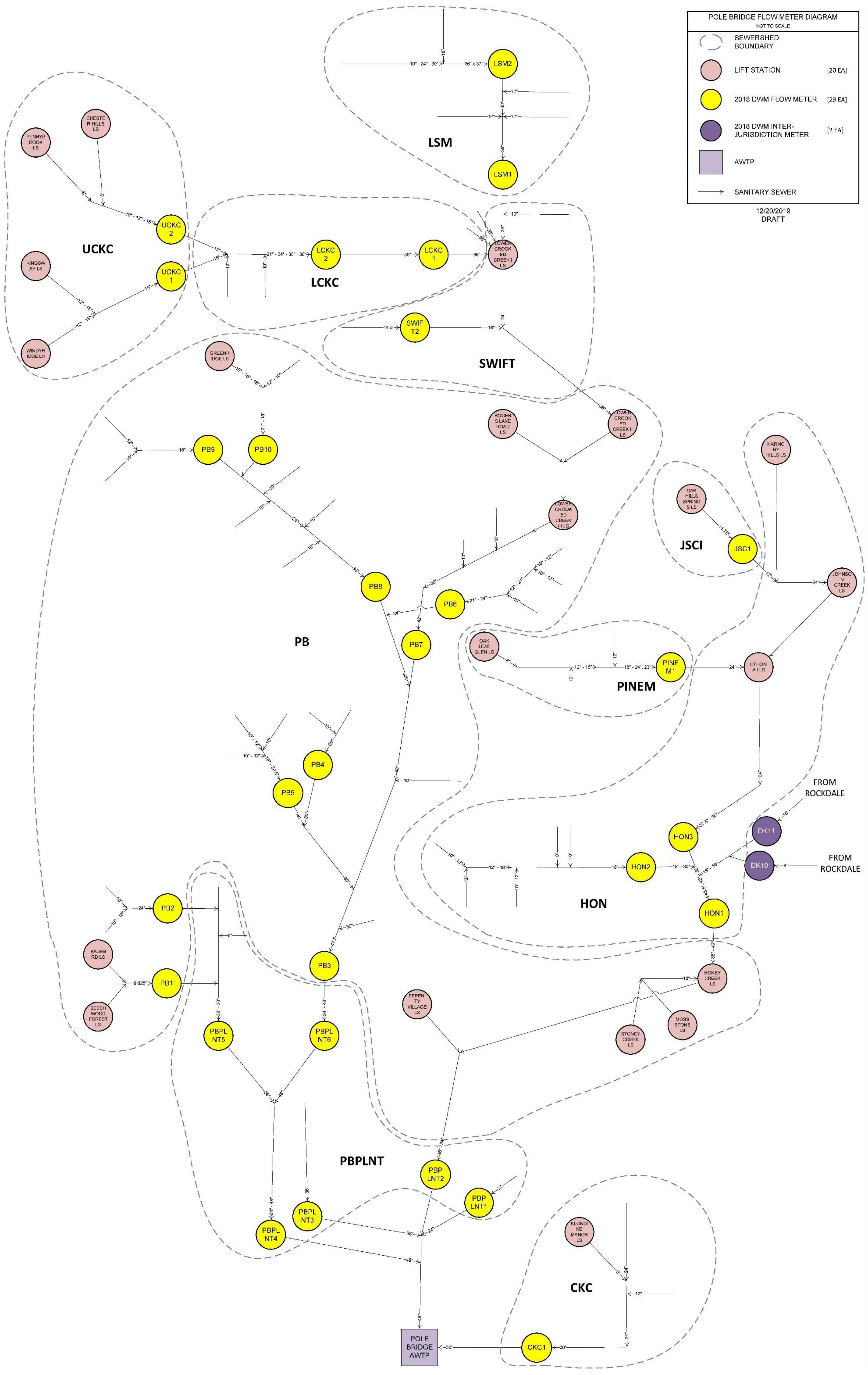

Figure 2-3. Flow Meter Relationship Diagram

Table 2-3. DWM Flow Meters Summary

Meter ID	Measured Pipe ID	Measured Pipe Size (in)	Sewershed
CKC1	11-230-s280__11-230-s281	30	Crooked Creek
HON1	16-181-s012__16-181-s013	43.5	Honey Creek
HON2	16-182-s036__16-182-s007	18	Honey Creek
HON3	16-202-s007A__16-202-s008	37.5	Honey Creek
JSC1	16-219-s271__16-219-s270	11.75	Johnson Creek
LCKC1	16-161-s020__16-161-s019	36	Lower Crooked Creek
LCKC2	16-160-s116__16-160-s117	36	Lower Crooked Creek
LSM1	16-161-s007__16-161-s008	36	Lower Stone Mountain Creek
LSM2	18-030-s043__18-030-s042	36	Lower Stone Mountain Creek
PB1	16-078-s026__16-078-s006	9.625	Pole Bridge Creek
PB2	16-076-s225__16-076-s008	24	Pole Bridge Creek
PB3	16-076-s020__16-076-s285	47.5	Pole Bridge Creek
PB4	16-087-s002__16-087-s001	30	Pole Bridge Creek
PB5	16-074-s006__16-074-s005	20.5	Pole Bridge Creek
PB6	16-105-s018__16-105-s017	21	Pole Bridge Creek
PB7	16-105-s031__16-105-s030	42	Pole Bridge Creek
PB8	16-105-s033__16-105-s015	30	Pole Bridge Creek
PB9	16-071-s058__16-071-s009	15	Pole Bridge Creek
PB10	16-070-s201__16-071-s009	21	Pole Bridge Creek
PBPLNT1	11-251-s008__11-251-s009	27	Pole Bridge Creek
PBPLNT2	11-251-s006__11-251-s010	36	Pole Bridge Creek
PBPLNT3	11-251-s013__11-251-s012	36	Pole Bridge Creek
PBPLNT4	11-251-s036__11-251-s037	54	Pole Bridge Creek
PBPLNT5	16-079-s007__16-079-s006	36	Pole Bridge Creek
PBPLNT6	16-079-s017__16-079-s016	54	Pole Bridge Creek
PINEM1	16-200-s008__16-200-s011	23	Pine Mountain Creek
SWIFT2	16-162-s003__16-162-s037	14.5	Swift Creek
UCKC1	16-098-s350__16-098-s315	15	Upper Crooked Creek
UCKC2	16-097-s035__16-097-s604	15	Upper Crooked Creek
DK10	16-204-s001__16-181-s098	8	Honey Creek
DK11	16-203-s004__16-203-s003	15	Honey Creek

Notes:
in = inches

The ten listed DWM-owned rain gauges were first assigned to different meters based on distance and the preliminary assignment was then adjusted during the calibration process. Table 2-4 lists the preliminary mapping between rain gauges and meters based on distance, which could be adjusted during the model wet weather flow (WWF) calibration process for better fit between flow and rainfall correlations. In addition, the radar weather coverage map records from the National Oceanic and Atmosphere Administration (NOAA)[1] were also reviewed to help understand the rainfall spatial and temporal distribution.

Table 2-4. Preliminary Rain Gauges Assignment

Meter ID	Rain Gauge
CKC1	RGPB4
HON1	RGHON1
HON2	RGHON1
HON3	RGHON1
JSC1	RGJSC1
LCKC1	RGLCKC1
LCKC2	RGLCKC1
LSM1	RGLCKC1
LSM2	RGLCKC1
PB1	RGPB2
PB2	RGPB2
PB3	RGPB2
PB4	RGPB2
PB5	RGPB2
PB6	RGPB3
PB7	RGPB3
PB8	RGPB3
PB9	RGPB1
PB10	RGPB1
PBPLNT1	RGPB4
PBPLNT2	RGPB4
PBPLNT3	RGPB4
PBPLNT4	RGPB4
PBPLNT5	RGPB2
PBPLNT6	RGPB2
PINEM1	RGPINEM1
SWIFT2	RGLCKC2
UCKC1	RGUCKC1
UCKC2	RGUCKC1
DK10	RGHON1
DK11	RGHON1

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[1] https://gis.ncdc.noaa.gov/maps/ncei/radar

Figure 2-4 shows flow and rainfall monitoring locations and approximate metershed boundaries.

Additional flow and rainfall data are provided in the 2019 flow and rainfall monitoring report (CDPMT, 2019). This section of the report focuses on the data review related to model flow input and calibration needs. Because of schedule considerations, flow data collected from September 2018 to February 2019 were used. During the 4 months from November 2018 to February 2019, the system experienced extremely wet conditions from multiple large storm events. The data review was done using EPA's Sanitary Sewer Overflow Analysis and Planning (SSOAP) software.

2.4.2 Data Review

The collected data in the Pole Bridge Basin and throughout DWM's sewer system were first checked daily and monthly by the combined efforts from DWM and DWM's outside flow monitoring contractors to identify data drops, equipment malfunction, unusual flow patterns, etc. (CDPMT, 2019), then further reviewed in EPA's SSOAP application per the following criteria applicable for modeling needs:

- Adequate data recorded for qualified dry weather periods
- Capture at least three qualified storm events, each with a minimum total rainfall greater than 0.5 inches and RDII responses that were generally observed at most monitors
- Data quality was acceptable for major monitors for each event

Figure 2-5 shows the dry days vs. wet days comparison at the three rain gauges. Based on the comparison, there are enough dry data periods to generate the model DWF inputs. Figure 2-6 summarizes the data quality for the 31 meters per routine DWM data checks (CDPMT, 2019). In general, four major challenges were revealed from the routine data quality checks:

- **LCKC1:** the flow monitor repeatedly experienced velocity signal issues, including flatlined velocity signals. Velocity signal issues could result from backwater from the Lower Crooked Creek I Lift Station. A total of 62 percent of the monitored days had bad or missing data. However, a sufficient number of dry weather days were measured to estimate average DWF conditions for model input.
- **LSM1**: as with LCKC1, the flow monitor repeatedly experienced velocity signal issues, including flatlined velocity signals. Velocity signal issues could result from backwater from the Lower Crooked Creek I Lift Station. A total of 56 percent of the monitored days had bad or missing data. However, a sufficient number of dry weather days were measured to estimate average DWF conditions for model input.
- **LSM2**: the flow monitor experienced some velocity signal issues that resulted in bad data quality. There were also periods of long-term data loss. A total of 61 percent of monitoring days had missing or bad data. However, a sufficient number of dry weather days were measured to estimate average DWF conditions for model input.
- **RGPB3**: the flow monitor measured less than the other rain gauges in the Pole Bridge Basin during November and December. For these months, a U.S. Geological Survey rain gauge in the same region was used instead.

DWF mass flow balance was performed to check the flow routing between the meters and the model network connectivity. There were no DWF mass flow balance issues in Pole Bridge Basin during the flow monitoring period.

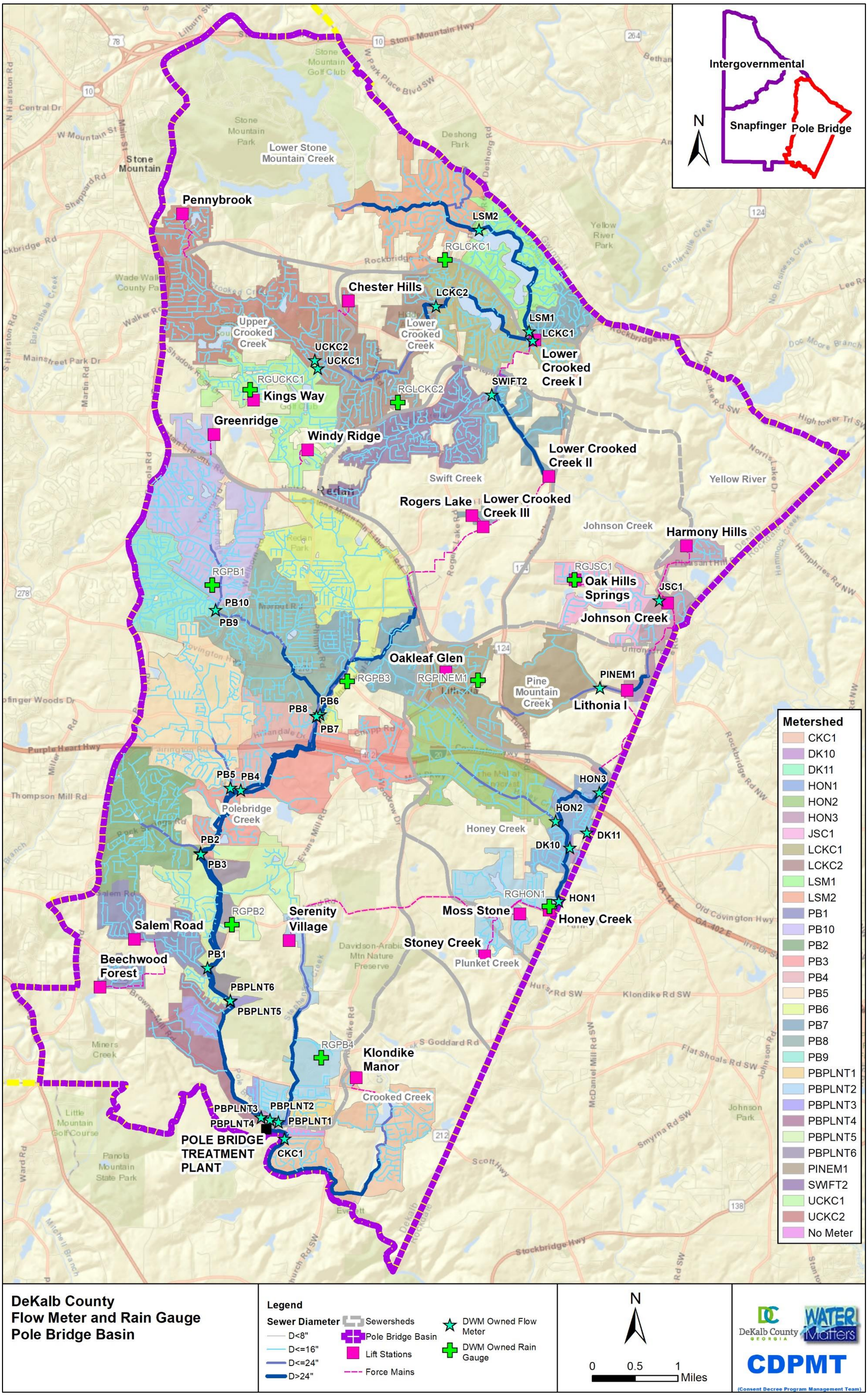

Figure 2-4. Flow Meter and Rain Gauge Locations and Metershed Boundaries (as of February 2019)

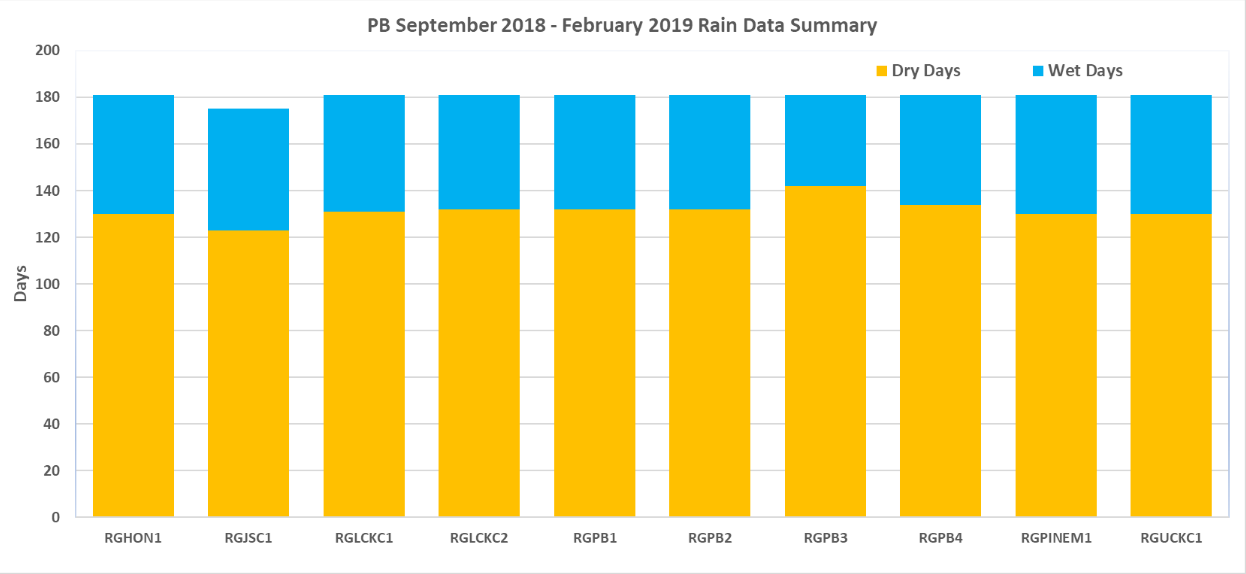

Figure 2-5. Flow Monitoring Dry and Wet Days Summary

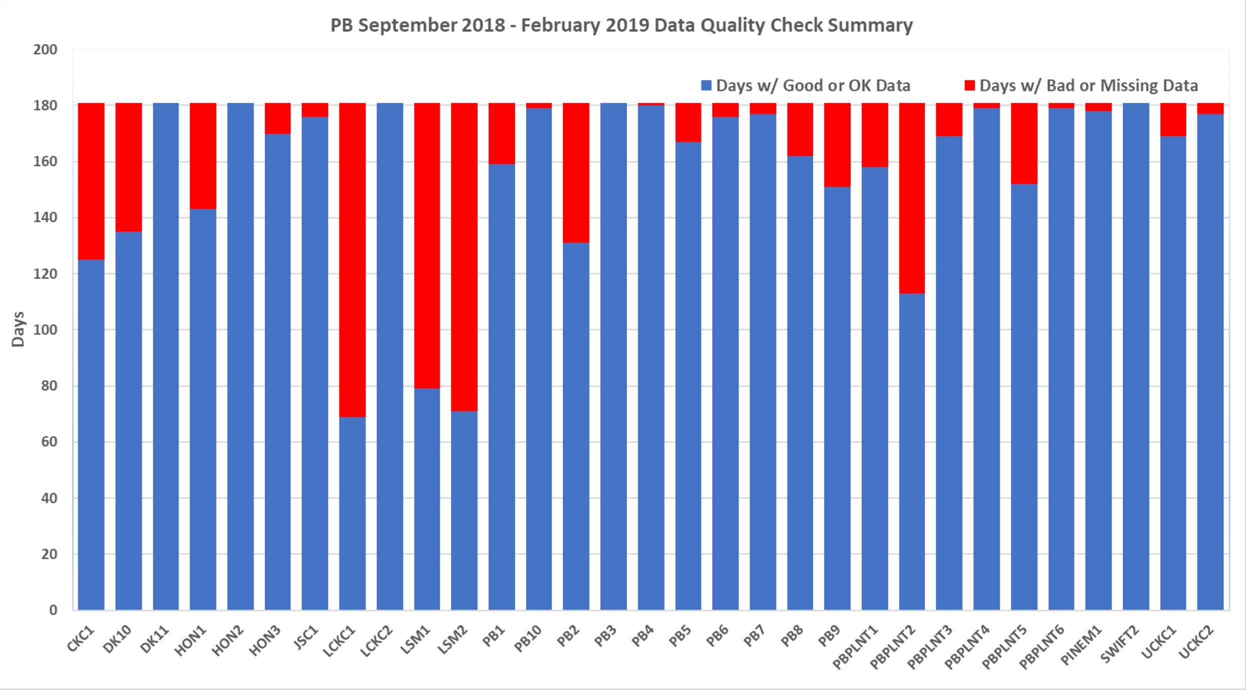

Figure 2-6. Flow Monitoring Data Quality Summary

Overall, the flow monitoring program produced qualifying flow monitoring data. However, there were some conditions and activities that caused some data uncertainty, including:

- Flow monitoring equipment malfunction
- Hydraulic condition at the meter site (debris, etc.)
- Backwater and surcharging caused by lift stations
- Rainfall: spatial variation
- Maintenance frequency
- Others: stolen meter/battery

The impact from the uncertainties was considered while using the flow data to compare the model results during calibration process, as discussed in Section 5.

2.4.3 Storm Events Selection

An important objective of the flow data review was to evaluate the storm events captured during the 6-month flow monitoring period mentioned in Section 2.4.1 and to identify potential qualifying storm events for model calibration. Three major factors were considered for the selection process, including:

1. Rainfall:
    a. Total volume within 24 hours of greater than 0.5 inches.
    b. Avoid storm events with significant variation among different rain gauges.
2. Data quality: data quality was acceptable for major monitors for the same event.
3. RDII response: RDII responses were observed at most of the monitors.

During the 6 months of flow data, four relatively large events were captured:

- October 10, 2018: approximately 2.80 inches were measured during a 24-hour period.
- November 12, 2018: approximately 2.19 inches were measured during a 24-hour period.
- December 8, 2018: approximately 2.48 inches were measured during a 24-hour period.
- December 27, 2018: approximately 2.16 inches were measured during a 24-hour period.

Figure 2-7 plots the total rainfall volume within 24 hours at the DWM-owned rain gauges. A total of 17 storm events were selected as potential qualifying events (circled in red on Figure 2-7).

For the Pole Bridge Basin model, November 2018 to February 2019 were extremely wet compared to September and October 2018. Table 2-5 summarizes the number of selected storm events for the DWM-owned meters in the Pole Bridge Basin. LSM1, LSM2, LCKC1, and PBPLNT2 had data quality issues for more than 50 percent of the identified storm events. At least 50 percent of the selected storm events for the other meters showed RDII responses and had no observed data quality issues during routine flow monitoring quality assurance/quality control (QA/QC). The other events with observed data quality issues during routine flow monitoring QA/QC were revisited during the calibration process and were included in the calibration based on engineering judgement, as discussed in Section 5.3. Appendix A provides the detailed evaluation for each event.

Table 2-5. Storm Selection Summary

Meter ID	Selected Storm Events without Data Quality Issues[a]	Notes
CKC1	12	
DK10	15	
DK11	16	
HON1	13	
HON2	17	
HON3	17	
JSC1	17	
LCKC1	4	Velocity signal issues and backwater from downstream lift station
LCKC2	17	

Table 2-5. Storm Selection Summary

Meter ID	Selected Storm Events without Data Quality Issues[a]	Notes
LSM1	4	Velocity signal issues and backwater from downstream lift station
LSM2	10	Velocity signal issues and missing data
PB1	16	
PB10	16	
PB2	9	
PB3	17	
PB4	17	
PB5	15	
PB6	17	
PB7	17	
PB8	14	
PB9	16	
PBPLNT1	15	
PBPLNT2	6	Periods of long-term data loss
PBPLNT3	14	
PBPLNT4	16	
PBPLNT5	13	
PBPLNT6	17	
PINEM1	17	
SWIFT2	16	
UCKC1	16	

[a] Based on flow monitoring monthly routine check

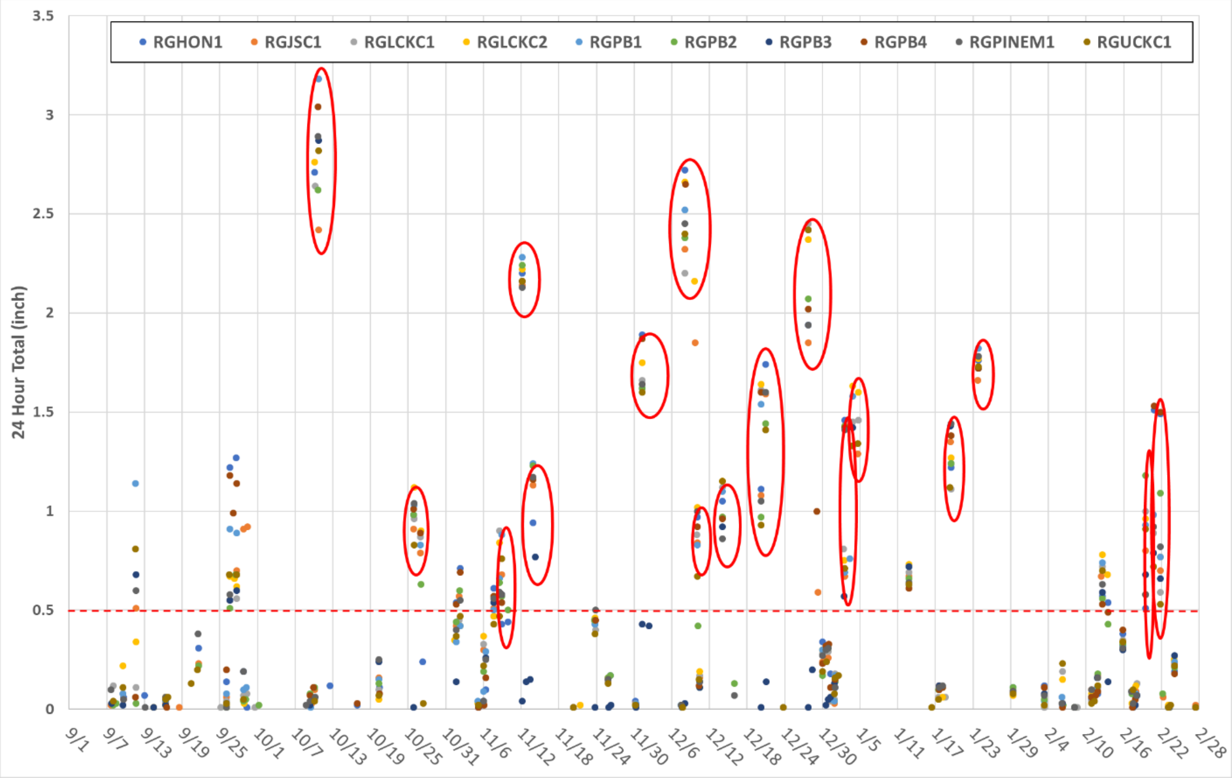

Figure 2-7. Storm Event Evaluation

2.5 Other Data Sources

To assist in the model update and upgrade, the following additional data sources were included:

- Data were collected to update sanitary flow distribution in the model including:
  - Updated geocoded water billing data for 2015 by AECOM. These data were also used for the ongoing County master planning program. Questionable billing data from 2016 through 2019 were reviewed by DWM, who determined that the data should not be used because of quality issues.
  - Large wastewater dischargers provided by DWM.
  - Latest coverage map data for unsewered areas with septic tanks from DWM: the water billing data for those areas will not be used to allocate sanitary flow because the wastewater generated from those users is not discharged to the collection system.
- Sanitary sewer overflow (SSO) records from DWM were reviewed to assist the model results verification, as discussed in Section 5.4.

SECTION 3

Model Updates

This section discusses model updates since the steady-state model was delivered to DWM in December 2017. The model updates since 2017 follow the same model development approaches and assumptions discussed in the 2017 model report (CDPMT, 2017), which are discussed in detail in this section.

To help differentiate the models in the report discussion herein, the model delivered in December 2017 is referred as the “2017 base model” for the remainder of this report.

3.1 Model Protocol

The Pole Bridge Basin model adheres to the updated protocol as included in the 2017 base model report. A model protocol was originally developed by MWH Global Inc. as part of their previous modeling work for the County in 2011 (MWH, 2011). In 2017, the protocol was updated to reflect changes and modeling needs since 2011. The updates were in the following areas:

- Data Flags
- Lift Station: Force Main
- DWF Development

Adjustments to the WWF model parameters setup are explained in Section 4.

3.2 Model Extent

The 2017 base model report included detailed discussion of the model extent delineation process meeting the CD requirements and is summarized below.

The model extent includes all pipes in the County-provided GIS special database engine (SDE) files. However, pipe segments referenced in the CD were called the “CD extent” segments and were generally the focus and priority of the modeling effort. The selection of specific pipe segments and components for the model’s CD extent were defined by the following CD requirements:

- Sewer pipelines and force mains connecting lift stations.
- Gravity sewer pipes with diameters of 18 inches and greater.
- SSOs and known system capacity restrictions. The initial 2015 hydraulic model development used the SSO records from 2012, 2013, and 2014 to identify SSO locations.
- Flow meter locations.
- PASARP high-priority areas.

However, sewer pipes not meeting the CD extent definition were included in the model. Any missing data for the “non-CD extent” sewers were interpolated, and no field efforts were required to resolve connectivity or missing data to meet CD requirements. Including the interpolated data for the non-CD extent pipes did not materially affect model performance. Model components for the CD extent sewers were noted in the model database attribute table. The model is adequate for the intended uses.

The model extent was updated as described herein per the recent field survey results by adding new sewer pipelines and manholes or deleting abandoned sewer pipelines and manholes. The CD extent was updated to include the recent SSO records after December 2017. Figure 3-1 shows the updated model CD extent. Table 3-1 summarizes the model’s inventory of infrastructure assets for the Pole Bridge Basin. The table also shows the portion that made up the CD extent sewers.

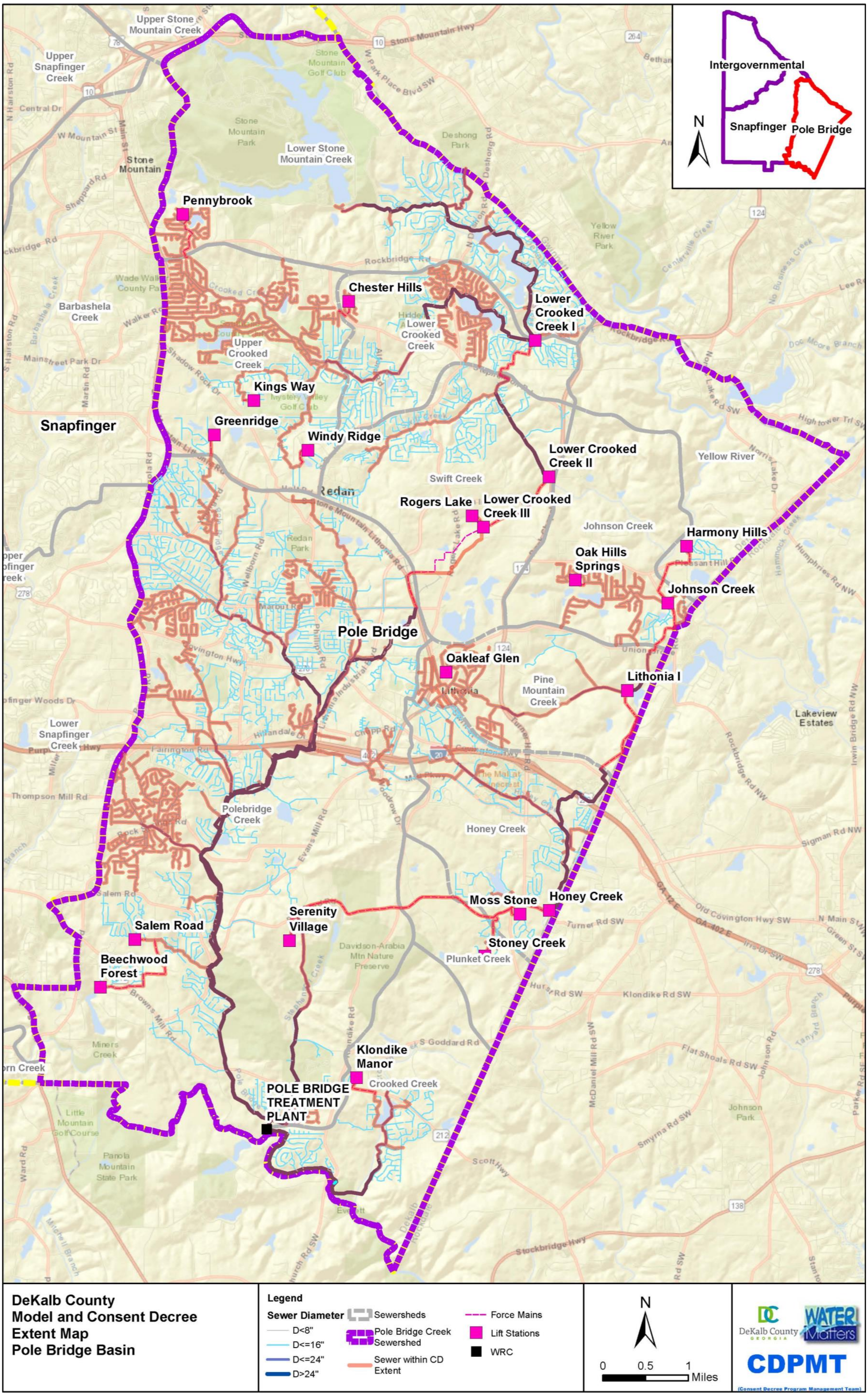

Figure 3-1. Pole Bridge Basin Model and CD Extent Map (as of November 2019)

Table 3-1. Updated Model Extent Summary

Entire Model Extent			CD Extent		
No. of Manholes	**Sewer Pipe Length (ft)**	**No. of Lift Stations**	**No. of Manholes**	**Sewer Pipe Length (ft)**	**No. of Lift Stations**
10,771	2,215,549	21	4,052	951,137	21

Note:
ft = feet

3.3 Model Development Documentation

As discussed in 2017 base model report (CDPMT, 2017), documentation was incorporated throughout the modeling process using data flags, hyperlinks, and user text/number fields for model elements and attributes. These documentation features in the 2017 base model were updated to include new data sources described herein in Section 2. The updates indicate when changes were made to the element or attribute, and the source and reason for the change (field verification, calibration, etc.).

Table 3-2 lists the updated model data flags to track source data and changes including updates since the 2017 base model.

Table 3-2. Updated Model Data Flags
As of November 2019

Name	Description
GI	GIS Data from sewer mapping (2015 DWM GIS)
G2	November 2016 DWM GIS
G3	August 2017 DWM GIS (only changes since June 2016 extracted by DWM)
IG	Interpolated Manhole Rim/Ground Elevation from Topo
SM	Set by modeler with engineer judgement if inferred data from topo causing validation error
GC	GIS changed per Model Calibration and Peak flow simulation
IN	Inferred Automatically by InfoWorks
CB	Calibration change (if original data from GIS, use GC)
RD	Record Drawings
SD	Surveyed Data or Field Check in 2015
S2	Surveyed Data or Field Check in 2016
S3	37 critical field check sites by Brown and Caldwell and Arcadis in August 2017
RA	Updates from PASARP assessment, not published in the DWM GIS SDE as of August 2017
D1	Field survey requested by the County in 2017, not published in the County GIS SDE as of August 2017
D2	Field survey requested by the County in 2017, not published in the County GIS SDE as of February 2018
S5	Surveyed data or field check in 2018 (after February 2018)
R2	Updates from PASARP assessment, not published in the County GIS SDE as of Feb of 2018
CC	2018 closed-circuit television data
DD	2018 lift station drawdown test records

Hyperlinks were used in the model to link to:

- Field survey records and drawings

Model user text/number fields were also used as described below:

- User Text:
  - User Text #1 (Node, Link, Subcatchment): Metershed ID from 2018 Flow Monitoring Program
  - User Text #2 (Node, Link, Subcatchment): Updated CDextent

3.4 Model Network

As discussed in Section 2, the model network updates throughout the entire DWM system incorporate the field survey records up to February 2018 and significant system changes after February 2018 through the corresponding flow monitoring periods. Significant system changes are those that will have a significant hydraulic impact on model results and will change the capacity assessment conclusions. For example, the addition on a previously unknown interconnection between two sewers that can change flow rates in each pipe would be an example of a significant change.

Tables 3-3 through 3-5 list the data sources and corresponding data flags used to document the updated model development decisions on major manhole and sewer pipe input parameters. A total of 17 sewer pipe segments and 40 manholes were updated since the submission of the December 2017 base model.

After the model network updates, 135 sewer pipe segments (1.3 percent of total pipe segments) had negative slopes, 14 manholes (0.1 percent of total manholes) had outgoing pipes higher (at least 0.5 ft) than incoming sewer pipes, and 21 locations had large-diameter sewer pipe connecting to smaller-diameter sewer pipe (at least 1-inch difference). Those sewer pipelines may cause local capacity restrictions and affect the model-predicted capacity results, as discussed in Section 6. Sewer diameters and slopes should be verified at those locations.

Six manholes have depths of less than 2 ft. One of the manhole rim elevations and connected pipe invert levels were surveyed. The other five manhole rim elevations and connected pipe invert levels were imported from GIS or interpolated. Further field verification is recommended for these five manholes.

As shown on Figure 2-1, there are 21 County-owned lift stations within the Pole Bridge model extent. Lower Crooked Creek II, Honey Creek, Johnson Creek, and Stonecrest lift stations were updated with new data, while the remaining lift stations are included in the model as described in 2017 model report. Wet wells were represented as nodes and the cross-sectional area was determined by wet well dimensions. Each pump was represented by a specific pump link, and each force main was also represented by a link. The lift station pump on and off levels were updated based on the 2018 lift station drawdown test records, as discussed in Section 2.2. No pump curve was available for Lower Crooked Creek I Lift Station, so it was set as a fixed discharge pump at design rate in the model.

Table 3-3. Data Source Flags for Updated Model Manhole Rim Elevation

As of November 2019

Data Source	**Data Source Flag**	**Rim Elevation 2017 Base Model**	**Rim Elevation Updated Model**
		(No. of Manholes)	**(No. of Manholes)**
County GIS	GI	9,887	9,860
	G2	14	13
Data Assumption	IG	144	142
	SM	273	280
	GC	0	0
	IN	0	0
Drawings	RD	75	86

Table 3-3. Data Source Flags for Updated Model Manhole Rim Elevation

As of November 2019

Data Source	**Data Source Flag**	**Rim Elevation 2017 Base Model**	**Rim Elevation Updated Model**
		(No. of Manholes)	**(No. of Manholes)**
Field Survey	SD	347	325
	S2	5	5
	S3	8	8
	S5	0	8
	D1	0	0
	D2	0	44
	Total	**10,753**	**10,771**

Table 3-4. Data Source Flags for Updated Model Pipe Inverts

As of November 2019

Data Source	**Data Source Flag**	**No. of Pipe Segments 2017 Base Model**		**No. of Pipe Segments Updated Model**	
		Upstream Inverts	**Downstream Inverts**	**Upstream Inverts**	**Downstream Inverts**
GIS	GI	9,846	9,855	9,813	9,806
	G2	282	282	281	282
	G3	0	0	0	0
Data Assumption	IG	25	17	25	17
	SM	68	34	68	33
	GC	7	9	7	9
	IN	104	112	104	112
Drawings	RD	95	104	111	119
Field Survey	SD	318	331	299	313
	S2	2	1	2	1
	S3	8	10	8	10
	S5	0	0	8	11
	D2	0	0	46	59
	Total	**10,755**	**10,755**	**10,772**	**10,772**

Table 3-5. Data Source Flags for Updated Model Pipe Diameter

As of November 2019

Data Source	**Data Source Flag**	**Pipe Diameter 2017 Base Model (No. of Pipe Segments)**	**Pipe Diameter Updated Model (No. of Pipe Segments)**
GIS	GI	10,018	9,996
	G2	290	284
	G3	0	0
Data Assumption	SM	10	10

Table 3-5. Data Source Flags for Updated Model Pipe Diameter
As of November 2019

Data Source	**Data Source Flag**	**Pipe Diameter 2017 Base Model (No. of Pipe Segments)**	**Pipe Diameter Updated Model (No. of Pipe Segments)**
	GC	0	0
	IN	13	13
Drawings	RD	79	100
Field Survey	SD	337	327
	S2	0	0
	S3	8	2
	S5	0	7
	D2	0	17
	CC	0	16
	Total	**10,755**	**10,772**

3.5 Modeling Subcatchments

In the 2017 base model, only “dummy” subcatchments were developed to carry the DWF inputs and peak flow factors. To upgrade the 2017 base model to include the dynamic WWF model parameters, WWF subcatchments (which can be much smaller in drainage area than a metershed) were delineated to represent estimated drainage areas where rainfall runoff may contribute to the sanitary sewer flow. The subcatchment delineation followed the procedures specified in the model protocol included in Appendix A of the 2017 base model report (CDPMT, 2017). The procedures were developed by MWH Global Inc. (MWH, 2011) and are described in the following text.

Subcatchments contain all information associated with dry and wet weather flows. Because this is a sanitary sewer model, subcatchments, or contributing areas, should generally be defined by property boundaries. However, when encountering large permeable areas, subcatchments may be delineated assuming an offset from the sewer line to account for any I/I that may occur. The maximum size of the subcatchments should be no more than 50 acres but preferably smaller than 20 acres. Smaller subcatchments will be required in parts of the catchment that are very complex, such as regions with high concentration of flow splits, or sanitary sewer overflows. Subcatchments should, where possible, contain only one development type (land use). Development types include various densities of housing, warehouses, offices, factories, commercial development, etc. In the case of major developments such as large retail or industrial parks, it may be necessary to obtain private drainage records to help identify where flows enter the collection system. Large permeable or ‘green’ areas that exist within an urban catchment (such as playing fields, golf courses or park land), which are known to not contribute to the sanitary collection system, shall be omitted from the model except for areas along sewer lines where I/I may occur. These areas will have no sanitary flow contribution.

The catchment boundaries shall be created directly in InfoWorks or digitized in the GIS and imported into the modeling software. Careful consideration is required when choosing the node to which the subcatchment areas should be assigned. The approach will always be an approximation, as in reality areas will connect at a number of points along the modeled pipe length. Because this is a sanitary sewer model, the manner in which tributary sewers connect to the modeled pipe should be considered when deciding where to assign a particular area. In general, if there is a suitable manhole within or adjacent to the subcatchment where an increase in pipe size occurs, then this is the node to which the area should be assigned. If there is no increase in pipe size, the area should be assigned to a suitable node midway along the appropriate sewer length bounded by the subcatchment. In upstream reaches of the system or in locations of summit manholes, the most upstream or summit manhole should be assigned to ensure that all pipe segments carry some flow.

If larger subcatchments are delineated in the upstream reaches of the system, this may sometimes result in the prediction of spurious flooding and surcharging. In this situation, the selection of an appropriate node to which to assign areas must be driven more strictly by pipe size changes on the branch to be modeled, and by studying the way in which the tributary sewer network connects to the modeled pipe. Where a choice has to be made between two or more possible manholes, areas should be assigned toward the downstream end of the pipe running through or past each subcatchment. This will be slightly conservative in terms of peak flows being passed forward in the model. It is important, however, when defining the upstream limits of the model that sufficient length of pipe is retained in the model to adequately represent the routing of flow through the collection system. Failure to do this will result in flows passing too rapidly into the downstream part of the model, with consequent over-prediction of peak flows.

Additional delineation procedures were followed to further enhance the resolution of the subcatchment coverage including:

- Use of parcels as base unit for the delineation for higher distribution resolution.
- Refined septic service areas per the latest DWM GIS database.
- Refined large permeable ground cover or water bodies that existed within the urbanized areas. These areas generally provide no contribution to the sanitary sewer system flows. These areas were omitted from the model, except for areas along sewer lines where RDII may occur.
- Included subcatchments for contributing areas from neighboring collection systems.

For the Pole Bridge Basin model, there are a total of 3,684 WWF subcatchments. Table 3-6 summarizes the subcatchment coverage per metershed.

Table 3-6. Model WWF Subcatchment Summary

Metershed	Sum of Contributing Area (acre)	Count of Subcatchment	Largest Contributing Area (acre)	Smallest Contributing Area (acre)	Notes
CKC1	726	145	78.048	0.519	
DK10	136	2	130.323	6.027	Extends into Rockdale County
DK11	111	1	110.849	110.849	Extends into Rockdale County
HON1	331	65	28.183	0.424	
HON2	864	125	30.217	0.194	
HON3	422	64	50.811	1.109	
JSC1	365	72	16.087	0.380	
LCKC1	650	194	14.744	0.405	
LCKC2	858	204	40.611	0.214	
LSM1	483	115	28.229	0.412	
LSM2	761	122	40.070	0.915	
PB1	519	93	34.057	0.598	
PB10	1,121	235	43.881	0.106	

Table 3-6. Model WWF Subcatchment Summary

Metershed	Sum of Contributing Area (acre)	Count of Subcatchment	Largest Contributing Area (acre)	Smallest Contributing Area (acre)	Notes
PB2	844	158	44.420	0.523	
PB3	1,008	117	80.994	0.499	
PB4	380	60	34.539	0.646	
PB5	1,143	138	92.927	0.177	
PB6	1,138	142	64.161	0.221	
PB7	1,058	198	42.865	0.229	
PB8	1,010	218	42.921	0.517	
PB9	497	117	17.693	0.303	
PBPLNT1	98	18	14.958	1.745	
PBPLNT2	900	124	85.705	0.367	
PBPLNT3	153	20	22.329	1.663	
PBPLNT4	334	29	90.318	0.677	
PBPLNT5	732	85	76.601	0.791	
PBPLNT6	181	7	74.965	3.562	
PINEM1	980	101	143.574	0.632	
SWIFT2	678	218	8.955	0.213	
UCKC1	677	174	33.266	0.368	
UCKC2	1,240	314	43.837	0.061	
Unmetered	48	9	13.077	2.935	Area downstream of CKC1 and upstream of the Pole Bridge AWTP

3.6 Dynamic Hydraulic Model Flow Inputs

The dynamic hydraulic model flow inputs were updated based on portions of the flow data analysis of the 2018 and early 2019 flow and rainfall monitoring data for County wide model areas. As discussed in Section 2.4, EPA's SSOAP application was used for data analysis. The detailed SSOAP data analysis is included in the 2019 flow and rainfall monitoring report (CDPMT, 2019). Section 3.6 focuses only on the analysis results from the 6-month flow data collected from September 2018 through February 2019 for Pole Bridge Basin.

The detailed explanation of the different flow components and the methodology to distribute the different DWF components is provided in the 2017 base model report (CDPMT, 2017) and is summarized as follows. DWF consisted of groundwater infiltration (GWI) and sanitary flow.

- Following EPA (2007) guidance, GWI was determined using flow meter data by taking the minimum reading (typically between 2:00 a.m. and 5:00 a.m.) and assuming that 15 percent of that flow was sanitary flow and the remaining 85 percent flow was constant groundwater infiltration. However, the percentage of the minimum reading presumed to groundwater infiltration was adjusted as needed to reach mass flow balance among the meters.

- The base sanitary flow (BSF) was the load directly contributed by the County's customers. Sanitary flows were determined using flow meter data by subtracting GWI from the calculated average DWF. The average BSF was then distributed based on geocoded water consumption data provided by the County.

Table 3-7 summarizes the updated DWF model inputs for each metershed within Pole Bridge Basin including sanitary flow and base groundwater infiltration.

There was also a small area not covered by the DWM flow meters because of lack of accessibility to manholes or unacceptable hydraulic condition for meter installation. As shown on Figure 2-3, the unmetered area within the Pole Bridge Basin is limited to the small area close to the Pole Bridge AWTP. The flow in the unmetered area was estimated based on water billing data using the following procedures:

- For the BSF, assumed 75 percent of returning rate from the water usage records, which is based on the estimated average indoor water use of 72 to 78 percent for DeKalb County per Metropolitan North Georgia Water Planning District (MNGWPD, 2017)
- For the base GWI:
  - Used the immediate upstream meter data to calculate the percentage of minimum nighttime flow over average daily dry weather flow (ADDF). If there is no upstream meter, the system-wide average percentage was used.
  - Assumed 75 percent of minimum nighttime flow is GWI as an initial value per the Model Protocol section in Appendix A of the 2017 base model report (CDPMT, 2017).
  - Calculated the estimated ADDF for the unmetered area based on the estimated BSF and the above assumptions.
  - Back-calculated base GWI from the estimated ADDF and BSF based on the above procedures.

The model DWF distribution within each metershed was also updated. The base GWI distribution was refined based on the drainage area of the delineated WWF subcatchments. Sanitary flow distribution in the model was updated based on the 2015 water billing data, which was used by AECOM for the master planning task. Questionable billing data from 2016 through 2019 were reviewed by DWM, who determined that the data should not be used.

As recommended in the 2017 base model report, sanitary flow distribution was also further refined for locations with identified large water users and dischargers. The large water users were identified from the 2015 water billing data within each model area, and the large dischargers were provided by the County.

The distribution was adjusted based on the large water users and large dischargers as follows:

- For each DWM-provided large wastewater discharger, the provided monthly average flow (February 2018) was assumed for the 2015 average upon confirmation with DWM and added as trade flow in the subcatchment table to replace the existing sanitary flow loading based on water billing data.
- For identified large water users, the data records were reviewed and the corresponding loaded flow in the model was adjusted only if there was information available to calculate the new flow loading. Further evaluation of those large water users is recommended as the County's sewer variance program information becomes available.

Table 3-7. Model DWF Inputs Based on 2018–2019 Flow Monitoring Data

				Model Weekday DWF Input				Model Weekend DWF Input				Model Dry GWI Input			
Meter ID	**Sewershed**	**DS Metershed**	**WW Profile**	**ADDF (CUM)**	**ADDF (SUB)**	**BSF (CUM)**	**BSF (SUB)**	**ADDF (CUM)**	**ADDF (SUB)**	**BSF (CUM)**	**BSF (SUB)**	**CUM GWI (WKD&WKE)**	**GWI % of MINQ**	**CUM ADDF MINQ (WKD&WKE)**	**SUB GWI (WKD&WKE)**
CKC1	Crooked Creek	Pole Bridge AWTP	121	0.27	0.27	0.12	0.12	0.31	0.31	0.16	0.16	0.15	0.75	0.20	0.15
HON1	Honey Creek	PBPLNT2	151	1.30	0.24	0.85	0.23	1.36	0.22	0.91	0.20	0.45	0.75	0.60	0.01
HON2	Honey Creek	HON1	152	0.41	0.41	0.25	0.25	0.46	0.46	0.30	0.30	0.16	0.75	0.22	0.16
HON3	Honey Creek	HON1	153	0.46	0.10	0.27	0.07	0.50	0.12	0.30	0.09	0.19	0.75	0.26	0.03
JSC1	Johnson Creek	HON3	191	0.17	0.17	0.10	0.10	0.19	0.19	0.12	0.12	0.06	0.75	0.08	0.06
LCKC1	Lower Crooked Creek	PB7	201	1.26	0.08	0.73	0.04	1.34	0.15	0.81	0.12	0.53	0.75	0.71	0.04
LCKC2	Lower Crooked Creek	LCKC1	202	1.18	0.51	0.68	0.30	1.19	0.47	0.69	0.27	0.49	0.75	0.66	0.20
LSM1	Lower Stone Mountain Creek	PB7	241	0.59	0.23	0.26	0.10	0.63	0.24	0.30	0.11	0.33	0.75	0.44	0.13
LSM2	Lower Stone Mountain Creek	LSM1	242	0.36	0.36	0.16	0.16	0.40	0.40	0.20	0.20	0.20	0.75	0.27	0.20
PB1	Pole Bridge Creek	PBPLNT5	441	0.19	0.19	0.10	0.10	0.20	0.20	0.11	0.11	0.09	0.75	0.12	0.09
PB2	Pole Bridge Creek	PBPLNT5	442	0.48	0.48	0.25	0.25	0.54	0.54	0.32	0.32	0.22	0.75	0.29	0.22
PB3	Pole Bridge Creek	PBPLNT6	443	5.05	0.09	2.84	0.02	5.36	0.08	3.14	0.01	2.22	0.64	3.46	0.07

Table 3-7. Model DWF Inputs Based on 2018–2019 Flow Monitoring Data

				Model Weekday DWF Input				Model Weekend DWF Input				Model Dry GWI Input			
Meter ID	**Sewershed**	**DS Metershed**	**WW Profile**	**ADDF (CUM)**	**ADDF (SUB)**	**BSF (CUM)**	**BSF (SUB)**	**ADDF (CUM)**	**ADDF (SUB)**	**BSF (CUM)**	**BSF (SUB)**	**CUM GWI (WKD&WKE)**	**GWI % of MINQ**	**CUM ADDF MINQ (WKD&WKE)**	**SUB GWI (WKD&WKE)**
PB4	Pole Bridge Creek	PB3	444	0.40	0.40	0.20	0.20	0.43	0.43	0.24	0.24	0.19	0.75	0.26	0.19
PB5	Pole Bridge Creek	PB3	445	0.76	0.76	0.39	0.39	0.72	0.72	0.35	0.35	0.37	0.75	0.49	0.37
PB6	Pole Bridge Creek	PB3	446	0.29	0.29	0.15	0.15	0.29	0.29	0.15	0.15	0.14	0.75	0.18	0.14
PB7	Pole Bridge Creek	PB3	447	2.57	0.43	1.55	0.40	2.81	0.52	1.79	0.50	1.02	0.78	1.30	0.02
PB8	Pole Bridge Creek	PB3	448	0.96	0.21	0.53	0.14	1.04	0.26	0.61	0.19	0.43	0.75	0.57	0.07
PB9	Pole Bridge Creek	PB8	449	0.32	0.32	0.16	0.16	0.32	0.32	0.16	0.16	0.16	0.75	0.21	0.16
PB10	Pole Bridge Creek	PB8	450	0.43	0.43	0.24	0.24	0.46	0.46	0.26	0.26	0.20	0.75	0.26	0.20
PBPLNT1	Pole Bridge Creek	Pole Bridge AWTP	451	0.03	0.03	0.02	0.02	0.03	0.03	0.02	0.02	0.01	0.75	0.01	0.01
PBPLNT2	Pole Bridge Creek	Pole Bridge AWTP	452	1.92	0.62	1.08	0.23	2.01	0.65	1.17	0.26	0.84	0.75	1.12	0.39
PBPLNT3	Pole Bridge Creek	Pole Bridge AWTP	453	0.07	0.07	0.03	0.03	0.07	0.07	0.03	0.03	0.04	0.75	0.05	0.04
PBPLNT4	Pole Bridge Creek	Pole Bridge AWTP	454	7.40	0.43	3.61	0.29	7.42	0.17	3.63	0.03	3.79	0.72	5.26	0.14
PBPLNT5	Pole Bridge Creek	PBPLNT4	455	0.73	0.06	0.36	0.01	0.80	0.05	0.43	0.00	0.37	0.73	0.50	0.05

Table 3-7. Model DWF Inputs Based on 2018–2019 Flow Monitoring Data

				Model Weekday DWF Input				Model Weekend DWF Input				Model Dry GWI Input			
Meter ID	**Sewershed**	**DS Metershed**	**WW Profile**	**ADDF (CUM)**	**ADDF (SUB)**	**BSF (CUM)**	**BSF (SUB)**	**ADDF (CUM)**	**ADDF (SUB)**	**BSF (CUM)**	**BSF (SUB)**	**CUM GWI (WKD&WKE)**	**GWI % of MINQ**	**CUM ADDF MINQ (WKD&WKE)**	**SUB GWI (WKD&WKE)**
PBPLNT6	Pole Bridge Creek	PBPLNT4	456	6.24	1.19	2.96	0.12	6.45	1.09	3.17	0.03	3.28	0.73	4.50	1.06
PINEM1	Pine Mountain Creek	HON3	421	0.20	0.20	0.09	0.09	0.19	0.19	0.09	0.09	0.10	0.75	0.13	0.10
SWIFT2	Swift Creek	PB7	561	0.28	0.28	0.15	0.15	0.31	0.31	0.18	0.18	0.13	0.75	0.17	0.13
UCKC1	Upper Crooked Creek	LCKC2	571	0.20	0.20	0.12	0.12	0.22	0.22	0.13	0.13	0.08	0.75	0.11	0.08
UCKC2	Upper Crooked Creek	LCKC2	572	0.47	0.47	0.26	0.26	0.50	0.50	0.29	0.29	0.21	0.75	0.28	0.21
DK10	Honey Creek	HON1	154	0.05	0.05	0.04	0.04	0.06	0.06	0.04	0.04	0.02	0.75	0.02	0.02
DK11	Honey Creek	HON1	155	0.13	0.13	0.07	0.07	0.12	0.12	0.06	0.06	0.06	0.75	0.08	0.06

Table 3-8 lists the identified large wastewater dischargers within the Pole Bridge Basin based on the list provided by the County. Table 3-9 lists the identified large water users within the Pole Bridge Basin.

Table 3-8. Large Wastewater Dischargers

Name	Model Loading Manhole ID	Monthly Average Flow (gpm)
WESTROCK CP LLC	16-123-s063	1.1
WEYERHAEUSER & CO	16-135-s216	19.6
MASTER WALL INC	16-121-p218	0.5

Note:
gpm = gallons per minute

Table 3-9. Top 10 Large Water Users

Ranking	Location ID	Name	Water Consumption (gpm)
1	1122707	DART CONTAINER CORPORATION	87.5
2	8922601	MARRIOTT EVERGRN CONFRN RESORT	49.5
3	104205	STONE MOUNTAIN PARK SILVER DOLLAR CITY INC	39.9
4	102097	ROCK ROSE DEVON PLACE PROPERTY HOLDINGS LLC	39.2
5	420523	WESLEY KENSINGTON PARTNERS, LLC	38.6
6	8832306	WOODCREST APARTMENTS, LLC	33.2
7	103711	DMS CHELSEA	32.6
8	9928805	HPI CREEKSIDE, LLC	30.8
9	107816	BELLE VISTA LLC	27.9
10	325533	FAIRINGTON VILLAGE/RIDGE CONDOS	27.5

3.7 Basic Modeling Assumptions

The basic modeling assumptions were the same as those presented in the 2017 base model report (CDPMT, 2017) and included:

- Head loss: it was assumed that the manholes were in good condition and normal manhole head loss condition was used.
- Pipe Roughness: Table 3-10 lists the default Manning’s N for different pipe material in the County’s system. When the pipe’s material was not known, a value of 0.013 was assumed. As with other calibration parameters, the Manning’s N coefficient was occasionally adjusted in the calibration process.
- Manhole flooding: Manholes in the network were assumed to have a flooding type of “lost”. If there were any force mains, the nodes were represented as “sealed”.

Table 3-10. Manning's N for Various Pipe Material
Source: Haestad Methods, 2004

Pipe Material	Initial Manning's N
Brick	0.015
CI	0.014
CIP	0.013
CIP(lined)	0.012
CMP	0.015
Concrete	0.013
DIP	0.013
HDPE	0.012
Lined	0.012
Other	0.013
Polyethylene	0.01
PVC	0.012
RCP	0.013
Tile	0.015
Truss	0.012
VCP	0.013

SECTION 4

WWF Model Setup for Dynamic Hydraulic Modeling

A portion of WWF from rainfall runoff can work its way into the sewer system. The model simulates this time-dependent rainfall-to-sewer system phenomena in the hydraulic model. The WWF consists of three model components included in the InfoWorks ICM: initial loss (depression storage), runoff volume, and runoff routing. Incident rainfall is initially stored in surface depressions, which are subject to evaporative loss. When rainfall exceeds depression storage in a given model calculation time step, a proportion of the excess rainfall goes to runoff according to the particular volume and routing models used.

As discussed in the dynamic model approach TM (CDPMT, 2018), runoff model (both volume and routing) solutions offered in InfoWorks ICM were evaluated to determine which solution best reflected RDII characteristics using the following flow monitoring data:

- Observed inter-event impacts (for example, flow not returned to the base flow before the next storm event).
- Long-term impact from GWI from dry and wet periods.

The combined model solution of the hydrologic/surface runoff models (Fixed Percentage Runoff volume model + Wallingford routing model) and Ground Infiltration Model (GIM) was selected based on the pilot study results of a portion of DWM's sewer system by evaluating the three approaches listed below. This pilot study was presented in 2018 Innovyze's Atlanta User Group Meeting (Lu et al., 2018). Comparing the three different model solutions resulted in the following findings:

- RTK methodology[2] is widely used as one empirical approach but has limited features to simulate the inter-event impacts and long-term impacts from GWI over different dry and wet periods (not selected).
- Hydrologic (surface runoff) models including both volume and routing models offered in InfoWorks ICM can conceptualize the RDII responses as surface runoff inputs but have limitations to represent slow response (selected as part of the combined solutions).
- GIM is effective for simulating inter-event impacts from antecedent moisture conditions or a highly attenuated response to rainfall ("long tail") but is complicated and has multiple parameters to adjust (selected as part of the combined solutions).

The following sections introduce the combined model solution approach, the major model parameters, and the assumptions applied in the model setup.

4.1 Combined Model Solution Approach

4.1.1 Hydrologic (Surface Runoff) Models

For the dynamic model, the Fixed Percentage Runoff (PR) volume model was paired with the Wallingford routing model to simulate the fast and medium responses of the RDII.

The Fixed PR volume model defines a fixed percentage of the net rainfall that becomes runoff. It uses one parameter, fixed runoff coefficient, to define the runoff volume. For example, a value of 0.1 means

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[2] R=fraction of rainfall volume entering the sewer system as RDII; T=time to peak; K=the ratio of time of recession to time to peak

that 10 percent of the generated runoff from the contributing area for the defined runoff surface enters the sewer as RDII.

The Wallingford routing model, also known as the double linear reservoir model, was selected for the runoff routing model. The Fixed PR volume model calculated the net resulting rainfall runoff entering the sewer. The Wallingford routing model transformed the generated net runoff for each subcatchment into an inflow hydrograph at each WWF loading node. The model was simplified to use only one parameter—the runoff routing value in the InfoWorks ICM runoff surface grid table (Innovyze, 2017)—to control the speed of the flow entering the sewer. This parameter affects the peak flow of the WWF hydrograph.

4.1.2 Ground Infiltration Model

Beyond the surface runoff discussed on the previous page, the remaining rainfall is directed into the soil storage reservoir. When the soil reaches a given saturation threshold, water starts to percolate downwards. A proportion of this percolation flow infiltrates directly into the sewer network while the remainder penetrates deeper to feed the groundwater storage reservoir. The above process can be simulated by GIM in InfoWorks ICM. By using the double layer reservoirs theory, GIM can simulate the inter-event impact from antecedent moisture conditions or a highly attenuated response to rainfall (long tail). However, this model is complicated, with 12 major parameters to calibrate to simulate the physical process including soil depth, percolation coefficient, baseflow coefficient, infiltration coefficient, percolation threshold, percolation percentage infiltrating, porosity of soil, porosity of ground, baseflow threshold level, baseflow threshold type, infiltration threshold level, and infiltration threshold type. It also requires a long simulation time to simulate the long-term impact from GWI, which was not appropriate for this study scope and schedule.

For this study, the GIM methodology was simplified to consider only the first layer reservoir, with three major parameters to calibrate (percolation coefficient, percolation percentage infiltrating, and percolation threshold). With proper calibration of the three parameters, GIM simulated both the medium and slow response of the RDII.

GIM was used only for meters that could not calibrate with the Fixed PR and Wallingford models because of intensive ground infiltration.

The simplified GIM approach did not fully use the features for long-term simulation but retained the comprehensive advanced modeling technology to account for the inter-event impact, which was limited with the RTK methodology as discussed in the pilot study (Lu et al., 2018). It addresses the delayed impacts of individual storms but is not calibrated to address multi-season or multi-year groundwater impacts.

4.2 WWF Model Setup Parameter Groups

The WWF model setup parameters from the combined model solutions were categorized into two major groups according to their effects on model RDII simulation results:

- Volume: this parameter group defined the proportion of rainfall landing on the catchment surface that enters the sewer as RDII, which affects the total RDII volume.
- Routing: this parameter group defined the speed with which rainfall enters the sewer as RDII. Parameters in this group affect the shape of the flow hydrograph (the timing and peak flow).

Parameters representing initial loss in processes, such as dampening and cooling of the catchment surface and filling up small surface depressions, were also used in the model to help address the inter-event impact issues by pairing with GIM. Group parameters were only applied as needed per calibration results.

Table 4-1 summarizes the major parameter groups discussed above. The parameters not listed in Table 4-1 were set with default values and were not adjusted in the model calibration process.

Table 4-1. WWF Parameters Summary

ICM Grid Table	Parameter	Group	Model Solutions	Notes
Subcatchment	Contributing Area	Volume	not applicable	
Land Use	Default Area 1 (%)	Volume	not applicable	Calibration Parameter
Runoff Surface	Runoff Routing Value	Routing	Wallingford Routing	Calibration Parameter
Runoff Surface	Initial Loss Value (ft)	Volume	not applicable	Calibration Parameter
Runoff Surface	Fixed Runoff Coefficient	Volume	Fixed PR Run off	Calibration Parameter
Ground Infiltration	Percolation Percentage Infiltrating	Volume	GIM	Calibration Parameter
Ground Infiltration	Percolation Coefficient	Routing	GIM	Calibration Parameter
Ground Infiltration	Percolation Threshold	Volume	GIM	Calibration Parameter

4.3 Assumptions

As discussed in the previous section, the combined model solution approach used the runoff model solutions for stormwater to conceptualize the RDII characteristics. The original comprehensive model solutions in InfoWorks ICM were intended to simulate the complex physical process of runoff and infiltration. This complex model process was simplified in the WWF model setup. The simplification enabled RDII in a separated sewer system to be simulated by converting the originally intended physical process-based model solutions to a hybrid model solution with empirical modeling assumptions. The assumptions related to the simplification included:

1. All parameters were simplified as volume-related or speed-related, as explained in Section 4.2. The original physical meaning and limitations of the parameters were not applied in this simplified model solution. For example, the imperviousness percentage was used only to specify the overall potential runoff generated before subtracting the flow to the sewer through the fixed runoff model and GIM; it did not represent the real imperviousness of the contributing area.
2. Initial loss is a complex physical process with uncertainty factors related to rainfall spatial and temporal distribution and soil conditions. The related parameters were considered only per calibration needs.
3. For unmetered areas, the system average values from the calibrated model were assumed for the major WWF parameters.

The assumptions inherently reduce the complex, physically based InfoWorks ICM runoff model to a calibration-based simplification. A calibration-based simplification is required for RDII simulation because it is not feasible to identify and subsequently physically represent all processes and opportunities that allow rainfall to enter the sanitary sewer.

SECTION 5

Model Results Calibration and Verification

The 2017 base model report (CDPMT, 2017) provides detailed discussion of the model build, calibration and verification approach, and sensitivity analysis for DWF, which is summarized in this section. This section focuses on the DWF recalibration results, the dynamic WWF calibration, and verification.

The sensitivity analysis for WWF model parameters is also included in this section. Although the parameters used in the analysis were adopted from one example subcatchment in the ITMC model, the effects of those parameters on the results remain similar for all DeKalb collection system model sewersheds and the sensitivity analysis results from the ITMC model example are also applicable to the remaining six DWM hydraulic models using the same WWF model solutions and parameters.

5.1 Calibration Criteria

For DWF model calibration, CDPMT continued to use the same model calibration/verification criteria stated in Section 4.1.1 of the 2017 base model report (CDPMT, 2017). The criteria used for dry weather calibration during individual 24-hour qualified dry day were:

- ±10 percent peak DWF
- ±10 percent volume

For WWF model calibration, CDPMT adopted the criteria that were accepted by DWM per Section 10.1 of the developed Model Protocol section in Appendix A of the 2017 base model report. The criteria included accepting calibration results variations within the following ranges:

- +25/-15 percent for peak flow
- +20/-10 percent for volumes
- +1.5/-0.5 ft for depths where surcharge occurred with system data quality supported

The above criteria were also the same as the standards from the Chartered Institution of Water and Environmental Management (CIWEM) Urban Drainage Group (UDG), except for depth which was normalized for SI units[3] instead of metric, so +1.5 ft/-0.5 ft instead of +0.5 m/-0.1 m (CIWEM, 2017). Those criteria were met for at least three qualified storm events.

For extremely low flows, a large percentage difference between predicted and recorded flows do not correspond to significantly different flow magnitudes and volumes. For these low-flow conditions, while the percent difference between modeled and observed flows is high, the absolute difference is considered negligible if the flow was less than 0.1 mgd or the volume was less than 0.1 million gallons (Water Environment Federation [2011] Table 5.2).

Figure 5-1 shows one example of applying the above volume criteria in the WWF calibration summary graph.

As explained in the dynamic model approach TM (CDPMT, 2018), the above criteria represented expected levels of accuracy, depending on the data quality. Noncompliance to the criteria was acceptable if justified by limitations either in the flow monitoring data or the available system data (for example, questionable GIS sewer pipe inverts causing depth violation). The emphasis of the calibration process was in determining and attaining fitness for modeling purpose, rather than on strict numerical agreement with flow and field survey data that may be subject to recording errors. Consideration was

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[3] International System of Units (Système international)

given to known operational issues, for example blockages, pumping station failures, ongoing PASARP system cleaning activities, or intervention by operators at control structures if applicable.

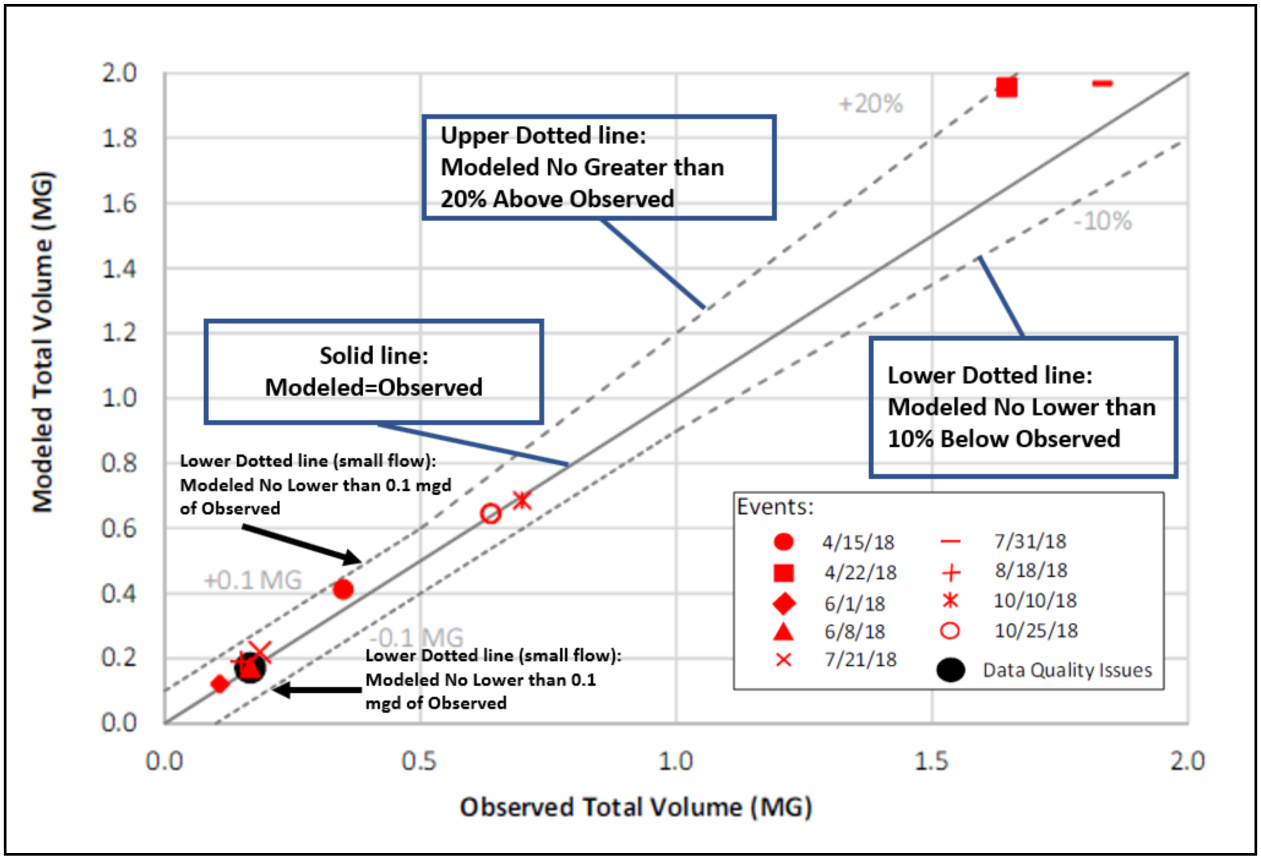


Figure 5-1. WWF Calibration Criteria Graph Example: Volume

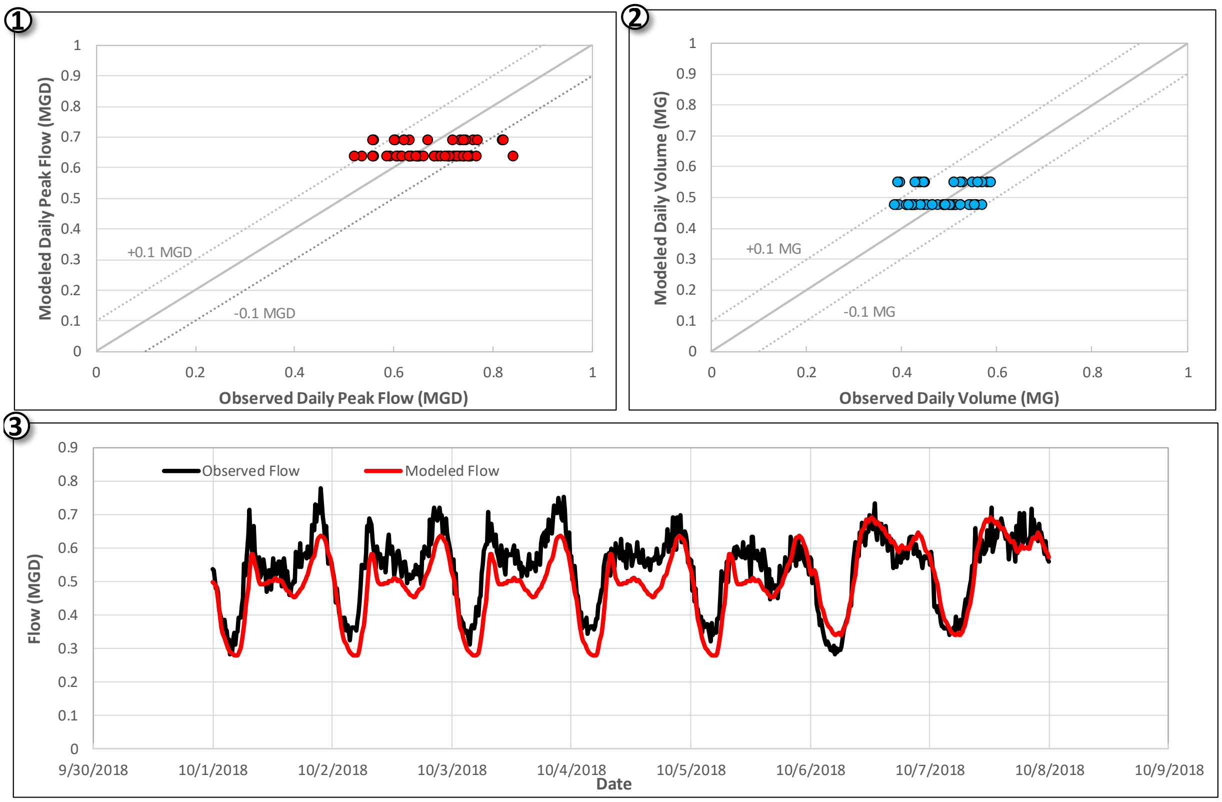
5.2 Dry Weather Flow Calibration

5.2.1 Calibration Summary

Dry weather time periods used for model calibration were preceded by 2 days with daily rainfall totals of 0.1 inches or less. Where possible, both weekend and weekdays were selected for dry weather calibration such that the model flow tracked, within the criteria tolerances, the variation in the recorded flow for a typical week. Per the developed Model Protocol section in Appendix A of the 2017 base model report (CDPMT, 2017), flows were acceptable for calibration if they met the level of accuracy described above for a minimum of 2 weekdays and 1 weekend day. However, where possible more days were desirable.

Table 5-1 summarizes the model DWF calibration results for the Pole Bridge Basin model. The calibration of the overall volume, peak flow, and shape of the hydrograph was considered acceptable. Appendix B provides the detail calibration summary graphs for each meter.

Figure 5-2 provides an example plot of the comparison between model and monitored DWF data at meter PB2. Appendix B provides similar calibration graphs for all meters. The model was considered calibrated for DWF when the modeled daily peak flows matched observed daily peak flows within the criteria range for most meters.



DeKalb Calibration Results

Dry Weather
Flow Summary

Flow Meter:
PB2

Sewershed:
Pole Bridge Creek

Sewer Basin:
Pole Bridge Basin

① Daily Volume

② Daily Peak Flow

③ One Week Time Series

Total Compared Dry Days:

59

Figure 5-2. Example Dry Weather Flow Calibration Plot at Meter PB2

The surcharged pipes (pipes where the flow depth exceeds the crown of the pipe) during DWF were also checked. Approximately 53 sewer pipe segments were surcharged based on the DWF model calibration results, including:

- A total of 50 sewer pipe segments had surcharge caused by reversed/flat sewer pipes or offsets between incoming and outgoing pipes.
- A total of 1 sewer pipe segment is immediately upstream of the wet well at Lower Crooked Creek II LS and its surcharge was caused by pump on/off levels that are based on 2018 drawdown testing records.
- A total of 2 other sewer pipe segments had surcharge caused by small steep pipes with downstream inverts equal to the invert of a larger pipe.

The County will review wet weather model scenarios to determine if the predicted surcharging resulting from the reversed/flat sewer pipes represents a risk for SSOs and will prioritize efforts to confirm invert elevation information of such pipes.

Table 5-1. DWF Calibration Summary

Meter Name	Weekday (Days)			Weekend (Days)			Total			Comments
	Total Dry Days	Calibrated on Peak	Calibrated on Volume	Total Dry Days	Calibrated on Peak	Calibrated on Volume	Total Dry Days	Calibrated on Peak	Calibrated on Volume	
CKC1	37	36	37	18	17	18	55	53	55	Depth is consistently overestimated, possibly because of inaccurate pipe invert elevations. There is one pipe directly downstream of the flow meter with reversed grade verified by field survey. There are also two additional pipes downstream of the flow meter with reversed grade based on GIS and inferred invert elevations. Recommend verifying reversed pipes.
DK10	46	44	46	17	16	17	63	60	63	
DK11	55	53	55	20	20	20	75	73	75	Superseded 15-minute data by comparing hourly data because the measured data had wide variations in peak flow; model calibration captured average pattern.
HON1	45	14	21	19	8	10	64	27	34	Flow varied throughout flow monitoring period; DWF calibration captured the average peak flows and volume.
HON2	55	45	50	20	13	15	75	58	65	Superseded 15-minute data by comparing hourly data because the measured data had wide variations in peak flow; model calibration captured average pattern.

Table 5-1. DWF Calibration Summary

	Weekday (Days)			**Weekend (Days)**			**Total**			
Meter Name	**Total Dry Days**	**Calibrated on Peak**	**Calibrated on Volume**	**Total Dry Days**	**Calibrated on Peak**	**Calibrated on Volume**	**Total Dry Days**	**Calibrated on Peak**	**Calibrated on Volume**	**Comments**
HON3	56	20	17	18	12	9	74	41	25	Flow varied throughout flow monitoring period; DWF calibration captured the average peak flows and volume.
JSC1	57	49	57	22	14	22	79	62	79	
LCKC1	30	25	28	10	10	10	40	35	38	Flow depth affected by backwater from downstream lift station.
LCKC2	60	35	26	22	14	8	82	49	34	Flow varied throughout flow monitoring period; DWF calibration captured the average peak flows and volume.
LSM1	29	13	26	14	10	10	43	23	36	Superseded 15-minute data by comparing hourly data because the measured data had wide variations in peak flow; model calibration captured average pattern.
LSM2	41	27	33	17	12	13	58	39	46	
PB1	60	54	58	20	19	20	80	73	78	
PB2	46	24	32	13	12	9	59	36	41	
PB3	61	52	52	22	8	14	83	63	66	
PB4	59	55	59	21	19	21	80	74	80	

Table 5-1. DWF Calibration Summary

	Weekday (Days)			Weekend (Days)			Total			
Meter Name	**Total Dry Days**	**Calibrated on Peak**	**Calibrated on Volume**	**Total Dry Days**	**Calibrated on Peak**	**Calibrated on Volume**	**Total Dry Days**	**Calibrated on Peak**	**Calibrated on Volume**	**Comments**
PB5	55	33	33	22	7	13	77	40	46	Superseded 15-minute data by comparing hourly data because the measured data had wide variations in peak flow; model calibration captured average pattern.
PB6	57	37	38	22	17	17	79	54	55	Superseded 15-minute data by comparing hourly data because the measured data had wide variations in peak flow; model calibration captured average pattern.
PB7	61	17	22	21	13	8	82	30	30	Superseded 15-minute data by comparing hourly data because the measured data had wide variations in peak flow; model calibration captured average pattern.
PB8	53	14	29	20	2	13	73	16	42	Superseded 15-minute data by comparing hourly data because the measured data had wide variations in peak flow; model calibration captured average pattern.
PB9	51	18	27	20	7	11	71	25	38	Flow varied throughout flow monitoring period; DWF calibration captured the average peak flows and volume during drier months.
PB10	52	33	37	18	13	13	70	46	50	
PBPLNT1	43	41	43	19	19	19	62	60	62	

Table 5-1. DWF Calibration Summary

Meter Name	Weekday (Days)			Weekend (Days)			Total			Comments
	Total Dry Days	Calibrated on Peak	Calibrated on Volume	Total Dry Days	Calibrated on Peak	Calibrated on Volume	Total Dry Days	Calibrated on Peak	Calibrated on Volume	
PBPLNT2	41	11	23	17	3	12	58	14	35	Flows and flow depth affected by backwater from downstream lift station; model calibration captured average peak flows and volume.
PBPLNT3	51	49	49	22	22	22	73	71	71	
PBPLNT4	59	38	32	25	18	15	84	56	47	
PBPLNT5	58	19	19	18	6	6	76	25	25	Superseded 15-minute data by comparing hourly data because the measured data had wide variations in peak flow; model calibration captured average pattern.
PBPLNT6	62	38	22	22	14	8	84	51	30	Flow varied throughout flow monitoring period; DWF calibration captured the average peak flows and volume.
PINEM1	28	26	27	12	12	12	40	38	39	
SWIFT2	61	52	61	24	19	22	85	71	83	
UCKC1	54	45	54	20	15	18	74	60	72	
UCKC2	58	31	39	21	15	13	79	46	52	

5.2.2 Sensitivity Analysis

The DWF parameters remained the same as the 2017 base model including BSF, GWI, and diurnal patterns. The sensitivity analysis discussed in Section 4 of the 2017 base model report was also applied to the modeling work discussed herein. The key analysis issues are summarized below:

- Flow input (BSF and GWI) – Increasing or decreasing these flow parameters affects the overall volume of the flow measured during dry weather. If the daily volume of the DWF of the model appeared higher or lower than the metered flow, then the BSF/GWI was adjusted until model results matched the metered data.
- Diurnal Patterns – Diurnal patterns were created from flow meter data to represent the DWF hourly variations at the meter site location and applied to the entire corresponding metershed within the model. Some diurnal patterns may have needed adjustment to account for the travel time within the metershed, especially for areas with long distances from upstream points to the downstream flow meter. As diurnals are unit multipliers, adjusting the diurnal did not affect the volume of flow but rather the maximum and minimum flows.
- The changes on any combination of the above parameters lead to direct proportional changes on the model results.

5.3 Wet Weather Flow Calibration

5.3.1 Calibration Summary

Unlike traditional event specific WWF calibration, a continuous simulation was conducted for the 6-month flow monitoring period to simulate the inter-event impacts. For each meter, the model-predicted results were compared with the monitored data for the selected RDII events. An RDII event is not exactly the same as the storm event discussed in Section 2.4.3. Both share the same start time, but the RDII event may last longer to include the retention time after the storm ends to allow the flow to return to base, pre-event flow condition. Depending on the flow retention time after the storm, one RDII event could include multiple storm events.

For the calibration summary presentation, up to nine RDII events were selected based on the selected storm events listed in Appendix A for use with the detailed statistical comparison of monitored flow data against the calibration criteria. Table 5-2 lists the 9 selected RDII events and provides characteristic data for each of the selected events. In addition, the model could be calibrated to events outside the nine selected RDII events. For the Pole Bridge Basin model, the calibration focused on events after October 2018 with high wet condition, as discussed in Section 2.4.3.

Table 5-2. RDII Events Summary

Event	Date	Duration (hours)	Peak Rainfall Intensity (in/hr)	Total Rainfall (in)
1	11/12/2018 4:30	90.75	0.76	3.73
2	12/1/2018 6:45	22.75	1.12	1.75
3	12/8/2018 1:45	69.75	0.48	2.97
4	12/14/2018 2:30	30	0.6	1.23
5	12/20/2018 5:00	34	0.4	1.73
6	12/27/2018 18:30	18.75	0.92	2.37

Table 5-2. RDII Events Summary

Event	Date	Duration (hours)	Peak Rainfall Intensity (in/hr)	Total Rainfall (in)
7	1/19/2019 8:45	16.75	1.12	1.44
8	1/23/2019 19:15	10.75	1.84	1.82
9	2/19/2019 12:45	22.25	0.92	1.00

Table 5-3 summarizes the total number of RDII events calibrated to each criteria category out of the selected events with quality data suitable for statistical comparison. The RDII event IDs refer to Table 5-2. Appendix C provides the detailed statistical summary table and graphs showing calibration results for each meter.

Table 5-3. WWF Calibration Summary

Meter ID	Total RDII Events with Quality Data	Total No. of Events Calibrated to Peak Flow	Total No. of Events Calibrated to Volume	Total No. of Events Calibrated to Depth	Notes
CKC1	4 (RDII events 1, 4–5, 9)	4	4	4	Backwater and reverse flow from plant during storm events affect calibration during events 6–8
DK10	5 (RDII events 1, 6–9)	4	4	5	Velocity data loss impacts flow estimations and data quality for events 2–5
DK11	8 (RDII events 1–8)	7	8	8	Large peak flow during event 9 after rainfall prevents criteria from being met
HON1	4 (RDII events 5–6, 8–9)	4	4	4	Meter was offline for parts of events 1–4; was able to calibrate peak and volume for 4 quality events; event 7 peak flow and depth criteria are not met because of large spike unrelated to rainfall, therefore hourly average values were used for comparisons because of spikes in the observed data caused by upstream lift station operation
HON2	9 (RDII events 1–9)	4	8	9	
HON3	9 (RDII events 1–9)	9	5	9	
JSC1	9 (RDII events 1–9)	8	8	9	
LCKC1	1 (RDII event 9)	1	1	1	Meter has quality issues with frequent velocity drops during events 1–8 because of apparent backwater from the downstream Lower Crooked Creek I LS, resulting in the model consistently under-estimating depth; only one quality event for calibration

Table 5-3. WWF Calibration Summary

Meter ID	Total RDII Events with Quality Data	Total No. of Events Calibrated to Peak Flow	Total No. of Events Calibrated to Volume	Total No. of Events Calibrated to Depth	Notes
LCKC2	9 (RDII events 1–9)	8	9	9	
LSM1	0	0	0	0	Meter has quality issues with frequent velocity signal drops; evidence of long-term level drift impacting flow data quality after January; depth consistently underestimated, possibly because of downstream lift station operations; no quality events available for calibration
LSM2	3 (RDII events 7–9)	3	3	3	Poor velocity signal during November affects event 1 data quality; LSM2 was offline during December; was able to calibrate all other available quality events
PB1	8 (RDII events 2–9)	6	6	8	Event 1 flow drops below typical DWF
PB10	9 (RDII events 1-9)	8	8	9	
PB2	6 (RDII events 1–6)	5	5	6	Missing data during events 7–9
PB3	9 (RDII events 1–9)	4	8	9	
PB4	8 (RDII events 1–5,7–9)	8	8	8	Large flows during event 6 unrelated to rainfall
PB5	8 (RDII events 1–5,7–9)	8	8	8	
PB6	9 (RDII events 1–9)	6	4	9	
PB7	9 (RDII events 1–9)	7	8	9	
PB8	8 (RDII events 1–7, 9)	8	7	8	Meter experienced velocity loss and negative readings during event 8
PB9	8 (RDII events 1–3,5–9)	3	3	8	
PBPLNT1	6 (RDII events 1–2, 5, 7–9)	0	1	6	Very low DWF and depth; backwater effects from plant during storm events affect calibration

Table 5-3. WWF Calibration Summary

Meter ID	Total RDII Events with Quality Data	Total No. of Events Calibrated to Peak Flow	Total No. of Events Calibrated to Volume	Total No. of Events Calibrated to Depth	Notes
PBPLNT2	2 (RDII events 8–9)	1	2	2	Meter was offline for much of November and December, affecting events 1–6; experienced backwater from plant; additional 1/12/19-1/14/19 event outside the 9 common events is calibrated for peak, volume, and depth (refer to Appendix C)
PBPLNT3	2 (RDII events 8–9)	0	1	2	Backwater and reverse flow from plant during storm events affects calibration
PBPLNT4	8 (RDII events 1–5, 7–9)	5	7	5	Experienced backwater from plant during event 6; model consistently overpredicted depths at this meter, which is just upstream of the plant outfall; a boundary level was used at the plant outfall, which resulted in predicted depths matching observed depths at the other downstream plant meters; this could possibly be result from inaccurate GIS elevations
PBPLNT5	8 (RDII events 2–9)	4	6	8	Velocity signal is poor in November, affecting Event 1 flow data
PBPLNT6	9 (RDII events 1–9)	7	8	9	
PINEM1	9 (RDII events 1–9)	6	5	9	
SWIFT2	9 (RDII events 1–9)	9	9	9	
UCKC1	7 (RDII events 1–2, 5–9)	6	7	7	During events 3 and 4, meter velocity signal strength became low, affecting flow data reliability
UCKC2	9 (RDII events 1–9)	7	8	7	

As shown by the calibration summary, most meters are calibrated to a large range of selected events that had quality data for the 6-month-long continuous simulation. For meters with less than three events calibrated, notes explain the noncompliance and impact on model accuracy. Major findings related to data uncertainties and assumptions are as follows:

- **Pump Operation Impact**. LSM1, LCKC1, PBPLNT1, PBPLNT2, and PBPLNT3 were affected by downstream pumps. LSM1 and LCKC1 seemed to experience backwater from the downstream Lower Crooked Creek I Lift Station (LS). PBPLNT1, PBPLNT2, and PBPLNT3 experienced backwater from the plant intake pumps. Additional events outside the common 9 events were used as available.
- **Elevation uncertainty**. PBPLNT4 flow depths were consistently overestimated, though a boundary level was used at the plant outfall that resulted in the other downstream plant meter depths being

calibrated. It is possible that the elevations in the model for the pipe inverts at PBPLNT4 are inaccurate.

- **Data quality issues**. LCKC1 and LSM1 experienced bad or missing data for more than half of the flow monitoring period. This limited the available RDII events for calibration. These meters have only limited or no events with quality data for calibration.

The impacts from the above uncertainties and assumptions need to be considered for model applications focusing on any detailed hydraulic analysis of the impacted local area.

5.3.2 Sensitivity Analysis

The major WWF input and calibration parameters listed in Section 4.2 were evaluated through sensitivity analysis for their impact on the model results. For WWF, the runoff results generated from one representative ITMC subcatchment were used in the analysis for the rest of the six models including the Pole Bridge Basin model. The absolute percentage changes varied for different metersheds as the RDII components for fast and slow response change. However, the observed trends from the ITMC example subcatchment below also apply to the metersheds in other sewershed/basin models using the same WWF parameters.

The model-predicted volume and peak flow were used to compare the model response to the major model input parameters changes from two scenarios:

1. Scenario 1: Base scenario with initial parameter values in one model run
2. Scenario 2: Comparison scenario including a series of model runs with parameter values changed by 50 percent (only one parameter changes for each individual run)

To avoid the impact from rainfall variations, the 2-year, 24-hour design storm was used for this sensitivity analysis.

One subcatchment within the ITMC5 metershed in the ITMC sewershed model was used as an example for the analysis. Tables 5-4, 5-5, and 5-6 summarize the comparison between the two scenarios for different RDII components. A total of 8 parameters were evaluated, and the contributing area was included as measured input parameter, not a calibration parameter, which does not change through the calibration process.

The sensitivity analysis results revealed the following trends:

- The contributing area and the default area have the dominant impact on both volume and peak flow results for both fast and slow RDII response. Changes to any combination of contributing area and default area lead to direct proportional changes on both model-predicted volume and peak flow results.

  Runoff routing and fixed runoff coefficient mainly affect the overall peak flow rate through the fast RDII response.

Table 5-4. WWF Parameters Sensitivity Analysis Summary

ICM Grid Table	Field	Input Parameter Values			Model Results_Total RDII Volume (MG)			Model Results_Total RDII Peak Flow (MGD)		
		Scenario 1	Scenario 2	% Difference	Scenario 1	Scenario 2	% Difference	Scenario 1	Scenario 2	% Difference
Subcatchment	Contributing Area	215.788	323.682	**50%**	0.01616	0.02425	**50%**	0.06080	0.09120	**50%**
Land Use	Default Area 1 (%)	1.28	1.92	**50%**	0.01616	0.02425	**50%**	0.06080	0.09120	**50%**
Runoff Surface	Runoff Routing Value	13	19.5	**50%**	0.01616	0.01616	**0%**	0.06080	0.05430	**-11%**
Runoff Surface	Initial Loss Value (ft)	0.000233	0.0003495	**50%**	0.01616	0.01615	**0%**	0.06080	0.06080	**0%**
Runoff Surface	Fixed Runoff Coefficient	0.2	0.3	**50%**	0.01616	0.01703	**5%**	0.06080	0.08250	**36%**
Ground Infiltration	Percolation Percentage Infiltrating	66	99	**50%**	0.01616	0.02174	**35%**	0.06080	0.06740	**11%**
Ground Infiltration	Percolation Coefficient	0.47	0.705	**50%**	0.01616	0.01587	**-2%**	0.06080	0.05650	**-7%**
Ground Infiltration	Percolation Threshold	60	90	**50%**	0.01616	0.01512	**-6%**	0.06080	0.05890	**-3%**

Table 5-5. WWF Parameters Sensitivity Analysis Summary - Fast Response

ICM Grid Table	Field	Input Parameter Values			Model Results_Fast Responds Volume (MG)			Model Results_Fast Responds Peak Flow (MGD)		
		Scenario 1	Scenario 2	% Difference	Scenario 1	Scenario 2	% Difference	Scenario 1	Scenario 2	% Difference
Subcatchment	Contributing Area	215.788	323.682	**50%**	0.00500	0.00751	**50%**	0.04750	0.07130	**50%**
Land Use	Default Area 1 (%)	1.28	1.92	**50%**	0.00500	0.00751	**50%**	0.04750	0.07130	**50%**
Runoff Surface	Runoff Routing Value	13	19.5	**50%**	0.00500	0.00501	**0%**	0.04750	0.04100	**-14%**
Runoff Surface	Initial Loss Value (ft)	0.000233	0.0003495	**50%**	0.00500	0.00500	**0%**	0.04750	0.04750	**0%**
Runoff Surface	Fixed Runoff Coefficient	0.2	0.3	**50%**	0.00500	0.00751	**50%**	0.04750	0.07130	**50%**
Ground Infiltration	Percolation Percentage Infiltrating	66	99	**50%**	0.00500	0.00500	**0%**	0.04750	0.04750	**0%**
Ground Infiltration	Percolation Coefficient	0.47	0.705	**50%**	0.00500	0.00500	**0%**	0.04750	0.04750	**0%**
Ground Infiltration	Percolation Threshold	60	90	**50%**	0.00500	0.00500	**0%**	0.04750	0.04750	**0%**

Table 5-6. WWF Parameters Sensitivity Analysis Summary - Slow Response

ICM Grid Table	Field	Input Parameter Values			Model Results_Slow Responds Volume (MG)			Model Results_Slow Responds Peak Flow (MGD)		
		Scenario 1	Scenario 2	% Difference	Scenario 1	Scenario 2	% Difference	Scenario 1	Scenario 2	% Difference
Subcatchment	Contributing Area	215.788	323.682	**50%**	0.01115	0.01674	**50%**	0.01530	0.02300	**50%**
Land Use	Default Area 1 (%)	1.28	1.92	**50%**	0.01115	0.01674	**50%**	0.01530	0.02300	**50%**
Runoff Surface	Runoff Routing Value	13	19.5	**50%**	0.01115	0.01115	**0%**	0.01530	0.01530	**0%**
Runoff Surface	Initial Loss Value (ft)	0.000233	0.0003495	**50%**	0.01115	0.01115	**0%**	0.01530	0.01530	**0%**
Runoff Surface	Fixed Runoff Coefficient	0.2	0.3	**50%**	0.01115	0.00952	**-15%**	0.01530	0.01310	**-14%**
Ground Infiltration	Percolation Percentage Infiltrating	66	99	**50%**	0.01115	0.01674	**50%**	0.01530	0.02300	**50%**
Ground Infiltration	Percolation Coefficient	0.47	0.705	**50%**	0.01115	0.01087	**-3%**	0.01530	0.01090	**-29%**
Ground Infiltration	Percolation Threshold	60	90	**50%**	0.01115	0.01011	**-9%**	0.01530	0.01370	**-10%**

5.4 Model Verification

As discussed in the 2017 base model report (CDPMT, 2017), where adequate data were available the verification used data and observations that are independent of those used for model calibration to provide added confidence that the model was sufficiently robust to realistically evaluate conditions other than those for which it was calibrated. The dynamic WWF calibrated model was further verified through the following check:

- SSOs recorded during the flow monitoring period were used to compare the model results in combination with the monitored depth at the meter. However, the model did not necessarily reproduce the recorded SSOs because certain causes of SSOs (for example, debris) cannot be directly modeled.
- One storm event independent from the selected calibration events was used to compare the model-predicted volume, peak flow, and depth with the monitored meter data.

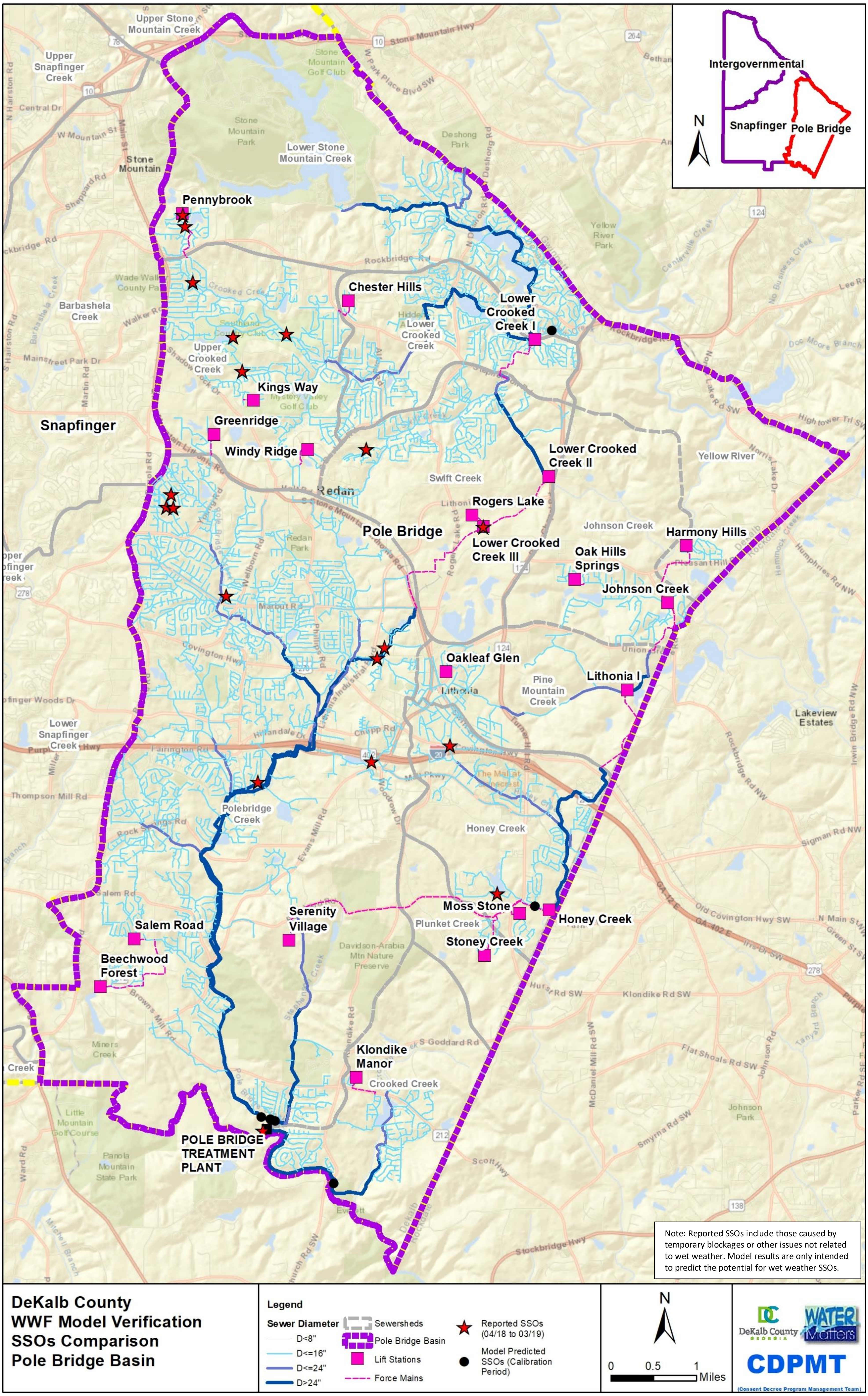
For the SSOs verification, Figure 5-3 shows a map with recorded SSO locations (red stars) vs. model-predicted SSO locations (black dots). The model predicted 7 SSOs while 20 SSOs were recorded within the Pole Bridge Basin. Per the field notes, all recorded SSOs were caused by either grease blockage, pipe broken, system cleaning, lift station malfunction, or air release valve malfunction, which the model could not predict. Causes of the 7 model-predicted SSOs are summarized as follows:

- **Pole Bridge Creek Sewershed Honey Creek LS.** One SSO was predicted on a small, 8-inch-diameter pipe upstream of PBPLNT2 near Honey Creek LS. The model assumed the entire metershed area has the same RDII parameters based on the observed RDII at the meter site, which could lead to overpredicted RDII at the upstream stretch of these metersheds.
- **Pole Bridge Creek Sewershed Lower Crooked Creek I LS.** One SSO was predicted at a shallow manhole upstream of the Lower Crooked Creek I LS. Field investigation and additional flow monitoring for these areas are recommended to refine the RDII distributions in the model.
- **Pole Bridge Creek Sewershed Plant Intake.** Four SSOs were predicted just upstream of the Pole Bridge intake pumps. The recorded depths at PBPLNT2, PBPLNT1, and PBPLNT3 show that severe surcharging occurred. It is possible that backups from the plant could cause potential SSOs.
- **Crooked Creek Sewershed.** One SSO was predicted at a 30-inch-diameter pipe upstream of CKC1. Flow meter CKC1 measured depths as high as 13 ft during extreme surcharging, apparently caused by backups from the intake pumps at the plant. The manhole at which the SSO is predicted is lower than surrounding manholes. CKC1 depths in the model match those recorded. Total volume and peak flows were also generally well-calibrated. It is possible that this backup could cause SSOs upstream. Field investigation is also recommended to confirm the predicted SSO.

For the Pole Bridge Basin model, the October 10, 2018, event had a total of 2.9 inches of rainfall and was selected for model verification. It occurred during relatively dry conditions compared to the period of the selected model calibration events. Verification can take on many forms and purposes; the October 10, 2018, event was chosen because it provided different influencing parameters for what the model was calibrated. There were other storm events during the calibration period that could have been selected for verification and have a better flow meter match but would not have provided insights into the model limits. As discussed in Section 5.3.1, the Pole Bridge Basin model was calibrated to the events during the wet months. The October 10, 2018, event was used for verification to understand the limitations of this model.

Appendix D includes a summary table with the comparison of results between the calibration criteria and model for the verification event. As expected, the model consistently overpredicted peak flows for this dry period at most meters. However, the flow hydrograph followed matching patterns at most meters, as shown in Appendix D.

The Pole Bridge Basin model parameters were calibrated to periods during which soil moisture and amount of wet weather events observed in DeKalb system were much higher than average. These are extreme conditions that could result in the model being overly conservative. If the County wants to simulate the system operation during less severe wet seasons, the initial soil saturation values and seasonal variation factors should be adjusted for relatively lower antecedent moisture condition. As a long-term solution, the County should consider further building out the GIM using data from a wider range of moisture conditions. Such build-out of the GIM model requires observed field data of conditions that are not reflected in the available monitoring records. By using additional parameters calibrated in the GIM, even widely varying antecedent conditions can be more accurately represented in the model.



Note: Reported SSOs include those caused by temporary blockages or other issues not related to wet weather. Model results are only intended to predict the potential for wet weather SSOs.

Figure 5-3. Model Verification: SSOs Check

SECTION 6

System Capacity Assessment

6.1 System Performance Criteria

As discussed in 2017 base model report (CDPMT, 2017), the depth or elevation to which water rises in the sewer system (the hydraulic grade line [HGL]) was the primary model output to evaluate system performance and simulation acceptance. The detailed discussion of the use of the criteria and the assumptions are provided in the 2017 base model report and summarized below.

Figure 6-1 illustrates and describes the updated HGL system performance criteria selected by DWM to be achieved during the design storm conditions and used to review model results for WWF capacity assessment simulations, which is the focus of this section.

This criterion was applied to all County sewers, not just the CD extent sewers, as it was important to identify any model-projected SSO location. Private property critical elevations, such as basement flooding, were not evaluated or considered in the model output. It was assumed that existing critical elevations would have already been identified from historical storm events. Therefore, any sewer recommended for upsizing would be required by the County to be evaluated during design for any local critical elevations that might need to be addressed in the design.

With DWM's agreement, the 2-year, 24-hour design storm was used for the WWF flow capacity assessment simulation, and the DWF criteria of less than full pipe during dry weather flow was used to identify areas with capacity deficiencies.

Design storm details were as follows:

- Rainfall depth and duration for the selected annual exceedance comes from;
    - NOAA Atlas 14 (Perica et al., 2013) is referenced in the most recent update of the 2016 edition of Georgia Stormwater Management Manual (AECOM et al., 2016).
    - NOAA Station: Atlanta WB City.
    - NOAA Atlas 14: total 2-year, 24-hour total rainfall depth of 3.70 inches.
- Intra-storm rainfall distribution comes from Soil Conservation Service (SCS) Type II Distribution (NRCS, 2015): hourly time interval with peak intensity of 1.58 inches per hour.

Figure 6-2 presents the design storm hourly distribution. The hourly design storm was globally applied to the modeled areas.

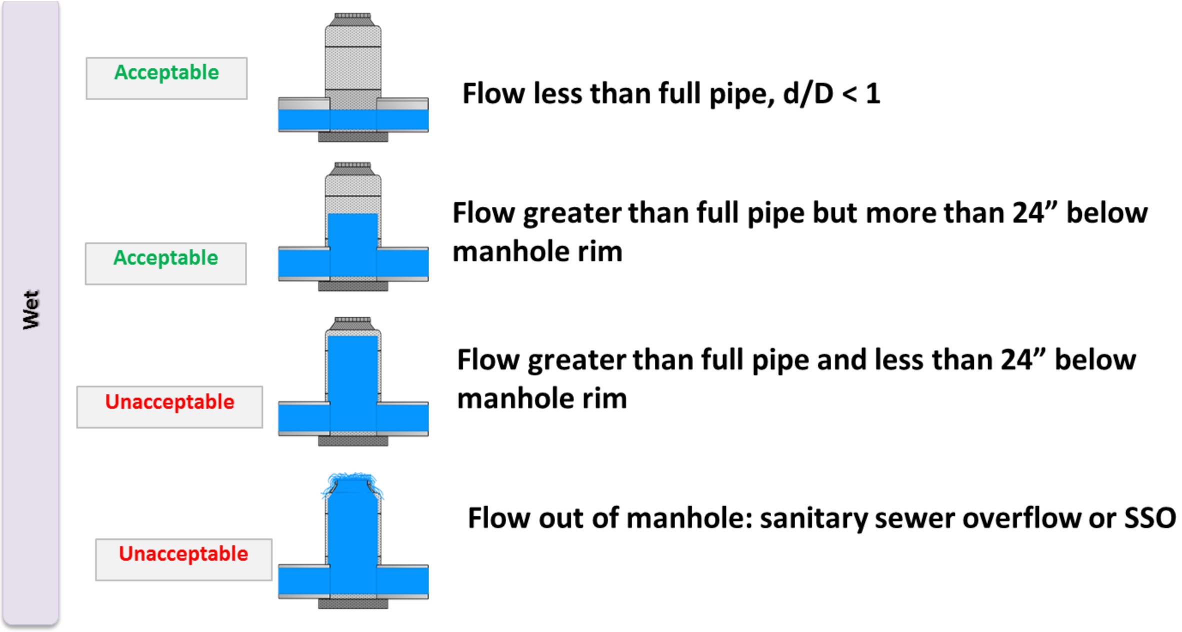


Figure 6-1. System Performance Criteria

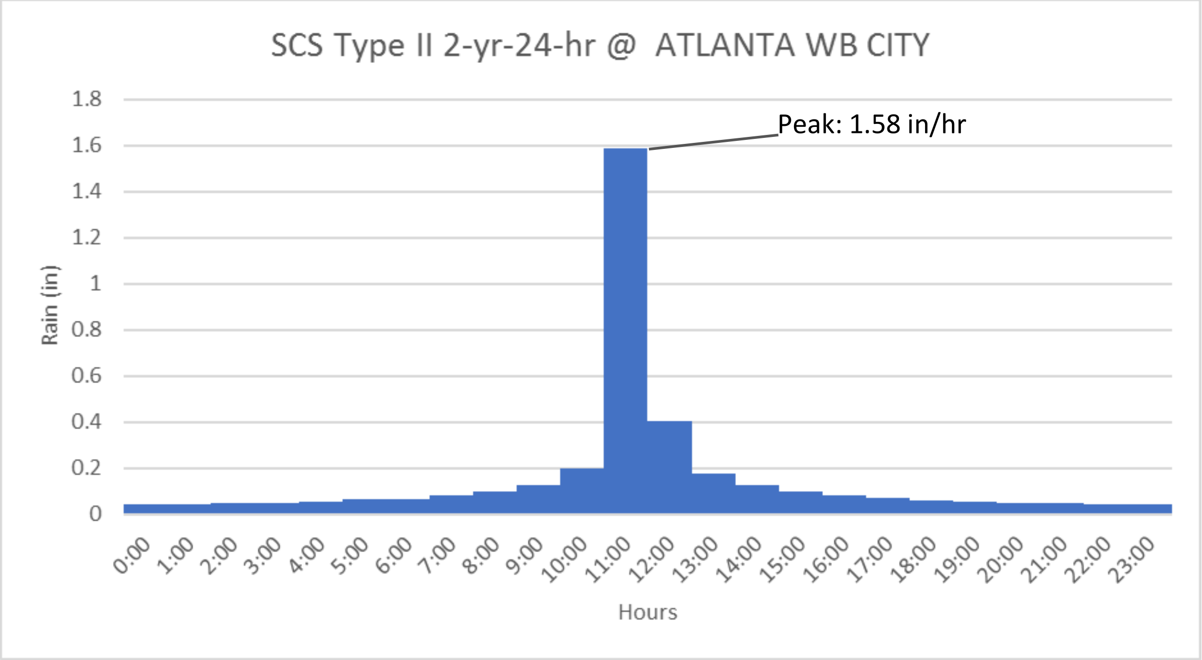


Figure 6-2. SCS Type II 2-year, 24-hour Design Storm

6.2 System Capacity Assessment Modeling Results

For system capacity assessment, the calibrated hydraulic model was updated to reflect the ideal system condition with clean pipes including the following changes:

- Remove sedimentation, high Manning’s n, or dummy pipe size, which were added to mimic the temporary restriction during the model calibration.
- Remove boundary level condition at downstream outfall, which represented unknown plant operations during calibration period, and replace with the average minimum depth observed at the most downstream meters.

Both DWF and WWF conditions were simulated while WWF results were the focus for existing system capacity assessment. This report evaluated current performance based only on existing flows and did not consider future projected flow, which is considered in system capacity improvement project evaluation (*See* Section 6.3).

Figure 6-3 shows the model-predicted DWF results for the Pole Bridge Basin. The results are similar to those observed during the DWF calibration. The majority of the surcharge was mainly caused by negative sewer pipe gradients, sewer pipe jumps at manhole, or pump on/off levels as discussed in Section 5.2.1. These locations were recommended for further investigation.

Figure 6-4 presents the WWF capacity assessment results. The majority of the system met the performance criteria. Based on the capacity assessment results, approximately 0.2 percent (25 sewer pipe segments) of the gravity lines had flows that exceeded the capacity criteria. There were a total 6 SSOs predicted for the 2-year, 24-hour design storm including:

- A total of 4 SSOs are along 8-inch-diameter pipes upstream of the Honey Creek LS, including at the manhole predicted during the model calibration.
- One SSO is predicted upstream of the Lower Crooked Creek I LS at the same location that was predicted during the calibration. This is a shallow manhole on an 8-inch-diameter pipe.
- One additional SSO is identified during the 2-year, 24-hour design storm (larger than the observed storm events used for calibration) along an 8-inch-diameter pipe upstream of flow meter PB7.

There are also 6 SSOs predicted from the model calibration but not from the model capacity assessment simulation with the 2-year, 24-hour design storm. This phenomenon is due to the following reasons:

- Those 6 SSOs are located at the most downstream reaches of the system. As explained in Section 2.3, the boundary level for capacity assessment is assumed for average condition, which is lower than the boundary level assumed for model calibration (the observed depth at the most downstream meters). Therefore, fewer SSOs were predicted during capacity assessment.

6.3 System Capacity Improvement Projects Evaluation

The hydraulic model can be used not only for capacity assessment of the existing system but also to identify projects to address capacity limitations. In developing potential projects for pipe sizing and storage, DWM shall consider projected growth and development so that no SSOs would be expected to occur as a result of a representative two (2) year twenty-four (24) hour storm event.

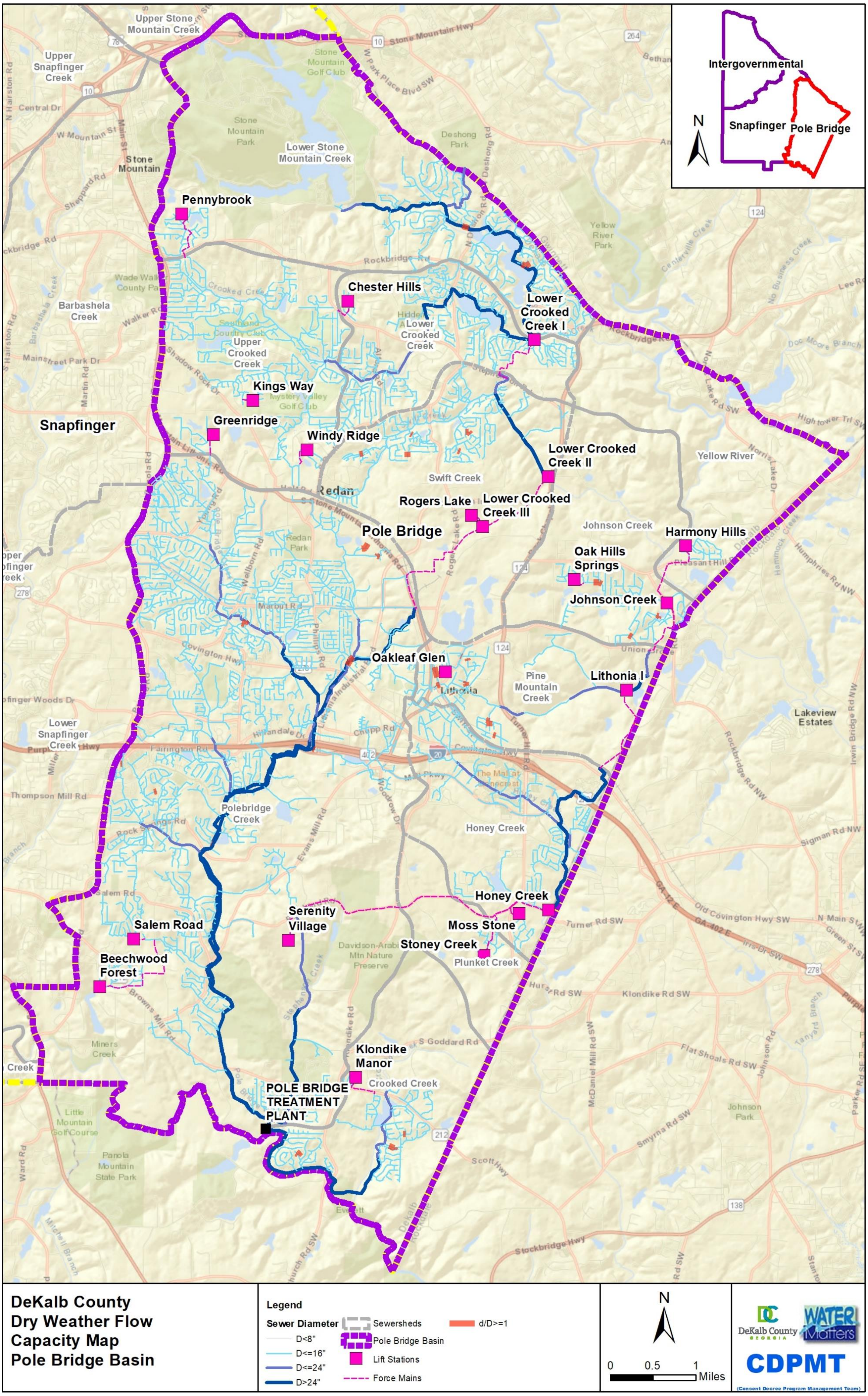


Figure 6-3. Dry Weather Flow Model Capacity Assessment Results
As of October 2019

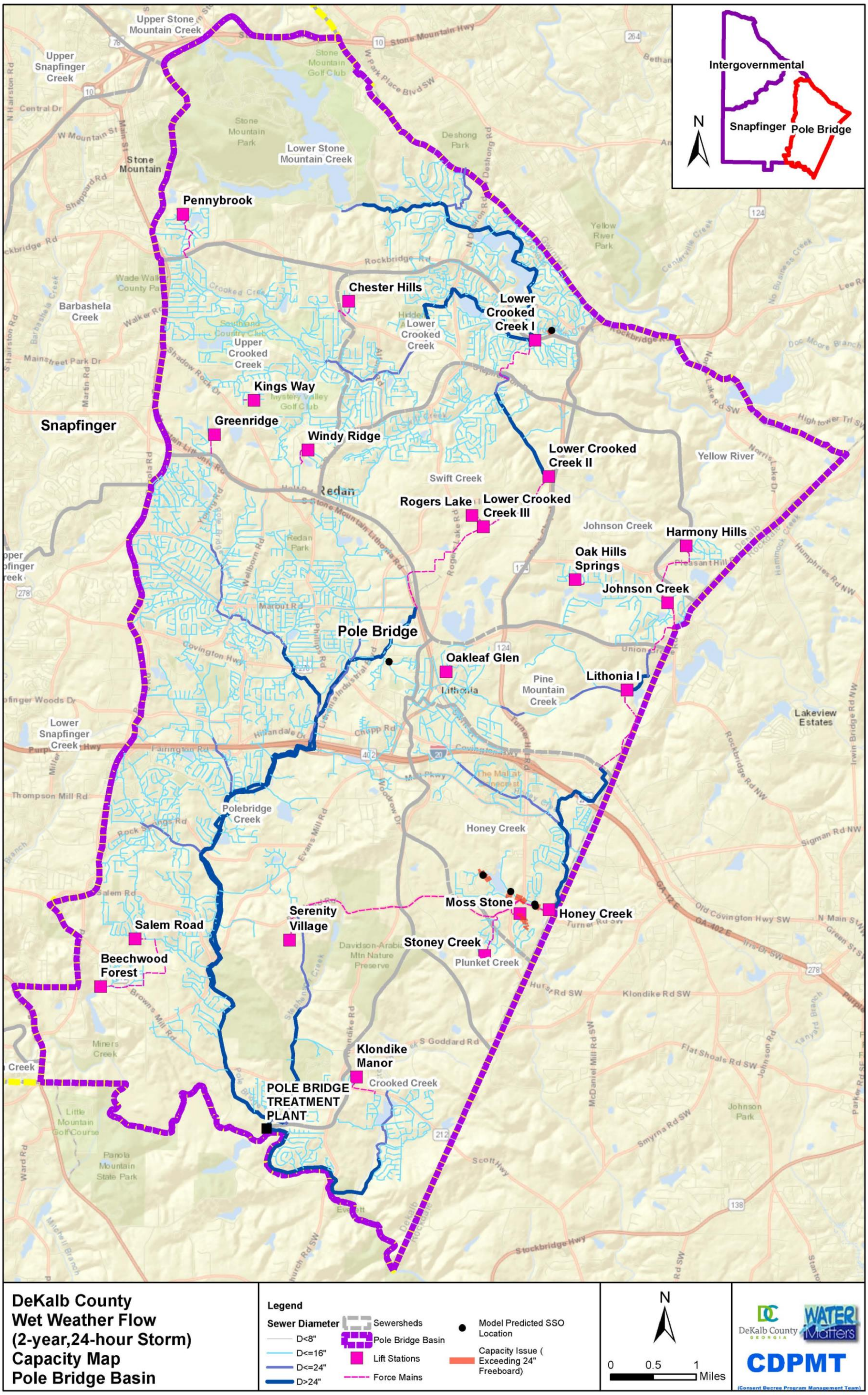


Figure 6-4. Wet Weather Flow Model Capacity Assessment Results
As of September 2019

SECTION 7

Capacity Request Evaluation Using Dynamic Model

7.1 Background

Prior to the dynamic model completion, the County has been using a maximum month average day flow (MMADF) condition steady-state model to process capacity requests along with the protocols presented in two County documents: Interim Sanitary Sewer Capacity Evaluation Program (hereafter, "the Program") (DeKalb County, 2017a), which described the Program components and requirements and, Interim Standard Operating Procedures (SOP), which provided standardized procedures for evaluating capacity availability (DeKalb County, 2017b). The procedures were discussed in detail in the 2017 model report and summarized below.

The County evaluated the MMADF in comparison with other hydrological conditions. The County determined that the MMADF represented an acceptable hydrologic modeling condition and level of service risk for evaluating potential SSOs resulting from proposed new increased flows. The MMADF wet weather condition could give the County adequate conveyance protection and give new capacity requestors an opportunity to sustain growth within the County's service area. The MMADF would be one component of the County's multi-faceted capacity considerations that contributed to the MMADF condition selection.

The MMADF was initially determined by selecting the meter flow from the wettest month recorded from the County's January through June 2015 flow monitoring results. The MMADF will need to be updated over time and as needed, as the MMADF will vary depending on how dry or wet the year's rainfall produced. When evaluating a new capacity request, the MMADF factor would be applied to the calibrated DWF.

After the County and EPA/Georgia Environmental Protection Division accept the dynamic model described herein and the MCD and the appended CAP are entered in Federal Court, the steady-state MMADF scenario will be replaced with the dynamic model and capacity request evaluations will be based on the flow conditions, requirements, and procedures described in the CAP. (Appendix D to MCD, CAP, Section 1.4).

7.2 Approach

The dynamic model was developed with guidance by the CD requirements. Page 41, Paragraph 28 (g) of the CD relates to the model's capabilities and its use for evaluating new capacity requests:

> "The Model is capable of predicting the flow regime of those portions of the WCTS receiving flows from proposed developments. The Model will assist the County in assuring the availability of WCTS and WWTF capacity prior to permitting new development. Once the Model is fully developed for each Sewershed, the County shall authorize new sewer service connections or increases in flow from existing sewer service connections in that Sewershed only after certifying that the receiving portions of the WCTS have adequate collection and transmission capacity and the applicable WWTF has adequate treatment capacity to accept flows from such new sewer service connections and/or increases in flows from existing service connections. The Program shall set forth specific definitions and parameters for how the County will determine the adequacy of collection, transmission and treatment capacity. In developing estimates and projections for certifying adequate capacity, the

> County shall use flow meter data, the Model, and sound engineering judgment. All certifications of adequate collection, transmission and treatment capacity shall be made by a professional engineer registered in the State of Georgia and shall be approved by a responsible party of the County as defined by 40 C.F.R. § 122.22(b). The County shall maintain all such certifications and all data on which such certifications are based.”

To proceed with the capacity request evaluation, the dynamic model setup for capacity assessment can be adopted directly as base model by following the SOP for the MMADF steady-state model to:

- Update the model network to reflect the latest recorded system infrastructure
- Update the model flow input updates from the most current sewershed or basin flow study
- add the subcatchment data representing the required DWF rates from pending, conditionally approved, and approved capacity requests

The SOP for the MMADF steady -state model contains guidance for scenario naming and management.

7.3 Assumptions

In addition to the assumptions stated in previous sections, the following considerations are noted for capacity request evaluation:

- The current model focuses on infrastructure within the CD extent as defined in Section 3.2. Pipelines and facilities outside the CD extent may have lower data accuracy. Further field verification is recommended if those areas affect the capacity request study.
- The capacity assessment model assumes ideal conditions without maintenance issues including temporary blockages.
- The model DWF distribution is based on 2015 water billing data. For areas outside the 2015 billing data coverage or experiencing significant changes since 2015, temporary flow monitoring is recommended to refine the DWF distribution with the areas affected by the capacity request.
- The initial loss parameters in the model assumed the same as calibration.

7.4 System Performance Criteria

System modeling performance criteria for capacity request simulation should continue to use the sewer flow depth or elevation as the primary model output to evaluate performance and acceptance. Acceptance evaluation will be specified through the capacity request program protocol update.

7.5 Hydraulic Modeling Results

Capacity request modeling will be described in the CAP, and the associated documents will discuss how the dynamic model results are to be evaluated for capacity request applications.

Recommendations

Recommendations for further development and use of the WCTS hydraulic model are provided as follows:

- Conduct additional field investigations to improve the model representations of the network physical attributes. The recommended locations for field check were included in selection sets in the delivered ICM model files, and also exported as shape files included in the model delivery package. This is particularly important in those cases where field verification is recommended to verify model results and areas outside the CD model extents (as noted in Section 7.3). Specific items noted in the report include:
    - Six shallow manholes (<2 ft) not investigated (Section 3.4)
    - Two reversed-grade pipes downstream of CKC1 (Section 5.2.1)
    - Elevations along the line where PBPLNT4 is located (Section 5.3.1)
    - Unconfirmed, model-predicted SSOs from calibration and 2-year, 24-hour design storm (Sections 5.4 and 6.2)
    - 50 sewer pipe segments that had negative sewer pipe gradients or sewer pipe jump at manhole causing DWF surcharge (Section 5.2.1)
- Improve model RDII prediction
    - Install temporary meters at the branch sewer upstream of unconfirmed, model-predicted SSOs from calibration and 2-year, 24-hour design storm (Sections 5.4 and 6.2)
- Improve model BSF distribution by:
    - Using more recent year records as reliable water meter data become available.
    - Further refining the distribution at large user locations (both wastewater discharger and water users) as more information becomes available.
    - Further evaluation of those large water users as the County's sewer variance program information becomes available
- Improve model accuracy for RDII simulations. As indicated during the model verification, the model could overpredict as calibrated to the extreme wet conditions observed during November 2018 to February 2019. The CDPMT recommends removing the seasonal variation factors applied in the calibration model and reducing the default area (%) for scenarios where the County wants to simulate the system behavior during normal wet seasons. As a long-term solution, the County should consider building out the GIM further. By using additional parameters in the GIM, even widely varying antecedent conditions can be more accurately represented in the model.
- Improve model pump station setup by:
    - Performing investigation to confirm model settings on wet well elevations, influent pipes, and pump on/off levels
    - Conducting detail drawdown tests to estimate pump curves for lift stations
- Maintain permanent flow meters at major locations to reflect flow condition changes of the post-PASARP.
- Use the model to answer questions about the existing system and its performance.

- Conduct a study to evaluate other design storm alternatives including alternating block for various rainfall distribution and understand the impact from different design storms on master planning
- Use the model along with other tools to optimize the master planning alternatives.
- Update the model as the hydraulic system changes to reflect new piping, upgraded pump stations, and new connections.
- Update the model to reflect the impact of pipe rehabilitation.
- Update the model software/version for both the GIS and the modeling software, after evaluation, when software vendors offer a new version.
- Upgrade the model for periodic capacity assessment to support master planning and to evaluate whether the WCTS has capacity for both ever-changing regulatory expectations and growth projections.

SECTION 9

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Appendix A
Storm Event Selection

		Storm Event 1				Storm Event 2				Storm Event 3			Storm Event 4				Storm Event 5					Storm Event 6				Storm Event 7			
Meter ID	Raingage	10/10/18	10/11/18	RDII Response	Model Calib	10/25/18	10/26/18	RDII Response	Model Calib	11/7/18	RDII Response	Model Calib	11/12/18	11/13/18	RDII Response	Model Calib	11/13/18	11/14/18	11/15/18	RDII Response	Model Calib	12/1/18	12/2/18	RDII Response	Model Calib	12/8/18	12/9/18	RDII Response	Model Calib
CKC1	RGPB4	OK	OK	Y	Y	OK	OK	Y	Maybe	GD	Y	Y	GD	GD	Y	Y	GD	GD	GD	Y	Y	**BD**	GD	Y	Y	GD	BS	Y	Y
DK10	RGHON1	**BD**	**BD**	Slight	N	GD	OK	Slight	Y	OK	Y	Y	OK	GD	Slight	Y	GD	GD	GD	Slight	Y	GD	GD	Y	Y	OK	GD	Y	Y
DK11	RGHON1	OK	OK	Slight	Y	OK	OK	Slight	Y	OK	N	N	OK	OK	Y	Y	OK	OK	GD	Slight	Y	OK	OK	Slight	Y	OK	OK	Y	Y
HON1	RGHON1	GD	GD	Slight	Y	OK	OK	Slight	Y	GD	Slight	Y	OK	GD	Y	Y	GD	GD	MD	Slight	N	MD	MD	N	N	MD	MD	N	N
HON2	RGHON1	GD	OK	Y	Y	GD	GD	Slight	Y	GD	Y	Y	GD	GD	Y	Y	GD	GD	GD	Y	Y	GD	GD	Y	Y	GD	GD	Y	Y
HON3	RGHON1	GD	GD	Slight	Y	GD	GD	Slight	Y	GD	Slight	Y	GD	GD	Y	Y	GD	GD	GD	Slight	Y	GD	GD	Slight	Y	GD	OK	Slight	Y
JSC1	RGJSC1	GD	GD	Slight	Y	GD	GD	Slight	Y	GD	Slight	Y	GD	GD	Y	Y	GD	GD	GD	Slight	Y	GD	OK	Slight	Y	OK	GD	Slight	Y
LCKC1	RGLCKC1	OK	OK	Slight	Y	OK	OK	Slight	Y	**BD**	N	N	**BD**	**BD**	N	N	**BD**	**BD**	**BD**	N	N	**BD**	**BD**	N	N	**BD**	**BD**	N	N
LCKC2	RGLCKC1	GD	GD	Slight	Y	GD	GD	Slight	Y	GD	Slight	Y	GD	GD	Y	Y	GD	GD	GD	Y	Y	GD	GD	Y	Y	GD	GD	Y	Y
LSM1	RGLCKC1	GD	GD	Y	Y	GD	GD	Y	Y	OK	Slight	Y	OK	**BD**	Y	N	**BD**	OK	**BD**	Slight	Maybe	**BD**	**BD**	N	N	**BD**	**BD**	N	N
LSM2	RGLCKC1	GD	GD	Slight	Y	GD	GD	Slight	Y	GD	Slight	Y	GD	OK	Y	Y	OK	OK	OK	Y	Maybe	MD	MD	N	N	MD	MD	N	N
PB1	RGPB2	**BD**	**BD**	N	N	**BD**	**BD**	Slight	Y	GD	Slight	Y	GD	GD	Y	Y	GD	GD	GD	Y	Maybe	GD	GD	Y	Y	GD	GD	Y	Y
PB10	RGPB1	OK	GD	Y	Y	OK	OK	N	N	OK	Slight	Y	OK	OK	Y	Y	OK	OK	GD	Y	Y	OK	OK	Y	Y	OK	GD	Y	Y
PB2	RGPB2	GD	GD	Y	Y	GD	GD	Slight	Maybe	**BD**	N	N	GD	GD	Y	Y	GD	GD	GD	Y	Y	GD	GD	Y	Y	GD	GD	Y	Y
PB3	RGPB2	GD	GD	Y	Y	GD	GD	Y	Y	GD	Y	Y	GD	GD	Y	Y	GD	GD	GD	Y	Y	GD	GD	Y	Y	GD	GD	Y	Y
PB4	RGPB2	GD	GD	Y	Y	GD	GD	Slight	Y	GD	Slight	Y	GD	GD	Y	Y	GD	GD	GD	Y	Y	GD	GD	Y	Y	GD	GD	Y	Y
PB5	RGPB2	GD	GD	Y	Y	GD	GD	Y	Y	GD	Y	Y	GD	GD	Y	Y	GD	GD	GD	Y	Y	GD	GD	Y	Y	GD	GD	Y	Y
PB6	RGPB3	OK	GD	Y	Y	OK	OK	Slight	Maybe	GD	Y	Y	GD	GD	Y	Y	GD	GD	GD	Y	Y	GD	GD	Y	Y	GD	GD	Y	Y
PB7	RGPB3	GD	GD	Slight	Y	GD	GD	Slight	Y	GD	Y	Y	GD	GD	Y	Y	GD	GD	GD	Slight	Y	GD	GD	Slight	Y	GD	GD	Slight	Y
PB8	RGPB3	GD	GD	Y	Y	OK	OK	N	N	GD	N	N	GD	GD	Y	Y	GD	GD	GD	Y	Y	GD	OK	Y	Y	GD	GD	Y	Y
PB9	RGPB1	GD	GD	Slight	Maybe	OK	OK	N	N	GD	Slight	Maybe	GD	GD	Y	Y	GD	GD	OK	Y	Y	GD	GD	Y	Maybe	GD	GD	Y	Y
PBPLNT1	RGPB4	OK	GS	Y	Y	GD	GD	N	N	GD	Slight	Y	GD	GD	Y	Y	GD	OK	GD	Y	Y	OK	GD	Y	Y	OK	GD	Y	Y
PBPLNT2	RGPB4	MD	MD	N	N	MD	GD	Slight	N	MD	N	N	MD	MD	N	N	MD	MD	MD	N	N	GD	**BD**	Slight	Y	MD	MD	N	N
PBPLNT3	RGPB4	GD	GD	Y	Y	GD	GD	Slight	Y	GD	Y	Y	GD	GD	Y	Y	GD	OK	GD	Y	Y	**BD**	GD	Y	Maybe	OK	**BD**	Y	N
PBPLNT4	RGPB4	GD	GD	Y	Y	GD	GD	N	N	GD	Slight	Maybe	GD	GD	Y	Y	GD	GD	GD	Y	Y	OK	GD	Y	Y	GD	OK	Y	Maybe
PBPLNT5	RGPB2	GD	GD	Y	Y	GD	GD	N	N	**BD**	N	N	**BD**	**BD**	N	N	**BD**	**BD**	**BD**	Y	N	GD	GD	Y	Y	GD	GD	Y	Y
PBPLNT6	RGPB2	GD	GD	Y	Y	GD	GD	Slight	Y	GD	Slight	Y	GD	GD	Y	Y	GD	GD	GD	Y	Y	GD	GD	Y	Y	GD	GD	Y	Y
PINEM1	RGPINEM1	GD	OK	Y	Y	GD	GD	Y	Y	GD	Y	Y	GD	GD	Y	Y	GD	GD	OK	Y	Y	GD	GD	Y	Y	OK	GD	Y	Y
SWIFT2	RGLCKC2	GD	GD	Slight	Y	GD	GD	N	N	GD	Slight	Y	GD	GD	Y	Y	GD	GD	GD	Y	Y	GD	GD	Y	Y	GD	GD	Slight	Y
UCKC1	RGUCKC1	GD	GD	Y	Y	GD	GD	N	N	GD	Slight	Y	GD	GD	Y	Y	GD	GD	GD	Y	Y	GD	GD	Y	Y	OK	OK	Y	Y
UCKC2	RGUCKC1	GD	GD	Y	Y	GD	GD	Slight	Maybe	**BD**	N	N	GD	GD	Y	Y	GD	GD	GD	Y	Y	GD	OK	Y	Y	GD	GD	Y	Y

Color Code:

🟥 not proper for model use either because bad or no data per QA/QC summary, or other issues noted in comments

🟨 appears questionable data or RDII responses and can't be used for model calibration directly. Those may be still usable if confirmed with DWM for proper postprocessing adjustment

Database Values Matrix

Code	Title	Description
NM	No Meter	Meter not installed.
OB	Over Flow / Bypass	Meter expected to read zero flow except during large rain events.
GD	Good	No issues observed in data
GS	Good Surcharge	Surcharge conditions with good data
OK	OK	Minor issues observed in data. Requires use of comments field.
BD	Bad	Severe issues observed in data. Requires use of comments field.
BS	Bad Surcharge	Surcharge conditions with bad data
MD	Missing Data	More than 16 hours of missing data.

Flow Meter QC Tags

Code	Format
NM	NM
OB	OB
GD	GD
GS	GS
OK	OK
OS	OS
BD	BD
BS	BS
AD	AD
MD	MD

		Storm Event 8				Storm Event 9				Storm Event 10			
Meter ID	Raingage	12/14/18	12/15/18	RDII Response	Model Calib	12/20/18	12/21/18	RDII Response	Model Calib	12/27/18	12/28/18	RDII Response	Model Calib
CKC1	RGPB4	GD	GD	Y	Y	GD	GD	Y	Y	GD	BS	Y	N
DK10	RGHON1	GD	OK	Y	Y	**BD**	**BD**	N	N	OK	OK	Y	Y
DK11	RGHON1	OK	OK	Y	Y	OK	OK	Slight	Y	OK	GD	Slight	Y
HON1	RGHON1	MD	MD	N	N	GD	GD	Slight	Maybe	GD	GD	Y	Y
HON2	RGHON1	GD	GD	Y	Y	GD	GD	Y	Y	GD	GD	Y	Y
HON3	RGHON1	OK	OK	Slight	Y	OK	GD	Slight	Y	GD	OK	Slight	Y
JSC1	RGJSC1	GD	GD	Slight	Y	GD	GD	Slight	Y	GD	GD	Slight	Y
LCKC1	RGLCKC1	**BD**	**BD**	N	N	**BD**	**BD**	N	N	**BD**	**BD**	N	N
LCKC2	RGLCKC1	GD	GD	Y	Y	GD	GD	Y	Y	GD	GD	Y	Y
LSM1	RGLCKC1	**BD**	**BD**	N	N	**BD**	**BD**	N	N	**BD**	**BD**	N	N
LSM2	RGLCKC1	MD	MD	N	N	MD	MD	N	N	MD	MD	N	N
PB1	RGPB2	GD	GD	Y	Y	GD	GD	Y	Y	GD	GD	Y	Y
PB10	RGPB1	OK	OK	Y	Y	OK	GD	Y	Y	OK	GD	Y	Y
PB2	RGPB2	GD	GD	Y	Y	GD	GD	Y	Y	GD	GD	Y	Y
PB3	RGPB2	GD	OK	Y	Y	GD	GD	Y	Y	GD	GD	Y	Y
PB4	RGPB2	GD	GD	Y	Y	GD	GD	Slight	Y	GD	GD	Y	Y
PB5	RGPB2	GD	GD	Y	Y	GD	GD	Y	Y	OK	OK	Y	Y
PB6	RGPB3	GD	GD	Y	Y	GD	GD	Y	Y	GD	GD	Y	Y
PB7	RGPB3	GD	GD	Slight	Y	GD	GD	Slight	Y	GD	GD	Slight	Y
PB8	RGPB3	GD	GD	Y	Y	GD	GD	Y	Y	GD	GD	Y	Y
PB9	RGPB1	OK	**BD**	Y	Maybe	GD	GD	Y	Y	GD	GD	Y	Y
PBPLNT1	RGPB4	**BD**	OK	Y	Maybe	OK	GD	Y	Y	OK	OS	Y	Maybe
PBPLNT2	RGPB4	MD	MD	N	N	MD	MD	N	N	MD	MD	N	N
PBPLNT3	RGPB4	OK	GD	Y	Y	GD	GD	Y	Y	OK	BS	Y	N
PBPLNT4	RGPB4	GD	OK	Y	Y	GD	GD	Y	Y	GD	GS	Y	Y
PBPLNT5	RGPB2	GD	GD	Y	Y	GD	GD	Y	Y	GD	GD	Y	Y
PBPLNT6	RGPB2	GD	GD	Y	Y	GD	GD	Slight	Y	GD	GD	Y	Y
PINEM1	RGPINEM1	GD	GD	Y	Y	OK	GD	Y	Y	OK	GD	Y	Y
SWIFT2	RGLCKC2	GD	OK	Y	Maybe	GD	GD	Slight	Y	GD	GD	Y	Y
UCKC1	RGUCKC1	**BD**	**BD**	Y	Maybe	GD	GD	Y	Y	GD	GD	Y	Y
UCKC2	RGUCKC1	GS	GD	Y	Y	GD	GD	Y	Y	GD	OS	Y	Y

		Storm Event 11				Storm Event 12				Storm Event 13				Storm Event 14		
Meter ID	Raingage	1/2/19	1/3/19	RDII Response	Model Calib	1/3/19	1/4/19	RDII Response	Model Calib	1/12/19	1/13/19	RDII Response	Model Calib	1/19/19	RDII Response	Model Calib
CKC1	RGPB4	GD	GD	Y	Y	GD	**BD**	N	N	**BD**	**BD**	N	N	**BD**	N	N
DK10	RGHON1	OK	OK	Y	Y	OK	OK	Y	Y	OK	GD	Y	Y	OK	Y	Y
DK11	RGHON1	OK	OK	Y	Y	OK	OK	Y	Y	OK	OK	Y	Y	OK	Y	Y
HON1	RGHON1	OK	GD	Slight	Y	GD	GD	Y	Y	GD	GD	Slight	Y	GD	Y	Y
HON2	RGHON1	GD	GD	Y	Y	GD	GD	Y	Y	GD	GD	Y	Y	GD	Y	Y
HON3	RGHON1	OK	OK	Slight	Y	OK	OK	Y	Y	OK	OK	Y	Y	OK	Y	Y
JSC1	RGJSC1	GD	GD	Slight	Y	GD	GD	Y	Y	GD	OK	Slight	Y	GD	Y	Y
LCKC1	RGLCKC1	**BD**	**BD**	N	N	**BD**	**BD**	N	N	**BD**	**BD**	N	N	**BD**	N	N
LCKC2	RGLCKC1	GD	GD	Y	Y	GD	GD	Y	Y	GD	GD	Y	Y	GD	Y	Y
LSM1	RGLCKC1	**BD**	**BD**	N	N	**BD**	**BD**	N	N	**BD**	**BD**	N	N	**BD**	N	N
LSM2	RGLCKC1	MD	MD	N	N	MD	MD	N	N	**BD**	**BD**	Y	Maybe	**BD**	Y	Maybe
PB1	RGPB2	OK	GD	Y	Y	GD	OK	Y	Y	GD	GD	Y	Y	GD	Y	Y
PB10	RGPB1	OK	OK	Y	Y	OK	OK	Y	Y	OK	OK	Y	Y	OK	Y	Y
PB2	RGPB2	GD	MD	Y	N	MD	MD	N	N	MD	MD	N	N	MD	N	N
PB3	RGPB2	GD	GD	Y	Y	GD	GD	Y	Y	GD	GD	Y	Y	GD	Y	Y
PB4	RGPB2	GD	GD	Y	Y	GD	GD	Y	Y	GD	GD	Y	Y	GD	Y	Y
PB5	RGPB2	**BD**	**BD**	N	N	**BD**	GD	Y	N	GD	OK	Y	Y	GD	Y	Y
PB6	RGPB3	GD	GD	Y	Y	GD	GD	Y	Y	GD	GD	Y	Y	GD	Y	Y
PB7	RGPB3	GD	GD	Slight	Y	GD	GD	Y	Y	GD	GD	Y	Y	GD	Y	Y
PB8	RGPB3	GD	GD	Y	Y	GD	OK	Y	Y	GD	GD	Y	Y	GD	Y	Y
PB9	RGPB1	GD	GD	Y	Y	GD	GD	Y	Y	GD	GD	Y	Y	GD	Y	Y
PBPLNT1	RGPB4	OK	GD	Slight	Y	GD	BS	Y	N	OK	GD	Y	Y	OK	Y	Y
PBPLNT2	RGPB4	MD	MD	N	N	MD	MD	N	N	GD	GD	Slight	Y	GD	Y	Y
PBPLNT3	RGPB4	GD	GD	Slight	Maybe	GD	BS	Y	N	OK	OK	Y	Y	GD	Y	Y
PBPLNT4	RGPB4	GD	GD	Y	Maybe	GD	GS	Y	Y	GD	GD	Y	Y	GD	Y	Y
PBPLNT5	RGPB2	GD	GD	Y	Y	GD	OK	Y	Y	GD	GD	Y	Y	GD	Y	Y
PBPLNT6	RGPB2	GD	GD	Y	Y	GD	GD	Y	Y	GD	GD	Y	Y	GD	Y	Y
PINEM1	RGPINEM1	OK	OK	Y	Y	OK	OK	Y	Y	GD	GD	Y	Y	GD	Y	Y
SWIFT2	RGLCKC2	GD	GD	Y	Y	GD	GD	Y	Y	GD	GD	Y	Y	GD	Y	Y
UCKC1	RGUCKC1	GD	GD	Slight	Y	GD	GD	Y	Y	GD	GD	Y	Y	GD	Y	Y
UCKC2	RGUCKC1	GD	GD	Y	Y	GD	GD	Y	Y	GD	GD	Y	Maybe	GD	Y	Y

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Flow Meter QC Tags

Code	Format
NM	NM
OB	OB
GD	GD
GS	GS
OK	OK
OS	OS
BD	BD
BS	BS
AD	AD
MD	MD

		Storm Event 15				Storm Event 16				Storm Event 17			
Meter ID	Raingage	1/23/19	1/24/19	RDII Response	Model Calib	2/19/19	2/20/19	RDII Response	Model Calib	2/20/19	2/21/19	RDII Response	Model Calib
CKC1	RGPB4	BD	BD	N	N	GD	GD	Y	Y	GD	BD	Y	Maybe
DK10	RGHON1	OK	OK	Y	Y	OK	OK	Slight	Y	OK	OK	Y	Y
DK11	RGHON1	OK	OK	Y	Y	OK	OK	Y	Y	OK	OK	Y	Y
HON1	RGHON1	OK	OK	Y	Y	GD	GD	Slight	Y	GD	GD	Y	Y
HON2	RGHON1	GD	GD	Y	Y	GD	GD	Slight	Y	GD	GD	Y	Y
HON3	RGHON1	OK	GD	Y	Y	OK	OK	Slight	Y	OK	OK	Y	Y
JSC1	RGJSC1	GD	GD	Y	Y	OK	OK	Y	Y	OK	GD	Y	Y
LCKC1	RGLCKC1	BD	BD	N	N	GD	GD	Y	Y	GD	GD	Y	Y
LCKC2	RGLCKC1	GD	GD	Y	Y	GD	GD	Y	Y	GD	GD	Y	Y
LSM1	RGLCKC1	BD	BD	N	N	BD	BD	N	N	BD	BD	N	N
LSM2	RGLCKC1	BD	BD	Y	Maybe	BD	BD	Y	Maybe	BD	BD	Y	Maybe
PB1	RGPB2	OK	GD	Y	Y	GD	GD	Slight	Y	GD	GD	Y	Y
PB10	RGPB1	OK	GD	Y	Y	OK	OK	Y	Y	OK	GD	Y	Y
PB2	RGPB2	MD	MD	N	N	BD	BD	N	N	BD	GD	Y	N
PB3	RGPB2	GD	GD	Y	Y	GD	GD	Y	Y	GD	GD	Y	Y
PB4	RGPB2	OK	GD	Y	Y	GD	GD	Y	Y	GD	OK	Y	Y
PB5	RGPB2	GD	OK	Y	Y	GD	GD	Y	Y	GD	GD	Y	Y
PB6	RGPB3	GD	GD	Y	Y	GD	GD	Y	Y	GD	GD	Y	Y
PB7	RGPB3	GD	GD	Y	Y	GD	GD	Slight	Y	GD	GD	Y	Y
PB8	RGPB3	BD	BD	Y	N	GD	GD	Y	Y	GD	GD	Y	Y
PB9	RGPB1	GD	GD	Y	Y	GD	GD	Y	Y	GD	GD	Y	Y
PBPLNT1	RGPB4	OK	GD	Y	Y	OK	OK	Y	Y	OK	GD	Y	Y
PBPLNT2	RGPB4	GD	GD	Y	Y	GD	GD	Slight	Y	GD	GD	Y	Y
PBPLNT3	RGPB4	OK	OK	Y	Y	GD	OK	Slight	Y	OK	OK	Y	Maybe
PBPLNT4	RGPB4	GD	GD	Y	Maybe	GD	GD	Slight	Y	GD	OK	Y	Maybe
PBPLNT5	RGPB2	GD	GD	Y	Y	GD	GD	Slight	Y	GD	GD	Y	Y
PBPLNT6	RGPB2	GD	GD	Y	Y	GD	GD	Y	Y	GD	GD	Y	Y
PINEM1	RGPINEM1	OK	GD	Y	Y	GD	GD	Y	Y	GD	GD	Y	Y
SWIFT2	RGLCKC2	GD	GD	Y	Y	GD	GD	Y	Y	GD	GD	Y	Y
UCKC1	RGUCKC1	GD	GD	Y	Y	GD	GD	Y	Y	GD	GD	Y	Y
UCKC2	RGUCKC1	OK	GD	Y	Y	GD	GD	Y	Y	GD	GD	Y	Y

Color Code:

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Flow Meter QC Tags

Code	Format
NM	NM
OB	OB
GD	GD
GS	GS
OK	OK
OS	OS
BD	BD
BS	BS
AD	AD
MD	MD

Rain Gauge:	RGHON1
Sewershed	Honey Creek
Sewer Basin	Polebridge

		Peak Precipitation Volume (inches)							
Duration		15-minute	30-minute	1-hour	2-hour	3-hour	6-hour	12-hour	24-hour
Return Frequency	1-year	0.71	1.02	1.32	1.62	1.81	2.22	2.74	3.29
	2-year	0.82	1.18	1.52	1.85	2.06	2.49	3.05	3.70
	5-year	1.00	1.44	1.85	2.25	2.49	2.97	3.60	4.40
	10-year	1.16	1.66	2.14	2.61	2.88	3.42	4.11	5.03
	25-year	1.38	1.98	2.56	3.13	3.46	4.10	4.88	5.95
	50-year	1.56	2.24	2.90	3.56	3.95	4.67	5.53	6.70
	100-year	1.74	2.50	3.25	4.01	4.46	5.29	6.23	7.50
Event	8/10/18	0.03	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	8/17/18	0.14	0.17	0.17	0.17	0.17	0.17	0.17	0.17
	8/18/18	0.11	0.20	0.22	0.25	0.25	0.25	0.25	0.25
	8/21/18	0.06	0.08	0.08	0.08	0.08	0.08	0.08	0.08
	8/22/18	0.01	0.01	0.01	0.01	0.01	0.01	0.09	0.09
	8/29/18	0.42	0.62	0.65	0.65	0.65	0.65	0.65	0.65
	8/29/18	0.16	0.17	0.17	0.17	0.17	0.17	0.82	0.82
	9/9/18	0.03	0.06	0.06	0.06	0.06	0.06	0.06	0.06
	9/13/18	0.06	0.06	0.07	0.07	0.07	0.07	0.07	0.07
	9/16/18	0.01	0.02	0.03	0.03	0.03	0.04	0.05	0.05
	9/21/18	0.21	0.31	0.31	0.31	0.31	0.31	0.31	0.31
	9/26/18	0.13	0.14	0.14	0.14	0.14	0.14	0.14	0.14
	9/26/18	0.67	0.94	1.01	1.02	1.04	1.07	1.08	1.22
	9/27/18	0.15	0.19	0.25	0.28	0.29	0.30	0.30	1.27
	9/29/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	10/9/18	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.04
	10/10/18	0.23	0.34	0.48	0.68	0.86	1.39	2.36	2.71
	10/12/18	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.12
	10/16/18	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	10/20/18	0.03	0.04	0.06	0.10	0.11	0.11	0.11	0.11
	10/25/18	0.09	0.12	0.15	0.24	0.34	0.56	0.93	0.98
	10/27/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.24
	11/1/18	0.16	0.22	0.32	0.39	0.46	0.54	0.54	0.54
	11/2/18	0.02	0.03	0.05	0.10	0.12	0.16	0.18	0.71
	11/5/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	11/5/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02
	11/6/18	0.03	0.05	0.09	0.09	0.09	0.09	0.10	0.10
	11/7/18	0.04	0.07	0.13	0.25	0.37	0.61	0.61	0.61
	11/8/18	0.03	0.05	0.10	0.18	0.23	0.30	0.37	0.43
	11/9/18	0.01	0.01	0.01	0.01	0.01	0.01	0.09	0.44
	11/12/18	0.05	0.09	0.17	0.32	0.48	0.84	1.49	2.20
	11/13/18	0.02	0.04	0.07	0.13	0.18	0.32	0.57	0.94
	11/23/18	0.06	0.11	0.18	0.30	0.34	0.39	0.43	0.43

Rain Gauge:	RGHON1
Sewershed	Honey Creek
Sewer Basin	Polebridge

		Peak Precipitation Volume (inches)							
Duration		15-minute	30-minute	1-hour	2-hour	3-hour	6-hour	12-hour	24-hour
Return Frequency	1-year	0.71	1.02	1.32	1.62	1.81	2.22	2.74	3.29
	2-year	0.82	1.18	1.52	1.85	2.06	2.49	3.05	3.70
	5-year	1.00	1.44	1.85	2.25	2.49	2.97	3.60	4.40
	10-year	1.16	1.66	2.14	2.61	2.88	3.42	4.11	5.03
	25-year	1.38	1.98	2.56	3.13	3.46	4.10	4.88	5.95
	50-year	1.56	2.24	2.90	3.56	3.95	4.67	5.53	6.70
	100-year	1.74	2.50	3.25	4.01	4.46	5.29	6.23	7.50
Event	11/25/18	0.02	0.04	0.08	0.13	0.15	0.16	0.16	0.16
	11/26/18	0.01	0.01	0.01	0.01	0.01	0.01	0.17	0.17
	11/30/18	0.02	0.03	0.03	0.03	0.04	0.04	0.04	0.04
	12/1/18	0.20	0.31	0.43	0.66	0.95	1.64	1.86	1.89
	12/7/18	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02
	12/8/18	0.11	0.21	0.33	0.48	0.63	1.18	1.91	2.72
	12/10/18	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.97
	12/10/18	0.01	0.02	0.03	0.05	0.06	0.10	0.12	0.14
	12/14/18	0.12	0.23	0.32	0.64	0.71	0.79	0.88	1.05
	12/20/18	0.07	0.13	0.25	0.43	0.56	0.89	1.11	1.11
	12/20/18	0.09	0.16	0.25	0.46	0.55	0.61	0.65	1.74
	12/27/18	0.25	0.50	0.54	0.61	0.68	0.80	1.43	1.94
	12/30/18	0.08	0.08	0.08	0.14	0.14	0.17	0.23	0.34
	12/31/18	0.01	0.01	0.01	0.01	0.01	0.01	0.08	0.18
	12/31/18	0.03	0.03	0.05	0.07	0.09	0.11	0.11	0.11
	1/2/19	0.10	0.17	0.31	0.56	0.62	1.22	1.31	1.46
	1/12/19	0.11	0.14	0.24	0.34	0.38	0.59	0.63	0.63
	1/17/19	0.03	0.06	0.07	0.07	0.08	0.09	0.10	0.10
	1/19/19	0.16	0.31	0.47	0.85	1.05	1.20	1.22	1.22
	1/23/19	0.38	0.60	0.91	1.16	1.35	1.66	1.76	1.76
	1/29/19	0.02	0.04	0.06	0.09	0.11	0.11	0.11	0.11
	2/3/19	0.07	0.08	0.11	0.12	0.12	0.12	0.12	0.12
	2/6/19	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02
	2/10/19	0.01	0.02	0.02	0.03	0.03	0.03	0.05	0.05
	2/11/19	0.01	0.02	0.03	0.03	0.03	0.04	0.04	0.08
	2/12/19	0.38	0.40	0.46	0.50	0.51	0.53	0.53	0.57
	2/13/19	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.54
	2/15/19	0.08	0.12	0.17	0.24	0.28	0.31	0.37	0.38
	2/17/19	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.08
	2/17/19	0.01	0.01	0.02	0.02	0.03	0.03	0.04	0.06
	2/19/19	0.09	0.13	0.21	0.25	0.26	0.35	0.45	0.51
	2/20/19	0.23	0.29	0.41	0.56	0.83	1.11	1.48	1.51
	2/21/19	0.15	0.17	0.18	0.18	0.18	0.19	0.20	1.49
	2/24/19	0.03	0.05	0.10	0.18	0.19	0.19	0.19	0.19
	2/27/19	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	2/28/19	0.05	0.09	0.17	0.22	0.24	0.33	0.33	0.33

Rain Gauge:	RGJSC1
Sewershed	Johnson Creek
Sewer Basin	Polebridge

		Peak Precipitation Volume (inches)							
Duration		15-minute	30-minute	1-hour	2-hour	3-hour	6-hour	12-hour	24-hour
Return Frequency	1-year	0.71	1.02	1.32	1.62	1.81	2.22	2.74	3.29
	2-year	0.82	1.18	1.52	1.85	2.06	2.49	3.05	3.70
	5-year	1.00	1.44	1.85	2.25	2.49	2.97	3.60	4.40
	10-year	1.16	1.66	2.14	2.61	2.88	3.42	4.11	5.03
	25-year	1.38	1.98	2.56	3.13	3.46	4.10	4.88	5.95
	50-year	1.56	2.24	2.90	3.56	3.95	4.67	5.53	6.70
	100-year	1.74	2.50	3.25	4.01	4.46	5.29	6.23	7.50
Event	8/10/18	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
	8/17/18	0.13	0.20	0.21	0.27	0.38	0.48	0.48	0.48
	8/18/18	0.48	0.53	0.53	0.54	0.59	0.59	0.60	0.60
	8/21/18	0.22	0.26	0.29	0.29	0.29	0.43	0.45	0.45
	8/29/18	0.03	0.06	0.06	0.06	0.06	0.06	0.06	0.06
	8/29/18	0.05	0.05	0.05	0.05	0.05	0.05	0.11	0.11
	9/7/18	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	9/9/18	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	9/11/18	0.41	0.47	0.51	0.51	0.51	0.51	0.51	0.51
	9/16/18	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03
	9/18/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	9/21/18	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
	9/26/18	0.04	0.05	0.05	0.05	0.06	0.06	0.06	0.06
	9/26/18	0.29	0.37	0.41	0.41	0.45	0.48	0.49	0.55
	9/27/18	0.12	0.23	0.30	0.33	0.33	0.33	0.33	0.70
	9/28/18	0.45	0.86	0.86	0.91	0.91	0.91	0.91	0.91
	9/29/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.92
	10/9/18	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	10/10/18	0.02	0.02	0.02	0.03	0.04	0.06	0.07	0.10
	10/10/18	0.21	0.31	0.46	0.73	1.09	1.67	2.36	2.42
	10/20/18	0.08	0.10	0.10	0.16	0.16	0.16	0.16	0.16
	10/25/18	0.07	0.10	0.16	0.22	0.32	0.53	0.86	0.91
	10/27/18	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.79
	11/1/18	0.15	0.25	0.31	0.41	0.42	0.42	0.42	0.42
	11/2/18	0.04	0.06	0.09	0.11	0.13	0.14	0.17	0.57
	11/5/18	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02
	11/5/18	0.14	0.24	0.27	0.28	0.28	0.29	0.30	0.30
	11/7/18	0.08	0.13	0.22	0.43	0.51	0.51	0.51	0.51
	11/8/18	0.06	0.08	0.08	0.08	0.08	0.08	0.08	0.59
	11/8/18	0.11	0.17	0.24	0.27	0.29	0.33	0.53	0.68
	11/12/18	0.18	0.24	0.32	0.60	0.78	0.97	1.79	2.14
	11/13/18	0.06	0.10	0.15	0.24	0.34	0.60	1.01	1.13
	11/23/18	0.07	0.13	0.19	0.31	0.35	0.40	0.44	0.45
	11/25/18	0.05	0.08	0.09	0.11	0.14	0.14	0.15	0.15
	11/30/18	0.01	0.02	0.02	0.02	0.03	0.03	0.03	0.03
	12/1/18	0.18	0.30	0.44	0.67	0.89	1.45	1.59	1.64
	12/7/18	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02
	12/8/18	0.10	0.18	0.31	0.43	0.57	0.98	1.56	2.32

Rain Gauge:	RGJSC1
Sewershed	Johnson Creek
Sewer Basin	Polebridge

		Peak Precipitation Volume (inches)							
Duration		15-minute	30-minute	1-hour	2-hour	3-hour	6-hour	12-hour	24-hour
Return Frequency	1-year	0.71	1.02	1.32	1.62	1.81	2.22	2.74	3.29
	2-year	0.82	1.18	1.52	1.85	2.06	2.49	3.05	3.70
	5-year	1.00	1.44	1.85	2.25	2.49	2.97	3.60	4.40
	10-year	1.16	1.66	2.14	2.61	2.88	3.42	4.11	5.03
	25-year	1.38	1.98	2.56	3.13	3.46	4.10	4.88	5.95
	50-year	1.56	2.24	2.90	3.56	3.95	4.67	5.53	6.70
	100-year	1.74	2.50	3.25	4.01	4.46	5.29	6.23	7.50
Event	12/9/18	0.01	0.01	0.01	0.01	0.01	0.01	0.39	1.85
	12/10/18	0.01	0.01	0.01	0.01	0.02	0.02	0.03	0.84
	12/10/18	0.01	0.02	0.04	0.06	0.08	0.12	0.13	0.16
	12/14/18	0.10	0.18	0.27	0.48	0.53	0.62	0.75	0.97
	12/20/18	0.08	0.14	0.25	0.43	0.55	0.86	1.08	1.08
	12/20/18	0.09	0.15	0.23	0.38	0.45	0.50	0.52	1.59
	12/27/18	0.26	0.34	0.43	0.49	0.56	0.76	1.32	1.85
	12/29/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.59
	12/30/18	0.06	0.08	0.10	0.17	0.18	0.23	0.24	0.24
	12/30/18	0.01	0.01	0.01	0.01	0.01	0.01	0.21	0.25
	12/30/18	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.26
	12/31/18	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.04
	12/31/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.03
	12/31/18	0.04	0.06	0.07	0.11	0.12	0.14	0.14	0.14
	1/2/19	0.08	0.09	0.12	0.19	0.21	0.39	0.59	0.67
	1/3/19	0.14	0.22	0.35	0.54	0.63	1.16	1.24	1.33
	1/4/19	0.01	0.01	0.01	0.01	0.01	0.01	0.99	1.29
	1/12/19	0.09	0.14	0.20	0.31	0.38	0.61	0.67	0.67
	1/17/19	0.03	0.06	0.09	0.09	0.10	0.12	0.12	0.12
	1/19/19	0.19	0.32	0.51	0.91	1.16	1.29	1.34	1.35
	1/23/19	0.29	0.57	0.89	1.11	1.28	1.57	1.66	1.66
	1/29/19	0.02	0.03	0.05	0.07	0.08	0.08	0.08	0.08
	2/3/19	0.07	0.08	0.10	0.11	0.11	0.11	0.11	0.11
	2/6/19	0.01	0.02	0.02	0.02	0.03	0.03	0.03	0.03
	2/8/19	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	2/10/19	0.03	0.04	0.05	0.07	0.07	0.07	0.10	0.10
	2/11/19	0.03	0.05	0.07	0.07	0.07	0.10	0.10	0.17
	2/12/19	0.33	0.43	0.49	0.53	0.55	0.56	0.57	0.67
	2/15/19	0.05	0.07	0.12	0.19	0.21	0.22	0.32	0.32
	2/17/19	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02
	2/17/19	0.04	0.04	0.04	0.05	0.05	0.06	0.07	0.09
	2/19/19	0.24	0.26	0.30	0.36	0.43	0.58	0.77	0.80
	2/21/19	0.02	0.03	0.03	0.03	0.03	0.03	0.05	0.70
	2/22/19	0.01	0.01	0.01	0.01	0.01	0.01	0.04	0.06
	2/23/19	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02
	2/24/19	0.05	0.08	0.14	0.22	0.23	0.23	0.23	0.23
	2/27/19	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02
	2/28/19	0.03	0.06	0.11	0.18	0.19	0.27	0.27	0.27

Rain Gauge:	RGLCKC1
Sewershed	Lower Crooked Creek
Sewer Basin	Polebridge

		Peak Precipitation Volume (inches)							
Duration		15-minute	30-minute	1-hour	2-hour	3-hour	6-hour	12-hour	24-hour
Return Frequency	1-year	0.71	1.02	1.32	1.62	1.81	2.22	2.74	3.29
	2-year	0.82	1.18	1.52	1.85	2.06	2.49	3.05	3.70
	5-year	1.00	1.44	1.85	2.25	2.49	2.97	3.60	4.40
	10-year	1.16	1.66	2.14	2.61	2.88	3.42	4.11	5.03
	25-year	1.38	1.98	2.56	3.13	3.46	4.10	4.88	5.95
	50-year	1.56	2.24	2.90	3.56	3.95	4.67	5.53	6.70
	100-year	1.74	2.50	3.25	4.01	4.46	5.29	6.23	7.50
Event	8/10/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	8/17/18	0.47	0.62	0.66	0.78	0.78	0.80	0.80	0.80
	8/18/18	0.13	0.21	0.21	0.21	0.21	0.22	0.22	0.22
	8/20/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	8/21/18	0.12	0.19	0.20	0.20	0.20	0.20	0.20	0.20
	9/8/18	0.10	0.11	0.11	0.11	0.11	0.12	0.12	0.12
	9/9/18	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
	9/11/18	0.07	0.09	0.10	0.11	0.11	0.11	0.11	0.11
	9/16/18	0.02	0.02	0.04	0.05	0.05	0.05	0.05	0.05
	9/25/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	9/26/18	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.04
	9/26/18	0.19	0.23	0.27	0.27	0.29	0.49	0.52	0.55
	9/27/18	0.23	0.27	0.34	0.37	0.37	0.37	0.37	0.56
	9/28/18	0.04	0.06	0.07	0.07	0.07	0.07	0.07	0.07
	9/29/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
	9/30/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	10/10/18	0.23	0.35	0.50	0.74	1.07	1.67	2.56	2.64
	10/20/18	0.04	0.06	0.06	0.10	0.10	0.10	0.10	0.10
	10/25/18	0.07	0.11	0.16	0.29	0.38	0.57	0.92	0.96
	10/26/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.87
	11/1/18	0.08	0.15	0.25	0.35	0.37	0.37	0.37	0.37
	11/2/18	0.05	0.06	0.06	0.06	0.07	0.07	0.13	0.45
	11/5/18	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02
	11/5/18	0.13	0.17	0.22	0.22	0.22	0.25	0.33	0.33
	11/7/18	0.07	0.14	0.26	0.41	0.47	0.47	0.47	0.47
	11/8/18	0.20	0.39	0.45	0.45	0.46	0.55	0.78	0.90
	11/12/18	0.12	0.21	0.40	0.66	0.91	1.21	1.82	2.16
	11/20/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	11/23/18	0.07	0.11	0.20	0.31	0.33	0.37	0.40	0.40
	11/25/18	0.05	0.07	0.08	0.10	0.13	0.13	0.14	0.14
	11/30/18	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02
	12/1/18	0.24	0.31	0.45	0.61	0.82	1.43	1.57	1.66
	12/8/18	0.10	0.18	0.30	0.39	0.53	0.84	1.43	2.20
	12/10/18	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.88
	12/10/18	0.02	0.04	0.05	0.06	0.09	0.13	0.15	0.17
	12/14/18	0.12	0.21	0.33	0.52	0.67	0.78	0.96	1.12
	12/20/18	0.09	0.15	0.23	0.40	0.54	0.87	1.07	1.61
	12/23/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01

Rain Gauge:	RGLCKC1
Sewershed	Lower Crooked Creek
Sewer Basin	Polebridge

		Peak Precipitation Volume (inches)							
Duration		15-minute	30-minute	1-hour	2-hour	3-hour	6-hour	12-hour	24-hour
Return Frequency	1-year	0.71	1.02	1.32	1.62	1.81	2.22	2.74	3.29
	2-year	0.82	1.18	1.52	1.85	2.06	2.49	3.05	3.70
	5-year	1.00	1.44	1.85	2.25	2.49	2.97	3.60	4.40
	10-year	1.16	1.66	2.14	2.61	2.88	3.42	4.11	5.03
	25-year	1.38	1.98	2.56	3.13	3.46	4.10	4.88	5.95
	50-year	1.56	2.24	2.90	3.56	3.95	4.67	5.53	6.70
	100-year	1.74	2.50	3.25	4.01	4.46	5.29	6.23	7.50
Event	12/27/18	0.21	0.38	0.46	0.73	0.84	1.14	1.84	2.45
	12/30/18	0.06	0.10	0.12	0.20	0.22	0.26	0.27	0.28
	12/30/18	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.29
	12/31/18	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.04
	12/31/18	0.01	0.02	0.03	0.03	0.03	0.03	0.04	0.05
	1/1/19	0.09	0.12	0.14	0.15	0.18	0.18	0.18	0.18
	1/2/19	0.10	0.15	0.18	0.27	0.29	0.44	0.74	0.81
	1/3/19	0.24	0.33	0.47	0.61	0.72	1.28	1.39	1.45
	1/4/19	0.05	0.05	0.05	0.05	0.05	0.05	1.12	1.46
	1/12/19	0.07	0.12	0.21	0.29	0.38	0.61	0.69	0.69
	1/17/19	0.02	0.04	0.05	0.05	0.05	0.06	0.06	0.06
	1/18/19	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.06
	1/19/19	0.18	0.27	0.39	0.70	0.92	1.02	1.11	1.11
	1/23/19	0.43	0.63	0.93	1.20	1.38	1.70	1.78	1.78
	1/29/19	0.02	0.03	0.05	0.08	0.08	0.08	0.08	0.08
	2/3/19	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	2/6/19	0.06	0.11	0.13	0.13	0.15	0.19	0.19	0.19
	2/8/19	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	2/10/19	0.01	0.01	0.02	0.03	0.04	0.04	0.04	0.04
	2/11/19	0.05	0.08	0.08	0.09	0.09	0.10	0.11	0.11
	2/12/19	0.34	0.41	0.50	0.59	0.59	0.61	0.62	0.72
	2/15/19	0.07	0.12	0.16	0.19	0.22	0.25	0.35	0.35
	2/17/19	0.01	0.01	0.01	0.01	0.01	0.02	0.03	0.03
	2/18/19	0.04	0.08	0.09	0.09	0.10	0.10	0.11	0.13
	2/19/19	0.23	0.43	0.52	0.72	0.75	0.83	0.93	1.00
	2/20/19	0.17	0.27	0.28	0.34	0.37	0.64	0.77	0.89
	2/21/19	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.59
	2/23/19	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	2/24/19	0.06	0.08	0.12	0.20	0.21	0.22	0.22	0.22
	2/27/19	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	2/28/19	0.06	0.10	0.16	0.22	0.24	0.33	0.33	0.33

Rain Gauge:	RGLCKC2
Sewershed	Lower Crooked Creek
Sewer Basin	Polebridge

		Peak Precipitation Volume (inches)							
Duration		15-minute	30-minute	1-hour	2-hour	3-hour	6-hour	12-hour	24-hour
Return Frequency	1-year	0.71	1.02	1.32	1.62	1.81	2.22	2.74	3.29
	2-year	0.82	1.18	1.52	1.85	2.06	2.49	3.05	3.70
	5-year	1.00	1.44	1.85	2.25	2.49	2.97	3.60	4.40
	10-year	1.16	1.66	2.14	2.61	2.88	3.42	4.11	5.03
	25-year	1.38	1.98	2.56	3.13	3.46	4.10	4.88	5.95
	50-year	1.56	2.24	2.90	3.56	3.95	4.67	5.53	6.70
	100-year	1.74	2.50	3.25	4.01	4.46	5.29	6.23	7.50
Event	8/10/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	8/10/18	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.11
	8/17/18	0.09	0.18	0.26	0.31	0.31	0.38	0.38	0.38
	8/18/18	0.25	0.32	0.38	0.39	0.40	0.40	0.40	0.40
	8/20/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	8/21/18	0.16	0.25	0.34	0.36	0.36	0.37	0.38	0.38
	8/22/18	0.01	0.01	0.01	0.01	0.01	0.01	0.37	0.39
	9/9/18	0.17	0.22	0.22	0.22	0.22	0.22	0.22	0.22
	9/11/18	0.15	0.30	0.33	0.34	0.34	0.34	0.34	0.34
	9/14/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	9/16/18	0.02	0.03	0.05	0.06	0.06	0.06	0.06	0.06
	9/26/18	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02
	9/26/18	0.35	0.35	0.35	0.36	0.38	0.63	0.65	0.67
	9/27/18	0.01	0.01	0.01	0.01	0.01	0.01	0.06	0.66
	9/27/18	0.27	0.34	0.41	0.44	0.44	0.44	0.45	0.62
	9/28/18	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03
	10/10/18	0.19	0.31	0.51	0.79	1.14	1.81	2.71	2.76
	10/20/18	0.04	0.04	0.04	0.05	0.05	0.05	0.05	0.05
	10/25/18	0.07	0.10	0.16	0.28	0.39	0.65	1.06	1.12
	10/27/18	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.90
	11/1/18	0.07	0.13	0.22	0.31	0.32	0.33	0.35	0.35
	11/2/18	0.04	0.05	0.07	0.08	0.09	0.09	0.09	0.42
	11/5/18	0.01	0.02	0.02	0.03	0.03	0.03	0.03	0.03
	11/5/18	0.13	0.22	0.31	0.31	0.31	0.32	0.37	0.37
	11/7/18	0.07	0.13	0.24	0.42	0.46	0.47	0.47	0.47
	11/8/18	0.23	0.27	0.37	0.38	0.39	0.49	0.71	0.84
	11/12/18	0.12	0.23	0.40	0.64	0.90	1.20	1.85	2.22
	11/13/18	0.05	0.08	0.15	0.26	0.36	0.63	1.04	1.16
	11/21/18	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	11/23/18	0.06	0.11	0.20	0.32	0.35	0.41	0.46	0.46
	11/25/18	0.05	0.07	0.08	0.10	0.15	0.15	0.16	0.16
	11/30/18	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02
	12/1/18	0.28	0.38	0.53	0.71	0.92	1.50	1.67	1.75
	12/7/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	12/8/18	0.12	0.22	0.36	0.48	0.68	1.05	1.80	2.66
	12/9/18	0.01	0.01	0.01	0.01	0.01	0.01	0.53	2.16
	12/10/18	0.01	0.01	0.01	0.01	0.02	0.02	0.02	1.02

Rain Gauge:	RGLCKC2
Sewershed	Lower Crooked Creek
Sewer Basin	Polebridge

		Peak Precipitation Volume (inches)							
Duration		15-minute	30-minute	1-hour	2-hour	3-hour	6-hour	12-hour	24-hour
Return Frequency	1-year	0.71	1.02	1.32	1.62	1.81	2.22	2.74	3.29
	2-year	0.82	1.18	1.52	1.85	2.06	2.49	3.05	3.70
	5-year	1.00	1.44	1.85	2.25	2.49	2.97	3.60	4.40
	10-year	1.16	1.66	2.14	2.61	2.88	3.42	4.11	5.03
	25-year	1.38	1.98	2.56	3.13	3.46	4.10	4.88	5.95
	50-year	1.56	2.24	2.90	3.56	3.95	4.67	5.53	6.70
	100-year	1.74	2.50	3.25	4.01	4.46	5.29	6.23	7.50
Event	12/10/18	0.02	0.03	0.04	0.05	0.06	0.12	0.17	0.19
	12/14/18	0.10	0.18	0.33	0.44	0.61	0.74	0.95	1.15
	12/20/18	0.10	0.18	0.27	0.41	0.54	0.87	1.09	1.64
	12/27/18	0.23	0.35	0.47	0.69	0.80	1.09	1.75	2.37
	12/30/18	0.05	0.09	0.10	0.13	0.16	0.20	0.22	0.30
	12/31/18	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.04
	1/1/19	0.10	0.11	0.11	0.15	0.16	0.16	0.16	0.16
	1/2/19	0.08	0.12	0.16	0.23	0.26	0.43	0.68	0.75
	1/3/19	0.28	0.40	0.56	0.72	0.86	1.44	1.55	1.63
	1/4/19	0.01	0.01	0.01	0.01	0.01	0.01	1.23	1.60
	1/12/19	0.07	0.12	0.17	0.30	0.38	0.64	0.73	0.73
	1/17/19	0.01	0.02	0.03	0.03	0.04	0.05	0.05	0.05
	1/18/19	0.01	0.01	0.01	0.01	0.01	0.01	0.05	0.06
	1/19/19	0.27	0.37	0.50	0.82	1.06	1.18	1.27	1.27
	1/23/19	0.44	0.66	0.91	1.17	1.36	1.70	1.77	1.77
	1/29/19	0.02	0.03	0.05	0.06	0.07	0.07	0.07	0.07
	2/3/19	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	2/6/19	0.06	0.10	0.11	0.11	0.13	0.15	0.15	0.15
	2/8/19	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	2/10/19	0.01	0.02	0.03	0.05	0.06	0.06	0.08	0.08
	2/11/19	0.03	0.04	0.04	0.05	0.05	0.07	0.11	0.12
	2/12/19	0.43	0.50	0.59	0.64	0.65	0.67	0.70	0.78
	2/13/19	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.68
	2/15/19	0.07	0.13	0.18	0.23	0.24	0.27	0.34	0.34
	2/17/19	0.01	0.01	0.01	0.01	0.01	0.02	0.03	0.03
	2/17/19	0.06	0.06	0.06	0.07	0.07	0.08	0.09	0.12
	2/19/19	0.21	0.34	0.40	0.53	0.56	0.71	0.87	0.96
	2/21/19	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.77
	2/23/19	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02
	2/24/19	0.06	0.07	0.12	0.23	0.24	0.25	0.25	0.25
	2/28/19	0.05	0.08	0.14	0.20	0.22	0.31	0.31	0.31

Rain Gauge:	RGPB1
Sewershed	Pole Bridge Creek
Sewer Basin	Polebridge

		Peak Precipitation Volume (inches)							
Duration		15-minute	30-minute	1-hour	2-hour	3-hour	6-hour	12-hour	24-hour
Return Frequency	1-year	0.71	1.02	1.32	1.62	1.81	2.22	2.74	3.29
	2-year	0.82	1.18	1.52	1.85	2.06	2.49	3.05	3.70
	5-year	1.00	1.44	1.85	2.25	2.49	2.97	3.60	4.40
	10-year	1.16	1.66	2.14	2.61	2.88	3.42	4.11	5.03
	25-year	1.38	1.98	2.56	3.13	3.46	4.10	4.88	5.95
	50-year	1.56	2.24	2.90	3.56	3.95	4.67	5.53	6.70
	100-year	1.74	2.50	3.25	4.01	4.46	5.29	6.23	7.50
Event	8/17/18	0.15	0.30	0.42	0.46	0.46	0.52	0.52	0.52
	8/18/18	0.38	0.44	0.44	0.44	0.44	0.44	0.44	0.44
	8/21/18	0.34	0.44	0.54	0.55	0.55	0.98	1.03	1.03
	8/29/18	0.02	0.02	0.03	0.04	0.04	0.04	0.04	0.04
	8/29/18	0.03	0.04	0.04	0.05	0.05	0.05	0.09	0.09
	9/9/18	0.05	0.06	0.06	0.08	0.08	0.08	0.08	0.08
	9/11/18	0.46	0.83	1.14	1.14	1.14	1.14	1.14	1.14
	9/16/18	0.02	0.03	0.03	0.03	0.04	0.04	0.04	0.04
	9/26/18	0.05	0.06	0.07	0.08	0.08	0.08	0.08	0.08
	9/26/18	0.51	0.56	0.63	0.64	0.68	0.79	0.83	0.91
	9/27/18	0.15	0.18	0.25	0.29	0.29	0.29	0.29	0.89
	9/28/18	0.02	0.03	0.05	0.08	0.08	0.10	0.10	0.10
	9/29/18	0.01	0.01	0.01	0.01	0.01	0.01	0.09	0.11
	10/9/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	10/10/18	0.02	0.02	0.02	0.02	0.02	0.04	0.05	0.06
	10/10/18	0.24	0.42	0.62	0.94	1.48	2.11	3.14	3.18
	10/20/18	0.05	0.08	0.09	0.14	0.14	0.15	0.15	0.15
	10/25/18	0.10	0.13	0.17	0.27	0.38	0.63	0.99	1.03
	10/26/18	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.83
	11/1/18	0.09	0.14	0.24	0.33	0.34	0.34	0.34	0.34
	11/2/18	0.03	0.05	0.06	0.07	0.08	0.08	0.08	0.42
	11/5/18	0.01	0.02	0.02	0.03	0.04	0.04	0.04	0.04
	11/5/18	0.04	0.04	0.04	0.04	0.05	0.05	0.05	0.09
	11/6/18	0.11	0.20	0.24	0.24	0.24	0.24	0.29	0.29
	11/7/18	0.07	0.13	0.24	0.44	0.50	0.50	0.50	0.50
	11/8/18	0.14	0.16	0.16	0.16	0.16	0.16	0.16	0.66
	11/8/18	0.19	0.25	0.31	0.33	0.34	0.45	0.70	0.88
	11/12/18	0.14	0.24	0.41	0.67	0.92	1.21	1.90	2.28
	11/13/18	0.06	0.10	0.16	0.25	0.37	0.65	1.10	1.24
	11/23/18	0.06	0.11	0.17	0.28	0.31	0.38	0.42	0.43
	11/25/18	0.03	0.06	0.07	0.09	0.14	0.14	0.15	0.15
	11/30/18	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	12/1/18	0.21	0.35	0.51	0.68	0.89	1.45	1.58	1.62
	12/7/18	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02
	12/8/18	0.11	0.20	0.33	0.45	0.62	0.99	1.69	2.52
	12/10/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.83
	12/10/18	0.02	0.02	0.04	0.06	0.07	0.11	0.13	0.14
	12/14/18	0.17	0.26	0.42	0.56	0.63	0.73	0.92	1.10

Rain Gauge:	RGPB1
Sewershed	Pole Bridge Creek
Sewer Basin	Polebridge

		Peak Precipitation Volume (inches)							
Duration		15-minute	30-minute	1-hour	2-hour	3-hour	6-hour	12-hour	24-hour
Return Frequency	1-year	0.71	1.02	1.32	1.62	1.81	2.22	2.74	3.29
	2-year	0.82	1.18	1.52	1.85	2.06	2.49	3.05	3.70
	5-year	1.00	1.44	1.85	2.25	2.49	2.97	3.60	4.40
	10-year	1.16	1.66	2.14	2.61	2.88	3.42	4.11	5.03
	25-year	1.38	1.98	2.56	3.13	3.46	4.10	4.88	5.95
	50-year	1.56	2.24	2.90	3.56	3.95	4.67	5.53	6.70
	100-year	1.74	2.50	3.25	4.01	4.46	5.29	6.23	7.50
Event	12/20/18	0.12	0.16	0.23	0.37	0.52	0.84	1.03	1.54
	12/27/18	0.21	0.41	0.47	0.69	0.79	1.08	1.82	2.42
	12/30/18	0.06	0.09	0.11	0.18	0.21	0.26	0.27	0.30
	12/31/18	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.05
	12/31/18	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.04
	1/1/19	0.11	0.12	0.13	0.16	0.17	0.17	0.17	0.17
	1/2/19	0.09	0.15	0.17	0.26	0.28	0.47	0.68	0.69
	1/3/19	0.02	0.03	0.04	0.05	0.07	0.07	0.34	0.76
	1/3/19	0.19	0.37	0.51	0.70	0.82	1.38	1.49	1.58
	1/12/19	0.07	0.13	0.19	0.31	0.39	0.64	0.72	0.72
	1/17/19	0.03	0.05	0.08	0.08	0.08	0.11	0.11	0.11
	1/19/19	0.24	0.33	0.46	0.79	1.02	1.14	1.24	1.24
	1/23/19	0.46	0.67	0.94	1.20	1.38	1.75	1.82	1.82
	1/29/19	0.02	0.03	0.05	0.08	0.09	0.09	0.09	0.09
	2/3/19	0.02	0.03	0.04	0.04	0.04	0.04	0.04	0.04
	2/6/19	0.02	0.03	0.03	0.03	0.05	0.06	0.06	0.06
	2/10/19	0.02	0.02	0.03	0.05	0.06	0.06	0.06	0.06
	2/11/19	0.04	0.05	0.05	0.05	0.06	0.08	0.11	0.11
	2/12/19	0.39	0.45	0.55	0.60	0.61	0.63	0.64	0.74
	2/15/19	0.05	0.09	0.14	0.20	0.21	0.22	0.32	0.32
	2/17/19	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02
	2/17/19	0.04	0.04	0.04	0.04	0.04	0.06	0.06	0.08
	2/19/19	0.34	0.36	0.43	0.51	0.54	0.69	0.82	0.93
	2/20/19	0.17	0.22	0.25	0.39	0.45	0.67	0.93	0.98
	2/21/19	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.77
	2/23/19	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	2/24/19	0.04	0.07	0.13	0.22	0.24	0.24	0.24	0.24
	2/28/19	0.04	0.08	0.13	0.19	0.20	0.28	0.29	0.29

Rain Gauge:	RGPB2
Sewershed	Pole Bridge Creek
Sewer Basin	Polebridge

		Peak Precipitation Volume (inches)							
Duration		15-minute	30-minute	1-hour	2-hour	3-hour	6-hour	12-hour	24-hour
Return Frequency	1-year	0.71	1.02	1.32	1.62	1.81	2.22	2.74	3.29
	2-year	0.82	1.18	1.52	1.85	2.06	2.49	3.05	3.70
	5-year	1.00	1.44	1.85	2.25	2.49	2.97	3.60	4.40
	10-year	1.16	1.66	2.14	2.61	2.88	3.42	4.11	5.03
	25-year	1.38	1.98	2.56	3.13	3.46	4.10	4.88	5.95
	50-year	1.56	2.24	2.90	3.56	3.95	4.67	5.53	6.70
	100-year	1.74	2.50	3.25	4.01	4.46	5.29	6.23	7.50
Event	8/12/18	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	8/17/18	0.35	0.65	0.68	0.71	0.82	0.82	0.82	0.82
	8/18/18	0.64	0.67	0.70	0.71	0.71	0.71	0.71	0.71
	8/29/18	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	8/29/18	0.15	0.24	0.24	0.24	0.24	0.25	0.26	0.27
	9/8/18	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	9/8/18	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.03
	9/11/18	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	9/16/18	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	9/21/18	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22
	9/26/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	9/26/18	0.35	0.39	0.42	0.43	0.46	0.49	0.50	0.51
	9/27/18	0.17	0.20	0.25	0.28	0.28	0.29	0.29	0.68
	9/28/18	0.02	0.03	0.04	0.04	0.04	0.04	0.04	0.04
	9/29/18	0.01	0.01	0.01	0.01	0.01	0.01	0.05	0.05
	10/1/18	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	10/9/18	0.04	0.06	0.06	0.06	0.06	0.08	0.08	0.08
	10/10/18	0.01	0.01	0.01	0.02	0.02	0.03	0.03	0.11
	10/10/18	0.22	0.37	0.50	0.77	1.22	1.71	2.60	2.62
	10/20/18	0.05	0.06	0.09	0.13	0.13	0.13	0.13	0.13
	10/25/18	0.06	0.09	0.13	0.23	0.34	0.57	0.91	0.98
	10/27/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.63
	11/1/18	0.13	0.23	0.35	0.43	0.44	0.44	0.44	0.44
	11/2/18	0.05	0.09	0.10	0.13	0.14	0.16	0.16	0.60
	11/5/18	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02
	11/5/18	0.07	0.09	0.14	0.15	0.16	0.16	0.19	0.19
	11/7/18	0.10	0.15	0.28	0.48	0.57	0.57	0.57	0.57
	11/8/18	0.06	0.07	0.07	0.07	0.07	0.07	0.07	0.64
	11/8/18	0.14	0.19	0.24	0.27	0.28	0.33	0.46	0.57
	11/9/18	0.01	0.01	0.01	0.01	0.01	0.01	0.11	0.50
	11/12/18	0.19	0.23	0.37	0.66	0.87	1.02	1.86	2.24
	11/13/18	0.06	0.10	0.17	0.24	0.36	0.64	1.09	1.23
	11/23/18	0.08	0.13	0.21	0.32	0.36	0.42	0.44	0.45
	11/25/18	0.04	0.07	0.09	0.12	0.16	0.16	0.16	0.16
	11/26/18	0.01	0.01	0.01	0.01	0.01	0.01	0.17	0.17
	11/30/18	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02
	12/1/18	0.16	0.24	0.40	0.59	0.82	1.41	1.60	1.62
	12/7/18	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02

Rain Gauge:	RGPB2
Sewershed	Pole Bridge Creek
Sewer Basin	Polebridge

		Peak Precipitation Volume (inches)							
Duration		15-minute	30-minute	1-hour	2-hour	3-hour	6-hour	12-hour	24-hour
Return Frequency	1-year	0.71	1.02	1.32	1.62	1.81	2.22	2.74	3.29
	2-year	0.82	1.18	1.52	1.85	2.06	2.49	3.05	3.70
	5-year	1.00	1.44	1.85	2.25	2.49	2.97	3.60	4.40
	10-year	1.16	1.66	2.14	2.61	2.88	3.42	4.11	5.03
	25-year	1.38	1.98	2.56	3.13	3.46	4.10	4.88	5.95
	50-year	1.56	2.24	2.90	3.56	3.95	4.67	5.53	6.70
	100-year	1.74	2.50	3.25	4.01	4.46	5.29	6.23	7.50
Event	12/8/18	0.11	0.19	0.30	0.41	0.56	1.01	1.63	2.38
	12/10/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.42
	12/10/18	0.02	0.02	0.03	0.03	0.04	0.06	0.10	0.11
	12/14/18	0.10	0.16	0.26	0.40	0.49	0.62	0.80	0.97
	12/15/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.13
	12/20/18	0.07	0.12	0.22	0.38	0.49	0.81	0.97	0.97
	12/20/18	0.10	0.15	0.23	0.34	0.41	0.46	0.50	1.44
	12/27/18	0.25	0.38	0.46	0.58	0.67	0.88	1.50	2.07
	12/30/18	0.05	0.07	0.07	0.13	0.13	0.16	0.17	0.17
	12/30/18	0.07	0.10	0.12	0.13	0.13	0.13	0.26	0.30
	12/30/18	0.01	0.01	0.01	0.01	0.02	0.02	0.15	0.31
	12/31/18	0.03	0.03	0.05	0.08	0.11	0.13	0.14	0.14
	1/2/19	0.10	0.20	0.35	0.56	0.64	1.22	1.30	1.43
	1/12/19	0.09	0.15	0.25	0.33	0.39	0.60	0.66	0.66
	1/17/19	0.05	0.05	0.06	0.07	0.07	0.10	0.10	0.10
	1/18/19	0.01	0.01	0.01	0.01	0.01	0.01	0.08	0.11
	1/19/19	0.20	0.31	0.50	0.83	1.06	1.18	1.24	1.24
	1/23/19	0.35	0.60	0.89	1.14	1.32	1.64	1.72	1.72
	1/29/19	0.02	0.04	0.06	0.09	0.11	0.11	0.11	0.11
	2/3/19	0.02	0.04	0.04	0.04	0.05	0.05	0.05	0.05
	2/6/19	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	2/8/19	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	2/10/19	0.02	0.02	0.02	0.03	0.03	0.04	0.06	0.06
	2/11/19	0.05	0.09	0.10	0.10	0.10	0.14	0.14	0.18
	2/12/19	0.27	0.31	0.36	0.39	0.40	0.42	0.42	0.56
	2/13/19	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.43
	2/15/19	0.05	0.09	0.13	0.21	0.23	0.25	0.33	0.33
	2/17/19	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.08
	2/17/19	0.02	0.02	0.02	0.04	0.04	0.04	0.05	0.07
	2/19/19	0.16	0.22	0.31	0.45	0.54	0.91	1.15	1.18
	2/21/19	0.04	0.04	0.04	0.04	0.04	0.04	0.06	1.09
	2/22/19	0.01	0.01	0.01	0.01	0.01	0.01	0.05	0.08
	2/23/19	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	2/24/19	0.04	0.07	0.13	0.20	0.20	0.20	0.20	0.21
	2/28/19	0.04	0.08	0.14	0.20	0.21	0.30	0.30	0.30

Rain Gauge:	RGPB3
Sewershed	Pole Bridge Creek
Sewer Basin	Polebridge

		Peak Precipitation Volume (inches)							
Duration		15-minute	30-minute	1-hour	2-hour	3-hour	6-hour	12-hour	24-hour
Return Frequency	1-year	0.71	1.02	1.32	1.62	1.81	2.22	2.74	3.29
	2-year	0.82	1.18	1.52	1.85	2.06	2.49	3.05	3.70
	5-year	1.00	1.44	1.85	2.25	2.49	2.97	3.60	4.40
	10-year	1.16	1.66	2.14	2.61	2.88	3.42	4.11	5.03
	25-year	1.38	1.98	2.56	3.13	3.46	4.10	4.88	5.95
	50-year	1.56	2.24	2.90	3.56	3.95	4.67	5.53	6.70
	100-year	1.74	2.50	3.25	4.01	4.46	5.29	6.23	7.50
Event	8/17/18	0.35	0.42	0.48	0.61	0.64	0.72	0.72	0.72
	8/18/18	0.39	0.39	0.39	0.44	0.44	0.44	0.45	0.73
	8/21/18	0.30	0.31	0.31	0.31	0.31	0.52	0.52	0.52
	8/22/18	0.01	0.01	0.01	0.01	0.01	0.01	0.22	0.53
	8/29/18	0.01	0.02	0.03	0.03	0.03	0.03	0.03	0.03
	8/29/18	0.13	0.14	0.14	0.14	0.14	0.14	0.17	0.17
	9/7/18	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	9/9/18	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02
	9/11/18	0.52	0.67	0.68	0.68	0.68	0.68	0.68	0.68
	9/14/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	9/16/18	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02
	9/26/18	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03
	9/26/18	0.22	0.30	0.40	0.41	0.44	0.51	0.52	0.55
	9/27/18	0.10	0.19	0.26	0.29	0.29	0.29	0.29	0.60
	9/28/18	0.09	0.16	0.18	0.19	0.19	0.19	0.19	0.19
	10/9/18	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02
	10/10/18	0.01	0.01	0.01	0.02	0.02	0.03	0.04	0.05
	10/10/18	0.25	0.47	0.63	0.94	1.38	1.95	2.84	2.87
	10/20/18	0.15	0.18	0.18	0.24	0.24	0.24	0.24	0.24
	10/25/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	11/1/18	0.09	0.14	0.14	0.14	0.14	0.14	0.14	0.14
	11/5/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	11/5/18	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.04
	11/6/18	0.11	0.20	0.23	0.23	0.23	0.23	0.26	0.26
	11/7/18	0.07	0.13	0.24	0.44	0.54	0.54	0.54	0.54
	11/8/18	0.04	0.05	0.05	0.05	0.05	0.05	0.05	0.59
	11/8/18	0.08	0.11	0.18	0.20	0.21	0.29	0.47	0.58
	11/12/18	0.01	0.02	0.04	0.04	0.04	0.04	0.04	0.04
	11/12/18	0.03	0.05	0.05	0.06	0.08	0.10	0.10	0.14
	11/13/18	0.01	0.02	0.03	0.05	0.05	0.05	0.05	0.15
	11/14/18	0.04	0.07	0.13	0.23	0.32	0.52	0.64	0.77
	11/23/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	11/25/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	11/26/18	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02
	11/30/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	12/1/18	0.11	0.17	0.30	0.31	0.32	0.37	0.39	0.43
	12/2/18	0.01	0.01	0.01	0.01	0.01	0.01	0.05	0.42
	12/7/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01

Rain Gauge:	RGPB3
Sewershed	Pole Bridge Creek
Sewer Basin	Polebridge

		Peak Precipitation Volume (inches)							
Duration		15-minute	30-minute	1-hour	2-hour	3-hour	6-hour	12-hour	24-hour
Return Frequency	1-year	0.71	1.02	1.32	1.62	1.81	2.22	2.74	3.29
	2-year	0.82	1.18	1.52	1.85	2.06	2.49	3.05	3.70
	5-year	1.00	1.44	1.85	2.25	2.49	2.97	3.60	4.40
	10-year	1.16	1.66	2.14	2.61	2.88	3.42	4.11	5.03
	25-year	1.38	1.98	2.56	3.13	3.46	4.10	4.88	5.95
	50-year	1.56	2.24	2.90	3.56	3.95	4.67	5.53	6.70
	100-year	1.74	2.50	3.25	4.01	4.46	5.29	6.23	7.50
Event	12/8/18	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.03
	12/10/18	0.01	0.02	0.03	0.05	0.06	0.09	0.11	0.11
	12/14/18	0.09	0.13	0.25	0.37	0.46	0.60	0.76	0.92
	12/20/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	12/21/18	0.09	0.11	0.12	0.13	0.13	0.13	0.13	0.14
	12/27/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	12/28/18	0.05	0.09	0.10	0.13	0.17	0.19	0.19	0.20
	12/30/18	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02
	12/30/18	0.02	0.02	0.03	0.03	0.03	0.03	0.05	0.05
	12/31/18	0.01	0.01	0.01	0.01	0.01	0.01	0.04	0.06
	12/31/18	0.03	0.06	0.08	0.09	0.11	0.13	0.13	0.13
	1/2/19	0.06	0.11	0.14	0.22	0.23	0.31	0.47	0.57
	1/3/19	0.18	0.26	0.41	0.61	0.71	1.29	1.38	1.42
	1/12/19	0.10	0.14	0.22	0.34	0.43	0.65	0.72	0.72
	1/17/19	0.04	0.06	0.09	0.09	0.09	0.12	0.12	0.12
	1/19/19	0.25	0.41	0.56	0.94	1.23	1.35	1.42	1.43
	1/23/19	0.33	0.62	0.90	1.13	1.33	1.64	1.72	1.72
	1/29/19	0.03	0.04	0.05	0.07	0.09	0.09	0.09	0.09
	2/3/19	0.03	0.05	0.08	0.08	0.08	0.08	0.08	0.08
	2/6/19	0.01	0.01	0.02	0.02	0.03	0.03	0.03	0.03
	2/8/19	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	2/10/19	0.02	0.02	0.03	0.03	0.03	0.04	0.06	0.06
	2/11/19	0.05	0.06	0.06	0.07	0.08	0.12	0.12	0.16
	2/12/19	0.21	0.33	0.40	0.45	0.46	0.47	0.47	0.59
	2/13/19	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.14
	2/15/19	0.06	0.07	0.10	0.18	0.19	0.20	0.30	0.30
	2/17/19	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	2/17/19	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02
	2/18/19	0.04	0.05	0.05	0.05	0.05	0.05	0.06	0.07
	2/19/19	0.15	0.18	0.24	0.30	0.32	0.48	0.60	0.68
	2/20/19	0.10	0.11	0.18	0.31	0.37	0.55	0.75	0.79
	2/21/19	0.02	0.03	0.03	0.03	0.03	0.03	0.04	0.66
	2/23/19	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	2/24/19	0.09	0.12	0.19	0.27	0.27	0.27	0.27	0.27
	2/28/19	0.04	0.08	0.13	0.20	0.22	0.30	0.31	0.31

Rain Gauge:	RGPB4
Sewershed	Pole Bridge Creek
Sewer Basin	Polebridge

		Peak Precipitation Volume (inches)							
Duration		15-minute	30-minute	1-hour	2-hour	3-hour	6-hour	12-hour	24-hour
Return Frequency	1-year	0.71	1.02	1.32	1.62	1.81	2.22	2.74	3.29
	2-year	0.82	1.18	1.52	1.85	2.06	2.49	3.05	3.70
	5-year	1.00	1.44	1.85	2.25	2.49	2.97	3.60	4.40
	10-year	1.16	1.66	2.14	2.61	2.88	3.42	4.11	5.03
	25-year	1.38	1.98	2.56	3.13	3.46	4.10	4.88	5.95
	50-year	1.56	2.24	2.90	3.56	3.95	4.67	5.53	6.70
	100-year	1.74	2.50	3.25	4.01	4.46	5.29	6.23	7.50
Event	8/12/18	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	8/17/18	0.03	0.04	0.05	0.06	0.07	0.07	0.07	0.07
	8/18/18	0.11	0.16	0.26	0.30	0.30	0.30	0.30	0.30
	8/19/18	0.01	0.01	0.01	0.01	0.01	0.01	0.31	0.31
	8/29/18	0.07	0.10	0.10	0.10	0.10	0.10	0.10	0.10
	8/29/18	0.02	0.02	0.02	0.02	0.02	0.02	0.12	0.12
	9/11/18	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.06
	9/16/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	9/26/18	0.16	0.16	0.20	0.20	0.20	0.20	0.20	0.20
	9/26/18	0.35	0.66	0.84	0.84	0.86	0.97	0.98	1.18
	9/27/18	0.01	0.01	0.01	0.01	0.01	0.01	0.89	0.99
	9/27/18	0.25	0.27	0.33	0.35	0.35	0.35	0.35	1.14
	10/9/18	0.04	0.05	0.05	0.05	0.06	0.07	0.07	0.07
	10/9/18	0.01	0.01	0.01	0.02	0.02	0.03	0.07	0.11
	10/10/18	0.28	0.42	0.55	0.85	1.34	1.97	3.03	3.04
	10/16/18	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03
	10/20/18	0.03	0.04	0.07	0.08	0.08	0.08	0.08	0.08
	10/25/18	0.08	0.10	0.14	0.24	0.34	0.58	0.92	1.01
	10/26/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.89
	11/1/18	0.12	0.24	0.40	0.51	0.53	0.53	0.53	0.53
	11/2/18	0.05	0.08	0.11	0.13	0.14	0.16	0.16	0.69
	11/5/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	11/6/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02
	11/6/18	0.07	0.10	0.14	0.15	0.15	0.15	0.16	0.16
	11/7/18	0.07	0.14	0.24	0.44	0.57	0.57	0.57	0.57
	11/8/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.58
	11/8/18	0.29	0.32	0.34	0.36	0.37	0.43	0.50	0.54
	11/12/18	0.11	0.21	0.33	0.61	0.80	0.94	1.79	2.16
	11/13/18	0.06	0.10	0.15	0.23	0.34	0.60	1.02	1.16
	11/23/18	0.08	0.13	0.18	0.30	0.33	0.42	0.45	0.45
	11/25/18	0.05	0.07	0.08	0.11	0.14	0.14	0.15	0.15
	12/1/18	0.17	0.26	0.40	0.64	0.91	1.61	1.84	1.87
	12/7/18	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02
	12/8/18	0.11	0.20	0.33	0.48	0.65	1.17	1.87	2.65
	12/10/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.92
	12/10/18	0.01	0.02	0.03	0.04	0.04	0.06	0.09	0.12
	12/14/18	0.11	0.19	0.29	0.51	0.57	0.64	0.78	0.96
	12/20/18	0.12	0.19	0.30	0.45	0.54	0.82	1.02	1.60

Rain Gauge:	RGPB4
Sewershed	Pole Bridge Creek
Sewer Basin	Polebridge

		Peak Precipitation Volume (inches)							
Duration		15-minute	30-minute	1-hour	2-hour	3-hour	6-hour	12-hour	24-hour
Return Frequency	1-year	0.71	1.02	1.32	1.62	1.81	2.22	2.74	3.29
	2-year	0.82	1.18	1.52	1.85	2.06	2.49	3.05	3.70
	5-year	1.00	1.44	1.85	2.25	2.49	2.97	3.60	4.40
	10-year	1.16	1.66	2.14	2.61	2.88	3.42	4.11	5.03
	25-year	1.38	1.98	2.56	3.13	3.46	4.10	4.88	5.95
	50-year	1.56	2.24	2.90	3.56	3.95	4.67	5.53	6.70
	100-year	1.74	2.50	3.25	4.01	4.46	5.29	6.23	7.50
Event	12/27/18	0.35	0.50	0.55	0.61	0.66	0.78	1.50	2.02
	12/29/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	1.00
	12/30/18	0.14	0.14	0.14	0.20	0.21	0.23	0.23	0.23
	12/30/18	0.03	0.05	0.07	0.08	0.09	0.09	0.28	0.32
	12/31/18	0.01	0.01	0.01	0.01	0.01	0.01	0.10	0.33
	12/31/18	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.11
	12/31/18	0.03	0.05	0.07	0.09	0.11	0.15	0.15	0.15
	1/2/19	0.10	0.19	0.32	0.53	0.61	1.18	1.29	1.42
	1/12/19	0.07	0.14	0.22	0.31	0.36	0.55	0.61	0.61
	1/17/19	0.03	0.05	0.06	0.07	0.07	0.10	0.10	0.10
	1/18/19	0.01	0.01	0.01	0.01	0.01	0.01	0.08	0.11
	1/19/19	0.26	0.48	0.61	1.03	1.24	1.36	1.38	1.38
	1/23/19	0.34	0.59	0.94	1.16	1.35	1.64	1.72	1.72
	1/29/19	0.02	0.03	0.05	0.08	0.09	0.09	0.09	0.09
	2/3/19	0.04	0.07	0.11	0.11	0.11	0.11	0.11	0.11
	2/6/19	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	2/10/19	0.02	0.02	0.03	0.03	0.03	0.04	0.06	0.06
	2/11/19	0.01	0.01	0.01	0.01	0.01	0.01	0.04	0.07
	2/11/19	0.01	0.01	0.02	0.02	0.03	0.04	0.05	0.09
	2/12/19	0.28	0.35	0.41	0.45	0.46	0.48	0.48	0.53
	2/13/19	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.49
	2/15/19	0.08	0.11	0.15	0.22	0.26	0.29	0.39	0.40
	2/17/19	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	2/17/19	0.01	0.01	0.02	0.02	0.02	0.03	0.04	0.05
	2/19/19	0.09	0.15	0.20	0.26	0.27	0.40	0.51	0.58
	2/20/19	0.19	0.24	0.41	0.55	0.80	1.16	1.49	1.53
	2/21/19	0.07	0.10	0.10	0.10	0.10	0.11	0.13	1.50
	2/23/19	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	2/24/19	0.04	0.06	0.11	0.17	0.17	0.18	0.18	0.18
	2/27/19	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	2/28/19	0.07	0.11	0.18	0.23	0.24	0.32	0.32	0.32

Rain Gauge:	RGPINEM1
Sewershed	Pine Mountain
Sewer Basin	Polebridge

		Peak Precipitation Volume (inches)							
Duration		15-minute	30-minute	1-hour	2-hour	3-hour	6-hour	12-hour	24-hour
Return Frequency	1-year	0.71	1.02	1.32	1.62	1.81	2.22	2.74	3.29
	2-year	0.82	1.18	1.52	1.85	2.06	2.49	3.05	3.70
	5-year	1.00	1.44	1.85	2.25	2.49	2.97	3.60	4.40
	10-year	1.16	1.66	2.14	2.61	2.88	3.42	4.11	5.03
	25-year	1.38	1.98	2.56	3.13	3.46	4.10	4.88	5.95
	50-year	1.56	2.24	2.90	3.56	3.95	4.67	5.53	6.70
	100-year	1.74	2.50	3.25	4.01	4.46	5.29	6.23	7.50
Event	8/10/18	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	8/17/18	0.21	0.27	0.28	0.36	0.47	0.53	0.53	0.53
	8/18/18	0.43	0.44	0.44	0.48	0.48	0.48	0.50	0.55
	8/19/18	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.53
	8/21/18	0.31	0.32	0.32	0.32	0.32	0.48	0.49	0.49
	8/28/18	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	8/29/18	0.02	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	8/29/18	0.05	0.07	0.07	0.07	0.07	0.07	0.11	0.11
	9/7/18	0.07	0.10	0.10	0.10	0.10	0.10	0.10	0.10
	9/9/18	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	9/11/18	0.48	0.60	0.60	0.60	0.60	0.60	0.60	0.60
	9/13/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	9/16/18	0.03	0.03	0.05	0.05	0.05	0.06	0.06	0.06
	9/21/18	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38
	9/26/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	9/26/18	0.27	0.39	0.48	0.49	0.51	0.56	0.57	0.58
	9/27/18	0.14	0.24	0.30	0.32	0.32	0.32	0.32	0.68
	9/28/18	0.10	0.13	0.13	0.18	0.19	0.19	0.19	0.19
	10/8/18	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	10/9/18	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.04
	10/10/18	0.01	0.02	0.02	0.03	0.03	0.04	0.04	0.06
	10/10/18	0.32	0.48	0.65	0.98	1.41	1.95	2.85	2.89
	10/20/18	0.15	0.17	0.18	0.25	0.25	0.25	0.25	0.25
	10/25/18	0.07	0.10	0.17	0.27	0.36	0.61	0.98	1.04
	11/1/18	0.12	0.23	0.29	0.38	0.39	0.40	0.40	0.40
	11/2/18	0.05	0.07	0.10	0.11	0.13	0.15	0.15	0.55
	11/5/18	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02
	11/5/18	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.04
	11/6/18	0.16	0.20	0.23	0.23	0.23	0.23	0.25	0.25
	11/7/18	0.08	0.14	0.26	0.47	0.56	0.56	0.56	0.56
	11/8/18	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.59
	11/8/18	0.14	0.17	0.24	0.26	0.27	0.32	0.48	0.58
	11/12/18	0.18	0.27	0.34	0.64	0.82	0.99	1.79	2.13
	11/13/18	0.06	0.10	0.16	0.25	0.34	0.62	1.05	1.17
	11/20/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	11/23/18	0.07	0.13	0.21	0.32	0.37	0.45	0.49	0.50
	11/25/18	0.05	0.09	0.09	0.11	0.15	0.15	0.15	0.15
	11/30/18	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02

Rain Gauge:	RGPINEM1
Sewershed	Pine Mountain
Sewer Basin	Polebridge

		Peak Precipitation Volume (inches)							
Duration		15-minute	30-minute	1-hour	2-hour	3-hour	6-hour	12-hour	24-hour
Return Frequency	1-year	0.71	1.02	1.32	1.62	1.81	2.22	2.74	3.29
	2-year	0.82	1.18	1.52	1.85	2.06	2.49	3.05	3.70
	5-year	1.00	1.44	1.85	2.25	2.49	2.97	3.60	4.40
	10-year	1.16	1.66	2.14	2.61	2.88	3.42	4.11	5.03
	25-year	1.38	1.98	2.56	3.13	3.46	4.10	4.88	5.95
	50-year	1.56	2.24	2.90	3.56	3.95	4.67	5.53	6.70
	100-year	1.74	2.50	3.25	4.01	4.46	5.29	6.23	7.50
Event	12/1/18	0.16	0.27	0.41	0.63	0.86	1.45	1.61	1.64
	12/7/18	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02
	12/8/18	0.10	0.19	0.32	0.43	0.59	1.04	1.69	2.45
	12/10/18	0.01	0.01	0.01	0.01	0.02	0.02	0.02	1.00
	12/10/18	0.02	0.03	0.04	0.07	0.07	0.10	0.12	0.14
	12/14/18	0.09	0.17	0.26	0.45	0.51	0.58	0.71	0.86
	12/15/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.07
	12/20/18	0.07	0.13	0.23	0.39	0.51	0.85	1.05	1.05
	12/20/18	0.11	0.20	0.28	0.44	0.52	0.55	0.60	1.60
	12/27/18	0.31	0.41	0.47	0.52	0.59	0.78	1.39	1.94
	12/30/18	0.11	0.13	0.13	0.22	0.23	0.27	0.27	0.27
	12/30/18	0.01	0.02	0.03	0.03	0.03	0.03	0.26	0.30
	12/30/18	0.01	0.01	0.01	0.01	0.01	0.02	0.05	0.31
	12/31/18	0.03	0.05	0.06	0.08	0.09	0.11	0.11	0.11
	1/2/19	0.12	0.21	0.35	0.56	0.64	1.22	1.31	1.41
	1/12/19	0.09	0.13	0.20	0.31	0.37	0.59	0.64	0.64
	1/17/19	0.04	0.06	0.09	0.09	0.09	0.11	0.11	0.11
	1/18/19	0.01	0.01	0.01	0.01	0.01	0.01	0.10	0.12
	1/19/19	0.28	0.36	0.53	1.00	1.26	1.39	1.43	1.44
	1/23/19	0.31	0.59	0.95	1.18	1.37	1.69	1.78	1.78
	1/29/19	0.02	0.03	0.05	0.07	0.09	0.09	0.09	0.09
	2/3/19	0.06	0.07	0.07	0.07	0.07	0.07	0.07	0.07
	2/6/19	0.01	0.01	0.01	0.02	0.02	0.03	0.03	0.03
	2/8/19	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	2/10/19	0.02	0.04	0.06	0.06	0.06	0.07	0.10	0.10
	2/11/19	0.03	0.04	0.05	0.05	0.05	0.09	0.09	0.16
	2/12/19	0.23	0.40	0.47	0.52	0.53	0.54	0.54	0.63
	2/15/19	0.05	0.07	0.11	0.19	0.21	0.23	0.31	0.31
	2/17/19	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.09
	2/17/19	0.01	0.01	0.01	0.01	0.01	0.02	0.03	0.03
	2/18/19	0.03	0.03	0.03	0.03	0.03	0.04	0.05	0.07
	2/19/19	0.12	0.16	0.20	0.25	0.27	0.40	0.52	0.58
	2/20/19	0.17	0.18	0.26	0.41	0.45	0.66	0.87	0.92
	2/21/19	0.03	0.04	0.04	0.04	0.04	0.05	0.08	0.82
	2/23/19	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	2/24/19	0.04	0.07	0.14	0.21	0.21	0.21	0.21	0.22
	2/28/19	0.04	0.07	0.13	0.20	0.22	0.31	0.32	0.32

Rain Gauge:	RGUCKC1
Sewershed	Upper Crooked Creek
Sewer Basin	Polebridge

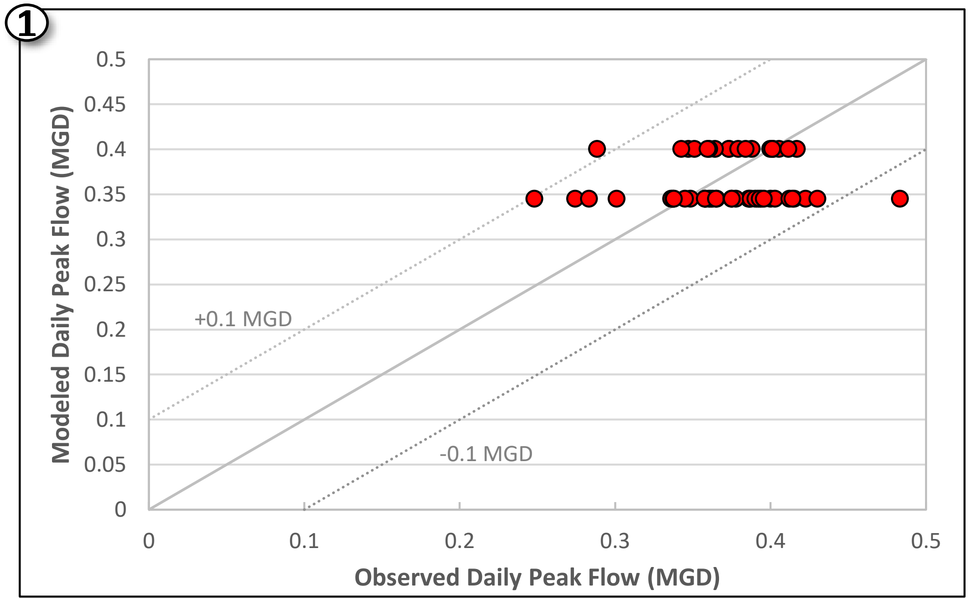
		Peak Precipitation Volume (inches)							
Duration		15-minute	30-minute	1-hour	2-hour	3-hour	6-hour	12-hour	24-hour
Return Frequency	1-year	0.71	1.02	1.32	1.62	1.81	2.22	2.74	3.29
	2-year	0.82	1.18	1.52	1.85	2.06	2.49	3.05	3.70
	5-year	1.00	1.44	1.85	2.25	2.49	2.97	3.60	4.40
	10-year	1.16	1.66	2.14	2.61	2.88	3.42	4.11	5.03
	25-year	1.38	1.98	2.56	3.13	3.46	4.10	4.88	5.95
	50-year	1.56	2.24	2.90	3.56	3.95	4.67	5.53	6.70
	100-year	1.74	2.50	3.25	4.01	4.46	5.29	6.23	7.50
Event	8/10/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	8/10/18	0.04	0.07	0.07	0.07	0.07	0.07	0.08	0.08
	8/17/18	0.37	0.44	0.59	0.64	0.64	0.66	0.66	0.66
	8/18/18	0.09	0.12	0.21	0.21	0.22	0.22	0.22	0.22
	8/21/18	0.13	0.24	0.32	0.32	0.32	0.33	0.33	0.33
	9/8/18	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	9/9/18	0.10	0.11	0.11	0.11	0.11	0.11	0.11	0.11
	9/11/18	0.64	0.77	0.81	0.81	0.81	0.81	0.81	0.81
	9/16/18	0.02	0.03	0.04	0.05	0.05	0.05	0.05	0.05
	9/16/18	0.01	0.01	0.01	0.01	0.01	0.01	0.06	0.06
	9/20/18	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
	9/21/18	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
	9/26/18	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03
	9/26/18	0.31	0.35	0.39	0.40	0.43	0.61	0.65	0.68
	9/27/18	0.17	0.22	0.30	0.35	0.35	0.35	0.35	0.68
	9/28/18	0.02	0.03	0.03	0.04	0.04	0.05	0.05	0.05
	10/10/18	0.01	0.01	0.02	0.02	0.02	0.03	0.04	0.04
	10/10/18	0.18	0.29	0.48	0.76	1.16	1.84	2.78	2.82
	10/20/18	0.04	0.04	0.05	0.07	0.07	0.07	0.07	0.07
	10/25/18	0.06	0.09	0.14	0.22	0.30	0.49	0.78	0.83
	10/27/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.03
	11/1/18	0.11	0.16	0.25	0.35	0.36	0.37	0.37	0.37
	11/2/18	0.04	0.06	0.07	0.08	0.10	0.10	0.10	0.47
	11/5/18	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02
	11/5/18	0.07	0.11	0.14	0.14	0.15	0.18	0.22	0.22
	11/7/18	0.06	0.12	0.24	0.38	0.43	0.43	0.43	0.43
	11/8/18	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.47
	11/8/18	0.27	0.34	0.39	0.40	0.41	0.50	0.69	0.76
	11/12/18	0.13	0.22	0.41	0.64	0.91	1.19	1.84	2.16
	11/20/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	11/23/18	0.06	0.11	0.17	0.27	0.29	0.33	0.37	0.38
	11/25/18	0.04	0.07	0.07	0.09	0.12	0.12	0.13	0.13
	11/30/18	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	12/1/18	0.20	0.26	0.39	0.59	0.77	1.34	1.47	1.60
	12/7/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	12/8/18	0.10	0.18	0.29	0.41	0.57	0.90	1.60	2.40
	12/10/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.67
	12/10/18	0.01	0.02	0.04	0.06	0.07	0.12	0.13	0.15

Rain Gauge:	RGUCKC1
Sewershed	Upper Crooked Creek
Sewer Basin	Polebridge

		Peak Precipitation Volume (inches)							
Duration		15-minute	30-minute	1-hour	2-hour	3-hour	6-hour	12-hour	24-hour
Return Frequency	1-year	0.71	1.02	1.32	1.62	1.81	2.22	2.74	3.29
	2-year	0.82	1.18	1.52	1.85	2.06	2.49	3.05	3.70
	5-year	1.00	1.44	1.85	2.25	2.49	2.97	3.60	4.40
	10-year	1.16	1.66	2.14	2.61	2.88	3.42	4.11	5.03
	25-year	1.38	1.98	2.56	3.13	3.46	4.10	4.88	5.95
	50-year	1.56	2.24	2.90	3.56	3.95	4.67	5.53	6.70
	100-year	1.74	2.50	3.25	4.01	4.46	5.29	6.23	7.50
Event	12/14/18	0.15	0.25	0.35	0.61	0.67	0.77	0.96	1.15
	12/20/18	0.06	0.11	0.20	0.36	0.49	0.76	0.93	0.93
	12/20/18	0.08	0.15	0.21	0.33	0.40	0.47	0.50	1.41
	12/23/18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	12/27/18	0.19	0.34	0.44	0.71	0.80	1.12	1.84	2.42
	12/30/18	0.04	0.08	0.10	0.12	0.14	0.18	0.19	0.19
	12/30/18	0.02	0.02	0.02	0.02	0.03	0.03	0.18	0.24
	12/31/18	0.02	0.02	0.04	0.04	0.04	0.04	0.04	0.08
	1/1/19	0.10	0.12	0.14	0.15	0.16	0.16	0.16	0.16
	1/1/19	0.01	0.01	0.01	0.01	0.01	0.01	0.04	0.17
	1/2/19	0.07	0.11	0.15	0.23	0.25	0.41	0.64	0.71
	1/3/19	0.17	0.26	0.40	0.54	0.63	1.16	1.27	1.33
	1/4/19	0.03	0.04	0.04	0.04	0.04	0.04	1.00	1.34
	1/12/19	0.07	0.12	0.16	0.26	0.32	0.56	0.63	0.63
	1/16/19	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	1/17/19	0.01	0.02	0.03	0.04	0.04	0.05	0.05	0.05
	1/19/19	0.19	0.27	0.39	0.70	0.91	1.03	1.12	1.12
	1/23/19	0.38	0.56	0.92	1.18	1.34	1.67	1.73	1.73
	1/29/19	0.02	0.03	0.05	0.07	0.08	0.08	0.08	0.08
	2/3/19	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02
	2/6/19	0.11	0.18	0.19	0.19	0.21	0.23	0.23	0.23
	2/10/19	0.01	0.01	0.02	0.03	0.03	0.03	0.03	0.03
	2/11/19	0.01	0.01	0.01	0.01	0.01	0.01	0.04	0.04
	2/11/19	0.05	0.07	0.07	0.08	0.08	0.09	0.11	0.12
	2/12/19	0.36	0.42	0.50	0.57	0.57	0.59	0.61	0.70
	2/15/19	0.08	0.11	0.18	0.21	0.22	0.25	0.34	0.34
	2/17/19	0.04	0.06	0.06	0.06	0.06	0.07	0.08	0.10
	2/19/19	0.21	0.33	0.39	0.56	0.59	0.70	0.81	0.91
	2/20/19	0.11	0.16	0.16	0.21	0.24	0.45	0.65	0.72
	2/21/19	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.53
	2/23/19	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	2/23/19	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02
	2/24/19	0.05	0.07	0.12	0.20	0.20	0.21	0.21	0.22
	2/27/19	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	2/28/19	0.06	0.09	0.14	0.20	0.22	0.29	0.30	0.30

Appendix B
DWF Calibration

①



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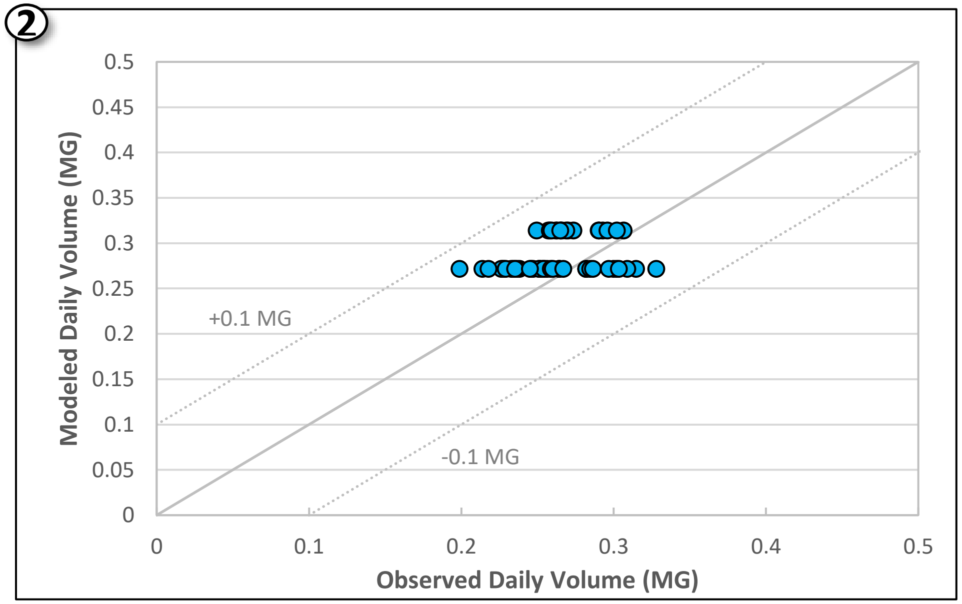

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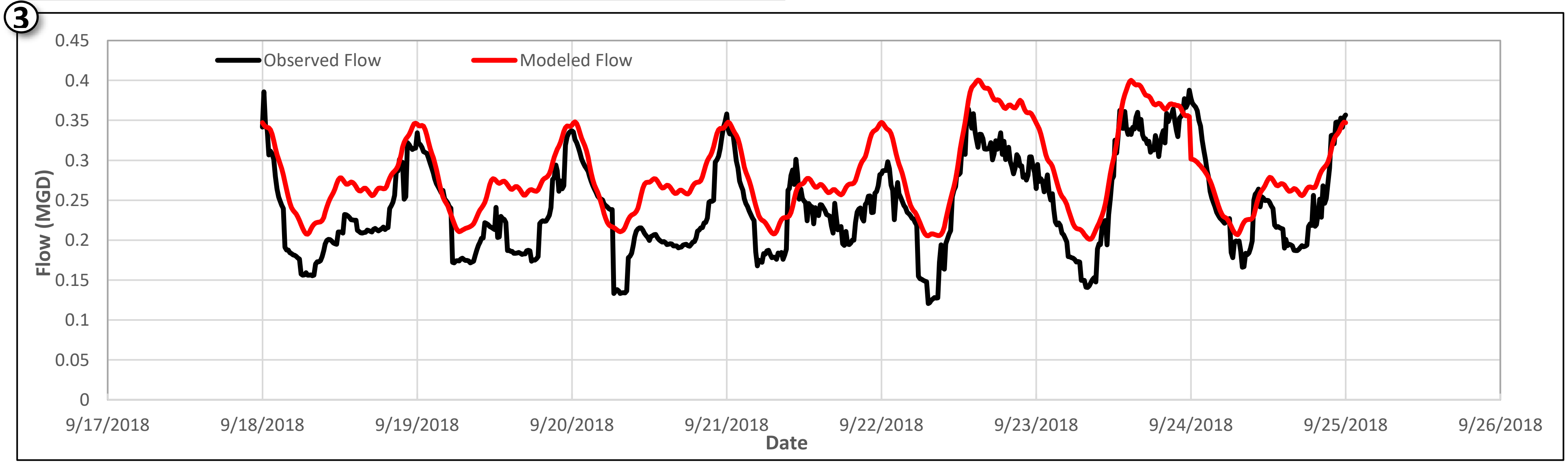


DeKalb Calibration Results

Dry Weather
Flow Summary

Flow Meter: **CKC1**

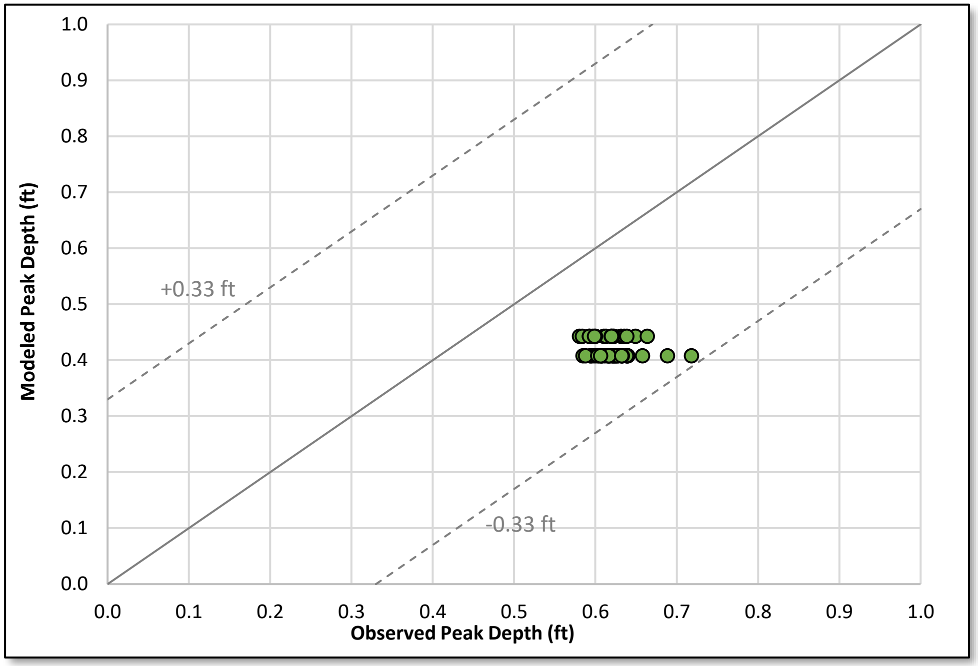
Sewershed: **Crooked Creek**

Sewer Basin: **Pole Bridge Basin**

① Daily Volume
② Daily Peak Flow
③ One Week Time Series

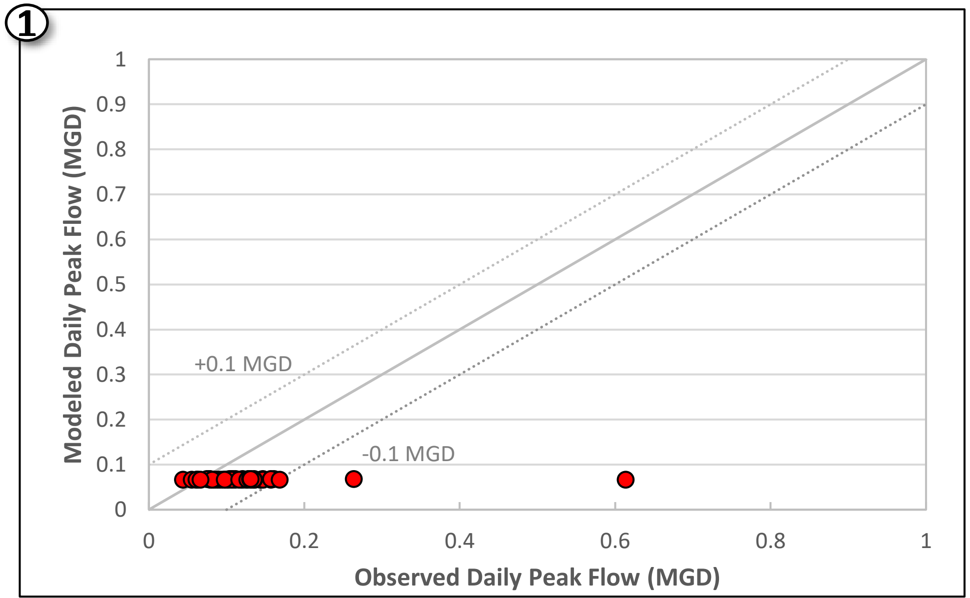
Total Compared Dry Days:

55



Flow Meter:
CKC1

①



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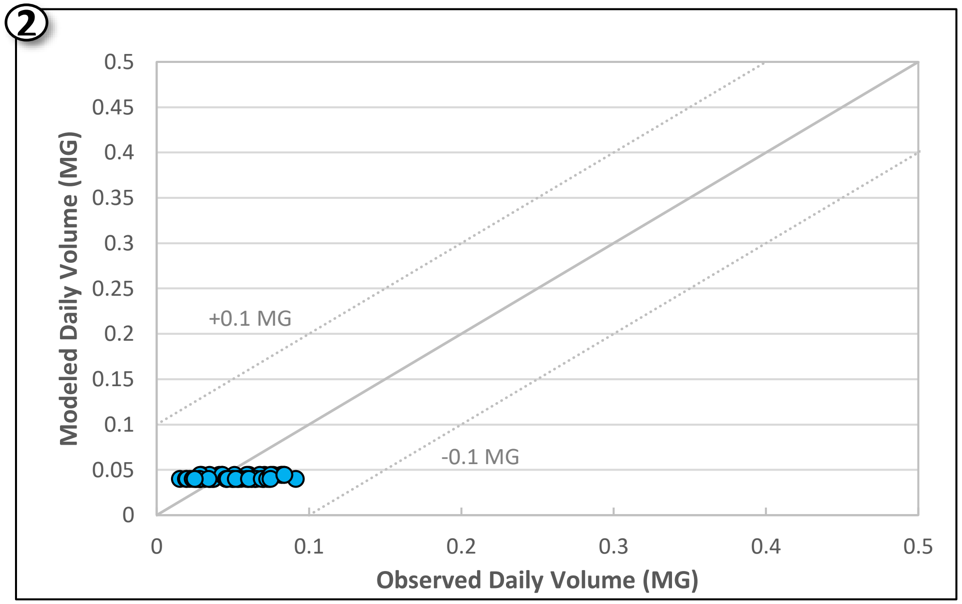

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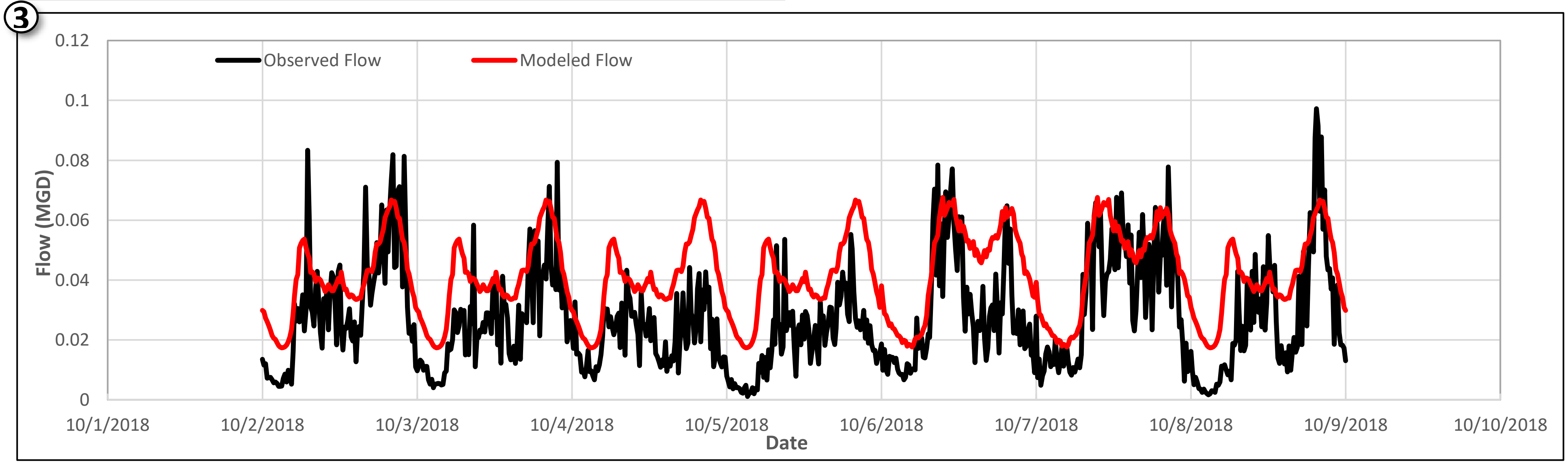


DeKalb Calibration Results

Dry Weather
Flow Summary

Flow Meter: **DK10**

Sewershed: **Honey Creek**

Sewer Basin: **Pole Bridge Basin**

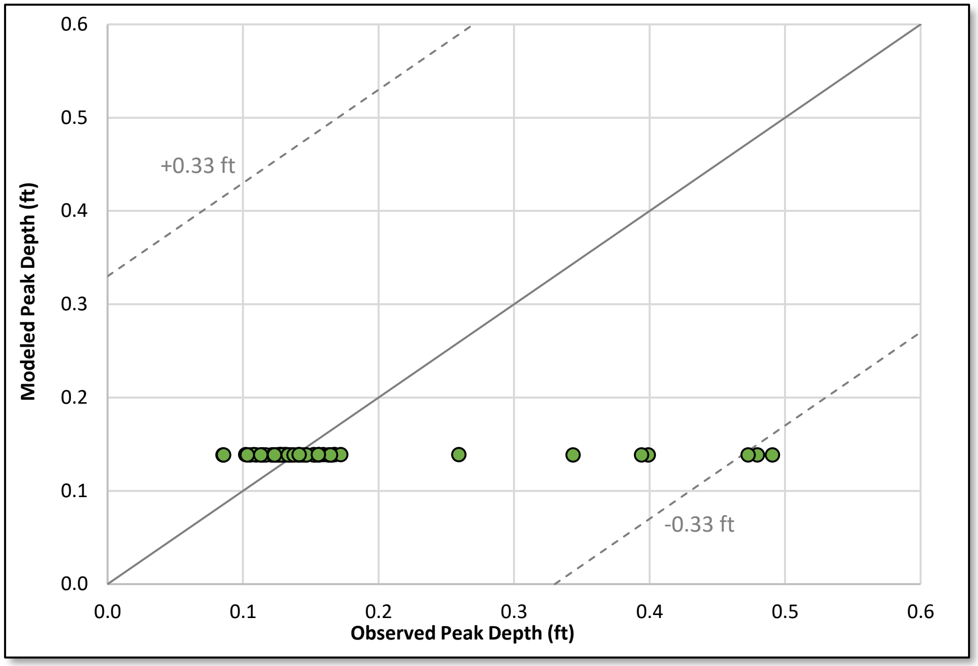
① Daily Volume

② Daily Peak Flow

③ One Week Time Series

Total Compared Dry Days:

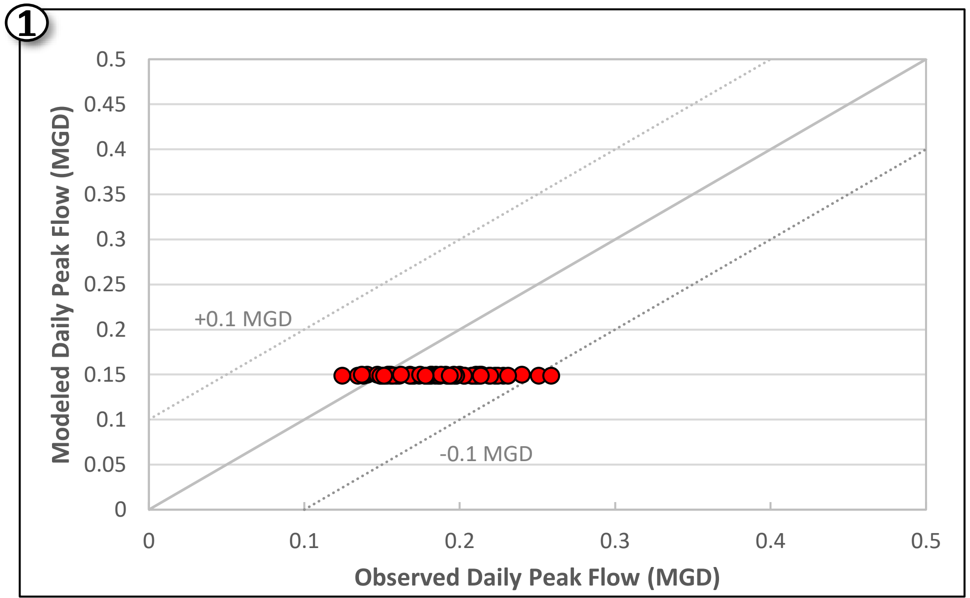
63



Flow Meter:

DK10

①



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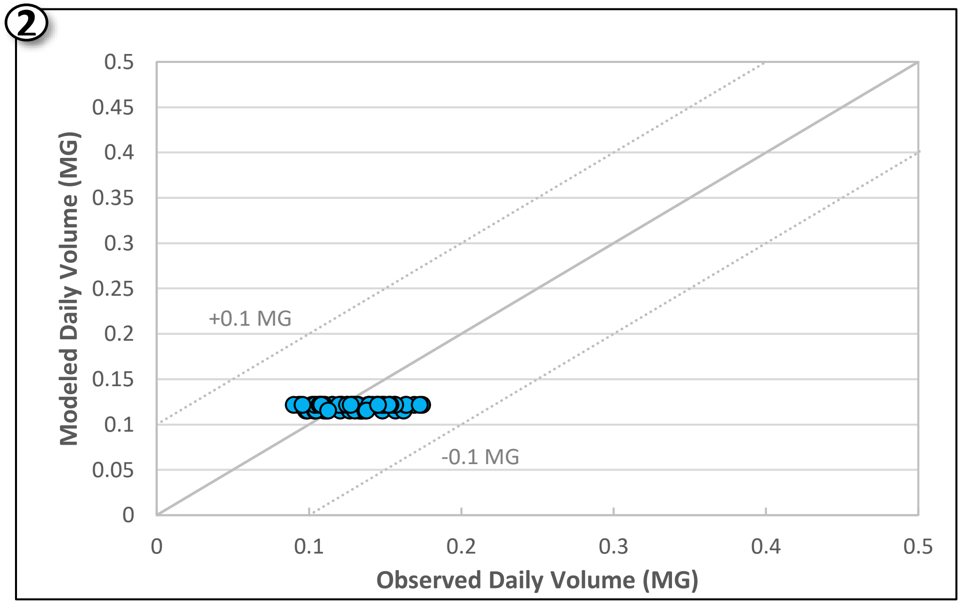

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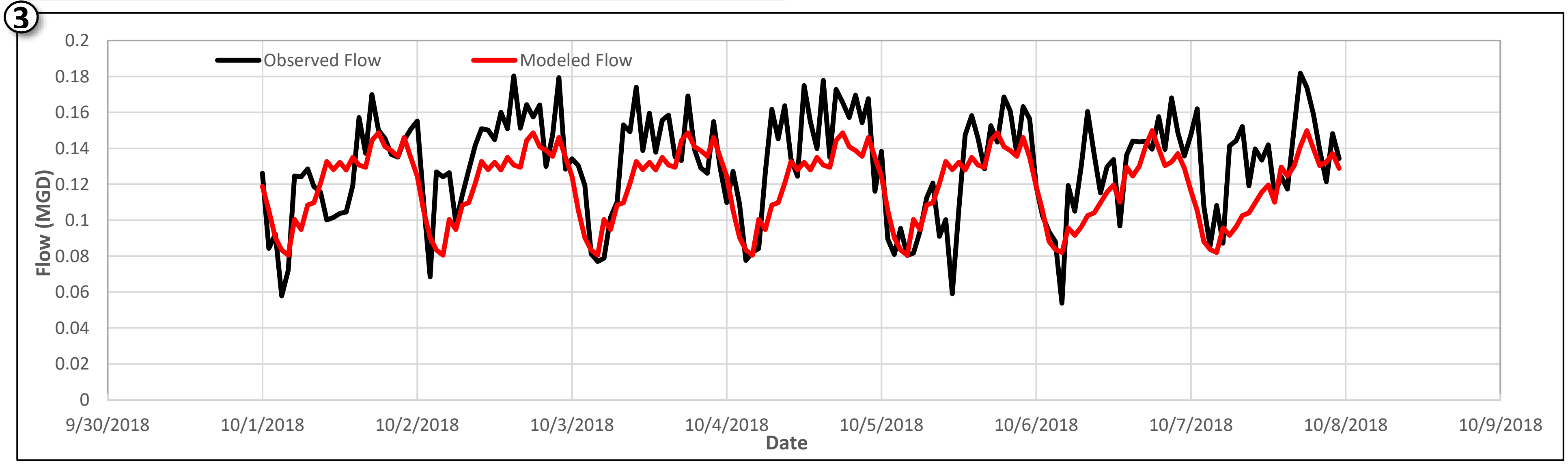


DeKalb Calibration Results

Dry Weather
Flow Summary

Flow Meter: **DK11**

Sewershed: **Honey Creek**

Sewer Basin: **Pole Bridge Basin**

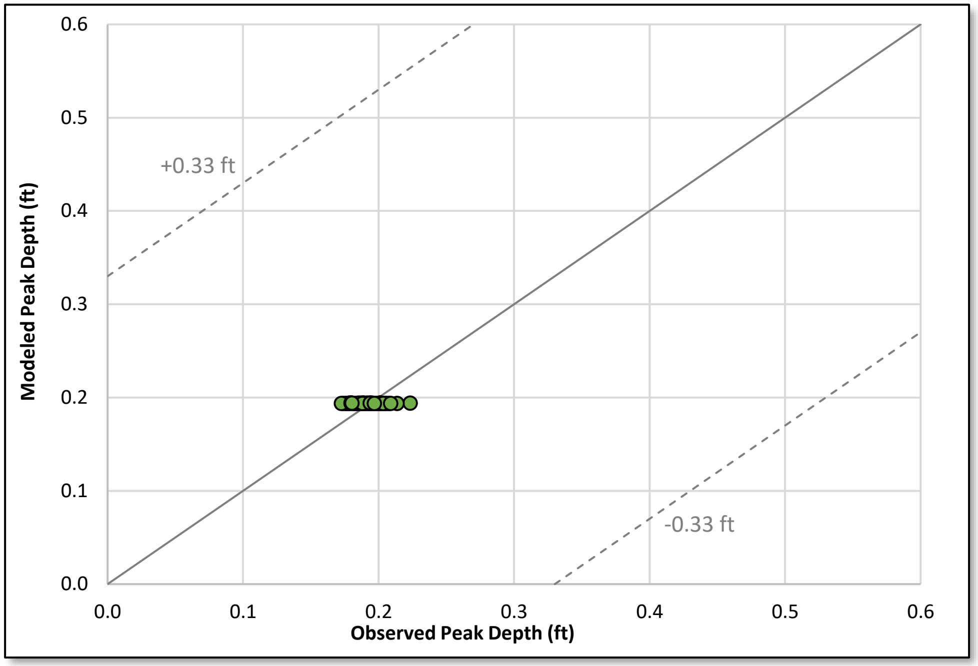
① Daily Volume

② Daily Peak Flow

③ One Week Time Series

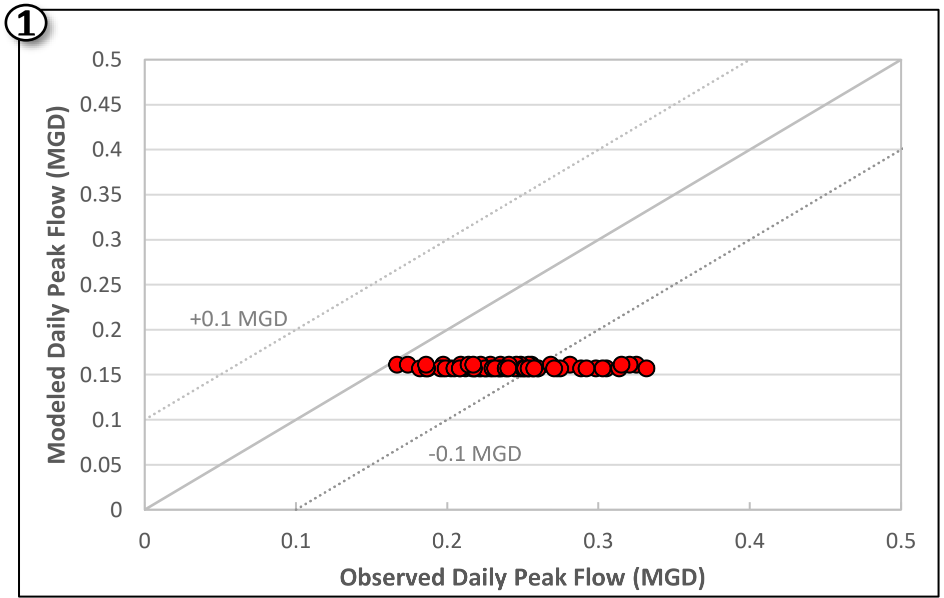
Total Compared Dry Days:

75



Flow Meter:
DK11

①



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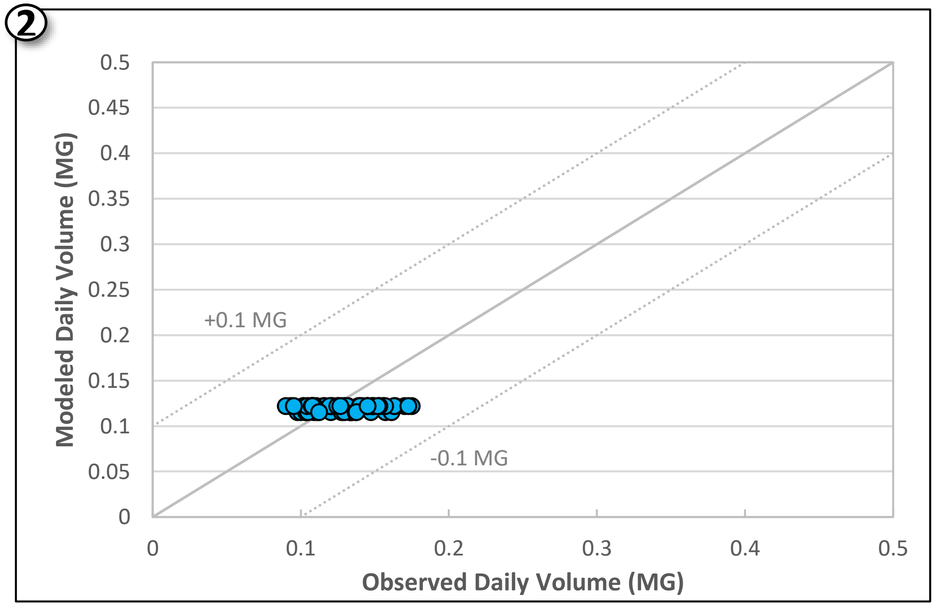

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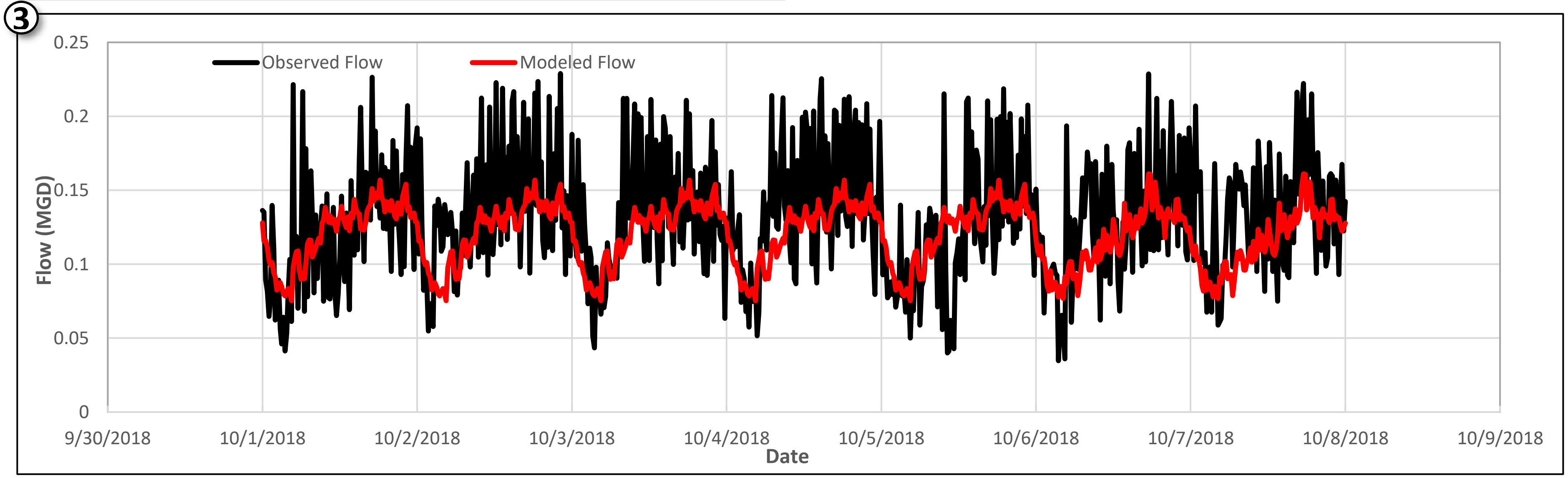


DeKalb Calibration Results

Dry Weather
Flow Summary

Flow Meter: **DK11**

Sewershed: **Honey Creek**

Sewer Basin: **Pole Bridge Basin**

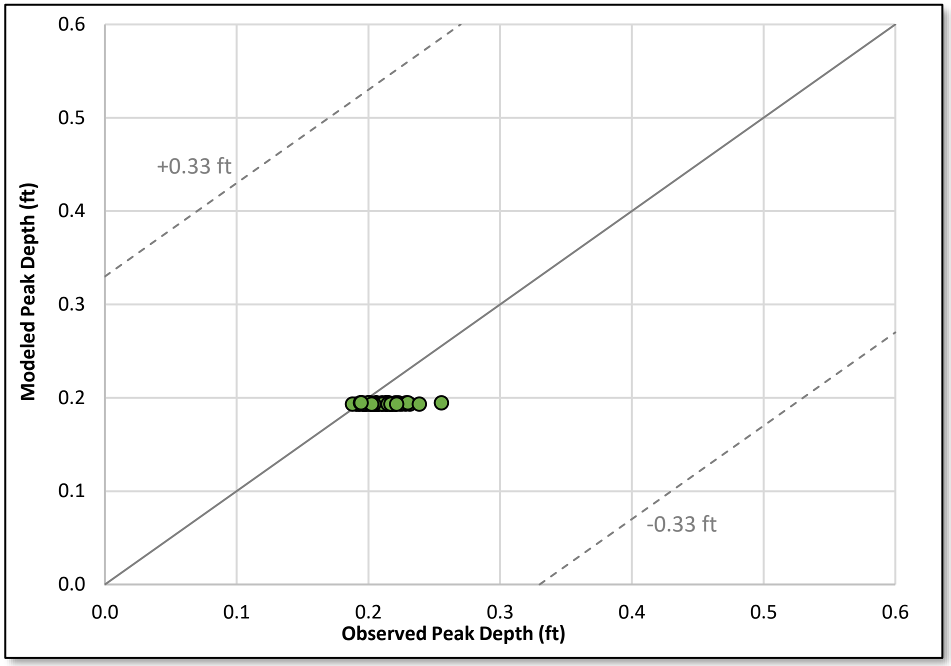
① Daily Volume

② Daily Peak Flow

③ One Week Time Series

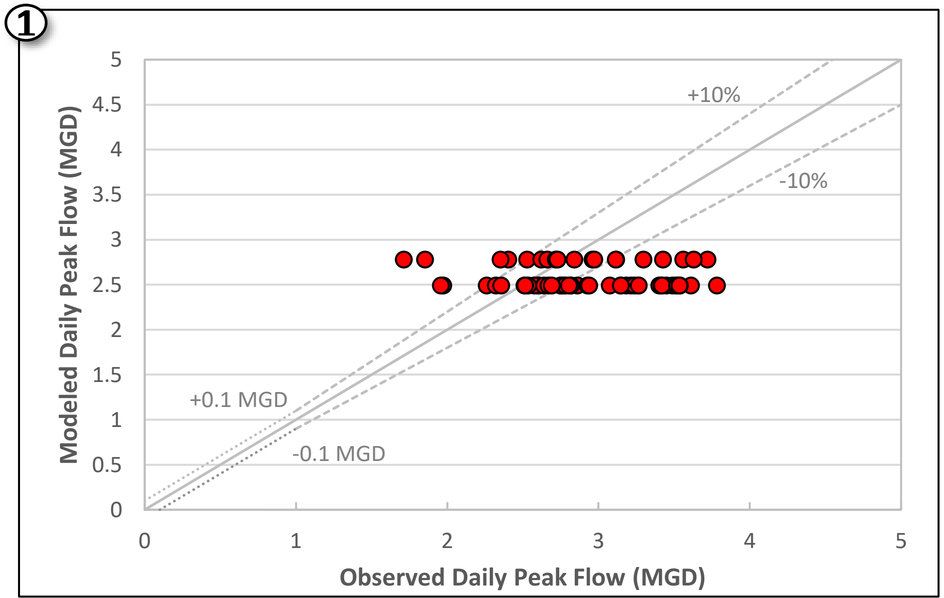
Total Compared Dry Days:

75



Flow Meter:
DK11

①



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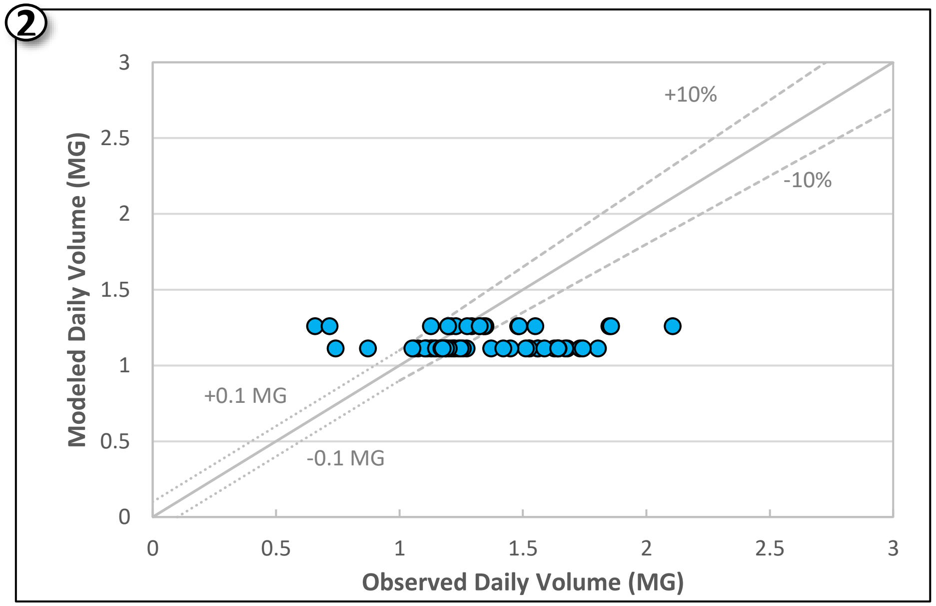

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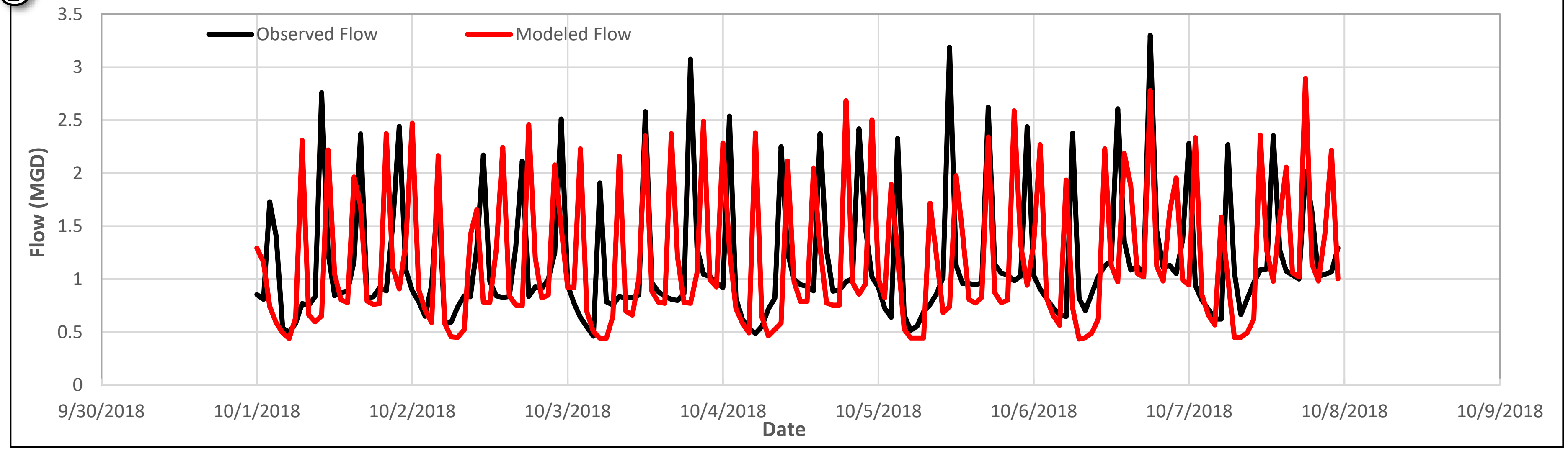


DeKalb Calibration Results

Dry Weather
Flow Summary

Flow Meter: **HON1**

Sewershed: **Honey Creek**

Sewer Basin: **Pole Bridge Basin**

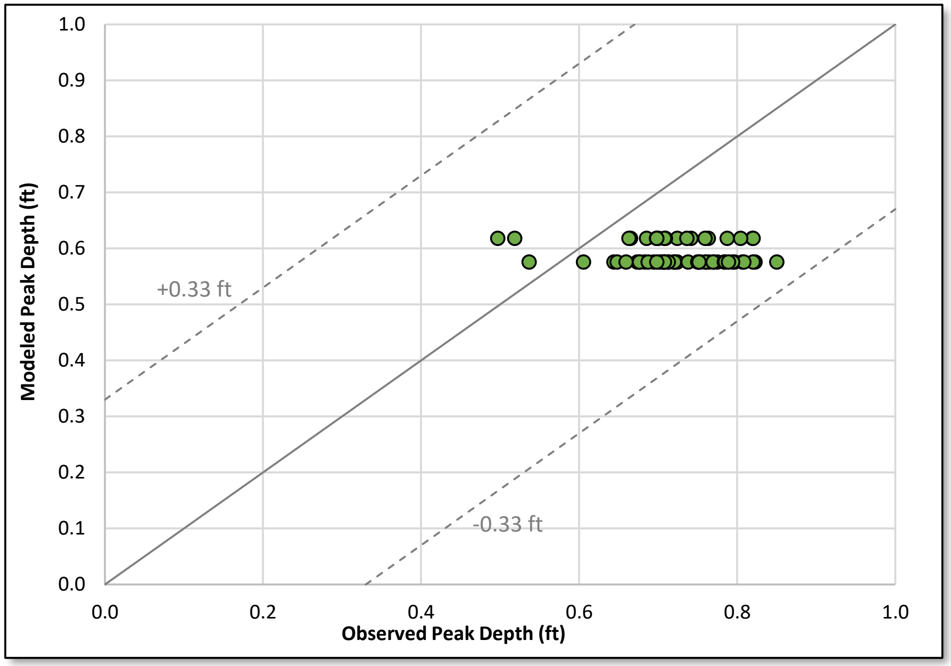
① Daily Volume

② Daily Peak Flow

③ One Week Time Series

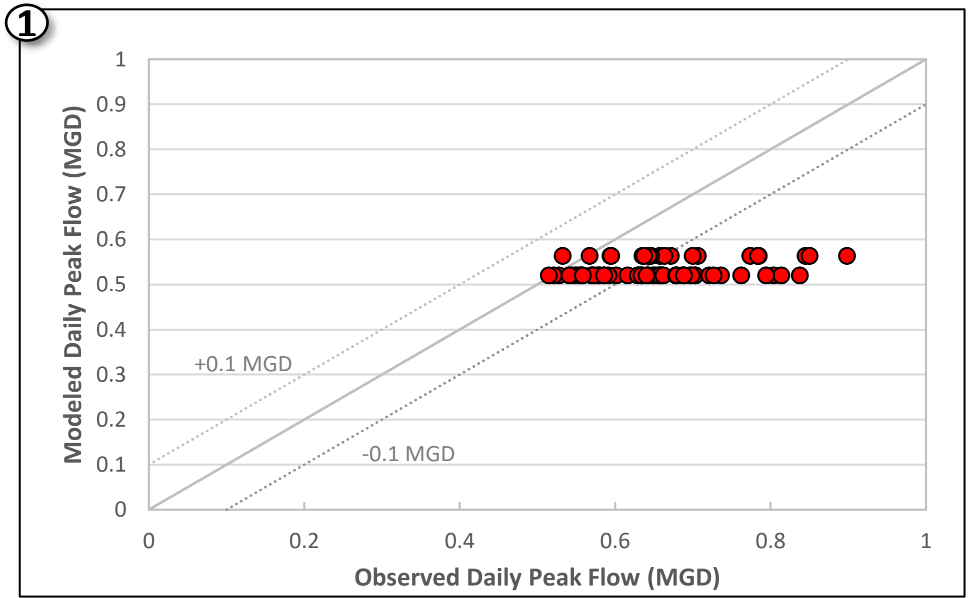
Total Compared Dry Days:

64



Flow Meter:
HON1

①



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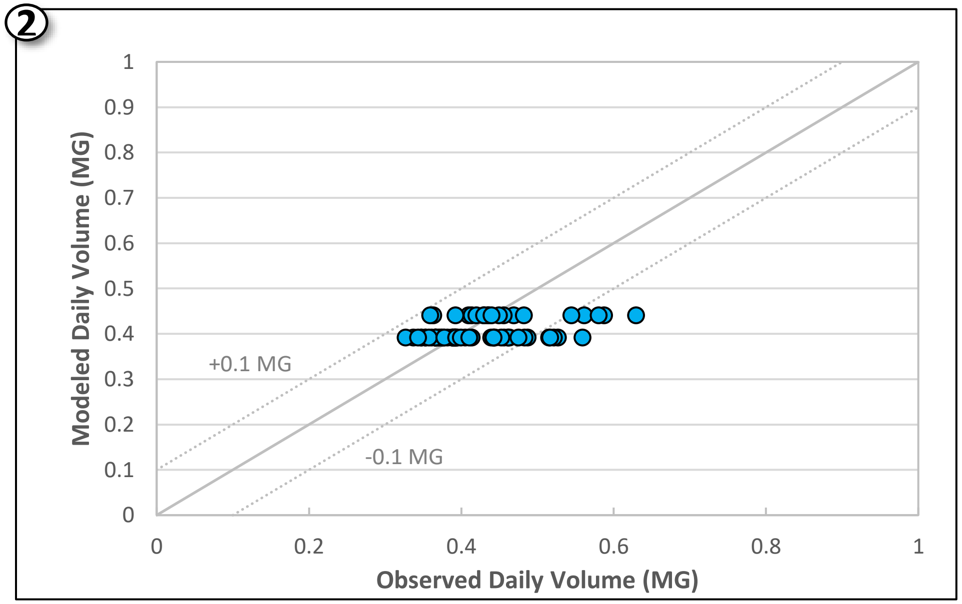

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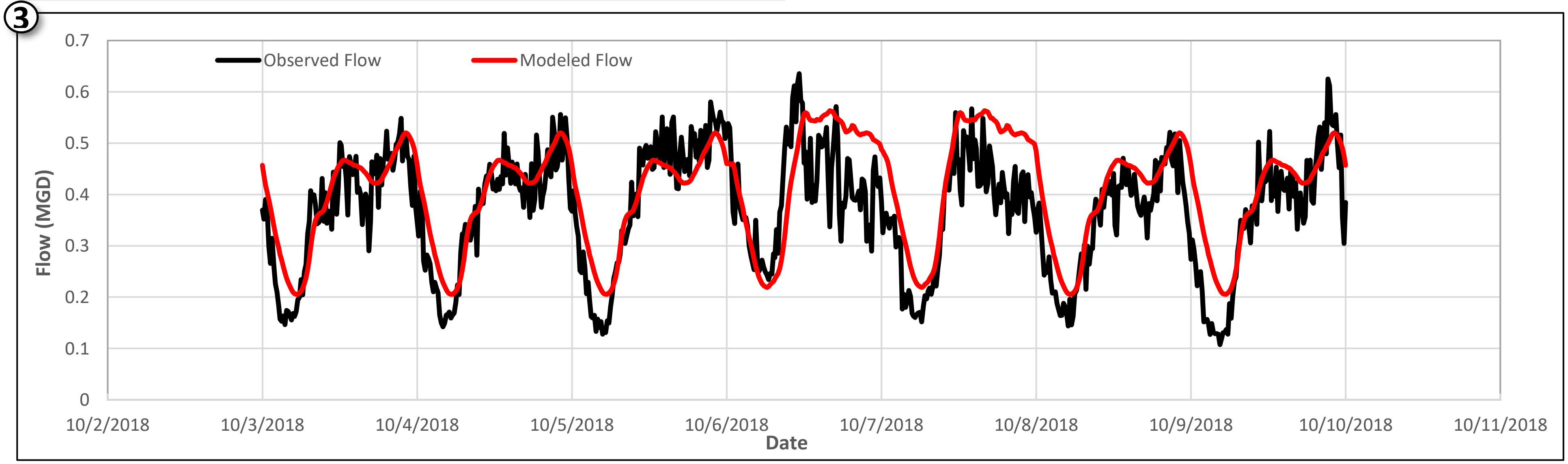


DeKalb Calibration Results

Dry Weather
Flow Summary

Flow Meter: **HON2**

Sewershed: **Honey Creek**

Sewer Basin: **Pole Bridge Basin**

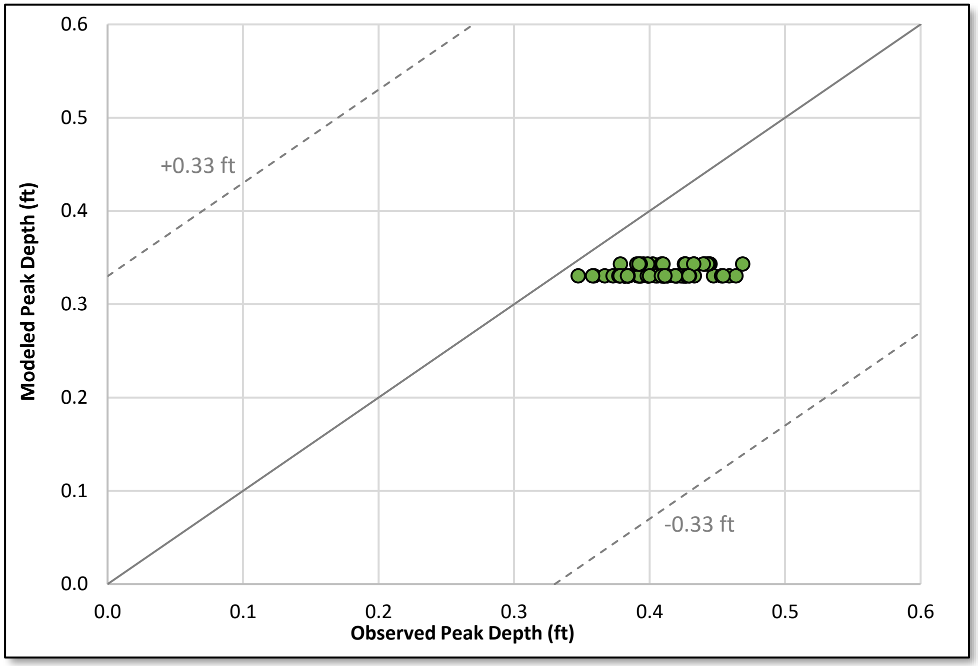
① Daily Volume

② Daily Peak Flow

③ One Week Time Series

Total Compared Dry Days:

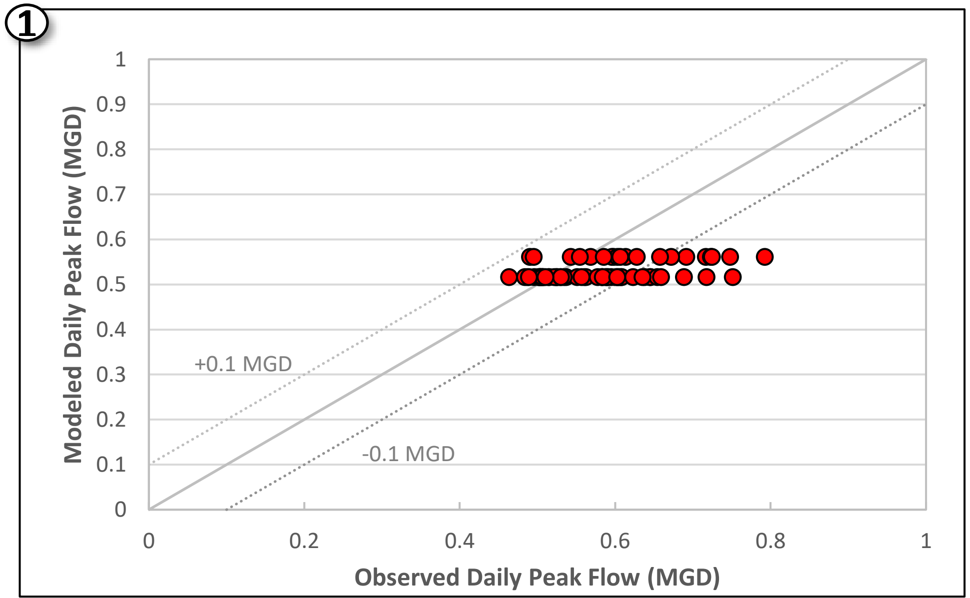
75



Flow Meter:

HON2

①



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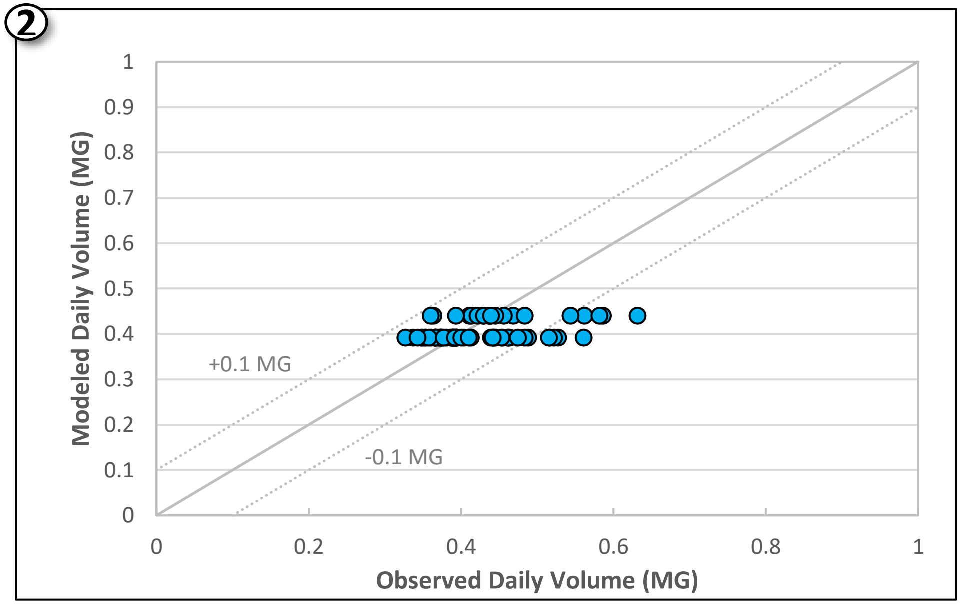

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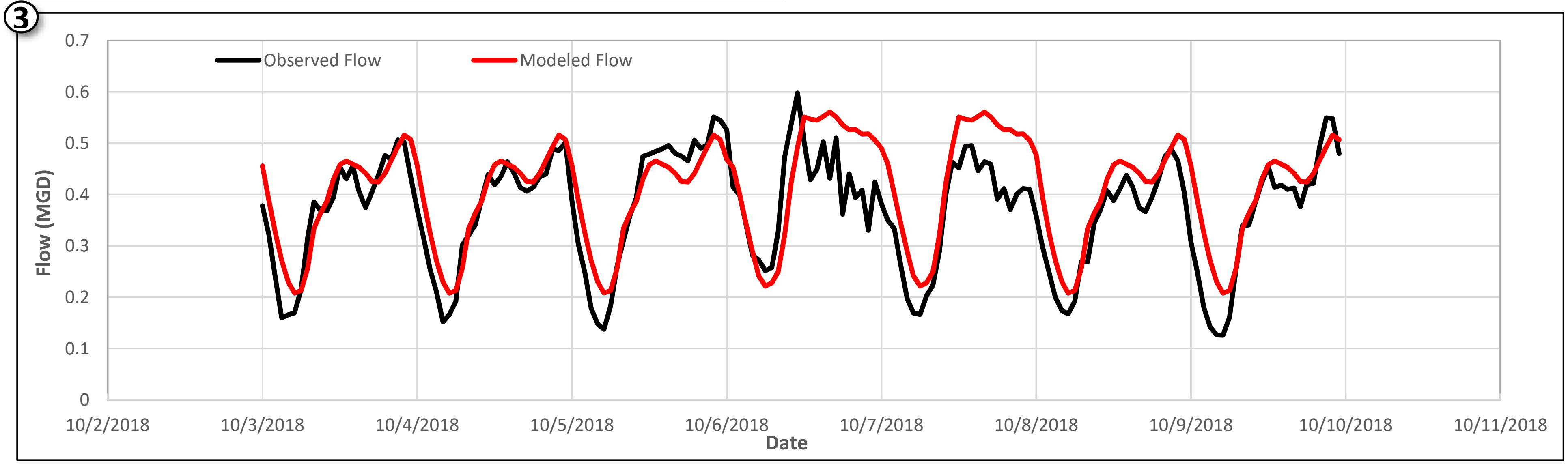


DeKalb Calibration Results

Dry Weather
Flow Summary

Flow Meter: **HON2**

Sewershed: **Honey Creek**

Sewer Basin: **Pole Bridge Basin**

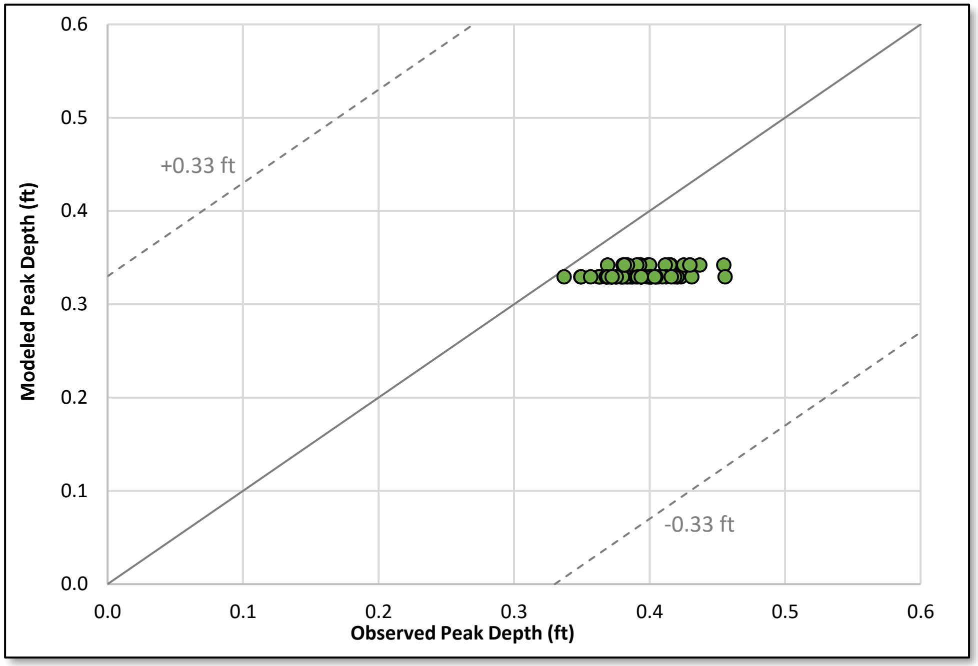
① Daily Volume

② Daily Peak Flow

③ One Week Time Series

Total Compared Dry Days:

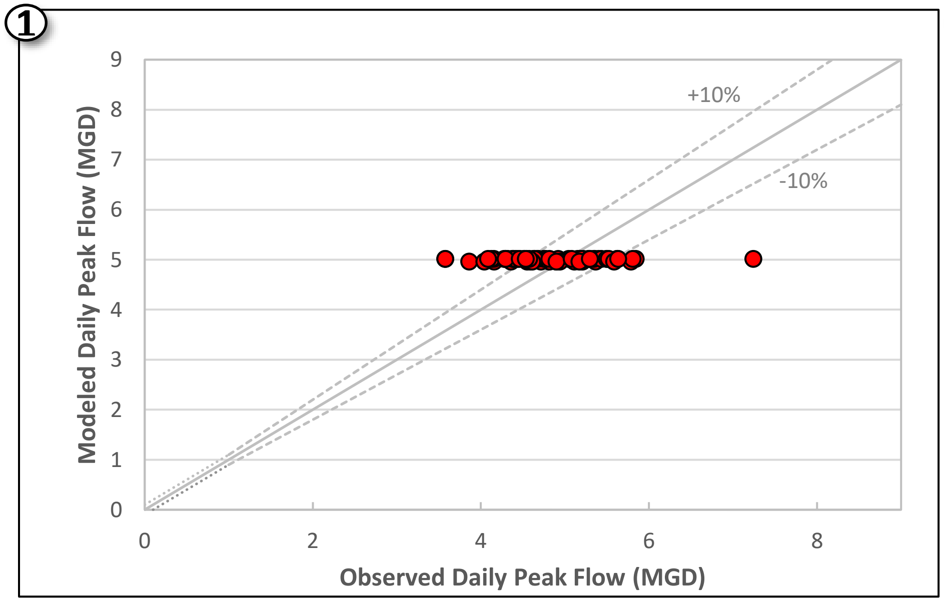
75



Flow Meter:

HON2

①



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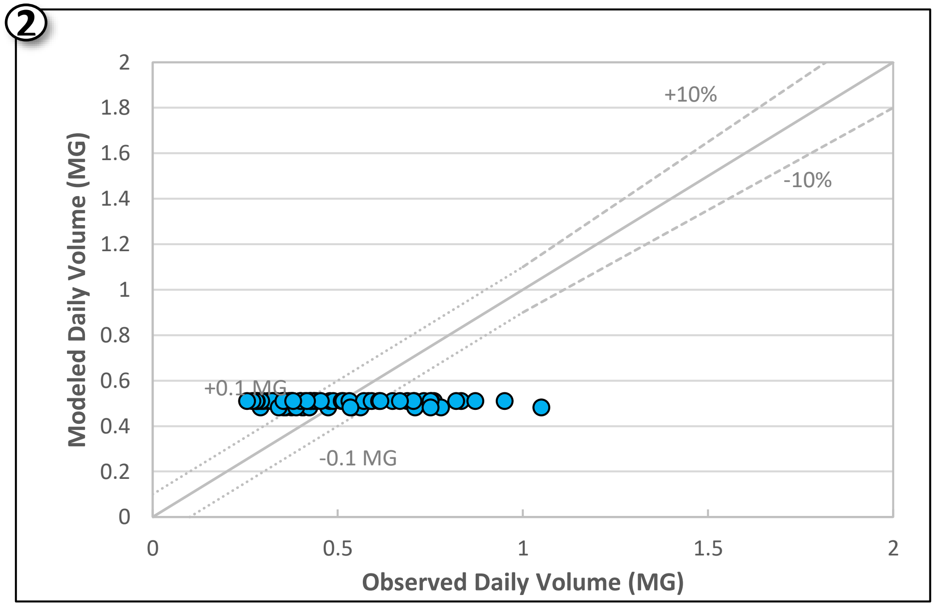

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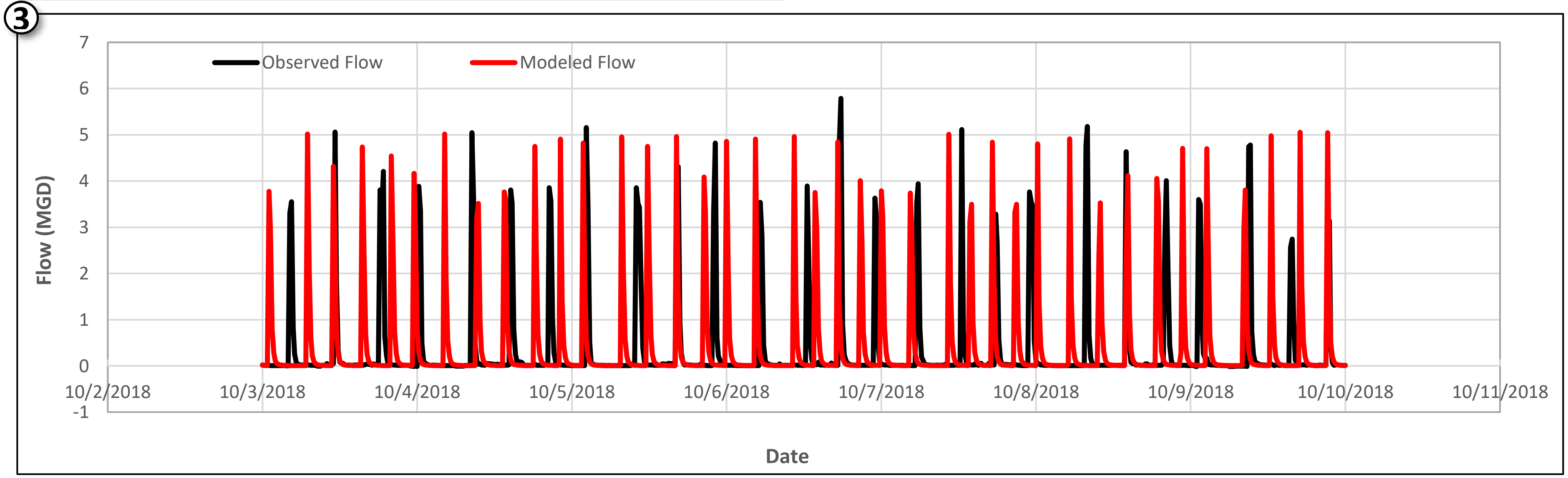


DeKalb Calibration Results

Dry Weather
Flow Summary

Flow Meter: **HON3**

Sewershed: **Honey Creek**

Sewer Basin: **Pole Bridge Basin**

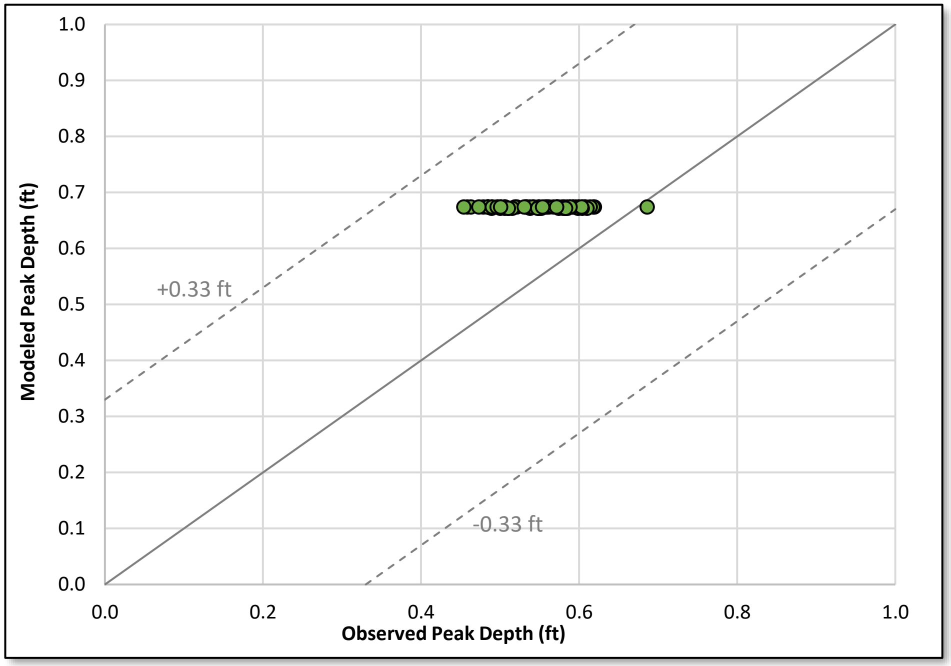
① Daily Volume

② Daily Peak Flow

③ One Week Time Series

Total Compared Dry Days:

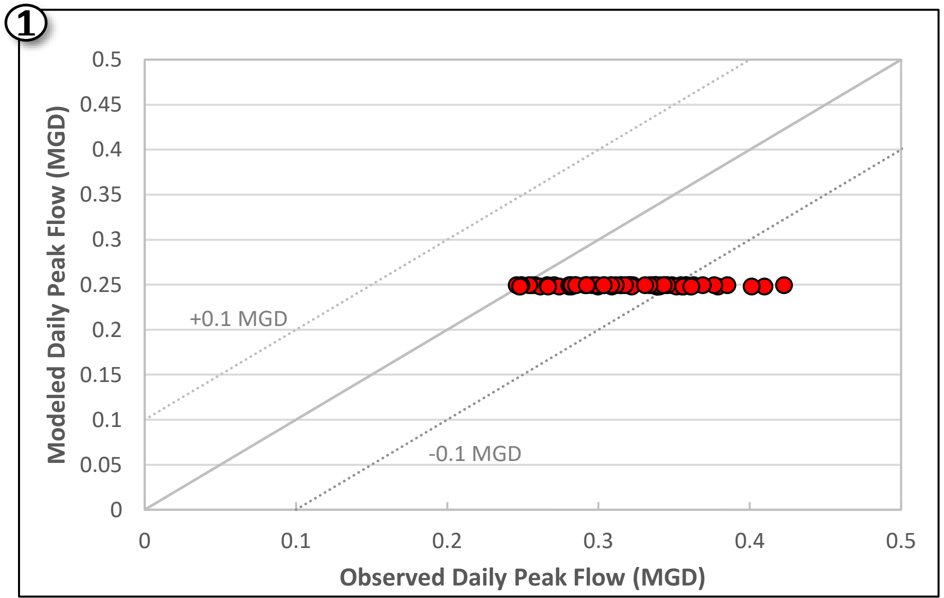
74



Flow Meter:

HON3

①



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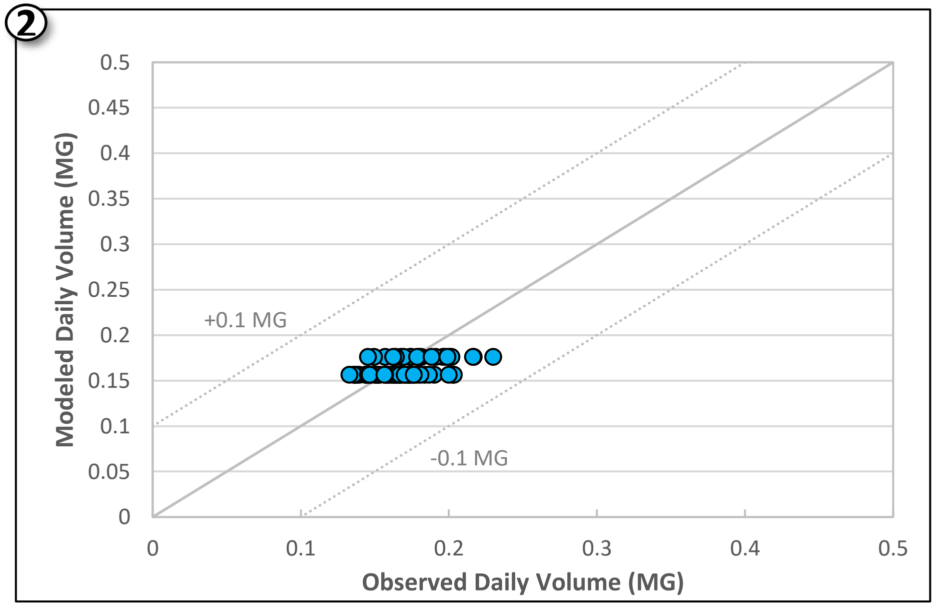

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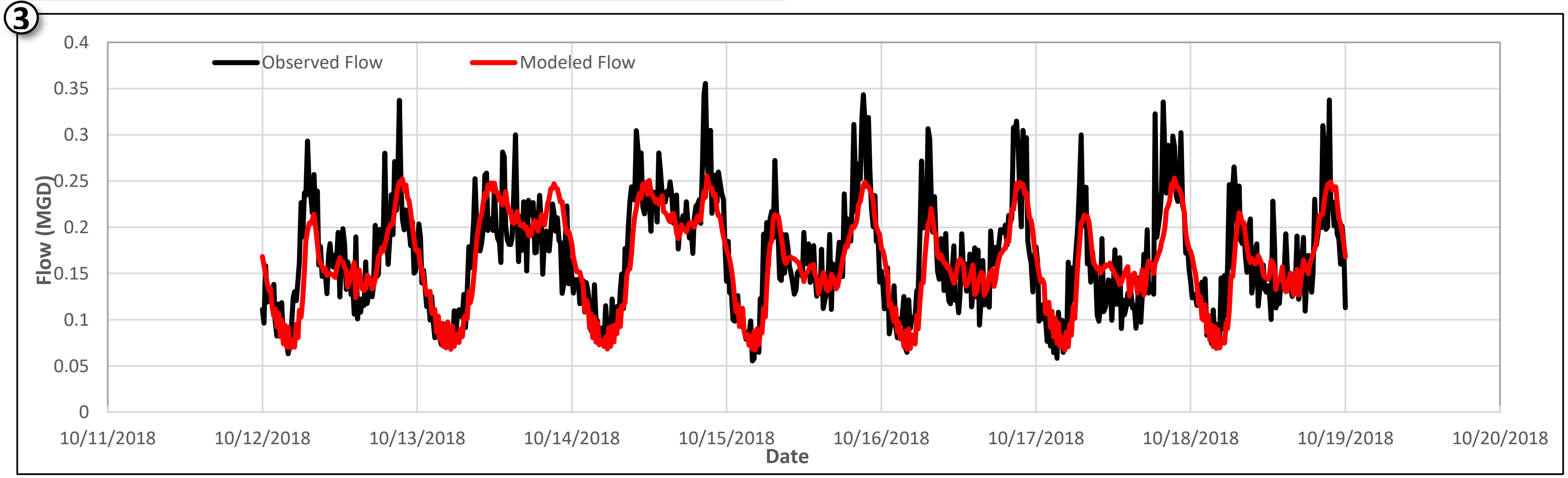


DeKalb Calibration Results

Dry Weather
Flow Summary

Flow Meter: **JSC1**

Sewershed: **Johnson Creek**

Sewer Basin: **Pole Bridge Basin**

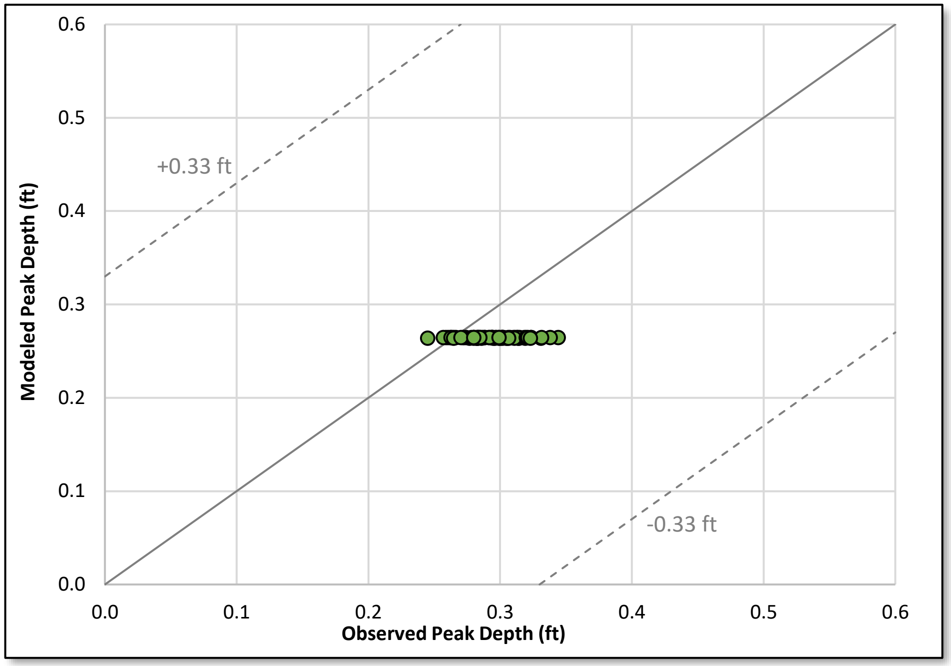
① Daily Volume

② Daily Peak Flow

③ One Week Time Series

Total Compared Dry Days:

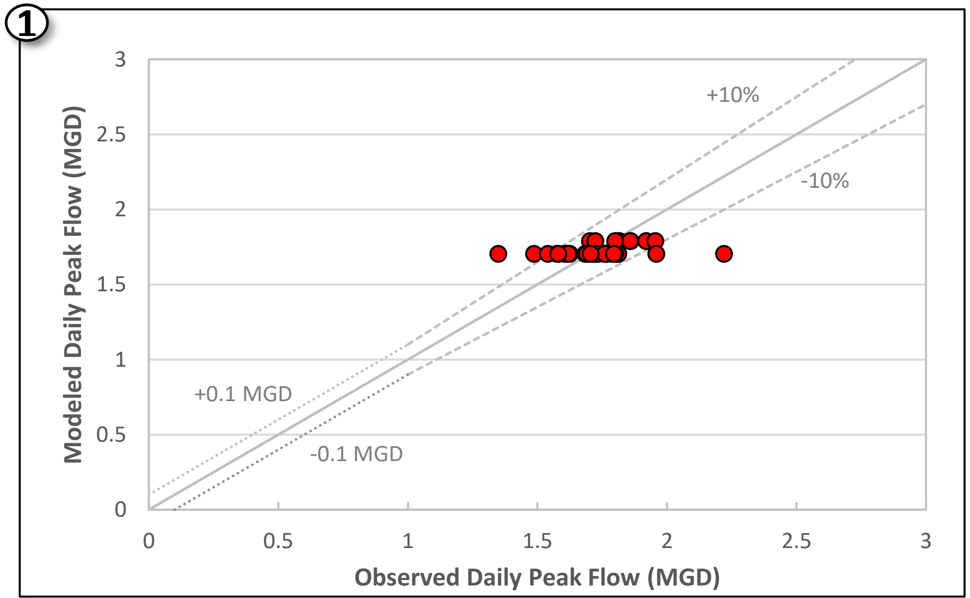
79



Flow Meter:

JSC1

①



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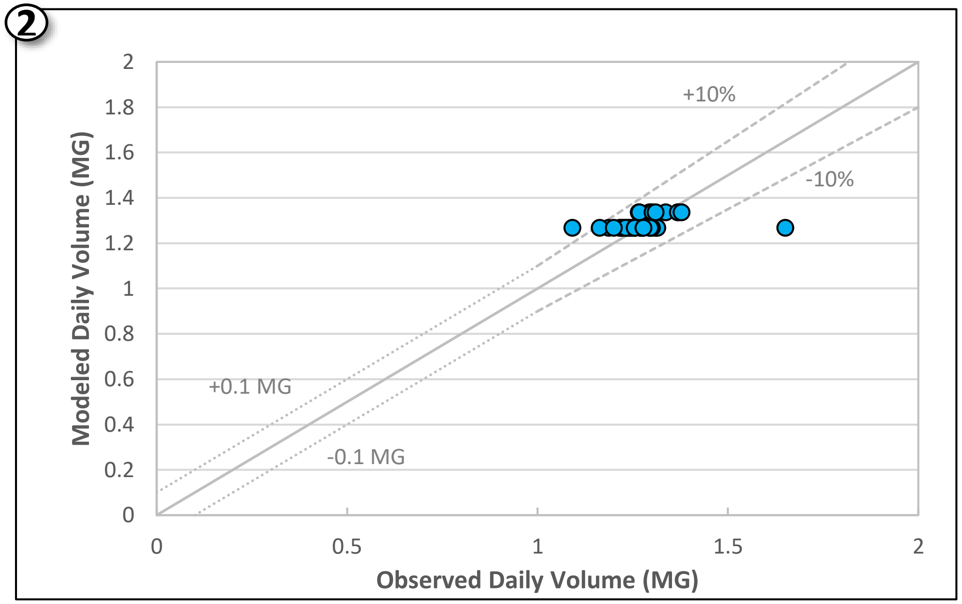

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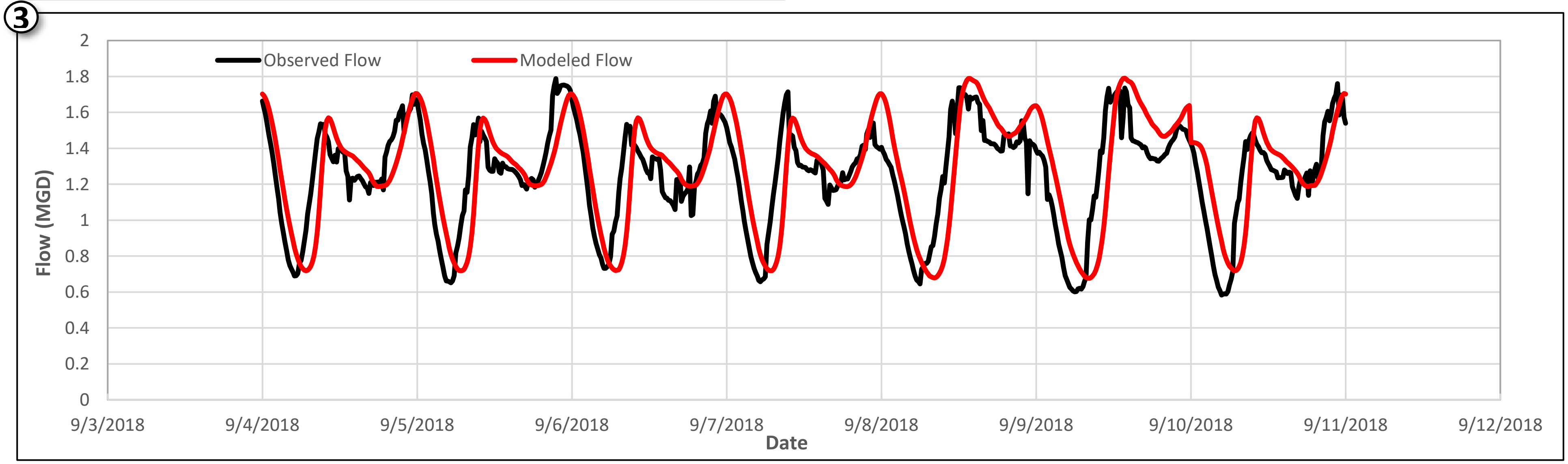


DeKalb Calibration Results

Dry Weather
Flow Summary

Flow Meter: **LCKC1**

Sewershed: **Lower Crooked Creek**

Sewer Basin: **Pole Bridge Basin**

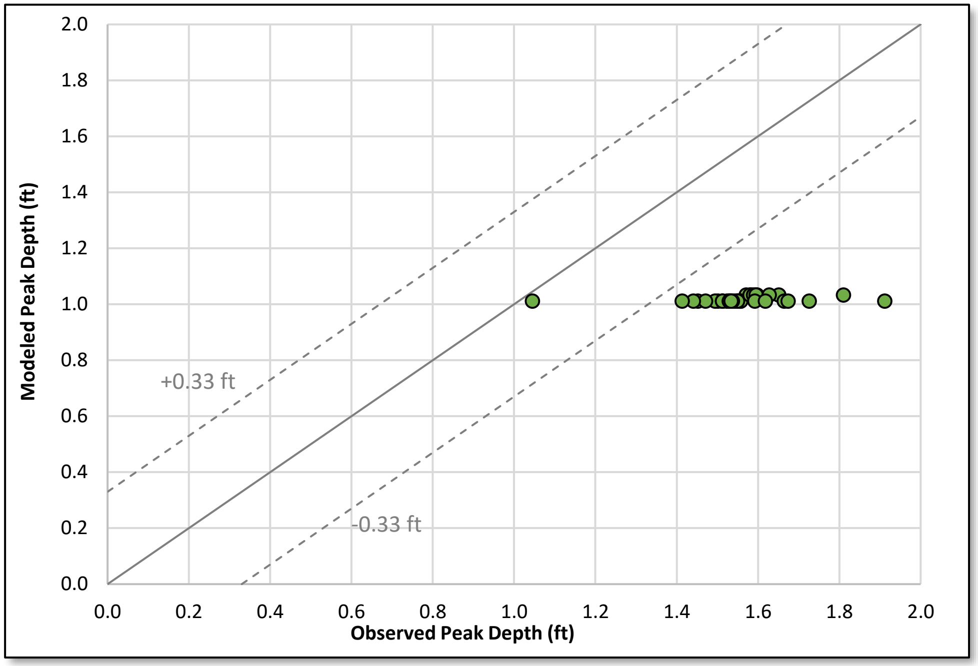
① Daily Volume

② Daily Peak Flow

③ One Week Time Series

Total Compared Dry Days:

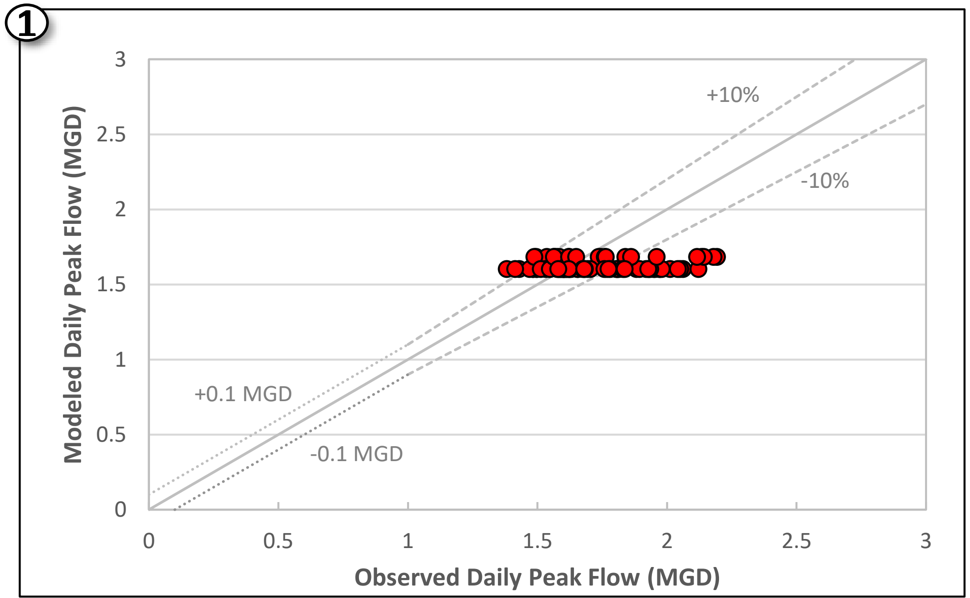
40



Flow Meter:

LCKC1

①



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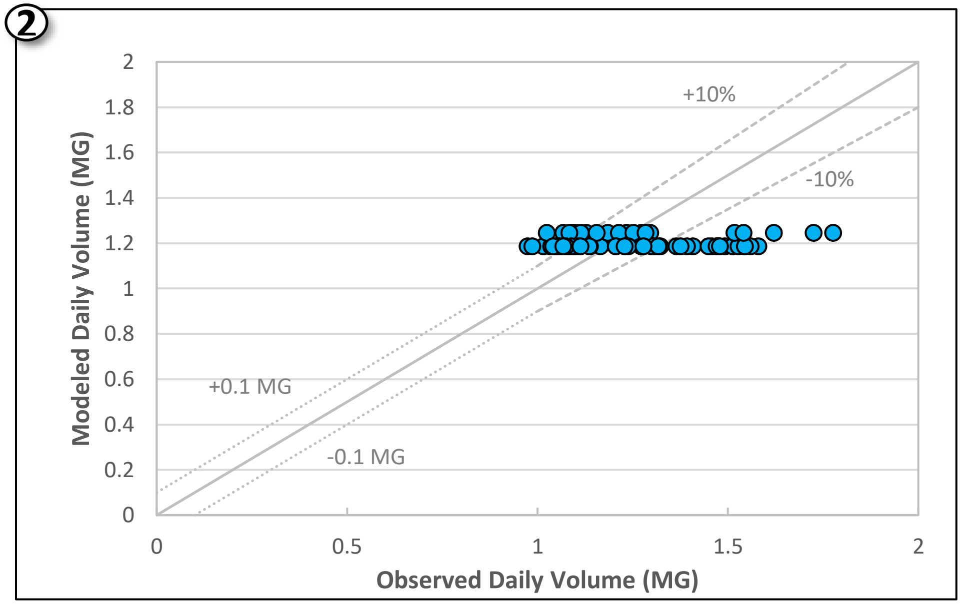

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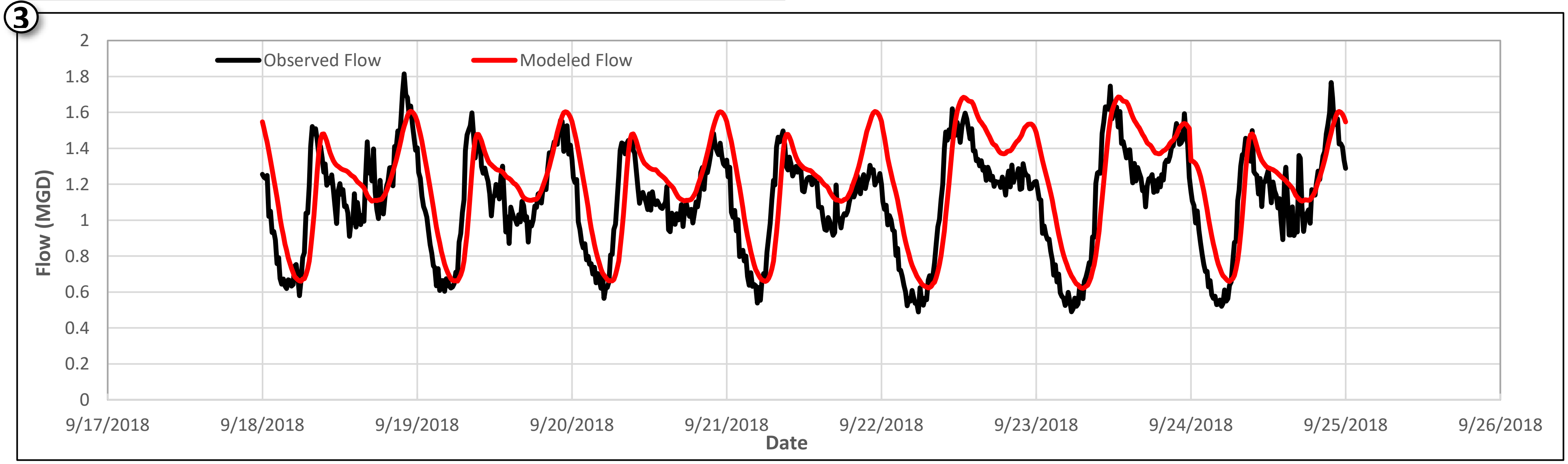


DeKalb Calibration Results

Dry Weather
Flow Summary

Flow Meter: **LCKC2**

Sewershed: **Lower Crooked Creek**

Sewer Basin: **Pole Bridge Basin**

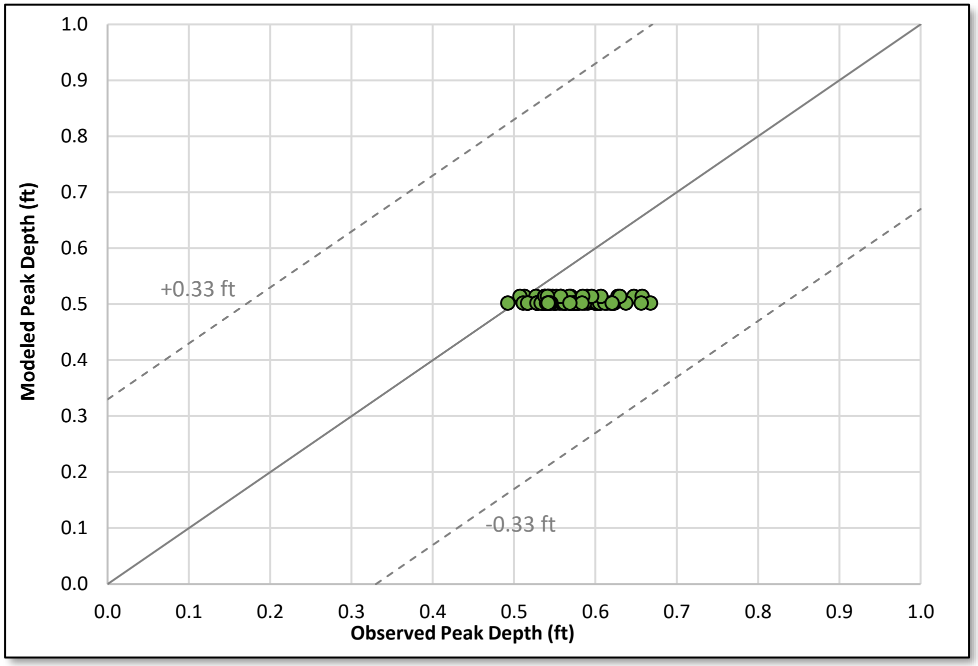
① Daily Volume

② Daily Peak Flow

③ One Week Time Series

Total Compared Dry Days:

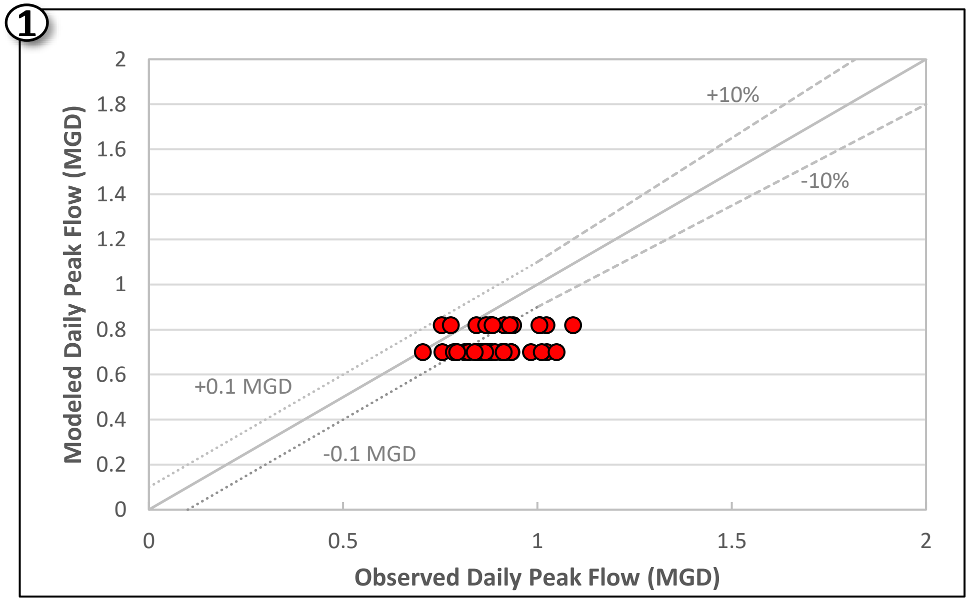
82



Flow Meter:

LCKC2

①



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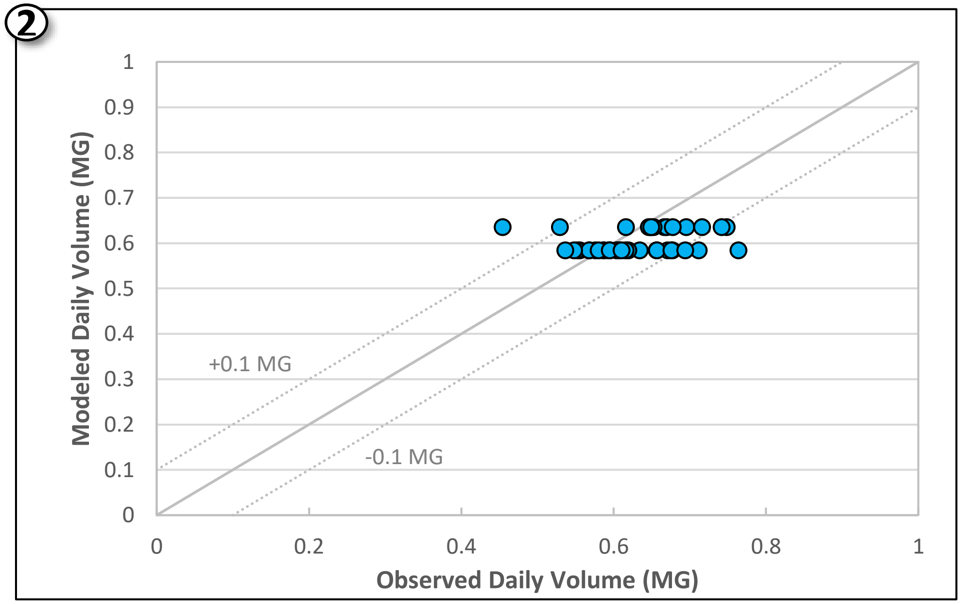

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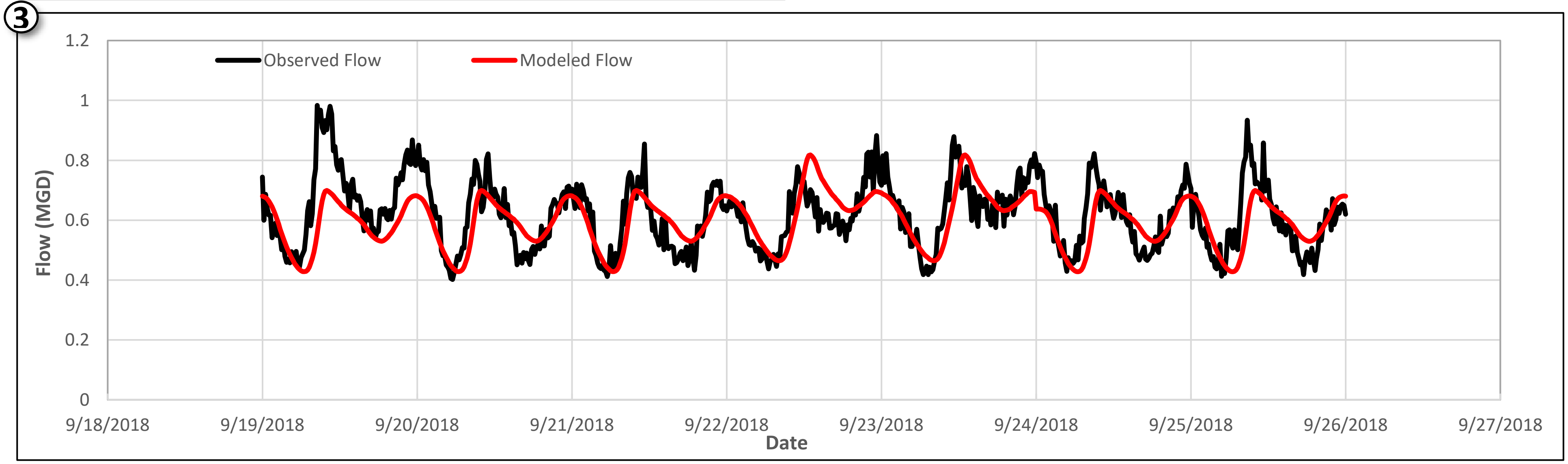


DeKalb Calibration Results

Dry Weather
Flow Summary

Flow Meter: **LSM1**

Sewershed: **Lower Stone Mountain**

Sewer Basin: **Pole Bridge Basin**

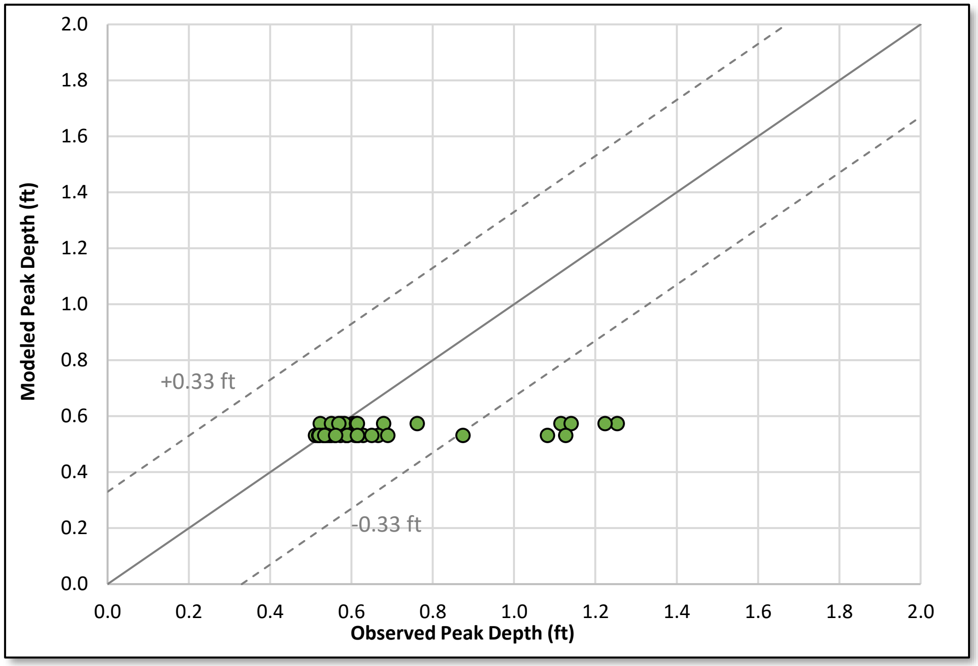
① Daily Volume

② Daily Peak Flow

③ One Week Time Series

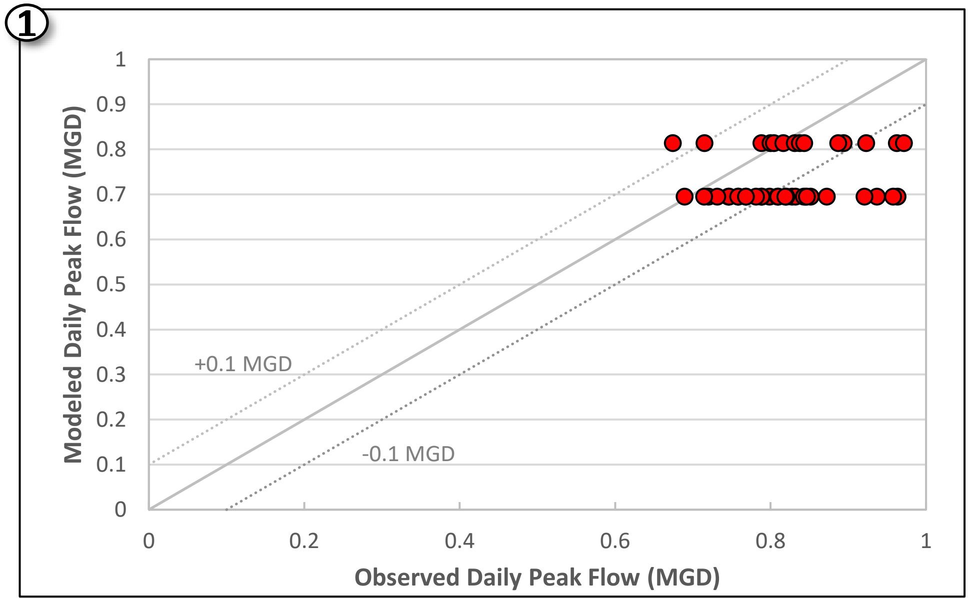
Total Compared Dry Days:

43



Flow Meter:
LSM1

①



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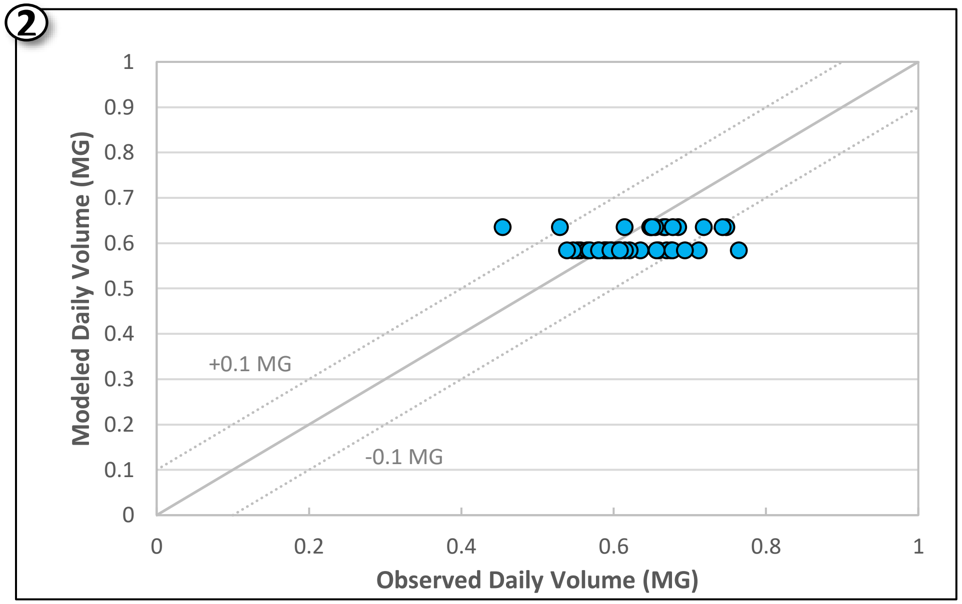

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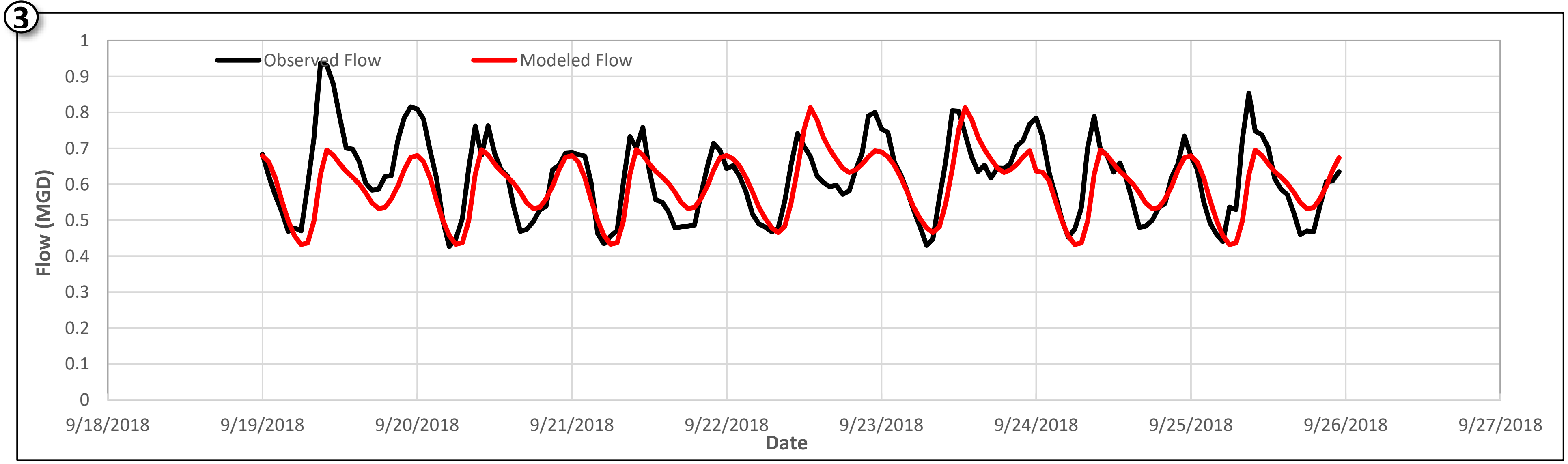


DeKalb Calibration Results

Dry Weather
Flow Summary

Flow Meter: **LSM1**

Sewershed: **Lower Stone Mountain**

Sewer Basin: **Pole Bridge Basin**

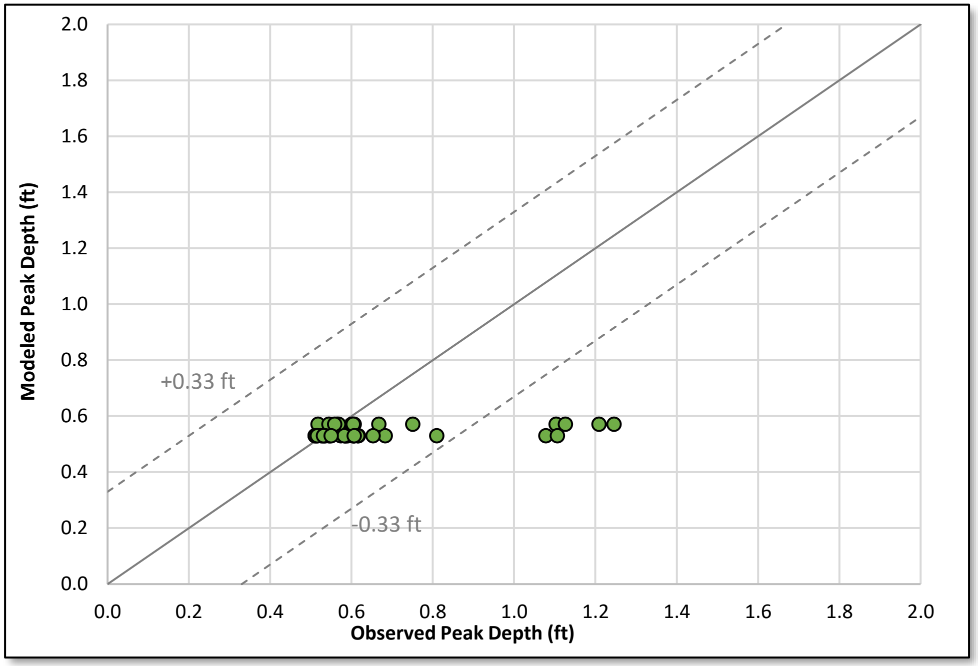
① Daily Volume

② Daily Peak Flow

③ One Week Time Series

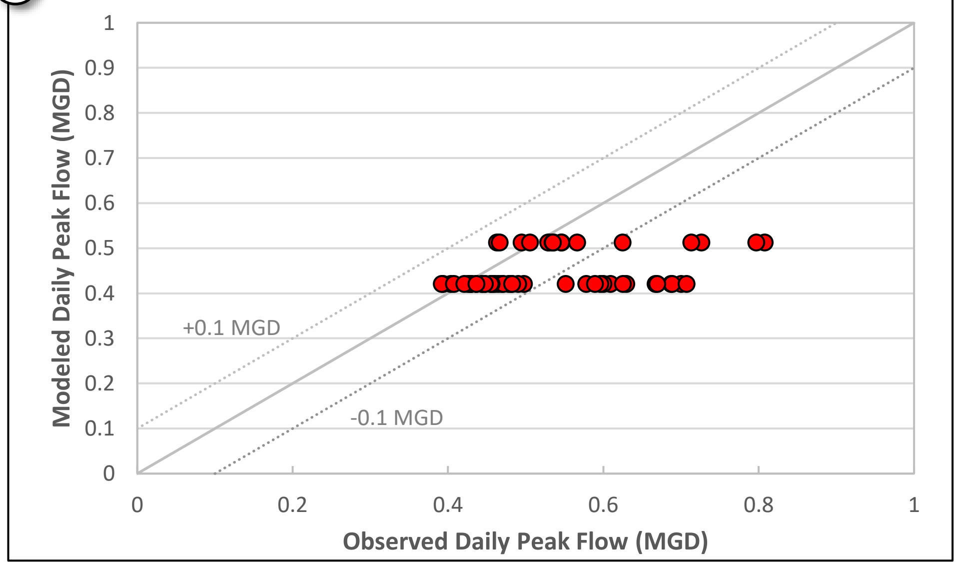
Total Compared Dry Days:

43



Flow Meter:
LSM1

①



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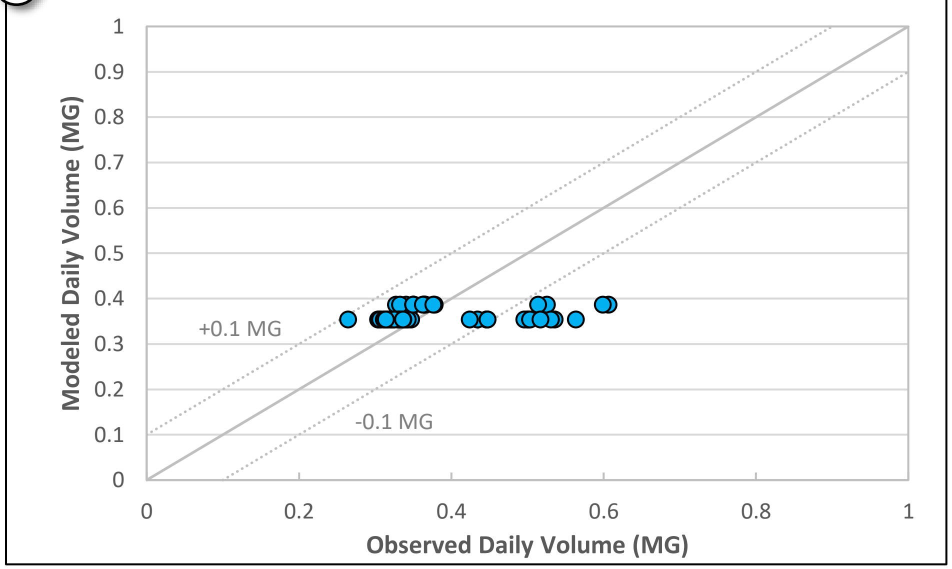

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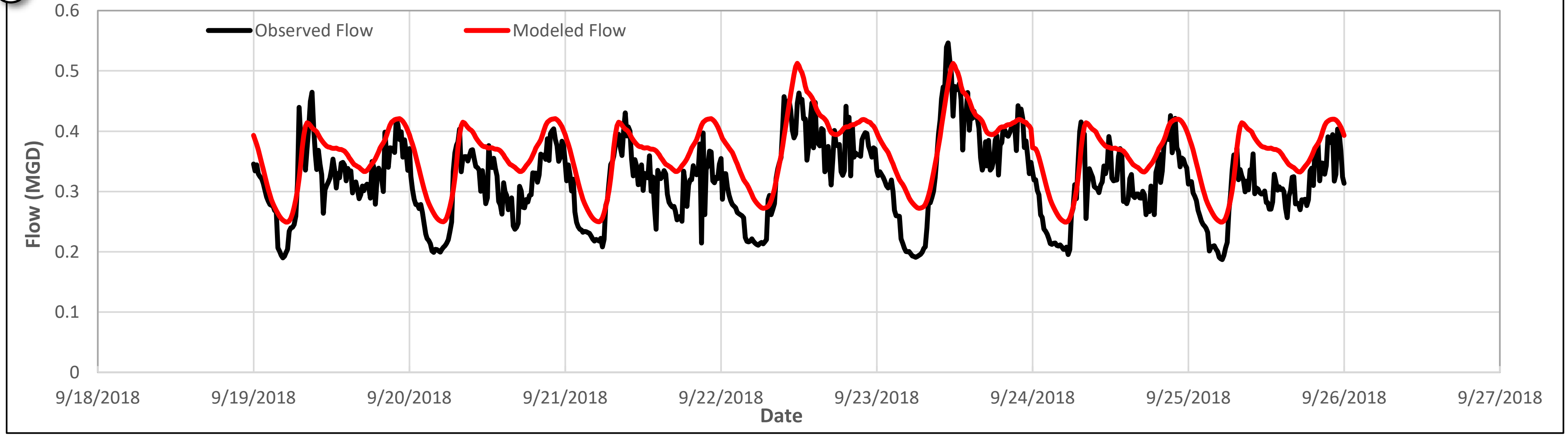


DeKalb Calibration Results

Dry Weather
Flow Summary

Flow Meter: **LSM2**

Sewershed: **Lower Stone Mountain**

Sewer Basin: **Pole Bridge Basin**

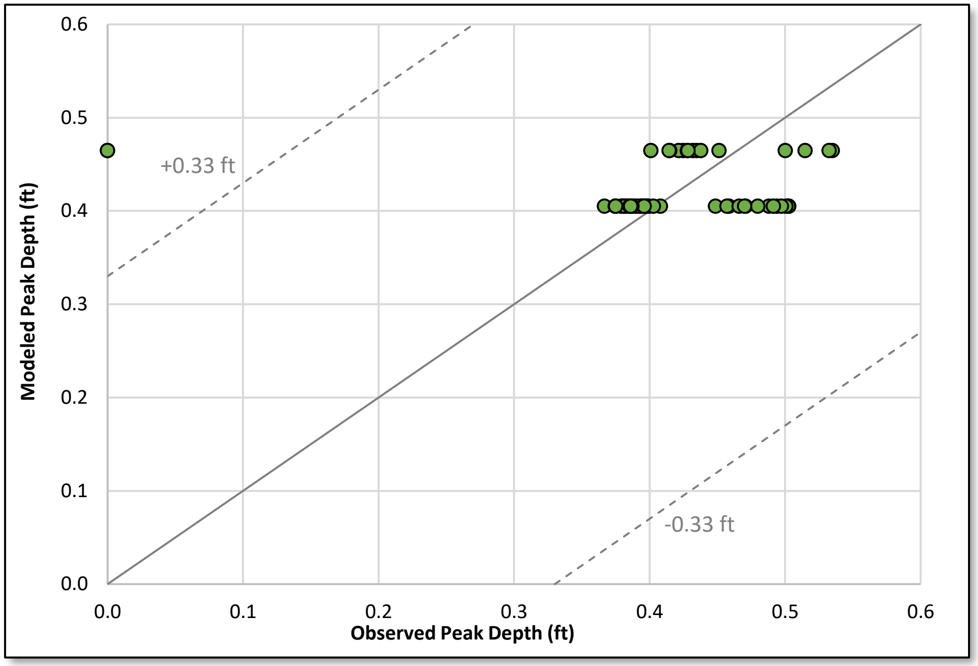
① Daily Volume

② Daily Peak Flow

③ One Week Time Series

Total Compared Dry Days:

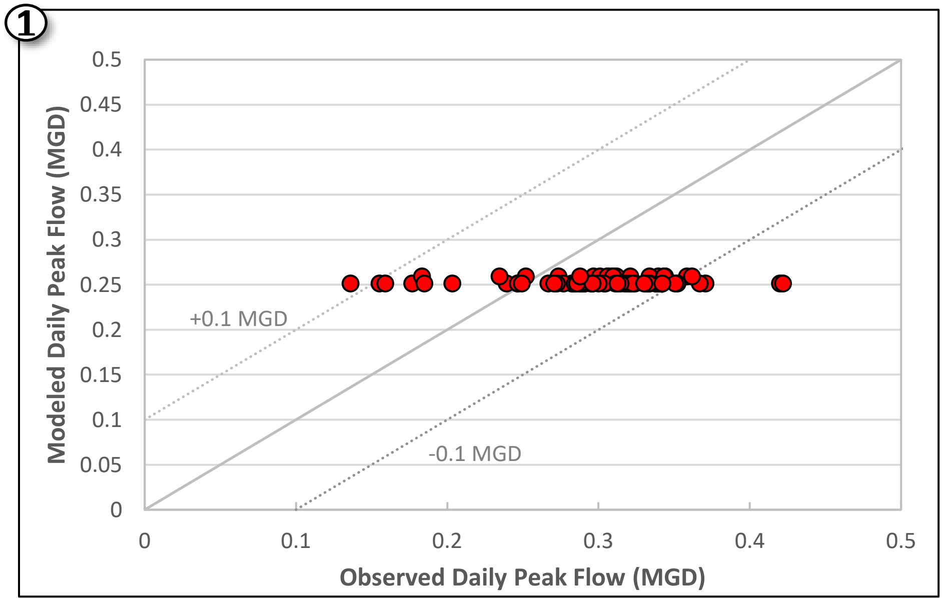
58



Flow Meter:

LSM2

①



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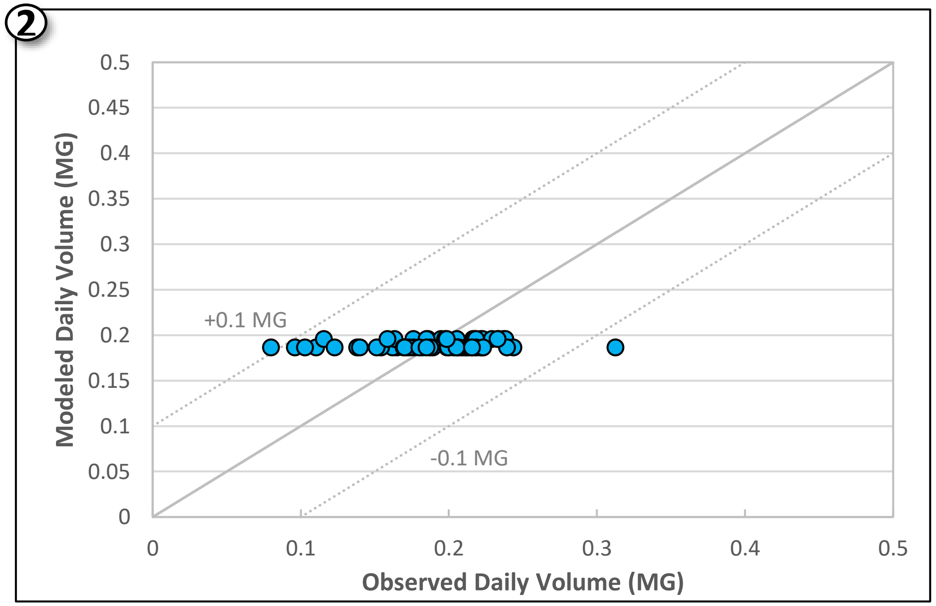

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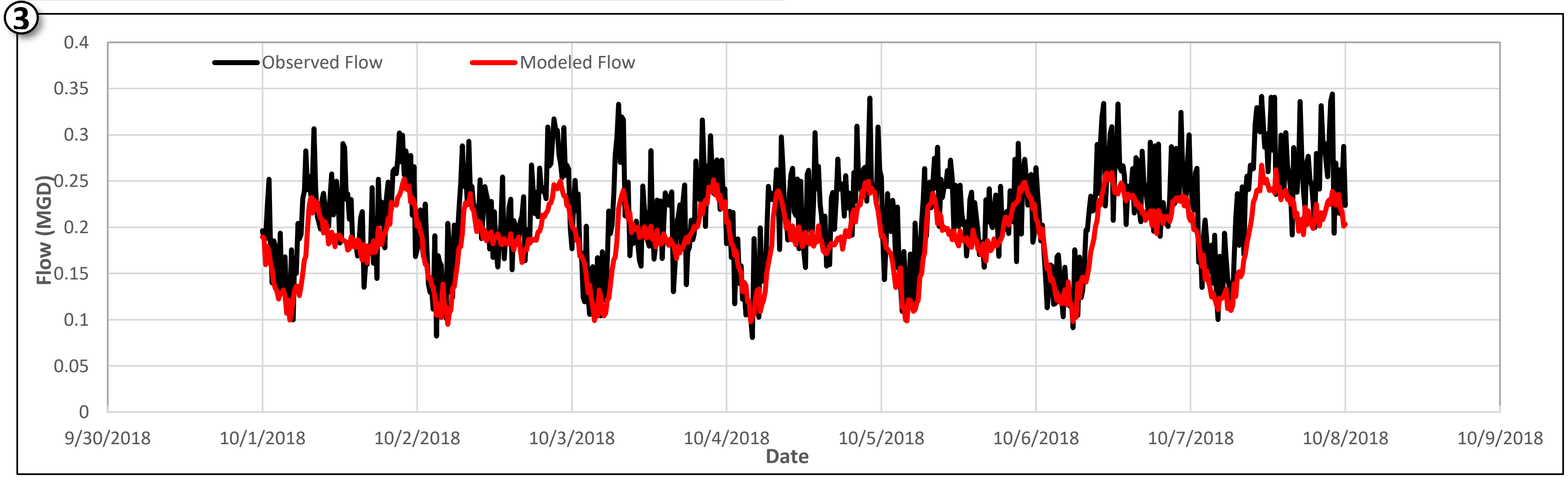


DeKalb Calibration Results

Dry Weather
Flow Summary

Flow Meter: **PB1**

Sewershed: **Pole Bridge Creek**

Sewer Basin: **Pole Bridge Basin**

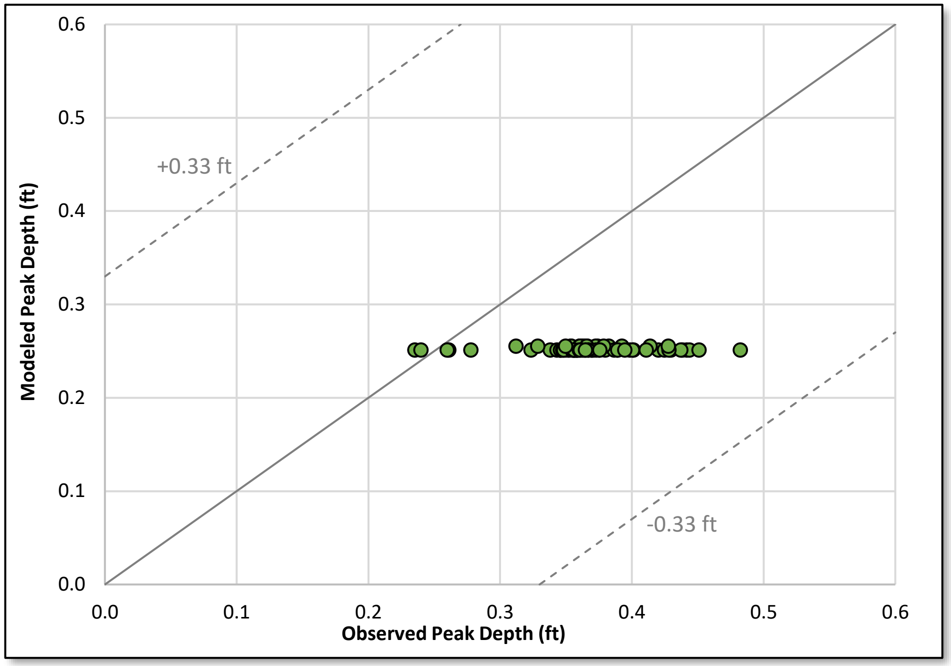
① Daily Volume

② Daily Peak Flow

③ One Week Time Series

Total Compared Dry Days:

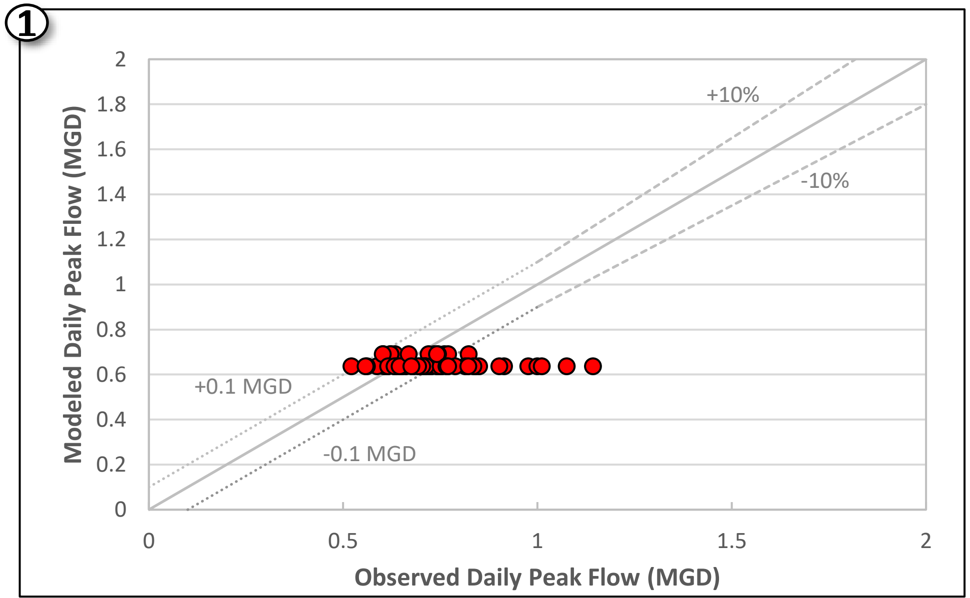
80



Flow Meter:

PB1

①



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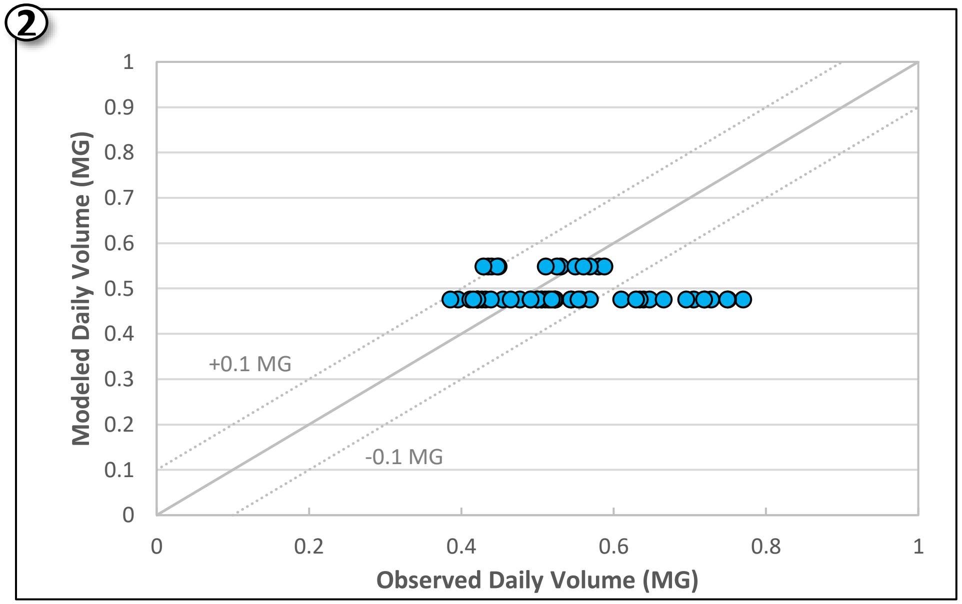

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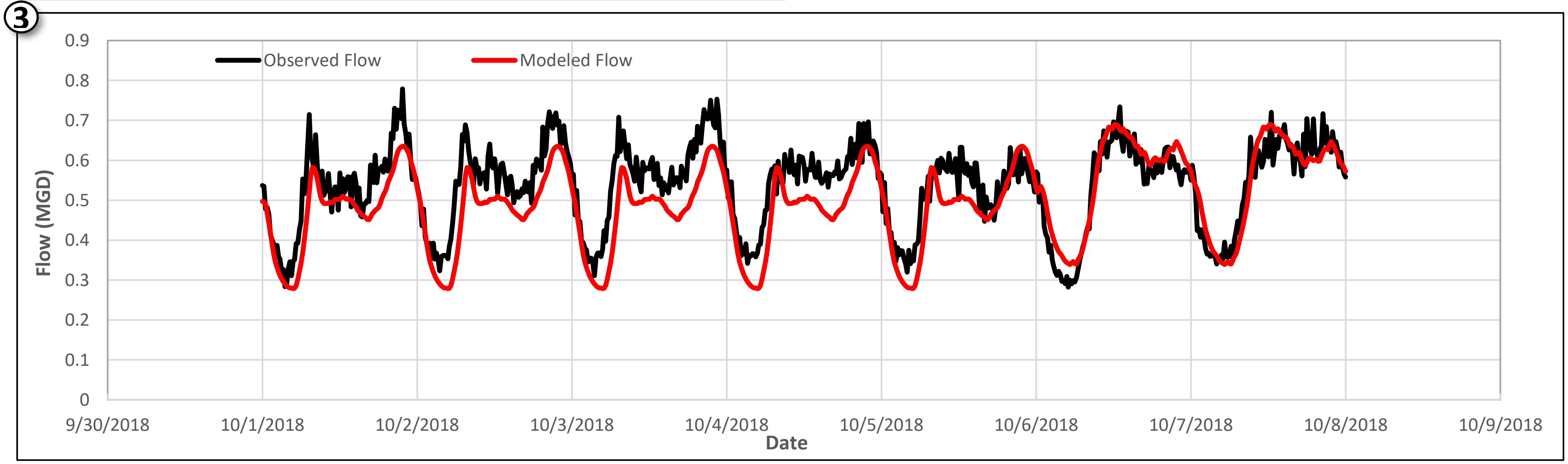


DeKalb Calibration Results

Dry Weather
Flow Summary

Flow Meter: **PB2**

Sewershed: **Pole Bridge Creek**

Sewer Basin: **Pole Bridge Basin**

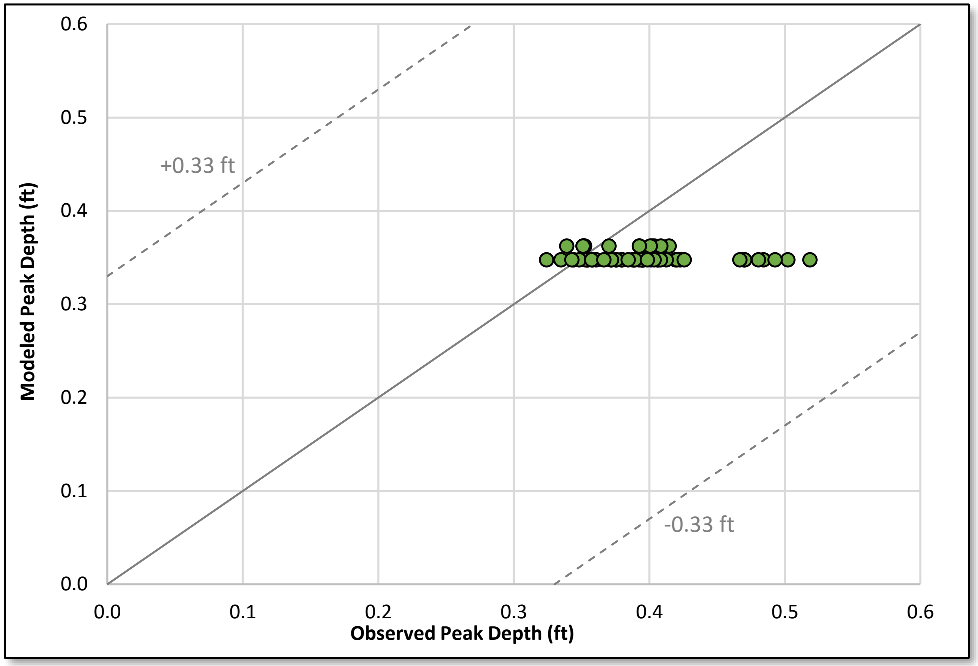
① Daily Volume

② Daily Peak Flow

③ One Week Time Series

Total Compared Dry Days:

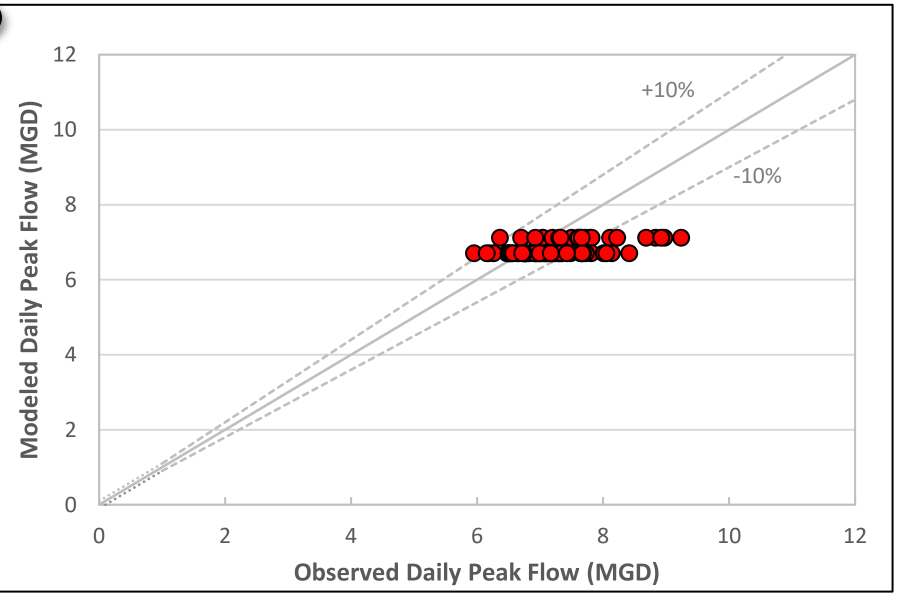
59



Flow Meter:

PB2

①



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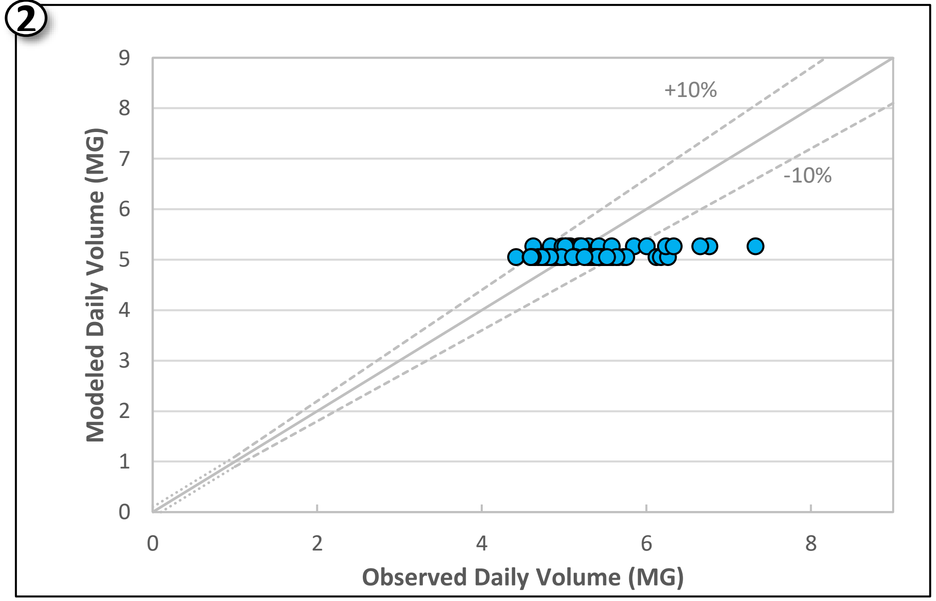

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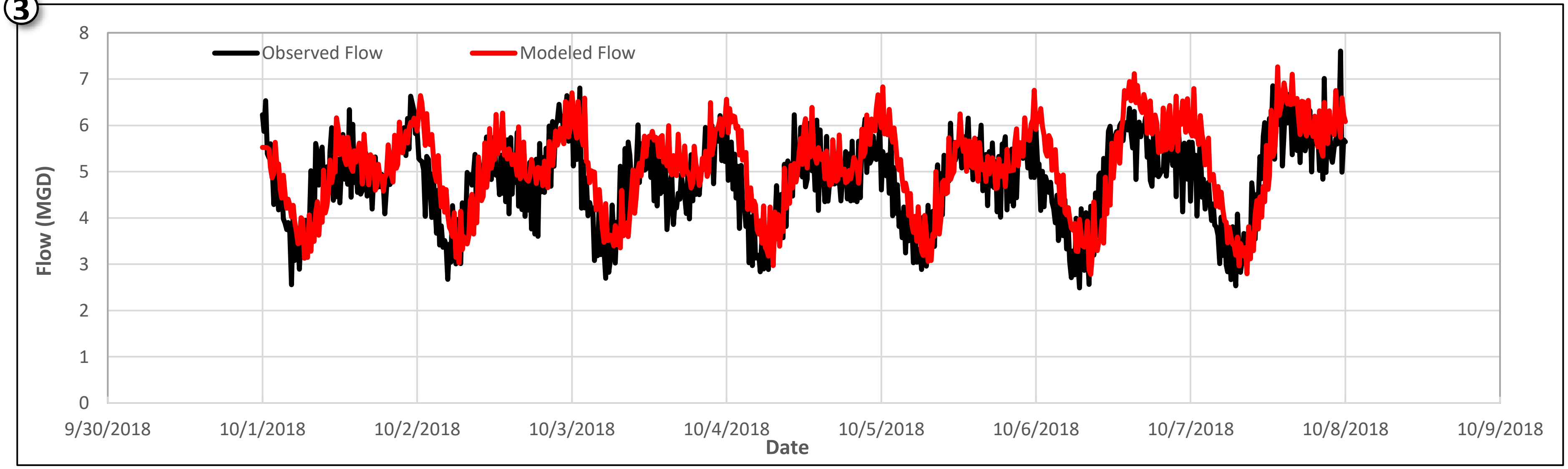


DeKalb Calibration Results

Dry Weather
Flow Summary

Flow Meter: **PB3**

Sewershed: **Pole Bridge Creek**

Sewer Basin: **Pole Bridge Basin**

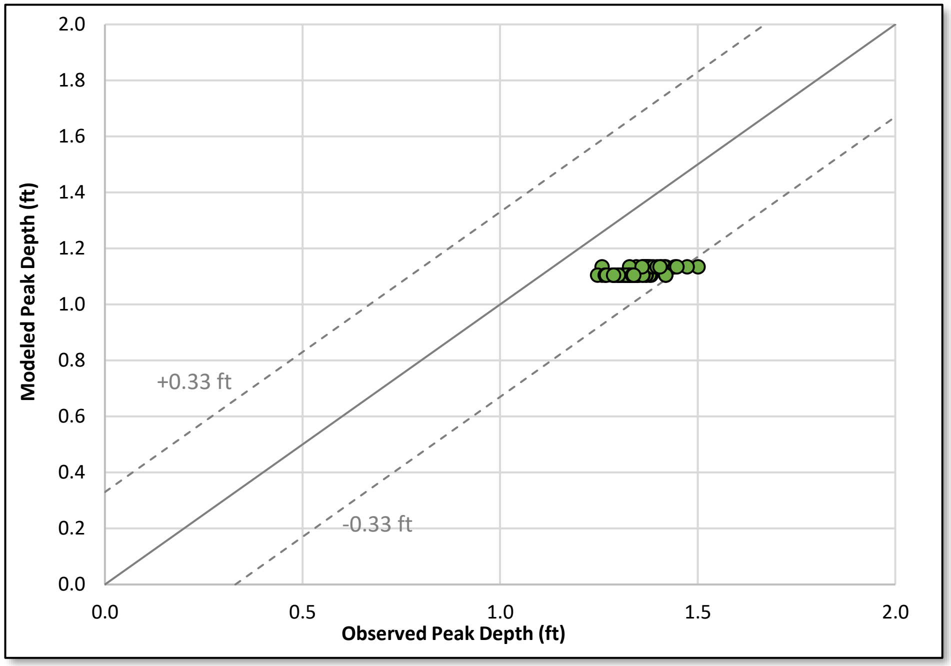
① Daily Volume

② Daily Peak Flow

③ One Week Time Series

Total Compared Dry Days:

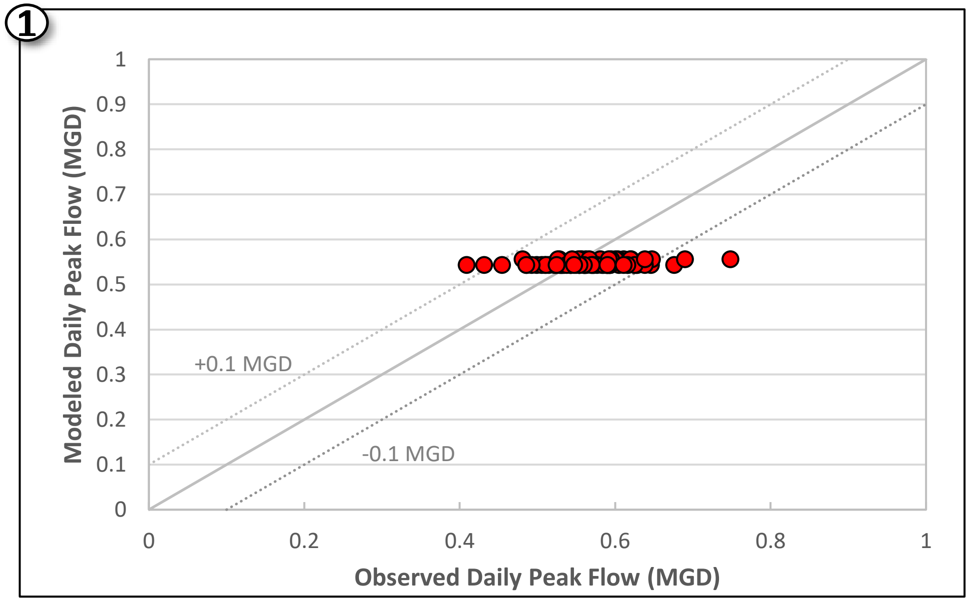
83



Flow Meter:

PB3

①



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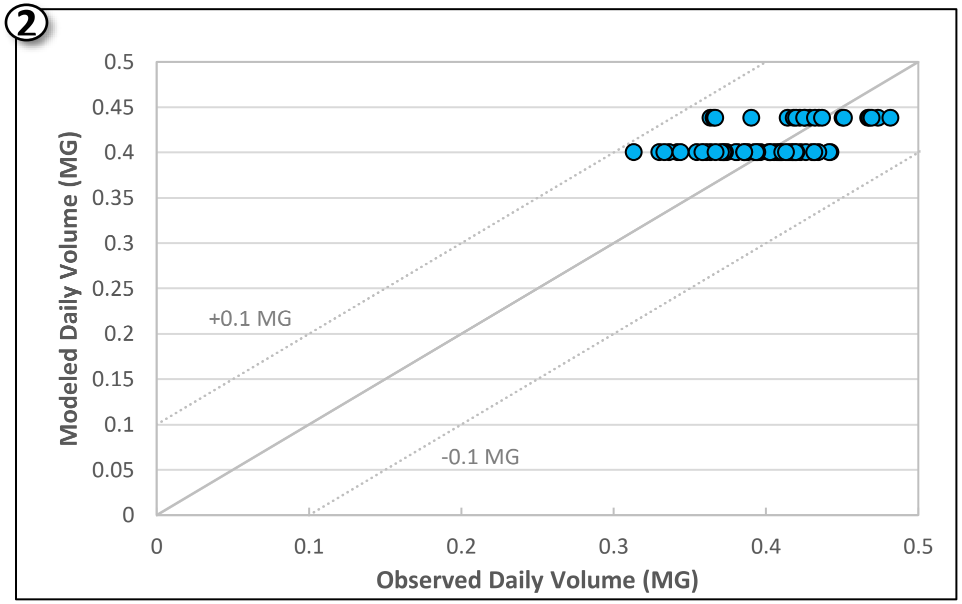

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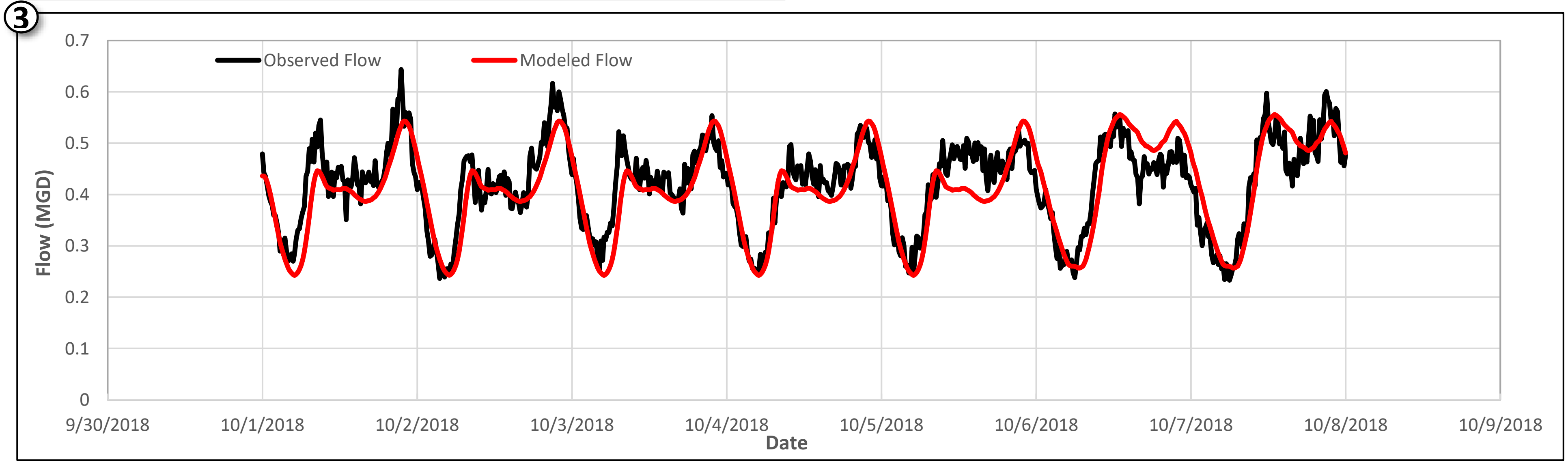


DeKalb Calibration Results

Dry Weather
Flow Summary

Flow Meter: **PB4**

Sewershed: **Pole Bridge Creek**

Sewer Basin: **Pole Bridge Basin**

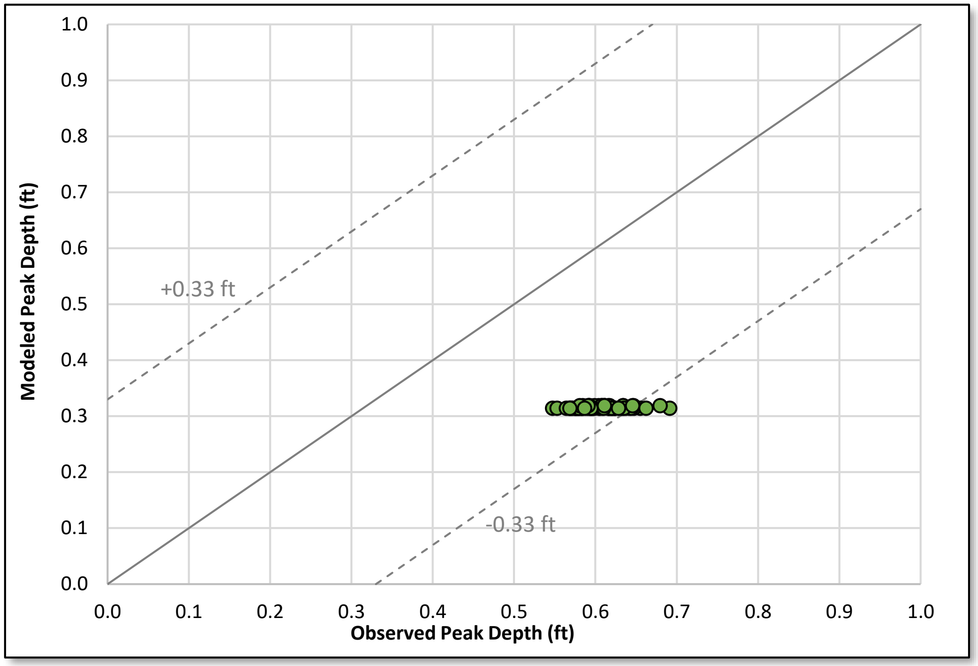
① Daily Volume

② Daily Peak Flow

③ One Week Time Series

Total Compared Dry Days:

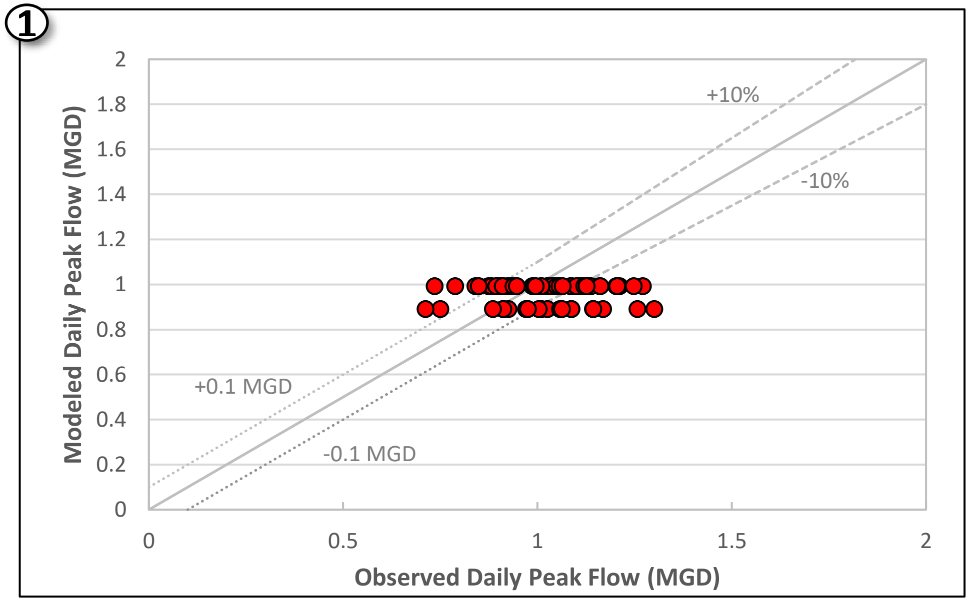
80



Flow Meter:

PB4

①



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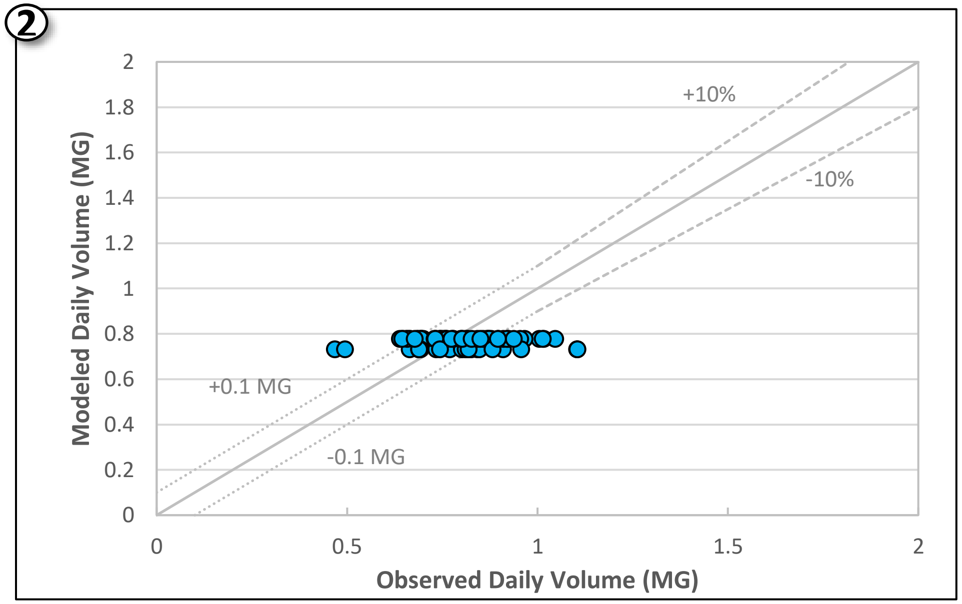

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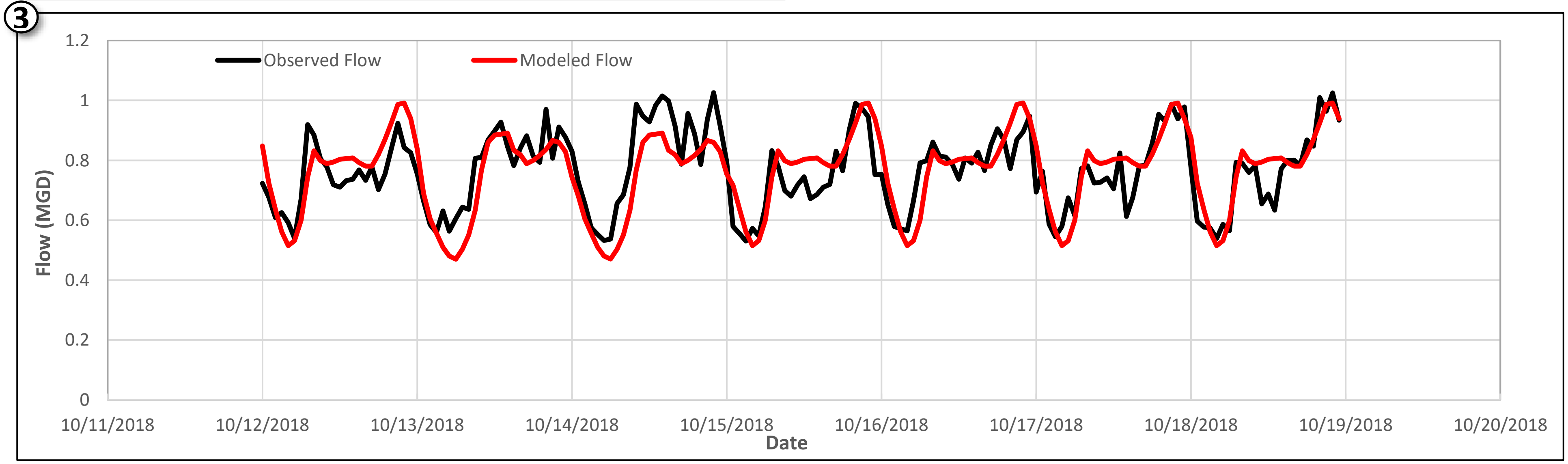


DeKalb Calibration Results

Dry Weather
Flow Summary

Flow Meter: **PB5**

Sewershed: **Pole Bridge Creek**

Sewer Basin: **Pole Bridge Basin**

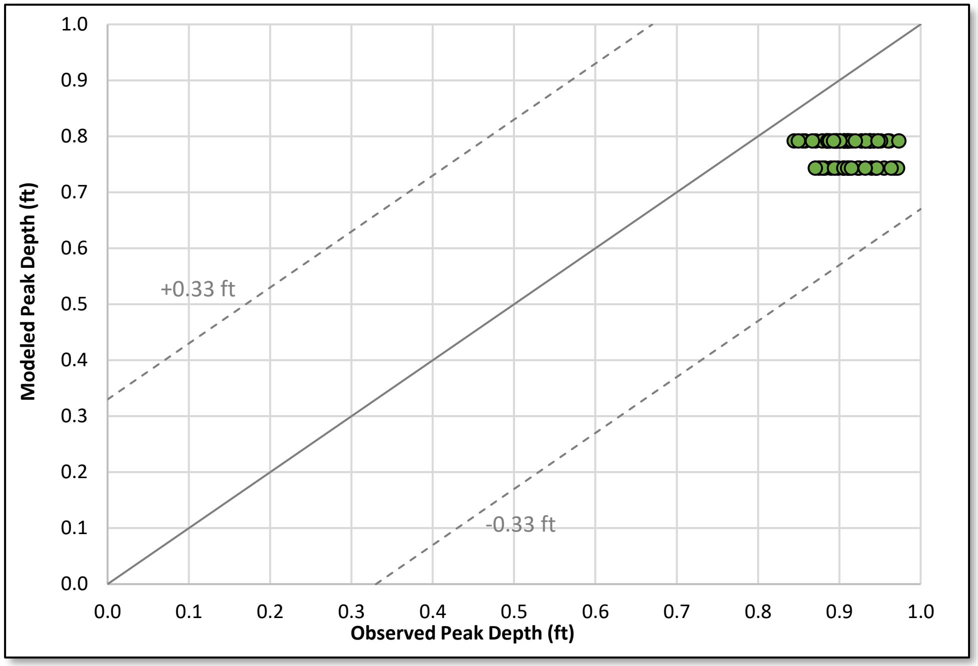
① Daily Volume

② Daily Peak Flow

③ One Week Time Series

Total Compared Dry Days:

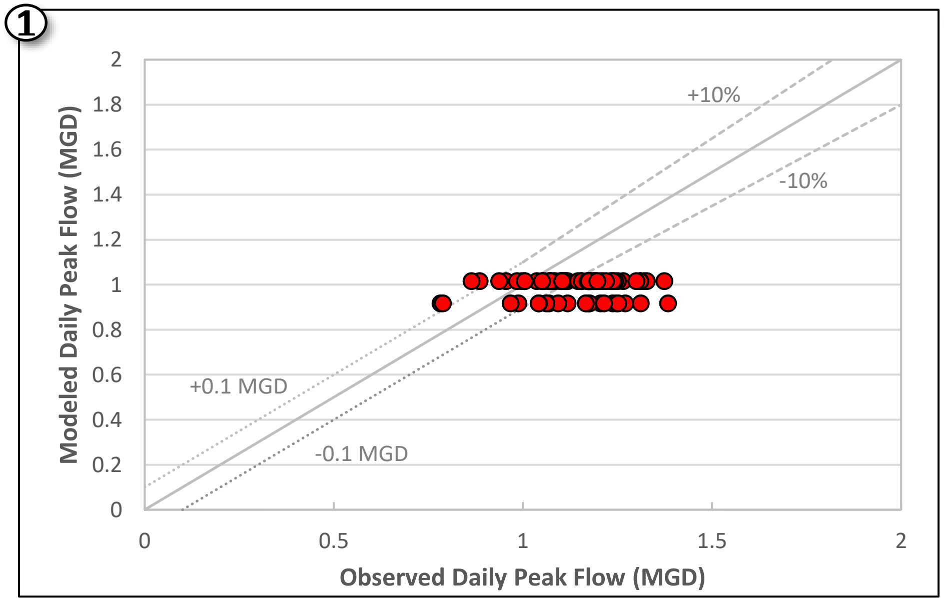
77



Flow Meter:

PB5

①



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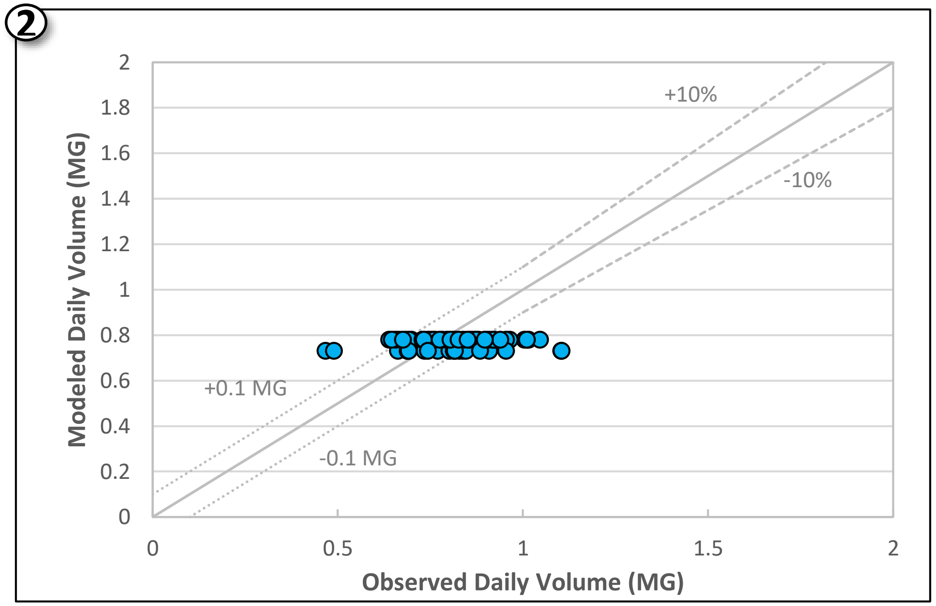

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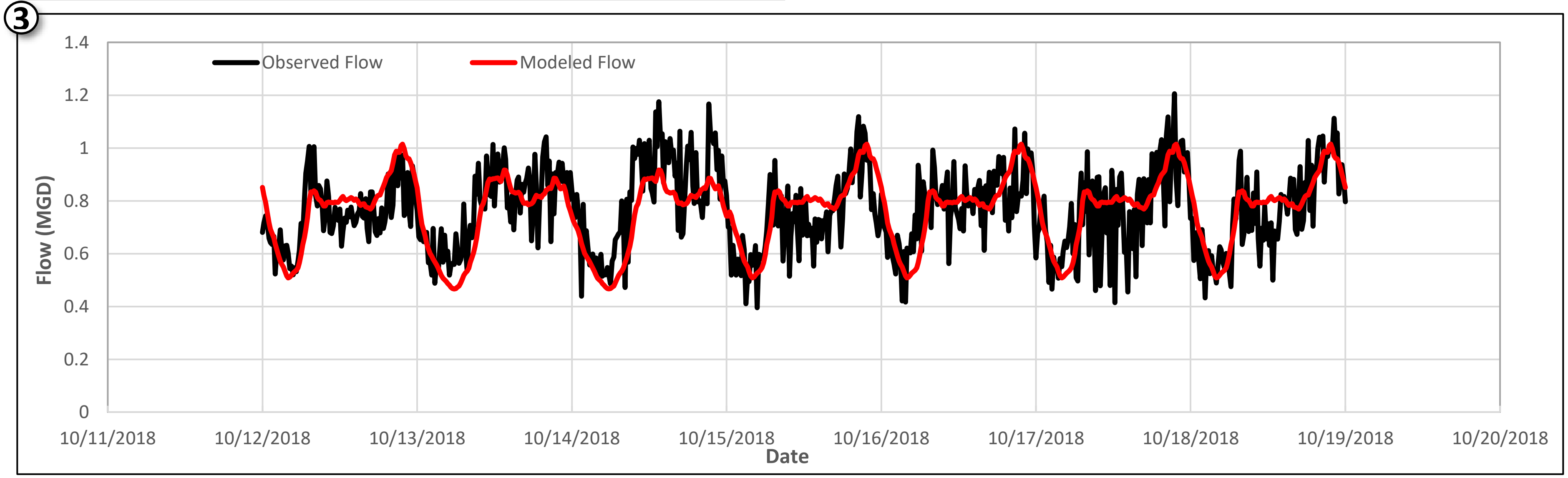


DeKalb Calibration Results

Dry Weather
Flow Summary

Flow Meter: **PB5**

Sewershed: **Pole Bridge Creek**

Sewer Basin: **Pole Bridge Basin**

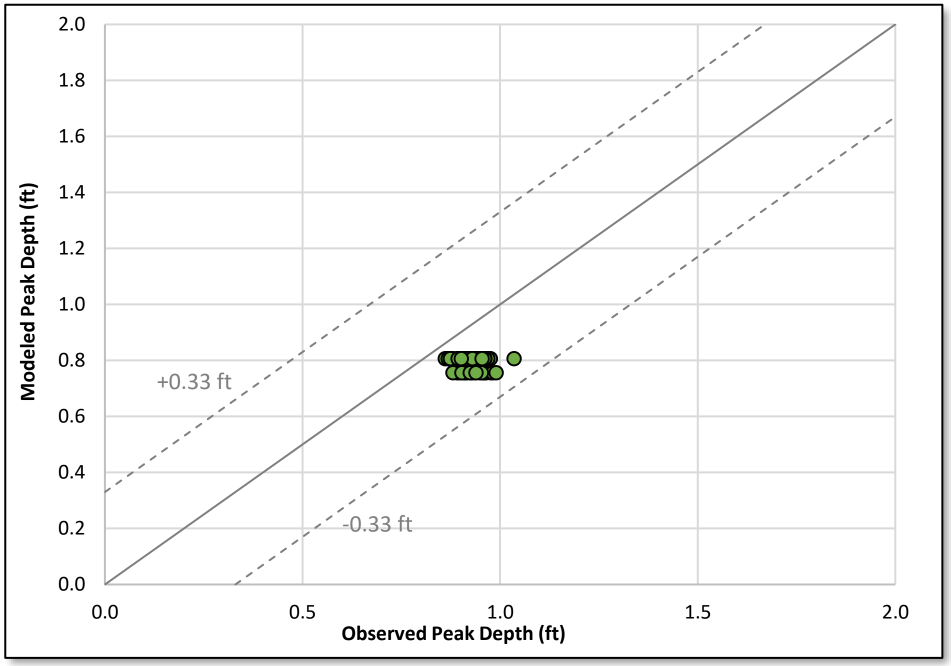
① Daily Volume

② Daily Peak Flow

③ One Week Time Series

Total Compared Dry Days:

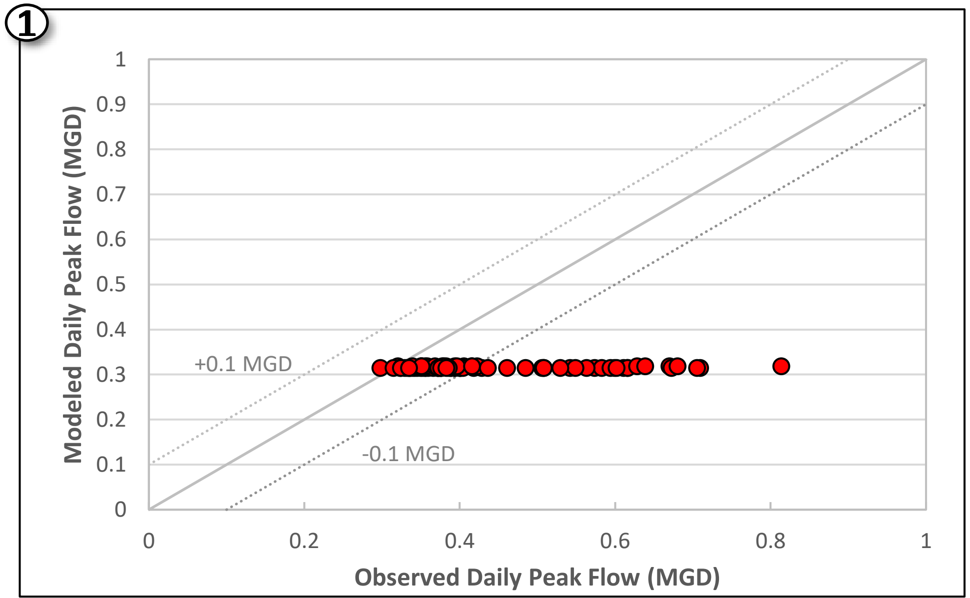
77



Flow Meter:

PB5

①



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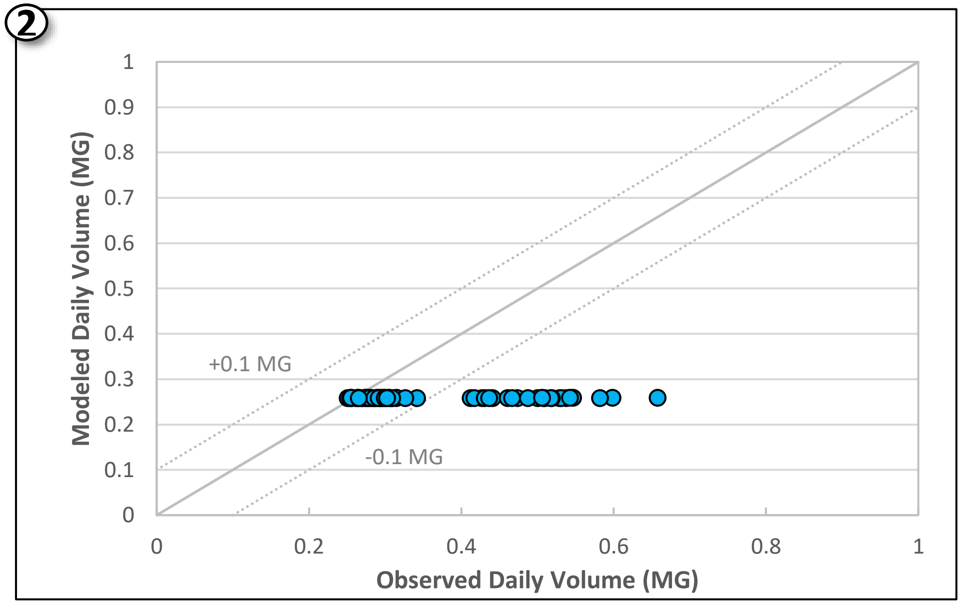

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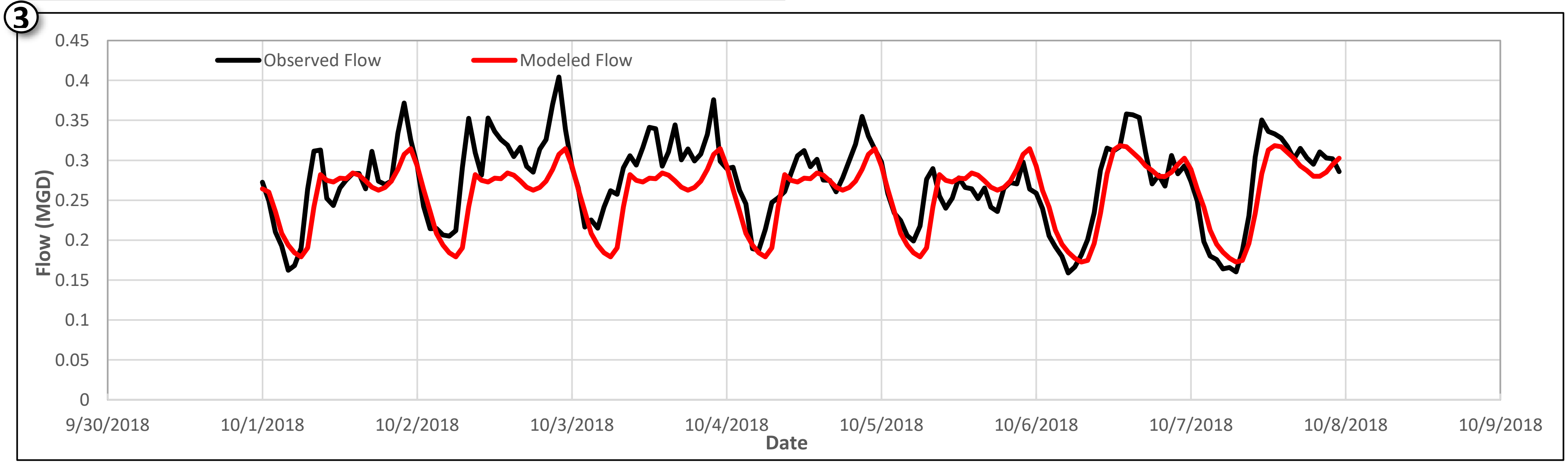


DeKalb Calibration Results

Dry Weather
Flow Summary

Flow Meter: **PB6**

Sewershed: **Pole Bridge Creek**

Sewer Basin: **Pole Bridge Basin**

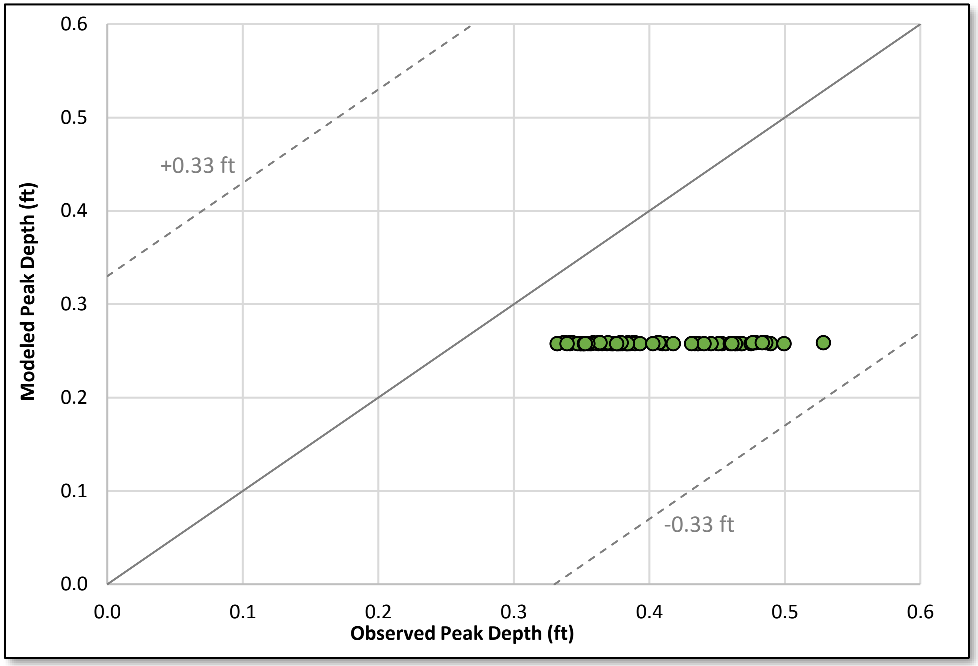
① Daily Volume

② Daily Peak Flow

③ One Week Time Series

Total Compared Dry Days:

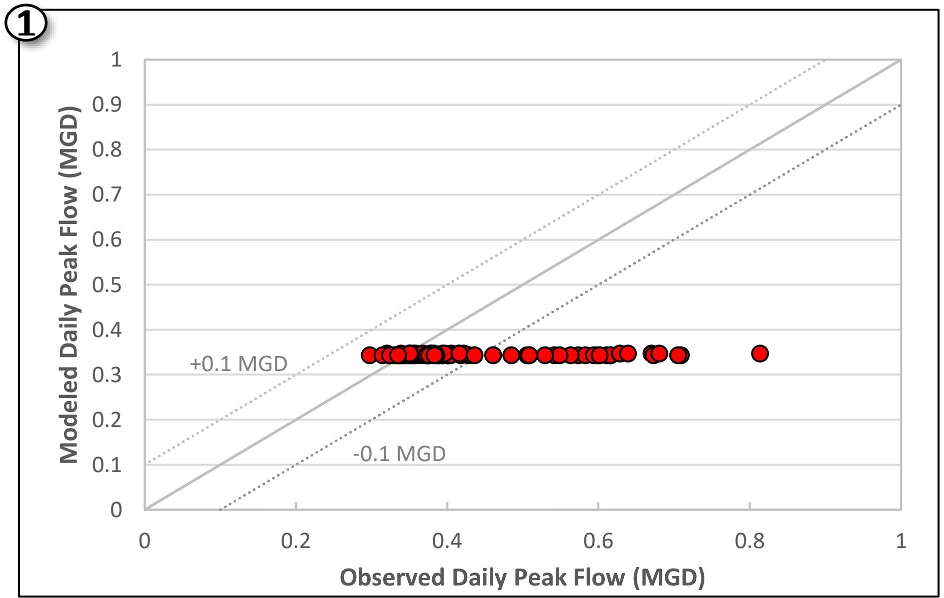
79



Flow Meter:

PB6

①



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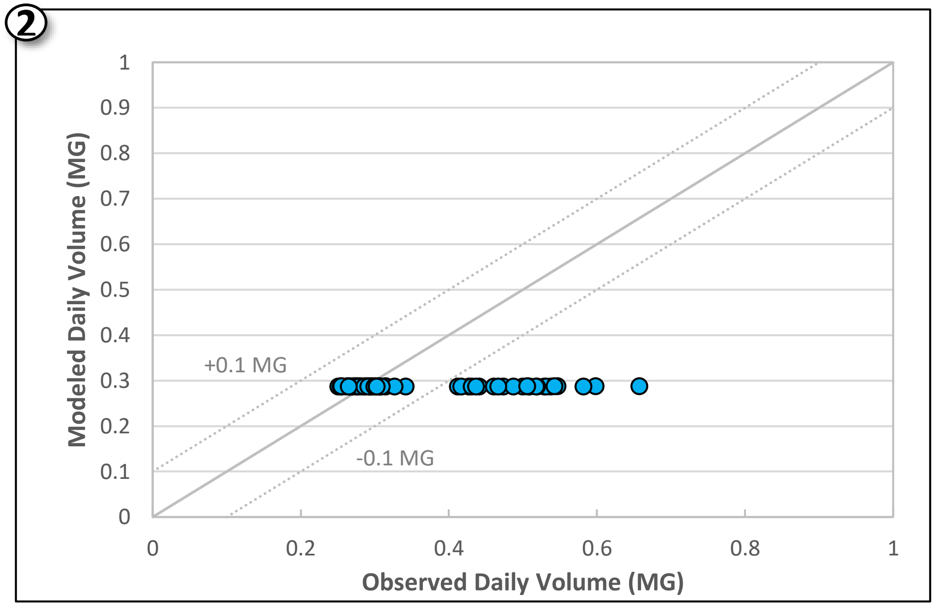

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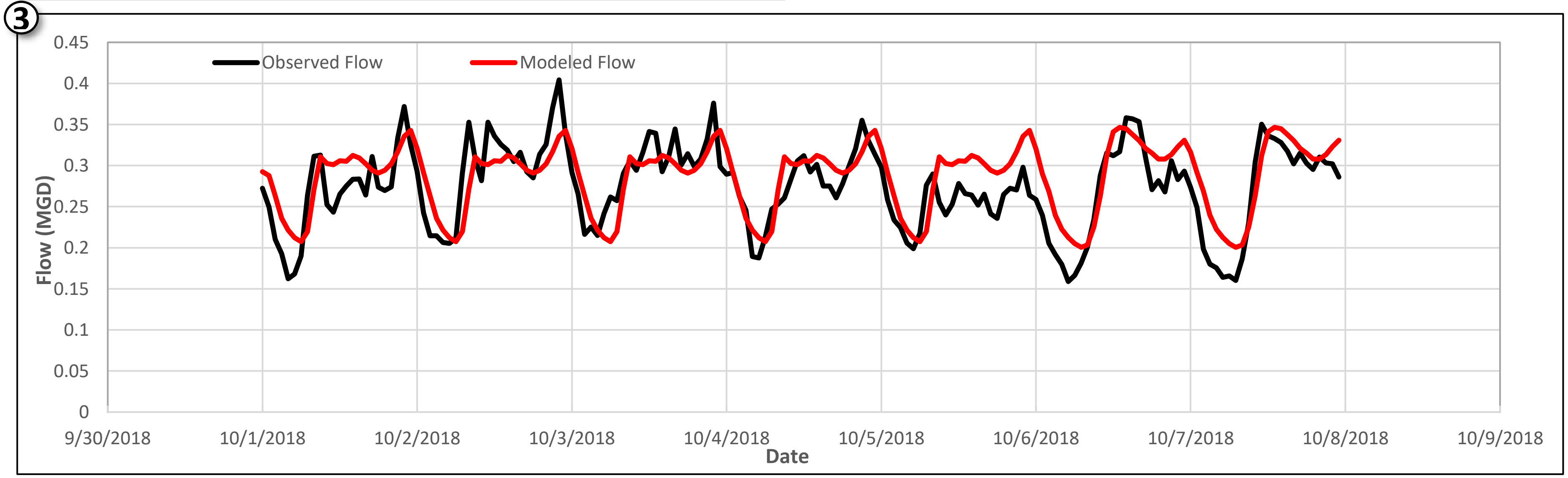


DeKalb Calibration Results

Dry Weather
Flow Summary

Flow Meter: **PB6**

Sewershed: **Pole Bridge Creek**

Sewer Basin: **Pole Bridge Basin**

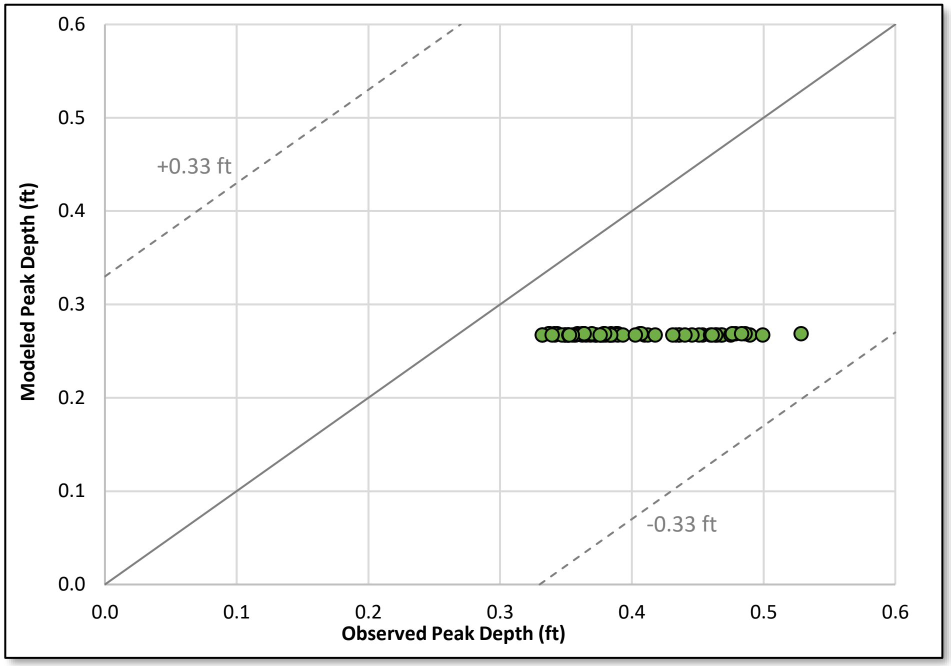
① Daily Volume

② Daily Peak Flow

③ One Week Time Series

Total Compared Dry Days:

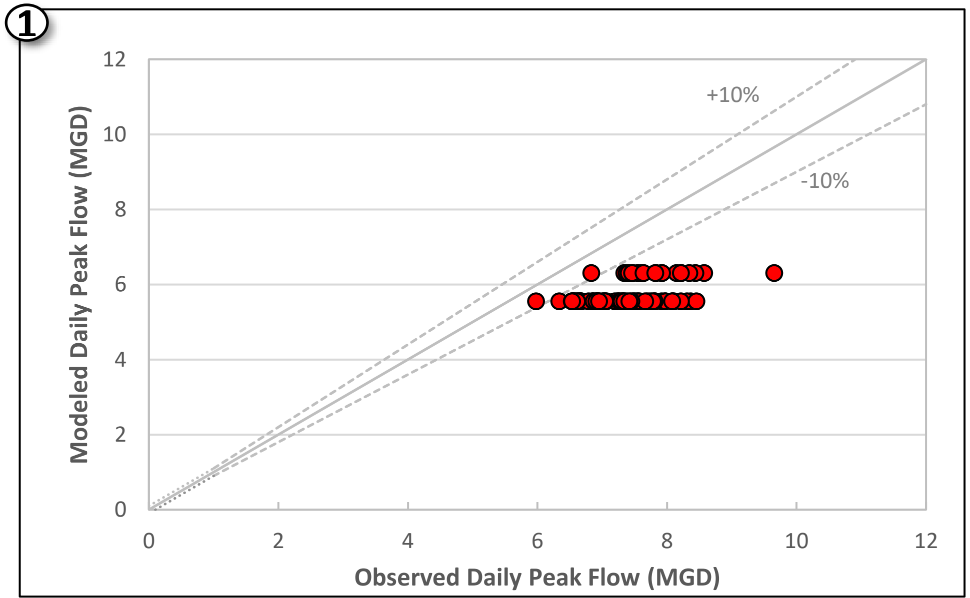
79



Flow Meter:

PB6

①



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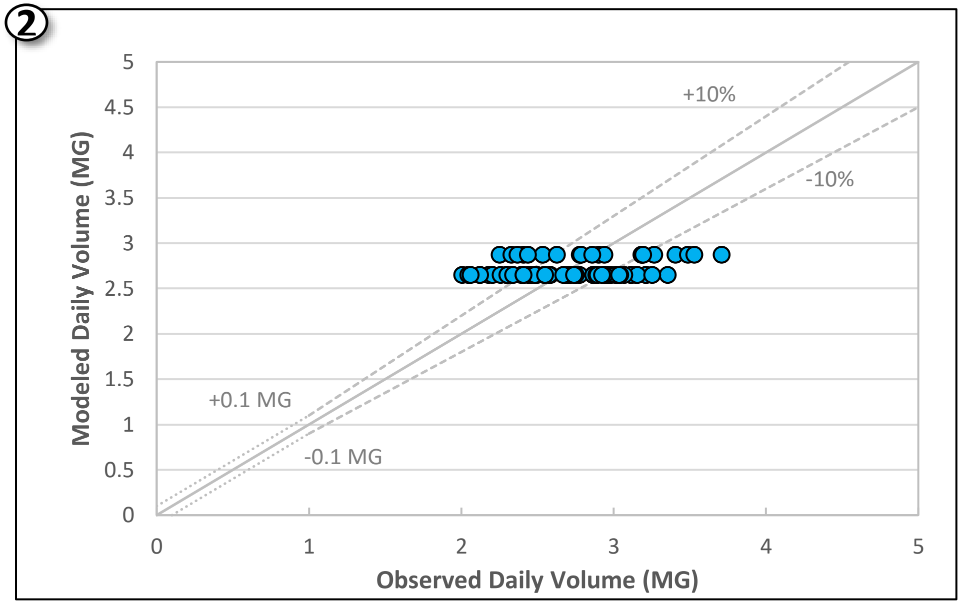

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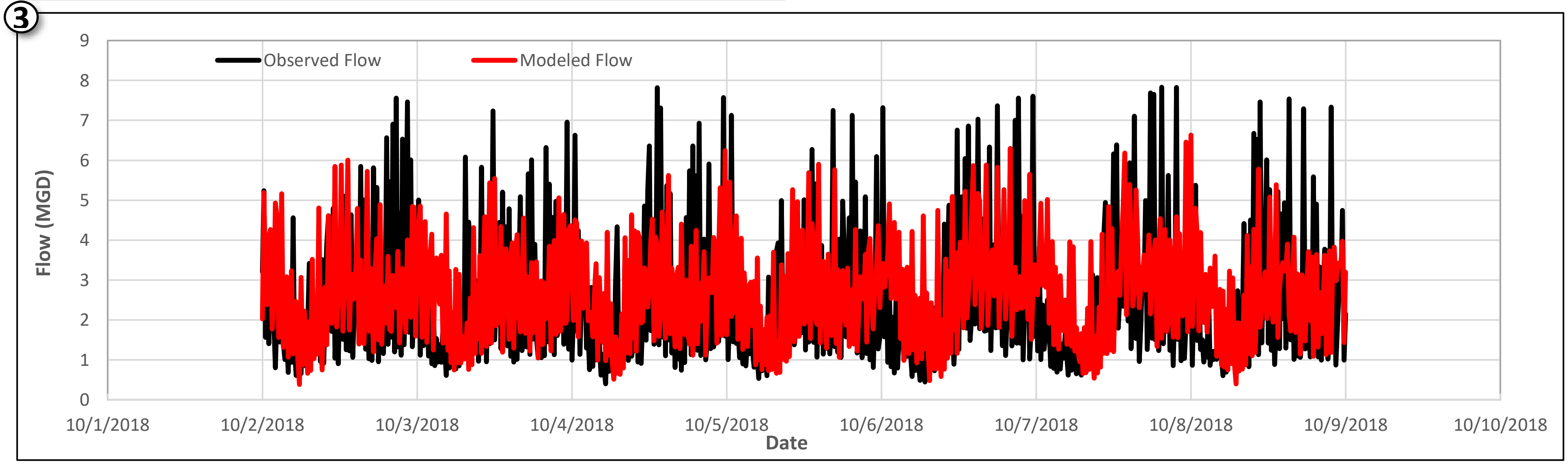


DeKalb Calibration Results

Dry Weather
Flow Summary

Flow Meter: **PB7**

Sewershed: **Pole Bridge Creek**

Sewer Basin: **Pole Bridge Basin**

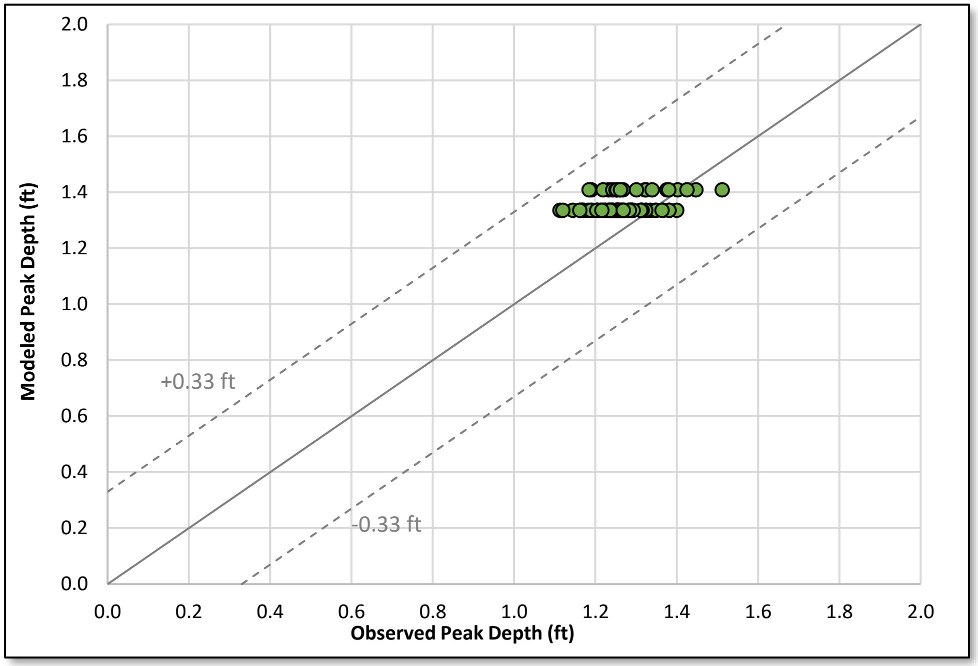
① Daily Volume

② Daily Peak Flow

③ One Week Time Series

Total Compared Dry Days:

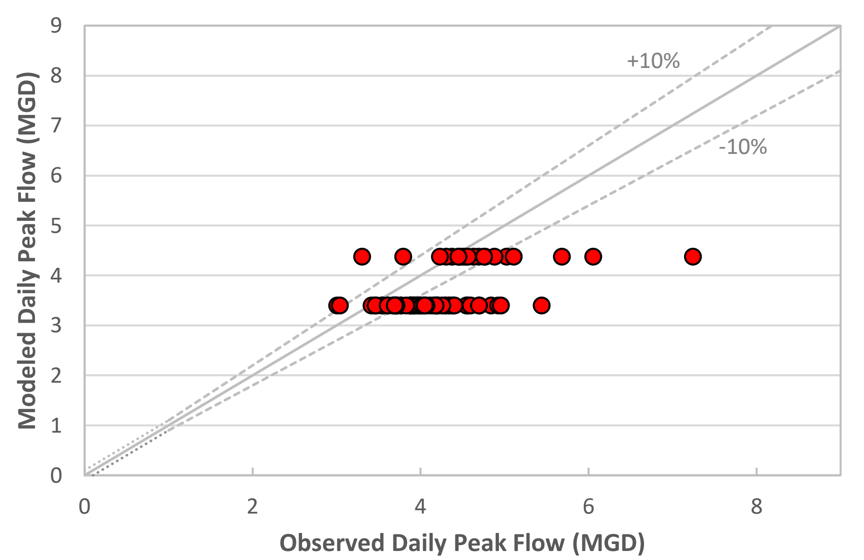
82



Flow Meter:

PB7

①



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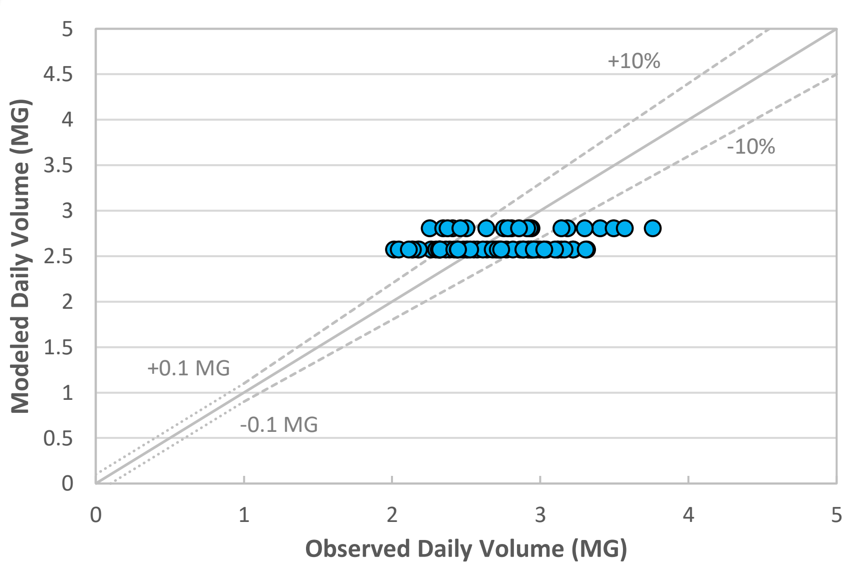

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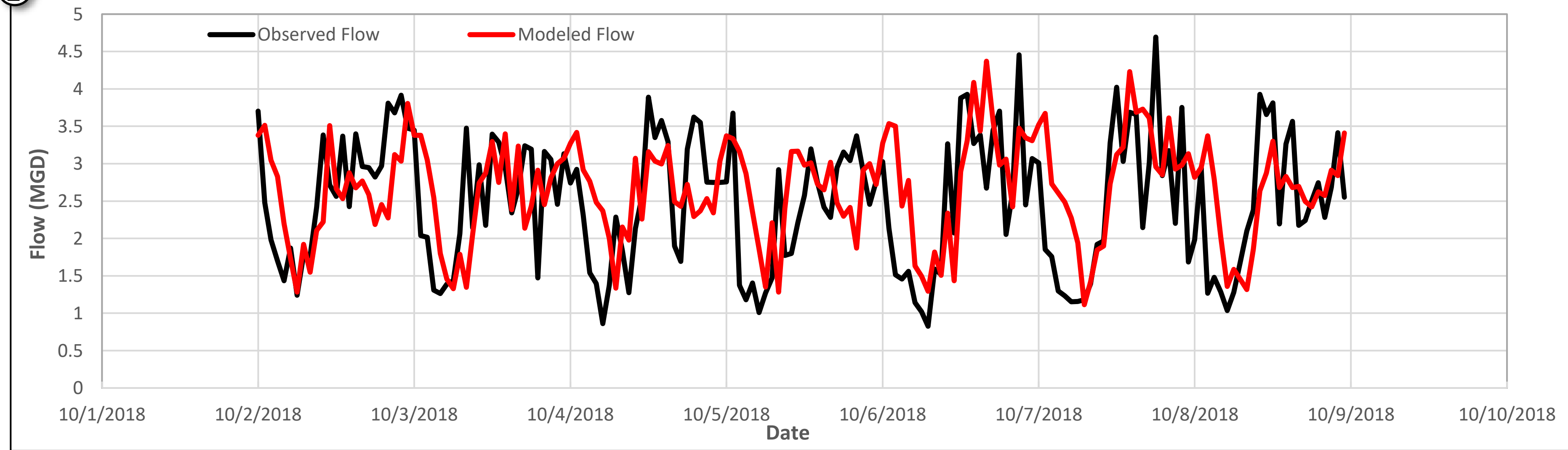


DeKalb Calibration Results

Dry Weather
Flow Summary

Flow Meter: **PB7**

Sewershed: **Pole Bridge Creek**

Sewer Basin: **Pole Bridge Basin**

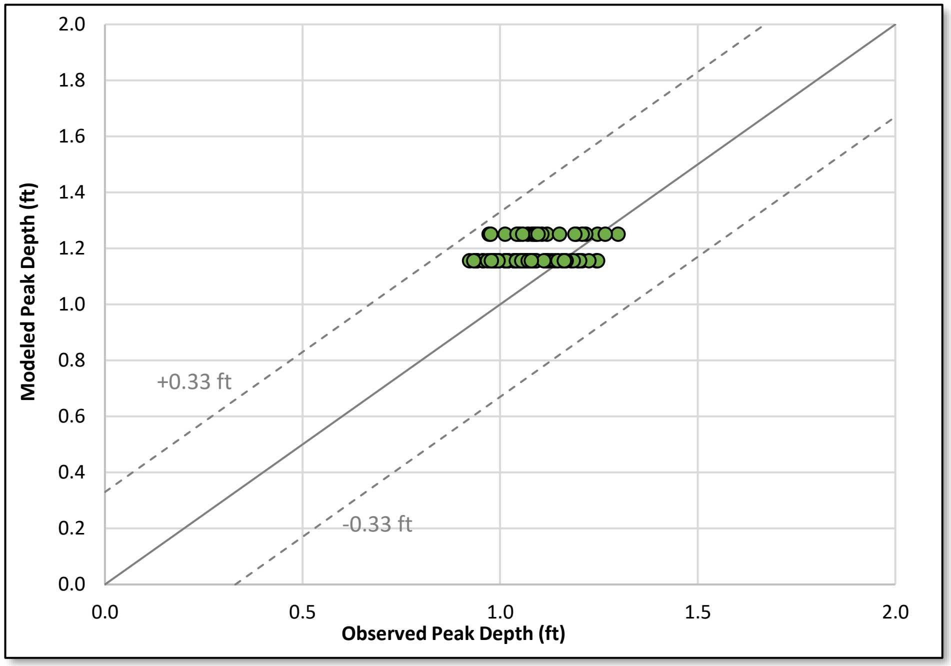
① Daily Volume

② Daily Peak Flow

③ One Week Time Series

Total Compared Dry Days:

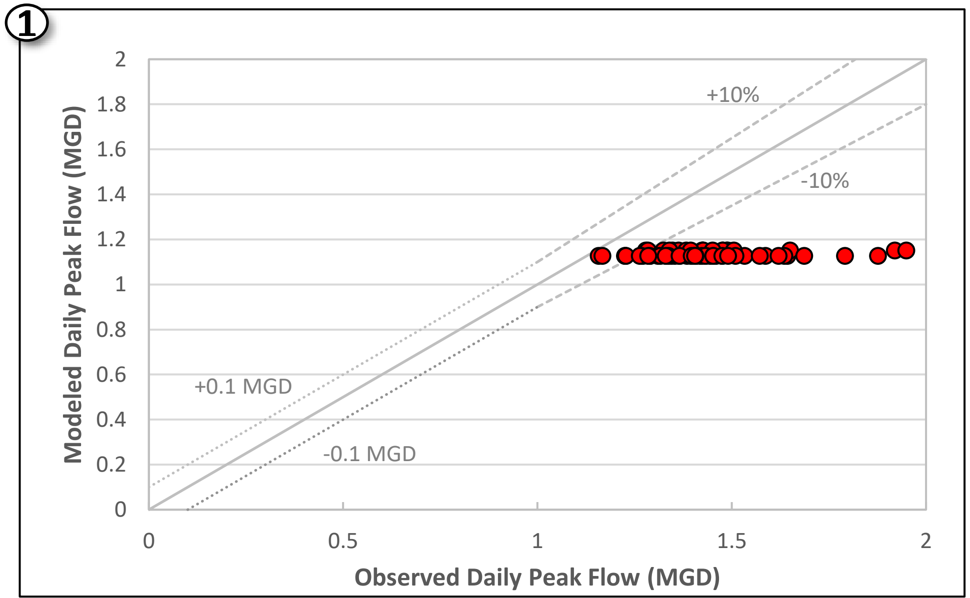
82



Flow Meter:

PB7

①



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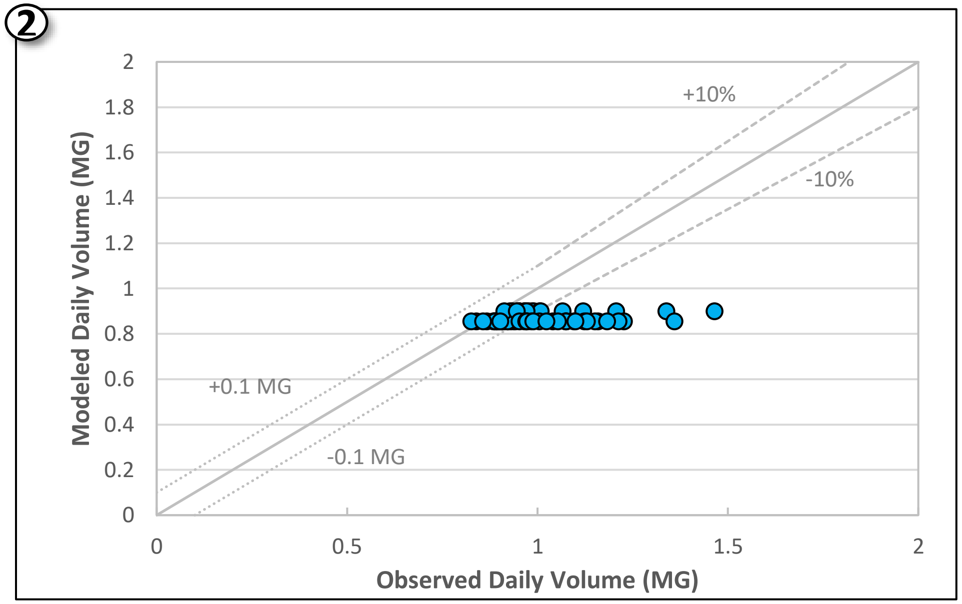

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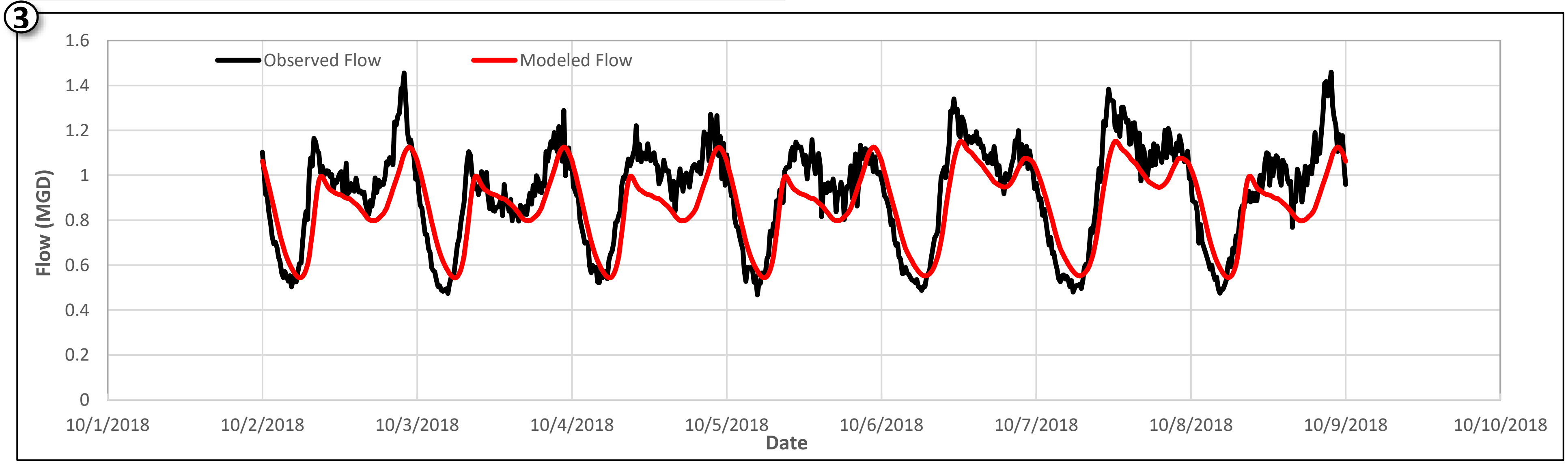


DeKalb Calibration Results

Dry Weather
Flow Summary

Flow Meter: **PB8**

Sewershed: **Pole Bridge Creek**

Sewer Basin: **Pole Bridge Basin**

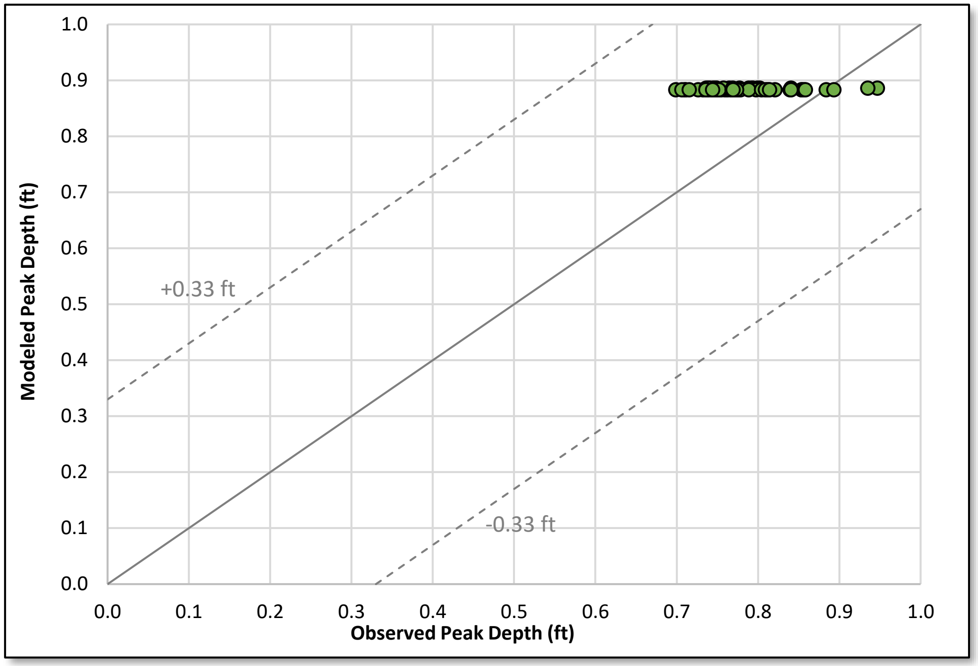
① Daily Volume

② Daily Peak Flow

③ One Week Time Series

Total Compared Dry Days:

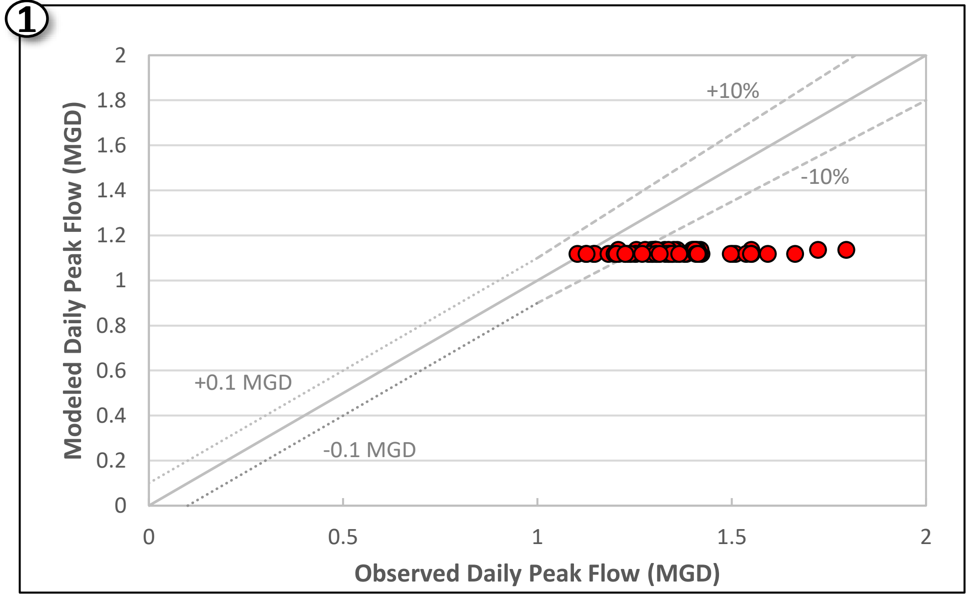
73



Flow Meter:

PB8

①



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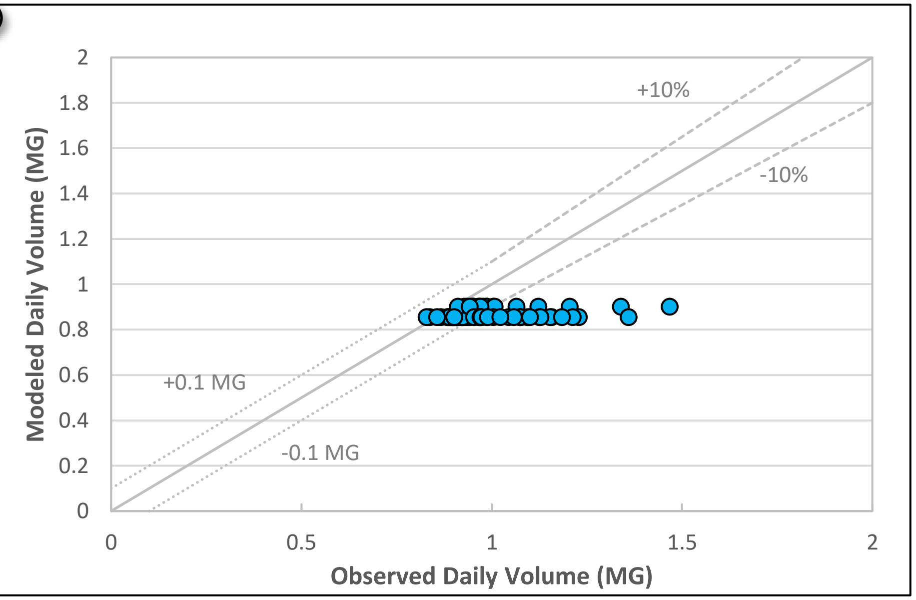

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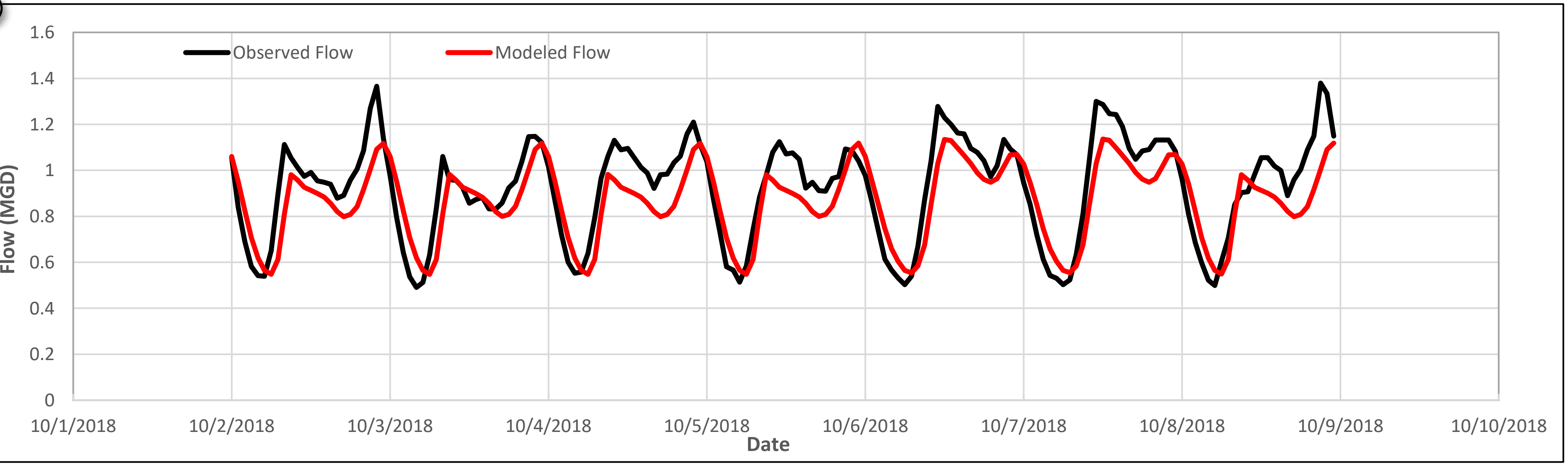


DeKalb Calibration Results

Dry Weather
Flow Summary

Flow Meter: **PB8**

Sewershed: **Pole Bridge Creek**

Sewer Basin: **Pole Bridge Basin**

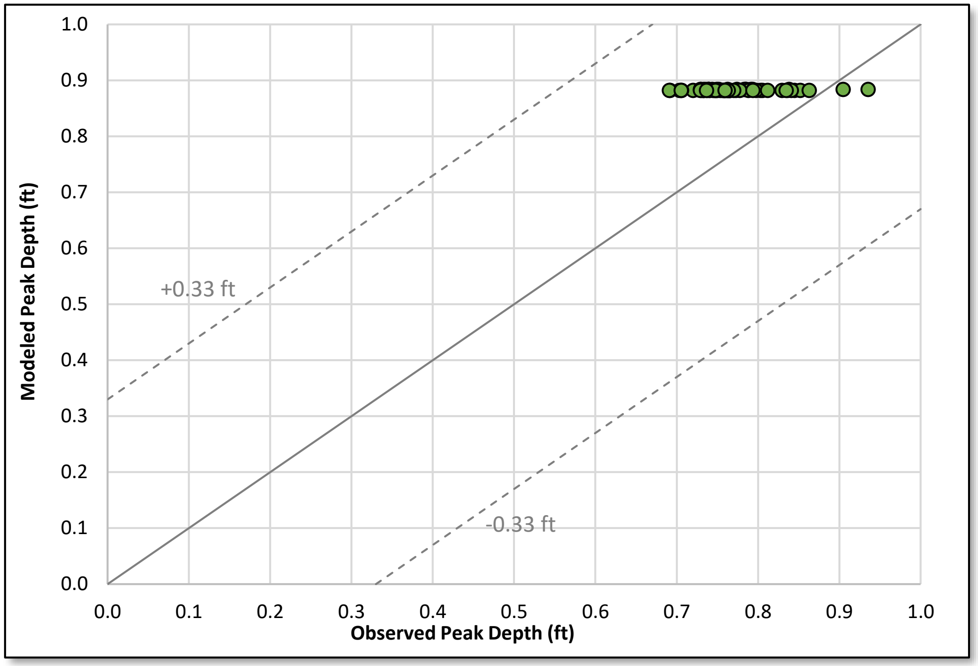
① Daily Volume

② Daily Peak Flow

③ One Week Time Series

Total Compared Dry Days:

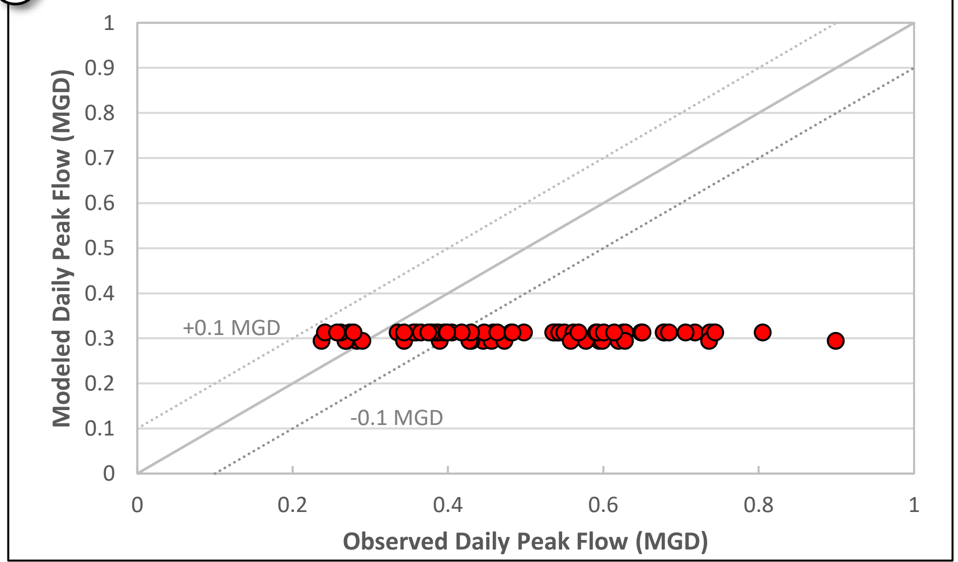
73



Flow Meter:

PB8

①



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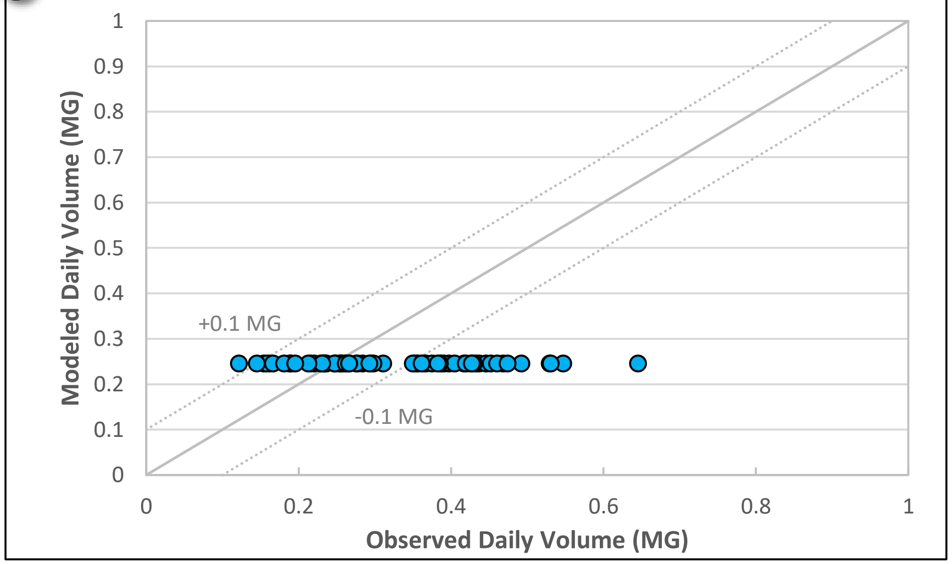

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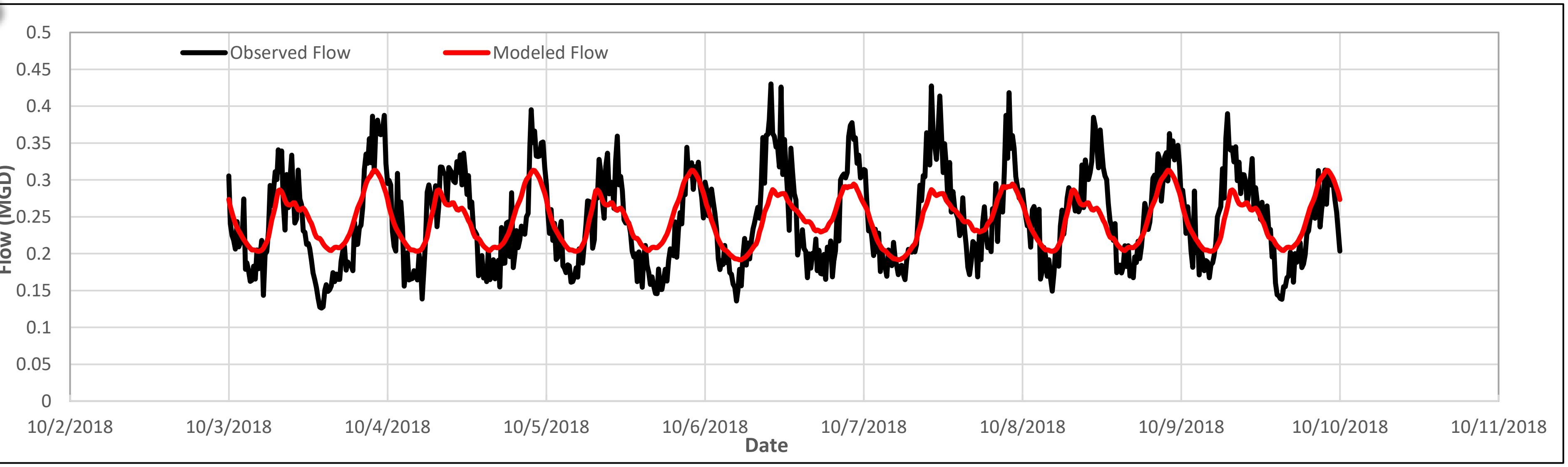


DeKalb Calibration Results

Dry Weather
Flow Summary

Flow Meter: **PB9**

Sewershed: **Pole Bridge Creek**

Sewer Basin: **Pole Bridge Basin**

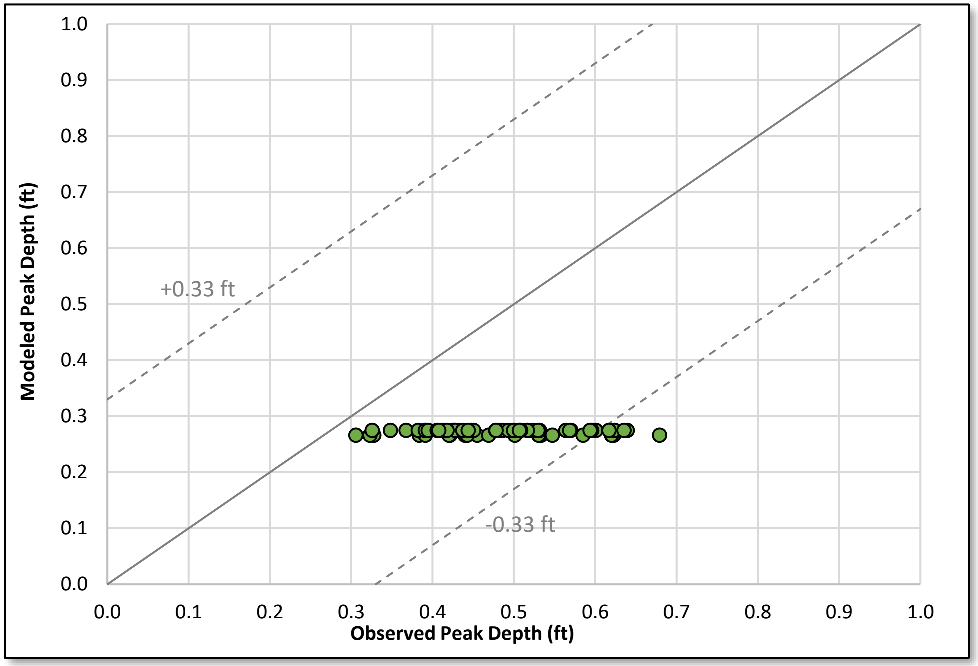
① Daily Volume

② Daily Peak Flow

③ One Week Time Series

Total Compared Dry Days:

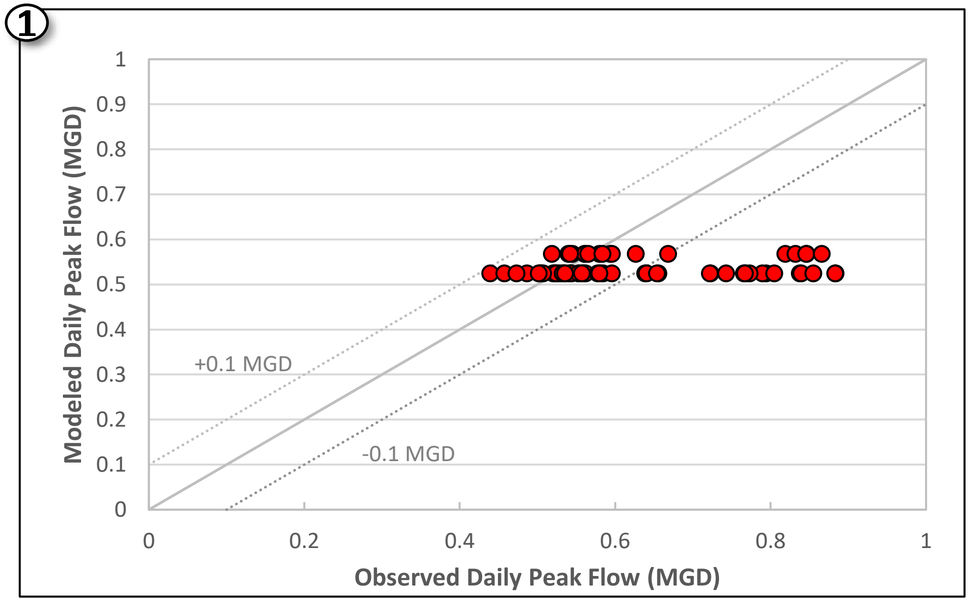
71



Flow Meter:

PB9

①



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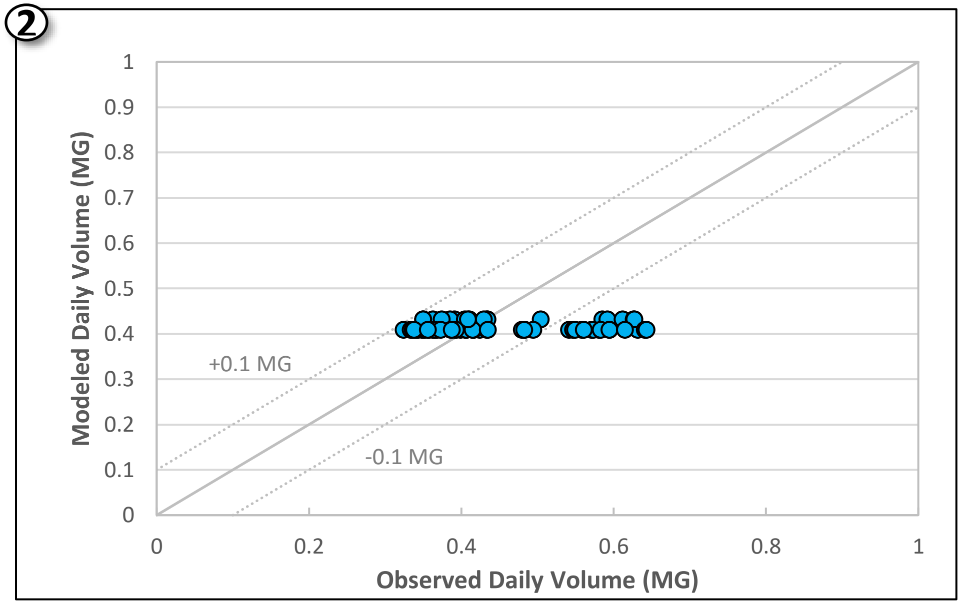

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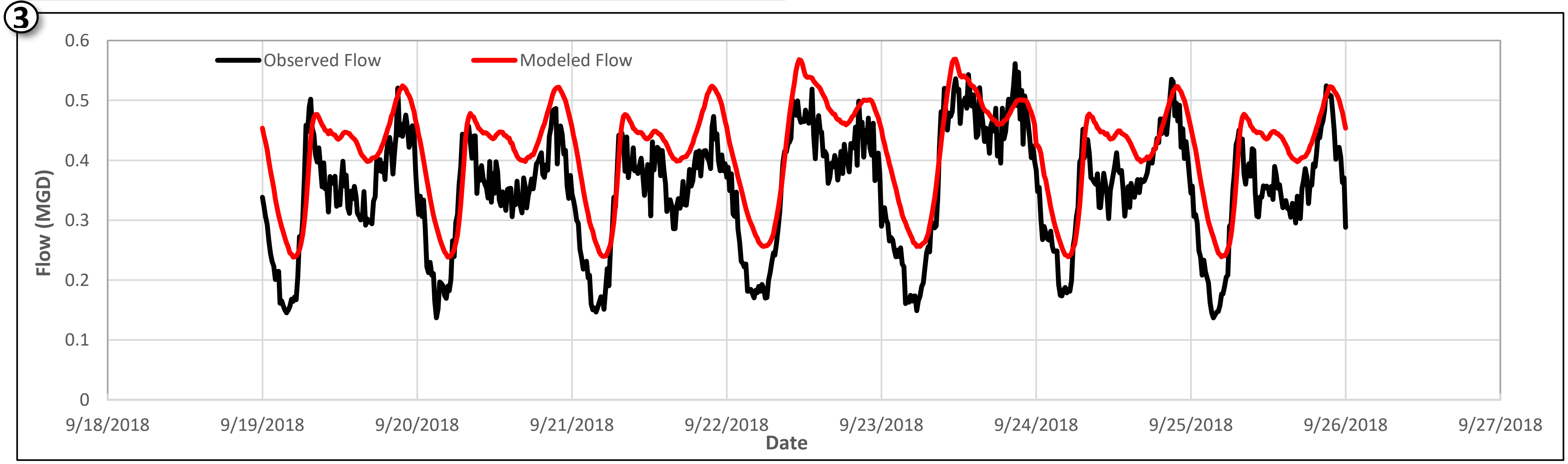


DeKalb Calibration Results

Dry Weather
Flow Summary

Flow Meter: **PB10**

Sewershed: **Pole Bridge Creek**

Sewer Basin: **Pole Bridge Basin**

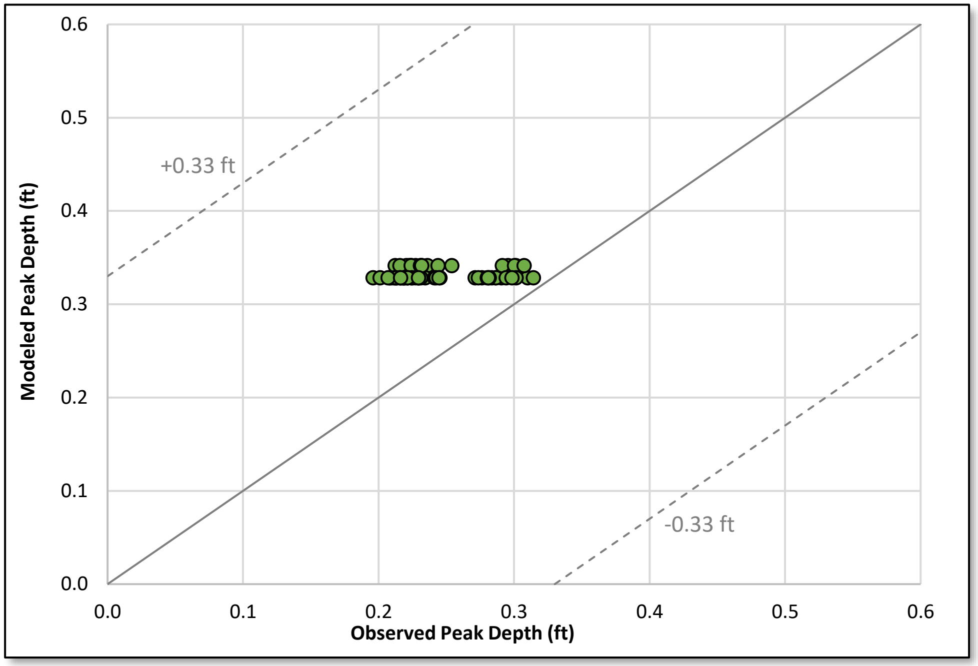
① Daily Volume

② Daily Peak Flow

③ One Week Time Series

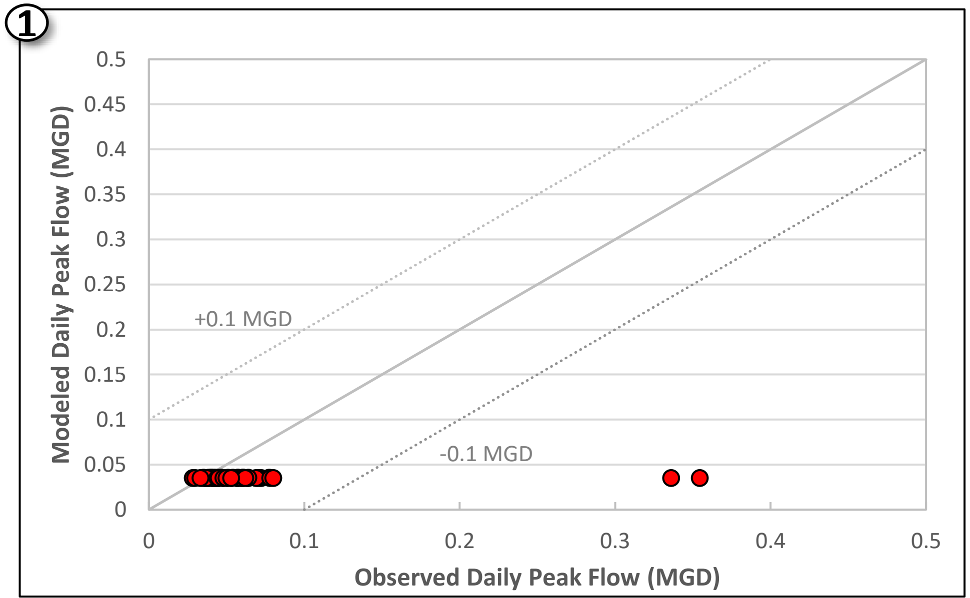
Total Compared Dry Days:

70



Flow Meter:
PB10

①



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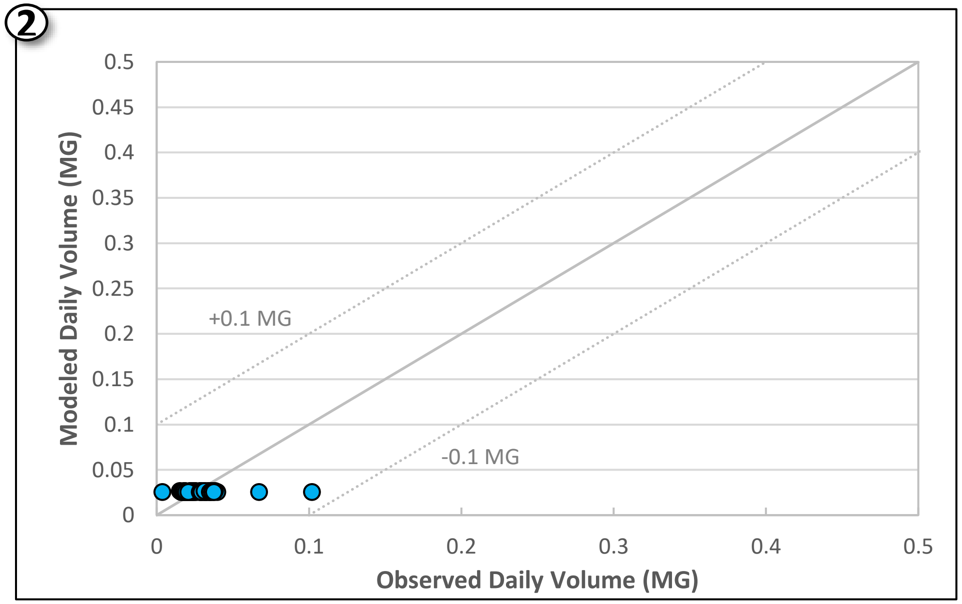

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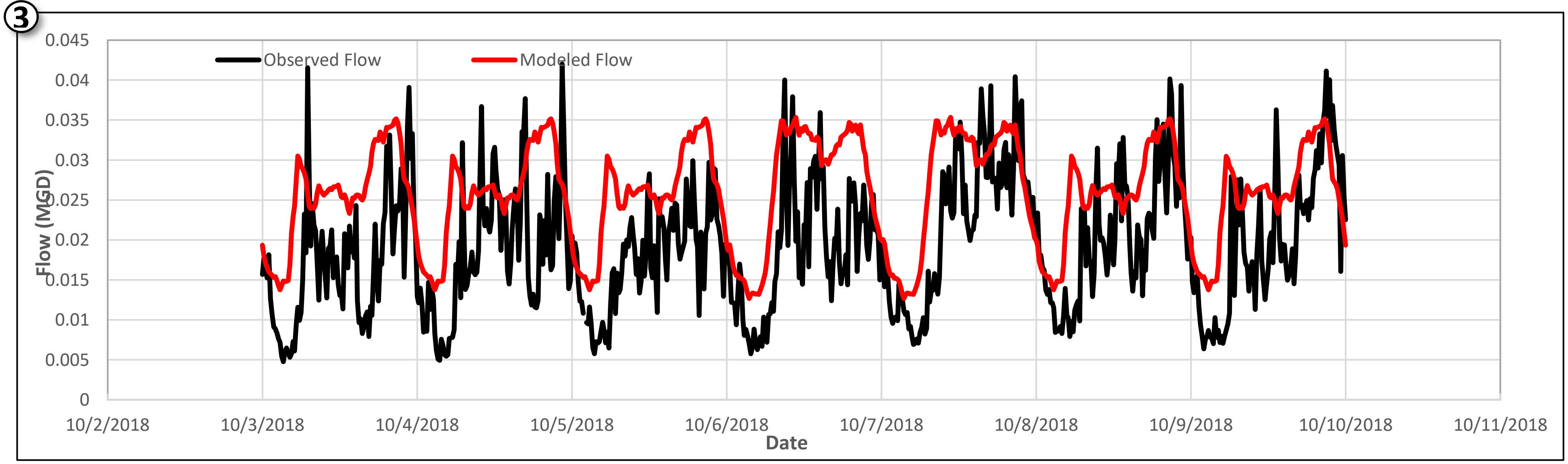


DeKalb Calibration Results

Dry Weather
Flow Summary

Flow Meter: **PBPLNT1**

Sewershed: **Pole Bridge Creek**

Sewer Basin: **Pole Bridge Basin**

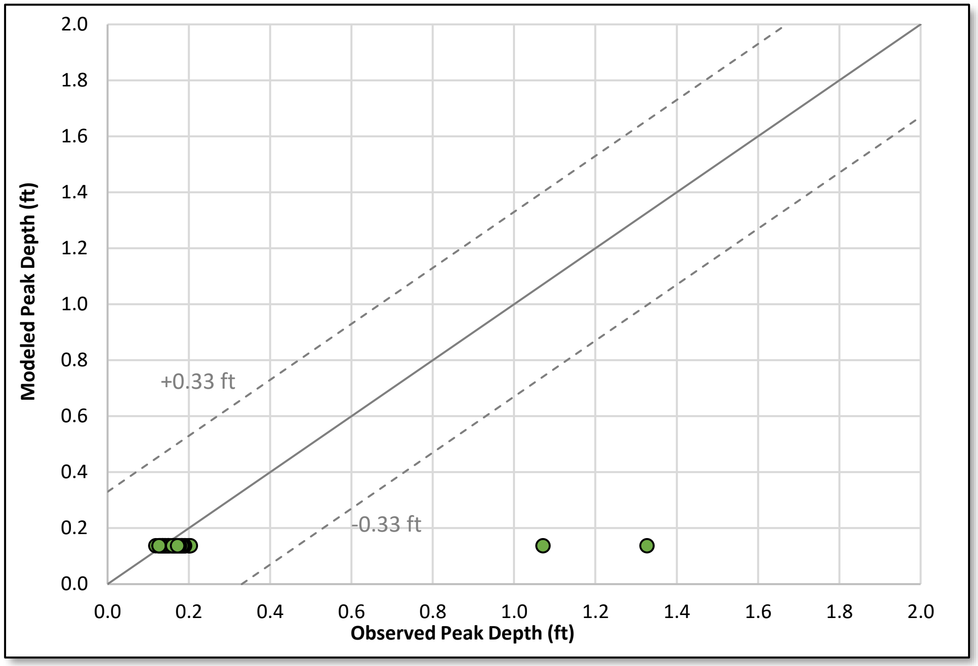
① Daily Volume

② Daily Peak Flow

③ One Week Time Series

Total Compared Dry Days:

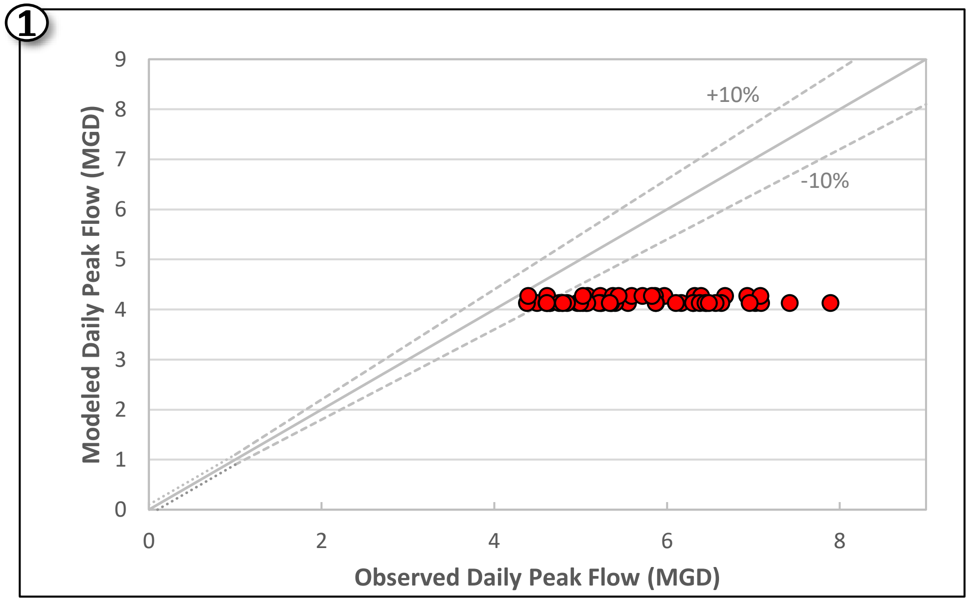
62



Flow Meter:

PBPLNT1

①



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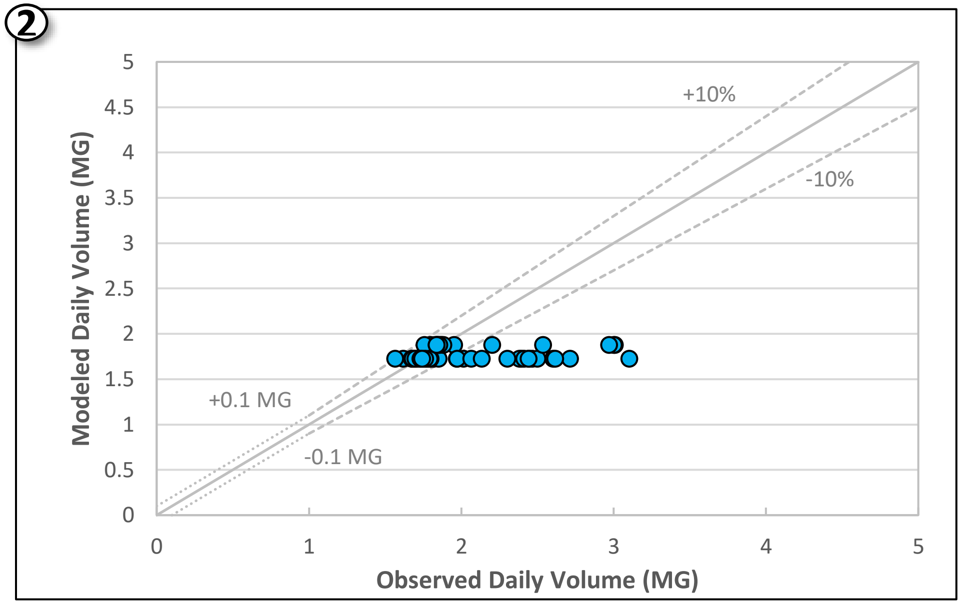

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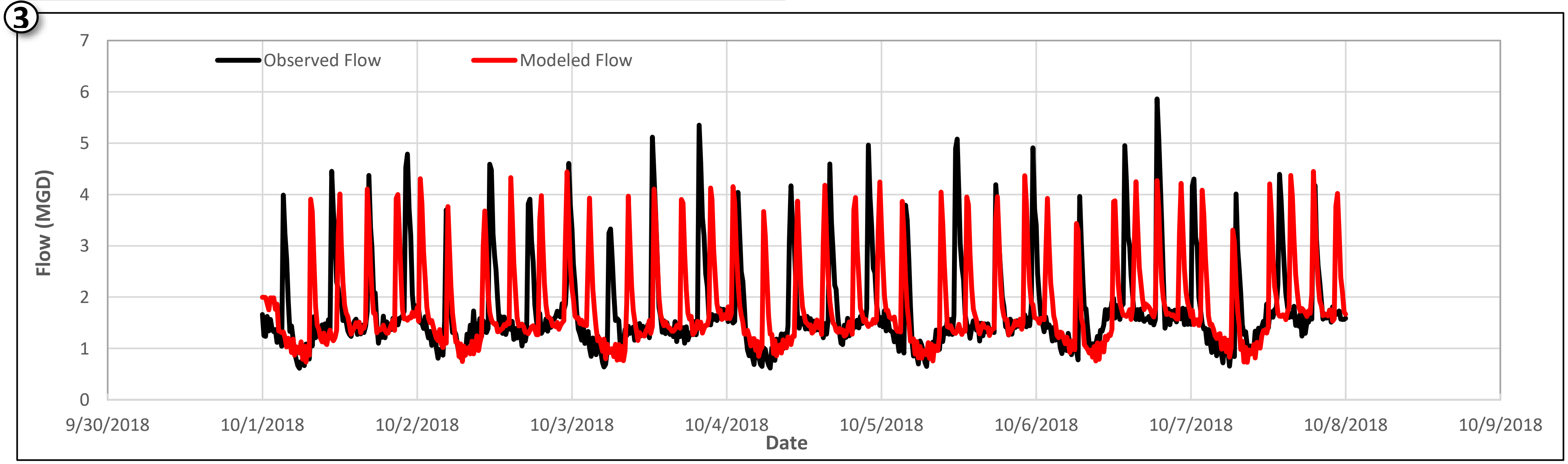


DeKalb Calibration Results

Dry Weather
Flow Summary

Flow Meter: **PBPLNT2**

Sewershed: **Pole Bridge Creek**

Sewer Basin: **Pole Bridge Basin**

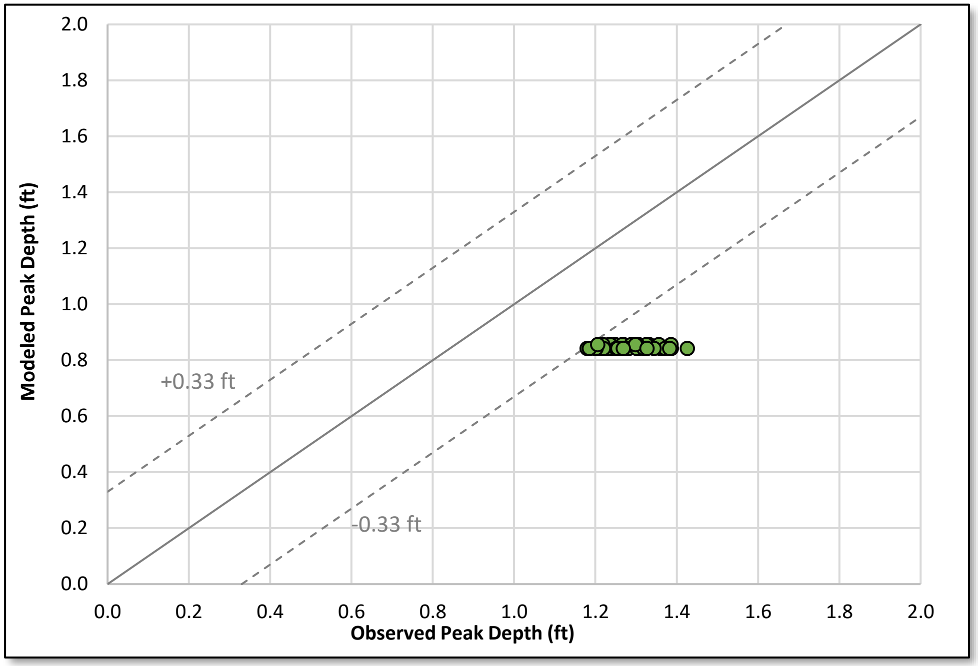
① Daily Volume

② Daily Peak Flow

③ One Week Time Series

Total Compared Dry Days:

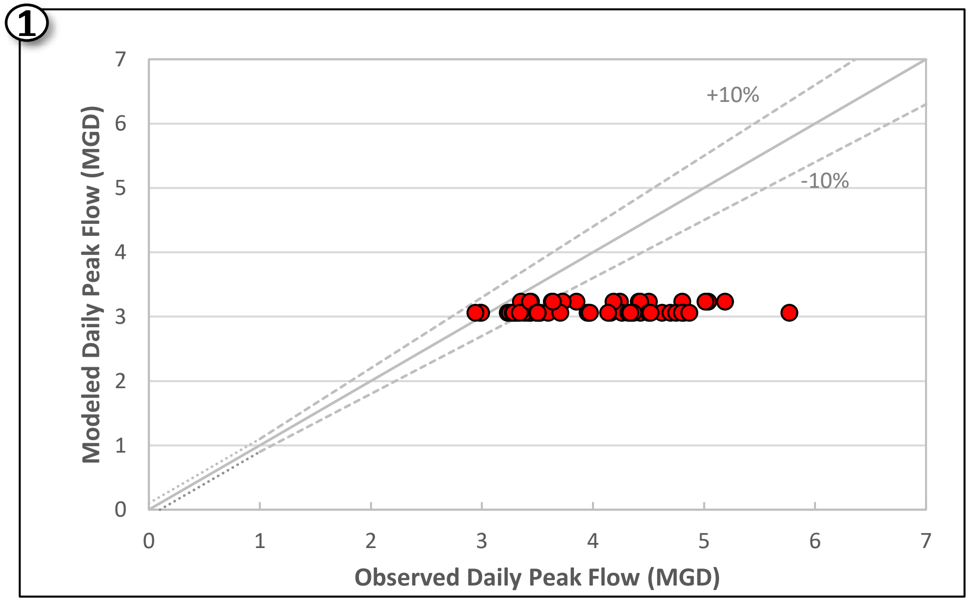
58



Flow Meter:

PBPLNT2

①



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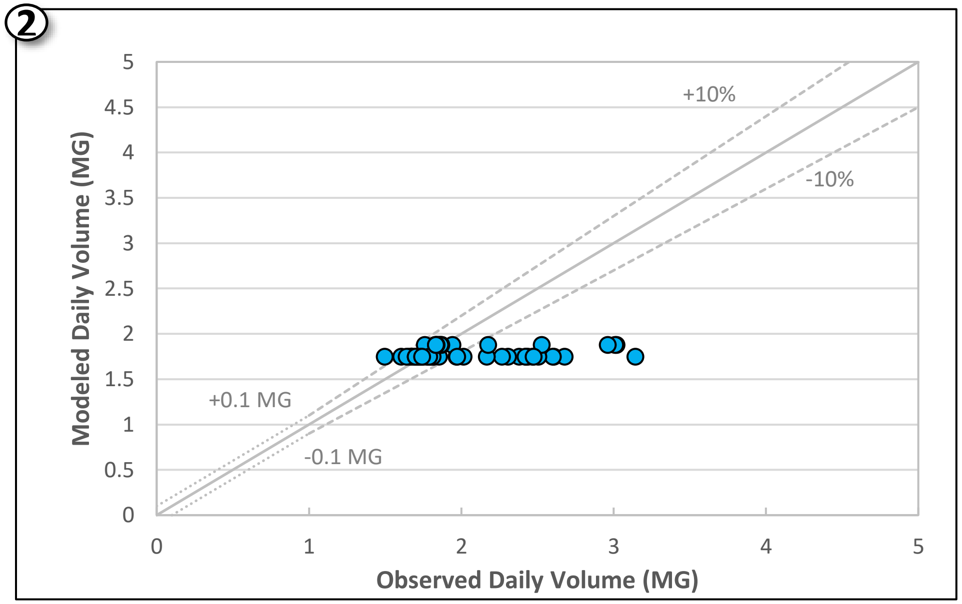

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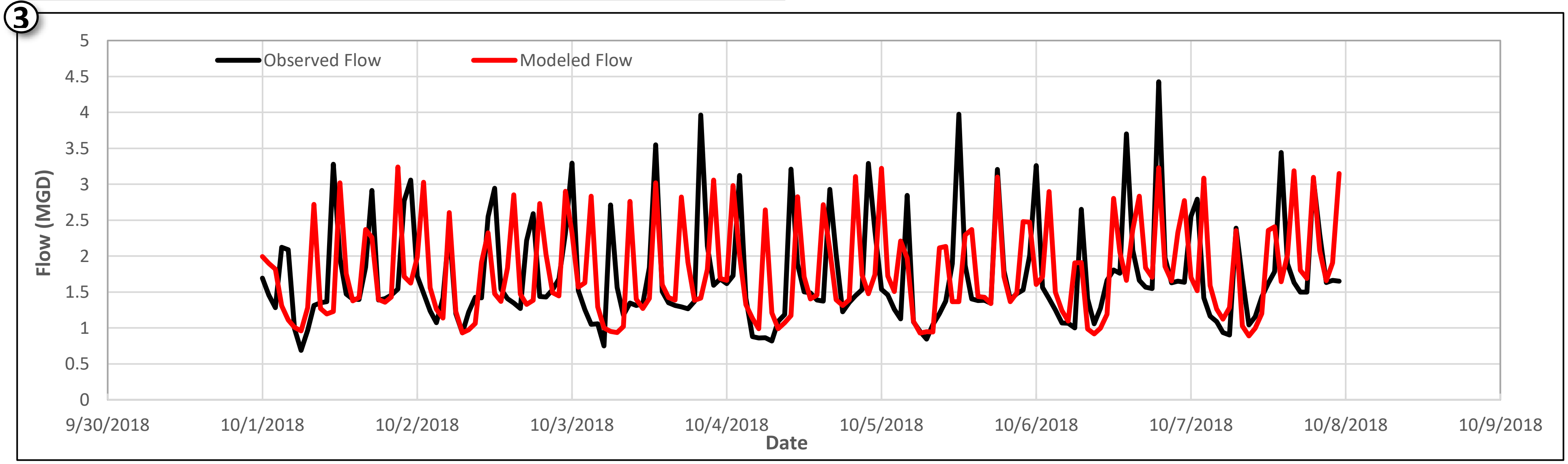


DeKalb Calibration Results

Dry Weather
Flow Summary

Flow Meter: **PBPLNT2**

Sewershed: **Pole Bridge Creek**

Sewer Basin: **Pole Bridge Basin**

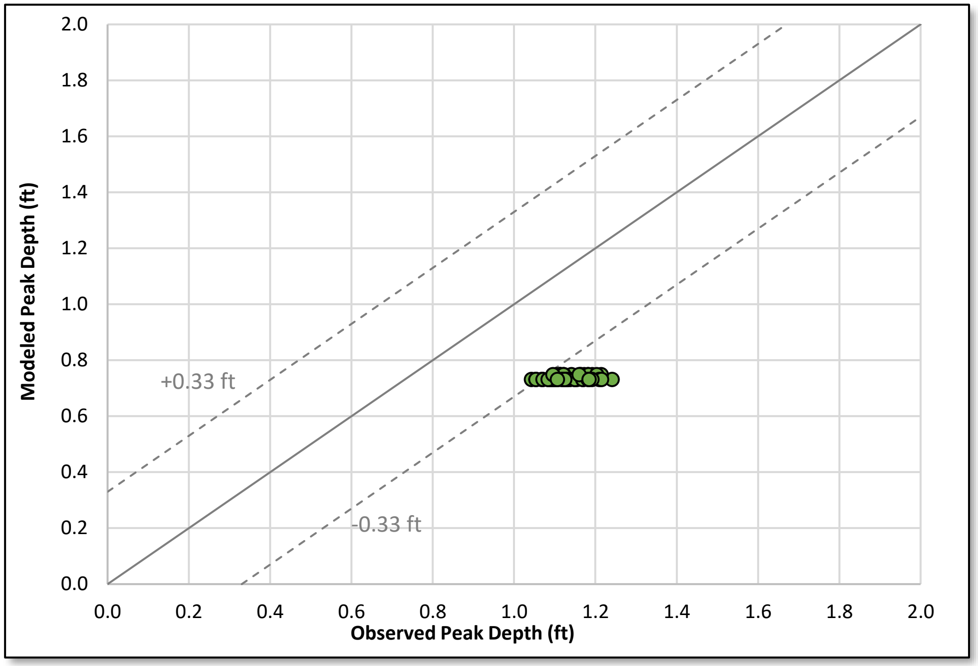
① Daily Volume

② Daily Peak Flow

③ One Week Time Series

Total Compared Dry Days:

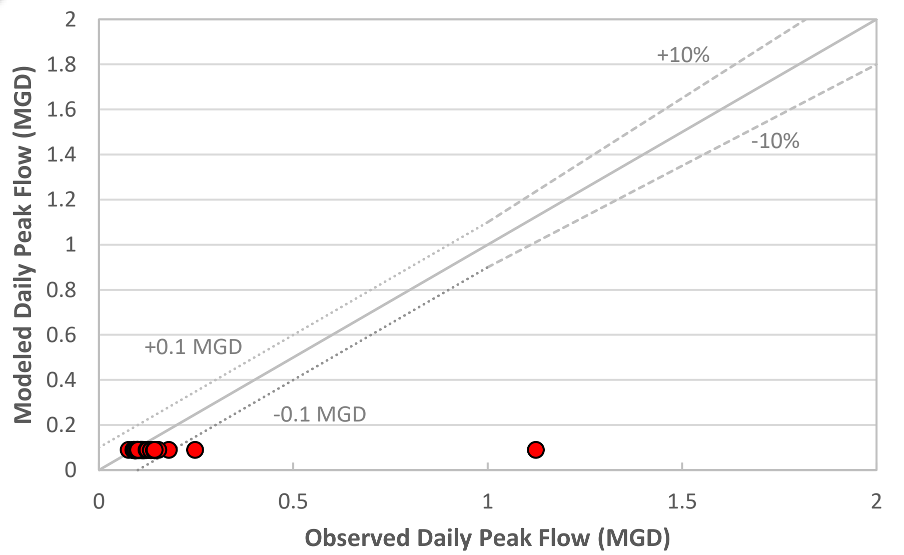
58



Flow Meter:

PBPLNT2

①



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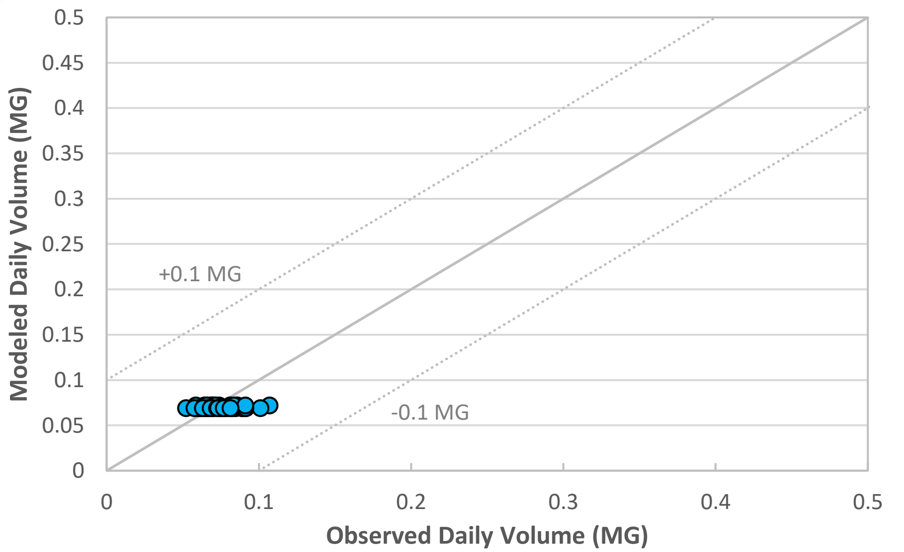

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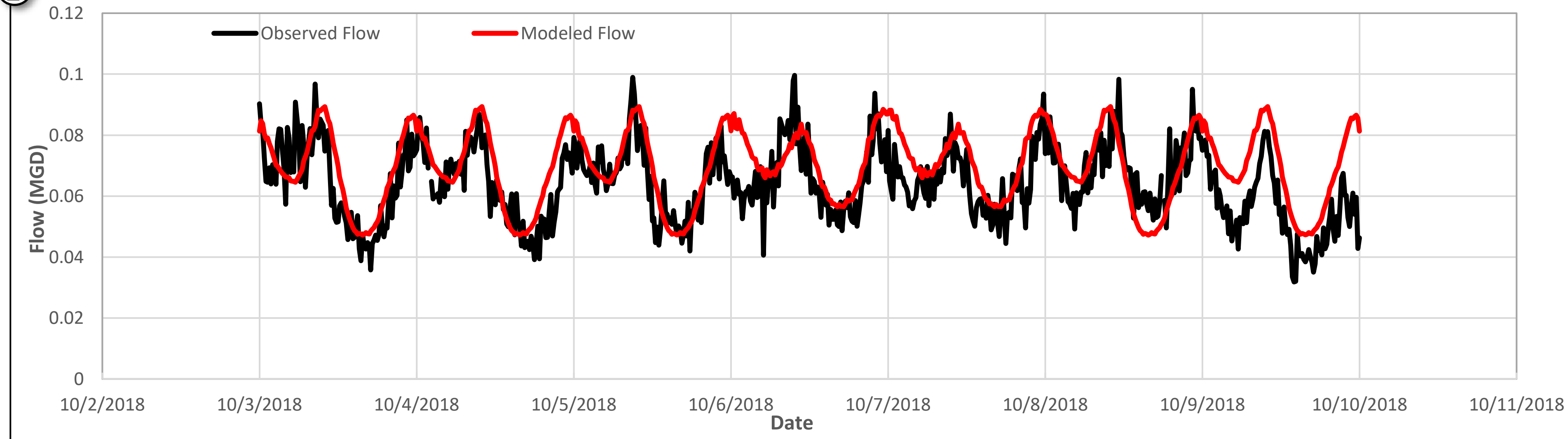


DeKalb Calibration Results

Dry Weather
Flow Summary

Flow Meter: **PBPLNT3**

Sewershed: **Pole Bridge Creek**

Sewer Basin: **Pole Bridge Basin**

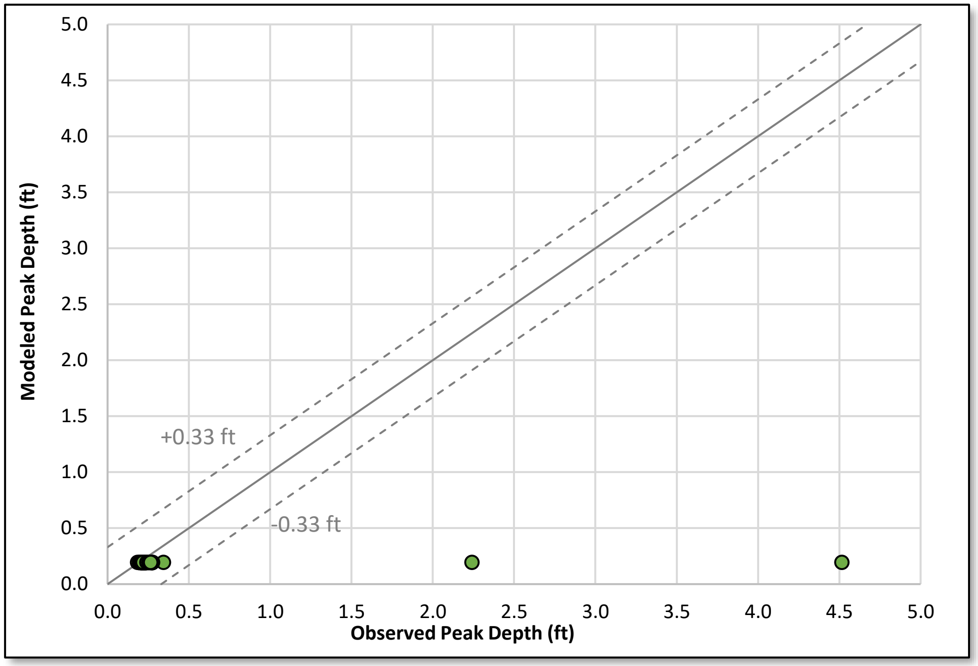
① Daily Volume

② Daily Peak Flow

③ One Week Time Series

Total Compared Dry Days:

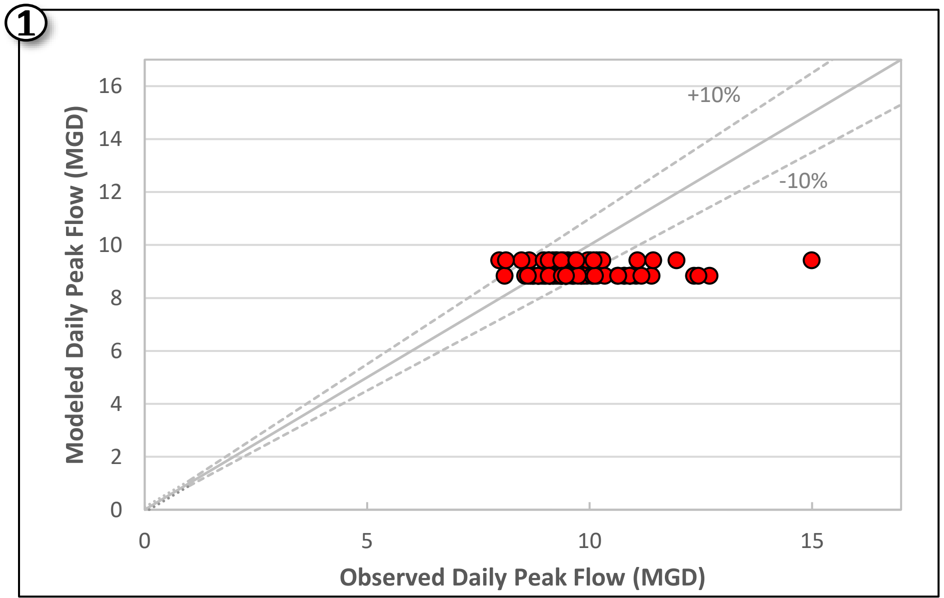
73



Flow Meter:

PBPLNT3

①



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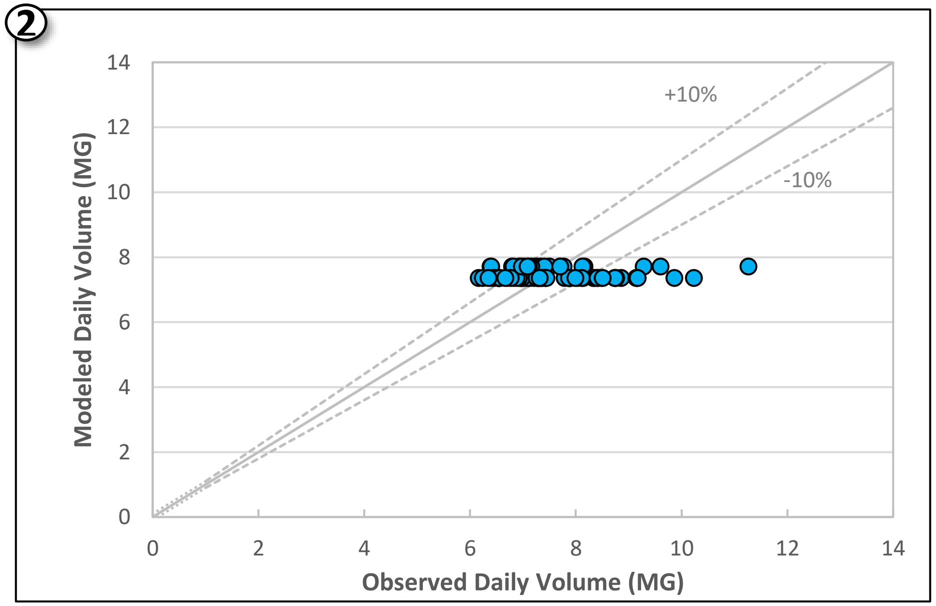

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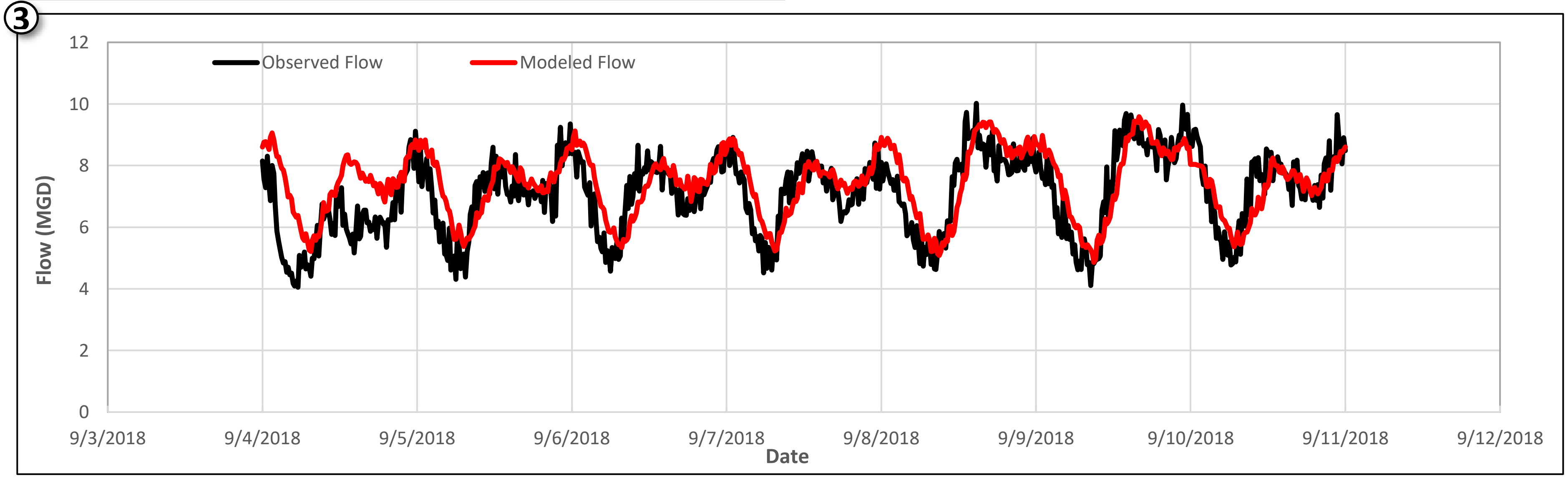


DeKalb Calibration Results

Dry Weather
Flow Summary

Flow Meter: **PBPLNT4**

Sewershed: **Pole Bridge Creek**

Sewer Basin: **Pole Bridge Basin**

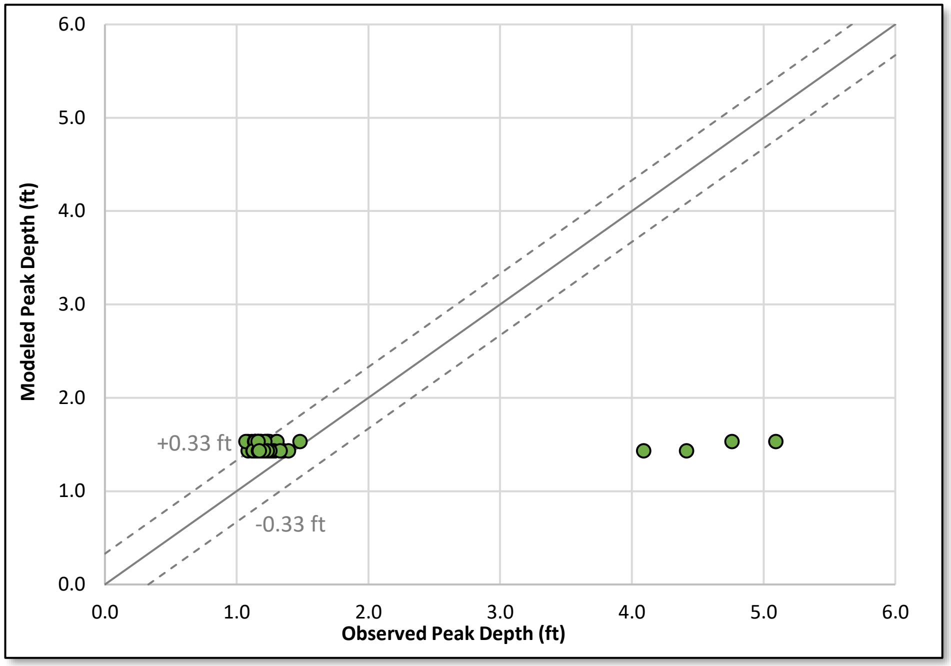
① Daily Volume

② Daily Peak Flow

③ One Week Time Series

Total Compared Dry Days:

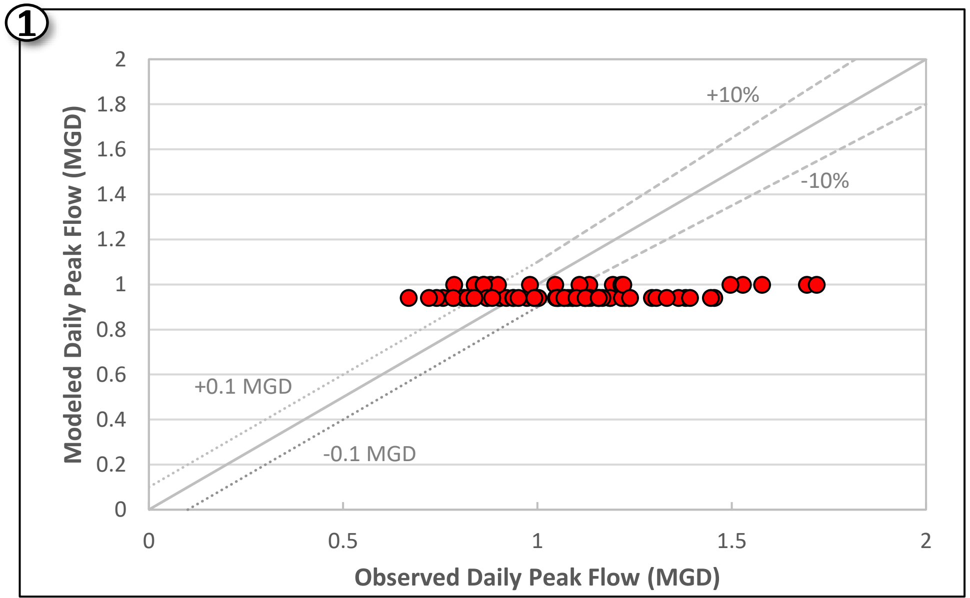
84



Flow Meter:

PBPLNT4

①



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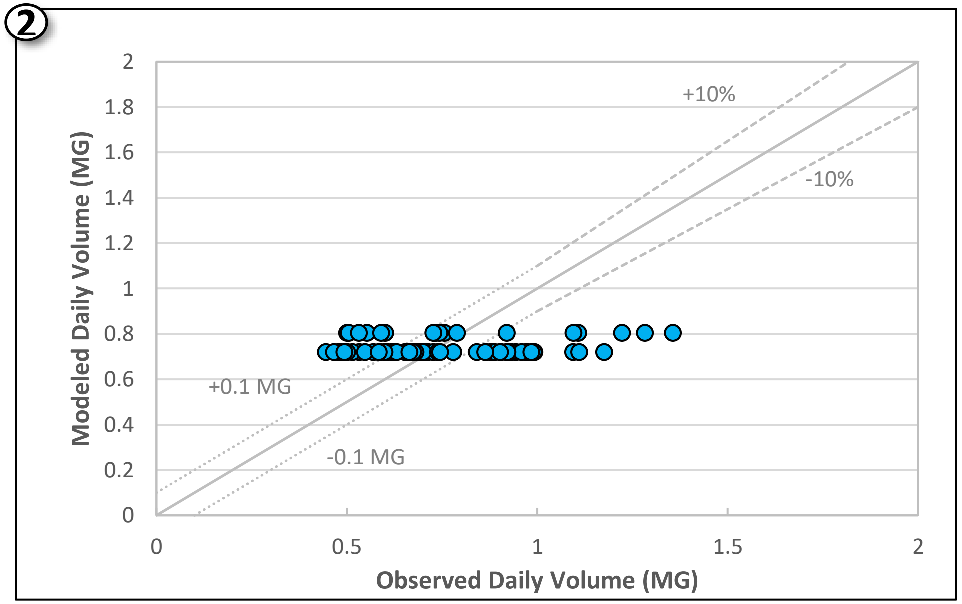

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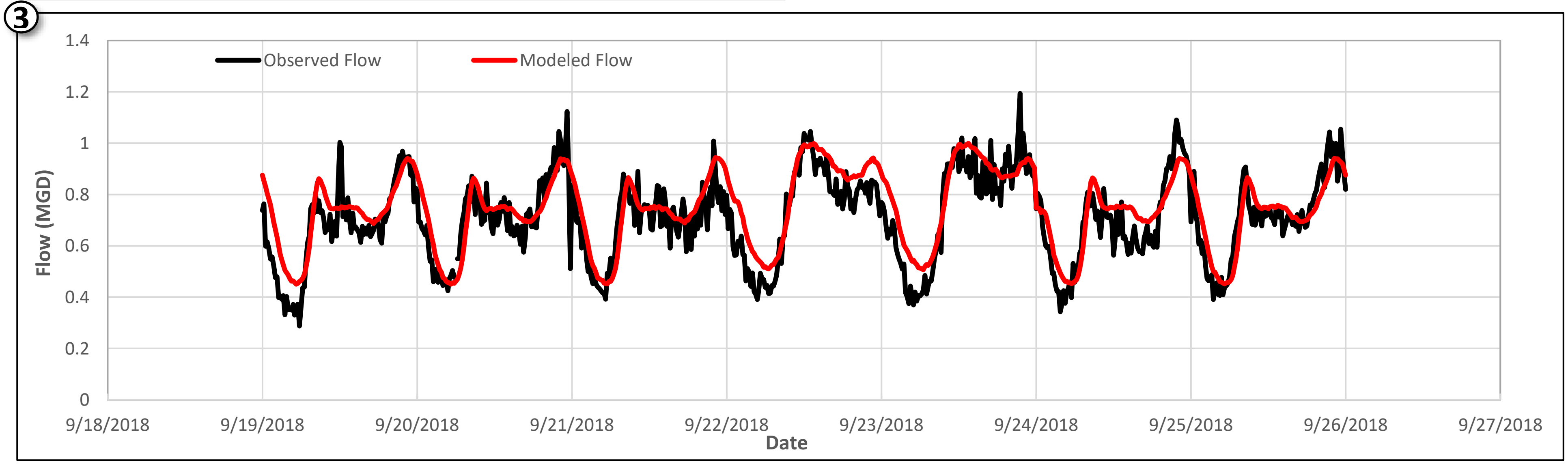


DeKalb Calibration Results

Dry Weather
Flow Summary

Flow Meter: **PBPLNT5**

Sewershed: **Pole Bridge Creek**

Sewer Basin: **Pole Bridge Basin**

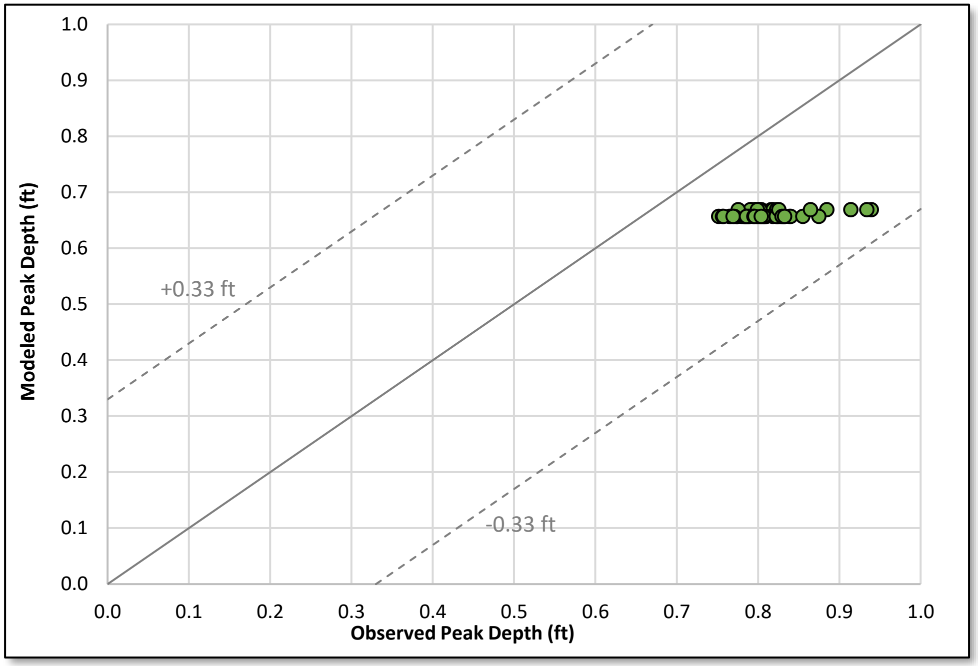
① Daily Volume

② Daily Peak Flow

③ One Week Time Series

Total Compared Dry Days:

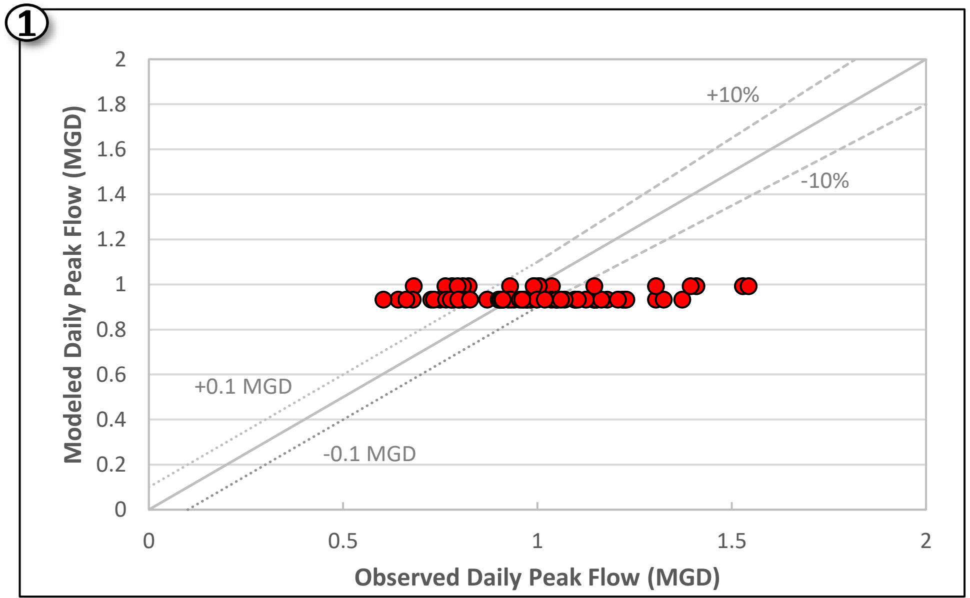
76



Flow Meter:

PBPLNT5

①



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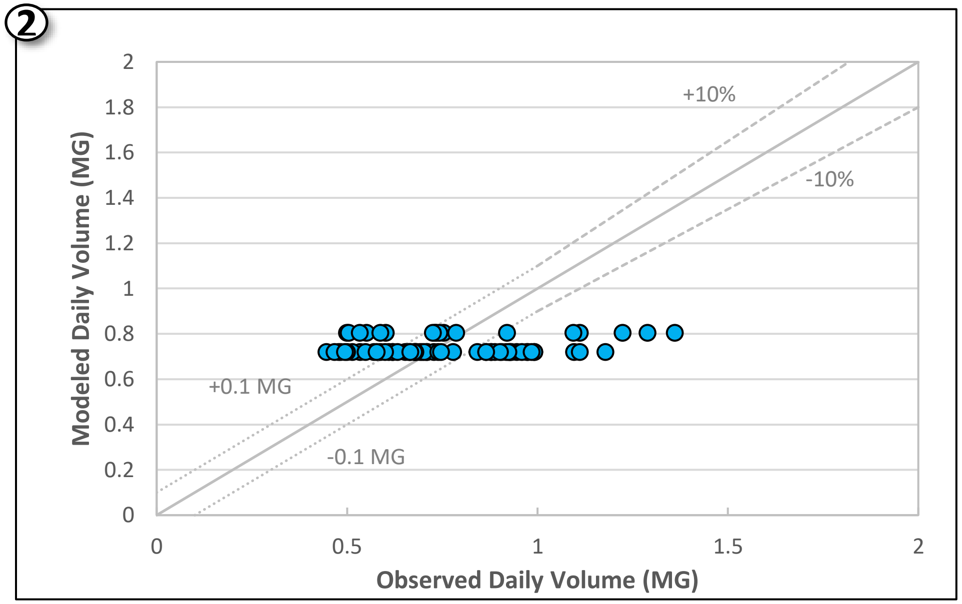

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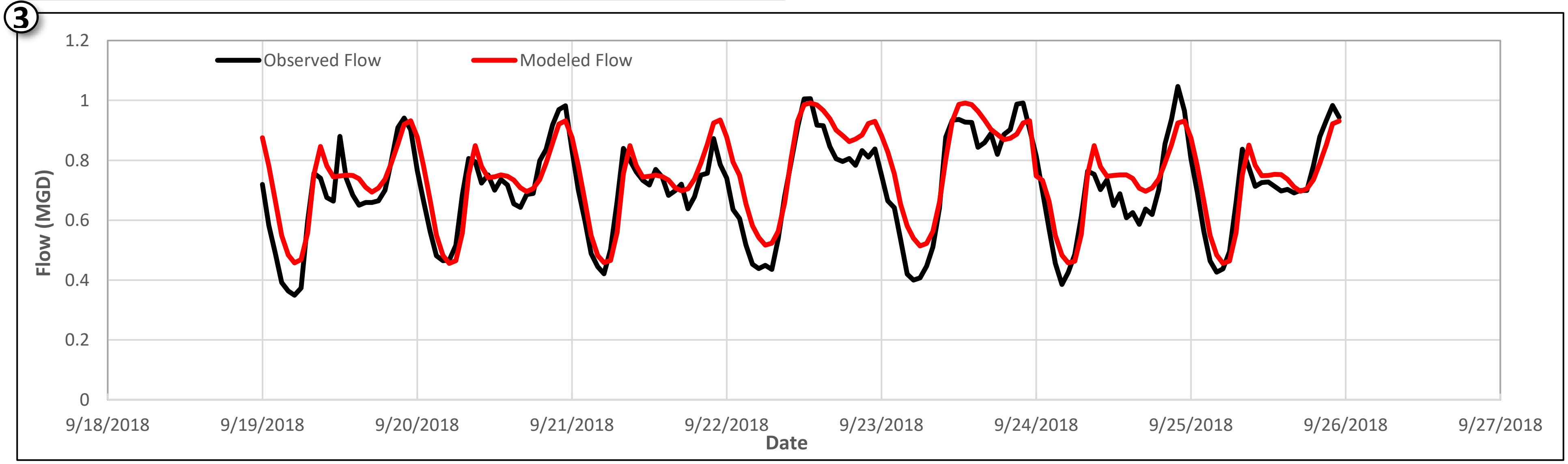


DeKalb Calibration Results

Dry Weather
Flow Summary

Flow Meter: **PBPLNT5**

Sewershed: **Pole Bridge Creek**

Sewer Basin: **Pole Bridge Basin**

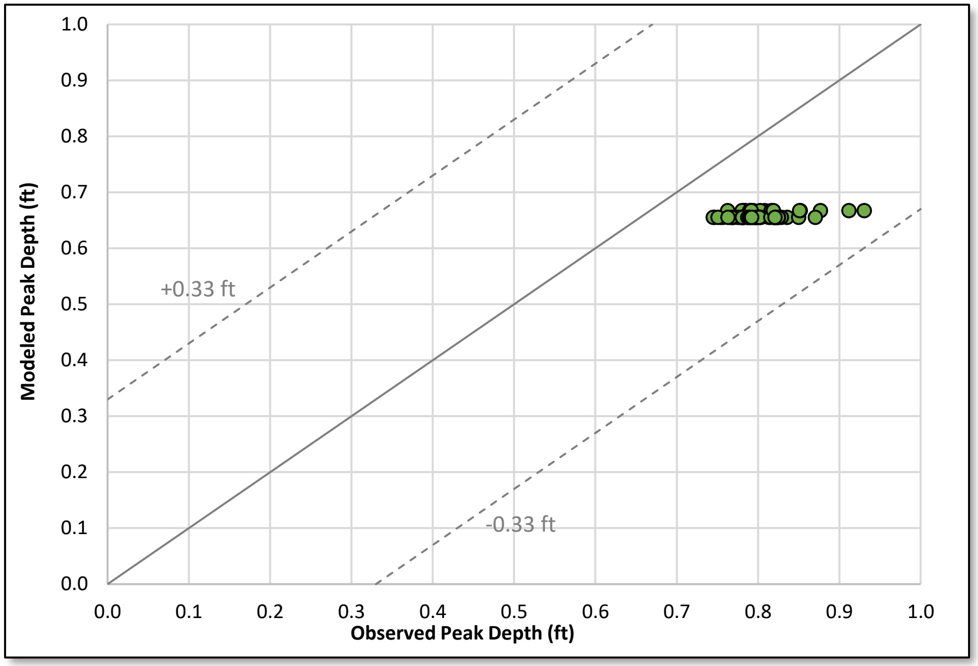
① Daily Volume

② Daily Peak Flow

③ One Week Time Series

Total Compared Dry Days:

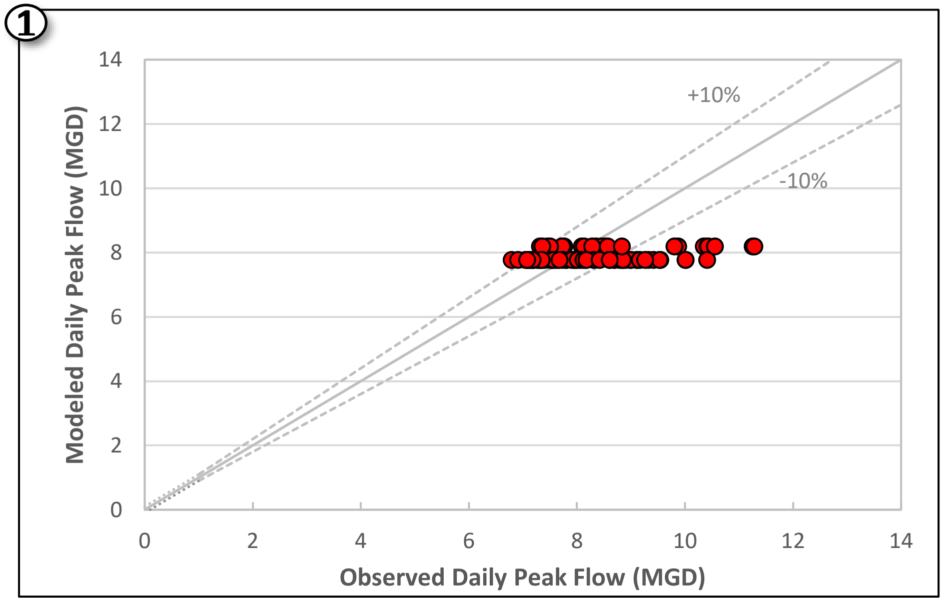
76



Flow Meter:

PBPLNT5

①



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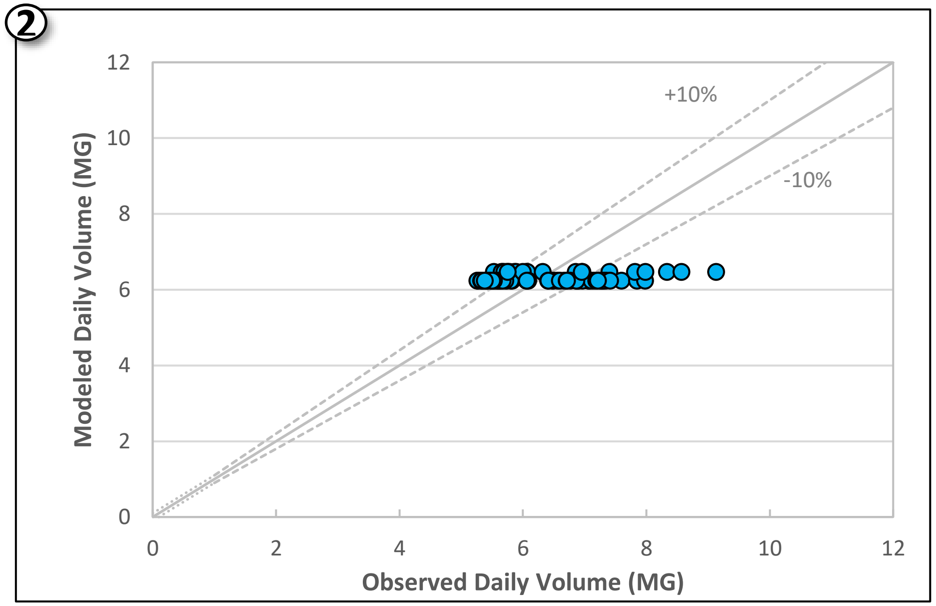

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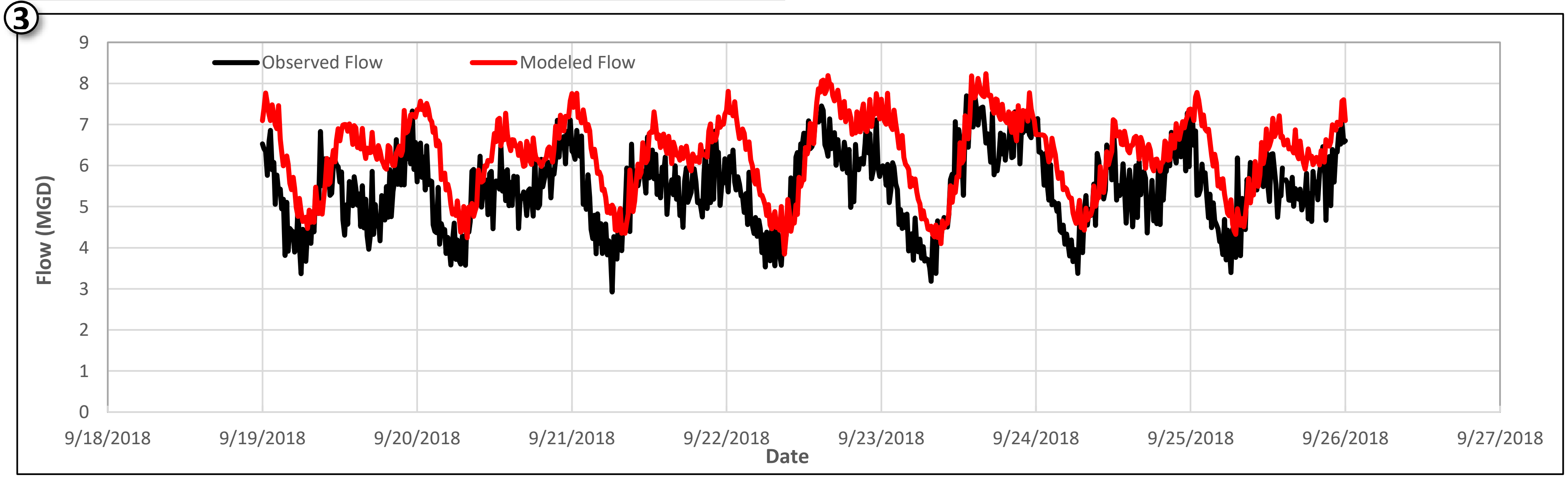


DeKalb Calibration Results

Dry Weather
Flow Summary

Flow Meter: **PBPLNT6**

Sewershed: **Pole Bridge Creek**

Sewer Basin: **Pole Bridge Basin**

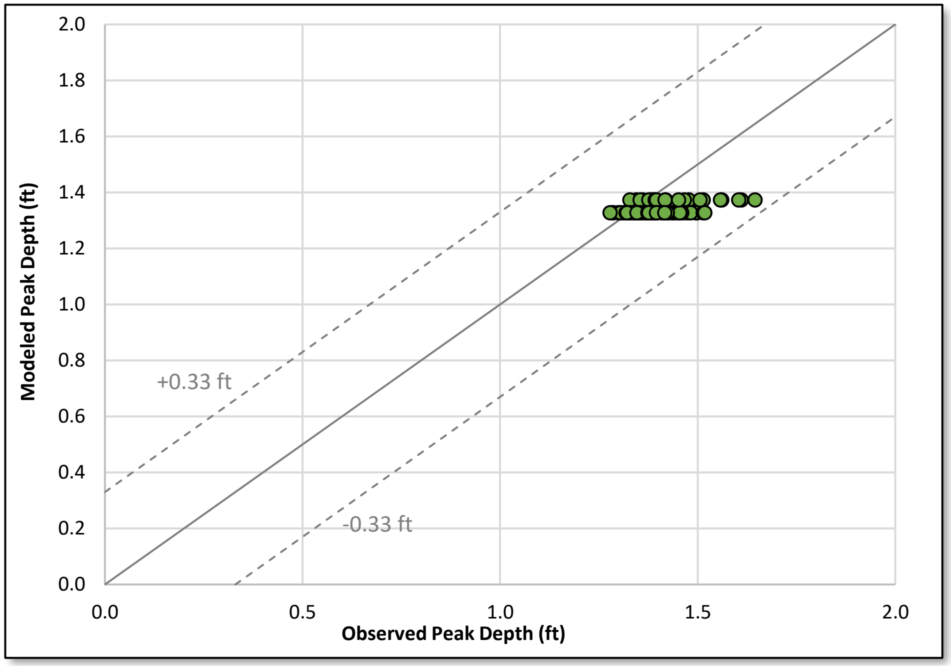
① Daily Volume

② Daily Peak Flow

③ One Week Time Series

Total Compared Dry Days:

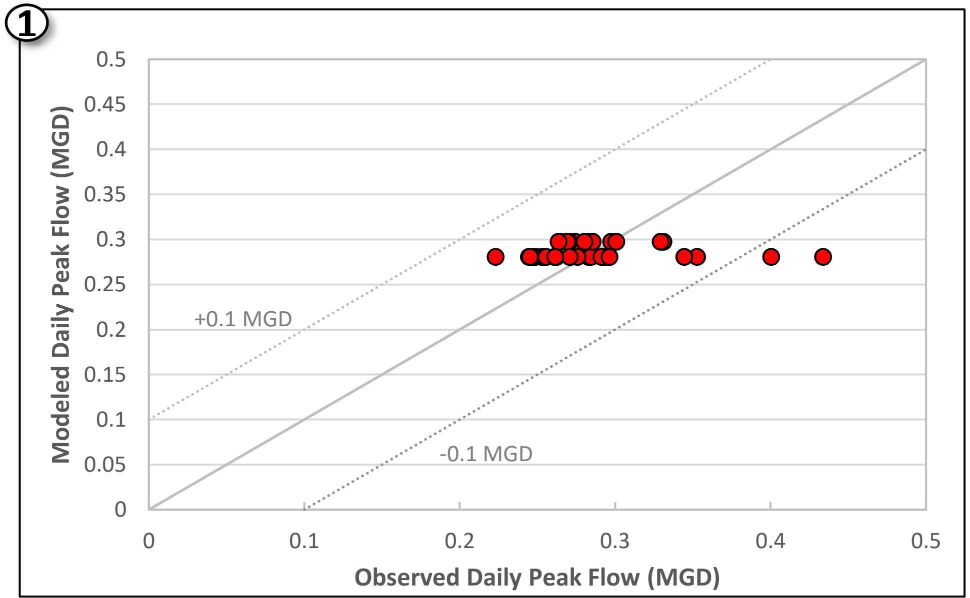
84



Flow Meter:

PBPLNT6

①



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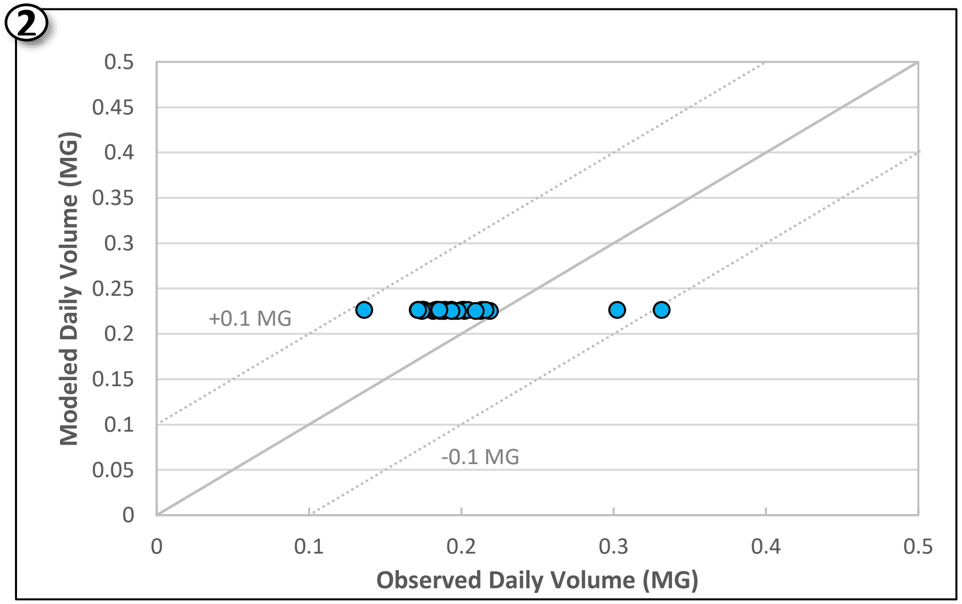

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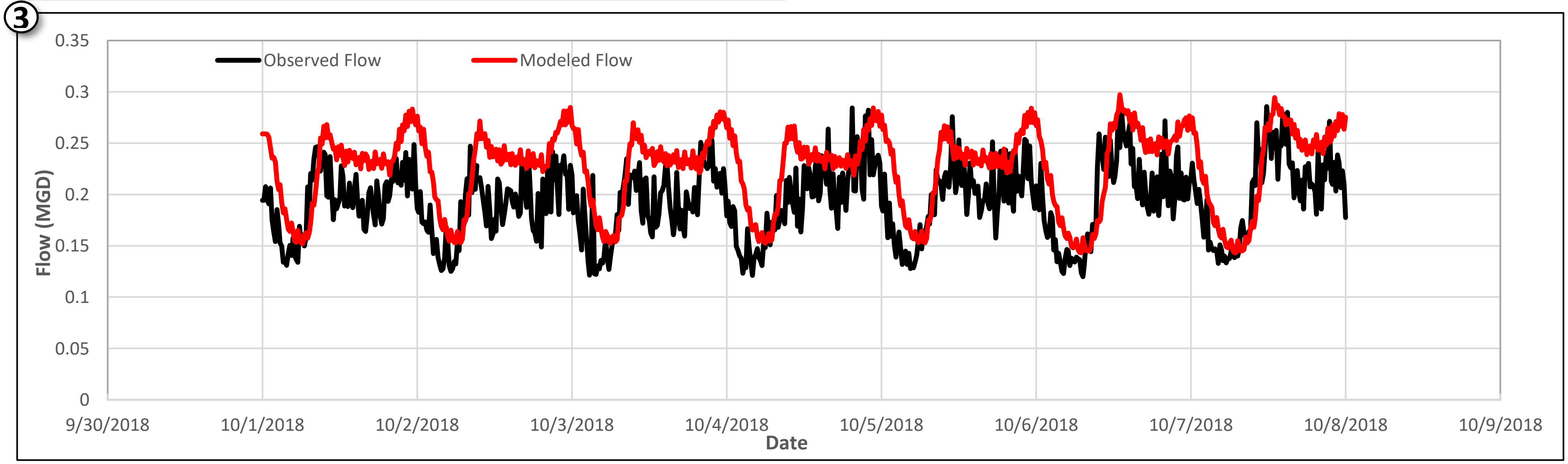


DeKalb Calibration Results

Dry Weather
Flow Summary

Flow Meter: **PINEM1**

Sewershed: **Pine Mountain Creek**

Sewer Basin: **Pole Bridge Basin**

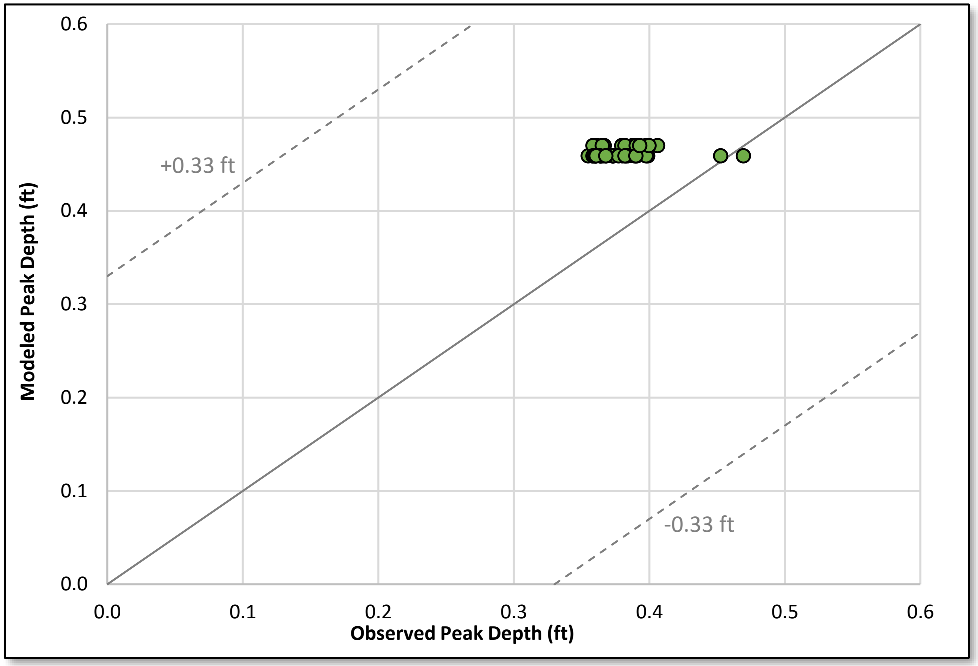
① Daily Volume

② Daily Peak Flow

③ One Week Time Series

Total Compared Dry Days:

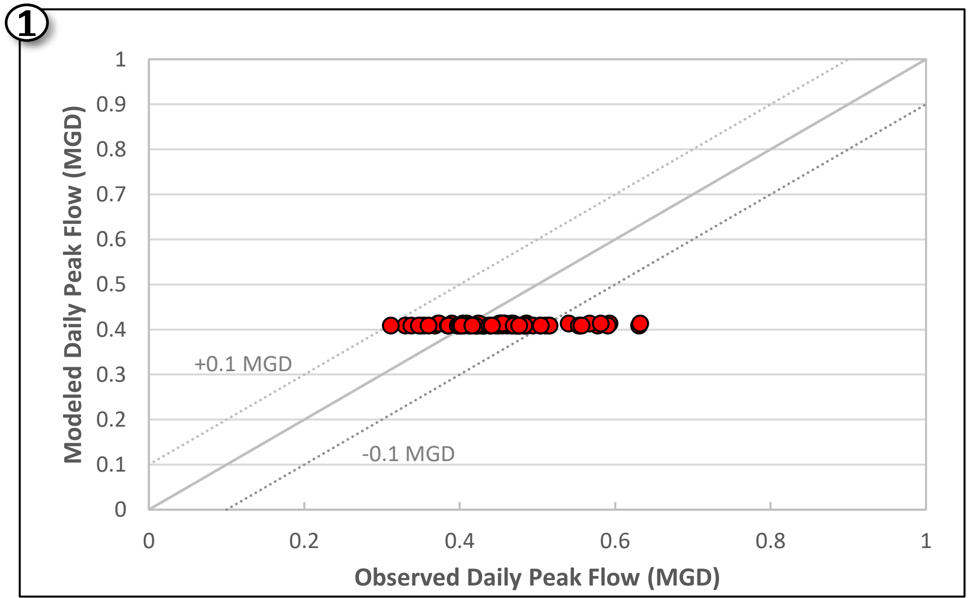
40



Flow Meter:

PINEM1

①



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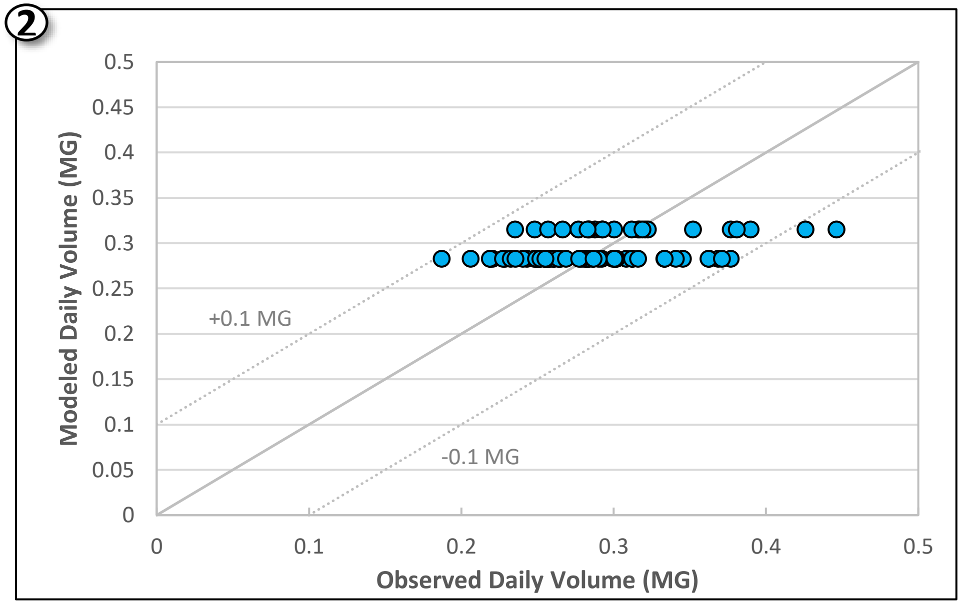

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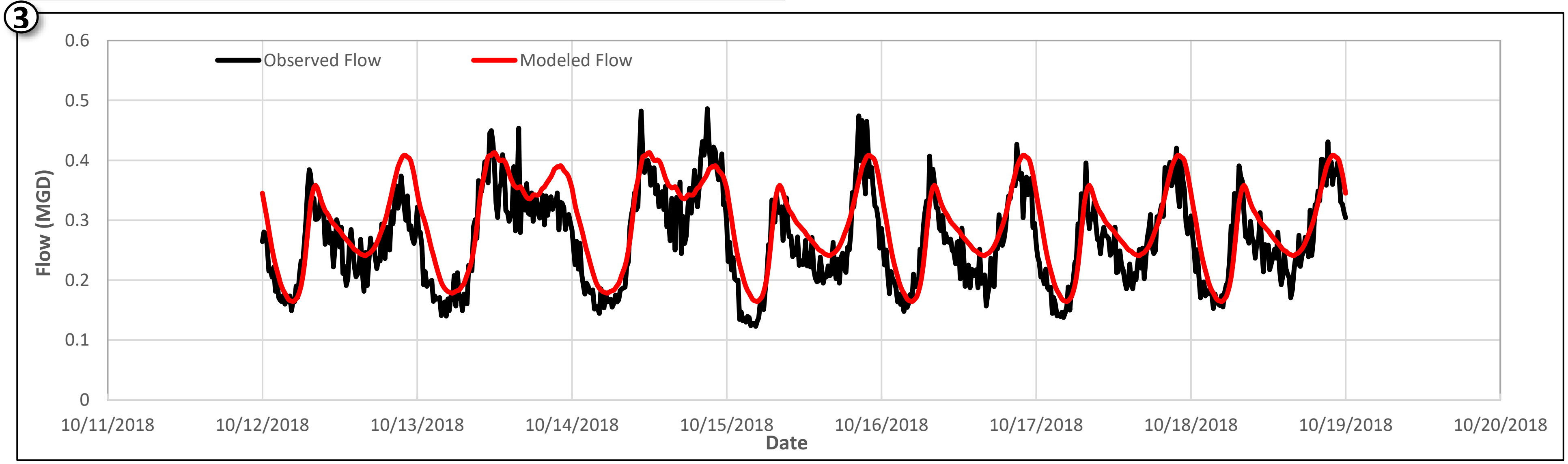


DeKalb Calibration Results

Dry Weather
Flow Summary

Flow Meter: **SWIFT2**

Sewershed: **Swift Creek**

Sewer Basin: **Pole Bridge Basin**

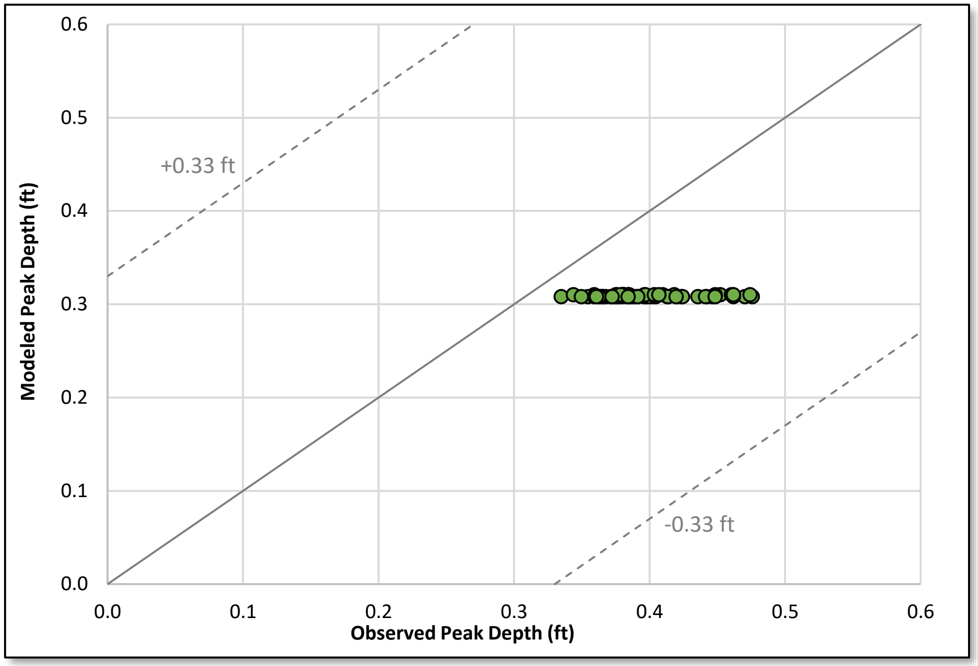
① Daily Volume

② Daily Peak Flow

③ One Week Time Series

Total Compared Dry Days:

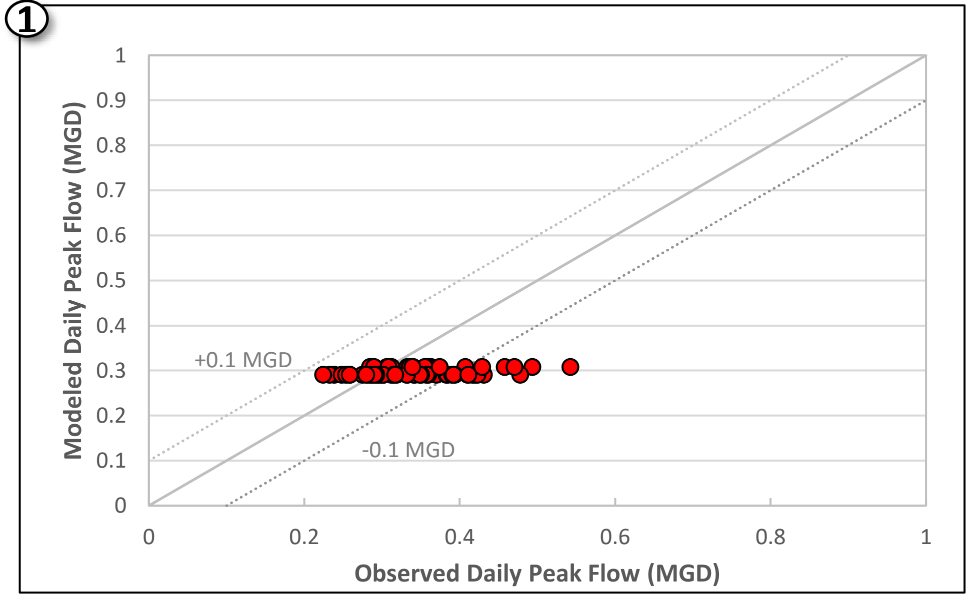
85



Flow Meter:

SWIFT2

①



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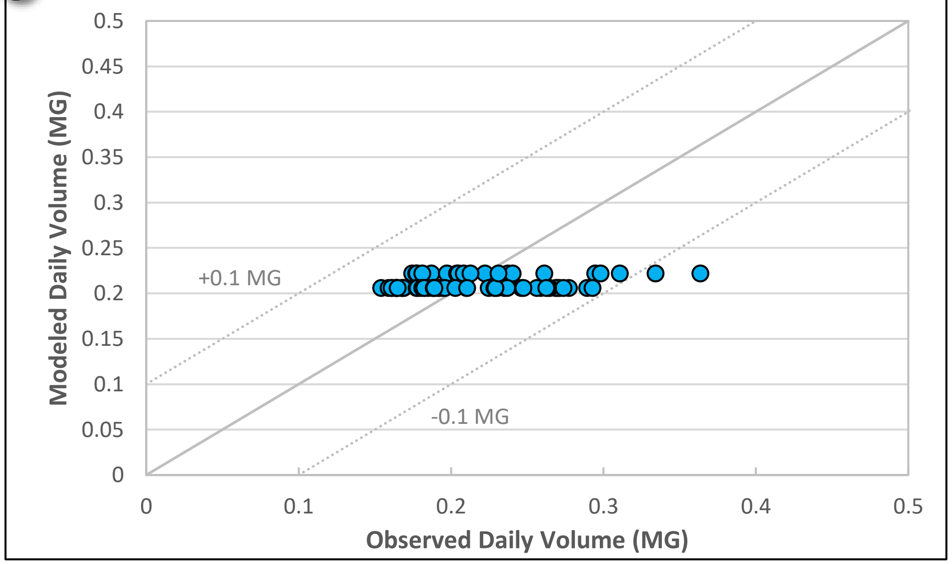

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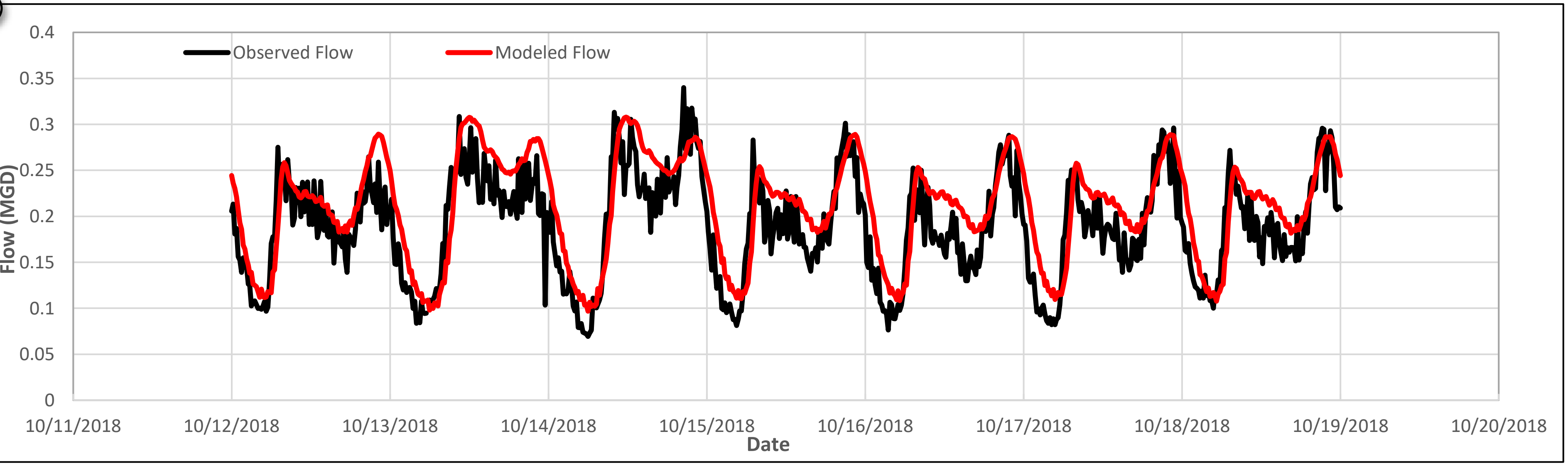


DeKalb Calibration Results

Dry Weather
Flow Summary

Flow Meter: **UCKC1**

Sewershed: **Upper Crooked Creek**

Sewer Basin: **Pole Bridge Basin**

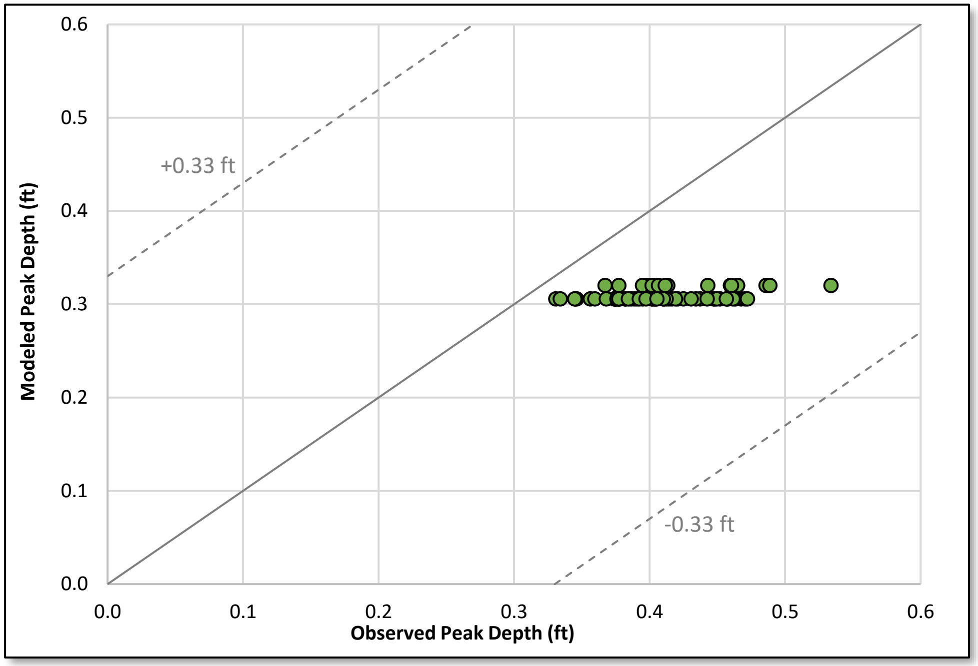
① Daily Volume

② Daily Peak Flow

③ One Week Time Series

Total Compared Dry Days:

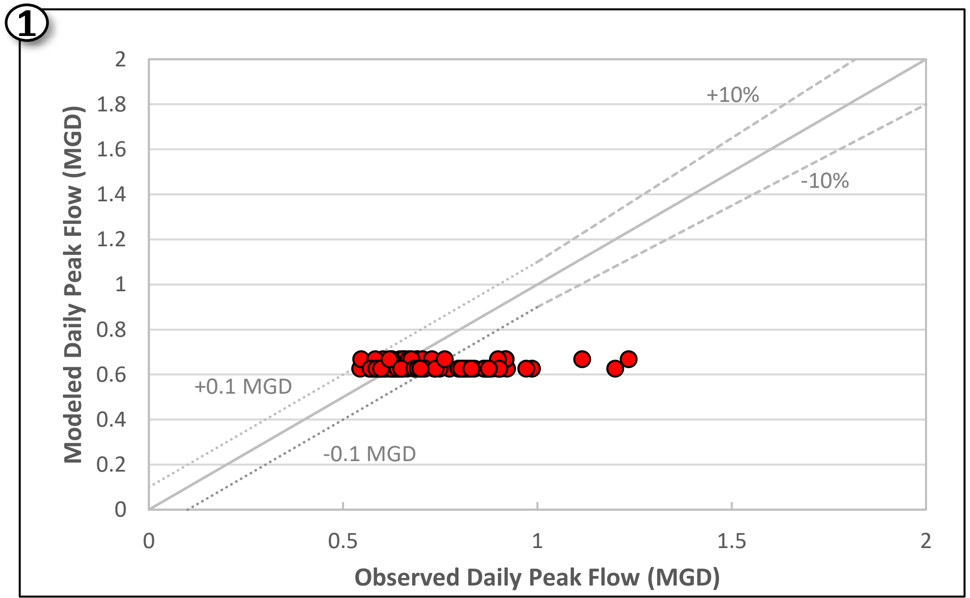
74



Flow Meter:

UCKC1

①



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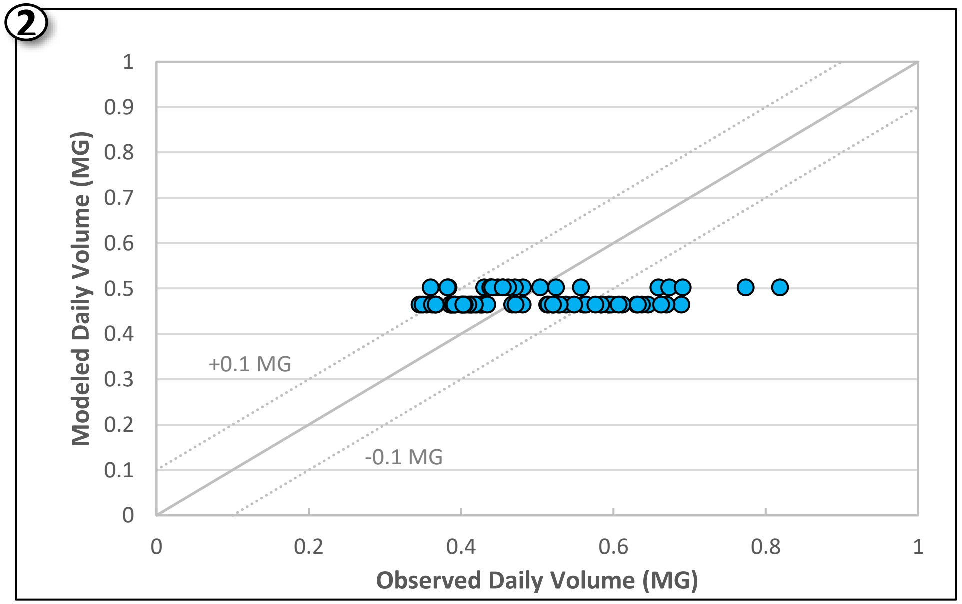

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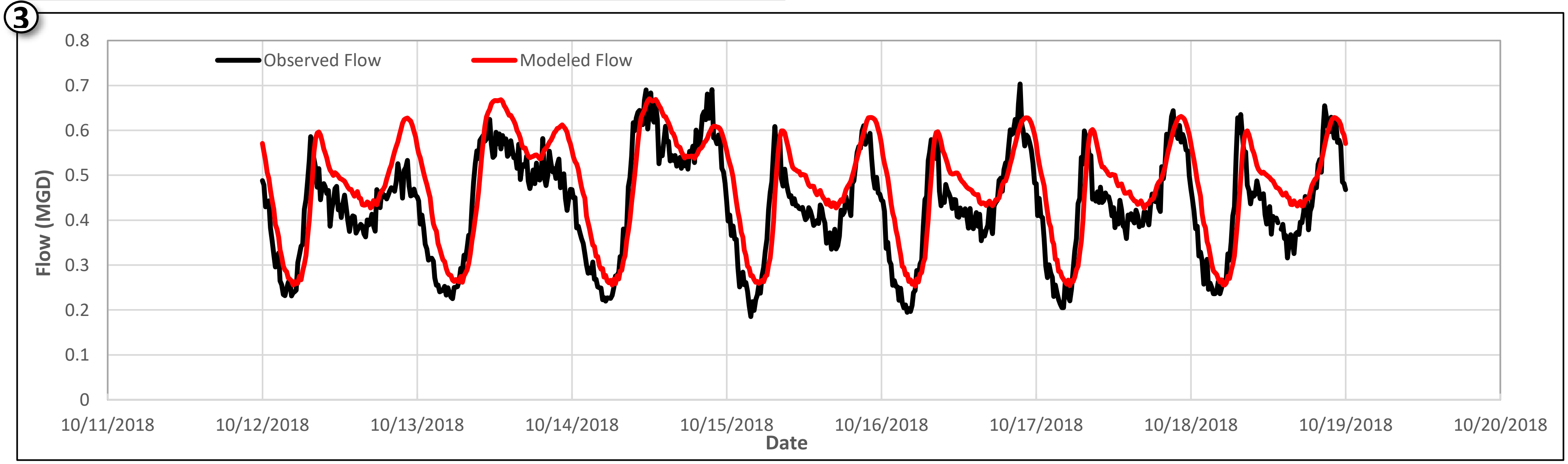


DeKalb Calibration Results

Dry Weather
Flow Summary

Flow Meter: **UCKC2**

Sewershed: **Upper Crooked Creek**

Sewer Basin: **Pole Bridge Basin**

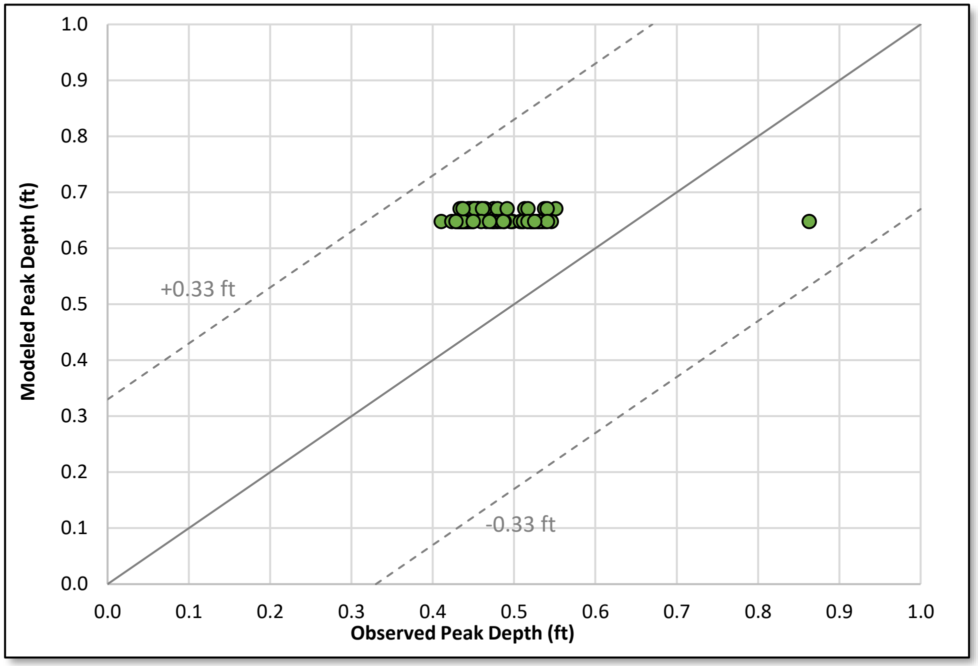
① Daily Volume

② Daily Peak Flow

③ One Week Time Series

Total Compared Dry Days:

79



Flow Meter:

UCKC2

Appendix C

WWF Calibration

Appendix C
WWF Calibration

Meter	Rain Gauge	Pipe Size (in)	Event ID	Event Start Time	Event End Time	Data Quality Issues?	Monitored				Modeled				Comparison						
							Peak Flow (mgd)	Total Volume (MG)	Peak Depth (ft)	Observed Surcharge?	Peak Flow (MGD)	Total Volume (MG)	Peak Depth (ft)	Predicted Surcharge?	Peak Flow % Diff	Total Volume % Diff	Peak Depth Diff (ft)	Peak Flow Calibration Flag (1: Calibrated regardless data	Total Volume Calibration Flag (1: Calibrated regardless data	Peak Depth Calibration flag (1: Calibrated regardless data	Notes for Calibration
CKC1	RGPB4	30.0	1	11/12/2018 0:00	11/16/18 0:00	N	0.72	1.53	0.79	N	0.74	1.80	0.83	N	2.9%	18.1%	0.04	1	1	1	Backwater and reverse flow from plant during storm events affect calibration during events 6-8;
			2	12/1/2018 0:00	12/7/18 23:59	Y	1.21	2.28	1.08	N	0.91	2.44	1.04	N	-24.5%	7.3%	-0.05	0	0	0	
			3	12/8/2018 0:00	12/13/18 23:59	Y	2.24	2.44	3.10	Y	2.05	2.39	3.05	Y	-8.8%	-2.1%	-0.05	0	0	0	
			4	12/14/2018 0:00	12/19/18 23:59	N	0.55	2.01	0.67	N	0.55	1.97	0.70	N	-0.8%	-1.7%	0.03	1	1	1	
			5	12/20/2018 0:00	12/27/18 11:59	N	0.59	2.79	0.75	N	0.50	2.53	0.74	N	-14.5%	-9.2%	-0.01	1	1	1	
			6	12/27/2018 12:00	1/2/19 12:00	Y	3.05	3.61	13.10	Y	2.89	1.89	12.96	Y	-5.4%	-47.7%	-0.14	0	0	0	
			7	1/19/2019 12:00	1/23/19 11:59	Y	0.58	0.20	0.70	N	0.72	1.53	0.76	N	23.6%	655.1%	0.06	0	0	0	
			8	1/23/2019 12:00	1/27/19 0:00	Y	1.33	0.77	1.46	N	0.76	1.43	1.42	N	-42.7%	84.3%	-0.04	0	0	0	
			9	2/19/2019 0:00	2/23/19 0:00	N	0.77	1.46	1.46	N	0.71	1.58	1.42	N	-7.7%	8.3%	-0.04	1	1	1	
DK10	RGHON1	8.0	1	11/12/2018 0:00	11/16/18 0:00	N	0.15	0.23	0.19	N	0.10	0.27	0.16	N	-32.2%	15.5%	-0.03	1	1	1	Velocity data loss impacts flow estimations and data quality for events 2 through 5
			2	12/1/2018 0:00	12/7/18 23:59	Y	0.15	0.40	0.43	N	0.17	0.45	0.21	N	17.2%	13.3%	-0.22	0	0	0	
			3	12/8/2018 0:00	12/13/18 23:59	Y	0.59	0.37	0.37	N	0.12	0.46	0.18	N	-80.2%	24.5%	-0.20	0	0	0	
			4	12/14/2018 0:00	12/19/18 23:59	Y	0.51	0.32	0.38	N	0.15	0.42	0.19	N	-71.4%	28.8%	-0.19	0	0	0	
			5	12/20/2018 0:00	12/27/18 11:59	Y	0.75	0.50	0.49	N	0.11	0.51	0.17	N	-85.9%	2.8%	-0.33	0	0	0	
			6	12/27/2018 12:00	1/2/19 12:00	N	0.28	0.60	0.23	N	0.18	0.46	0.21	N	-36.9%	-24.0%	-0.02	0	0	1	
			7	1/19/2019 12:00	1/23/19 11:59	N	0.16	0.29	0.17	N	0.18	0.33	0.21	N	10.3%	14.2%	0.04	1	1	1	
			8	1/23/2019 12:00	1/27/19 0:00	N	0.18	0.28	0.17	N	0.26	0.32	0.25	N	39.1%	17.2%	0.08	1	1	1	
			9	2/19/2019 0:00	2/23/19 0:00	N	0.17	0.43	0.17	N	0.21	0.34	0.23	N	21.6%	-22.8%	0.05	1	1	1	
DK11	RGHON1	16.0	1	11/12/2018 0:00	11/16/18 0:00	N	0.27	0.53	0.22	N	0.18	0.55	0.20	N	-34.2%	3.2%	-0.02	1	1	1	Large peak flow during event 9 after rainfall prevents criteria from being met
			2	12/1/2018 0:00	12/7/18 23:59	N	0.26	0.97	0.21	N	0.22	1.06	0.22	N	-16.6%	8.7%	0.01	1	1	1	
			3	12/8/2018 0:00	12/13/18 23:59	N	0.31	0.92	0.22	N	0.22	0.93	0.22	N	-28.0%	1.0%	0.00	1	1	1	
			4	12/14/2018 0:00	12/19/18 23:59	N	0.32	0.95	0.23	N	0.23	0.92	0.22	N	-28.2%	-3.2%	0.00	1	1	1	
			5	12/20/2018 0:00	12/27/18 11:59	N	0.34	1.14	0.23	N	0.21	1.14	0.21	N	-37.8%	0.4%	-0.01	0	1	1	
			6	12/27/2018 12:00	1/2/19 12:00	N	0.33	0.92	0.23	N	0.26	0.93	0.23	N	-21.1%	0.7%	0.00	1	1	1	
			7	1/19/2019 12:00	1/23/19 11:59	N	0.28	0.49	0.23	N	0.23	0.59	0.22	N	-19.8%	19.8%	-0.01	1	1	1	
			8	1/23/2019 12:00	1/27/19 0:00	N	0.32	0.46	0.22	N	0.30	0.54	0.25	N	-4.8%	16.9%	0.02	1	1	1	
			9	2/19/2019 0:00	2/23/19 0:00	Y	0.54	0.53	0.30	N	0.20	0.58	0.21	N	-62.5%	8.4%	-0.09	0	0	0	
HON1	RGHON1	42.0	1	11/12/2018 0:00	11/16/18 0:00	Y	3.63	4.49	0.80	N	4.20	8.69	0.77	N	15.6%	93.4%	-0.03	0	0	0	Meter was offline for parts of events 1-4; was able to calibrate peak and volume for 4 quality events; event 7 peak flow and depth criteria are not met because of large spike unrelated to rainfall therefore hourly average values were used for comparisons due to spikes in the observed data caused by upstream lift station operation
			2	12/1/2018 0:00	12/7/18 23:59	Y	0.00	0.00	0.00	N	5.12	13.07	0.89	N	NA	NA	0.89	0	0	0	
			3	12/8/2018 0:00	12/13/18 23:59	Y	0.00	0.00	0.00	N	4.51	13.09	0.82	N	NA	NA	0.82	0	0	0	
			4	12/14/2018 0:00	12/19/18 23:59	Y	2.91	0.58	0.73	N	4.77	11.52	0.84	N	64.0%	1891.1%	0.10	0	0	0	
			5	12/20/2018 0:00	12/27/18 11:59	N	3.86	12.82	0.83	N	4.06	14.35	0.76	N	5.1%	12.0%	-0.07	1	1	1	
			6	12/27/2018 12:00	1/2/19 12:00	N	4.90	12.82	0.98	N	4.65	12.86	0.83	N	-5.1%	0.3%	-0.15	1	1	1	
			7	1/19/2019 12:00	1/23/19 11:59	Y	12.45	8.00	1.77	N	5.52	8.38	0.93	N	-55.6%	4.7%	-0.84	0	0	0	
			8	1/23/2019 12:00	1/27/19 0:00	N	5.64	7.83	1.09	N	6.59	8.32	1.78	N	16.9%	6.2%	0.69	1	1	1	
			9	2/19/2019 0:00	2/23/19 0:00	N	3.94	7.50	0.86	N	4.27	7.61	0.78	N	8.5%	1.5%	-0.08	1	1	1	
HON2	RGHON1	18.0	1	11/12/2018 0:00	11/16/18 0:00	N	1.16	2.03	0.52	N	0.83	2.36	0.42	N	-28.2%	16.2%	-0.10	0	1	1	
			2	12/1/2018 0:00	12/7/18 23:59	N	1.16	3.17	0.54	N	1.14	3.64	0.49	N	-1.4%	14.6%	-0.05	1	1	1	
			3	12/8/2018 0:00	12/13/18 23:59	N	1.35	3.49	0.58	N	0.91	3.51	0.43	N	-32.7%	0.5%	-0.14	0	1	1	
			4	12/14/2018 0:00	12/19/18 23:59	N	0.87	2.92	0.48	N	1.05	3.07	0.47	N	21.4%	5.2%	-0.01	1	1	1	
			5	12/20/2018 0:00	12/27/18 11:59	N	1.06	4.16	0.51	N	0.75	3.83	0.40	N	-29.2%	-8.0%	-0.11	0	1	1	
			6	12/27/2018 12:00	1/2/19 12:00	N	1.73	4.19	0.65	N	1.10	3.38	0.48	N	-36.3%	-19.5%	-0.17	0	0	1	
			7	1/19/2019 12:00	1/23/19 11:59	N	1.50	2.41	0.60	N	1.27	2.29	0.52	N	-15.6%	-4.9%	-0.08	0	1	1	
			8	1/23/2019 12:00	1/27/19 0:00	N	1.69	2.41	0.65	N	1.51	2.22	0.56	N	-10.8%	-8.1%	-0.08	1	1	1	
			9	2/19/2019 0:00	2/23/19 0:00	N	0.89	2.06	0.47	N	0.91	2.24	0.43	N	1.8%	8.4%	-0.04	1	1	1	
HON3	RGHON1	36.0	1	11/12/2018 0:00	11/16/18 0:00	N	5.61	3.26	0.56	N	5.38	4.31	0.69	N	-4.1%	32.1%	0.13	1	0	1	
			2	12/1/2018 0:00	12/7/18 23:59	N	5.22	3.77	0.54	N	5.30	5.26	0.69	N	1.6%	39.6%	0.15	1	0	1	
			3	12/8/2018 0:00	12/13/18 23:59	N	4.76	3.93	0.52	N	5.37	5.82	0.69	N	12.9%	48.2%	0.17	1	0	1	
			4	12/14/2018 0:00	12/19/18 23:59	N	4.87	3.13	0.52	N	5.36	4.83	0.69	N	10.1%	54.2%	0.17	1	0	1	
			5	12/20/2018 0:00	12/27/18 11:59	N	4.93	5.22	0.52	N	5.36	6.33	0.69	N	8.8%	21.2%	0.17	1	0	1	
			6	12/27/2018 12:00	1/2/19 12:00	N	5.79	5.89	0.62	N	5.35	5.62	0.69	N	-7.6%	-4.6%	0.07	1	1	1	
			7	1/19/2019 12:00	1/23/19 11:59	N	5.71	3.57	0.58	N	5.40	3.46	0.69	N	-5.4%	-3.2%	0.12	1	1	1	
			8	1/23/2019 12:00	1/27/19 0:00	N	5.63	3.56	0.57	N	5.43	3.65	0.70	N	-3.7%	2.5%	0.12	1	1	1	
			9	2/19/2019 0:00	2/23/19 0:00	N	5.67	2.99	0.57	N	5.30	2.88	0.69	N	-6.6%	-3.7%	0.11	1	1	1	
JSC1	RGJSC1	12.0	1	11/12/2018 0:00	11/16/18 0:00	N	0.36	0.67	0.31	N	0.36	0.70	0.32	N	-0.8%	4.6%	0.01	1	1	1	
			2	12/1/2018 0:00	12/7/18 23:59	N	0.44	1.11	0.35	N	0.46	1.21	0.36	N	4.9%	9.2%	0.01	1	1	1	
			3	12/8/2018 0:00	12/13/18 23:59	N	0.36	1.17	0.32	N	0.33	1.06	0.30	N	-9.9%	-9.4%	-0.01	1	1	1	
			4	12/14/2018 0:00	12/19/18 23:59	N	0.32	1.05	0.32	N	0.38	1.03	0.33	N	19.9%	-1.6%	0.01	1	1	1	
			5	12/20/2018 0:00	12/27/18 11:59	N	0.34	1.36	0.30	N	0.33	1.28	0.30	N	-1.3%	-5.9%	0.00	1	1	1	
			6	12/27/2018 12:00	1/2/19 12:00	N	0.43	1.25	0.32	N	0.39	1.08	0.33	N	-8.6%	-13.8%	0.01	1	0	1	
			7	1/19/2019 12:00	1/23/19 11:59	N	0.44	0.77	0.34	N	0.49	0.78	0.37	N	12.6%	2.1%	0.03	1	1	1	
			8	1/23/2019 12:00	1/27/19 0:00	N	0.45	0.70	0.35	N	0.66	0.69	0.43	N	45.3%	-1.8%	0.08	0	1	1	
			9	2/19/2019 0:00	2/23/19 0:00	N	0.40	0.70	0.31	N	0.30	0.65	0.29	N	-23.7%	-6.8%	-0.02	1	1	1	
LCKC1	RGLCKC1	36.0	1	11/12/2018 0:00	11/16/18 0:00	Y	1.76	3.70	2.85	N	2.69	7.33	1.23	N	53.1%	97.9%	-1.62	0	0	0	Meter has quality issues with frequent velocity drops during events 1 through 8 due to apparent backwater from the downstream Lower Crooked Creek I Lift Station, resulting in the model consistently underestimating depth; only one quality event for calibration
			2	12/1/2018 0:00	12/7/18 23:59	Y	1.50	1.09	3.37	Y	3.06	10.81	1.30	N	103.2%	889.8%	-2.08	0	0	0	
			3	12/8/2018 0:00	12/13/18 23:59	Y	1.50	0.62	3.44	Y	2.70	10.23	1.23	N	79.8%	1540.5%	-2.21	0	0	0	
			4	12/14/2018 0:00	12/19/18 23:59	Y	1.50	2.87	3.52	Y	2.88	9.28	1.26	N	91.4%	223.4%	-2.25	0	0	0	
			5	12/20/2018 0:00	12/27/18 11:59	Y	1.50	7.81	3.39	Y	2.27	11.47	1.14	N	51.2%	46.9%	-2.25	0	0	0	
			6	12/27/2018 12:00	1/2/19 12:00	Y	1.82	6.19	4.46	Y	2.93	10.56	1.27	N	61.5%	70.7%	-3.18	0	0	0	
			7	1/19/2019 12:00	1/23/19 11:59	Y	1.33	0.25	3.63	Y	2.96	6.90	1.28	N	123.4%	2692.5%	-2.35	0	0	0	
			8	1/23/2019 12:00	1/27/19 0:00	Y	1.33	0.98	4.02	Y	3.83	6.54	1.44	N	189.1%	567.0%	-2.58	0	0	0	
			9	2/19/2019 0:00	2/23/19 0:00	N	3.63	7.08	1.09	N	1.97	4.05	1.15	N	-3.6%	-6.2%	0.06	1	1	1	
LCKC2	RGLCKC1	36.0	1	11/12/2018 0:00	11/16/18 0:00	N	2.72	6.40	0.67	N	2.60	6.98	0.64	N	-4.4%	9.0%	-0.04	1	1	1	
			2	12/1/2018 0:00	12/7/18 23:59	N	2.54	9.65	0.68	N	2.92	10.21	0.67	N	14.8%	5.8%	-0.01	1	1	1	
			3	12/8/2018 0:00	12/13/18 23:59	N	2.66	9.63	0.68	N	2.60	9.70	0.64	N	-2.2%	0.8%	-0.04	1	1	1	
			4	12/14/2018 0:00	12/19/18 23:59	N	2.94	9.57	0.72	N	2.79	8.77	0.66	N	-5.0%	-8.4%	-0.07	1	1	1	
			5	12/20/2018 0:00	12/27/18 11:59	N	2.21	11.54	0.63	N	2.16	10.82	0.58	N	-2.0%	-6.2%	-0.05	1	1	1	
			6	12/27/2018 12:00	1/2/19 12:00	N	2.73	9.27	0.69	N	2.90	10.04	0.67	N	5.9%	8.3%	-0.02	1	1	1	
			7	1/19/2019 12:00	1/23/19 11:59	N	2.57	6.15	0.75	N	2.89	6.54	0.67	N	12.5%	6.2%	-0.07	1	1	1	
			8	1/23/2019 12:00	1/27/19 0:00	N	2.98	5.71	0.77	N	3.74	6.24	0.76	N	25.3%	9.3%	-0.01	0	1	1	
			9	2/19/2019 0:00	2/23/19 0:00	N	2.20	6.44	0.63	N	2.31	6.26	0.60	N	5.1%	-2.8%	-0.03	1	1	1	
LSM1	RGLCKC1	36.0	1	11/12/2018 0:00	11/16/18 0:00	Y	1.32	2.44	1.79	N	1.13	3.39	0.70	N	-14.4%	38.8%	-1.10	0	0	0	Meter has quality issues with frequent velocity signal drops; evidence of long-term level drift impacting flow data quality after January; depth consistently underestimated, possibly due to downstream lift station operations; no quality events available for calibration
			2	12/1/2018 0:00	12/7/18 23:59	Y	41.91	-33.25	2.22	N	1.30	5.07	0.75	N	-96.9%	-115.2%	-1.47	0	0	0	
			3	12/8/2018 0:00	12/13/18 23:59	Y	55.57	51.33	2.39	N	1.18	4.83	0.71	N	-97.9%	-90.6%	-1.68	0	0	0	
			4	12/14/2018 0:00	12/19/18 23:59	Y	45.47	7.65	2.37	N	1.15	4.40	0.70	N	-97.5%	-42.5%	-1.67	0	0	0	
			5	12/20/2018 0:00	12/27/18 11:59	Y	48.92	76.78	2.29	N	1.03	5.47	0.66	N	-97.9%	-92.9%	-1.63	0	0	0	
			6	12/27/2018 12:00	1/2/19 12:00	Y	55.72	9.79	3.46	Y	1.24	5.07	0.73	N	-97.8%	-48.2%	-2.73	0	0	0	
			7	1/19/2019 12:00	1/23/19 11:59	Y	0.25	-0.46	2.55	N	1.28	3.15	0.74	N	414.5%	-789.5%	-1.81	0	0	0	
			8	1/23/2019 12:00	1/27/19 0:00	Y	0.22	0.69	2.92	N	1.56	3.07	0.82	N	598.2%	347.3%	-2.10	0	0	0	
			9	2/19/2019 0:00	2/23/19 0:00	Y	0.59	1.61	0.61	N	1.07	3.29	0.67	N	82.2%	104.3%	0.05	0	0	0	

Appendix C
WWF Calibration

							Monitored				Modeled				Comparison						
Meter	Rain Gauge	Pipe Size (in)	Event ID	Event Start Time	Event End Time	Data Quality Issues?	Peak Flow (mgd)	Total Volume (MG)	Peak Depth (ft)	Observed Surcharge?	Peak Flow (MGD)	Total Volume (MG)	Peak Depth (ft)	Predicted Surcharge?	Peak Flow % Diff	Total Volume % Diff	Peak Depth Diff (ft)	Peak Flow Calibration Flag (1: Calibrated regardless data	Total Volume Calibration Flag (1: Calibrated regardless data	Peak Depth Calibration flag (1: Calibrated regardless data	Notes for Calibration
LSM2	RGLCKC1	36.5	1	11/12/2018 0:00	11/16/18 0:00	Y	0.75	1.57	0.00	N	0.88	2.45	0.65	N	18.2%	55.5%	0.65	0	0	0	Poor velocity signal during November affects event 1 data quality; LSM2 was offline during December; was able to calibrate all other available quality events
			2	12/1/2018 0:00	12/7/18 23:59	Y	0.00	0.00	0.00	N	0.99	3.40	0.70	N	NA	NA	NA	0	0	0	
			3	12/8/2018 0:00	12/13/18 23:59	Y	0.00	0.00	0.00	N	0.86	3.38	0.64	N	NA	NA	NA	0	0	0	
			4	12/14/2018 0:00	12/19/18 23:59	Y	0.00	0.00	0.00	N	0.88	2.96	0.65	N	NA	NA	NA	0	0	0	
			5	12/20/2018 0:00	12/27/18 11:59	Y	0.00	0.00	0.00	N	0.73	3.67	0.58	N	NA	NA	NA	0	0	0	
			6	12/27/2018 12:00	1/2/19 12:00	Y	0.00	0.00	0.00	N	0.99	3.62	0.70	N	NA	NA	NA	0	0	0	
			7	1/19/2019 12:00	1/23/19 11:59	N	0.89	2.07	0.55	N	1.02	2.17	0.71	N	14.1%	5.2%	0.16	1	1	1	
			8	1/23/2019 12:00	1/27/19 0:00	N	1.11	2.20	0.62	N	1.26	2.23	0.80	N	13.1%	1.2%	0.18	1	1	1	
			9	2/19/2019 0:00	2/23/19 0:00	N	0.94	2.38	0.55	N	0.84	2.34	0.63	N	-10.0%	-1.6%	0.08	1	1	1	
PB1	RGPB2	10.0	1	11/12/2018 0:00	11/16/18 0:00	Y	0.37	0.71	0.41	N	0.51	1.04	0.36	N	35.7%	46.2%	-0.05	0	0	0	Event 1 flow drops below typical DWF;
			2	12/1/2018 0:00	12/7/18 23:59	N	0.53	1.31	0.50	N	0.56	1.56	0.38	N	5.8%	18.8%	-0.12	1	1	1	
			3	12/8/2018 0:00	12/13/18 23:59	N	0.58	1.57	0.54	N	0.42	1.43	0.33	N	-27.8%	-8.8%	-0.21	0	1	1	
			4	12/14/2018 0:00	12/19/18 23:59	N	0.38	1.29	0.45	N	0.43	1.31	0.33	N	14.2%	1.4%	-0.11	1	1	1	
			5	12/20/2018 0:00	12/27/18 11:59	N	0.39	1.61	0.46	N	0.37	1.64	0.31	N	-5.5%	1.4%	-0.15	1	1	1	
			6	12/27/2018 12:00	1/2/19 12:00	N	0.53	1.33	0.51	N	0.46	1.42	0.34	N	-13.8%	7.4%	-0.17	1	1	1	
			7	1/19/2019 12:00	1/23/19 11:59	N	0.43	0.61	0.42	N	0.57	0.92	0.39	N	33.0%	50.4%	-0.03	0	0	1	
			8	1/23/2019 12:00	1/27/19 0:00	N	0.55	1.05	0.50	N	0.62	0.86	0.41	N	13.8%	-18.6%	-0.09	1	0	1	
			9	2/19/2019 0:00	2/23/19 0:00	N	0.42	0.99	0.45	N	0.38	0.94	0.31	N	-9.4%	-5.4%	-0.14	1	1	1	
PB10	RGPB1	21.0	1	11/12/2018 0:00	11/16/18 0:00	N	0.90	2.02	0.30	N	0.87	2.23	0.42	N	-3.0%	10.2%	0.12	1	1	1	
			2	12/1/2018 0:00	12/7/18 23:59	N	1.00	3.01	0.33	N	1.12	3.40	0.48	N	11.9%	12.9%	0.15	1	1	1	
			3	12/8/2018 0:00	12/13/18 23:59	N	0.97	3.14	0.32	N	0.85	3.16	0.42	N	-12.7%	0.8%	0.10	1	1	1	
			4	12/14/2018 0:00	12/19/18 23:59	N	0.83	2.73	0.28	N	0.96	2.89	0.44	N	15.2%	5.9%	0.16	1	1	1	
			5	12/20/2018 0:00	12/27/18 11:59	N	0.71	3.61	0.25	N	0.69	3.60	0.38	N	-3.4%	-0.5%	0.12	1	1	1	
			6	12/27/2018 12:00	1/2/19 12:00	N	1.40	3.25	0.40	N	1.12	3.17	0.48	N	-20.1%	-2.6%	0.08	0	1	1	
			7	1/19/2019 12:00	1/23/19 11:59	N	1.08	1.98	0.33	N	1.00	1.99	0.45	N	-7.4%	0.7%	0.12	1	1	1	
			8	1/23/2019 12:00	1/27/19 0:00	N	1.27	2.12	0.37	N	1.38	1.87	0.53	N	8.6%	-11.7%	0.16	1	0	1	
			9	2/19/2019 0:00	2/23/19 0:00	N	0.91	2.14	0.31	N	0.85	2.07	0.42	N	-6.5%	-3.3%	0.11	1	1	1	
PB2	RGPB2	24.0	1	11/12/2018 0:00	11/16/18 0:00	N	1.44	3.40	0.58	N	1.04	2.89	0.44	N	-27.7%	-15.0%	-0.13	0	0	1	Missing data during events 7 through 9;
			2	12/1/2018 0:00	12/7/18 23:59	N	1.26	5.54	0.56	N	1.32	5.56	0.50	N	5.2%	0.5%	-0.06	1	1	1	
			3	12/8/2018 0:00	12/13/18 23:59	N	1.48	4.93	0.59	N	1.45	5.19	0.53	N	-2.2%	5.3%	-0.07	1	1	1	
			4	12/14/2018 0:00	12/19/18 23:59	N	0.99	4.06	0.47	N	1.22	4.72	0.48	N	22.9%	16.2%	0.01	1	1	1	
			5	12/20/2018 0:00	12/27/18 11:59	N	1.01	5.23	0.46	N	1.17	5.84	0.47	N	16.3%	11.7%	0.01	1	1	1	
			6	12/27/2018 12:00	1/2/19 12:00	N	1.40	4.63	0.56	N	1.26	5.16	0.49	N	-10.0%	11.5%	-0.08	1	1	1	
			7	1/19/2019 12:00	1/23/19 11:59	Y	0.00	0.00	0.00	N	1.25	3.34	0.49	N	NA	NA	NA	0	0	0	
			8	1/23/2019 12:00	1/27/19 0:00	Y	0.00	0.00	0.00	N	1.20	3.11	0.48	N	NA	NA	NA	0	0	0	
			9	2/19/2019 0:00	2/23/19 0:00	Y	0.78	1.97	0.41	N	0.85	2.37	0.40	N	8.2%	20.1%	-0.01	0	0	0	
PB3	RGPB2	48.0	1	11/12/2018 0:00	11/16/18 0:00	N	11.02	26.69	1.72	N	13.84	33.13	1.59	N	25.7%	24.1%	-0.13	0	0	1	
			2	12/1/2018 0:00	12/7/18 23:59	N	12.29	40.35	1.73	N	15.83	43.69	1.70	N	28.8%	8.3%	-0.04	0	1	1	
			3	12/8/2018 0:00	12/13/18 23:59	N	12.46	39.89	1.76	N	13.13	42.78	1.55	N	5.4%	7.3%	-0.21	1	1	1	
			4	12/14/2018 0:00	12/19/18 23:59	N	9.12	34.67	1.48	N	12.18	36.88	1.49	N	33.6%	6.4%	0.01	0	1	1	
			5	12/20/2018 0:00	12/27/18 11:59	N	8.85	44.82	1.43	N	10.46	46.34	1.38	N	18.1%	3.4%	-0.05	1	1	1	
			6	12/27/2018 12:00	1/2/19 12:00	N	14.65	41.82	1.83	N	16.39	43.74	1.73	N	11.9%	4.6%	-0.10	1	1	1	
			7	1/19/2019 12:00	1/23/19 11:59	N	11.78	24.53	1.67	N	14.88	27.62	1.65	N	26.4%	12.6%	-0.02	0	1	1	
			8	1/23/2019 12:00	1/27/19 0:00	N	13.27	23.91	1.74	N	19.39	27.04	1.89	N	46.1%	13.1%	0.15	0	1	1	
			9	2/19/2019 0:00	2/23/19 0:00	N	9.32	24.28	1.48	N	11.20	28.35	1.42	N	20.2%	16.8%	-0.06	1	1	1	
PB4	RGPB2	30.0	1	11/12/2018 0:00	11/16/18 0:00	N	0.99	2.09	0.75	N	1.01	2.18	0.45	N	2.3%	4.4%	-0.30	1	1	1	Large flows during event 6 unrelated to rainfall;
			2	12/1/2018 0:00	12/7/18 23:59	N	0.90	3.08	0.72	N	1.03	3.13	0.46	N	14.3%	1.7%	-0.27	1	1	1	
			3	12/8/2018 0:00	12/13/18 23:59	N	0.95	2.95	0.73	N	0.82	2.88	0.41	N	-13.5%	-2.4%	-0.32	1	1	1	
			4	12/14/2018 0:00	12/19/18 23:59	N	0.68	2.69	0.63	N	0.85	2.64	0.41	N	24.3%	-1.7%	-0.22	1	1	1	
			5	12/20/2018 0:00	12/27/18 11:59	N	0.62	3.15	0.62	N	0.66	3.29	0.36	N	6.6%	4.4%	-0.26	1	1	1	
			6	12/27/2018 12:00	1/2/19 12:00	Y	1.12	3.16	0.98	Y	0.92	2.86	0.43	N	-17.7%	-9.7%	-0.55	0	0	0	
			7	1/19/2019 12:00	1/23/19 11:59	N	0.95	1.66	0.74	N	1.08	1.83	0.47	N	14.5%	10.3%	-0.27	1	1	1	
			8	1/23/2019 12:00	1/27/19 0:00	N	1.44	1.60	0.89	N	1.23	1.70	0.51	N	-14.5%	6.1%	-0.39	1	1	1	
			9	2/19/2019 0:00	2/23/19 0:00	N	0.58	1.55	0.61	N	0.72	1.78	0.38	N	25.0%	15.4%	-0.23	1	1	1	
PB5	RGPB2	20.5	1	11/12/2018 0:00	11/16/18 0:00	N	1.54	4.03	1.10	N	1.80	4.56	1.39	N	17.4%	13.1%	0.29	1	1	1	
			2	12/1/2018 0:00	12/7/18 23:59	N	1.65	6.24	1.13	N	1.67	6.27	1.24	N	1.0%	0.5%	0.11	1	1	1	
			3	12/8/2018 0:00	12/13/18 23:59	N	1.58	6.15	1.07	N	1.55	5.89	1.12	N	-1.7%	-4.3%	0.05	1	1	1	
			4	12/14/2018 0:00	12/19/18 23:59	N	1.60	5.78	1.07	N	1.49	5.21	1.08	N	-7.0%	-9.8%	0.01	1	1	1	
			5	12/20/2018 0:00	12/27/18 11:59	N	1.46	7.16	0.98	N	1.31	6.59	0.98	N	-10.3%	-8.0%	0.00	1	1	1	
			6	12/27/2018 12:00	1/2/19 12:00	Y	1.84	4.63	1.16	N	1.81	5.84	1.40	N	-1.9%	26.1%	0.24	0	0	0	
			7	1/19/2019 12:00	1/23/19 11:59	N	1.74	3.76	1.20	N	1.61	3.67	1.18	N	-7.5%	-2.6%	-0.01	1	1	1	
			8	1/23/2019 12:00	1/27/19 0:00	N	1.76	3.42	1.15	N	1.98	3.54	1.64	N	12.7%	3.5%	0.49	1	1	1	
			9	2/19/2019 0:00	2/23/19 0:00	N	1.46	4.13	1.01	N	1.34	3.81	0.99	N	-8.3%	-7.9%	-0.02	1	1	1	
PB6	RGPB3	21.0	1	11/12/2018 0:00	11/16/18 0:00	N	0.92	1.70	0.51	N	1.09	2.81	0.47	N	18.5%	65.2%	-0.04	1	0	1	
			2	12/1/2018 0:00	12/7/18 23:59	N	1.03	2.40	0.54	N	1.20	2.93	0.49	N	16.3%	22.3%	-0.05	1	0	1	
			3	12/8/2018 0:00	12/13/18 23:59	N	0.79	2.32	0.49	N	1.04	3.29	0.46	N	32.4%	41.9%	-0.04	0	0	1	
			4	12/14/2018 0:00	12/19/18 23:59	N	0.99	2.64	0.52	N	1.03	2.47	0.45	N	3.7%	-6.2%	-0.06	1	1	1	
			5	12/20/2018 0:00	12/27/18 11:59	N	0.90	3.70	0.57	N	0.73	3.09	0.38	N	-19.0%	-16.5%	-0.19	0	0	1	
			6	12/27/2018 12:00	1/2/19 12:00	N	1.36	3.35	0.63	N	1.45	3.37	0.53	N	6.9%	0.7%	-0.10	1	1	1	
			7	1/19/2019 12:00	1/23/19 11:59	N	1.57	2.17	0.71	N	1.18	1.96	0.48	N	-24.8%	-10.0%	-0.22	0	0	1	
			8	1/23/2019 12:00	1/27/19 0:00	N	1.86	2.20	0.71	N	1.79	2.12	0.60	N	-4.0%	-3.5%	-0.11	1	1	1	
			9	2/19/2019 0:00	2/23/19 0:00	N	0.87	2.12	0.52	N	0.93	2.11	0.43	N	6.6%	-0.1%	-0.09	1	1	1	
PB7	RGPB3	42.0	1	11/12/2018 0:00	11/16/18 0:00	N	9.15	13.88	1.69	N	8.86	16.87	1.73	N	-3.1%	21.6%	0.03	1	0	1	
			2	12/1/2018 0:00	12/7/18 23:59	N	9.00	21.35	1.70	N	10.90	23.00	1.85	N	21.1%	7.7%	0.15	1	1	1	
			3	12/8/2018 0:00	12/13/18 23:59	N	9.75	21.00	1.73	N	9.47	22.38	1.75	N	-2.9%	6.6%	0.02	1	1	1	
			4	12/14/2018 0:00	12/19/18 23:59	N	8.69	19.34	1.55	N	8.45	19.33	1.67	N	-2.7%	-0.1%	0.12	1	1	1	
			5	12/20/2018 0:00	12/27/18 11:59	N	8.42	25.26	1.49	N	7.62	24.38	1.58	N	-9.6%	-3.5%	0.08	1	1	1	
			6	12/27/2018 12:00	1/2/19 12:00	N	10.41	23.04	1.88	N	11.36	23.07	1.91	N	9.1%	0.1%	0.03	1	1	1	
			7	1/19/2019 12:00	1/23/19 11:59	N	8.37	13.29	1.74	N	10.29	14.53	1.83	N	22.9%	9.3%	0.09	1	1	1	
			8	1/23/2019 12:00	1/27/19 0:00	N	9.02	12.30	1.84	N	12.06	14.35	1.98	N	33.8%	16.6%	0.13	0	1	1	
			9	2/19/2019 0:00	2/23/19 0:00	N	10.26	13.36	1.55	N	7.76	14.76	1.63	N	-24.3%	10.5%	0.08	0	1	1	
PB8	RGPB3	30.0	1	11/12/2018 0:00	11/16/18 0:00	N	2.49	5.00	1.07	N	2.56	6.03	1.08	N	2.6%	20.7%	0.01	1	0	1	Meter experienced velocity loss and negative readings during event 8;
			2	12/1/2018 0:00	12/7/18 23:59	N	2.32	6.87	1.08	N	2.59	7.73	1.09	N	11.7%	12.5%	0.00	1	1	1	
			3	12/8/2018 0:00	12/13/18 23:59	N	2.42	7.53	1.08	N	2.41	7.70	1.06	N	-0.2%	2.2%	-0.02	1	1	1	
			4	12/14/2018 0:00	12/19/18 23:59	N	1.91	6.85	0.93	N	2.25	6.48	1.04	N	17.6%	-5.5%	0.11	1	1	1	
			5	12/20/2018 0:00	12/27/18 11:59	N	1.69	8.95	0.89	N	1.69	8.14	0.97	N	-0.2%	-9.0%	0.08	1	1	1	
			6	12/27/2018 12:00	1/2/19 12:00	N	3.28	8.24	1.28	N	2.83	7.92	1.12	N	-13.7%	-3.9%	-0.16	1	1	1	
			7	1/19/2019 12:00	1/23/19 11:59	N	2.62	5.37	1.26	N	2.58	5.14	1.08	N	-1.5%	-4.2%	-0.17	1	1	1	
			8	1/23/2019 12:00	1/27/19 0:00	Y	4.61	10.13	1.97	N	3.19	5.04	1.15	N	-30.8%	-50.3%	-0.82	0	0	0	
			9	2/19/2019 0:00	2/23/19 0:00	N	1.87	5.08	0.92	N	1.96	5.49	1.01	N	4.5%	8.0%	0.09	1	1	1	

Meter	Rain Gauge	Pipe Size (in)	Event ID	Event Start Time	Event End Time	Data Quality Issues?	Monitored				Modeled				Comparison						
							Peak Flow (mgd)	Total Volume (MG)	Peak Depth (ft)	Observed Surcharge?	Peak Flow (MGD)	Total Volume (MG)	Peak Depth (ft)	Predicted Surcharge?	Peak Flow % Diff	Total Volume % Diff	Peak Depth Diff (ft)	Peak Flow Calibration Flag (1: Calibrated regardless data	Total Volume Calibration Flag (1: Calibrated regardless data	Peak Depth Calibration flag (1: Calibrated regardless data	Notes for Calibration
PB9	RGPB1	15.0	1	11/12/2018 0:00	11/16/18 0:00	N	0.52	1.05	0.45	N	0.52	1.23	0.35	N	-0.1%	16.8%	-0.10	1	1	1	
			2	12/1/2018 0:00	12/7/18 23:59	N	0.53	1.70	0.46	N	0.56	1.97	0.37	N	5.4%	15.9%	-0.09	1	1	1	
			3	12/8/2018 0:00	12/13/18 23:59	N	0.55	1.63	0.49	N	0.46	1.78	0.33	N	-16.2%	9.1%	-0.15	1	1	1	
			4	12/14/2018 0:00	12/19/18 23:59	Y	0.46	1.56	0.45	N	0.52	1.68	0.36	N	13.2%	7.1%	-0.10	0	0	0	
			5	12/20/2018 0:00	12/27/18 11:59	N	0.59	2.69	0.55	N	0.41	2.10	0.32	N	-30.4%	-21.8%	-0.23	0	0	1	
			6	12/27/2018 12:00	1/2/19 12:00	N	0.81	2.22	0.57	N	0.58	1.92	0.38	N	-27.5%	-13.5%	-0.19	0	0	1	
			7	1/19/2019 12:00	1/23/19 11:59	N	0.91	2.17	0.68	N	0.66	1.53	0.40	N	-27.8%	-29.7%	-0.28	0	0	1	
			8	1/23/2019 12:00	1/27/19 0:00	N	1.22	2.09	0.76	N	0.82	1.38	0.45	N	-32.2%	-33.8%	-0.31	0	0	1	
			9	2/19/2019 0:00	2/23/19 0:00	N	0.78	2.02	0.65	N	0.58	1.53	0.37	N	-26.1%	-24.5%	-0.28	0	0	1	
PBPLNT1	RGPB4	27.0	1	11/12/2018 0:00	11/16/18 0:00	N	0.94	0.65	0.65	N	0.45	0.52	0.29	N	-52.0%	-20.5%	-0.36	0	0	1	Very low dry weather flow and depth; back water effects from plant during storm events affect calibration
			2	12/1/2018 0:00	12/7/18 23:59	N	0.52	0.33	0.49	N	0.64	0.42	0.34	N	23.4%	28.6%	-0.14	1	1	1	
			3	12/8/2018 0:00	12/13/18 23:59	Y	1.22	0.69	1.93	N	0.52	0.51	0.31	N	-57.3%	-26.5%	-1.62	0	0	0	
			4	12/14/2018 0:00	12/19/18 23:59	Y	0.10	0.20	0.22	N	0.31	0.29	0.25	N	201.9%	45.2%	0.03	0	0	0	
			5	12/20/2018 0:00	12/27/18 11:59	N	0.15	0.31	0.24	N	0.32	0.41	0.25	N	116.2%	31.3%	0.01	0	1	1	
			6	12/27/2018 12:00	1/2/19 12:00	Y	1.39	0.95	10.51	Y	0.42	0.47	0.28	N	-70.1%	-51.0%	-10.23	0	0	0	
			7	1/19/2019 12:00	1/23/19 11:59	N	0.52	0.26	0.49	N	0.65	0.29	0.34	N	24.2%	12.6%	-0.14	1	1	1	
			8	1/23/2019 12:00	1/27/19 0:00	N	1.00	0.56	0.67	N	0.69	0.32	0.36	N	-30.6%	-43.2%	-0.32	0	0	1	
			9	2/19/2019 0:00	2/23/19 0:00	N	0.38	0.26	0.43	N	0.51	0.38	0.31	N	32.5%	47.6%	-0.13	0	0	1	
PBPLNT2	RGPB4	36.0	1	11/12/2018 0:00	11/16/18 0:00	Y	0.00	0.00	0.00	N	6.96	12.05	2.30	N	NA	NA	NA	0	0	0	Meter was offline for much of November and December, affecting events 1 through 6; experienced backwater from plant; additional 1/12/19-1/14/19 event outside the 9 common events is calibrated for peak, volume, and depth (refer to Appendix C)
			2	12/1/2018 0:00	12/7/18 23:59	Y	8.26	14.34	1.81	N	8.55	18.10	2.42	N	3.5%	26.2%	0.62	0	0	0	
			3	12/8/2018 0:00	12/13/18 23:59	Y	0.00	0.00	0.00	N	6.83	17.76	4.43	Y	NA	NA	NA	0	0	0	
			4	12/14/2018 0:00	12/19/18 23:59	Y	1.75	0.03	0.90	N	6.63	15.71	2.15	N	279.1%	50129.3%	1.25	0	0	0	
			5	12/20/2018 0:00	12/27/18 11:59	Y	0.00	0.00	0.00	N	6.23	19.63	2.08	N	NA	NA	NA	0	0	0	
			6	12/27/2018 12:00	1/2/19 12:00	Y	0.00	0.00	0.00	N	7.43	7.85	12.75	Y	NA	NA	NA	0	0	0	
			7	1/19/2019 12:00	1/23/19 11:59	Y	9.27	11.05	1.51	N	8.29	11.72	2.36	N	-10.5%	6.1%	0.85	0	0	0	
			8	1/23/2019 12:00	1/27/19 0:00	N	9.64	12.35	2.31	N	9.32	11.18	2.98	N	-3.3%	-9.5%	0.66	1	1	1	
			9	2/19/2019 0:00	2/23/19 0:00	N	8.84	11.04	2.26	N	6.43	11.00	2.75	N	-27.3%	-0.3%	0.50	0	1	1	
			10	*1/12/2019 0:00*	*1/14/19 0:00*	*N*	*6.27*	*5.01*	*1.30*	*N*	*5.53*	*6.03*	*1.87*	*N*	*-8.2%*	*9.2%*	*0.57*	1	1	1	
PBPLNT3	RGPB4	36.0	1	11/12/2018 0:00	11/16/18 0:00	Y	0.24	0.41	0.32	N	0.54	0.64	0.85	N	123.8%	55.2%	0.53	0	0	0	Backwater and reverse flow from plant during storm events affects calibration
			2	12/1/2018 0:00	12/7/18 23:59	Y	0.82	0.58	0.76	N	0.72	0.69	1.02	N	-13.3%	18.9%	0.27	0	0	0	
			3	12/8/2018 0:00	12/13/18 23:59	Y	4.05	0.52	2.55	N	0.54	0.72	3.01	Y	-86.6%	39.0%	0.45	0	0	0	
			4	12/14/2018 0:00	12/19/18 23:59	Y	0.16	0.47	0.26	N	0.45	0.53	0.72	N	177.2%	14.6%	0.46	0	0	0	
			5	12/20/2018 0:00	12/27/18 11:59	Y	0.21	0.70	0.30	N	0.39	0.71	0.69	N	83.0%	2.6%	0.39	0	0	0	
			6	12/27/2018 12:00	1/2/19 12:00	Y	1.61	1.22	11.90	Y	1.64	0.68	11.44	Y	1.8%	-44.4%	-0.46	0	0	0	
			7	1/19/2019 12:00	1/23/19 11:59	Y	0.34	0.49	0.38	N	0.83	0.39	0.90	N	147.9%	-19.2%	0.52	0	0	0	
			8	1/23/2019 12:00	1/27/19 0:00	N	1.74	1.65	1.38	N	0.97	0.39	1.49	N	-44.1%	-76.3%	0.11	0	0	1	
			9	2/19/2019 0:00	2/23/19 0:00	N	0.76	0.48	1.32	N	0.58	0.54	1.32	N	-23.5%	12.8%	0.00	0	1	1	
PBPLNT4	RGPB4	54.0	1	11/12/2018 0:00	11/16/18 0:00	N	15.06	36.19	1.68	N	17.06	43.88	3.67	N	13.3%	21.2%	1.99	1	0	0	Experienced backwater from plant during event 6. Model consistently overpredicted depths at this meter which is just upstream of the plant outfall. A boundary level was used at the plant outfall, which resulted in predicted depths matching observed depths at the other downstream plant meters. This could possibly be due to inaccurate GIS elevations. Several pipes between PBPLNT4 and PBPLNT5 were changed to 54" based on available CCTV data. Recommend verifying pipe size.
			2	12/1/2018 0:00	12/7/18 23:59	N	14.10	56.50	2.55	N	19.27	62.87	3.86	N	36.7%	11.3%	1.31	0	1	1	
			3	12/8/2018 0:00	12/13/18 23:59	N	15.58	54.52	4.80	Y	16.09	59.86	5.86	Y	3.3%	9.8%	1.05	1	1	1	
			4	12/14/2018 0:00	12/19/18 23:59	N	11.83	51.42	2.08	N	15.76	53.26	3.51	N	33.1%	3.6%	1.43	0	1	1	
			5	12/20/2018 0:00	12/27/18 11:59	N	13.24	68.58	1.42	N	13.25	66.76	3.47	N	0.0%	-2.7%	2.05	1	1	0	
			6	12/27/2018 12:00	1/2/19 12:00	Y	17.34	37.86	13.56	Y	19.03	60.79	15.23	Y	9.7%	60.6%	1.67	0	0	0	
			7	1/19/2019 12:00	1/23/19 11:59	N	16.36	39.83	1.71	N	18.46	38.97	3.69	N	12.8%	-2.2%	1.98	1	1	0	
			8	1/23/2019 12:00	1/27/19 0:00	N	16.93	36.61	3.22	N	22.26	37.21	4.34	N	31.5%	1.6%	1.12	0	1	1	
			9	2/19/2019 0:00	2/23/19 0:00	N	14.65	35.26	3.11	N	13.96	38.57	4.15	N	-4.7%	9.4%	1.04	1	1	1	
PBPLNT5	RGPB2	36.0	1	11/12/2018 0:00	11/16/18 0:00	Y	1.07	1.76	0.99	N	1.70	4.33	0.86	N	58.7%	145.3%	-0.13	0	0	0	Velocity signal is poor in November, affecting Event 1 flow data
			2	12/1/2018 0:00	12/7/18 23:59	N	1.65	5.98	0.97	N	2.20	7.62	0.99	N	33.3%	27.5%	0.02	0	0	1	
			3	12/8/2018 0:00	12/13/18 23:59	N	2.52	6.55	1.03	N	1.92	7.12	0.87	N	-23.7%	8.7%	-0.16	0	1	1	
			4	12/14/2018 0:00	12/19/18 23:59	N	1.63	5.98	0.90	N	1.75	6.45	0.84	N	7.3%	7.9%	-0.06	1	1	1	
			5	12/20/2018 0:00	12/27/18 11:59	N	1.53	7.60	0.89	N	1.51	8.01	0.78	N	-1.0%	5.5%	-0.11	1	1	1	
			6	12/27/2018 12:00	1/2/19 12:00	N	2.47	7.03	1.07	N	1.82	7.07	0.92	N	-26.4%	0.6%	-0.15	0	1	1	
			7	1/19/2019 12:00	1/23/19 11:59	N	2.15	4.52	1.04	N	2.02	4.59	0.93	N	-6.2%	1.5%	-0.10	1	1	1	
			8	1/23/2019 12:00	1/27/19 0:00	N	2.19	4.45	1.03	N	2.32	4.26	1.08	N	6.1%	-4.2%	0.05	1	1	1	
			9	2/19/2019 0:00	2/23/19 0:00	N	1.80	4.34	0.93	N	1.36	3.63	0.76	N	-24.8%	-16.4%	-0.18	0	0	1	
PBPLNT6	RGPB2	54.0	1	11/12/2018 0:00	11/16/18 0:00	N	12.41	30.94	1.79	N	14.89	37.87	2.16	N	20.0%	22.4%	0.36	1	0	1	
			2	12/1/2018 0:00	12/7/18 23:59	N	12.78	48.03	1.77	N	16.91	52.08	2.38	N	32.4%	8.4%	0.61	0	1	1	
			3	12/8/2018 0:00	12/13/18 23:59	N	14.96	48.32	1.85	N	14.15	50.01	2.07	N	-5.4%	3.5%	0.22	1	1	1	
			4	12/14/2018 0:00	12/19/18 23:59	N	11.05	43.78	1.59	N	13.57	44.08	2.03	N	22.8%	0.7%	0.44	1	1	1	
			5	12/20/2018 0:00	12/27/18 11:59	N	10.02	55.06	1.55	N	11.44	55.32	1.80	N	14.2%	0.5%	0.25	1	1	1	
			6	12/27/2018 12:00	1/2/19 12:00	N	15.87	51.38	1.98	N	17.17	50.96	2.37	N	8.2%	-0.8%	0.40	1	1	1	
			7	1/19/2019 12:00	1/23/19 11:59	N	13.44	31.73	1.81	N	16.41	32.47	2.30	N	22.1%	2.3%	0.49	1	1	1	
			8	1/23/2019 12:00	1/27/19 0:00	N	14.80	29.89	1.88	N	20.00	31.29	2.65	N	35.2%	4.7%	0.77	0	1	1	
			9	2/19/2019 0:00	2/23/19 0:00	N	10.41	31.20	1.58	N	12.34	33.14	1.87	N	18.5%	6.2%	0.29	1	1	1	
PINEM1	RGPINEM1	24.0	1	11/12/2018 0:00	11/16/18 0:00	N	1.74	2.34	0.85	N	1.60	3.39	0.99	N	-8.4%	44.9%	0.14	1	0	1	
			2	12/1/2018 0:00	12/7/18 23:59	N	1.33	2.77	0.77	N	1.66	3.63	1.01	N	24.8%	30.9%	0.24	1	0	1	
			3	12/8/2018 0:00	12/13/18 23:59	N	1.84	3.53	0.92	N	1.39	4.26	0.93	N	-24.6%	20.7%	0.01	0	0	1	
			4	12/14/2018 0:00	12/19/18 23:59	N	0.80	2.82	0.61	N	1.25	3.41	0.89	N	57.5%	21.1%	0.28	0	0	1	
			5	12/20/2018 0:00	12/27/18 11:59	N	1.09	3.97	0.71	N	1.15	4.32	0.85	N	5.0%	8.7%	0.14	1	1	1	
			6	12/27/2018 12:00	1/2/19 12:00	N	1.54	3.64	0.86	N	1.44	4.05	0.94	N	-6.9%	11.1%	0.08	1	1	1	
			7	1/19/2019 12:00	1/23/19 11:59	N	1.68	2.05	0.88	N	2.01	2.29	1.10	N	19.2%	12.1%	0.22	1	1	1	
			8	1/23/2019 12:00	1/27/19 0:00	N	1.80	2.32	1.00	N	2.26	2.56	1.17	N	26.0%	10.6%	0.17	0	1	1	
			9	2/19/2019 0:00	2/23/19 0:00	N	0.82	1.97	0.62	N	1.01	2.04	0.81	N	23.9%	3.7%	0.19	1	1	1	
SWIFT2	RGLCKC2	15.0	1	11/12/2018 0:00	11/16/18 0:00	N	0.69	1.40	0.45	N	0.79	1.63	0.44	N	14.5%	16.6%	-0.01	1	1	1	
			2	12/1/2018 0:00	12/7/18 23:59	N	0.82	2.22	0.50	N	0.94	2.31	0.49	N	14.9%	4.0%	-0.01	1	1	1	
			3	12/8/2018 0:00	12/13/18 23:59	N	0.64	1.96	0.48	N	0.71	2.19	0.42	N	10.2%	11.6%	-0.06	1	1	1	
			4	12/14/2018 0:00	12/19/18 23:59	N	0.70	1.91	0.48	N	0.73	1.95	0.42	N	3.6%	2.1%	-0.06	1	1	1	
			5	12/20/2018 0:00	12/27/18 11:59	N	0.57	2.66	0.46	N	0.54	2.43	0.36	N	-5.7%	-8.8%	-0.10	1	1	1	
			6	12/27/2018 12:00	1/2/19 12:00	N	0.97	2.35	0.60	N	0.85	2.19	0.47	N	-11.7%	-7.0%	-0.13	1	1	1	
			7	1/19/2019 12:00	1/23/19 11:59	N	0.93	1.25	0.56	N	0.90	1.44	0.48	N	-3.2%	15.7%	-0.08	1	1	1	
			8	1/23/2019 12:00	1/27/19 0:00	N	1.00	1.15	0.58	N	1.07	1.35	0.53	N	6.8%	16.5%	-0.05	1	1	1	
			9	2/19/2019 0:00	2/23/19 0:00	N	0.64	1.34	0.45	N	0.56	1.37	0.37	N	-11.6%	2.4%	-0.08	1	1	1	
UCKC1	RGUCKC1	15.0	1	11/12/2018 0:00	11/16/18 0:00	N	0.46	1.06	0.48	N	0.43	1.15	0.41	N	-7.3%	8.5%	-0.07	1	1	1	During events 3 and 4, meter velocity signal strength became low, affecting flow data reliability;
			2	12/1/2018 0:00	12/7/18 23:59	N	0.46	1.46	0.49	N	0.50	1.72	0.46	N	8.2%	17.7%	-0.03	1	1	1	
			3	12/8/2018 0:00	12/13/18 23:59	Y	0.43	1.43	0.48	N	0.39	1.65	0.39	N	-8.3%	15.0%	-0.10	0	0	0	
			4	12/14/2018 0:00	12/19/18 23:59	Y	0.34	1.37	0.49	N	0.49	1.56	0.46	N	43.6%	13.7%	-0.03	0	0	0	
			5	12/20/2018 0:00	12/27/18 11:59	N	0.41	2.00	0.45	N	0.38	1.88	0.37	N	-8.7%	-6.1%	-0.08	1	1	1	
			6	12/27/2018 12:00	1/2/19 12:00	N	0.75	1.90	0.65	N	0.46	1.73	0.44	N	-38.0%	-9.0%	-0.22	0	1	1	
			7	1/19/2019 12:00	1/23/19 11:59	N	0.53	1.13	0.53	N	0.53	1.17	0.48	N	0.3%	4.2%	-0.05	1	1	1	
			8	1/23/2019 12:00	1/27/19 0:00	N	0.77	1.12	0.68	N	0.77	1.11	0.63	N	-0.2%	-1.1%	-0.04	1	1	1	
			9	2/19/2019 0:00	2/23/19 0:00	N	0.49	1.14	0.54	N	0.41	1.06	0.40	N	-16.6%	-6.9%	-0.14	1	1	1	

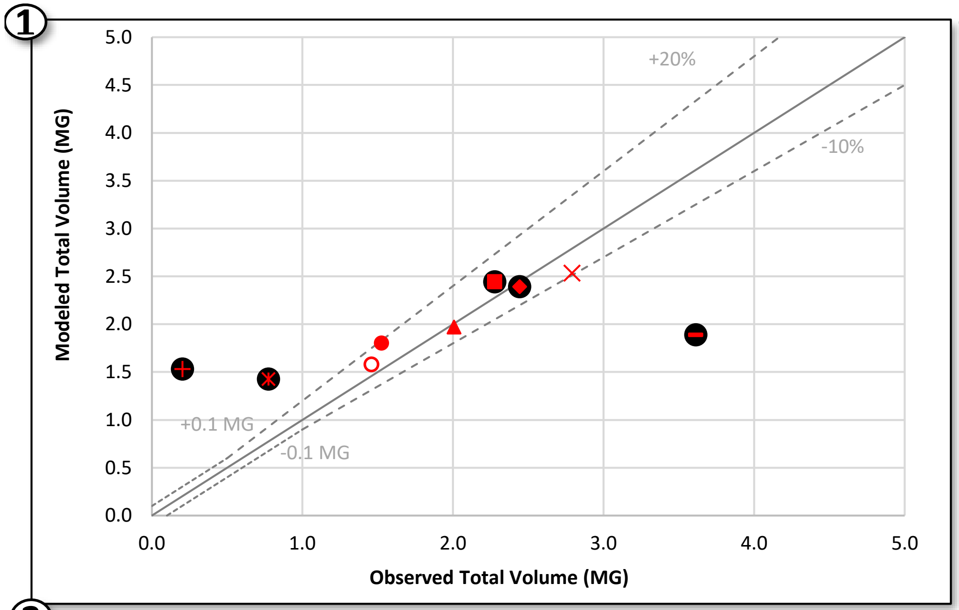
Appendix C
WWF Calibration

Meter	Rain Gauge	Pipe Size (in)	Event ID	Event Start Time	Event End Time	Data Quality Issues?	Monitored				Modeled				Comparison						
							Peak Flow (mgd)	Total Volume (MG)	Peak Depth (ft)	Observed Surcharge?	Peak Flow (MGD)	Total Volume (MG)	Peak Depth (ft)	Predicted Surcharge?	Peak Flow % Diff	Total Volume % Diff	Peak Depth Diff (ft)	Peak Flow Calibration Flag (1: Calibrated regardless data	Total Volume Calibration Flag (1: Calibrated regardless data	Peak Depth Calibration flag (1: Calibrated regardless data	Notes for Calibration
UCKC2	RGUCKC1	15.0	1	11/12/2018 0:00	11/16/18 0:00	N	1.19	2.40	0.73	N	1.31	3.21	1.05	N	10.3%	33.3%	0.32	1	0	1	
			2	12/1/2018 0:00	12/7/18 23:59	N	1.35	4.02	1.14	N	1.48	4.32	1.21	N	9.2%	7.5%	0.07	1	1	1	
			3	12/8/2018 0:00	12/13/18 23:59	N	1.34	4.36	1.22	N	1.22	4.29	0.99	N	-9.0%	-1.6%	-0.23	1	1	1	
			4	12/14/2018 0:00	12/19/18 23:59	N	1.60	3.60	2.48	Y	1.40	3.67	1.13	N	-12.5%	2.0%	-1.35	1	1	0	
			5	12/20/2018 0:00	12/27/18 11:59	N	1.03	4.66	0.83	N	1.00	4.50	0.86	N	-3.2%	-3.5%	0.03	1	1	1	
			6	12/27/2018 12:00	1/2/19 12:00	N	1.42	4.72	2.39	Y	1.55	4.42	1.30	Y	9.0%	-6.2%	-1.09	1	1	0	
			7	1/19/2019 12:00	1/23/19 11:59	N	1.13	2.50	0.66	N	1.47	2.79	1.22	N	30.5%	11.6%	0.57	0	1	1	
			8	1/23/2019 12:00	1/27/19 0:00	N	1.42	2.52	0.97	N	1.96	2.75	2.00	Y	38.0%	9.1%	1.03	0	1	1	
			9	2/19/2019 0:00	2/23/19 0:00	N	1.29	2.95	0.59	N	1.26	2.74	1.01	N	-2.6%	-7.2%	0.43	1	1	1	

Notes

1	Calibrated regardless data quality with % criteria
<u>1</u>	Calibrated regardless data quality with low flow criteria

①



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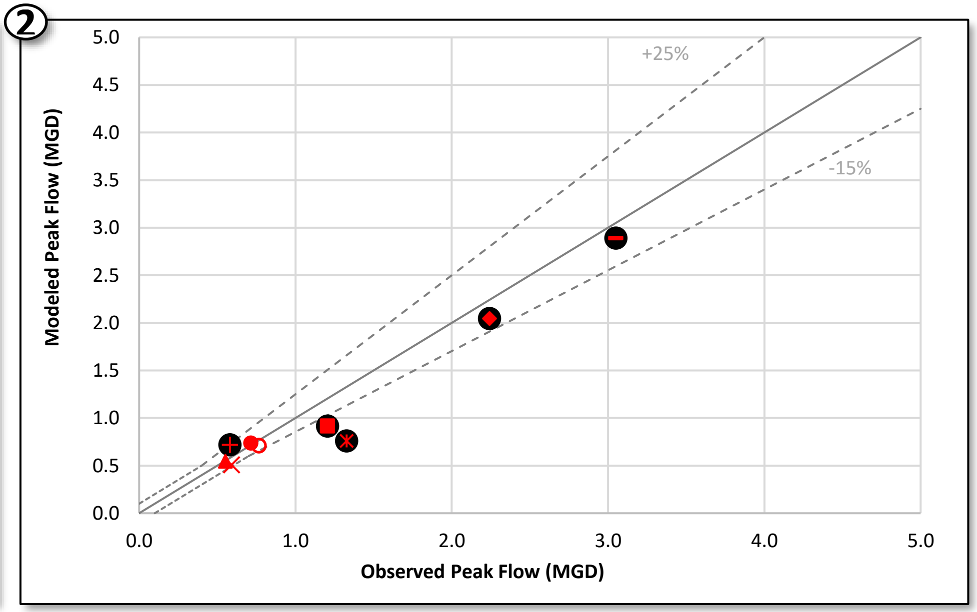

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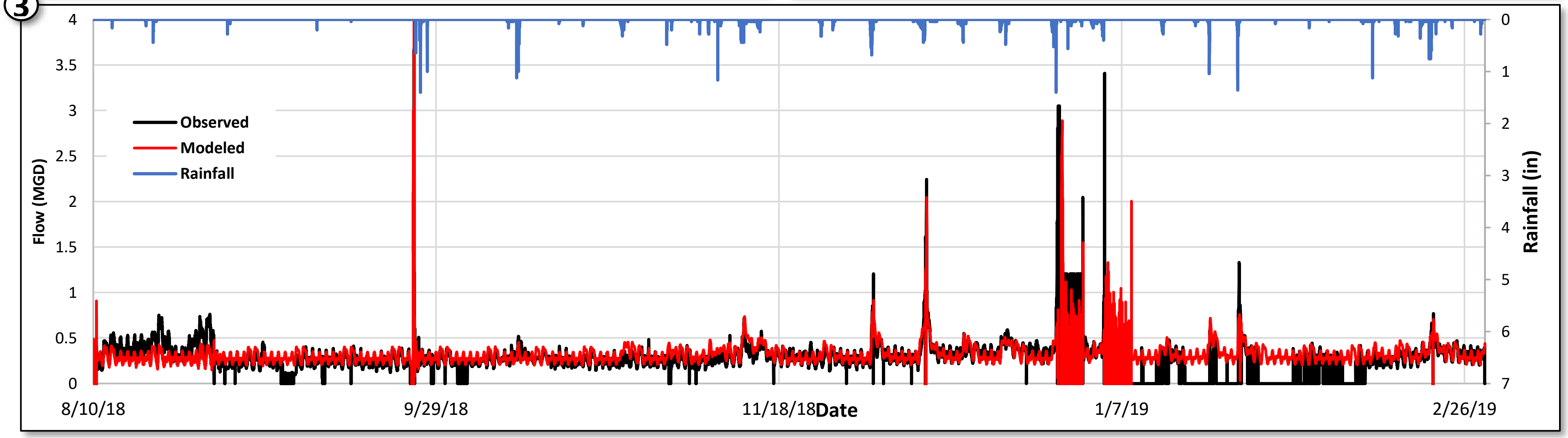


DeKalb Calibration Results

Wet Weather
Flow Summary

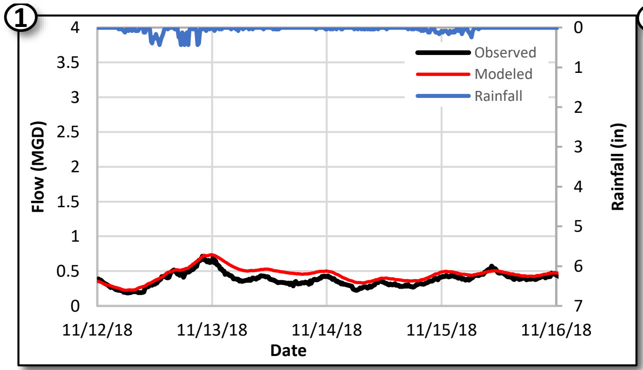
Flow Meter:
CKC1
Sewershed:
Crooked Creek
Sewer Basin:
Pole Bridge Basin

① Total Event Volume
② Peak Event Flow
③ Time Series

Events:

● 11/12/18
■ 12/1/18
◆ 12/8/18
▲ 12/14/18
× 12/20/18
− 12/27/18
+ 1/19/19
✳ 1/23/19
○ 2/19/19
● Excluded Event Due to Data Quality

①



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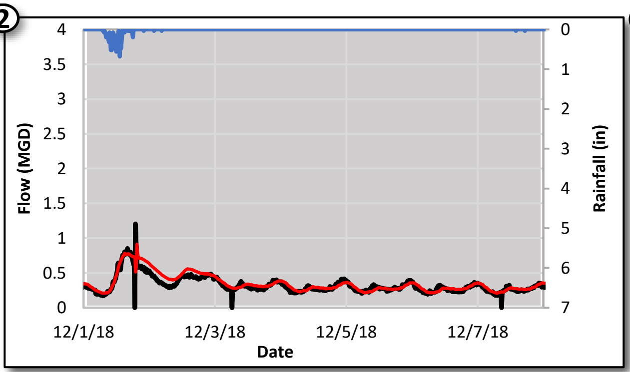

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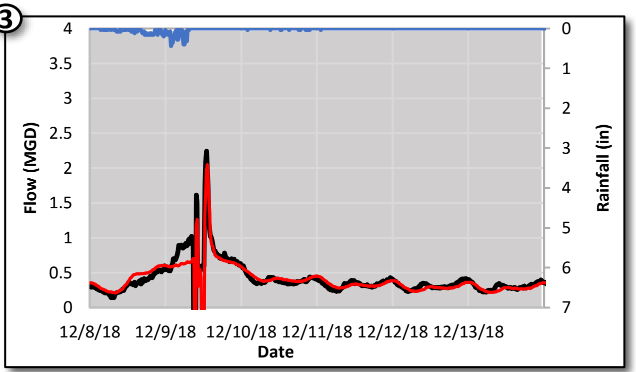

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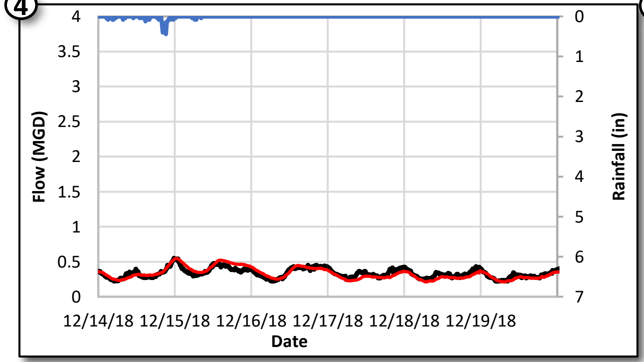

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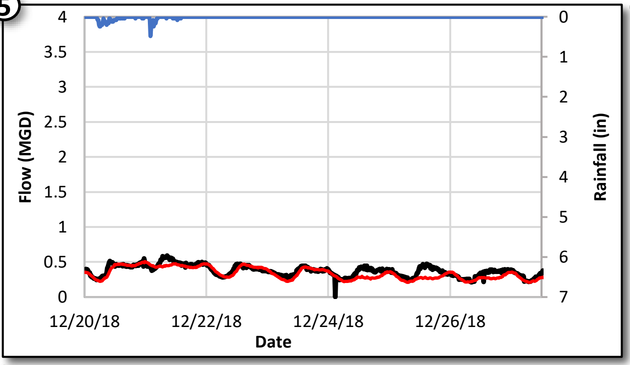

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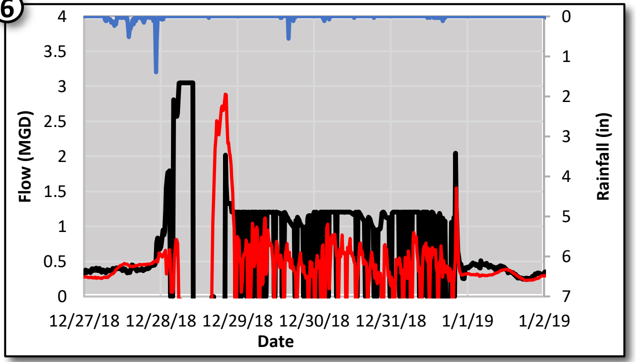

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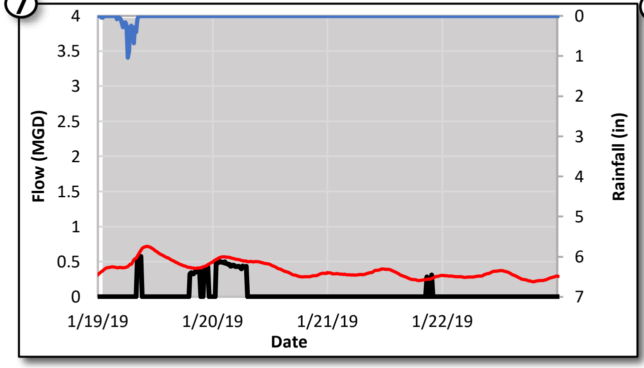

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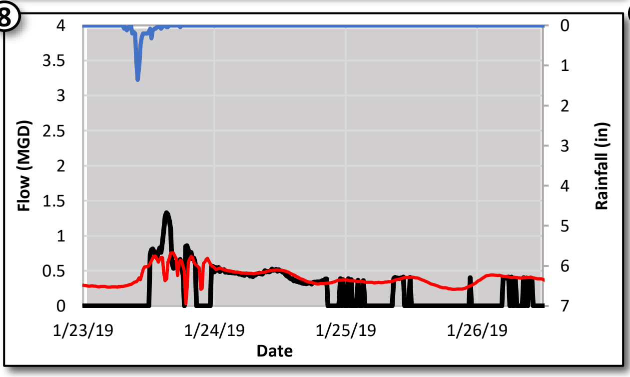

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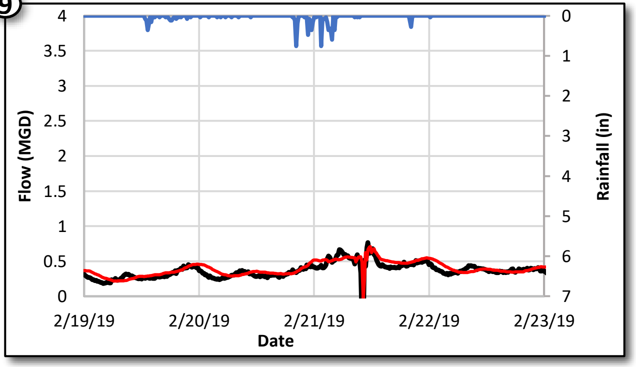


DeKalb Calibration Results

Event Hydrographs

Flow Meter:

CKC1

Sewershed:

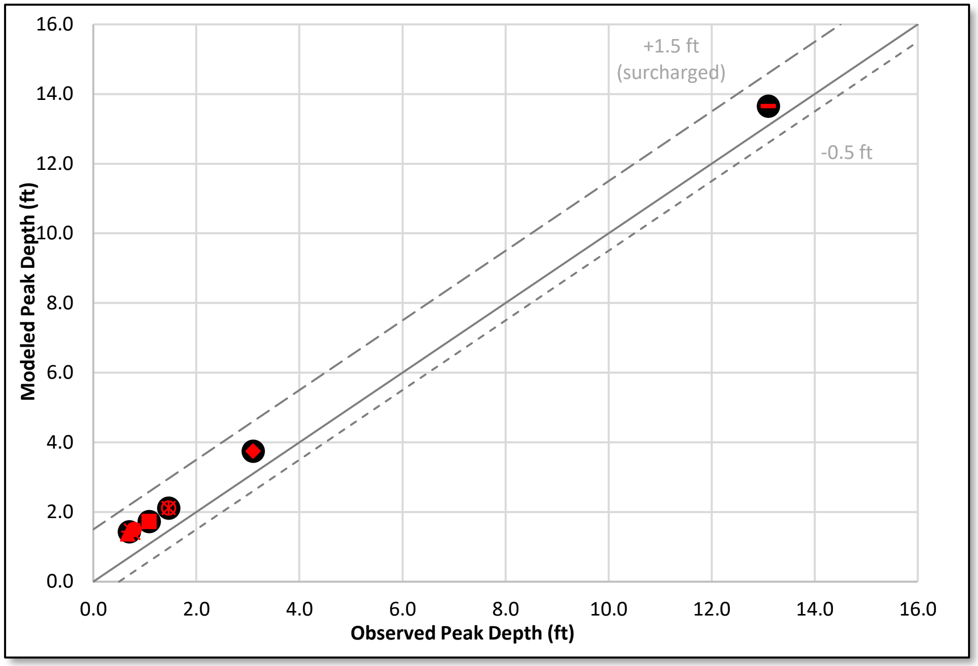
Crooked Creek

Sewer Basin:

Pole Bridge Basin

Events:

①	11/12/18	⑤	12/20/18	⑨	2/19/19
②	12/1/18	⑥	12/27/18	▨	Excluded Event Due to Data Quality
③	12/8/18	⑦	1/19/19		
④	12/14/18	⑧	1/23/19		



Flow Meter:

CKC1

Events:

● 11/12/18

■ 12/1/18

◆ 12/8/18

▲ 12/14/18

× 12/20/18

— 12/27/18

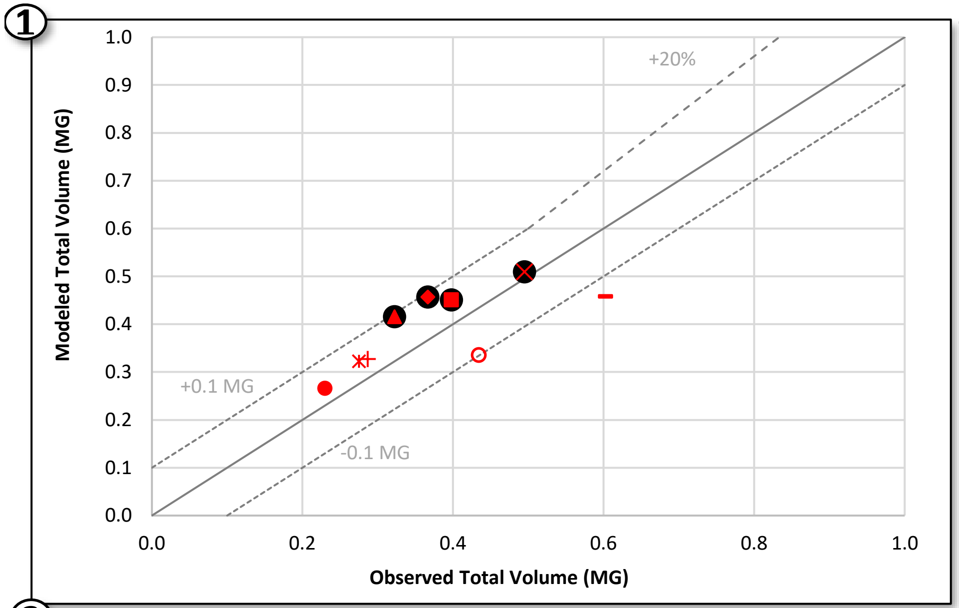
+ 1/19/19

* 1/23/19

○ 2/19/19

⬤ Excluded Event Due to Data Quality

①



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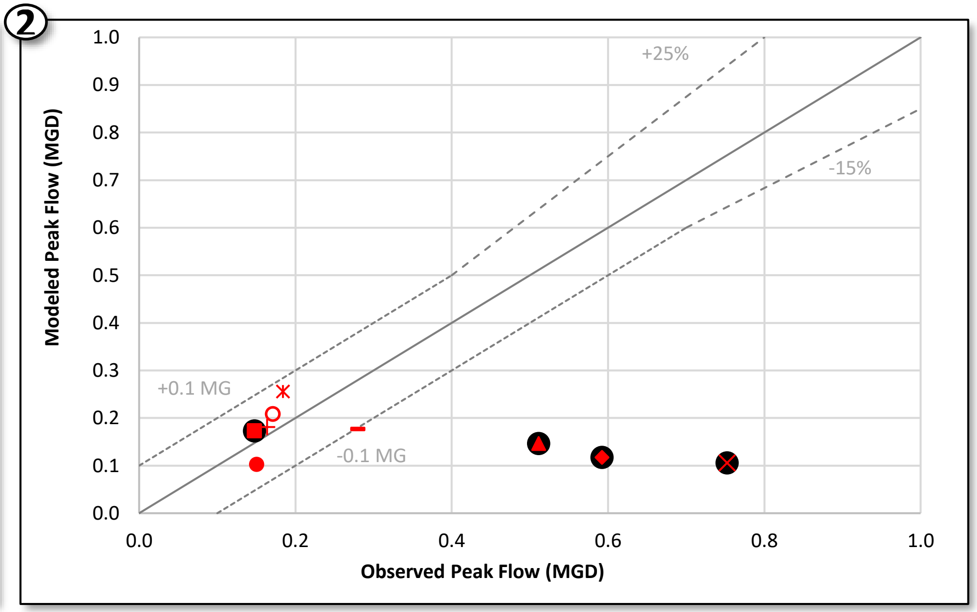

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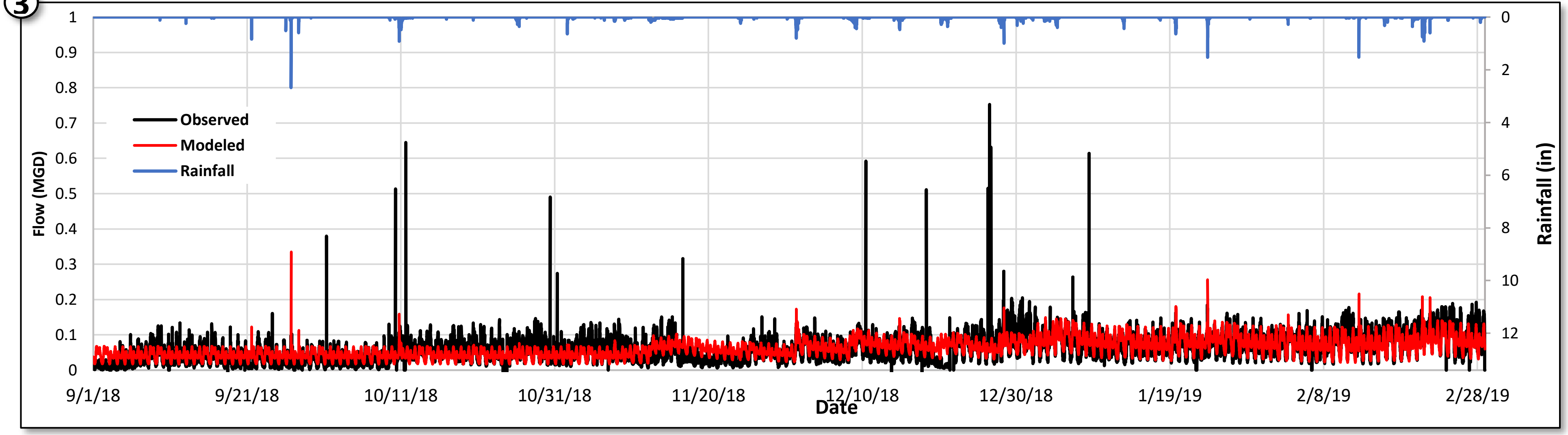


DeKalb Calibration Results

Wet Weather
Flow Summary

Flow Meter:

DK10

Sewershed:
Honey Creek

Sewer Basin:
Pole Bridge Basin

① Total Event Volume

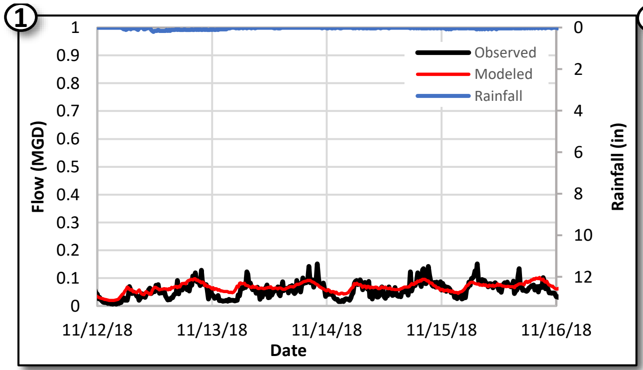
② Peak Event Flow

③ Time Series

Events:

●	11/12/18	–	12/27/18
■	12/1/18	+	1/19/19
◆	12/8/18	✳	1/23/19
▲	12/14/18	○	2/19/19
×	12/20/18	●	Excluded Event Due to Data Quality

①



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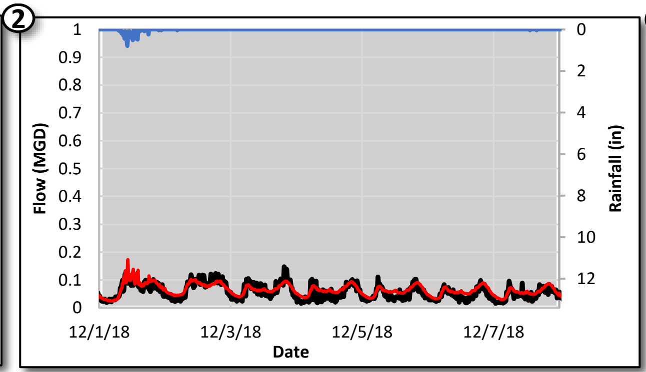

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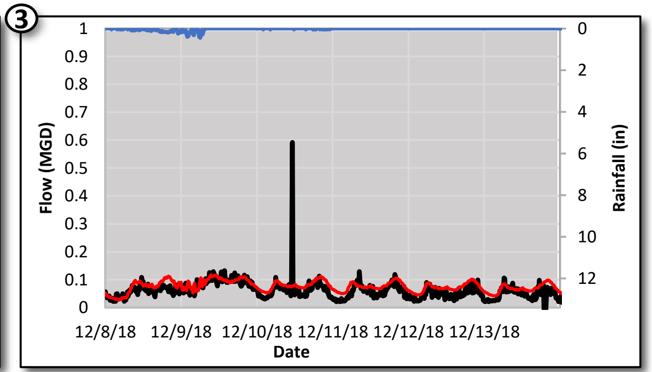

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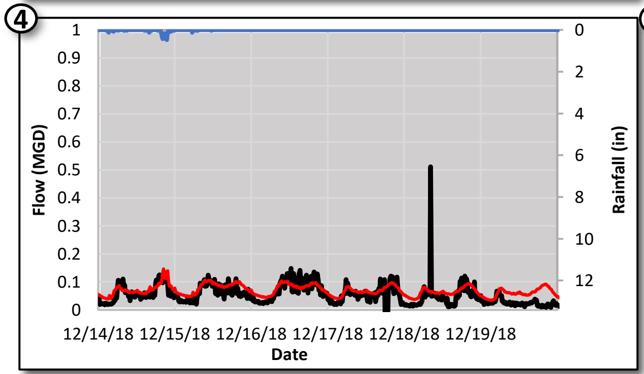

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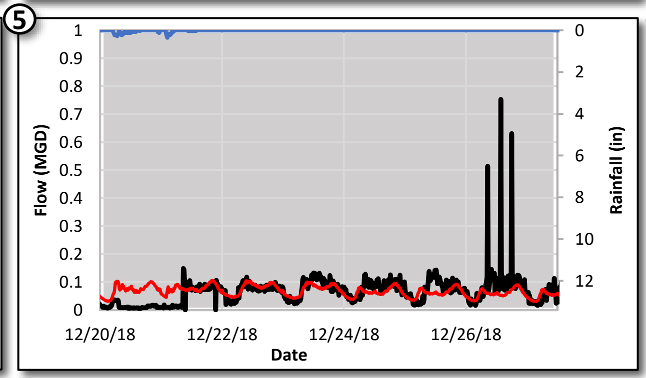

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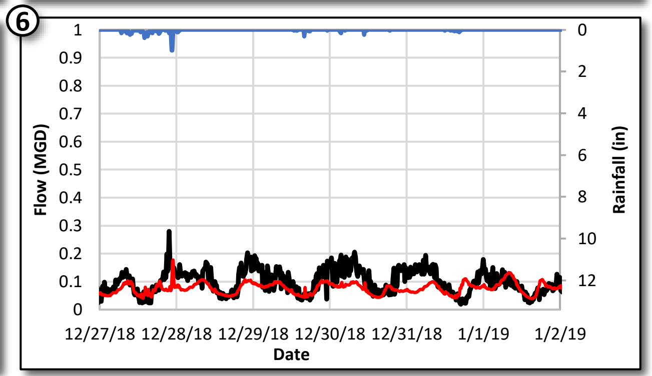

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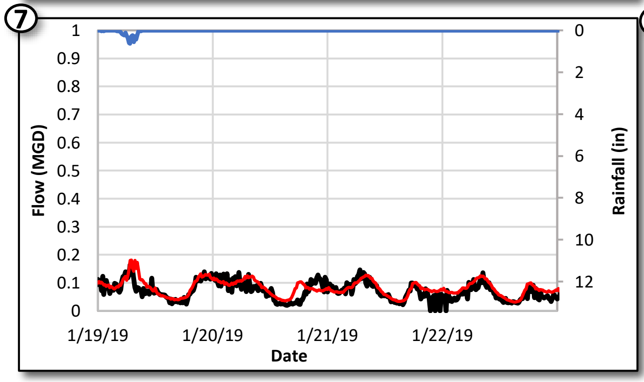

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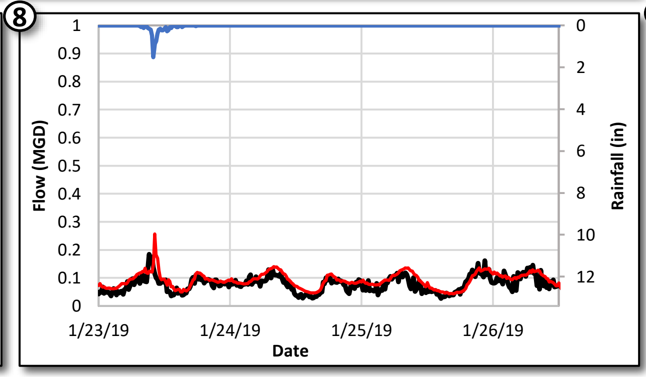

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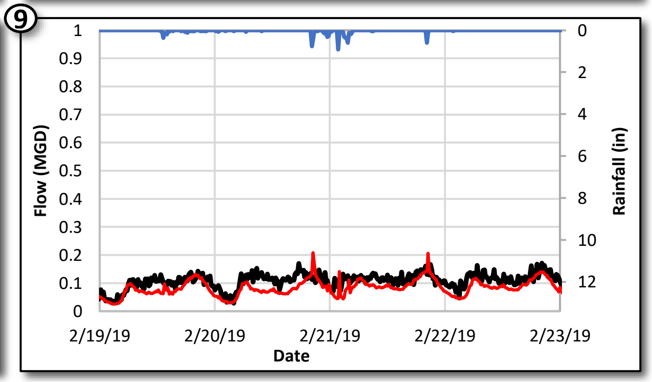


DeKalb Calibration Results

Event Hydrographs

Flow Meter:

DK10

Sewershed:

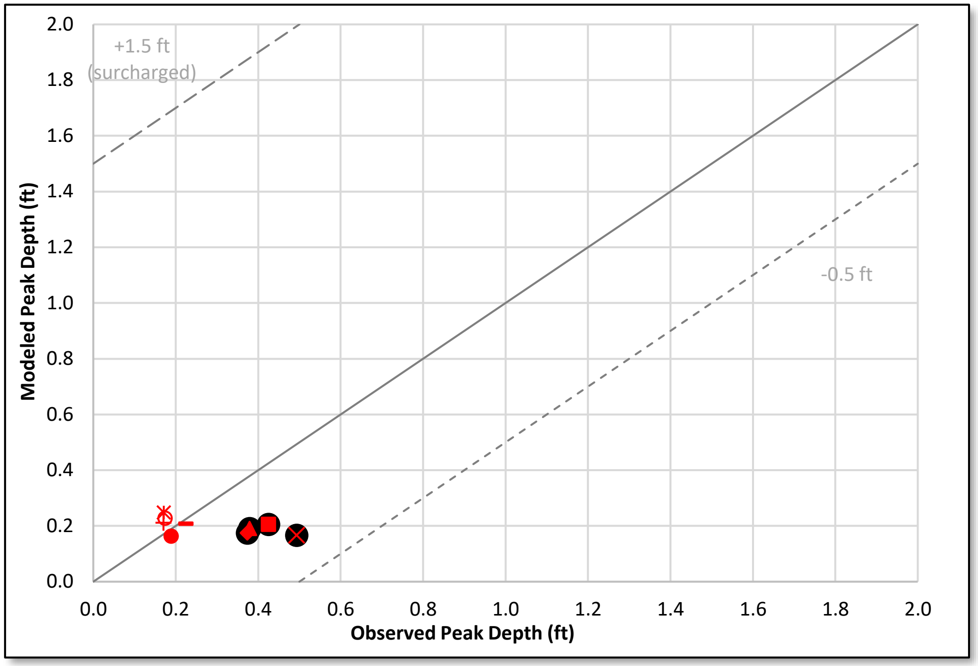
Honey Creek

Sewer Basin:

Pole Bridge Basin

Events:

①	11/12/18	⑤	12/20/18	⑨	2/19/19
②	12/1/18	⑥	12/27/18	▨	Excluded Event Due to Data Quality
③	12/8/18	⑦	1/19/19		
④	12/14/18	⑧	1/23/19		



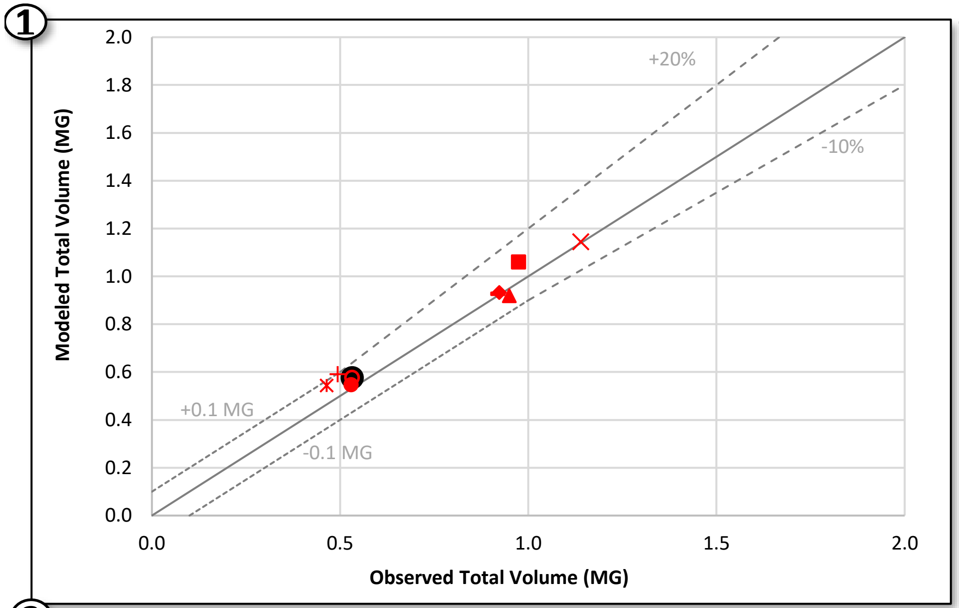
Flow Meter:

DK10

Events:

●	11/12/18	—	12/27/18
■	12/1/18	+	1/19/19
◆	12/8/18	⁎	1/23/19
▲	12/14/18	○	2/19/19
×	12/20/18	●	Excluded Event Due to Data Quality

①



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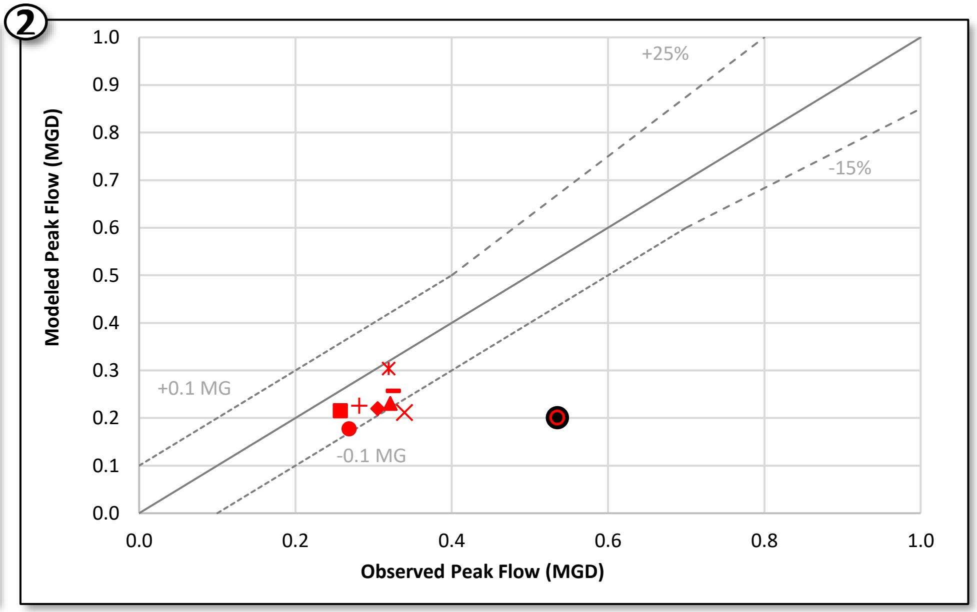

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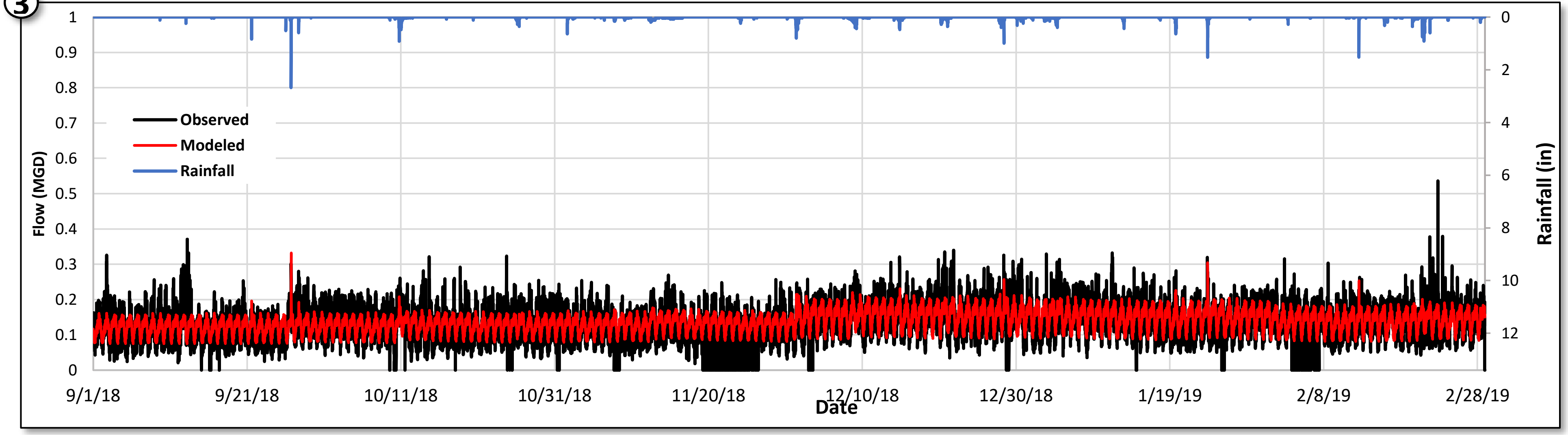


DeKalb Calibration Results

Wet Weather
Flow Summary

Flow Meter:

DK11

Sewershed:
Honey Creek

Sewer Basin:
Pole Bridge Basin

① Total Event Volume

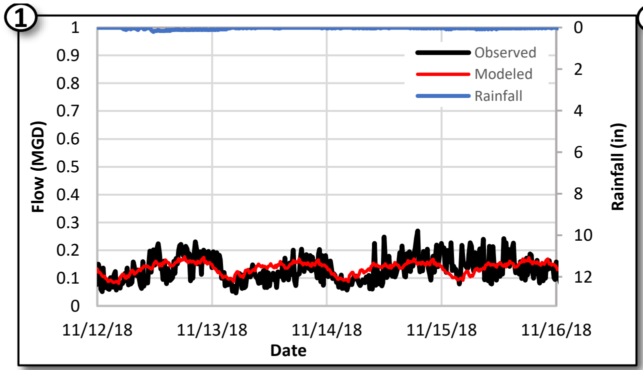
② Peak Event Flow

③ Time Series

Events:

●	11/12/18	—	12/27/18
■	12/1/18	+	1/19/19
◆	12/8/18	✳	1/23/19
▲	12/14/18	○	2/19/19
×	12/20/18	●	Excluded Event Due to Data Quality

①



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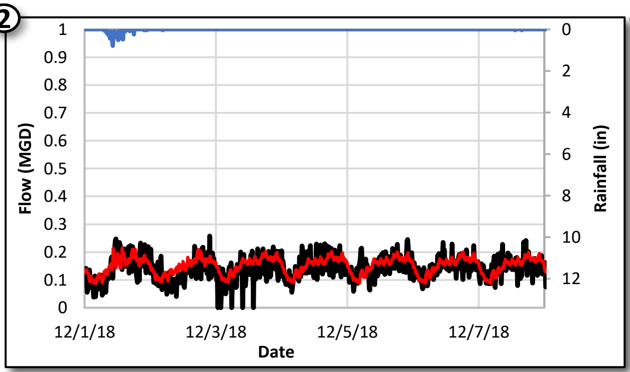

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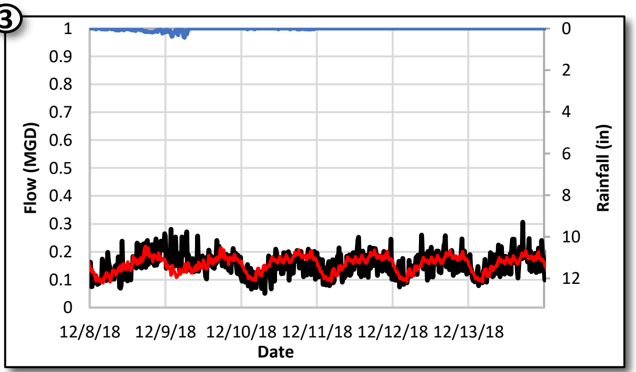

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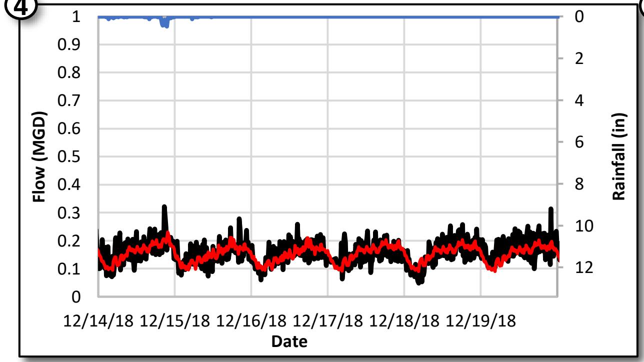

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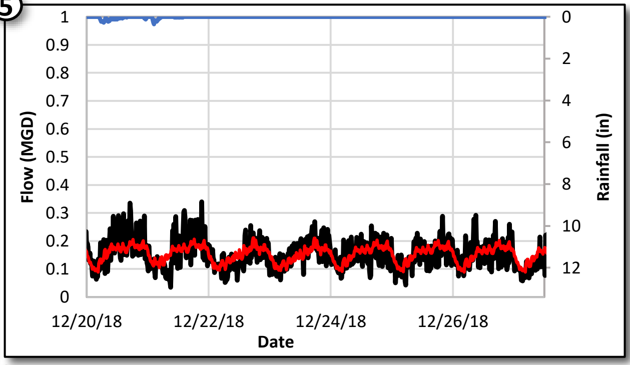

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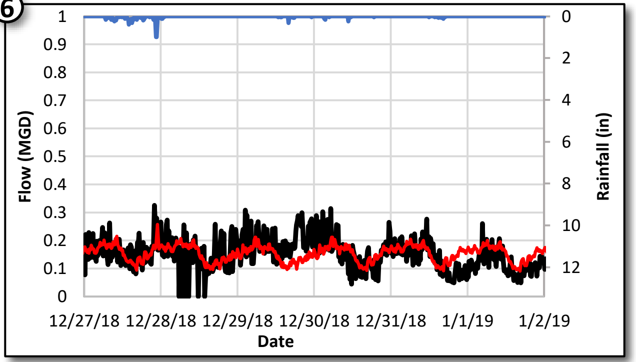

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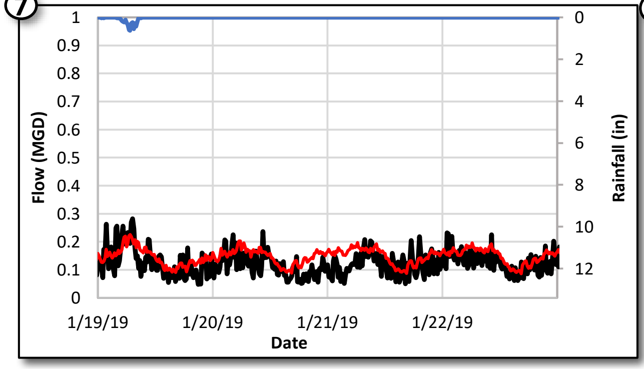

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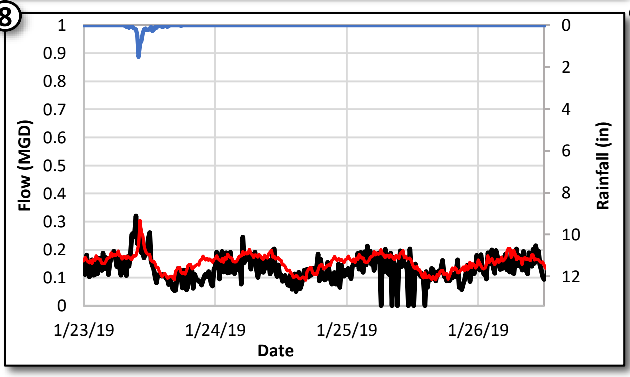

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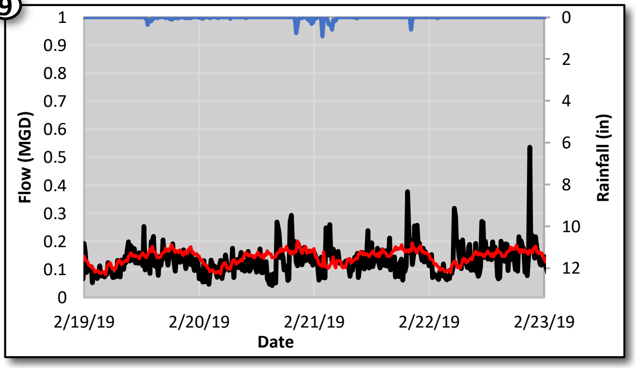


DeKalb Calibration Results

Event Hydrographs

Flow Meter:

DK11

Sewershed:

Honey Creek

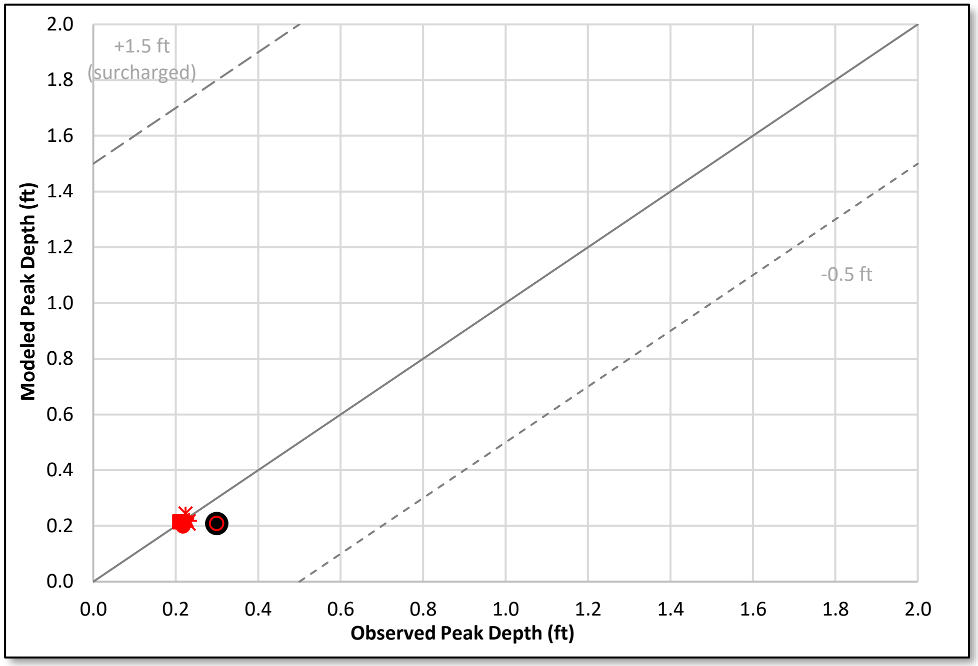
Sewer Basin:

Pole Bridge Basin

Events:

① 11/12/18
② 12/1/18
③ 12/8/18
④ 12/14/18
⑤ 12/20/18
⑥ 12/27/18
⑦ 1/19/19
⑧ 1/23/19
⑨ 2/19/19

▨ Excluded Event Due to Data Quality



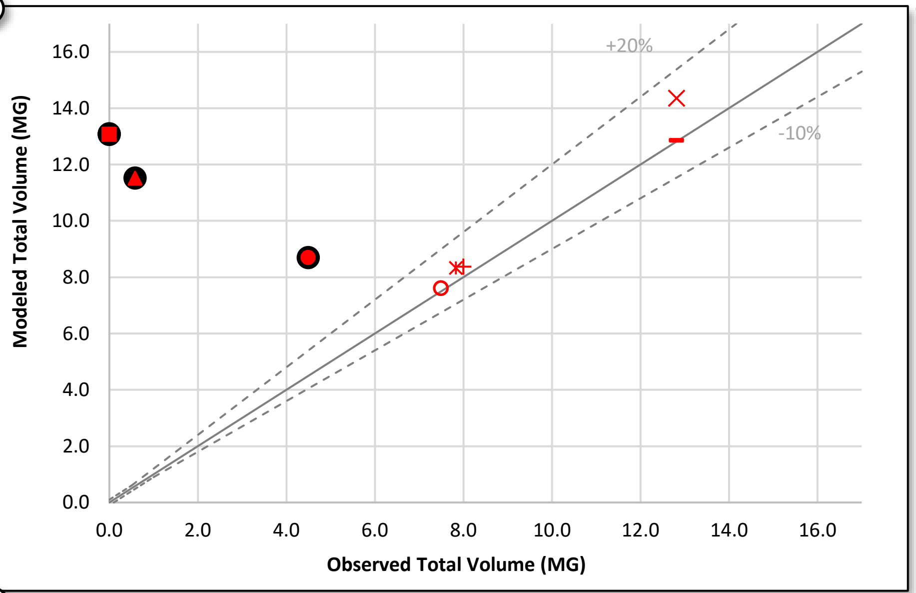
Flow Meter:

DK11

Events:

● 11/12/18
■ 12/1/18
◆ 12/8/18
▲ 12/14/18
× 12/20/18
— 12/27/18
+ 1/19/19
✳ 1/23/19
○ 2/19/19
● Excluded Event Due to Data Quality

①



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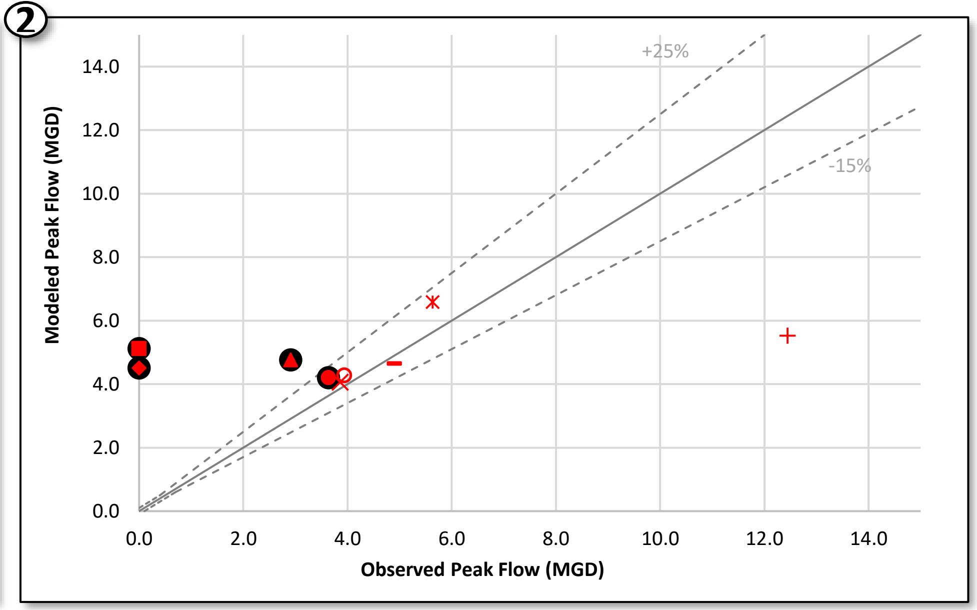

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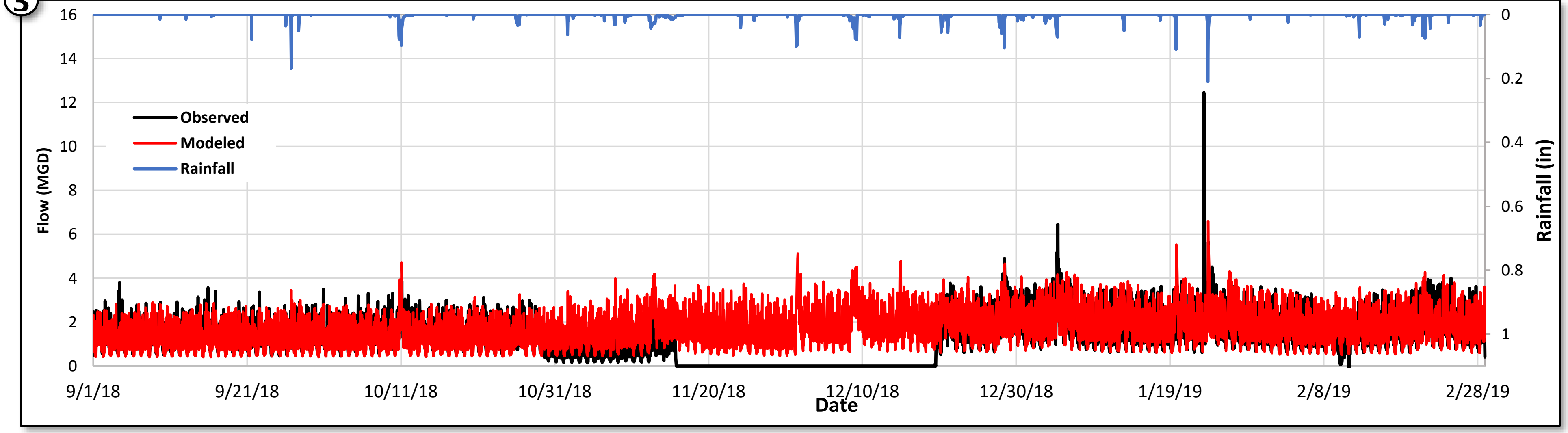


DeKalb Calibration Results

Wet Weather
Flow Summary

Flow Meter:
HON1

Sewershed:
Honey Creek

Sewer Basin:
Pole Bridge Basin

① Total Event Volume

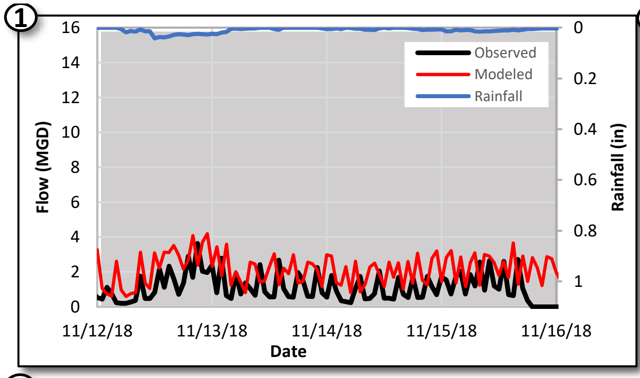
② Peak Event Flow

③ Time Series

Events:

●	11/12/18	—	12/27/18
■	12/1/18	+	1/19/19
◆	12/8/18	✳	1/23/19
▲	12/14/18	○	2/19/19
×	12/20/18	●	Excluded Event Due to Data Quality

①



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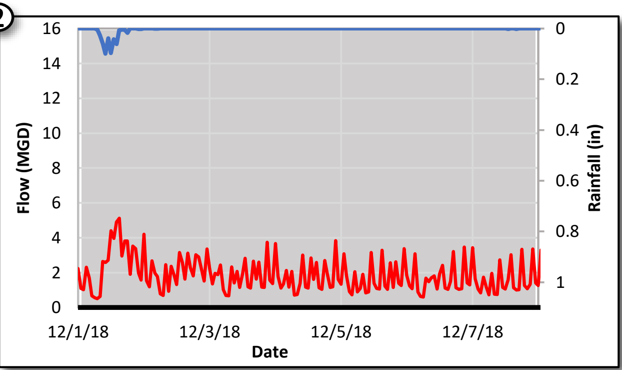

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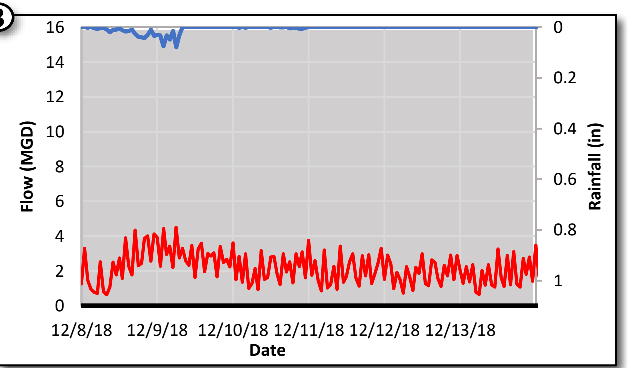

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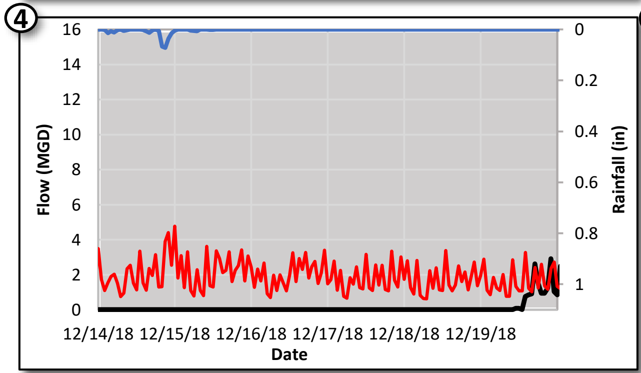

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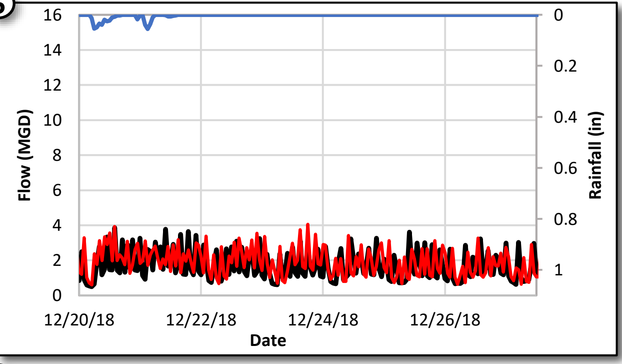

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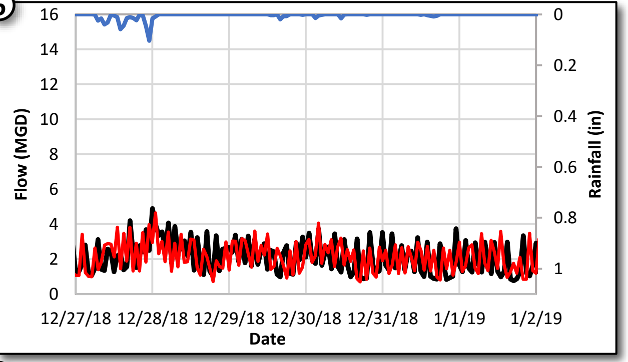

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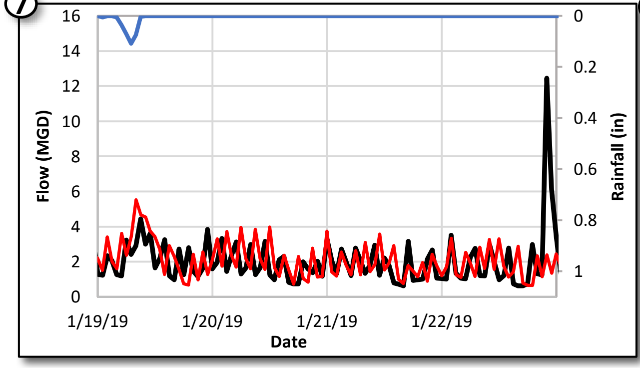

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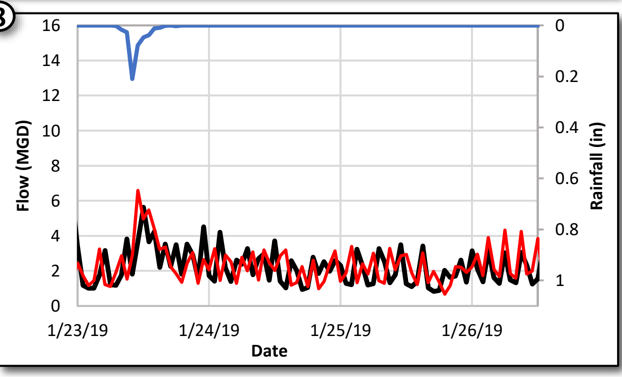

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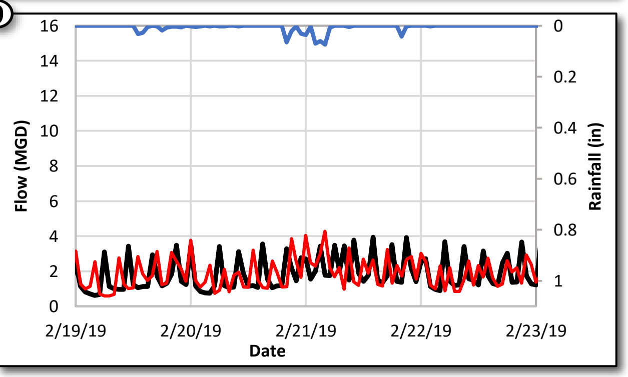


DeKalb Calibration Results

Event Hydrographs

Flow Meter:

HON1

Sewershed:

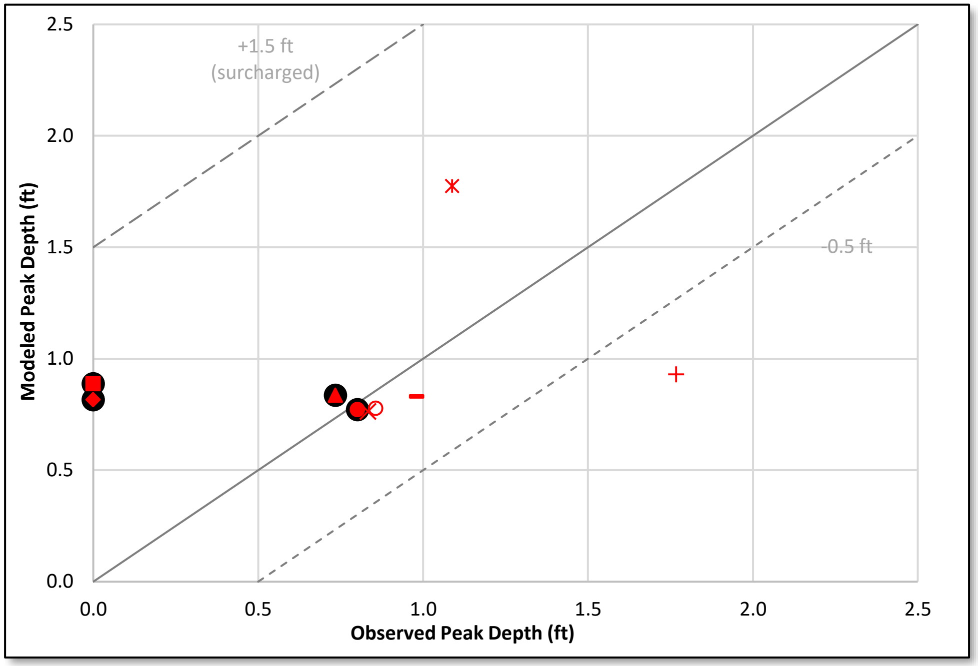
Honey Creek

Sewer Basin:

Pole Bridge Basin

Events:

①	11/12/18	⑤	12/20/18	⑨	2/19/19
②	12/1/18	⑥	12/27/18	▨	Excluded Event Due to Data Quality
③	12/8/18	⑦	1/19/19		
④	12/14/18	⑧	1/23/19		



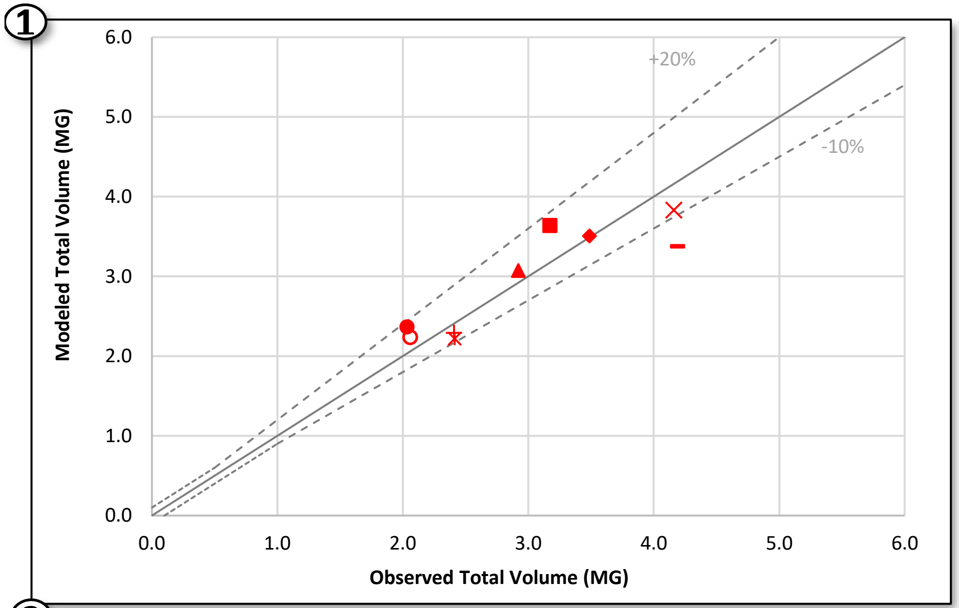
Flow Meter:

HON1

Events:

●	11/12/18	—	12/27/18
■	12/1/18	+	1/19/19
◆	12/8/18	✳	1/23/19
▲	12/14/18	○	2/19/19
×	12/20/18	●	Excluded Event Due to Data Quality

①



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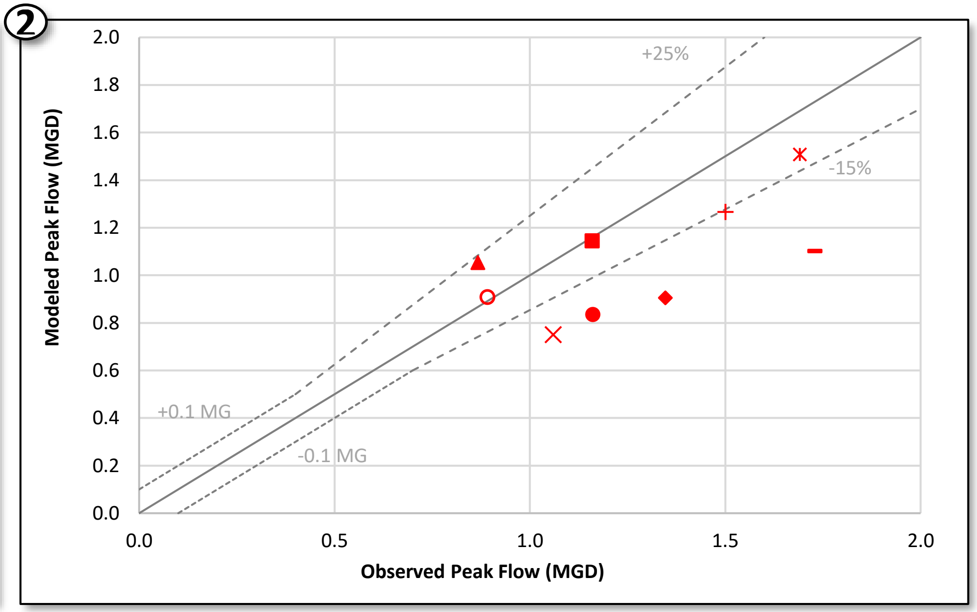

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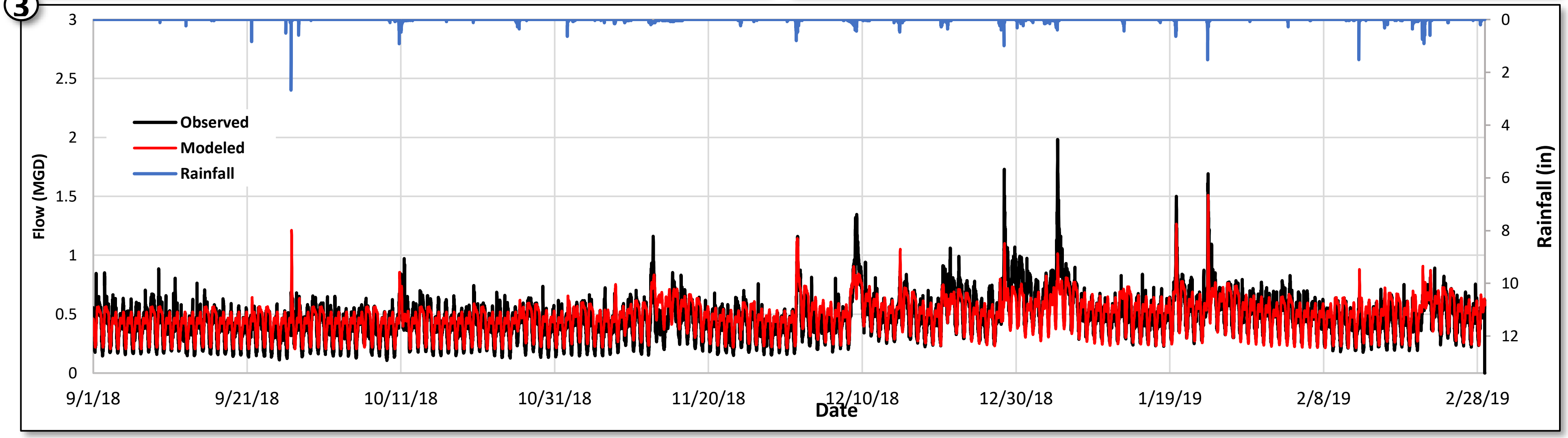


DeKalb Calibration Results

Wet Weather
Flow Summary

Flow Meter:

HON2

Sewershed:
Honey Creek

Sewer Basin:
Pole Bridge Basin

① Total Event Volume

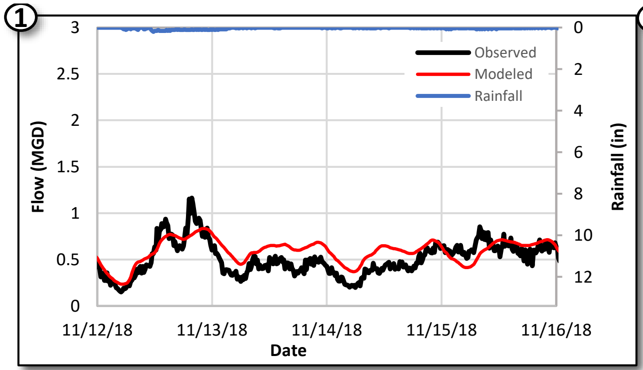
② Peak Event Flow

③ Time Series

Events:

●	11/12/18	–	12/27/18
■	12/1/18	+	1/19/19
◆	12/8/18	✳	1/23/19
▲	12/14/18	○	2/19/19
×	12/20/18	●	Excluded Event Due to Data Quality

①



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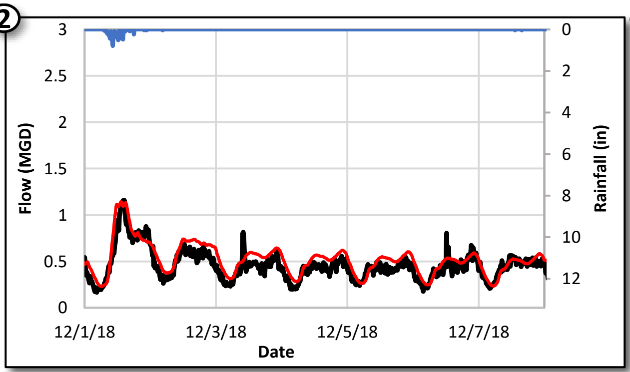

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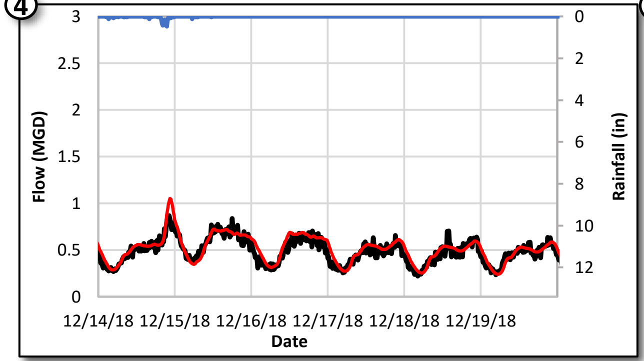
④



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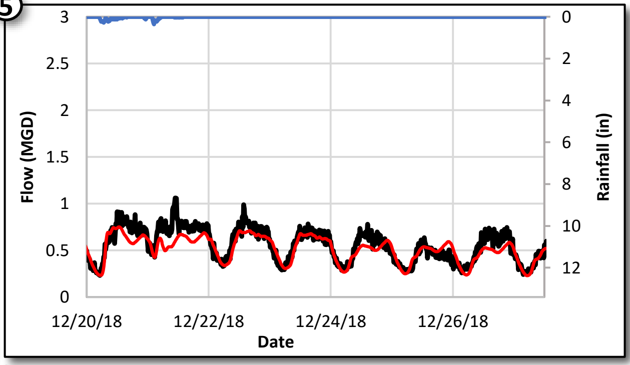

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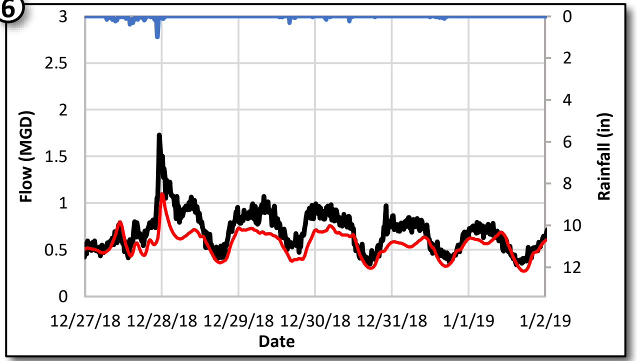

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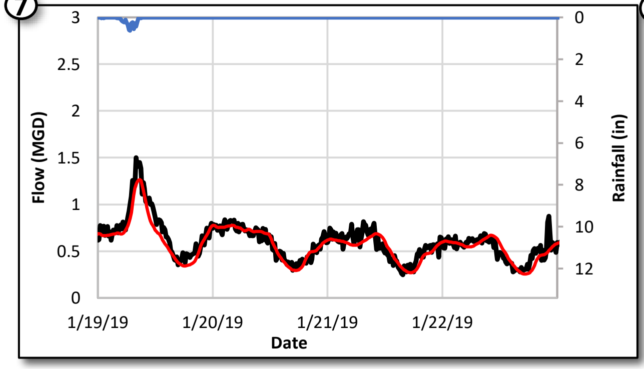

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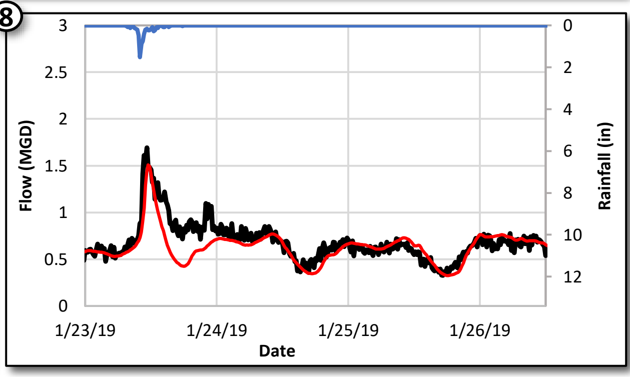

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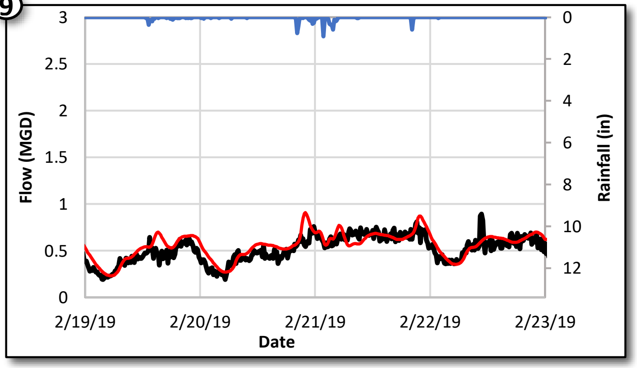


DeKalb Calibration Results

Event Hydrographs

Flow Meter:

HON2

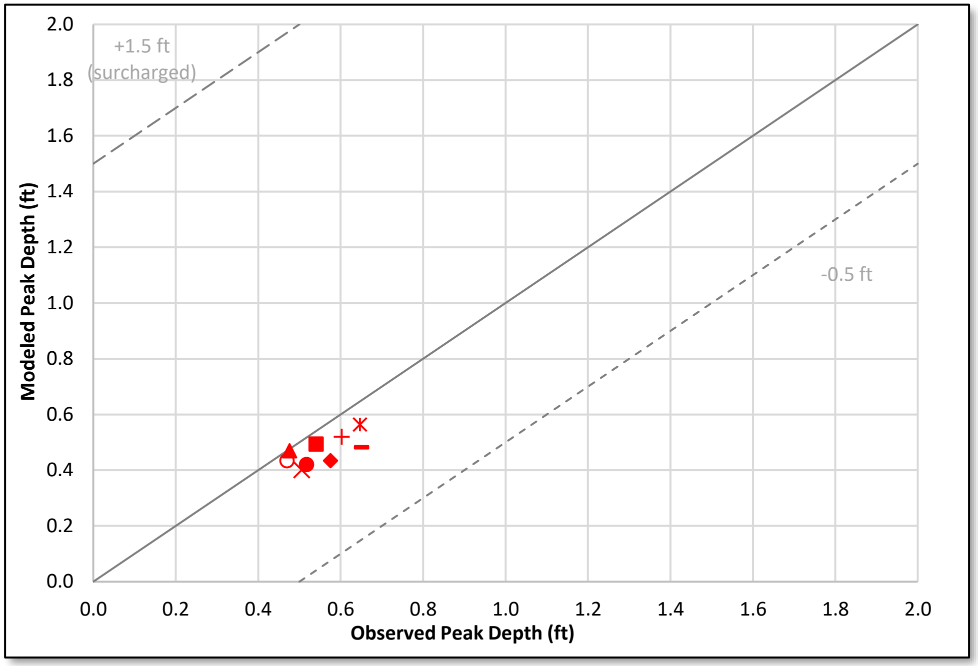
Sewershed:
Honey Creek

Sewer Basin:
Pole Bridge Basin

Events:

① 11/12/18
② 12/1/18
③ 12/8/18
④ 12/14/18
⑤ 12/20/18
⑥ 12/27/18
⑦ 1/19/19
⑧ 1/23/19
⑨ 2/19/19

▨ Excluded Event Due to Data Quality



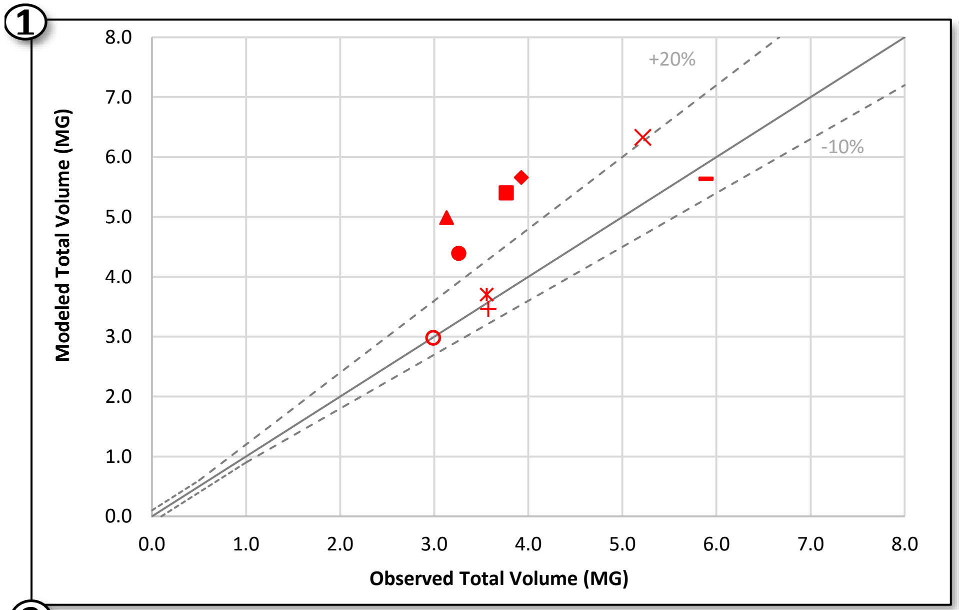
Flow Meter:

HON2

Events:

●	11/12/18	−	12/27/18
■	12/1/18	+	1/19/19
◆	12/8/18	✳	1/23/19
▲	12/14/18	○	2/19/19
×	12/20/18	●	Excluded Event Due to Data Quality

①



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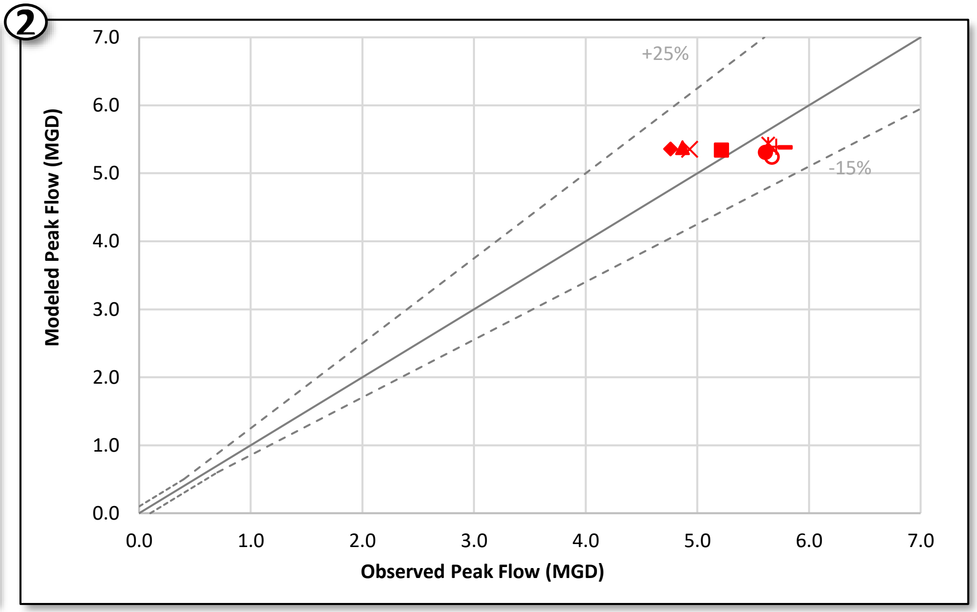

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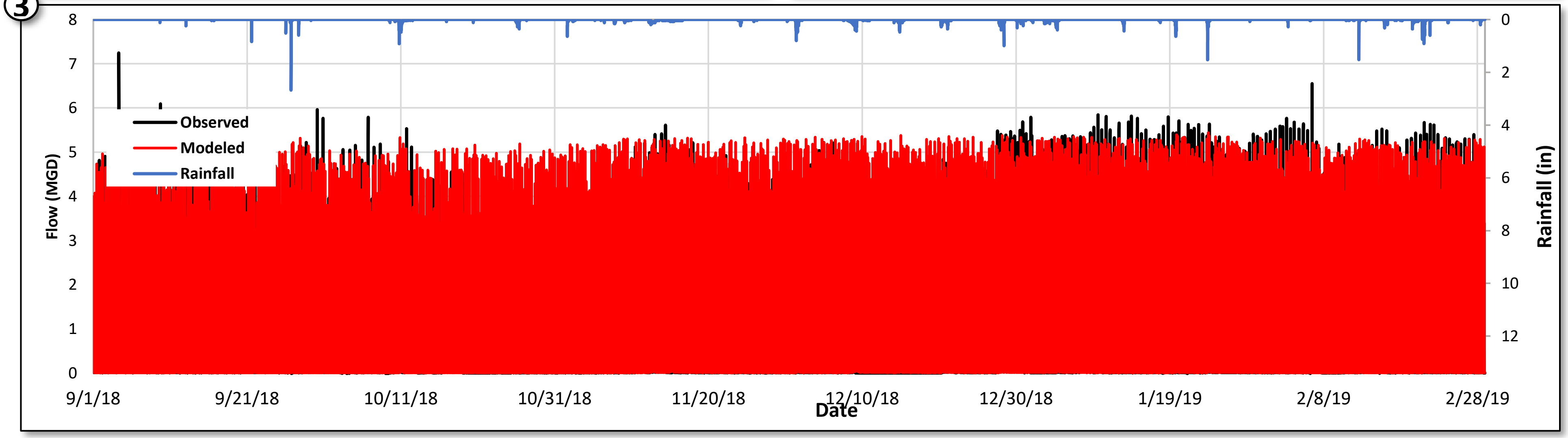


DeKalb Calibration Results

Wet Weather
Flow Summary

Flow Meter:

HON3

Sewershed:
Honey Creek

Sewer Basin:
Pole Bridge Basin

① Total Event Volume

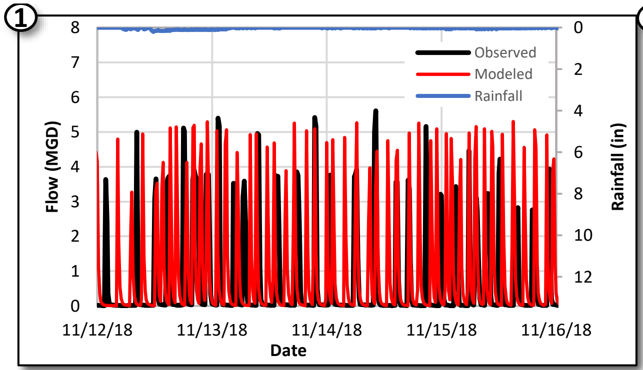
② Peak Event Flow

③ Time Series

Events:

● 11/12/18
■ 12/1/18
◆ 12/8/18
▲ 12/14/18
× 12/20/18
− 12/27/18
+ 1/19/19
✳ 1/23/19
○ 2/19/19
● Excluded Event Due to Data Quality

①



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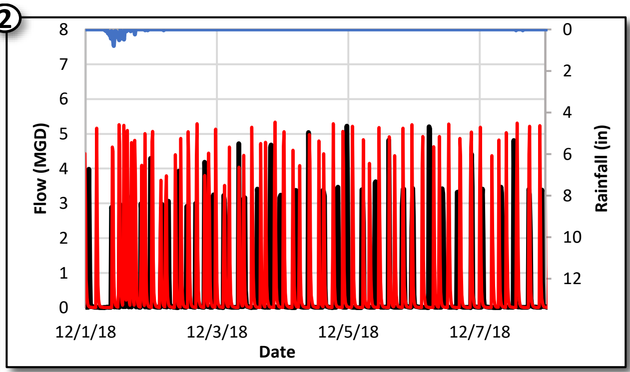

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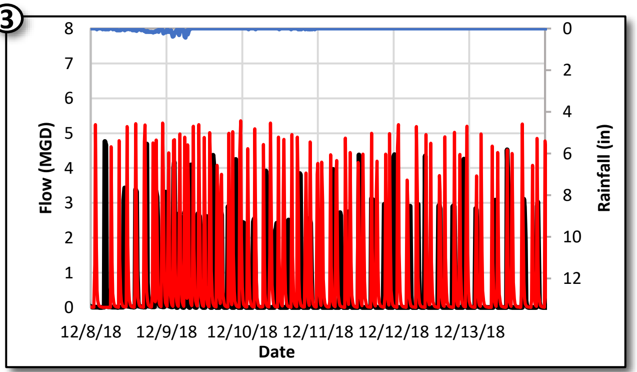

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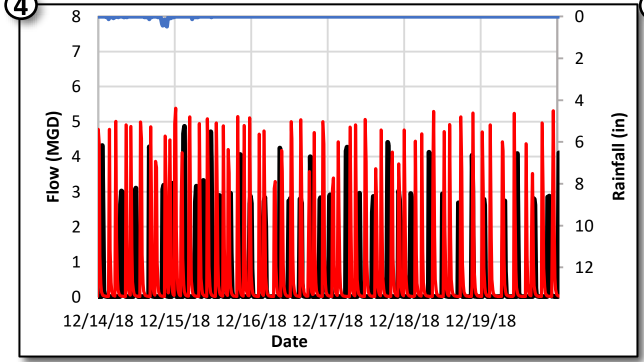

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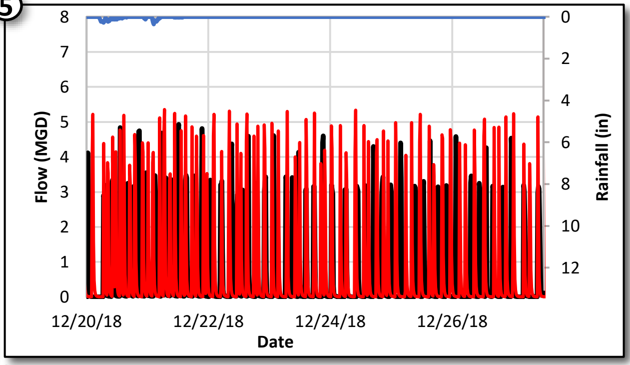

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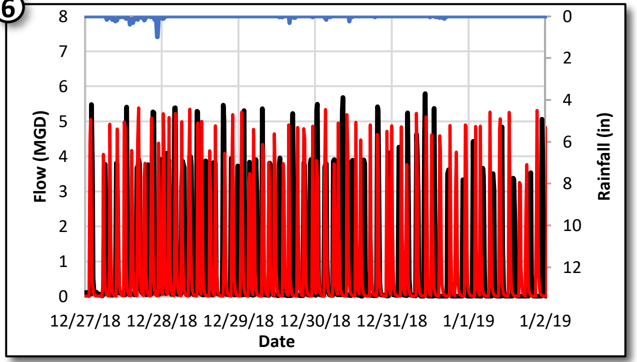

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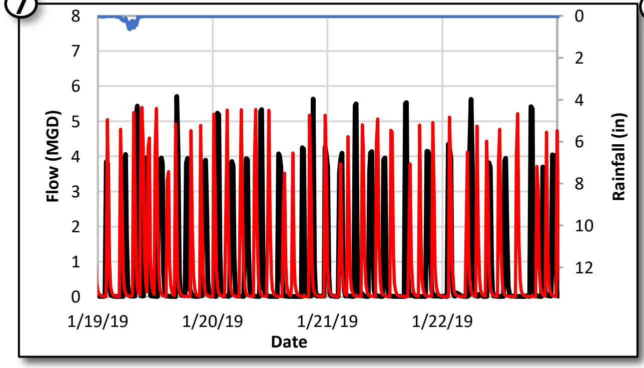

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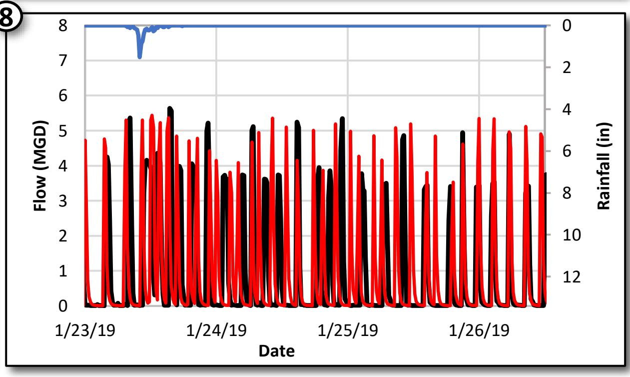

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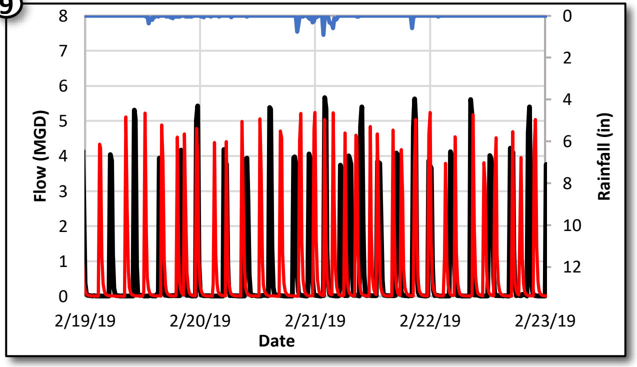


DeKalb Calibration Results

Event Hydrographs

Flow Meter:

HON3

Sewershed:

Honey Creek

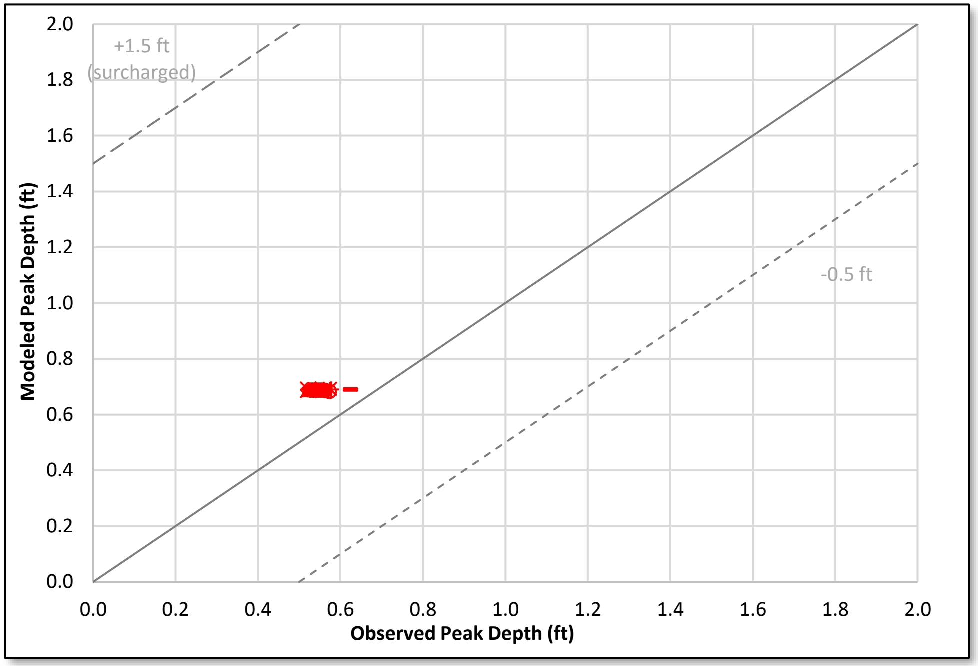
Sewer Basin:

Pole Bridge Basin

Events:

① 11/12/18
② 12/1/18
③ 12/8/18
④ 12/14/18
⑤ 12/20/18
⑥ 12/27/18
⑦ 1/19/19
⑧ 1/23/19
⑨ 2/19/19

▨ Excluded Event Due to Data Quality

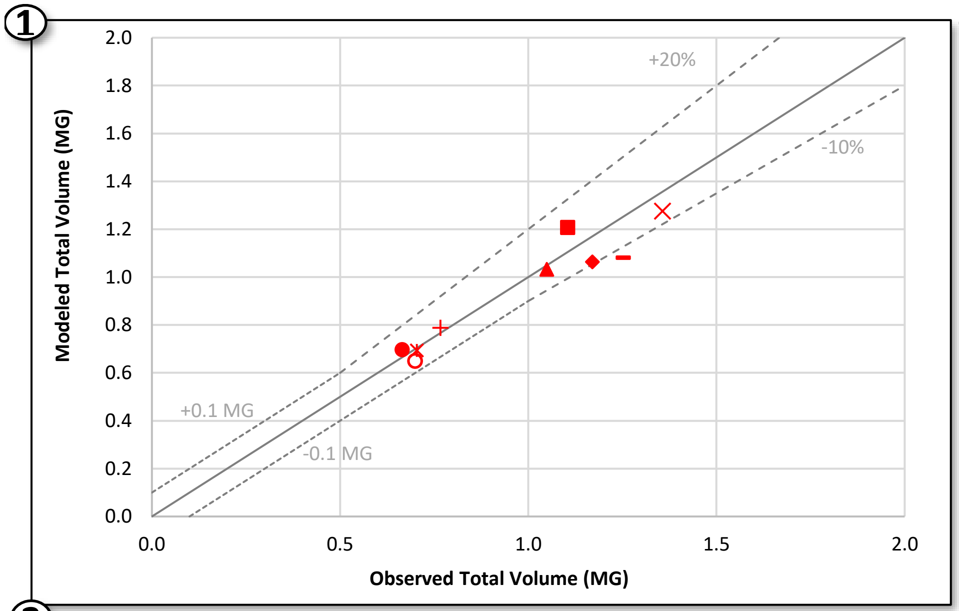


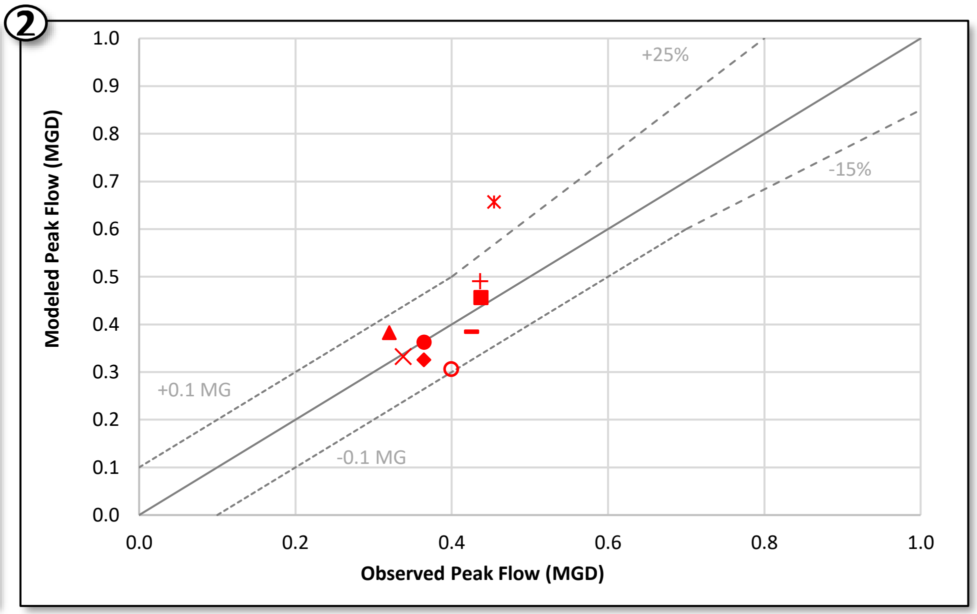
Flow Meter:

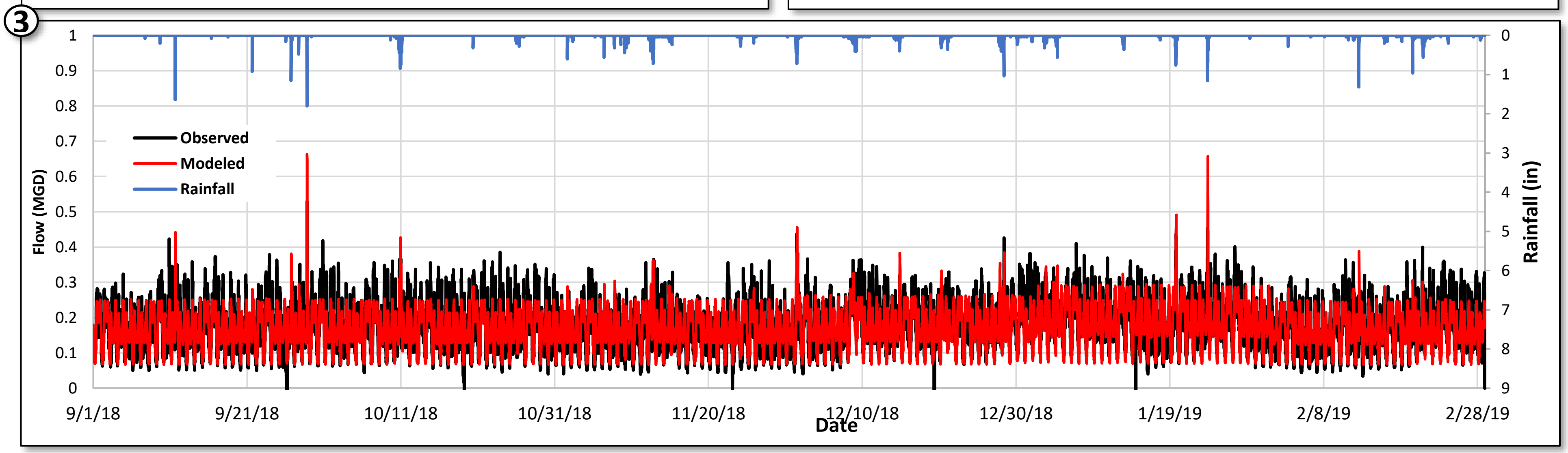
HON3

Events:

●	11/12/18	−	12/27/18
■	12/1/18	+	1/19/19
◆	12/8/18	∗	1/23/19
▲	12/14/18	○	2/19/19
×	12/20/18	●	Excluded Event Due to Data Quality







DeKalb Calibration Results

Wet Weather
Flow Summary

Flow Meter:

JSC1

Sewershed:
Johnson Creek

Sewer Basin:
Pole Bridge Basin

① Total Event Volume

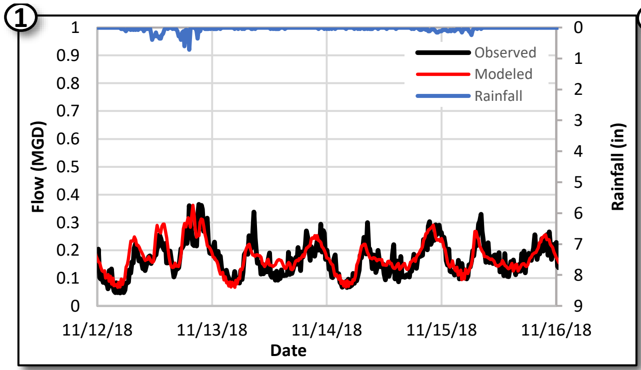
② Peak Event Flow

③ Time Series

Events:

●	11/12/18	−	12/27/18
■	12/1/18	+	1/19/19
◆	12/8/18	✳	1/23/19
▲	12/14/18	○	2/19/19
×	12/20/18	●	Excluded Event Due to Data Quality

①



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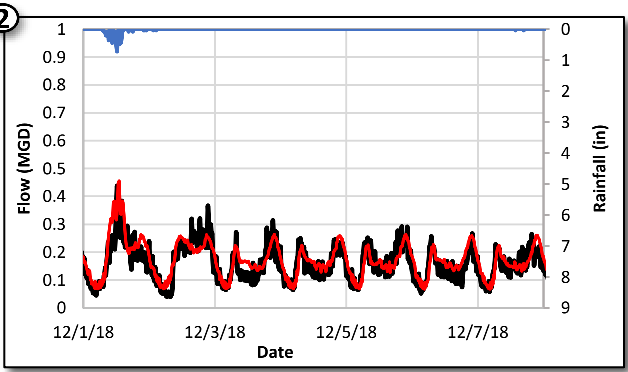

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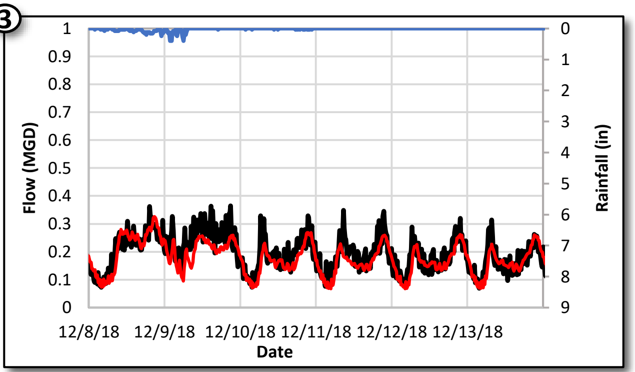

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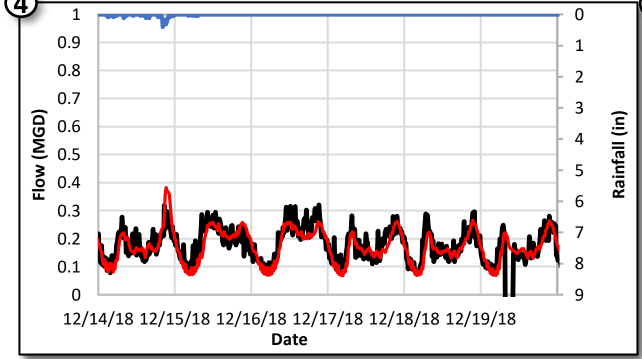

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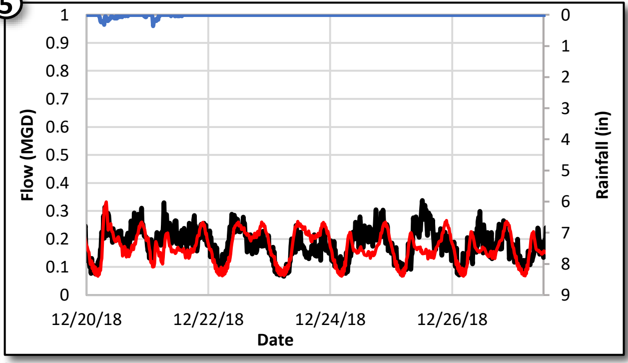

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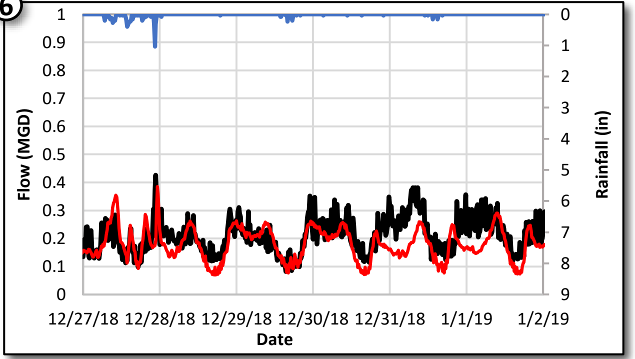

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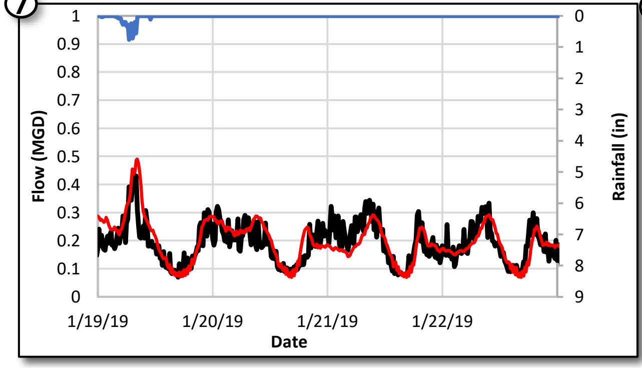

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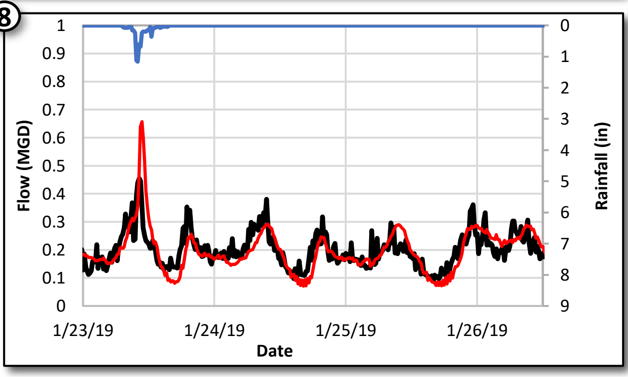

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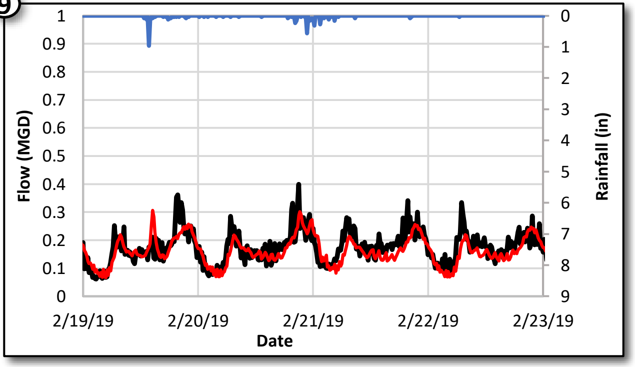


DeKalb Calibration Results

Event Hydrographs

Flow Meter:

JSC1

Sewershed:

Johnson Creek

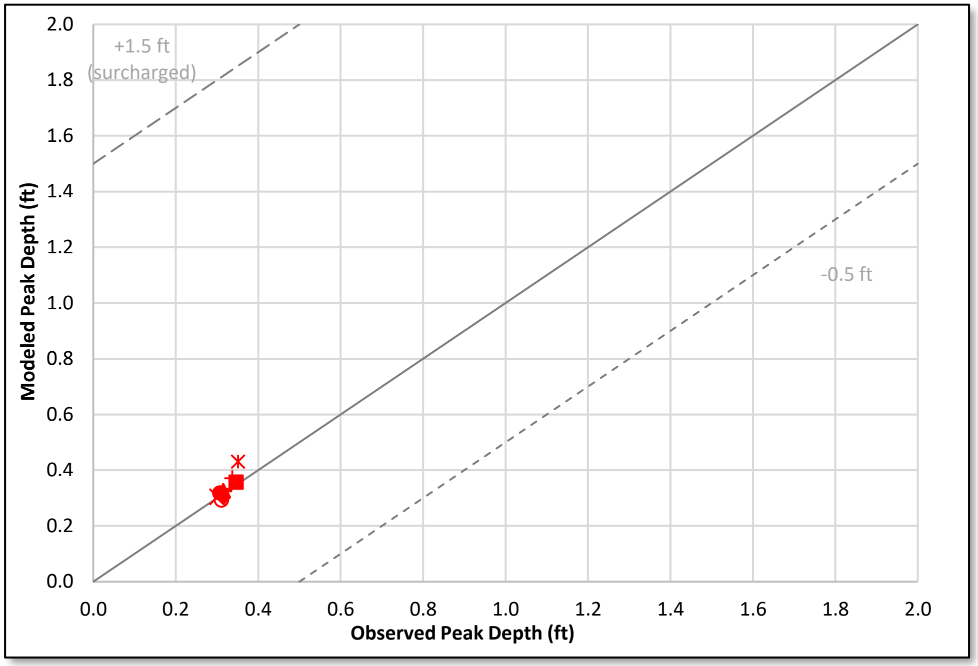
Sewer Basin:

Pole Bridge Basin

Events:

① 11/12/18
② 12/1/18
③ 12/8/18
④ 12/14/18
⑤ 12/20/18
⑥ 12/27/18
⑦ 1/19/19
⑧ 1/23/19
⑨ 2/19/19

▨ Excluded Event Due to Data Quality



Flow Meter:

JSC1

Events:

● 11/12/18

■ 12/1/18

◆ 12/8/18

▲ 12/14/18

× 12/20/18

− 12/27/18

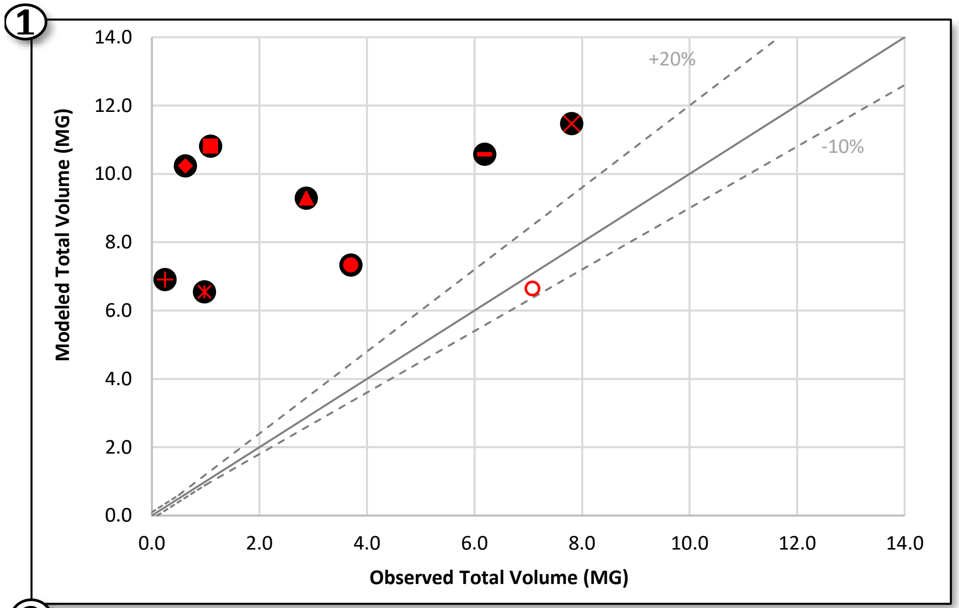
+ 1/19/19

✳ 1/23/19

○ 2/19/19

● Excluded Event Due to Data Quality

①



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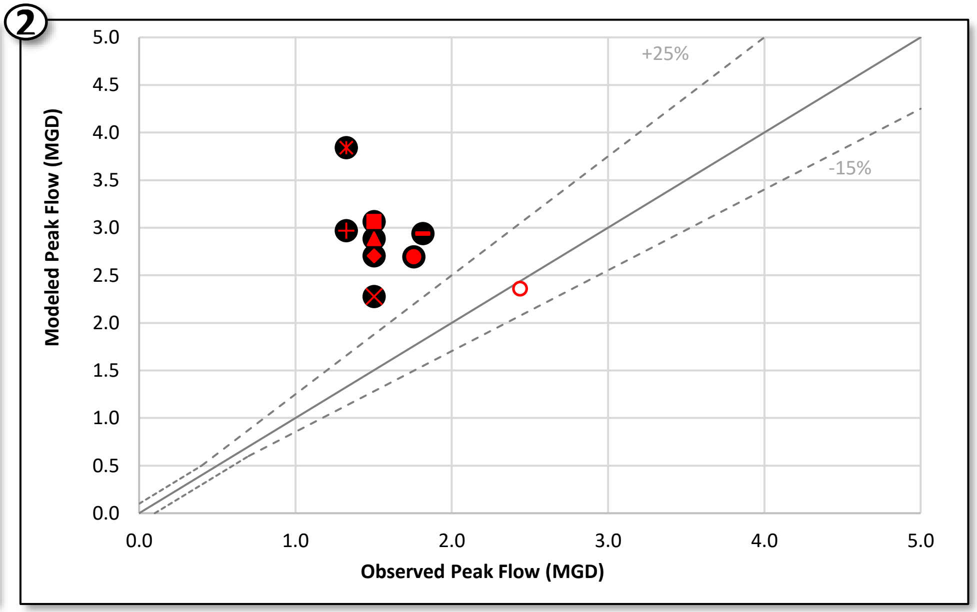

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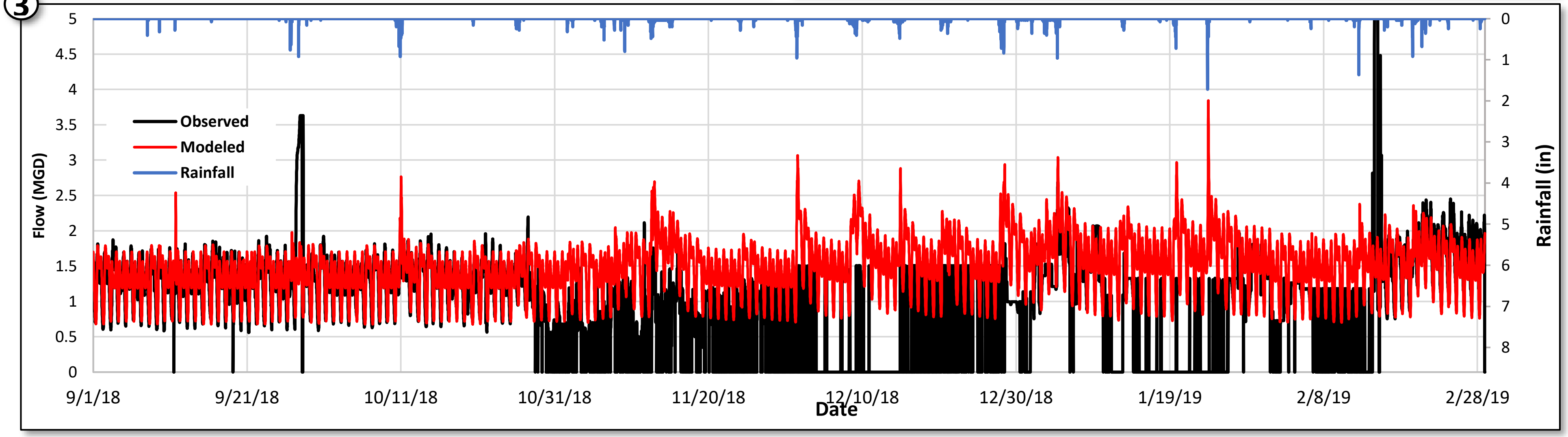


DeKalb Calibration Results

Wet Weather
Flow Summary

Flow Meter:

LCKC1

Sewershed:
Lower Crooked Creek

Sewer Basin:
Pole Bridge Basin

① Total Event Volume

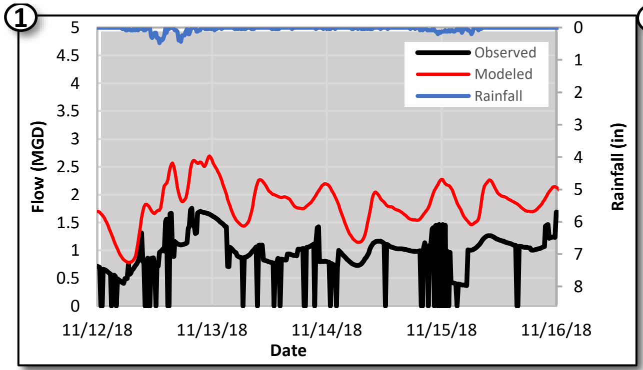
② Peak Event Flow

③ Time Series

Events:

● 11/12/18
■ 12/1/18
◆ 12/8/18
▲ 12/14/18
× 12/20/18
— 12/27/18
+ 1/19/19
✳ 1/23/19
○ 2/19/19
● Excluded Event Due to Data Quality

①



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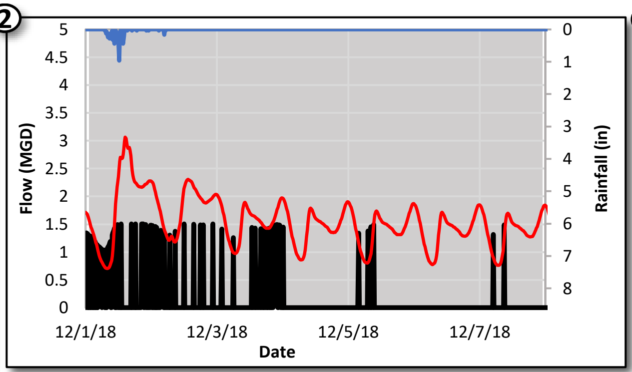

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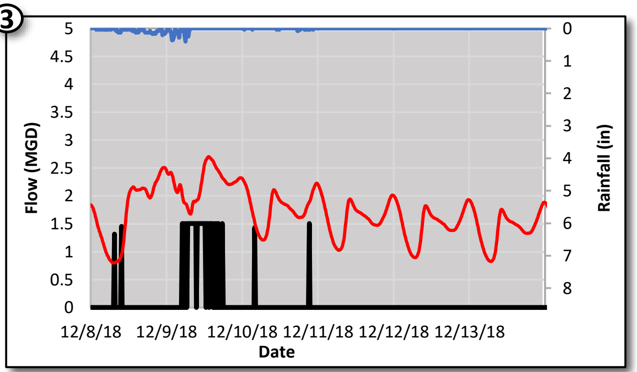

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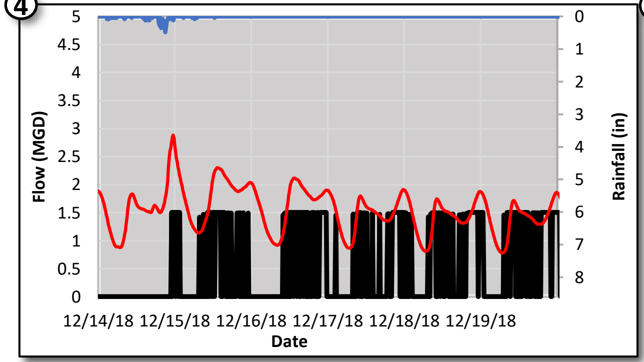

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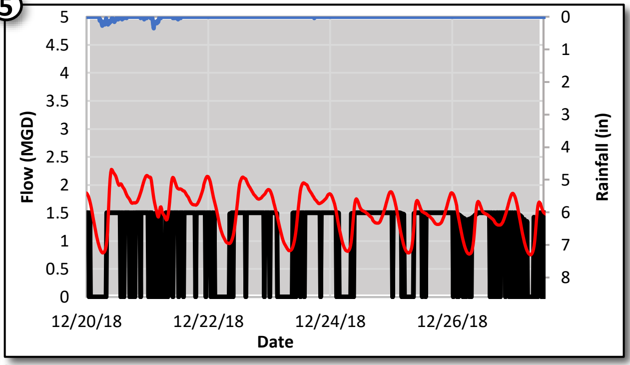

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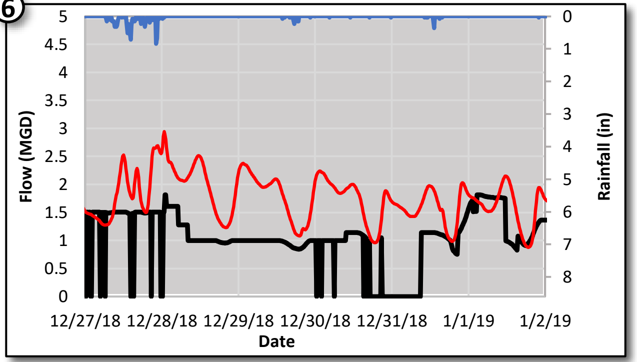

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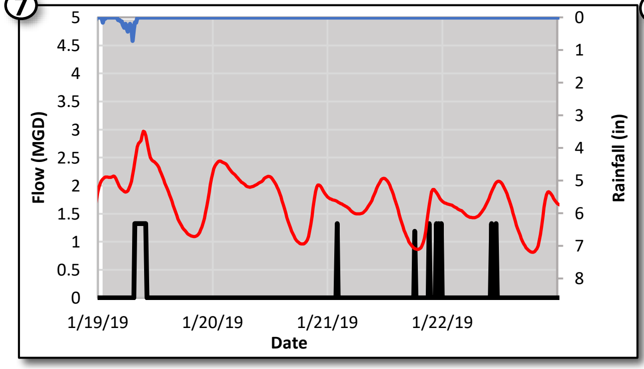

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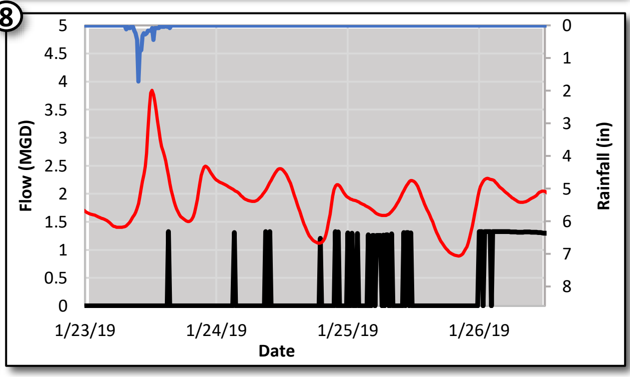

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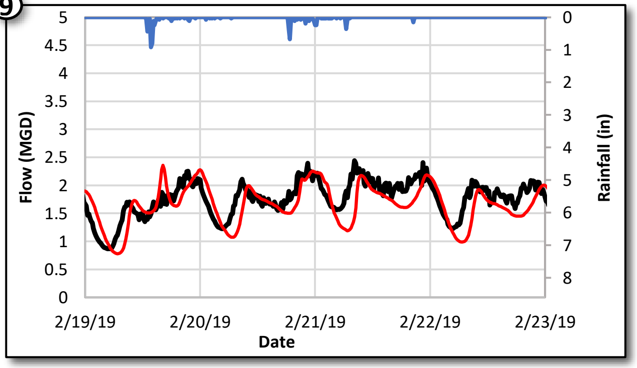


DeKalb Calibration Results

Event Hydrographs

Flow Meter:

LCKC1

Sewershed:

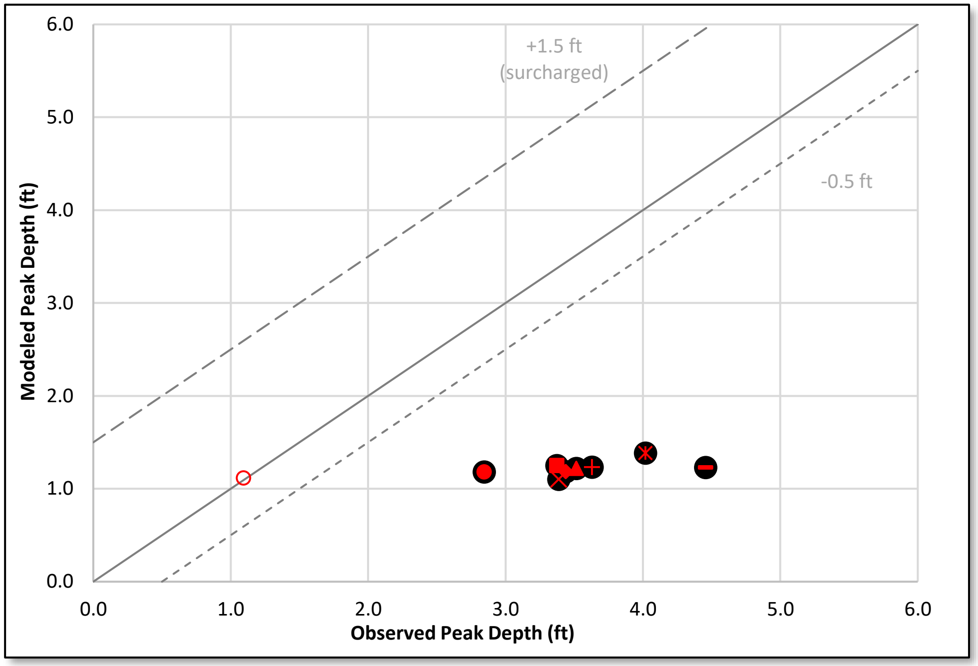
Lower Crooked Creek

Sewer Basin:

Pole Bridge Basin

Events:

①	11/12/18	⑤	12/20/18	⑨	2/19/19
②	12/1/18	⑥	12/27/18	▨	Excluded Event Due to Data Quality
③	12/8/18	⑦	1/19/19		
④	12/14/18	⑧	1/23/19		



Flow Meter:

LCKC1

Events:

● 11/12/18

■ 12/1/18

◆ 12/8/18

▲ 12/14/18

× 12/20/18

− 12/27/18

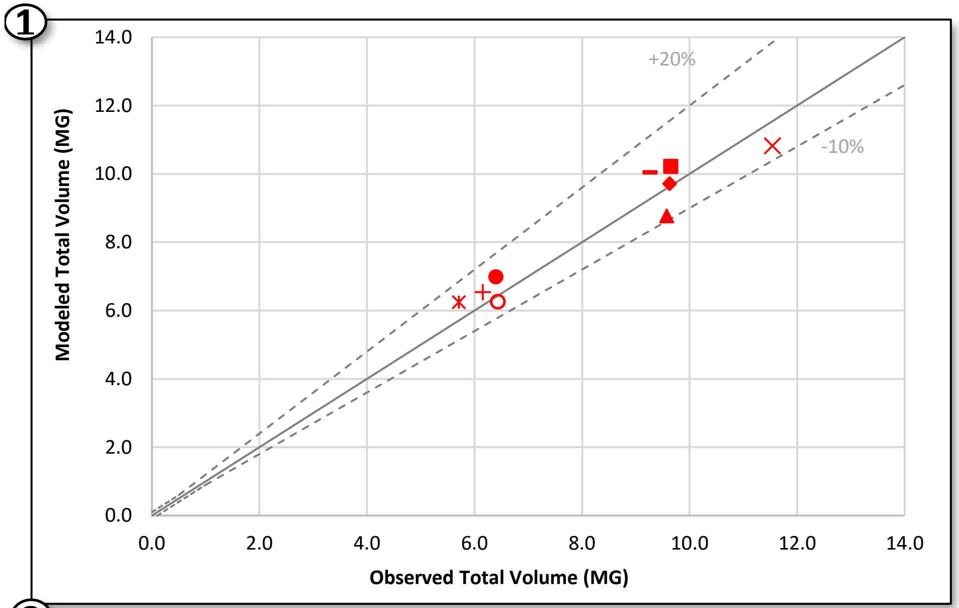
+ 1/19/19

✱ 1/23/19

○ 2/19/19

● Excluded Event Due to Data Quality

①



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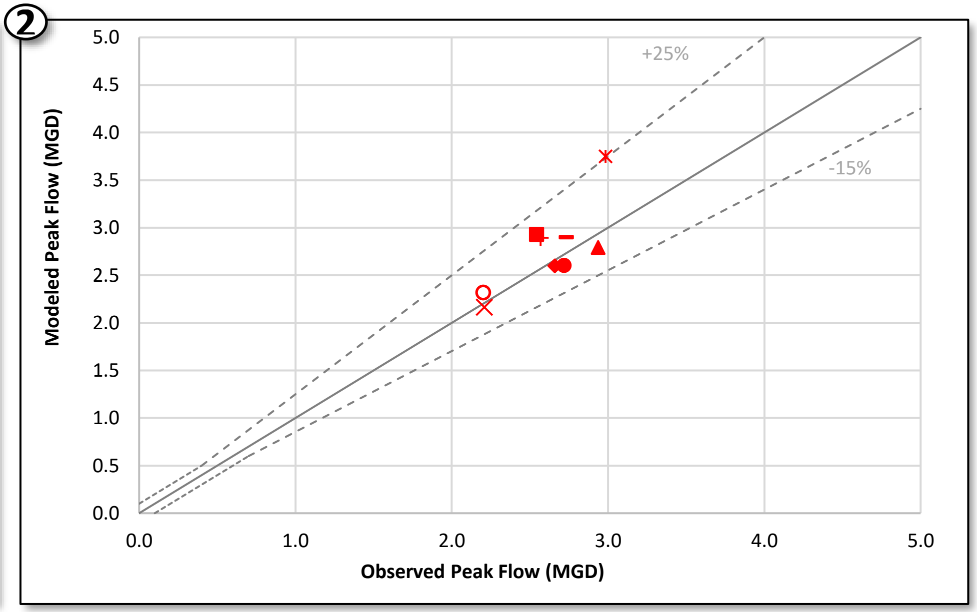

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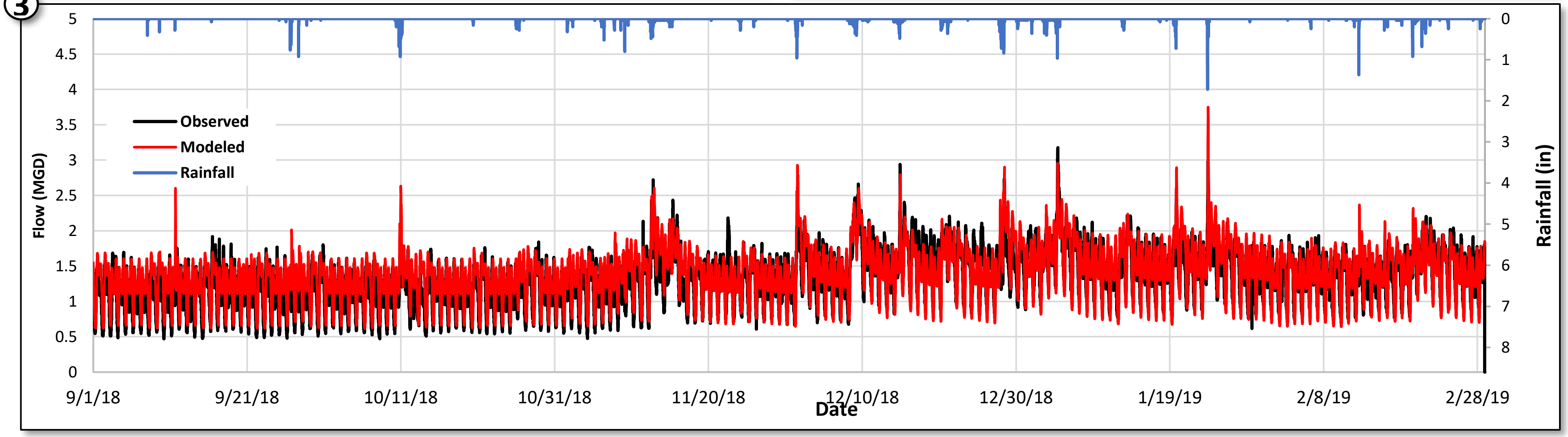


DeKalb Calibration Results

Wet Weather
Flow Summary

Flow Meter:

LCKC2

Sewershed:
Lower Crooked Creek

Sewer Basin:
Pole Bridge Basin

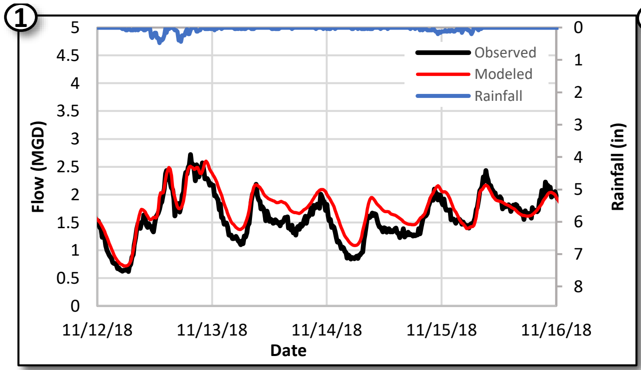
① Total Event Volume

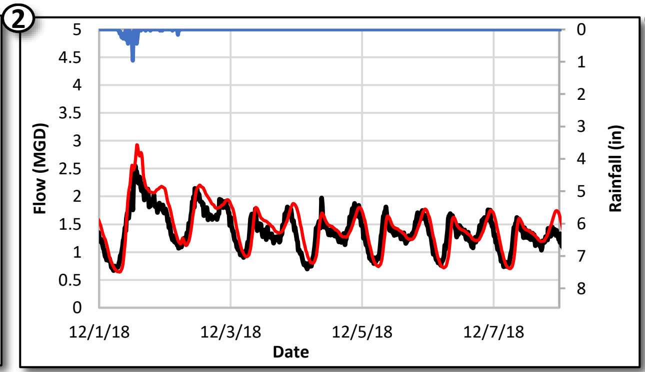
② Peak Event Flow

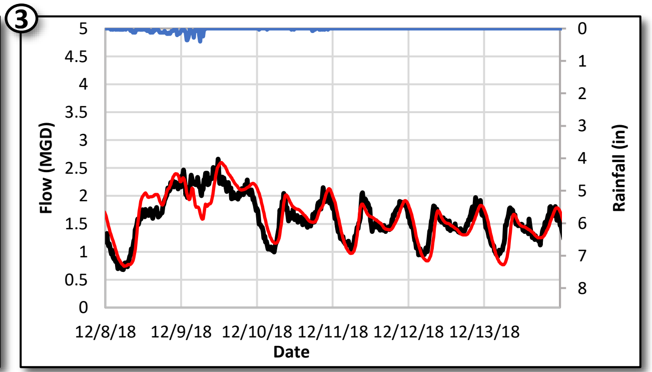
③ Time Series

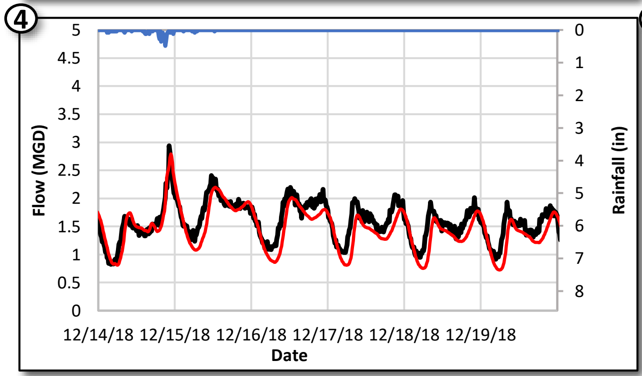
Events:

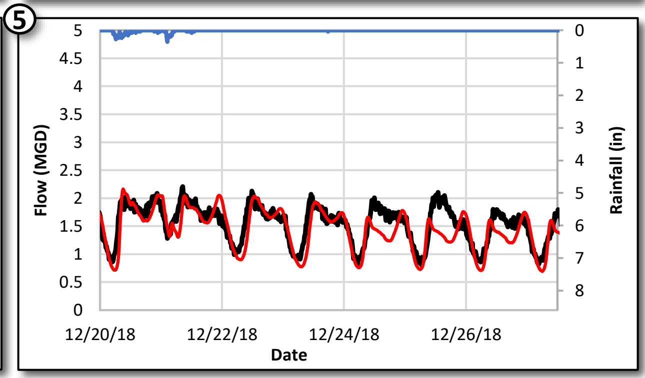
●	11/12/18	—	12/27/18
■	12/1/18	+	1/19/19
◆	12/8/18	✳	1/23/19
▲	12/14/18	○	2/19/19
×	12/20/18	●	Excluded Event Due to Data Quality

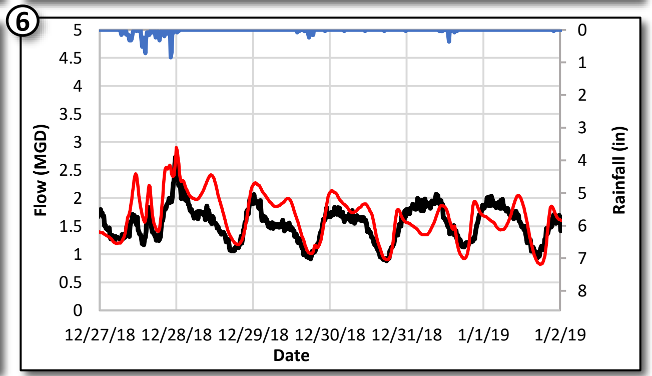


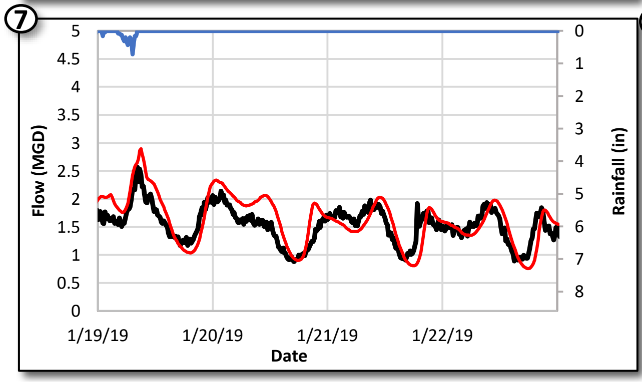


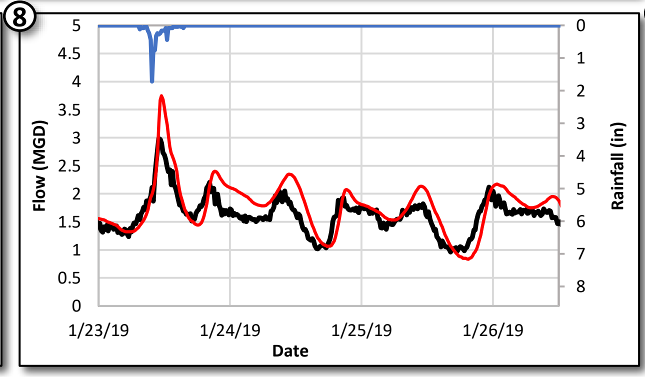


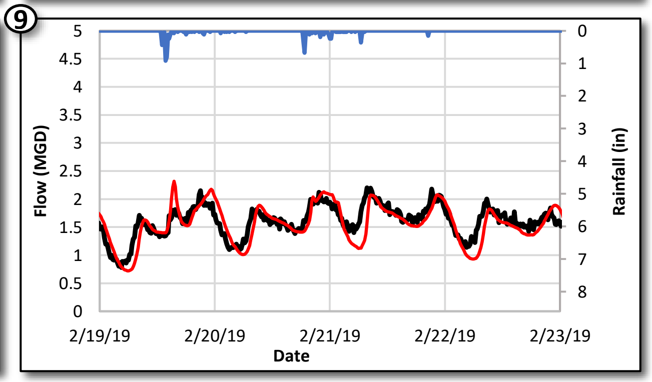












DeKalb Calibration Results

Event Hydrographs

Flow Meter:

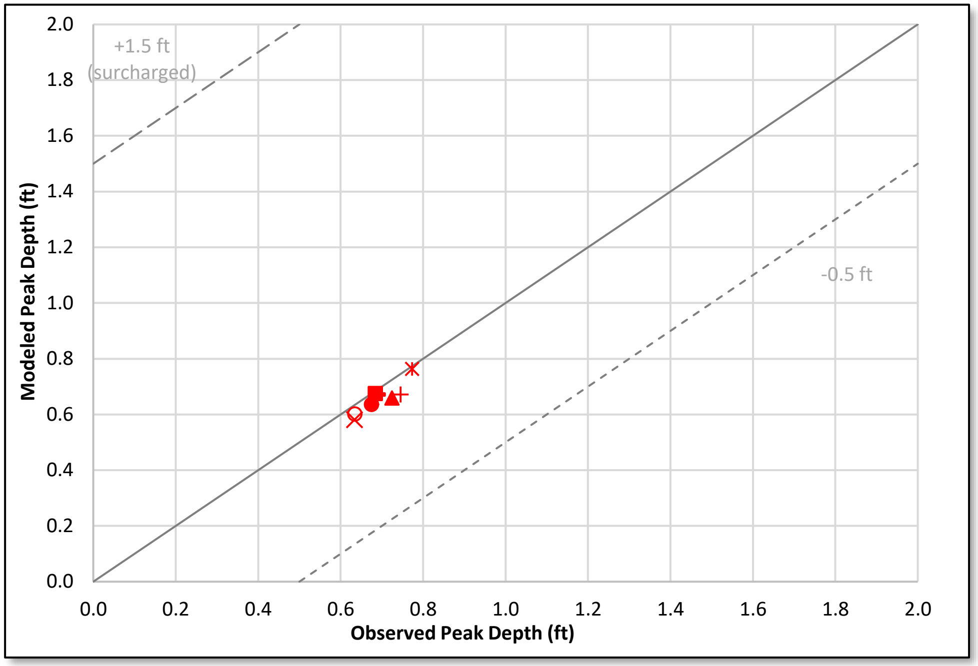
LCKC2

Sewershed:
Lower Crooked Creek

Sewer Basin:
Pole Bridge Basin

Events:

①	11/12/18	⑤	12/20/18	⑨	2/19/19
②	12/1/18	⑥	12/27/18	▨	Excluded Event Due to Data Quality
③	12/8/18	⑦	1/19/19		
④	12/14/18	⑧	1/23/19		



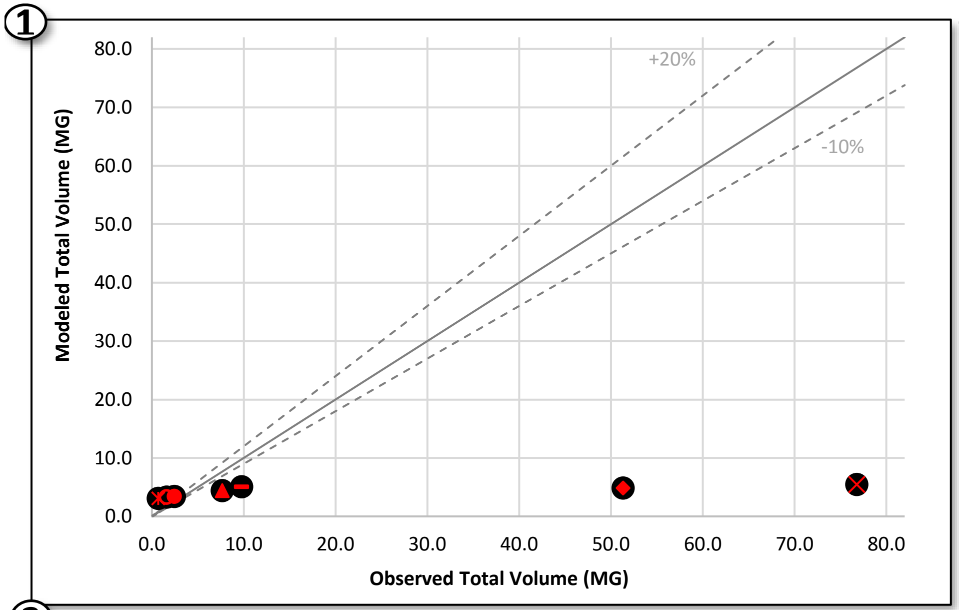
Flow Meter:

LCKC2

Events:

●	11/12/18	—	12/27/18
■	12/1/18	+	1/19/19
◆	12/8/18	✳	1/23/19
▲	12/14/18	○	2/19/19
×	12/20/18	●	Excluded Event Due to Data Quality

①



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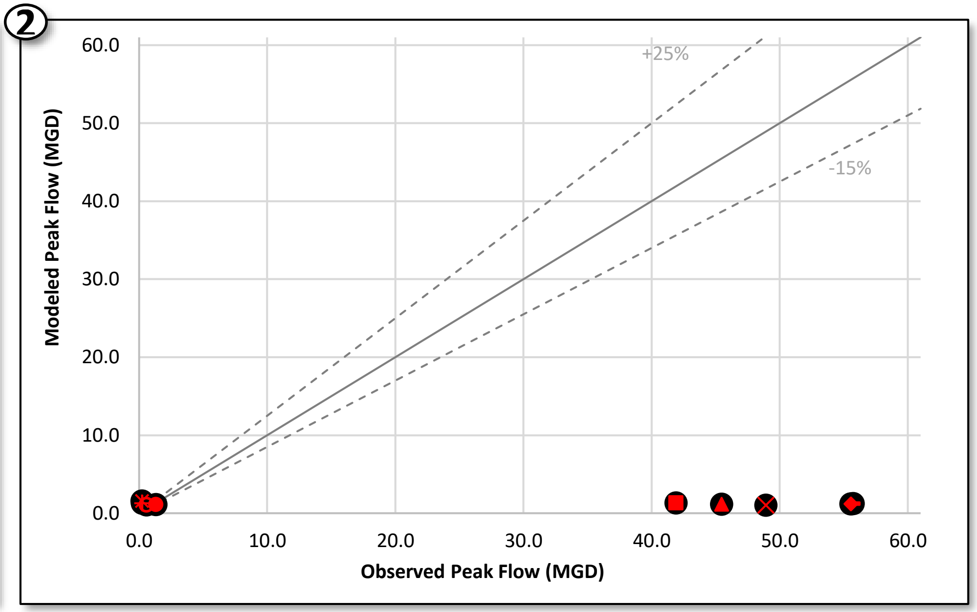

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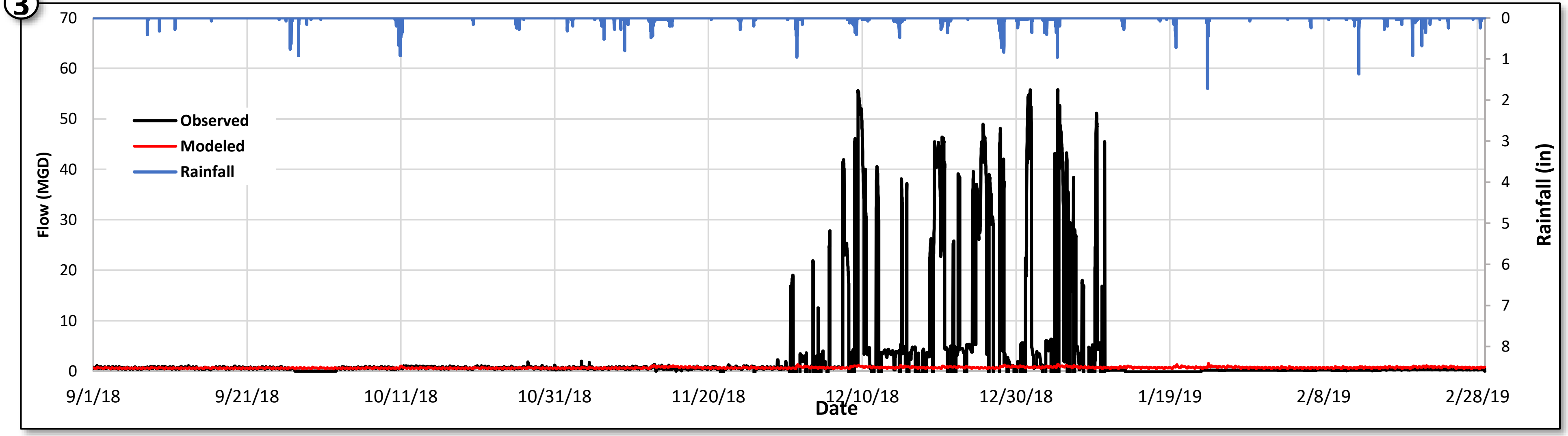


DeKalb Calibration Results

Wet Weather
Flow Summary

Flow Meter:

LSM1

Sewershed:
Lower Stone Mountain Creek

Sewer Basin:
Pole Bridge Basin

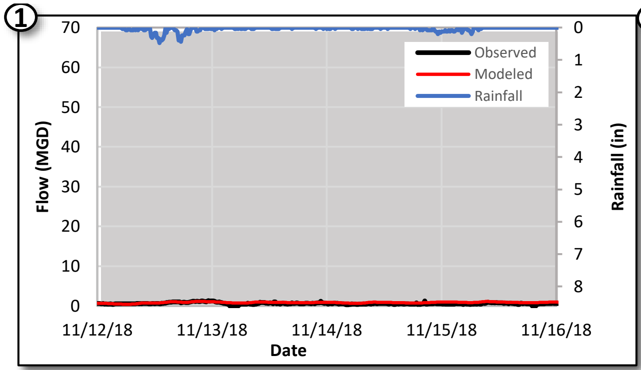
① Total Event Volume

② Peak Event Flow

③ Time Series

Events:

●	11/12/18	—	12/27/18
■	12/1/18	+	1/19/19
◆	12/8/18	✳	1/23/19
▲	12/14/18	○	2/19/19
×	12/20/18	●	Excluded Event Due to Data Quality

①


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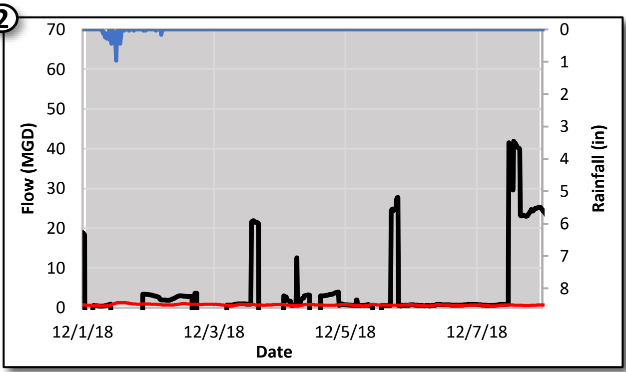

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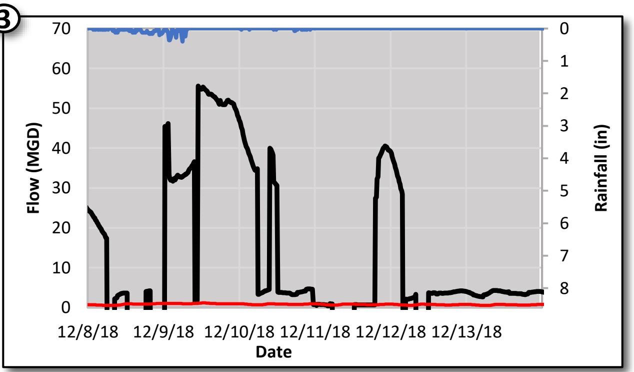

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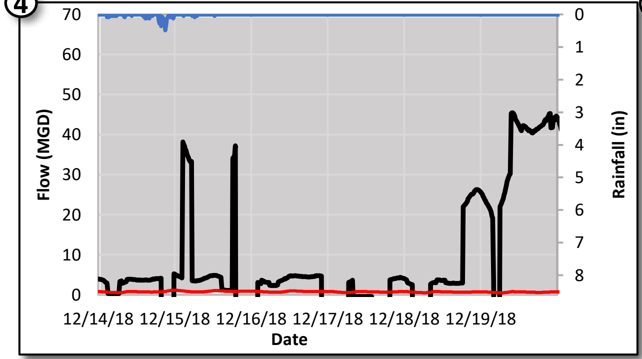

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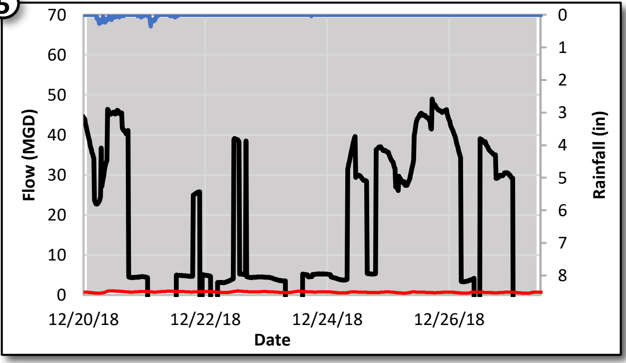

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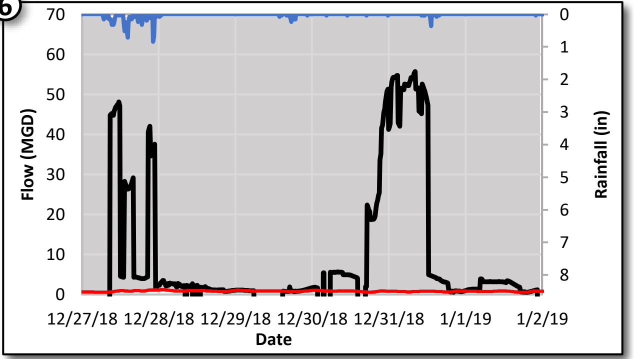

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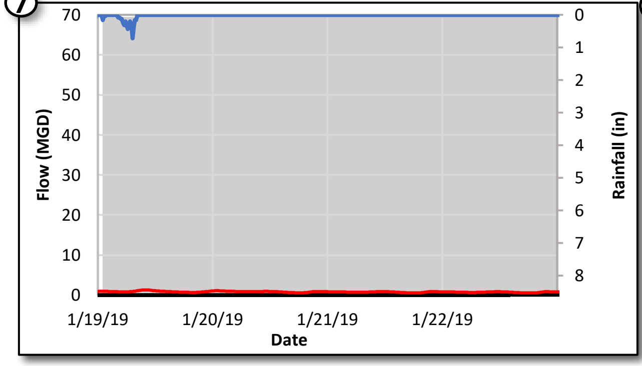

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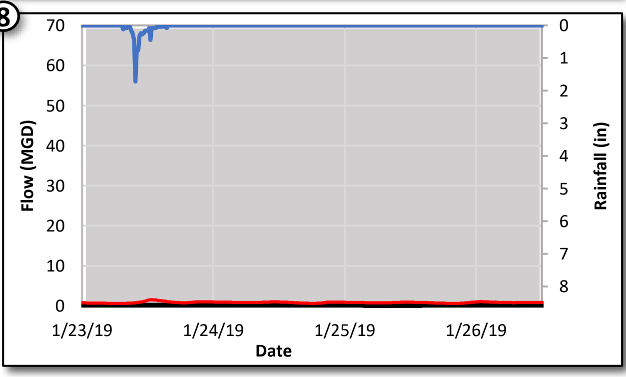

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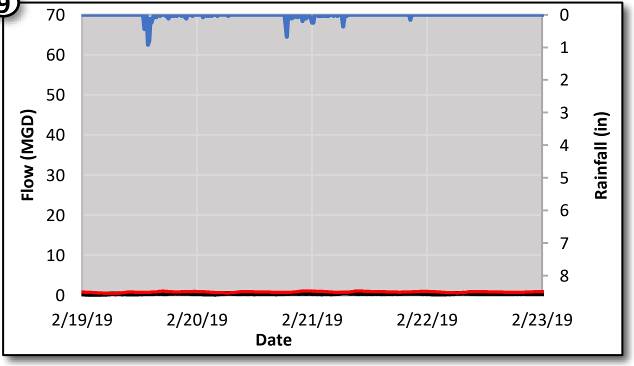


DeKalb Calibration Results

Event Hydrographs

Flow Meter:

LSM1

Sewershed:

Lower Stone Mountain Creek

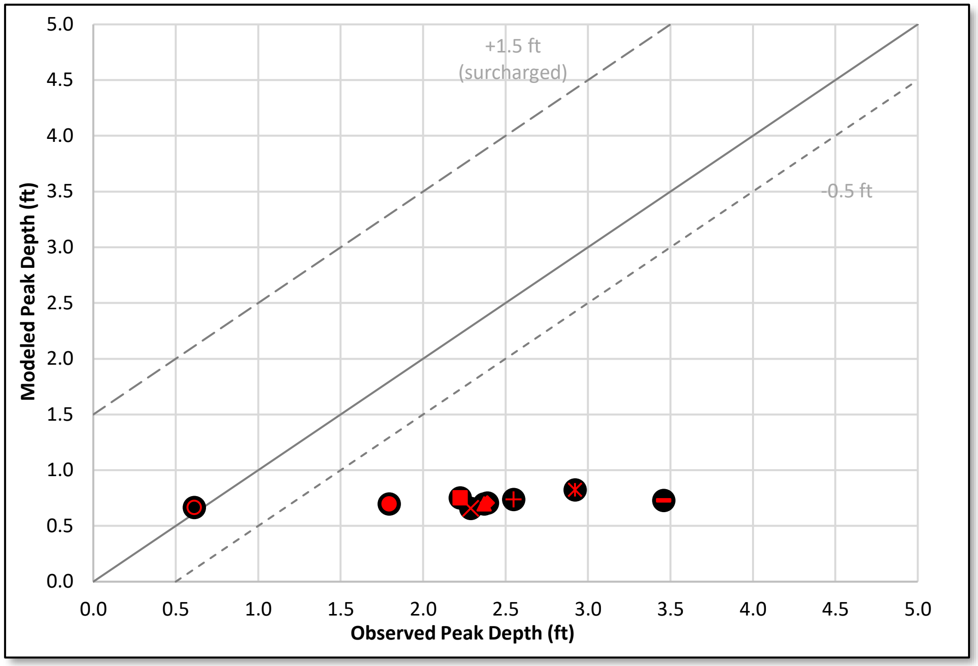
Sewer Basin:

Pole Bridge Basin

Events:

① 11/12/18
② 12/1/18
③ 12/8/18
④ 12/14/18
⑤ 12/20/18
⑥ 12/27/18
⑦ 1/19/19
⑧ 1/23/19
⑨ 2/19/19

▨ Excluded Event Due to Data Quality



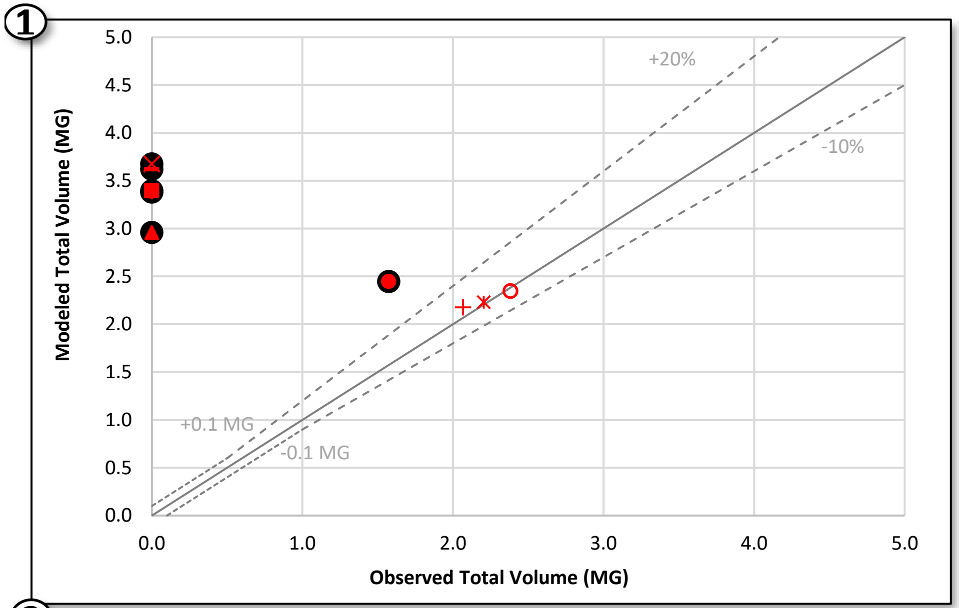
Flow Meter:

LSM1

Events:

●	11/12/18	—	12/27/18
■	12/1/18	+	1/19/19
◆	12/8/18	✱	1/23/19
▲	12/14/18	○	2/19/19
×	12/20/18	⬤	Excluded Event Due to Data Quality

①



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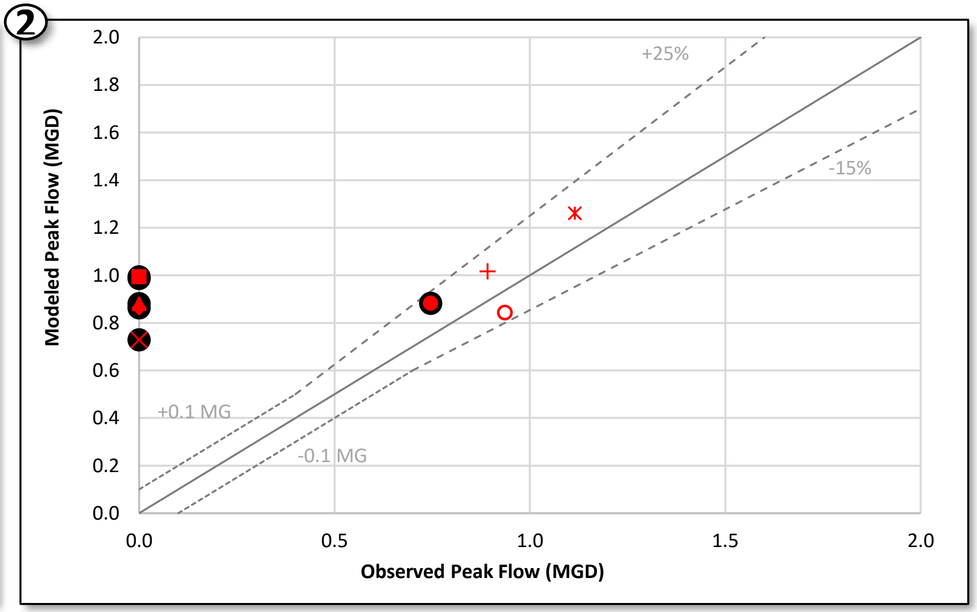

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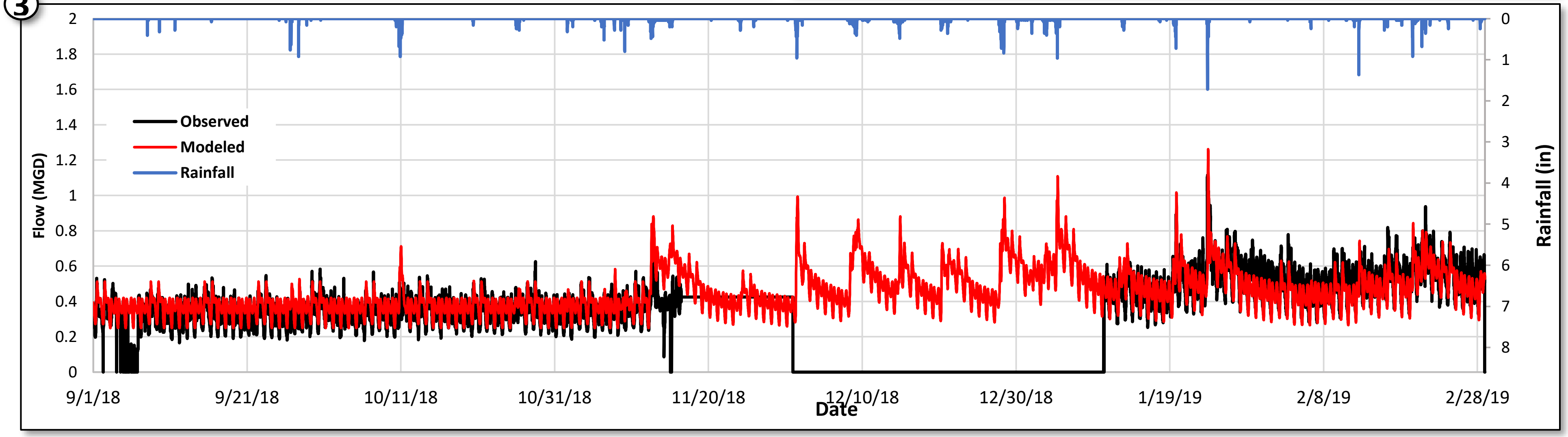


DeKalb Calibration Results

Wet Weather
Flow Summary

Flow Meter:

LSM2

Sewershed:
Lower Stone Mountain Creek

Sewer Basin:
Pole Bridge Basin

① Total Event Volume

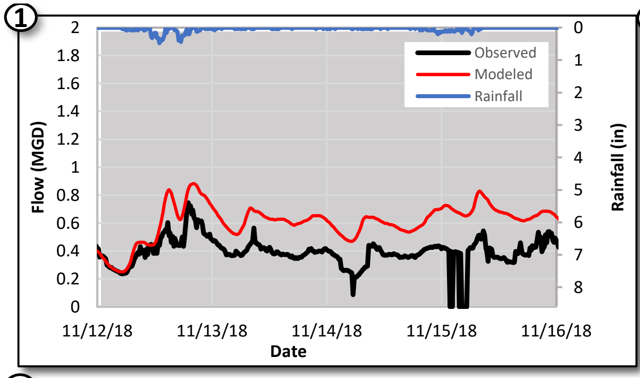
② Peak Event Flow

③ Time Series

Events:

● 11/12/18
■ 12/1/18
◆ 12/8/18
▲ 12/14/18
× 12/20/18
— 12/27/18
+ 1/19/19
✱ 1/23/19
○ 2/19/19
● Excluded Event Due to Data Quality

①



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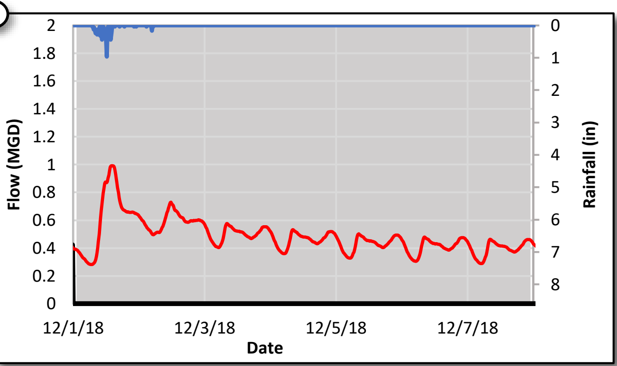

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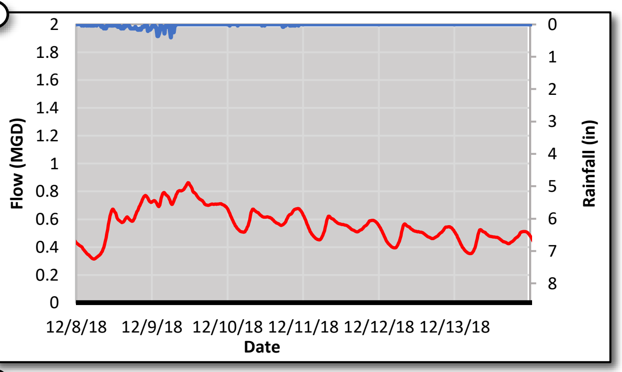

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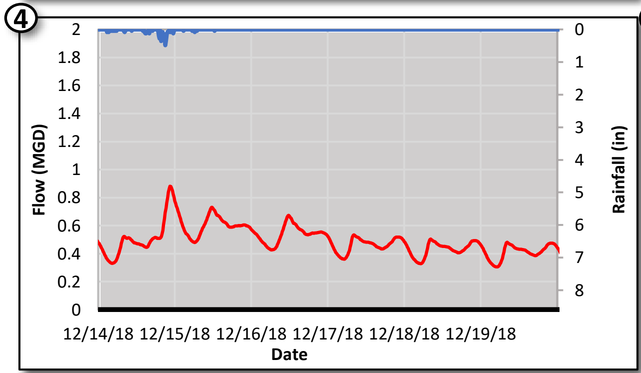

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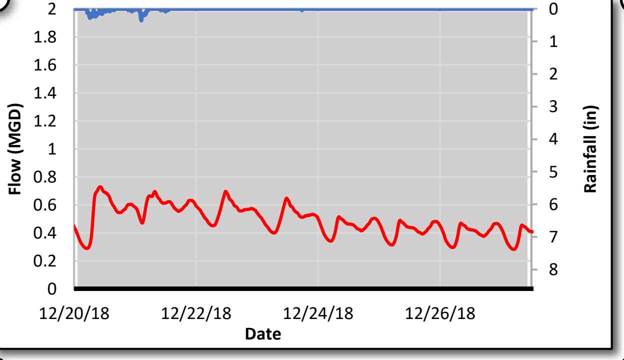

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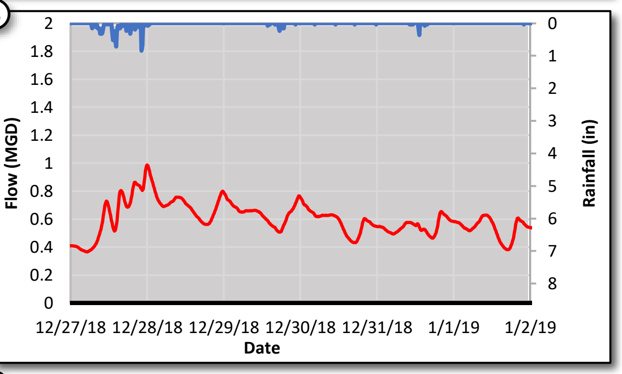

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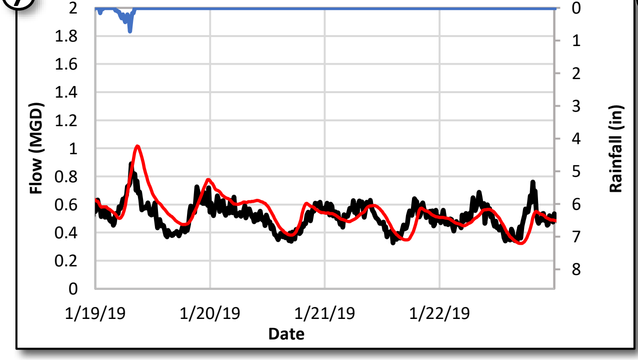

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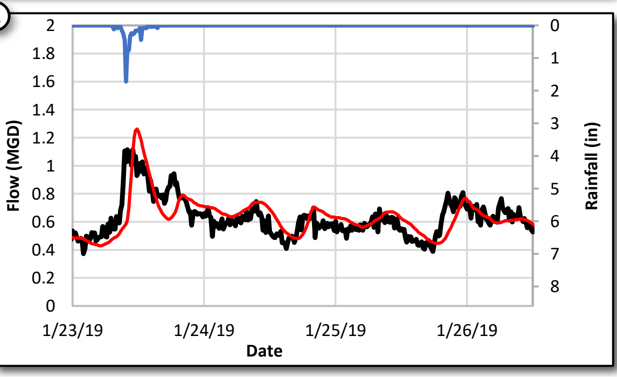

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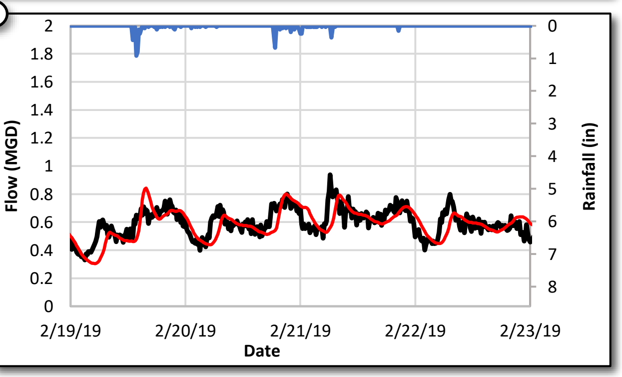


DeKalb Calibration Results

Event Hydrographs

Flow Meter:

LSM2

Sewershed:

Lower Stone Mountain Creek

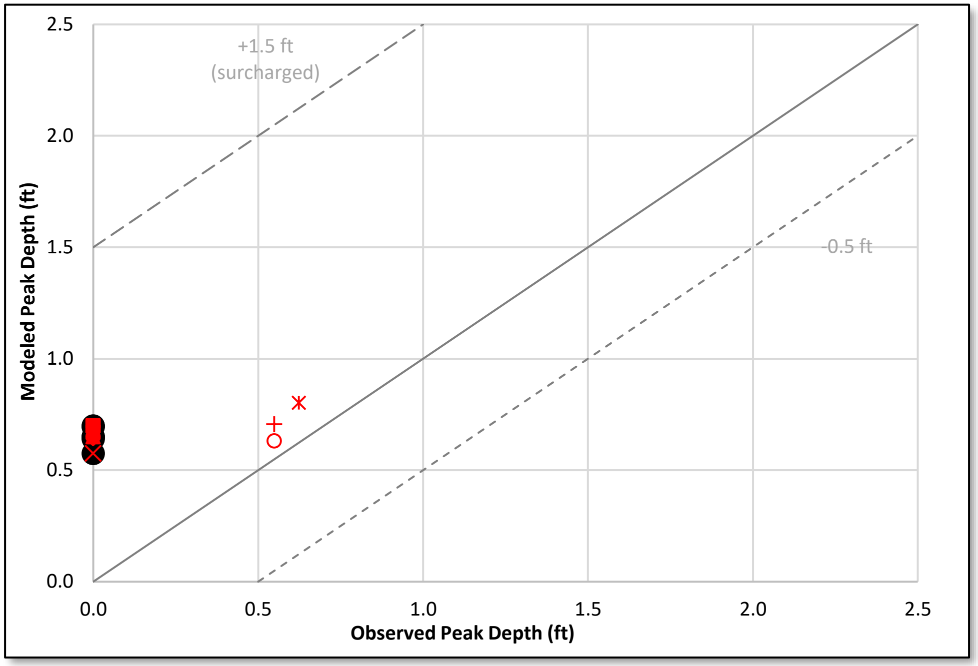
Sewer Basin:

Pole Bridge Basin

Events:

① 11/12/18
② 12/1/18
③ 12/8/18
④ 12/14/18
⑤ 12/20/18
⑥ 12/27/18
⑦ 1/19/19
⑧ 1/23/19
⑨ 2/19/19

▨ Excluded Event Due to Data Quality

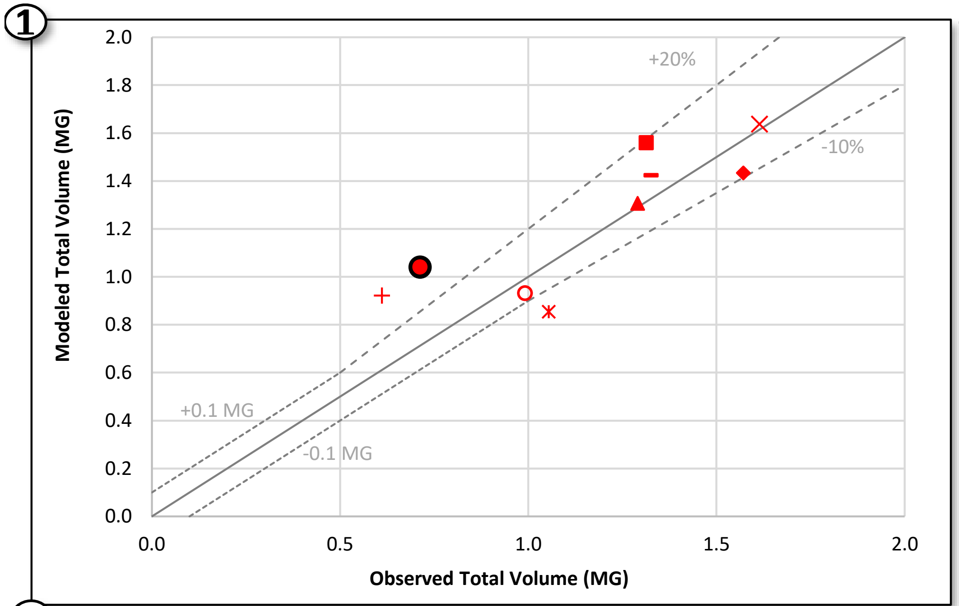


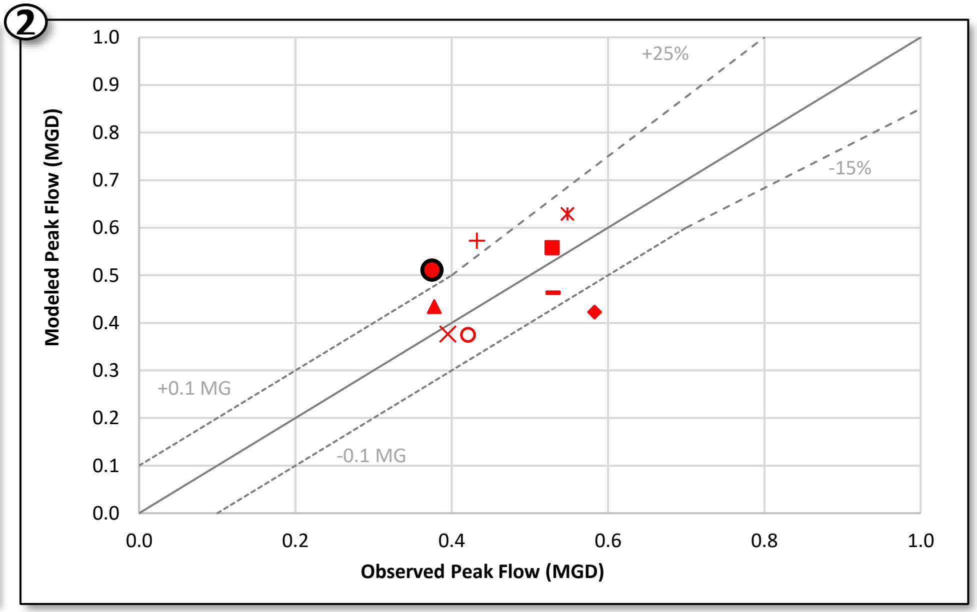
Flow Meter:

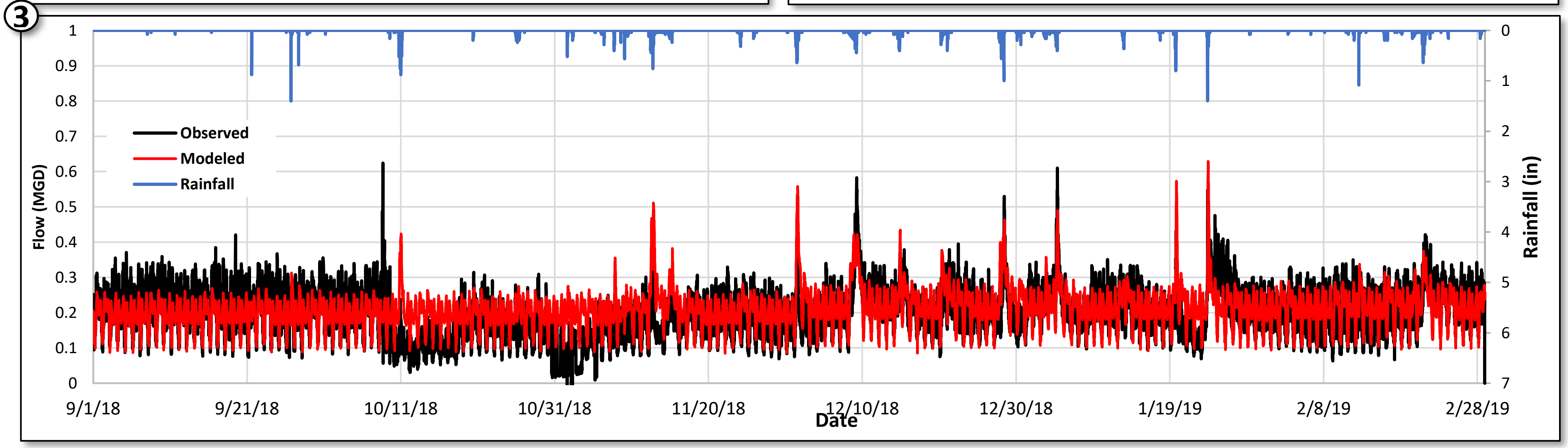
LSM2

Events:

●	11/12/18	—	12/27/18
■	12/1/18	+	1/19/19
◆	12/8/18	✳	1/23/19
▲	12/14/18	○	2/19/19
×	12/20/18	●	Excluded Event Due to Data Quality







DeKalb Calibration Results

Wet Weather
Flow Summary

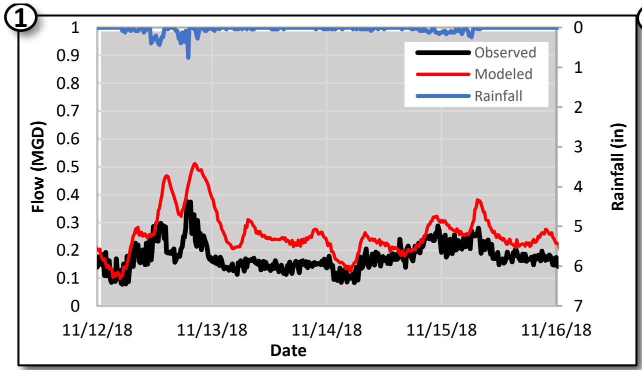
Flow Meter:
PB1
Sewershed:
Pole Bridge Creek
Sewer Basin:
Pole Bridge Basin

① Total Event Volume
② Peak Event Flow
③ Time Series

Events:

●	11/12/18	—	12/27/18
■	12/1/18	+	1/19/19
◆	12/8/18	✳	1/23/19
▲	12/14/18	○	2/19/19
×	12/20/18	●	Excluded Event Due to Data Quality

①



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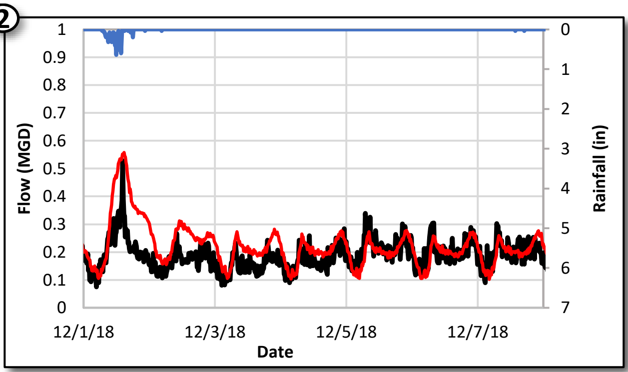

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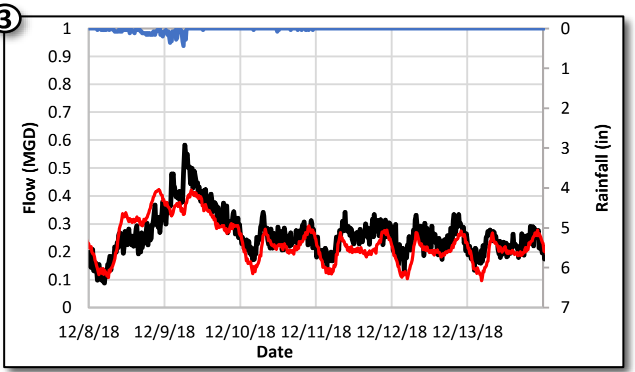

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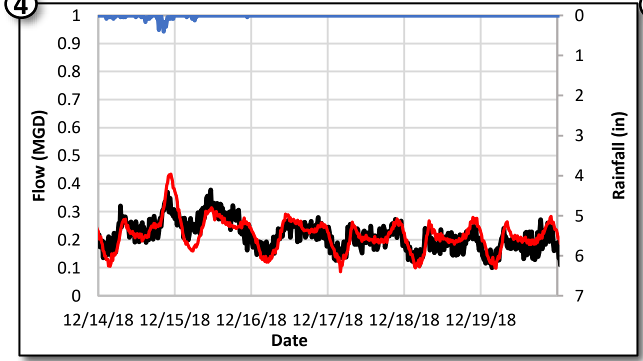

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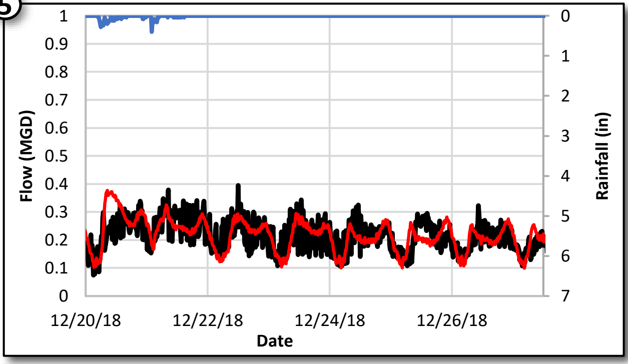

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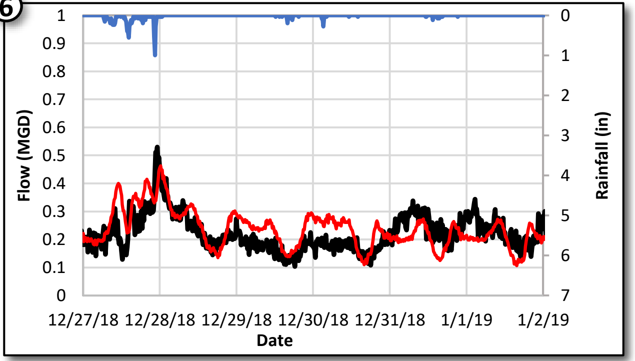

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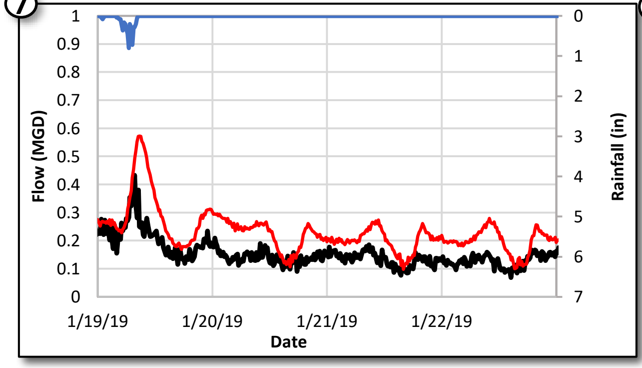

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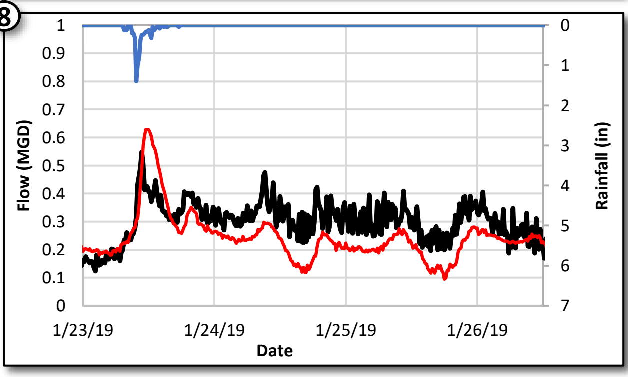

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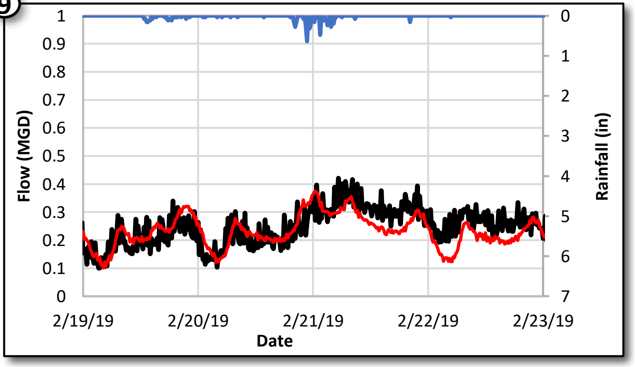


DeKalb Calibration Results

Event Hydrographs

Flow Meter:

PB1

Sewershed:

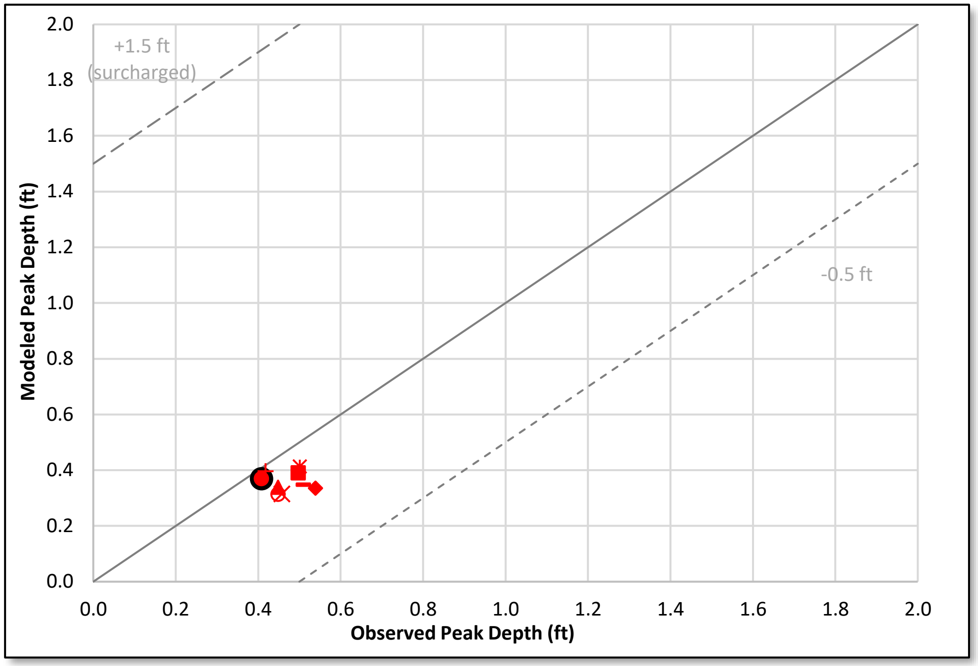
Pole Bridge Creek

Sewer Basin:

Pole Bridge Basin

Events:

①	11/12/18	⑤	12/20/18	⑨	2/19/19
②	12/1/18	⑥	12/27/18	▨	Excluded Event Due to Data Quality
③	12/8/18	⑦	1/19/19		
④	12/14/18	⑧	1/23/19		



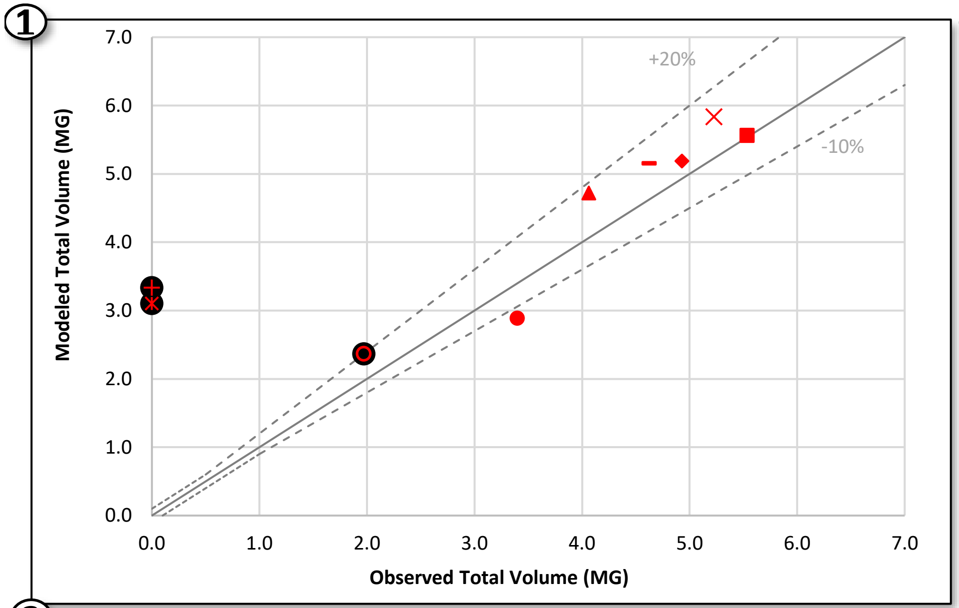
Flow Meter:

PB1

Events:

●	11/12/18	−	12/27/18
■	12/1/18	+	1/19/19
◆	12/8/18	✱	1/23/19
▲	12/14/18	○	2/19/19
×	12/20/18	●	Excluded Event Due to Data Quality

①



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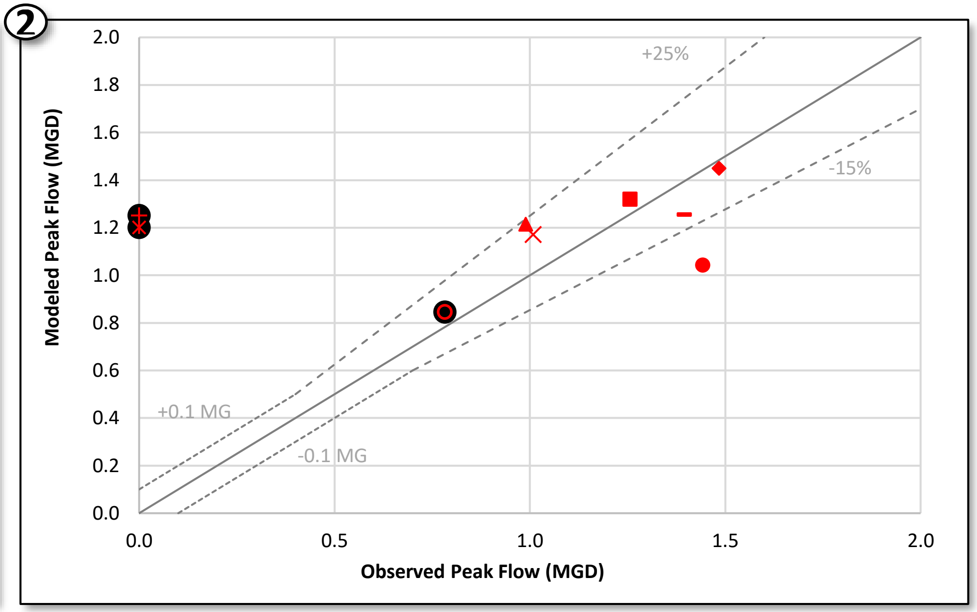

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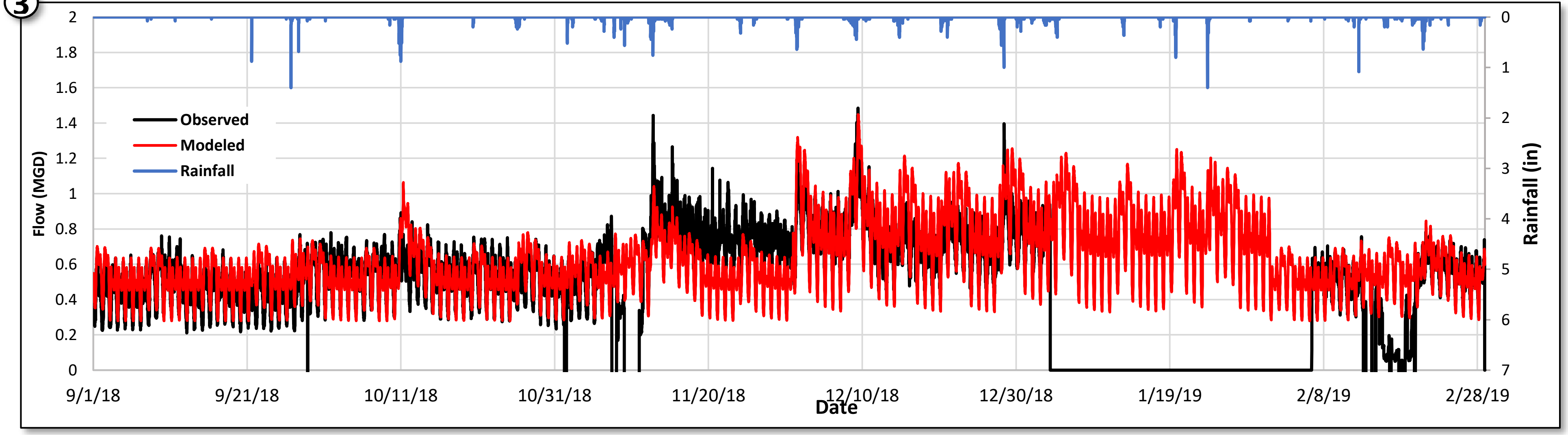


DeKalb Calibration Results

Wet Weather
Flow Summary

Flow Meter:

PB2

Sewershed:
Pole Bridge Creek

Sewer Basin:
Pole Bridge Basin

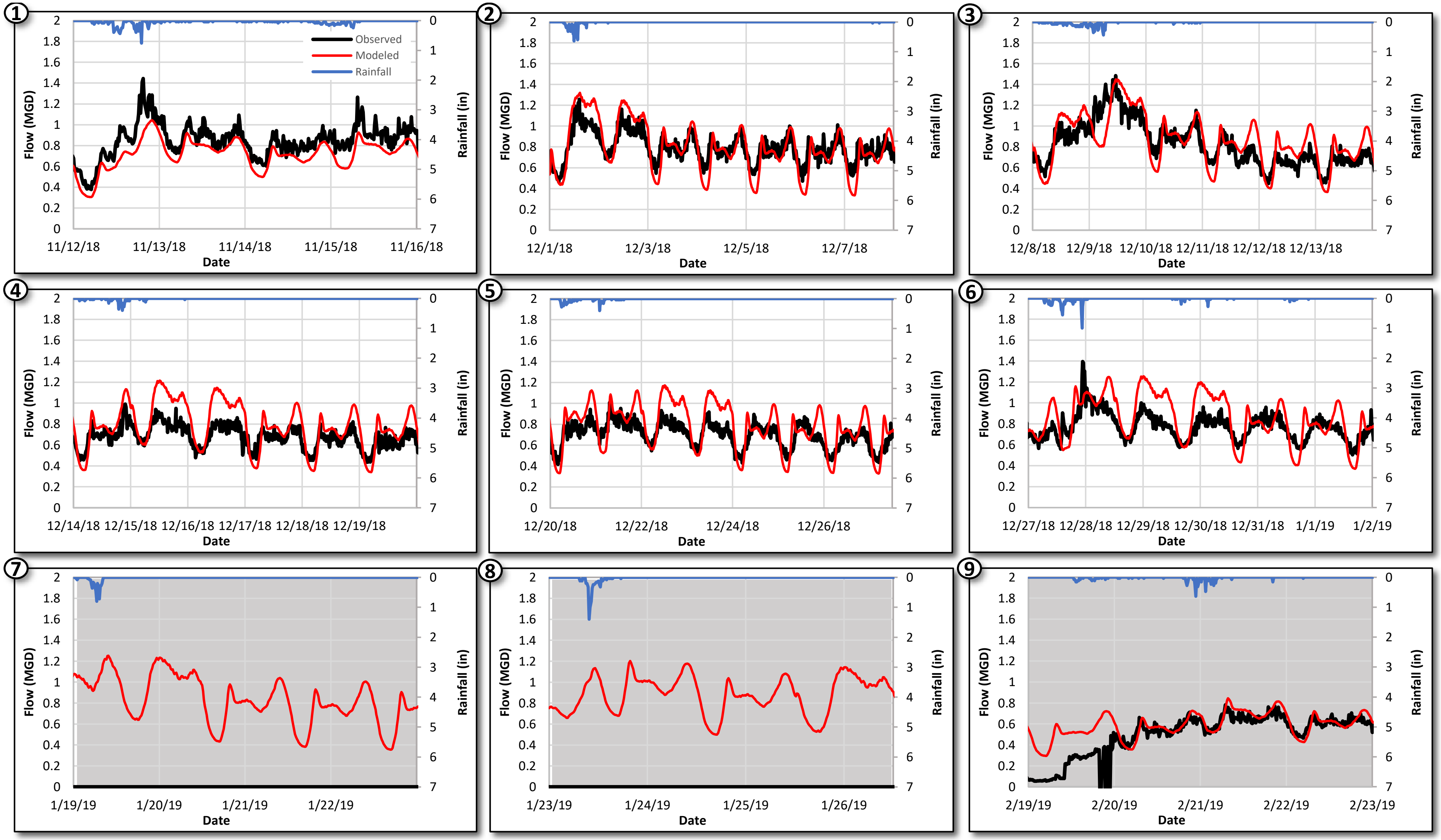
① Total Event Volume

② Peak Event Flow

③ Time Series

Events:

● 11/12/18
■ 12/1/18
◆ 12/8/18
▲ 12/14/18
× 12/20/18
– 12/27/18
+ 1/19/19
✳ 1/23/19
○ 2/19/19
● Excluded Event Due to Data Quality



DeKalb Calibration Results

Event Hydrographs

Flow Meter:

PB2

Sewershed:

Pole Bridge Creek

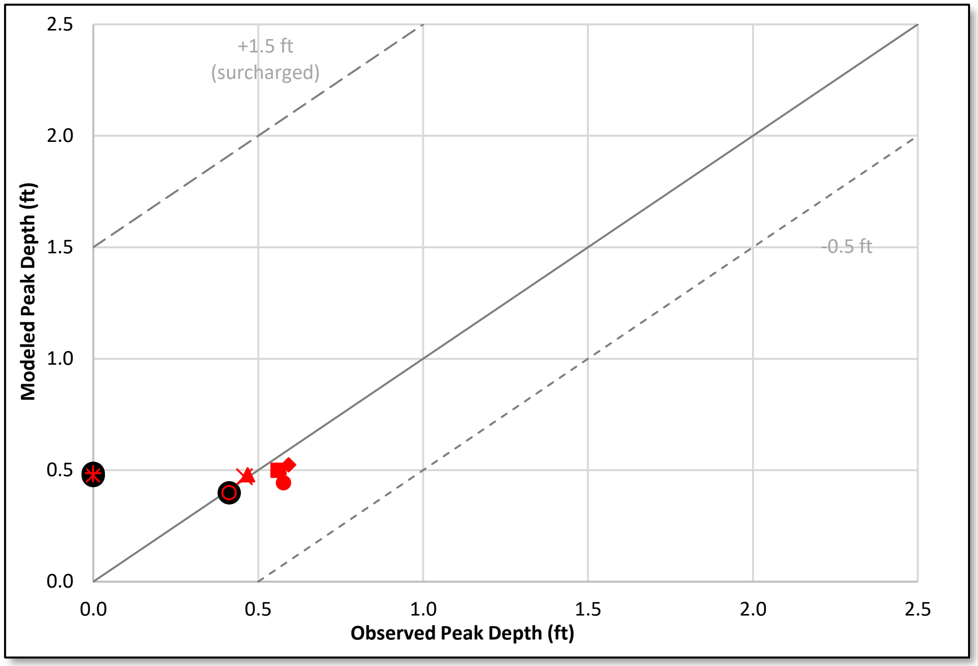
Sewer Basin:

Pole Bridge Basin

Events:

① 11/12/18
② 12/1/18
③ 12/8/18
④ 12/14/18
⑤ 12/20/18
⑥ 12/27/18
⑦ 1/19/19
⑧ 1/23/19
⑨ 2/19/19

▨ Excluded Event Due to Data Quality



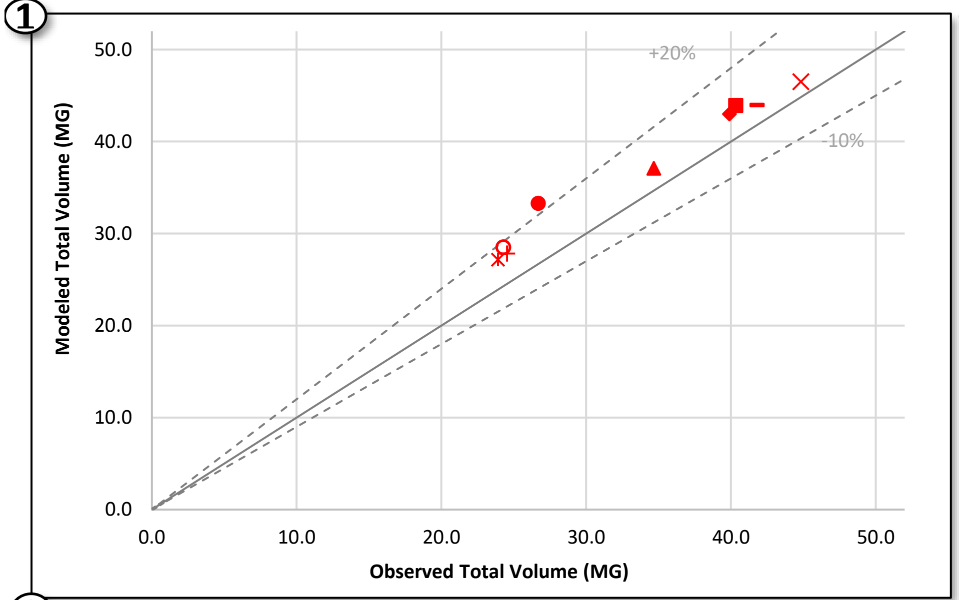
Flow Meter:

PB2

Events:

●	11/12/18	—	12/27/18
■	12/1/18	+	1/19/19
◆	12/8/18	✳	1/23/19
▲	12/14/18	○	2/19/19
×	12/20/18	●	Excluded Event Due to Data Quality

①



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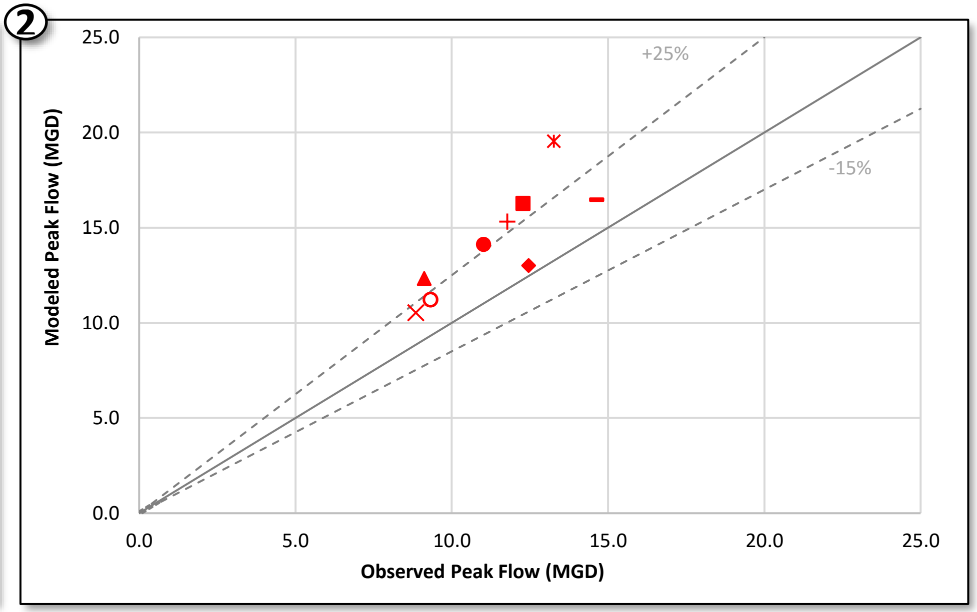

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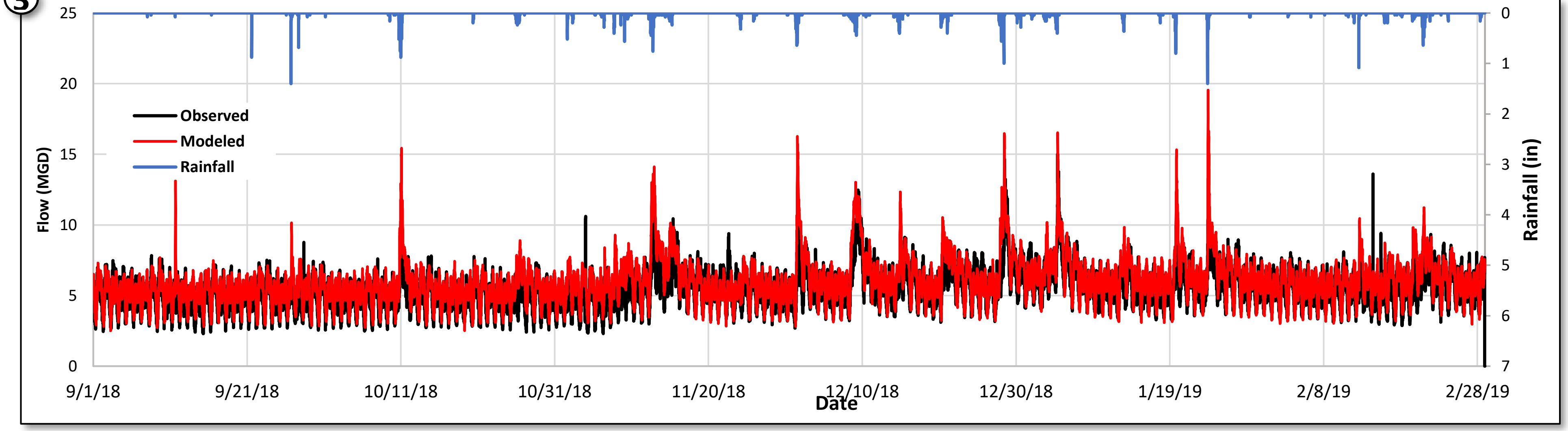


DeKalb Calibration Results

Wet Weather
Flow Summary

Flow Meter:

PB3

Sewershed:
Pole Bridge Creek

Sewer Basin:
Pole Bridge Basin

① Total Event Volume

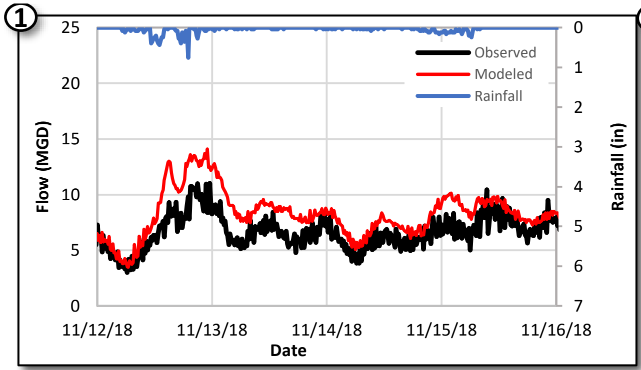
② Peak Event Flow

③ Time Series

Events:

● 11/12/18
■ 12/1/18
◆ 12/8/18
▲ 12/14/18
× 12/20/18
− 12/27/18
+ 1/19/19
✳ 1/23/19
○ 2/19/19
● Excluded Event Due to Data Quality

①



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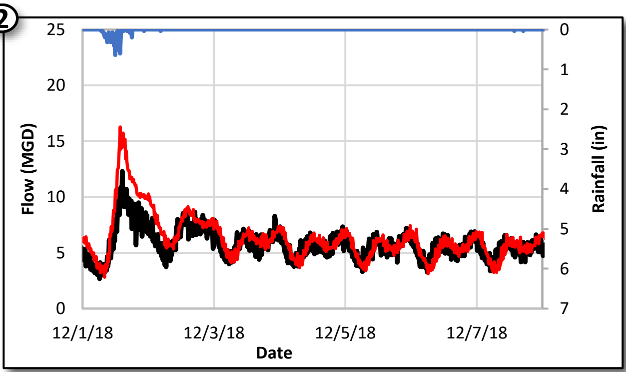

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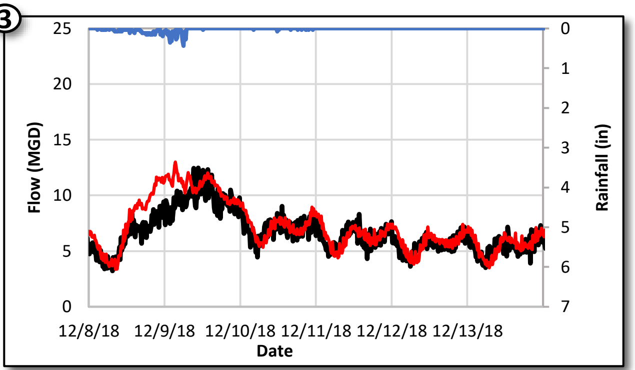

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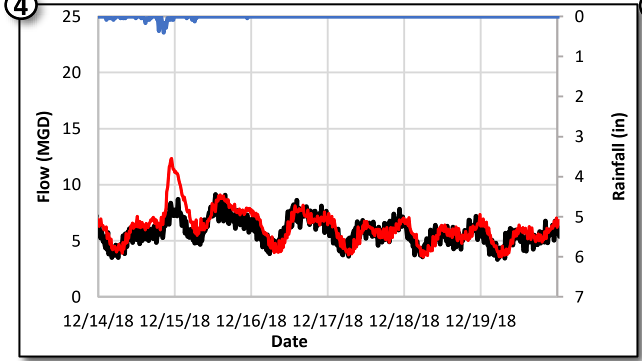

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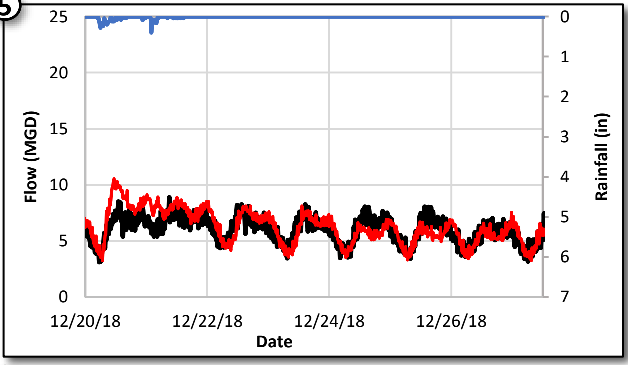

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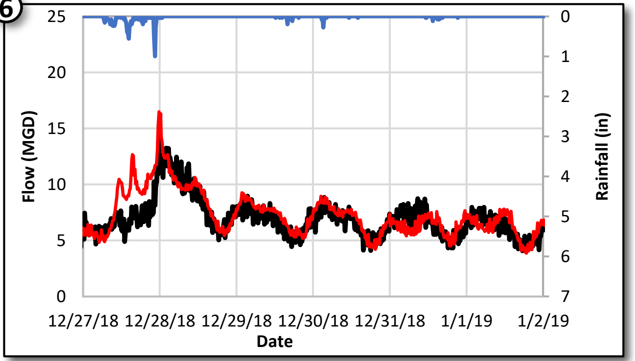

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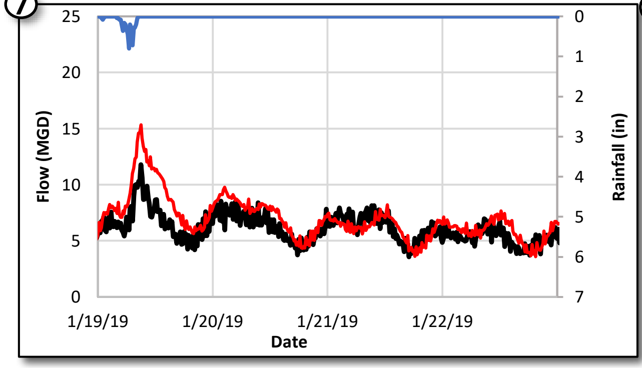

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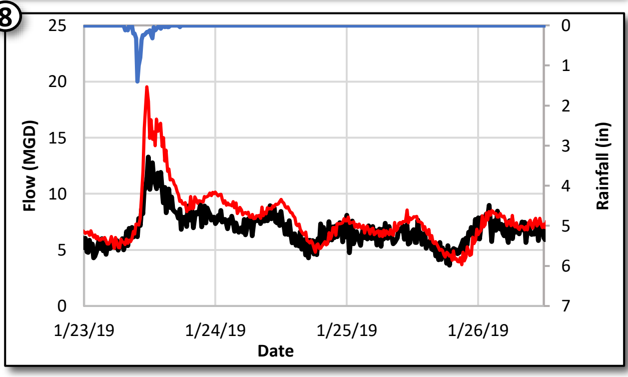

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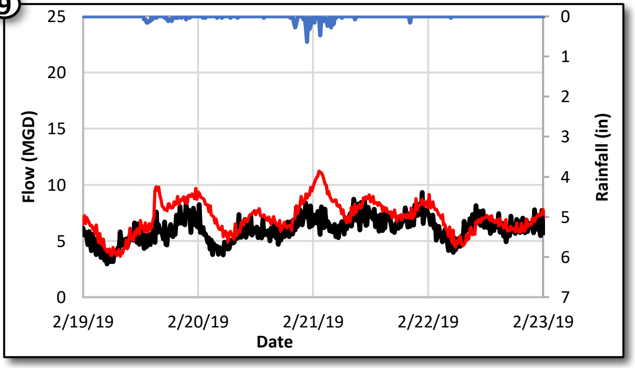


DeKalb Calibration Results

Event Hydrographs

Flow Meter:

PB3

Sewershed:

Pole Bridge Creek

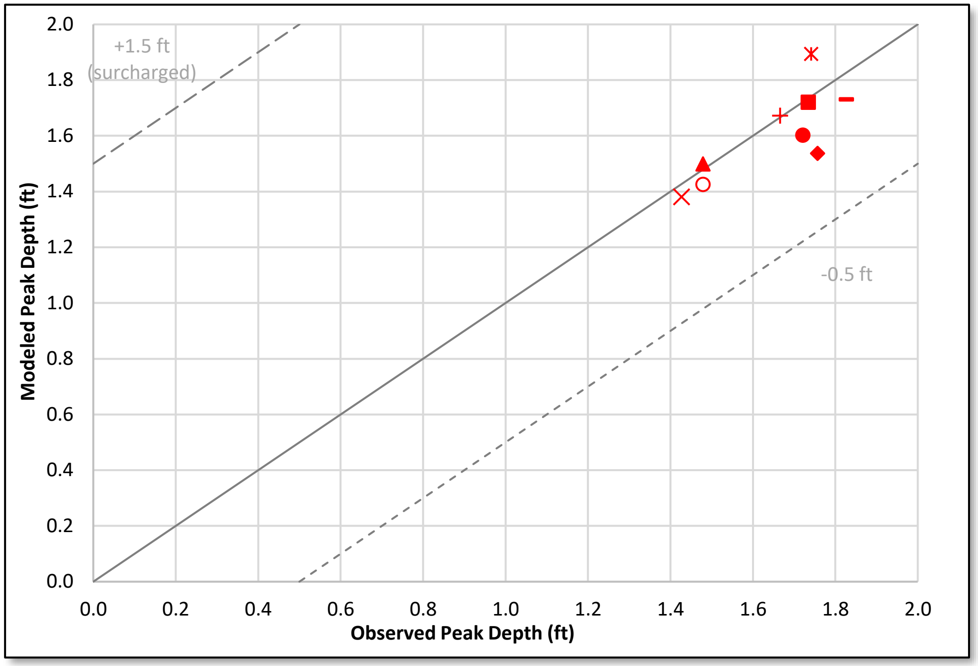
Sewer Basin:

Pole Bridge Basin

Events:

① 11/12/18
② 12/1/18
③ 12/8/18
④ 12/14/18
⑤ 12/20/18
⑥ 12/27/18
⑦ 1/19/19
⑧ 1/23/19
⑨ 2/19/19

▨ Excluded Event Due to Data Quality



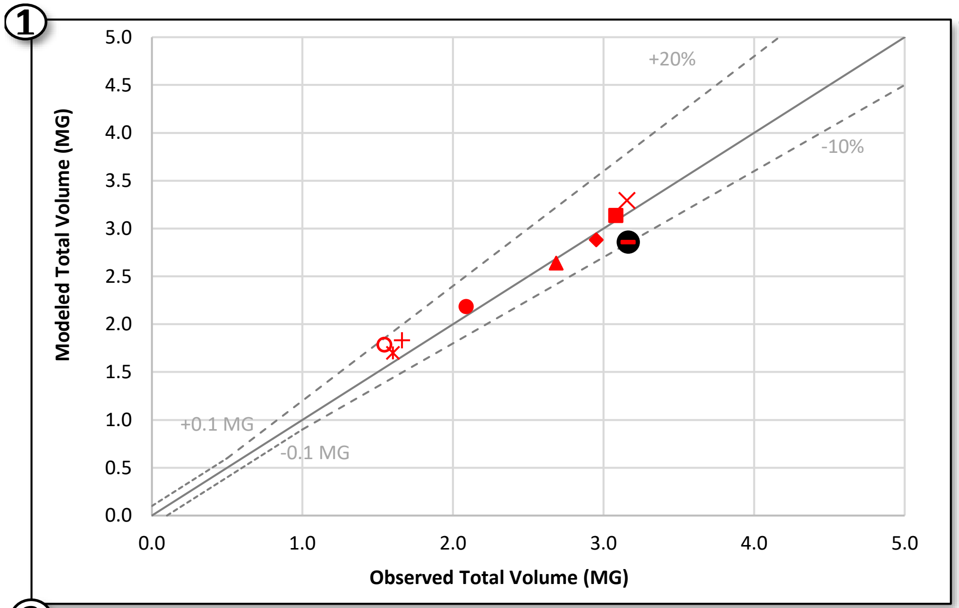
Flow Meter:

PB3

Events:

●	11/12/18	–	12/27/18
■	12/1/18	+	1/19/19
◆	12/8/18	✳	1/23/19
▲	12/14/18	○	2/19/19
×	12/20/18	●	Excluded Event Due to Data Quality

①



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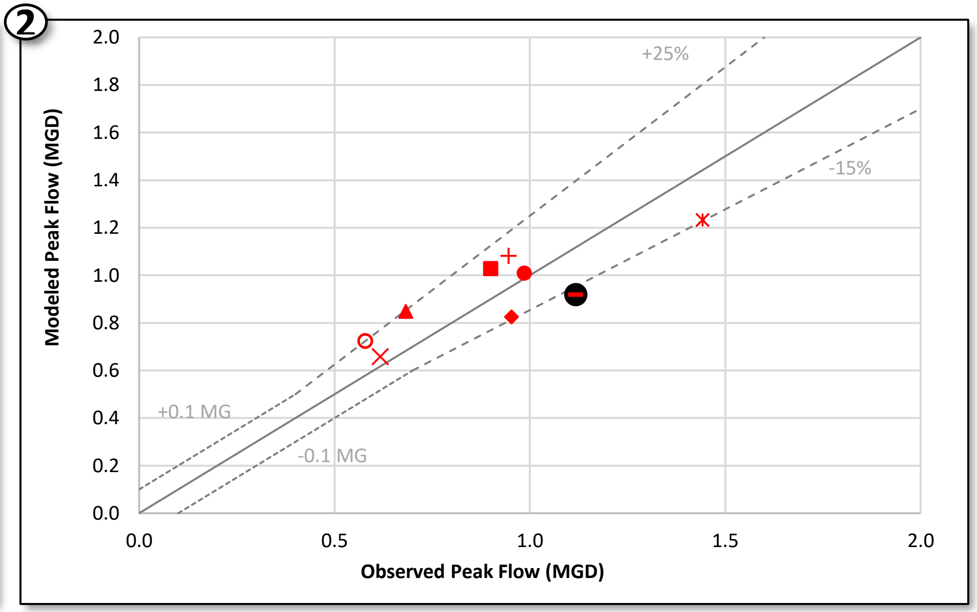

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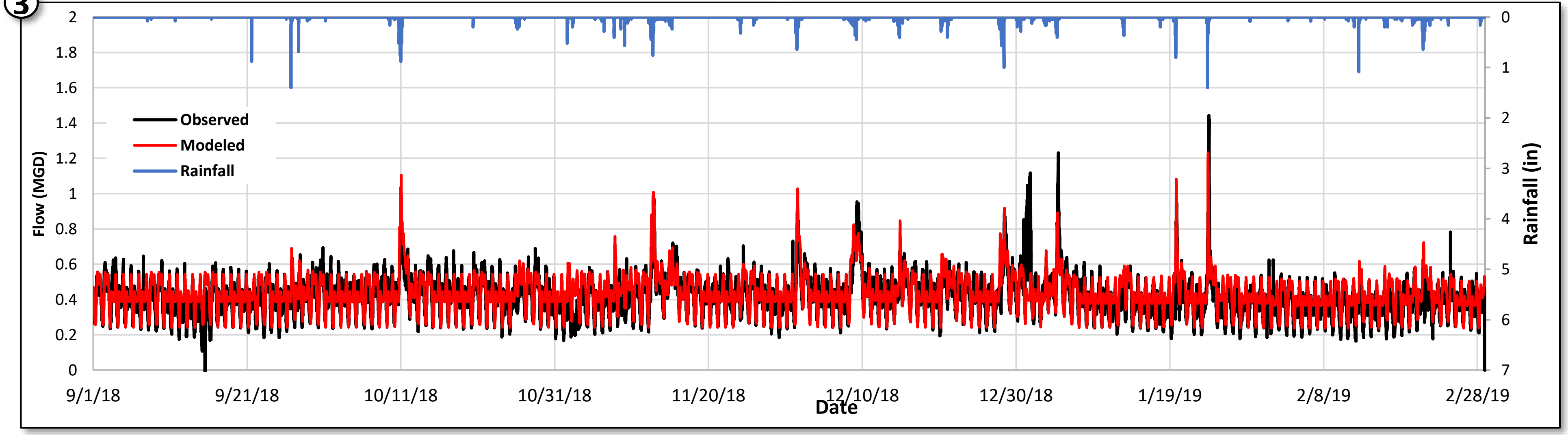


DeKalb Calibration Results

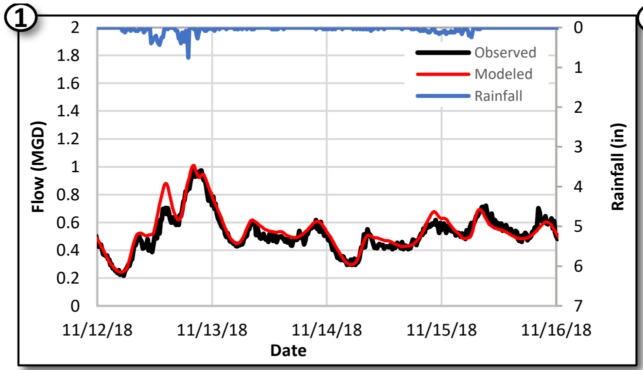
Wet Weather
Flow Summary

Flow Meter:
PB4
Sewershed:
Pole Bridge Creek
Sewer Basin:
Pole Bridge Basin

① Total Event Volume
② Peak Event Flow
③ Time Series

Events:
● 11/12/18
■ 12/1/18
◆ 12/8/18
▲ 12/14/18
× 12/20/18
— 12/27/18
+ 1/19/19
✳ 1/23/19
○ 2/19/19
● Excluded Event Due to Data Quality

①



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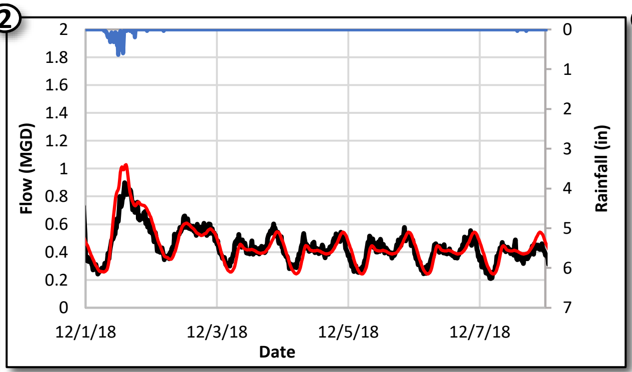

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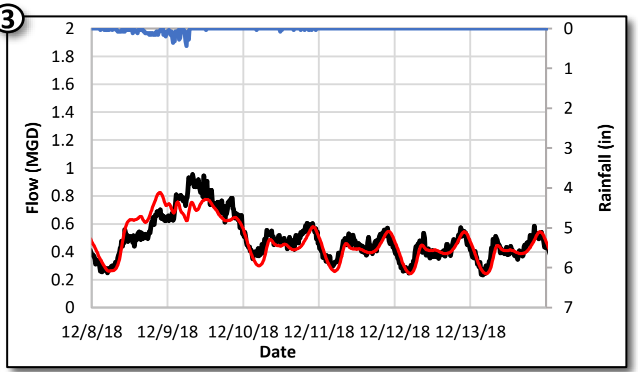

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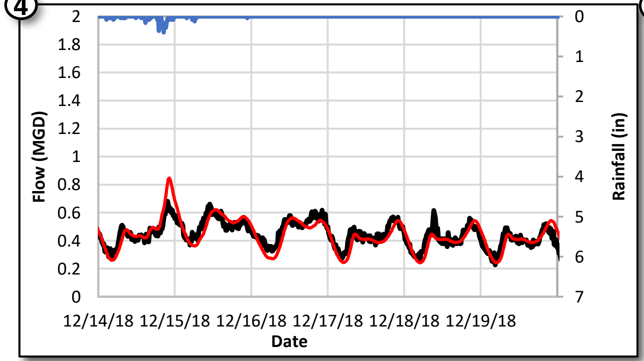

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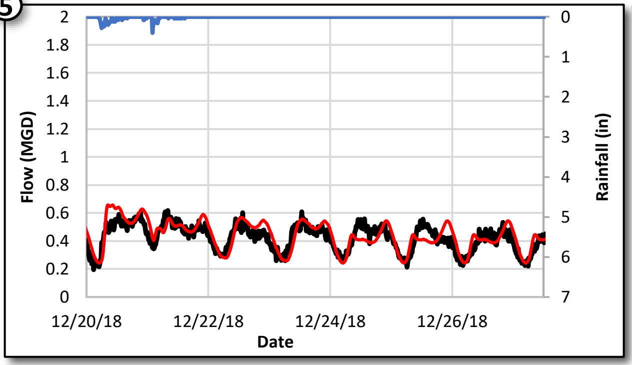

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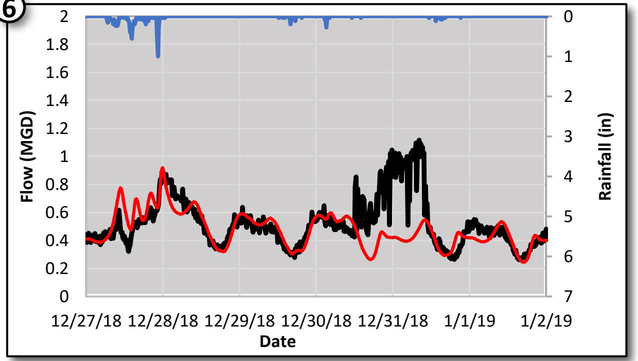

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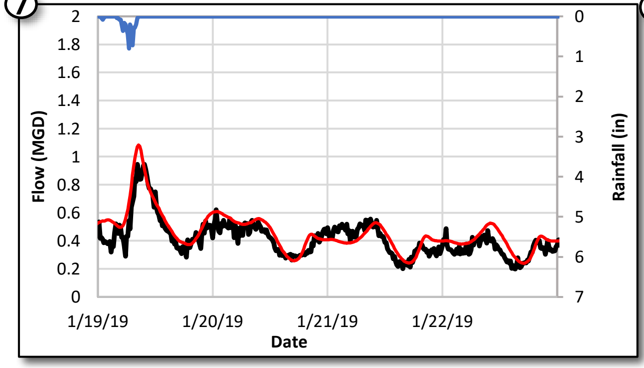

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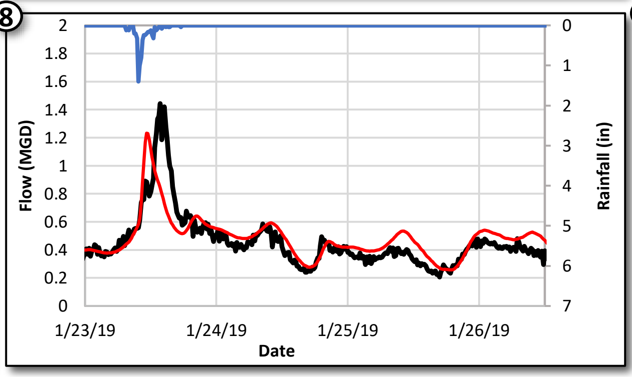

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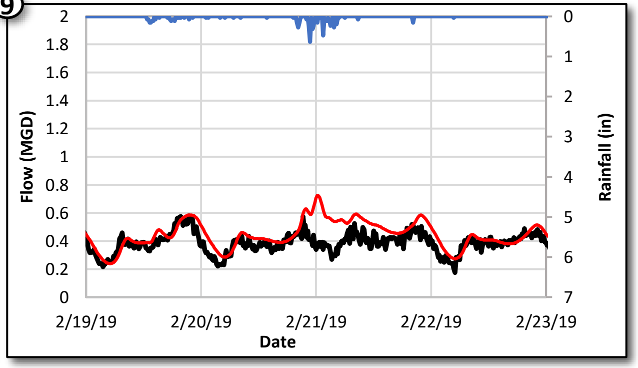


DeKalb Calibration Results

Event Hydrographs

Flow Meter:

PB4

Sewershed:

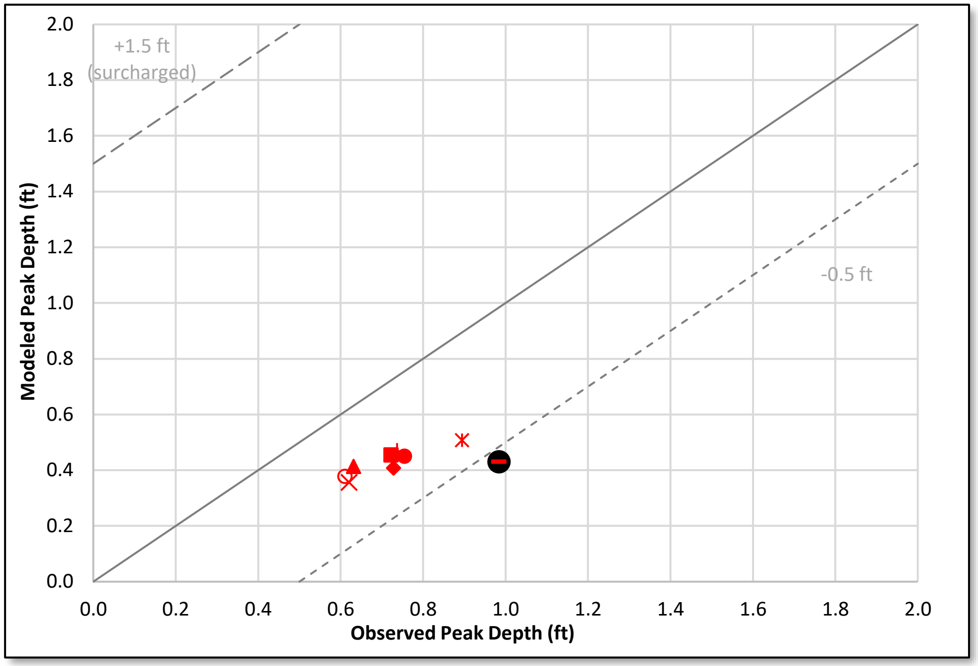
Pole Bridge Creek

Sewer Basin:

Pole Bridge Basin

Events:

①	11/12/18	⑤	12/20/18	⑨	2/19/19
②	12/1/18	⑥	12/27/18	▨	Excluded Event Due to Data Quality
③	12/8/18	⑦	1/19/19		
④	12/14/18	⑧	1/23/19		



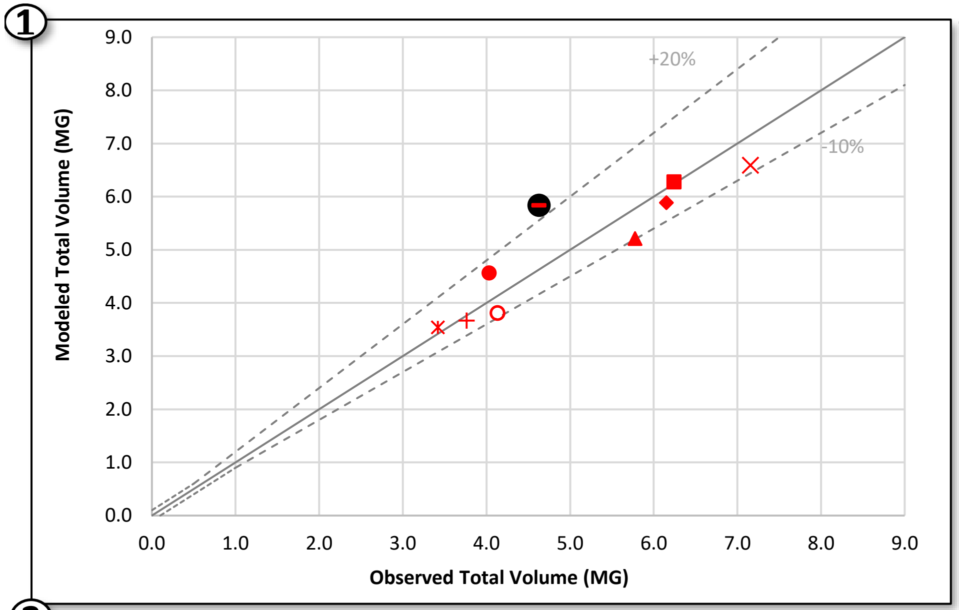
Flow Meter:

PB4

Events:

●	11/12/18	—	12/27/18
■	12/1/18	+	1/19/19
◆	12/8/18	✱	1/23/19
▲	12/14/18	○	2/19/19
×	12/20/18	●	Excluded Event Due to Data Quality

①



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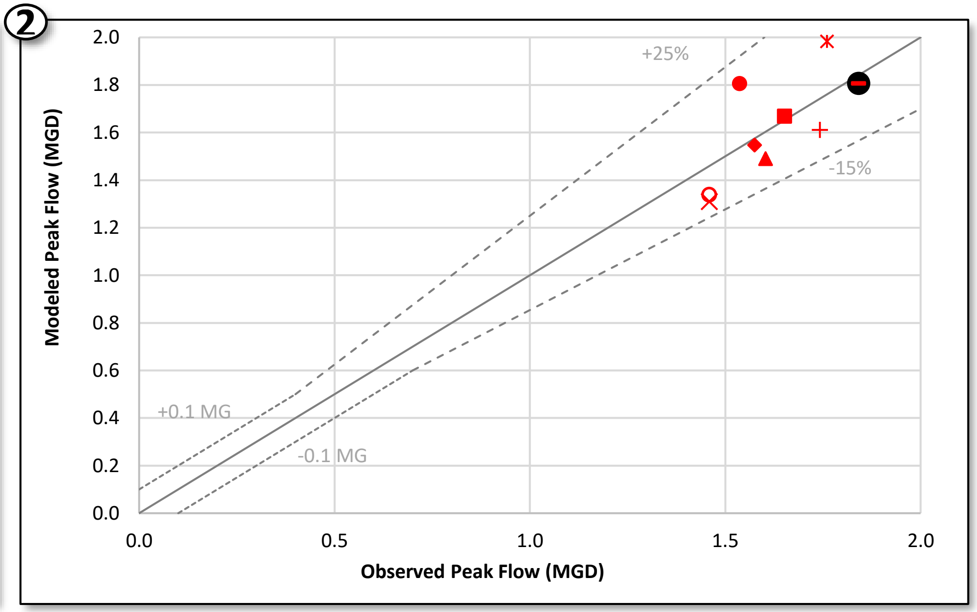

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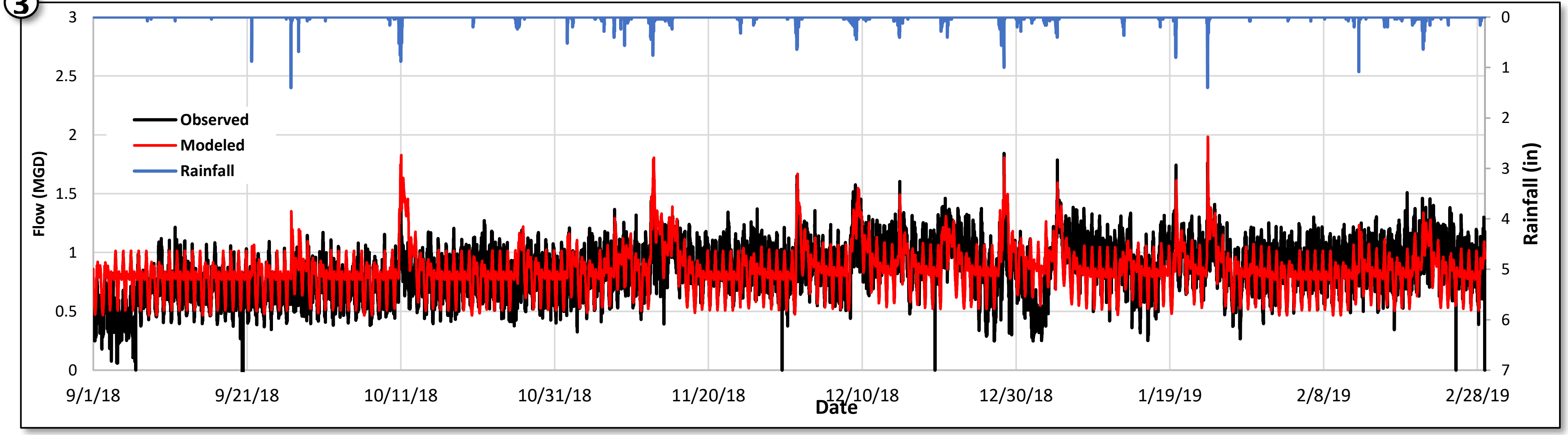


DeKalb Calibration Results

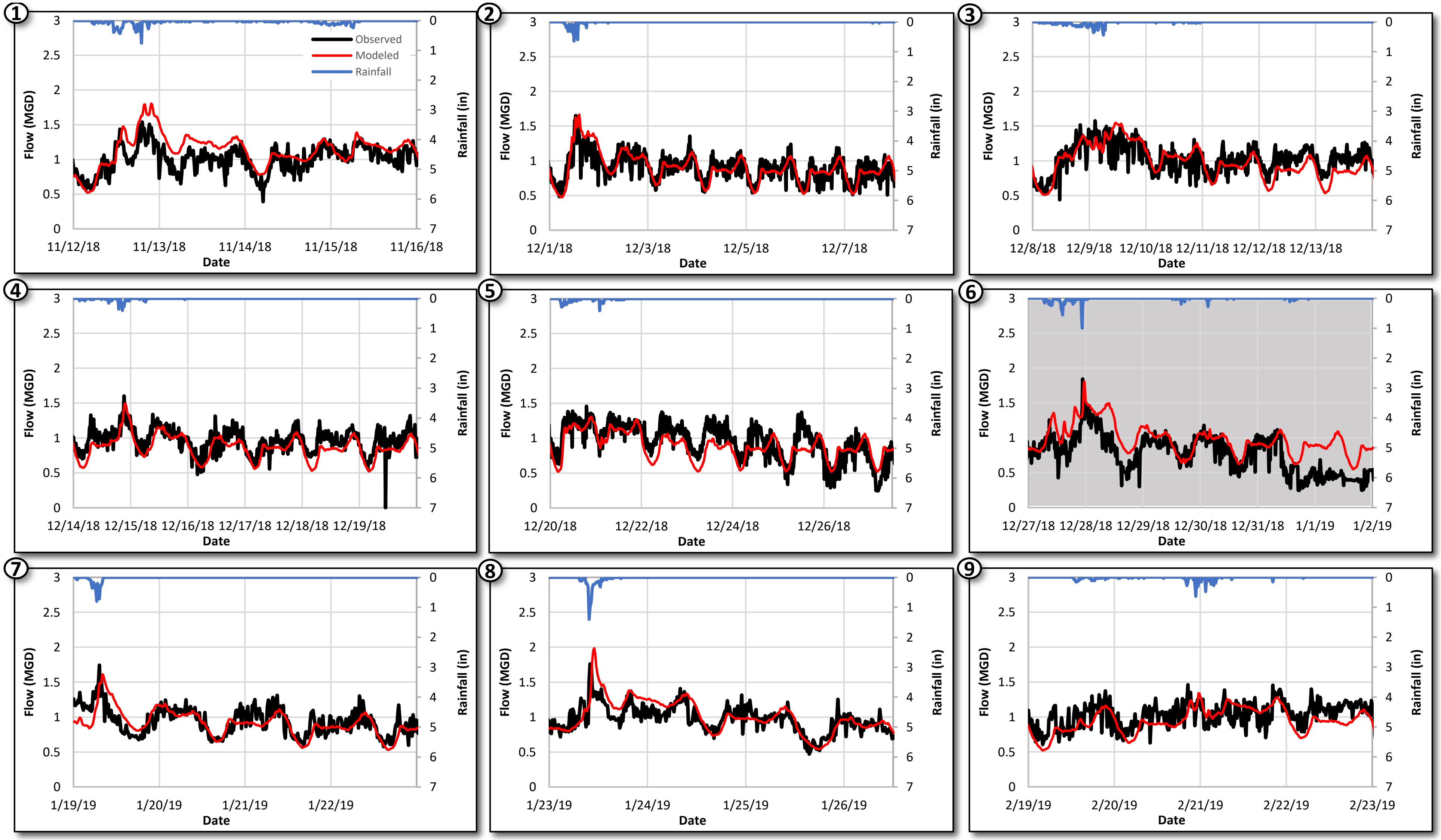
Wet Weather
Flow Summary

Flow Meter:
PB5
Sewershed:
Pole Bridge Creek
Sewer Basin:
Pole Bridge Basin

① Total Event Volume
② Peak Event Flow
③ Time Series

Events:

●	11/12/18	—	12/27/18
■	12/1/18	+	1/19/19
◆	12/8/18	✳	1/23/19
▲	12/14/18	○	2/19/19
×	12/20/18	●	Excluded Event Due to Data Quality



DeKalb Calibration Results

Event Hydrographs

Flow Meter:

PB5

Sewershed:

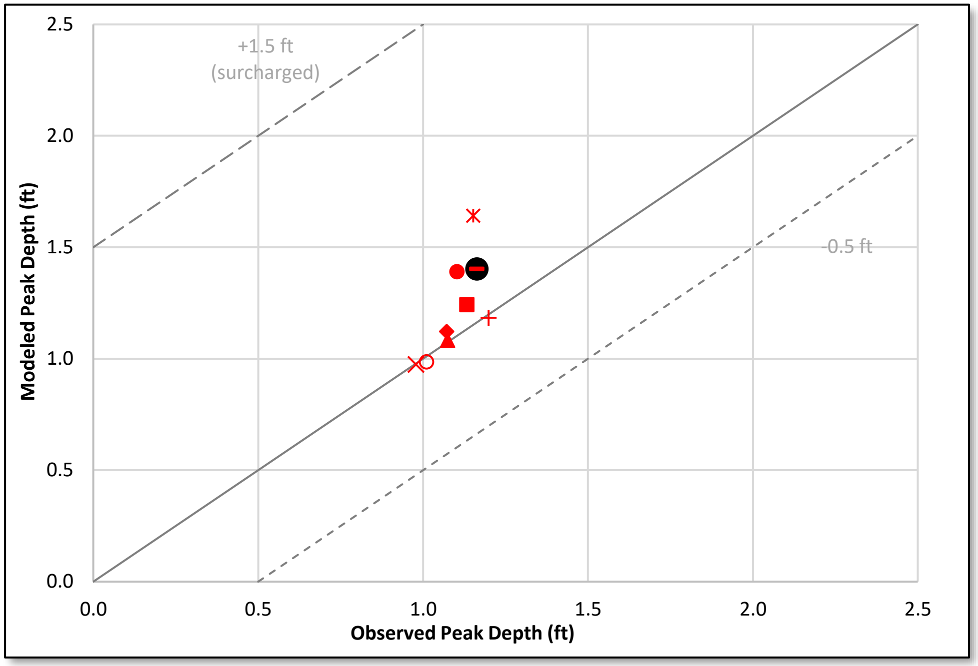
Pole Bridge Creek

Sewer Basin:

Pole Bridge Basin

Events:

①	11/12/18	⑤	12/20/18	⑨	2/19/19
②	12/1/18	⑥	12/27/18	▨	Excluded Event Due to Data Quality
③	12/8/18	⑦	1/19/19		
④	12/14/18	⑧	1/23/19		

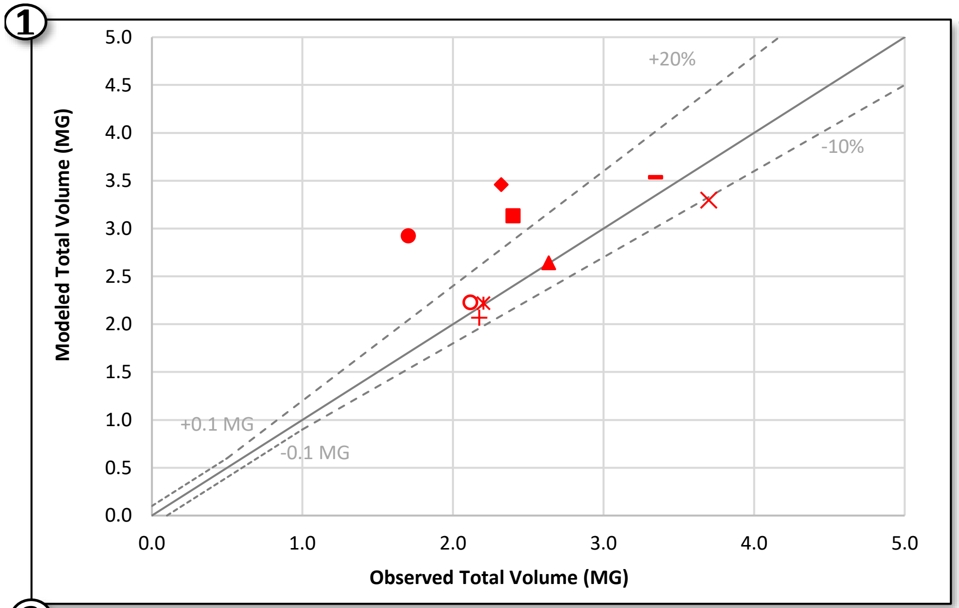


Flow Meter:

PB5

Events:

●	11/12/18	—	12/27/18
■	12/1/18	+	1/19/19
◆	12/8/18	✳	1/23/19
▲	12/14/18	○	2/19/19
×	12/20/18	●	Excluded Event Due to Data Quality

①


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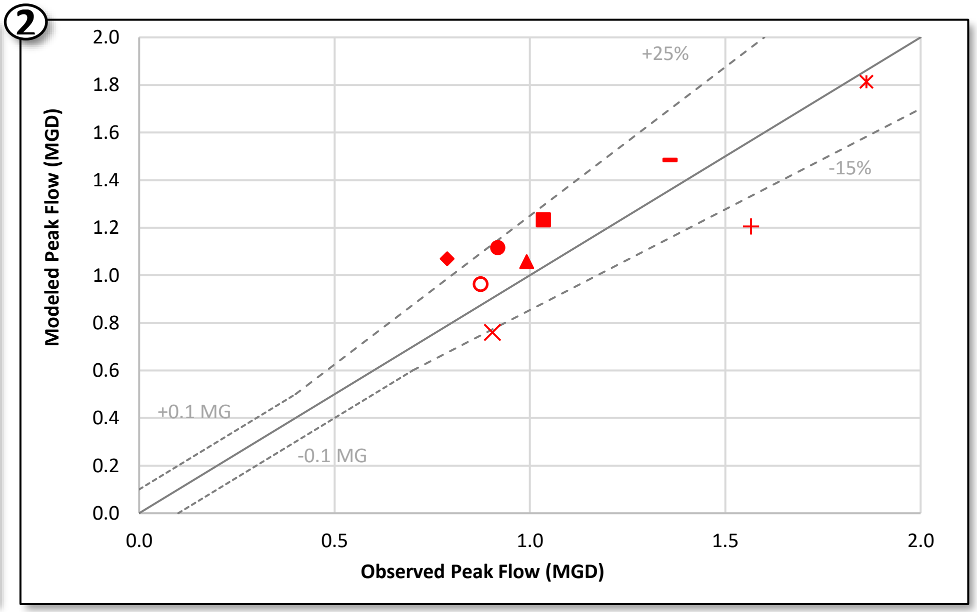

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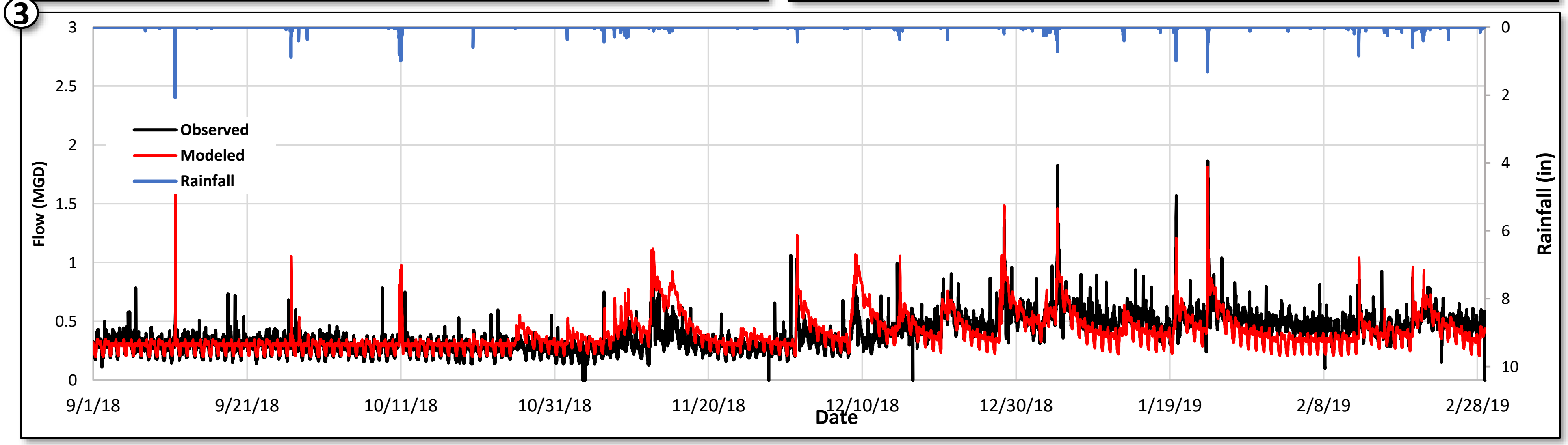


DeKalb Calibration Results

Wet Weather
Flow Summary

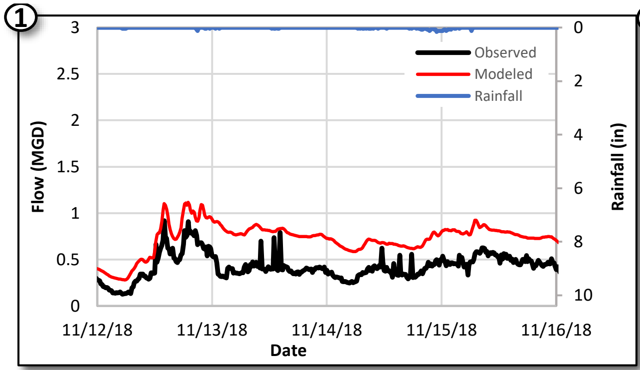
Flow Meter:
PB6
Sewershed:
Pole Bridge Creek
Sewer Basin:
Pole Bridge Basin

① Total Event Volume
② Peak Event Flow
③ Time Series

Events:

●	11/12/18	–	12/27/18
■	12/1/18	+	1/19/19
◆	12/8/18	✳	1/23/19
▲	12/14/18	○	2/19/19
×	12/20/18	●	Excluded Event Due to Data Quality

①



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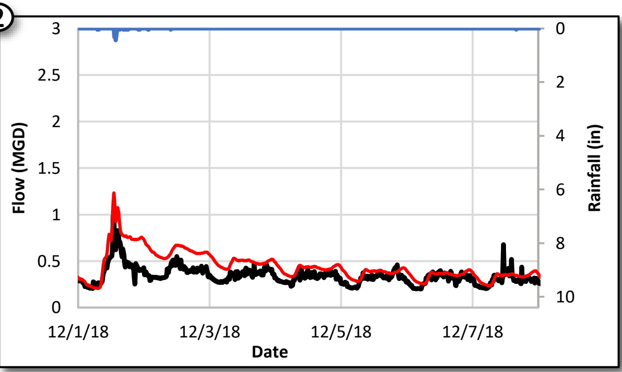

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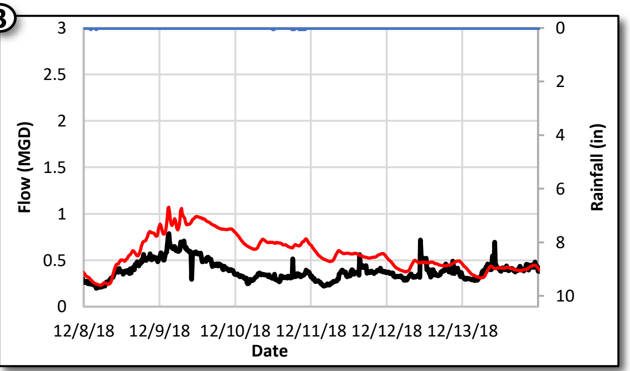

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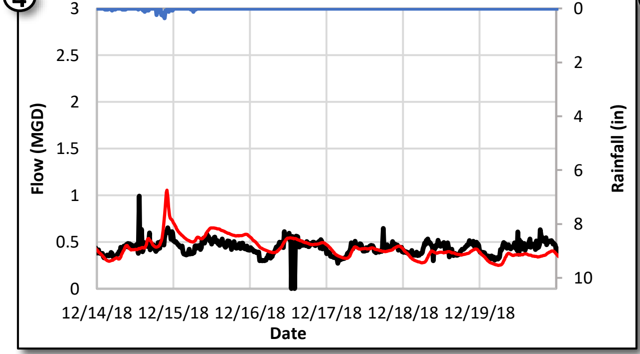

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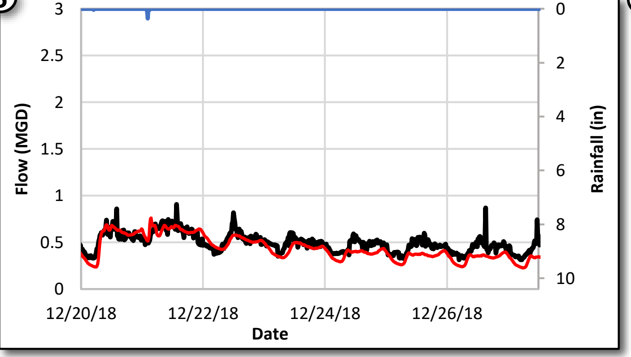

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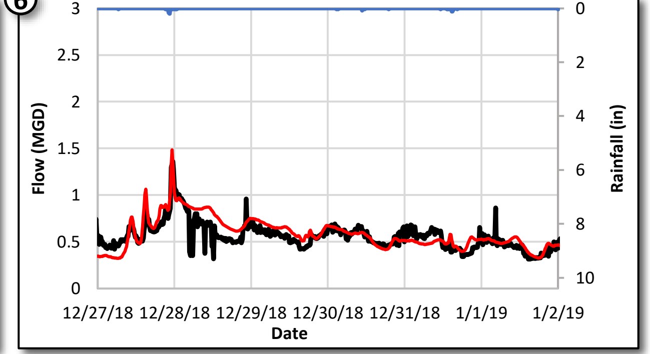

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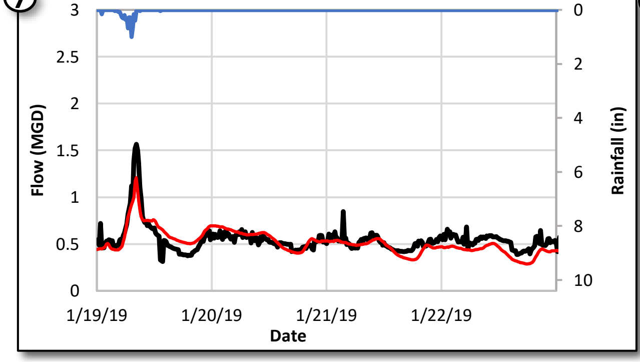

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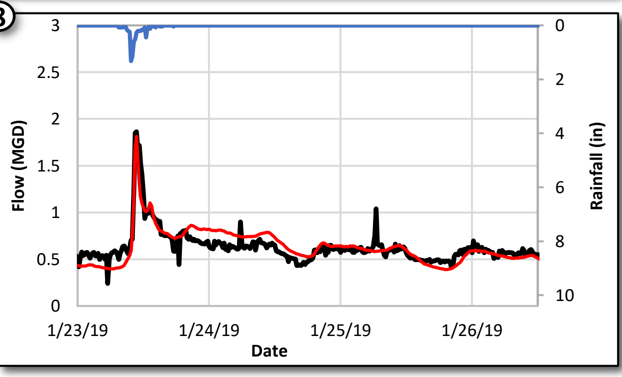

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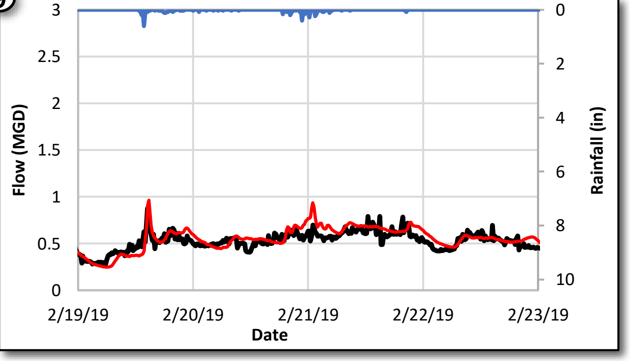


DeKalb Calibration Results

Event Hydrographs

Flow Meter:

PB6

Sewershed:

Pole Bridge Creek

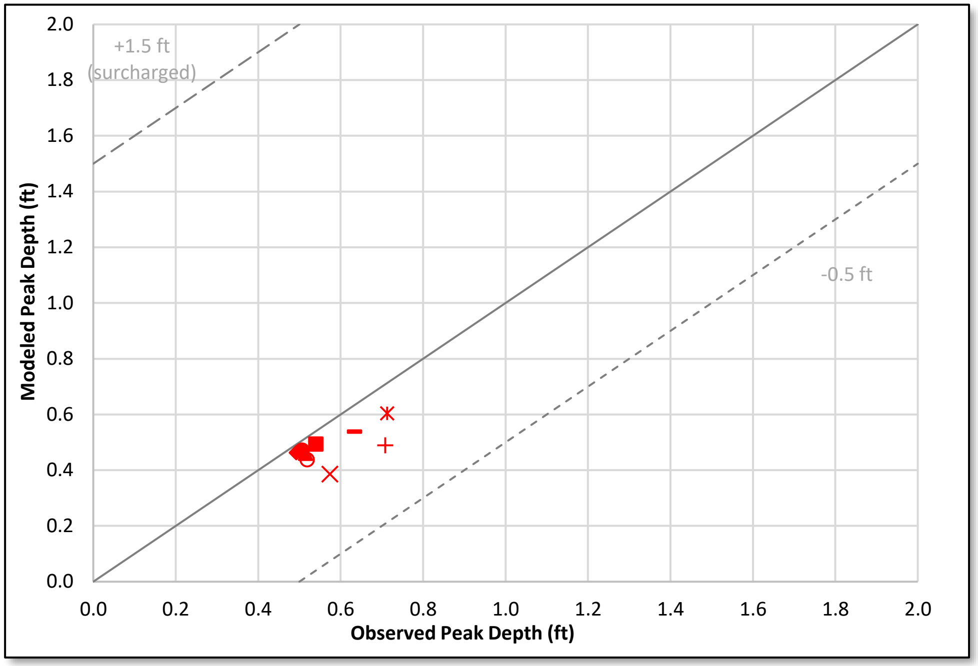
Sewer Basin:

Pole Bridge Basin

Events:

① 11/12/18
② 12/1/18
③ 12/8/18
④ 12/14/18
⑤ 12/20/18
⑥ 12/27/18
⑦ 1/19/19
⑧ 1/23/19
⑨ 2/19/19

▨ Excluded Event Due to Data Quality



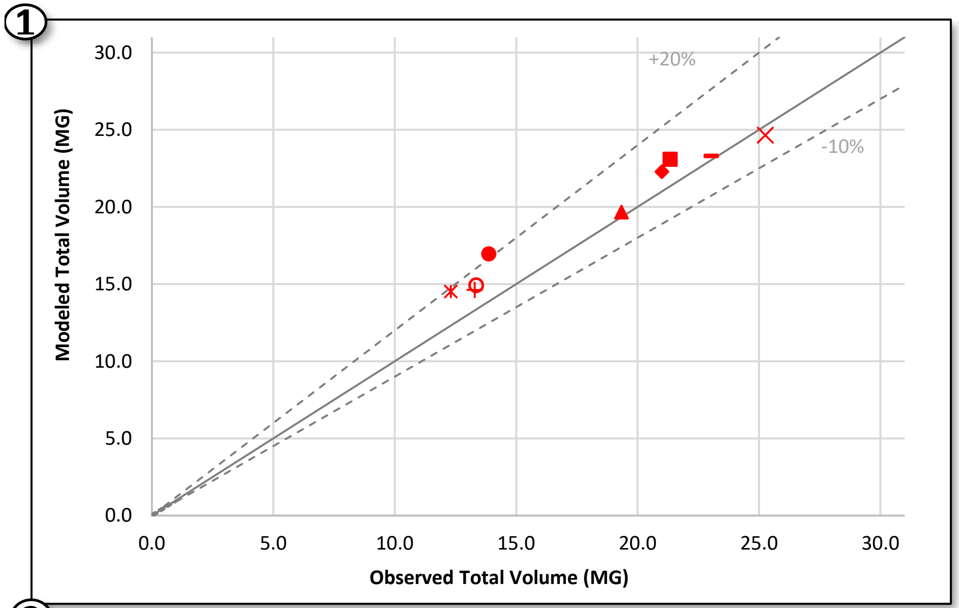
Flow Meter:

PB6

Events:

●	11/12/18	−	12/27/18
■	12/1/18	+	1/19/19
◆	12/8/18	✳	1/23/19
▲	12/14/18	○	2/19/19
×	12/20/18	●	Excluded Event Due to Data Quality

①



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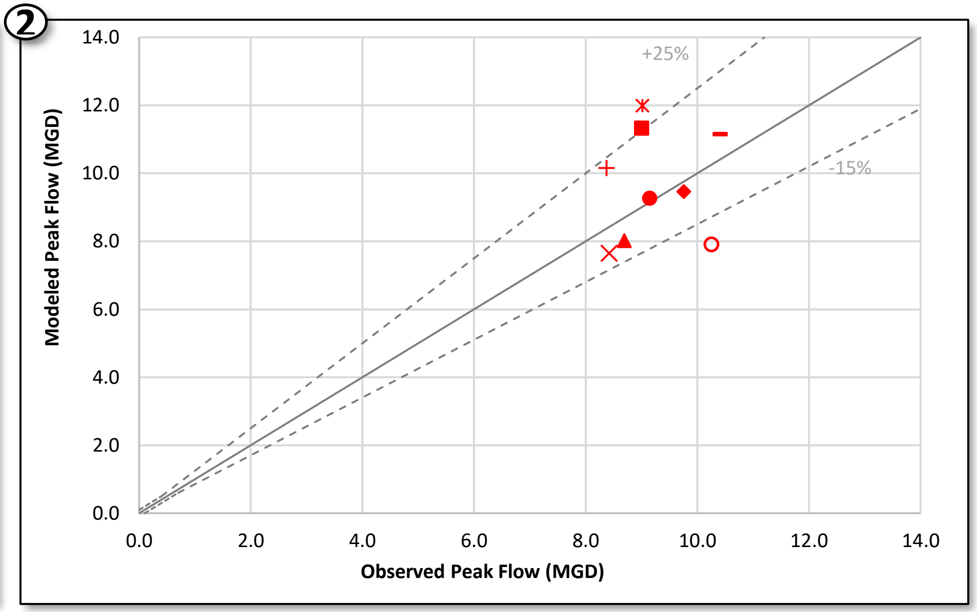

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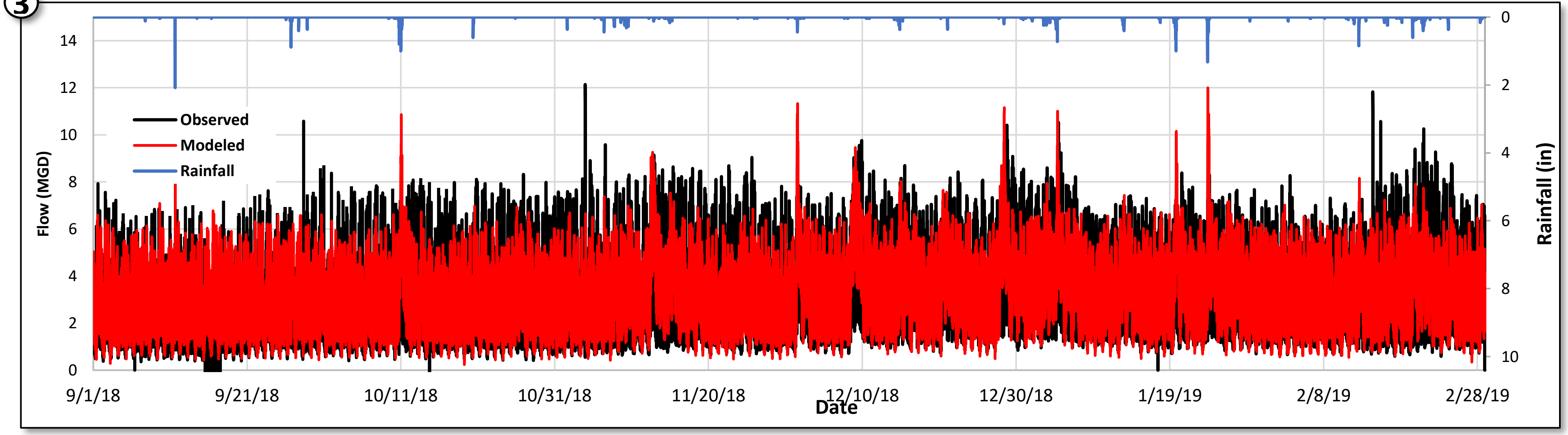


DeKalb Calibration Results

Wet Weather
Flow Summary

Flow Meter:

PB7

Sewershed:
Pole Bridge Creek

Sewer Basin:
Pole Bridge Basin

① Total Event Volume

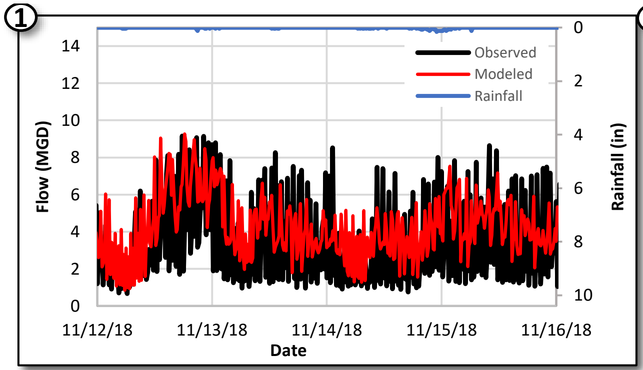
② Peak Event Flow

③ Time Series

Events:

● 11/12/18
■ 12/1/18
◆ 12/8/18
▲ 12/14/18
× 12/20/18
– 12/27/18
+ 1/19/19
✳ 1/23/19
○ 2/19/19
● Excluded Event Due to Data Quality

①



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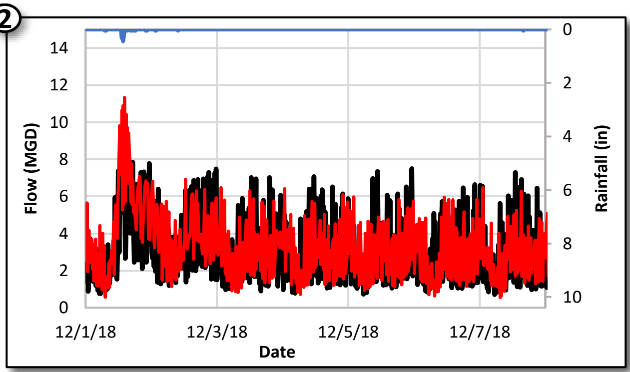

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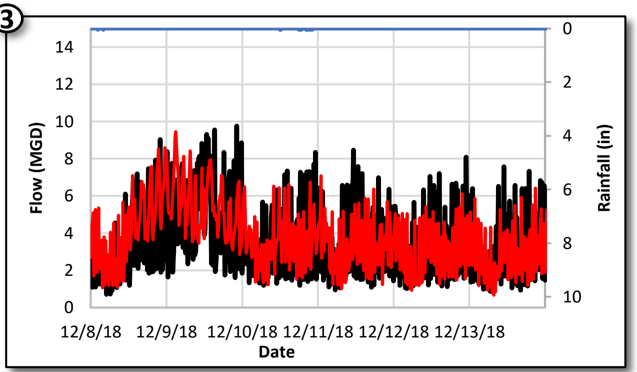

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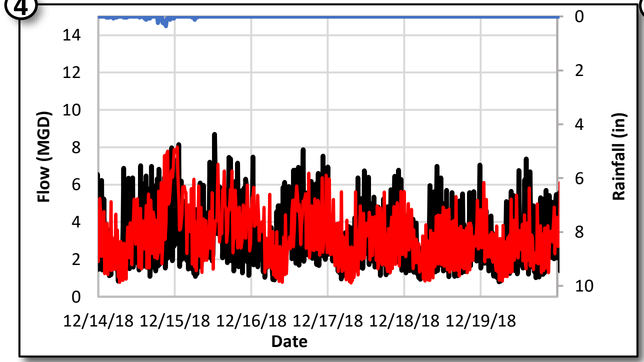

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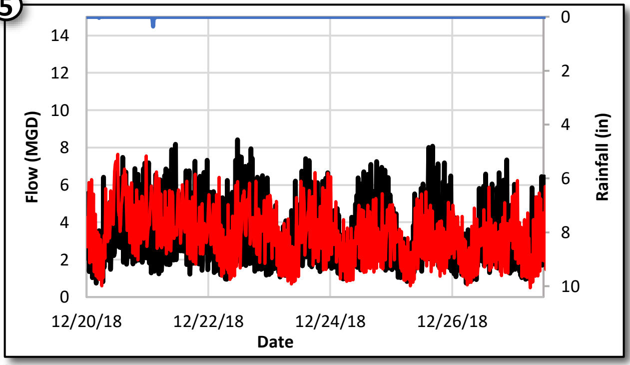

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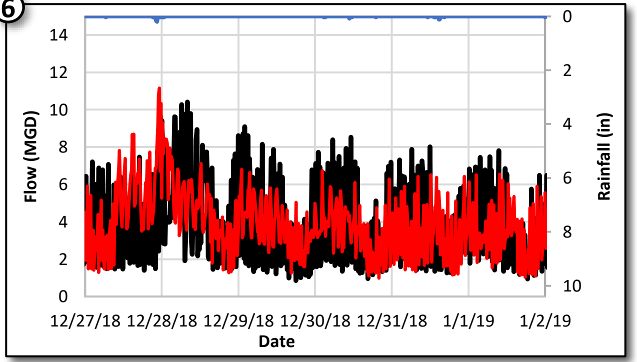

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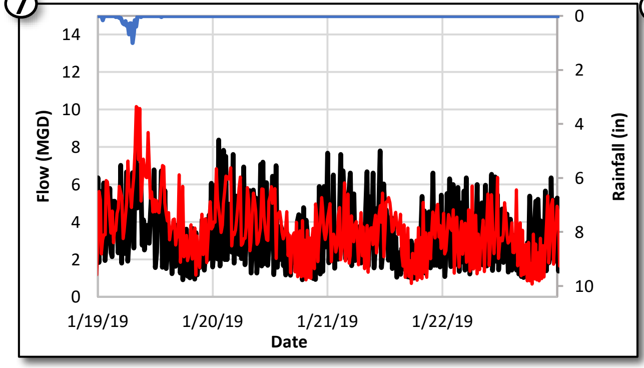

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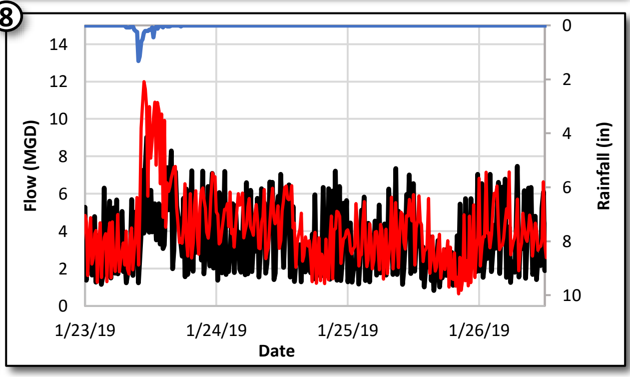

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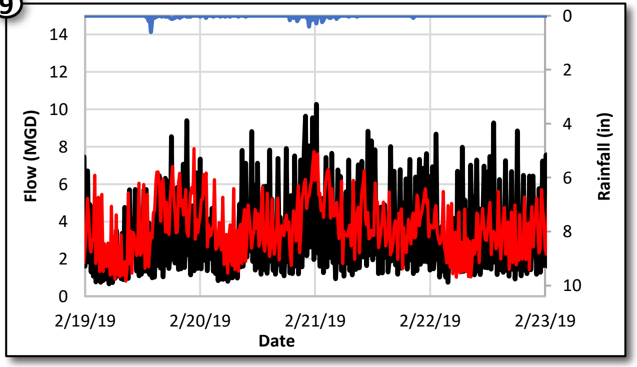


DeKalb Calibration Results

Event Hydrographs

Flow Meter:

PB7

Sewershed:

Pole Bridge Creek

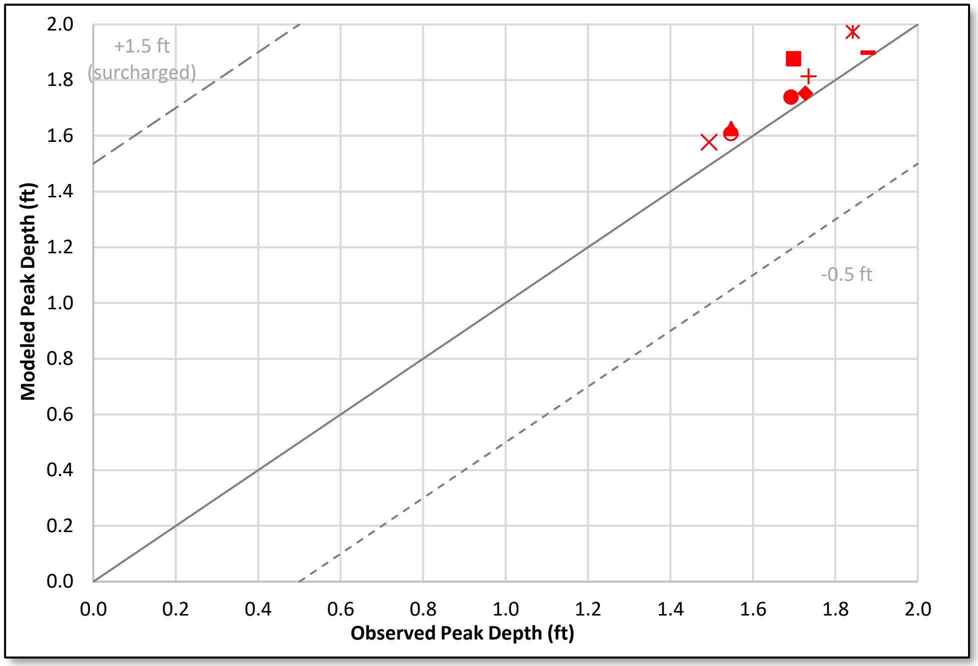
Sewer Basin:

Pole Bridge Basin

Events:

① 11/12/18
② 12/1/18
③ 12/8/18
④ 12/14/18
⑤ 12/20/18
⑥ 12/27/18
⑦ 1/19/19
⑧ 1/23/19
⑨ 2/19/19

▨ Excluded Event Due to Data Quality



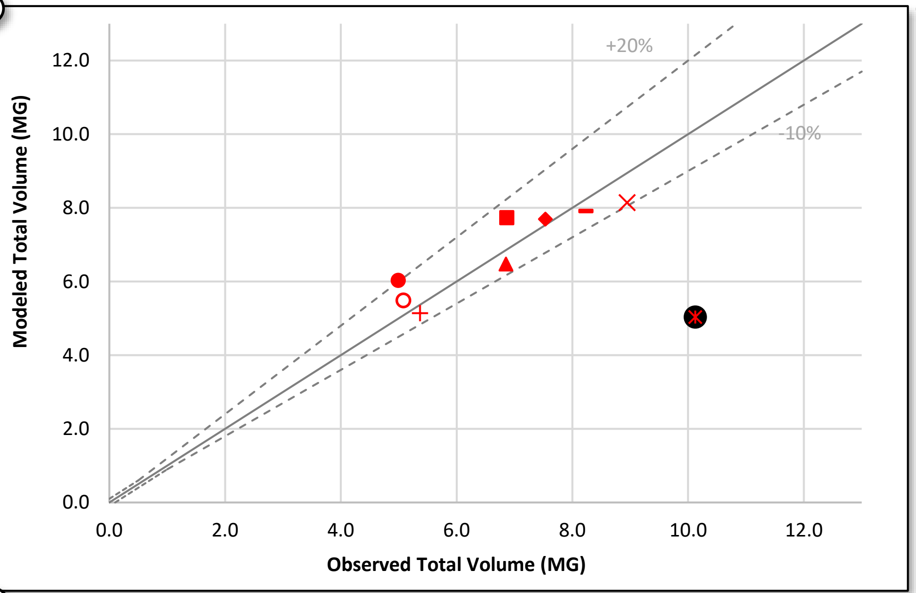
Flow Meter:

PB7

Events:

● 11/12/18
■ 12/1/18
◆ 12/8/18
▲ 12/14/18
× 12/20/18
− 12/27/18
+ 1/19/19
⁎ 1/23/19
○ 2/19/19
● Excluded Event Due to Data Quality

①



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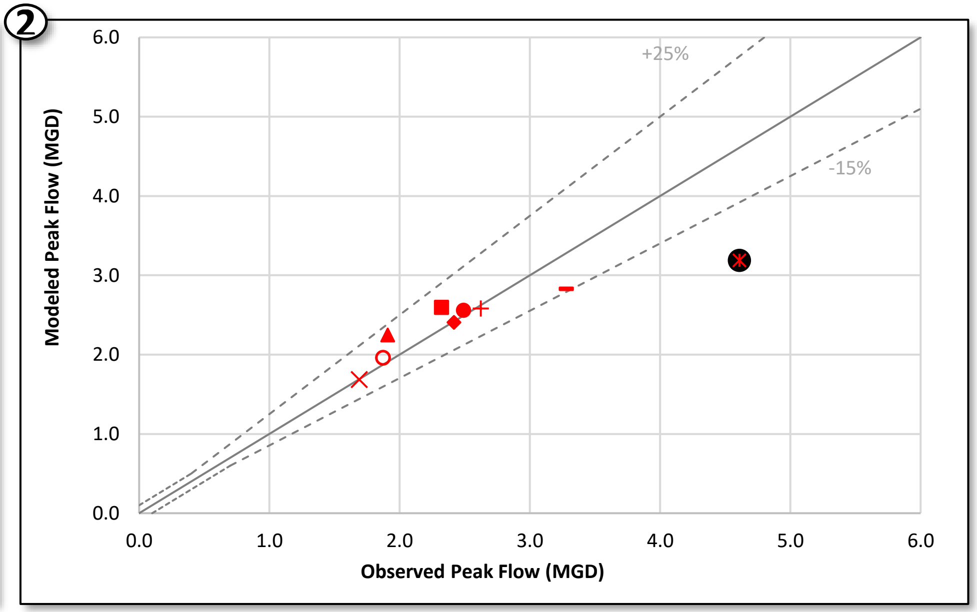

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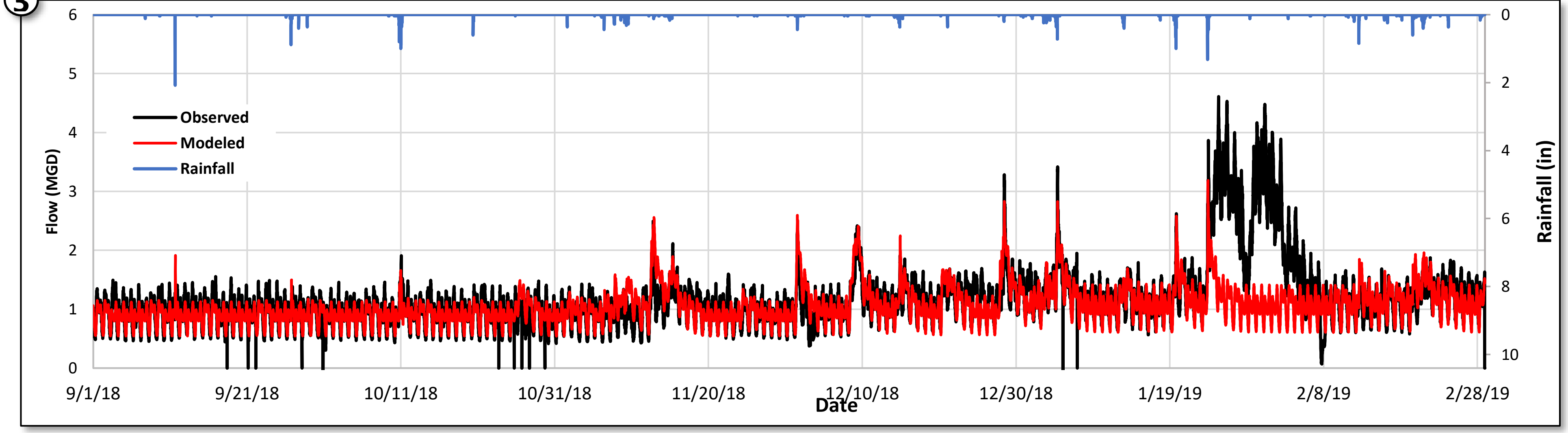


DeKalb Calibration Results

Wet Weather
Flow Summary

Flow Meter:

PB8

Sewershed:
Pole Bridge Creek

Sewer Basin:
Pole Bridge Basin

① Total Event Volume

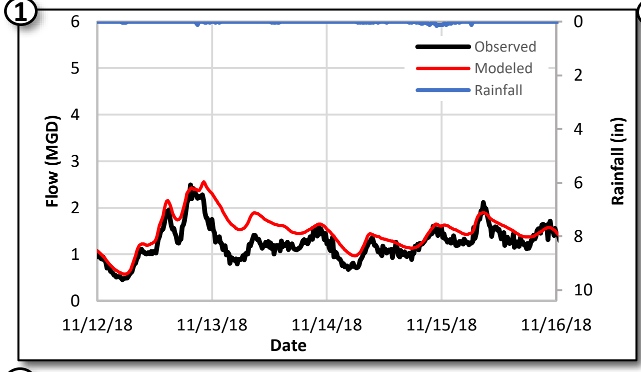
② Peak Event Flow

③ Time Series

Events:

●	11/12/18	–	12/27/18
■	12/1/18	+	1/19/19
◆	12/8/18	✳	1/23/19
▲	12/14/18	○	2/19/19
×	12/20/18	●	Excluded Event Due to Data Quality

①



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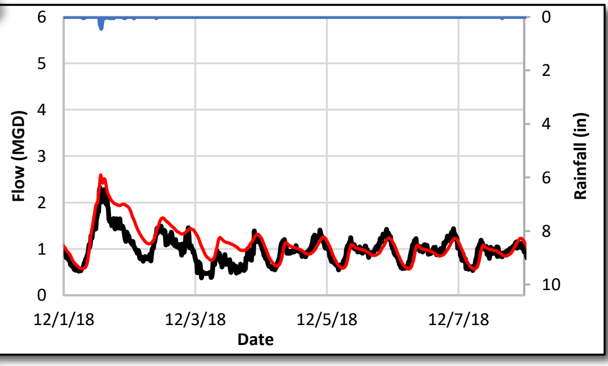

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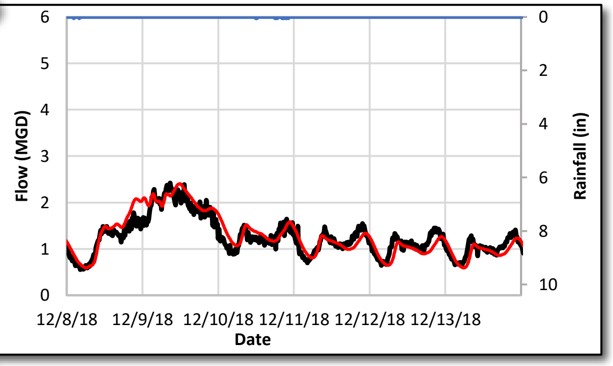

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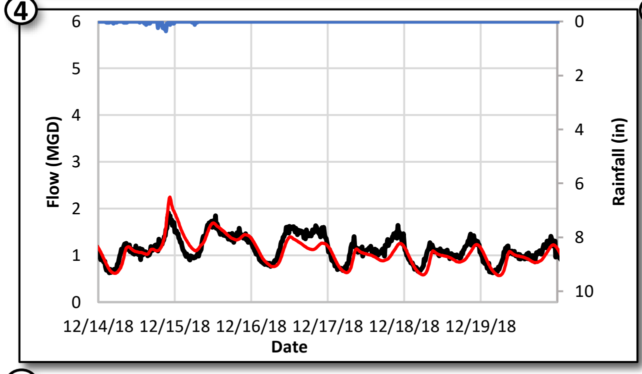

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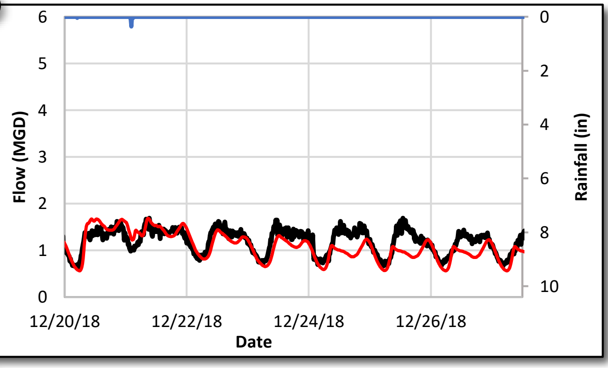

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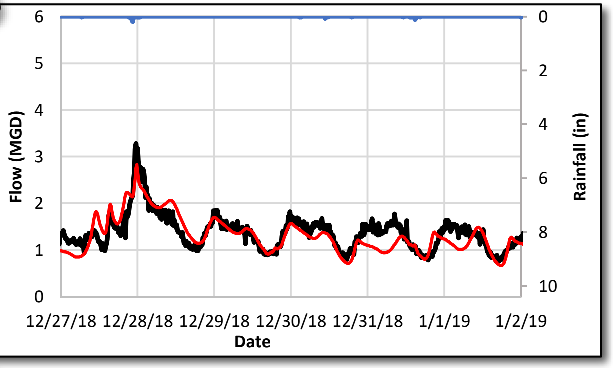

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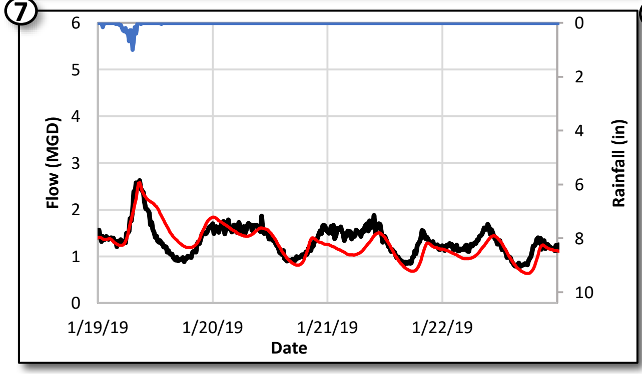

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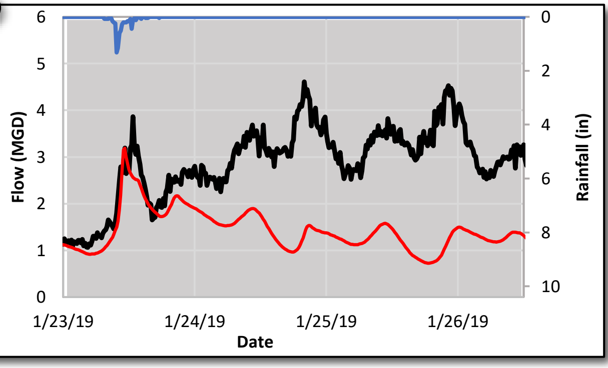

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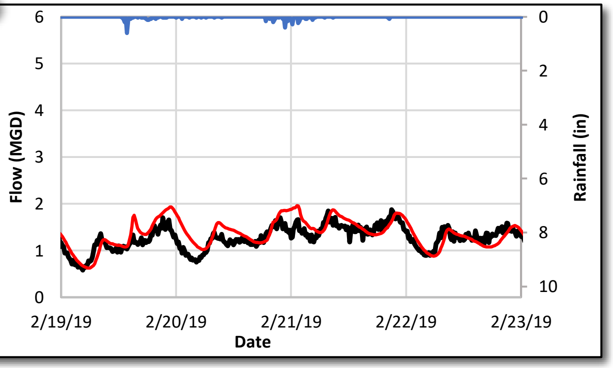


DeKalb Calibration Results

Event Hydrographs

Flow Meter:

PB8

Sewershed:

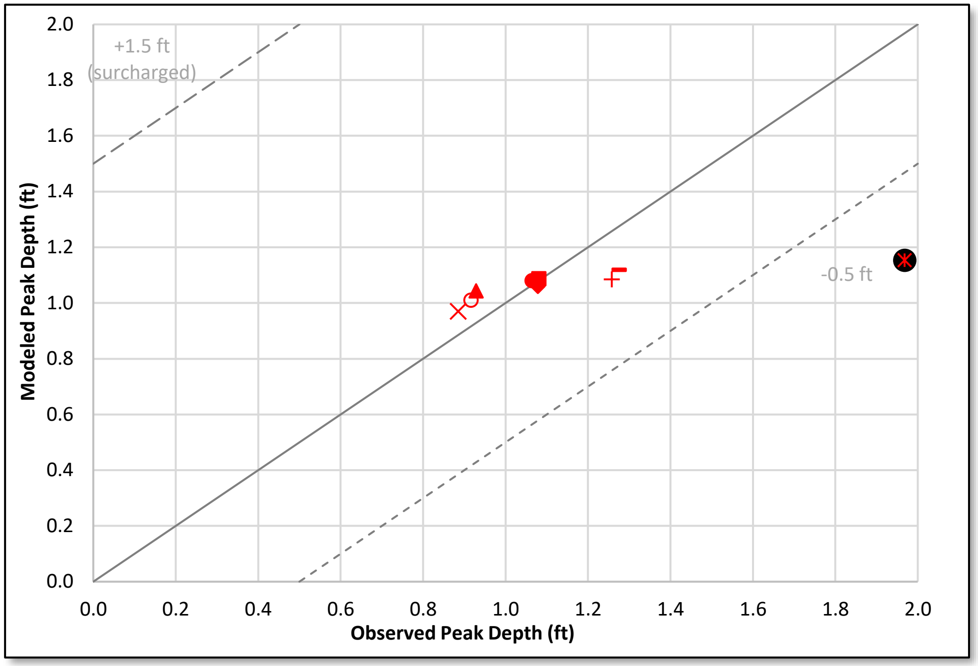
Pole Bridge Creek

Sewer Basin:

Pole Bridge Basin

Events:

①	11/12/18	⑤	12/20/18	⑨	2/19/19
②	12/1/18	⑥	12/27/18	▨	Excluded Event Due to Data Quality
③	12/8/18	⑦	1/19/19		
④	12/14/18	⑧	1/23/19		



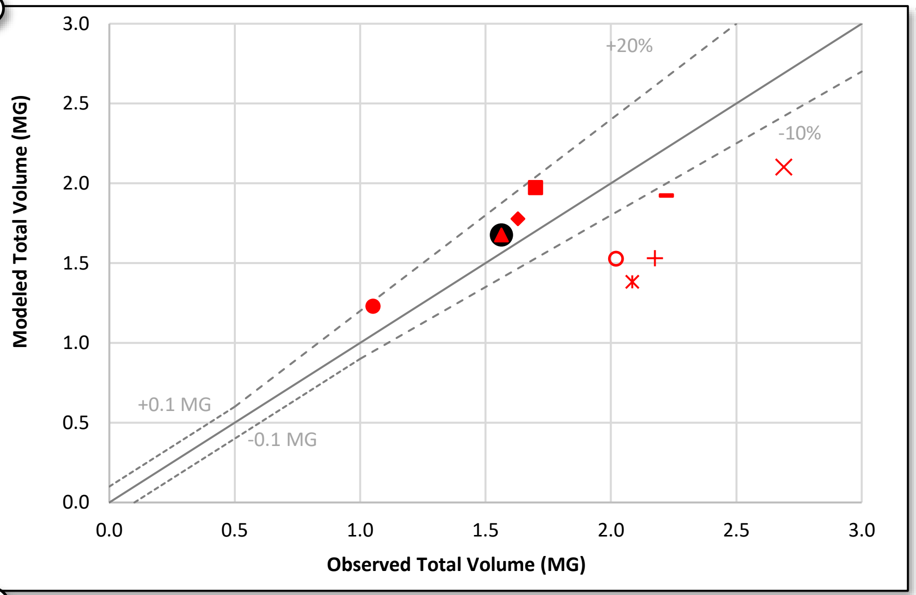
Flow Meter:

PB8

Events:

●	11/12/18	—	12/27/18
■	12/1/18	+	1/19/19
◆	12/8/18	✳	1/23/19
▲	12/14/18	○	2/19/19
×	12/20/18	●	Excluded Event Due to Data Quality

①



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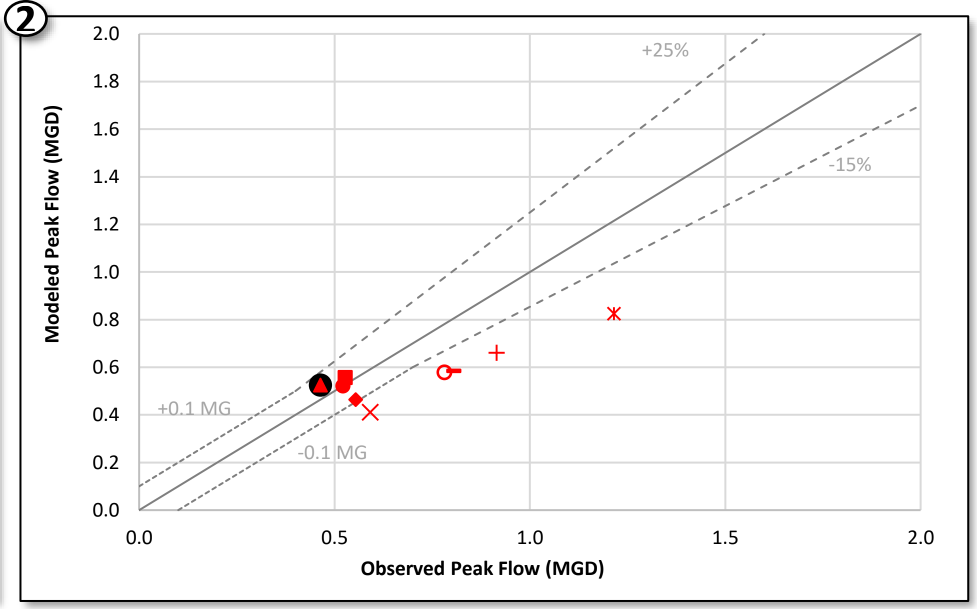

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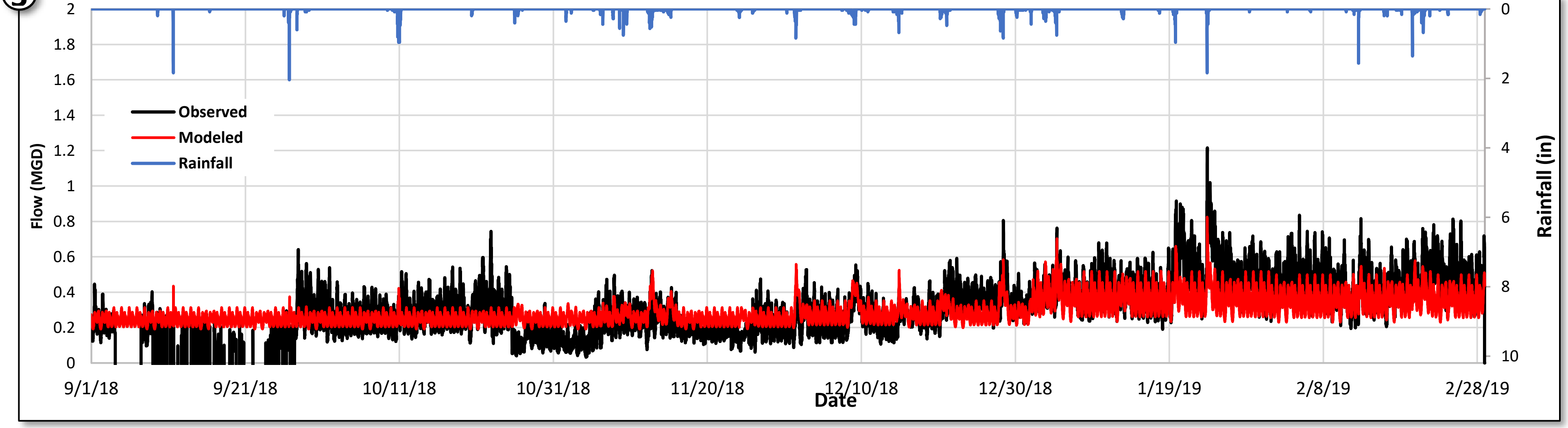


DeKalb Calibration Results

Wet Weather
Flow Summary

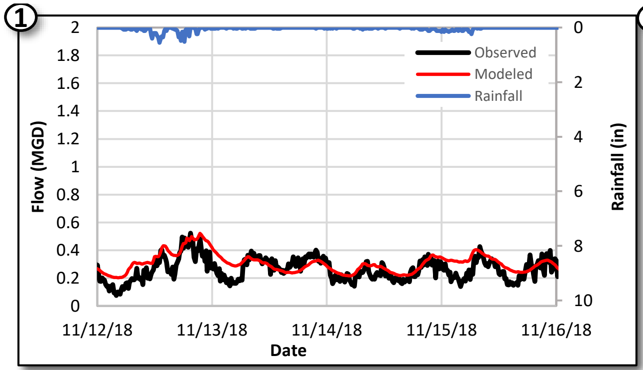
Flow Meter:
PB9
Sewershed:
Pole Bridge Creek
Sewer Basin:
Pole Bridge Basin

① Total Event Volume
② Peak Event Flow
③ Time Series

Events:

●	11/12/18	—	12/27/18
■	12/1/18	+	1/19/19
◆	12/8/18	✱	1/23/19
▲	12/14/18	○	2/19/19
×	12/20/18	●	Excluded Event Due to Data Quality

①



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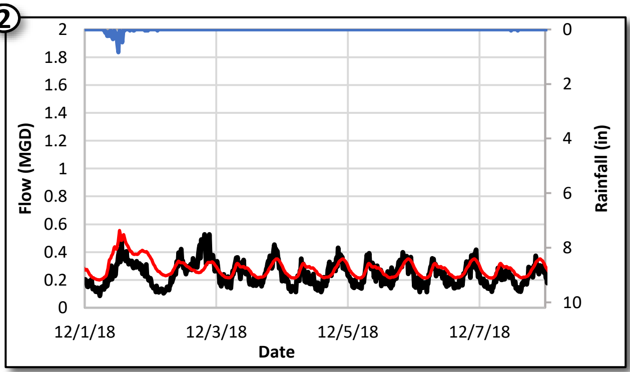

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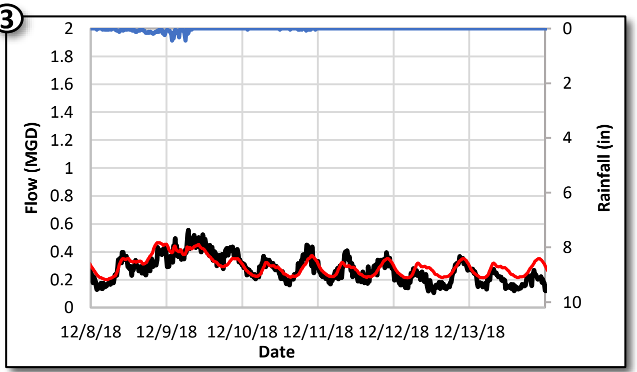

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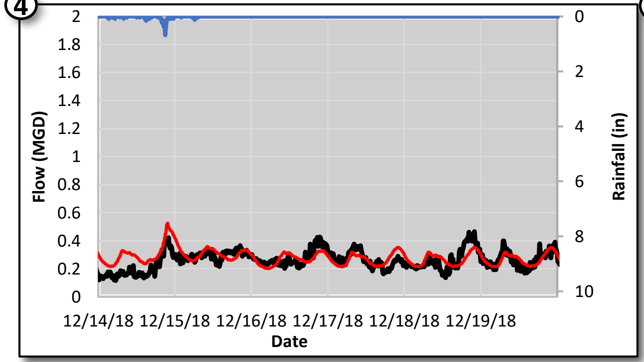

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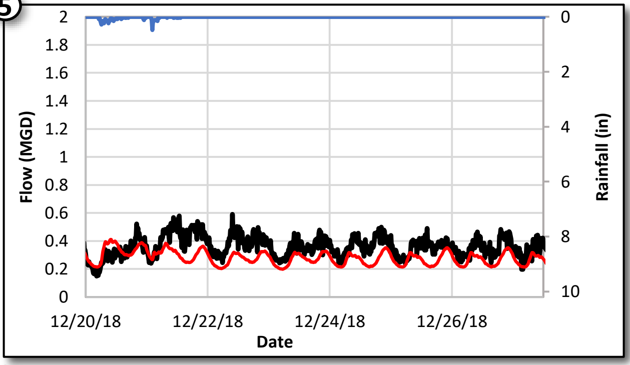

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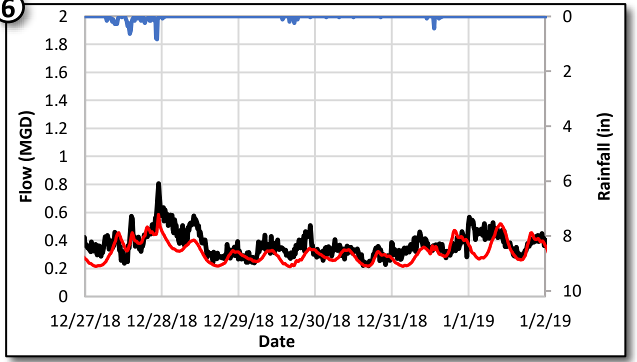

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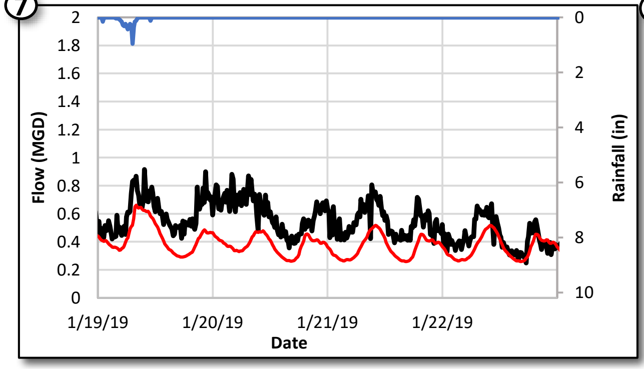

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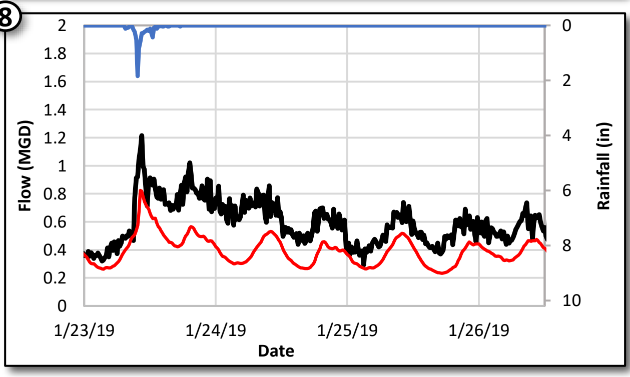

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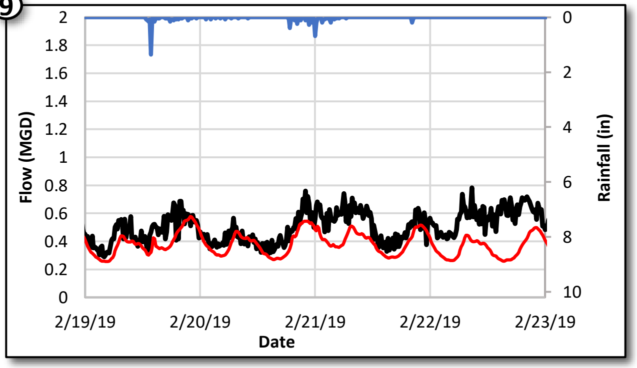


DeKalb Calibration Results

Event Hydrographs

Flow Meter:

PB9

Sewershed:

Pole Bridge Creek

Sewer Basin:

Pole Bridge Basin

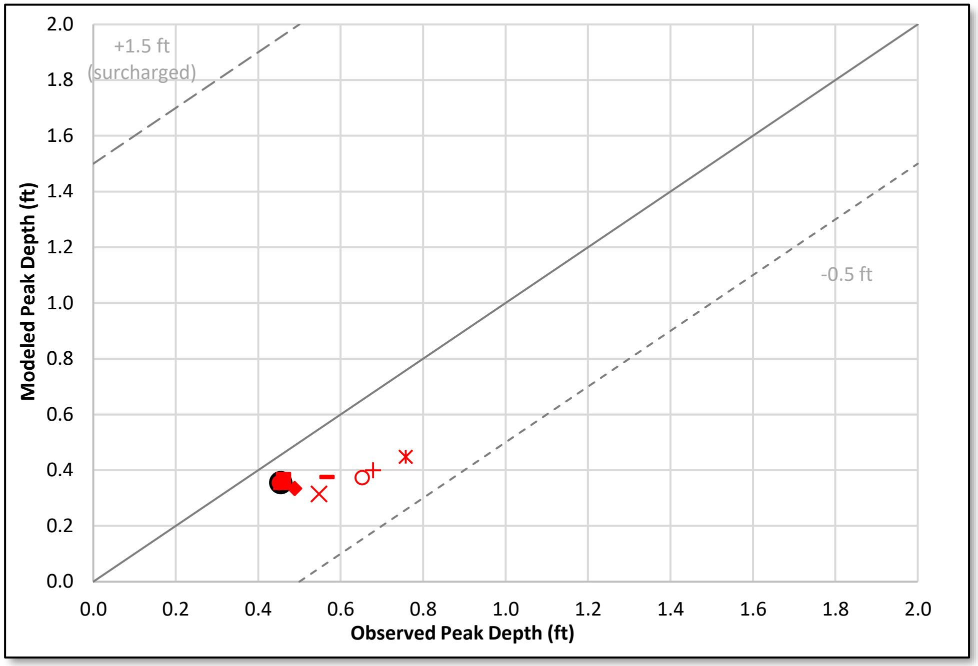
Events:

① 11/12/18
② 12/1/18
③ 12/8/18
④ 12/14/18

⑤ 12/20/18
⑥ 12/27/18
⑦ 1/19/19
⑧ 1/23/19

⑨ 2/19/19

▨ Excluded Event Due to Data Quality



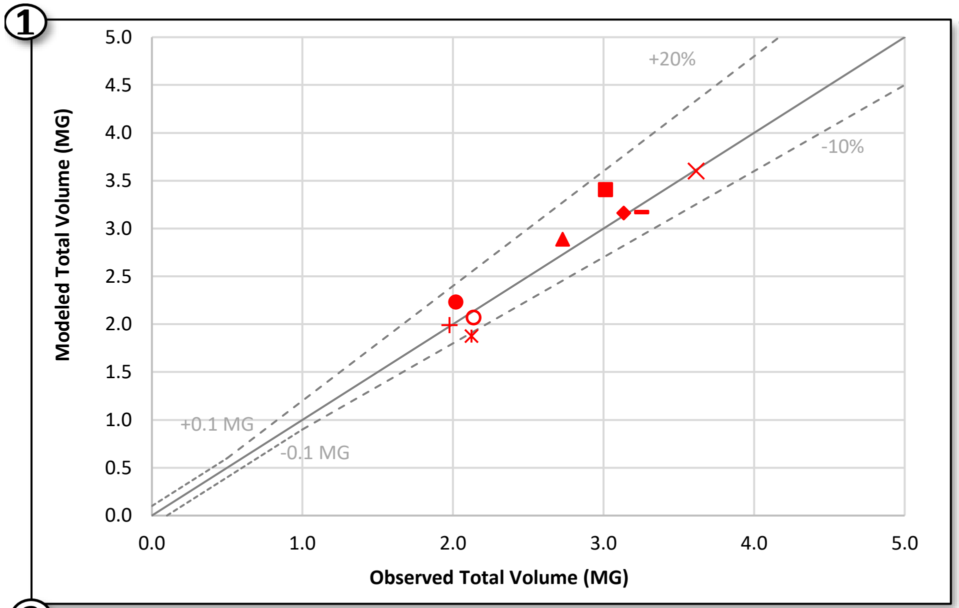
Flow Meter:

PB9

Events:

●	11/12/18	−	12/27/18
■	12/1/18	+	1/19/19
◆	12/8/18	✱	1/23/19
▲	12/14/18	○	2/19/19
×	12/20/18	●	Excluded Event Due to Data Quality

①



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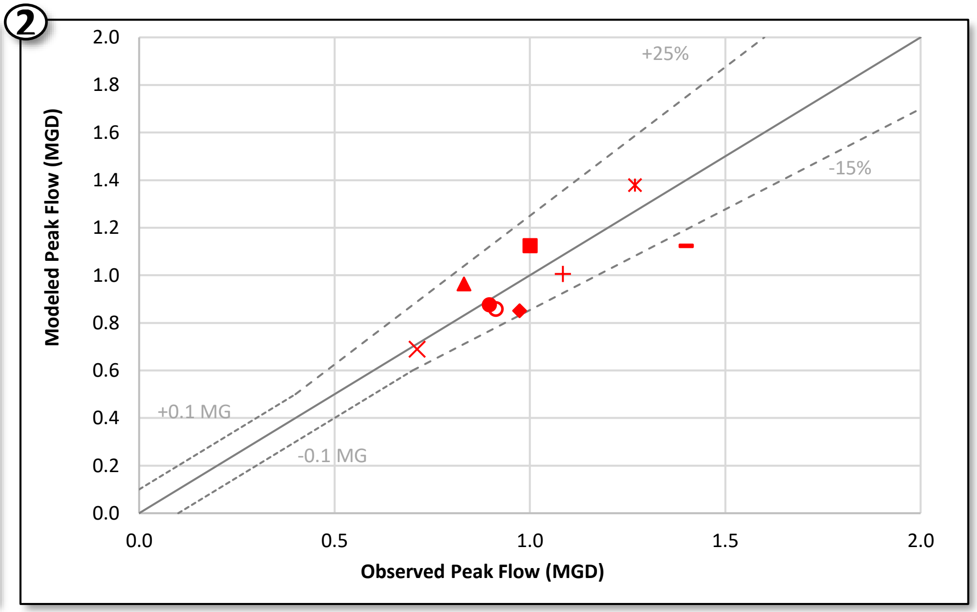

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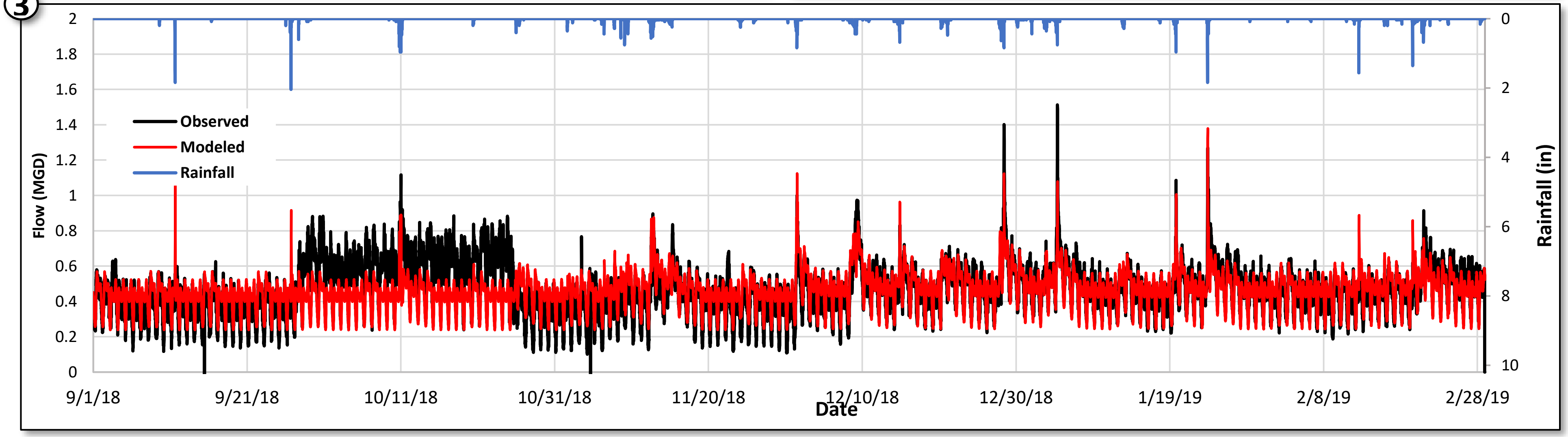


DeKalb Calibration Results

Wet Weather
Flow Summary

Flow Meter:

PB10

Sewershed:
Pole Bridge Creek

Sewer Basin:
Pole Bridge Basin

① Total Event Volume

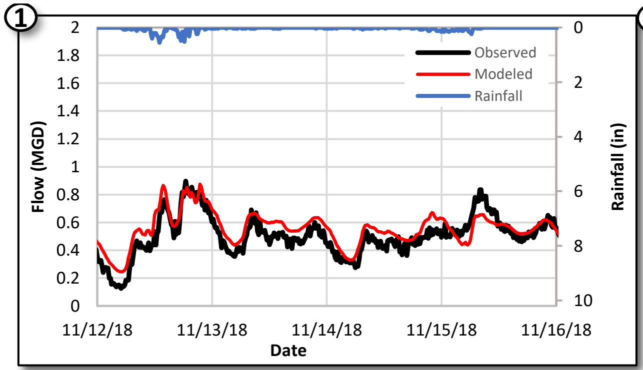
② Peak Event Flow

③ Time Series

Events:

●	11/12/18	−	12/27/18
■	12/1/18	+	1/19/19
◆	12/8/18	✳	1/23/19
▲	12/14/18	○	2/19/19
×	12/20/18	●	Excluded Event Due to Data Quality

①



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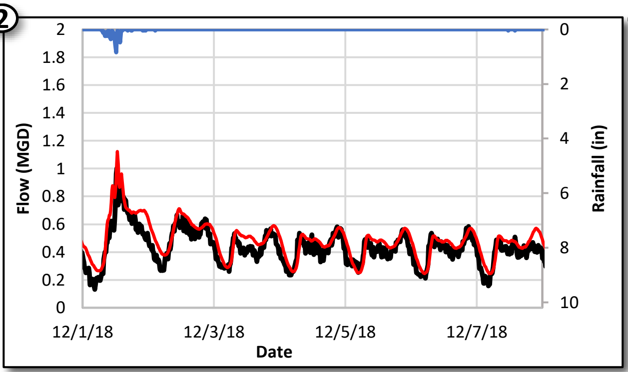

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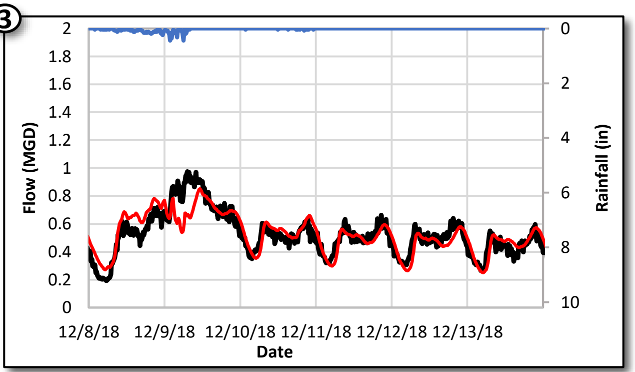

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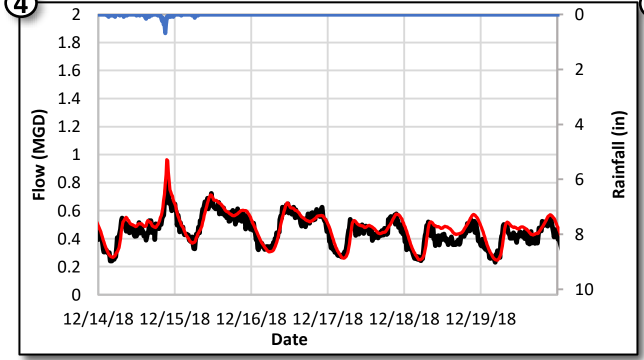

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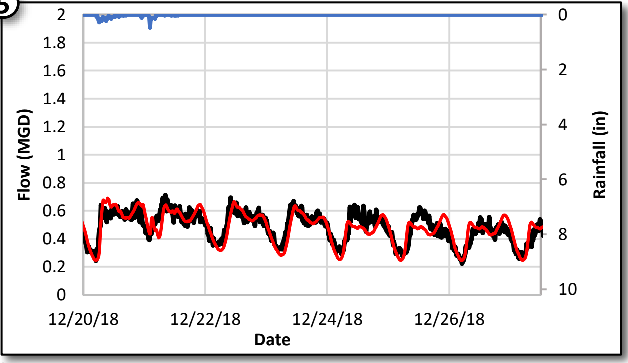

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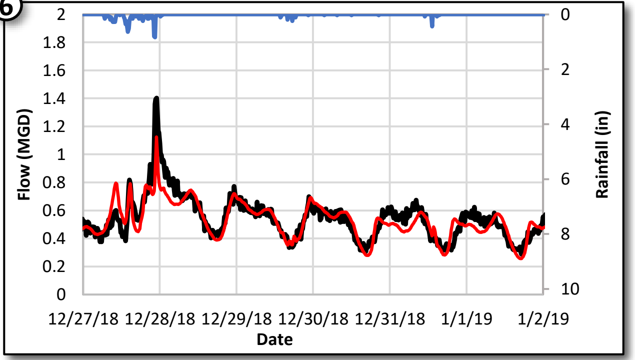

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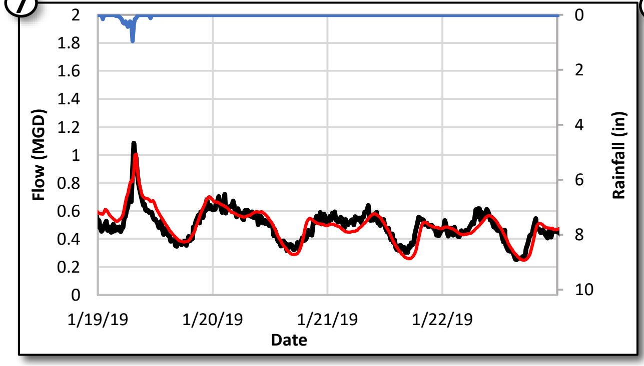

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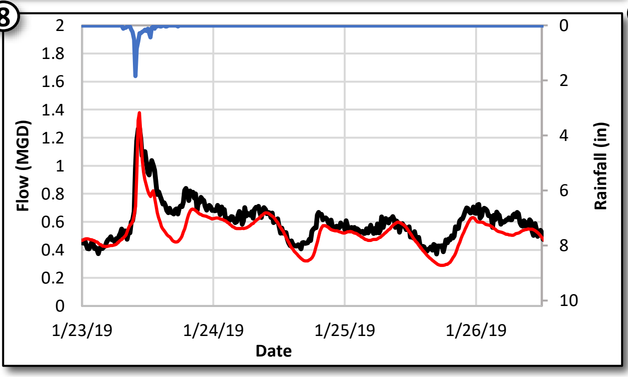

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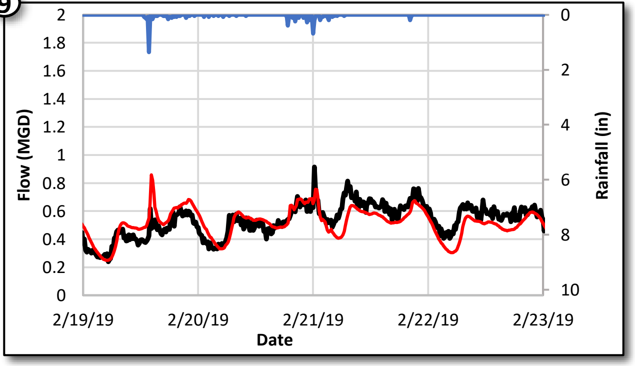


DeKalb Calibration Results

Event Hydrographs

Flow Meter:

PB10

Sewershed:

Pole Bridge Creek

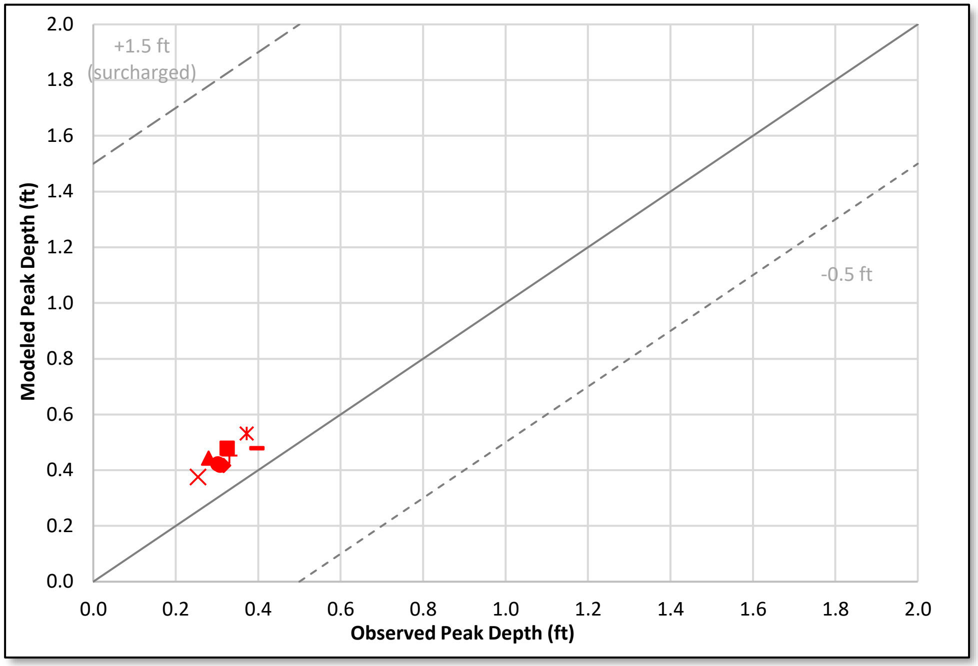
Sewer Basin:

Pole Bridge Basin

Events:

① 11/12/18
② 12/1/18
③ 12/8/18
④ 12/14/18
⑤ 12/20/18
⑥ 12/27/18
⑦ 1/19/19
⑧ 1/23/19
⑨ 2/19/19

▨ Excluded Event Due to Data Quality



Flow Meter:

PB10

Events:

● 11/12/18

■ 12/1/18

◆ 12/8/18

▲ 12/14/18

× 12/20/18

— 12/27/18

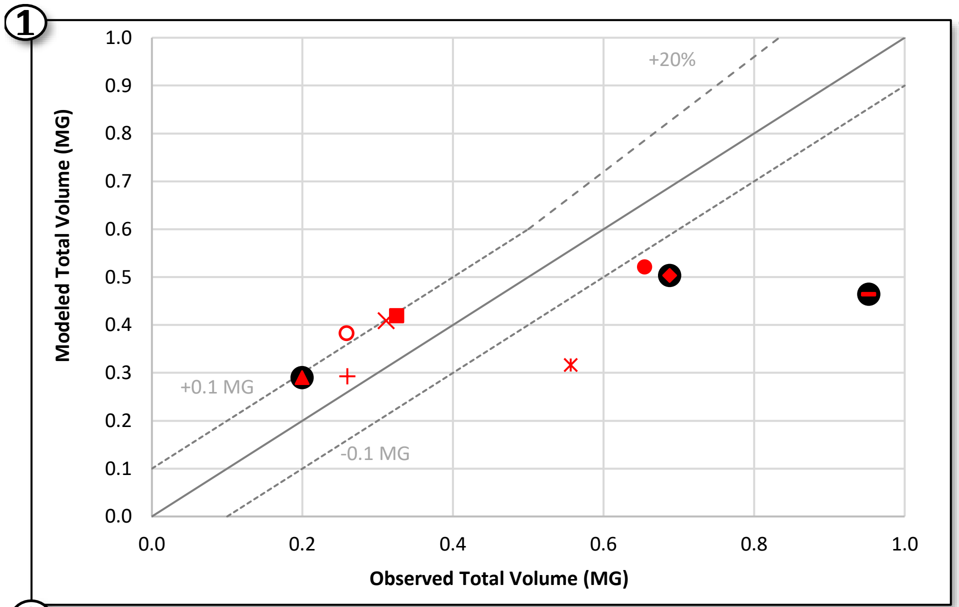
+ 1/19/19

✱ 1/23/19

○ 2/19/19

● Excluded Event Due to Data Quality

①



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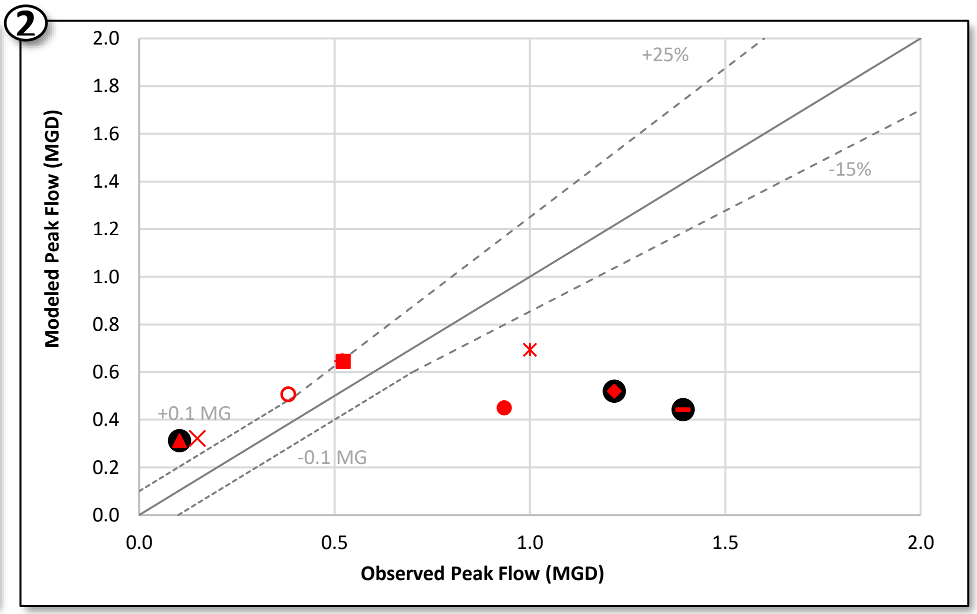

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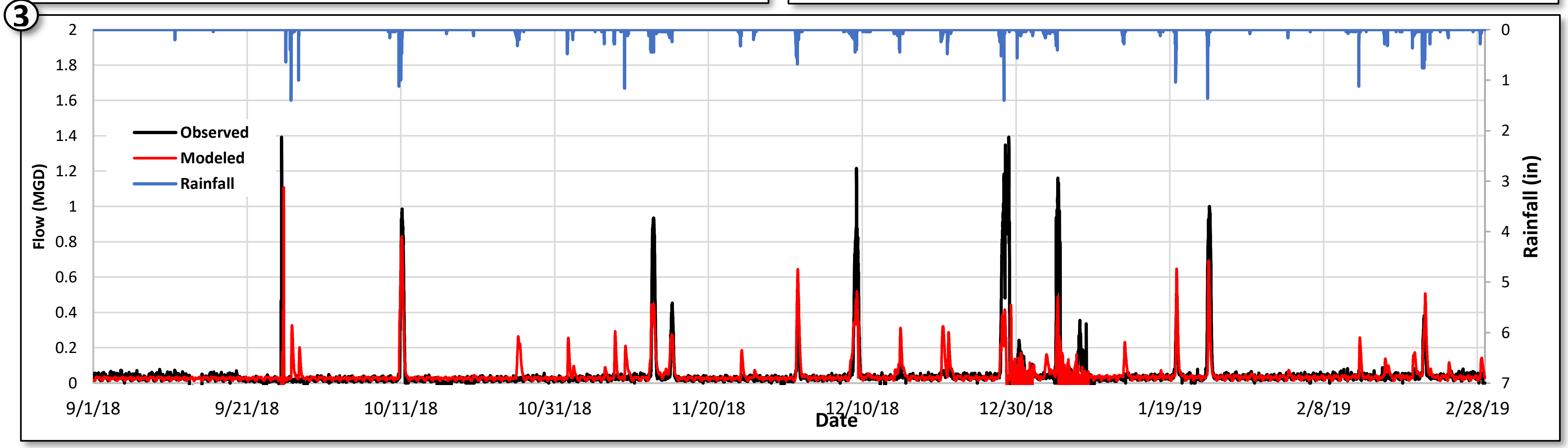


DeKalb Calibration Results

Wet Weather
Flow Summary

Flow Meter:
PBPLNT1

Sewershed:
Pole Bridge Creek

Sewer Basin:
Pole Bridge Basin

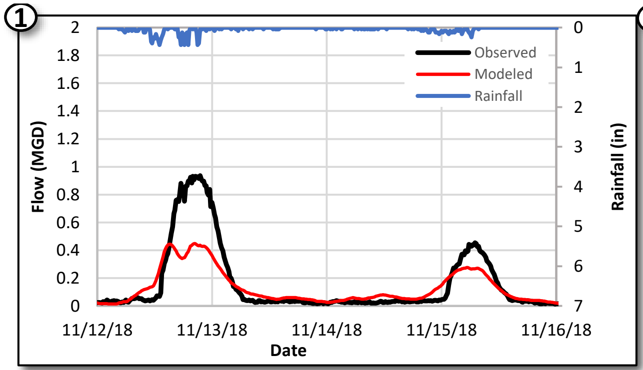
① Total Event Volume

② Peak Event Flow

③ Time Series

Events:

●	11/12/18	—	12/27/18
■	12/1/18	+	1/19/19
◆	12/8/18	✳	1/23/19
▲	12/14/18	○	2/19/19
×	12/20/18	●	Excluded Event Due to Data Quality

①


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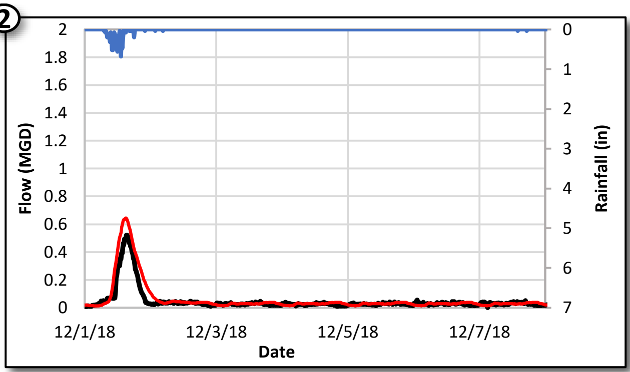

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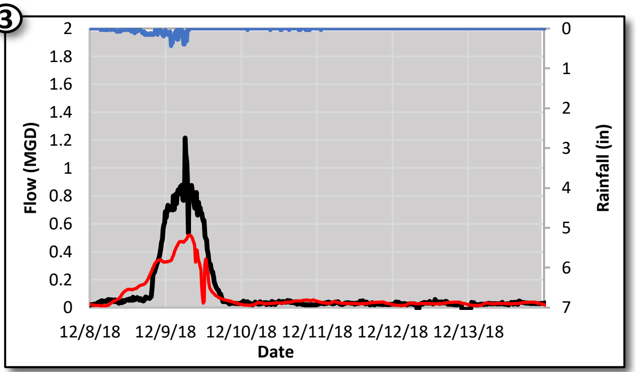

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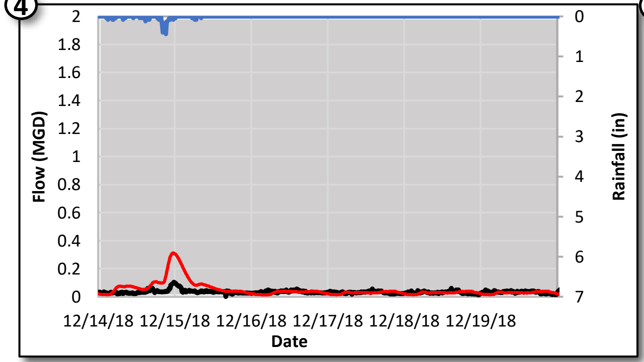

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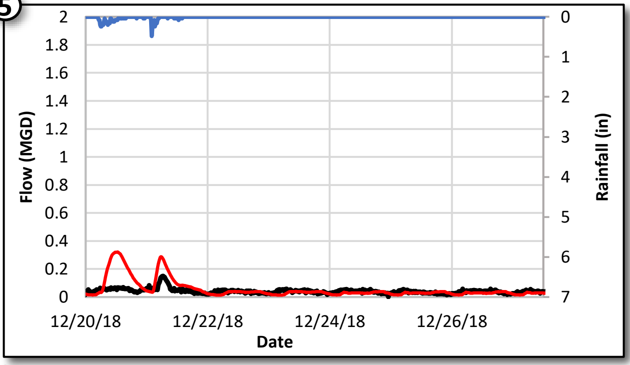

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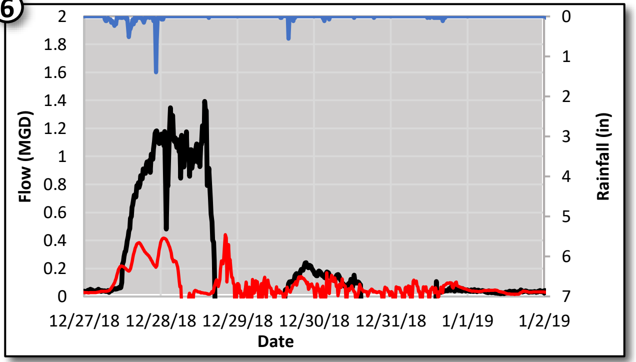

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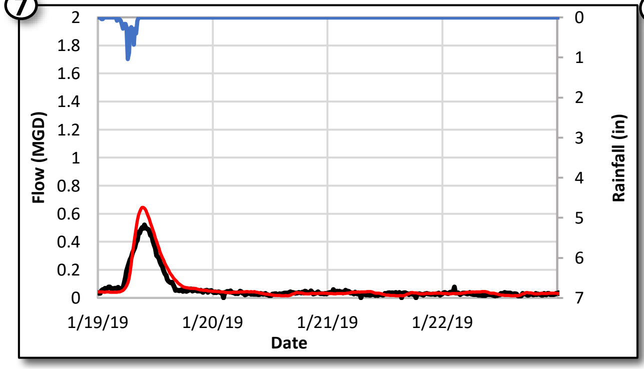

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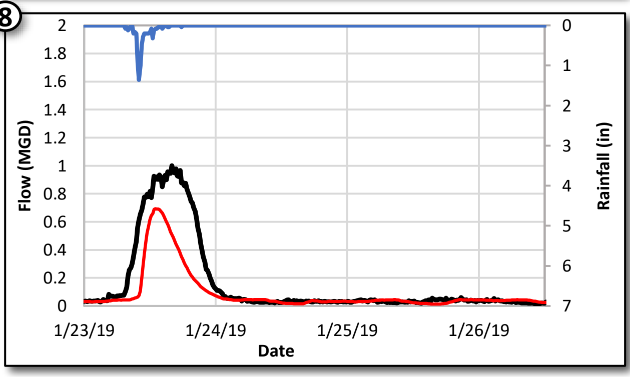

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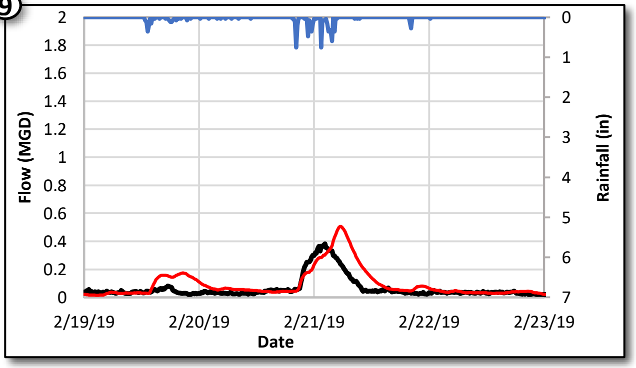


DeKalb Calibration Results

Event Hydrographs

Flow Meter:

PBPLNT1

Sewershed:

Pole Bridge Creek

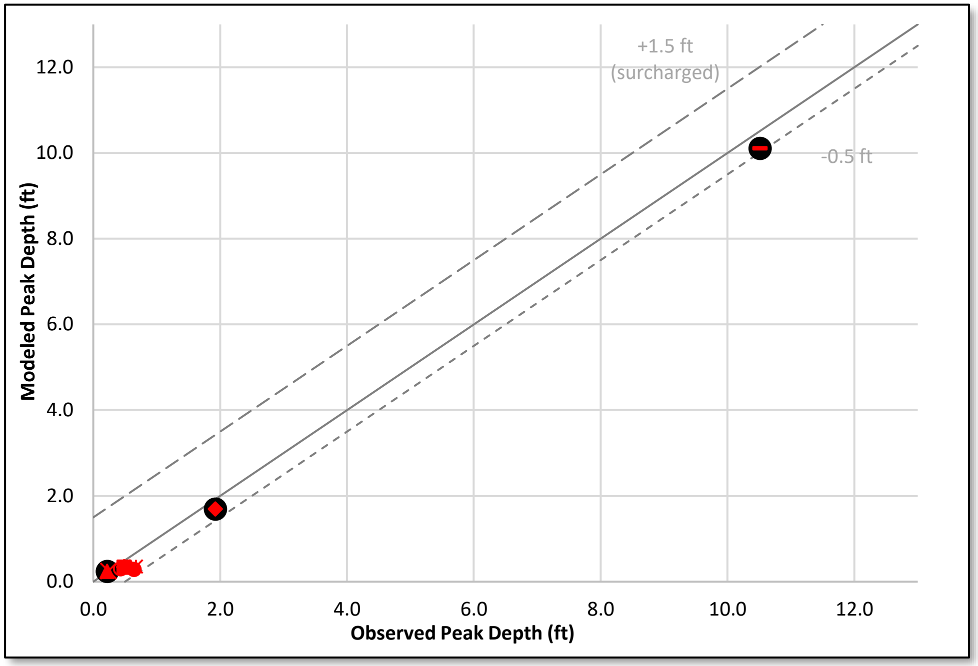
Sewer Basin:

Pole Bridge Basin

Events:

①	11/12/18
②	12/1/18
③	12/8/18
④	12/14/18
⑤	12/20/18
⑥	12/27/18
⑦	1/19/19
⑧	1/23/19
⑨	2/19/19

▨ Excluded Event Due to Data Quality



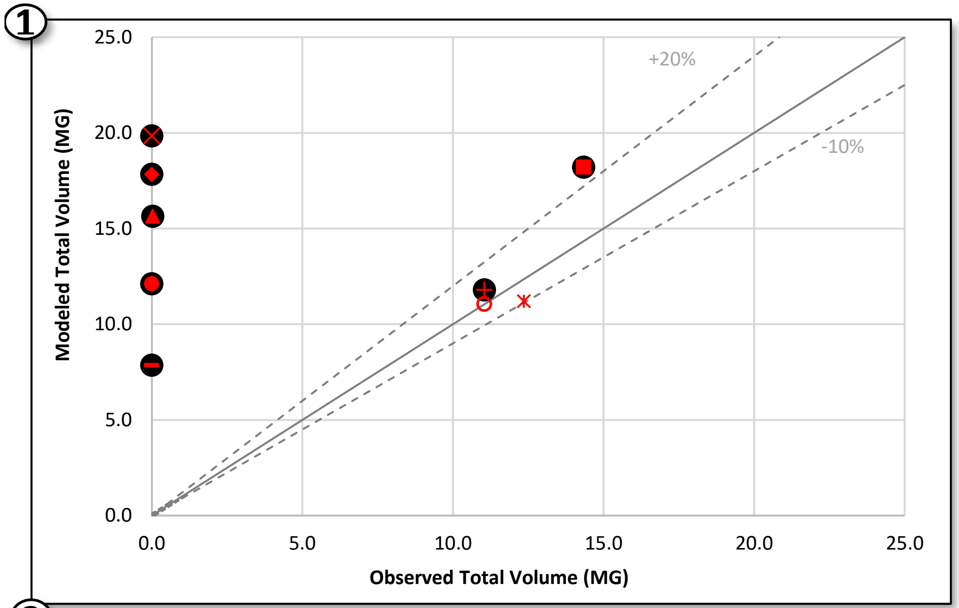
Flow Meter:

PBPLNT1

Events:

●	11/12/18	—	12/27/18
■	12/1/18	+	1/19/19
◆	12/8/18	✳	1/23/19
▲	12/14/18	○	2/19/19
×	12/20/18	⬤	Excluded Event Due to Data Quality

①



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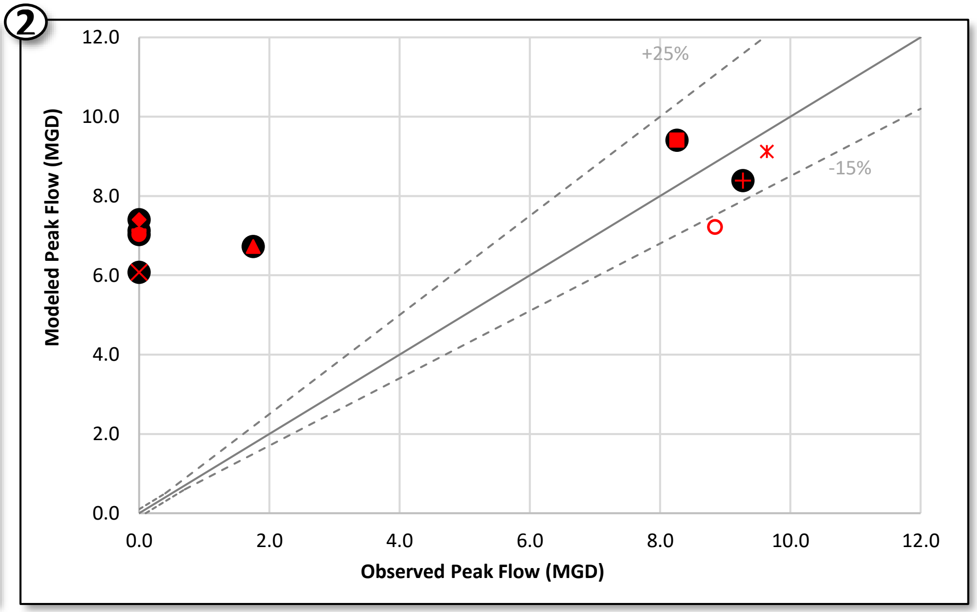

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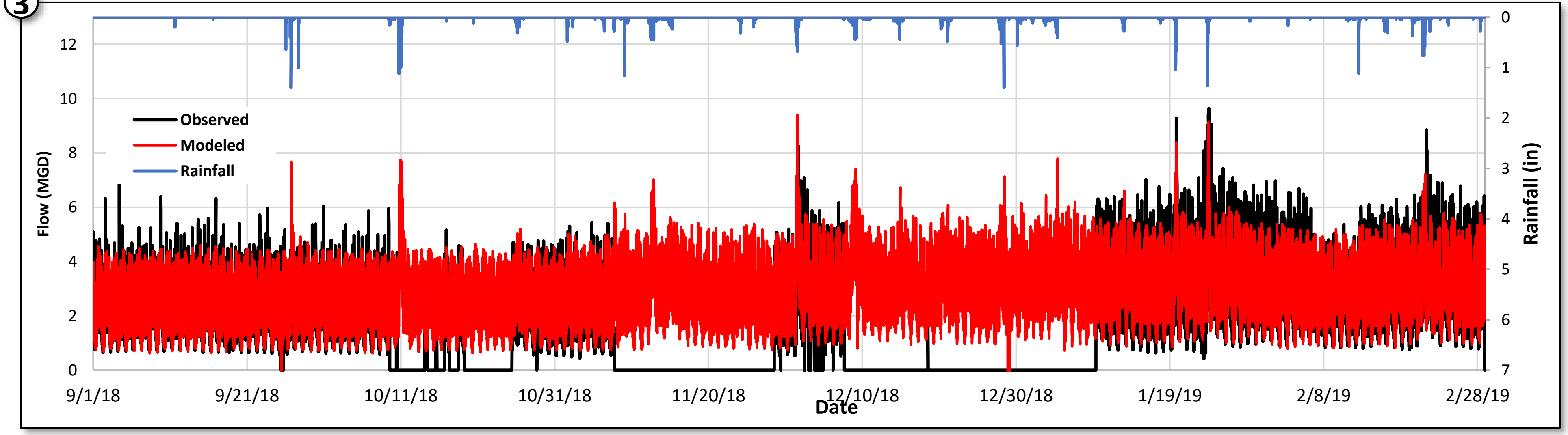


DeKalb Calibration Results

Wet Weather
Flow Summary

Flow Meter:

PBPLNT2

Sewershed:
Pole Bridge Creek

Sewer Basin:
Pole Bridge Basin

① Total Event Volume

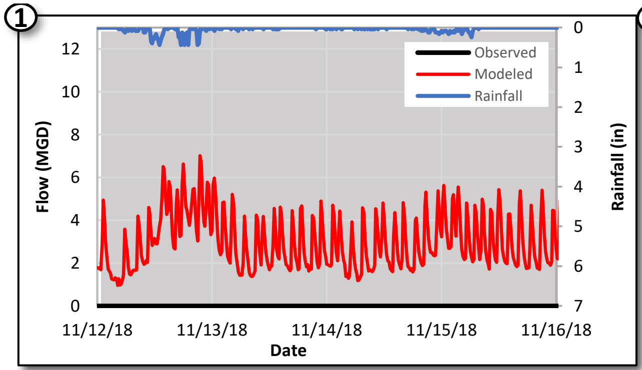
② Peak Event Flow

③ Time Series

Events:

● 11/12/18
■ 12/1/18
◆ 12/8/18
▲ 12/14/18
× 12/20/18
— 12/27/18
+ 1/19/19
✳ 1/23/19
○ 2/19/19
● Excluded Event Due to Data Quality

①



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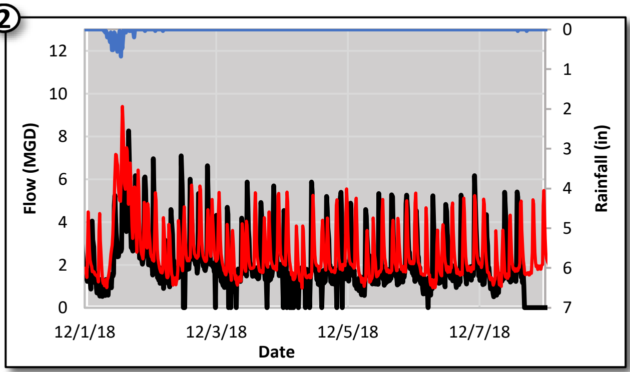

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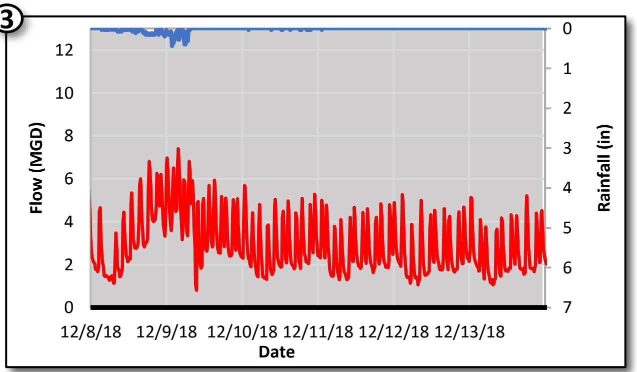

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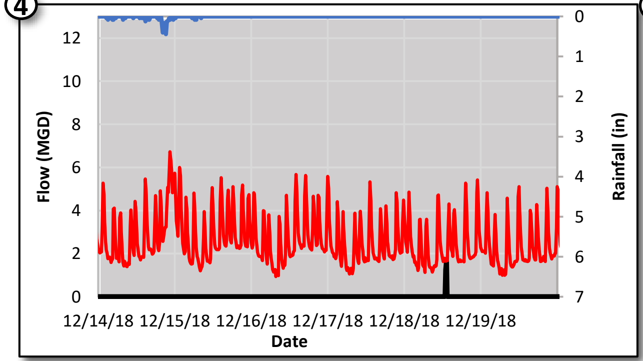

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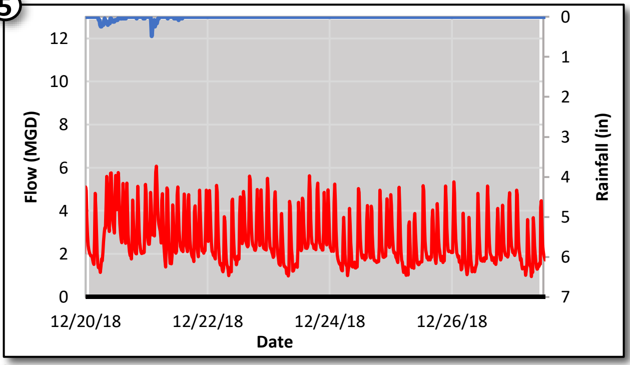

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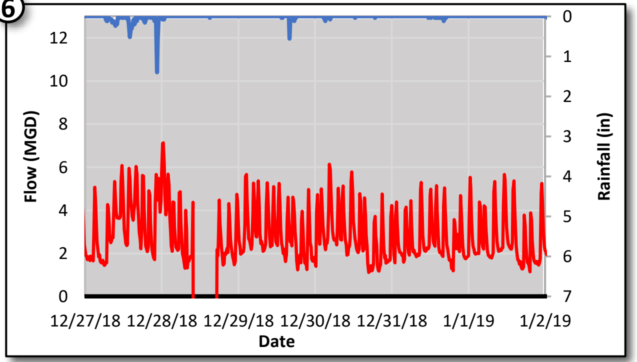

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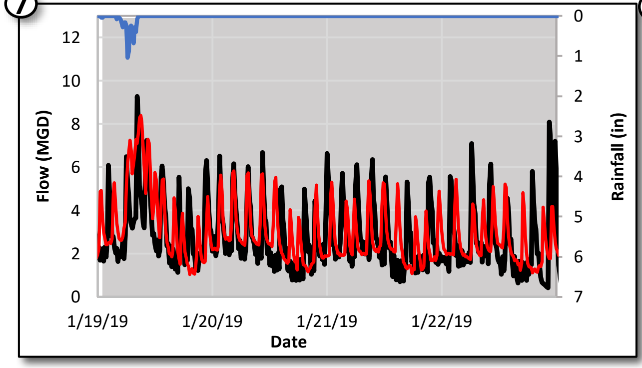

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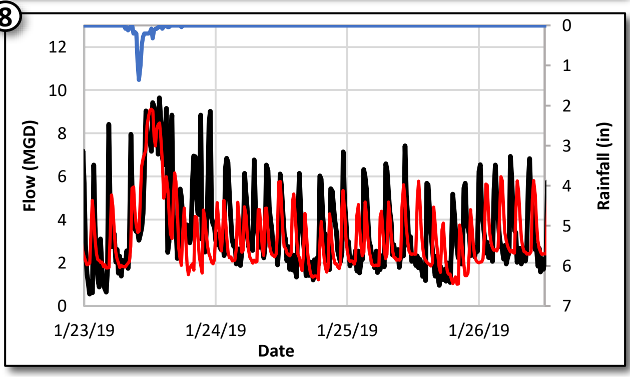

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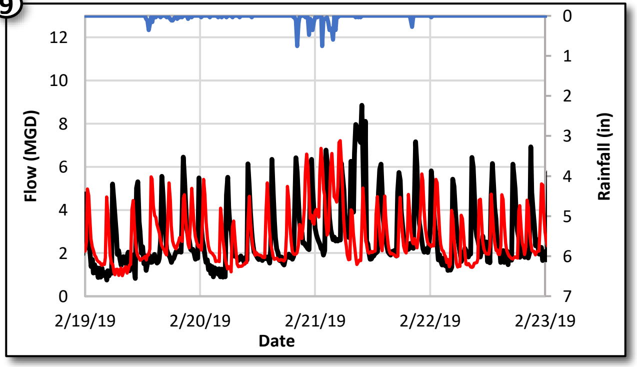


DeKalb Calibration Results

Event Hydrographs

Flow Meter:

PBPLNT2

Sewershed:

Pole Bridge Creek

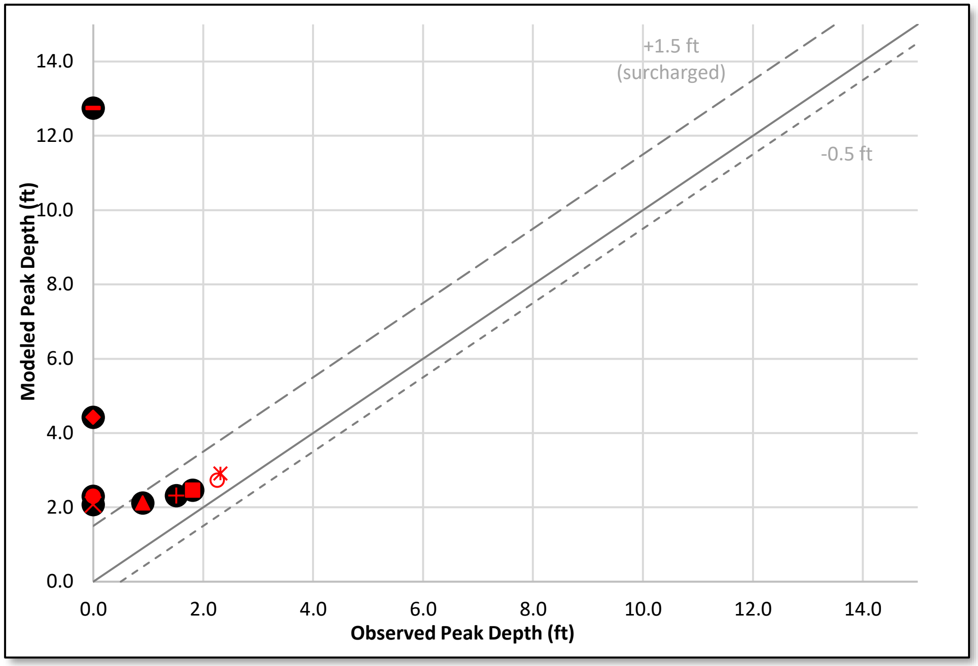
Sewer Basin:

Pole Bridge Basin

Events:

① 11/12/18
② 12/1/18
③ 12/8/18
④ 12/14/18
⑤ 12/20/18
⑥ 12/27/18
⑦ 1/19/19
⑧ 1/23/19
⑨ 2/19/19

▨ Excluded Event Due to Data Quality



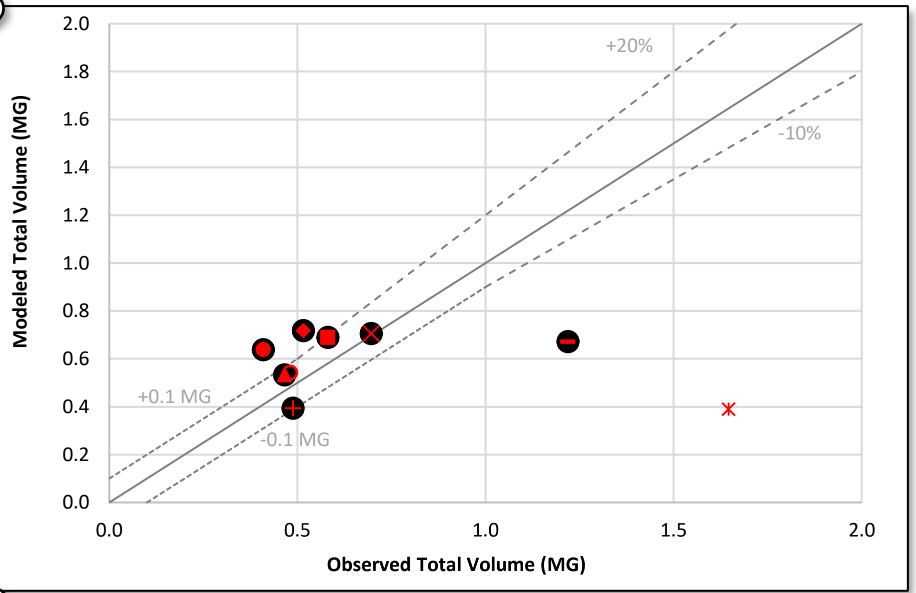
Flow Meter:

PBPLNT2

Events:

● 11/12/18
■ 12/1/18
◆ 12/8/18
▲ 12/14/18
× 12/20/18
– 12/27/18
+ 1/19/19
✳ 1/23/19
○ 2/19/19
● Excluded Event Due to Data Quality

①



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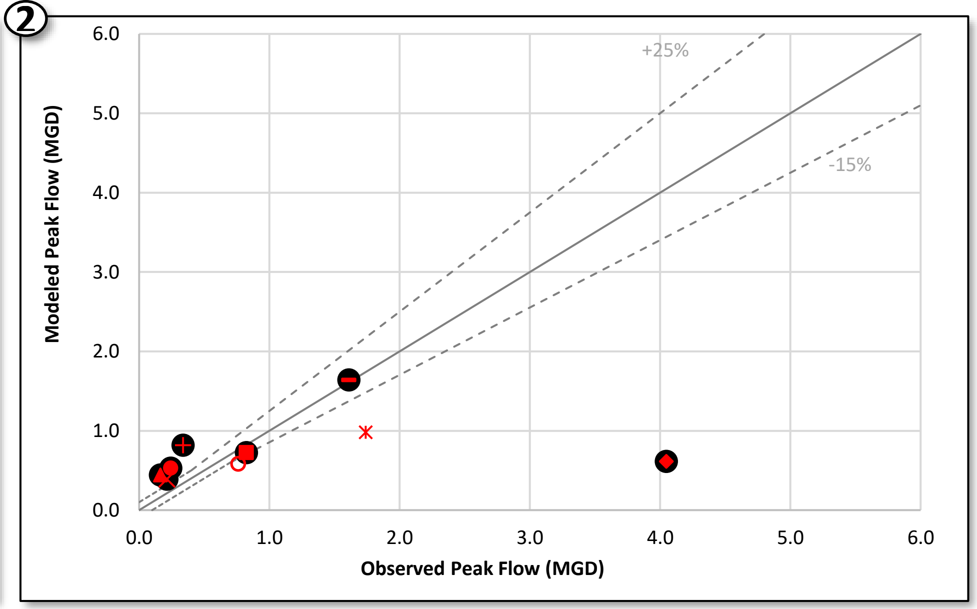

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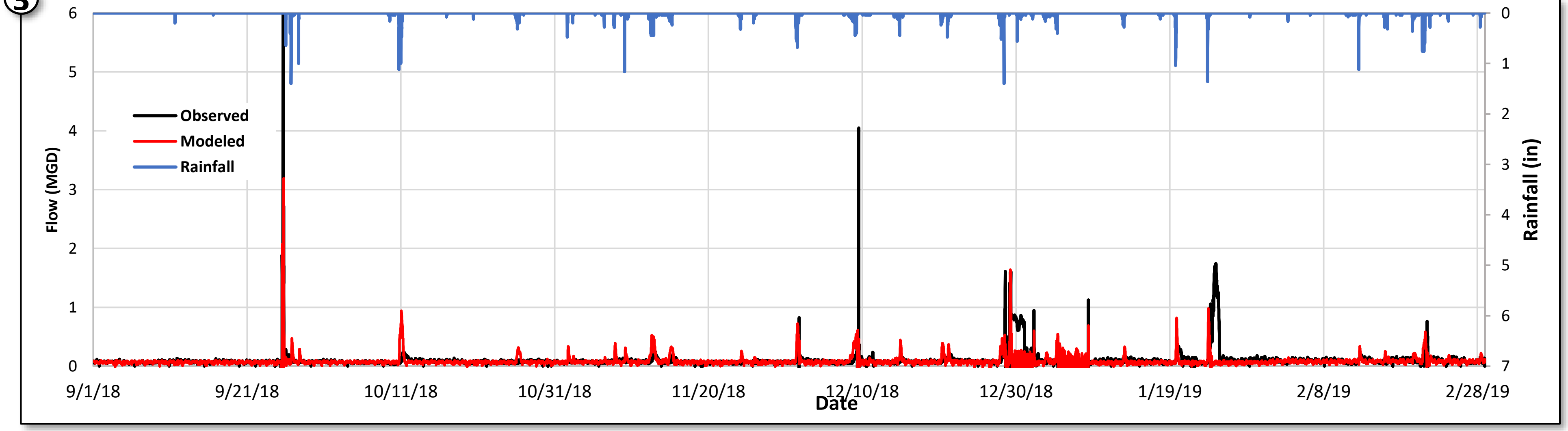


DeKalb Calibration Results

Wet Weather
Flow Summary

Flow Meter:

PBPLNT3

Sewershed:
Pole Bridge Creek

Sewer Basin:
Pole Bridge Basin

① Total Event Volume

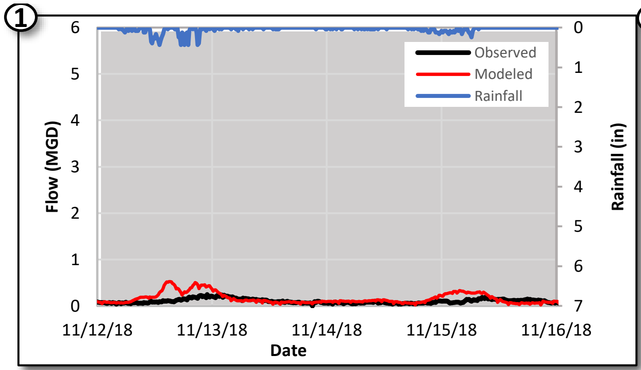
② Peak Event Flow

③ Time Series

Events:

●	11/12/18	−	12/27/18
■	12/1/18	+	1/19/19
◆	12/8/18	✳	1/23/19
▲	12/14/18	○	2/19/19
×	12/20/18	⬤	Excluded Event Due to Data Quality

①



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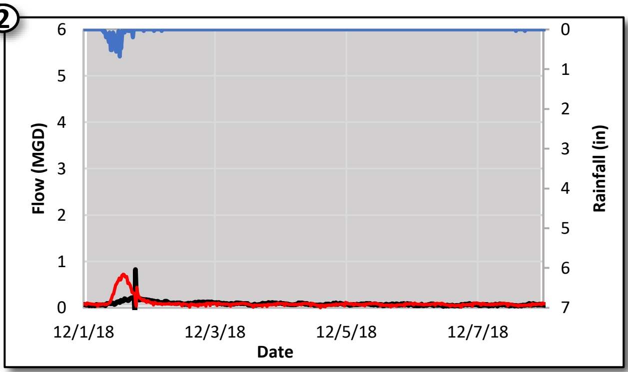

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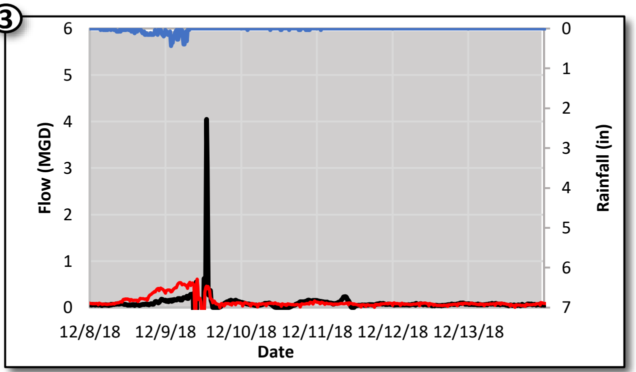

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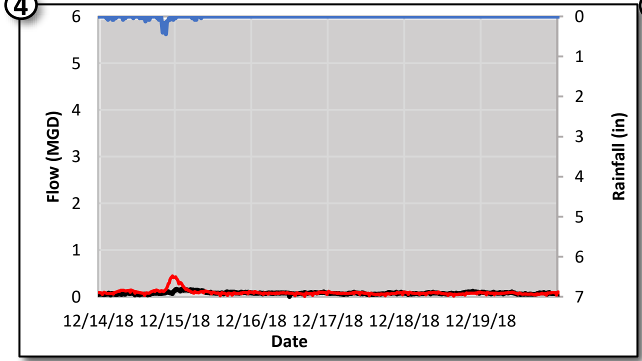

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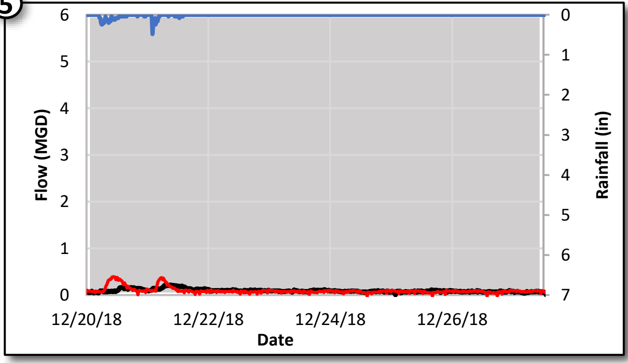

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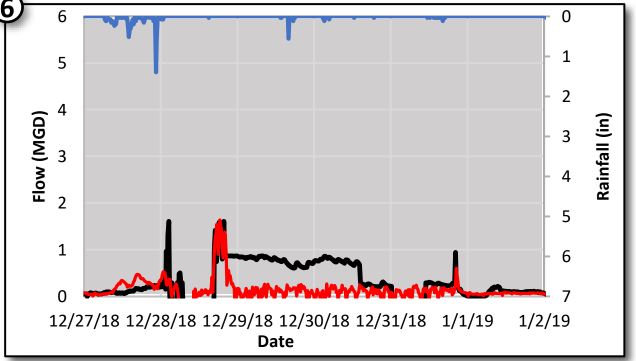

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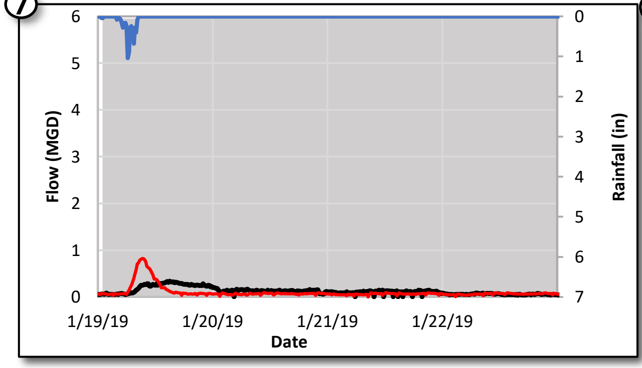

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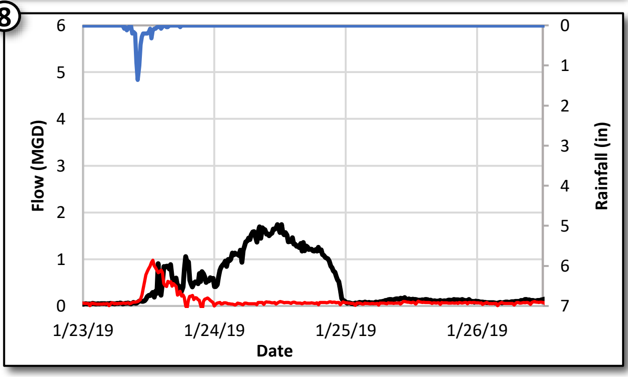

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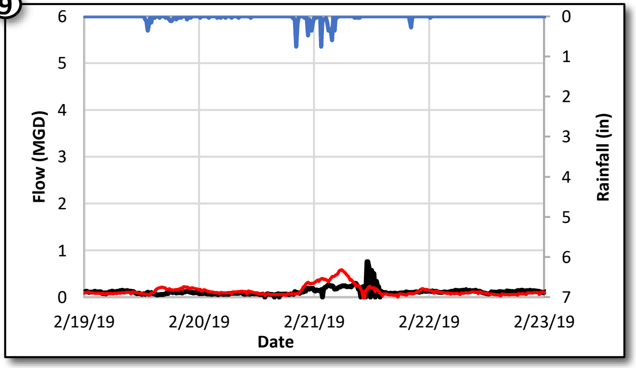


DeKalb Calibration Results

Event Hydrographs

Flow Meter:

PBPLNT3

Sewershed:

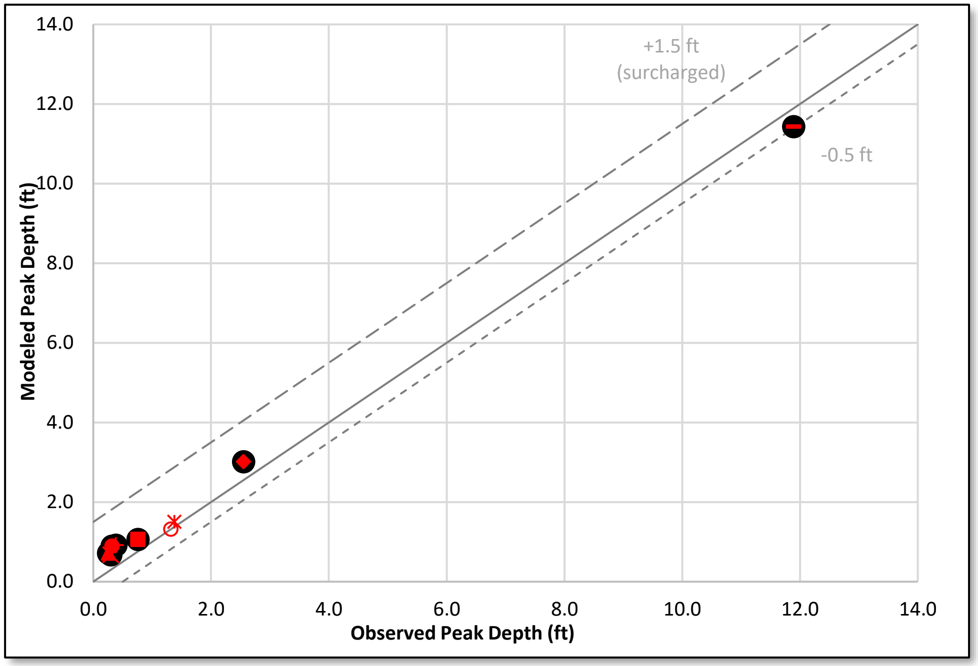
Pole Bridge Creek

Sewer Basin:

Pole Bridge Basin

Events:

①	11/12/18	⑤	12/20/18	⑨	2/19/19
②	12/1/18	⑥	12/27/18	▨	Excluded Event Due to Data Quality
③	12/8/18	⑦	1/19/19		
④	12/14/18	⑧	1/23/19		



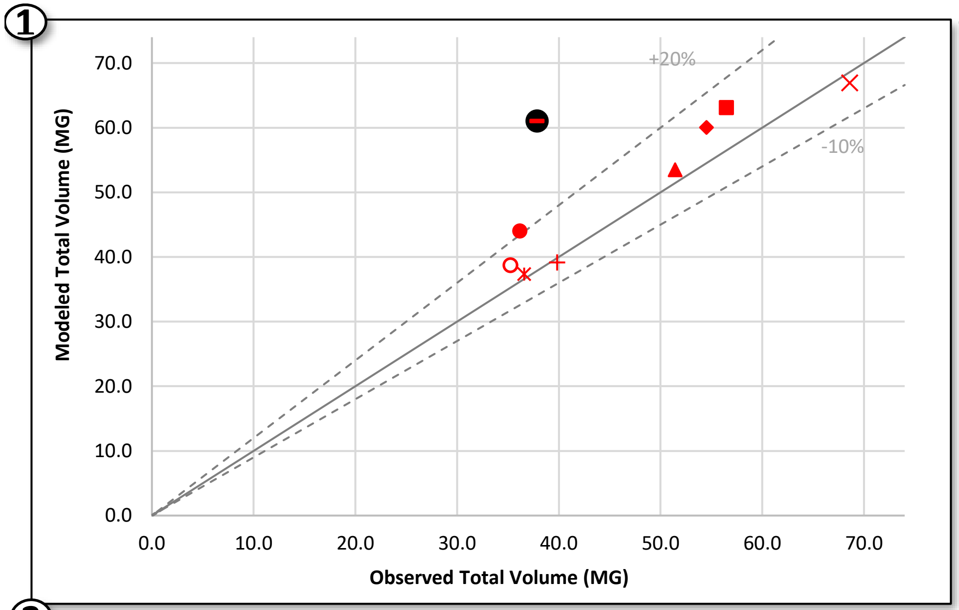
Flow Meter:

PBPLNT3

Events:

●	11/12/18	—	12/27/18
■	12/1/18	+	1/19/19
◆	12/8/18	✱	1/23/19
▲	12/14/18	○	2/19/19
×	12/20/18	●	Excluded Event Due to Data Quality

①



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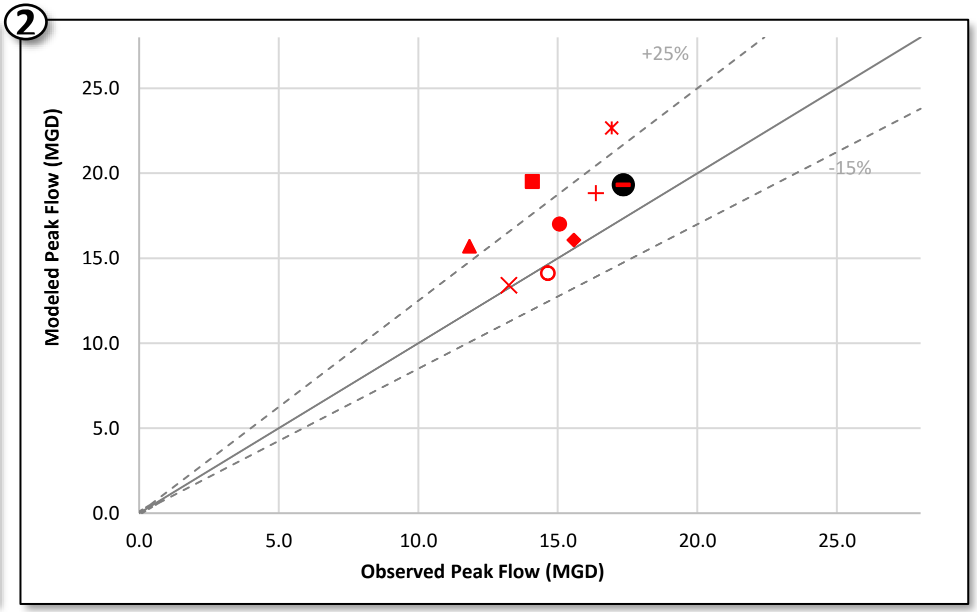

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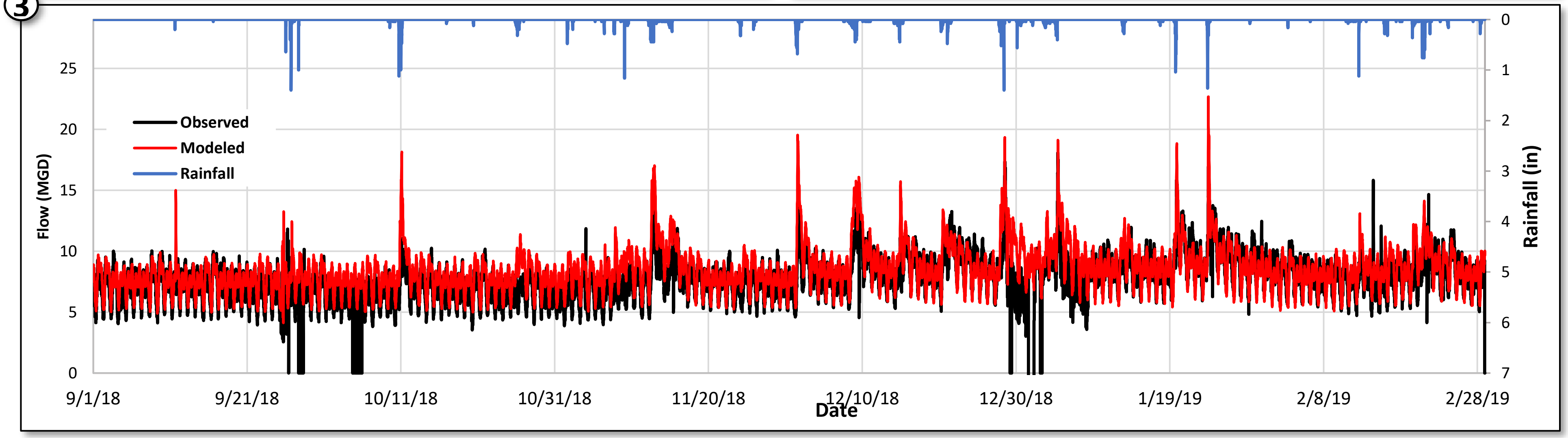


DeKalb Calibration Results

Wet Weather
Flow Summary

Flow Meter:

PBPLNT4

Sewershed:
Pole Bridge Creek

Sewer Basin:
Pole Bridge Basin

① Total Event Volume

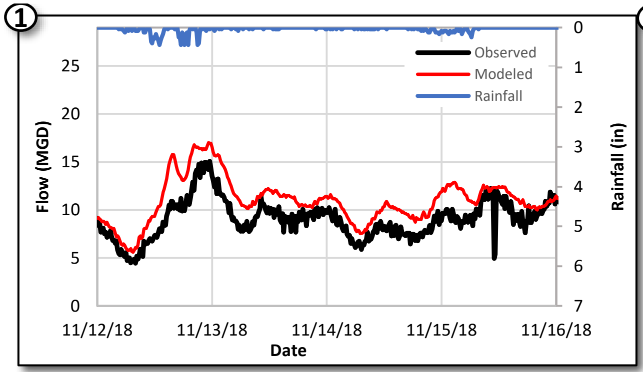
② Peak Event Flow

③ Time Series

Events:

●	11/12/18	—	12/27/18
■	12/1/18	+	1/19/19
◆	12/8/18	✳	1/23/19
▲	12/14/18	○	2/19/19
×	12/20/18	●	Excluded Event Due to Data Quality

①



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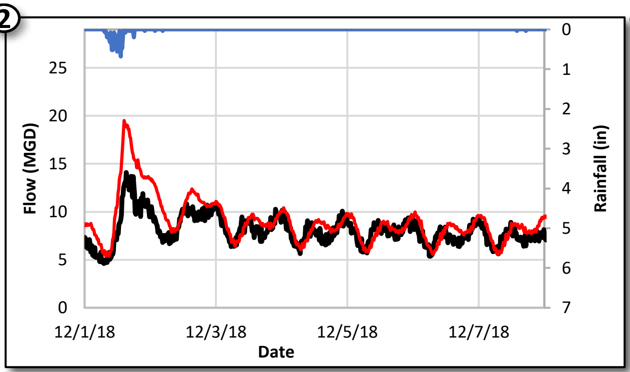

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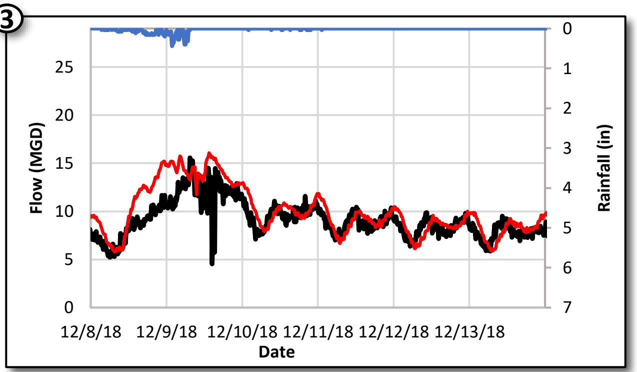

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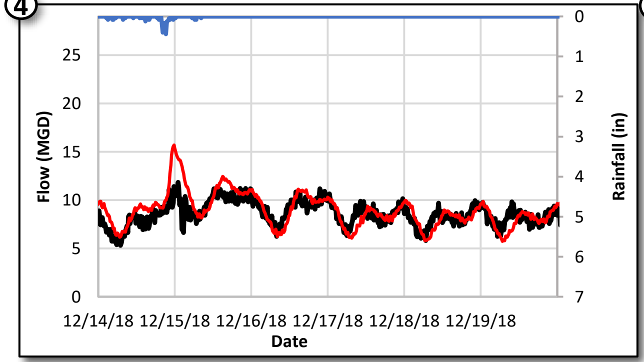

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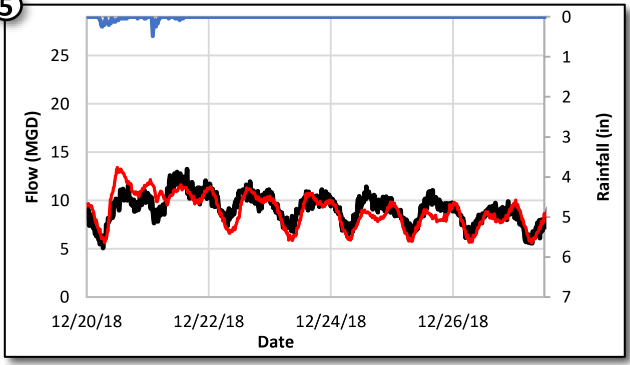

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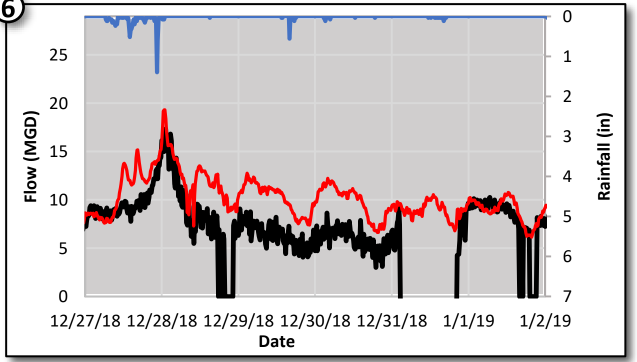

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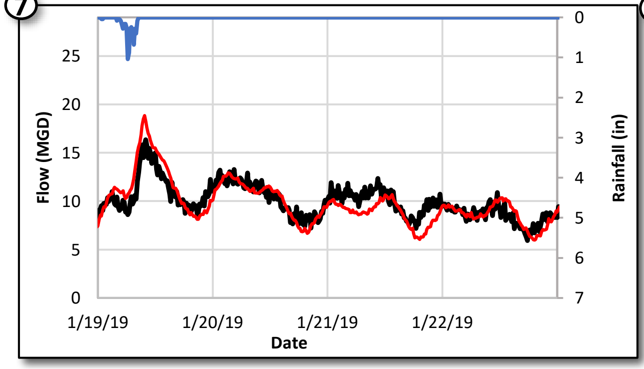

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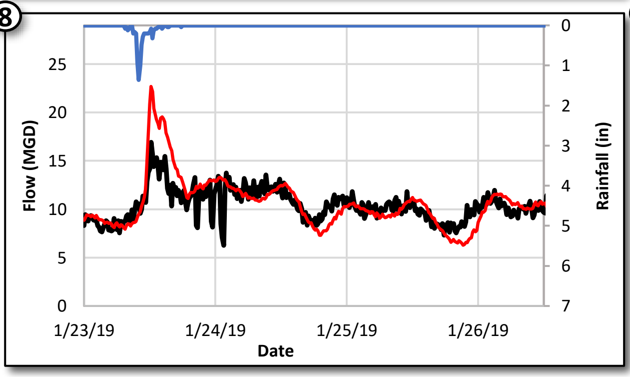

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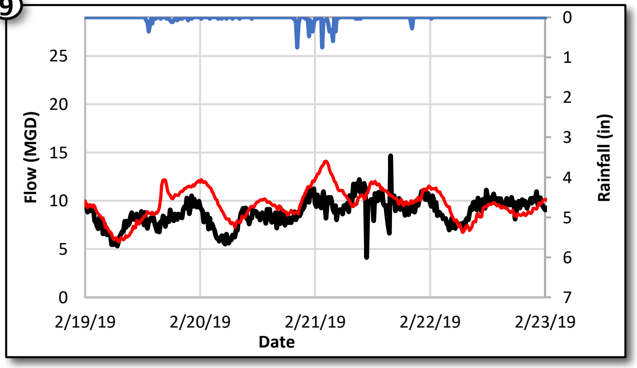


DeKalb Calibration Results

Event Hydrographs

Flow Meter:

PBPLNT4

Sewershed:

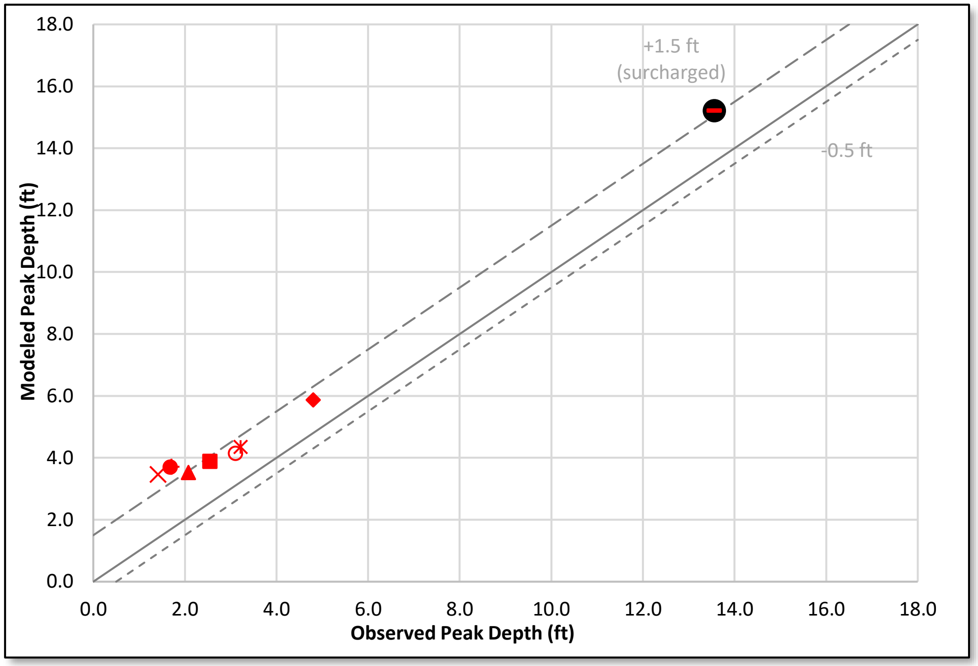
Pole Bridge Creek

Sewer Basin:

Pole Bridge Basin

Events:

① 11/12/18
② 12/1/18
③ 12/8/18
④ 12/14/18
⑤ 12/20/18
⑥ 12/27/18
⑦ 1/19/19
⑧ 1/23/19
⑨ 2/19/19
▨ Excluded Event Due to Data Quality



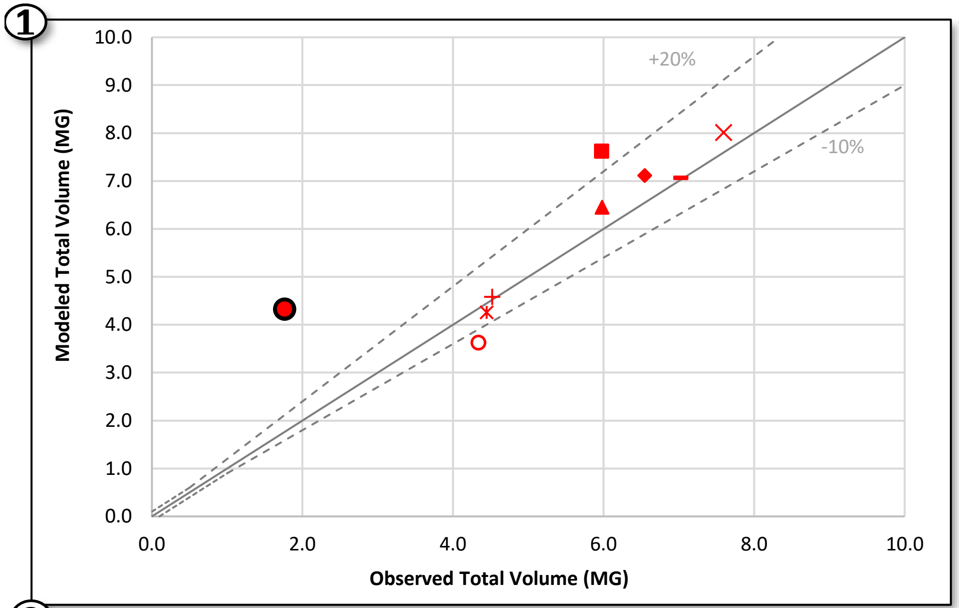
Flow Meter:

PBPLNT4

Events:

●	11/12/18	—	12/27/18
■	12/1/18	+	1/19/19
◆	12/8/18	✳	1/23/19
▲	12/14/18	○	2/19/19
×	12/20/18	●	Excluded Event Due to Data Quality

①



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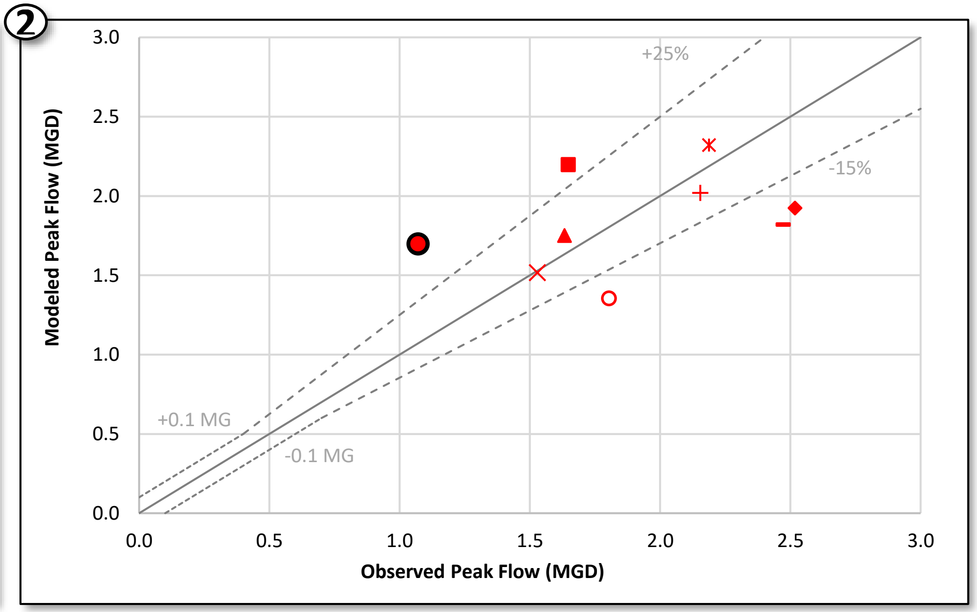

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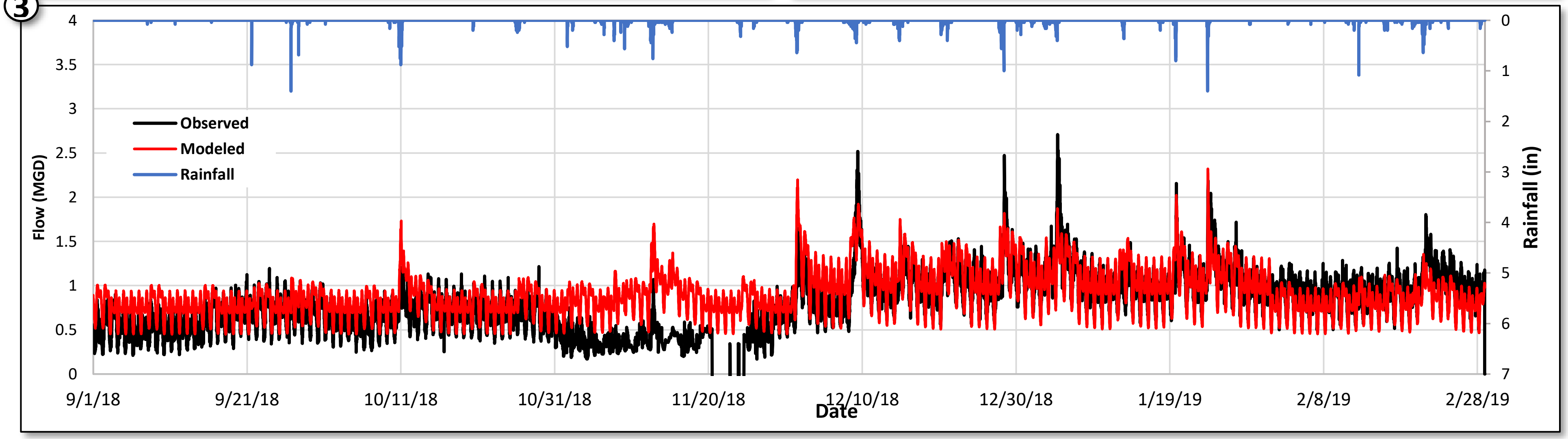


DeKalb Calibration Results

Wet Weather
Flow Summary

Flow Meter:

PBPLNT5

Sewershed:
Pole Bridge Creek

Sewer Basin:
Pole Bridge Basin

① Total Event Volume

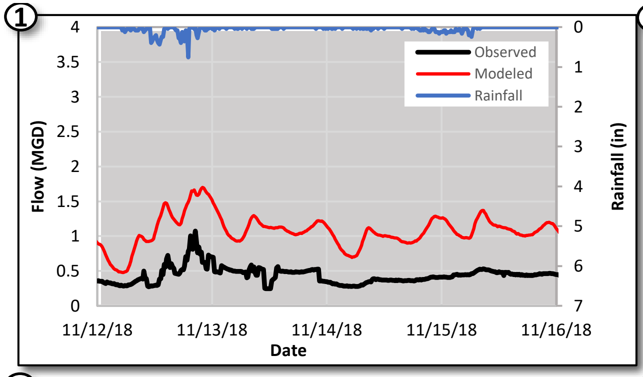
② Peak Event Flow

③ Time Series

Events:

●	11/12/18	−	12/27/18
■	12/1/18	+	1/19/19
◆	12/8/18	✳	1/23/19
▲	12/14/18	○	2/19/19
×	12/20/18	●	Excluded Event Due to Data Quality

①



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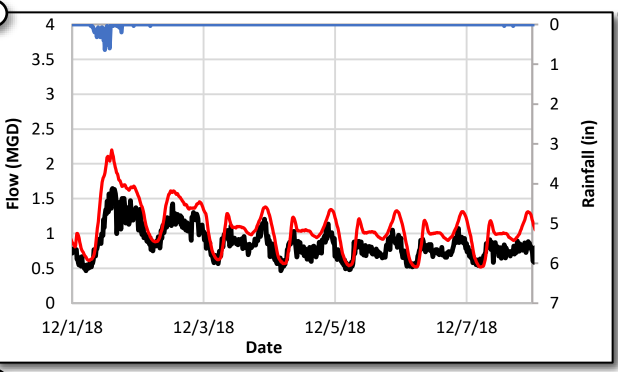

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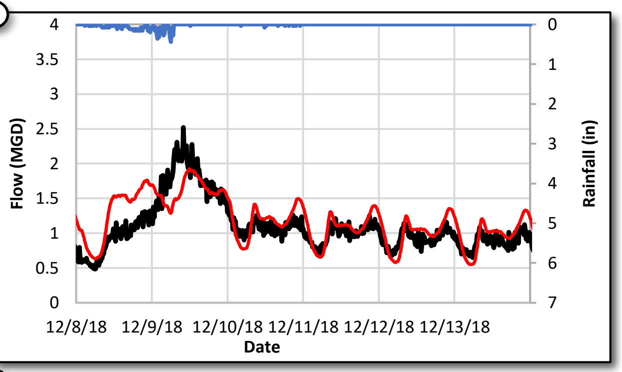

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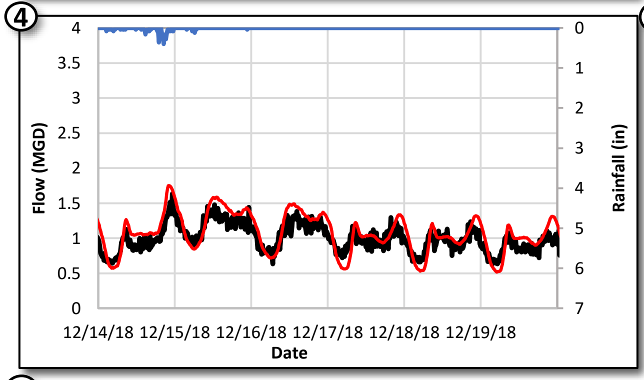

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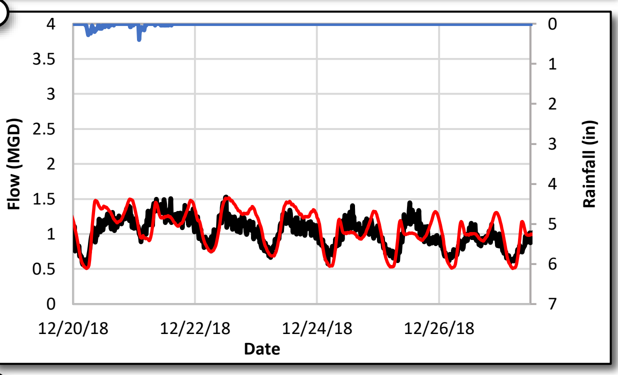

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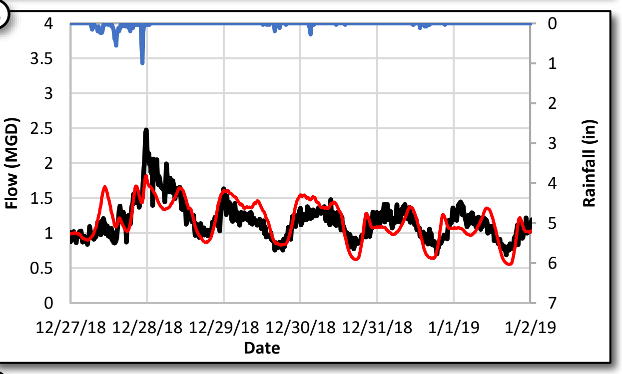

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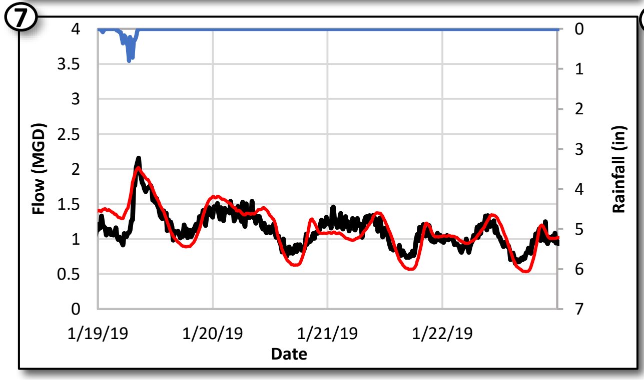

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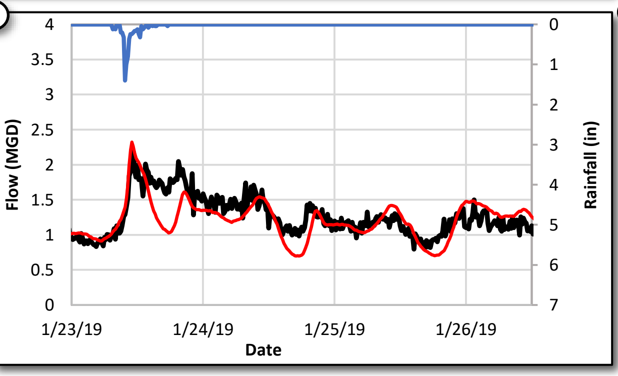

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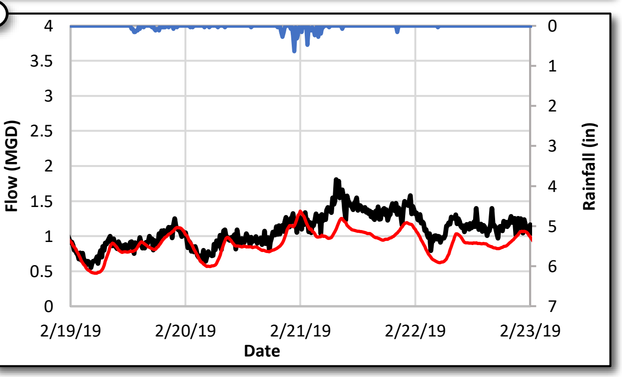


DeKalb Calibration Results

Event Hydrographs

Flow Meter:

PBPLNT5

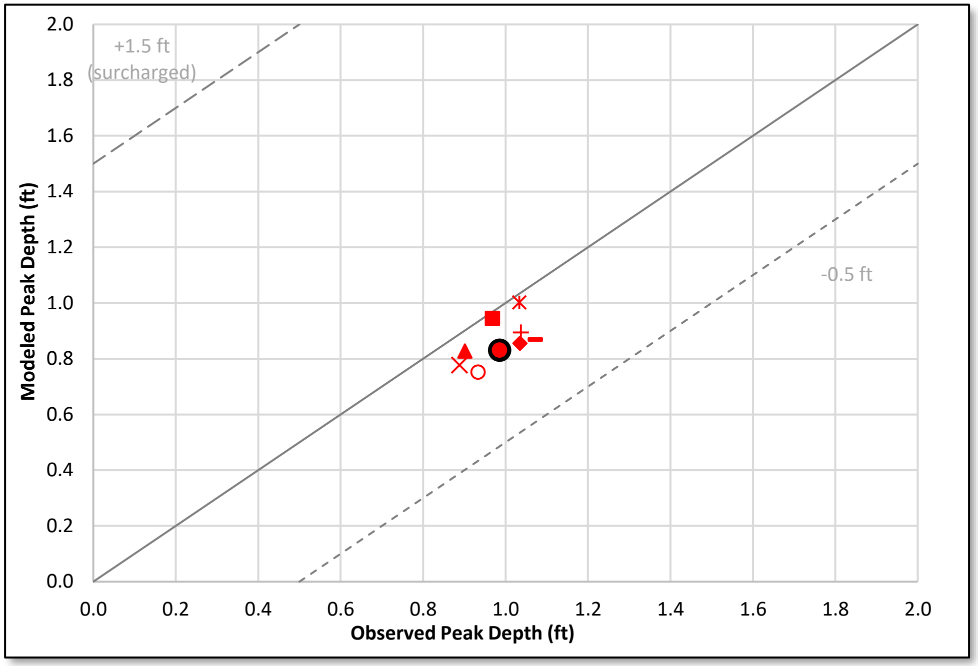
Sewershed:
Pole Bridge Creek

Sewer Basin:
Pole Bridge Basin

Events:

① 11/12/18
② 12/1/18
③ 12/8/18
④ 12/14/18
⑤ 12/20/18
⑥ 12/27/18
⑦ 1/19/19
⑧ 1/23/19
⑨ 2/19/19

▨ Excluded Event Due to Data Quality



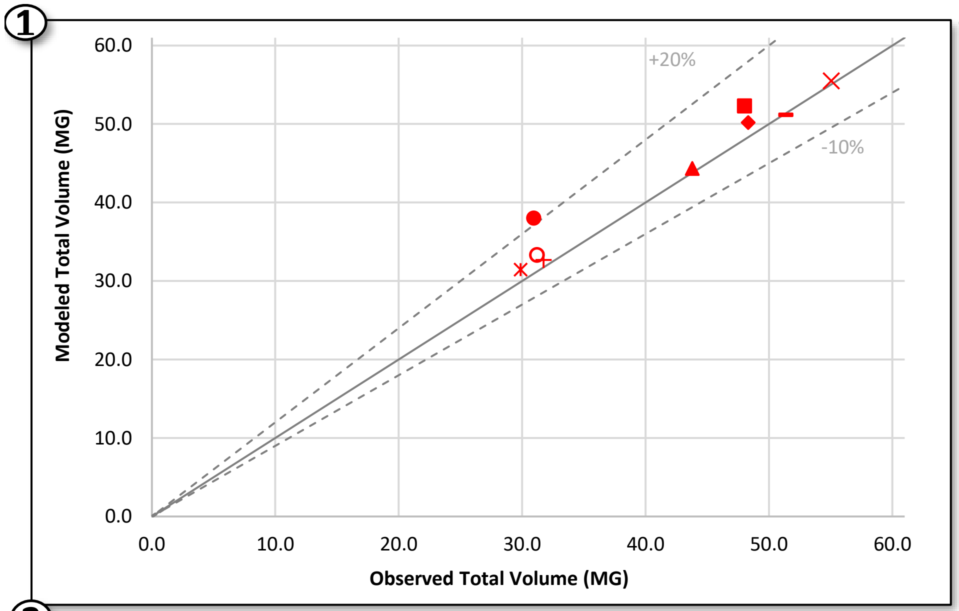
Flow Meter:

PBPLNT5

Events:

●	11/12/18	—	12/27/18
■	12/1/18	+	1/19/19
◆	12/8/18	✳	1/23/19
▲	12/14/18	○	2/19/19
×	12/20/18	●	Excluded Event Due to Data Quality

①



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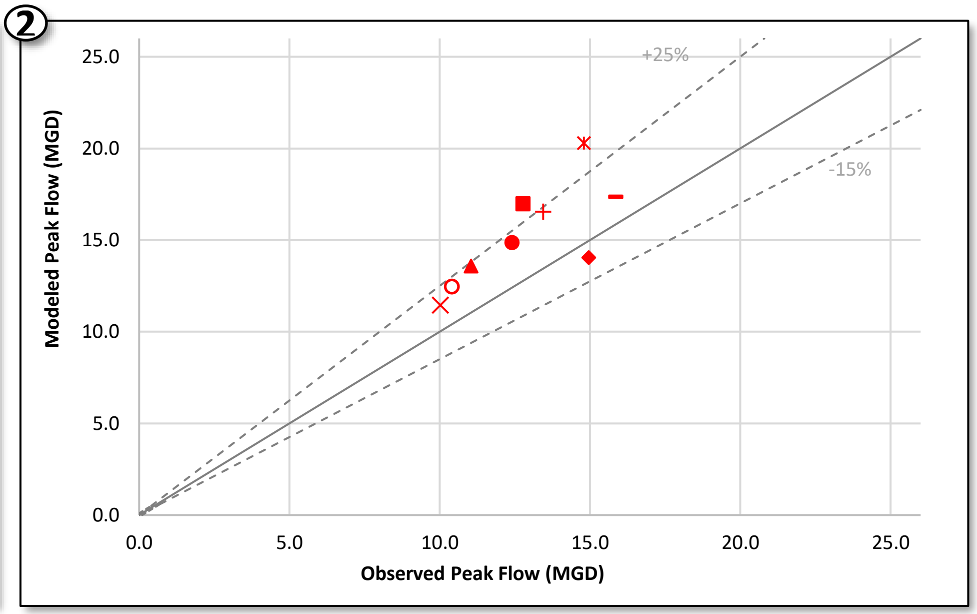

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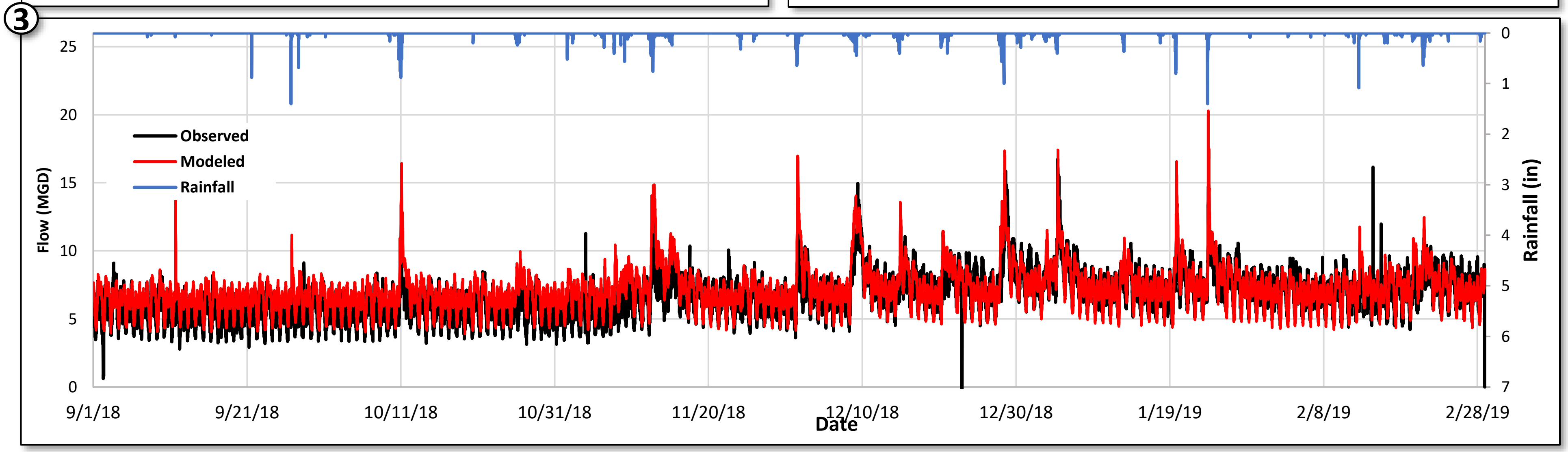


DeKalb Calibration Results

Wet Weather
Flow Summary

Flow Meter:

PBPLNT6

Sewershed:
Pole Bridge Creek

Sewer Basin:
Pole Bridge Basin

① Total Event Volume

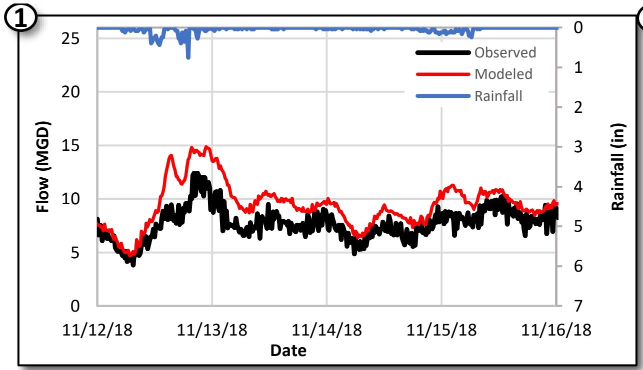
② Peak Event Flow

③ Time Series

Events:

●	11/12/18	—	12/27/18
■	12/1/18	+	1/19/19
◆	12/8/18	✱	1/23/19
▲	12/14/18	○	2/19/19
×	12/20/18	●	Excluded Event Due to Data Quality

①



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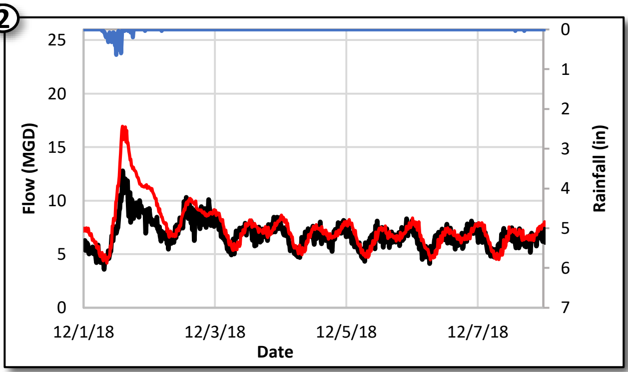

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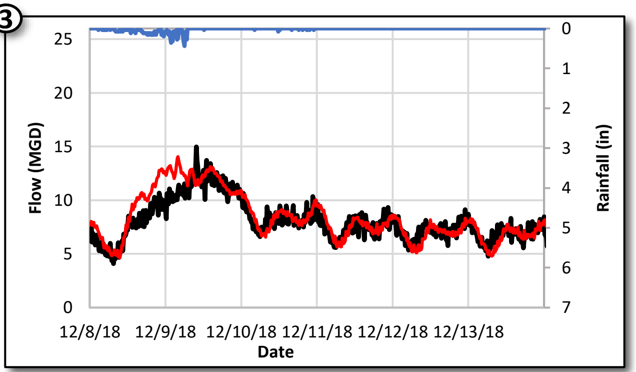

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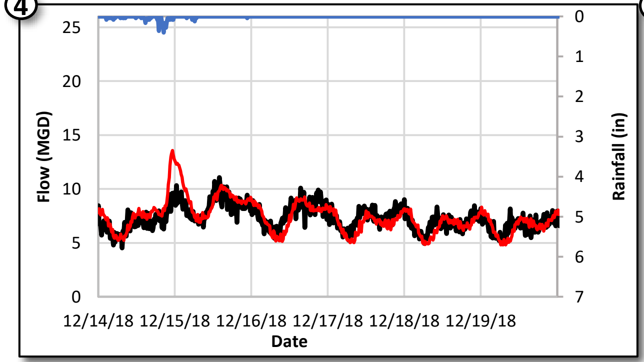

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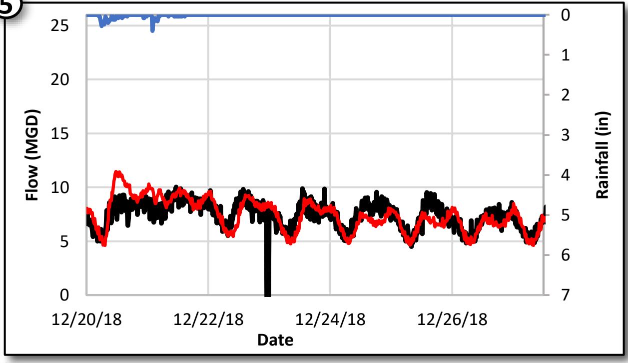

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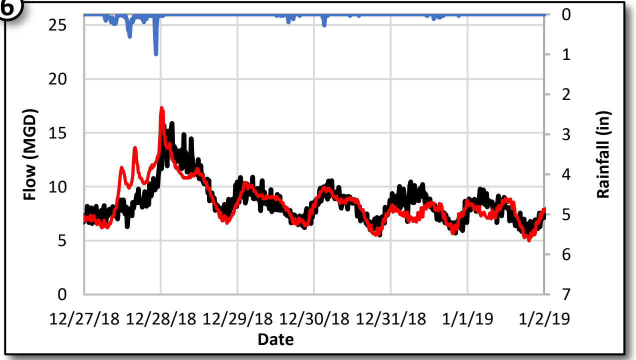

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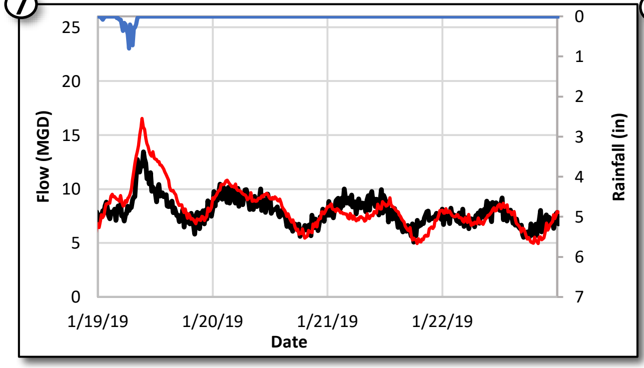

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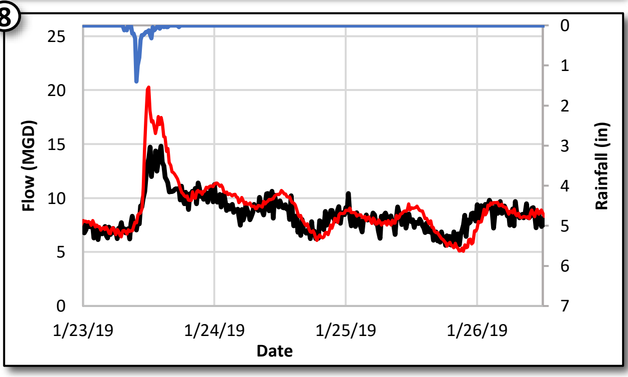

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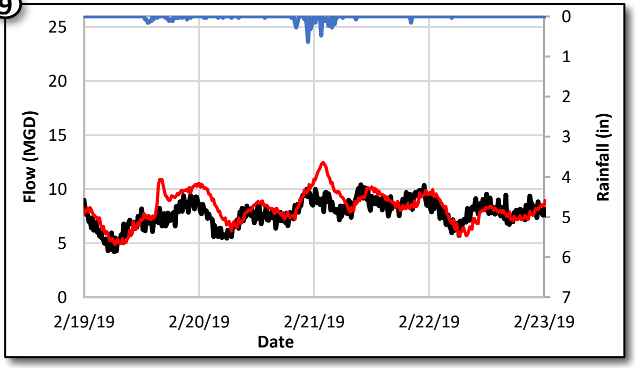


DeKalb Calibration Results

Event Hydrographs

Flow Meter:

PBPLNT6

Sewershed:

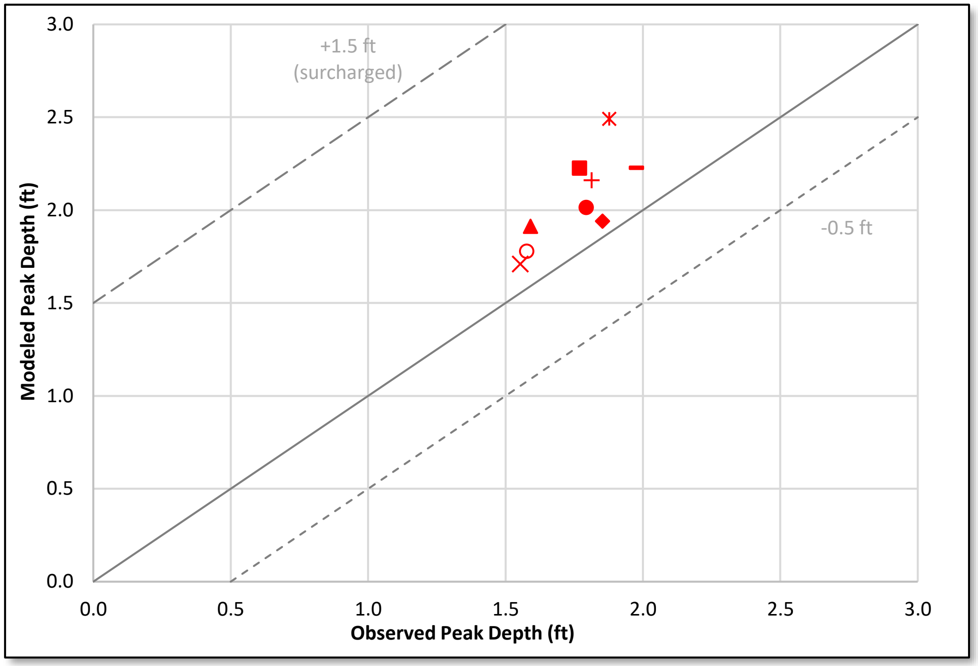
Pole Bridge Creek

Sewer Basin:

Pole Bridge Basin

Events:

①	11/12/18	⑤	12/20/18	⑨	2/19/19
②	12/1/18	⑥	12/27/18	▨	Excluded Event Due to Data Quality
③	12/8/18	⑦	1/19/19		
④	12/14/18	⑧	1/23/19		



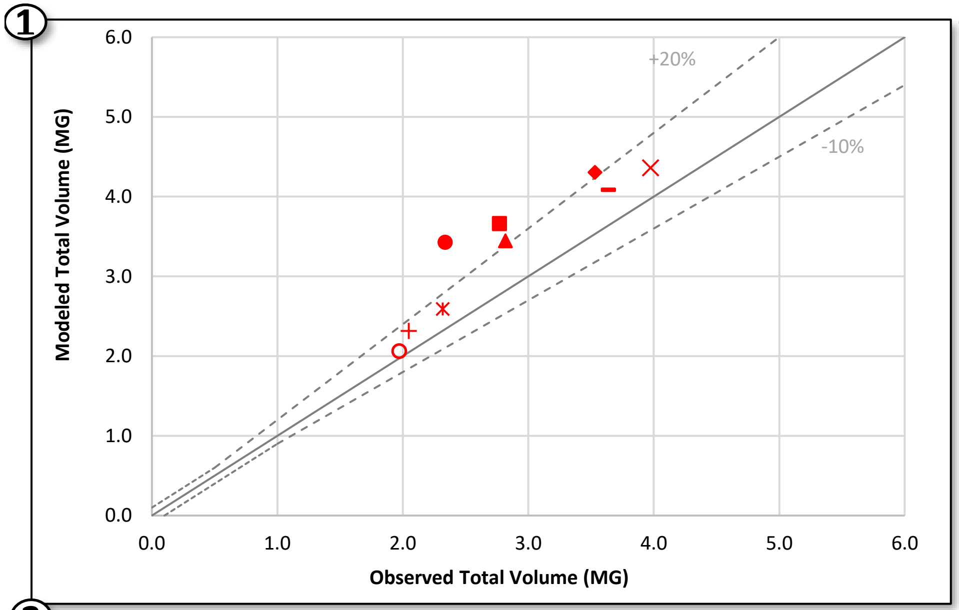
Flow Meter:

PBPLNT6

Events:

●	11/12/18	—	12/27/18
■	12/1/18	+	1/19/19
◆	12/8/18	✳	1/23/19
▲	12/14/18	○	2/19/19
×	12/20/18	●	Excluded Event Due to Data Quality

①



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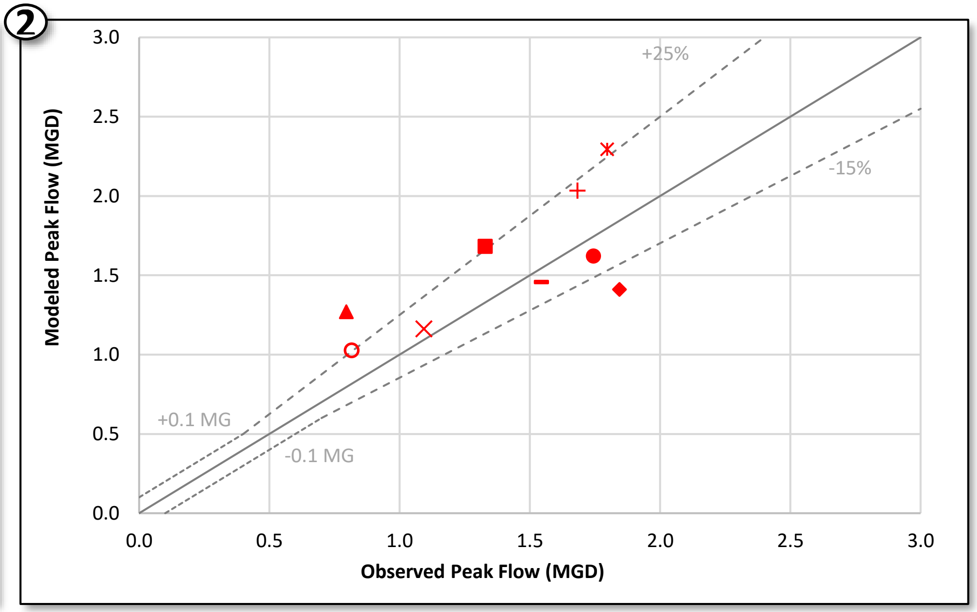

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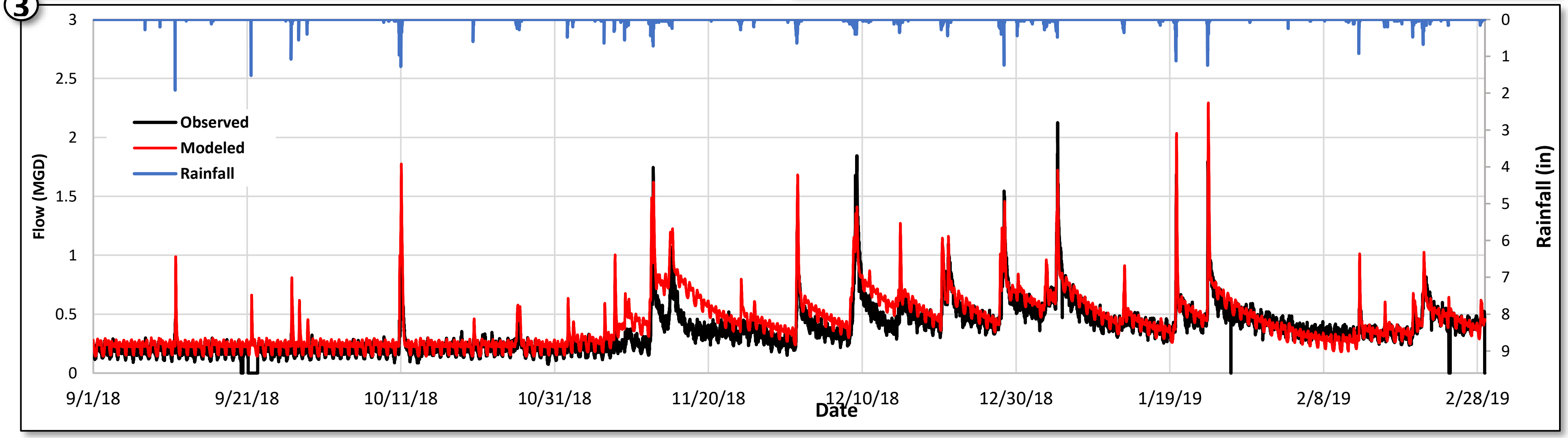


DeKalb Calibration Results

Wet Weather
Flow Summary

Flow Meter:

PINEM1

Sewershed:
Pine Mountain Creek

Sewer Basin:
Pole Bridge Basin

① Total Event Volume

② Peak Event Flow

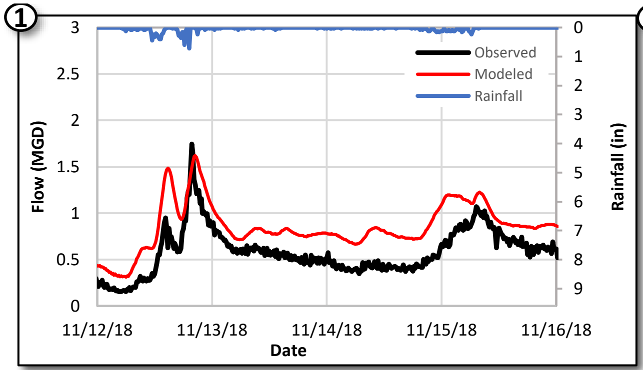
③ Time Series

Events:

● 11/12/18
■ 12/1/18
◆ 12/8/18
▲ 12/14/18
× 12/20/18

− 12/27/18
+ 1/19/19
✳ 1/23/19
○ 2/19/19
● Excluded Event Due to Data Quality

①



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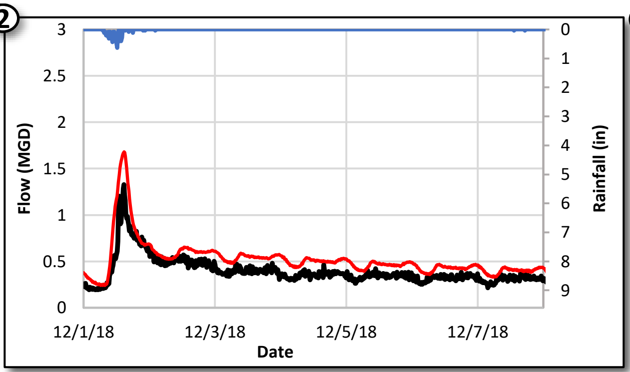

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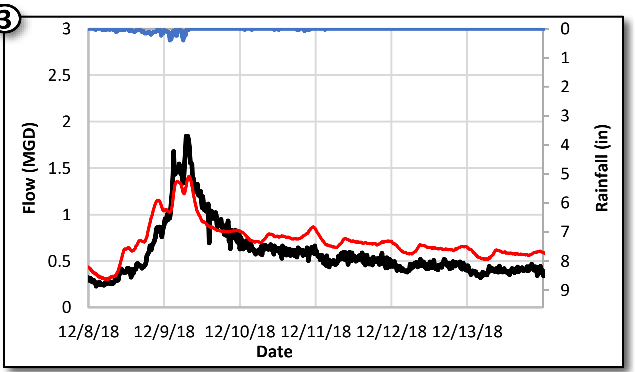

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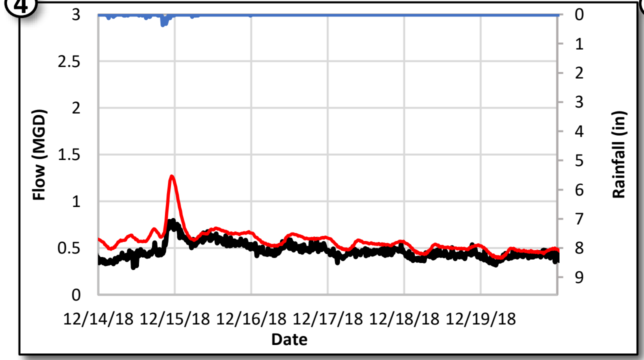

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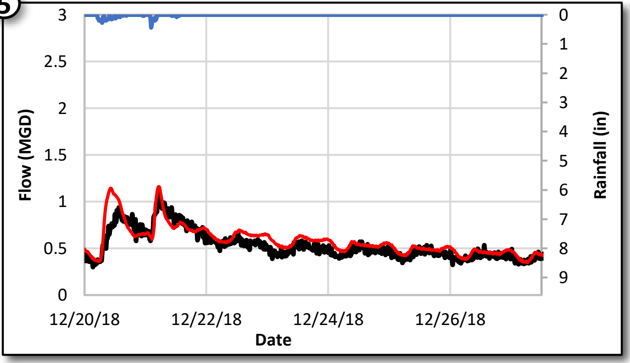

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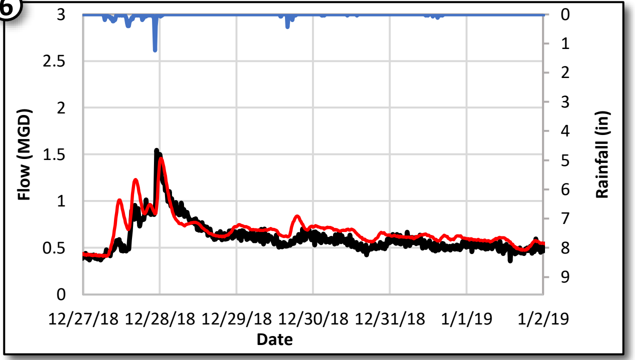

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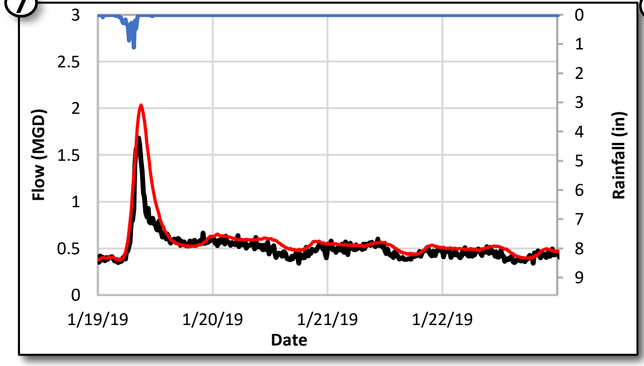

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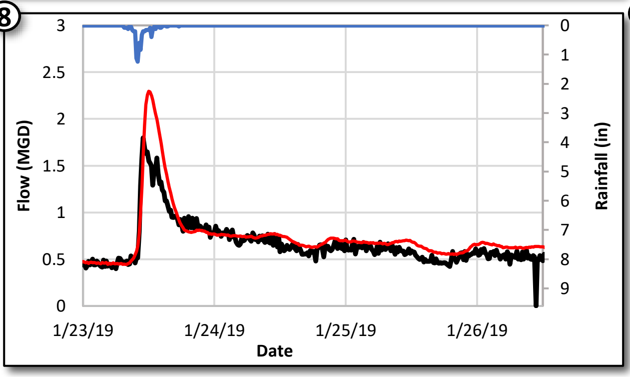

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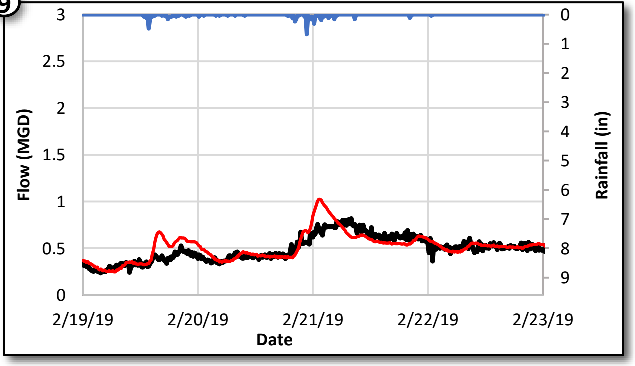


DeKalb Calibration Results

Event Hydrographs

Flow Meter:

PINEM1

Sewershed:

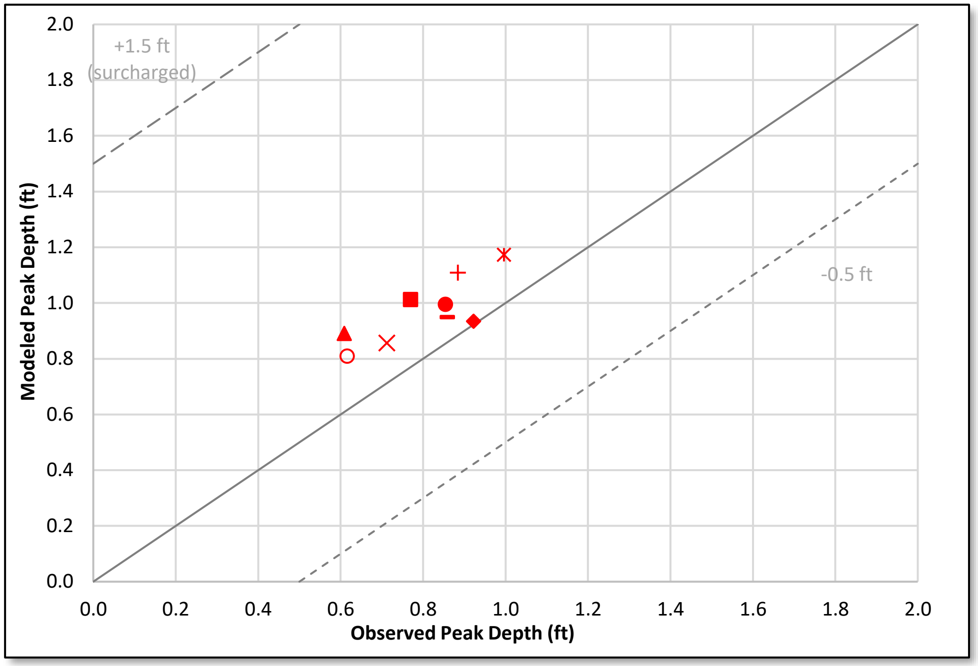
Pine Mountain Creek

Sewer Basin:

Pole Bridge Basin

Events:

①	11/12/18	⑤	12/20/18	⑨	2/19/19
②	12/1/18	⑥	12/27/18	▨	Excluded Event Due to Data Quality
③	12/8/18	⑦	1/19/19		
④	12/14/18	⑧	1/23/19		



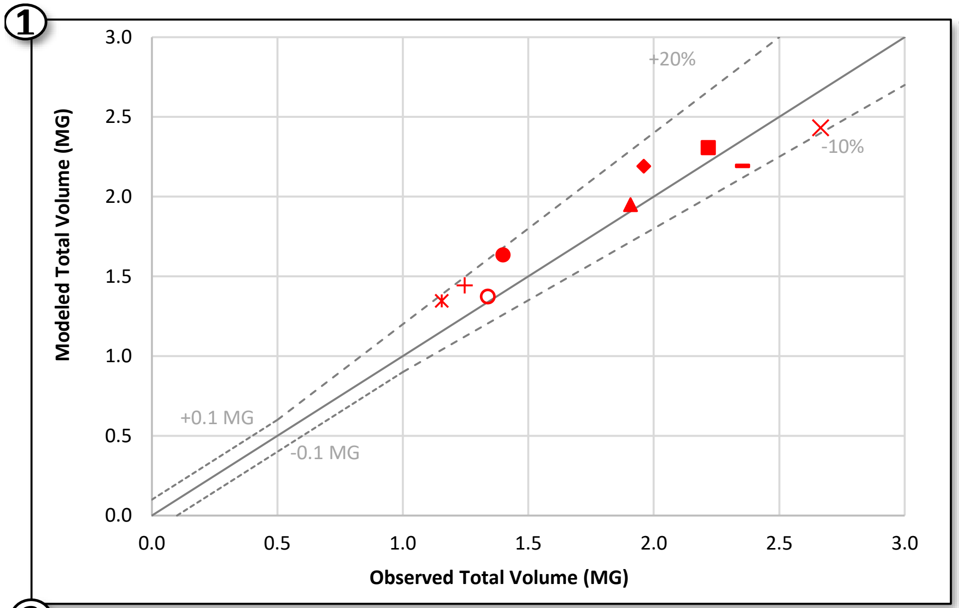
Flow Meter:

PINEM1

Events:

●	11/12/18	–	12/27/18
■	12/1/18	+	1/19/19
◆	12/8/18	✳	1/23/19
▲	12/14/18	○	2/19/19
×	12/20/18	●	Excluded Event Due to Data Quality

①



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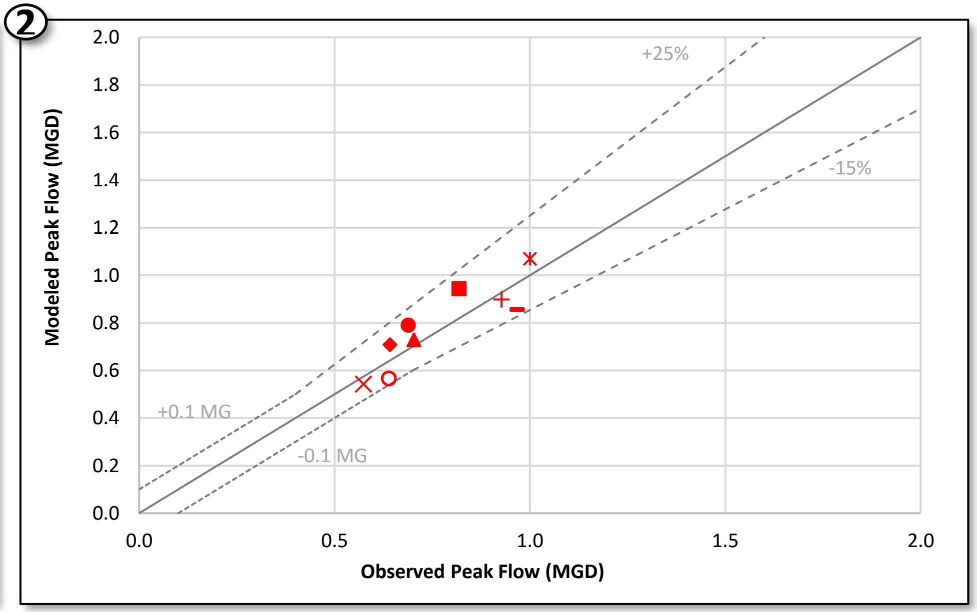

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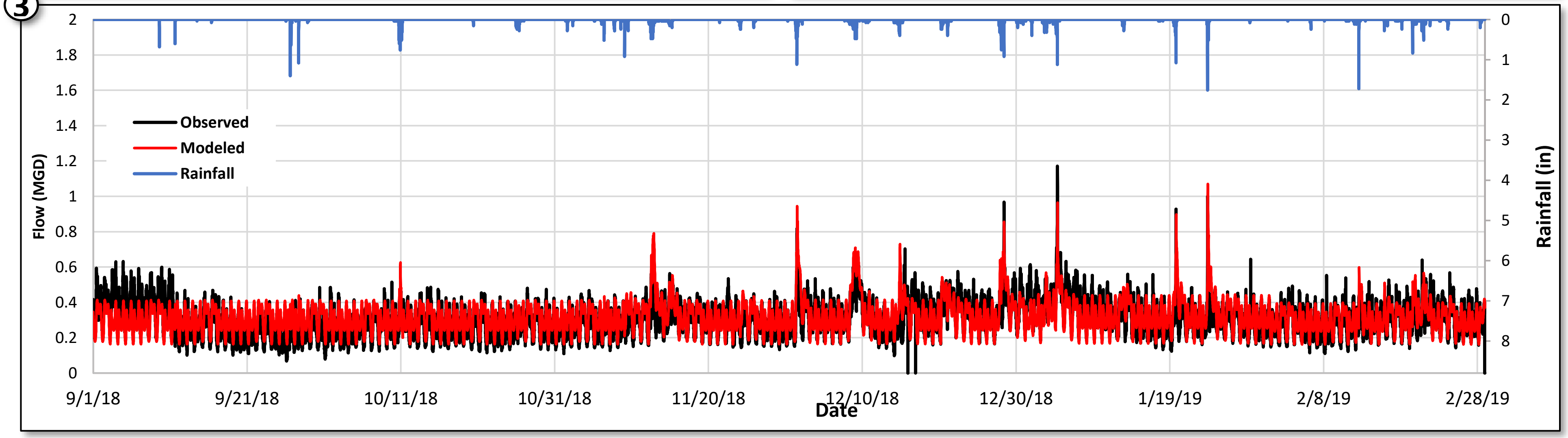


DeKalb Calibration Results

Wet Weather
Flow Summary

Flow Meter:

SWIFT2

Sewershed:
Swift Creek

Sewer Basin:
Pole Bridge Basin

① Total Event Volume

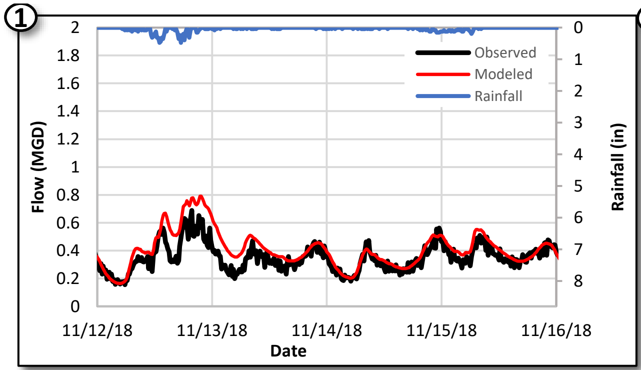
② Peak Event Flow

③ Time Series

Events:

●	11/12/18	—	12/27/18
■	12/1/18	+	1/19/19
◆	12/8/18	✱	1/23/19
▲	12/14/18	○	2/19/19
×	12/20/18	●	Excluded Event Due to Data Quality

①



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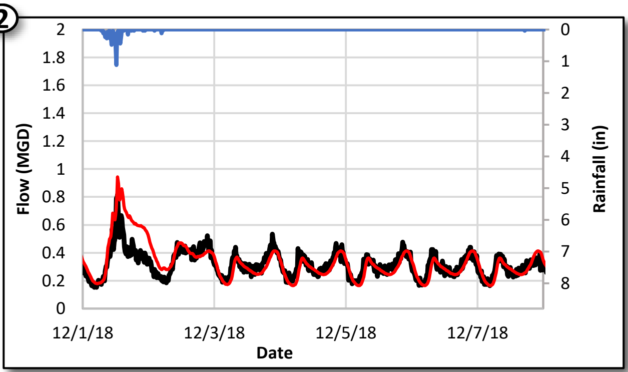

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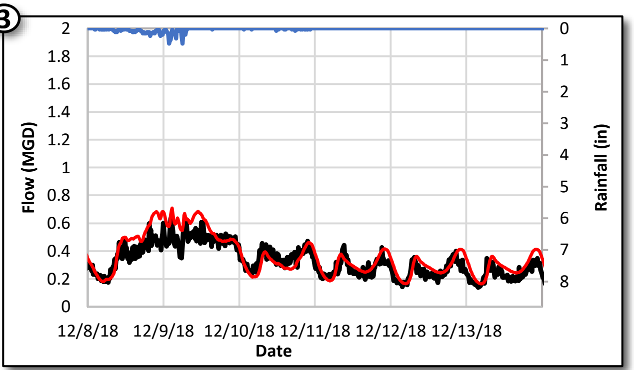

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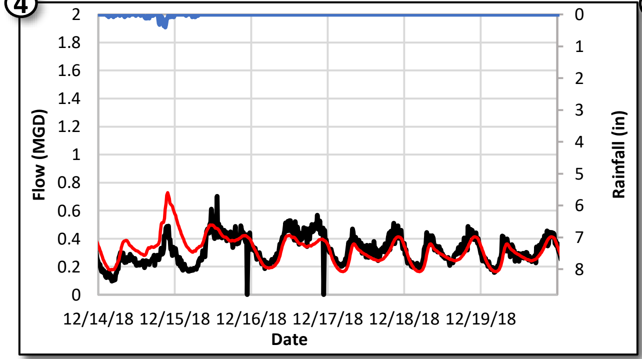

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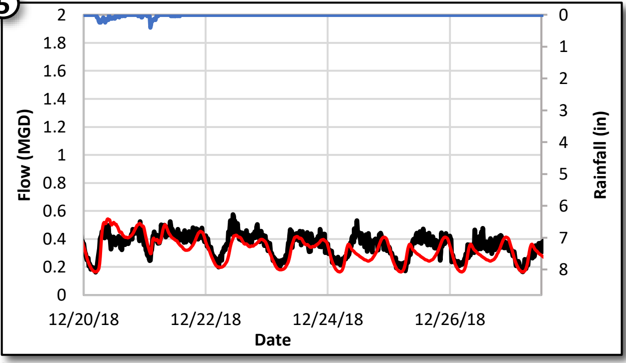

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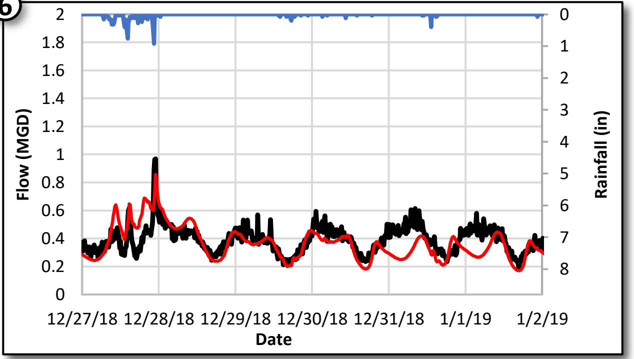

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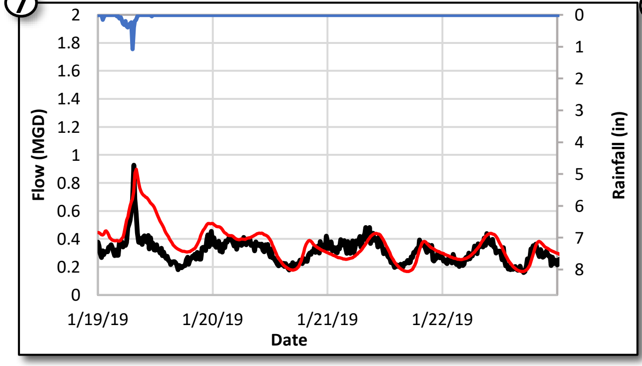

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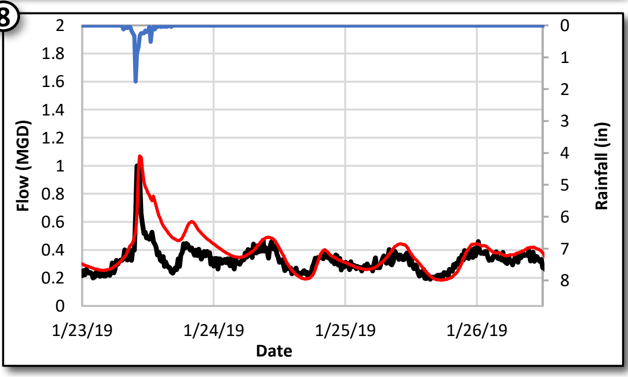

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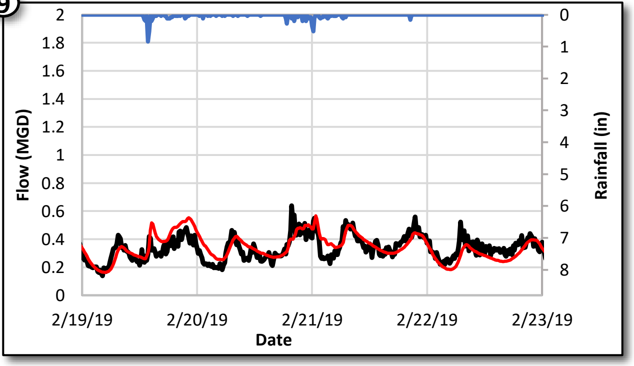


DeKalb Calibration Results

Event Hydrographs

Flow Meter:

SWIFT2

Sewershed:

Swift Creek

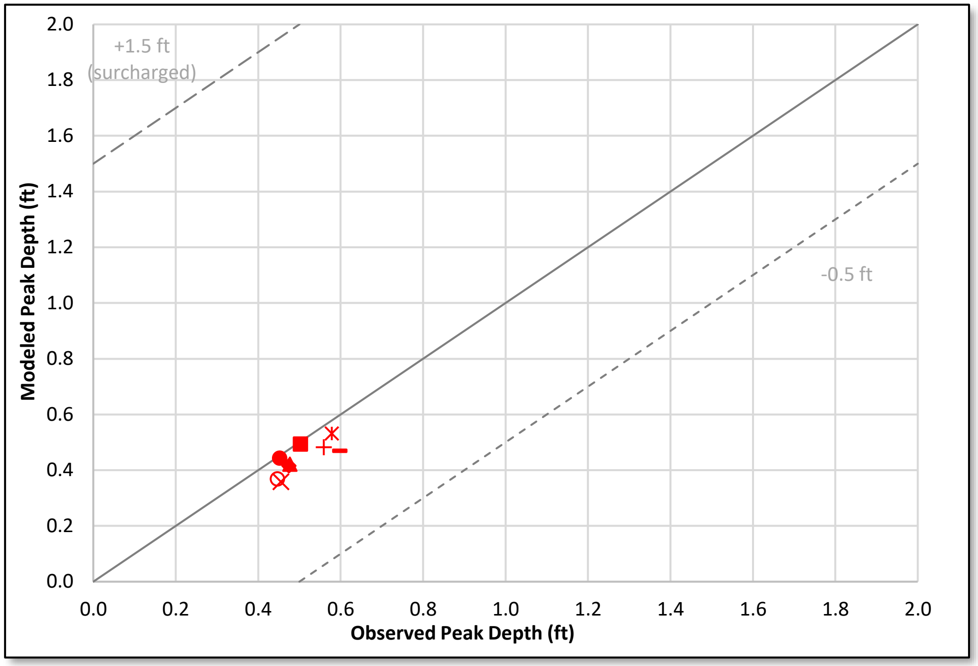
Sewer Basin:

Pole Bridge Basin

Events:

① 11/12/18
② 12/1/18
③ 12/8/18
④ 12/14/18
⑤ 12/20/18
⑥ 12/27/18
⑦ 1/19/19
⑧ 1/23/19
⑨ 2/19/19

▨ Excluded Event Due to Data Quality



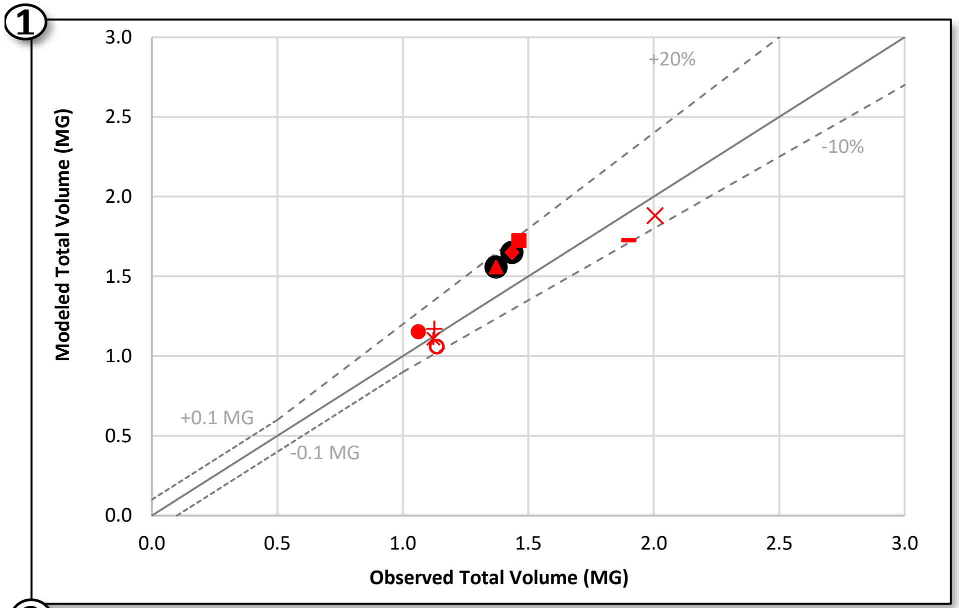
Flow Meter:

SWIFT2

Events:

●	11/12/18	–	12/27/18
■	12/1/18	+	1/19/19
◆	12/8/18	✳	1/23/19
▲	12/14/18	○	2/19/19
×	12/20/18	●	Excluded Event Due to Data Quality

①



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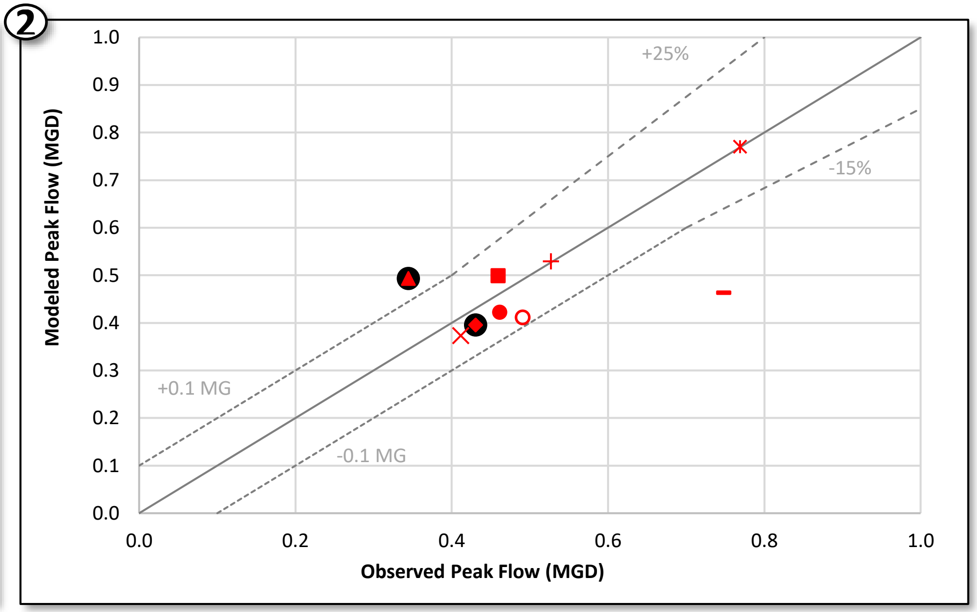

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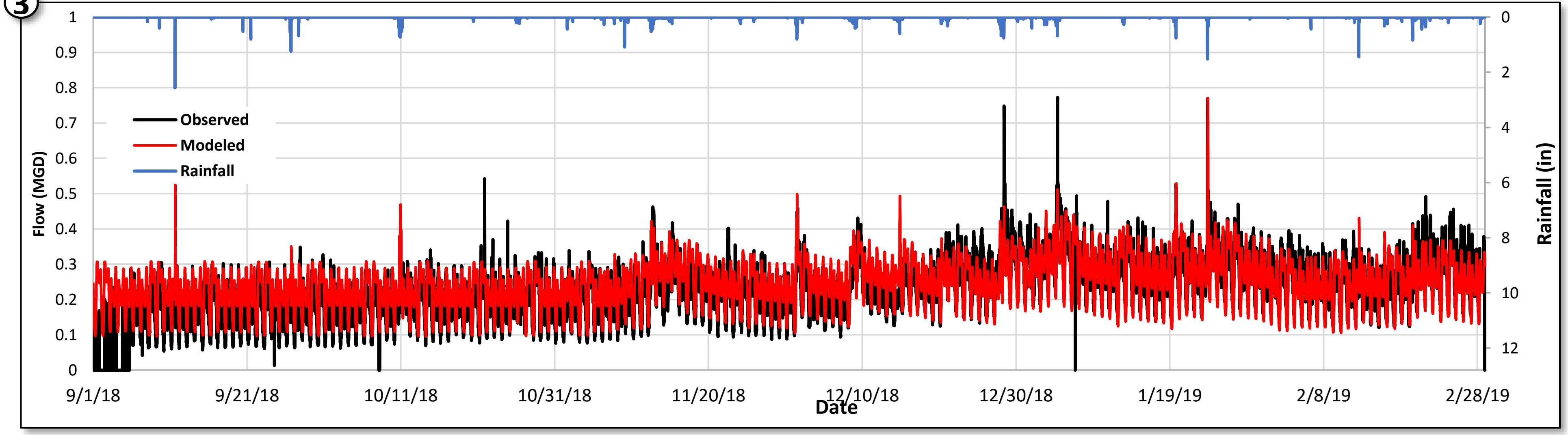


DeKalb Calibration Results

Wet Weather
Flow Summary

Flow Meter:

UCKC1

Sewershed:
Upper Crooked Creek

Sewer Basin:
Pole Bridge Basin

① Total Event Volume

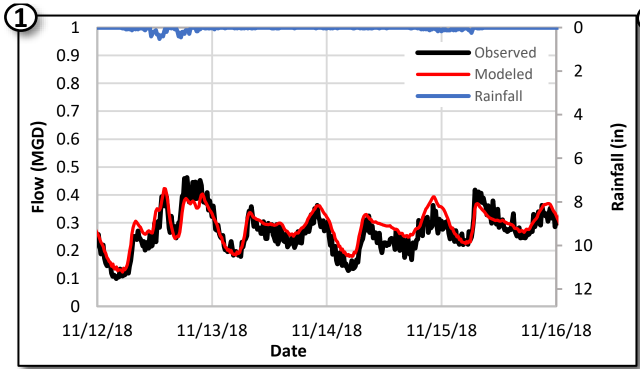
② Peak Event Flow

③ Time Series

Events:

●	11/12/18	–	12/27/18
■	12/1/18	+	1/19/19
◆	12/8/18	✳	1/23/19
▲	12/14/18	○	2/19/19
×	12/20/18	●	Excluded Event Due to Data Quality

①



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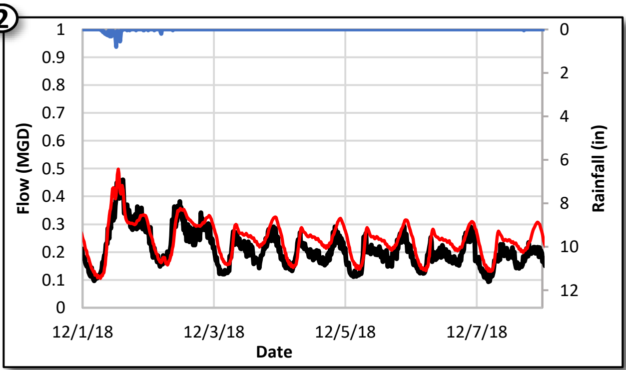

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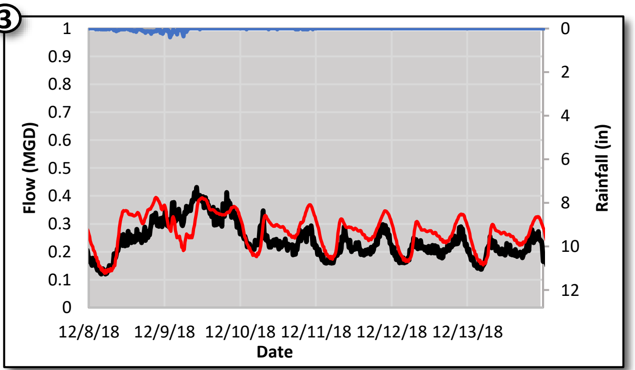

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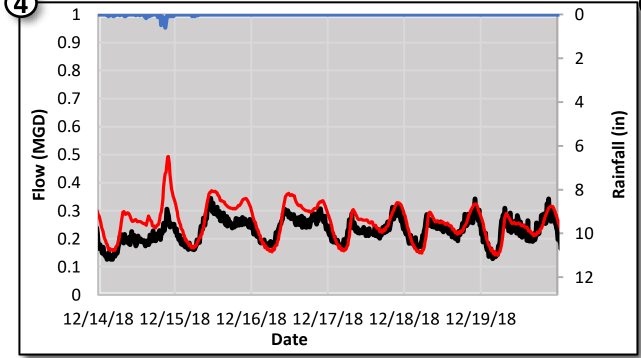

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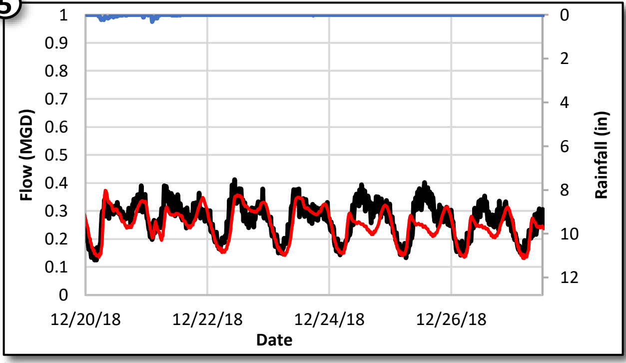

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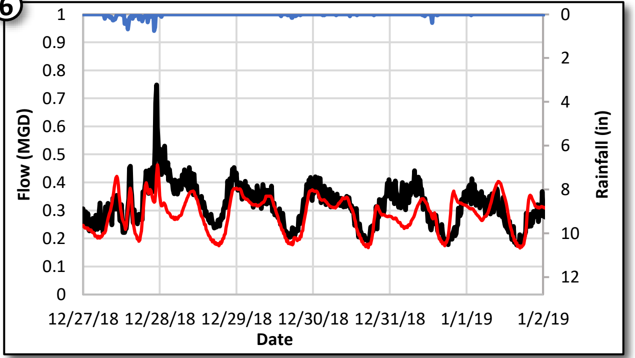

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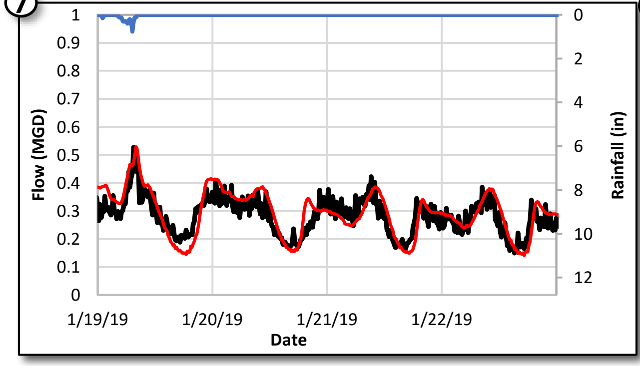

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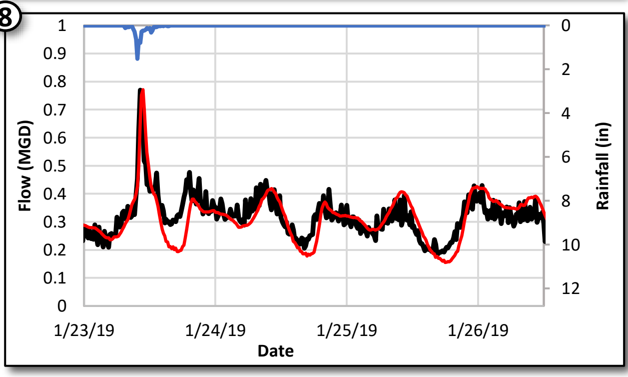

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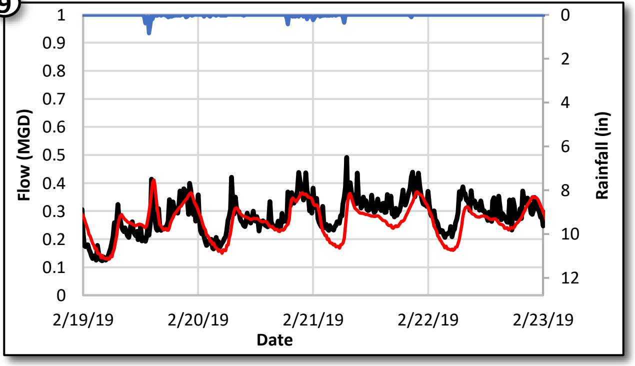


DeKalb Calibration Results

Event Hydrographs

Flow Meter:

UCKC1

Sewershed:

Upper Crooked Creek

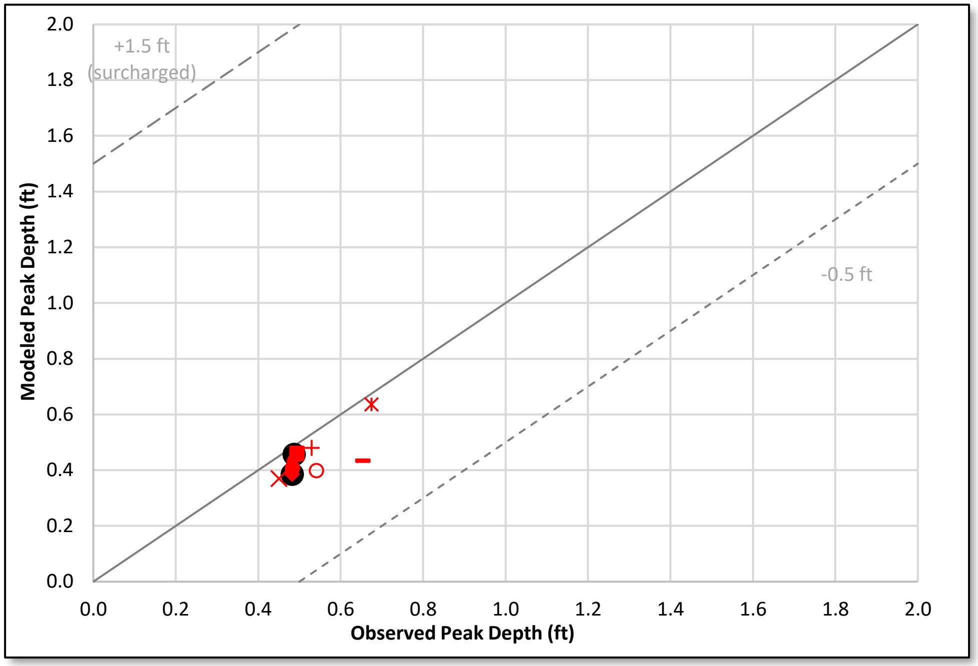
Sewer Basin:

Pole Bridge Basin

Events:

① 11/12/18
② 12/1/18
③ 12/8/18
④ 12/14/18
⑤ 12/20/18
⑥ 12/27/18
⑦ 1/19/19
⑧ 1/23/19
⑨ 2/19/19

▨ Excluded Event Due to Data Quality

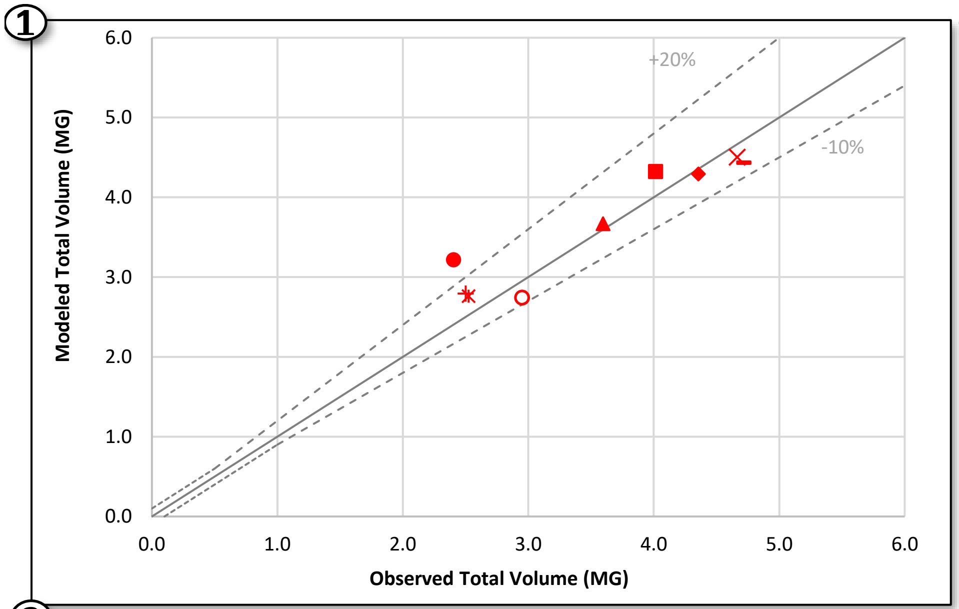


Flow Meter:

UCKC1

Events:

●	11/12/18	—	12/27/18
■	12/1/18	+	1/19/19
◆	12/8/18	✳	1/23/19
▲	12/14/18	○	2/19/19
×	12/20/18	●	Excluded Event Due to Data Quality

①


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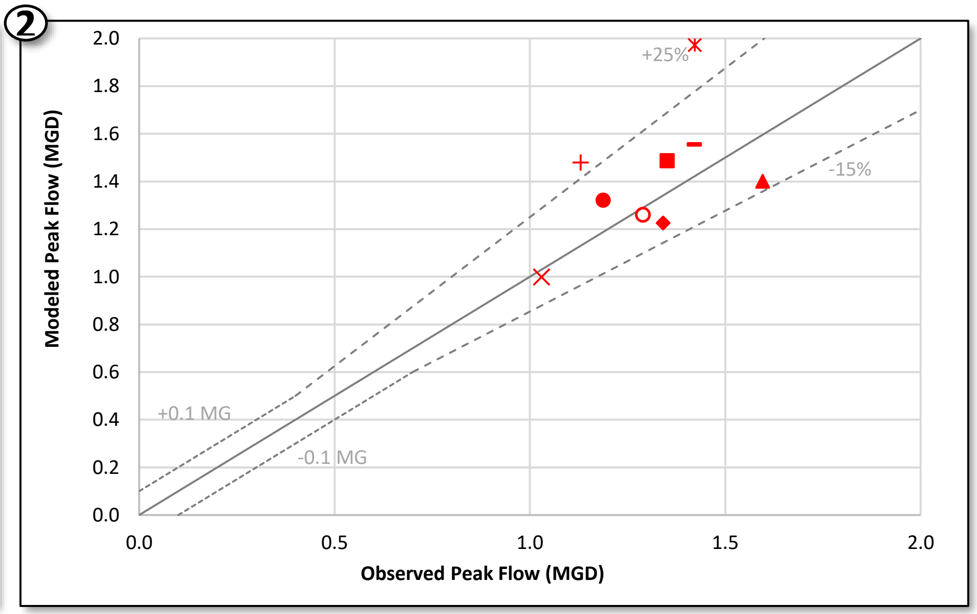

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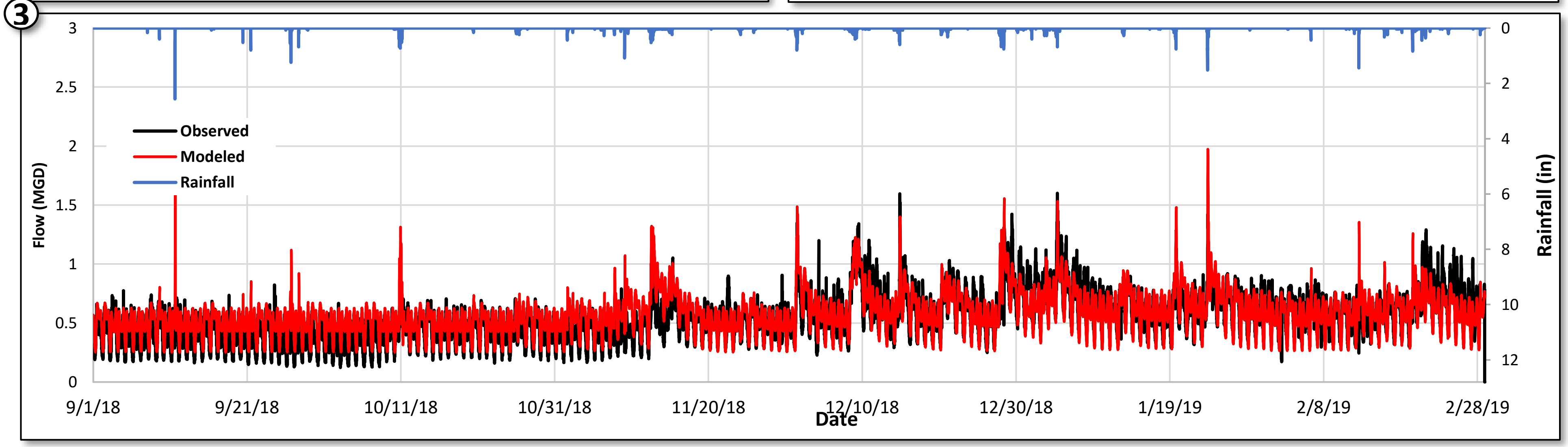


DeKalb Calibration Results

Wet Weather
Flow Summary

Flow Meter:

UCKC2

Sewershed:
Upper Crooked Creek

Sewer Basin:
Pole Bridge Basin

① Total Event Volume

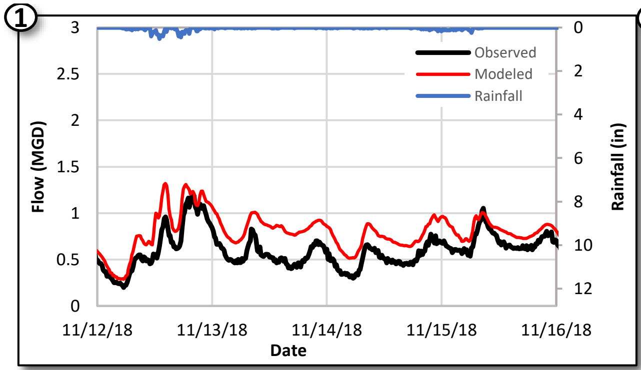
② Peak Event Flow

③ Time Series

Events:

● 11/12/18
■ 12/1/18
◆ 12/8/18
▲ 12/14/18
× 12/20/18
— 12/27/18
+ 1/19/19
✳ 1/23/19
○ 2/19/19
● Excluded Event Due to Data Quality

①



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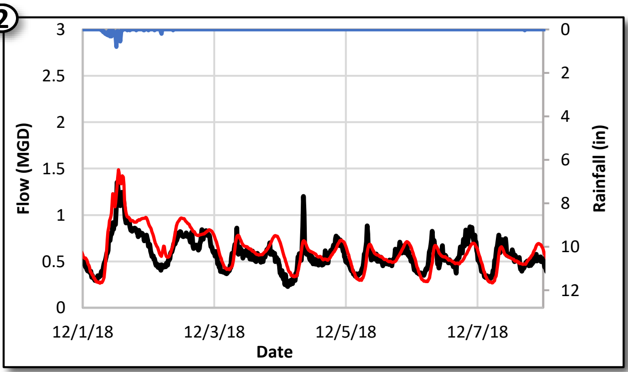

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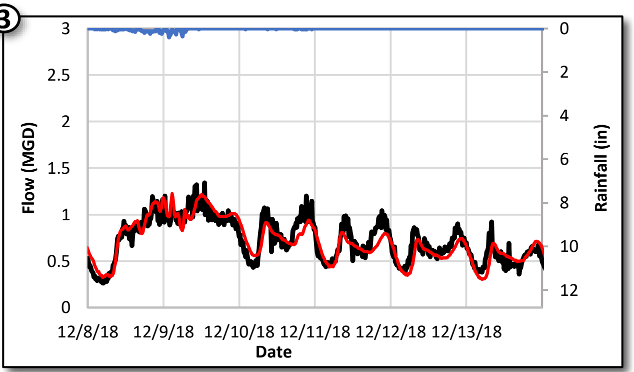

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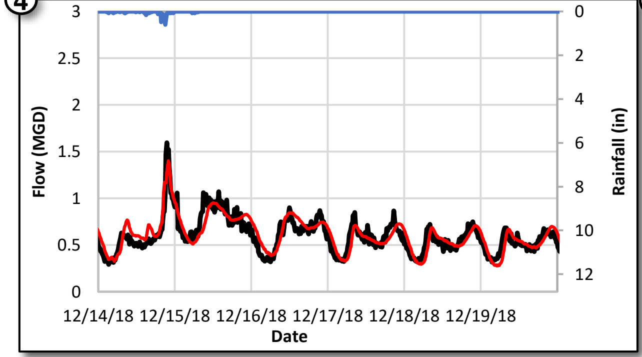

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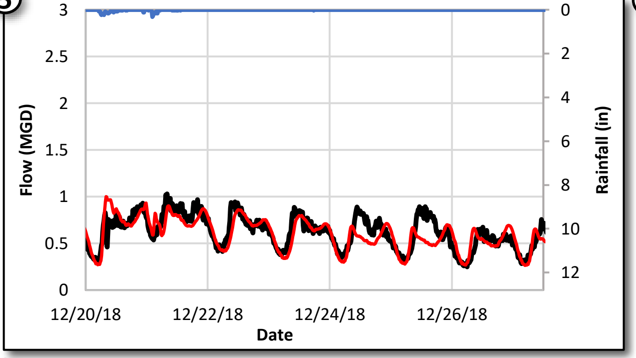

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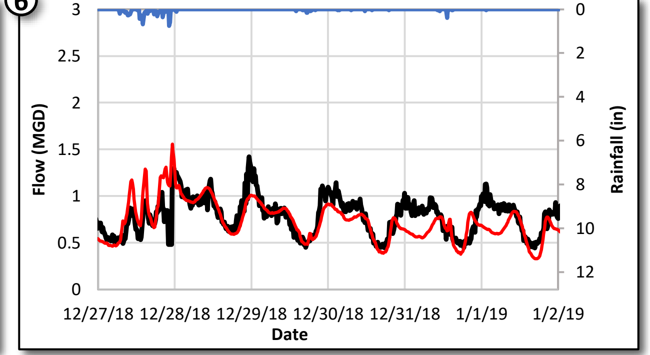

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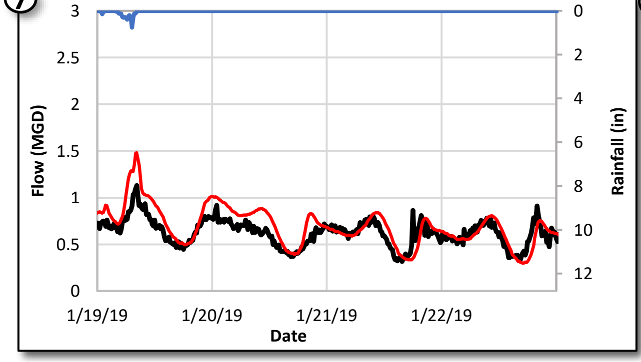

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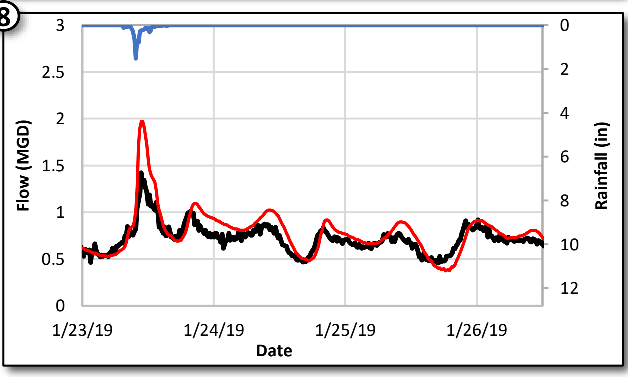

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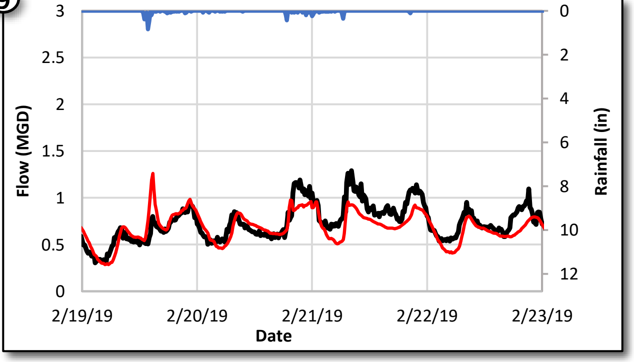


DeKalb Calibration Results

Event Hydrographs

Flow Meter:

UCKC2

Sewershed:

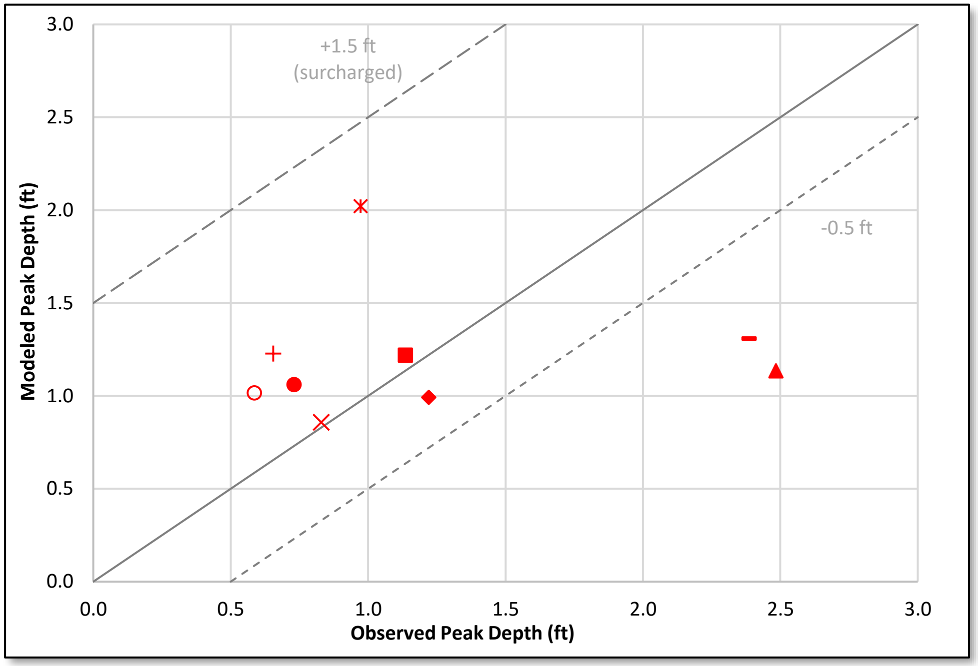
Upper Crooked Creek

Sewer Basin:

Pole Bridge Basin

Events:

① 11/12/18
② 12/1/18
③ 12/8/18
④ 12/14/18
⑤ 12/20/18
⑥ 12/27/18
⑦ 1/19/19
⑧ 1/23/19
⑨ 2/19/19
▨ Excluded Event Due to Data Quality



Flow Meter:

UCKC2

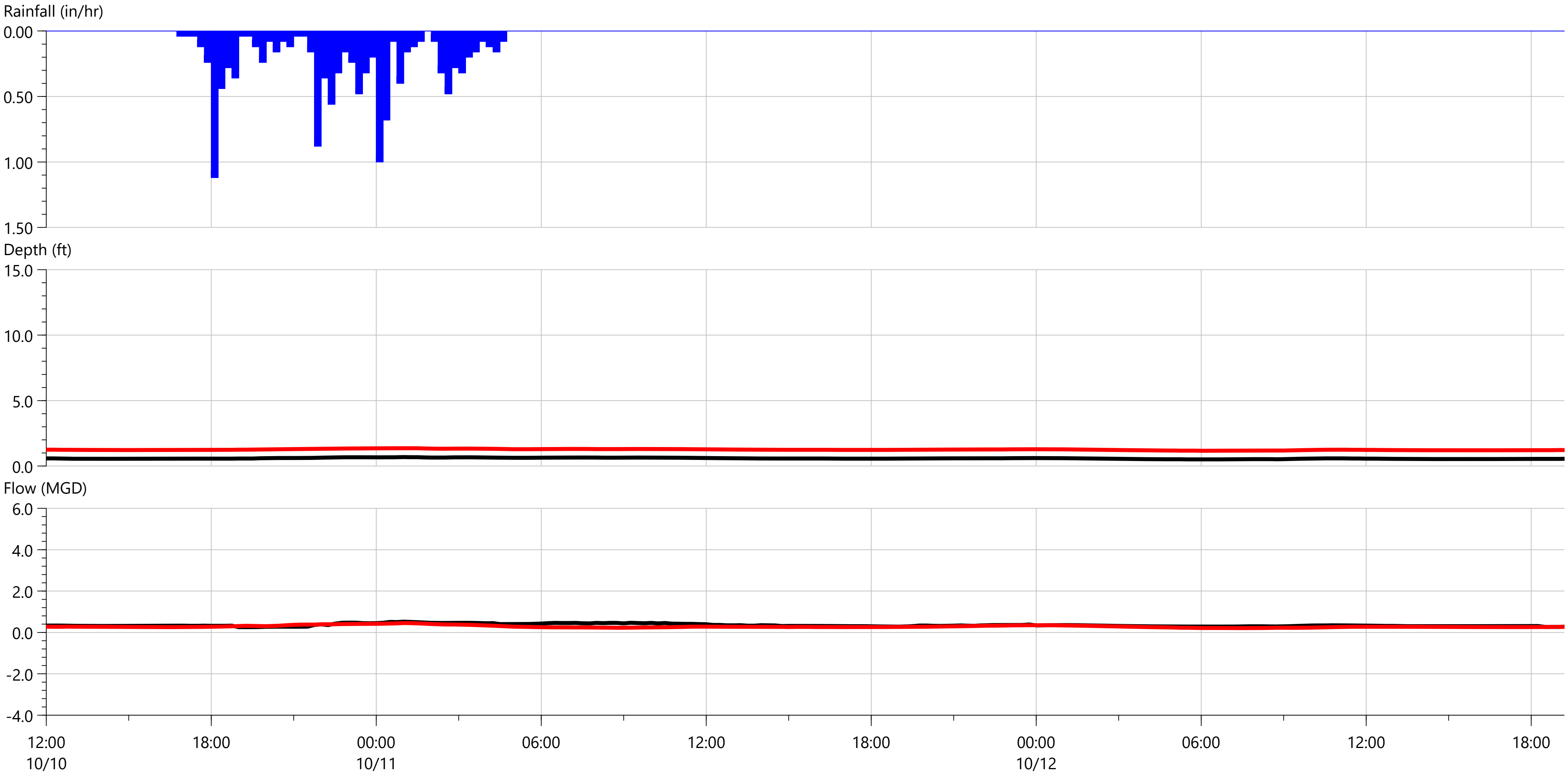
Events:

● 11/12/18
■ 12/1/18
◆ 12/8/18
▲ 12/14/18
× 12/20/18
– 12/27/18
+ 1/19/19
✳ 1/23/19
○ 2/19/19
⬤ Excluded Event Due to Data Quality

Appendix D
WWF Verification

Meter ID	Monitored				Modeled			Comparison				Comments
	Total Volume (MG)	Peak Flow (mgd)	Peak Depth (ft)	Observed Surcharge?	Total Volume (MG)	Peak Flow (mgd)	Peak Depth (ft)	Peak Flow (mgd)	Total Volume (MG)	Peak Depth (ft)	Predicted Surcharge?	
CKC1	0.80	0.52	0.68	N	0.66	0.46	1.37	-12.3%	**-17.6%**	0.69	N	
DK10	0.14	0.64	0.44	N	0.11	0.16	0.20	**-75.4%**	**-23.9%**	-0.25	N	Flow meter velocity signal issues during verification event. Large peak not related to rainfall prevents peak flow criteria from being met.
DK11	0.34	0.26	0.20	N	0.31	0.21	0.21	**-20.2%**	-7.6%	0.02	N	
HON1	3.78	6.03	1.08	N	3.76	6.89	1.07	14.2%	-0.4%	-0.01	N	
HON2	1.10	0.97	0.49	N	1.08	0.86	0.42	-11.9%	-1.6%	-0.07	N	
HON3	1.09	5.53	0.55	N	1.63	5.32	0.69	-3.9%	**50.1%**	0.14	N	
JSC1	0.42	0.37	0.34	N	0.41	0.43	0.34	17.3%	-2.2%	0.01	N	
LCKC1	3.29	1.95	1.66	N	3.58	2.76	1.20	**41.7%**	8.7%	-0.46	N	Flow meter velocity signal issues during verification event
LCKC2	2.88	1.92	0.61	N	3.36	2.63	0.64	**37.3%**	16.8%	0.03	N	
LSM1	1.51	1.05	0.62	N	1.50	1.04	0.68	-1.0%	-0.7%	0.06	N	
LSM2	0.83	0.51	0.41	N	0.94	0.71	0.57	**40.1%**	13.6%	0.15	N	
PB1	0.24	0.24	0.31	N	0.51	0.43	0.33	**81.2%**	**112.1%**	0.02	N	Flow meter velocity signal issues during verification event
PB10	1.52	1.12	0.35	N	1.15	0.89	0.43	**-20.2%**	**-24.6%**	0.07	N	
PB2	1.39	0.89	0.44	N	1.72	1.06	0.45	19.2%	**24.5%**	0.01	N	
PB3	13.23	10.26	1.57	N	16.32	15.77	1.69	**53.6%**	**23.4%**	0.12	N	
PB4	1.19	0.86	0.73	N	1.33	1.10	0.47	**28.2%**	11.8%	-0.26	N	
PB5	1.95	1.58	1.13	N	2.81	1.83	1.43	16.0%	**44.5%**	0.30	N	
PB6	0.85	0.79	0.51	N	0.81	0.98	0.44	24.1%	-4.7%	-0.07	N	
PB7	6.69	8.08	1.48	N	8.81	11.74	1.85	**45.2%**	**31.6%**	0.37	N	
PB8	2.43	1.91	0.96	N	2.23	1.66	0.98	-13.0%	-8.6%	0.02	N	
PB9	0.63	0.52	0.47	N	0.58	0.42	0.32	**-18.3%**	-7.7%	-0.16	N	
PBPLNT1	0.45	0.98	0.67	N	0.42	0.89	0.40	-10.1%	-5.6%	-0.27	N	
PBPLNT2	3.98	4.34	1.18	N	6.05	7.60	2.25	**75.2%**	**51.9%**	1.08	N	Missing data
PBPLNT3	0.27	0.24	0.33	N	0.47	0.95	0.85	**296.5%**	**69.7%**	0.53	N	
PBPLNT4	17.55	11.05	1.24	N	22.51	18.32	3.65	**65.8%**	**28.3%**	2.40	N	
PBPLNT5	1.82	1.21	0.84	N	2.48	1.73	0.83	**43.3%**	**36.0%**	-0.01	N	
PBPLNT6	15.13	11.21	1.60	N	19.06	16.67	2.16	**48.7%**	**25.9%**	0.56	N	
PINEM1	0.70	1.18	0.73	N	0.99	1.77	1.04	**50.5%**	**41.2%**	0.30	N	
SWIFT2	0.67	0.47	0.39	N	0.69	0.62	0.39	**32.9%**	2.8%	0.00	N	
UCKC1	0.48	0.36	0.40	N	0.52	0.47	0.44	**30.6%**	7.9%	0.04	N	
UCKC2	1.12	0.81	0.49	N	1.25	1.31	1.06	**61.7%**	11.9%	0.56	N	

Flow Survey Location (Obs.) CKC1, Model Location (Pred.) D/S 11-230-s280.1, Rainfall Profile: RGPB4



	Rainfall			Depth (ft)		Flow (MGD)		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min	Max	Min	Max	Volume (US Mgal)
Rain —	3.030	1.120	0.055					
Obs. —				0.496	0.677	0.255	0.520	0.801
...>Rainfall Event_Evaporation —				1.167	1.368	0.209	0.456	0.660

Observed / Predicted Report
Verification Event

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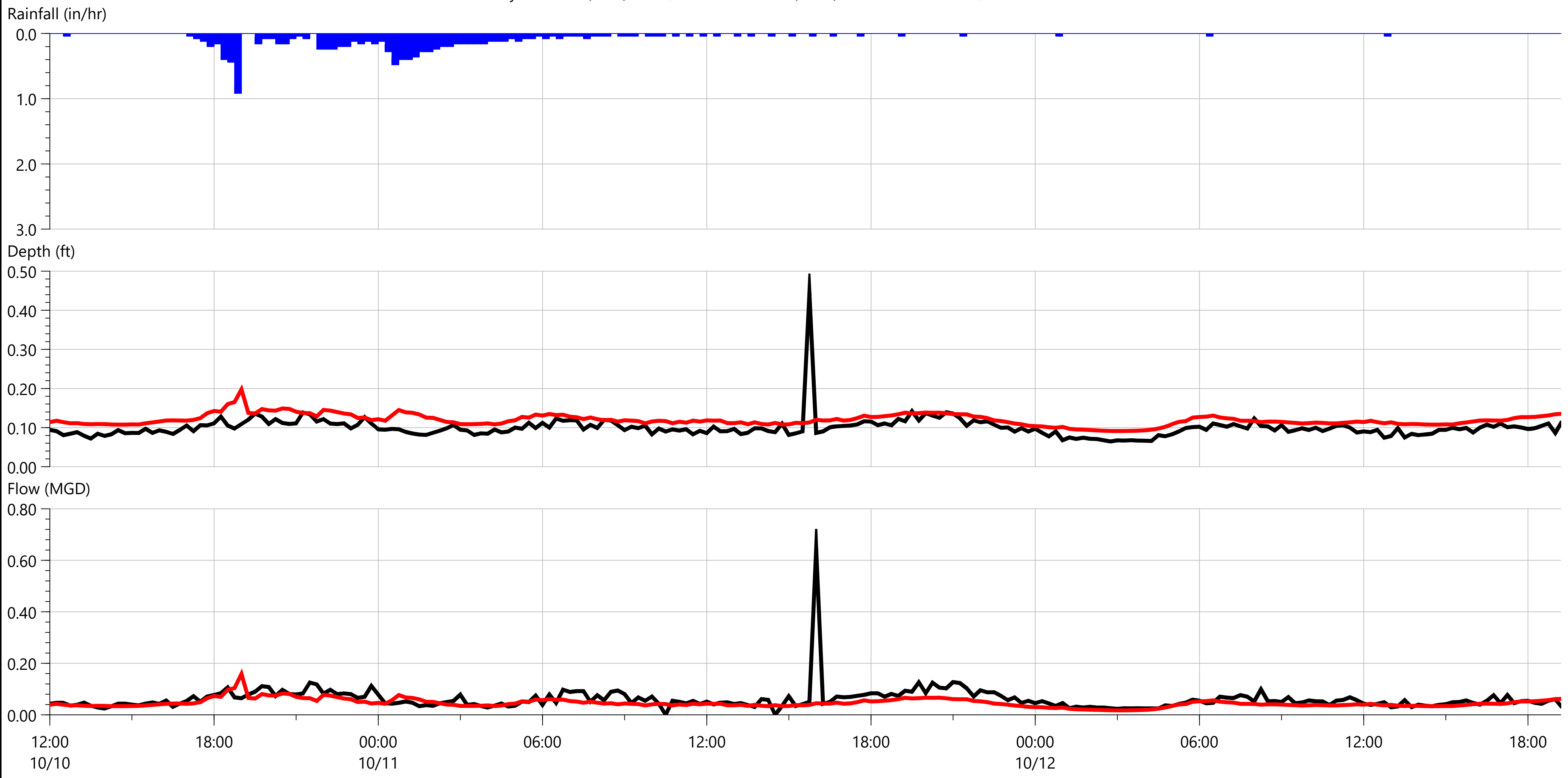
Flow Survey Location (Obs.) DK10, Model Location (Pred.) D/S 16-204-s001.1, Rainfall Profile: RGHON1



	Rainfall			Depth (ft)		Flow (MGD)		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min	Max	Min	Max	Volume (US Mgal)
Rain 🟦	2.780	0.920	0.051					
Obs. ■				0.064	0.443	0.000	0.644	0.138
...>Rainfall Event_Evaporation 🟥				0.091	0.198	0.017	0.159	0.105

Observed / Predicted Report
Verification Event

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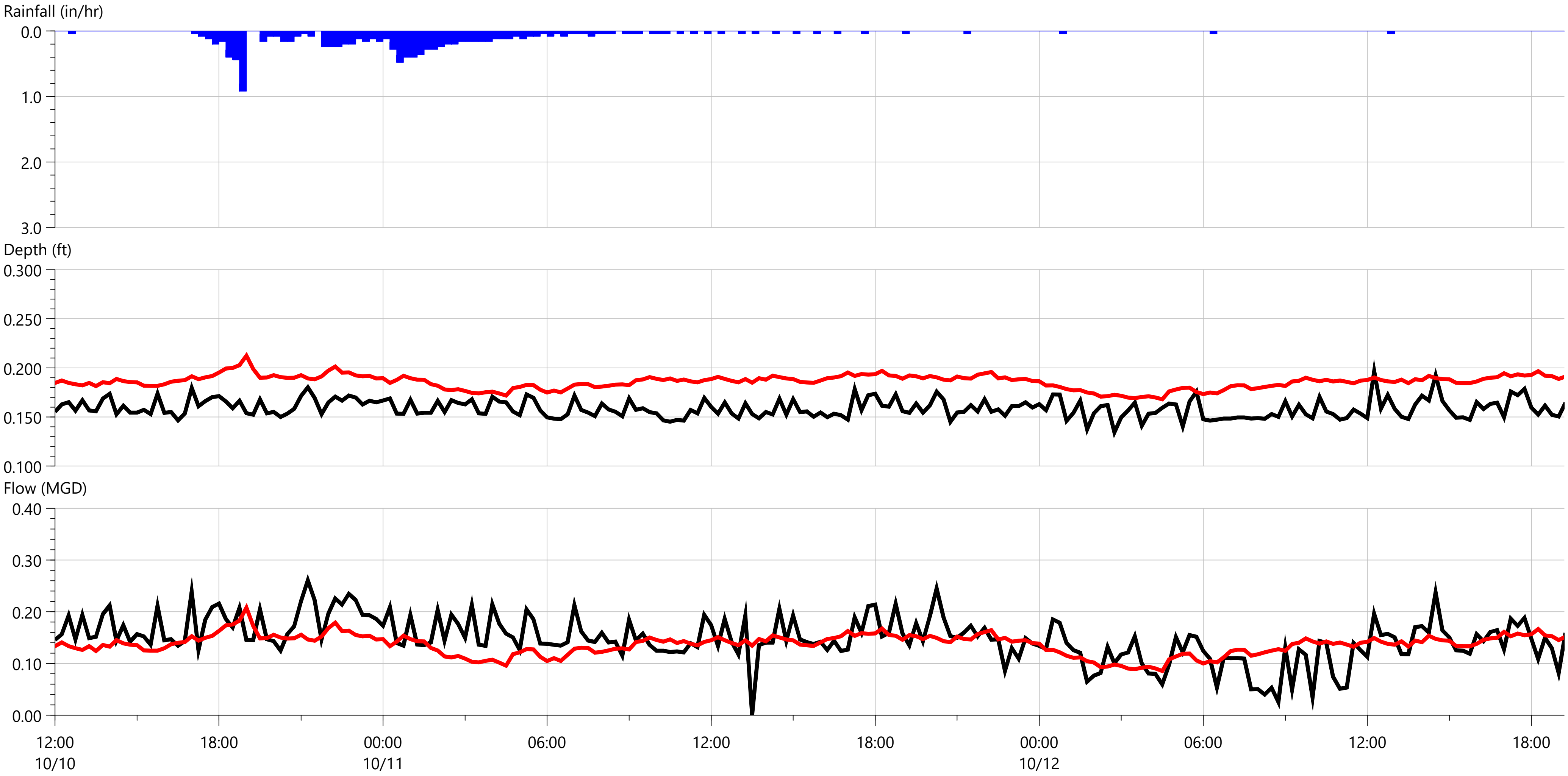
Flow Survey Location (Obs.) DK11, Model Location (Pred.) D/S 16-203-s004.1, Rainfall Profile: RGHON1



		Rainfall			Depth (ft)		Flow (MGD)		
		Depth (in)	Peak (in/hr)	Average (in/hr)	Min	Max	Min	Max	Volume (US Mgal)
Rain	—	2.780	0.920	0.051					
Obs.	—				0.134	0.197	0.000	0.261	0.340
...>Rainfall Event_Evaporation	—				0.168	0.212	0.086	0.208	0.314

Observed / Predicted Report
Verification Event

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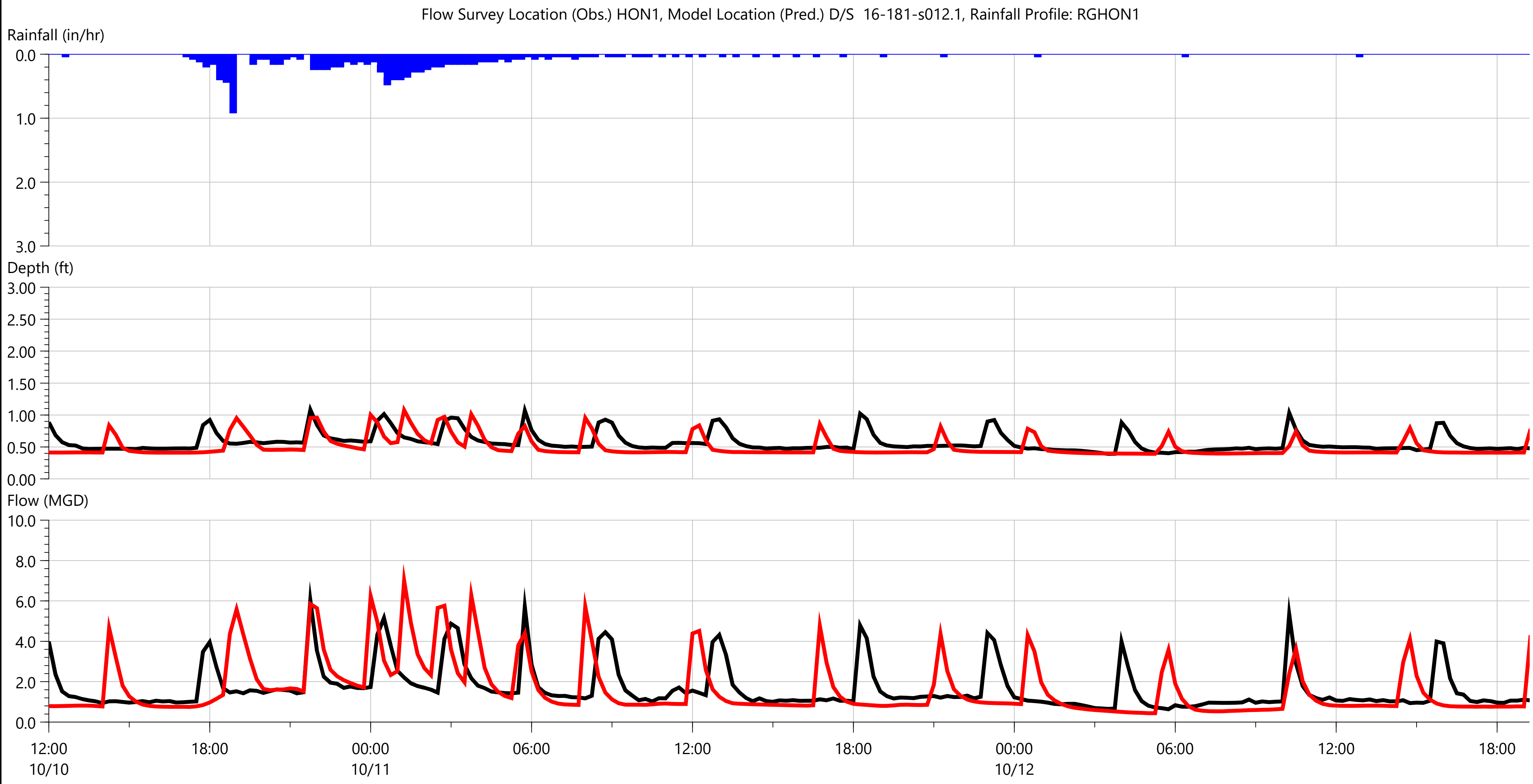

	Rainfall			Depth (ft)		Flow (MGD)		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min	Max	Min	Max	Volume (US Mgal)
Rain 🟦	2.780	0.920	0.051					
Obs. ⬛				0.389	1.081	0.632	6.034	3.778
...>Rainfall Event_Evaporation 🟥				0.392	1.077	0.438	7.013	3.761

Observed / Predicted Report
Verification Event

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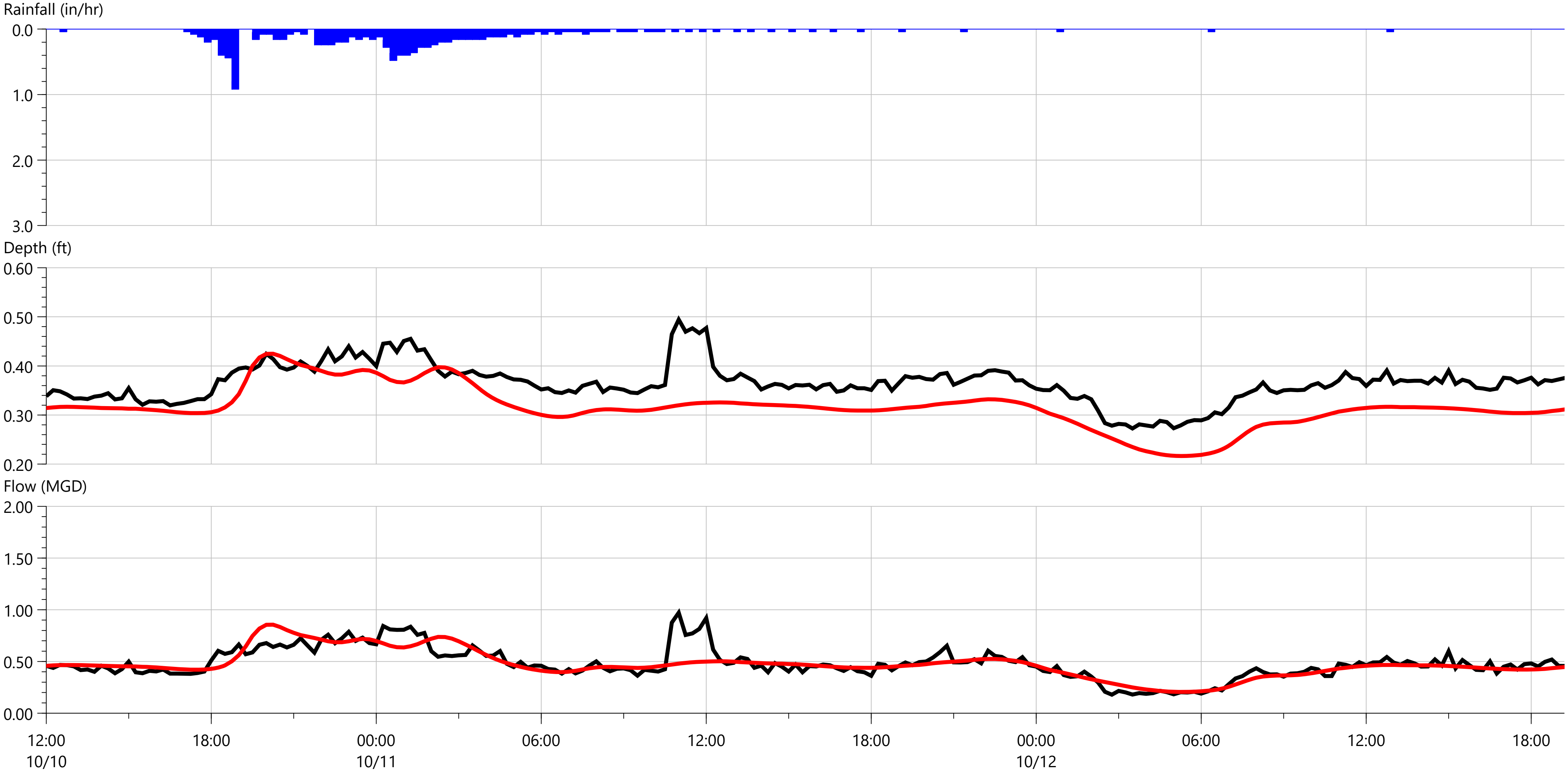
Flow Survey Location (Obs.) HON2, Model Location (Pred.) D/S 16-182-s036.1, Rainfall Profile: RGHON1



	Rainfall			Depth (ft)		Flow (MGD)		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min	Max	Min	Max	Volume (US Mgal)
Rain ━	2.780	0.920	0.051					
Obs. ━				0.272	0.494	0.179	0.972	1.101
...>Rainfall Event_Evaporation ━				0.216	0.425	0.206	0.856	1.083

Observed / Predicted Report
Verification Event

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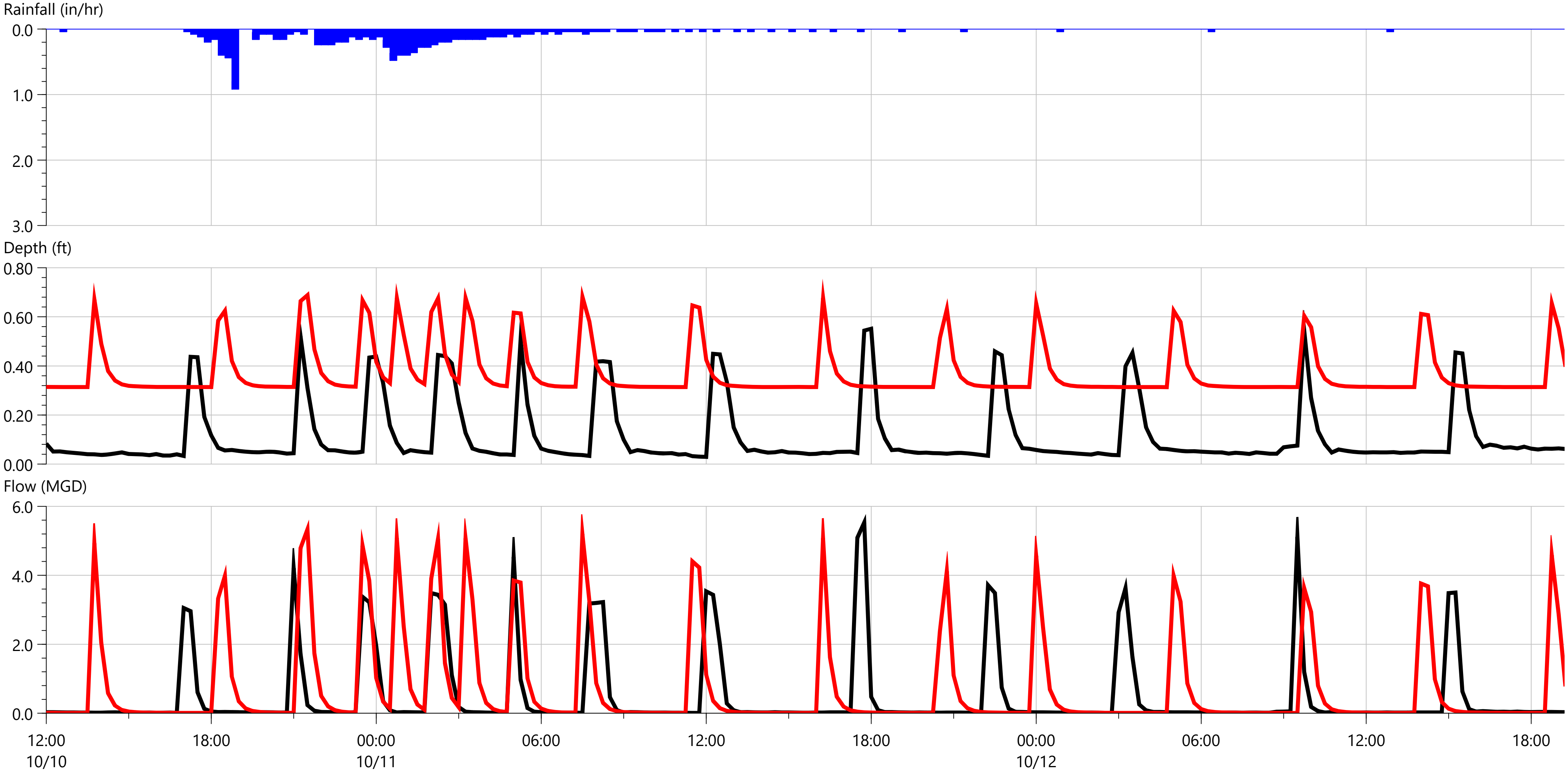
Flow Survey Location (Obs.) HON3, Model Location (Pred.) D/S 16-202-s008A.1, Rainfall Profile: RGHON1



	Rainfall			Depth (ft)		Flow (MGD)		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min	Max	Min	Max	Volume (US Mgal)
Rain —	2.780	0.920	0.051					
Obs. —				0.029	0.551	0.007	5.528	1.087
...>Rainfall Event_Evaporation —				0.313	0.688	0.005	5.334	1.632

Observed / Predicted Report
Verification Event

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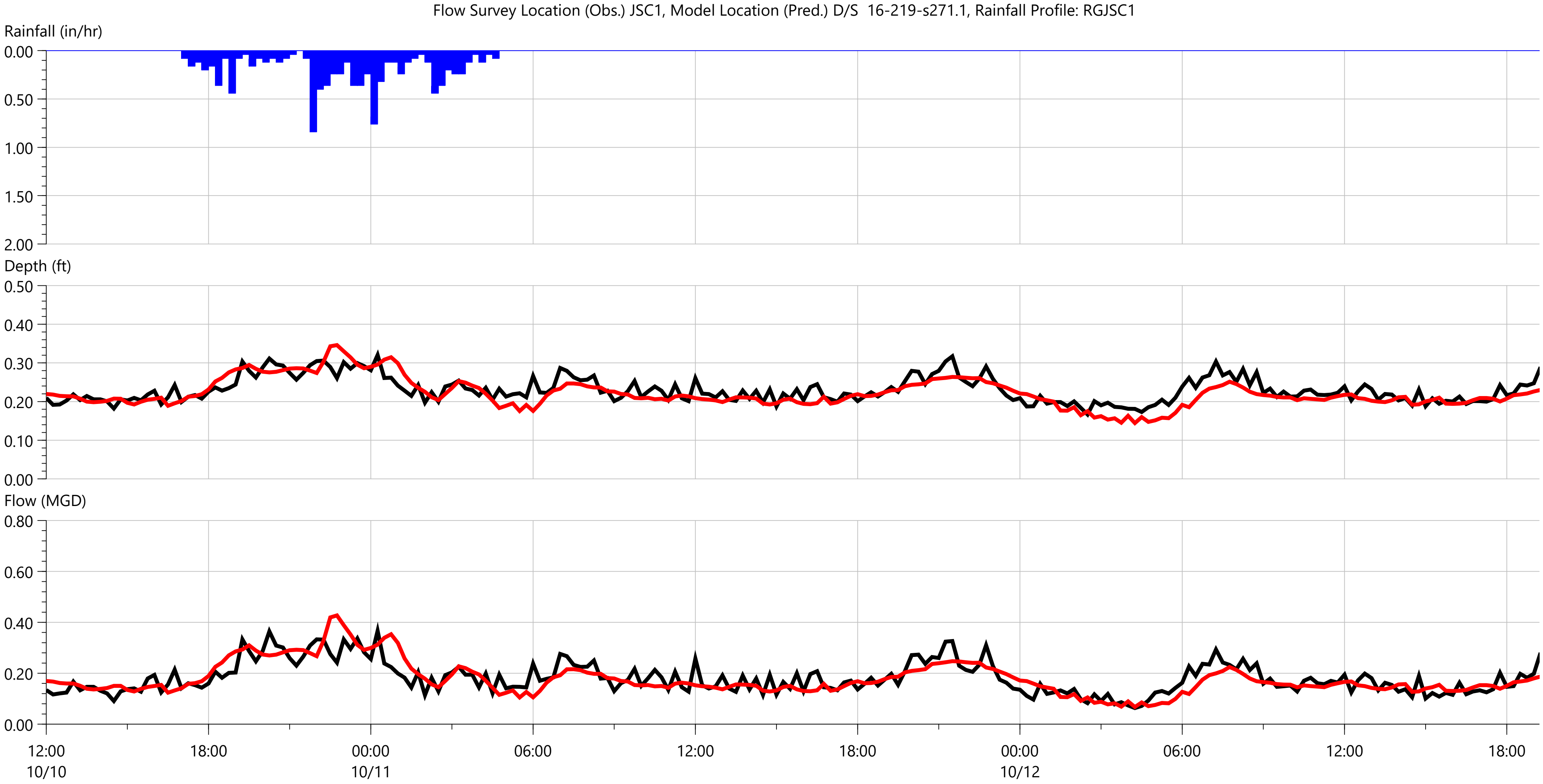

		Rainfall			Depth (ft)		Flow (MGD)		
		Depth (in)	Peak (in/hr)	Average (in/hr)	Min	Max	Min	Max	Volume (US Mgal)
Rain	▬	2.360	0.840	0.043					
Obs.	▬				0.166	0.320	0.063	0.367	0.415
...>Rainfall Event_Evaporation	▬				0.144	0.346	0.068	0.427	0.406

Observed / Predicted Report
Verification Event

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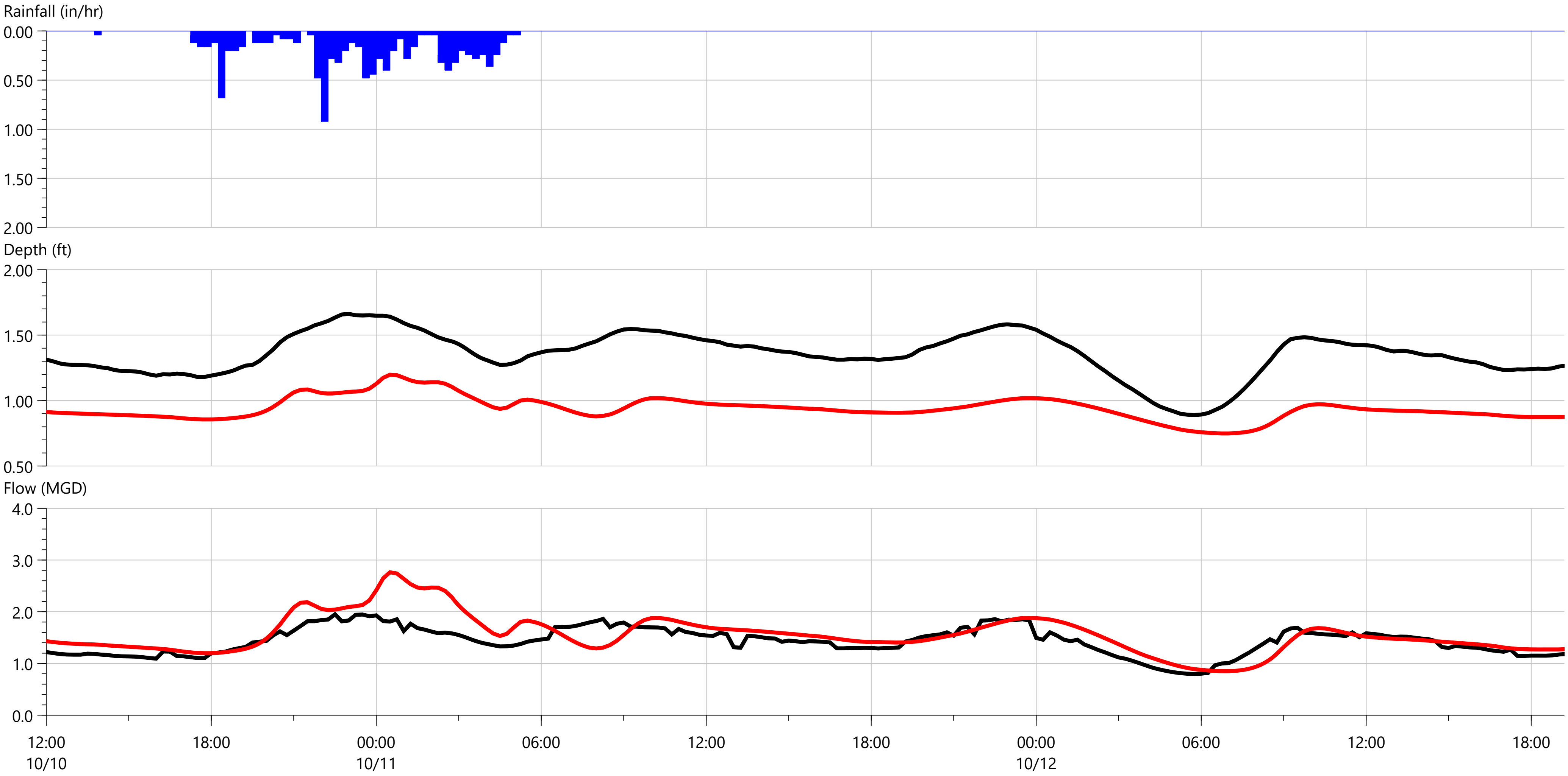
Flow Survey Location (Obs.) LCKC1, Model Location (Pred.) D/S 16-161-s020.1, Rainfall Profile: RGLCKC1



	Rainfall			Depth (ft)		Flow (MGD)		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min	Max	Min	Max	Volume (US Mgal)
Rain —	2.570	0.920	0.047					
Obs. —				0.889	1.662	0.798	1.951	3.292
...>Rainfall Event_Evaporation —				0.749	1.198	0.850	2.764	3.580

Observed / Predicted Report Verification Event

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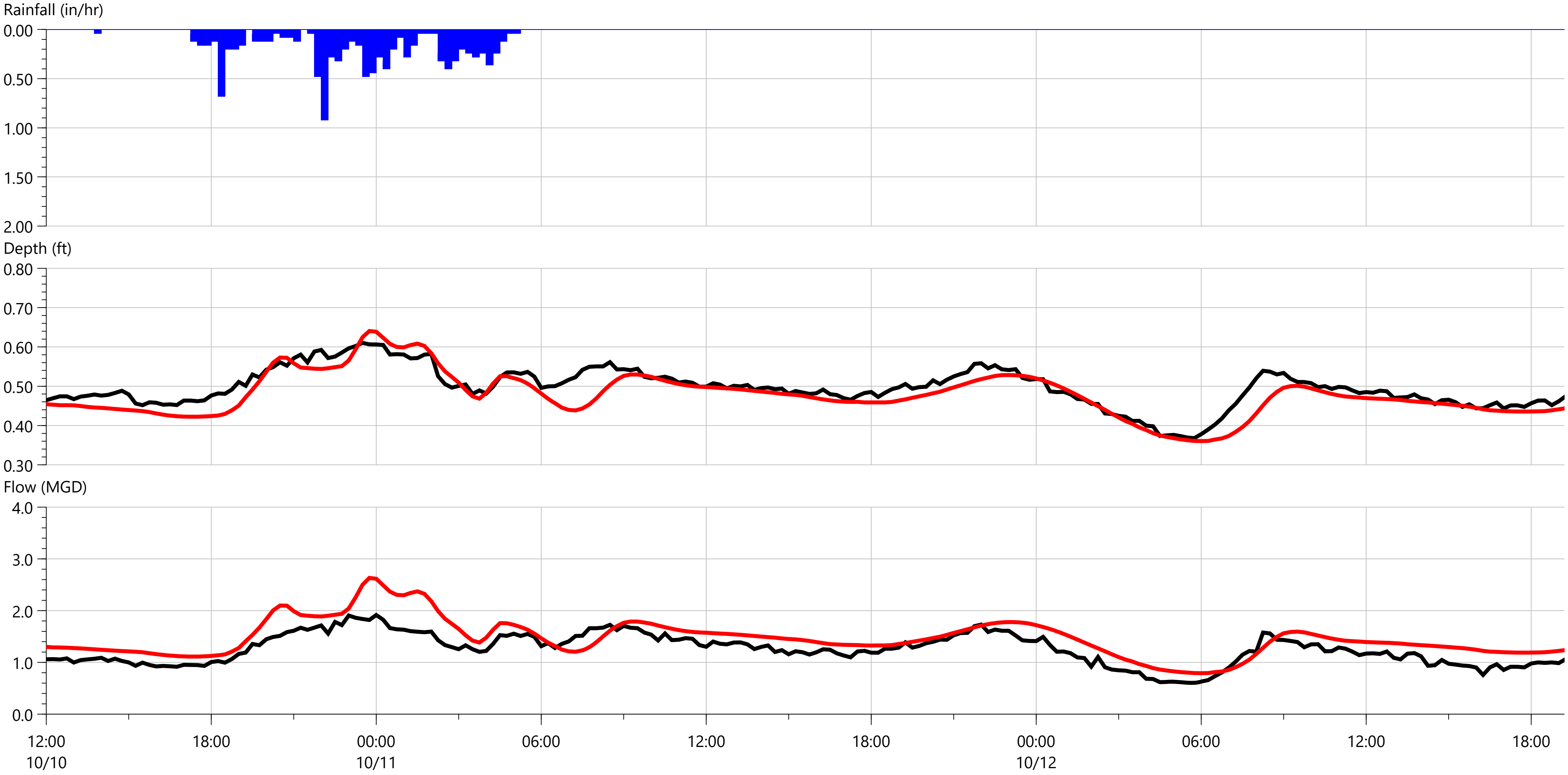
Flow Survey Location (Obs.) LCKC2, Model Location (Pred.) D/S 16-160-s116.1, Rainfall Profile: RGLCKC1



	Rainfall			Depth (ft)		Flow (MGD)		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min	Max	Min	Max	Volume (US Mgal)
Rain —	2.570	0.920	0.047					
Obs. —				0.368	0.610	0.605	1.916	2.881
...>Rainfall Event_Evaporation —				0.360	0.640	0.792	2.631	3.364

Observed / Predicted Report
Verification Event

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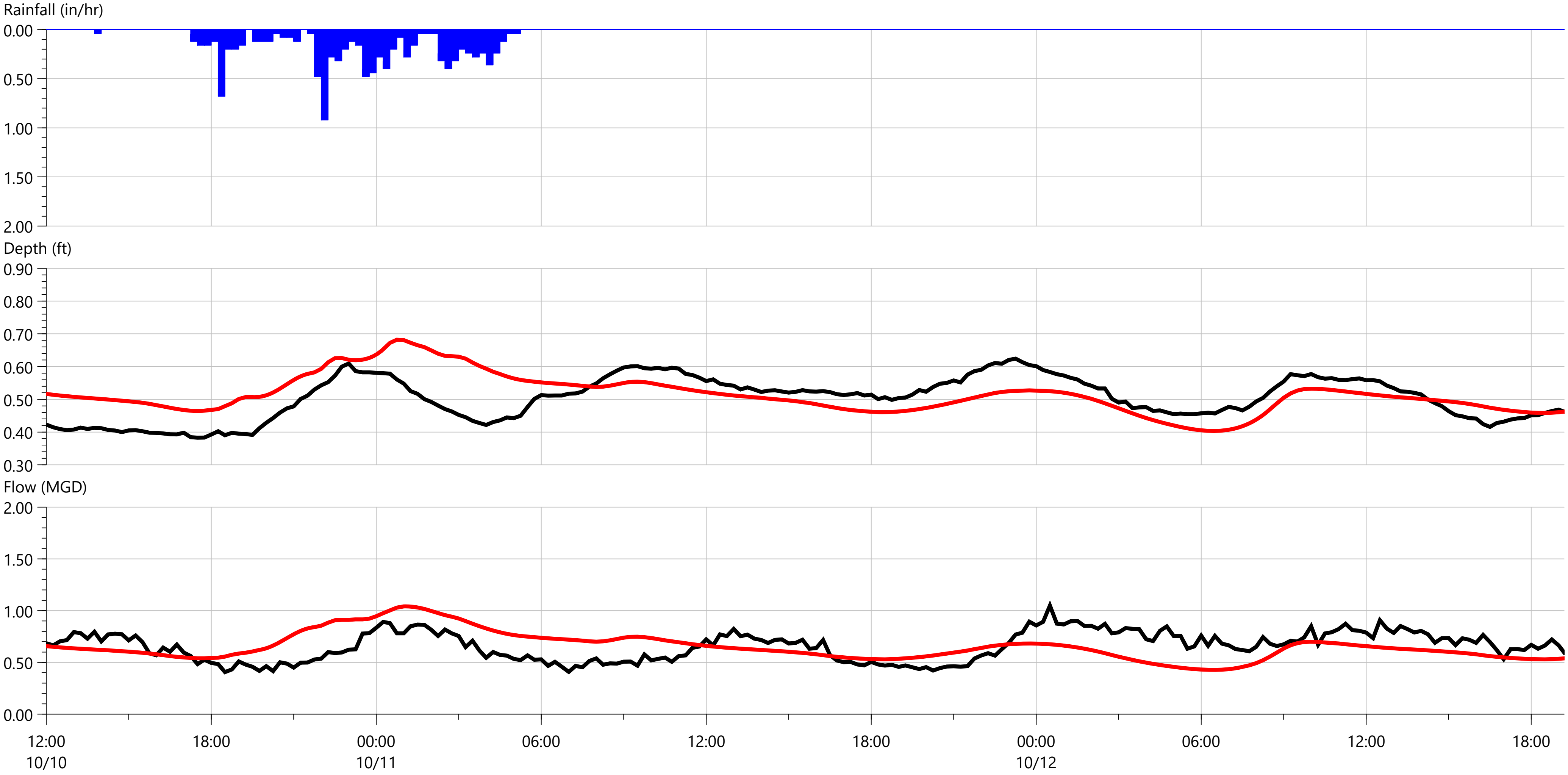
Flow Survey Location (Obs.) LSM1, Model Location (Pred.) D/S 16-161-s007.1, Rainfall Profile: RGLCKC1



	Rainfall			Depth (ft)		Flow (MGD)		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min	Max	Min	Max	Volume (US Mgal)
Rain	2.570	0.920	0.047					
Obs.				0.383	0.624	0.406	1.049	1.511
...>Rainfall Event_Evaporation				0.404	0.682	0.428	1.040	1.501

Observed / Predicted Report
Verification Event

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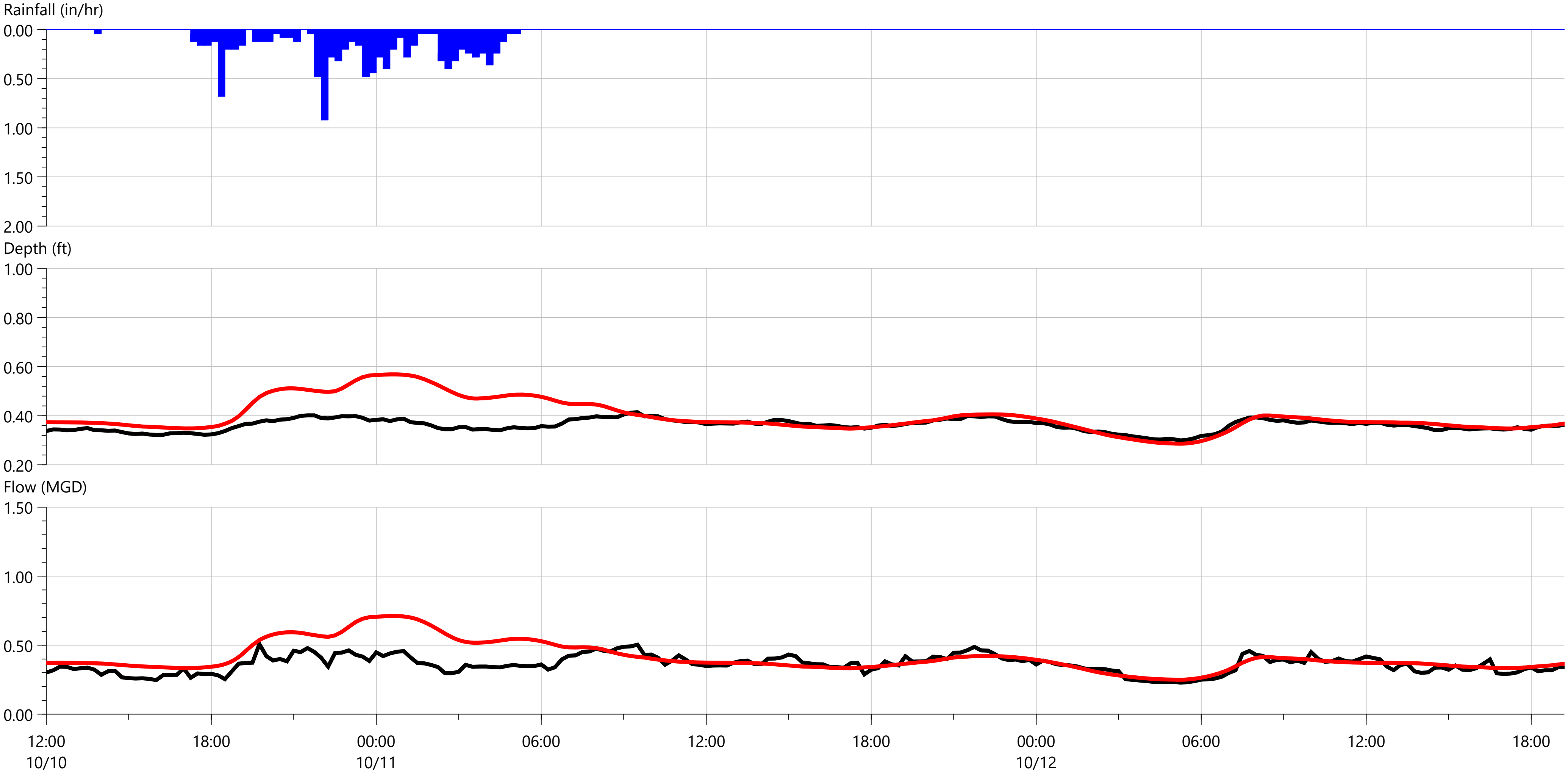
Flow Survey Location (Obs.) LSM2, Model Location (Pred.) D/S 18-030-s043.1, Rainfall Profile: RGLCKC1



	Rainfall			Depth (ft)		Flow (MGD)		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min	Max	Min	Max	Volume (US Mgal)
Rain —	2.570	0.920	0.047					
Obs. —				0.299	0.414	0.229	0.508	0.831
...>Rainfall Event_Evaporation —				0.286	0.568	0.250	0.711	0.944

Observed / Predicted Report
Verification Event

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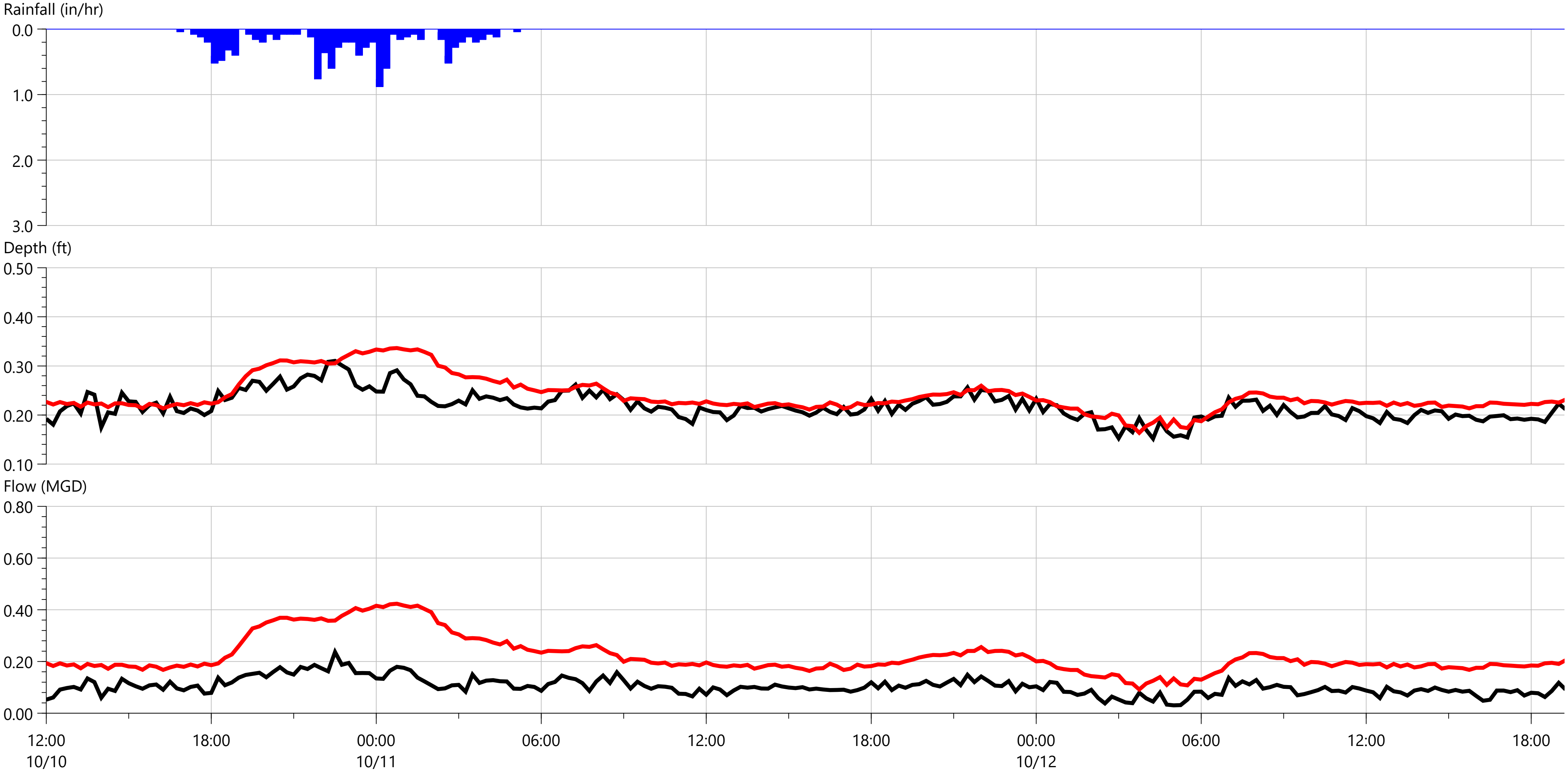
Flow Survey Location (Obs.) PB1, Model Location (Pred.) D/S 16-078-s026.1, Rainfall Profile: RGPB2



		Rainfall			Depth (ft)		Flow (MGD)		
		Depth (in)	Peak (in/hr)	Average (in/hr)	Min	Max	Min	Max	Volume (US Mgal)
Rain	▬	2.610	0.880	0.047					
Obs.	▬				0.152	0.310	0.030	0.237	0.239
...>Rainfall Event_Evaporation	▬				0.164	0.336	0.092	0.423	0.507

Observed / Predicted Report
Verification Event

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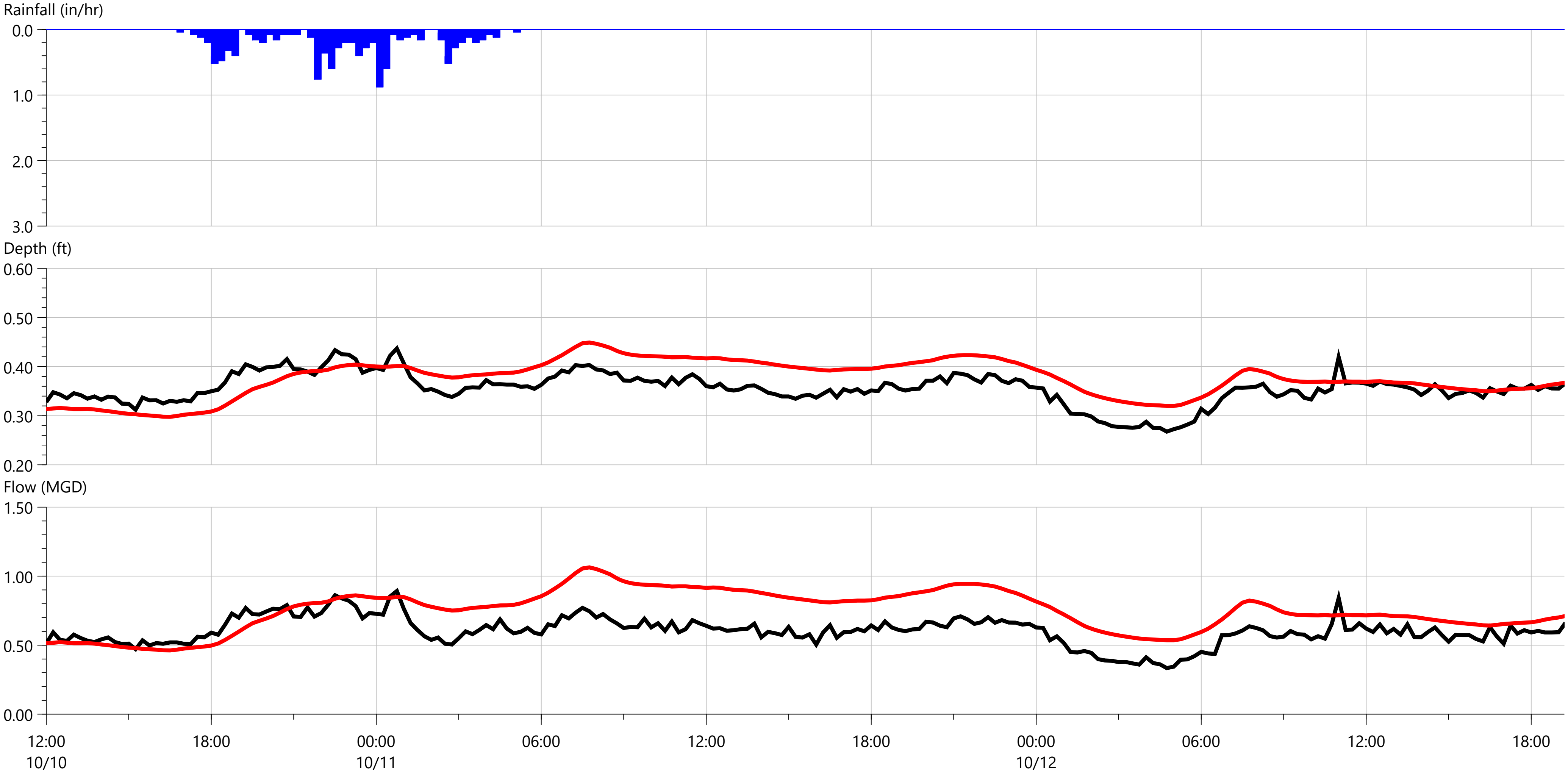
Flow Survey Location (Obs.) PB2, Model Location (Pred.) D/S 16-076-s225.1, Rainfall Profile: RGPB2



	Rainfall			Depth (ft)		Flow (MGD)		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min	Max	Min	Max	Volume (US Mgal)
Rain —	2.610	0.880	0.047					
Obs. —				0.268	0.437	0.333	0.892	1.385
...>Rainfall Event_Evaporation —				0.298	0.449	0.462	1.064	1.724

Observed / Predicted Report
Verification Event

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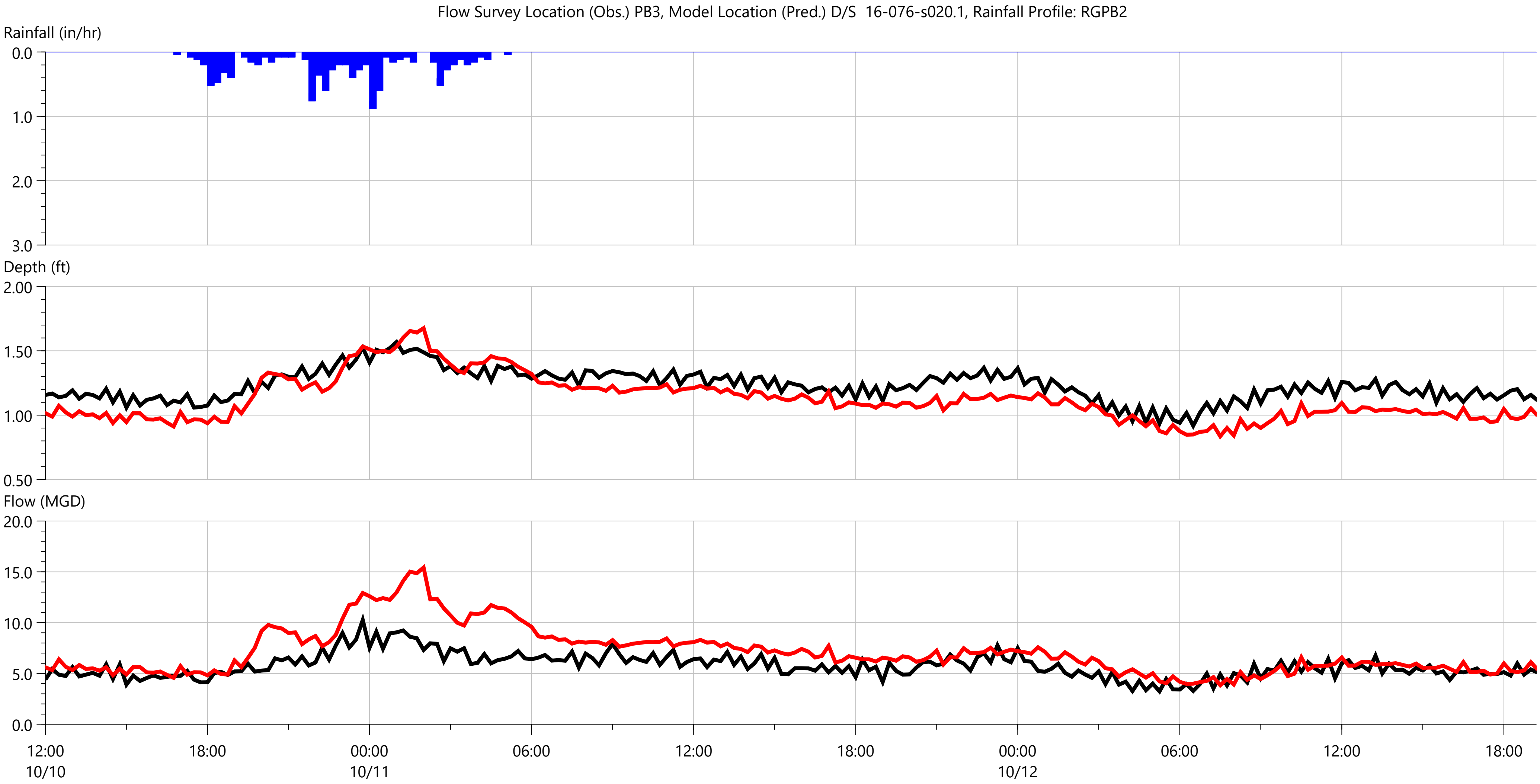

		Rainfall			Depth (ft)		Flow (MGD)		
		Depth (in)	Peak (in/hr)	Average (in/hr)	Min	Max	Min	Max	Volume (US Mgal)
Rain	—	2.610	0.880	0.047					
Obs.	—				0.917	1.569	3.234	10.263	13.225
...>Rainfall Event_Evaporation	—				0.836	1.676	3.846	15.425	16.319

Observed / Predicted Report
Verification Event

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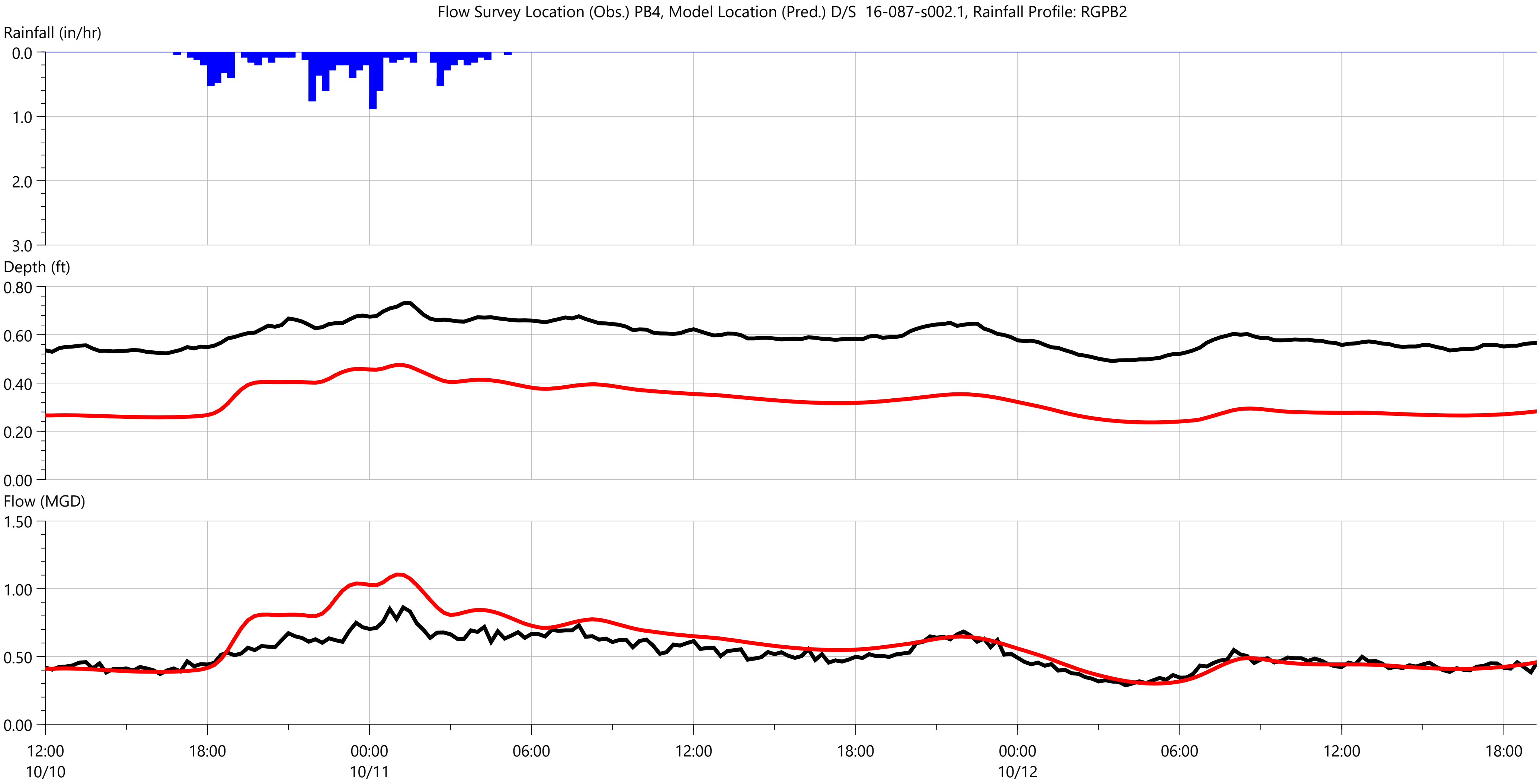

	Rainfall			Depth (ft)		Flow (MGD)		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min	Max	Min	Max	Volume (US Mgal)
Rain —	2.610	0.880	0.047					
Obs. —				0.491	0.732	0.288	0.862	1.193
...>Rainfall Event_Evaporation —				0.236	0.474	0.300	1.105	1.334

Observed / Predicted Report
Verification Event

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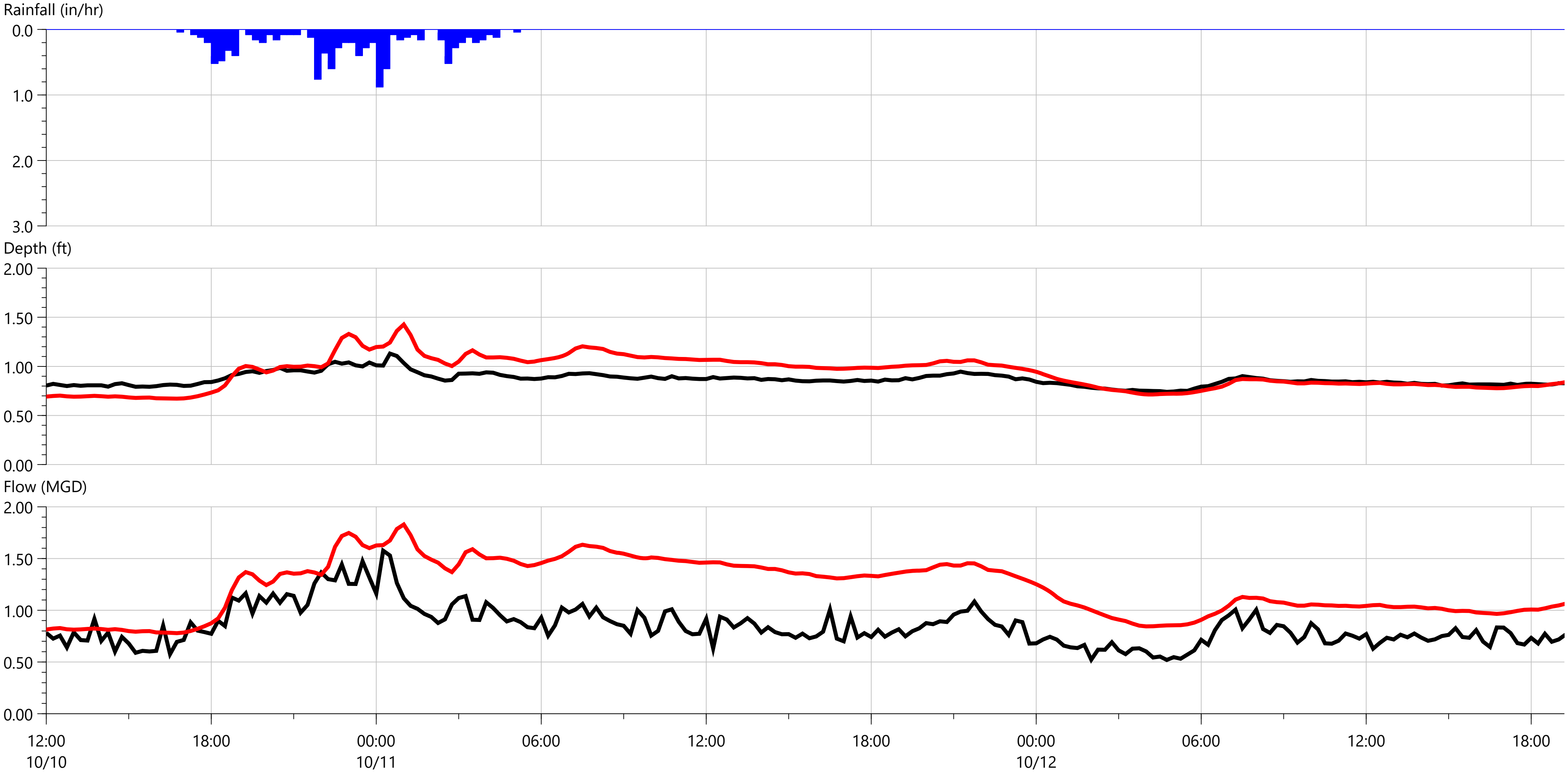
Flow Survey Location (Obs.) PB5, Model Location (Pred.) D/S 16-074-s006.1, Rainfall Profile: RGPB2



		Rainfall			Depth (ft)		Flow (MGD)		
		Depth (in)	Peak (in/hr)	Average (in/hr)	Min	Max	Min	Max	Volume (US Mgal)
Rain	—	2.610	0.880	0.047					
Obs.	—				0.740	1.130	0.520	1.576	1.946
...>Rainfall Event_Evaporation	—				0.671	1.427	0.778	1.828	2.811

Observed / Predicted Report
Verification Event

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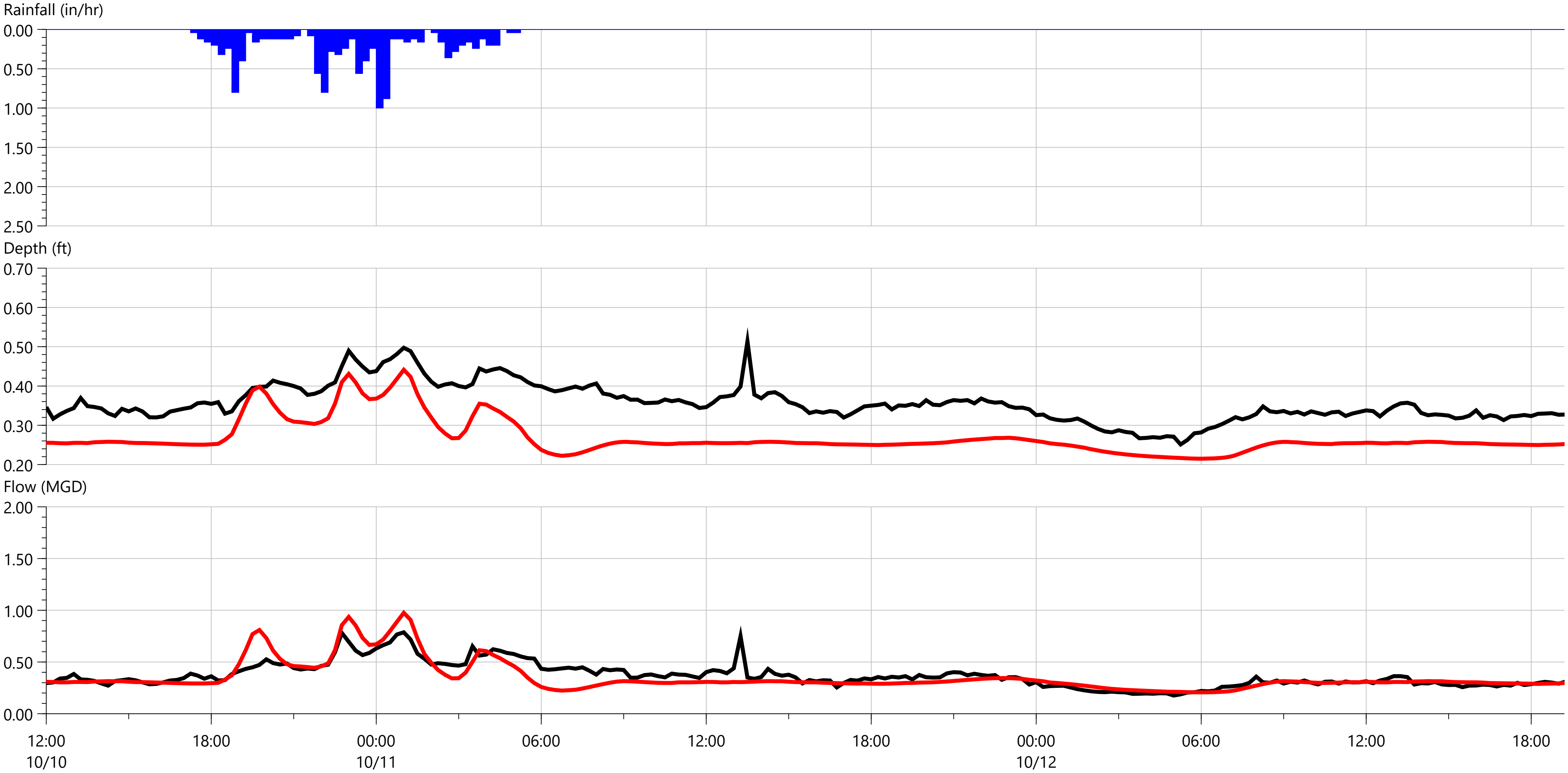
Flow Survey Location (Obs.) PB6, Model Location (Pred.) D/S 16-105-s018.1, Rainfall Profile: RGPB3



	Rainfall			Depth (ft)		Flow (MGD)		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min	Max	Min	Max	Volume (US Mgal)
Rain ▬	2.840	1.000	0.052					
Obs. ▬				0.251	0.514	0.176	0.787	0.846
...>Rainfall Event_Evaporation ▬				0.215	0.441	0.206	0.976	0.806

Observed / Predicted Report
Verification Event

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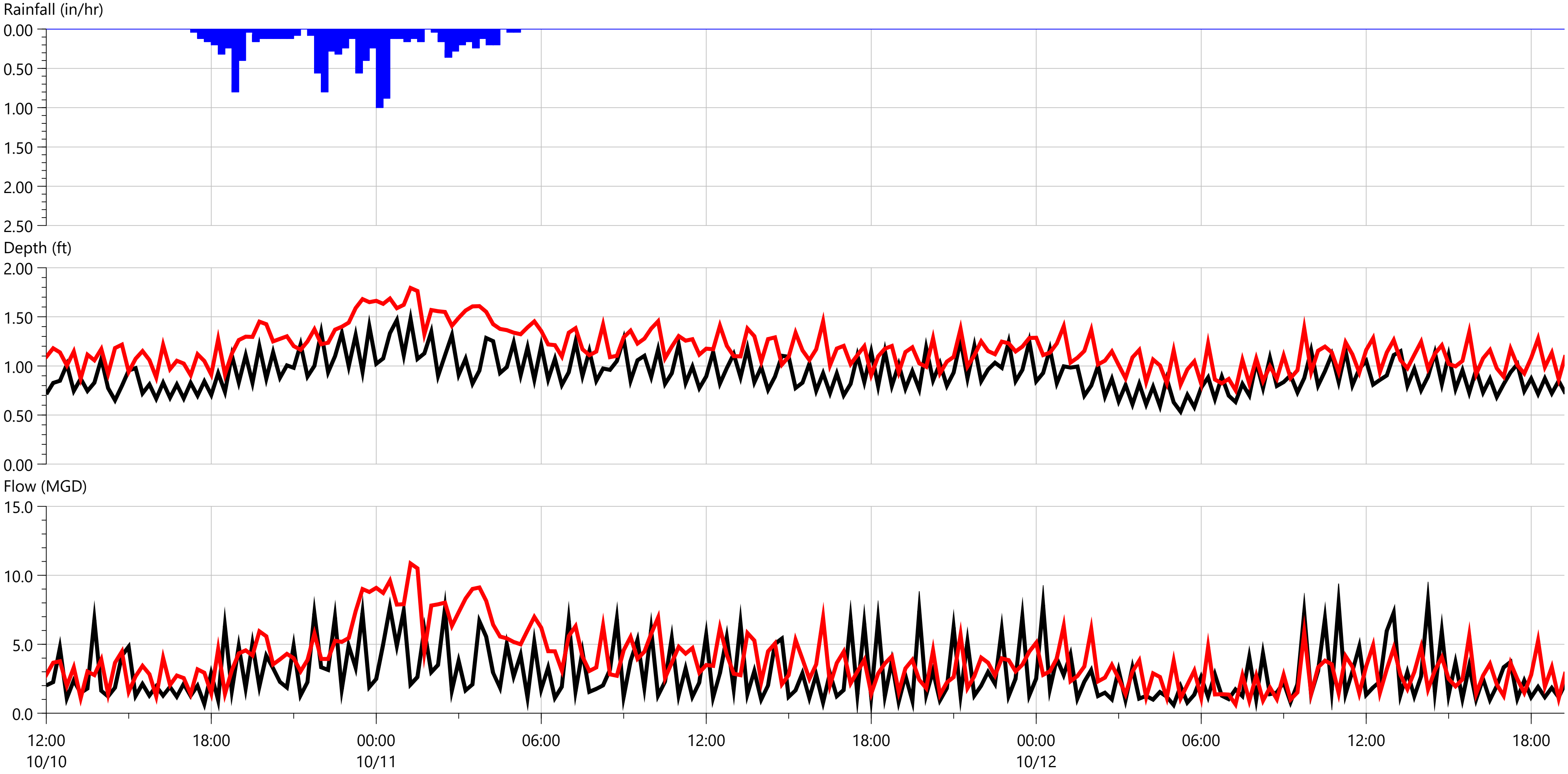
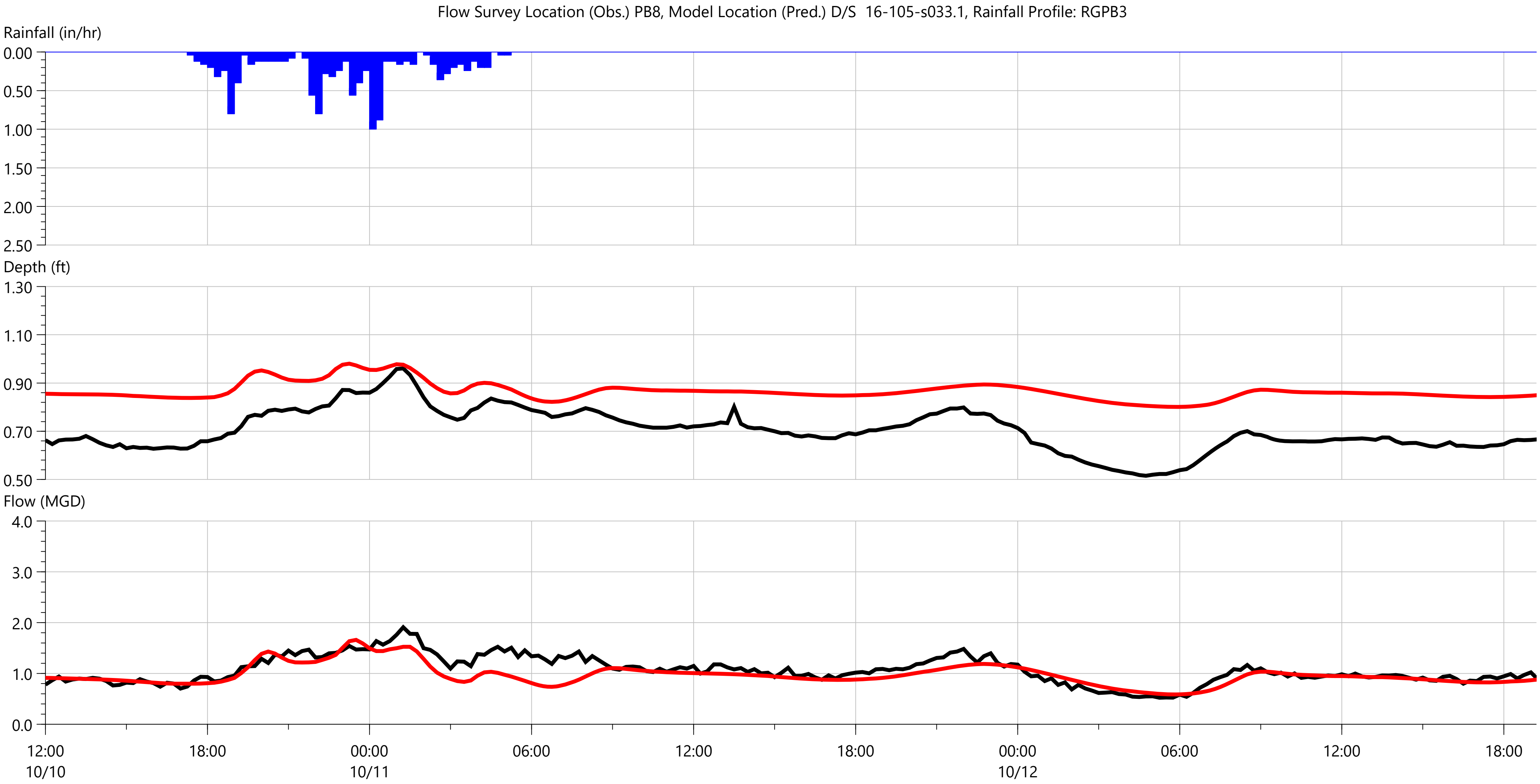
Flow Survey Location (Obs.) PB7, Model Location (Pred.) D/S 16-105-s031.1, Rainfall Profile: RGPB3



		Rainfall			Depth (ft)		Flow (MGD)		
		Depth (in)	Peak (in/hr)	Average (in/hr)	Min	Max	Min	Max	Volume (US Mgal)
Rain	▬	2.840	1.000	0.052					
Obs.	▬				0.535	1.480	0.588	8.084	6.690
...>Rainfall Event_Evaporation	▬				0.752	1.794	0.640	10.859	8.807

Observed / Predicted Report
Verification Event

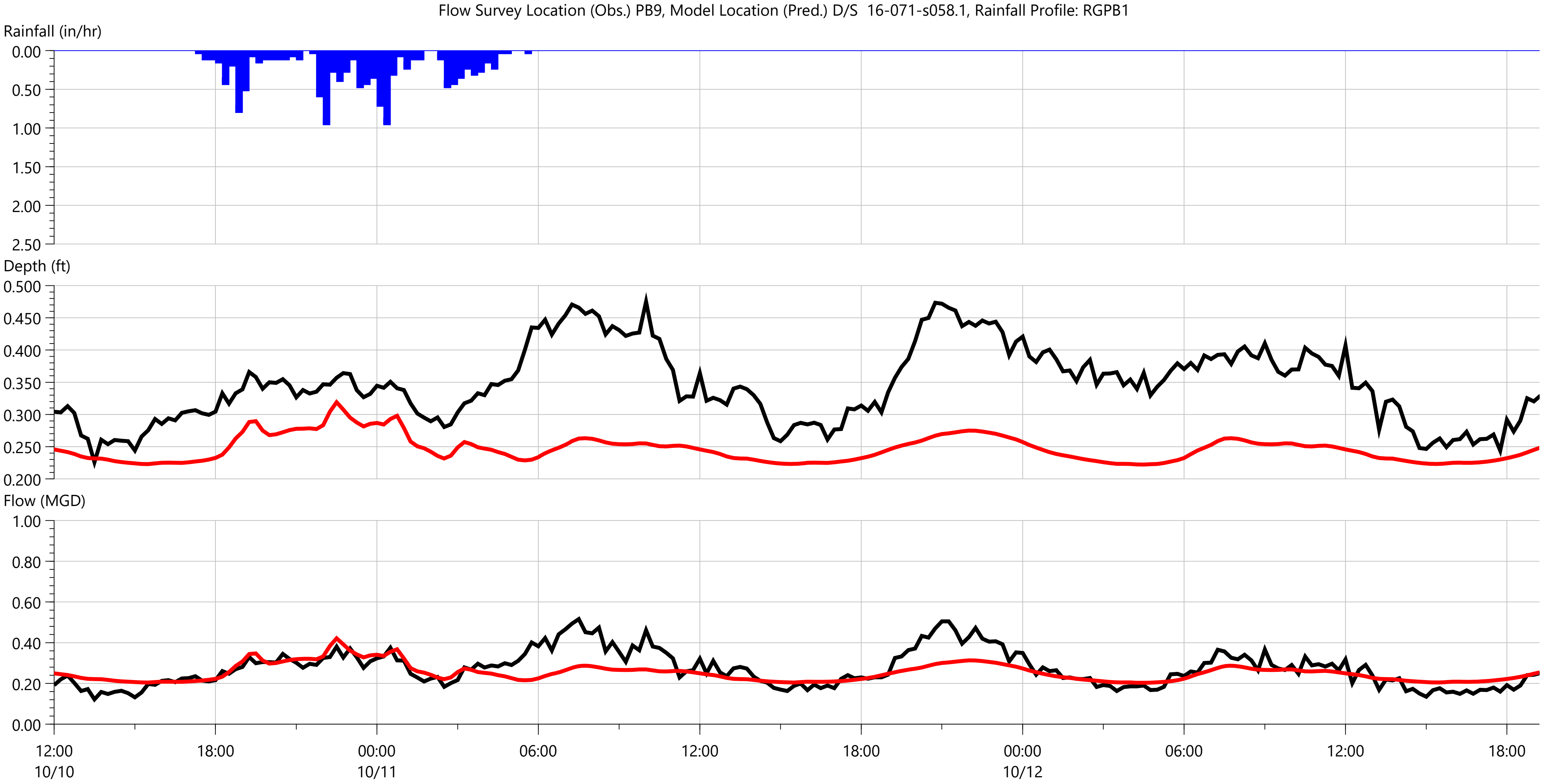
Powered by InfoWorks®



		Rainfall			Depth (ft)		Flow (MGD)		
		Depth (in)	Peak (in/hr)	Average (in/hr)	Min	Max	Min	Max	Volume (US Mgal)
Rain	▬	2.840	1.000	0.052					
Obs.	▬				0.515	0.961	0.522	1.910	2.434
...>Rainfall Event_Evaporation	▬				0.801	0.980	0.588	1.660	2.225

Observed / Predicted Report
Verification Event

Powered by InfoWorks®


Flow Survey Location (Obs.) PB9, Model Location (Pred.) D/S 16-071-s058.1, Rainfall Profile: RGPB1

		Rainfall			Depth (ft)		Flow (MGD)		
		Depth (in)	Peak (in/hr)	Average (in/hr)	Min	Max	Min	Max	Volume (US Mgal)
Rain	—	3.150	0.960	0.057					
Obs.	—				0.226	0.475	0.122	0.516	0.626
...>Rainfall Event_Evaporation	—				0.222	0.319	0.203	0.421	0.578

Observed / Predicted Report
Verification Event

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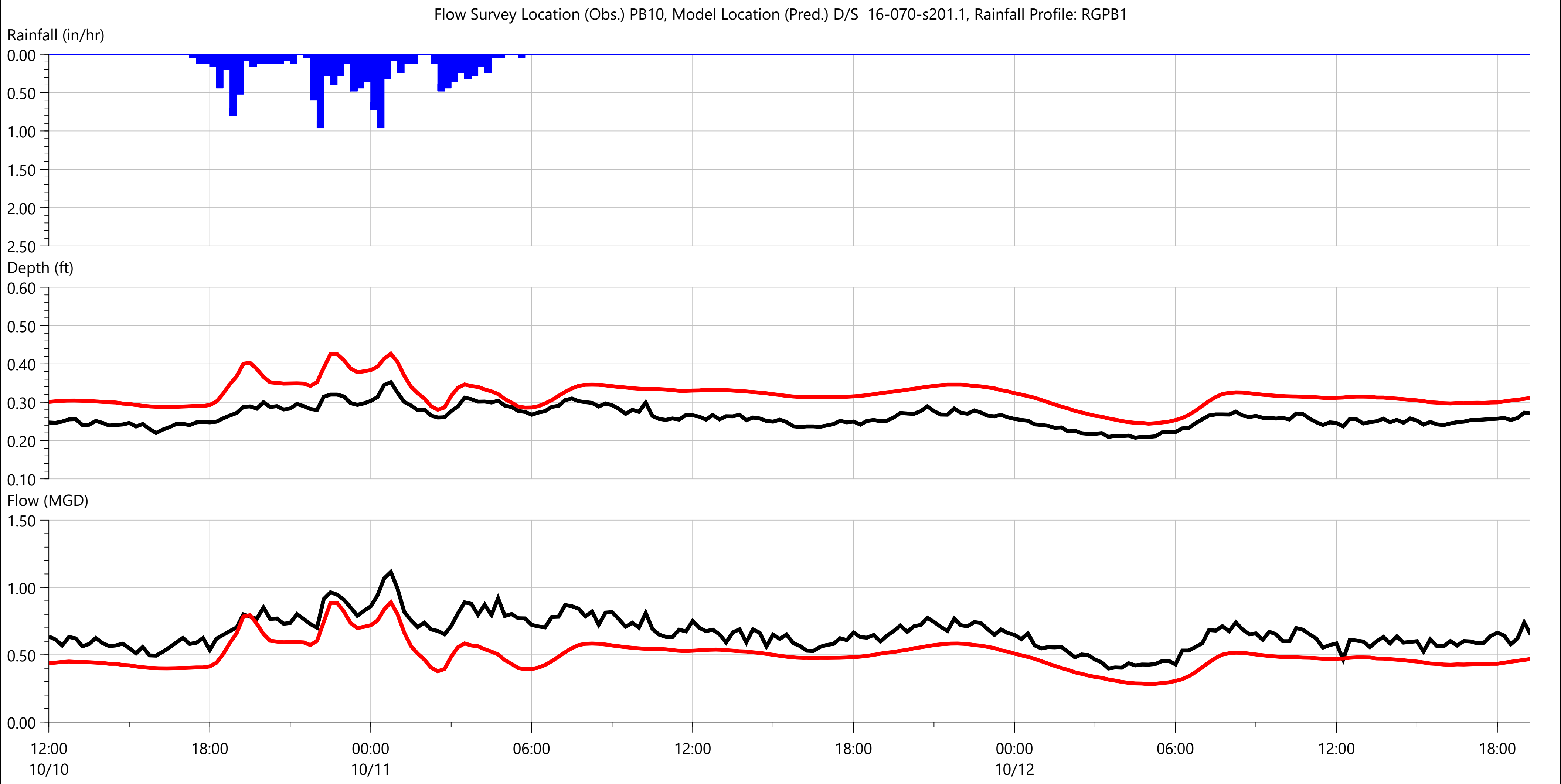

	Rainfall			Depth (ft)		Flow (MGD)		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min	Max	Min	Max	Volume (US Mgal)
Rain 🟦	3.150	0.960	0.057					
Obs. ⬛				0.207	0.352	0.398	1.115	1.519
...>Rainfall Event_Evaporation 🟥				0.244	0.427	0.282	0.890	1.145

Observed / Predicted Report
Verification Event

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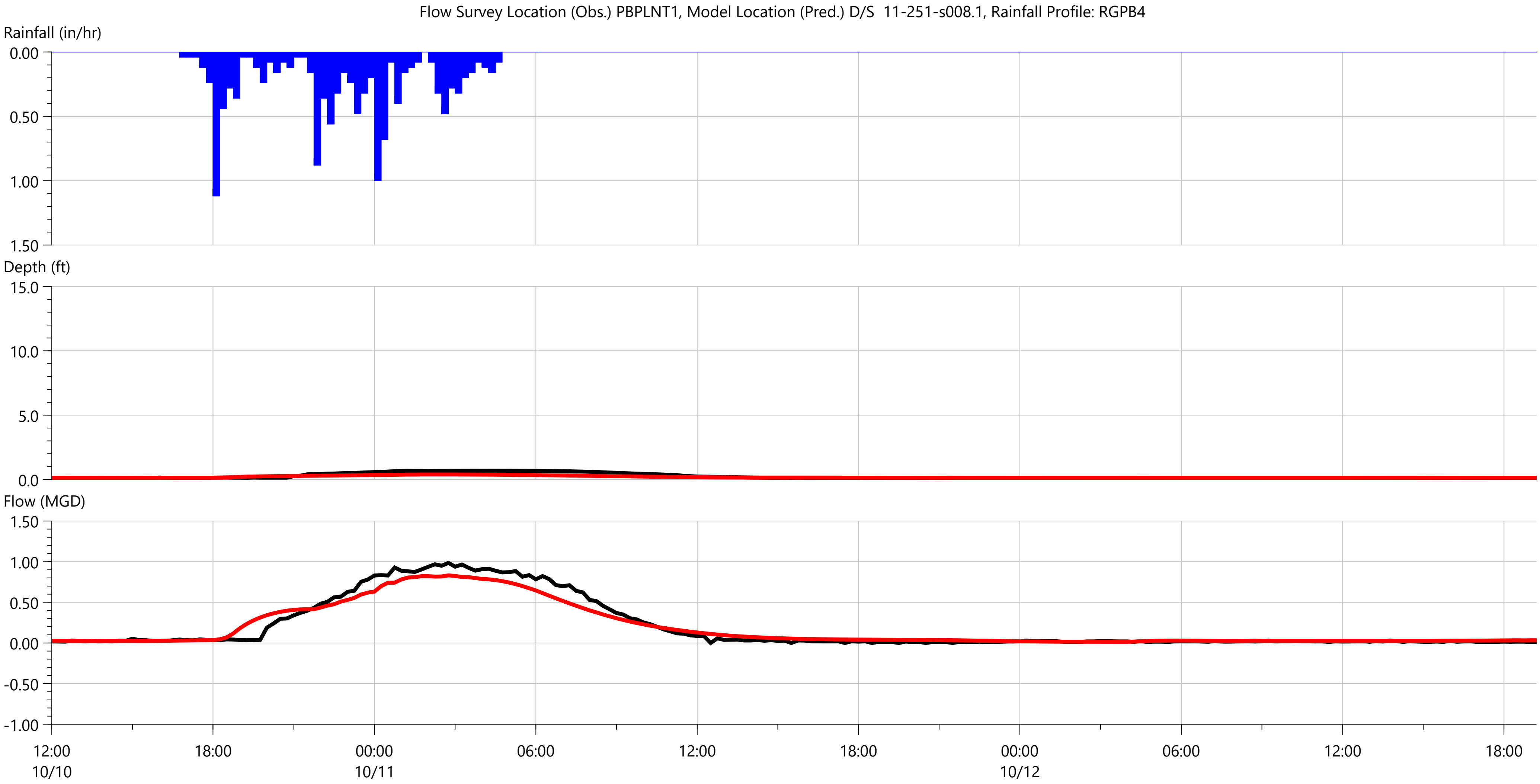

	Rainfall			Depth (ft)		Flow (MGD)		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min	Max	Min	Max	Volume (US Mgal)
Rain 🟦	3.030	1.120	0.055					
Obs. ⬛				0.080	0.673	0.000	0.985	0.445
...>Rainfall Event_Evaporation 🟥				0.124	0.388	0.014	0.831	0.420

Observed / Predicted Report Verification Event

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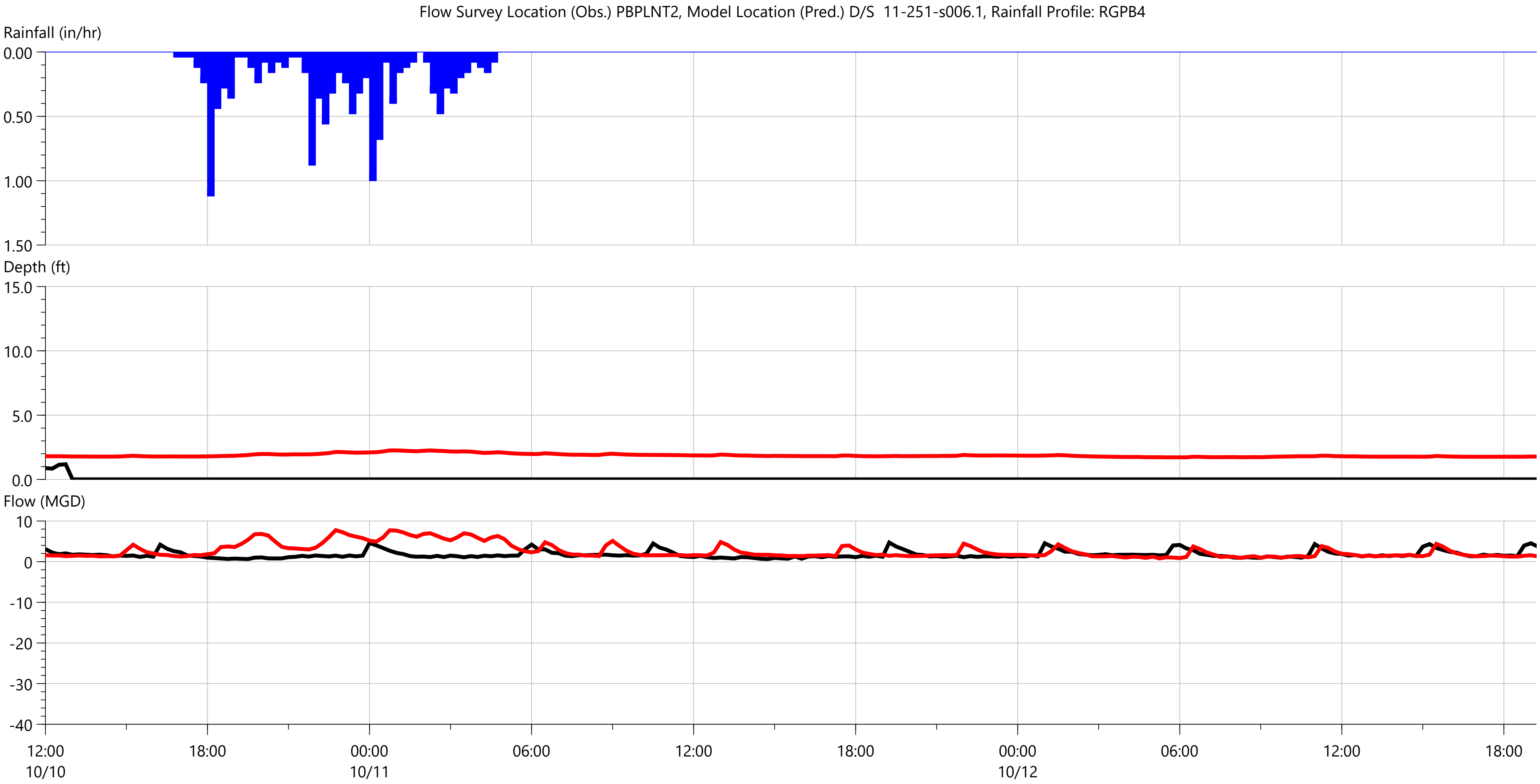

	Rainfall			Depth (ft)		Flow (MGD)		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min	Max	Min	Max	Volume (US Mgal)
Rain 🟦	3.030	1.120	0.055					
Obs. ■				0.000	1.176	0.634	4.707	3.982
...>Rainfall Event_Evaporation 🟥				1.707	2.251	0.804	7.740	6.050

Observed / Predicted Report
Verification Event

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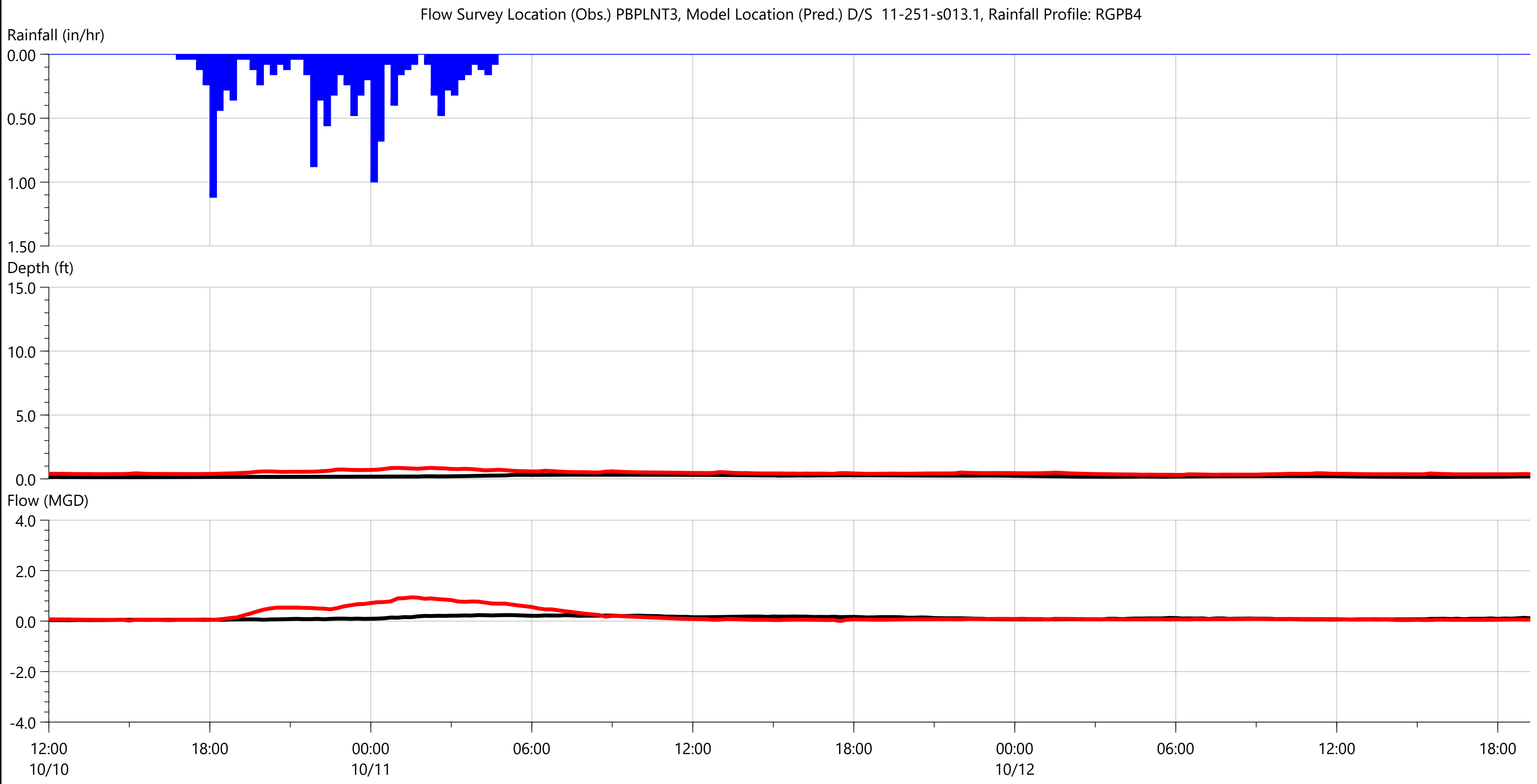

	Rainfall			Depth (ft)		Flow (MGD)		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min	Max	Min	Max	Volume (US Mgal)
Rain 🟦	3.030	1.120	0.055					
Obs. ■				0.119	0.329	0.034	0.241	0.274
...>Rainfall Event_Evaporation 🟥				0.305	0.854	0.005	0.941	0.465

Observed / Predicted Report
Verification Event

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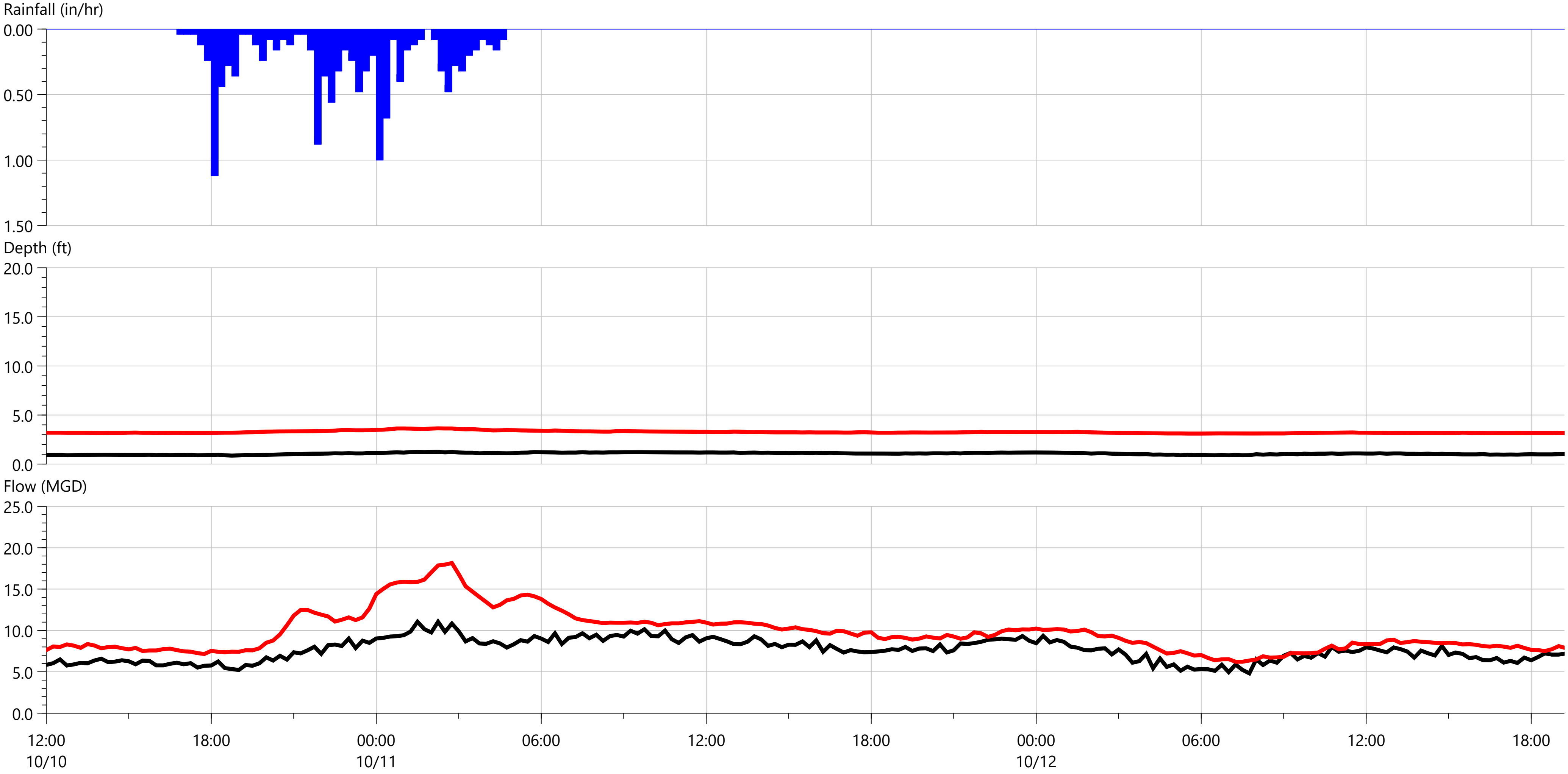
Flow Survey Location (Obs.) PBPLNT4, Model Location (Pred.) D/S 11-251-s036.1, Rainfall Profile: RGPB4



	Rainfall			Depth (ft)		Flow (MGD)		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min	Max	Min	Max	Volume (US Mgal)
Rain —	3.030	1.120	0.055					
Obs. —				0.860	1.244	4.817	11.048	17.546
...>Rainfall Event_Evaporation —				3.106	3.645	6.226	18.148	22.514

Observed / Predicted Report
Verification Event

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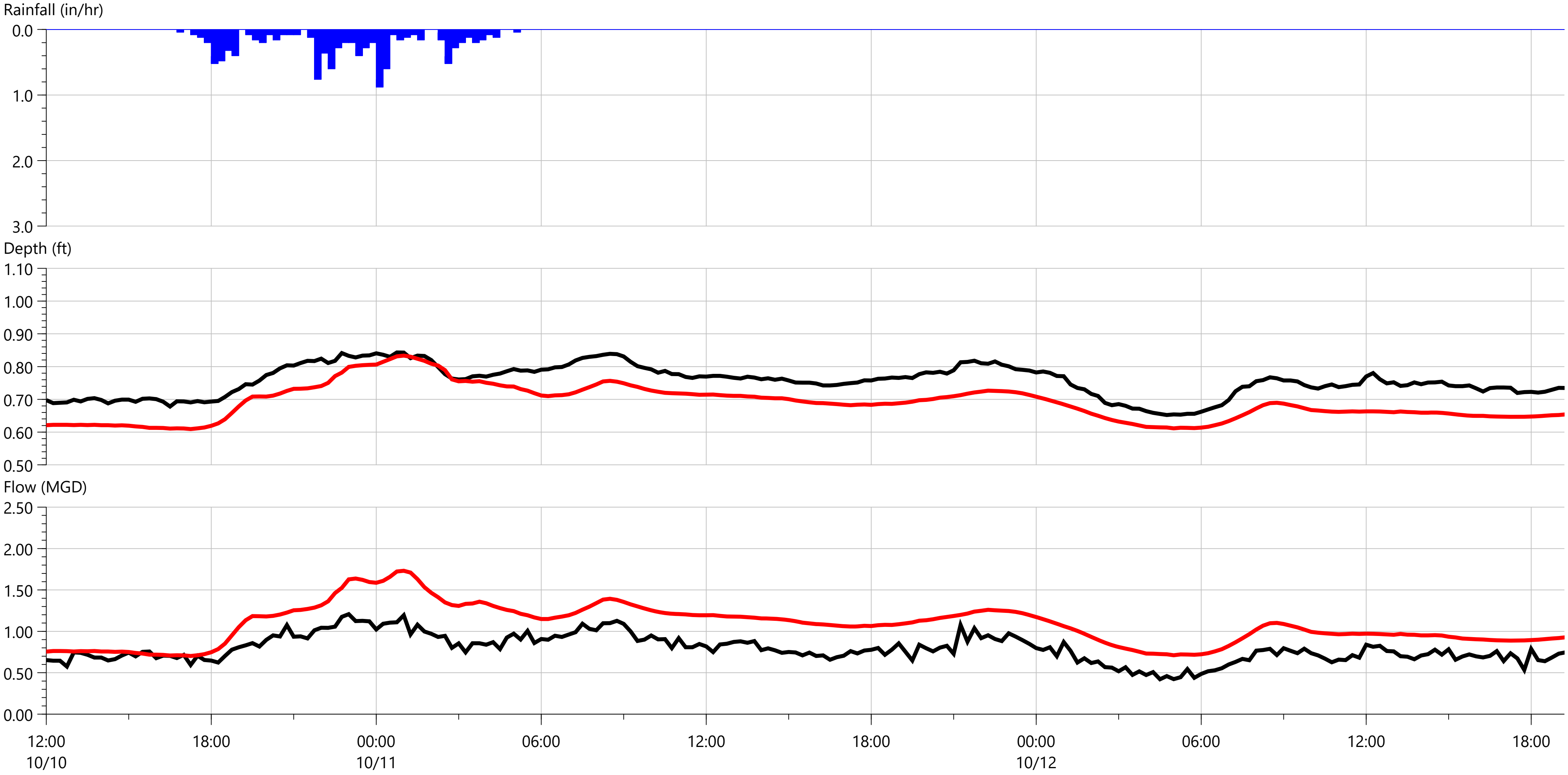
Flow Survey Location (Obs.) PBPLNT5, Model Location (Pred.) D/S 16-079-s007.1, Rainfall Profile: RGPB2



	Rainfall			Depth (ft)		Flow (MGD)		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min	Max	Min	Max	Volume (US Mgal)
Rain ━	2.610	0.880	0.047					
Obs. ━				0.652	0.843	0.422	1.207	1.820
...>Rainfall Event_Evaporation ━				0.609	0.833	0.703	1.731	2.476

Observed / Predicted Report
Verification Event

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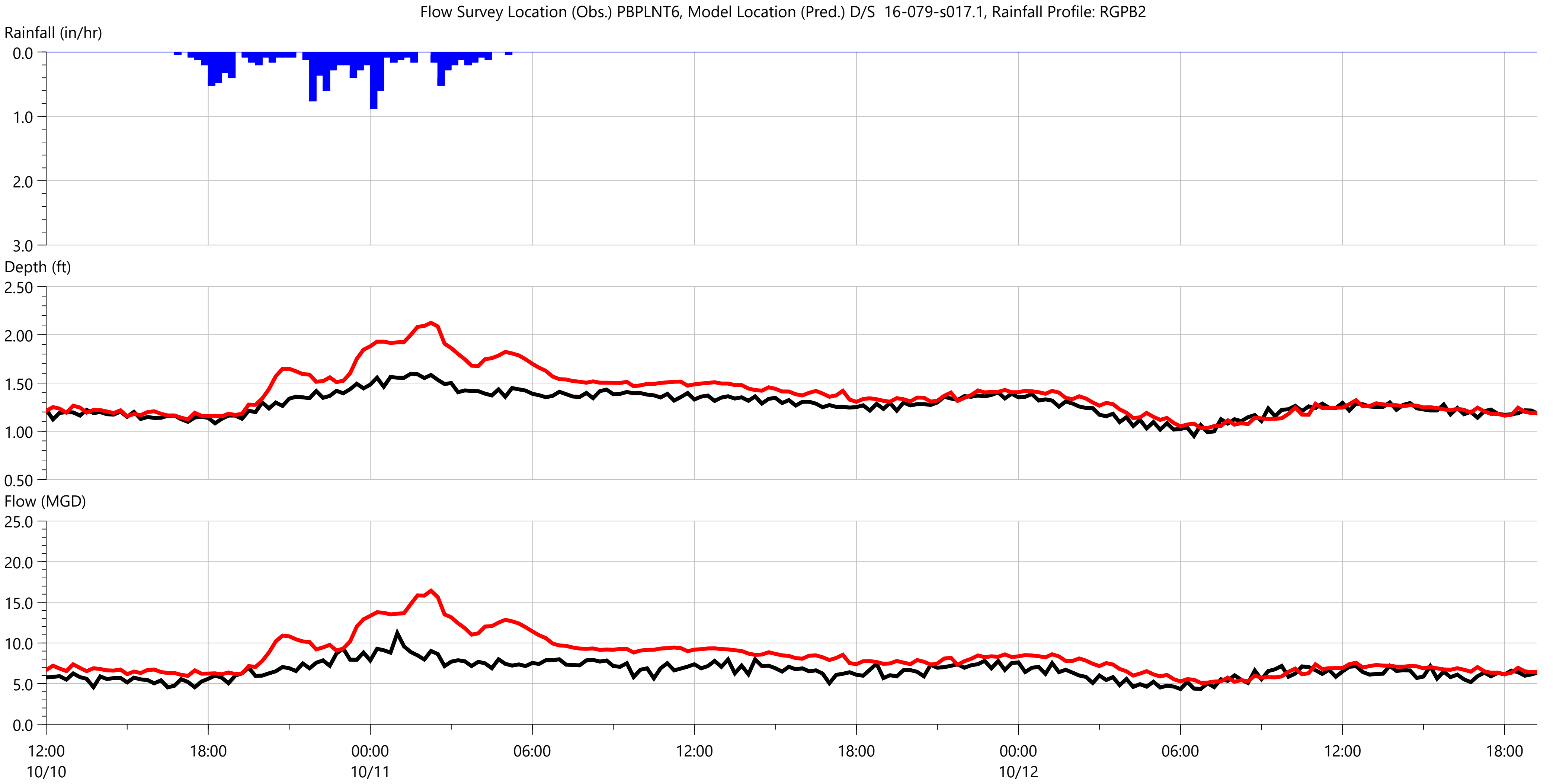
Flow Survey Location (Obs.) PBPLNT6, Model Location (Pred.) D/S 16-079-s017.1, Rainfall Profile: RGPB2

	Rainfall			Depth (ft)		Flow (MGD)		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min	Max	Min	Max	Volume (US Mgal)
Rain ▬	2.610	0.880	0.047					
Obs. ▬				0.950	1.596	4.332	11.212	15.130
...>Rainfall Event_Evaporation ▬				1.033	2.124	5.094	16.424	19.055

Observed / Predicted Report
Verification Event

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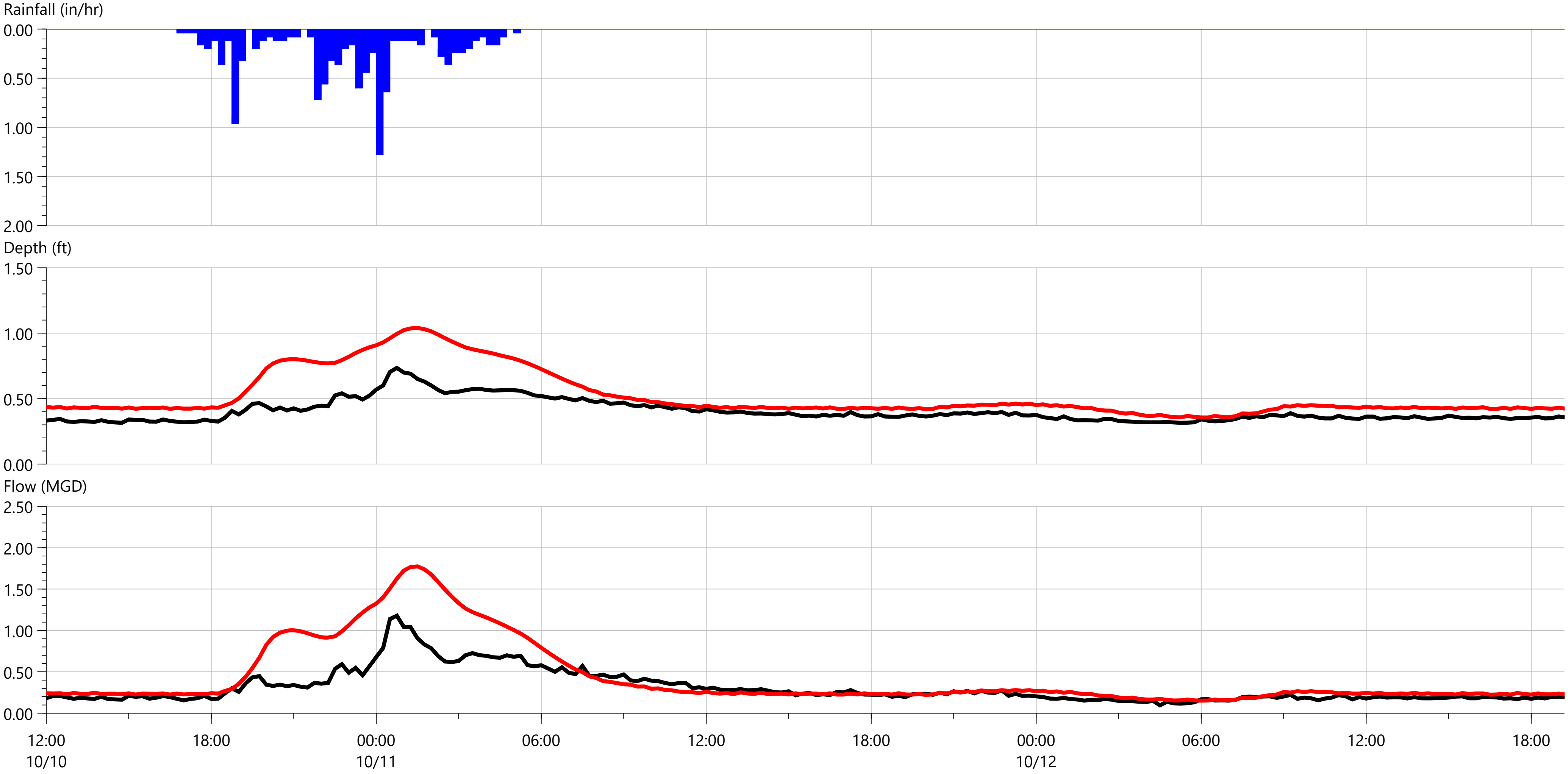
Flow Survey Location (Obs.) PINEM1, Model Location (Pred.) D/S 16-200-s008.1, Rainfall Profile: RGPINEM1



	Rainfall			Depth (ft)		Flow (MGD)		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min	Max	Min	Max	Volume (US Mgal)
Rain ▬	2.860	1.280	0.052					
Obs. ▬				0.315	0.735	0.095	1.179	0.704
...>Rainfall Event_Evaporation ▬				0.356	1.040	0.153	1.774	0.994

Observed / Predicted Report
Verification Event

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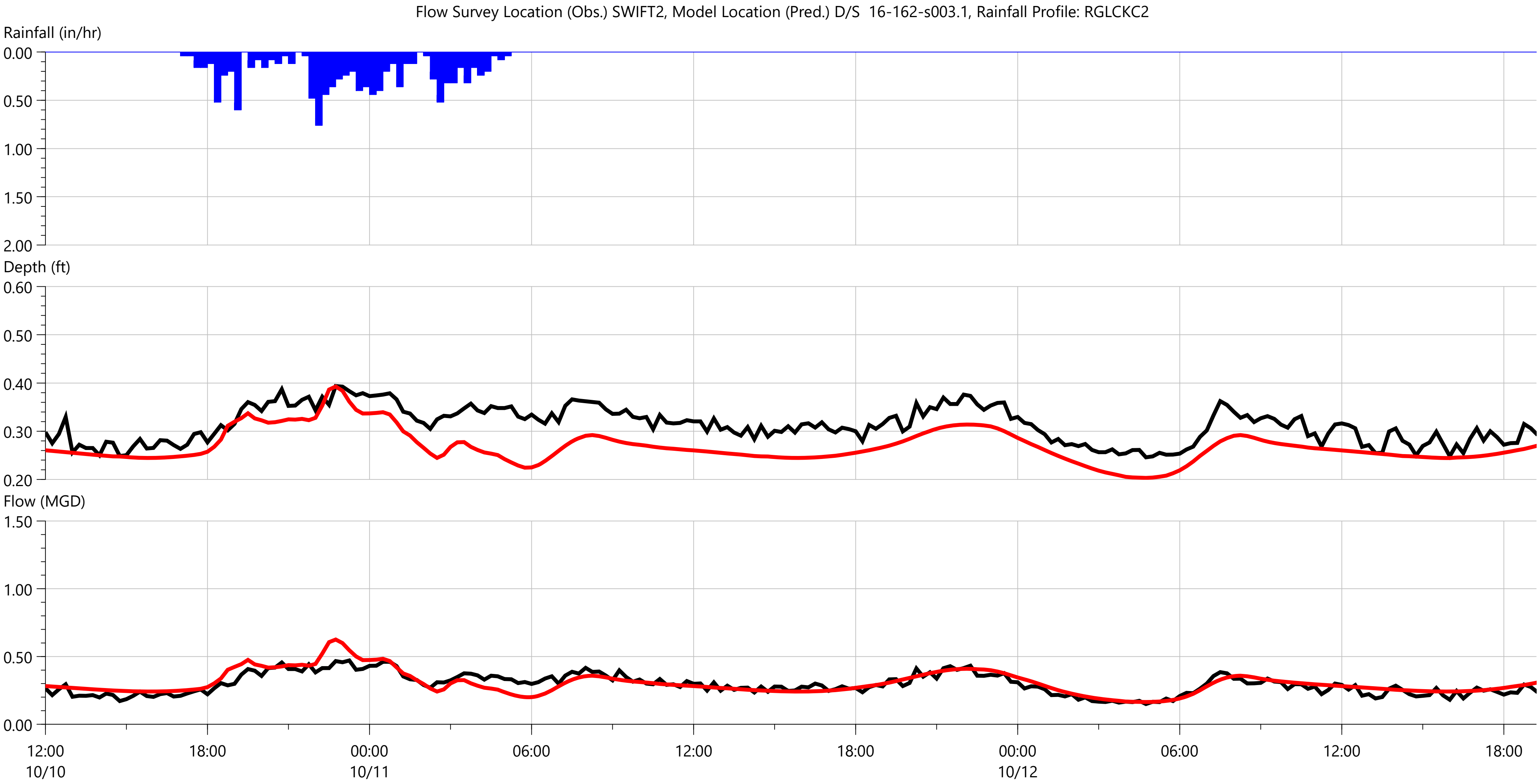
Flow Survey Location (Obs.) SWIFT2, Model Location (Pred.) D/S 16-162-s003.1, Rainfall Profile: RGLCKC2

		Rainfall			Depth (ft)		Flow (MGD)		
		Depth (in)	Peak (in/hr)	Average (in/hr)	Min	Max	Min	Max	Volume (US Mgal)
Rain	▬	2.720	0.760	0.049					
Obs.	▬				0.246	0.394	0.149	0.470	0.674
...>Rainfall Event_Evaporation	▬				0.203	0.393	0.164	0.625	0.693

Observed / Predicted Report
Verification Event

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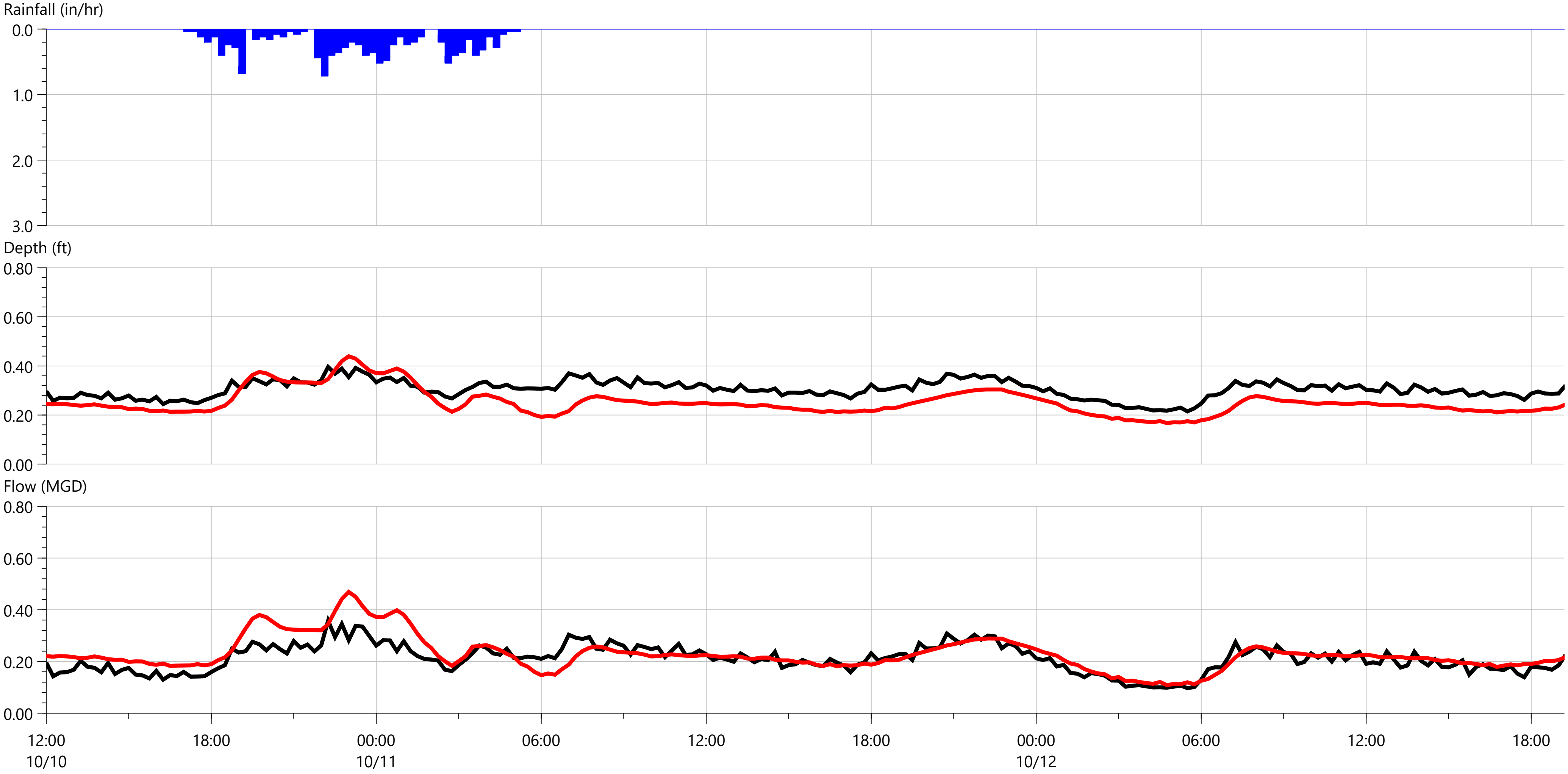
Flow Survey Location (Obs.) UCKC1, Model Location (Pred.) D/S 16-098-s350.1, Rainfall Profile: RGUCKC1



		Rainfall			Depth (ft)		Flow (MGD)		
		Depth (in)	Peak (in/hr)	Average (in/hr)	Min	Max	Min	Max	Volume (US Mgal)
Rain	—	2.790	0.720	0.051					
Obs.	—				0.215	0.396	0.097	0.358	0.484
...>Rainfall Event_Evaporation	—				0.167	0.439	0.109	0.469	0.522

Observed / Predicted Report
Verification Event

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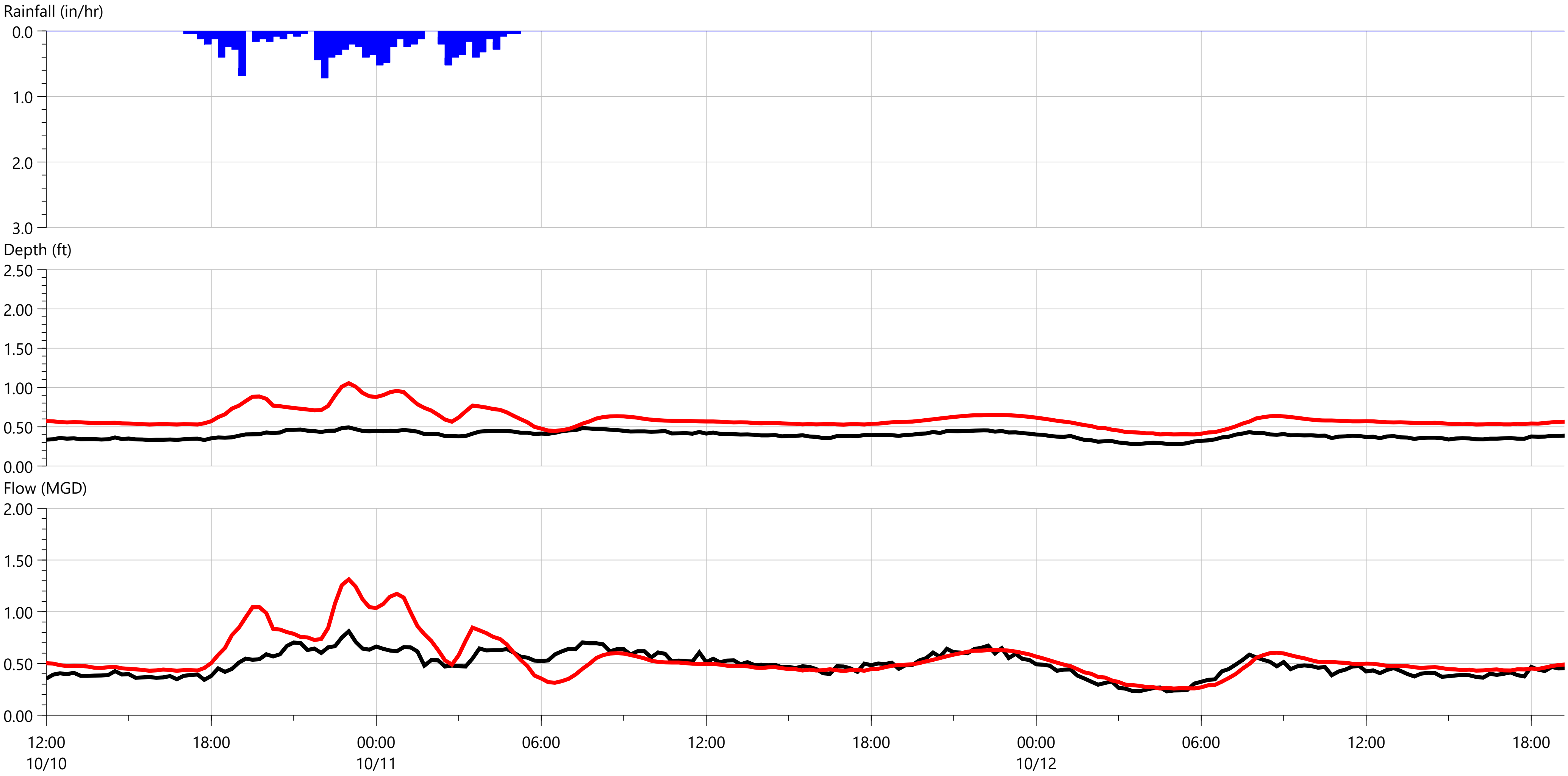
Flow Survey Location (Obs.) UCKC2, Model Location (Pred.) D/S 16-097-s035.1, Rainfall Profile: RGUCKC1



		Rainfall			Depth (ft)		Flow (MGD)		
		Depth (in)	Peak (in/hr)	Average (in/hr)	Min	Max	Min	Max	Volume (US Mgal)
Rain	▬	2.790	0.720	0.051					
Obs.	▬				0.279	0.492	0.231	0.812	1.121
...>Rainfall Event_Evaporation	▬				0.402	1.056	0.257	1.312	1.254

Observed / Predicted Report
Verification Event

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Appendix E
Certification Letter

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March 31, 2021

Attention: Director Maria Houser
Director of Consent Decree and Environmental Compliance
DeKalb County Department of Watershed Management
4572 Memorial Drive
Decatur, GA 30032

Subject: Final Sanitary Sewer System-Wide Hydraulic Model Application Reports

Dear Director Houser,

In March 2021, our team submitted final Sanitary Sewer System-Wide Hydraulic Model Application Reports to DeKalb County for the County's collection and transmission system. The model reports were provided in draft beginning May 31, 2019 and have been reviewed and commented on by the County, a third party peer reviewer, the U.S. Environmental Protection Agency, and the Georgia Environmental Protection Division. The March 2021 final reports reflect changes associated with those reviews and comments.

There are seven final reports, one for each of the County's seven hydraulically independent drainage areas within the system, which are:

- *Snapfinger Basin* encompassing all flows to the Snapfinger WWTF
- *Pole Bridge Basin* encompassing all flows to the Pole Bridge WWTF
- *South Fork Peachtree Creek* encompassing all flows to the City of Atlanta's South Fork Peachtree Creek Trunk/Relief Sewer
- *North Fork Peachtree Creek* encompassing all flows to the City of Atlanta's North Fork Peachtree Creek Trunk/Relief Sewer
- *Intrenchment Creek* encompassing all flows to the City of Atlanta's Sugar Creek Trunk Sewer
- *Nancy Creek* encompassing all flows to the City of Atlanta's Nancy Creek Basin
- *Miscellaneous Sewersheds* encompassing all flows to Fulton County and Gwinnett County.

Pursuant to the Modification to Consent Decree, lodged October 21, 2020 in *United States and State of Georgia v. DeKalb County*, Civil Action No. 1:10-cv-04039-SDG (the Modification), Jacobs certifies that each of the seven above described reports was developed fully consistent with the requirements of the Consent Decree, as amended by the lodged Modification. In particular, each of the above reports meets the requirements of new paragraphs 28 and 29 to the Consent Decree (*See* Modification, ¶4, p. 9-20), including specifically the requirements of paragraph 29(a). We note that, while the final reports addressed comments received, the prior drafts of these reports also met all the requirements of the lodged Modification.

We note that to achieve meaningful results, these tools must be properly applied by a competent professional in the manner anticipated in the reports and consistent with DeKalb County's Capacity Assurance Program document.

Please let us know if you have any questions or need any further assistance.

Sincerely,

CH2M Hill Engineers, Inc.

Kai Iaukea, P.E.
Program Manager