CSO Model Development and Baseline Conditions
Final Report

Albany Pool
Part B Long-Term Control Plan

Prepared for:
Capital District Regional Planning Commission (CDRPC)

CDRPC

Prepared by:
Albany Pool Joint Venture Team (APJVT)

albany pool Joint Venture Team
CDM MALCOLM PIRNIE CHA

February 2010

11 British American Boulevard
Latham, New York 12110
tel: 518 782-4500
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February 22, 2010

Ms. Andrea Dzierwa, P.E.
New York State Department of Environmental Conservation
Region IV
1150 North Westcott Road
Albany, New York 12306

Subject: **Albany Pool CSO LTCP**
CSS Model Development and Baseline Conditions Final Report

Dear Andrea:

On behalf of the Capital District Regional Planning Commission and the Albany Pool Communities, please find enclosed one electronic copy on CD and one hard copy of the Combined Sewer System (CSS) Model Development and Baseline Conditions Final Report with supporting documentation for your files. The CSS Model Development and Baseline Conditions Final Report was approved by NYSDEC on February 1, 2010.

If you have any questions or require additional information, please contact me at (518) 782-4500.

Very truly yours,

Daniel D. Durfee, P.E., BCEE
Associate
Camp Dresser & McKee

c: C. Webber, NYSDEC
R. Ferraro, CDRPC (1 hard copy, 1 electronic copy on CD)
D. Shannon, CDRPC
R. Albright, CDM (1 electronic copy on CD)
M. Miller, CHA (1 electronic copy on CD)
R. Rudolph, CHA

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J. Kosa, City of Albany
Mayor John McDonald, City of Cohoes
D. Dressel, City of Watervliet
S. Ward, Village of Green Island
N. Bonesteel, City of Troy
M. Pettit, City of Rensselaer
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RECEIVED
FEB 03 2010
BY:

Alexander B. Grannis
Commissioner

February 1, 2010

Rocco Ferraro
Executive Director
Capital District Regional Planning Commission
One Park Place
Albany, New York 12205

Re: Albany Pool Combined Sewer Overflow Long-Term Control Plan Development;
CSS Model Development and Baseline Conditions Report, February 2010
SPDES numbers: NY0025747, NY0026026, NY0099309, NY0030899, NY0031046, and NY0033031

Dear Mr. Ferraro;

The Department has reviewed the final CSS Model Development and Baseline Conditions Report, dated February 2010, which includes additional information provided to the Department on January 21, 2010. The report includes the following information: (1) a summary of data collection efforts that preceded model development; (2) a description of the modeling approach and development; (3) a description of model calibration including calibration graphics; (4) precipitation selection, and (5) long-term baseline simulations.

The report is acceptable to the Department and is hereby approved.

As always, thank you for your continuing efforts on this project. Please call me if you have any questions at (518) 402-8115.

Sincerely,

Cheryle Webber

Cheryle Webber, P.E.
Chief, Wastewater Permits - South Section

albany pool Joint Venture Team
CDM MALCOLM PIRNIE CHA

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January 19, 2010

Ms. Andrea J. Dzierwa, P.E.
NYSDEC Region 4 Headquarters
1150 North Westcott Road
Schenectady NY 12306

Re: Preliminary Response to NYS DEC Comments
SPDES Permit No. NY-002 5747 (City of Albany)
SPDES Permit No. NY-002 6026 (City of Rensselaer)
SPDES Permit No. NY-009 9309 (City of Troy)
SPDES Permit No. NY-003 0899 (City of Watervliet)
SPDES Permit No. NY-003 1046 (City of Cohoes)
SPDES Permit No. NY-003 3031 (Village of Green Island)

Dear Andrea:

The Capital District Regional Planning Commission (CDRPC), the Albany Pool Communities (SPDES Permit holders referenced above), and the Albany Pool Joint Venture Team (APJVT) have received correspondence from Cheryle Webber of the New York State Department of Environmental Conservation's (NYSDEC) Central Office detailing comments on the October 2009 Draft CSS Model Development and Baseline Conditions Report. Our responses to these comments have been prepared for your consideration. For clarity we have numbered and restated the specific comments in the sequence in which they were received.

The following items directly address your comments.

Comment 1 – *In Table 5-4, please provide the percent capture of all of the communities and Rensselaer County Sewer District.*

Response 1 –Table 5-4 is updated below.

Table 5-4 Baseline Annual CSO by Community

Community	Million gallons	Hours	Events	Percent capture
Cohoes	21	380	61	89
Green Island	4.5	220	41	84
Watervliet	4.8	330	44	92
ACSD North	30			90
Albany / ACSD South	753	637	58	65
Rensselaer	20	192	52	88
Troy	447	723	65	67
RCSD	467			69
Albany Pool total	1254			

Comment 2 – *In Section 5-4, please make the tables consistent so they all contain a column entitled, "Contributing Combined Sewer Area (acres)."*

Response 2 – We have updated the tables below. There are minor updates to ACSD North results. The Albany South table is reprinted as in the original report. The annual number of events is based on an average taken over the 5 year model simulation. The number indicated has been rounded to the nearest event.

Table 5-6 ACSD North Baseline Annual CSO

Outfall	Contributing Combined Sewer Area (acres)	Million gallons	Hours	Events
Cohoes				
Hudson Ave 001	20	0.2	188	69
Bridge Ave 002	9	0.7	143	43
Van Schaick Ave 003	10	0.3	91	33
Myrtle Ave 004	11	0.6	154	44
Continental Ave 005	42	2.9	23	11
Ontario St 006	91	0.7	59	23
Mohawk St 007	245	4.2	380	21
Little C 008	821	8.6	49	11

Outfall	Contributing Combined Sewer Area (acres)	Million gallons	Hours	Events
Conboy Ave 009	17	1.0	157	38
Peach St 010	14	0.5	23	5
Cedar St 011	7	0.05	0.8	1
Duncan 012	68	0.05	13	1
Eagles Nest 015	266	0.02	1	1
River St 016	27	0.3	4	3
Linden St 017	48	0.4	36	13
Cohoes	1,694	20.4	380	69
Green Island				
Swan St	150	4.0	207	43
Hamilton St	34	0.4	220	35
Saratoga Ave	21	0.2	41	13
Green Island	204	4.6	220	43
Watervliet				
25th St	108	0.001	0.1	1
Avenue A	316	0.01	6	1
14th St	71	0.1	51	17
7th St	50	4.5	330	45
6th St	61	0.1	100	25
3rd St	79	0.03	15	5
Watervliet	684	4.8	330	45
ACSD North	2,583	29.8		

Table 5-7 ACSD South Baseline Annual CSO

Outfall	Contributing Combined Sewer Area (acres)	Million gallons	Hours	Events
013	600	94.2	637	58
014	110	6.4	258	23
015	17	0.9	87	14
016	6	0.3	12	8
017	3,290	546.5	513	48
018	6	0.5	25	13

Outfall	Contributing Combined Sewer Area (acres)	Million gallons	Hours	Events
021	43	3.4	85	29
022	3	1.0	85	19
025	135	18.5	213	42
029	247	48.1	496	56
031	360	35.8	260	55
033	25	1.0	61	39
ACSD South	4,842	756.6	637	58

Table 5-8 Rensselaer Baseline Annual CSO

Outfall	Contributing Combined Sewer Area (acres)	Million gallons	Hours	Events
002	16	0.5	39	27
003	140	8.5	109	41
006	187	5.6	192	40
007	88	1.8	108	42
008	7	0.004	0.2	1
009	33	0.4	27	23
010	76	3.2	158	52
011	40	0.01	0.8	1
012	37	0.01	0.5	1
Rensselaer	624	20.0	192	52

Table 5-9 Troy Baseline Annual CSO

Outfall	Contributing Combined Sewer Area (acres)	Million gallons	Hours	Events
001	145	0.3	18	16
002	151	1.1	26	17
003	14	6.9	442	53
004	38	2.0	123	46
005	47	11.8	543	55
006	29	14.6	197	51

Outfall	Contributing Combined Sewer Area (acres)	Million gallons	Hours	Events
007	31	14.3	662	56
008	29	2.0	174	52
009	32	7.6	214	50
010	30	3.3	227	57
011	33	7.5	93	44
012	23	7.8	181	48
013	39	17.4	396	23
013A	12	10.1	381	65
014	29	7.6	168	47
015	34	9.8	148	44
016	51	4.6	119	40
017	25	3.9	101	40
018	24	1.8	214	57
019	22	4.4	39	31
020	29	1.4	151	51
022	210	10.6	51	21
023	19	1.6	34	22
024	587	24.7	100	33
025	6	0.5	20	18
026	108	23.0	429	62
027	334	19.3	216	50
028	8	0.4	9	10
029	23	3.4	61	28
030	15	1.7	34	21
031	239	53.7	415	52
032	4	3.2	183	37
033	3	4.2	265	45
034	3	0.1	6	6
035	88	55.2	518	53
036	11	18.2	723	56
037	51	24.6	346	50

Outfall	Contributing Combined Sewer Area (acres)	Million gallons	Hours	Events
038	86	12.6	143	34
039	696	11.8	186	37
040	32	2.3	33	21
041	46	12.5	201	45
042	88	3.4	62	30
043	47	6.1	88	29
044	27	5.2	88	24
045	624	1.4	29	12
046A	111	4.8	185	51
046B	25	0.7	76	40
047	48	1.9	102	41
Troy	4,407	447.3	723	65

Comment 3 – *Page 5-6 states that during simulations, peak flow to the North Plant exceeded 90 mgd, "causing moderate backwater" along the interceptor. Please provide the volume of backwater and describe whether that contributed to a combined sewer overflow (CSO) discharge.*

Response 3 – Backwater does not influence ACSD North system CSO. If the 90 mgd modeled flow limit is removed, the peak flow can reach 110 mgd. The maximum hydraulic grade line (HGL) in the Hudson River interceptor pipe from Watervliet to the North Plant with no flow restriction is shown in Figure R3-1. The maximum HGL with flow limited to 90 mgd at the plant is shown in Figure R3-2. The 90 mgd profile shows that the interceptor does not surcharge upgradient of node DHRIS72. The most downstream overflow is near node DHRIS130, one mile upgradient of the surcharge.

Figure R3-1 Hudson River Interceptor Maximum HGL Without Flow Restriction

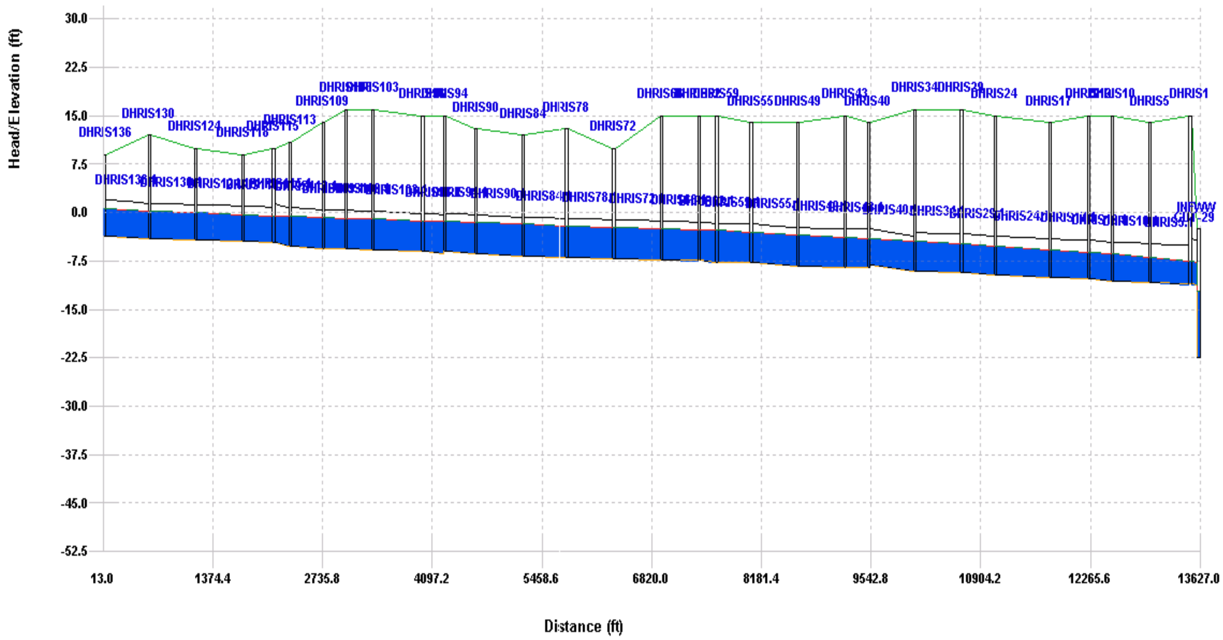
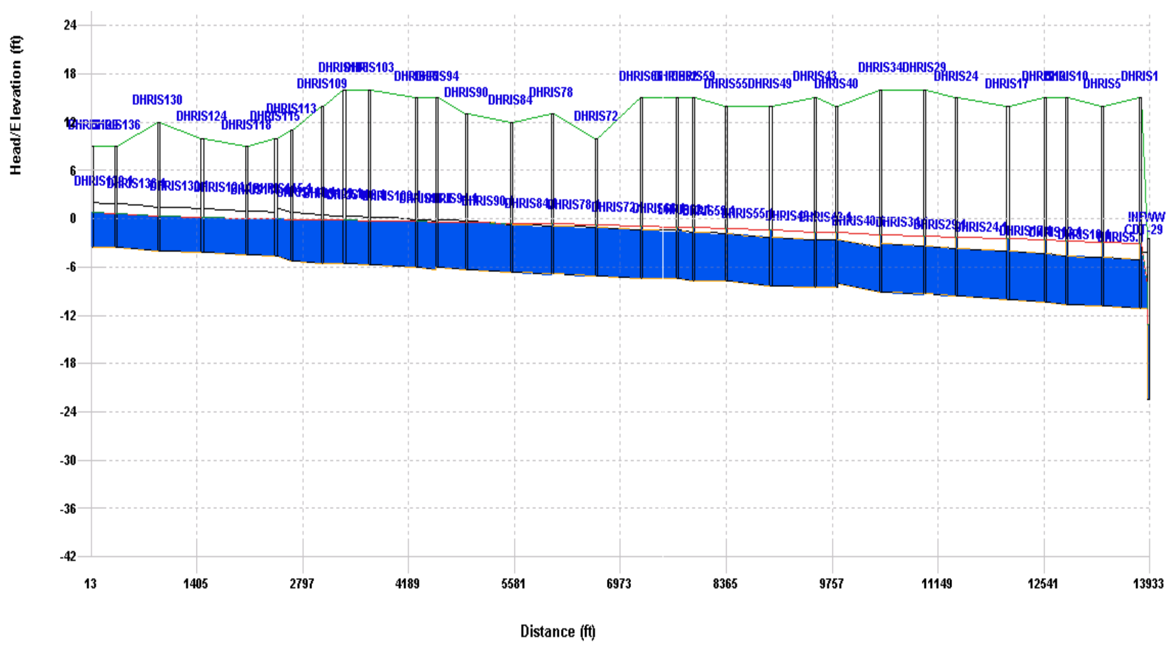


Figure R3-2 Hudson River Interceptor Maximum HGL with 90 mgd Flow Restriction



Comment 4 - *In Table 5-6, please provide exact values for millions of gallons, rather than stating "<0.1".*

Response 4 – The discharge volumes as predicted by the model are provided in the updated Tables 5-6 through 5-9 above. It should be recognized that those volumes less than 0.1 mgal are generally beyond the expected accuracy of the model.

Comment 5 – *Rensselaer CSO outfall 012 seems to be in a separated area of the City. Please provide information showing that this is a CSO.*

Response 5 –The outfall 012 area serving the Farley Drive neighborhood is only partially separated. Several streets in the sewershed are served by a single pipe connected to the combined sewer.

Comment 6 – *Please provide calculated values of inflow and infiltration from tributary communities as well as infiltration and tidal inflow from Albany Pool communities.*

Response 6 – Tables R6-1 and R6-2 present the requested values. The models do not necessarily completely distinguish base wastewater flow from dry weather groundwater infiltration; some flow identified in the model as sanitary flow may actually be dry weather infiltration and vice-versa. Combined sewer system models did not traditionally distinguish between dry weather infiltration and sanitary flow; both were lumped together as dry weather flow. Partitioning between these two components was based on the engineer's judgment, as this study focuses on quantifying rainfall induced combined sewer flows, not infiltration/inflow identification. The dry weather infiltration values presented in Tables R6-1 and R6-2 plus the simulated sanitary flows totals average dry weather flow to the treatment facilities. Dry weather groundwater infiltration is represented as a seasonally varied input to the models at each load point.

River inflow (Table R6-2) was only represented in Troy where leaky tide gates were identified as a significant component of system flow. The 1 mgd reported here was calculated from the output of the five-year simulation.

Inflow from non-Pool tributary communities in Table R6-2 is the average excess flow from those areas beyond their sanitary flows and groundwater infiltration contribution. Infiltration from these areas was estimated in the same manner as for the Pool communities. Inflow was calculated from the output of the five-year simulation.

Table R6-1 Average Infiltration and River Inflow for Albany Pool Communities (mgd)

	Dry weather groundwater Infiltration	River Inflow
Albany (ACSD North)	1.6	0
Cohoes	0.9	0
Green Island	0.2	0
Watervliet	1.1	0
Albany (ACSD South)	13.0	0
Rensselaer	1.6	0
Troy	11.1	1.0

Table R6-2 Average Infiltration and Inflow for Tributary Communities (mgd)

	Infiltration	Inflow
Town of Colonie	4.0	0.1
Village of Colonie	0.2	0.004
Village of Menands	0.3	0.09
Guilderland	0.2	0.003
Schaghticoke	0.1	0.0002
Brunswick	0.5	0.003
North Greenbush	0.3	0.006

Very truly yours,

Daniel D. Durfee, P.E., BCEE
Associate
Camp Dresser & McKee

Attachments

cc: C. Webber, NYSDEC
F. Sievers, NYSDEC
R. Ferraro, CDRPC
D. Shannon, CDRPC
D. Loewenstein, Malcolm Pirnie – Albany
J. Kleyman, Malcolm Pirnie – Buffalo
R. Albright, CDM – Syracuse
E. Burgess, CDM – Cincinnati
R. Rudolph, CHA
M. Miller, CHA
J. Kosa, City of Albany
Mayor John McDonald, City of Cohoes
N. Ostapkovich, City of Watervliet
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Alexander B. Grannis
Commissioner

VIA E-MAIL AND MAIL

December 18, 2009

Rocco Ferraro
Executive Director
Capital District Regional Planning Commission
One Park Place
Albany, New York 12205

Re: Albany Pool Combined Sewer Overflow Long-Term Control Plan Development;
Draft CSS Model Development and Baseline Conditions Report, October 2009
SPDES numbers: NY0025747, NY0026026, NY0099309, NY0030899, NY0031046, and NY0033031

Dear Mr. Ferraro;

The Department has reviewed the Draft CSS Model Development and Baseline Conditions Report, submitted in October 2009. The report includes the following information: (1) a summary of data collection efforts that preceded model development; (2) a description of the modeling approach and development; (3) a description of model calibration including calibration graphics; (4) precipitation selection, and (5) long-term baseline simulations.

The Department has the following comments on the Report that should be included in a final report:

1. In Table 5-4, please provide the percent capture of all of the communities and Rensselaer County Sewer District;
2. In Section 5-4, please make the tables consistent so they all contain a column entitled, "Contributing Combined Sewer area (acres)";
3. Page 5-6 states that during simulations, peak flow to the North Plant exceeded 90 mgd, "causing moderate backwater" along the interceptor. Please provide the volume of backwater and describe whether that contributed to a combined sewer overflow (CSO) discharge.
4. In Table 5-6, please provide exact values for millions of gallons, rather than stating "<0.1".
5. Rensselaer CSO outfall 012 seems to be in a separated area of the city. Please provide information showing that this is a CSO.
6. Please provide calculated values of inflow and infiltration from tributary communities as well as infiltration and tidal inflow from Albany Pool communities.

Please submit the final report to the Department by January 18, 2009 for approval. As always, thank you for your continuing efforts on this project. Please call me if you have any questions at (518) 402-8115.

Sincerely,

Cheryle Webber, P.E.
Chief, Wastewater Permits - South Section

cc:

Robert Cross, Albany Water Board
Sean Ward, Green Island
Mayor John McDonald, III, Cohoes
Mary Beth Petitt, Rensselaer
Neil Bonesteel, P.E., Troy
Nick Ostopkavich, Watervliet
Deb Shannon, CDRPC
Michelle Josilo, EPA Reg. II

Andrea Dzierwa
BWCP
Koon Tang
Shayne Mitchell
Chandler Rowell
Phil O'Brien
Derek Thorsland

CSO Model Development and Baseline Conditions

Albany Pool
Part B Long-Term Control Plan

Prepared for:
Capital District Regional Planning Commission (CDRPC)

CDRPC

Prepared by:
Albany Pool Joint Venture Team (APJVT)

albany pool Joint Venture Team
CDM MALCOLM PIRNIE CHA

October 2009

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1. Introduction

1.1 Overview

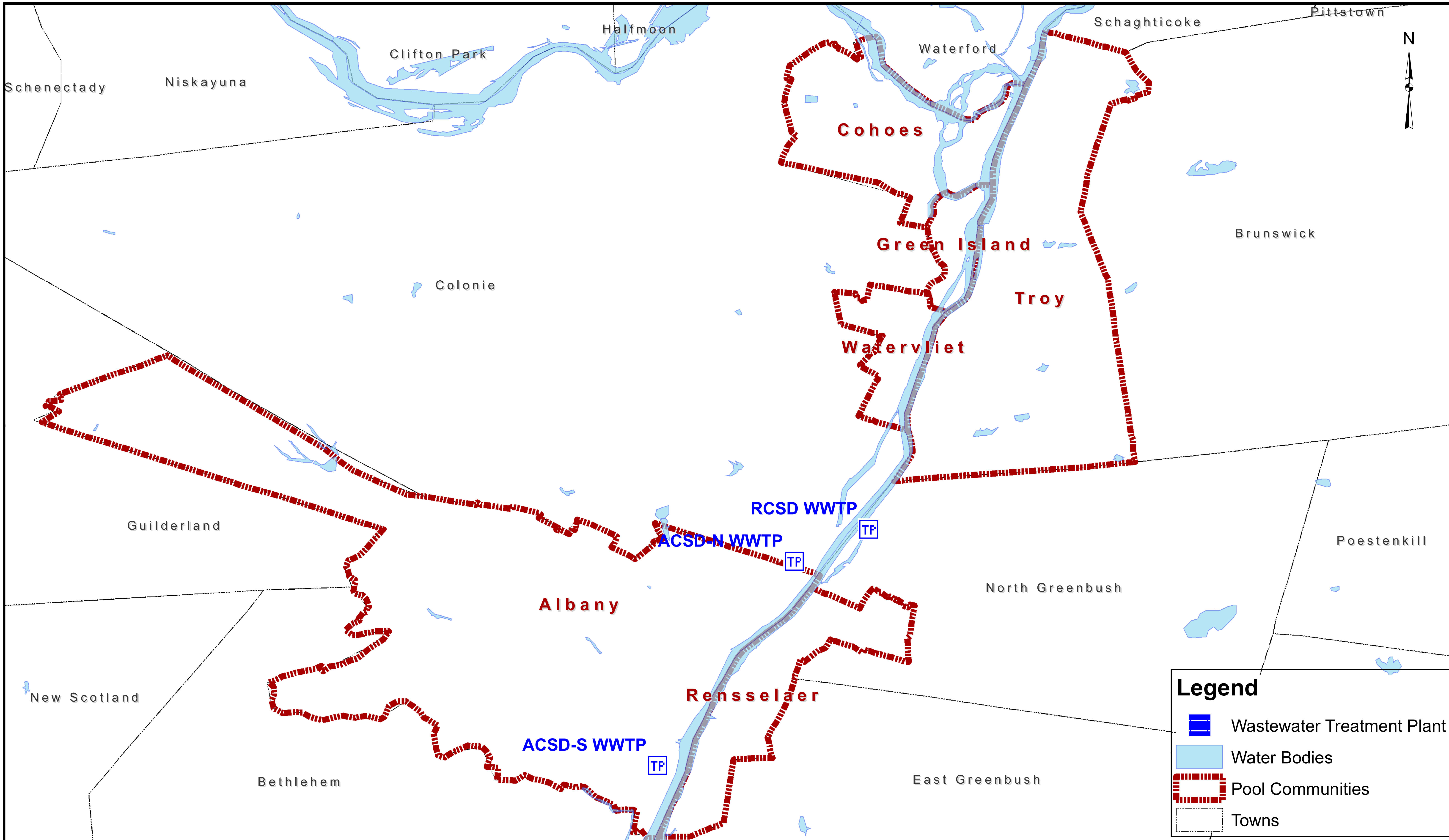
The Albany Pool communities have 92 combined sewer overflows (CSOs) that discharge to the Hudson and Mohawk rivers. To develop a plan for limiting impact from these discharges, the City of Albany, City of Cohoes, City of Rensselaer, City of Troy, City of Watervliet and the Village of Green Island (the *"Pool"* communities) have joined in a comprehensive inter-municipal venture, led by the Capital District Regional Planning Commission, to develop a Phase I CSO Long Term Control Plan.

The Albany Pool project team developed sewer system models to characterize the combined sewer systems, quantify CSO discharges and evaluate CSO control alternatives. The models are used to evaluate impacts of future development, sewer system improvements, and changes in maintenance and operational procedures. The models inform assessment of CSO discharges that may impair water quality and affect contact recreation and habitat in the Class C waters of the Hudson and Mohawk rivers. The modeling was done in accordance with the September 2007 *Combined Sewer System Modeling Work Plan* approved by New York State Department of Environmental Conservation (NYSDEC).

The models simulate conveyance of combined and sanitary flows through interceptor sewers, selected trunk sewers, CSO regulators and overflow conduits. Three modeling teams developed and calibrated four computer models. Each model encompasses the complete collection system upgradient of an entrance to one of the three wastewater treatment plants (WWTPs) serving Pool communities:

- Malcolm Pirnie modeled the area tributary to the Albany County Sewer District (ACSD) North Plant, which serves Cohoes, Watervliet and Green Island. The WWTP also receives sanitary wastewater from Albany drained directly to the plant via Patroons Creek Interceptor, Colonie and Guilderland;
- Clough Harbour & Associates (CHA) modeled the area tributary to the ACSD South Plant, which primarily serves Albany;
- CDM developed individual models for Troy and Rensselaer; these communities drain independently to the Rensselaer County Sewer District (RCSD) WWTP. Additional sanitary wastewater is conveyed through these sewer systems from North Greenbush, Brunswick, and Schaghticoke.

Figure 1-1 shows the modeled combined sewer communities.



albany pool Joint Venture Team CDM Malcolm Pirnie CHA	ALBANY POOL CSO LTCP	MODELED COMBINED SEWER COMMUNITIES	FIGURE 1-1

1.2 Software

The computer models were developed using USEPA SWMM 5. SWMM is collection system modeling software originally developed by USEPA in 1971. SWMM 5 was released in 2004, and has since been updated regularly. It is a complete redevelopment of the program's code. SWMM is the most widely used model for large-scale urban collection system studies in the United States.

SWMM's hydrologic component describes rainfall-runoff characteristics for catchments within a watershed. The hydrologic module typically runs at a five-minute timestep during wet weather, and can simulate a long-term hydrologic record.

SWMM's hydraulic component routes water through a collection system. It simulates a wide variety of conduit types, weirs, pumps, and real-time controls. It dynamically computes hydraulic grade lines at a timestep typically near five seconds. It uses dynamic wave routing, allowing it to compute free-flowing or surcharged conditions at each timestep of a simulation. SWMM can be run for a single event or for a long-term simulation of months or years, depending on model complexity and acceptable run times.

To integrate the models with geographic information systems (GIS) data, the modeling teams supplemented the EPA SWMM software with MWH Soft's InfoSWMM and DHI's MIKE URBAN. These packages offer pre- and post-processing capabilities for SWMM, while maintaining complete compatibility with EPA file formats.

1.3 Report Organization

This report describes development, calibration, and initial application of the models:

- Section 2 summarizes common data collection efforts that preceded model development. Appendix A presents rainfall hyetographsfor principal storms during the flow metering program.
- Section 3 describes modeling approach and development.
- Section 4 describes model calibration and includes representative calibration graphics. Complete sets of calibration graphics are in Appendices B through G.
- Section 5 presents precipitation selection and long term baseline simulations.

2. Data Collection

2.1. Collection System Asset Data

Data were initially obtained from available Town, City, and County resources including design drawings and GIS. These data were supplemented with summer 2008 flow monitoring data, field survey, and other information obtained from the sewer districts and state and national databases.

Cohoes collection system asset data and regulator configurations were obtained from CAD mapping, record drawings, and older city sewer maps. Much of the system was field surveyed to supplement the City's asset data. Information for the seven modeled pump stations was obtained from *Cohoes Pump Station Evaluation* report (Malcolm Pirnie).

Watervliet GIS layers provided the extents of the storm, sanitary, and combined systems. No attribute information such as pipe diameter, invert, or manhole rim elevation was included in these layers. These system attributes as well as regulator inverts and configurations were taken from a combination of as-built drawings, construction drawings, and field surveys.

Green Island collection system asset data and pump station information were extracted from as-built and construction drawings. Field surveys were conducted to confirm regulator invert elevations and configurations.

Albany collection system asset data was obtained primarily from the 1913 *Intercepting Sewer* construction record drawings, the 1972 *Regulators for the Intercepting Sewer* drawings, CHA regulator surveys and the City sewer atlas. Regulator operation and controls were obtained from the design reports and verified with ACSD.

ACSD design drawings for the North and South Plants were helpful in understanding the WWTP design. The drawings were used to establish elevations at the South Plant.

Rensselaer collection system asset data were obtained from CAD mapping and supplemented with construction drawings. Field surveys were conducted to confirm invert elevations and regulator configurations. Regulator operation and condition of outfalls and tide gates were verified with RCSD and reflected in the models accordingly.

Troy has a comprehensive GIS incorporating all sewer pipes and manholes. These data were extracted for use in the model and supplemented with information from as-built and construction drawings as needed.

RCSD operates four major pump stations: Troy's 106th Street and Monroe Street Pump Stations, and Rensselaer's Forbes Avenue and Aiken Avenue Pump Stations. Physical and operating procedures for RCSD pump stations were obtained from the *Wastewater Pumping*

Stations Energy Feasibility Study and Improvement Evaluation Report (O'Brien & Gere, 2005).

2.2. Flow and Rainfall Monitoring Program

ADS Environmental Services conducted flow metering and rain gaging from June to September 2008 to support model calibration. Flow meters were installed at 45 sites as described in the April 2007 *Scope of Work and Characterization, Monitoring and Modeling Plan* and detailed in a July 11, 2008 letter from the Joint Venture Team to NYSDEC. There were 14 meters installed in the Albany North system, 8 in Albany South, 4 in Rensselaer, and 19 in Troy, along with one rain gage each in Rensselaer, Troy, Cohoes, and Albany. Figure 2-1 shows meter locations. Appendix A lists meter locations. Complete metering data was documented in an ADS Environmental Services October 2008 report *Temporary Flow Monitoring Study, Albany NY.*

2.2.1. Rainfall Data

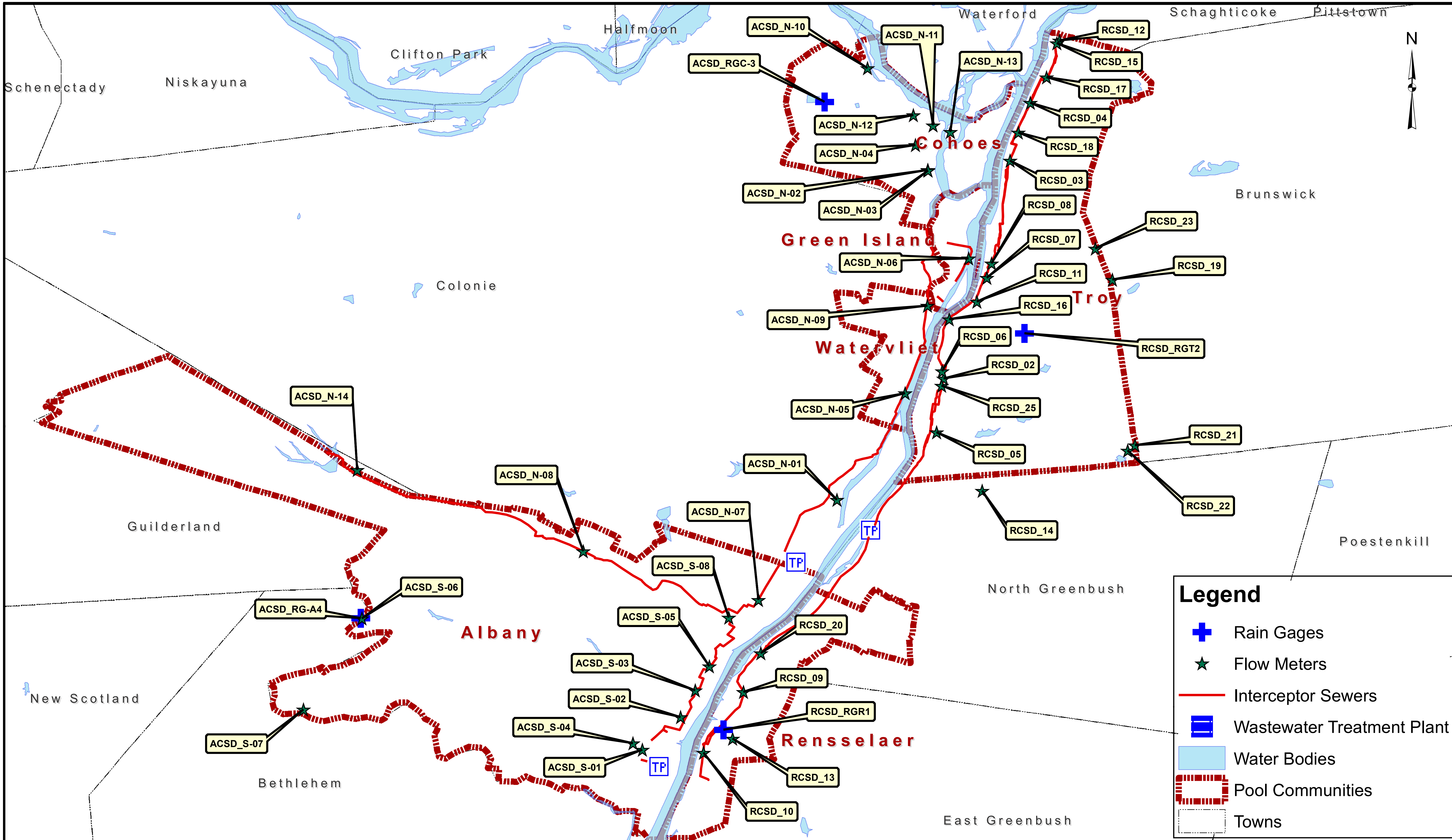
ADS deployed temporary rain gages in Rensselaer, Troy, Cohoes, and Albany to accompany the flow metering data. The rain gages recorded 5-minute rainfall accumulations in 0.01-inch increments. Table 2-1 shows precipitation normals, 2008 monthly totals during the metering program, and corresponding National Weather Service data from Albany Airport at the northwest corner of the study area. Precipitation was well above average in June and July. August was slightly above average at most locations, while Hurricane Hanna produced over an inch of rain on September 6.

Table 2-1. Normal precipitation and 2008 totals

	Normal	Rensselaer	Troy	Cohoes	Albany	Airport
June 5-30	2.7	5.9	5.4	5.7	5.6	5.4
July	3.3	6.6	5.0	7.0	7.0	6.9
August	3.4	6.6	3.8	3.6	4.6	3.0
September 1-8	0.9	1.6	1.4	1.4	NA	1.3
Total	10.3	20.7	15.6	17.7	17.1	16.6

Note: Normal precipitation was obtained from long-term Albany Airport data.

The largest storms during the flow-metering period occurred on June 6, July 23-24, August 7, August 11-12, and September 6. Table 2-2 lists all storms that totaled at least one-half inch at any program rain gage.



albany pool Joint Venture Team CDM MALCOLM PIRNIE CHA

ALBANY POOL CSO LTCP	METER LOCATIONS	FIGURE 2-1

Table 2-2: Albany-area storm totals summer 2008

Date	Rensselaer	Troy	Cohoes	Albany	Airport
June 6	1.9	2.3	2.2	1.9	1.8
June 16-17	1.3	1.1	1.2	1.0	1.4
June 18	0.3	0.2	0.2	0.6	0.5
June 22	0.8	0.7	0.7	0.3	0.5
June 23	0.3	0.2	0.2	0.5	0.2
June 29	0.5	0.3	0.1	0.2	0.1
July 8	0.4	0	0	0.9	0.1
July 13	0.7	0.8	1.2	0.8	1.1
July 20	0.3	0.4	0.8	0.4	0.5
July 22	0.4	0.2	0.5	0.8	0.5
July 23-24	2.6	2.9	2.7	2.8	3.5
July 26	0	0	0.6	0	0.2
July 27	1.1	0.4	0.6	0.4	0.2
August 2	1.2	0.7	0.1	1.4	0.4
August 3	0	0.6	0.9	0	0.2
August 7	1.8	0.4	0.1	1.8	0.1
August 8	0	0	0.5	0	0.1
August 11-12	3.0	1.5	1.4	1.0	1.5
September 6	1.6	1.4	1.4	NA	1.3

The August storms exhibited high spatial variation; events from other months were thus preferred for use in model calibration.

Table 2-3 presents Albany-area recurrence interval statistics compiled from National Weather Service atlases and analysis of Albany Airport data.

Table 2-3. Albany area rainfall recurrence interval statistics

Return Period	15-minute	1-hour	3-hour	6-hour	24-hour	4-day
3-month	0.2	0.5	0.7	0.9	1.3	1.7
6-month	0.3	0.6	1.0	1.2	1.7	2.2
1-yr	0.5	1.0	1.3	1.5	2.3	3.0
2-yr	0.7	1.2	1.6	2.0	2.7	4.0
5-yr	0.9	1.5	2.0	2.5	3.5	5.0
10-yr	1.0	1.8	2.5	3.0	4.0	6.0

Sources:
3- and 6-month: NetSTORM analysis of Albany Airport data
15-minute 2-10 yr: HYDRO-35
1-yr 1-hr to 10-yr 24-hr: TP-40
96-hr: TP-49

Table 2-4 lists frequency statistics for the summer 2009 storms at the Rensselaer rain gage; the other sites would exhibit similar results. The table shows that the July 13 storm was a typical small event, while the July 23 storm had a 1-year recurrence frequency at intervals from 15 minutes to 4 days. The August 7 storm was a 5-year event at a 1-hour interval, and when considered together with the August 11 event, produced 2-year 4-day rainfall.

Table 2-4. Rensselaer rainfall maxima summer 2008

Date	15-min	1-hr	3-hr	6-hr	24-hr	4-day	Recurrence Interval
6 June	0.5	0.7	1.1	1.5	1.9	2.1	6-mo from 1 - 12 hr
16 June	0.6	1.0	1.1	1.1	1.3	1.6	1-yr 1-hr
13 July	0.1	0.2	0.4	0.6	0.7	0.7	<3-month
23 July	0.5	1.0	1.2	1.5	2.3	3.5	1-yr from 15-min to 4-day
2 August	0.4	0.8	0.8	0.8	1.2	1.5	6-mo 1-hr
7 August	0.8	1.7	1.8	1.8	1.8	4.5	5-yr 1-hr; 2-yr 4-day
11 August	0.6	1.8	2.5	2.8	3.0		10-yr from 1 to 3 hr
6 Sep.	0.1	0.3	0.6	1.0	1.6	1.6	6-month 24-hour

The July 13 and July 23 events were chosen as principal storms for calibrating all the models. Due to variations in rainfall and flow meter data availability, other storms were used in different locations as a third principal calibration event. The third event was September 6 for Albany North, August 2 for Albany South, September 6 for the Rensselaer model, and June 6 for Troy. Hyetographs at each rain gage for principal storms during the monitoring period are presented in Appendix A.

2.2.2. Flow Metering

ADS deployed and maintained Sigma 930 area-velocity flow meters at the 45 metering sites. Most meters were located immediately upgradient of principal CSO regulators to capture unregulated flows from their sewersheds. Other meter sites were along principal interceptors to assess conveyance, or where outlying community sewers discharge to Albany Pool systems.

The meters recorded velocity and depth data at five-minute intervals. Data were checked for inconsistencies by ADS, and further reviewed by the modeling teams prior to use in model calibration. Meter locations and summary of the metering data are presented in Appendix A.

2.3. Field Survey

CHA field surveyed all regulators in the Albany Pool systems in 2008. They documented regulator manhole invert and depth, weir and flap gate dimensions, connecting pipe diameters, and flow directions. The condition of each regulator was recorded, accompanied by site photos. CHA provided electronic records of these measurements to the modeling teams to inform model development. Additional field survey was completed to fill gaps in the sewer system attributes obtained from the drawing and GIS databases.

2.4. Sewer District Data

Flow and operational data were obtained from ACSD and RCSD for the 2008 monitoring period. These included flows to the WWTPs, flows at connection points of municipal sewers to the ACSD interceptors, flows at principal pump stations, and gate movement records. Pump station data, where available, were digitized from paper charts for calibration events.

2.5. Other Data

Various other data sources were used in development of the model. These include:

- USGS Hudson River level records
- National Weather Service Albany Airport precipitation
- USGS National Elevation Dataset
- National Land Cover Dataset (NLCD) imperviousness
- USDA soils data

The Albany Pool reach of the Hudson River is tidal below the Federal Dam. The dam spans the river between Troy and Green Island. River stage data in the tidal section was obtained from USGS gage 01359139 at Albany; stage above the dam was obtained from USGS gage 01358000 at Green Island. Both gages record level at 15-minute intervals. These data are used to specify boundary conditions at CSO outfalls.

Precipitation data for Albany Airport (National Weather Service COOP ID 300042) for different periods and data intervals were obtained from several sources:

- City of Albany with eleven (11) CSOs under SPDES Permit No. NY-002 5747;
- City of Rensselaer with eight (8) CSOs under SPDES Permit No. NY-002 6026;
- Preliminary daily precipitation totals were obtained from the National Weather Service Albany office website (www.erh.noaa.gov/er/aly).
- Preliminary one-minute precipitation for 2008 was obtained from DSI-6406 data files at the National Climatic Data Center (NCDC) FTP site.
- Hourly precipitation since 1948 was obtained from NCDC data set DSI-3240
- Monthly precipitation since 1826 was obtained from the U.S. Historical Climatology Network database.

USGS elevation data were obtained from the National Map Seamless Server (seamless.usgs.gov). These data were used to delineate drainage catchments and to establish manhole rims and inverts upgradient of CSO regulators where design drawings were not available.

National Land Cover Dataset imperviousness was obtained from the National Map Seamless Server. The raster dataset classifies percent imperviousness at 30-meter resolution in US urban areas. Imperviousness is a key input parameter for SWMM's rainfall-runoff calculations.

Soil survey data for Albany and Rensselaer counties were obtained from the National Resources Conservation Service's Soil Survey Geographic (SSURGO) Database. Soil infiltration parameters are input parameters required for computation of runoff from pervious surfaces.

3. Model Development

3.1. Approach

Planning-level sewer system models were developed to support the LTCP preparation. While these models provide robust representation of interceptor hydraulics and CSO discharges, they are generally less detailed in upgradient areas. The models extend along a 12-mile length of the Hudson River, including the ACSD and RCSD interceptor sewers and all CSO regulating structures and overflow points. The hydraulic network of each model begins a minimum of one pipe segment above each combined sewer regulator. Long runs of principal sewers upgradient of modeled regulators were included with limited detail. The ACSD North model has more detail than the other models due to the presence of CSO regulators along small pipes throughout the system, particularly in Cohoes.

The models are bounded at the WWTPs and CSOs. The hydraulic networks generally exclude manholes in straight runs of pipe to maintain parsimony. The hydraulics of principal control structures, including gates, weirs, and pumps were directly modeled wherever practical. Pipe hydraulics were simulated using SWMM's dynamic wave solution (called "Extran" in earlier SWMM versions). The model accounts for channel storage, backwater, form losses, flow reversal, and pressurized flow.

The models simulate diurnally varied sanitary flow, monthly baseflows, and rainfall-runoff. Runoff is simulated using SWMM's non-linear reservoir formulation for all combined, separate sanitary and stormwater-only areas contributing to the sewer systems.

The models use North American Datum of 1983 (NAD 83) New York State East geodetic reference system and North American Vertical Datum of 1988 (NAVD 88) vertical datum, both in English units.

3.2. Hydraulics

Each model terminates at or near the entrance to its WWTP with a flow constraint or other appropriate boundary condition. Hydraulic boundaries at certain CSOs are modeled as free discharges. Where river stage potentially influences sewer system hydraulics upgradient of regulators, the models include the overflow pipe and a time-series boundary representing river level.

Invert elevation and depth of manholes were obtained from data and record drawings. Missing inverts and manhole rims were surveyed or interpolated from nearby known values and USGS elevation data.

Pipe dimensions and elevations were obtained from municipal GIS, review of record drawings, and inspection reports from the field survey and flow metering. Conduit roughness was initially estimated with Manning's coefficient ("n") of 0.013. This parameter was later calibrated within reasonable bounds according to metered data. Sediment accumulations were specified in pipe dimensions where it was observed or reported. Physical characteristics of modeled trunk sewer extensions were estimated as needed; no survey was conducted in these areas.

Real-time control rules to control gate movements were established from standard operating protocols obtained from the sewer districts.

3.3. Dry-Weather Flow

Dry-weather wastewater flows were divided into baseflow and sanitary flow components based on analysis of flow metering data and long-term flows at the WWTPs. Baseflows, representing dry weather infiltration into the collection system, were specified with an average value and a monthly pattern. Sanitary flows were specified with an average value and distinct hourly patterns for weekdays and for weekends. Dry weather flows were generally loaded at the same locations as catchment loads. Dry weather flows were calibrated to fit the flow metering data.

3.4. Hydrology

The hydrologic model components account for all areas contributing flow to Pool sewer systems. The contributing area was discretized into subcatchments according to elevation data and sewer network layout. Each subcatchment was assigned hydrologic parameters including contributing area, imperviousness, pervious routing fraction, catchment width, slope, roughness, depression storage, and soil infiltration characteristics. The Green-Ampt infiltration method was used to compute runoff and infiltration from pervious surfaces.

In separated and partially separated sewersheds in Troy, Rensselaer, and Albany South, contributing areas were adjusted to represent the area contributing rainfall-dependent inflow and infiltration (RDII) to the sewer system. The degree of separation for each catchment was estimated from sewer maps, interviews with community staff, and flow metering data. Sanitary sewersheds outside the Pool communities that contribute to Pool sewer systems were coarsely delineated. The Albany North system had a more significant portion of separate sanitary contributing area (primarily along Patroons Creek) compared to the other areas. Because of this, RDII into these areas was simulated by applying pervious runoff from SWMM's runoff model, with the Green-Ampt infiltration model used to drive the pervious runoff calculations.

NLCD imperviousness data were used to compute average imperviousness for each catchment. Each catchment was initially assigned a routing fraction of 60%, indicating that 60% of runoff onto impervious areas is routed to pervious area. Imperviousness was generally fixed at the NLCD value, while the routing fraction was calibrated to observed flows. The routing fraction strongly influences total runoff volume.

SWMM's catchment width parameter was set proportional to the square root of the area and then calibrated to observed flows. This parameter strongly influences hydrograph timing.

Manning's coefficients for impervious and pervious areas were fixed at 0.03 and 0.08 respectively. Depression storage for impervious and pervious areas was specified as 0.05 and 0.10 inches respectively, in line with recommendations in SWMM 5 guidance documents.

Catchment slope was computed from GIS zonal statistics or specified with model-wide values based on overall drainage characteristics. As SWMM lumps catchment width, slope, and roughness into a single parameter, the slope estimation method is not important when width is calibrated.

Predominant soil types in the study area are "urban land" and sandy loam. Soil characteristics for urban lands were estimated based on typical nearby soils. Infiltration parameters were selected from SWMM guidance documents (e.g. www.dynsystem.com/netstorm/GreenAmptParameters.html).

Monthly evaporation was specified based on values reported in NOAA Technical Report NWS 34 (1982) and a pan coefficient of 0.77 obtained from NOAA Technical Report NWS 33 (1982). Evaporation varies from 0.02 inches per day in December and January to 0.16 inches per day in July. Evaporation primarily affects initial abstraction depth available at the beginning of storms.

3.5. Individual Models

General characteristics of the models are presented in Table 3-1 and discussed below.

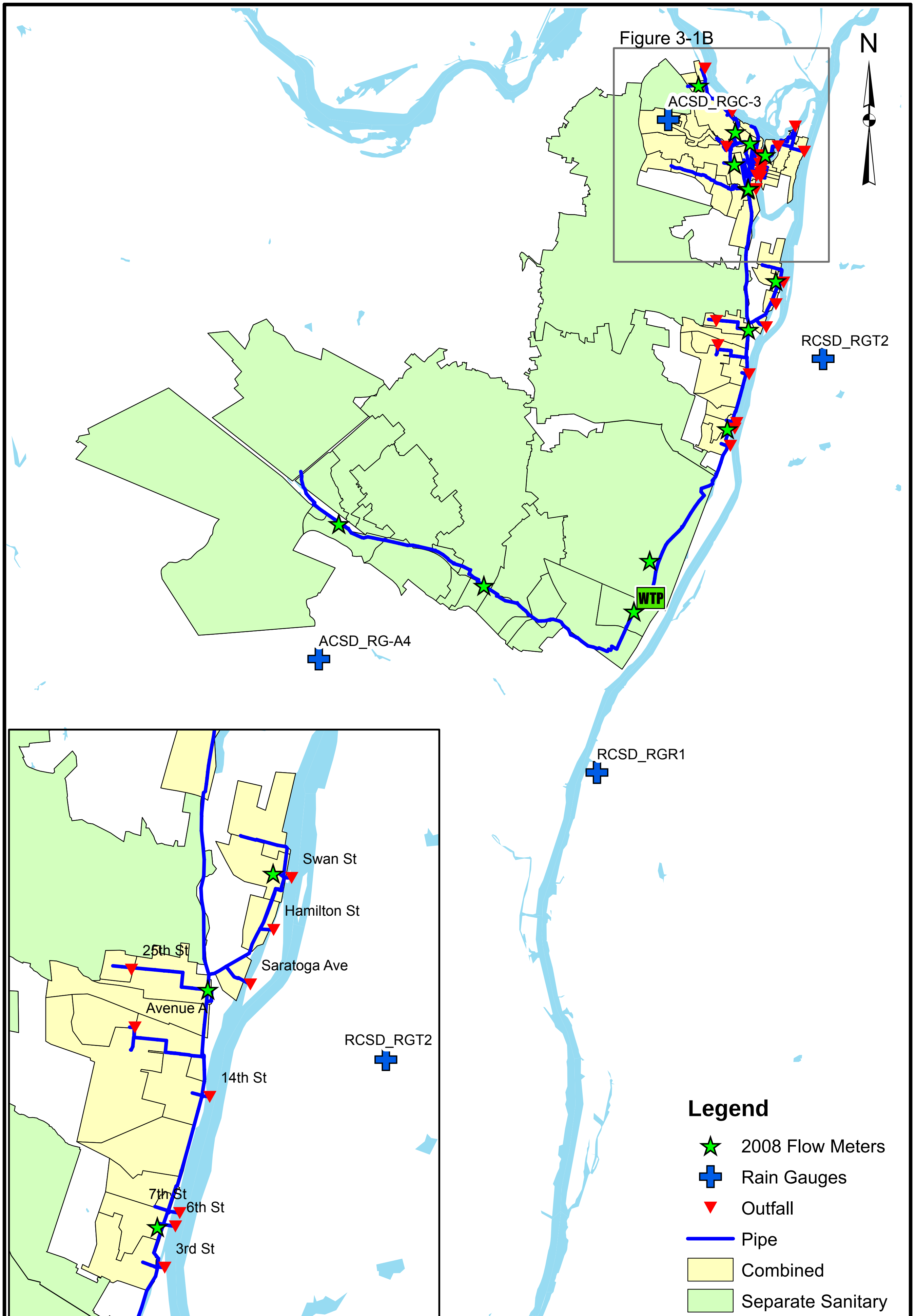
Table 3-1. Model Characteristics

System	CSOs	Manholes	Pipe miles	Sewershed (acres)		Catchments
				Combined	Sanitary	
Albany North	24	550	30	2,800	23,700	68
Albany South	12	250	13	4,800	1,700	30
Rensselaer	9	90	8	740	700	17
Troy	49	460	33	5,500[1]	11,300	97

[1] - includes stormwater-only areas

3.5.1. Albany North

Figure 3-1 shows the Albany North model pipe network, catchments, and CSO locations. The City of Cohoes' main trunk sewer drains south along the Hudson River. Tributary



albany pool CDM CHA	ALBANY POOL CSO LTCP	ALBANY NORTH	FIGURE 3-1A

sewers enter the trunk sewer from the west via gravity, while four force main connections bring pumped flow from the east. Multiple CSO regulators along the trunk sewer discharge to the Mohawk and Hudson Rivers during wet weather. The principal regulator structure in the City of Cohoes combined sewer system, "Little C" is located where the City's main trunk connects to an interceptor sewer.

The City interceptor sewer continues three-quarters of one mile downstream of Little C. South of Cohoes, the interceptor is ACSD's responsibility and is known as the Hudson River Interceptor (HRI). HRI receives flow from Watervliet and Menands gravity sewers from the west and Green Island's force main connection from the east. Multiple CSO regulators on Watervliet and Green Island tributary sewers divert excess wet weather flow to the Hudson River. The combined flow continues south in HRI for two and one-half miles, collecting sanitary flows from unincorporated Colonie before treatment at the North Plant. All flow entering HRI is monitored by ACSD for billing purposes.

ACSD's Patroons Creek Trunk Sewer collects sanitary flow from the Town of Colonie and northern portions of the City of Albany and drains east for seven miles to the North Plant. This sewer enters the plant's influent manhole seven feet above HRI. It was therefore modeled hydraulically separate from any HRI backwater conditions. All flows entering Patroons Creek Trunk Sewer are monitored by ACSD.

3.5.2. Albany South

Figure 3-2 shows the Albany South model pipe network and catchments. The Albany South sewer collection system includes a main intercepting sewer paralleling the Hudson River through downtown Albany that conveys sewage from most of the City to the South Plant.

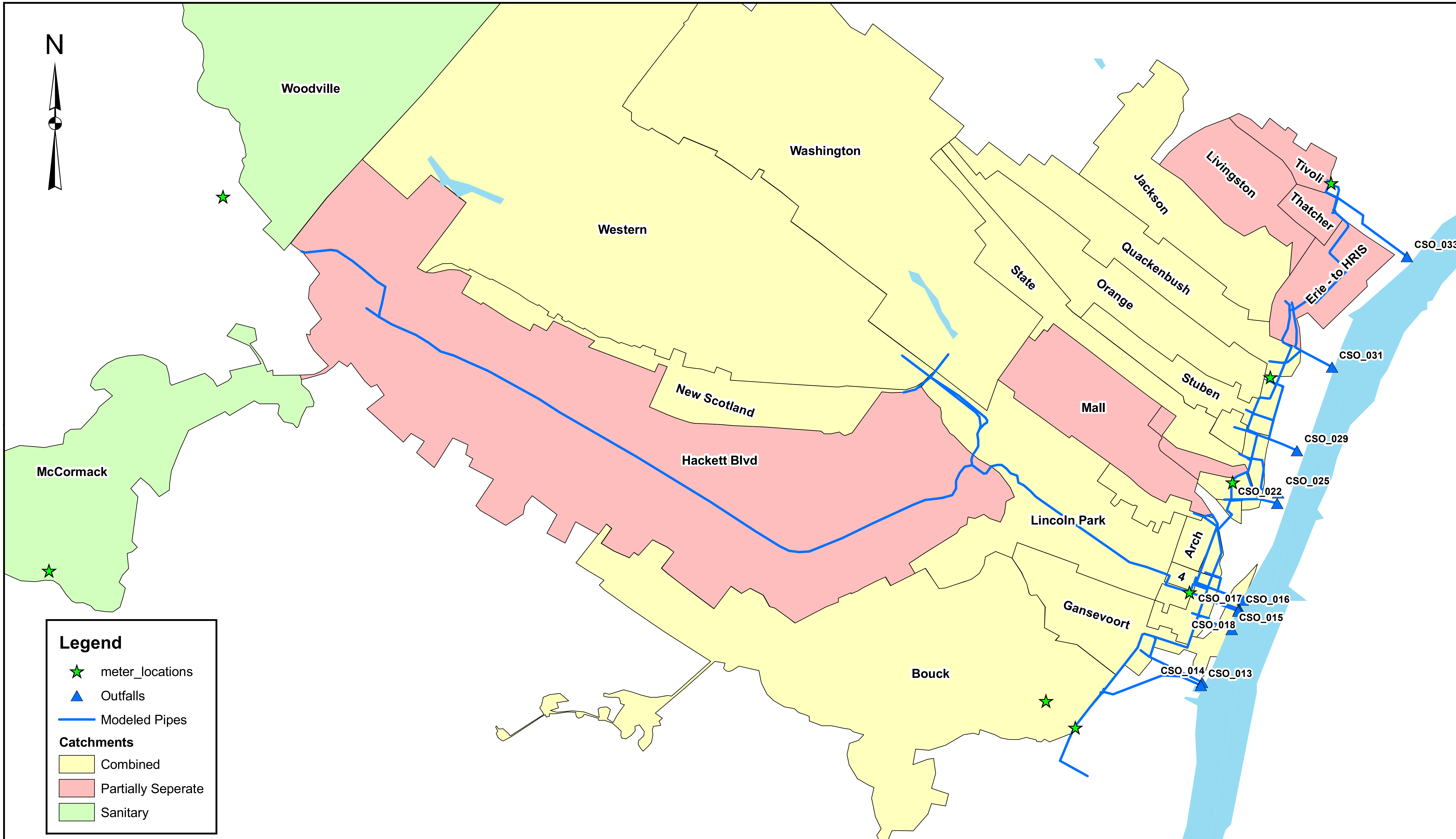
The Beaver Creek Sewer, an 8-foot by14-foot box culvert, conveys combined sewage from three-fourths of the South Plant sewershed to the "Big C" regulator, where flow continues to the interceptor or is diverted to the Hudson River.

The South Plant sewershed was delineated into subcatchments for use in the model. The Beaver Creek sewershed upgradient of Big C was subdivided into six subcatchments. Its Woodsville and McCormack subcatchments are fully separated. Other subcatchments distributed throughout the city are partially separated.

Sluice gates at South Plant are used to limit peak wet-weather flow, as reported to the modeling team by South Plant personnel. WWTP records indicate the plant rarely receives sustained flows above 35 million gallons per day (mgd). CHA thus imposed a 35 mgd inflow limit at South Plant for baseline simulations.

3.5.3. Rensselaer

Figure 3-3 shows the Rensselaer model pipe network and catchments. The Rensselaer sewer system parallels the Hudson River draining north to the RCSD WWTP. Its interceptors, regulators, and pump stations are owned and operated by Rensselaer County



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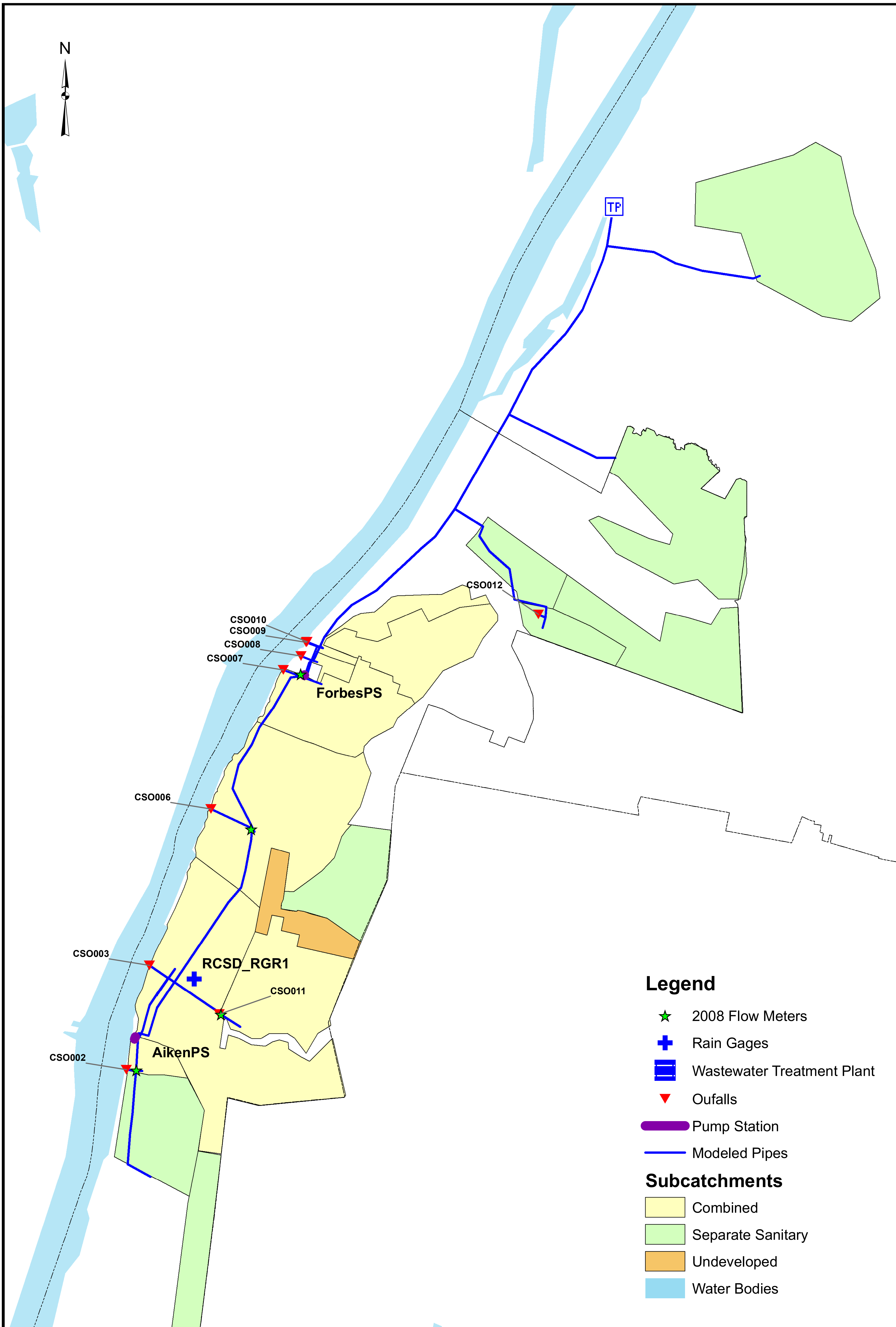
ALBANY POOL CSO LTCP | **ALBANY SOUTH** | **FIGURE 3-2**



albany pool Joint Venture Team CDM MALCOLM PIRNIE CHA

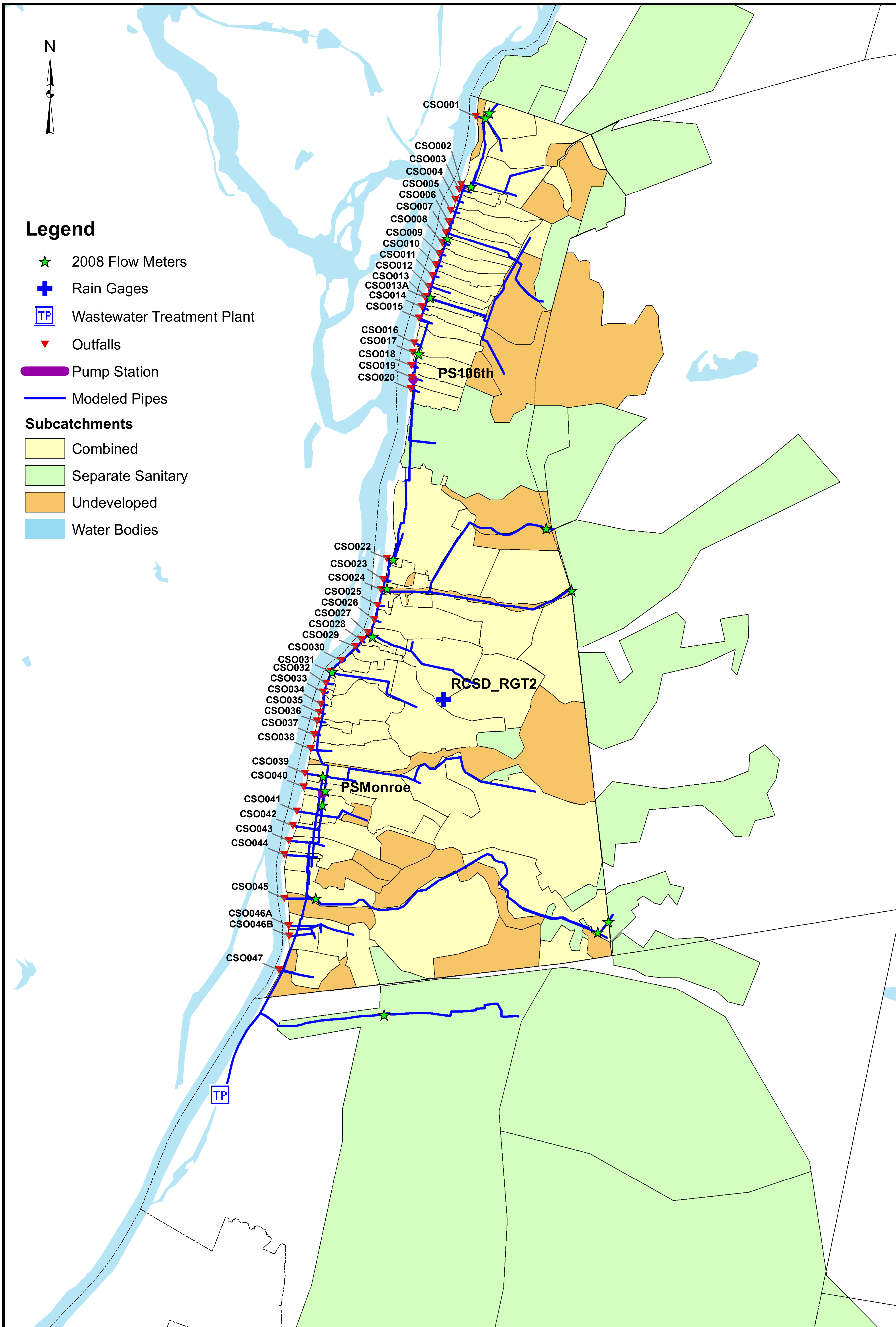
ALBANY POOL CSO LTCP | Rensselaer | FIGURE 3-3

Sewer District (RCSD). The southern portion of the City, between the Port of Albany-Rensselaer and Herrick Street, is serviced by two gravity interceptor sewers that convey wastewater to the 11.6 mgd Aiken Avenue Pump Station (PS). It lifts flow from 0 feet NGVD to 14 feet and discharges into a one-mile long force main. Two miles north of Aiken Avenue, flow enters the 14.2 mgd Forbes Avenue PS. The Forbes Avenue sub-system services the north of the City, between Herrick and Washington Streets. At Forbes PS, wastewater is pumped from 0 feet NGVD to 17 feet and discharged via a three-mile force main to the RCSD WWTP in North Greenbush. Other tributary sewers enter the force main from the east via gravity, including sanitary wastewater from North Greenbush.

There is considerable sewer separation throughout Rensselaer. Storm drains and open channel drainage that discharge to the Hudson River are not included in the sewer model.

3.5.4. Troy

The Troy model is also shown in Figure 3-4. Troy's interceptor sewer system drains south from the northern City border towards the RCSD WWTP. The interceptor, regulators and pump stations are owned and operated by RCSD. A gravity interceptor sewer ranging from 16 to 36 inches diameter services the portion of the City between River Road and 102nd Street. The interceptor collects wastewater from trunk sewers tributary to CSOs 001 through 020 and conveys wastewater to the 8.1 mgd 106th Street PS. Flow is then conveyed via a 24-inch force main to a gravity interceptor sewer, which runs from Rensselaer Street to the 31.2 mgd Monroe Street PS. The gravity sewer collects wastewater from trunk sewers tributary to CSOs 022 through 040. Another gravity interceptor sewer collects wastewater from areas tributary to CSOs 041 through 046 and conveys flow to Monroe Street PS. Wastewater is conveyed from Monroe Street via a 42-inch force main to the RCSD WWTP. Combined sewage from areas tributary to CSOs 046A, 046B and 047 enter the pressurized force main along with flow from the North Greenbush Trunk Sewer and Rensselaer Technology Park between Monroe Street PS and the WWTP.



Joint Venture Team albany pool CDM MALCOLM PIRNIE CHA

ALBANY POOL CSO LTCP | TROY | FIGURE 3-4

4. Model Calibration

4.1. Overview

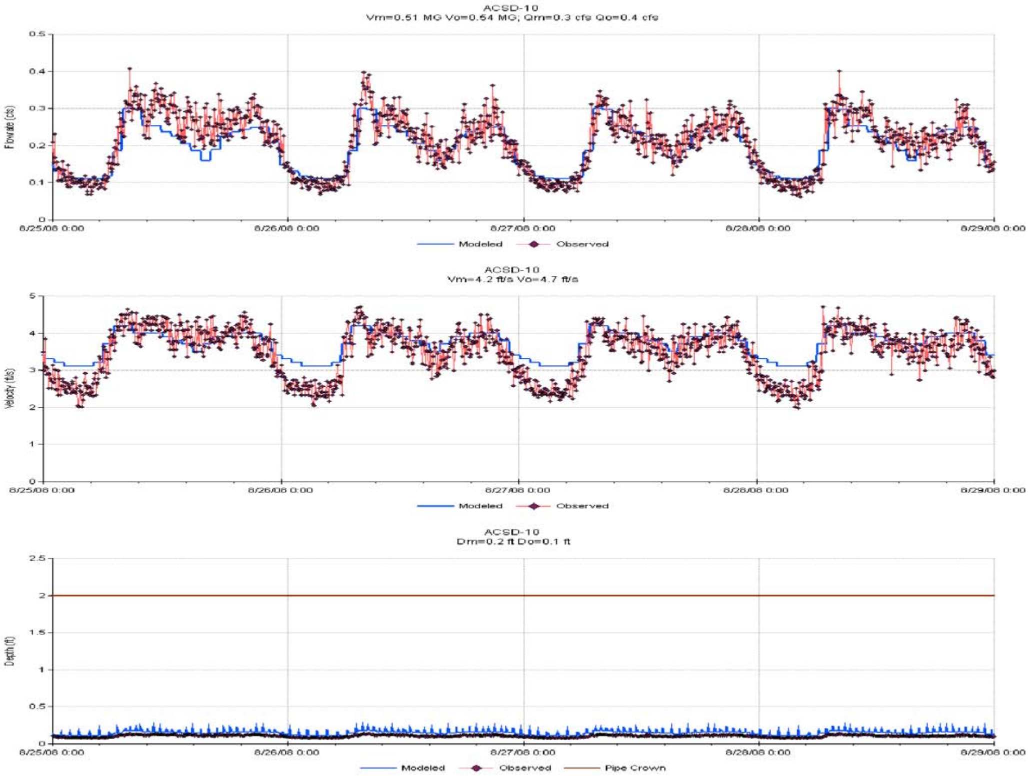
The models were calibrated for dry weather flow, wet weather flow, and a multi-month continuous simulation. The models were adjusted within reasonable limits to minimize differences between observed and modeled timing of peaks and troughs, peak flow rates, peak velocity, and total volume at each metered location. Calibration was assessed by evaluating differences between observed and modeled values for each type of simulation. Calibration was primarily based on visual match of metered and simulated hydrographs to match peak flow, volume and timing in accordance with USEPA's *Combined Sewer Overflows: Guidance for Monitoring and Modeling* (1999) guidelines. Quantitative comparisons between model results and monitored data followed guidelines in the UK Wastewater Planning Users Group (WaPUG) *Code of Practice for the Hydraulic Modelling of Sewer Systems* (2002).

4.2. Dry Weather

Dry weather calibration was performed for a four-day period in late August at most meter locations. The models were adjusted to provide reasonable correspondence between measured and observed flows, depths, and velocities throughout the calibration period. Principal calibration parameters were the sanitary and baseflow values and patterns, and pipe roughness. Roughness for pipes with very low flow depths in dry weather, was only calibrated to wet weather data, as roughness near the pipe invert may not represent overall pipe condition. Efforts to replicate the diurnal pattern observed at each site were similarly limited, as minor fluctuations in dry weather flow have minimal bearing on total flow during storms.

Figure 4-1 shows representative dry weather flow calibration plots of depth, velocity, and discharge for ACSD meter 10, a 24-inch pipe in the Albany North system. The modeled time series are shown as smooth blue lines. The observed data are shown as red lines with markers. The plots show average flow rates between 0.1 and 0.3 cfs, velocities between 2 and 5 feet per second, and flow depths of 0.1 to 0.2 feet from June 25 to June 28, 2008.The model generally mimics the observations, although it omits the small high-frequency in the data that may be due to upstream pump cycling. All dry weather flow time series plots are presented in Appendix B.

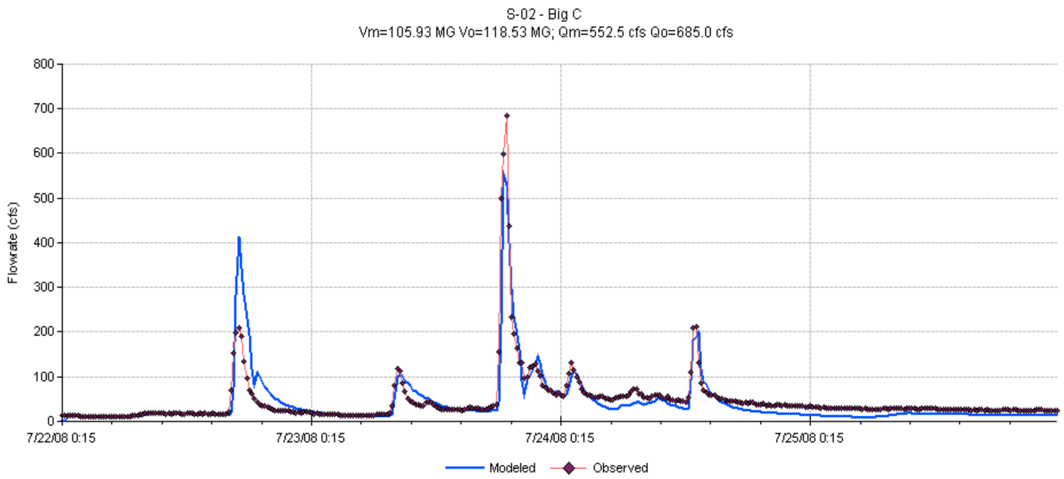
Figure 4-1. Dry weather calibration time series at ACSD-10



4.3. Principal Storms

The models were adjusted to match observed hydrographs for three principal storms at each flow meter. Catchment width, routing fraction, and pipe roughness were principal calibration parameters. For partially separated catchments, contributing area was also adjusted. Figure 4-2 shows simulated and observed flow in the 8-foot by 14-foot box culvert at Big C tributary to outfall CSO 017 in the Albany South system for the July 23 storm. The model slightly overestimates peak discharge on July 22, overestimates discharge on July 23, and correctly simulates peak discharge on July 24. Total volume modeled over the four days shown is 106 MG, which is within 10% of the 119 MG measured. These results indicate good overall calibration. They must be considered in conjunction with corresponding plots of depth and velocity, and in comparison with comparable plots for dry weather flow, the two other storm calibration events, and scatterplots of results for all storms (discussed below). Similar plots were produced for series of depth, flow rate, and velocity at each meter for three storms. All calibration time series are included in Appendices C through F.

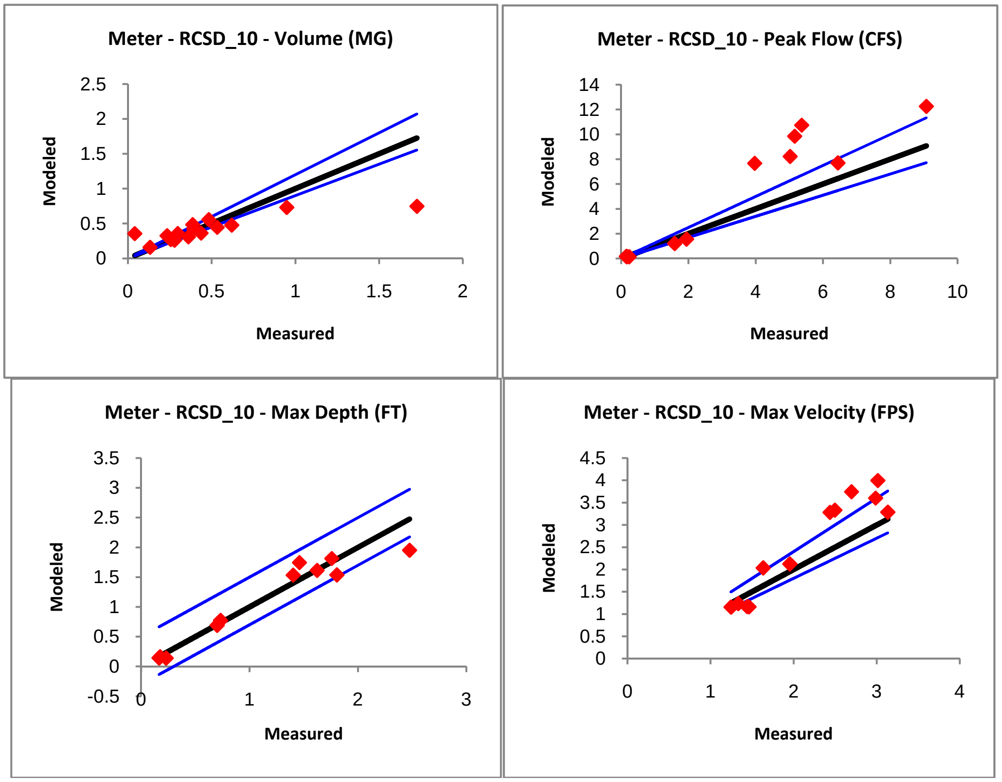
Figure 4-2. Flow Calibration Plot for Big C Regulator



4.4. All Metered Storms

Each model was run continuously for the three-month metering period to assess its performance across the spectrum of observed storms. For each storm at each flow meter, metered and simulated flow volumes, peak discharge, and peak depth were compared to observed values. Scatterplots were prepared to compare metered and simulated flows, volumes, depths, and velocities at all events. Scatterplots at Rensselaer meter XX are presented in Figure 4-3. Points plotted above the 45-degree line indicate where the modeled result is larger than the observed value. Points below the line indicate where the model results are lower than the observed values. The blue lines indicate ideal ranges for calibration: modeled peak flows within +25% to -15% of measurements, volumes within +20 to -10%, and depths within +0.5 to -0.3 ft, and velocities within ±10%. The model conforms to the data at this location with minimal bias. Scatterplots for all flow meters are included in Appendix G.

Figure 4-3. Scatterplots for Meter RCSD-10



4.5. System-Specific Issues

4.5.1. Albany North

The HRI receives combined sewage from Cohoes, Green Island, and Watervliet. Storm flows from some Cohoes subcatchments exhibited typical combined system high inflow peaking factors along with extended recession limbs, indicating significant infiltration. To simulate this phenomenon, slow-response subcatchments representing groundwater infiltration were added to portions of the Albany North Model. This allowed the model to better match observed data during the end of large events or during back-to-back storms.

4.5.2. Albany South

Metering showed infiltration or inflow of 2.7 mgd entering the interceptor between Big C and South Plant. This section of the interceptor was built in the early 1900s; it is likely subject to higher than average rates of infiltration. In addition, based on discussions with the Albany Water Board and ACSD personnel, the Joint Venture Team believes there may be leaking or missing tide gates along this reach. Additional baseflow was assigned to the interceptor sewer at various manholes between the south plant and Big C to account for this.

4.5.3. Rensselaer

Much of the Rensselaer sewer system is partially separated; separate storm drains throughout the city convey storm water to drainage outfalls along the Hudson. Calibration of the model required adjustment of the effective contributing area for many catchments. The contributing area for the CSO 003 sewershed was reduced to 60% of its total service area, while the contributing area for the 011 area was reduced to 40% of its service area. These figures do not reflect the precise amount of separation within the sewersheds, but are indicative of extensive separation and diversion of stormwater out of the sewer system. RCSD flow meter 9 operated very erratically; it produced valid depth data throughout the metering program, but its velocity sensor failed in the July 13 calibration event, as well as in the middle of the July 23 storm. It operated well at the end of the metering program, and produced valid data throughout the September 6 storm.

4.5.4. Troy

The Troy sewer system accepts natural drainage from the east of the city and from Brunswick. The calibration process helped identify the principal sources of drainage. Pond outlet structures and pumps associated with drainage from outlying areas were added to the model. To represent the variations in drainage baseflow entering the sewer system, observed flows from the 2008 metering program were correlated with streamflow data at USGS gaging stations in the Albany area. Monthly baseflow patterns were established based on long-term mean streamflow. Subsequent testing of the model for long-term simulation indicated the likelihood of substantial dry weather overflow from CSO regulators downgradient of several areas receiving natural drainage. These locations were reviewed with the City of Troy. Subsequent field investigation in 2009 led to confirmation of sporadic dry weather overflow at two locations. The City and RCSD have implemented improvements to the regulators and introduced best management practices to improve sewer hydraulics to remediate the overflows.

Model calibration also led to identification of two locations in Troy where leaking tide gates were permitting Hudson River flows to enter the sewer system during high stage conditions.

5. Long Term Baseline Simulation

5.1. Long-Term Period Selection

Precipitation data from Albany Airport were used for simulation of CSO baseline conditions. The Airport has complete digital hourly precipitation data for May 1948 through the present. The data were analyzed to identify a representative five-year period with precipitation close to long-term averages.

It is desirable to use a representative period, since it takes several hours to simulate a single year for each CSO model. Simulations of the selected period should produce results that would align very closely with results from simulation of the complete record. A five-year period was selected to obtain more robust statistics than would be possible from a single representative year simulation, which is used in many other CSO studies. The moderate size of the Pool models makes five-year runs feasible.

The years 1985 through 1989 were selected as having representative precipitation. Table 5-1 shows that precipitation was close to the long-term average for the five years. It was below average in 1985 and 1988, and above average the other years. Expected CSO volume was estimated using a simple NetSTORM model that simulates CSO based on contributing acreage, estimated runoff coefficient, storage volume, and system-wide treatment rate. CSO estimated with NetSTORM for this period was also close to the long-term average. Annual CSO estimates in Table 5-1 are normalized to inches over the contributing area.

Table 5-1. Albany Precipitation 1985-1989

	Precipitation		CSO	
Year	(inches)	Percentile	(inches)	Percentile
1985	30.0	13%	2.7	14%
1986	44.0	86%	4.5	88%
1987	39.3	68%	4.0	70%
1988	29.6	10%	2.7	18%
1989	39.7	72%	3.9	63%
Average	36.5		3.5	
Long-Term Mean	36.8		3.6	

Three other checks were made to assess appropriateness of 1985-1989 as the representative period: frequency of moderately large storms, occurrence of extreme storms, and counts of storms at various depths.

Table 5-2 lists storms during the period that exceed a 1-year, 6-hour or 1-year, 24-hour rainfall. The table identifies five events at a 6-hour interval, and six events at a 24-hour interval. The ideal 5-year period would have five storms at each interval; the selected period matches this criterion well.

Table 5-2. Albany 1-year storms at 6-hour and 24-hour intervals, 1985-1989

Date	Depth (inches)	
	6-hr	24-hr
1-year depth	1.5	2.3
March 14, 1986	0.9	2.4
June 19, 1986	1.6	1.8
July 30, 1986	1.7	2.2
September 8, 1987	2.2	2.9
October 3, 1987	1.9	3.3
October 27, 1987	1.5	2.0
August 28, 1988	1.0	2.4
October 19, 1989	1.2	2.3

It would be undesirable to include an event in the representative period with a recurrence interval significantly longer than five years. None of these storms was an extreme event; the September 1987 storm was a 3-year event at a 6-hour interval, while the October 1987 storm was a 4-year event at 24 hours. No rainfall had recurrence intervals beyond 10 years at any duration from one hour to four days. Measureable precipitation in the region averages 700 hours per year, with 64 storms recording at least 0.1 inches depth.

Table 5-3 lists the average number of storms per year exceeding selected depths based on a 9-hour interevent time, along with long-term means computed from 1948-2006 data.

Table 5-3. Storms per year for select histogram bins 1985-1989

Year	≥0.25"	≥0.50"	≥0.75"	≥1.0"	≥1.5"	≥2.0"	≥2.5"
1985	33	20	12	6	2	0	0
1986	40	29	20	18	5	3	2
1987	41	25	19	11	4	3	2
1988	33	20	13	7	1	1	1
1989	44	27	19	12	6	1	0
Average	38	24	17	11	3.6	1.6	1.0
Long-term mean	41	24	15	8	3.4	1.3	0.7

Table 5-3 shows that 1985 through1989 met or slightly exceeded the long-term average at each depth except for storms between one-quarter and one-half inch.

These statistics demonstrate that the selected period is representative of Albany-area long-term precipitation. Prior to use in the models, the hourly data were synthetically disaggregated to 5-minute frequency using NetSTORM software to account for shortduration high-intensity rainfall and to ensure compatibility with calibrated conditions for long-term simulations.

5.2. Planning Horizon Adjustments

CDRPC predicts a 2% population decline in Pool communities from 2007 to 2040 (statistics accessed at www.cdrpc.org/Proj-Pop.html). Growth of 0.3% and 4% is predicted for Albany and Green Island respectively, while population declines from 3% to 6% are predicted for the other communities. Because these population changes are small and their correlation with water use is difficult to forecast, the calibrated existing condition sanitary flows in the models were not changed for baseline simulations.

The only other model adjustment from the calibrated conditions was elimination of model-predicted dry weather overflow in Troy. These predictions were discussed with Troy and RCSD personnel and additional field investigations were performed to assess the likelihood of overflows. Where investigations identified peak dry weather flow depths near the crest of the regulator diversion weir, modifications were made to the model to reflect regulator pipe cleaning and weir modifications recently performed by RCSD staff as part of their best management practices and interceptor system maintenance program.

High-resolution Hudson River stage data are not available for 1985-1989. Daily stage above Federal Dam was calculated from reported discharge data for 1985-1989. Hourly stage data below the dam was represented by transposing hourly data from 2004-2008. The key feature of the tidal stage data is that it generally varies semi-diurnally from -1 to 5 feet NGVD except typically for a few days in April each year when it consistently crests near 10 feet. Substituting data from a different year was judged to have minimal impact on model results.

5.3. CSO Statistics

Baseline CSO statistics and percentage capture were computed from the five-year simulation results. Table 5-4 lists average annual CSO volume, duration of discharge, number of overflow events, and percent capture for each Albany Pool community. Percent capture is the ratio of flow treated at each WWTP during wet weather to the total flow entering the collection system during wet weather.

While percent capture for the ACSD North and Rensselaer systems exceed the 85% capture “presumptive approach” criterion, overflow frequency in these systems is much greater than the limit of four to seven overflow events annually specified in the presumptive approach. These estimates are consistent with other smaller communities that are partially separated or have lower density development. These systems overflow frequently, but with shorter durations, smaller discharge volume, and higher capture rates than in larger cities.

Table 5-4. Baseline Annual CSO by Community

Community	Million gallons	Hours	Events	Percent Capture
Cohoes	21	380	61	
Green Island	4.6	220	41	
Watervliet	4.8	330	44	
ACSD North	30			91
Albany / ACSD South	757	637	58	63
Rensselaer	20	192	52	88
Troy	447	723	65	67
RCSD	467			
Albany Pool total	1254			

In Albany and Troy, CSOs occur during most storms. Capture rates are well below 85% and overflow frequency far exceeds four per year. These results are consistent with the larger combined sewer service areas, which typically have larger trunk sewers and outfalls and limited interceptor system capacity. Overflows from these sewersheds tend to be frequent and longer, producing much higher overflow volumes than the smaller communities.

Table 5-5 lists the top ten CSOs by annual discharge volume. The Big C overflow in Albany accounts for 45% of all CSO in the Pool communities. Together, the six largest CSOs by volume, all in Albany and Troy, account for 851 million gallons (MG), two-thirds of CSO.

Table 5-5. Most Active CSOs by Volume

Community	Outfall	Street	MG	Hours	Events
Albany	017	Big C	546.5	513	48
Albany	013	Bouck	94.2	637	58
Troy	035	Liberty St	55.2	518	53
Troy	031	State St	53.7	415	52
Albany	029	Maiden, Orange, Steuben	48.1	496	56
Albany	031	Livingston, Jackson, Quackenbush	35.8	260	55
Troy	024	Hoosick St	24.7	100	33
Troy	037	Adams St	24.6	346	50
Troy	026	Jacob St	23.0	429	62
Troy	027	Federal St	19.3	216	50

It may be equally important to address both high frequency and high volume overflows to meet water quality standards. The impacts of the small volume, frequent overflows are being assessed using the one-dimensional Hudson River water quality model.

CSO statistics for each individual community are presented with a discussion of each respective sewer system in Section 5-4.

5.4. System-Specific Issues

5.4.1. ACSD North

Table 5-7 summarizes Albany North baseline annual CSO statistics by community. CSO outfalls Mohawk St 007 (4.2 MG) and Little C 008 (8.6 MG) in Cohoes, Swan Street (4.0 MG) in Green Island, and Seventh Street (4.5 MG) in Watervliet are the four largest overflows by volume, accounting for 71% of annual Albany North overflow volume (21.3 MG out of 30 MG). A bottleneck along Cohoes' main interceptor between Little C and HRI is mainly responsible for the overflow at Little C 008. At the Mohawk and Seventh Street overflows, low weirs within the CSO regulators and limited downstream conveyance yield the second and third largest overflow volumes.

Most highly active overflows in Albany North occur at pump stations with small drainage areas in upstream areas and produce minimal CSO volume. CSO Outfalls Hudson Avenue 001, Bridge Avenue 002 in Cohoes, Swan Street in Green Island, and Seventh street in Watervliet are the four most active overflows, each with over 40 overflows annually. Pump station capacity limitations are primarily responsible for the Hudson Avenue, Bridge Avenue, and Swan Street overflows.

Annual CSO volumes range from 1,000 gallons at 25th Street to 8.6 MG at Little C. CSO from all 24 overflows is 30 MG, less than three percent of the total CSO discharged by Albany Pool communities to the Hudson River.

Table 5-6. ACSD North Baseline Annual CSO Statistics by Community

Outfall	Million gallons	Hours	Events
Cohoes			
Hudson Ave 001	0.2	188	61
Bridge Ave 002	0.7	304	45
Van Schaick Ave 003	0.3	195	35
Myrtle Ave 004	0.6	151	40
Continental Ave 005	2.9	23	11
Ontario St 006	0.7	61	22
Mohawk St 007	4.2	380	21
Little C 008	8.6	30	11
Conboy Ave 009	1.0	147	32

Outfall	Million gallons	Hours	Events
Peach St 010	0.5	23	5
Cedar St 011	<0.1	<1	<1
Duncan 012	<0.1	13	1.4
Eagles Nest 015	<0.1	<1	<1
River St 016	0.3	4	3
Linden St 017	0.4	36	12
Cohoes	21	380	61
Green Island			
Swan St	4.0	209	41
Hamilton St	0.4	220	34
Saratoga Ave	0.2	41	12
Green Island	4.6	220	41
Watervliet			
7th St	4.5	330	44
6th St	0.2	100	24
14th St	0.1	51	16
3rd St	<0.1	14	5
Avenue A	<0.1	6	1.2
25th St	<0.1	<1	<1
Watervliet	4.8	330	44
ACSD North	30		

A peak capacity of 90 mgd was assumed at the North Plant for establishing baseline conditions. This is based upon the estimated peak hydraulic firm capacity of the WWTP headworks pumps. During the five-year simulations, peak flow to the WWTP exceeded this capacity, causing moderate backwater along the Hudson River Interceptor. WWTP capacity is being analyzed as part of the LTCP and will be considered in development of CSO abatement alternatives.

5.4.2. Albany

Table 5-7 lists baseline CSO baseline conditions for the City of Albany. The largest CSOs by area discharge the largest volume to the Hudson River. Discharge volumes range from 0.3 MG to 547 MG. Each outfall discharges between eight and 58 times annually. The most active is CSO 013. This is the most downstream regulator in the system. CSO017 discharges the greatest volume of combined sewage, due to its large contributing area.

Table 5-7. Albany Baseline Annual CSO

Outfall	Contributing Combined Sewer area (acres)	Million gallons	Hours	Events
013	600	94.2	637	58
014	110	6.4	258	23
015	17	0.9	87	14
016	6	0.3	12	8
017	3,290	546.5	513	48
018	6	0.5	25	13
021	43	3.4	85	29
022	3	1.0	85	19
025	135	18.5	213	42
029	247	48.1	496	56
031	360	35.8	260	55
033	25	1.0	61	39

5.4.3. Rensselaer

Table 5-8 summarizes City of Rensselaer baseline CSO statistics. Outfalls 003 and 006, which relieve the two largest sewersheds in the City, discharge the most CSO by volume. While these areas are partially separated, 60% of their sewersheds have combined sewers. Interceptor capacity limitations are the main cause of overflow at both these outfalls. Overflows at CSO 003 are also affected by capacity limitations at Aiken Avenue Pump Station. The limitations at CSO 006 are due to flows contributed to the interceptor by the force main connection from Aiken Avenue Pump Station. The peak wet weather flow conveyed by the pump station limits the interceptor’s capacity to receive flow from the CSO 006 sewershed.

CSO 010 is the most active overflow with 52 events annually. Its 24-inch trunk sewer connects to the upstream end of the 16-inch interceptor conveying wastewater to the Forbes Avenue Pump Station from the northern end of the City. During wet weather, peak flows from sewersheds tributary to CSOs 008 and 009 consume the conveyance capacity of the 16-inch interceptor to the Forbes Avenue Pump Station, leaving limited capacity for flows to enter the interceptor from the sewershed tributary to CSO 010.

During intense storms, the interceptors surcharge, causing CSOs up to 52 times per year. Annual CSO discharge volumes range from 4,000 gallons to 8.5 MG. Total annual CSO from all Rensselaer CSOs is 20 MG, less than two percent of the total CSO discharged by Albany Pool communities to the Hudson River.

Table 5-8. Rensselaer Baseline Annual CSO

Outfall	Million gallons	Hours	Events
002	0.5	39	27
003	8.5	109	41
006	5.6	192	40
007	1.8	108	42
008	0.004	0.2	0.6
009	0.4	27	23
010	3.2	158	52
011	0.01	0.8	1.2
012	0.01	0.5	1.2

5.4.4. Troy

Table 5-9 summarizes baseline modeling results for the City of Troy. Overflow frequency for its 49 CSOs ranges from 6 to 65 events per year; discharge volumes range from 0.1 to 55.2 million gallons per year.

Table 5-9. Troy Baseline Annual CSO

Outfall	Million gallons	Hours	Events
001	0.3	18	16
002	1.1	26	17
003	6.9	442	53
004	2.0	123	46
005	11.8	543	55
006	14.6	197	51
007	14.3	662	56
008	2.0	174	52
009	7.6	214	50
010	3.3	227	57
011	7.5	93	44
012	7.8	181	48
013	17.4	396	23
013A	10.1	381	65
014	7.6	168	47
015	9.8	148	44
016	4.6	119	40
017	3.9	101	40

018	1.8	214	57
019	4.4	39	31
020	1.4	151	51
022	10.6	51	21
023	1.6	34	22
024	24.7	100	33
025	0.5	20	18
026	23.0	429	62
027	19.3	216	50
028	0.4	9	10
029	3.4	61	28
030	1.7	34	21
031	53.7	415	52
032	3.2	183	37
033	4.2	265	45
034	0.1	6	6
035	55.2	518	53
036	18.2	723	56
037	24.6	346	50
038	12.6	143	34
039	11.8	186	37
040	2.3	33	21
041	12.5	201	45
042	3.4	62	30
043	6.1	88	29
044	5.2	88	24
045	1.4	29	12
046A	4.8	185	51
046B	0.7	76	40
047	1.9	102	41

CSO in Troy is driven by a combination of collection system constraints and sources contributing flows. Key issues affecting Troy's CSO are sanitary sewer inputs from neighboring communities, pump station limitations, streamflow entering the sewer system, and leakage through tide gates.

In addition to sharing the Rensselaer County WWTP with the City of Rensselaer, Troy also accepts flow into its sewer system from North Greenbush and Wynantskill to the south and portions of Brunswick and Schaghticoke to the east and north respectively. Dry weather flows from these communities are estimated at 0.5 to 0.7 mgd. Infiltration and inflow from these neighboring towns further burden Troy's collection system. Peak wet weather contributions from the upstream communities range up to 5 mgd in a one-year event.

The 106th and Monroe Street Pumping Stations limit interceptor flows, thereby contributing to CSO at upgradient regulators. Pumping capacity at the stations is 8.1 mgd at 106th and 31.2 mgd at Monroe. CSOs 018, 019, and 020 are less than 500 ft upgradient of the 106th Street station. CSOs 039, 040, and 041 are within 1,000 feet of the Monroe Street PS. During wet weather, the manually cleaned pump station screens become partially obstructed. This surcharges the interceptors at the pump station entrances, contributing to overflow at the nearby CSOs, and at other CSOs with low-lying weir crests. The most susceptible locations to pump station backup are CSOs 031, 033, 035, 036, and 037. The crown of the interceptor entering Monroe Street PS from the north is 1.5 ft NAVD, while weir crests on the regulators to those CSOs range from 4.6 to 5.9 ft NAVD. CSOs 031 and 035 account for one-fourth of Troy's CSO; these are two of the four structures with 500 hours of annual CSO activity.

Along Troy's eastern edge, storm drainage and streamflow enter the collection system at numerous points from within Troy and from Brunswick. Areas tributary to CSOs 002, 013, 017, 024, 041, 043, and 044 receive streamflow. CSO 013 is the third most active outfall by volume in the City. The other CSOs receiving streamflow are not among the most active, but these areas elevate baseflows in the sewer system year-round, and further burden the collection system during wet weather. As discussed in Section 4, dry-weather overflow was observed at CSOs 013 and 024 in summer 2009. Table 5-10 shows that the CSO 013 drainage area accounts for 70% of the stormwater-only drainage contributing to Troy's sewer system. The CSO 017 service area includes pumped drainage from Lansingburgh High School and Knickerbacker Middle School near Knickerbacker Park. A 1.4 mgd pump station dewaters the low-lying field complex to the combined sewer system during large storms.

Table 5-10. Troy stormwater-only contributing areas

Sewershed SPDES	Acres	Imperviousness (%)
002	60	18
013	750	20
017	34	10
024	62	21
041	71	30
043	27	12
044	51	22
Total	1055	20

Tide gates at several CSO outfalls regularly become stuck partially open, allowing river water to enter the sewer system. This condition was observed during the 2008 field survey at CSOs 003, 006, 007, 012, 014, 015, and 017. Tidal inflow to the sewer system based on calibration to 2008 conditions was included in the CSO baseline conditions through simulation of leaky tide gates. This condition was removed for simulation of CSO mitigation alternatives.

Ultimately, Troy's collection system is constrained by the capacity of the force main downgradient of the Monroe pump station. While the 42-inch force main could convey 37 mgd of flow at 6 ft/s velocity, the resultant 42 feet of head loss is beyond the capacity of the Monroe Street PS.

During intense storms, the interceptor system surcharges, causing CSOs 65 times per year on average. Average annual discharge at City CSOs ranges from 0.1 to 55 MG. Troy's total annual CSO is 447 MG, constituting 36% of CSO discharged by Albany Pool communities to the Hudson River.

Peak capacity of 63.5 mgd was assumed at the RCSD WWTP for establishing baseline conditions. This is based upon the estimated peak hydraulic capacity of the WWTP headworks facilities. As the combined peak pumping capacity of the Forbes Avenue PS in Rensselaer and the Monroe Street PS in Troy is 44 mgd, WWTP capacity does not appear to be a limiting factor. WWTP wet weather capacity is being analyzed as part of the LTCP and will be considered in development of CSO abatement alternatives.

Appendix A. Flow metering program

Table A-1 Meter Locations

ID	NAME	LOCATION	CITY	NOTES
1	ACSD_N-01	Off Market Rd. down dirt access drive, right past power lines	Menands	Downstream end of North Hudson R Int.
2	ACSD_N-02	349 Saratoga St at fence	Cohoes	Little C
3	ACSD_N-03	349 Saratoga St- in field	Cohoes	Captures a large CSO subarea
4	ACSD_N-04	Columbia St at Congress St	Cohoes	Captures a large CSO subarea
5	ACSD_N-05	Broadway at 7th St	Watervliet	6th St CSO subarea
6	ACSD_N-06	Swan St end	Green Island	Swan St CSO
7	ACSD_N-07	400' N of 39 Erie Blvd	Menands	Downstream end of Patroons Creek Int.
8	ACSD_N-08	36 Industrial Park Road	Albany	Midpoint of Patroons Creek Int.
9	ACSD_N-09	2332 Broadway	Watervliet	Captures total flow from Green Island
10	ACSD_N-10	Manor Ave at N Reservoir St	Cohoes	upper point of North Cohoes Int
11	ACSD_N-11	244 Ontario St	Cohoes	Most of Cohoes North - to interceptor
12	ACSD_N-12	Cayuga at Olmstead, 300' north into woods	Cohoes	Midpt of Cohoes North interceptor
13	ACSD_N-13	Pershing Ave end, 175' into woods	Cohoes	Captures majority of flow from islands
14	ACSD_N-14	136 Fuller Road	Albany	Upstream end of Patroons Creek Int.
15	ACSD_RG-A4	Woodville PS	Albany	rain gauge
16	ACSD_RGC-3	319 Vliet Blvd	Cohoes	rain gauge
17	ACSD_S-01	431 S Pearl St	Albany	Downstream end of Hudson R Int.
18	ACSD_S-02	Rensselaer St at Green St	Albany	Big C
19	ACSD_S-03	Dallius St. btwn Division and Hudson Sts	Albany	Midpoint of Hudson R Int.
20	ACSD_S-04	1st Ave, 25' S of Elmendorf	Albany	Capture majority of Bouck subarea
21	ACSD_S-05	Orange Street btwn Broadway and Water St	Albany	Orange Street regulator
22	ACSD_S-06	End of Woodville Ave	Albany	flow entering Woodville Pump Station
23	ACSD_S-07	McCormack Rd at Meadow Ln	Albany	flow entering McCormack Pump Station
24	ACSD_S-08	N Pearl St. 50' SW of Tivoli St	Albany	Upstream end of Hudson R Int.
25	RCSD_02	1st St at Monroe St	Troy	Troy Interceptor - DS of Outfall 039

ID	NAME	LOCATION	CITY	NOTES
26	RCSD_03	343 2nd Ave.	Troy	Troy Interceptor - DS of Outfall 017
27	RCSD_04	679 1st Ave.	Troy	Troy Interceptor - DS of Outfall 006
28	RCSD_05	Cross St at Burden Ave	Troy	Trunk sewer - US of CSO 045
29	RCSD_06	7 Madison St	Troy	Trunk sewer - US of CSO 039
30	RCSD_07	River St at Hoosik St	Troy	CSO 024 subarea
31	RCSD_08	Rensselaer St at River St	Troy	CSO 022 subarea
32	RCSD_09	Amtrak Maint. Rd	Rensselaer	Trunk sewer - US of CSO 006
33	RCSD_10	23 Riverside Ave at Belmore Pl	Rensselaer	Rensselaer Interceptor - 002 subarea
34	RCSD_11	Federal St - Parking lot of Fresno's	Troy	Trunk sewer - US of CSO 011
35	RCSD_12	River Rd at Roosevelt Ave	Troy	Schaghticoke Trunk Sewer connection
36	RCSD_13	2nd Ave	Rensselaer	CSO 011 subarea
37	RCSD_14	N Greenbush Rd at Glenmore Rd	Troy	N Greenbush Trunk sewer
38	RCSD_15	148 River Rd	Troy	CSO 001 subarea
39	RCSD_16	Front St at State St	Troy	Trunk sewer - US of CSO 031
40	RCSD_17	842 2nd Ave - parking lot	Troy	CSO 002 subarea
41	RCSD_18	1st Ave at 113th St	Troy	CSO 013 subarea
42	RCSD_19	Mt Pleasant Ave at Hoosik St	Troy	Rt 7 trunk sewer
43	RCSD_20	Forbes Ave Pump Station	Rensselaer	Captures influent to Forbes Ave PS
44	RCSD_21	22 Mountain View Rd	Troy	Mountain Ave sewer from Brunswick
45	RCSD_22	Pawling Ave 50' N of Mountain View Rd	Troy	Pawling Ave trunk sewer from Bruns. E Grn
46	RCSD_23	Frear Park Rd near golf course	Troy	Brunswick contributory area
47	RCSD_25	392 1st St	Troy	CSO 041 subarea
48	RCSD_RGR1	62 Washington St (Rensselaer City Hall)	Rensselaer	rain gauge
49	RCSD_RGT2	15th St at Bouton Rd - Fire Station	Troy	rain gauge

Table A-2 Flow Metering Data Summary

Meter ID	Flow, mgd			Depth, in			Velocity, fps		
	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min
ACSD_N-01	11.82	51.59	3.82	18.88	66.01	9.84	3.06	3.72	0.48
ACSD_N-02	2.81	32.68	0.98	8.1	25.81	5.49	3.05	8.32	2
ACSD_N-03	0.22	3.21	0.02	1.59	7.53	0.45	4.39	8.42	2.59
ACSD_N-04	0.65	23.1	0.22	2.66	74.74	1.38	4.97	13.86	2.2
ACSD_N-05	0.24	40.56	0.06	2.14	32.54	1.12	1.89	12.78	0.86
ACSD_N-06	0.25	16.23	0.07	9.78	44.95	8.76	0.42	6.13	0.15
ACSD_N-07	7.03	42.43	2.96	12.01	37.91	8.01	4.05	5.51	3.06
ACSD_N-08	5.15	24.05	1.23	9.91	29.72	5.38	4.17	6.43	2.37
ACSD_N-09	6.78	33.46	1.24	13.08	35.58	6.84	3.59	5.83	1.48
ACSD_N-10	0.25	2.77	0.03	1.64	6.1	0.71	4.07	8.28	1.66
ACSD_N-11	1.16	11.17	0.41	2.57	10.52	1.62	9.29	13.05	6.34
ACSD_N-12	0.66	7.54	0.11	7.1	23.55	4.48	1.01	2.95	0.33
ACSD_N-13	0.42	3.18	0.04	14.31	121.35	1.09	2.7	5.32	0.07
ACSD_N-14	2.1	6.12	0.7	9.79	18.43	5.51	1.88	2.72	1.05
ACSD_S-01	19.9	44.86	10.68	33.88	153.98	21.91	2.96	4.21	1.12
ACSD_S-02	4.96	367.9	0.63	10.45	112.68	4.46	2.31	5.67	0.63
ACSD_S-03	4.63	14.97	1.12	26.81	149.58	21.28	1.87	2.51	0.14
ACSD_S-04	0.93	146.7	0.02	1.6	52.67	0.17	6.44	17.24	3.23
ACSD_S-05	1.05	106.7	0.19	2.95	96.58	1.6	2.5	6.95	0.86
ACSD_S-06	0.75	4.62	0.23	6.85	20	4.71	1.75	3.3	0.68
ACSD_S-07	0.19	1.03	0.05	1.35	3.61	0.75	5.89	8.71	2.88
ACSD_S-08	0.07	16.39	0	1.68	38.02	0.08	0.86	3.74	0
RCSD_02	9.71	24.79	0	45.84	143.41	22.58	1.32	3.24	0
RCSD_03	2.57	9.09	0.99	28.56	146.34	12.65	1.25	2.05	0.22
RCSD_04	1.17	2.79	0	26.96	151.61	17.09	1.14	1.66	0
RCSD_05	0.9	27.23	0.2	2.78	28.93	1.06	3.9	8.14	2.7

RCSD_06	2.11	73.08	0.95	8.29	80.12	5.87	3.71	10.17	1.47
RCSD_07	2.23	173.2	0.32	3	44.65	1.37	9.12	18.11	1.08
RCSD_08	0.6	106.6	0.09	7.95	71.63	3.27	0.58	5.9	0.11
RCSD_09	0.5	6.53	0.02	7.04	45.03	0.96	1.28	3.24	0.18
RCSD_10	0.14	6.52	0.05	2.28	31.17	1.34	1.27	3.35	0.18
RCSD_11	1.23	75.58	0.4	6.72	85.68	4.82	2.29	8.64	1.39
RCSD_12	0.04	2.08	0	0.64	63.07	0.02	1.14	3.24	0.1
RCSD_13	0.15	6.43	0.01	1.92	36.28	0.99	1.72	5.44	0.36
RCSD_14	0.77	3.99	0.04	2.52	21	0.57	6.41	11.59	1.84
RCSD_15	0.31	12.06	0.08	4.02	126.07	2.36	1.24	5.94	0.72
RCSD_16	0.83	57.94	0	2.82	46.52	0.3	5.62	16.81	0
RCSD_17	0.12	15.53	0	1.28	77.04	0.08	1.61	5.9	0.32
RCSD_18	0.92	22.67	0.16	10.06	46.63	7.09	0.84	4.97	0.25
RCSD_19	0.23	0.64	0.04	6.68	20.88	4.68	0.8	1.78	0.2
RCSD_20	0.22	2.29	0	3.64	79.51	2.55	1.34	3.71	0
RCSD_21	0.1	0.82	0.01	0.84	3.03	0.3	6.9	13.14	4.36
RCSD_22	0.04	0.71	0.01	4.85	21.02	3.34	0.18	0.9	0.1
RCSD_23	0.16	0.59	0.03	1.24	3.01	0.45	6.34	8.53	3.92
RCSD_25	1.59	8.85	0.44	10.75	58.65	6.9	1.78	4.36	0.9

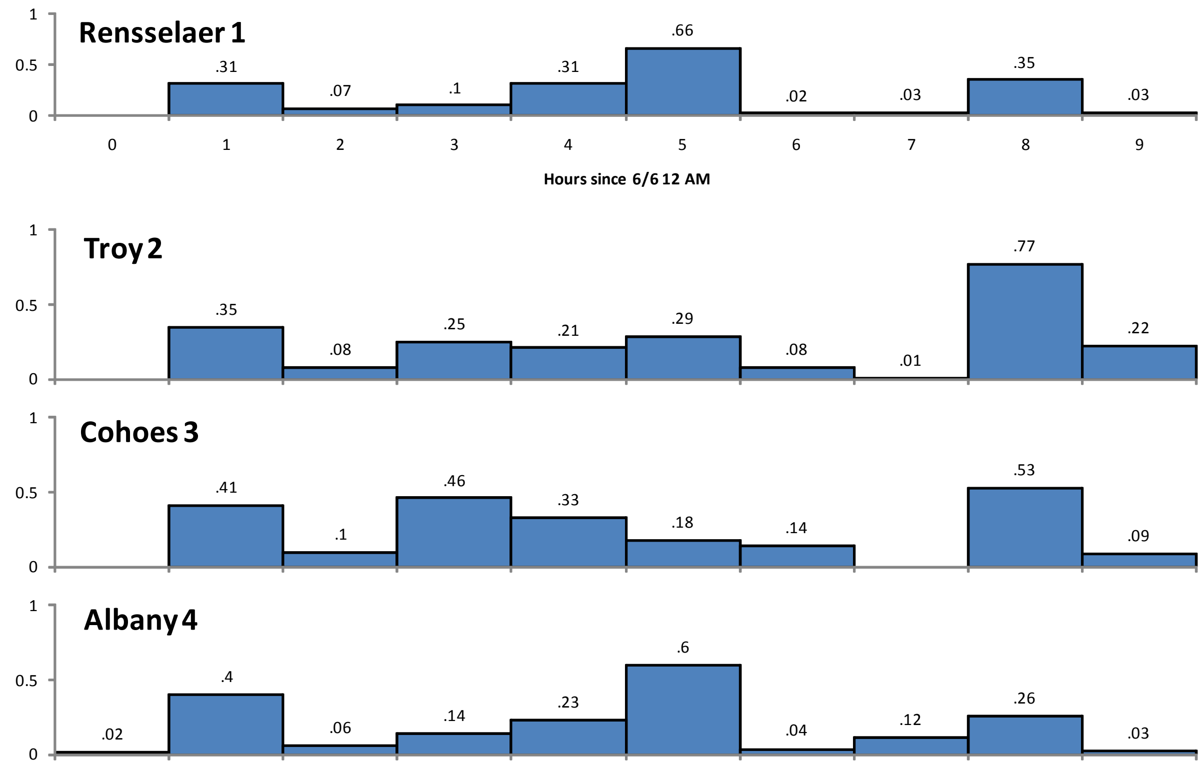


Figure A-1. Hyetographs for June 6, 2008 storm

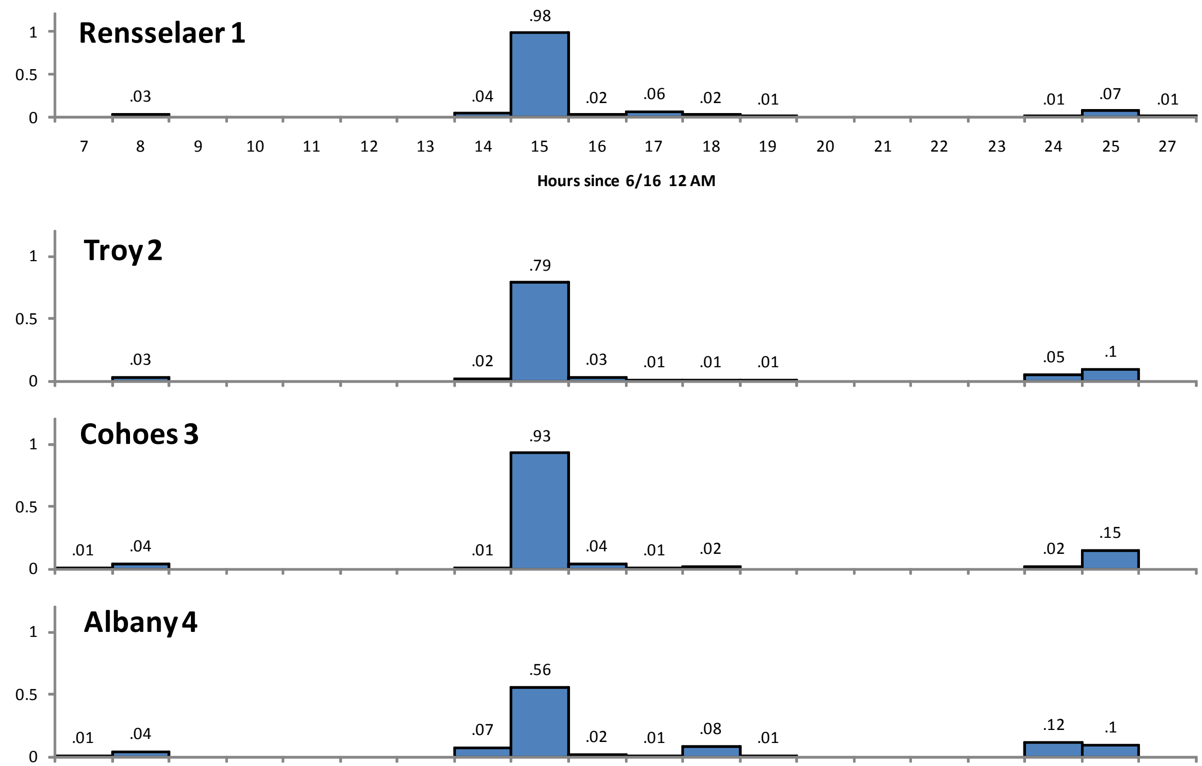


Figure A-2. Hyetographs for June 16-17, 2008 storm

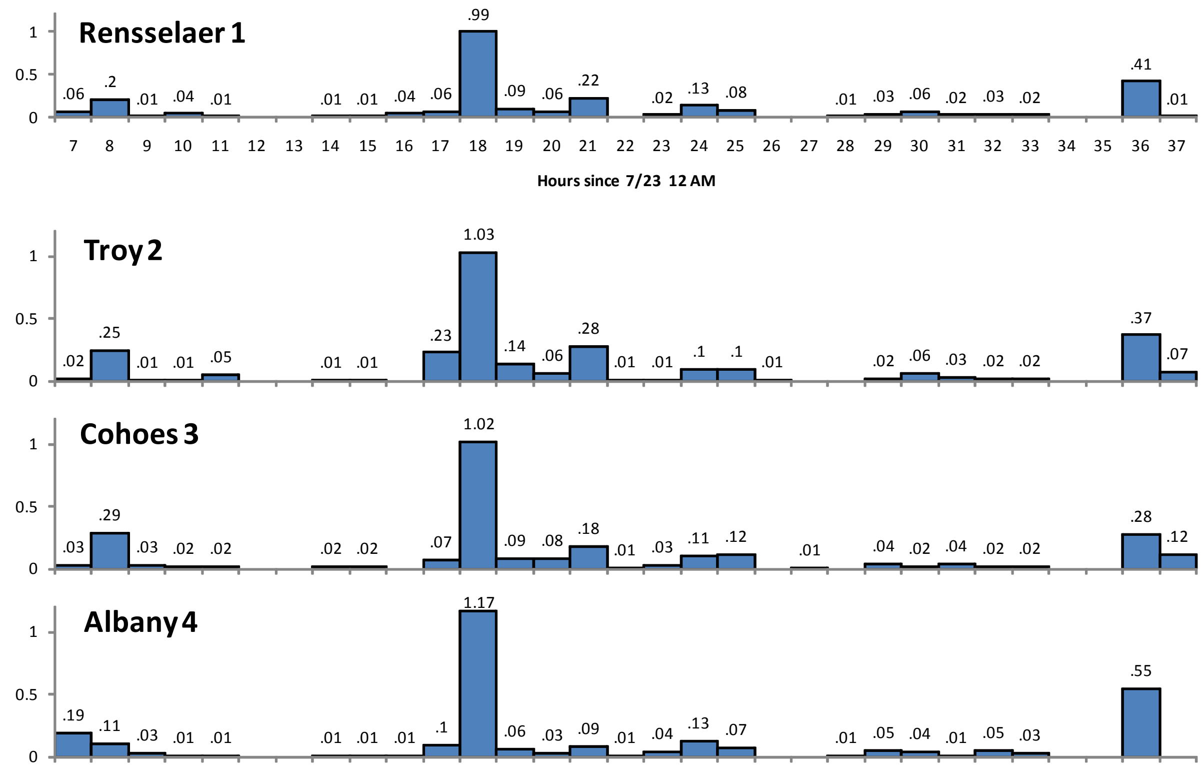


Figure A-3. Hyetographs for July 23-24, 2008 storm

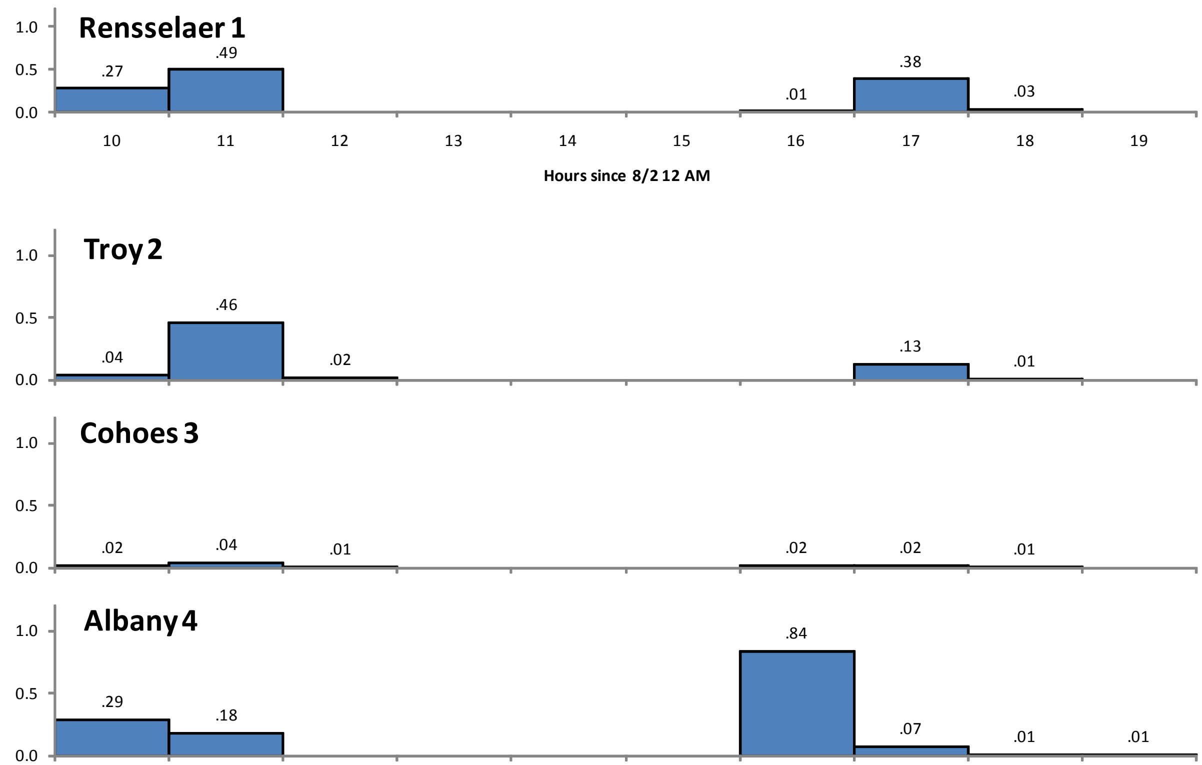


Figure A-4. Hyetographs for August 2, 2008 storm

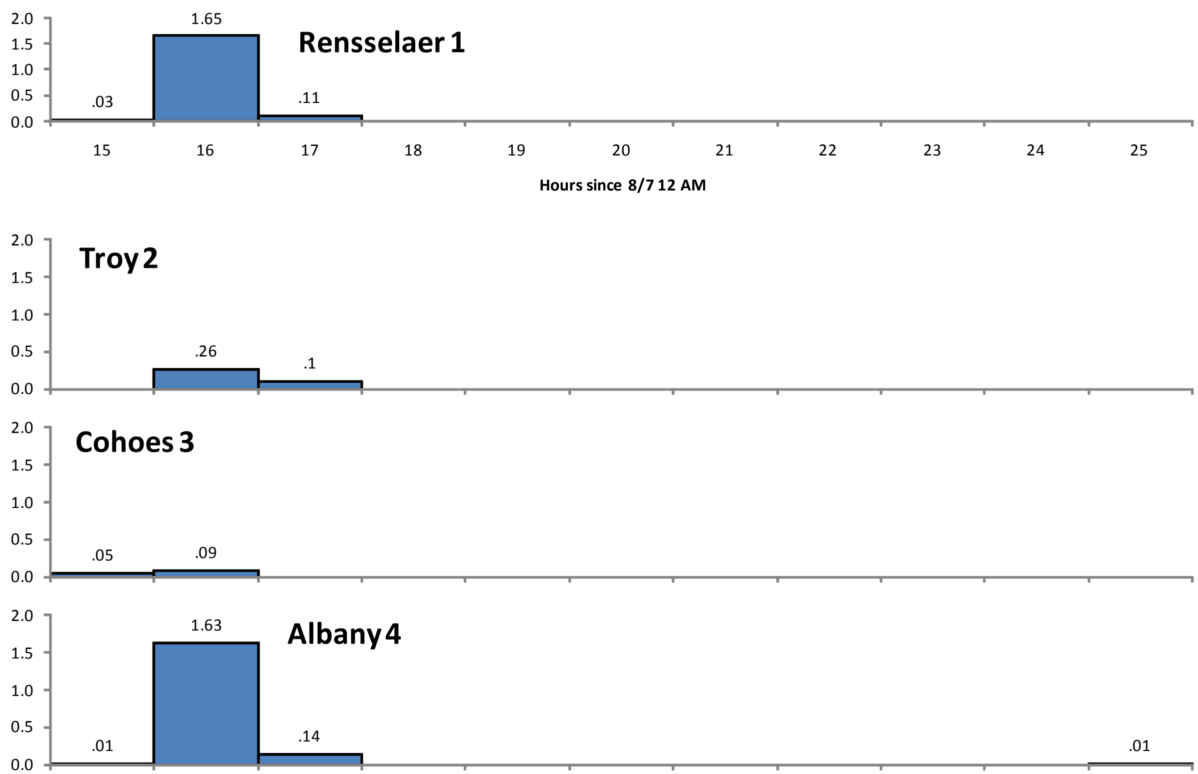


Figure A-5. Hyetographs for August 7, 2008 storm

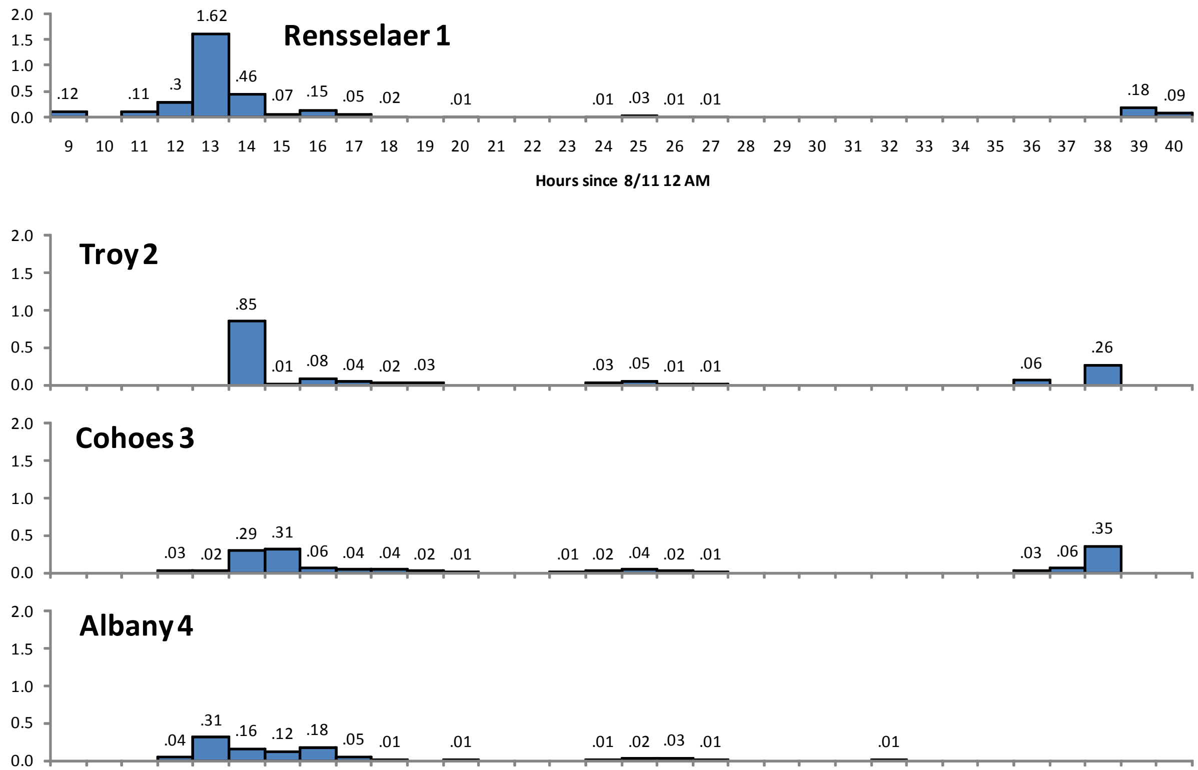


Figure A-6. Hyetographs for August 11-12, 2008 storm

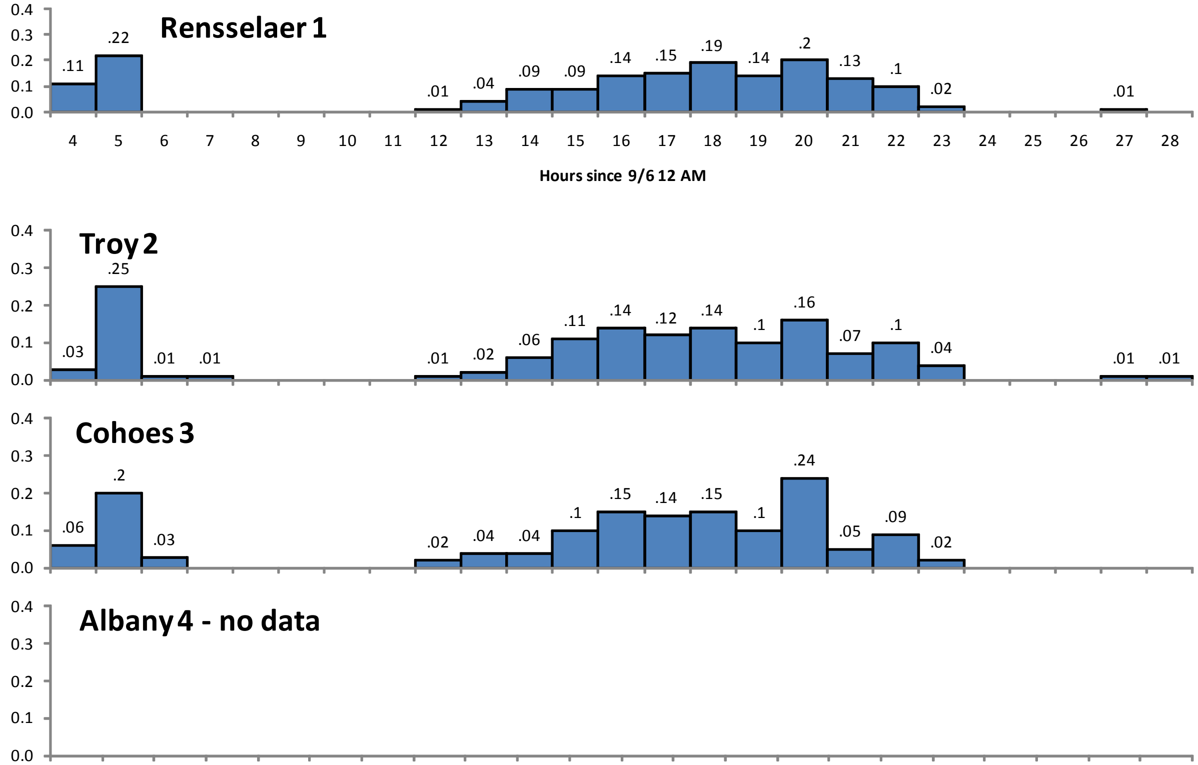
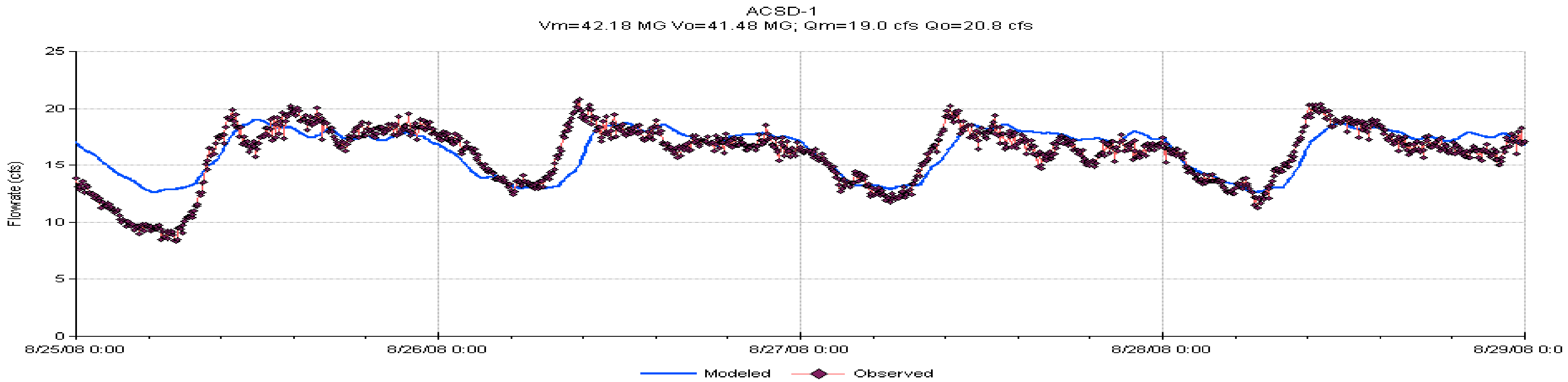
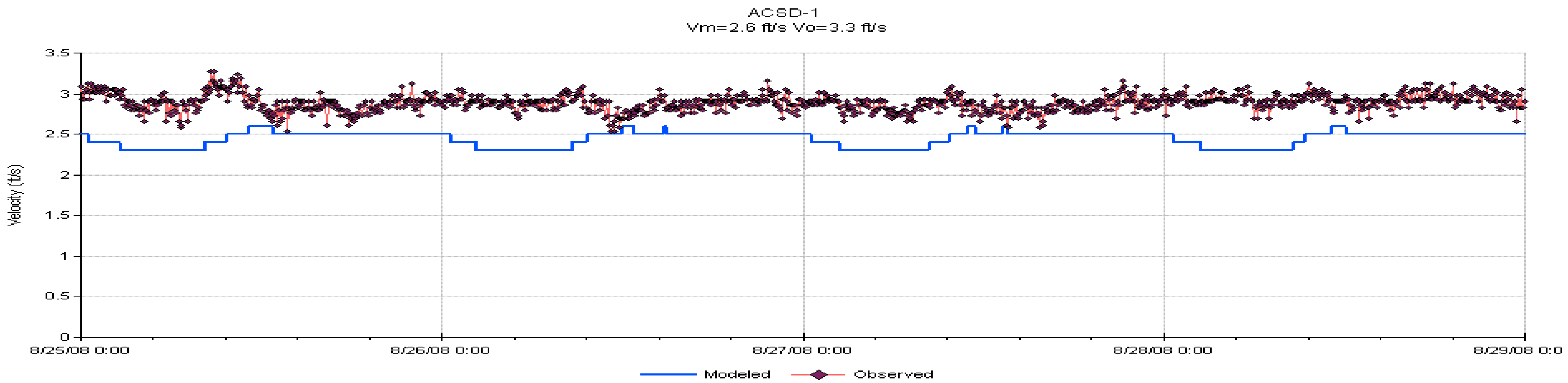
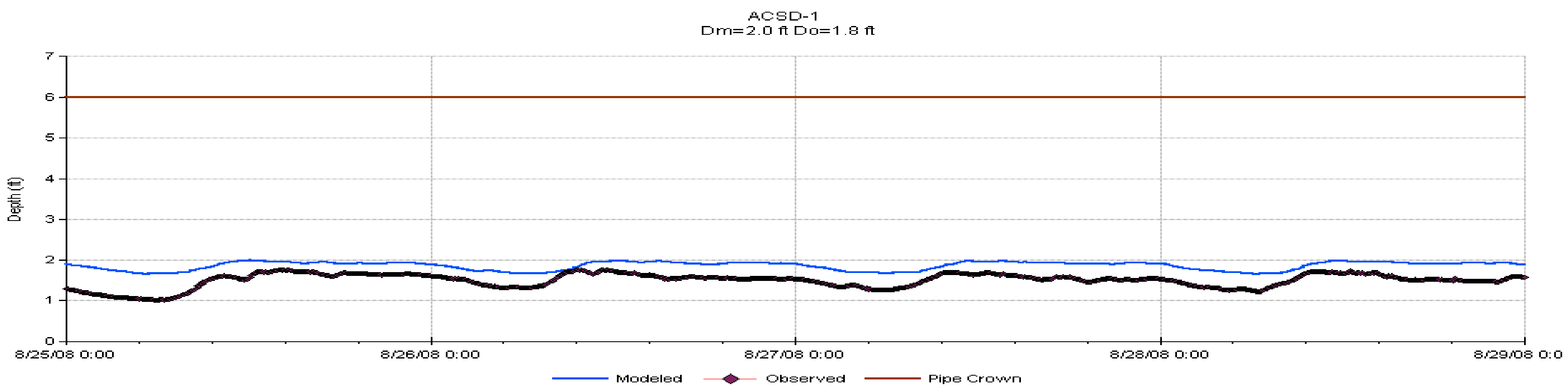


Figure A-7. Hyetographs for September 6, 2008 storm

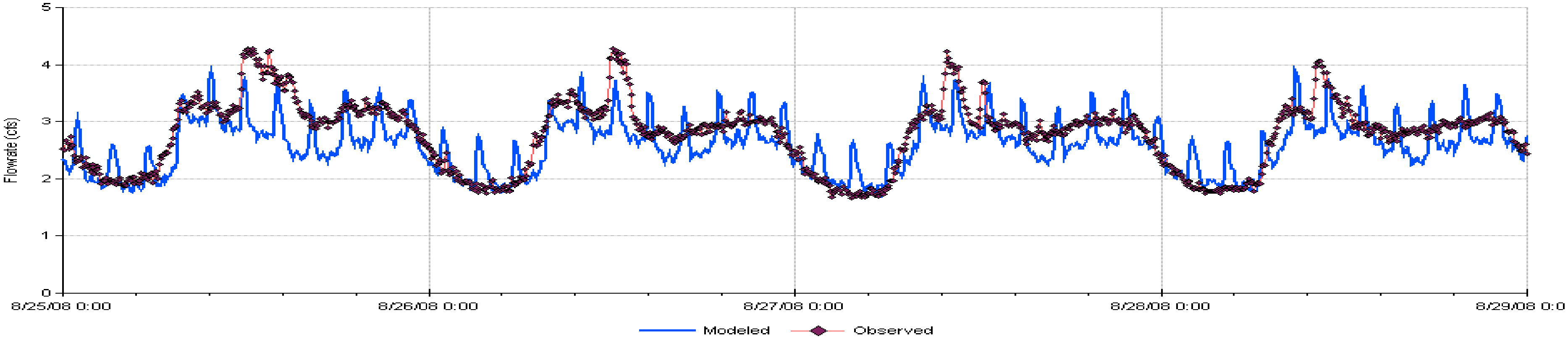
Appendix B. Dry weather calibration


ACSD-1
Vm=42.18 MG Vo=41.48 MG; Qm=19.0 cfs Qo=20.8 cfs
Flowrate (cfs)
25
20
15
10
5
0
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
8/29/08 0:0
Modeled
Observed

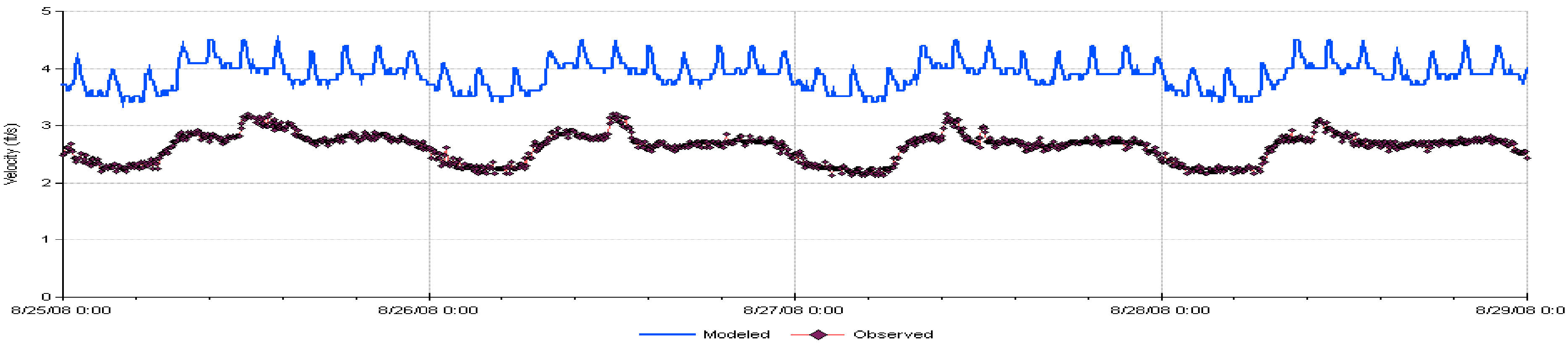

ACSD-1
Vm=2.6 ft/s Vo=3.3 ft/s
Velocity (ft/s)
3.5
3
2.5
2
1.5
1
0.5
0
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
8/29/08 0:0
Modeled
Observed


ACSD-1
Dm=2.0 ft Do=1.8 ft
Depth (ft)
7
6
5
4
3
2
1
0
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
8/29/08 0:0
Modeled
Observed
Pipe Crown

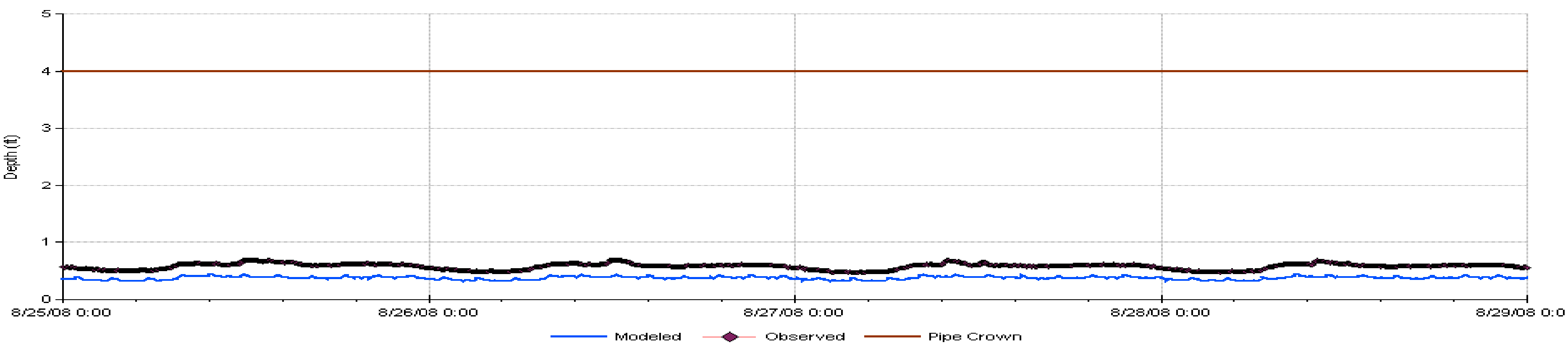
ACSD-2
Vm=6.75 MG Vo=7.19 MG; Qm=3.9 cfs Qo=4.3 cfs

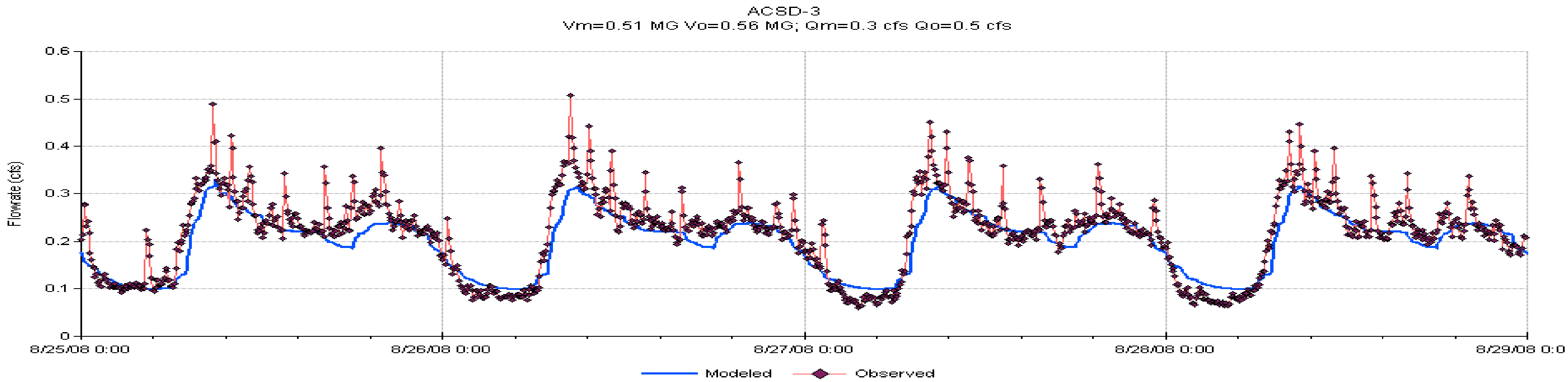


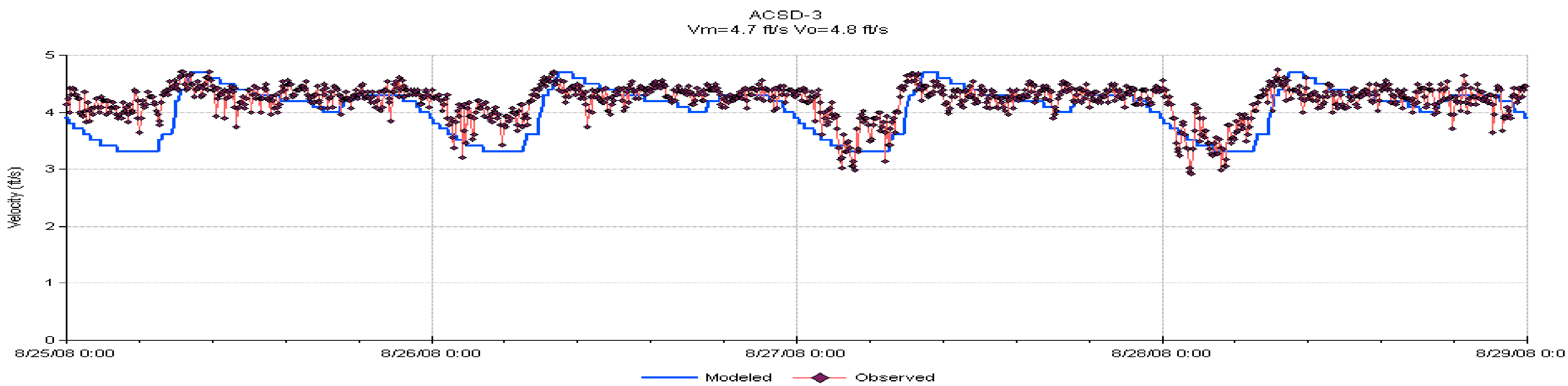
ACSD-2
Vm=4.5 ft/s Vo=3.2 ft/s

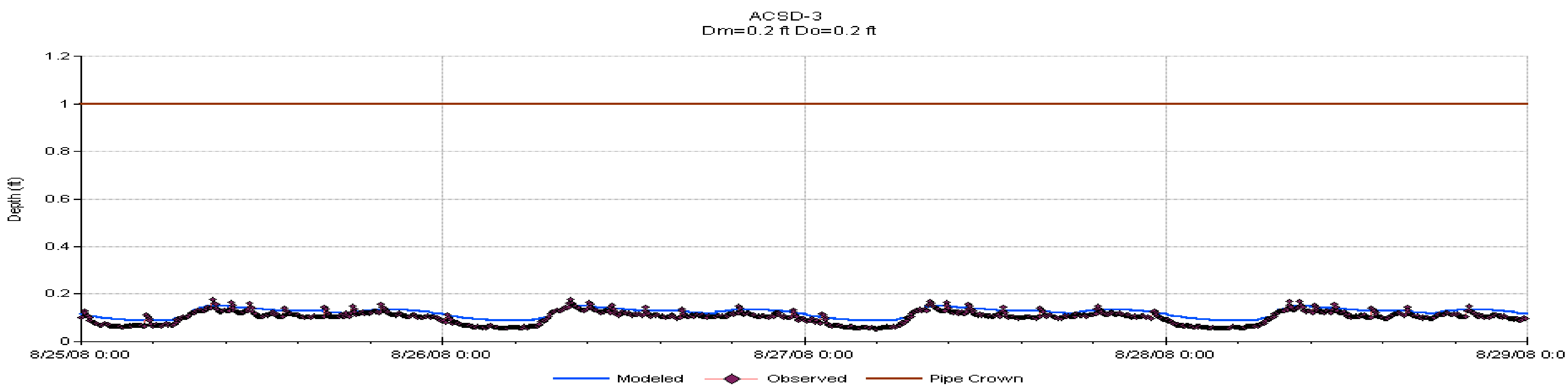


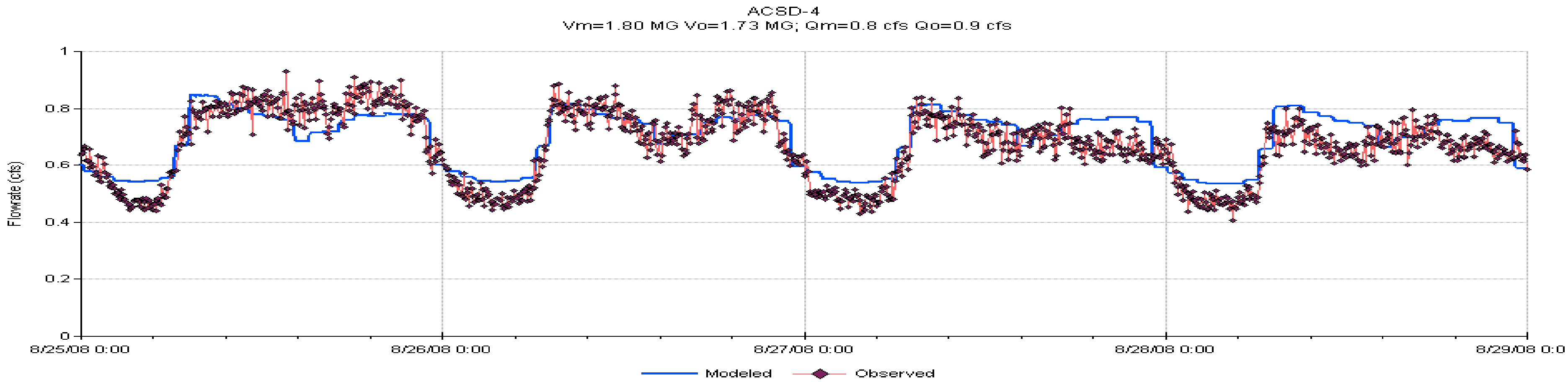
ACSD-2
Dm=0.4 ft Do=0.7 ft

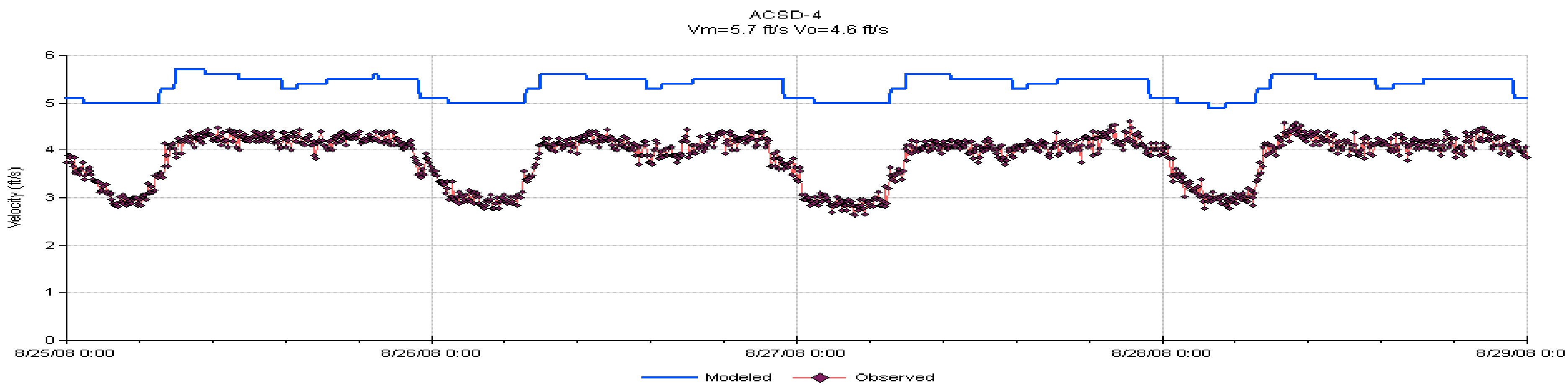


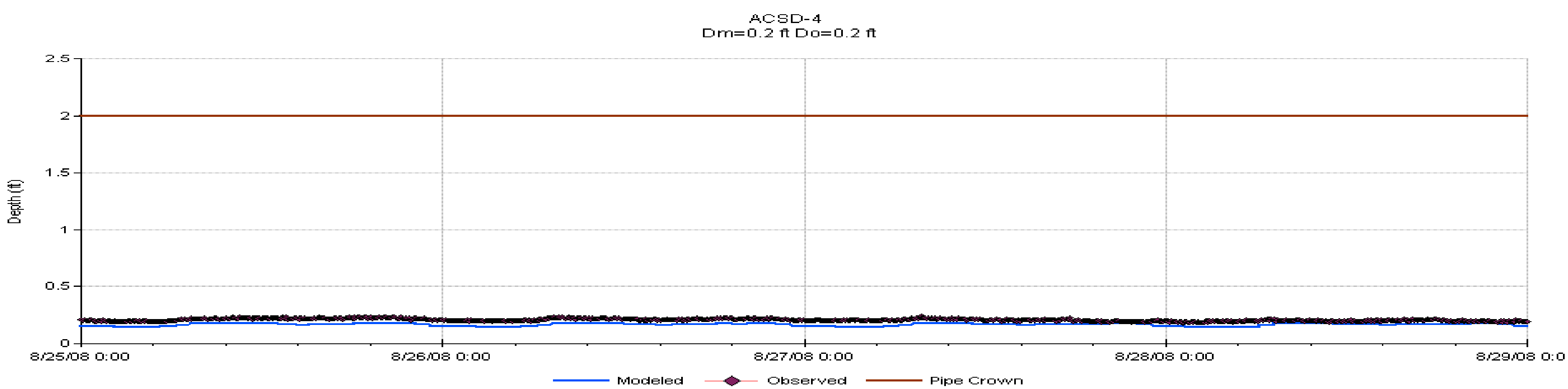

ACSD-3
Vm=0.51 MG Vo=0.56 MG; Qm=0.3 cfs Qo=0.5 cfs
Flowrate (cfs)
0.6
0.5
0.4
0.3
0.2
0.1
0
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
8/29/08 0:0
Modeled
Observed

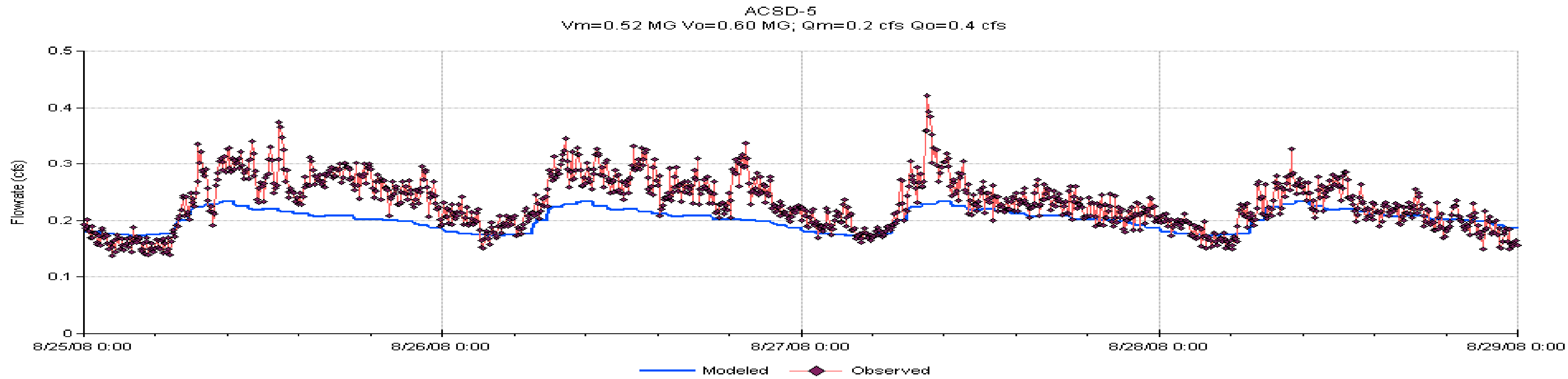

ACSD-3
Vm=4.7 ft/s Vo=4.8 ft/s
Velocity (ft/s)
5
4
3
2
1
0
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
8/29/08 0:0
Modeled
Observed

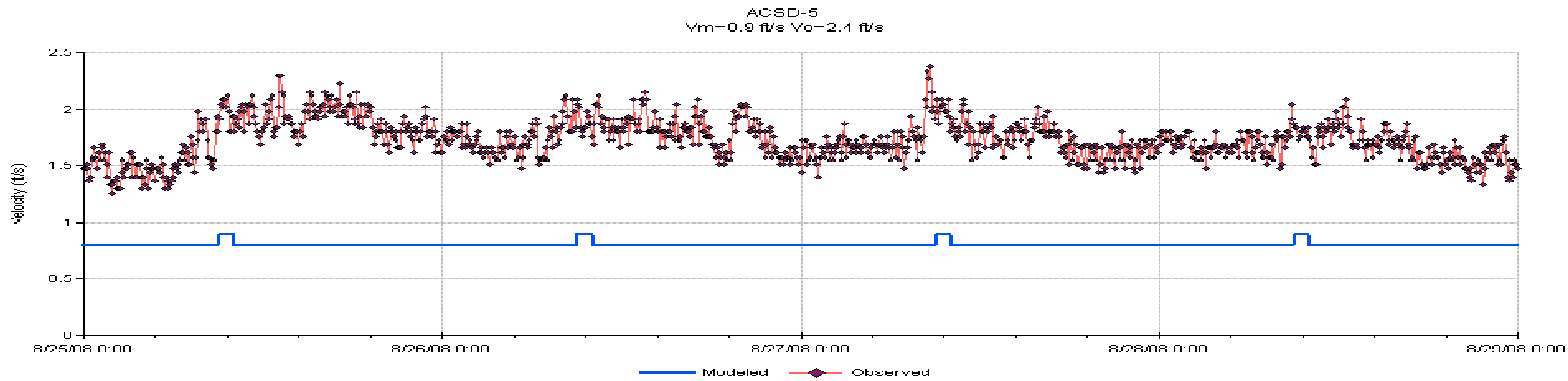

ACSD-3
Dm=0.2 ft Do=0.2 ft
Depth (ft)
1.2
1
0.8
0.6
0.4
0.2
0
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
8/29/08 0:0
Modeled
Observed
Pipe Crown

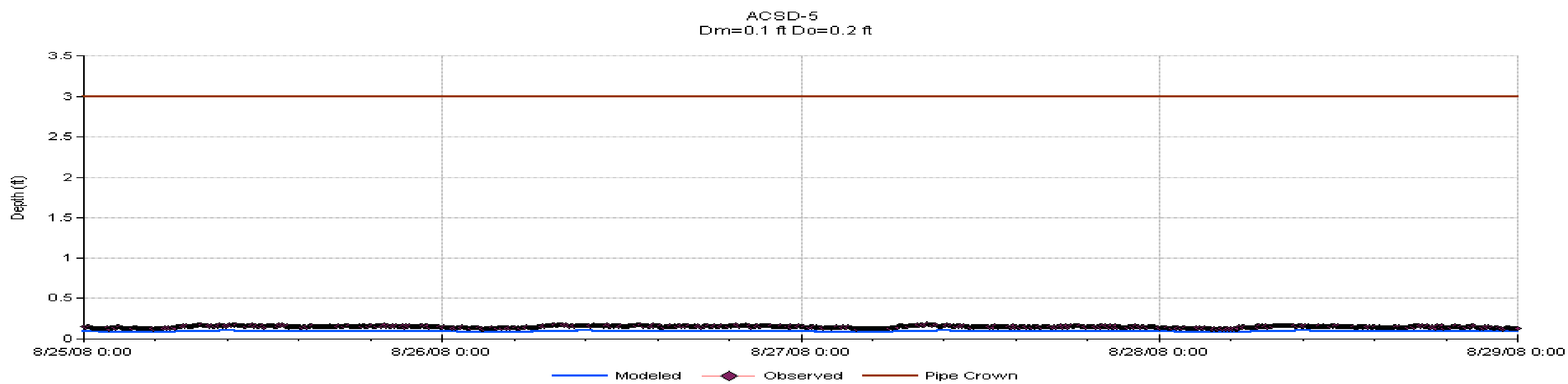

ACSD-4
Vm=1.80 MG Vo=1.73 MG; Qm=0.8 cfs Qo=0.9 cfs
Flowrate (cfs)
1
0.8
0.6
0.4
0.2
0
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
8/29/08 0:0
Modeled
Observed

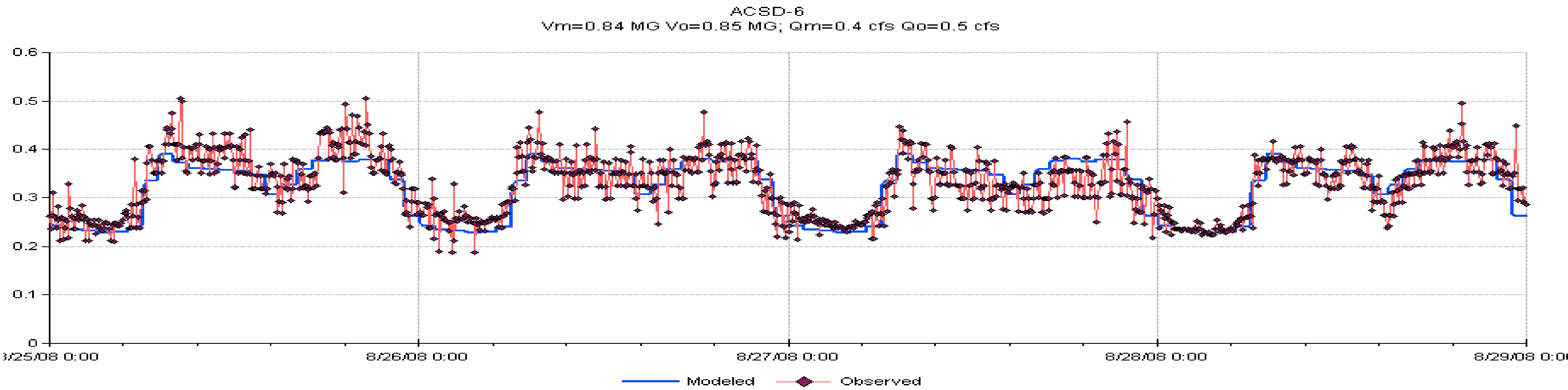

ACSD-4
Vm=5.7 ft/s Vo=4.6 ft/s
Velocity (ft/s)
6
5
4
3
2
1
0
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
8/29/08 0:0
Modeled
Observed

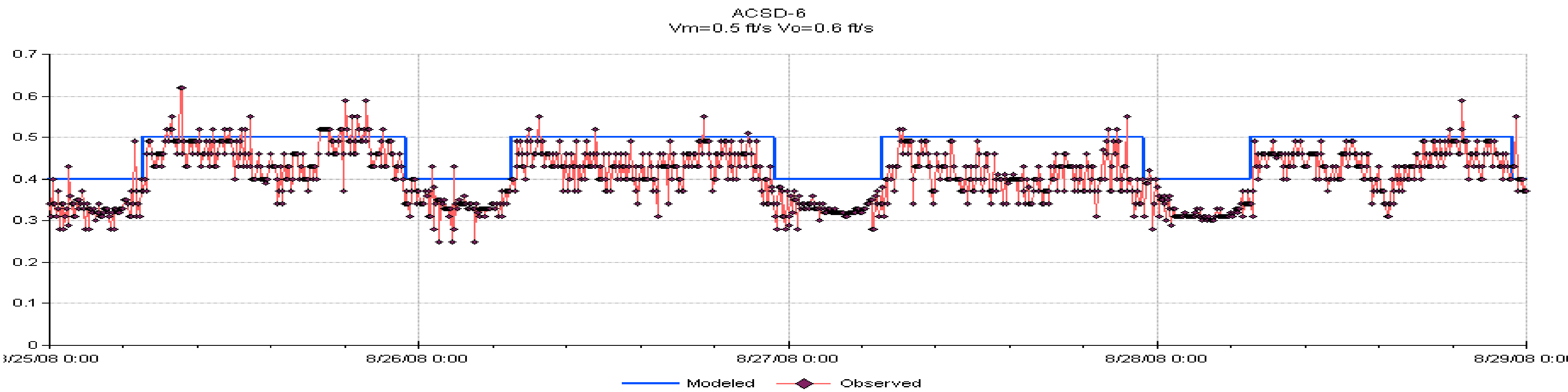

ACSD-4
Dm=0.2 ft Do=0.2 ft
Depth (ft)
2.5
2
1.5
1
0.5
0
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
8/29/08 0:0
Modeled
Observed
Pipe Crown

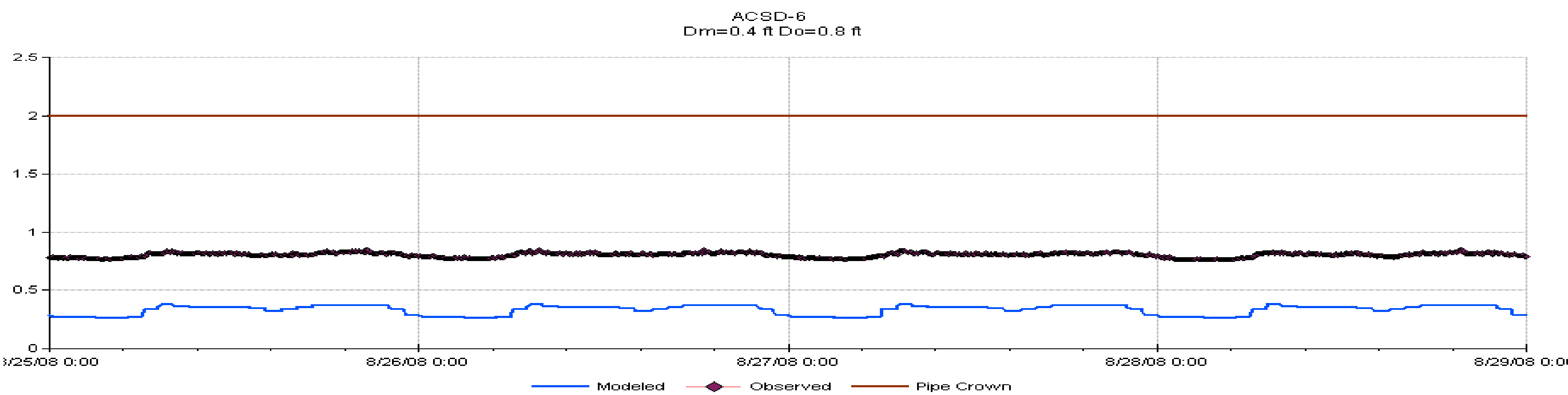

ACSD-5
Vm=0.52 MG Vo=0.60 MG; Qm=0.2 cfs Qo=0.4 cfs
Flowrate (cfs)
0.5
0.4
0.3
0.2
0.1
0
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
8/29/08 0:00
Modeled
Observed

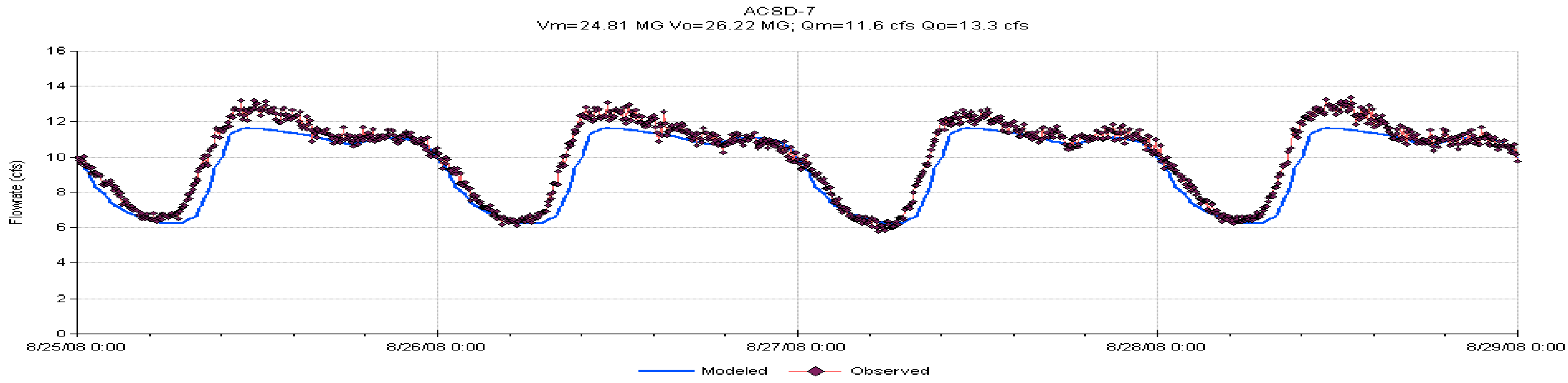

ACSD-5
Vm=0.9 ft/s Vo=2.4 ft/s
Velocity (ft/s)
2.5
2
1.5
1
0.5
0
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
8/29/08 0:00
Modeled
Observed

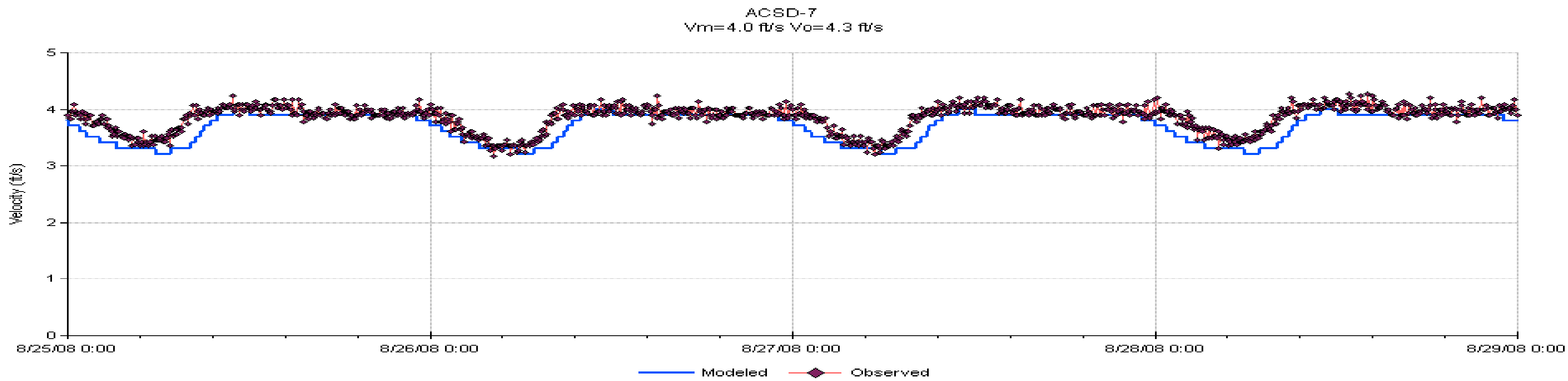

ACSD-5
Dm=0.1 ft Do=0.2 ft
Depth (ft)
3.5
3
2.5
2
1.5
1
0.5
0
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
8/29/08 0:00
Modeled
Observed
Pipe Crown

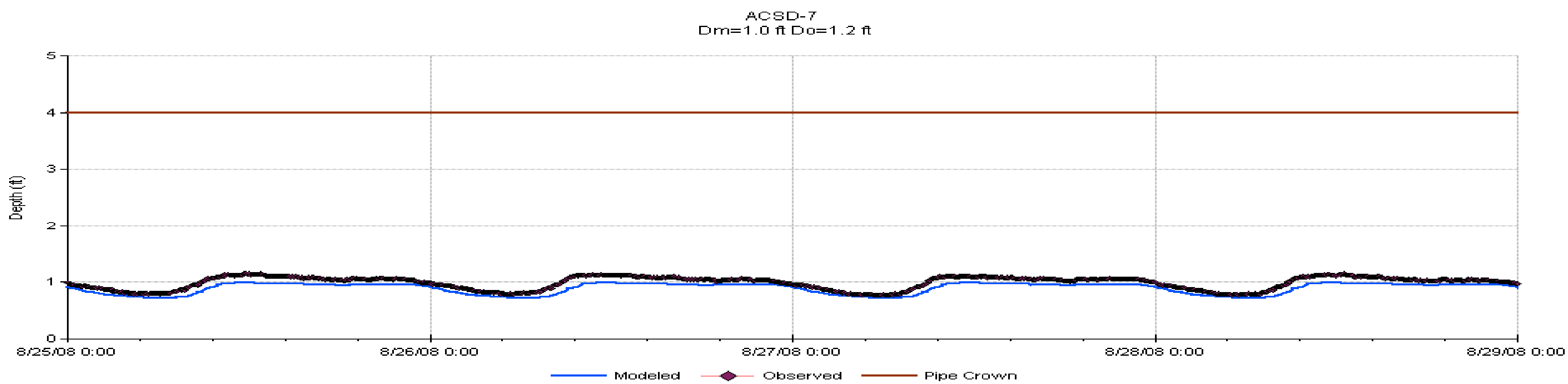

ACSD-6
Vm=0.84 MG Vo=0.85 MG; Qm=0.4 cfs Qo=0.5 cfs
0.6
0.5
0.4
0.3
0.2
0.1
0
/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
8/29/08 0:00
Modeled
Observed

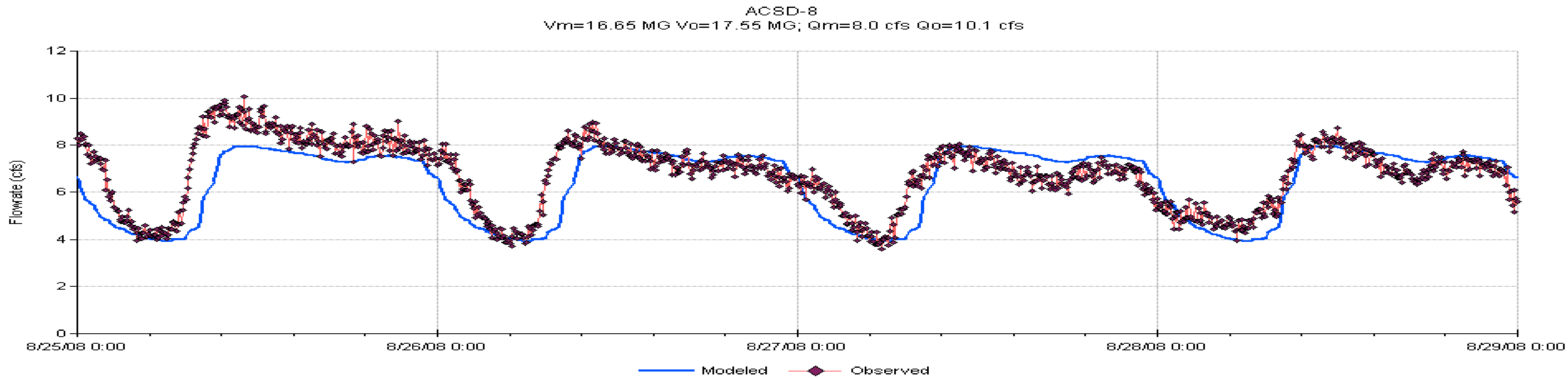

ACSD-6
Vm=0.5 ft/s Vo=0.6 ft/s
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
8/29/08 0:00
Modeled
Observed

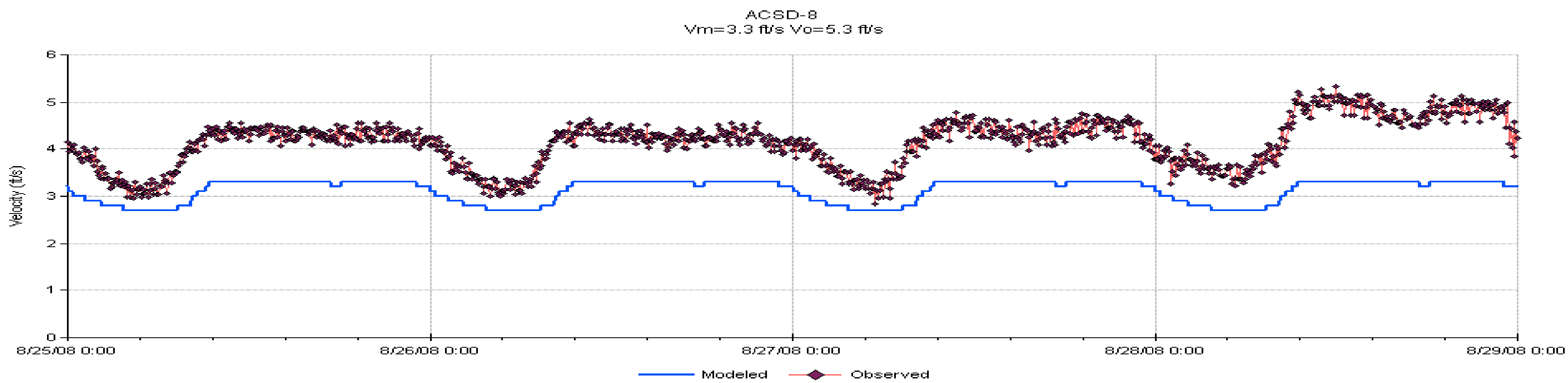

ACSD-6
Dm=0.4 ft Do=0.8 ft
2.5
2
1.5
1
0.5
0
/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
8/29/08 0:00
Modeled
Observed
Pipe Crown

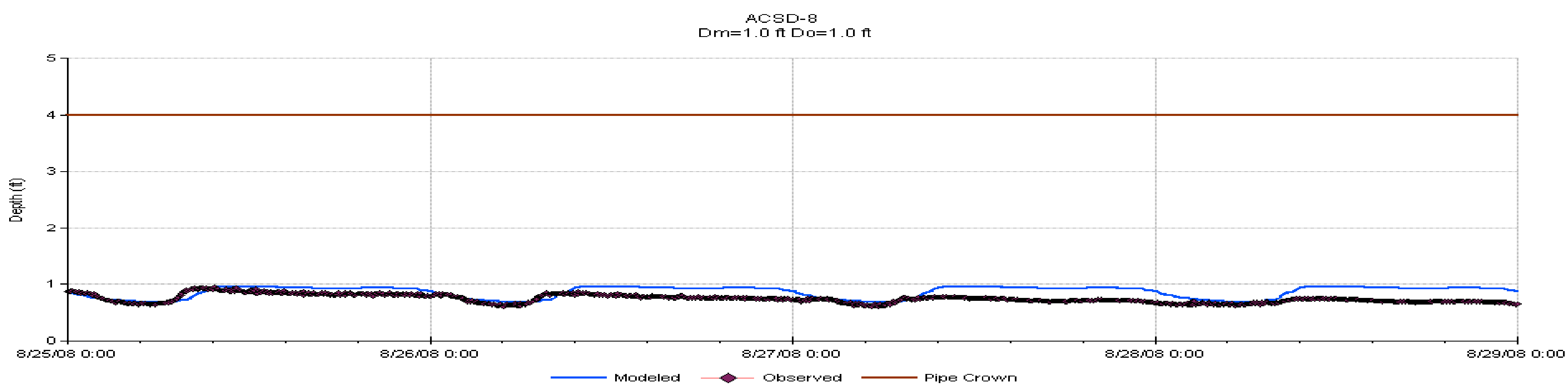

ACSD-7
Vm=24.81 MG Vo=26.22 MG; Qm=11.6 cfs Qo=13.3 cfs
Flowrate (cfs)
0
2
4
6
8
10
12
14
16
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
8/29/08 0:00
Modeled
Observed

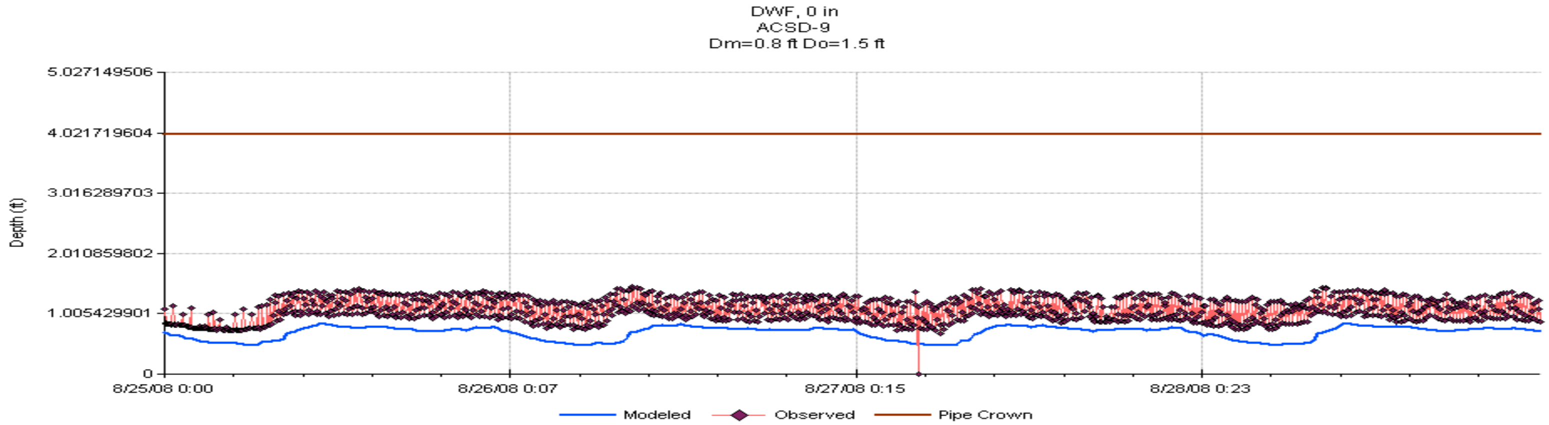

ACSD-7
Vm=4.0 ft/s Vo=4.3 ft/s
Velocity (ft/s)
0
1
2
3
4
5
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
8/29/08 0:00
Modeled
Observed

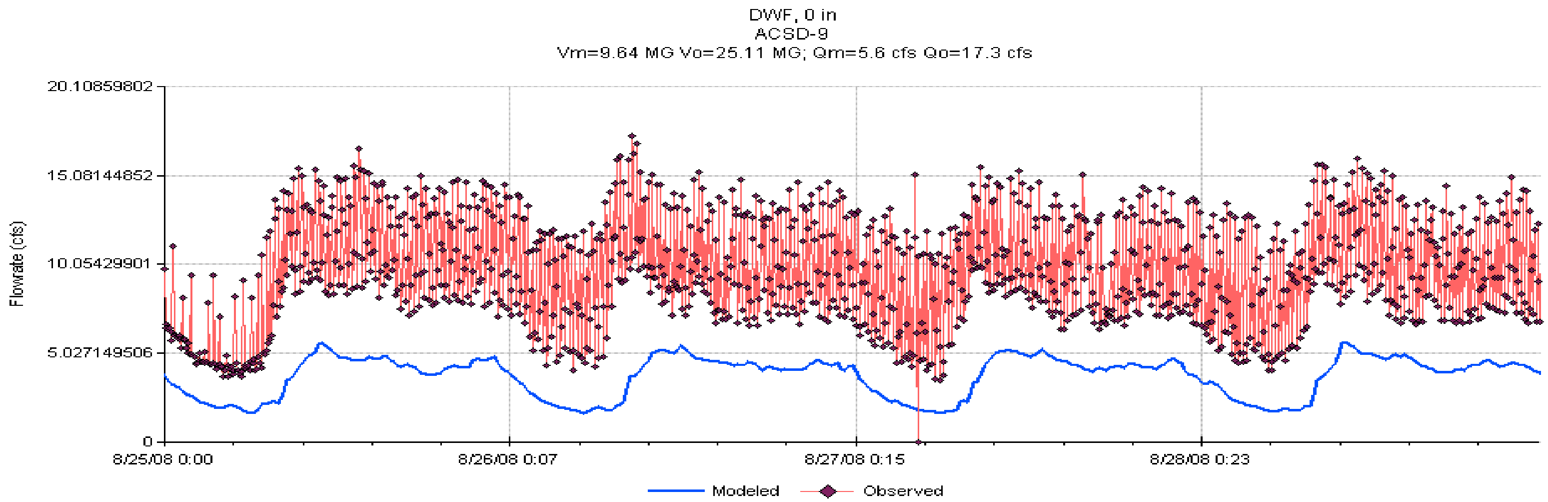

ACSD-7
Dm=1.0 ft Do=1.2 ft
Depth (ft)
0
1
2
3
4
5
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
8/29/08 0:00
Modeled
Observed
Pipe Crown

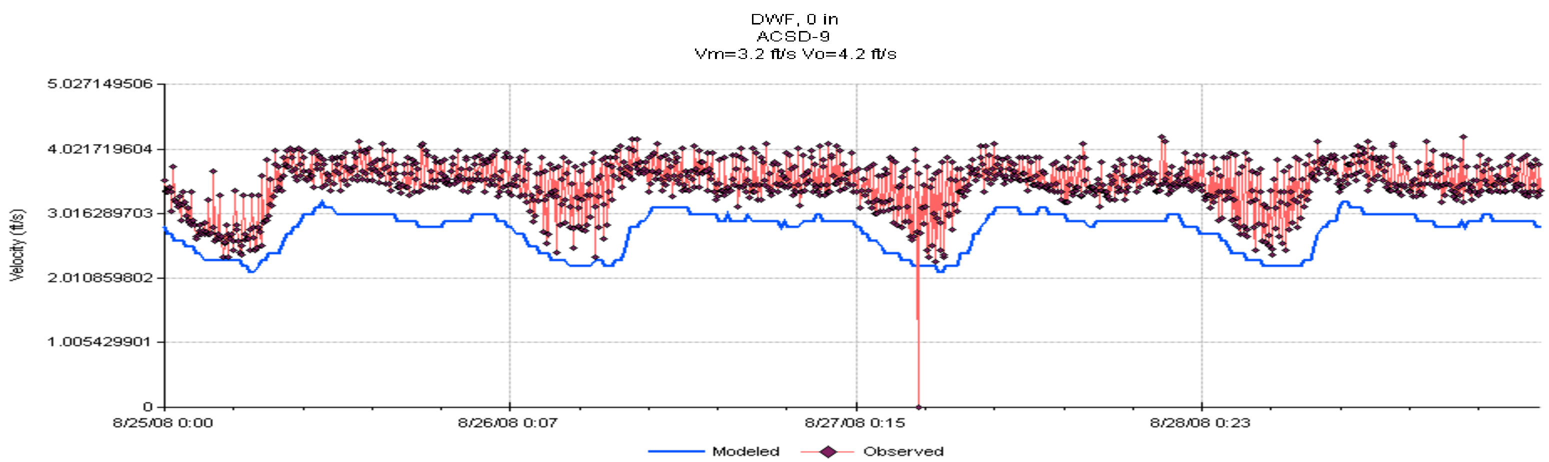

ACSD-8
Vm=16.65 MG Vo=17.55 MG; Qm=8.0 cfs Qo=10.1 cfs
Flowrate (cfs)
0
2
4
6
8
10
12
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
8/29/08 0:00
Modeled
Observed

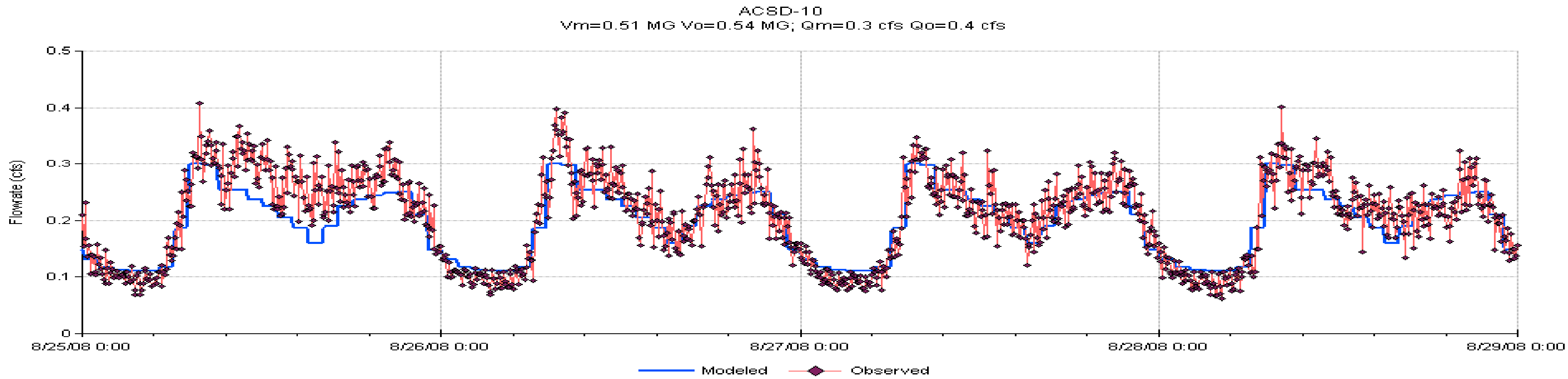

ACSD-8
Vm=3.3 ft/s Vo=5.3 ft/s
Velocity (ft/s)
0
1
2
3
4
5
6
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
8/29/08 0:00
Modeled
Observed


ACSD-8
Dm=1.0 ft Do=1.0 ft
Depth (ft)
0
1
2
3
4
5
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
8/29/08 0:00
Modeled
Observed
Pipe Crown

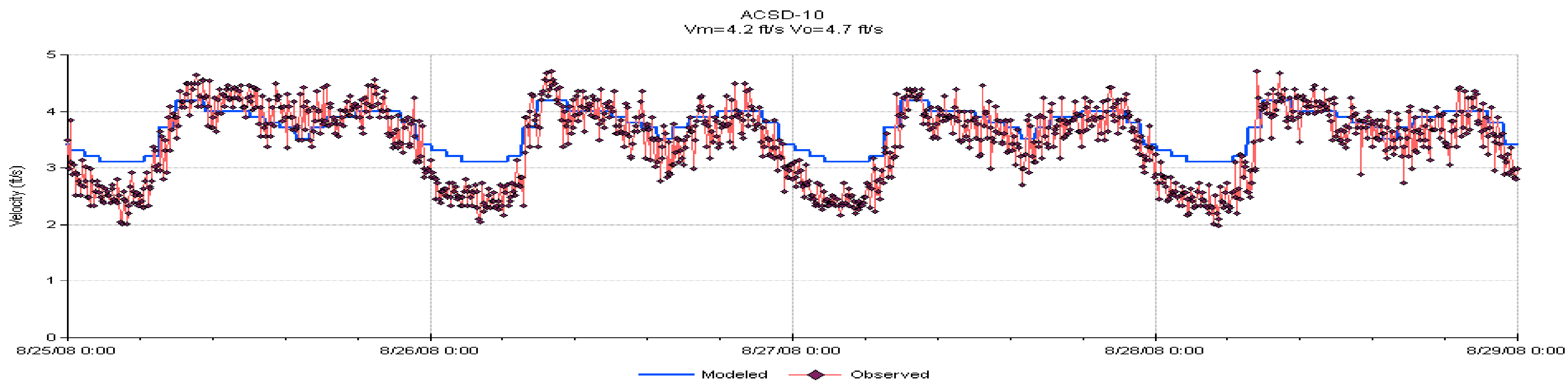

DWF, 0 in
ACSD-9
Dm=0.8 ft Do=1.5 ft
Depth (ft)
5.027149506
4.021719604
3.016289703
2.010859802
1.005429901
0
8/25/08 0:00
8/26/08 0:07
8/27/08 0:15
8/28/08 0:23
Modeled
Observed
Pipe Crown


DWF, 0 in
ACSD-9
Vm=9.64 MG Vo=25.11 MG; Qm=5.6 cfs Qo=17.3 cfs
Flowrate (cfs)
20.10859802
15.08144852
10.05429901
5.027149506
0
8/25/08 0:00
8/26/08 0:07
8/27/08 0:15
8/28/08 0:23
Modeled
Observed

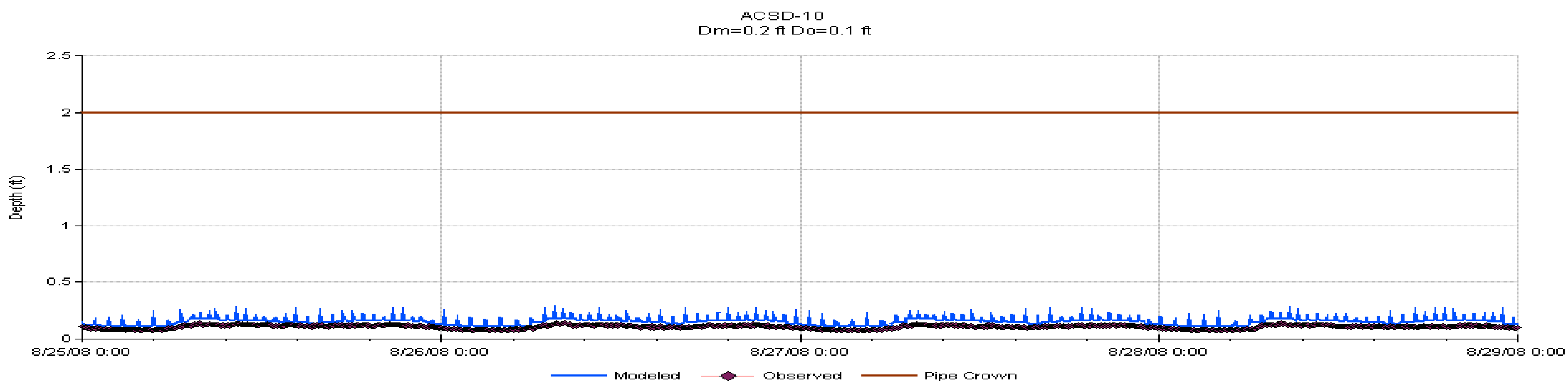

DWF, 0 in
ACSD-9
Vm=3.2 ft/s Vo=4.2 ft/s
Velocity (ft/s)
5.027149506
4.021719604
3.016289703
2.010859802
1.005429901
0
8/25/08 0:00
8/26/08 0:07
8/27/08 0:15
8/28/08 0:23
Modeled
Observed



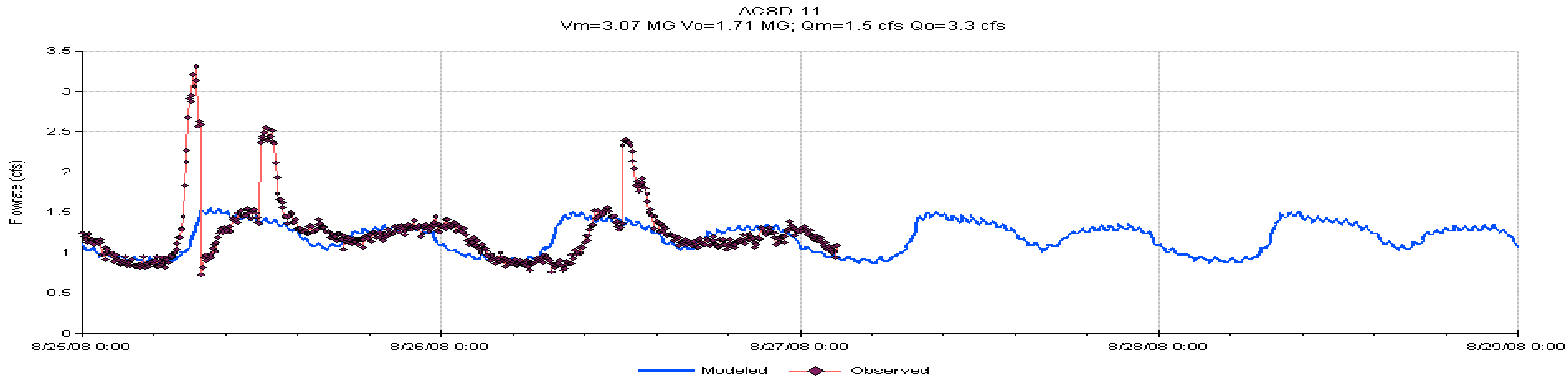
ACSD-10
Vm=0.51 MG Vo=0.54 MG; Qm=0.3 cfs Qo=0.4 cfs
Flowrate (cfs)
0.5
0.4
0.3
0.2
0.1
0
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
8/29/08 0:00
Modeled
Observed

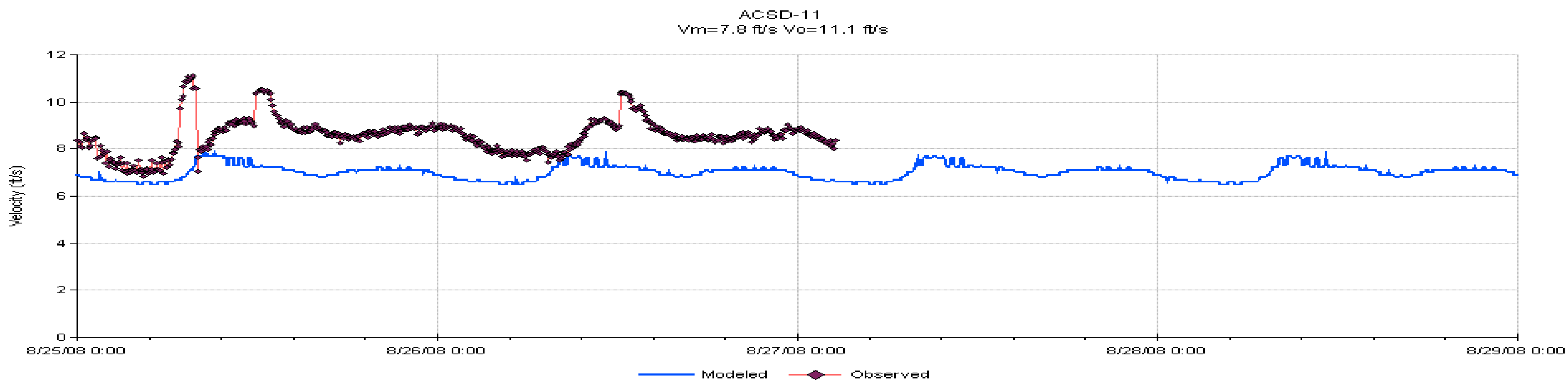


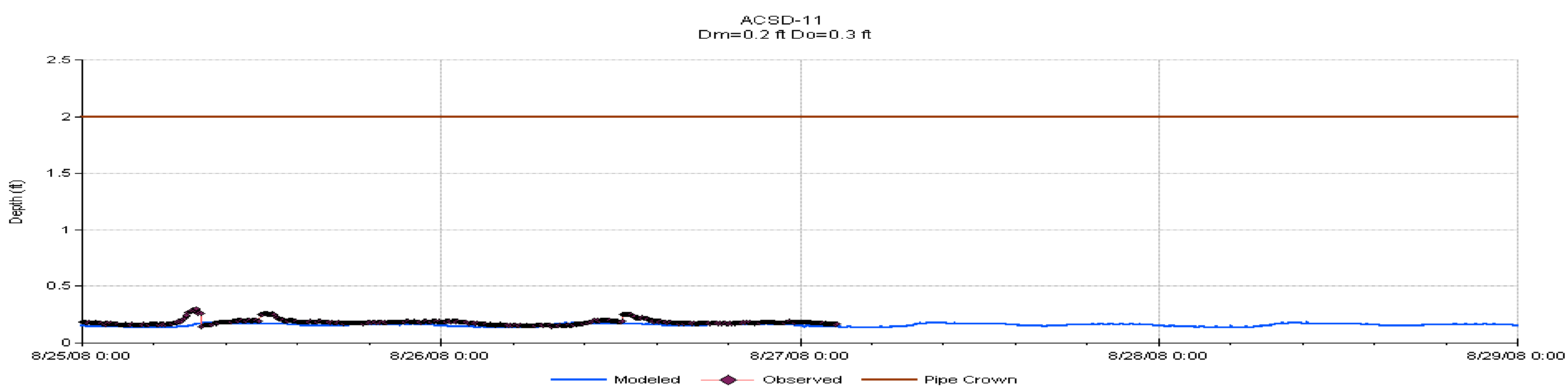
ACSD-10
Vm=4.2 ft/s Vo=4.7 ft/s
Velocity (ft/s)
5
4
3
2
1
0
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
8/29/08 0:00
Modeled
Observed

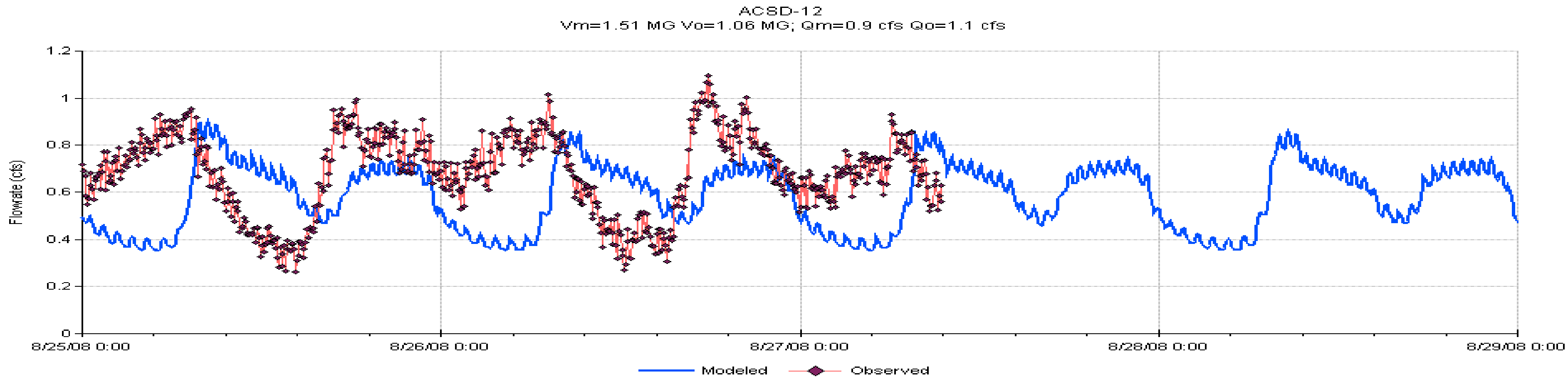


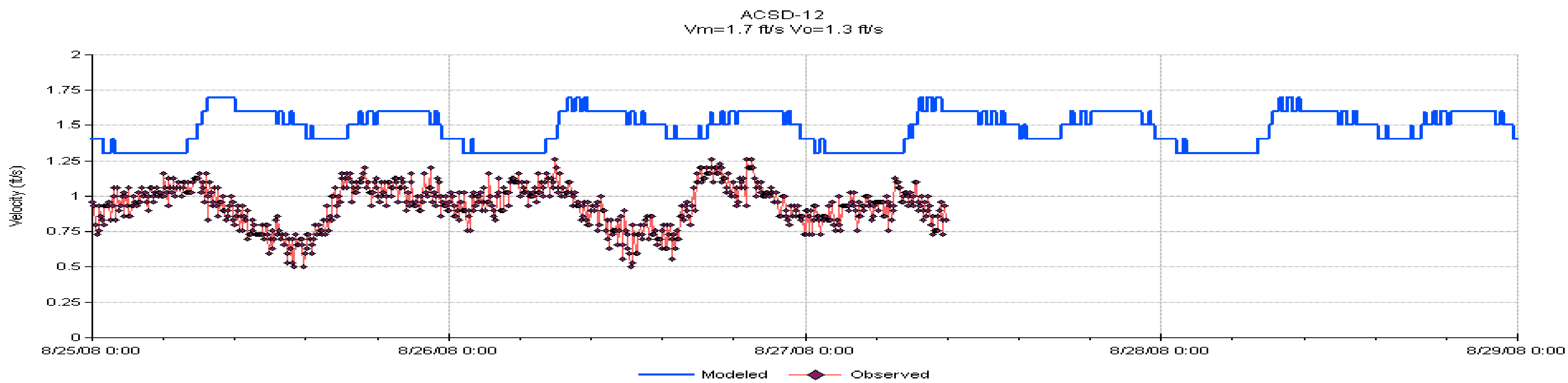
ACSD-10
Dm=0.2 ft Do=0.1 ft
Depth (ft)
2.5
2
1.5
1
0.5
0
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
8/29/08 0:00
Modeled
Observed
Pipe Crown

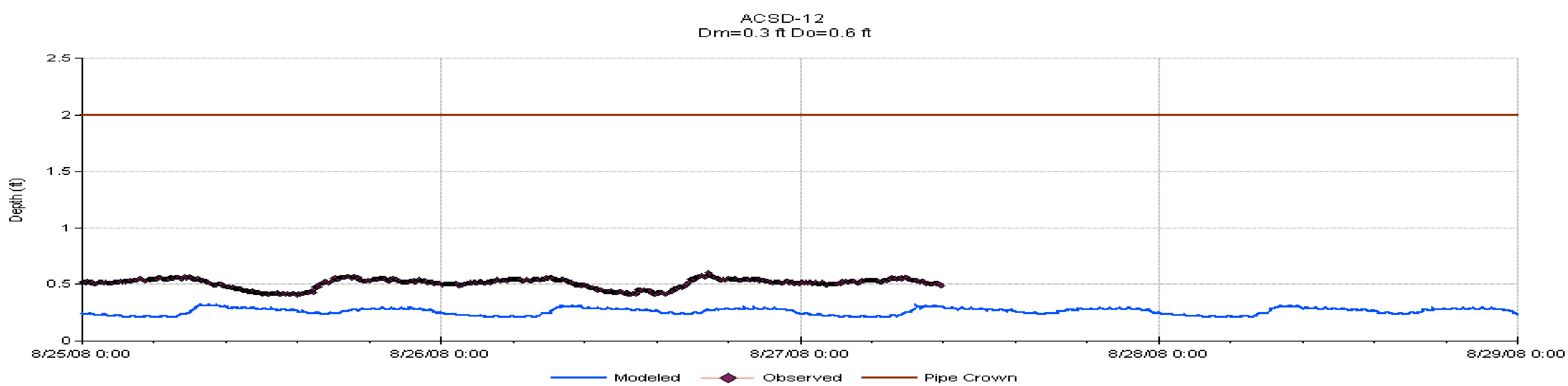

ACSD-11
Vm=3.07 MG Vo=1.71 MG; Qm=1.5 cfs Qo=3.3 cfs
Flowrate (cfs)
3.5
3
2.5
2
1.5
1
0.5
0
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
8/29/08 0:00
Modeled
Observed

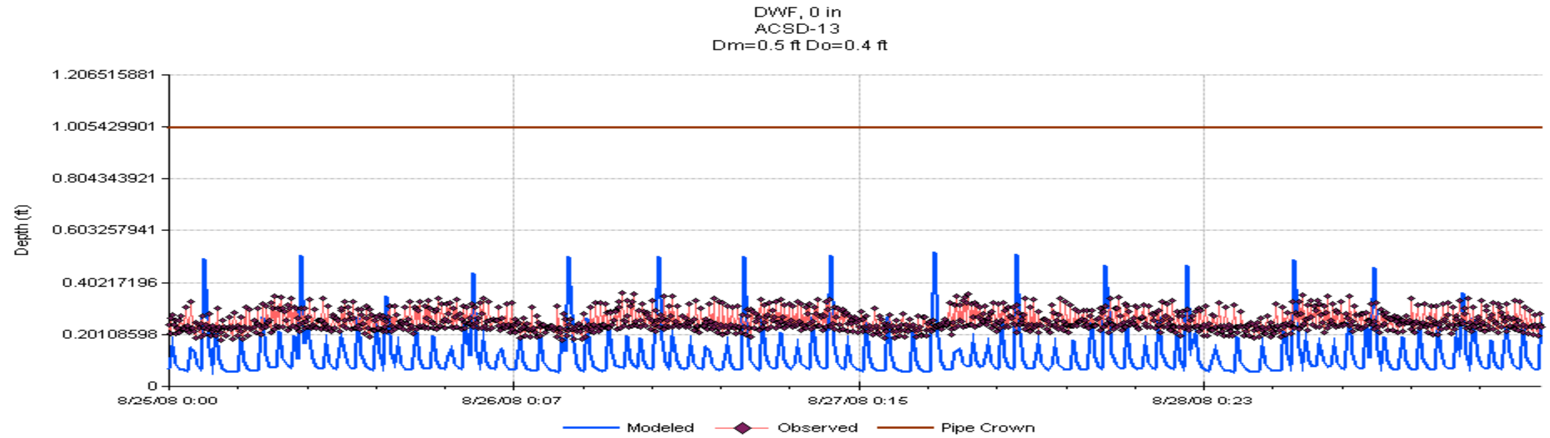

ACSD-11
Vm=7.8 ft/s Vo=11.1 ft/s
Velocity (ft/s)
12
10
8
6
4
2
0
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
8/29/08 0:00
Modeled
Observed

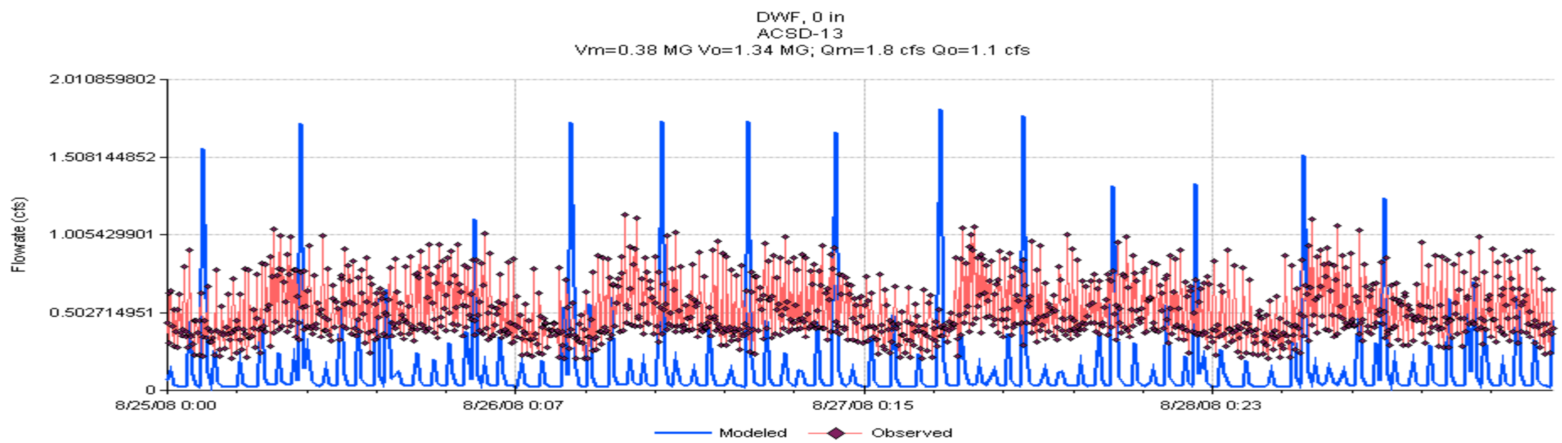

ACSD-11
Dm=0.2 ft Do=0.3 ft
Depth (ft)
2.5
2
1.5
1
0.5
0
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
8/29/08 0:00
Modeled
Observed
Pipe Crown

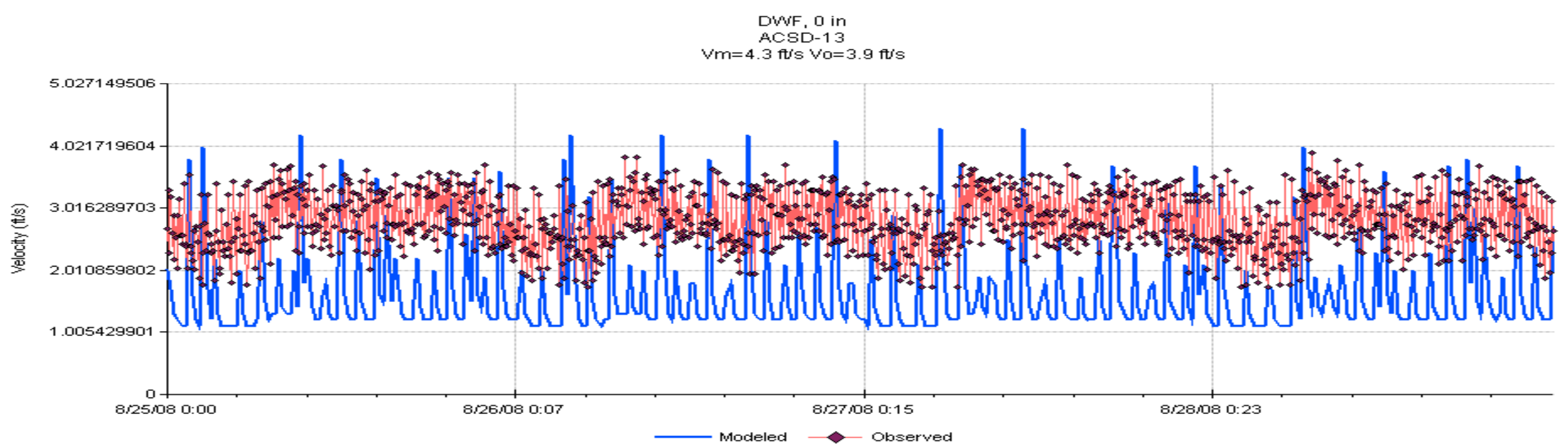

ACSD-12
Vm=1.51 MG Vo=1.06 MG; Qm=0.9 cfs Qo=1.1 cfs
Flowrate (cfs)
1.2
1
0.8
0.6
0.4
0.2
0
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
8/29/08 0:00
Modeled
Observed

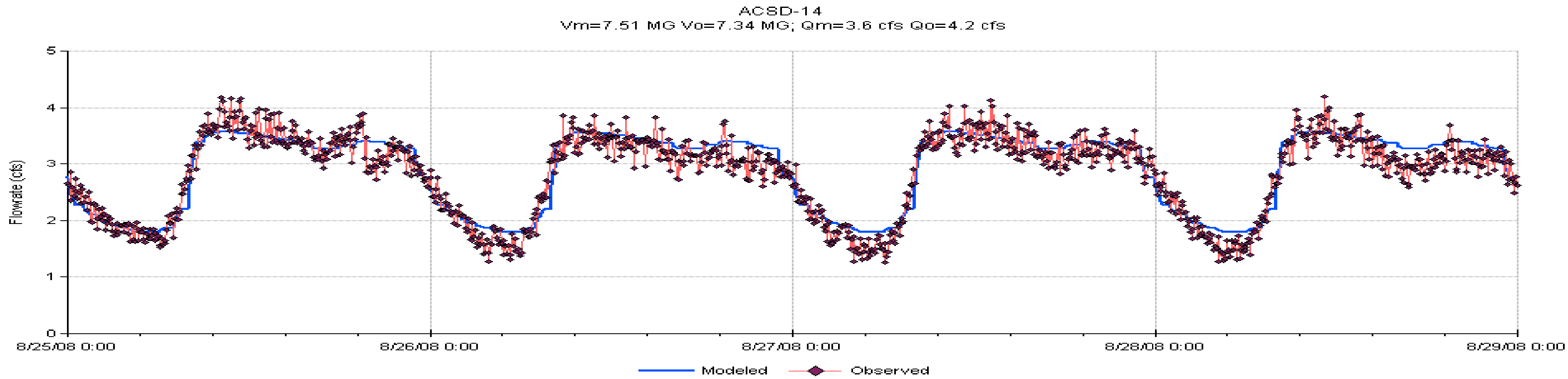

ACSD-12
Vm=1.7 ft/s Vo=1.3 ft/s
Velocity (ft/s)
2
1.75
1.5
1.25
1
0.75
0.5
0.25
0
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
8/29/08 0:00
Modeled
Observed

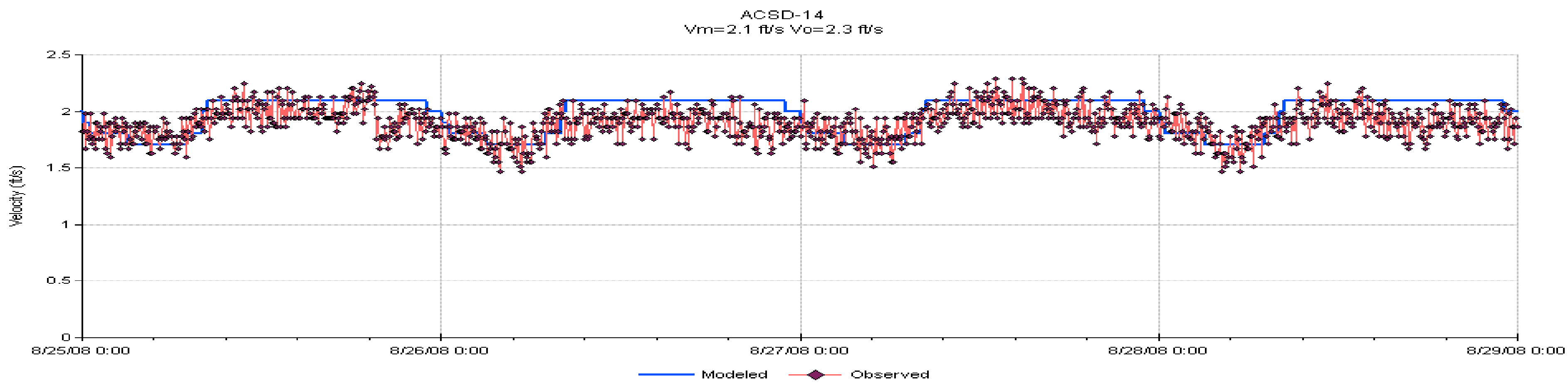

ACSD-12
Dm=0.3 ft Do=0.6 ft
Depth (ft)
2.5
2
1.5
1
0.5
0
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
8/29/08 0:00
Modeled
Observed
Pipe Crown

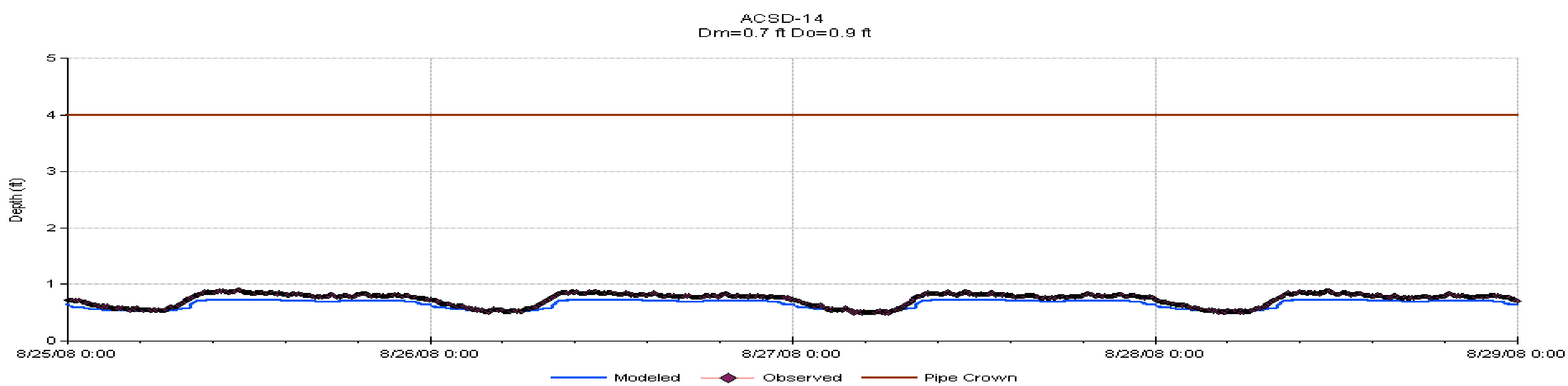

DWF, 0 in
ACSD-13
Dm=0.5 ft Do=0.4 ft
1.206515881
1.005429901
0.804343921
0.603257941
0.40217196
0.20108598
0
Depth (ft)
8/25/08 0:00
8/26/08 0:07
8/27/08 0:15
8/28/08 0:23
Modeled
Observed
Pipe Crown


DWF, 0 in
ACSD-13
Vm=0.38 MG Vo=1.34 MG; Qm=1.8 cfs Qo=1.1 cfs
2.010859802
1.508144852
1.005429901
0.502714951
0
Flowrate (cfs)
8/25/08 0:00
8/26/08 0:07
8/27/08 0:15
8/28/08 0:23
Modeled
Observed

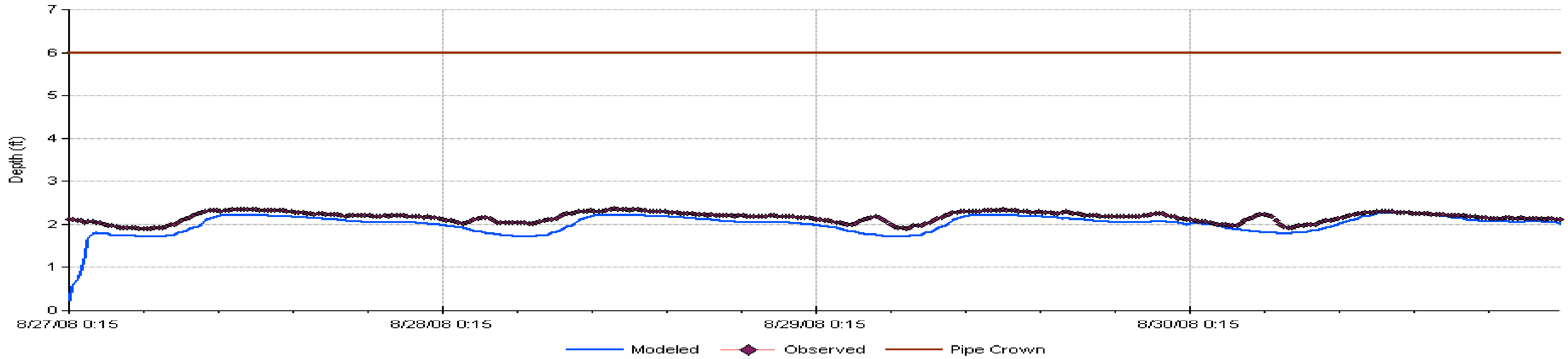

DWF, 0 in
ACSD-13
Vm=4.3 ft/s Vo=3.9 ft/s
5.027149506
4.021719604
3.016289703
2.010859802
1.005429901
0
Velocity (ft/s)
8/25/08 0:00
8/26/08 0:07
8/27/08 0:15
8/28/08 0:23
Modeled
Observed


ACSD-14
Vm=7.51 MG Vo=7.34 MG; Qm=3.6 cfs Qo=4.2 cfs
Flowrate (cfs)
5
4
3
2
1
0
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
8/29/08 0:00
Modeled
Observed

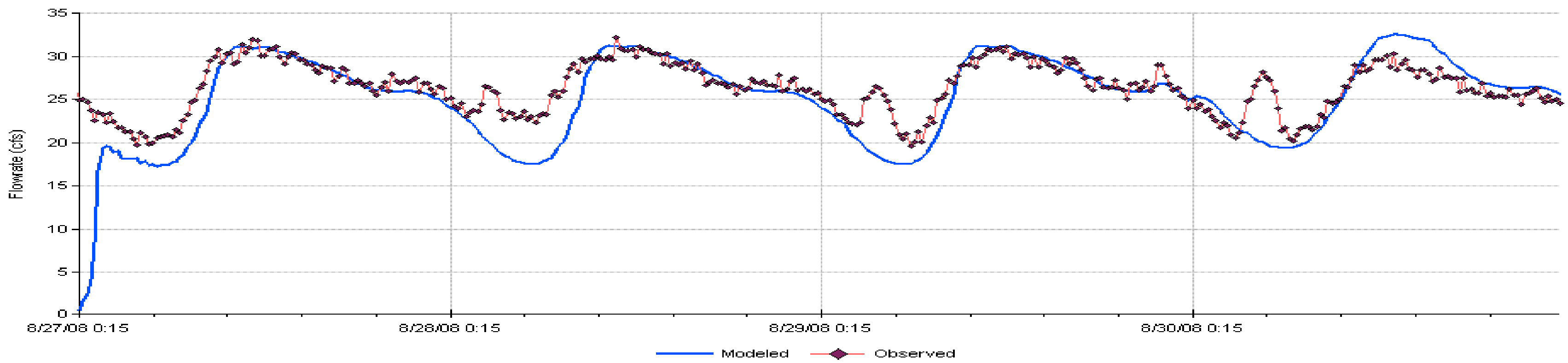

ACSD-14
Vm=2.1 ft/s Vo=2.3 ft/s
Velocity (ft/s)
2.5
2
1.5
1
0.5
0
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
8/29/08 0:00
Modeled
Observed


ACSD-14
Dm=0.7 ft Do=0.9 ft
Depth (ft)
5
4
3
2
1
0
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
8/29/08 0:00
Modeled
Observed
Pipe Crown

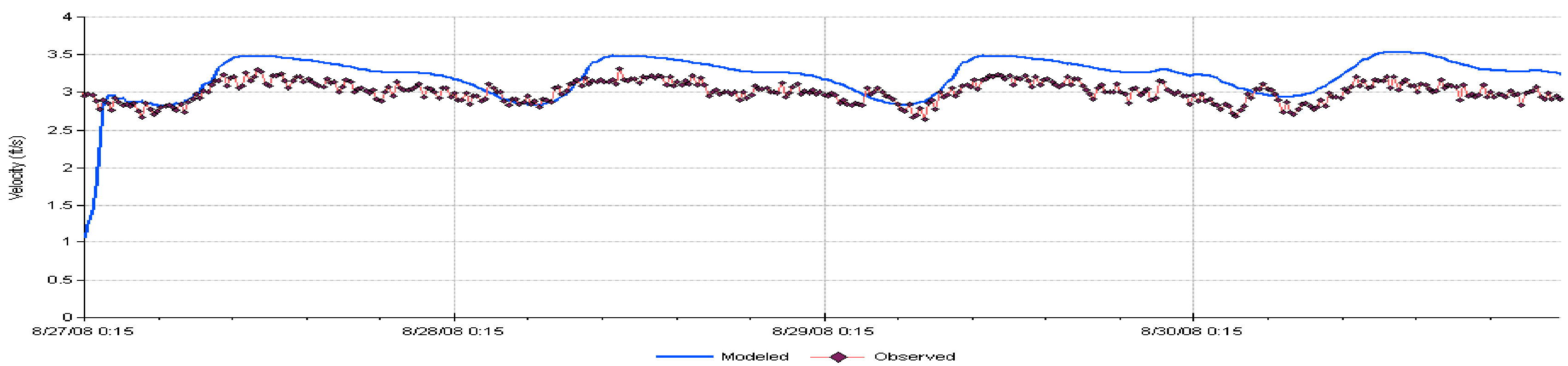
S-01 - At WWTP
Dm=2.3 ft Do=2.4 ft

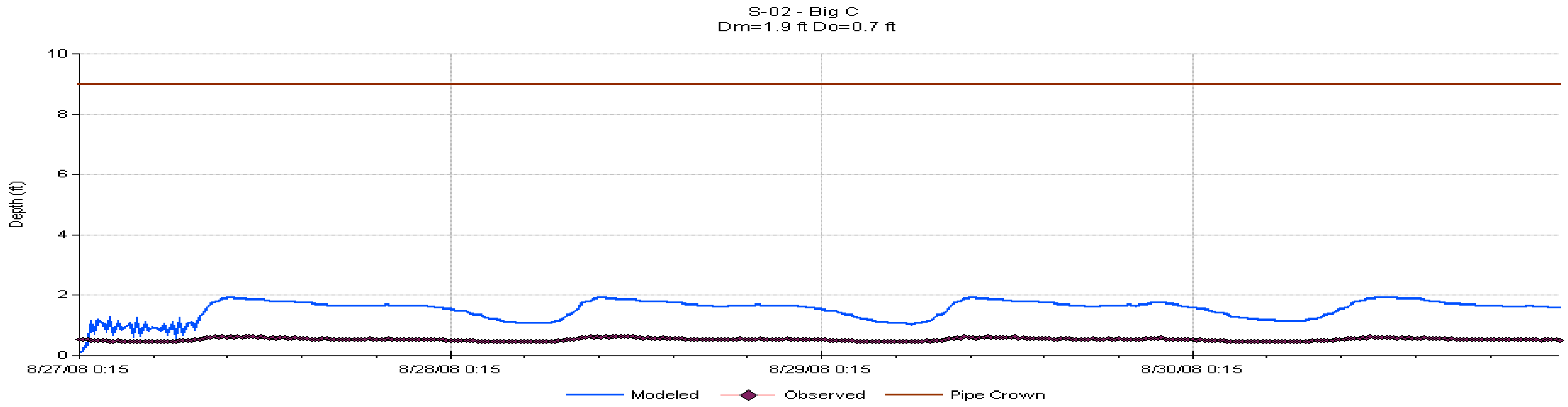


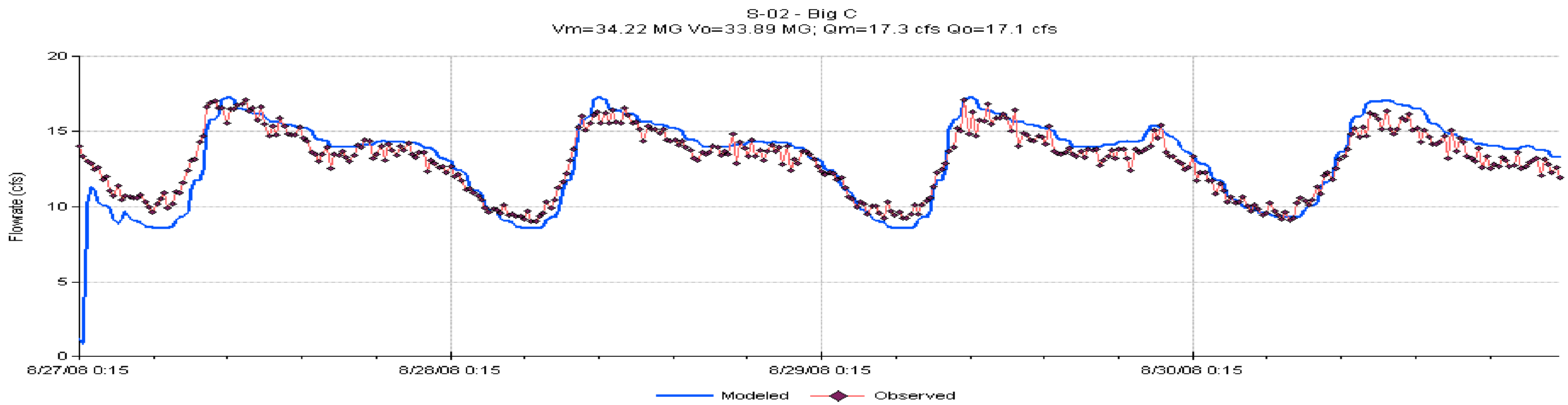
S-01 - At WWTP
Vm=65.05 MG Vo=68.28 MG; Qm=32.5 cfs Qo=32.2 cfs

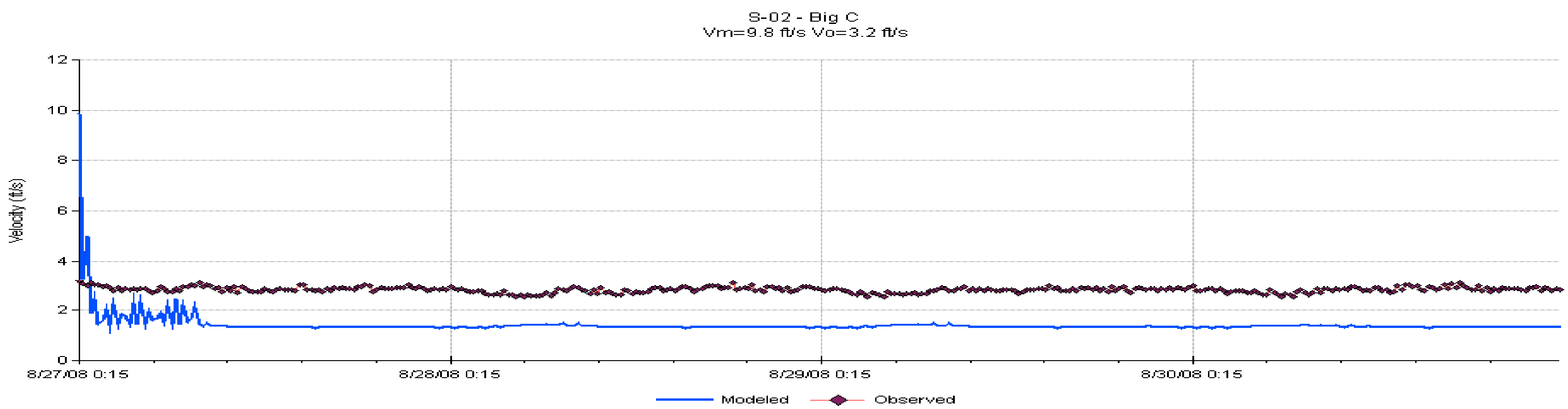


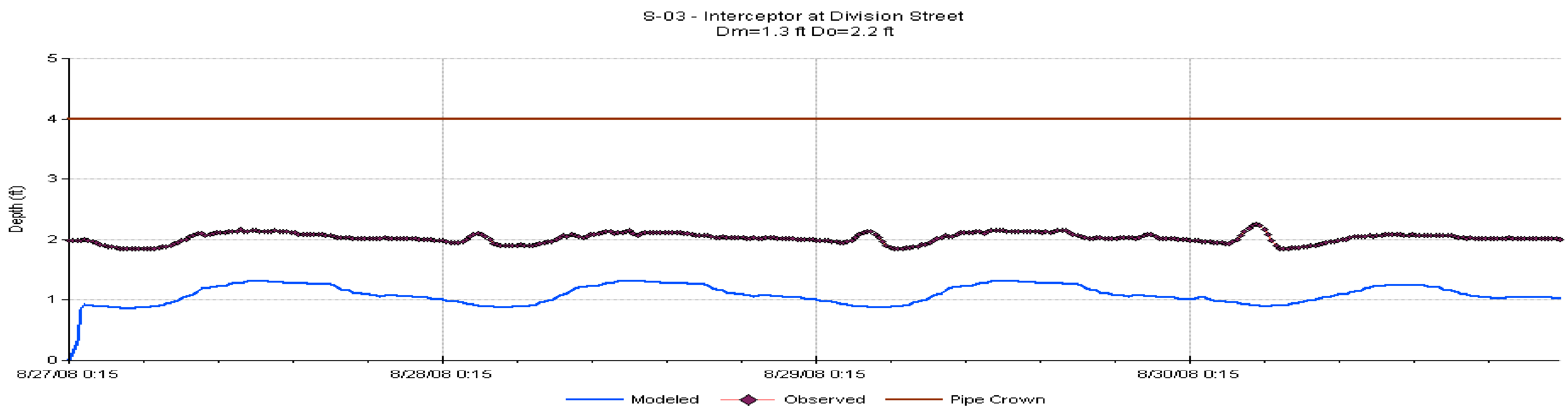
S-01 - At WWTP
Vm=3.5 ft/s Vo=3.3 ft/s



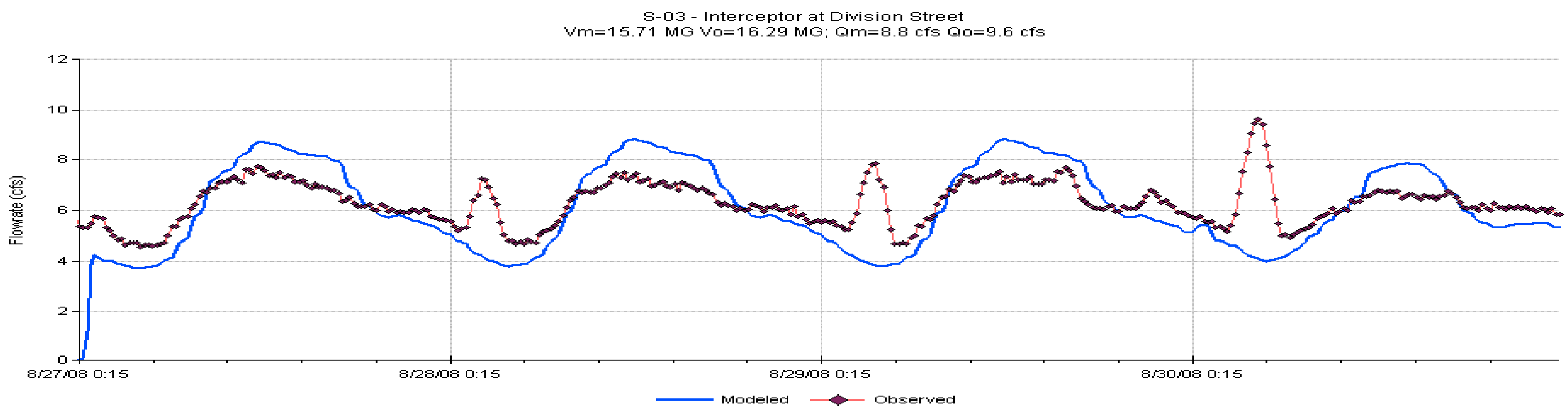

S-02 - Big C
Dm=1.9 ft Do=0.7 ft
Depth (ft)
10
8
6
4
2
0
8/27/08 0:15
8/28/08 0:15
8/29/08 0:15
8/30/08 0:15
Modeled
Observed
Pipe Crown


S-02 - Big C
Vm=34.22 MG Vo=33.89 MG; Qm=17.3 cfs Qo=17.1 cfs
Flowrate (cfs)
20
15
10
5
0
8/27/08 0:15
8/28/08 0:15
8/29/08 0:15
8/30/08 0:15
Modeled
Observed

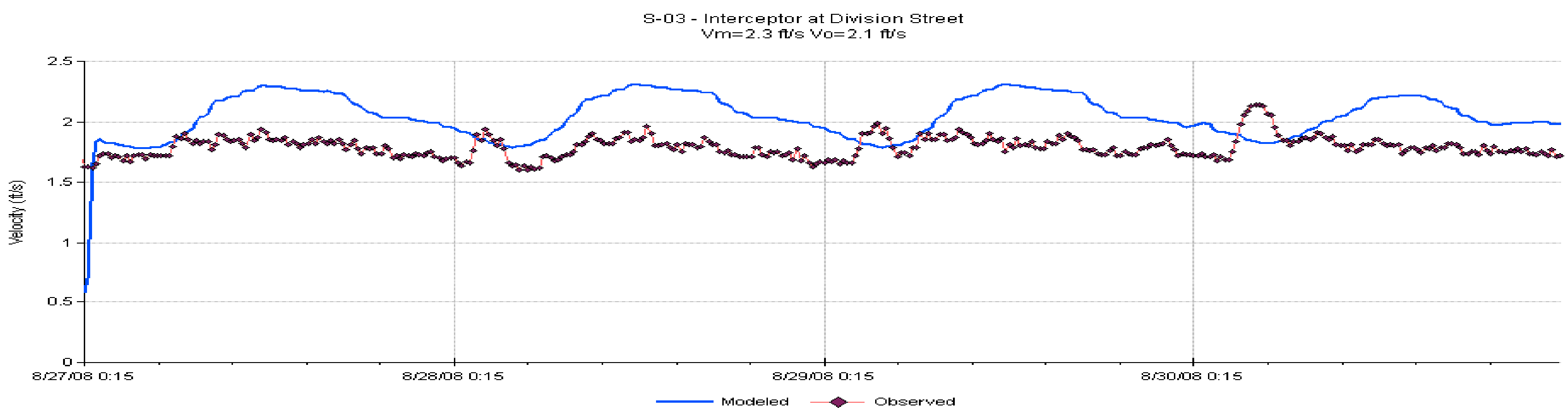

S-02 - Big C
Vm=9.8 ft/s Vo=3.2 ft/s
Velocity (ft/s)
12
10
8
6
4
2
0
8/27/08 0:15
8/28/08 0:15
8/29/08 0:15
8/30/08 0:15
Modeled
Observed



S-03 - Interceptor at Division Street
Dm=1.3 ft Do=2.2 ft
Depth (ft)
0
1
2
3
4
5
8/27/08 0:15
8/28/08 0:15
8/29/08 0:15
8/30/08 0:15
Modeled
Observed
Pipe Crown

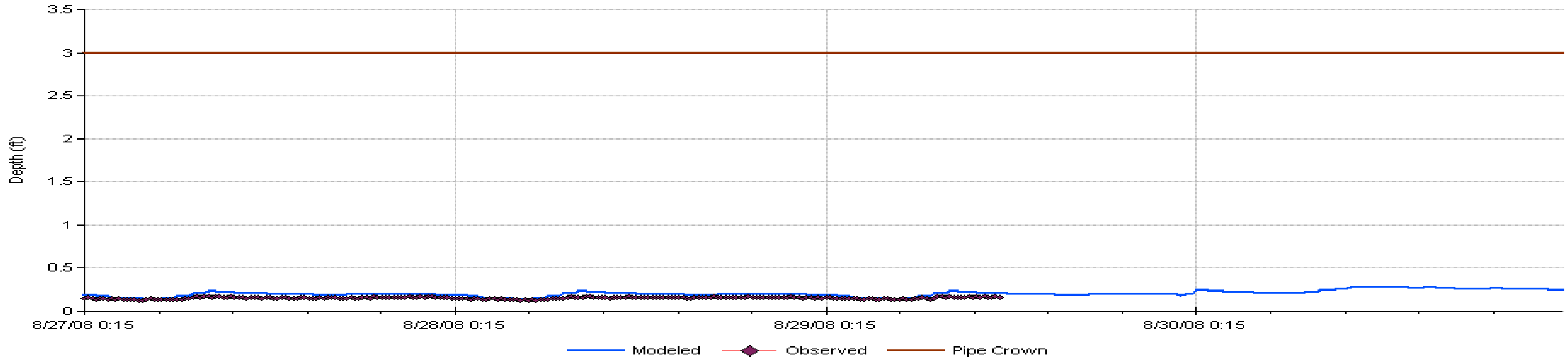


S-03 - Interceptor at Division Street
Vm=15.71 MG Vo=16.29 MG; Qm=8.8 cfs Qo=9.6 cfs
Flowrate (cfs)
0
2
4
6
8
10
12
8/27/08 0:15
8/28/08 0:15
8/29/08 0:15
8/30/08 0:15
Modeled
Observed

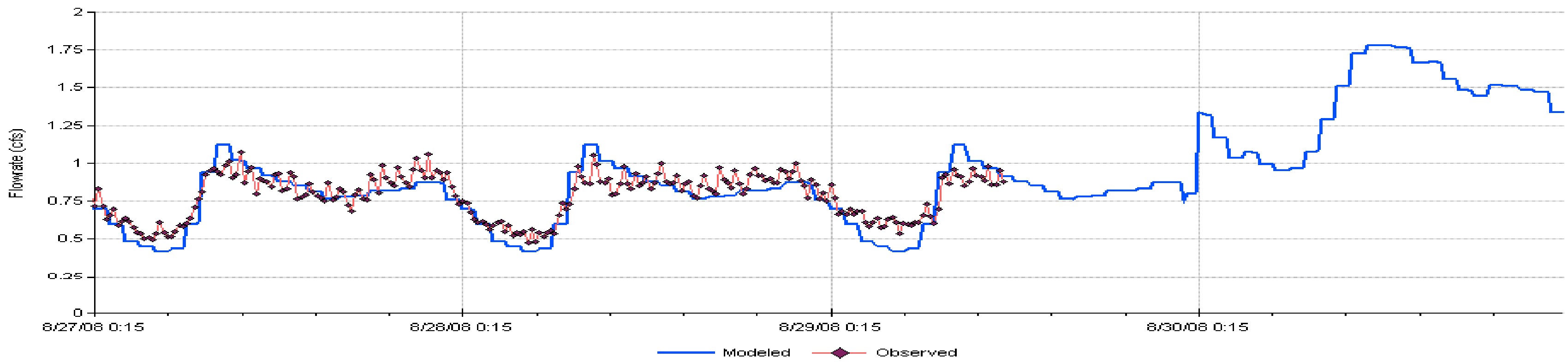


S-03 - Interceptor at Division Street
Vm=2.3 ft/s Vo=2.1 ft/s
Velocity (ft/s)
0
0.5
1
1.5
2
2.5
8/27/08 0:15
8/28/08 0:15
8/29/08 0:15
8/30/08 0:15
Modeled
Observed

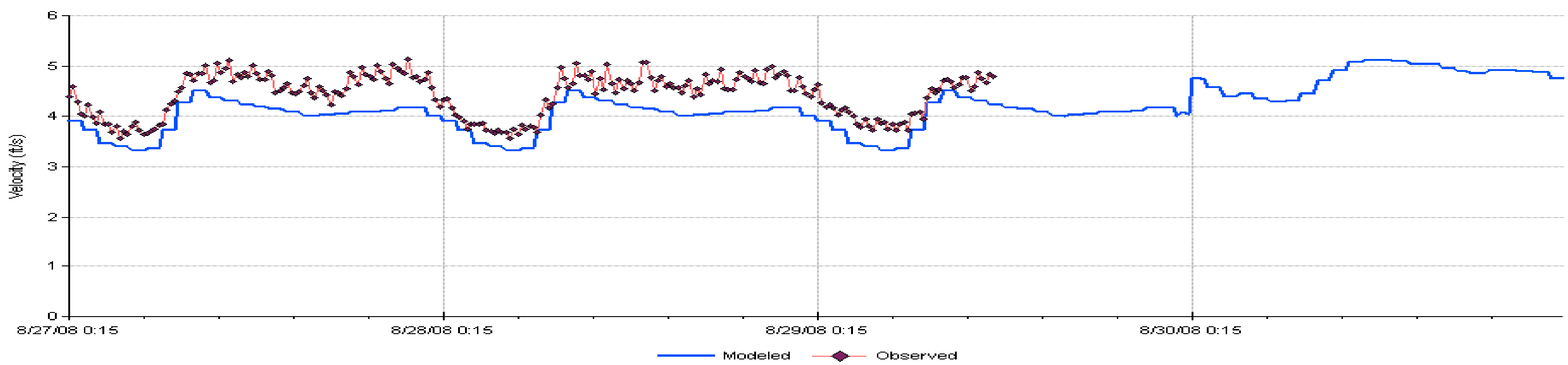
S-04 - A portion of Bouck
Dm=0.3 ft Do=0.2 ft

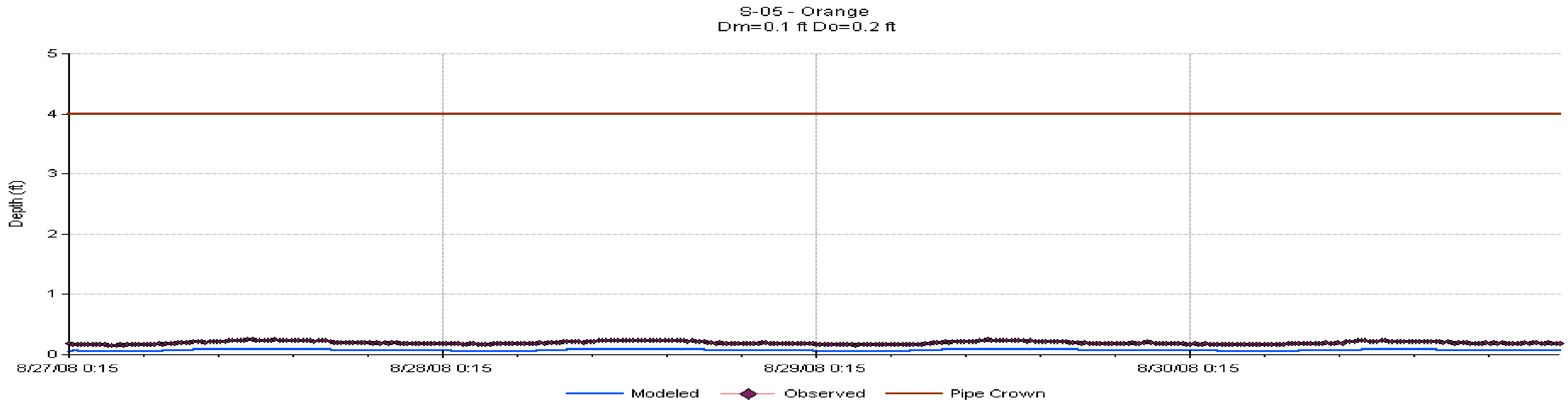


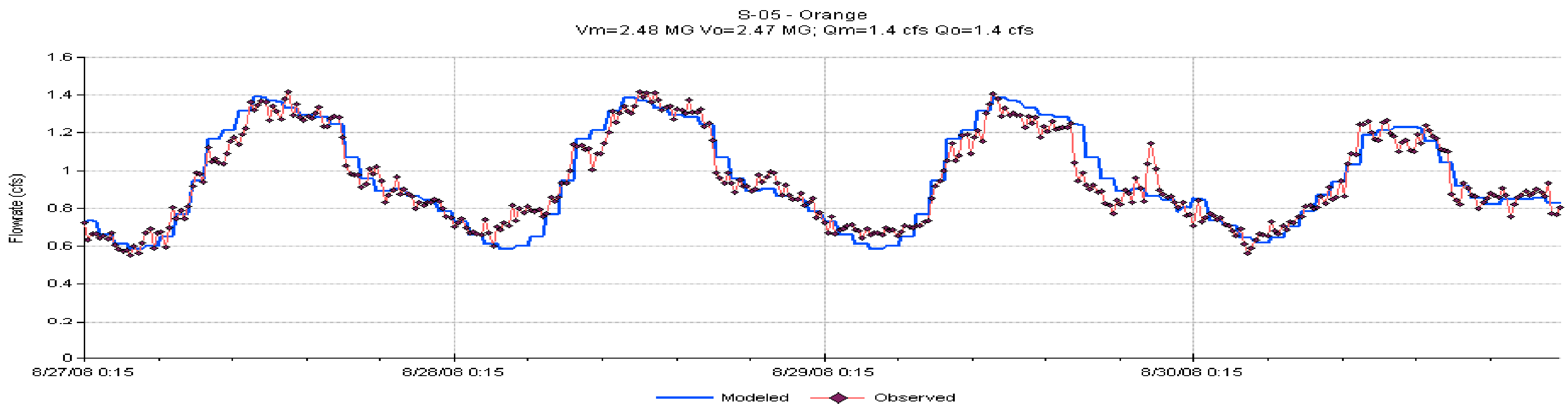
S-04 - A portion of Bouck
Vm=2.40 MG Vo=1.27 MG; Qm=1.8 cfs Qo=1.1 cfs

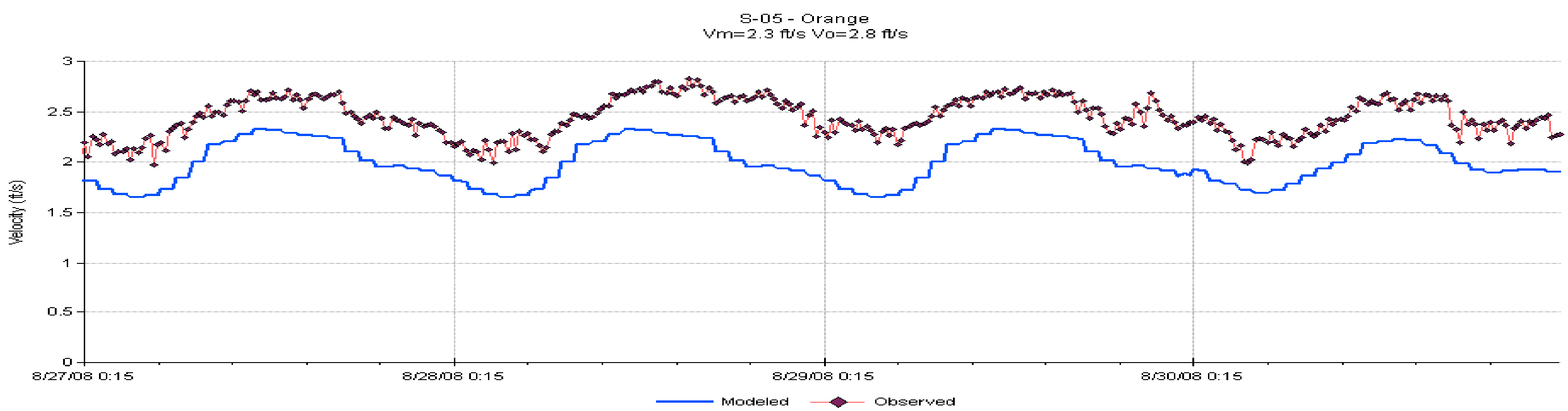


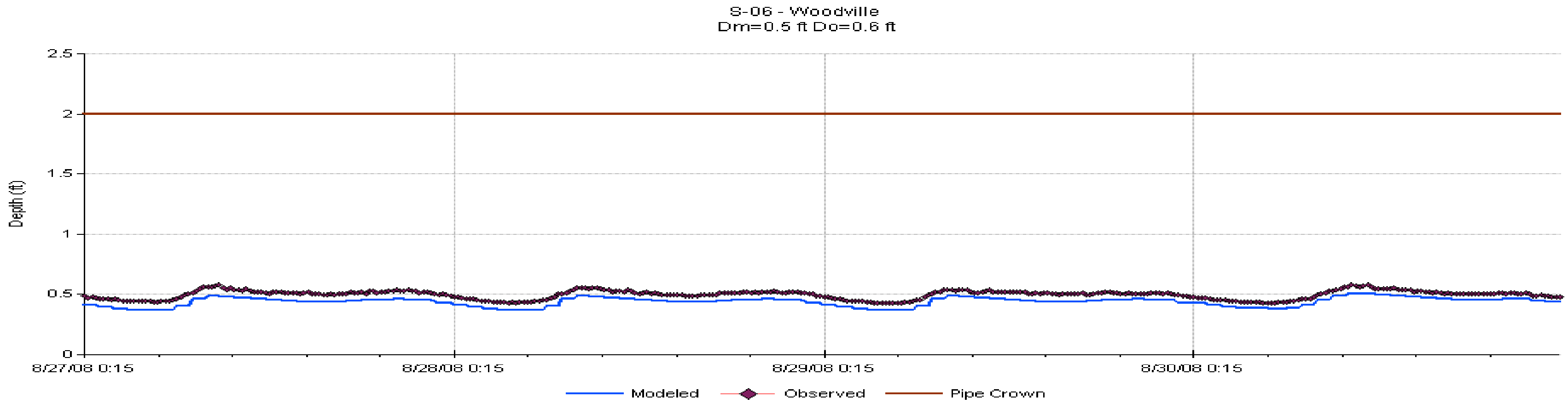
S-04 - A portion of Bouck
Vm=5.1 ft/s Vo=5.1 ft/s

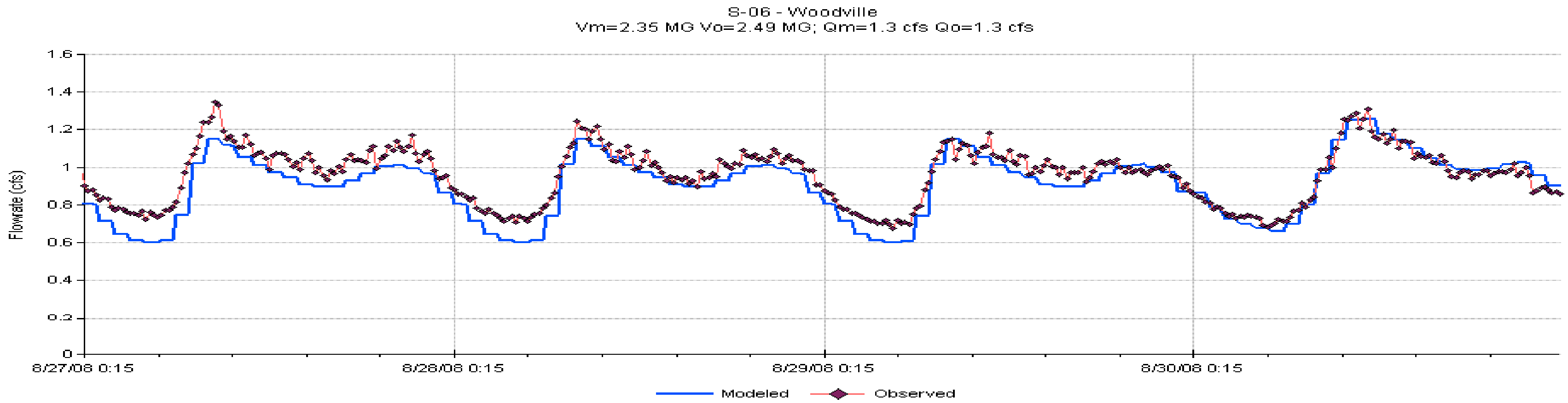


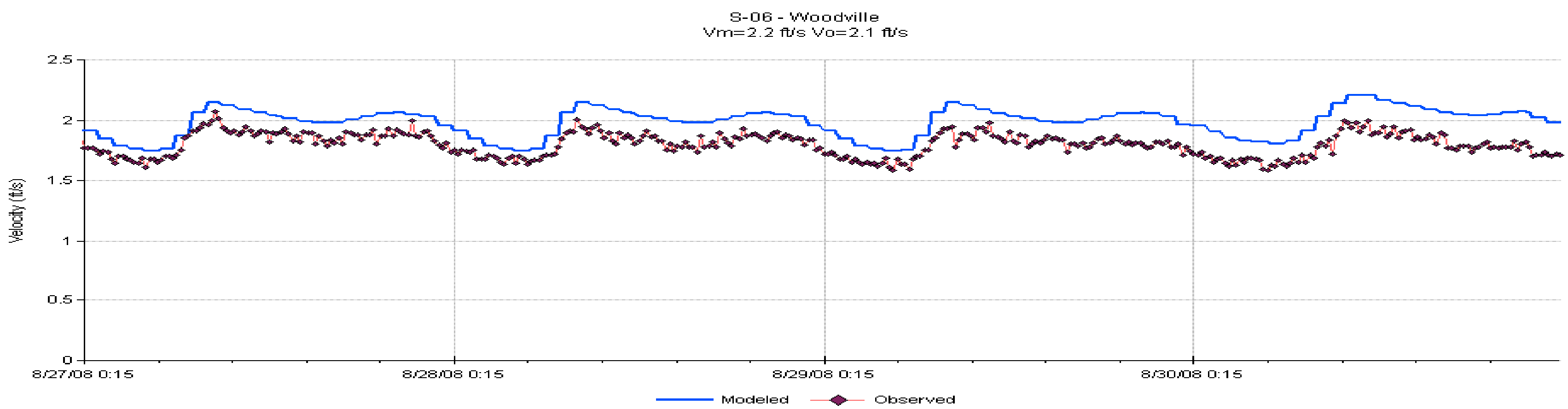

S-05 - Orange
Dm=0.1 ft Do=0.2 ft
Depth (ft)
0
1
2
3
4
5
8/27/08 0:15
8/28/08 0:15
8/29/08 0:15
8/30/08 0:15
Modeled
Observed
Pipe Crown

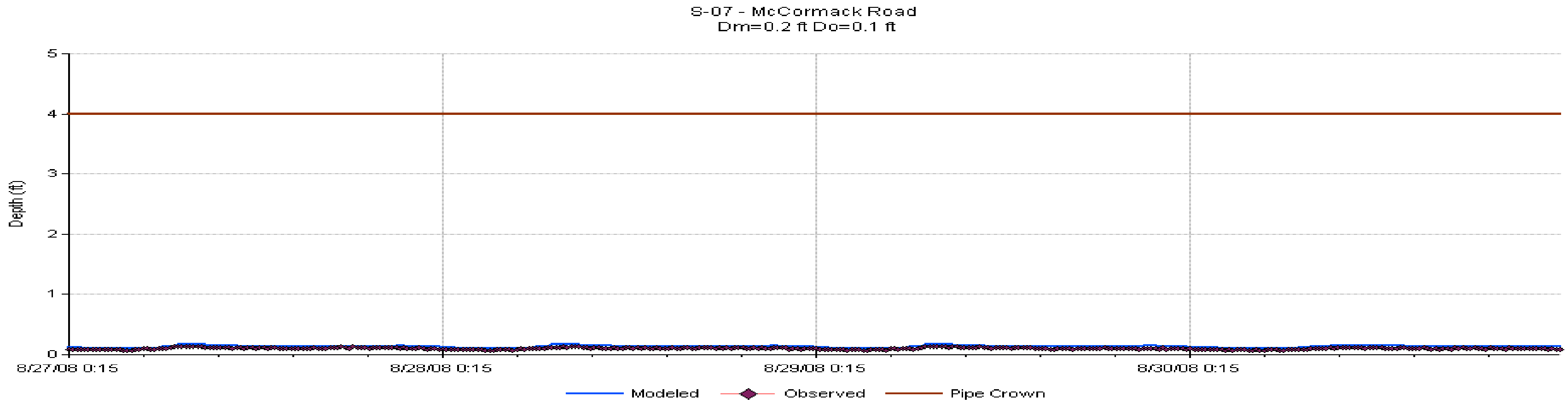

S-05 - Orange
Vm=2.48 MG Vo=2.47 MG; Qm=1.4 cfs Qo=1.4 cfs
Flowrate (cfs)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
8/27/08 0:15
8/28/08 0:15
8/29/08 0:15
8/30/08 0:15
Modeled
Observed

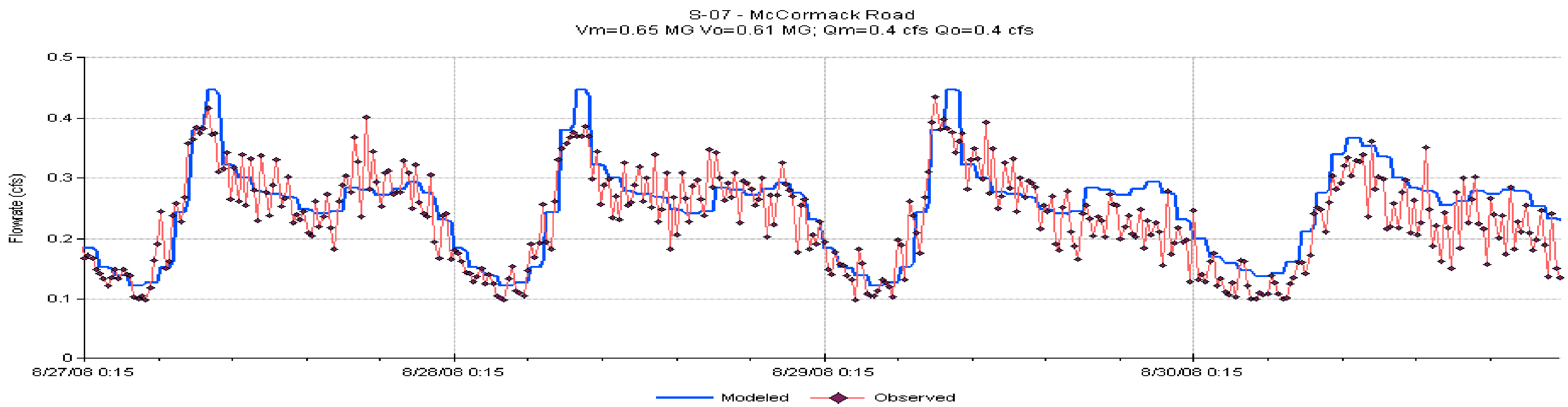

S-05 - Orange
Vm=2.3 ft/s Vo=2.8 ft/s
Velocity (ft/s)
0
0.5
1
1.5
2
2.5
3
8/27/08 0:15
8/28/08 0:15
8/29/08 0:15
8/30/08 0:15
Modeled
Observed

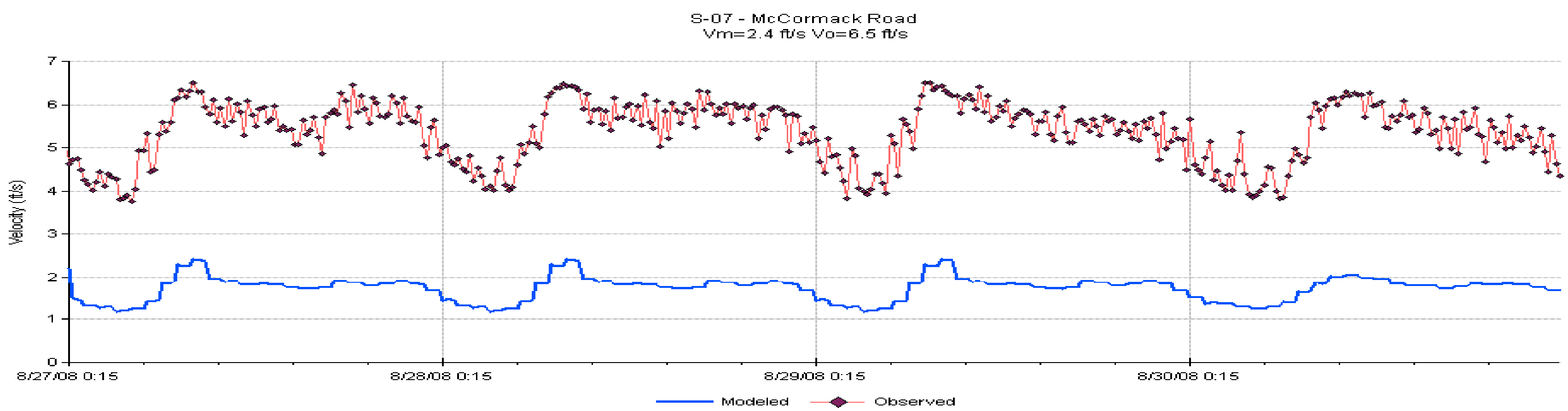

S-06 - Woodville
Dm=0.5 ft Do=0.6 ft
Depth (ft)
2.5
2
1.5
1
0.5
0
8/27/08 0:15
8/28/08 0:15
8/29/08 0:15
8/30/08 0:15
Modeled
Observed
Pipe Crown

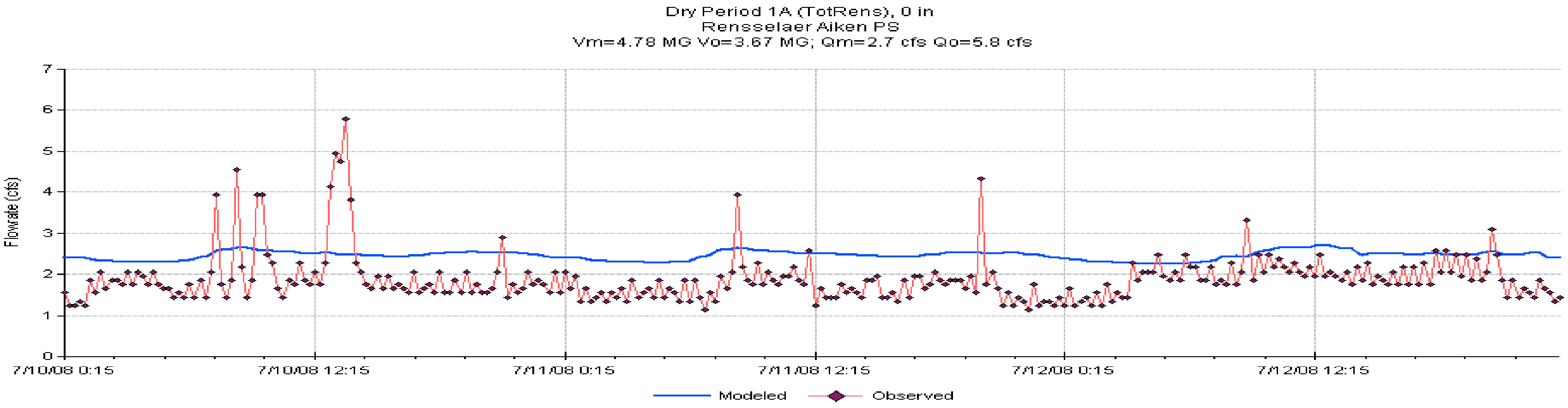

S-06 - Woodville
Vm=2.35 MG Vo=2.49 MG; Qm=1.3 cfs Qo=1.3 cfs
Flowrate (cfs)
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
8/27/08 0:15
8/28/08 0:15
8/29/08 0:15
8/30/08 0:15
Modeled
Observed

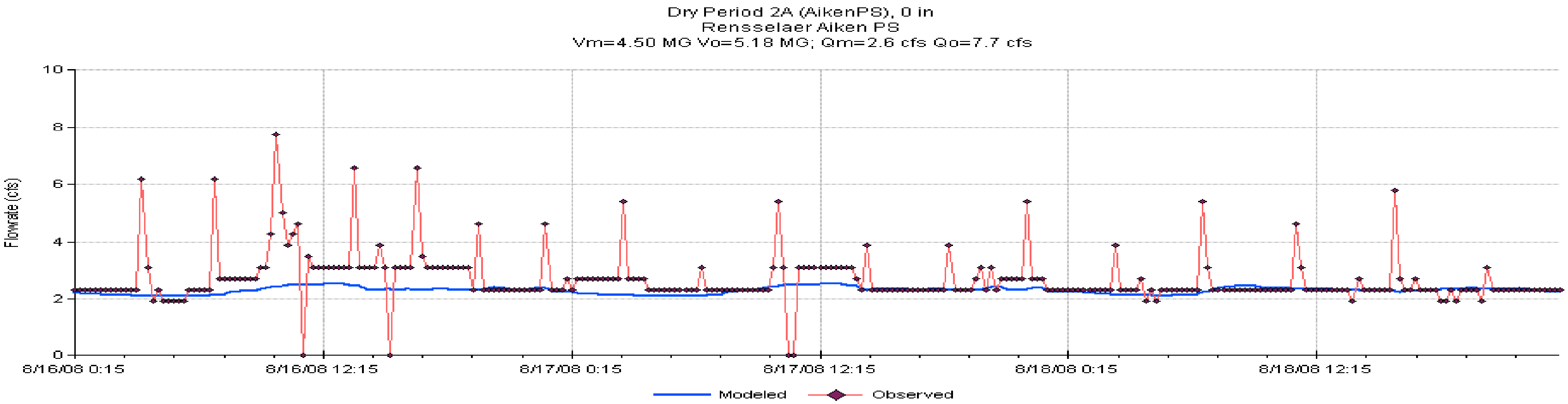

S-06 - Woodville
Vm=2.2 ft/s Vo=2.1 ft/s
Velocity (ft/s)
2.5
2
1.5
1
0.5
0
8/27/08 0:15
8/28/08 0:15
8/29/08 0:15
8/30/08 0:15
Modeled
Observed

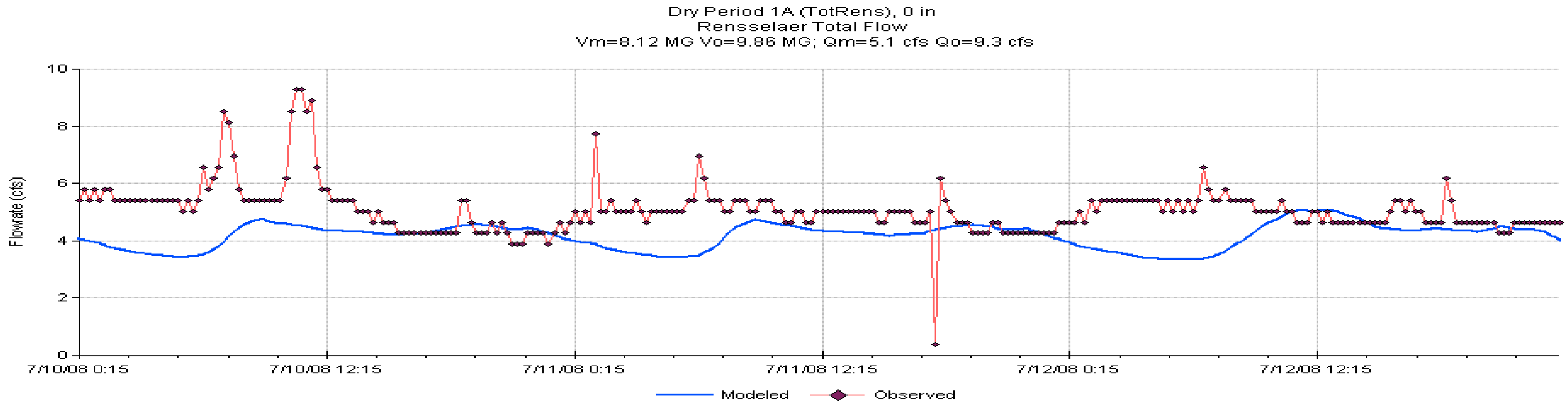

S-07 - McCormack Road
Dm=0.2 ft Do=0.1 ft
Depth (ft)
8/27/08 0:15
8/28/08 0:15
8/29/08 0:15
8/30/08 0:15
Modeled
Observed
Pipe Crown

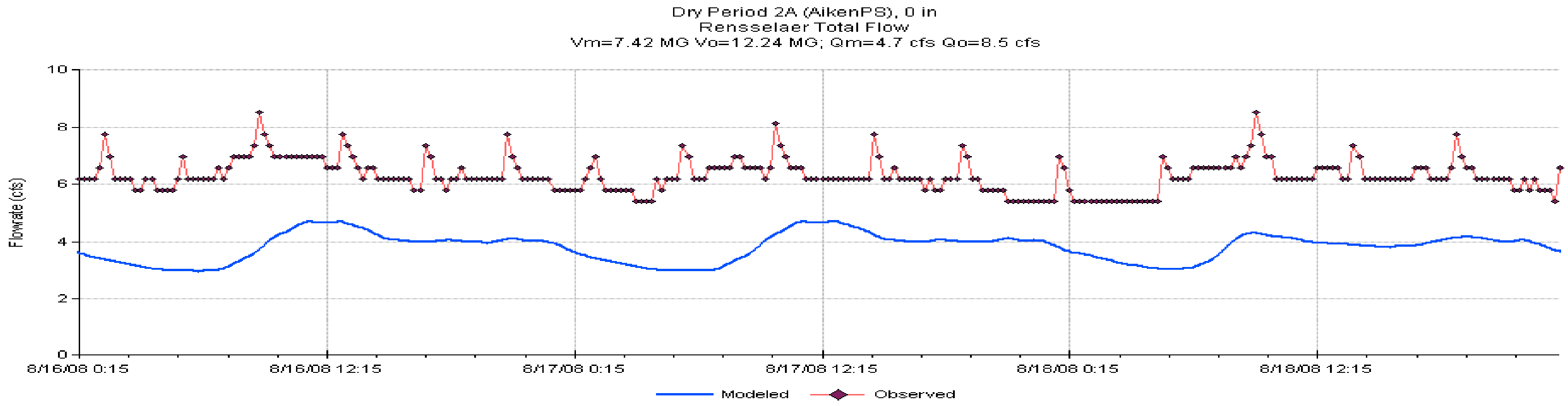

S-07 - McCormack Road
Vm=0.65 MG Vo=0.61 MG; Qm=0.4 cfs Qo=0.4 cfs
Flowrate (cfs)
8/27/08 0:15
8/28/08 0:15
8/29/08 0:15
8/30/08 0:15
Modeled
Observed

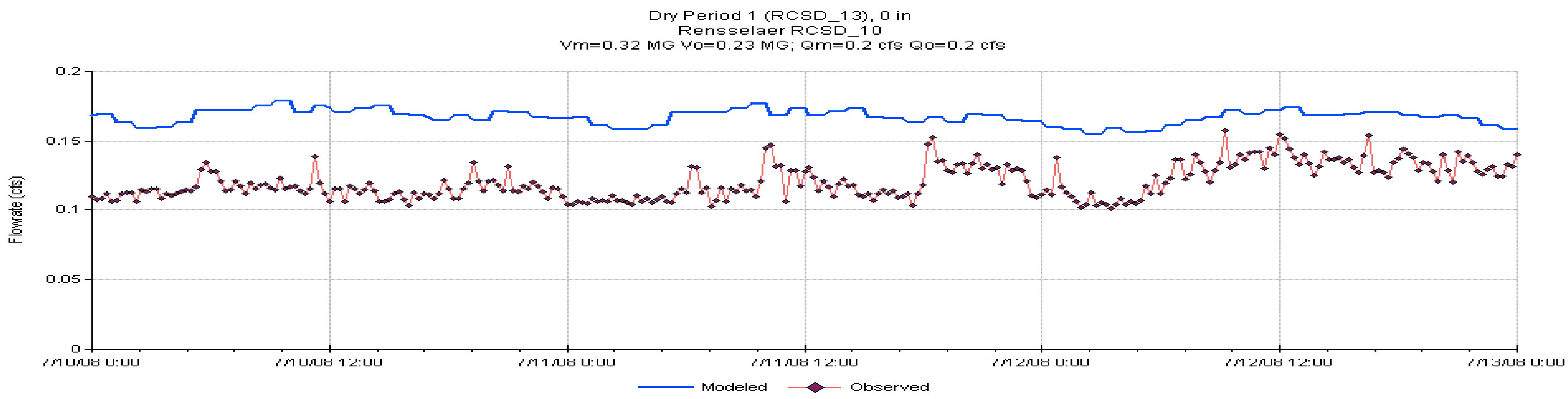

S-07 - McCormack Road
Vm=2.4 ft/s Vo=6.5 ft/s
Velocity (ft/s)
8/27/08 0:15
8/28/08 0:15
8/29/08 0:15
8/30/08 0:15
Modeled
Observed


Dry Period 1A (TotRens), 0 in
Rensselaer Aiken PS
Vm=4.78 MG Vo=3.67 MG; Qm=2.7 cfs Qo=5.8 cfs
Flowrate (cfs)
7/10/08 0:15
7/10/08 12:15
7/11/08 0:15
7/11/08 12:15
7/12/08 0:15
7/12/08 12:15
Modeled
Observed

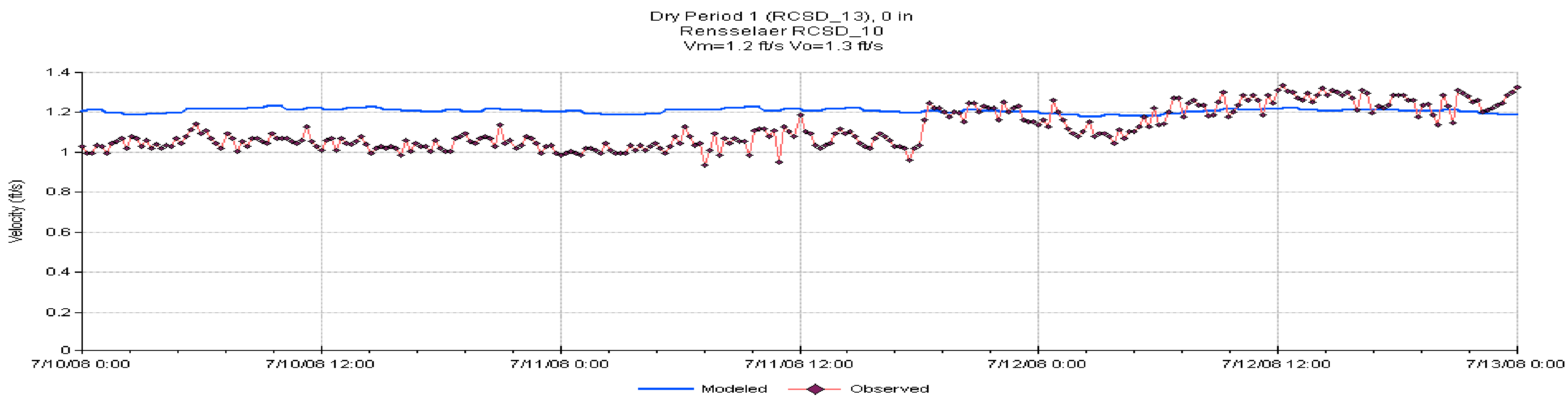

Dry Period 2A (AikenPS), 0 in
Rensselaer Aiken PS
Vm=4.50 MG Vo=5.18 MG; Qm=2.6 cfs Qo=7.7 cfs
Flowrate (cfs)
8/16/08 0:15
8/16/08 12:15
8/17/08 0:15
8/17/08 12:15
8/18/08 0:15
8/18/08 12:15
Modeled
Observed


Dry Period 1A (TotRens), 0 in
Rensselaer Total Flow
Vm=8.12 MG Vo=9.86 MG; Qm=5.1 cfs Qo=9.3 cfs
Flowrate (cfs)
0
2
4
6
8
10
7/10/08 0:15
7/10/08 12:15
7/11/08 0:15
7/11/08 12:15
7/12/08 0:15
7/12/08 12:15
Modeled
Observed

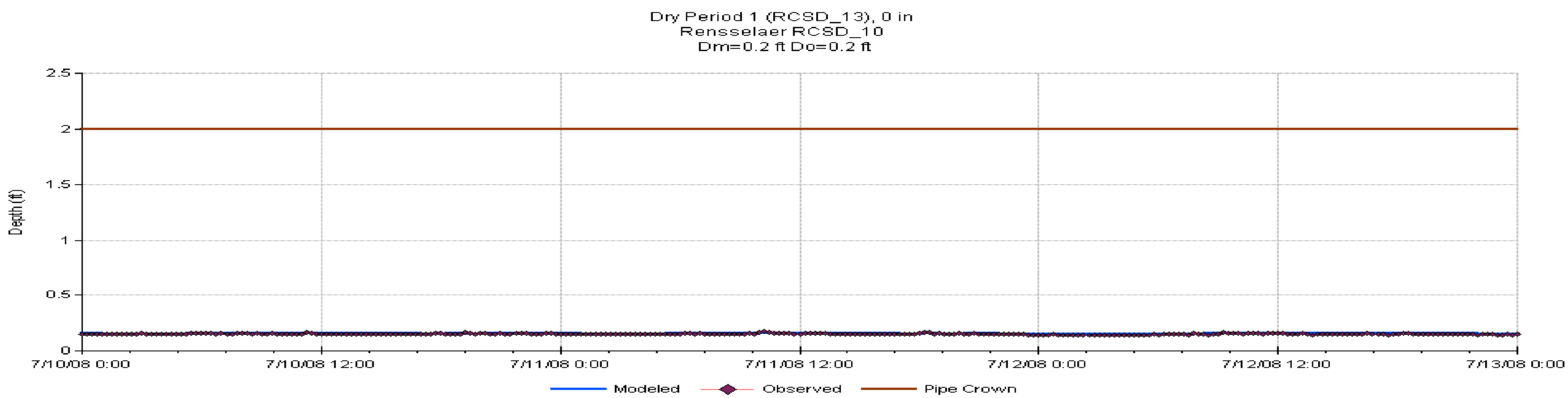

Dry Period 2A (AikenPS), 0 in
Rensselaer Total Flow
Vm=7.42 MG Vo=12.24 MG; Qm=4.7 cfs Qo=8.5 cfs
Flowrate (cfs)
0
2
4
6
8
10
8/16/08 0:15
8/16/08 12:15
8/17/08 0:15
8/17/08 12:15
8/18/08 0:15
8/18/08 12:15
Modeled
Observed



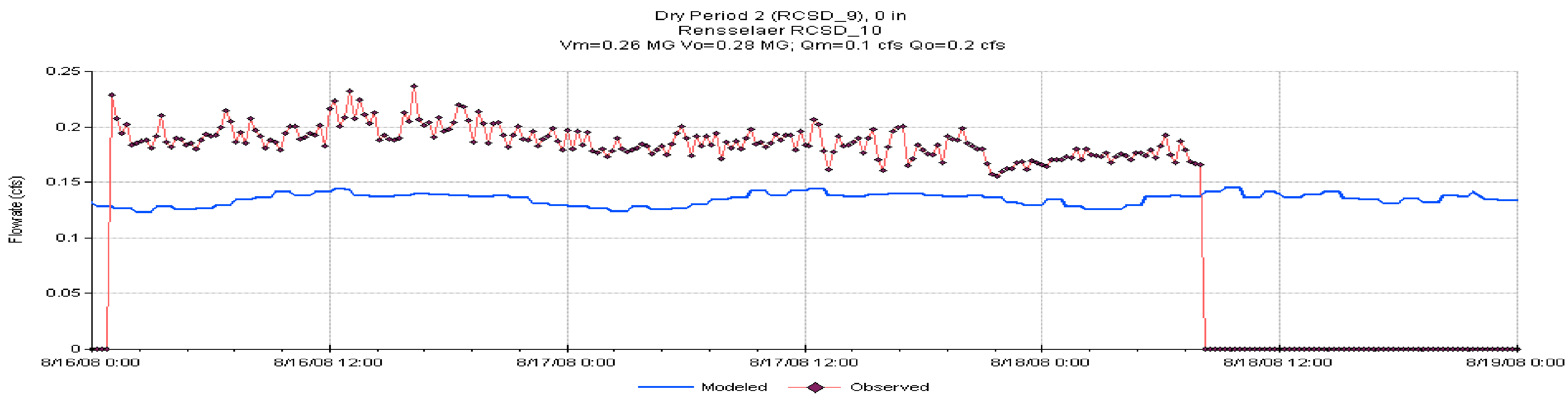
Dry Period 1 (RCSD_13), 0 in
Rensselaer RCSD_10
Vm=0.32 MG Vo=0.23 MG; Qm=0.2 cfs Qo=0.2 cfs
Flowrate (cfs)
0.2
0.15
0.1
0.05
0
7/10/08 0:00
7/10/08 12:00
7/11/08 0:00
7/11/08 12:00
7/12/08 0:00
7/12/08 12:00
7/13/08 0:00
Modeled
Observed



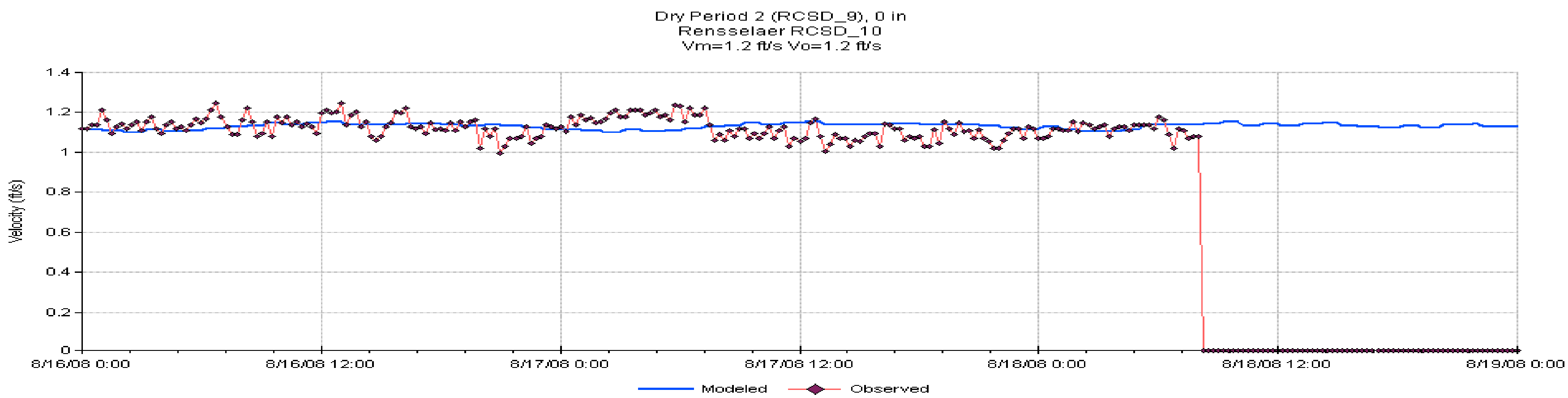
Dry Period 1 (RCSD_13), 0 in
Rensselaer RCSD_10
Vm=1.2 ft/s Vo=1.3 ft/s
Velocity (ft/s)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
7/10/08 0:00
7/10/08 12:00
7/11/08 0:00
7/11/08 12:00
7/12/08 0:00
7/12/08 12:00
7/13/08 0:00
Modeled
Observed



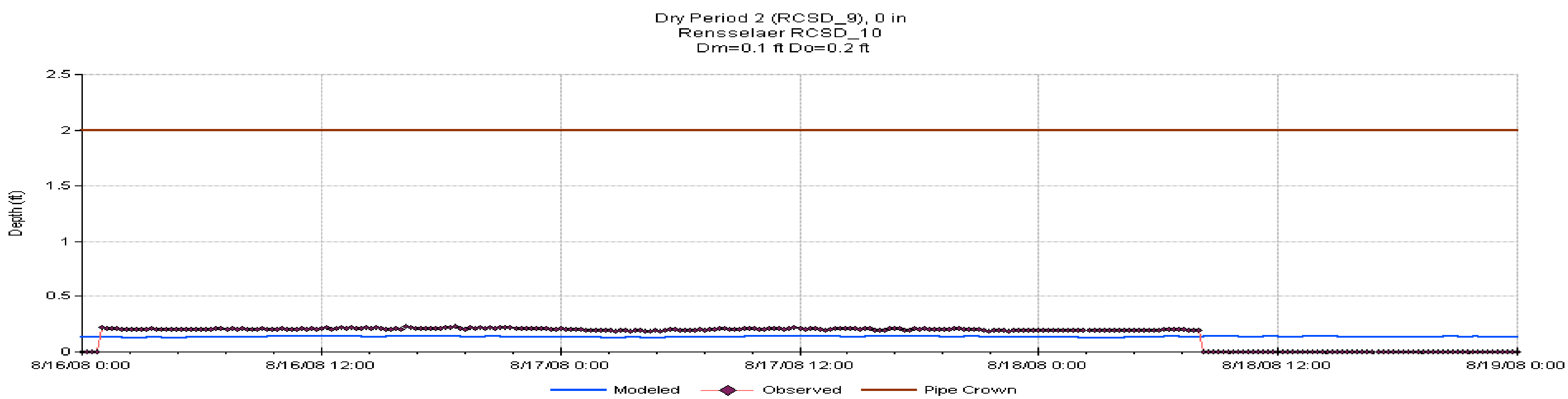
Dry Period 1 (RCSD_13), 0 in
Rensselaer RCSD_10
Dm=0.2 ft Do=0.2 ft
Depth (ft)
2.5
2
1.5
1
0.5
0
7/10/08 0:00
7/10/08 12:00
7/11/08 0:00
7/11/08 12:00
7/12/08 0:00
7/12/08 12:00
7/13/08 0:00
Modeled
Observed
Pipe Crown



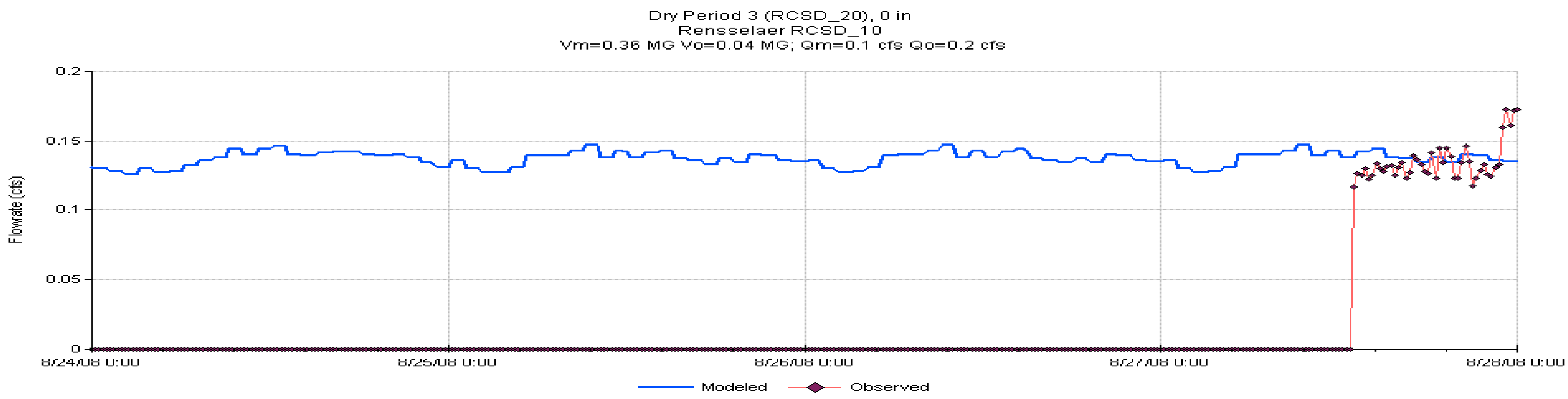
Dry Period 2 (RCSD_9), 0 in
Rensselaer RCSD_10
Vm=0.26 MG Vo=0.28 MG; Qm=0.1 cfs Qo=0.2 cfs
Flowrate (cfs)
0.25
0.2
0.15
0.1
0.05
0
8/16/08 0:00
8/16/08 12:00
8/17/08 0:00
8/17/08 12:00
8/18/08 0:00
8/18/08 12:00
8/19/08 0:00
Modeled
Observed

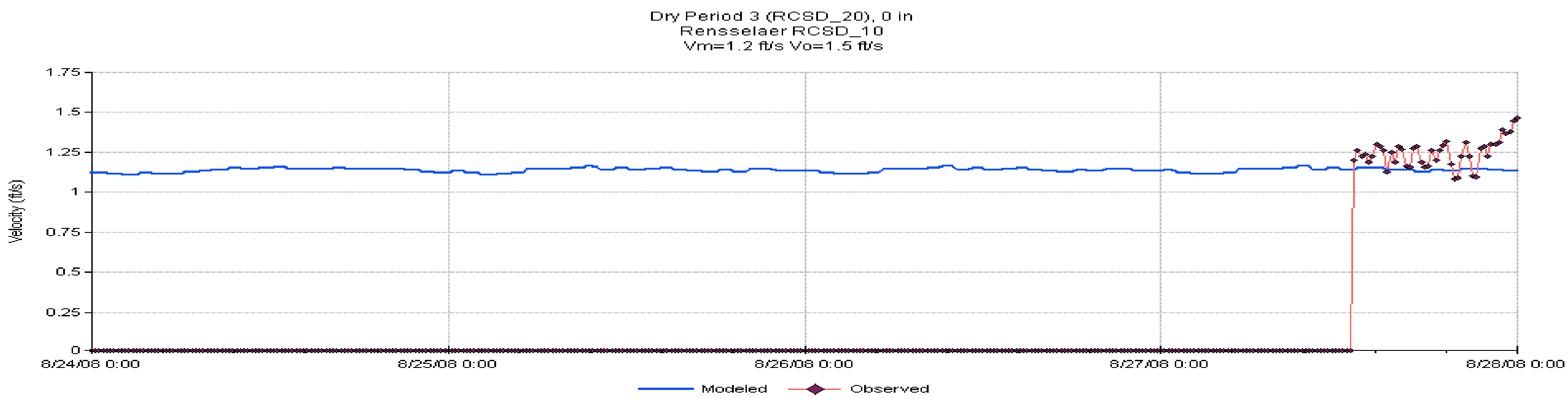


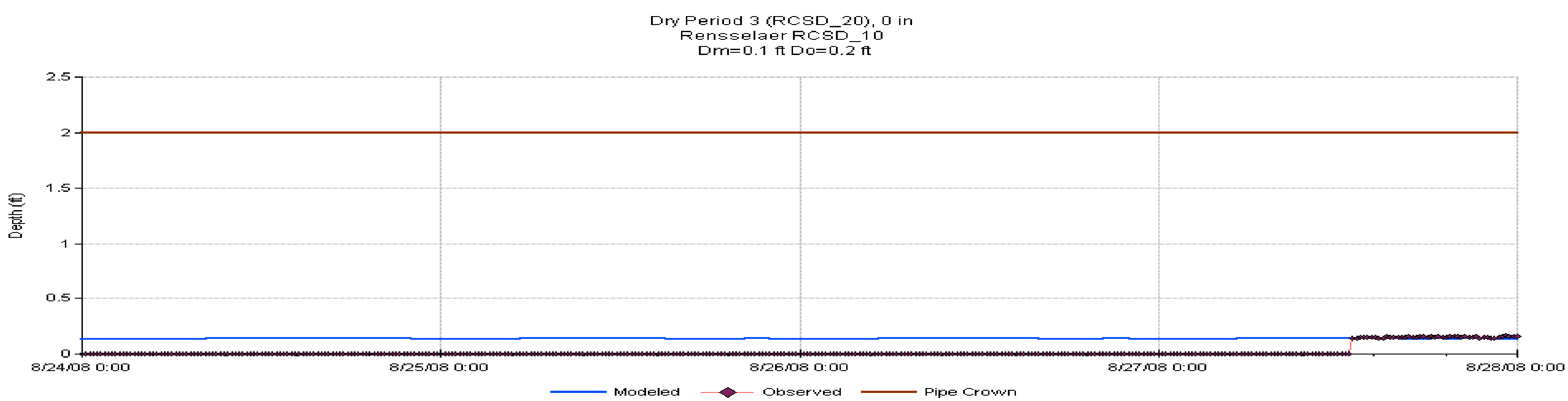
Dry Period 2 (RCSD_9), 0 in
Rensselaer RCSD_10
Vm=1.2 ft/s Vo=1.2 ft/s
Velocity (ft/s)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
8/16/08 0:00
8/16/08 12:00
8/17/08 0:00
8/17/08 12:00
8/18/08 0:00
8/18/08 12:00
8/19/08 0:00
Modeled
Observed

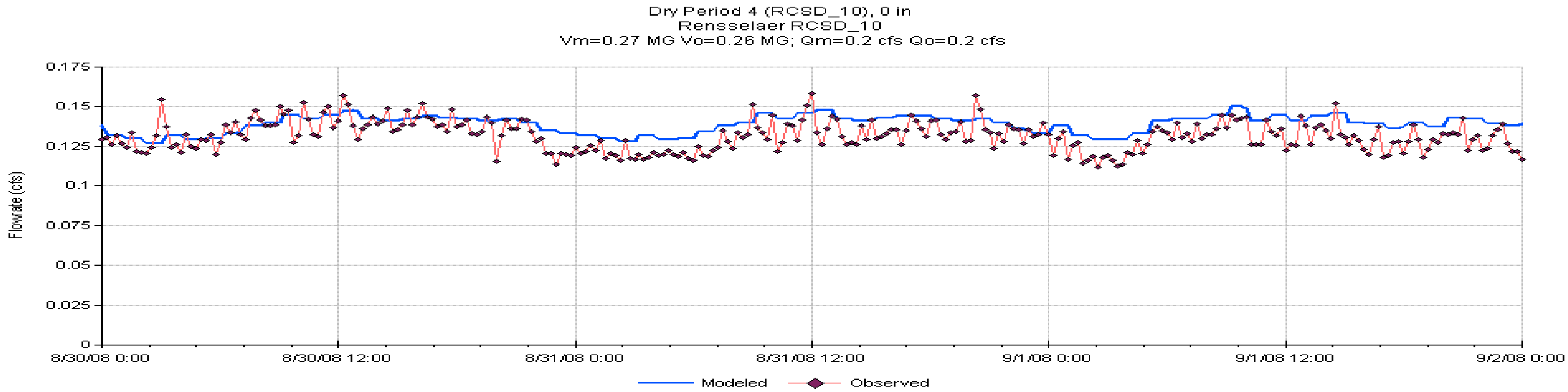


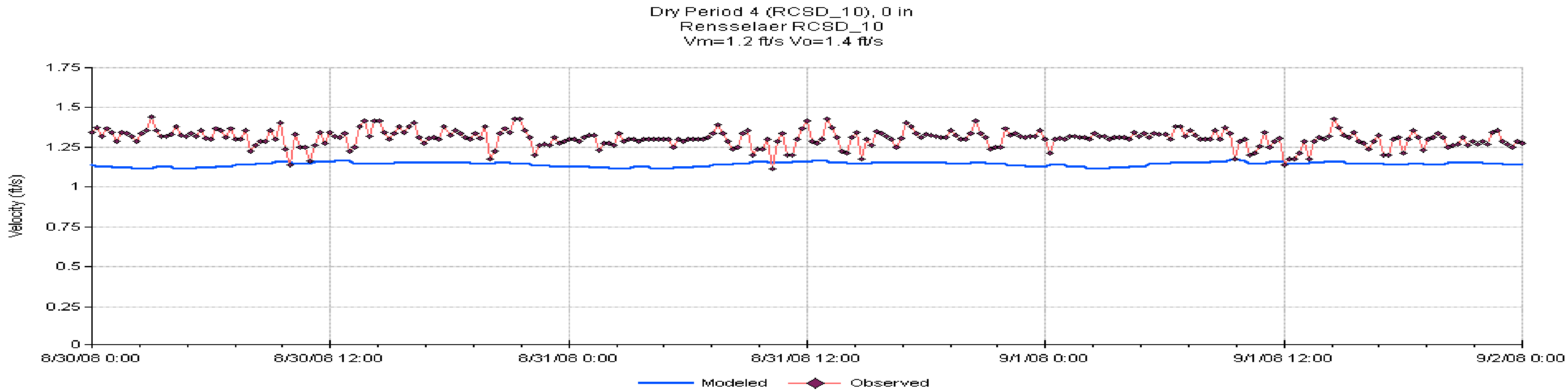
Dry Period 2 (RCSD_9), 0 in
Rensselaer RCSD_10
Dm=0.1 ft Do=0.2 ft
Depth (ft)
2.5
2
1.5
1
0.5
0
8/16/08 0:00
8/16/08 12:00
8/17/08 0:00
8/17/08 12:00
8/18/08 0:00
8/18/08 12:00
8/19/08 0:00
Modeled
Observed
Pipe Crown

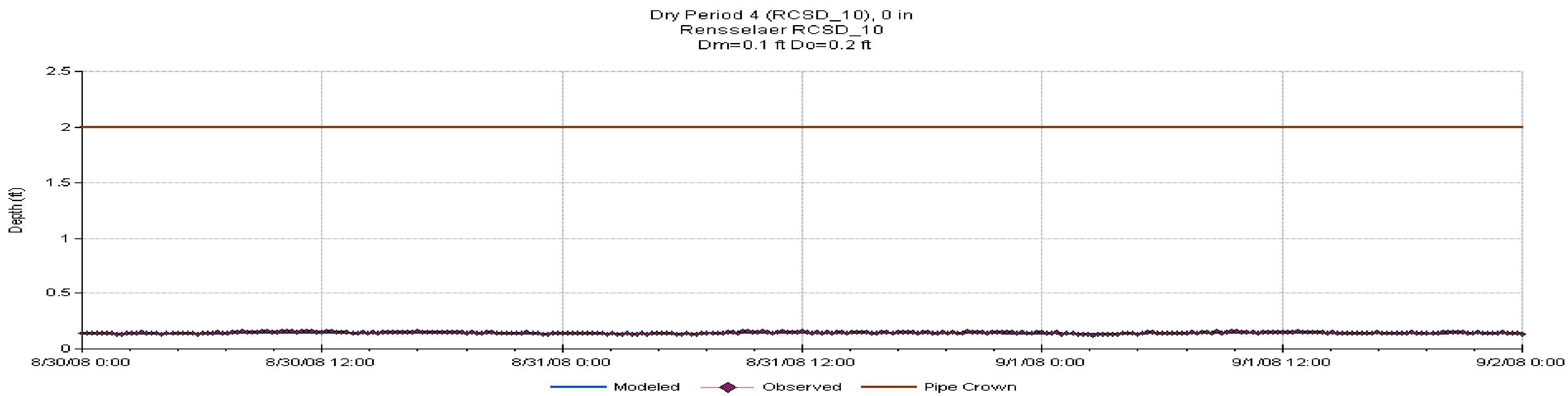

Dry Period 3 (RCSD_20), 0 in
Rensselaer RCSD_10
Vm=0.36 MG Vo=0.04 MG; Qm=0.1 cfs Qo=0.2 cfs
Flowrate (cfs)
0.2
0.15
0.1
0.05
0
8/24/08 0:00
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
Modeled
Observed


Dry Period 3 (RCSD_20), 0 in
Rensselaer RCSD_10
Vm=1.2 ft/s Vo=1.5 ft/s
Velocity (ft/s)
1.75
1.5
1.25
1
0.75
0.5
0.25
0
8/24/08 0:00
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
Modeled
Observed

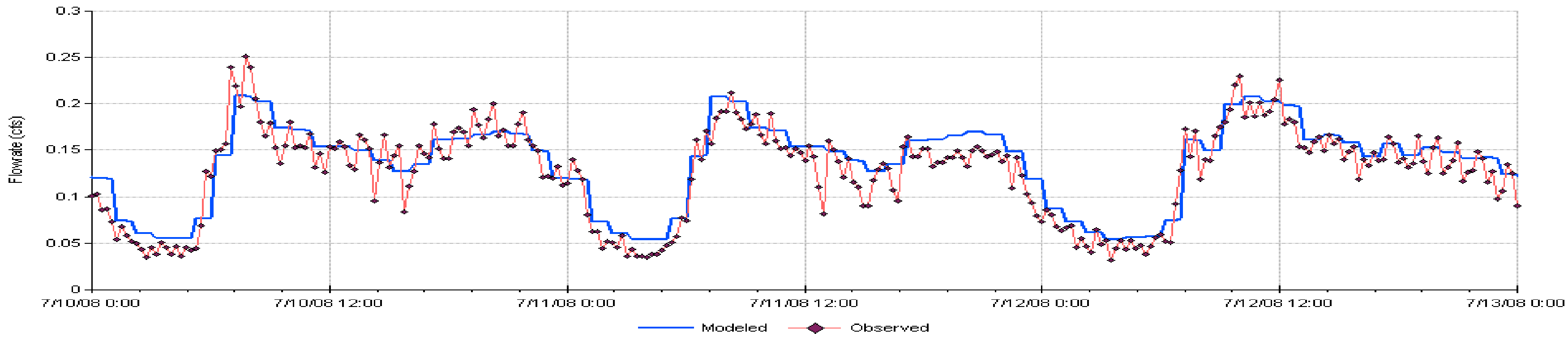

Dry Period 3 (RCSD_20), 0 in
Rensselaer RCSD_10
Dm=0.1 ft Do=0.2 ft
Depth (ft)
2.5
2
1.5
1
0.5
0
8/24/08 0:00
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
Modeled
Observed
Pipe Crown


Dry Period 4 (RCSD_10), 0 in
Rensselaer RCSD_10
Vm=0.27 MG Vo=0.26 MG; Qm=0.2 cfs Qo=0.2 cfs
Flowrate (cfs)
0.175
0.15
0.125
0.1
0.075
0.05
0.025
0
8/30/08 0:00
8/30/08 12:00
8/31/08 0:00
8/31/08 12:00
9/1/08 0:00
9/1/08 12:00
9/2/08 0:00
Modeled
Observed

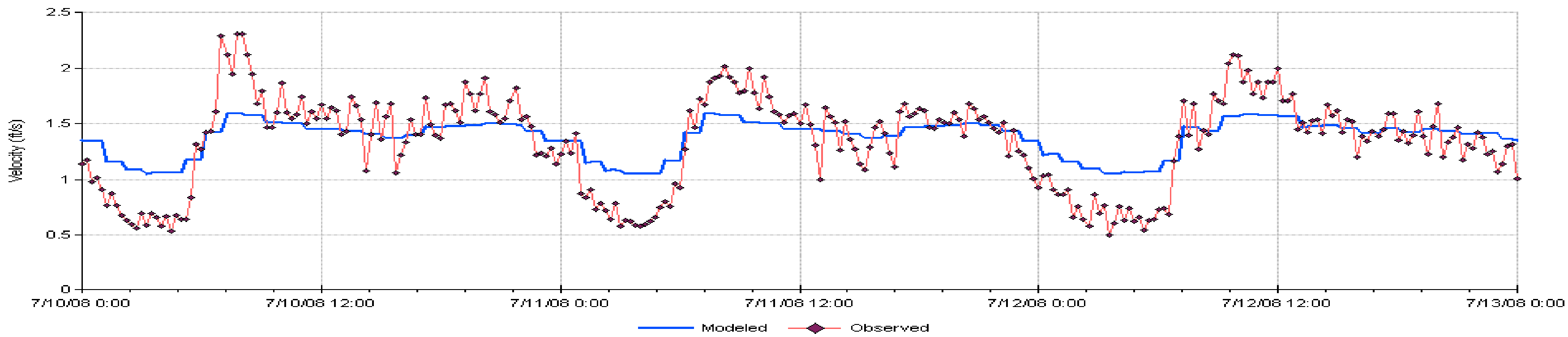

Dry Period 4 (RCSD_10), 0 in
Rensselaer RCSD_10
Vm=1.2 ft/s Vo=1.4 ft/s
Velocity (ft/s)
1.75
1.5
1.25
1
0.75
0.5
0.25
0
8/30/08 0:00
8/30/08 12:00
8/31/08 0:00
8/31/08 12:00
9/1/08 0:00
9/1/08 12:00
9/2/08 0:00
Modeled
Observed


Dry Period 4 (RCSD_10), 0 in
Rensselaer RCSD_10
Dm=0.1 ft Do=0.2 ft
Depth (ft)
2.5
2
1.5
1
0.5
0
8/30/08 0:00
8/30/08 12:00
8/31/08 0:00
8/31/08 12:00
9/1/08 0:00
9/1/08 12:00
9/2/08 0:00
Modeled
Observed
Pipe Crown

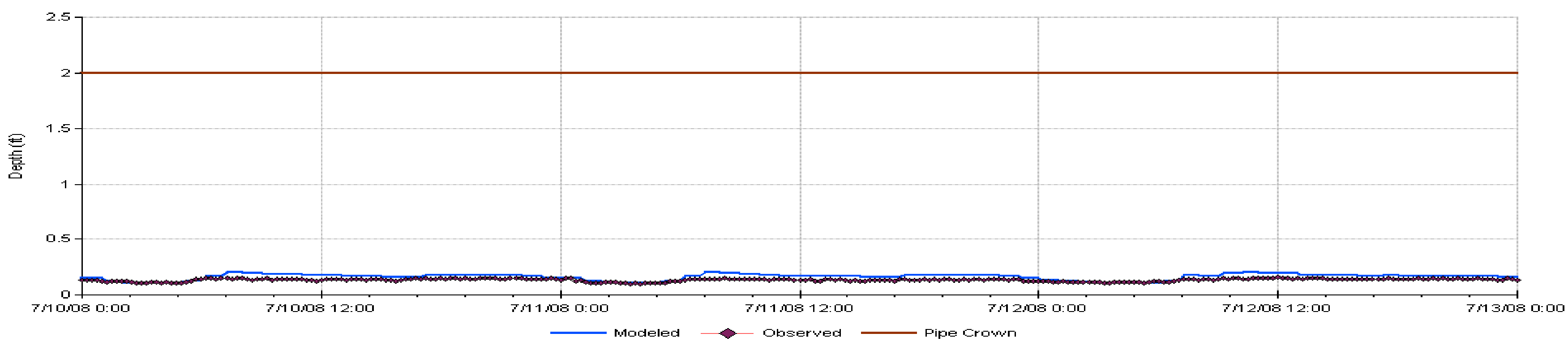
Dry Period 1 (RCSD_13), 0 in
Rensselaer RCSD_13
Vm=0.26 MG Vo=0.25 MG; Qm=0.2 cfs Qo=0.3 cfs

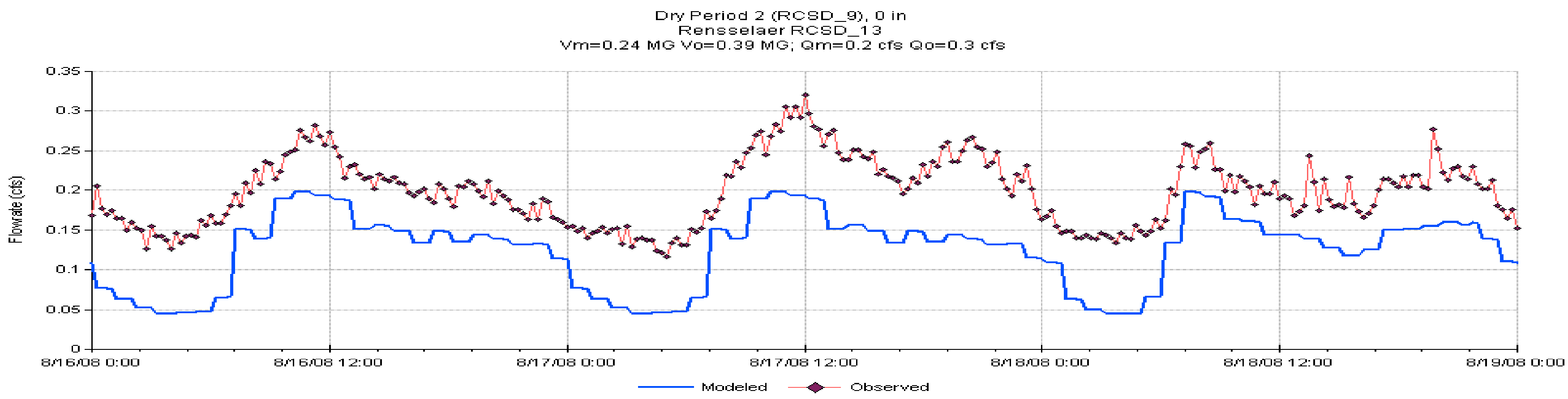


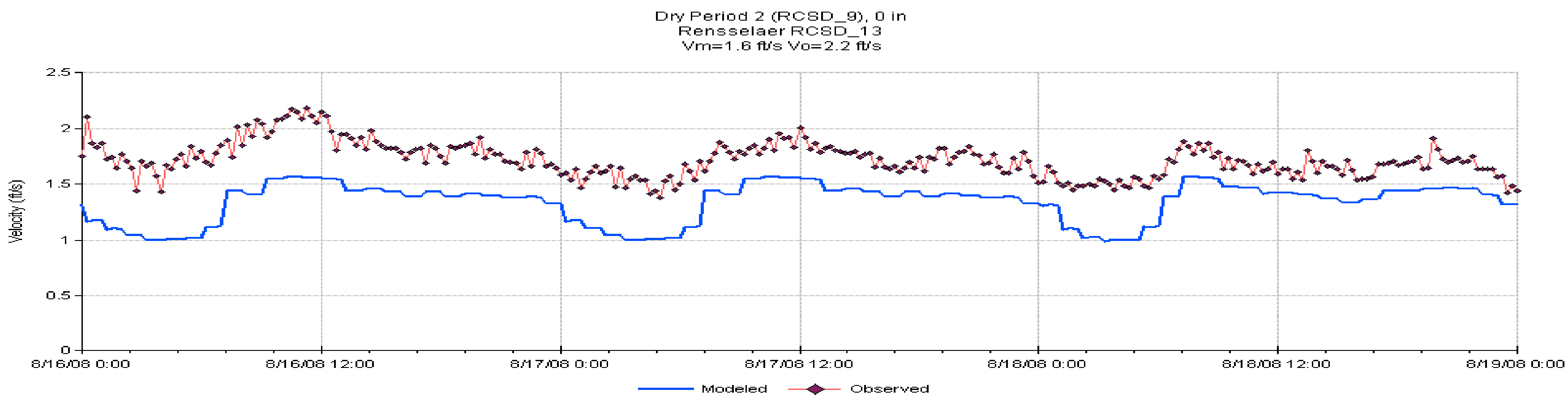
Dry Period 1 (RCSD_13), 0 in
Rensselaer RCSD_13
Vm=1.6 ft/s Vo=2.3 ft/s

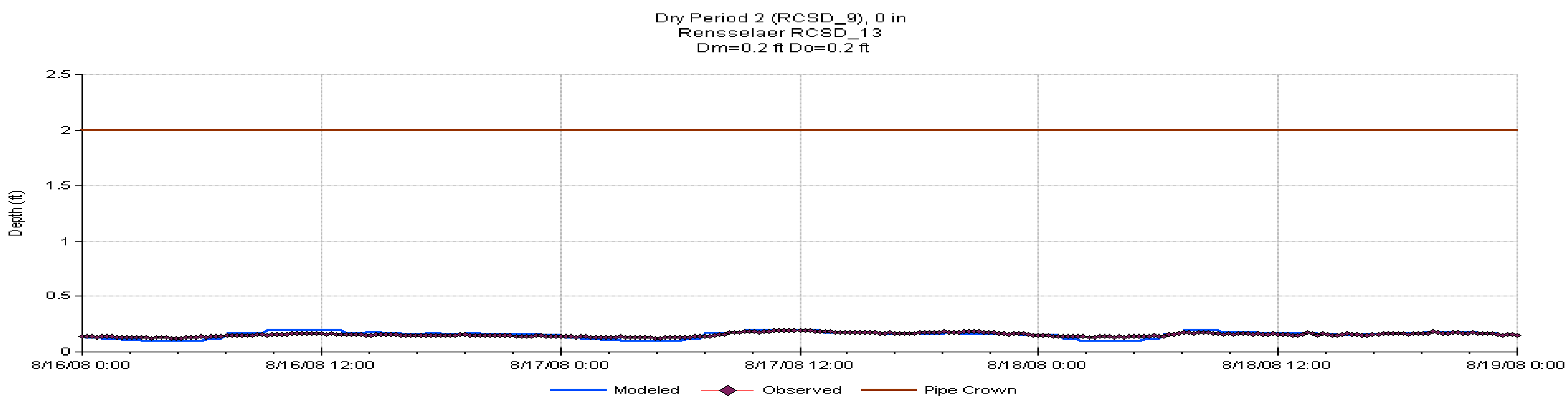


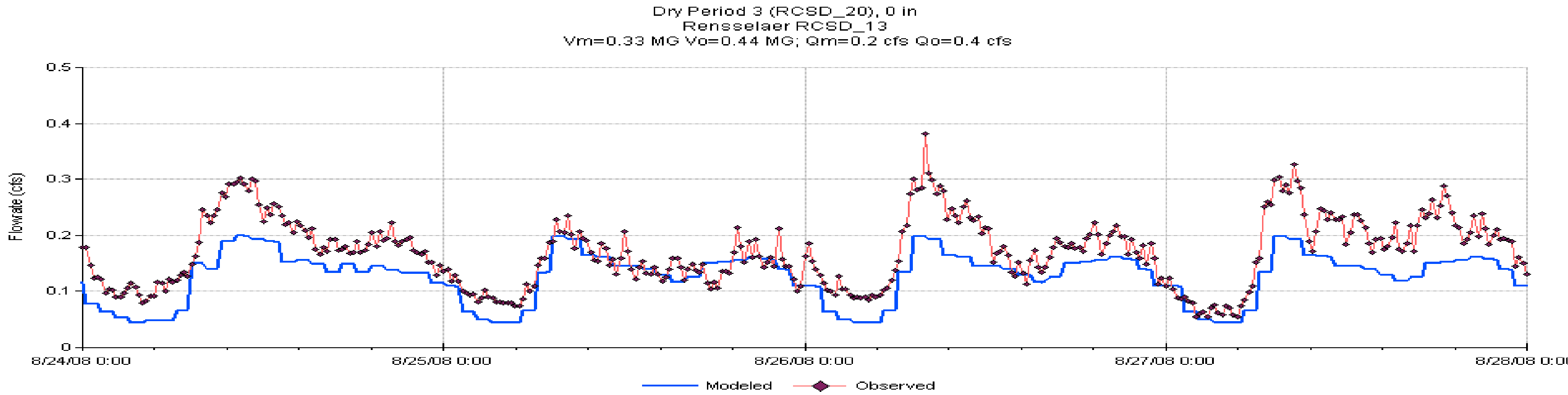
Dry Period 1 (RCSD_13), 0 in
Rensselaer RCSD_13
Dm=0.2 ft Do=0.2 ft

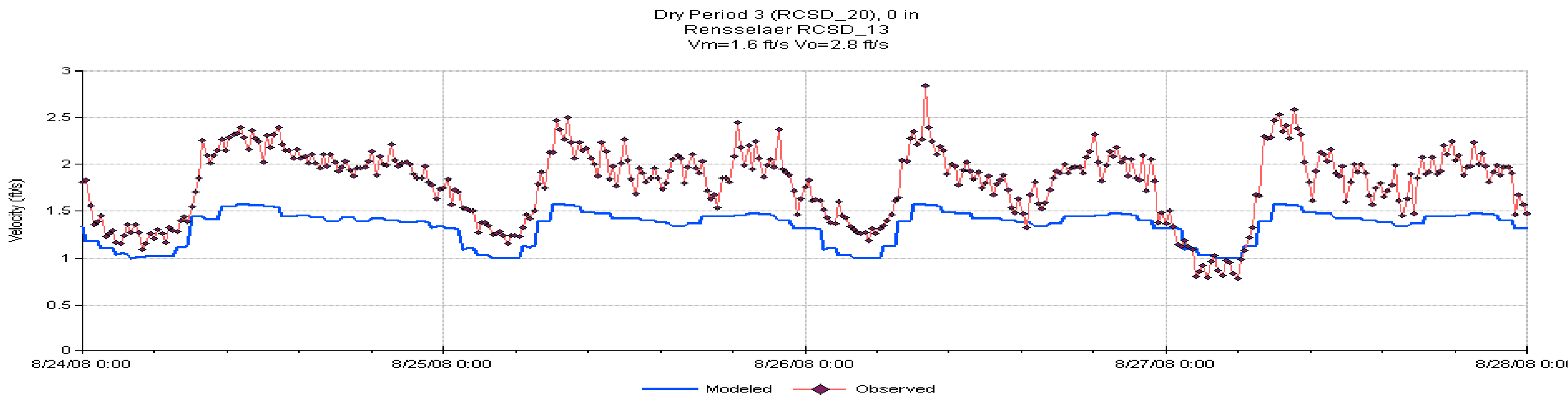


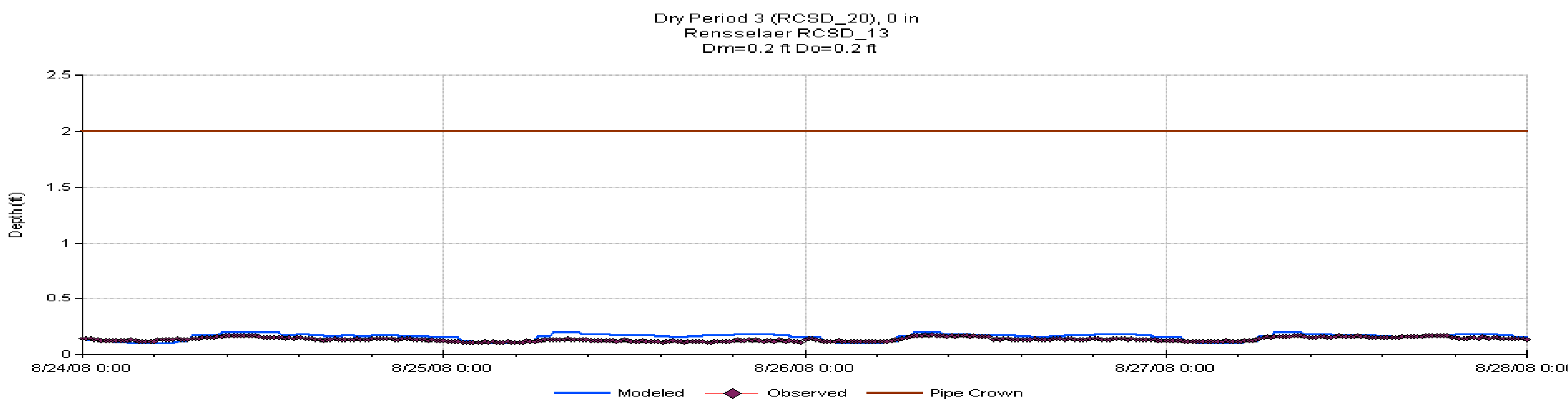

Dry Period 2 (RCSD_9), 0 in
Rensselaer RCSD_13
Vm=0.24 MG Vo=0.39 MG; Qm=0.2 cfs Qo=0.3 cfs
Flowrate (cfs)
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
8/16/08 0:00
8/16/08 12:00
8/17/08 0:00
8/17/08 12:00
8/18/08 0:00
8/18/08 12:00
8/19/08 0:00
Modeled
Observed

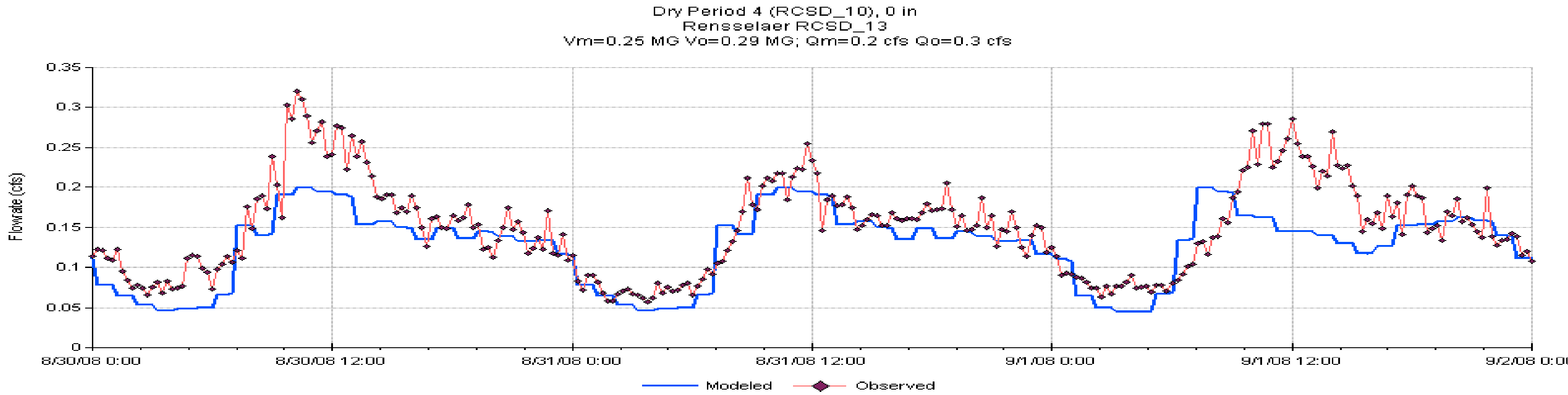

Dry Period 2 (RCSD_9), 0 in
Rensselaer RCSD_13
Vm=1.6 ft/s Vo=2.2 ft/s
Velocity (ft/s)
2.5
2
1.5
1
0.5
0
8/16/08 0:00
8/16/08 12:00
8/17/08 0:00
8/17/08 12:00
8/18/08 0:00
8/18/08 12:00
8/19/08 0:00
Modeled
Observed

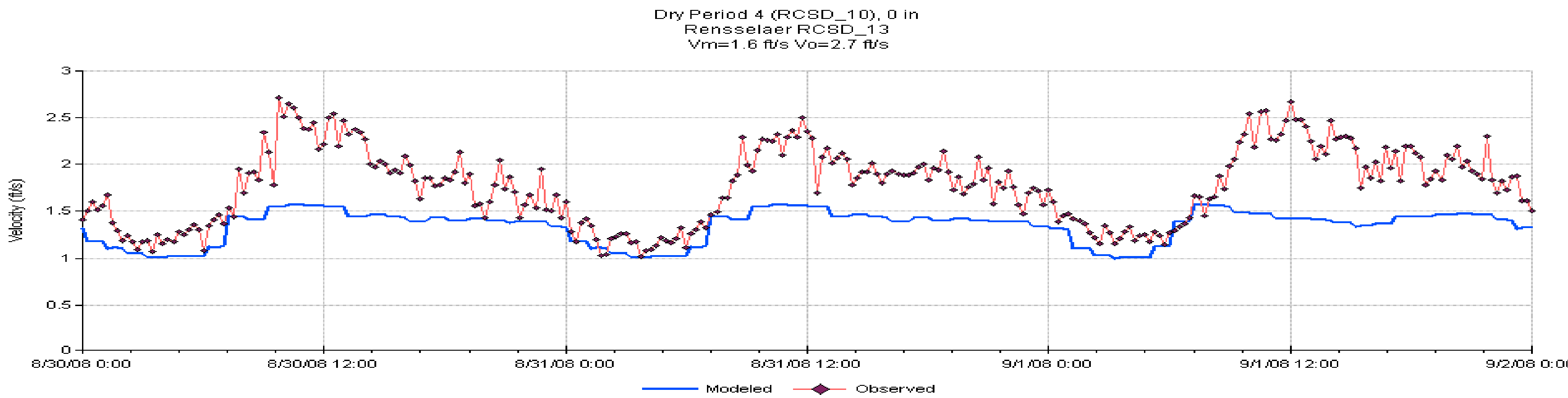

Dry Period 2 (RCSD_9), 0 in
Rensselaer RCSD_13
Dm=0.2 ft Do=0.2 ft
Depth (ft)
2.5
2
1.5
1
0.5
0
8/16/08 0:00
8/16/08 12:00
8/17/08 0:00
8/17/08 12:00
8/18/08 0:00
8/18/08 12:00
8/19/08 0:00
Modeled
Observed
Pipe Crown

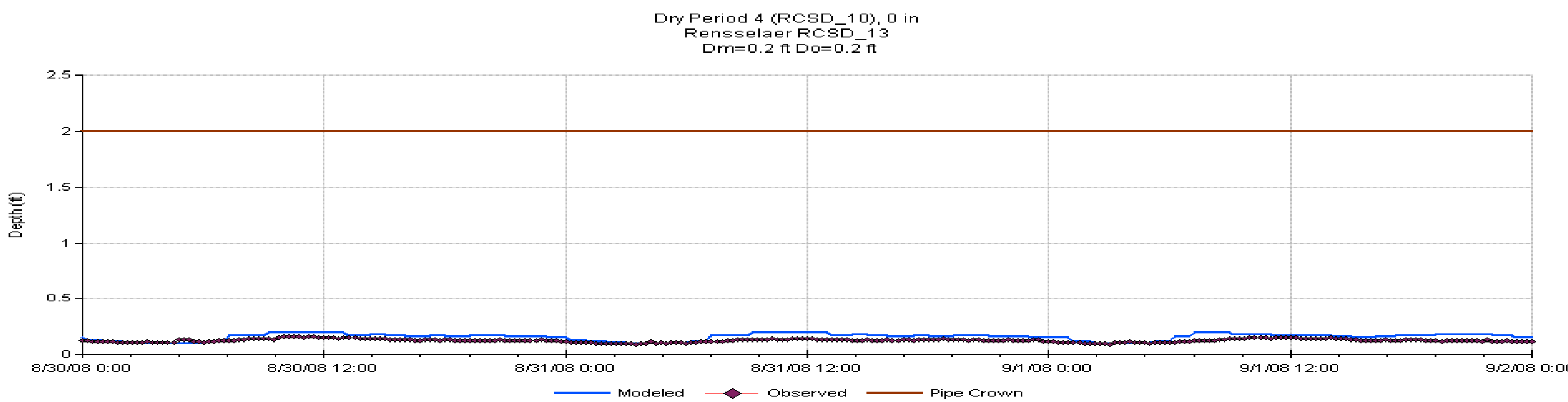

Dry Period 3 (RCSD_20), 0 in
Rensselaer RCSD_13
Vm=0.33 MG Vo=0.44 MG; Qm=0.2 cfs Qo=0.4 cfs
Flowrate (cfs)
0.5
0.4
0.3
0.2
0.1
0
8/24/08 0:00
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
Modeled
Observed

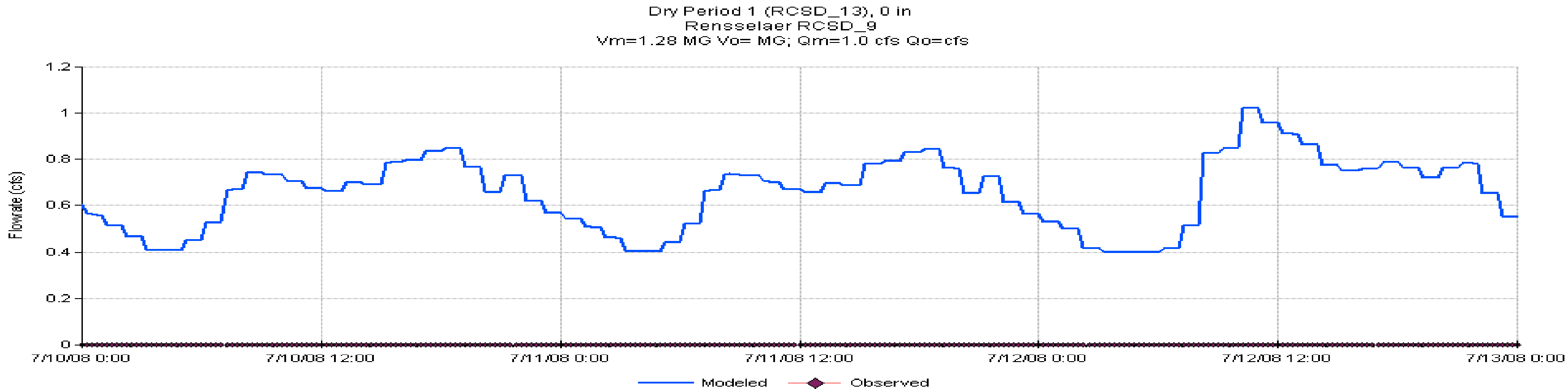

Dry Period 3 (RCSD_20), 0 in
Rensselaer RCSD_13
Vm=1.6 ft/s Vo=2.8 ft/s
Velocity (ft/s)
3
2.5
2
1.5
1
0.5
0
8/24/08 0:00
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
Modeled
Observed

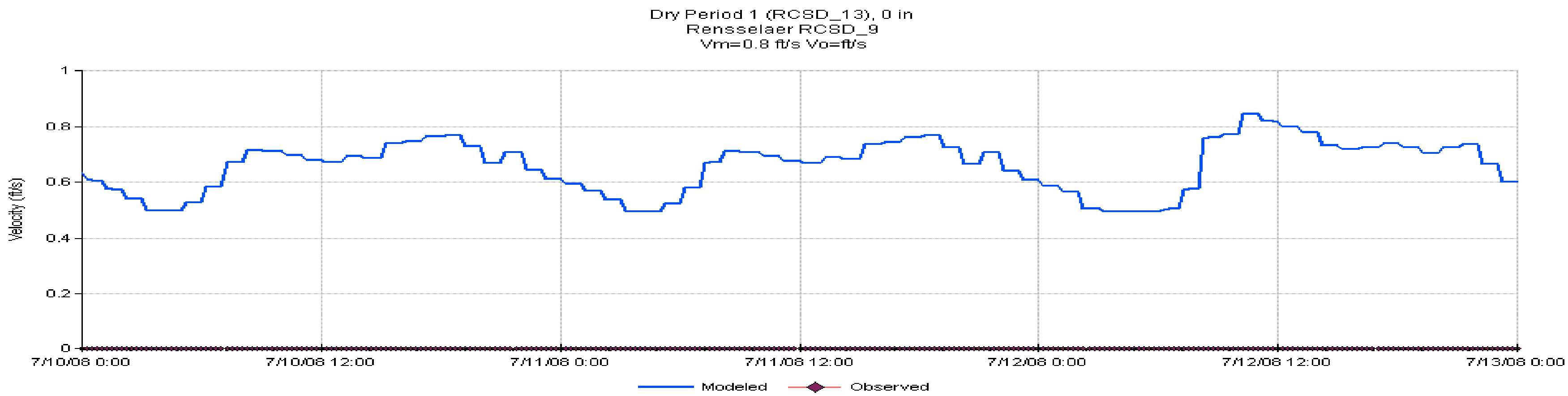

Dry Period 3 (RCSD_20), 0 in
Rensselaer RCSD_13
Dm=0.2 ft Do=0.2 ft
Depth (ft)
2.5
2
1.5
1
0.5
0
8/24/08 0:00
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
Modeled
Observed
Pipe Crown

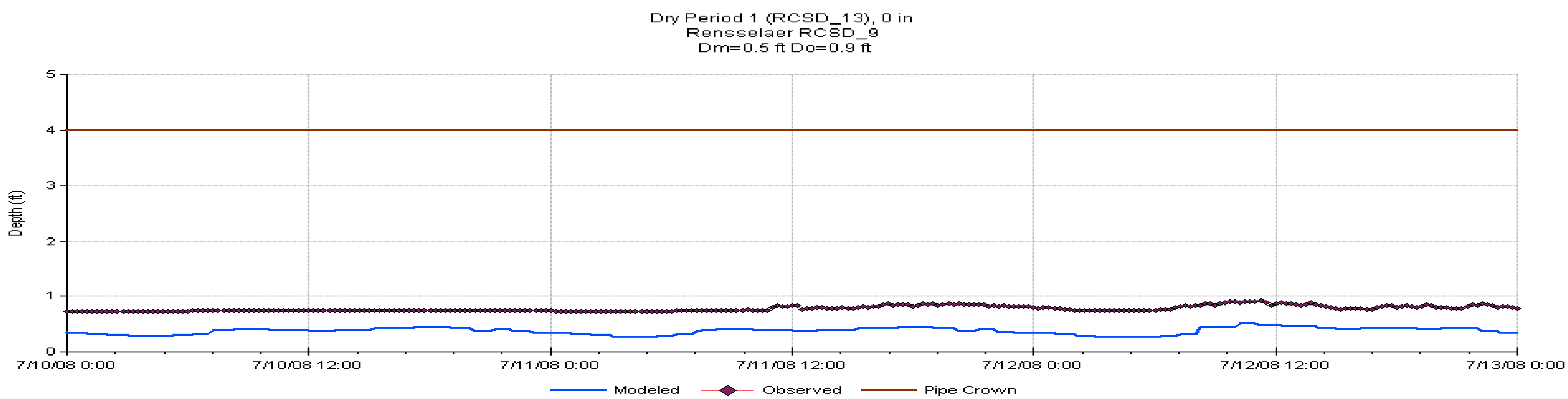

Dry Period 4 (RCSD_10), 0 in
Rensselaer RCSD_13
Vm=0.25 MG Vo=0.29 MG; Qm=0.2 cfs Qo=0.3 cfs
Flowrate (cfs)
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
8/30/08 0:00
8/30/08 12:00
8/31/08 0:00
8/31/08 12:00
9/1/08 0:00
9/1/08 12:00
9/2/08 0:00
Modeled
Observed

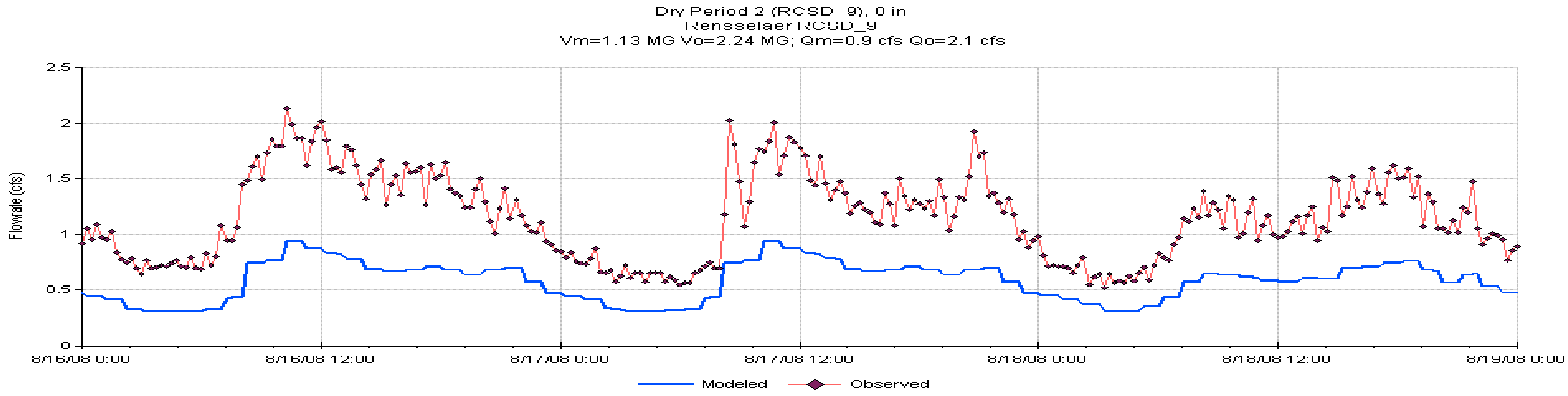

Dry Period 4 (RCSD_10), 0 in
Rensselaer RCSD_13
Vm=1.6 ft/s Vo=2.7 ft/s
Velocity (ft/s)
0
0.5
1
1.5
2
2.5
3
8/30/08 0:00
8/30/08 12:00
8/31/08 0:00
8/31/08 12:00
9/1/08 0:00
9/1/08 12:00
9/2/08 0:00
Modeled
Observed

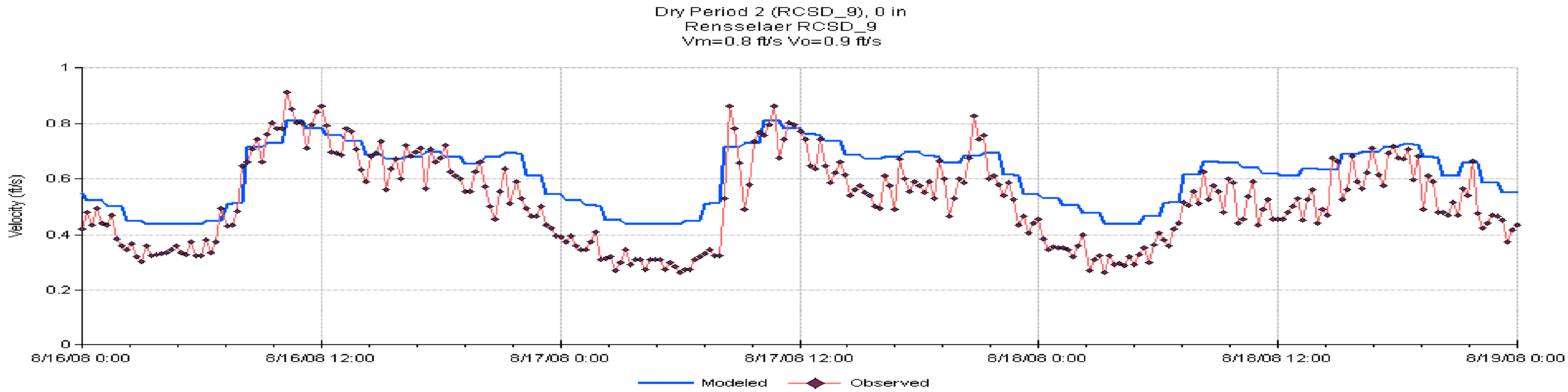

Dry Period 4 (RCSD_10), 0 in
Rensselaer RCSD_13
Dm=0.2 ft Do=0.2 ft
Depth (ft)
0
0.5
1
1.5
2
2.5
8/30/08 0:00
8/30/08 12:00
8/31/08 0:00
8/31/08 12:00
9/1/08 0:00
9/1/08 12:00
9/2/08 0:00
Modeled
Observed
Pipe Crown

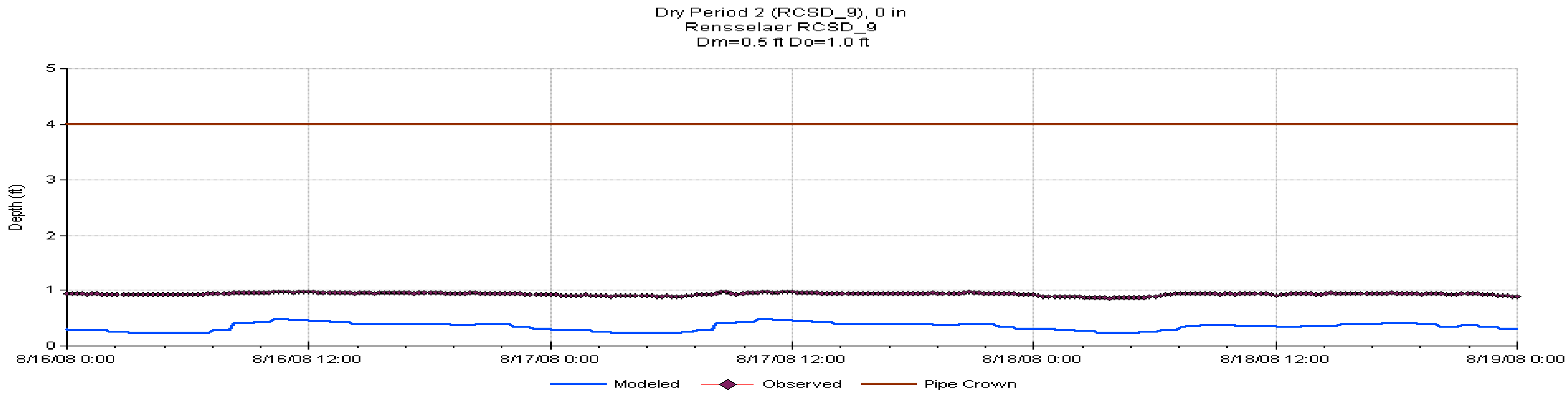

Dry Period 1 (RCSD_13), 0 in
Rensselaer RCSD_9
Vm=1.28 MG Vo= MG; Qm=1.0 cfs Qo=cfs
Flowrate (cfs)
1.2
1
0.8
0.6
0.4
0.2
0
7/10/08 0:00
7/10/08 12:00
7/11/08 0:00
7/11/08 12:00
7/12/08 0:00
7/12/08 12:00
7/13/08 0:00
Modeled
Observed

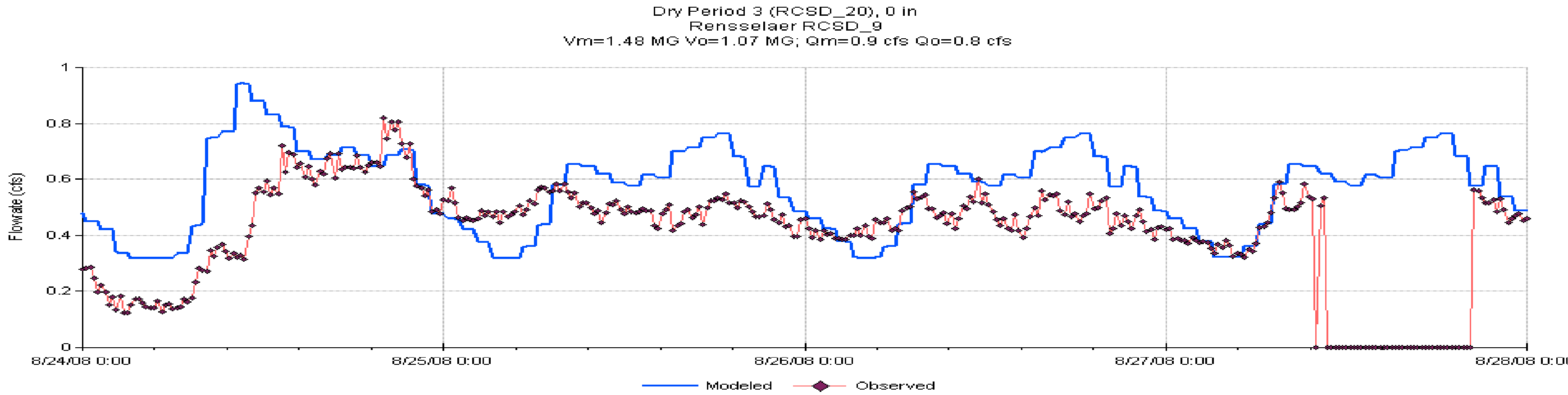

Dry Period 1 (RCSD_13), 0 in
Rensselaer RCSD_9
Vm=0.8 ft/s Vo=ft/s
Velocity (ft/s)
1
0.8
0.6
0.4
0.2
0
7/10/08 0:00
7/10/08 12:00
7/11/08 0:00
7/11/08 12:00
7/12/08 0:00
7/12/08 12:00
7/13/08 0:00
Modeled
Observed

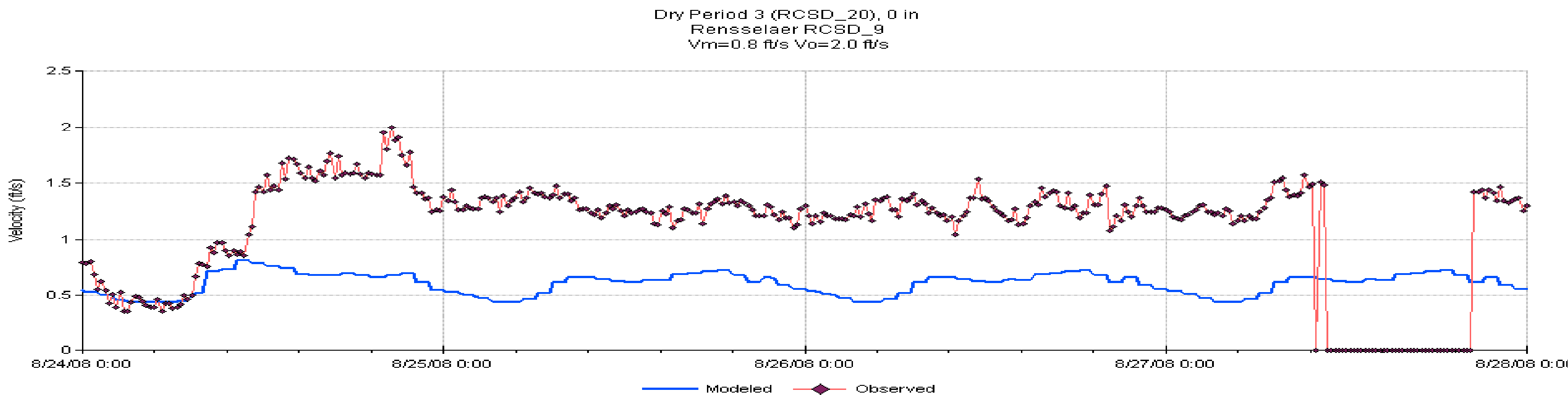

Dry Period 1 (RCSD_13), 0 in
Rensselaer RCSD_9
Dm=0.5 ft Do=0.9 ft
Depth (ft)
5
4
3
2
1
0
7/10/08 0:00
7/10/08 12:00
7/11/08 0:00
7/11/08 12:00
7/12/08 0:00
7/12/08 12:00
7/13/08 0:00
Modeled
Observed
Pipe Crown

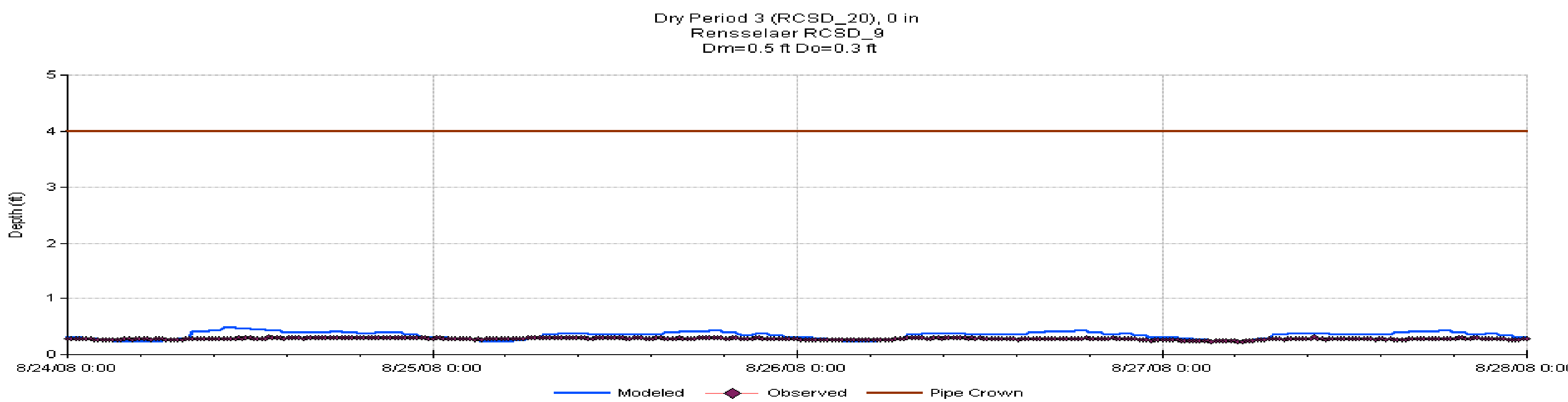

Dry Period 2 (RCSD_9), 0 in
Rensselaer RCSD_9
Vm=1.13 MG Vo=2.24 MG; Qm=0.9 cfs Qo=2.1 cfs
Flowrate (cfs)
2.5
2
1.5
1
0.5
0
8/16/08 0:00
8/16/08 12:00
8/17/08 0:00
8/17/08 12:00
8/18/08 0:00
8/18/08 12:00
8/19/08 0:00
Modeled
Observed

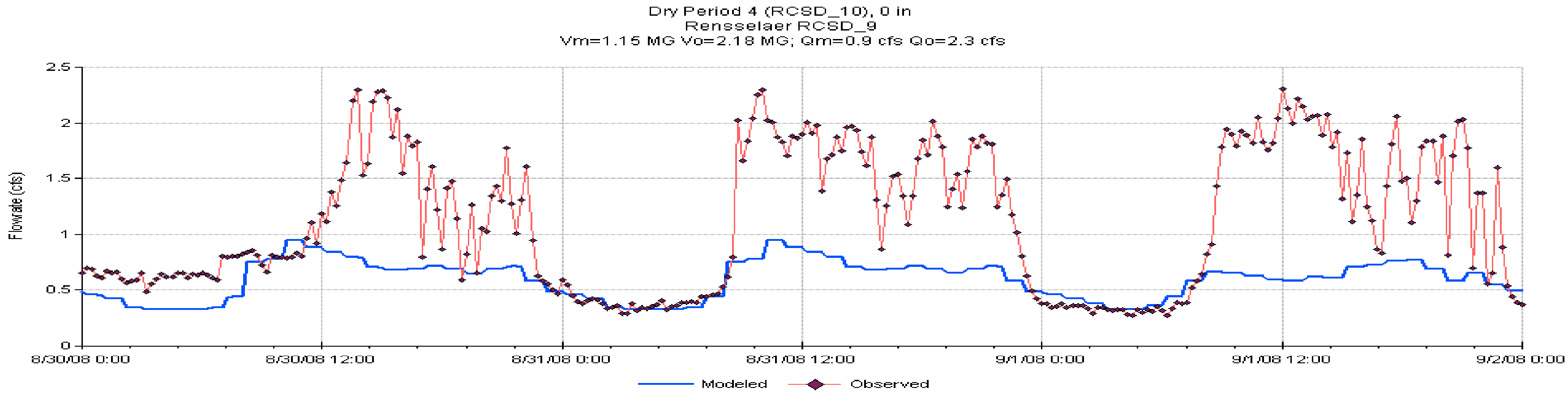

Dry Period 2 (RCSD_9), 0 in
Rensselaer RCSD_9
Vm=0.8 ft/s Vo=0.9 ft/s
Velocity (ft/s)
1
0.8
0.6
0.4
0.2
0
8/16/08 0:00
8/16/08 12:00
8/17/08 0:00
8/17/08 12:00
8/18/08 0:00
8/18/08 12:00
8/19/08 0:00
Modeled
Observed

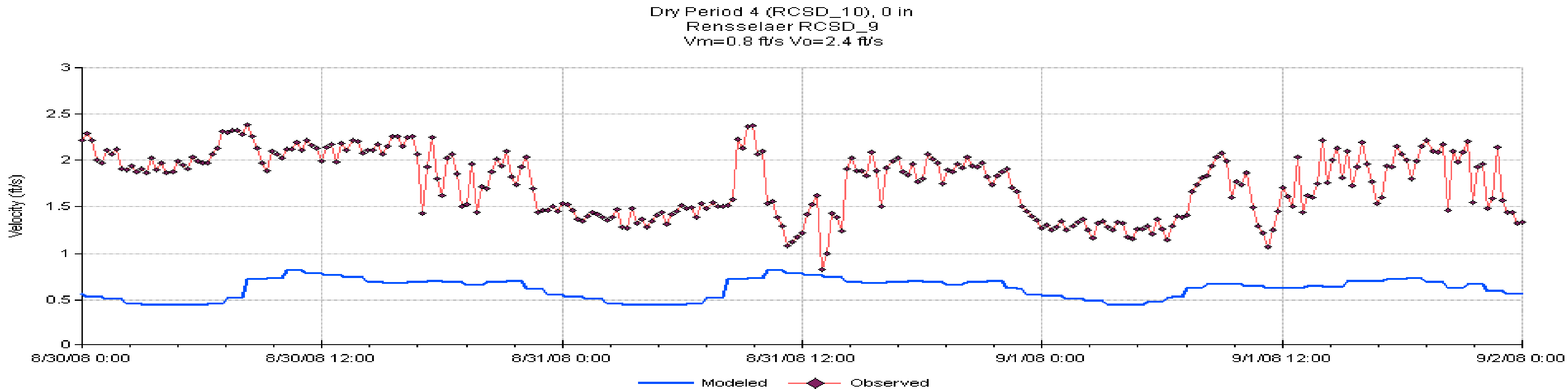

Dry Period 2 (RCSD_9), 0 in
Rensselaer RCSD_9
Dm=0.5 ft Do=1.0 ft
Depth (ft)
5
4
3
2
1
0
8/16/08 0:00
8/16/08 12:00
8/17/08 0:00
8/17/08 12:00
8/18/08 0:00
8/18/08 12:00
8/19/08 0:00
Modeled
Observed
Pipe Crown

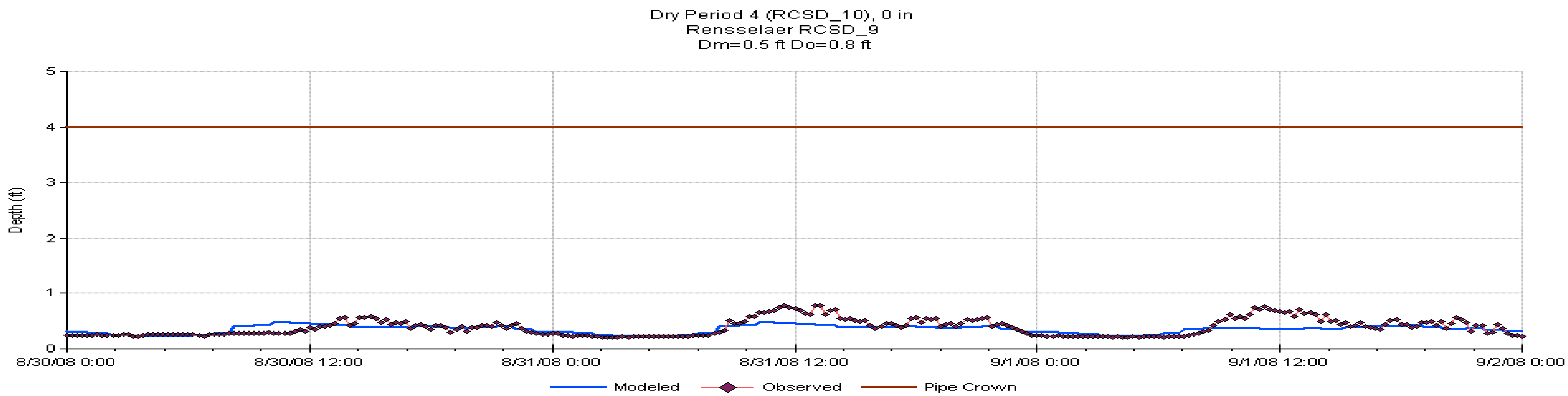

Dry Period 3 (RCSD_20), 0 in
Rensselaer RCSD_9
Vm=1.48 MG Vo=1.07 MG; Qm=0.9 cfs Qo=0.8 cfs
Flowrate (cfs)
1
0.8
0.6
0.4
0.2
0
8/24/08 0:00
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
Modeled
Observed

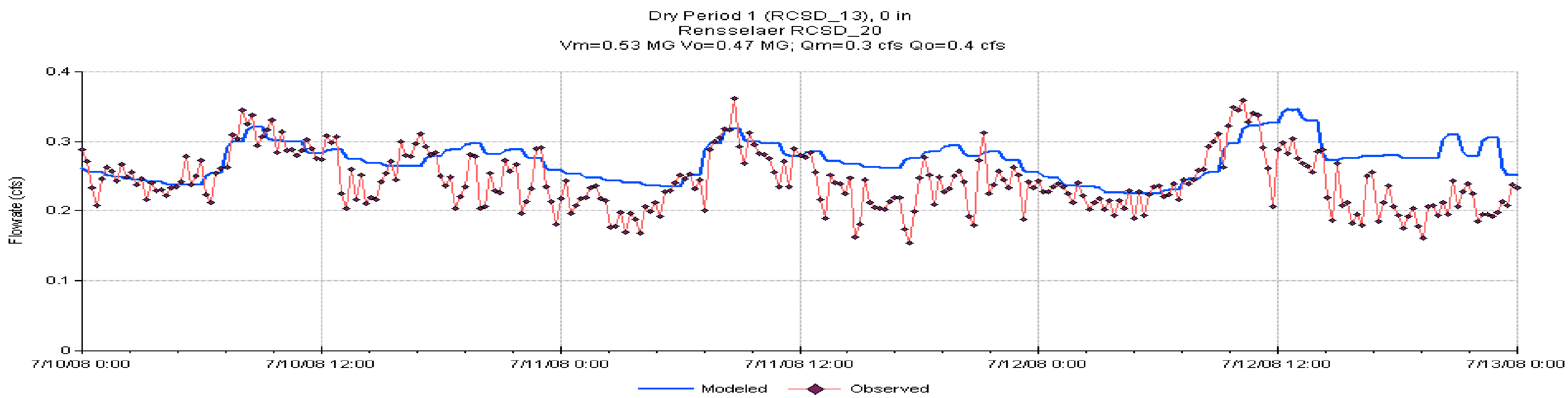

Dry Period 3 (RCSD_20), 0 in
Rensselaer RCSD_9
Vm=0.8 ft/s Vo=2.0 ft/s
Velocity (ft/s)
2.5
2
1.5
1
0.5
0
8/24/08 0:00
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
Modeled
Observed

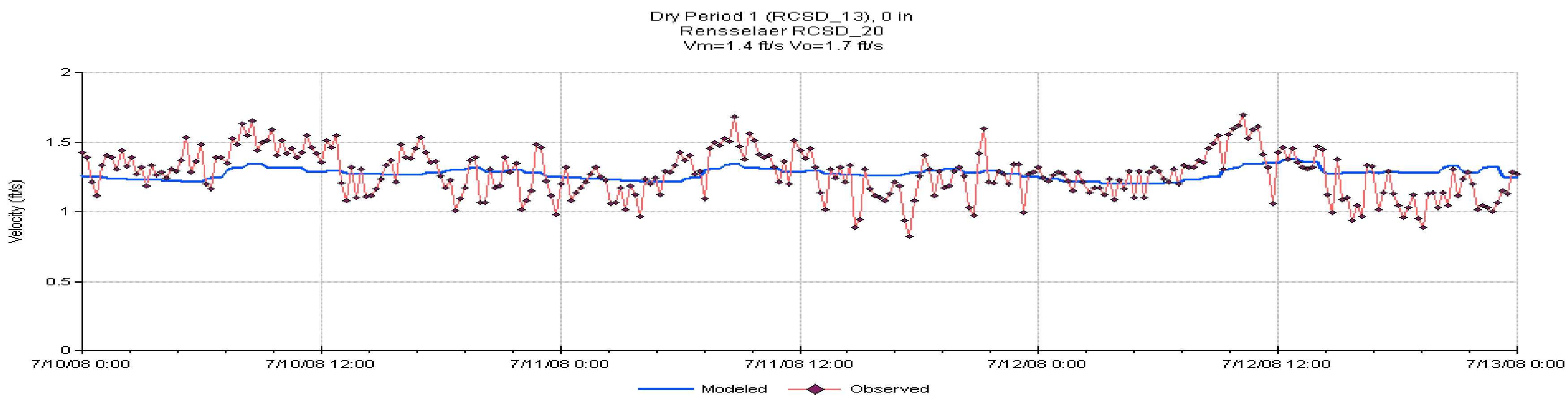

Dry Period 3 (RCSD_20), 0 in
Rensselaer RCSD_9
Dm=0.5 ft Do=0.3 ft
Depth (ft)
5
4
3
2
1
0
8/24/08 0:00
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
Modeled
Observed
Pipe Crown

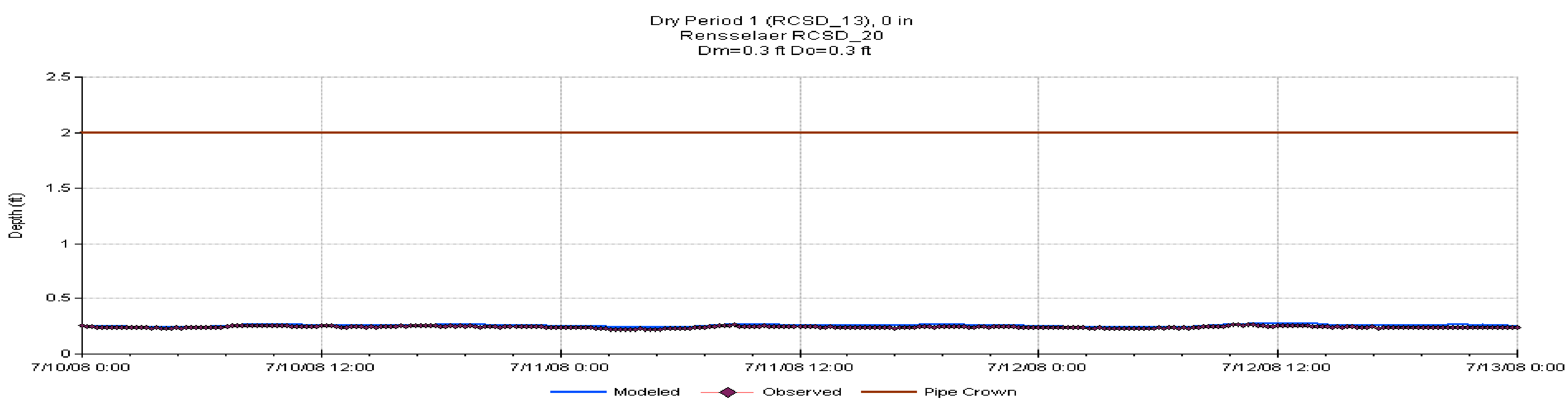

Dry Period 4 (RCSD_10), 0 in
Rensselaer RCSD_9
Vm=1.15 MG Vo=2.18 MG; Qm=0.9 cfs Qo=2.3 cfs
Flowrate (cfs)
8/30/08 0:00
8/30/08 12:00
8/31/08 0:00
8/31/08 12:00
9/1/08 0:00
9/1/08 12:00
9/2/08 0:00
Modeled
Observed

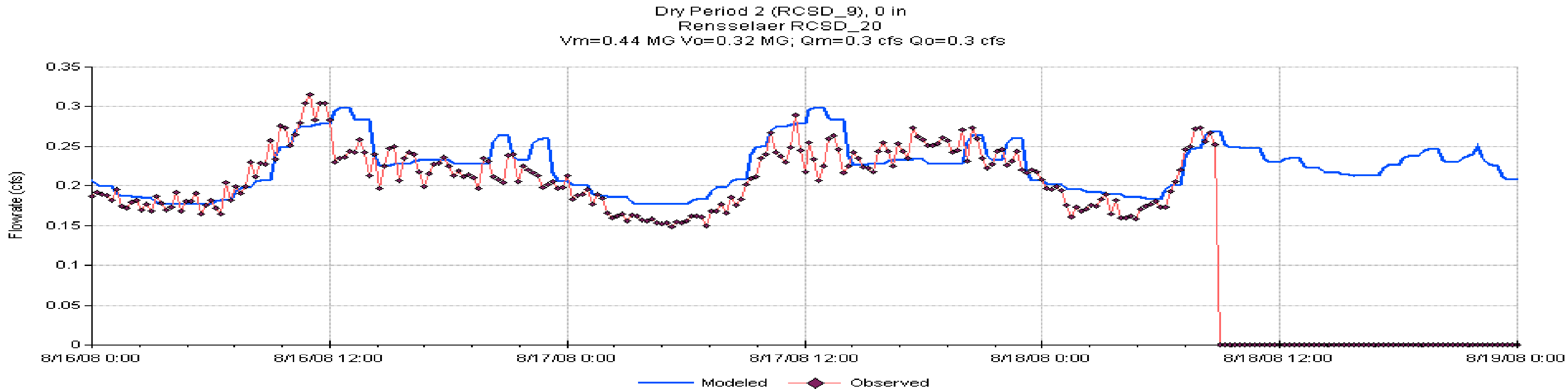

Dry Period 4 (RCSD_10), 0 in
Rensselaer RCSD_9
Vm=0.8 ft/s Vo=2.4 ft/s
Velocity (ft/s)
8/30/08 0:00
8/30/08 12:00
8/31/08 0:00
8/31/08 12:00
9/1/08 0:00
9/1/08 12:00
9/2/08 0:00
Modeled
Observed

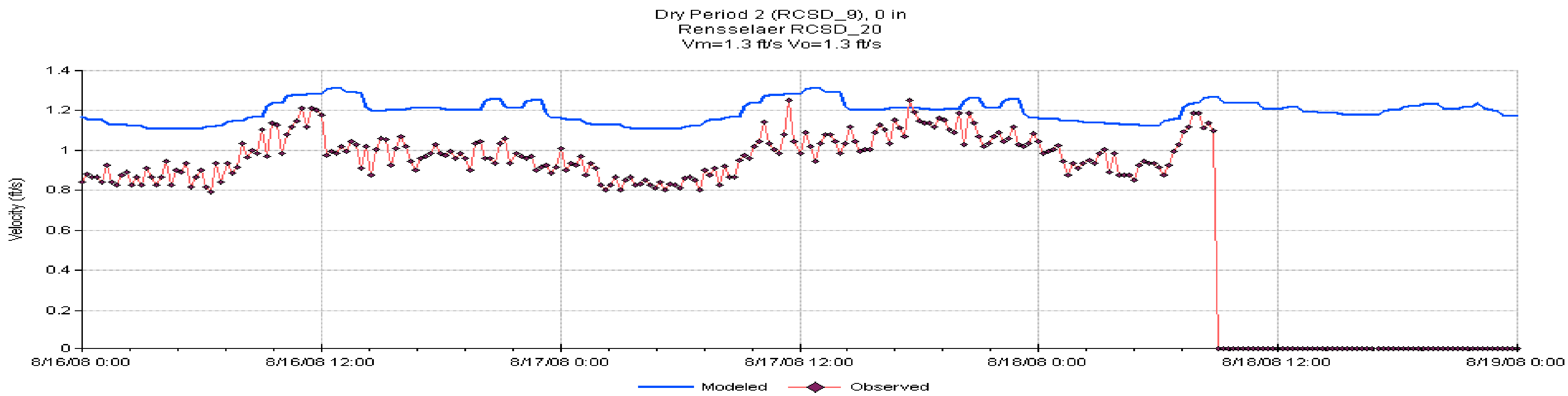

Dry Period 4 (RCSD_10), 0 in
Rensselaer RCSD_9
Dm=0.5 ft Do=0.8 ft
Depth (ft)
8/30/08 0:00
8/30/08 12:00
8/31/08 0:00
8/31/08 12:00
9/1/08 0:00
9/1/08 12:00
9/2/08 0:00
Modeled
Observed
Pipe Crown

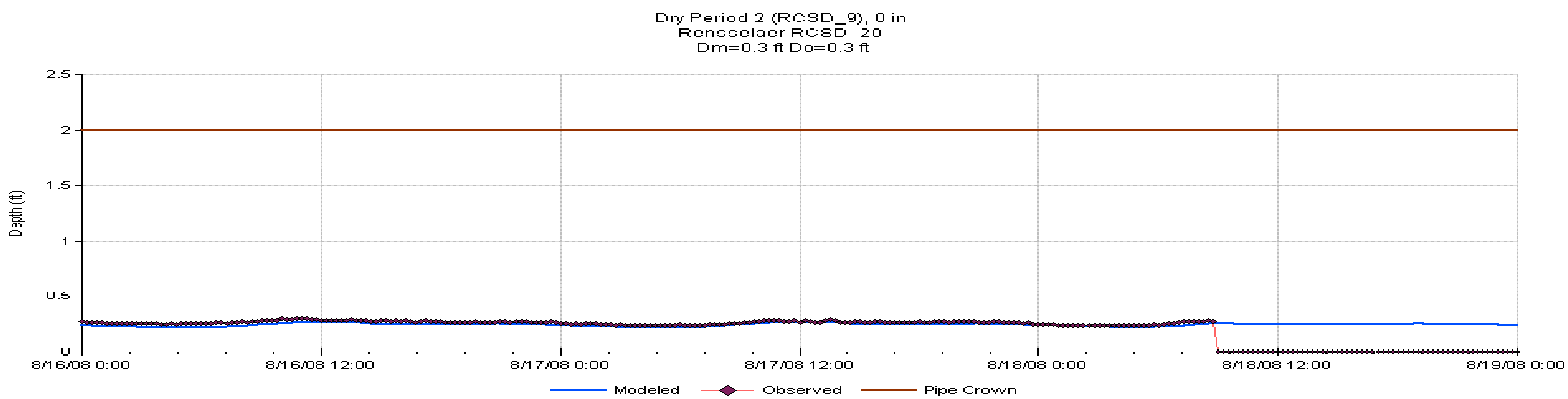

Dry Period 1 (RCSD_13), 0 in
Rensselaer RCSD_20
Vm=0.53 MG Vo=0.47 MG; Qm=0.3 cfs Qo=0.4 cfs
Flowrate (cfs)
0.4
0.3
0.2
0.1
0
7/10/08 0:00
7/10/08 12:00
7/11/08 0:00
7/11/08 12:00
7/12/08 0:00
7/12/08 12:00
7/13/08 0:00
Modeled
Observed

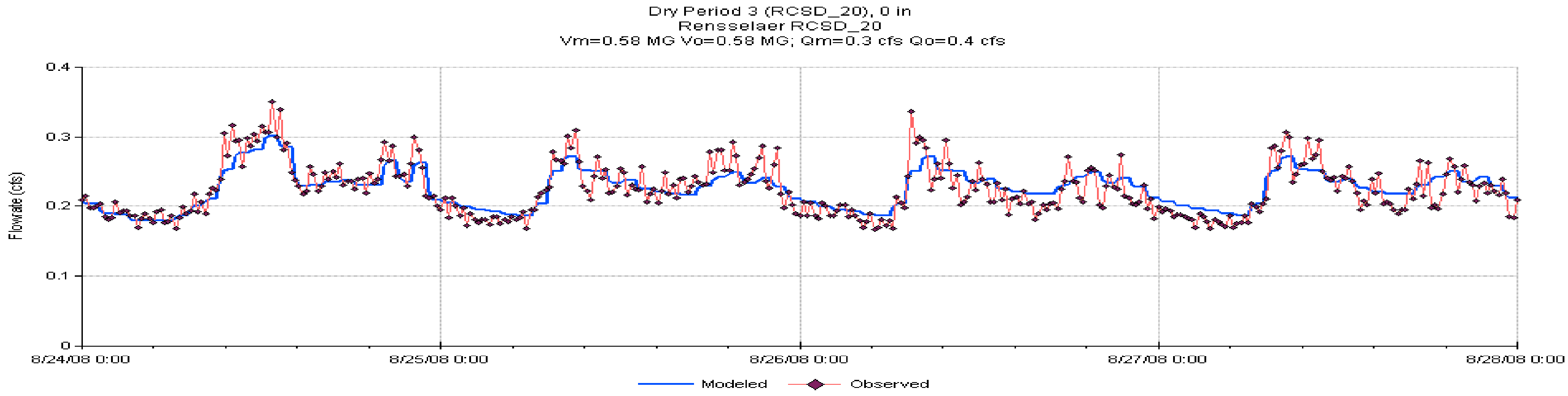

Dry Period 1 (RCSD_13), 0 in
Rensselaer RCSD_20
Vm=1.4 ft/s Vo=1.7 ft/s
Velocity (ft/s)
2
1.5
1
0.5
0
7/10/08 0:00
7/10/08 12:00
7/11/08 0:00
7/11/08 12:00
7/12/08 0:00
7/12/08 12:00
7/13/08 0:00
Modeled
Observed


Dry Period 1 (RCSD_13), 0 in
Rensselaer RCSD_20
Dm=0.3 ft Do=0.3 ft
Depth (ft)
2.5
2
1.5
1
0.5
0
7/10/08 0:00
7/10/08 12:00
7/11/08 0:00
7/11/08 12:00
7/12/08 0:00
7/12/08 12:00
7/13/08 0:00
Modeled
Observed
Pipe Crown

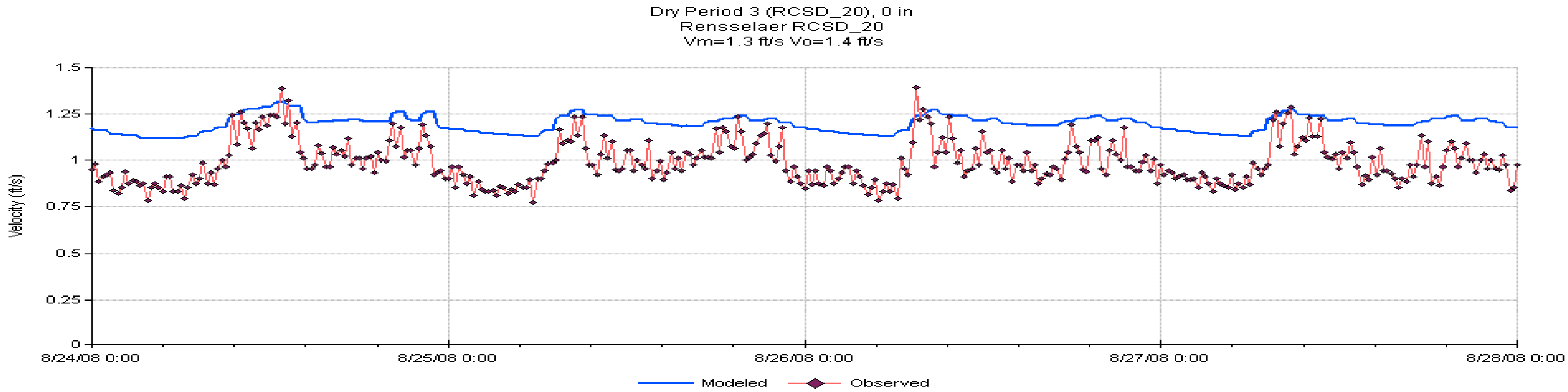

Dry Period 2 (RCSD_9), 0 in
Rensselaer RCSD_20
Vm=0.44 MG Vo=0.32 MG; Qm=0.3 cfs Qo=0.3 cfs
Flowrate (cfs)
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
8/16/08 0:00
8/16/08 12:00
8/17/08 0:00
8/17/08 12:00
8/18/08 0:00
8/18/08 12:00
8/19/08 0:00
Modeled
Observed


Dry Period 2 (RCSD_9), 0 in
Rensselaer RCSD_20
Vm=1.3 ft/s Vo=1.3 ft/s
Velocity (ft/s)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
8/16/08 0:00
8/16/08 12:00
8/17/08 0:00
8/17/08 12:00
8/18/08 0:00
8/18/08 12:00
8/19/08 0:00
Modeled
Observed

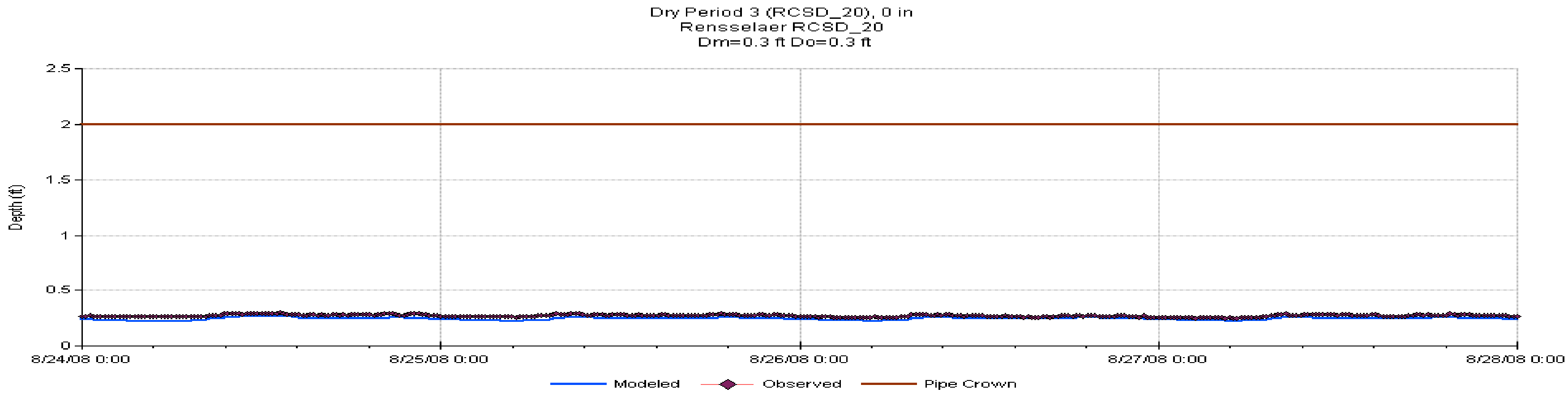

Dry Period 2 (RCSD_9), 0 in
Rensselaer RCSD_20
Dm=0.3 ft Do=0.3 ft
Depth (ft)
2.5
2
1.5
1
0.5
0
8/16/08 0:00
8/16/08 12:00
8/17/08 0:00
8/17/08 12:00
8/18/08 0:00
8/18/08 12:00
8/19/08 0:00
Modeled
Observed
Pipe Crown



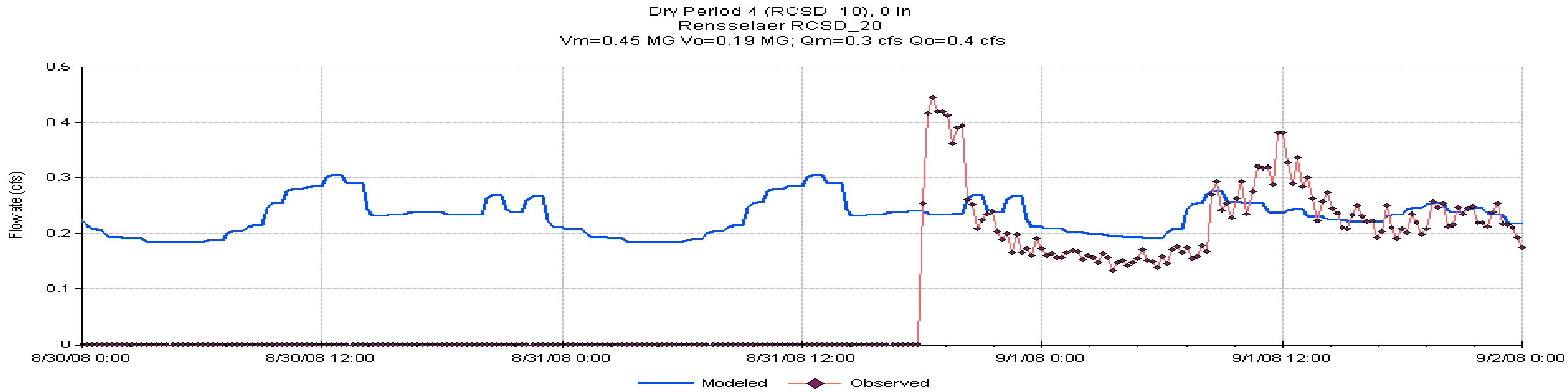
Dry Period 3 (RCSD_20), 0 in
Rensselaer RCSD_20
Vm=0.58 MG Vo=0.58 MG; Qm=0.3 cfs Qo=0.4 cfs
Flowrate (cfs)
0.4
0.3
0.2
0.1
0
8/24/08 0:00
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
Modeled
Observed

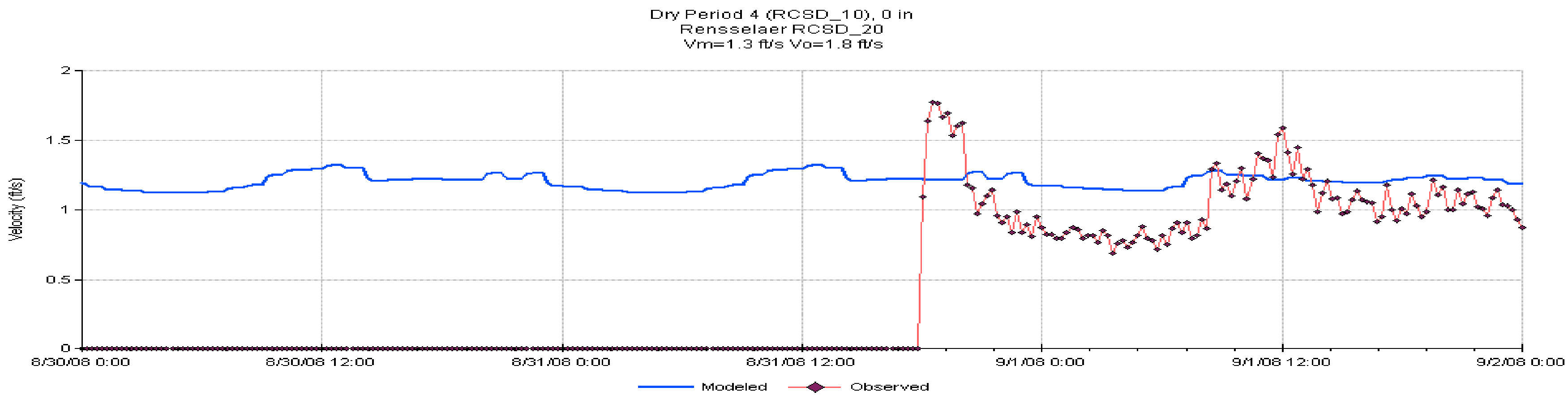


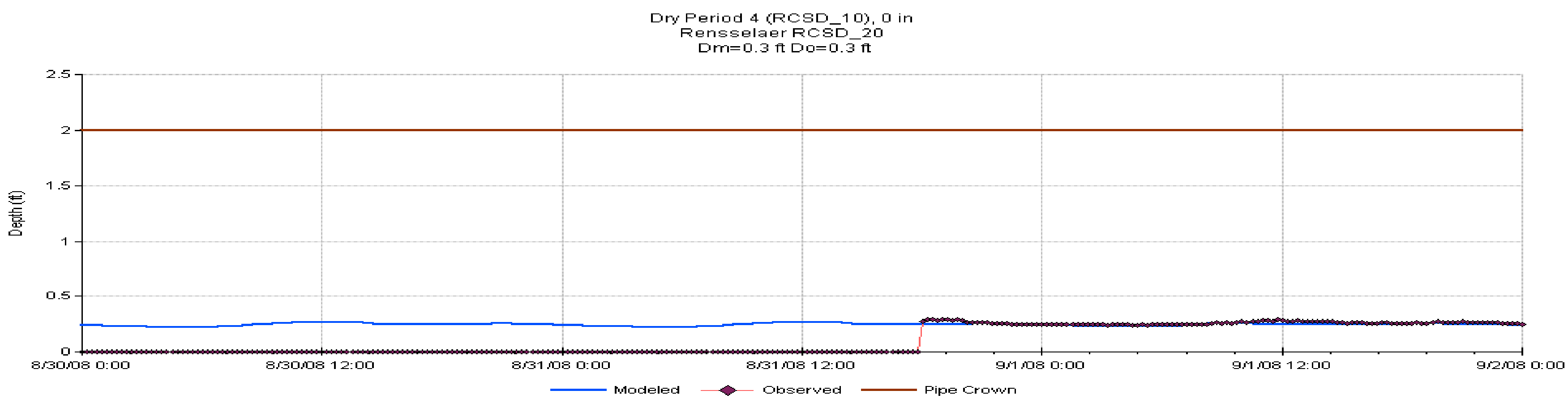
Dry Period 3 (RCSD_20), 0 in
Rensselaer RCSD_20
Vm=1.3 ft/s Vo=1.4 ft/s
Velocity (ft/s)
1.5
1.25
1
0.75
0.5
0.25
0
8/24/08 0:00
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
Modeled
Observed

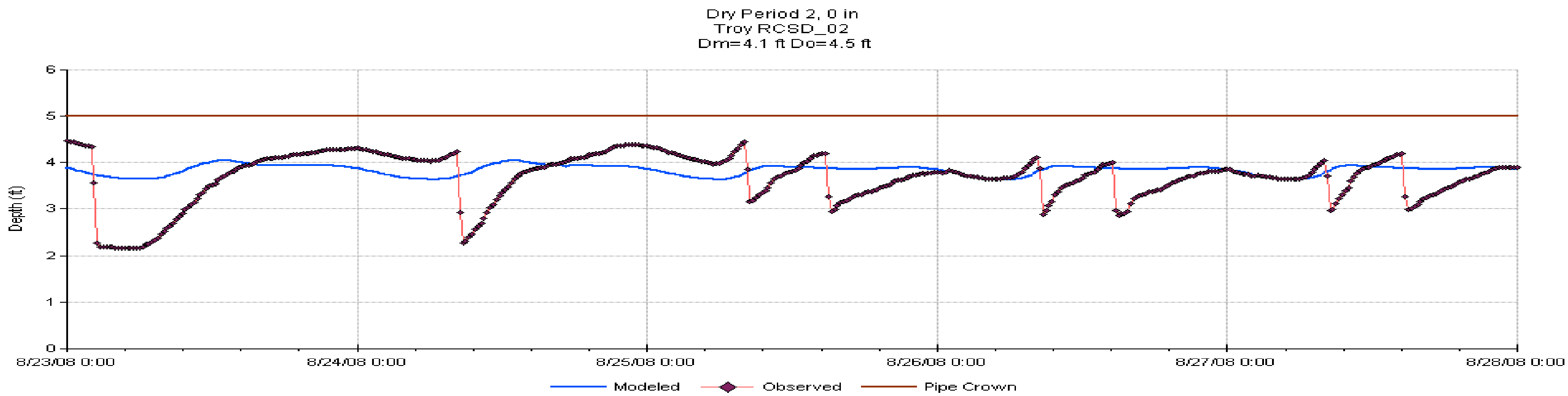


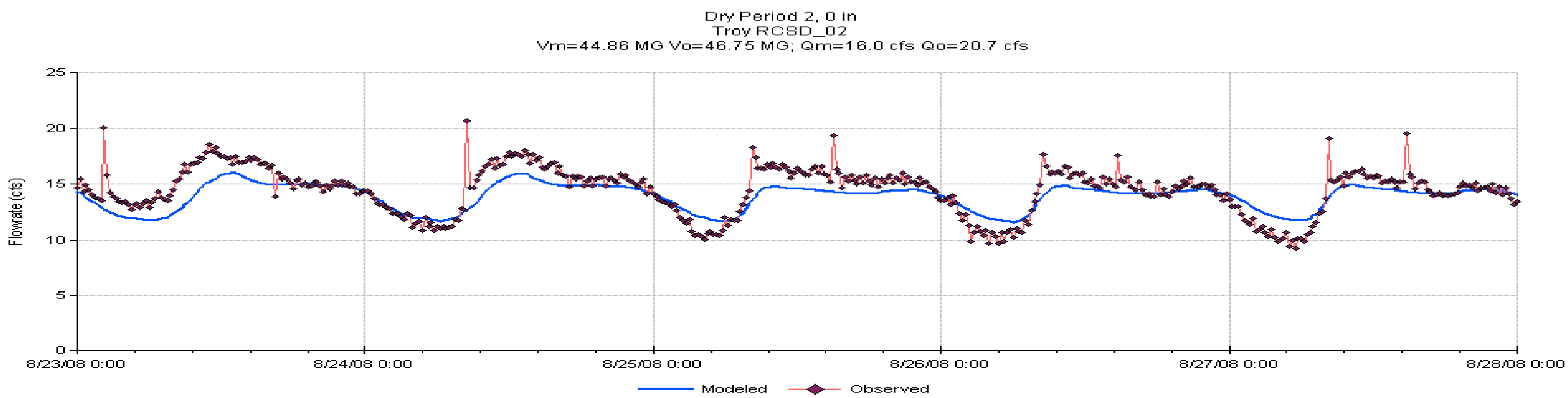
Dry Period 3 (RCSD_20), 0 in
Rensselaer RCSD_20
Dm=0.3 ft Do=0.3 ft
Depth (ft)
2.5
2
1.5
1
0.5
0
8/24/08 0:00
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
Modeled
Observed
Pipe Crown

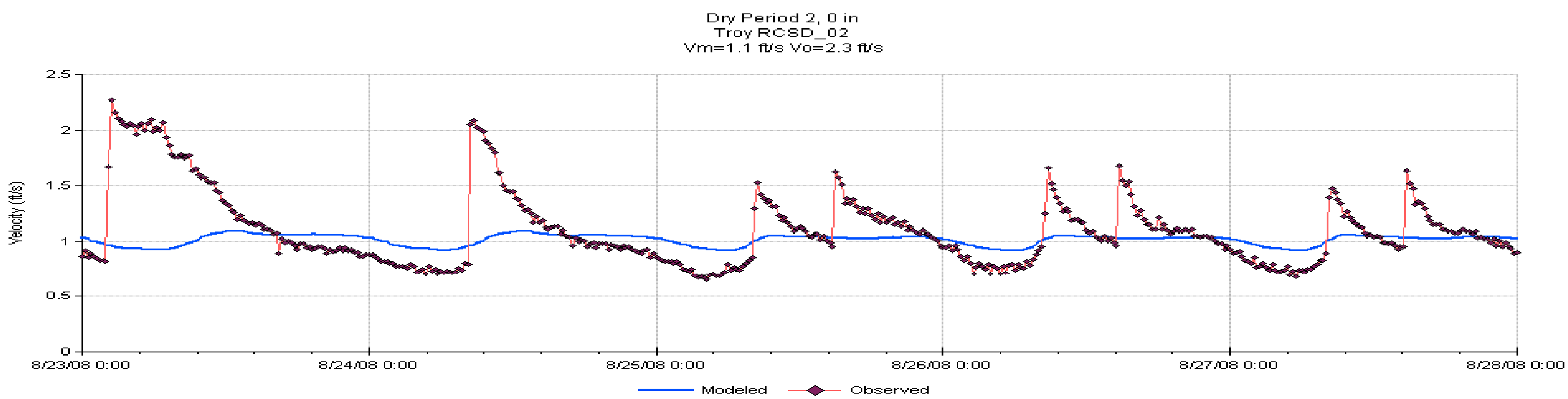

Dry Period 4 (RCSD_10), 0 in
Rensselaer RCSD_20
Vm=0.45 MG Vo=0.19 MG; Qm=0.3 cfs Qo=0.4 cfs
Flowrate (cfs)
0.5
0.4
0.3
0.2
0.1
0
8/30/08 0:00
8/30/08 12:00
8/31/08 0:00
8/31/08 12:00
9/1/08 0:00
9/1/08 12:00
9/2/08 0:00
Modeled
Observed

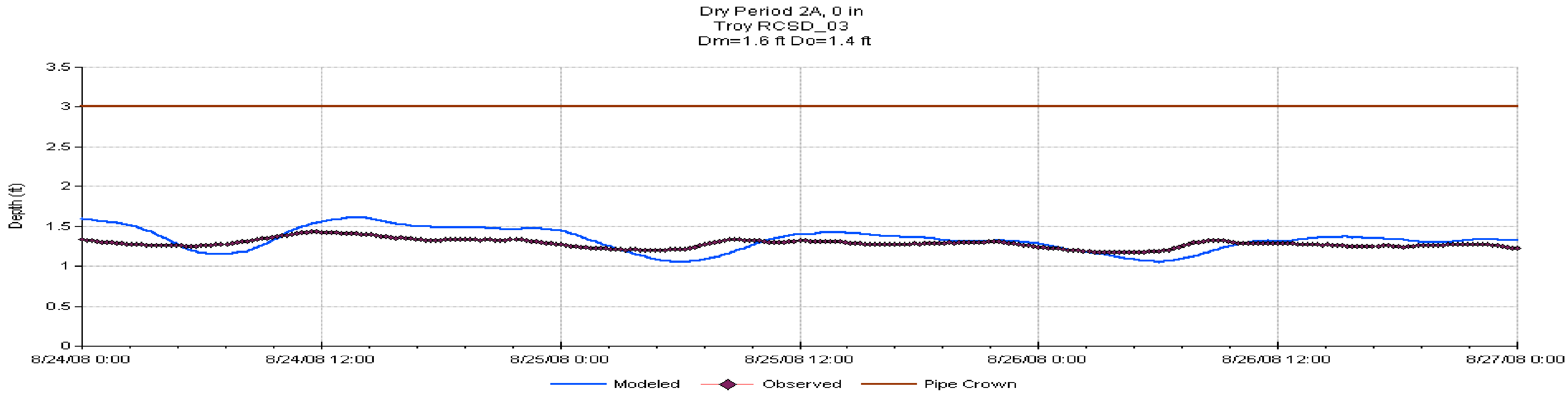

Dry Period 4 (RCSD_10), 0 in
Rensselaer RCSD_20
Vm=1.3 ft/s Vo=1.8 ft/s
Velocity (ft/s)
2
1.5
1
0.5
0
8/30/08 0:00
8/30/08 12:00
8/31/08 0:00
8/31/08 12:00
9/1/08 0:00
9/1/08 12:00
9/2/08 0:00
Modeled
Observed

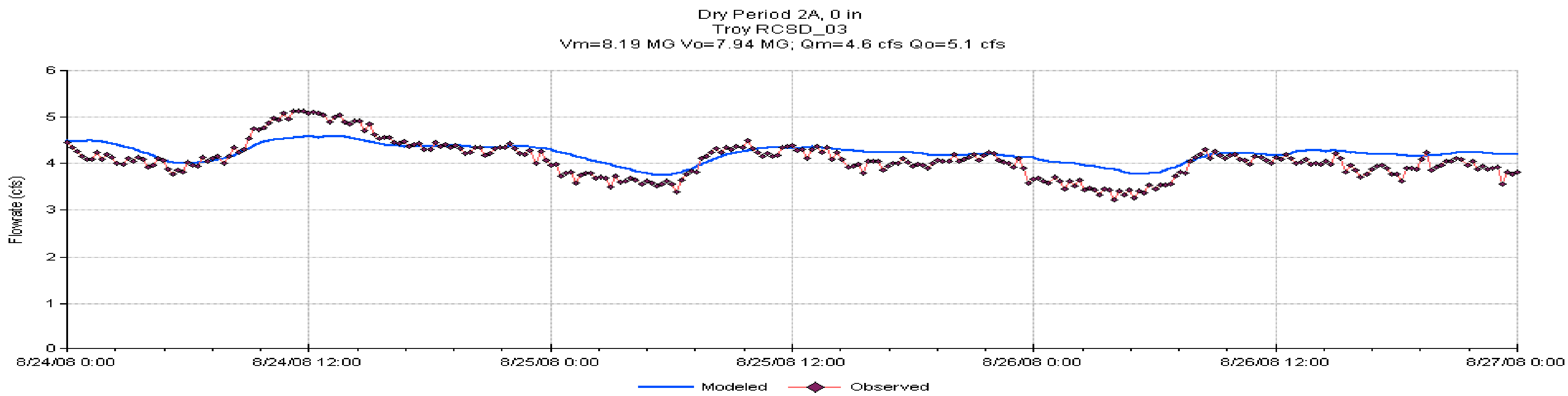

Dry Period 4 (RCSD_10), 0 in
Rensselaer RCSD_20
Dm=0.3 ft Do=0.3 ft
Depth (ft)
2.5
2
1.5
1
0.5
0
8/30/08 0:00
8/30/08 12:00
8/31/08 0:00
8/31/08 12:00
9/1/08 0:00
9/1/08 12:00
9/2/08 0:00
Modeled
Observed
Pipe Crown

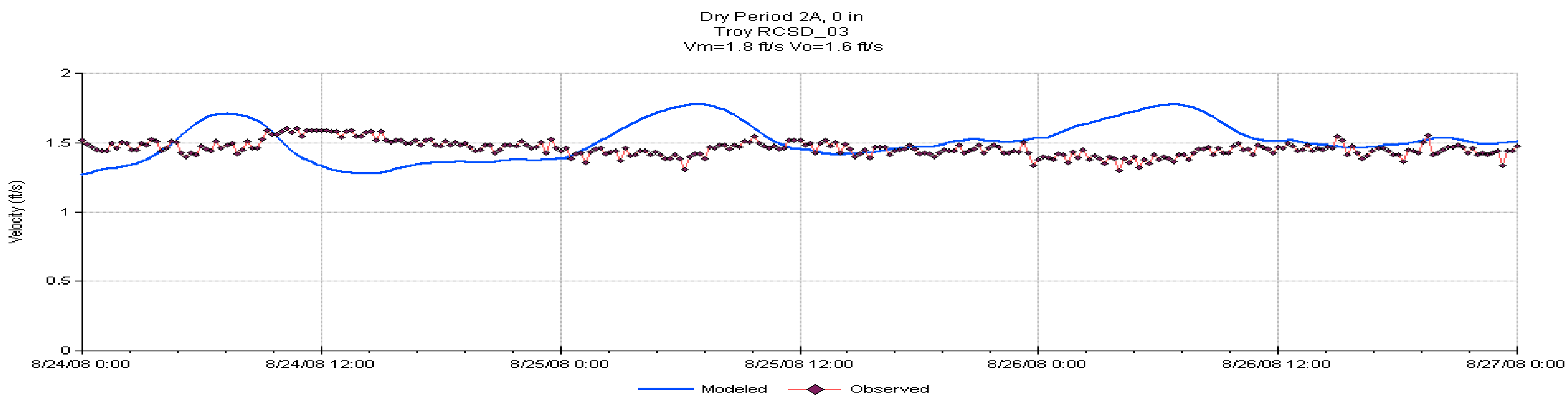

Dry Period 2, 0 in
Troy RCSD_02
Dm=4.1 ft Do=4.5 ft
Depth (ft)
0
1
2
3
4
5
6
8/23/08 0:00
8/24/08 0:00
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
Modeled
Observed
Pipe Crown

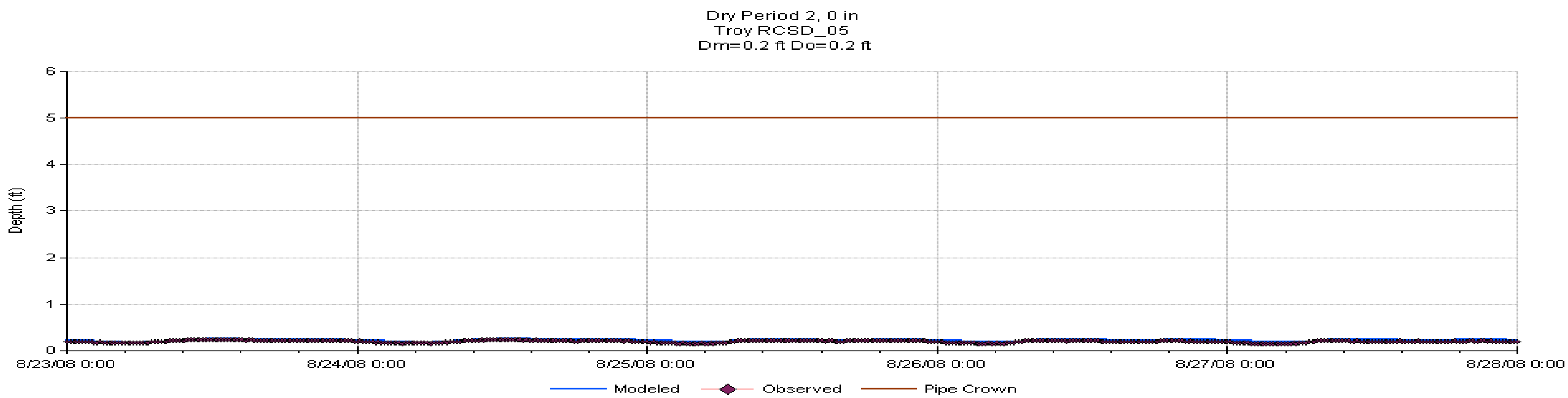

Dry Period 2, 0 in
Troy RCSD_02
Vm=44.86 MG Vo=46.75 MG; Qm=16.0 cfs Qo=20.7 cfs
Flowrate (cfs)
0
5
10
15
20
25
8/23/08 0:00
8/24/08 0:00
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
Modeled
Observed


Dry Period 2, 0 in
Troy RCSD_02
Vm=1.1 ft/s Vo=2.3 ft/s
Velocity (ft/s)
0
0.5
1
1.5
2
2.5
8/23/08 0:00
8/24/08 0:00
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
Modeled
Observed

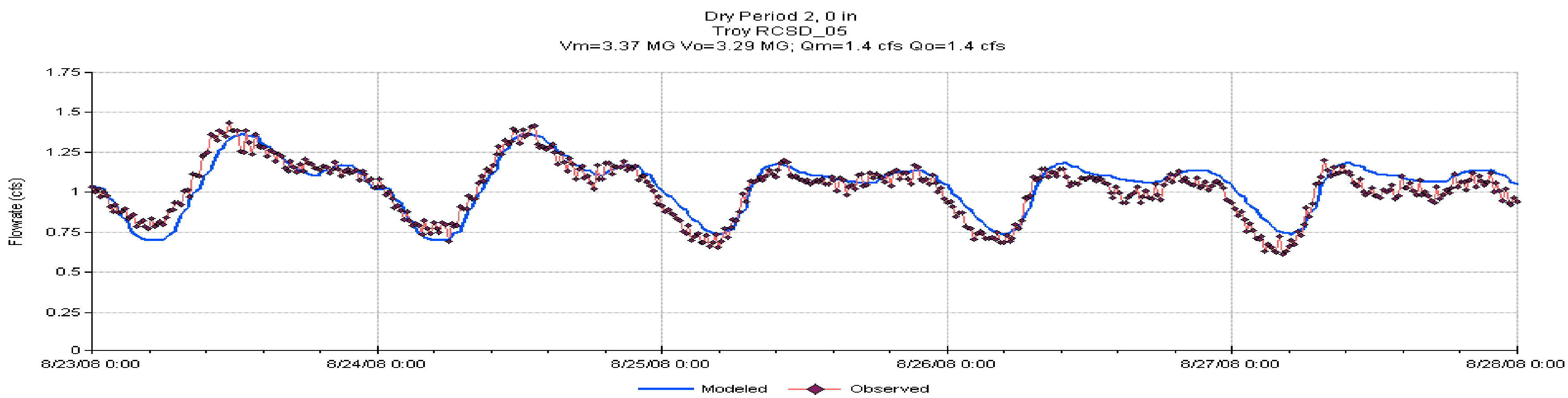

Dry Period 2A, 0 in
Troy RCSD_03
Dm=1.6 ft Do=1.4 ft
Depth (ft)
Modeled
Observed
Pipe Crown


Dry Period 2A, 0 in
Troy RCSD_03
Vm=8.19 MG Vo=7.94 MG; Qm=4.6 cfs Qo=5.1 cfs
Flowrate (cfs)
Modeled
Observed

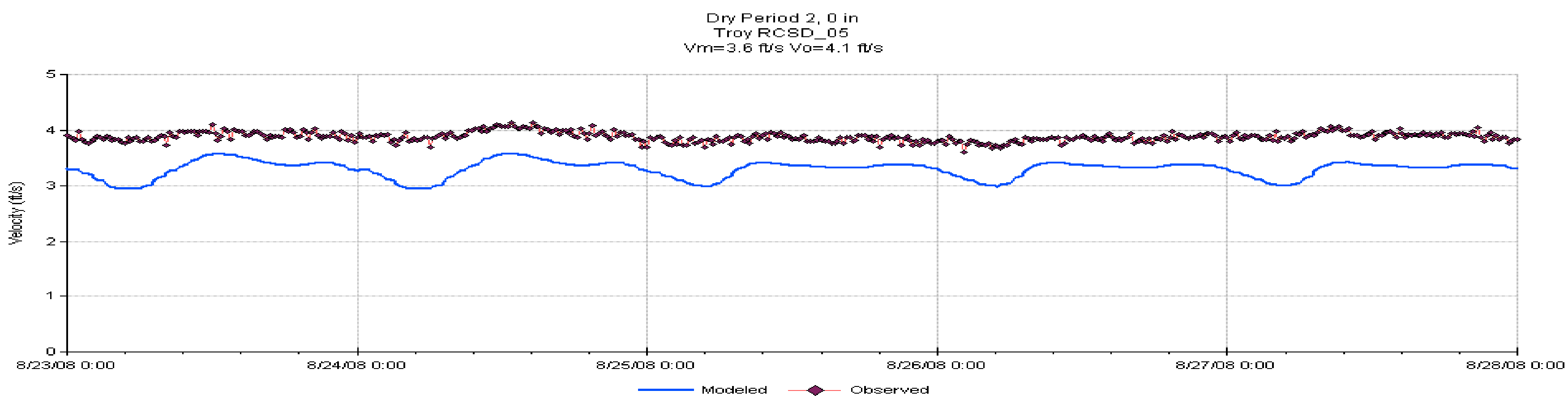

Dry Period 2A, 0 in
Troy RCSD_03
Vm=1.8 ft/s Vo=1.6 ft/s
Velocity (ft/s)
Modeled
Observed



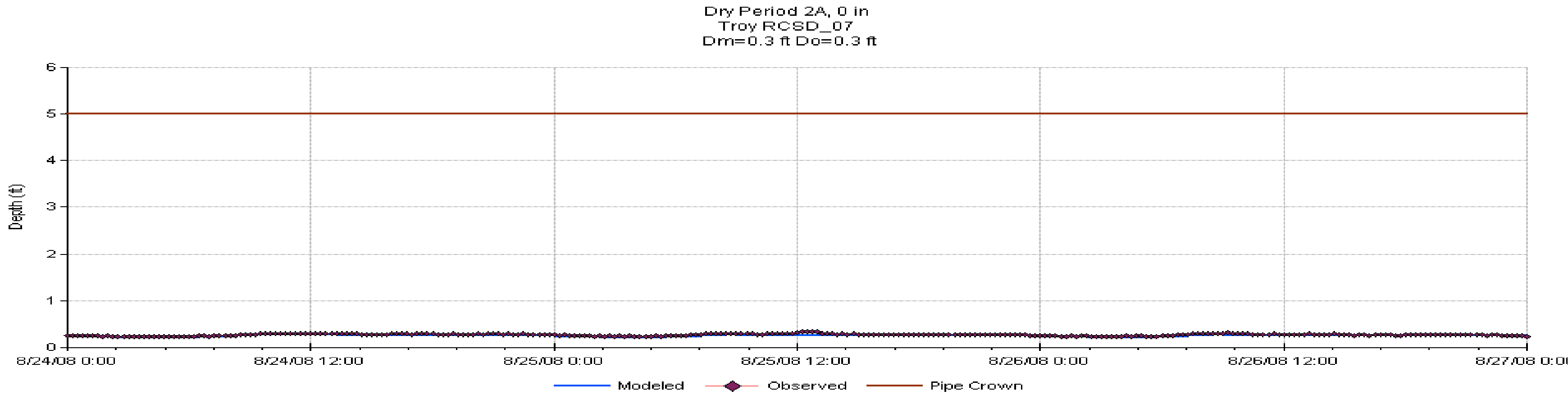
Dry Period 2, 0 in
Troy RCSD_05
Dm=0.2 ft Do=0.2 ft
Depth (ft)
6
5
4
3
2
1
0
8/23/08 0:00
8/24/08 0:00
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
Modeled
Observed
Pipe Crown

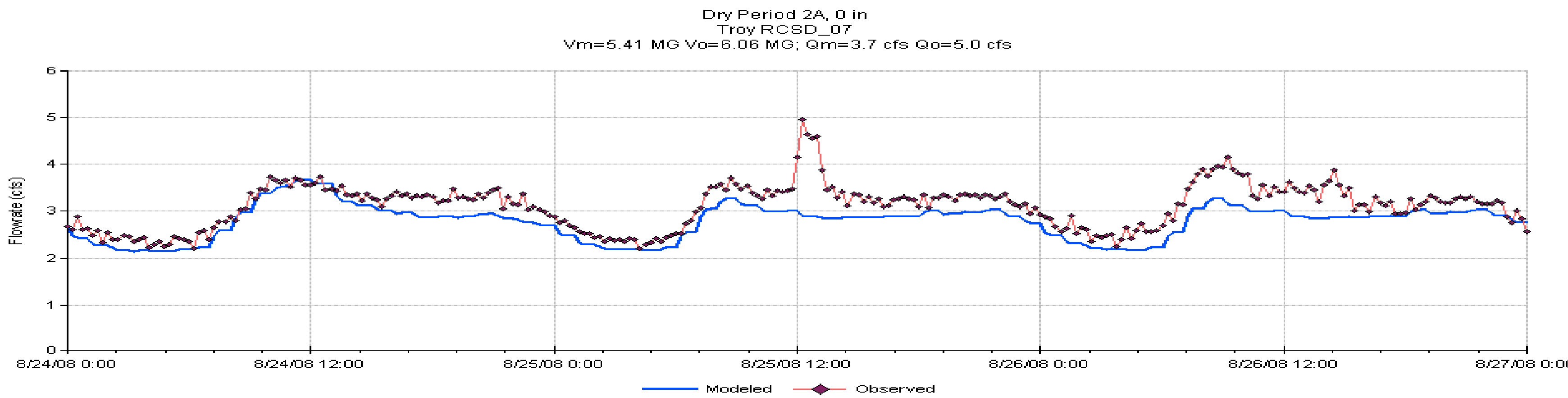


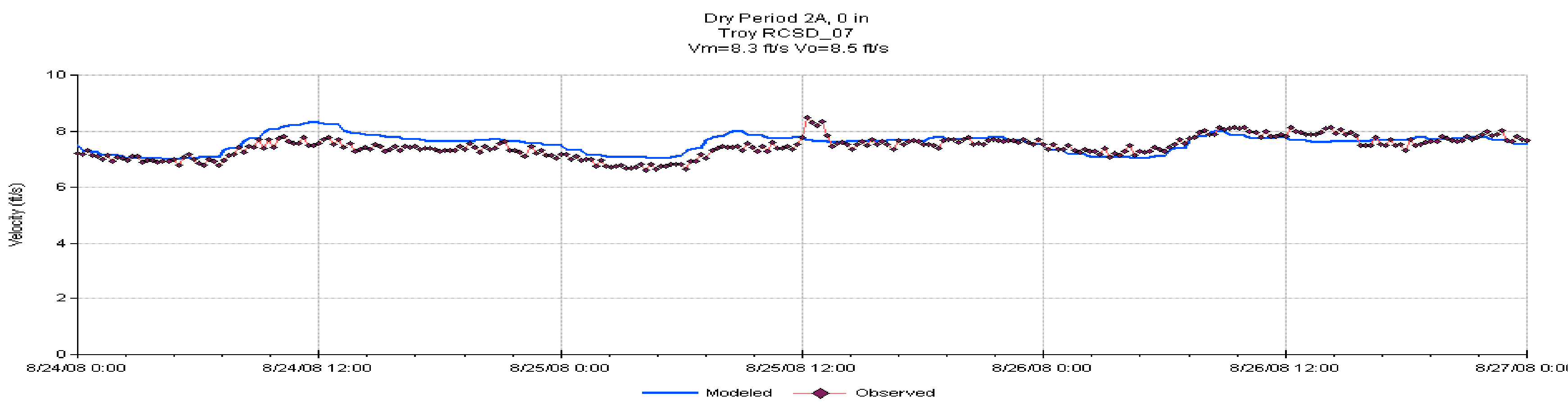
Dry Period 2, 0 in
Troy RCSD_05
Vm=3.37 MG Vo=3.29 MG; Qm=1.4 cfs Qo=1.4 cfs
Flowrate (cfs)
1.75
1.5
1.25
1
0.75
0.5
0.25
0
8/23/08 0:00
8/24/08 0:00
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
Modeled
Observed

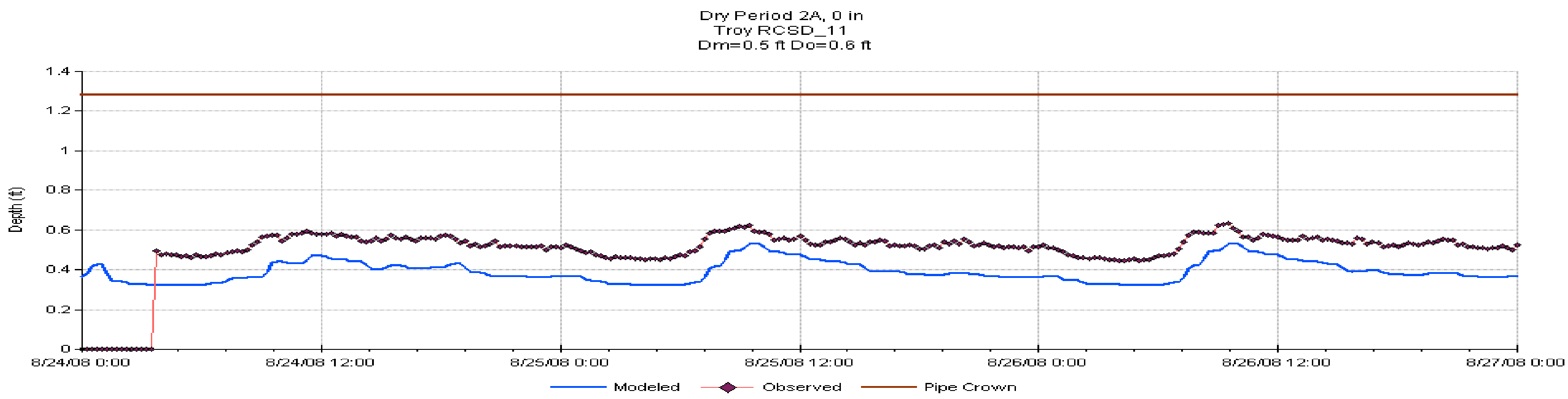


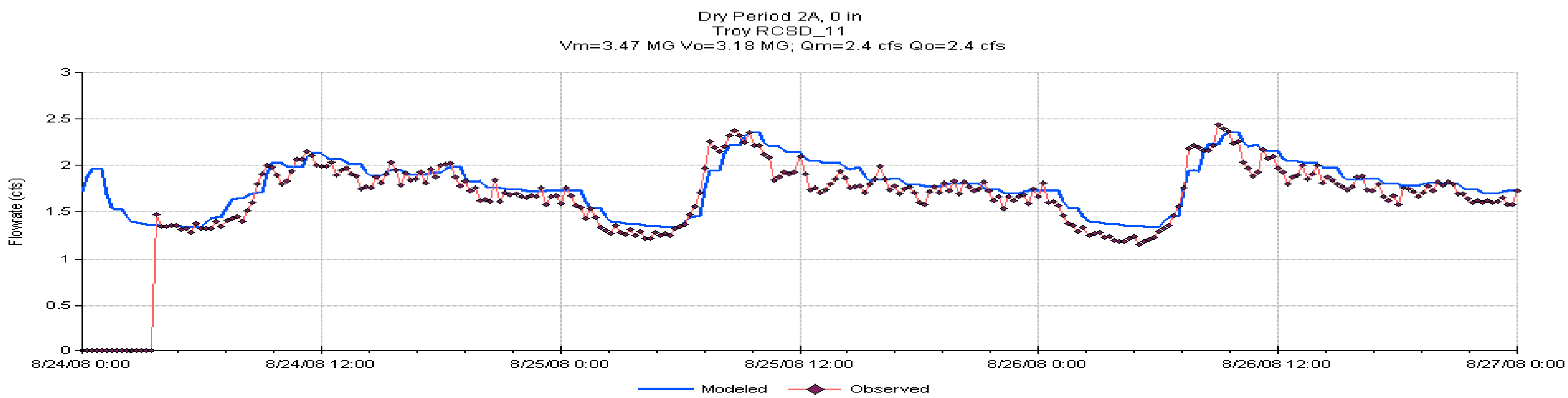
Dry Period 2, 0 in
Troy RCSD_05
Vm=3.6 ft/s Vo=4.1 ft/s
Velocity (ft/s)
5
4
3
2
1
0
8/23/08 0:00
8/24/08 0:00
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
Modeled
Observed

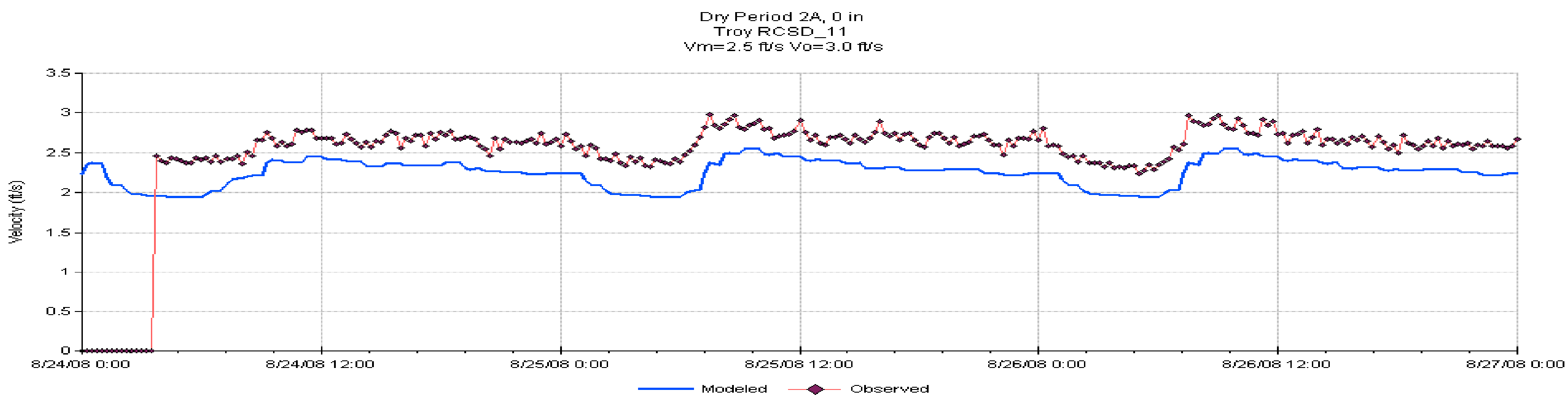

Dry Period 2A, 0 in
Troy RCSD_07
Dm=0.3 ft Do=0.3 ft
Depth (ft)
0
1
2
3
4
5
6
8/24/08 0:00
8/24/08 12:00
8/25/08 0:00
8/25/08 12:00
8/26/08 0:00
8/26/08 12:00
8/27/08 0:00
Modeled
Observed
Pipe Crown

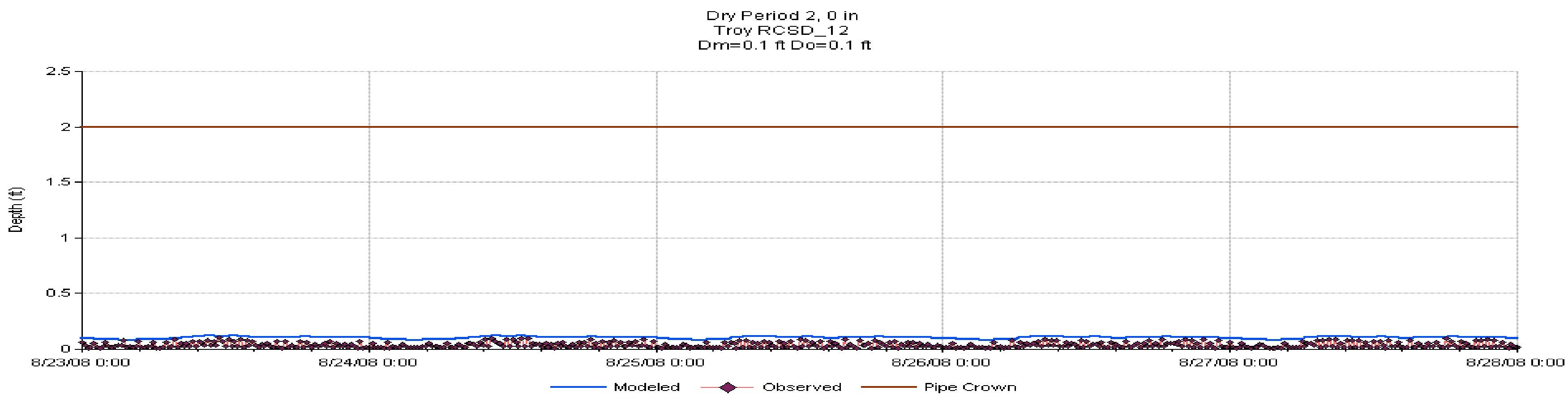

Dry Period 2A, 0 in
Troy RCSD_07
Vm=5.41 MG Vo=6.06 MG; Qm=3.7 cfs Qo=5.0 cfs
Flowrate (cfs)
0
1
2
3
4
5
6
8/24/08 0:00
8/24/08 12:00
8/25/08 0:00
8/25/08 12:00
8/26/08 0:00
8/26/08 12:00
8/27/08 0:00
Modeled
Observed

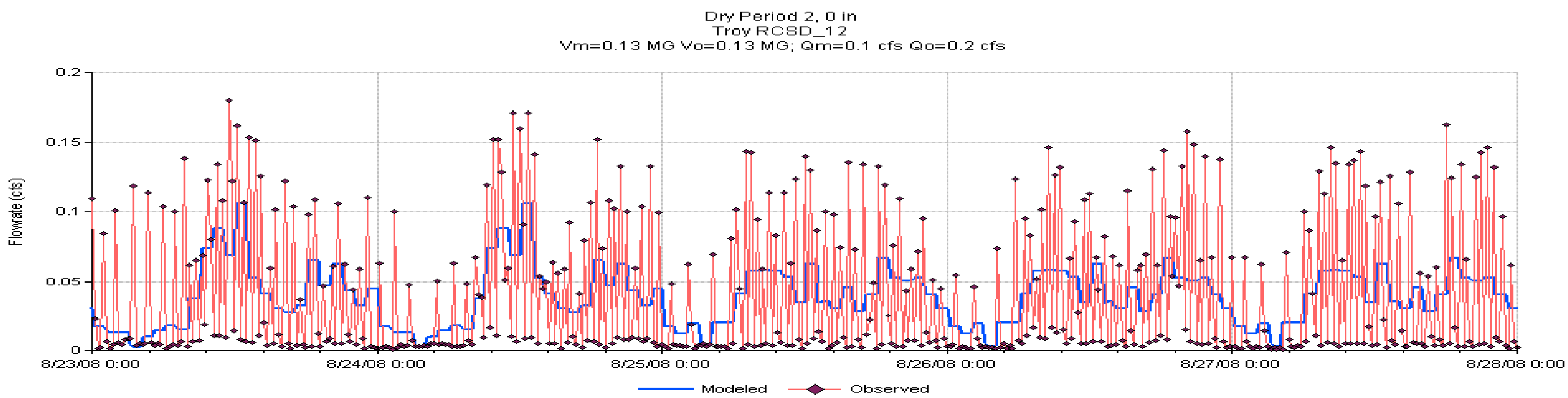

Dry Period 2A, 0 in
Troy RCSD_07
Vm=8.3 ft/s Vo=8.5 ft/s
Velocity (ft/s)
0
2
4
6
8
10
8/24/08 0:00
8/24/08 12:00
8/25/08 0:00
8/25/08 12:00
8/26/08 0:00
8/26/08 12:00
8/27/08 0:00
Modeled
Observed

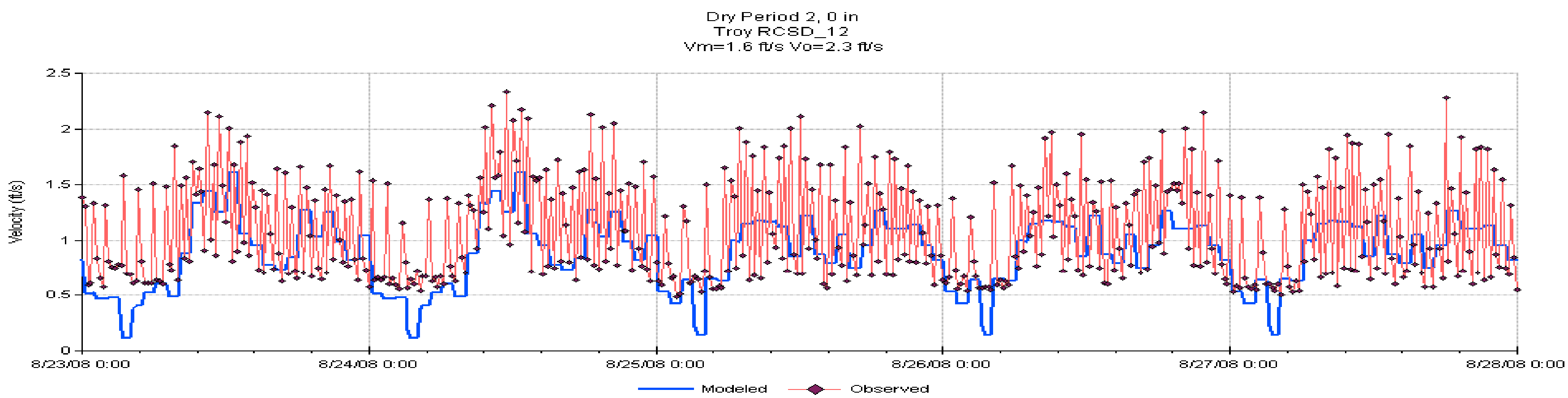

Dry Period 2A, 0 in
Troy RCSD_11
Dm=0.5 ft Do=0.6 ft
Depth (ft)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
8/24/08 0:00
8/24/08 12:00
8/25/08 0:00
8/25/08 12:00
8/26/08 0:00
8/26/08 12:00
8/27/08 0:00
Modeled
Observed
Pipe Crown

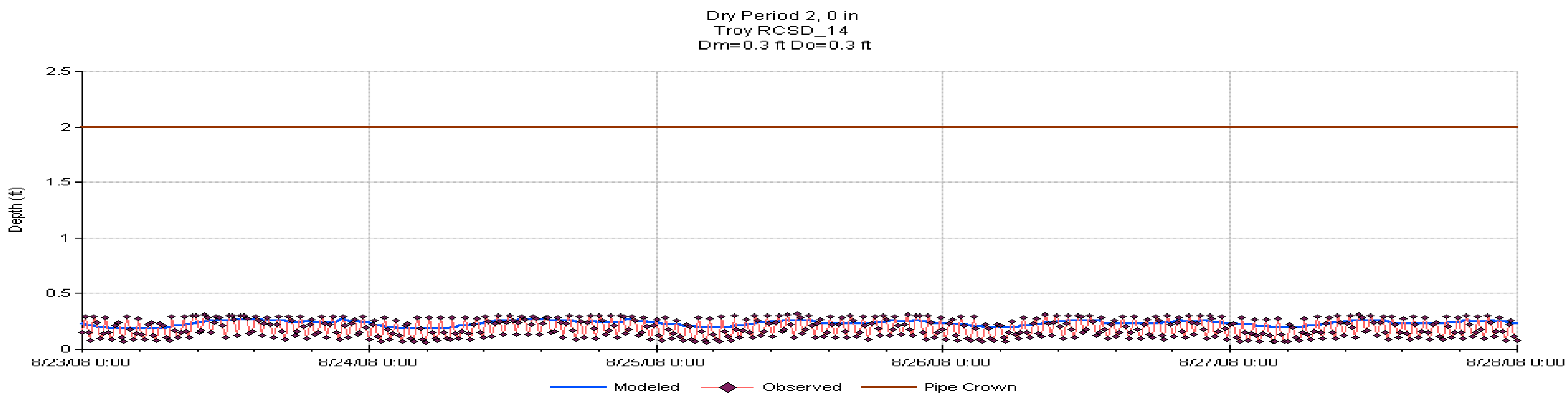

Dry Period 2A, 0 in
Troy RCSD_11
Vm=3.47 MG Vo=3.18 MG; Qm=2.4 cfs Qo=2.4 cfs
Flowrate (cfs)
3
2.5
2
1.5
1
0.5
0
8/24/08 0:00
8/24/08 12:00
8/25/08 0:00
8/25/08 12:00
8/26/08 0:00
8/26/08 12:00
8/27/08 0:00
Modeled
Observed

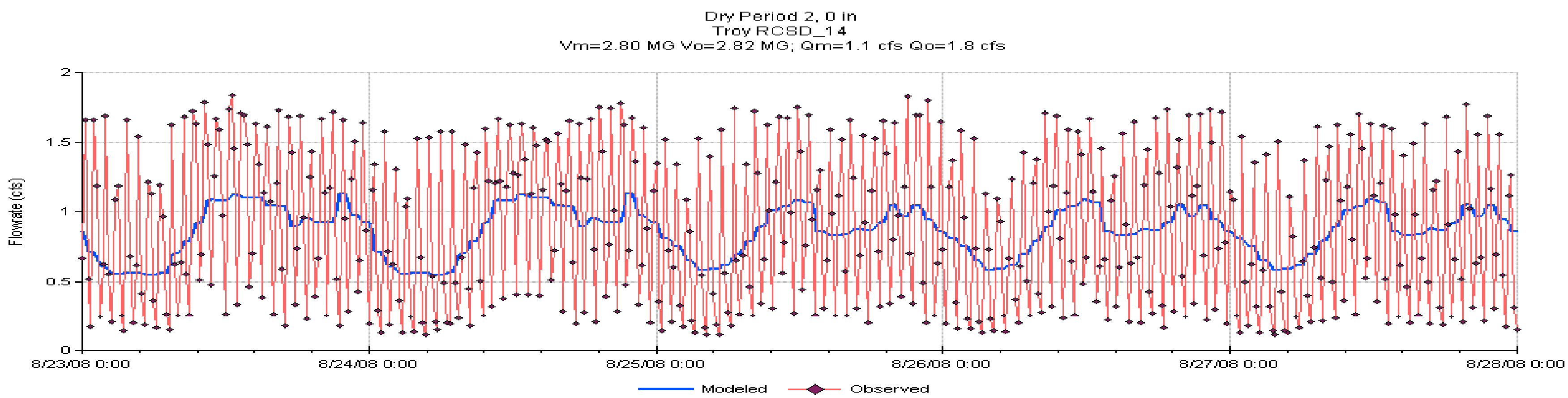

Dry Period 2A, 0 in
Troy RCSD_11
Vm=2.5 ft/s Vo=3.0 ft/s
Velocity (ft/s)
3.5
3
2.5
2
1.5
1
0.5
0
8/24/08 0:00
8/24/08 12:00
8/25/08 0:00
8/25/08 12:00
8/26/08 0:00
8/26/08 12:00
8/27/08 0:00
Modeled
Observed

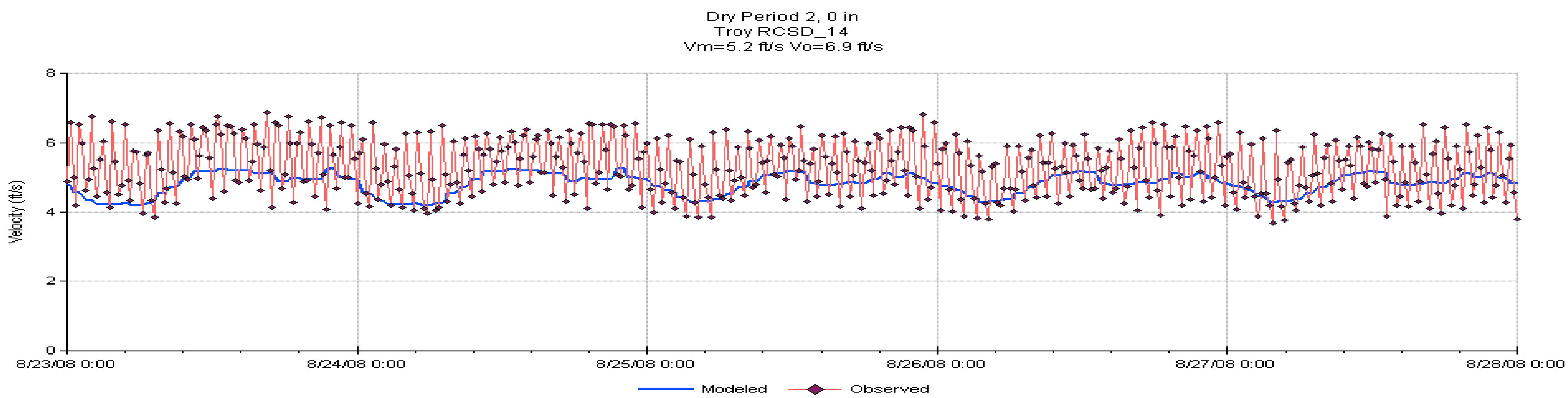

Dry Period 2, 0 in
Troy RCSD_12
Dm=0.1 ft Do=0.1 ft
Depth (ft)
2.5
2
1.5
1
0.5
0
8/23/08 0:00
8/24/08 0:00
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
Modeled
Observed
Pipe Crown

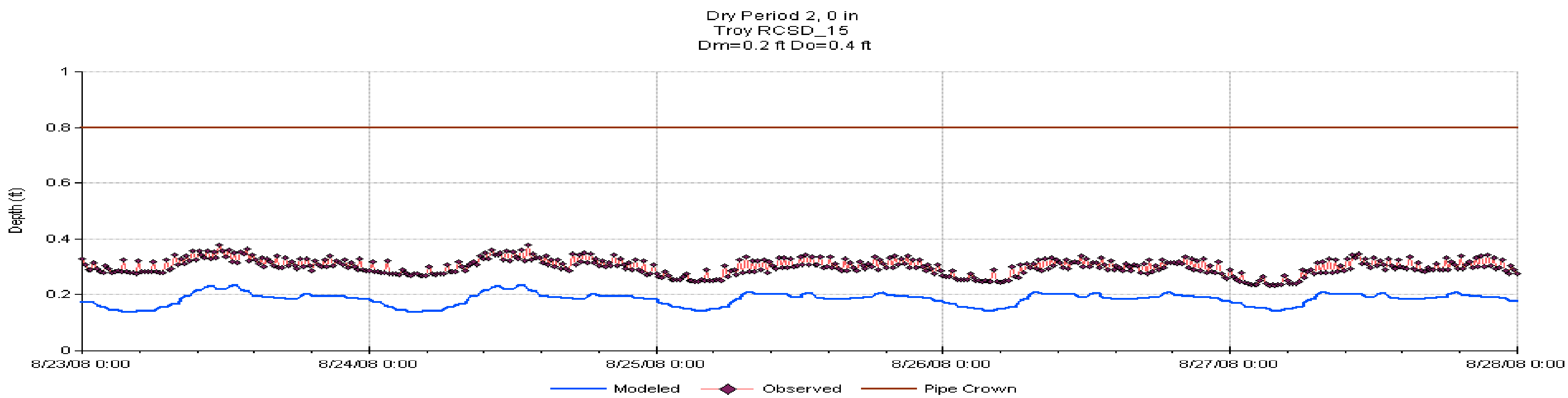

Dry Period 2, 0 in
Troy RCSD_12
Vm=0.13 MG Vo=0.13 MG; Qm=0.1 cfs Qo=0.2 cfs
Flowrate (cfs)
0.2
0.15
0.1
0.05
0
8/23/08 0:00
8/24/08 0:00
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
Modeled
Observed

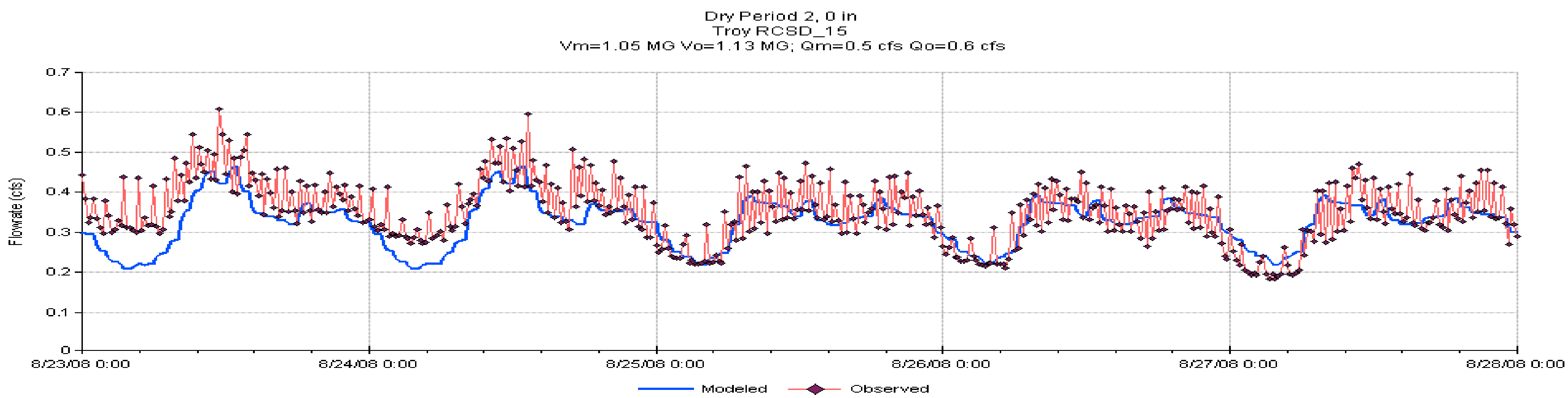

Dry Period 2, 0 in
Troy RCSD_12
Vm=1.6 ft/s Vo=2.3 ft/s
Velocity (ft/s)
2.5
2
1.5
1
0.5
0
8/23/08 0:00
8/24/08 0:00
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
Modeled
Observed

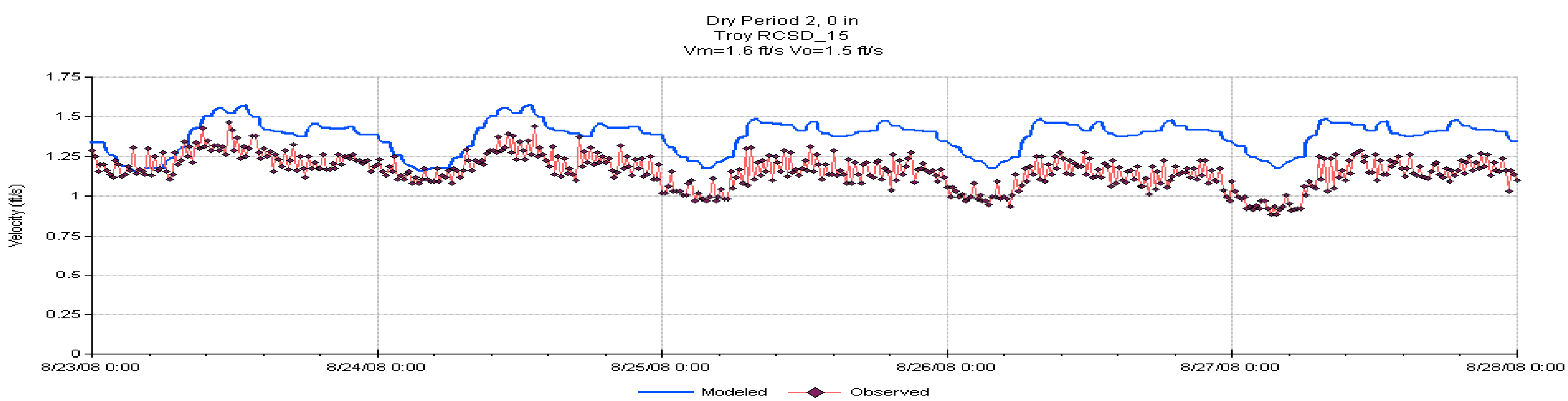

Dry Period 2, 0 in
Troy RCSD_14
Dm=0.3 ft Do=0.3 ft
Depth (ft)
2.5
2
1.5
1
0.5
0
8/23/08 0:00
8/24/08 0:00
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
Modeled
Observed
Pipe Crown


Dry Period 2, 0 in
Troy RCSD_14
Vm=2.80 MG Vo=2.82 MG; Qm=1.1 cfs Qo=1.8 cfs
Flowrate (cfs)
2
1.5
1
0.5
0
8/23/08 0:00
8/24/08 0:00
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
Modeled
Observed

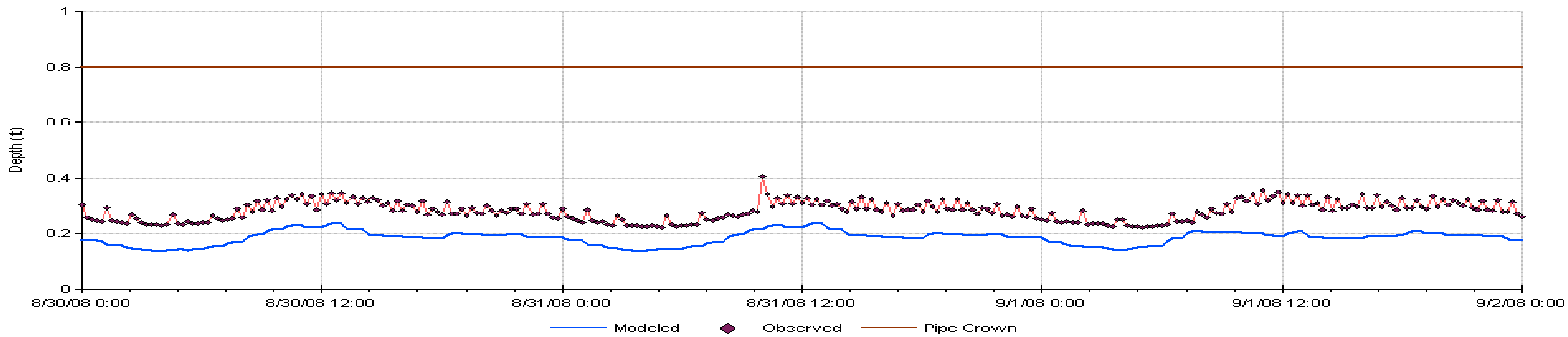

Dry Period 2, 0 in
Troy RCSD_14
Vm=5.2 ft/s Vo=6.9 ft/s
Velocity (ft/s)
8
6
4
2
0
8/23/08 0:00
8/24/08 0:00
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
Modeled
Observed


Dry Period 2, 0 in
Troy RCSD_15
Dm=0.2 ft Do=0.4 ft
Depth (ft)
1
0.8
0.6
0.4
0.2
0
8/23/08 0:00
8/24/08 0:00
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
Modeled
Observed
Pipe Crown

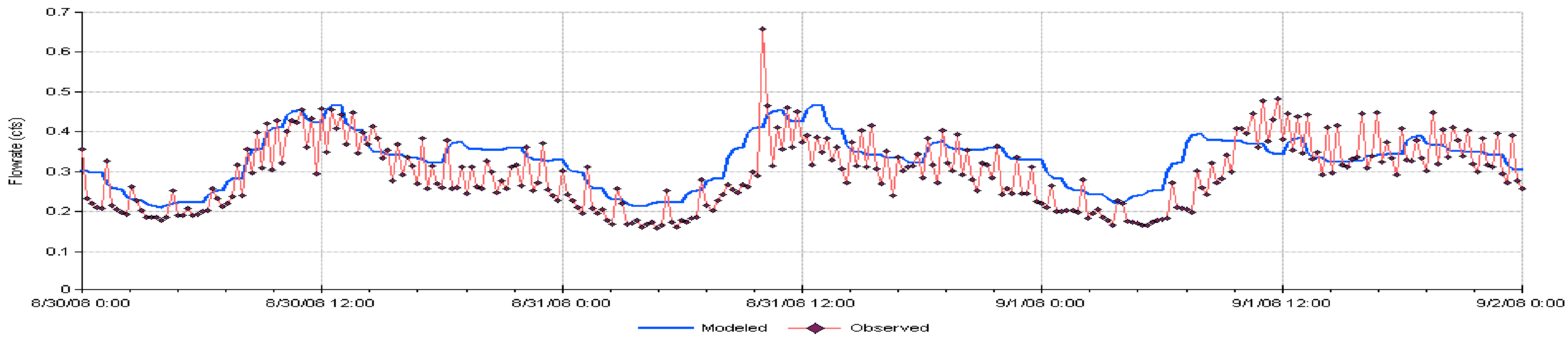

Dry Period 2, 0 in
Troy RCSD_15
Vm=1.05 MG Vo=1.13 MG; Qm=0.5 cfs Qo=0.6 cfs
Flowrate (cfs)
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
8/23/08 0:00
8/24/08 0:00
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
Modeled
Observed


Dry Period 2, 0 in
Troy RCSD_15
Vm=1.6 ft/s Vo=1.5 ft/s
Velocity (ft/s)
1.75
1.5
1.25
1
0.75
0.5
0.25
0
8/23/08 0:00
8/24/08 0:00
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
Modeled
Observed

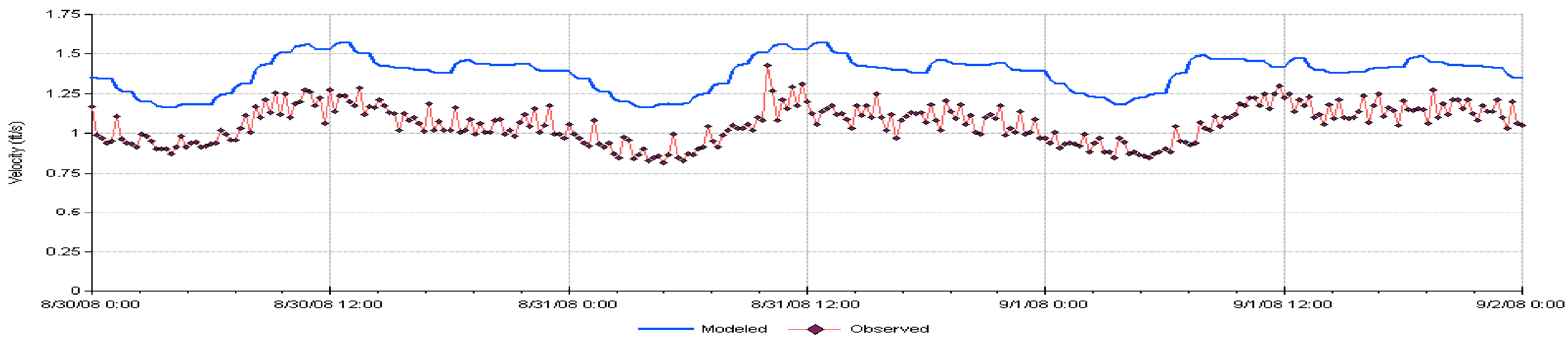
Dry Period 3, 0 in
Troy RCSD_15
Dm=0.2 ft Do=0.4 ft

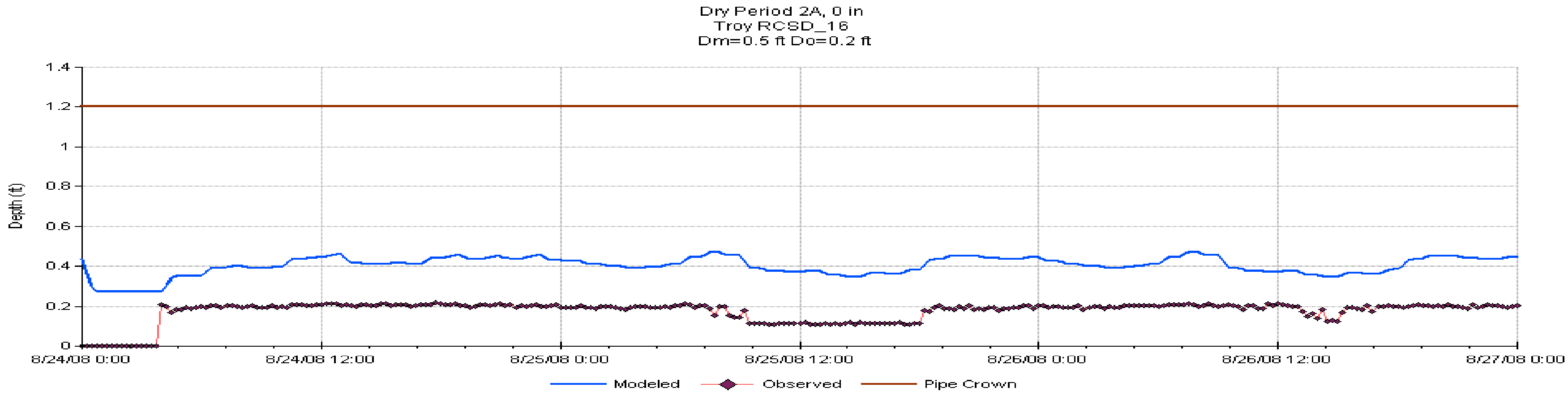


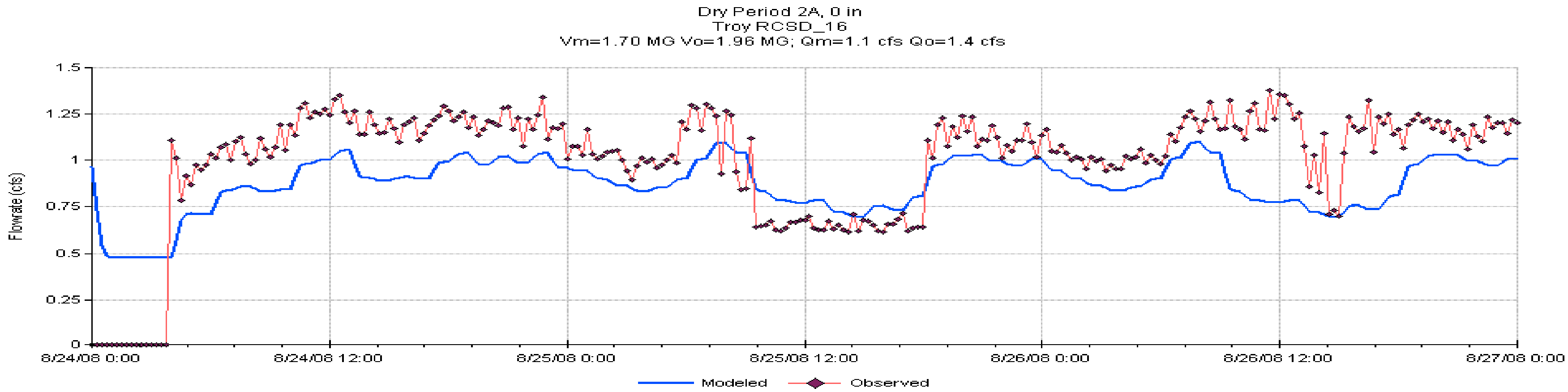
Dry Period 3, 0 in
Troy RCSD_15
Vm=0.64 MG Vo=0.57 MG; Qm=0.5 cfs Qo=0.7 cfs

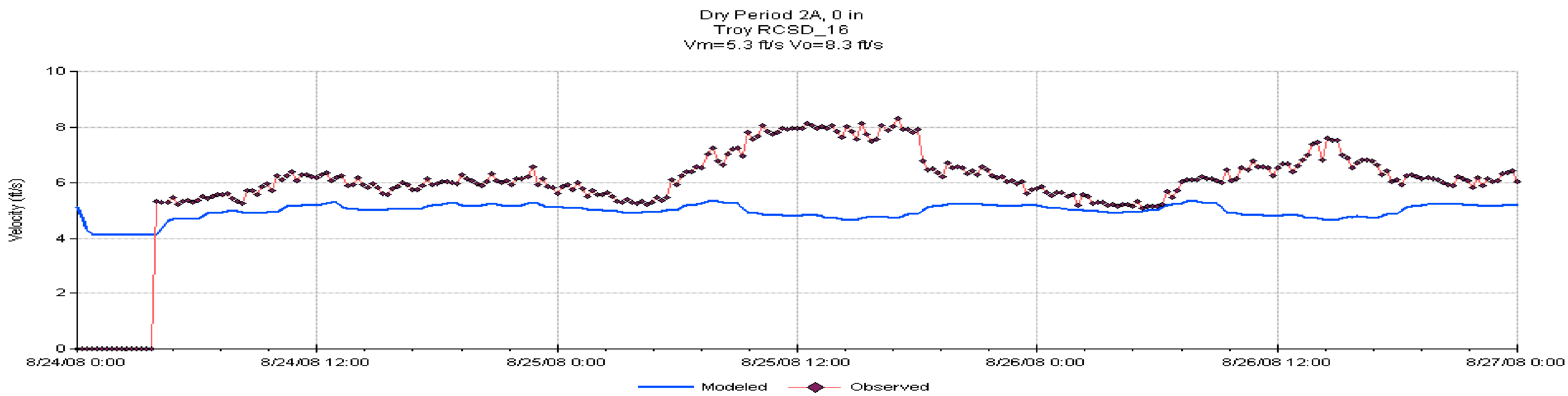


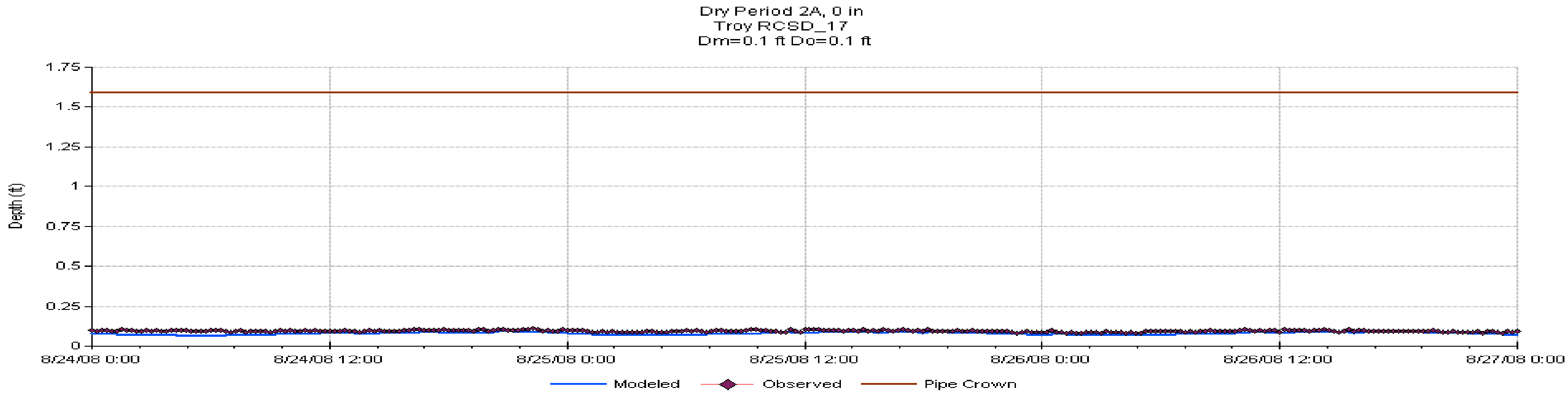
Dry Period 3, 0 in
Troy RCSD_15
Vm=1.6 ft/s Vo=1.4 ft/s

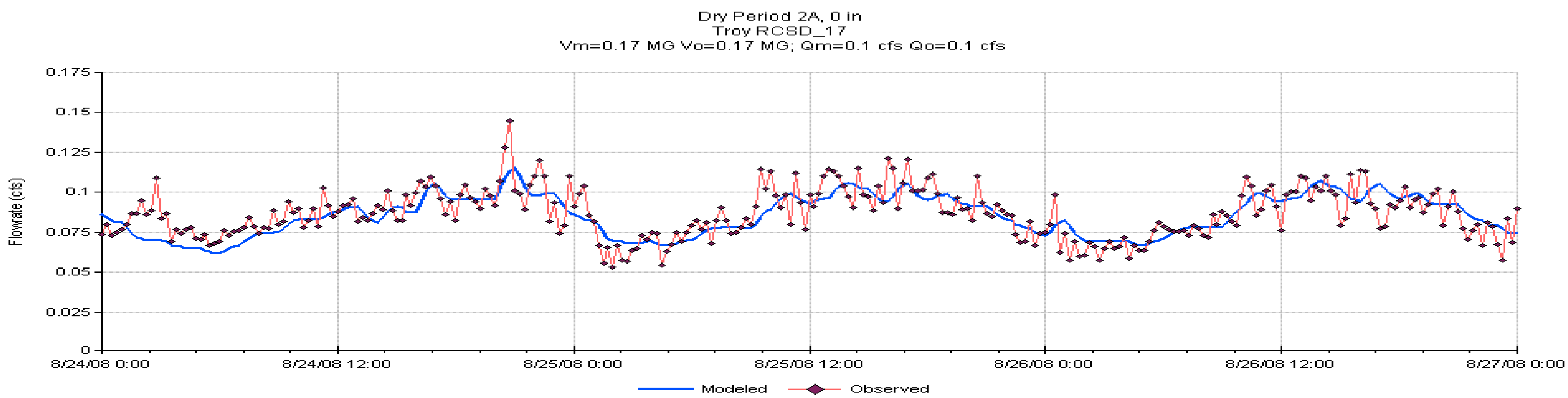


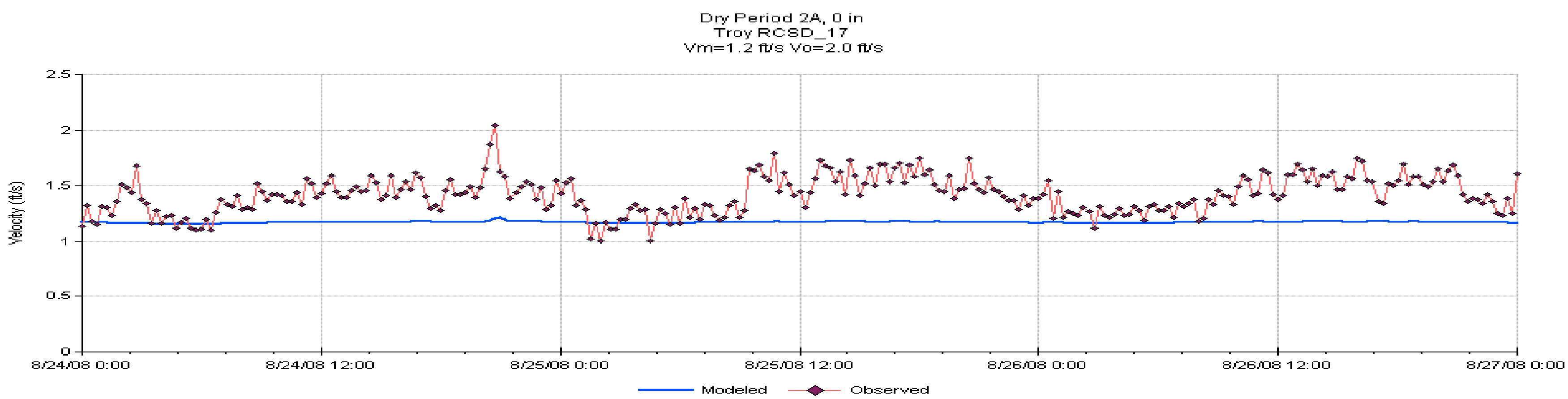

Dry Period 2A, 0 in
Troy RCSD_16
Dm=0.5 ft Do=0.2 ft
Depth (ft)
8/24/08 0:00
8/24/08 12:00
8/25/08 0:00
8/25/08 12:00
8/26/08 0:00
8/26/08 12:00
8/27/08 0:00
Modeled
Observed
Pipe Crown


Dry Period 2A, 0 in
Troy RCSD_16
Vm=1.70 MG Vo=1.96 MG; Qm=1.1 cfs Qo=1.4 cfs
Flowrate (cfs)
8/24/08 0:00
8/24/08 12:00
8/25/08 0:00
8/25/08 12:00
8/26/08 0:00
8/26/08 12:00
8/27/08 0:00
Modeled
Observed

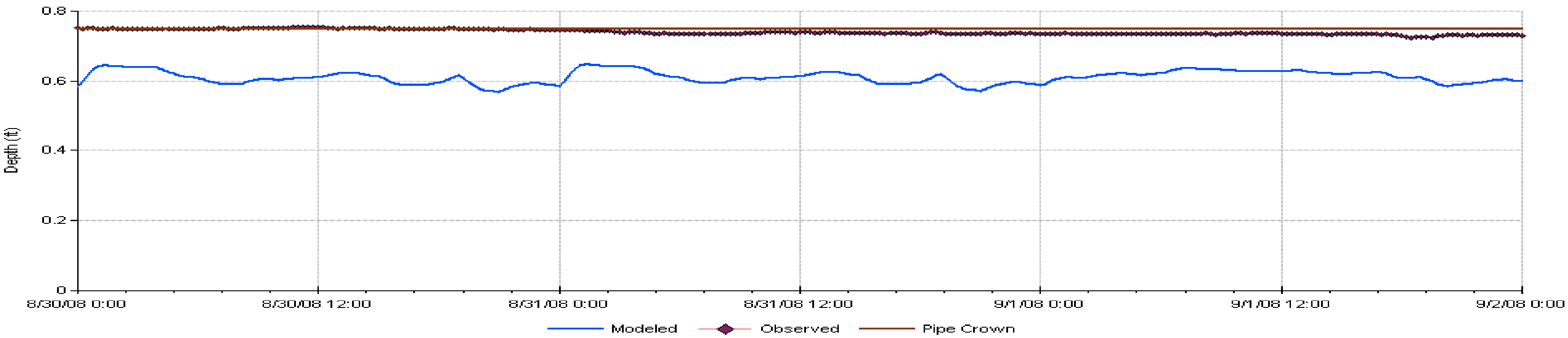

Dry Period 2A, 0 in
Troy RCSD_16
Vm=5.3 ft/s Vo=8.3 ft/s
Velocity (ft/s)
8/24/08 0:00
8/24/08 12:00
8/25/08 0:00
8/25/08 12:00
8/26/08 0:00
8/26/08 12:00
8/27/08 0:00
Modeled
Observed


Dry Period 2A, 0 in
Troy RCSD_17
Dm=0.1 ft Do=0.1 ft
Depth (ft)
1.75
1.5
1.25
1
0.75
0.5
0.25
0
8/24/08 0:00
8/24/08 12:00
8/25/08 0:00
8/25/08 12:00
8/26/08 0:00
8/26/08 12:00
8/27/08 0:00
Modeled
Observed
Pipe Crown

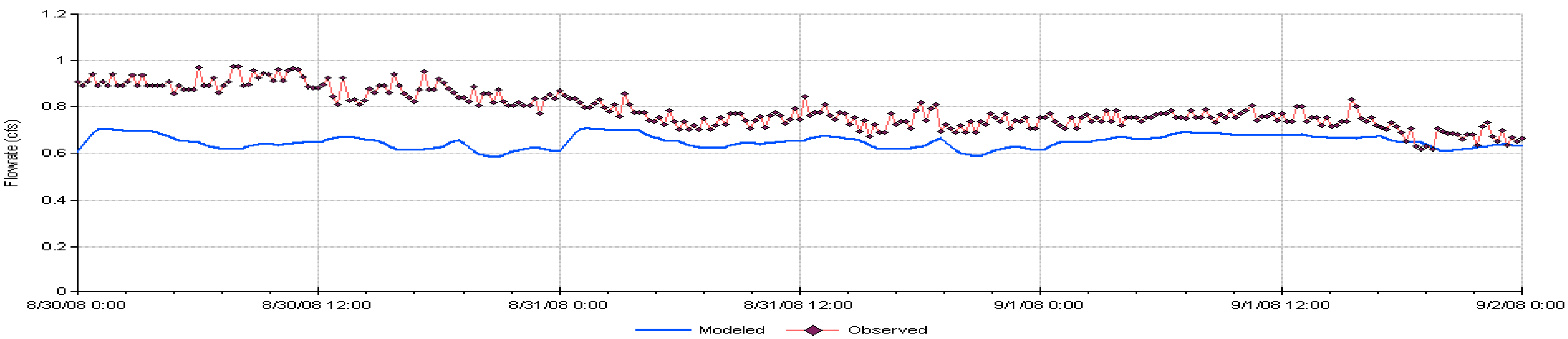

Dry Period 2A, 0 in
Troy RCSD_17
Vm=0.17 MG Vo=0.17 MG; Qm=0.1 cfs Qo=0.1 cfs
Flowrate (cfs)
0.175
0.15
0.125
0.1
0.075
0.05
0.025
0
8/24/08 0:00
8/24/08 12:00
8/25/08 0:00
8/25/08 12:00
8/26/08 0:00
8/26/08 12:00
8/27/08 0:00
Modeled
Observed


Dry Period 2A, 0 in
Troy RCSD_17
Vm=1.2 ft/s Vo=2.0 ft/s
Velocity (ft/s)
2.5
2
1.5
1
0.5
0
8/24/08 0:00
8/24/08 12:00
8/25/08 0:00
8/25/08 12:00
8/26/08 0:00
8/26/08 12:00
8/27/08 0:00
Modeled
Observed

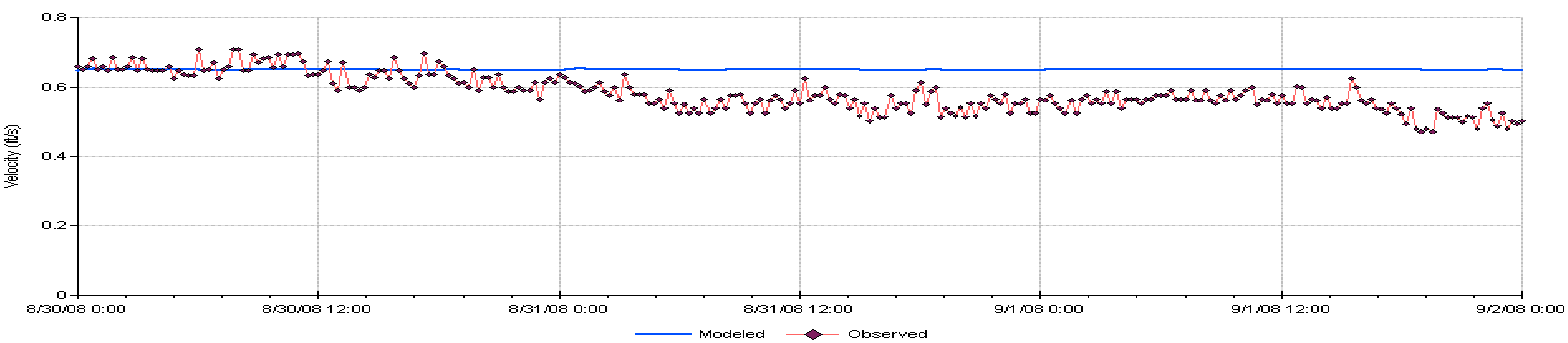
Dry Period 3, 0 in
Troy RCSD_18
Dm=0.6 ft Do=0.8 ft

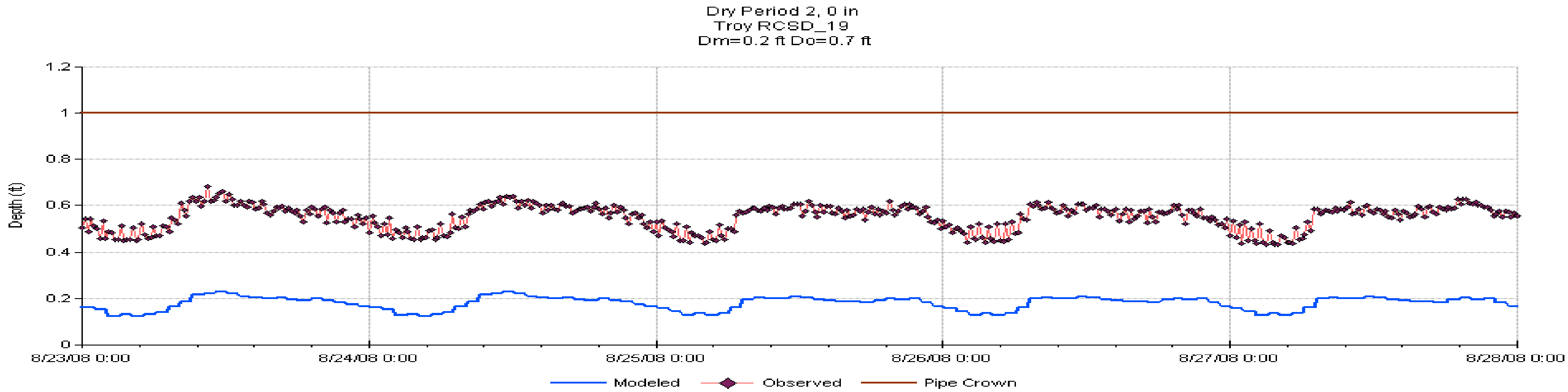


Dry Period 3, 0 in
Troy RCSD_18
Vm=1.26 MG Vo=1.54 MG; Qm=0.7 cfs Qo=1.0 cfs

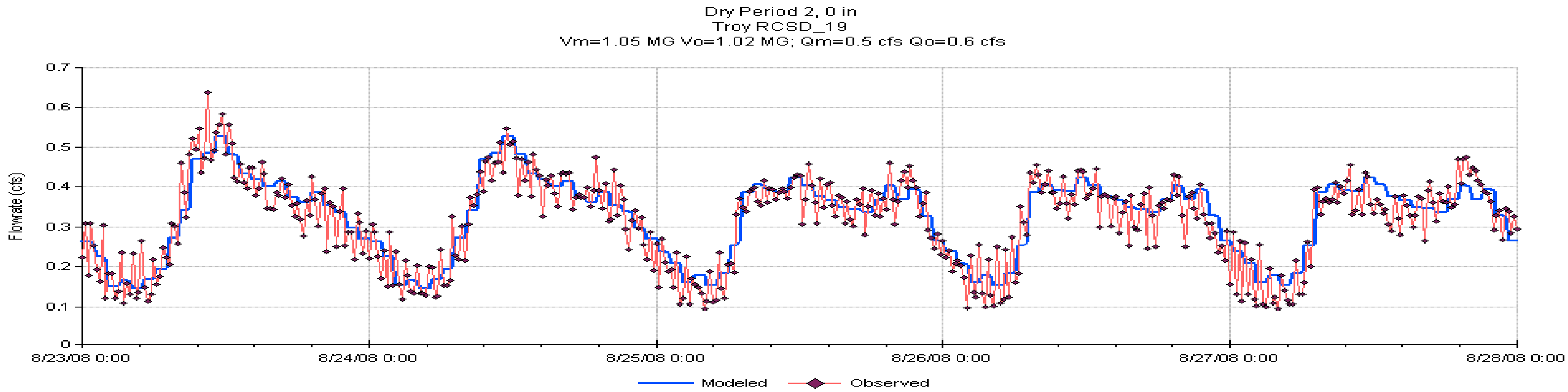


Dry Period 3, 0 in
Troy RCSD_18
Vm=0.7 ft/s Vo=0.7 ft/s

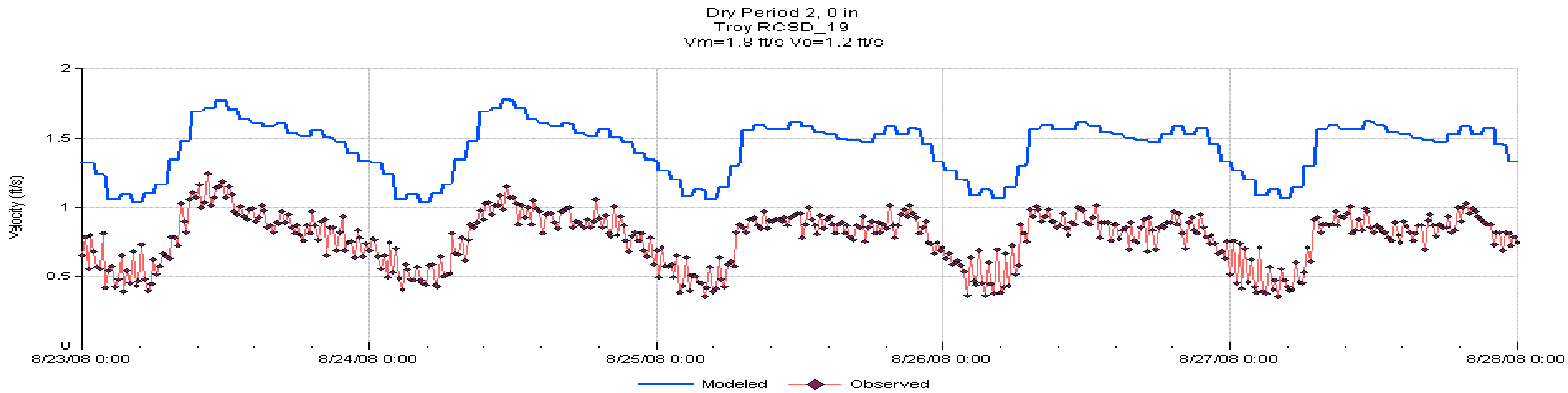




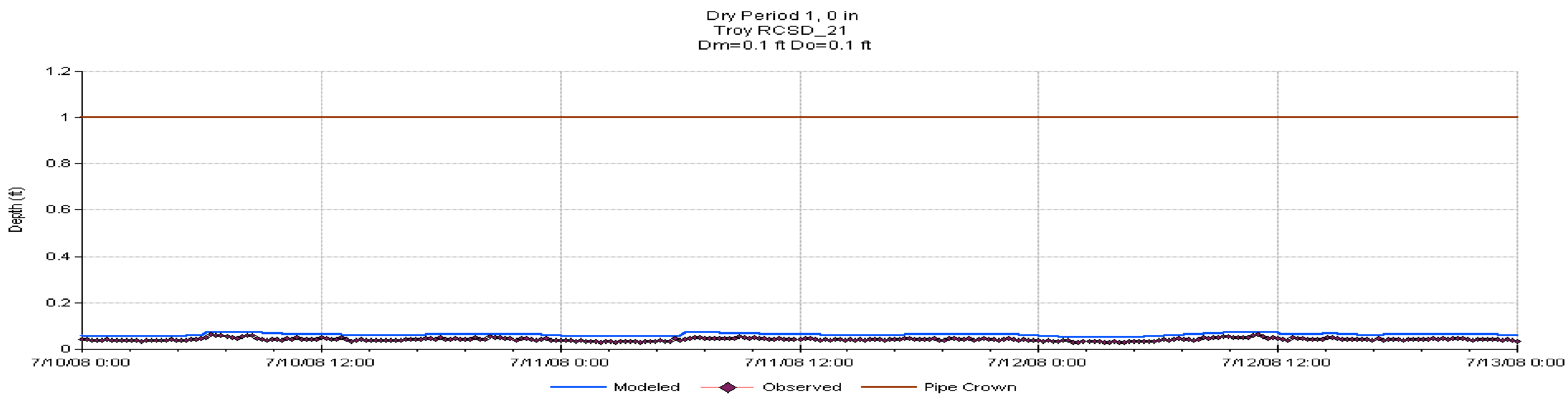
Dry Period 2, 0 in
Troy RCSD_19
Dm=0.2 ft Do=0.7 ft
Depth (ft)
1.2
1
0.8
0.6
0.4
0.2
0
8/23/08 0:00
8/24/08 0:00
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
Modeled
Observed
Pipe Crown

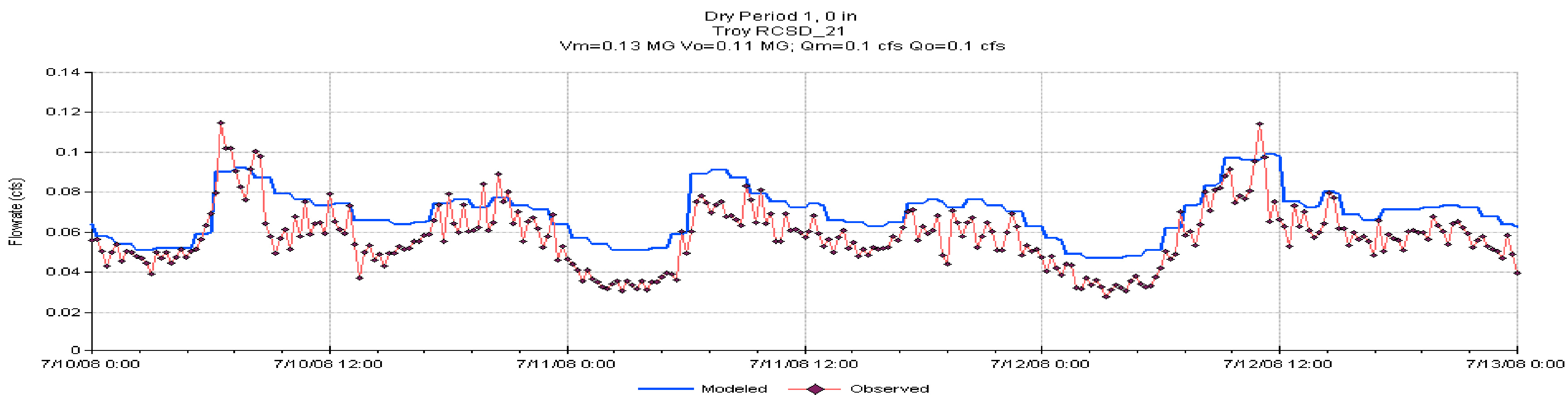


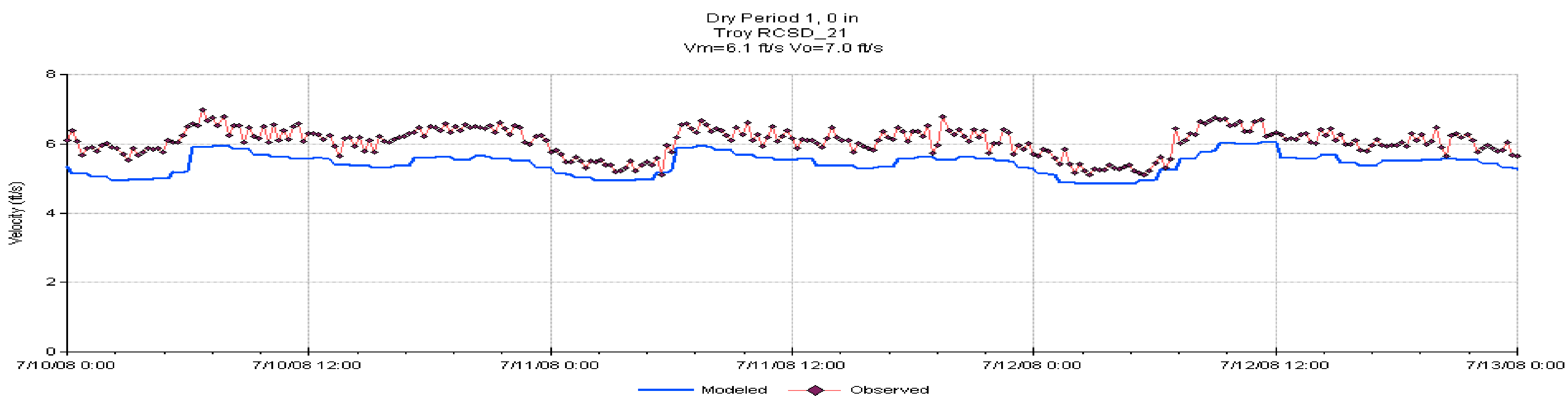
Dry Period 2, 0 in
Troy RCSD_19
Vm=1.05 MG Vo=1.02 MG; Qm=0.5 cfs Qo=0.6 cfs
Flowrate (cfs)
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
8/23/08 0:00
8/24/08 0:00
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
Modeled
Observed

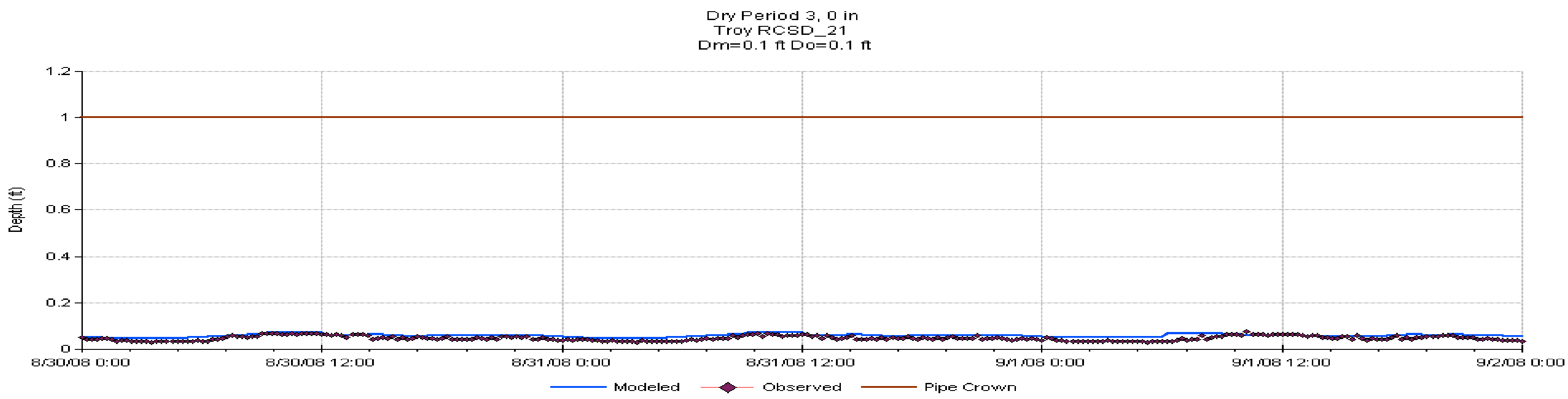


Dry Period 2, 0 in
Troy RCSD_19
Vm=1.8 ft/s Vo=1.2 ft/s
Velocity (ft/s)
2
1.5
1
0.5
0
8/23/08 0:00
8/24/08 0:00
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
Modeled
Observed

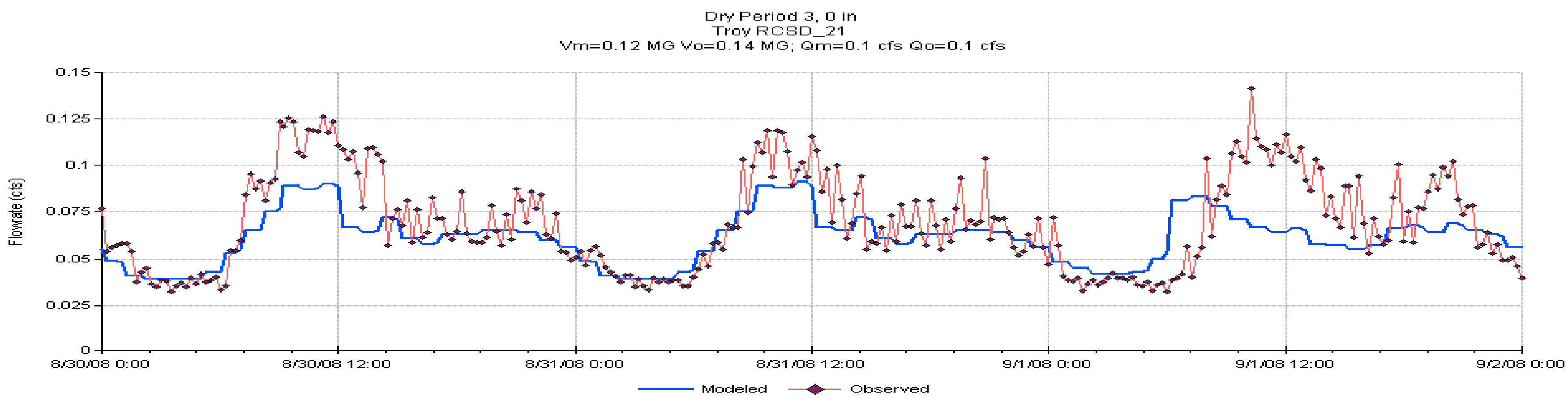

Dry Period 1, 0 in
Troy RCSD_21
Dm=0.1 ft Do=0.1 ft
Depth (ft)
1.2
1
0.8
0.6
0.4
0.2
0
7/10/08 0:00
7/10/08 12:00
7/11/08 0:00
7/11/08 12:00
7/12/08 0:00
7/12/08 12:00
7/13/08 0:00
Modeled
Observed
Pipe Crown


Dry Period 1, 0 in
Troy RCSD_21
Vm=0.13 MG Vo=0.11 MG; Qm=0.1 cfs Qo=0.1 cfs
Flowrate (cfs)
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
7/10/08 0:00
7/10/08 12:00
7/11/08 0:00
7/11/08 12:00
7/12/08 0:00
7/12/08 12:00
7/13/08 0:00
Modeled
Observed

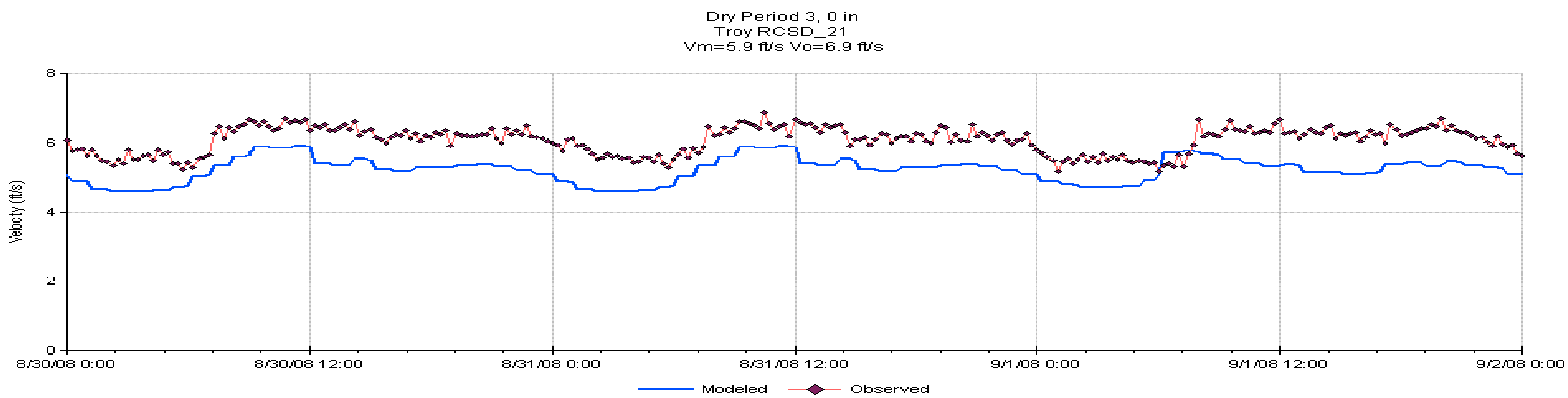

Dry Period 1, 0 in
Troy RCSD_21
Vm=6.1 ft/s Vo=7.0 ft/s
Velocity (ft/s)
8
6
4
2
0
7/10/08 0:00
7/10/08 12:00
7/11/08 0:00
7/11/08 12:00
7/12/08 0:00
7/12/08 12:00
7/13/08 0:00
Modeled
Observed



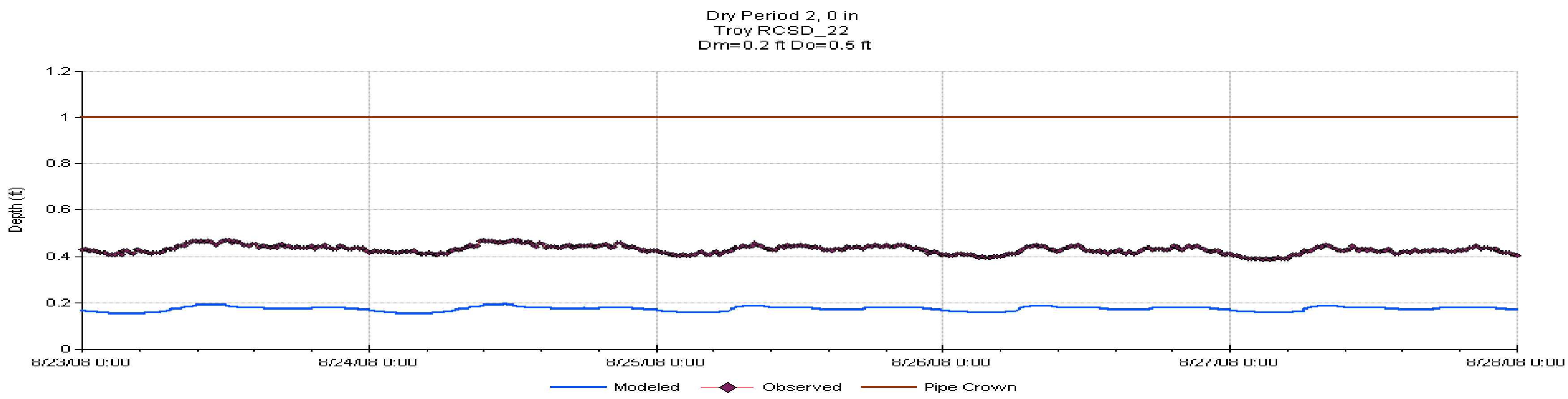
Dry Period 3, 0 in
Troy RCSD_21
Dm=0.1 ft Do=0.1 ft
Depth (ft)
8/30/08 0:00
8/30/08 12:00
8/31/08 0:00
8/31/08 12:00
9/1/08 0:00
9/1/08 12:00
9/2/08 0:00
Modeled
Observed
Pipe Crown

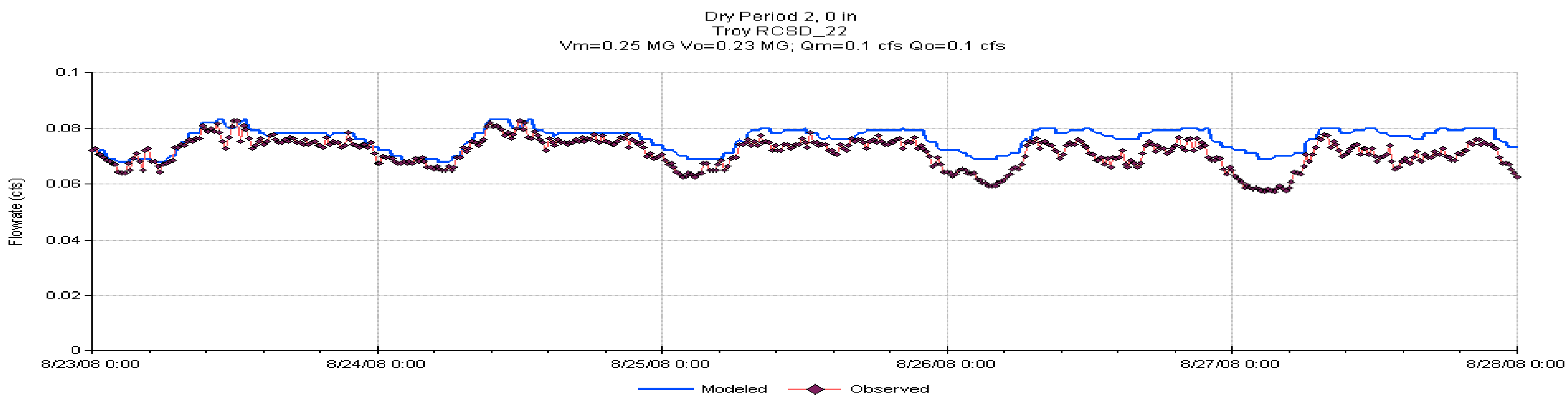


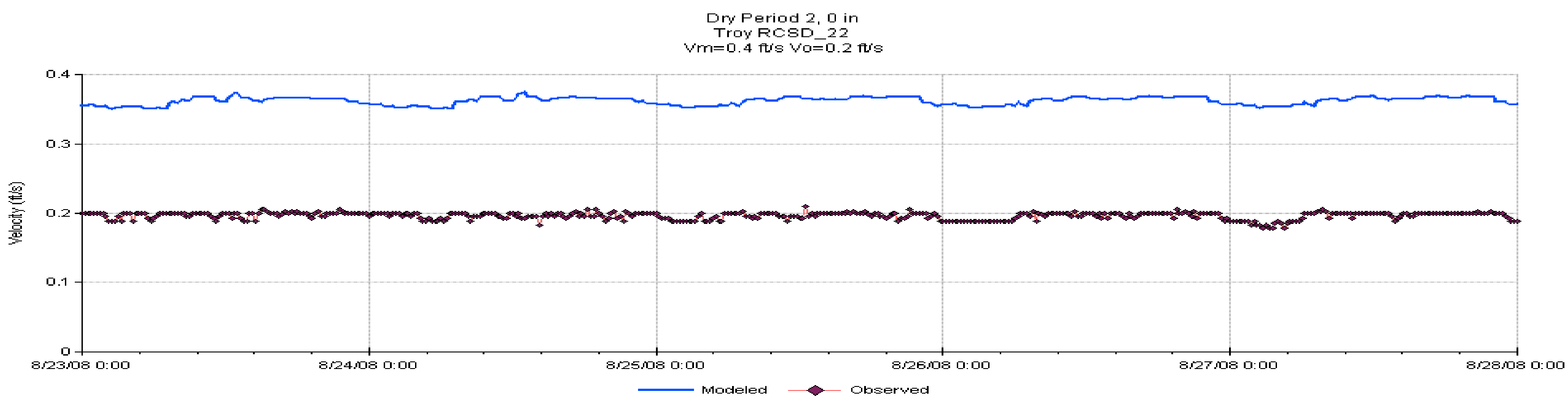
Dry Period 3, 0 in
Troy RCSD_21
Vm=0.12 MG Vo=0.14 MG; Qm=0.1 cfs Qo=0.1 cfs
Flowrate (cfs)
8/30/08 0:00
8/30/08 12:00
8/31/08 0:00
8/31/08 12:00
9/1/08 0:00
9/1/08 12:00
9/2/08 0:00
Modeled
Observed

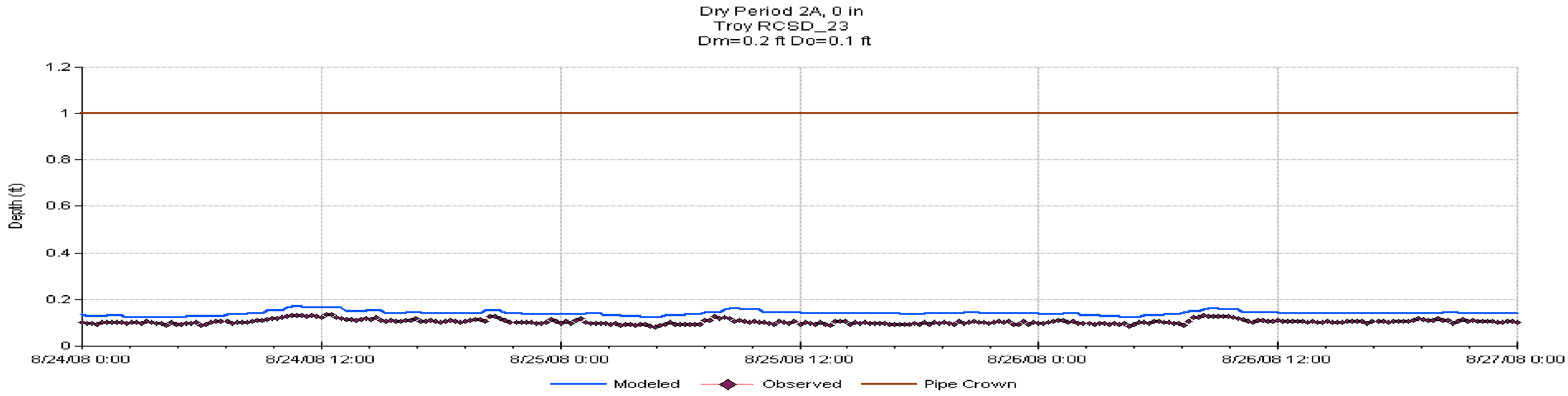


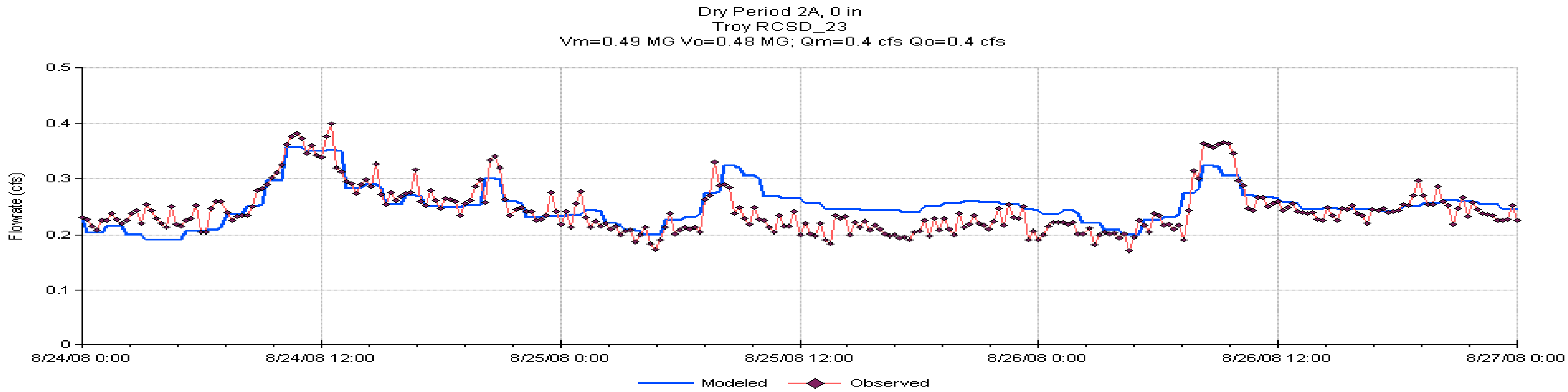
Dry Period 3, 0 in
Troy RCSD_21
Vm=5.9 ft/s Vo=6.9 ft/s
Velocity (ft/s)
8/30/08 0:00
8/30/08 12:00
8/31/08 0:00
8/31/08 12:00
9/1/08 0:00
9/1/08 12:00
9/2/08 0:00
Modeled
Observed

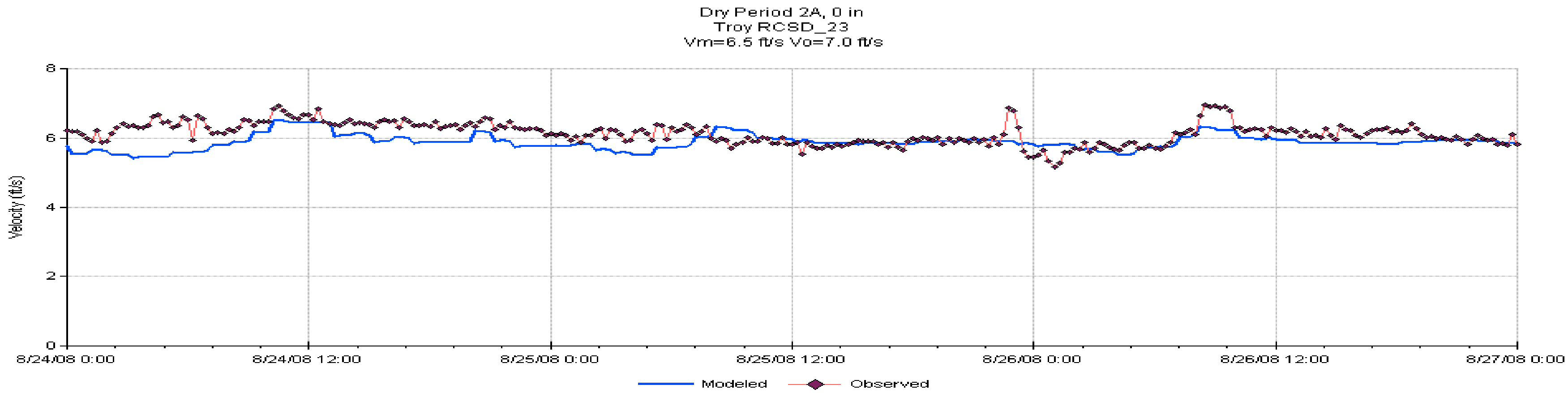

Dry Period 2, 0 in
Troy RCSD_22
Dm=0.2 ft Do=0.5 ft
Depth (ft)
1.2
1
0.8
0.6
0.4
0.2
0
8/23/08 0:00
8/24/08 0:00
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
Modeled
Observed
Pipe Crown

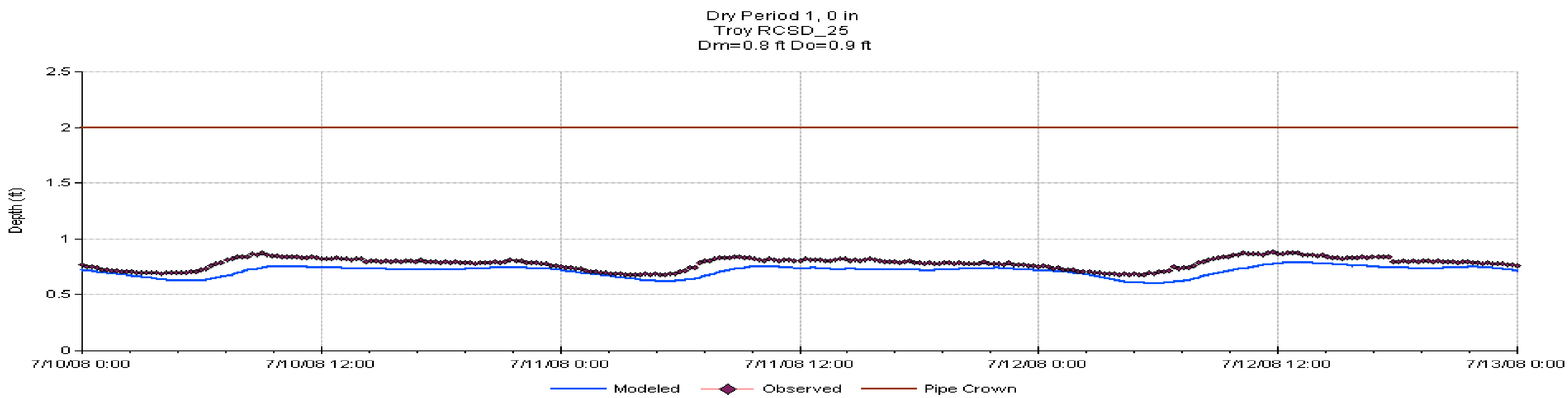

Dry Period 2, 0 in
Troy RCSD_22
Vm=0.25 MG Vo=0.23 MG; Qm=0.1 cfs Qo=0.1 cfs
Flowrate (cfs)
0.1
0.08
0.06
0.04
0.02
0
8/23/08 0:00
8/24/08 0:00
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
Modeled
Observed


Dry Period 2, 0 in
Troy RCSD_22
Vm=0.4 ft/s Vo=0.2 ft/s
Velocity (ft/s)
0.4
0.3
0.2
0.1
0
8/23/08 0:00
8/24/08 0:00
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
Modeled
Observed

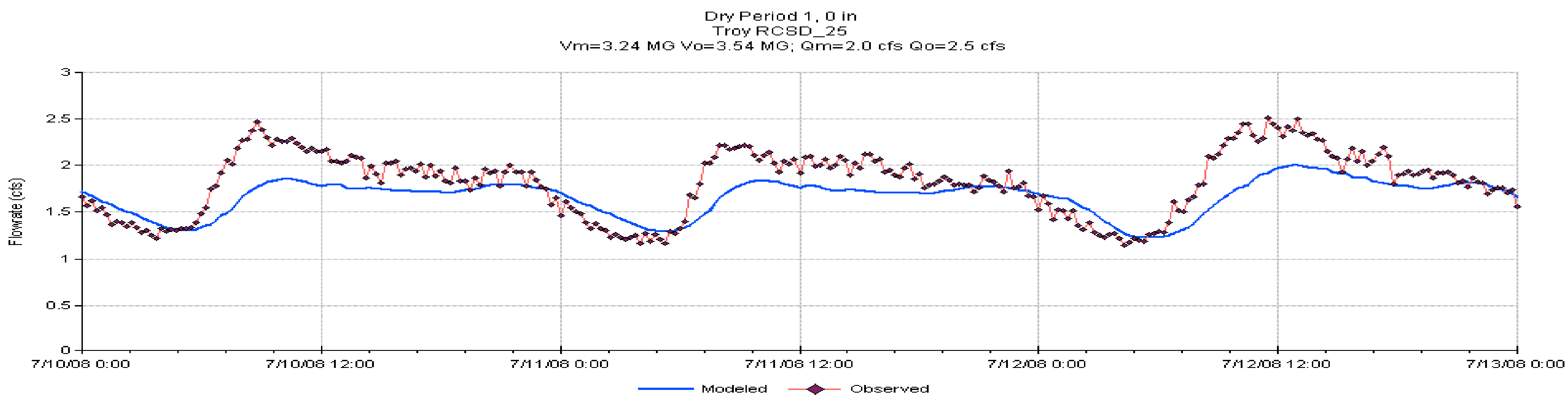

Dry Period 2A, 0 in
Troy RCSD_23
Dm=0.2 ft Do=0.1 ft
Depth (ft)
1.2
1
0.8
0.6
0.4
0.2
0
8/24/08 0:00
8/24/08 12:00
8/25/08 0:00
8/25/08 12:00
8/26/08 0:00
8/26/08 12:00
8/27/08 0:00
Modeled
Observed
Pipe Crown


Dry Period 2A, 0 in
Troy RCSD_23
Vm=0.49 MG Vo=0.48 MG; Qm=0.4 cfs Qo=0.4 cfs
Flowrate (cfs)
0.5
0.4
0.3
0.2
0.1
0
8/24/08 0:00
8/24/08 12:00
8/25/08 0:00
8/25/08 12:00
8/26/08 0:00
8/26/08 12:00
8/27/08 0:00
Modeled
Observed

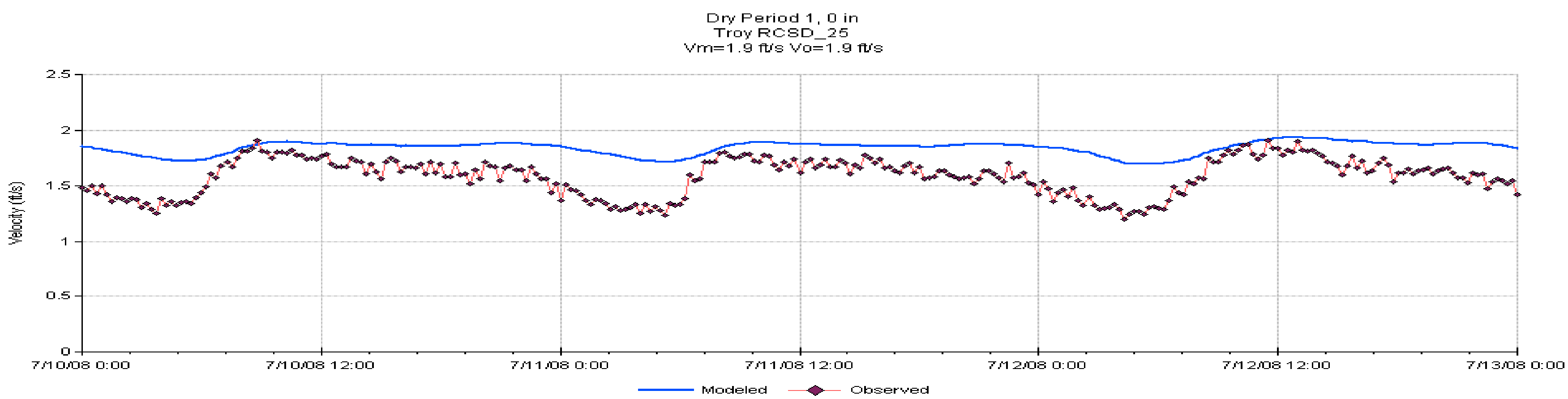

Dry Period 2A, 0 in
Troy RCSD_23
Vm=6.5 ft/s Vo=7.0 ft/s
Velocity (ft/s)
8
6
4
2
0
8/24/08 0:00
8/24/08 12:00
8/25/08 0:00
8/25/08 12:00
8/26/08 0:00
8/26/08 12:00
8/27/08 0:00
Modeled
Observed



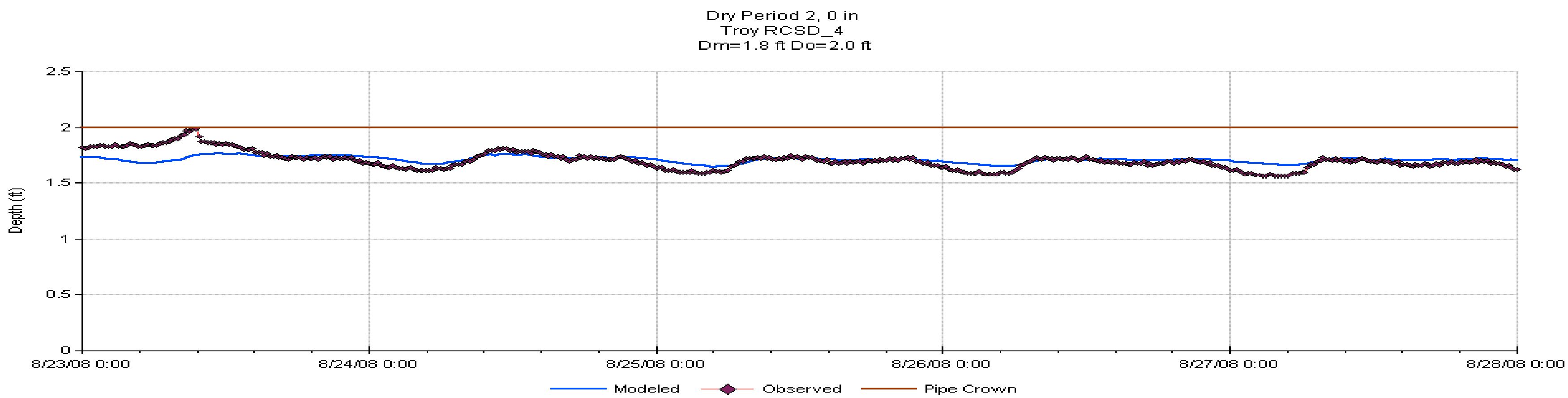
Dry Period 1, 0 in
Troy RCSD_25
Dm=0.8 ft Do=0.9 ft
Depth (ft)
2.5
2
1.5
1
0.5
0
7/10/08 0:00
7/10/08 12:00
7/11/08 0:00
7/11/08 12:00
7/12/08 0:00
7/12/08 12:00
7/13/08 0:00
Modeled
Observed
Pipe Crown

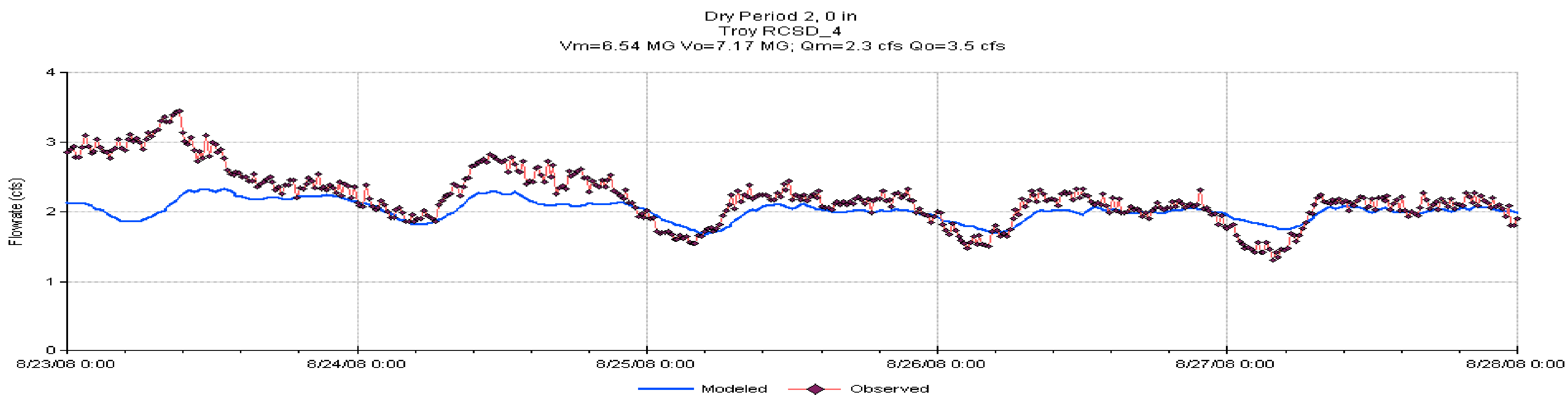


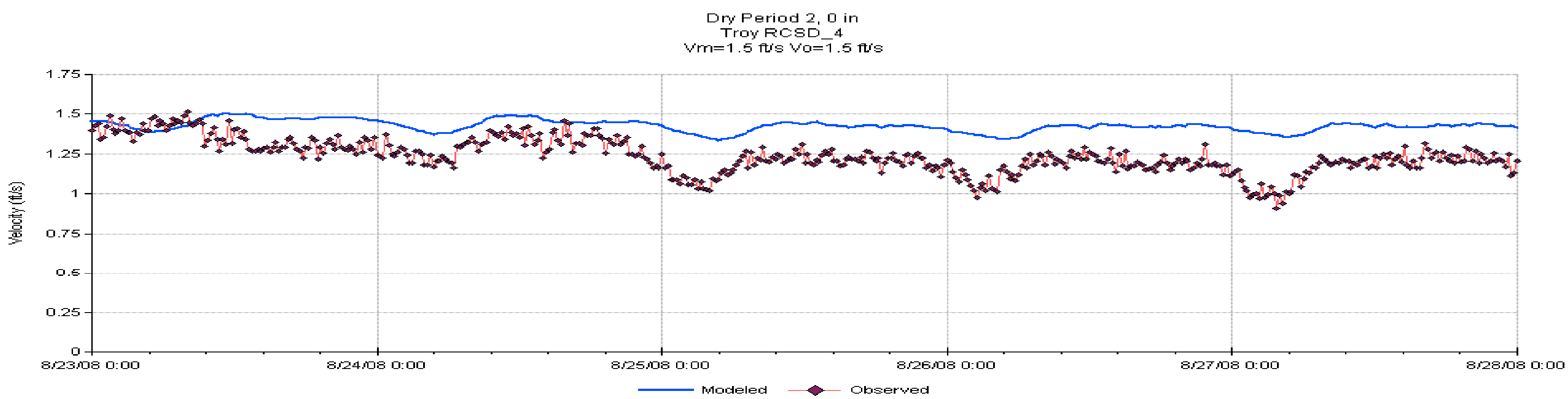
Dry Period 1, 0 in
Troy RCSD_25
Vm=3.24 MG Vo=3.54 MG; Qm=2.0 cfs Qo=2.5 cfs
Flowrate (cfs)
3
2.5
2
1.5
1
0.5
0
7/10/08 0:00
7/10/08 12:00
7/11/08 0:00
7/11/08 12:00
7/12/08 0:00
7/12/08 12:00
7/13/08 0:00
Modeled
Observed

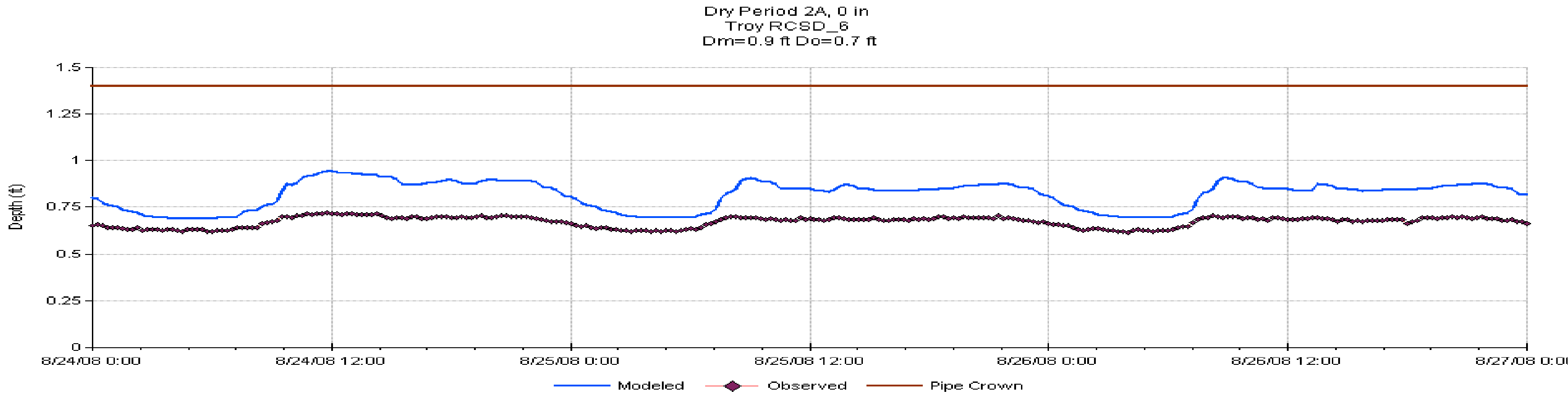


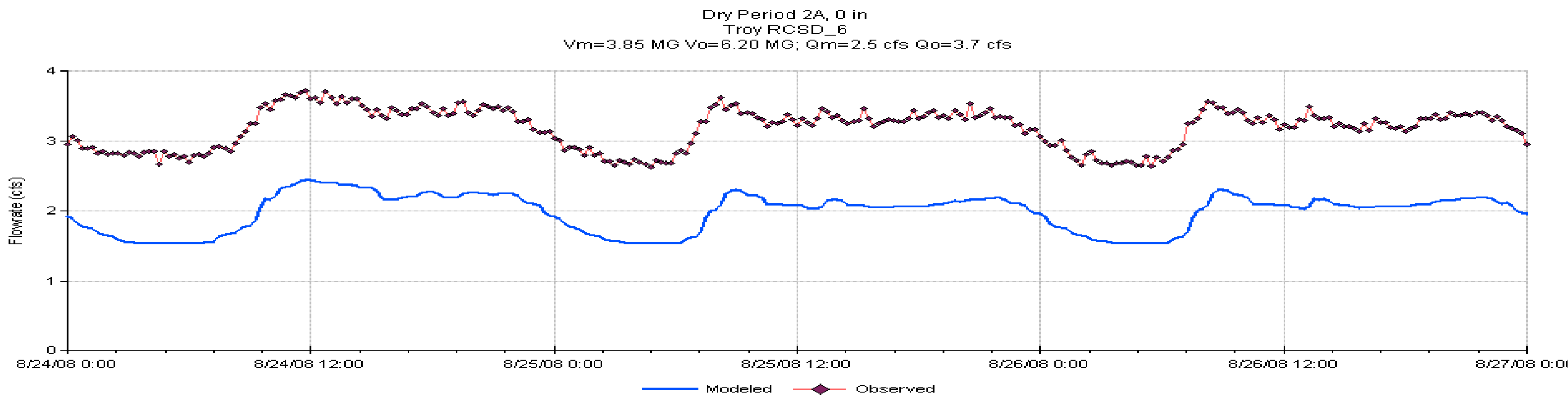
Dry Period 1, 0 in
Troy RCSD_25
Vm=1.9 ft/s Vo=1.9 ft/s
Velocity (ft/s)
2.5
2
1.5
1
0.5
0
7/10/08 0:00
7/10/08 12:00
7/11/08 0:00
7/11/08 12:00
7/12/08 0:00
7/12/08 12:00
7/13/08 0:00
Modeled
Observed

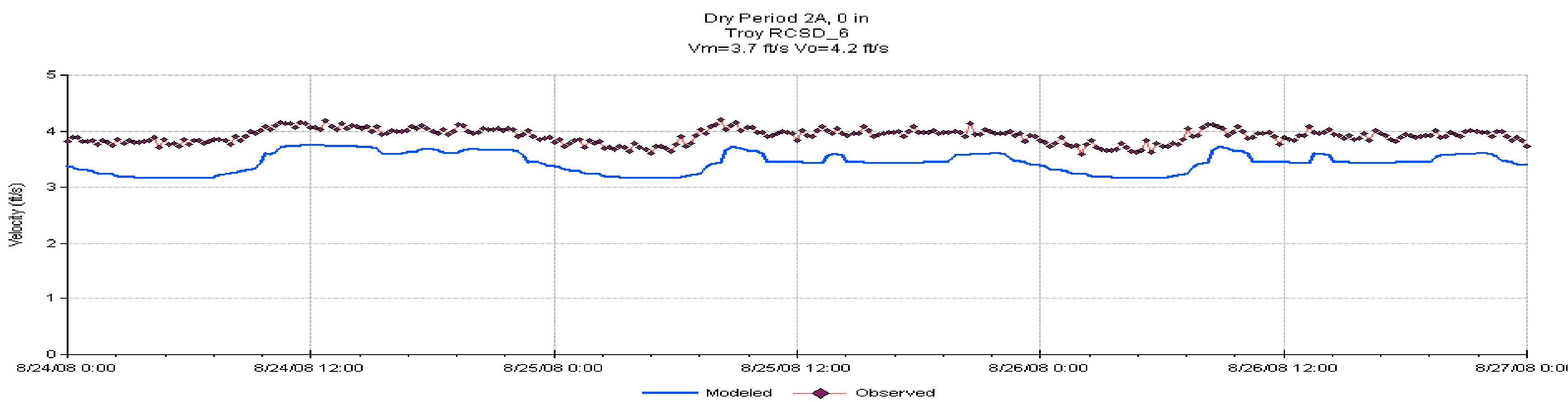

Dry Period 2, 0 in
Troy RCSD_4
Dm=1.8 ft Do=2.0 ft
Depth (ft)
2.5
2
1.5
1
0.5
0
8/23/08 0:00
8/24/08 0:00
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
Modeled
Observed
Pipe Crown

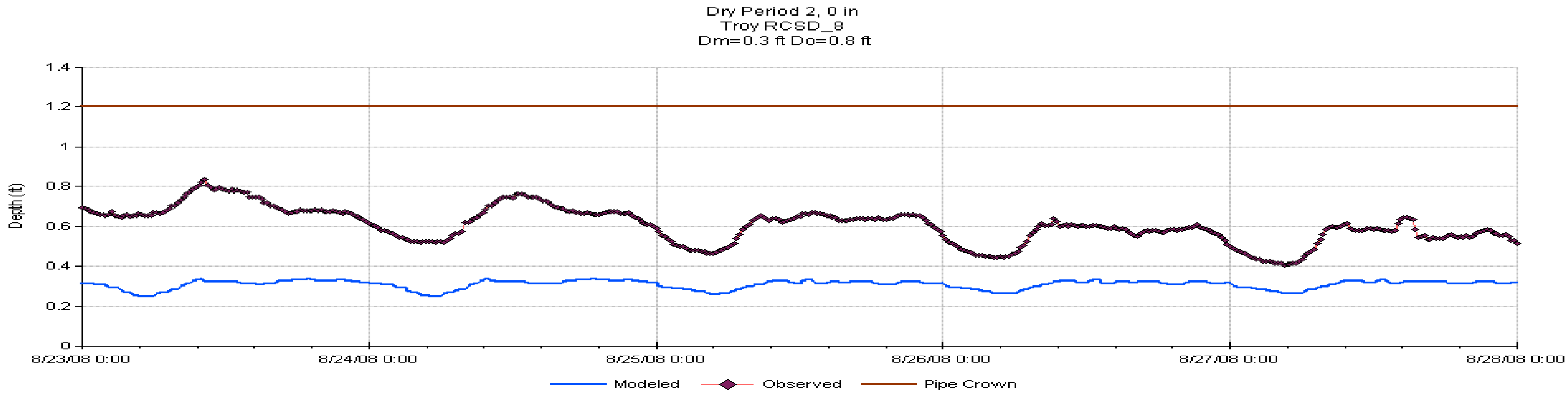

Dry Period 2, 0 in
Troy RCSD_4
Vm=6.54 MG Vo=7.17 MG; Qm=2.3 cfs Qo=3.5 cfs
Flowrate (cfs)
4
3
2
1
0
8/23/08 0:00
8/24/08 0:00
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
Modeled
Observed

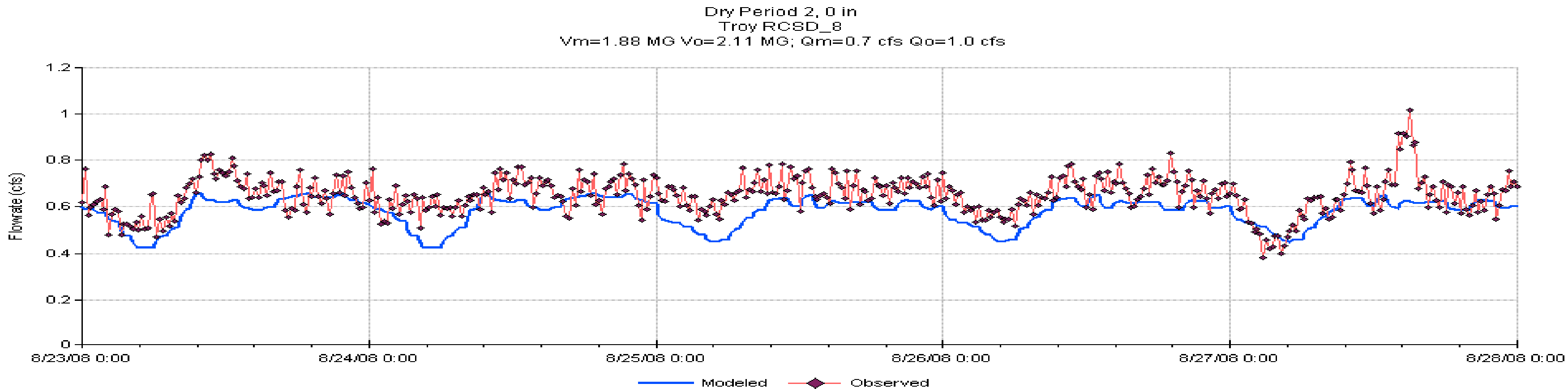

Dry Period 2, 0 in
Troy RCSD_4
Vm=1.5 ft/s Vo=1.5 ft/s
Velocity (ft/s)
1.75
1.5
1.25
1
0.75
0.5
0.25
0
8/23/08 0:00
8/24/08 0:00
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
Modeled
Observed

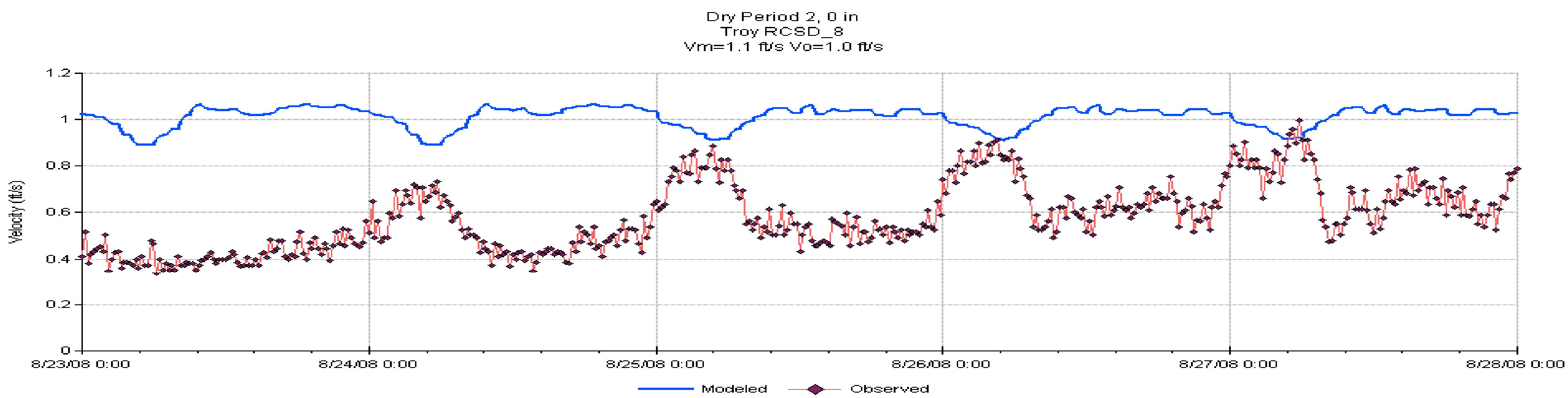

Dry Period 2A, 0 in
Troy RCSD_6
Dm=0.9 ft Do=0.7 ft
Depth (ft)
1.5
1.25
1
0.75
0.5
0.25
0
8/24/08 0:00
8/24/08 12:00
8/25/08 0:00
8/25/08 12:00
8/26/08 0:00
8/26/08 12:00
8/27/08 0:00
Modeled
Observed
Pipe Crown

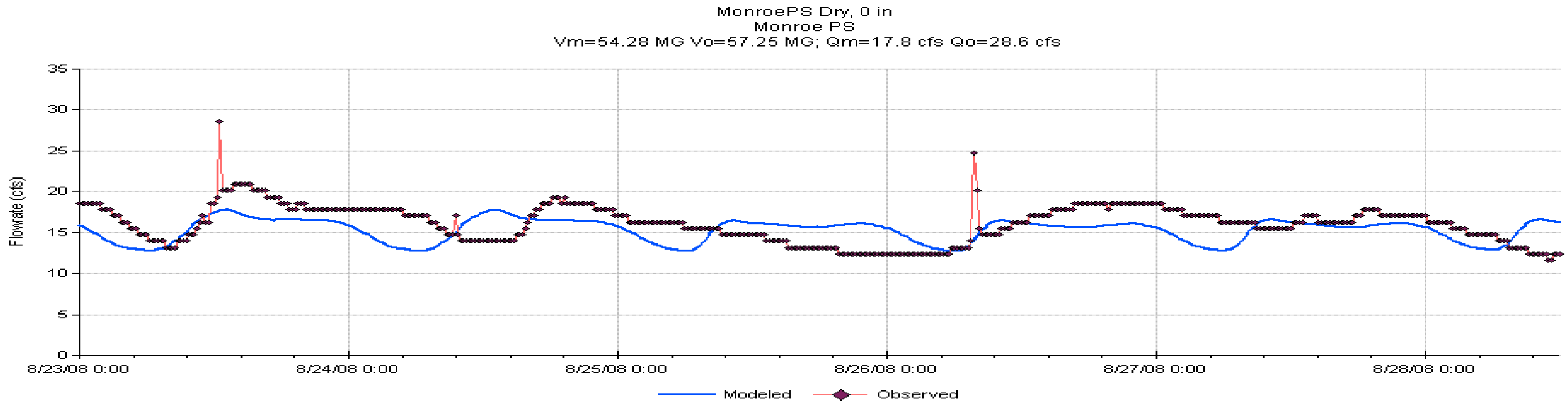

Dry Period 2A, 0 in
Troy RCSD_6
Vm=3.85 MG Vo=6.20 MG; Qm=2.5 cfs Qo=3.7 cfs
Flowrate (cfs)
4
3
2
1
0
8/24/08 0:00
8/24/08 12:00
8/25/08 0:00
8/25/08 12:00
8/26/08 0:00
8/26/08 12:00
8/27/08 0:00
Modeled
Observed

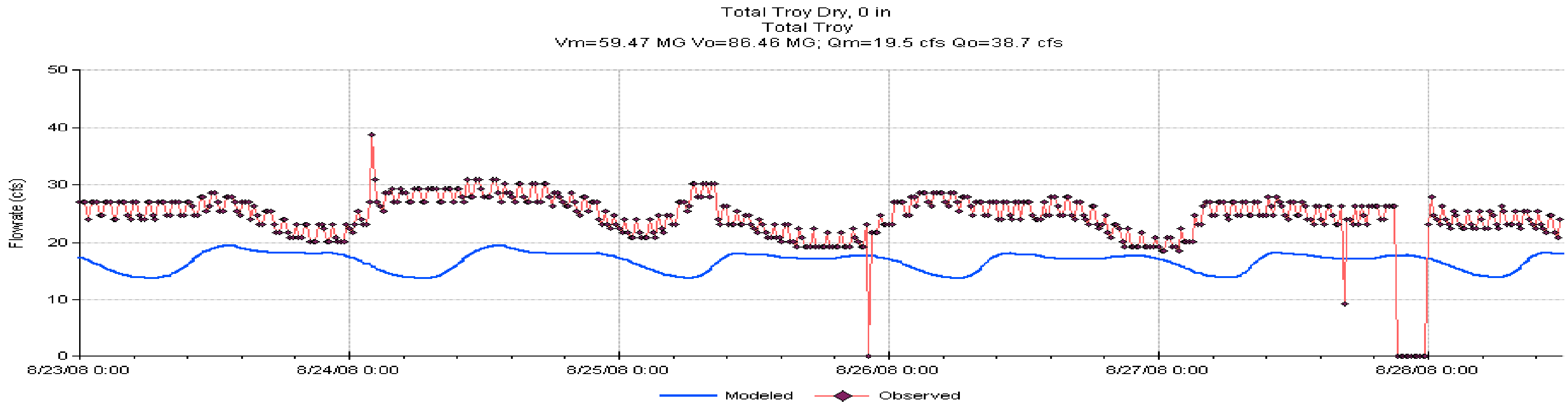

Dry Period 2A, 0 in
Troy RCSD_6
Vm=3.7 ft/s Vo=4.2 ft/s
Velocity (ft/s)
5
4
3
2
1
0
8/24/08 0:00
8/24/08 12:00
8/25/08 0:00
8/25/08 12:00
8/26/08 0:00
8/26/08 12:00
8/27/08 0:00
Modeled
Observed

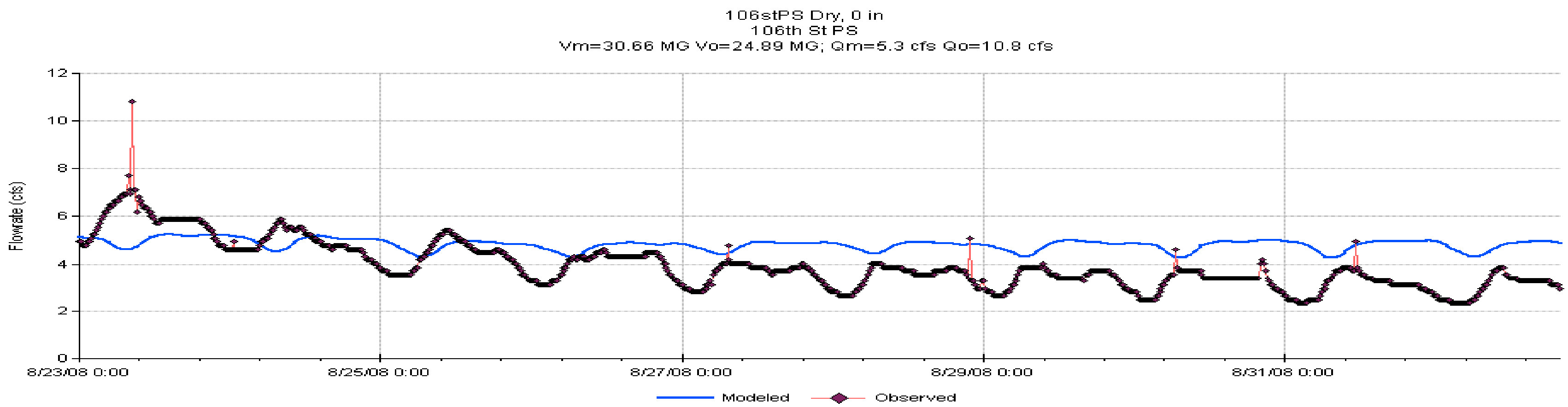

Dry Period 2, 0 in
Troy RCSD_8
Dm=0.3 ft Do=0.8 ft
Depth (ft)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
8/23/08 0:00
8/24/08 0:00
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
Modeled
Observed
Pipe Crown


Dry Period 2, 0 in
Troy RCSD_8
Vm=1.88 MG Vo=2.11 MG; Qm=0.7 cfs Qo=1.0 cfs
Flowrate (cfs)
1.2
1
0.8
0.6
0.4
0.2
0
8/23/08 0:00
8/24/08 0:00
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
Modeled
Observed

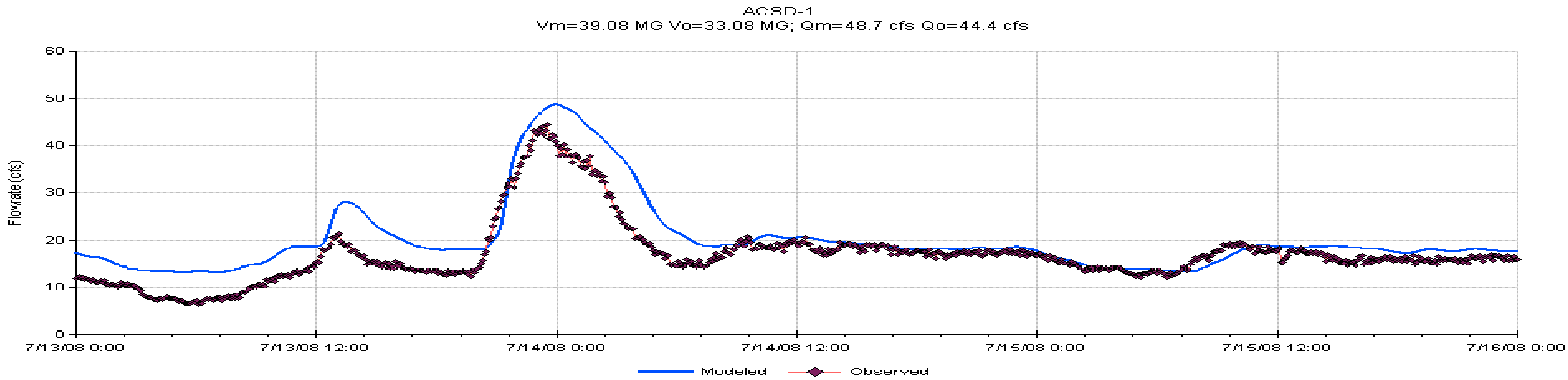

Dry Period 2, 0 in
Troy RCSD_8
Vm=1.1 ft/s Vo=1.0 ft/s
Velocity (ft/s)
1.2
1
0.8
0.6
0.4
0.2
0
8/23/08 0:00
8/24/08 0:00
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
Modeled
Observed

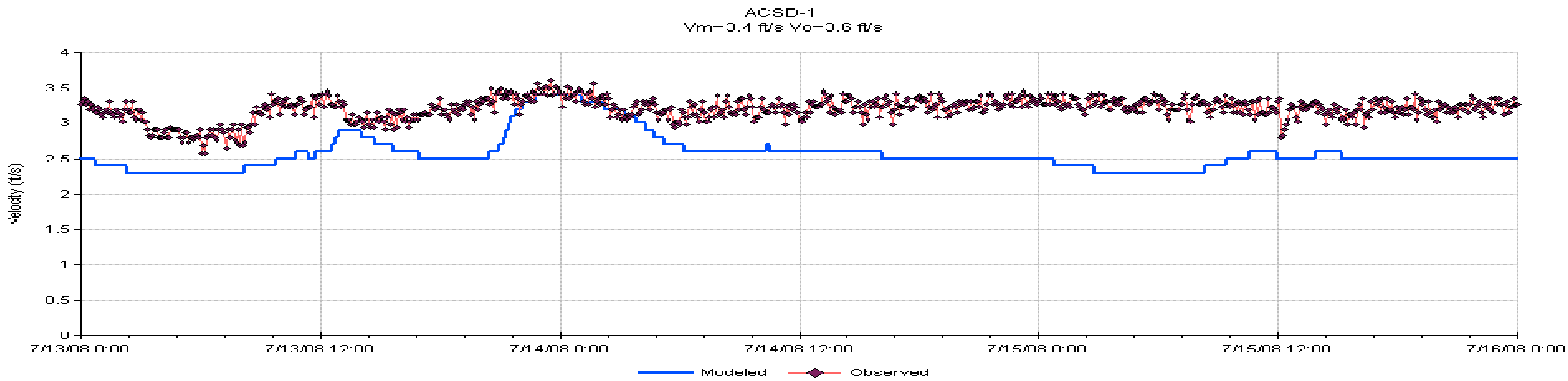

MonroePS Dry, 0 in
Monroe PS
Vm=54.28 MG Vo=57.25 MG; Qm=17.8 cfs Qo=28.6 cfs
Flowrate (cfs)
35
30
25
20
15
10
5
0
8/23/08 0:00
8/24/08 0:00
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
Modeled
Observed

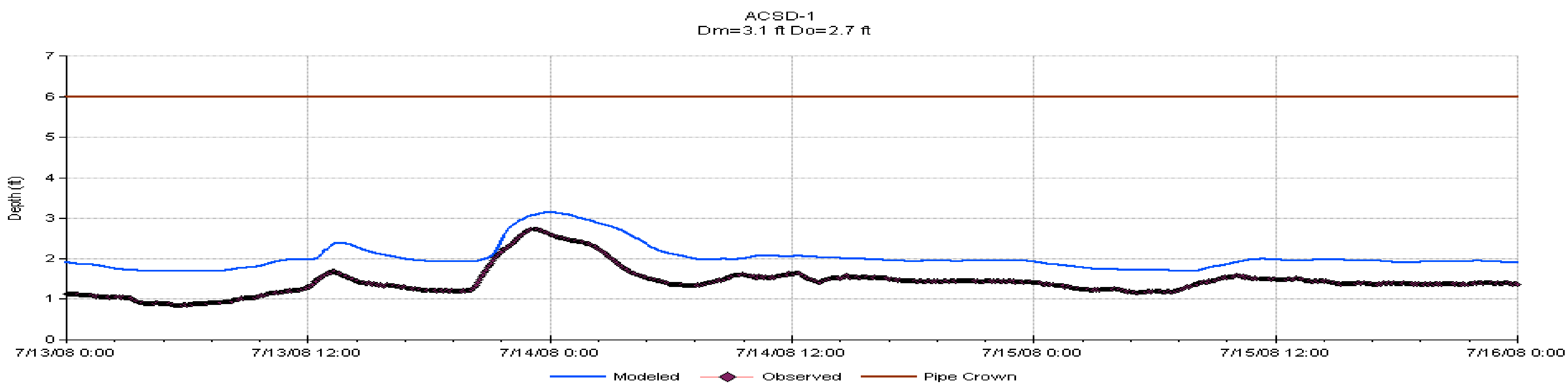

Total Troy Dry, 0 in
Total Troy
Vm=59.47 MG Vo=86.46 MG; Qm=19.5 cfs Qo=38.7 cfs
Flowrate (cfs)
50
40
30
20
10
0
8/23/08 0:00
8/24/08 0:00
8/25/08 0:00
8/26/08 0:00
8/27/08 0:00
8/28/08 0:00
Modeled
Observed


106stPS Dry, 0 in
106th St PS
Vm=30.66 MG Vo=24.89 MG; Qm=5.3 cfs Qo=10.8 cfs
Flowrate (cfs)
12
10
8
6
4
2
0
8/23/08 0:00
8/25/08 0:00
8/27/08 0:00
8/29/08 0:00
8/31/08 0:00
Modeled
Observed

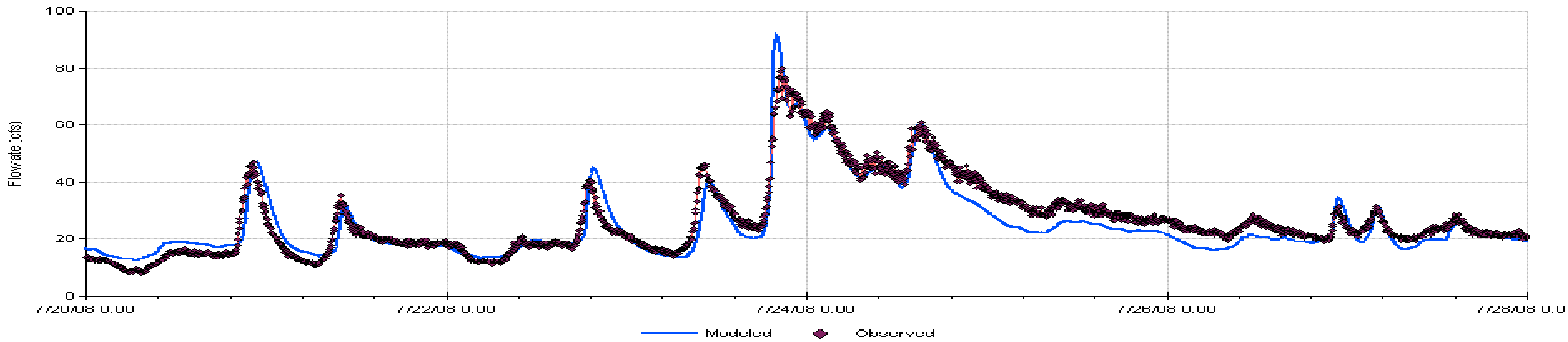
Appendix C. Albany North principal storm calibration


ACSD-1
Vm=39.08 MG Vo=33.08 MG; Qm=48.7 cfs Qo=44.4 cfs
Flowrate (cfs)
7/13/08 0:00
7/13/08 12:00
7/14/08 0:00
7/14/08 12:00
7/15/08 0:00
7/15/08 12:00
7/16/08 0:00
Modeled
Observed

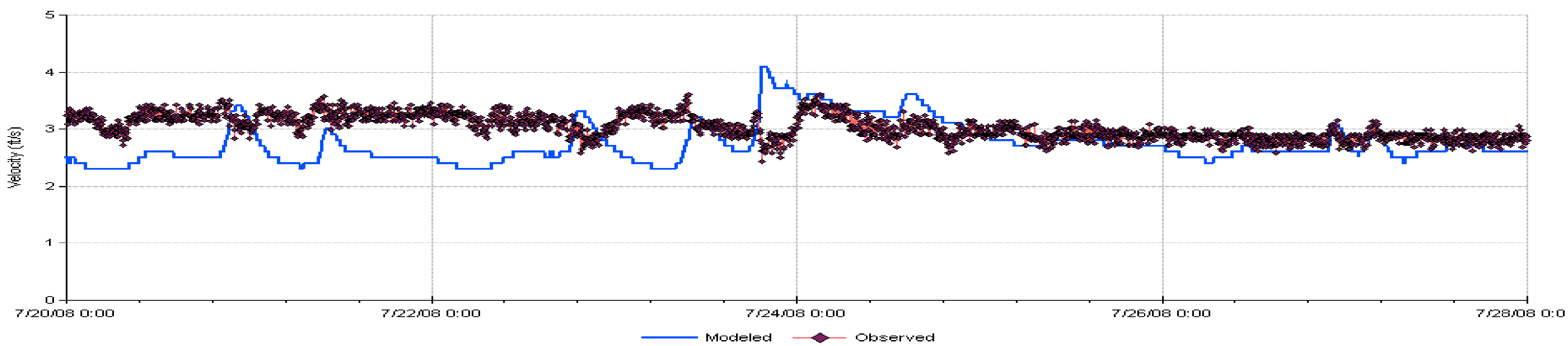

ACSD-1
Vm=3.4 ft/s Vo=3.6 ft/s
Velocity (ft/s)
7/13/08 0:00
7/13/08 12:00
7/14/08 0:00
7/14/08 12:00
7/15/08 0:00
7/15/08 12:00
7/16/08 0:00
Modeled
Observed


ACSD-1
Dm=3.1 ft Do=2.7 ft
Depth (ft)
7/13/08 0:00
7/13/08 12:00
7/14/08 0:00
7/14/08 12:00
7/15/08 0:00
7/15/08 12:00
7/16/08 0:00
Modeled
Observed
Pipe Crown

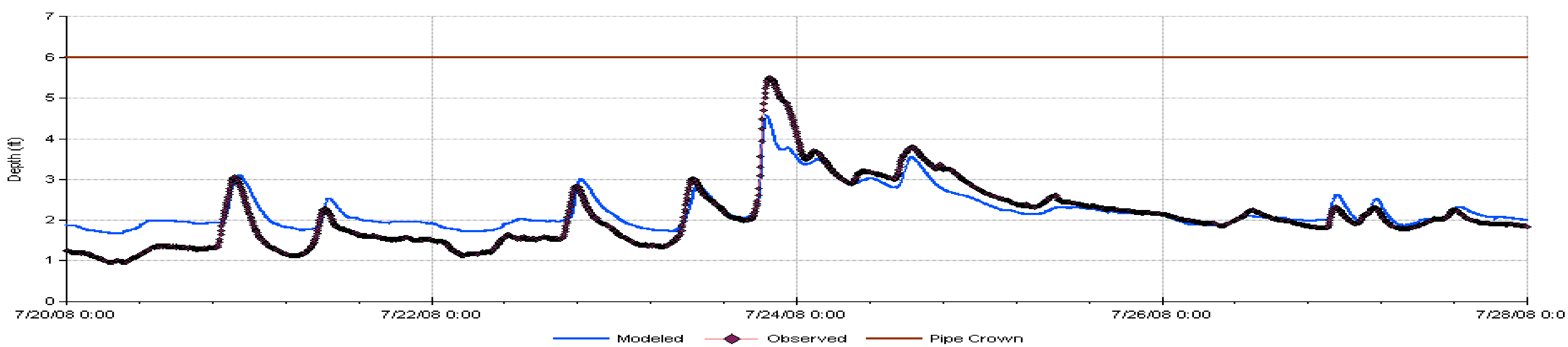
ACSD-1
Vm=130.78 MG Vo=138.86 MG; Qm=91.6 cfs Qo=79.8 cfs

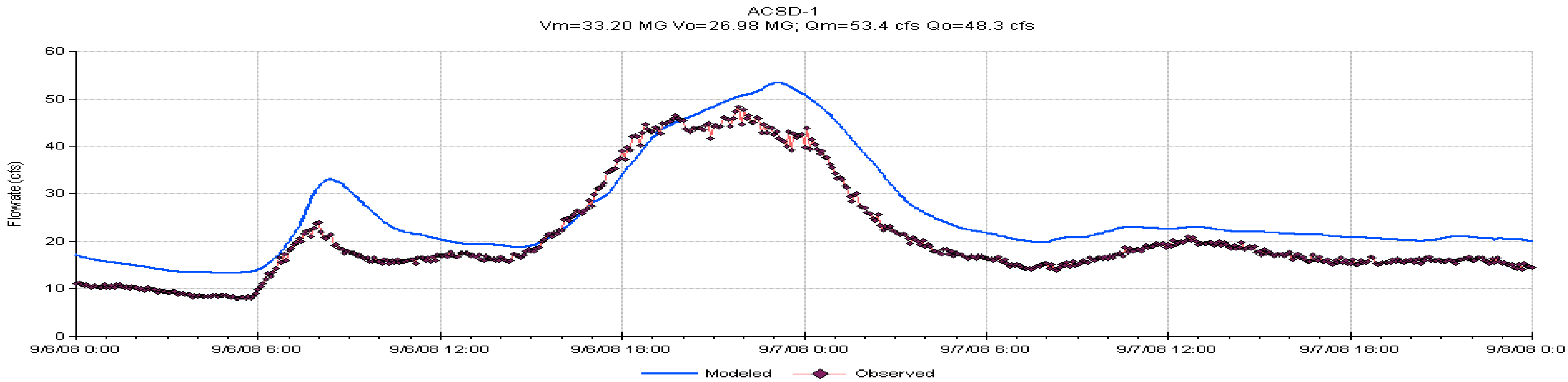


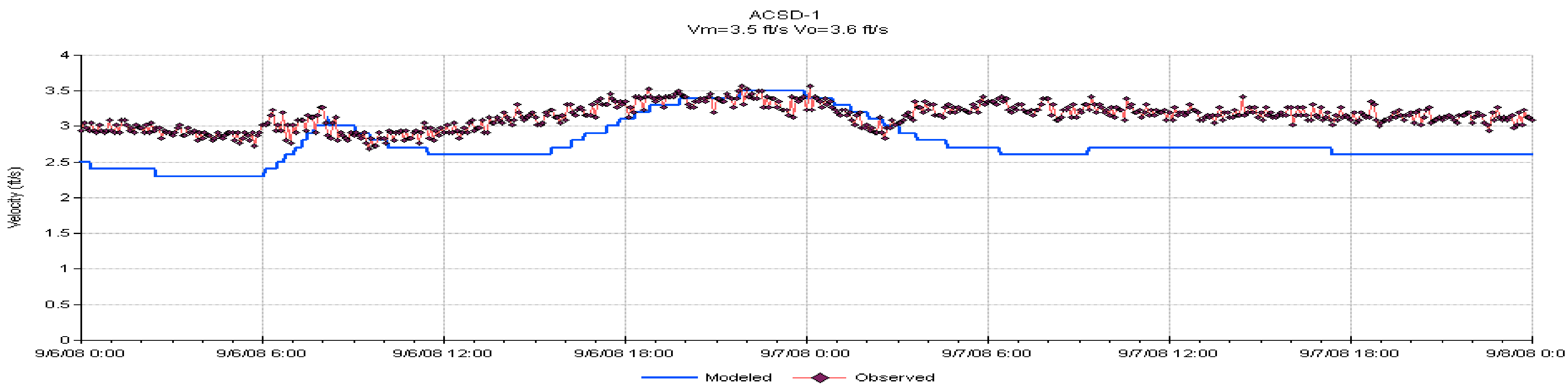
ACSD-1
Vm=4.1 ft/s Vo=3.6 ft/s

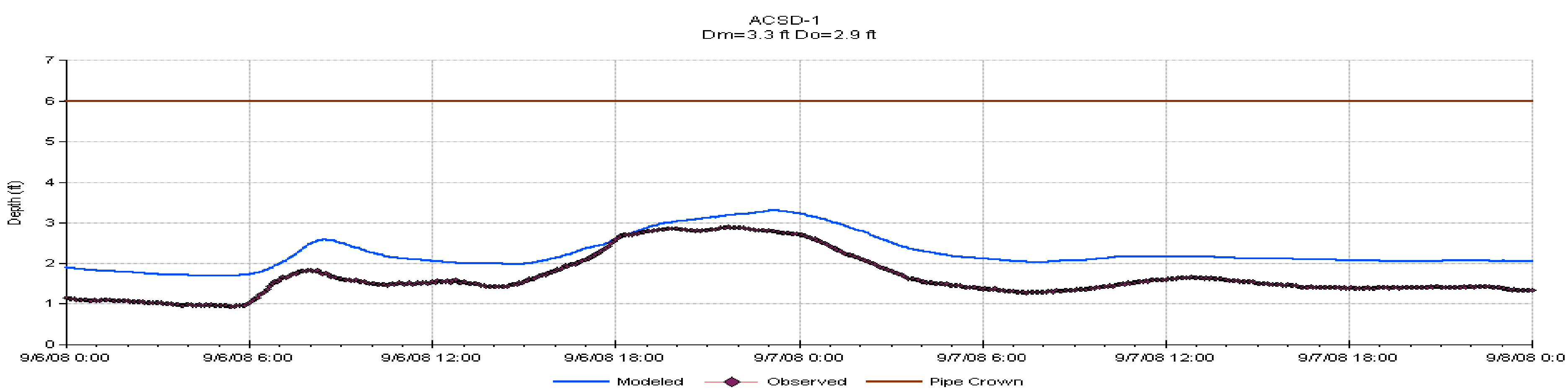


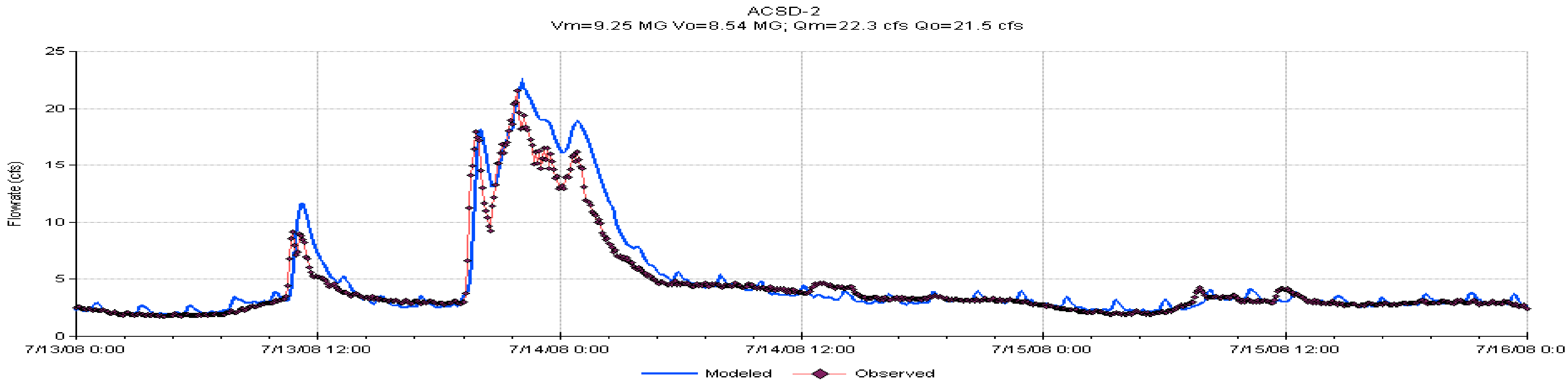
ACSD-1
Dm=4.5 ft Do=5.5 ft

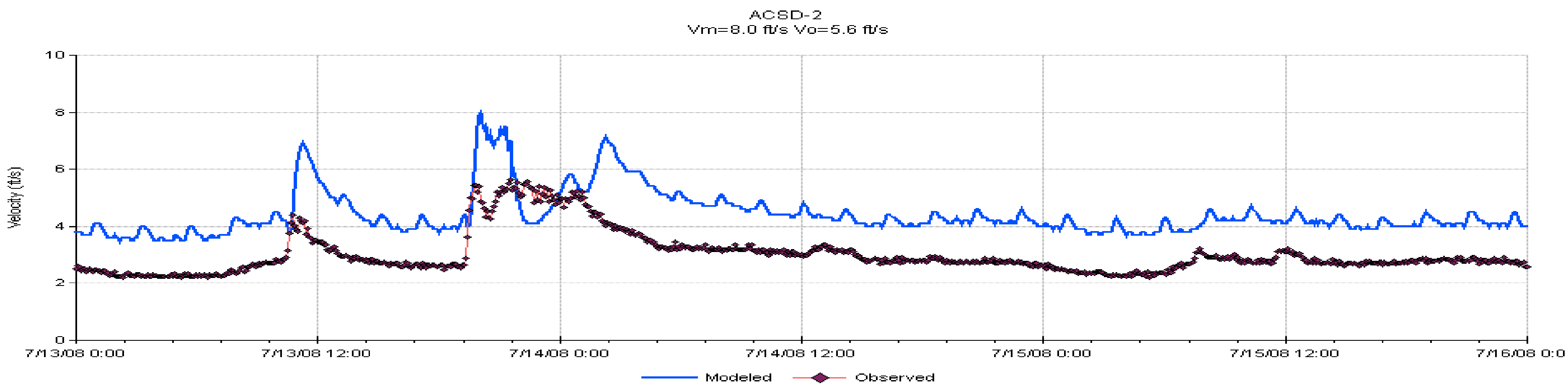


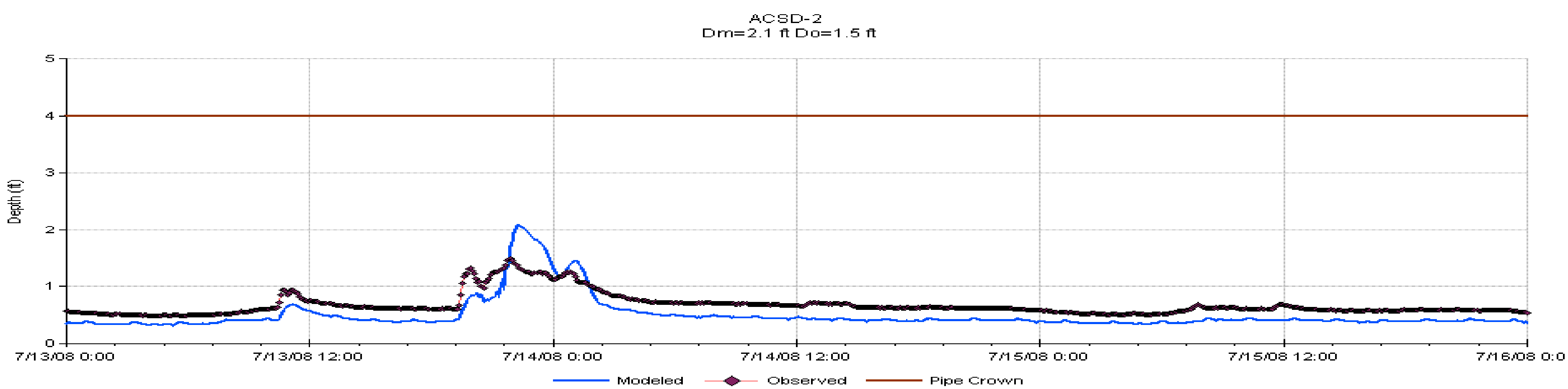

ACSD-1
Vm=33.20 MG Vo=26.98 MG; Qm=53.4 cfs Qo=48.3 cfs
Flowrate (cfs)
0
10
20
30
40
50
60
9/6/08 0:00
9/6/08 6:00
9/6/08 12:00
9/6/08 18:00
9/7/08 0:00
9/7/08 6:00
9/7/08 12:00
9/7/08 18:00
9/8/08 0:0
Modeled
Observed

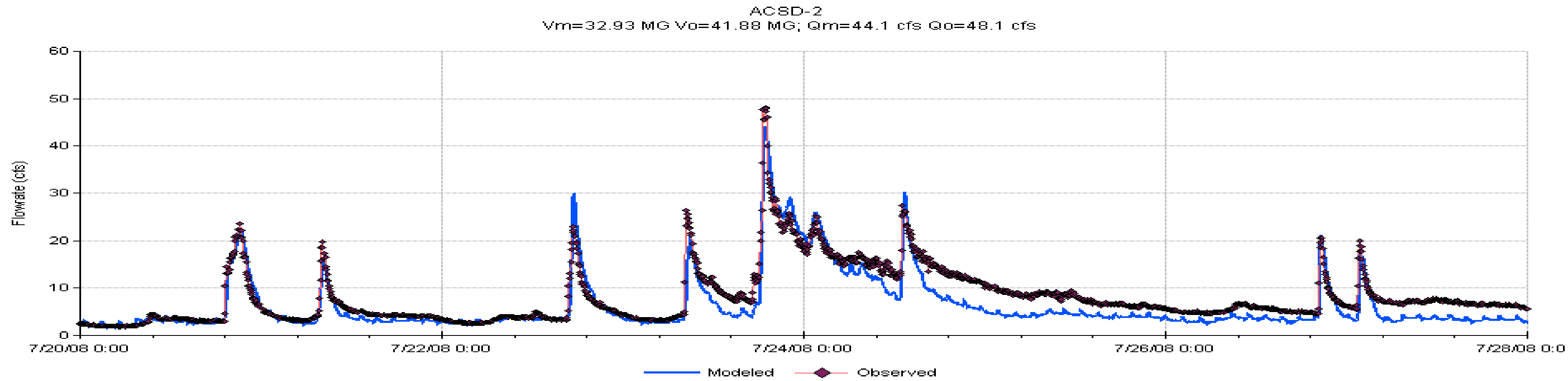

ACSD-1
Vm=3.5 ft/s Vo=3.6 ft/s
Velocity (ft/s)
0
0.5
1
1.5
2
2.5
3
3.5
4
9/6/08 0:00
9/6/08 6:00
9/6/08 12:00
9/6/08 18:00
9/7/08 0:00
9/7/08 6:00
9/7/08 12:00
9/7/08 18:00
9/8/08 0:0
Modeled
Observed

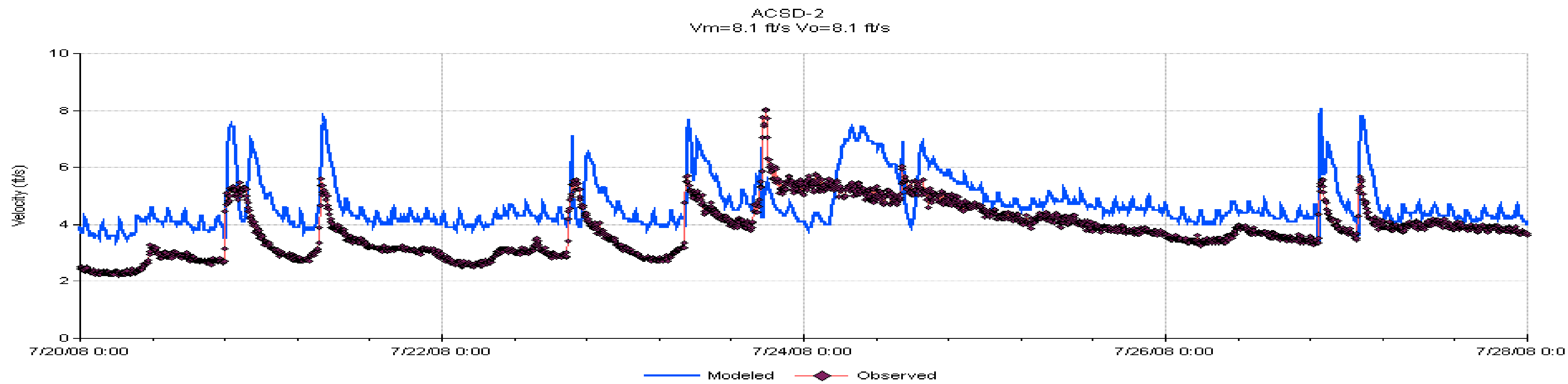

ACSD-1
Dm=3.3 ft Do=2.9 ft
Depth (ft)
0
1
2
3
4
5
6
7
9/6/08 0:00
9/6/08 6:00
9/6/08 12:00
9/6/08 18:00
9/7/08 0:00
9/7/08 6:00
9/7/08 12:00
9/7/08 18:00
9/8/08 0:0
Modeled
Observed
Pipe Crown

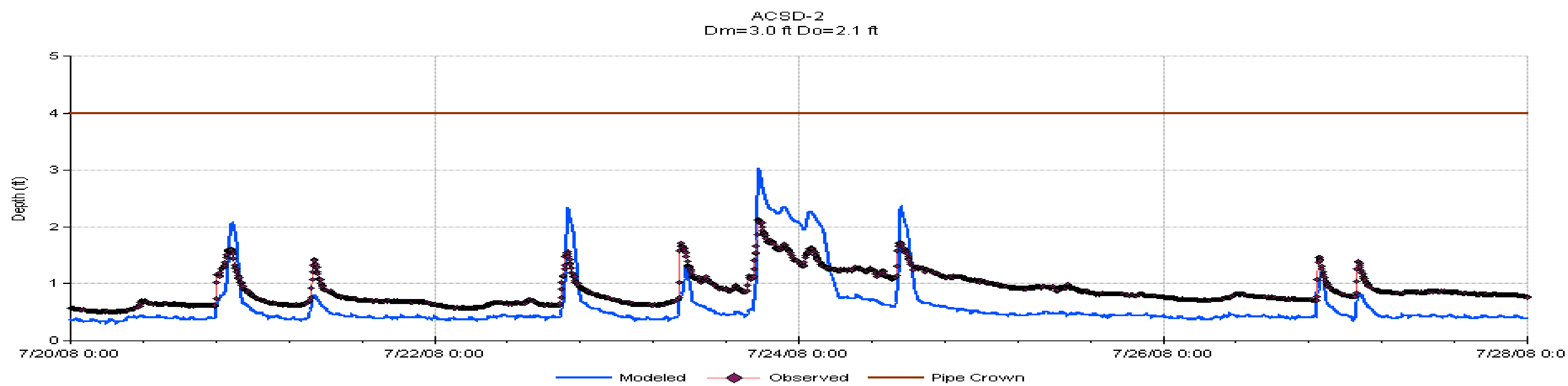

ACSD-2
Vm=9.25 MG Vo=8.54 MG; Qm=22.3 cfs Qo=21.5 cfs
Flowrate (cfs)
25
20
15
10
5
0
7/13/08 0:00
7/13/08 12:00
7/14/08 0:00
7/14/08 12:00
7/15/08 0:00
7/15/08 12:00
7/16/08 0:0
Modeled
Observed

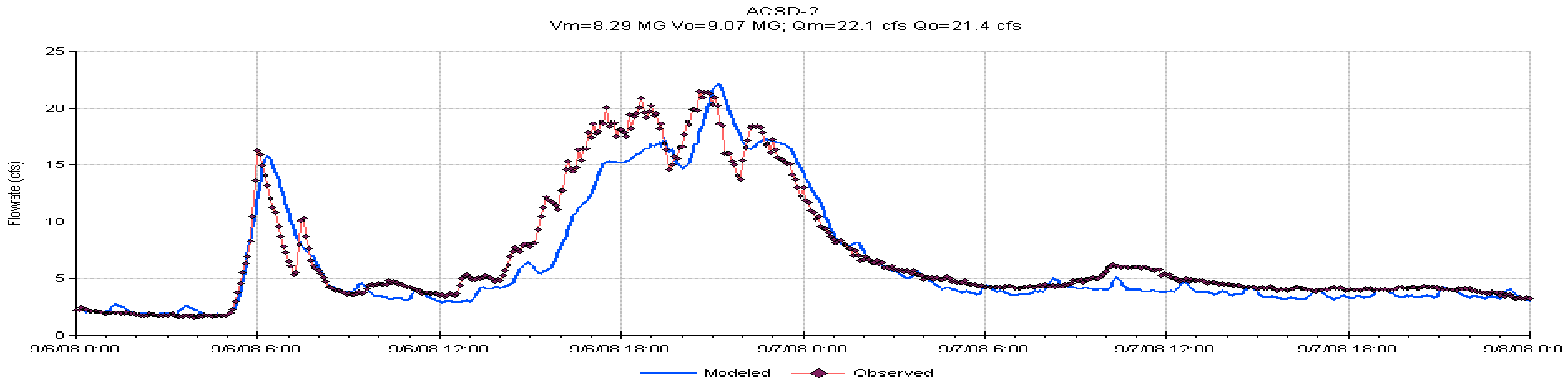

ACSD-2
Vm=8.0 ft/s Vo=5.6 ft/s
Velocity (ft/s)
10
8
6
4
2
0
7/13/08 0:00
7/13/08 12:00
7/14/08 0:00
7/14/08 12:00
7/15/08 0:00
7/15/08 12:00
7/16/08 0:0
Modeled
Observed


ACSD-2
Dm=2.1 ft Do=1.5 ft
Depth (ft)
5
4
3
2
1
0
7/13/08 0:00
7/13/08 12:00
7/14/08 0:00
7/14/08 12:00
7/15/08 0:00
7/15/08 12:00
7/16/08 0:0
Modeled
Observed
Pipe Crown

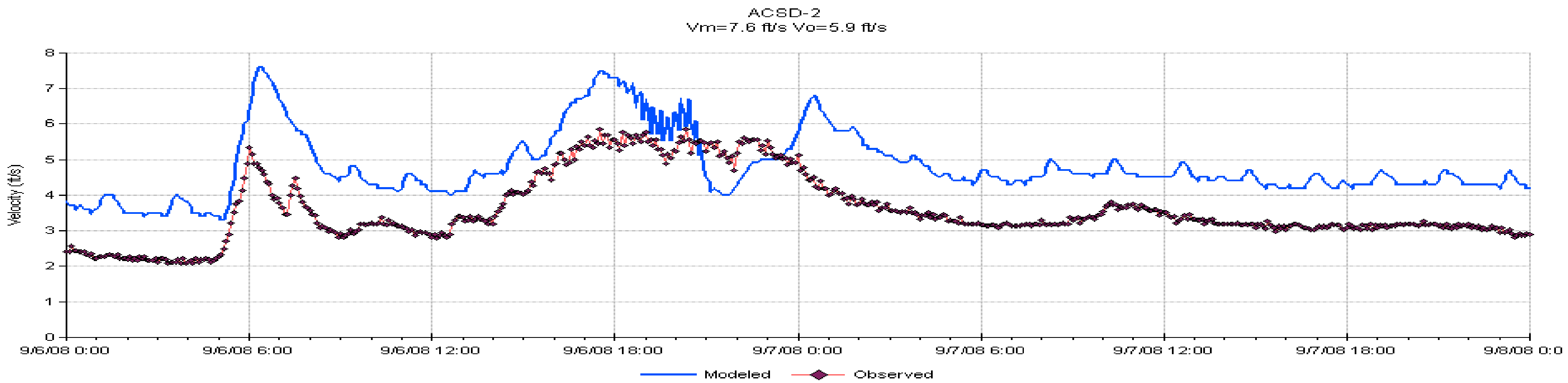

ACSD-2
Vm=32.93 MG Vo=41.88 MG; Qm=44.1 cfs Qo=48.1 cfs
Flowrate (cfs)
Modeled
Observed


ACSD-2
Vm=8.1 ft/s Vo=8.1 ft/s
Velocity (ft/s)
Modeled
Observed

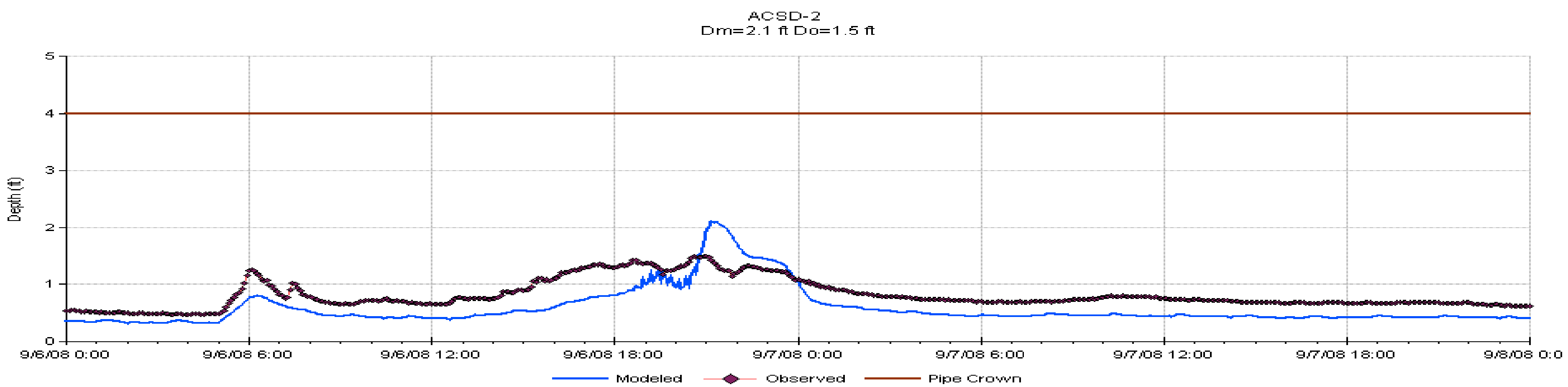

ACSD-2
Dm=3.0 ft Do=2.1 ft
Depth (ft)
Modeled
Observed
Pipe Crown



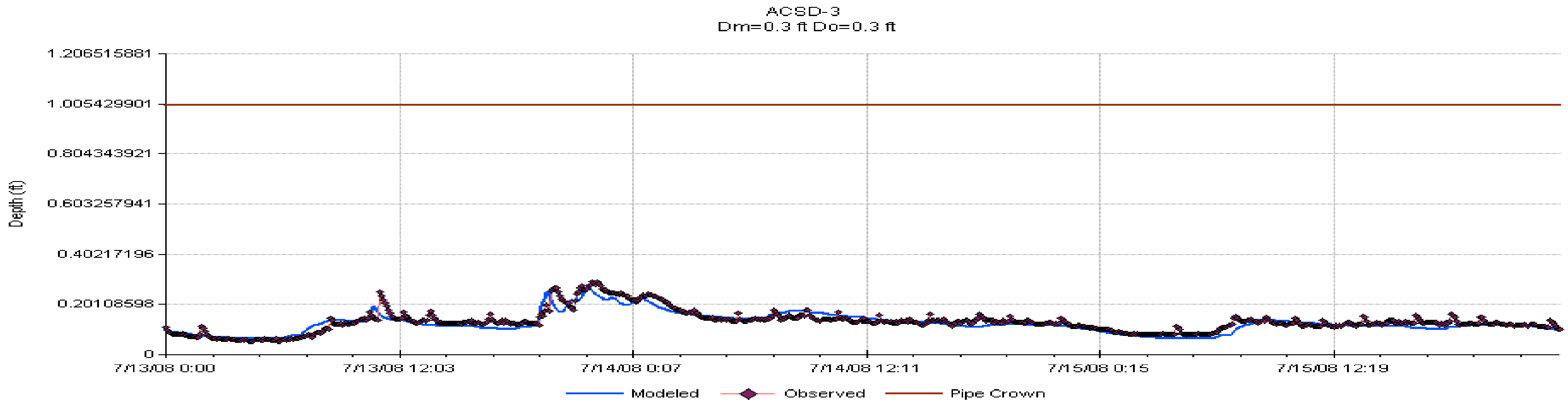
ACSD-2
Vm=8.29 MG Vo=9.07 MG; Qm=22.1 cfs Qo=21.4 cfs
Flowrate (cfs)
25
20
15
10
5
0
9/6/08 0:00
9/6/08 6:00
9/6/08 12:00
9/6/08 18:00
9/7/08 0:00
9/7/08 6:00
9/7/08 12:00
9/7/08 18:00
9/8/08 0:0
Modeled
Observed

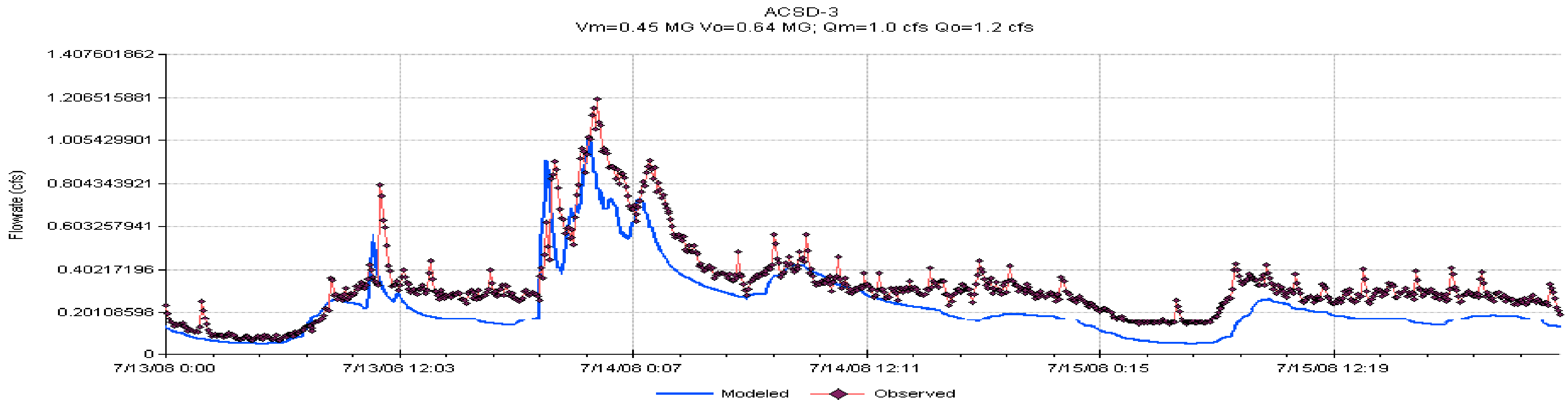


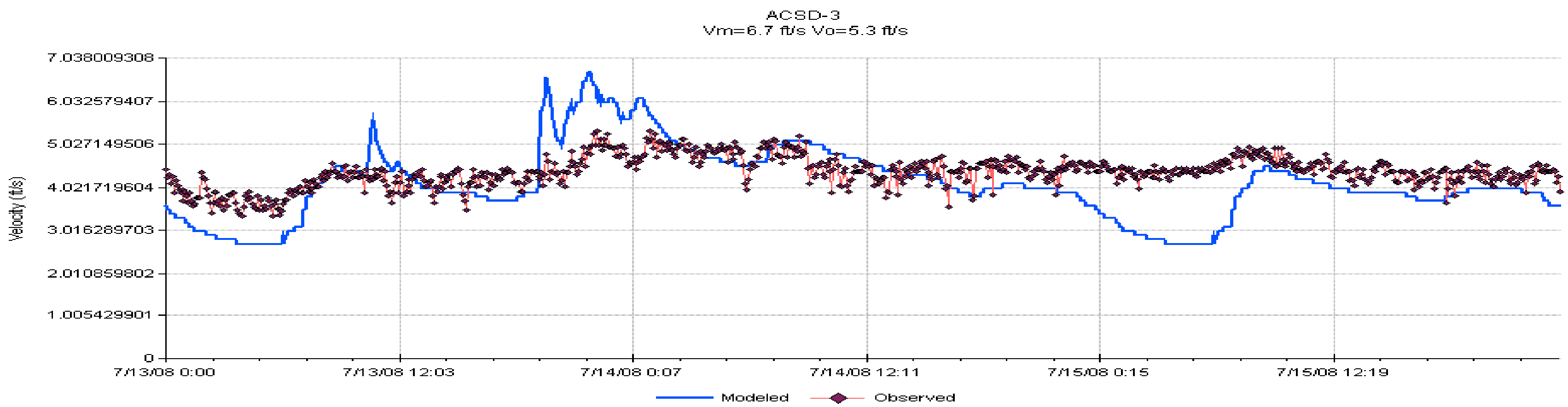
ACSD-2
Vm=7.6 ft/s Vo=5.9 ft/s
Velocity (ft/s)
8
7
6
5
4
3
2
1
0
9/6/08 0:00
9/6/08 6:00
9/6/08 12:00
9/6/08 18:00
9/7/08 0:00
9/7/08 6:00
9/7/08 12:00
9/7/08 18:00
9/8/08 0:0
Modeled
Observed

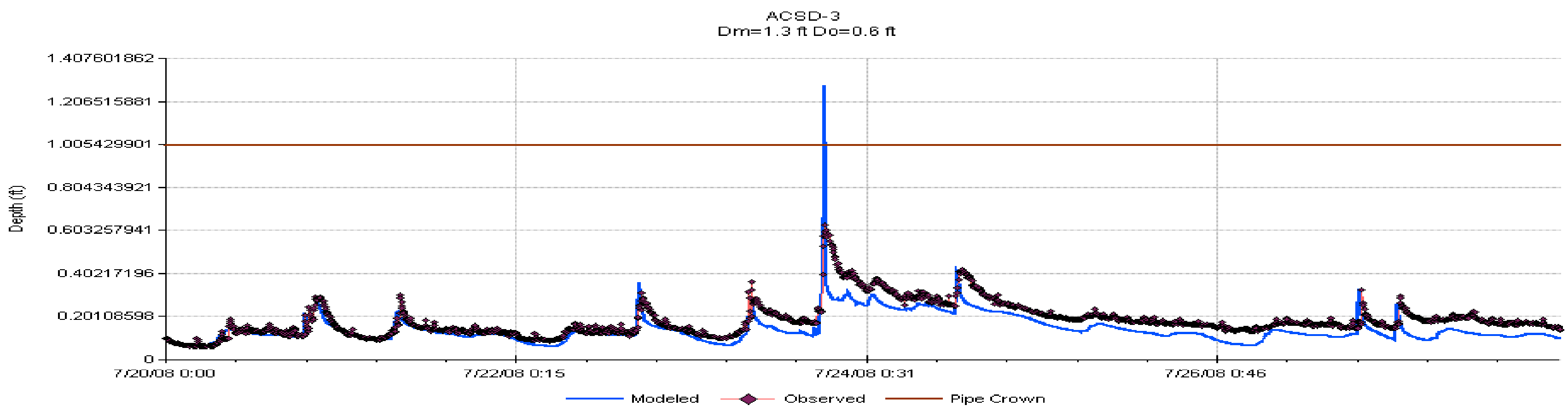


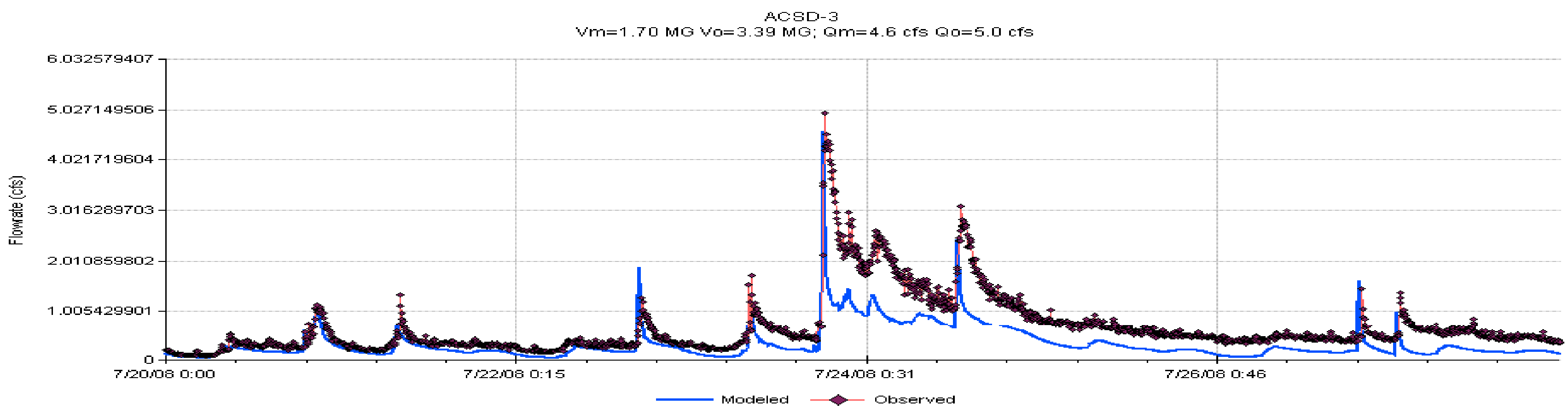
ACSD-2
Dm=2.1 ft Do=1.5 ft
Depth (ft)
5
4
3
2
1
0
9/6/08 0:00
9/6/08 6:00
9/6/08 12:00
9/6/08 18:00
9/7/08 0:00
9/7/08 6:00
9/7/08 12:00
9/7/08 18:00
9/8/08 0:0
Modeled
Observed
Pipe Crown

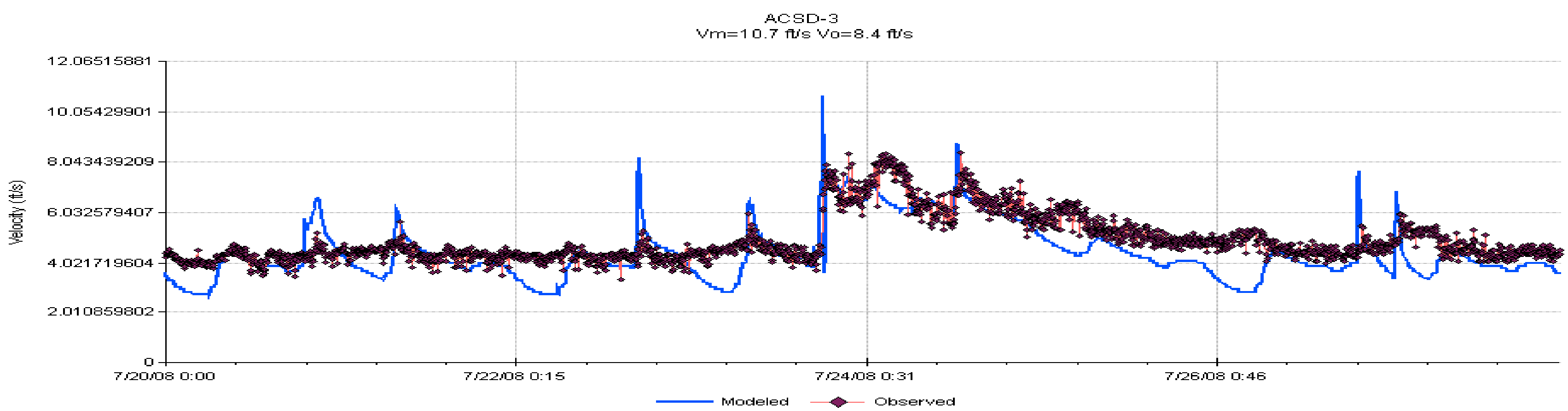

ACSD-3
Dm=0.3 ft Do=0.3 ft
Depth (ft)
1.206515881
1.005429901
0.804343921
0.603257941
0.40217196
0.20108598
0
7/13/08 0:00
7/13/08 12:03
7/14/08 0:07
7/14/08 12:11
7/15/08 0:15
7/15/08 12:19
Modeled
Observed
Pipe Crown

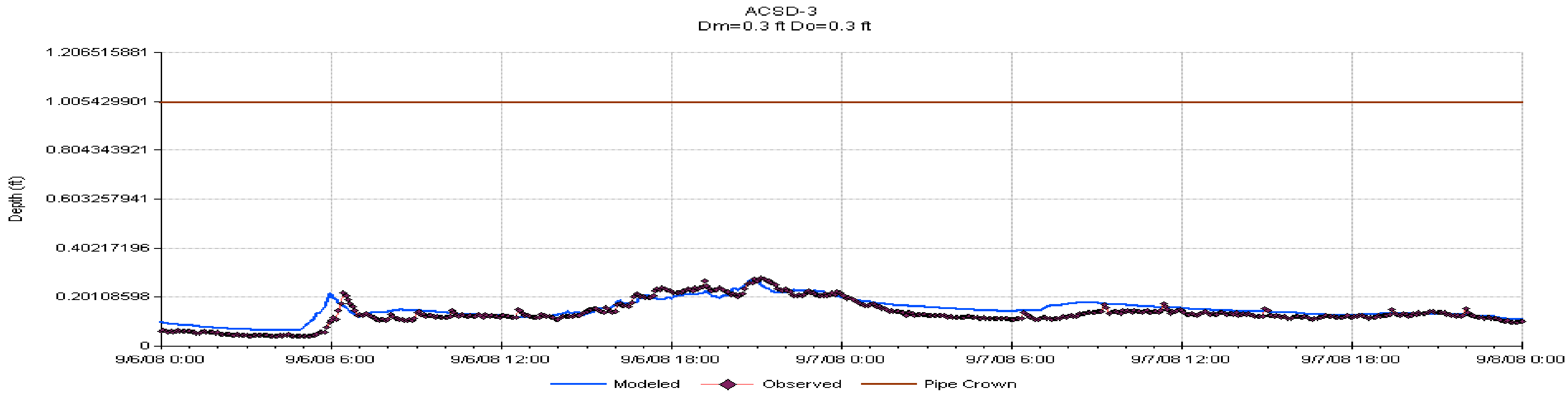

ACSD-3
Vm=0.45 MG Vo=0.64 MG; Qm=1.0 cfs Qo=1.2 cfs
Flowrate (cfs)
1.407601862
1.206515881
1.005429901
0.804343921
0.603257941
0.40217196
0.20108598
0
7/13/08 0:00
7/13/08 12:03
7/14/08 0:07
7/14/08 12:11
7/15/08 0:15
7/15/08 12:19
Modeled
Observed


ACSD-3
Vm=6.7 ft/s Vo=5.3 ft/s
Velocity (ft/s)
7.038009308
6.032579407
5.027149506
4.021719604
3.016289703
2.010859802
1.005429901
0
7/13/08 0:00
7/13/08 12:03
7/14/08 0:07
7/14/08 12:11
7/15/08 0:15
7/15/08 12:19
Modeled
Observed

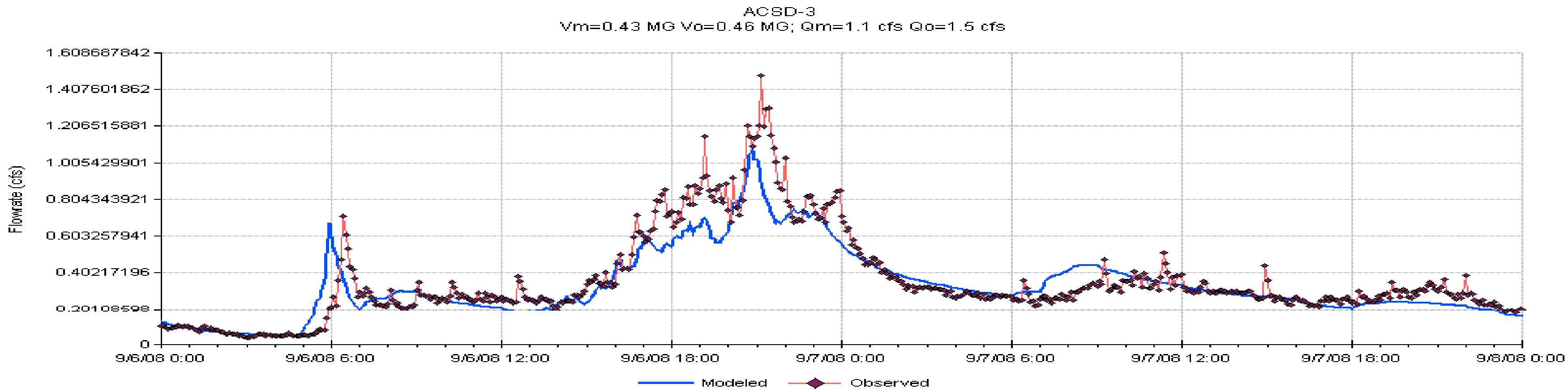

ACSD-3
Dm=1.3 ft Do=0.6 ft
1.407601862
1.206515881
1.005429901
0.804343921
0.603257941
0.40217196
0.20108598
0
Depth (ft)
7/20/08 0:00
7/22/08 0:15
7/24/08 0:31
7/26/08 0:46
Modeled
Observed
Pipe Crown


ACSD-3
Vm=1.70 MG Vo=3.39 MG; Qm=4.6 cfs Qo=5.0 cfs
6.032579407
5.027149506
4.021719604
3.016289703
2.010859802
1.005429901
0
Flowrate (cfs)
7/20/08 0:00
7/22/08 0:15
7/24/08 0:31
7/26/08 0:46
Modeled
Observed

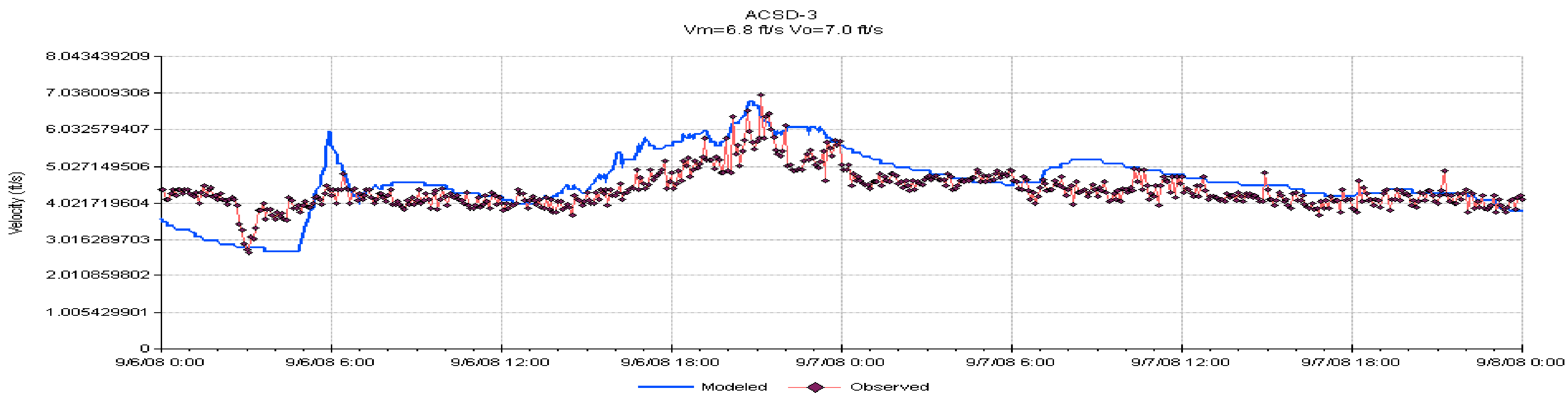

ACSD-3
Vm=10.7 ft/s Vo=8.4 ft/s
12.06515881
10.05429901
8.043439209
6.032579407
4.021719604
2.010859802
0
Velocity (ft/s)
7/20/08 0:00
7/22/08 0:15
7/24/08 0:31
7/26/08 0:46
Modeled
Observed



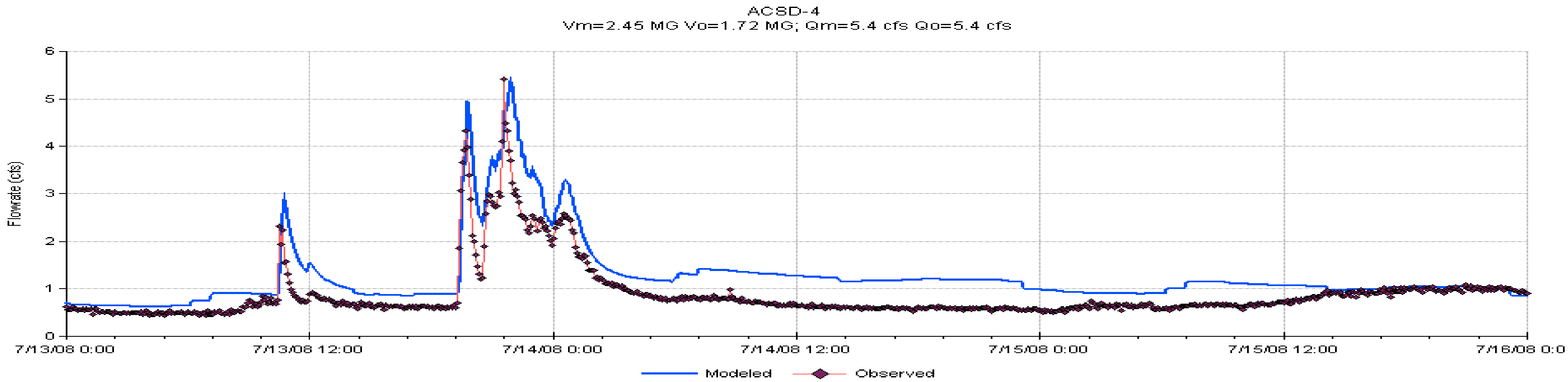
ACSD-3
Dm=0.3 ft Do=0.3 ft
Depth (ft)
1.206515881
1.005429901
0.804343921
0.603257941
0.40217196
0.20108598
0
9/6/08 0:00
9/6/08 6:00
9/6/08 12:00
9/6/08 18:00
9/7/08 0:00
9/7/08 6:00
9/7/08 12:00
9/7/08 18:00
9/8/08 0:00
Modeled
Observed
Pipe Crown

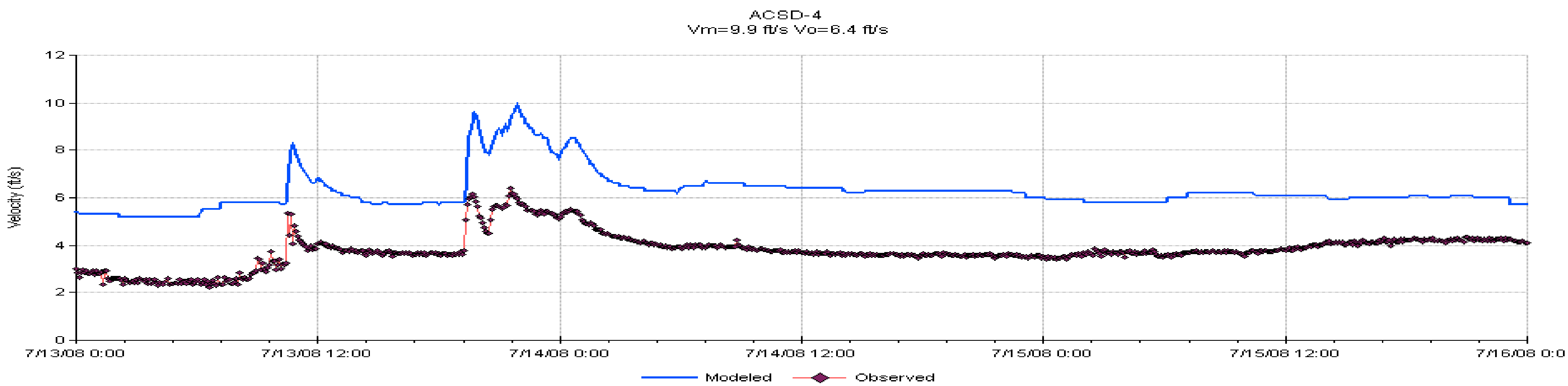


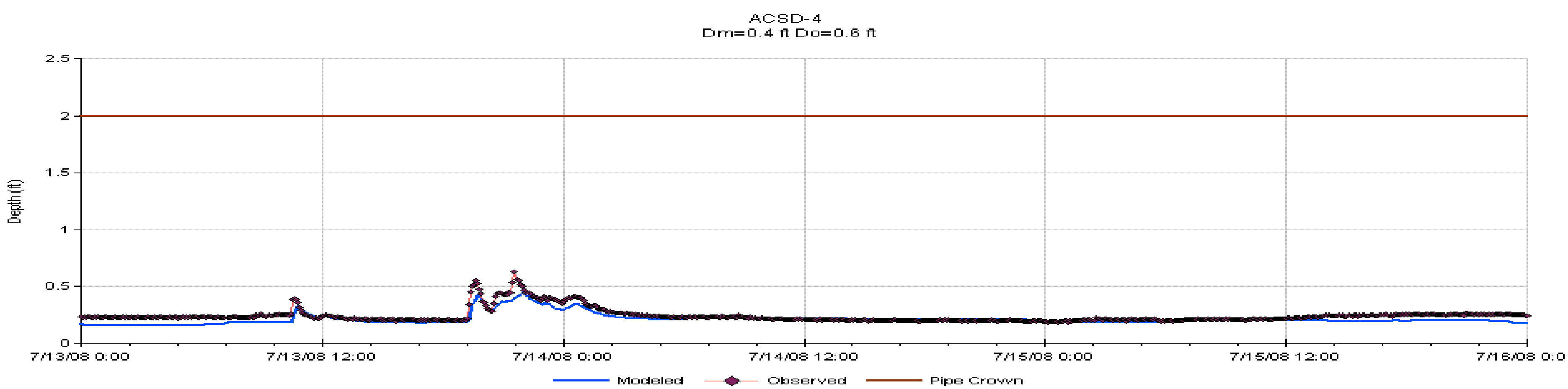
ACSD-3
Vm=0.43 MG Vo=0.46 MG; Qm=1.1 cfs Qo=1.5 cfs
Flowrate (cfs)
1.608687842
1.407601862
1.206515881
1.005429901
0.804343921
0.603257941
0.40217196
0.20108598
0
9/6/08 0:00
9/6/08 6:00
9/6/08 12:00
9/6/08 18:00
9/7/08 0:00
9/7/08 6:00
9/7/08 12:00
9/7/08 18:00
9/8/08 0:00
Modeled
Observed

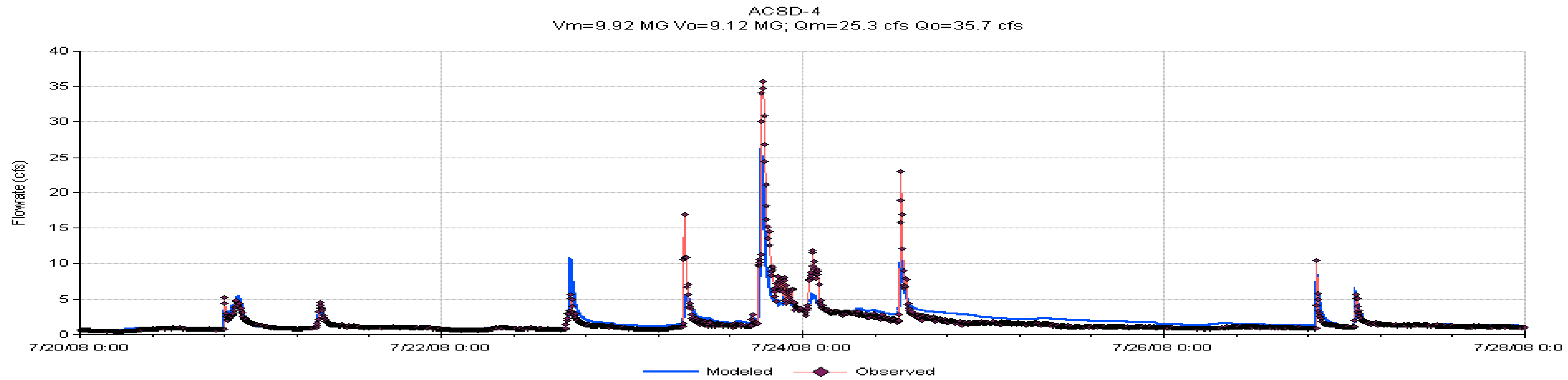


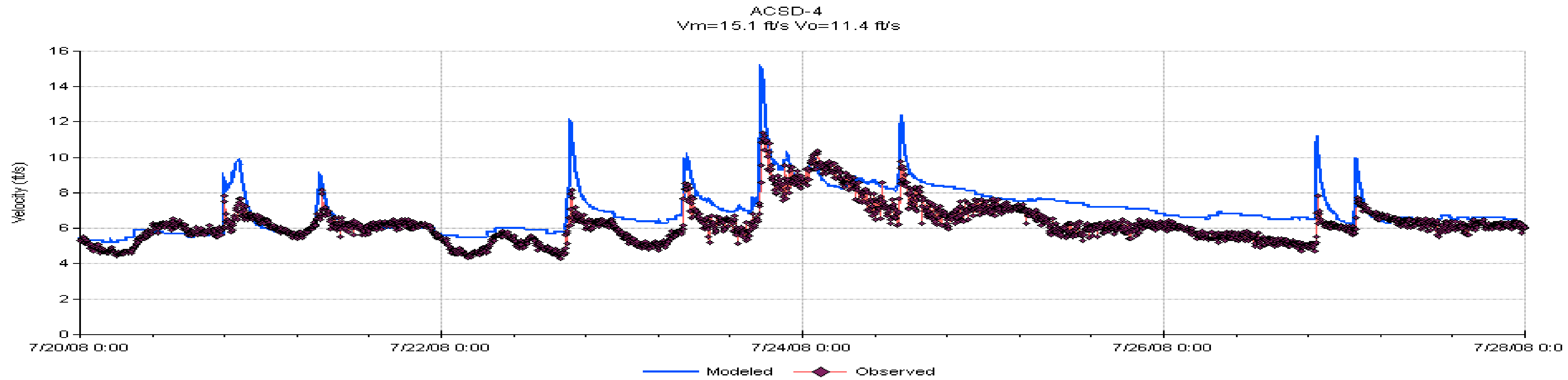
ACSD-3
Vm=6.8 ft/s Vo=7.0 ft/s
Velocity (ft/s)
8.043439209
7.038009308
6.032579407
5.027149506
4.021719604
3.016289703
2.010859802
1.005429901
0
9/6/08 0:00
9/6/08 6:00
9/6/08 12:00
9/6/08 18:00
9/7/08 0:00
9/7/08 6:00
9/7/08 12:00
9/7/08 18:00
9/8/08 0:00
Modeled
Observed

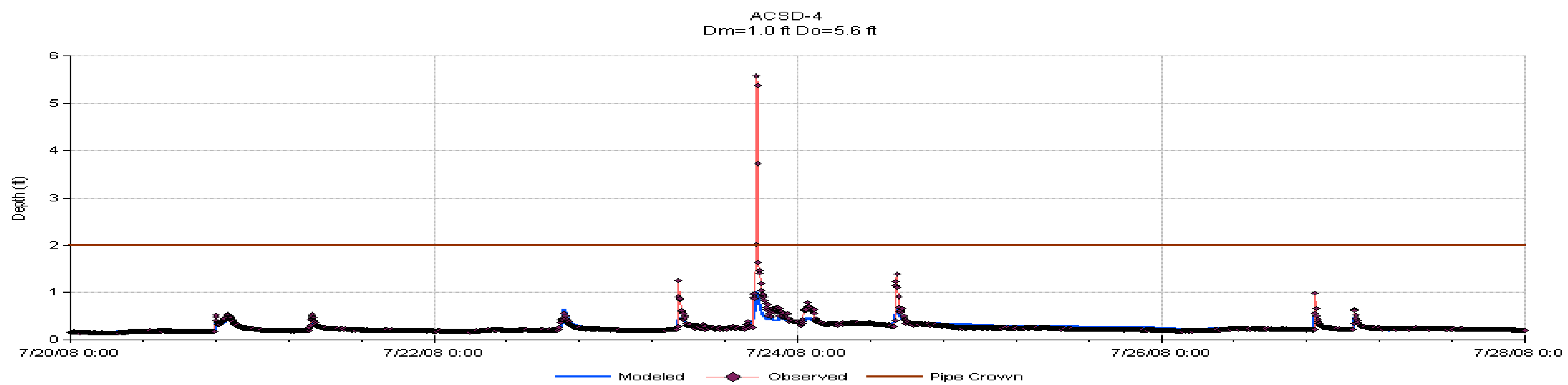

ACSD-4
Vm=2.45 MG Vo=1.72 MG; Qm=5.4 cfs Qo=5.4 cfs
Flowrate (cfs)
7/13/08 0:00
7/13/08 12:00
7/14/08 0:00
7/14/08 12:00
7/15/08 0:00
7/15/08 12:00
7/16/08 0:0
Modeled
Observed

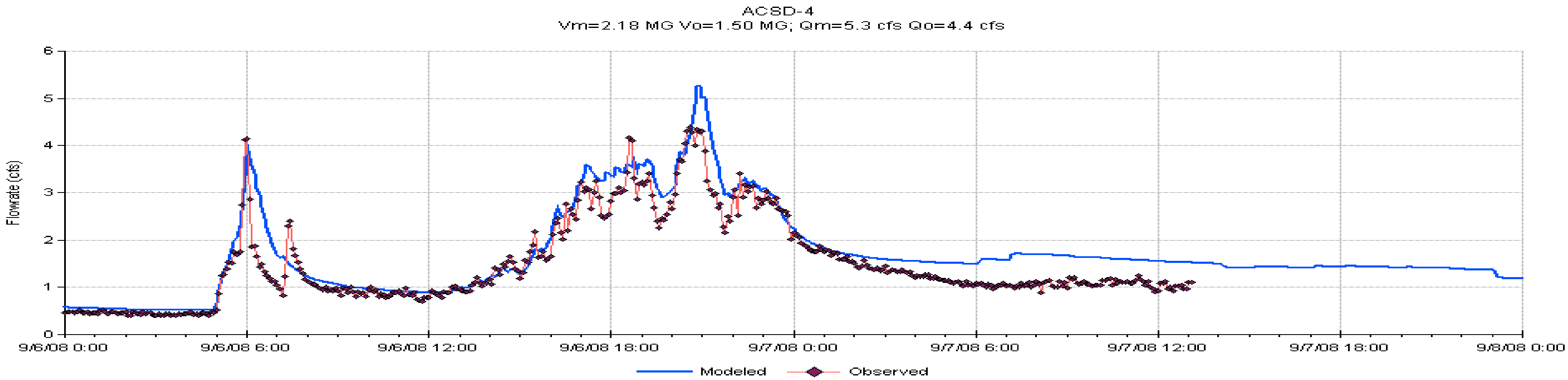

ACSD-4
Vm=9.9 ft/s Vo=6.4 ft/s
Velocity (ft/s)
7/13/08 0:00
7/13/08 12:00
7/14/08 0:00
7/14/08 12:00
7/15/08 0:00
7/15/08 12:00
7/16/08 0:0
Modeled
Observed

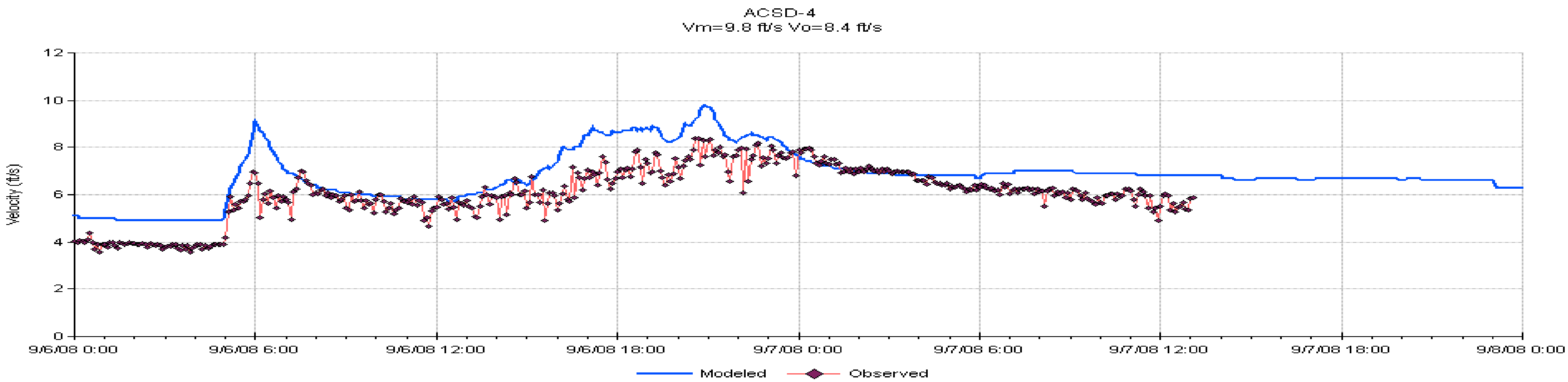

ACSD-4
Dm=0.4 ft Do=0.6 ft
Depth (ft)
7/13/08 0:00
7/13/08 12:00
7/14/08 0:00
7/14/08 12:00
7/15/08 0:00
7/15/08 12:00
7/16/08 0:0
Modeled
Observed
Pipe Crown

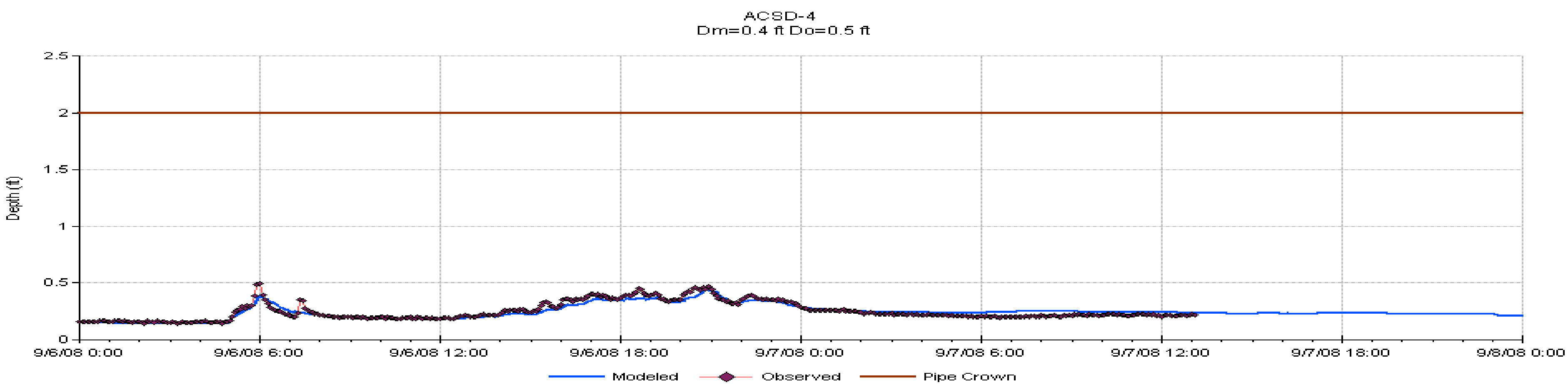

ACSD-4
Vm=9.92 MG Vo=9.12 MG; Qm=25.3 cfs Qo=35.7 cfs
Flowrate (cfs)
0
5
10
15
20
25
30
35
40
7/20/08 0:00
7/22/08 0:00
7/24/08 0:00
7/26/08 0:00
7/28/08 0:0
Modeled
Observed

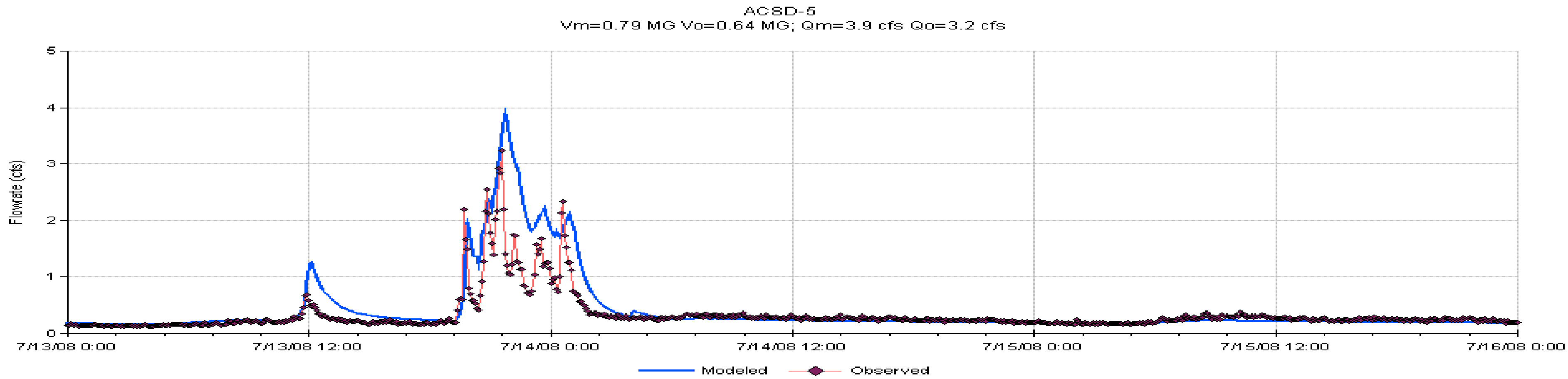

ACSD-4
Vm=15.1 ft/s Vo=11.4 ft/s
Velocity (ft/s)
0
2
4
6
8
10
12
14
16
7/20/08 0:00
7/22/08 0:00
7/24/08 0:00
7/26/08 0:00
7/28/08 0:0
Modeled
Observed

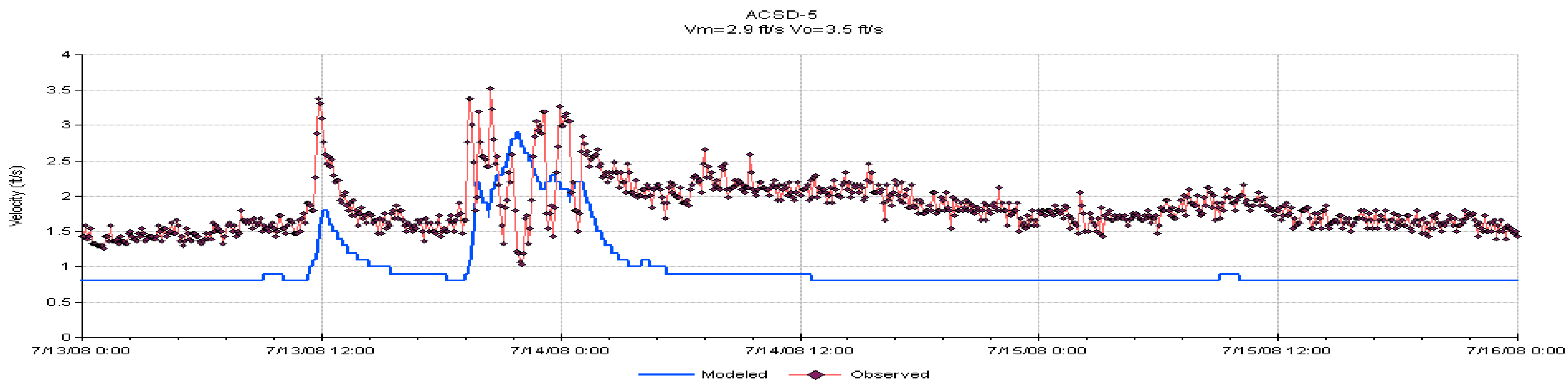

ACSD-4
Dm=1.0 ft Do=5.6 ft
Depth (ft)
0
1
2
3
4
5
6
7/20/08 0:00
7/22/08 0:00
7/24/08 0:00
7/26/08 0:00
7/28/08 0:0
Modeled
Observed
Pipe Crown

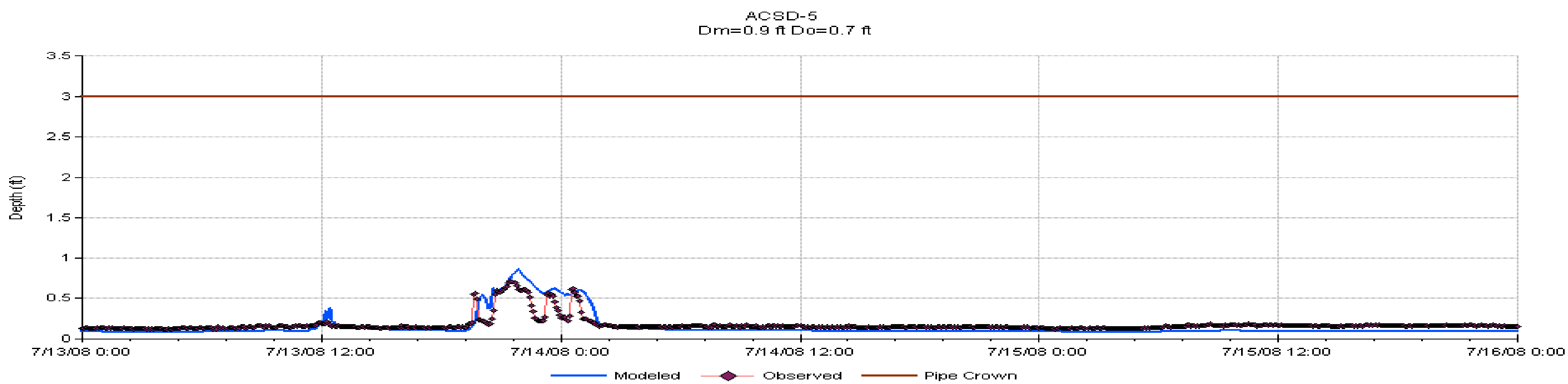

ACSD-4
Vm=2.18 MG Vo=1.50 MG; Qm=5.3 cfs Qo=4.4 cfs
Flowrate (cfs)
0
1
2
3
4
5
6
9/6/08 0:00
9/6/08 6:00
9/6/08 12:00
9/6/08 18:00
9/7/08 0:00
9/7/08 6:00
9/7/08 12:00
9/7/08 18:00
9/8/08 0:00
Modeled
Observed

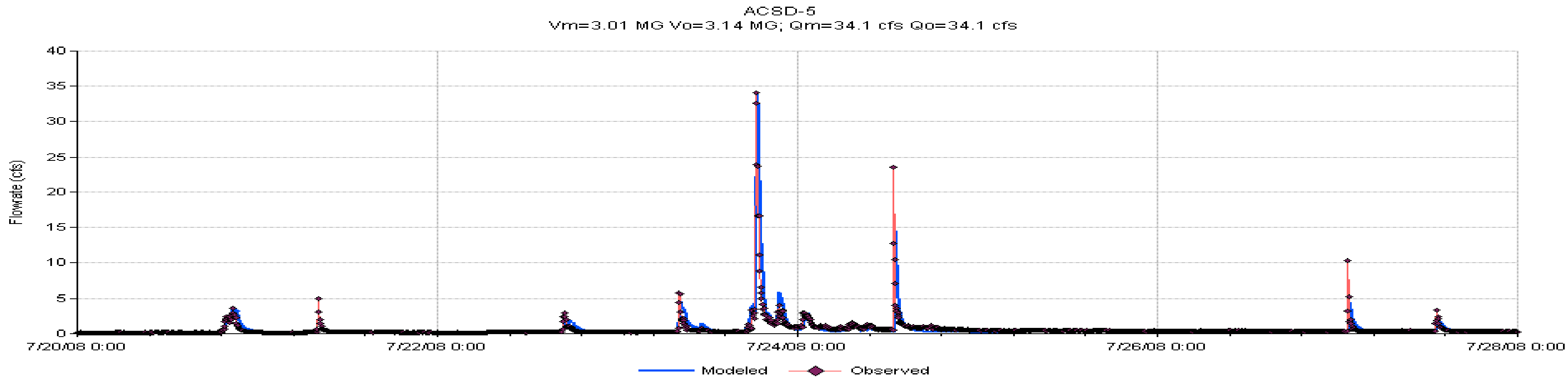

ACSD-4
Vm=9.8 ft/s Vo=8.4 ft/s
Velocity (ft/s)
0
2
4
6
8
10
12
9/6/08 0:00
9/6/08 6:00
9/6/08 12:00
9/6/08 18:00
9/7/08 0:00
9/7/08 6:00
9/7/08 12:00
9/7/08 18:00
9/8/08 0:00
Modeled
Observed

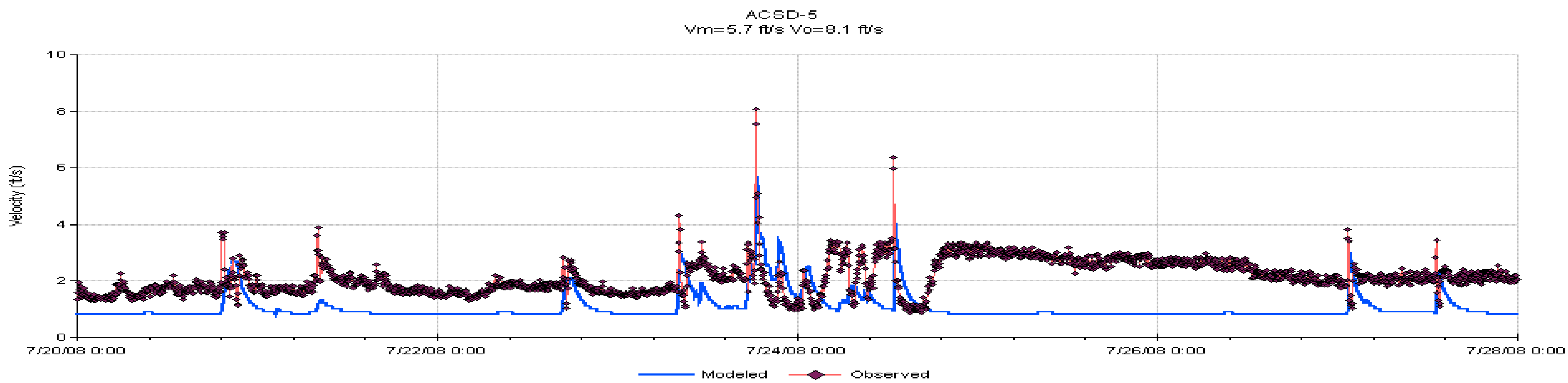

ACSD-4
Dm=0.4 ft Do=0.5 ft
Depth (ft)
0
0.5
1
1.5
2
2.5
9/6/08 0:00
9/6/08 6:00
9/6/08 12:00
9/6/08 18:00
9/7/08 0:00
9/7/08 6:00
9/7/08 12:00
9/7/08 18:00
9/8/08 0:00
Modeled
Observed
Pipe Crown

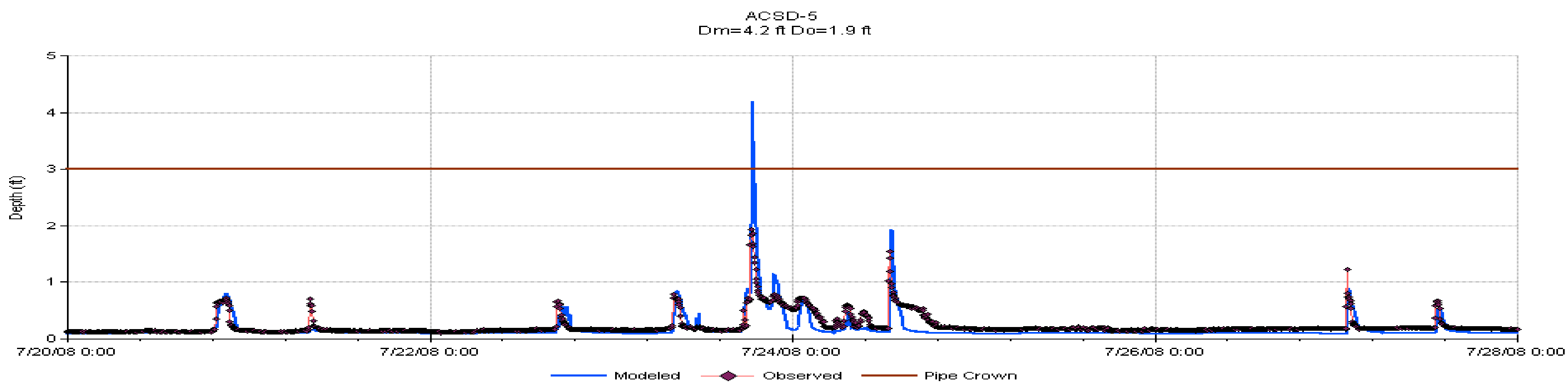

ACSD-5
Vm=0.79 MG Vo=0.64 MG; Qm=3.9 cfs Qo=3.2 cfs
Flowrate (cfs)
0
1
2
3
4
5
7/13/08 0:00
7/13/08 12:00
7/14/08 0:00
7/14/08 12:00
7/15/08 0:00
7/15/08 12:00
7/16/08 0:00
Modeled
Observed

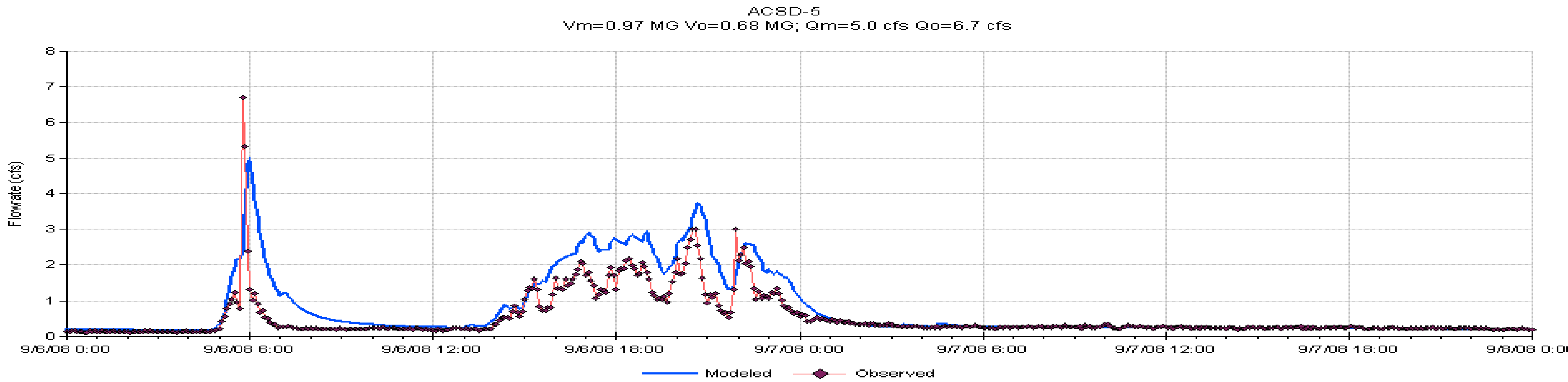

ACSD-5
Vm=2.9 ft/s Vo=3.5 ft/s
Velocity (ft/s)
0
0.5
1
1.5
2
2.5
3
3.5
4
7/13/08 0:00
7/13/08 12:00
7/14/08 0:00
7/14/08 12:00
7/15/08 0:00
7/15/08 12:00
7/16/08 0:00
Modeled
Observed

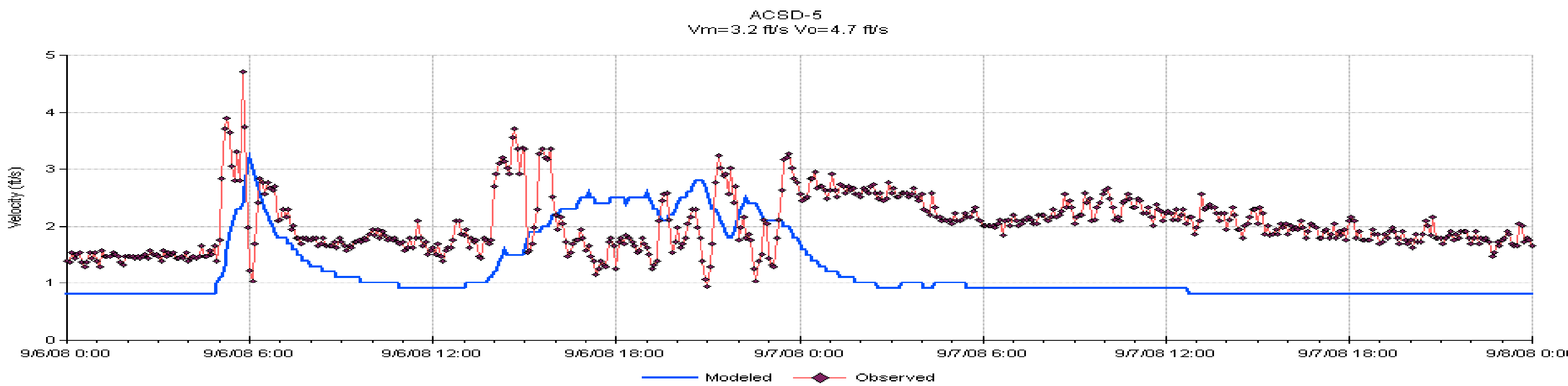

ACSD-5
Dm=0.9 ft Do=0.7 ft
Depth (ft)
0
0.5
1
1.5
2
2.5
3
3.5
7/13/08 0:00
7/13/08 12:00
7/14/08 0:00
7/14/08 12:00
7/15/08 0:00
7/15/08 12:00
7/16/08 0:00
Modeled
Observed
Pipe Crown

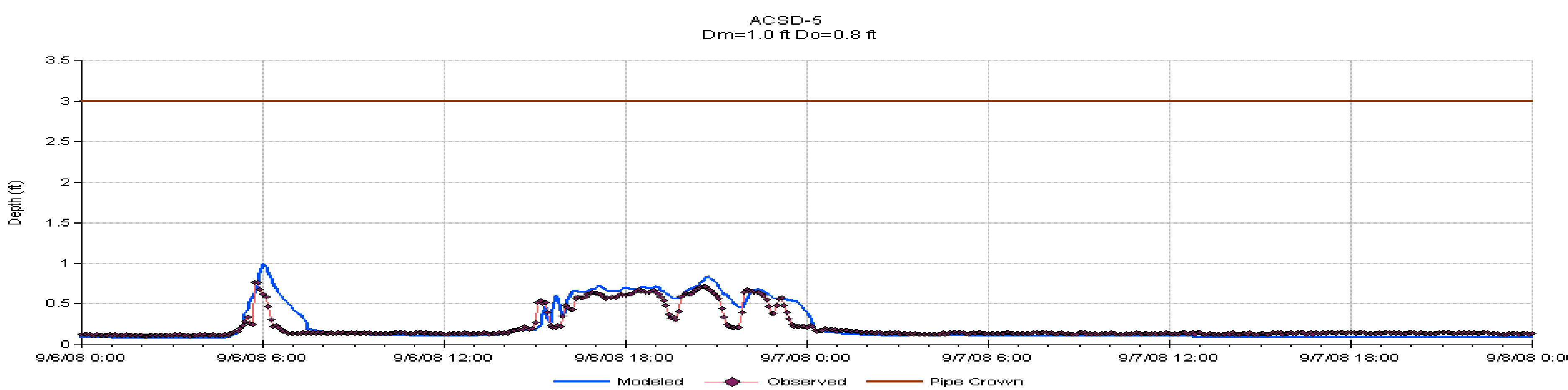

ACSD-5
Vm=3.01 MG Vo=3.14 MG; Qm=34.1 cfs Qo=34.1 cfs
Flowrate (cfs)
0
5
10
15
20
25
30
35
40
7/20/08 0:00
7/22/08 0:00
7/24/08 0:00
7/26/08 0:00
7/28/08 0:00
Modeled
Observed

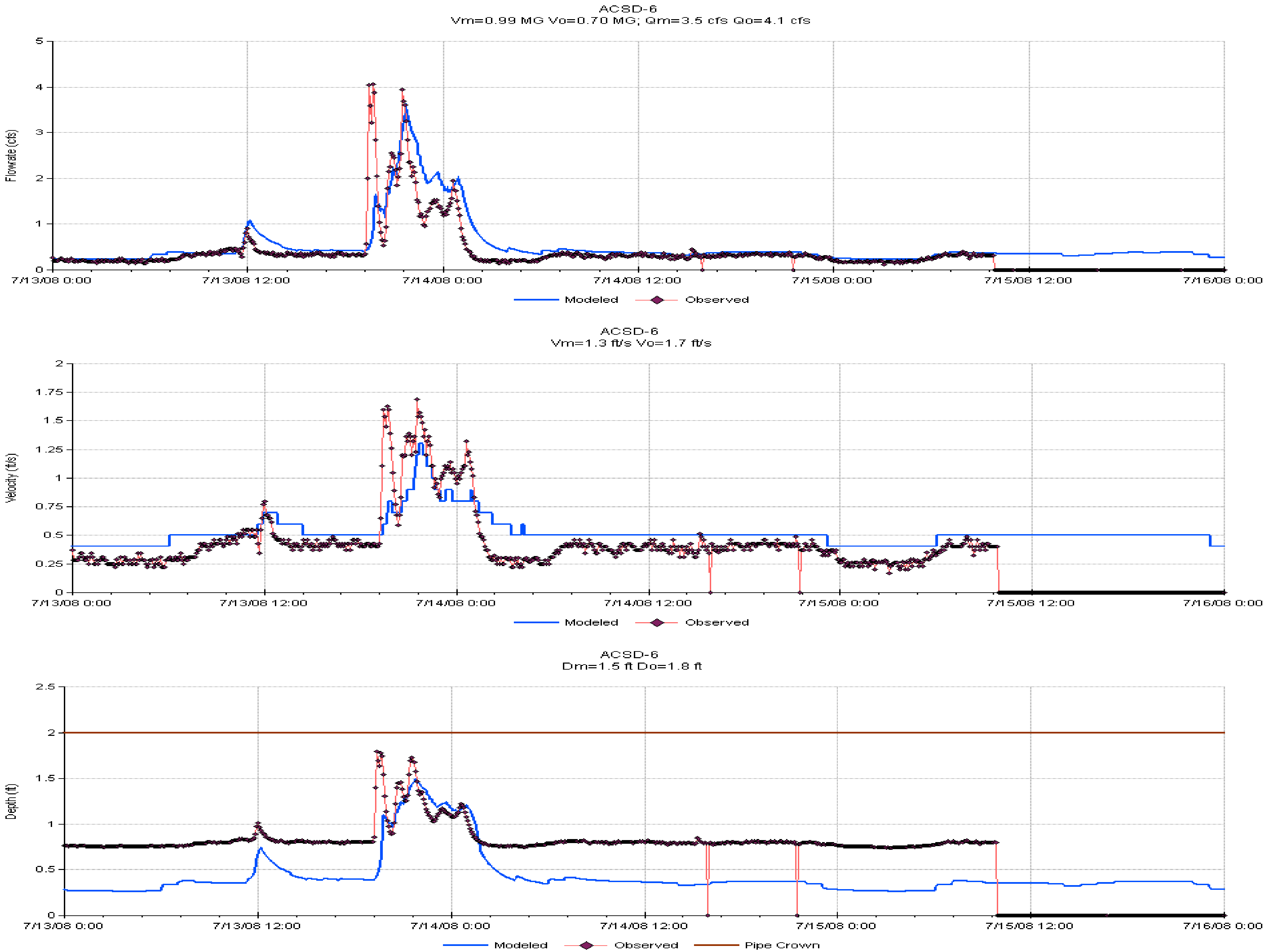

ACSD-5
Vm=5.7 ft/s Vo=8.1 ft/s
Velocity (ft/s)
0
2
4
6
8
10
7/20/08 0:00
7/22/08 0:00
7/24/08 0:00
7/26/08 0:00
7/28/08 0:00
Modeled
Observed

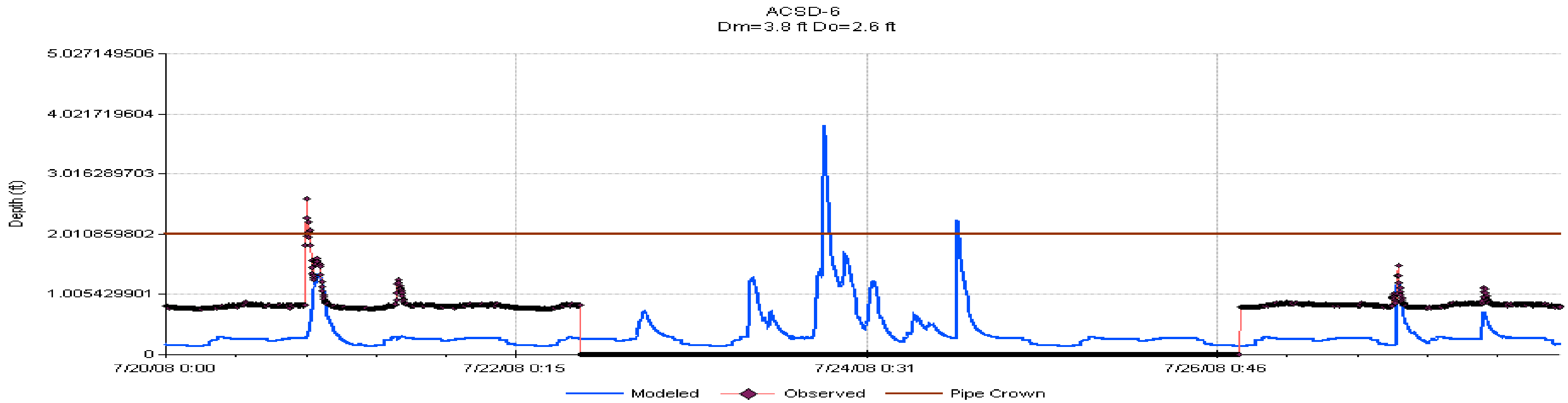

ACSD-5
Dm=4.2 ft Do=1.9 ft
Depth (ft)
0
1
2
3
4
5
7/20/08 0:00
7/22/08 0:00
7/24/08 0:00
7/26/08 0:00
7/28/08 0:00
Modeled
Observed
Pipe Crown

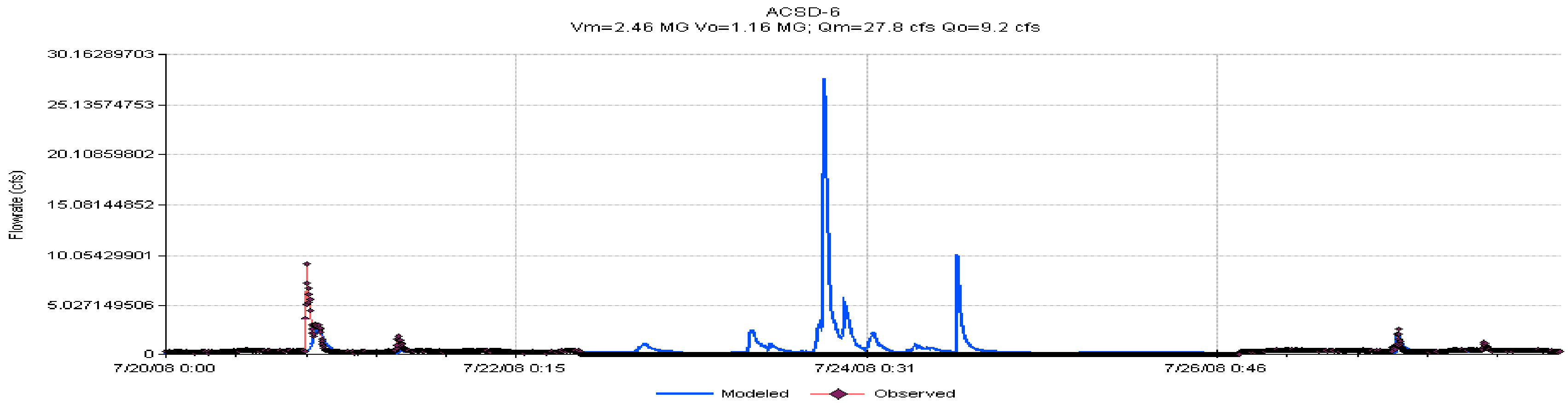

ACSD-5
Vm=0.97 MG Vo=0.68 MG; Qm=5.0 cfs Qo=6.7 cfs
Flowrate (cfs)
9/6/08 0:00
9/6/08 6:00
9/6/08 12:00
9/6/08 18:00
9/7/08 0:00
9/7/08 6:00
9/7/08 12:00
9/7/08 18:00
9/8/08 0:00
Modeled
Observed

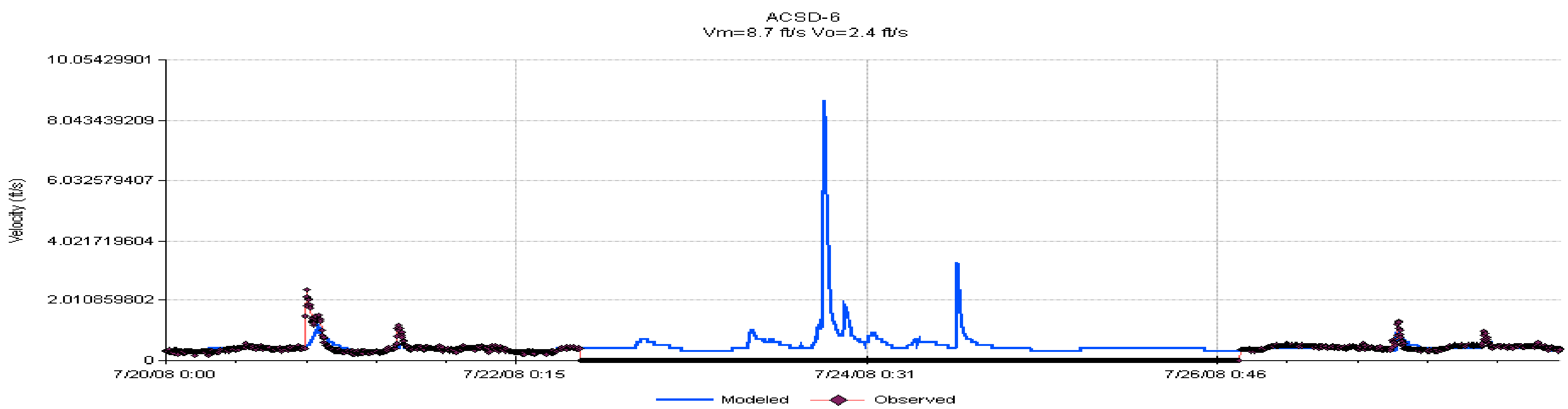

ACSD-5
Vm=3.2 ft/s Vo=4.7 ft/s
Velocity (ft/s)
9/6/08 0:00
9/6/08 6:00
9/6/08 12:00
9/6/08 18:00
9/7/08 0:00
9/7/08 6:00
9/7/08 12:00
9/7/08 18:00
9/8/08 0:00
Modeled
Observed

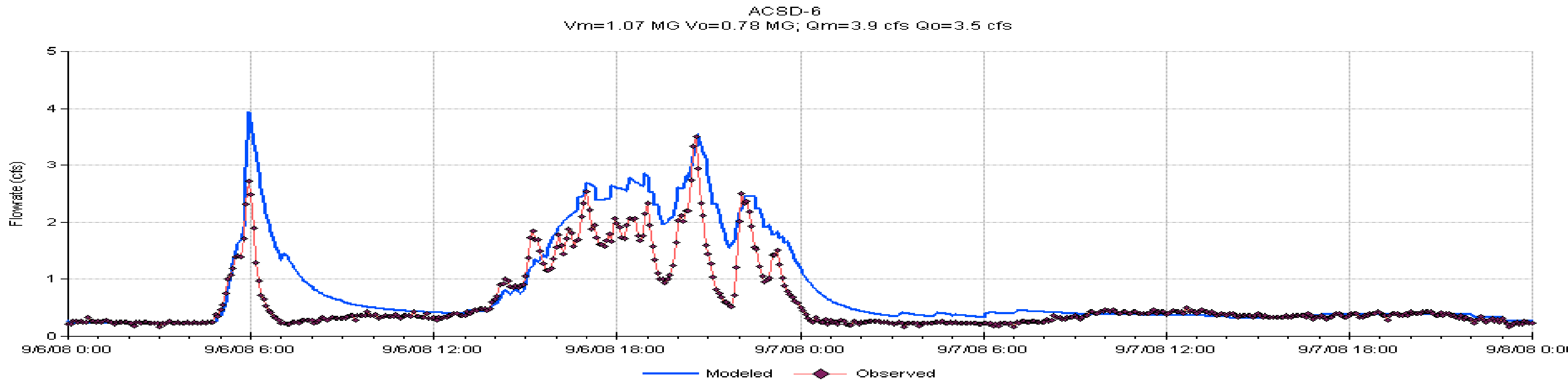

ACSD-5
Dm=1.0 ft Do=0.8 ft
Depth (ft)
9/6/08 0:00
9/6/08 6:00
9/6/08 12:00
9/6/08 18:00
9/7/08 0:00
9/7/08 6:00
9/7/08 12:00
9/7/08 18:00
9/8/08 0:00
Modeled
Observed
Pipe Crown

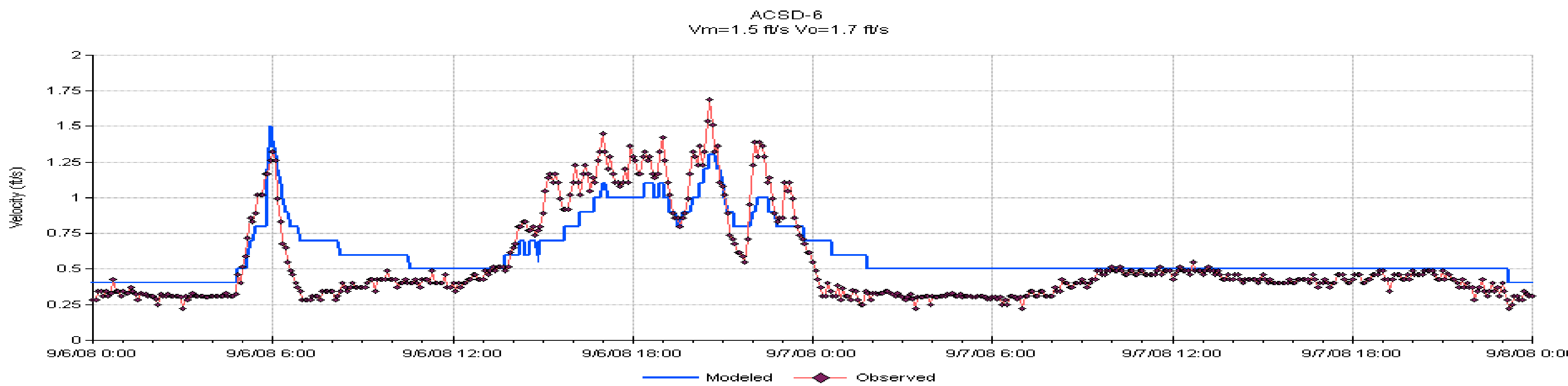

ACSD-6
Vm=0.99 MG Vo=0.70 MG; Qm=3.5 cfs Qo=4.1 cfs
Flowrate (cfs)
7/13/08 0:00
7/13/08 12:00
7/14/08 0:00
7/14/08 12:00
7/15/08 0:00
7/15/08 12:00
7/16/08 0:00
Modeled
Observed
ACSD-6
Vm=1.3 ft/s Vo=1.7 ft/s
Velocity (ft/s)
Modeled
Observed
ACSD-6
Dm=1.5 ft Do=1.8 ft
Depth (ft)
Modeled
Observed
Pipe Crown

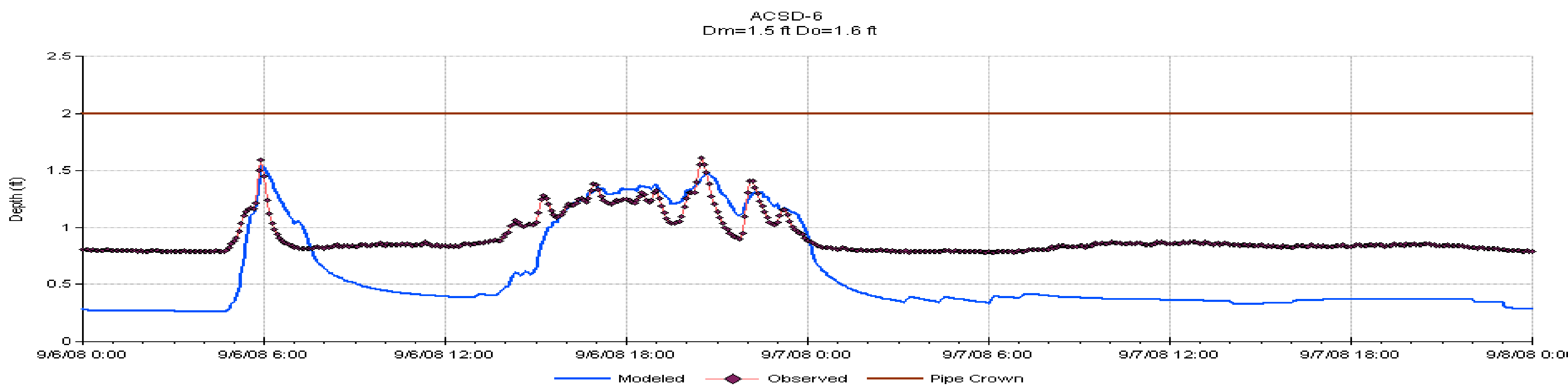

ACSD-6
Dm=3.8 ft Do=2.6 ft
Depth (ft)
5.027149506
4.021719604
3.016289703
2.010859802
1.005429901
0
7/20/08 0:00
7/22/08 0:15
7/24/08 0:31
7/26/08 0:46
Modeled
Observed
Pipe Crown

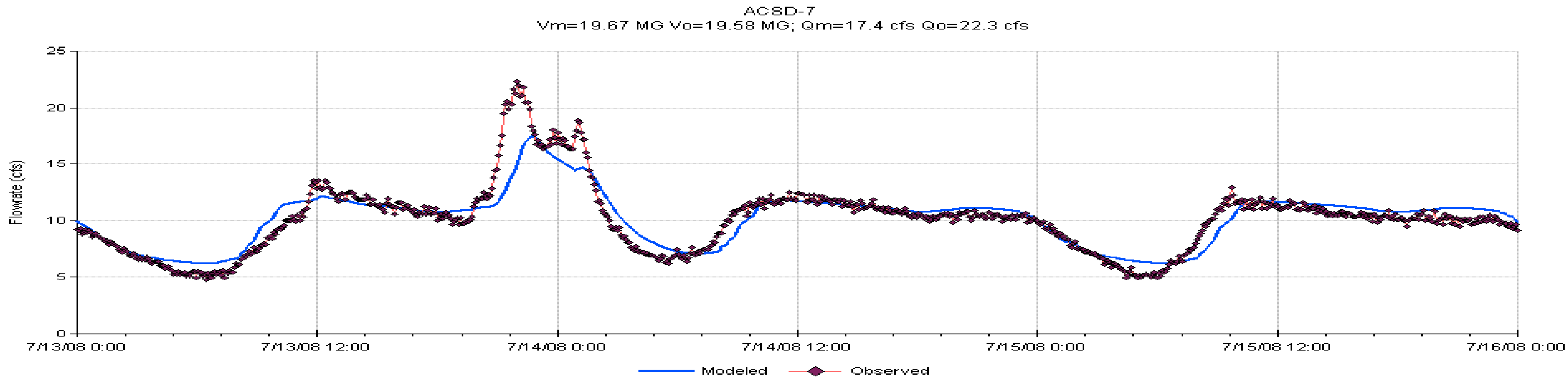

ACSD-6
Vm=2.46 MG Vo=1.16 MG; Qm=27.8 cfs Qo=9.2 cfs
Flowrate (cfs)
30.16289703
25.13574753
20.10859802
15.08144852
10.05429901
5.027149506
0
7/20/08 0:00
7/22/08 0:15
7/24/08 0:31
7/26/08 0:46
Modeled
Observed


ACSD-6
Vm=8.7 ft/s Vo=2.4 ft/s
Velocity (ft/s)
10.05429901
8.043439209
6.032579407
4.021719604
2.010859802
0
7/20/08 0:00
7/22/08 0:15
7/24/08 0:31
7/26/08 0:46
Modeled
Observed

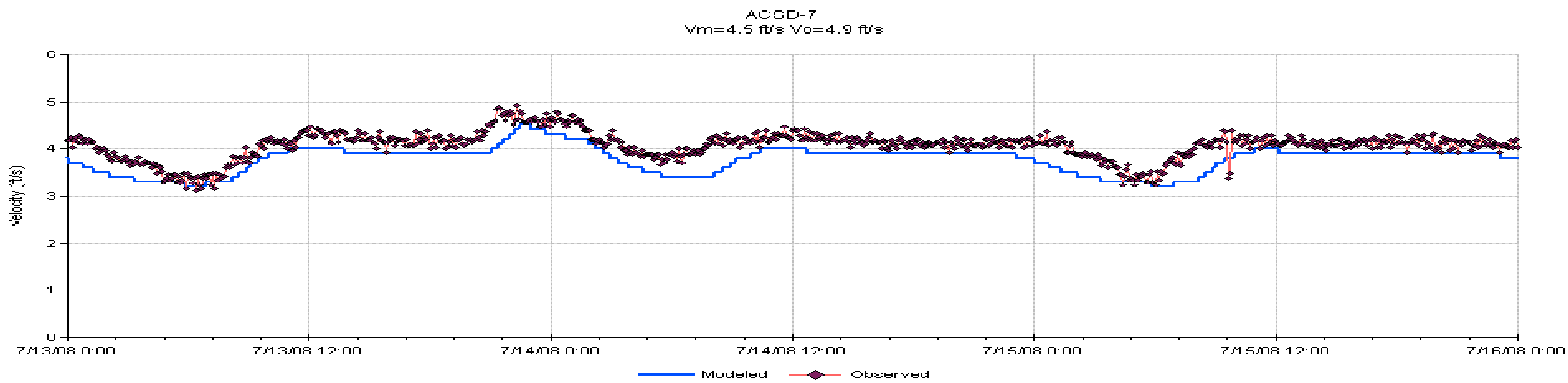

ACSD-6
Vm=1.07 MG Vo=0.78 MG; Qm=3.9 cfs Qo=3.5 cfs
Flowrate (cfs)
9/6/08 0:00
9/6/08 6:00
9/6/08 12:00
9/6/08 18:00
9/7/08 0:00
9/7/08 6:00
9/7/08 12:00
9/7/08 18:00
9/8/08 0:00
Modeled
Observed


ACSD-6
Vm=1.5 ft/s Vo=1.7 ft/s
Velocity (ft/s)
9/6/08 0:00
9/6/08 6:00
9/6/08 12:00
9/6/08 18:00
9/7/08 0:00
9/7/08 6:00
9/7/08 12:00
9/7/08 18:00
9/8/08 0:00
Modeled
Observed

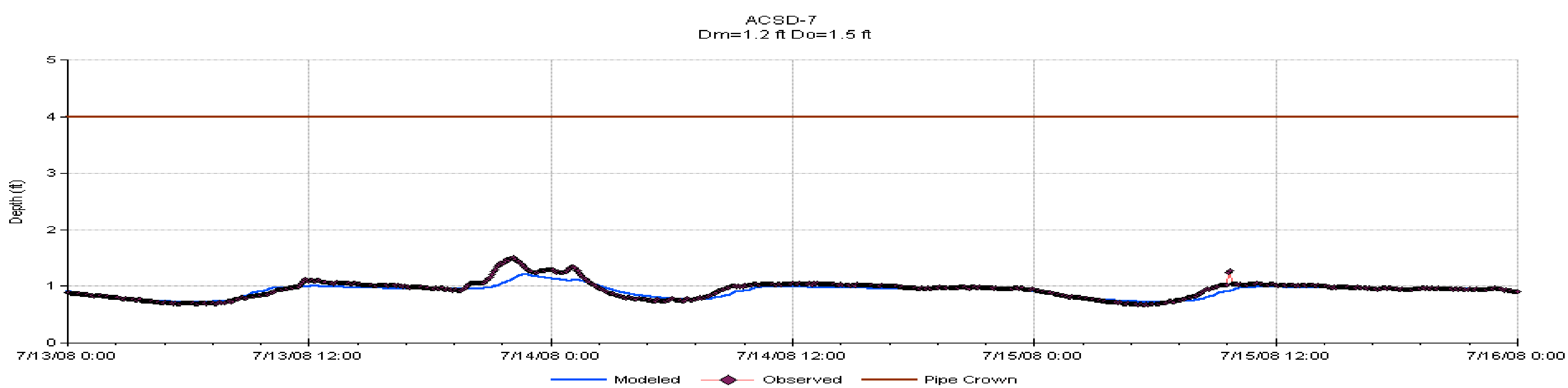

ACSD-6
Dm=1.5 ft Do=1.6 ft
Depth (ft)
9/6/08 0:00
9/6/08 6:00
9/6/08 12:00
9/6/08 18:00
9/7/08 0:00
9/7/08 6:00
9/7/08 12:00
9/7/08 18:00
9/8/08 0:00
Modeled
Observed
Pipe Crown



ACSD-7
Vm=19.67 MG Vo=19.58 MG; Qm=17.4 cfs Qo=22.3 cfs
Flowrate (cfs)
0
5
10
15
20
25
7/13/08 0:00
7/13/08 12:00
7/14/08 0:00
7/14/08 12:00
7/15/08 0:00
7/15/08 12:00
7/16/08 0:00
Modeled
Observed

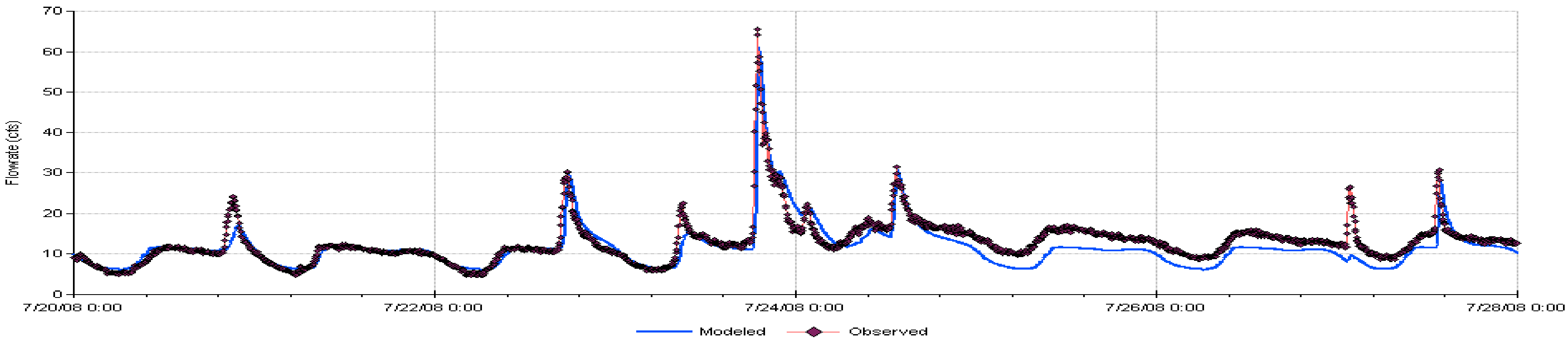


ACSD-7
Vm=4.5 ft/s Vo=4.9 ft/s
Velocity (ft/s)
0
1
2
3
4
5
6
7/13/08 0:00
7/13/08 12:00
7/14/08 0:00
7/14/08 12:00
7/15/08 0:00
7/15/08 12:00
7/16/08 0:00
Modeled
Observed

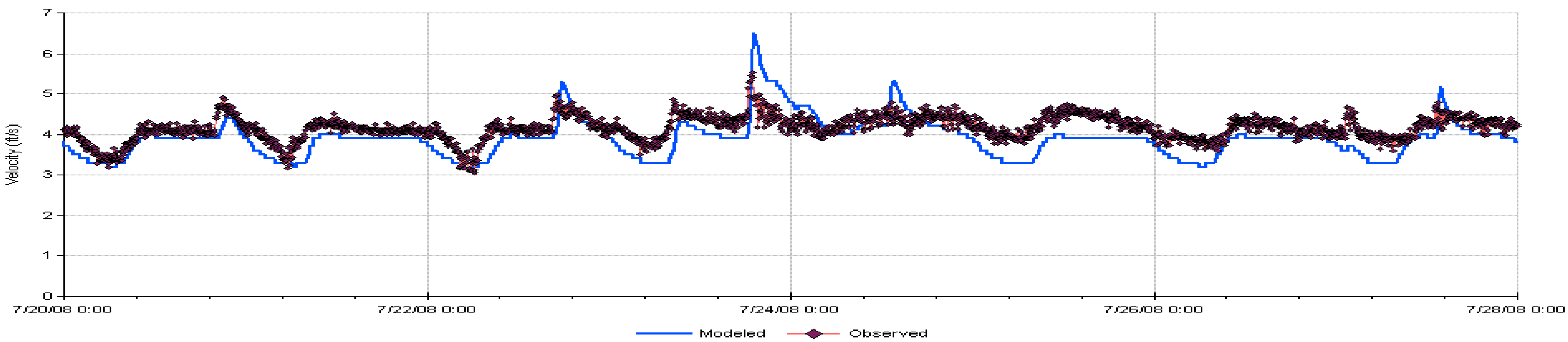


ACSD-7
Dm=1.2 ft Do=1.5 ft
Depth (ft)
0
1
2
3
4
5
7/13/08 0:00
7/13/08 12:00
7/14/08 0:00
7/14/08 12:00
7/15/08 0:00
7/15/08 12:00
7/16/08 0:00
Modeled
Observed
Pipe Crown

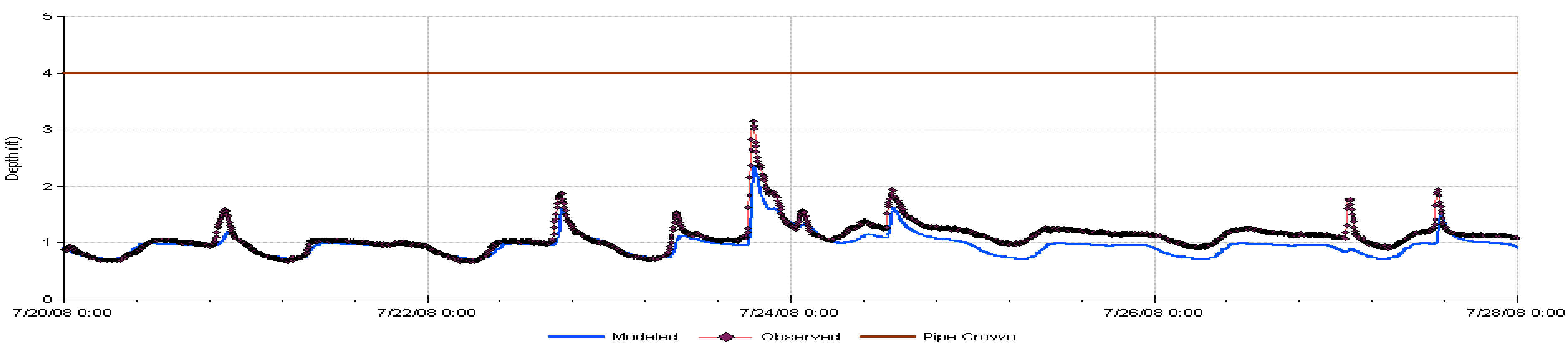
ACSD-7
Vm=60.25 MG Vo=66.96 MG; Qm=60.1 cfs Qo=65.6 cfs

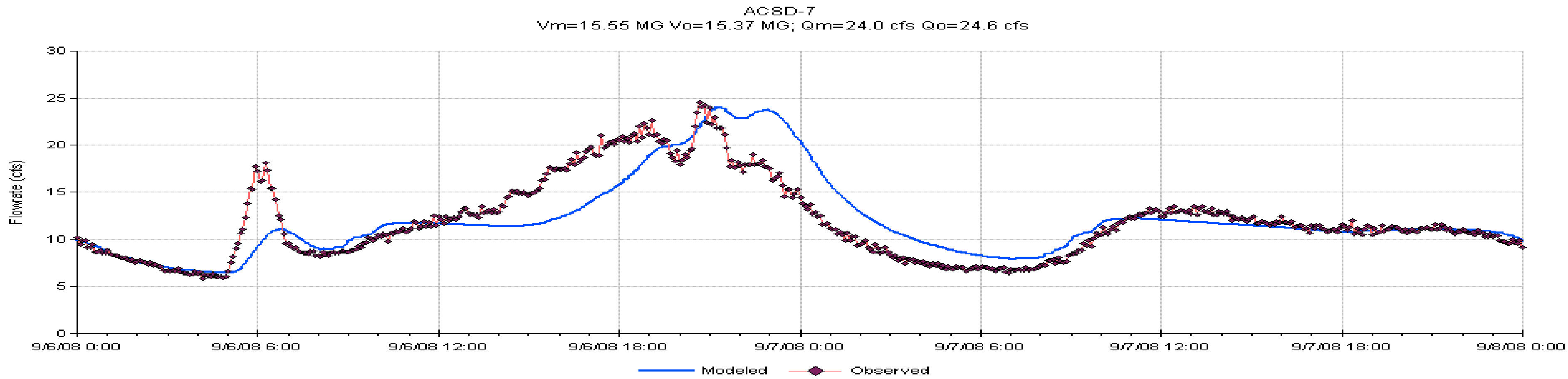


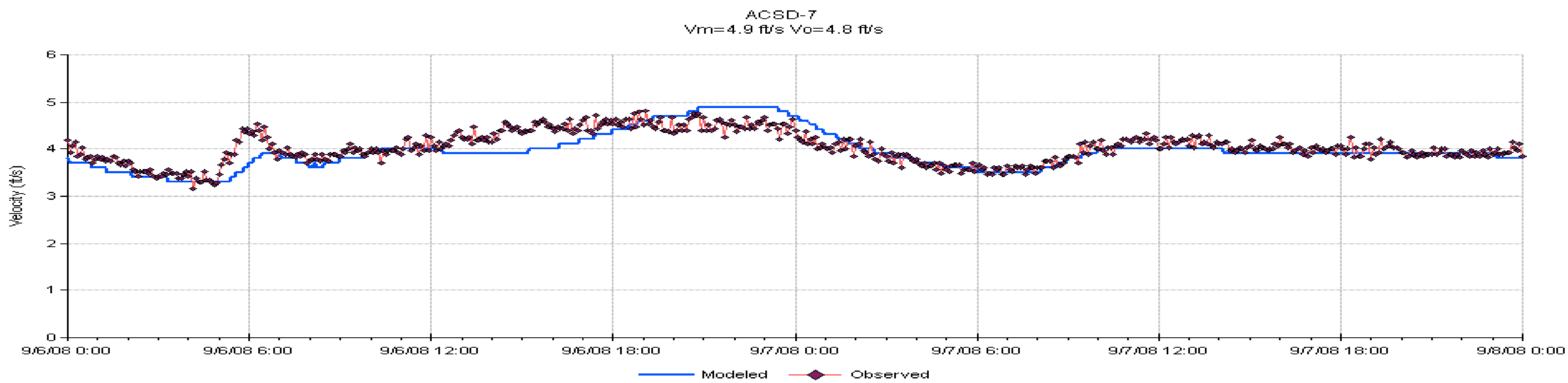
ACSD-7
Vm=6.5 ft/s Vo=5.5 ft/s

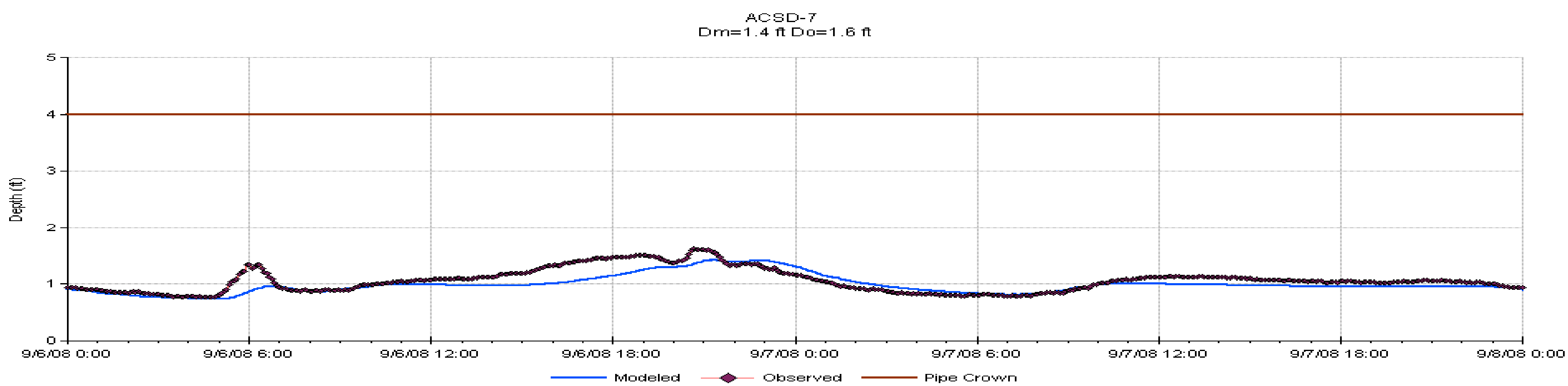


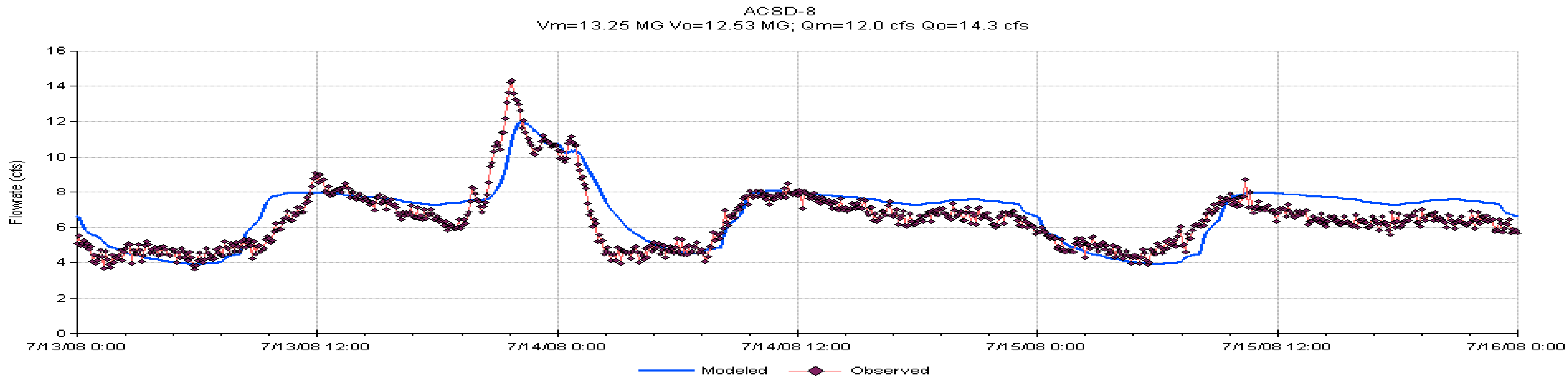
ACSD-7
Dm=2.4 ft Do=3.2 ft

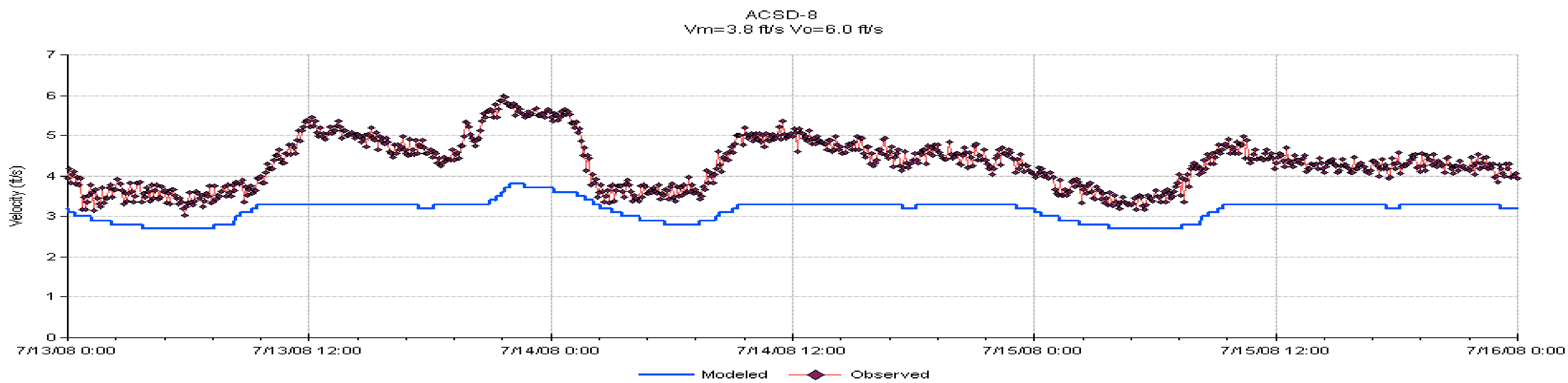


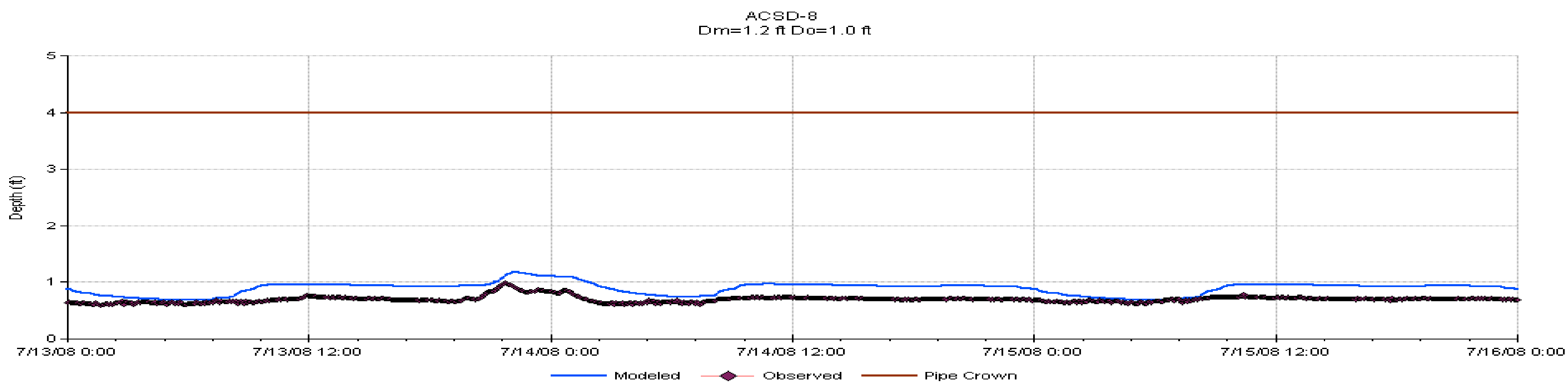

ACSD-7
Vm=15.55 MG Vo=15.37 MG; Qm=24.0 cfs Qo=24.6 cfs
Flowrate (cfs)
0
5
10
15
20
25
30
9/6/08 0:00
9/6/08 6:00
9/6/08 12:00
9/6/08 18:00
9/7/08 0:00
9/7/08 6:00
9/7/08 12:00
9/7/08 18:00
9/8/08 0:00
Modeled
Observed

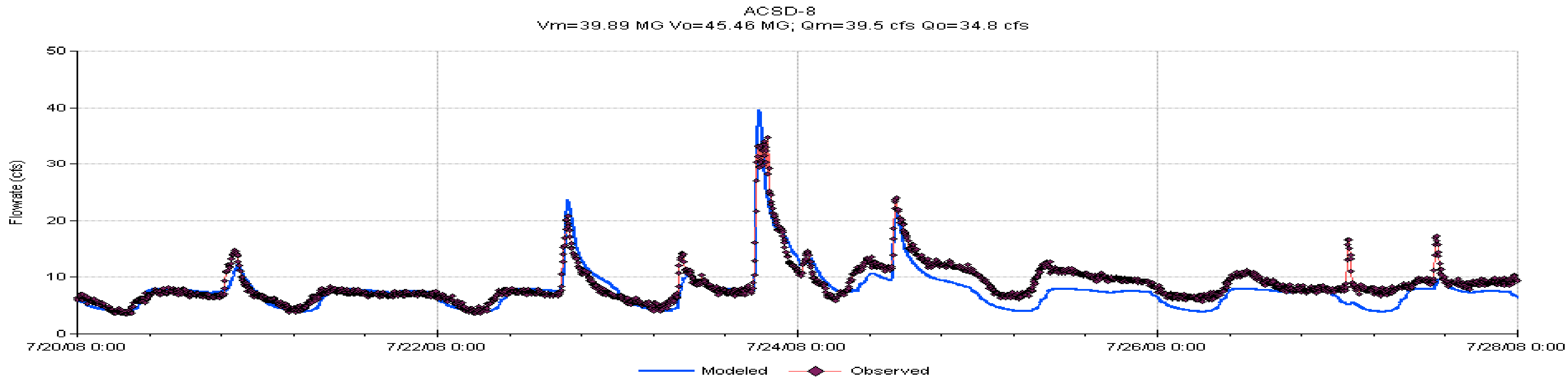

ACSD-7
Vm=4.9 ft/s Vo=4.8 ft/s
Velocity (ft/s)
0
1
2
3
4
5
6
9/6/08 0:00
9/6/08 6:00
9/6/08 12:00
9/6/08 18:00
9/7/08 0:00
9/7/08 6:00
9/7/08 12:00
9/7/08 18:00
9/8/08 0:00
Modeled
Observed

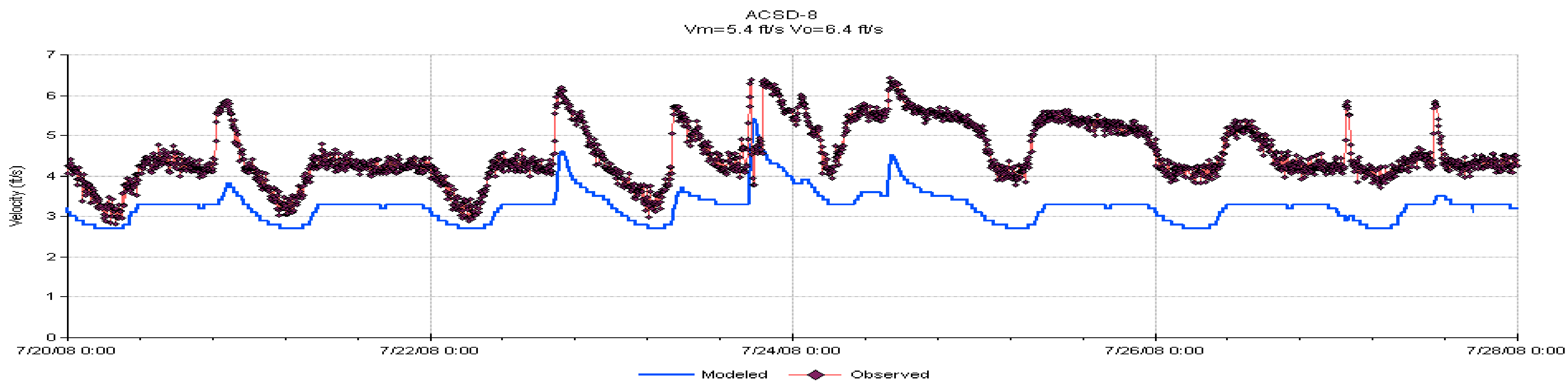

ACSD-7
Dm=1.4 ft Do=1.6 ft
Depth (ft)
0
1
2
3
4
5
9/6/08 0:00
9/6/08 6:00
9/6/08 12:00
9/6/08 18:00
9/7/08 0:00
9/7/08 6:00
9/7/08 12:00
9/7/08 18:00
9/8/08 0:00
Modeled
Observed
Pipe Crown

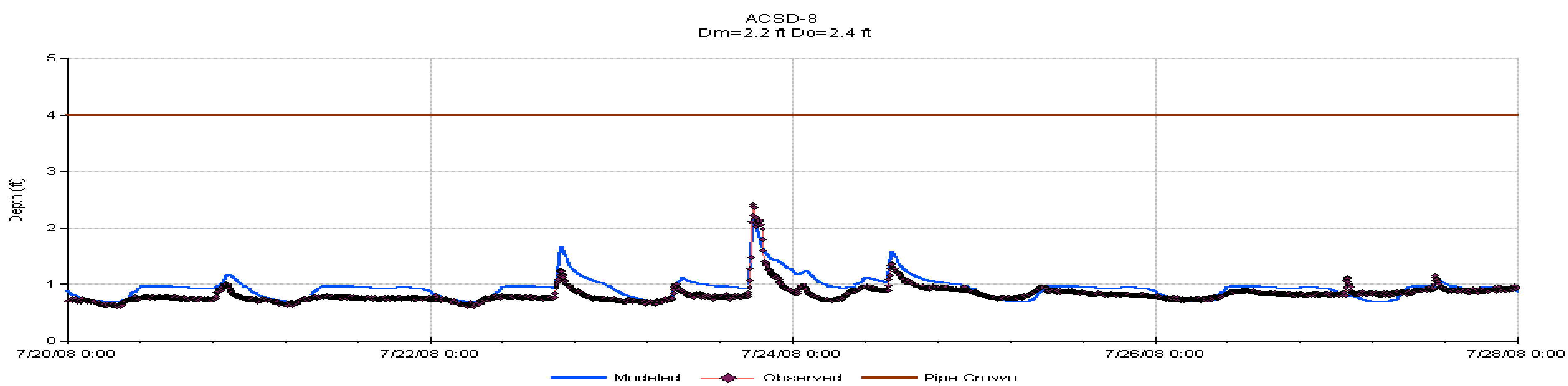

ACSD-8
Vm=13.25 MG Vo=12.53 MG; Qm=12.0 cfs Qo=14.3 cfs
Flowrate (cfs)
0
2
4
6
8
10
12
14
16
7/13/08 0:00
7/13/08 12:00
7/14/08 0:00
7/14/08 12:00
7/15/08 0:00
7/15/08 12:00
7/16/08 0:00
Modeled
Observed

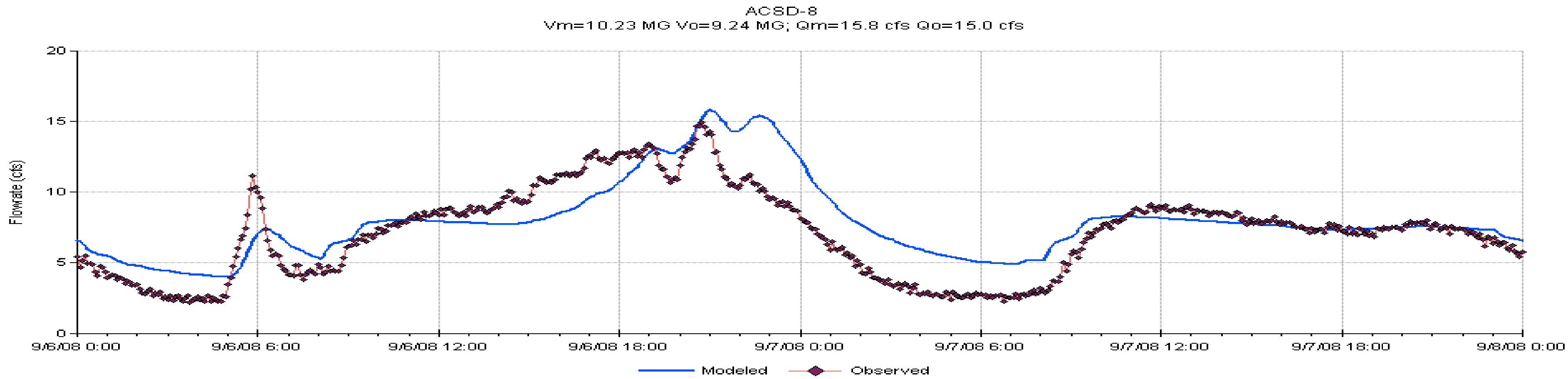

ACSD-8
Vm=3.8 ft/s Vo=6.0 ft/s
Velocity (ft/s)
0
1
2
3
4
5
6
7
7/13/08 0:00
7/13/08 12:00
7/14/08 0:00
7/14/08 12:00
7/15/08 0:00
7/15/08 12:00
7/16/08 0:00
Modeled
Observed

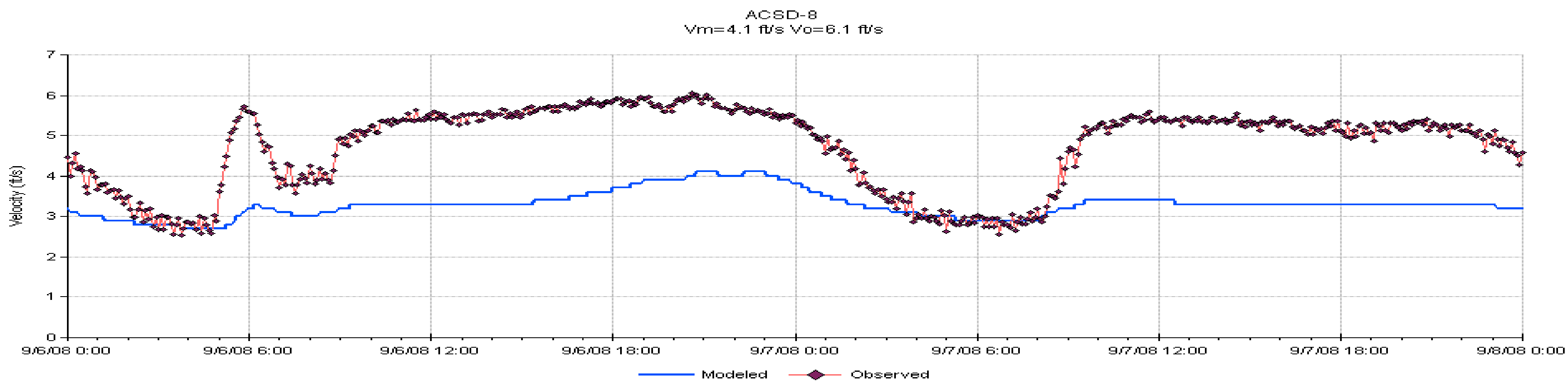

ACSD-8
Dm=1.2 ft Do=1.0 ft
Depth (ft)
0
1
2
3
4
5
7/13/08 0:00
7/13/08 12:00
7/14/08 0:00
7/14/08 12:00
7/15/08 0:00
7/15/08 12:00
7/16/08 0:00
Modeled
Observed
Pipe Crown

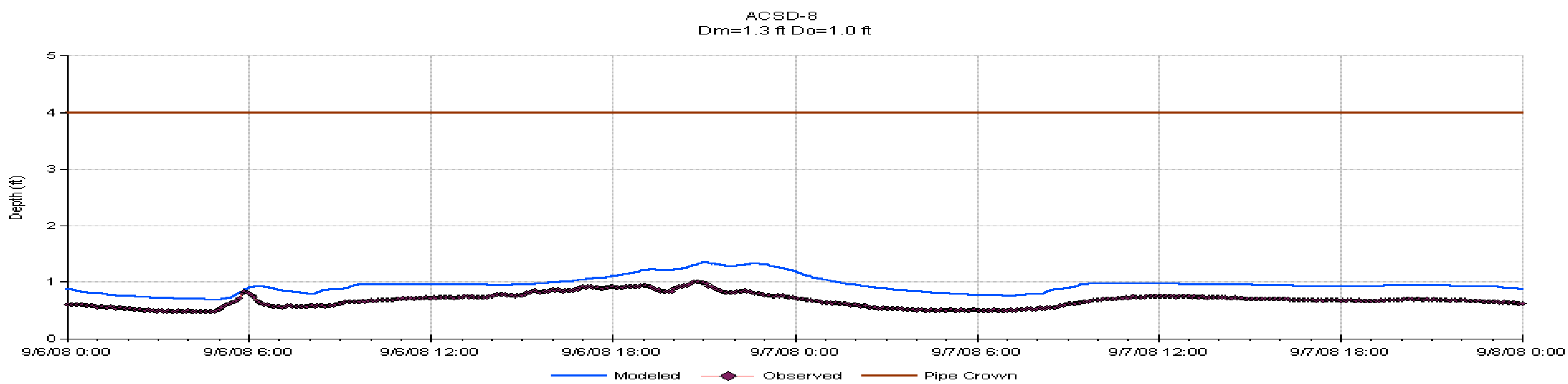

ACSD-8
Vm=39.89 MG Vo=45.46 MG; Qm=39.5 cfs Qo=34.8 cfs
Flowrate (cfs)
50
40
30
20
10
0
7/20/08 0:00
7/22/08 0:00
7/24/08 0:00
7/26/08 0:00
7/28/08 0:00
Modeled
Observed

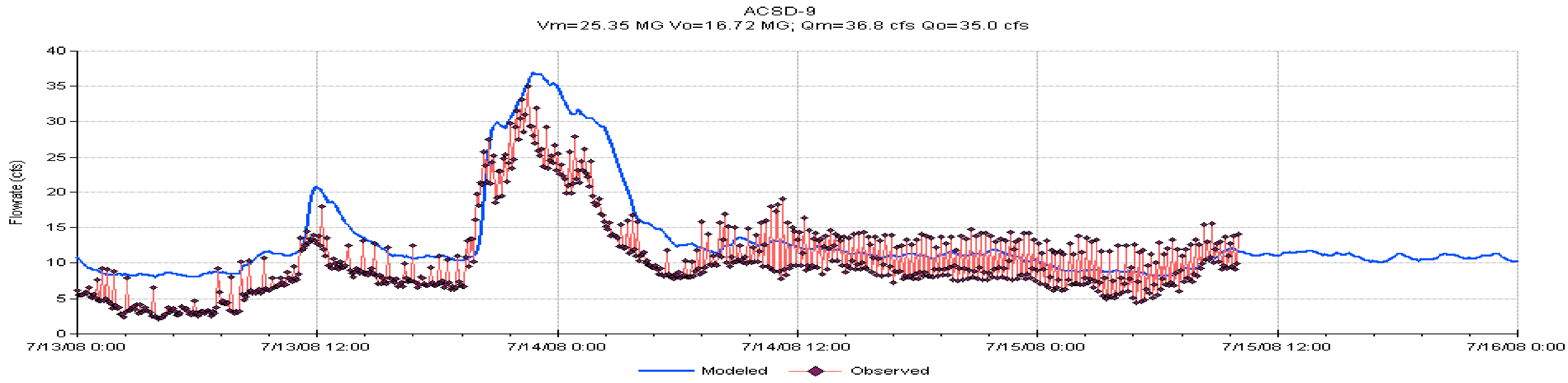

ACSD-8
Vm=5.4 ft/s Vo=6.4 ft/s
Velocity (ft/s)
7
6
5
4
3
2
1
0
7/20/08 0:00
7/22/08 0:00
7/24/08 0:00
7/26/08 0:00
7/28/08 0:00
Modeled
Observed

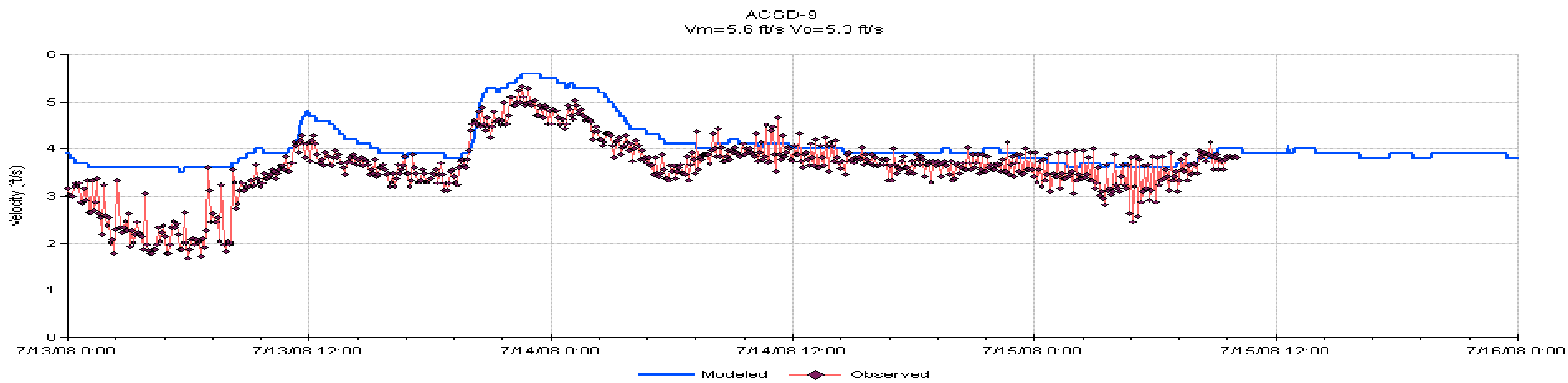

ACSD-8
Dm=2.2 ft Do=2.4 ft
Depth (ft)
5
4
3
2
1
0
7/20/08 0:00
7/22/08 0:00
7/24/08 0:00
7/26/08 0:00
7/28/08 0:00
Modeled
Observed
Pipe Crown

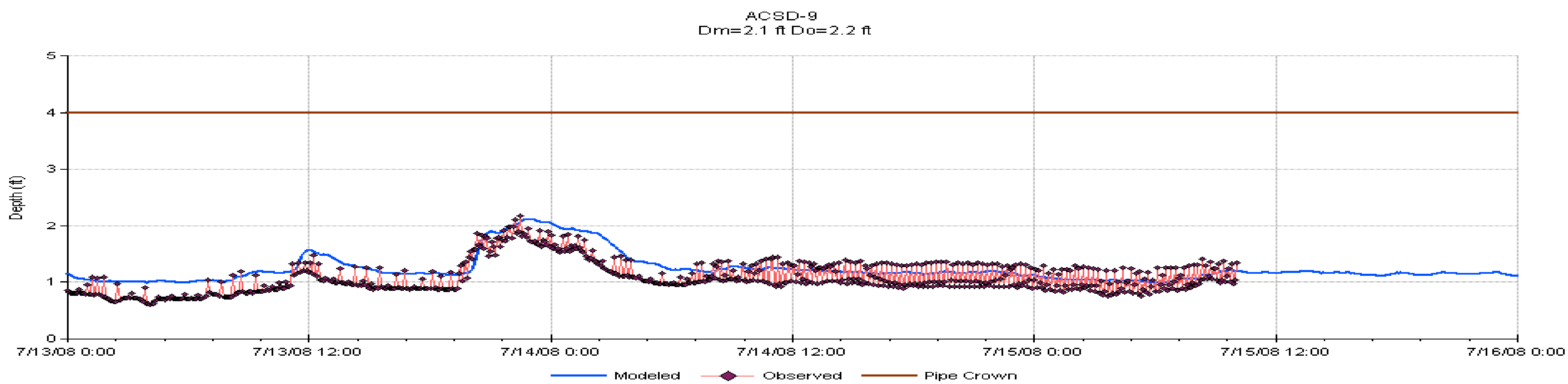

ACSD-8
Vm=10.23 MG Vo=9.24 MG; Qm=15.8 cfs Qo=15.0 cfs
Flowrate (cfs)
20
15
10
5
0
9/6/08 0:00
9/6/08 6:00
9/6/08 12:00
9/6/08 18:00
9/7/08 0:00
9/7/08 6:00
9/7/08 12:00
9/7/08 18:00
9/8/08 0:00
Modeled
Observed

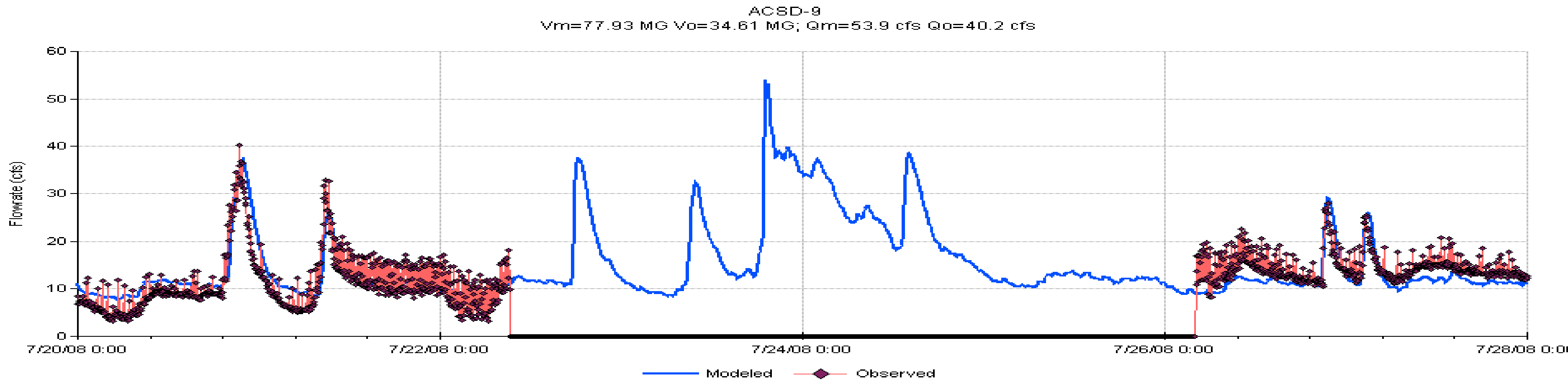

ACSD-8
Vm=4.1 ft/s Vo=6.1 ft/s
Velocity (ft/s)
7
6
5
4
3
2
1
0
9/6/08 0:00
9/6/08 6:00
9/6/08 12:00
9/6/08 18:00
9/7/08 0:00
9/7/08 6:00
9/7/08 12:00
9/7/08 18:00
9/8/08 0:00
Modeled
Observed

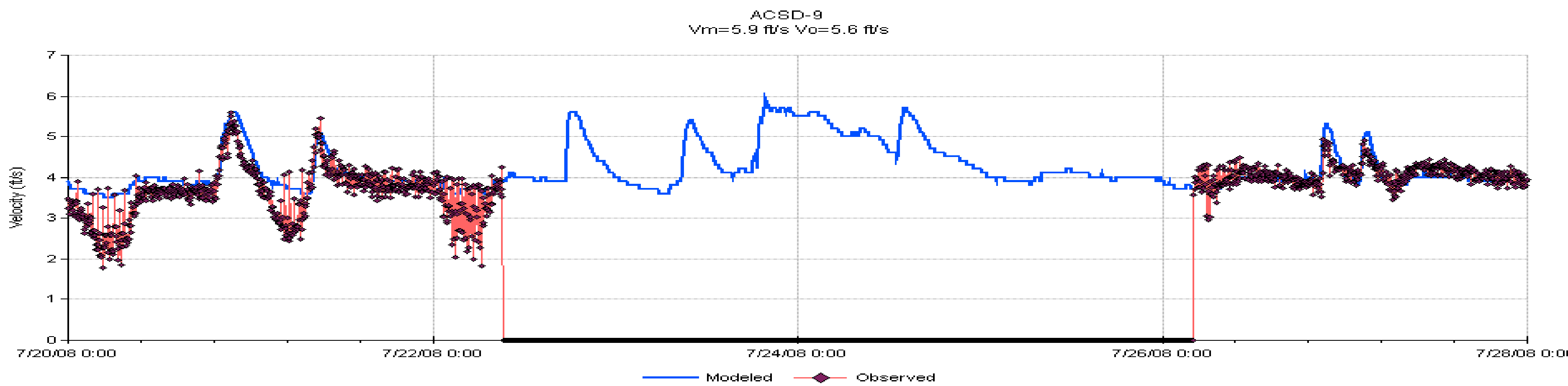

ACSD-8
Dm=1.3 ft Do=1.0 ft
Depth (ft)
5
4
3
2
1
0
9/6/08 0:00
9/6/08 6:00
9/6/08 12:00
9/6/08 18:00
9/7/08 0:00
9/7/08 6:00
9/7/08 12:00
9/7/08 18:00
9/8/08 0:00
Modeled
Observed
Pipe Crown

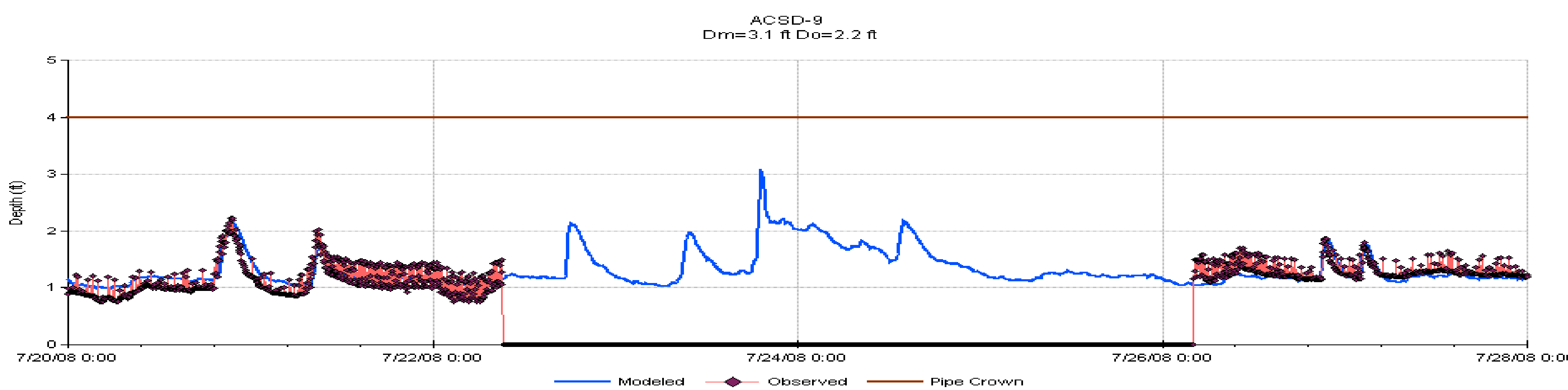

ACSD-9
Vm=25.35 MG Vo=16.72 MG; Qm=36.8 cfs Qo=35.0 cfs
Flowrate (cfs)
0
5
10
15
20
25
30
35
40
7/13/08 0:00
7/13/08 12:00
7/14/08 0:00
7/14/08 12:00
7/15/08 0:00
7/15/08 12:00
7/16/08 0:00
Modeled
Observed


ACSD-9
Vm=5.6 ft/s Vo=5.3 ft/s
Velocity (ft/s)
0
1
2
3
4
5
6
7/13/08 0:00
7/13/08 12:00
7/14/08 0:00
7/14/08 12:00
7/15/08 0:00
7/15/08 12:00
7/16/08 0:00
Modeled
Observed

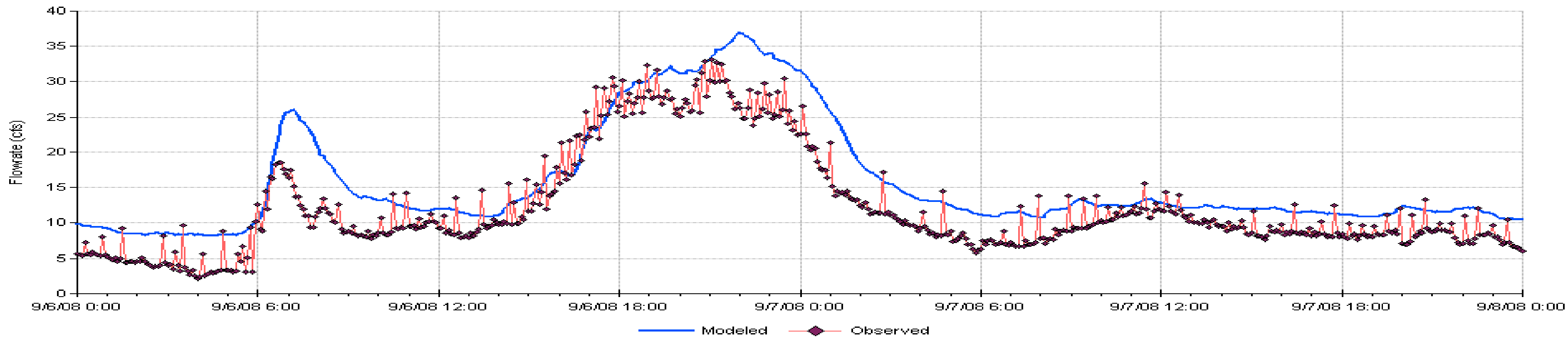

ACSD-9
Dm=2.1 ft Do=2.2 ft
Depth (ft)
0
1
2
3
4
5
7/13/08 0:00
7/13/08 12:00
7/14/08 0:00
7/14/08 12:00
7/15/08 0:00
7/15/08 12:00
7/16/08 0:00
Modeled
Observed
Pipe Crown


ACSD-9
Vm=77.93 MG Vo=34.61 MG; Qm=53.9 cfs Qo=40.2 cfs
Flowrate (cfs)
0
10
20
30
40
50
60
7/20/08 0:00
7/22/08 0:00
7/24/08 0:00
7/26/08 0:00
7/28/08 0:00
Modeled
Observed

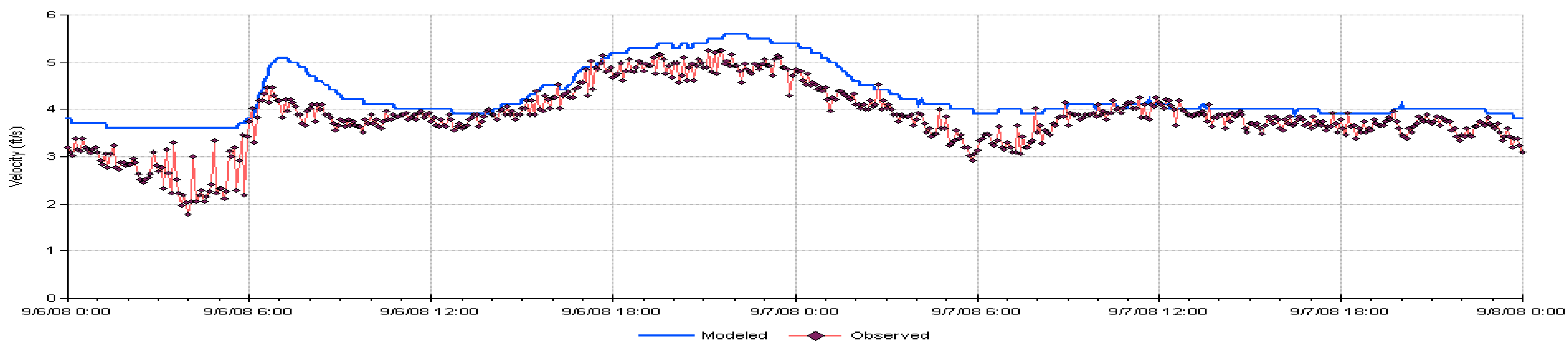

ACSD-9
Vm=5.9 ft/s Vo=5.6 ft/s
Velocity (ft/s)
0
1
2
3
4
5
6
7
7/20/08 0:00
7/22/08 0:00
7/24/08 0:00
7/26/08 0:00
7/28/08 0:00
Modeled
Observed


ACSD-9
Dm=3.1 ft Do=2.2 ft
Depth (ft)
0
1
2
3
4
5
7/20/08 0:00
7/22/08 0:00
7/24/08 0:00
7/26/08 0:00
7/28/08 0:00
Modeled
Observed
Pipe Crown

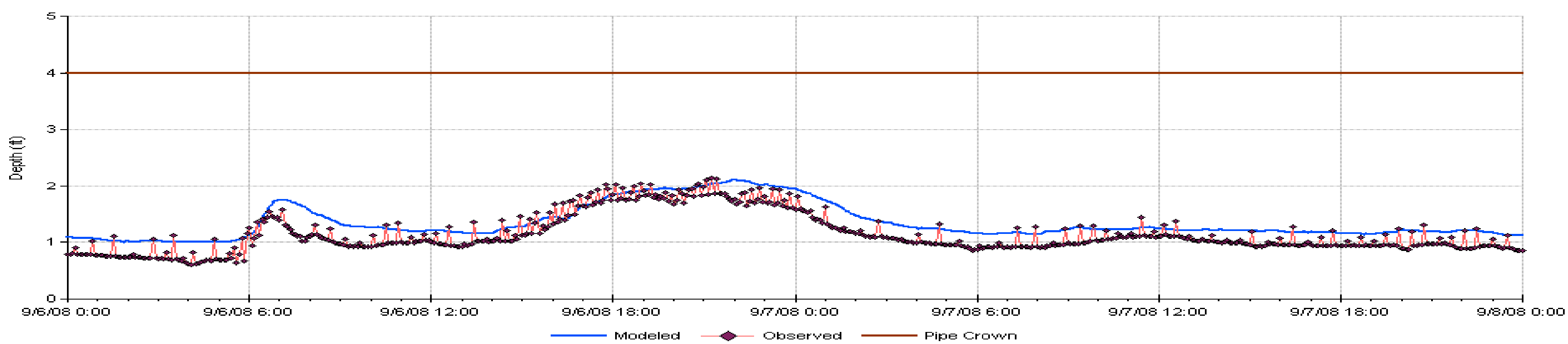
ACSD-9
Vm=20.50 MG Vo=15.93 MG; Qm=36.9 cfs Qo=33.1 cfs

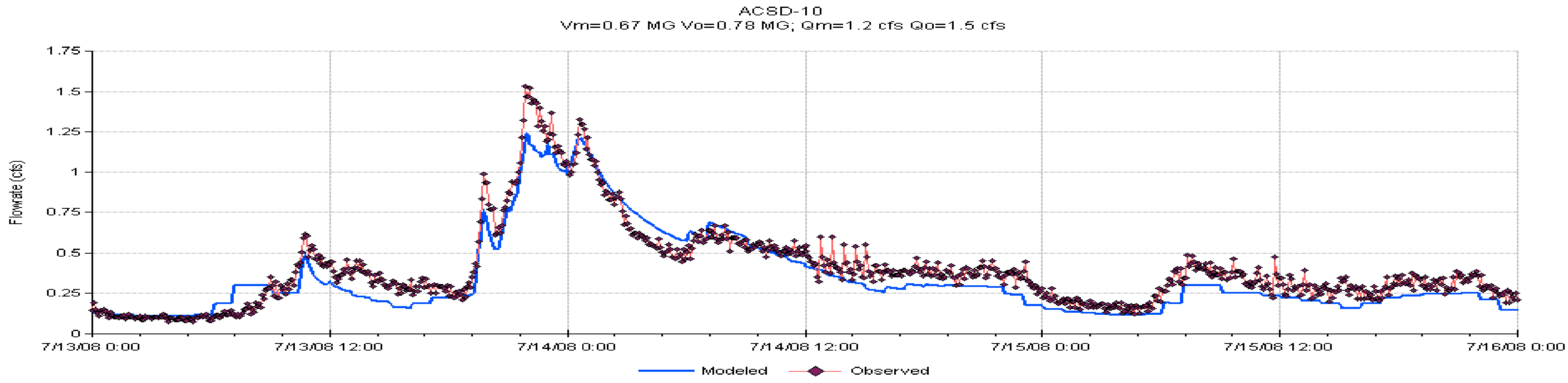


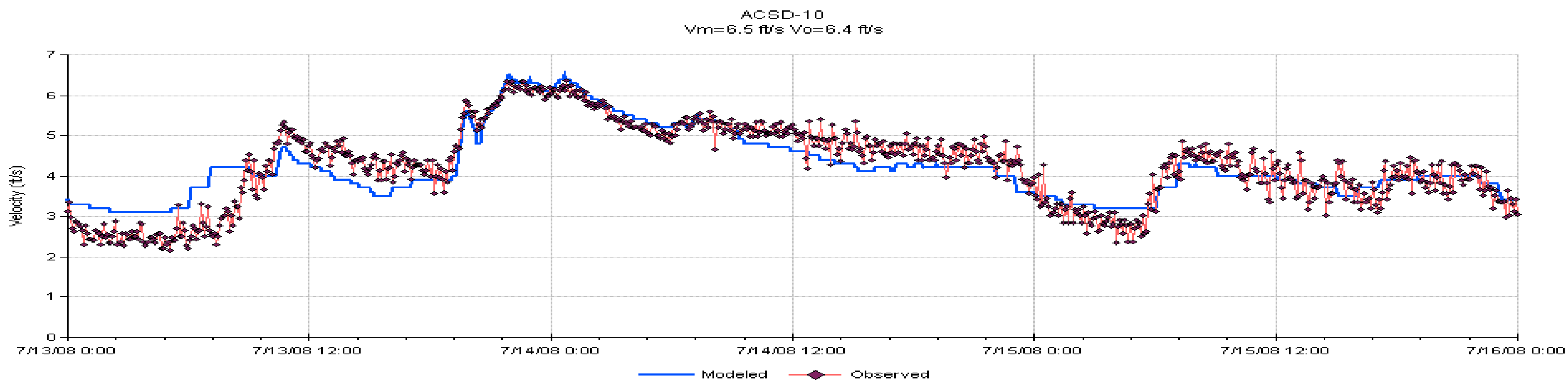
ACSD-9
Vm=5.6 ft/s Vo=5.3 ft/s

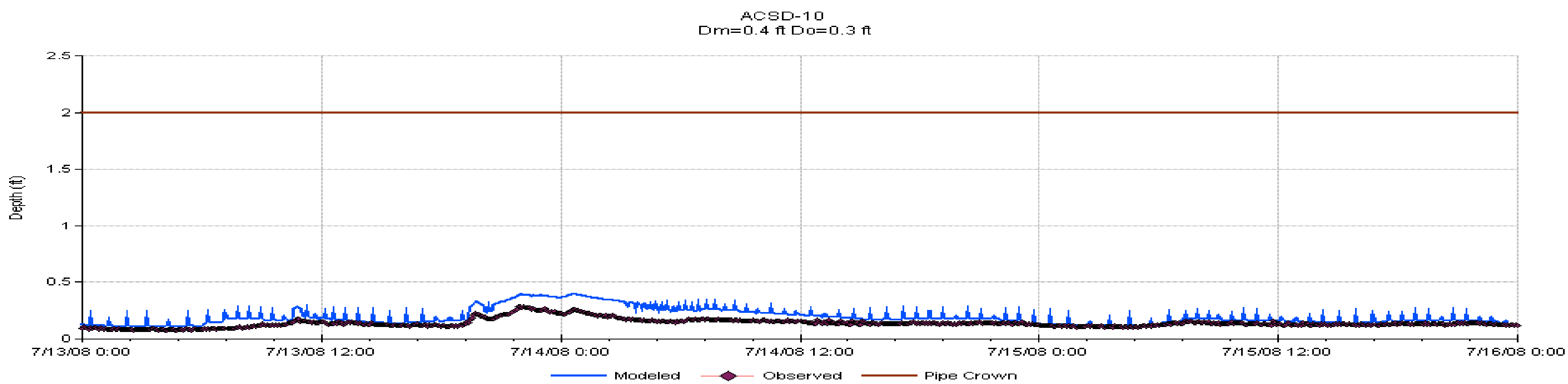


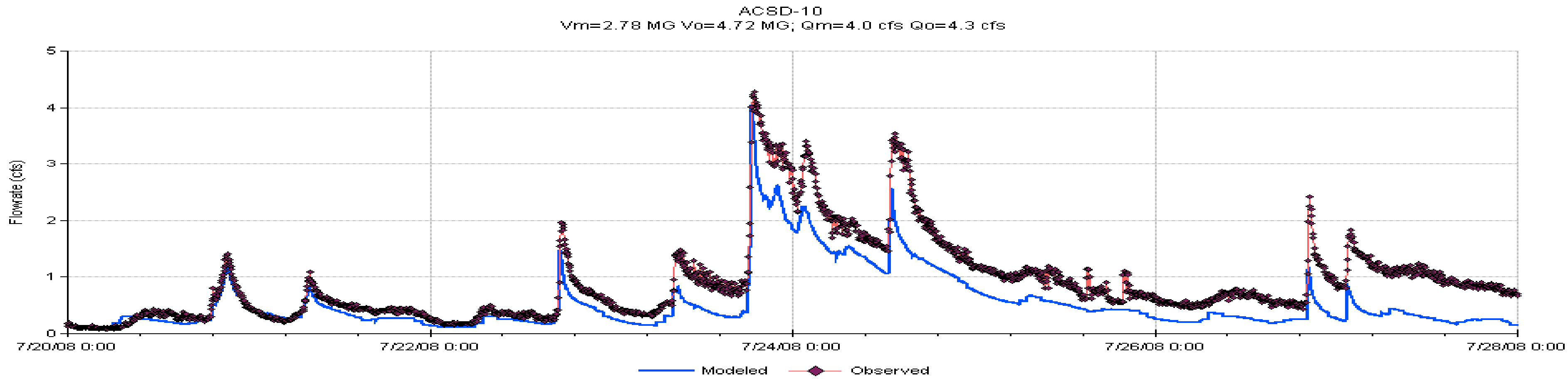
ACSD-9
Dm=2.1 ft Do=2.1 ft

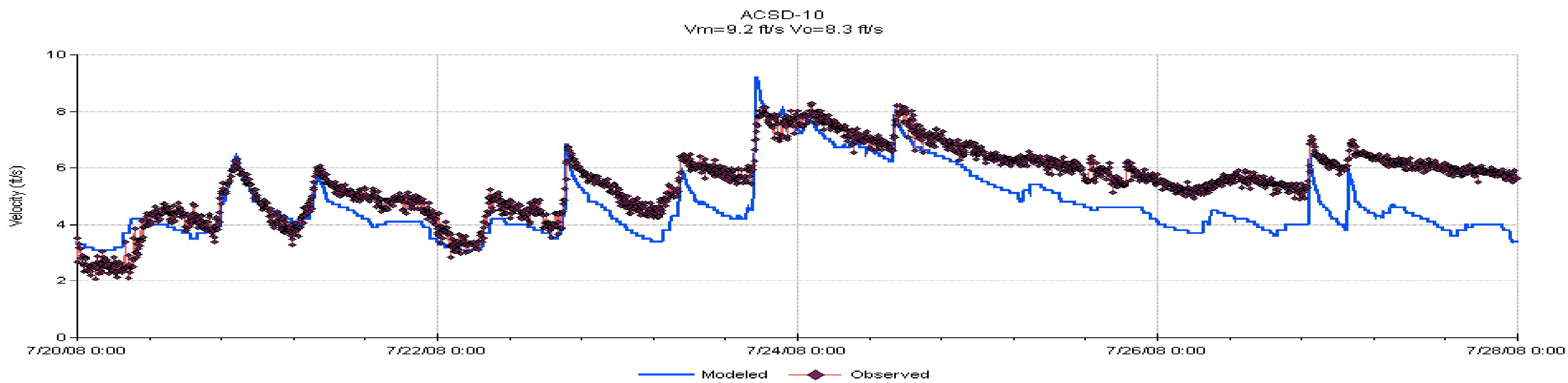


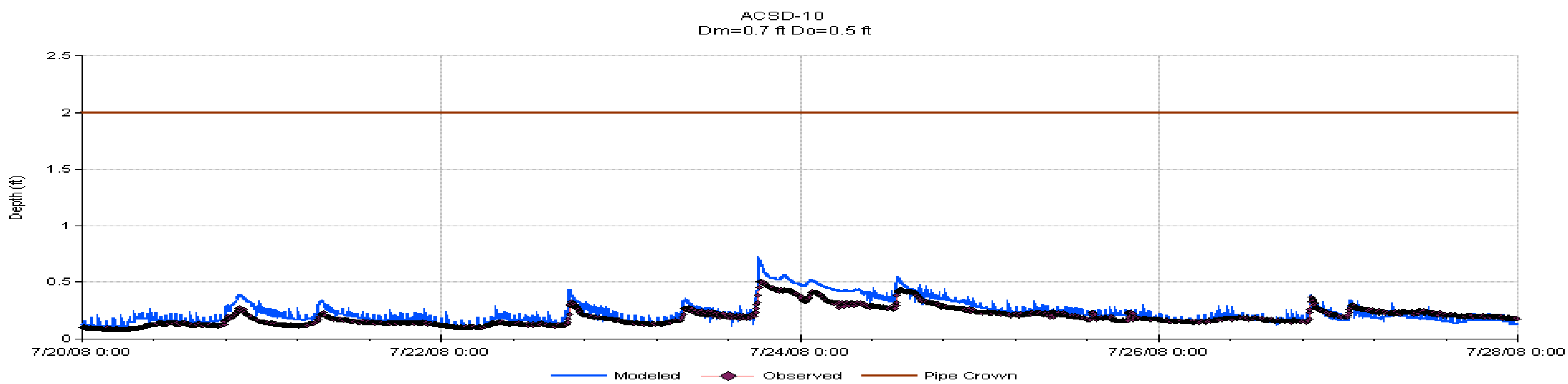

ACSD-10
Vm=0.67 MG Vo=0.78 MG; Qm=1.2 cfs Qo=1.5 cfs
Flowrate (cfs)
1.75
1.5
1.25
1
0.75
0.5
0.25
0
7/13/08 0:00
7/13/08 12:00
7/14/08 0:00
7/14/08 12:00
7/15/08 0:00
7/15/08 12:00
7/16/08 0:00
Modeled
Observed

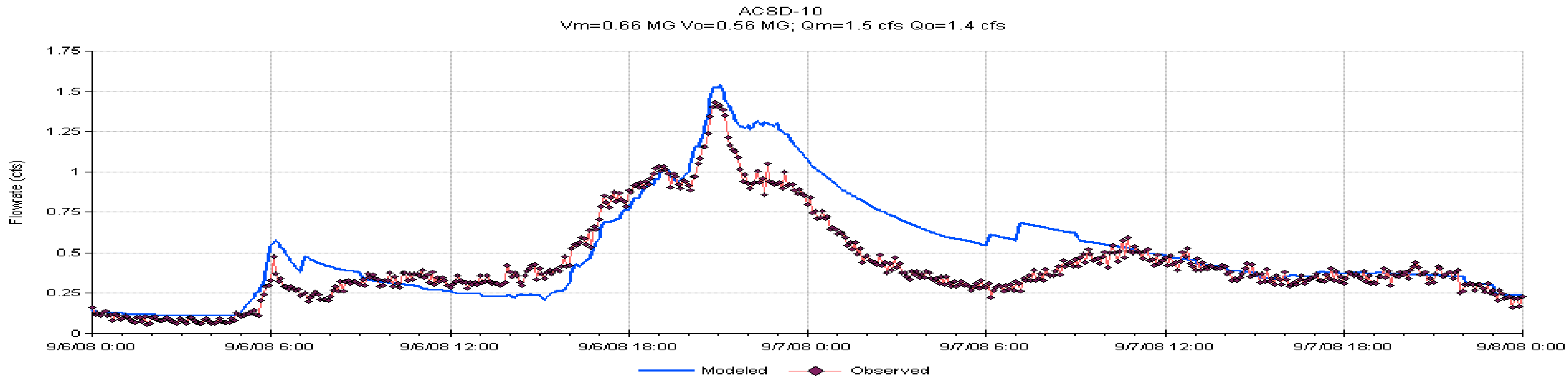

ACSD-10
Vm=6.5 ft/s Vo=6.4 ft/s
Velocity (ft/s)
7
6
5
4
3
2
1
0
7/13/08 0:00
7/13/08 12:00
7/14/08 0:00
7/14/08 12:00
7/15/08 0:00
7/15/08 12:00
7/16/08 0:00
Modeled
Observed

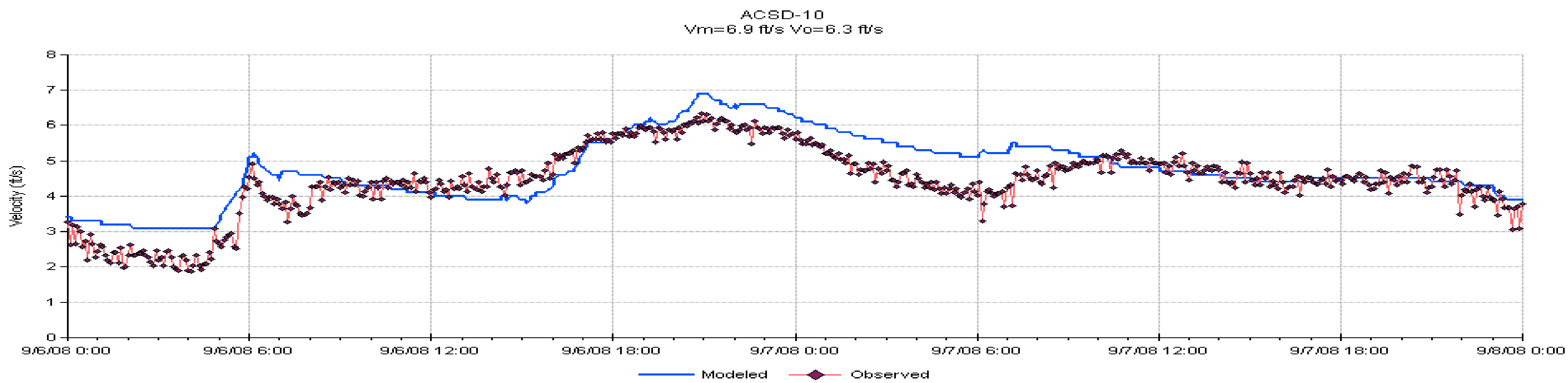

ACSD-10
Dm=0.4 ft Do=0.3 ft
Depth (ft)
2.5
2
1.5
1
0.5
0
7/13/08 0:00
7/13/08 12:00
7/14/08 0:00
7/14/08 12:00
7/15/08 0:00
7/15/08 12:00
7/16/08 0:00
Modeled
Observed
Pipe Crown

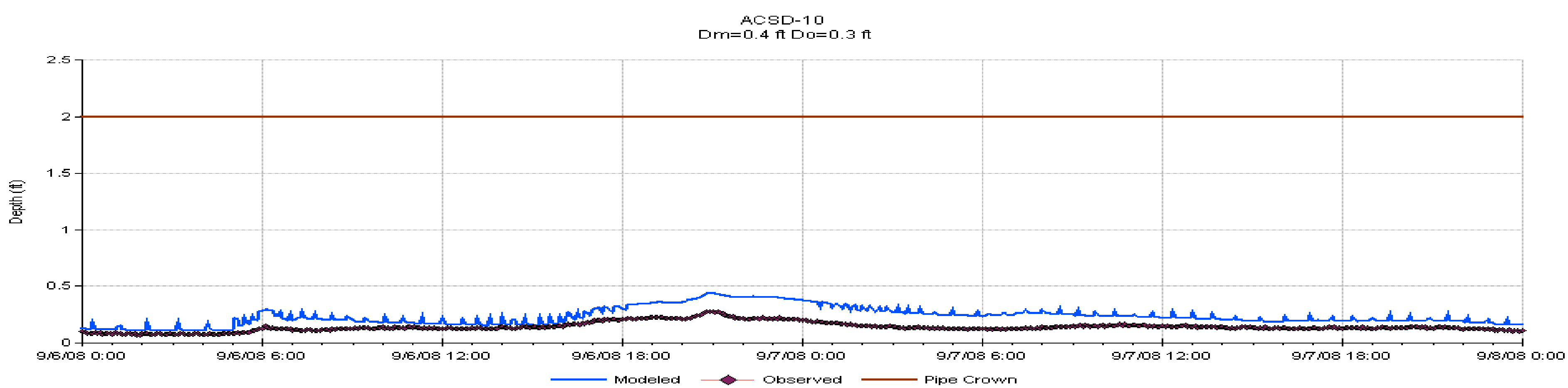

ACSD-10
Vm=2.78 MG Vo=4.72 MG; Qm=4.0 cfs Qo=4.3 cfs
Flowrate (cfs)
7/20/08 0:00
7/22/08 0:00
7/24/08 0:00
7/26/08 0:00
7/28/08 0:00
Modeled
Observed

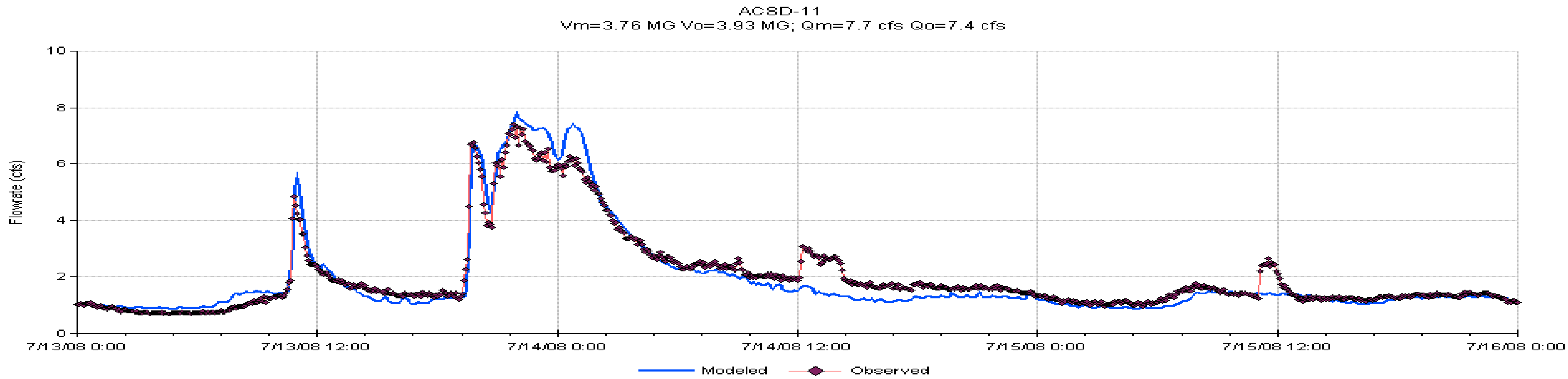

ACSD-10
Vm=9.2 ft/s Vo=8.3 ft/s
Velocity (ft/s)
7/20/08 0:00
7/22/08 0:00
7/24/08 0:00
7/26/08 0:00
7/28/08 0:00
Modeled
Observed

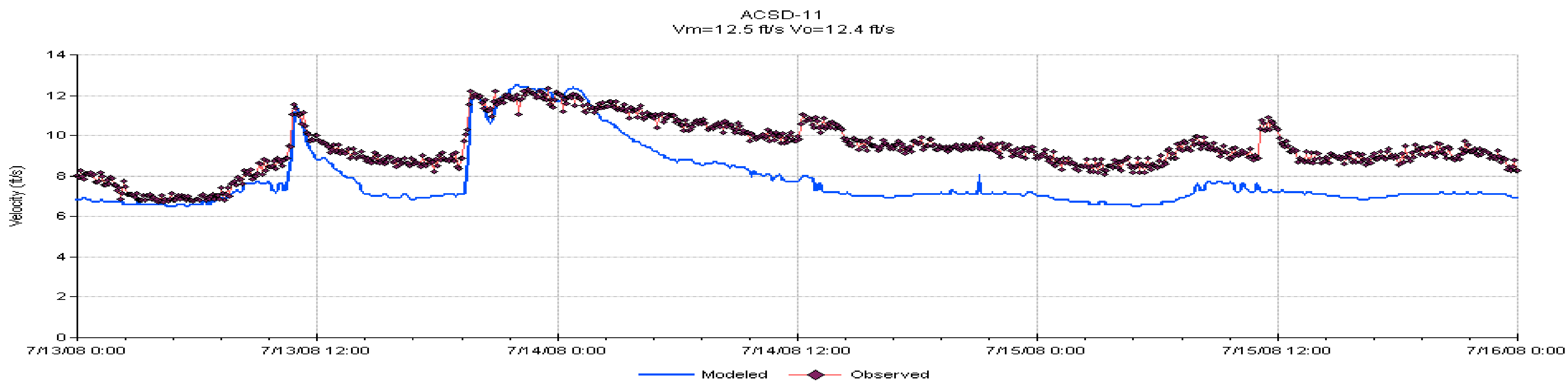

ACSD-10
Dm=0.7 ft Do=0.5 ft
Depth (ft)
7/20/08 0:00
7/22/08 0:00
7/24/08 0:00
7/26/08 0:00
7/28/08 0:00
Modeled
Observed
Pipe Crown

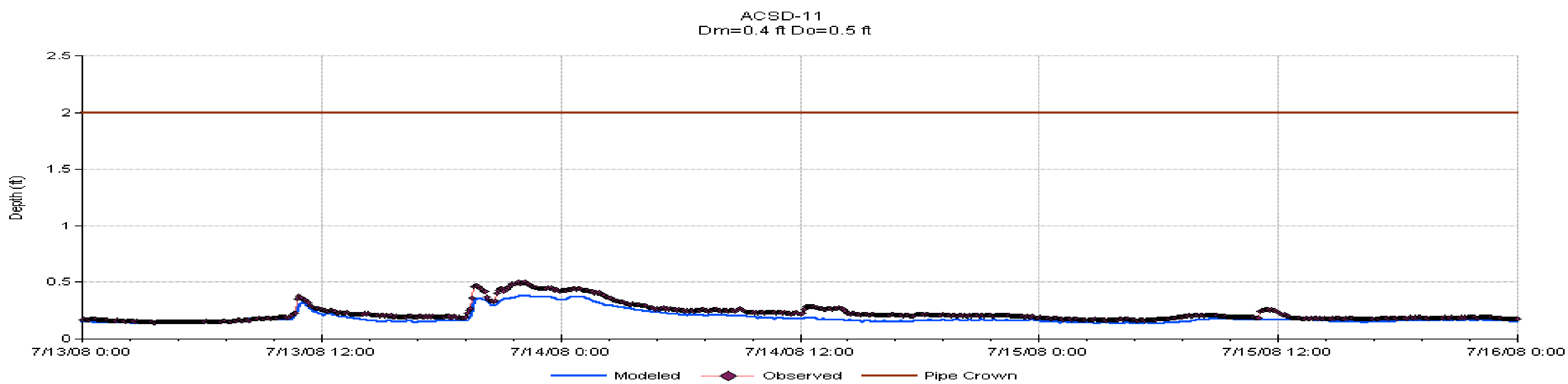

ACSD-10
Vm=0.66 MG Vo=0.56 MG; Qm=1.5 cfs Qo=1.4 cfs
Flowrate (cfs)
1.75
1.5
1.25
1
0.75
0.5
0.25
0
9/6/08 0:00
9/6/08 6:00
9/6/08 12:00
9/6/08 18:00
9/7/08 0:00
9/7/08 6:00
9/7/08 12:00
9/7/08 18:00
9/8/08 0:00
Modeled
Observed

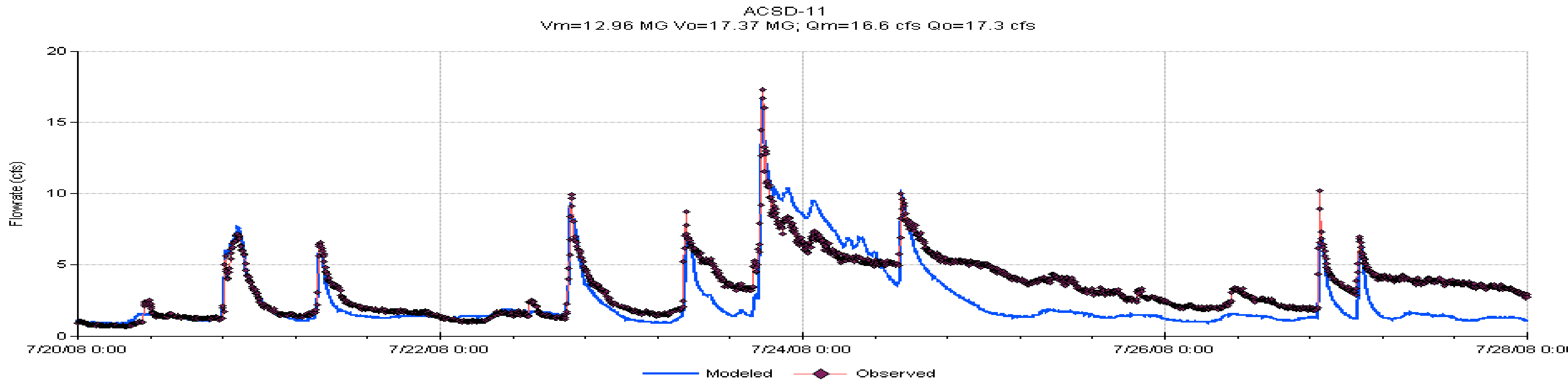

ACSD-10
Vm=6.9 ft/s Vo=6.3 ft/s
Velocity (ft/s)
8
7
6
5
4
3
2
1
0
9/6/08 0:00
9/6/08 6:00
9/6/08 12:00
9/6/08 18:00
9/7/08 0:00
9/7/08 6:00
9/7/08 12:00
9/7/08 18:00
9/8/08 0:00
Modeled
Observed

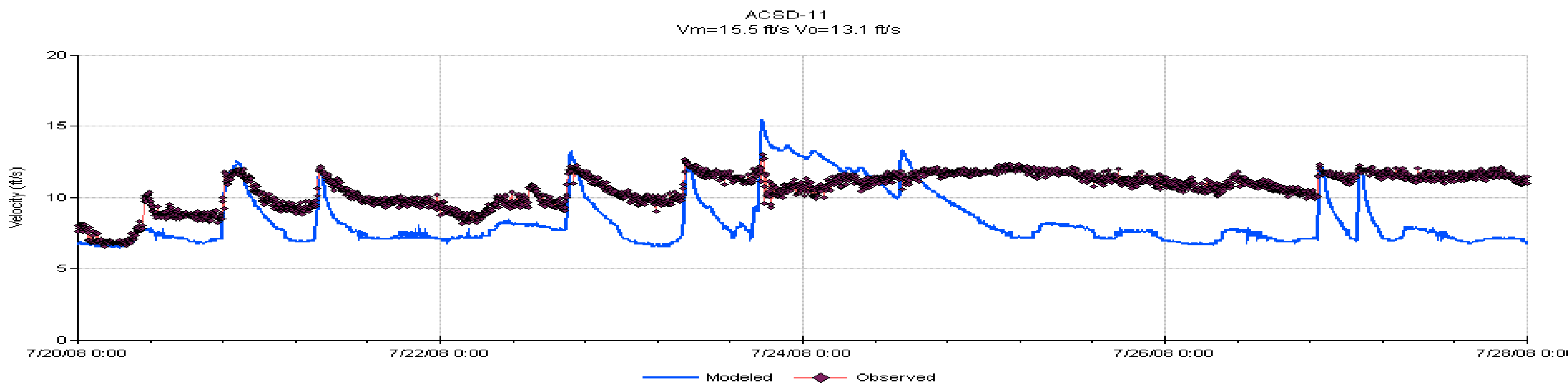

ACSD-10
Dm=0.4 ft Do=0.3 ft
Depth (ft)
2.5
2
1.5
1
0.5
0
9/6/08 0:00
9/6/08 6:00
9/6/08 12:00
9/6/08 18:00
9/7/08 0:00
9/7/08 6:00
9/7/08 12:00
9/7/08 18:00
9/8/08 0:00
Modeled
Observed
Pipe Crown

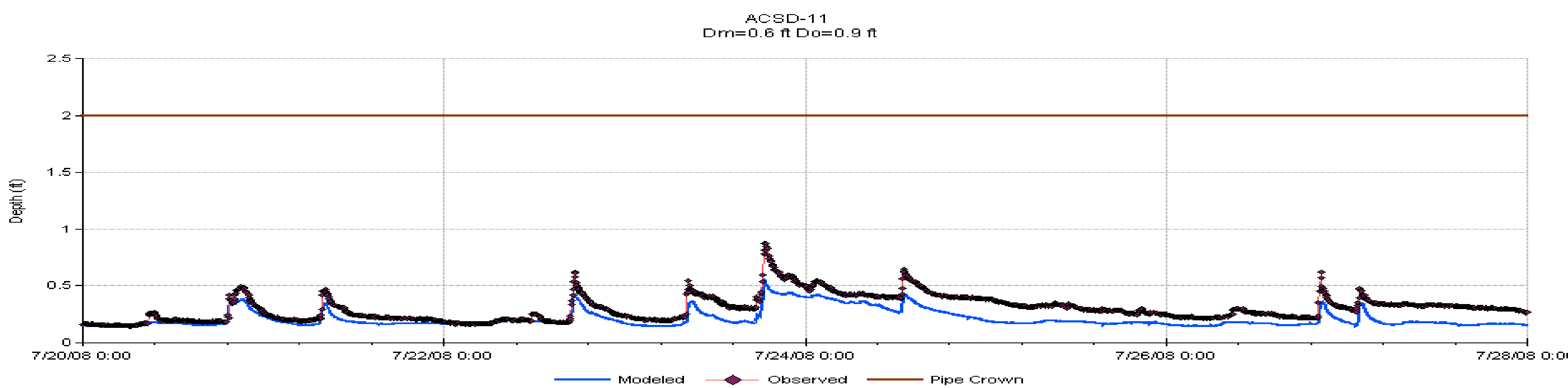

ACSD-11
Vm=3.76 MG Vo=3.93 MG; Qm=7.7 cfs Qo=7.4 cfs
Flowrate (cfs)
0
2
4
6
8
10
7/13/08 0:00
7/13/08 12:00
7/14/08 0:00
7/14/08 12:00
7/15/08 0:00
7/15/08 12:00
7/16/08 0:00
Modeled
Observed


ACSD-11
Vm=12.5 ft/s Vo=12.4 ft/s
Velocity (ft/s)
0
2
4
6
8
10
12
14
7/13/08 0:00
7/13/08 12:00
7/14/08 0:00
7/14/08 12:00
7/15/08 0:00
7/15/08 12:00
7/16/08 0:00
Modeled
Observed

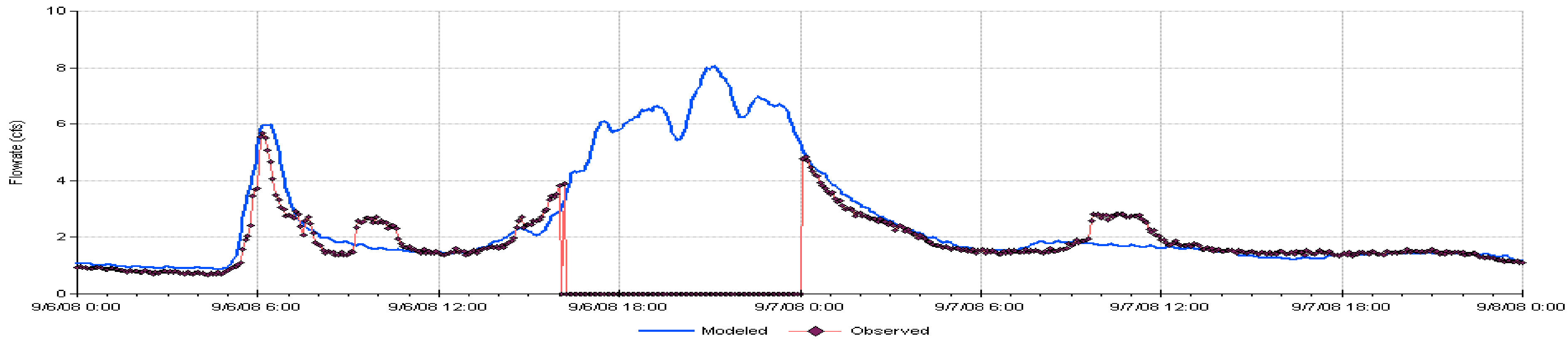

ACSD-11
Dm=0.4 ft Do=0.5 ft
Depth (ft)
0
0.5
1
1.5
2
2.5
7/13/08 0:00
7/13/08 12:00
7/14/08 0:00
7/14/08 12:00
7/15/08 0:00
7/15/08 12:00
7/16/08 0:00
Modeled
Observed
Pipe Crown


ACSD-11
Vm=12.96 MG Vo=17.37 MG; Qm=16.6 cfs Qo=17.3 cfs
Flowrate (cfs)
0
5
10
15
20
7/20/08 0:00
7/22/08 0:00
7/24/08 0:00
7/26/08 0:00
7/28/08 0:00
Modeled
Observed

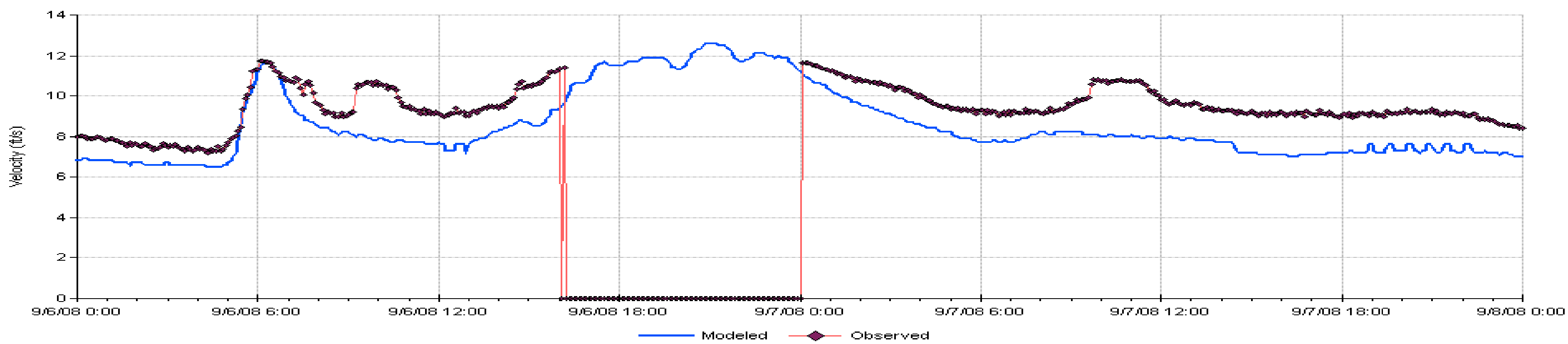

ACSD-11
Vm=15.5 ft/s Vo=13.1 ft/s
Velocity (ft/s)
0
5
10
15
20
7/20/08 0:00
7/22/08 0:00
7/24/08 0:00
7/26/08 0:00
7/28/08 0:00
Modeled
Observed


ACSD-11
Dm=0.6 ft Do=0.9 ft
Depth (ft)
0
0.5
1
1.5
2
2.5
7/20/08 0:00
7/22/08 0:00
7/24/08 0:00
7/26/08 0:00
7/28/08 0:00
Modeled
Observed
Pipe Crown

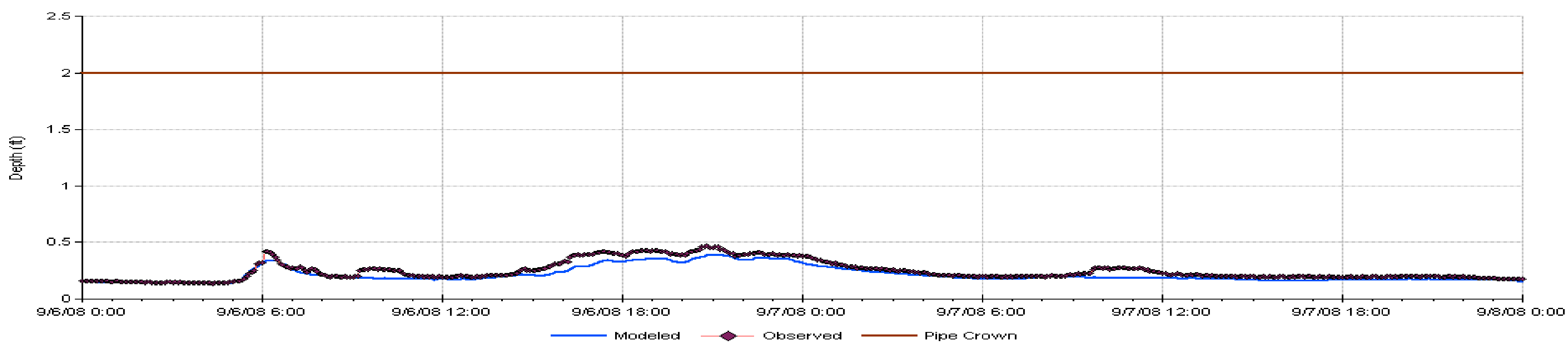
ACSD-11
Vm=3.31 MG Vo=1.98 MG; Qm=8.0 cfs Qo=5.7 cfs

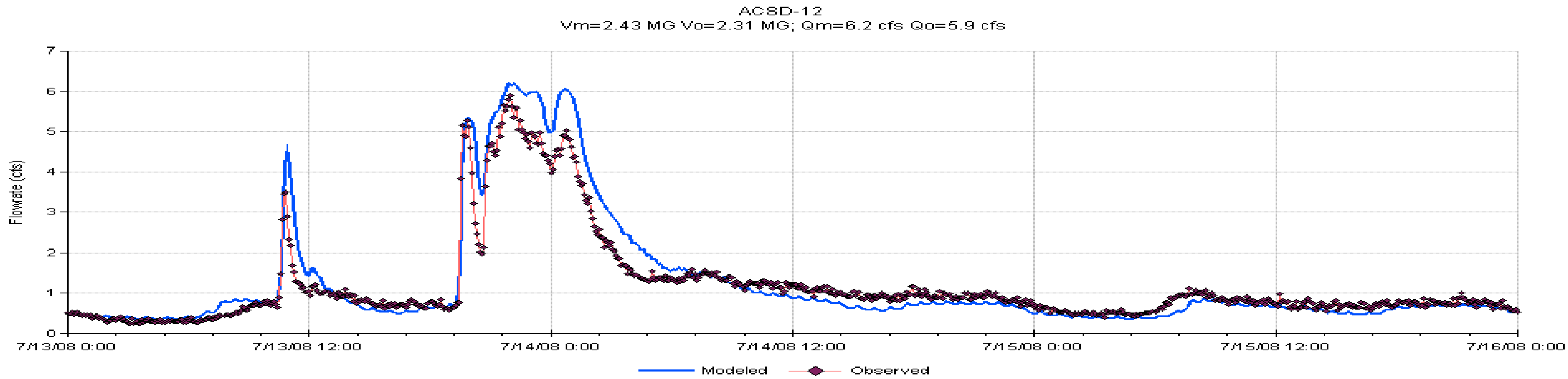


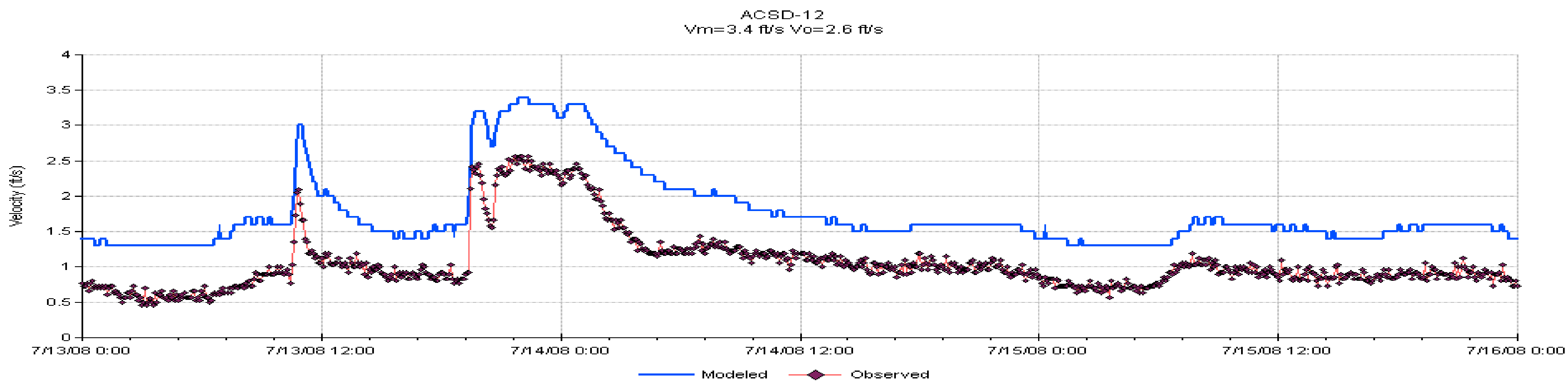
ACSD-11
Vm=12.6 ft/s Vo=11.7 ft/s

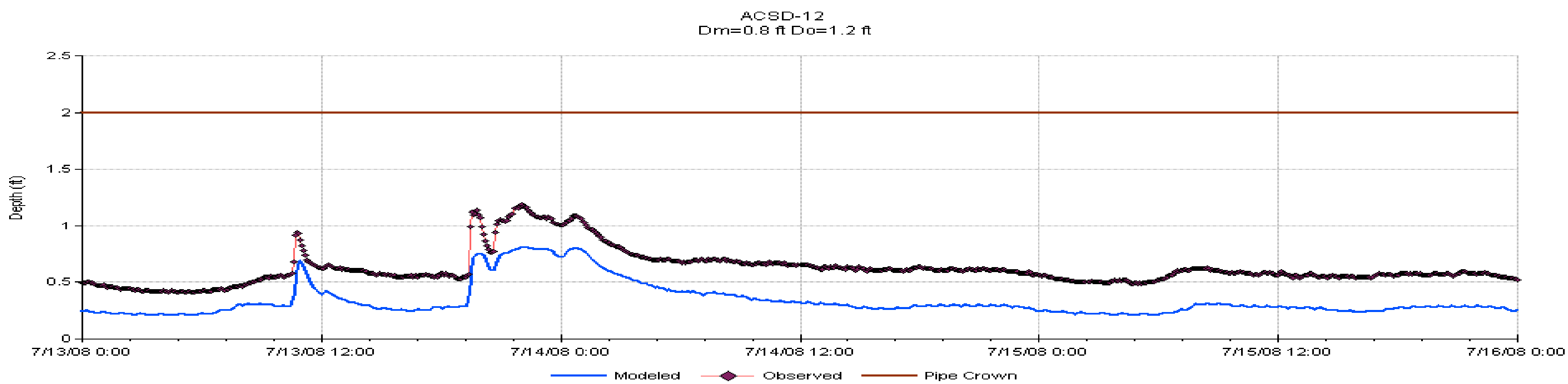


ACSD-11
Dm=0.4 ft Do=0.5 ft

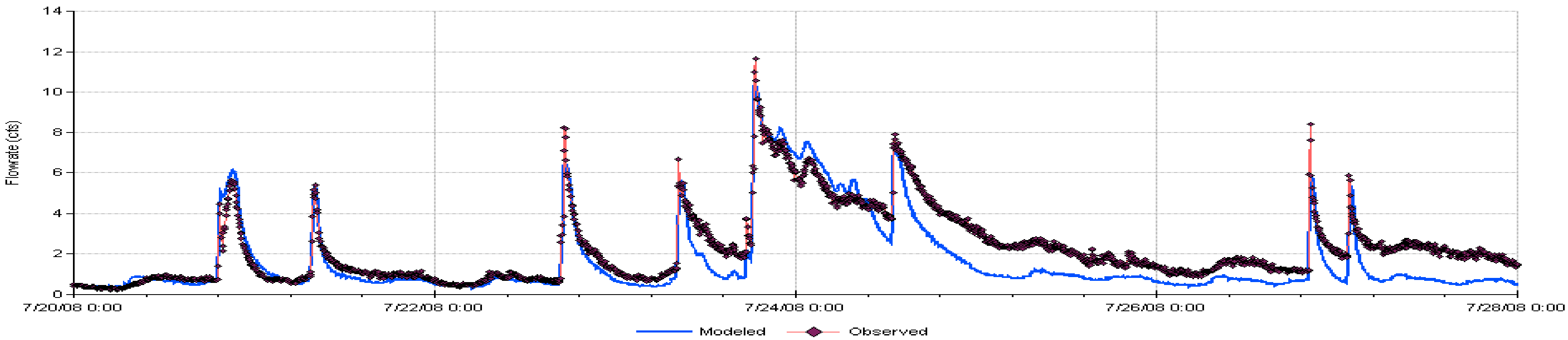



ACSD-12
Vm=2.43 MG Vo=2.31 MG; Qm=6.2 cfs Qo=5.9 cfs
Flowrate (cfs)
0
1
2
3
4
5
6
7
7/13/08 0:00
7/13/08 12:00
7/14/08 0:00
7/14/08 12:00
7/15/08 0:00
7/15/08 12:00
7/16/08 0:00
Modeled
Observed

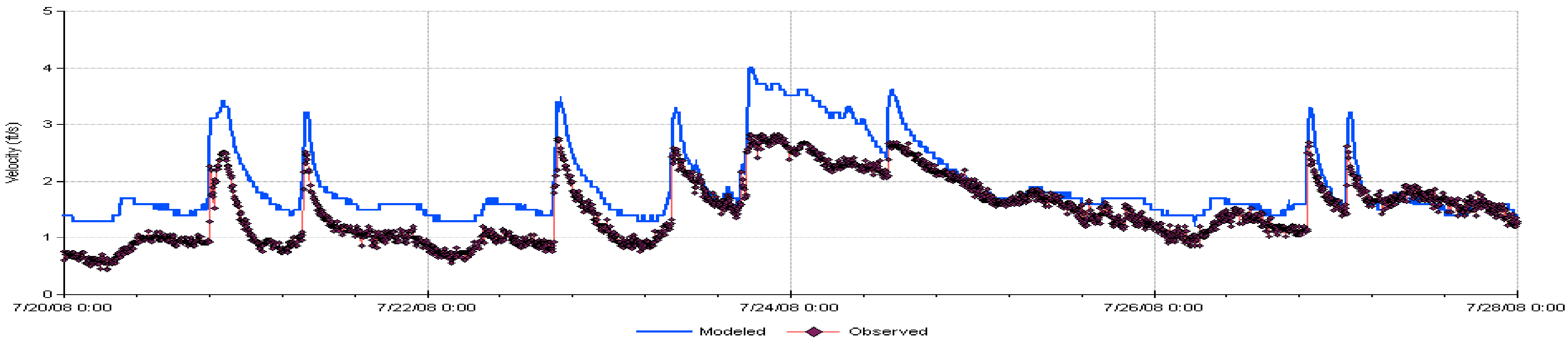

ACSD-12
Vm=3.4 ft/s Vo=2.6 ft/s
Velocity (ft/s)
0
0.5
1
1.5
2
2.5
3
3.5
4
7/13/08 0:00
7/13/08 12:00
7/14/08 0:00
7/14/08 12:00
7/15/08 0:00
7/15/08 12:00
7/16/08 0:00
Modeled
Observed


ACSD-12
Dm=0.8 ft Do=1.2 ft
Depth (ft)
0
0.5
1
1.5
2
2.5
7/13/08 0:00
7/13/08 12:00
7/14/08 0:00
7/14/08 12:00
7/15/08 0:00
7/15/08 12:00
7/16/08 0:00
Modeled
Observed
Pipe Crown

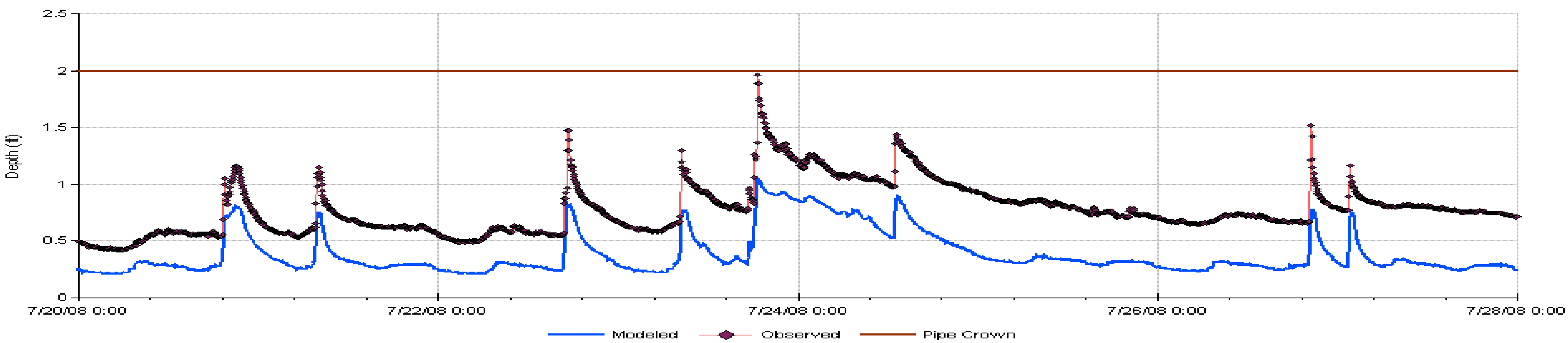
ACSD-12
Vm=8.67 MG Vo=11.63 MG; Qm=10.3 cfs Qo=11.7 cfs

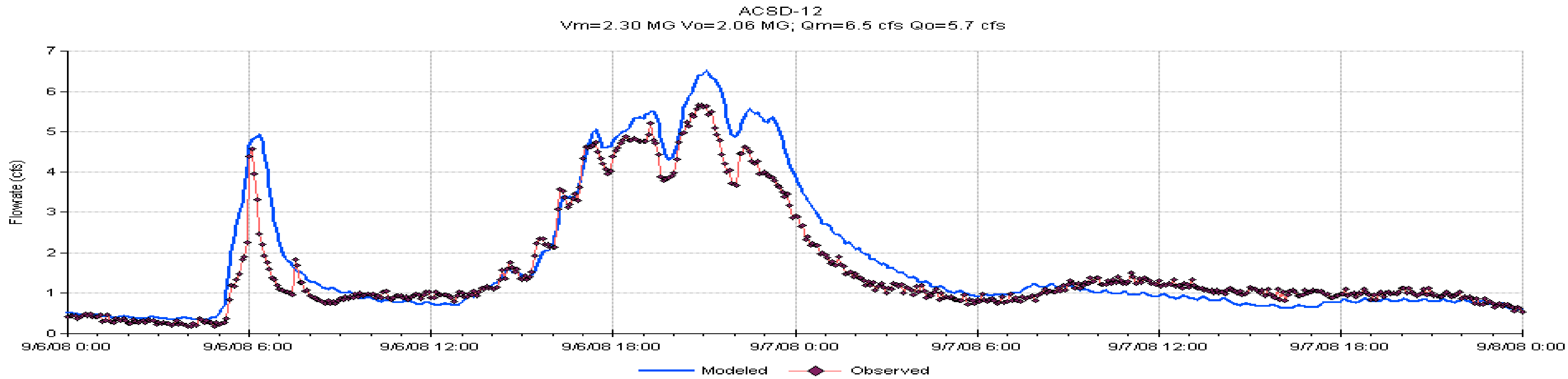


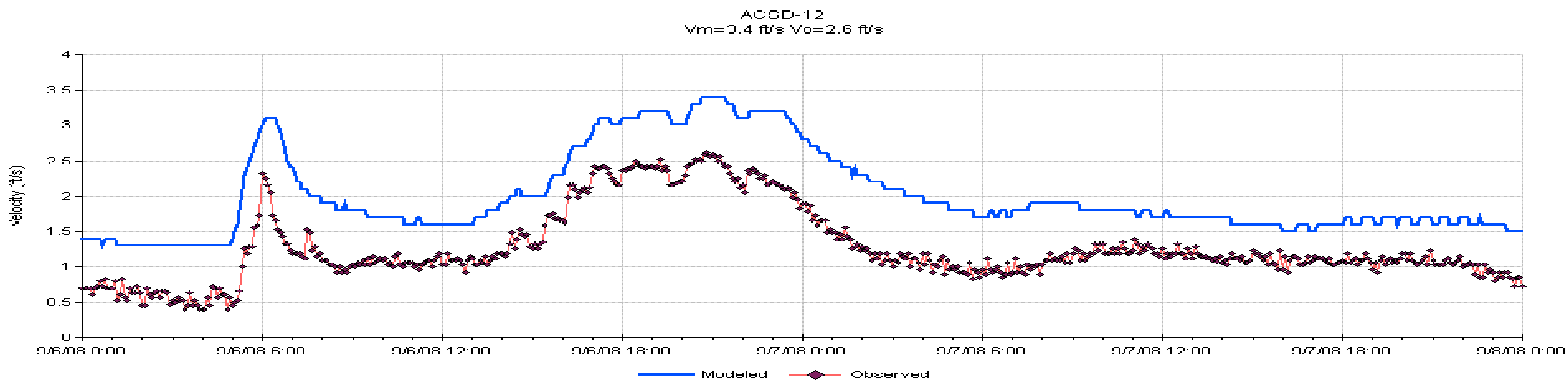
ACSD-12
Vm=4.0 ft/s Vo=2.8 ft/s

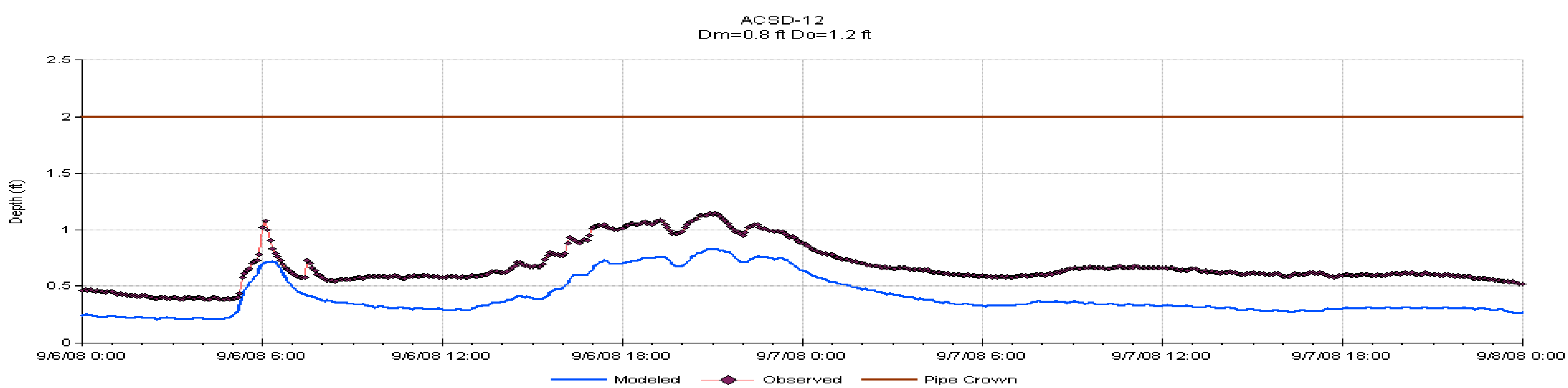


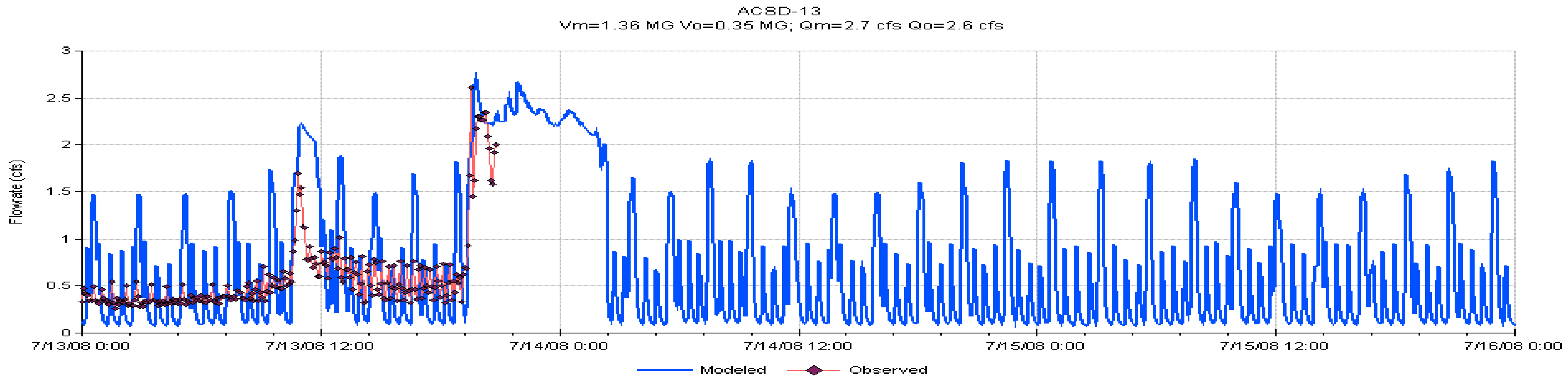
ACSD-12
Dm=1.1 ft Do=2.0 ft

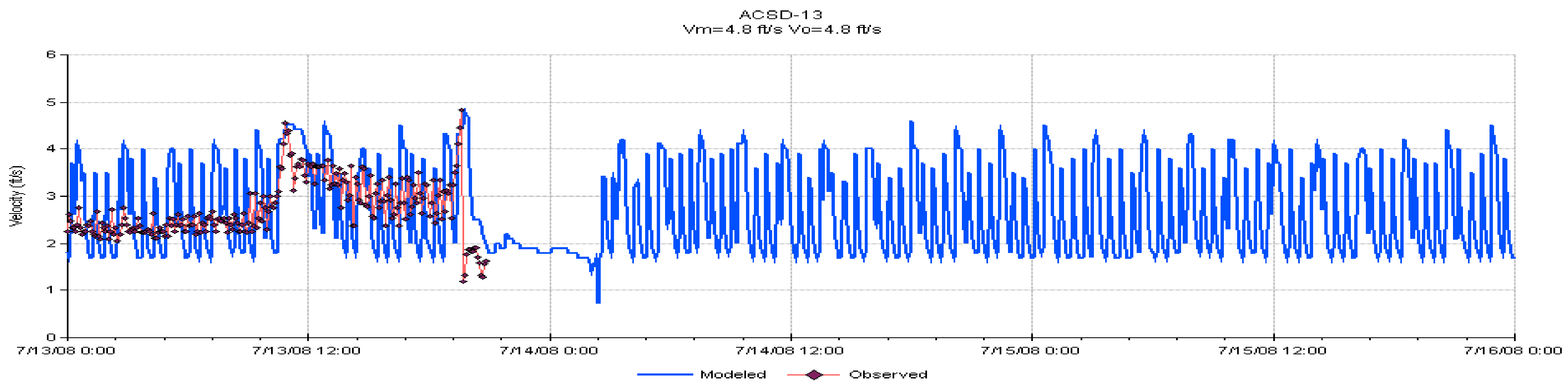


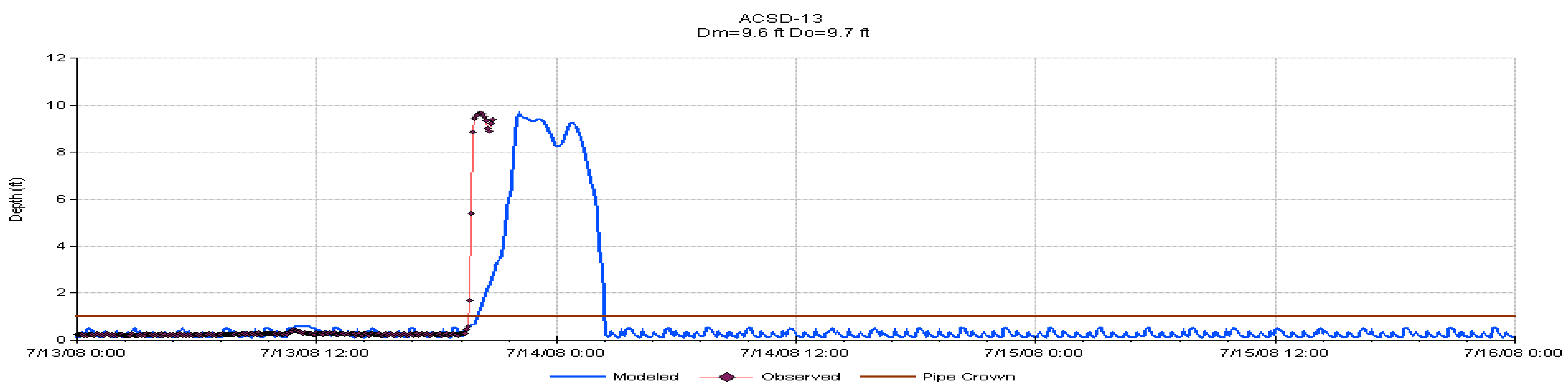

ACSD-12
Vm=2.30 MG Vo=2.06 MG; Qm=6.5 cfs Qo=5.7 cfs
Flowrate (cfs)
9/6/08 0:00
9/6/08 6:00
9/6/08 12:00
9/6/08 18:00
9/7/08 0:00
9/7/08 6:00
9/7/08 12:00
9/7/08 18:00
9/8/08 0:00
Modeled
Observed


ACSD-12
Vm=3.4 ft/s Vo=2.6 ft/s
Velocity (ft/s)
9/6/08 0:00
9/6/08 6:00
9/6/08 12:00
9/6/08 18:00
9/7/08 0:00
9/7/08 6:00
9/7/08 12:00
9/7/08 18:00
9/8/08 0:00
Modeled
Observed

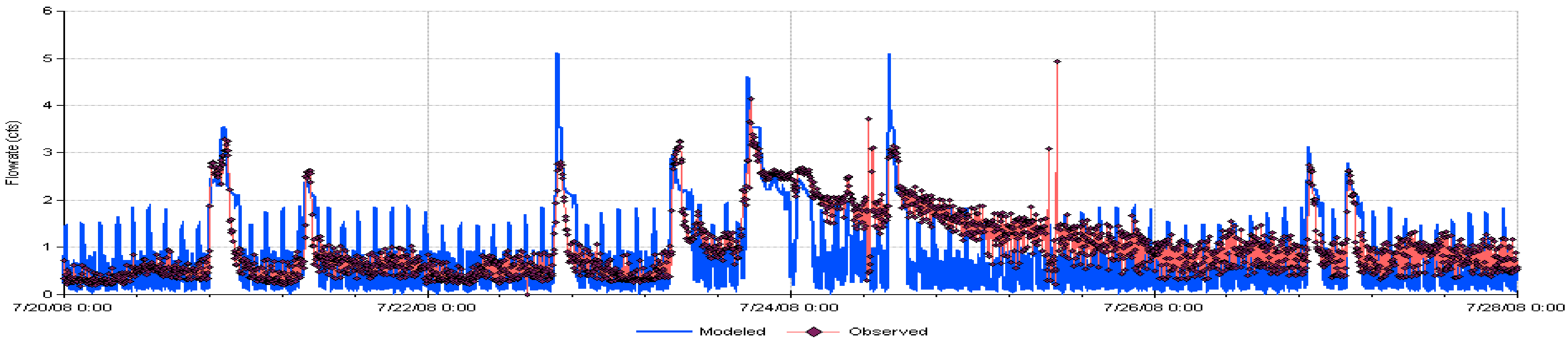

ACSD-12
Dm=0.8 ft Do=1.2 ft
Depth (ft)
9/6/08 0:00
9/6/08 6:00
9/6/08 12:00
9/6/08 18:00
9/7/08 0:00
9/7/08 6:00
9/7/08 12:00
9/7/08 18:00
9/8/08 0:00
Modeled
Observed
Pipe Crown


ACSD-13
Vm=1.36 MG Vo=0.35 MG; Qm=2.7 cfs Qo=2.6 cfs
Flowrate (cfs)
7/13/08 0:00
7/13/08 12:00
7/14/08 0:00
7/14/08 12:00
7/15/08 0:00
7/15/08 12:00
7/16/08 0:00
Modeled
Observed

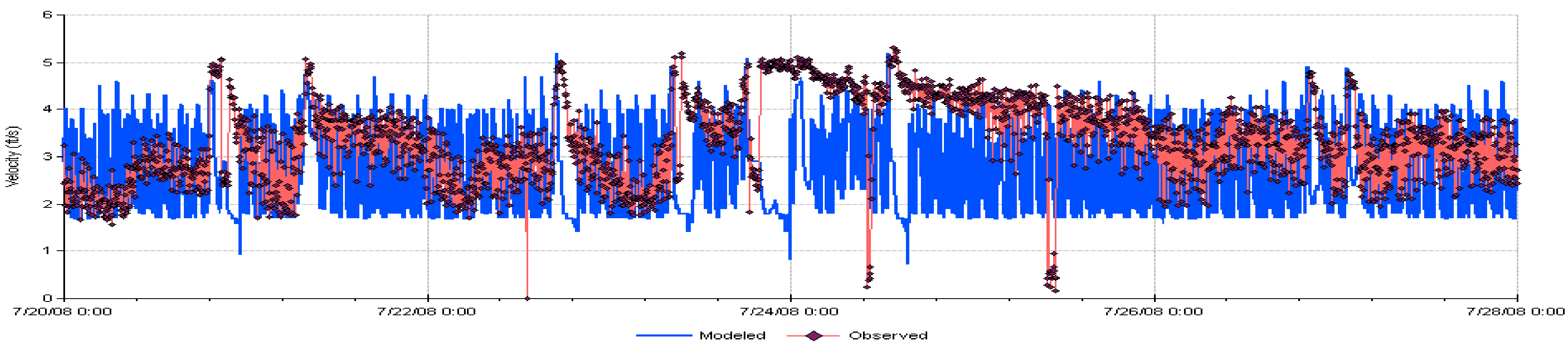

ACSD-13
Vm=4.8 ft/s Vo=4.8 ft/s
Velocity (ft/s)
7/13/08 0:00
7/13/08 12:00
7/14/08 0:00
7/14/08 12:00
7/15/08 0:00
7/15/08 12:00
7/16/08 0:00
Modeled
Observed


ACSD-13
Dm=9.6 ft Do=9.7 ft
Depth (ft)
7/13/08 0:00
7/13/08 12:00
7/14/08 0:00
7/14/08 12:00
7/15/08 0:00
7/15/08 12:00
7/16/08 0:00
Modeled
Observed
Pipe Crown

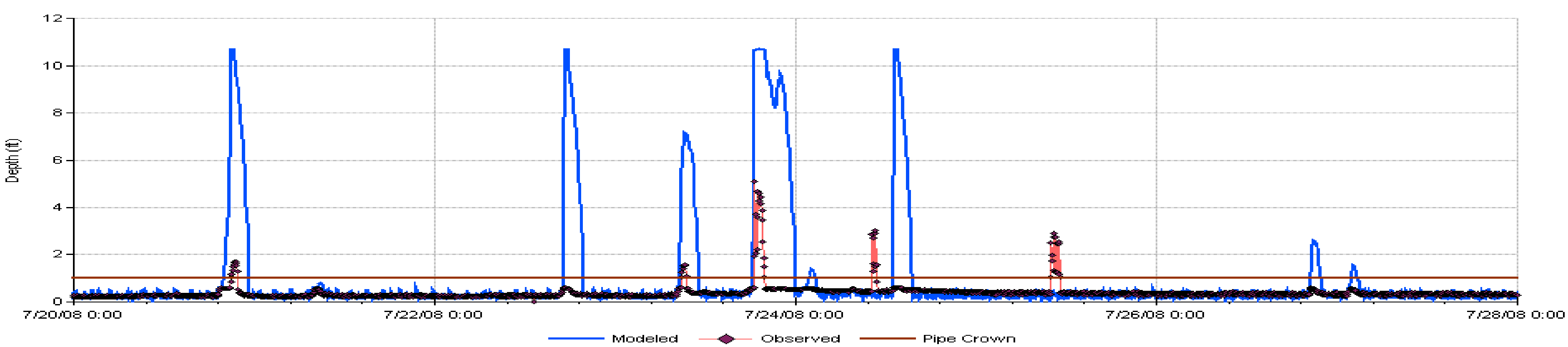
ACSD-13
Vm=4.06 MG Vo=5.39 MG; Qm=5.1 cfs Qo=4.9 cfs

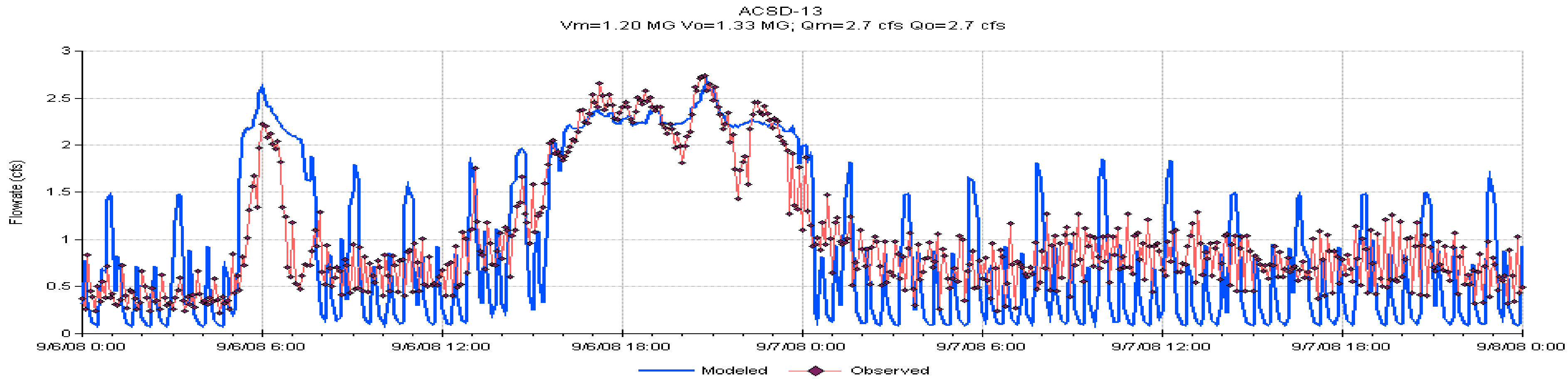


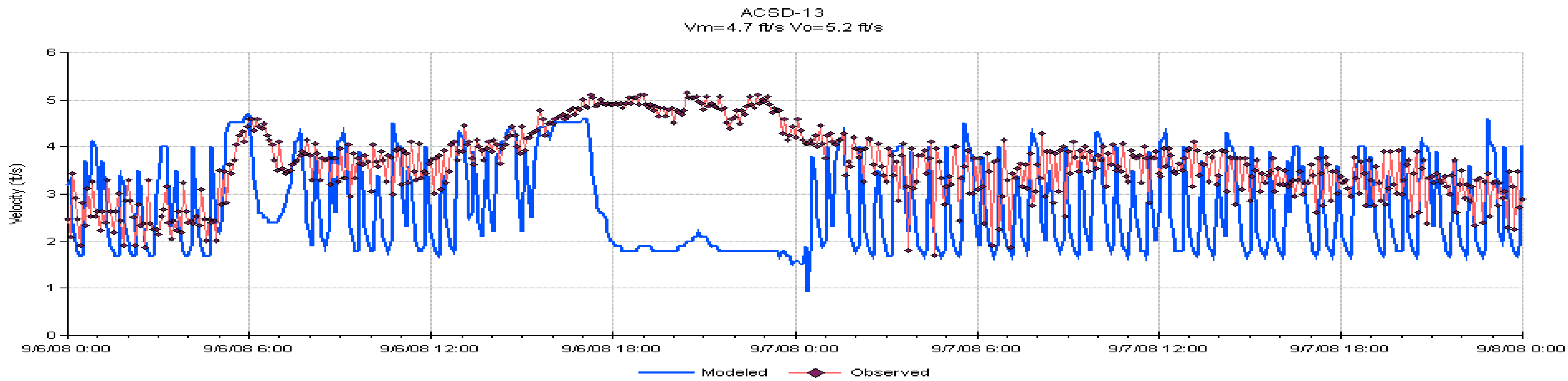
ACSD-13
Vm=5.2 ft/s Vo=5.3 ft/s

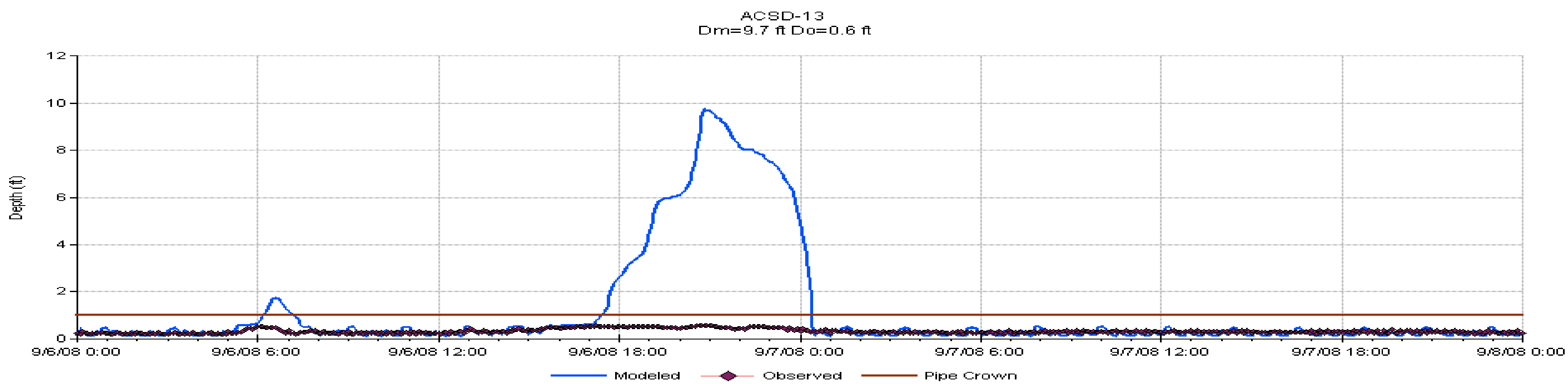


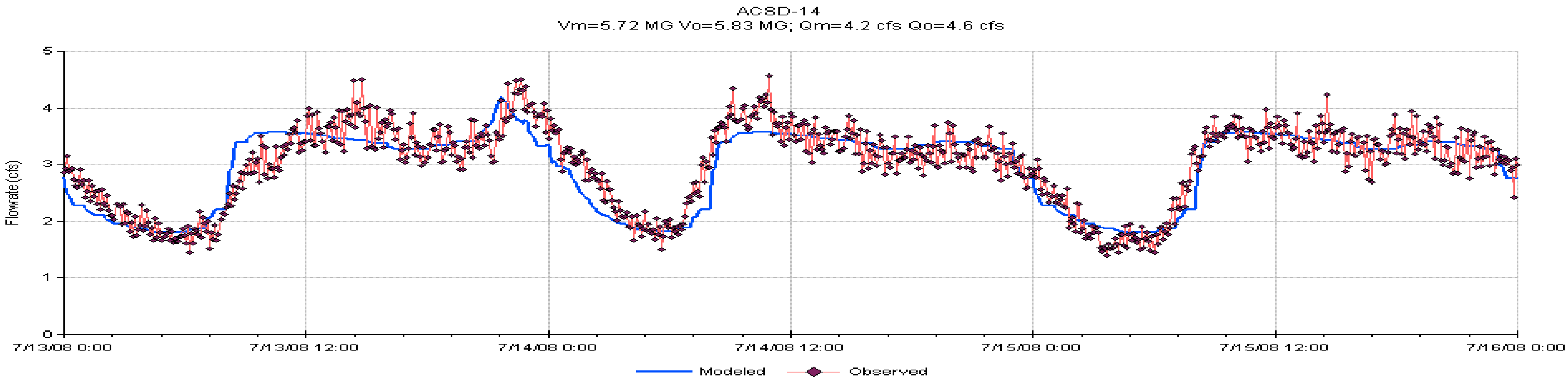
ACSD-13
Dm=10.7 ft Do=5.1 ft

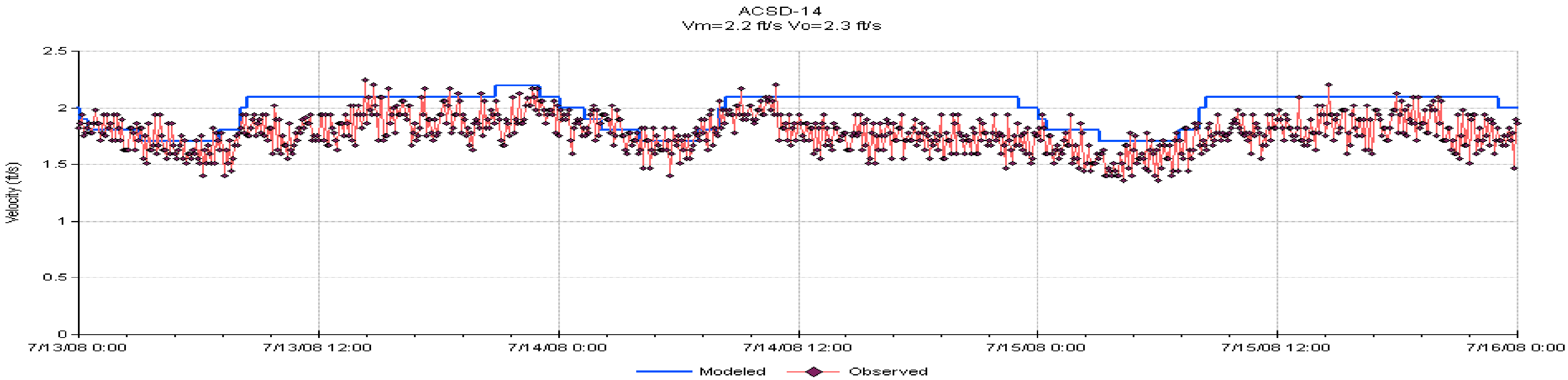


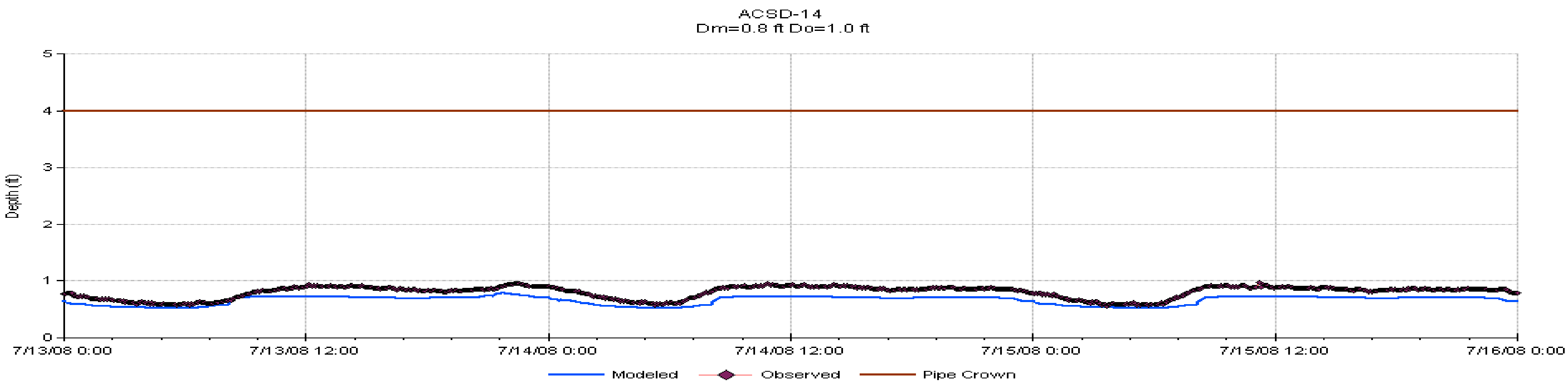

ACSD-13
Vm=1.20 MG Vo=1.33 MG; Qm=2.7 cfs Qo=2.7 cfs
Flowrate (cfs)
3
2.5
2
1.5
1
0.5
0
9/6/08 0:00
9/6/08 6:00
9/6/08 12:00
9/6/08 18:00
9/7/08 0:00
9/7/08 6:00
9/7/08 12:00
9/7/08 18:00
9/8/08 0:00
Modeled
Observed

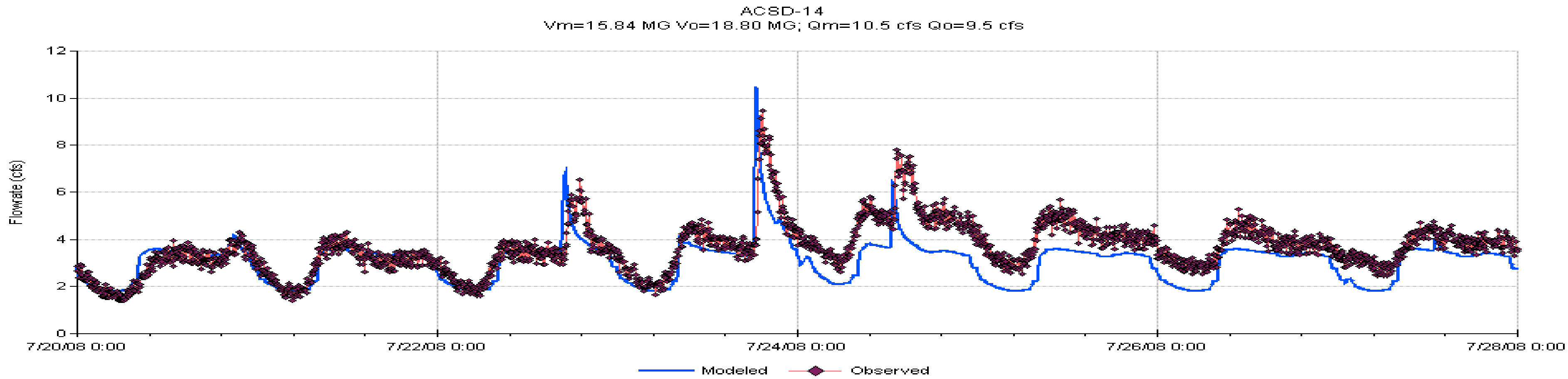

ACSD-13
Vm=4.7 ft/s Vo=5.2 ft/s
Velocity (ft/s)
6
5
4
3
2
1
0
9/6/08 0:00
9/6/08 6:00
9/6/08 12:00
9/6/08 18:00
9/7/08 0:00
9/7/08 6:00
9/7/08 12:00
9/7/08 18:00
9/8/08 0:00
Modeled
Observed

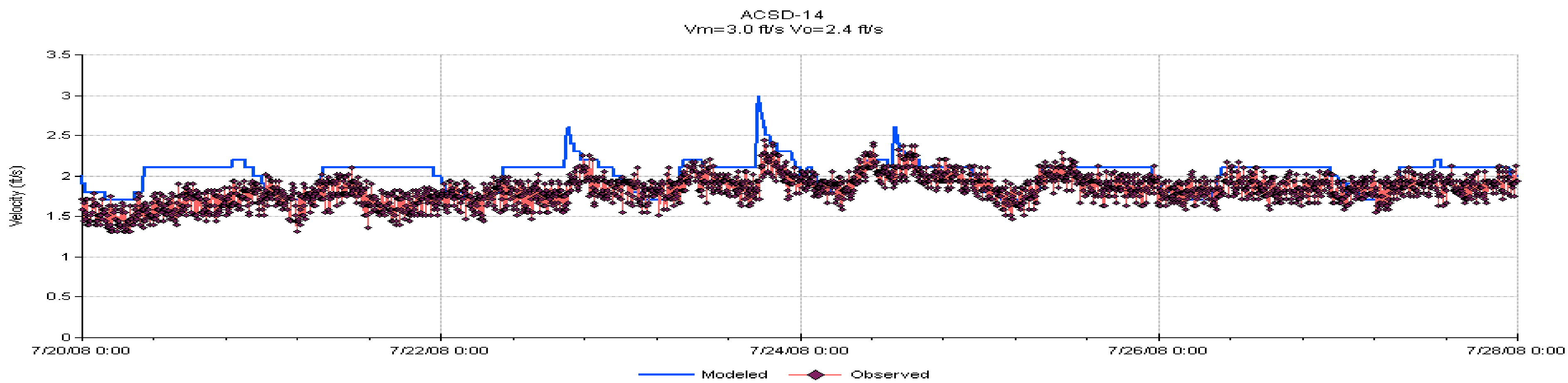

ACSD-13
Dm=9.7 ft Do=0.6 ft
Depth (ft)
12
10
8
6
4
2
0
9/6/08 0:00
9/6/08 6:00
9/6/08 12:00
9/6/08 18:00
9/7/08 0:00
9/7/08 6:00
9/7/08 12:00
9/7/08 18:00
9/8/08 0:00
Modeled
Observed
Pipe Crown

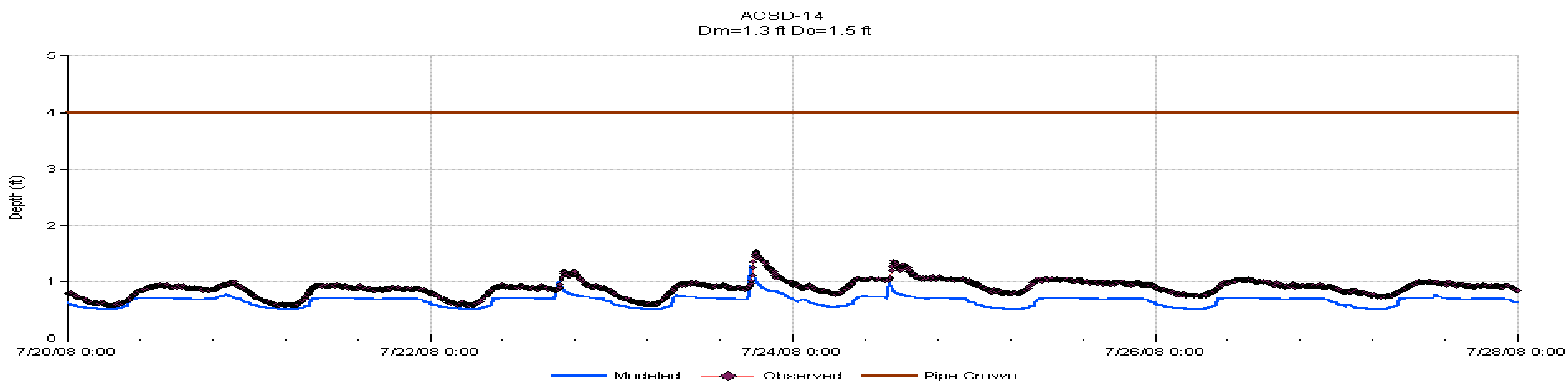

ACSD-14
Vm=5.72 MG Vo=5.83 MG; Qm=4.2 cfs Qo=4.6 cfs
Flowrate (cfs)
0
1
2
3
4
5
7/13/08 0:00
7/13/08 12:00
7/14/08 0:00
7/14/08 12:00
7/15/08 0:00
7/15/08 12:00
7/16/08 0:00
Modeled
Observed

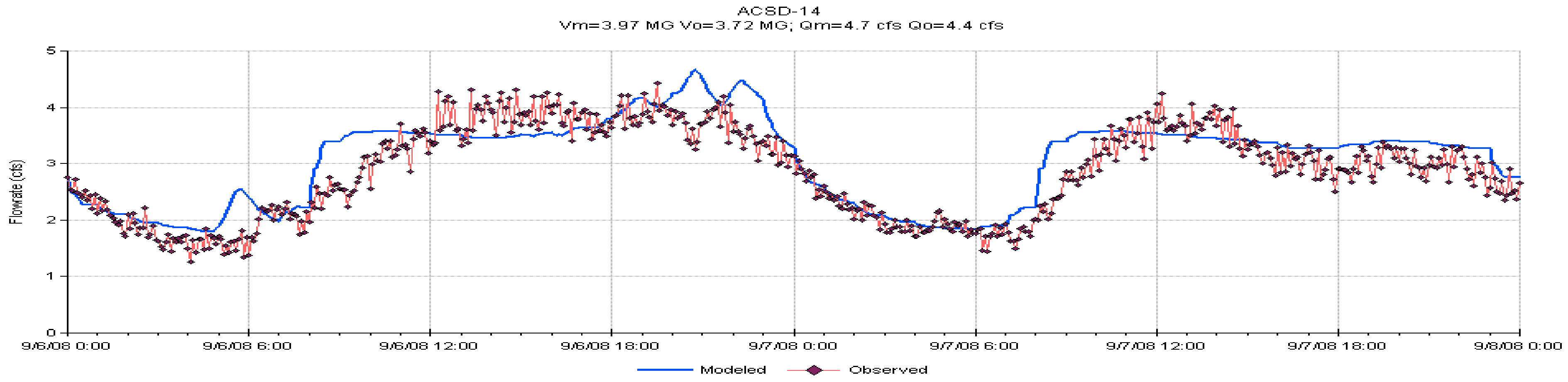

ACSD-14
Vm=2.2 ft/s Vo=2.3 ft/s
Velocity (ft/s)
0
0.5
1
1.5
2
2.5
7/13/08 0:00
7/13/08 12:00
7/14/08 0:00
7/14/08 12:00
7/15/08 0:00
7/15/08 12:00
7/16/08 0:00
Modeled
Observed

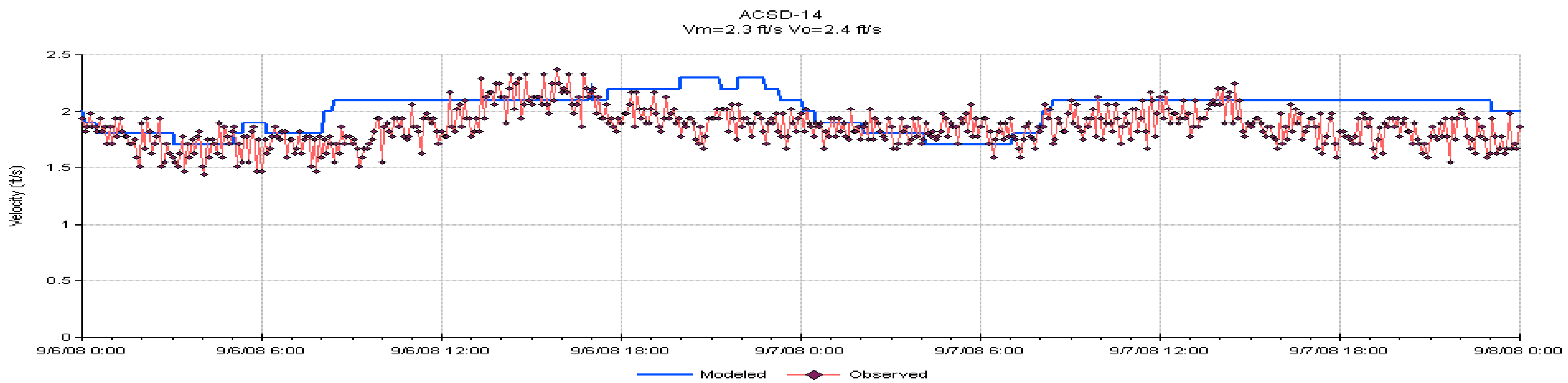

ACSD-14
Dm=0.8 ft Do=1.0 ft
Depth (ft)
0
1
2
3
4
5
7/13/08 0:00
7/13/08 12:00
7/14/08 0:00
7/14/08 12:00
7/15/08 0:00
7/15/08 12:00
7/16/08 0:00
Modeled
Observed
Pipe Crown

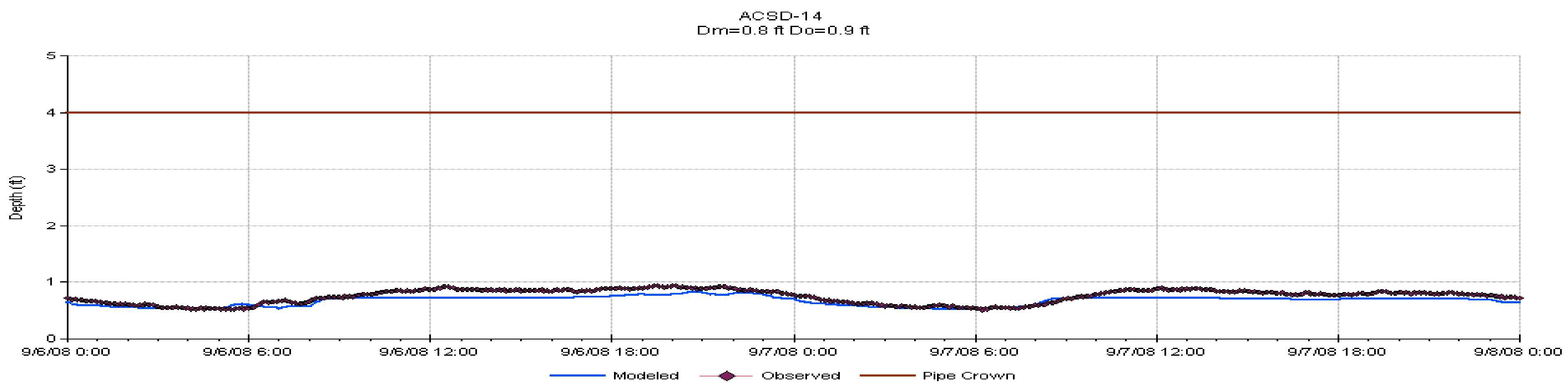

ACSD-14
Vm=15.84 MG Vo=18.80 MG; Qm=10.5 cfs Qo=9.5 cfs
Flowrate (cfs)
0
2
4
6
8
10
12
7/20/08 0:00
7/22/08 0:00
7/24/08 0:00
7/26/08 0:00
7/28/08 0:00
Modeled
Observed


ACSD-14
Vm=3.0 ft/s Vo=2.4 ft/s
Velocity (ft/s)
0
0.5
1
1.5
2
2.5
3
3.5
7/20/08 0:00
7/22/08 0:00
7/24/08 0:00
7/26/08 0:00
7/28/08 0:00
Modeled
Observed


ACSD-14
Dm=1.3 ft Do=1.5 ft
Depth (ft)
0
1
2
3
4
5
7/20/08 0:00
7/22/08 0:00
7/24/08 0:00
7/26/08 0:00
7/28/08 0:00
Modeled
Observed
Pipe Crown

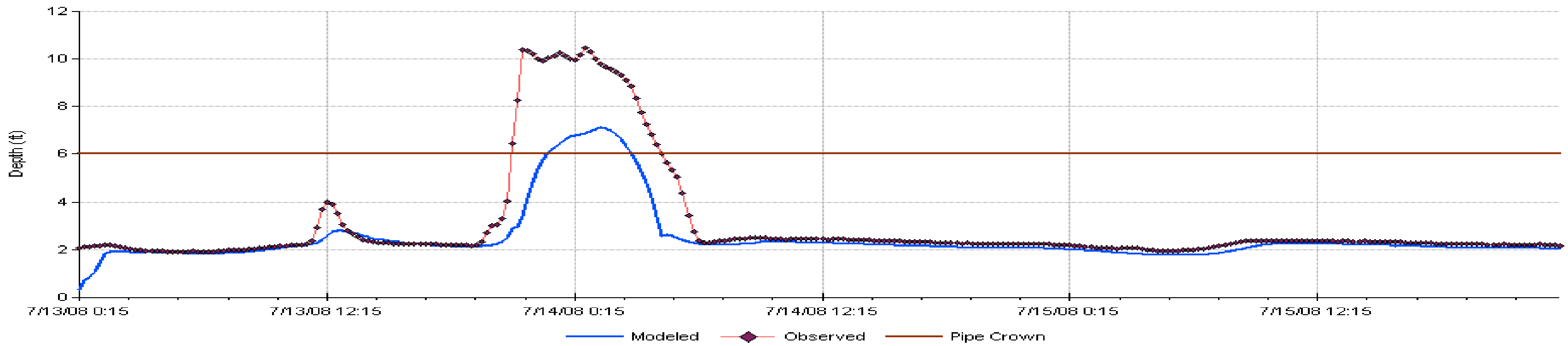

ACSD-14
Vm=3.97 MG Vo=3.72 MG; Qm=4.7 cfs Qo=4.4 cfs
Flowrate (cfs)
9/6/08 0:00
9/6/08 6:00
9/6/08 12:00
9/6/08 18:00
9/7/08 0:00
9/7/08 6:00
9/7/08 12:00
9/7/08 18:00
9/8/08 0:00
Modeled
Observed


ACSD-14
Vm=2.3 ft/s Vo=2.4 ft/s
Velocity (ft/s)
9/6/08 0:00
9/6/08 6:00
9/6/08 12:00
9/6/08 18:00
9/7/08 0:00
9/7/08 6:00
9/7/08 12:00
9/7/08 18:00
9/8/08 0:00
Modeled
Observed

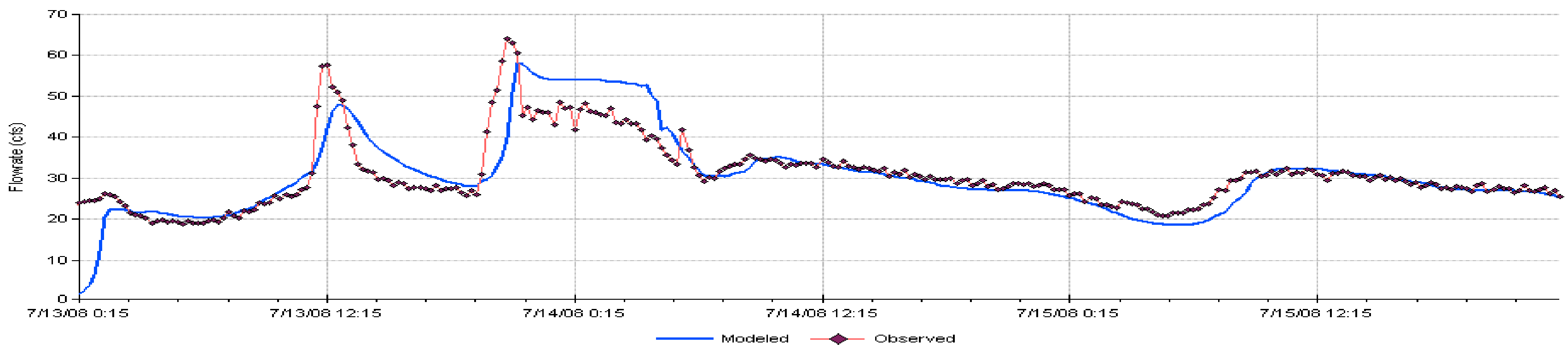

ACSD-14
Dm=0.8 ft Do=0.9 ft
Depth (ft)
9/6/08 0:00
9/6/08 6:00
9/6/08 12:00
9/6/08 18:00
9/7/08 0:00
9/7/08 6:00
9/7/08 12:00
9/7/08 18:00
9/8/08 0:00
Modeled
Observed
Pipe Crown

Appendix D. Albany South principal storm calibration

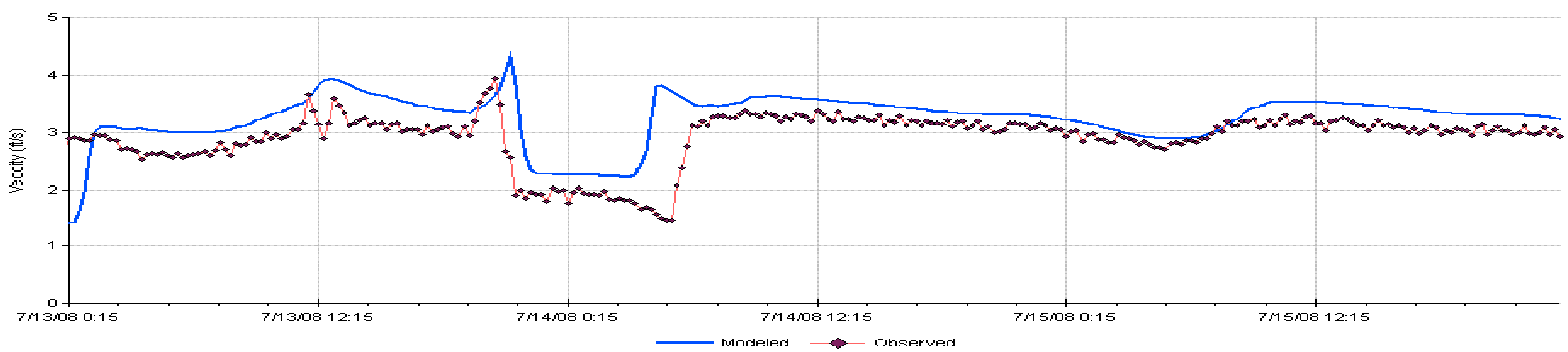
Jul13, 0.8 in
S-01 - At WWTP
Dm=7.1 ft Do=10.5 ft

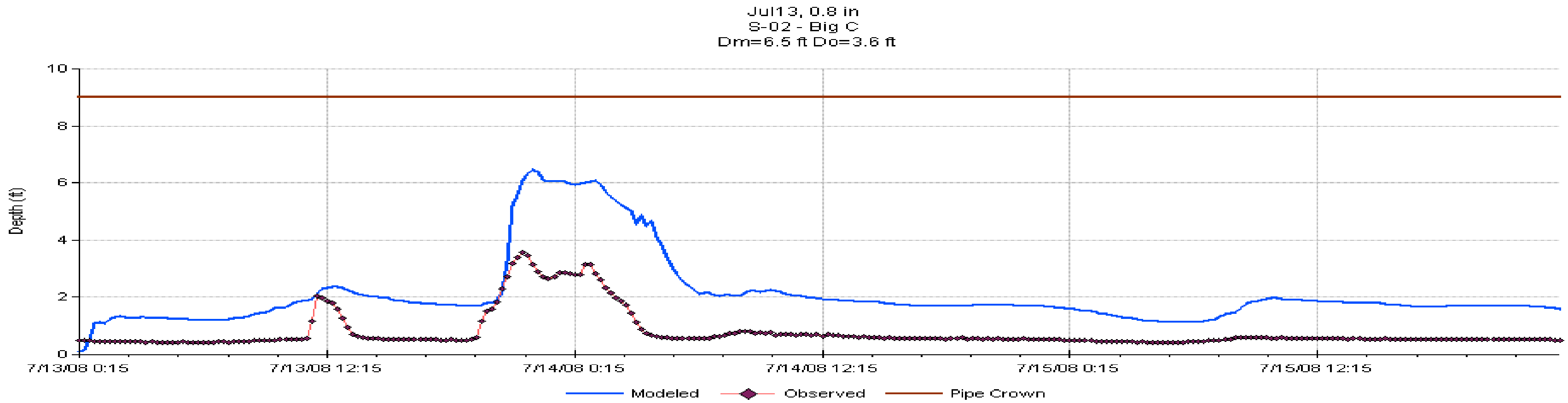


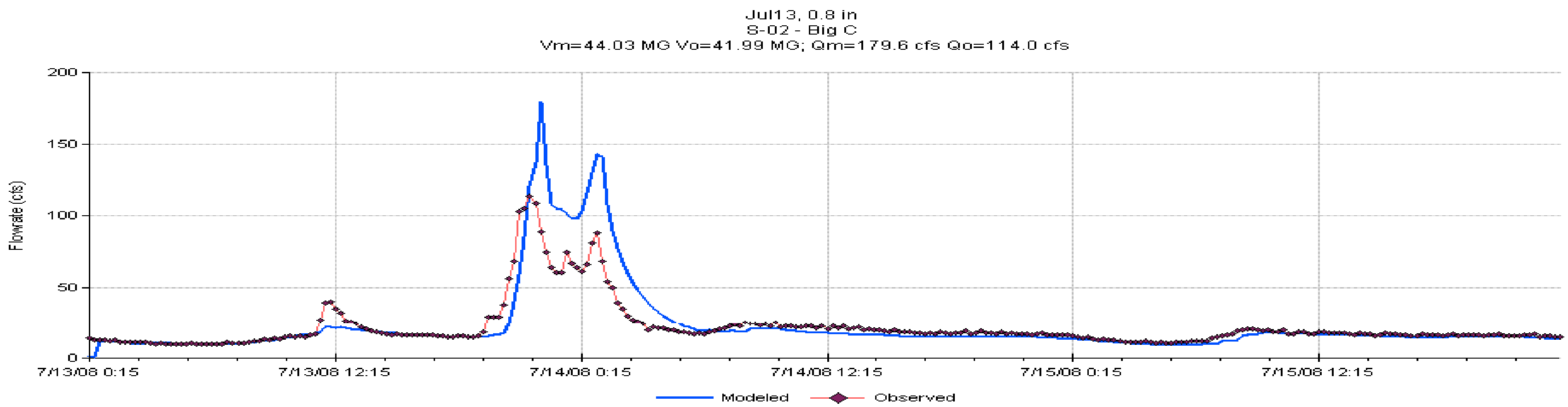
Jul13, 0.8 in
S-01 - At WWTP
Vm=59.48 MG Vo=59.80 MG; Qm=58.0 cfs Qo=64.0 cfs

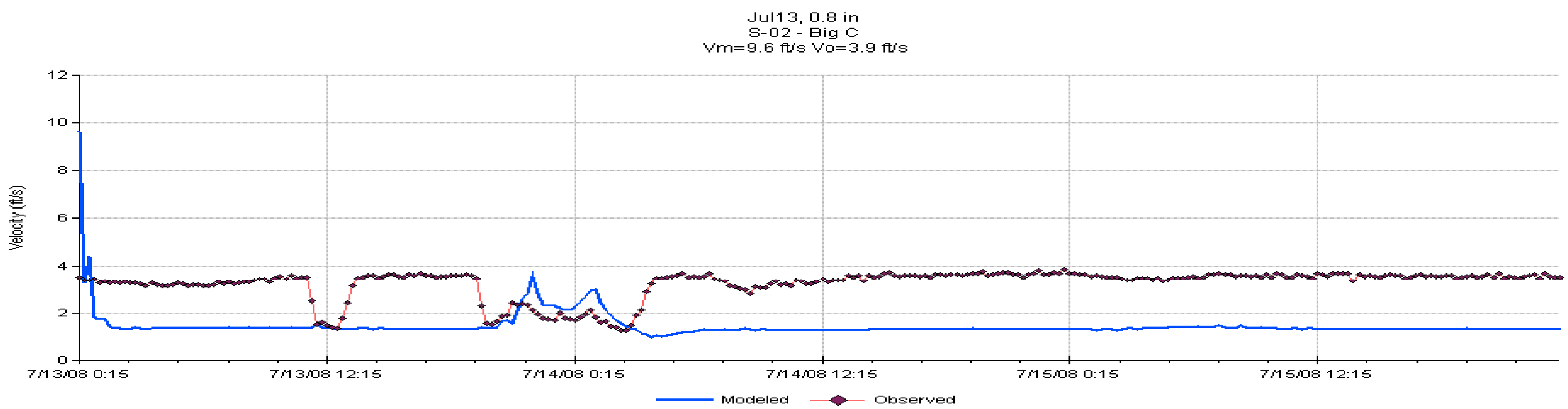


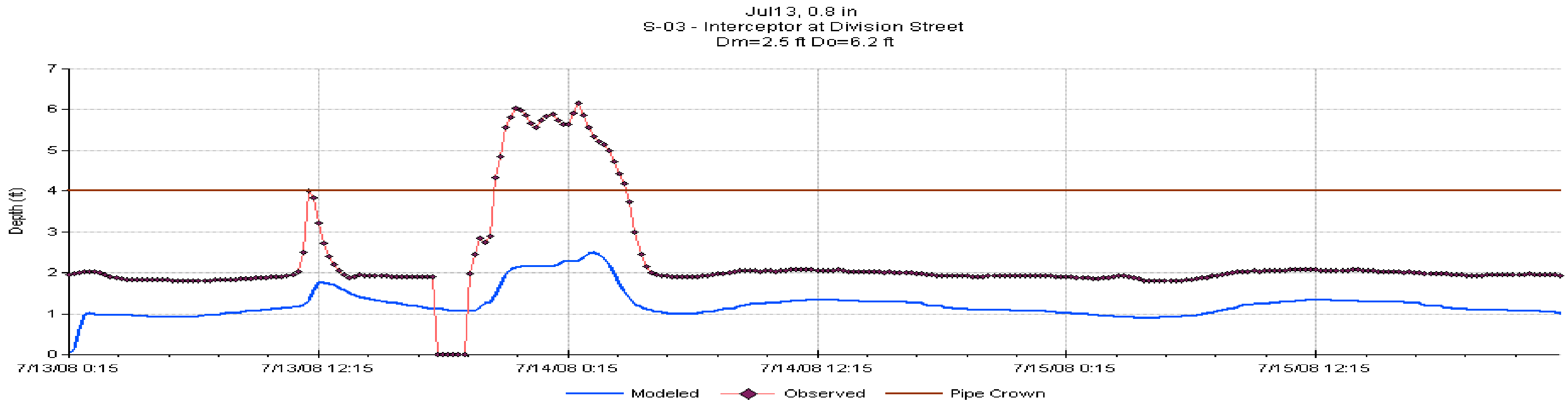
Jul13, 0.8 in
S-01 - At WWTP
Vm=4.3 ft/s Vo=3.9 ft/s

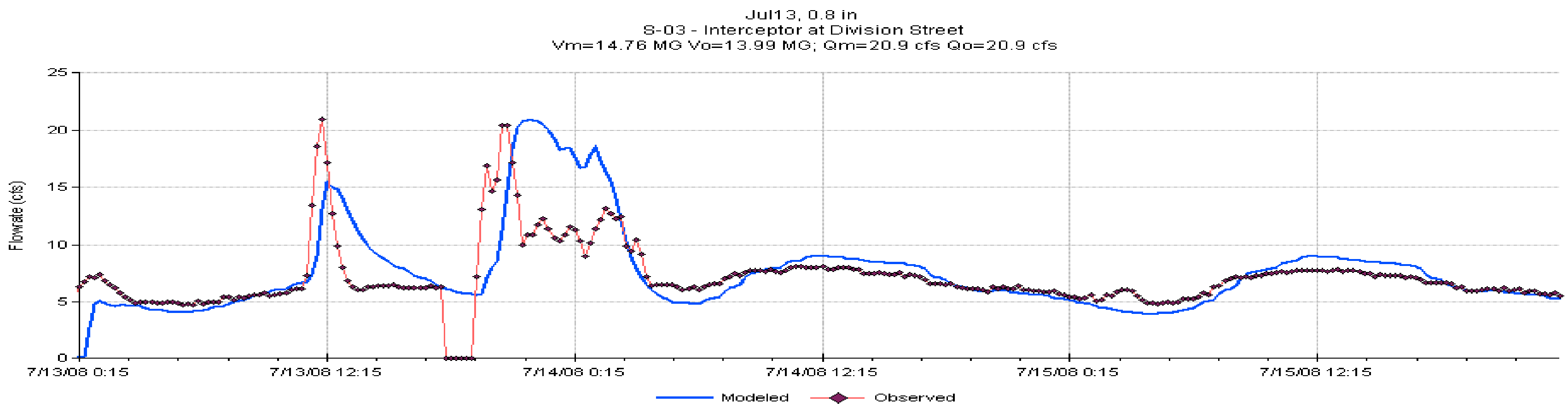


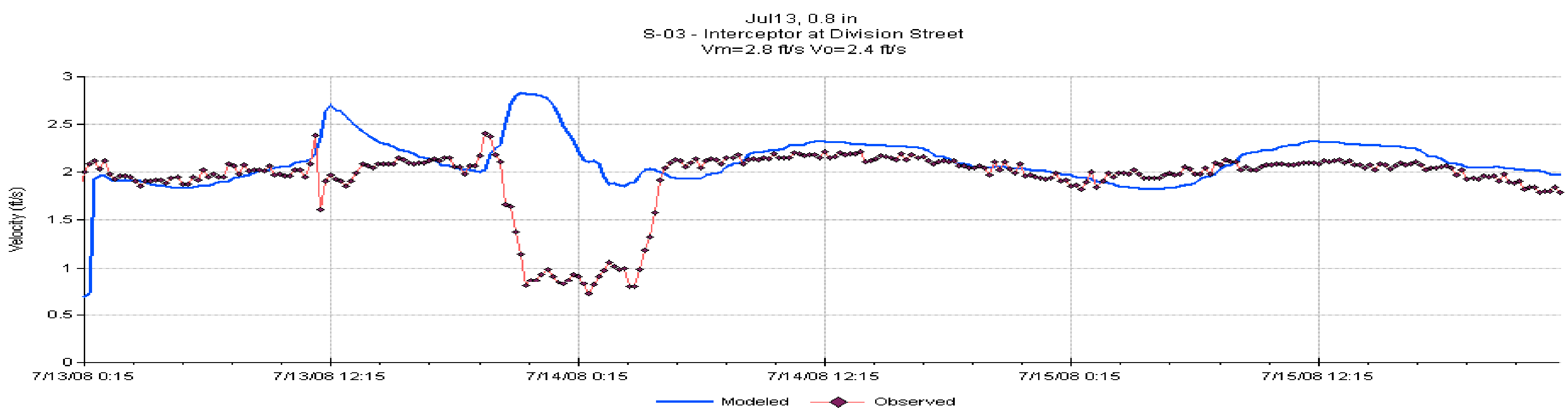

Jul13, 0.8 in
S-02 - Big C
Dm=6.5 ft Do=3.6 ft
Depth (ft)
0
2
4
6
8
10
7/13/08 0:15
7/13/08 12:15
7/14/08 0:15
7/14/08 12:15
7/15/08 0:15
7/15/08 12:15
Modeled
Observed
Pipe Crown

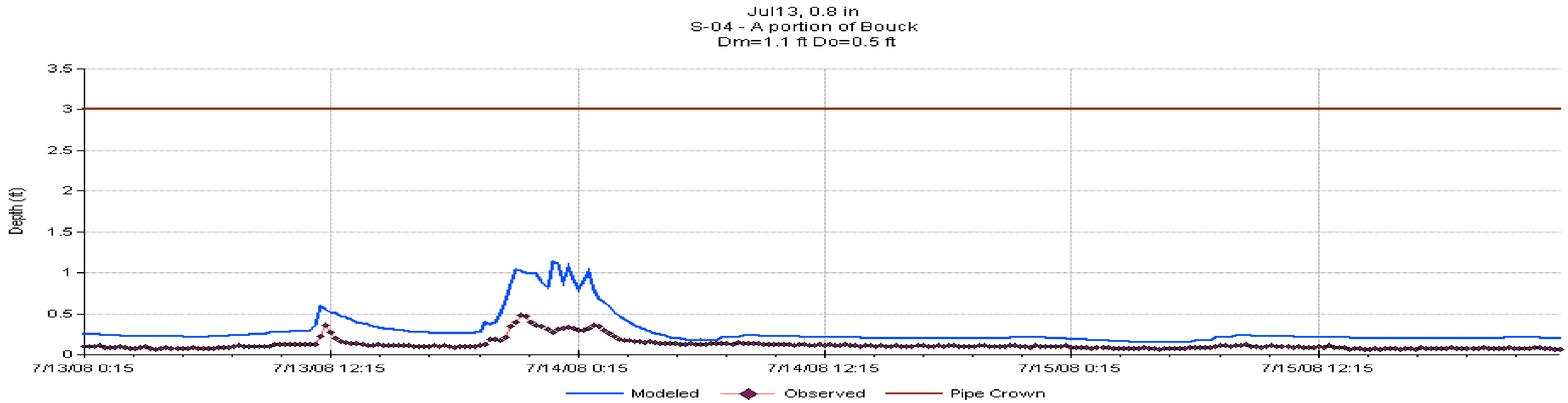

Jul13, 0.8 in
S-02 - Big C
Vm=44.03 MG Vo=41.99 MG; Qm=179.6 cfs Qo=114.0 cfs
Flowrate (cfs)
0
50
100
150
200
7/13/08 0:15
7/13/08 12:15
7/14/08 0:15
7/14/08 12:15
7/15/08 0:15
7/15/08 12:15
Modeled
Observed

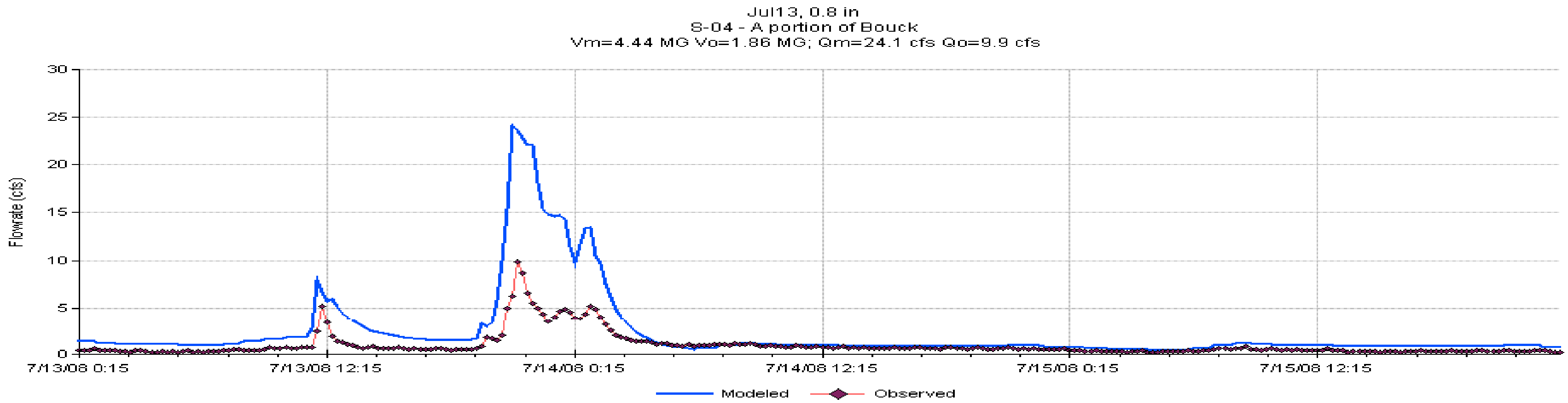

Jul13, 0.8 in
S-02 - Big C
Vm=9.6 ft/s Vo=3.9 ft/s
Velocity (ft/s)
0
2
4
6
8
10
12
7/13/08 0:15
7/13/08 12:15
7/14/08 0:15
7/14/08 12:15
7/15/08 0:15
7/15/08 12:15
Modeled
Observed

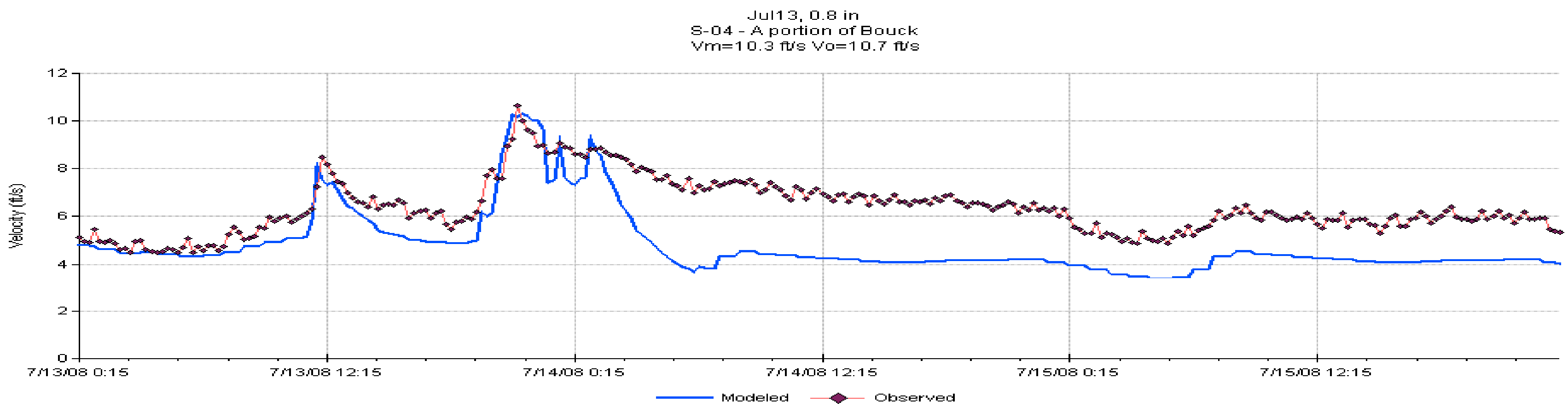

Jul13, 0.8 in
S-03 - Interceptor at Division Street
Dm=2.5 ft Do=6.2 ft
Depth (ft)
7/13/08 0:15
7/13/08 12:15
7/14/08 0:15
7/14/08 12:15
7/15/08 0:15
7/15/08 12:15
Modeled
Observed
Pipe Crown

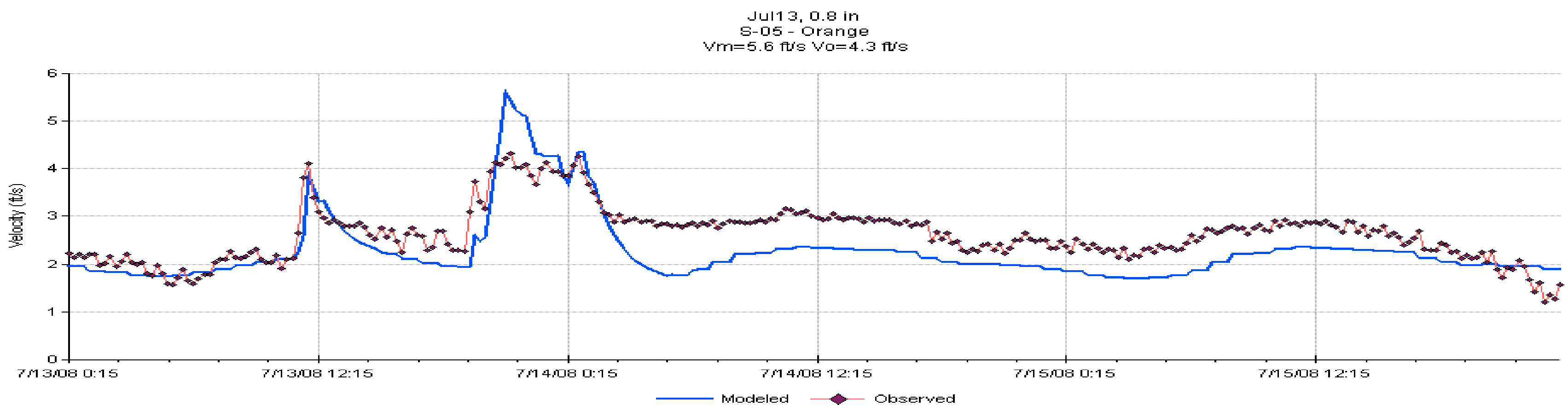

Jul13, 0.8 in
S-03 - Interceptor at Division Street
Vm=14.76 MG Vo=13.99 MG; Qm=20.9 cfs Qo=20.9 cfs
Flowrate (cfs)
7/13/08 0:15
7/13/08 12:15
7/14/08 0:15
7/14/08 12:15
7/15/08 0:15
7/15/08 12:15
Modeled
Observed


Jul13, 0.8 in
S-03 - Interceptor at Division Street
Vm=2.8 ft/s Vo=2.4 ft/s
Velocity (ft/s)
7/13/08 0:15
7/13/08 12:15
7/14/08 0:15
7/14/08 12:15
7/15/08 0:15
7/15/08 12:15
Modeled
Observed

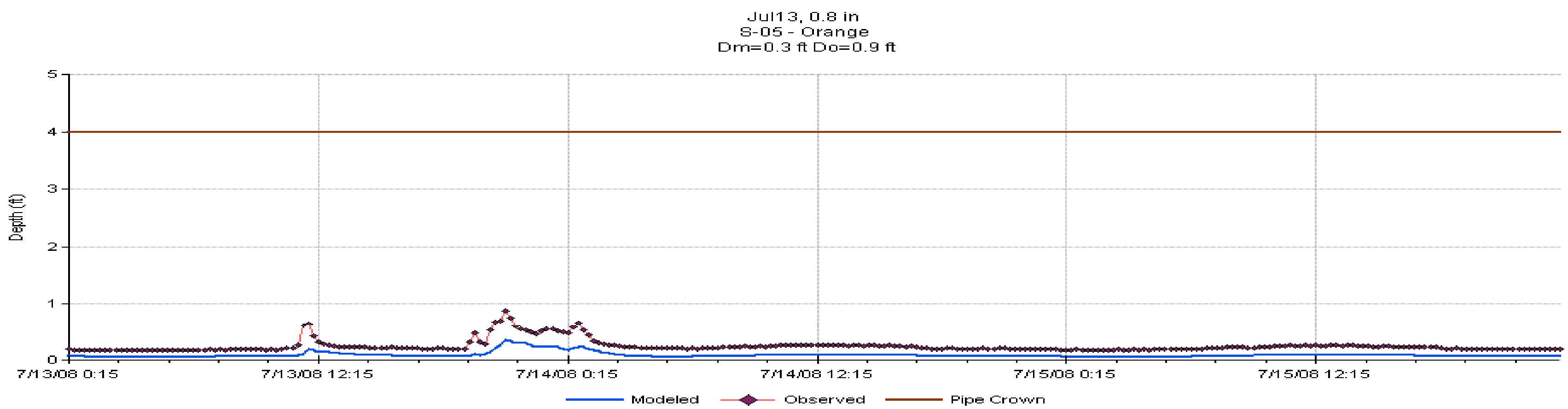

Jul13, 0.8 in
S-04 - A portion of Bouck
Dm=1.1 ft Do=0.5 ft
Depth (ft)
3.5
3
2.5
2
1.5
1
0.5
0
7/13/08 0:15
7/13/08 12:15
7/14/08 0:15
7/14/08 12:15
7/15/08 0:15
7/15/08 12:15
Modeled
Observed
Pipe Crown


Jul13, 0.8 in
S-04 - A portion of Bouck
Vm=4.44 MG Vo=1.86 MG; Qm=24.1 cfs Qo=9.9 cfs
Flowrate (cfs)
30
25
20
15
10
5
0
7/13/08 0:15
7/13/08 12:15
7/14/08 0:15
7/14/08 12:15
7/15/08 0:15
7/15/08 12:15
Modeled
Observed

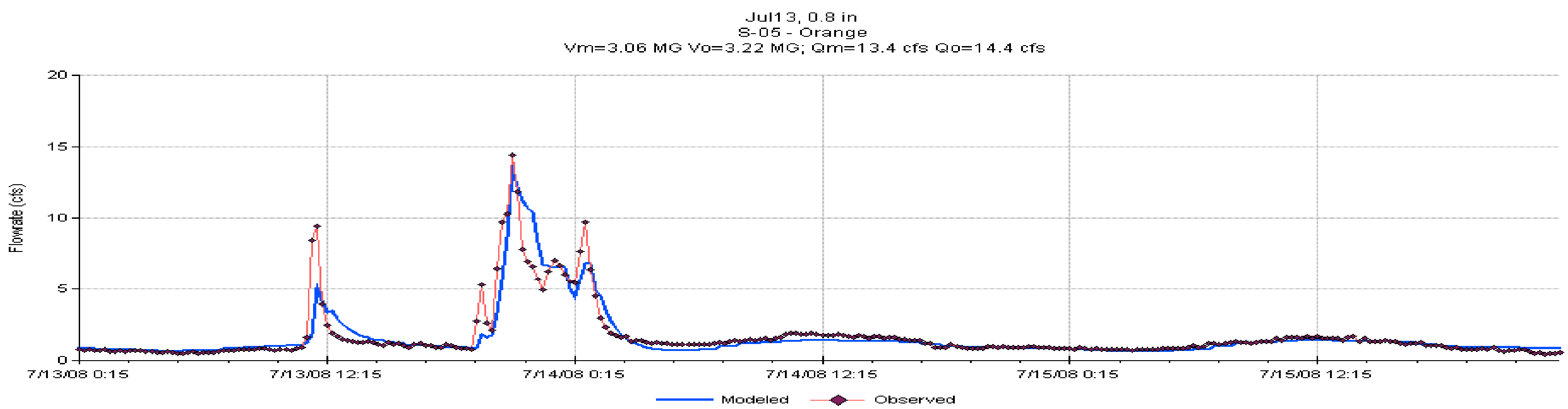

Jul13, 0.8 in
S-04 - A portion of Bouck
Vm=10.3 ft/s Vo=10.7 ft/s
Velocity (ft/s)
12
10
8
6
4
2
0
7/13/08 0:15
7/13/08 12:15
7/14/08 0:15
7/14/08 12:15
7/15/08 0:15
7/15/08 12:15
Modeled
Observed



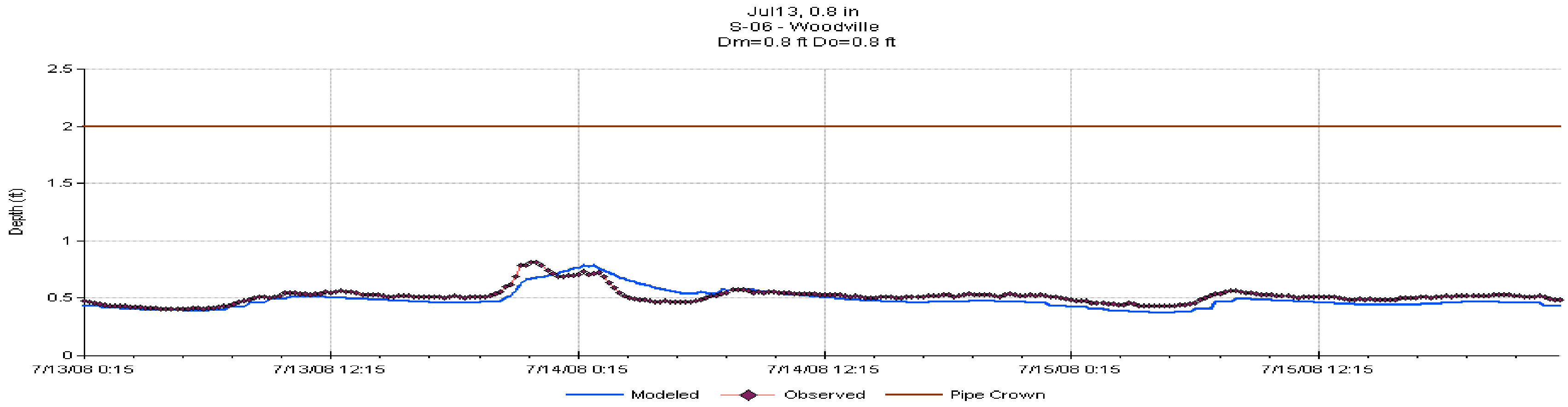
Jul13, 0.8 in
S-05 - Orange
Vm=5.6 ft/s Vo=4.3 ft/s
Velocity (ft/s)
0
1
2
3
4
5
6
7/13/08 0:15
7/13/08 12:15
7/14/08 0:15
7/14/08 12:15
7/15/08 0:15
7/15/08 12:15
Modeled
Observed

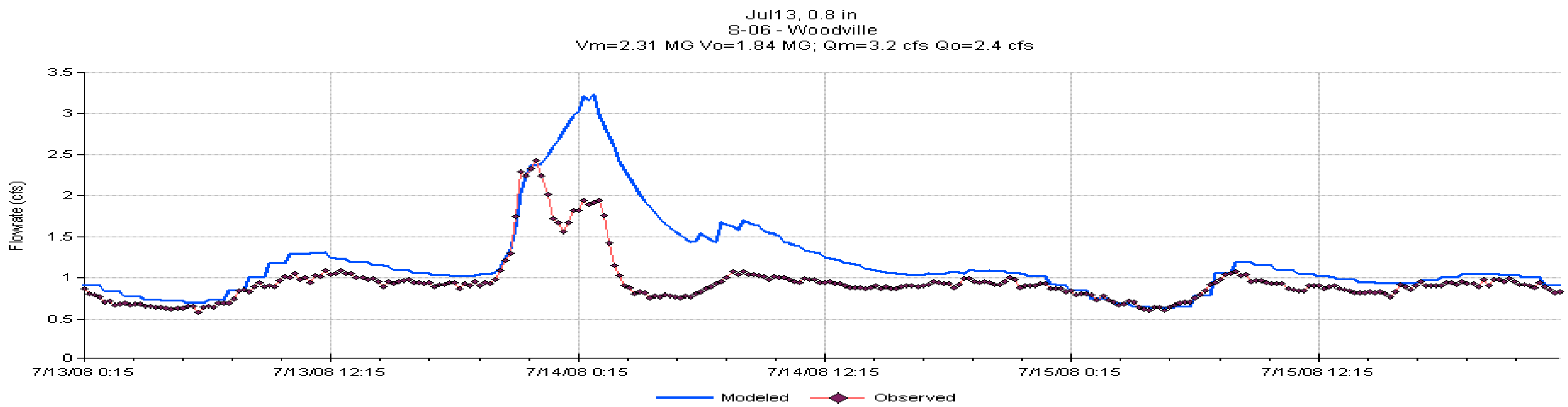


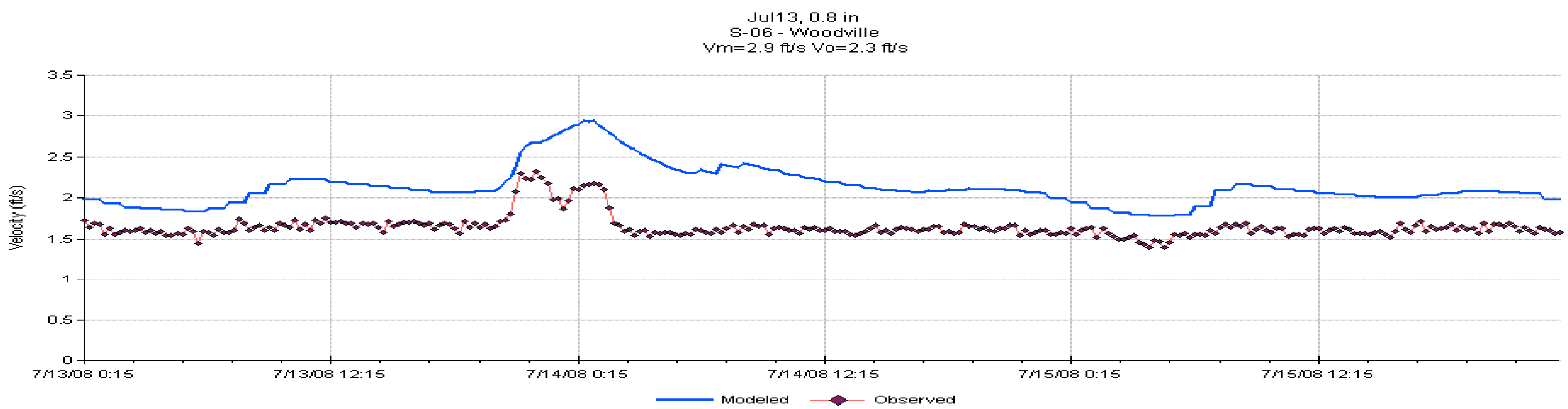
Jul13, 0.8 in
S-05 - Orange
Dm=0.3 ft Do=0.9 ft
Depth (ft)
0
1
2
3
4
5
7/13/08 0:15
7/13/08 12:15
7/14/08 0:15
7/14/08 12:15
7/15/08 0:15
7/15/08 12:15
Modeled
Observed
Pipe Crown

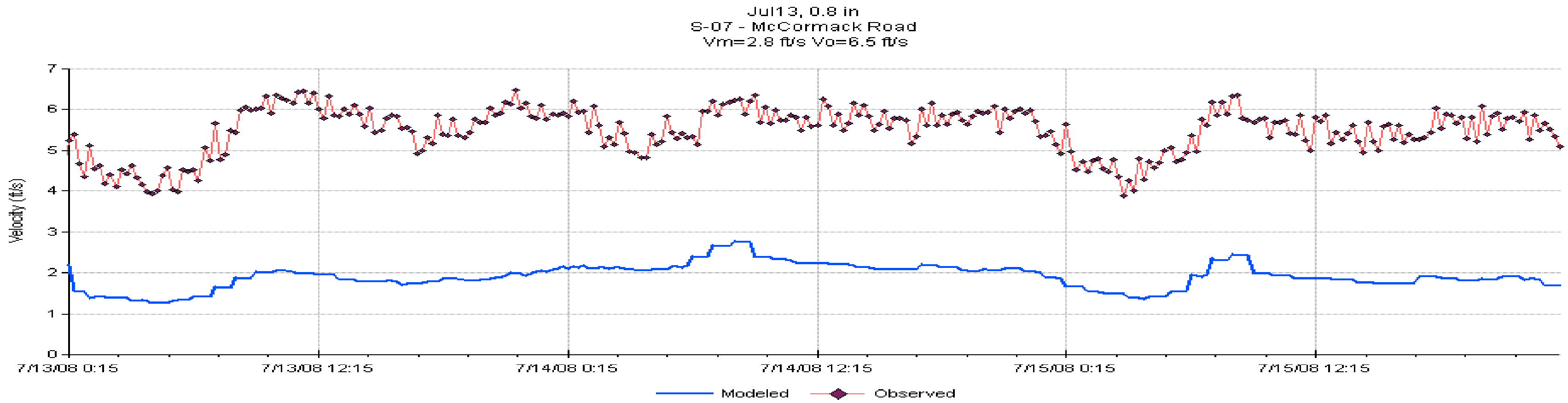


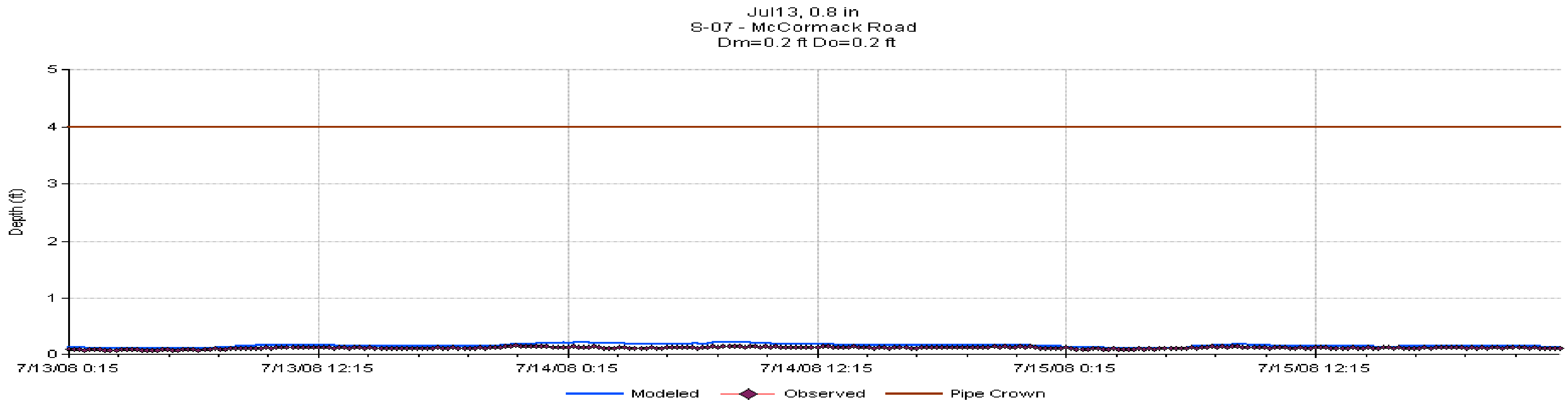
Jul13, 0.8 in
S-05 - Orange
Vm=3.06 MG Vo=3.22 MG; Qm=13.4 cfs Qo=14.4 cfs
Flowrate (cfs)
0
5
10
15
20
7/13/08 0:15
7/13/08 12:15
7/14/08 0:15
7/14/08 12:15
7/15/08 0:15
7/15/08 12:15
Modeled
Observed

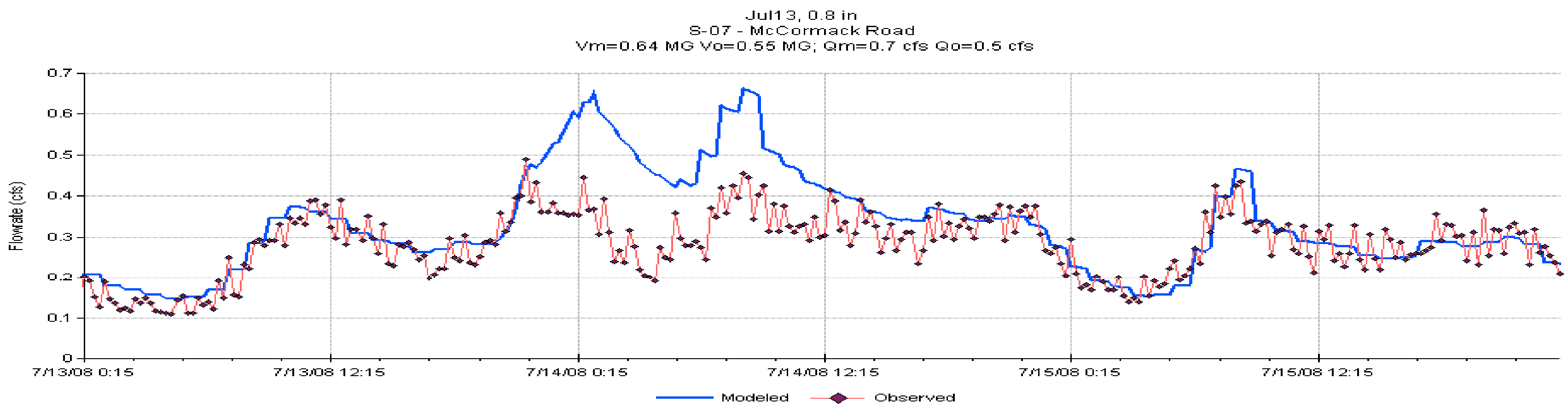

Jul13, 0.8 in
S-06 - Woodville
Dm=0.8 ft Do=0.8 ft
Depth (ft)
7/13/08 0:15
7/13/08 12:15
7/14/08 0:15
7/14/08 12:15
7/15/08 0:15
7/15/08 12:15
Modeled
Observed
Pipe Crown

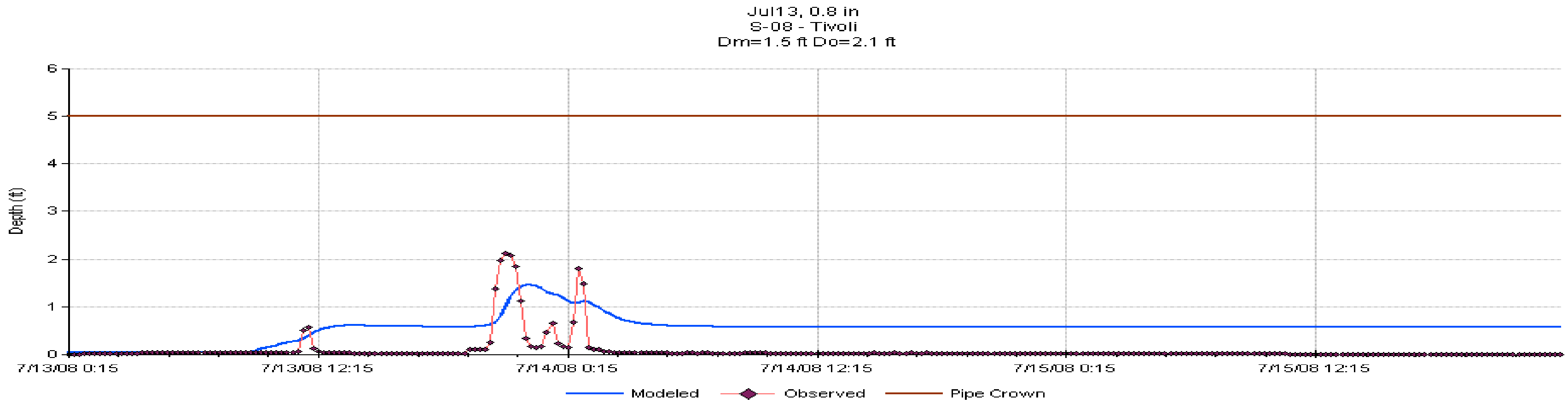

Jul13, 0.8 in
S-06 - Woodville
Vm=2.31 MG Vo=1.84 MG; Qm=3.2 cfs Qo=2.4 cfs
Flowrate (cfs)
7/13/08 0:15
7/13/08 12:15
7/14/08 0:15
7/14/08 12:15
7/15/08 0:15
7/15/08 12:15
Modeled
Observed


Jul13, 0.8 in
S-06 - Woodville
Vm=2.9 ft/s Vo=2.3 ft/s
Velocity (ft/s)
7/13/08 0:15
7/13/08 12:15
7/14/08 0:15
7/14/08 12:15
7/15/08 0:15
7/15/08 12:15
Modeled
Observed

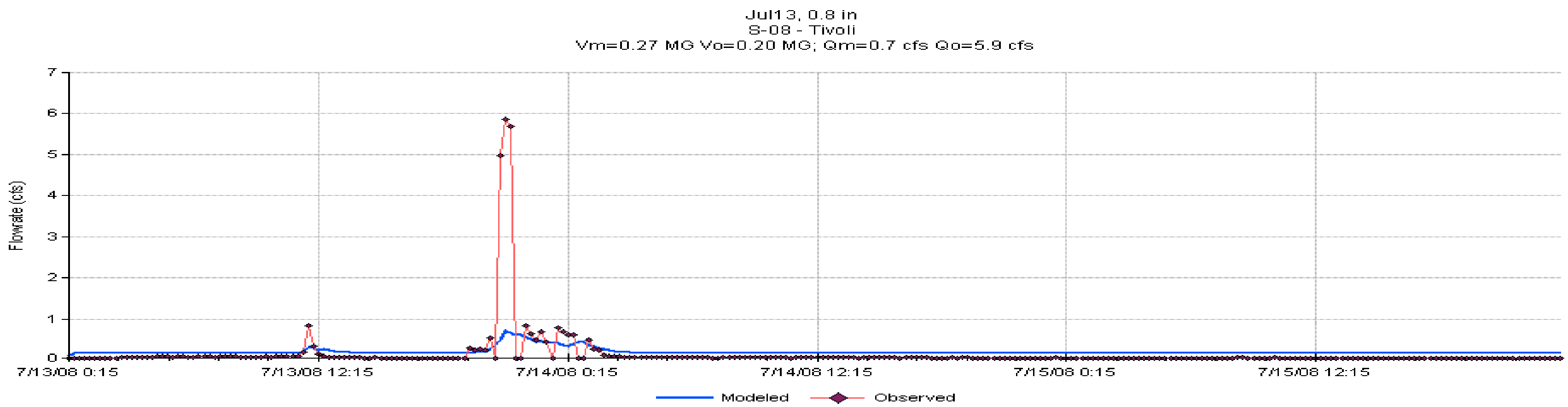

Jul13, 0.8 in
S-07 - McCormack Road
Vm=2.8 ft/s Vo=6.5 ft/s
Velocity (ft/s)
7/13/08 0:15
7/13/08 12:15
7/14/08 0:15
7/14/08 12:15
7/15/08 0:15
7/15/08 12:15
Modeled
Observed


Jul13, 0.8 in
S-07 - McCormack Road
Dm=0.2 ft Do=0.2 ft
Depth (ft)
7/13/08 0:15
7/13/08 12:15
7/14/08 0:15
7/14/08 12:15
7/15/08 0:15
7/15/08 12:15
Modeled
Observed
Pipe Crown

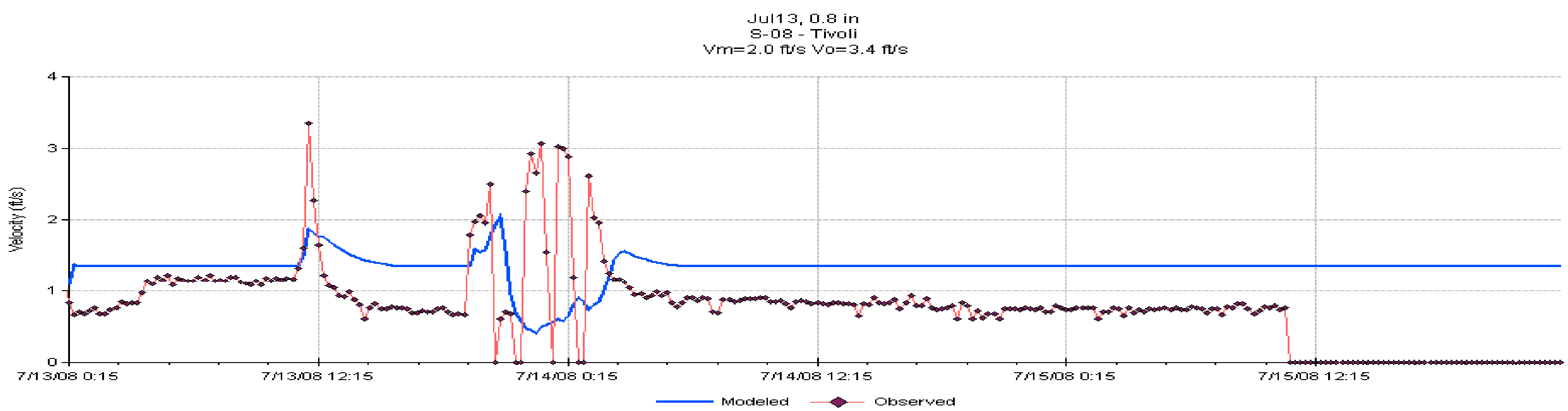

Jul13, 0.8 in
S-07 - McCormack Road
Vm=0.64 MG Vo=0.55 MG; Qm=0.7 cfs Qo=0.5 cfs
Flowrate (cfs)
7/13/08 0:15
7/13/08 12:15
7/14/08 0:15
7/14/08 12:15
7/15/08 0:15
7/15/08 12:15
Modeled
Observed



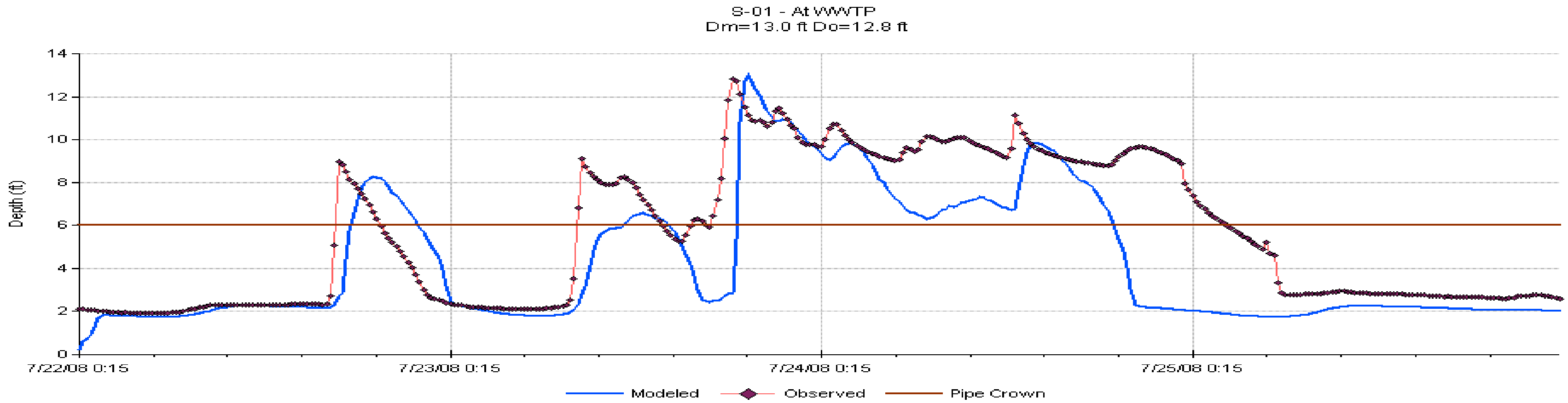
Jul13, 0.8 in
S-08 - Tivoli
Dm=1.5 ft Do=2.1 ft
Depth (ft)
0
1
2
3
4
5
6
7/13/08 0:15
7/13/08 12:15
7/14/08 0:15
7/14/08 12:15
7/15/08 0:15
7/15/08 12:15
Modeled
Observed
Pipe Crown

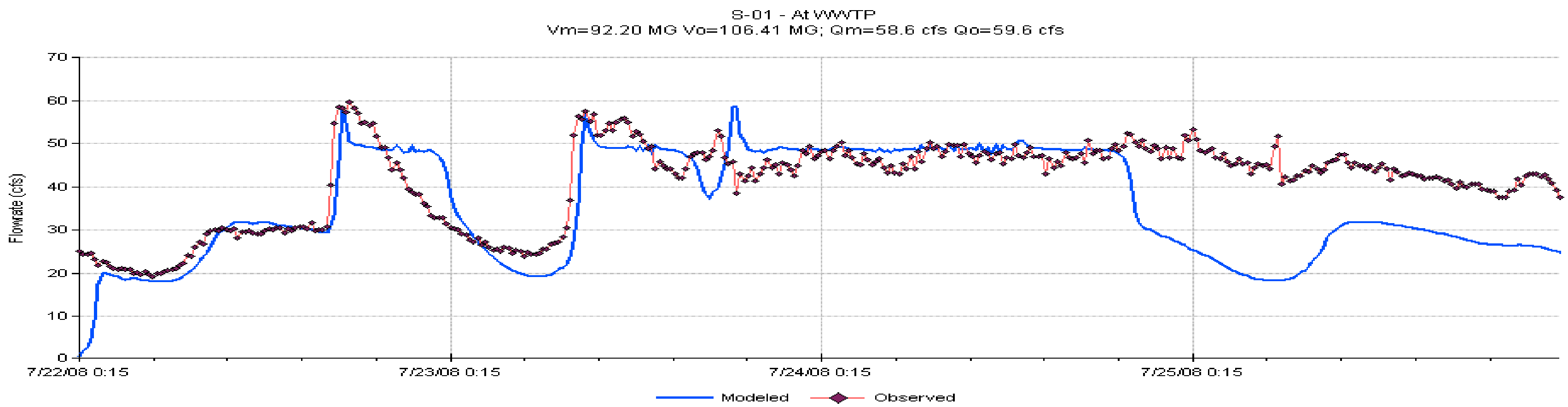


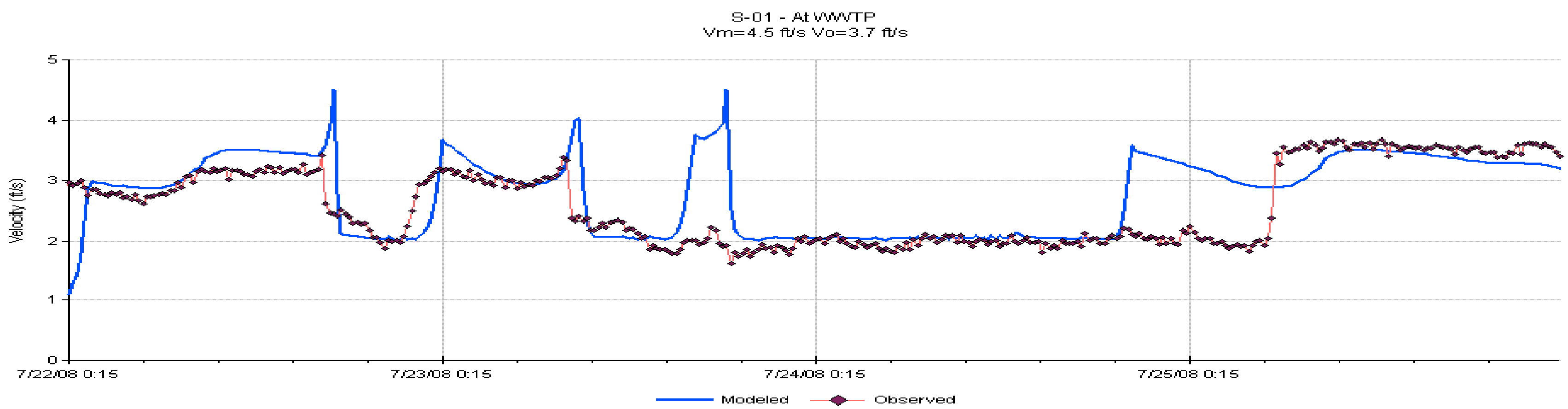
Jul13, 0.8 in
S-08 - Tivoli
Vm=0.27 MG Vo=0.20 MG; Qm=0.7 cfs Qo=5.9 cfs
Flowrate (cfs)
0
1
2
3
4
5
6
7
7/13/08 0:15
7/13/08 12:15
7/14/08 0:15
7/14/08 12:15
7/15/08 0:15
7/15/08 12:15
Modeled
Observed

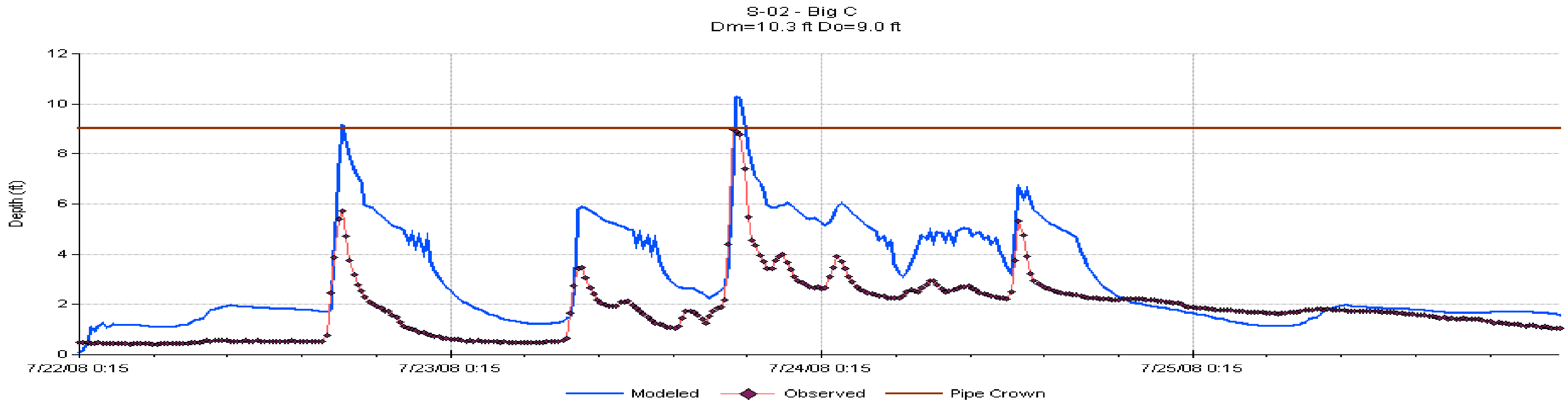


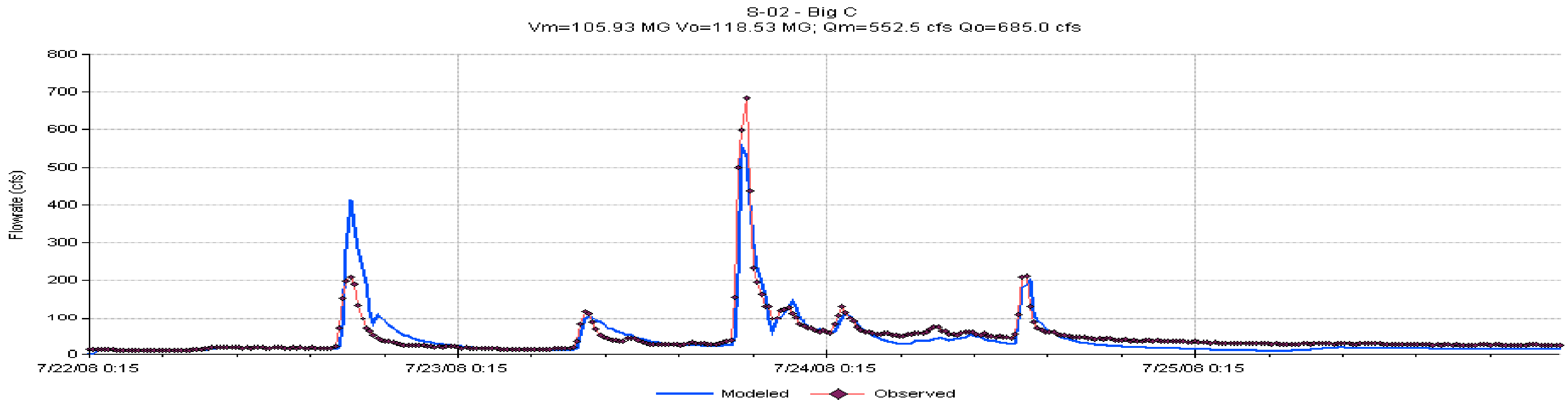
Jul13, 0.8 in
S-08 - Tivoli
Vm=2.0 ft/s Vo=3.4 ft/s
Velocity (ft/s)
0
1
2
3
4
7/13/08 0:15
7/13/08 12:15
7/14/08 0:15
7/14/08 12:15
7/15/08 0:15
7/15/08 12:15
Modeled
Observed

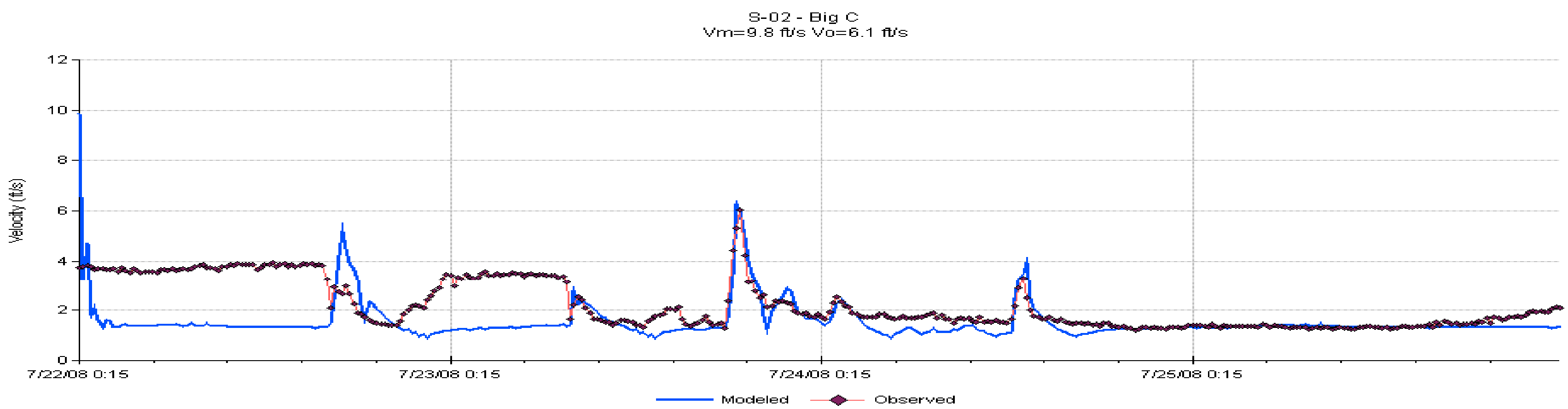

S-01 - At WWTP
Dm=13.0 ft Do=12.8 ft
Depth (ft)
14
12
10
8
6
4
2
0
7/22/08 0:15
7/23/08 0:15
7/24/08 0:15
7/25/08 0:15
Modeled
Observed
Pipe Crown

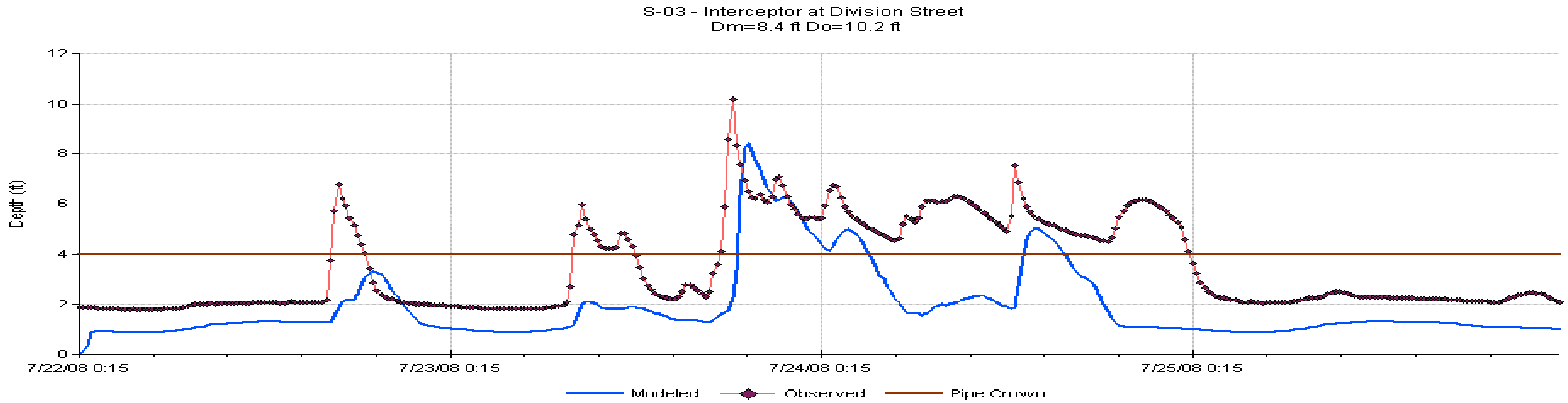

S-01 - At WWTP
Vm=92.20 MG Vo=106.41 MG; Qm=58.6 cfs Qo=59.6 cfs
Flowrate (cfs)
70
60
50
40
30
20
10
0
7/22/08 0:15
7/23/08 0:15
7/24/08 0:15
7/25/08 0:15
Modeled
Observed

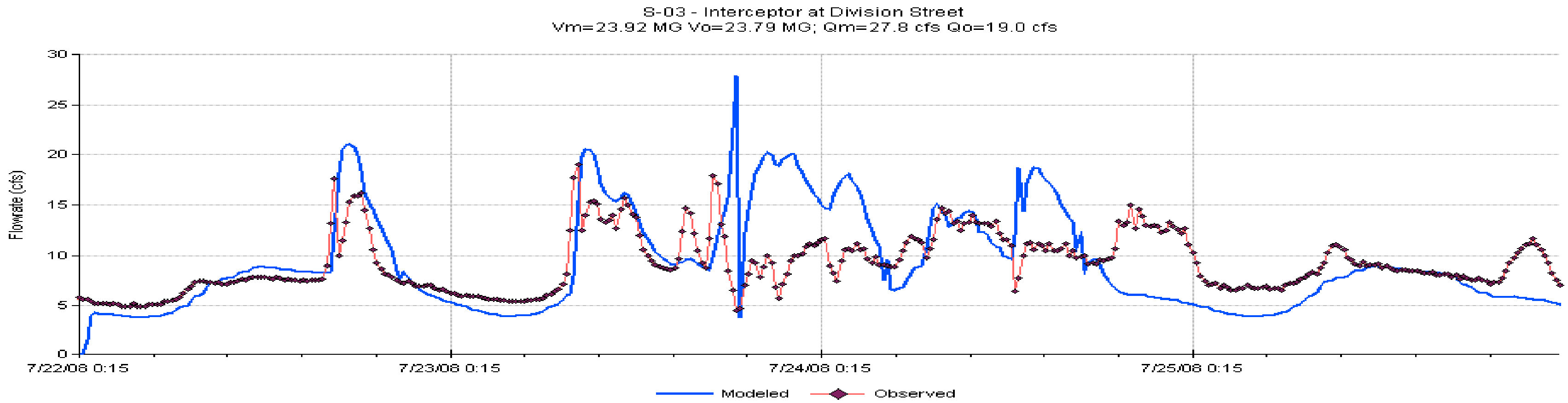

S-01 - At WWTP
Vm=4.5 ft/s Vo=3.7 ft/s
Velocity (ft/s)
5
4
3
2
1
0
7/22/08 0:15
7/23/08 0:15
7/24/08 0:15
7/25/08 0:15
Modeled
Observed

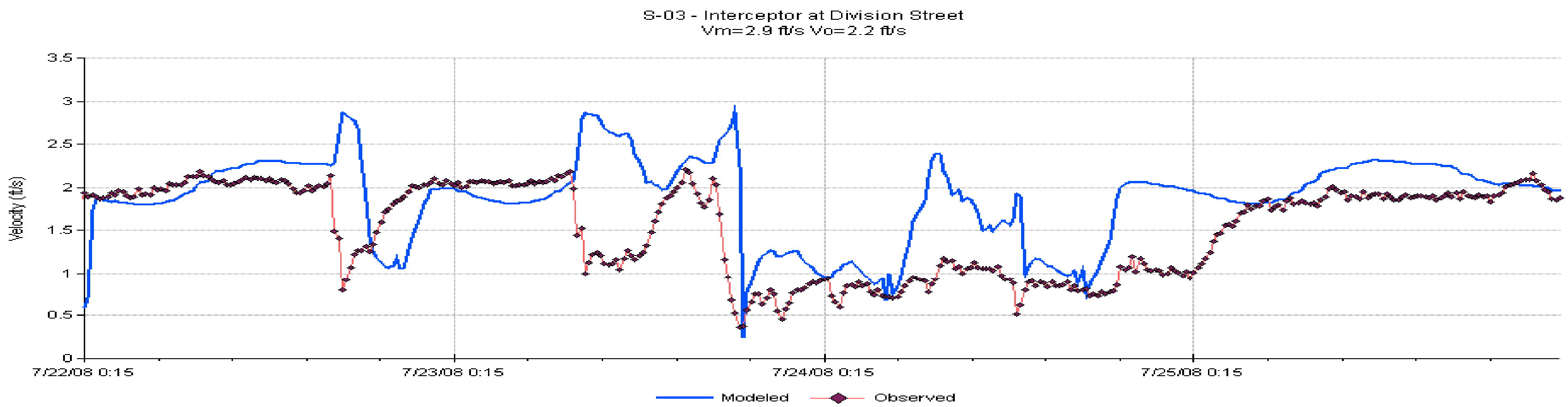

S-02 - Big C
Dm=10.3 ft Do=9.0 ft
Depth (ft)
12
10
8
6
4
2
0
7/22/08 0:15
7/23/08 0:15
7/24/08 0:15
7/25/08 0:15
Modeled
Observed
Pipe Crown

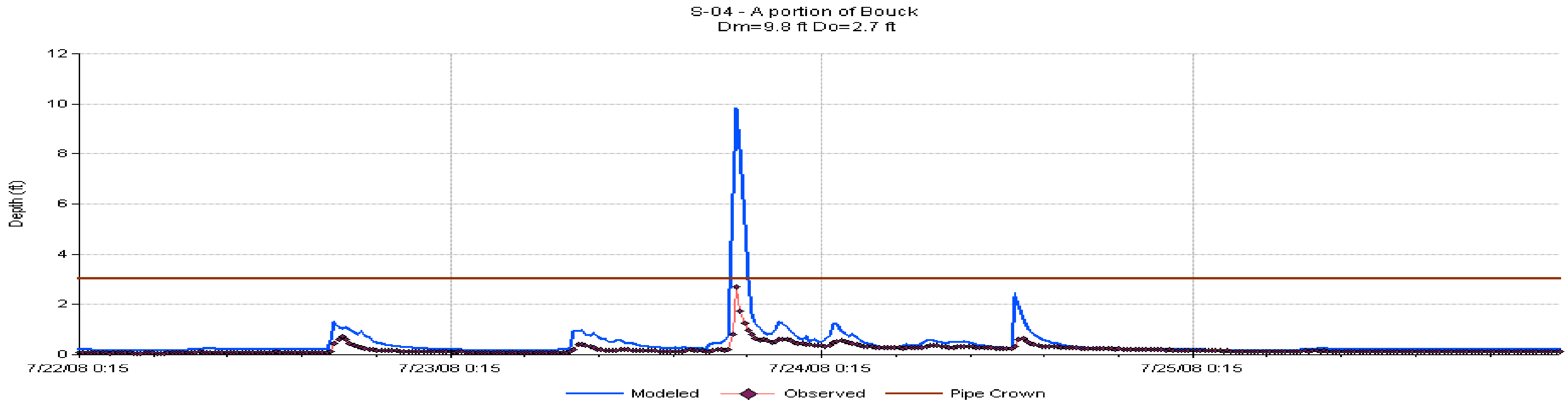

S-02 - Big C
Vm=105.93 MG Vo=118.53 MG; Qm=552.5 cfs Qo=685.0 cfs
Flowrate (cfs)
800
700
600
500
400
300
200
100
0
7/22/08 0:15
7/23/08 0:15
7/24/08 0:15
7/25/08 0:15
Modeled
Observed


S-02 - Big C
Vm=9.8 ft/s Vo=6.1 ft/s
Velocity (ft/s)
12
10
8
6
4
2
0
7/22/08 0:15
7/23/08 0:15
7/24/08 0:15
7/25/08 0:15
Modeled
Observed

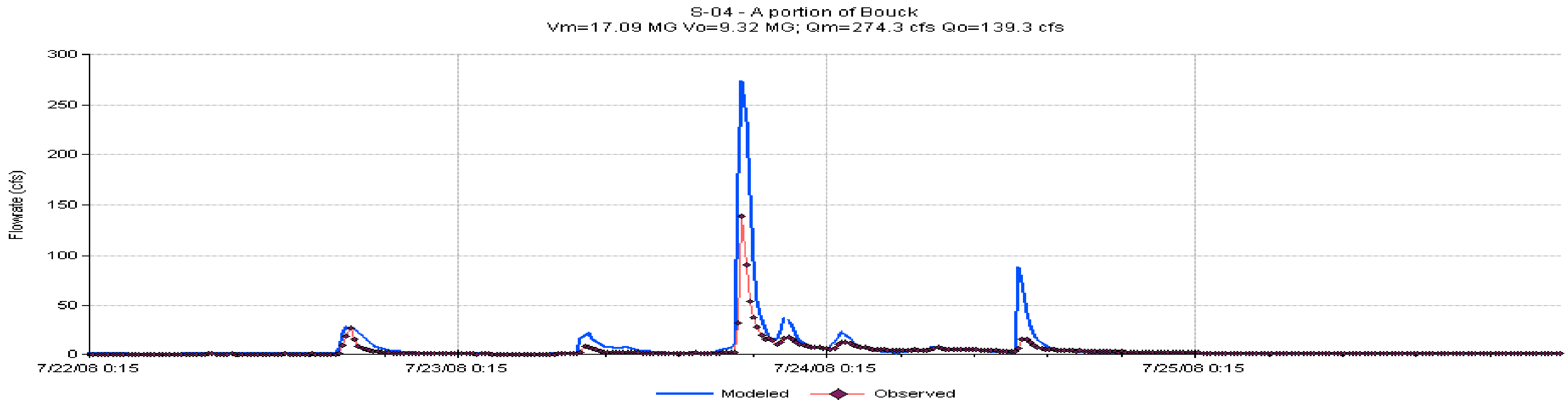

S-03 - Interceptor at Division Street
Dm=8.4 ft Do=10.2 ft
Depth (ft)
12
10
8
6
4
2
0
7/22/08 0:15
7/23/08 0:15
7/24/08 0:15
7/25/08 0:15
Modeled
Observed
Pipe Crown


S-03 - Interceptor at Division Street
Vm=23.92 MG Vo=23.79 MG; Qm=27.8 cfs Qo=19.0 cfs
Flowrate (cfs)
30
25
20
15
10
5
0
7/22/08 0:15
7/23/08 0:15
7/24/08 0:15
7/25/08 0:15
Modeled
Observed

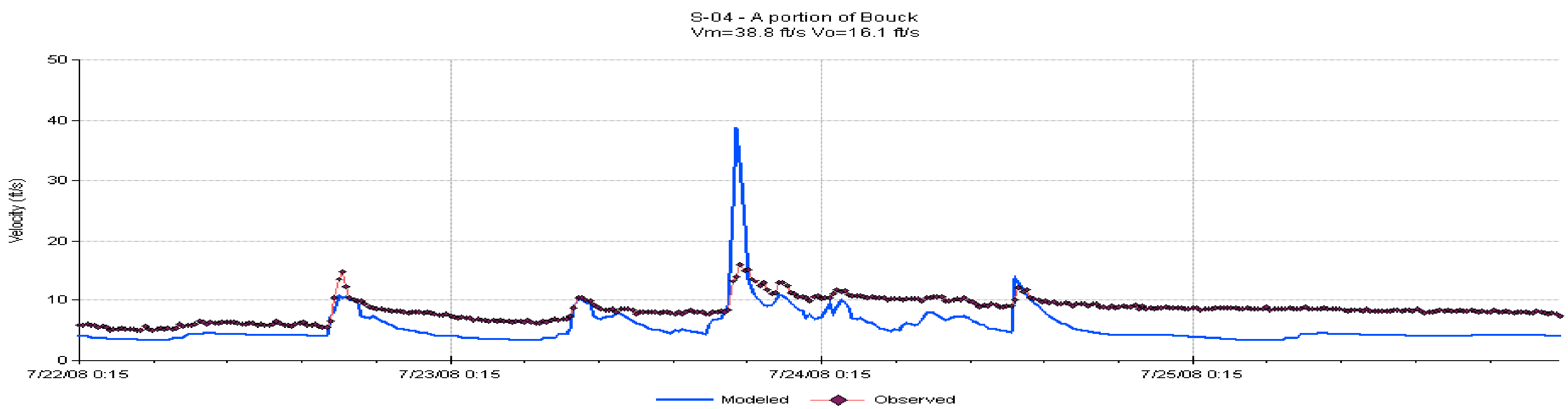

S-03 - Interceptor at Division Street
Vm=2.9 ft/s Vo=2.2 ft/s
Velocity (ft/s)
3.5
3
2.5
2
1.5
1
0.5
0
7/22/08 0:15
7/23/08 0:15
7/24/08 0:15
7/25/08 0:15
Modeled
Observed



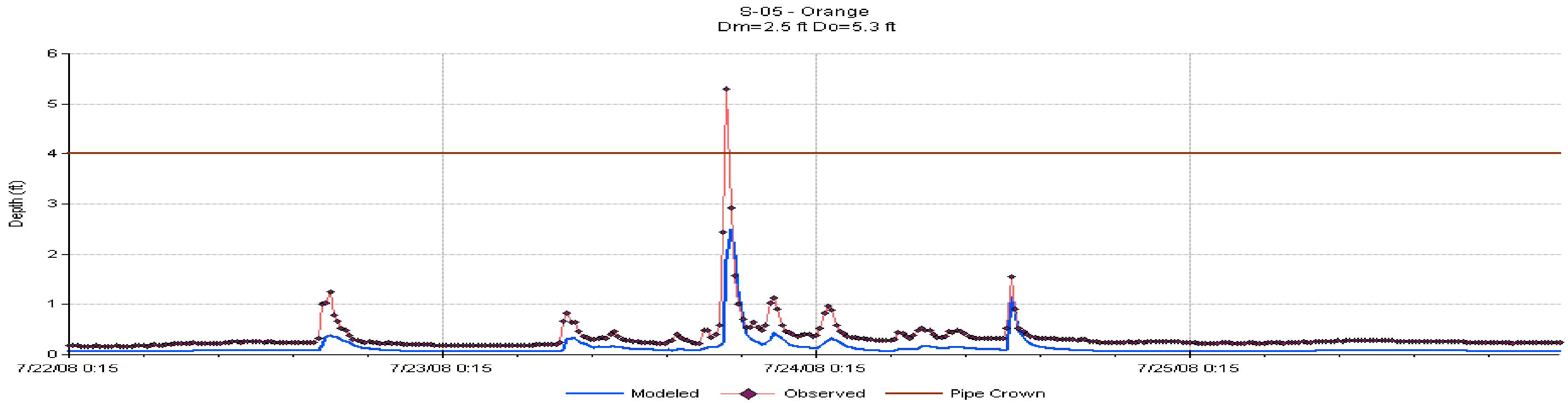
S-04 - A portion of Bouck
Dm=9.8 ft Do=2.7 ft
Depth (ft)
12
10
8
6
4
2
0
7/22/08 0:15
7/23/08 0:15
7/24/08 0:15
7/25/08 0:15
Modeled
Observed
Pipe Crown

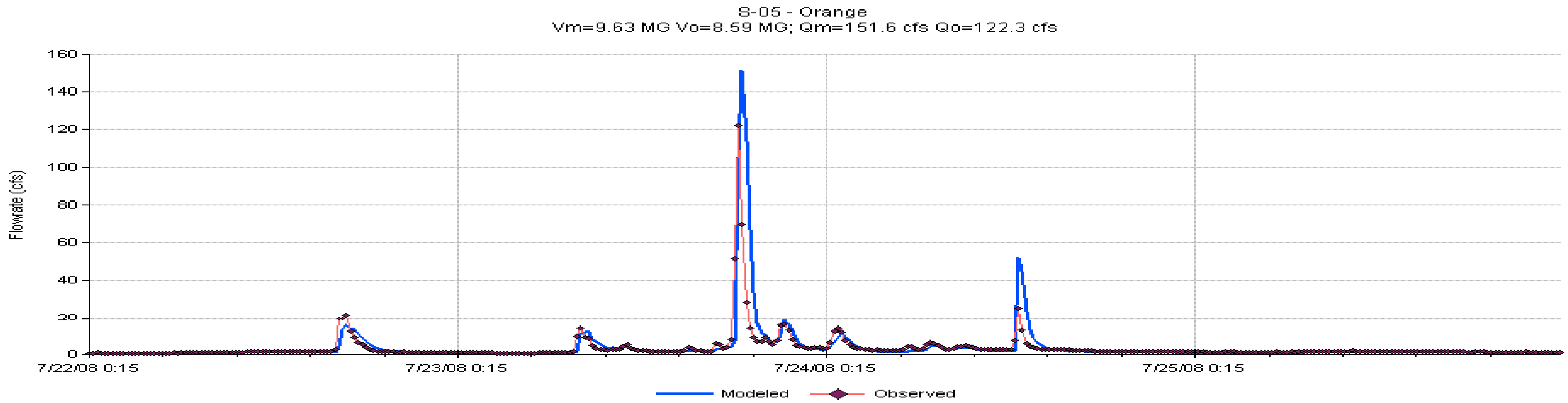


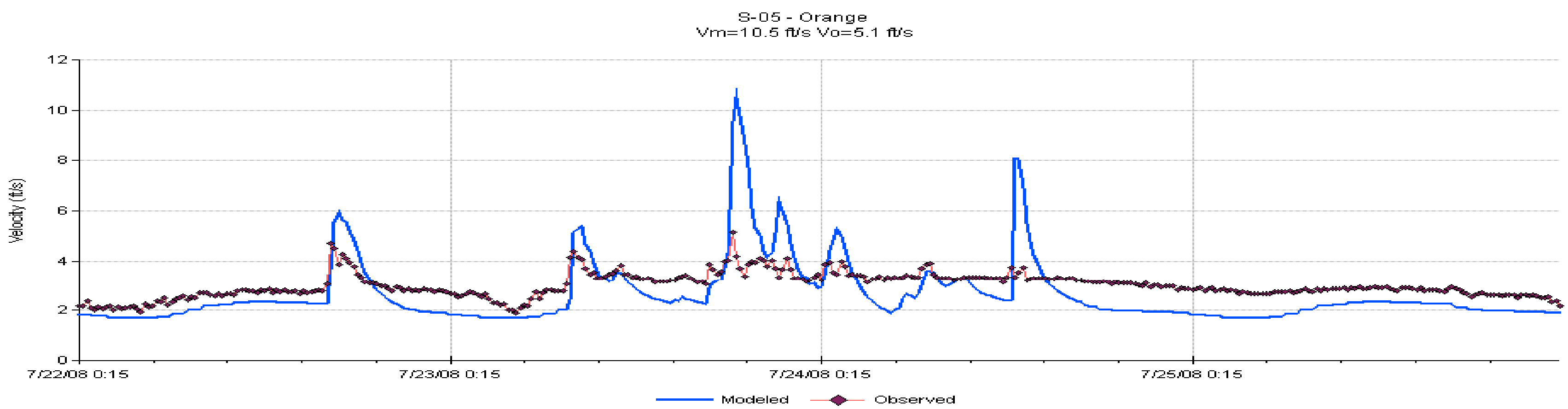
S-04 - A portion of Bouck
Vm=17.09 MG Vo=9.32 MG; Qm=274.3 cfs Qo=139.3 cfs
Flowrate (cfs)
300
250
200
150
100
50
0
7/22/08 0:15
7/23/08 0:15
7/24/08 0:15
7/25/08 0:15
Modeled
Observed

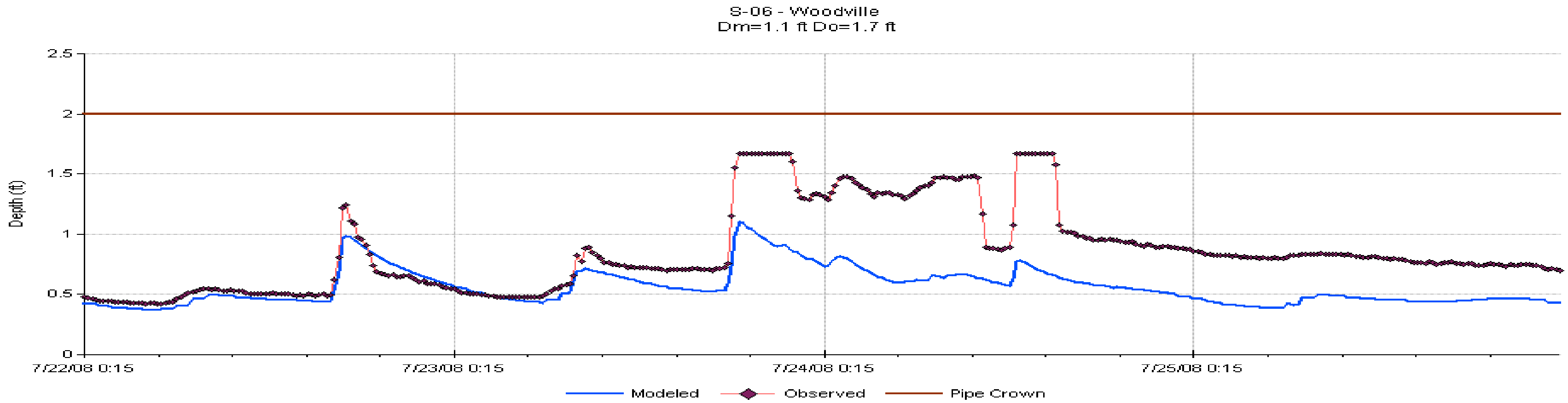


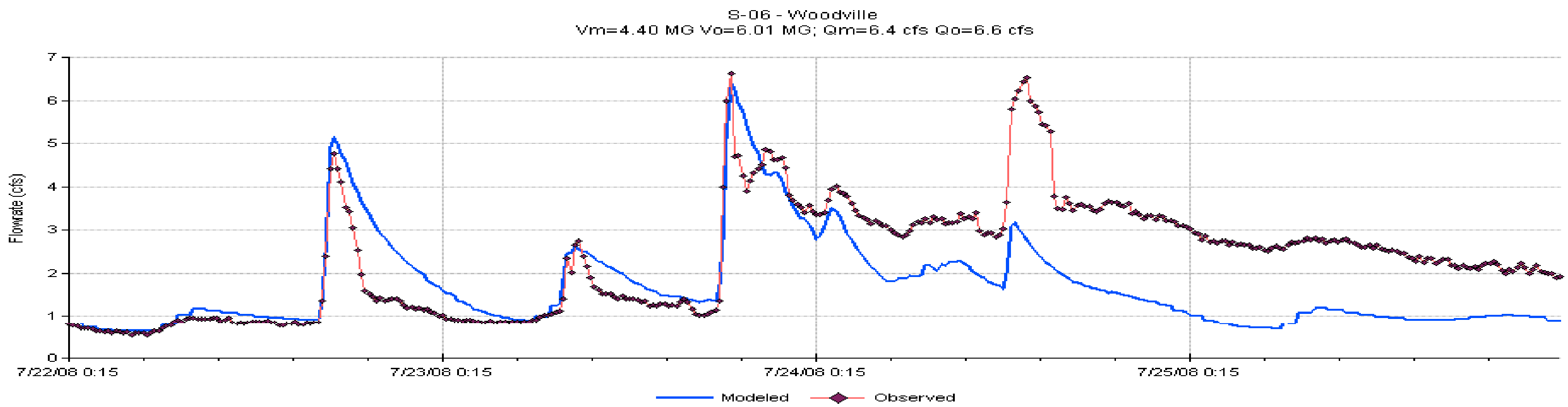
S-04 - A portion of Bouck
Vm=38.8 ft/s Vo=16.1 ft/s
Velocity (ft/s)
50
40
30
20
10
0
7/22/08 0:15
7/23/08 0:15
7/24/08 0:15
7/25/08 0:15
Modeled
Observed

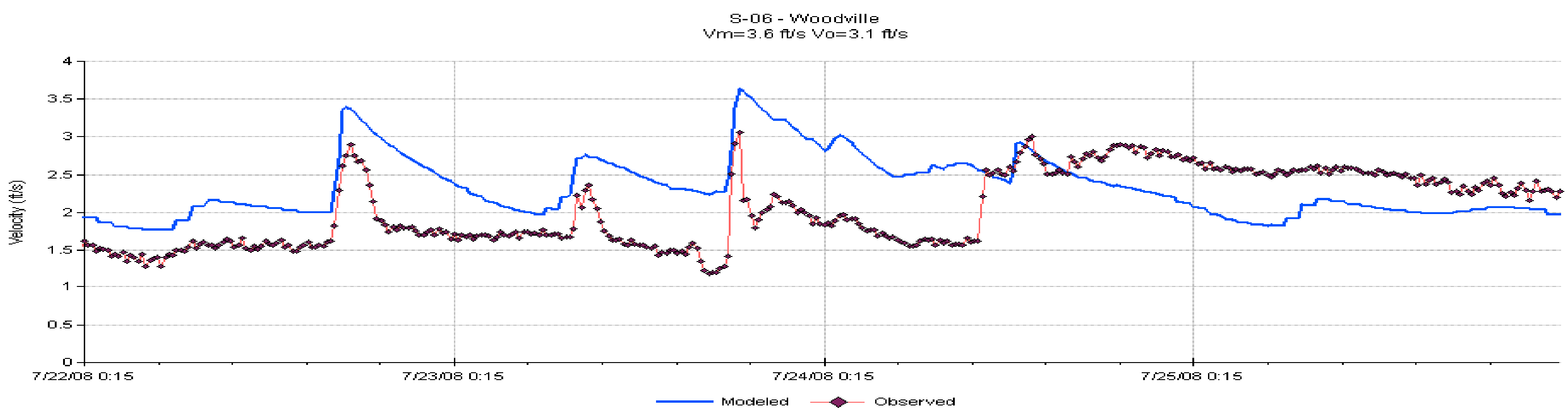

S-05 - Orange
Dm=2.5 ft Do=5.3 ft
Depth (ft)
0
1
2
3
4
5
6
7/22/08 0:15
7/23/08 0:15
7/24/08 0:15
7/25/08 0:15
Modeled
Observed
Pipe Crown

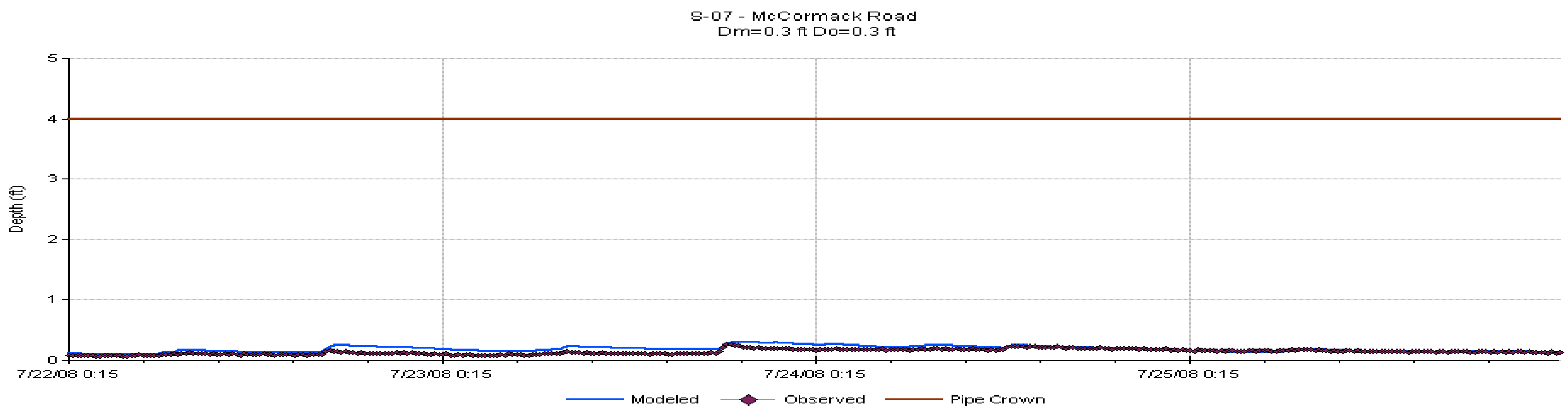

S-05 - Orange
Vm=9.63 MG Vo=8.59 MG; Qm=151.6 cfs Qo=122.3 cfs
Flowrate (cfs)
0
20
40
60
80
100
120
140
160
7/22/08 0:15
7/23/08 0:15
7/24/08 0:15
7/25/08 0:15
Modeled
Observed

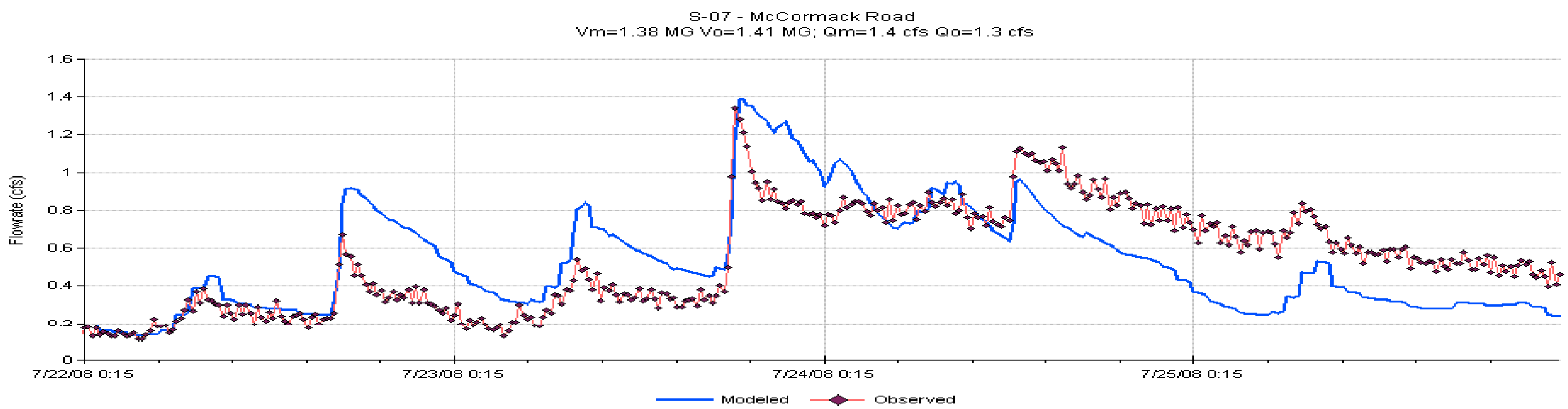

S-05 - Orange
Vm=10.5 ft/s Vo=5.1 ft/s
Velocity (ft/s)
0
2
4
6
8
10
12
7/22/08 0:15
7/23/08 0:15
7/24/08 0:15
7/25/08 0:15
Modeled
Observed

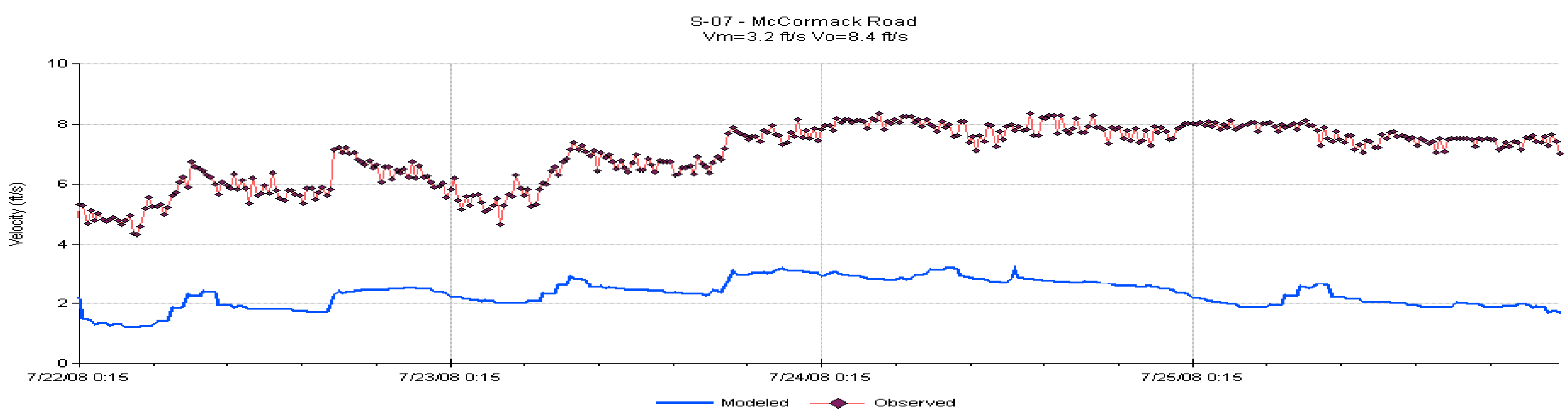

S-06 - Woodville
Dm=1.1 ft Do=1.7 ft
Depth (ft)
7/22/08 0:15
7/23/08 0:15
7/24/08 0:15
7/25/08 0:15
Modeled
Observed
Pipe Crown

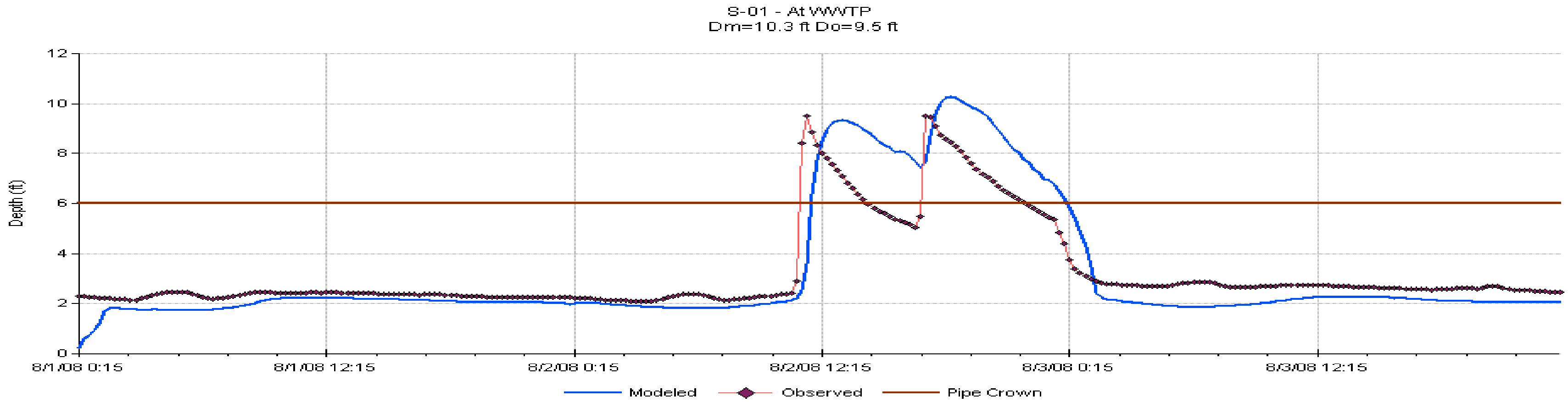

S-06 - Woodville
Vm=4.40 MG Vo=6.01 MG; Qm=6.4 cfs Qo=6.6 cfs
Flowrate (cfs)
7/22/08 0:15
7/23/08 0:15
7/24/08 0:15
7/25/08 0:15
Modeled
Observed

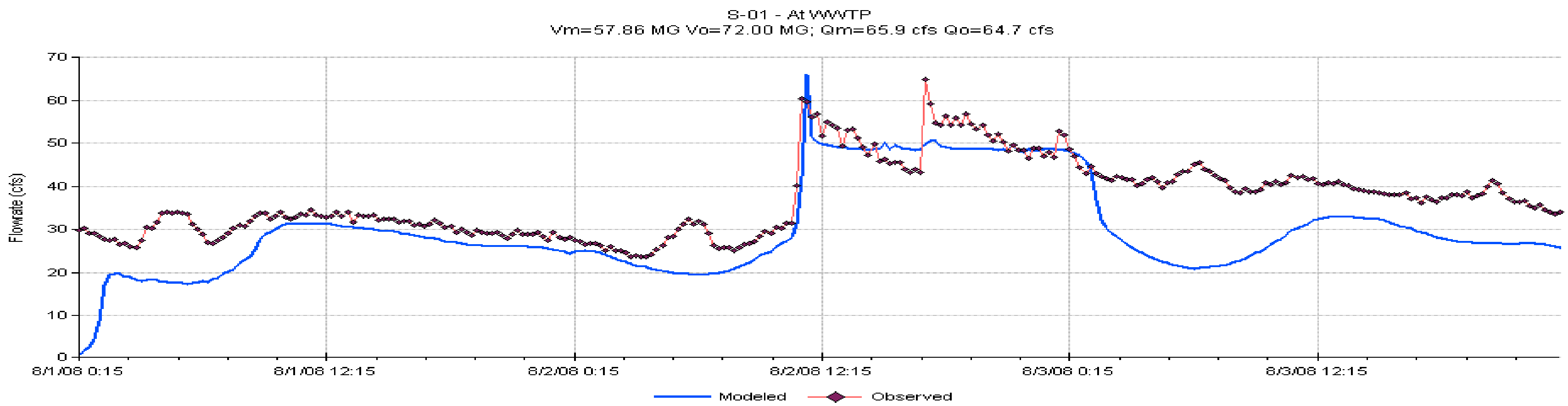

S-06 - Woodville
Vm=3.6 ft/s Vo=3.1 ft/s
Velocity (ft/s)
7/22/08 0:15
7/23/08 0:15
7/24/08 0:15
7/25/08 0:15
Modeled
Observed

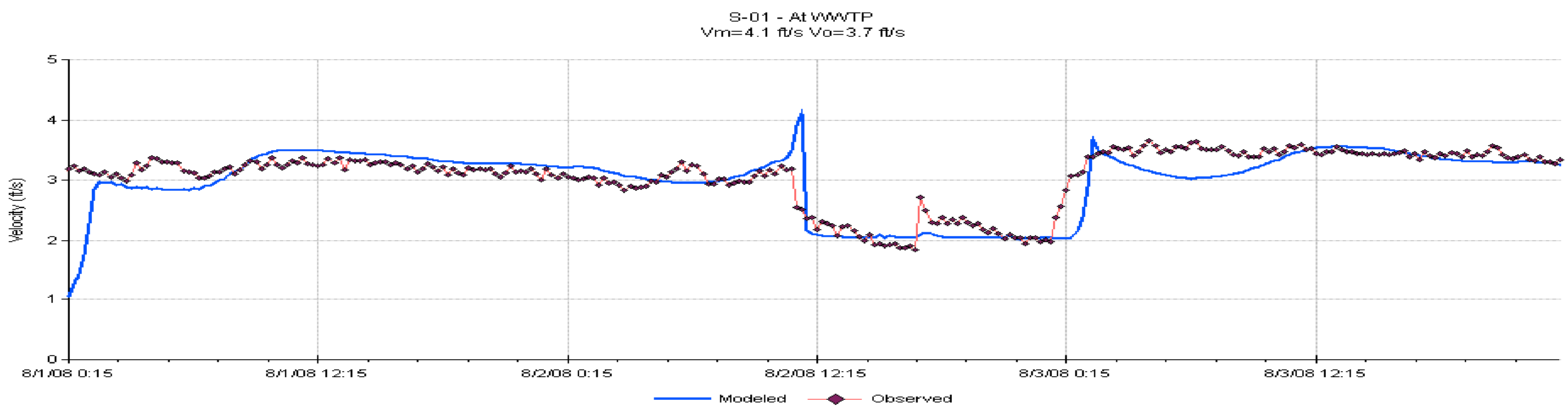

S-07 - McCormack Road
Dm=0.3 ft Do=0.3 ft
Depth (ft)
5
4
3
2
1
0
7/22/08 0:15
7/23/08 0:15
7/24/08 0:15
7/25/08 0:15
Modeled
Observed
Pipe Crown

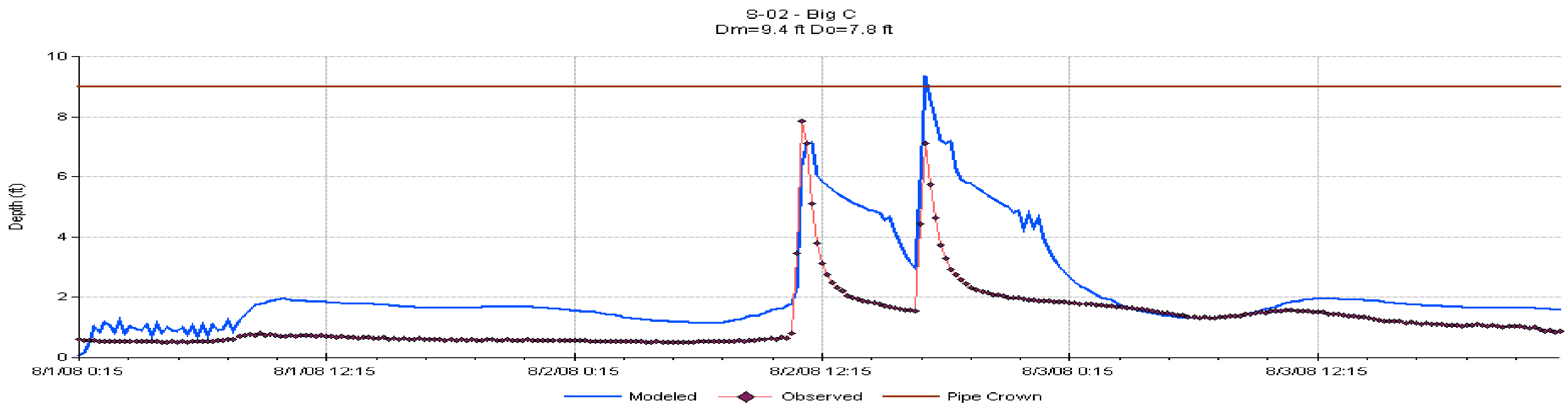

S-07 - McCormack Road
Vm=1.38 MG Vo=1.41 MG; Qm=1.4 cfs Qo=1.3 cfs
Flowrate (cfs)
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
7/22/08 0:15
7/23/08 0:15
7/24/08 0:15
7/25/08 0:15
Modeled
Observed

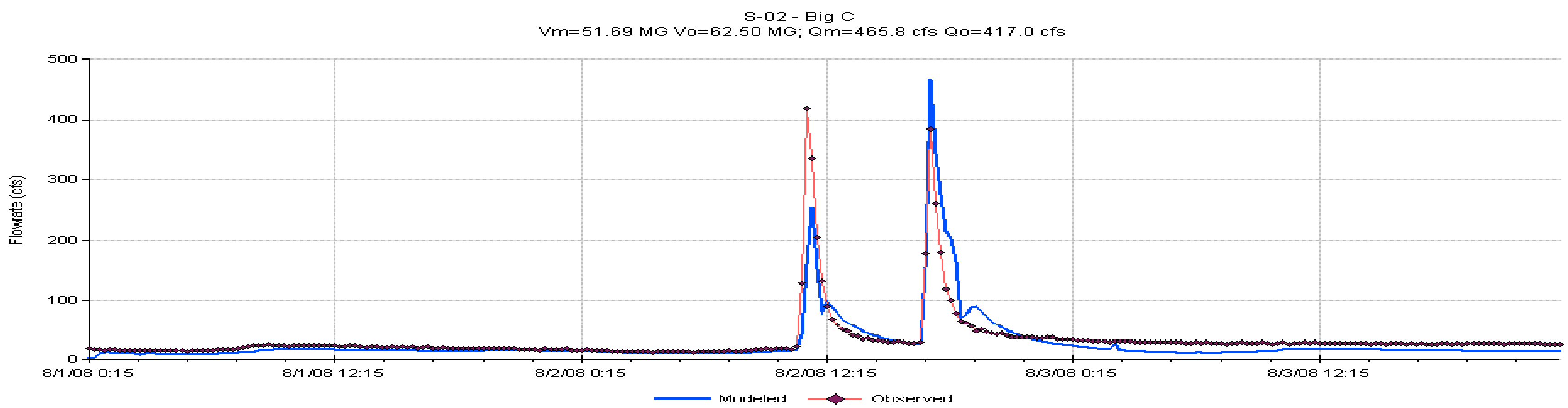

S-07 - McCormack Road
Vm=3.2 ft/s Vo=8.4 ft/s
Velocity (ft/s)
10
8
6
4
2
0
7/22/08 0:15
7/23/08 0:15
7/24/08 0:15
7/25/08 0:15
Modeled
Observed

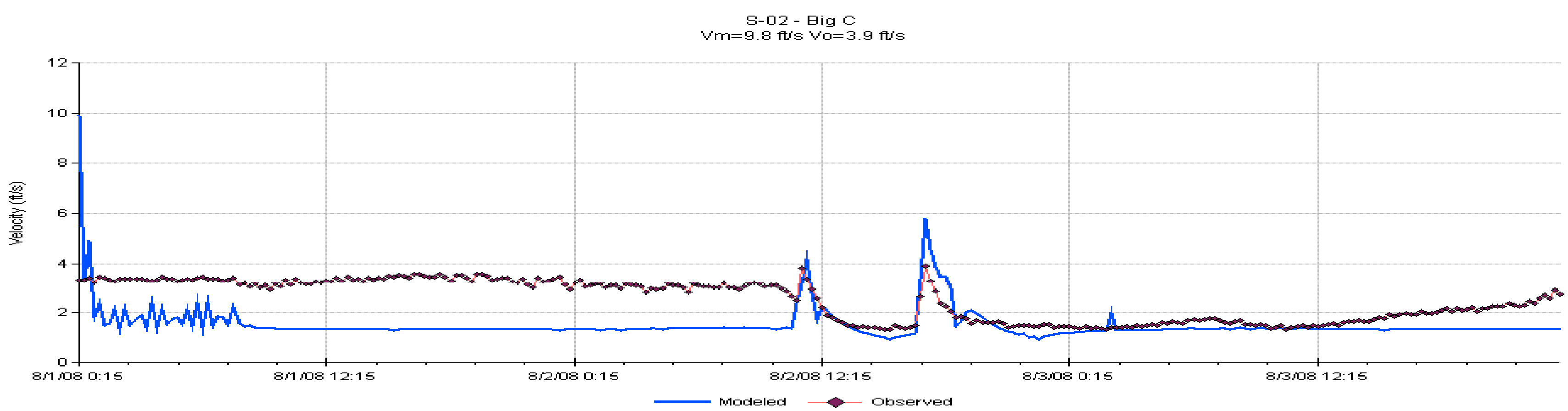

S-01 - At WWTP
Dm=10.3 ft Do=9.5 ft
Depth (ft)
0
2
4
6
8
10
12
8/1/08 0:15
8/1/08 12:15
8/2/08 0:15
8/2/08 12:15
8/3/08 0:15
8/3/08 12:15
Modeled
Observed
Pipe Crown

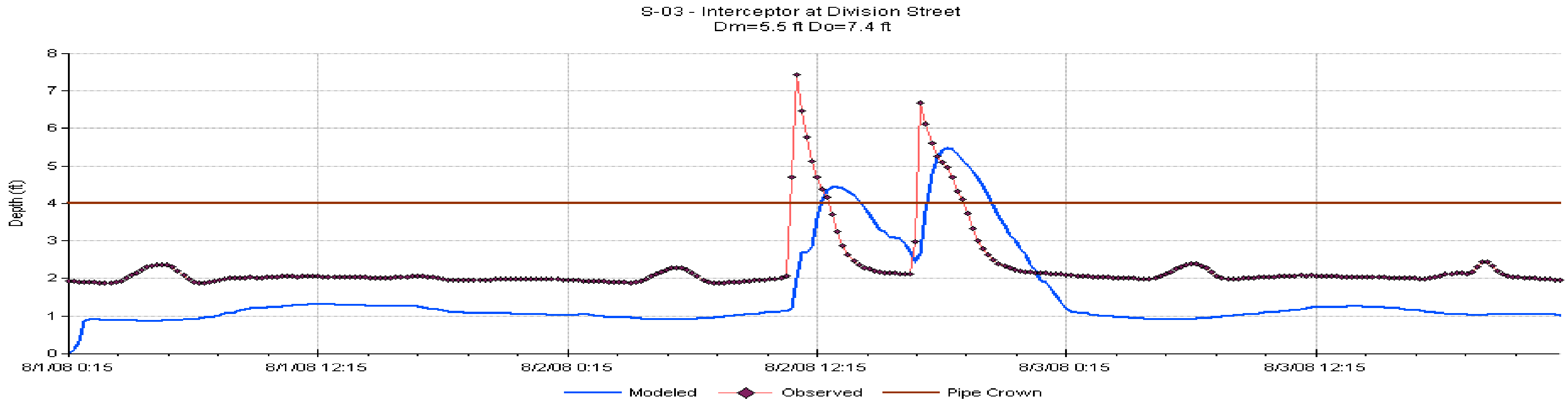

S-01 - At WWTP
Vm=57.86 MG Vo=72.00 MG; Qm=65.9 cfs Qo=64.7 cfs
Flowrate (cfs)
0
10
20
30
40
50
60
70
8/1/08 0:15
8/1/08 12:15
8/2/08 0:15
8/2/08 12:15
8/3/08 0:15
8/3/08 12:15
Modeled
Observed

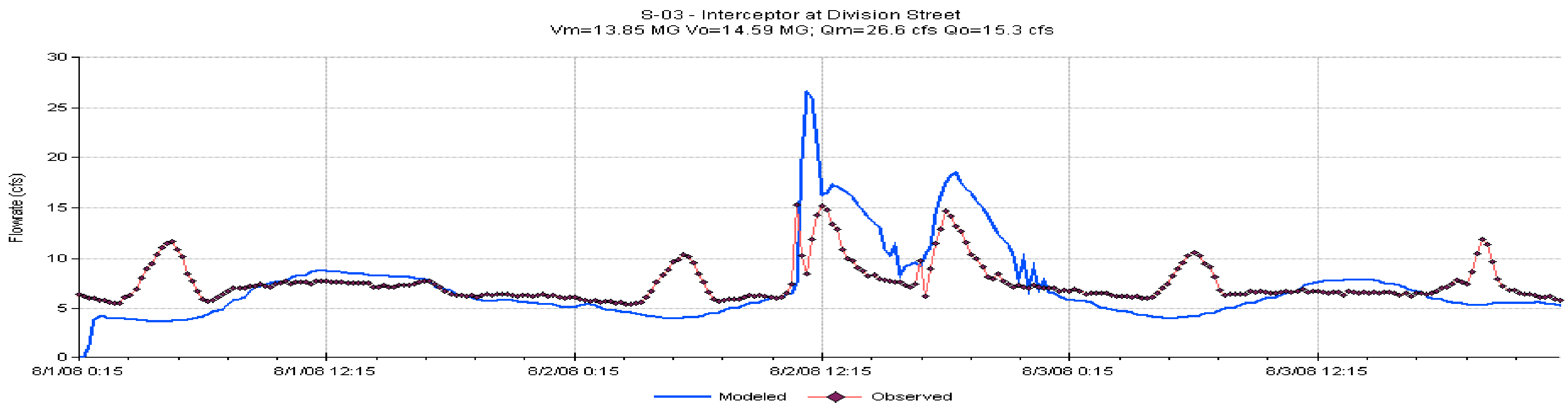

S-01 - At WWTP
Vm=4.1 ft/s Vo=3.7 ft/s
Velocity (ft/s)
0
1
2
3
4
5
8/1/08 0:15
8/1/08 12:15
8/2/08 0:15
8/2/08 12:15
8/3/08 0:15
8/3/08 12:15
Modeled
Observed

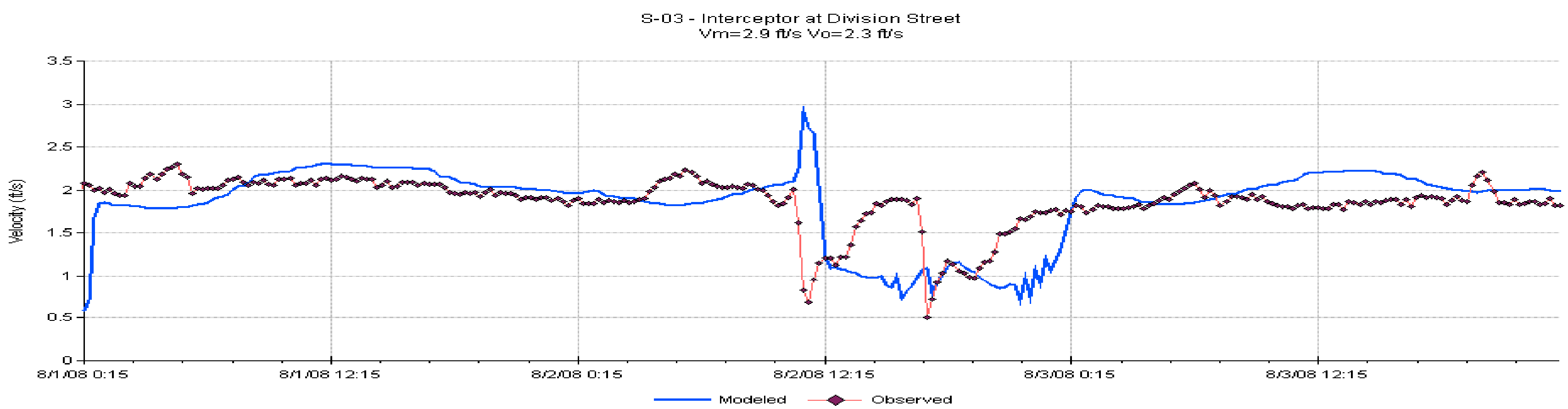

S-02 - Big C
Dm=9.4 ft Do=7.8 ft
Depth (ft)
0
2
4
6
8
10
8/1/08 0:15
8/1/08 12:15
8/2/08 0:15
8/2/08 12:15
8/3/08 0:15
8/3/08 12:15
Modeled
Observed
Pipe Crown

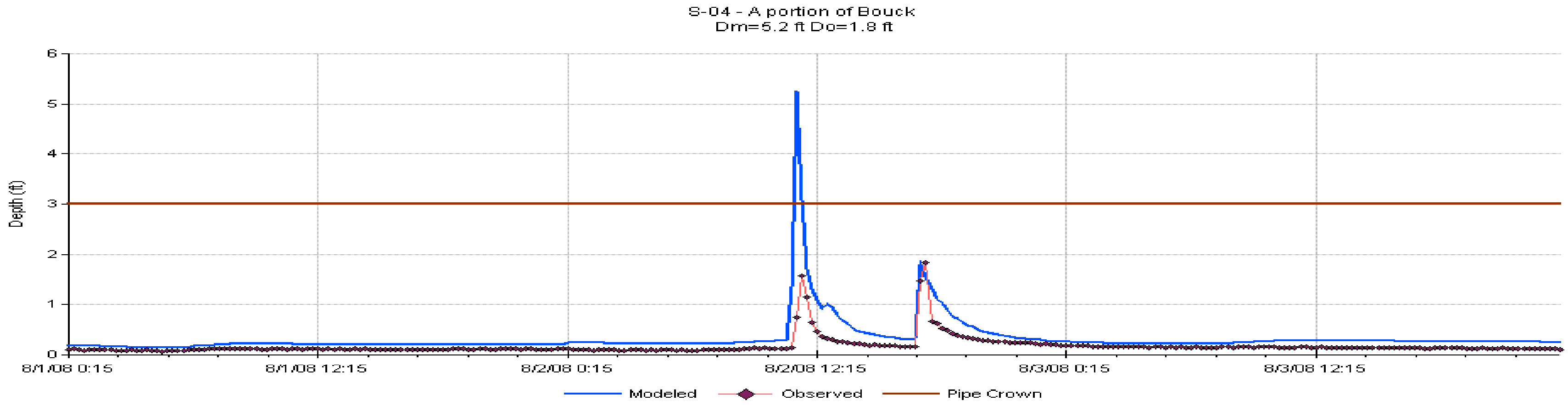

S-02 - Big C
Vm=51.69 MG Vo=62.50 MG; Qm=465.8 cfs Qo=417.0 cfs
Flowrate (cfs)
0
100
200
300
400
500
8/1/08 0:15
8/1/08 12:15
8/2/08 0:15
8/2/08 12:15
8/3/08 0:15
8/3/08 12:15
Modeled
Observed

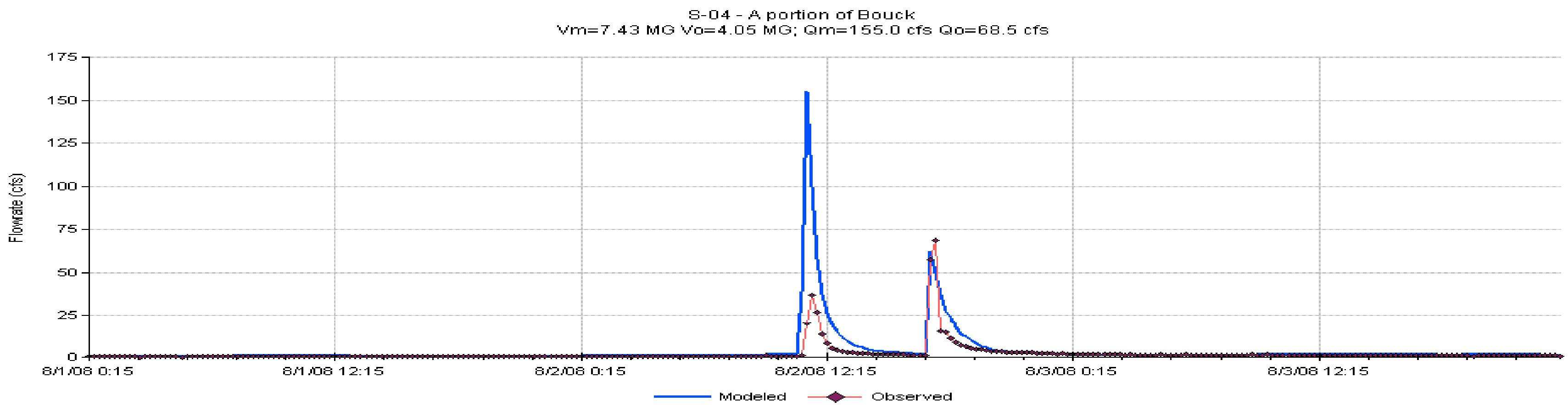

S-02 - Big C
Vm=9.8 ft/s Vo=3.9 ft/s
Velocity (ft/s)
0
2
4
6
8
10
12
8/1/08 0:15
8/1/08 12:15
8/2/08 0:15
8/2/08 12:15
8/3/08 0:15
8/3/08 12:15
Modeled
Observed

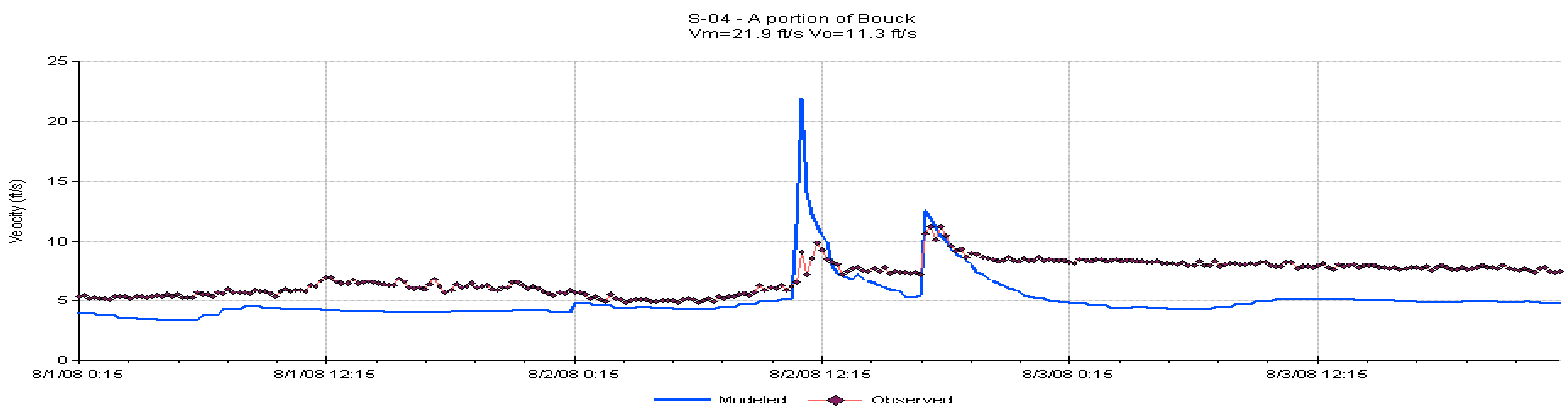

S-03 - Interceptor at Division Street
Dm=5.5 ft Do=7.4 ft
Depth (ft)
0
1
2
3
4
5
6
7
8
8/1/08 0:15
8/1/08 12:15
8/2/08 0:15
8/2/08 12:15
8/3/08 0:15
8/3/08 12:15
Modeled
Observed
Pipe Crown

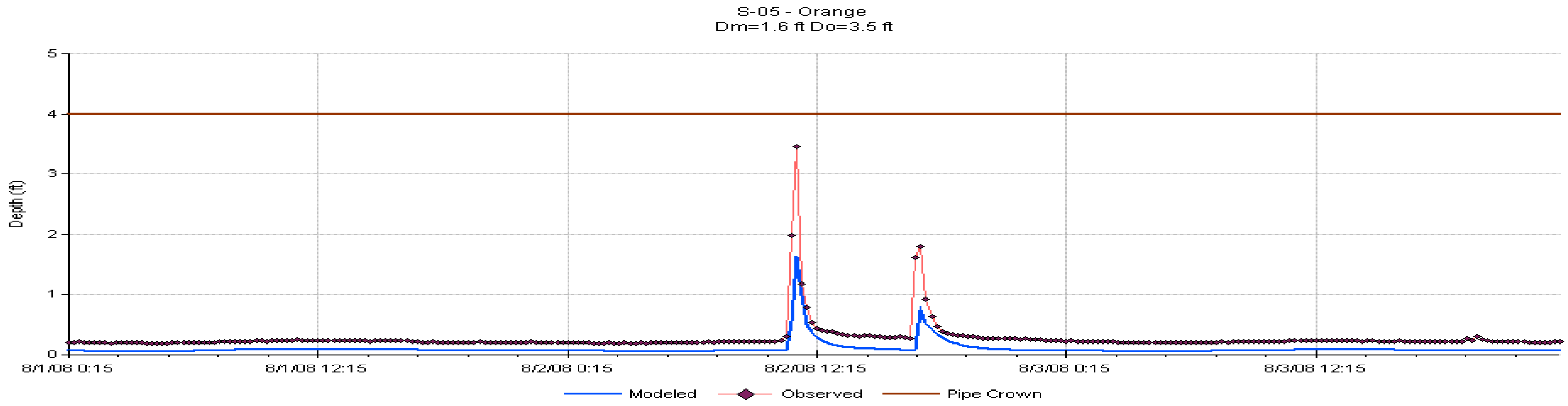

S-03 - Interceptor at Division Street
Vm=13.85 MG Vo=14.59 MG; Qm=26.6 cfs Qo=15.3 cfs
Flowrate (cfs)
0
5
10
15
20
25
30
8/1/08 0:15
8/1/08 12:15
8/2/08 0:15
8/2/08 12:15
8/3/08 0:15
8/3/08 12:15
Modeled
Observed


S-03 - Interceptor at Division Street
Vm=2.9 ft/s Vo=2.3 ft/s
Velocity (ft/s)
0
0.5
1
1.5
2
2.5
3
3.5
8/1/08 0:15
8/1/08 12:15
8/2/08 0:15
8/2/08 12:15
8/3/08 0:15
8/3/08 12:15
Modeled
Observed

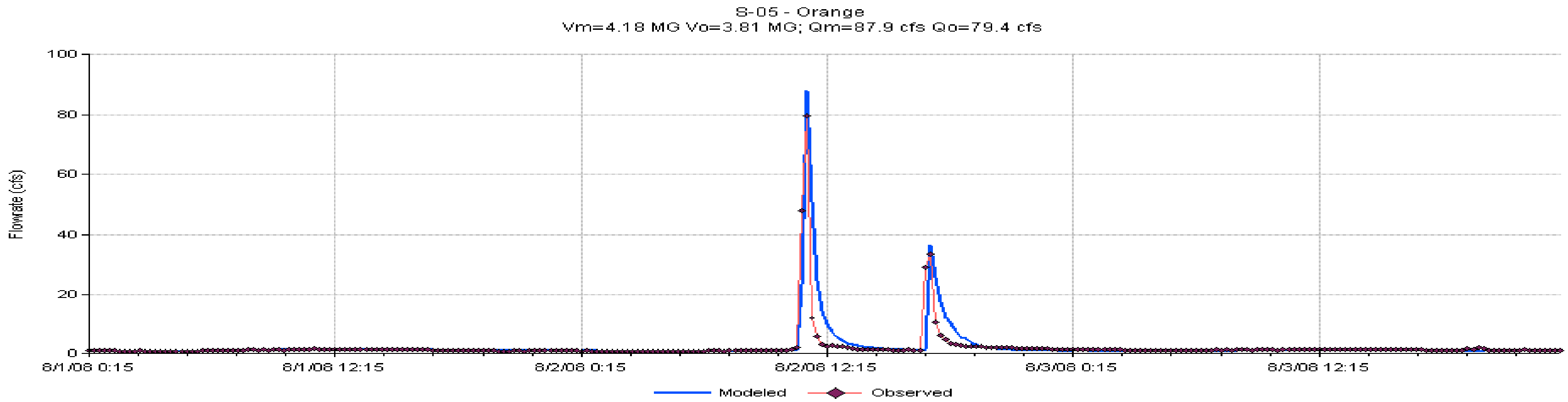

S-04 - A portion of Bouck
Dm=5.2 ft Do=1.8 ft
Depth (ft)
6
5
4
3
2
1
0
8/1/08 0:15
8/1/08 12:15
8/2/08 0:15
8/2/08 12:15
8/3/08 0:15
8/3/08 12:15
Modeled
Observed
Pipe Crown


S-04 - A portion of Bouck
Vm=7.43 MG Vo=4.05 MG; Qm=155.0 cfs Qo=68.5 cfs
Flowrate (cfs)
175
150
125
100
75
50
25
0
8/1/08 0:15
8/1/08 12:15
8/2/08 0:15
8/2/08 12:15
8/3/08 0:15
8/3/08 12:15
Modeled
Observed

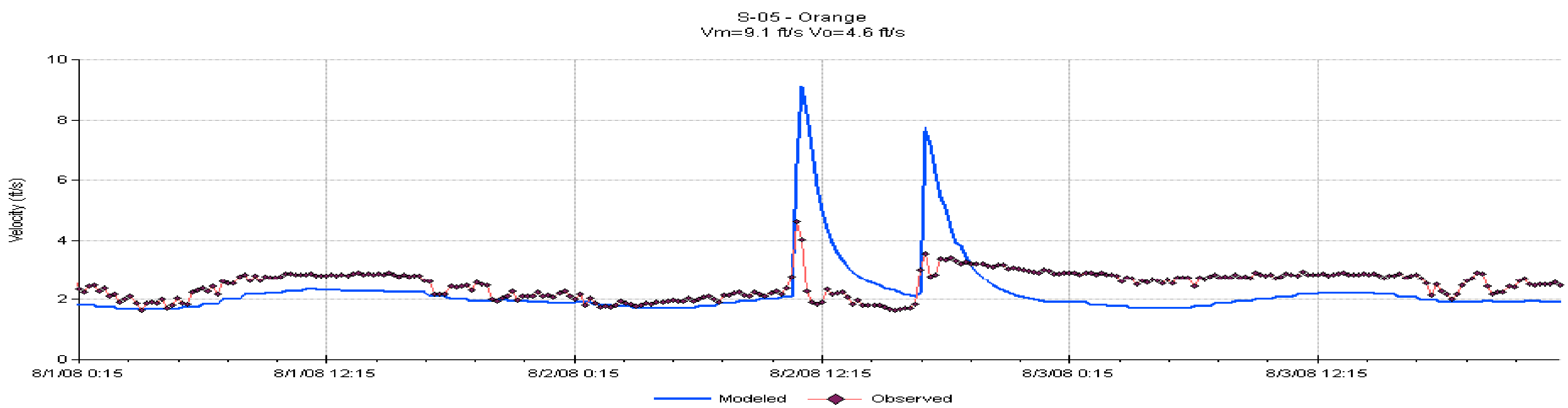

S-04 - A portion of Bouck
Vm=21.9 ft/s Vo=11.3 ft/s
Velocity (ft/s)
25
20
15
10
5
0
8/1/08 0:15
8/1/08 12:15
8/2/08 0:15
8/2/08 12:15
8/3/08 0:15
8/3/08 12:15
Modeled
Observed



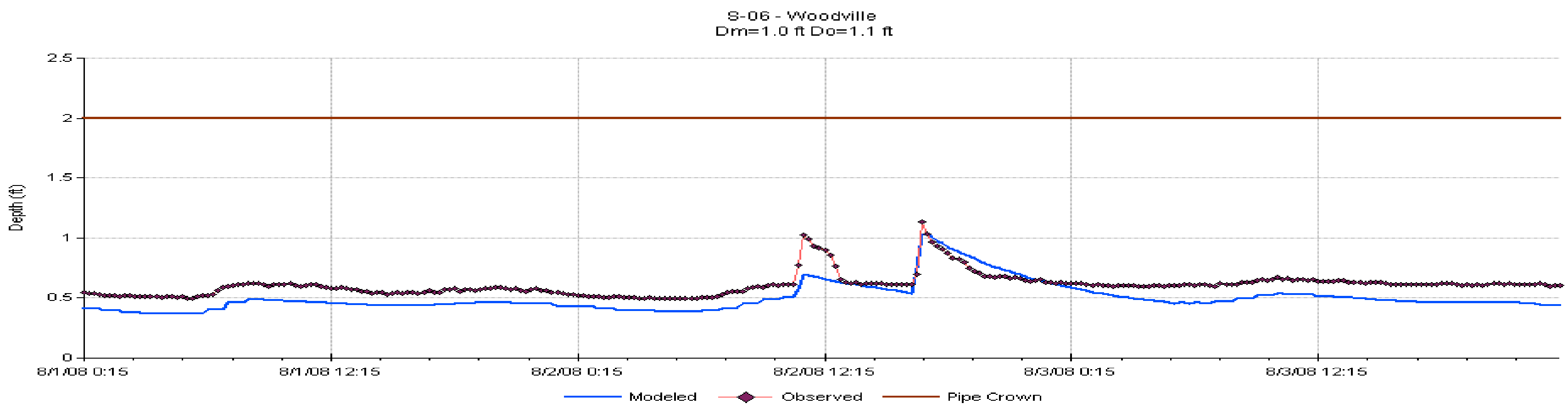
S-05 - Orange
Dm=1.6 ft Do=3.5 ft
Depth (ft)
0
1
2
3
4
5
8/1/08 0:15
8/1/08 12:15
8/2/08 0:15
8/2/08 12:15
8/3/08 0:15
8/3/08 12:15
Modeled
Observed
Pipe Crown

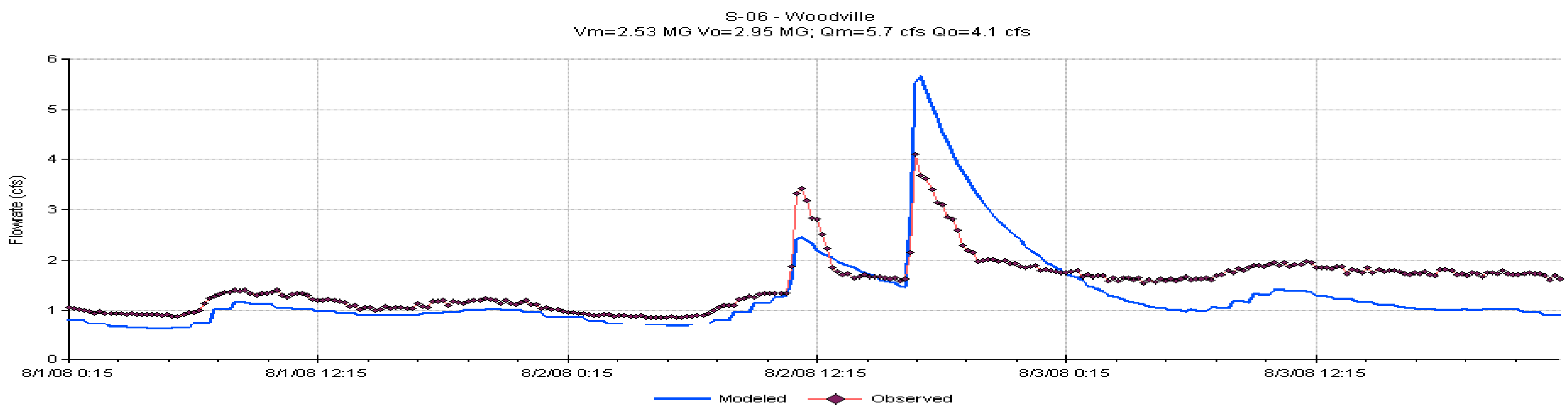


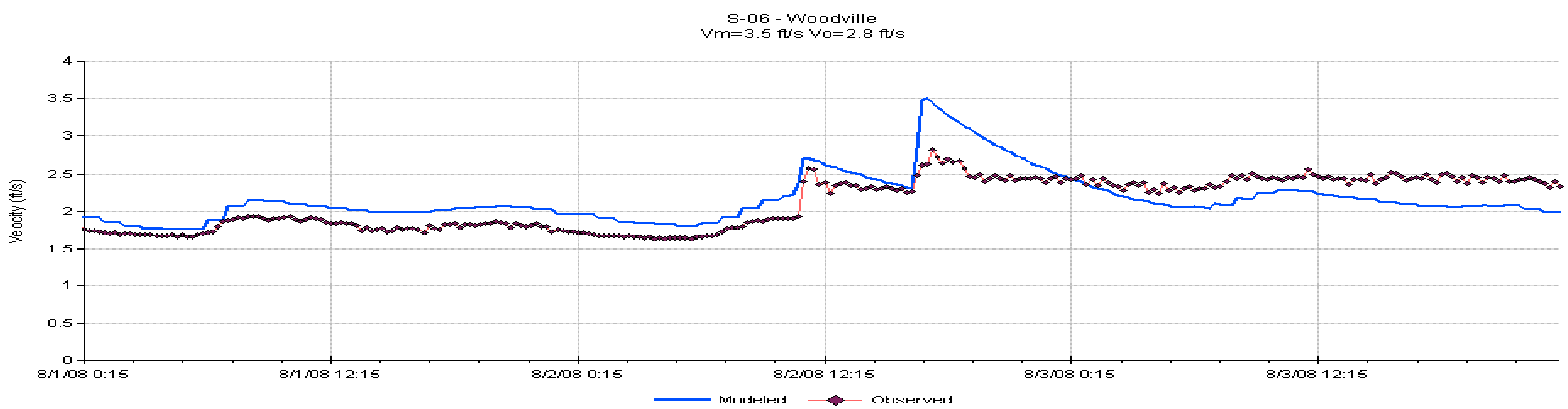
S-05 - Orange
Vm=4.18 MG Vo=3.81 MG; Qm=87.9 cfs Qo=79.4 cfs
Flowrate (cfs)
0
20
40
60
80
100
8/1/08 0:15
8/1/08 12:15
8/2/08 0:15
8/2/08 12:15
8/3/08 0:15
8/3/08 12:15
Modeled
Observed

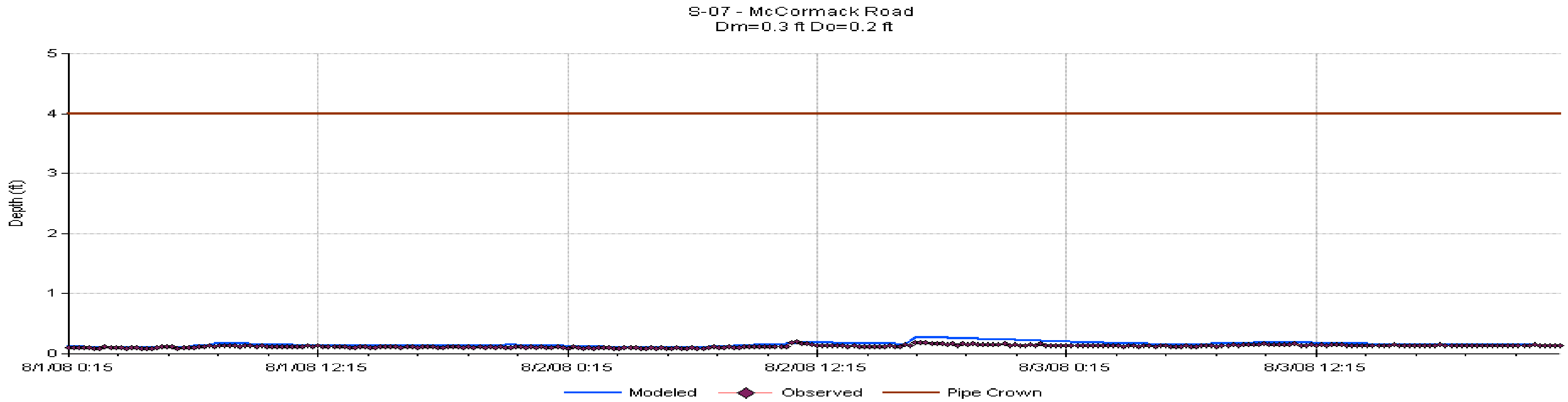


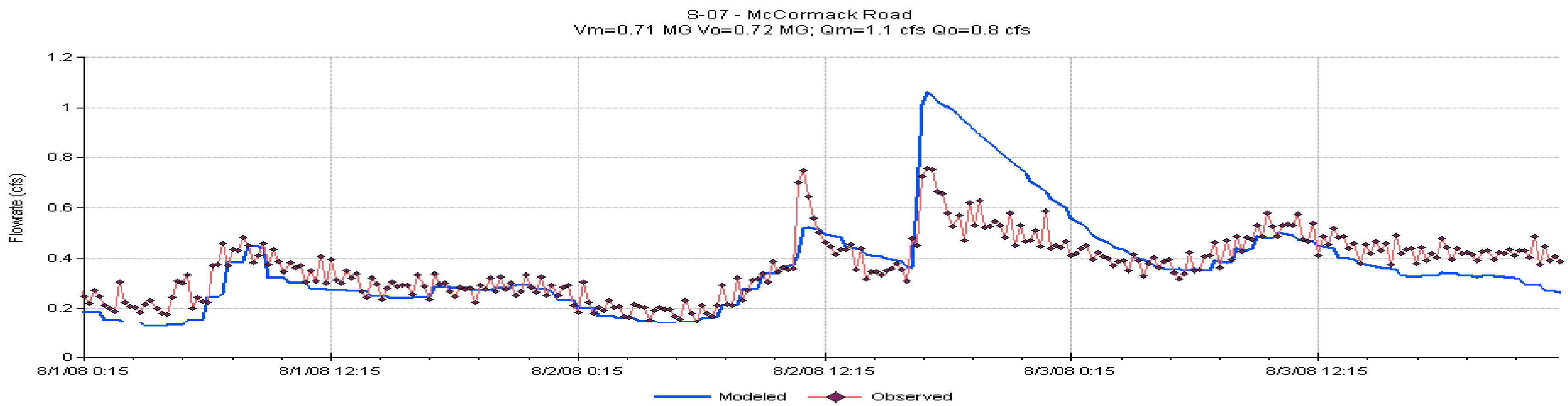
S-05 - Orange
Vm=9.1 ft/s Vo=4.6 ft/s
Velocity (ft/s)
0
2
4
6
8
10
8/1/08 0:15
8/1/08 12:15
8/2/08 0:15
8/2/08 12:15
8/3/08 0:15
8/3/08 12:15
Modeled
Observed

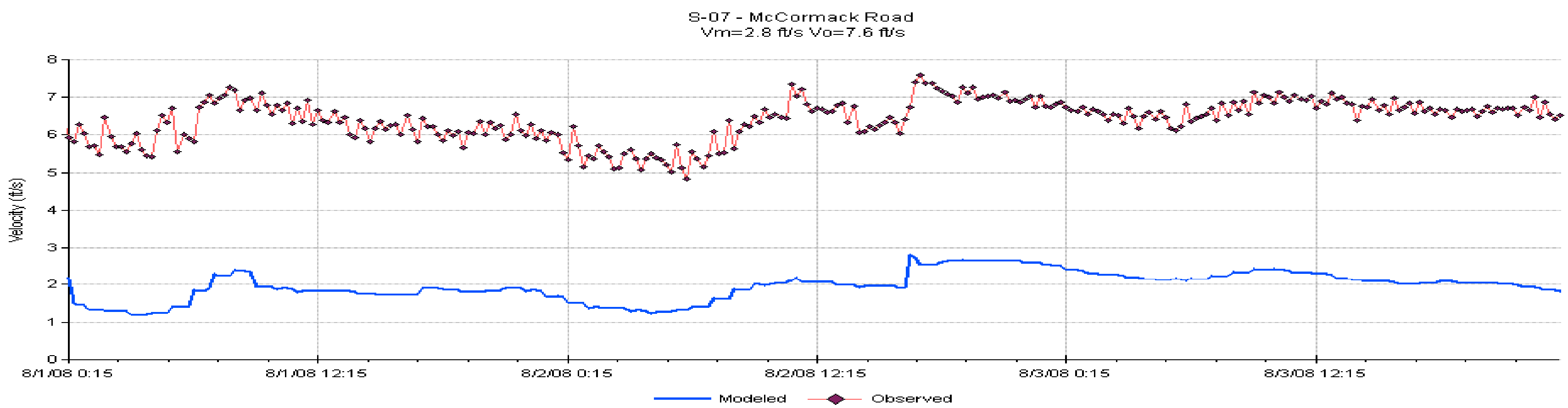

S-06 - Woodville
Dm=1.0 ft Do=1.1 ft
Depth (ft)
2.5
2
1.5
1
0.5
0
8/1/08 0:15
8/1/08 12:15
8/2/08 0:15
8/2/08 12:15
8/3/08 0:15
8/3/08 12:15
Modeled
Observed
Pipe Crown


S-06 - Woodville
Vm=2.53 MG Vo=2.95 MG; Qm=5.7 cfs Qo=4.1 cfs
Flowrate (cfs)
6
5
4
3
2
1
0
8/1/08 0:15
8/1/08 12:15
8/2/08 0:15
8/2/08 12:15
8/3/08 0:15
8/3/08 12:15
Modeled
Observed

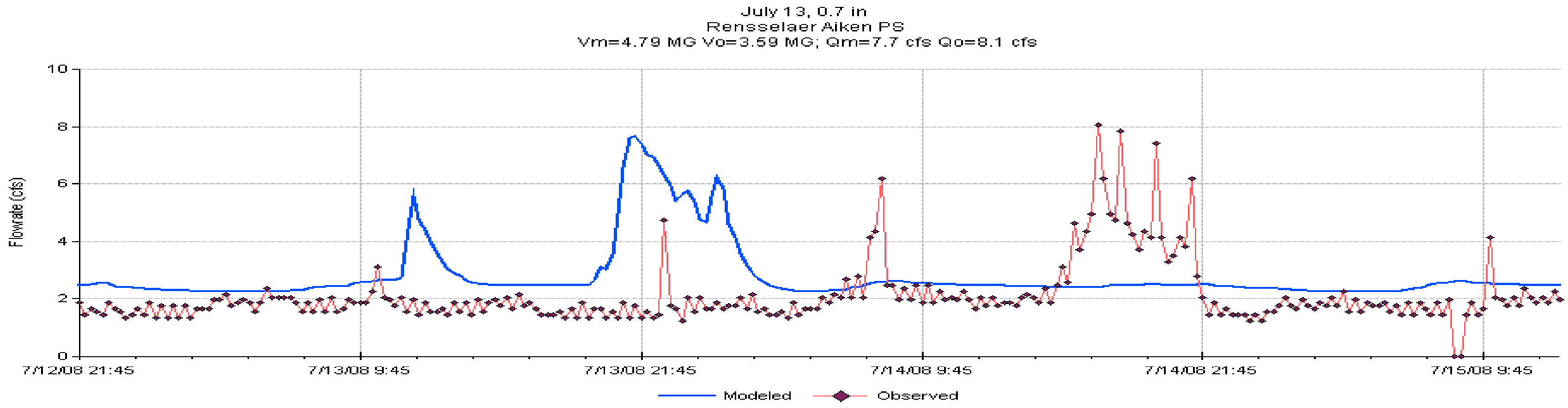

S-06 - Woodville
Vm=3.5 ft/s Vo=2.8 ft/s
Velocity (ft/s)
4
3.5
3
2.5
2
1.5
1
0.5
0
8/1/08 0:15
8/1/08 12:15
8/2/08 0:15
8/2/08 12:15
8/3/08 0:15
8/3/08 12:15
Modeled
Observed

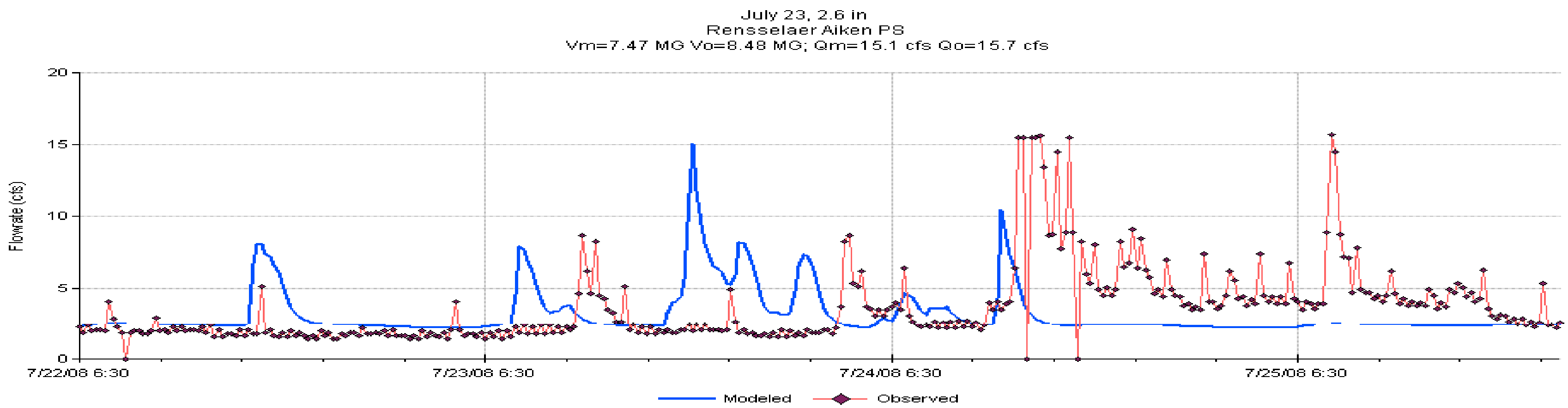

S-07 - McCormack Road
Dm=0.3 ft Do=0.2 ft
Depth (ft)
5
4
3
2
1
0
8/1/08 0:15
8/1/08 12:15
8/2/08 0:15
8/2/08 12:15
8/3/08 0:15
8/3/08 12:15
Modeled
Observed
Pipe Crown

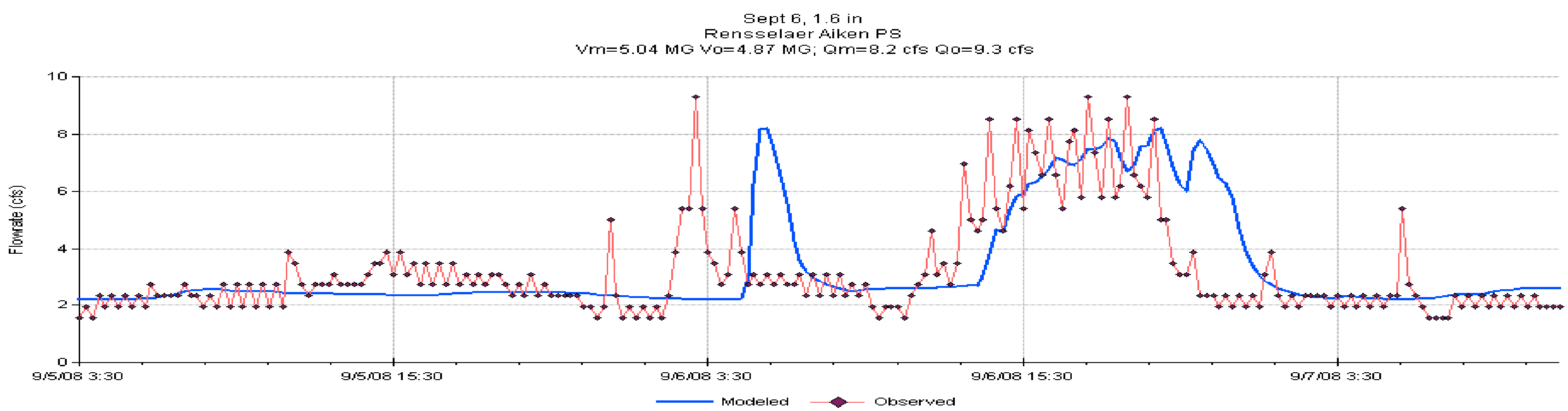

S-07 - McCormack Road
Vm=0.71 MG Vo=0.72 MG; Qm=1.1 cfs Qo=0.8 cfs
Flowrate (cfs)
1.2
1
0.8
0.6
0.4
0.2
0
8/1/08 0:15
8/1/08 12:15
8/2/08 0:15
8/2/08 12:15
8/3/08 0:15
8/3/08 12:15
Modeled
Observed

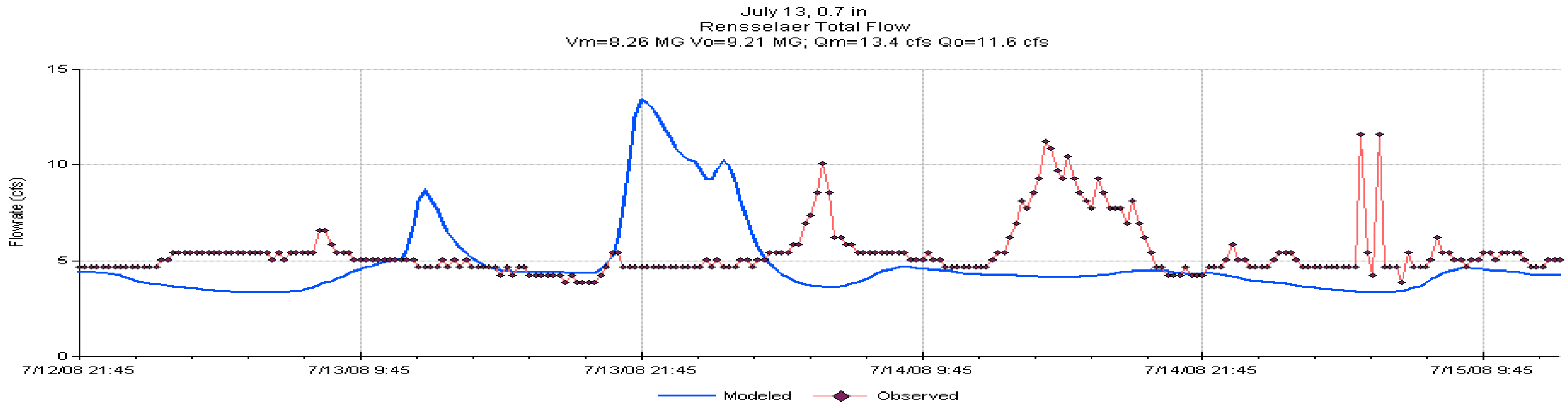

S-07 - McCormack Road
Vm=2.8 ft/s Vo=7.6 ft/s
Velocity (ft/s)
8
7
6
5
4
3
2
1
0
8/1/08 0:15
8/1/08 12:15
8/2/08 0:15
8/2/08 12:15
8/3/08 0:15
8/3/08 12:15
Modeled
Observed

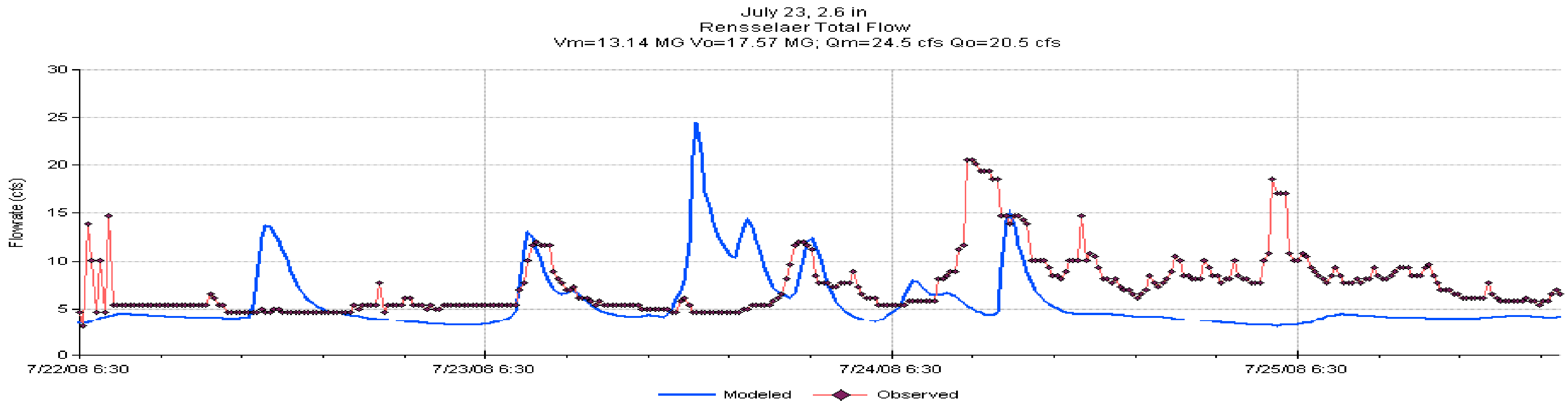
Appendix E. Rensselaer principal storm calibration

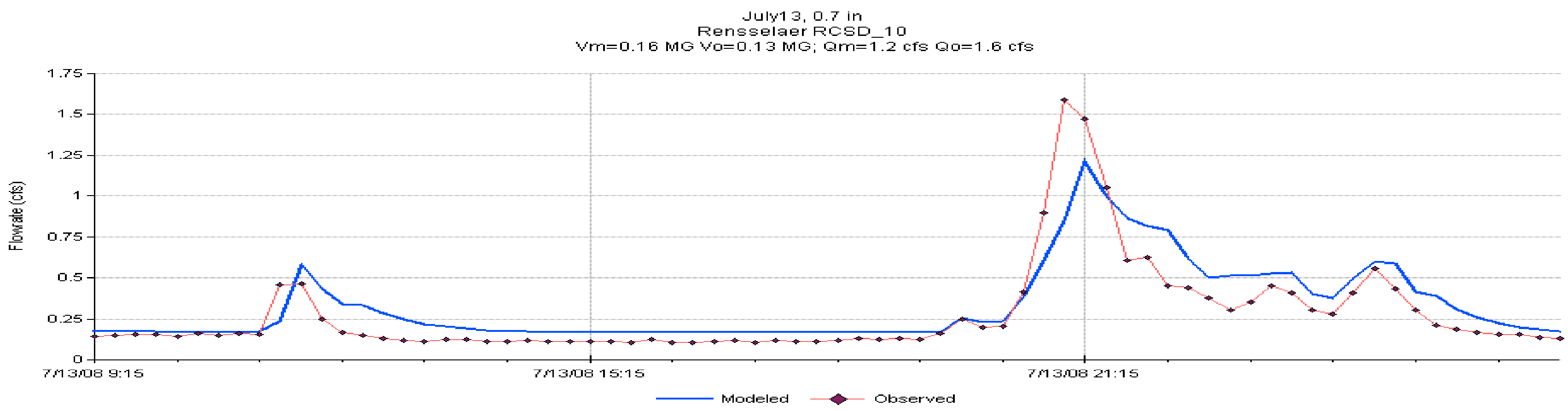

July 13, 0.7 in
Rensselaer Aiken PS
Vm=4.79 MG Vo=3.59 MG; Qm=7.7 cfs Qo=8.1 cfs
Flowrate (cfs)
10
8
6
4
2
0
7/12/08 21:45
7/13/08 9:45
7/13/08 21:45
7/14/08 9:45
7/14/08 21:45
7/15/08 9:45
Modeled
Observed

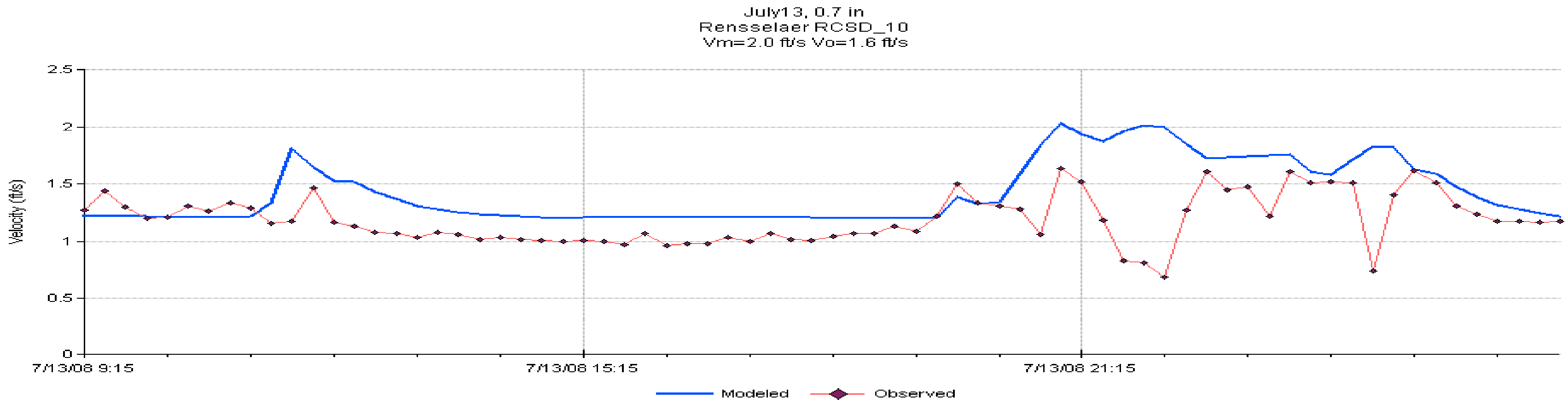

July 23, 2.6 in
Rensselaer Aiken PS
Vm=7.47 MG Vo=8.48 MG; Qm=15.1 cfs Qo=15.7 cfs
Flowrate (cfs)
20
15
10
5
0
7/22/08 6:30
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
Modeled
Observed

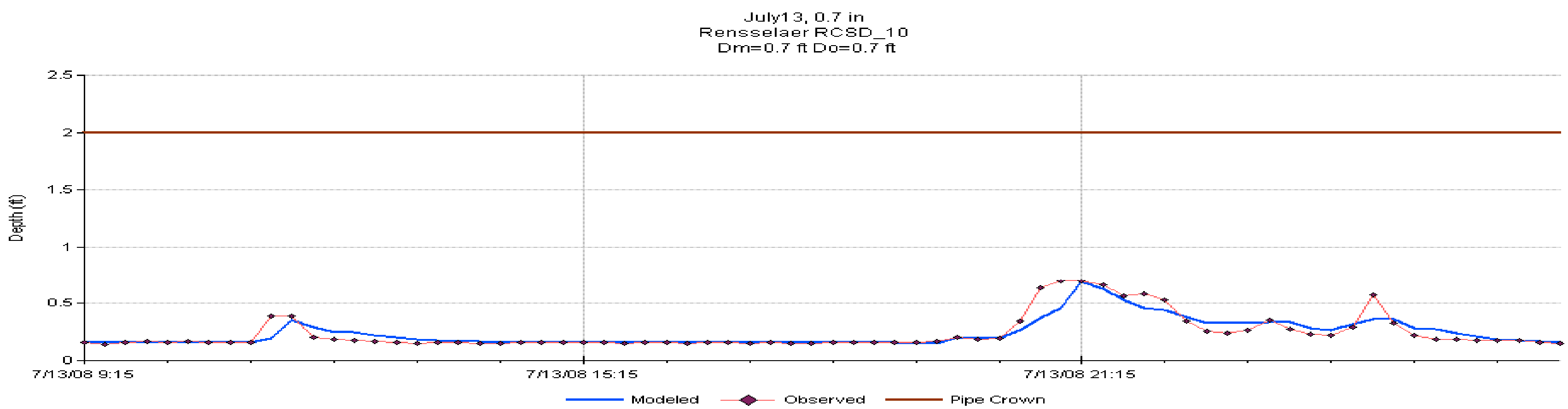

Sept 6, 1.6 in
Rensselaer Aiken PS
Vm=5.04 MG Vo=4.87 MG; Qm=8.2 cfs Qo=9.3 cfs
Flowrate (cfs)
10
8
6
4
2
0
9/5/08 3:30
9/5/08 15:30
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
Modeled
Observed

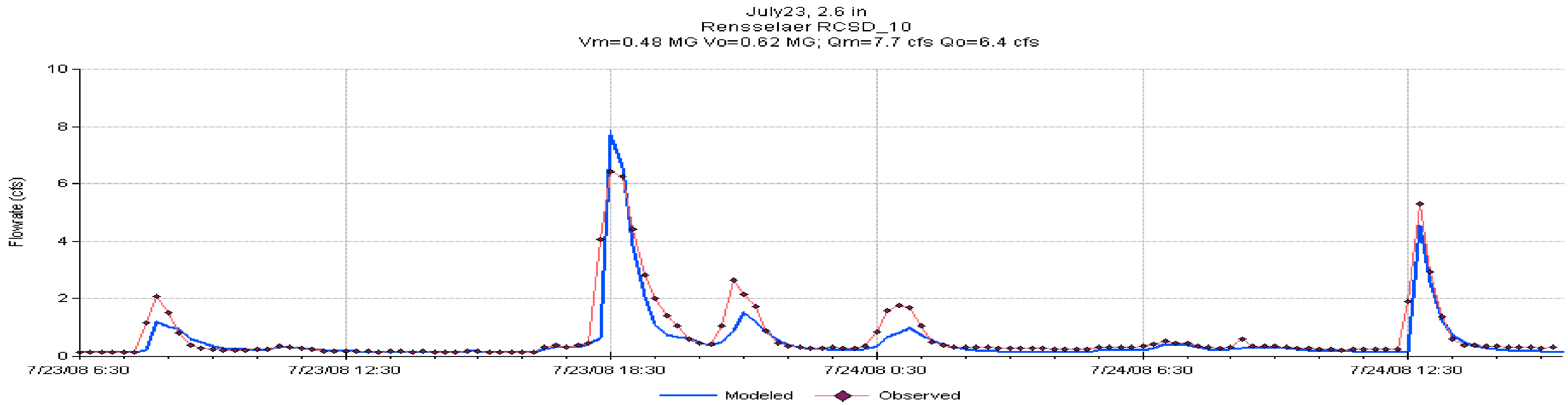

July 13, 0.7 in
Rensselaer Total Flow
Vm=8.26 MG Vo=9.21 MG; Qm=13.4 cfs Qo=11.6 cfs
Flowrate (cfs)
15
10
5
0
7/12/08 21:45
7/13/08 9:45
7/13/08 21:45
7/14/08 9:45
7/14/08 21:45
7/15/08 9:45
Modeled
Observed

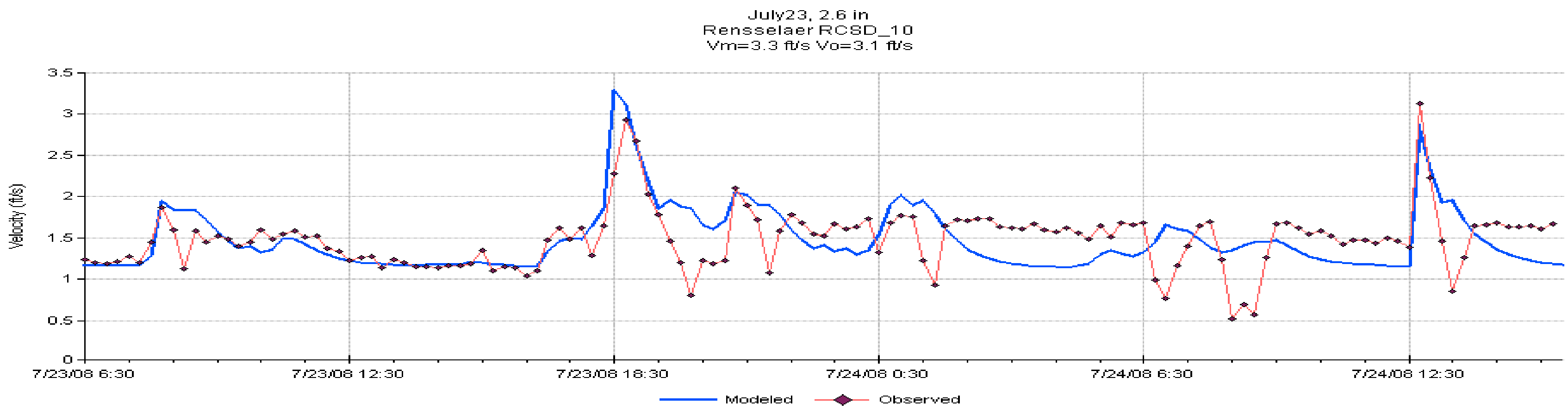

July 23, 2.6 in
Rensselaer Total Flow
Vm=13.14 MG Vo=17.57 MG; Qm=24.5 cfs Qo=20.5 cfs
Flowrate (cfs)
30
25
20
15
10
5
0
7/22/08 6:30
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
Modeled
Observed

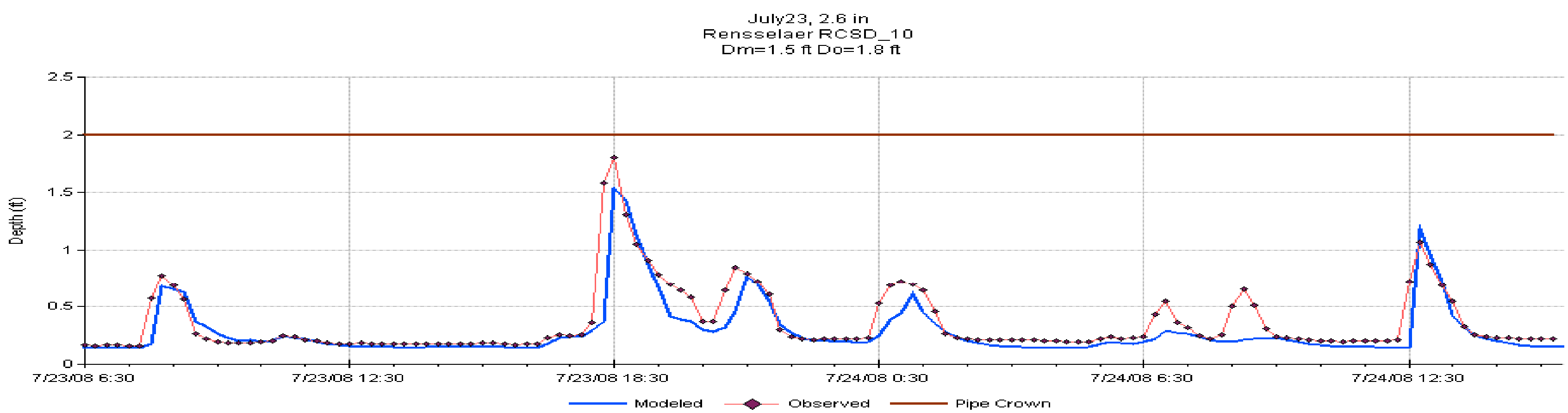

July13, 0.7 in
Rensselaer RCSD_10
Vm=0.16 MG Vo=0.13 MG; Qm=1.2 cfs Qo=1.6 cfs
Flowrate (cfs)
0
0.25
0.5
0.75
1
1.25
1.5
1.75
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
Modeled
Observed

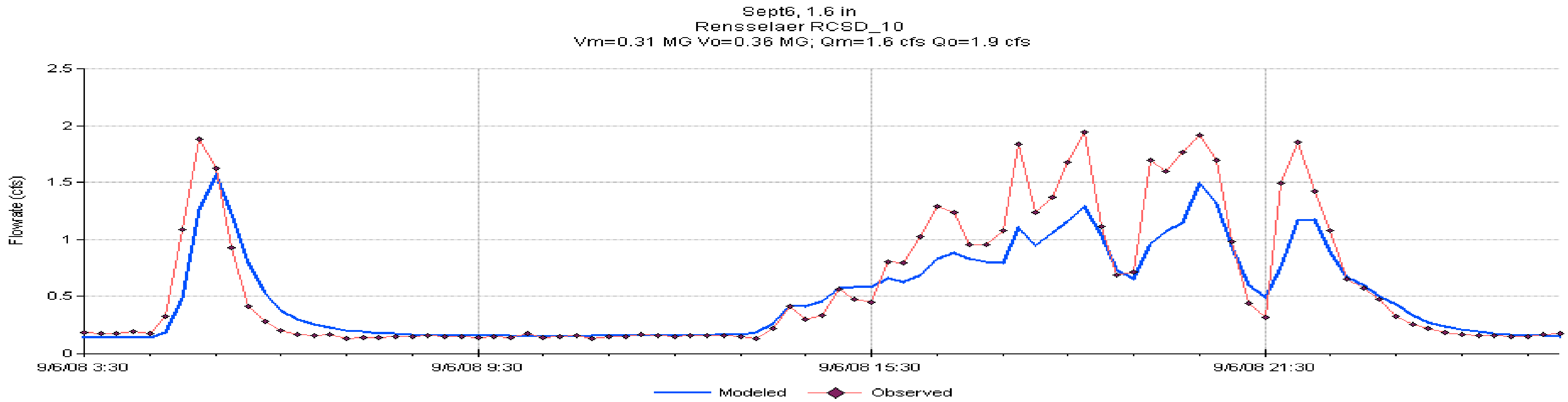

July13, 0.7 in
Rensselaer RCSD_10
Vm=2.0 ft/s Vo=1.6 ft/s
Velocity (ft/s)
0
0.5
1
1.5
2
2.5
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
Modeled
Observed

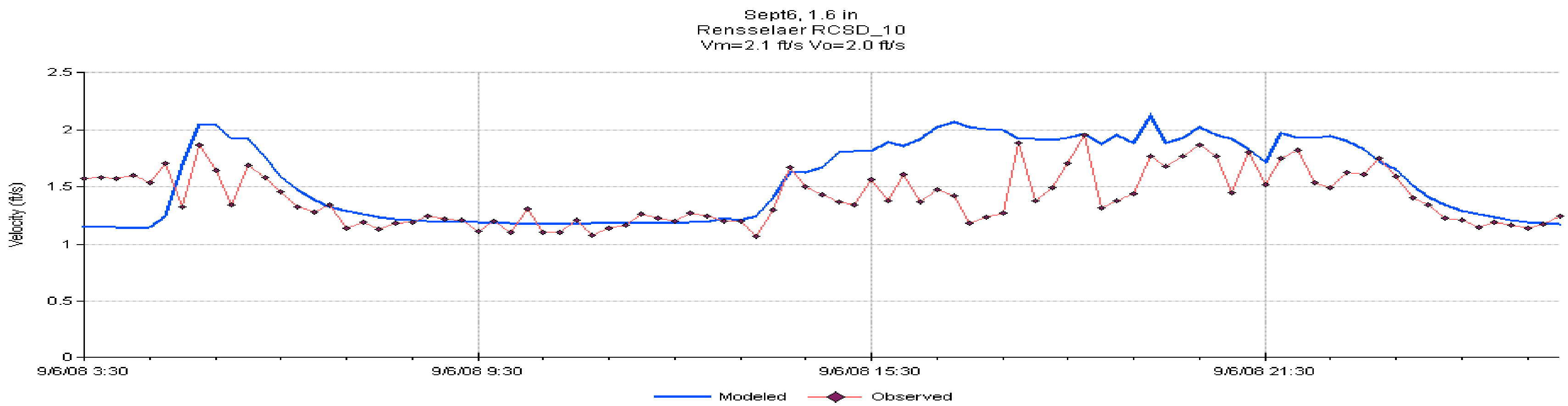

July13, 0.7 in
Rensselaer RCSD_10
Dm=0.7 ft Do=0.7 ft
Depth (ft)
0
0.5
1
1.5
2
2.5
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
Modeled
Observed
Pipe Crown

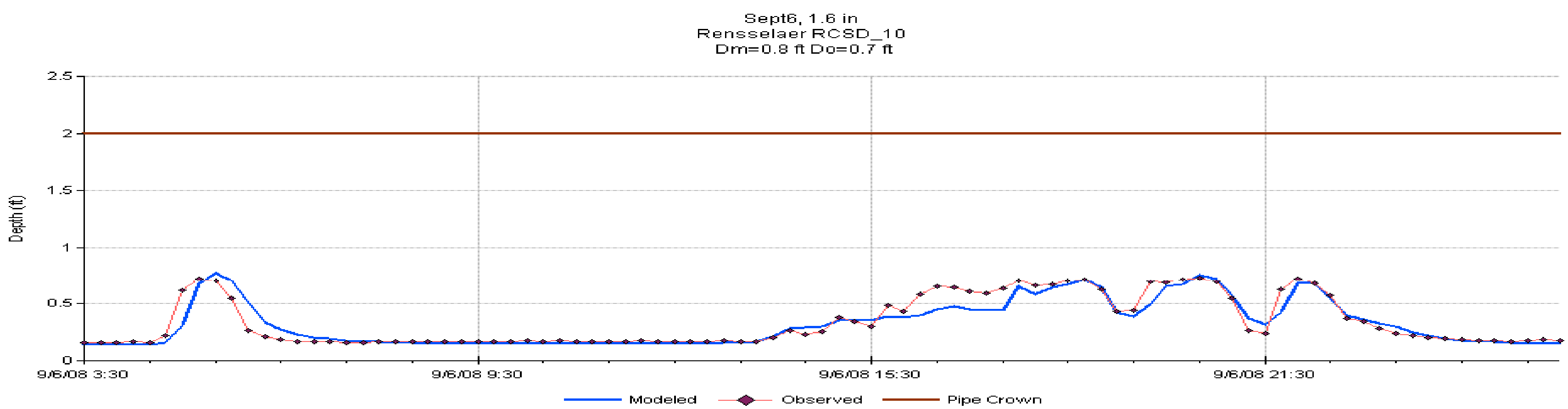

July23, 2.6 in
Rensselaer RCSD_10
Vm=0.48 MG Vo=0.62 MG; Qm=7.7 cfs Qo=6.4 cfs
Flowrate (cfs)
0
2
4
6
8
10
7/23/08 6:30
7/23/08 12:30
7/23/08 18:30
7/24/08 0:30
7/24/08 6:30
7/24/08 12:30
Modeled
Observed

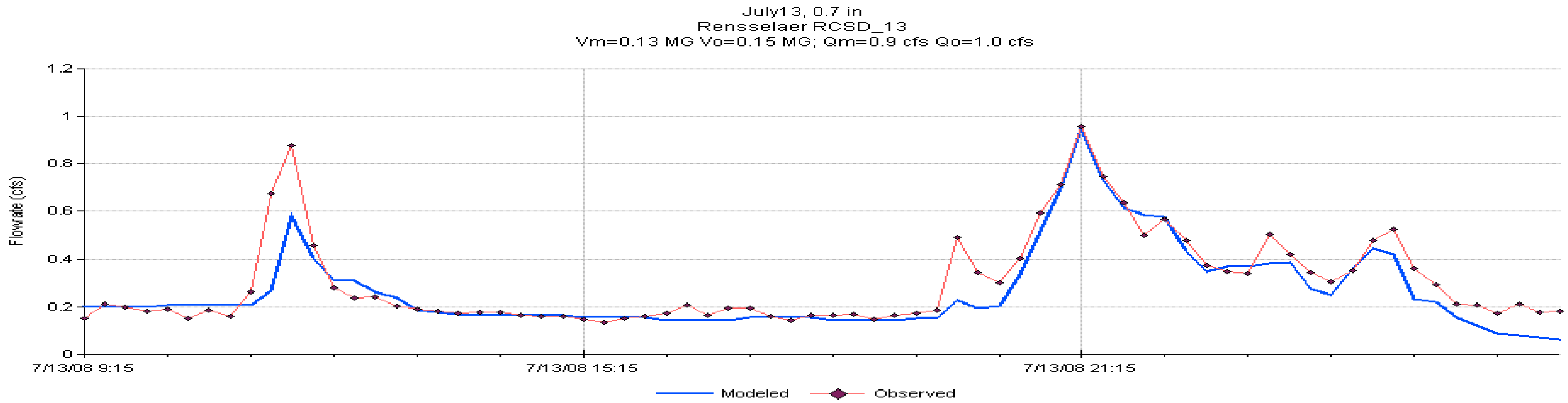

July23, 2.6 in
Rensselaer RCSD_10
Vm=3.3 ft/s Vo=3.1 ft/s
Velocity (ft/s)
0
0.5
1
1.5
2
2.5
3
3.5
7/23/08 6:30
7/23/08 12:30
7/23/08 18:30
7/24/08 0:30
7/24/08 6:30
7/24/08 12:30
Modeled
Observed

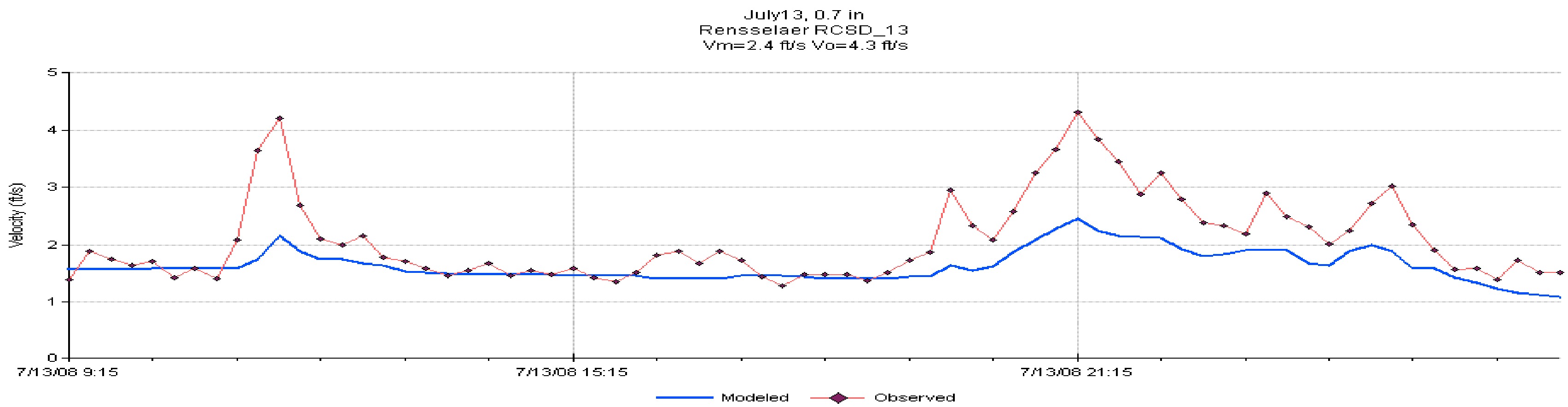

July23, 2.6 in
Rensselaer RCSD_10
Dm=1.5 ft Do=1.8 ft
Depth (ft)
0
0.5
1
1.5
2
2.5
7/23/08 6:30
7/23/08 12:30
7/23/08 18:30
7/24/08 0:30
7/24/08 6:30
7/24/08 12:30
Modeled
Observed
Pipe Crown

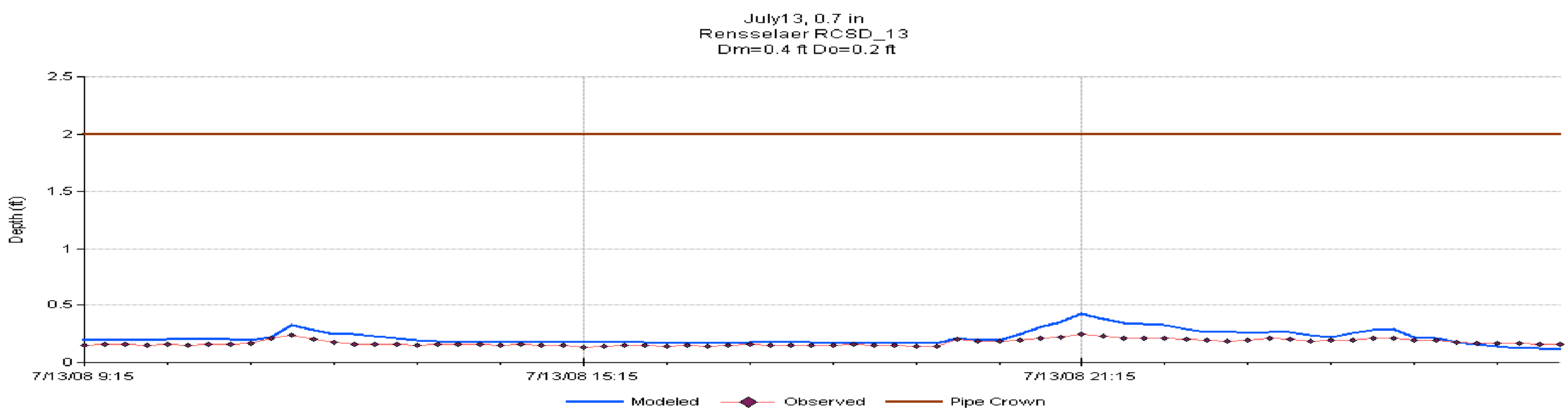

Sept6, 1.6 in
Rensselaer RCSD_10
Vm=0.31 MG Vo=0.36 MG; Qm=1.6 cfs Qo=1.9 cfs
Flowrate (cfs)
9/6/08 3:30
9/6/08 9:30
9/6/08 15:30
9/6/08 21:30
Modeled
Observed


Sept6, 1.6 in
Rensselaer RCSD_10
Vm=2.1 ft/s Vo=2.0 ft/s
Velocity (ft/s)
9/6/08 3:30
9/6/08 9:30
9/6/08 15:30
9/6/08 21:30
Modeled
Observed

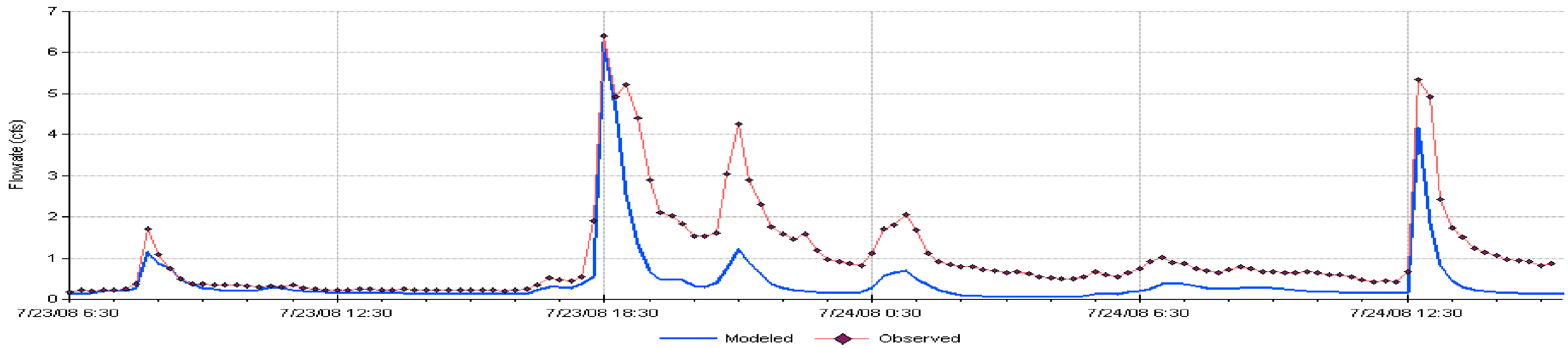

Sept6, 1.6 in
Rensselaer RCSD_10
Dm=0.8 ft Do=0.7 ft
Depth (ft)
9/6/08 3:30
9/6/08 9:30
9/6/08 15:30
9/6/08 21:30
Modeled
Observed
Pipe Crown


July13, 0.7 in
Rensselaer RCSD_13
Vm=0.13 MG Vo=0.15 MG; Qm=0.9 cfs Qo=1.0 cfs
Flowrate (cfs)
1.2
1
0.8
0.6
0.4
0.2
0
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
Modeled
Observed

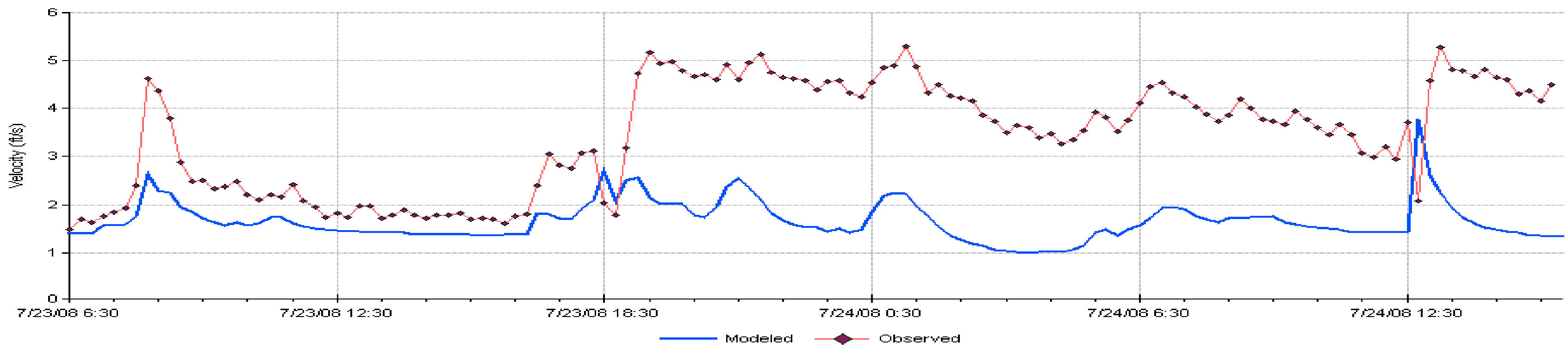

July13, 0.7 in
Rensselaer RCSD_13
Vm=2.4 ft/s Vo=4.3 ft/s
Velocity (ft/s)
5
4
3
2
1
0
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
Modeled
Observed


July13, 0.7 in
Rensselaer RCSD_13
Dm=0.4 ft Do=0.2 ft
Depth (ft)
2.5
2
1.5
1
0.5
0
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
Modeled
Observed
Pipe Crown

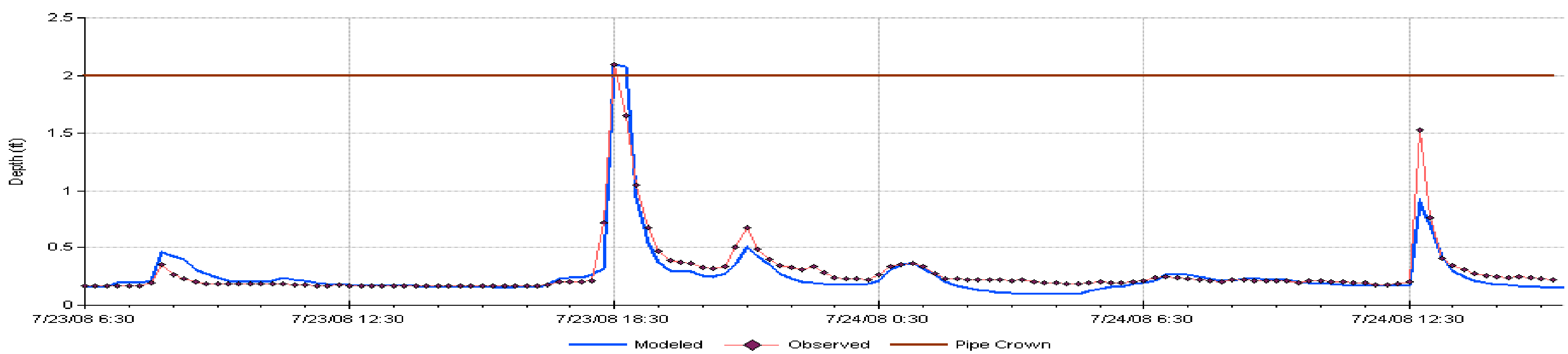
July23, 2.6 in
Rensselaer RCSD_13
Vm=0.37 MG Vo=0.93 MG; Qm=6.3 cfs Qo=6.4 cfs

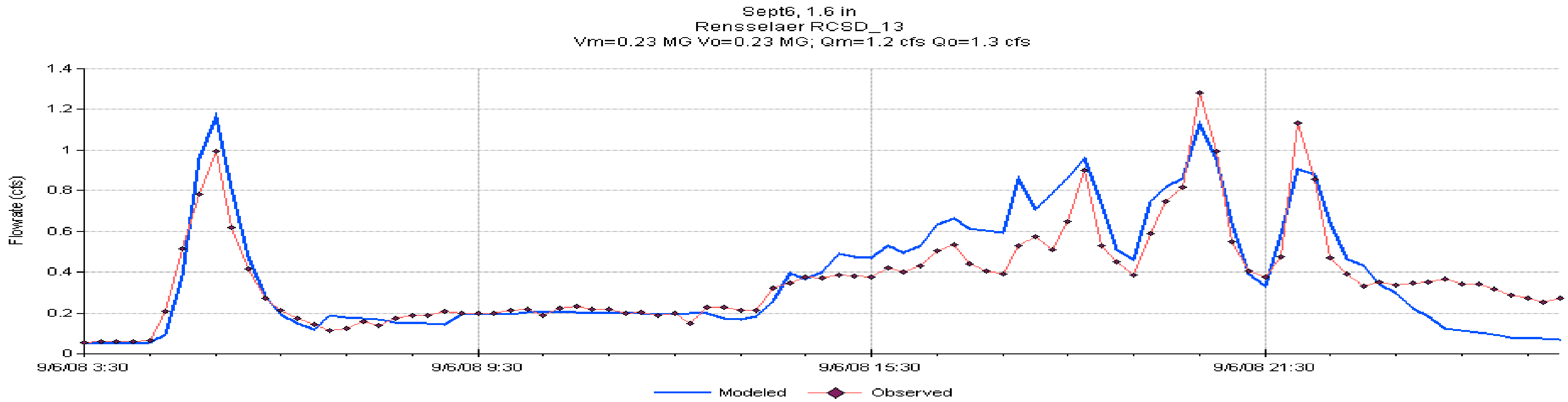


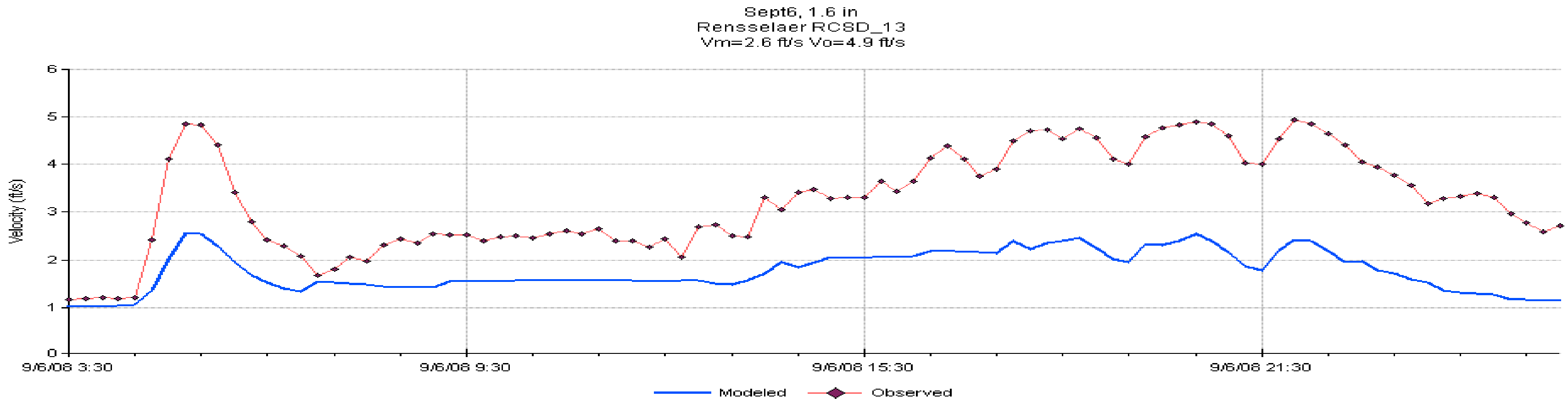
July23, 2.6 in
Rensselaer RCSD_13
Vm=3.8 ft/s Vo=5.3 ft/s

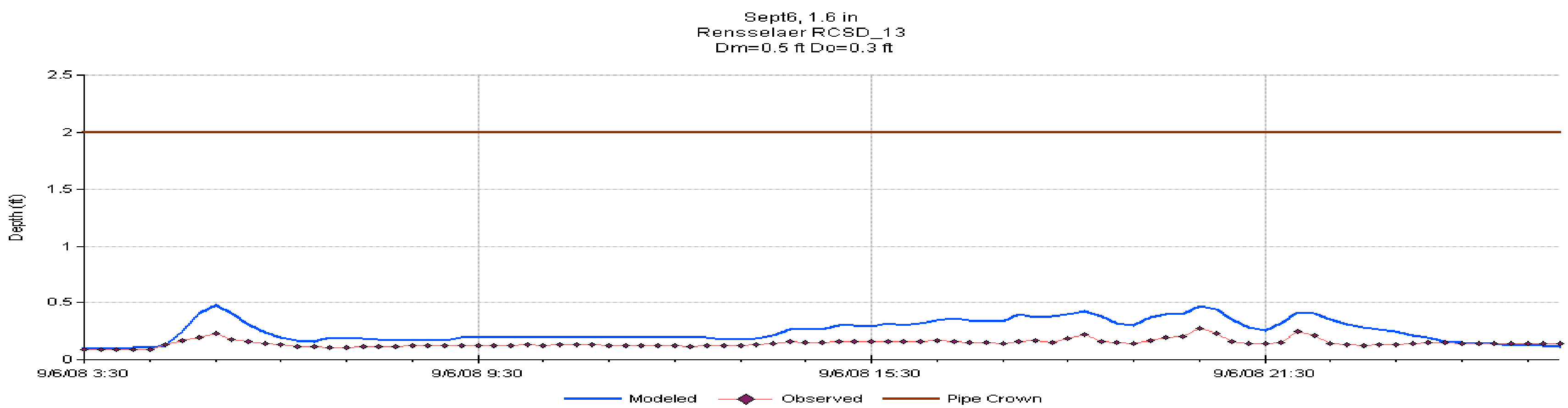


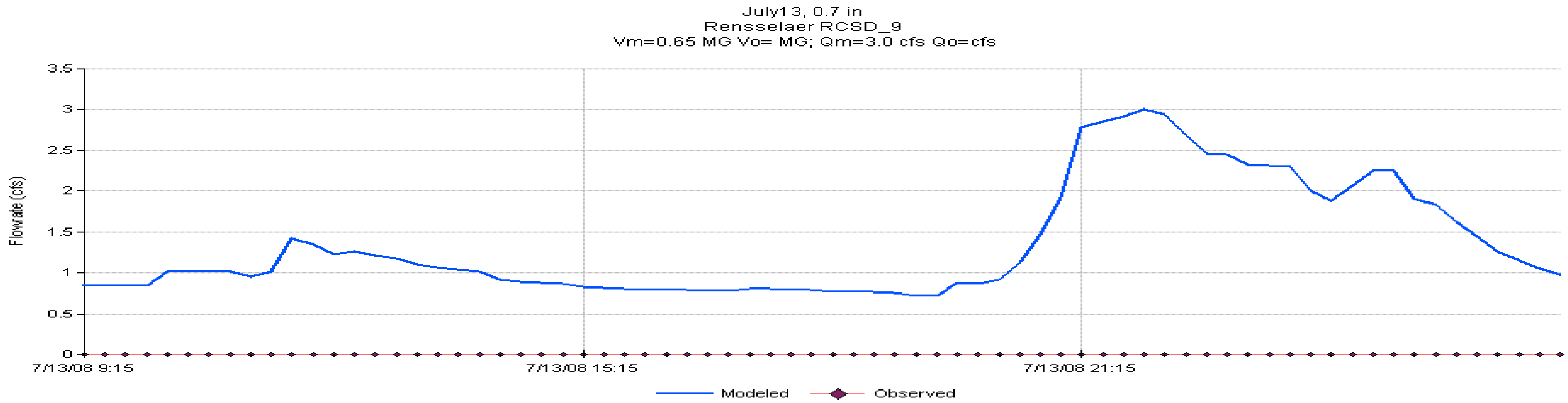
July23, 2.6 in
Rensselaer RCSD_13
Dm=2.1 ft Do=2.1 ft

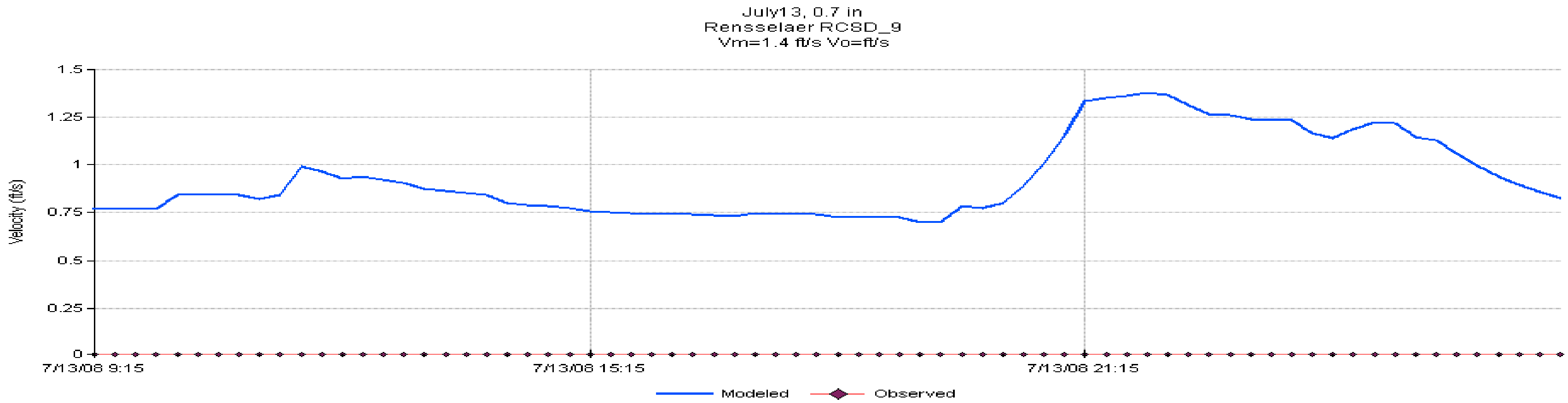


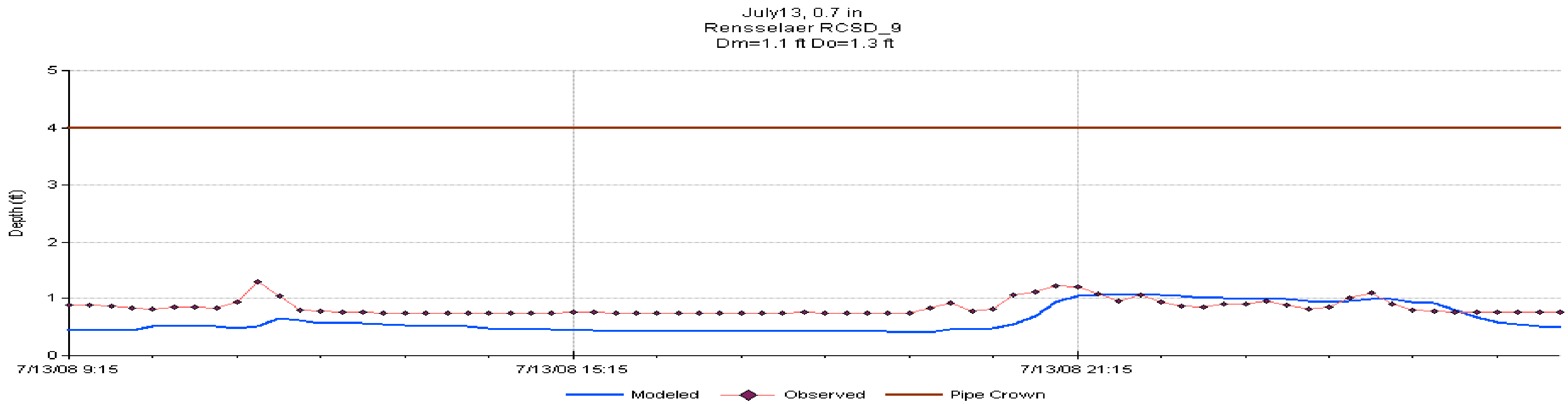

Sept6, 1.6 in
Rensselaer RCSD_13
Vm=0.23 MG Vo=0.23 MG; Qm=1.2 cfs Qo=1.3 cfs
Flowrate (cfs)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
9/6/08 3:30
9/6/08 9:30
9/6/08 15:30
9/6/08 21:30
Modeled
Observed

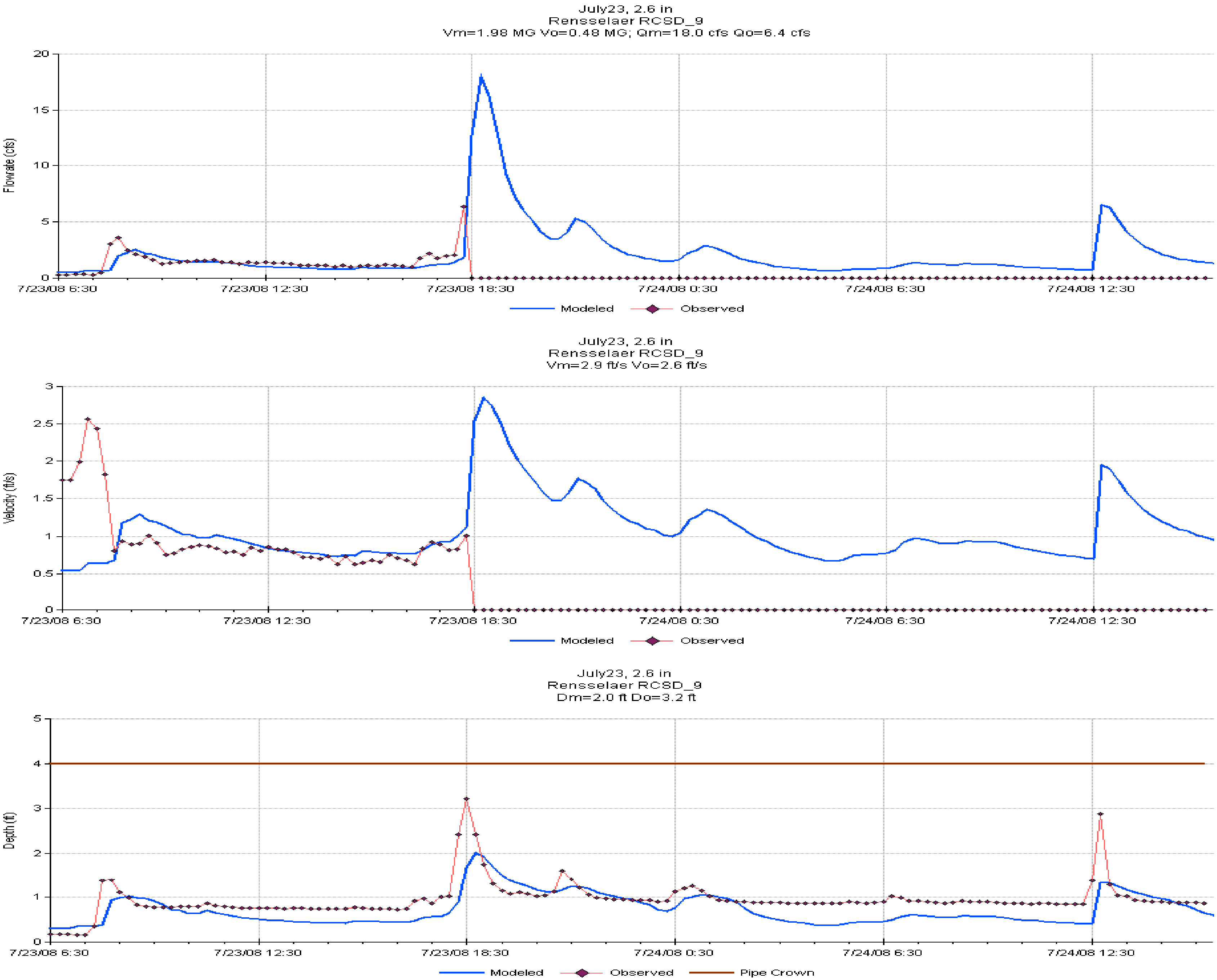

Sept6, 1.6 in
Rensselaer RCSD_13
Vm=2.6 ft/s Vo=4.9 ft/s
Velocity (ft/s)
6
5
4
3
2
1
0
9/6/08 3:30
9/6/08 9:30
9/6/08 15:30
9/6/08 21:30
Modeled
Observed


Sept6, 1.6 in
Rensselaer RCSD_13
Dm=0.5 ft Do=0.3 ft
Depth (ft)
2.5
2
1.5
1
0.5
0
9/6/08 3:30
9/6/08 9:30
9/6/08 15:30
9/6/08 21:30
Modeled
Observed
Pipe Crown

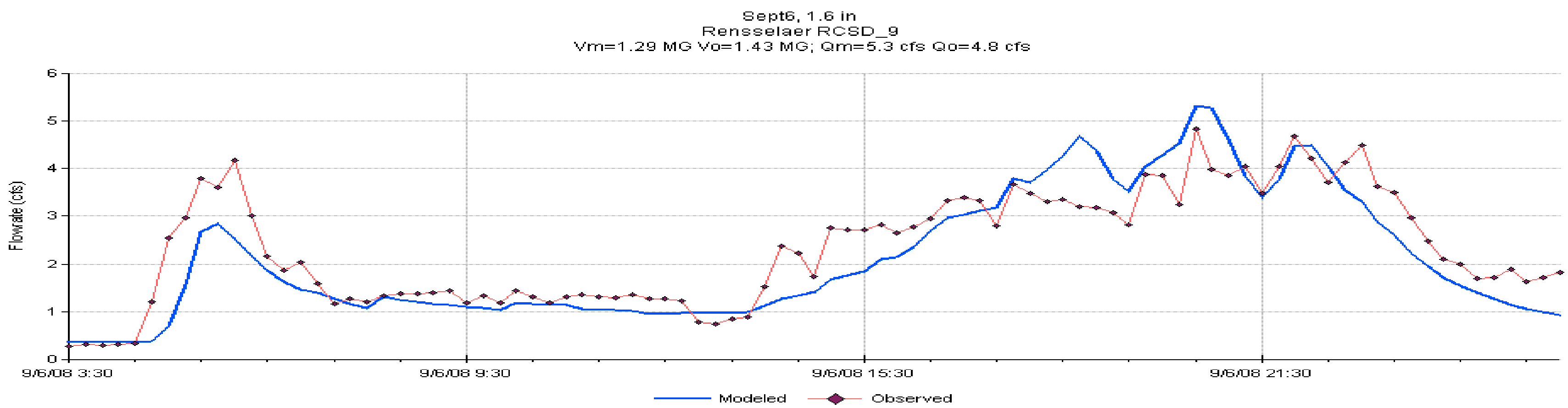

July13, 0.7 in
Rensselaer RCSD_9
Vm=0.65 MG Vo= MG; Qm=3.0 cfs Qo=cfs
Flowrate (cfs)
3.5
3
2.5
2
1.5
1
0.5
0
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
Modeled
Observed

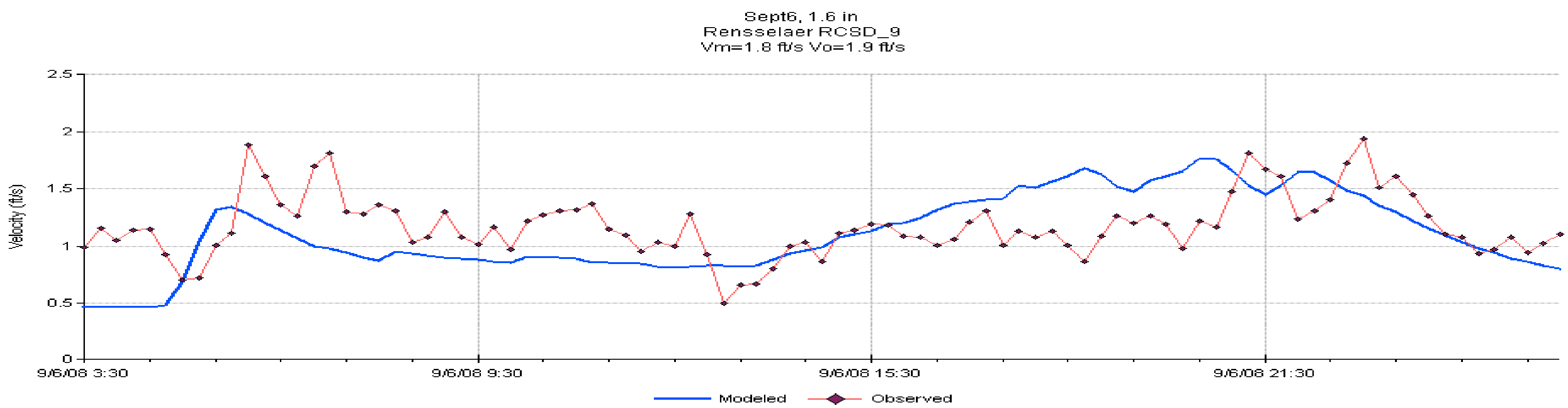

July13, 0.7 in
Rensselaer RCSD_9
Vm=1.4 ft/s Vo=ft/s
Velocity (ft/s)
1.5
1.25
1
0.75
0.5
0.25
0
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
Modeled
Observed

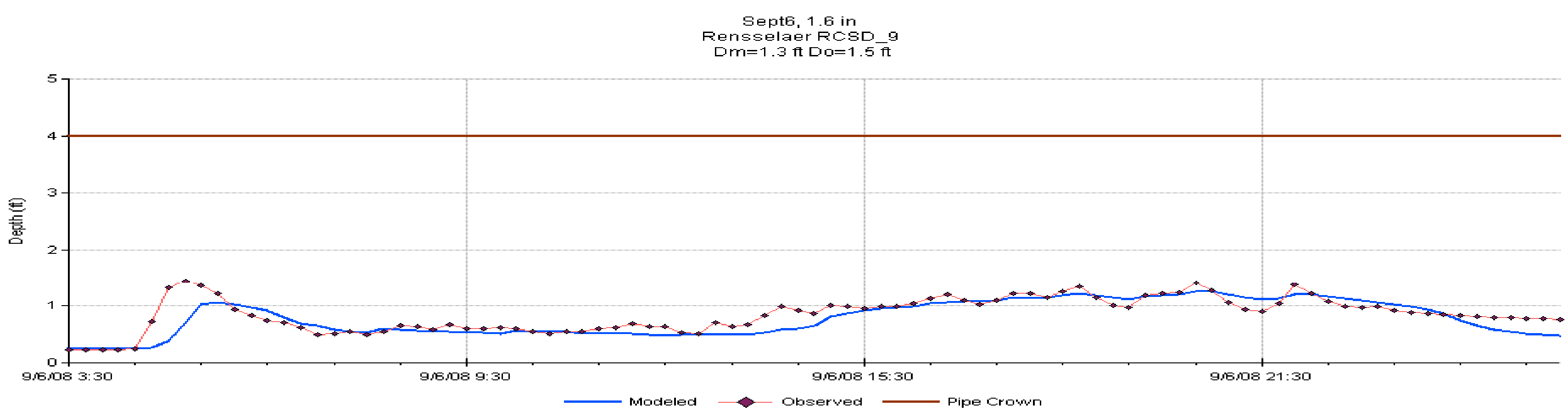

July13, 0.7 in
Rensselaer RCSD_9
Dm=1.1 ft Do=1.3 ft
Depth (ft)
5
4
3
2
1
0
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
Modeled
Observed
Pipe Crown

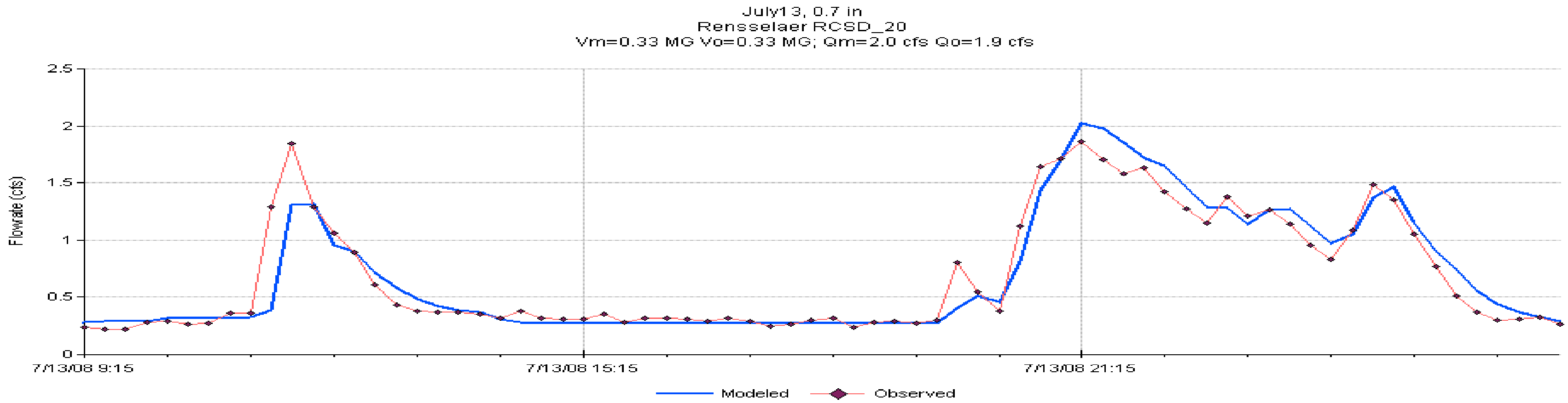


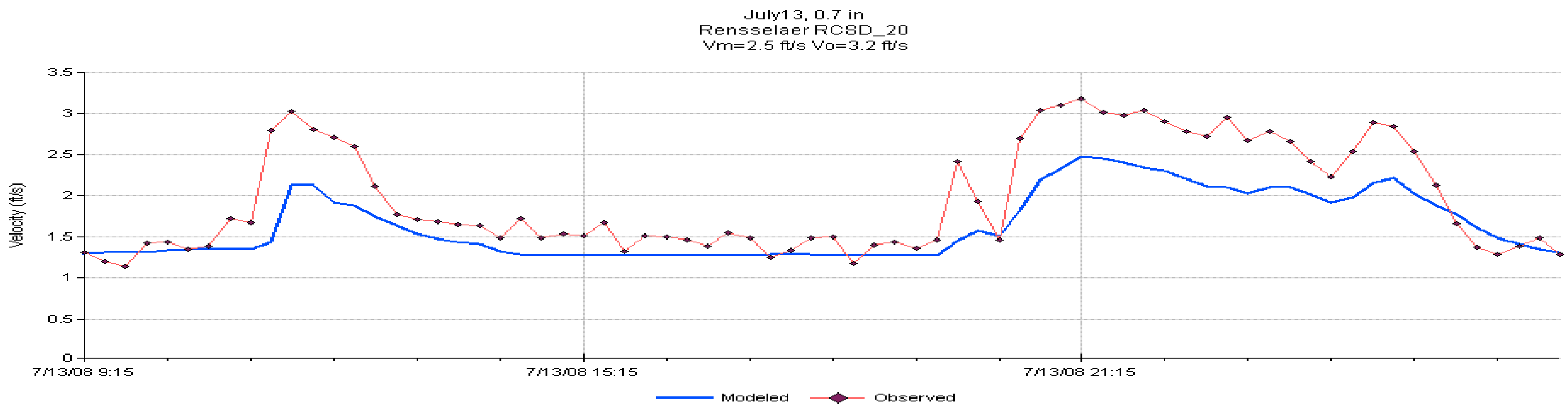
July23, 2.6 in
Rensselaer RCSD_9
Vm=1.98 MG Vo=0.48 MG; Qm=18.0 cfs Qo=6.4 cfs
Flowrate (cfs)
7/23/08 6:30
7/23/08 12:30
7/23/08 18:30
7/24/08 0:30
7/24/08 6:30
7/24/08 12:30
Modeled
Observed
July23, 2.6 in
Rensselaer RCSD_9
Vm=2.9 ft/s Vo=2.6 ft/s
Velocity (ft/s)
7/23/08 6:30
7/23/08 12:30
7/23/08 18:30
7/24/08 0:30
7/24/08 6:30
7/24/08 12:30
Modeled
Observed
July23, 2.6 in
Rensselaer RCSD_9
Dm=2.0 ft Do=3.2 ft
Depth (ft)
7/23/08 6:30
7/23/08 12:30
7/23/08 18:30
7/24/08 0:30
7/24/08 6:30
7/24/08 12:30
Modeled
Observed
Pipe Crown

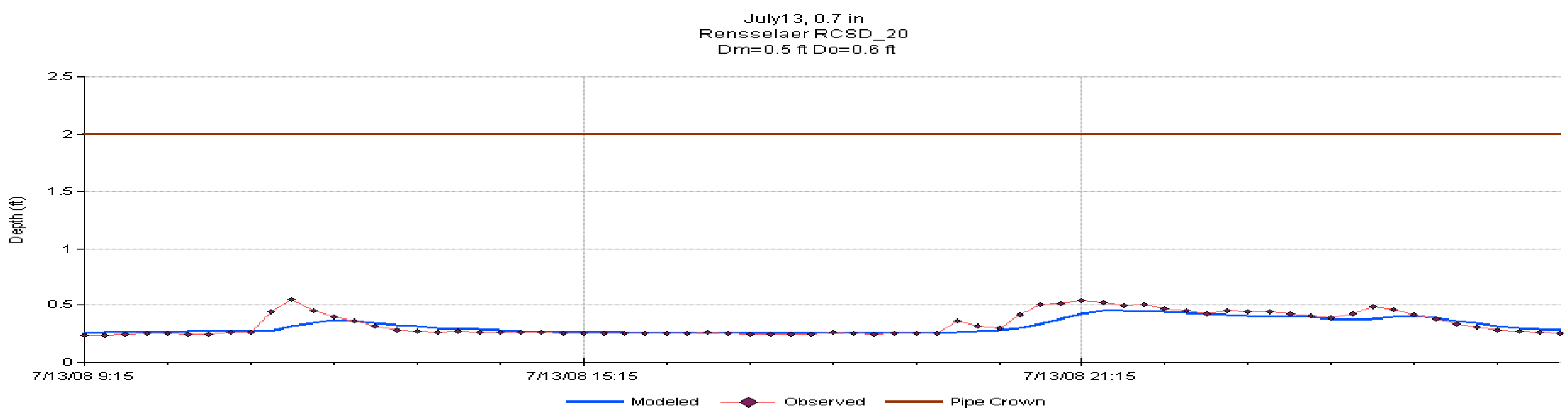

Sept6, 1.6 in
Rensselaer RCSD_9
Vm=1.29 MG Vo=1.43 MG; Qm=5.3 cfs Qo=4.8 cfs
Flowrate (cfs)
9/6/08 3:30
9/6/08 9:30
9/6/08 15:30
9/6/08 21:30
Modeled
Observed

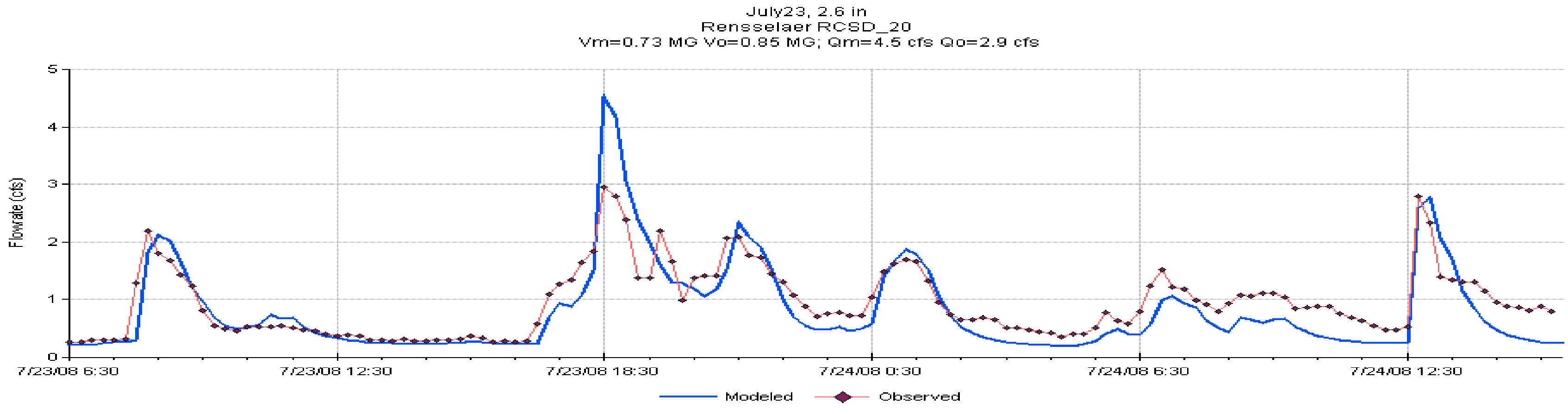

Sept6, 1.6 in
Rensselaer RCSD_9
Vm=1.8 ft/s Vo=1.9 ft/s
Velocity (ft/s)
9/6/08 3:30
9/6/08 9:30
9/6/08 15:30
9/6/08 21:30
Modeled
Observed

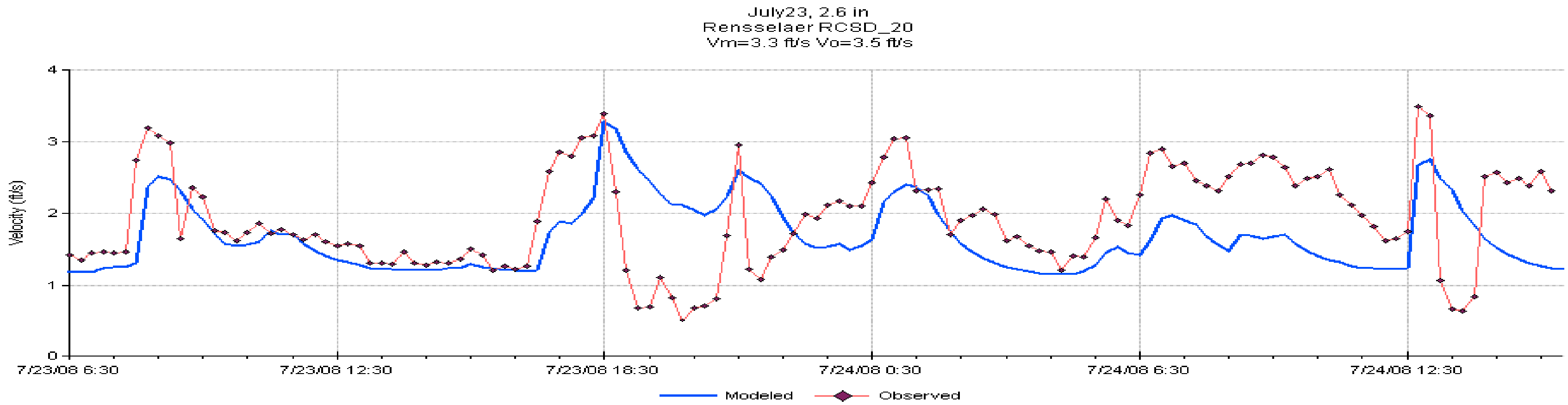

Sept6, 1.6 in
Rensselaer RCSD_9
Dm=1.3 ft Do=1.5 ft
Depth (ft)
9/6/08 3:30
9/6/08 9:30
9/6/08 15:30
9/6/08 21:30
Modeled
Observed
Pipe Crown

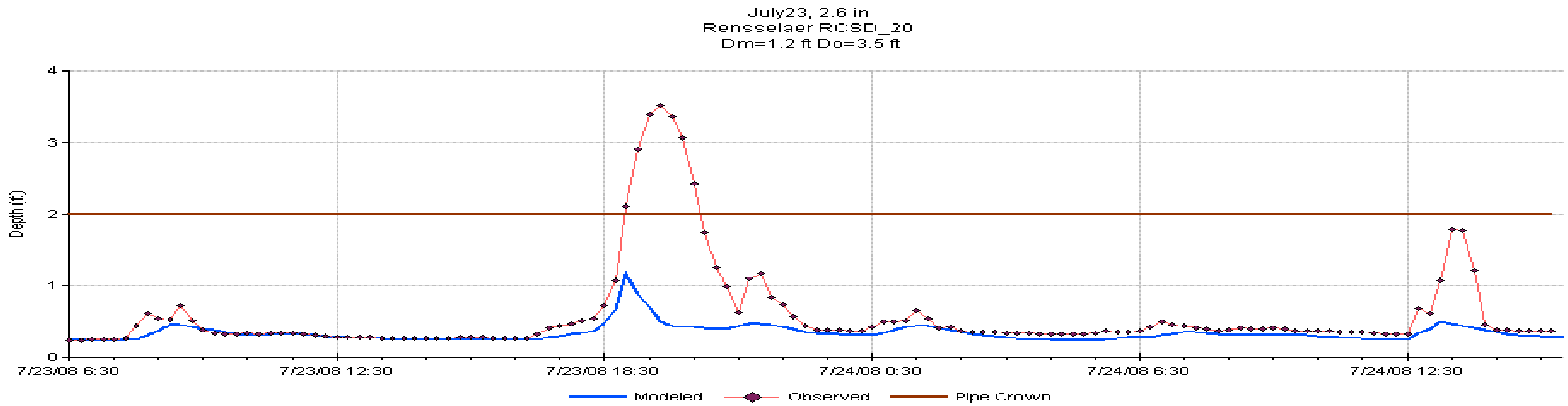

July13, 0.7 in
Rensselaer RCSD_20
Vm=0.33 MG Vo=0.33 MG; Qm=2.0 cfs Qo=1.9 cfs
Flowrate (cfs)
2.5
2
1.5
1
0.5
0
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
Modeled
Observed

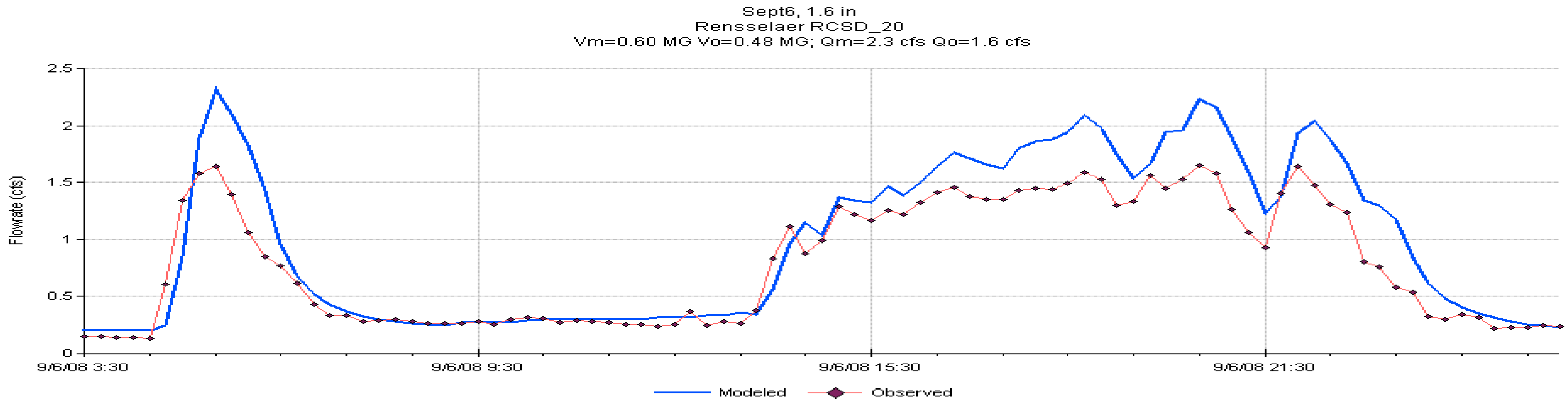

July13, 0.7 in
Rensselaer RCSD_20
Vm=2.5 ft/s Vo=3.2 ft/s
Velocity (ft/s)
3.5
3
2.5
2
1.5
1
0.5
0
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
Modeled
Observed


July13, 0.7 in
Rensselaer RCSD_20
Dm=0.5 ft Do=0.6 ft
Depth (ft)
2.5
2
1.5
1
0.5
0
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
Modeled
Observed
Pipe Crown

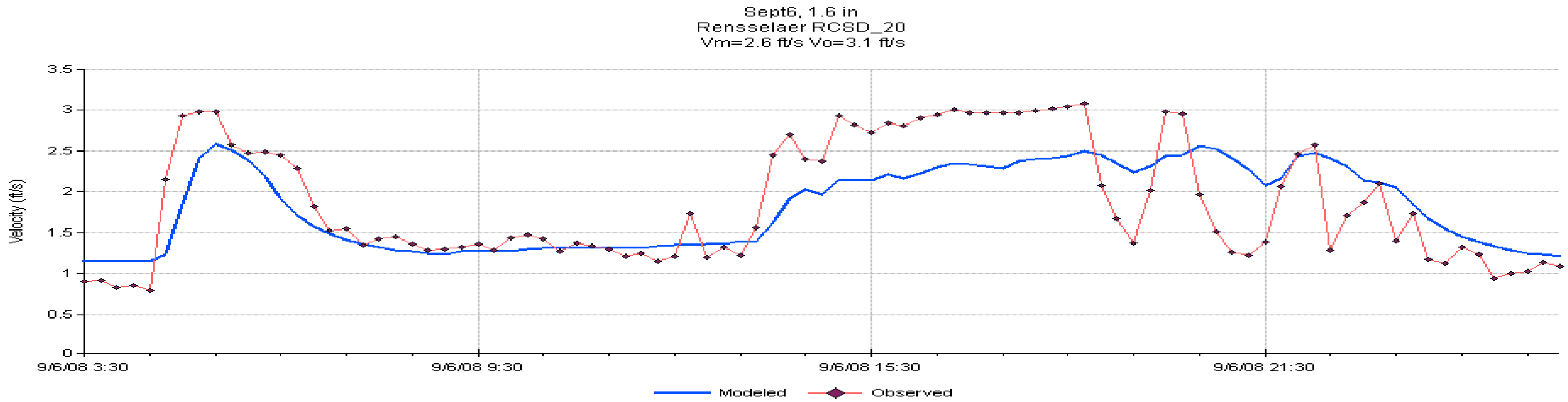

July23, 2.6 in
Rensselaer RCSD_20
Vm=0.73 MG Vo=0.85 MG; Qm=4.5 cfs Qo=2.9 cfs
Flowrate (cfs)
7/23/08 6:30
7/23/08 12:30
7/23/08 18:30
7/24/08 0:30
7/24/08 6:30
7/24/08 12:30
Modeled
Observed


July23, 2.6 in
Rensselaer RCSD_20
Vm=3.3 ft/s Vo=3.5 ft/s
Velocity (ft/s)
7/23/08 6:30
7/23/08 12:30
7/23/08 18:30
7/24/08 0:30
7/24/08 6:30
7/24/08 12:30
Modeled
Observed

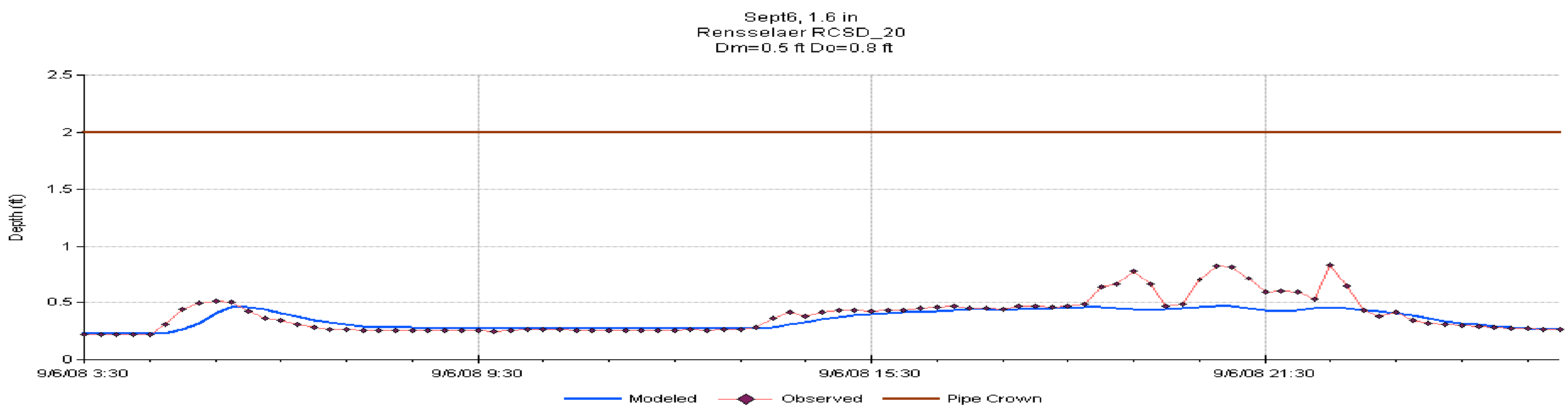

July23, 2.6 in
Rensselaer RCSD_20
Dm=1.2 ft Do=3.5 ft
Depth (ft)
7/23/08 6:30
7/23/08 12:30
7/23/08 18:30
7/24/08 0:30
7/24/08 6:30
7/24/08 12:30
Modeled
Observed
Pipe Crown



Sept6, 1.6 in
Rensselaer RCSD_20
Vm=0.60 MG Vo=0.48 MG; Qm=2.3 cfs Qo=1.6 cfs
Flowrate (cfs)
9/6/08 3:30
9/6/08 9:30
9/6/08 15:30
9/6/08 21:30
Modeled
Observed

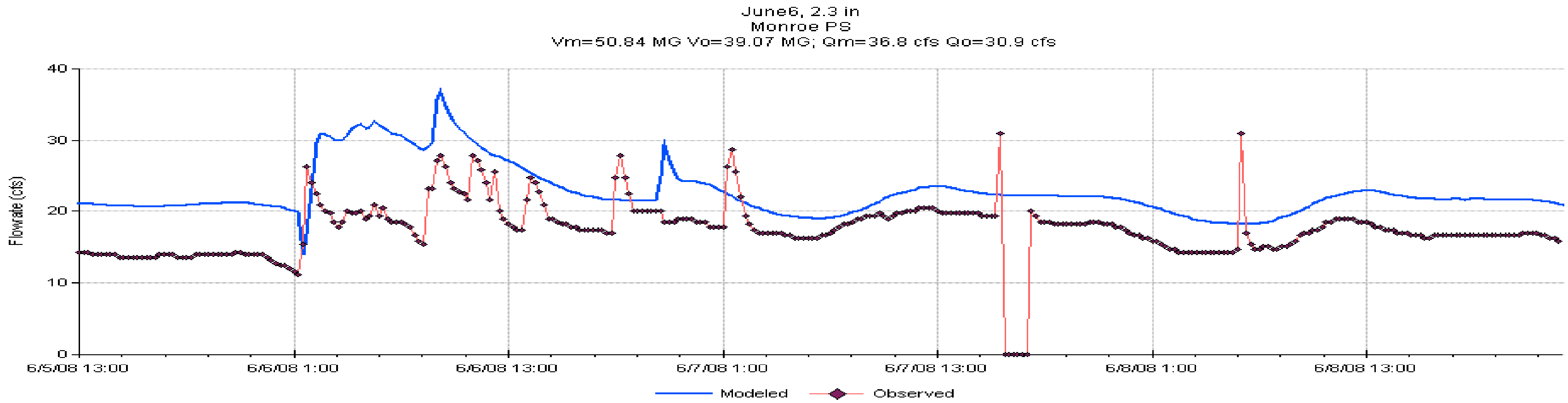


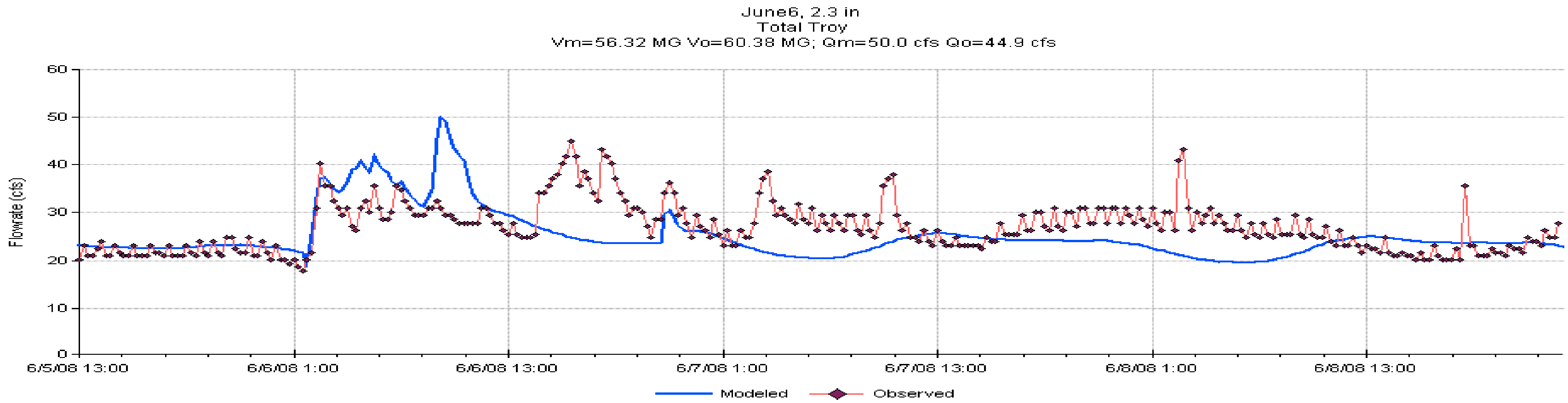
Sept6, 1.6 in
Rensselaer RCSD_20
Vm=2.6 ft/s Vo=3.1 ft/s
Velocity (ft/s)
9/6/08 3:30
9/6/08 9:30
9/6/08 15:30
9/6/08 21:30
Modeled
Observed

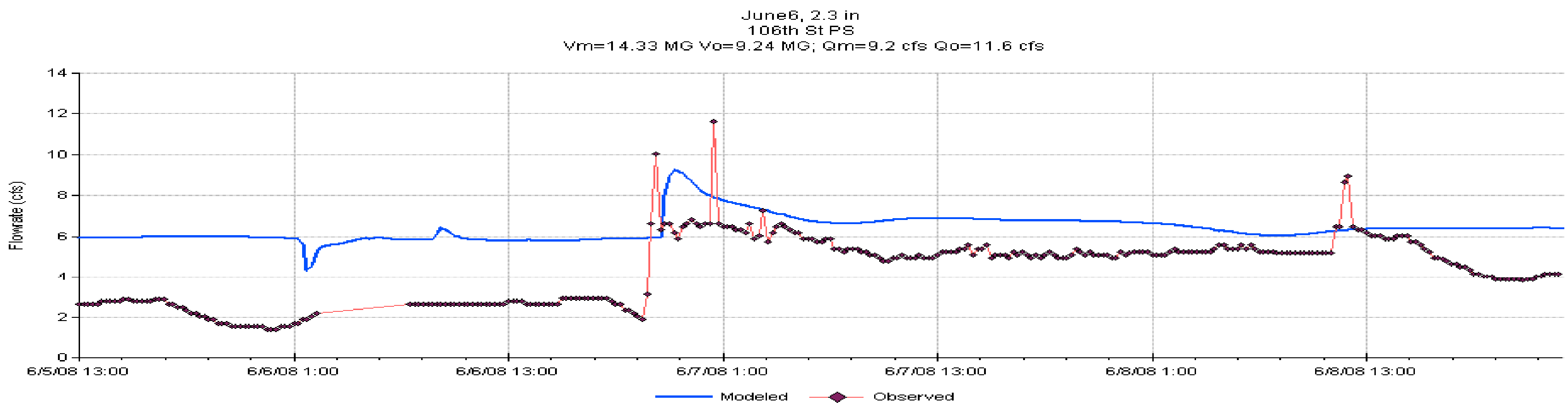


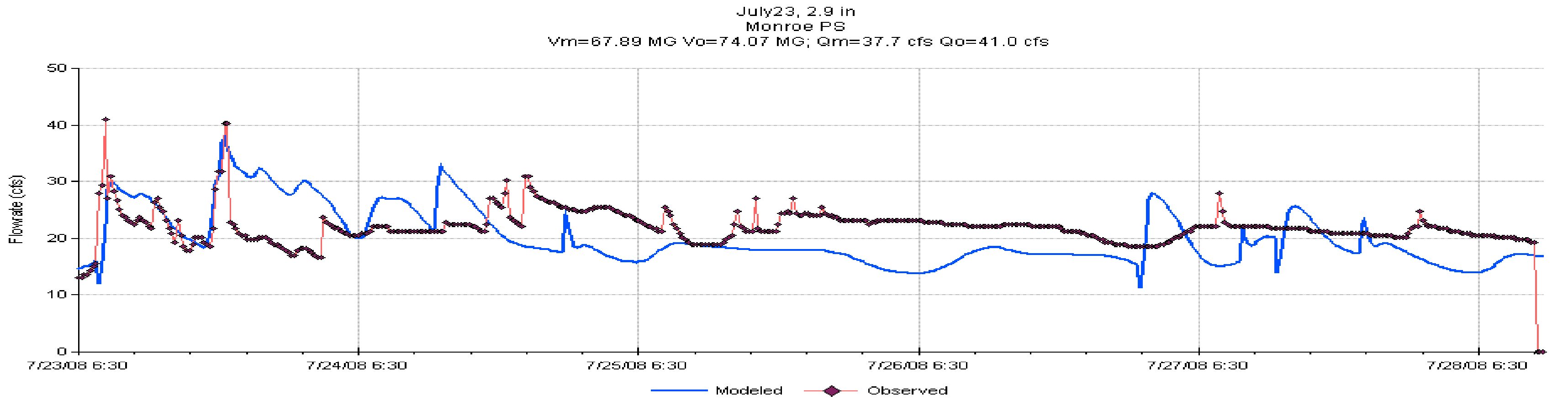
Sept6, 1.6 in
Rensselaer RCSD_20
Dm=0.5 ft Do=0.8 ft
Depth (ft)
9/6/08 3:30
9/6/08 9:30
9/6/08 15:30
9/6/08 21:30
Modeled
Observed
Pipe Crown

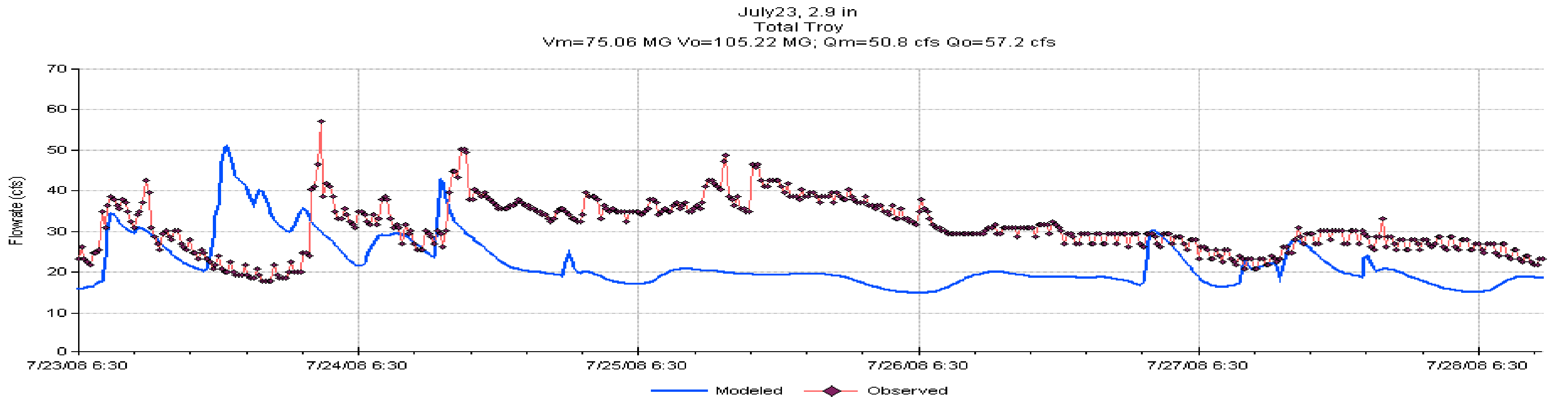
Appendix F. Troy principal storm calibration

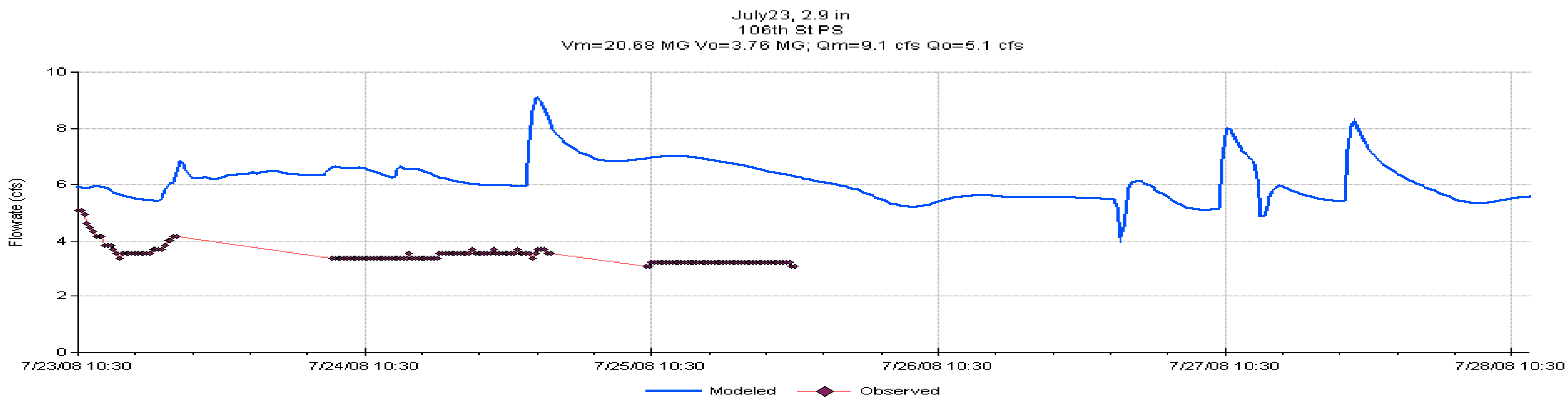

June6, 2.3 in
Monroe PS
Vm=50.84 MG Vo=39.07 MG; Qm=36.8 cfs Qo=30.9 cfs
Flowrate (cfs)
0
10
20
30
40
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed

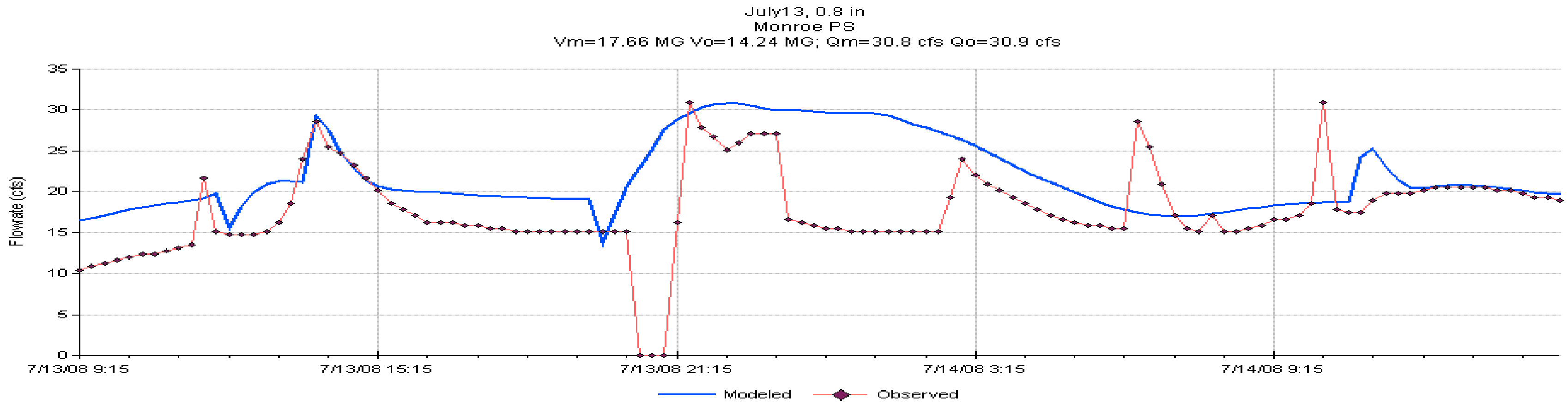

June6, 2.3 in
Total Troy
Vm=56.32 MG Vo=60.38 MG; Qm=50.0 cfs Qo=44.9 cfs
Flowrate (cfs)
0
10
20
30
40
50
60
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed

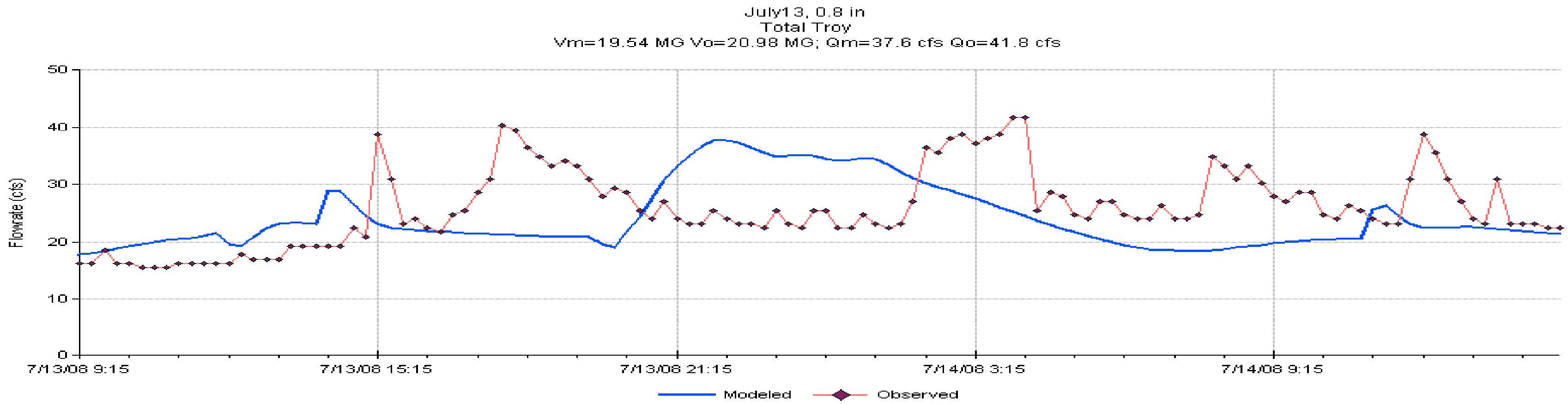

June6, 2.3 in
106th St PS
Vm=14.33 MG Vo=9.24 MG; Qm=9.2 cfs Qo=11.6 cfs
Flowrate (cfs)
0
2
4
6
8
10
12
14
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed

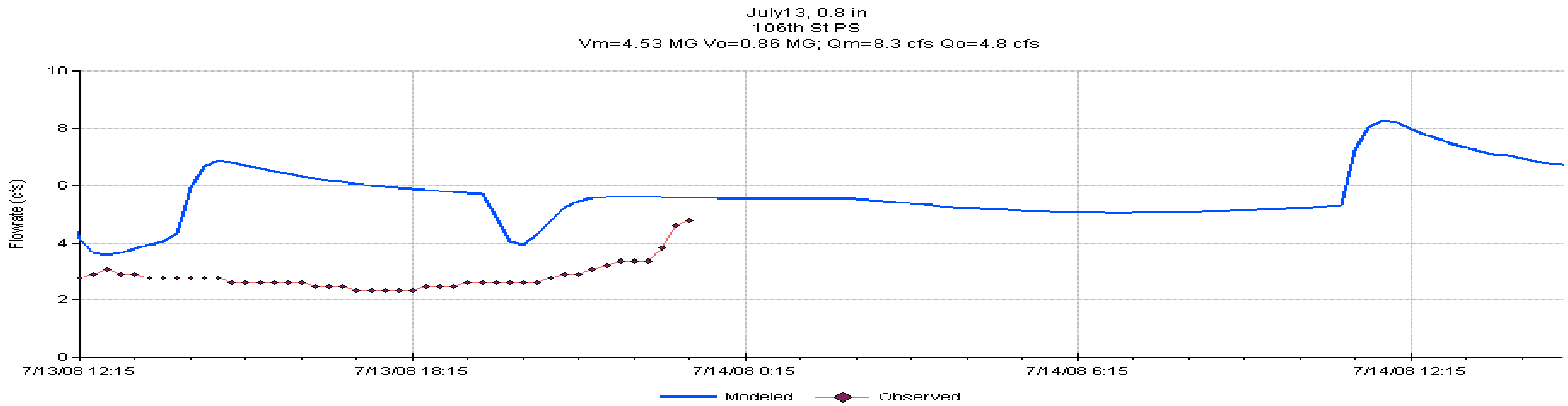

July23, 2.9 in
Monroe PS
Vm=67.89 MG Vo=74.07 MG; Qm=37.7 cfs Qo=41.0 cfs
Flowrate (cfs)
50
40
30
20
10
0
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed

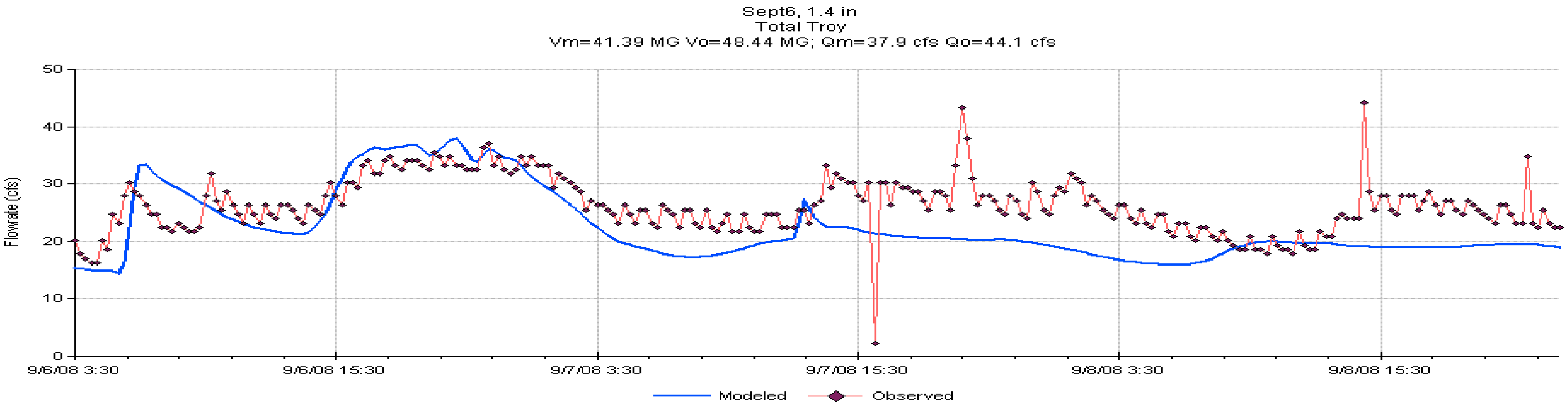

July23, 2.9 in
Total Troy
Vm=75.06 MG Vo=105.22 MG; Qm=50.8 cfs Qo=57.2 cfs
Flowrate (cfs)
70
60
50
40
30
20
10
0
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed

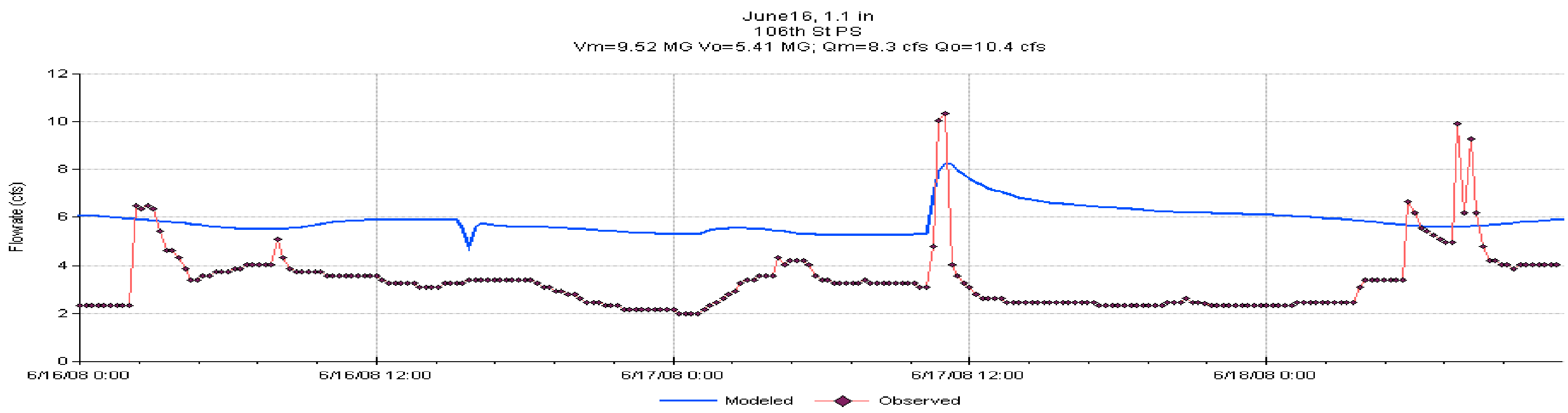

July23, 2.9 in
106th St PS
Vm=20.68 MG Vo=3.76 MG; Qm=9.1 cfs Qo=5.1 cfs
Flowrate (cfs)
10
8
6
4
2
0
7/23/08 10:30
7/24/08 10:30
7/25/08 10:30
7/26/08 10:30
7/27/08 10:30
7/28/08 10:30
Modeled
Observed


July13, 0.8 in
Monroe PS
Vm=17.66 MG Vo=14.24 MG; Qm=30.8 cfs Qo=30.9 cfs
Flowrate (cfs)
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed

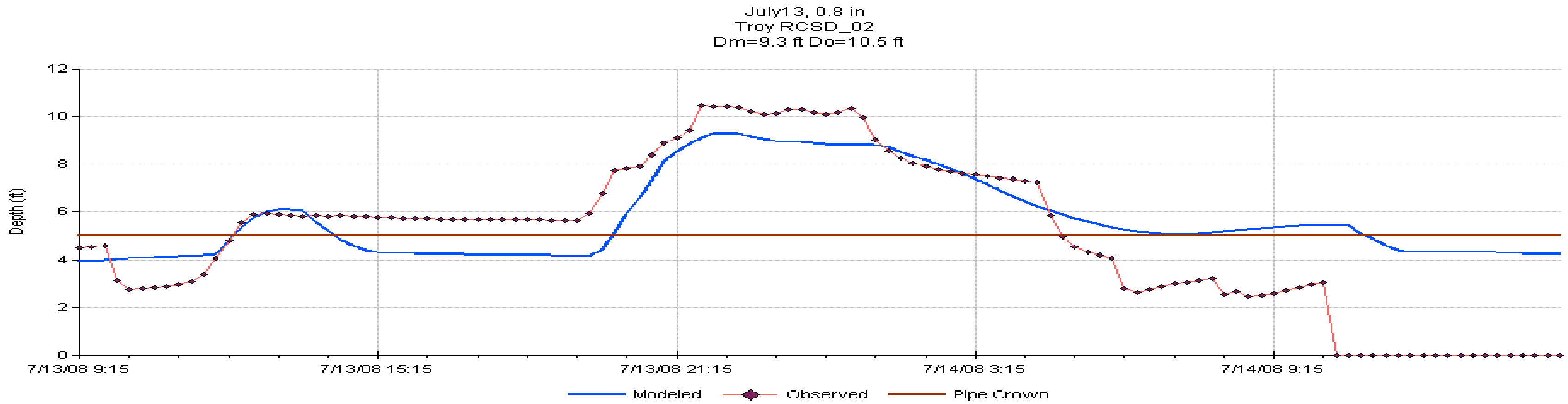

July13, 0.8 in
Total Troy
Vm=19.54 MG Vo=20.98 MG; Qm=37.6 cfs Qo=41.8 cfs
Flowrate (cfs)
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed

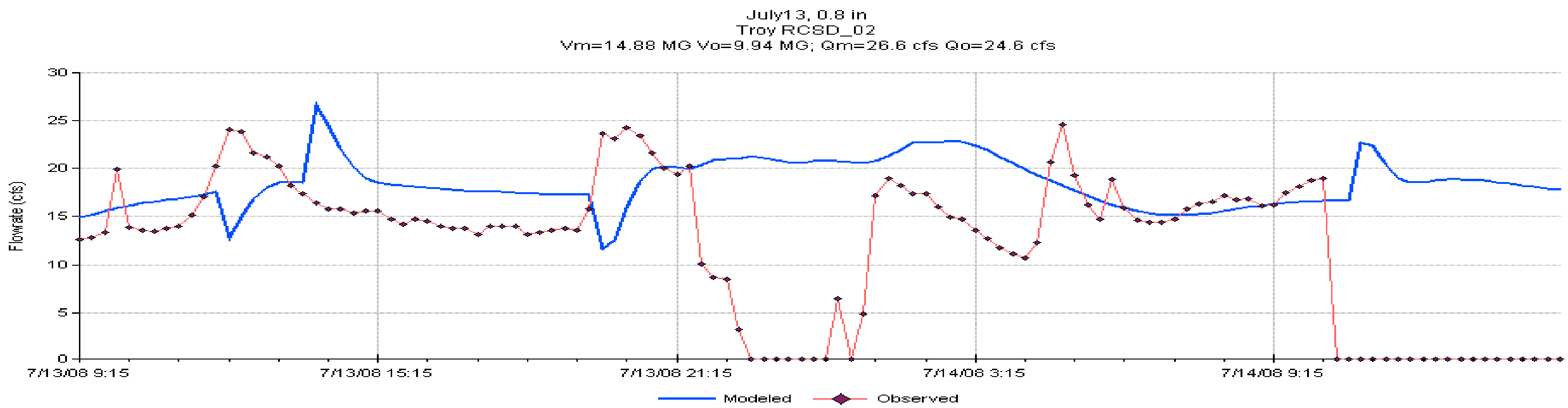

July13, 0.8 in
106th St PS
Vm=4.53 MG Vo=0.86 MG; Qm=8.3 cfs Qo=4.8 cfs
Flowrate (cfs)
7/13/08 12:15
7/13/08 18:15
7/14/08 0:15
7/14/08 6:15
7/14/08 12:15
Modeled
Observed

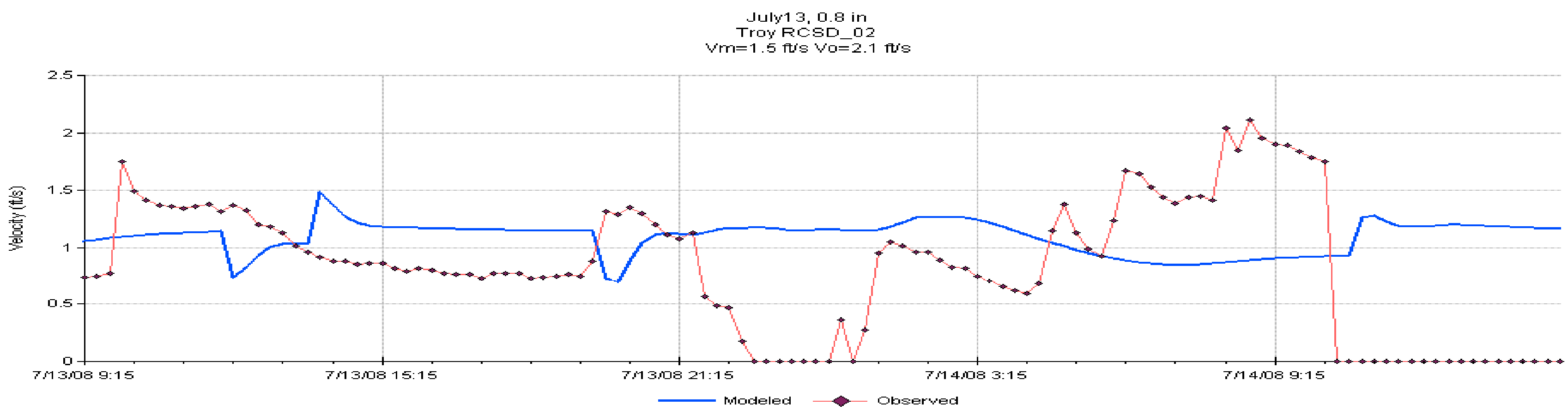

Sept6, 1.4 in
Total Troy
Vm=41.39 MG Vo=48.44 MG; Qm=37.9 cfs Qo=44.1 cfs
Flowrate (cfs)
50
40
30
20
10
0
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed

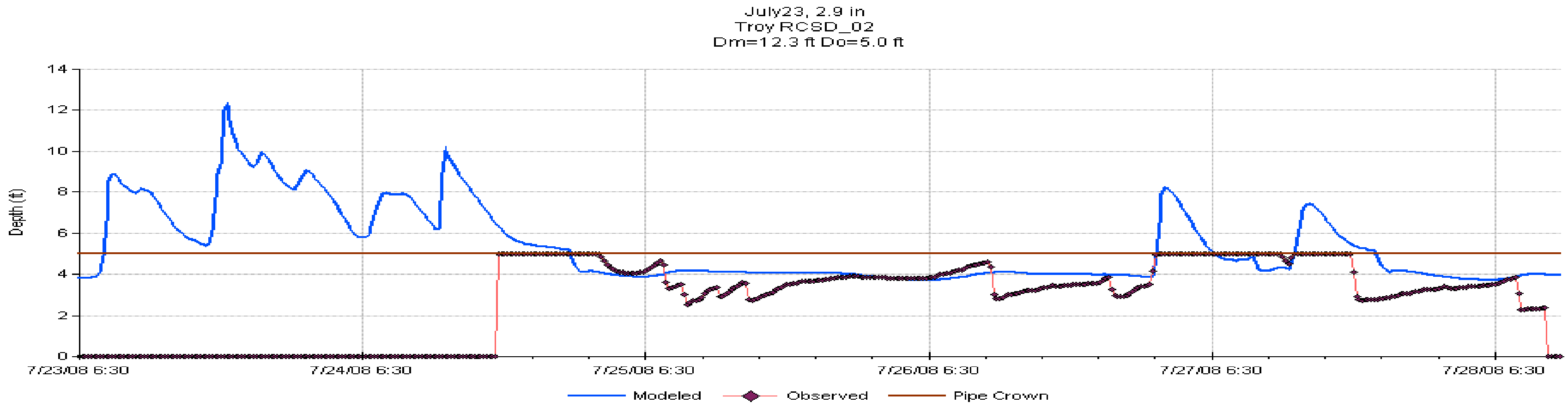


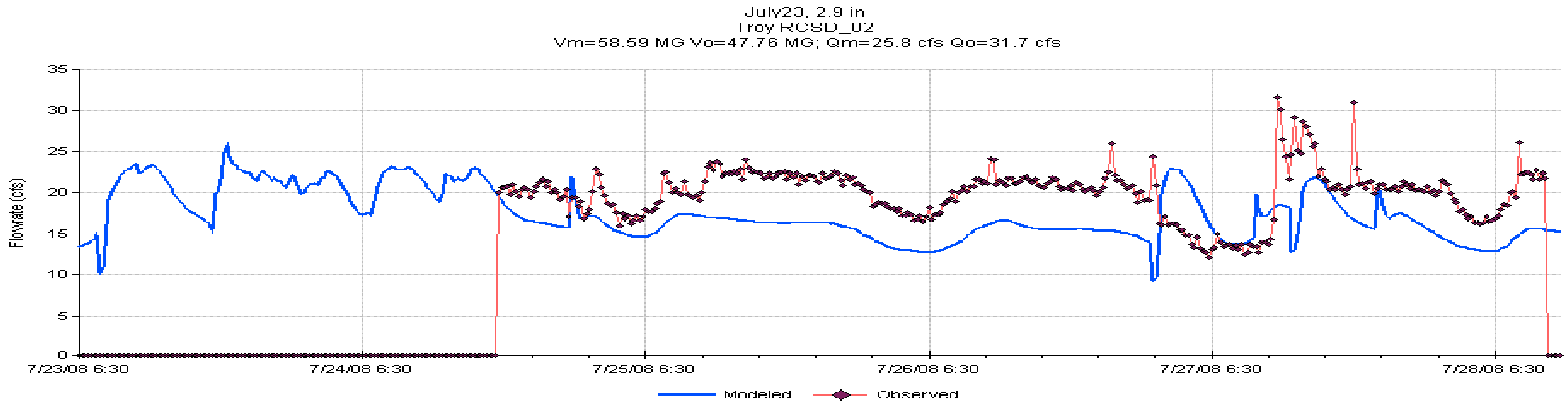
June16, 1.1 in
106th St PS
Vm=9.52 MG Vo=5.41 MG; Qm=8.3 cfs Qo=10.4 cfs
Flowrate (cfs)
12
10
8
6
4
2
0
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
Modeled
Observed

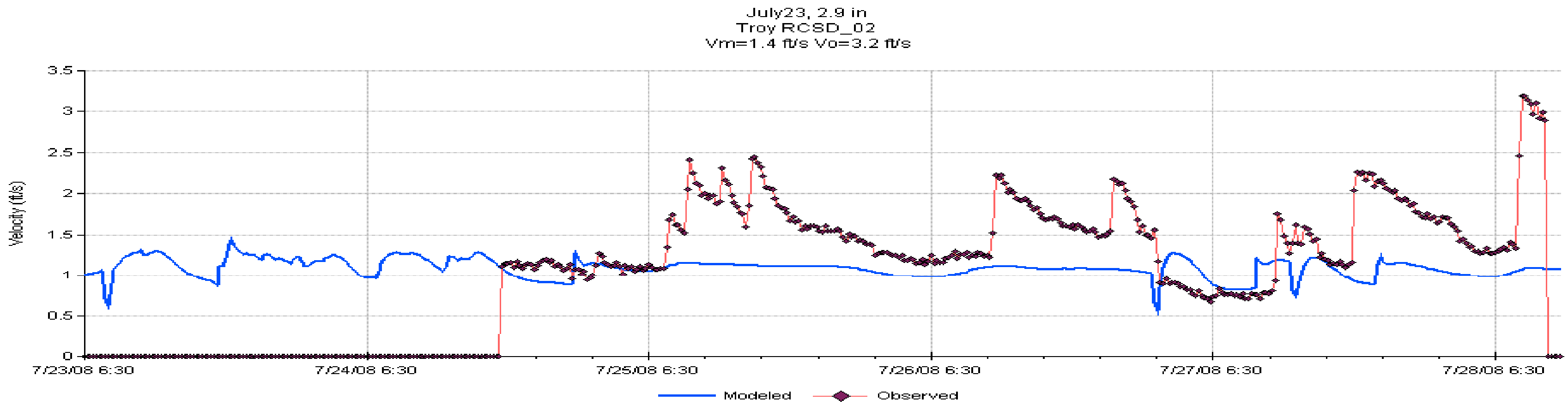

July13, 0.8 in
Troy RCSD_02
Dm=9.3 ft Do=10.5 ft
Depth (ft)
0
2
4
6
8
10
12
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed
Pipe Crown

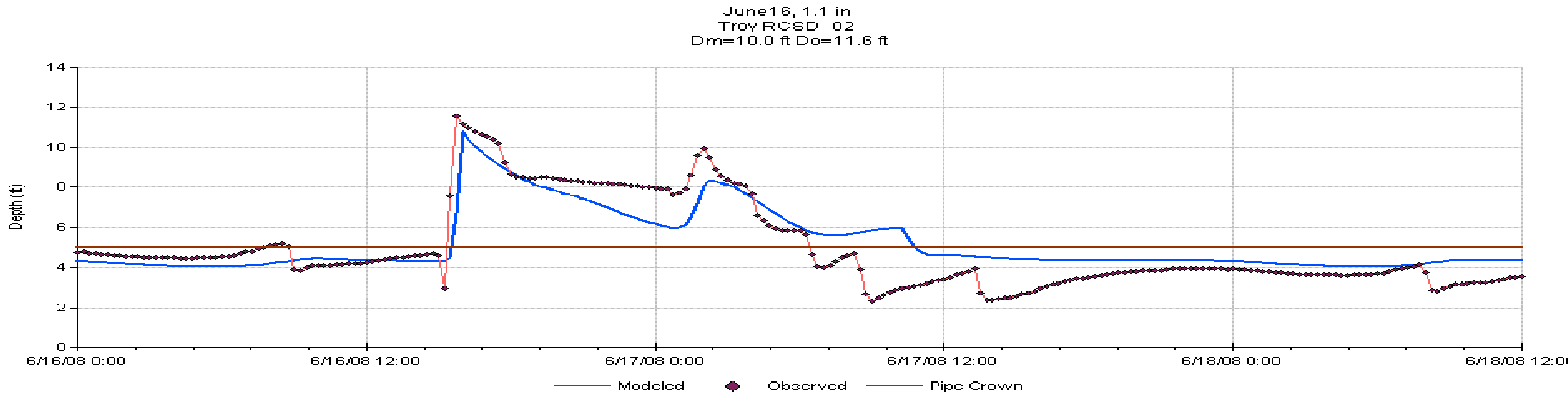

July13, 0.8 in
Troy RCSD_02
Vm=14.88 MG Vo=9.94 MG; Qm=26.6 cfs Qo=24.6 cfs
Flowrate (cfs)
0
5
10
15
20
25
30
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed

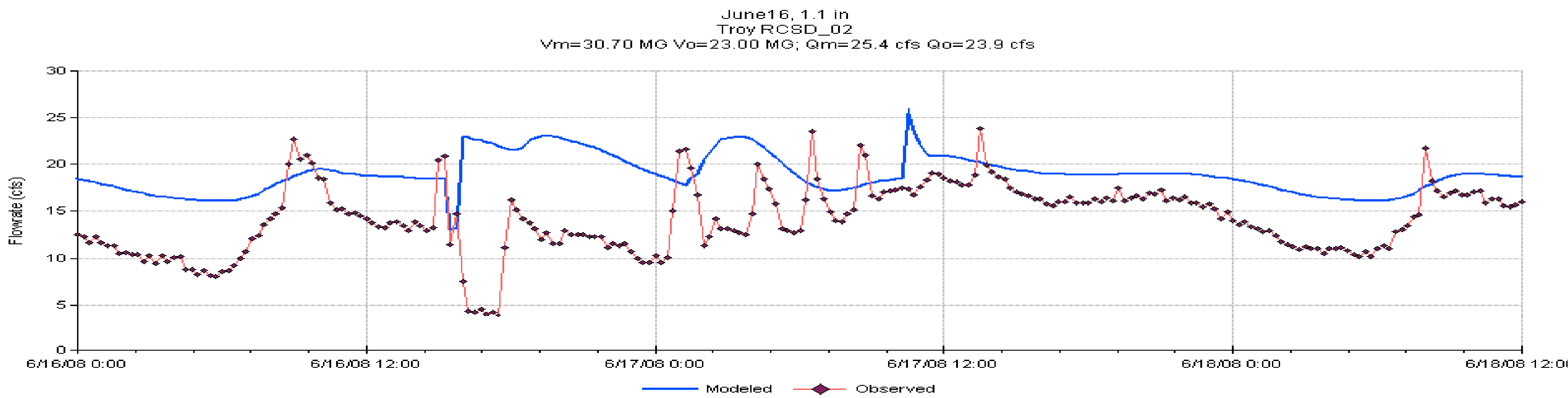

July13, 0.8 in
Troy RCSD_02
Vm=1.5 ft/s Vo=2.1 ft/s
Velocity (ft/s)
0
0.5
1
1.5
2
2.5
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed

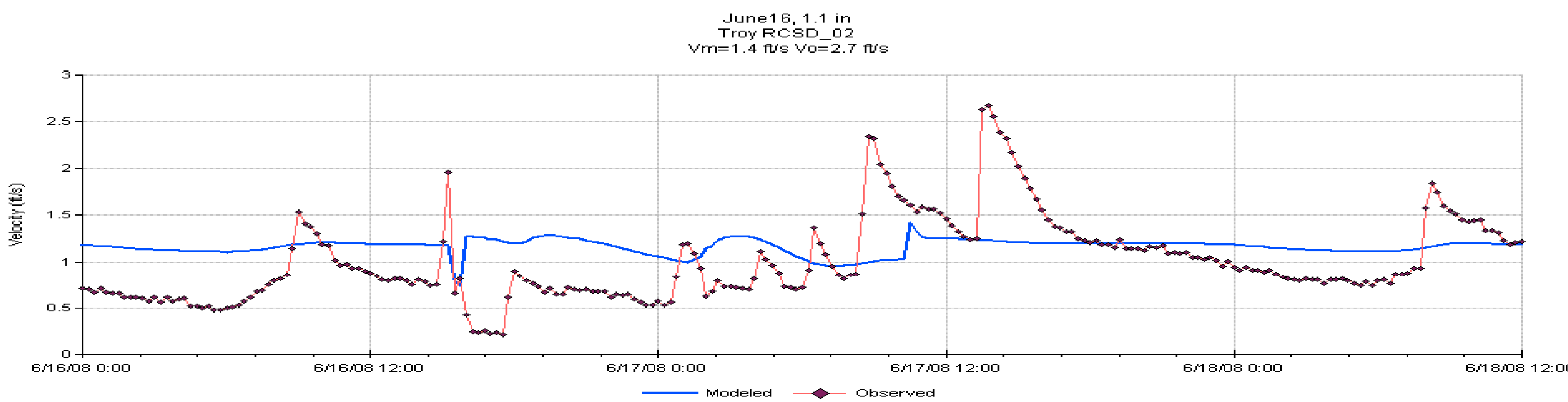

July23, 2.9 in
Troy RCSD_02
Dm=12.3 ft Do=5.0 ft
Depth (ft)
0
2
4
6
8
10
12
14
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed
Pipe Crown

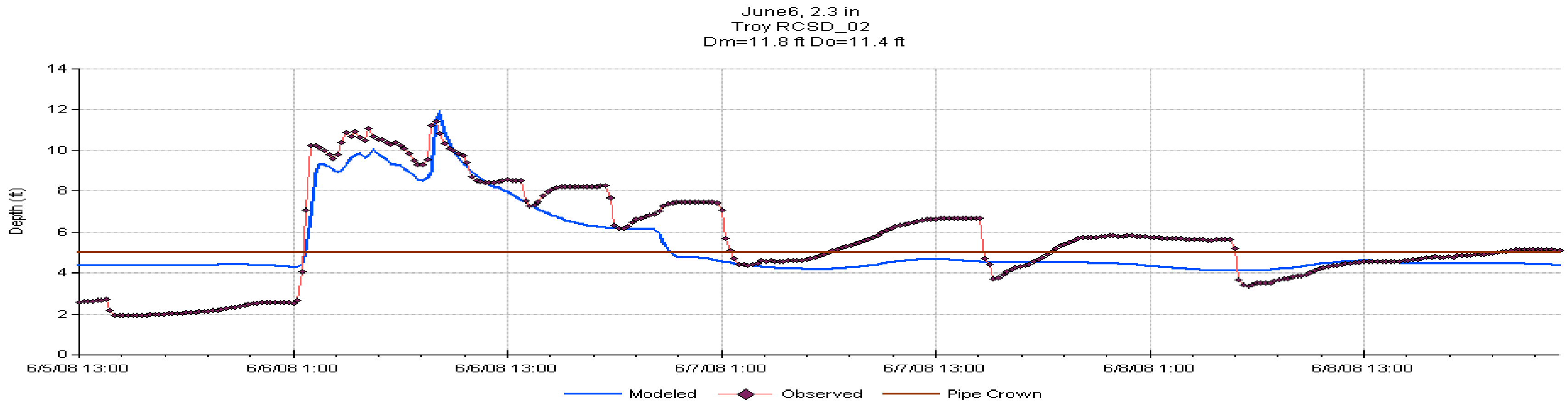

July23, 2.9 in
Troy RCSD_02
Vm=58.59 MG Vo=47.76 MG; Qm=25.8 cfs Qo=31.7 cfs
Flowrate (cfs)
0
5
10
15
20
25
30
35
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed

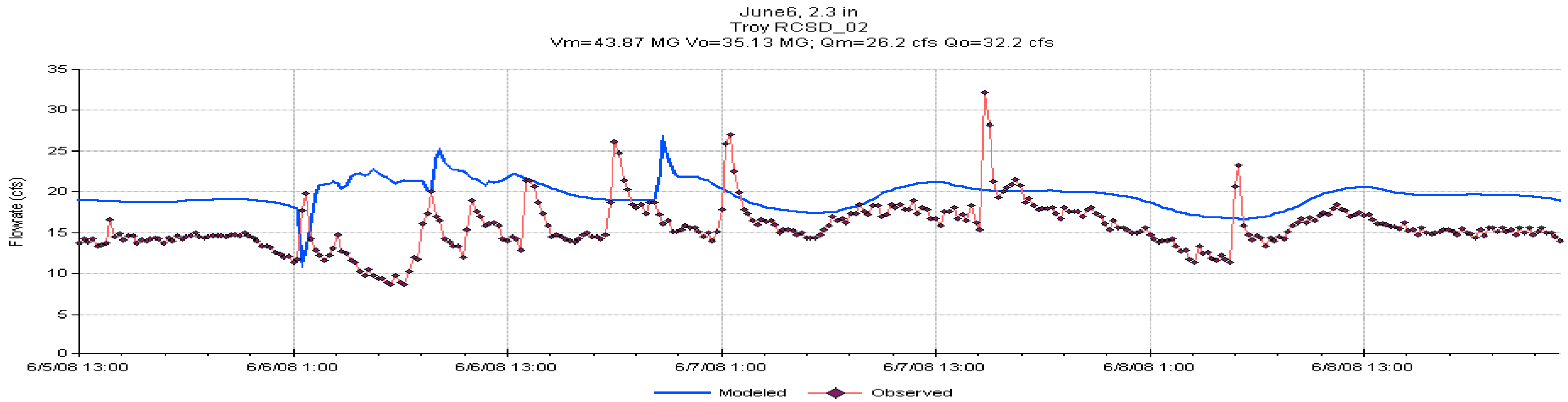

July23, 2.9 in
Troy RCSD_02
Vm=1.4 ft/s Vo=3.2 ft/s
Velocity (ft/s)
0
0.5
1
1.5
2
2.5
3
3.5
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed

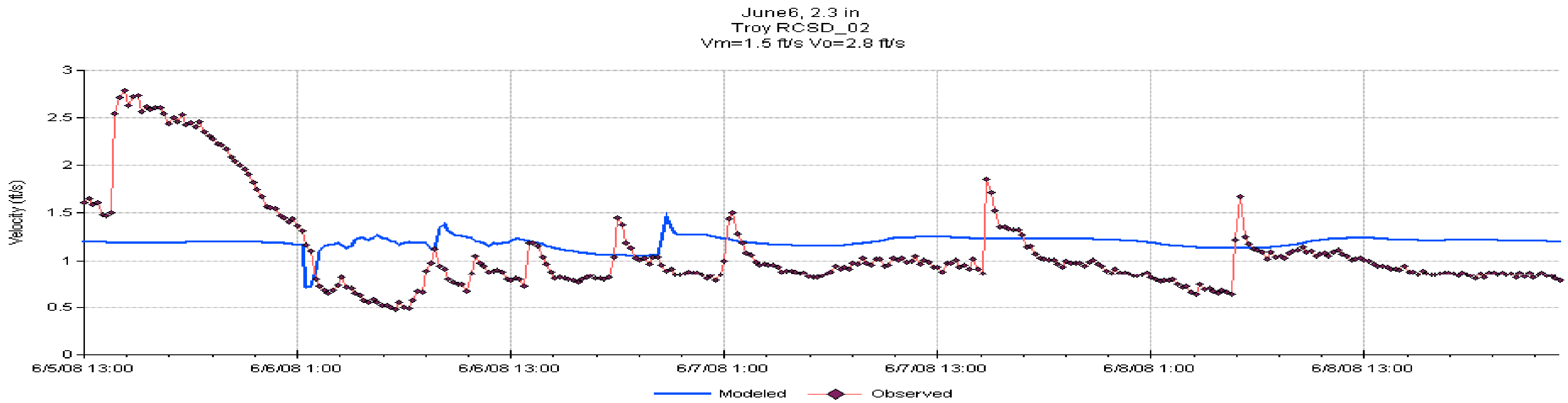

June16, 1.1 in
Troy RCSD_02
Dm=10.8 ft Do=11.6 ft
Depth (ft)
0
2
4
6
8
10
12
14
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
6/18/08 12:00
Modeled
Observed
Pipe Crown


June16, 1.1 in
Troy RCSD_02
Vm=30.70 MG Vo=23.00 MG; Qm=25.4 cfs Qo=23.9 cfs
Flowrate (cfs)
0
5
10
15
20
25
30
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
6/18/08 12:00
Modeled
Observed

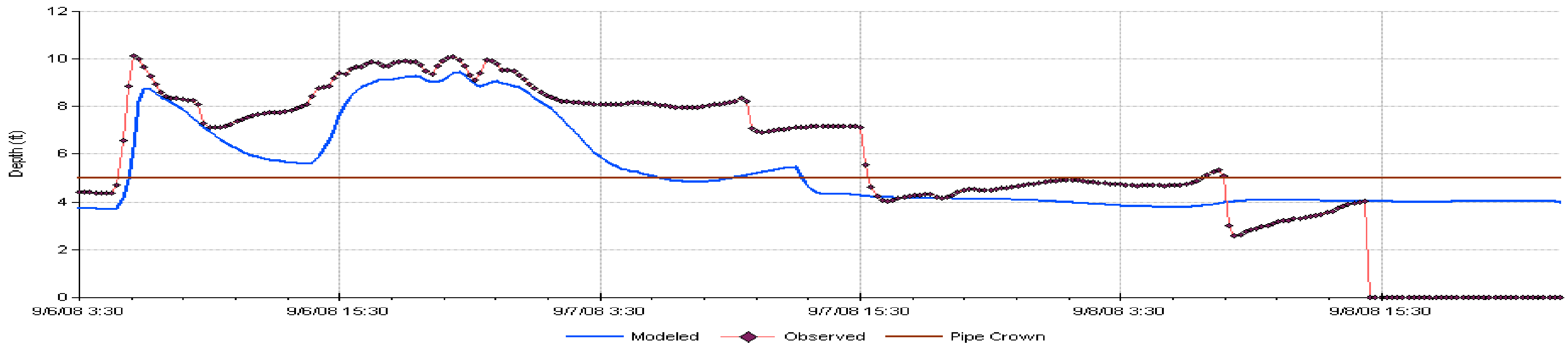

June16, 1.1 in
Troy RCSD_02
Vm=1.4 ft/s Vo=2.7 ft/s
Velocity (ft/s)
0
0.5
1
1.5
2
2.5
3
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
6/18/08 12:00
Modeled
Observed


June6, 2.3 in
Troy RCSD_02
Dm=11.8 ft Do=11.4 ft
Depth (ft)
14
12
10
8
6
4
2
0
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed
Pipe Crown

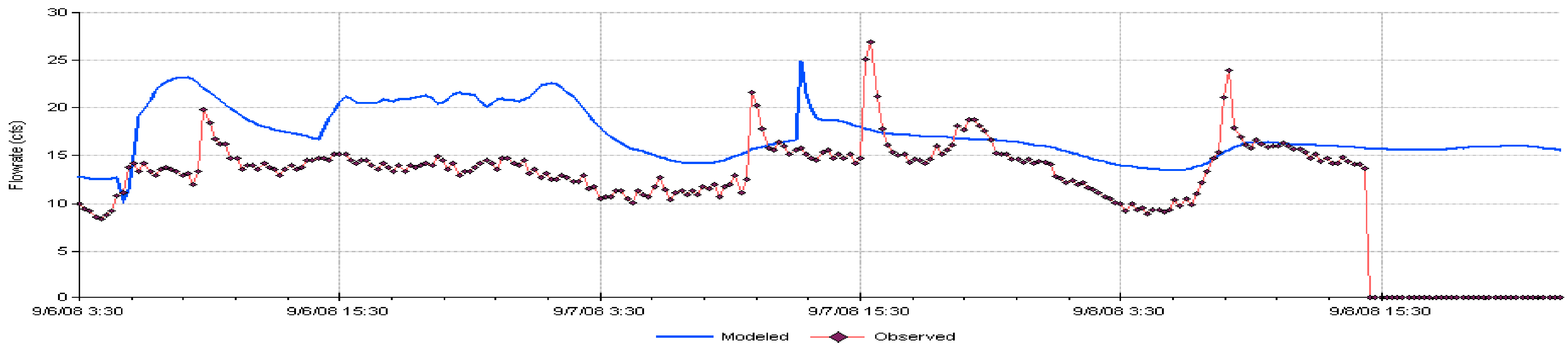

June6, 2.3 in
Troy RCSD_02
Vm=43.87 MG Vo=35.13 MG; Qm=26.2 cfs Qo=32.2 cfs
Flowrate (cfs)
35
30
25
20
15
10
5
0
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed


June6, 2.3 in
Troy RCSD_02
Vm=1.5 ft/s Vo=2.8 ft/s
Velocity (ft/s)
3
2.5
2
1.5
1
0.5
0
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed

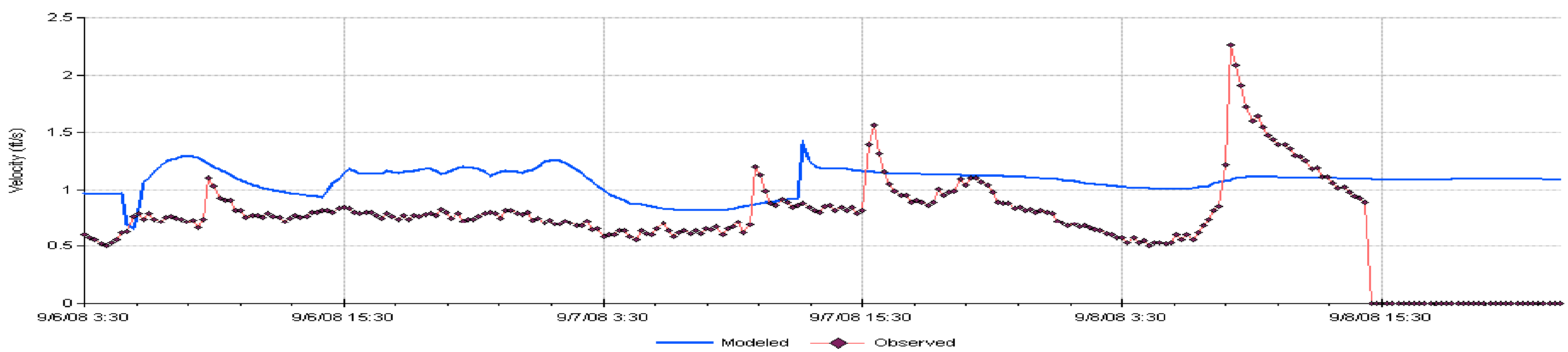
Sept6, 1.4 in
Troy RCSD_02
Dm=9.5 ft Do=10.1 ft

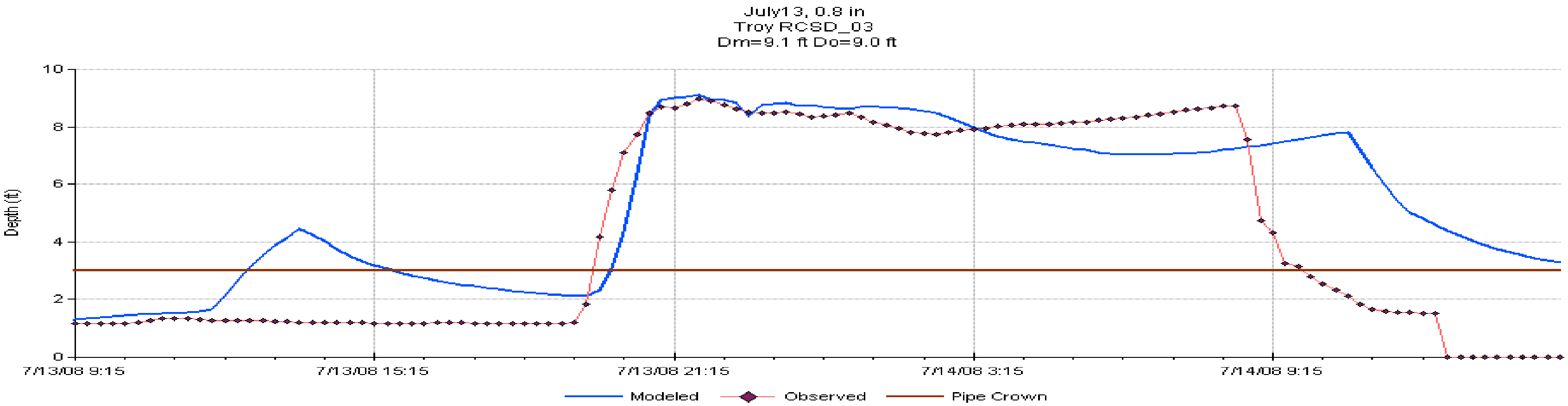


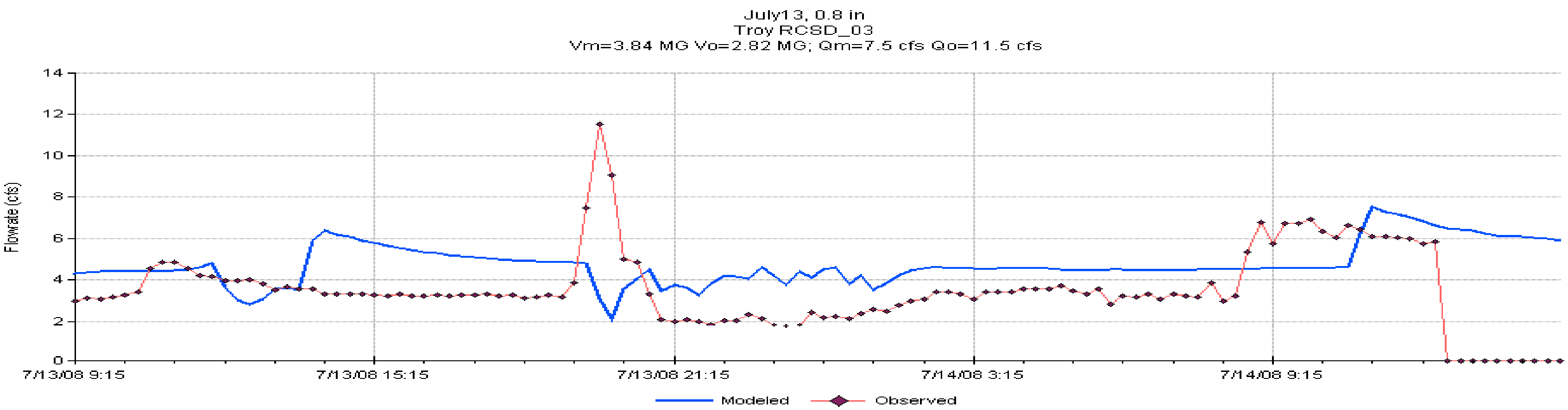
Sept6, 1.4 in
Troy RCSD_02
Vm=31.72 MG Vo=22.20 MG; Qm=24.9 cfs Qo=27.0 cfs

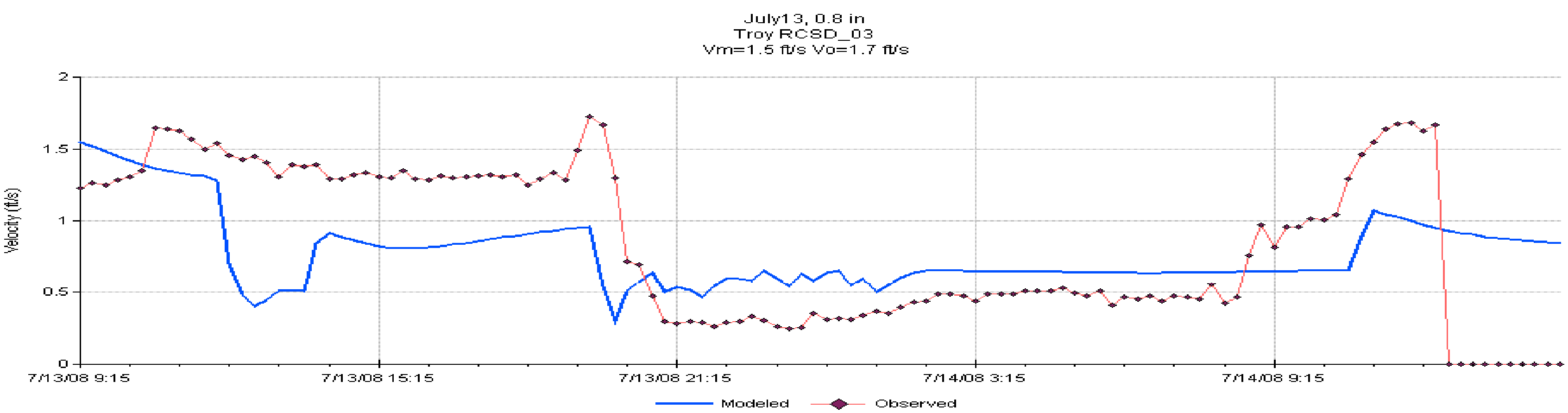


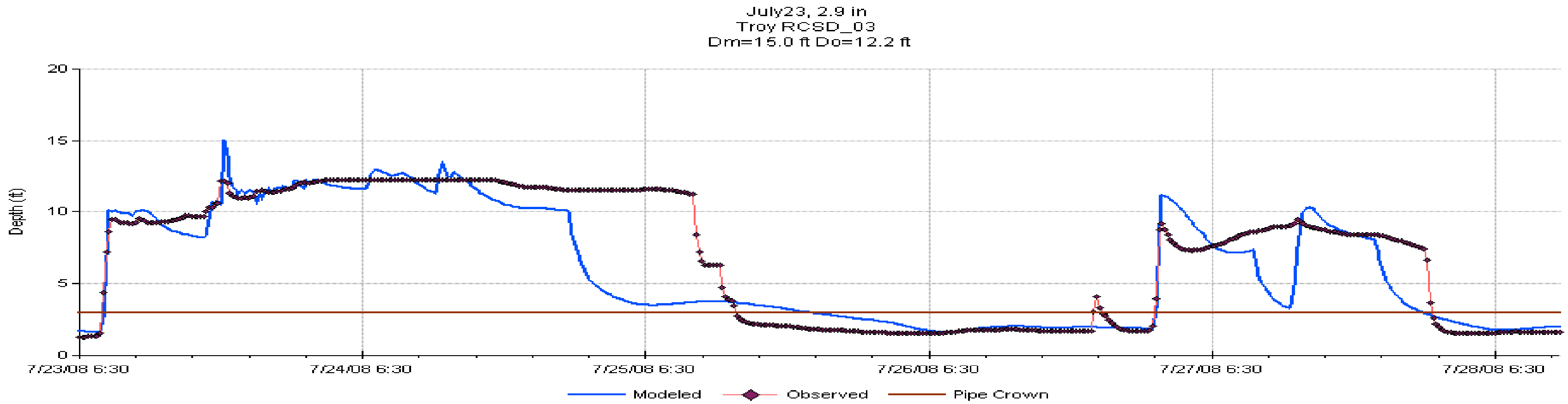
Sept6, 1.4 in
Troy RCSD_02
Vm=1.4 ft/s Vo=2.3 ft/s

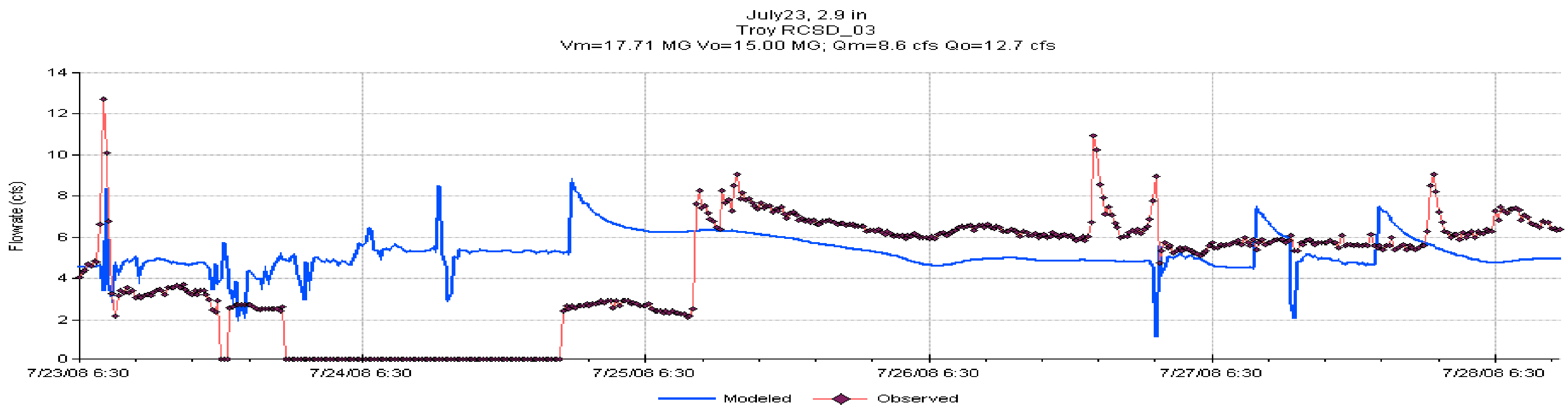


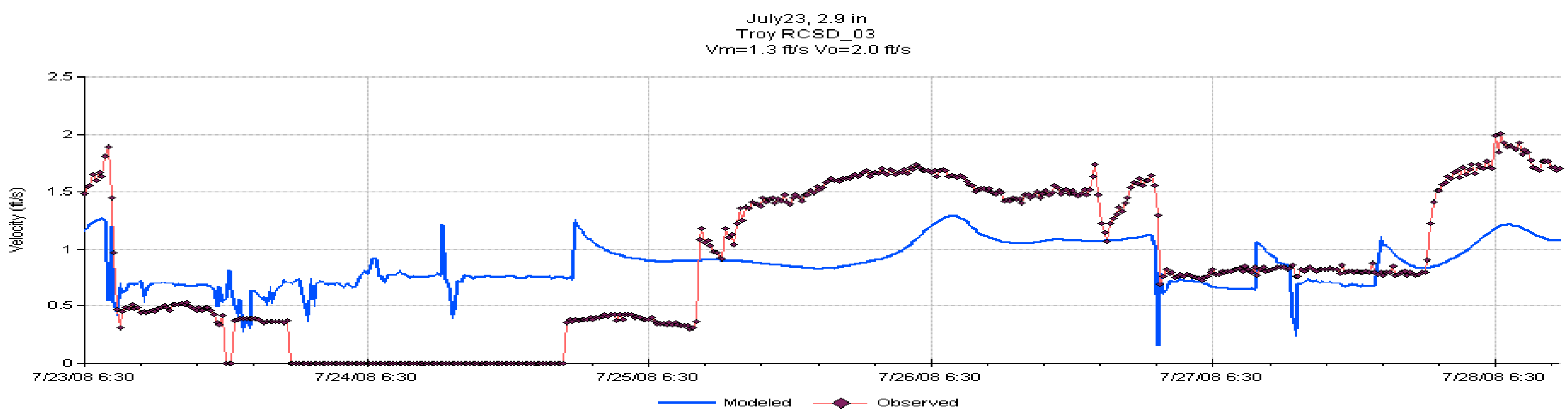

July13, 0.8 in
Troy RCSD_03
Dm=9.1 ft Do=9.0 ft
Depth (ft)
0
2
4
6
8
10
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed
Pipe Crown

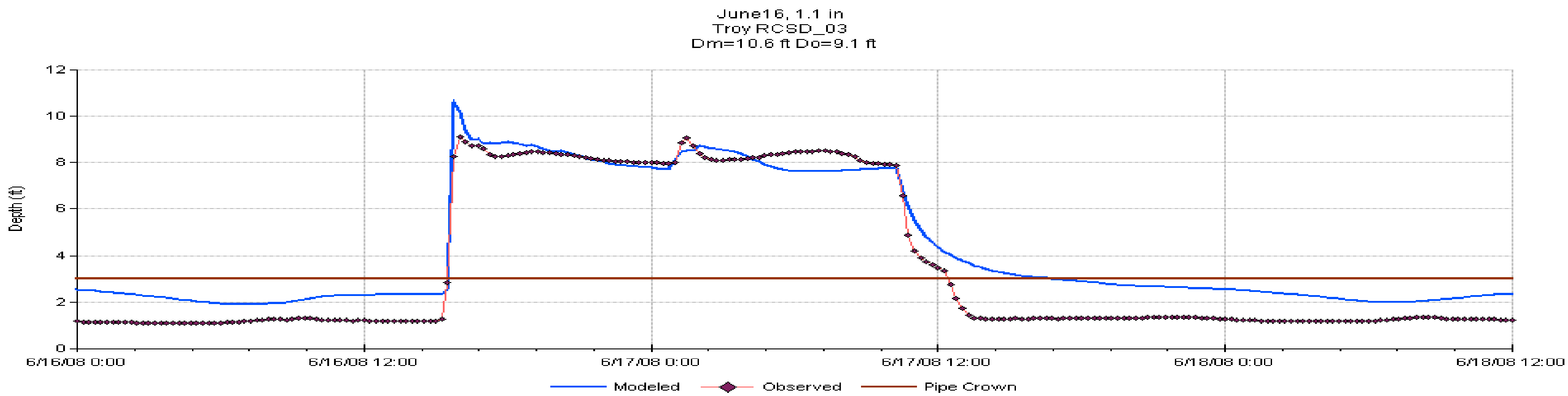

July13, 0.8 in
Troy RCSD_03
Vm=3.84 MG Vo=2.82 MG; Qm=7.5 cfs Qo=11.5 cfs
Flowrate (cfs)
0
2
4
6
8
10
12
14
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed

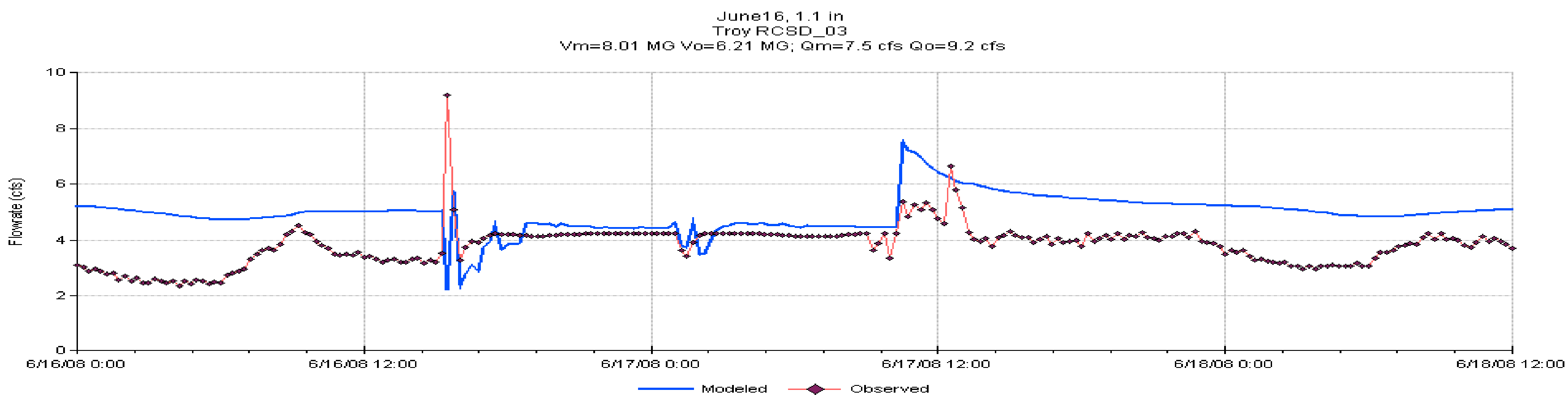

July13, 0.8 in
Troy RCSD_03
Vm=1.5 ft/s Vo=1.7 ft/s
Velocity (ft/s)
0
0.5
1
1.5
2
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed

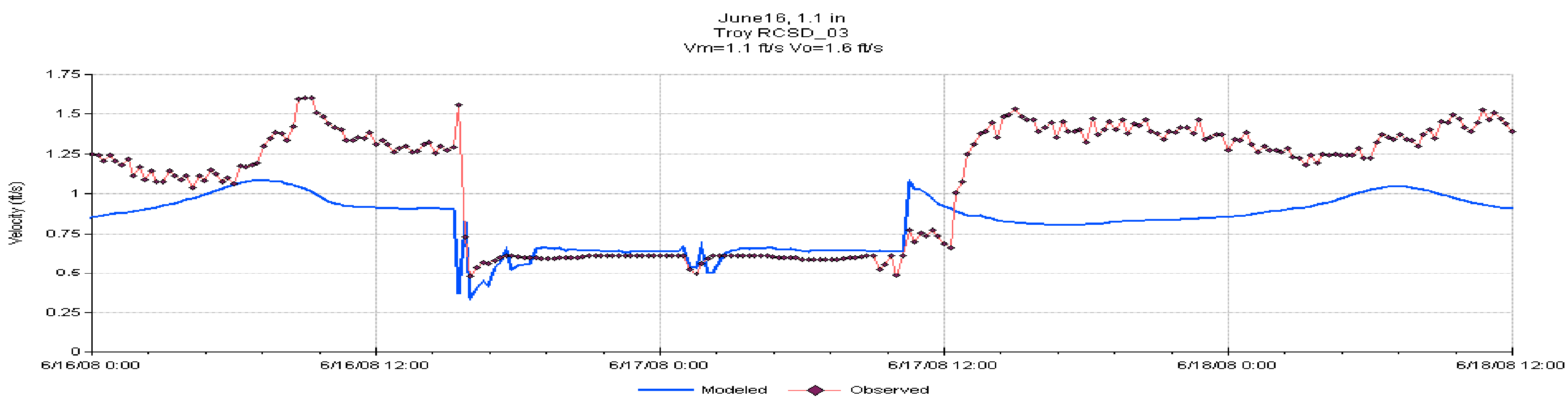

July23, 2.9 in
Troy RCSD_03
Dm=15.0 ft Do=12.2 ft
Depth (ft)
20
15
10
5
0
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed
Pipe Crown

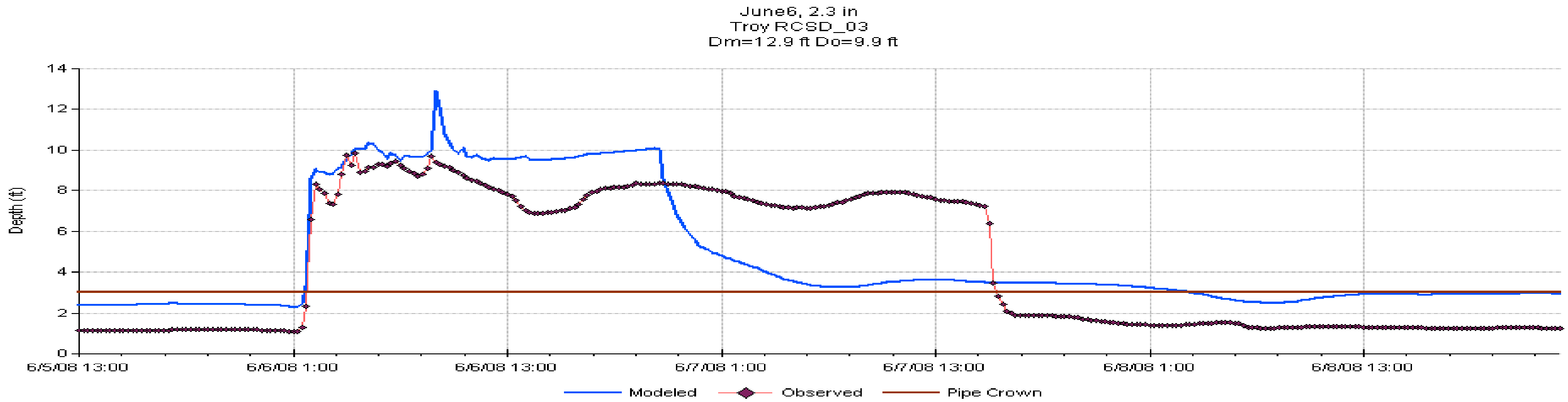

July23, 2.9 in
Troy RCSD_03
Vm=17.71 MG Vo=15.00 MG; Qm=8.6 cfs Qo=12.7 cfs
Flowrate (cfs)
14
12
10
8
6
4
2
0
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed

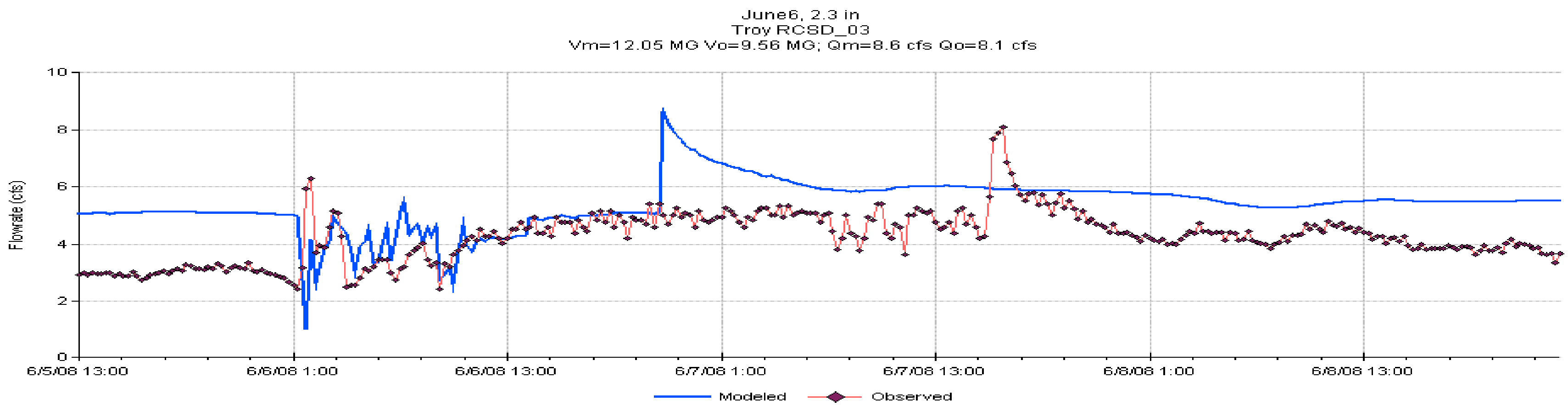

July23, 2.9 in
Troy RCSD_03
Vm=1.3 ft/s Vo=2.0 ft/s
Velocity (ft/s)
2.5
2
1.5
1
0.5
0
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed

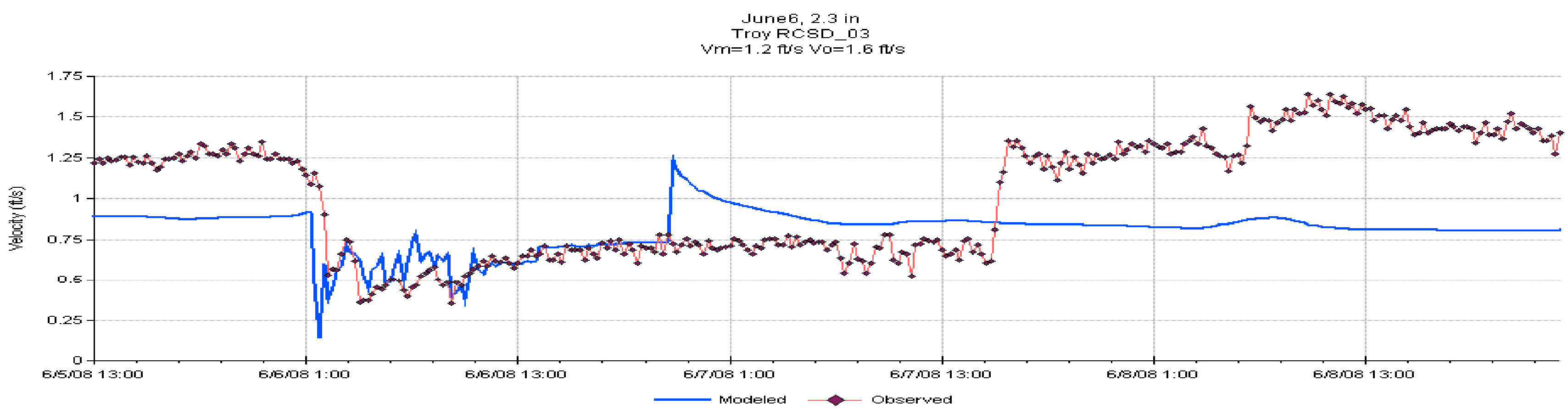

June16, 1.1 in
Troy RCSD_03
Dm=10.6 ft Do=9.1 ft
Depth (ft)
0
2
4
6
8
10
12
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
6/18/08 12:00
Modeled
Observed
Pipe Crown

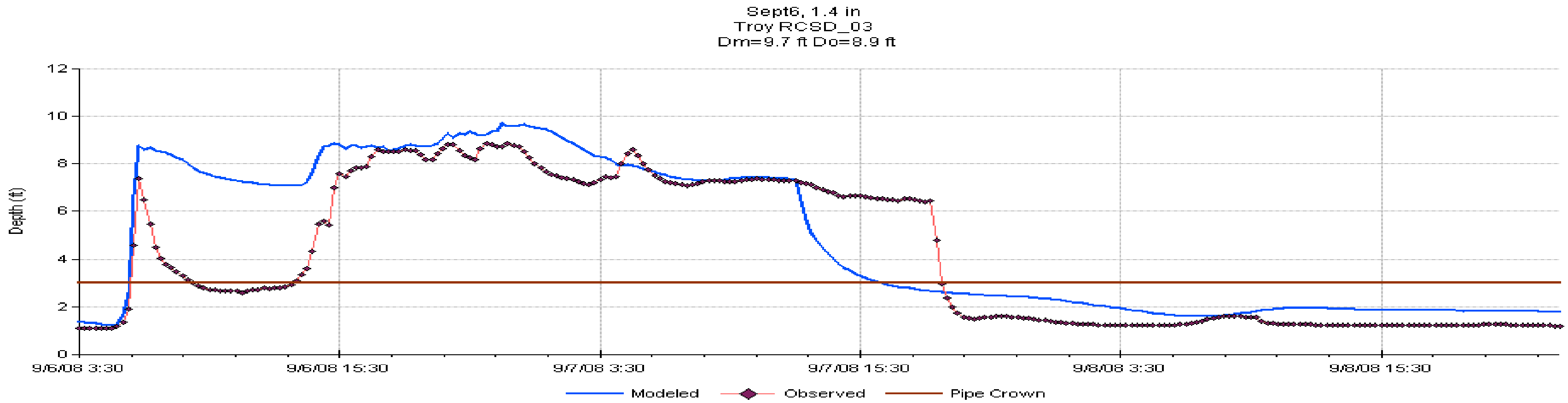

June16, 1.1 in
Troy RCSD_03
Vm=8.01 MG Vo=6.21 MG; Qm=7.5 cfs Qo=9.2 cfs
Flowrate (cfs)
0
2
4
6
8
10
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
6/18/08 12:00
Modeled
Observed

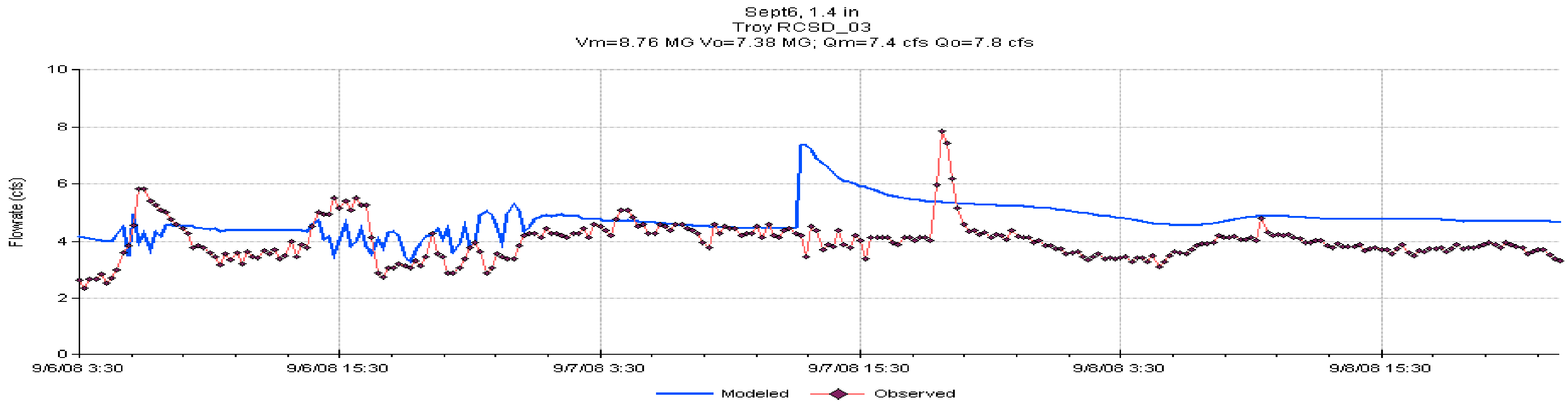

June16, 1.1 in
Troy RCSD_03
Vm=1.1 ft/s Vo=1.6 ft/s
Velocity (ft/s)
0
0.25
0.5
0.75
1
1.25
1.5
1.75
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
6/18/08 12:00
Modeled
Observed

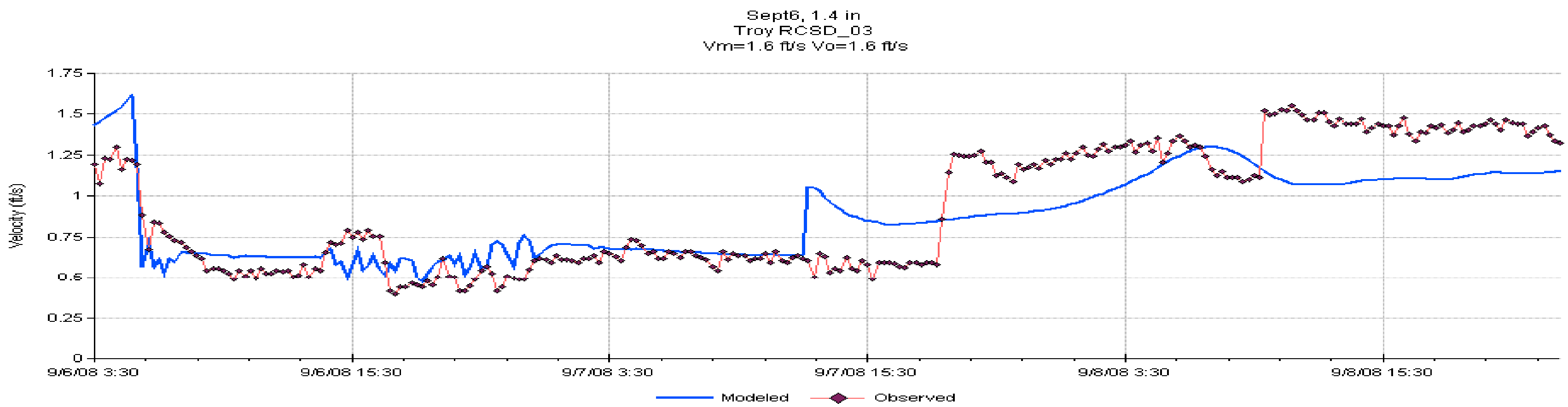

June6, 2.3 in
Troy RCSD_03
Dm=12.9 ft Do=9.9 ft
Depth (ft)
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed
Pipe Crown

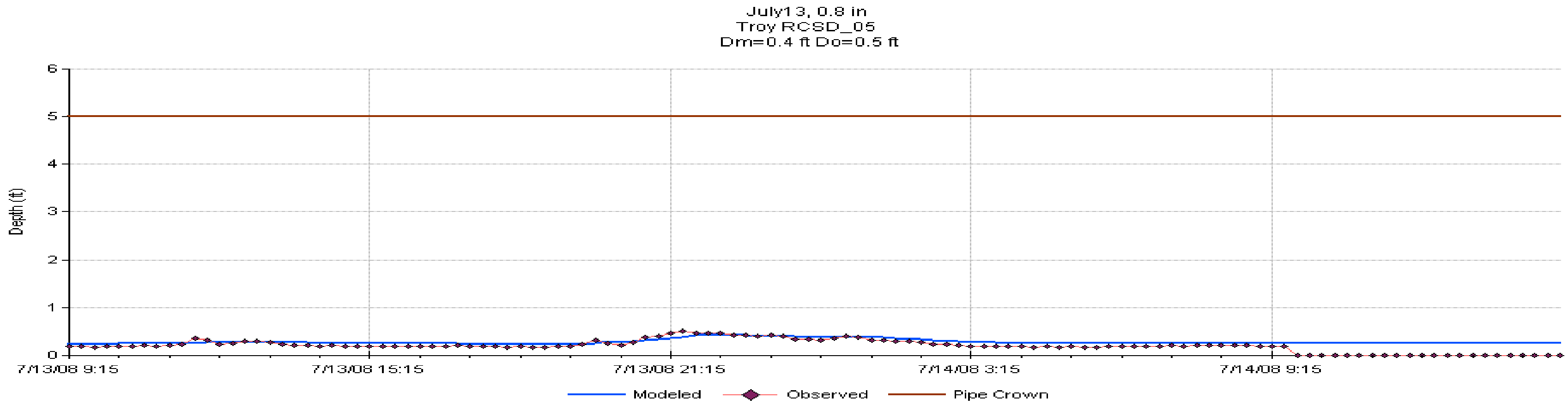

June6, 2.3 in
Troy RCSD_03
Vm=12.05 MG Vo=9.56 MG; Qm=8.6 cfs Qo=8.1 cfs
Flowrate (cfs)
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed

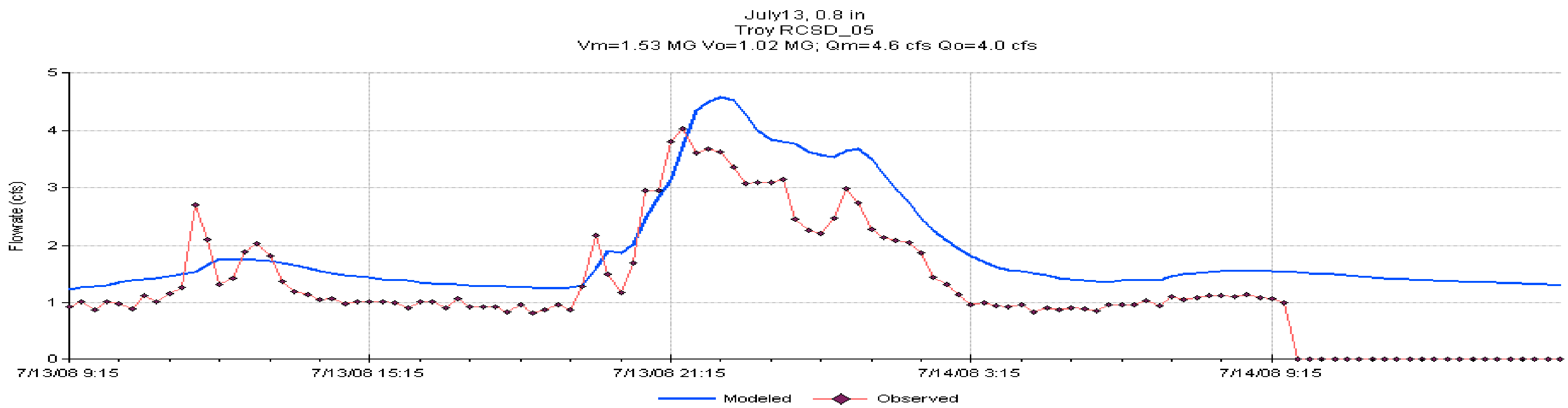

June6, 2.3 in
Troy RCSD_03
Vm=1.2 ft/s Vo=1.6 ft/s
Velocity (ft/s)
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed

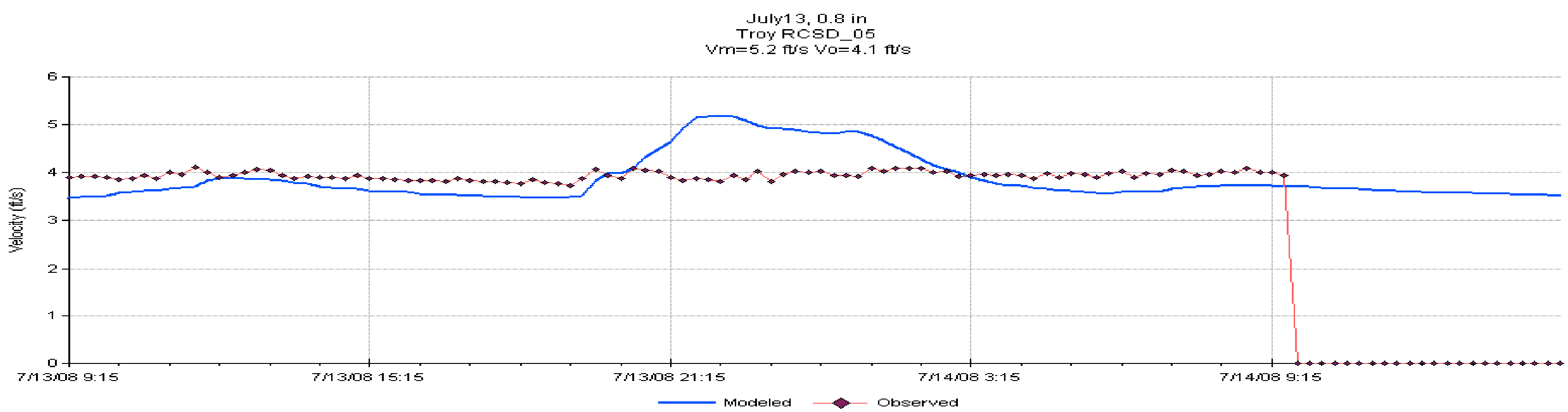

Sept6, 1.4 in
Troy RCSD_03
Dm=9.7 ft Do=8.9 ft
Depth (ft)
0
2
4
6
8
10
12
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed
Pipe Crown

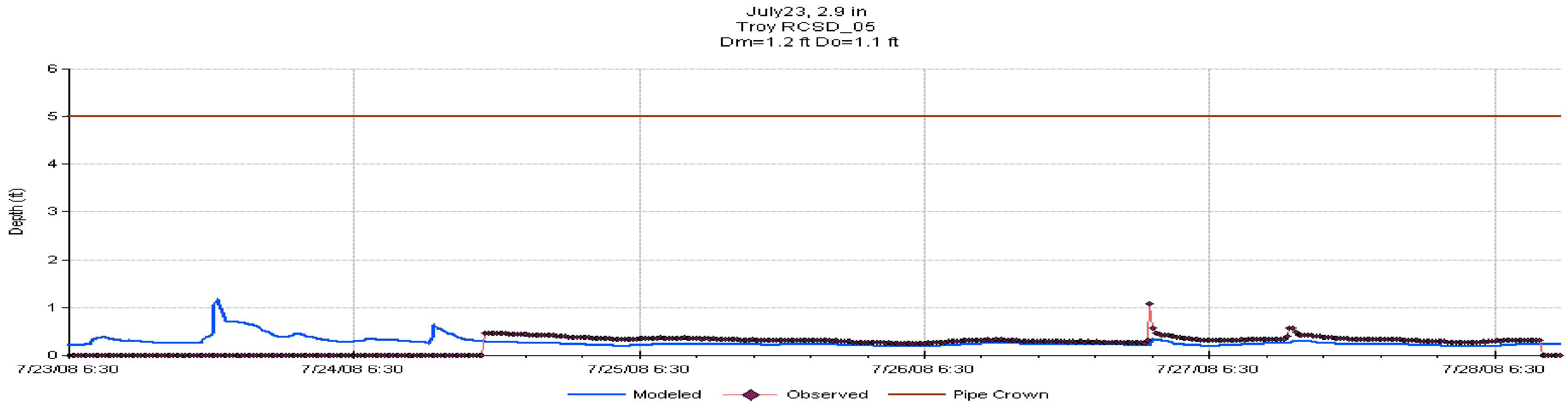

Sept6, 1.4 in
Troy RCSD_03
Vm=8.76 MG Vo=7.38 MG; Qm=7.4 cfs Qo=7.8 cfs
Flowrate (cfs)
0
2
4
6
8
10
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed

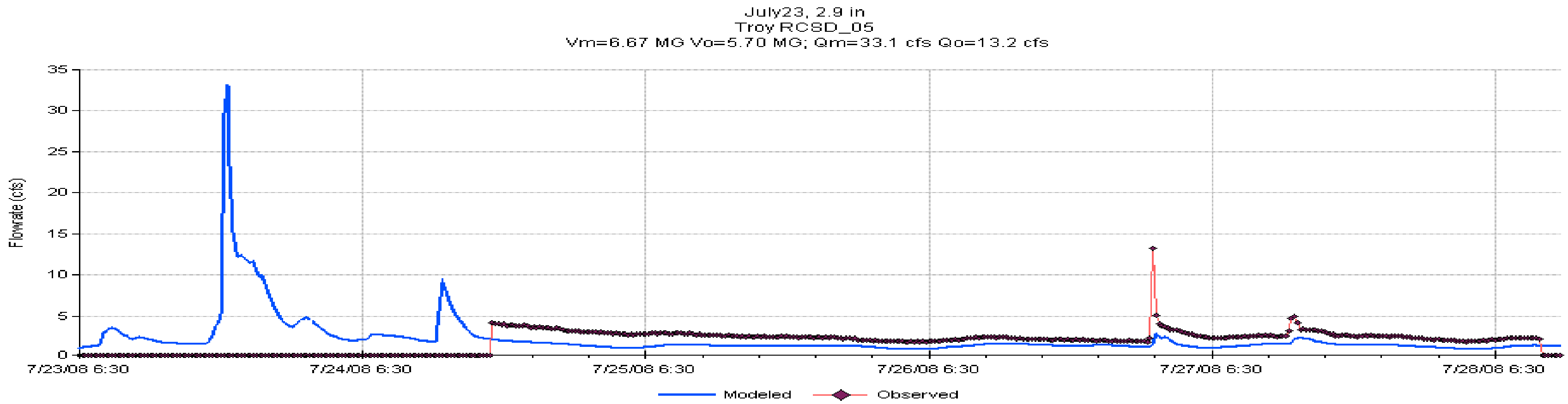

Sept6, 1.4 in
Troy RCSD_03
Vm=1.6 ft/s Vo=1.6 ft/s
Velocity (ft/s)
0
0.25
0.5
0.75
1
1.25
1.5
1.75
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed

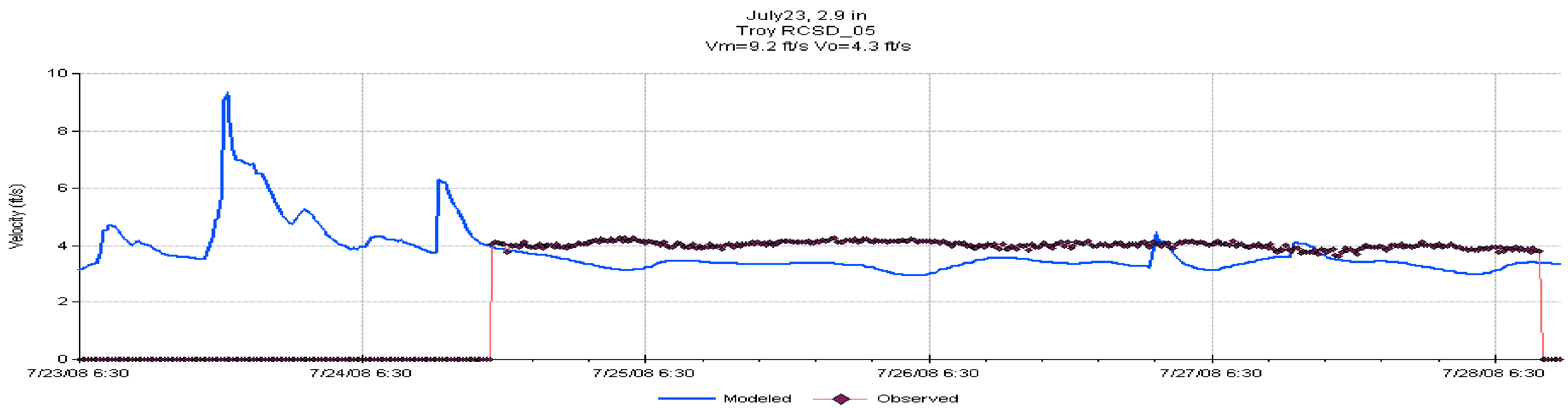

July13, 0.8 in
Troy RCSD_05
Dm=0.4 ft Do=0.5 ft
Depth (ft)
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed
Pipe Crown

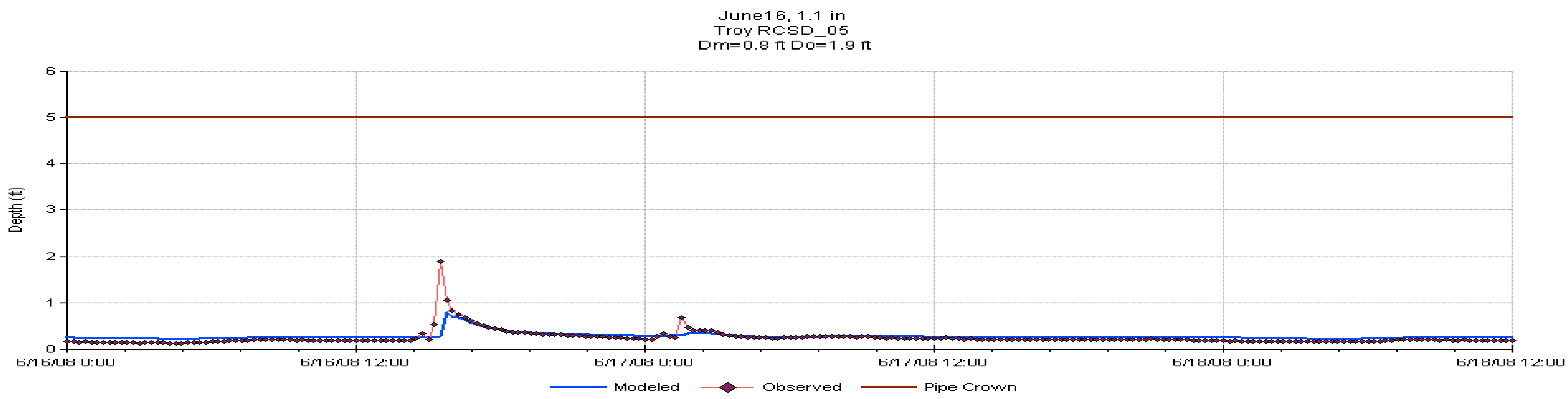

July13, 0.8 in
Troy RCSD_05
Vm=1.53 MG Vo=1.02 MG; Qm=4.6 cfs Qo=4.0 cfs
Flowrate (cfs)
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed

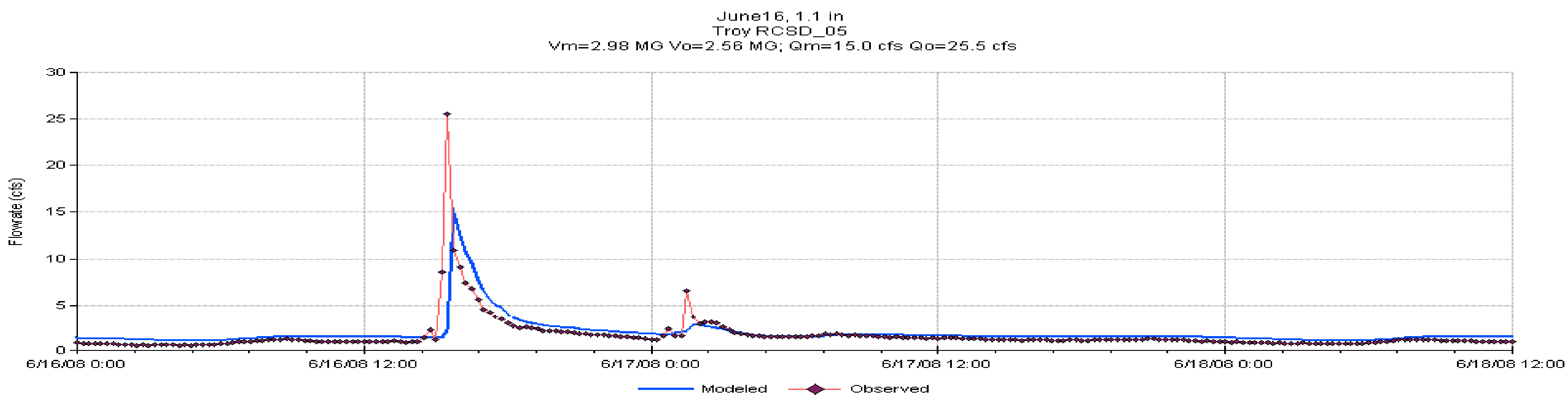

July13, 0.8 in
Troy RCSD_05
Vm=5.2 ft/s Vo=4.1 ft/s
Velocity (ft/s)
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed

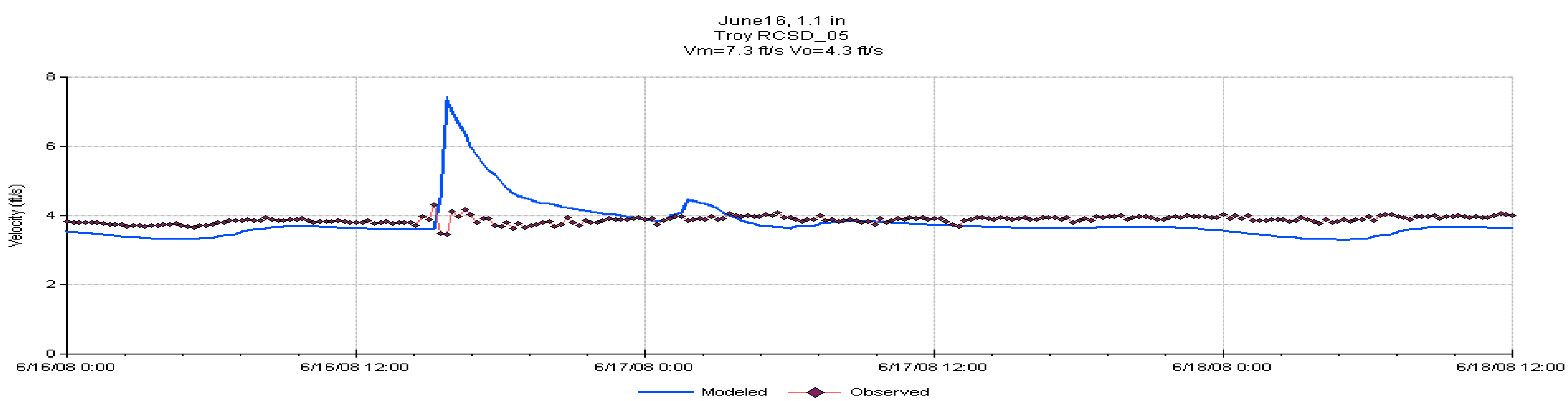

July23, 2.9 in
Troy RCSD_05
Dm=1.2 ft Do=1.1 ft
Depth (ft)
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed
Pipe Crown

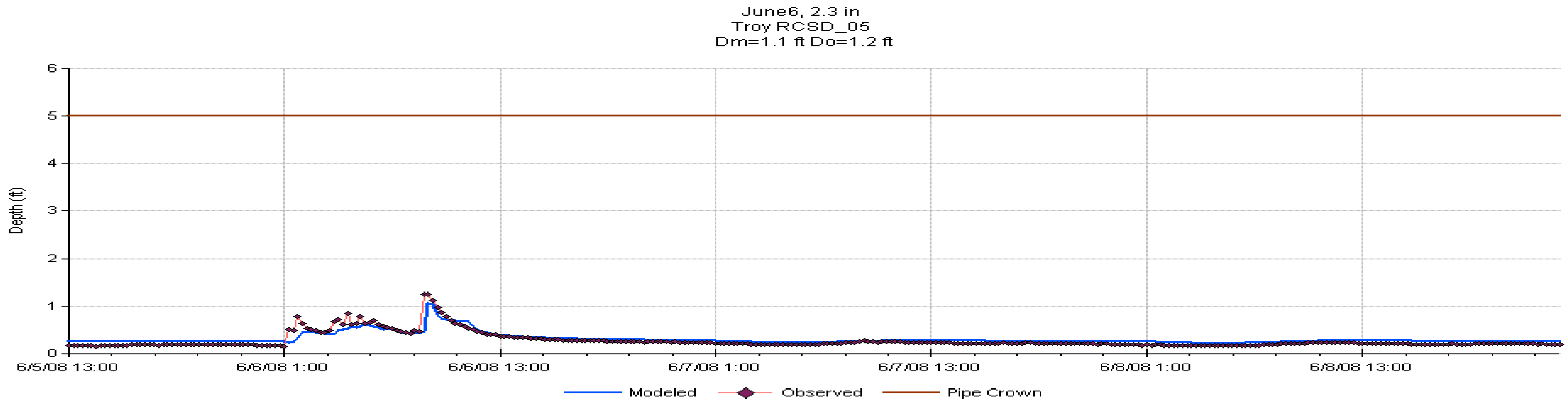

July23, 2.9 in
Troy RCSD_05
Vm=6.67 MG Vo=5.70 MG; Qm=33.1 cfs Qo=13.2 cfs
Flowrate (cfs)
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed

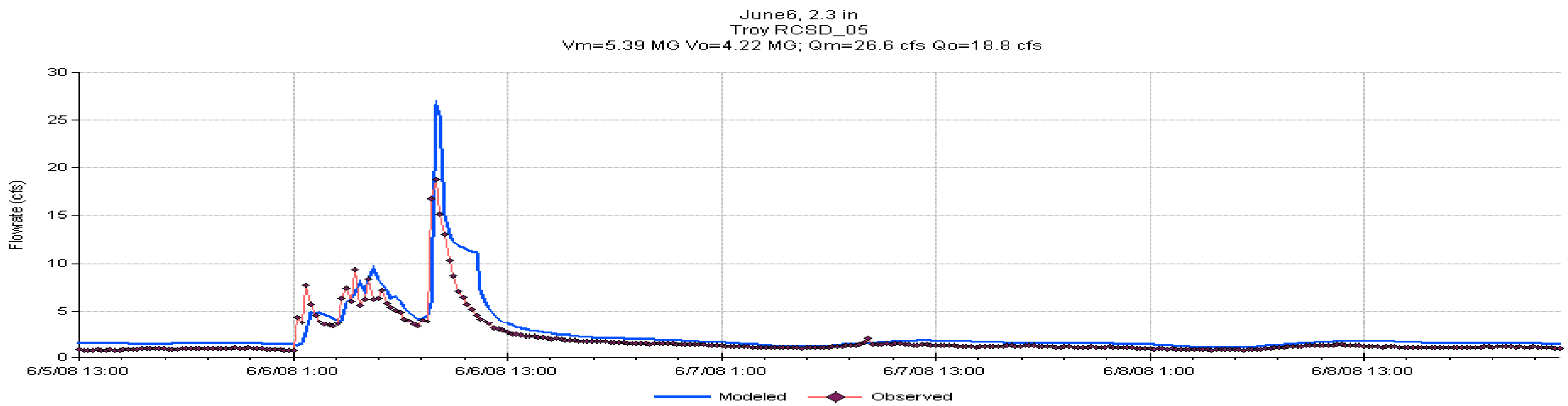

July23, 2.9 in
Troy RCSD_05
Vm=9.2 ft/s Vo=4.3 ft/s
Velocity (ft/s)
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed

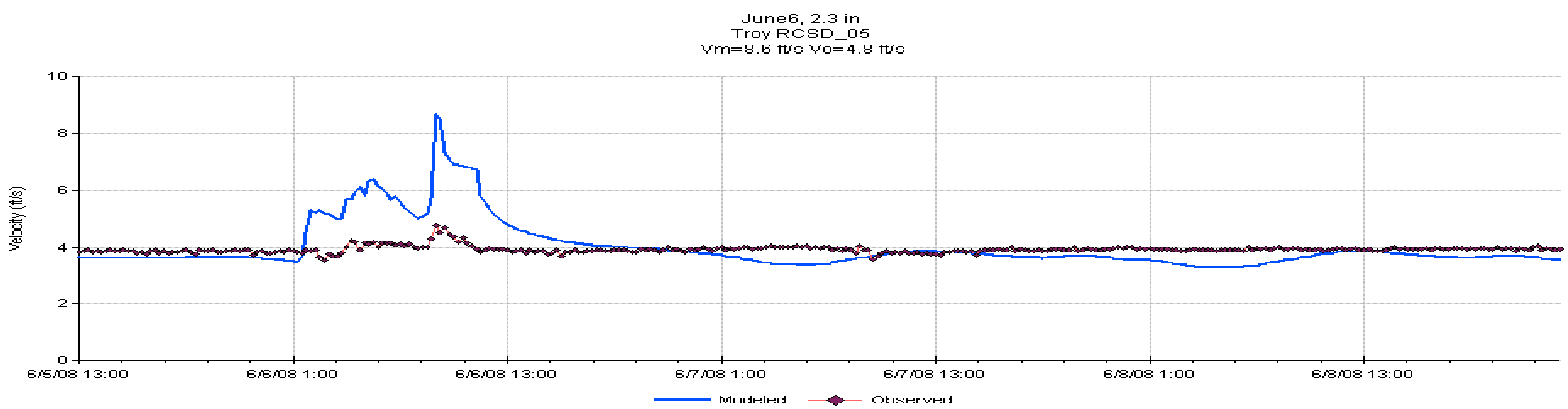

June16, 1.1 in
Troy RCSD_05
Dm=0.8 ft Do=1.9 ft
Depth (ft)
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
6/18/08 12:00
Modeled
Observed
Pipe Crown

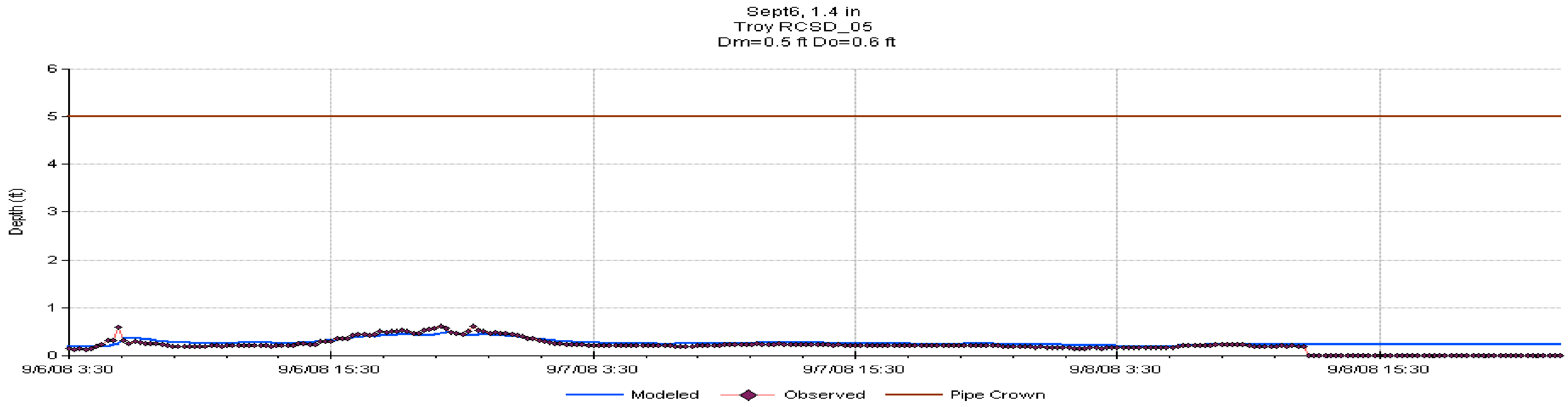

June16, 1.1 in
Troy RCSD_05
Vm=2.98 MG Vo=2.56 MG; Qm=15.0 cfs Qo=25.5 cfs
Flowrate (cfs)
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
6/18/08 12:00
Modeled
Observed

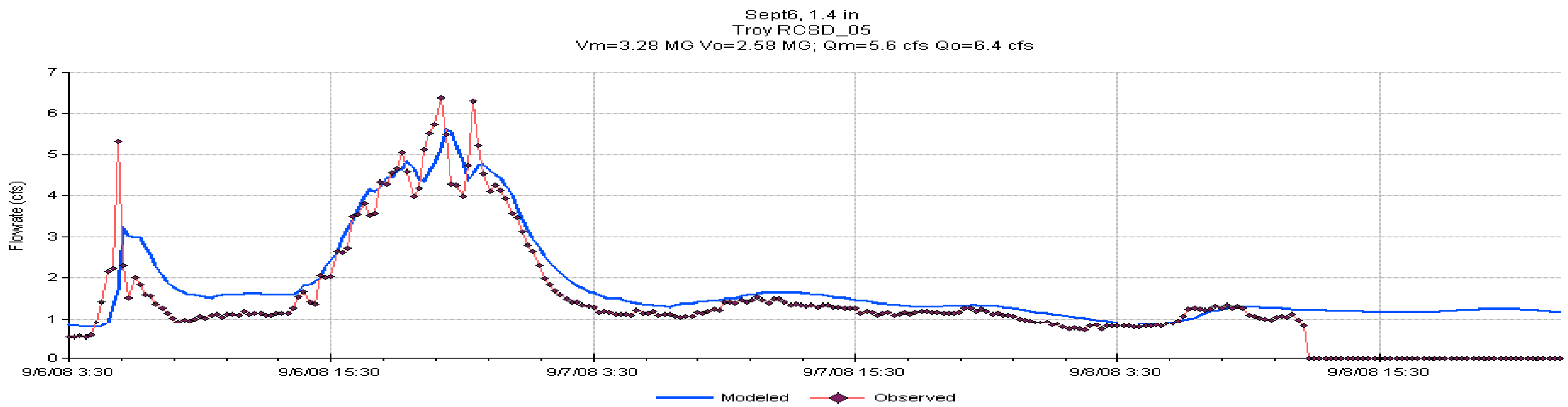

June16, 1.1 in
Troy RCSD_05
Vm=7.3 ft/s Vo=4.3 ft/s
Velocity (ft/s)
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
6/18/08 12:00
Modeled
Observed

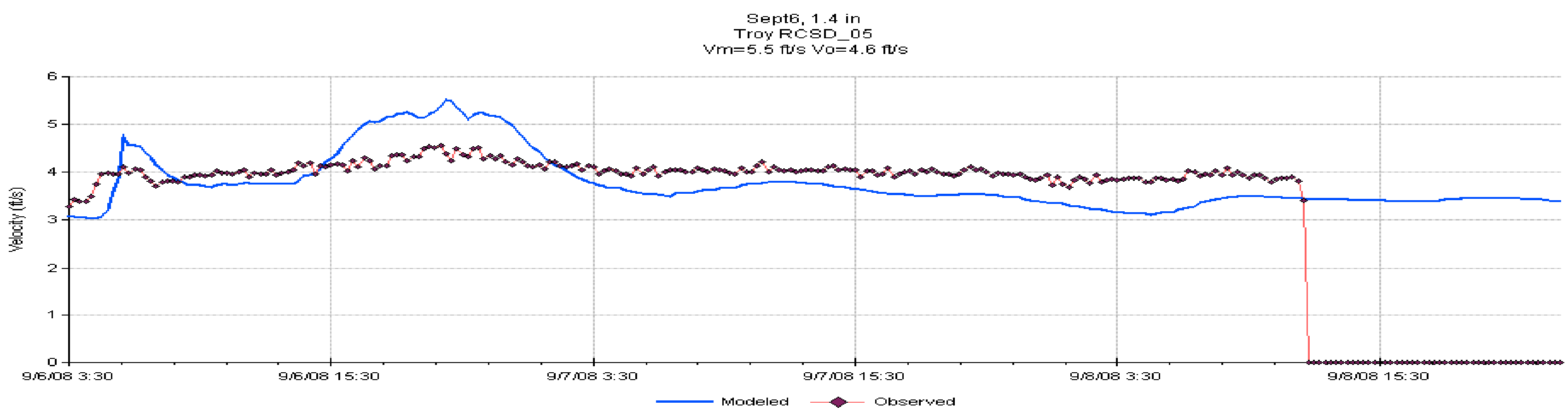

June6, 2.3 in
Troy RCSD_05
Dm=1.1 ft Do=1.2 ft
Depth (ft)
0
1
2
3
4
5
6
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed
Pipe Crown

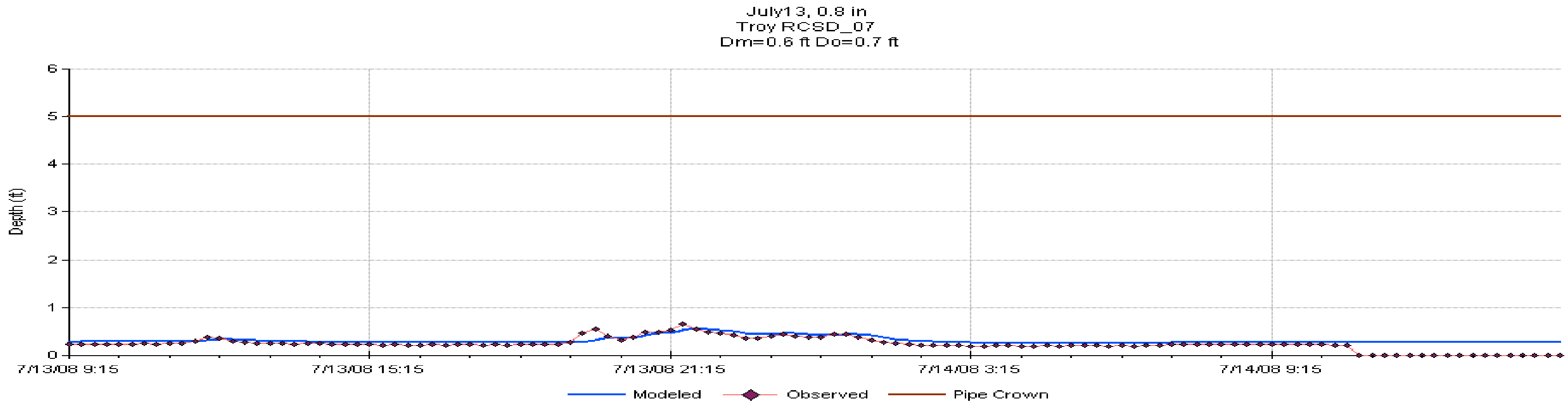

June6, 2.3 in
Troy RCSD_05
Vm=5.39 MG Vo=4.22 MG; Qm=26.6 cfs Qo=18.8 cfs
Flowrate (cfs)
0
5
10
15
20
25
30
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed

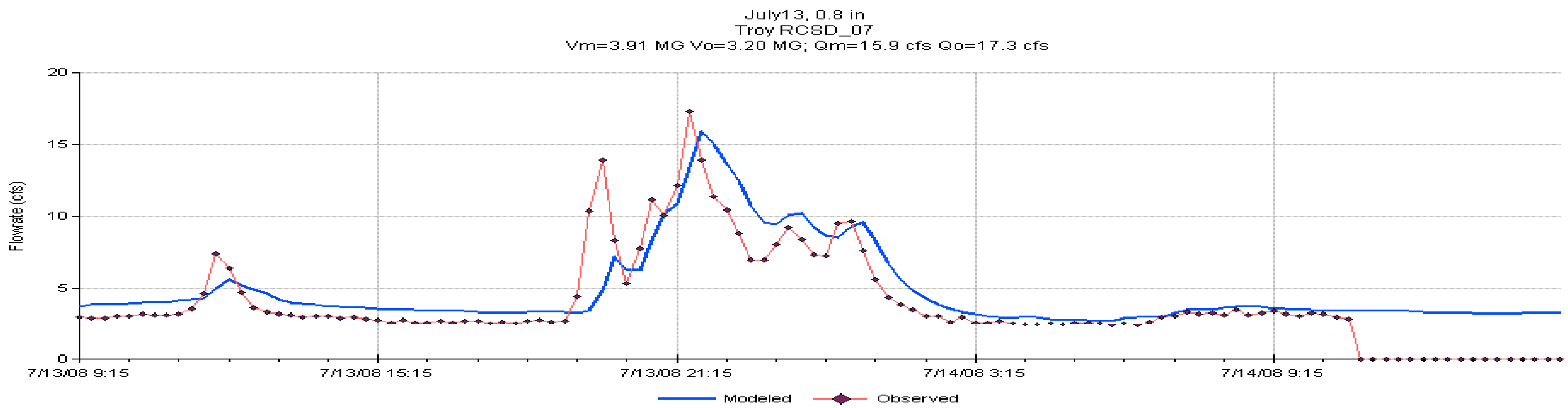

June6, 2.3 in
Troy RCSD_05
Vm=8.6 ft/s Vo=4.8 ft/s
Velocity (ft/s)
0
2
4
6
8
10
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed

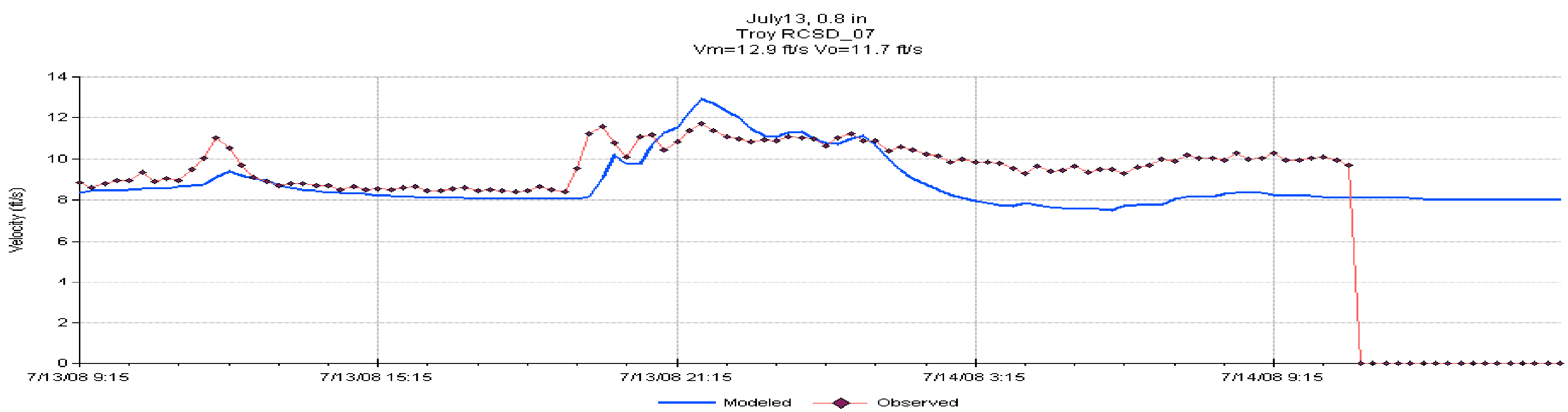

Sept6, 1.4 in
Troy RCSD_05
Dm=0.5 ft Do=0.6 ft
Depth (ft)
0
1
2
3
4
5
6
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed
Pipe Crown

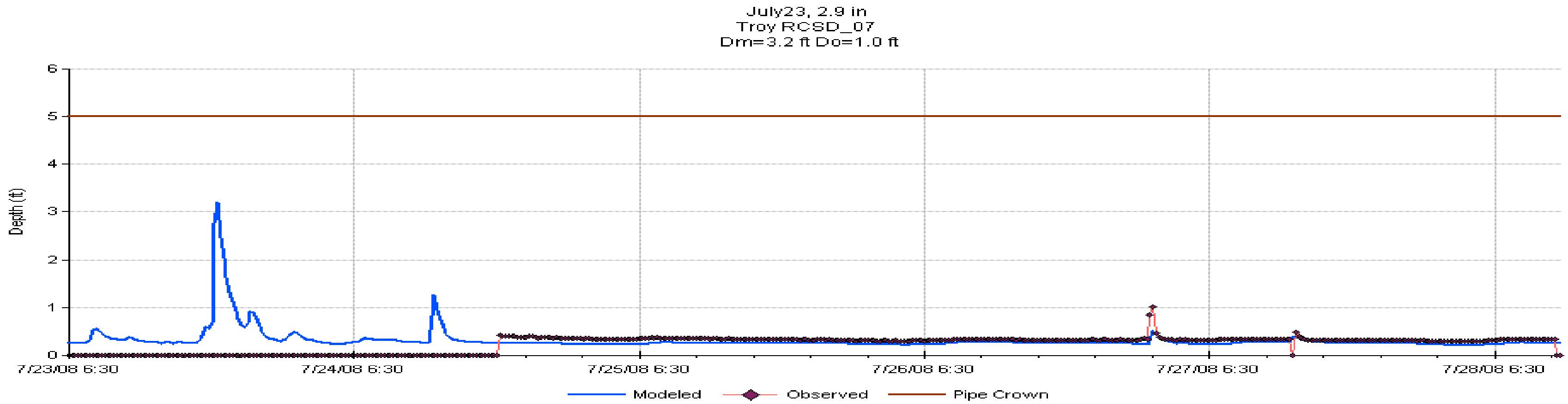

Sept6, 1.4 in
Troy RCSD_05
Vm=3.28 MG Vo=2.58 MG; Qm=5.6 cfs Qo=6.4 cfs
Flowrate (cfs)
0
1
2
3
4
5
6
7
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed

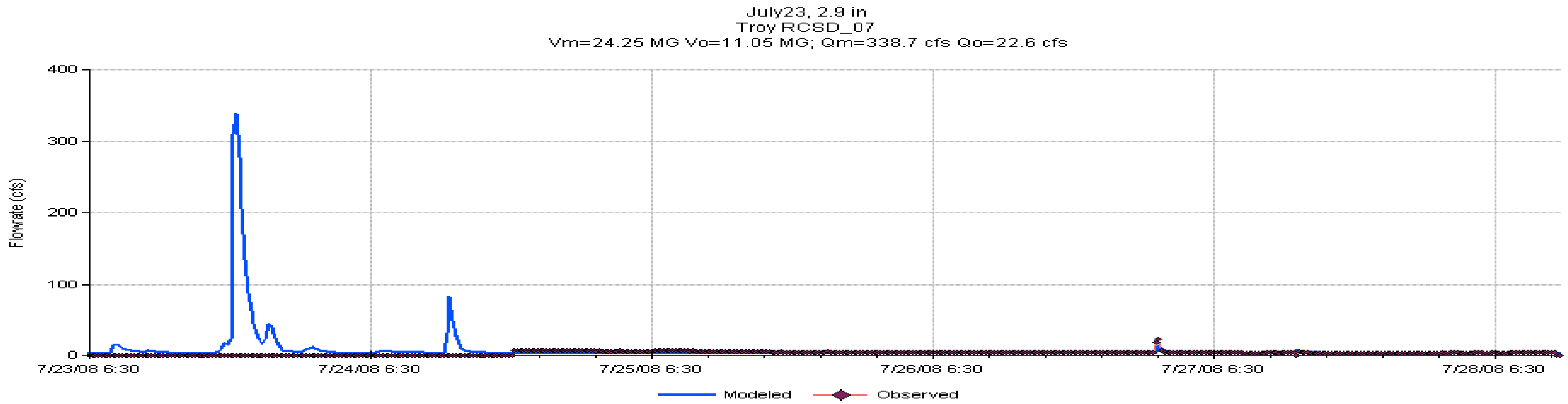

Sept6, 1.4 in
Troy RCSD_05
Vm=5.5 ft/s Vo=4.6 ft/s
Velocity (ft/s)
0
1
2
3
4
5
6
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed

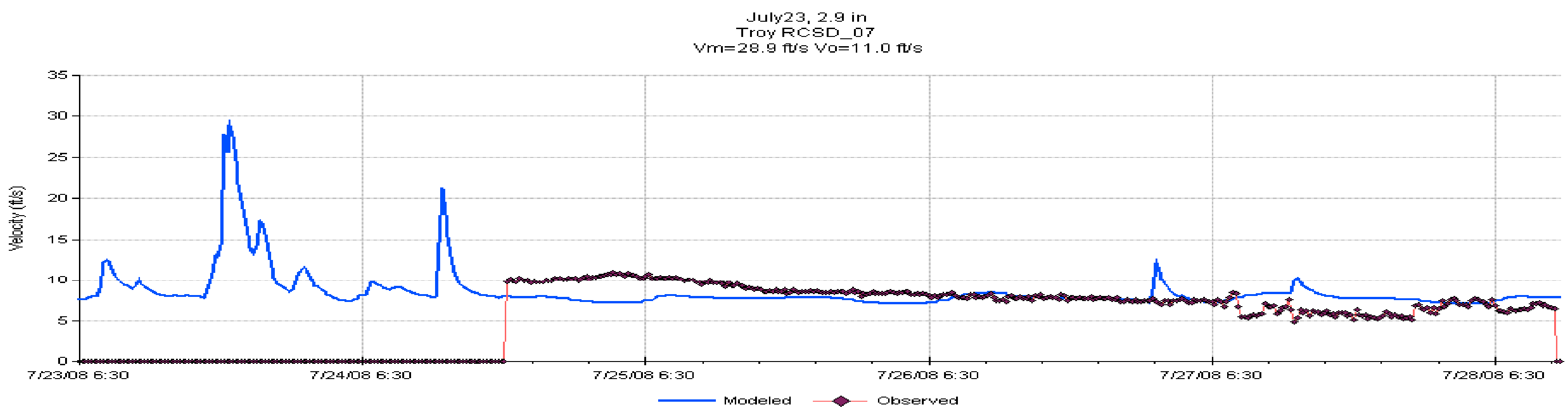

July13, 0.8 in
Troy RCSD_07
Dm=0.6 ft Do=0.7 ft
Depth (ft)
6
5
4
3
2
1
0
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed
Pipe Crown


July13, 0.8 in
Troy RCSD_07
Vm=3.91 MG Vo=3.20 MG; Qm=15.9 cfs Qo=17.3 cfs
Flowrate (cfs)
20
15
10
5
0
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed

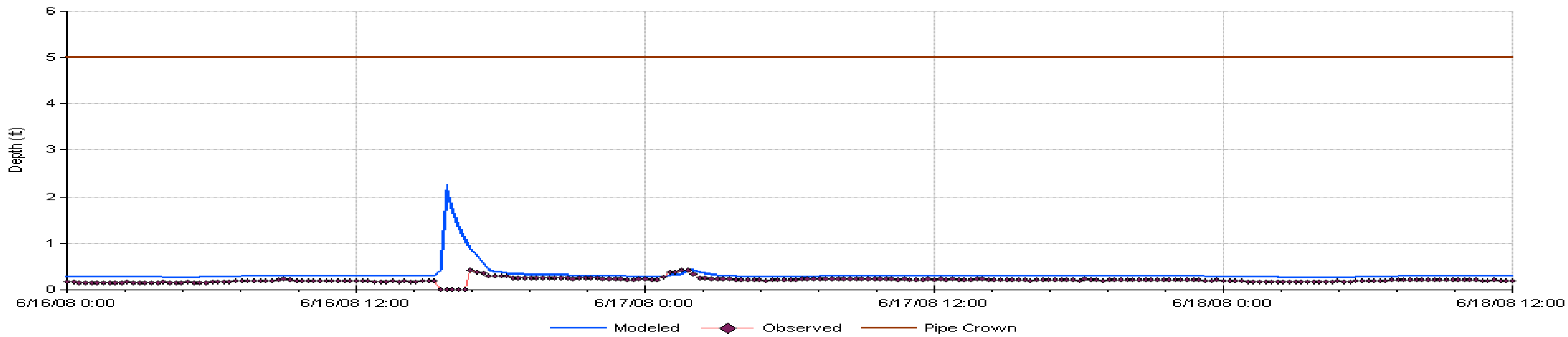

July13, 0.8 in
Troy RCSD_07
Vm=12.9 ft/s Vo=11.7 ft/s
Velocity (ft/s)
14
12
10
8
6
4
2
0
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed


July23, 2.9 in
Troy RCSD_07
Dm=3.2 ft Do=1.0 ft
Depth (ft)
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed
Pipe Crown

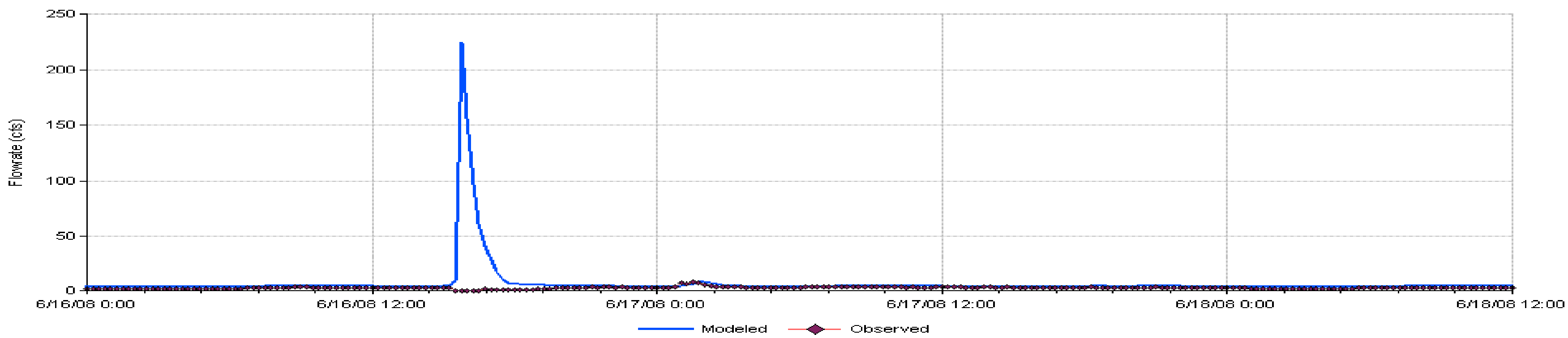

July23, 2.9 in
Troy RCSD_07
Vm=24.25 MG Vo=11.05 MG; Qm=338.7 cfs Qo=22.6 cfs
Flowrate (cfs)
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed


July23, 2.9 in
Troy RCSD_07
Vm=28.9 ft/s Vo=11.0 ft/s
Velocity (ft/s)
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed

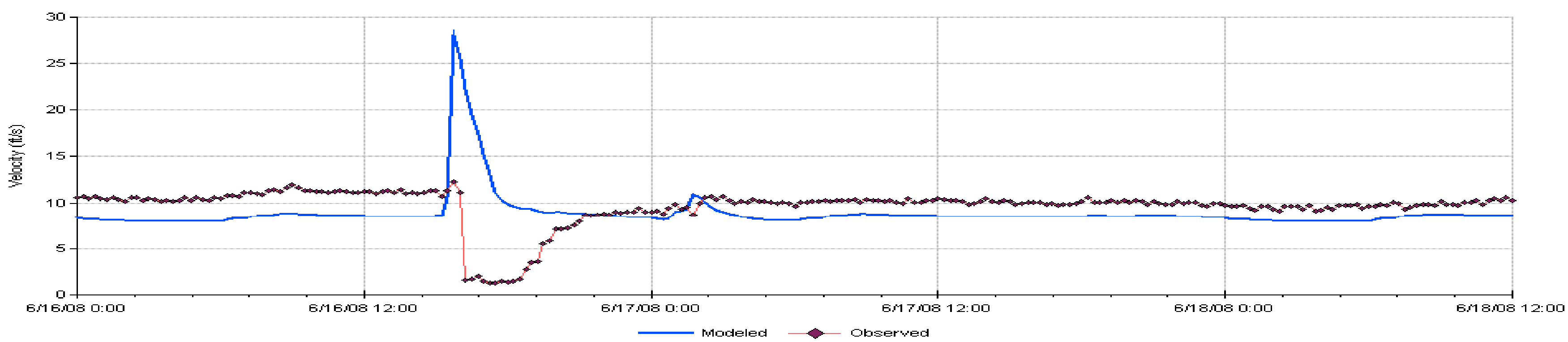
June16, 1.1 in
Troy RCSD_07
Dm=2.1 ft Do=0.4 ft

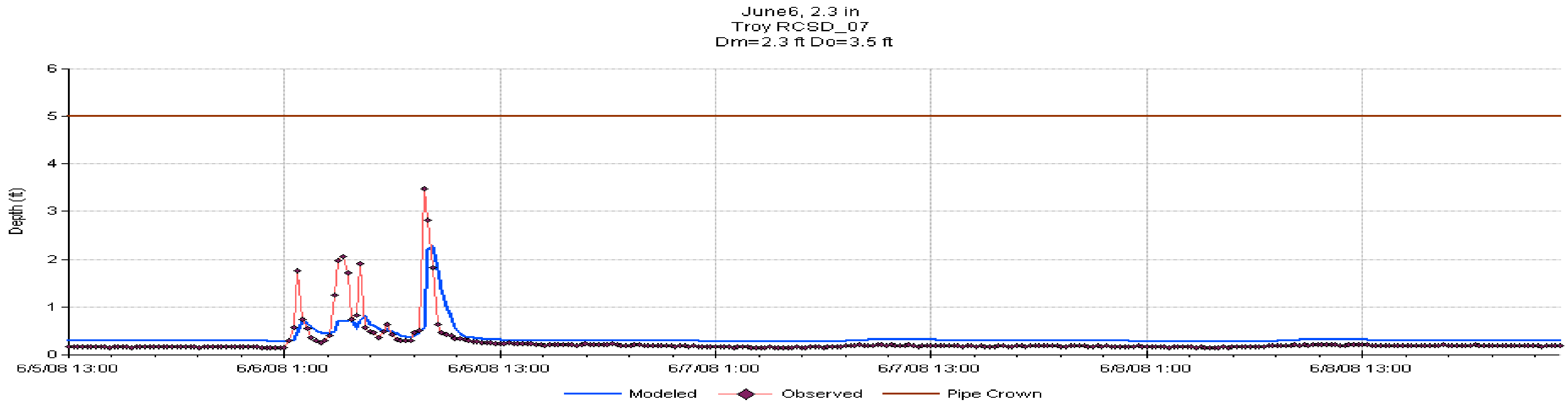


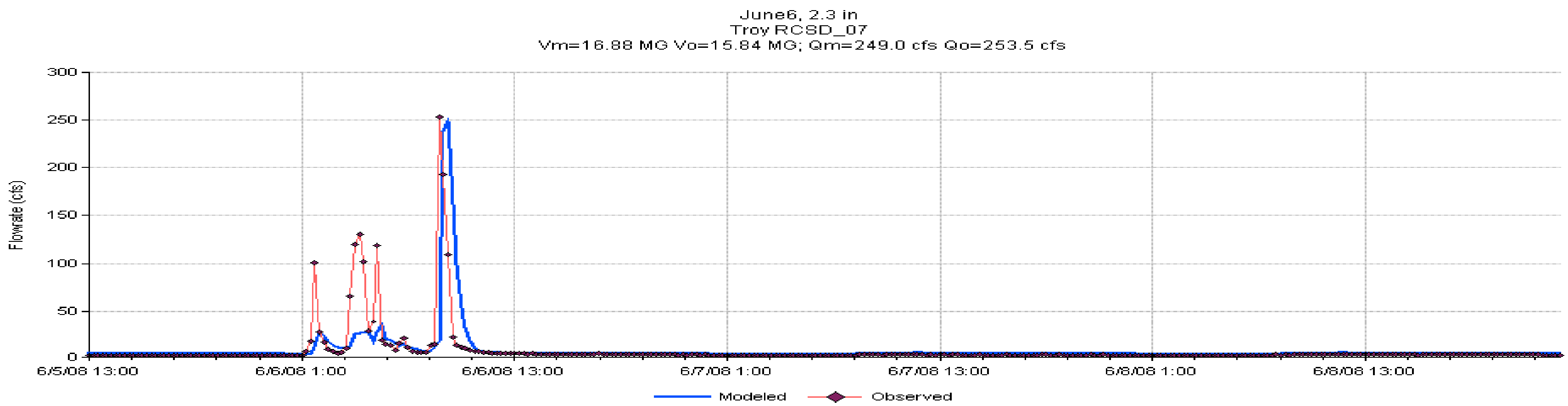
June16, 1.1 in
Troy RCSD_07
Vm=10.53 MG Vo=4.26 MG; Qm=224.4 cfs Qo=7.6 cfs

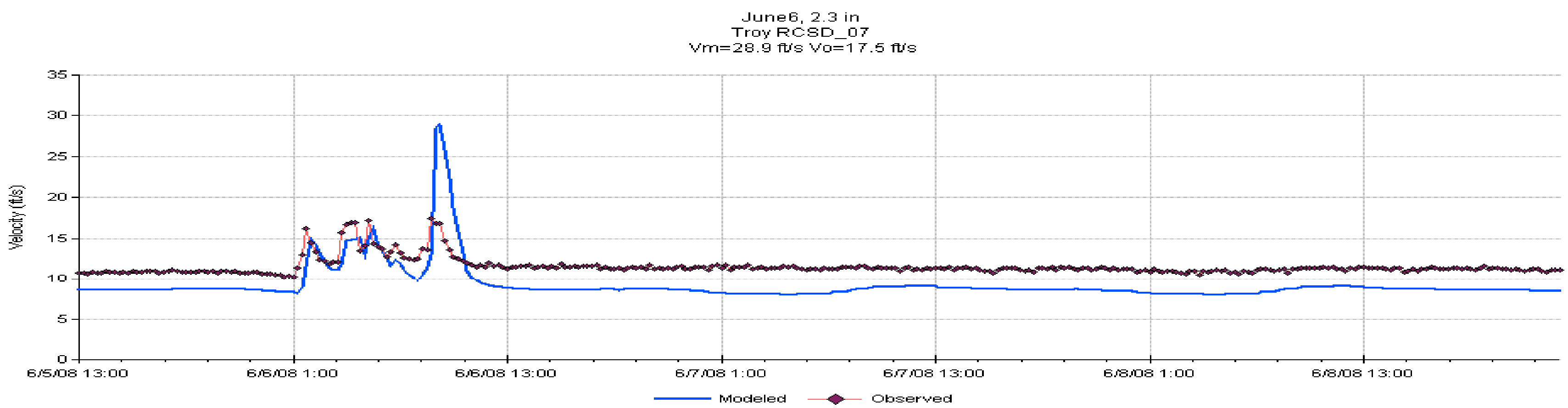


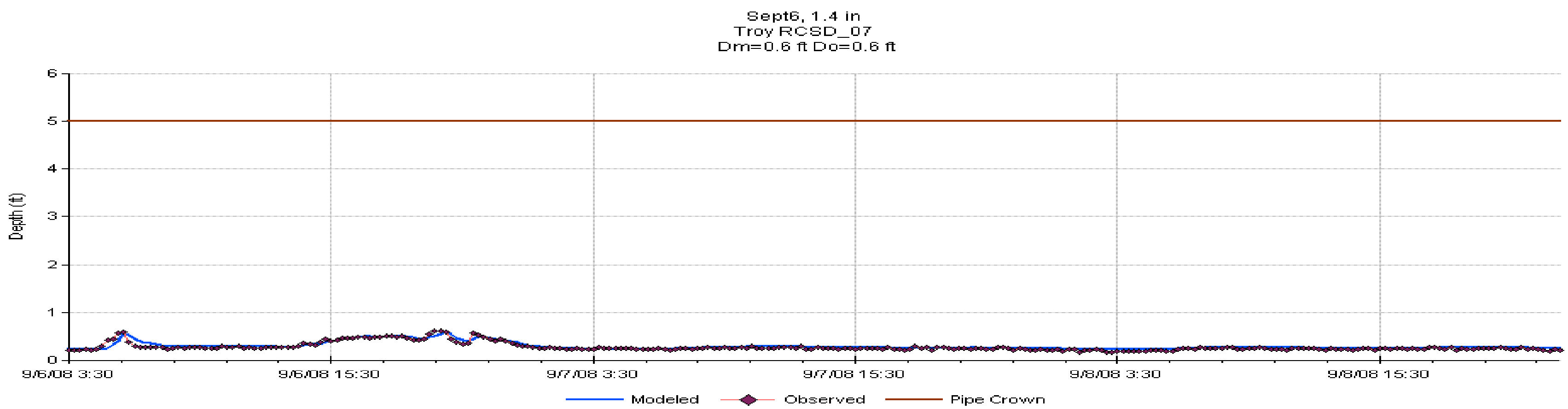
June16, 1.1 in
Troy RCSD_07
Vm=28.1 ft/s Vo=12.3 ft/s

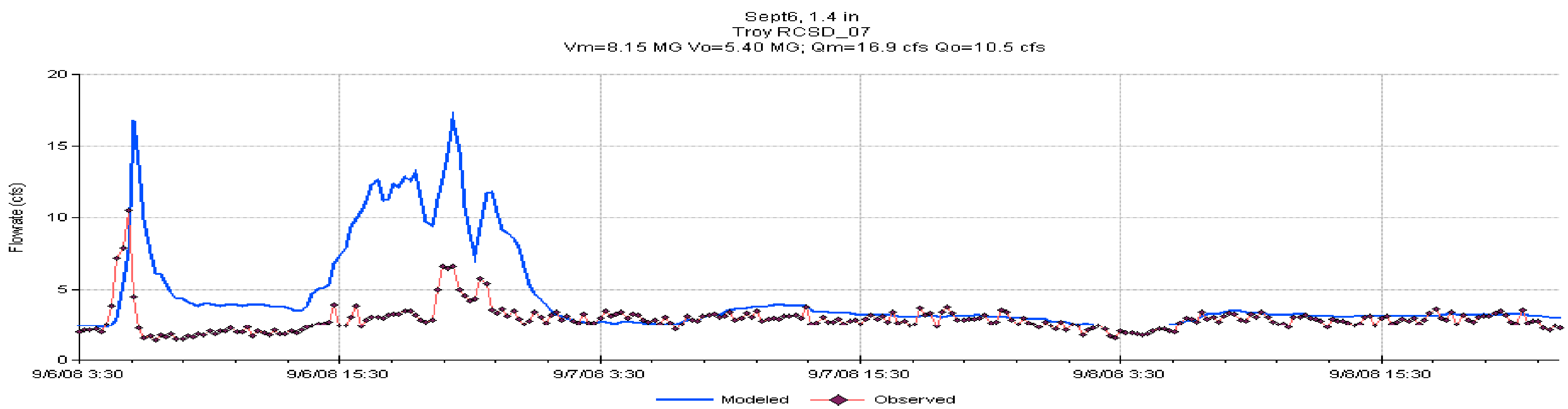


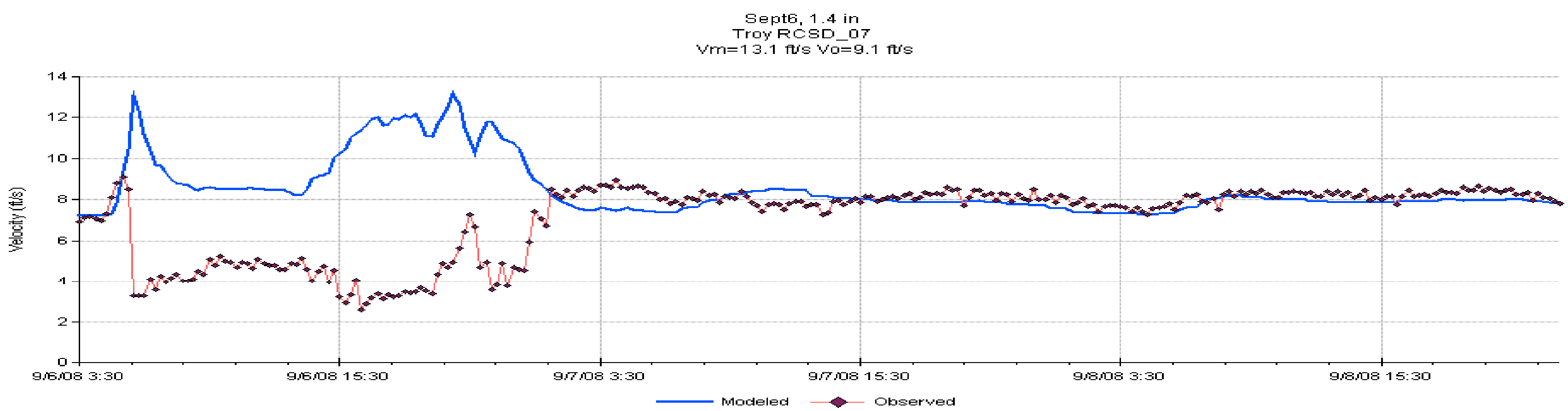

June6, 2.3 in
Troy RCSD_07
Dm=2.3 ft Do=3.5 ft
Depth (ft)
0
1
2
3
4
5
6
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed
Pipe Crown

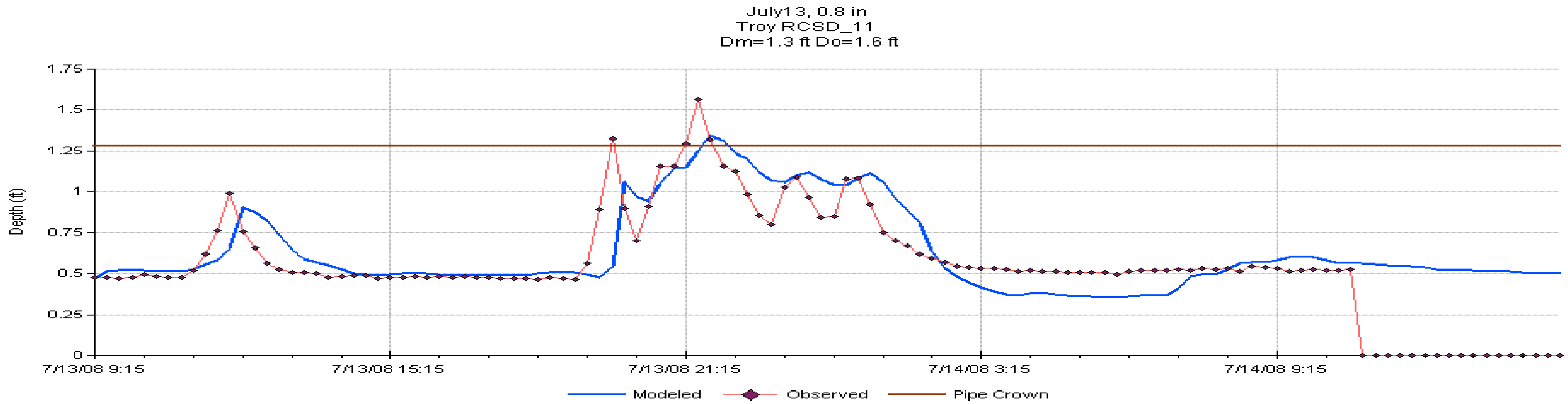

June6, 2.3 in
Troy RCSD_07
Vm=16.88 MG Vo=15.84 MG; Qm=249.0 cfs Qo=253.5 cfs
Flowrate (cfs)
0
50
100
150
200
250
300
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed

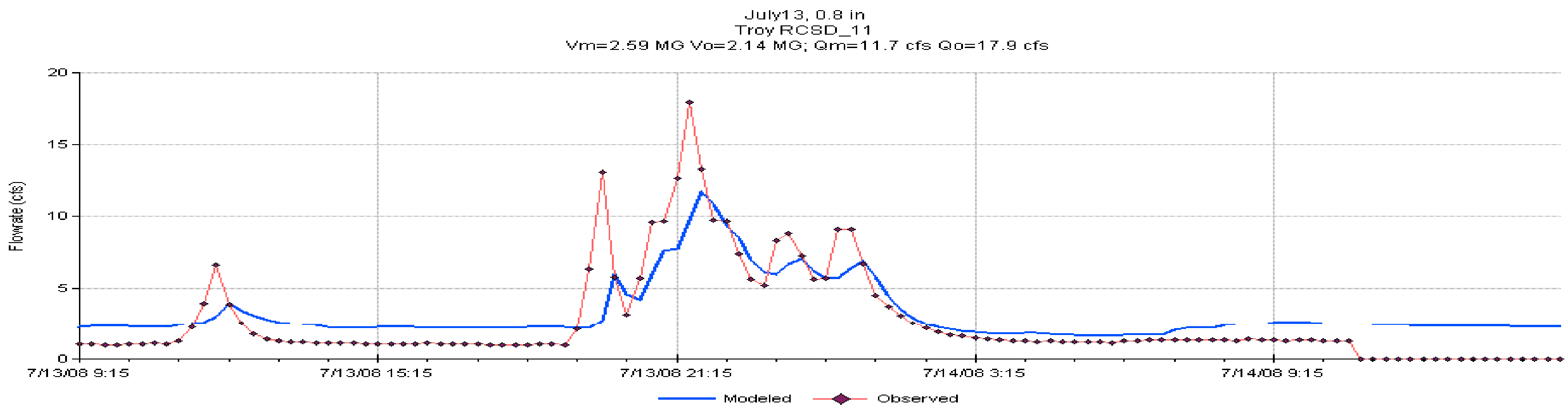

June6, 2.3 in
Troy RCSD_07
Vm=28.9 ft/s Vo=17.5 ft/s
Velocity (ft/s)
0
5
10
15
20
25
30
35
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed

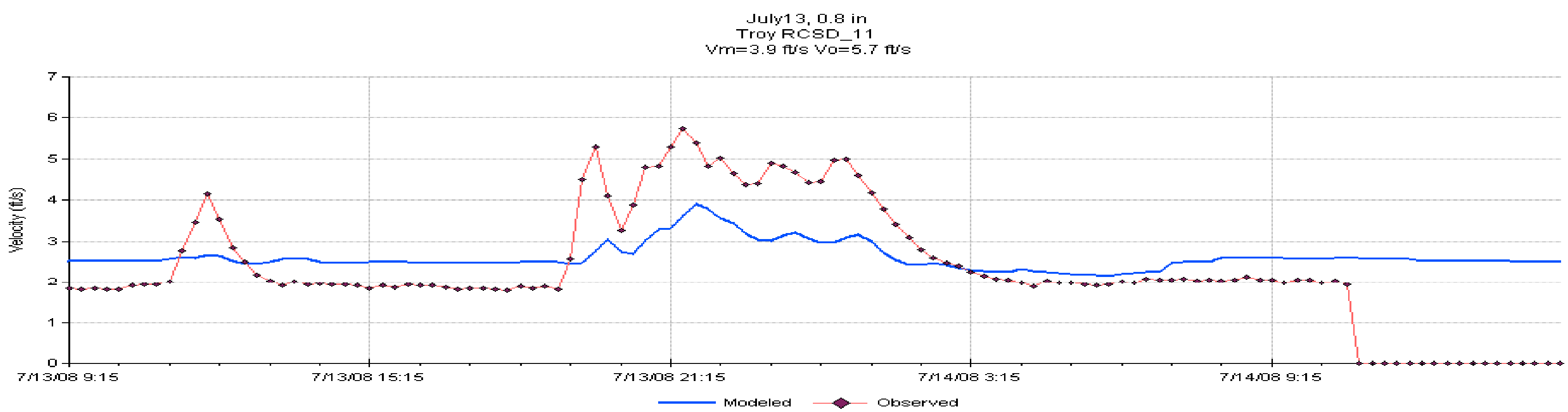

Sept6, 1.4 in
Troy RCSD_07
Dm=0.6 ft Do=0.6 ft
Depth (ft)
0
1
2
3
4
5
6
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed
Pipe Crown


Sept6, 1.4 in
Troy RCSD_07
Vm=8.15 MG Vo=5.40 MG; Qm=16.9 cfs Qo=10.5 cfs
Flowrate (cfs)
0
5
10
15
20
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed

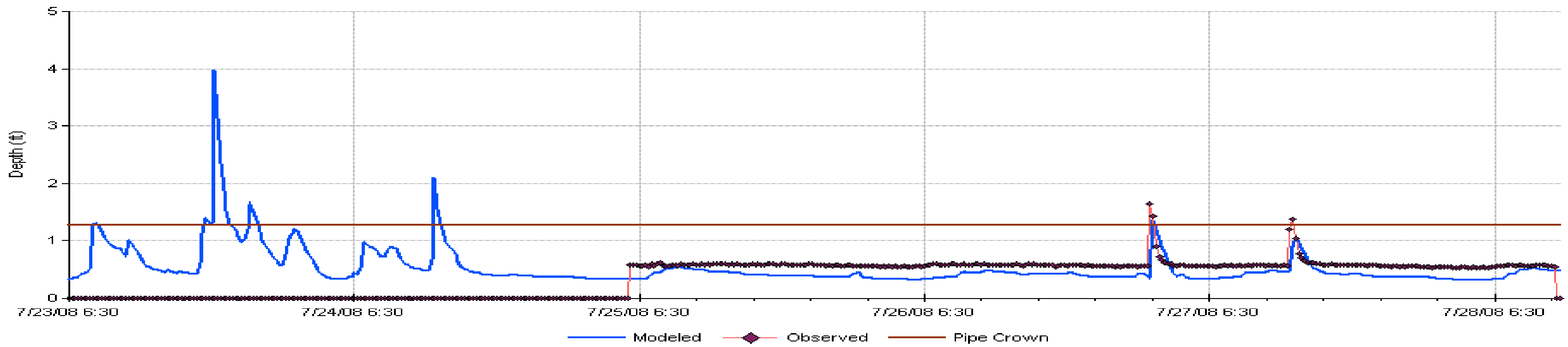

Sept6, 1.4 in
Troy RCSD_07
Vm=13.1 ft/s Vo=9.1 ft/s
Velocity (ft/s)
0
2
4
6
8
10
12
14
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed


July13, 0.8 in
Troy RCSD_11
Dm=1.3 ft Do=1.6 ft
Depth (ft)
1.75
1.5
1.25
1
0.75
0.5
0.25
0
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed
Pipe Crown

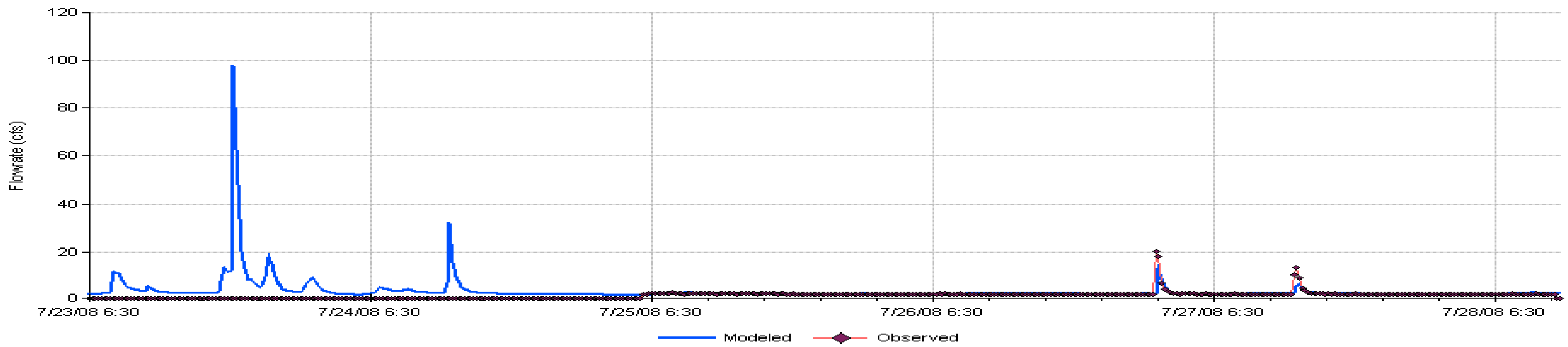

July13, 0.8 in
Troy RCSD_11
Vm=2.59 MG Vo=2.14 MG; Qm=11.7 cfs Qo=17.9 cfs
Flowrate (cfs)
20
15
10
5
0
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed


July13, 0.8 in
Troy RCSD_11
Vm=3.9 ft/s Vo=5.7 ft/s
Velocity (ft/s)
7
6
5
4
3
2
1
0
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed

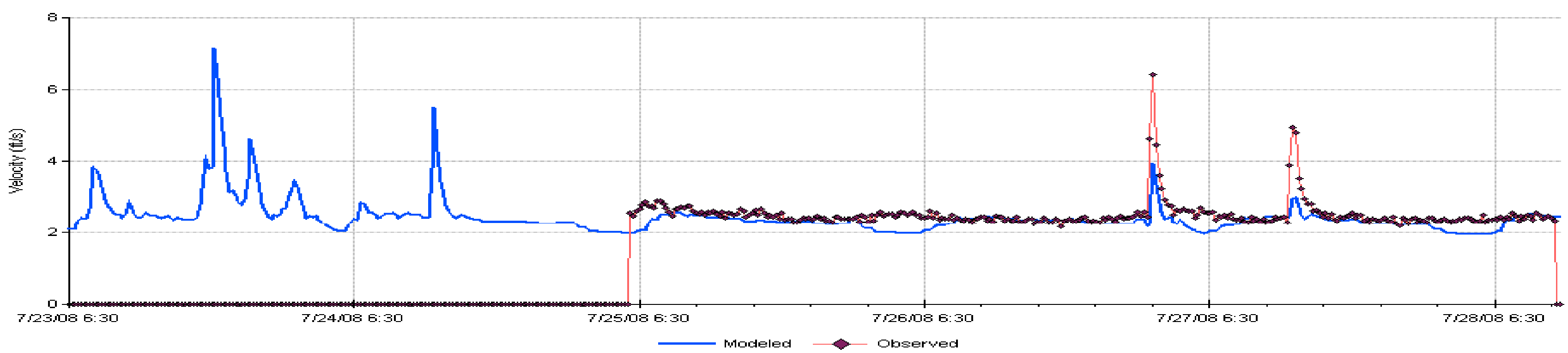
July23, 2.9 in
Troy RCSD_11
Dm=4.0 ft Do=1.6 ft

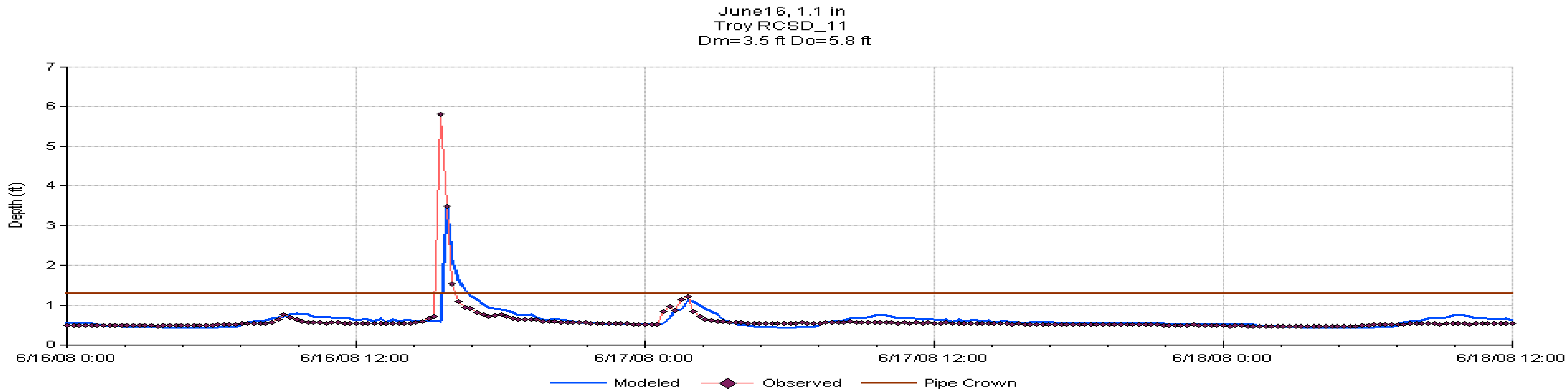


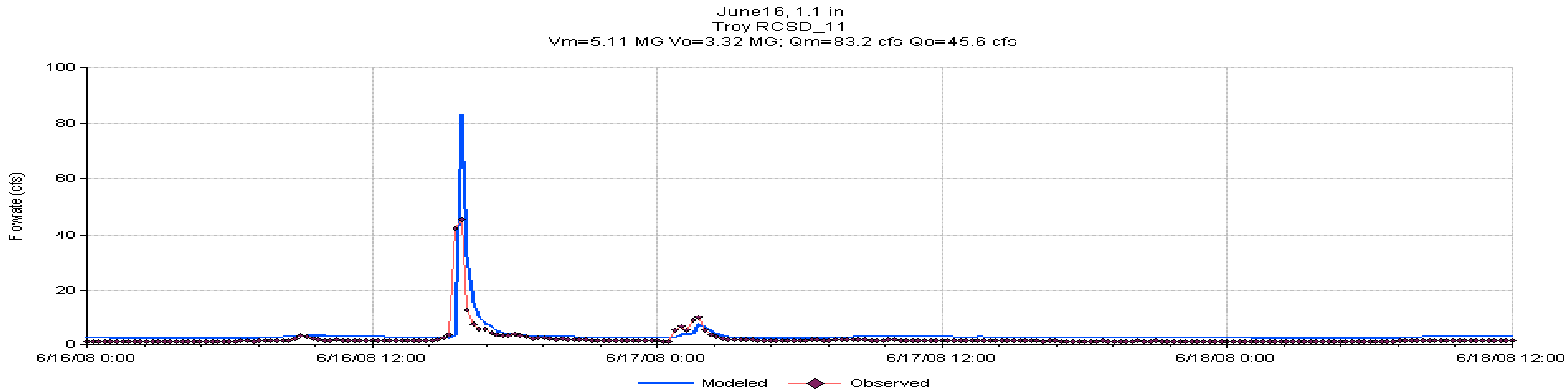
July23, 2.9 in
Troy RCSD_11
Vm=10.06 MG Vo=4.31 MG; Qm=98.0 cfs Qo=20.2 cfs

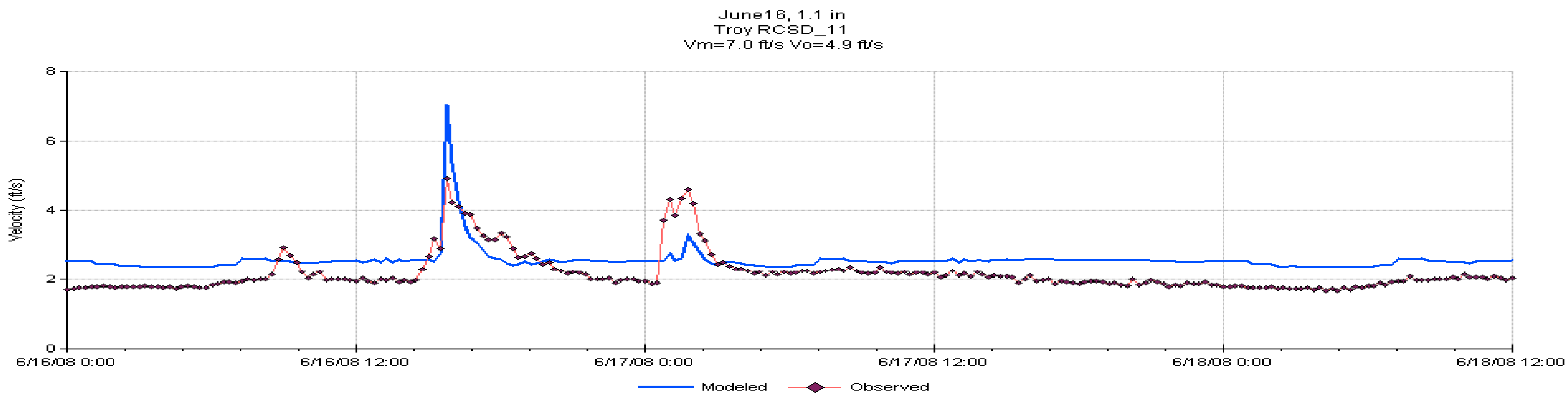


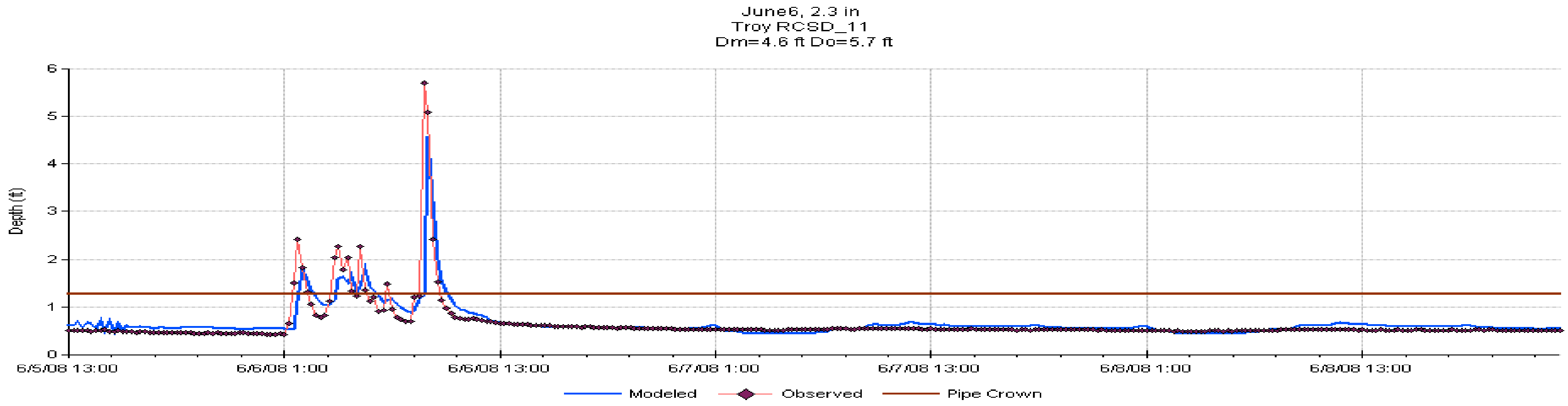
July23, 2.9 in
Troy RCSD_11
Vm=7.2 ft/s Vo=6.4 ft/s

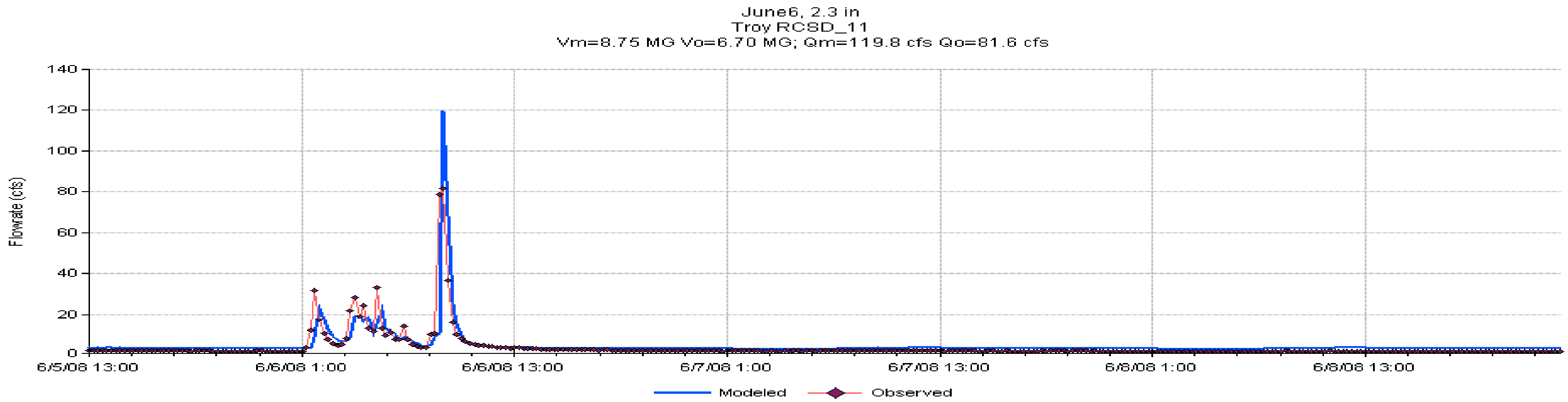


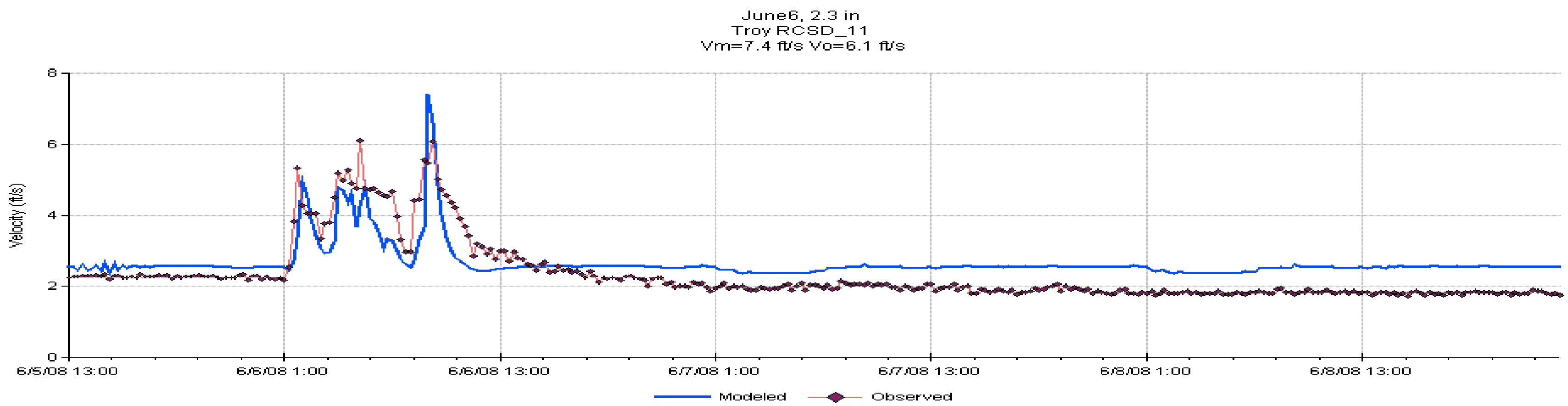

June16, 1.1 in
Troy RCSD_11
Dm=3.5 ft Do=5.8 ft
Depth (ft)
0
1
2
3
4
5
6
7
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
6/18/08 12:00
Modeled
Observed
Pipe Crown

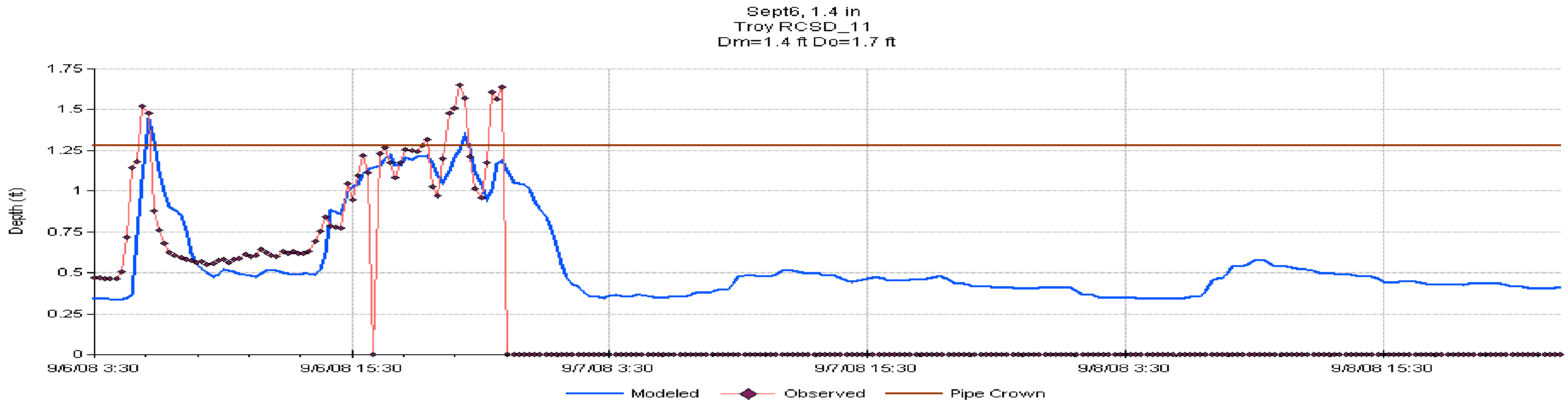

June16, 1.1 in
Troy RCSD_11
Vm=5.11 MG Vo=3.32 MG; Qm=83.2 cfs Qo=45.6 cfs
Flowrate (cfs)
0
20
40
60
80
100
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
6/18/08 12:00
Modeled
Observed

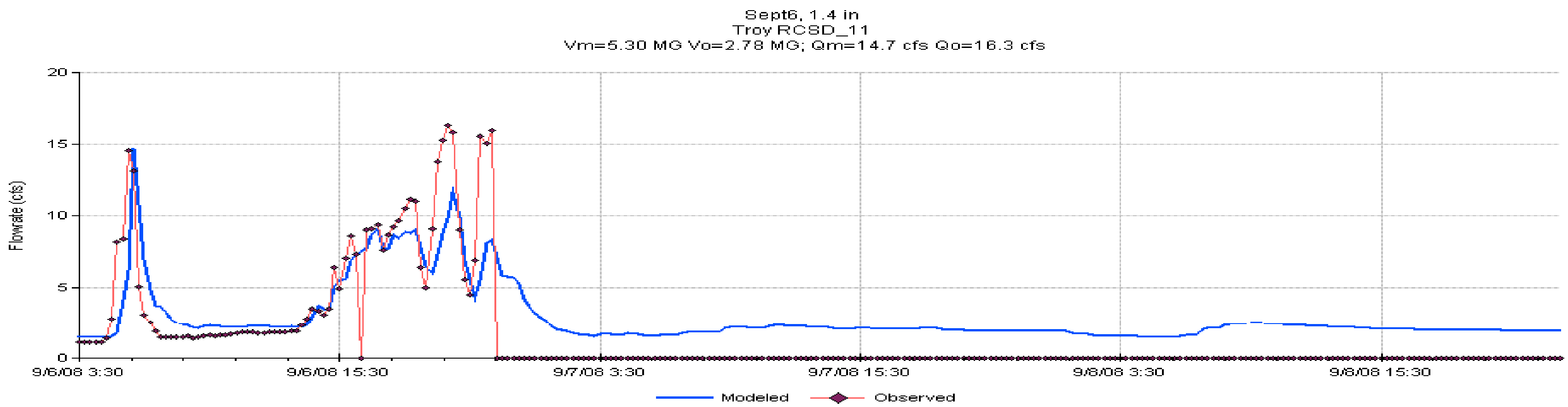

June16, 1.1 in
Troy RCSD_11
Vm=7.0 ft/s Vo=4.9 ft/s
Velocity (ft/s)
0
2
4
6
8
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
6/18/08 12:00
Modeled
Observed

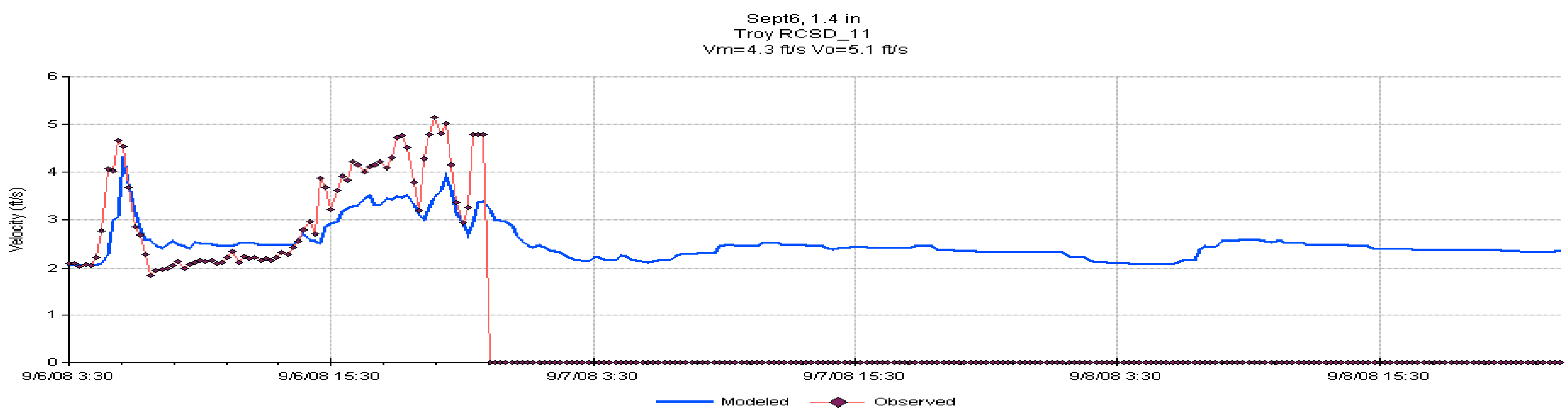

June6, 2.3 in
Troy RCSD_11
Dm=4.6 ft Do=5.7 ft
Depth (ft)
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed
Pipe Crown

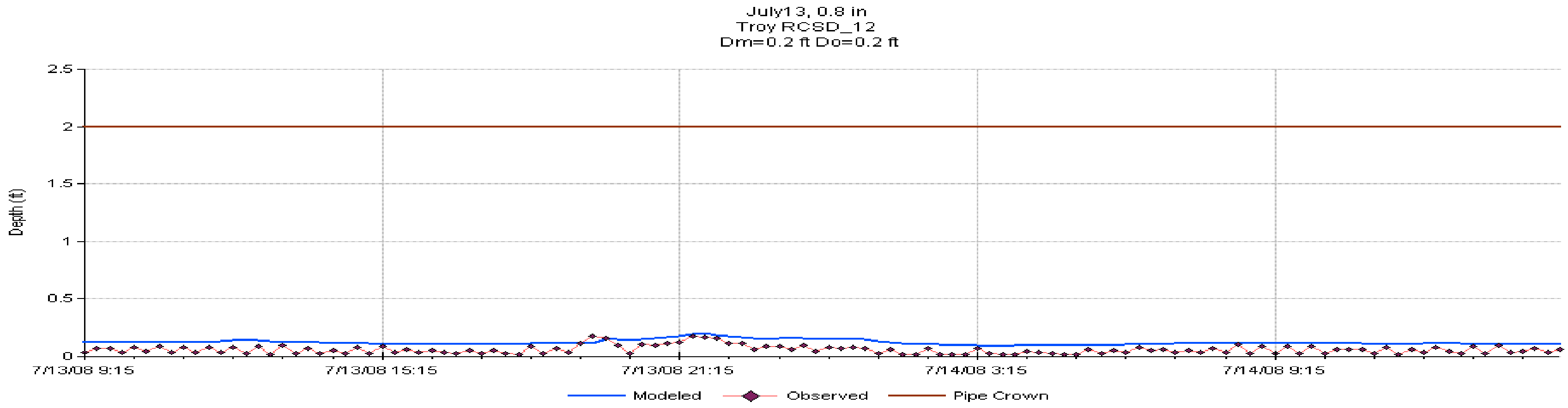

June6, 2.3 in
Troy RCSD_11
Vm=8.75 MG Vo=6.70 MG; Qm=119.8 cfs Qo=81.6 cfs
Flowrate (cfs)
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed

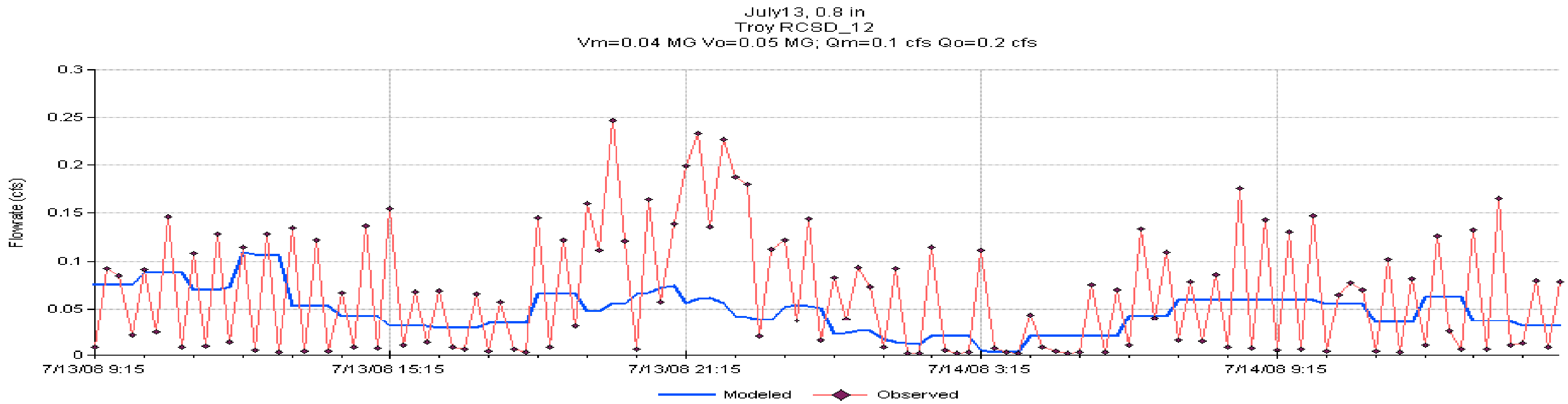

June6, 2.3 in
Troy RCSD_11
Vm=7.4 ft/s Vo=6.1 ft/s
Velocity (ft/s)
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed

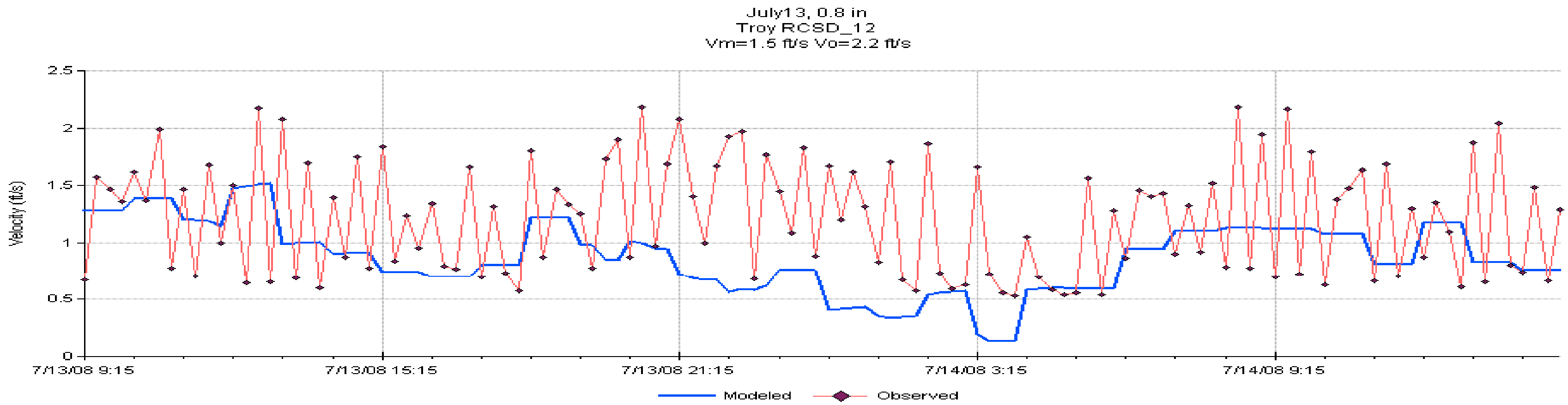

Sept6, 1.4 in
Troy RCSD_11
Dm=1.4 ft Do=1.7 ft
Depth (ft)
1.75
1.5
1.25
1
0.75
0.5
0.25
0
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed
Pipe Crown

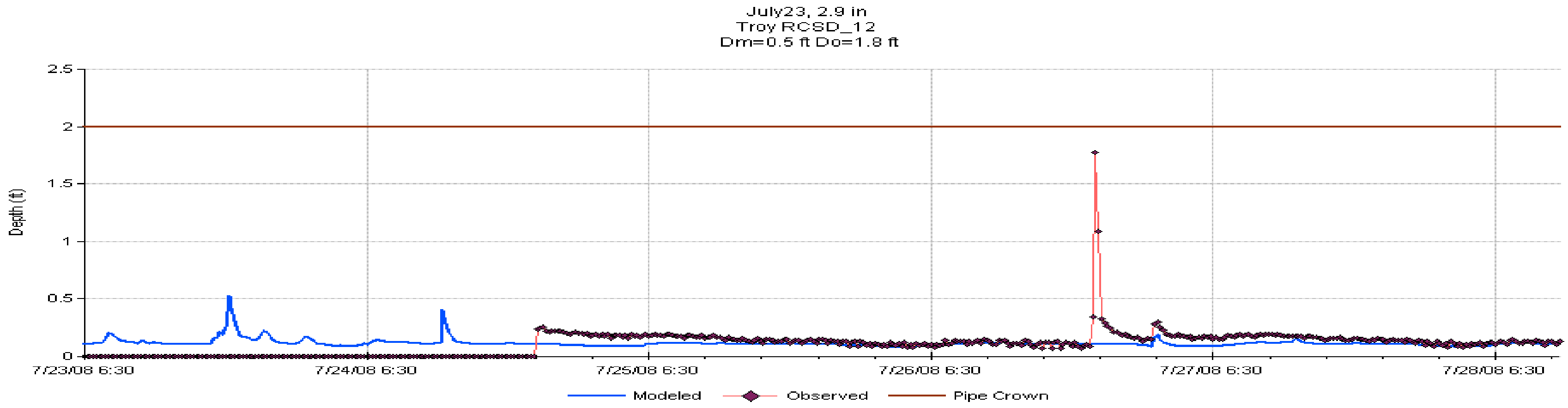

Sept6, 1.4 in
Troy RCSD_11
Vm=5.30 MG Vo=2.78 MG; Qm=14.7 cfs Qo=16.3 cfs
Flowrate (cfs)
20
15
10
5
0
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed

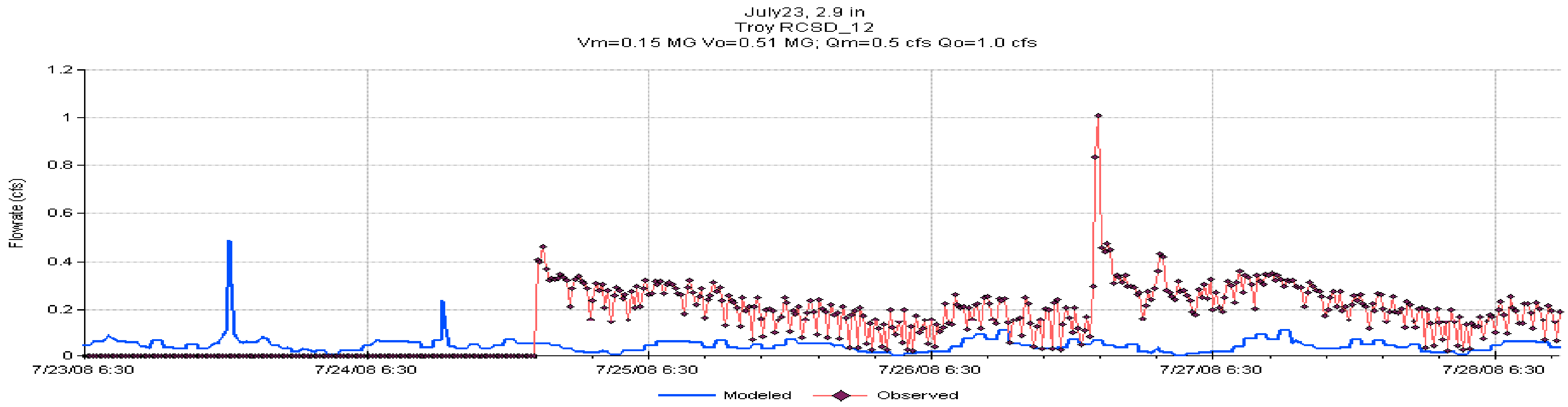

Sept6, 1.4 in
Troy RCSD_11
Vm=4.3 ft/s Vo=5.1 ft/s
Velocity (ft/s)
6
5
4
3
2
1
0
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed

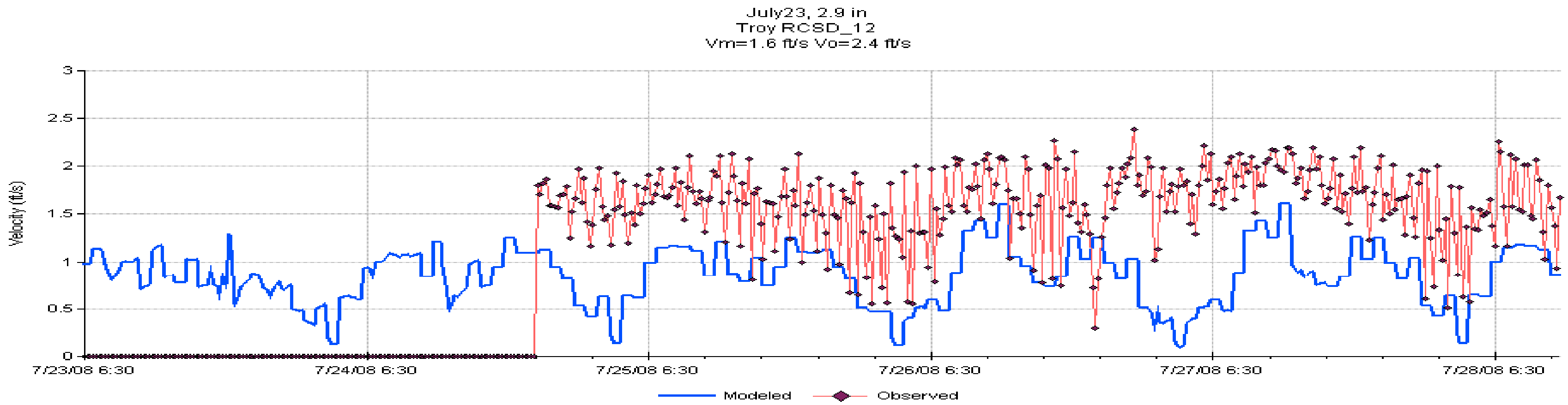

July13, 0.8 in
Troy RCSD_12
Dm=0.2 ft Do=0.2 ft
Depth (ft)
2.5
2
1.5
1
0.5
0
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed
Pipe Crown

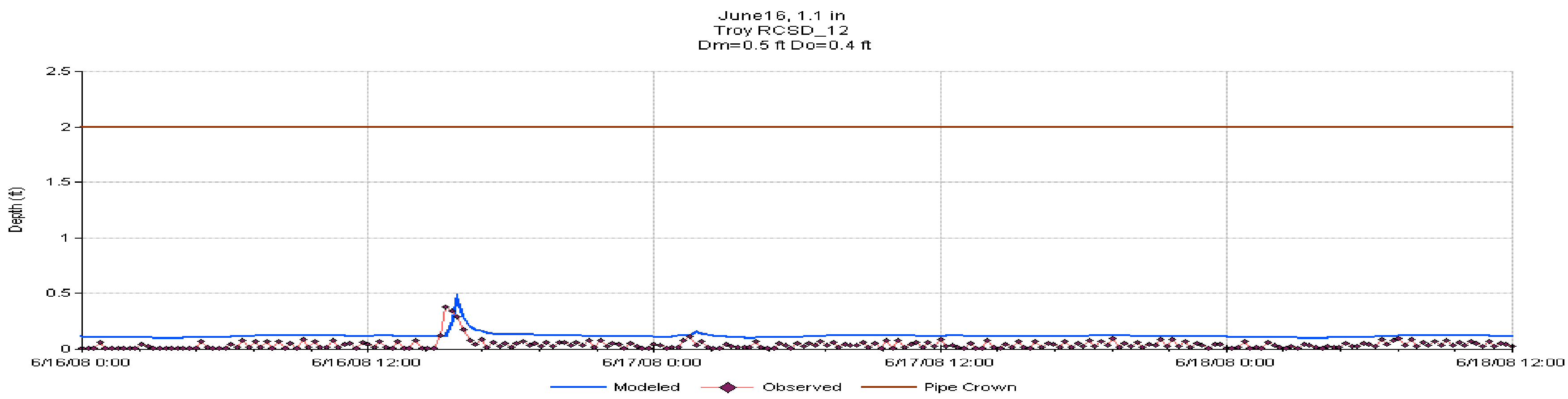

July13, 0.8 in
Troy RCSD_12
Vm=0.04 MG Vo=0.05 MG; Qm=0.1 cfs Qo=0.2 cfs
Flowrate (cfs)
0.3
0.25
0.2
0.15
0.1
0.05
0
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed

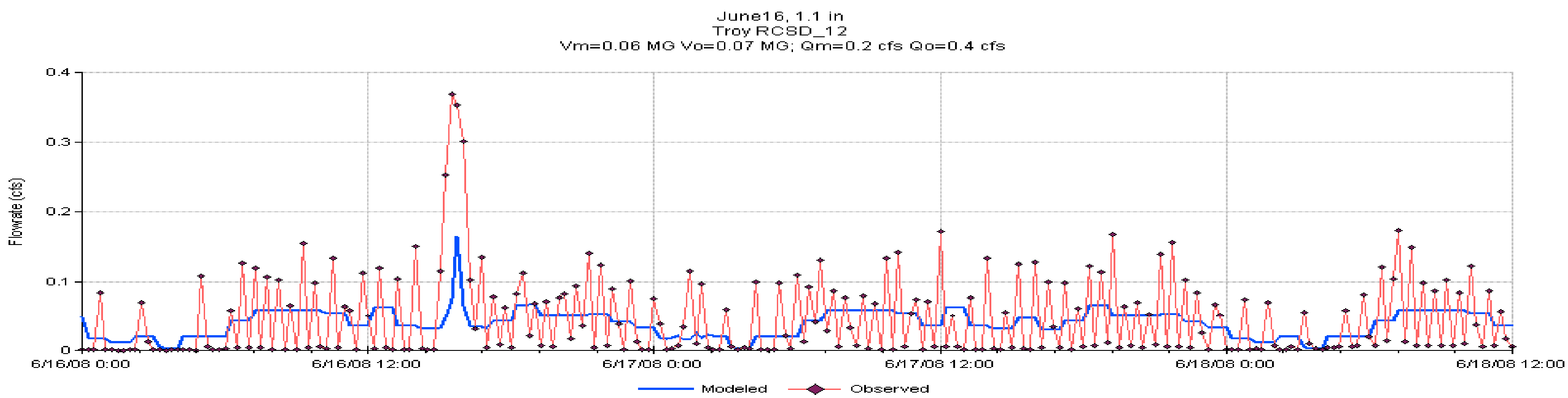

July13, 0.8 in
Troy RCSD_12
Vm=1.5 ft/s Vo=2.2 ft/s
Velocity (ft/s)
2.5
2
1.5
1
0.5
0
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed

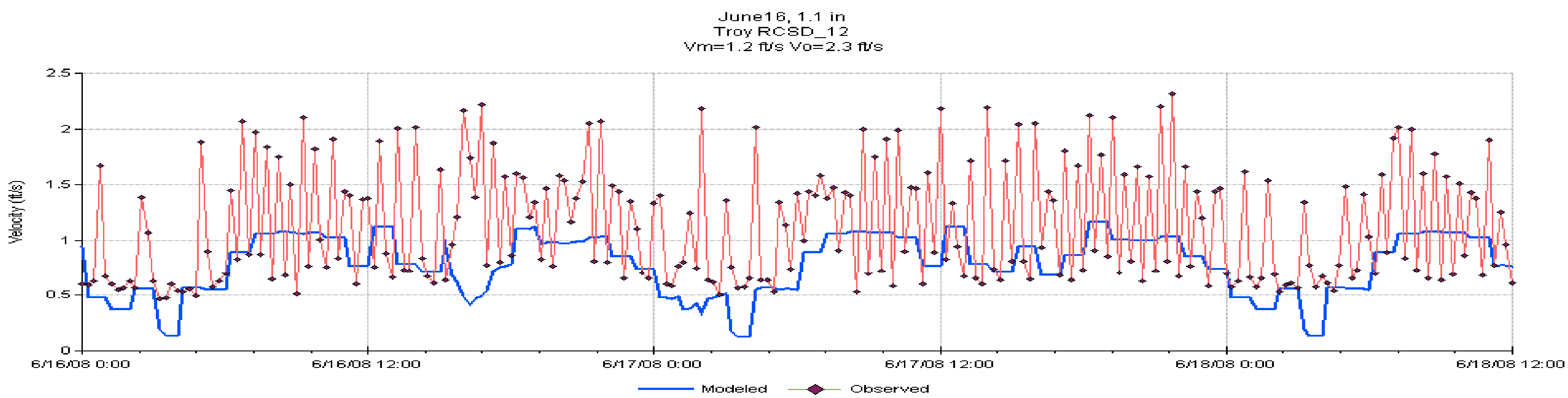

July23, 2.9 in
Troy RCSD_12
Dm=0.5 ft Do=1.8 ft
Depth (ft)
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed
Pipe Crown


July23, 2.9 in
Troy RCSD_12
Vm=0.15 MG Vo=0.51 MG; Qm=0.5 cfs Qo=1.0 cfs
Flowrate (cfs)
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed

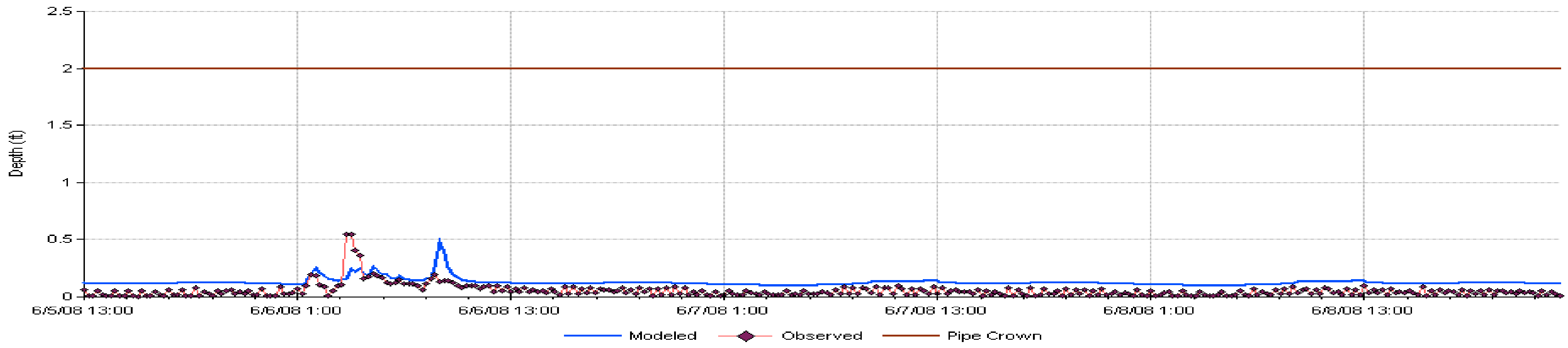

July23, 2.9 in
Troy RCSD_12
Vm=1.6 ft/s Vo=2.4 ft/s
Velocity (ft/s)
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed


June16, 1.1 in
Troy RCSD_12
Dm=0.5 ft Do=0.4 ft
Depth (ft)
2.5
2
1.5
1
0.5
0
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
6/18/08 12:00
Modeled
Observed
Pipe Crown

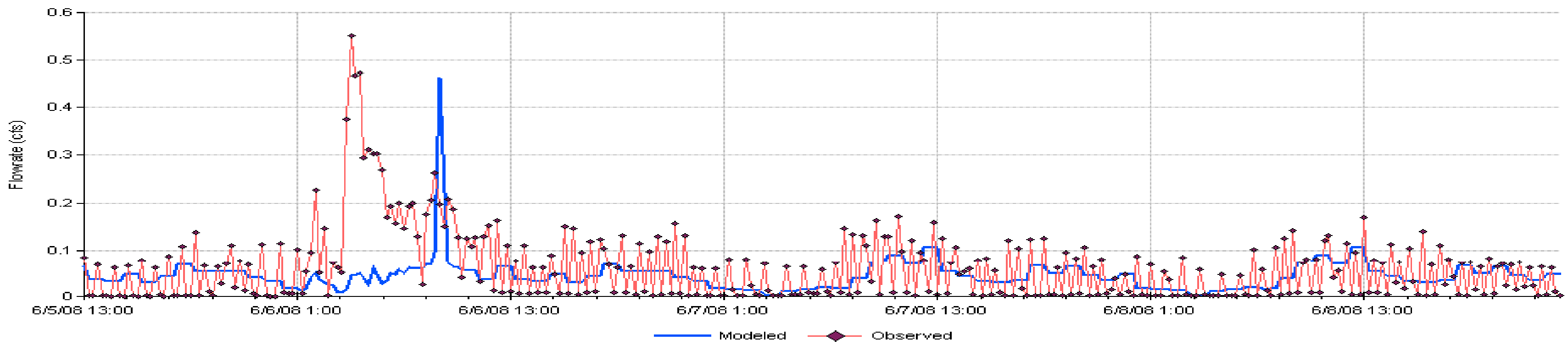

June16, 1.1 in
Troy RCSD_12
Vm=0.06 MG Vo=0.07 MG; Qm=0.2 cfs Qo=0.4 cfs
Flowrate (cfs)
0.4
0.3
0.2
0.1
0
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
6/18/08 12:00
Modeled
Observed


June16, 1.1 in
Troy RCSD_12
Vm=1.2 ft/s Vo=2.3 ft/s
Velocity (ft/s)
2.5
2
1.5
1
0.5
0
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
6/18/08 12:00
Modeled
Observed

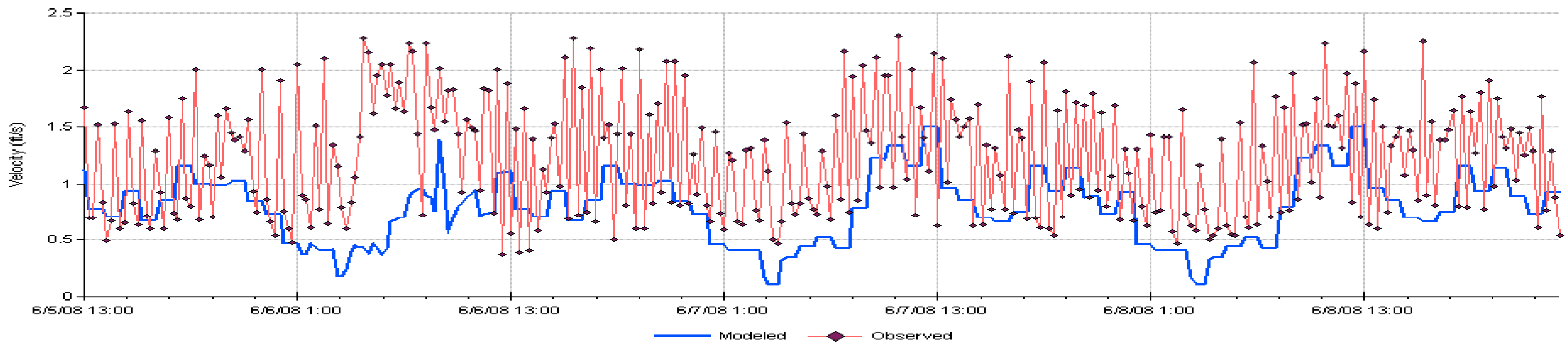
June6, 2.3 in
Troy RCSD_12
Dm=0.5 ft Do=0.6 ft

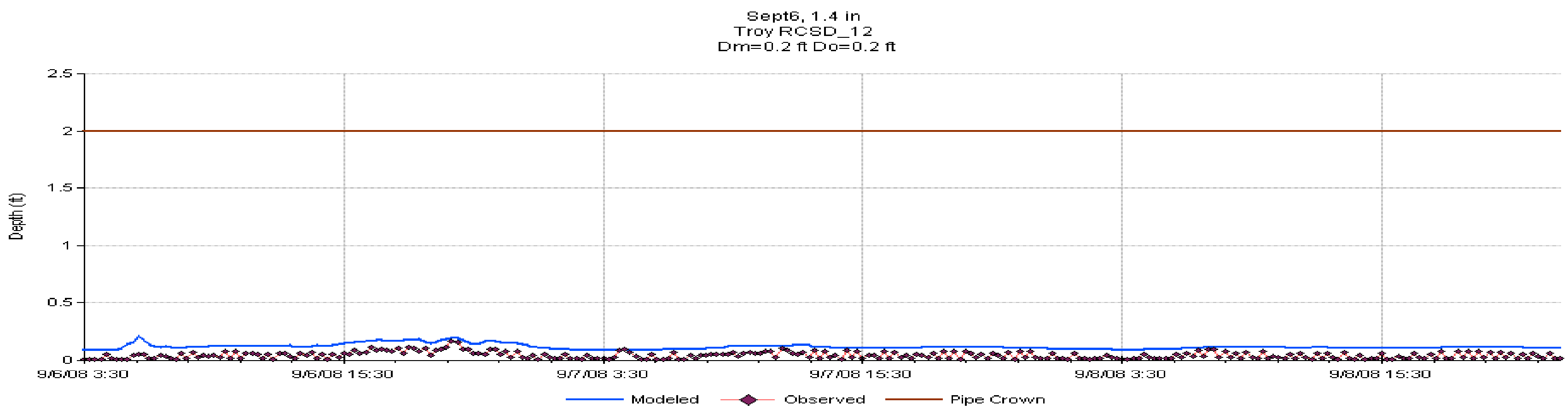


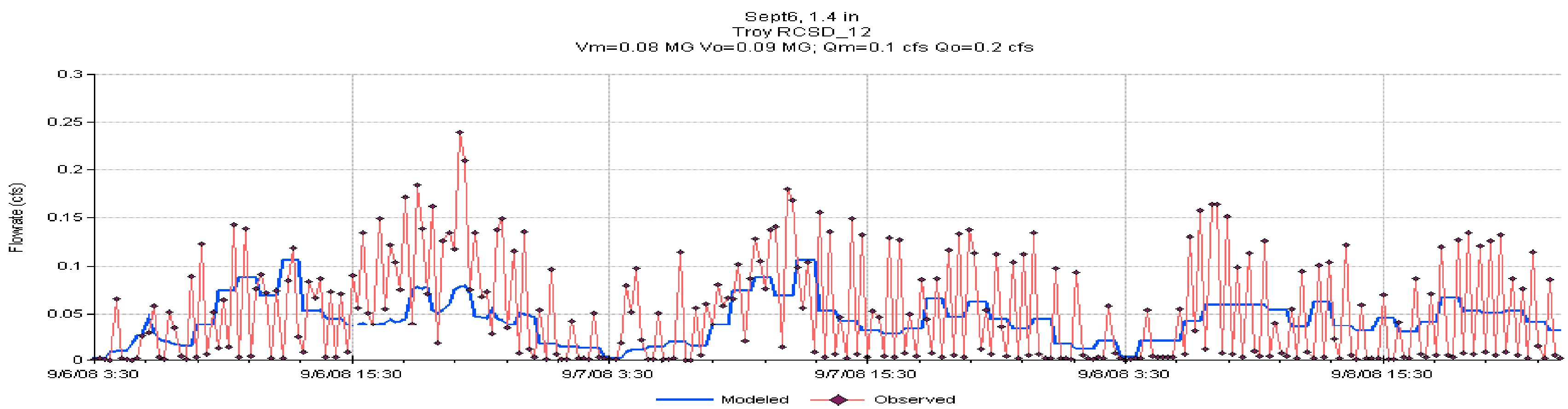
June6, 2.3 in
Troy RCSD_12
Vm=0.10 MG Vo=0.14 MG; Qm=0.5 cfs Qo=0.6 cfs

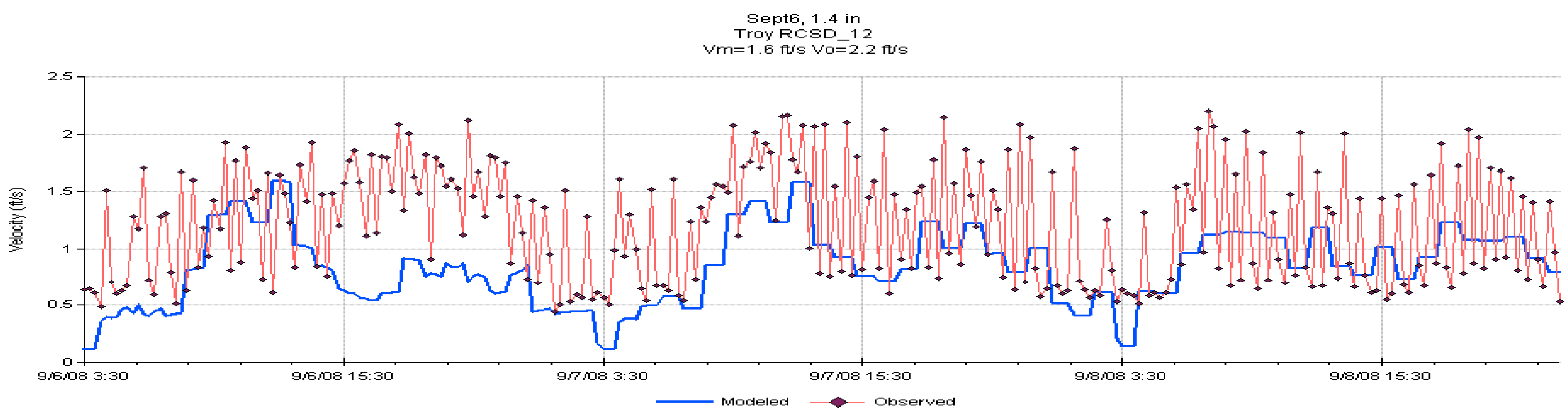


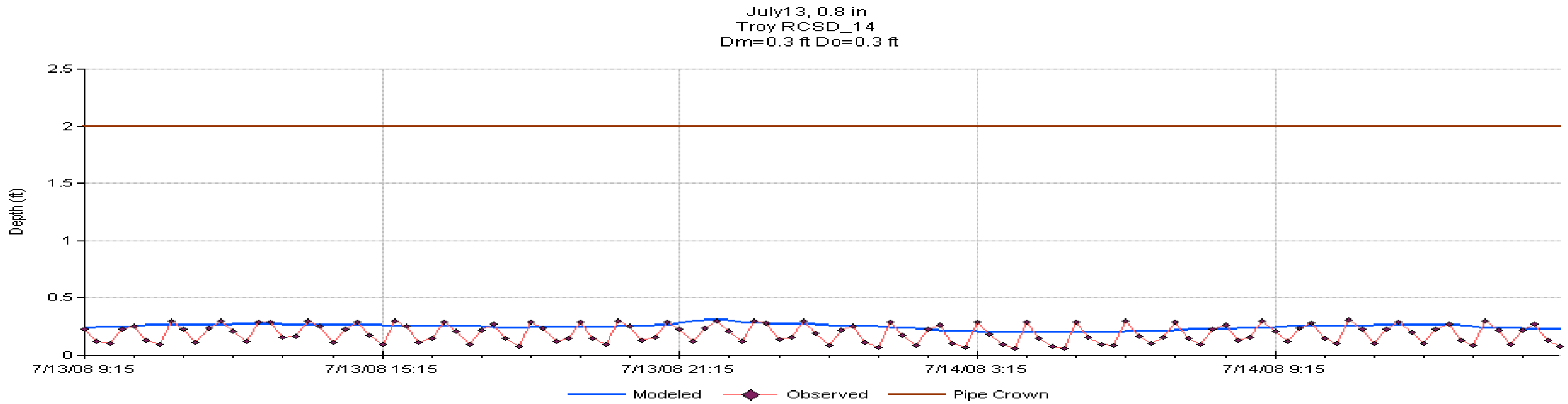
June6, 2.3 in
Troy RCSD_12
Vm=1.5 ft/s Vo=2.3 ft/s

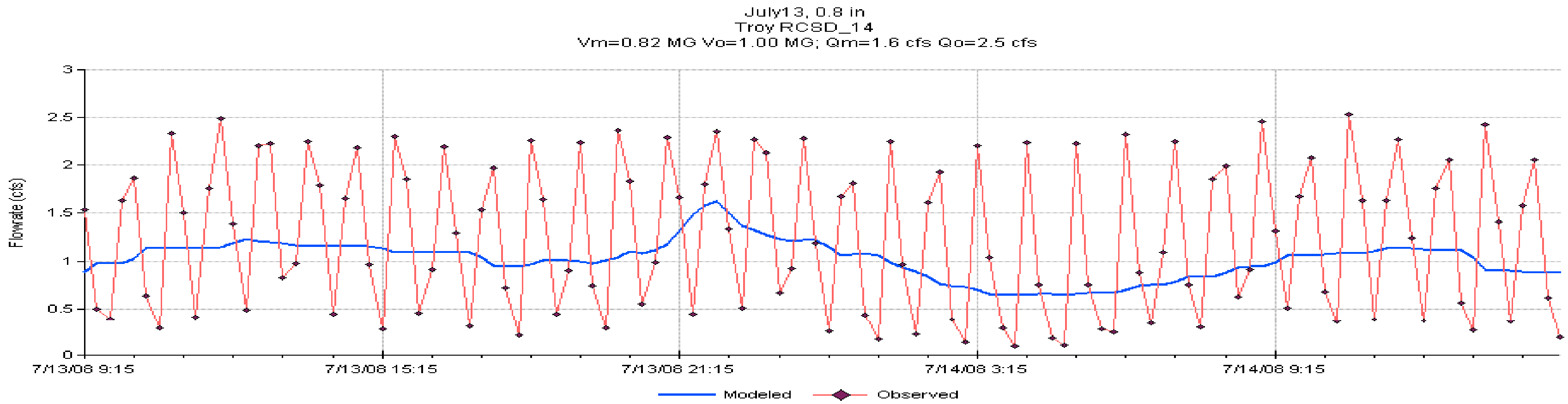


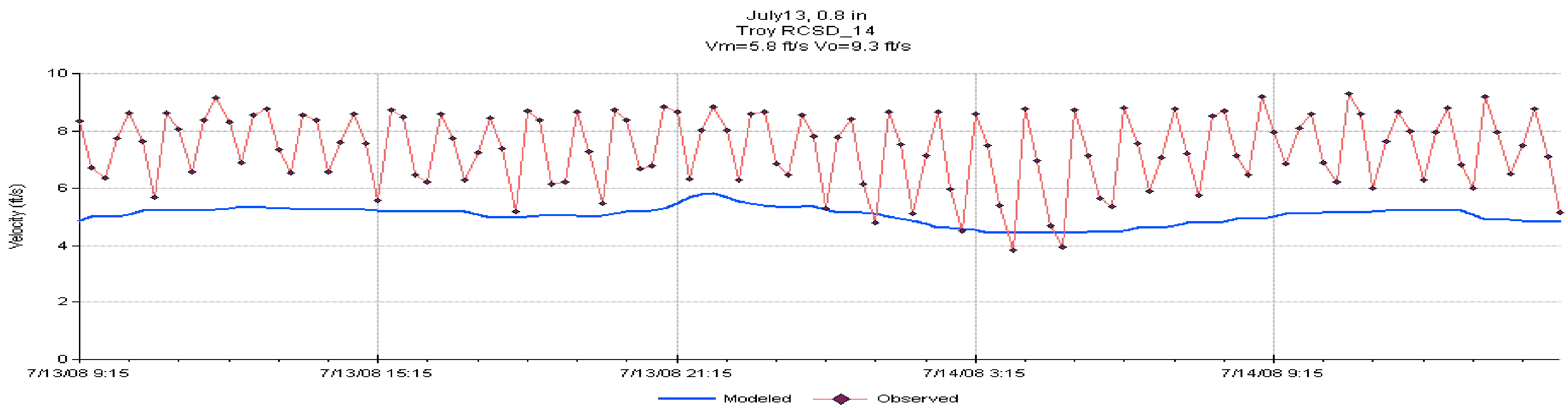

Sept6, 1.4 in
Troy RCSD_12
Dm=0.2 ft Do=0.2 ft
Depth (ft)
2.5
2
1.5
1
0.5
0
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed
Pipe Crown

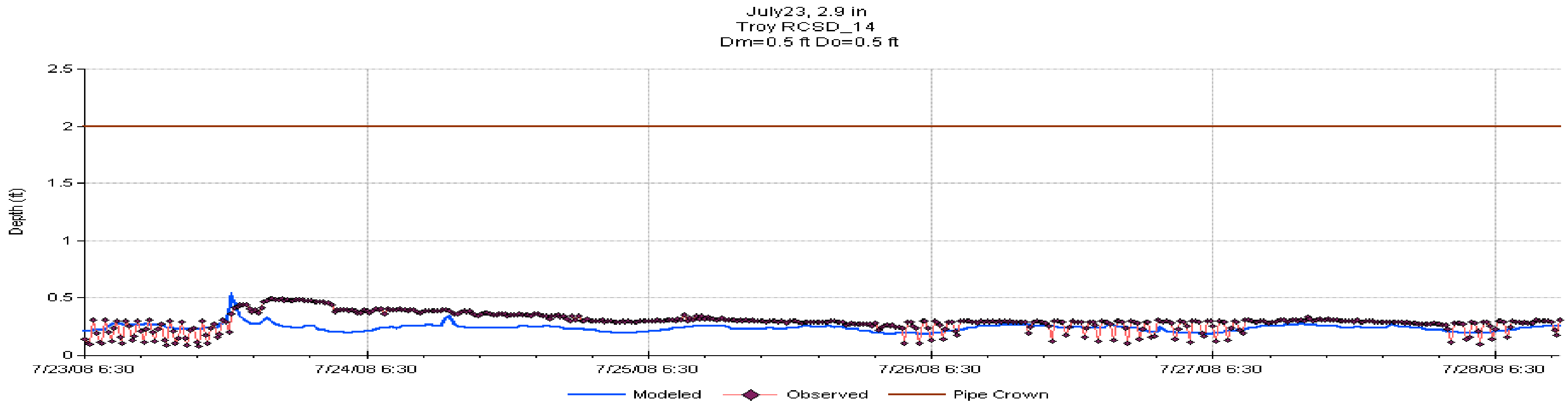

Sept6, 1.4 in
Troy RCSD_12
Vm=0.08 MG Vo=0.09 MG; Qm=0.1 cfs Qo=0.2 cfs
Flowrate (cfs)
0.3
0.25
0.2
0.15
0.1
0.05
0
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed

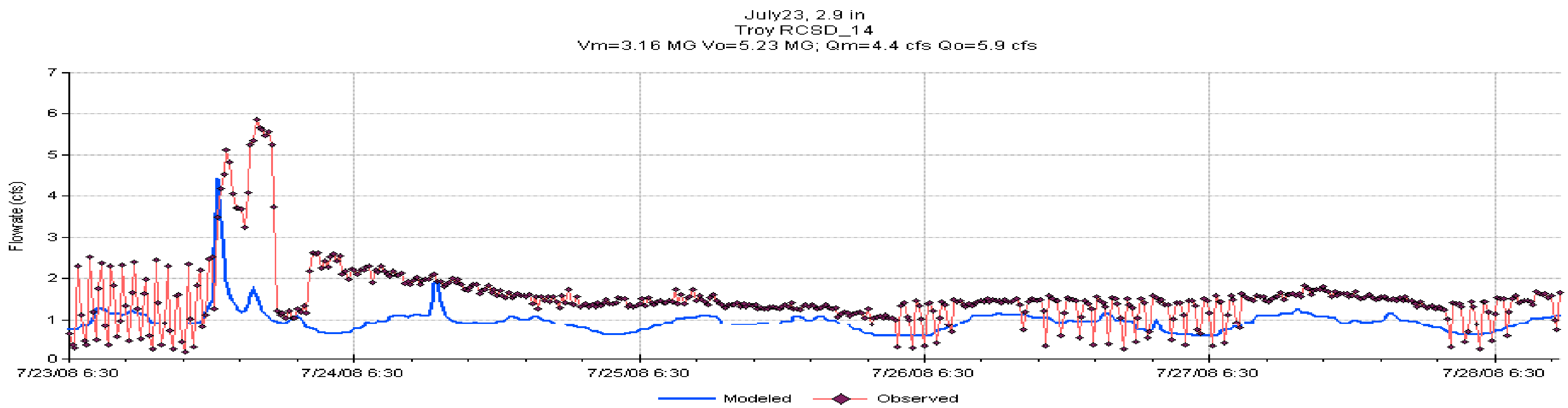

Sept6, 1.4 in
Troy RCSD_12
Vm=1.6 ft/s Vo=2.2 ft/s
Velocity (ft/s)
2.5
2
1.5
1
0.5
0
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed

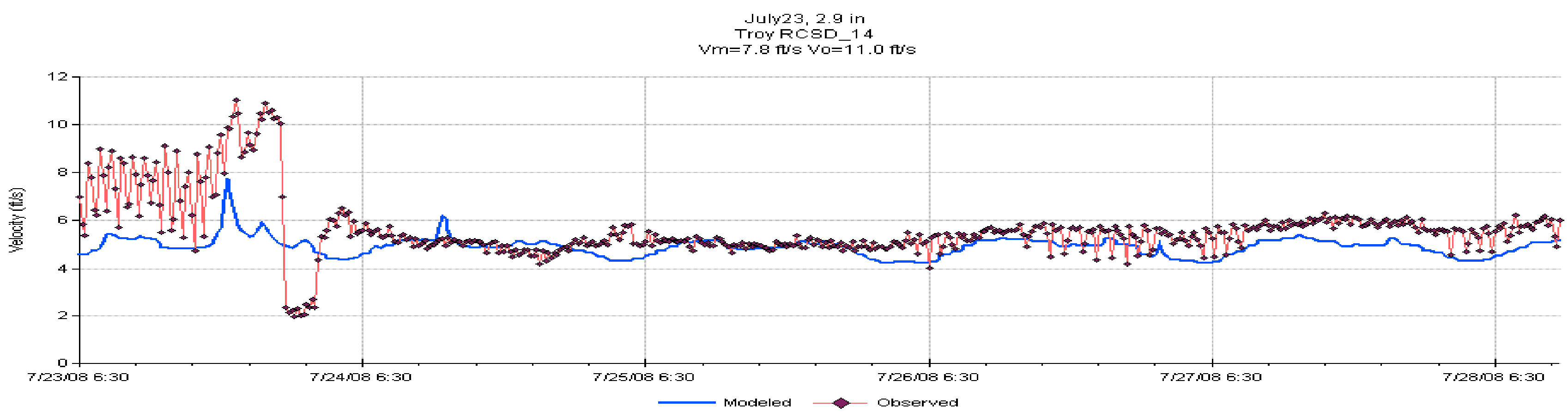

July13, 0.8 in
Troy RCSD_14
Dm=0.3 ft Do=0.3 ft
Depth (ft)
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed
Pipe Crown

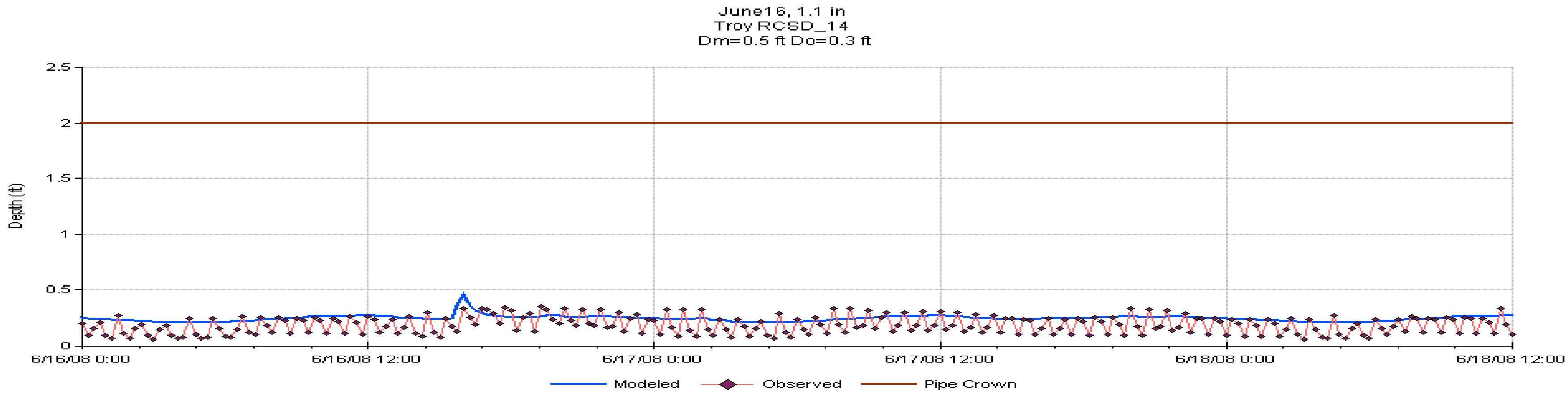

July13, 0.8 in
Troy RCSD_14
Vm=0.82 MG Vo=1.00 MG; Qm=1.6 cfs Qo=2.5 cfs
Flowrate (cfs)
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed

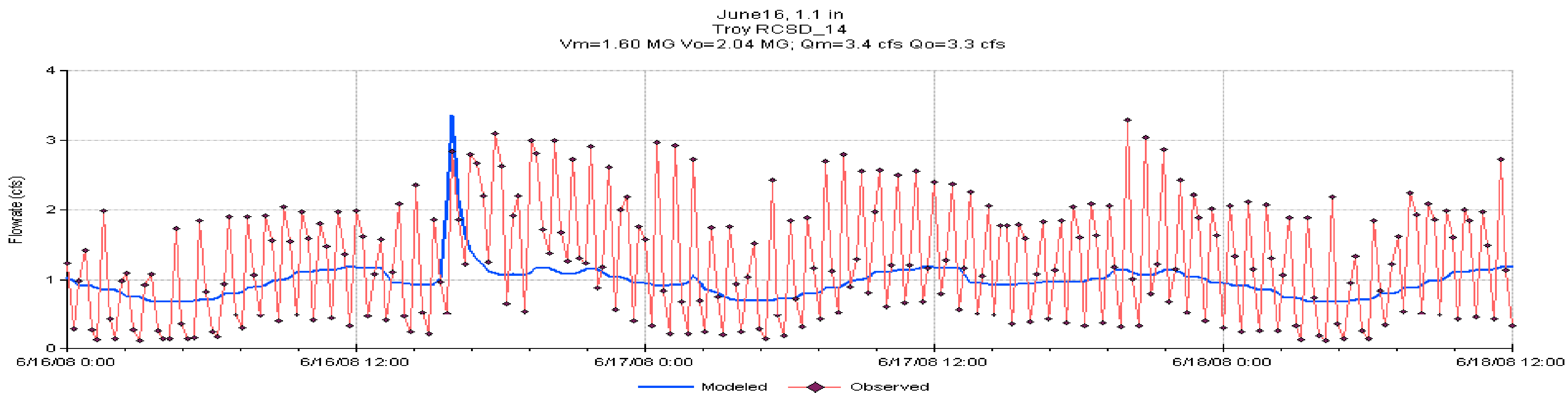

July13, 0.8 in
Troy RCSD_14
Vm=5.8 ft/s Vo=9.3 ft/s
Velocity (ft/s)
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed

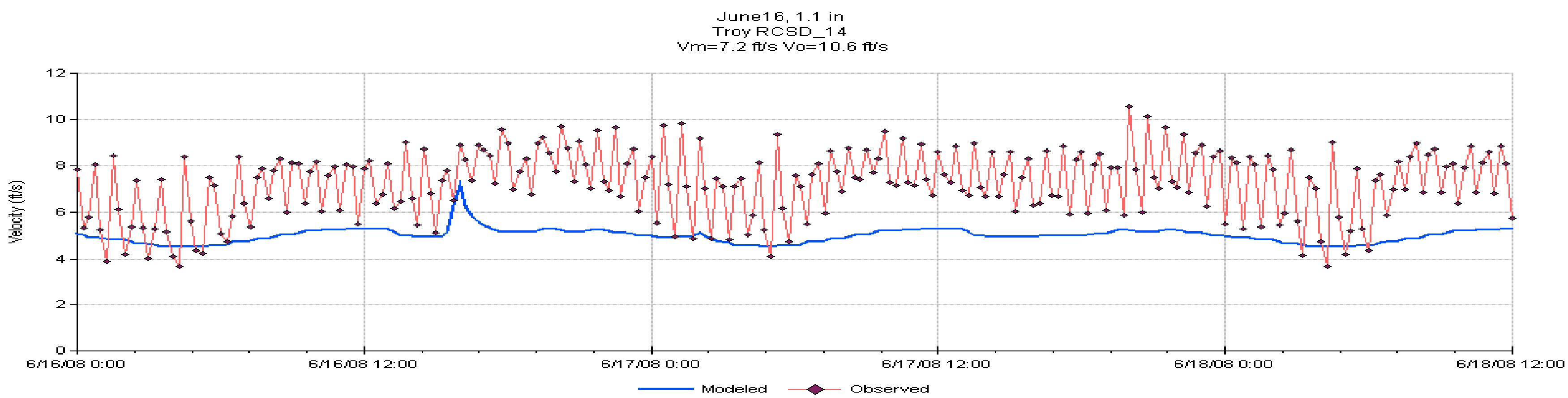

July23, 2.9 in
Troy RCSD_14
Dm=0.5 ft Do=0.5 ft
Depth (ft)
2.5
2
1.5
1
0.5
0
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed
Pipe Crown

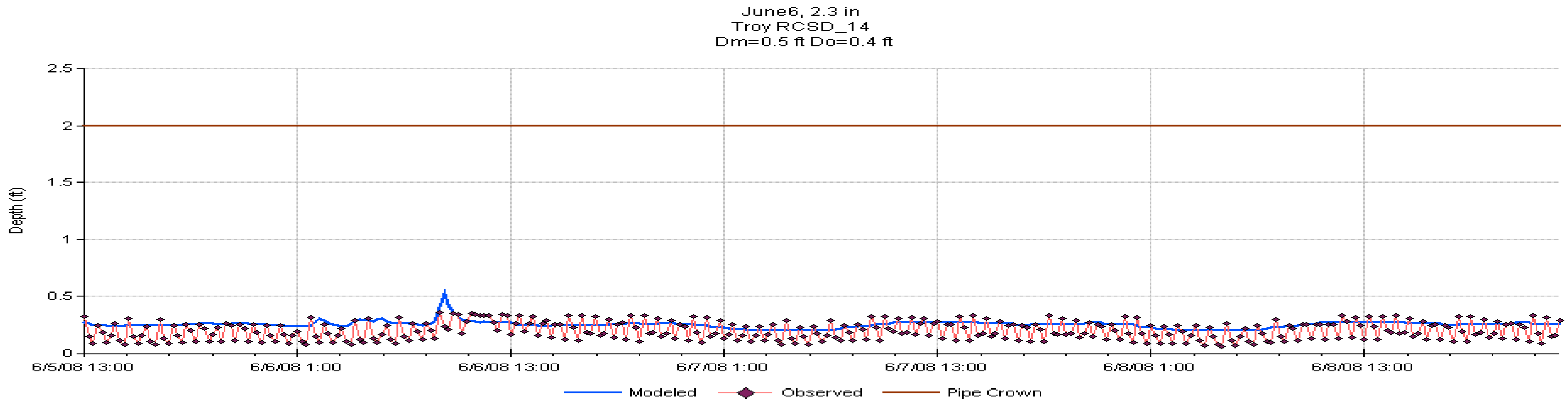

July23, 2.9 in
Troy RCSD_14
Vm=3.16 MG Vo=5.23 MG; Qm=4.4 cfs Qo=5.9 cfs
Flowrate (cfs)
7
6
5
4
3
2
1
0
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed

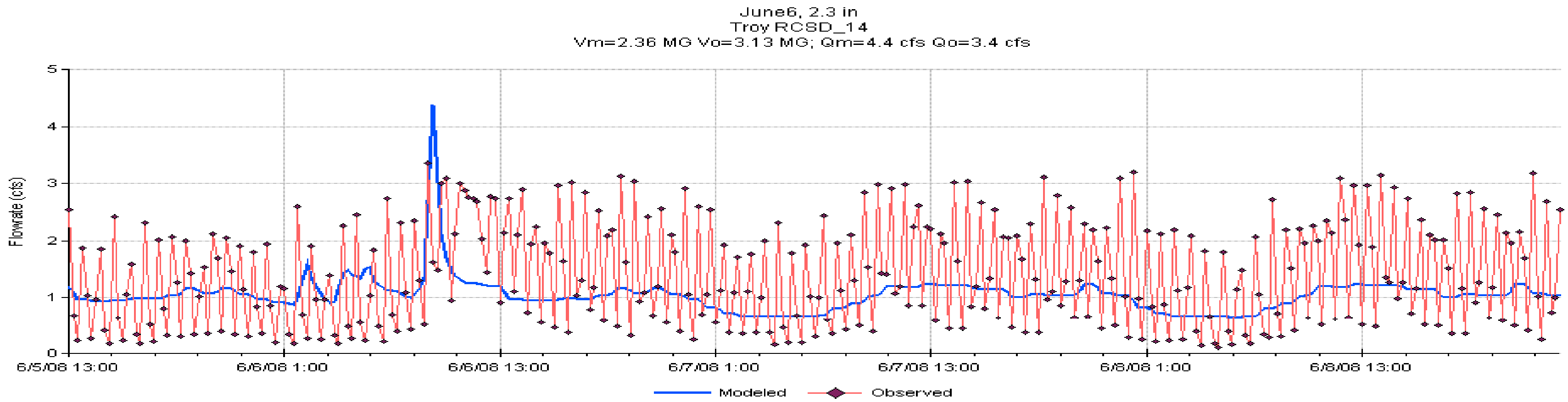

July23, 2.9 in
Troy RCSD_14
Vm=7.8 ft/s Vo=11.0 ft/s
Velocity (ft/s)
12
10
8
6
4
2
0
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed

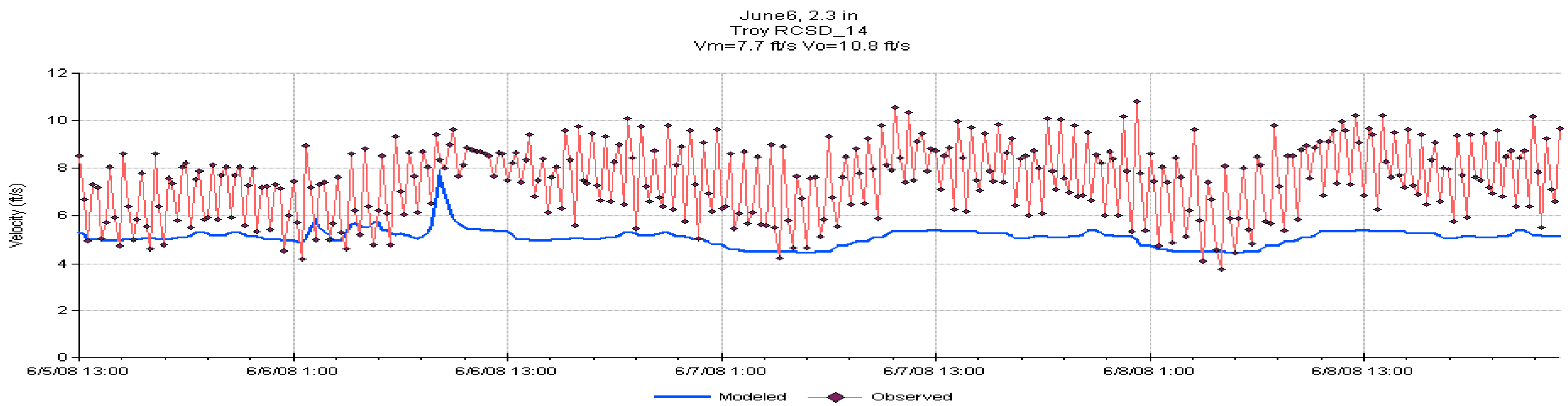

June16, 1.1 in
Troy RCSD_14
Dm=0.5 ft Do=0.3 ft
Depth (ft)
2.5
2
1.5
1
0.5
0
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
6/18/08 12:00
Modeled
Observed
Pipe Crown

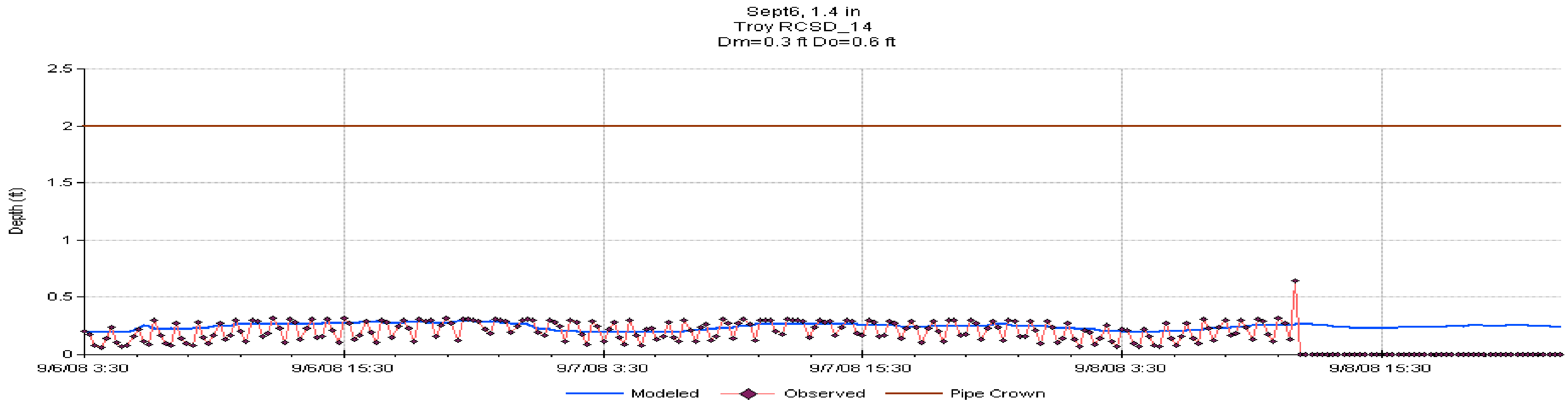

June16, 1.1 in
Troy RCSD_14
Vm=1.60 MG Vo=2.04 MG; Qm=3.4 cfs Qo=3.3 cfs
Flowrate (cfs)
4
3
2
1
0
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
6/18/08 12:00
Modeled
Observed

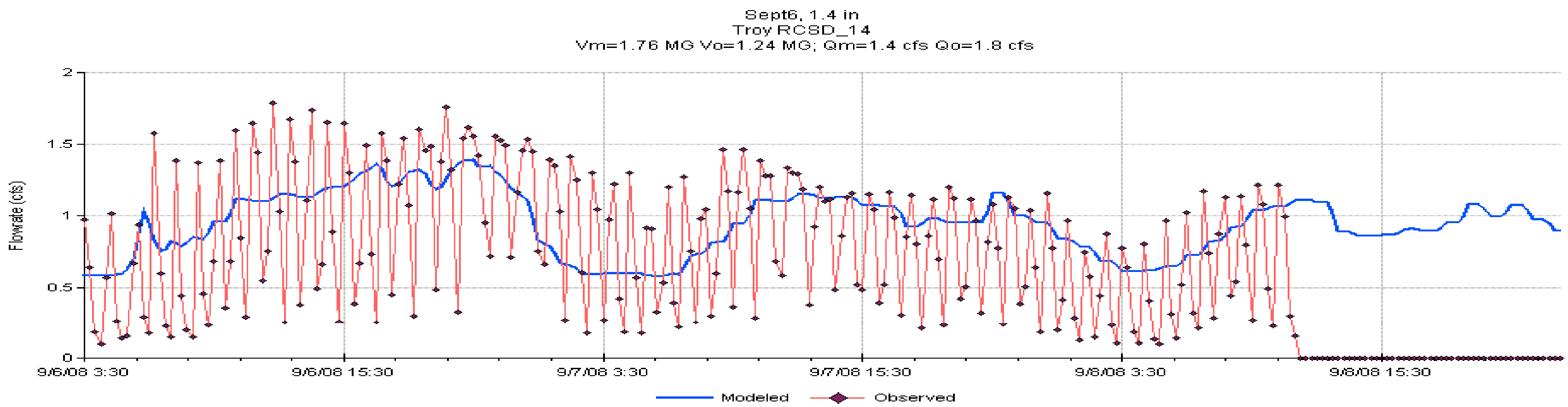

June16, 1.1 in
Troy RCSD_14
Vm=7.2 ft/s Vo=10.6 ft/s
Velocity (ft/s)
12
10
8
6
4
2
0
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
6/18/08 12:00
Modeled
Observed

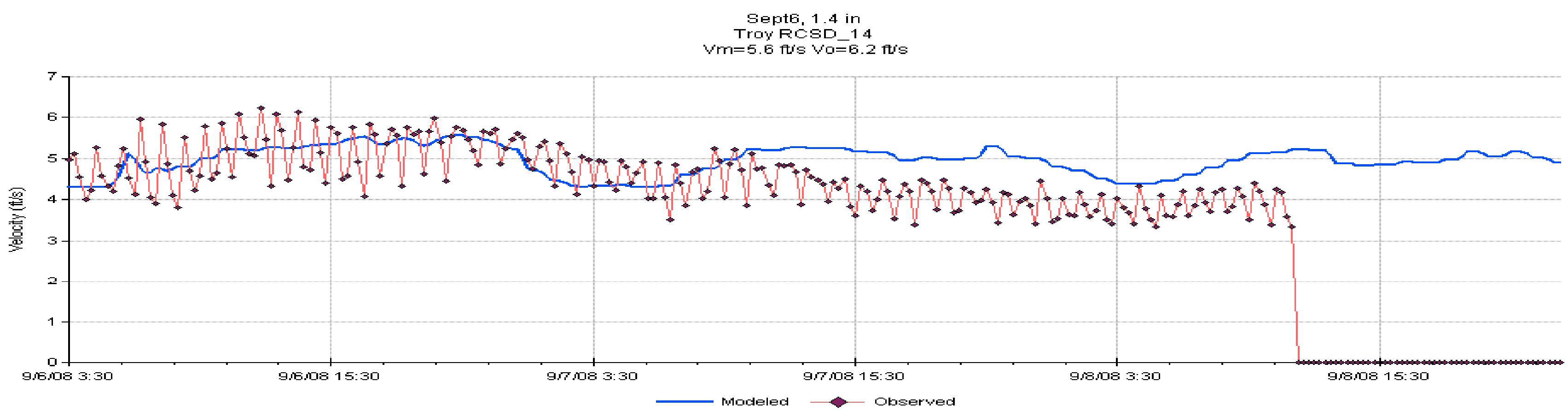

June6, 2.3 in
Troy RCSD_14
Dm=0.5 ft Do=0.4 ft
Depth (ft)
2.5
2
1.5
1
0.5
0
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed
Pipe Crown

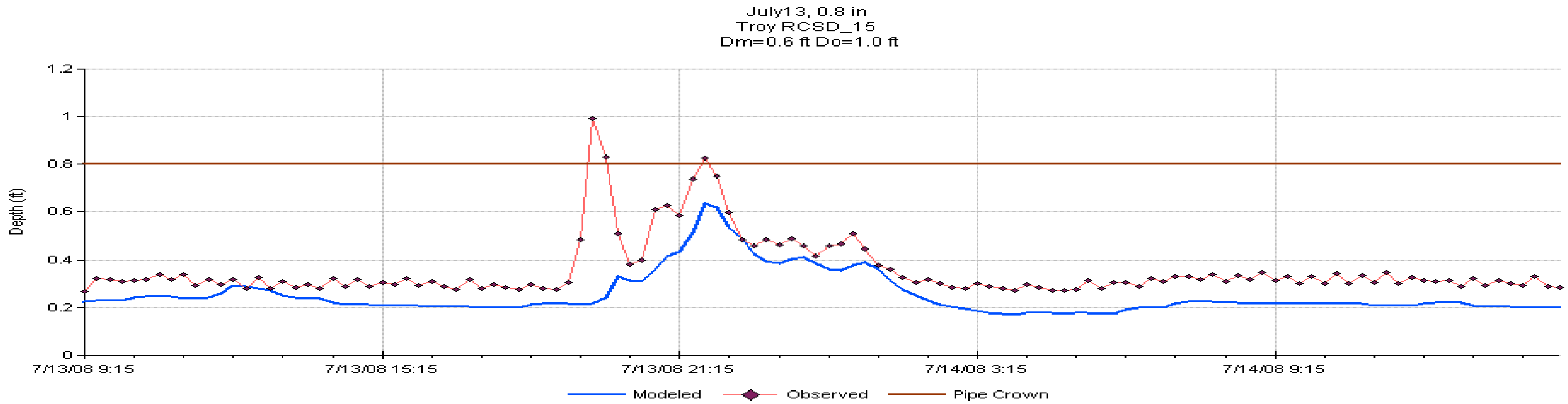

June6, 2.3 in
Troy RCSD_14
Vm=2.36 MG Vo=3.13 MG; Qm=4.4 cfs Qo=3.4 cfs
Flowrate (cfs)
5
4
3
2
1
0
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed

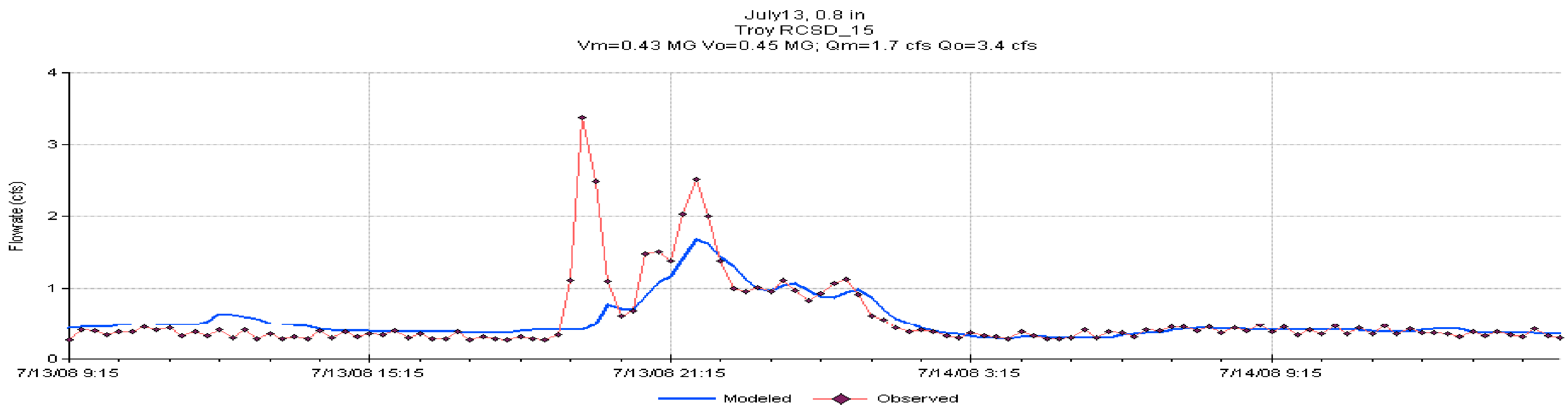

June6, 2.3 in
Troy RCSD_14
Vm=7.7 ft/s Vo=10.8 ft/s
Velocity (ft/s)
12
10
8
6
4
2
0
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed

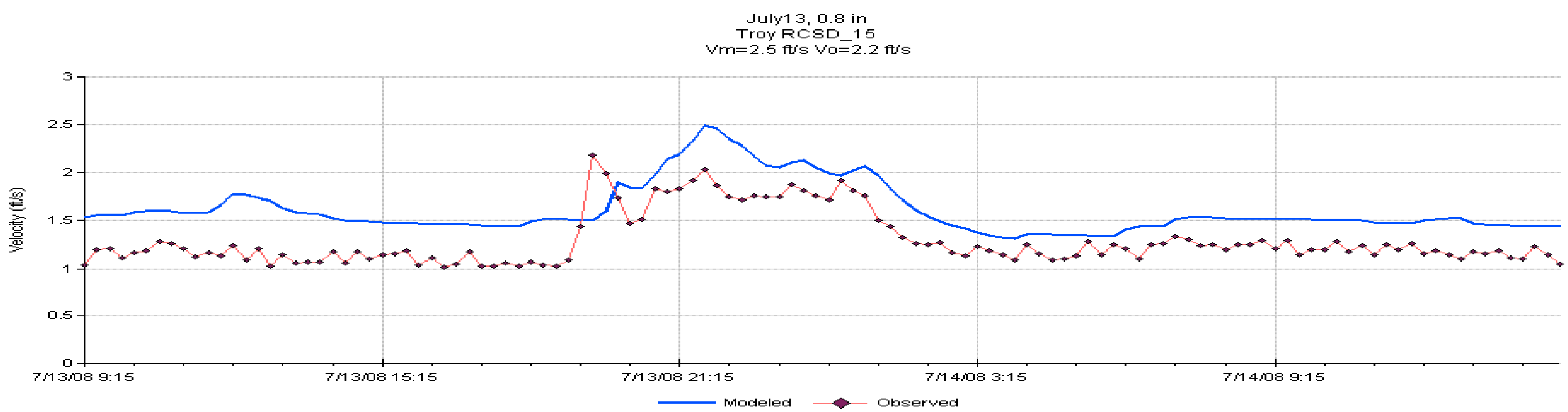

Sept6, 1.4 in
Troy RCSD_14
Dm=0.3 ft Do=0.6 ft
Depth (ft)
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed
Pipe Crown


Sept6, 1.4 in
Troy RCSD_14
Vm=1.76 MG Vo=1.24 MG; Qm=1.4 cfs Qo=1.8 cfs
Flowrate (cfs)
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed

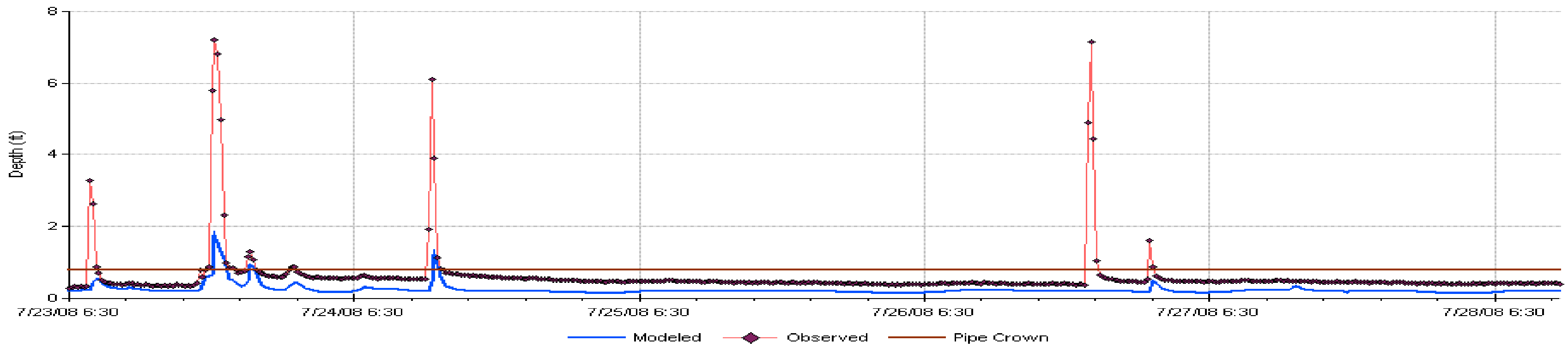

Sept6, 1.4 in
Troy RCSD_14
Vm=5.6 ft/s Vo=6.2 ft/s
Velocity (ft/s)
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed


July13, 0.8 in
Troy RCSD_15
Dm=0.6 ft Do=1.0 ft
Depth (ft)
1.2
1
0.8
0.6
0.4
0.2
0
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed
Pipe Crown

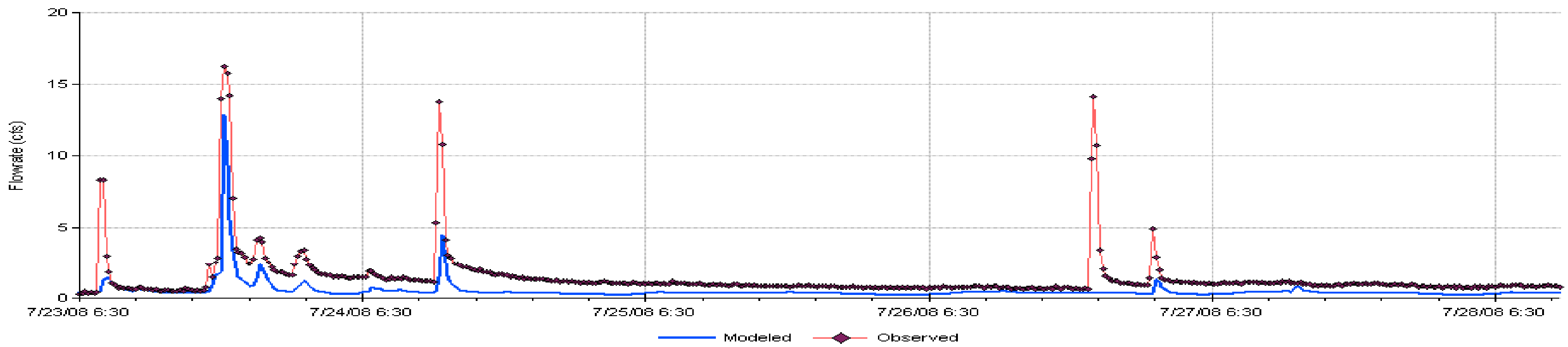

July13, 0.8 in
Troy RCSD_15
Vm=0.43 MG Vo=0.45 MG; Qm=1.7 cfs Qo=3.4 cfs
Flowrate (cfs)
4
3
2
1
0
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed


July13, 0.8 in
Troy RCSD_15
Vm=2.5 ft/s Vo=2.2 ft/s
Velocity (ft/s)
3
2.5
2
1.5
1
0.5
0
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed

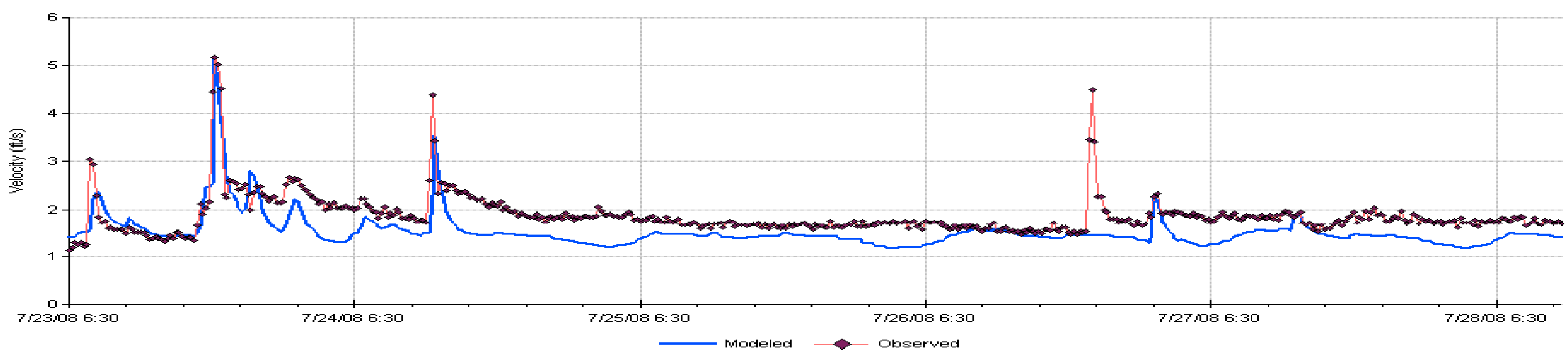
July23, 2.9 in
Troy RCSD_15
Dm=1.8 ft Do=7.2 ft

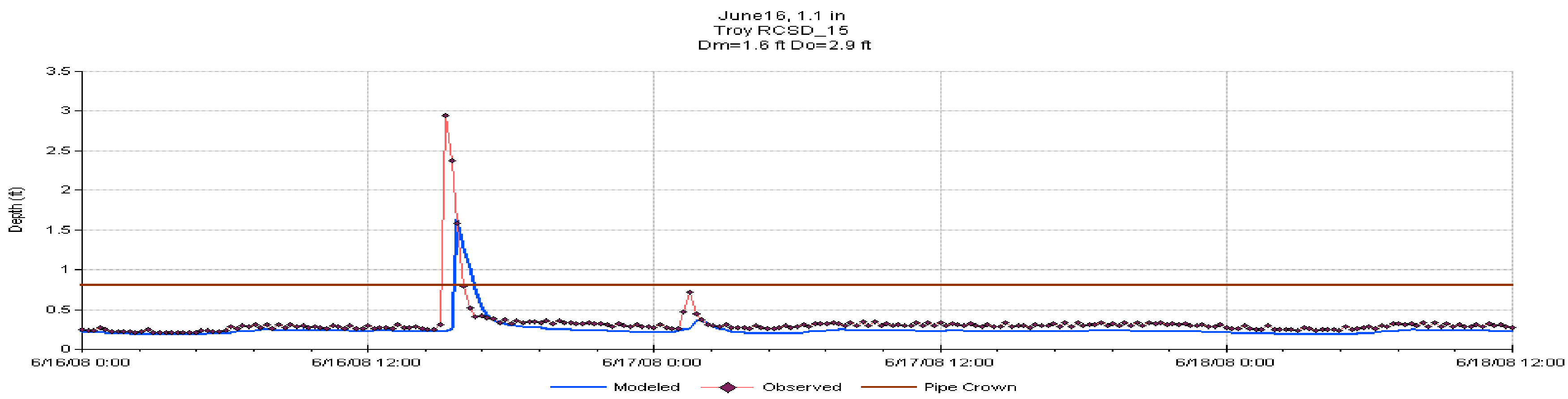


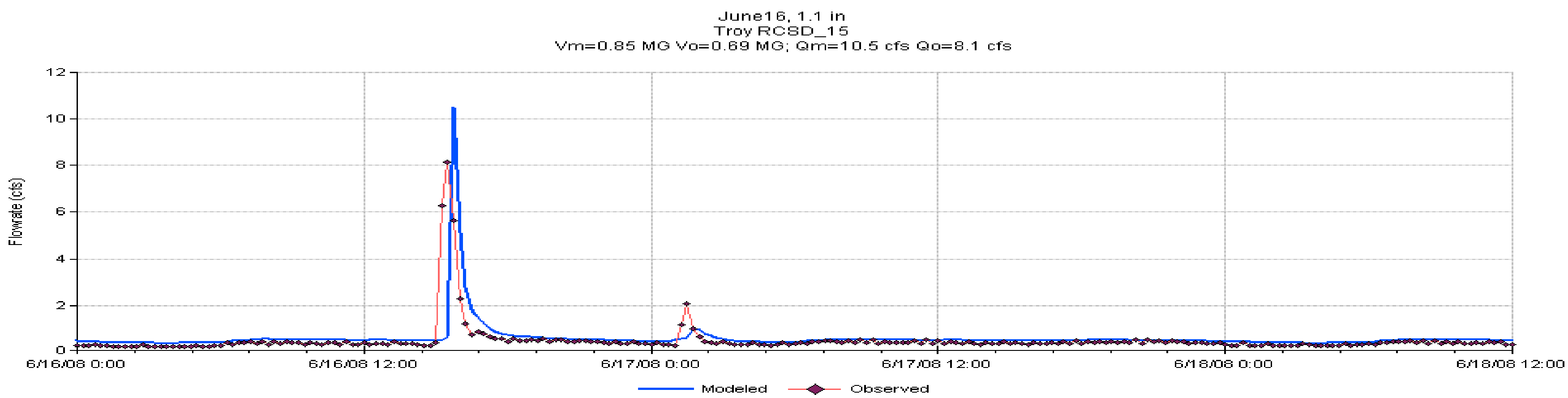
July23, 2.9 in
Troy RCSD_15
Vm=1.69 MG Vo=4.78 MG; Qm=12.9 cfs Qo=16.2 cfs

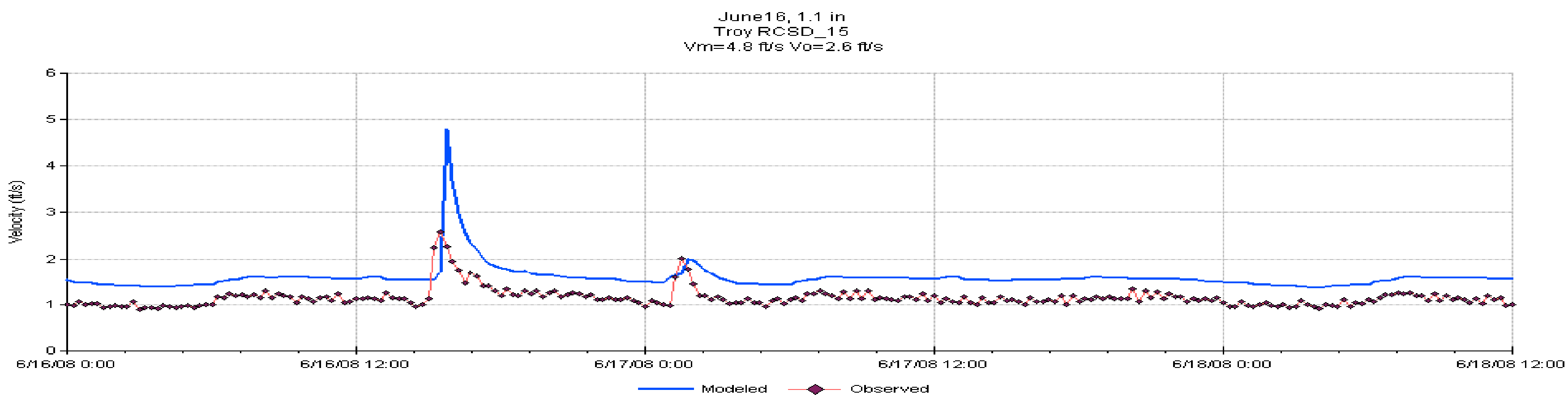


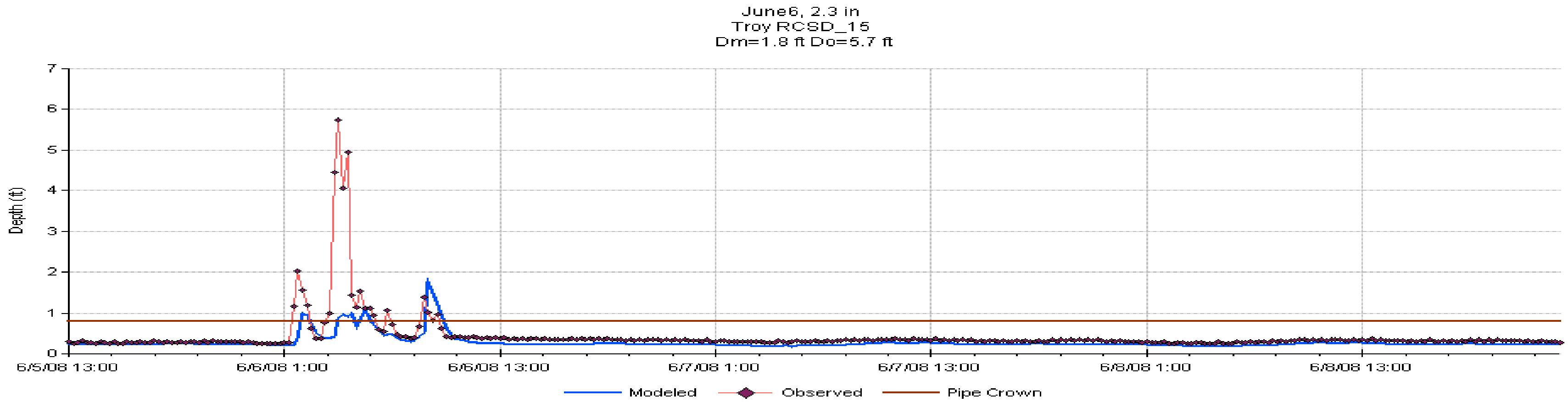
July23, 2.9 in
Troy RCSD_15
Vm=5.2 ft/s Vo=5.2 ft/s

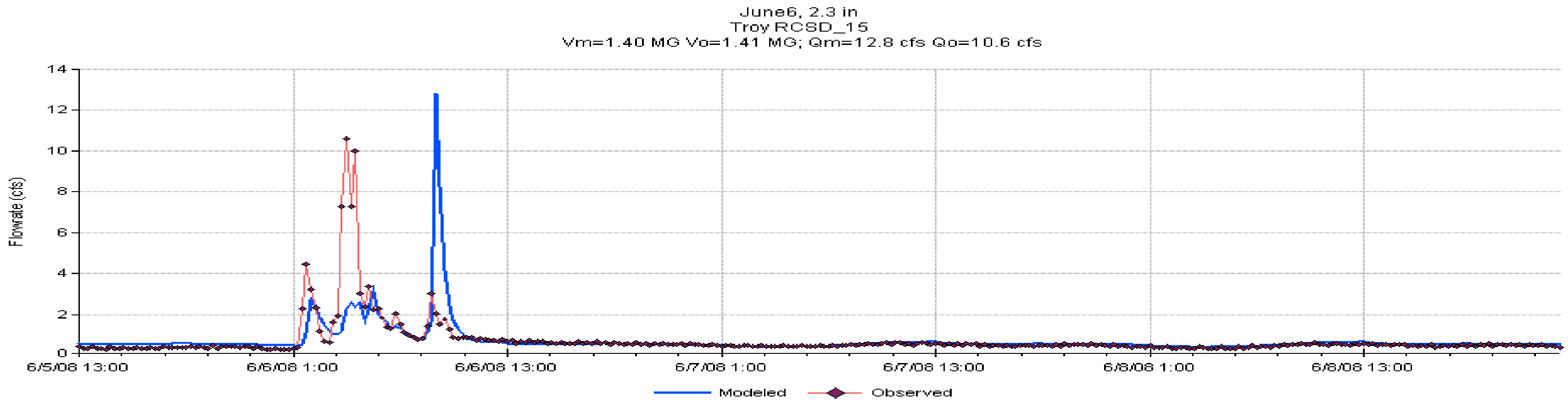


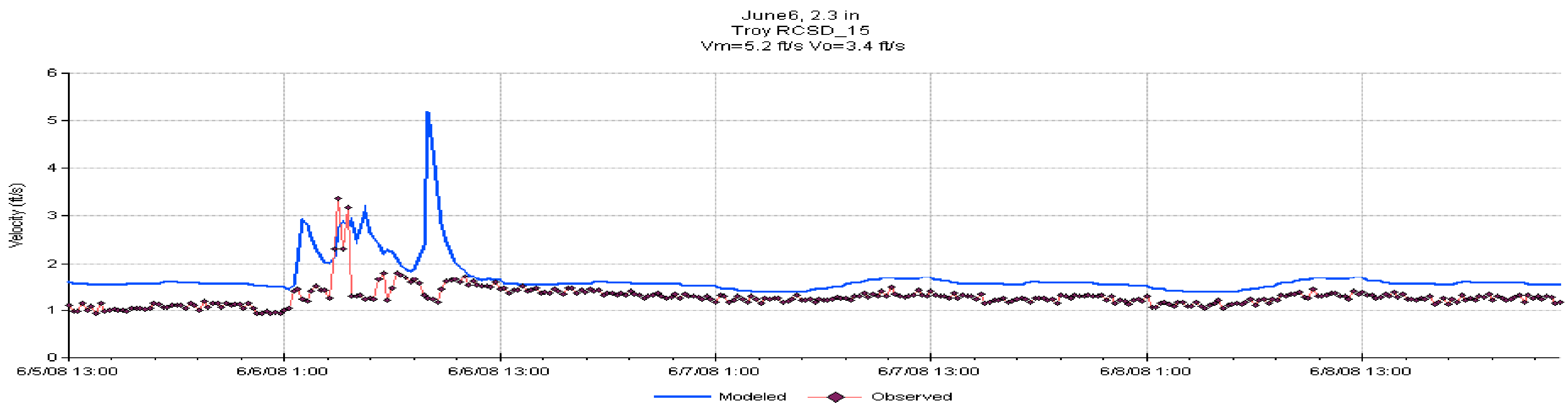

June16, 1.1 in
Troy RCSD_15
Dm=1.6 ft Do=2.9 ft
Depth (ft)
3.5
3
2.5
2
1.5
1
0.5
0
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
6/18/08 12:00
Modeled
Observed
Pipe Crown

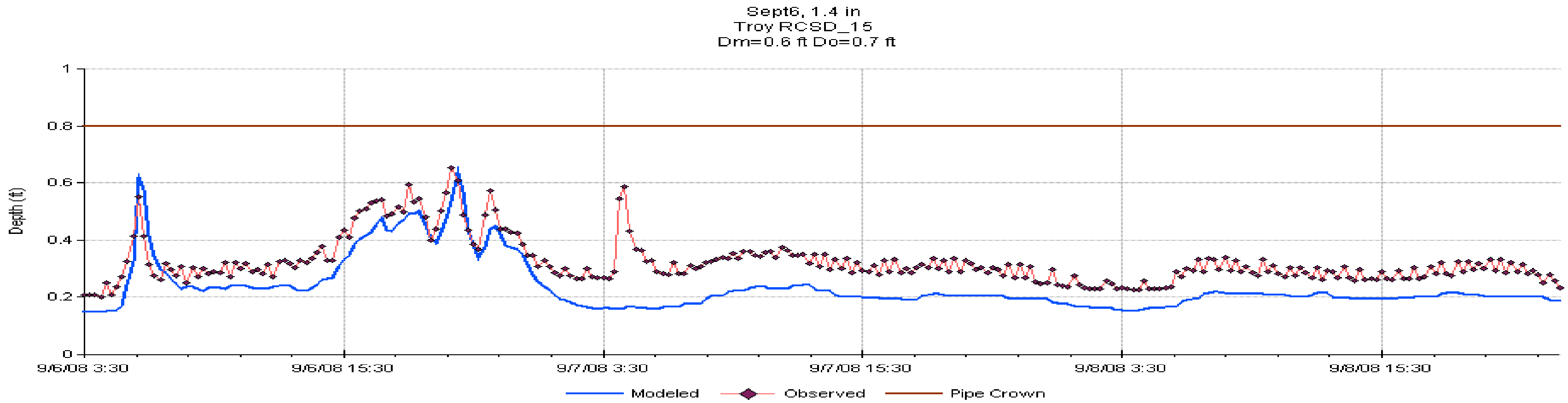

June16, 1.1 in
Troy RCSD_15
Vm=0.85 MG Vo=0.69 MG; Qm=10.5 cfs Qo=8.1 cfs
Flowrate (cfs)
12
10
8
6
4
2
0
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
6/18/08 12:00
Modeled
Observed

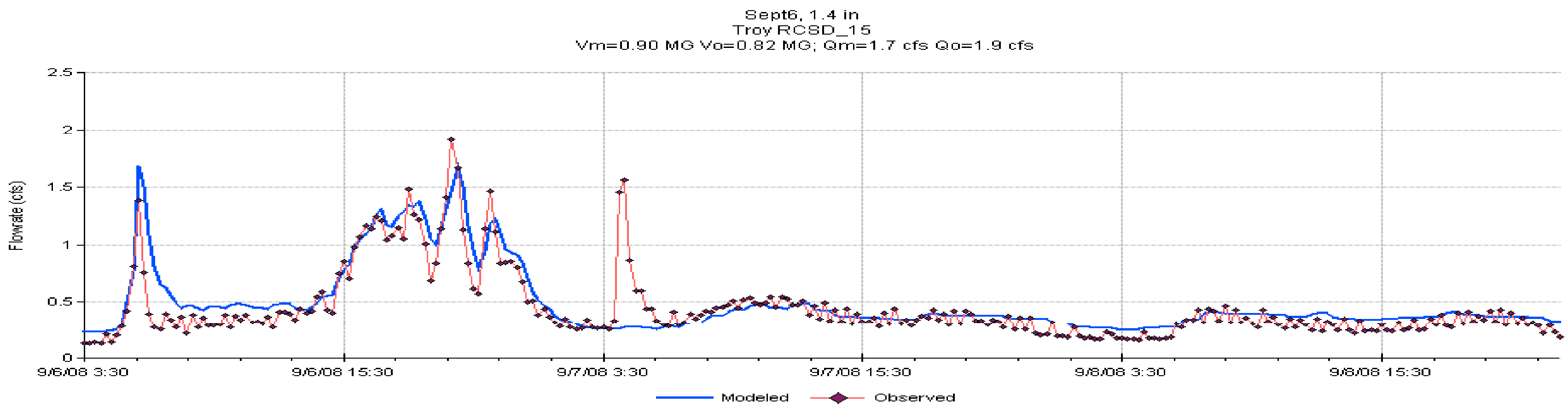

June16, 1.1 in
Troy RCSD_15
Vm=4.8 ft/s Vo=2.6 ft/s
Velocity (ft/s)
6
5
4
3
2
1
0
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
6/18/08 12:00
Modeled
Observed

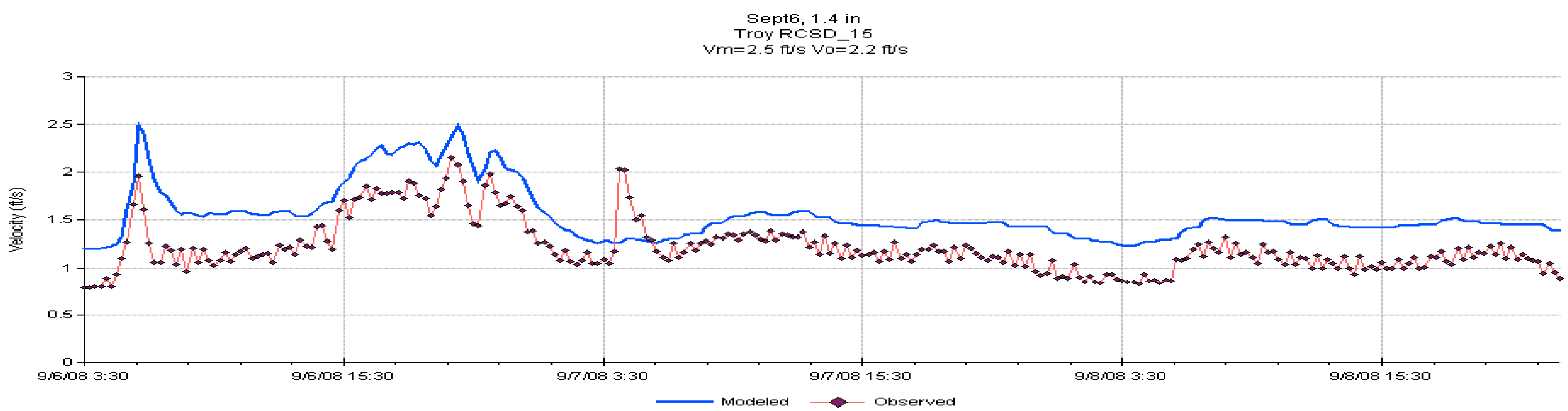

June6, 2.3 in
Troy RCSD_15
Dm=1.8 ft Do=5.7 ft
Depth (ft)
0
1
2
3
4
5
6
7
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed
Pipe Crown

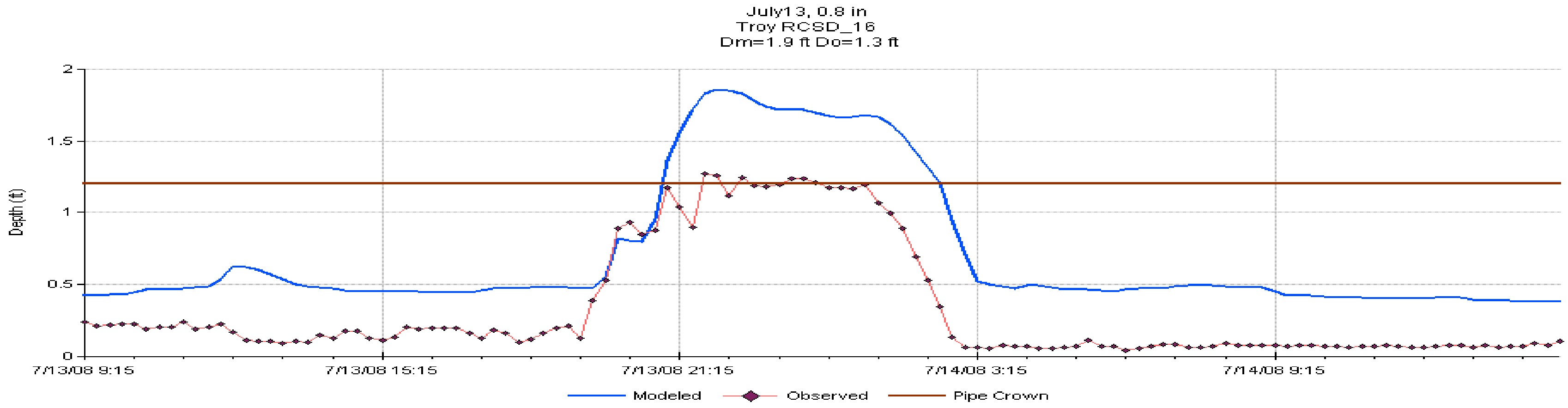

June6, 2.3 in
Troy RCSD_15
Vm=1.40 MG Vo=1.41 MG; Qm=12.8 cfs Qo=10.6 cfs
Flowrate (cfs)
0
2
4
6
8
10
12
14
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed

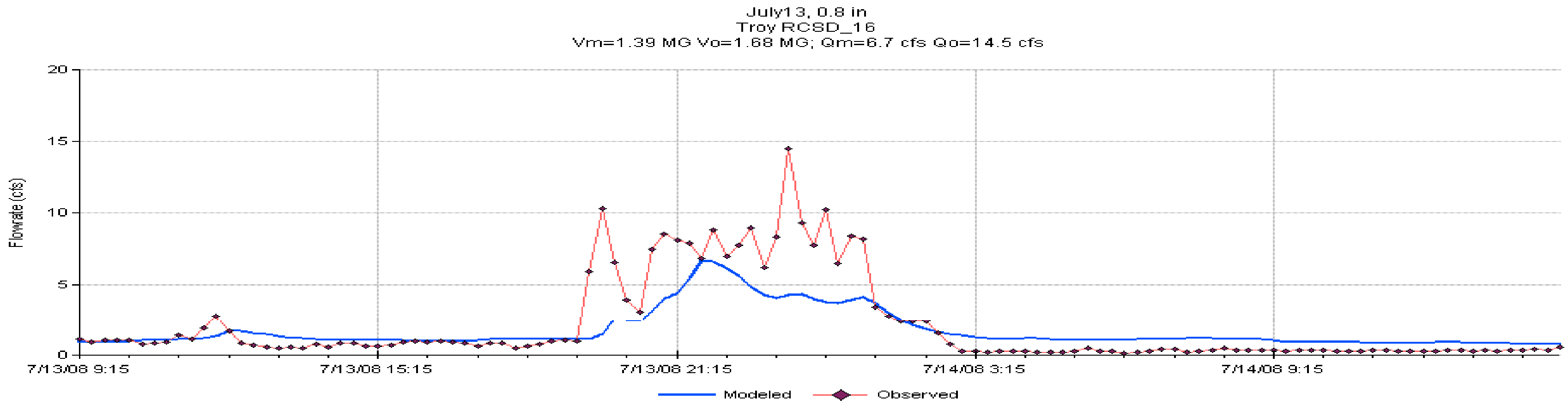

June6, 2.3 in
Troy RCSD_15
Vm=5.2 ft/s Vo=3.4 ft/s
Velocity (ft/s)
0
1
2
3
4
5
6
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed

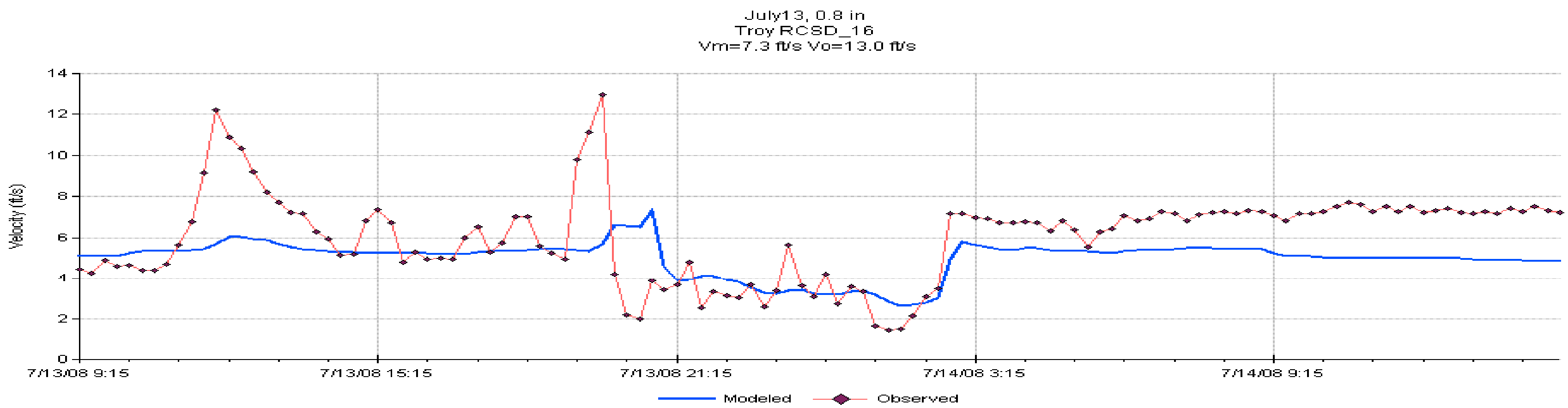

Sept6, 1.4 in
Troy RCSD_15
Dm=0.6 ft Do=0.7 ft
Depth (ft)
1
0.8
0.6
0.4
0.2
0
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed
Pipe Crown

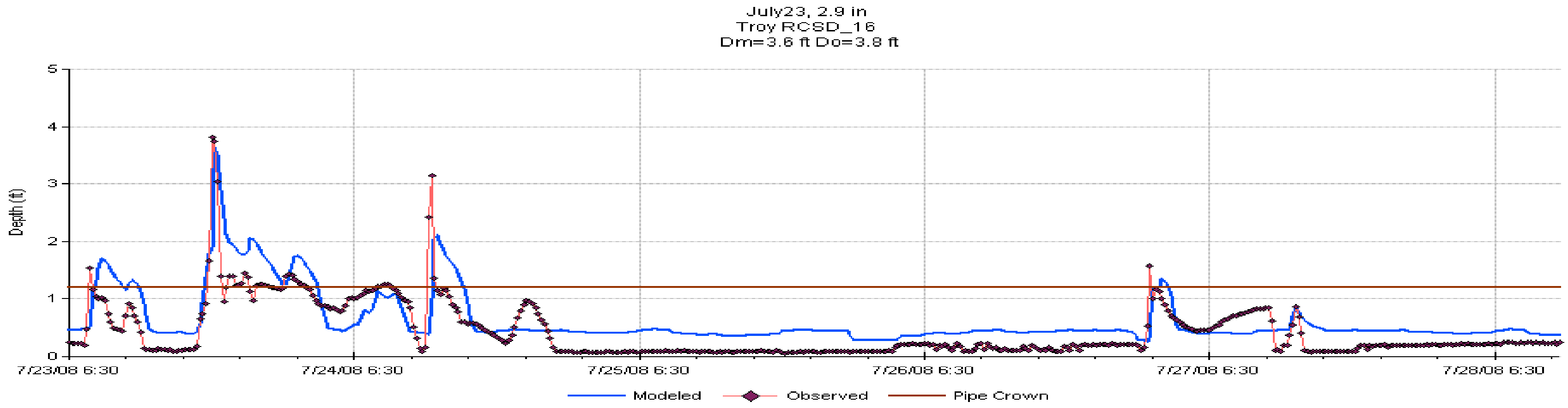

Sept6, 1.4 in
Troy RCSD_15
Vm=0.90 MG Vo=0.82 MG; Qm=1.7 cfs Qo=1.9 cfs
Flowrate (cfs)
2.5
2
1.5
1
0.5
0
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed

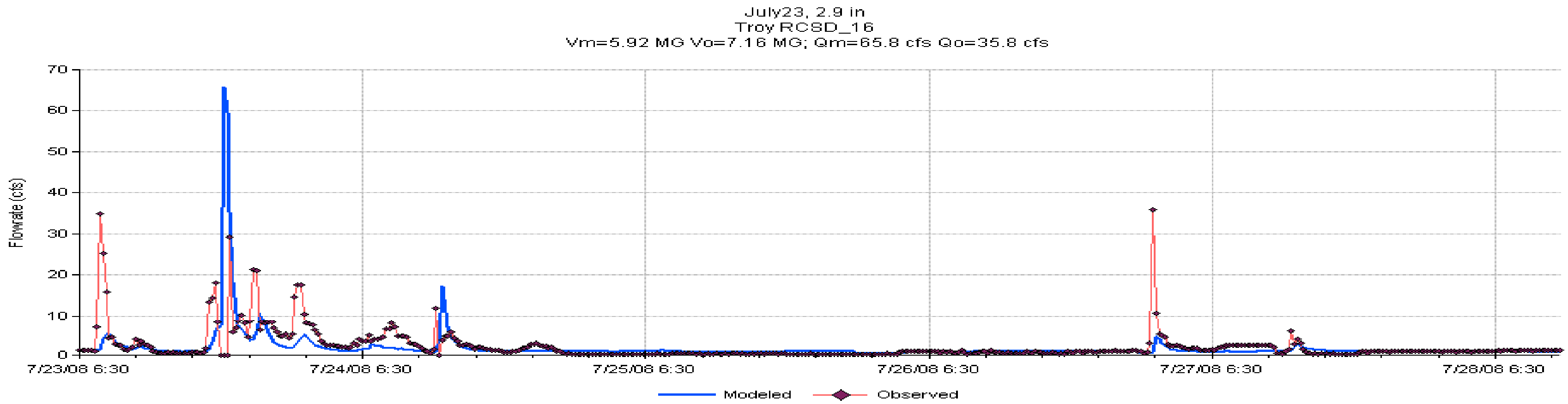

Sept6, 1.4 in
Troy RCSD_15
Vm=2.5 ft/s Vo=2.2 ft/s
Velocity (ft/s)
3
2.5
2
1.5
1
0.5
0
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed

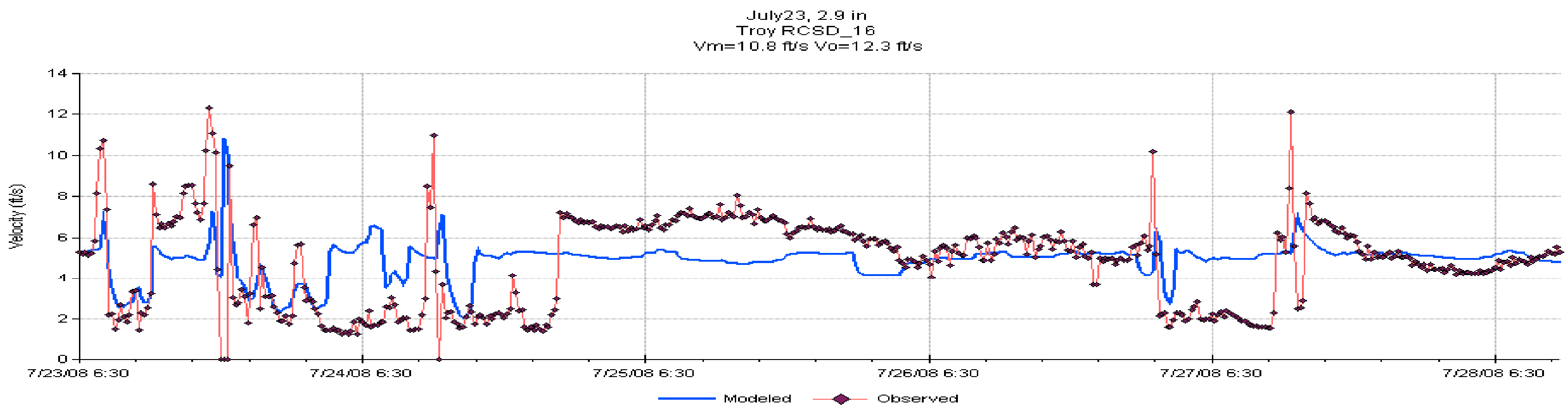

July13, 0.8 in
Troy RCSD_16
Dm=1.9 ft Do=1.3 ft
Depth (ft)
0
0.5
1
1.5
2
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed
Pipe Crown

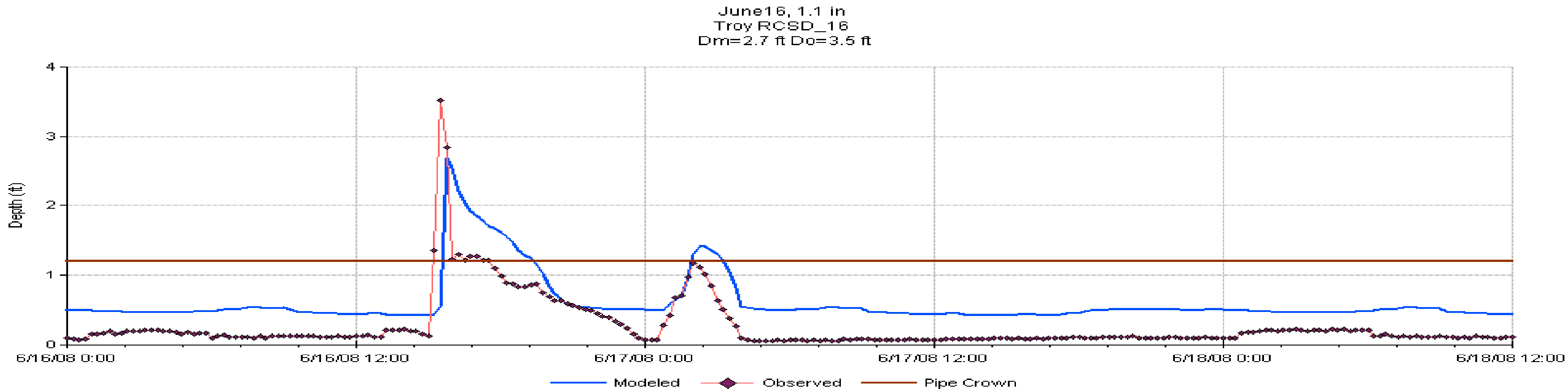

July13, 0.8 in
Troy RCSD_16
Vm=1.39 MG Vo=1.68 MG; Qm=6.7 cfs Qo=14.5 cfs
Flowrate (cfs)
0
5
10
15
20
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed


July13, 0.8 in
Troy RCSD_16
Vm=7.3 ft/s Vo=13.0 ft/s
Velocity (ft/s)
0
2
4
6
8
10
12
14
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed

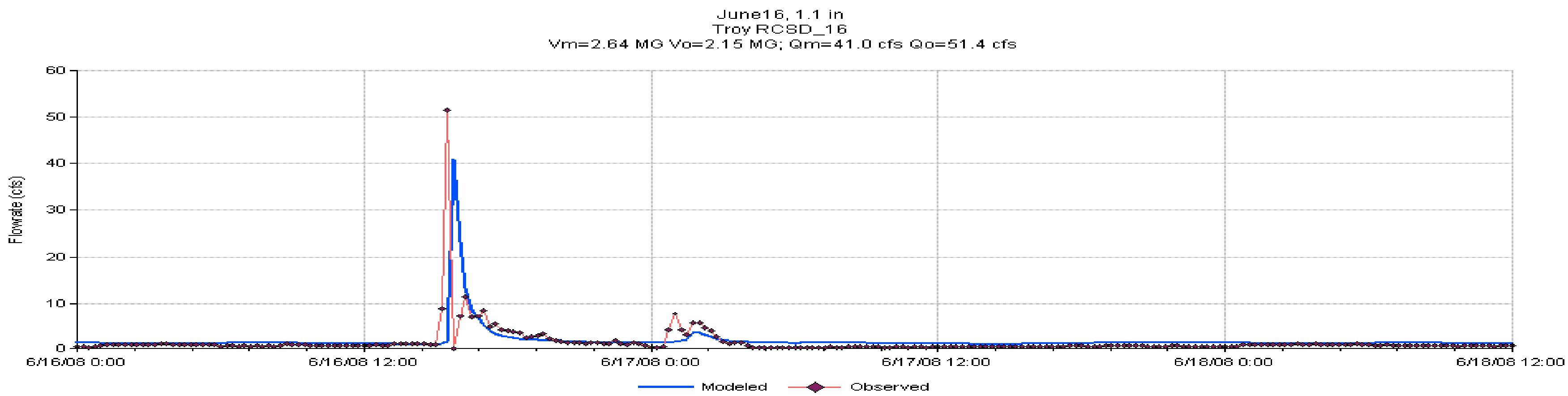

July23, 2.9 in
Troy RCSD_16
Dm=3.6 ft Do=3.8 ft
Depth (ft)
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed
Pipe Crown


July23, 2.9 in
Troy RCSD_16
Vm=5.92 MG Vo=7.16 MG; Qm=65.8 cfs Qo=35.8 cfs
Flowrate (cfs)
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed

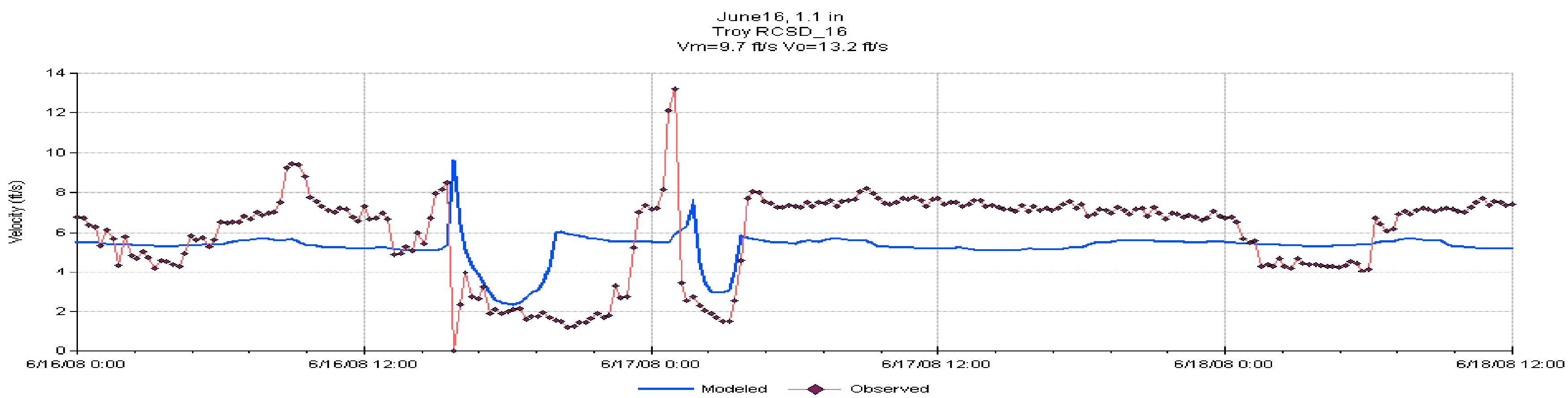

July23, 2.9 in
Troy RCSD_16
Vm=10.8 ft/s Vo=12.3 ft/s
Velocity (ft/s)
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed



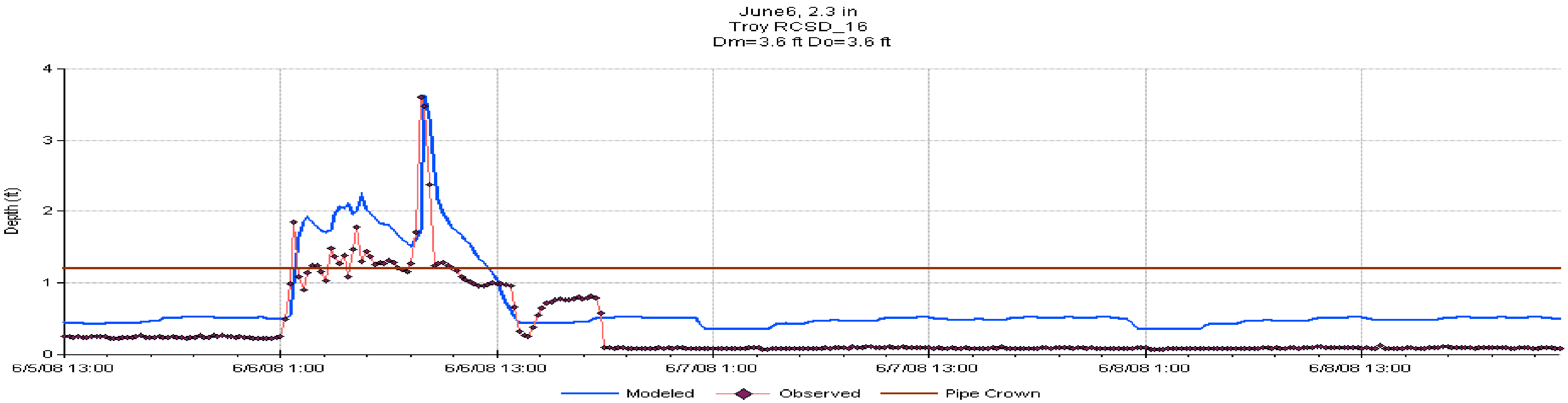
June16, 1.1 in
Troy RCSD_16
Dm=2.7 ft Do=3.5 ft
Depth (ft)
0
1
2
3
4
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
6/18/08 12:00
Modeled
Observed
Pipe Crown

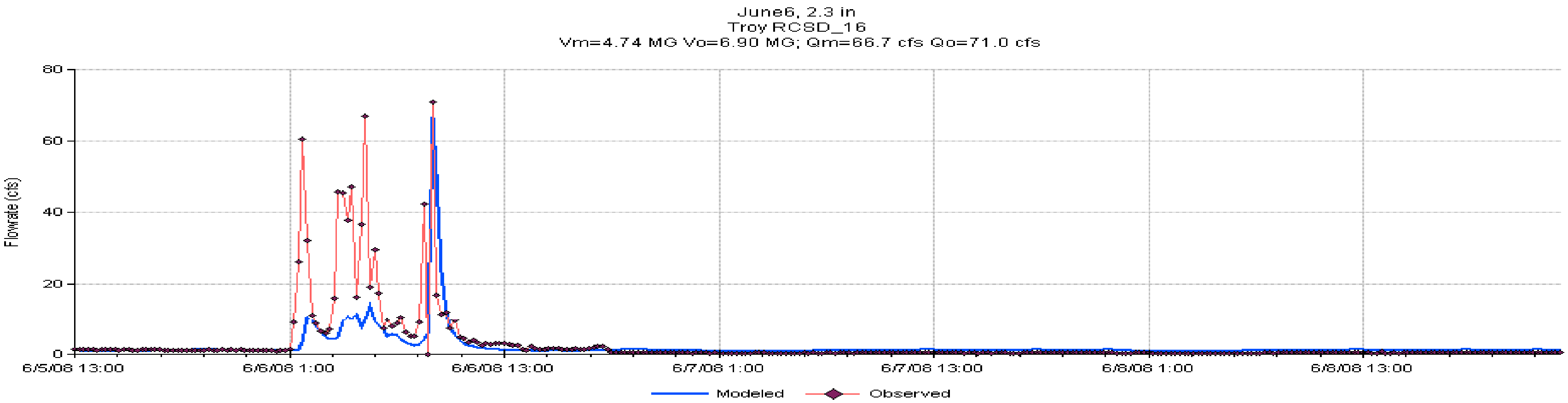


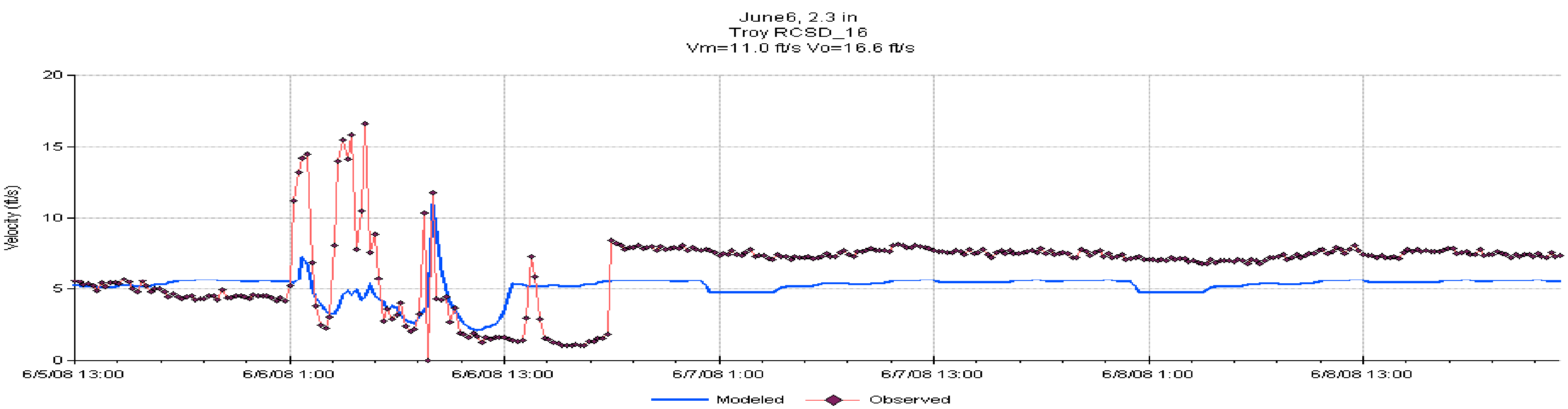
June16, 1.1 in
Troy RCSD_16
Vm=2.64 MG Vo=2.15 MG; Qm=41.0 cfs Qo=51.4 cfs
Flowrate (cfs)
0
10
20
30
40
50
60
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
6/18/08 12:00
Modeled
Observed

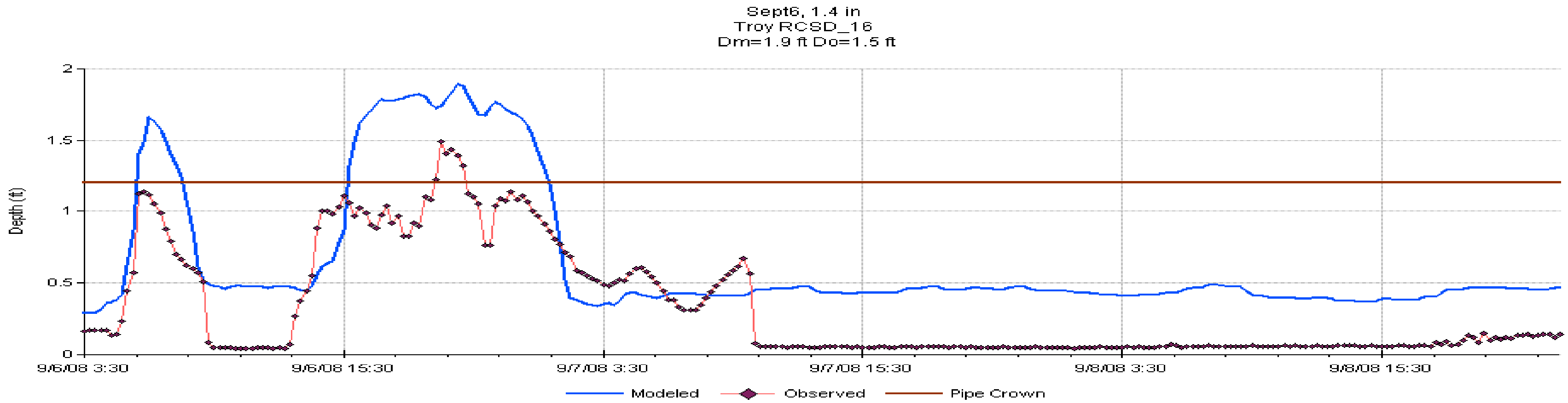


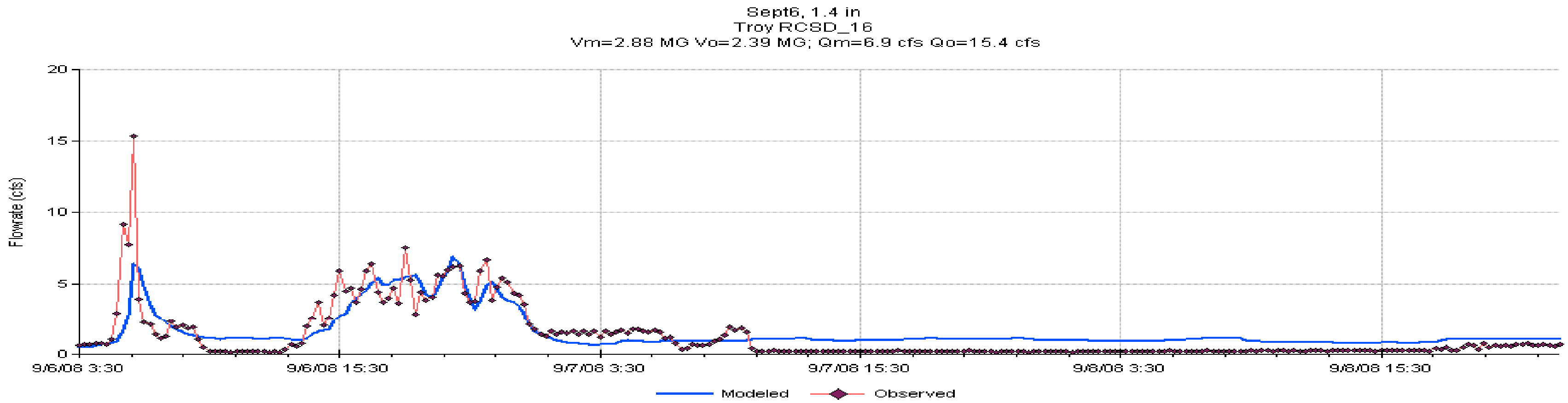
June16, 1.1 in
Troy RCSD_16
Vm=9.7 ft/s Vo=13.2 ft/s
Velocity (ft/s)
0
2
4
6
8
10
12
14
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
6/18/08 12:00
Modeled
Observed

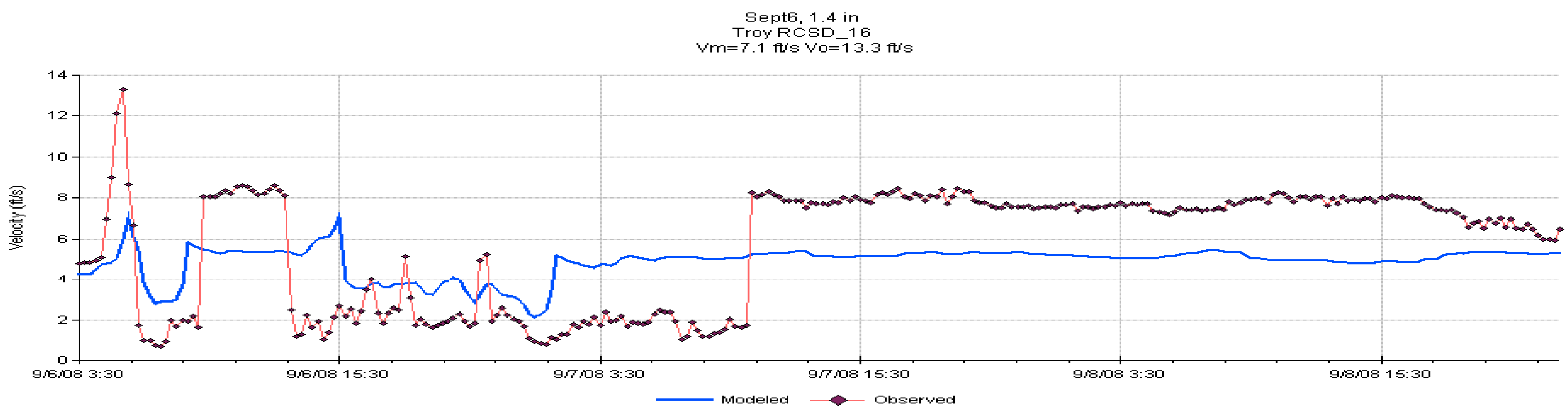

June6, 2.3 in
Troy RCSD_16
Dm=3.6 ft Do=3.6 ft
Depth (ft)
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed
Pipe Crown

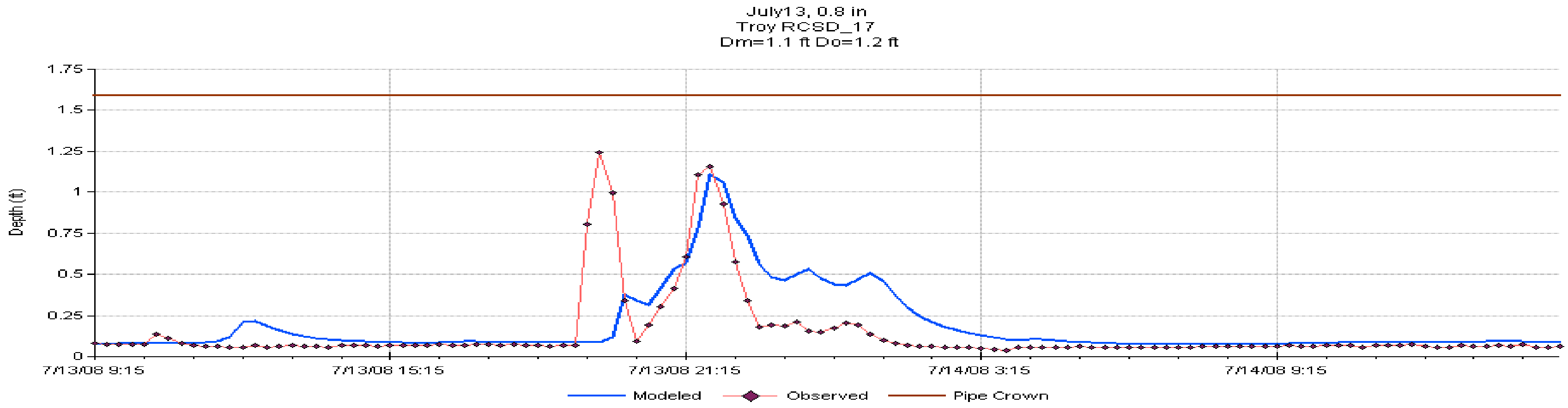

June6, 2.3 in
Troy RCSD_16
Vm=4.74 MG Vo=6.90 MG; Qm=66.7 cfs Qo=71.0 cfs
Flowrate (cfs)
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed

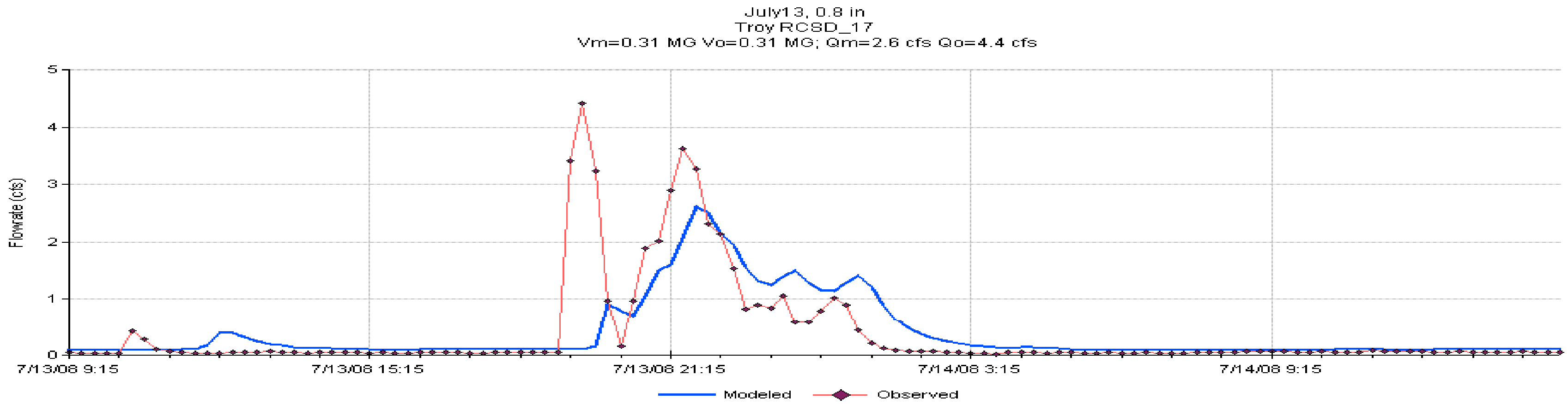

June6, 2.3 in
Troy RCSD_16
Vm=11.0 ft/s Vo=16.6 ft/s
Velocity (ft/s)
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed

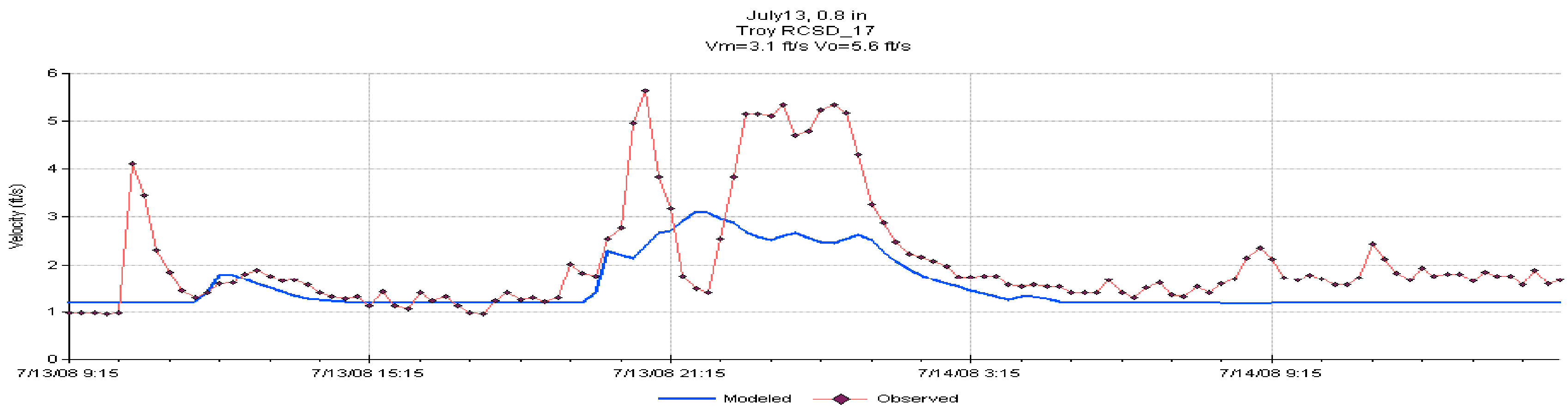

Sept6, 1.4 in
Troy RCSD_16
Dm=1.9 ft Do=1.5 ft
Depth (ft)
2
1.5
1
0.5
0
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed
Pipe Crown

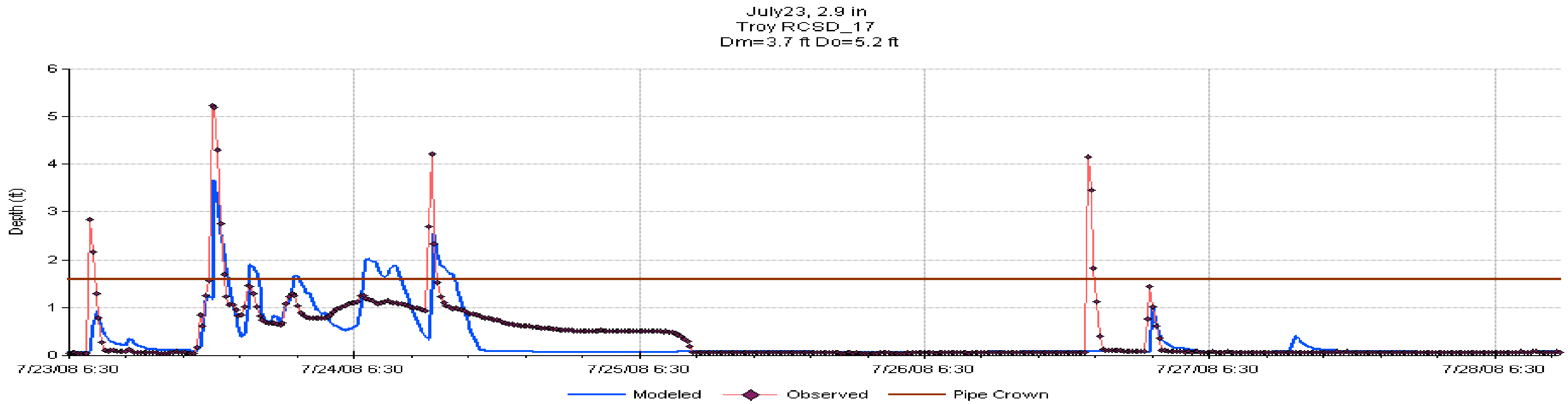

Sept6, 1.4 in
Troy RCSD_16
Vm=2.88 MG Vo=2.39 MG; Qm=6.9 cfs Qo=15.4 cfs
Flowrate (cfs)
20
15
10
5
0
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed

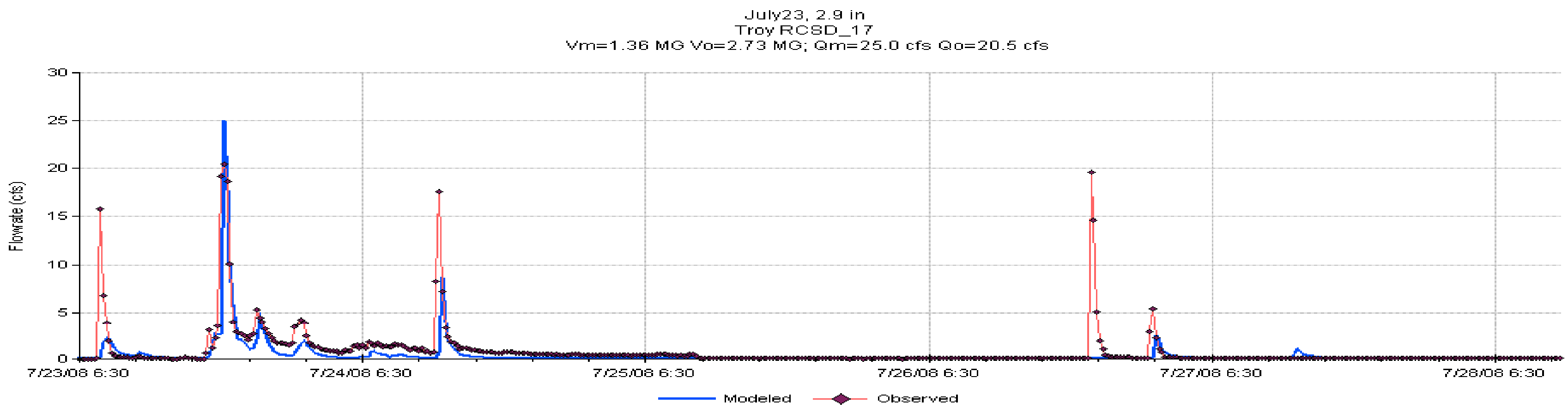

Sept6, 1.4 in
Troy RCSD_16
Vm=7.1 ft/s Vo=13.3 ft/s
Velocity (ft/s)
14
12
10
8
6
4
2
0
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed

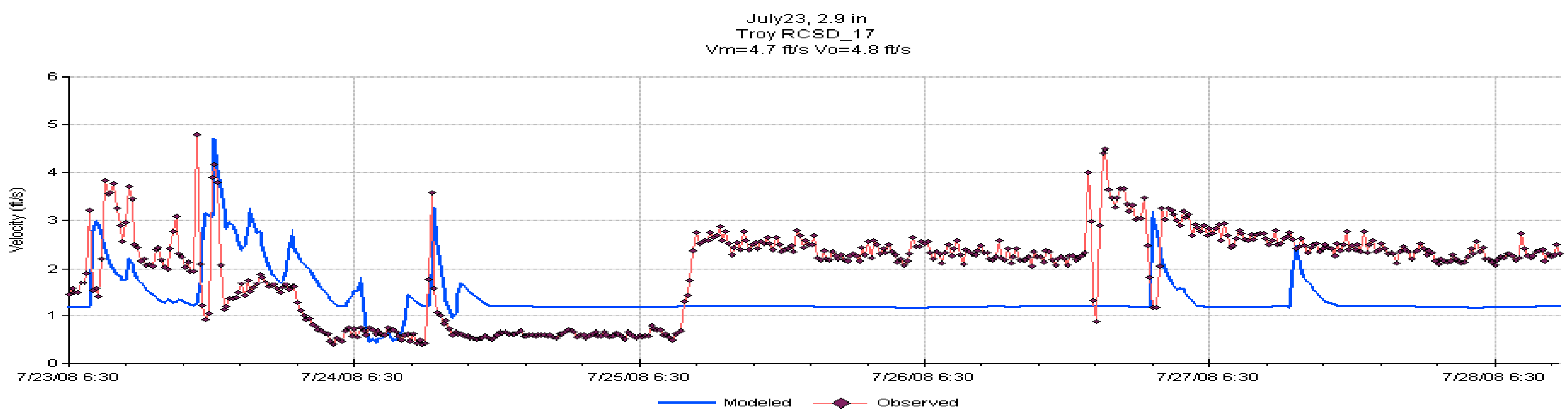

July13, 0.8 in
Troy RCSD_17
Dm=1.1 ft Do=1.2 ft
Depth (ft)
1.75
1.5
1.25
1
0.75
0.5
0.25
0
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed
Pipe Crown

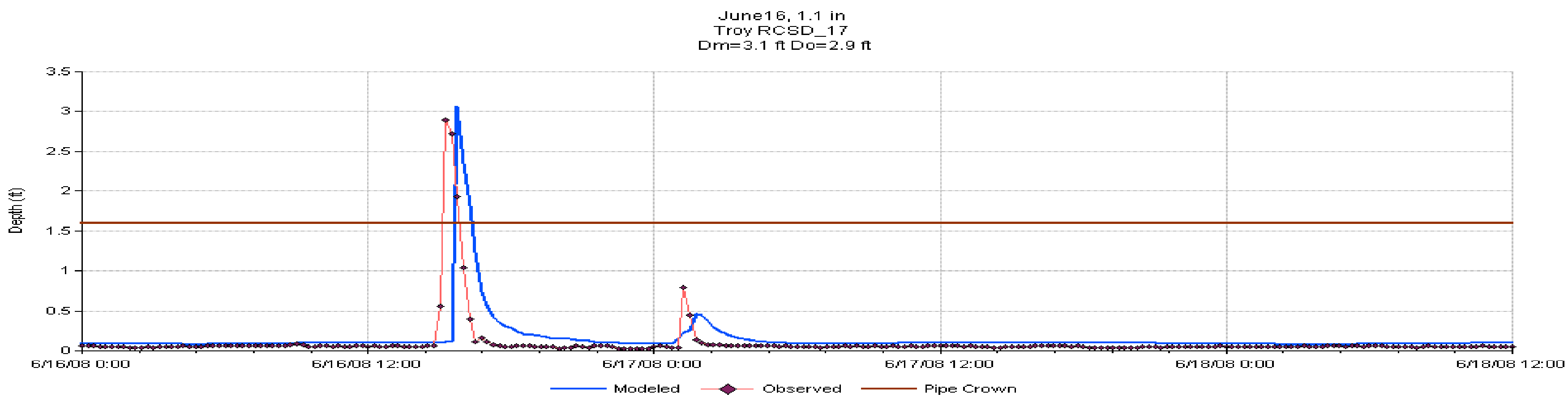

July13, 0.8 in
Troy RCSD_17
Vm=0.31 MG Vo=0.31 MG; Qm=2.6 cfs Qo=4.4 cfs
Flowrate (cfs)
5
4
3
2
1
0
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed

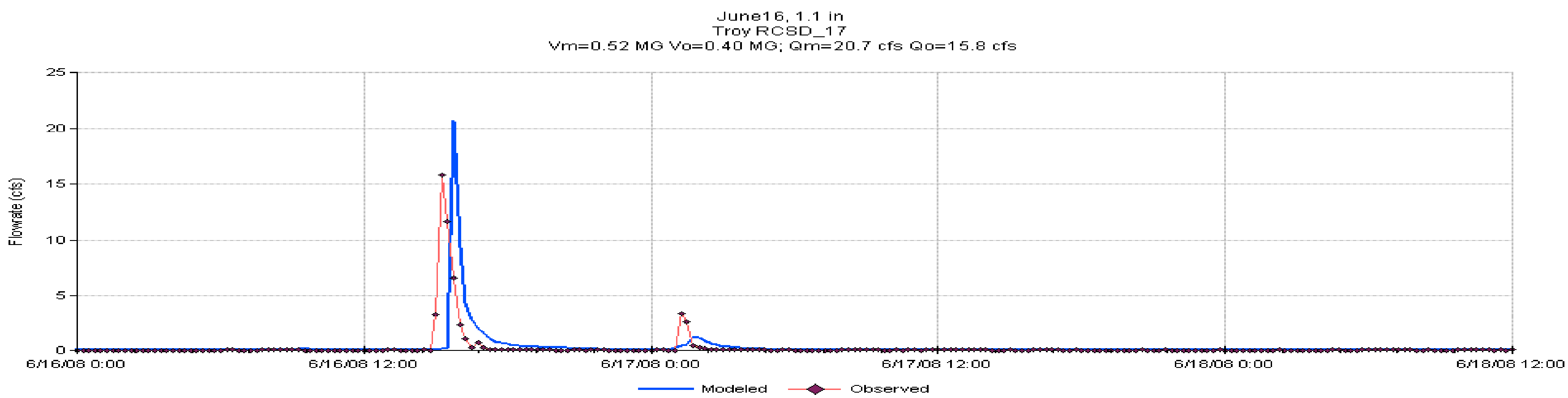

July13, 0.8 in
Troy RCSD_17
Vm=3.1 ft/s Vo=5.6 ft/s
Velocity (ft/s)
6
5
4
3
2
1
0
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed

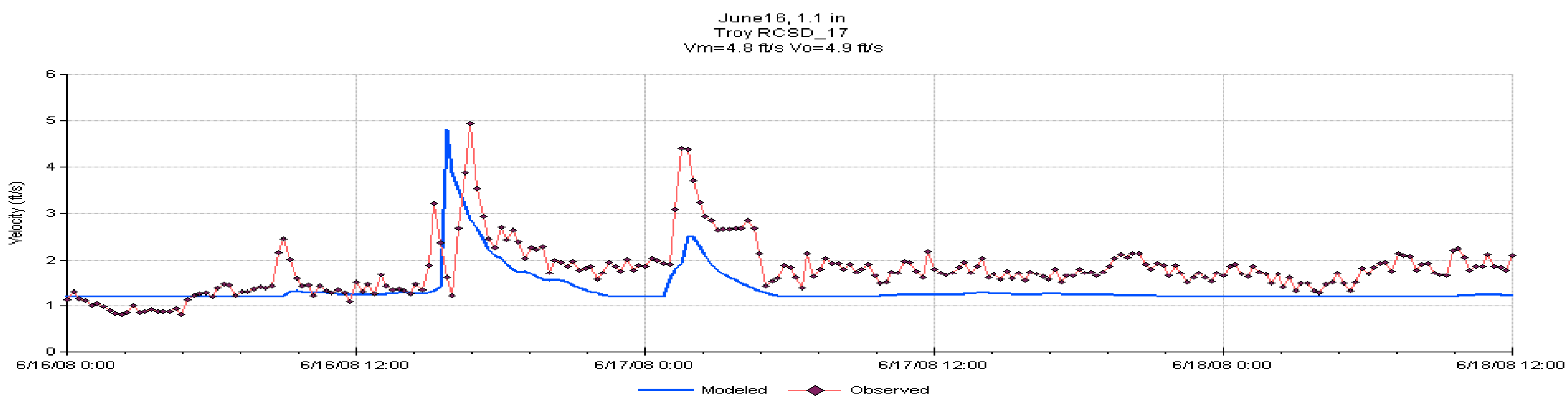

July23, 2.9 in
Troy RCSD_17
Dm=3.7 ft Do=5.2 ft
Depth (ft)
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed
Pipe Crown

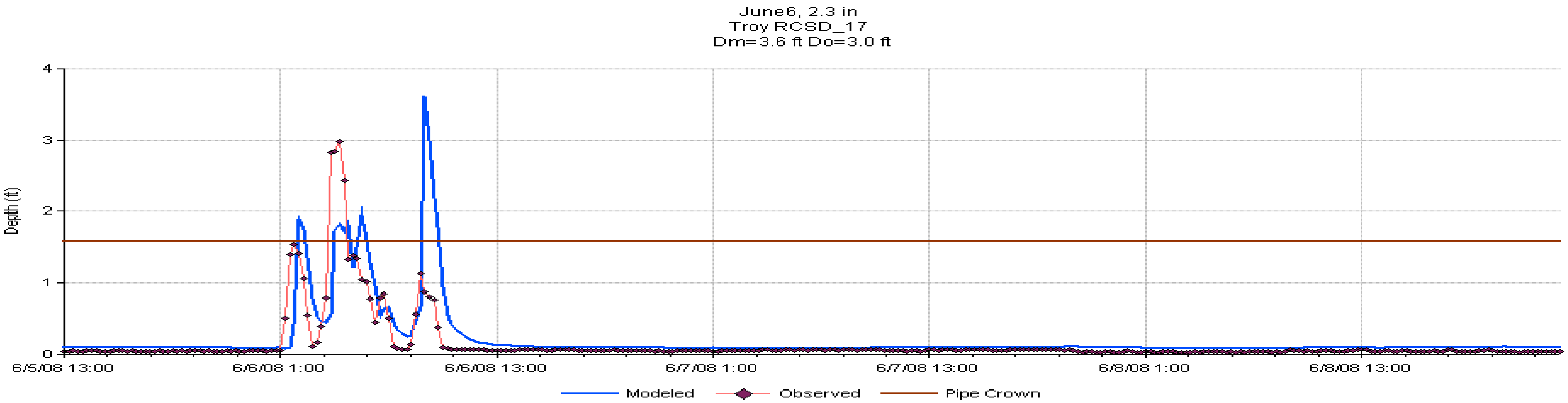

July23, 2.9 in
Troy RCSD_17
Vm=1.36 MG Vo=2.73 MG; Qm=25.0 cfs Qo=20.5 cfs
Flowrate (cfs)
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed

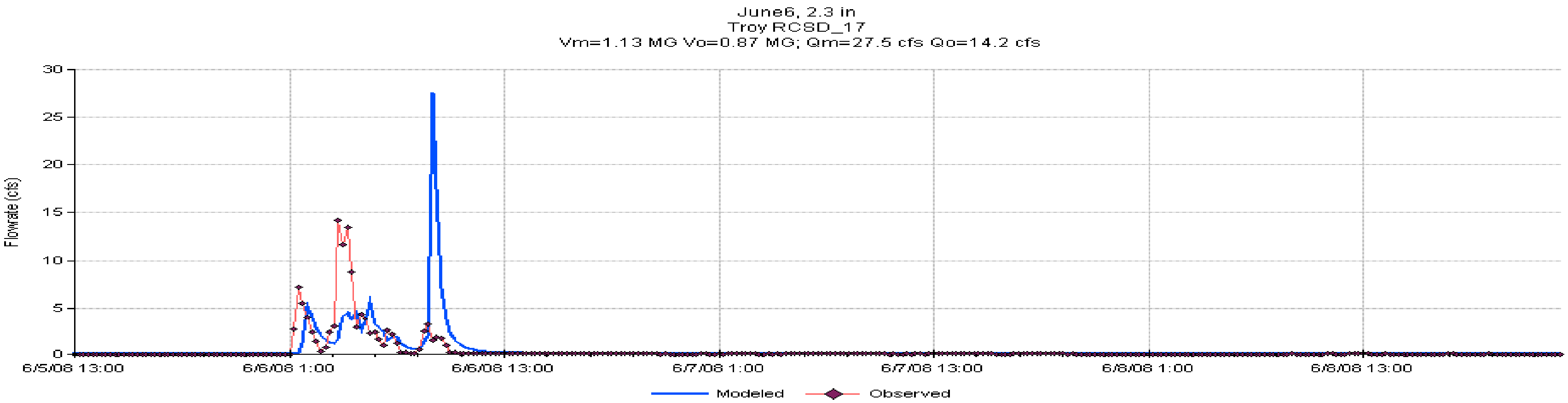

July23, 2.9 in
Troy RCSD_17
Vm=4.7 ft/s Vo=4.8 ft/s
Velocity (ft/s)
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed

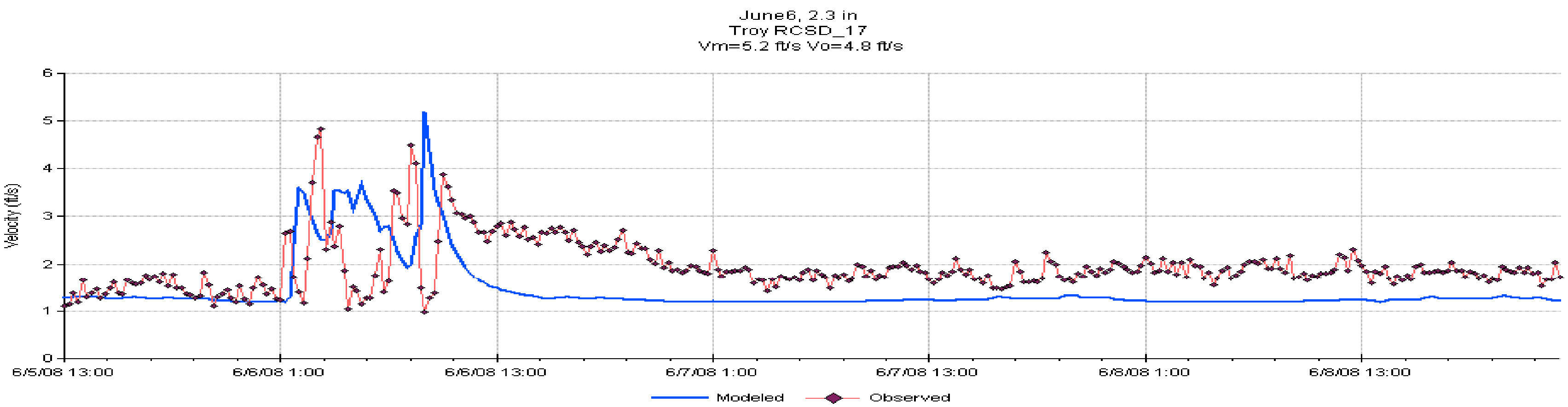

June16, 1.1 in
Troy RCSD_17
Dm=3.1 ft Do=2.9 ft
Depth (ft)
3.5
3
2.5
2
1.5
1
0.5
0
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
6/18/08 12:00
Modeled
Observed
Pipe Crown

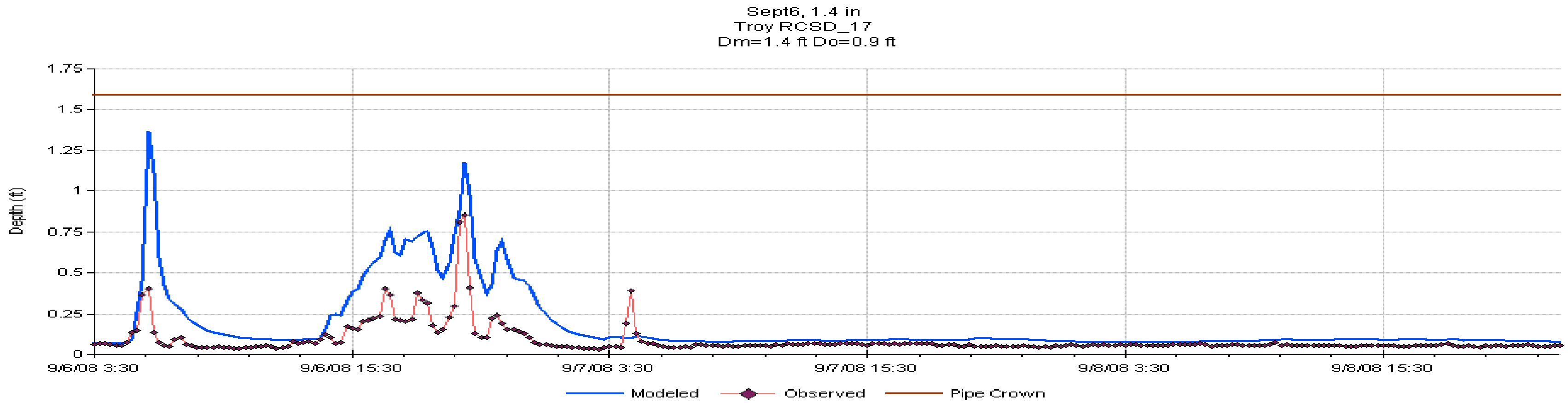

June16, 1.1 in
Troy RCSD_17
Vm=0.52 MG Vo=0.40 MG; Qm=20.7 cfs Qo=15.8 cfs
Flowrate (cfs)
25
20
15
10
5
0
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
6/18/08 12:00
Modeled
Observed

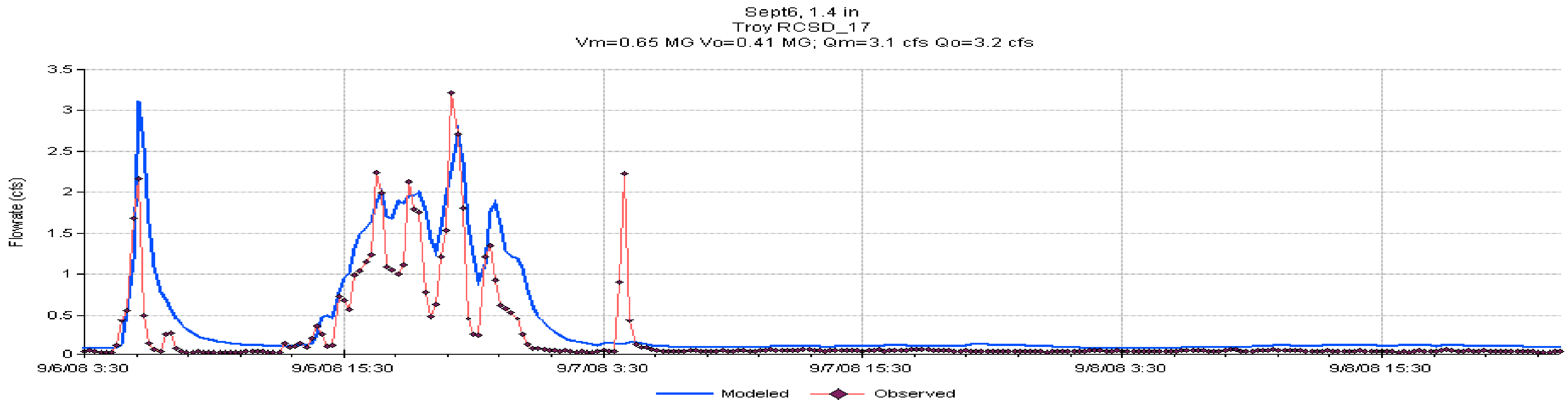

June16, 1.1 in
Troy RCSD_17
Vm=4.8 ft/s Vo=4.9 ft/s
Velocity (ft/s)
6
5
4
3
2
1
0
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
6/18/08 12:00
Modeled
Observed

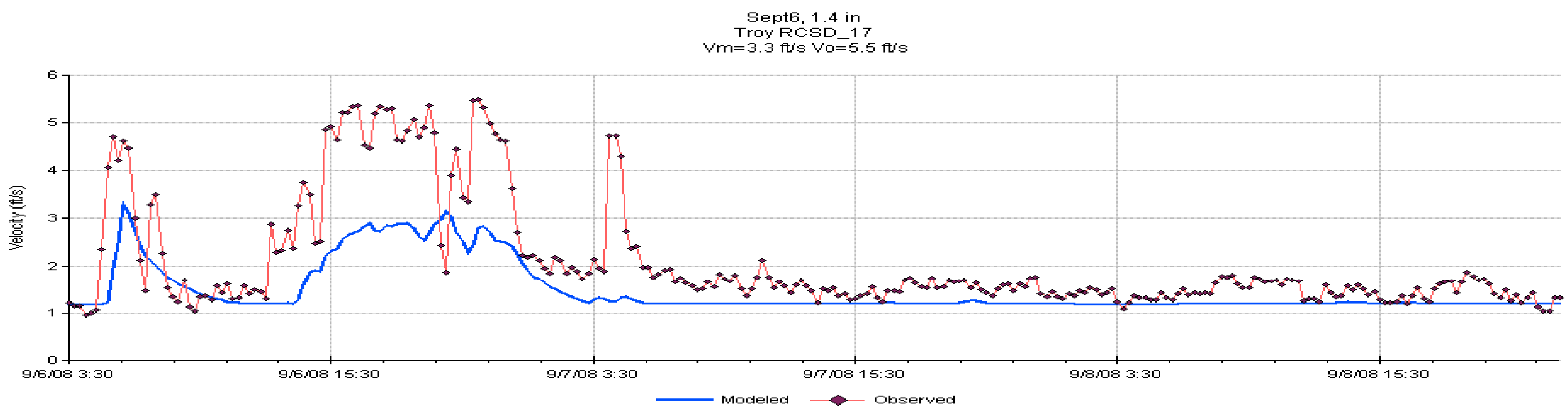

June6, 2.3 in
Troy RCSD_17
Dm=3.6 ft Do=3.0 ft
Depth (ft)
4
3
2
1
0
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed
Pipe Crown

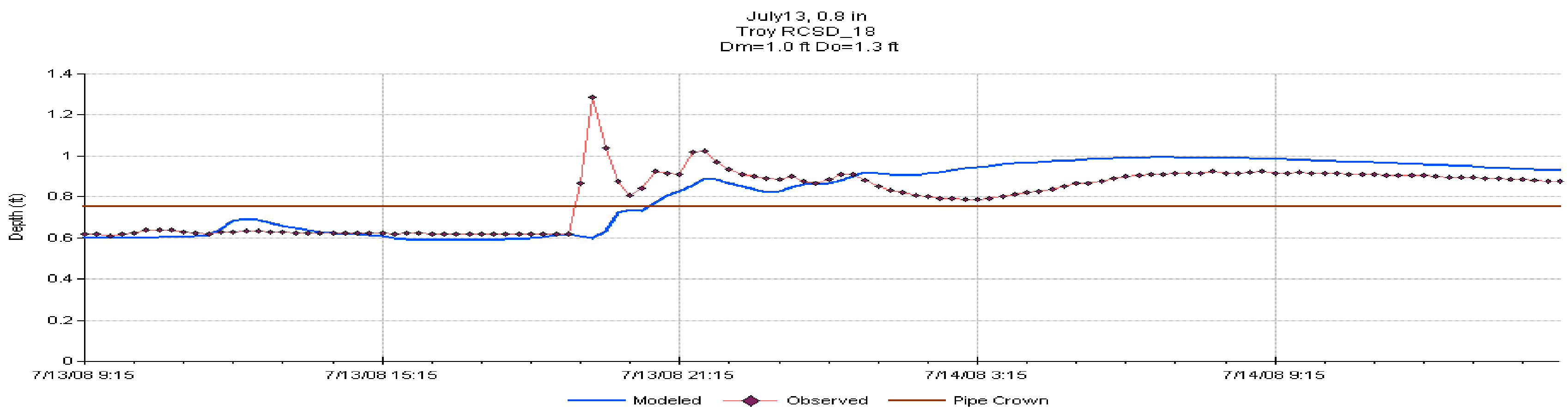

June6, 2.3 in
Troy RCSD_17
Vm=1.13 MG Vo=0.87 MG; Qm=27.5 cfs Qo=14.2 cfs
Flowrate (cfs)
30
25
20
15
10
5
0
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed


June6, 2.3 in
Troy RCSD_17
Vm=5.2 ft/s Vo=4.8 ft/s
Velocity (ft/s)
6
5
4
3
2
1
0
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed

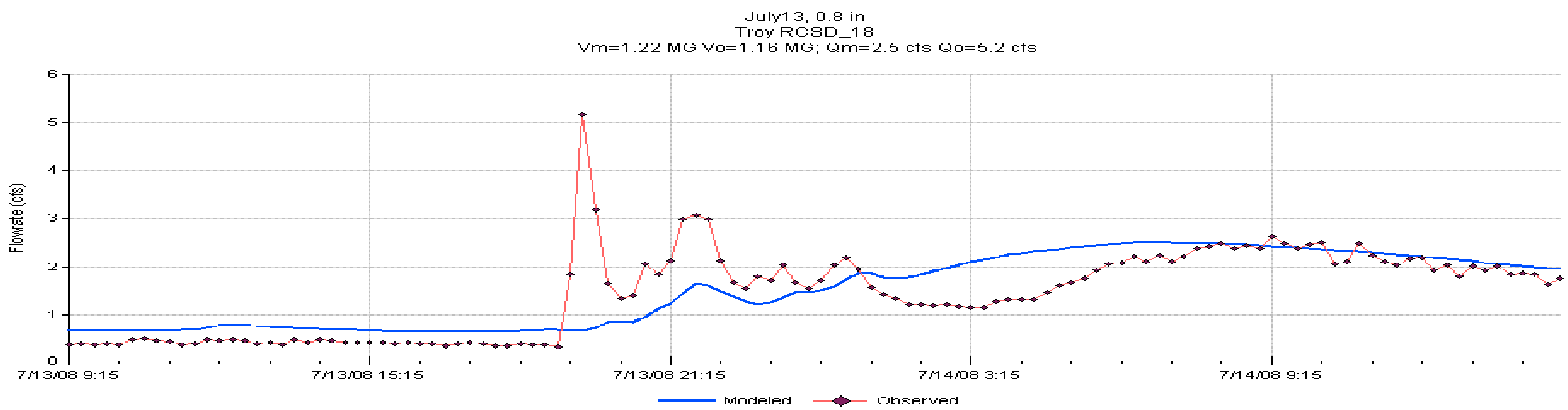

Sept6, 1.4 in
Troy RCSD_17
Dm=1.4 ft Do=0.9 ft
Depth (ft)
1.75
1.5
1.25
1
0.75
0.5
0.25
0
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed
Pipe Crown


Sept6, 1.4 in
Troy RCSD_17
Vm=0.65 MG Vo=0.41 MG; Qm=3.1 cfs Qo=3.2 cfs
Flowrate (cfs)
3.5
3
2.5
2
1.5
1
0.5
0
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed

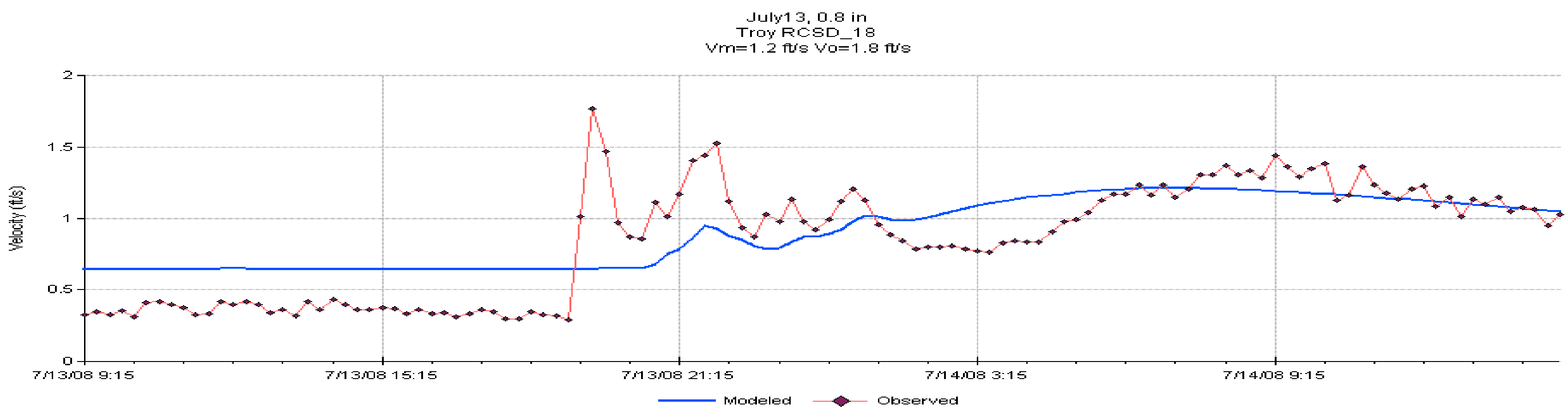

Sept6, 1.4 in
Troy RCSD_17
Vm=3.3 ft/s Vo=5.5 ft/s
Velocity (ft/s)
6
5
4
3
2
1
0
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed



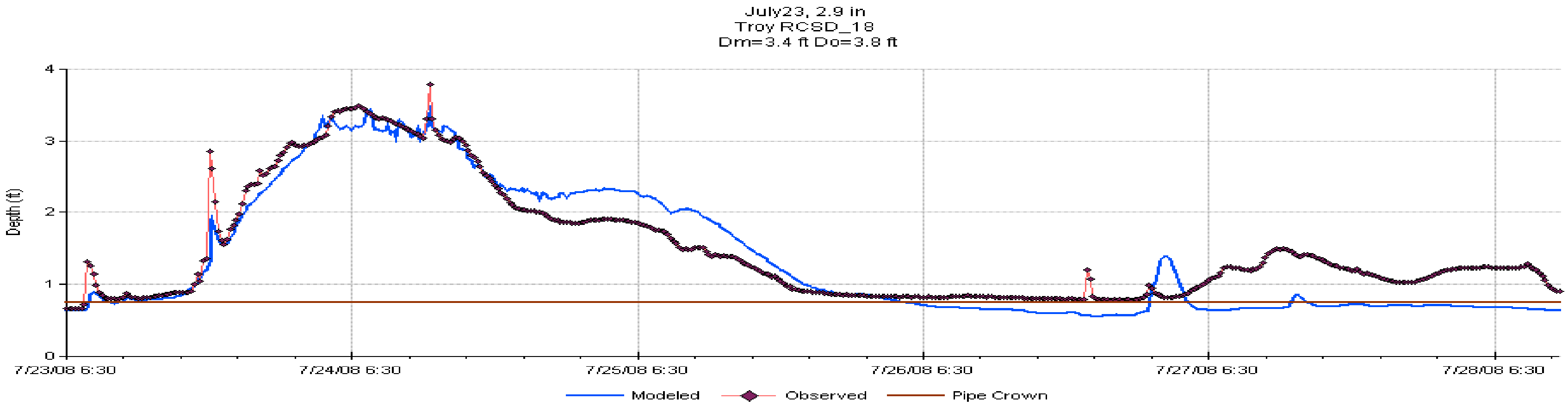
July13, 0.8 in
Troy RCSD_18
Dm=1.0 ft Do=1.3 ft
Depth (ft)
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed
Pipe Crown

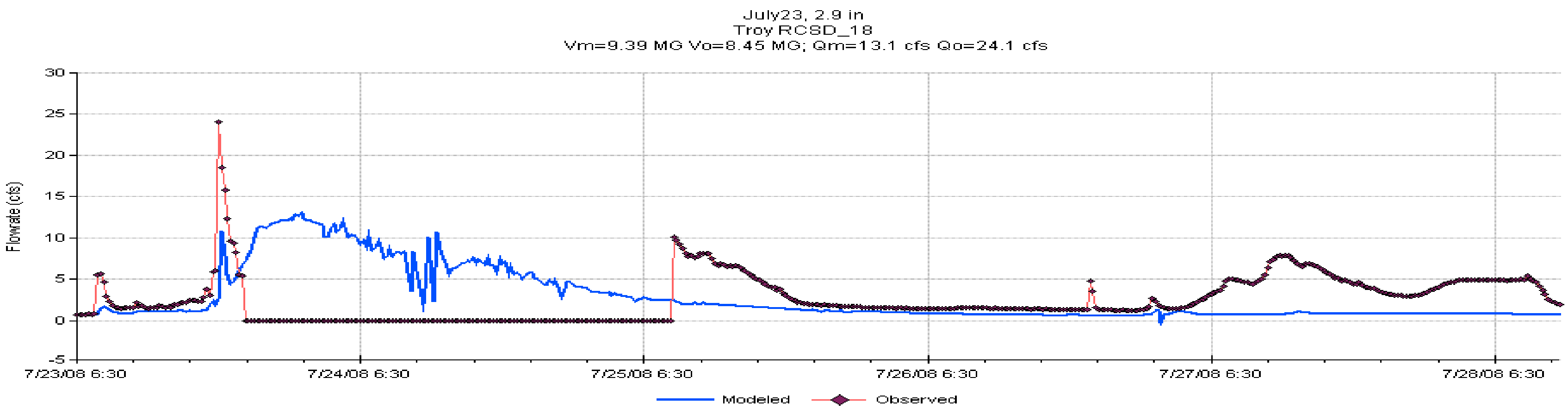


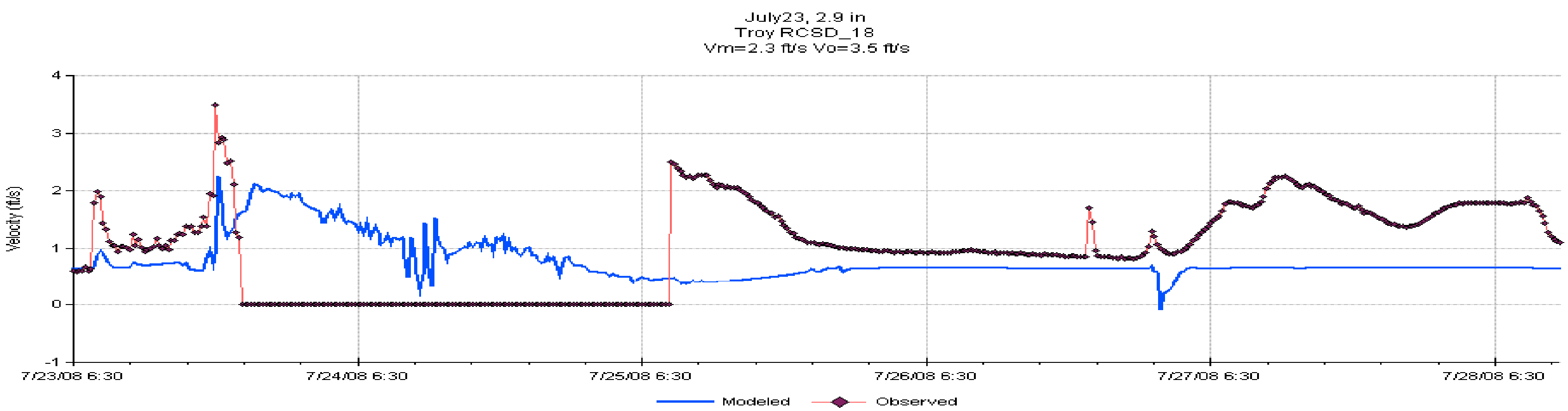
July13, 0.8 in
Troy RCSD_18
Vm=1.22 MG Vo=1.16 MG; Qm=2.5 cfs Qo=5.2 cfs
Flowrate (cfs)
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed

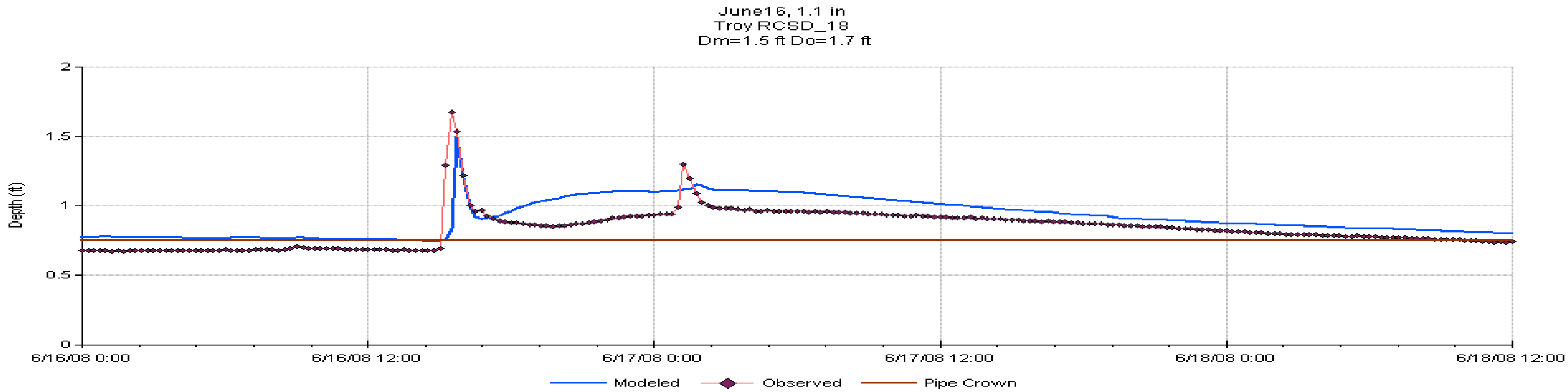


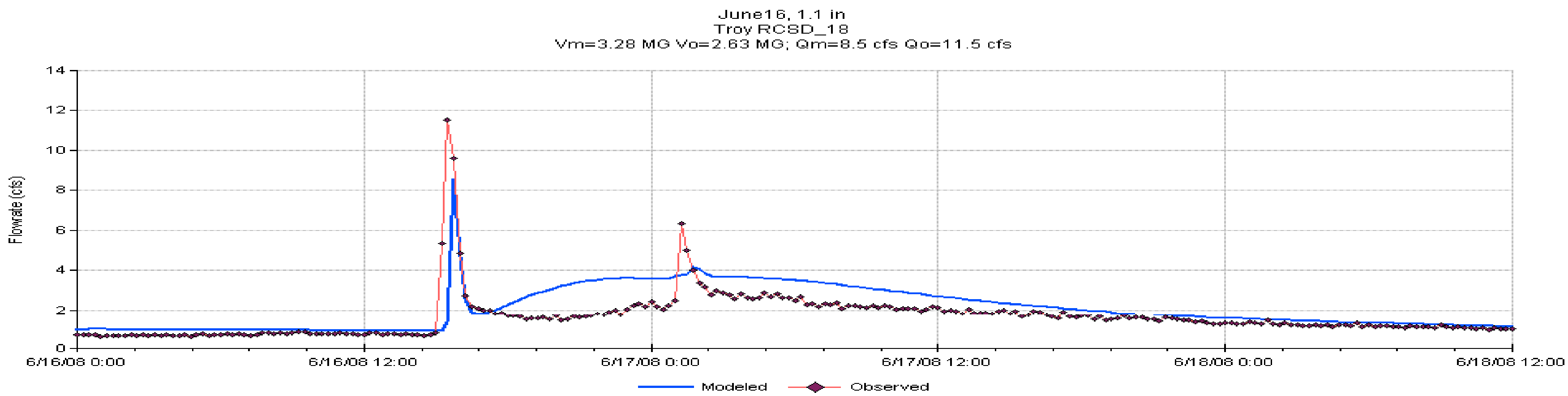
July13, 0.8 in
Troy RCSD_18
Vm=1.2 ft/s Vo=1.8 ft/s
Velocity (ft/s)
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed

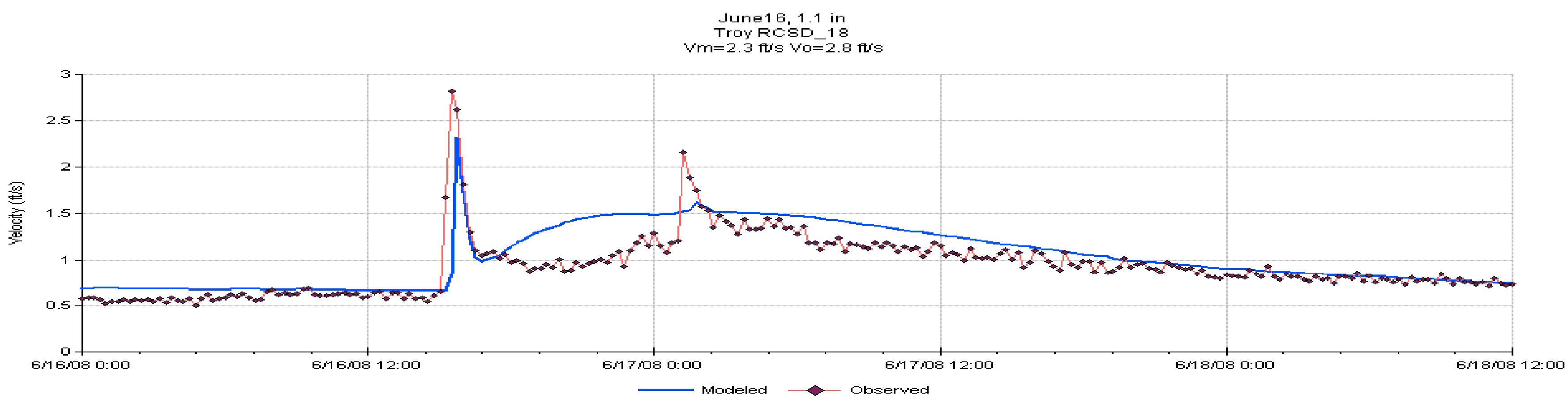

July23, 2.9 in
Troy RCSD_18
Dm=3.4 ft Do=3.8 ft
Depth (ft)
0
1
2
3
4
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed
Pipe Crown

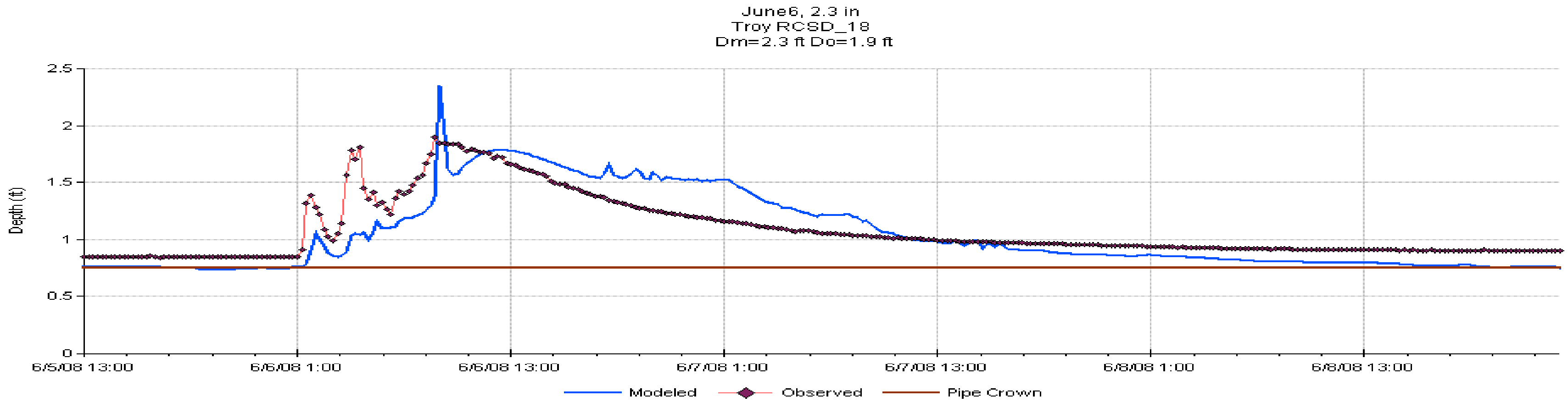

July23, 2.9 in
Troy RCSD_18
Vm=9.39 MG Vo=8.45 MG; Qm=13.1 cfs Qo=24.1 cfs
Flowrate (cfs)
-5
0
5
10
15
20
25
30
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed

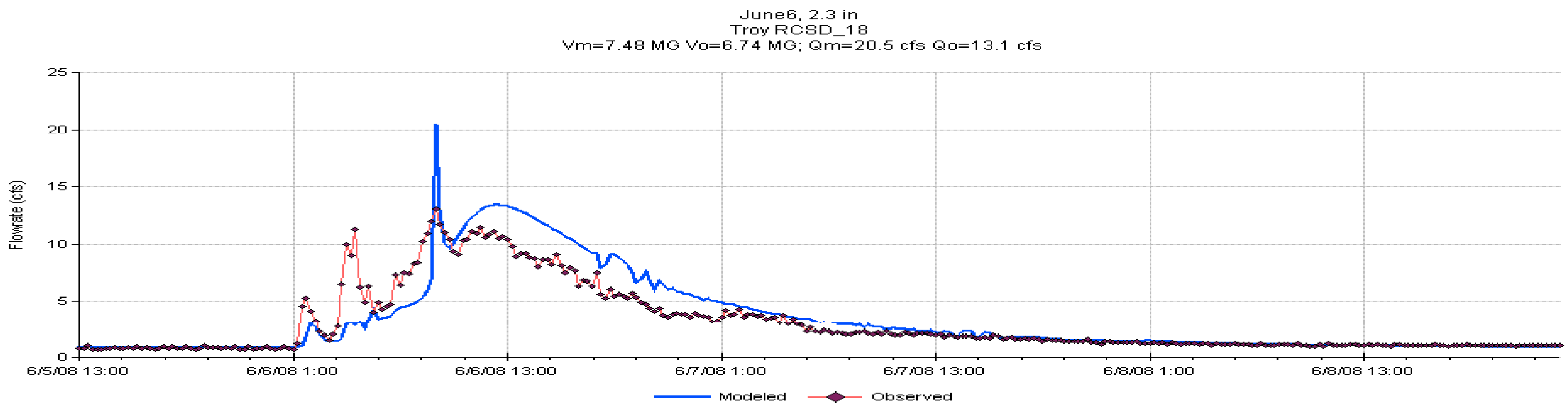

July23, 2.9 in
Troy RCSD_18
Vm=2.3 ft/s Vo=3.5 ft/s
Velocity (ft/s)
-1
0
1
2
3
4
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed

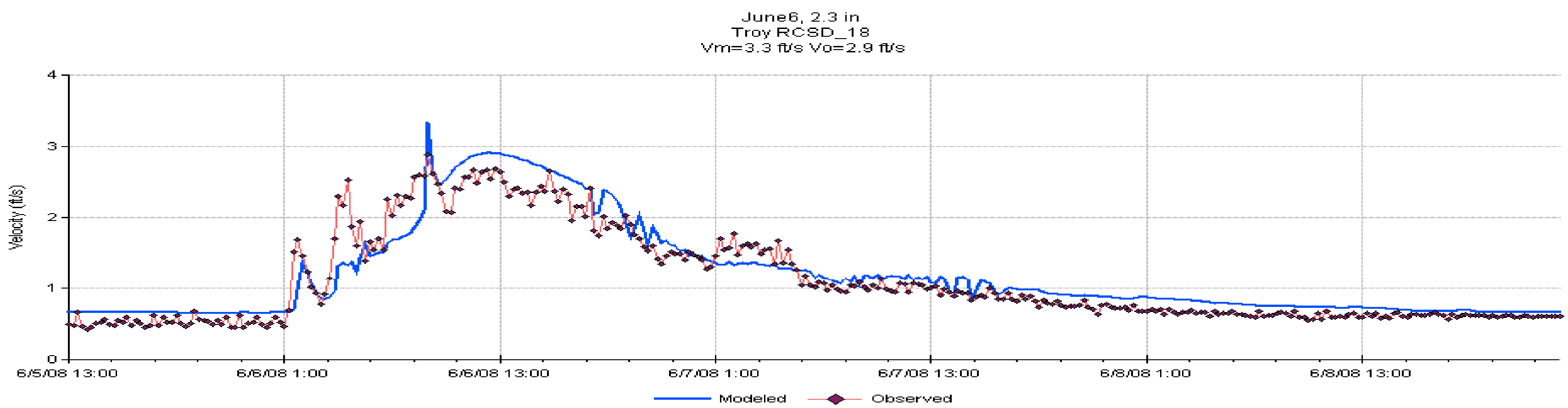

June16, 1.1 in
Troy RCSD_18
Dm=1.5 ft Do=1.7 ft
Depth (ft)
0
0.5
1
1.5
2
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
6/18/08 12:00
Modeled
Observed
Pipe Crown

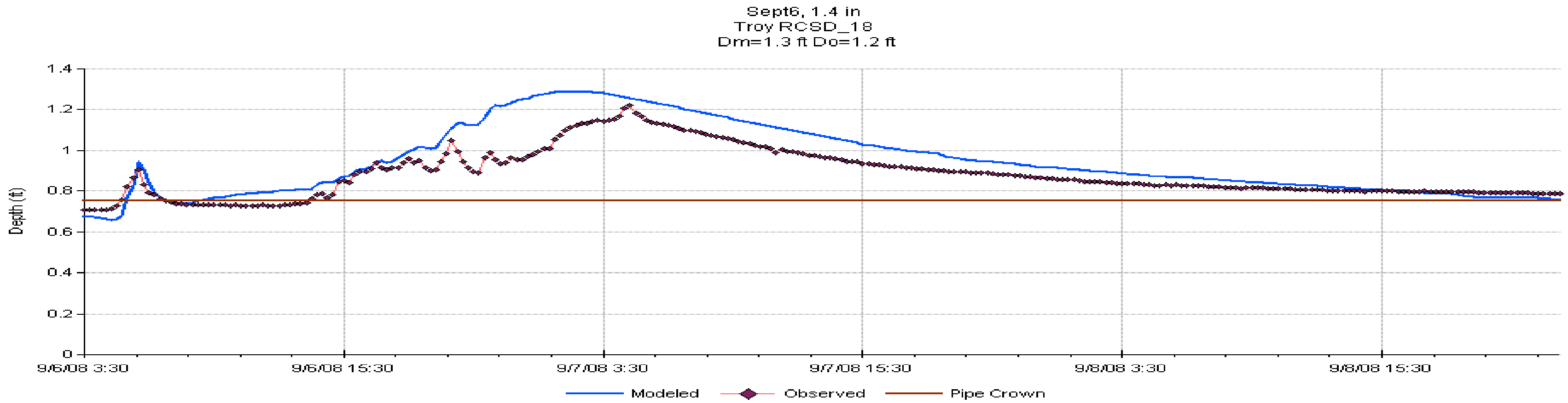

June16, 1.1 in
Troy RCSD_18
Vm=3.28 MG Vo=2.63 MG; Qm=8.5 cfs Qo=11.5 cfs
Flowrate (cfs)
0
2
4
6
8
10
12
14
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
6/18/08 12:00
Modeled
Observed

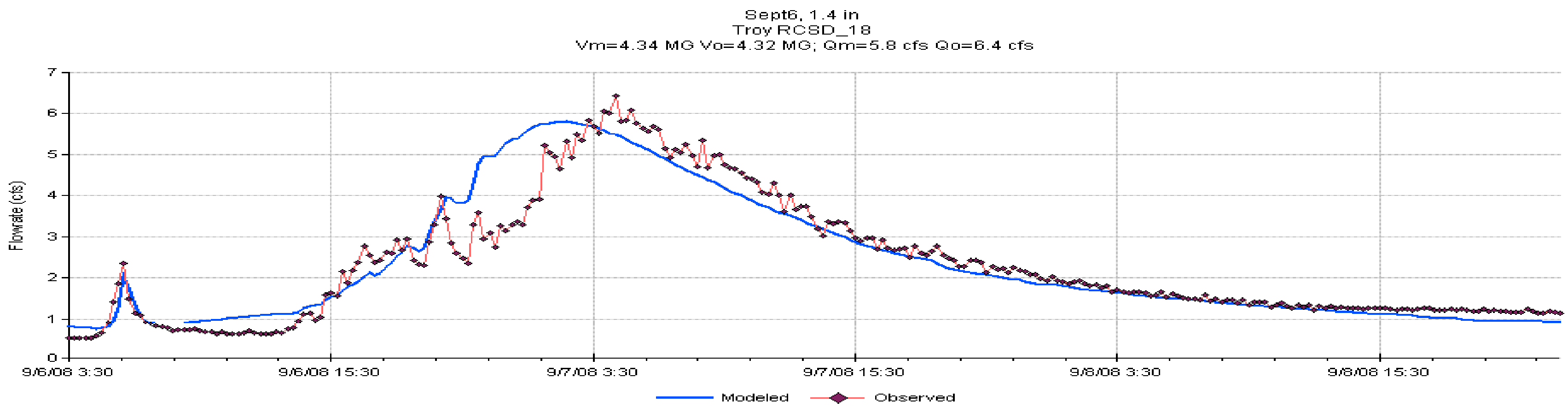

June16, 1.1 in
Troy RCSD_18
Vm=2.3 ft/s Vo=2.8 ft/s
Velocity (ft/s)
0
0.5
1
1.5
2
2.5
3
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
6/18/08 12:00
Modeled
Observed

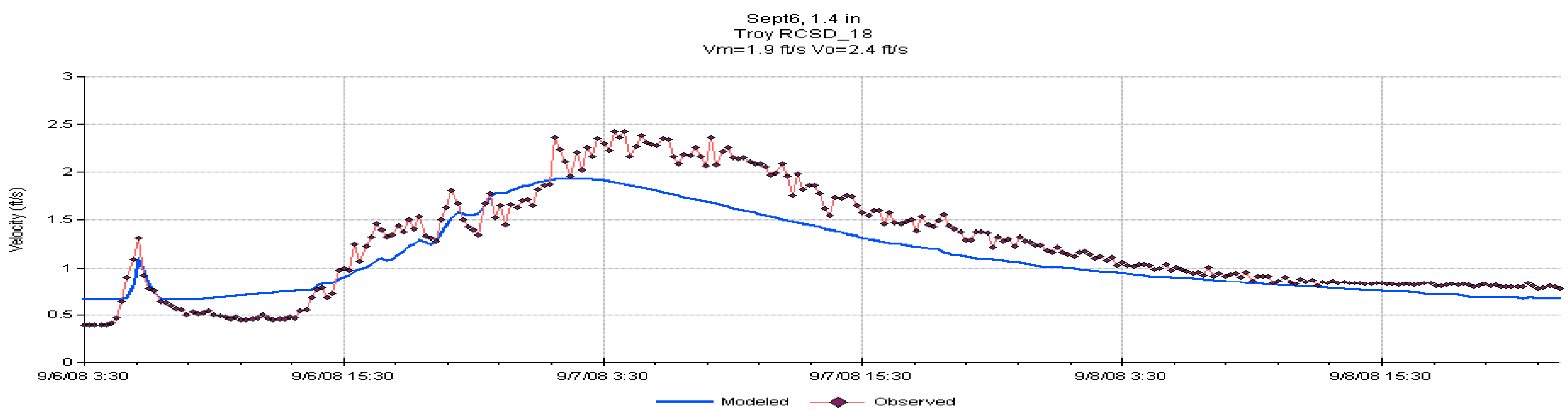

June6, 2.3 in
Troy RCSD_18
Dm=2.3 ft Do=1.9 ft
Depth (ft)
2.5
2
1.5
1
0.5
0
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed
Pipe Crown

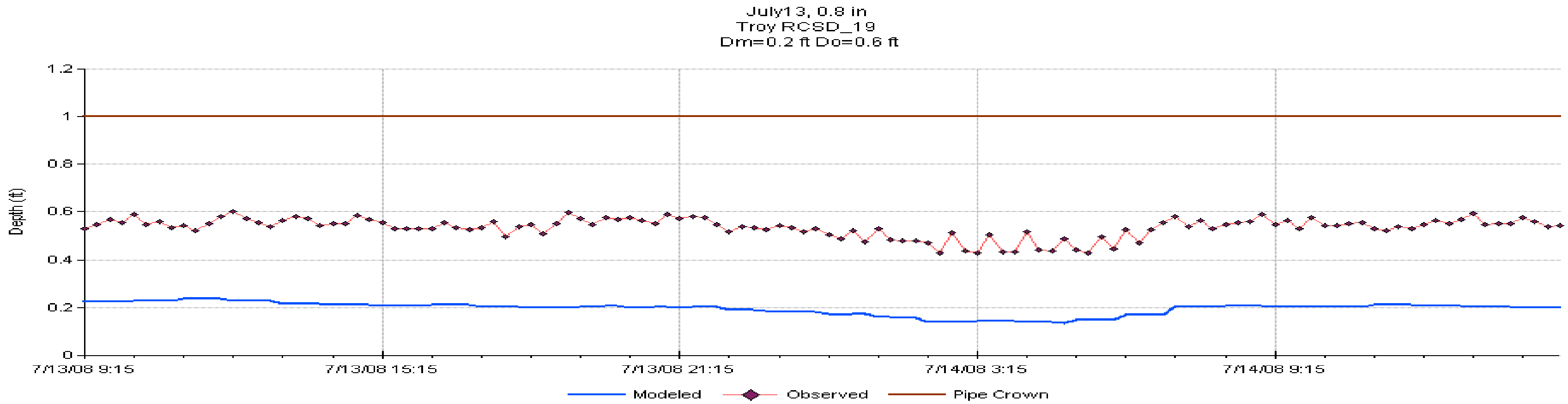

June6, 2.3 in
Troy RCSD_18
Vm=7.48 MG Vo=6.74 MG; Qm=20.5 cfs Qo=13.1 cfs
Flowrate (cfs)
25
20
15
10
5
0
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed

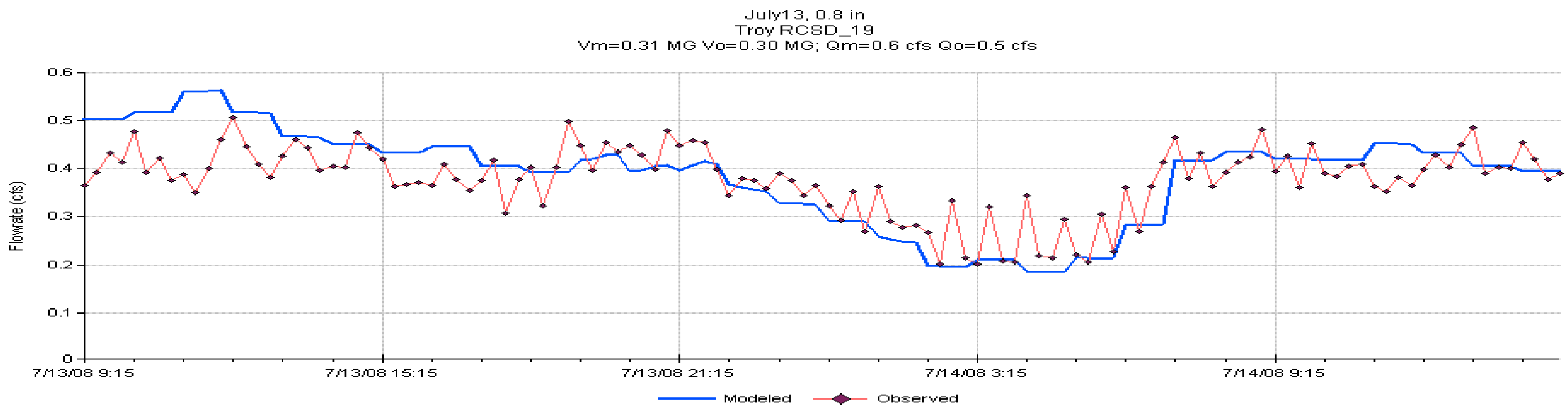

June6, 2.3 in
Troy RCSD_18
Vm=3.3 ft/s Vo=2.9 ft/s
Velocity (ft/s)
4
3
2
1
0
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed

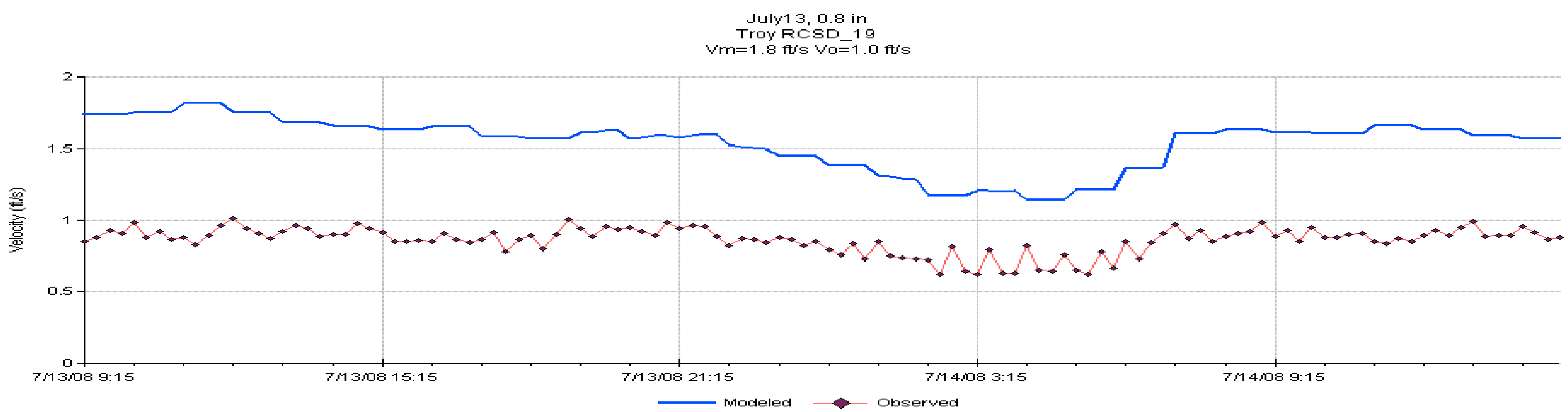

Sept6, 1.4 in
Troy RCSD_18
Dm=1.3 ft Do=1.2 ft
Depth (ft)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed
Pipe Crown

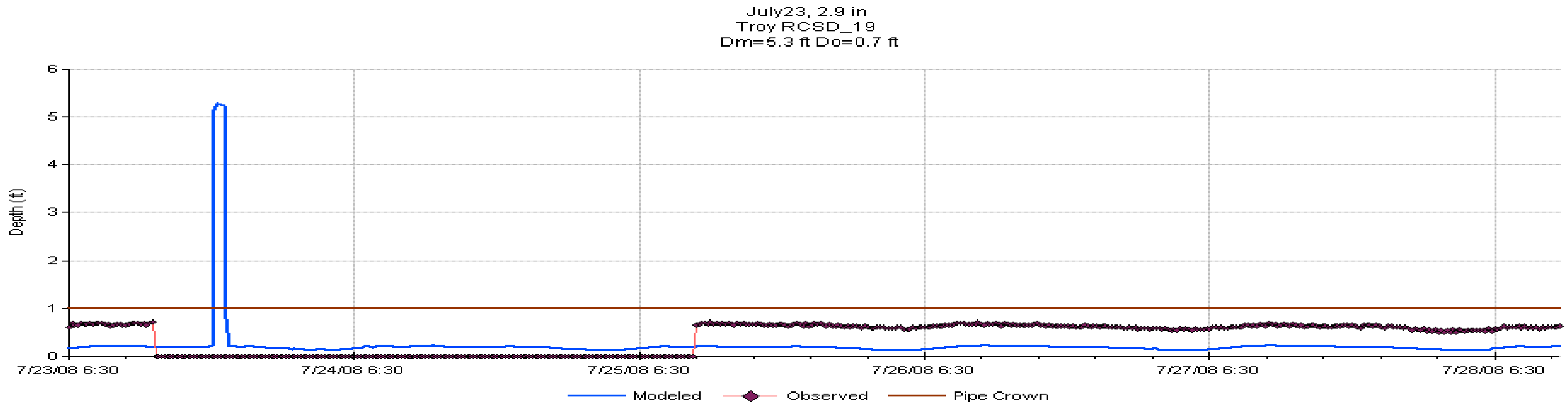

Sept6, 1.4 in
Troy RCSD_18
Vm=4.34 MG Vo=4.32 MG; Qm=5.8 cfs Qo=6.4 cfs
Flowrate (cfs)
7
6
5
4
3
2
1
0
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed

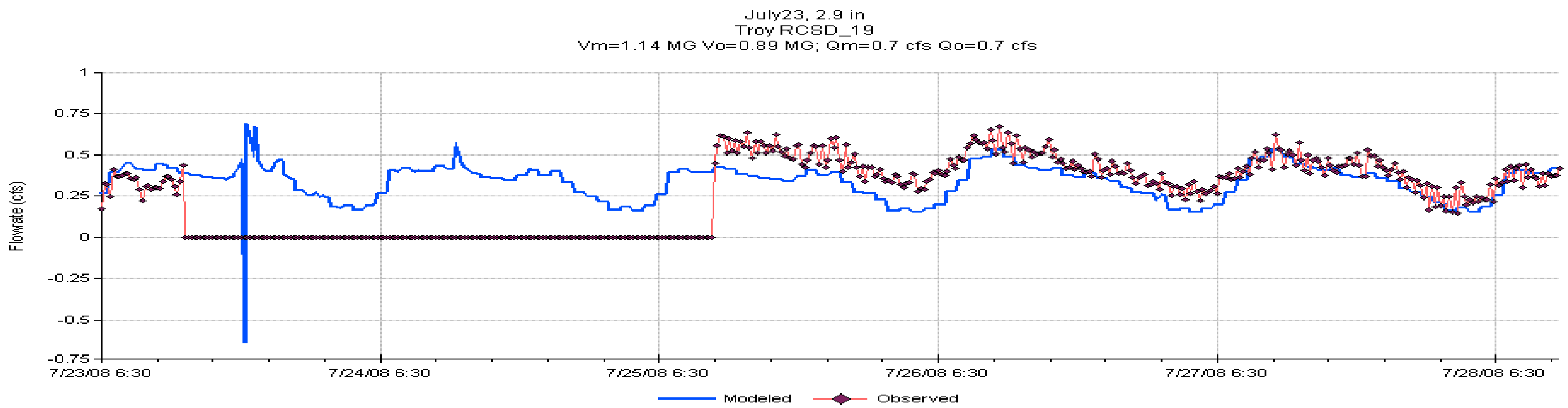

Sept6, 1.4 in
Troy RCSD_18
Vm=1.9 ft/s Vo=2.4 ft/s
Velocity (ft/s)
3
2.5
2
1.5
1
0.5
0
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed

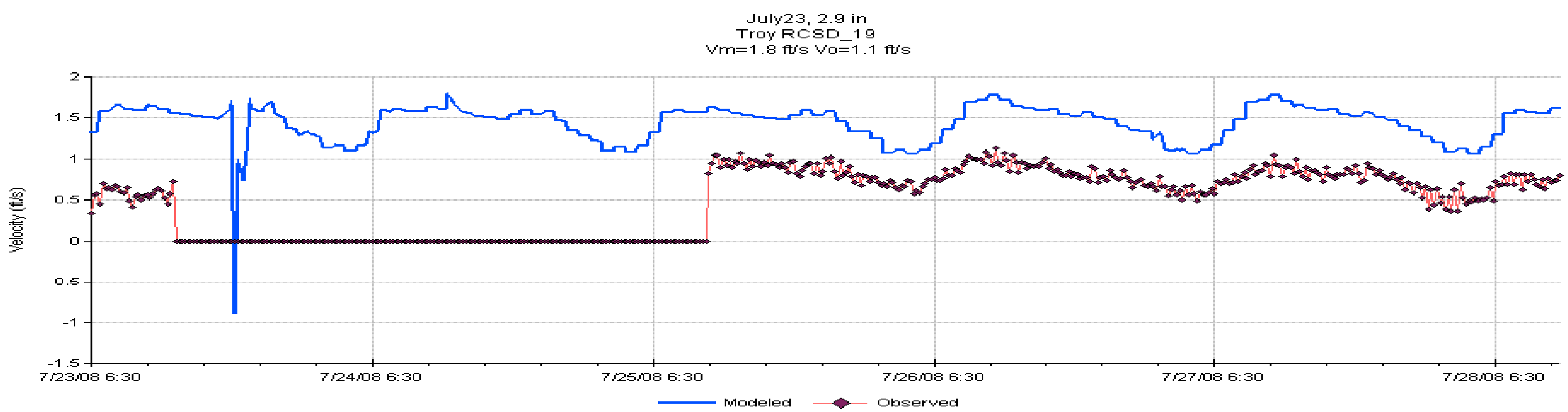

July13, 0.8 in
Troy RCSD_19
Dm=0.2 ft Do=0.6 ft
Depth (ft)
1.2
1
0.8
0.6
0.4
0.2
0
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed
Pipe Crown

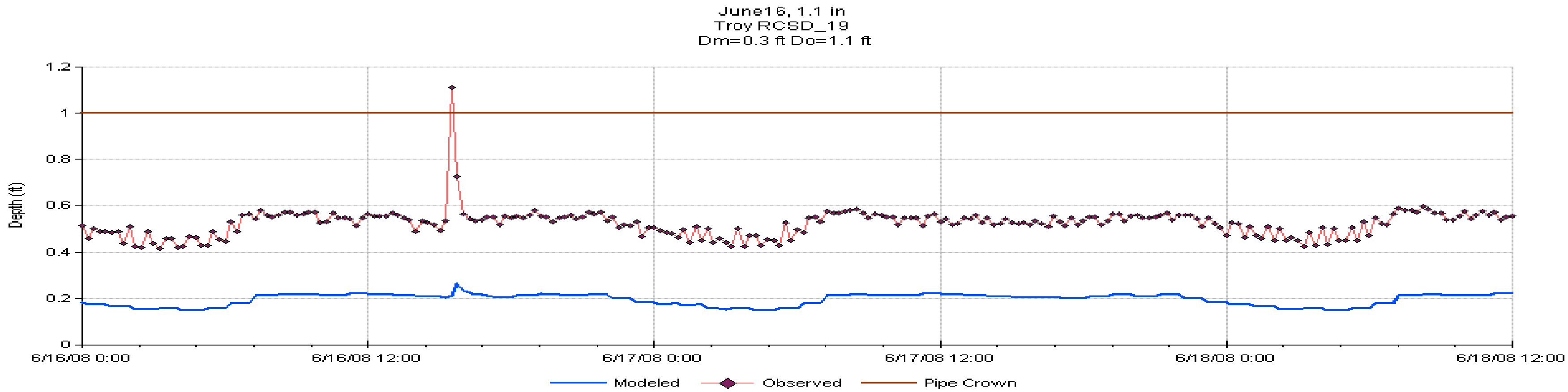

July13, 0.8 in
Troy RCSD_19
Vm=0.31 MG Vo=0.30 MG; Qm=0.6 cfs Qo=0.5 cfs
Flowrate (cfs)
0.6
0.5
0.4
0.3
0.2
0.1
0
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed

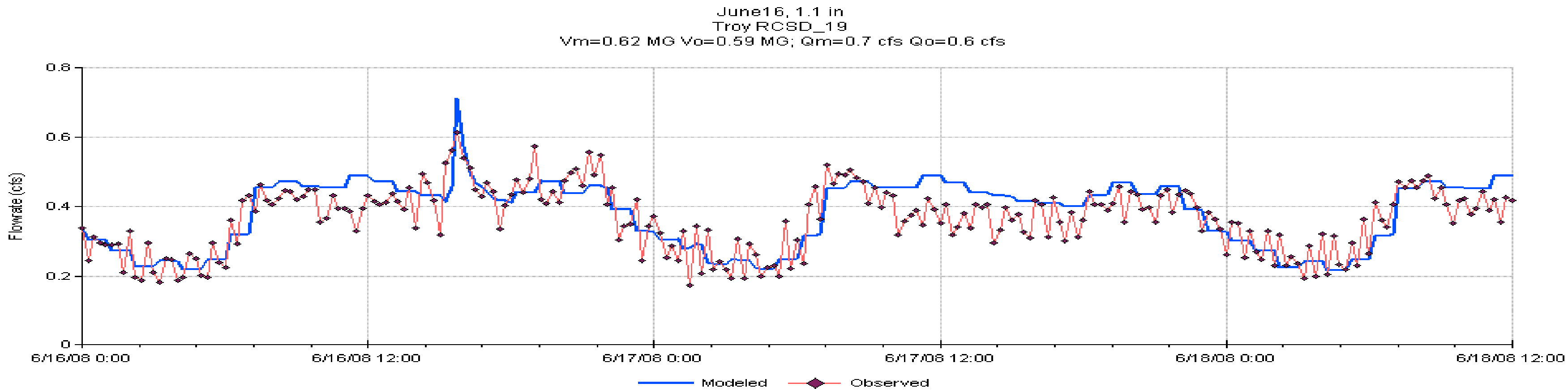

July13, 0.8 in
Troy RCSD_19
Vm=1.8 ft/s Vo=1.0 ft/s
Velocity (ft/s)
2
1.5
1
0.5
0
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed

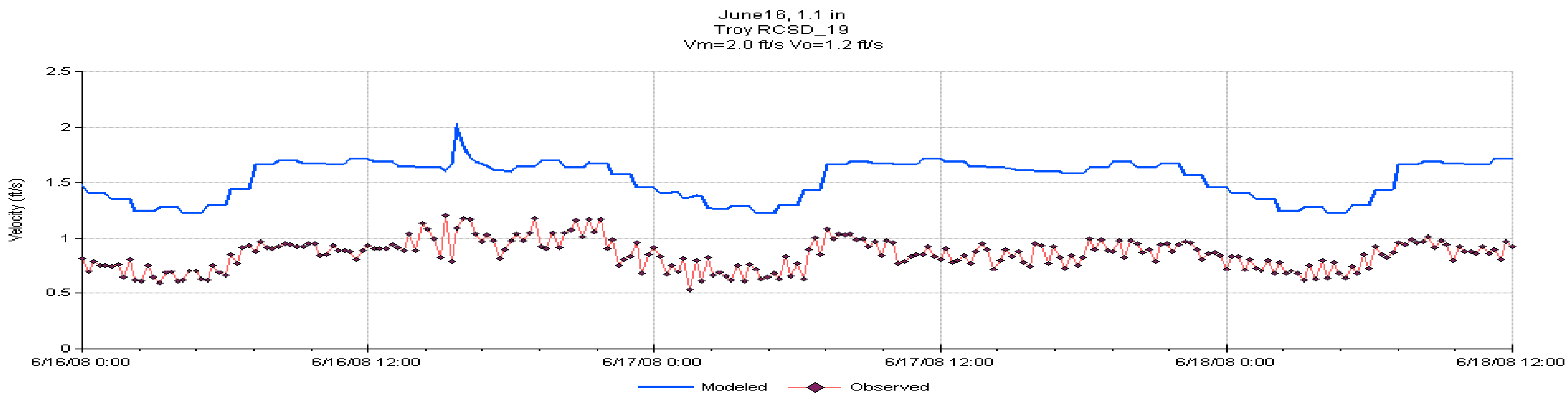

July23, 2.9 in
Troy RCSD_19
Dm=5.3 ft Do=0.7 ft
Depth (ft)
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed
Pipe Crown

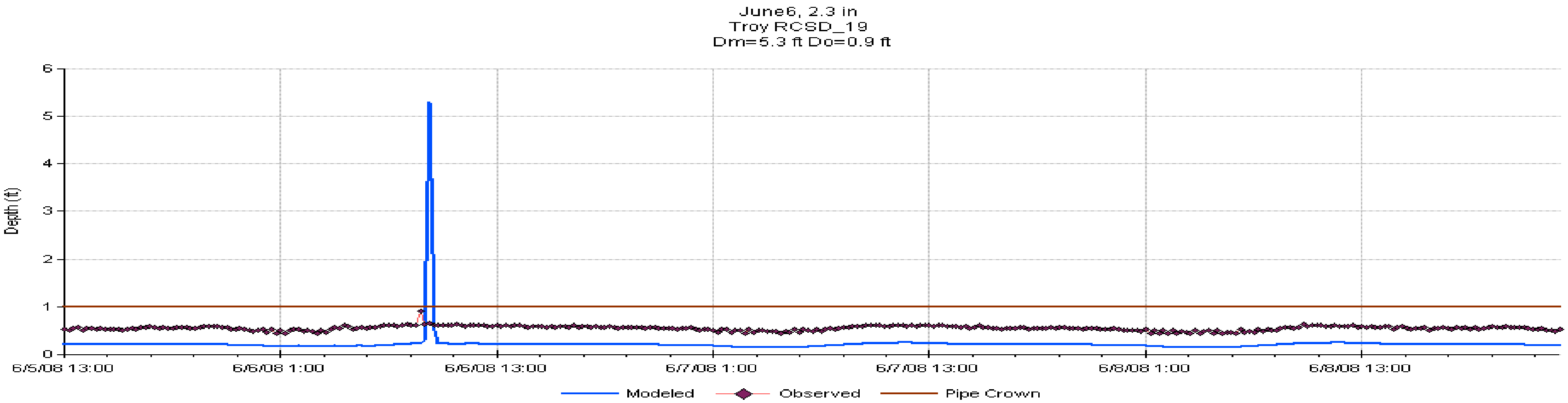

July23, 2.9 in
Troy RCSD_19
Vm=1.14 MG Vo=0.89 MG; Qm=0.7 cfs Qo=0.7 cfs
Flowrate (cfs)
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed

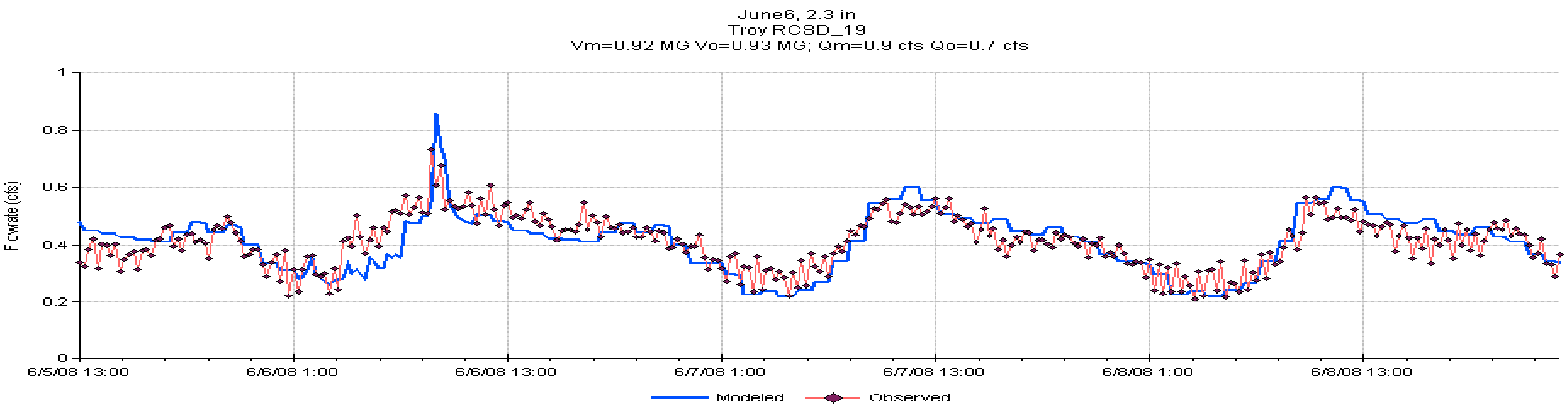

July23, 2.9 in
Troy RCSD_19
Vm=1.8 ft/s Vo=1.1 ft/s
Velocity (ft/s)
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed

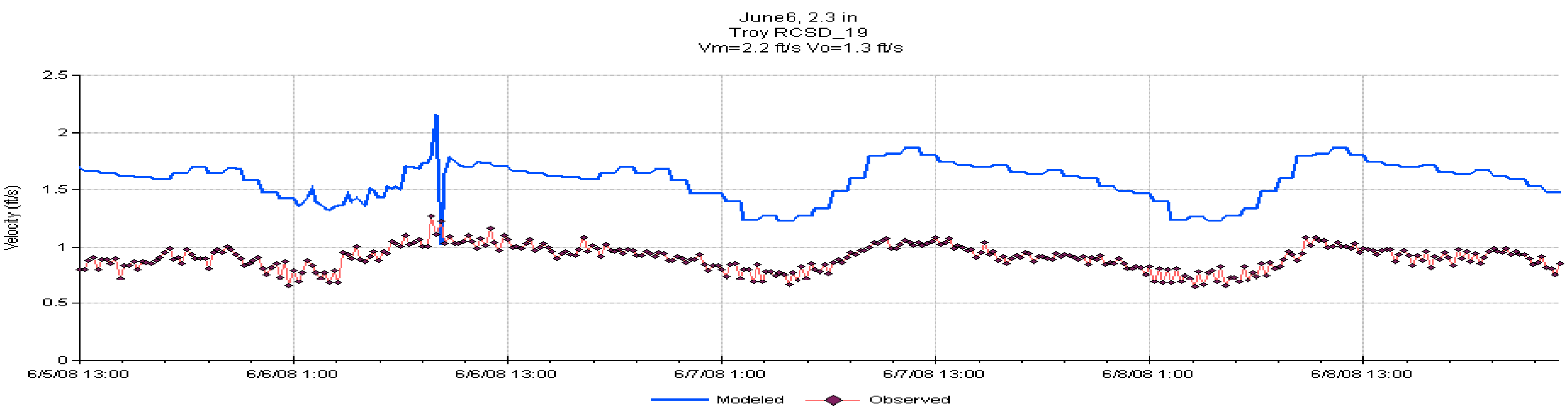

June16, 1.1 in
Troy RCSD_19
Dm=0.3 ft Do=1.1 ft
Depth (ft)
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
6/18/08 12:00
Modeled
Observed
Pipe Crown

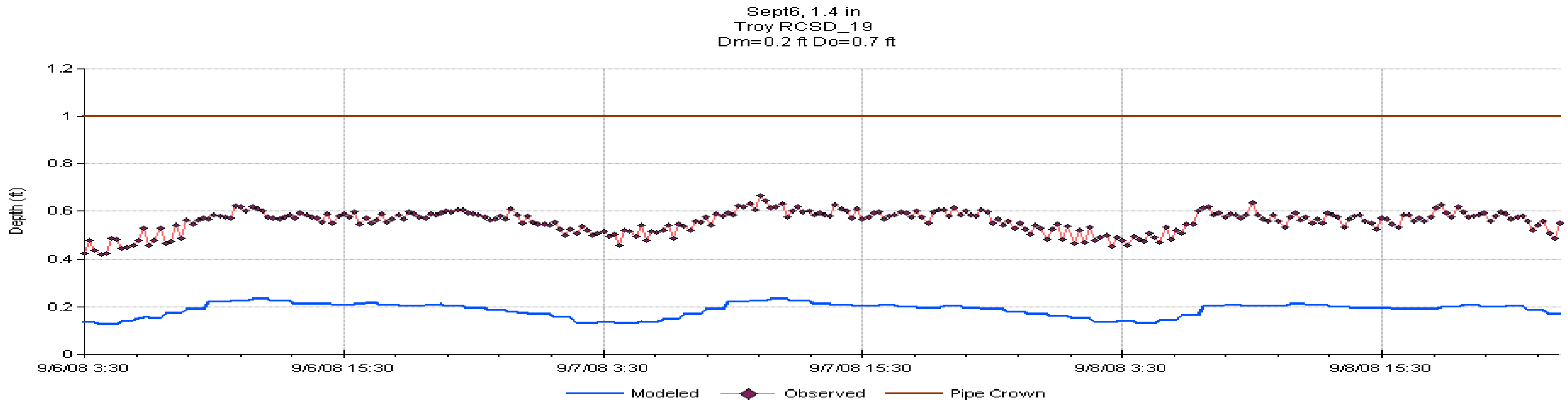

June16, 1.1 in
Troy RCSD_19
Vm=0.62 MG Vo=0.59 MG; Qm=0.7 cfs Qo=0.6 cfs
Flowrate (cfs)
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
6/18/08 12:00
Modeled
Observed

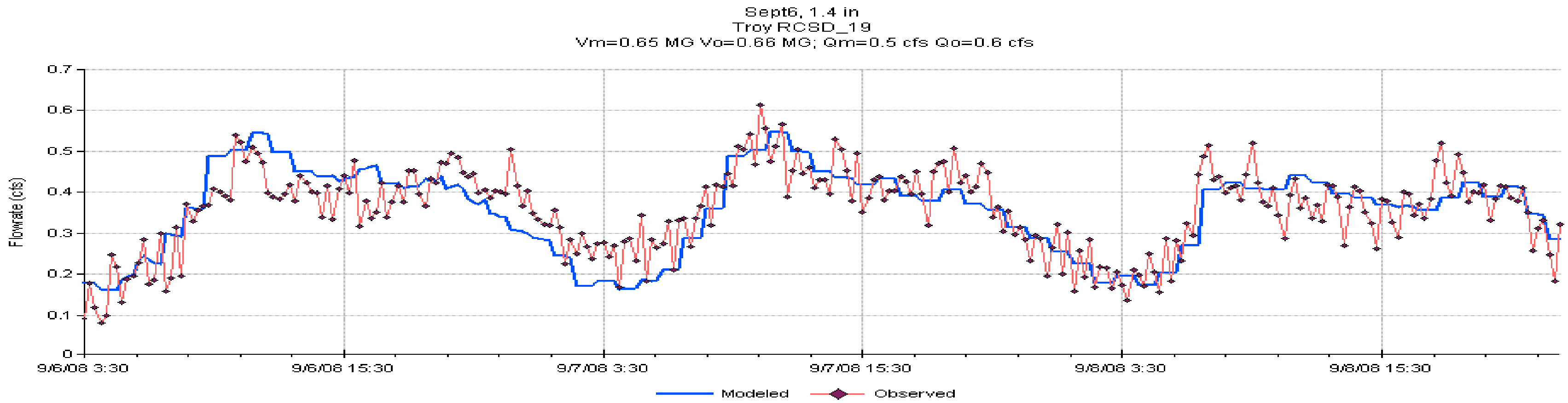

June16, 1.1 in
Troy RCSD_19
Vm=2.0 ft/s Vo=1.2 ft/s
Velocity (ft/s)
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
6/18/08 12:00
Modeled
Observed

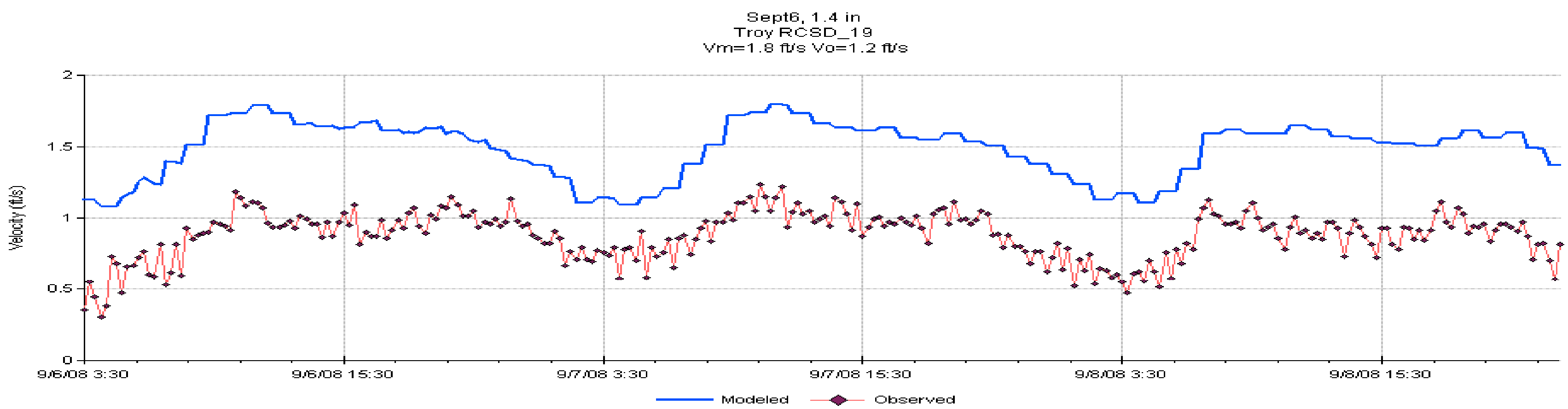

June6, 2.3 in
Troy RCSD_19
Dm=5.3 ft Do=0.9 ft
Depth (ft)
6
5
4
3
2
1
0
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed
Pipe Crown

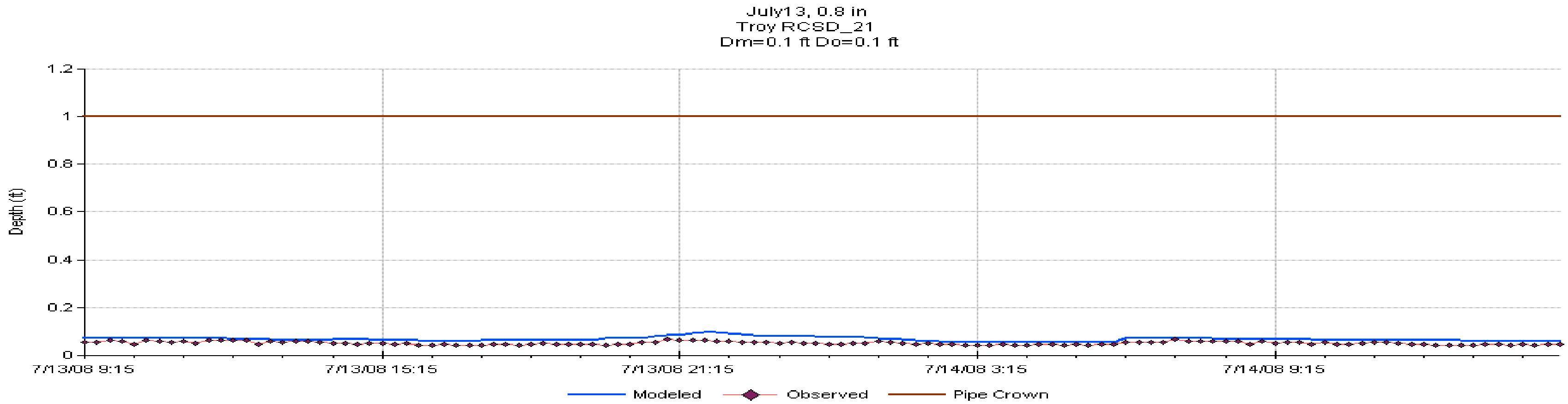

June6, 2.3 in
Troy RCSD_19
Vm=0.92 MG Vo=0.93 MG; Qm=0.9 cfs Qo=0.7 cfs
Flowrate (cfs)
1
0.8
0.6
0.4
0.2
0
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed

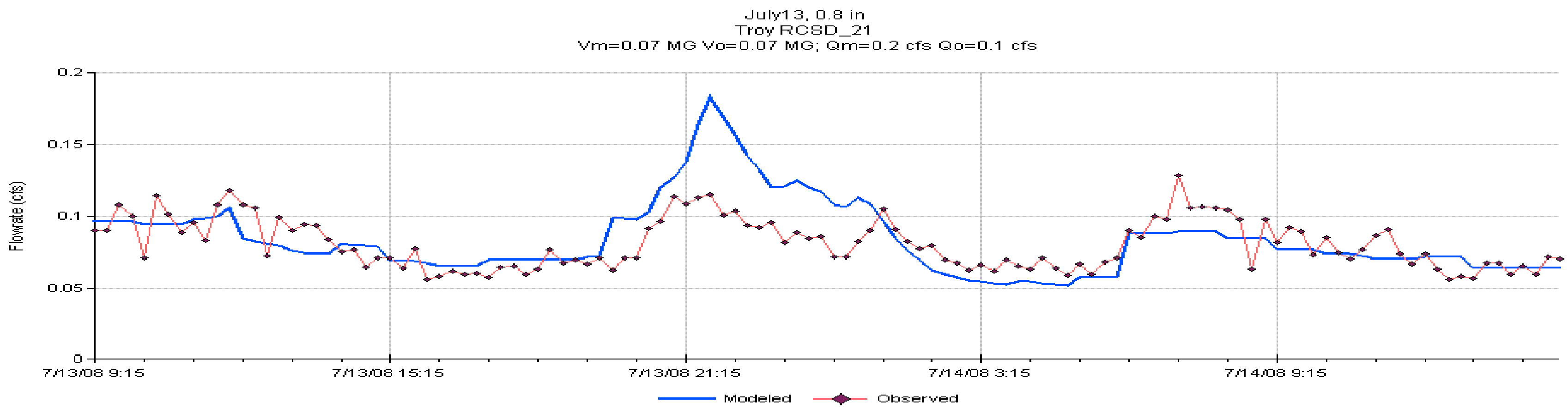

June6, 2.3 in
Troy RCSD_19
Vm=2.2 ft/s Vo=1.3 ft/s
Velocity (ft/s)
2.5
2
1.5
1
0.5
0
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed

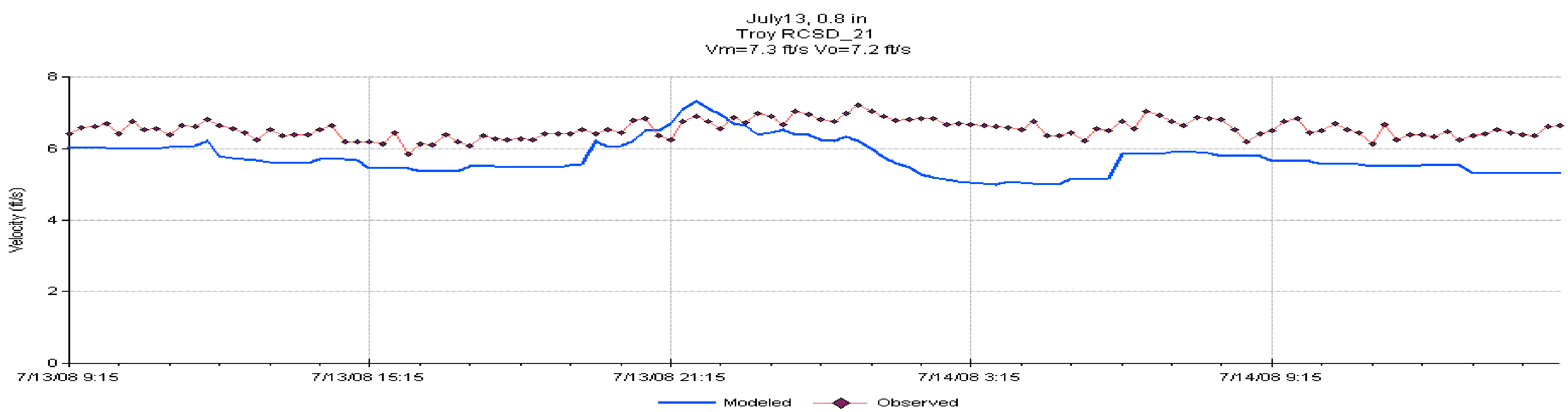

Sept6, 1.4 in
Troy RCSD_19
Dm=0.2 ft Do=0.7 ft
Depth (ft)
1.2
1
0.8
0.6
0.4
0.2
0
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed
Pipe Crown

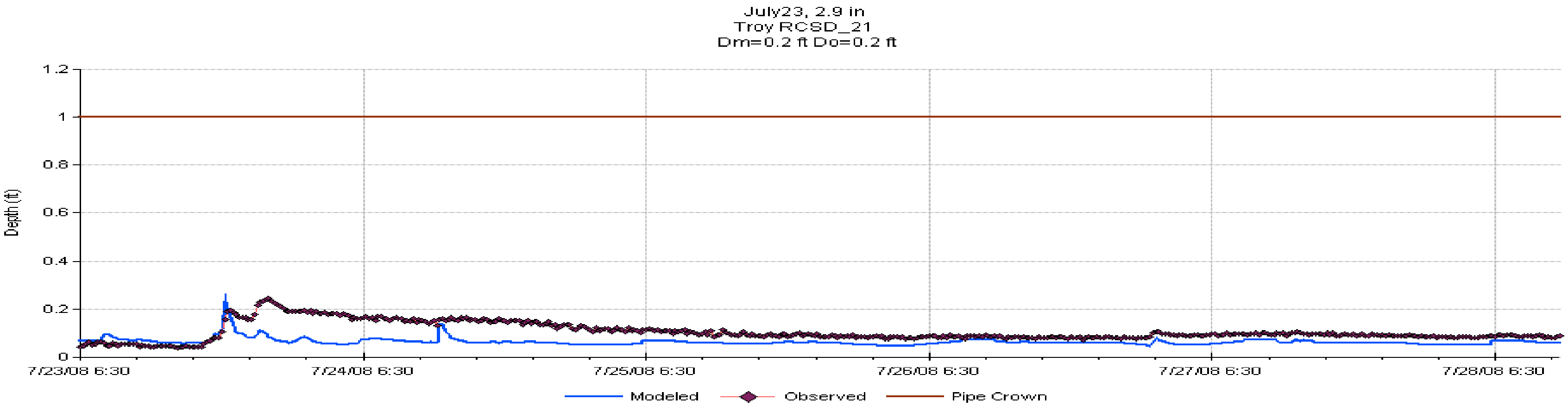

Sept6, 1.4 in
Troy RCSD_19
Vm=0.65 MG Vo=0.66 MG; Qm=0.5 cfs Qo=0.6 cfs
Flowrate (cfs)
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed

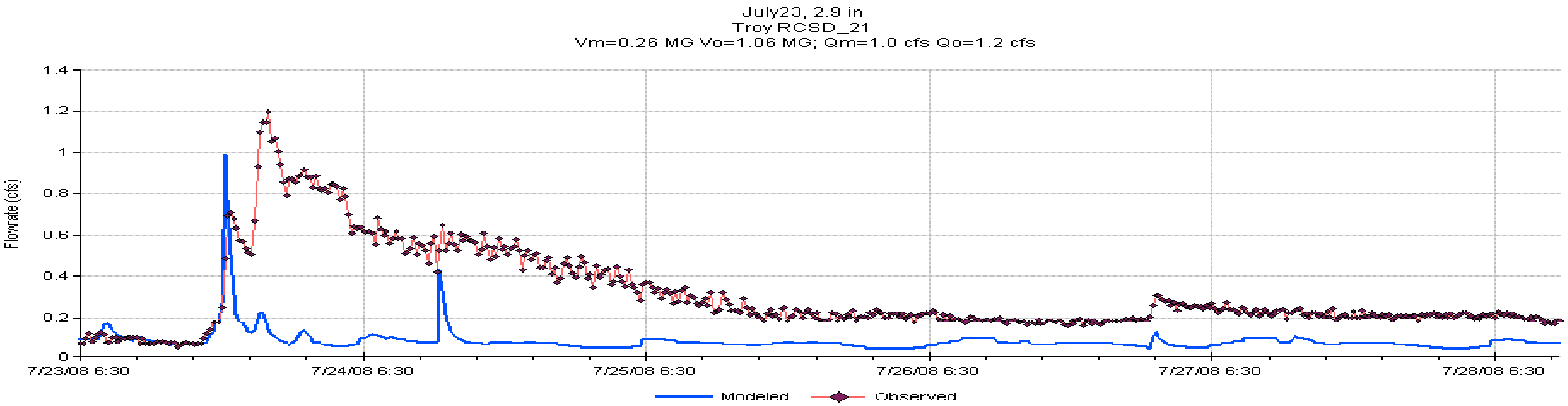

Sept6, 1.4 in
Troy RCSD_19
Vm=1.8 ft/s Vo=1.2 ft/s
Velocity (ft/s)
2
1.5
1
0.5
0
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed

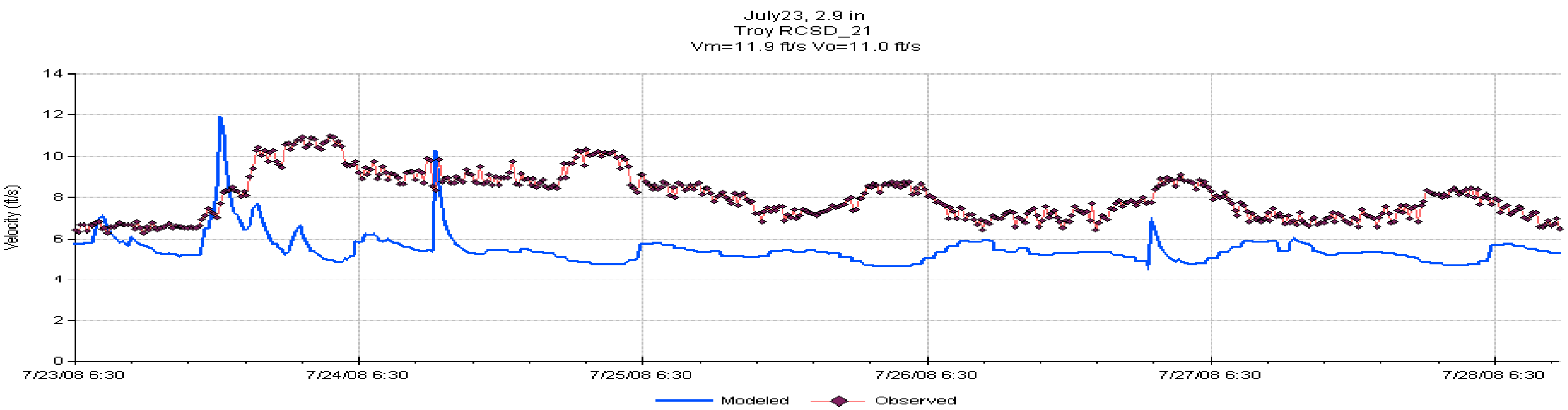

July13, 0.8 in
Troy RCSD_21
Dm=0.1 ft Do=0.1 ft
Depth (ft)
1.2
1
0.8
0.6
0.4
0.2
0
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed
Pipe Crown

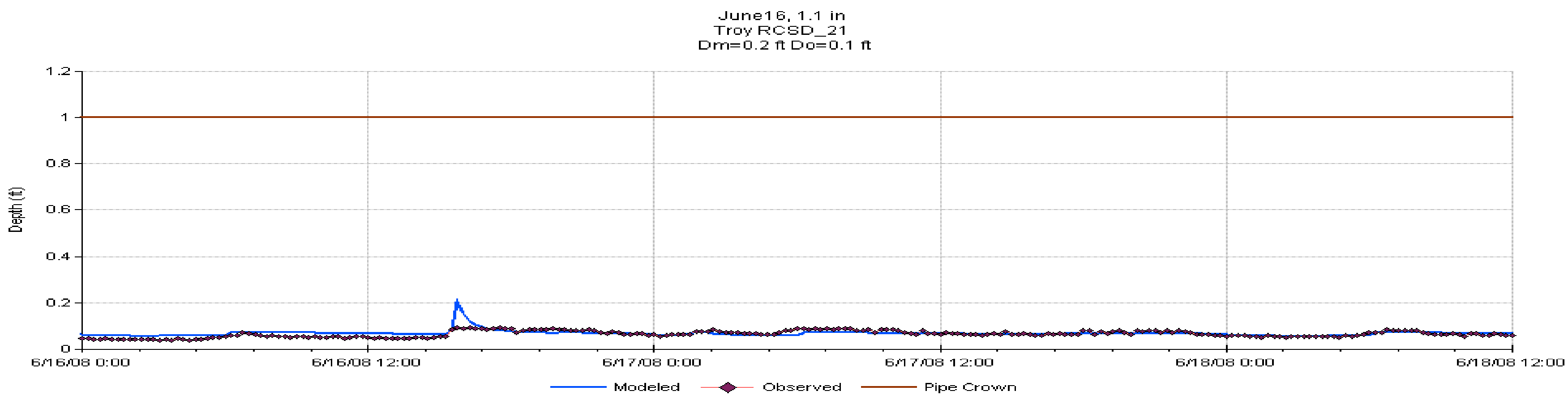

July13, 0.8 in
Troy RCSD_21
Vm=0.07 MG Vo=0.07 MG; Qm=0.2 cfs Qo=0.1 cfs
Flowrate (cfs)
0.2
0.15
0.1
0.05
0
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed

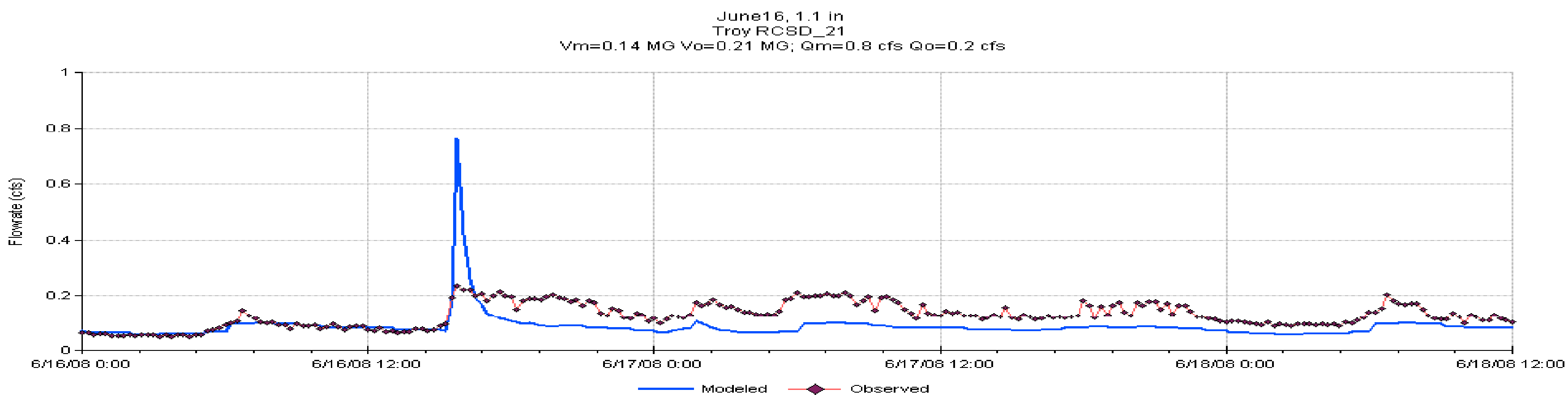

July13, 0.8 in
Troy RCSD_21
Vm=7.3 ft/s Vo=7.2 ft/s
Velocity (ft/s)
8
6
4
2
0
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed

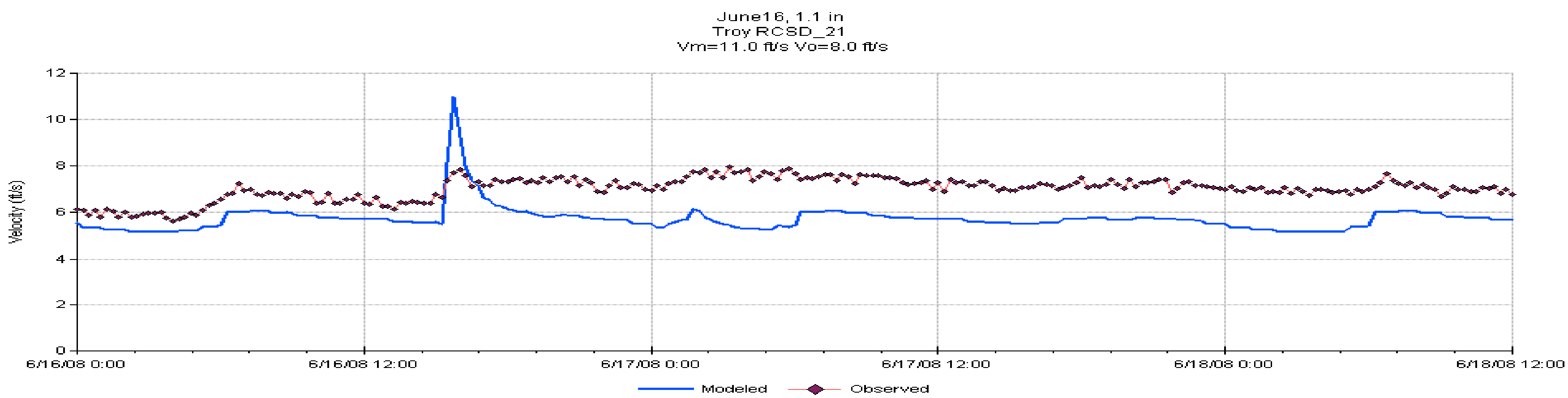

July23, 2.9 in
Troy RCSD_21
Dm=0.2 ft Do=0.2 ft
Depth (ft)
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed
Pipe Crown

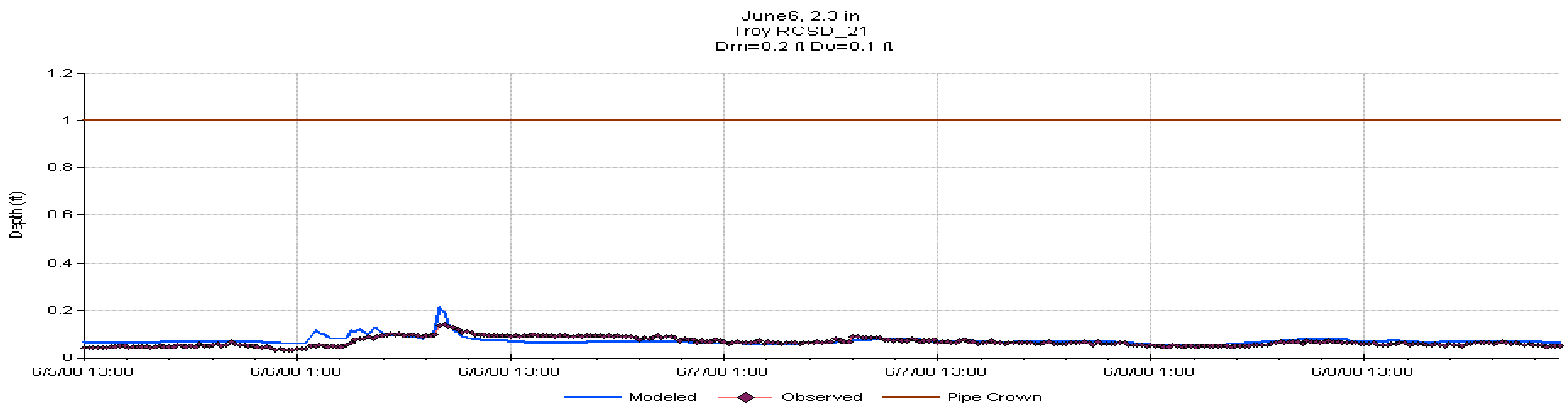

July23, 2.9 in
Troy RCSD_21
Vm=0.26 MG Vo=1.06 MG; Qm=1.0 cfs Qo=1.2 cfs
Flowrate (cfs)
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed


July23, 2.9 in
Troy RCSD_21
Vm=11.9 ft/s Vo=11.0 ft/s
Velocity (ft/s)
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed

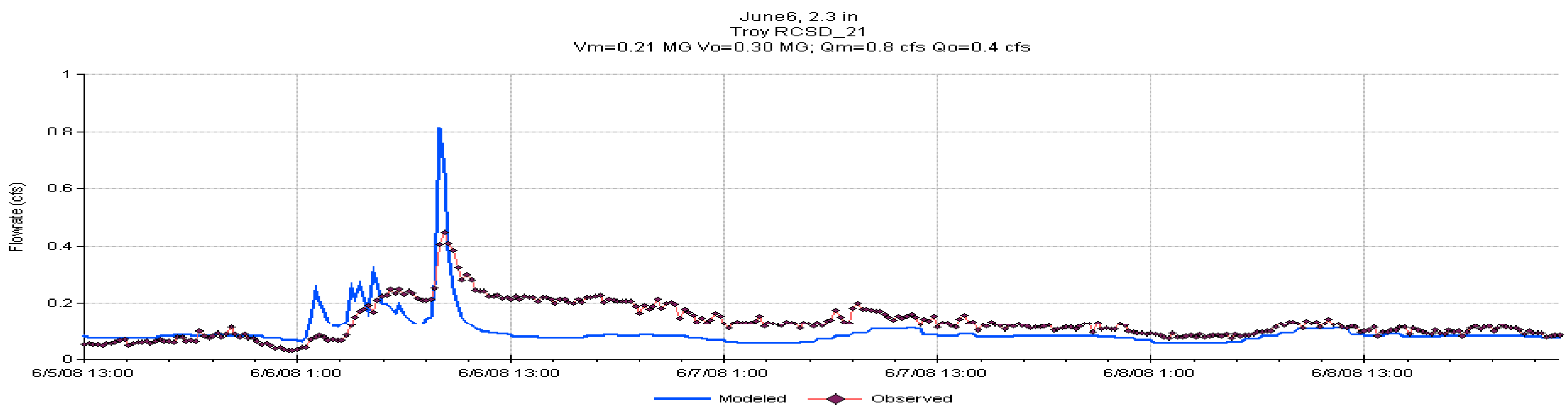

June16, 1.1 in
Troy RCSD_21
Dm=0.2 ft Do=0.1 ft
Depth (ft)
1.2
1
0.8
0.6
0.4
0.2
0
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
6/18/08 12:00
Modeled
Observed
Pipe Crown


June16, 1.1 in
Troy RCSD_21
Vm=0.14 MG Vo=0.21 MG; Qm=0.8 cfs Qo=0.2 cfs
Flowrate (cfs)
1
0.8
0.6
0.4
0.2
0
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
6/18/08 12:00
Modeled
Observed

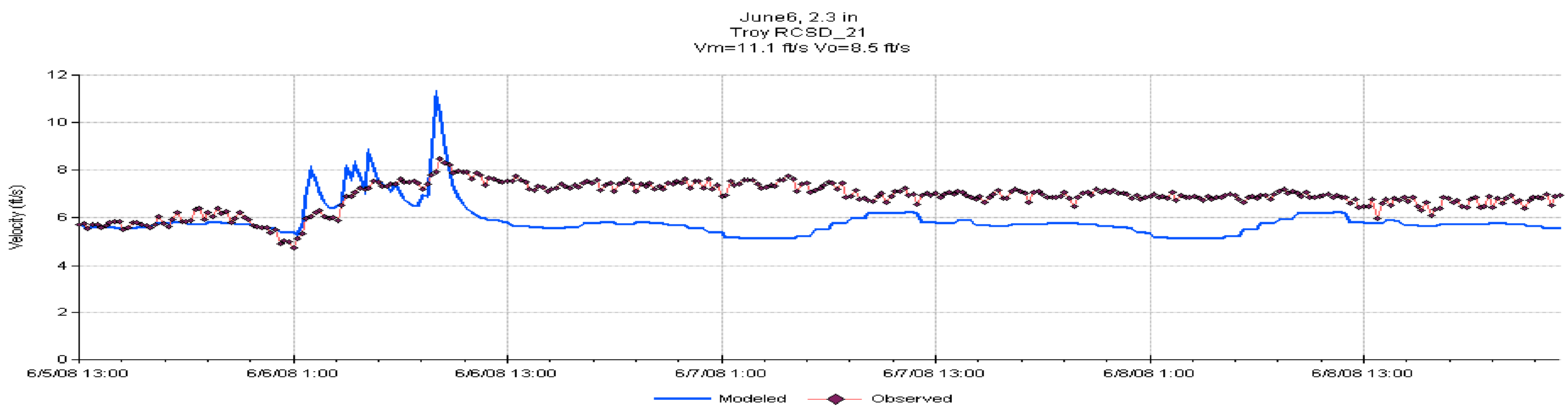

June16, 1.1 in
Troy RCSD_21
Vm=11.0 ft/s Vo=8.0 ft/s
Velocity (ft/s)
12
10
8
6
4
2
0
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
6/18/08 12:00
Modeled
Observed



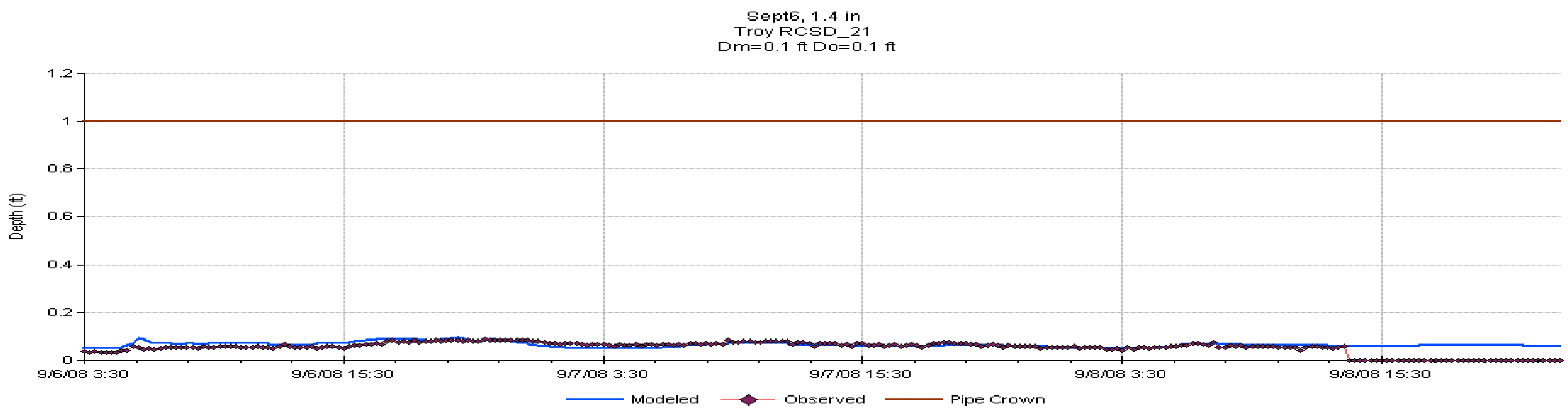
June6, 2.3 in
Troy RCSD_21
Dm=0.2 ft Do=0.1 ft
Depth (ft)
1.2
1
0.8
0.6
0.4
0.2
0
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed
Pipe Crown

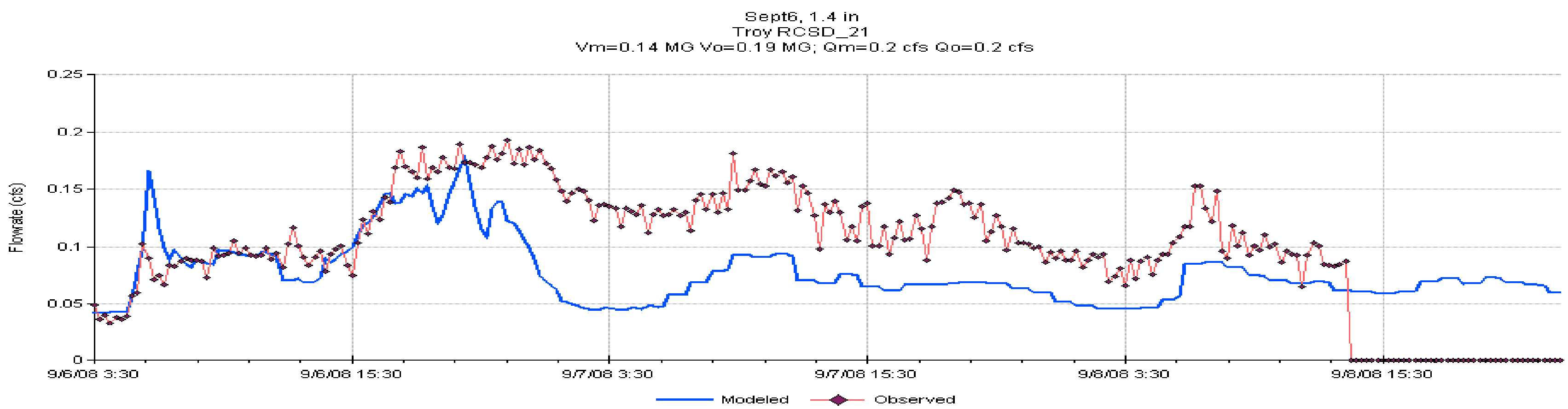


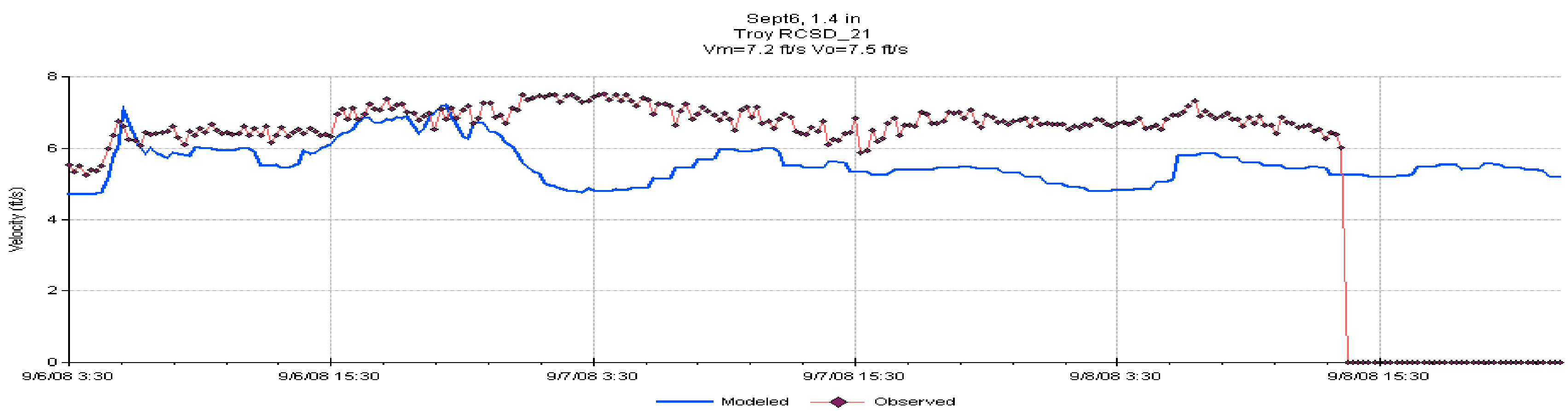
June6, 2.3 in
Troy RCSD_21
Vm=0.21 MG Vo=0.30 MG; Qm=0.8 cfs Qo=0.4 cfs
Flowrate (cfs)
1
0.8
0.6
0.4
0.2
0
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed

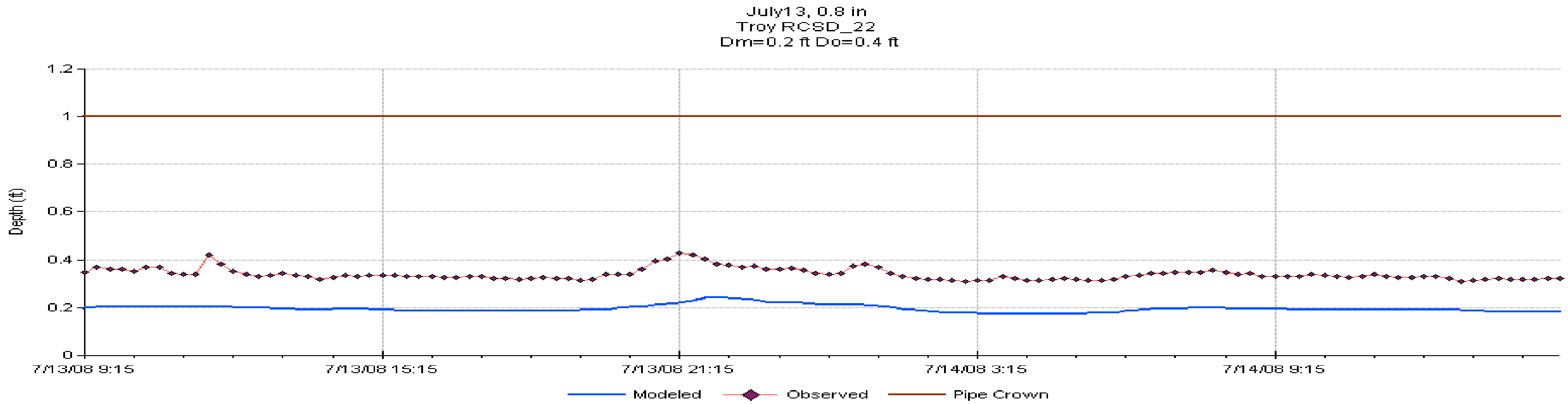


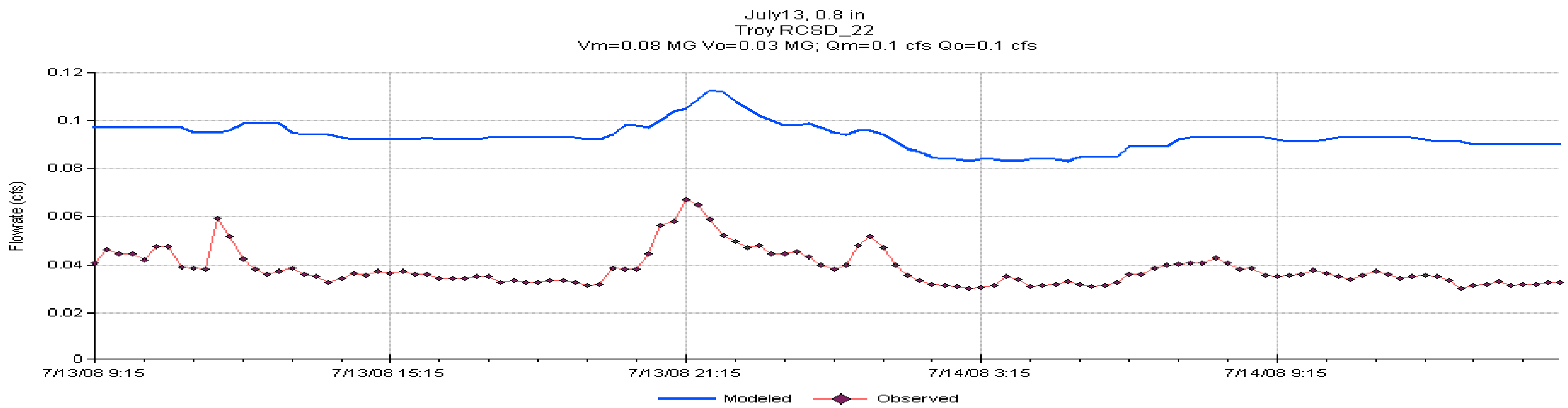
June6, 2.3 in
Troy RCSD_21
Vm=11.1 ft/s Vo=8.5 ft/s
Velocity (ft/s)
12
10
8
6
4
2
0
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed

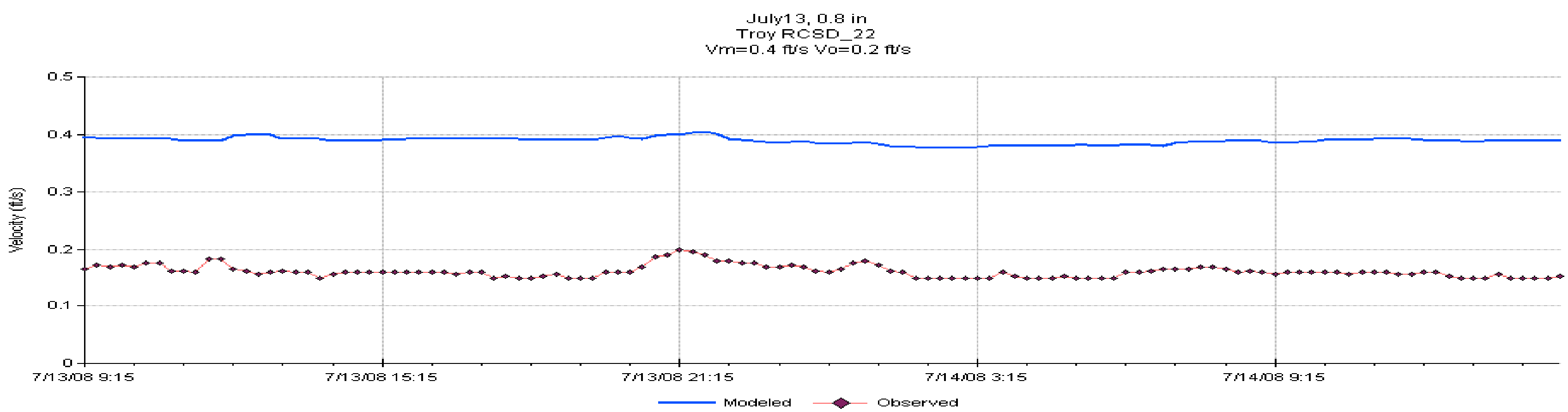

Sept6, 1.4 in
Troy RCSD_21
Dm=0.1 ft Do=0.1 ft
Depth (ft)
1.2
1
0.8
0.6
0.4
0.2
0
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed
Pipe Crown

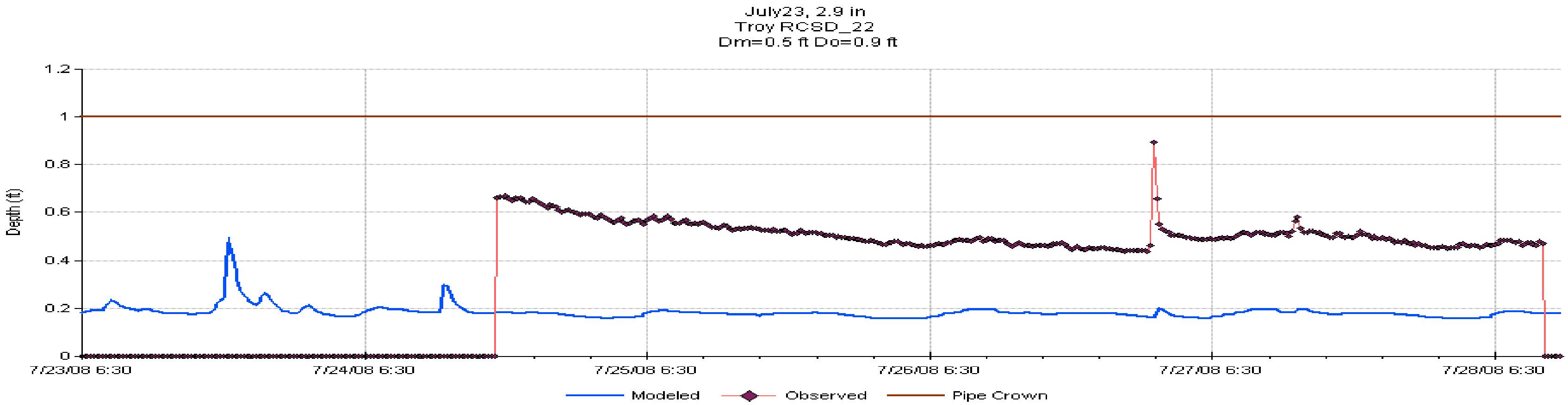

Sept6, 1.4 in
Troy RCSD_21
Vm=0.14 MG Vo=0.19 MG; Qm=0.2 cfs Qo=0.2 cfs
Flowrate (cfs)
0.25
0.2
0.15
0.1
0.05
0
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed

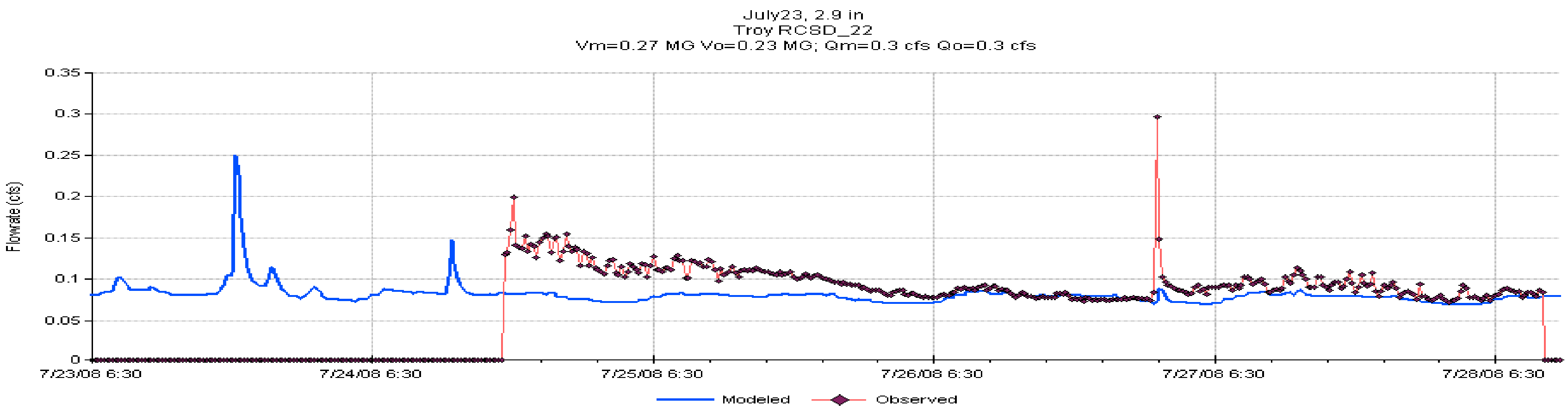

Sept6, 1.4 in
Troy RCSD_21
Vm=7.2 ft/s Vo=7.5 ft/s
Velocity (ft/s)
8
6
4
2
0
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed

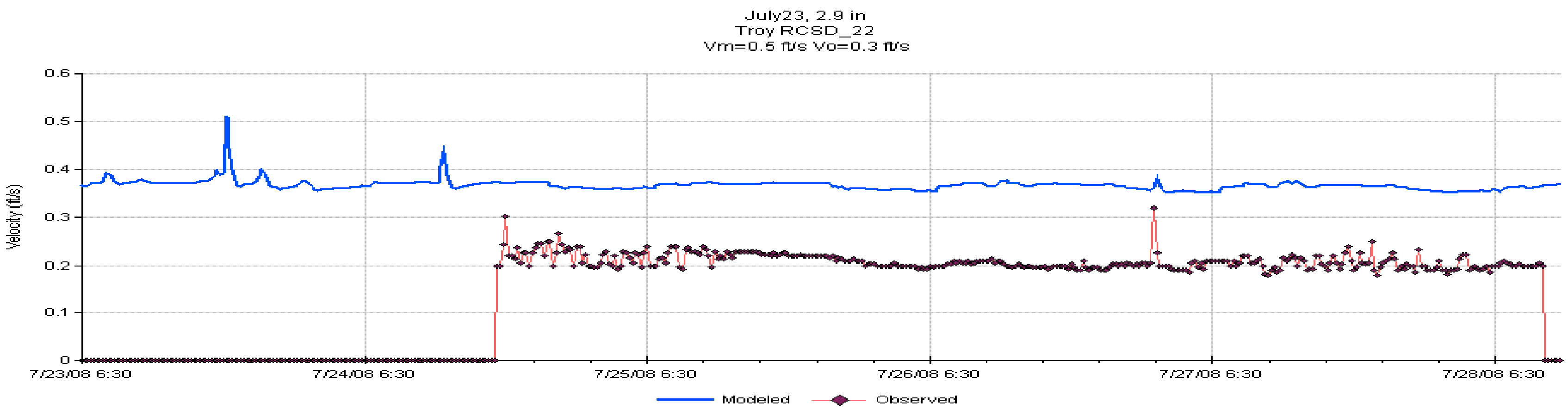

July13, 0.8 in
Troy RCSD_22
Dm=0.2 ft Do=0.4 ft
Depth (ft)
1.2
1
0.8
0.6
0.4
0.2
0
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed
Pipe Crown

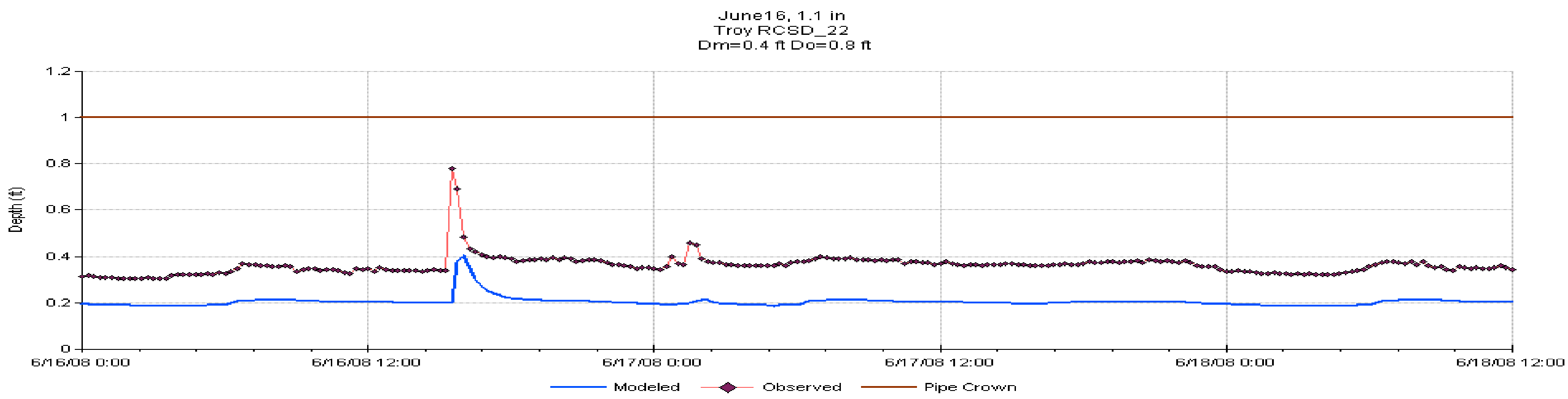

July13, 0.8 in
Troy RCSD_22
Vm=0.08 MG Vo=0.03 MG; Qm=0.1 cfs Qo=0.1 cfs
Flowrate (cfs)
0.12
0.1
0.08
0.06
0.04
0.02
0
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed

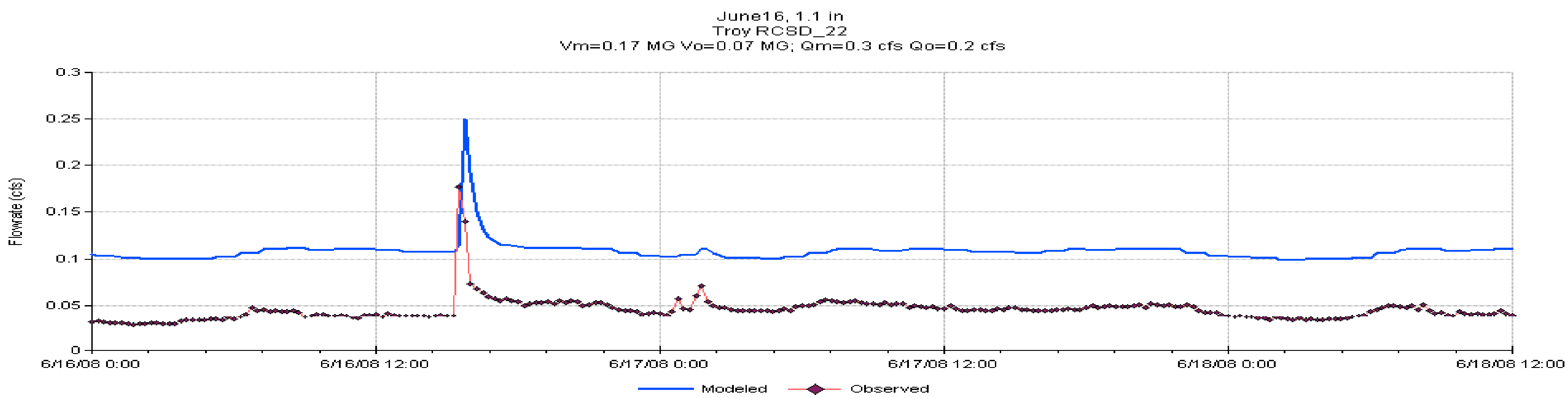

July13, 0.8 in
Troy RCSD_22
Vm=0.4 ft/s Vo=0.2 ft/s
Velocity (ft/s)
0.5
0.4
0.3
0.2
0.1
0
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed

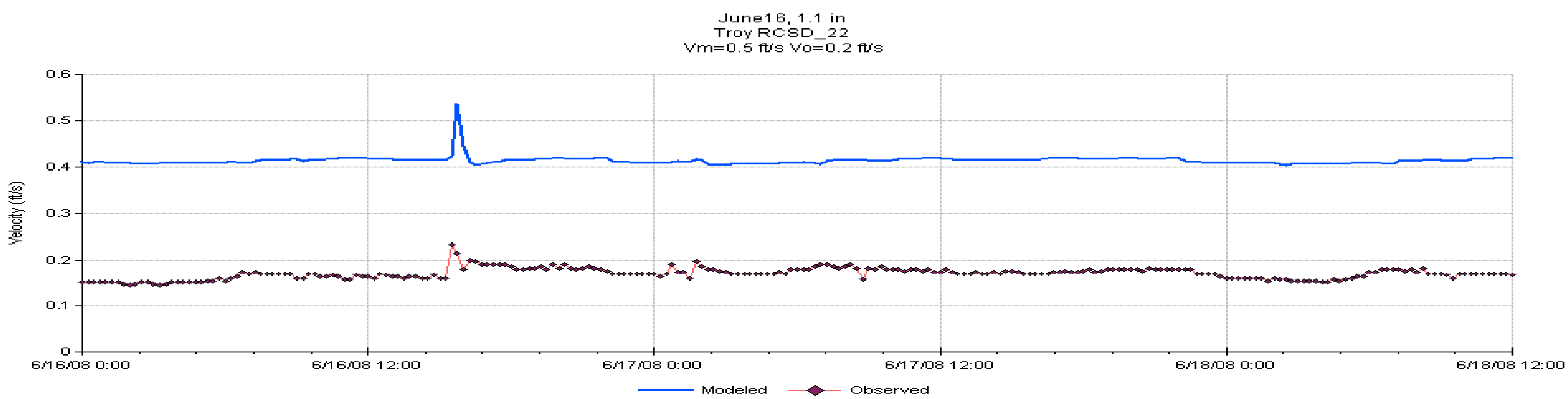

July23, 2.9 in
Troy RCSD_22
Dm=0.5 ft Do=0.9 ft
Depth (ft)
1.2
1
0.8
0.6
0.4
0.2
0
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed
Pipe Crown

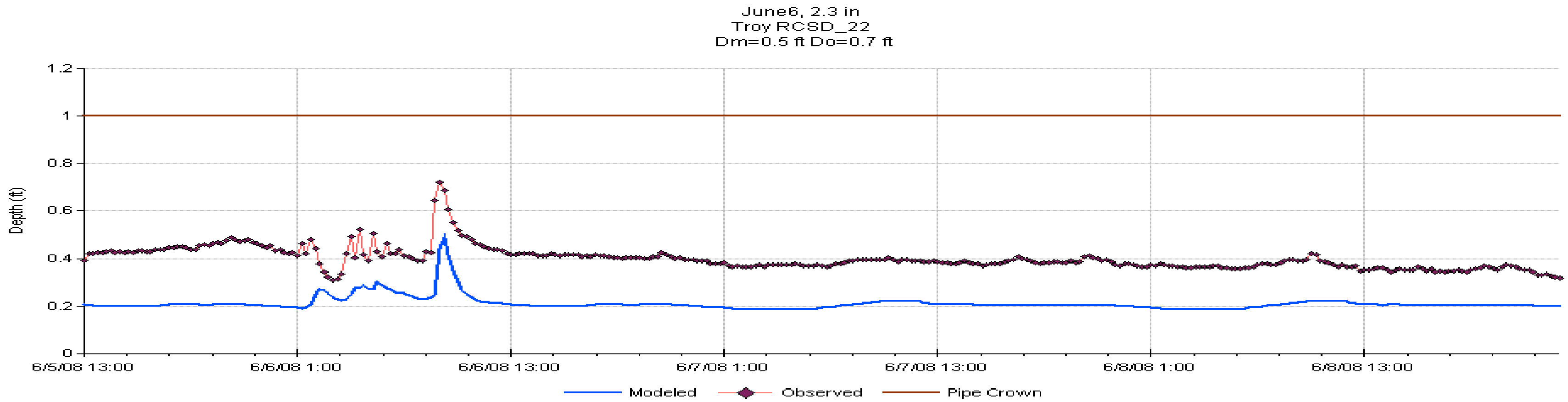

July23, 2.9 in
Troy RCSD_22
Vm=0.27 MG Vo=0.23 MG; Qm=0.3 cfs Qo=0.3 cfs
Flowrate (cfs)
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed

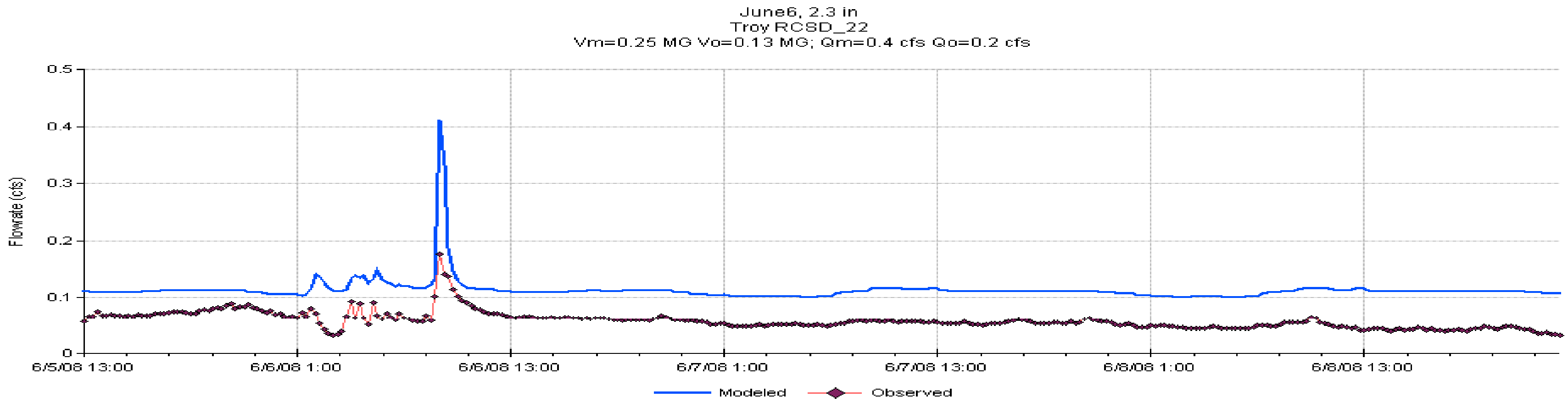

July23, 2.9 in
Troy RCSD_22
Vm=0.5 ft/s Vo=0.3 ft/s
Velocity (ft/s)
0.6
0.5
0.4
0.3
0.2
0.1
0
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed

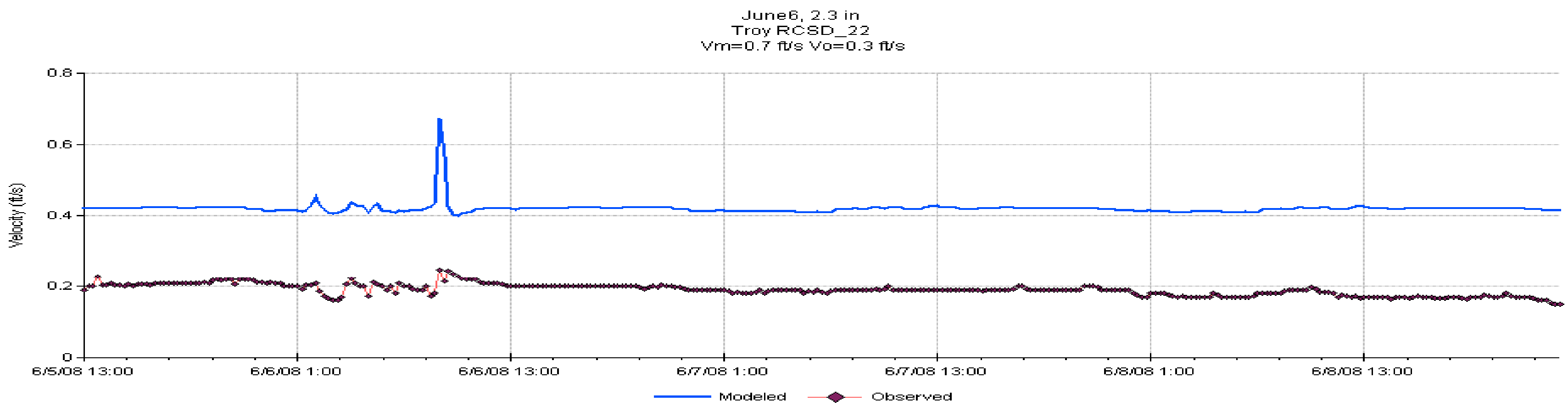

June16, 1.1 in
Troy RCSD_22
Dm=0.4 ft Do=0.8 ft
Depth (ft)
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
6/18/08 12:00
Modeled
Observed
Pipe Crown

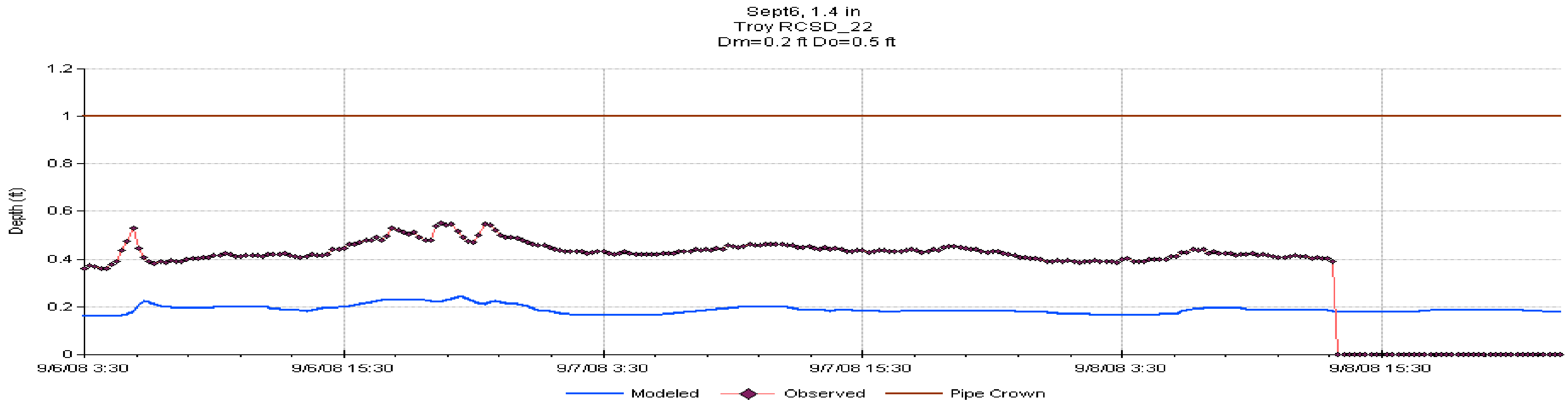

June16, 1.1 in
Troy RCSD_22
Vm=0.17 MG Vo=0.07 MG; Qm=0.3 cfs Qo=0.2 cfs
Flowrate (cfs)
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
6/18/08 12:00
Modeled
Observed

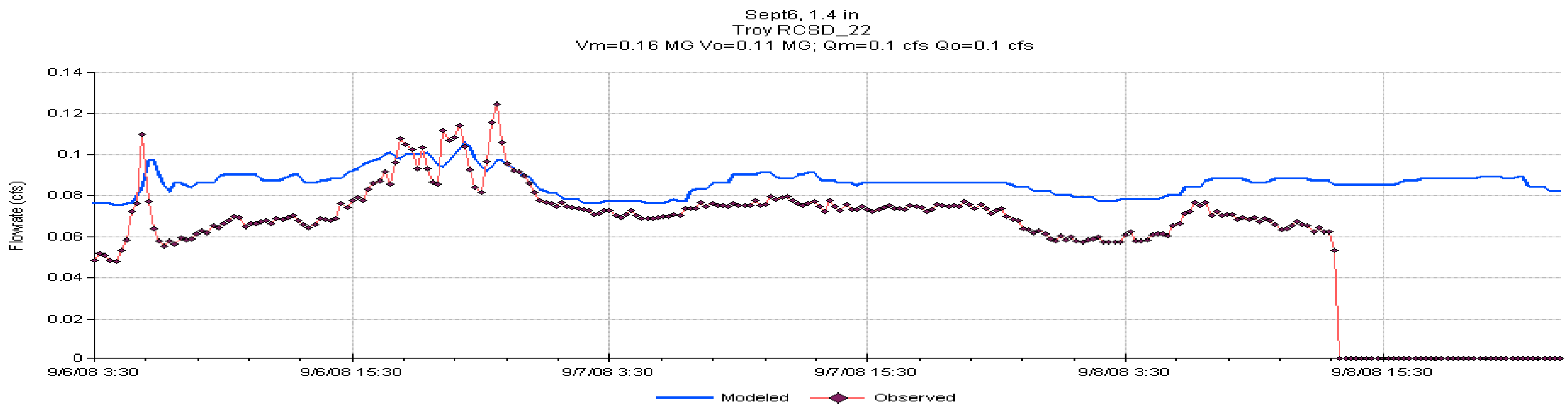

June16, 1.1 in
Troy RCSD_22
Vm=0.5 ft/s Vo=0.2 ft/s
Velocity (ft/s)
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
6/18/08 12:00
Modeled
Observed

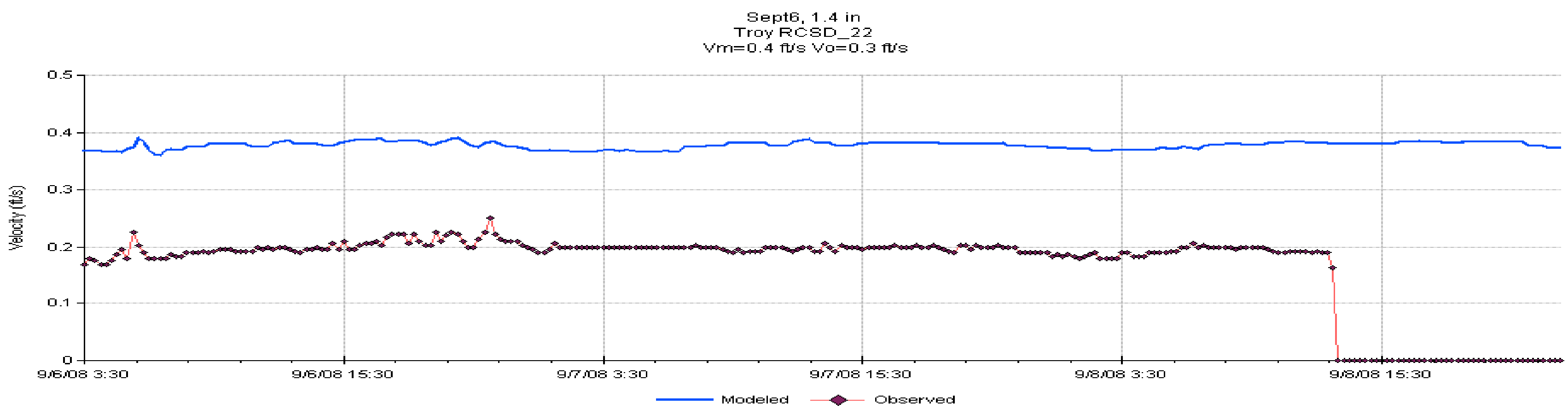

June6, 2.3 in
Troy RCSD_22
Dm=0.5 ft Do=0.7 ft
Depth (ft)
1.2
1
0.8
0.6
0.4
0.2
0
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed
Pipe Crown

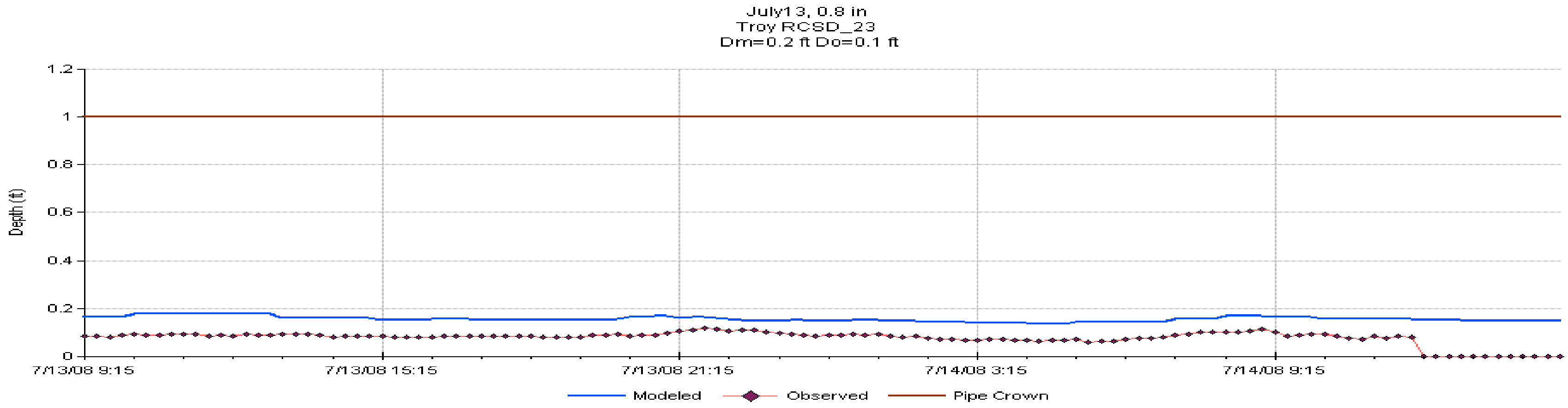

June6, 2.3 in
Troy RCSD_22
Vm=0.25 MG Vo=0.13 MG; Qm=0.4 cfs Qo=0.2 cfs
Flowrate (cfs)
0.5
0.4
0.3
0.2
0.1
0
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed

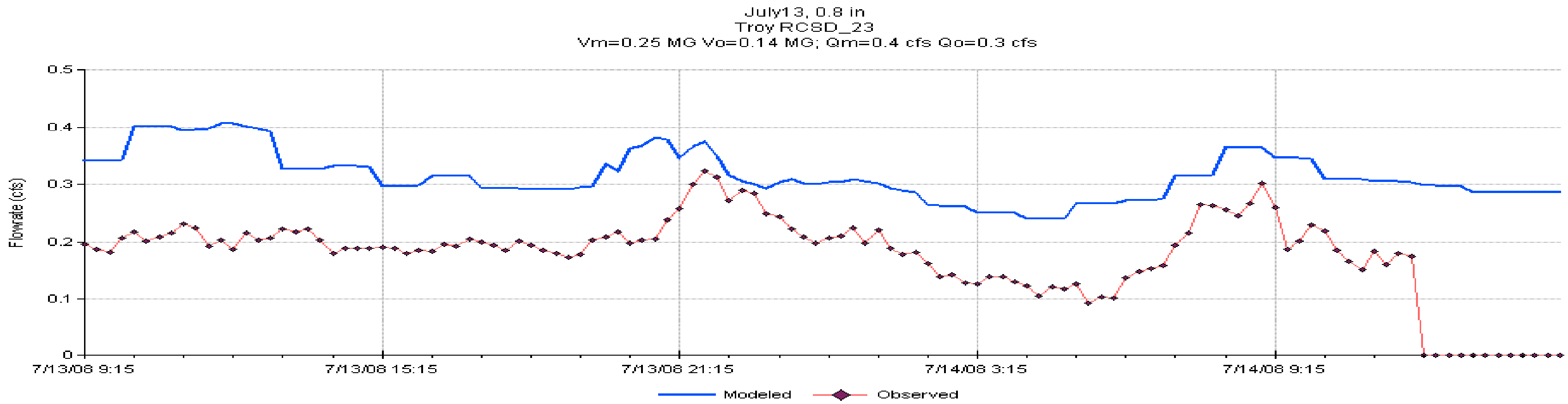

June6, 2.3 in
Troy RCSD_22
Vm=0.7 ft/s Vo=0.3 ft/s
Velocity (ft/s)
0.8
0.6
0.4
0.2
0
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed

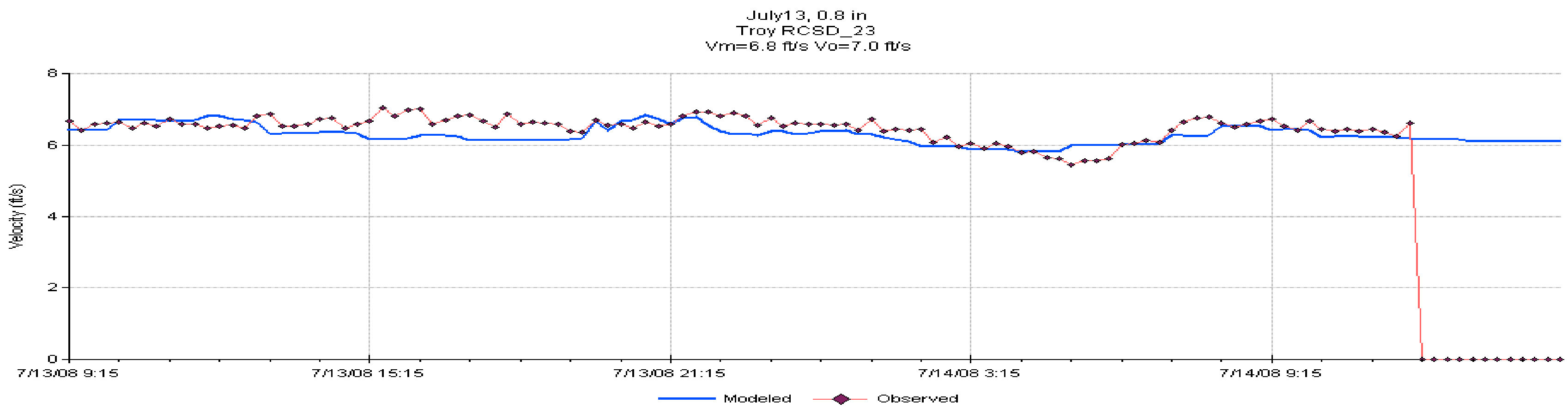

Sept6, 1.4 in
Troy RCSD_22
Dm=0.2 ft Do=0.5 ft
Depth (ft)
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed
Pipe Crown

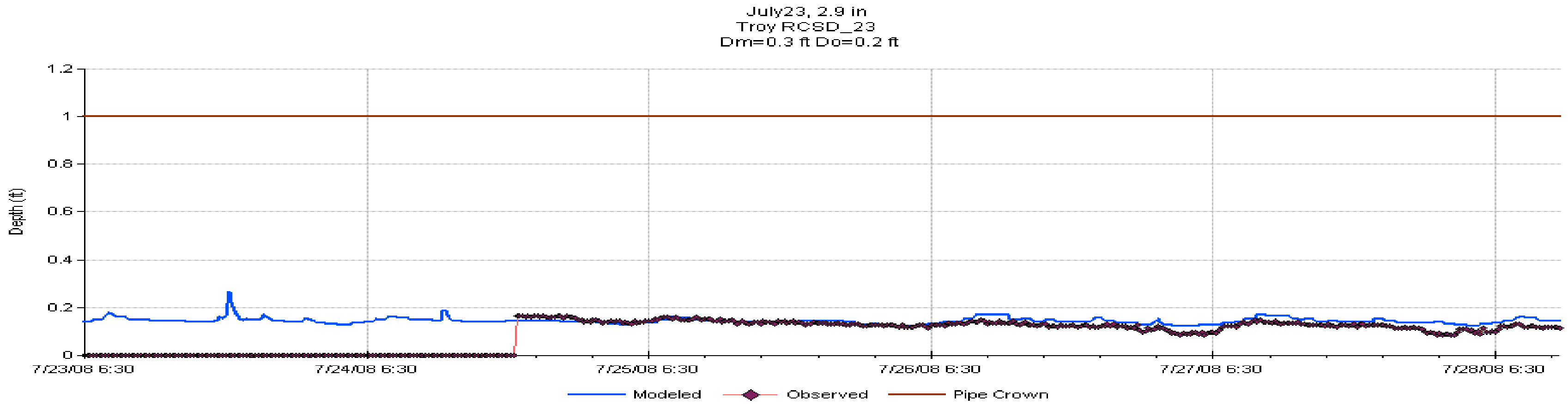

Sept6, 1.4 in
Troy RCSD_22
Vm=0.16 MG Vo=0.11 MG; Qm=0.1 cfs Qo=0.1 cfs
Flowrate (cfs)
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed

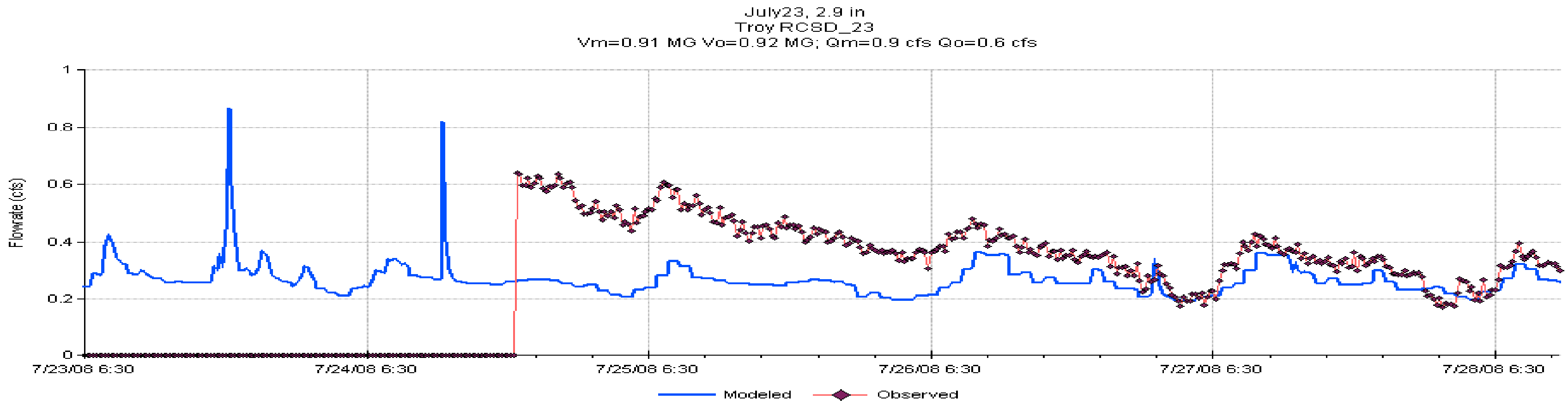

Sept6, 1.4 in
Troy RCSD_22
Vm=0.4 ft/s Vo=0.3 ft/s
Velocity (ft/s)
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed

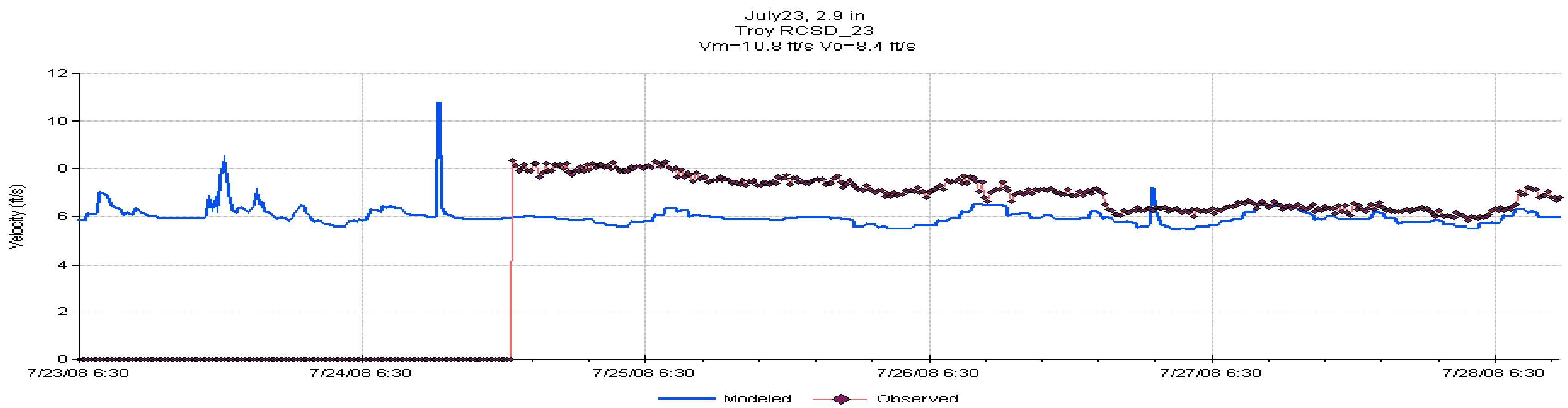

July13, 0.8 in
Troy RCSD_23
Dm=0.2 ft Do=0.1 ft
Depth (ft)
1.2
1
0.8
0.6
0.4
0.2
0
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed
Pipe Crown

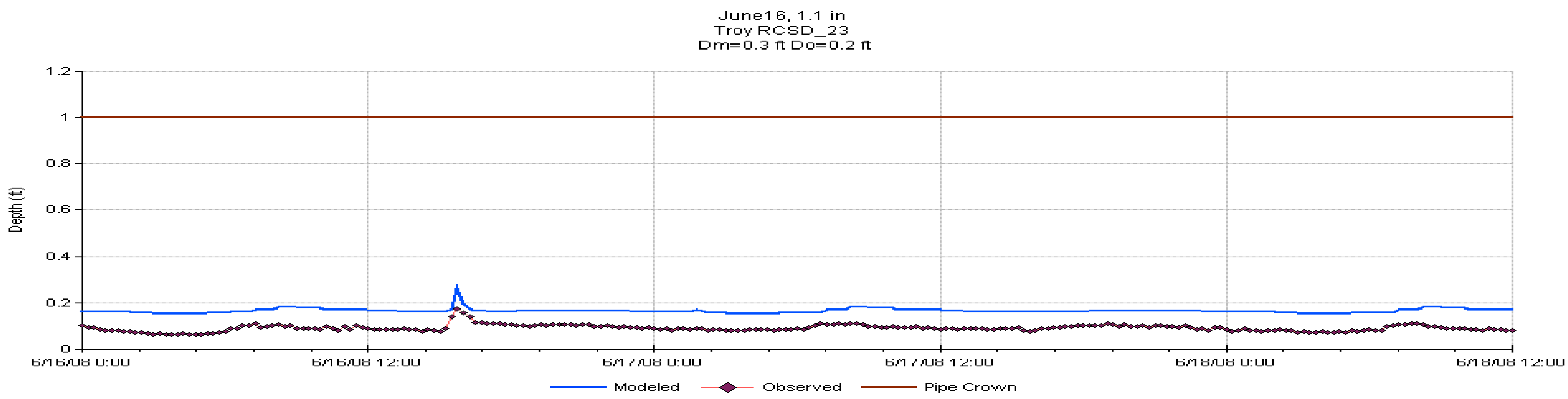

July13, 0.8 in
Troy RCSD_23
Vm=0.25 MG Vo=0.14 MG; Qm=0.4 cfs Qo=0.3 cfs
Flowrate (cfs)
0.5
0.4
0.3
0.2
0.1
0
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed


July13, 0.8 in
Troy RCSD_23
Vm=6.8 ft/s Vo=7.0 ft/s
Velocity (ft/s)
8
6
4
2
0
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed

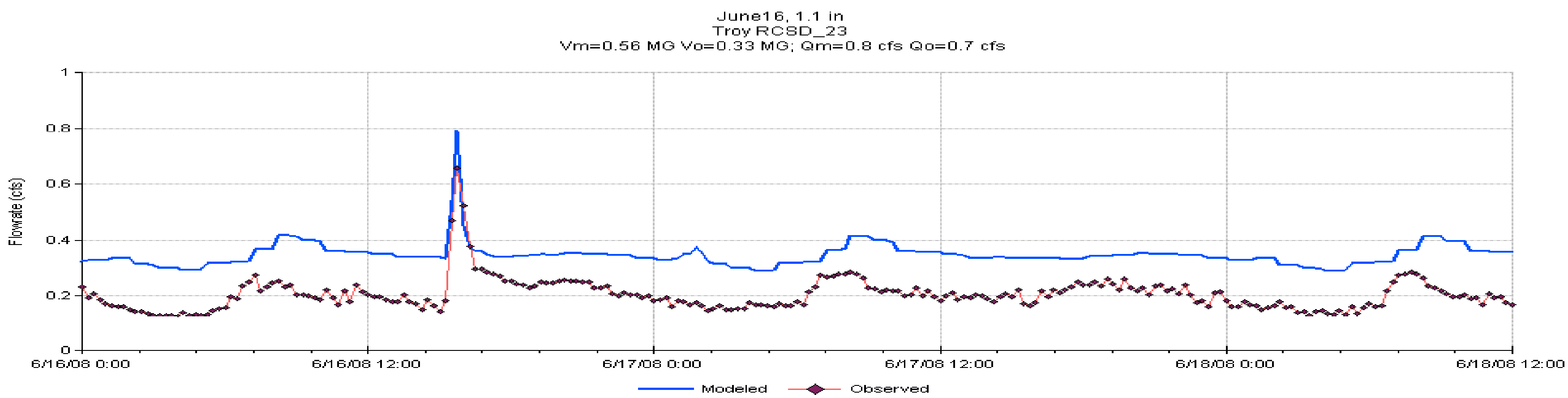

July23, 2.9 in
Troy RCSD_23
Dm=0.3 ft Do=0.2 ft
Depth (ft)
1.2
1
0.8
0.6
0.4
0.2
0
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed
Pipe Crown


July23, 2.9 in
Troy RCSD_23
Vm=0.91 MG Vo=0.92 MG; Qm=0.9 cfs Qo=0.6 cfs
Flowrate (cfs)
1
0.8
0.6
0.4
0.2
0
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed

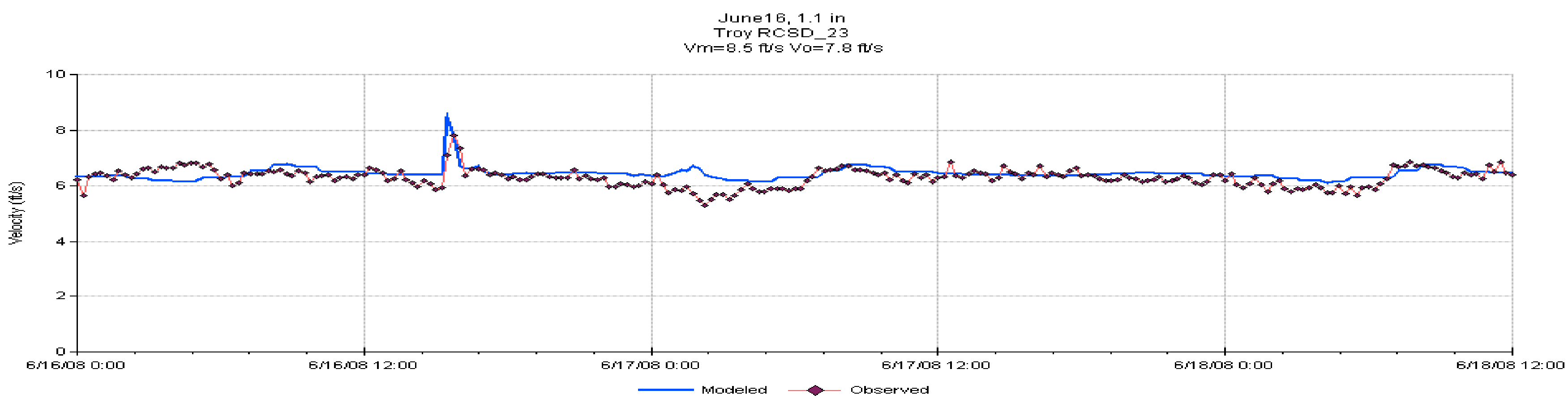

July23, 2.9 in
Troy RCSD_23
Vm=10.8 ft/s Vo=8.4 ft/s
Velocity (ft/s)
12
10
8
6
4
2
0
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed



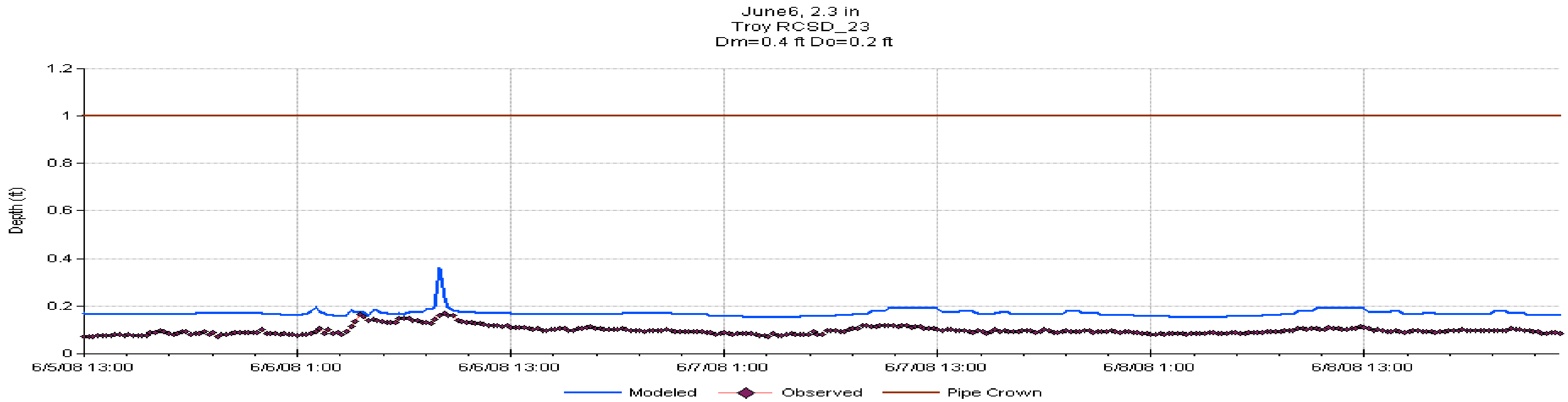
June16, 1.1 in
Troy RCSD_23
Dm=0.3 ft Do=0.2 ft
Depth (ft)
1.2
1
0.8
0.6
0.4
0.2
0
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
6/18/08 12:00
Modeled
Observed
Pipe Crown

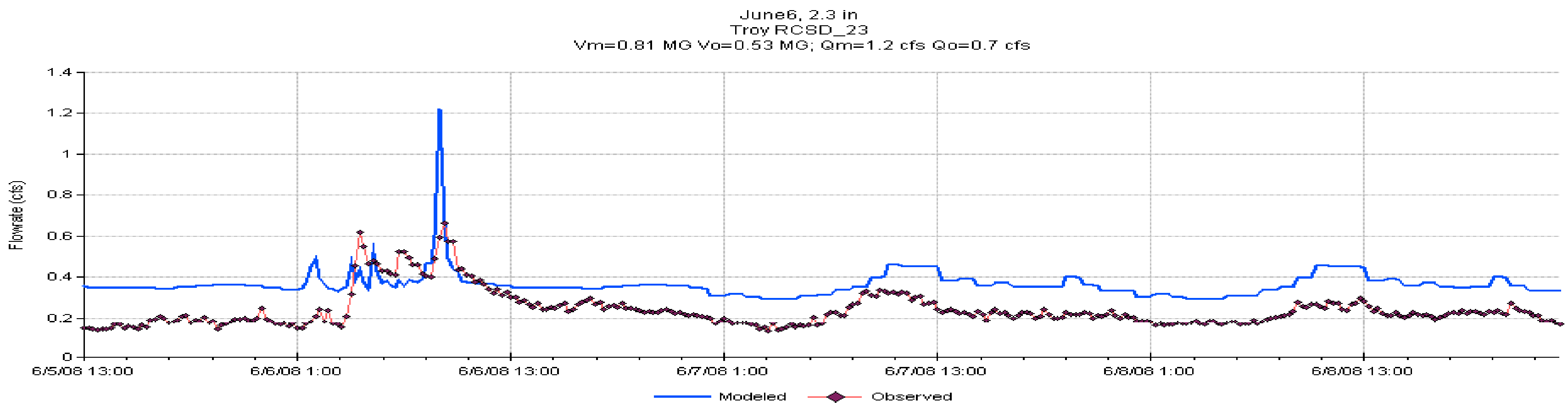


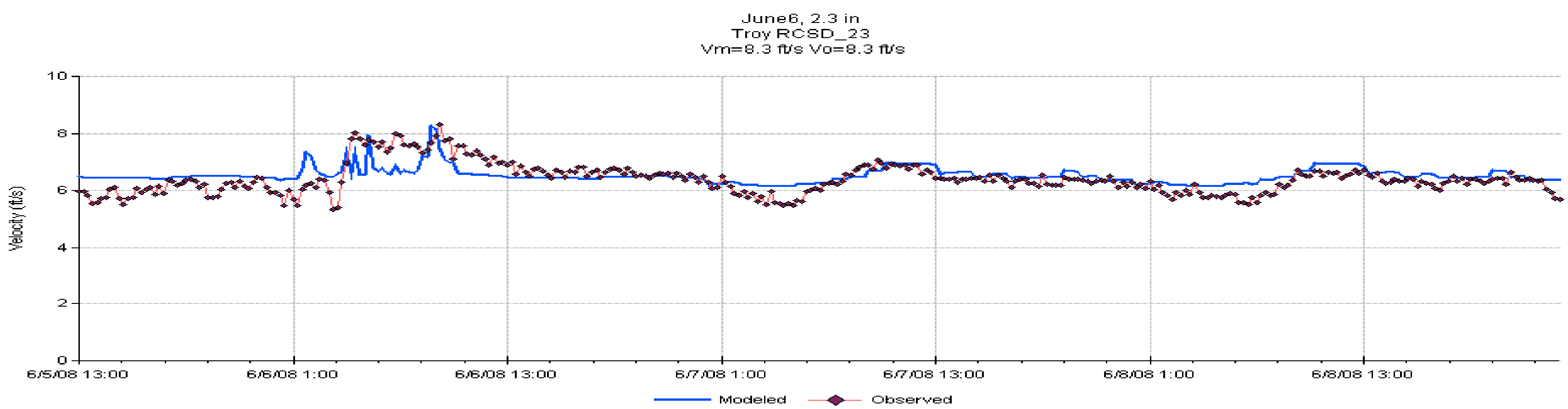
June16, 1.1 in
Troy RCSD_23
Vm=0.56 MG Vo=0.33 MG; Qm=0.8 cfs Qo=0.7 cfs
Flowrate (cfs)
1
0.8
0.6
0.4
0.2
0
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
6/18/08 12:00
Modeled
Observed

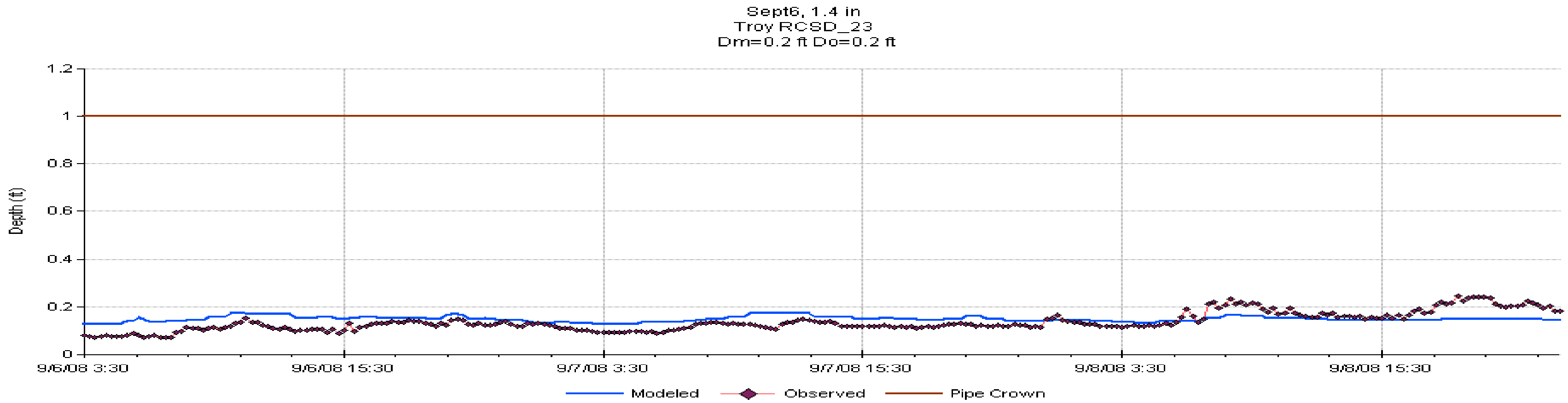


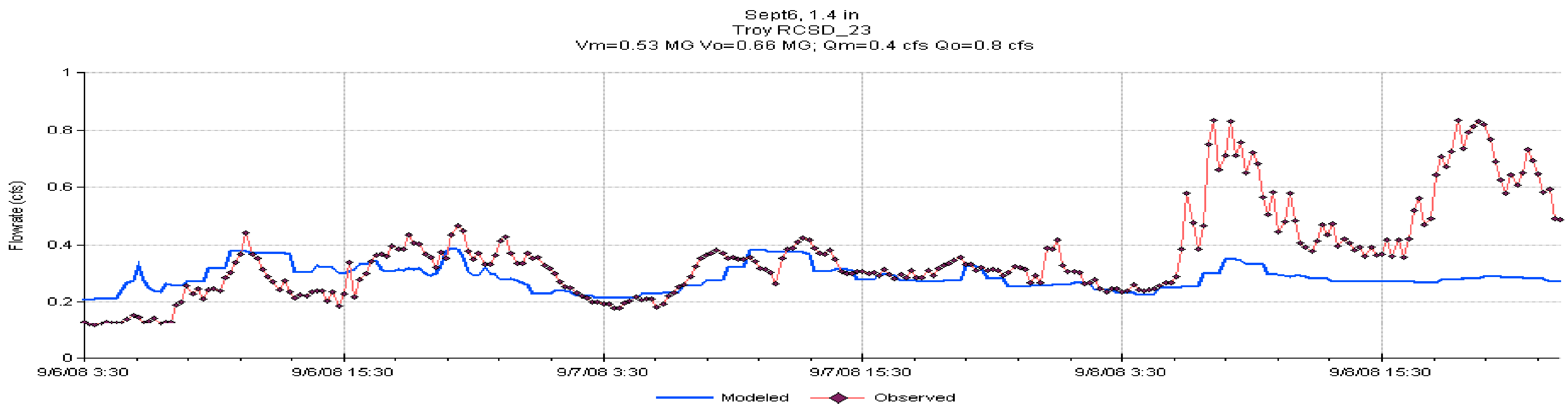
June16, 1.1 in
Troy RCSD_23
Vm=8.5 ft/s Vo=7.8 ft/s
Velocity (ft/s)
10
8
6
4
2
0
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
6/18/08 12:00
Modeled
Observed

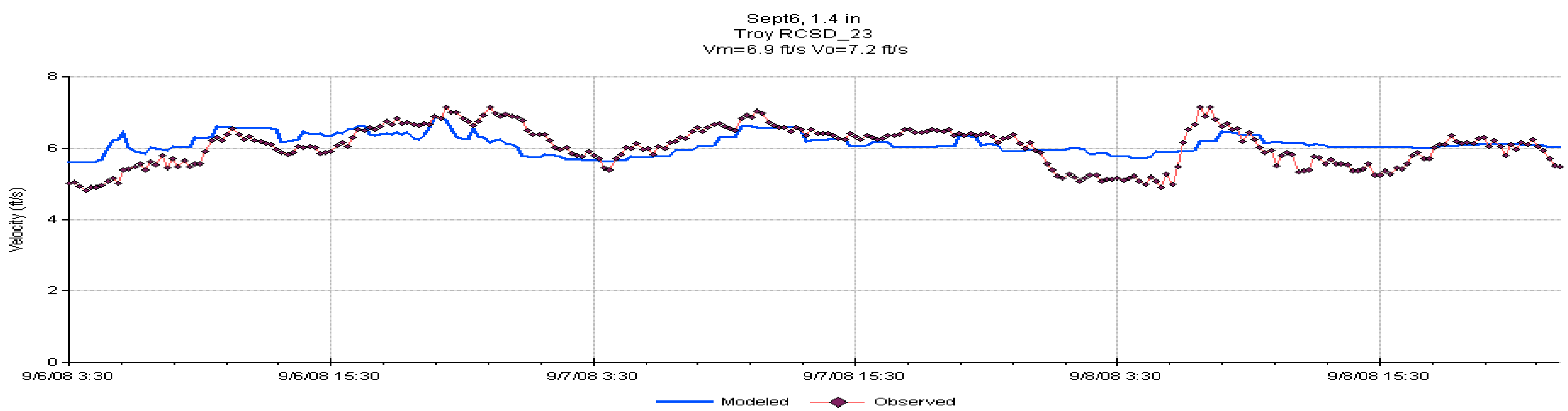

June6, 2.3 in
Troy RCSD_23
Dm=0.4 ft Do=0.2 ft
Depth (ft)
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed
Pipe Crown

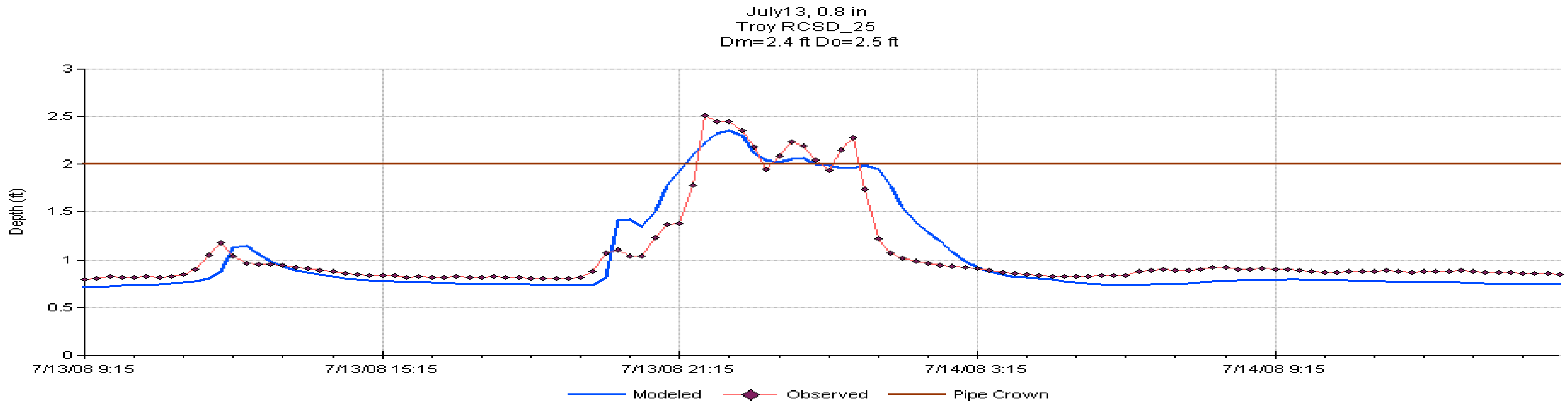

June6, 2.3 in
Troy RCSD_23
Vm=0.81 MG Vo=0.53 MG; Qm=1.2 cfs Qo=0.7 cfs
Flowrate (cfs)
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed

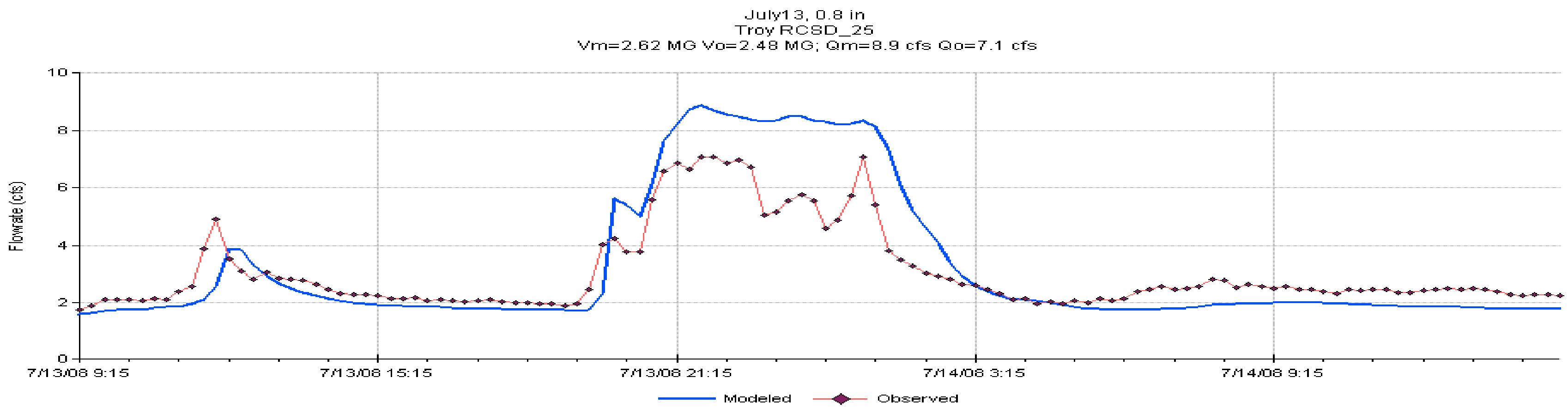

June6, 2.3 in
Troy RCSD_23
Vm=8.3 ft/s Vo=8.3 ft/s
Velocity (ft/s)
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed

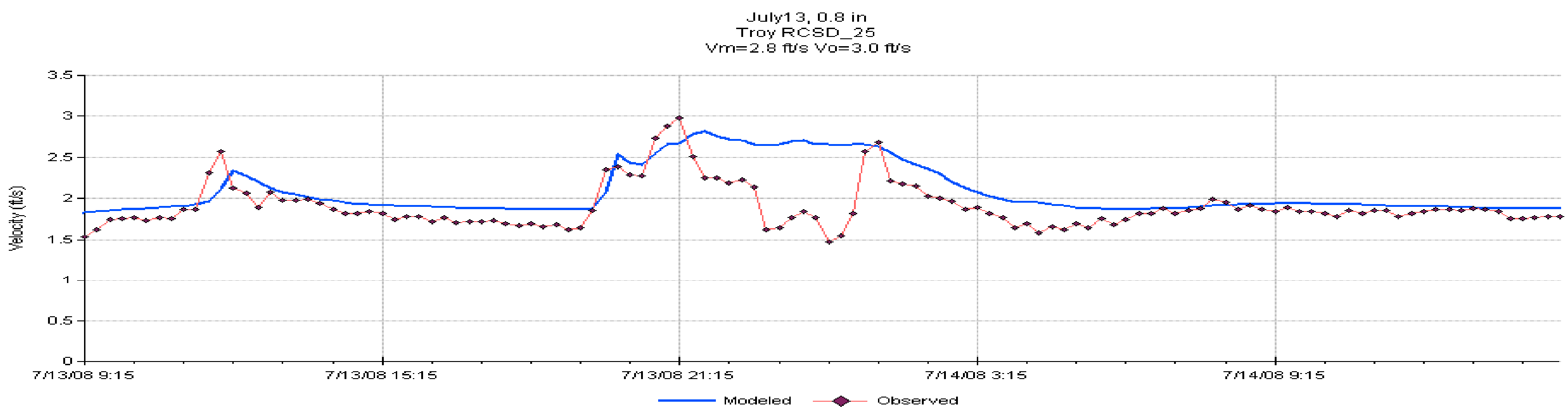

Sept6, 1.4 in
Troy RCSD_23
Dm=0.2 ft Do=0.2 ft
Depth (ft)
1.2
1
0.8
0.6
0.4
0.2
0
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed
Pipe Crown

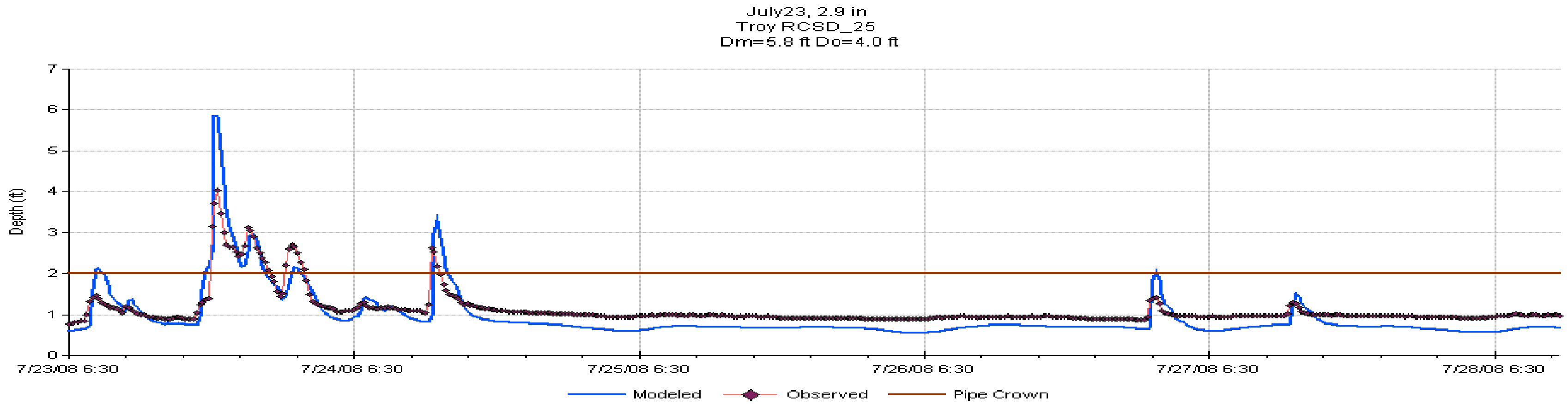

Sept6, 1.4 in
Troy RCSD_23
Vm=0.53 MG Vo=0.66 MG; Qm=0.4 cfs Qo=0.8 cfs
Flowrate (cfs)
1
0.8
0.6
0.4
0.2
0
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed

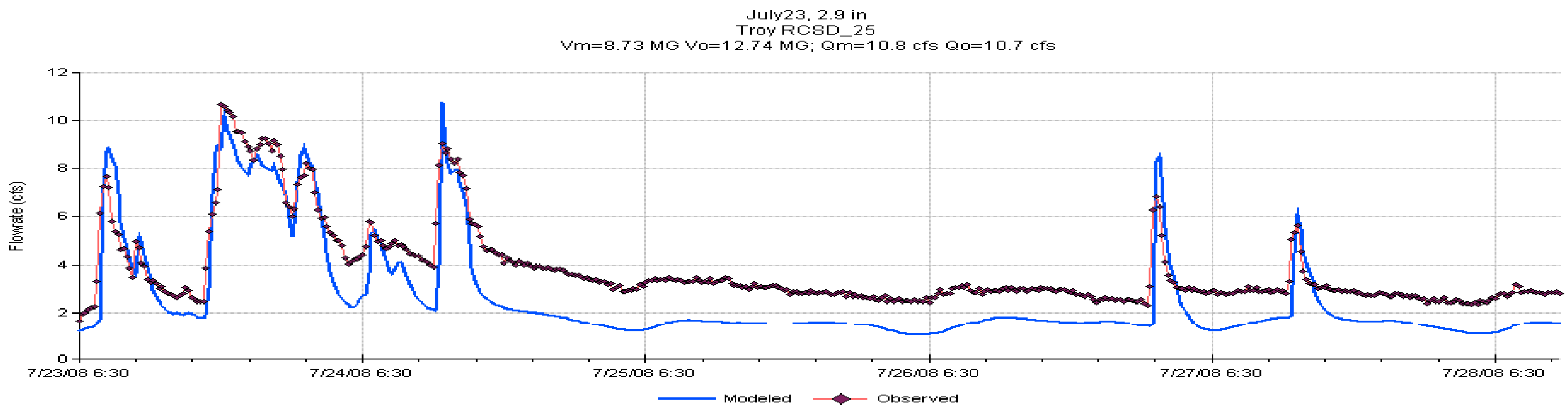

Sept6, 1.4 in
Troy RCSD_23
Vm=6.9 ft/s Vo=7.2 ft/s
Velocity (ft/s)
8
6
4
2
0
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed

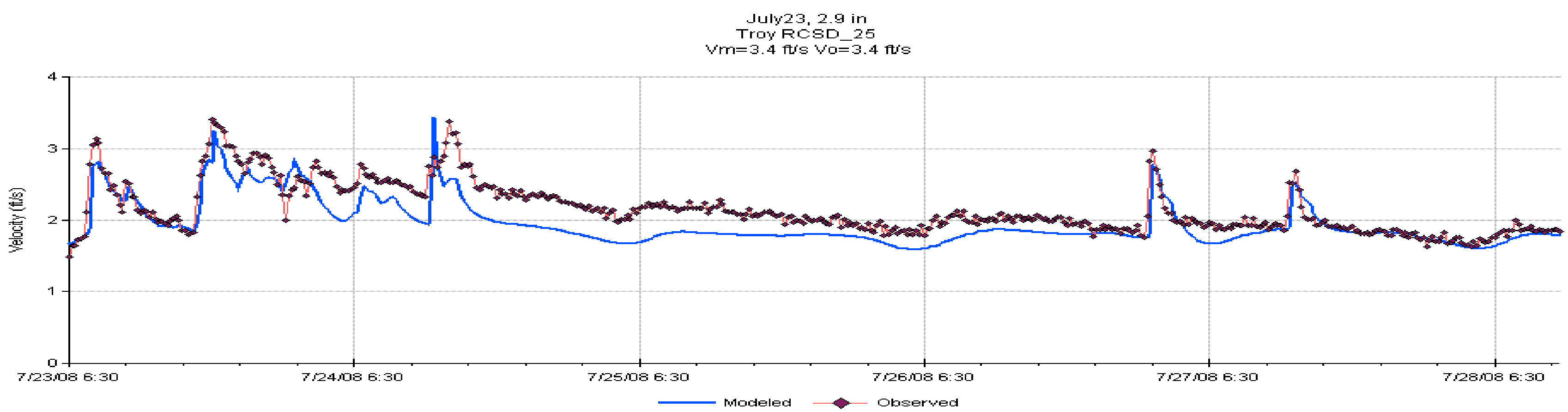

July13, 0.8 in
Troy RCSD_25
Dm=2.4 ft Do=2.5 ft
Depth (ft)
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed
Pipe Crown

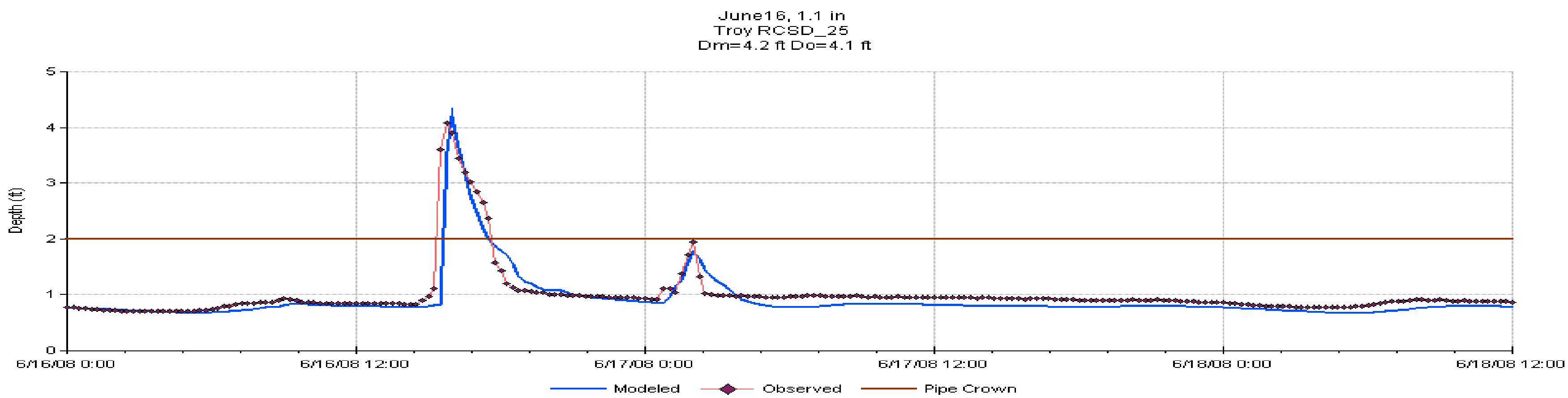

July13, 0.8 in
Troy RCSD_25
Vm=2.62 MG Vo=2.48 MG; Qm=8.9 cfs Qo=7.1 cfs
Flowrate (cfs)
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed


July13, 0.8 in
Troy RCSD_25
Vm=2.8 ft/s Vo=3.0 ft/s
Velocity (ft/s)
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed

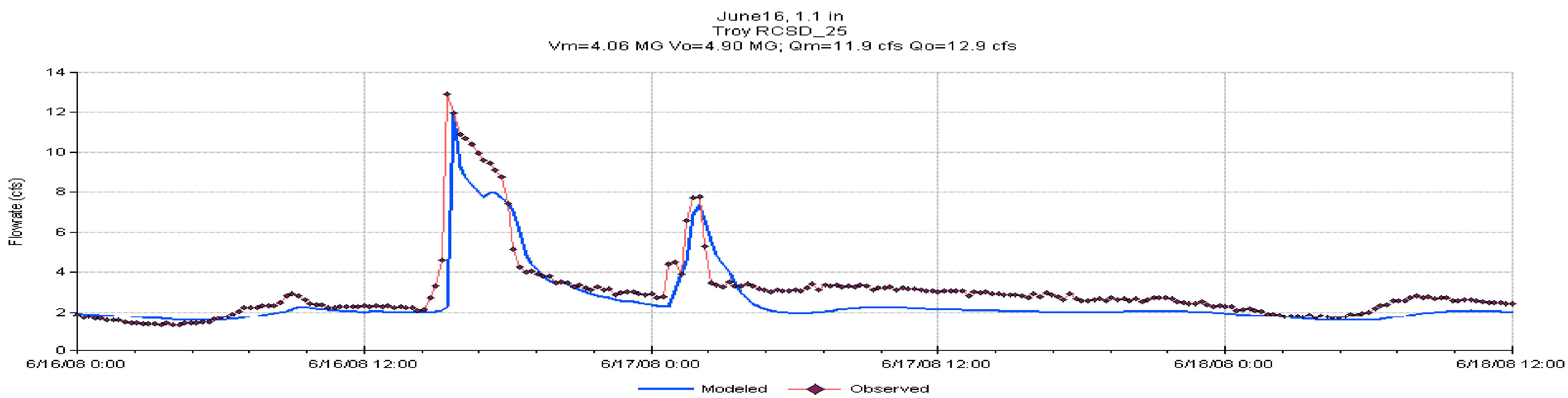

July23, 2.9 in
Troy RCSD_25
Dm=5.8 ft Do=4.0 ft
Depth (ft)
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed
Pipe Crown


July23, 2.9 in
Troy RCSD_25
Vm=8.73 MG Vo=12.74 MG; Qm=10.8 cfs Qo=10.7 cfs
Flowrate (cfs)
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed

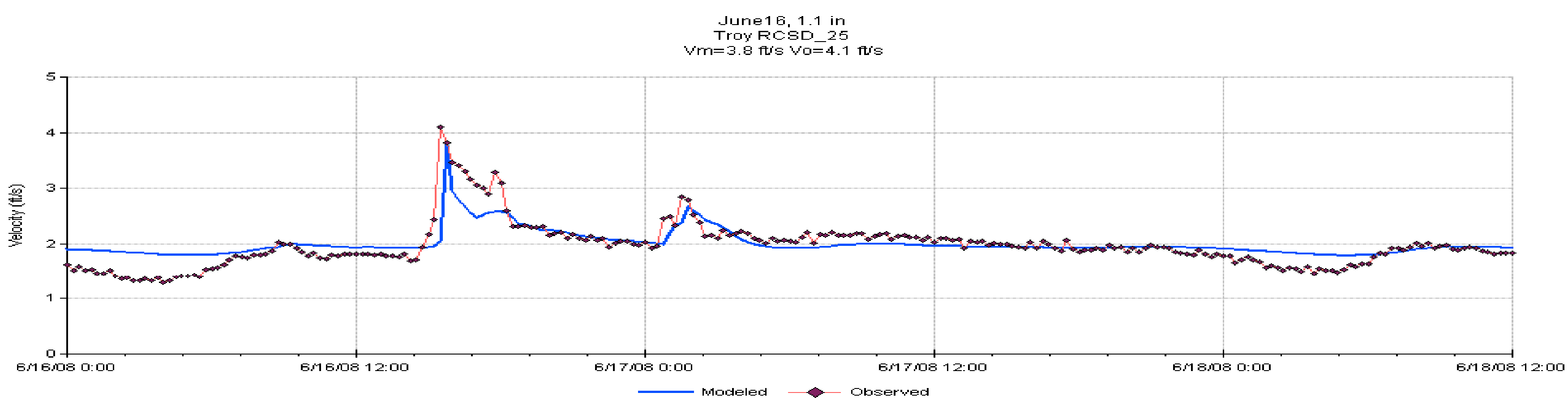

July23, 2.9 in
Troy RCSD_25
Vm=3.4 ft/s Vo=3.4 ft/s
Velocity (ft/s)
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed



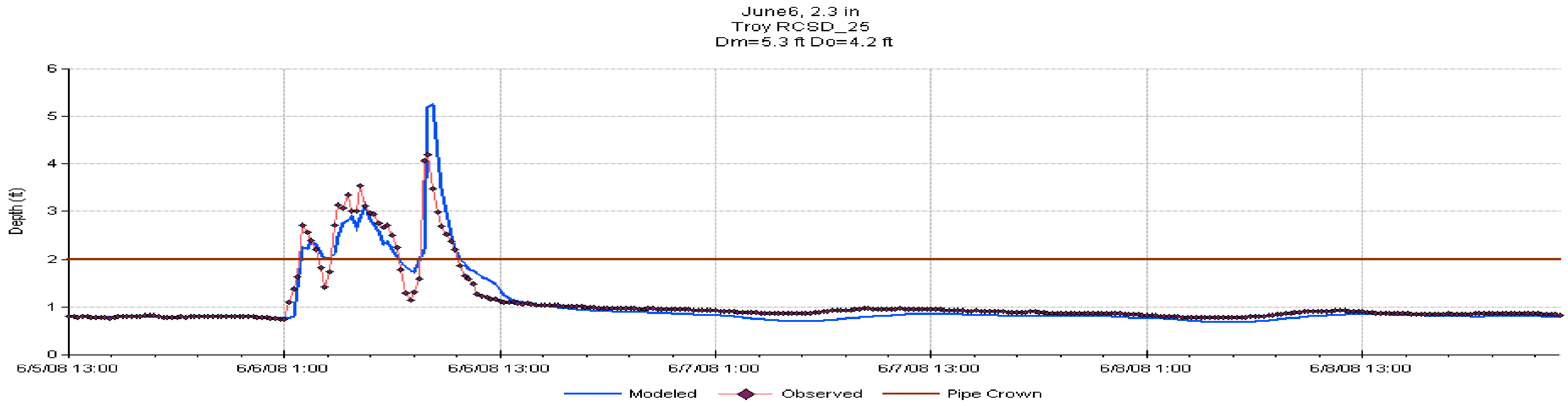
June16, 1.1 in
Troy RCSD_25
Dm=4.2 ft Do=4.1 ft
Depth (ft)
5
4
3
2
1
0
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
6/18/08 12:00
Modeled
Observed
Pipe Crown

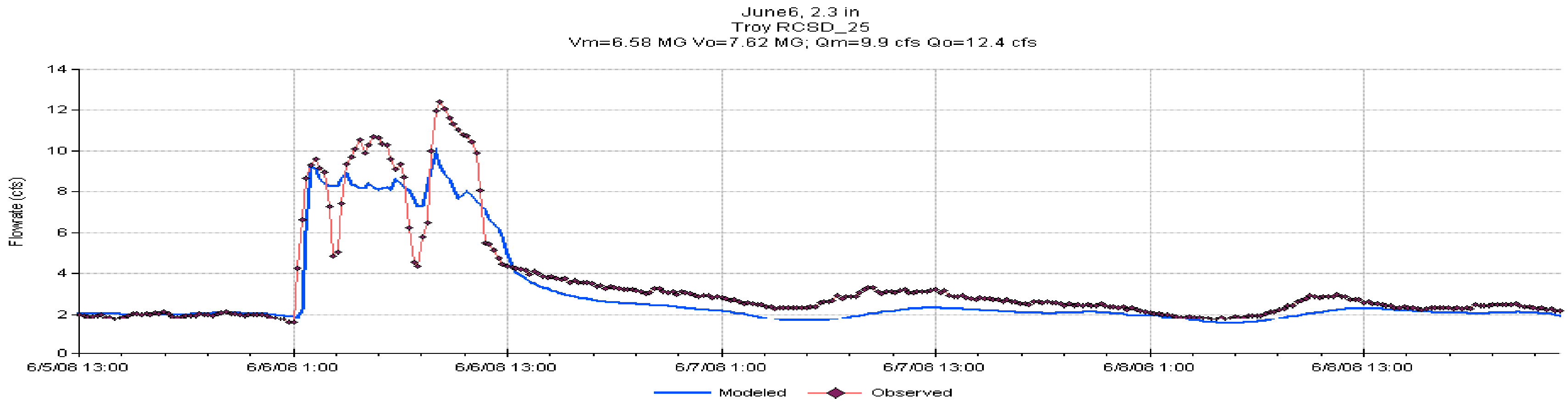


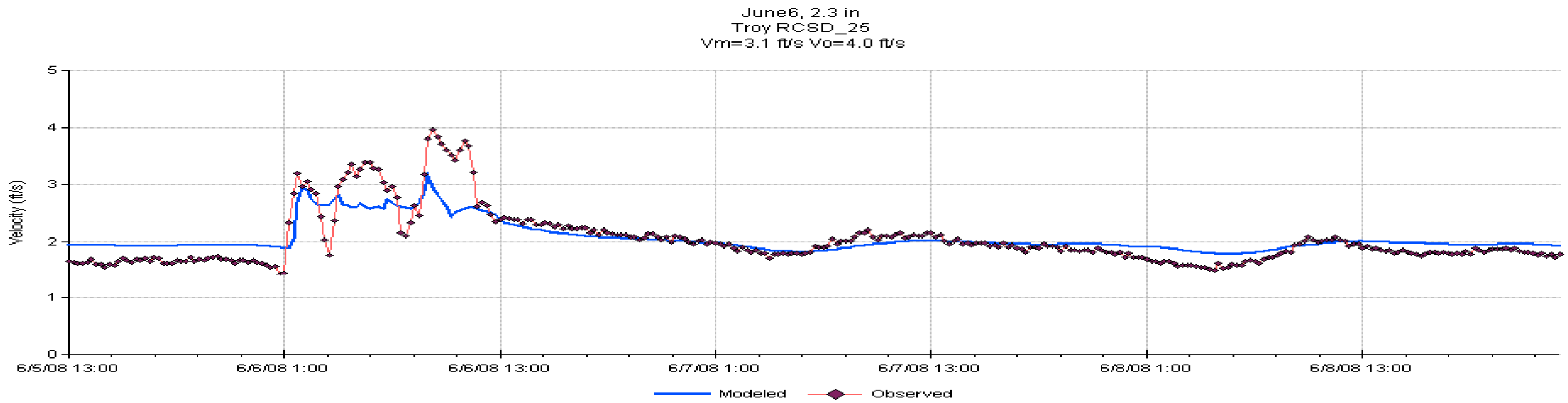
June16, 1.1 in
Troy RCSD_25
Vm=4.06 MG Vo=4.90 MG; Qm=11.9 cfs Qo=12.9 cfs
Flowrate (cfs)
14
12
10
8
6
4
2
0
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
6/18/08 12:00
Modeled
Observed

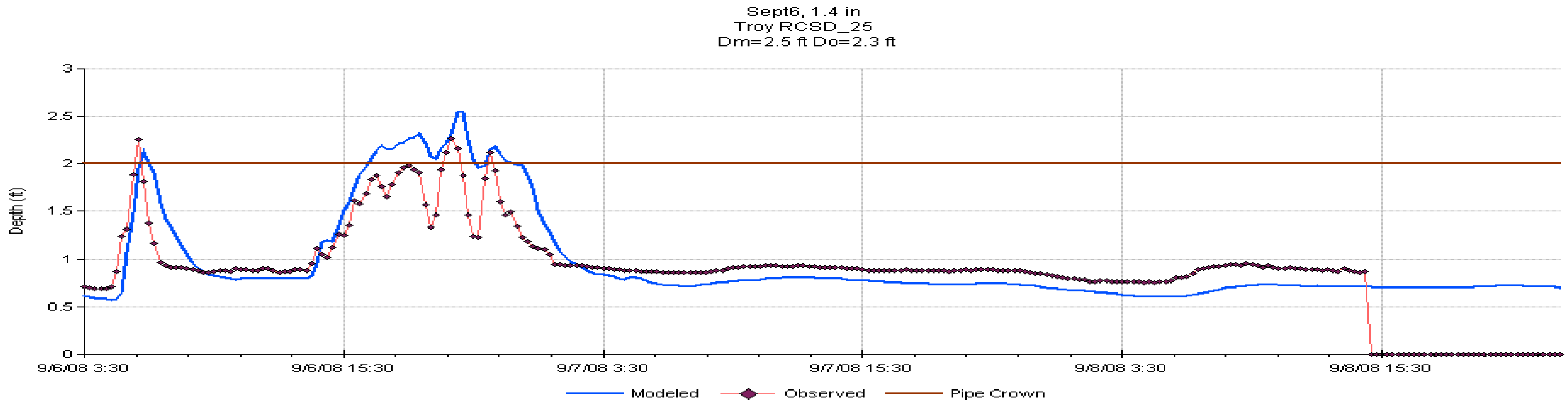


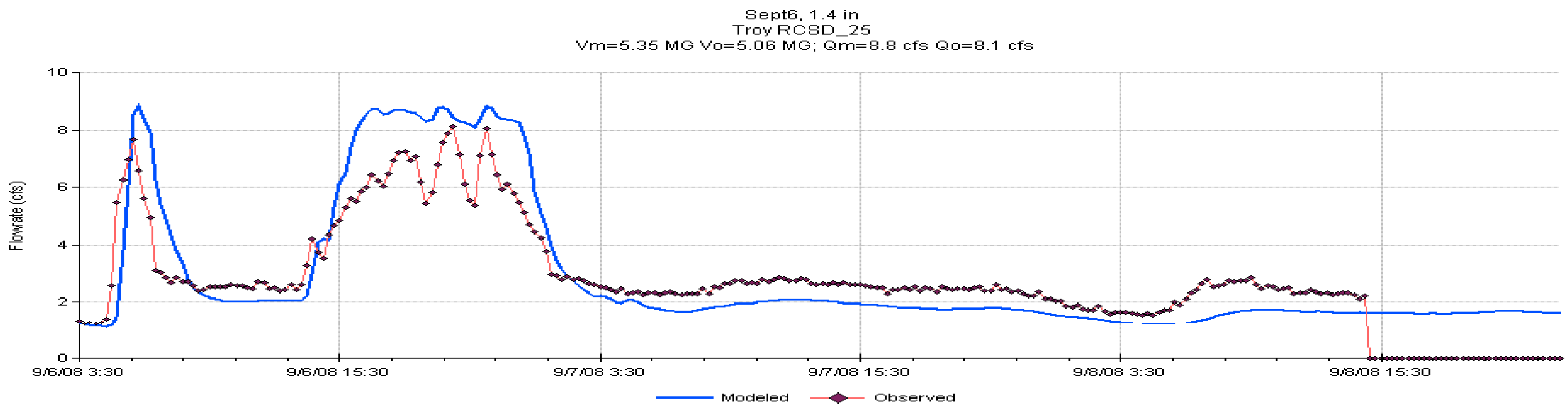
June16, 1.1 in
Troy RCSD_25
Vm=3.8 ft/s Vo=4.1 ft/s
Velocity (ft/s)
5
4
3
2
1
0
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
6/18/08 12:00
Modeled
Observed

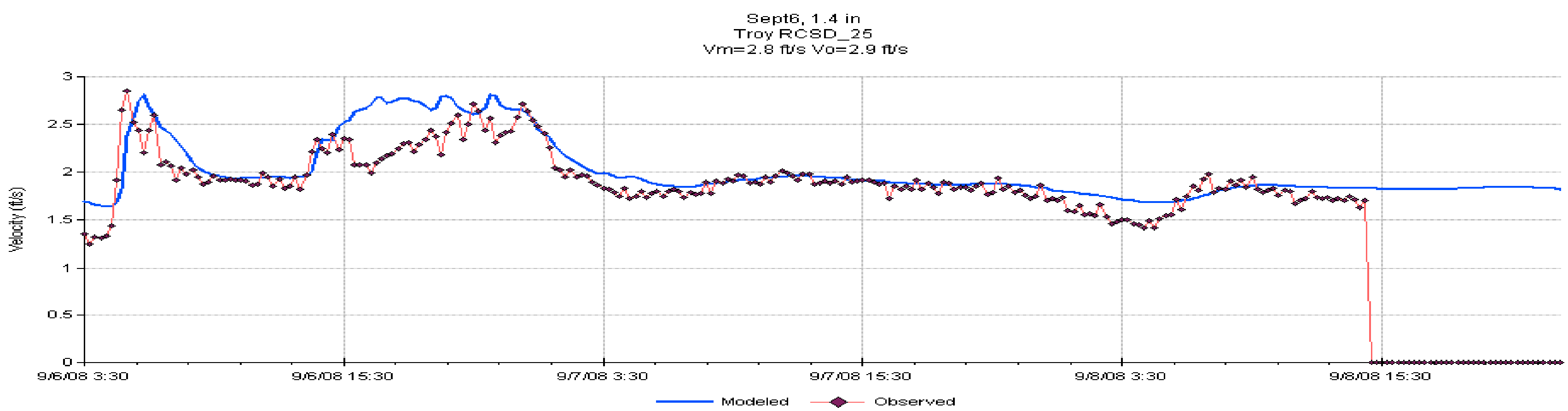

June6, 2.3 in
Troy RCSD_25
Dm=5.3 ft Do=4.2 ft
Depth (ft)
6
5
4
3
2
1
0
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed
Pipe Crown

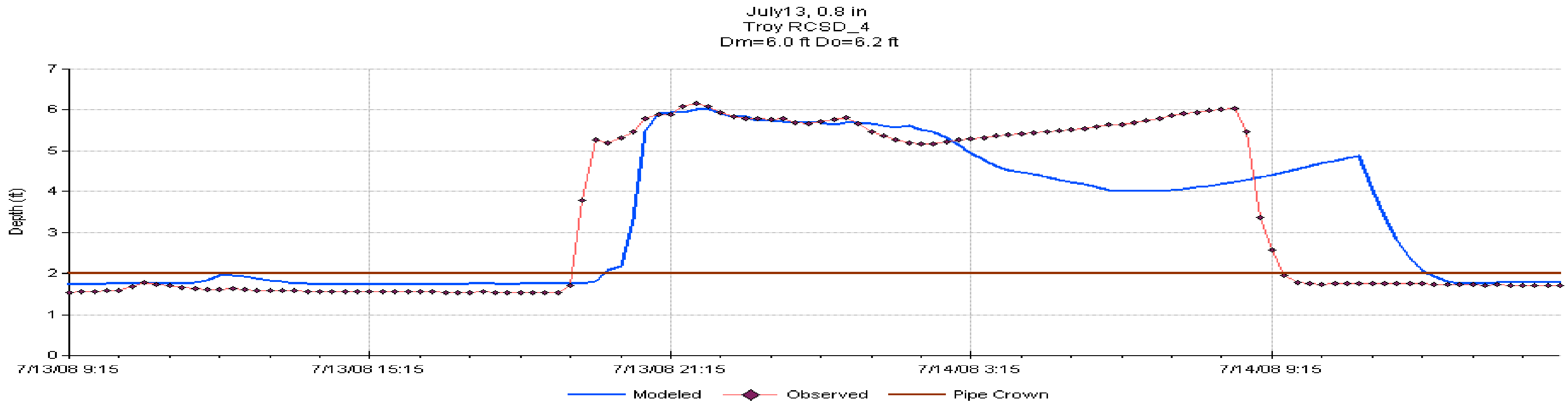

June6, 2.3 in
Troy RCSD_25
Vm=6.58 MG Vo=7.62 MG; Qm=9.9 cfs Qo=12.4 cfs
Flowrate (cfs)
14
12
10
8
6
4
2
0
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed

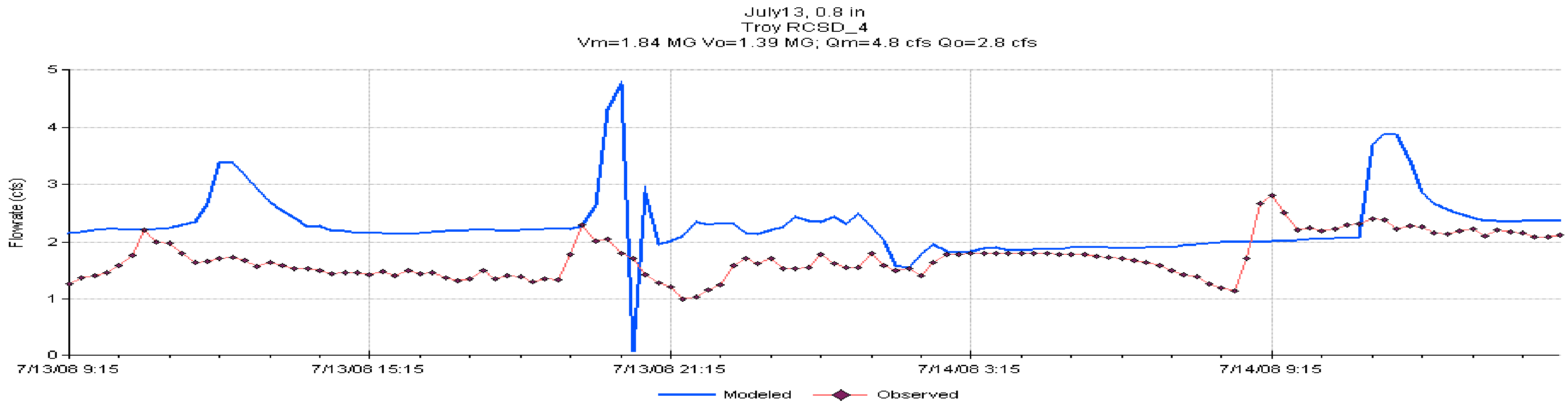

June6, 2.3 in
Troy RCSD_25
Vm=3.1 ft/s Vo=4.0 ft/s
Velocity (ft/s)
5
4
3
2
1
0
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed

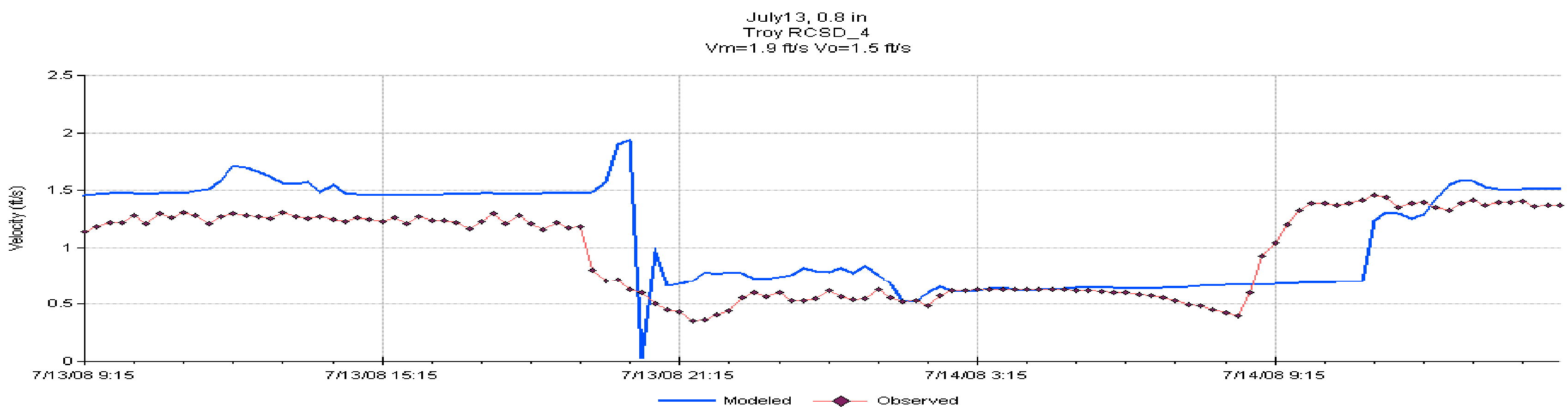

Sept6, 1.4 in
Troy RCSD_25
Dm=2.5 ft Do=2.3 ft
Depth (ft)
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed
Pipe Crown

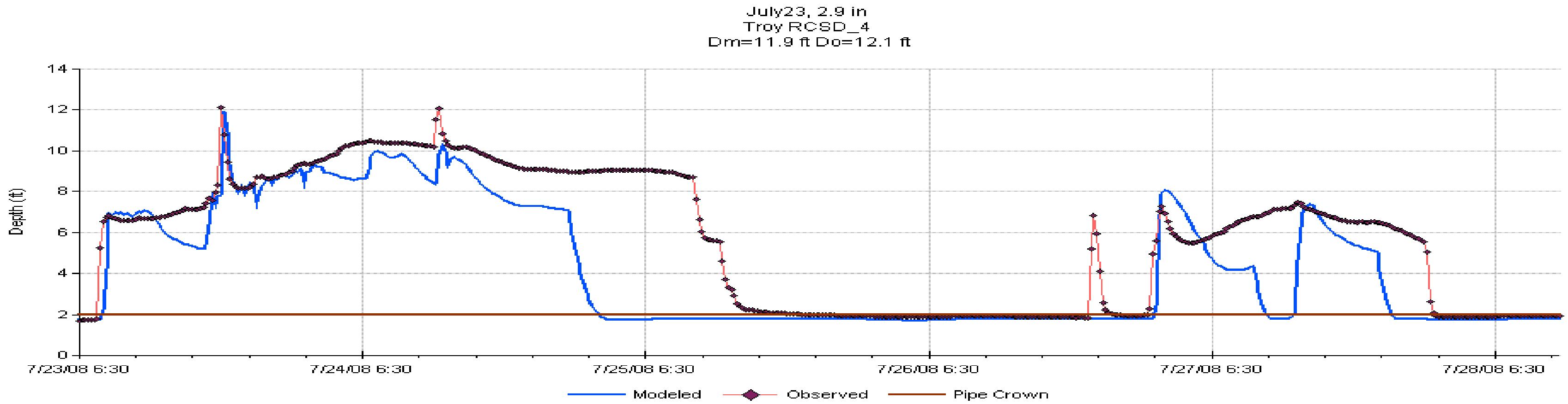

Sept6, 1.4 in
Troy RCSD_25
Vm=5.35 MG Vo=5.06 MG; Qm=8.8 cfs Qo=8.1 cfs
Flowrate (cfs)
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed

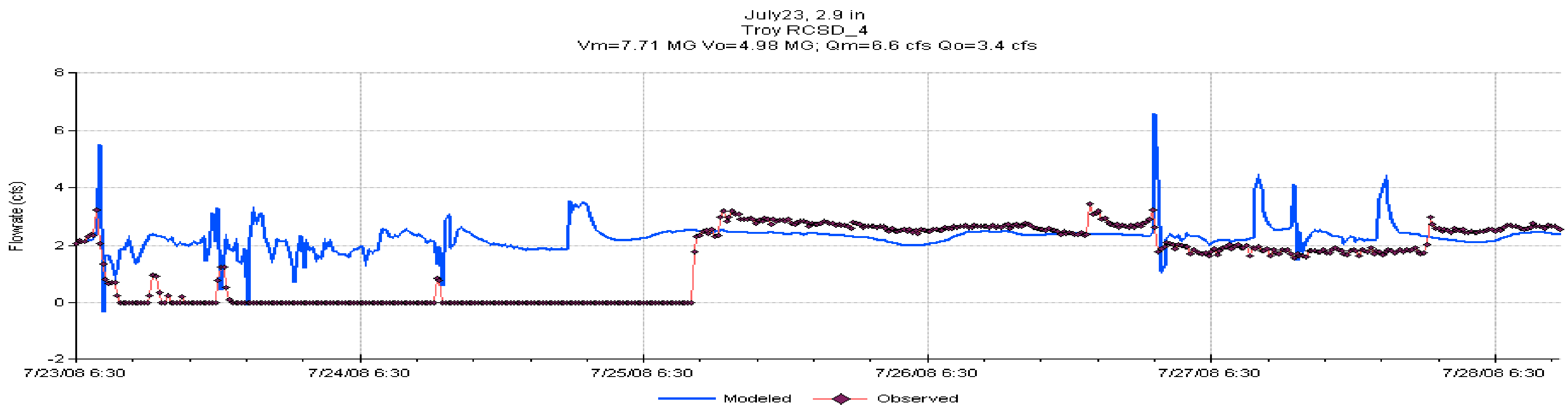

Sept6, 1.4 in
Troy RCSD_25
Vm=2.8 ft/s Vo=2.9 ft/s
Velocity (ft/s)
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed

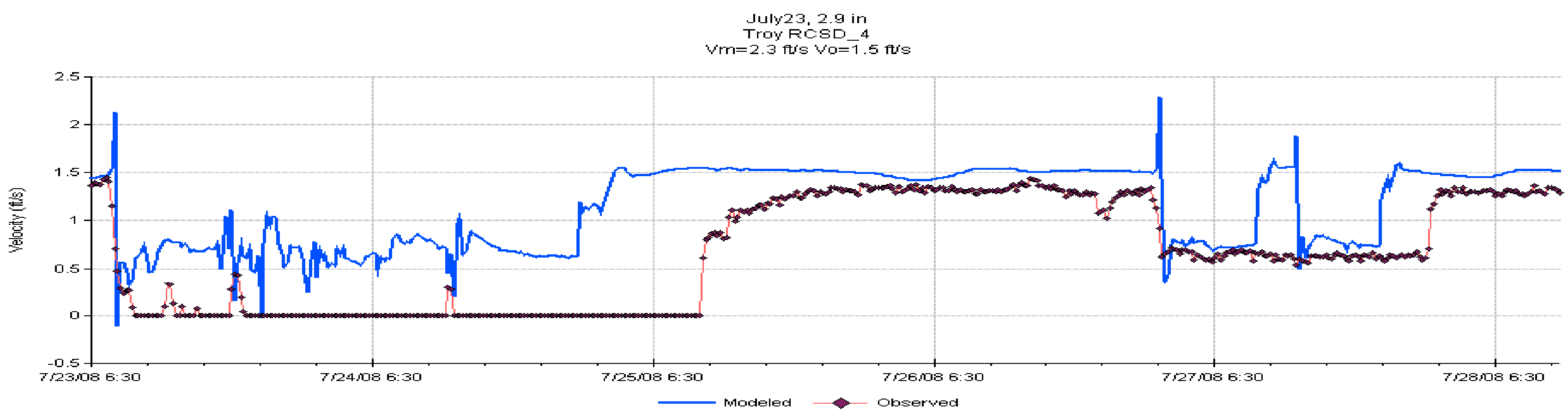

July13, 0.8 in
Troy RCSD_4
Dm=6.0 ft Do=6.2 ft
Depth (ft)
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed
Pipe Crown


July13, 0.8 in
Troy RCSD_4
Vm=1.84 MG Vo=1.39 MG; Qm=4.8 cfs Qo=2.8 cfs
Flowrate (cfs)
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed

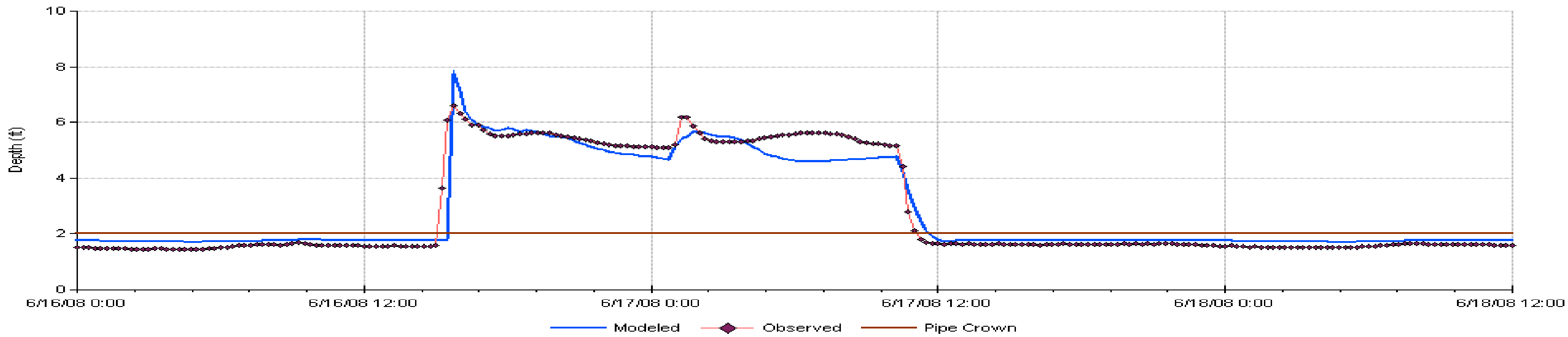

July13, 0.8 in
Troy RCSD_4
Vm=1.9 ft/s Vo=1.5 ft/s
Velocity (ft/s)
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed


July23, 2.9 in
Troy RCSD_4
Dm=11.9 ft Do=12.1 ft
Depth (ft)
14
12
10
8
6
4
2
0
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed
Pipe Crown

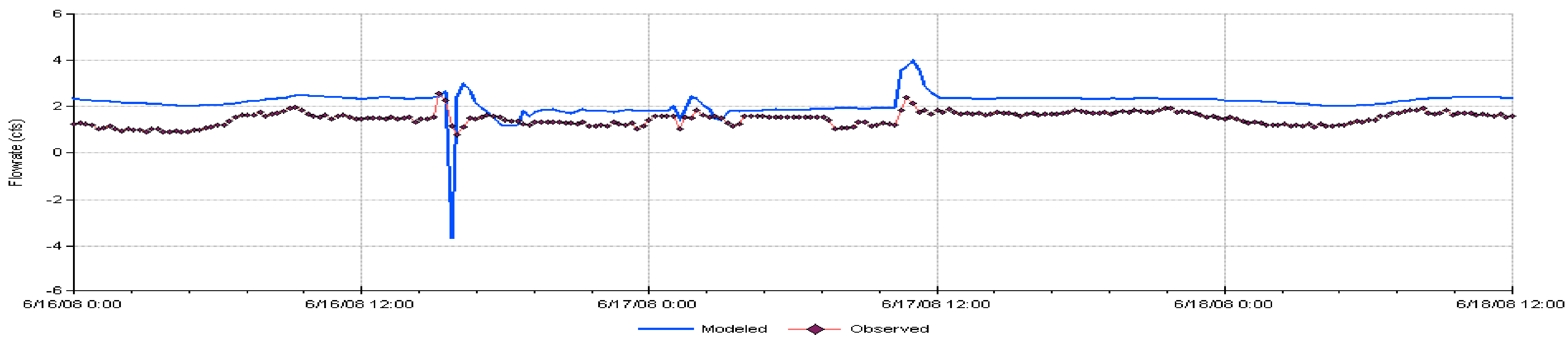

July23, 2.9 in
Troy RCSD_4
Vm=7.71 MG Vo=4.98 MG; Qm=6.6 cfs Qo=3.4 cfs
Flowrate (cfs)
8
6
4
2
0
-2
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed


July23, 2.9 in
Troy RCSD_4
Vm=2.3 ft/s Vo=1.5 ft/s
Velocity (ft/s)
2.5
2
1.5
1
0.5
0
-0.5
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed

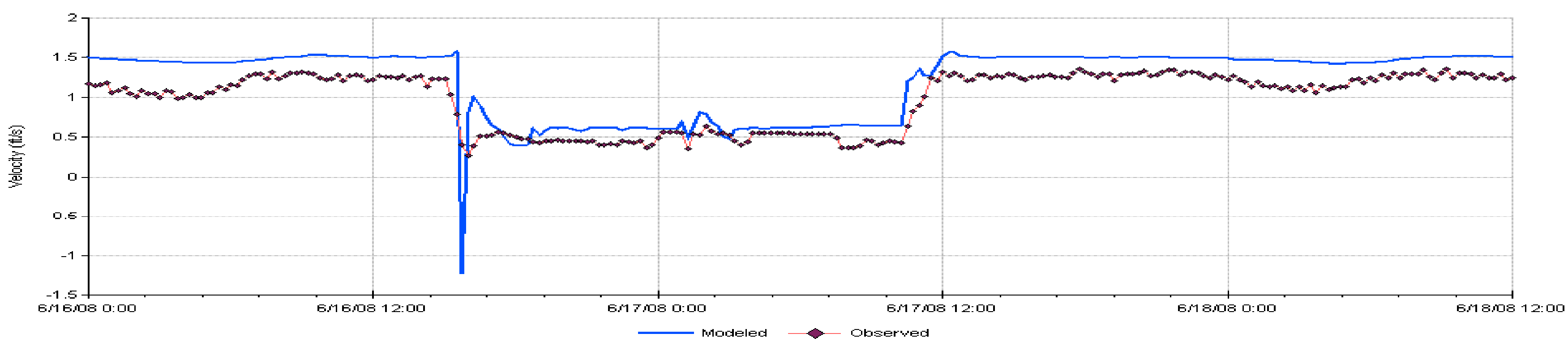
June16, 1.1 in
Troy RCSD_4
Dm=7.7 ft Do=6.6 ft

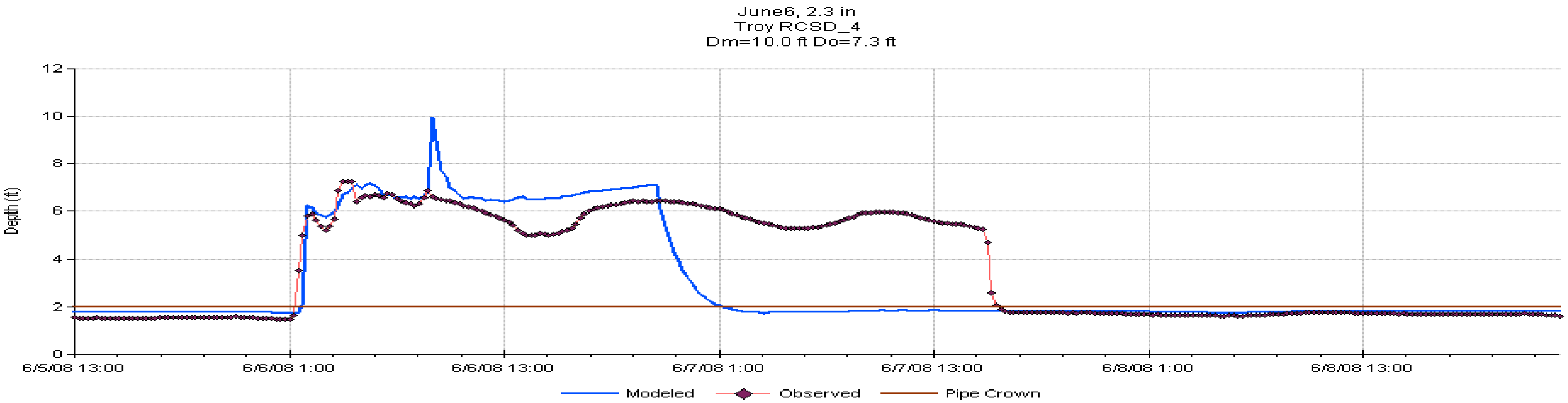


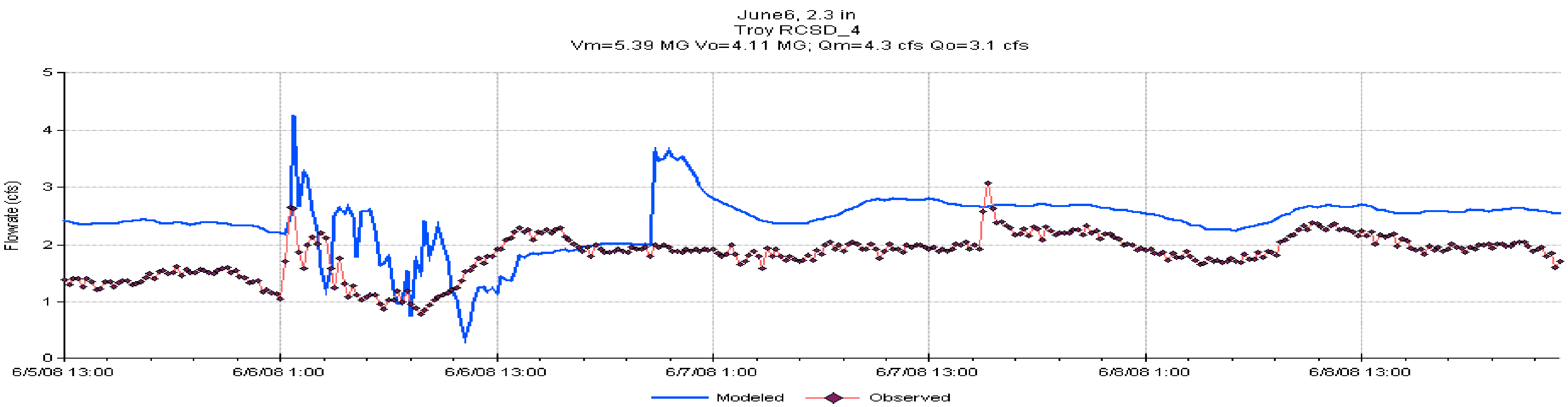
June16, 1.1 in
Troy RCSD_4
Vm=3.48 MG Vo=2.41 MG; Qm=4.0 cfs Qo=2.5 cfs

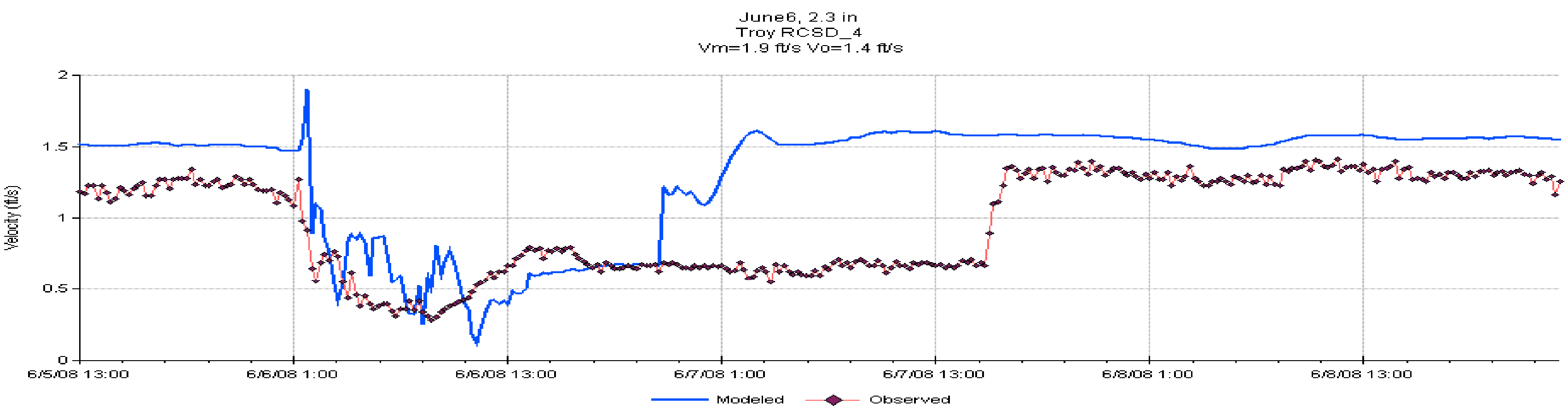


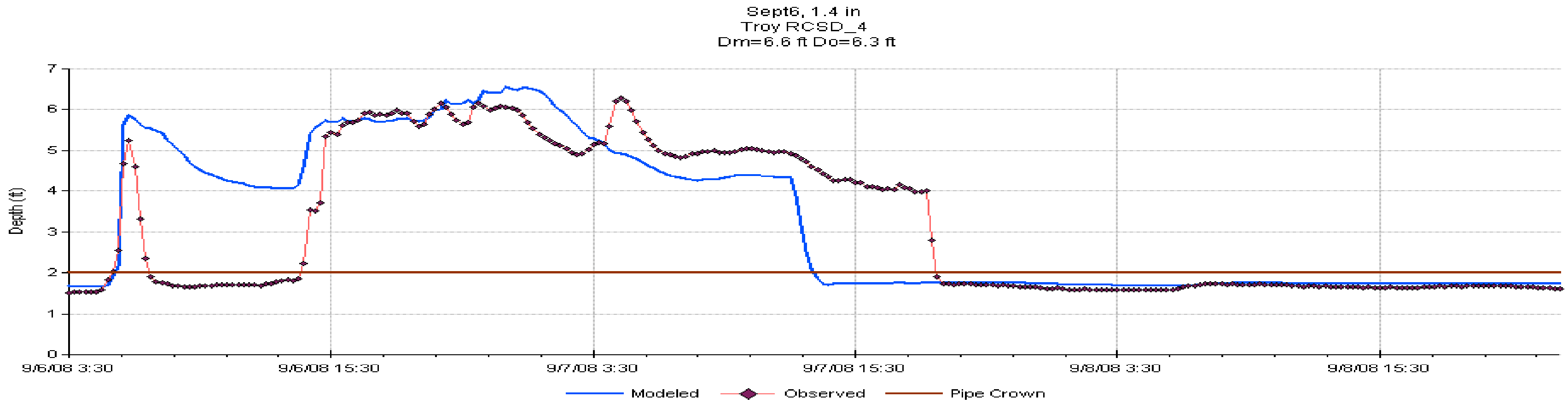
June16, 1.1 in
Troy RCSD_4
Vm=1.6 ft/s Vo=1.4 ft/s

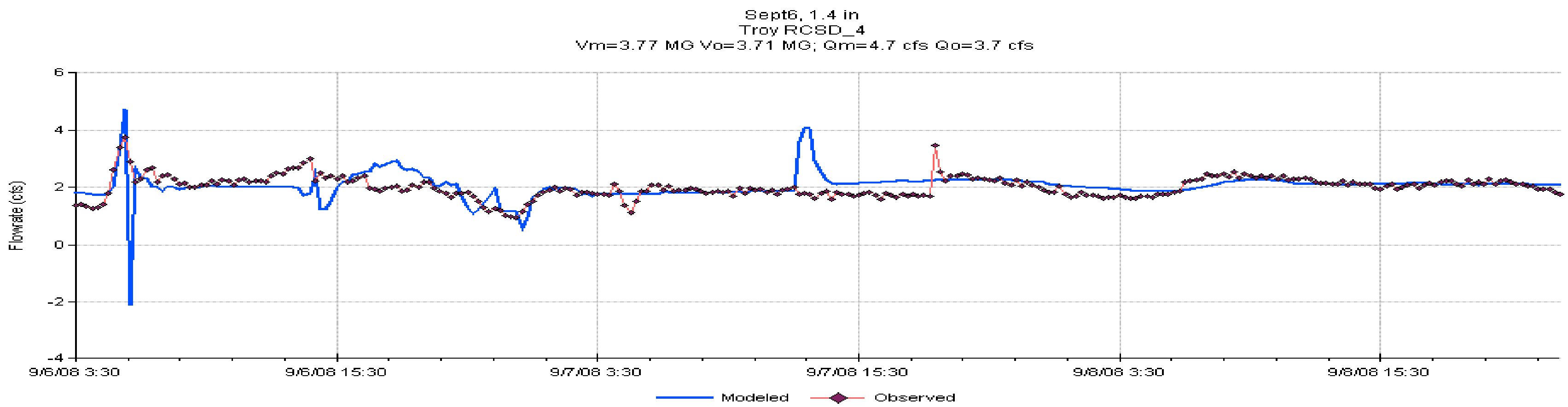


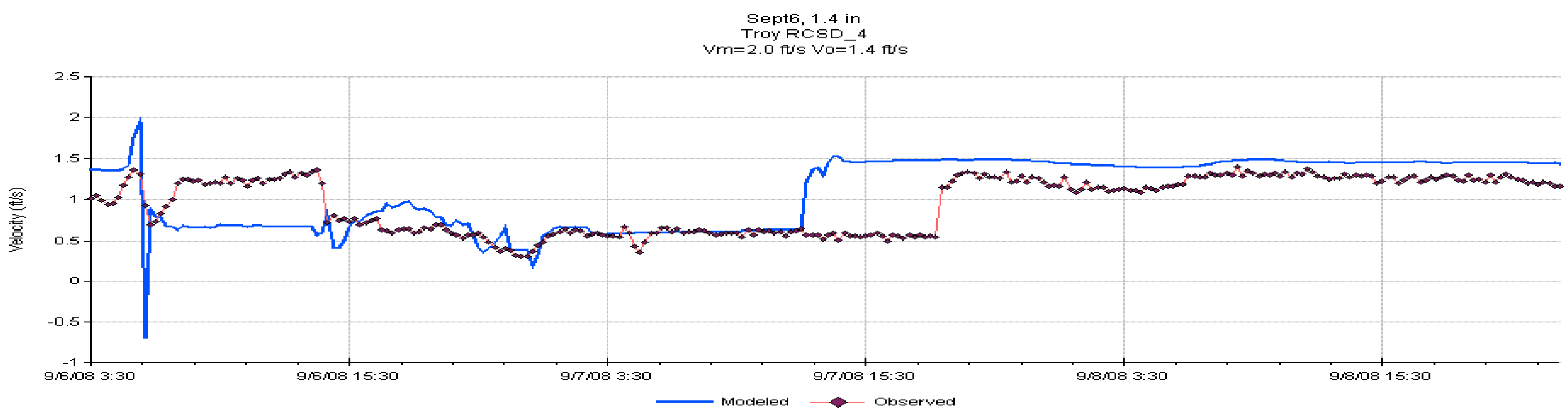

June6, 2.3 in
Troy RCSD_4
Dm=10.0 ft Do=7.3 ft
Depth (ft)
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed
Pipe Crown

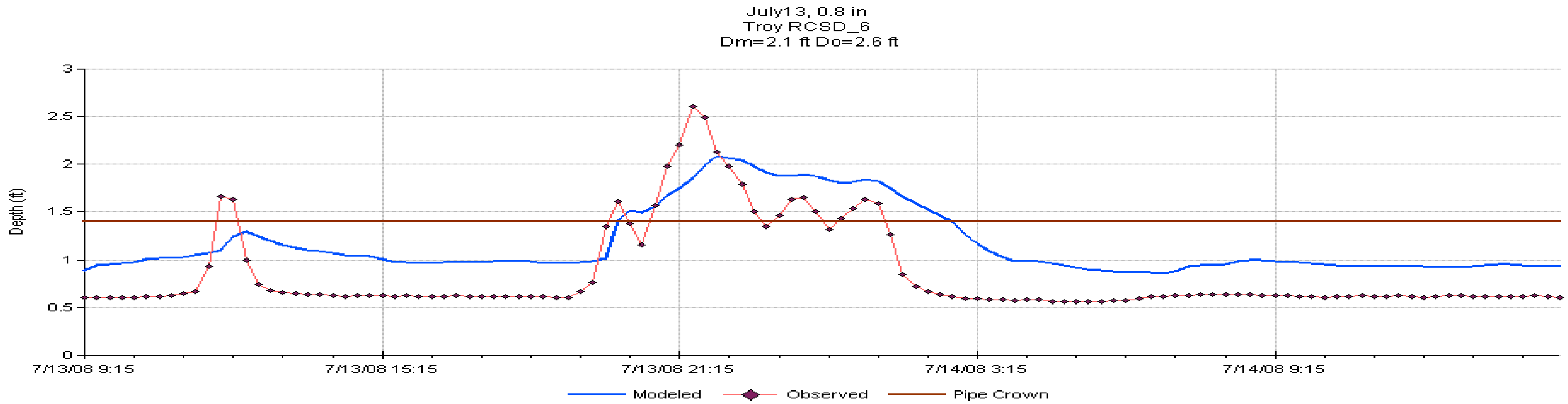

June6, 2.3 in
Troy RCSD_4
Vm=5.39 MG Vo=4.11 MG; Qm=4.3 cfs Qo=3.1 cfs
Flowrate (cfs)
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed

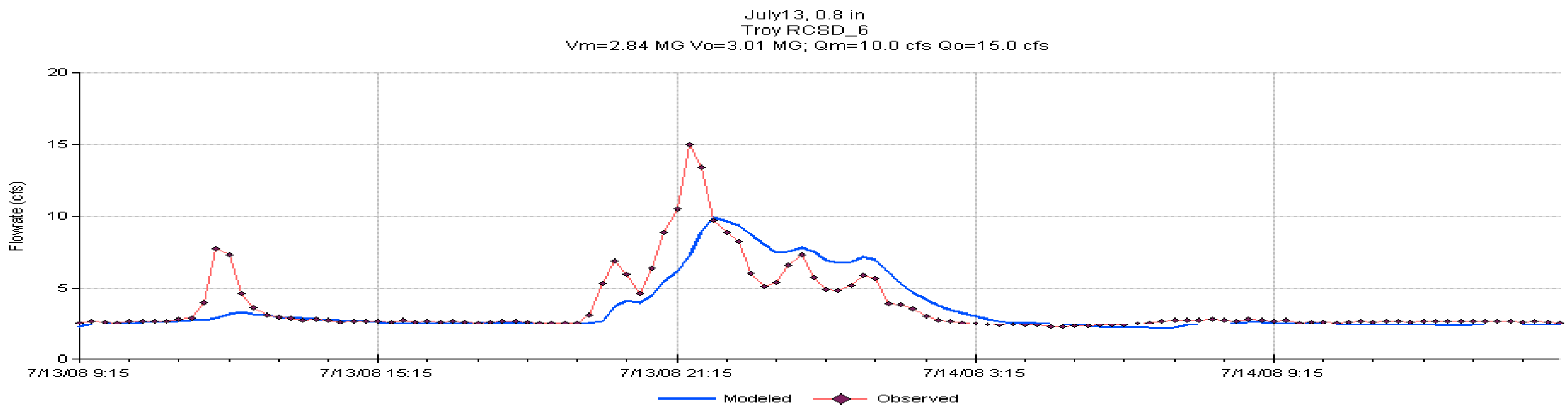

June6, 2.3 in
Troy RCSD_4
Vm=1.9 ft/s Vo=1.4 ft/s
Velocity (ft/s)
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed

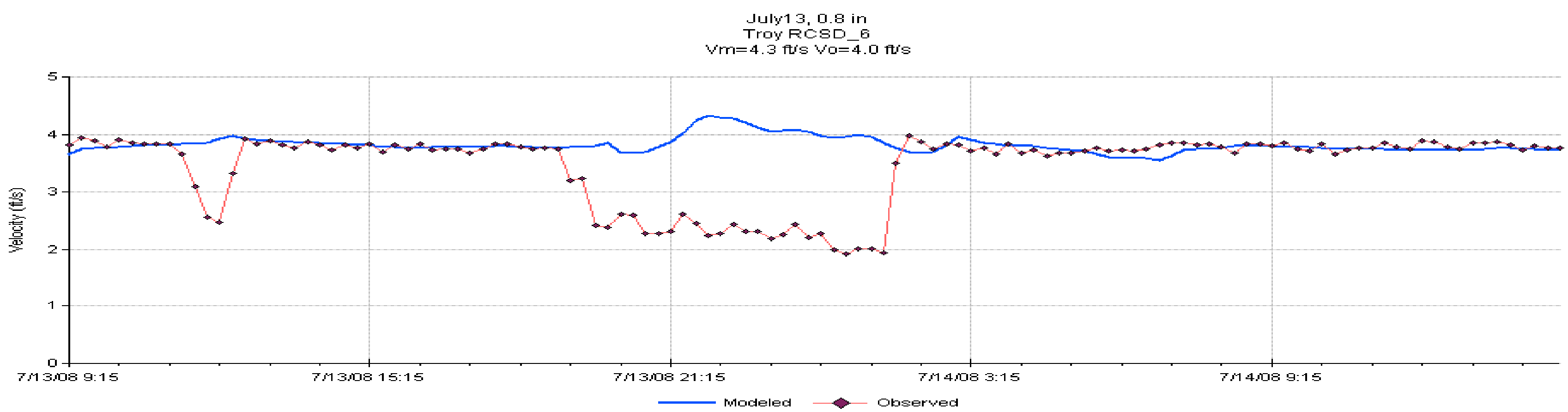

Sept6, 1.4 in
Troy RCSD_4
Dm=6.6 ft Do=6.3 ft
Depth (ft)
7
6
5
4
3
2
1
0
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed
Pipe Crown

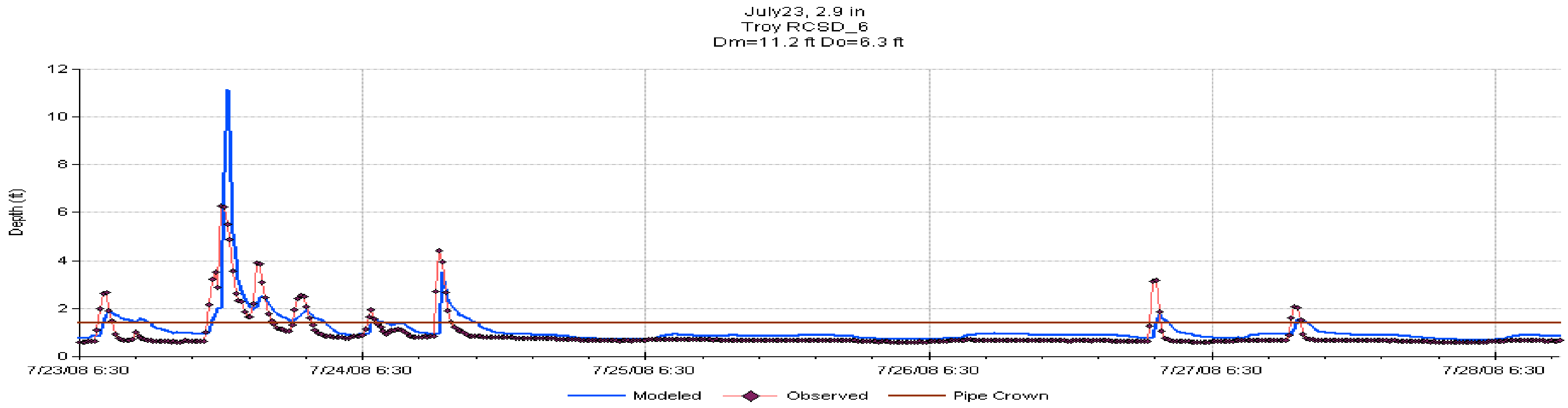

Sept6, 1.4 in
Troy RCSD_4
Vm=3.77 MG Vo=3.71 MG; Qm=4.7 cfs Qo=3.7 cfs
Flowrate (cfs)
6
4
2
0
-2
-4
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed

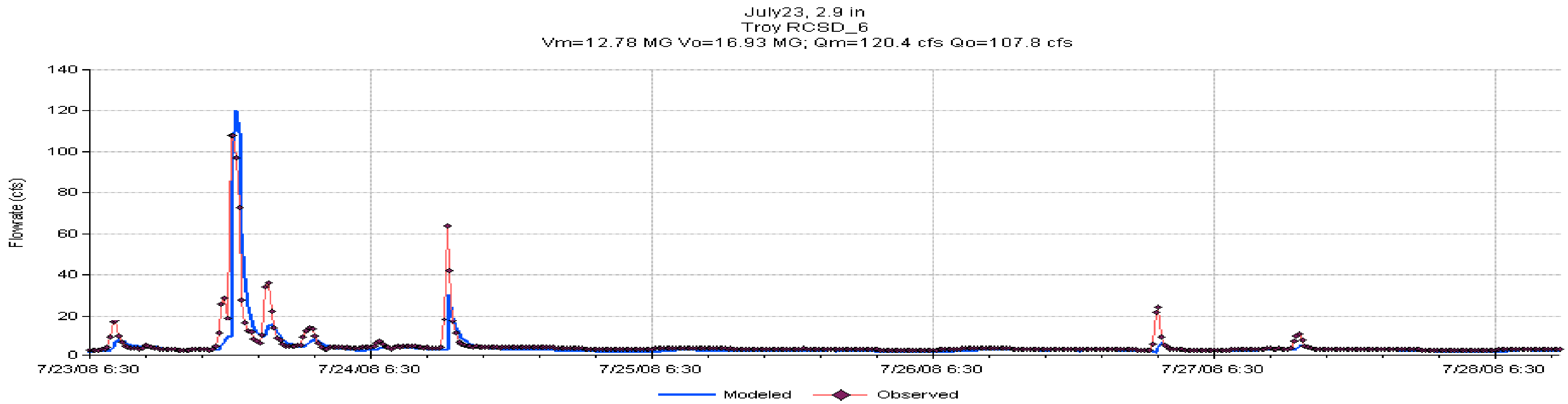

Sept6, 1.4 in
Troy RCSD_4
Vm=2.0 ft/s Vo=1.4 ft/s
Velocity (ft/s)
2.5
2
1.5
1
0.5
0
-0.5
-1
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed

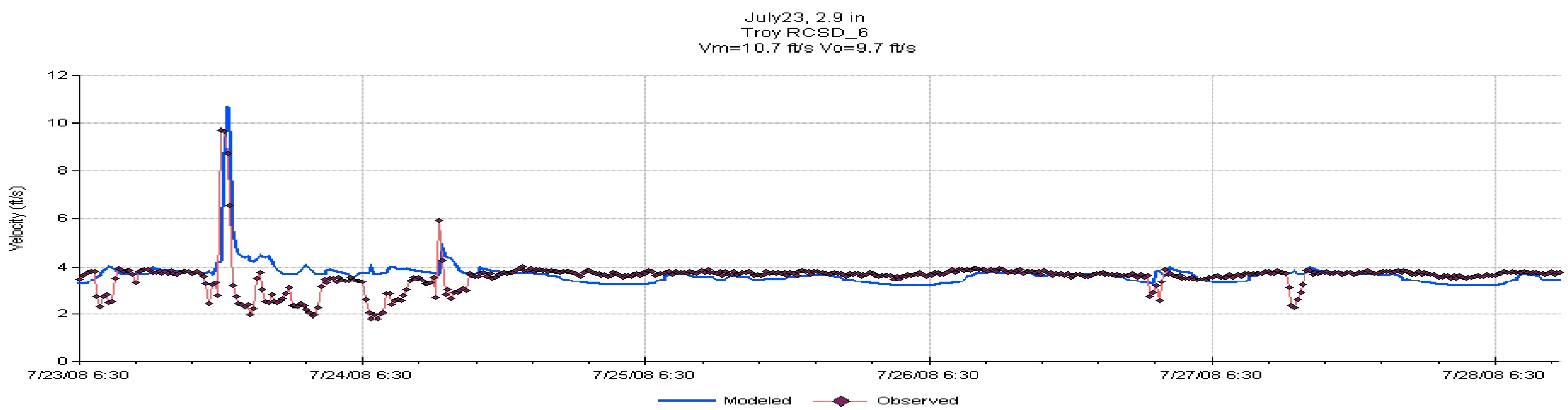

July13, 0.8 in
Troy RCSD_6
Dm=2.1 ft Do=2.6 ft
Depth (ft)
0
0.5
1
1.5
2
2.5
3
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed
Pipe Crown


July13, 0.8 in
Troy RCSD_6
Vm=2.84 MG Vo=3.01 MG; Qm=10.0 cfs Qo=15.0 cfs
Flowrate (cfs)
0
5
10
15
20
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed

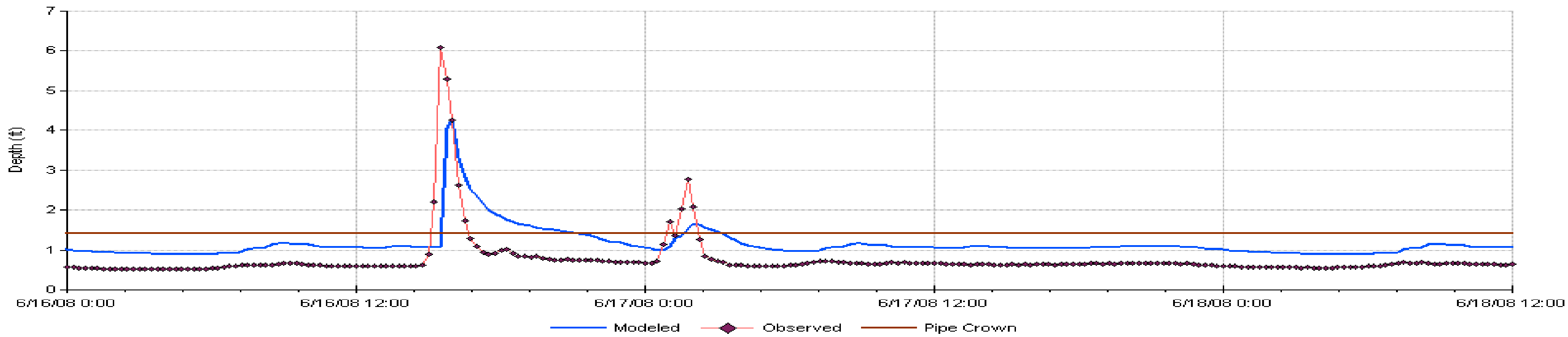

July13, 0.8 in
Troy RCSD_6
Vm=4.3 ft/s Vo=4.0 ft/s
Velocity (ft/s)
0
1
2
3
4
5
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed


July23, 2.9 in
Troy RCSD_6
Dm=11.2 ft Do=6.3 ft
Depth (ft)
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed
Pipe Crown

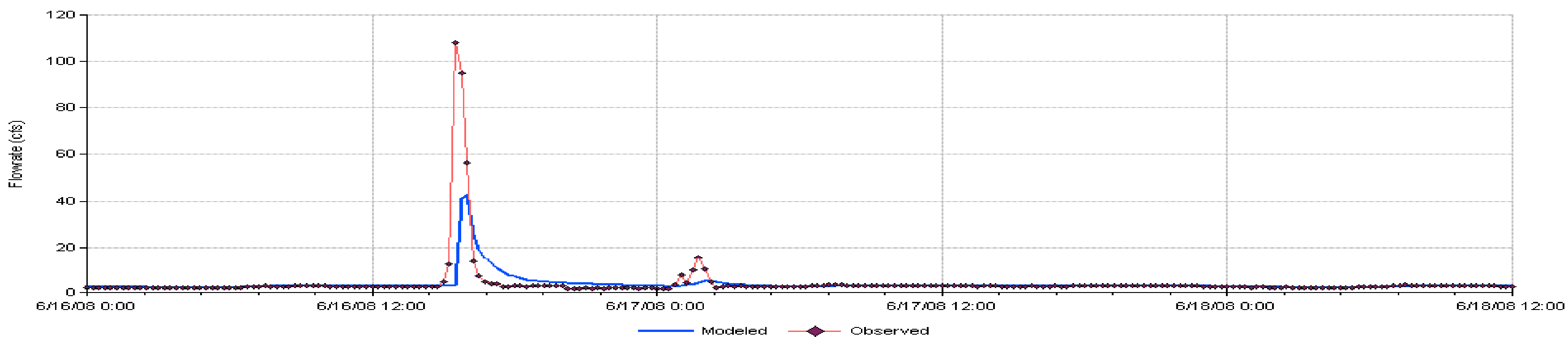

July23, 2.9 in
Troy RCSD_6
Vm=12.78 MG Vo=16.93 MG; Qm=120.4 cfs Qo=107.8 cfs
Flowrate (cfs)
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed


July23, 2.9 in
Troy RCSD_6
Vm=10.7 ft/s Vo=9.7 ft/s
Velocity (ft/s)
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed

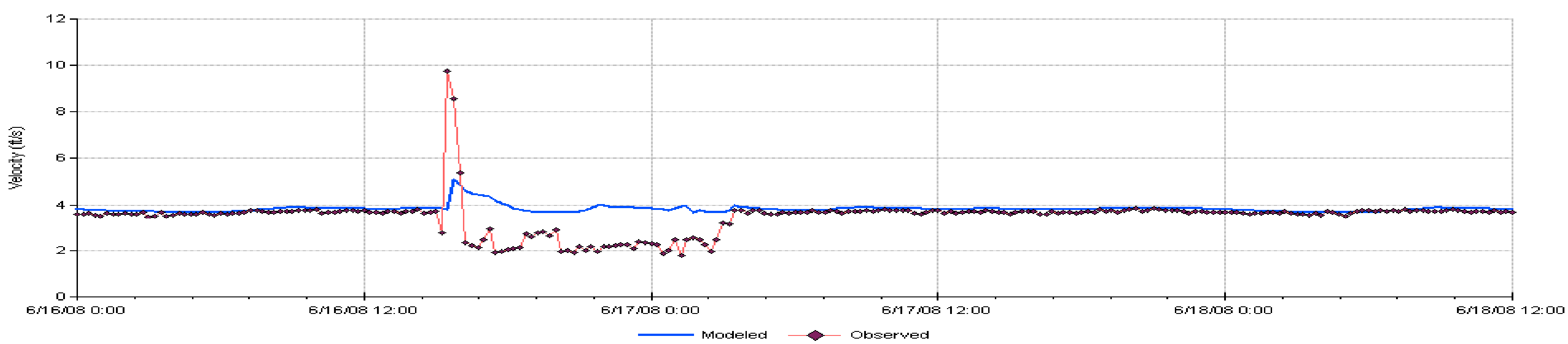
June16, 1.1 in
Troy RCSD_6
Dm=4.3 ft Do=6.1 ft

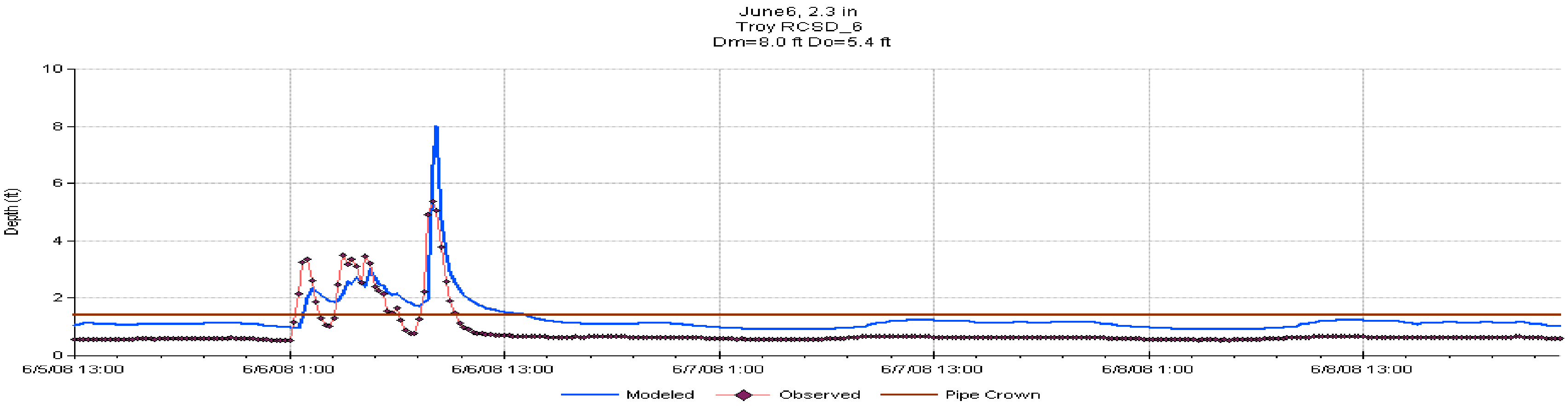


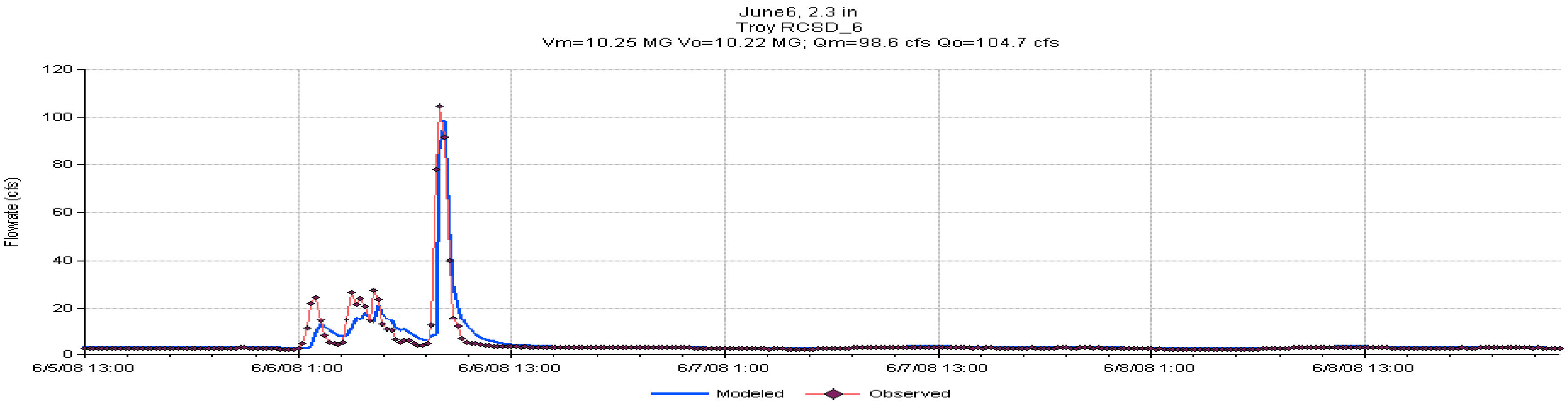
June16, 1.1 in
Troy RCSD_6
Vm=5.78 MG Vo=6.37 MG; Qm=42.4 cfs Qo=108.3 cfs

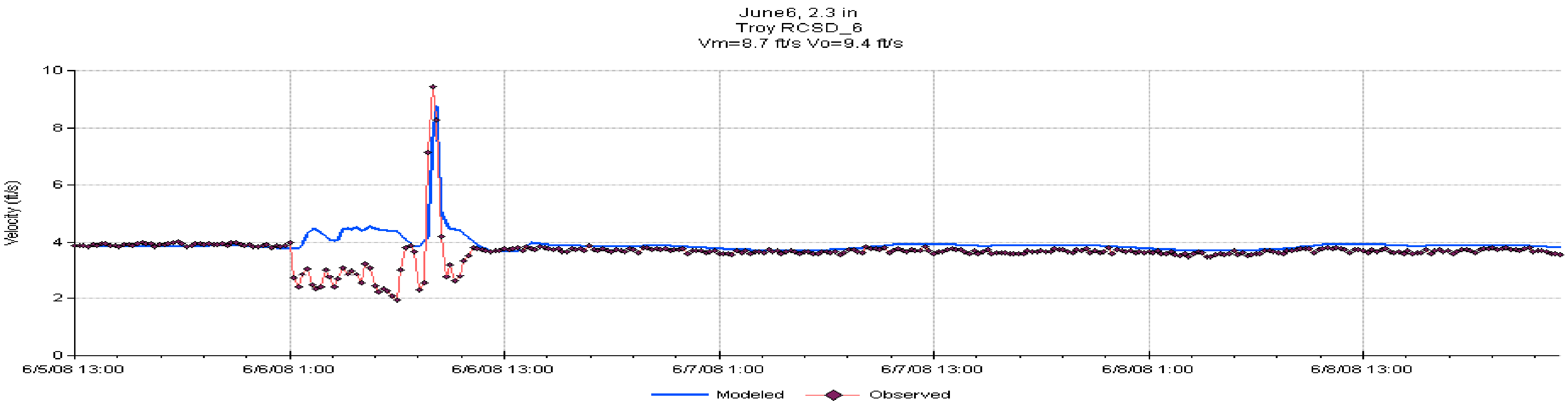


June16, 1.1 in
Troy RCSD_6
Vm=5.1 ft/s Vo=9.7 ft/s

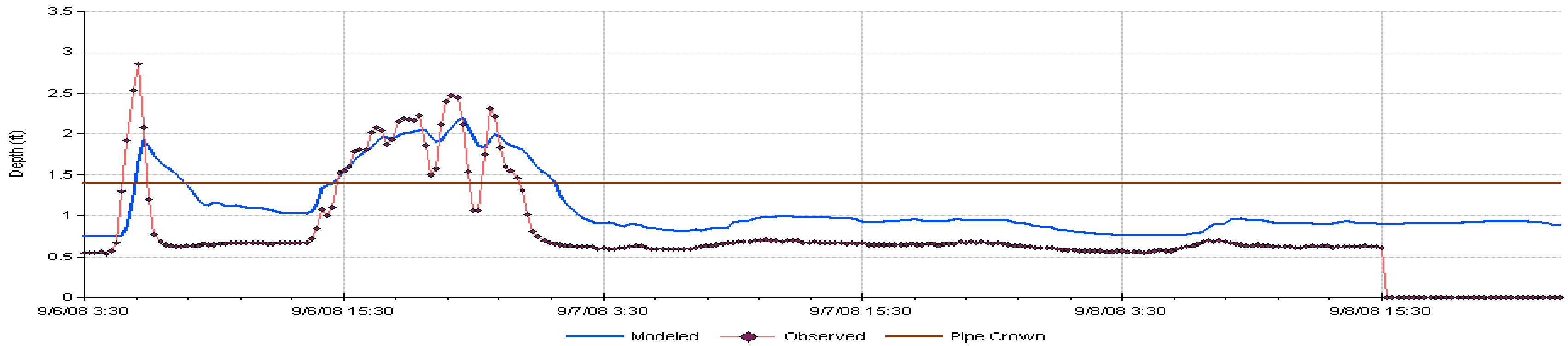



June6, 2.3 in
Troy RCSD_6
Dm=8.0 ft Do=5.4 ft
Depth (ft)
0
2
4
6
8
10
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed
Pipe Crown

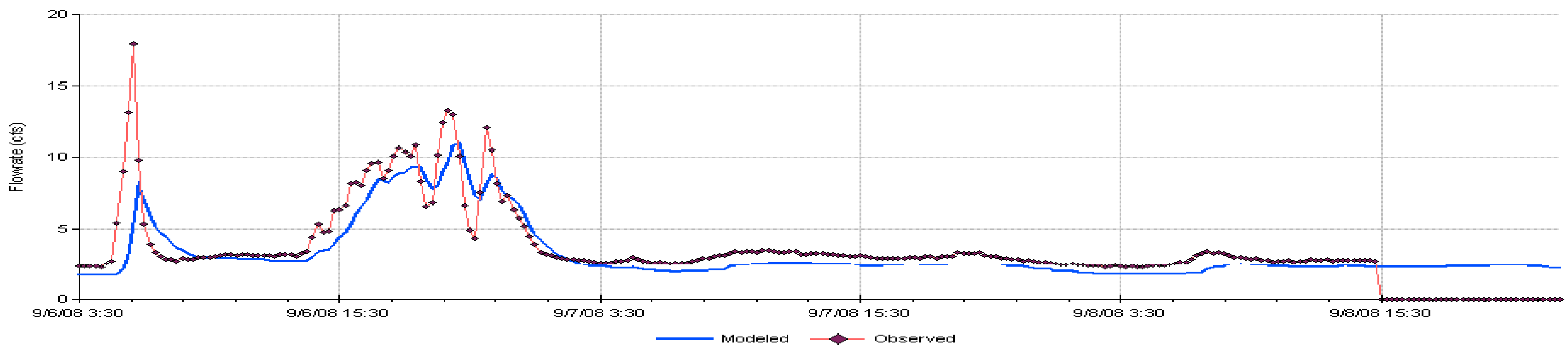

June6, 2.3 in
Troy RCSD_6
Vm=10.25 MG Vo=10.22 MG; Qm=98.6 cfs Qo=104.7 cfs
Flowrate (cfs)
0
20
40
60
80
100
120
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed


June6, 2.3 in
Troy RCSD_6
Vm=8.7 ft/s Vo=9.4 ft/s
Velocity (ft/s)
0
2
4
6
8
10
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed

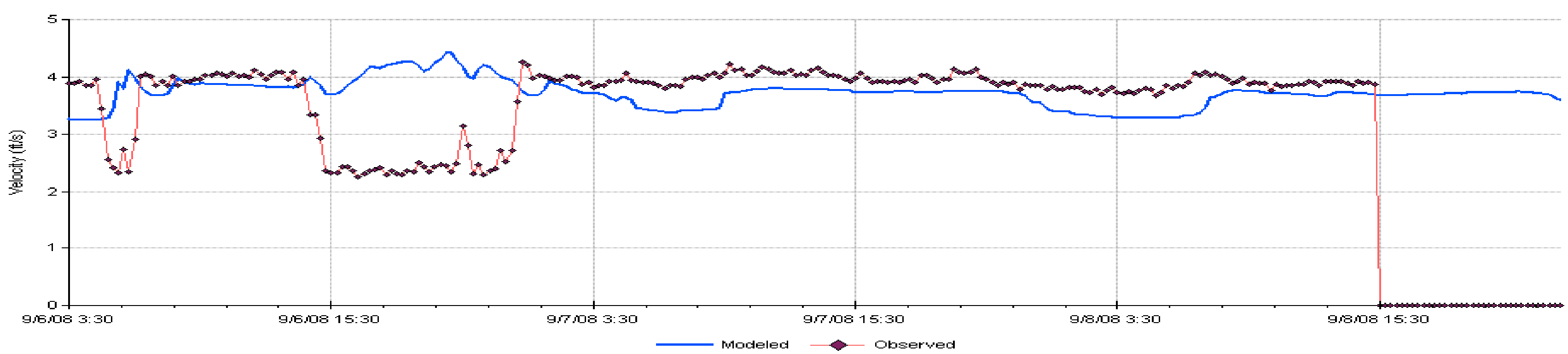
Sept6, 1.4 in
Troy RCSD_6
Dm=2.2 ft Do=2.9 ft

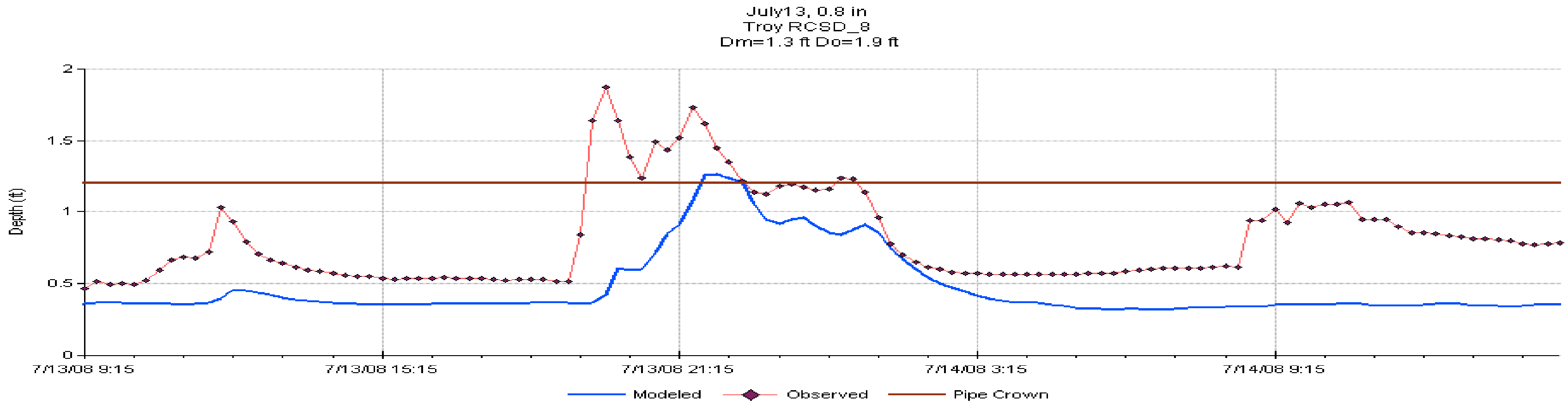


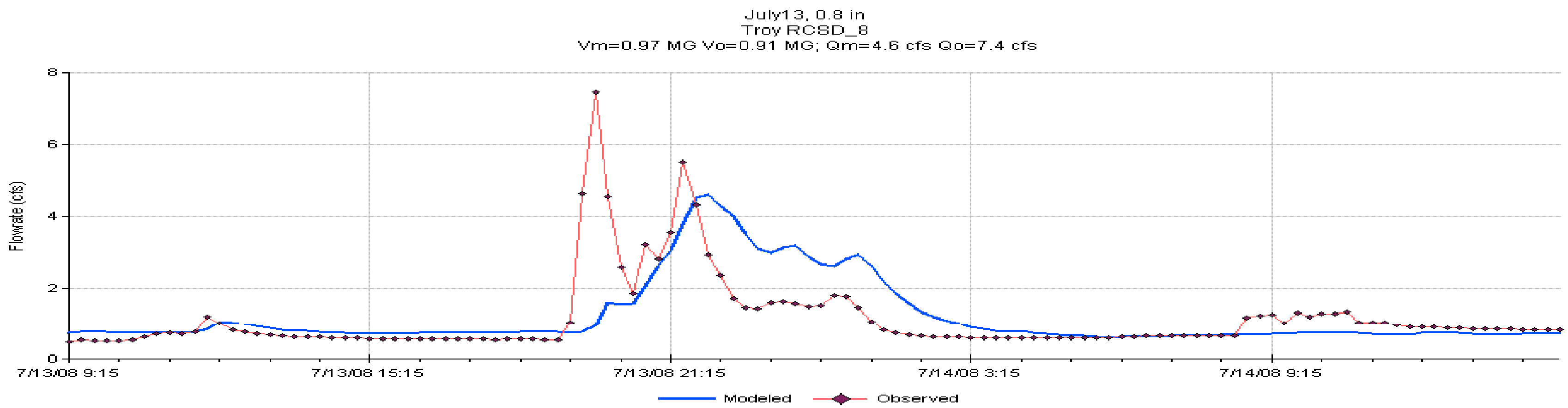
Sept6, 1.4 in
Troy RCSD_6
Vm=5.93 MG Vo=6.47 MG; Qm=11.0 cfs Qo=18.0 cfs

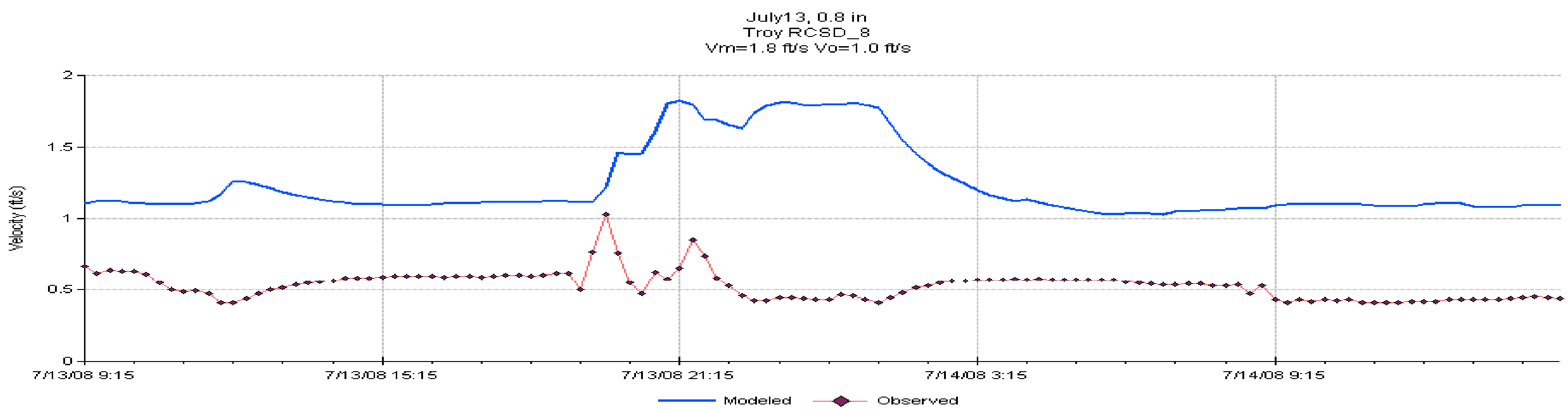


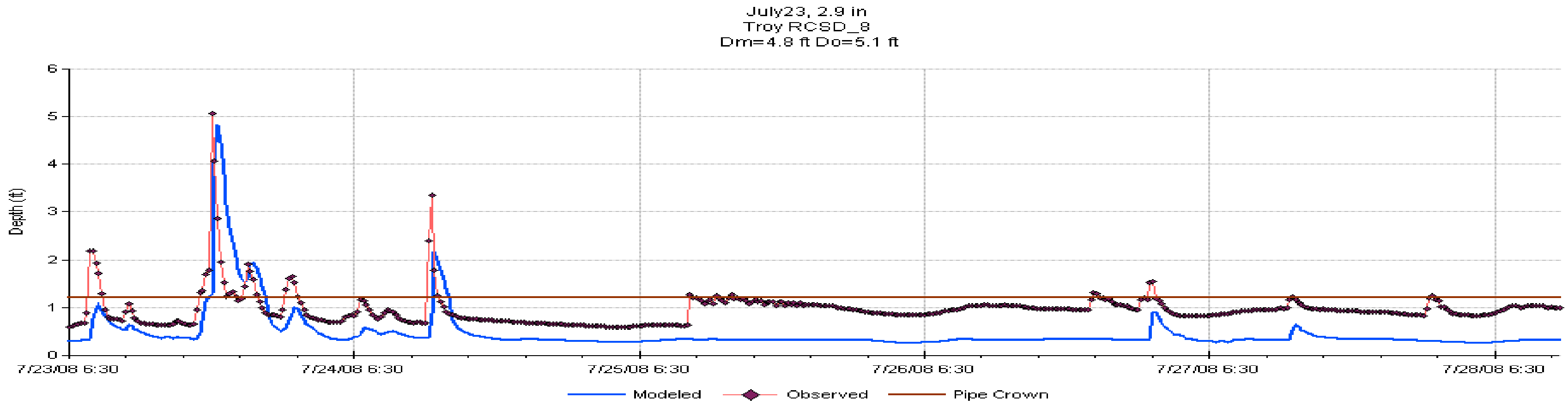
Sept6, 1.4 in
Troy RCSD_6
Vm=4.4 ft/s Vo=4.3 ft/s

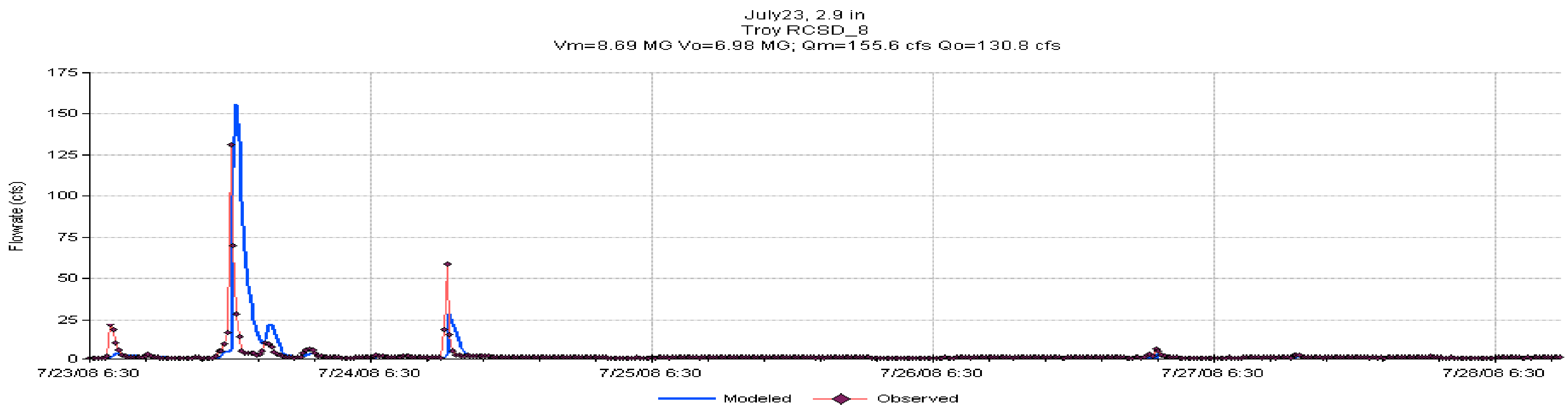


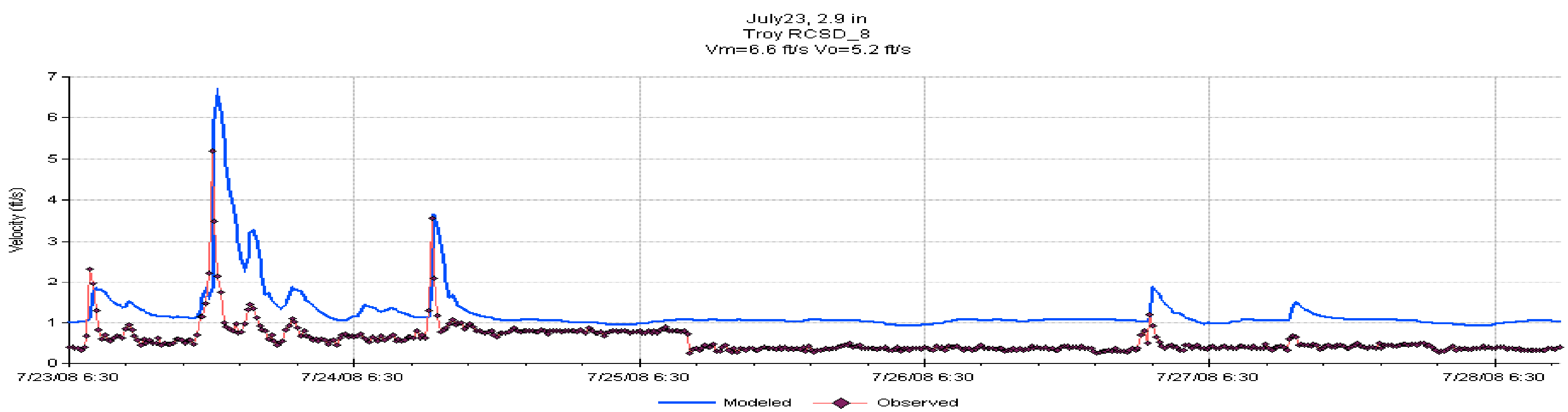

July13, 0.8 in
Troy RCSD_8
Dm=1.3 ft Do=1.9 ft
Depth (ft)
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed
Pipe Crown

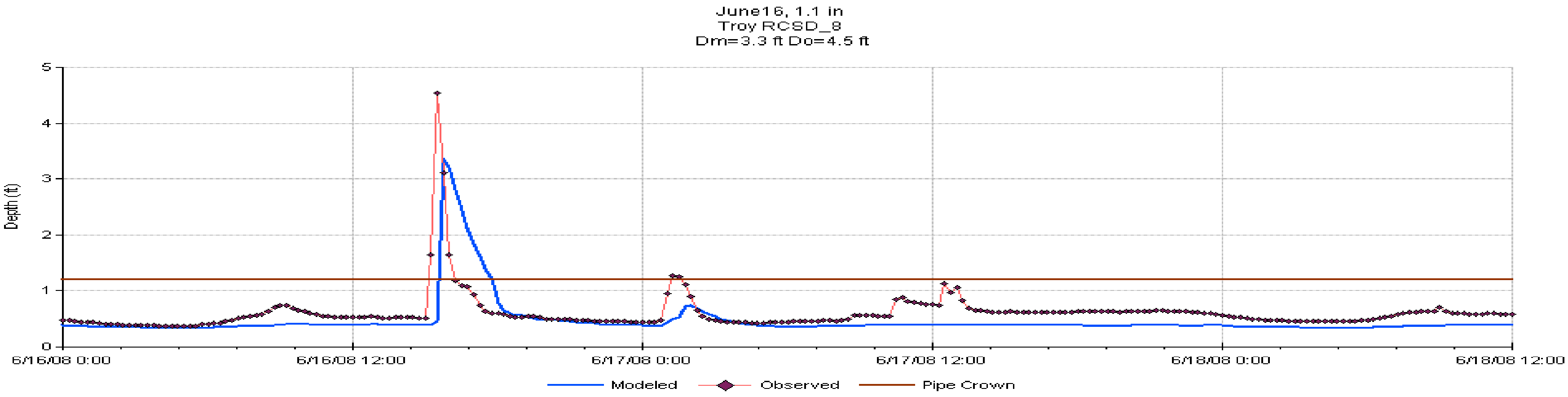

July13, 0.8 in
Troy RCSD_8
Vm=0.97 MG Vo=0.91 MG; Qm=4.6 cfs Qo=7.4 cfs
Flowrate (cfs)
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed

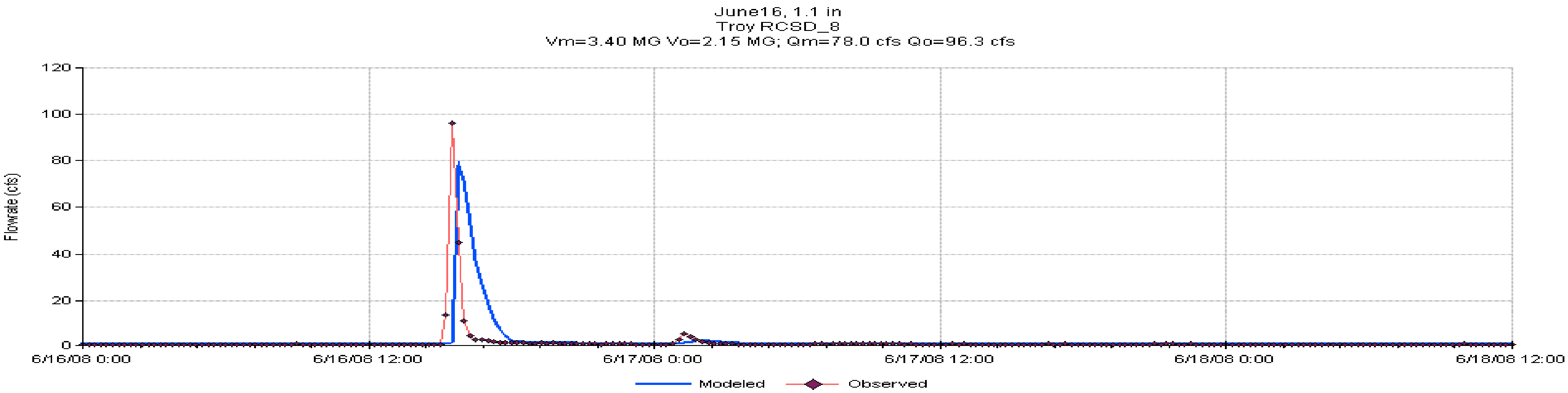

July13, 0.8 in
Troy RCSD_8
Vm=1.8 ft/s Vo=1.0 ft/s
Velocity (ft/s)
7/13/08 9:15
7/13/08 15:15
7/13/08 21:15
7/14/08 3:15
7/14/08 9:15
Modeled
Observed

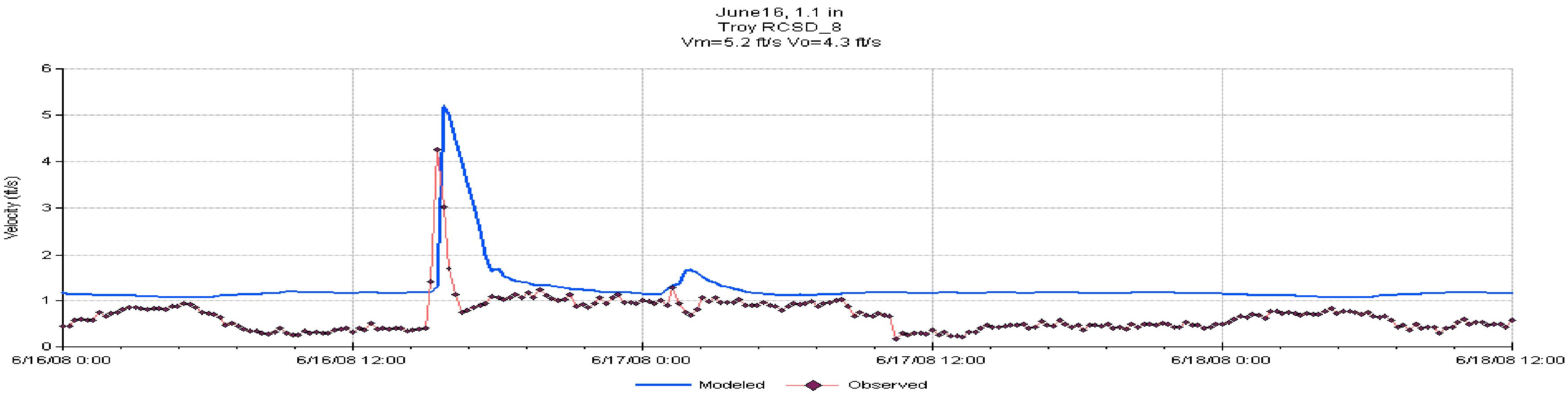

July23, 2.9 in
Troy RCSD_8
Dm=4.8 ft Do=5.1 ft
Depth (ft)
6
5
4
3
2
1
0
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed
Pipe Crown

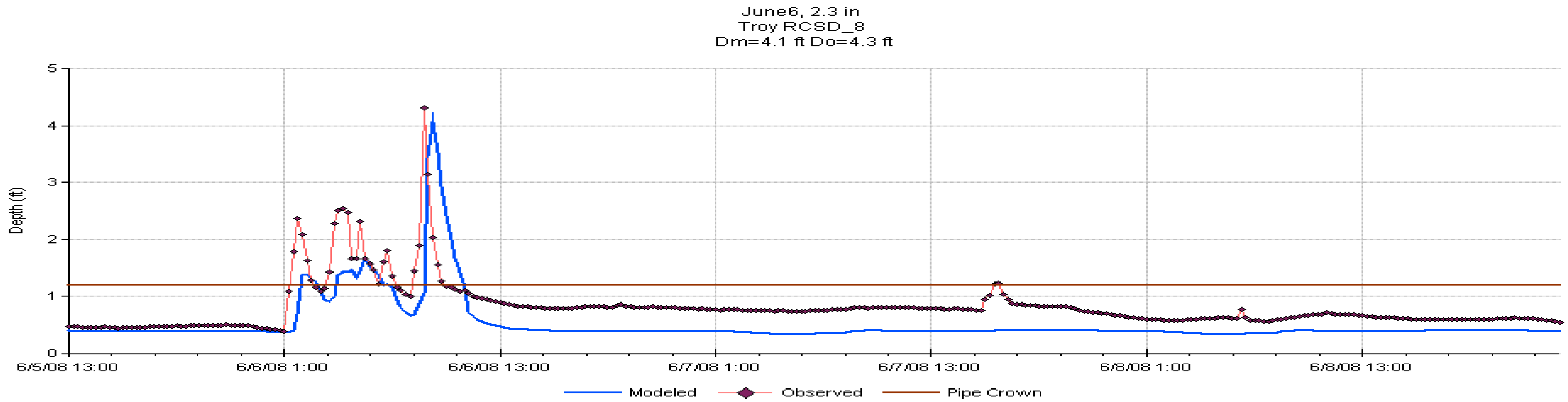

July23, 2.9 in
Troy RCSD_8
Vm=8.69 MG Vo=6.98 MG; Qm=155.6 cfs Qo=130.8 cfs
Flowrate (cfs)
175
150
125
100
75
50
25
0
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed

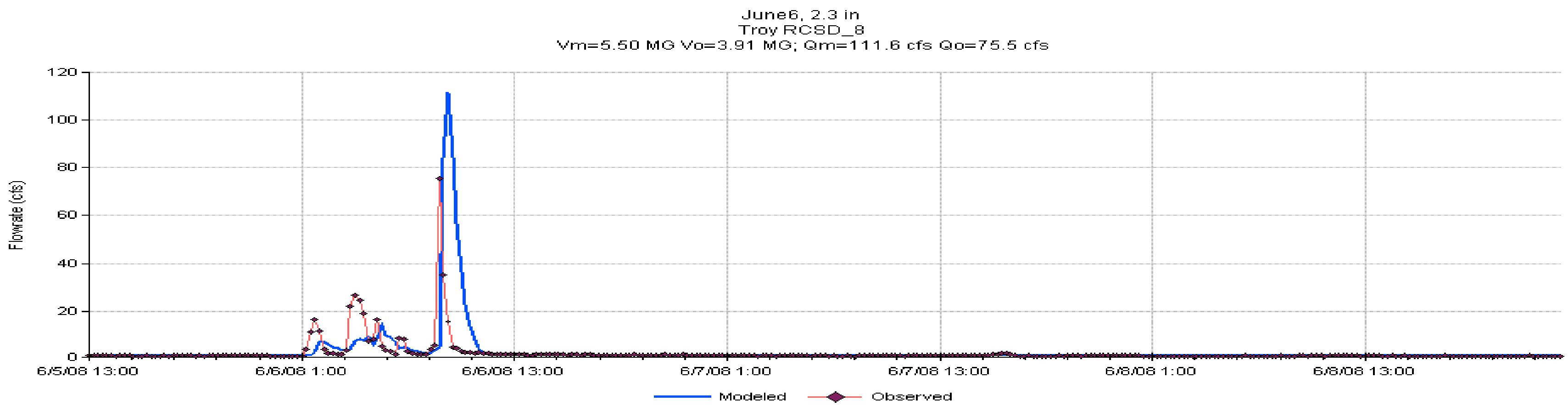

July23, 2.9 in
Troy RCSD_8
Vm=6.6 ft/s Vo=5.2 ft/s
Velocity (ft/s)
7
6
5
4
3
2
1
0
7/23/08 6:30
7/24/08 6:30
7/25/08 6:30
7/26/08 6:30
7/27/08 6:30
7/28/08 6:30
Modeled
Observed

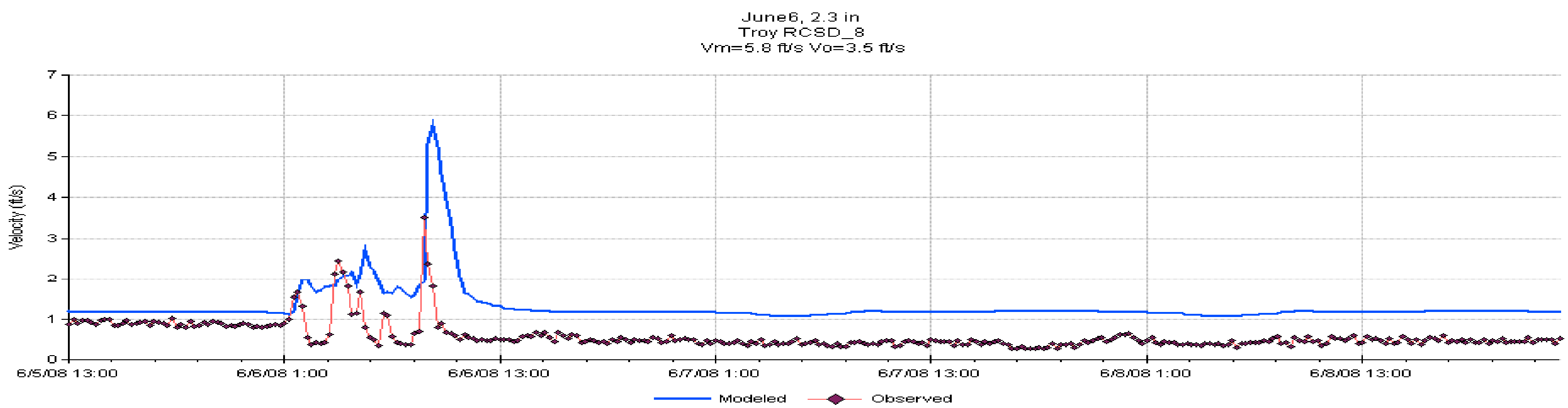

June16, 1.1 in
Troy RCSD_8
Dm=3.3 ft Do=4.5 ft
Depth (ft)
0
1
2
3
4
5
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
6/18/08 12:00
Modeled
Observed
Pipe Crown

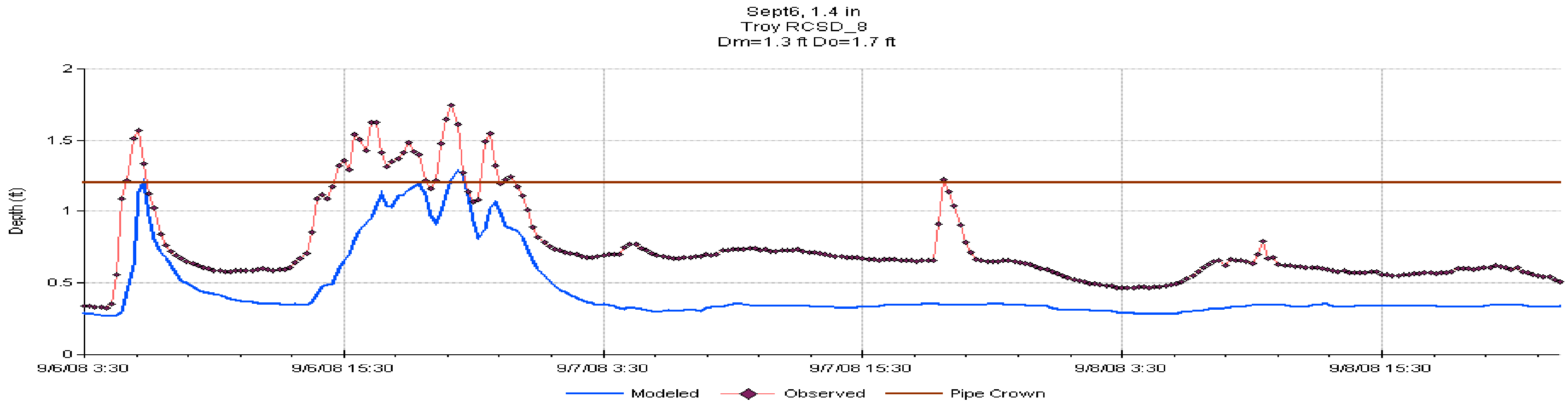

June16, 1.1 in
Troy RCSD_8
Vm=3.40 MG Vo=2.15 MG; Qm=78.0 cfs Qo=96.3 cfs
Flowrate (cfs)
0
20
40
60
80
100
120
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
6/18/08 12:00
Modeled
Observed

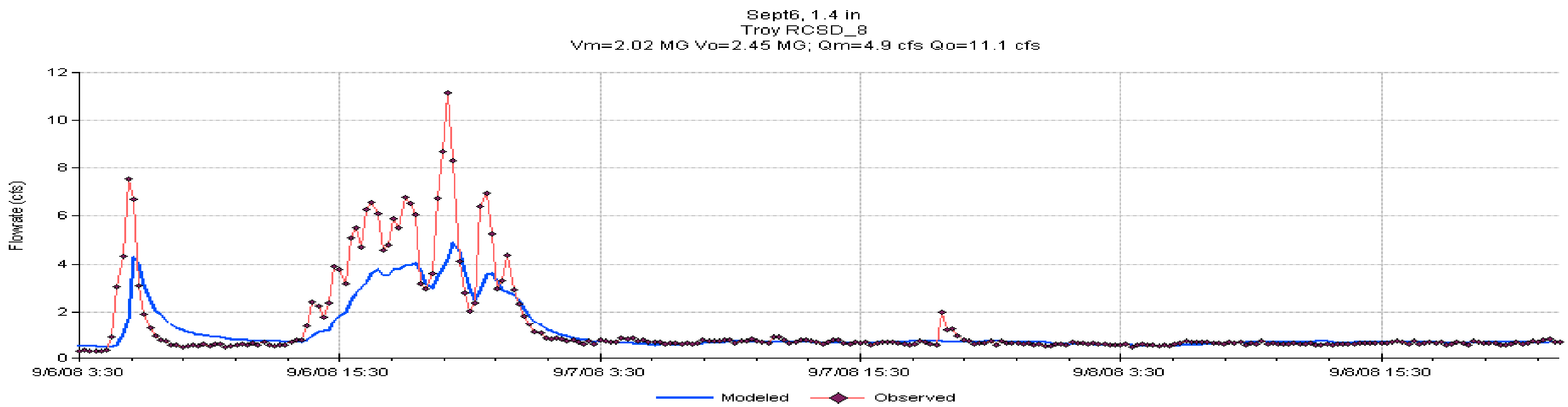

June16, 1.1 in
Troy RCSD_8
Vm=5.2 ft/s Vo=4.3 ft/s
Velocity (ft/s)
0
1
2
3
4
5
6
6/16/08 0:00
6/16/08 12:00
6/17/08 0:00
6/17/08 12:00
6/18/08 0:00
6/18/08 12:00
Modeled
Observed

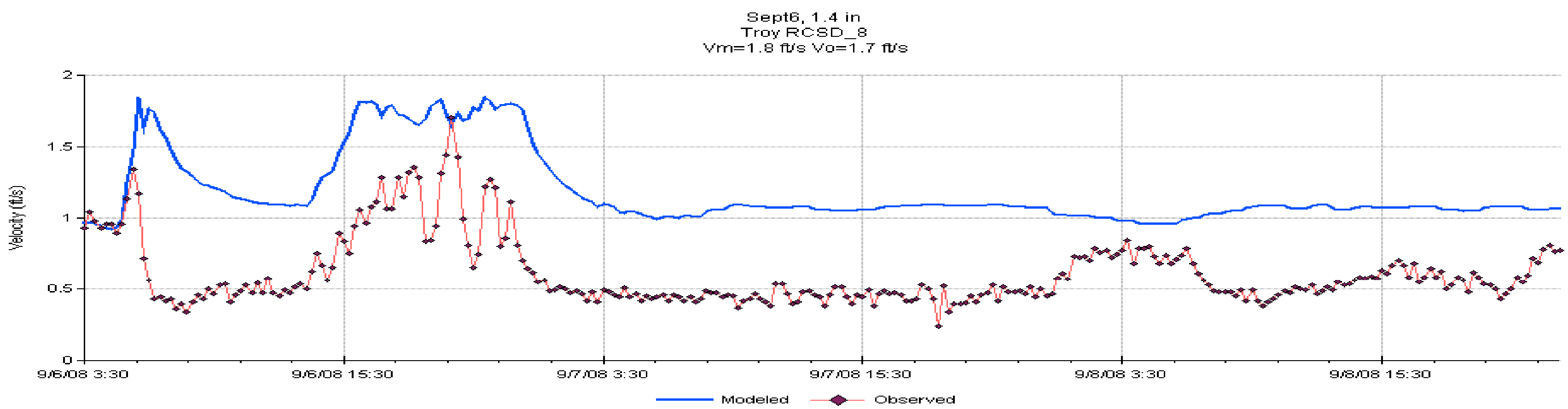

June6, 2.3 in
Troy RCSD_8
Dm=4.1 ft Do=4.3 ft
Depth (ft)
0
1
2
3
4
5
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed
Pipe Crown


June6, 2.3 in
Troy RCSD_8
Vm=5.50 MG Vo=3.91 MG; Qm=111.6 cfs Qo=75.5 cfs
Flowrate (cfs)
0
20
40
60
80
100
120
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed


June6, 2.3 in
Troy RCSD_8
Vm=5.8 ft/s Vo=3.5 ft/s
Velocity (ft/s)
0
1
2
3
4
5
6
7
6/5/08 13:00
6/6/08 1:00
6/6/08 13:00
6/7/08 1:00
6/7/08 13:00
6/8/08 1:00
6/8/08 13:00
Modeled
Observed

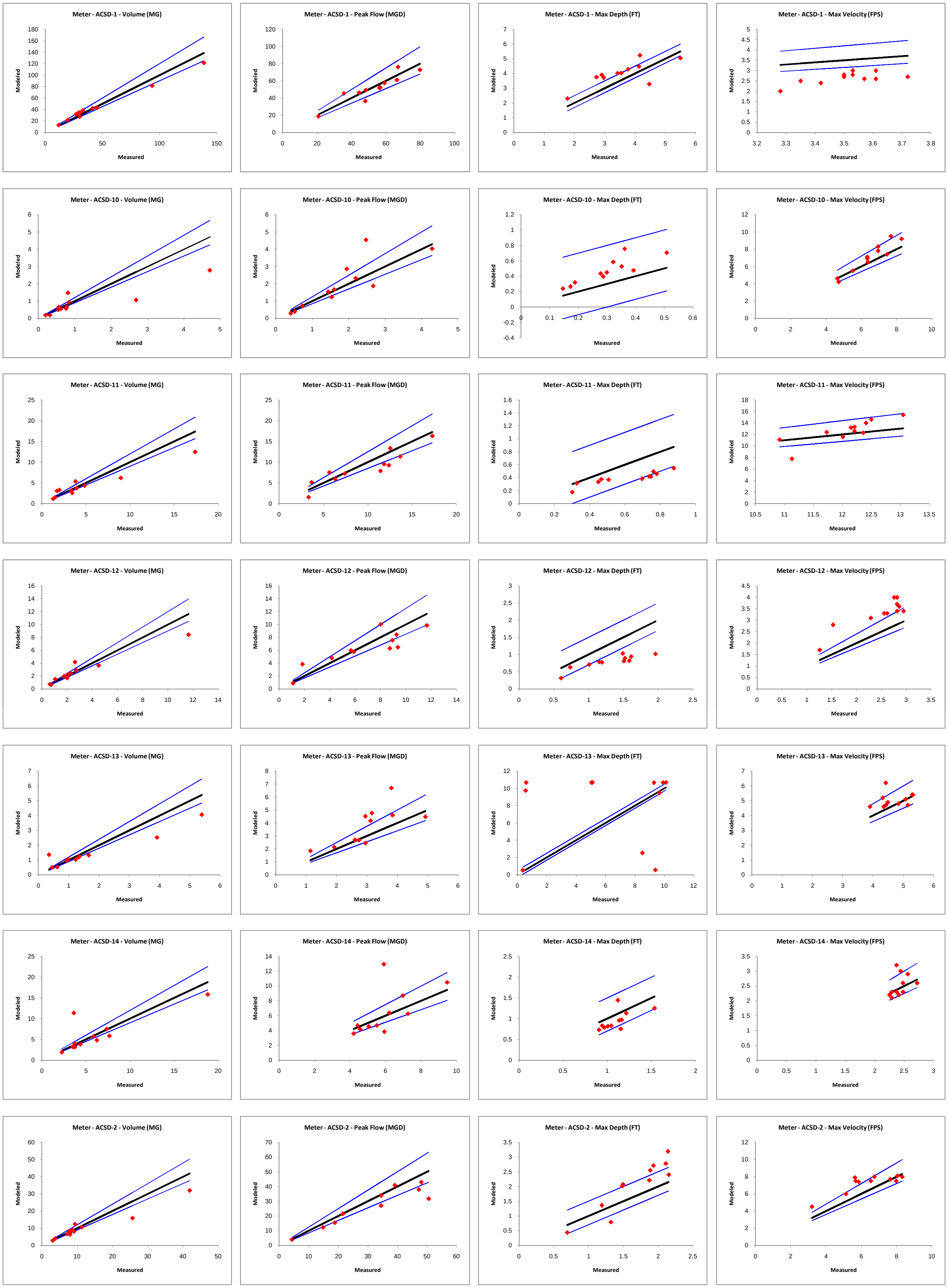

Sept6, 1.4 in
Troy RCSD_8
Dm=1.3 ft Do=1.7 ft
Depth (ft)
0
0.5
1
1.5
2
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed
Pipe Crown


Sept6, 1.4 in
Troy RCSD_8
Vm=2.02 MG Vo=2.45 MG; Qm=4.9 cfs Qo=11.1 cfs
Flowrate (cfs)
0
2
4
6
8
10
12
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed

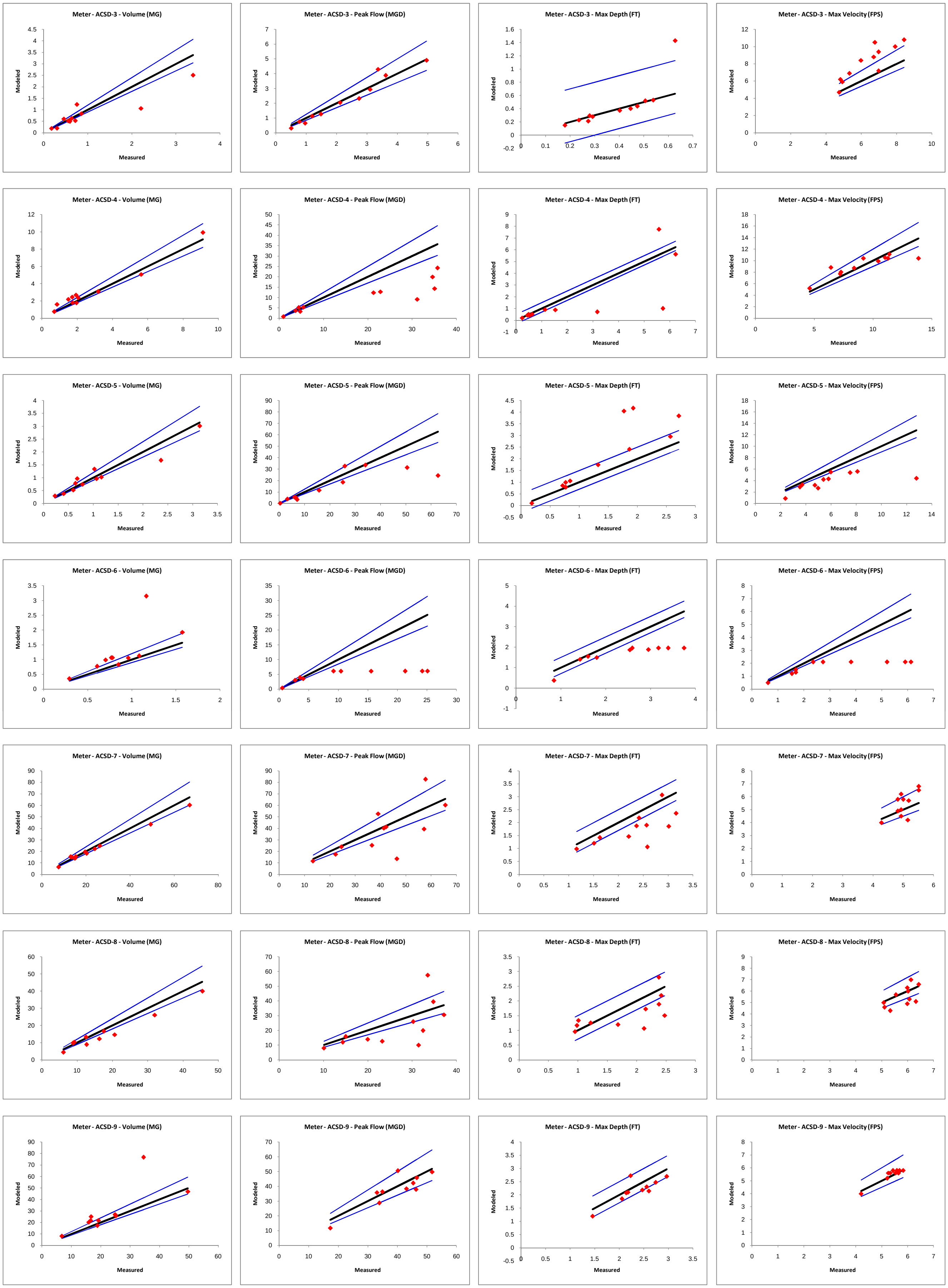

Sept6, 1.4 in
Troy RCSD_8
Vm=1.8 ft/s Vo=1.7 ft/s
Velocity (ft/s)
0
0.5
1
1.5
2
9/6/08 3:30
9/6/08 15:30
9/7/08 3:30
9/7/08 15:30
9/8/08 3:30
9/8/08 15:30
Modeled
Observed

Appendix G. All 2008 storms scatterplots

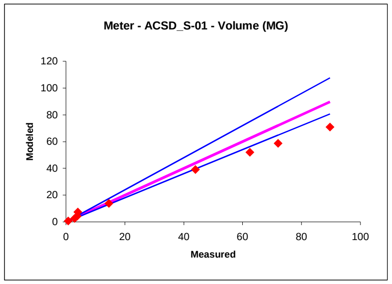
Albany North Model Calibration
All Storms and Dry Periods
10/19/2009

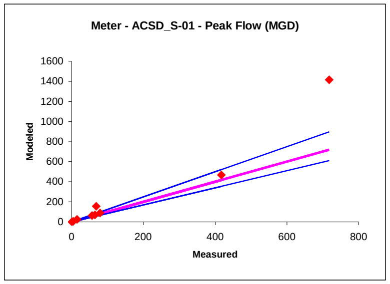


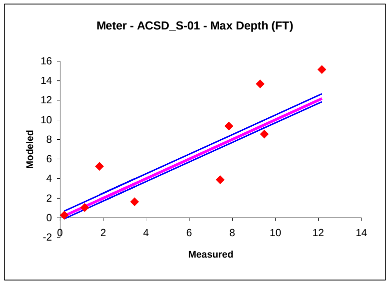
Albany North Model Calibration
All Storms and Dry Periods
10/19/2009

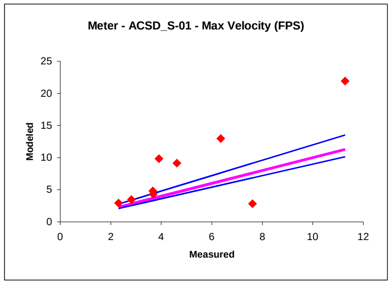


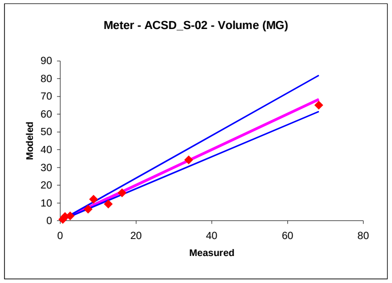
Albany South WWTP Model Calibration
All Storms and Dry Periods
(Baseline_10)

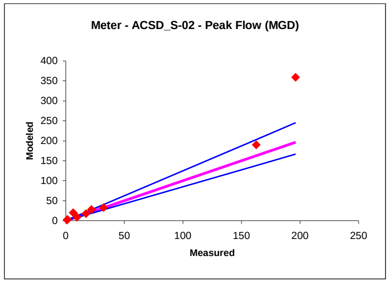


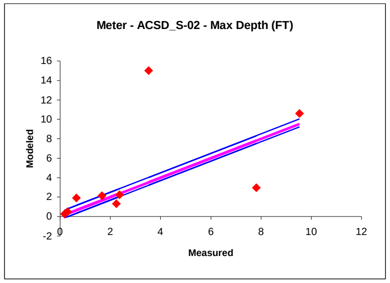


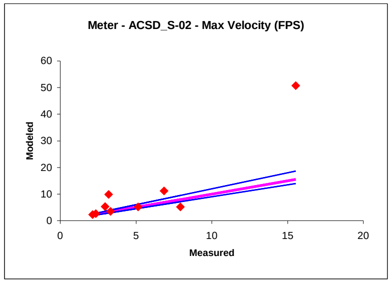


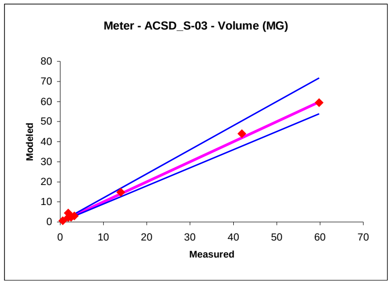


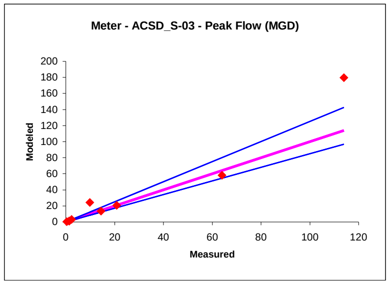


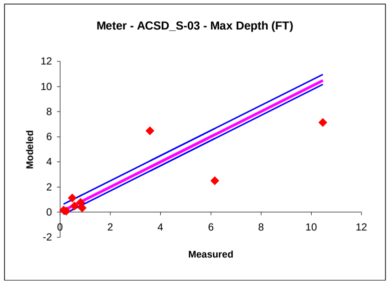


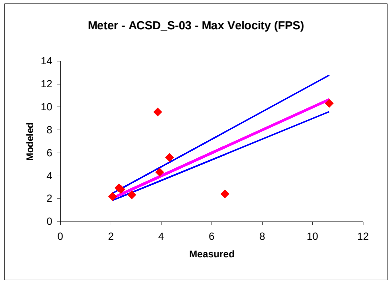


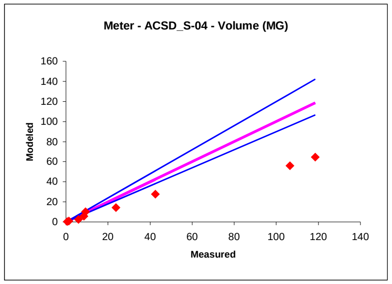


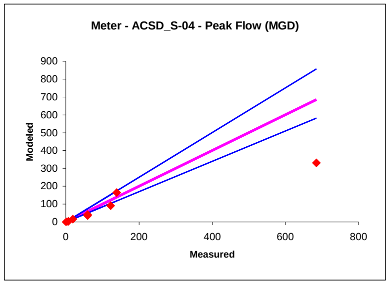


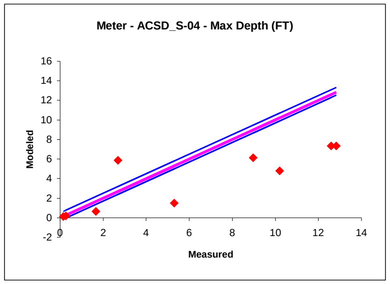


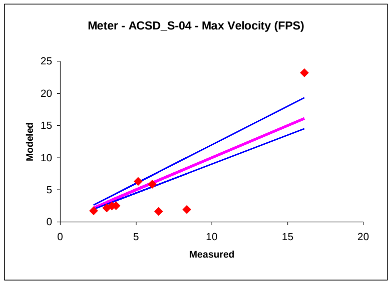




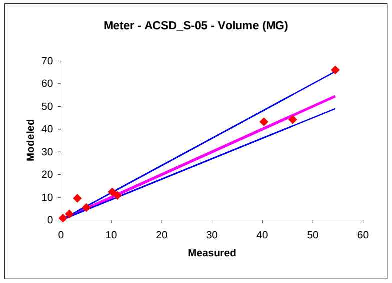


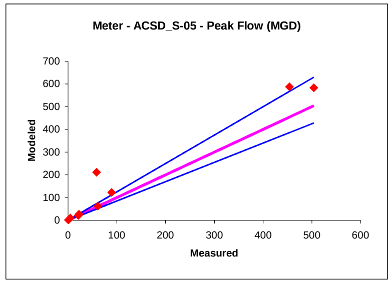


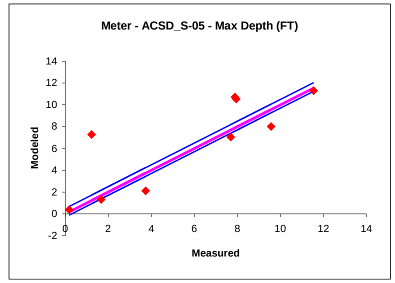


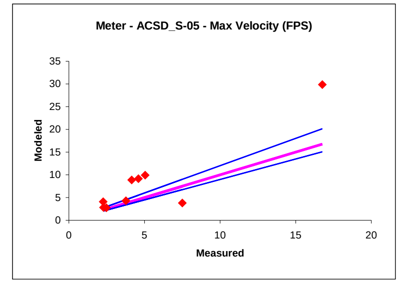


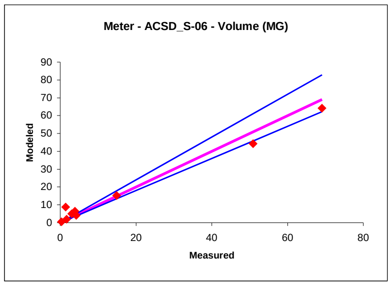
Albany South WWTP Model Calibration
All Storms and Dry Periods
(Baseline_10)

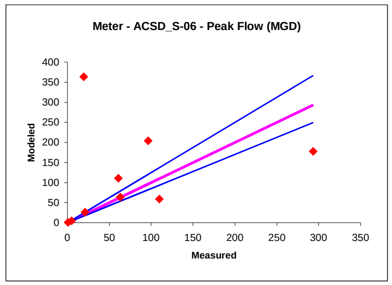


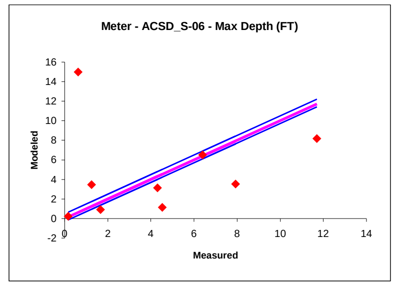


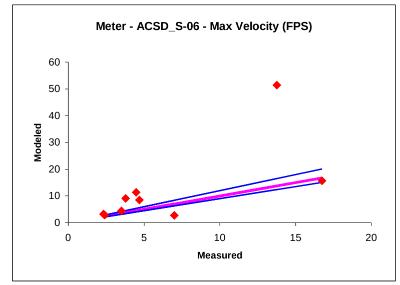


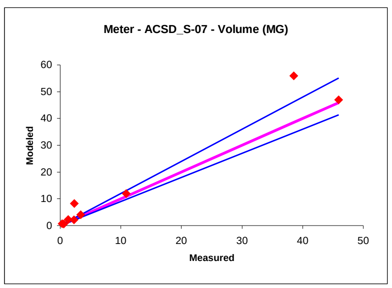


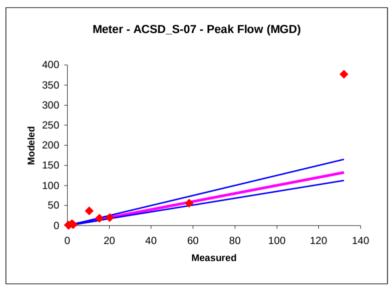


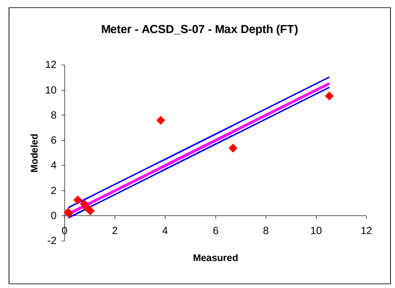


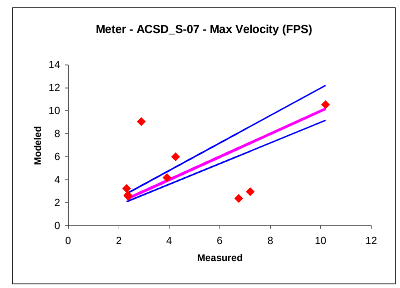




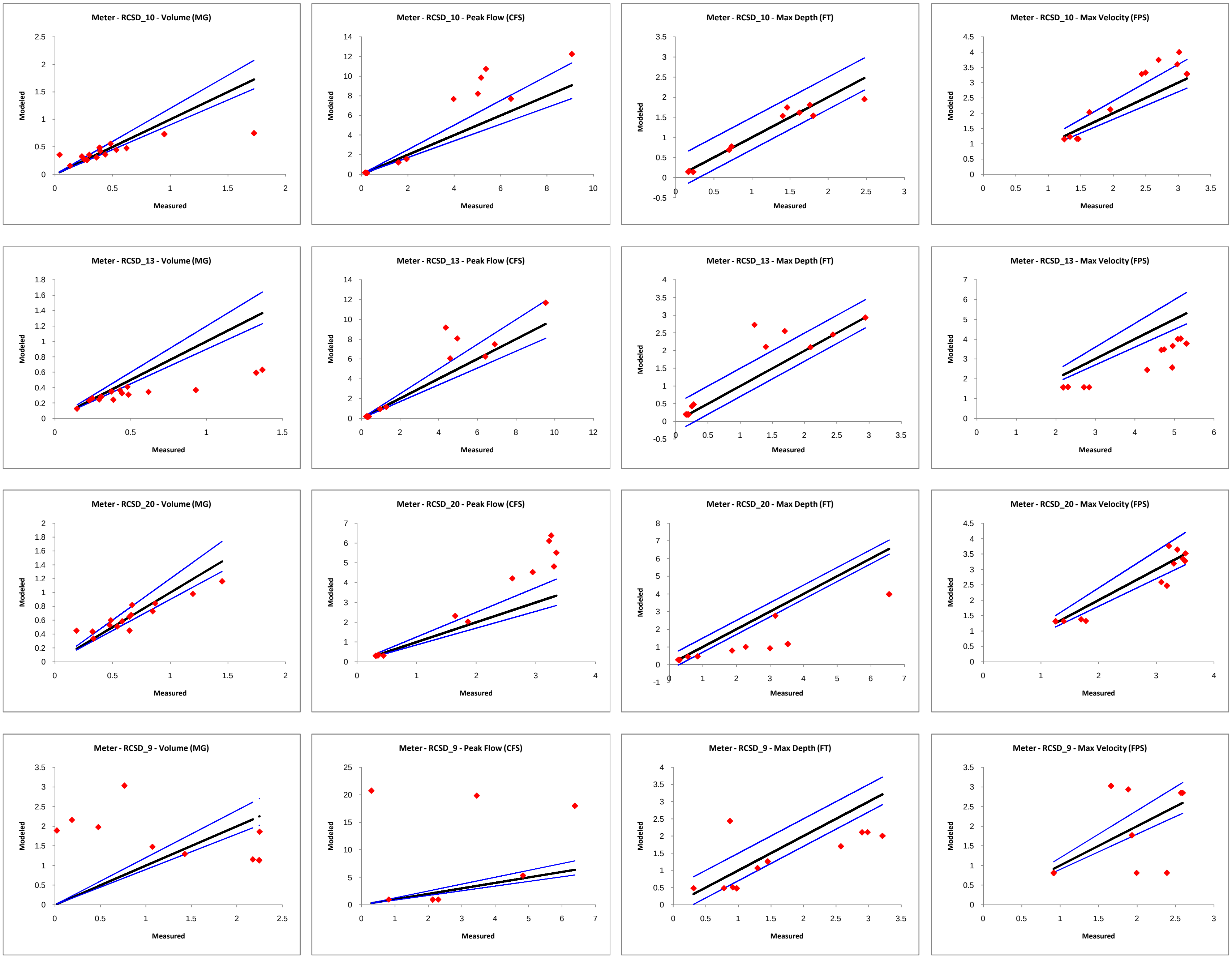




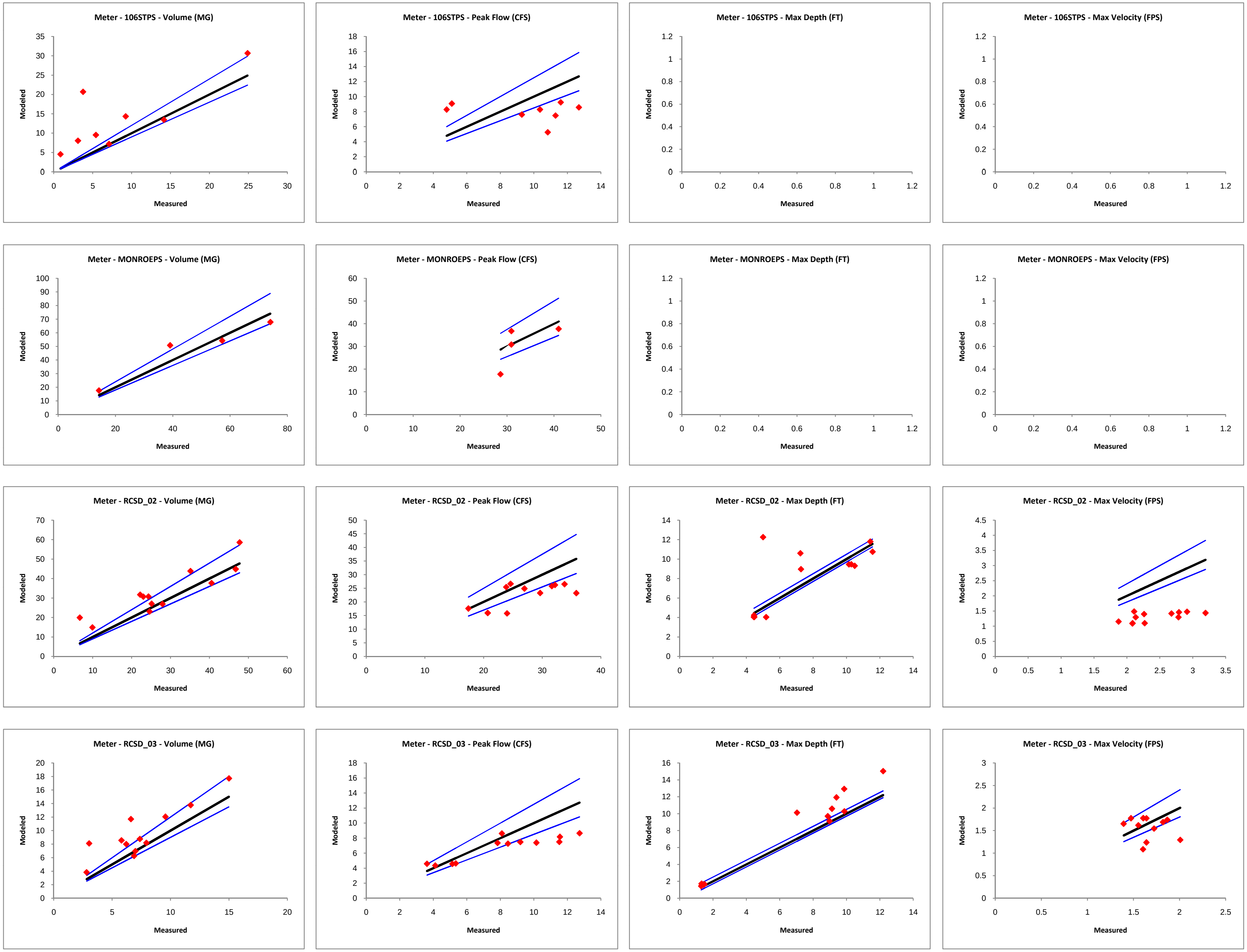




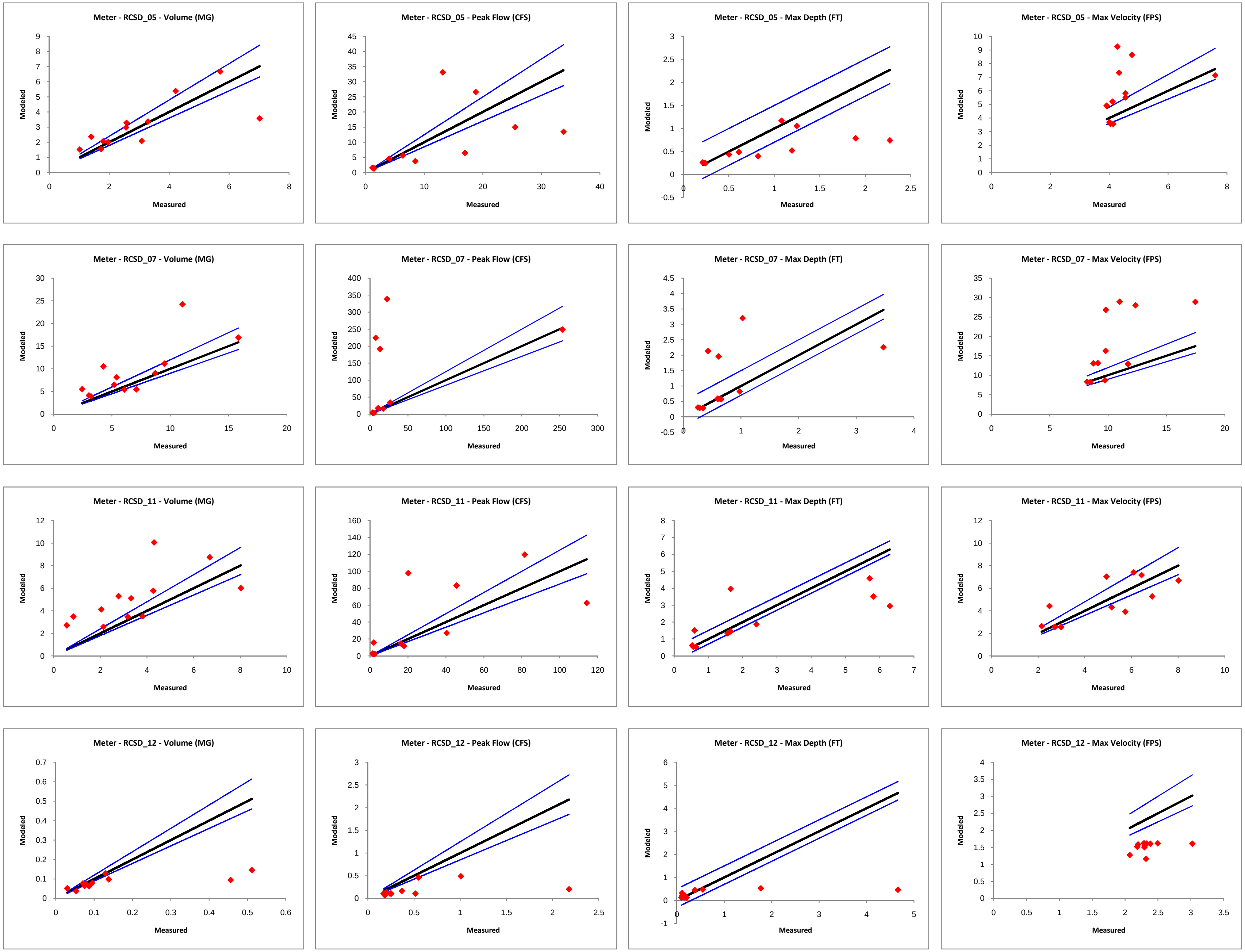
Rensselaer Model Calibration
All Storms and Dry Periods
3/14/09



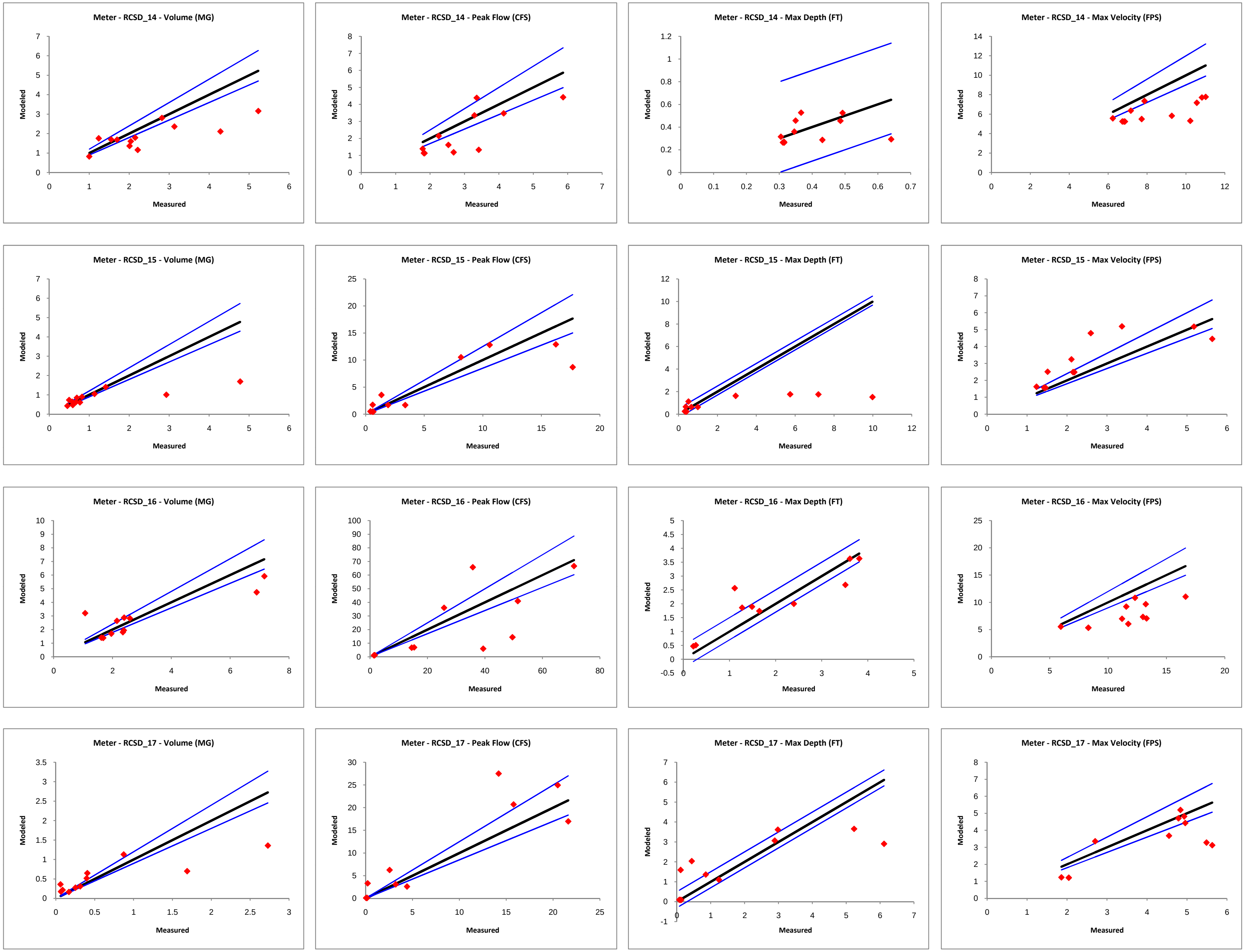
Troy Model Calibration
All Storms and Dry Periods
6/1/2009
(Troy_wet8)



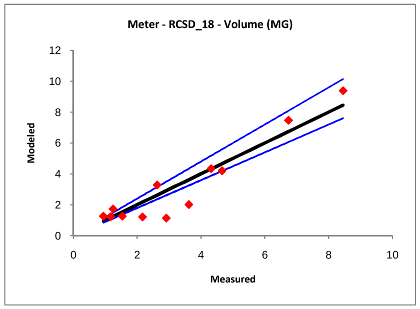
Troy Model Calibration
All Storms and Dry Periods
6/1/2009
(Troy_wet8)

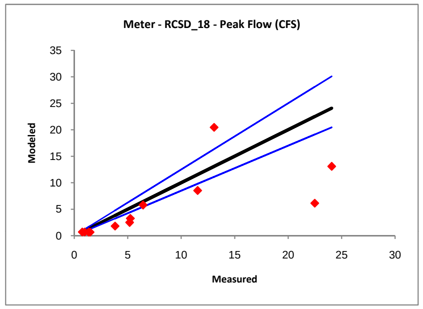


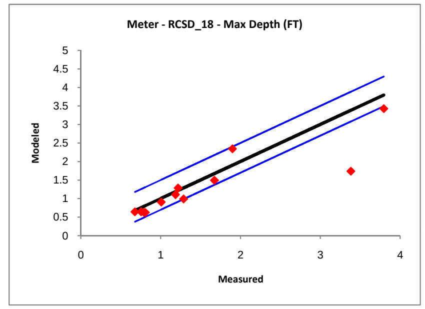
Troy Model Calibration
All Storms and Dry Periods
6/1/2009
(Troy_wet8)

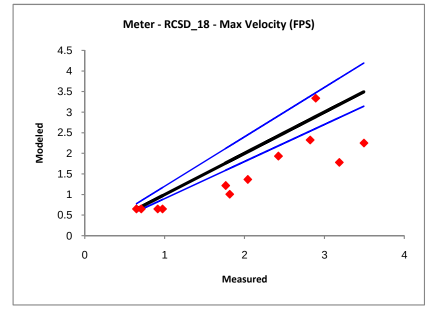


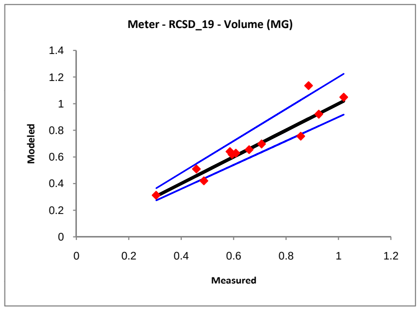
Troy Model Calibration
All Storms and Dry Periods
6/1/2009
(Troy_wet8)

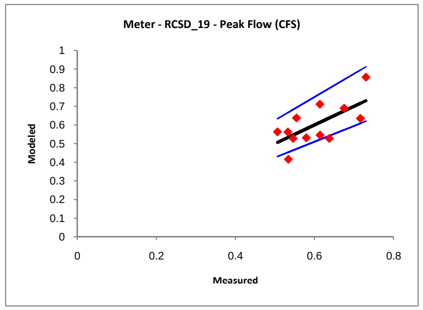


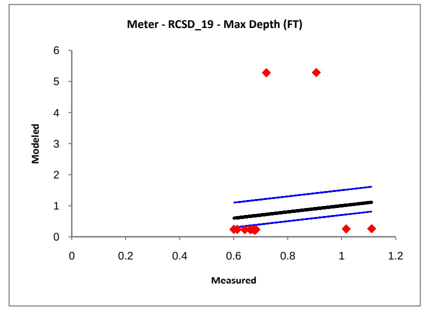


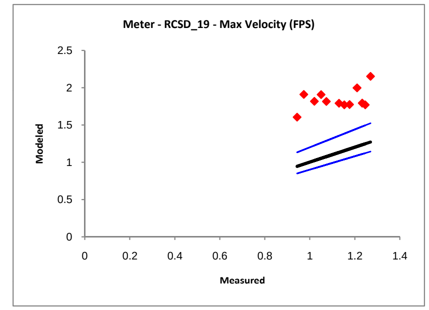


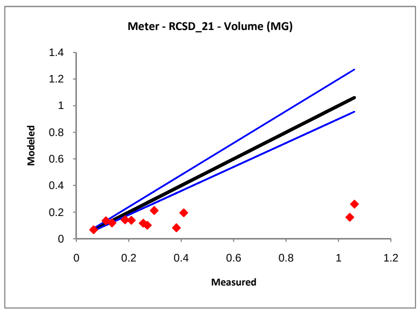


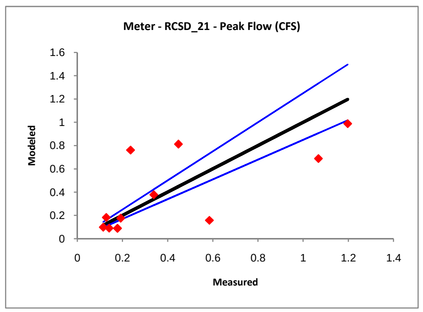


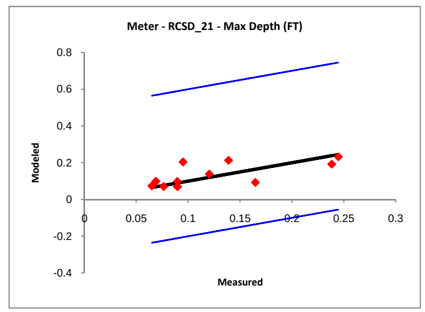


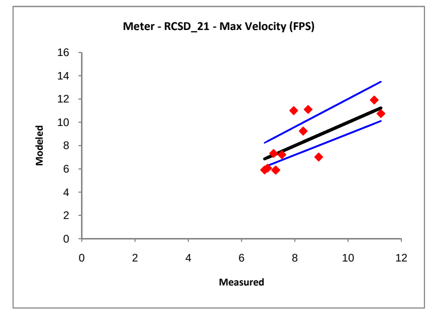


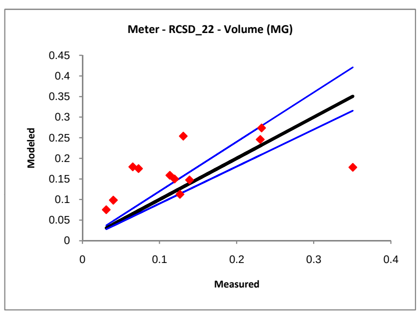


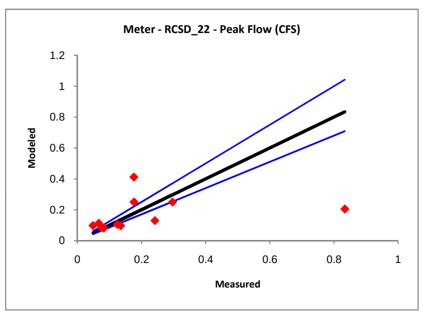


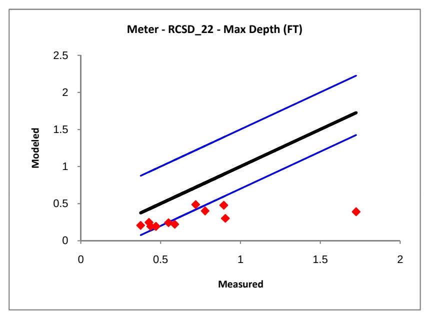


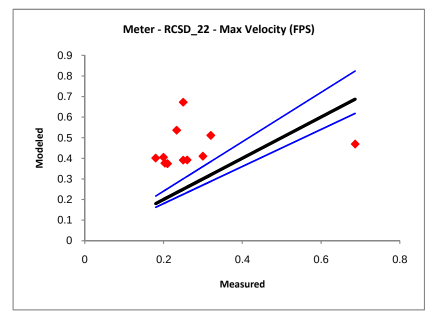




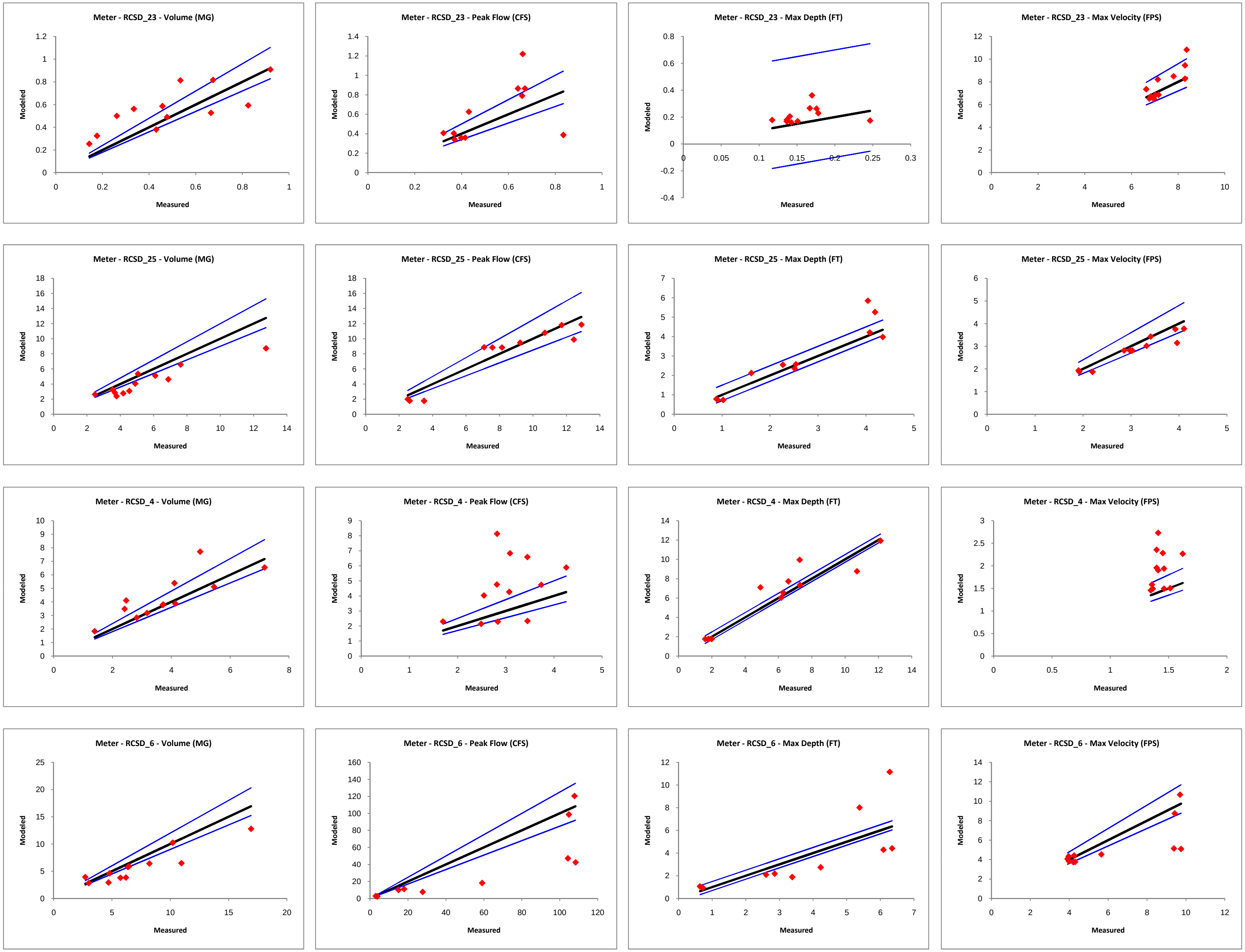




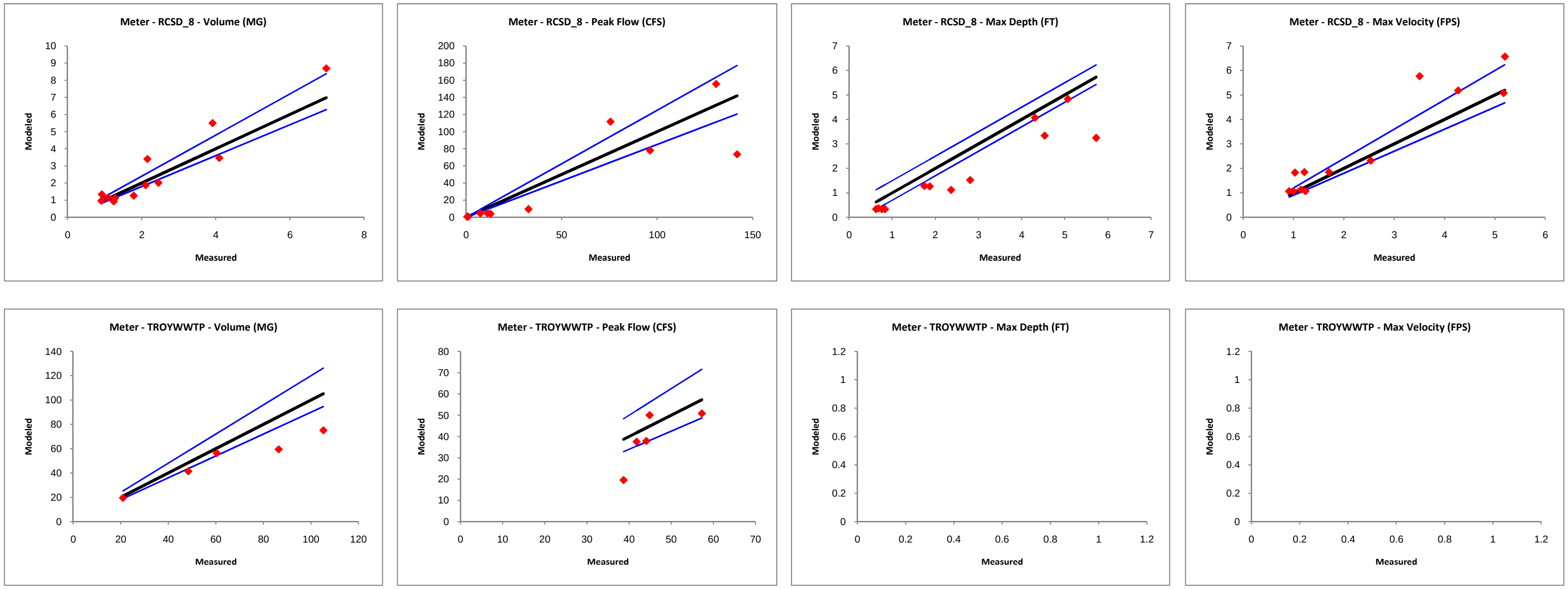




Troy Model Calibration
All Storms and Dry Periods
6/1/2009
(Troy_wet8)



Troy Model Calibration
All Storms and Dry Periods
6/1/2009
(Troy_wet8)



Citizens Advisory Committee Presentation

CSO Long Term Control Plan

Sewer System Baseline Conditions

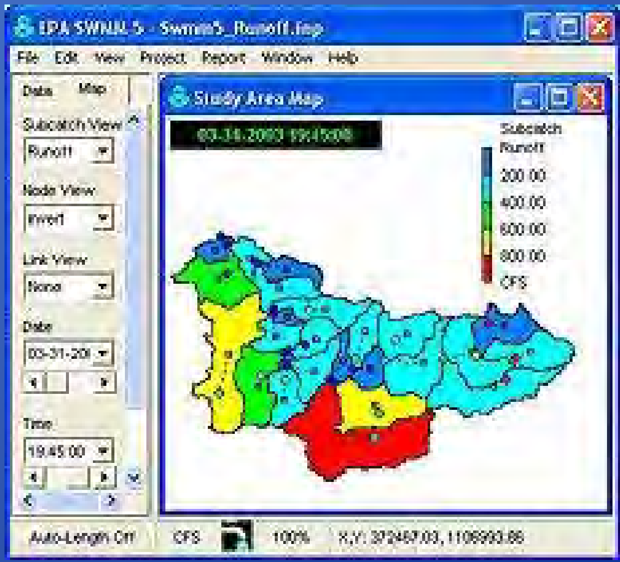
October 7, 2009

Outline

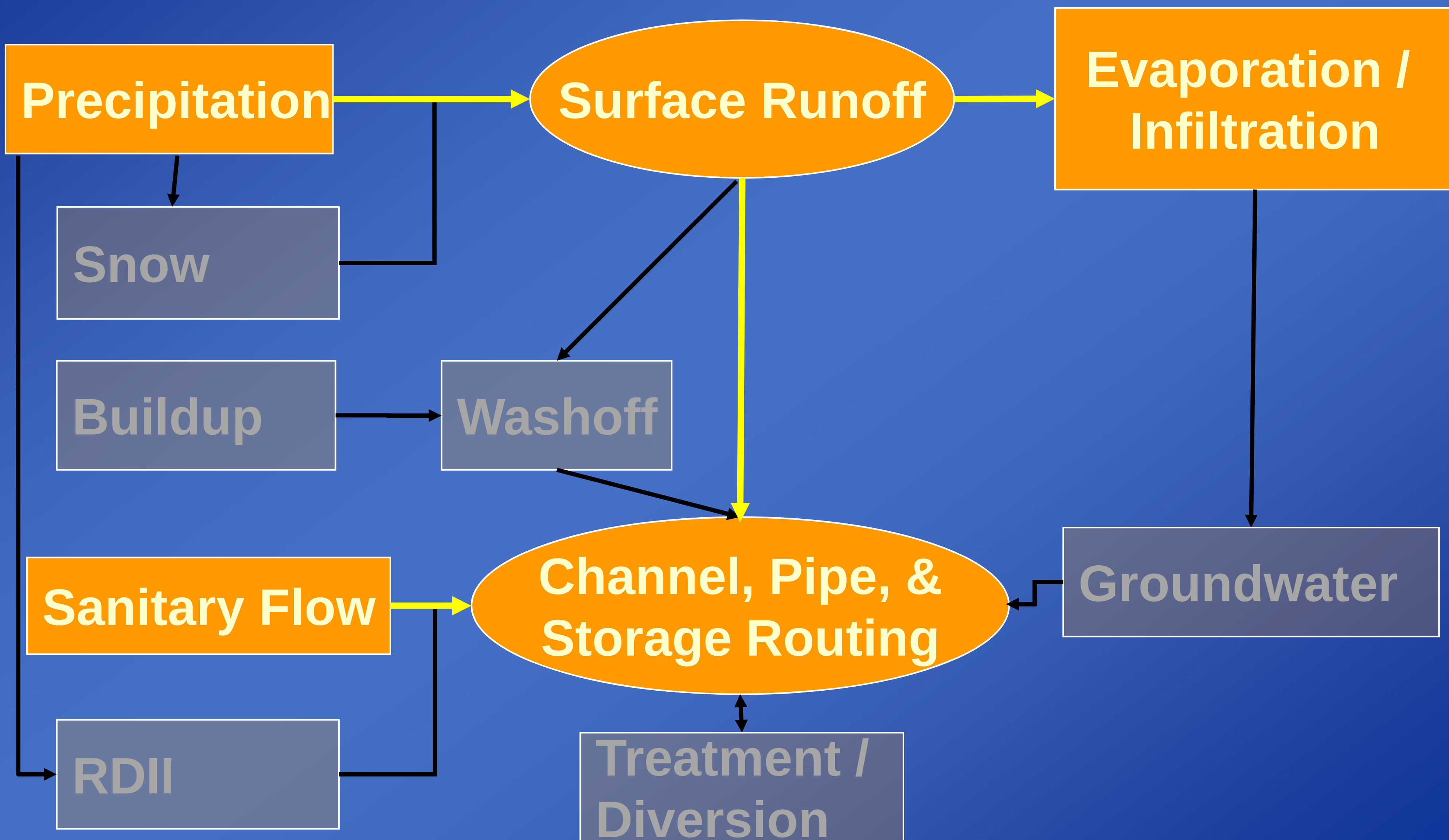
- Model development
  - Software overview
  - Model extents
  - Design rainfall
- Calibration
- Baseline conditions

Sewer Modeling Process

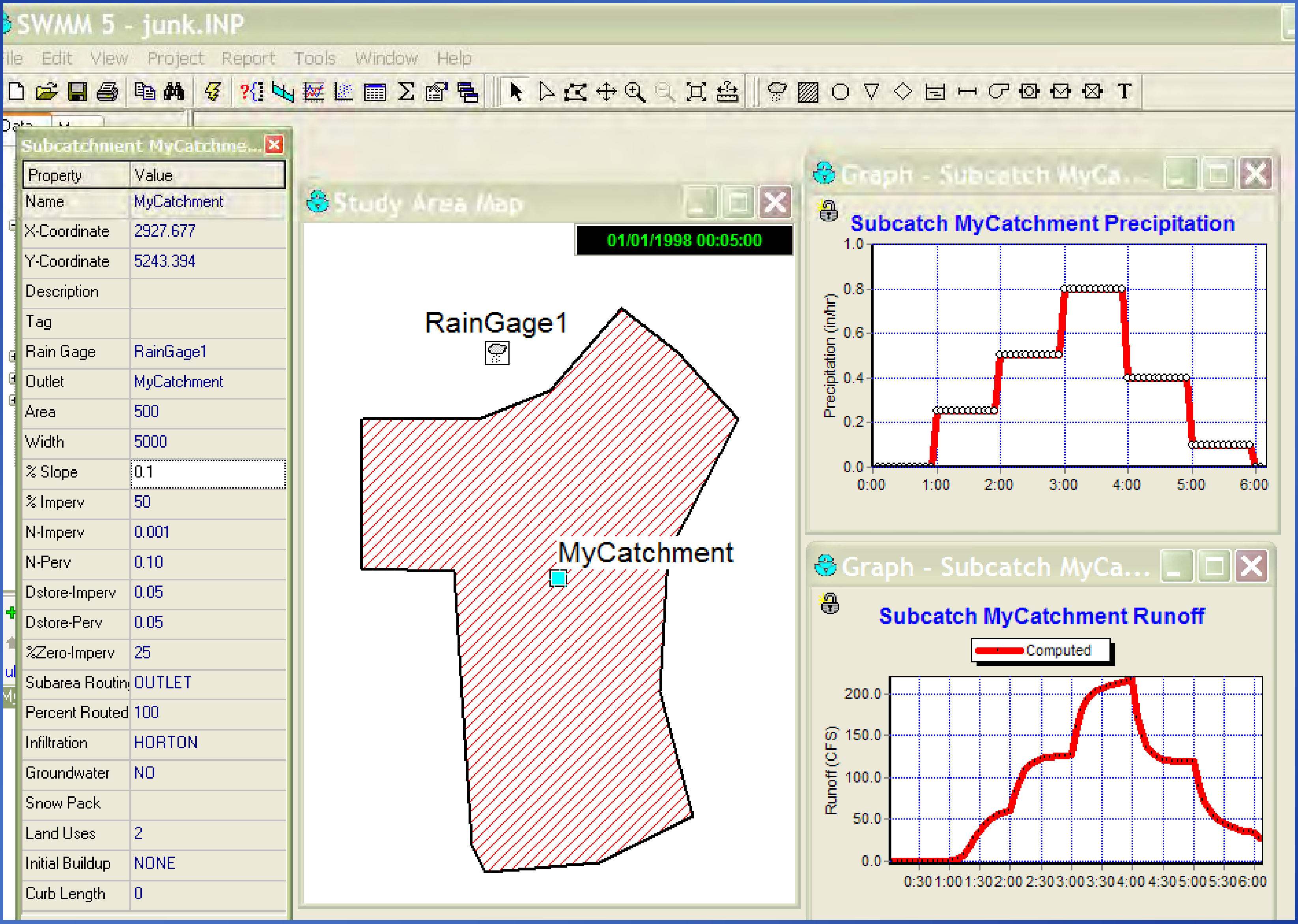
- State-of-the-art EPA SWMM 5 software
- Four models: Albany North, Albany South, Rensselaer, and Troy
- Models based on sewer plans, GIS, and field inspections
- Calibrated to 2008 flow metering



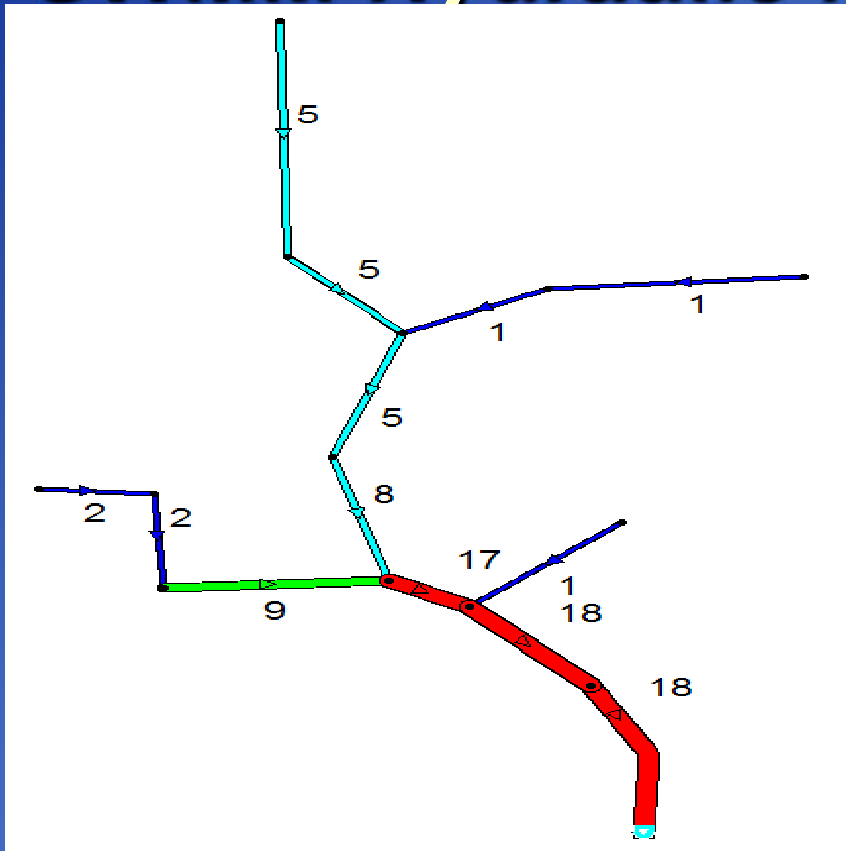
SWMM Process Models

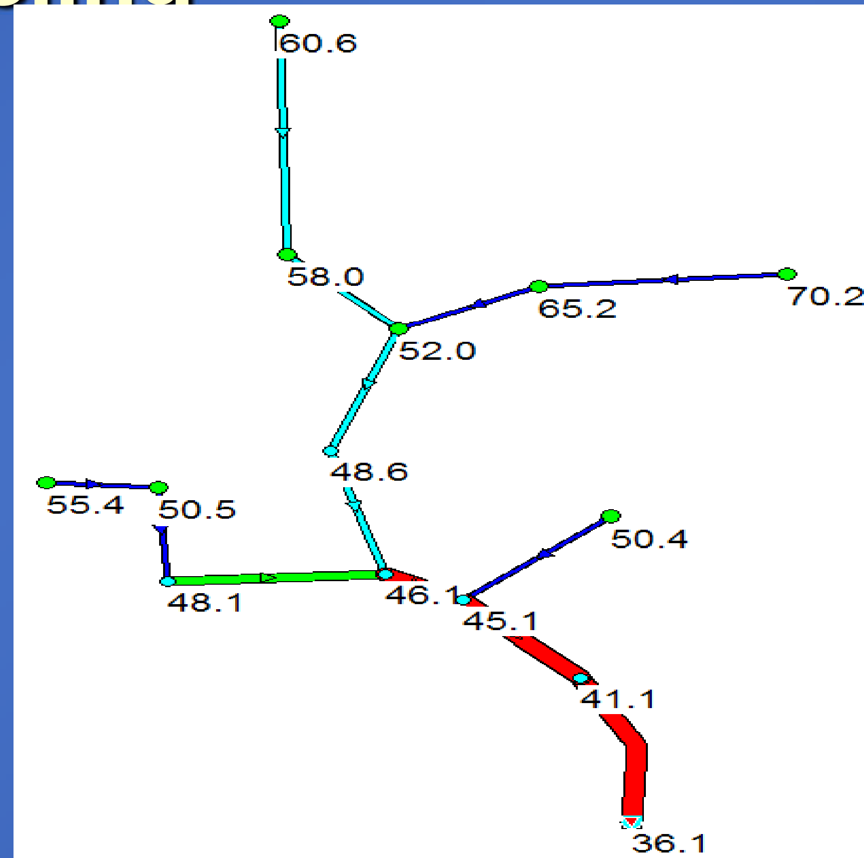


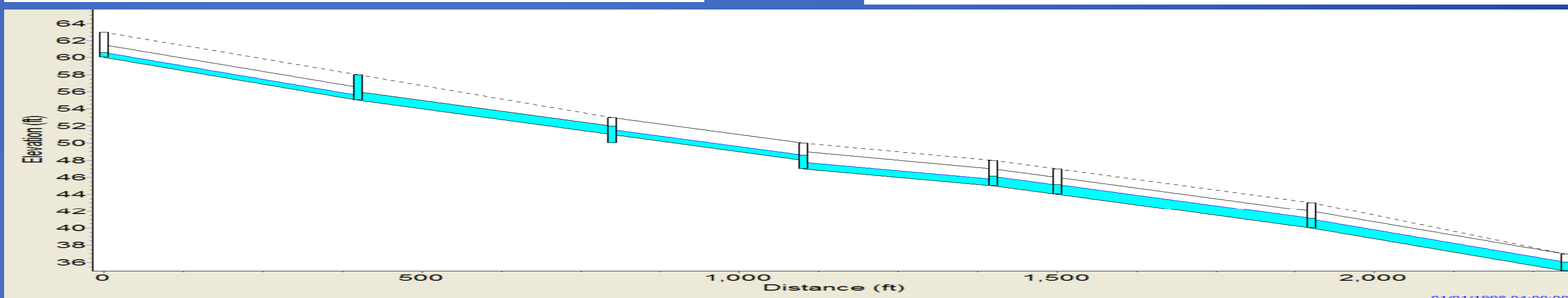
SWMM Runoff Modeling



SWMM Hydraulic Modeling





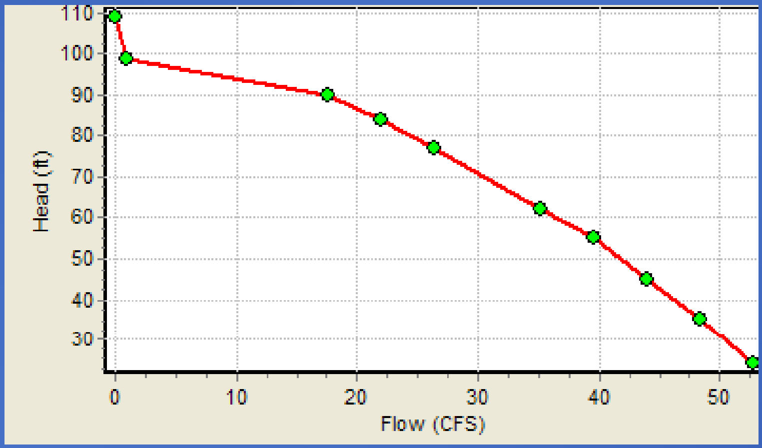


Model components

- Pipe hydraulics
- Dry weather flow
  - Sanitary wastewater
  - Base infiltration
- Runoff hydrology
  - Combined drainage
  - Sanitary sewer infiltration/inflow
  - Direct drainage connections

Hydraulics

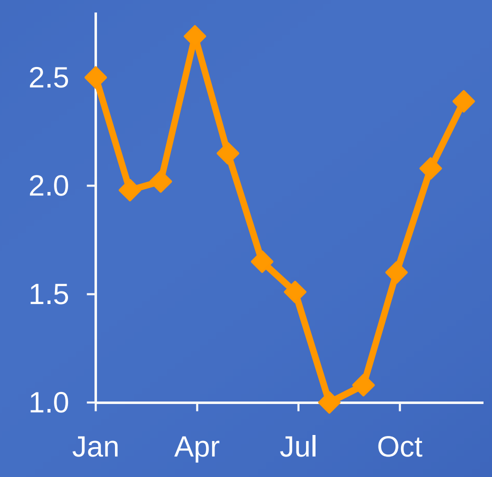
- Modeled pipes
  - All CSO regulators
  - All interceptors
  - Principal trunk sewers
- Pump stations, WWTPs, real-time controls
- Hudson River stage boundary

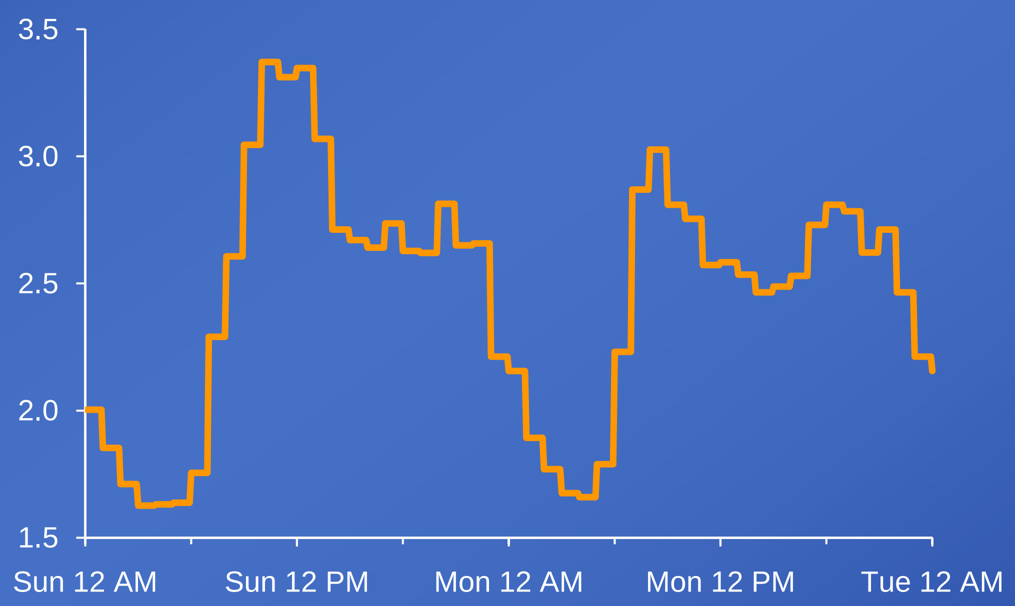


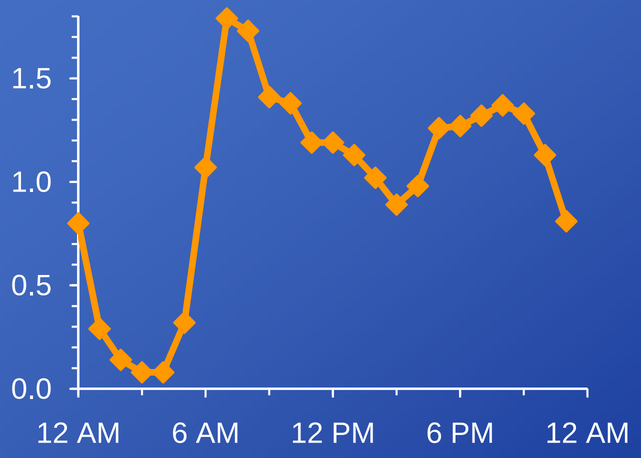
Rule Big_C_Regulator_2
If Node Scso_017R Depth = 2.58
Then Orifice Big_C_Gate Setting = 0.87

Dry Weather Flow

- Average sanitary and baseflow
- Diurnal patterns
- Baseflow variation



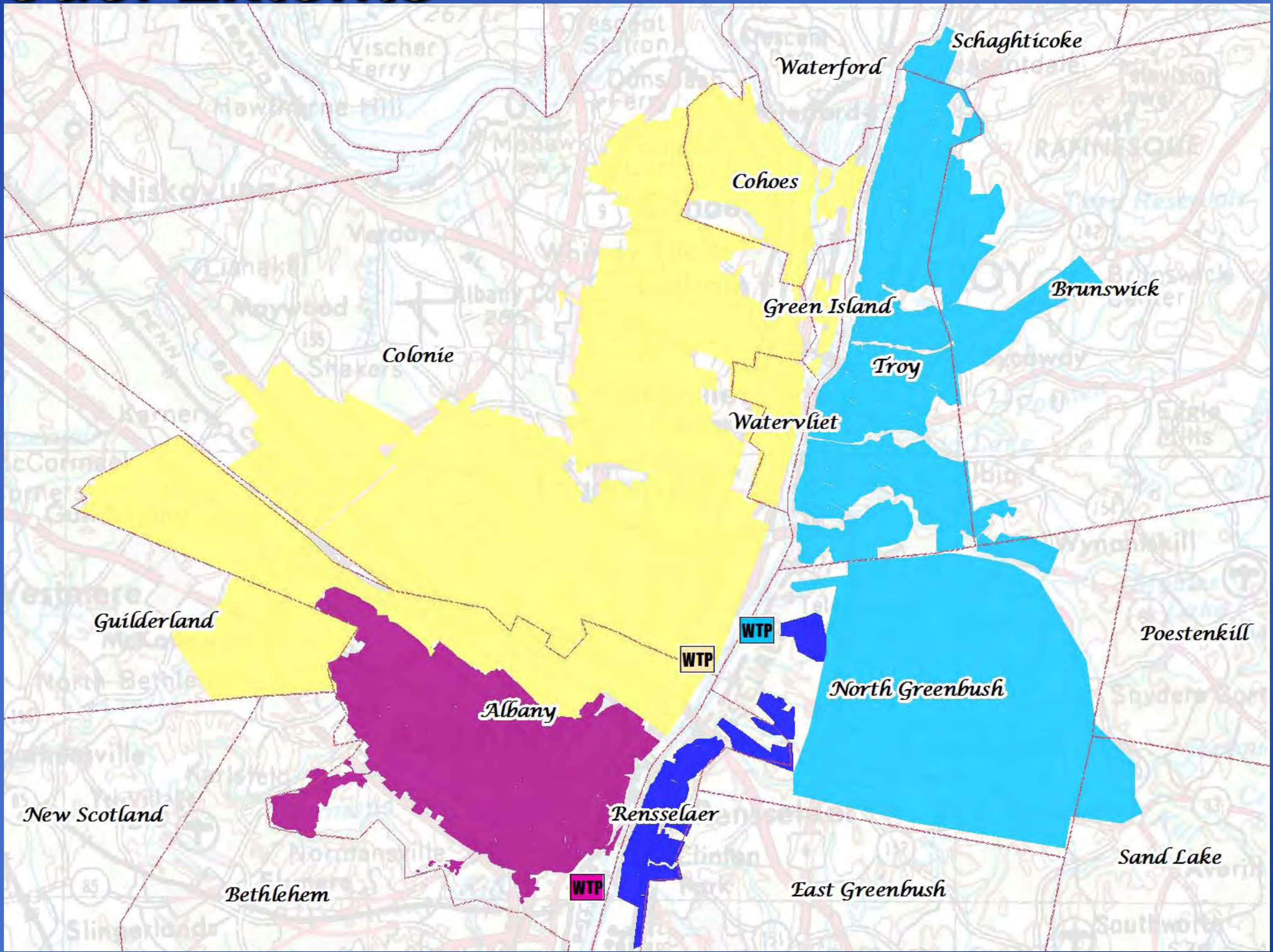




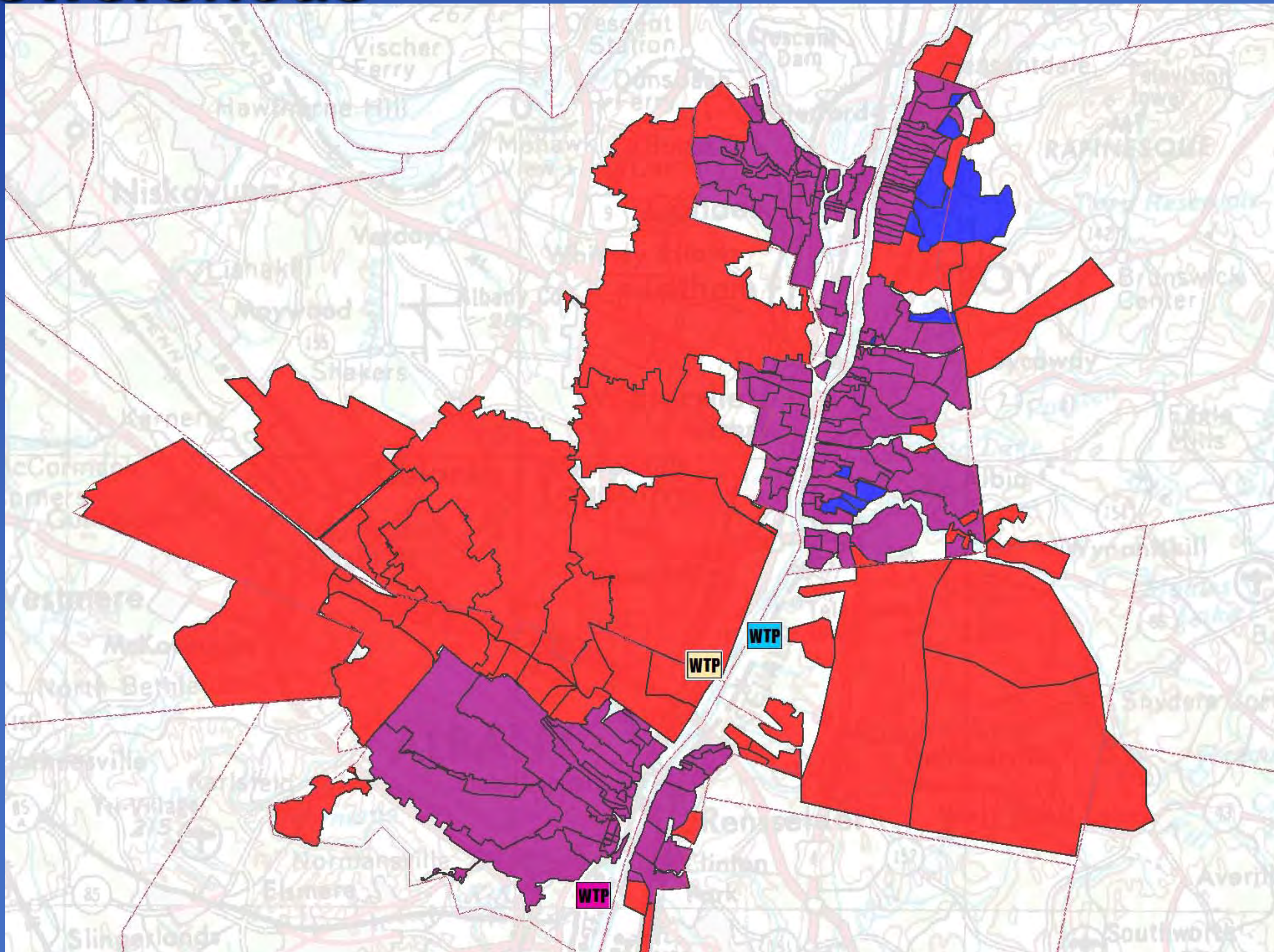
Hydrology

- All areas tributary to ACSD-N, ACSD-S and RCSD WWTPs
- Dynamically simulate:
  - runoff to combined sewers
  - infiltration / inflow into sanitary sewers
  - upstream drainage entering sewer system

Model Extents

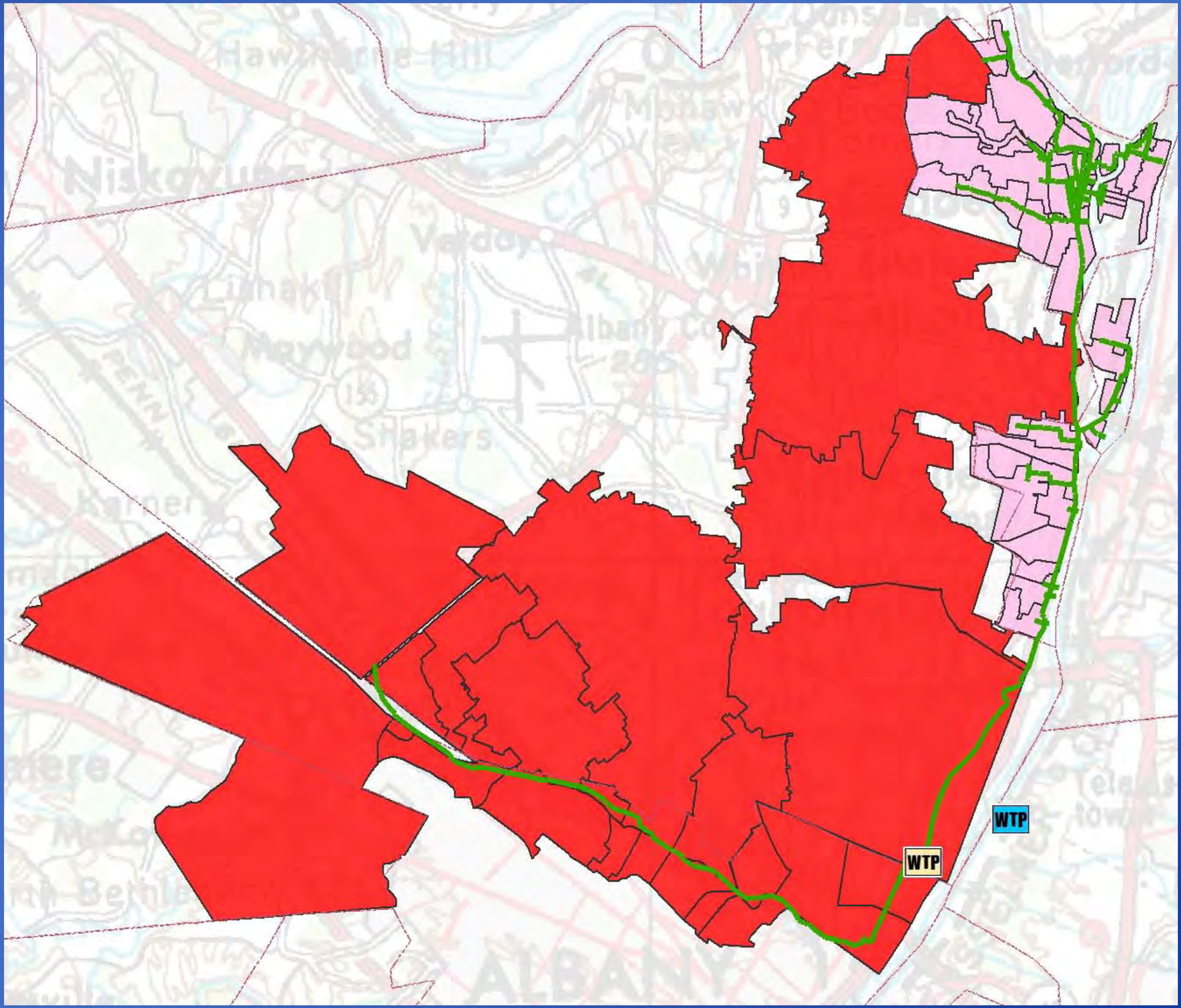


Sewersheds

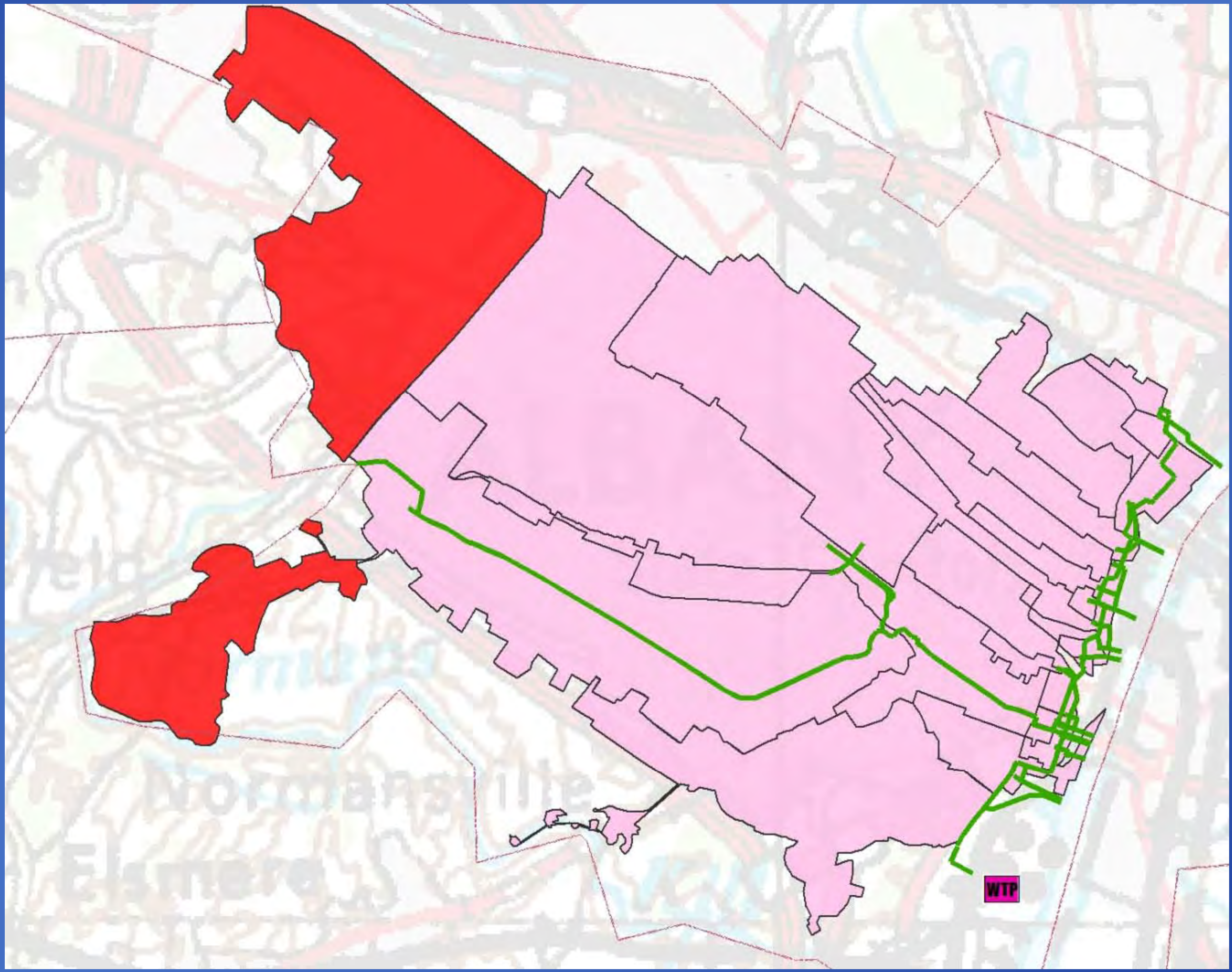


Albany North Model

- 600 pipes
- 68 catchments
- 24 CSOs
- 13 pump stations
- Includes Patroons Creek Interceptor



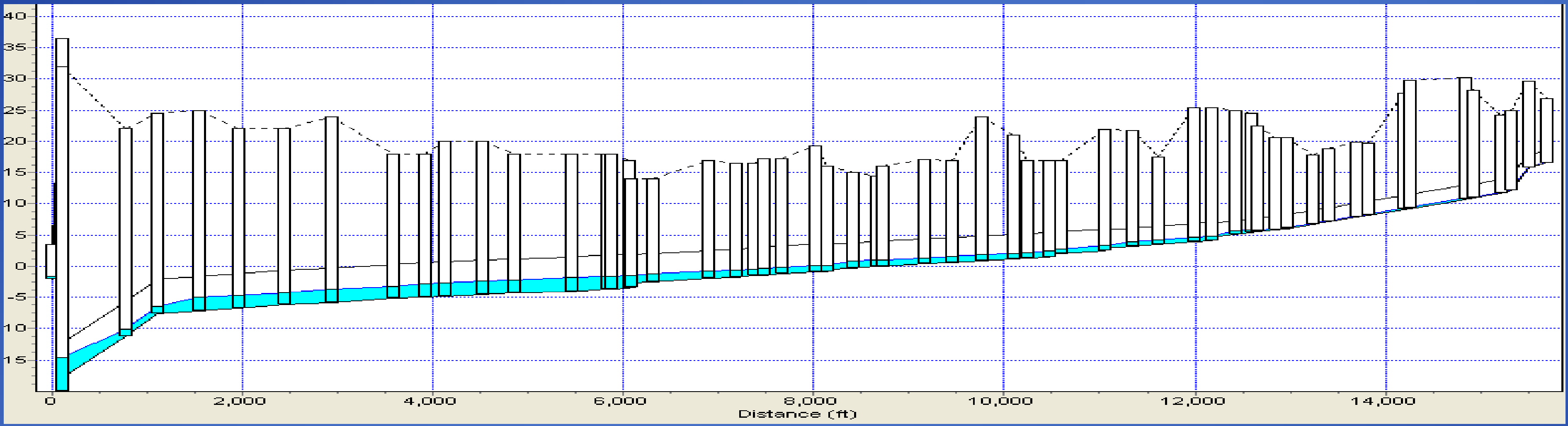
Albany South Model



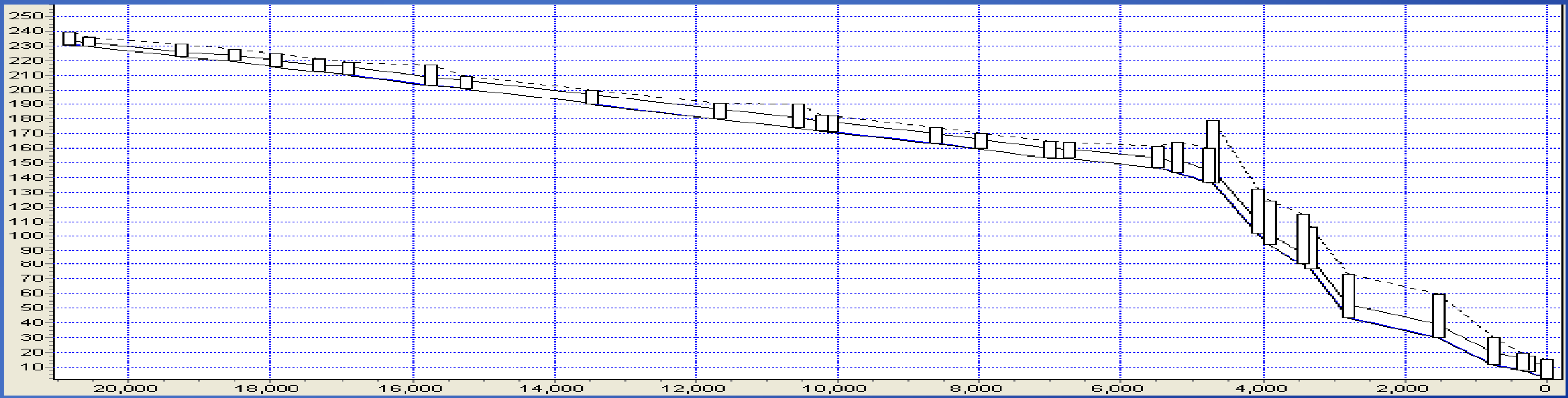
- 220 pipes
- 30 catchments
- 20 regulators
- 12 CSOs
- Tidal influence
- Significant I/I below Big C

ACSD Interceptor Profiles

- **Hudson River**

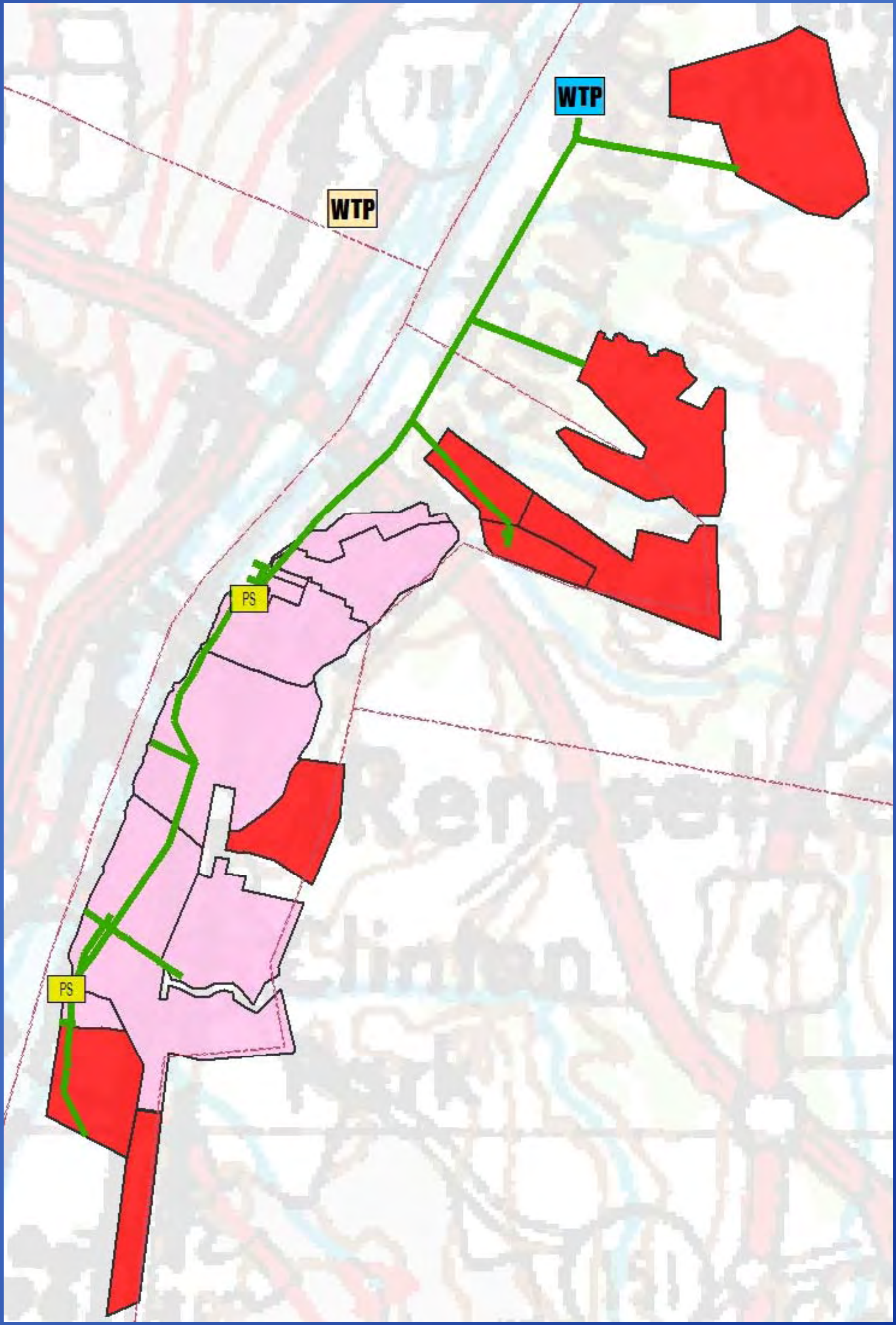


- **Beaver Creek**



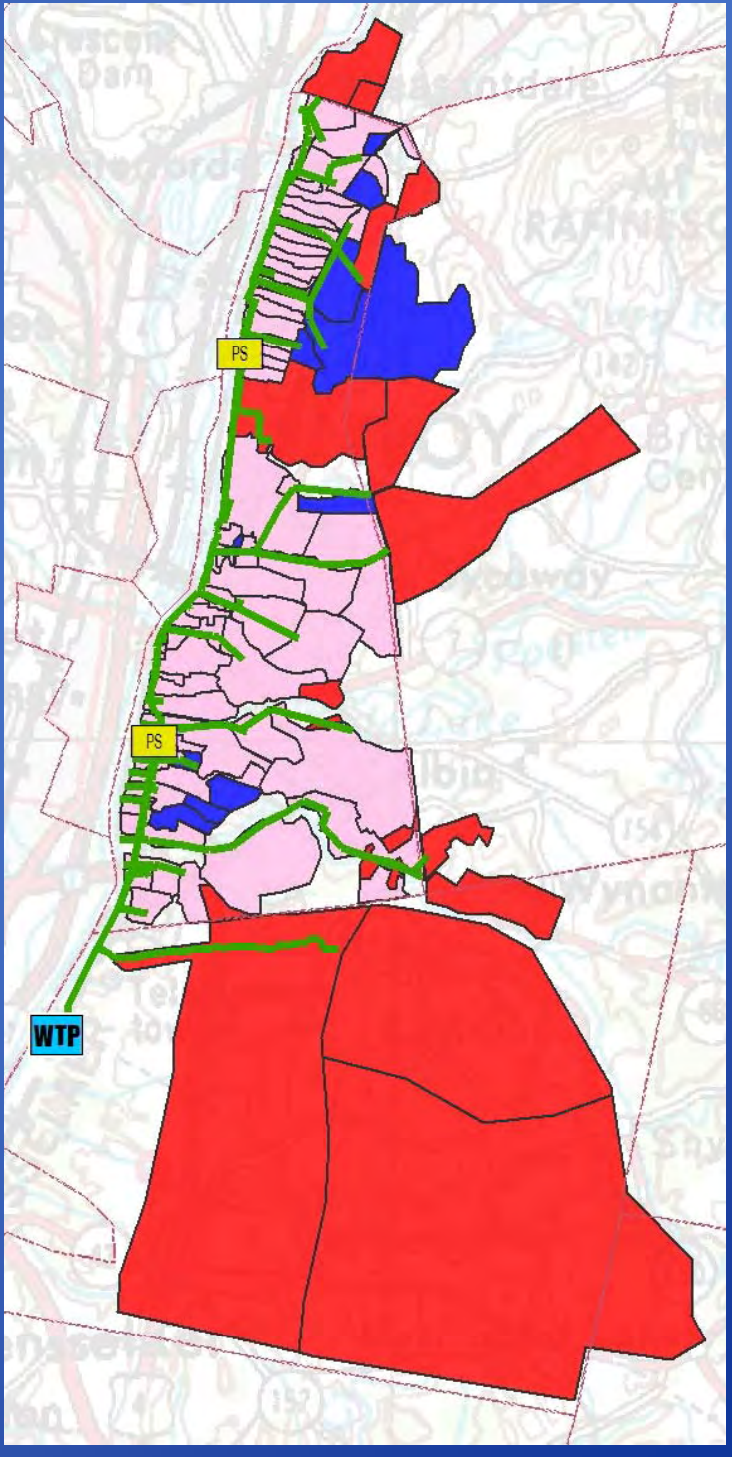
Rensselaer Model

- 90 pipes
- 17 catchments
- 9 CSOs
- Aiken, Forbes PS
- CSOs to tidal zone
- Considerable separation

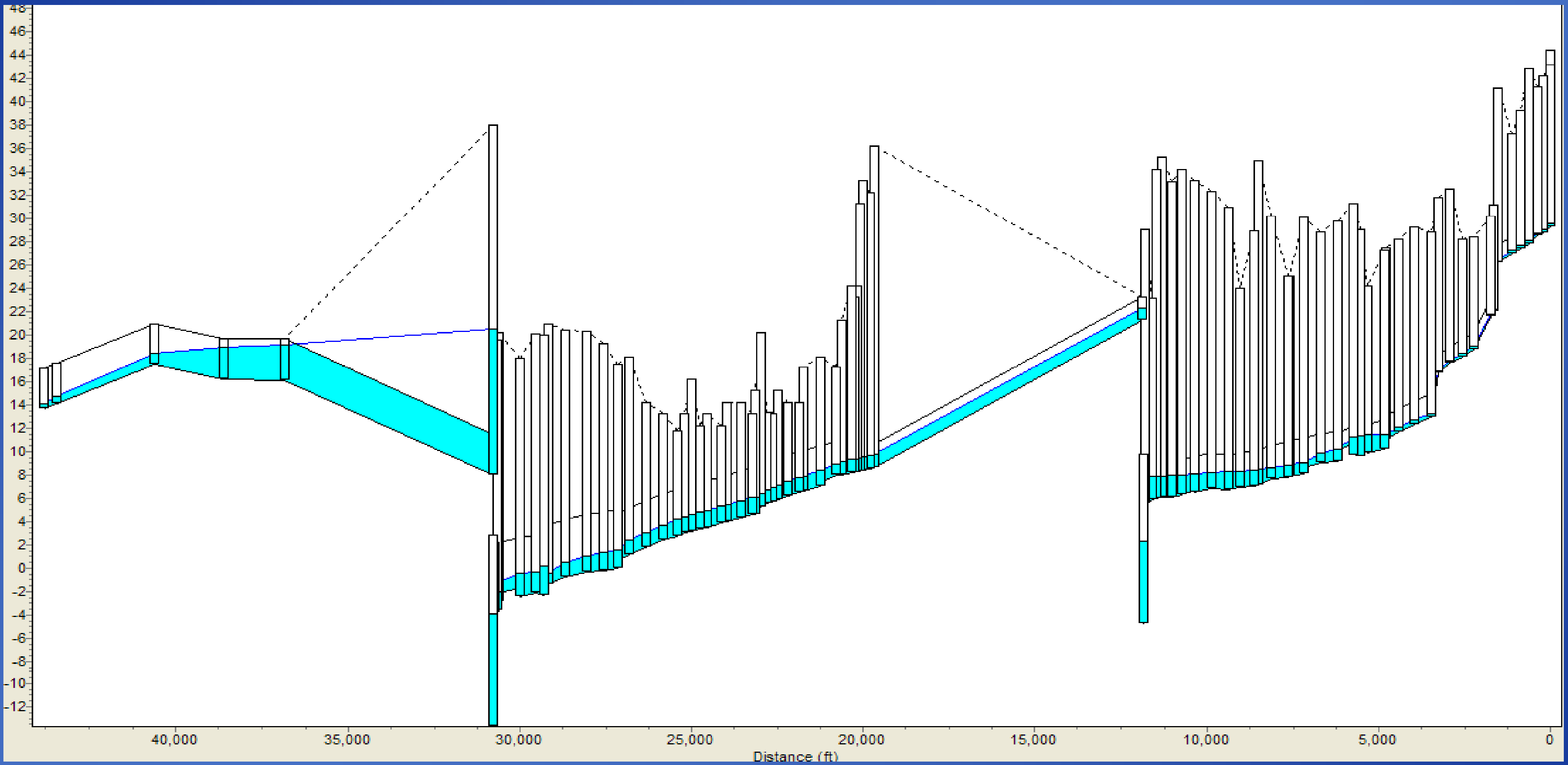


Troy Model

- 470 pipes
- 100 catchments
- 49 CSOs
- 106th, Monroe St. PS
- CSOs above and below Federal Dam
- Sanitary flows from Schaghticoke, Brunswick, and North Greenbush



RCSD Interceptor Profile

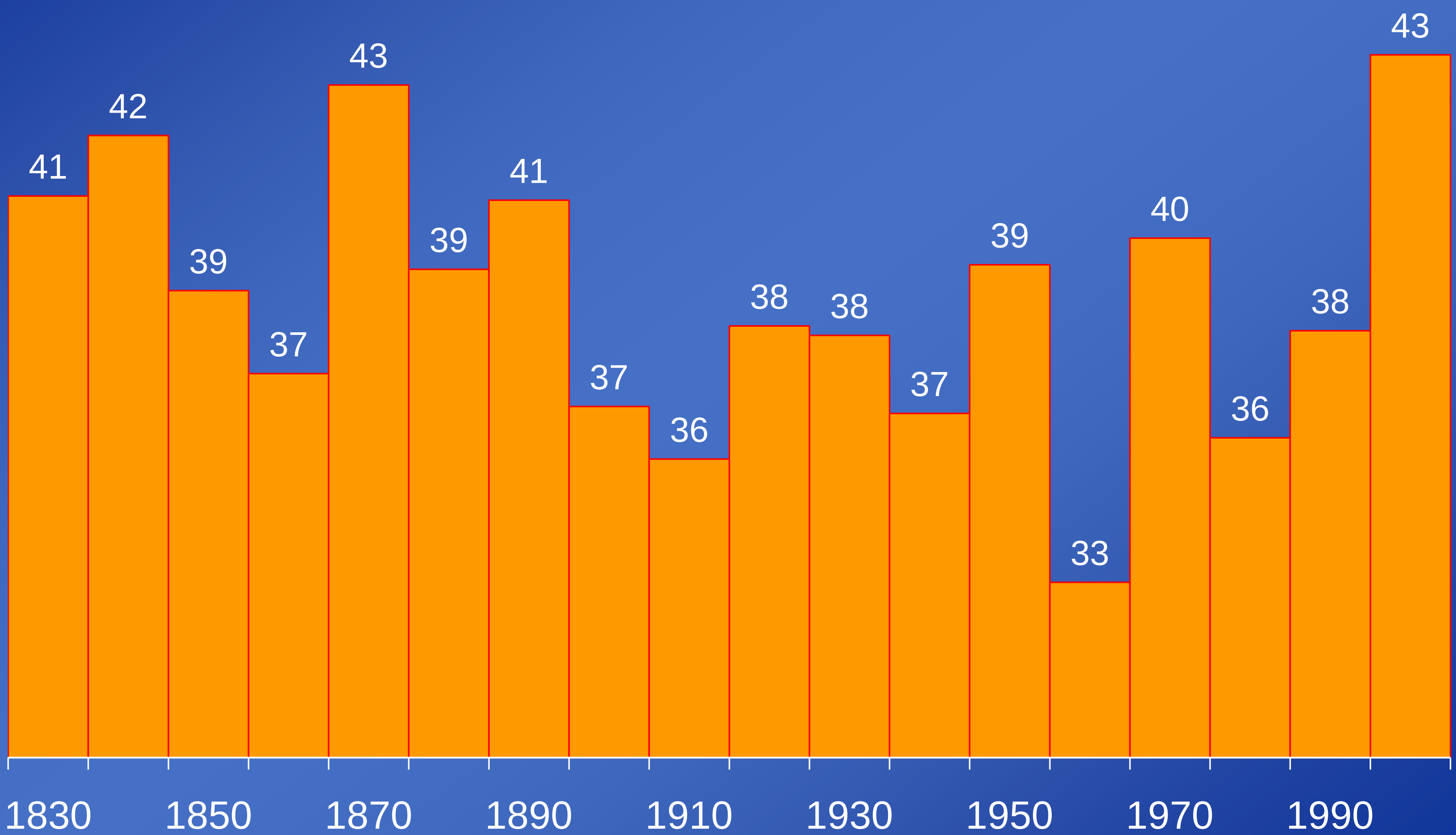


albany pool Joint Venture Team CDM MALCOLM PIRNIE CHA

Representative Period Selection

- 5-year period for long-term CSO statistics
  - average precipitation
  - wet and dry years
  - storm depths and frequencies

Average Annual Precipitation by Decade



Annual Precipitation 1985-1989

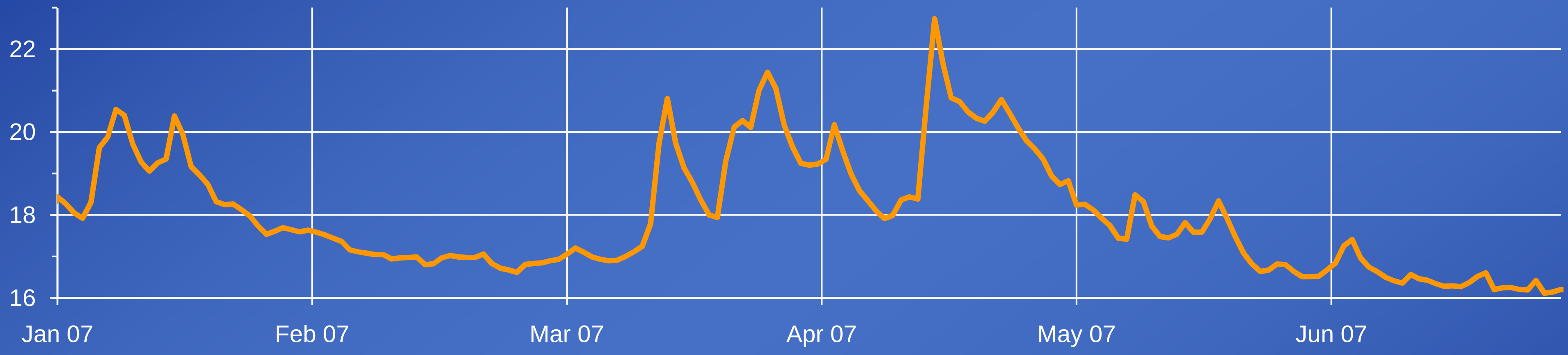
Year	Precipitation (inches)	Percentile
1985	30.0	13%
1986	44.0	86%
1987	39.3	68%
1988	29.6	10%
1989	39.7	72%
5-year average	36.5	
Long-term mean	36.8	

Storm Depth Histograms 1985-1989

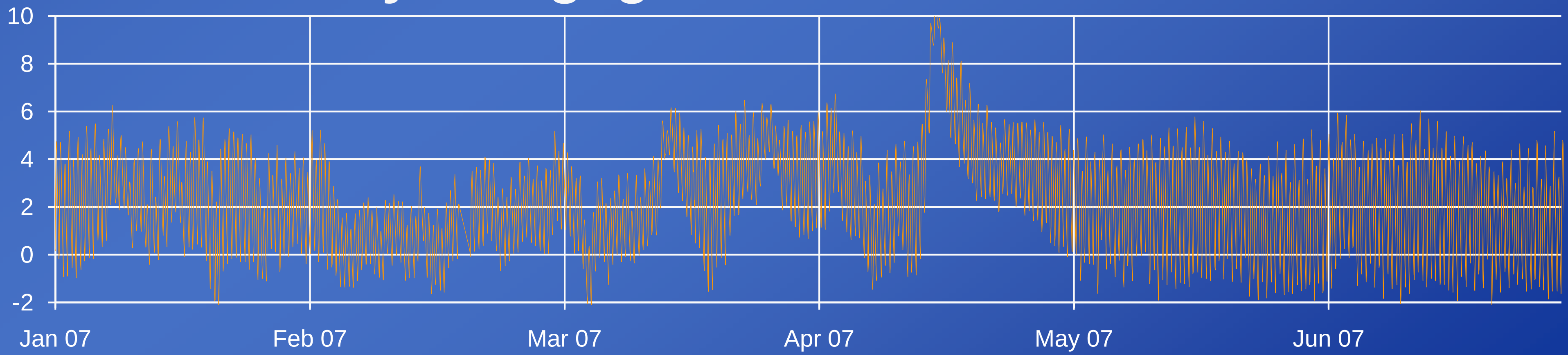
Year	≥0.25”	≥0.50”	≥0.75”	≥1.0”	≥1.5”	≥2.0”	≥2.5”
1985	33	20	12	6	2	0	0
1986	40	29	20	18	5	3	2
1987	41	25	19	11	4	3	2
1988	33	20	13	7	1	1	1
1989	44	27	19	12	6	1	0
5-year average	38	24	17	11	3.6	1.6	1.0
Long-term mean	41	24	15	8	3.4	1.3	0.7

River Stage

- Stage/discharge at Green Island

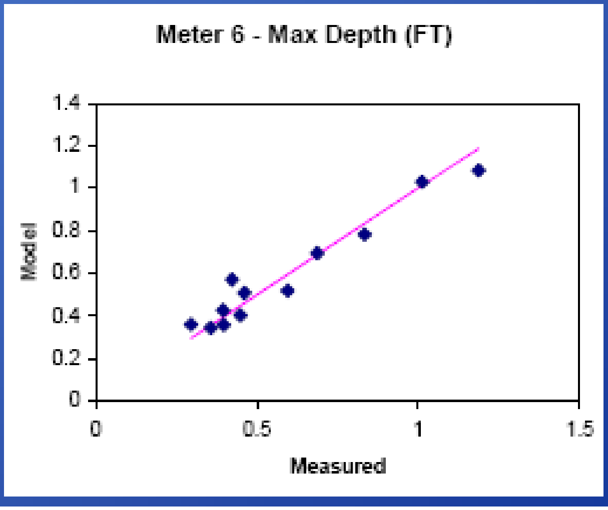


- Albany tide gage



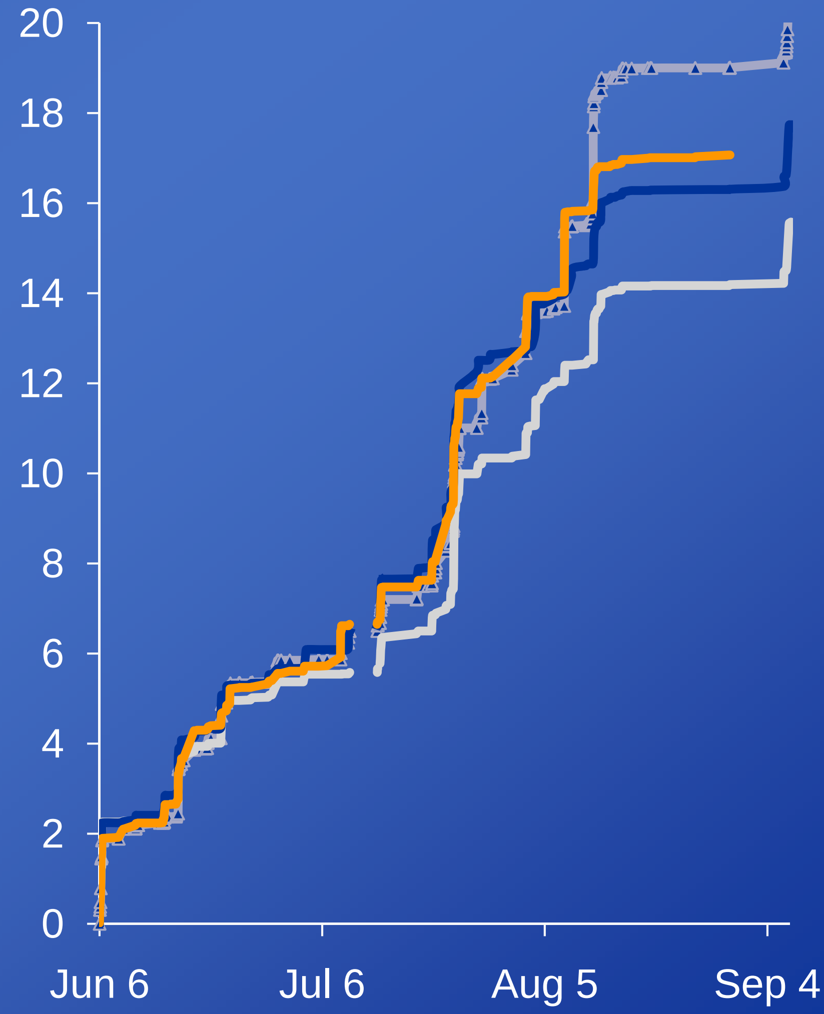
Calibration and Application

- Calibration to summer 2008 flow metering
- Models capable of running 5-year continuous simulations
- Calibrated models provide robust annual statistics for each CSO
  - Volume
  - Duration
  - Frequency



2008 Metering Rainfall

Date	Rennselaer	Troy	Cohoes	Albany	Airport
June 6	1.9	2.3	2.2	1.9	1.8
June 16	1.3	1.1	1.2	1.0	1.4
July 13	0.7	0.8	1.2	0.8	1.1
July 23	2.6	2.9	2.7	2.8	3.5
July 27	1.1	0.4	0.6	0.4	0.2
August 2	1.2	0.7	0.1	1.4	0.4
August 7	1.8	0.4	0.1	1.8	0.1
August 11	3.0	1.5	1.4	1.0	1.5
September 6	1.6	1.4	1.4		1.3



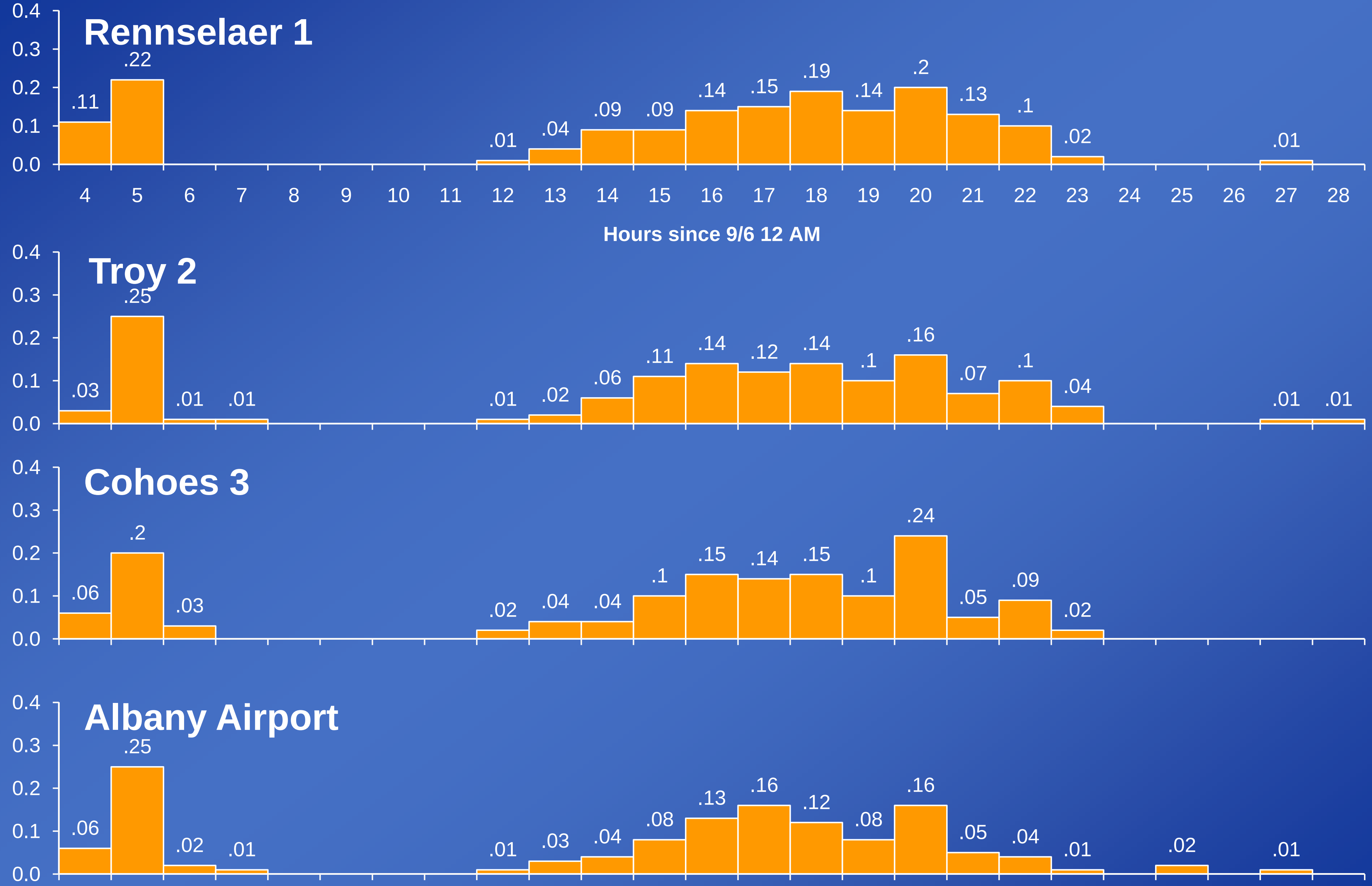
Calibration Methodology

- Discharge volume
- Timing of hydrographs
- Peak flows
- Water levels
- Velocity

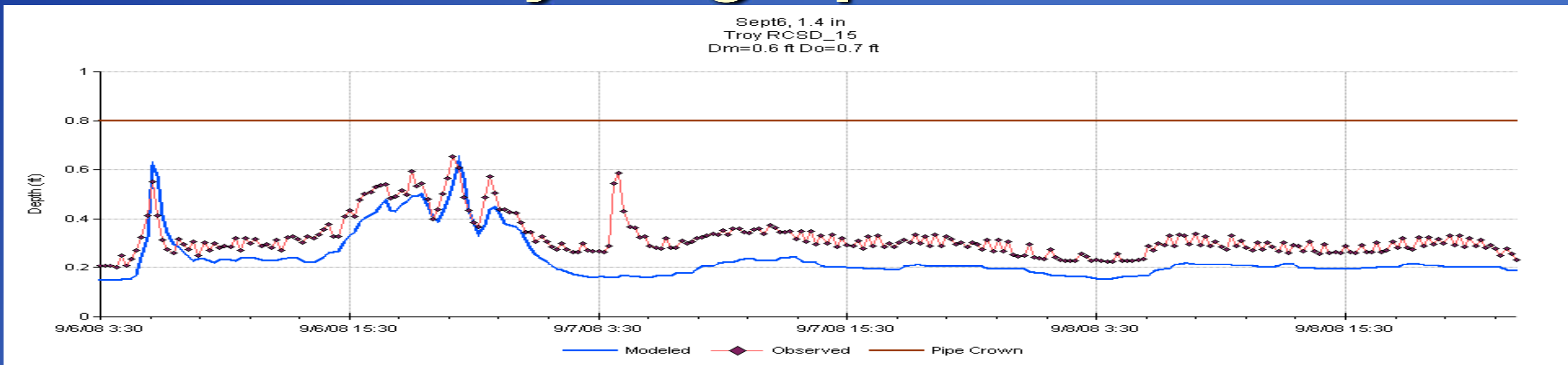
2008 Metering Data

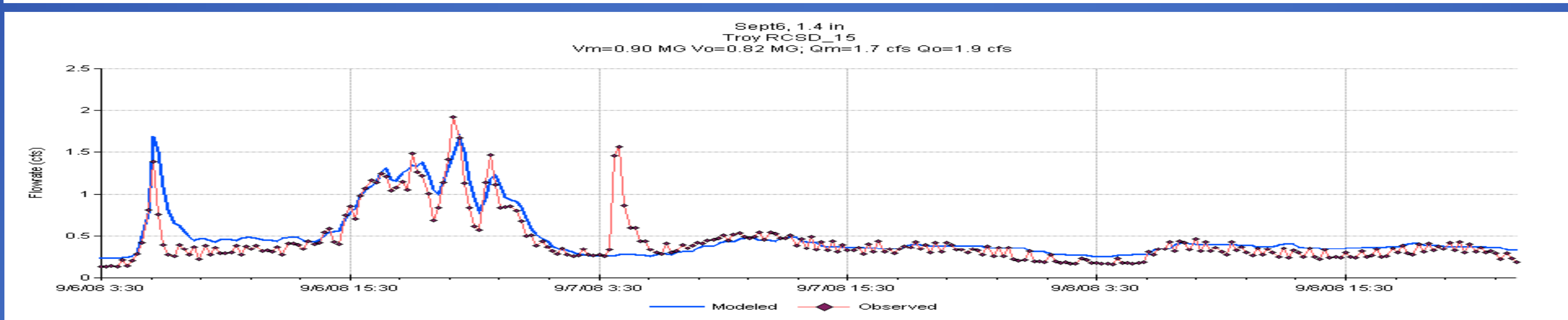
- Flow metering
- WWTP flow data
- River stage above and below dam

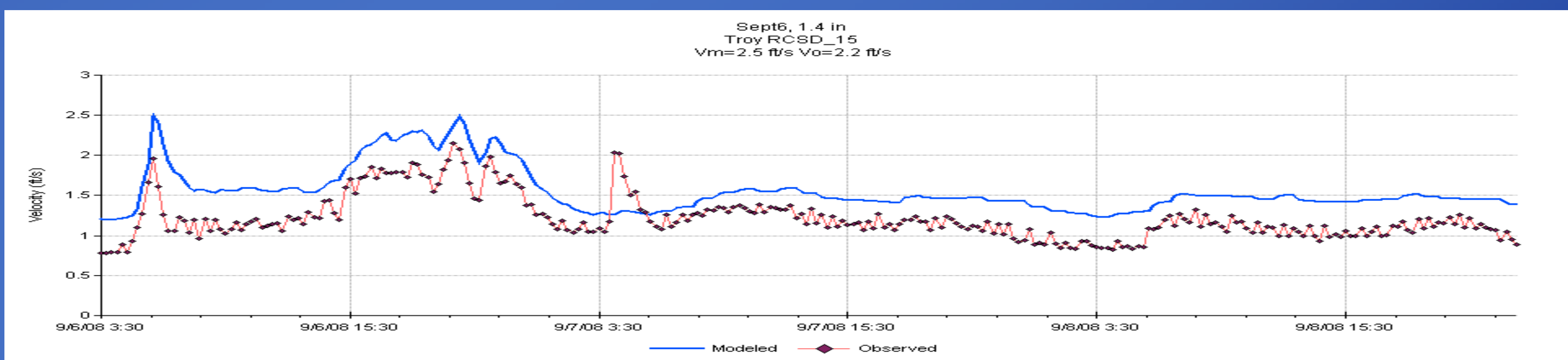
September 6, 2008 storm



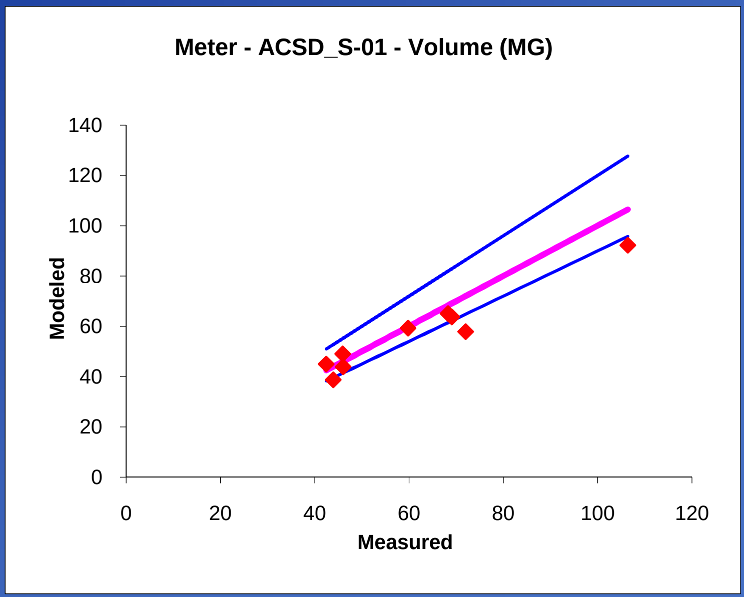
Calibration Hydrographs

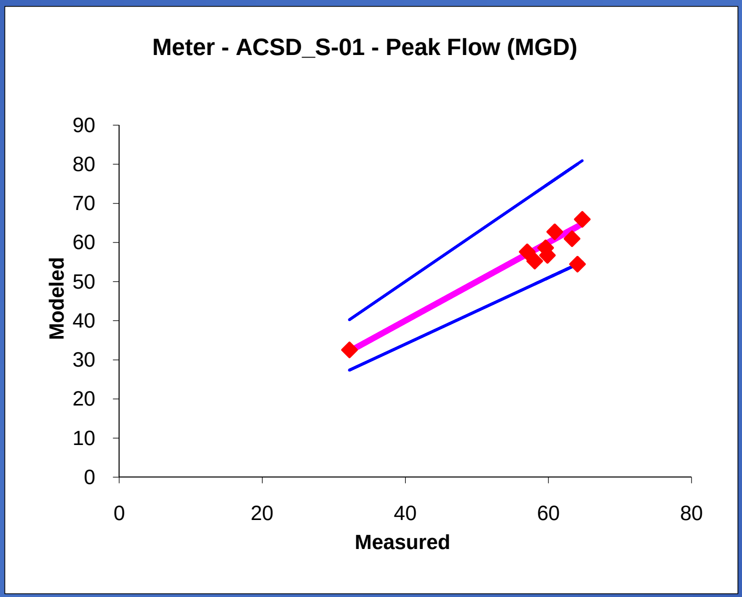


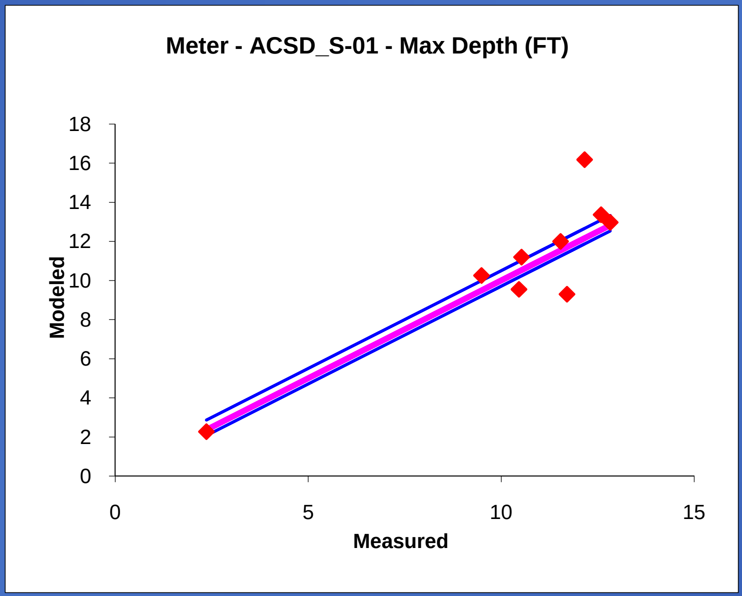


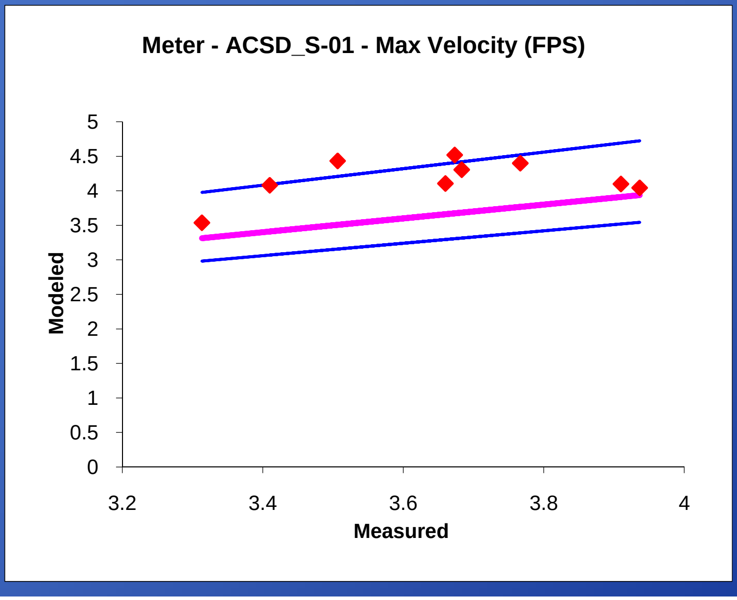


All Storms Scatterplots









Joint Venture Team albany pool CDM MALCOLM PIRNIE CHA

Baseline Conditions

- CSO statistics by system
- Most active CSOs
- Community-specific issues

Regional CSO

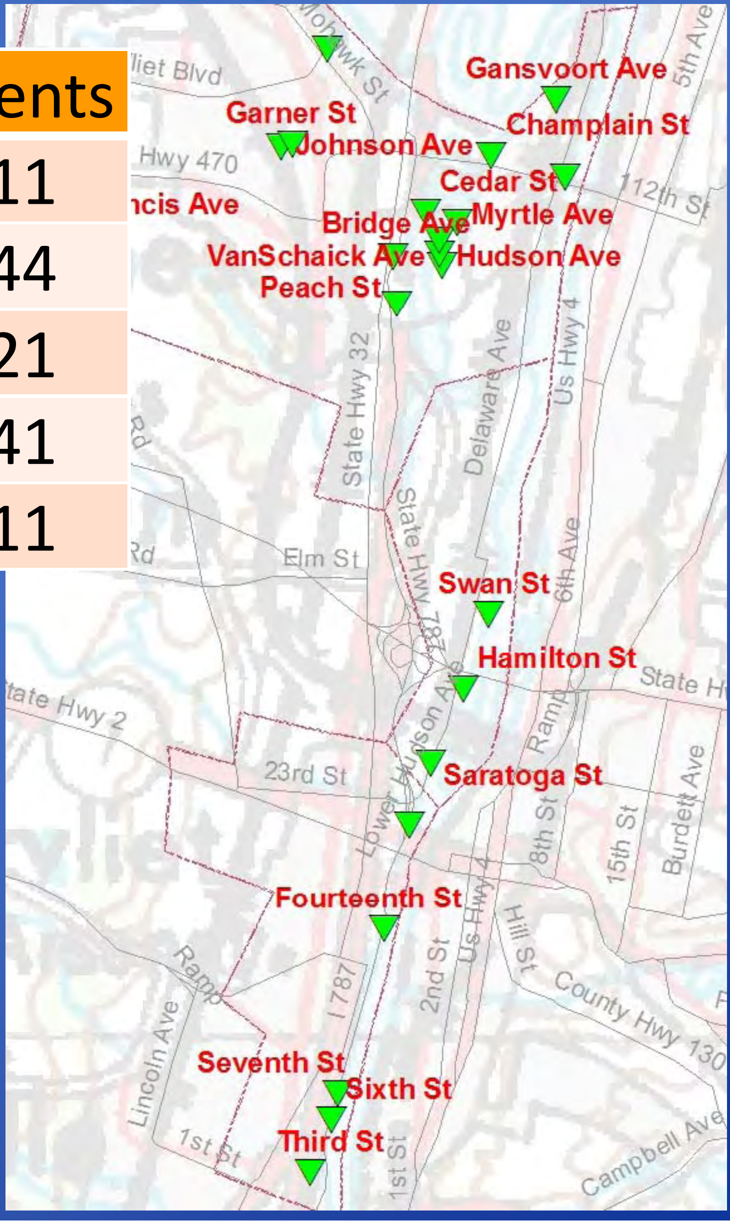
City	MG/year
Buffalo	4,000
Albany	1,251
Hartford	1,040
Syracuse	690
Springfield	630

Albany Pool Annual CSO

System	MG/year	Hours	Events	% Capture
Albany North	30	380	61	91
Albany South	753	640	58	63
Rensselaer	20	190	52	88
Troy	448	720	65	67
Total	1251			

Albany North - Most Active CSOs

Location	SPDES	Mgal	Hours	Events
Little C	008	8.6	30	11
7th Street		4.5	330	44
Mohawk Street	007	4.2	380	21
Swan Street		4.0	209	41
Continental Ave	005	2.9	23	11



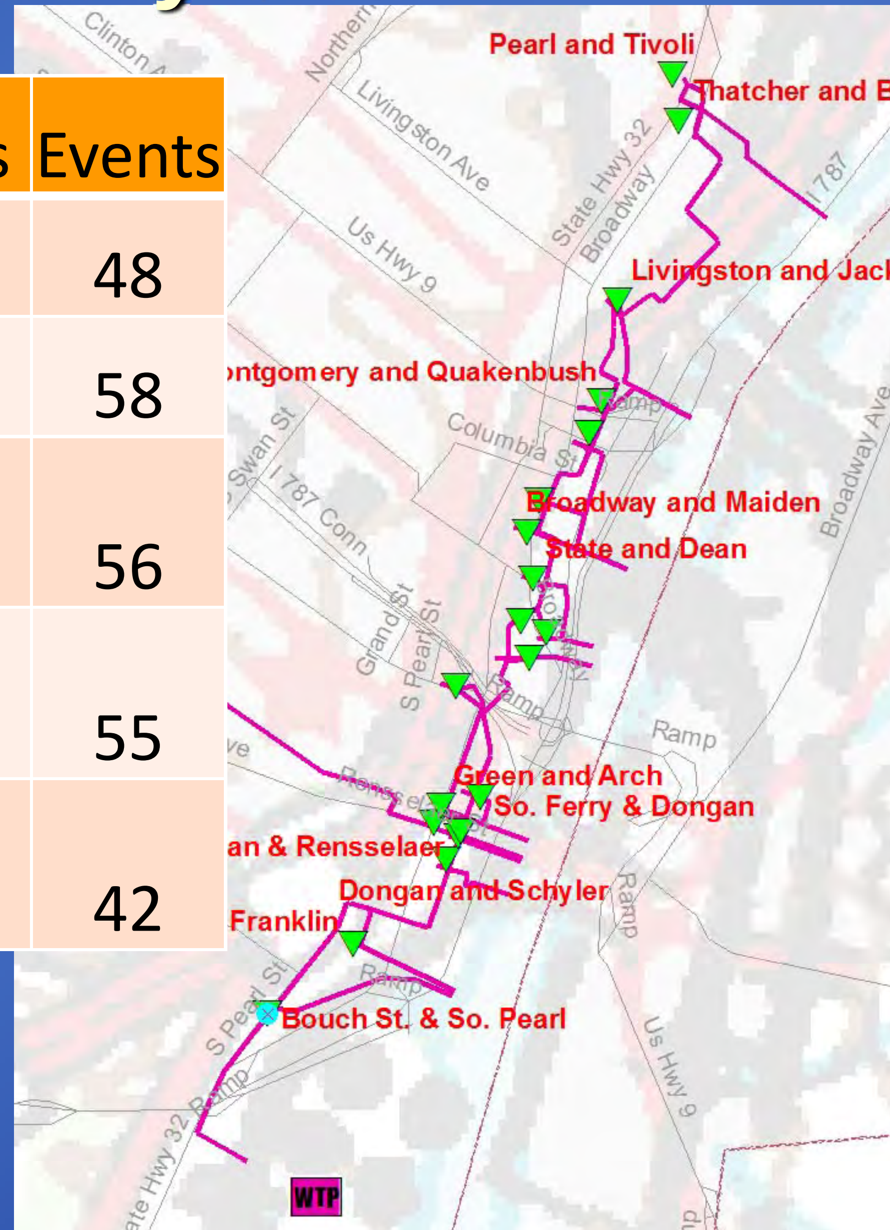
Five CSOs active ≥40 events/year

System Issues: Albany North

- Cohoes, Green Island, and Watervliet compete with separate sanitary contributors for Hudson River Interceptor capacity
- Capacity of 42-inch Cohoes Interceptor
- 13 pump stations, some with capacity limitations
- Multiple high frequency, low volume CSOs

Most Active CSOs – Albany South

Location	SPDES	Mgal	Hours	Events
Big C	017	547	513	48
Bouck	013	94	637	58
Maiden/ Orange/ Steuben	029	48	496	56
Livingston/ Jackson/ Quackenbush	031	36	260	55
Division/ State/ Hudson	025	19	213	42

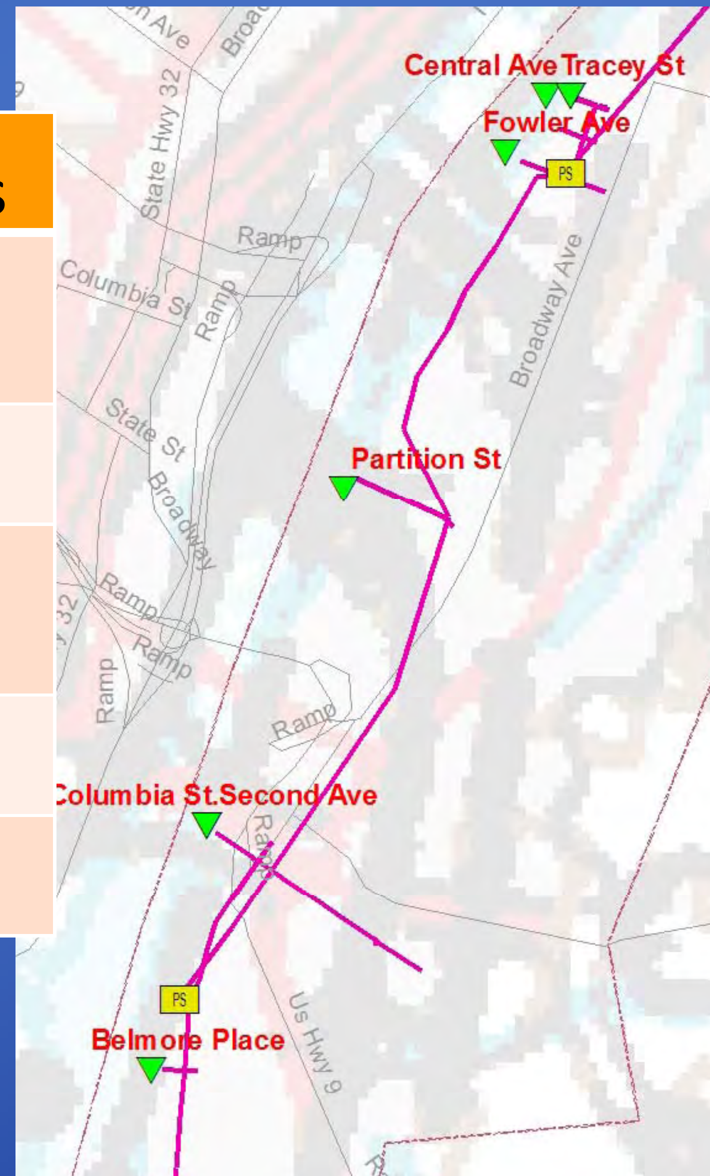


System Issues: Albany South

- Combined sewers serve 75% of ACSD-S area
- Anecdotal evidence of widespread flooding
- Two outfalls account for 85% of CSO
  - Big C (017) 72%
  - Bouck (013) 13%
- High overflow frequency everywhere
- Peak flows far exceed WWTP capacity

Most Active CSOs – Rensselaer

Location	SPDES	Mgal	Hours	Events
Columbia/ Second	003	8.5	109	41
Partition	006	5.6	192	40
Central/ Barnet	010	3.2	158	52
Fowler	007	1.8	108	42
Belmore	002	0.5	39	27



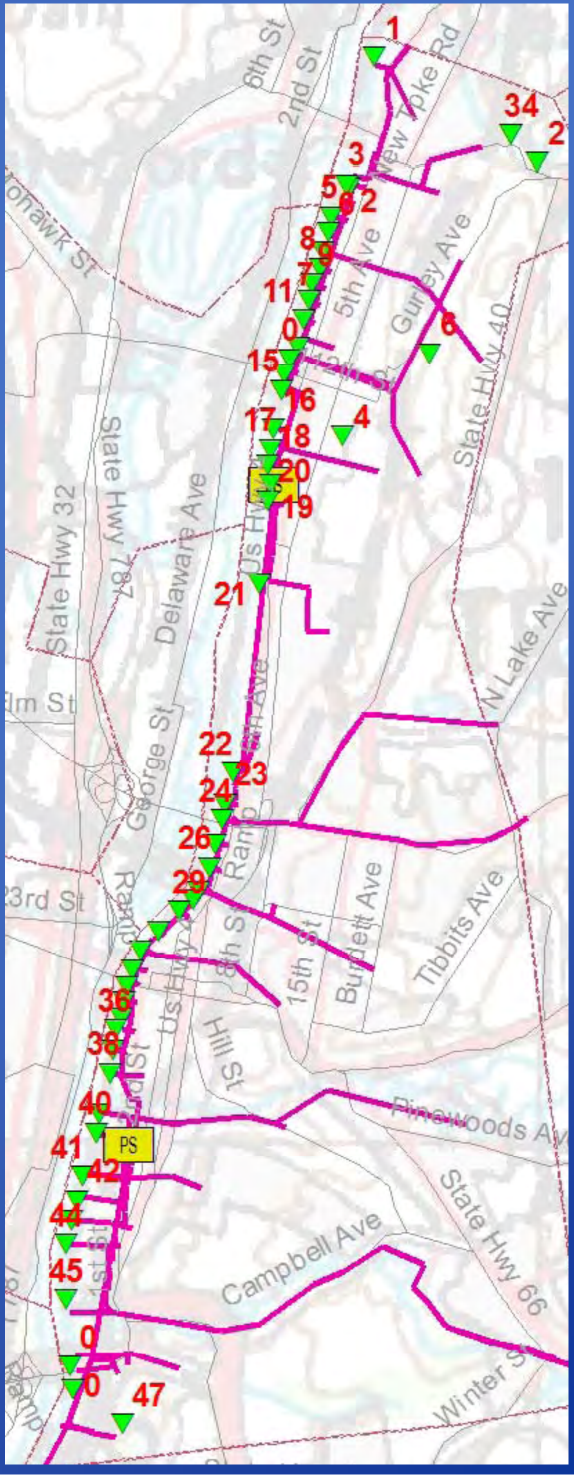
System Issues: Rensselaer

- Low CSO volume, but high frequency
- Pump station and force main constraints

Most Active CSOs – Troy

Location	SPDES	MGal	Hours	Events
Liberty	035	55	518	53
State	031	54	414	52
Hoosick	024	25	99	33
Adams	037	25	346	50
Jacob	026	23	429	62
Federal	027	19	217	51

- Four CSOs active 500-700 hours/y
- 17 CSOs ≥50 events/y

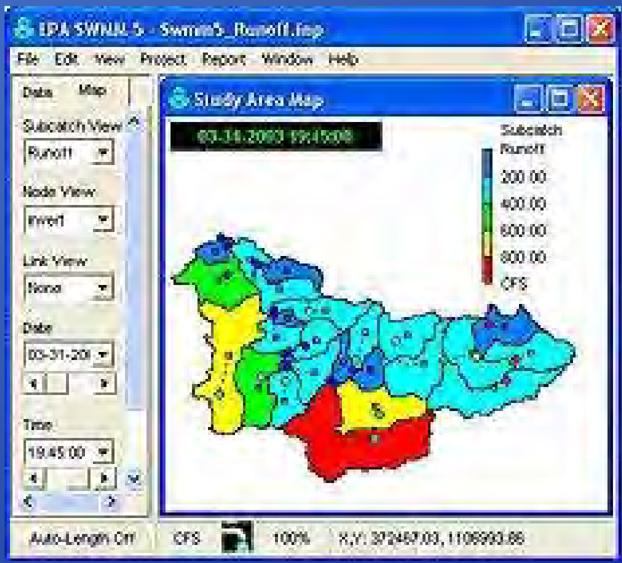


System Issues: Troy

- Two confirmed and three unconfirmed DWO locations identified
- RCSD regulator modifications have been identified to eliminate DWOs
- Pump station constraints
- River inflow
- Stream connections

Findings

- 1,250 MG CSO per year, mostly in Troy and Albany South systems
- Limited opportunities for optimization
- Few low-cost solutions
- DWOs in Troy; BMP solutions identified



Next Steps

- System optimization
- Hudson River water quality modeling
- Long-term solutions
  - Community-specific
  - East - west
  - Systemwide