CITY OF KERRVILLE

Water and Wastewater Master Plan Update

VOLUME II: APPENDICES

PREPARED FOR:
City of Kerrville

OCTOBER 2022

PREPARED BY:
Freese and Nichols, Inc.
10431 Morado Circle, Suite 300
Austin, Texas 78759
(512) 617-3100

Innovative approaches
Practical results
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WATER AND WASTEWATER MASTER PLAN UPDATE

VOLUME II: APPENDICES

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WATER AND WASTEWATER MASTER PLAN UPDATE

VOLUME II: APPENDICES

Prepared for:

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FREESE AND NICHOLS, INC.
TEXAS REGISTERED
ENGINEERING FIRM
F-2144

10/26/2022

City of Kerrville
701 Main Street
Kerrville, TX 78028

FREESE AND NICHOLS, INC.
10431 Morado Circle, Suite 300
Austin, Texas 78759
(512) 617-3100

FNI Project Number: KER21213

The City of Kerrville (City) contracted with Freese and Nichols, Inc. (FNI) in 2021 to provide an update to the Water Master Plan and Wastewater Master Plan. The goals of this study were to evaluate the capacity of the existing water distribution and wastewater collection systems and to recommend water and wastewater capital improvement plans (CIP). The recommended improvements will serve as a basis for the design, construction, and financing of facilities required to meet the City's water and wastewater capacity needs as a result of the projected population growth and commercial development. The following sections are appendices to the Master Plan Update Report, found in Volume I.

APPENDICES

Appendix A: Pressure Testing Results
Appendix B: Model Calibration Results
Appendix C: ADS Temporary Flow Monitoring Report
Appendix D: Field Inspection Summary
Appendix E: Short-term CIP Water Cost Sheets
Appendix F: Short-term CIP Wastewater Cost Sheets
Appendix G: Growth Driven CIP Water Cost Sheets
Appendix H: Growth Driven CIP Wastewater Cost Sheets

APPENDIX A
Pressure Testing Results

Created By Freese and Nichols, Inc.
Job No.: KER21213
Location: H:\W_WW_PLANNING\01_DELIVERABLES\11_Report_Maps\Report_Maps.aprx
Updated: Thursday, October 20, 2022
User Name: 08166

FIGURE 5-2
CITY OF KERRVILLE
PRESSURE TESTING LOCATIONS

LEGEND

- Elevated Storage Tank
- Ground Storage Tank
- Hydropneumatic Tank
- Production Well
- Pump Station
- Treatment Plant
- 8" and Smaller Water Line
- 10" and Larger Water Line
- Pressure Recorders
- Road
- Lake
- Stream
- City Limits
- ETJ Boundary

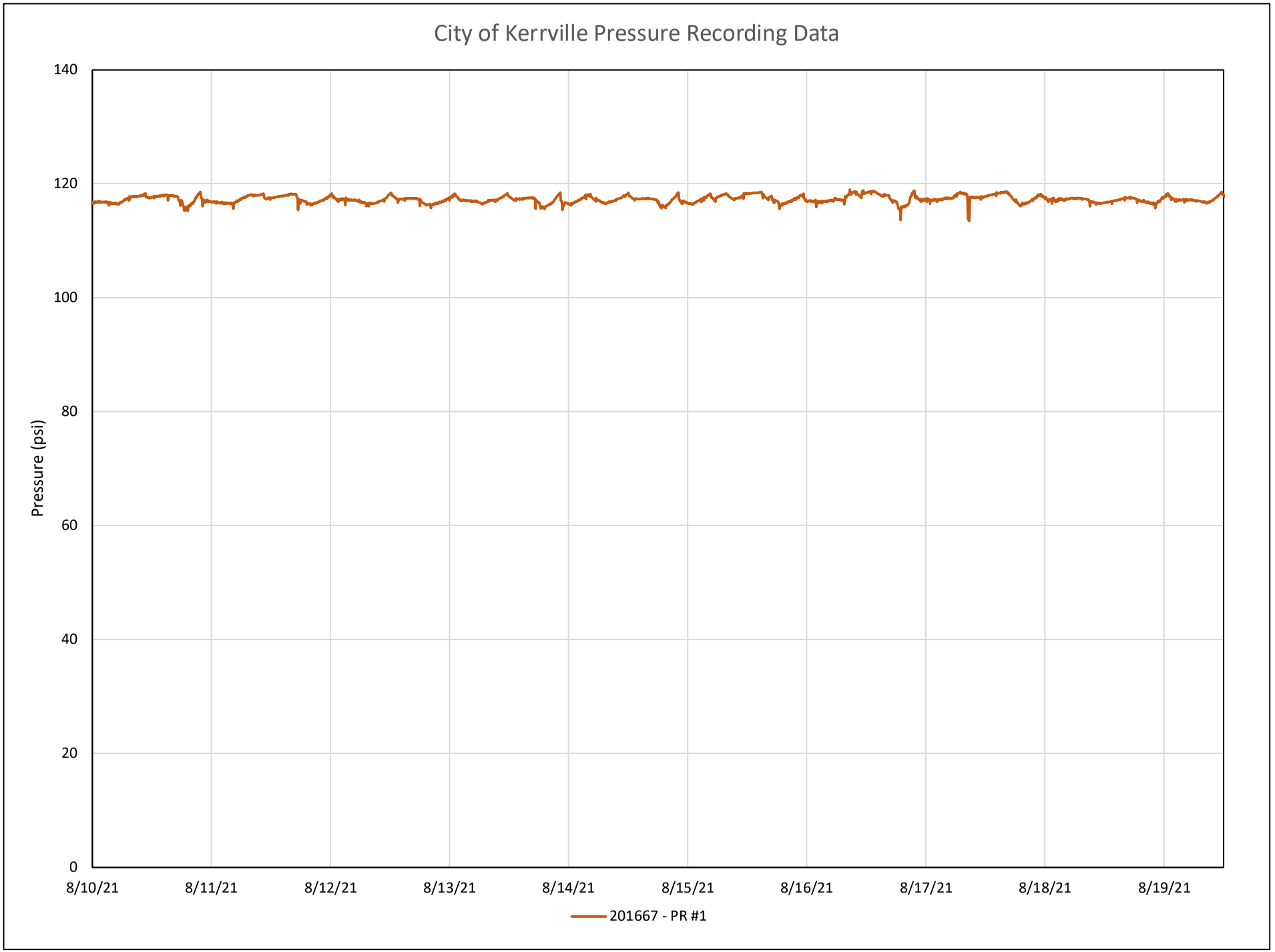
PRESSURE PLANES

- College Cove 1
- College Cove 2 PRV Zone
- Comanche Trace Lower PRV Zone
- Comanche Trace PRV Zone
- Hillcrest PRV Zone
- Hilltop Hydropneumatic Zone
- Kerrville North
- Keystone Hydropneumatic Zone
- Methodist
- Ridgewood
- Stadium
- Stone Ridge PRV Zone
- Summit
- The Heights Hydropneumatic Zone
- West Bluff Hydropneumatic Zone

FREESE AND NICHOLS

CITY OF KERRVILLE 1889 TEXAS

0 4,500
SCALE IN FEET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120
100
80
60
40
20
0
Pressure (psi)
8/10/21
8/11/21
8/12/21
8/13/21
8/14/21
8/15/21
8/16/21
8/17/21
8/18/21
8/19/21
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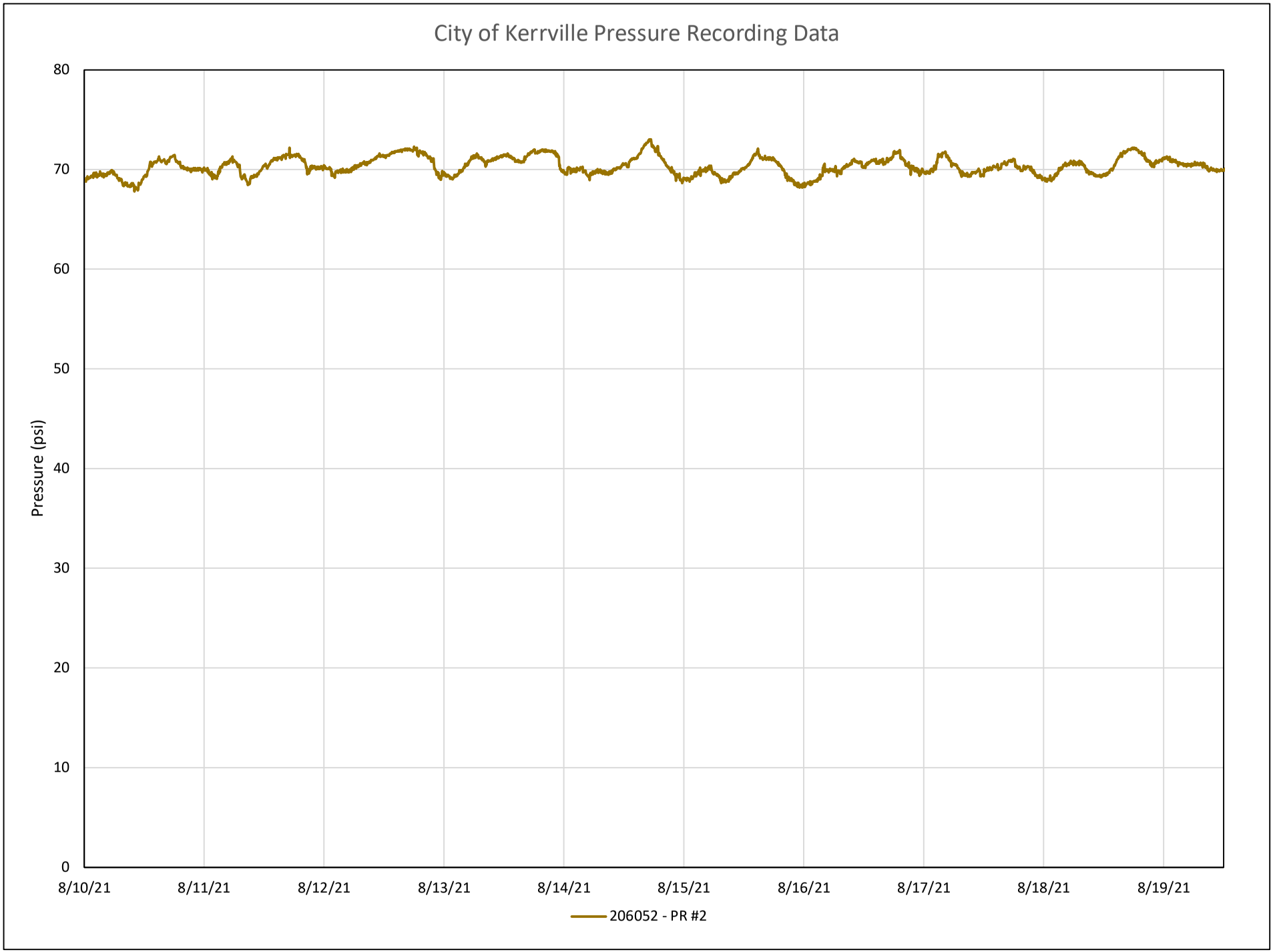
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Pressure (psi)
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70
60
50
40
30
20
10
0
8/10/21
8/11/21
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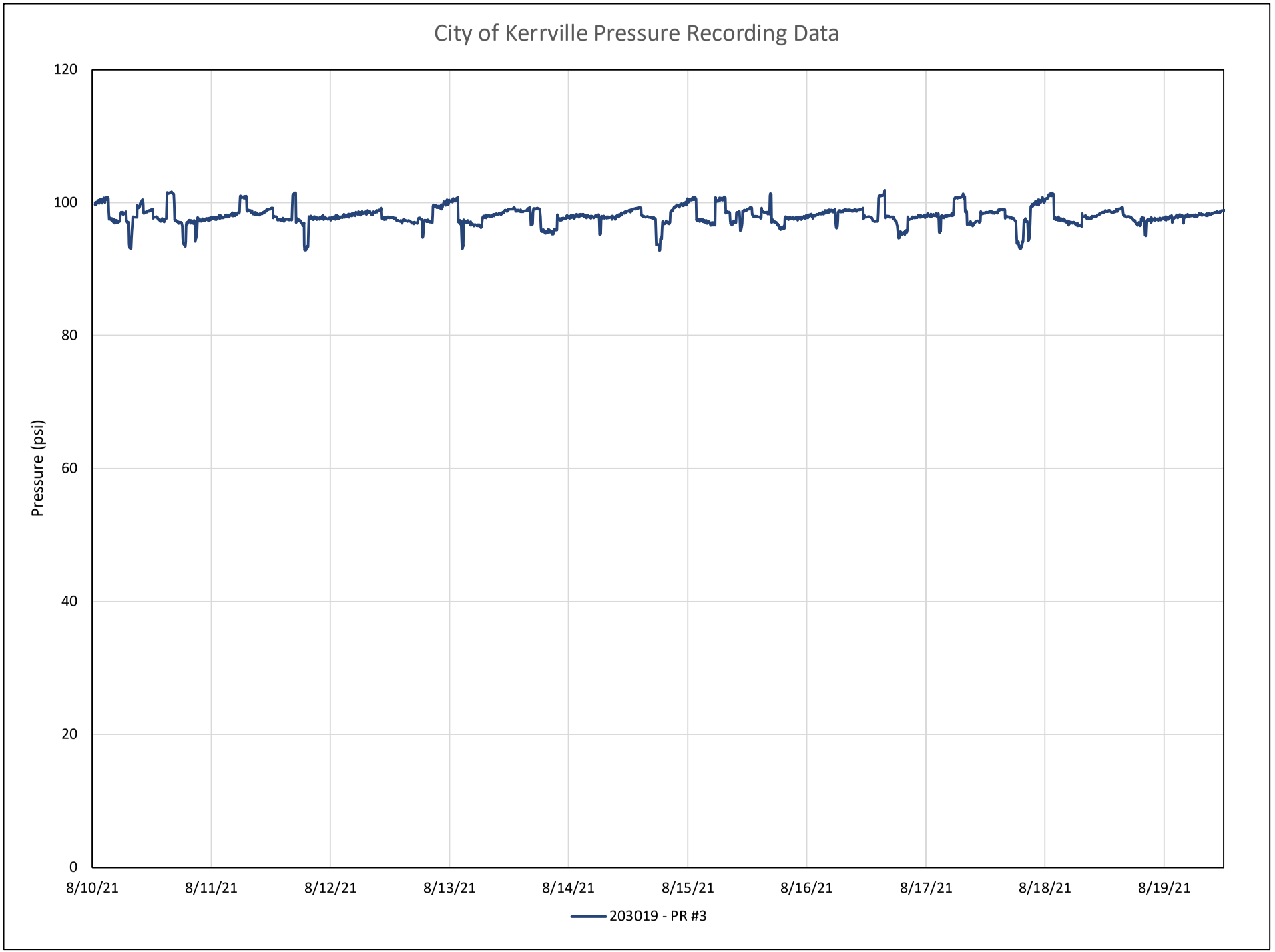
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100
80
60
40
20
0
Pressure (psi)
8/10/21
8/11/21
8/12/21
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8/15/21
8/16/21
8/17/21
8/18/21
8/19/21
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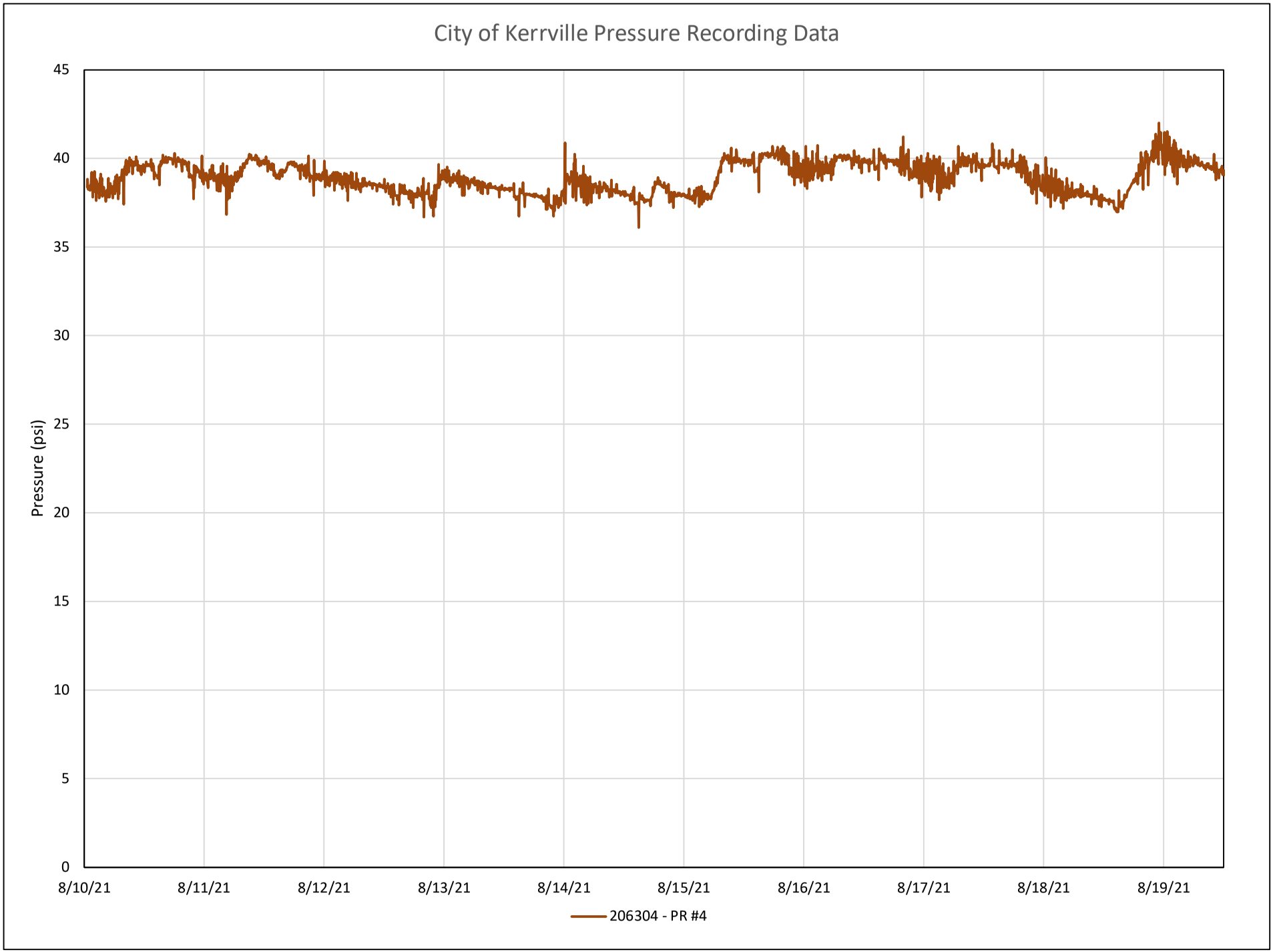
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Pressure (psi)
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40
35
30
25
20
15
10
5
0
8/10/21
8/11/21
8/12/21
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8/18/21
8/19/21
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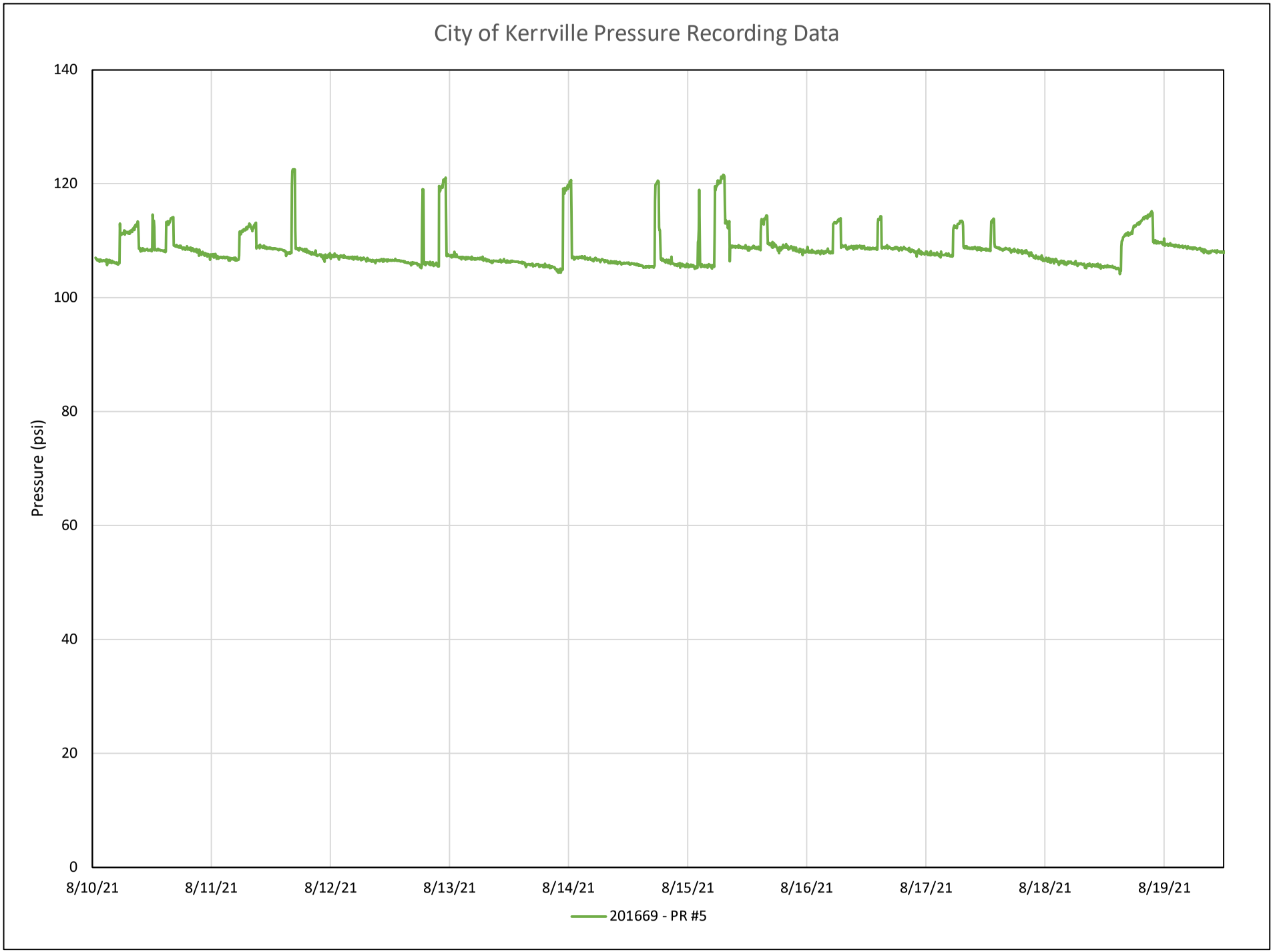
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120
100
80
60
40
20
0
Pressure (psi)
8/10/21
8/11/21
8/12/21
8/13/21
8/14/21
8/15/21
8/16/21
8/17/21
8/18/21
8/19/21
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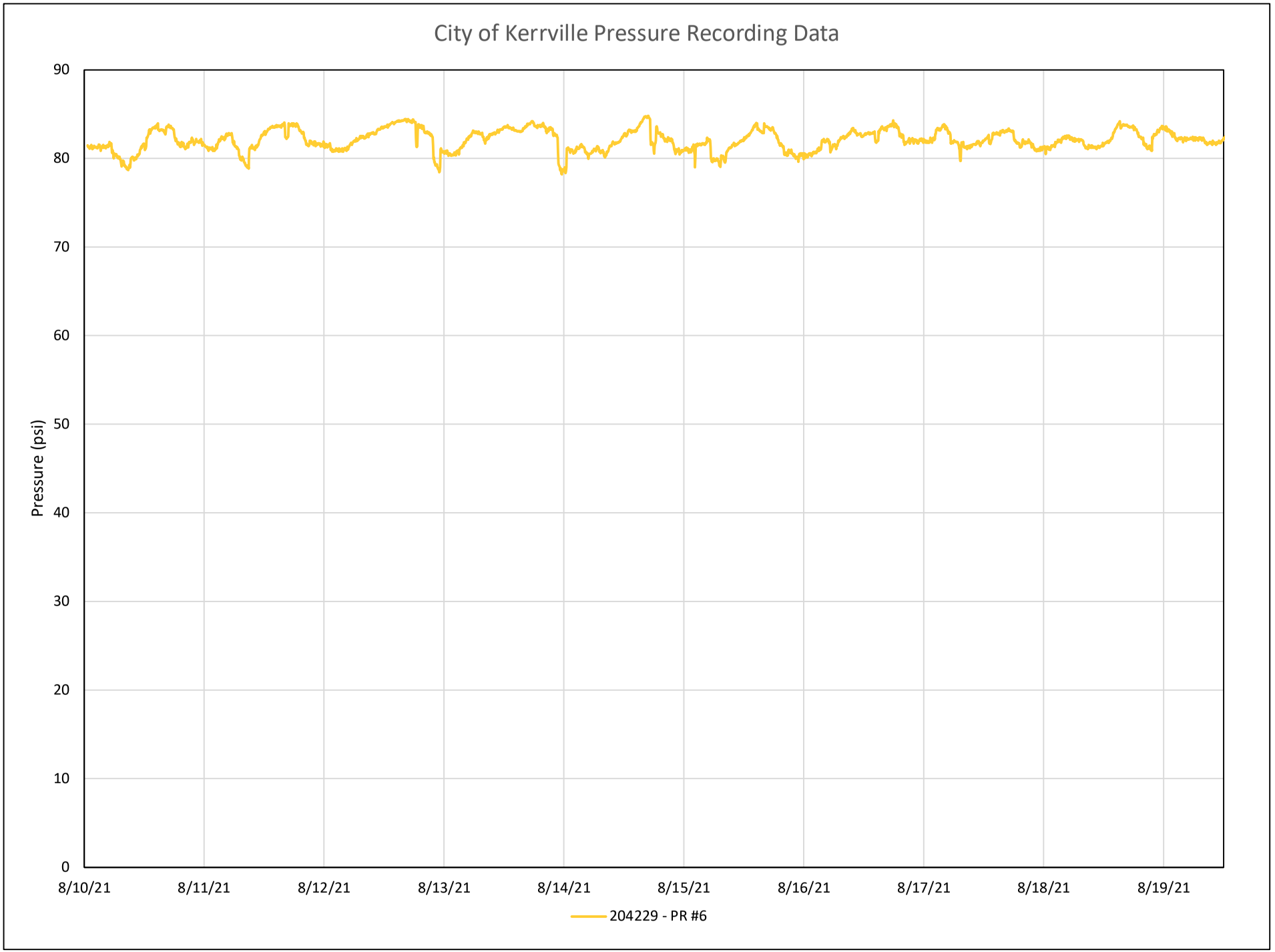
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Pressure (psi)
90
80
70
60
50
40
30
20
10
0
8/10/21
8/11/21
8/12/21
8/13/21
8/14/21
8/15/21
8/16/21
8/17/21
8/18/21
8/19/21
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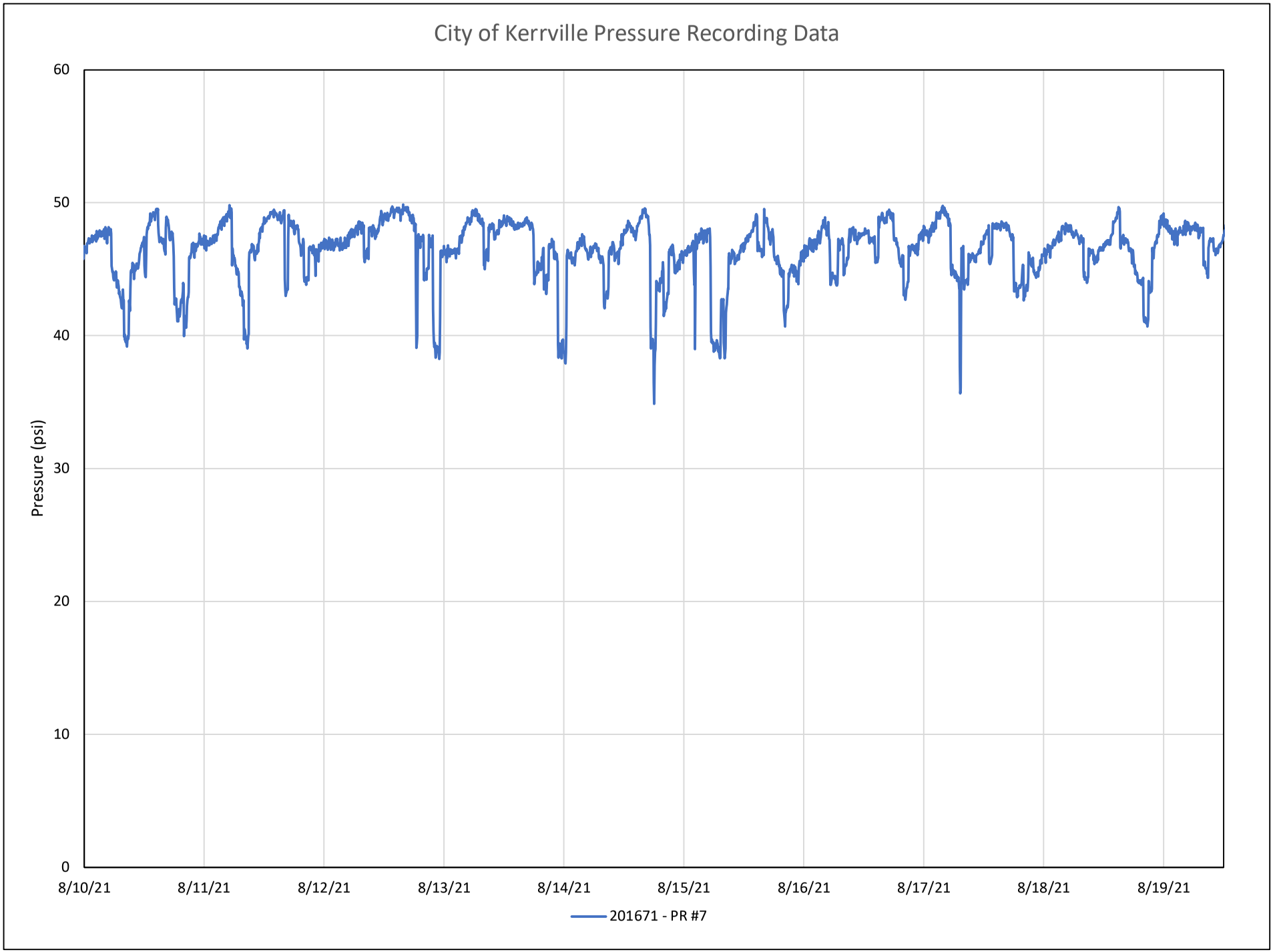
City of Kerrville Pressure Recording Data
Pressure (psi)
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50
40
30
20
10
0
8/10/21
8/11/21
8/12/21
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8/15/21
8/16/21
8/17/21
8/18/21
8/19/21
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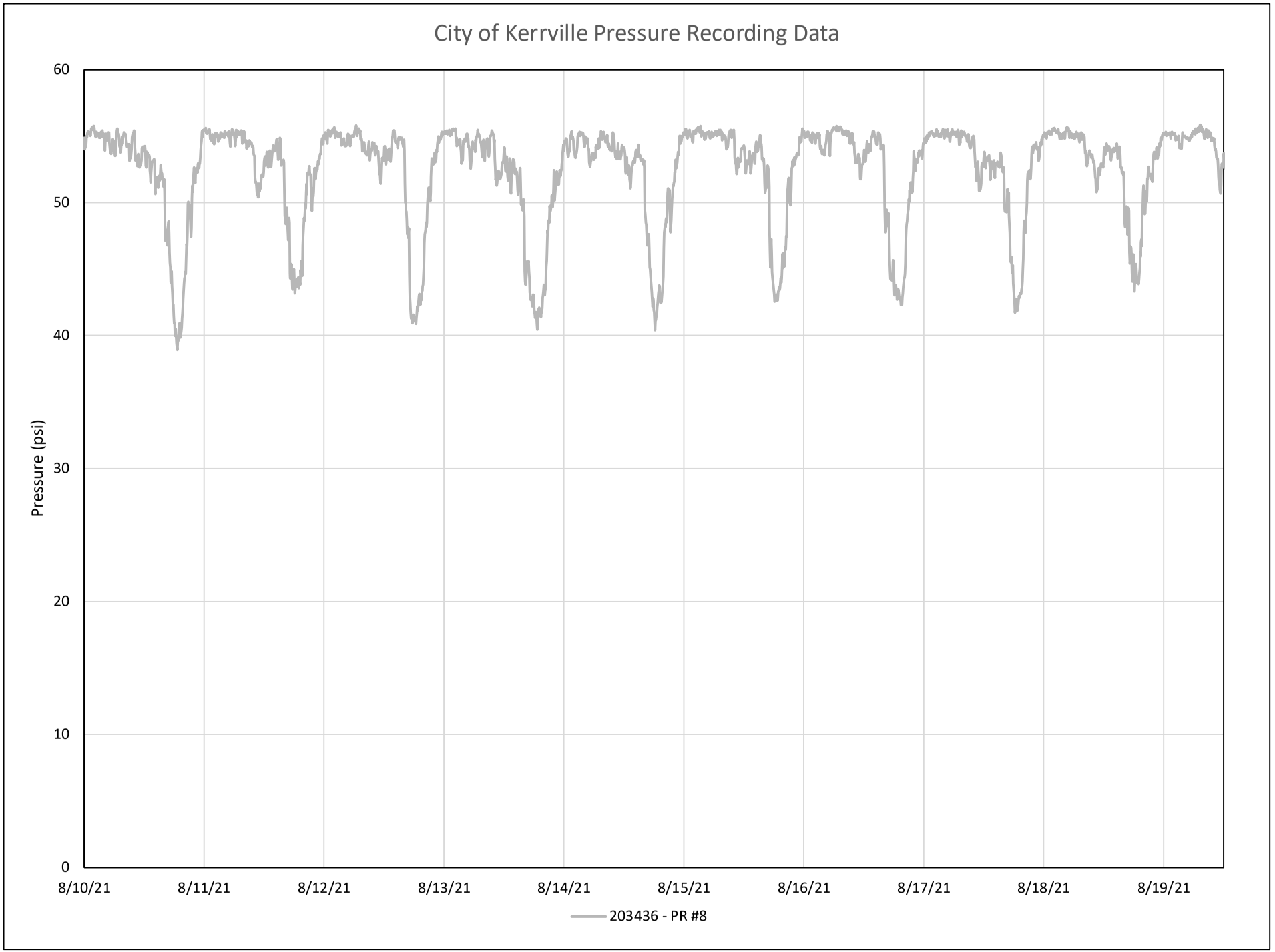
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Pressure (psi)
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50
40
30
20
10
0
8/10/21
8/11/21
8/12/21
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8/16/21
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8/18/21
8/19/21
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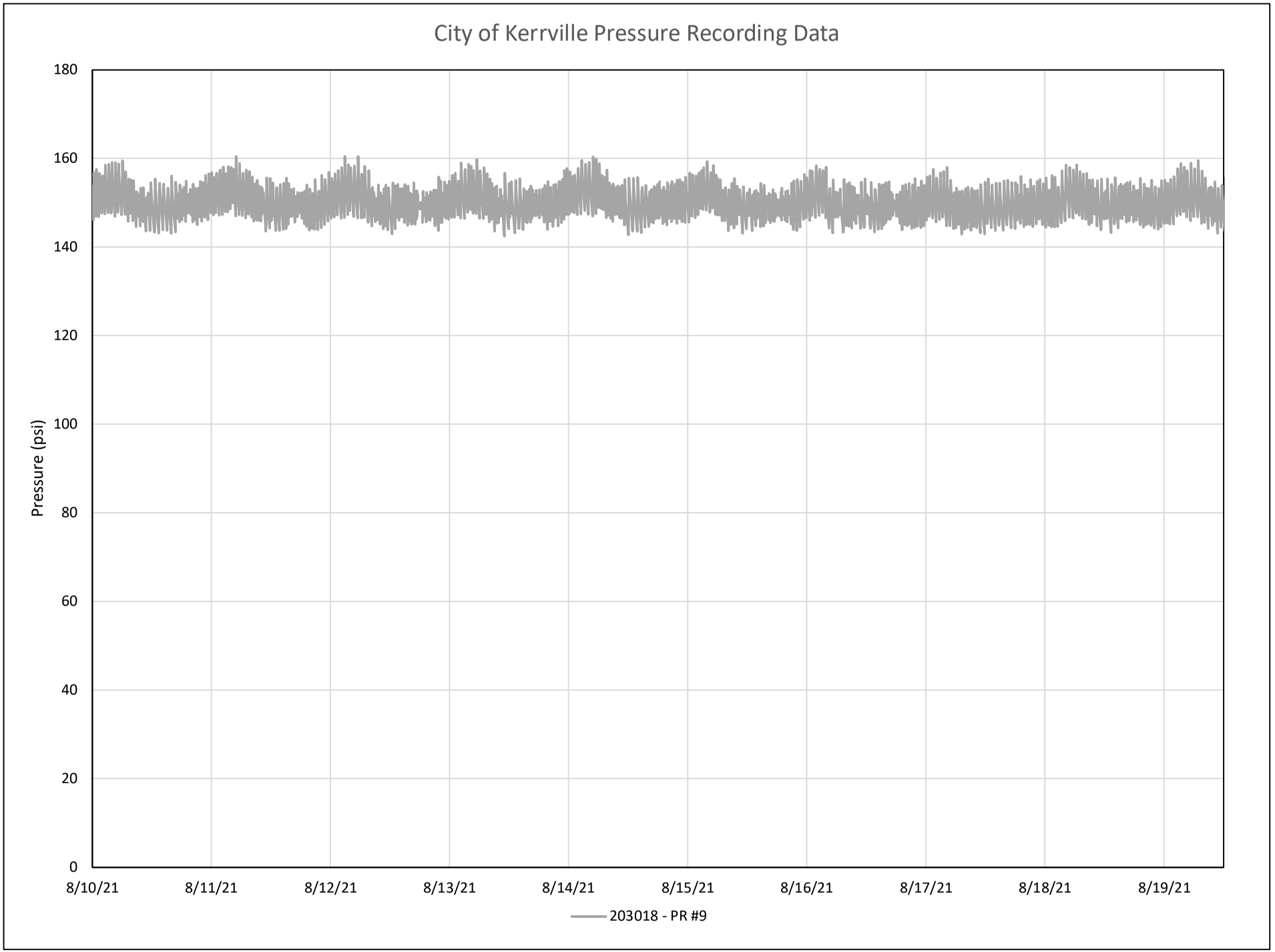
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Pressure (psi)
180
160
140
120
100
80
60
40
20
0
8/10/21
8/11/21
8/12/21
8/13/21
8/14/21
8/15/21
8/16/21
8/17/21
8/18/21
8/19/21
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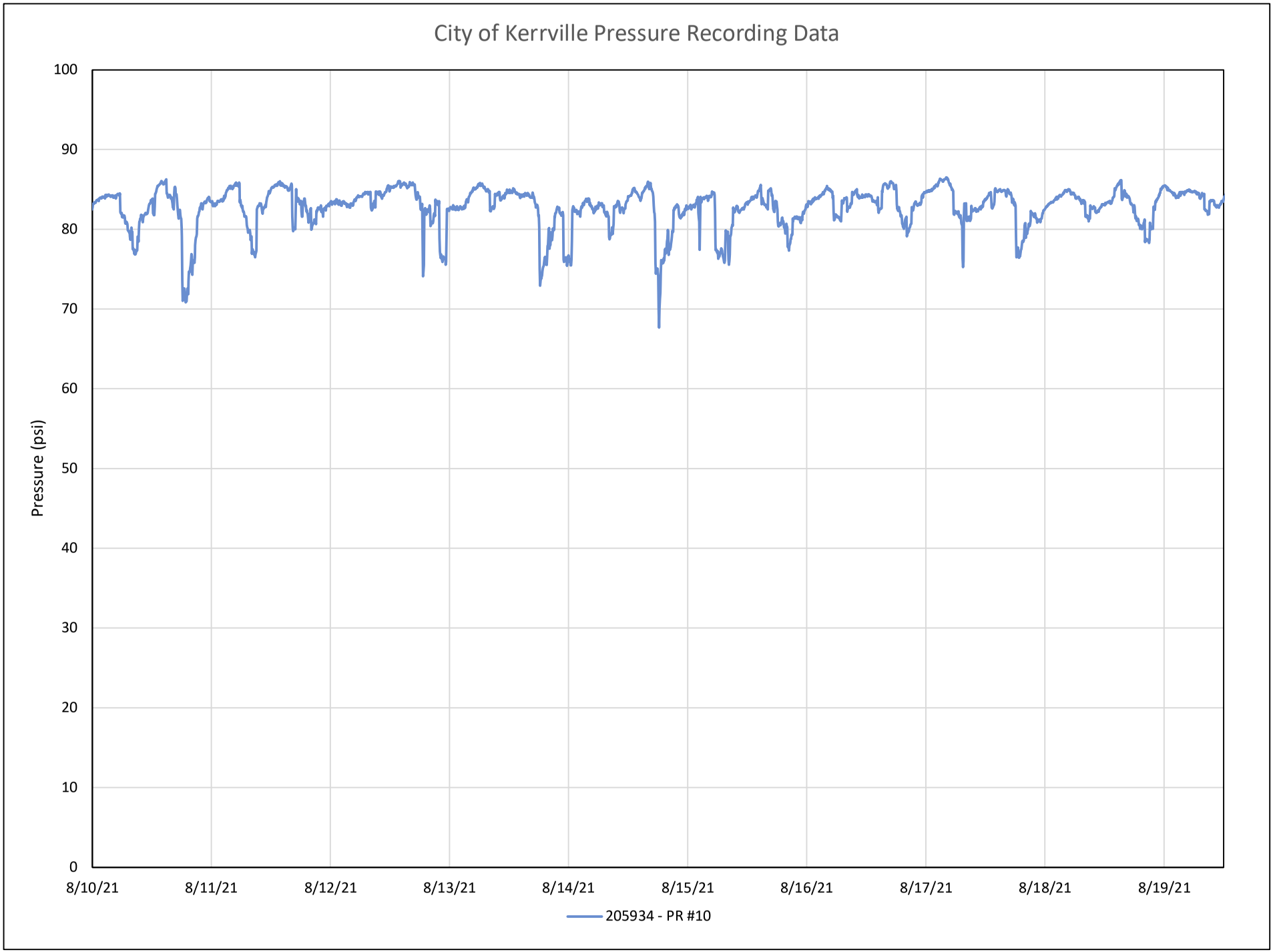
City of Kerrville Pressure Recording Data
Pressure (psi)
100
90
80
70
60
50
40
30
20
10
0
8/10/21
8/11/21
8/12/21
8/13/21
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8/15/21
8/16/21
8/17/21
8/18/21
8/19/21
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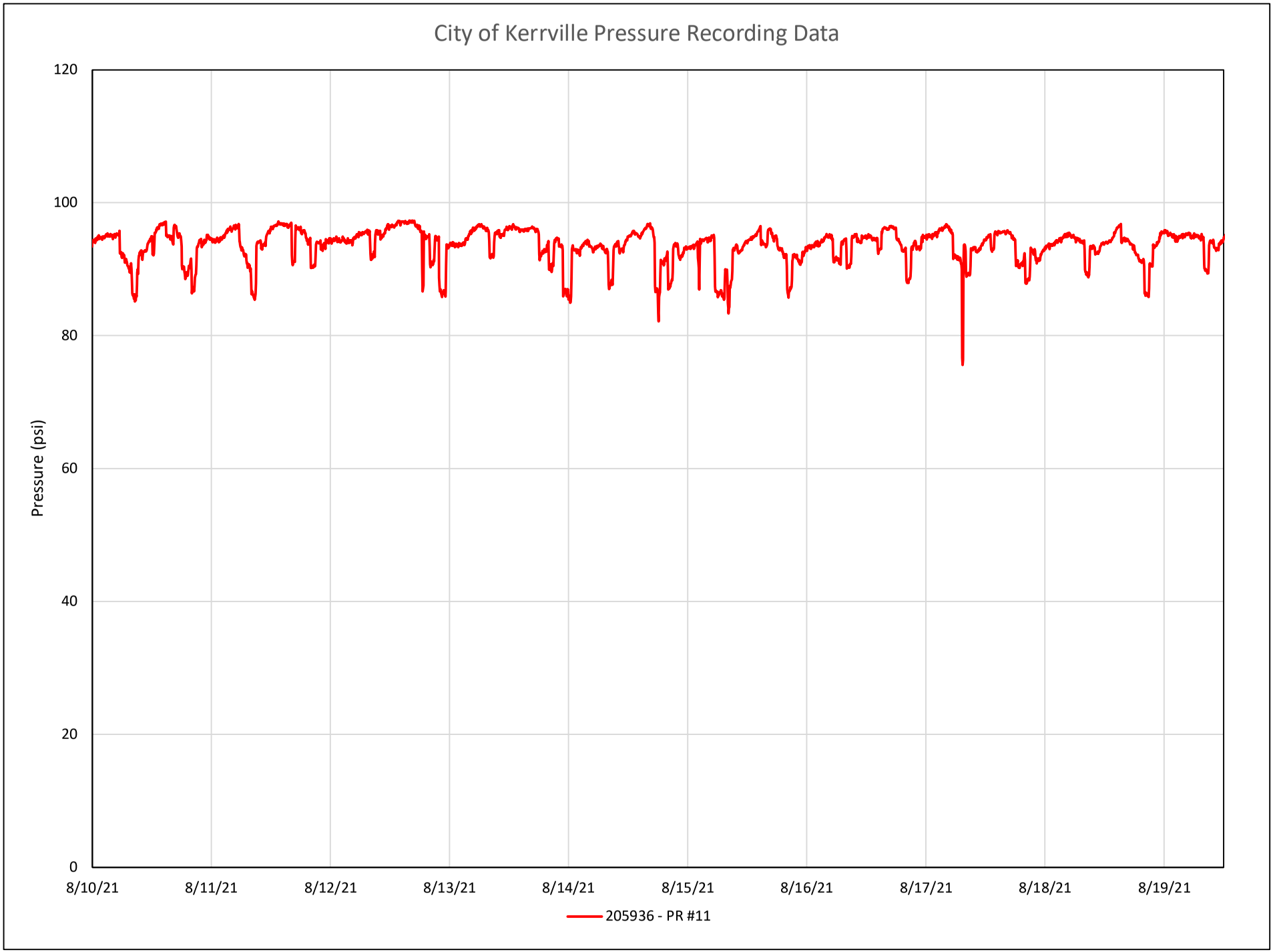
City of Kerrville Pressure Recording Data
120
100
80
60
40
20
0
Pressure (psi)
8/10/21
8/11/21
8/12/21
8/13/21
8/14/21
8/15/21
8/16/21
8/17/21
8/18/21
8/19/21
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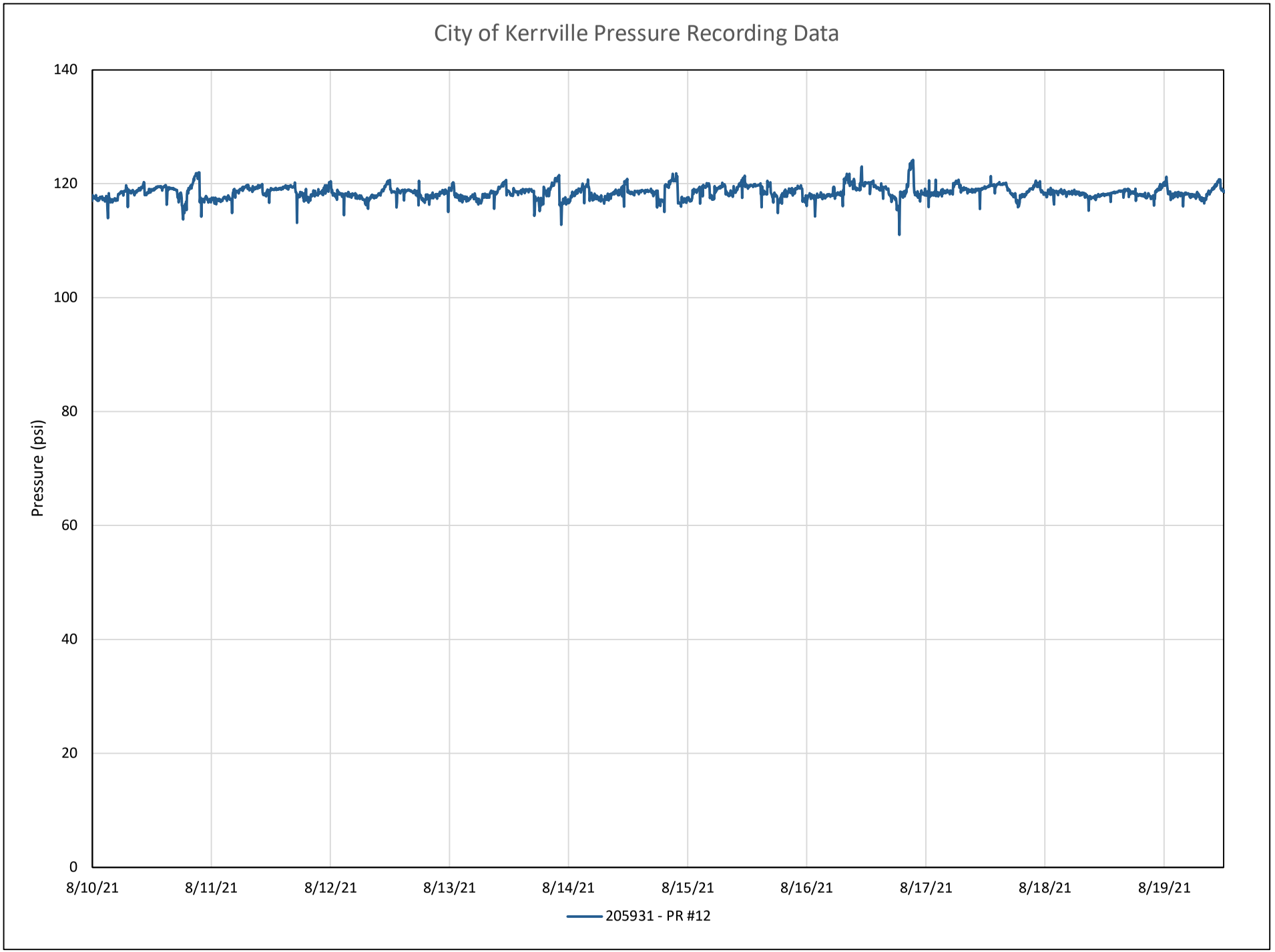
City of Kerrville Pressure Recording Data
140
120
100
80
60
40
20
0
Pressure (psi)
8/10/21
8/11/21
8/12/21
8/13/21
8/14/21
8/15/21
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8/17/21
8/18/21
8/19/21
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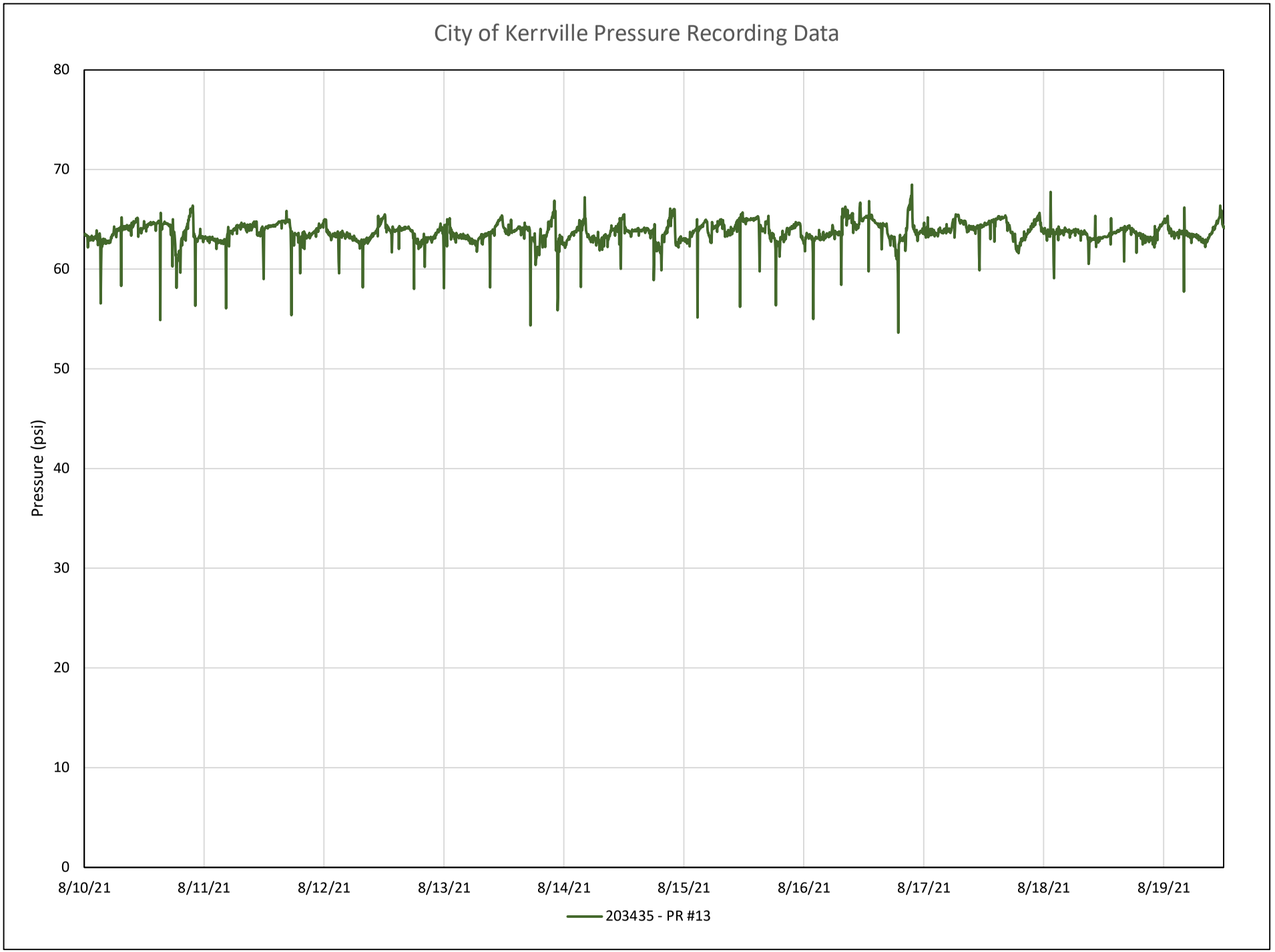
City of Kerrville Pressure Recording Data
Pressure (psi)
80
70
60
50
40
30
20
10
0
8/10/21
8/11/21
8/12/21
8/13/21
8/14/21
8/15/21
8/16/21
8/17/21
8/18/21
8/19/21
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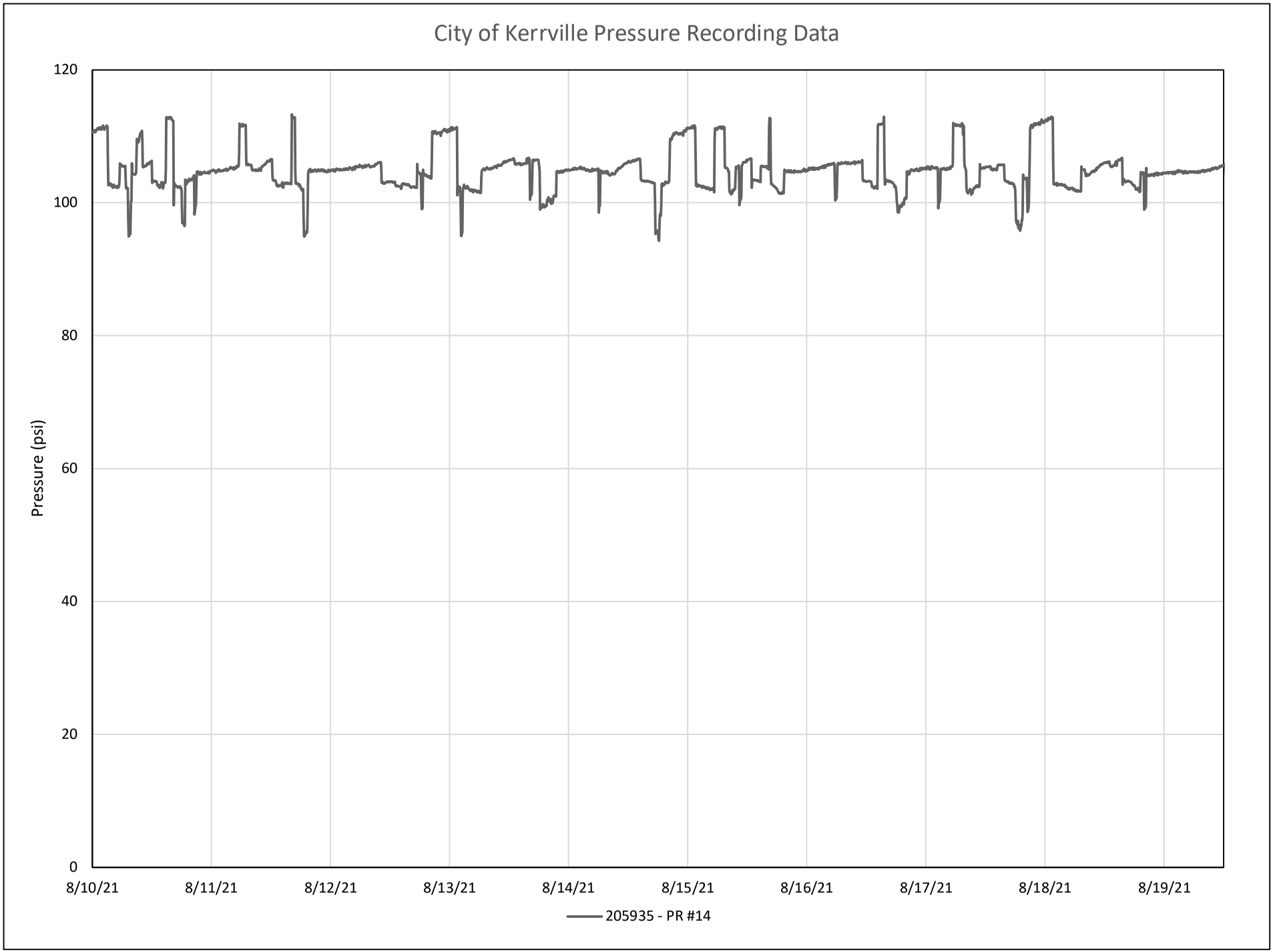
City of Kerrville Pressure Recording Data
120
100
80
60
40
20
0
Pressure (psi)
8/10/21
8/11/21
8/12/21
8/13/21
8/14/21
8/15/21
8/16/21
8/17/21
8/18/21
8/19/21
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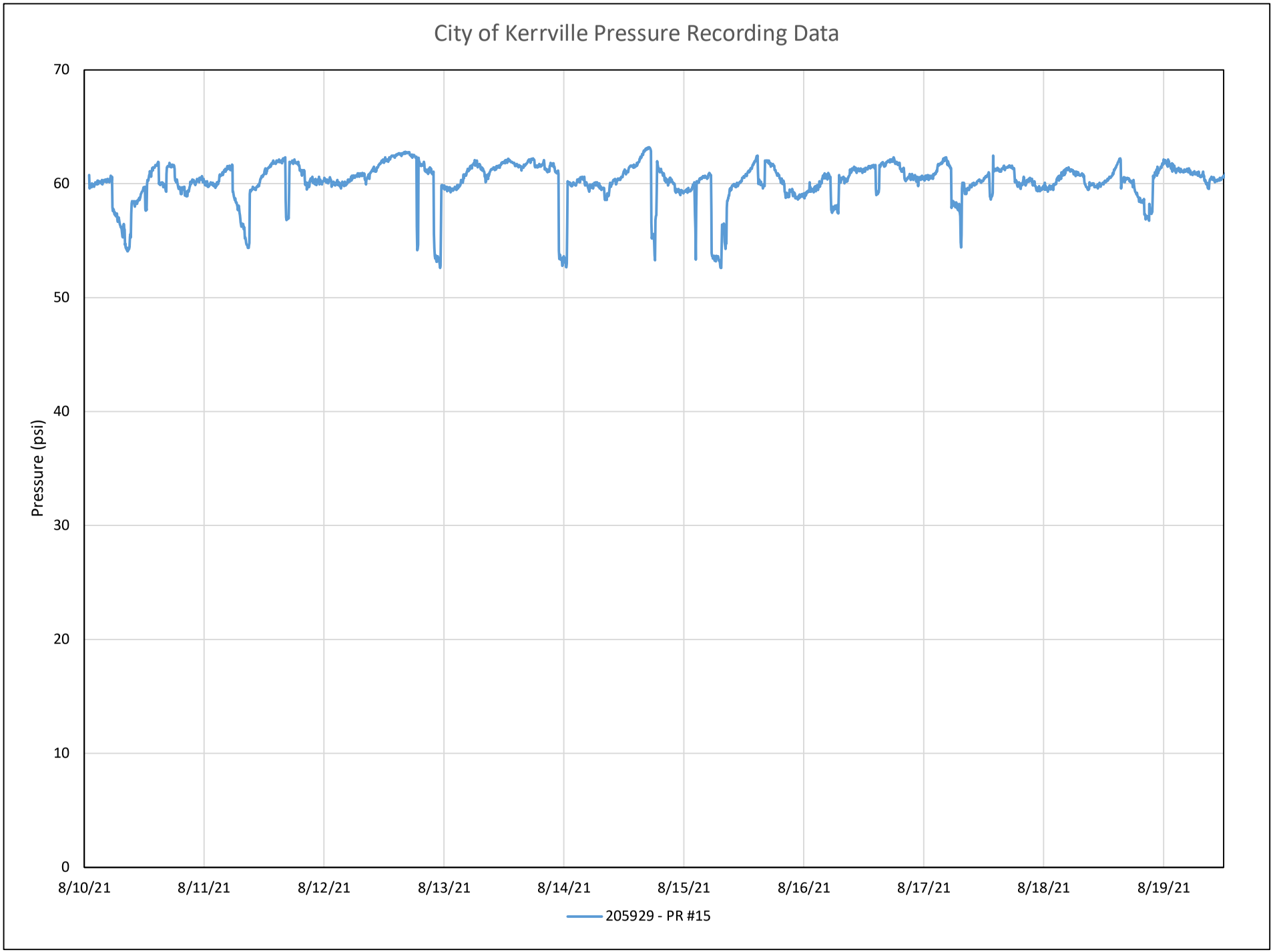
City of Kerrville Pressure Recording Data
Pressure (psi)
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60
50
40
30
20
10
0
8/10/21
8/11/21
8/12/21
8/13/21
8/14/21
8/15/21
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8/17/21
8/18/21
8/19/21
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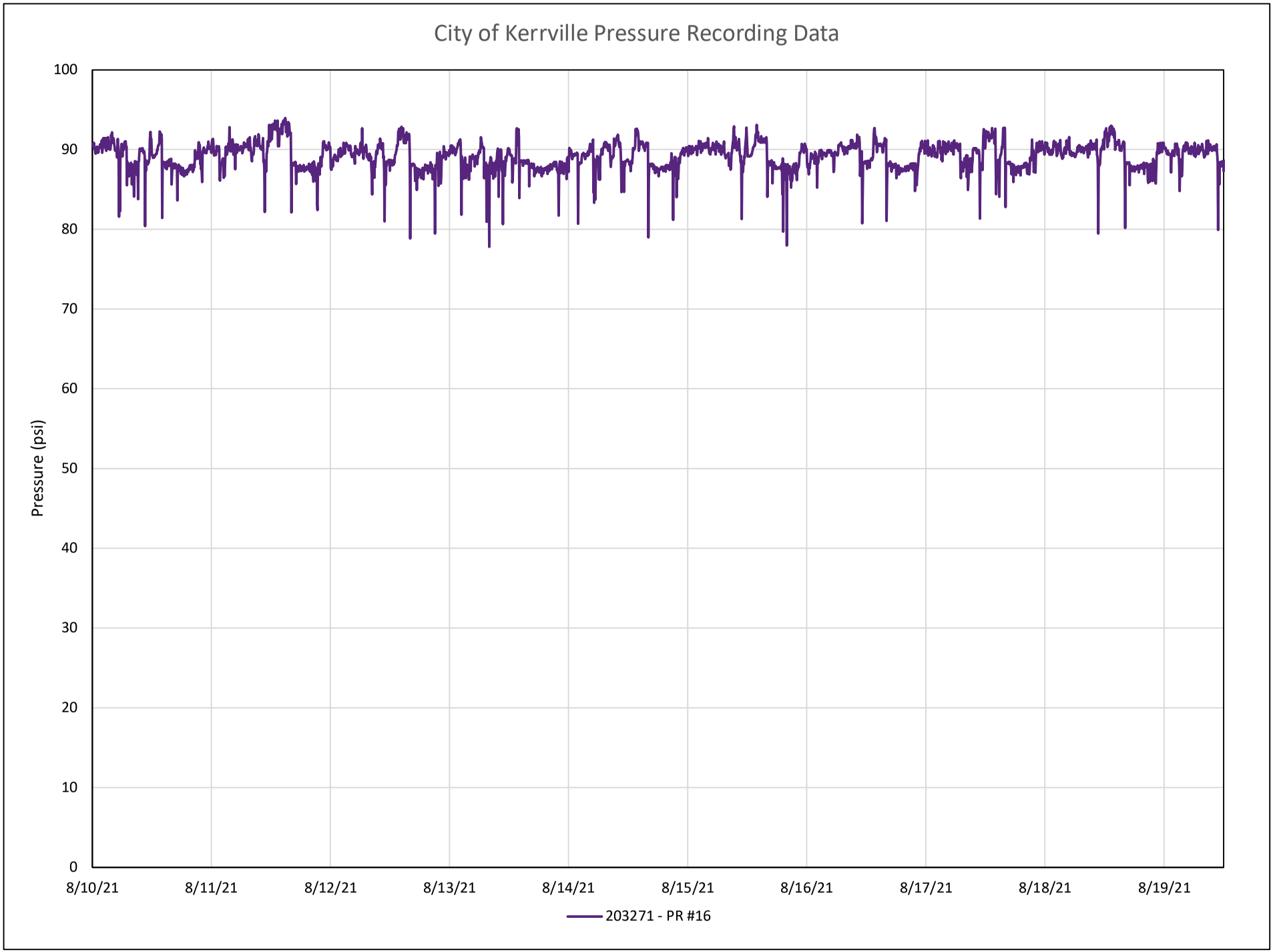
City of Kerrville Pressure Recording Data
Pressure (psi)
100
90
80
70
60
50
40
30
20
10
0
8/10/21
8/11/21
8/12/21
8/13/21
8/14/21
8/15/21
8/16/21
8/17/21
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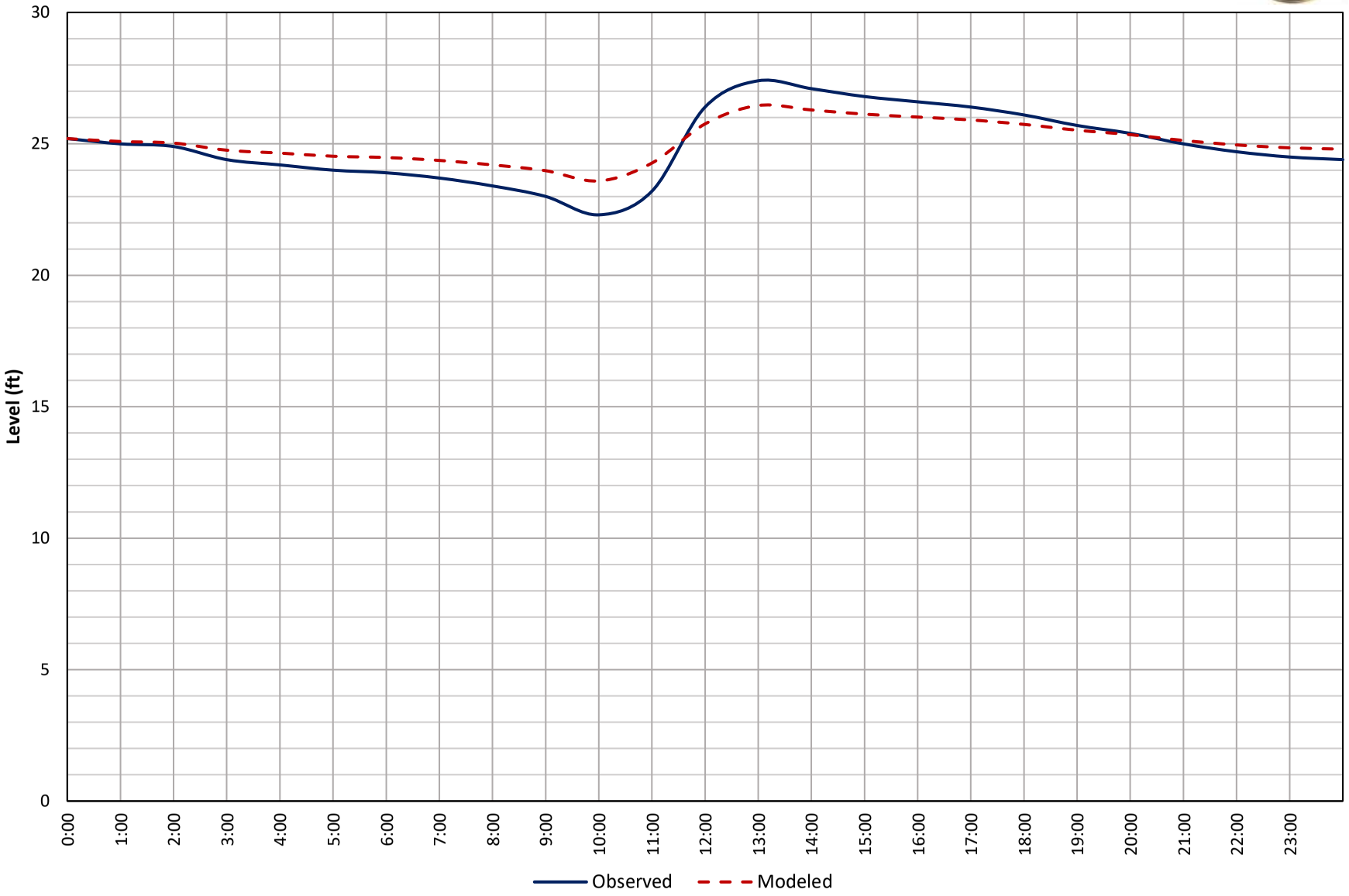
8/19/21
203271 - PR #16

APPENDIX B
Model Calibration Results

DRAFT

College Cove GST

August 14, 2021 Calibration



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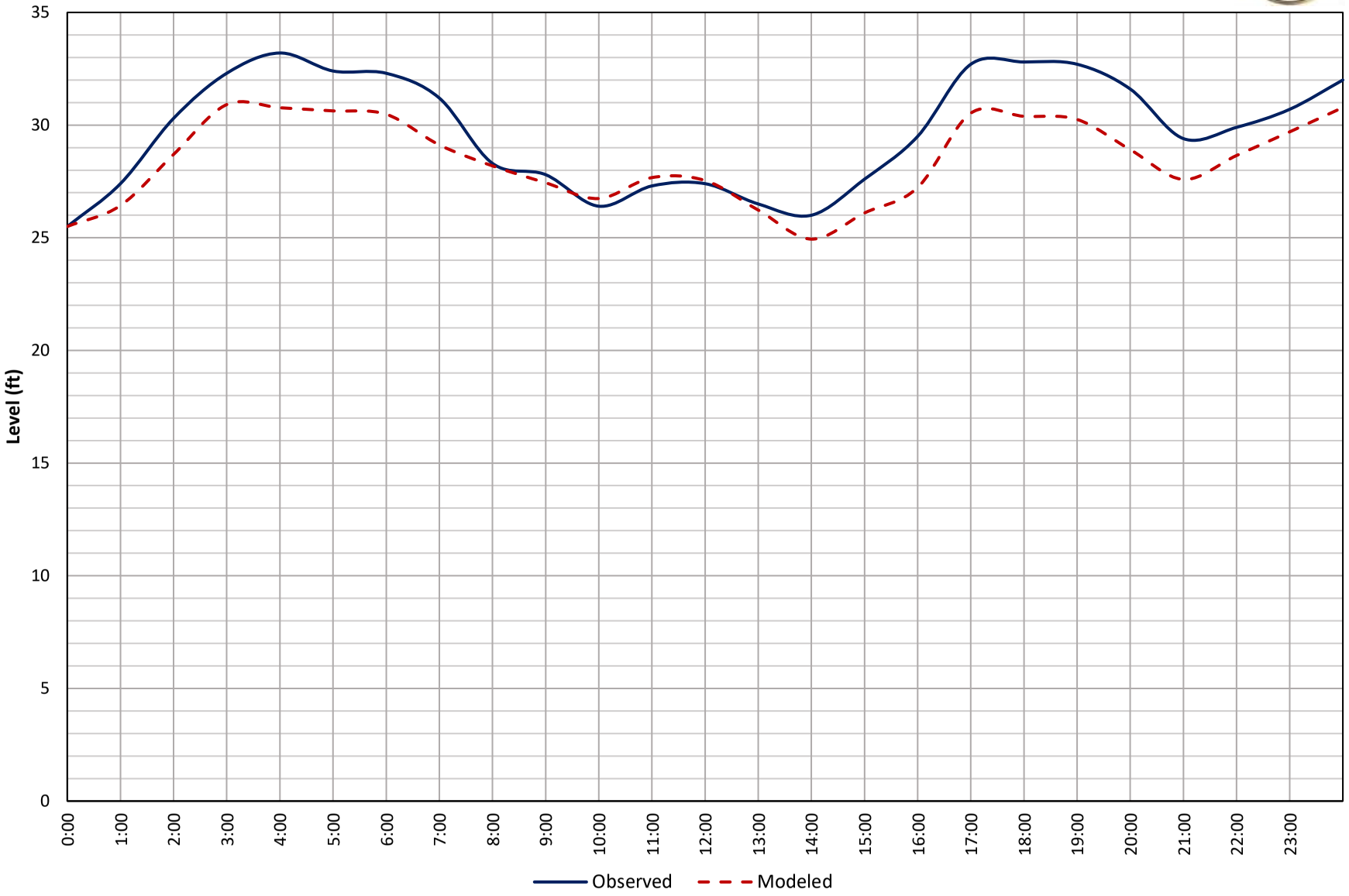
Lois GST

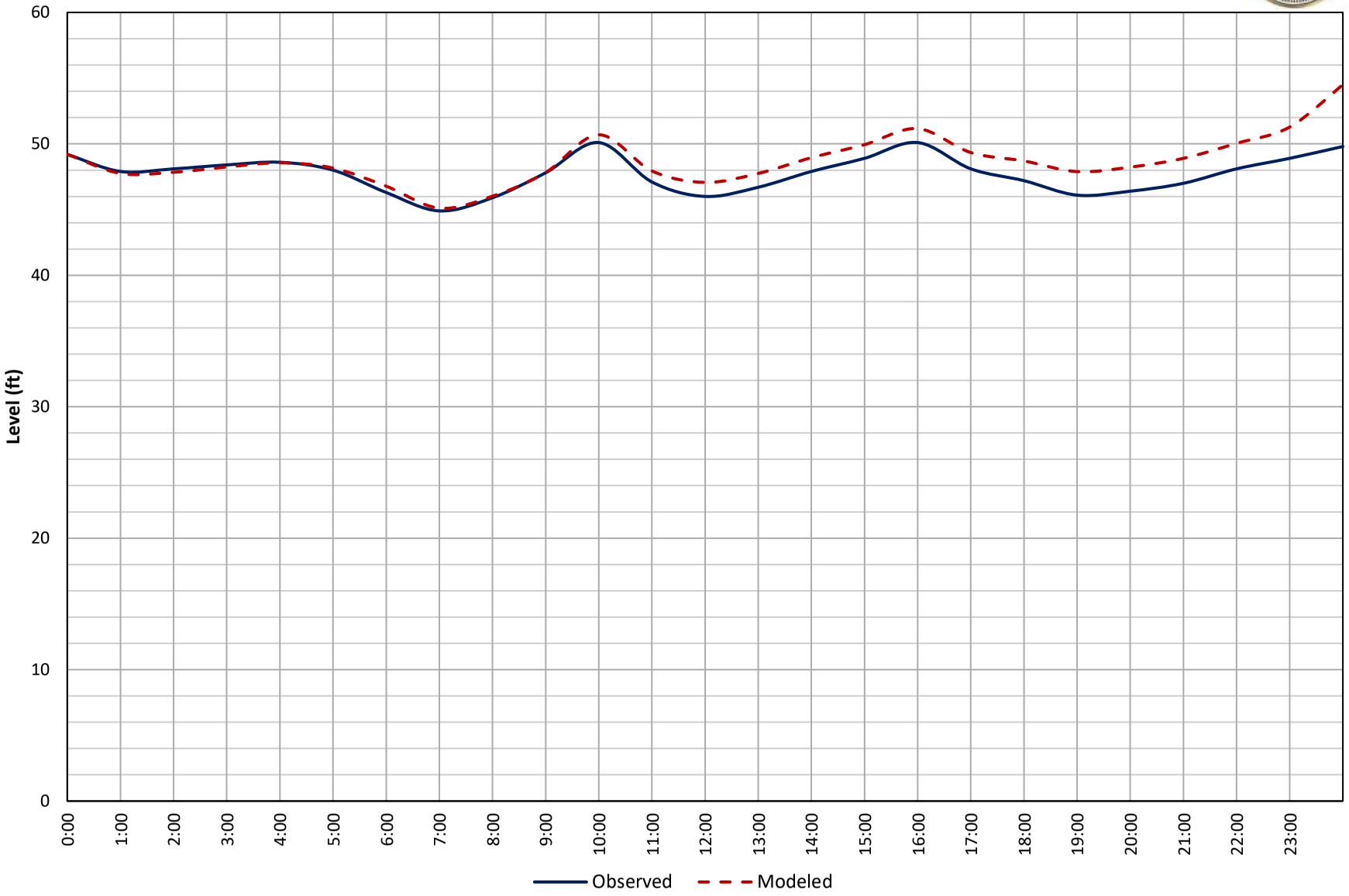
August 14, 2021 Calibration



DRAFT

Methodist GST

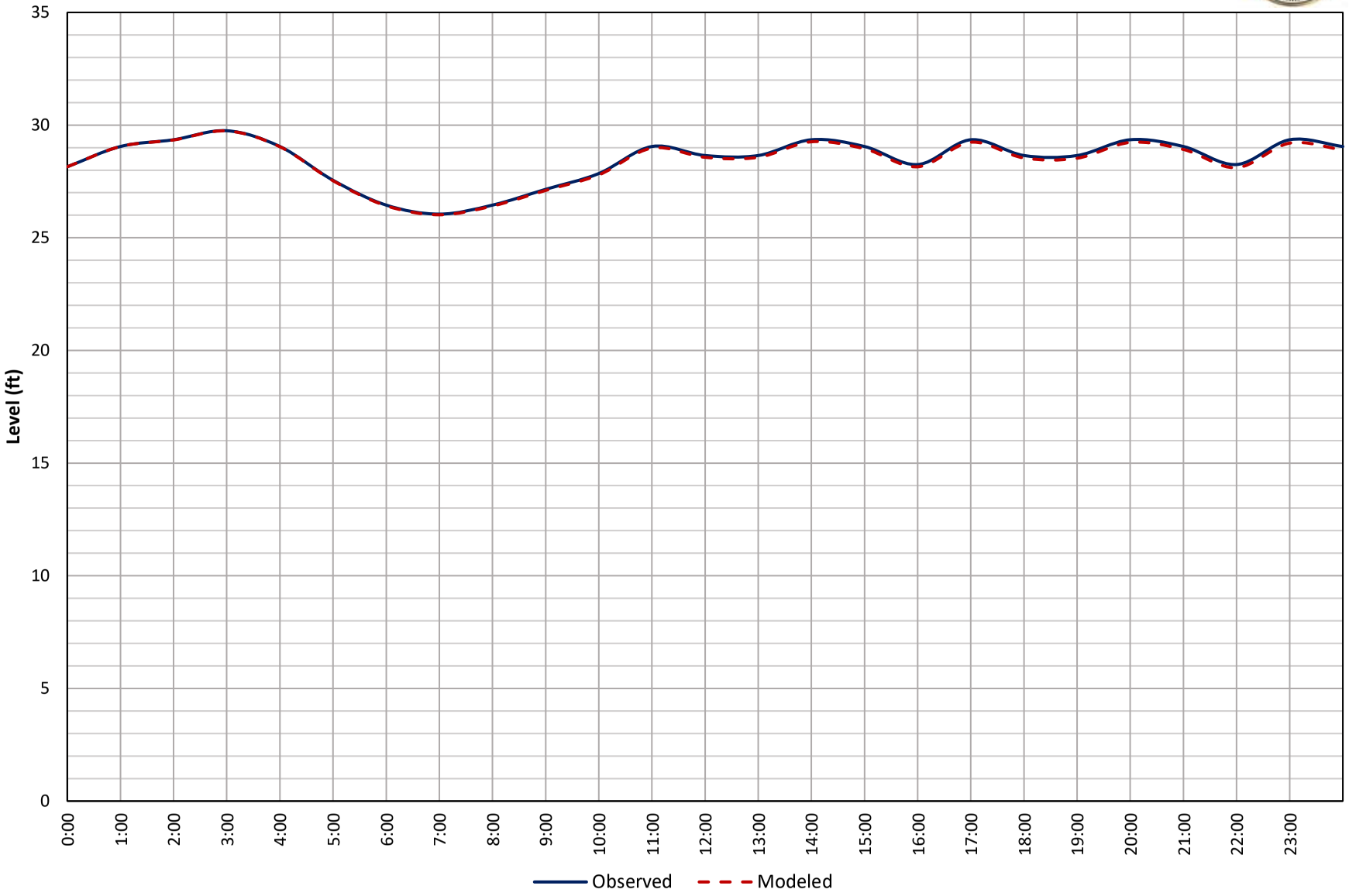
August 14, 2021 Calibration



DRAFT

Ridgewood EST

August 14, 2021 Calibration



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Riverhills EST

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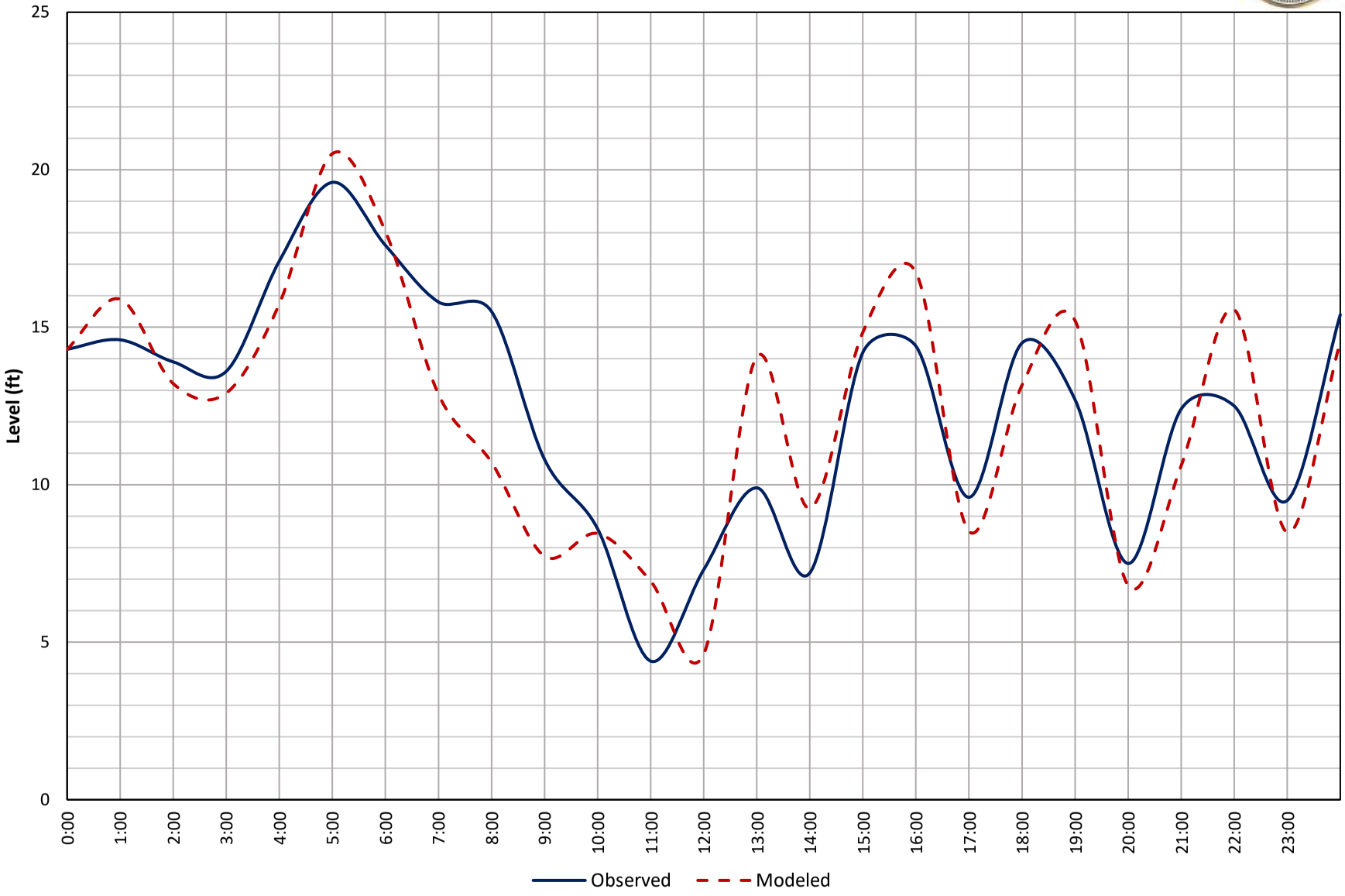

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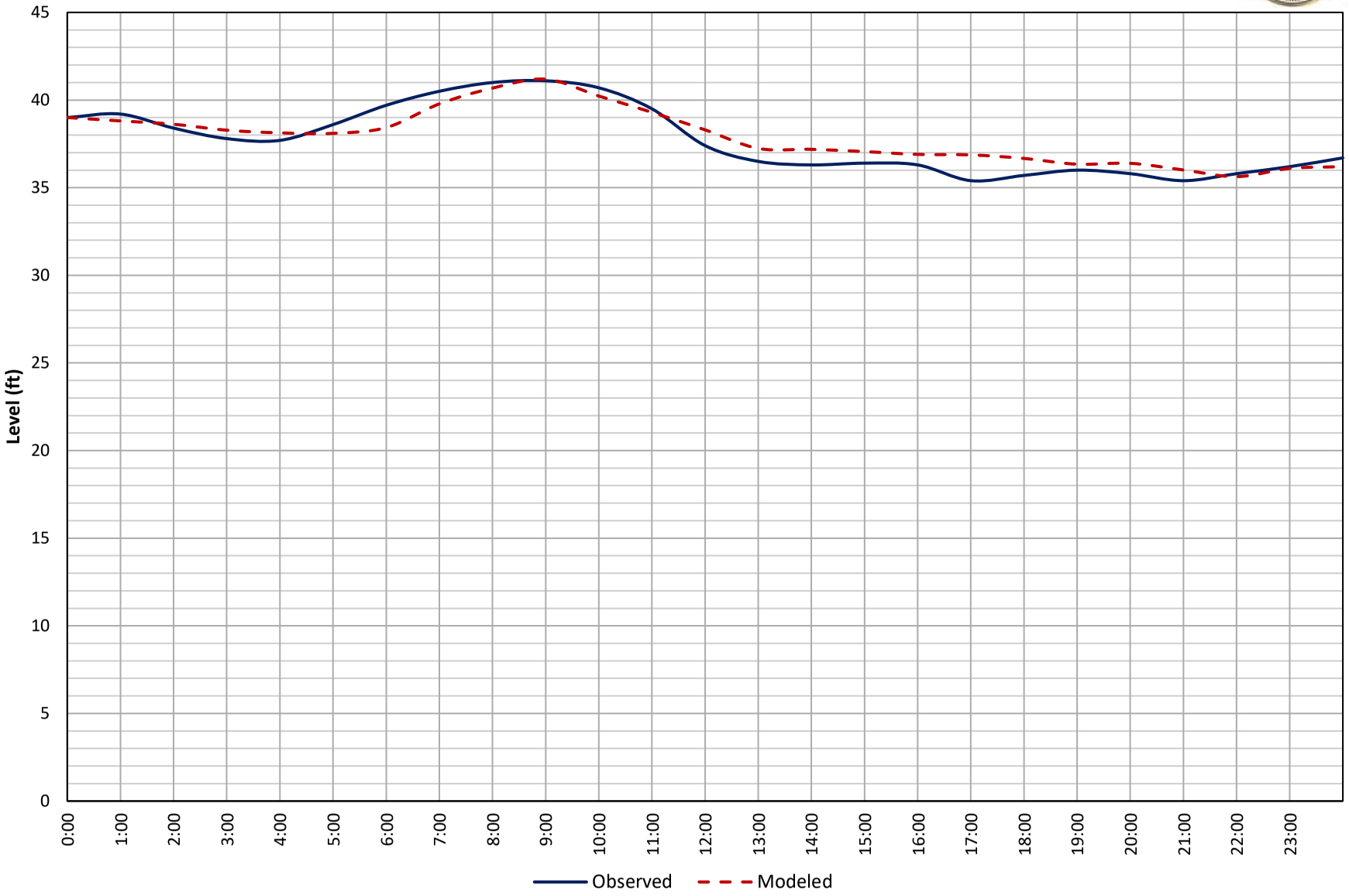
Stadium GST

August 14, 2021 Calibration



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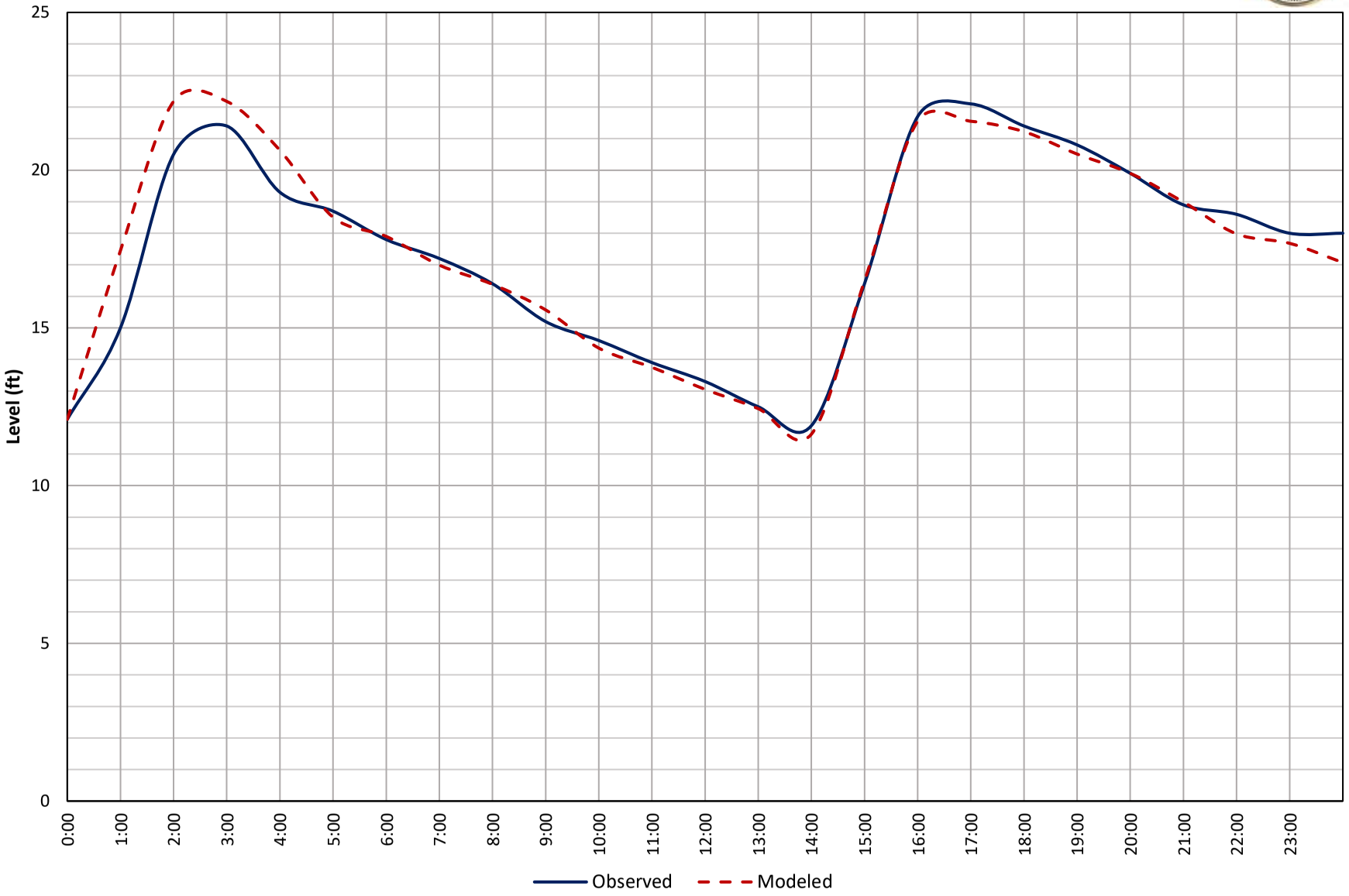
Summit EST

August 14, 2021 Calibration



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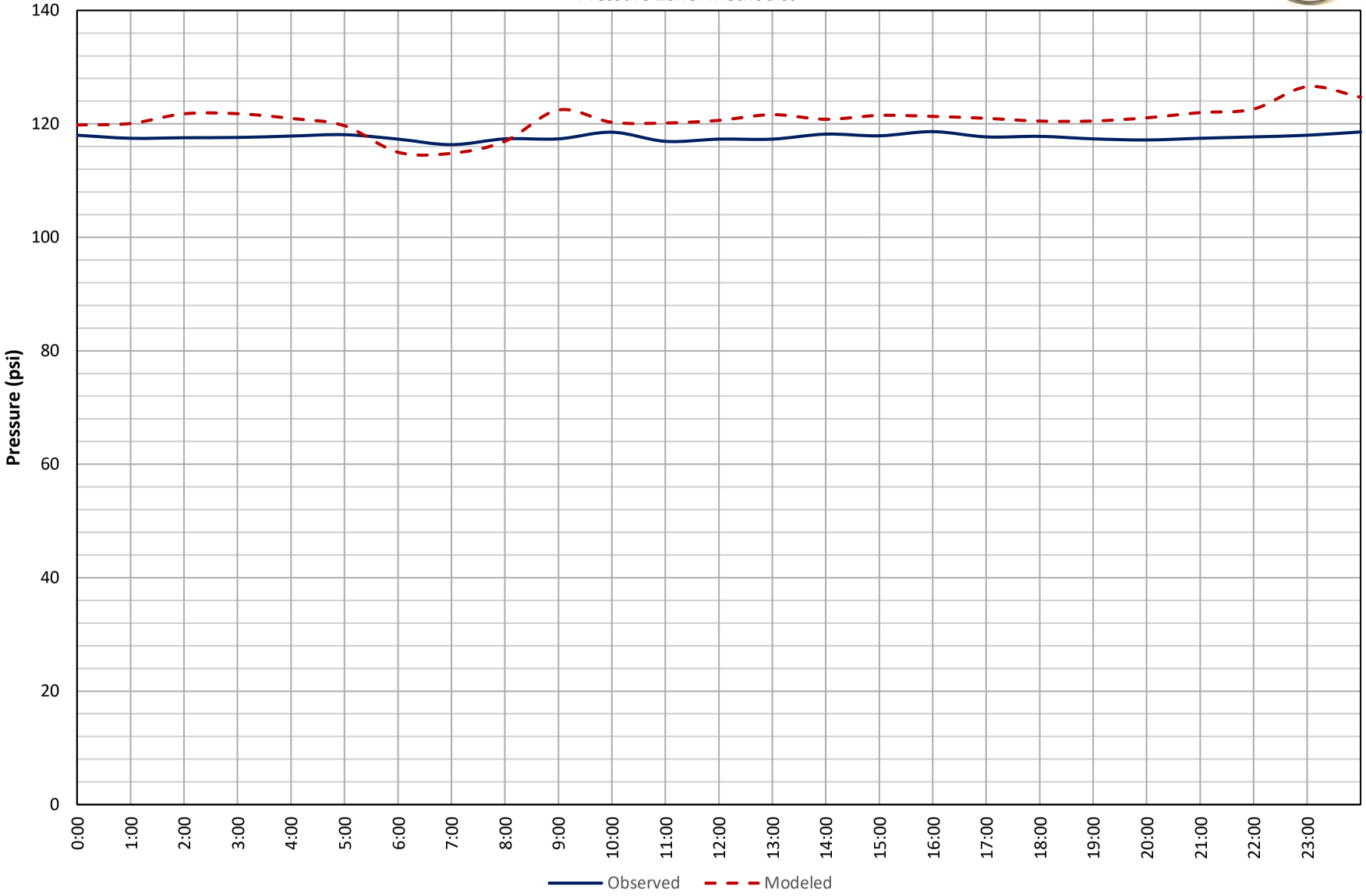
PR 1

August 14, 2021 Calibration

Pressure Zone: Methodist



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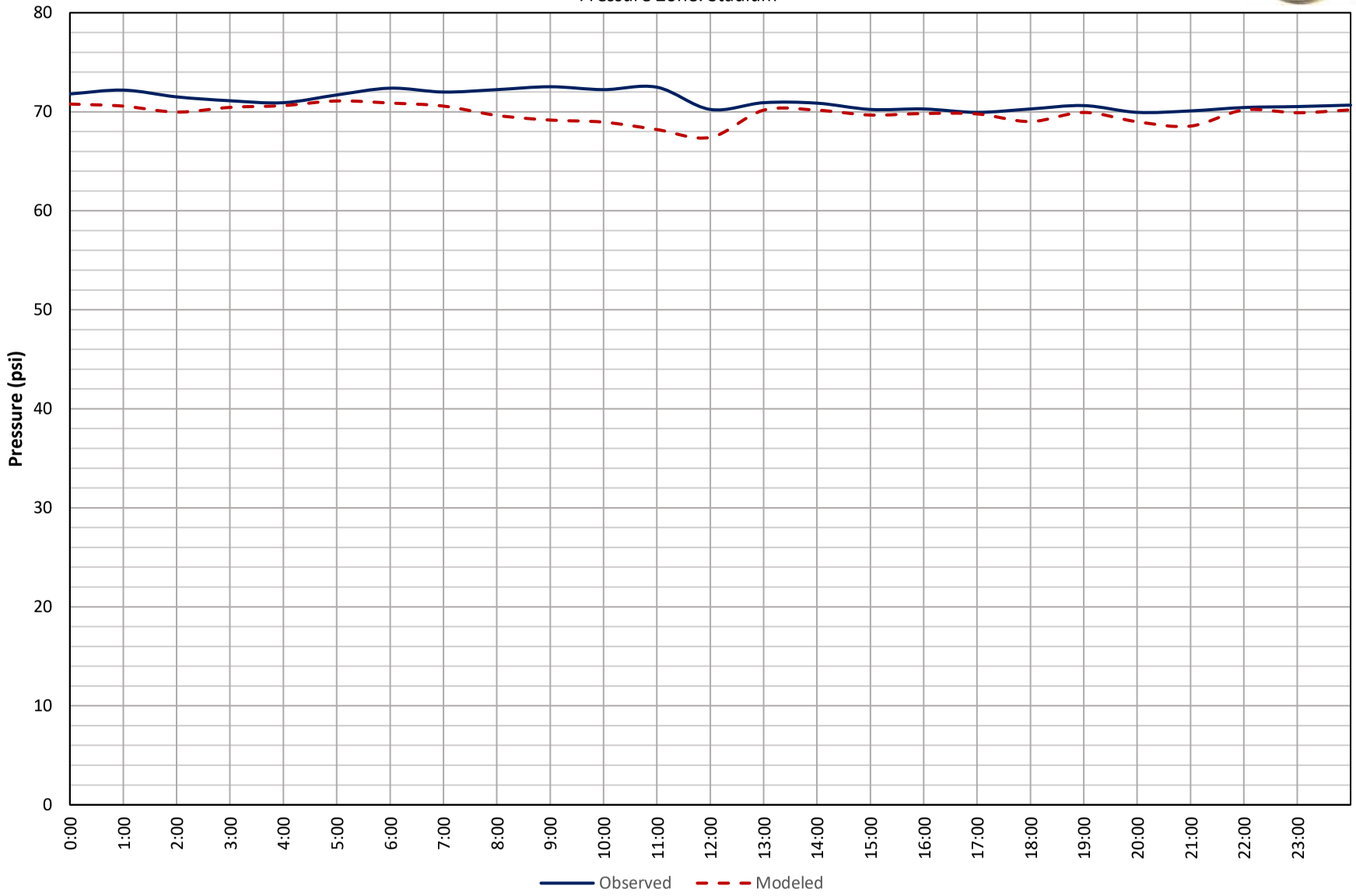
PR 2

August 14, 2021 Calibration

Pressure Zone: Stadium



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PR 3

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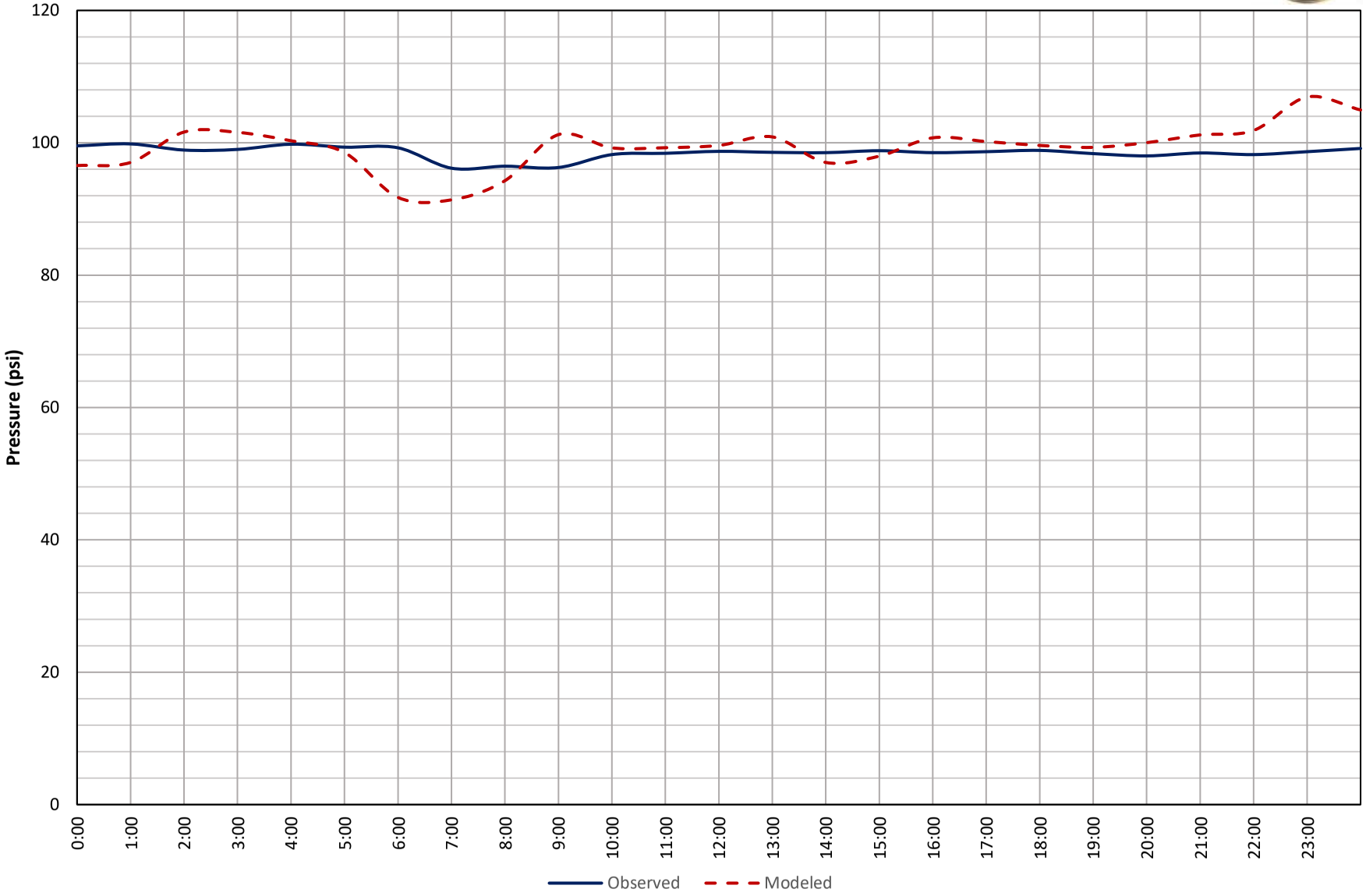
Pressure Zone: Kerrville North



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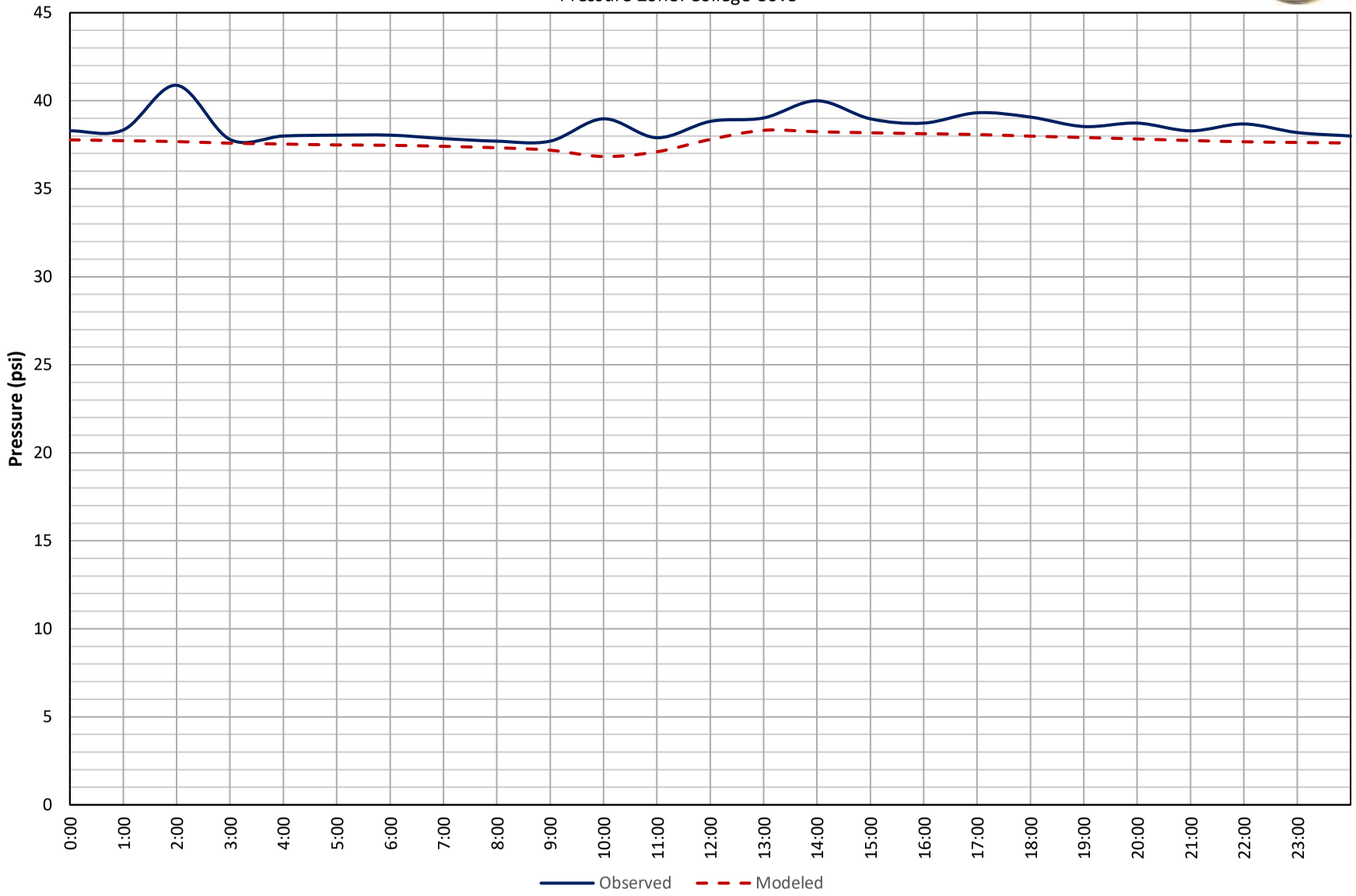
PR 4

August 14, 2021 Calibration

Pressure Zone: College Cove



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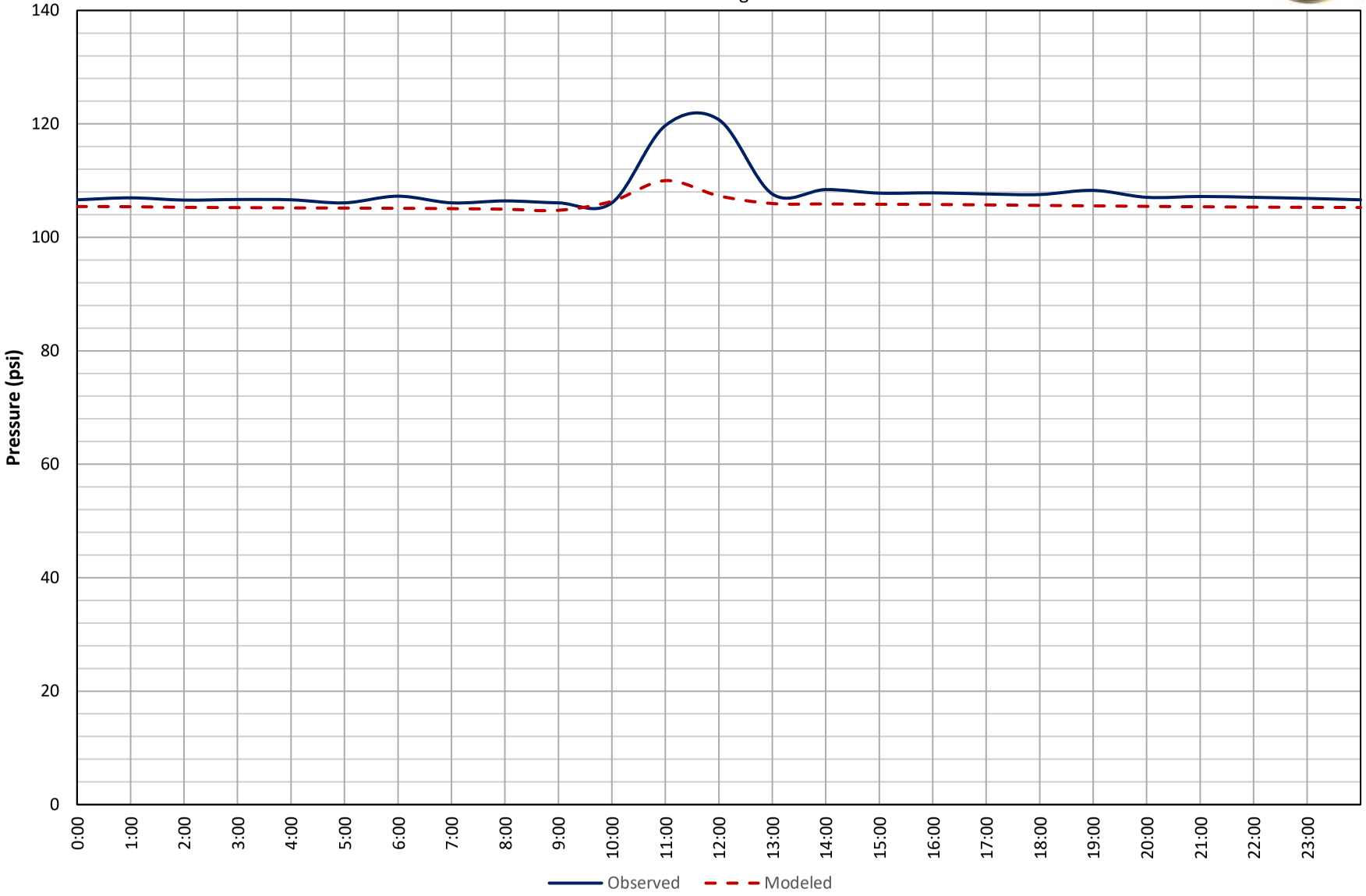
PR 5

August 14, 2021 Calibration

Pressure Zone: College Cove



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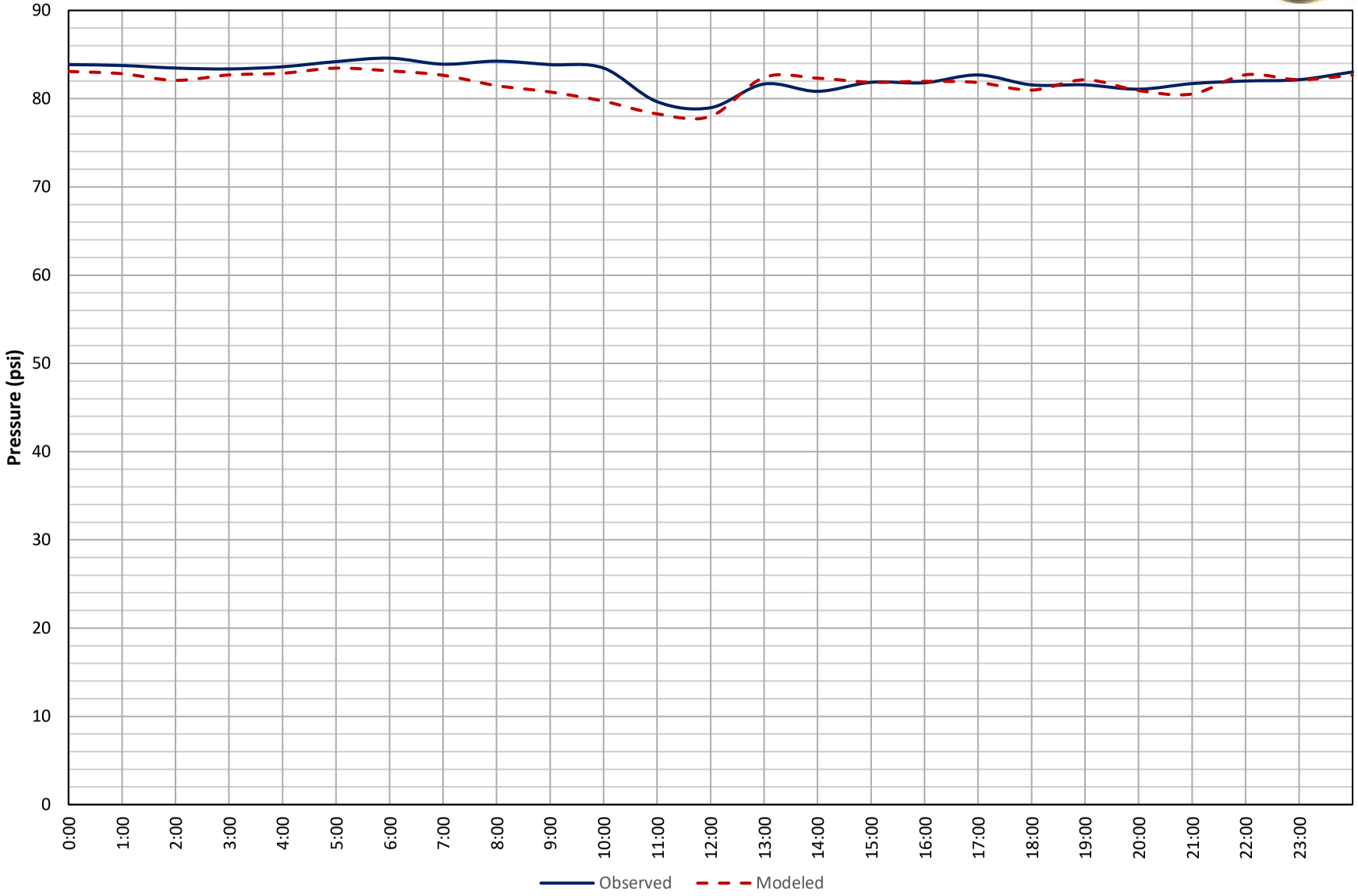
PR 6

August 14, 2021 Calibration

Pressure Zone: Stadium



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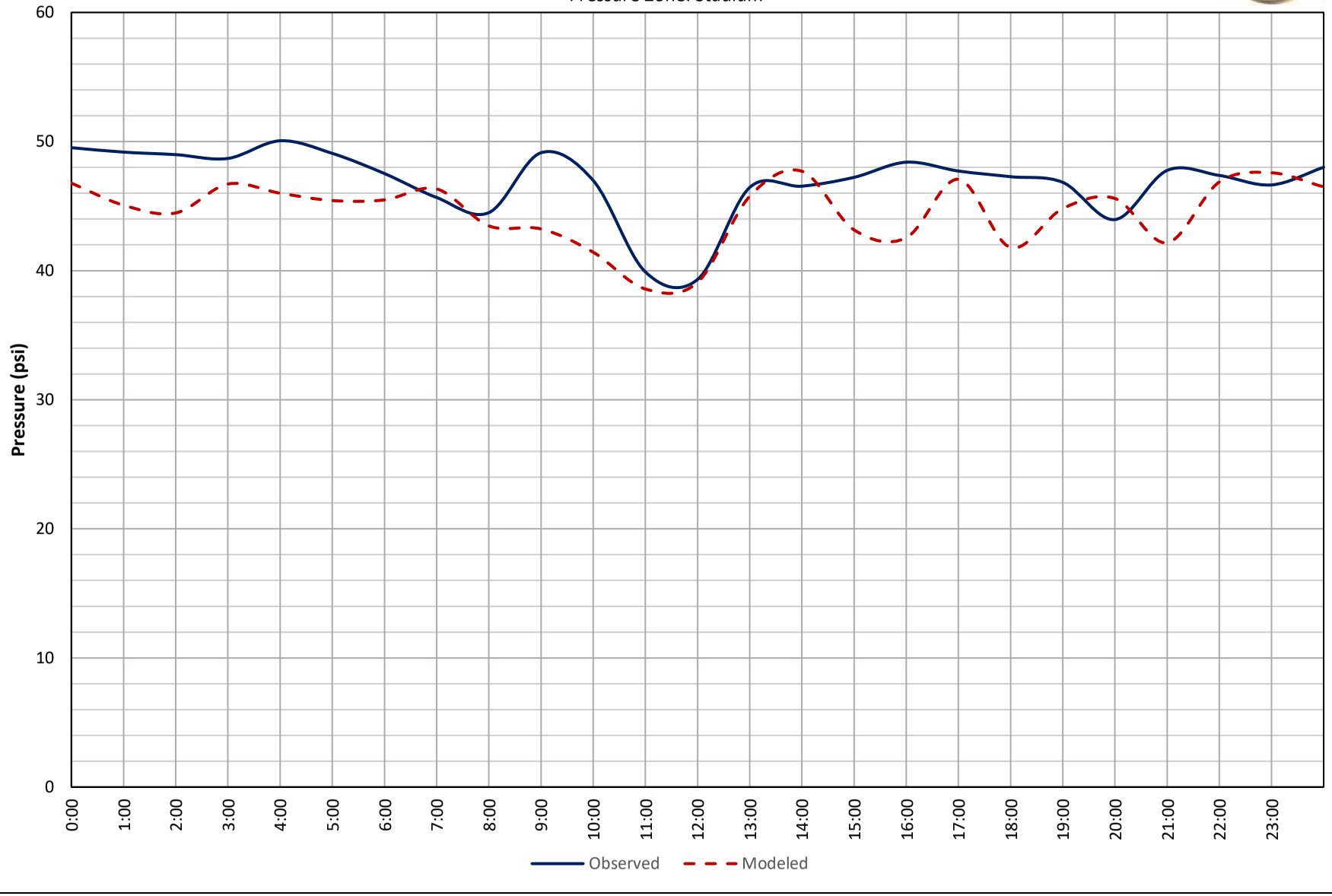
PR 7

August 14, 2021 Calibration

Pressure Zone: Stadium



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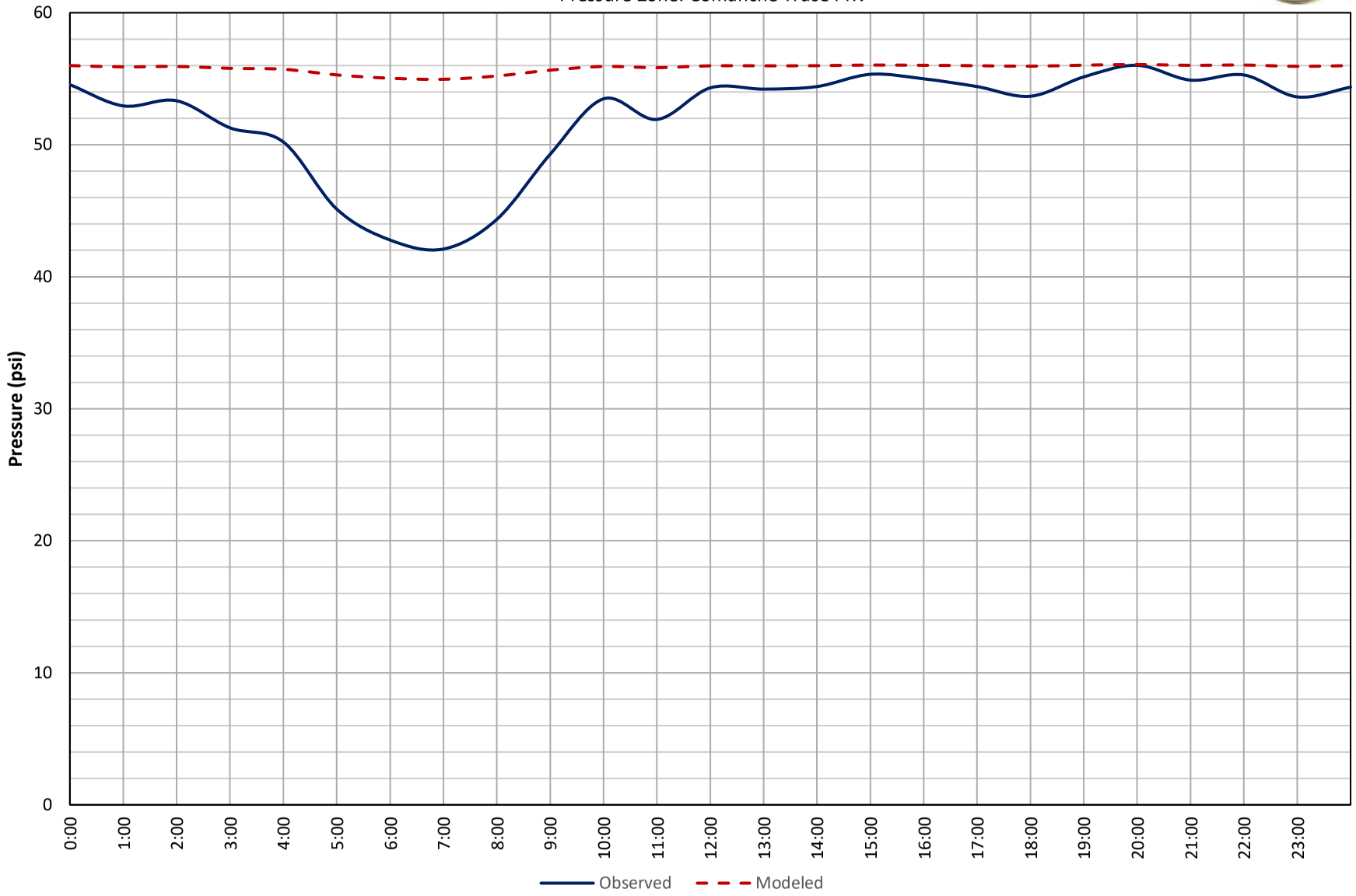
PR 8

August 14, 2021 Calibration

Pressure Zone: Comanche Trace PRV



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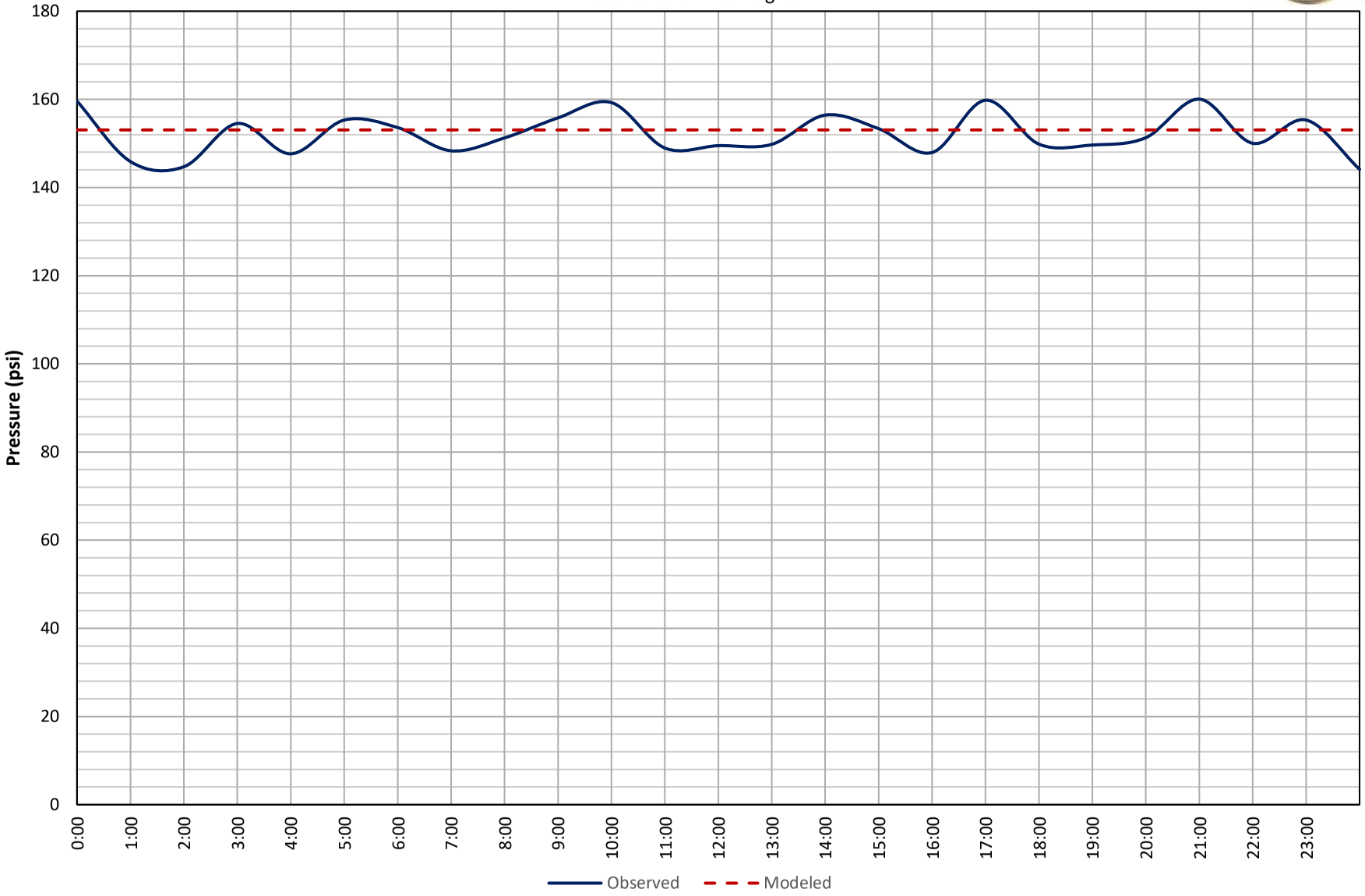
PR 9

August 14, 2021 Calibration

Pressure Zone: The Heights



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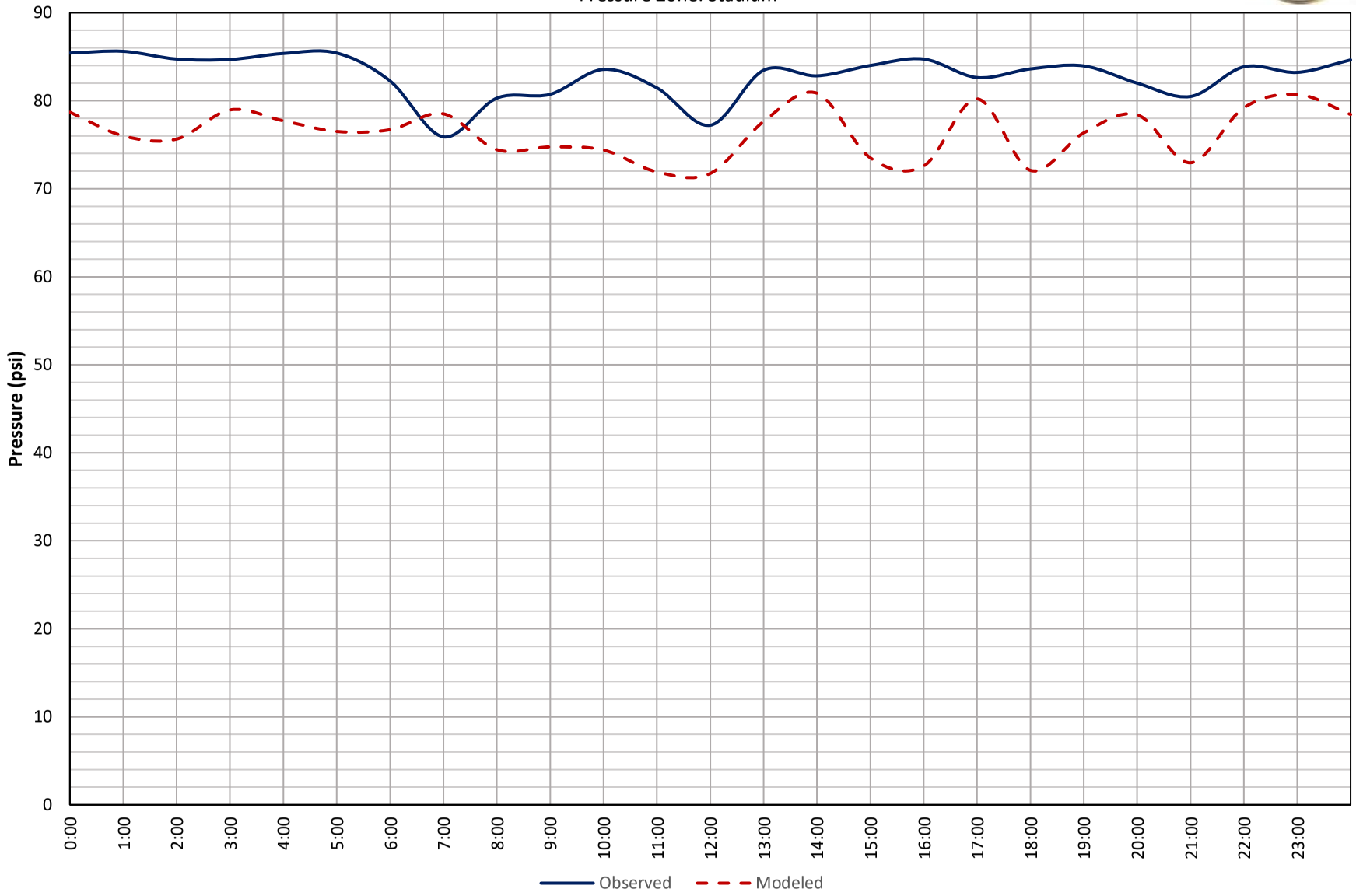
PR 10

August 14, 2021 Calibration

Pressure Zone: Stadium



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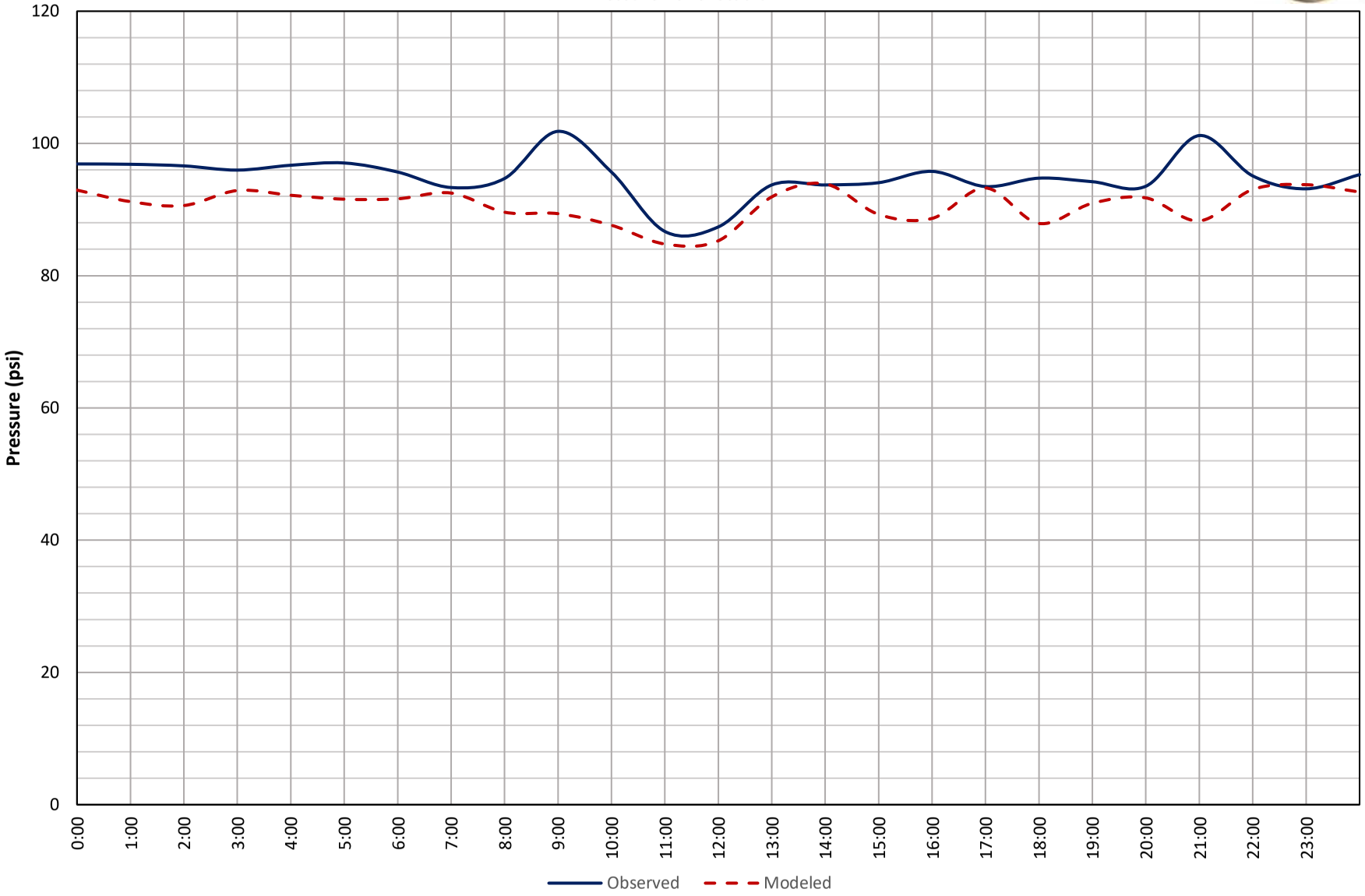
PR 11

August 14, 2021 Calibration

Pressure Zone: Stadium



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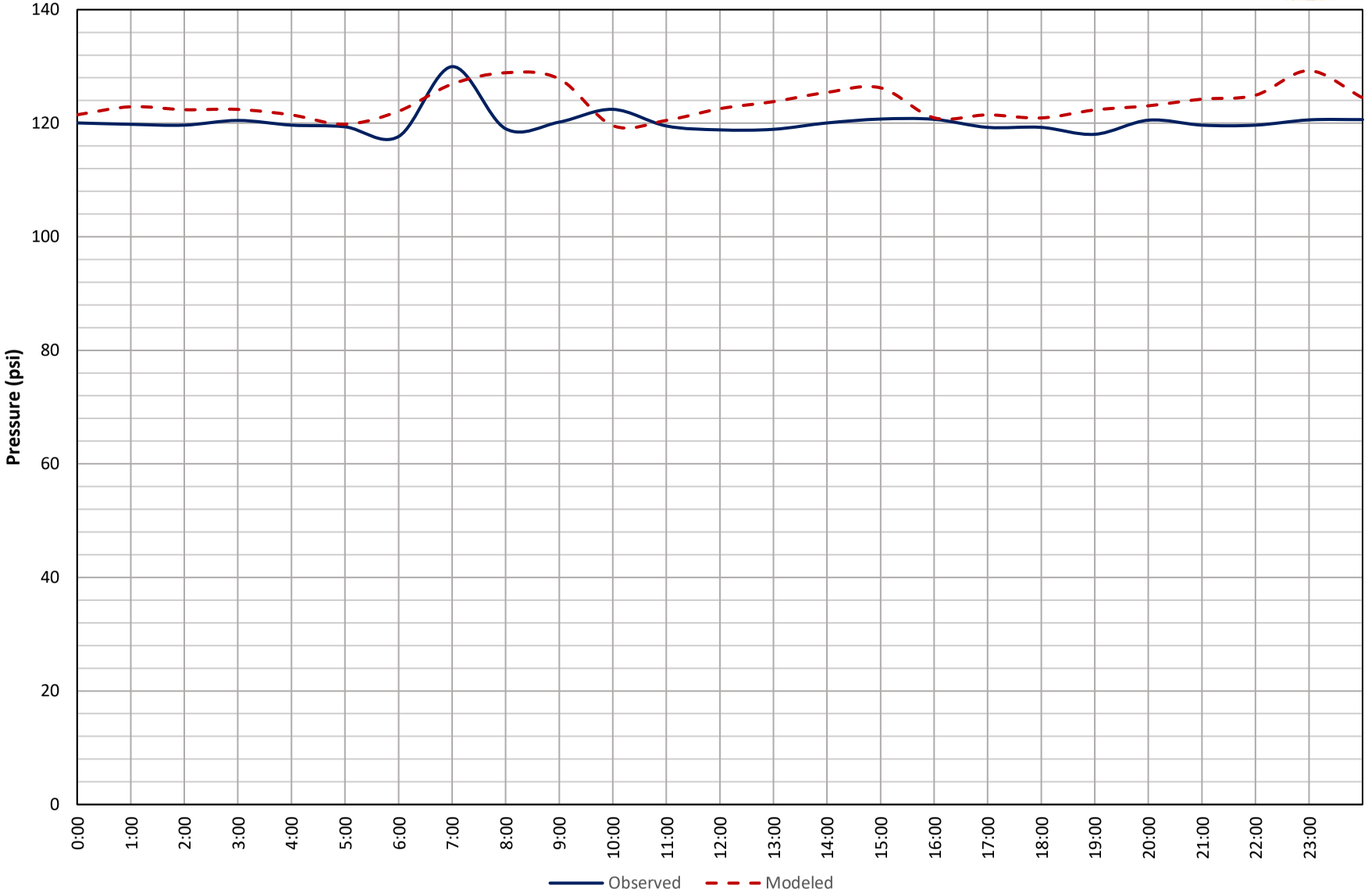
PR 12

August 14, 2021 Calibration

Pressure Zone: Methodist



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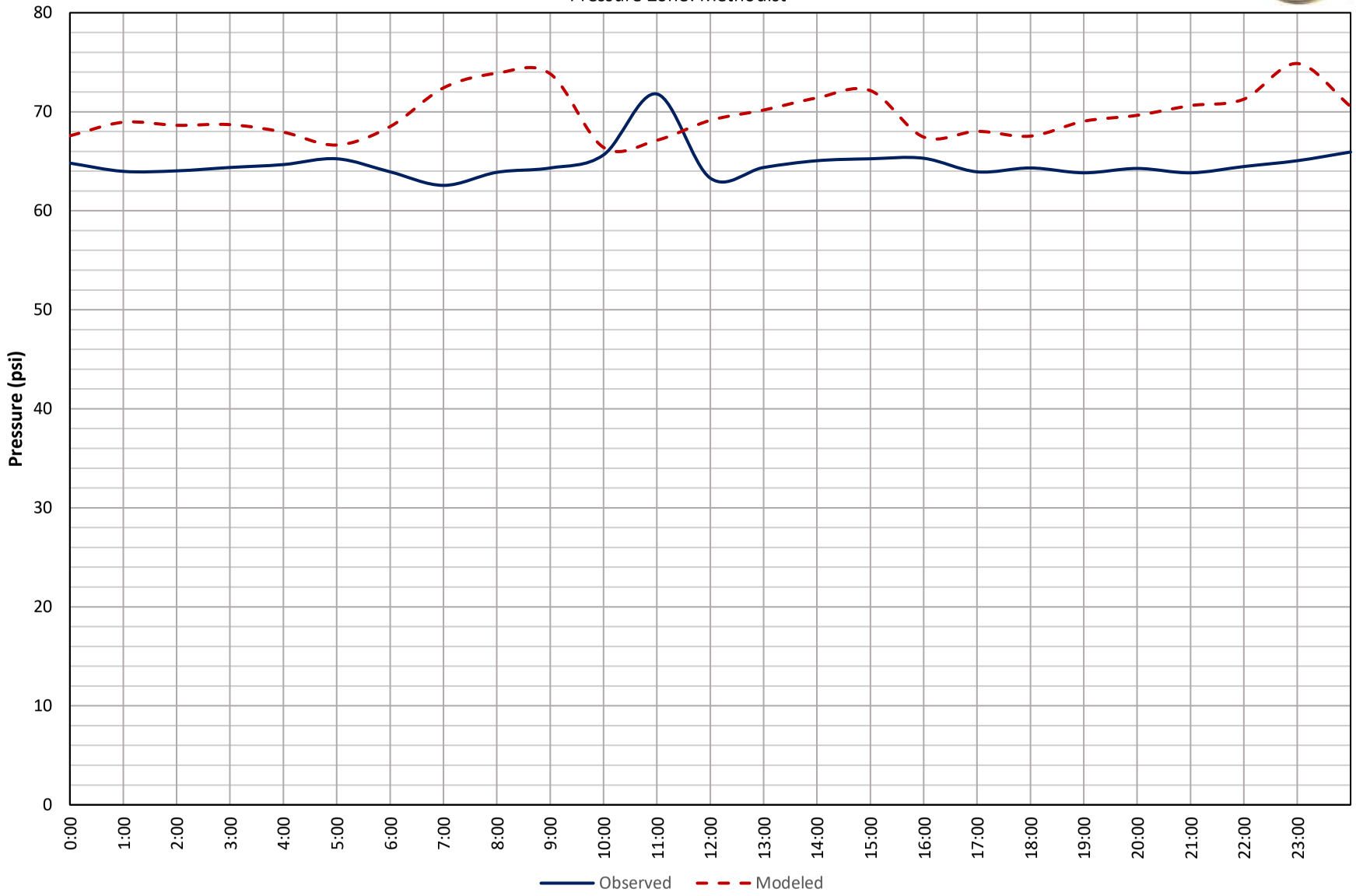
PR 13

August 14, 2021 Calibration

Pressure Zone: Methodist



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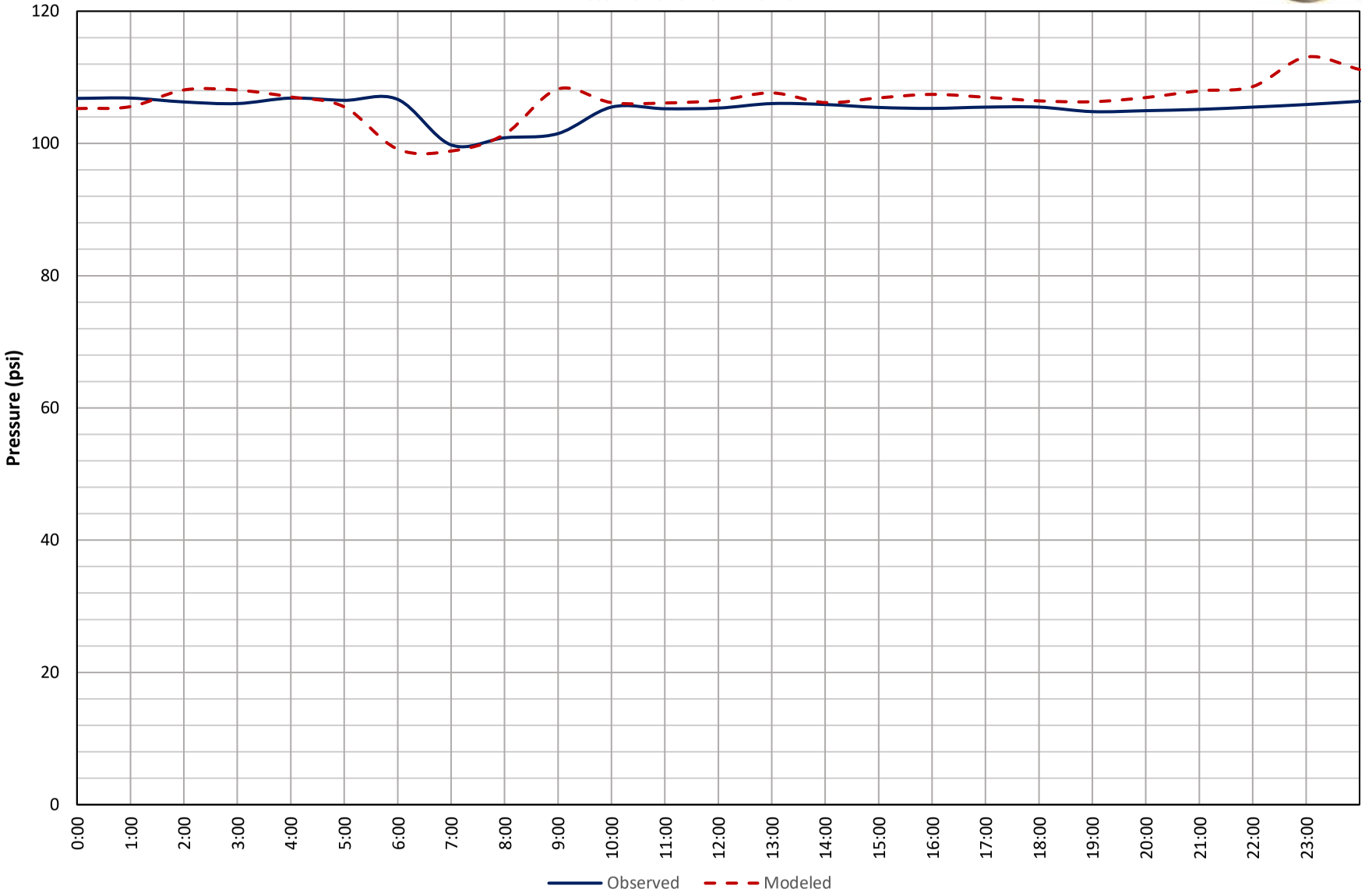
PR 14

August 14, 2021 Calibration

Pressure Zone: Kerrville North



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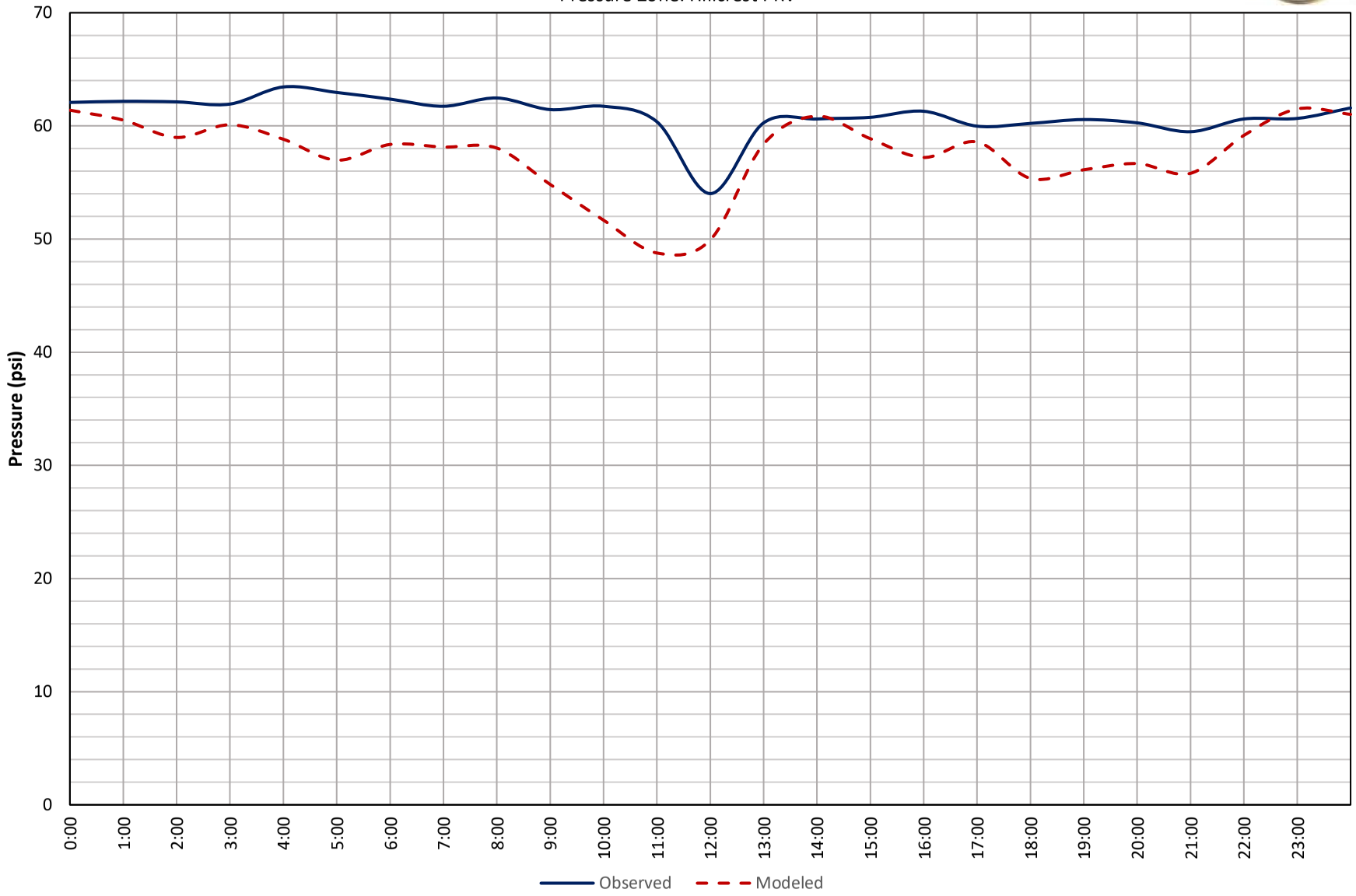
PR 15

August 14, 2021 Calibration

Pressure Zone: Hillcrest PRV

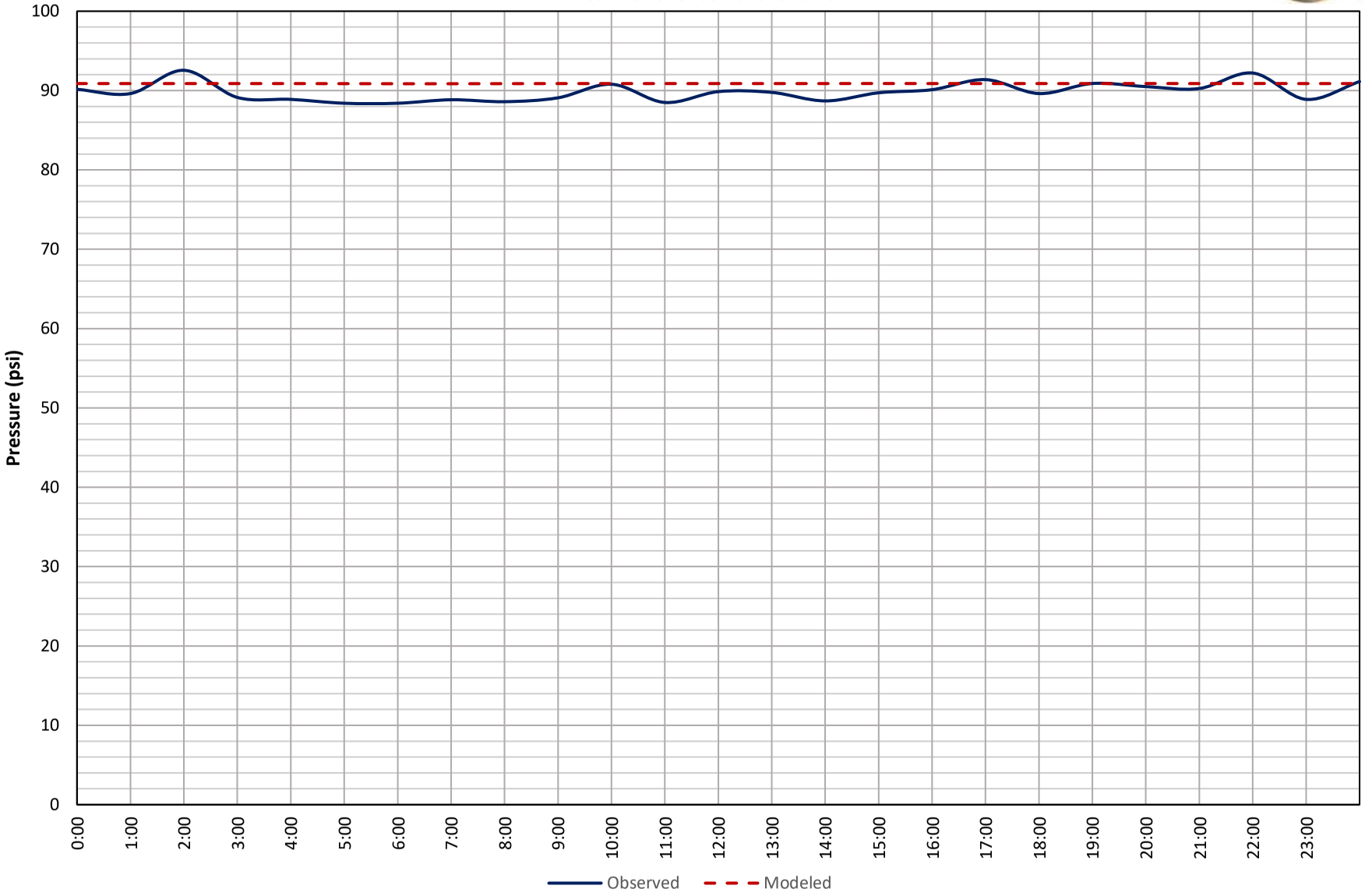


DRAFT

PR 16

August 14, 2021 Calibration

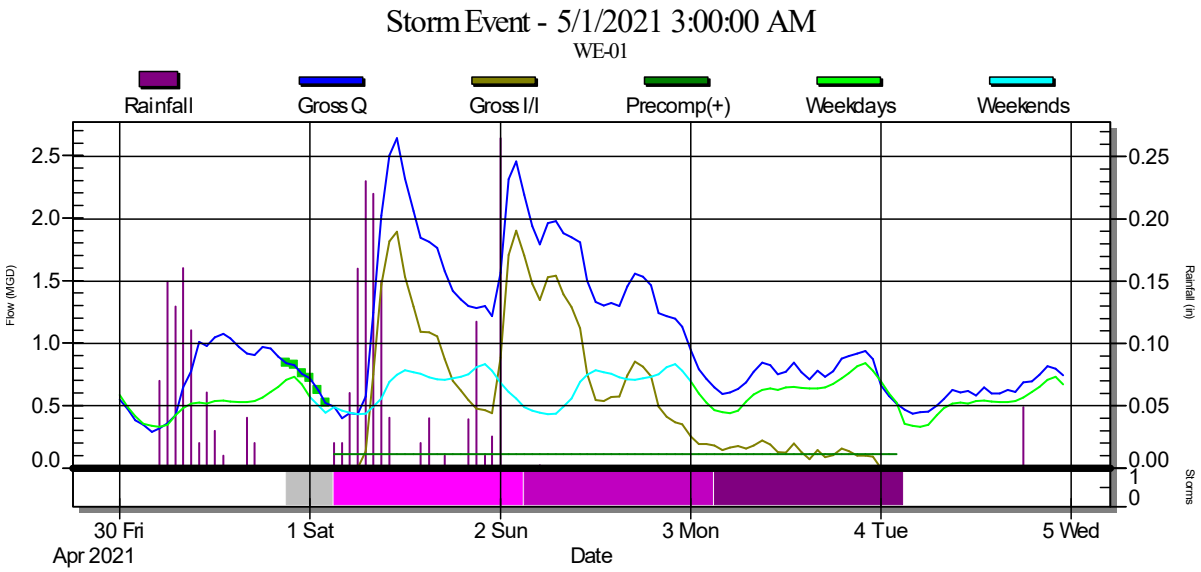
Pressure Zone: Comanche Lower PRV



APPENDIX C
ADS Temporary Flow Monitoring Report

Sewer System Performance Report

Wastewater Collection System, Kerrville TX



City Of Kerrville, Texas

PREPARED FOR

Freese and Nichols, Inc.

SUBMITTED

September 2021

FREESE AND NICHOLS

ADS ENVIRONMENTAL SERVICES®

ADS

Sewer System Performance Report

Wastewater Collection System, The City of Kerrville, Texas

Prepared for:

Freese and Nichols, Inc.

ADS Environmental Services

Table of Contents

Introduction

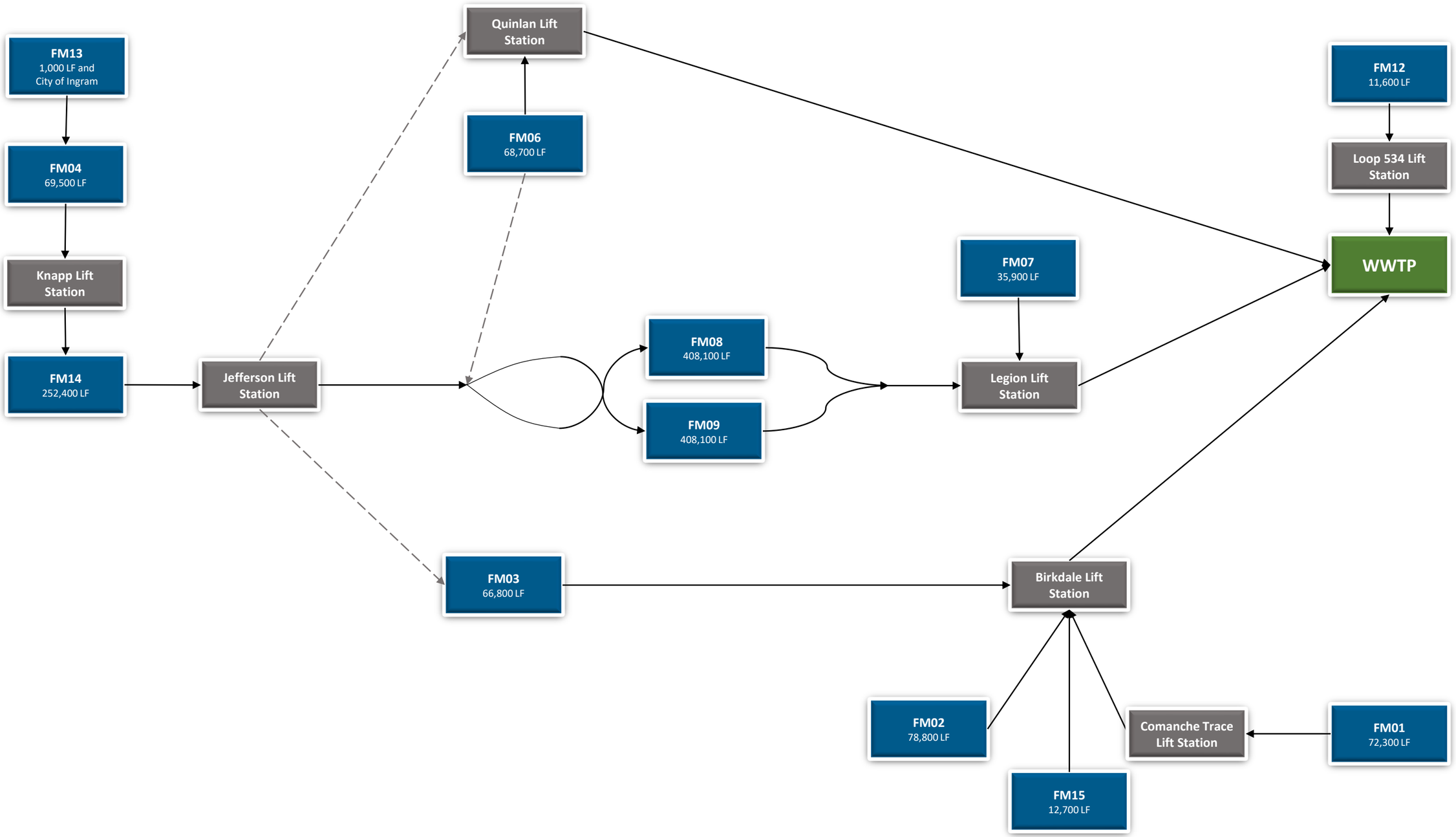
ADS Environmental Services (ADS) was retained by Freese and Nichols, Inc to gather and evaluate flow monitor and rainfall data within the existing collection system. The scope of this study is to characterize dry weather and wet weather flow conditions at select locations within the sewer system, evaluate key performance indicators, and rank the relative severity of observed rainfall-dependent inflow and infiltration (RDII) to assist the Engineer and the City in directing subsequent planning and rehabilitation activities.

Methodology

Dry weather and wet weather performance data were obtained by installing and analyzing data from temporary sanitary sewer flow monitors. A total of 12 flow monitors and three rain gauges were deployed for the purpose of master planning and identifing areas in need of sanitary sewer evaluation. ADS maintained the flow monitors and rain gauges through the course of the study to ensure quality flow and rain data.

Flow Monitor Locations

Preliminary flow monitor locations were selected by the Engineer and final locations were determined by ADS based on observed flow conditions, site access, and site safety considerations. The flow monitor schematic was provided by the Engineer and depicts the connectivity between each of the flow monitors It is included here as Figure 1. Descriptions of each sewer basin and its associated flow monitor are provided in Table 1.



* FM08 and FM09 are in parallel

Table 1: Flow Monitor and Basin Descriptions

Name	ADS Name	Upstream Main Dia (in)	Total Upstream Linear Footage (ft)	Average Daily Flow Rate (MGD)	Peak Daily Flow Rate (MGD)	Peaking Factor
FM01	KERR_FM01	18	72,300	0.09	1.20	13.3
FM02	KERR_FM02	18	78,800	0.81	1.38	1.7
FM03	KERR_FM03	27	66,800	0.14	0.94	6.7
FM04	KERR_FM04	12	69,500	0.28	1.32	4.7
FM06	KERR_FM06	12	68,700	0.23	1.16	5.0
FM07	KERR_FM07	12	35,900	0.10	0.50	5.0
FM08	KERR_FM08	21	408,100	0.36	1.45	4.0
FM09	KERR_FM09	24		1.14	3.63	3.2
FM12	KERR_FM12	18	11,600	0.01	0.23	23.0
FM13	KERR_FM13	15	1,000	0.14	1.15	8.2
FM14	KERR_FM14	30	252,400	0.76	2.32	3.1
FM15	KERR_FM15	10	12,700	0.05	0.23	4.6

*FM08 and FM09 are in parallel

Site installation reports with more detailed location information for each flow monitor are provided in Appendix A.

Flow Monitor Equipment

Sewer flow monitoring was performed using Triton+ flow monitors manufactured, installed, and maintained by ADS. Each flow monitor is mounted near the top of a manhole and is connected to depth and velocity sensors positioned in an incoming sewer. Detailed specifications of the flow monitor equipment used for this project are provided in Appendix B.

Flow Monitor Study Period

The data period for this study began on May 11, 2021 and continued through July 8, 2021.

Flow Monitor Data Format

Flow depth (d), flow velocity (v), and flow rate (Q) data from each sewer flow monitor are plotted on a variety of hydrographs and scattergraphs provided in Appendix C. Hydrographs display flow rate data vs. time for the duration of the observation period, along with associated rainfall data. Scattergraphs display flow depth vs. flow velocity data for each location.

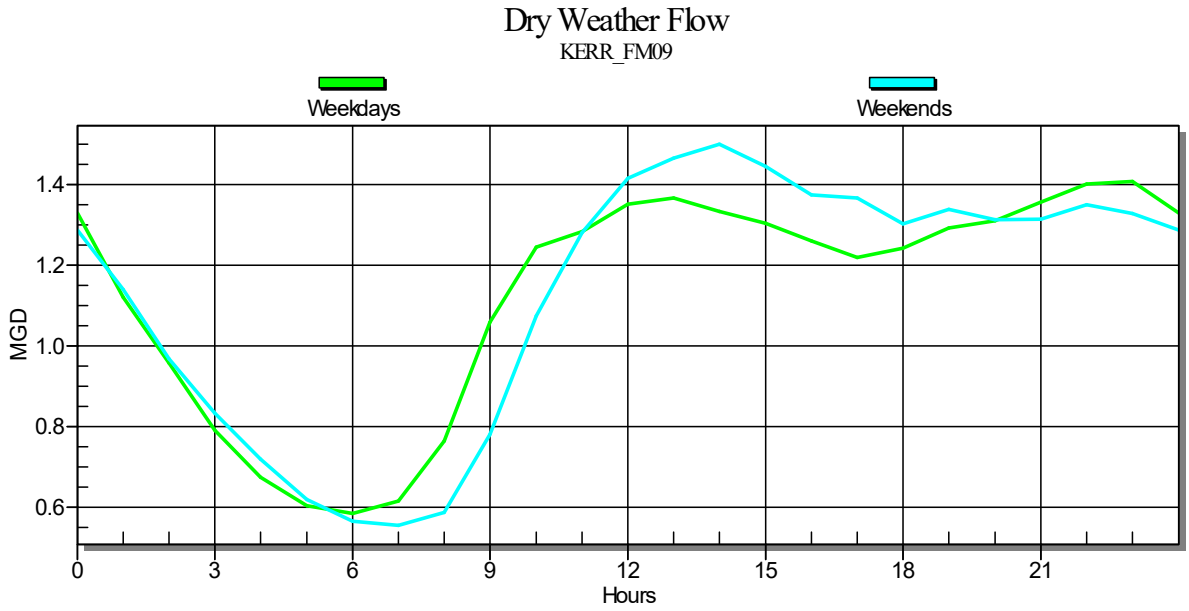
Results

Flow monitor data provides insight into sewer performance – revealing important information about how the existing sewer system accommodates observed flow rates. The following sections evaluate flow monitor data observed during both dry weather and wet weather periods using a variety of key performance indicators (KPIs).

Flow Rates and Peaking Factors

Dry weather flow conditions are characterized by evaluating flow monitor data observed during normal conditions, excluding wet weather events and the periods associated with the recovery from these events. The average dry day pattern is identified as a diurnal pattern and results from the collective sewer use of residential, commercial, institutional, and industrial users located upstream from a given flow monitor. Land use within a particular area affects the shape of the diurnal pattern. An example of a representative diurnal pattern observed during the study period is shown in Figure 2.

Figure 2: Dry Weather Hydrograph



The minimum, average, and maximum dry weather gross (as observed at the monitor) flow rates (Q_{min-D}, Q_{avg-D}, and Q_{max-D}) are determined from the dry weather diurnal pattern for each flow monitor location and are provided in Table 2, along with the resulting gross dry weather peaking factor (PF_D). The maximum gross wet weather flow rate (Q_{max-W}) determined for each flow monitor location is also provided, along with the resulting gross wet weather peaking factor (PF_W).

Peaking factors are commonly used to estimate maximum flow rates based on average flow rate estimates and play a key role in sewer design. Peaking factors are typically inversely proportional to the population served and generally decrease as the average dry weather flow rate increases.

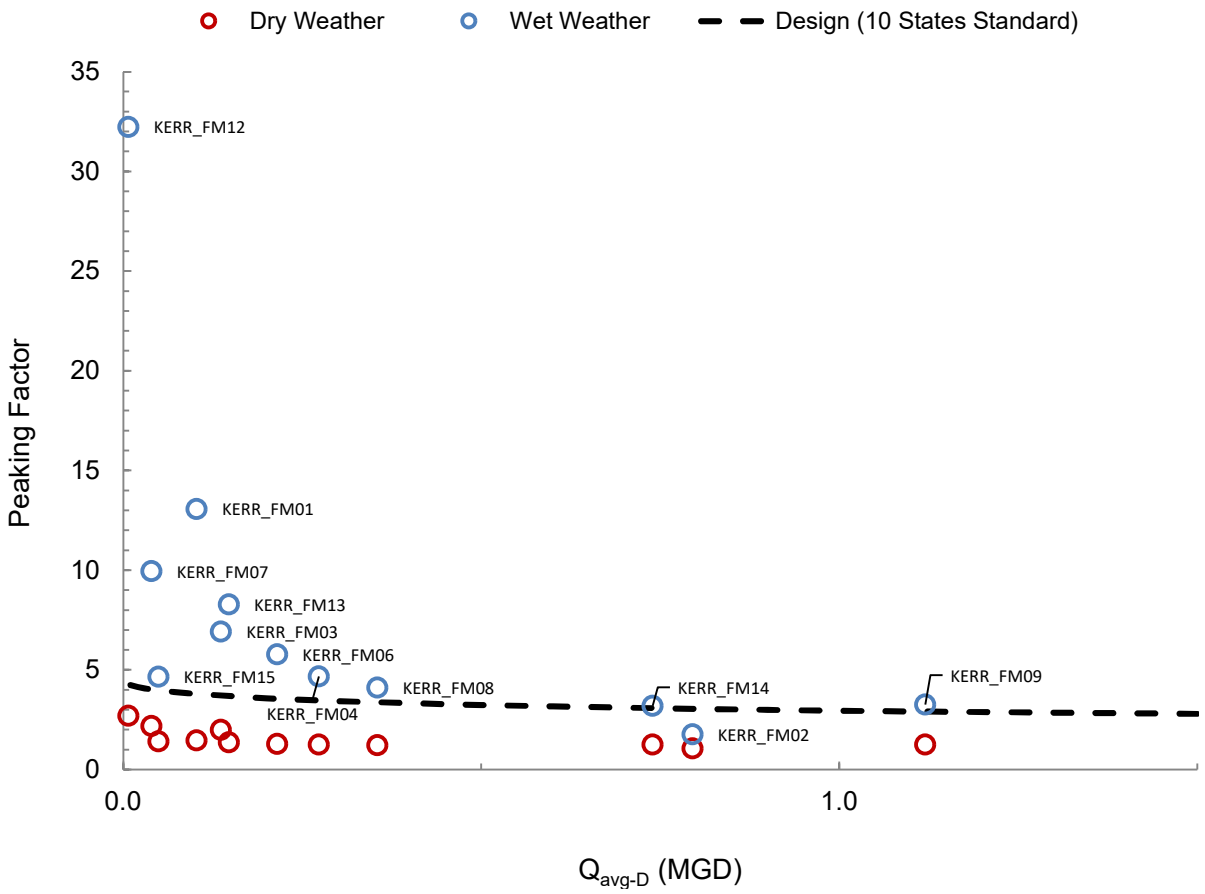
Dry weather peaking factors were consistently low across the study area. The largest wet weather peaking factors were at sites KERR_FM12, KERR_FM01, KERR_FM07 and KERR_FM13.

Peaking factors are graphed in Figure 3.

Table 2: Gross Dry and Wet Weather Flow Rates and Peaking Factors

Meter	Q_{min-D} (MGD)	Q_{avg-D} (MGD)	Q_{max-D} (MGD)	Q_{max-W} (MGD)	PF_D	PF_W
KERR_FM01	0.056	0.103	0.152	1.342	1.48	13.07
KERR_FM02	0.719	0.795	0.846	1.412	1.06	1.78
KERR_FM03	0.021	0.137	0.273	0.947	1.99	6.93
KERR_FM04	0.140	0.273	0.343	1.277	1.25	4.68
KERR_FM06	0.114	0.215	0.279	1.243	1.30	5.78
KERR_FM07	0.018	0.039	0.086	0.393	2.19	9.96
KERR_FM08	0.198	0.355	0.438	1.459	1.23	4.11
KERR_FM09	0.585	1.120	1.408	3.665	1.26	3.27
KERR_FM12	0.000	0.007	0.019	0.229	2.70	32.23
KERR_FM13	0.074	0.148	0.203	1.223	1.37	8.29
KERR_FM14	0.372	0.739	0.928	2.363	1.26	3.20
KERR_FM15	0.021	0.049	0.070	0.230	1.41	4.67

Figure 3: Dry and Wet Weather Peaking Factors



Depth-to-Diameter Ratios

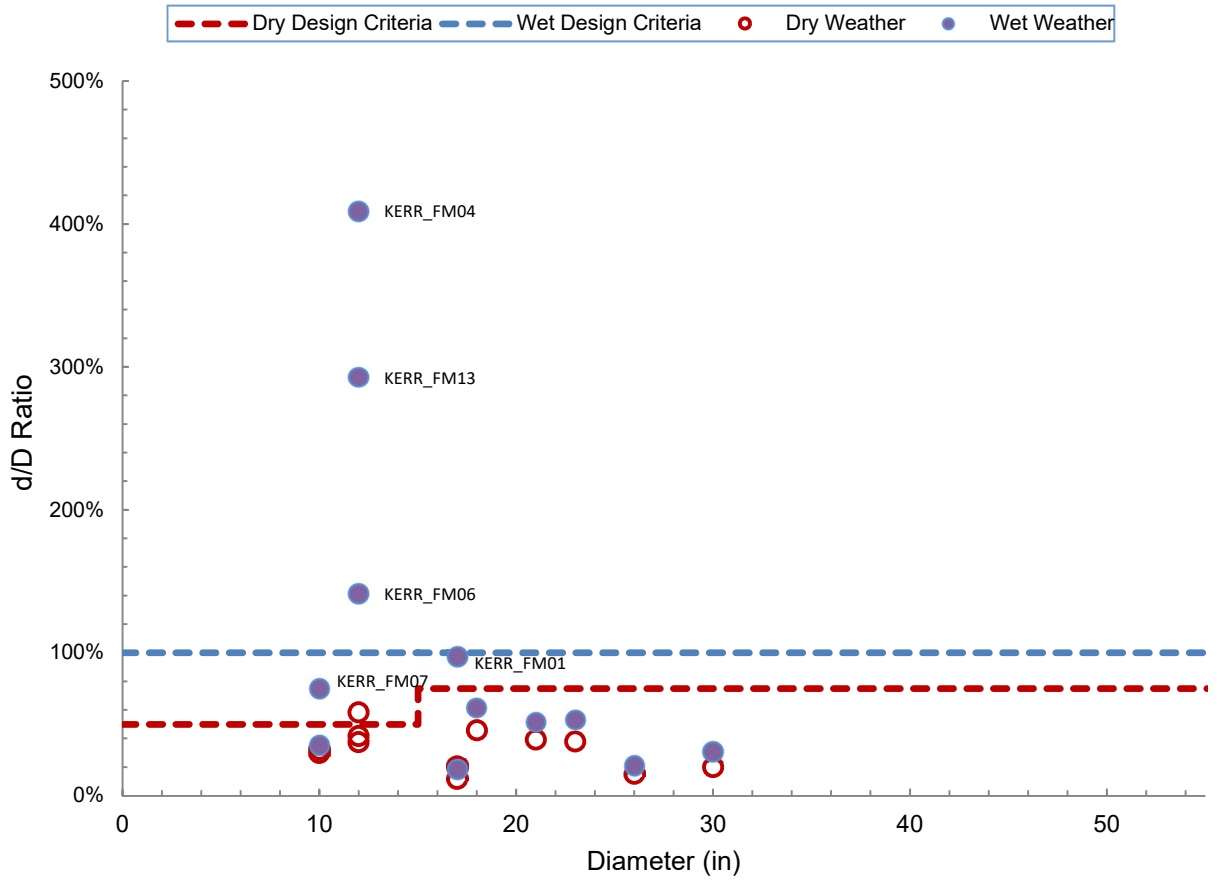
Once dry weather and wet weather flow rates are characterized, the hydraulic conditions under which they occur are evaluated. The maximum flow depth observed during dry weather (d_{max-D}) and wet weather (d_{max-W}) and their corresponding flow depth-to-diameter (d/D) ratios observed during the study period are provided in Table 3. The D values shown in the table represent field measurements for each pipe. The maximum dry weather flow depth is the flow depth associated with the maximum dry weather flow rate and is the approximate maximum flow depth that is consistently observed each day during normal dry weather conditions. The maximum wet weather flow depth may or may not be directly associated with the maximum wet weather flow rate, depending on the hydraulic conditions observed at a given flow monitor location.

Table 3: Dry and Wet Weather Depth-to-Diameter Ratios

	d_{max-D}	d_{max-W}	D	d_{max-D}/D	d_{max-W}/D
KERR_FM01	3.50	16.53	17	21%	97%
KERR_FM02	8.25	11.09	18	46%	62%
KERR_FM03	4.00	5.49	26	15%	21%
KERR_FM04	7.00	49.09	12	58%	409%
KERR_FM06	4.50	16.99	12	38%	142%
KERR_FM07	3.25	7.49	10	33%	75%
KERR_FM08	8.25	10.80	21	39%	51%
KERR_FM09	8.75	12.21	23	38%	53%
KERR_FM12	2.00	3.17	17	12%	19%
KERR_FM13	5.00	35.14	12	42%	293%
KERR_FM14	6.00	9.30	30	20%	31%
KERR_FM15	3.00	3.52	10	30%	35%

The d/D ratio is a performance indicator used to assess sewer capacity. Sewers are generally designed to flow under open channel flow conditions with some reserve capacity. As a result, ASCE and WEF recommend that sewers with diameters up to 15 inches be designed to flow with dry weather d/D ratios of 50%, and larger diameter sewers be designed to flow with dry weather d/D ratios of 75% (based on hourly averaged values). Sewers are not generally designed to operate under surcharge conditions with wet weather d/D ratios greater than 100%. These design and capacity assurance criteria are useful for comparison to observed d/D ratios as shown in Figure 4.

Figure 4: Flow Depth-to-Diameter Ratios Compared to Design Criteria



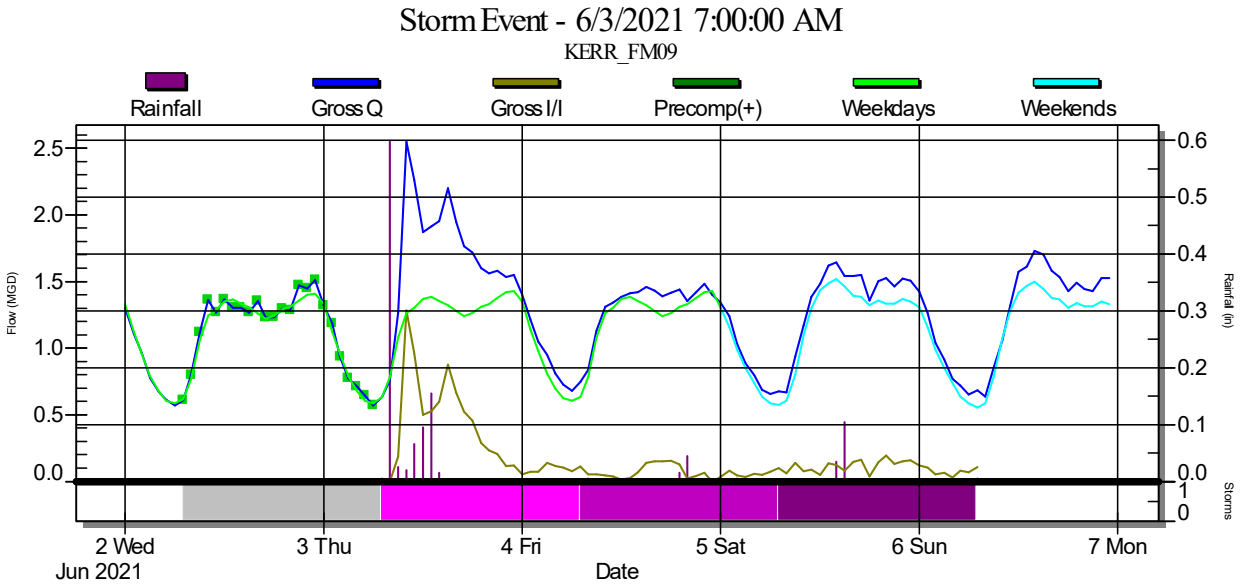
All the the observed d/D ratios, except KERR_FM04, were within design criteria recommended by ASCE and WEF during dry weather. The ratio at KERR_FM04 was 58% which only slightly exceeds the criteria.

During wet weather conditions, observed d/D ratios were a concern at at four locations. Locations KERR_FM04, KERR_FM13, KERR_FM06 and KERR_01 were greater than design critera. Those over 100% indicate surcharge in the collection system during the rain events.

Rainfall-Dependent Inflow and Infiltration (RDII)

During wet weather events, significant amounts of extraneous water can enter a sewer system, resulting in sanitary sewer overflows (SSOs), basement backups, and/or problems at the wastewater treatment plant (WWTP). A comparison of flow monitor data from dry weather and wet weather periods provides a quantification of rainfall-dependent inflow and infiltration (RDII), which is calculated by the difference in the measured flow (Gross Q) during a rainfall event from the flow pattern of an average dry day in the study period. A wet weather storm decomposition hydrograph is provided in Figure 5 for KERR_FM09. The storm event is depicted by the purple bands, and a precompensation period prior to the storm is depicted by the light gray band. The precompensation period allows adjustments to the average dry day pattern as needed to account for antecedent conditions by adjusting the dry day pattern so it more closely matches observed conditions prior to each storm event.

Figure 5: Storm Decomposition Hydrograph



Six storm events were observed and evaluated for each flow monitor basin during the study period, with event rainfall totals between approximately 0.11 and 2.72 inches. The storm event that occurred on June 27th demonstrates characteristics common to summer storms in that the event totaled only 0.11" at one gauge and 1.05" at another, RDII responses to that event reflect the variability.

Storm decomposition hydrographs are provided in Appendix C for each basin during each storm event and show the observed responses to rainfall during the study period. A summary of the storm events observed during the study is shown below in Table 4.

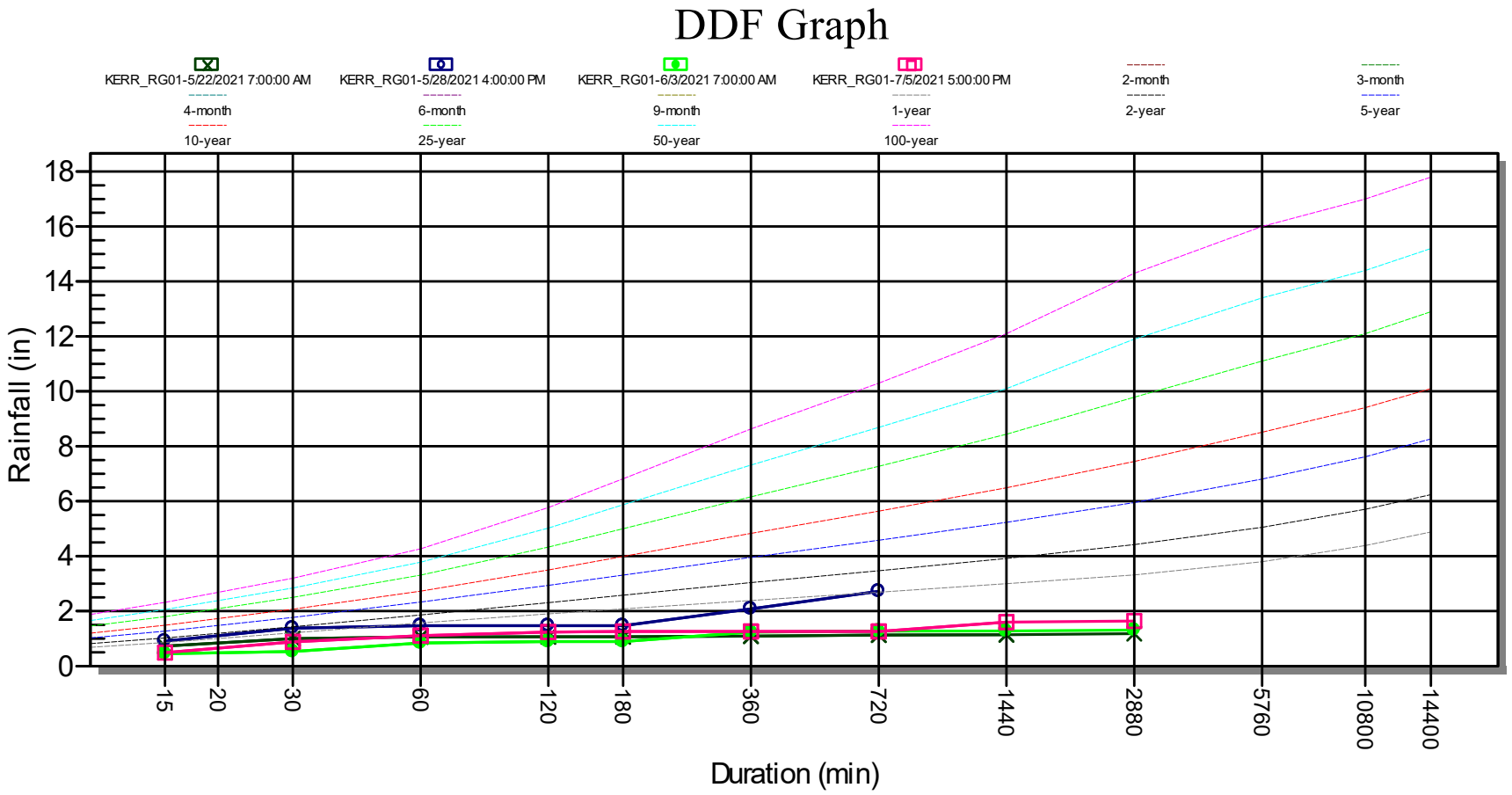
Table 4: Storm Summary

	KERR_RG01	KERR_RG02	KERR_RG03
5/22/2021	1.17	1.36	0.45
5/28/2021	2.72	2.53	2.38
6/3/2021	1.31	1.26	1.12
6/22/2021	1.16	1.14	0.97
6/27/2021	0.51	0.11	1.05
7/5/2021	1.64	1.11	1.98

A rainfall accumulation chart was prepared (called a Depth-Duration-Frequency or DDF graph or chart) based on the “Kerrville” public rain gauge and is depicted in Figure 6 for the four largest storms. This chart was used to compare captured rainfall to historical rainfall statistics for the area (thin color lines on the DDF chart)[1]. The storms plotted on the DDF graph to show how they compare to statistical records for the area. The storm event on 05/28/2021 was the largest with a 1.8 year frequency at the 30 minute mark with 1.4” of rain.

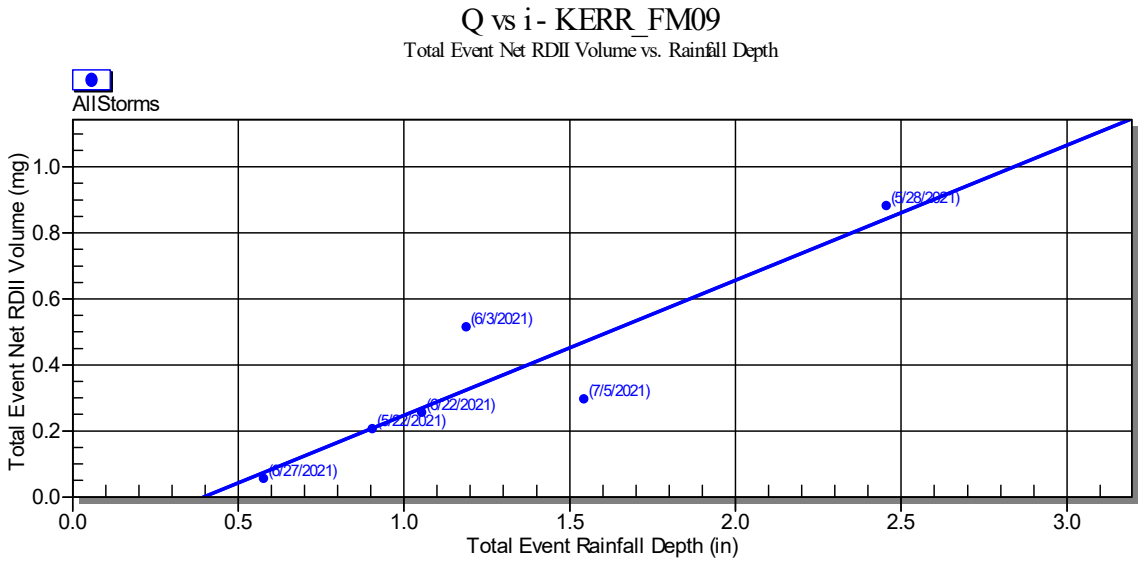
[1] NOAA Precipitation Frequency Data Server (https://hdsc.nws.noaa.gov/hdsc/pfds), Station Name: KERRVILLE.

Figure 6: Rainfall Depth Duration Frequency (DDF) Graph



After the RDII calculations are determined for each storm event, the results are plotted as a function of rainfall total. An example is shown in Figure 7 in which the relationship between the Storm Event RDII volume (mg) is plotted with respect to the Storm Event rainfall (inches) for each storm event. These relationships are called Q vs i diagrams and can then be used to evaluate the consistency of rainfall responses within the sanitary sewer system and estimate the RDII response for various rainfall amounts. Figure 7 also shows a best fit trend line on the storm data points. A storm volume representing 2.0 in. rain projects an expected RDII response of 0.65 MG for that volume of rain. Q vs i diagrams for each flow monitor basin are provided in Appendix C.

Figure 7: RDII Volume Response vs. Rainfall Depth



Gross RDII volumes for each event are presented in Table 6 below.

Table 5: Gross RDII (Million Gallons)

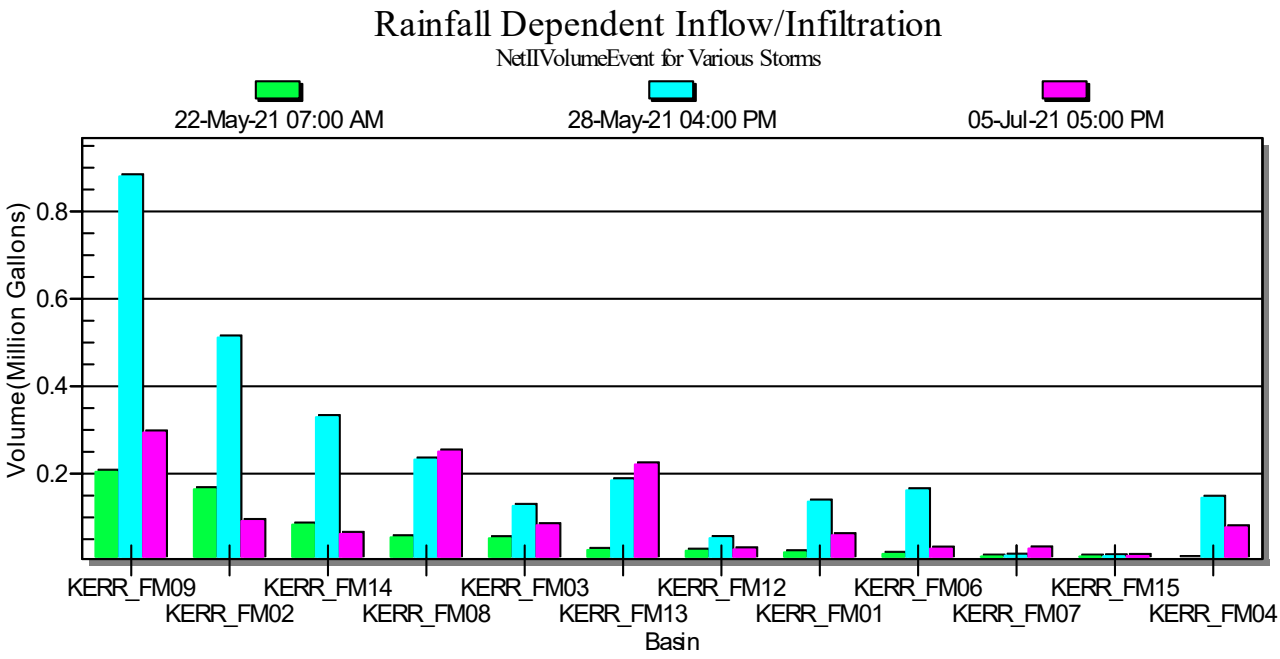
	5/22/2021	5/28/2021	6/3/2021	6/22/2021	6/27/2021	7/5/2021
KERR_FM01	0.020	0.136	0.044	0.057	0.049	0.059
KERR_FM02	0.164	0.511	0.137	0.046	0.005	0.092
KERR_FM03	0.052	0.126	0.036	0.043	0.039	0.082
KERR_FM04	0.017	0.282	0.120	0.095	0.031	0.231
KERR_FM06	0.016	0.162	0.128	0.072	0.009	0.029
KERR_FM07	0.010	0.012	0.030	0.027	0.017	0.029
KERR_FM08	0.054	0.232	0.074	0.093	0.014	0.250
KERR_FM09	0.204	0.880	0.512	0.254	0.053	0.294
KERR_FM12	0.024	0.052	0.023	0.018	0.015	0.027
KERR_FM13	0.025	0.185	0.090	0.080	0.037	0.221
KERR_FM14	0.095	0.601	0.343	0.192	0.069	0.271
KERR_FM15	0.010	0.011	0.015	0.004	0.012	0.012

Based on the results obtained during the study period, Net RDII volumes are reported for each flow monitor for each storm event. Net RDII volumes are computed by subtracting the Gross RDII volume of any upstream flow monitor basin from the Gross RDII volume measured at the outlet monitor(s) of each basin. The resulting Net RDII volumes for each basin for each storm are shown in Table 6 in millions of gallons (mg).

Table 6: Net RDII (Million Gallons)

	5/22/2021	5/28/2021	6/3/2021	6/22/2021	6/27/2021	7/5/2021
KERR_FM01	0.020	0.136	0.044	0.057	0.049	0.059
KERR_FM02	0.164	0.511	0.137	0.046	0.005	0.092
KERR_FM03	0.052	0.126	0.036	0.043	0.039	0.082
KERR_FM04	0.007	0.145	0.053	0.050	0.017	0.077
KERR_FM06	0.016	0.162	0.128	0.072	0.009	0.029
KERR_FM07	0.010	0.012	0.030	0.027	0.017	0.029
KERR_FM08	0.054	0.232	0.074	0.093	0.014	0.250
KERR_FM09	0.204	0.880	0.512	0.254	0.053	0.294
KERR_FM12	0.024	0.052	0.023	0.018	0.015	0.027
KERR_FM13	0.025	0.185	0.090	0.080	0.037	0.221
KERR_FM14	0.083	0.329	0.230	0.116	0.047	0.062
KERR_FM15	0.010	0.011	0.015	0.004	0.012	0.012

Figure 8: Net RDII Volume for largest three events



Based on the analysis, the area upstream of KERR_FM09 was the highest ranked (worst) basin in regards to Net RDII Volume, with a value of 0.880 MG for the May 28th storm. This was followed by basins KERR_FM02, KERR_FM14 and KERR_FM08.

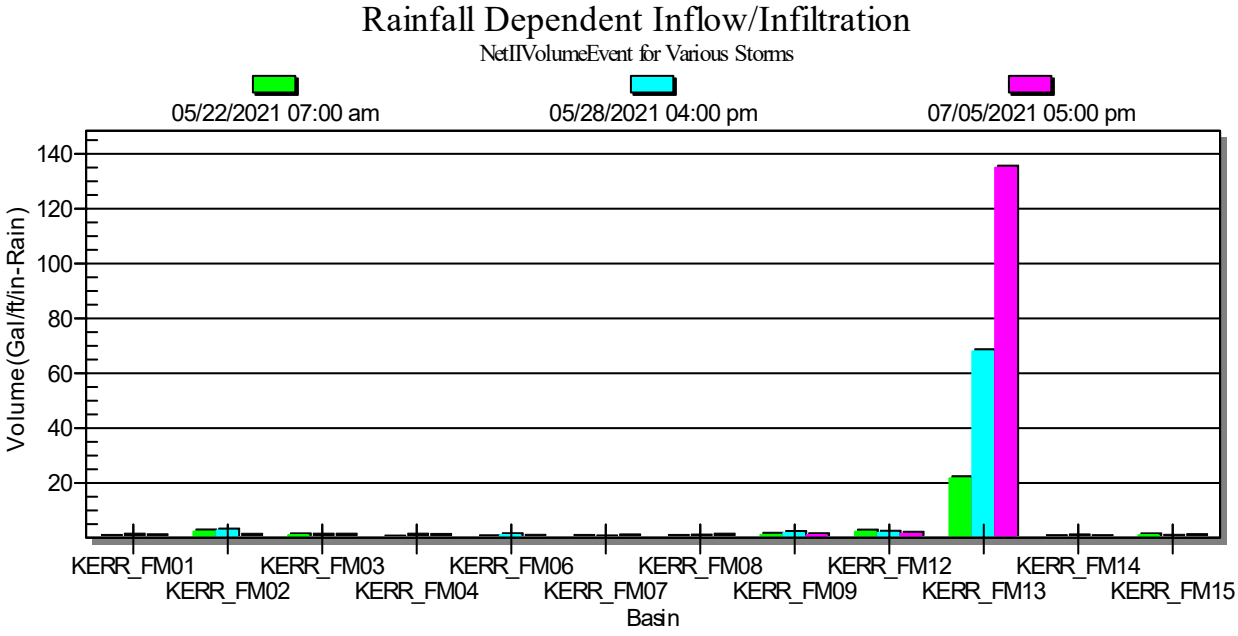
Normalized Net RDII is then calculated by dividing the net RDII volume by the associated basin size, units of gallons per foot (gal/LF). These Normalized RDII values are then normalized per inch of rain by dividing for each storm by the total inches of rain in each event at the respective site. These values are provided in Table 7 in units of gallons per foot per inch rain (gal/LF/in).

The basin upstream of KERR_FM13 by far contributed the largest amount of RDII on a per linear foot basis, however the upstream area is only 1,000 LF. This area should be investigated to be sure that all upstream pipe has been accounted for.

Table 7: Normalized Net RDII (gal/LF/in)

	5/22/2021	5/28/2021	6/3/2021	6/22/2021	6/27/2021	7/5/2021
KERR_FM01	0.306	0.765	0.516	0.749	1.176	0.528
KERR_FM02	2.297	2.64	1.457	0.551	0.106	0.752
KERR_FM03	0.861	0.769	0.45	0.603	0.999	0.792
KERR_FM04	0.087	0.778	0.588	0.631	0.48	0.687
KERR_FM06	0.176	0.931	1.485	0.917	1.077	0.37
KERR_FM07	0.312	0.137	0.711	0.72	0.819	0.518
KERR_FM08	0.293	0.463	0.306	0.43	0.122	0.794
KERR_FM09	1.102	1.755	2.108	1.181	0.448	0.933
KERR_FM12	2.249	1.837	1.638	1.447	2.18	1.483
KERR_FM13	21.724	68.003	68.598	69.092	72.598	134.949
KERR_FM14	0.245	0.516	0.723	0.403	1.512	0.219
KERR_FM15	0.868	0.34	0.989	0.318	1.642	0.589

Figure 9: Net Normalized RDII Volume for largest three events



Conclusions and Recommendations

The conclusions and recommendations in this study are based on data gathered using 14 flow monitors and three rain gauges. The study period was conducted from May 11, 2021 through July 8, 2021. Six rain events of interest were observed during the study period, with rainfall totals ranging from approximately 0.11 to 2.38 inches. A detailed analysis of dry weather and wet weather periods was performed and included an evaluation of various key performance indicators.

Dry Weather Performance

During dry weather conditions, all but one of the observed dry weather d/D ratios were within design criteria recommended by ASCE and WEF, indicating that there is sufficient capacity to accommodate dry weather flow rates at these locations. Peaking factors during dry weather are also very low indicating acceptable system performance.

Wet Weather Performance

The gross wet peaking factors were observed to be high at some locations during rain events. Locations KERR_FM12, KERR_FM01, KERR_FM07 and KERR_FM13 should be evaluated to determine if rehabilitation efforts can eliminate some of the extraneous flows. Additionally the

d/D KPI indicates surcharge was observed during this study period. Locations with d/D in excess of 100% should be evaluated.

Rainfall-Dependent Inflow and Infiltration

Based on the analysis, the KERR_FM09, KERR_FM02, KERR_FM14 and KERR_FM08 basins contributed the highest net volumes of RDII. Investigation of RDII sources is warranted as capacity issues can result from the RDII entering these areas during wet weather.

Definitions

Basin – a designation given to a series of interconnected sewers within a sanitary sewer system that collect and convey wastewater to a common manhole or pump station. The size and geographic extent of a given basin are system specific. Basin designations are established to provide a consistent nomenclature for system components to facilitate effective planning, operation, and maintenance.

Depth-to-Diameter (d/D) Ratio – a ratio of maximum flow depth to sewer diameter. d/D ratios are often calculated to describe both dry weather and wet weather periods and are one measure used to assess sewer capacity utilization. d/D ratios are typically computed using hourly average data.

Infiltration – water that enters a sanitary sewer system from the ground through defective system components including, but not limited to, defective sewers, manholes, service connections, or other system appurtenances. Infiltration is primarily dependent upon groundwater elevations, but may also be influenced by storm events and leaking water mains.

Inflow – storm water runoff that enters a sanitary sewer system from direct connections including, but not limited to, building downspouts, clean-outs, foundation drains, sump pumps, basement and area drains, and cross connections with storm sewer systems.

Peaking Factor (PF) – a ratio of maximum flow rate to average flow rate. Peaking factors are often calculated to describe both dry weather and wet weather periods, where maximum flow rates are compared to average dry weather flow rates. Peaking factors are usually computed using hourly average data.

Rain-Dependent Inflow and Infiltration (RDII) – the collective inflow and infiltration that enter a sewer system as a direct result of rainfall.

Sanitary Sewer Overflow (SSO) – a discharge of untreated wastewater from a sanitary sewer system, caused by a variety of reasons including, but not limited to, inadequate sewer design and construction, insufficient operation and maintenance, power failures, and vandalism.

Sanitary Sewer System – a collection of sewers, manholes, pump stations, and other appurtenances designed for the collection and transportation of wastewater.

References

1. Bizier, Paul, Editor (2007). *Gravity Sanitary Sewer Design and Construction*, ASCE Manuals and Reports on Engineering Practice No. 60, American Society of Civil Engineers: Reston, VA.

2. Enfinger, K.L. and Stevens, P.L. (2006). "Scattergraph Principles and Practice – Tools and Techniques to Evaluate Sewer Capacity," *Proceedings of the Pipeline Division Specialty Conference*; Chicago, IL; American Society of Civil Engineers: Reston, VA.

Appendix A – Flow Monitor Site Installation Details

ADS Site Report

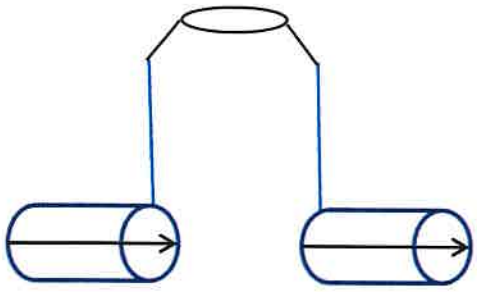
Quality Form

Project Name:	KERRVILLE	City/State:	KERRVILLE,TX	FM Initials:	DM
Site Name:	KERR_FM01	Monitor Series:	TRITON+	Monitor S/N#:	29196
Address / Location:	3012 Bandera Hwy, Kerrville, TX 78028			Manhole #:	
				Map Page #:	11
Access: easement	Type of System:	Sanitary: X	Storm:	Combined:	Pipe Height: 17
					Pipe Width: 17.25
					Phone Number: 10.5.1.102

Date/Time of Investigation:	5/5/2021 14:54:00 PM	Manhole Depth:	17'1" Feet
Site Hydraulics:	GOOD	Manhole Material / Condition:	Concrete
Upstream Input: (L/S, P/S)		Pipe Material / Condition:	PVC Good
Upstream Manhole:	DNL	Mini System Character:	Residential X / Commercial / Industrial / Other
Downstream Manhole:	DNL		
		Telephone Information:	N/A
Depth of Flow (Wet Dof):	2.75 +/- 0.25	Access Pole #:	N/A
Range (Air Dof):	+/-	Distance From Manhole:	N/A Feet
Peak Velocity:	1.08 fps	Road Cut Length:	N/A Feet
Silt:	0 Inches	Trenche Length:	N/A Feet

Manhole Information:

Other Information:



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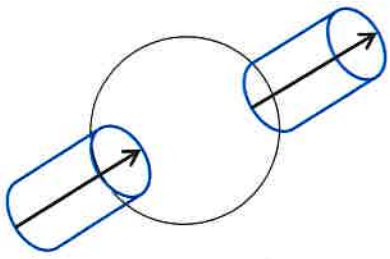


Planar N

Installation Information		Backup	Yes	No	?	Distance
Installation Type:	RING+CRANK	Trunk		X		
Sensors / Devices:	CS4	Lift/Pump Station	X			837.05 FT
Surcharge Height:	Feet NON VISIBLE	WWTP		X		
Rain Gauge Zone:		Other		X		

Additional Site Information / Comments:

GPS: 29.992358, -99.110916

Additional Information

Project Name: KERRVILLE

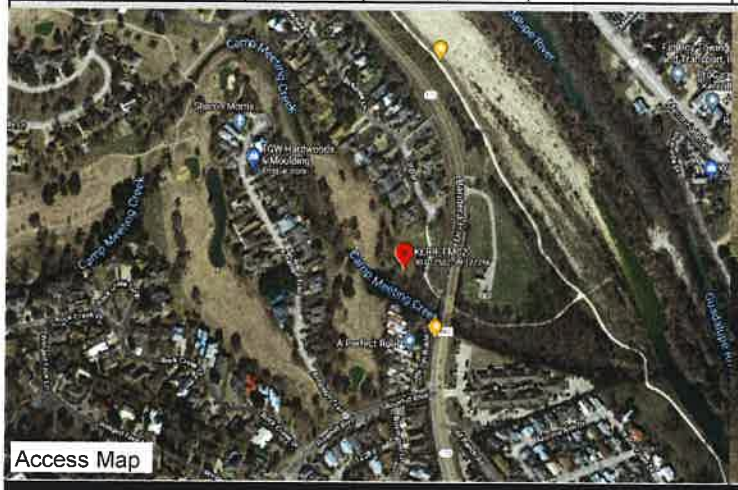
Project Number: 25784.11.325

Site Name: KERR_FM01

ADS Site Report

Quality Form

Project Name:	KERRVILLE	City/State:	KERRVILLE,TX	FM Initials:	DM
Site Name:	KERR_FM02	Monitor Series:	TRITON+	Monitor S/N#:	41718
Address / Location:	south of 2531 Birkdale Ln, Kerrville, TX 78028			Manhole #:	n/a
				Map Page #:	8
Access: Grass	Type of System:	Sanitary: X	Storm:	Combined:	Pipe Height: 17.25
					Pipe Width: 17.25
					Phone Number: 10.5.2.22



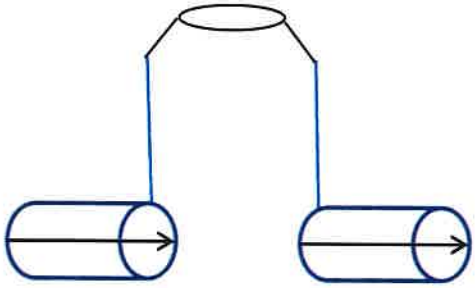
Access Map

Site Map

Date/Time of Investigation:	5/4/2021 15:28:00 PM		Manhole Depth:	12'3"	Feet	
Site Hydraulics:	GOOD		Manhole Material / Condition:	Concrete		
Upstream Input: (L/S, P/S)			Pipe Material / Condition:	PVC		Good
Upstream Manhole:	DNL		Mini System Character:	Residential: X	Commercial	Industrial / Other
Downstream Manhole:	DNL		**Telephone Information:** N/A			
Depth of Flow (Wet Dof):	7.75	+/- 0.25	Access Pole #:	N/A		
Range (Air Dof):		+/-	Distance From Manhole:	N/A	Feet	
Peak Velocity:	2.36	fps	Road Cut Length:	N/A	Feet	
Silt:	0	Inches	Trenche Length:	N/A	Feet	

Manhole Information:

Other Information: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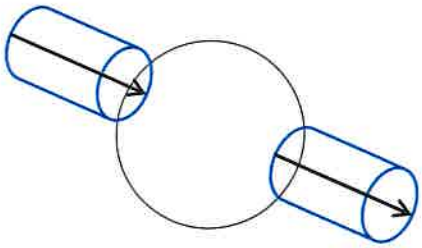

Planar N

Installation Information	
Installation Type:	RING+CRANK
Sensors / Devices:	CS4
Surcharge Height:	Feet NON VISIBLE
Rain Gauge Zone:	

Backup	Yes	No	?	Distance
Trunk		X		
Lift/Pump Station		X		
WWTP		X		
Other		X		

Additional Site Information / Comments:

GPS: 30.017582, -99.127256

Additional Information

Project Name: KERRVILLE

Project Number: 25784.11.325

Site Name: KERR_FM02

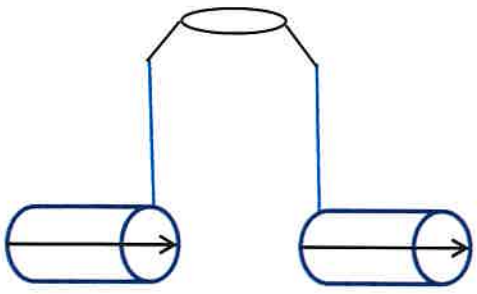
ADS Site Report

Quality Form

Project Name:	KERRVILLE	City/State:	KERRVILLE,TX	FM Initials:	DM
Site Name:	KERR_FM03	Monitor Series:	TRITON+	Monitor S/N#:	50610
Address / Location:	1K FT NORTH OF BIRKDALE LIFT STATION			Manhole #:	N/A
				Map Page #:	8
Access: BIKE TRAIL	Type of System:	Sanitary: X	Storm:	Combined:	Pipe Height: 25.68
					Pipe Width: 25.68
					Phone Number: 166.219.174.67

Date/Time of Investigation:	5/4/21 12:04 PM	Manhole Depth:	7'3" Feet
Site Hydraulics:	GOOD	Manhole Material / Condition:	Concrete
Upstream Input: (L/S, P/S)		Pipe Material / Condition:	PVC Good
Upstream Manhole:	DNL	Mini System Character:	Residential X / Commercial / Industrial / Other
Downstream Manhole:	DNL		
		Telephone Information:	N/A
Depth of Flow (Wet Dof):	3.74 +/- 0.25	Access Pole #:	N/A
Range (Air Dof):	+/-	Distance From Manhole:	N/A Feet
Peak Velocity:	1.54 fps	Road Cut Length:	N/A Feet
Silt:	0 Inches	Trenche Length:	N/A Feet

Other Information:



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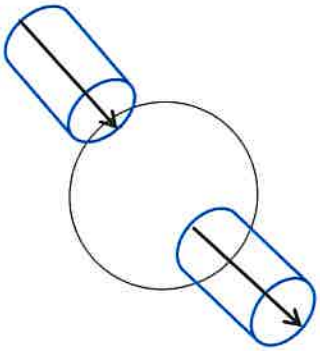


Planar N

Installation Information		Backup	Yes	No	?	Distance
Installation Type:	RING+CRANK	Trunk		X		
Sensors / Devices:	CS7	Lift/Pump Station	X			1,044.69 ft
Surcharge Height:	Feet NON VISIBLE	WWTP		X		
Rain Gauge Zone:		Other		X		

Additional Site Information / Comments:

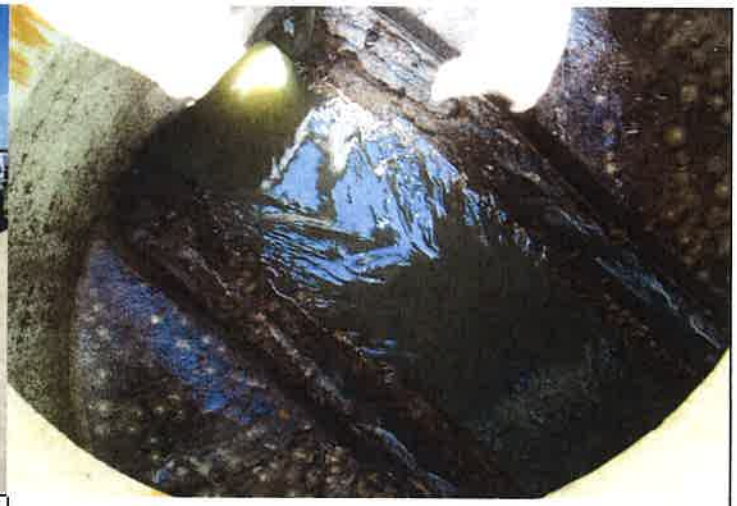
GPS: 30.020227, -99.126715

Additional Information

Project Name: KERRVILLE

Project Number: 25784.11.325

Site Name: KERR_FM03



ADS ENVIRONMENTAL SERVICES®

ADS Site Report

Quality Form

Flow Monitoring Site Safety Plan

Project Name:	KERRVILLE	Site ID:	KERR_FM03	Site Classification(see below)	1

* Hazards found at this site (Discuss Checked items below)			
Type	#	Specific Hazard	
Communic	1	The site is in a communications "Dead-Zone"	
Traffic	2	The site is located in or adjacent to an intersection	
	3	The site is located on a hill, curve, or where motorists visibility of the site or other vehicles is reduced	
	4	The site is located in a high speed (>45 MPH) or high density roadway	
	5	Site traffic is congested at peak hours	
Access	6	Site has access obstacles (rough terrain, fences, deep easement, etc.)	
Worksite	7	Worksite contains hazards (terrain, slope, obstructions, etc.)	
	8	Elevated work requiring a ladder / work near an unguarded edge. Raised manhole (indicate height below)	
	9	Pedestrian control necessary as the site is located in or near a walkway, school, playground, etc.	
	10	Work may be performed during darkness; requiring additional site lighting	X
	11	Sie is located in a high crime area (check with client & local authorities if unsure)	
Confined Space	12	Confined Space does not have useable rungs	X
	13	Confined Space depth is greater than 50 feet	
	14	Confined Space has internal platforms, weirs or other obstructions that interfere with or prevent unobstructed vertical retrieval	
	15	Work requires lateral movement that would interfere with or prevent unobstructed vertical retrieval	
	16	Flow is hazardous due to depth, velocity, pipe diameter, or is industrial process flow	
	17	Confined Space subject to surcharge during/after a rain event	X
	18	CO, H2S, low O2 or other toxic/flammable gases present or anticipated	X
	19	Confined Space has active drop connections	

* Hazards found at this site (Discuss Checked items below)		
	Class	Description
X	1	2-person crew. Standard procedures and equipment. No special requirements
	2	Worksite (non-traffic) with access obstacles and or worksite hazards
	3	Traffic site requiring special scheduling, additional personnel and/or traffic control equipment, or outsourcing
	4	Confined Space Entry requiring special scheduling, additional personnel and/or safety equipment
	5	Special Operation requiring a separate safety plan. *Must be approved by Corporate Safety Manager*

* Site Specific Safety Requiremnets, Must Complete for any site Class 2 & Above

TRAFFIC CONTROL PLAN

Note: All worksites located in a roadway or immediately adjacent to a roadway where the operation may impede the normal flow of traffic are required to have a Traffic Control Plan. Standard Traffic Control Plans are to be carried in the vehicle and referred to when setting up the worksite. Special Traffic Control Plans are to be developed when required by clients or regulating agencies or when a standard Traffic Control Plan is not sufficient to control traffic at the worksite.

- [X] This worksite does NOT require a traffic control plan
- [ ] Standard Traffic Control Plan TA18 to be used at this worksite
- [ ] This site requires a special Traffic Control Plan which is attached

Approved	Reviewed
Field Mgr Name: Dennis McPhearson	Project Mgr Name: Chuck Franklin
Signature: Dennis McPhearson	Signature:
Date: 1-May-21	Date: 5/1/2021

ADS Site Report

Quality Form

Project Name:	KERRVILLE	City/State:	KERRVILLE,TX	FM Initials:	DM		
Site Name:	KERR_FM04	Monitor Series:	TRITON+	Monitor S/N#:	63056		
Address / Location:	BEHIND 1355 Junction Hwy, Kerrville, TX 78028			Manhole #:	N/A		
				Map Page #:	2		
Access: GRASS	Type of System:	Sanitary: X	Storm:	Combined:	Pipe Height:	11.75	
					Pipe Width:	11.75	
					Phone Number:		107.80.17.38

Date/Time of Investigation:	5/5/21 9:36 AM		
Site Hydraulics:	GOOD		
Upstream Input: (L/S, P/S)			
Upstream Manhole:	DNL		
Downstream Manhole:	DNL		
Depth of Flow (Wet Dof):	5.75	+/- 0.25	
Range (Air Dof):		+/-	
Peak Velocity:	1.56	fps	
Silt:	0	Inches	

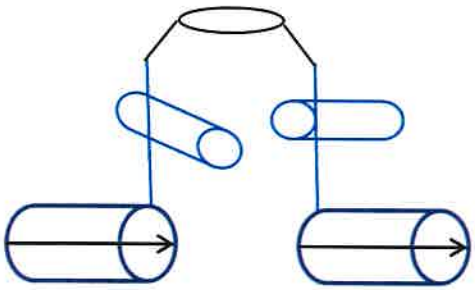
Manhole Information:

Manhole Depth:	11'	Feet			
Manhole Material / Condition:	Concrete				
Pipe Material / Condition:	VCP				Good
Mini System Character:	Residential: X	Commercial	Industrial	Other	

Telephone Information: N/A

Access Pole #:	N/A	
Distance From Manhole:	N/A	Feet
Road Cut Length:	N/A	Feet
Trenche Length:	N/A	Feet

Other Information:



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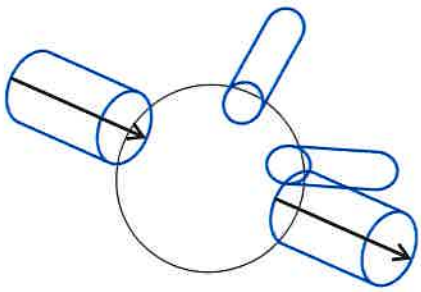


Planar N

Installation Information			Backup	Yes	No	?	Distance
Installation Type:	RING+CRANK		Trunk		X		
Sensors / Devices:	CS4		Lift/Pump Station	X			887.21 ft
Surcharge Height:	Feet	NON VISIBLE	WWTP		X		
Rain Gauge Zone:			Other		X		

Additional Site Information / Comments:

GPS: 30.061242, -99.171270

Additional Information

Project Name: KERRVILLE

Project Number: 25784.11.325

Site Name: KERR_FM04

ADS ENVIRONMENTAL SERVICES®

ADS Site Report

Quality Form

Flow Monitoring Site Safety Plan

Project Name:	KERRVILLE	Site ID:	KERR_FM04	Site Classification(see below)	1

*** Hazards found at this site (Discuss Checked items below)**

Type	#	Specific Hazard	
Communic	1	The site is in a communications "Dead-Zone"	
Traffic	2	The site is located in or adjacent to an intersection	
	3	The site is located on a hill, curve, or where motorists visibility of the site or other vehicles is reduced	
	4	The site is located in a high speed (>45 MPH) or high density roadway	
	5	Site traffic is congested at peak hours	
Access	6	Site has access obstacles (rough terrain, fences, deep easement, etc.)	
Worksite	7	Worksite contains hazards (terrain, slope, obstructions, etc.)	
	8	Elevated work requiring a ladder / work near an unguarded edge. Raised manhole (indicate height below)	
	9	Pedestrian control necessary as the site is located in or near a walkway, school, playground, etc.	
	10	Work may be performed during darkness; requiring additional site lighting	X
	11	Sie is located in a high crime area (check with client & local authorities if unsure)	
Confined Space	12	Confined Space does not have useable rungs	X
	13	Confined Space depth is greater than 50 feet	
	14	Confined Space has internal platforms, weirs or other obstructions that interfere with or prevent unobstructed vertical retrieval	
	15	Work requires lateral movement that would interfere with or prevent unobstructed vertical retrieval	
	16	Flow is hazardous due to depth, velocity, pipe diameter, or is industrial process flow	
	17	Confined Space subject to surcharge during/after a rain event	
	18	CO, H2S, low O2 or other toxic/flammable gases present or anticipated	X
	19	Confined Space has active drop connections	

*** Hazards found at this site (Discuss Checked items below)**

	Class	Description
X	1	2-person crew. Standard procedures and equipment. No special requirements
	2	Worksite (non-traffic) with access obstacles and or worksite hazards
	3	Traffic site requiring special scheduling, additional personnel and/or traffic control equipment, or outsourcing
	4	Confined Space Entry requiring special scheduling, additional personnel and/or safety equipment
	5	Special Operation requiring a separate safety plan. *Must be approved by Corporate Safety Manager*

*** Site Specific Safety Requiremnets, Must Complete for any site Class 2 & Above**

TRAFFIC CONTROL PLAN

Note: All worksites located in a roadway or immediately adjacent to a roadway where the operation may impede the normal flow of traffic are required to have a Traffic Control Plan. Standard Traffic Control Plans are to be carried in the vehicle and referred to when setting up the worksite. Special Traffic Control Plans are to be developed when required by clients or regulating agencies or when a standard Traffic Control Plan is not sufficient to control traffic at the worksite.

- [X] This worksite does NOT require a traffic control plan
- [ ] Standard Traffic Control Plan TA18 to be used at this worksite
- [ ] This site requires a special Traffic Control Plan which is attached

Approved	Reviewed
Field Mgr Name: Dennis McPhearson	Project Mgr Name: Chuck Franklin
Signature: Dennis McPhearson	Signature:
Date: 1-May-21	Date: 5/1/2021

ADS Site Report

Quality Form

Project Name:	KERRVILLE	City/State:	KERRVILLE,TX	FM Initials:	DM
Site Name:	KERR_FM06	Monitor Series:	TRITON+	Monitor S/N#:	42099
Address / Location:	1 Country Club Dr, Kerrville, TX 78028			Manhole #:	N/A
				Map Page #:	4
Access: GOLF COURSE	Type of System:	Sanitary: X	Storm:	Combined:	Pipe Height: 12
					Pipe Width: 11.88
					Phone Number: 107.80.22.198

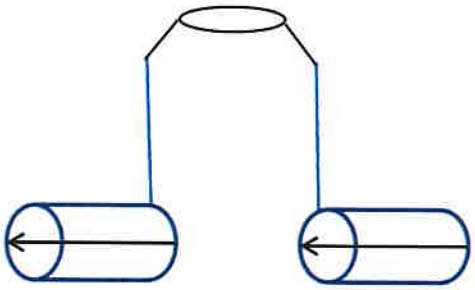
Access Map

Site Map

Date/Time of Investigation:	5/5/2021 13:22:00 PM		Manhole Depth:	13'	Feet	
Site Hydraulics:	GOOD		Manhole Material / Condition:	Concrete		
Upstream Input: (L/S, P/S)			Pipe Material / Condition:	VCP		Good
Upstream Manhole:	DNL		Mini System Character:	Residential: X	Commercial	Industrial / Other
Downstream Manhole:	DNL					
			Telephone Information: N/A			
Depth of Flow (Wet Dof):	4.5	+/- 0.25	Access Pole #:	N/A		
Range (Air Dof):		+/-	Distance From Manhole:	N/A	Feet	
Peak Velocity:	1.56	fps	Road Cut Length:	N/A	Feet	
Silt:	0	Inches	Trenche Length:	N/A	Feet	

Manhole Information:

Other Information:



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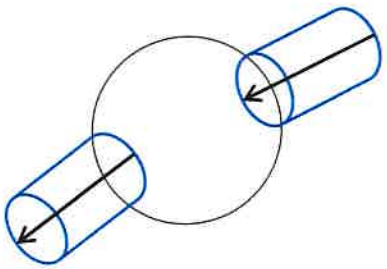


Planar N

Installation Information			Backup	Yes	No	?	Distance
Installation Type:	RING+CRANK		Trunk		X		
Sensors / Devices:	CS4		Lift/Pump Station		X		
Surcharge Height:	Feet	NON VISIBLE	WWTP		X		
Rain Gauge Zone:			Other		X		

Additional Site Information / Comments:

GPS: 30.052415, -99.126895

Additional Information

Project Name: KERRVILLE

Project Number: 25784.11.325

Site Name: KERR_FM06

ADS ENVIRONMENTAL SERVICES®

ADS Site Report

Quality Form

Flow Monitoring Site Safety Plan

Project Name:	KERRVILLE	Site ID:	KERR_FM06	Site Classification(see below)	1

* Hazards found at this site (Discuss Checked items below)			
Type	#	Specific Hazard	
Communic	1	The site is in a communications "Dead-Zone"	
Traffic	2	The site is located in or adjacent to an intersection	
	3	The site is located on a hill, curve, or where motorists visibility of the site or other vehicles is reduced	
	4	The site is located in a high speed (>45 MPH) or high density roadway	
	5	Site traffic is congested at peak hours	
Access	6	Site has access obstacles (rough terrain, fences, deep easement, etc.)	
Worksite	7	Worksite contains hazards (terrain, slope, obstructions, etc.)	
	8	Elevated work requiring a ladder / work near an unguarded edge. Raised manhole (indicate height below)	
	9	Pedestrian control necessary as the site is located in or near a walkway, school, playground, etc.	
	10	Work may be performed during darkness; requiring additional site lighting	X
	11	Sie is located in a high crime area (check with client & local authorities if unsure)	
Confined Space	12	Confined Space does not have useable rungs	X
	13	Confined Space depth is greater than 50 feet	
	14	Confined Space has internal platforms, weirs or other obstructions that interfere with or prevent unobstructed vertical retrieval	
	15	Work requires lateral movement that would interfere with or prevent unobstructed vertical retrieval	
	16	Flow is hazardous due to depth, velocity, pipe diameter, or is industrial process flow	
	17	Confined Space subject to surcharge during/after a rain event	
	18	CO, H2S, low O2 or other toxic/flammable gases present or anticipated	X
	19	Confined Space has active drop connections	

* Hazards found at this site (Discuss Checked items below)		

	Class	Description
X	1	2-person crew. Standard procedures and equipment. No special requirements
	2	Worksite (non-traffic) with access obstacles and or worksite hazards
	3	Traffic site requiring special scheduling, additional personnel and/or traffic control equipment, or outsourcing
	4	Confined Space Entry requiring special scheduling, additional personnel and/or safety equipment
	5	Special Operation requiring a separate safety plan. *Must be approved by Corporate Safety Manager*

* Site Specific Safety Requiremnets, Must Complete for any site Class 2 & Above

TRAFFIC CONTROL PLAN

Note: All worksites located in a roadway or immediately adjacent to a roadway where the operation may impede the normal flow of traffic are required to have a Traffic Control Plan. Standard Traffic Control Plans are to be carried in the vehicle and referred to when setting up the worksite. Special Traffic Control Plans are to be developed when required by clients or regulating agencies or when a standard Traffic Control Plan is not sufficient to control traffic at the worksite.

- [X] This worksite does NOT require a traffic control plan
- [ ] Standard Traffic Control Plan TA18 to be used at this worksite
- [ ] This site requires a special Traffic Control Plan which is attached

Approved	Reviewed
Field Mgr Name: Dennis McPhearson	Project Mgr Name: Chuck Franklin
Signature: Dennis McPhearson	Signature:
Date: 1-May-21	Date: 5/1/2021

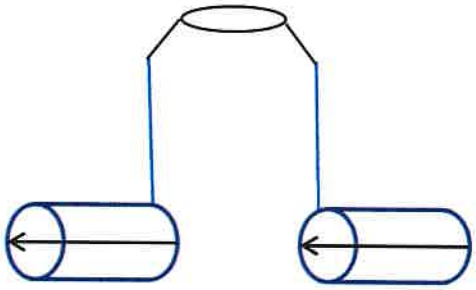
ADS Site Report

Quality Form

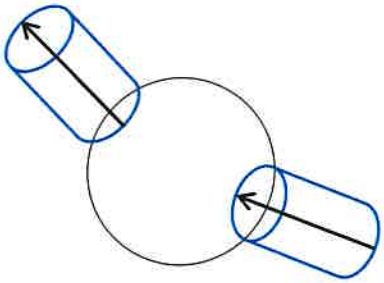
Project Name:	KERRVILLE	City/State:	KERRVILLE,TX	FM Initials:	DM
Site Name:	KERR_FM07	Monitor Series:	TRITON+	Monitor S/N#:	62568
Address / Location:	3410 Memorial Blvd, Kerrville, TX 78028			Manhole #:	N/A
				Map Page #:	10
Access: GRASS	Type of System:	Sanitary: X	Storm:	Combined:	Pipe Height: 9.5
					Pipe Width: 9.5
					Phone Number: 10.4.0.231

Date/Time of Investigation:	5/11/21 11:12 AM	Manhole Depth:	6'4" Feet
Site Hydraulics:	GOOD	Manhole Material / Condition:	Concrete
Upstream Input: (L/S, P/S)		Pipe Material / Condition:	PVC Good
Upstream Manhole:	DNL	Mini System Character:	Residential: X; Commercial; Industrial; Other
Downstream Manhole:	DNL		
		Telephone Information:	N/A
Depth of Flow (Wet Dof):	2 +/- 0.25	Access Pole #:	N/A
Range (Air Dof):	+/-	Distance From Manhole:	N/A Feet
Peak Velocity:	1.17 fps	Road Cut Length:	N/A Feet
Silt:	0 Inches	Trenche Length:	N/A Feet

Other Information:



Cross Section



Planar N

Installation Information		Backup	Yes	No	?	Distance
Installation Type:	RING+CRANK	Trunk		X		
Sensors / Devices:	CS4	Lift/Pump Station		X		
Surcharge Height:	Feet NON VISIBLE	WWTP		X		
Rain Gauge Zone:		Other		X		

Additional Site Information / Comments:

GPS: 30.014943, -99.117299

Additional Information

Project Name: KERRVILLE

Project Number: 25784.11.325

Site Name: KERR_FM07

ADS ENVIRONMENTAL SERVICES®

ADS Site Report

Quality Form

Flow Monitoring Site Safety Plan

Project Name:	KERRVILLE	Site ID:	KERR_FM07	Site Classification(see below)	1

* Hazards found at this site (Discuss Checked items below)			
Type	#	Specific Hazard	
Communic	1	The site is in a communications "Dead-Zone"	
Traffic	2	The site is located in or adjacent to an intersection	
	3	The site is located on a hill, curve, or where motorists visibility of the site or other vehicles is reduced	
	4	The site is located in a high speed (>45 MPH) or high density roadway	
	5	Site traffic is congested at peak hours	
Access	6	Site has access obstacles (rough terrain, fences, deep easement, etc.)	
Worksite	7	Worksite contains hazards (terrain, slope, obstructions, etc.)	
	8	Elevated work requiring a ladder / work near an unguarded edge. Raised manhole (indicate height below)	
	9	Pedestrian control necessary as the site is located in or near a walkway, school, playground, etc.	
	10	Work may be performed during darkness; requiring additional site lighting	X
	11	Sie is located in a high crime area (check with client & local authorities if unsure)	
Confined Space	12	Confined Space does not have useable rungs	X
	13	Confined Space depth is greater than 50 feet	
	14	Confined Space has internal platforms, weirs or other obstructions that interfere with or prevent unobstructed vertical retrieval	
	15	Work requires lateral movement that would interfere with or prevent unobstructed vertical retrieval	
	16	Flow is hazardous due to depth, velocity, pipe diameter, or is industrial process flow	
	17	Confined Space subject to surcharge during/after a rain event	X
	18	CO, H2S, low O2 or other toxic/flammable gases present or anticipated	X
	19	Confined Space has active drop connections	

* Hazards found at this site (Discuss Checked items below)		
	Class	**Description**
X	**1**	2-person crew. Standard procedures and equipment. No special requirements
	2	Worksite (non-traffic) with access obstacles and or worksite hazards
	3	Traffic site requiring special scheduling, additional personnel and/or traffic control equipment, or outsourcing
	4	Confined Space Entry requiring special scheduling, additional personnel and/or safety equipment
	5	Special Operation requiring a separate safety plan. *Must be approved by Corporate Safety Manager*

* Site Specific Safety Requiremnets, Must Complete for any site Class 2 & Above

TRAFFIC CONTROL PLAN

Note: All worksites located in a roadway or immediately adjacent to a roadway where the operation may impede the normal flow of traffic are required to have a Traffic Control Plan. Standard Traffic Control Plans are to be carried in the vehicle and referred to when setting up the worksite. Special Traffic Control Plans are to be developed when required by clients or regulating agencies or when a standard Traffic Control Plan is not sufficient to control traffic at the worksite.

- [X] This worksite does NOT require a traffic control plan
- [ ] Standard Traffic Control Plan TA18 to be used at this worksite
- [ ] This site requires a special Traffic Control Plan which is attached

Approved	Reviewed
Field Mgr Name: Dennis McPhearson	Project Mgr Name: Chuck Franklin
Signature: Dennis McPhearson	Signature:
Date: 1-May-21	Date: 5/1/2021

ADS Site Report

Quality Form

Project Name:	KERRVILLE	City/State:	KERRVILLE,TX	FM Initials:	DM
Site Name:	KERR_FM08	Monitor Series:	TRITON+	Monitor S/N#:	63810
Address / Location:	409A Meeker Rd, Kerrville, TX 78028			Manhole #:	N/A
				Map Page #:	7
Access: SIDE OF STREET	Type of System:	Sanitary: X	Storm:	Combined:	Pipe Height: 20.25
					Pipe Width: 23
					Phone Number: 107.80.27.74

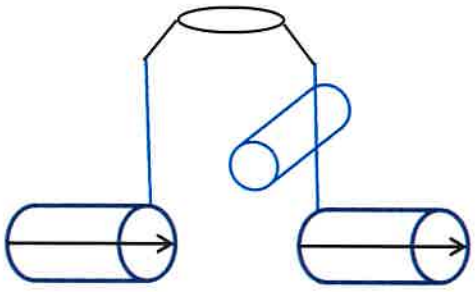
Access Map

Site Map

Date/Time of Investigation:	5/11/2021 14:31:00 PM	Manhole Depth:	7'6" Feet
Site Hydraulics:	GOOD	Manhole Material / Condition:	Brick
Upstream Input: (L/S, P/S)		Pipe Material / Condition:	VCP Poor
Upstream Manhole:	DNL	Mini System Character:	Residential: X; Commercial; Industrial; Other
Downstream Manhole:	DNL		
		Telephone Information:	N/A
Depth of Flow (Wet Dof):	7 +/- 0.13	Access Pole #:	N/A
Range (Air Dof):	+/-	Distance From Manhole:	N/A Feet
Peak Velocity:	0.69 fps	Road Cut Length:	N/A Feet
Silt:	2 Inches	Trenche Length:	N/A Feet

Manhole Information:

Other Information: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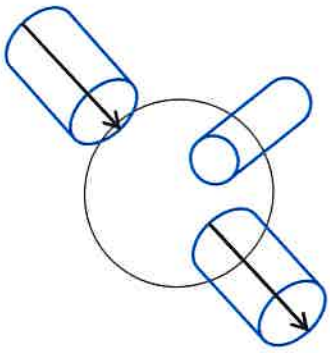
Planar N

Installation Information			Backup	Yes	No	?	Distance
Installation Type:	RING+CRANK		Trunk		X		
Sensors / Devices:	CS4		Lift/Pump Station		X		
Surcharge Height:	Feet	NON VISIBLE	WWTP		X		
Rain Gauge Zone:			Other		X		

Additional Site Information / Comments:

GPS: 30.023151, -99.121171

Additional Information

Project Name: KERRVILLE

Project Number: 25784.11.325

Site Name: KERR_FM08

ADS ENVIRONMENTAL SERVICES®

ADS Site Report

Quality Form

Flow Monitoring Site Safety Plan

Project Name:	KERRVILLE	Site ID:	KERR_FM08	Site Classification(see below)	1

*** Hazards found at this site (Discuss Checked items below)**

Type	#	Specific Hazard	
Communic	1	The site is in a communications "Dead-Zone"	
Traffic	2	The site is located in or adjacent to an intersection	
	3	The site is located on a hill, curve, or where motorists visibility of the site or other vehicles is reduced	
	4	The site is located in a high speed (>45 MPH) or high density roadway	
	5	Site traffic is congested at peak hours	
Access	6	Site has access obstacles (rough terrain, fences, deep easement, etc.)	
Worksite	7	Worksite contains hazards (terrain, slope, obstructions, etc.)	
	8	Elevated work requiring a ladder / work near an unguarded edge. Raised manhole (indicate height below)	
	9	Pedestrian control necessary as the site is located in or near a walkway, school, playground, etc.	
	10	Work may be performed during darkness; requiring additional site lighting	X
	11	Sie is located in a high crime area (check with client & local authorities if unsure)	
Confined Space	12	Confined Space does not have useable rungs	X
	13	Confined Space depth is greater than 50 feet	
	14	Confined Space has internal platforms, weirs or other obstructions that interfere with or prevent unobstructed vertical retrieval	
	15	Work requires lateral movement that would interfere with or prevent unobstructed vertical retrieval	
	16	Flow is hazardous due to depth, velocity, pipe diameter, or is industrial process flow	
	17	Confined Space subject to surcharge during/after a rain event	X
	18	CO, H2S, low O2 or other toxic/flammable gases present or anticipated	X
	19	Confined Space has active drop connections	

*** Hazards found at this site (Discuss Checked items below)**

	Class	Description
X	1	2-person crew. Standard procedures and equipment. No special requirements
	2	Worksite (non-traffic) with access obstacles and or worksite hazards
	3	Traffic site requiring special scheduling, additional personnel and/or traffic control equipment, or outsourcing
	4	Confined Space Entry requiring special scheduling, additional personnel and/or safety equipment
	5	Special Operation requiring a separate safety plan. *Must be approved by Corporate Safety Manager*

*** Site Specific Safety Requiremnets, Must Complete for any site Class 2 & Above**

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Approved	Reviewed
Field Mgr Name: Dennis McPhearson	Project Mgr Name: Chuck Franklin
Signature: Dennis McPhearson	Signature:
Date: 1-May-21	Date: 5/1/2021

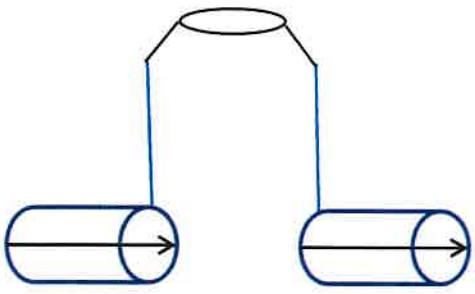
ADS Site Report

Quality Form

Project Name:	KERRVILLE	City/State:	KERRVILLE,TX	FM Initials:	DM
Site Name:	KERR_FM09	Monitor Series:	TRITON+	Monitor S/N#:	41747
Address / Location:	2888 Memorial Blvd, Kerrville, TX 78028			Manhole #:	N/A
				Map Page #:	9
Access: GRASS	Type of System:	Sanitary: X	Storm:	Combined:	Pipe Height: 23
					Pipe Width: 23
					Phone Number: 107.80.26.149

Date/Time of Investigation:	5/5/2021 11:146:00 AM	Manhole Depth:	11'4" Feet
Site Hydraulics:	GOOD	Manhole Material / Condition:	Concrete
Upstream Input: (L/S, P/S)		Pipe Material / Condition:	VCP Good
Upstream Manhole:	DNL	Mini System Character:	Residential X / Commercial / Industrial / Other
Downstream Manhole:	DNL		
		Telephone Information:	N/A
Depth of Flow (Wet Dof):	8 +/- 0.25	Access Pole #:	N/A
Range (Air Dof):	+/-	Distance From Manhole:	N/A Feet
Peak Velocity:	2.96 fps	Road Cut Length:	N/A Feet
Silt:	0 Inches	Trenche Length:	N/A Feet

Other Information:



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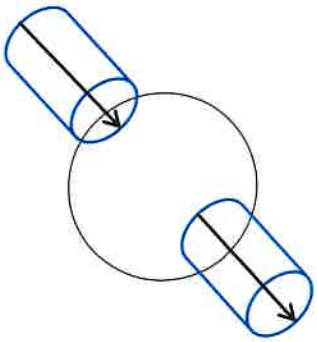

Planar N

Installation Information		Backup	Yes	No	?	Distance
Installation Type:	RING+CRANK	Trunk		X		
Sensors / Devices:	CS4	Lift/Pump Station		X		
Surcharge Height:	Feet NON VISIBLE	WWTP		X		
Rain Gauge Zone:		Other		X		

Additional Site Information / Comments:

GPS: 30.019641, -99.121441

Additional Information

Project Name: KERRVILLE

Project Number: 25784.11.325

Site Name: KERR_FM09

ADS ENVIRONMENTAL SERVICES®

ADS Site Report

Quality Form

Flow Monitoring Site Safety Plan

Project Name:	KERRVILLE	Site ID:	KERR_FM09	Site Classification(see below)	1

* Hazards found at this site (Discuss Checked items below)			
Type	#	Specific Hazard	
Communic	1	The site is in a communications "Dead-Zone"	
Traffic	2	The site is located in or adjacent to an intersection	
	3	The site is located on a hill, curve, or where motorists visibility of the site or other vehicles is reduced	
	4	The site is located in a high speed (>45 MPH) or high density roadway	
	5	Site traffic is congested at peak hours	
Access	6	Site has access obstacles (rough terrain, fences, deep easement, etc.)	
Worksite	7	Worksite contains hazards (terrain, slope, obstructions, etc.)	
	8	Elevated work requiring a ladder / work near an unguarded edge. Raised manhole (indicate height below)	
	9	Pedestrian control necessary as the site is located in or near a walkway, school, playground, etc.	
	10	Work may be performed during darkness; requiring additional site lighting	X
	11	Sie is located in a high crime area (check with client & local authorities if unsure)	
Confined Space	12	Confined Space does not have useable rungs	X
	13	Confined Space depth is greater than 50 feet	
	14	Confined Space has internal platforms, weirs or other obstructions that interfere with or prevent unobstructed vertical retrieval	
	15	Work requires lateral movement that would interfere with or prevent unobstructed vertical retrieval	
	16	Flow is hazardous due to depth, velocity, pipe diameter, or is industrial process flow	
	17	Confined Space subject to surcharge during/after a rain event	X
	18	CO, H2S, low O2 or other toxic/flammable gases present or anticipated	X
	19	Confined Space has active drop connections	

* Hazards found at this site (Discuss Checked items below)		
	Class	Description
X	1	2-person crew. Standard procedures and equipment. No special requirements
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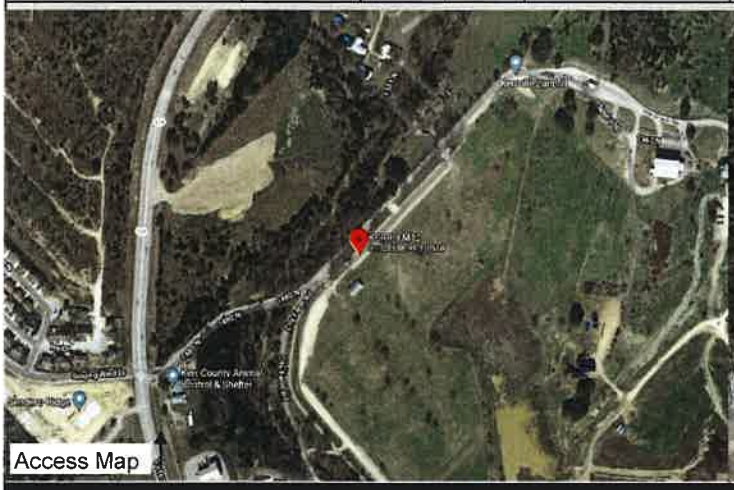
Approved	Reviewed
Field Mgr Name: Dennis McPhearson	Project Mgr Name: Chuck Franklin
Signature: Dennis McPhearson	Signature:
Date: 1-May-21	Date: 5/1/2021

ADS Site Report

Quality Form

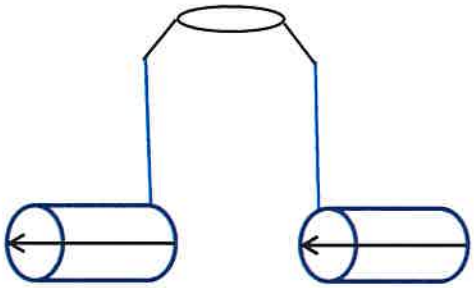
Project Name:	KERRVILLE	City/State:	KERRVILLE,TX	FM Initials:	DM		
Site Name:	KERR_FM12	Monitor Series:	TRITON+	Monitor S/N#:	51185		
Address / Location:	1480 N, Kerrville, TX 78028			Manhole #:	N/A		
				Map Page #:	6		
Access: PARK	Type of System:	Sanitary: X	Storm:	Combined:	Pipe Height:	17	
					Pipe Width:	17.25	
					Phone Number:		166.219.50.230



Manhole Information:

Date/Time of Investigation:	5/12/21 10:21 AM	Manhole Depth:	20'2"	Feet	
Site Hydraulics:	GOOD	Manhole Material / Condition:	Concrete		
Upstream Input: (L/S, P/S)		Pipe Material / Condition:	PVC		Good
Upstream Manhole:	DNL	Mini System Character:	Residential: X	Commercial	Industrial / Other
Downstream Manhole:	DNL				
		Telephone Information:	N/A		
Depth of Flow (Wet Dof):	1.32 +/- 0.13	Access Pole #:	N/A		
Range (Air Dof):	+/-	Distance From Manhole:	N/A	Feet	
Peak Velocity:	0.9 fps	Road Cut Length:	N/A	Feet	
Silt:	0 Inches	Trenche Length:	N/A	Feet	

Other Information:



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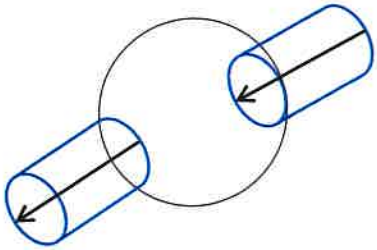


Planar N

Installation Information			Backup	Yes	No	?	Distance
Installation Type:	RING+CRANK		Trunk		X		
Sensors / Devices:	CS4		Lift/Pump Station		X		
Surcharge Height:	Feet	NON VISIBLE	WWTP		X		
Rain Gauge Zone:			Other		X		

Additional Site Information / Comments:

GPS: 30.028688, -99.110967

Additional Information

Project Name: KERRVILLE

Project Number: 25784.11.325

Site Name: KERR_FM12

ADS Site Report

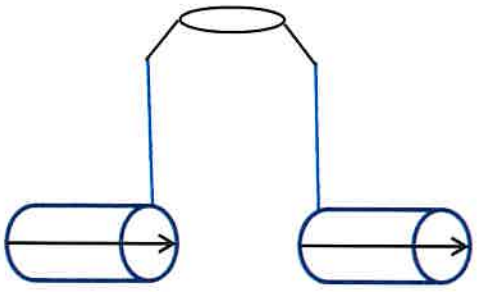
Quality Form

Project Name:	KERRVILLE	City/State:	KERRVILLE,TX	FM Initials:	DM
Site Name:	KERR_FM13	Monitor Series:	TRITON+	Monitor S/N#:	29468
Address / Location:	2668 Junction Hwy, Kerrville, TX 78028			Manhole #:	N/A
				Map Page #:	1
Access: DITCH	Type of System:	Sanitary: X	Storm:	Combined:	Pipe Height: 11.5
					Pipe Width: 11.5
					Phone Number: 10.5.1.107

Manhole Information:

Date/Time of Investigation:	5/11/21 11:11 AM	Manhole Depth:	4'6"	Feet	
Site Hydraulics:	GOOD	Manhole Material / Condition:	Concrete		
Upstream Input: (L/S, P/S)		Pipe Material / Condition:	PVC		Good
Upstream Manhole:	DNL	Mini System Character:	Residential: X	Commercial	Industrial / Other
Downstream Manhole:	DNL				
		Telephone Information: N/A			
Depth of Flow (Wet Dof):	4 +/- ,13	Access Pole #:	N/A		
Range (Air Dof):	+/-	Distance From Manhole:	N/A	Feet	
Peak Velocity:	0.76 fps	Road Cut Length:	N/A	Feet	
Silt:	1 Inches	Trenche Length:	N/A	Feet	

Other Information:



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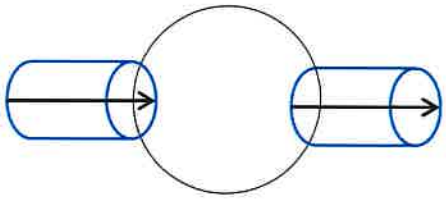

Planar N

Installation Information		Backup	Yes	No	?	Distance
Installation Type:	RING+CRANK	Trunk		X		
Sensors / Devices:	CS4	Lift/Pump Station		X		
Surcharge Height:	Feet NON VISIBLE	WWTP		X		
Rain Gauge Zone:		Other		X		

Additional Site Information / Comments:

GPS: 30.072529,-99.207653

Additional Information

Project Name: KERRVILLE

Project Number: 25784.11.325

Site Name: KERR_FM13

ADS ENVIRONMENTAL SERVICES

ADS Site Report

Quality Form

Flow Monitoring Site Safety Plan

Project Name:	KERRVILLE	Site ID:	KERR_FM13	Site Classification(see below)	1

*** Hazards found at this site (Discuss Checked items below)**

Type	#	Specific Hazard	
Communic	1	The site is in a communications "Dead-Zone"	
Traffic	2	The site is located in or adjacent to an intersection	
	3	The site is located on a hill, curve, or where motorists visibility of the site or other vehicles is reduced	
	4	The site is located in a high speed (>45 MPH) or high density roadway	
	5	Site traffic is congested at peak hours	
Access	6	Site has access obstacles (rough terrain, fences, deep easement, etc.)	
Worksite	7	Worksite contains hazards (terrain, slope, obstructions, etc.)	
	8	Elevated work requiring a ladder / work near an unguarded edge. Raised manhole (indicate height below)	
	9	Pedestrian control necessary as the site is located in or near a walkway, school, playground, etc.	
	10	Work may be performed during darkness; requiring additional site lighting	X
	11	Sie is located in a high crime area (check with client & local authorities if unsure)	
Confined Space	12	Confined Space does not have useable rungs	X
	13	Confined Space depth is greater than 50 feet	
	14	Confined Space has internal platforms, weirs or other obstructions that interfere with or prevent unobstructed vertical retrieval	
	15	Work requires lateral movement that would interfere with or prevent unobstructed vertical retrieval	
	16	Flow is hazardous due to depth, velocity, pipe diameter, or is industrial process flow	
	17	Confined Space subject to surcharge during/after a rain event	X
	18	CO, H2S, low O2 or other toxic/flammable gases present or anticipated	X
	19	Confined Space has active drop connections	

*** Hazards found at this site (Discuss Checked items below)**

	Class	Description
X	1	2-person crew. Standard procedures and equipment. No special requirements
	2	Worksite (non-traffic) with access obstacles and or worksite hazards
	3	Traffic site requiring special scheduling, additional personnel and/or traffic control equipment, or outsourcing
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TRAFFIC CONTROL PLAN

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Approved	Reviewed
Field Mgr Name: Dennis McPhearson	Project Mgr Name: Chuck Franklin
Signature: *Dennis McPhearson*	Signature:
Date: 1-May-21	Date: 5/1/2021

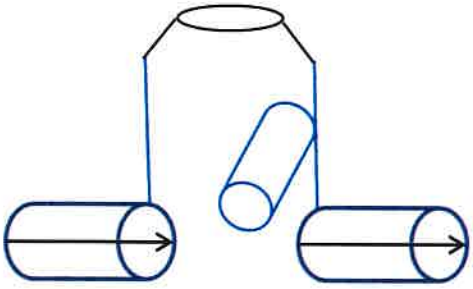
ADS Site Report

Quality Form

Project Name:	KERRVILLE	City/State:	KERRVILLE,TX	FM Initials:	DM
Site Name:	KERR_FM14	Monitor Series:	TRITON+	Monitor S/N#:	63671
Address / Location:	99 Jefferson St, Kerrville, TX 78028			Manhole #:	N/A
				Map Page #:	3
Access:	L.S.	Type of System:	Sanitary [X] Storm [ ] Combined [ ]	Pipe Height:	29.5
				Pipe Width:	29.5
				Phone Number:	10.5.1.243

Date/Time of Investigation:	5/11/21 9:14 AM	Manhole Depth:	29'4" Feet
Site Hydraulics:	GOOD	Manhole Material / Condition:	Concrete
Upstream Input: (L/S, P/S)		Pipe Material / Condition:	PVC Good
Upstream Manhole:	DNL	Mini System Character:	Residential X / Commercial / Industrial / Other
Downstream Manhole:	DNL		
		Telephone Information:	N/A
Depth of Flow (Wet Dof):	4.5 +/- 0.25	Access Pole #:	N/A
Range (Air Dof):	+/-	Distance From Manhole:	N/A Feet
Peak Velocity:	2.64 fps	Road Cut Length:	N/A Feet
Silt:	0 Inches	Trenche Length:	N/A Feet

Other Information:



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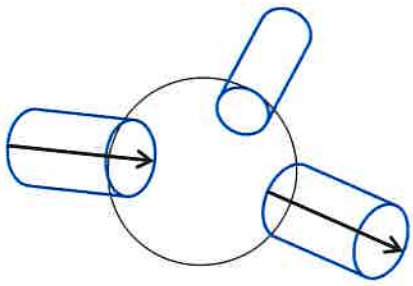


Planar N

Installation Information		Backup	Yes	No	?	Distance
Installation Type:	RING+CRANK	Trunk		X		
Sensors / Devices:	CS4	Lift/Pump Station	X			80FT
Surcharge Height:	Feet NON VISIBLE	WWTP		X		
Rain Gauge Zone:		Other		X		

Additional Site Information / Comments:

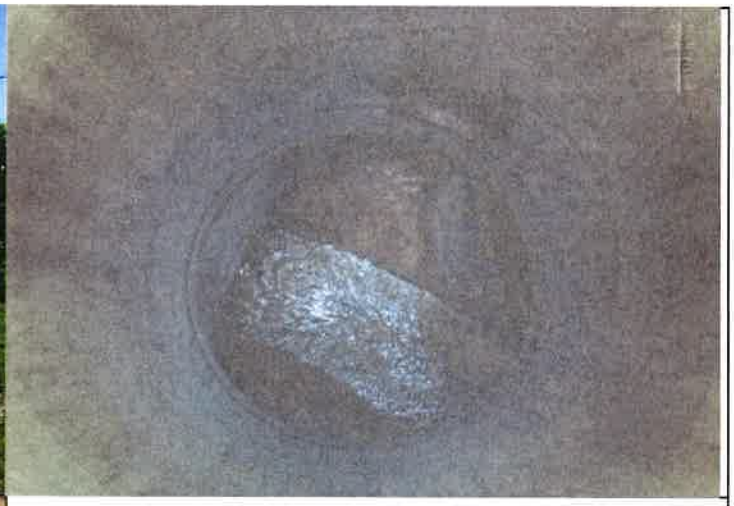
GPS: 30.053784, -99.145838

Additional Information

Project Name: KERRVILLE

Project Number: 25784.11.325

Site Name: KERR_FM14



ADS ENVIRONMENTAL SERVICES®

ADS Site Report

Quality Form

Flow Monitoring Site Safety Plan

Project Name:	KERRVILLE	Site ID:	KERR_FM14	Site Classification(see below)	1

*** Hazards found at this site (Discuss Checked items below)**

Type	#	Specific Hazard	
Communic	1	The site is in a communications "Dead-Zone"	
Traffic	2	The site is located in or adjacent to an intersection	
	3	The site is located on a hill, curve, or where motorists visibility of the site or other vehicles is reduced	
	4	The site is located in a high speed (>45 MPH) or high density roadway	
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Access	6	Site has access obstacles (rough terrain, fences, deep easement, etc.)	
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	9	Pedestrian control necessary as the site is located in or near a walkway, school, playground, etc.	
	10	Work may be performed during darkness; requiring additional site lighting	X
	11	Sie is located in a high crime area (check with client & local authorities if unsure)	
Confined Space	12	Confined Space does not have useable rungs	X
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	15	Work requires lateral movement that would interfere with or prevent unobstructed vertical retrieval	
	16	Flow is hazardous due to depth, velocity, pipe diameter, or is industrial process flow	
	17	Confined Space subject to surcharge during/after a rain event	X
	18	CO, H2S, low O2 or other toxic/flammable gases present or anticipated	X
	19	Confined Space has active drop connections	

*** Hazards found at this site (Discuss Checked items below)**

	Class	Description
X	1	2-person crew. Standard procedures and equipment. No special requirements
	2	Worksite (non-traffic) with access obstacles and or worksite hazards
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Approved	Reviewed
Field Mgr Name: Dennis McPhearson	Project Mgr Name: Chuck Franklin
Signature: Dennis McPhearson	Signature:
Date: 1-May-21	Date: 5/1/2021

ADS Site Report

Quality Form

Project Name:	KERRVILLE	City/State:	KERRVILLE,TX	FM Initials:	DM
Site Name:	KERR_FM15	Monitor Series:	TRITON+	Monitor S/N#:	63414
Address / Location:	EAST OF 2609 Calle Del Roble, Kerrville, TX 78028			Manhole #:	N/A
				Map Page #:	8
Access: GRASS	Type of System:	Sanitary: X	Storm:	Combined:	Pipe Height: 9.75
					Pipe Width: 9.88
					Phone Number: 166.213.158.47

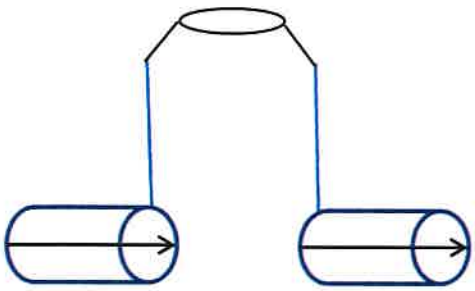
Access Map

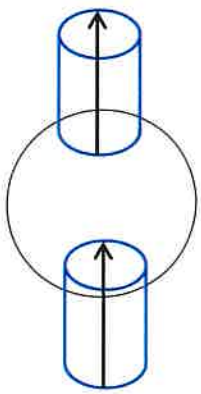
Site Map

Manhole Information:

Date/Time of Investigation:	5/6/21 10:06 AM		Manhole Depth:	8	Feet
Site Hydraulics:	GOOD		Manhole Material / Condition:	Concrete	
Upstream Input: (L/S, P/S)			Pipe Material / Condition:	PVC	Good
Upstream Manhole:	DNL		Mini System Character:	Residential: X	Commercial / Industrial / Other
Downstream Manhole:	DNL				
			Telephone Information: N/A		
Depth of Flow (Wet Dof):	2	+/- 0.13	Access Pole #:	N/A	
Range (Air Dof):		+/-	Distance From Manhole:	N/A	Feet
Peak Velocity:	1.14	fps	Road Cut Length:	N/A	Feet
Silt:	0	Inches	Trenche Length:	N/A	Feet

Other Information:


Cross Section


Planar N

Installation Information			Backup	Yes	No	?	Distance
Installation Type:	RING+CRANK		Trunk		X		
Sensors / Devices:	CS4		Lift/Pump Station		X		
Surcharge Height:	Feet	NON VISIBLE	WWTP		X		
Rain Gauge Zone:			Other		X		

Additional Site Information / Comments:

GPS: 30.016679, -99.126768

Additional Information

Project Name: KERRVILLE

Project Number: 25784.11.325

Site Name: KERR_FM15

ADS ENVIRONMENTAL SERVICES®

ADS Site Report

Quality Form

Flow Monitoring Site Safety Plan

Project Name:	KERRVILLE	Site ID:	KERR_FM15	Site Classification(see below)	1

* Hazards found at this site (Discuss Checked items below)			
Type	#	Specific Hazard	
Communic	1	The site is in a communications "Dead-Zone"	
Traffic	2	The site is located in or adjacent to an intersection	
	3	The site is located on a hill, curve, or where motorists visibility of the site or other vehicles is reduced	
	4	The site is located in a high speed (>45 MPH) or high density roadway	
	5	Site traffic is congested at peak hours	
Access	6	Site has access obstacles (rough terrain, fences, deep easement, etc.)	
Worksite	7	Worksite contains hazards (terrain, slope, obstructions, etc.)	
	8	Elevated work requiring a ladder / work near an unguarded edge. Raised manhole (indicate height below)	
	9	Pedestrian control necessary as the site is located in or near a walkway, school, playground, etc.	
	10	Work may be performed during darkness; requiring additional site lighting	X
	11	Sie is located in a high crime area (check with client & local authorities if unsure)	
Confined Space	12	Confined Space does not have useable rungs	X
	13	Confined Space depth is greater than 50 feet	
	14	Confined Space has internal platforms, weirs or other obstructions that interfere with or prevent unobstructed vertical retrieval	
	15	Work requires lateral movement that would interfere with or prevent unobstructed vertical retrieval	
	16	Flow is hazardous due to depth, velocity, pipe diameter, or is industrial process flow	
	17	Confined Space subject to surcharge during/after a rain event	X
	18	CO, H2S, low O2 or other toxic/flammable gases present or anticipated	X
	19	Confined Space has active drop connections	

* Hazards found at this site (Discuss Checked items below)		
	Class	Description
X	1	2-person crew. Standard procedures and equipment. No special requirements
	2	Worksite (non-traffic) with access obstacles and or worksite hazards
	3	Traffic site requiring special scheduling, additional personnel and/or traffic control equipment, or outsourcing
	4	Confined Space Entry requiring special scheduling, additional personnel and/or safety equipment
	5	Special Operation requiring a separate safety plan. *Must be approved by Corporate Safety Manager*

*** Site Specific Safety Requiremnets, Must Complete for any site Class 2 & Above**

TRAFFIC CONTROL PLAN

Note: All worksites located in a roadway or immediately adjacent to a roadway where the operation may impede the normal flow of traffic are required to have a Traffic Control Plan. Standard Traffic Control Plans are to be carried in the vehicle and referred to when setting up the worksite. Special Traffic Control Plans are to be developed when required by clients or regulating agencies or when a standard Traffic Control Plan is not sufficient to control traffic at the worksite.

- [X] This worksite does NOT require a traffic control plan
- [ ] Standard Traffic Control Plan TA18 to be used at this worksite
- [ ] This site requires a special Traffic Control Plan which is attached

Approved	Reviewed
Field Mgr Name: Dennis McPhearson	Project Mgr Name: Chuck Franklin
Signature: Dennis McPhearson	Signature:
Date: 1-May-21	Date: 5/1/2021

ADS Site Report

Quality Form

Project Name:	KERRVILLE	City/State:	KERRVILLE,TX	FM Initials:	DM		
Site Name:	KERR_RG01	Monitor Series:	TRITON+	Monitor S/N#:	10238		
Address / Location:	100 KNAPP RD			Manhole #:	N/A		
				Map Page #:			
Access:	L S	Type of System:	Sanitary [X] Storm [ ] Combined [ ]	Pipe Height:	N/A		
				Pipe Width:	N/A		
				Phone Number:			10.4.8.142

Manhole Information:

Date/Time of Investigation:	5/6/21 11:11 AM	Manhole Depth:		Feet	
Site Hydraulics:	GOOD	Manhole Material / Condition:			
Upstream Input: (L/S, P/S)		Pipe Material / Condition:			Good
Upstream Manhole:	DNL	Mini System Character:	Residential	Commercial	Industrial	Other
Downstream Manhole:	DNL		X			
		Telephone Information: N/A			
Depth of Flow (Wet Dof):	0 +/- 0.25	Access Pole #:	N/A		
Range (Air Dof):	+/-	Distance From Manhole:	N/A	Feet	
Peak Velocity:	fps	Road Cut Length:	N/A	Feet	
Silt:	0 Inches	Trenche Length:	N/A	Feet	

Other Information:

Cross Section

Planar N

Installation Information		Backup	Yes	No	?	Distance
Installation Type:	TIPPING BUCKET	Trunk		X		
Sensors / Devices:	RAIN ALERTIII	Lift/Pump Station		X		
Surcharge Height:	Feet NON VISIBLE	WWTP		X		
Rain Gauge Zone:		Other		X		

Additional Site Information / Comments:

GPS: 30.059777, -99.168984

Additional Information

Project Name: KERRVILLE

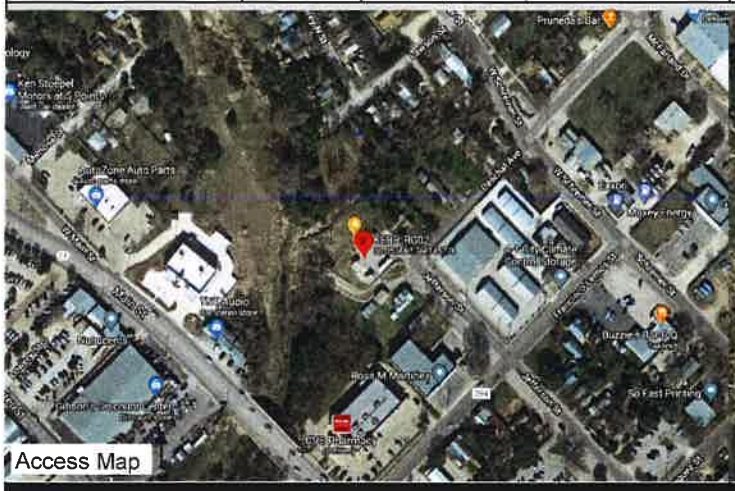
Project Number: 25784.11.325

Site Name: KERR_RG01

ADS Site Report

Quality Form

Project Name:	KERRVILLE	City/State:	KERRVILLE,TX	FM Initials:	DM
Site Name:	KERR_RG02	Monitor Series:	TRITON+	Monitor S/N#:	10266
Address / Location:	99 Jefferson St, Kerrville, TX 78028			Manhole #:	N/A
				Map Page #:	
Access: STREET	Type of System:	Sanitary [X]	Storm [ ]	Combined [ ]	Pipe Height: N/A
					Pipe Width: N/A
					Phone Number: 10.4.11.171



Manhole Information:

Date/Time of Investigation:	5/6/21 11:11 AM	Manhole Depth:	Feet		
Site Hydraulics:	GOOD	Manhole Material / Condition:			
Upstream Input: (L/S, P/S)		Pipe Material / Condition:	Good		
Upstream Manhole:	DNL	Mini System Character:	Residential: X	Commercial	Industrial / Other
Downstream Manhole:	DNL				
		Telephone Information: N/A			
Depth of Flow (Wet Dof):	0 +/- 0.25	Access Pole #:	N/A		
Range (Air Dof):	+/-	Distance From Manhole:	N/A Feet		
Peak Velocity:	fps	Road Cut Length:	N/A Feet		
Silt:	0 Inches	Trenche Length:	N/A Feet		

Other Information:

Cross Section

Planar N

Installation Information		Backup	Yes	No	?	Distance
Installation Type:	TIPPING BUCKET	Trunk		X		
Sensors / Devices:	RAIN ALERTIII	Lift/Pump Station		X		
Surcharge Height:	Feet NON VISIBLE	WWTP		X		
Rain Gauge Zone:		Other		X		

Additional Site Information / Comments:

GPS: 30.053667, -99.145778

Additional Information

Project Name: KERRVILLE

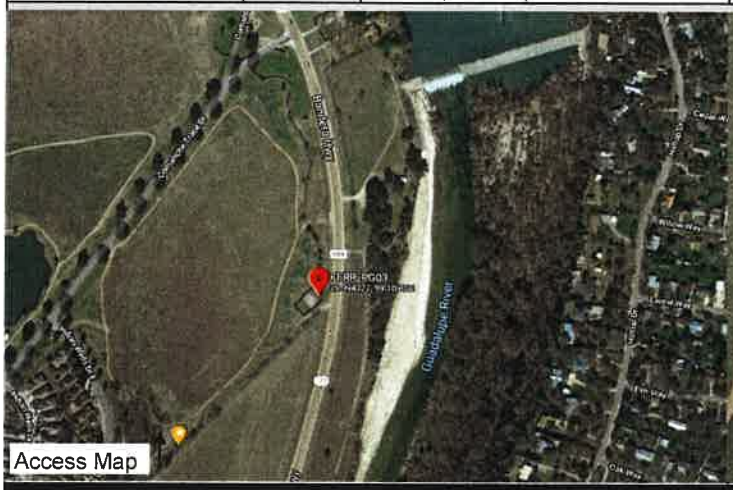
Project Number: 25784.11.325

Site Name: KERR_RG02

ADS Site Report

Quality Form

Project Name:	KERRVILLE	City/State:	KERRVILLE,TX	FM Initials:	DM
Site Name:	KERR_RG03	Monitor Series:	TRITON+	Monitor S/N#:	10059
Address / Location:	3012 Bandera Hwy, Kerrville, TX 78028			Manhole #:	N/A
				Map Page #:	
Access: L S	Type of System:	Sanitary: X	Storm:	Combined:	Pipe Height: N/A
					Pipe Width: N/A
					Phone Number: 10.4.8.215



Access Map

Manhole Information:

Date/Time of Investigation:	5/6/21 11:11 AM	Manhole Depth:	Feet		
Site Hydraulics:	GOOD	Manhole Material / Condition:			
Upstream Input: (L/S, P/S)		Pipe Material / Condition:	Good		
Upstream Manhole:	DNL	Mini System Character:	Residential: X	Commercial	Industrial / Other
Downstream Manhole:	DNL				
		Telephone Information: N/A			
Depth of Flow (Wet Dof):	0 +/- 0.25	Access Pole #:	N/A		
Range (Air Dof):	+/-	Distance From Manhole:	N/A Feet		
Peak Velocity:	fps	Road Cut Length:	N/A Feet		
Silt:	0 Inches	Trenche Length:	N/A Feet		

Other Information:

Cross Section

RG

Planar N

Installation Information		Backup	Yes	No	?	Distance
Installation Type:	TIPPING BUCKET	Trunk		X		
Sensors / Devices:	RAIN ALERTIII	Lift/Pump Station	X			
Surcharge Height:	Feet NON VISIBLE	WWTP		X		
Rain Gauge Zone:		Other		X		

Additional Site Information / Comments:

GPS: 29.994227, -99.109021

Additional Information

Project Name: KERRVILLE

Project Number: 25784.11.325

Site Name: KERR_RG03

Appendix B – Detailed Flow Monitor Specifications

HARDWARE

ADS TRITON+®

The ADS TRITON+® is an intrinsically safe, "Fit-for-Purpose" open channel flow monitor for use in sanitary, combined, and storm sewers. It is designed to be the most versatile flow monitoring system available for wastewater collection applications. It supports single pipe or dual pipe flow measurement installations.

ADS TRITON+

This multiple technology flow monitor will power almost every available sensor technology that is used in wastewater applications today. It is the most versatile and cost-effective, multiple-technology flow monitor on the market. The ***TRITON+*** includes four multiple technology sensor options: a Long Range Depth Sensor, a Peak Combo Sensor, a Surface Combo Sensor, and an Ultrasonic Level Sensor (see inside for technology and specifications). This array of monitoring technologies provides for unmatched flexibility in a fully integrated, fit-for-purpose monitoring platform.

The ***TRITON+*** platform adapts to a wide range of customer applications and budgets. It can be configured as an economical single sensor monitor or dual sensor monitor. It offers a longer battery life and fewer parts for a more reliable system. This provides a lower purchase price and a lower ownership cost over the life of the monitor. The ***TRITON+*** has the lowest operational cost per data sample of any Intrinsically Safe flow monitor available.

About ADS

A leading technology and service provider, ADS®LLC has established the industry standard for open channel flow monitoring and has the only ETV-verified flow monitoring technology for wastewater collection systems. These battery-powered monitors are specially designed to operate with reliability, durability, and accuracy in sewer environments.

TRITON+ Features

- Versatile performance that is easy to install and operate
- Two sensor ports supporting 4 interchangeable sensors providing up to 6 sensor readings at a time
- Single or dual pipe/monitoring point measurement capabilities
- Multi-carrier cellular 3G/4G UMTS/HSPA+ or Verzon® CDMA/EV-DO wireless communications; direct serial communications also available
- Industry-leading battery life with a wireless connection providing up to 15 months at the standard 15-minute sample rate (*varies with sensor configuration*)
- External power and Modbus network connectivity option available with an ADS External Power and Communications Unit (ExPAC™) and a 9-36 VDC power supply or an ADS XBUS™ which includes a power supply
- Analog and digital I/O expansion (4-20 mA and dry contacts) available with an ADS External I/O unit (XIO™)
- Modbus protocols enabling RTUs to help simplify SCADA system integration
- Supports the delivery of CSV files to an FTP site at user-defined intervals , and direct monitor SMS and e-mail messaging
- Supports actuation of a water quality sampler for flow proportional or level-based operation
- Monitor-Level Intelligence (MLI®) enables the ***TRITON+*** to effectively operate over a wide range of hydraulic conditions
- Superior noise reduction design for maximizing acoustic signal detection from depth and velocity sensors
- Five software packages for accessing flow information: Q*start*™ (configuration and activation); FlowView Operations (web-based alarming); Sliicer.com® (I/I analysis); FlowView Portal® (online data presentation and reporting); and Profile® (data collection, analysis, and reporting)
- Intrinsically-Safe (IS) certification by ATEX, IECEx and CSA for use in Zone 0 (equivalent to Class I, Division 1, Groups C & D) hazardous areas
- Thick, seamless, high-impact, ABS plastic canister with aluminum end cap (meets IP68 standard)
- Innovative circuit board dome-enclosure protects and limits exposure of electronics when opening the canister to change the battery

To Learn more, visit www.adsenv.com/TRITON+

ADS® LLC

Multiple Technology Sensors

The ***TRITON+*** features three depths and two velocities with three sensor options. Each sensor provides multiple technologies for continuous running of comparisons.

Peak Combo Sensor

Dimensions: 6.76 inches (172 mm) long x 1.23 inches (31 mm) wide x 0.83 inches (21 mm) high

This versatile and economical sensor includes three measurement technologies in a single housing: ADS-patented continuous wave peak velocity, uplooking ultrasonic depth, and pressure depth.

Continuous Wave Velocity
Range: -30 feet per second (-9.1 m/s) to +30 ft/sec (9.1 m/s)
Resolution: 0.01 feet per second (0.003 m/s)
Accuracy: +/- 0.2 feet per second (0.06 m/s) or 4% of actual peak velocity (whichever is greater) in flow velocities between -5 and 20 ft/sec (-1.52 and 6.10 m/s)

Uplooking Ultrasonic Depth
Performs with rotation of up to 15 degrees from the center of the invert; up to 30 degrees rotation with Silt Mount Adapter
Operating Range: 1.0 inch (25 mm) to 5 feet (152 cm)
Resolution: 0.01 inches (0.254 mm)
Accuracy: 0.5% of reading or 0.125 inches (3.2 mm), whichever is greater

Pressure Depth
Range: 0-5 PSI up to 11.5 feet (3.5 m); 0-15 PSI up to 34.5 feet (10.5 m); or 0-30 PSI up to 69 feet (21.0 m)
Accuracy: +/-1.0% of full scale
Resolution: 0.01 inches (0.25 mm)

Long Range Depth Sensor

Dimensions: 9.15 inches (232.4 mm) long X 4.40 inches (111.8 mm) wide x 4.22 inches (107.2 mm) high (without bracket)

A narrow, powerful ultrasonic beam allows this depth sensor to perform well over long ranges. Integral Submersion Sensor provides detection of flooding at the point of interest.

Long Range Ultrasonic Depth
Minimum Dead Band: 0.0 inch (0.0 mm) from the bottom of sensor housing; Maximum Operating Air Range: 240 inches (6.1 m)
Beam Angle: +/- 3 degrees
Resolution: 0.01 inch (0.24 mm)
Accuracy: +/- 0.25% of sensor range measurement or 0.13 inches (3.2 mm) whichever is greater, in a homogeneous temperature air column
Drift: 0.0 inches (0.0 mm)
Temperature Compensation: Additional compensation for variable temperature air column supported

Submersion
Detects submersion when fully covered with liquid.

Surface Combo Sensor

Dimensions: 10.61 inches (269 mm) long x 2.03 inches (52 mm) wide x 2.45 inches (62 mm) high

This revolutionary new sensor features four technologies including surface velocity, ultrasonic depth, surcharge continuous wave velocity, and pressure depth.

Surface Velocity *
Minimum air range: 3 inches (76 mm) from the bottom of the rear, descended portion of the sensor
Maximum air range: 42 inches (107 cm)
Range: 1.00 to 15 feet per second (0.30 to 4.57 m/s)
Resolution: 0.01 feet per second (0.003 m/s)
Accuracy: +/-0.25 feet per second (0.08 m/s) or 5% of actual reading (whichever is greater) in flow velocities between 1.00 and 15 ft/sec (0.30 and 4.57 m/s)

** The flow conditions existing in some applications may prevent the surface velocity technology from being used.*

Ultrasonic Depth
(*Does not require electronic offsets*)
Minimum dead band: 1.0 inches (25.4 mm) from the face of the sensor or 5% of the maximum range, whichever is greater
Maximum operating air range: 10 feet (3.05 m)
Resolution: 0.01 inches (0.25 mm)
Accuracy: +/- 0.125 inches (3.2 mm) with 0.0 inches (0 mm) drift, compensating for variations in air temperature

Surcharge Continuous Wave Velocity (*Under submerged conditions, this technology provides the same accuracy and range as* **Continuous Wave Velocity** *for Peak Combo Sensors*)

Surcharge Pressure Depth (*Under submerged conditions, this technology provides the same accuracy and range as* **Pressure Depth** *for Peak Combo Sensors*)

Ultrasonic Level Sensor

This non-intrusive, zero-drift sennsing method results in s stable, accurate, and reliable flow depth calculation. Two independent ultrasonic transducers allow for independent cross-checking.

TRITON+ Specifications

Connectors

U.S. Military specification MIL-C 26482 series 1, for environmental sealing, with gold-plated contacts

Communications

- Domestic coverage, Verizon® 4G LTE-M modem, FCC ID: R17ME910C1NV
- Global coverage , commercial UMTS/HSPA+/GSM modem, FCC ID: R17HE910
- Domestic coverage, Verizon CDMA/EV-DO modem, FCC ID: R17DE910-DUAL
- Direct connection to PC using an ADS USB serial cable

Monitor Interfaces

- Supports simultaneous interfaces with up to two combo sensors
- Supports optional Analog and Digital I/O with ADS XIO: two 4-20 mA inputs and outputs, two switch inputs and two relay outputs

Power

Internal - Battery life with a cellular modem:

- Over 15 months at a 15-minute sample rate*
- Over 6 months at a 5-minute sample rate*

External - Optional external power available with ADS External Power and Communications Unit (ExPAC) with an ADS- or customer-supplied 9-36 Volt DC power supply

* *Rate based on collecting data once a day and varies according to sensor configuration and operating temperature*

Operating and Storage Temperature

-4 degrees to 140 degrees F (-20 degrees to 60 degrees C)

Connectivity

- Modbus ASCII: Wireless; Wired using ADS ExPAC or XBUS
- Modbus RTU: Wireless; Wired using ADS ExPAC or XBUS
- Modbus TCP: Wireless only

Intrinsic Safety Certification

- Certified under the ATEX European Intrinsic Safety standards for Zone 0 rated hazardous areas
- Certified under IECEx (International Electrotechnical Commission) Intrinsic Safety Standards for use in Zone 0 rated hazardous areas (equivalent to Class I, Division 1, Groups C & D)
- CSA Certified to Class 225803 – Process Control Equipment, Intrinsically Safe and Non-Incendive Systems – For Zone 0 Hazardous Locations, Ex ia IIB T3 (152°C) in Canada
- CSA Certified to Class 225883 – Process Control Equipment, Intrinsically Safe and Non-Incendive Systems – For Class I Zone 0 Hazardous Locations, AEx ia IIB T3 (152°C) in the USA (equivalent to Class I, Division 1, Groups C & D)

Other Certifications/Compliances

- FCC Part 15 and Part 68 compliant
- ROHS (lead-free) compliant
- Carries the EU CE mark
- Canada IC CS-03 compliant

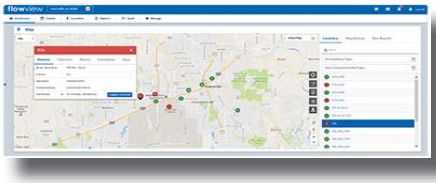
Connected by VERIZON

ISO 9001 Registered Company — sira CERTIFICATION — UKAS MANAGEMENT SYSTEMS 011

Certificate No: 940056

ADS Flow Monitoring Software

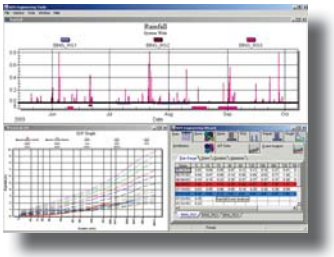
Q*start* is desktop software providing field crews with a simple, easy-to-use tool for quickly configuring and activating ADS monitors. Q*start* enables the user to collect and review the monitor's depth and velocity data in hydrograph and tabular views simultaneously.



FlowView is web-hosted software providing near real-time operational intelligence on the status of flow activity throughout the wastewater collection system. FlowView utilizes dynamic (or smart) alarming to inform clients about the occurrence of rain events, flow performance abnormalities, and data anomalies at the flow monitoring locations.

FlowView Portal is web-hosted software providing robust report delivery, enabling the user to manage data, customize reports, and select viewing parameters. FlowView Portal has a virtually unlimited database for storing and accessing historical data, using data for comparison and trend analysis purposes, and sharing information electronically.

Sliicer.com is web-hosted software providing a powerful set of engineering tools designed for both the consulting and municipal engineer. Sliicer.com's inflow and infiltration tools examine wastewater collection system dry and wet weather flow data and provide rigorous performance measurements in one-tenth the time of other analysis tools.



Profile is desktop software providing the industry's best data analysis tools, from basic flow monitoring data to complex hydraulic analysis. Profile is intuitive software that saves time and improves data quality by compiling project data into one location for analysis and reporting.

FLOW MONITORING APPLICATIONS

- Billing
- Inflow/Infiltration
- Model Calibration
- Combined Sewer Overflows (CSOs)
- Stormwater Monitoring
- Capacity Analysis
- Spill Notification

HARDWARE

ADS RAINALERT III™ Rainfall Monitor

The ADS RainAlert III provides rainfall data acquisition and intelligent alarming to support wastewater capital improvement, operations and maintenance, and regulatory programs. Applications include infiltration and inflow studies, hydraulic modeling, and overflow response and reporting.

The ADS RainAlert III is a low-cost, wireless rainfall monitor that alerts operators via text or email messages when rainfall intensity exceeds a critical threshold. RainAlert III technology is designed for ultra low power consumption, yielding up to a five-year battery life depending on modem and data delivery rate configuration.

* Reliable data delivery through established 3G/4G or 4G LTE-M mobile communications
* Rainfall intensity alarming for faster response to wet weather overflows
* Rugged design for easy installation and low maintenance
* Compatible with a range of tipping bucket rain gauges to match accuracy levels with local rainfall characteristics and design storms of interest

Features

- Priced for deployment as a stand-alone unit or part of a comprehensive flow and rain monitoring network
- Designed for ground-level, pole-mount, and rooftop installations
- Connects to ADS or customer-supplied tipping bucket
- Equipped with multi-carrier cellular 3G/4G UMTS/HSPA+ or Verizon 4G LTE-M wireless communications (U.S.A. only); USB communications also available
- Generates immediate cryouts of alarms and allows instant delivery of logged rain and alarm data
- Logs and time-stamps rainfall totals at user-specified intervals down to one minute
- Notifies via SMS text message and/or email whenever a user-defined rainfall threshold is exceeded
- Powered by long-life, replaceable, internal alkaline battery pack (or via an optional external 6 to 24-V DC, 1-A power supply)
- Uses internal cellular antenna or optional external antenna
- Easily configured and managed using ADS Q*start*™ software
- Provides 100% compatibility with ADS PRISM™ software for accessing and managing all alarm events, alarm history, and stored rain data over the Internet
- Automatically generates maintenance alarms for low battery conditions
- Two-year warranty

Mounting Options

Ground-Level

Pole-Mount

Rooftop

Specifications subject to change without notice.

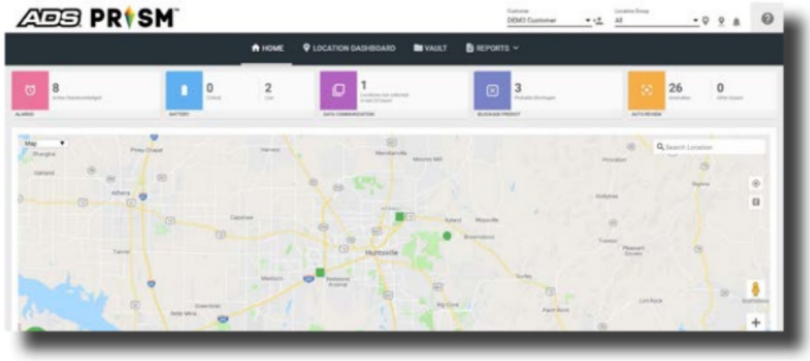
ADS RainAlert III Rain Gauge

The ADS RainAlert III Rainfall Monitor with tipping bucket and sun shield, provides automated remote rainfall measurement and alarming.

Applications

The ADS RainAlert III rainfall monitor is used to collect and alarm on precipitation data for use in many applications, including the following:

- Precipitation analysis
- CSO and SSO monitoring
- Rehabilitation effectiveness monitoring
- Early warning and notification based on rain intensity
- Infiltration/Inflow programs
- Sewer capacity studies/Trending
- Sewer master plan studies



PRISM Software Interface

The intuitive, graphical interface replicates client system maps for quick identification of system assets and provides drill-down functionality.

HARDWARE

Specifications

Enclosure
Polycarbonate enclosure reinforced with 10% glass fiber resin. NEMA Type 4X, IP67, and UL Rated. Access cover includes stainless steel latches and a continuous gasket.

Weight (including battery)
10 pounds (4.54 kg)

Dimensions
10.63 inches (270 mm) high x 7.09 inches (180 mm) wide x 4.53 inches (115 mm) deep

Operating Temperature
-4 to 140 degrees F (-20 to 60 degrees C)

Mounting
Optional sun shield designed for rooftop, ground, or pole-mount installation

Measurement Detail
0.01 inch/tip (United States)
0.1 mm/tip, 0.2 mm/tip, 0.5 mm/tip, 1.0 mm/tip (International)

Processor
Ultralow power ARM Cortex M4 microprocessor

Memory
1MB program memory, 256 KB RAM
8MB NV flash memory, 32KB NV FRAM

Data Storage
At a 5-minute Sample Rate:
3,784,704 bytes, 630,784 storage locations
Approximately 728 days for two stored entities (Rain and Rain Intensity)

Clock
Battery-backed real-time clock module

Firmware Upgrades
Remotely via wireless connection or locally via USB connection

Power
Replaceable 9V 60Ah alkaline battery pack or user-provided external power supply (6 to 24V DC, 1A)

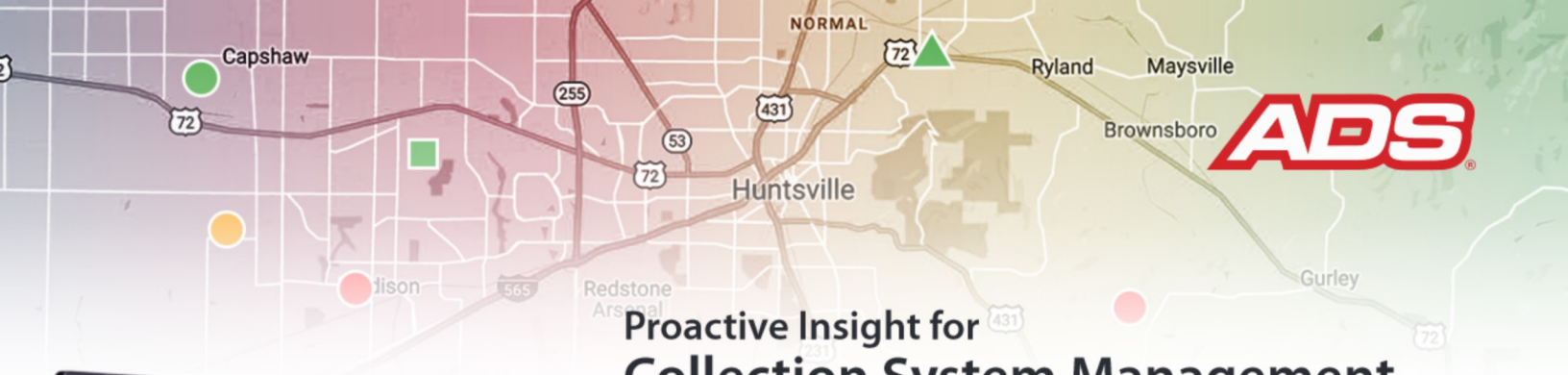
Tipping Bucket Connection
2-Conductor 22 AWG wire provided for connection to tipping bucket rain gauge

Diagnostics
Wireless communication or USB connection to the unit through ADS Q*start* software for reading the latest monitor status and performing diagnostics to resolve problems

Antenna
Delivered with an internal ultra-wide band I-BAR type antenna. An SMA connector on the board is available for applications requiring an external antenna.

Cellular Modem
Third-party, FCC/IC/EC- and carrier-approved.
Option 1: Global coverage, commercial UMTS/HSPA+/GSM modem. FCC ID: R17HE910.
Option 2: Domestic coverage, Verizon 4G LTE-M modem. FCC ID: R17ME910C1NV.
Local: On-Site, local wireless connection (Bluetooth)

ADS LLC
340 The Bridge Street, Suite 204, Huntsville, AL 35806
Phone: 256.430.3366/ Fax: 256.430.6333
Toll Free: 1.800.633.7246



Proactive Insight for Collection System Management

flowview PRISM™

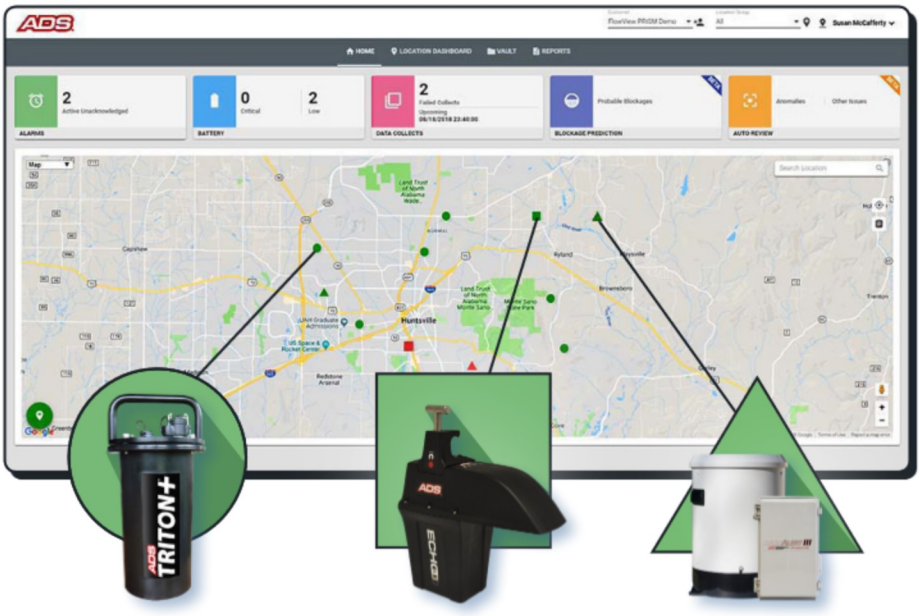
PRISM Transforms Your System Management

FlowView PRISM™ is a web application that puts critical data at your fingertips to support management, engineering, and operational decisions within your wastewater collection system. FlowView PRISM connects clients to an ADS® monitoring network, delivering near real-time operational intelligence on the status of your wastewater collection system. It is the fastest and easiest way to visualize the condition of your collection system. It offers dynamic analytical functions to fuel discoveries that will lead to enhanced management of your system.

- **Visualize** sewer system performance through intuitive dashboards and graphical displays
- Transform data into **actionable insight** with powerful analytics
- Ensure timely **performance notifications** with configurable alarms for advance notice of developing problems
- Provides an **easy and transformative** user experience for sewer data management
- **Collaborate for success** by sharing data, reports, and related files among cross-functional groups

System Wide Performance at a Glance

Access your data and device status on our cloud-based Collection System Management platform, FlowView PRISM. The home page provides immediate system insight including a map view reflecting flow, level, and rainfall monitors with location and condition details, leaderboard tiles with system status, and quick access to the data vault as well as specialized reports. The intuitive interface allows you to quickly manage alarms, check collection and device status, generate reports, and link third party data through our self-service API to automate and enhance your specific workflow.



www.adsenv.com/fvprism

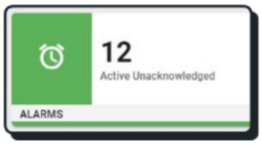
flowview PRISM

ADS
www.adsenv.com

Easy, Intuitive, Actionable

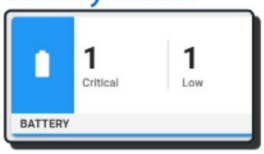
FlowView PRISM's dashboard transforms your experience. Get in-depth system analysis that places operational intelligence at your fingertips.

Alarms



Self manage and review alarms to inform you of events, performance, and data anomalies at flow, level, or rainfall monitoring locations.

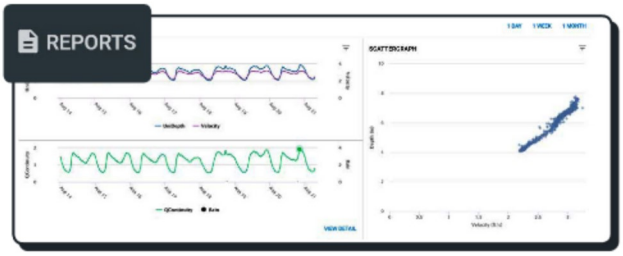
Battery Status



Easy battery status management ensures seamless operation of flow, level, and rainfall monitors.

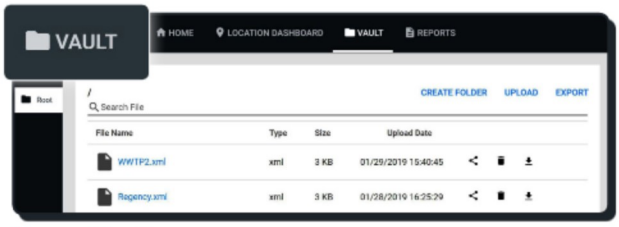
Collect Status

Track monitor communication status to identify any data collection problems that may arise.



Visualizing and Reporting

Graphing and reporting capabilities include side-by-side Hydrograph and Scattergraph comparisons for rapid viewing of each site's status.

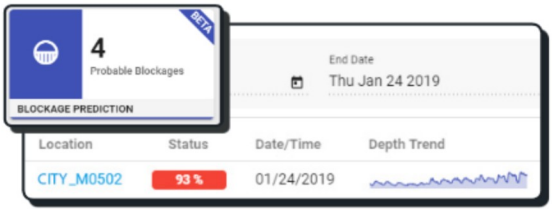


Data Vault

Upload, store, organize, and delete any files pertinent to your project. Share a time-sensitive link of your files with FlowView PRISM users or non-users.

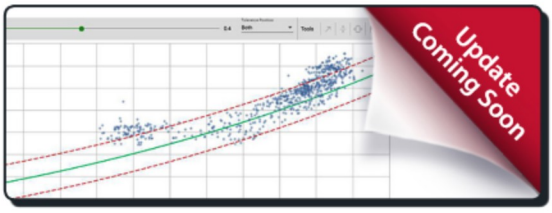
Advanced Features

ADS is introducing new advanced features so you can stay on top of your collection system with in-depth insights and specialized tools. Contact us for demos or purchase.



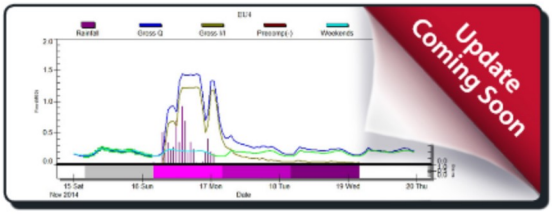
Blockage Prediction *(Q1 2019)*

Prevent sewer overflows by coupling flow depth data with smart algorithms to sense developing sewer blockages. This *advanced machine learning* application recognizes flow anomalies and provides advanced notifications so you can direct resources in a timely, cost-effective manner to pro-actively prevent sewer overflows before they become a problem.



Automated Anomaly Detection & Advanced Data Editing *(Q2 2019)*

Perform quality control operations on your data within FlowView PRISM. Within the editing interface, eliminate suspicious data from final entity generation and correct errors at will with the ability to add commentary about site conditions. The ability to design custom pipe shapes, create calculation based entities, and edit data is at your fingertips.



All New Sliicer *(Q4 2019)*

Together, PRISM and Sliicer provide a powerful set of online engineering tools designed to extract rigorous Dry and Wet Weather Performance measurements from sewer flow and rain data with speed and precision.

PRISM Updates:
www.adsenv.com/fvprismupdates

Access FlowView PRISM:
www.adsprism.com

Talk to a Trained Representative:
T: 800.633.7246
E: adssales@idexcorp.com

Specifications subject to change without notice.

ENGINEERING TOOLS

Sliicer.com I/I Tools

Sliicer.com® is the online I/I Answer Engine for wet and dry weather analyses that improves decision making and lowers project costs.

Sliicer.com

Sliicer.com is a powerful set of online engineering tools designed for both the consulting and municipal engineer. These tools extract rigorous Dry & Wet Weather Performance measurements from sewer flow and rain data in 1/10th the time of other analysis tools. We have codified what we have learned in conducting Rainfall Dependent Infiltration Inflow (RDII) studies over the last 20 years into Sliicer.com, which won the WEF Innovative Technology Award in October, 2009. Key outputs from Sliicer.com are described below.

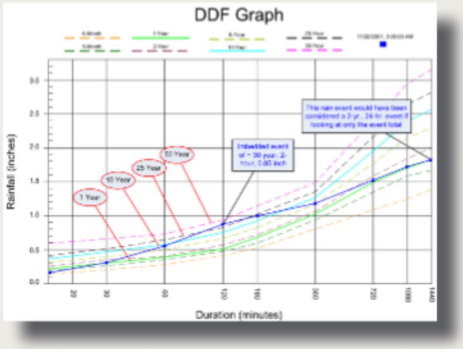
Municipal Engineers

Answer wet weather questions and validate rehab decisions in seconds with Sliicer.com. Through flow data analyses, calculate 'what-ifs'; incorporate Scattergraph tools; assess the operational capacity of pipes; diagnose upstream and downstream SSOs; and animate the pipe's performance in rain events, all with speed and precision. With 'human-viewing-speed graphics' Sliicer.com includes pre -and post- rehabilitation analyses, long term analyses and wet weather analyses featuring Rainfall Depth-Duration-Frequency (DDF), Scattergraph, Storm-by-Storm RDII, System-wide RDII, and Q vs. i analyses.

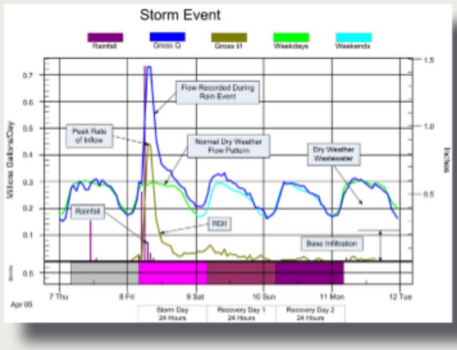
Consulting Engineers

Make ADS your wet weather expert and partner for I/I removal projects with Sliicer.com. As a bench mark of speed, in under 5 minutes Sliicer.com processes eight year's of data from 35 flow meters and generates dry day measurements by calendar quarter (32) and storm calculations for 375 storms. It generates repeatable data in seconds, reducing expensive labor and answering questions about wastewater collection system performance. (These powerful online tools automate 33 industry-accepted dry and wet weather calculations and help keep you focused on engineering tasks, while alleviating tedious spreadsheet calculations.)

Simple Questions. Difficult Analyses. Fast Answers.



Rainfall Depth-Duration-Frequency analysis shows how a storm behaved and can help explain the cause of overflows.



Time series data reveal information about the quantity of flow generated by the system upstream of the monitor.

About ADS

ADS Environmental Services®, a brand of ADS® LLC, is a leading technology and service provider and a reliable source of knowledge to the global wastewater collection system industry. Monitors manufactured, installed, and maintained by ADS measure over 4 billion gallons of flow daily across the globe. ADS delivers value to its customers by providing industry-leading solutions for flow monitoring, data analysis, reporting and field services. These customers rely on Underground Intelligence® from ADS to manage planning and rehabilitation, satellite community billing, regulatory compliance, O&M, and model calibration.

ADS®

Specifications subject to change without notice.

FEATURES

Rainfall Analysis

Every collection system manager has a good idea of how much rainfall is required before problems occur in their system. But some rains just don't produce consistent responses in the sewer. The DDF display (Depth-Duration-Frequency) allows the manager to immediately "see" how the storm behaved. What might appear to be a small 2-year, 24-hour storm could actually be a 30-year, 2-hour storm. This analysis can be performed in seconds for each rain gauge and for each storm.

RDII Calcualtions

One of the most tedious operations in conducting a wet weather study is the calculation of RDII for each storm and each meter. The rainfall for each calculation is often a blend of several rain gauges. As a benchmark, for a 10-month RDII study with 132 flow meters and 7 rain gauges, Sliicer.com processed all meters for 20 storms, and calculated rainfall for each meter basin using the Inverse Distance Squared method, in just 28 minutes. In addition, the dry day values and RDII values are separated into Winter and Summer seasons.

Q vs. i Relationships

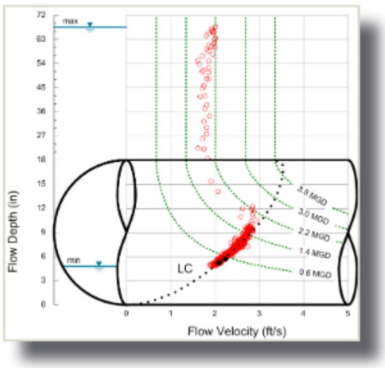
The rainfall-to-flow relationship is the key performance indicator of each wastewater sewer catchment in the collection system. It measures the "yield" or the amount of I/I generated in a basin. Tracking this yield can reveal one of the first "indicators of change" that a manager may see in the system. Analyzing Q vs. i relationships for several storms before and after an event make this a very effective evaluation. Managers also use Q vs. i relationships to quantify the impact of sewer rehabilitation projects.

Scattergraph Analysis

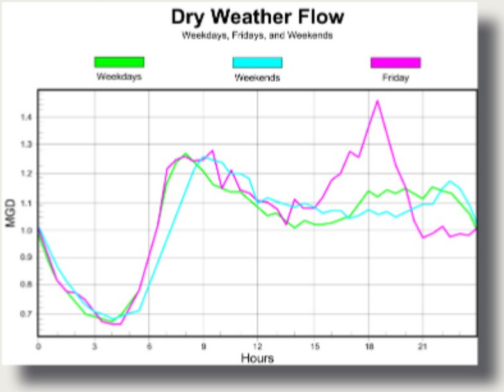
The Scattergraph is a useful 'human-viewing-speed graphic' that can reveal the hydraulic conditions in a sewer. They are used to determine both the theoretical and operational capacity of the sewer, spot SSO's, quantify the overflow volume and animate the pipe's performance in rain events.

RTK Solver

A new RTK solver with an intuitive graphical interface allows users to 'see' how well the RTK solution fits the data. Separate RTK solutions are produced by season. The RTK graphical interface is not available in the EPA SSOAP tool box.

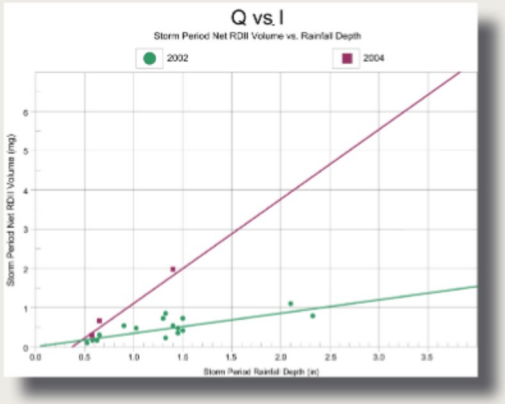


The Scattergraph shown at the left is equipped with iso-Q lines (lines of constant flow rate) and shows that this pipe actually carries 60 percent of its design capacity and is surcharged to a depth of 70 inches. This operational capacity can change over time, and being able to quantify operational capacity is key to spotting "lurking problems."



Dry Weather Flow Analysis

Dry weather flow is a critical component of calculating RDII and can also be exported to hydraulic models.



Q vs. i Analysis

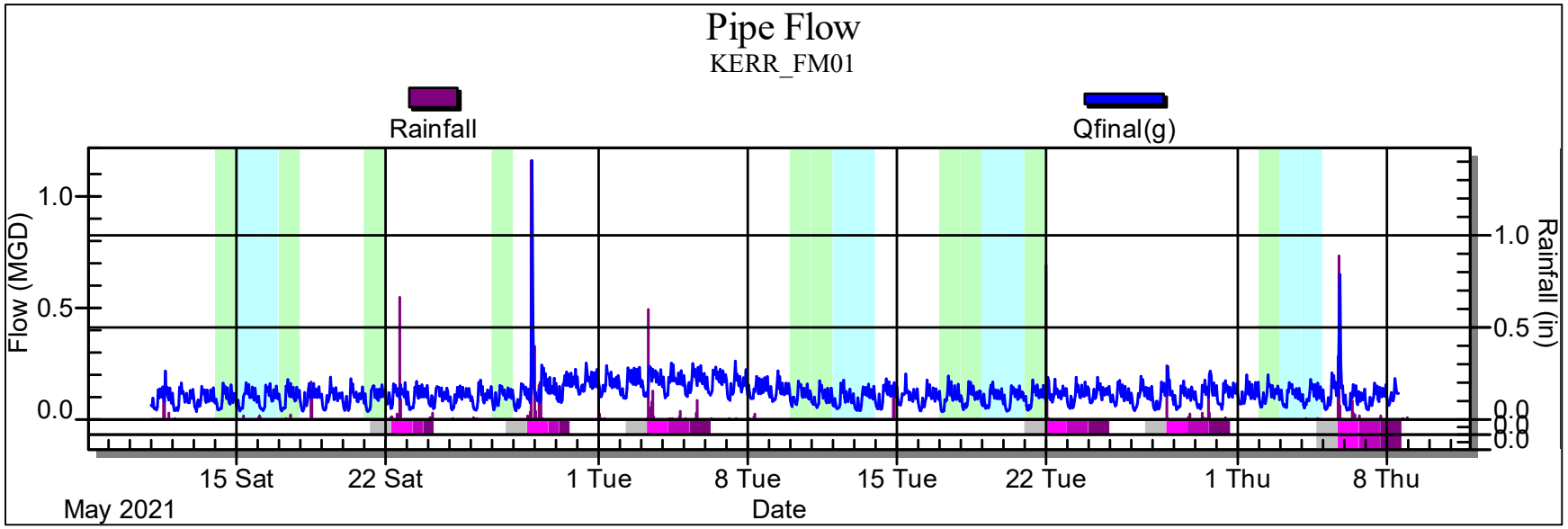
The Key Performance Indicator of a sewershed. Changes in these plots identify and quantify RDII reductions due to sewer rehabilitation. In this case the 2004 deterioration in performance was due to a bridge contractor connecting a storm sewer to the sanitary sewer.

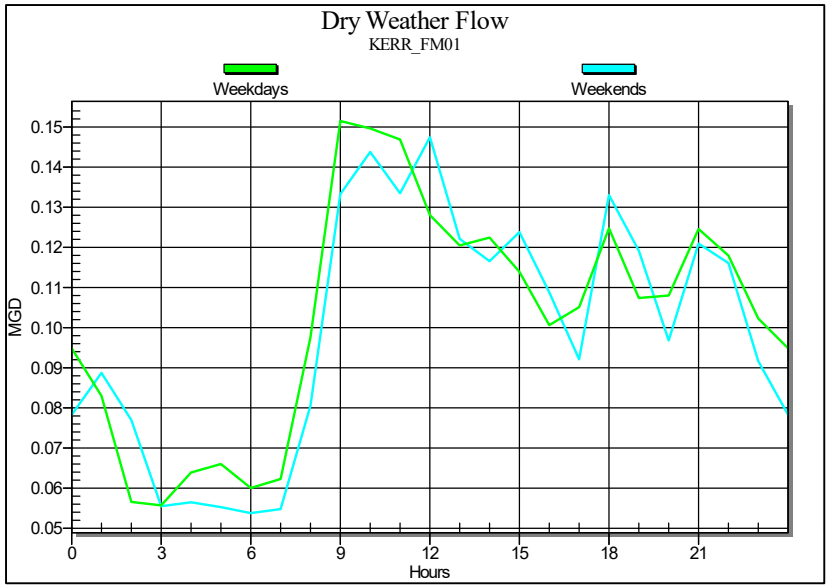
Add Sliicer.com and ADS to your winning team and gain the edge that wins the job, saves time, increases profitability, and answers more wet and dry weather analyses questions.

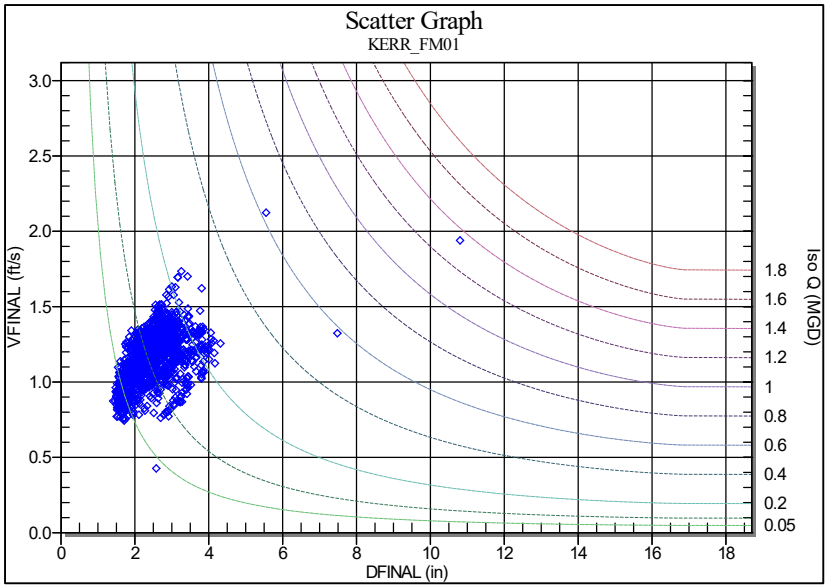
"You have to see it to believe it!"
Sign up for a Free Trial at www.sliicer.com.

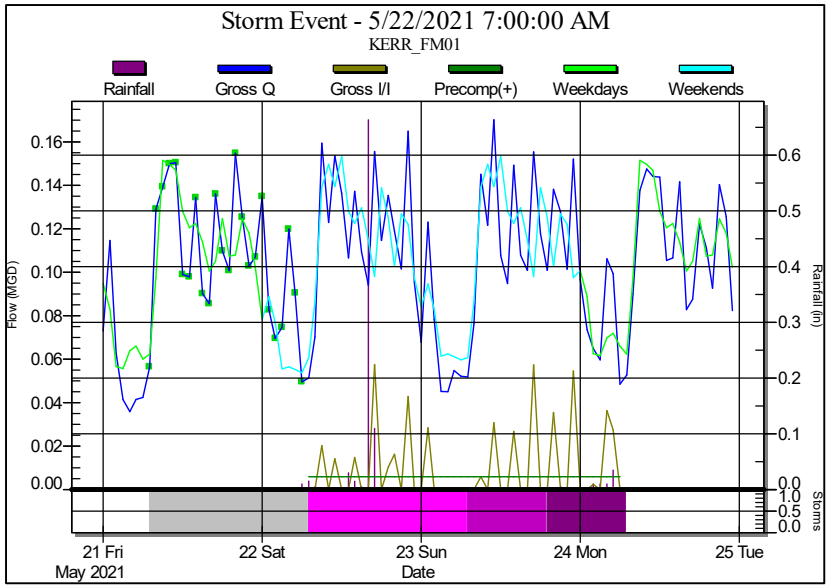
ADS®
340 The Bridge Street, Suite 204, Huntsville, AL 35806
Phone: 256-430-3366/ Fax: 256-430-6333
Toll Free: 1-800-633-7246

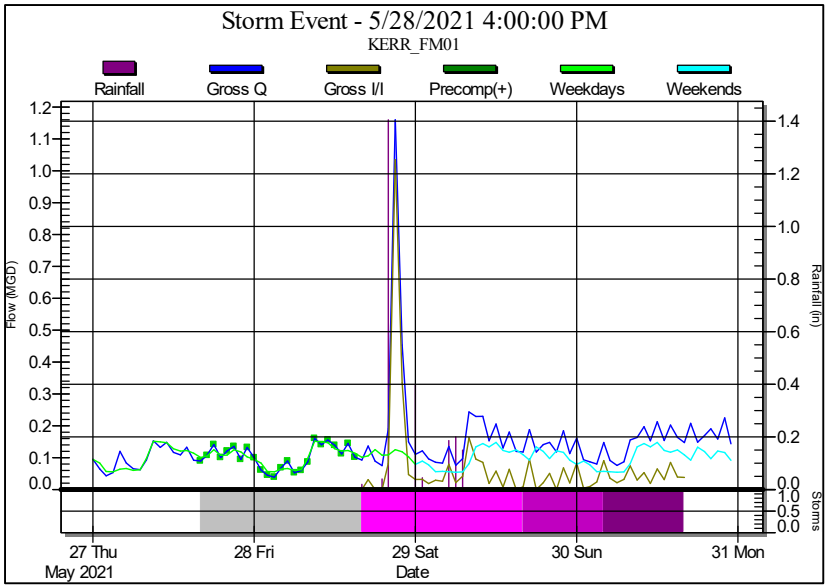
Appendix C – Flow Monitor RDII Performance Graphics

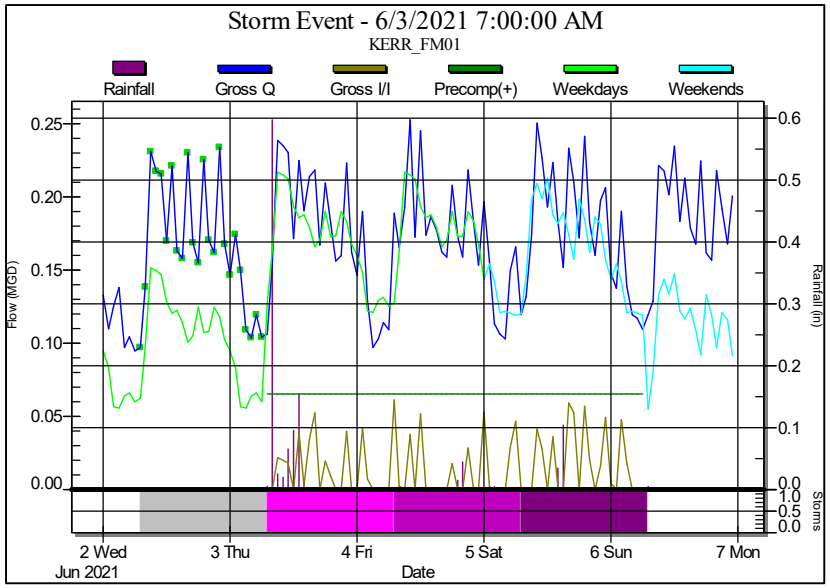

Pipe Flow
KERR_FM01
Rainfall
Qfinal(g)
Flow (MGD)
1.0
0.5
0.0
Rainfall (in)
1.0
0.5
0.0
15 Sat
22 Sat
1 Tue
8 Tue
15 Tue
22 Tue
1 Thu
8 Thu
May 2021
Date

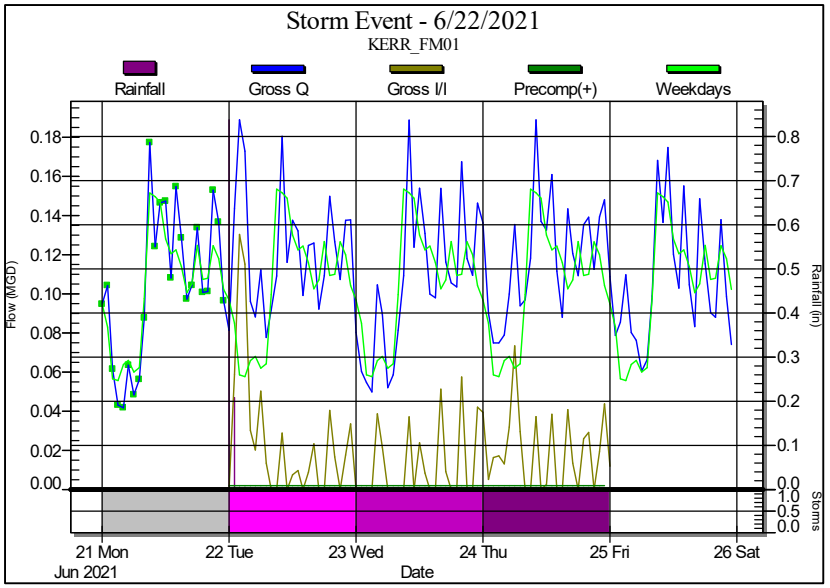

Dry Weather Flow
KERR_FM01
Weekdays
Weekends
MGD
0.15
0.14
0.13
0.12
0.11
0.10
0.09
0.08
0.07
0.06
0.05
0
3
6
9
12
15
18
21
Hours

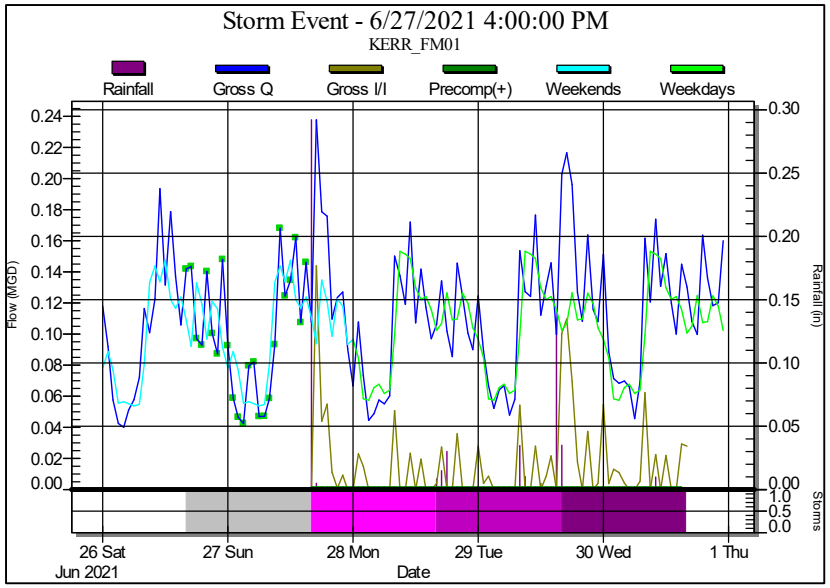

Scatter Graph
KERR_FM01
VFINAL (ft/s)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Iso Q (MGD)
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0.05
0
2
4
6
8
10
12
14
16
18
DFINAL (in)

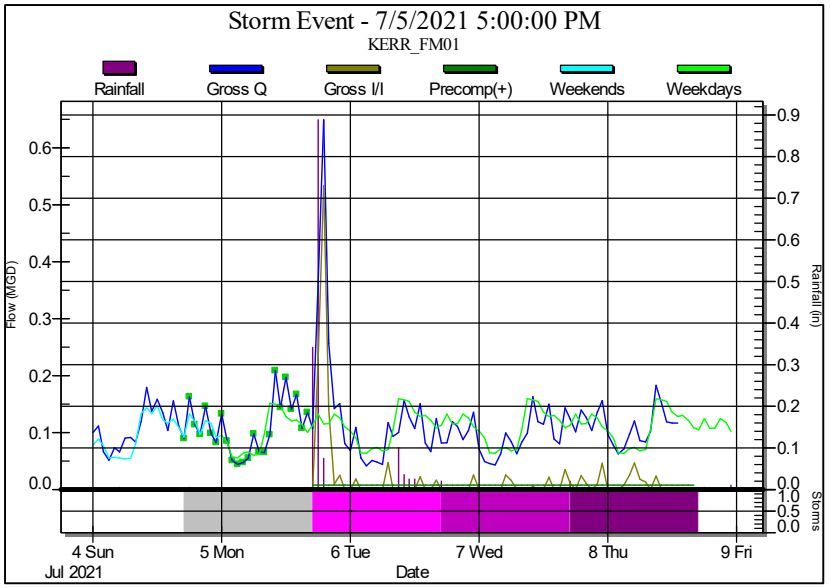

Storm Event - 5/22/2021 7:00:00 AM
KERR_FM01
Rainfall
Gross Q
Gross I/I
Precomp(+)
Weekdays
Weekends
Flow (MGD)
Rainfall (in)
Storms
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
0.0
0.1
0.2
0.3
0.4
0.5
0.6
1.0
0.5
0.0
21 Fri
May 2021
22 Sat
23 Sun
24 Mon
25 Tue
Date

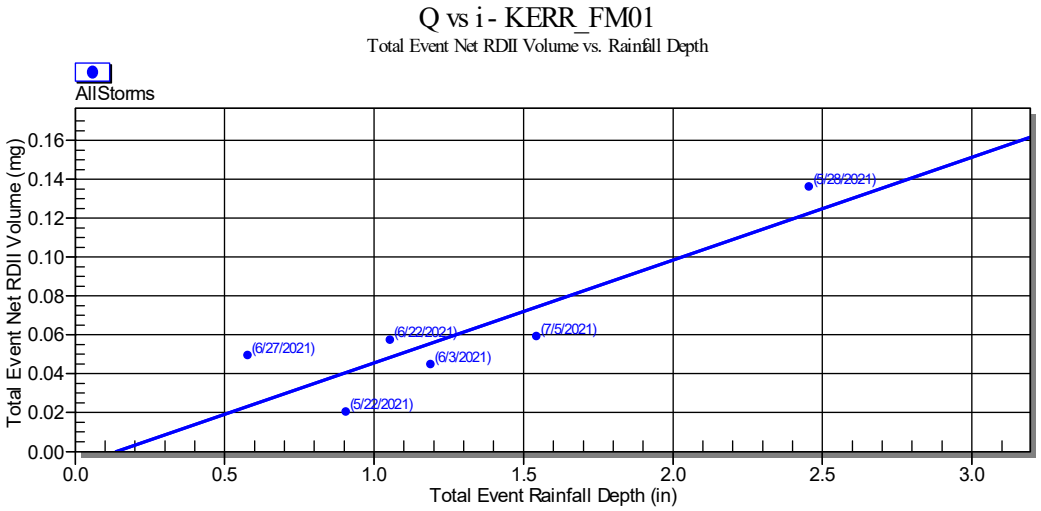

Storm Event - 5/28/2021 4:00:00 PM
KERR_FM01
Rainfall
Gross Q
Gross I/I
Precomp(+)
Weekdays
Weekends
Flow (MGD)
Rainfall (in)
Storms
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
1.1
1.2
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.0
0.5
0.0
27 Thu
May 2021
28 Fri
29 Sat
30 Sun
31 Mon
Date

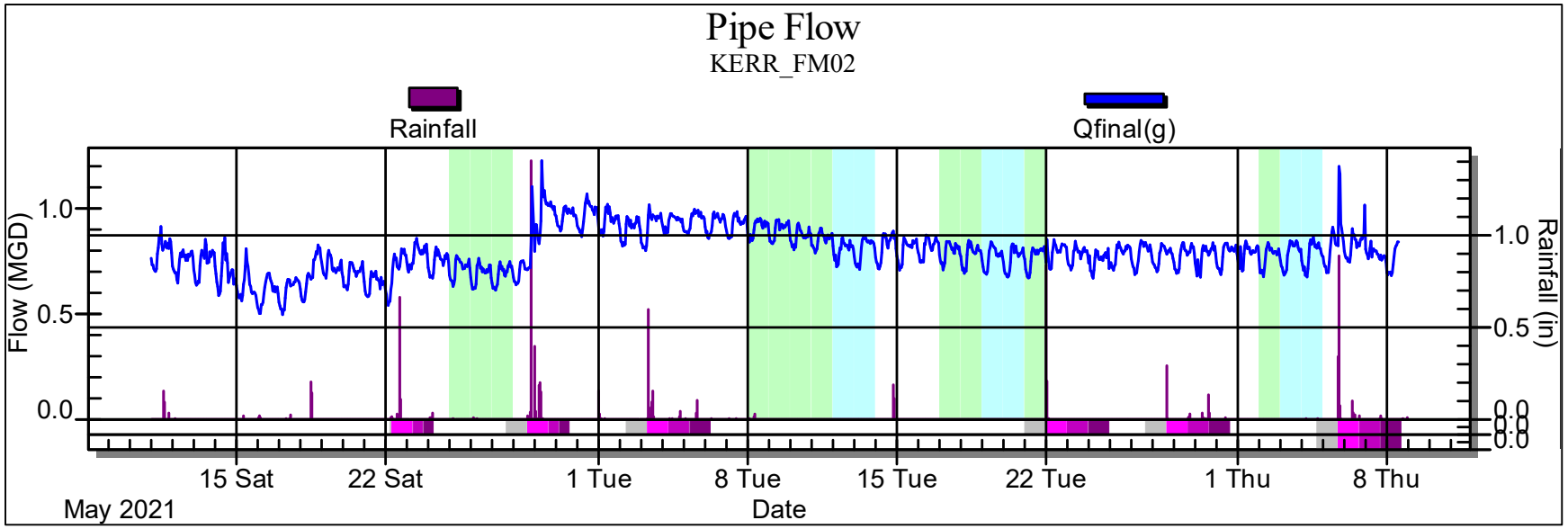

Storm Event - 6/3/2021 7:00:00 AM
KERR_FM01
Rainfall
Gross Q
Gross I/I
Precomp(+)
Weekdays
Weekends
Flow (MGD)
Rainfall (in)
Storms
0.00
0.05
0.10
0.15
0.20
0.25
0.0
0.1
0.2
0.3
0.4
0.5
0.6
1.0
0.5
0.0
2 Wed
Jun 2021
3 Thu
4 Fri
5 Sat
6 Sun
7 Mon
Date

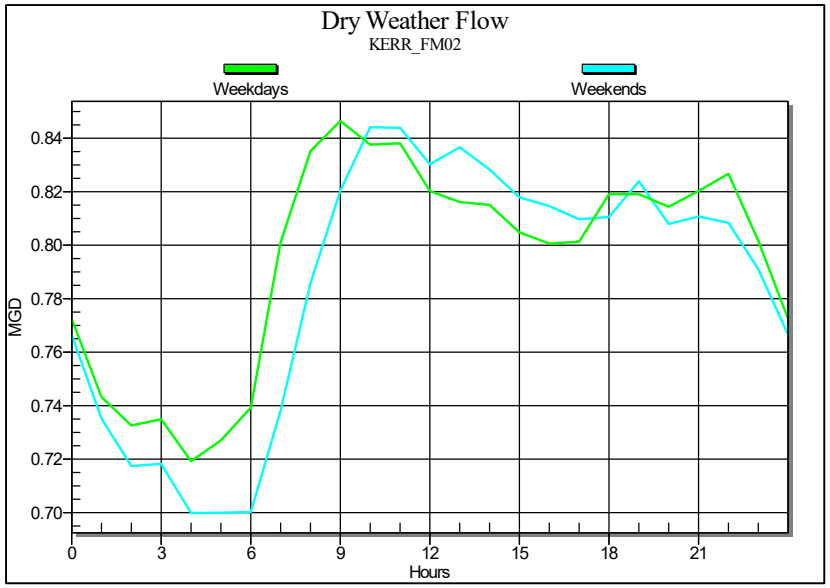

Storm Event - 6/22/2021
KERR_FM01
Rainfall
Gross Q
Gross I/I
Precomp(+)
Weekdays
Flow (MGD)
Rainfall (in)
Storms
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
0.18
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
1.0
0.5
0.0
21 Mon
Jun 2021
22 Tue
23 Wed
24 Thu
25 Fri
26 Sat
Date

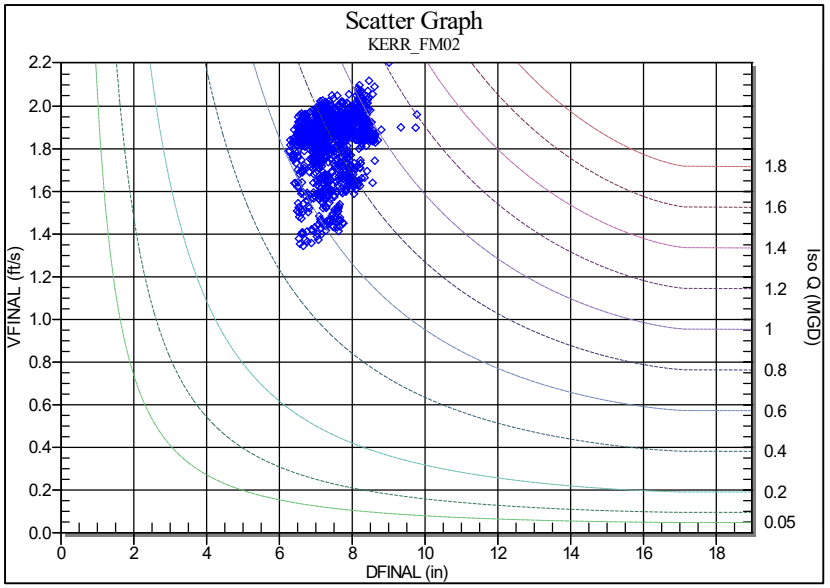

Storm Event - 6/27/2021 4:00:00 PM
KERR_FM01
Rainfall
Gross Q
Gross I/I
Precomp(+)
Weekends
Weekdays
Flow (MGD)
Rainfall (in)
Storms
26 Sat
Jun 2021
27 Sun
28 Mon
29 Tue
30 Wed
1 Thu
Date

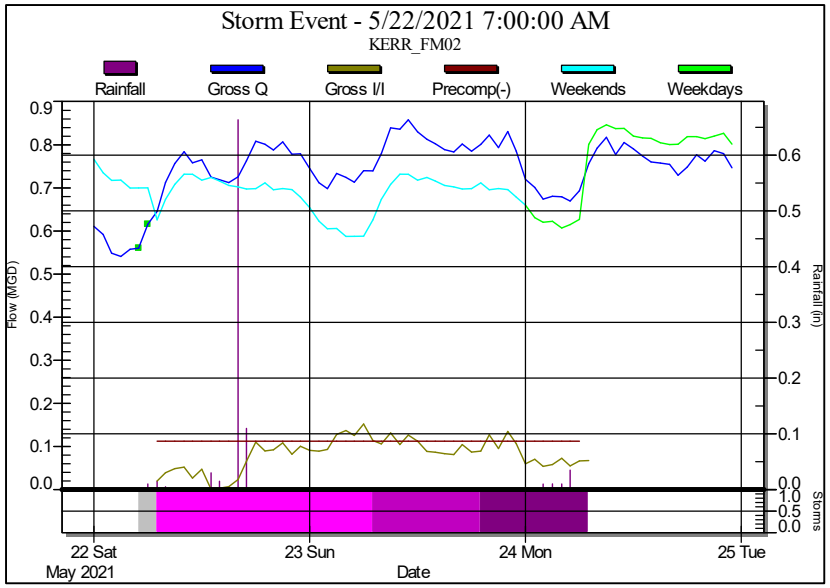

Storm Event - 7/5/2021 5:00:00 PM
KERR_FM01
Rainfall
Gross Q
Gross I/I
Precomp(+)
Weekends
Weekdays
Flow (MGD)
Rainfall (in)
Storms
4 Sun
Jul 2021
5 Mon
6 Tue
7 Wed
8 Thu
9 Fri
Date

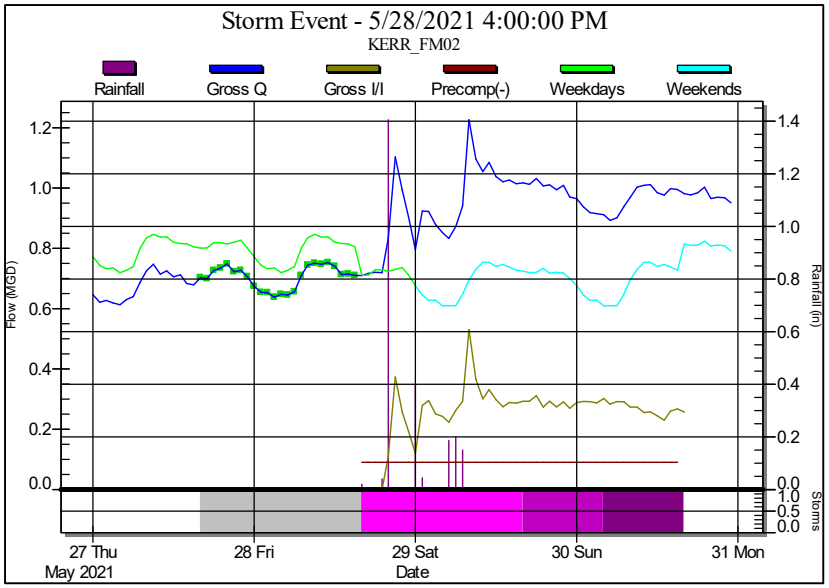

Q vs i - KERR_FM01
Total Event Net RDII Volume vs. Rainfall Depth
AllStorms
Total Event Net RDII Volume (mg)
Total Event Rainfall Depth (in)
(6/28/2021)
(6/22/2021)
(7/5/2021)
(6/27/2021)
(6/3/2021)
(5/22/2021)

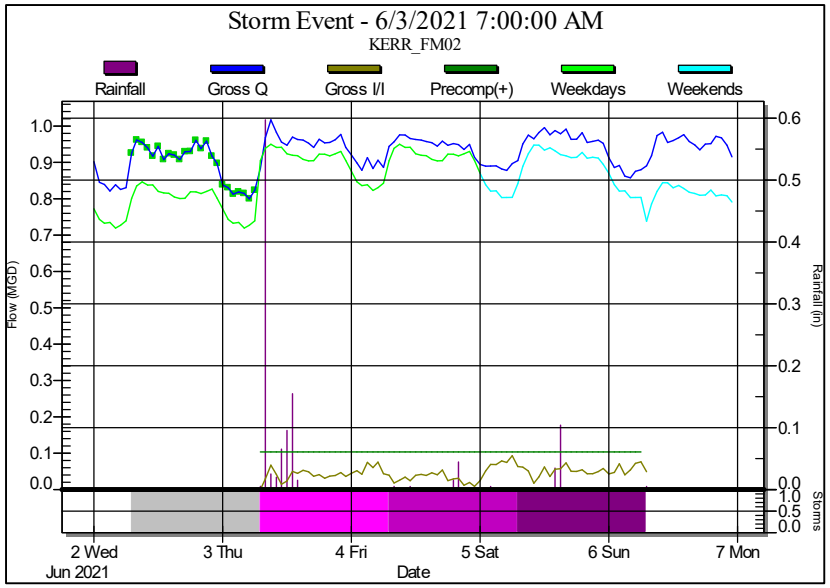

Pipe Flow
KERR_FM02
Rainfall
Qfinal(g)
Flow (MGD)
1.0
0.5
0.0
Rainfall (in)
1.0
0.5
0.0
15 Sat
22 Sat
1 Tue
8 Tue
15 Tue
22 Tue
1 Thu
8 Thu
May 2021
Date

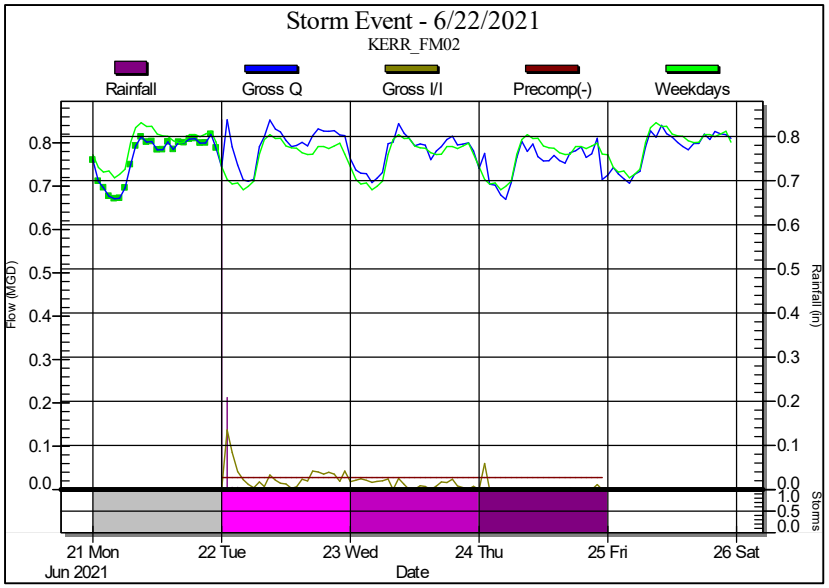

Dry Weather Flow
KERR_FM02
Weekdays
Weekends
MGD
0.84
0.82
0.80
0.78
0.76
0.74
0.72
0.70
0
3
6
9
12
15
18
21
Hours

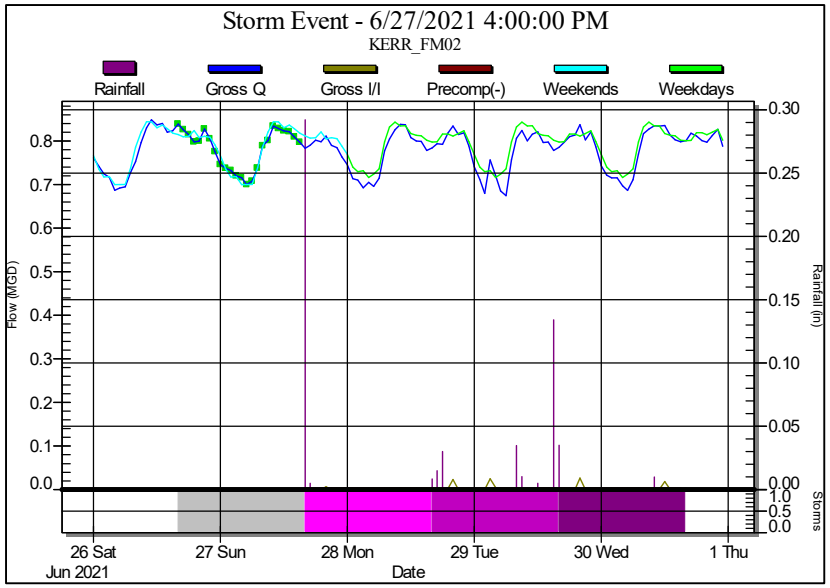

Scatter Graph
KERR_FM02
VFINAL (ft/s)
2.2
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Iso Q (MGD)
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0.05
0
2
4
6
8
10
12
14
16
18
DFINAL (in)

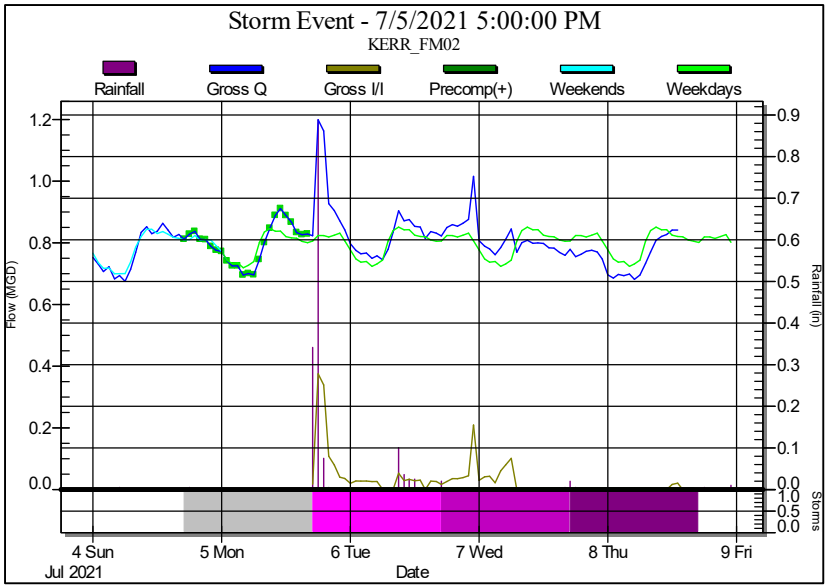

Storm Event - 5/22/2021 7:00:00 AM
KERR_FM02
Rainfall
Gross Q
Gross I/I
Precomp(-)
Weekends
Weekdays
Flow (MGD)
Rainfall (in)
Storms
22 Sat
May 2021
23 Sun
24 Mon
25 Tue
Date

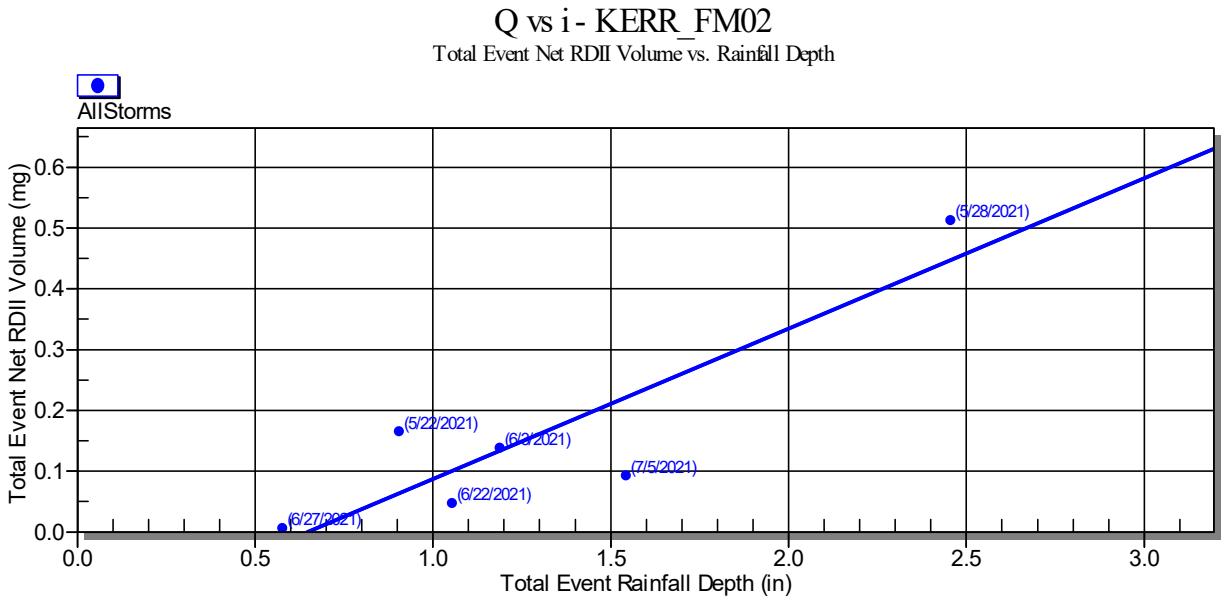

Storm Event - 5/28/2021 4:00:00 PM
KERR_FM02
Rainfall
Gross Q
Gross I/I
Precomp(-)
Weekdays
Weekends
Flow (MGD)
Rainfall (in)
Storms
27 Thu
May 2021
28 Fri
29 Sat
30 Sun
31 Mon
Date

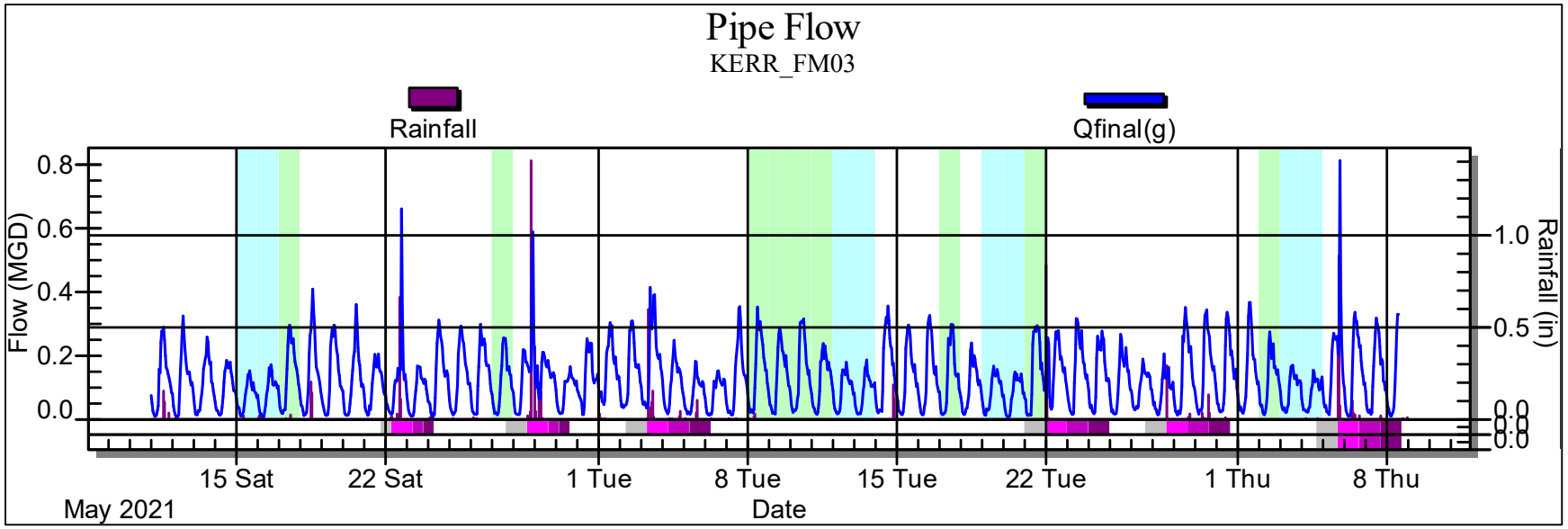

Storm Event - 6/3/2021 7:00:00 AM
KERR_FM02
Rainfall
Gross Q
Gross I/I
Precomp(+)
Weekdays
Weekends
Flow (MGD)
Rainfall (in)
Storms
2 Wed
Jun 2021
3 Thu
4 Fri
5 Sat
6 Sun
7 Mon
Date

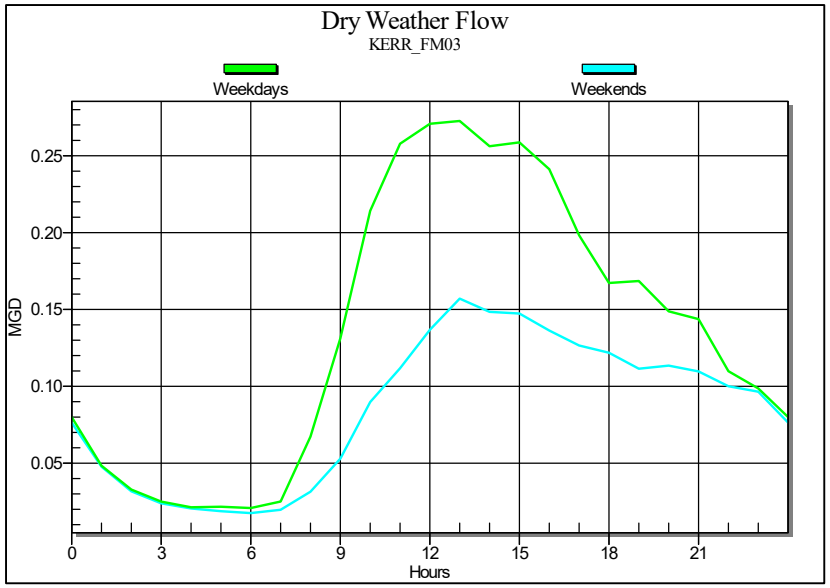

Storm Event - 6/22/2021
KERR_FM02
Rainfall
Gross Q
Gross I/I
Precomp(-)
Weekdays
Flow (MGD)
Rainfall (in)
Storms
21 Mon
Jun 2021
22 Tue
23 Wed
24 Thu
25 Fri
26 Sat
Date

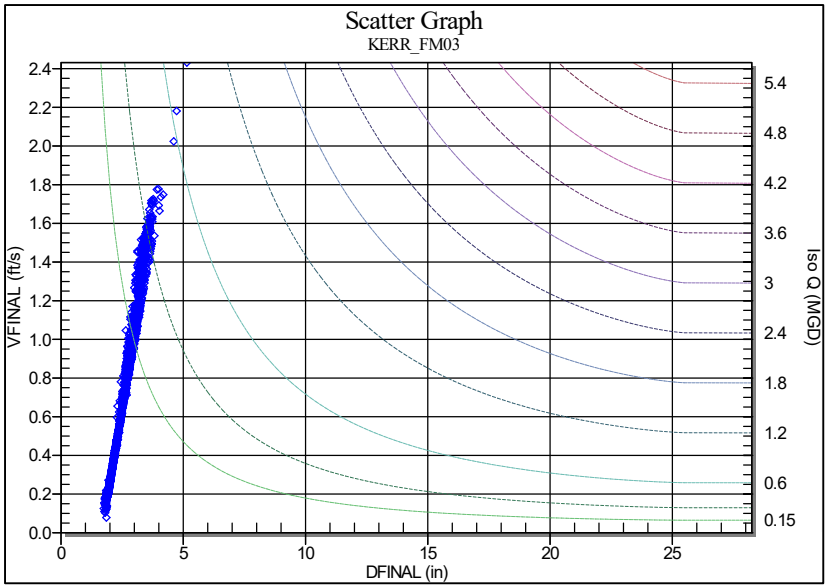

Storm Event - 6/27/2021 4:00:00 PM
KERR_FM02
Rainfall
Gross Q
Gross I/I
Precomp(-)
Weekends
Weekdays
Flow (MGD)
Rainfall (in)
Storms
26 Sat
Jun 2021
27 Sun
28 Mon
29 Tue
30 Wed
1 Thu
Date

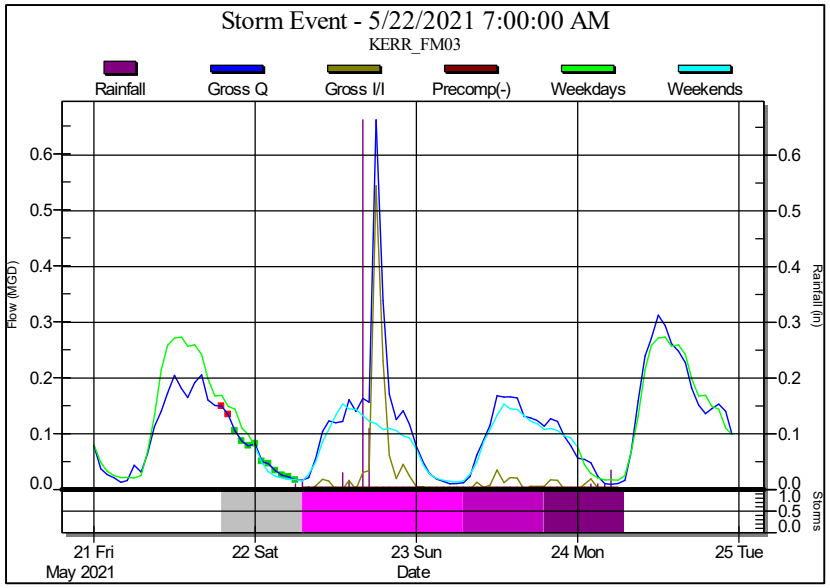

Storm Event - 7/5/2021 5:00:00 PM
KERR_FM02
Rainfall
Gross Q
Gross I/I
Precomp(+)
Weekends
Weekdays
Flow (MGD)
Rainfall (in)
Storms
4 Sun
Jul 2021
5 Mon
6 Tue
7 Wed
8 Thu
9 Fri
Date

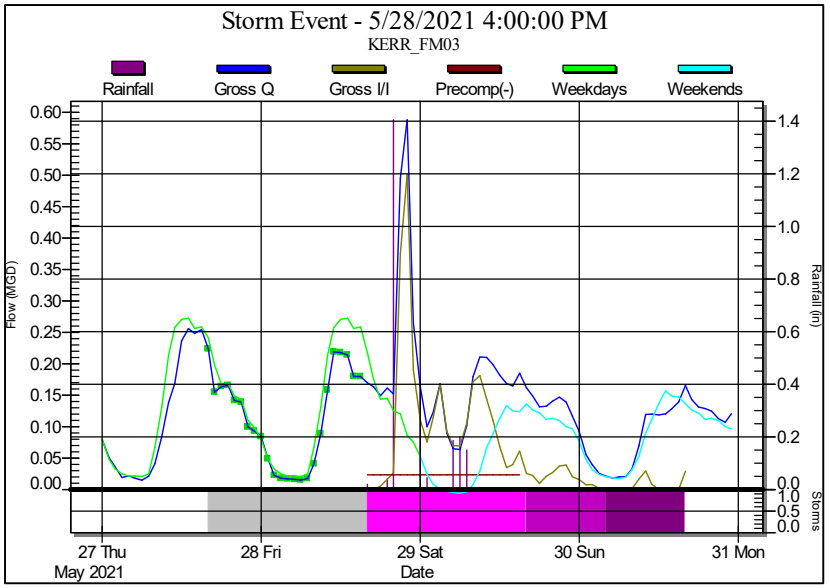

Q vs i - KERR_FM02
Total Event Net RDII Volume vs. Rainfall Depth
AllStorms
Total Event Net RDII Volume (mg)
Total Event Rainfall Depth (in)
(5/28/2021)
(5/22/2021)
(6/3/2021)
(7/5/2021)
(6/22/2021)
(6/27/2021)

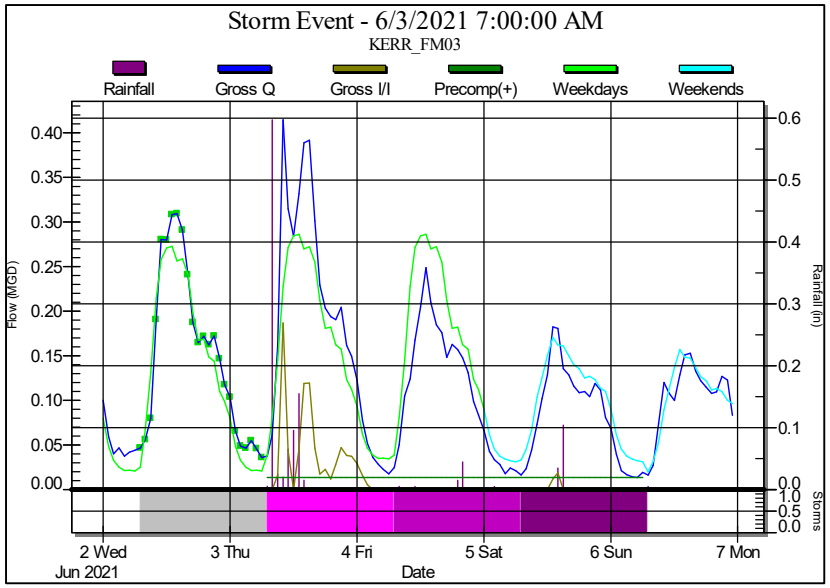

Pipe Flow
KERR_FM03
Rainfall
Qfinal(g)
Flow (MGD)
0.8
0.6
0.4
0.2
0.0
Rainfall (in)
1.0
0.5
0.0
15 Sat
22 Sat
1 Tue
8 Tue
15 Tue
22 Tue
1 Thu
8 Thu
May 2021
Date

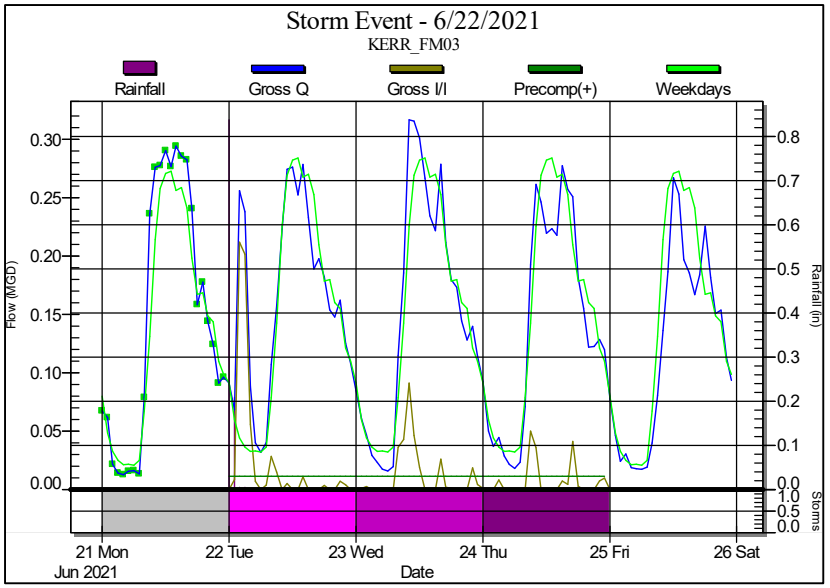

Dry Weather Flow
KERR_FM03
Weekdays
Weekends
MGD
0.25
0.20
0.15
0.10
0.05
0
3
6
9
12
15
18
21
Hours

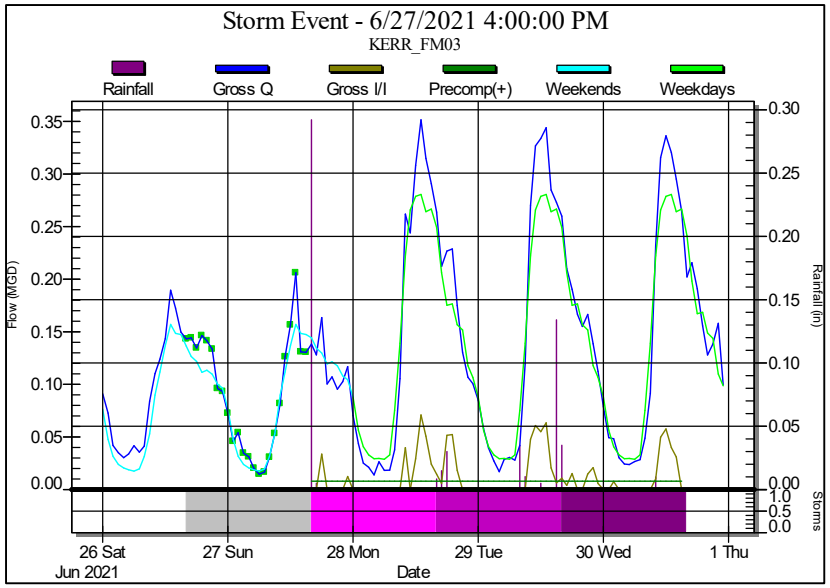

Scatter Graph
KERR_FM03
VFINAL (ft/s)
2.4
2.2
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Iso Q (MGD)
5.4
4.8
4.2
3.6
3
2.4
1.8
1.2
0.6
0.15
0
5
10
15
20
25
DFINAL (in)

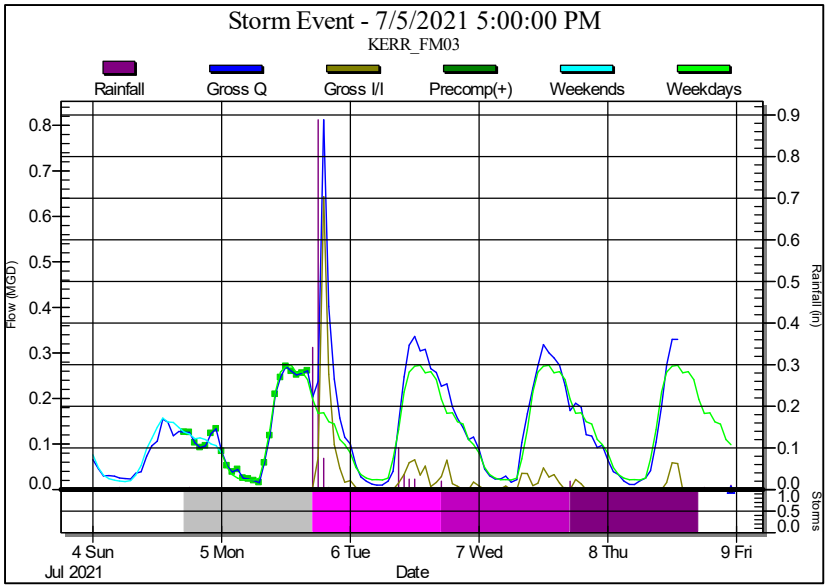

Storm Event - 5/22/2021 7:00:00 AM
KERR_FM03
Rainfall
Gross Q
Gross I/I
Precomp(-)
Weekdays
Weekends
Flow (MGD)
Rainfall (in)
Storms
21 Fri
May 2021
22 Sat
23 Sun
24 Mon
25 Tue
Date

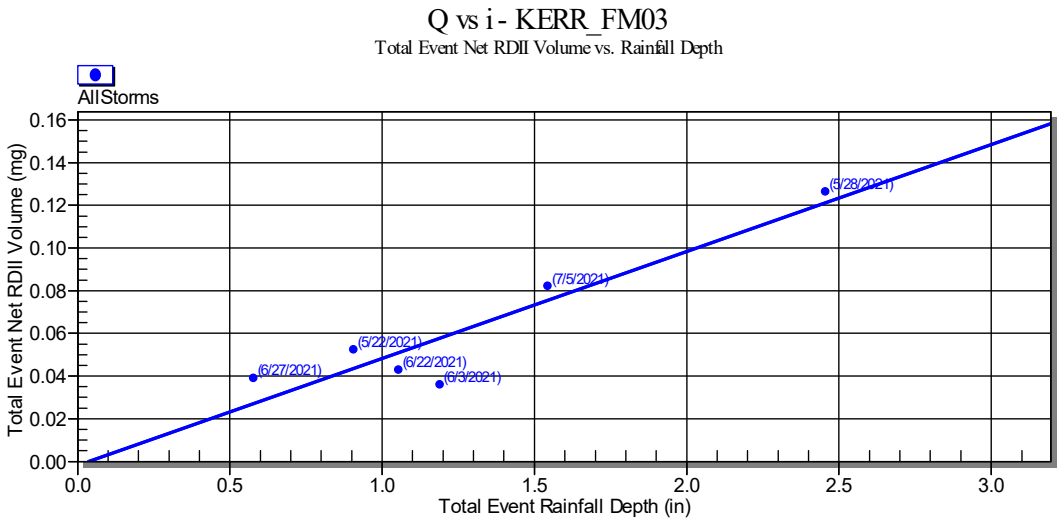

Storm Event - 5/28/2021 4:00:00 PM
KERR_FM03
Rainfall
Gross Q
Gross I/I
Precomp(-)
Weekdays
Weekends
Flow (MGD)
Rainfall (in)
Storms
27 Thu
May 2021
28 Fri
29 Sat
30 Sun
31 Mon
Date

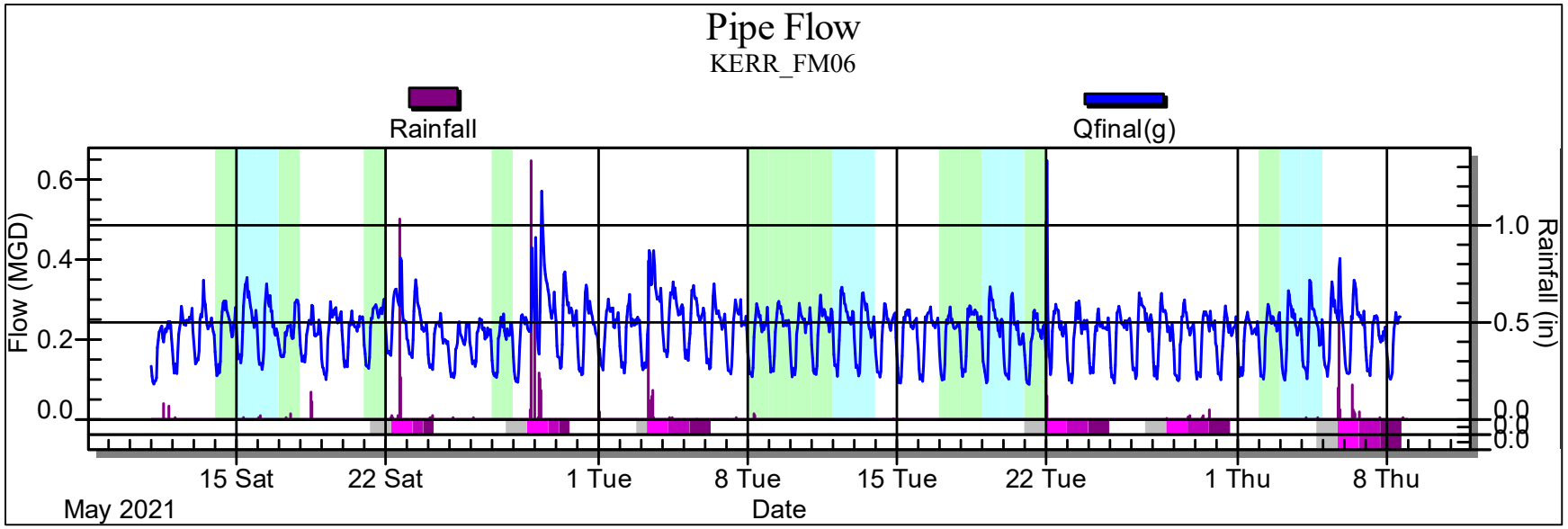

Storm Event - 6/3/2021 7:00:00 AM
KERR_FM03
Rainfall
Gross Q
Gross I/I
Precomp(+)
Weekdays
Weekends
Flow (MGD)
Rainfall (in)
Storms
2 Wed
Jun 2021
3 Thu
4 Fri
5 Sat
6 Sun
7 Mon
Date

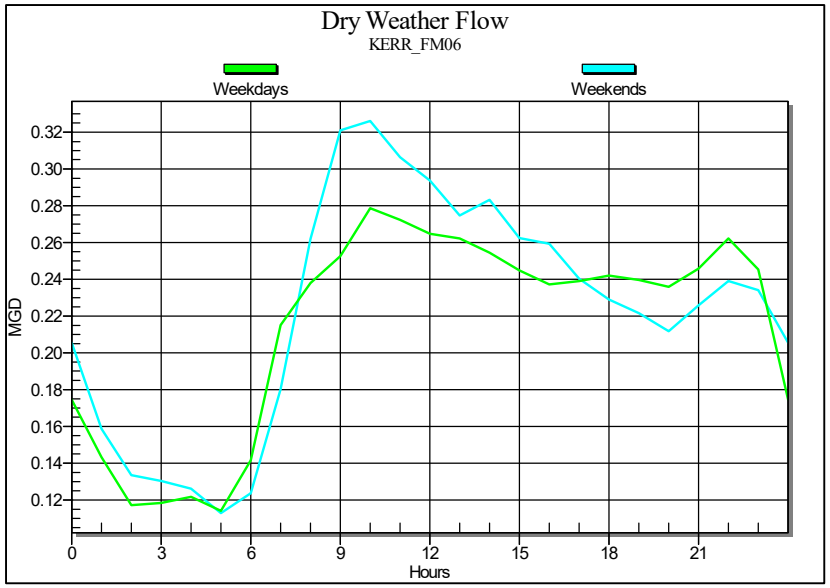

Storm Event - 6/22/2021
KERR_FM03
Rainfall
Gross Q
Gross I/I
Precomp(+)
Weekdays
Flow (MGD)
Rainfall (in)
Storms
21 Mon
Jun 2021
22 Tue
23 Wed
24 Thu
25 Fri
26 Sat
Date

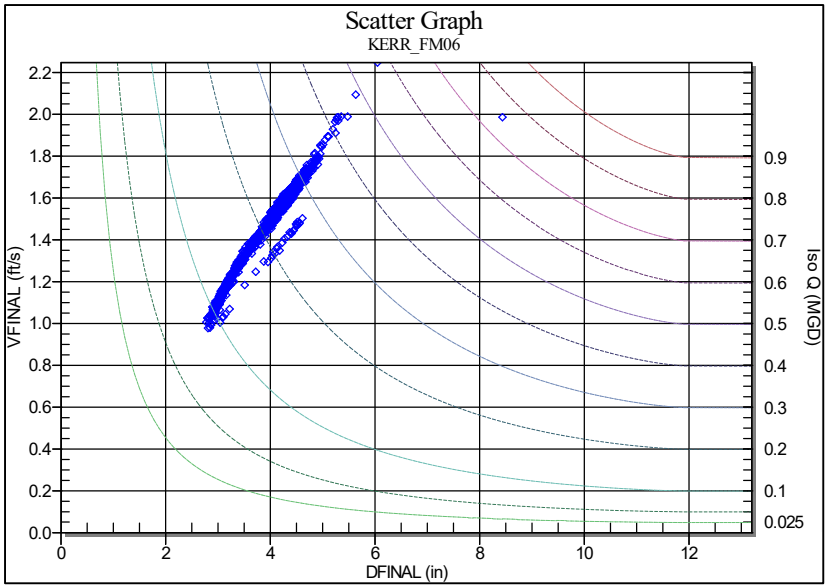

Storm Event - 6/27/2021 4:00:00 PM
KERR_FM03
Rainfall
Gross Q
Gross I/I
Precomp(+)
Weekends
Weekdays
Flow (MGD)
Rainfall (in)
Storms
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
1.0
0.5
0.0
26 Sat
Jun 2021
27 Sun
28 Mon
29 Tue
30 Wed
1 Thu
Date

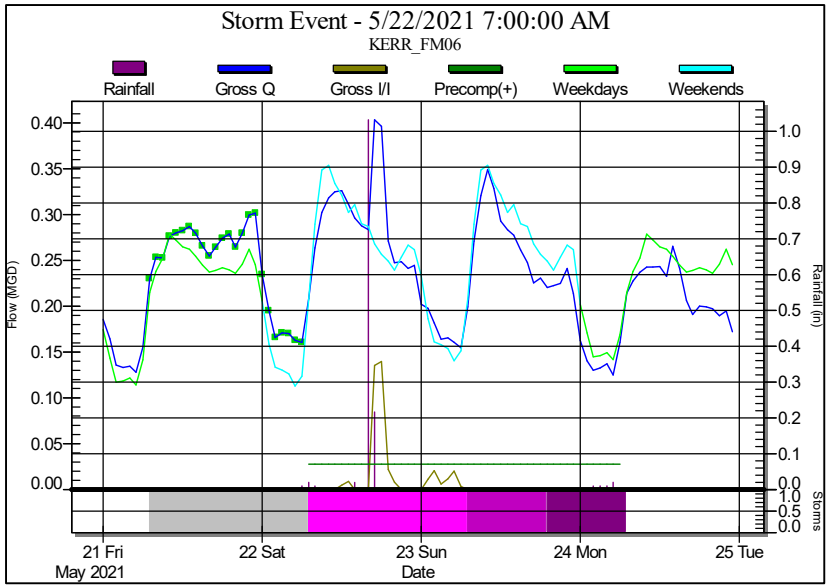

Storm Event - 7/5/2021 5:00:00 PM
KERR_FM03
Rainfall
Gross Q
Gross I/I
Precomp(+)
Weekends
Weekdays
Flow (MGD)
Rainfall (in)
Storms
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
1.0
0.5
0.0
4 Sun
Jul 2021
5 Mon
6 Tue
7 Wed
8 Thu
9 Fri
Date

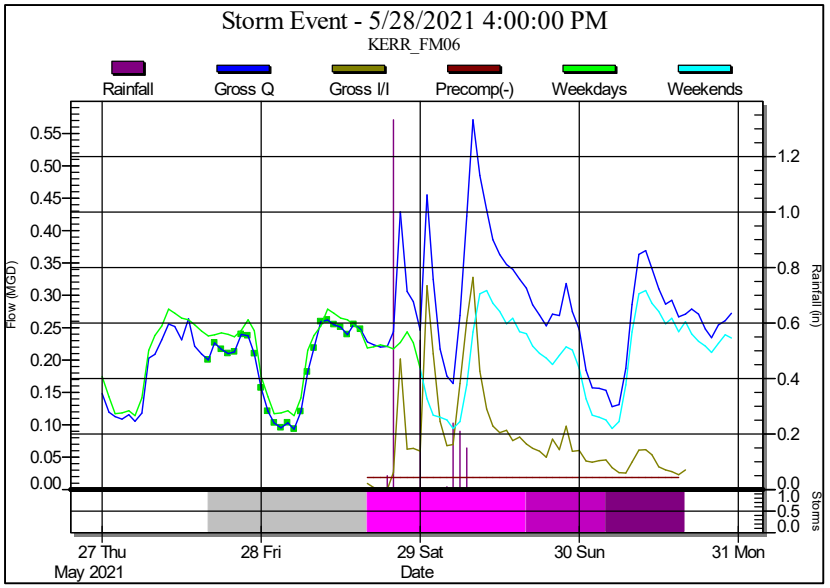

Q vs i - KERR_FM03
Total Event Net RDII Volume vs. Rainfall Depth
AllStorms
Total Event Net RDII Volume (mg)
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
(5/28/2021)
(7/5/2021)
(5/22/2021)
(6/22/2021)
(6/27/2021)
(6/3/2021)
0.0
0.5
1.0
1.5
2.0
2.5
3.0
Total Event Rainfall Depth (in)

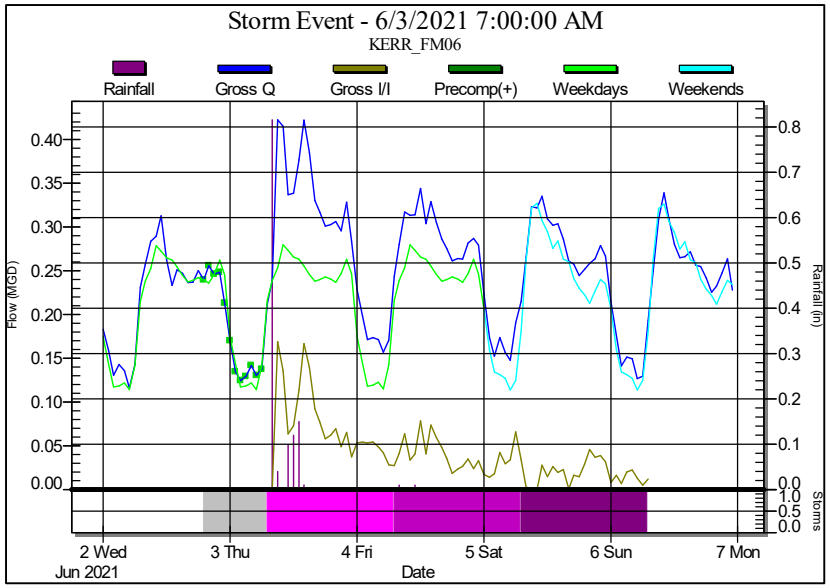

Pipe Flow
KERR_FM06
Rainfall
Qfinal(g)
Flow (MGD)
0.6
0.4
0.2
0.0
1.0
0.5
0.0
Rainfall (in)
15 Sat
22 Sat
1 Tue
8 Tue
15 Tue
22 Tue
1 Thu
8 Thu
May 2021
Date

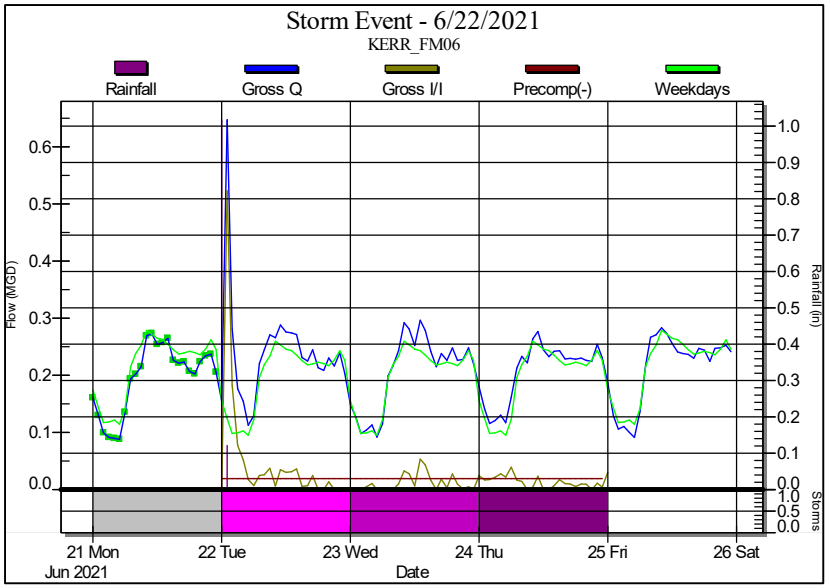

Dry Weather Flow
KERR_FM06
Weekdays
Weekends
MGD
0.32
0.30
0.28
0.26
0.24
0.22
0.20
0.18
0.16
0.14
0.12
0
3
6
9
12
15
18
21
Hours

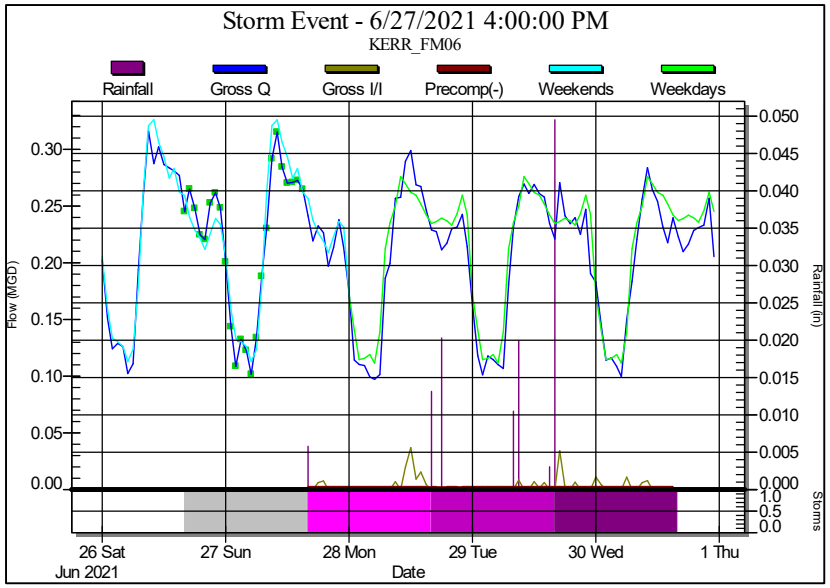

Scatter Graph
KERR_FM06
VFINAL (ft/s)
2.2
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0
2
4
6
8
10
12
DFINAL (in)
Iso Q (MGD)
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.025

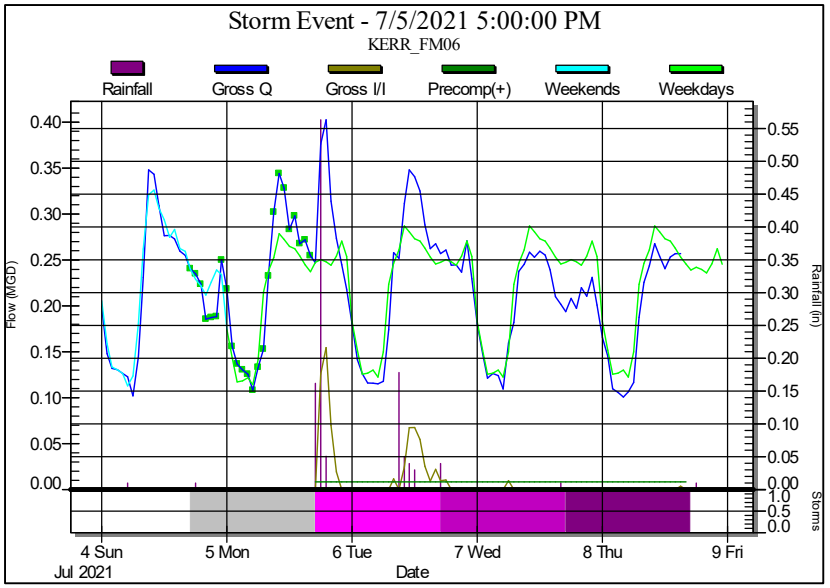

Storm Event - 5/22/2021 7:00:00 AM
KERR_FM06
Rainfall
Gross Q
Gross I/I
Precomp(+)
Weekdays
Weekends
Flow (MGD)
Rainfall (in)
Storms
21 Fri
May 2021
22 Sat
23 Sun
24 Mon
25 Tue
Date

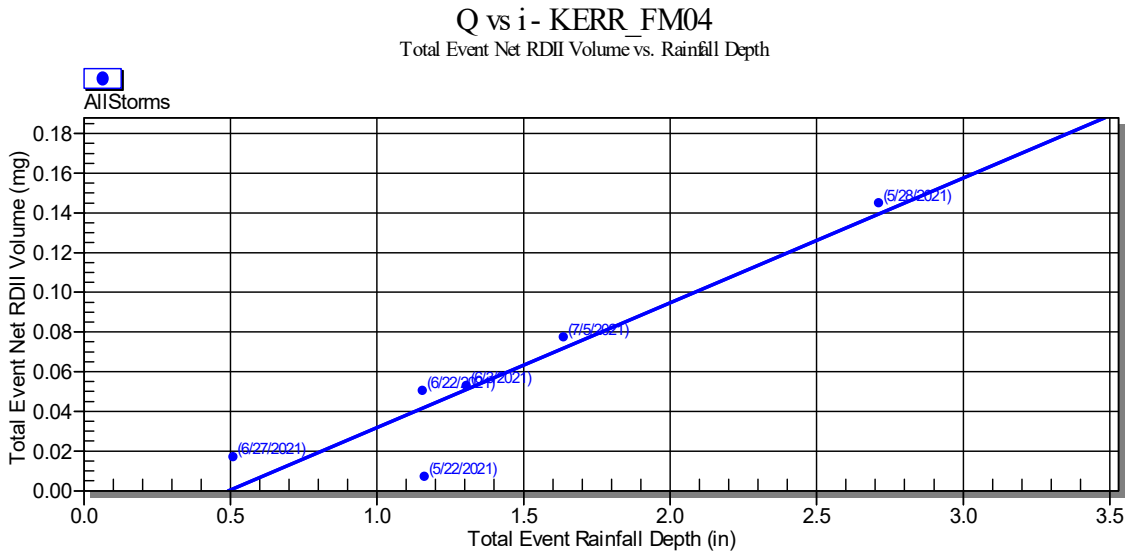

Storm Event - 5/28/2021 4:00:00 PM
KERR_FM06
Rainfall
Gross Q
Gross I/I
Precomp(-)
Weekdays
Weekends
Flow (MGD)
Rainfall (in)
Storms
27 Thu
May 2021
28 Fri
29 Sat
30 Sun
31 Mon
Date

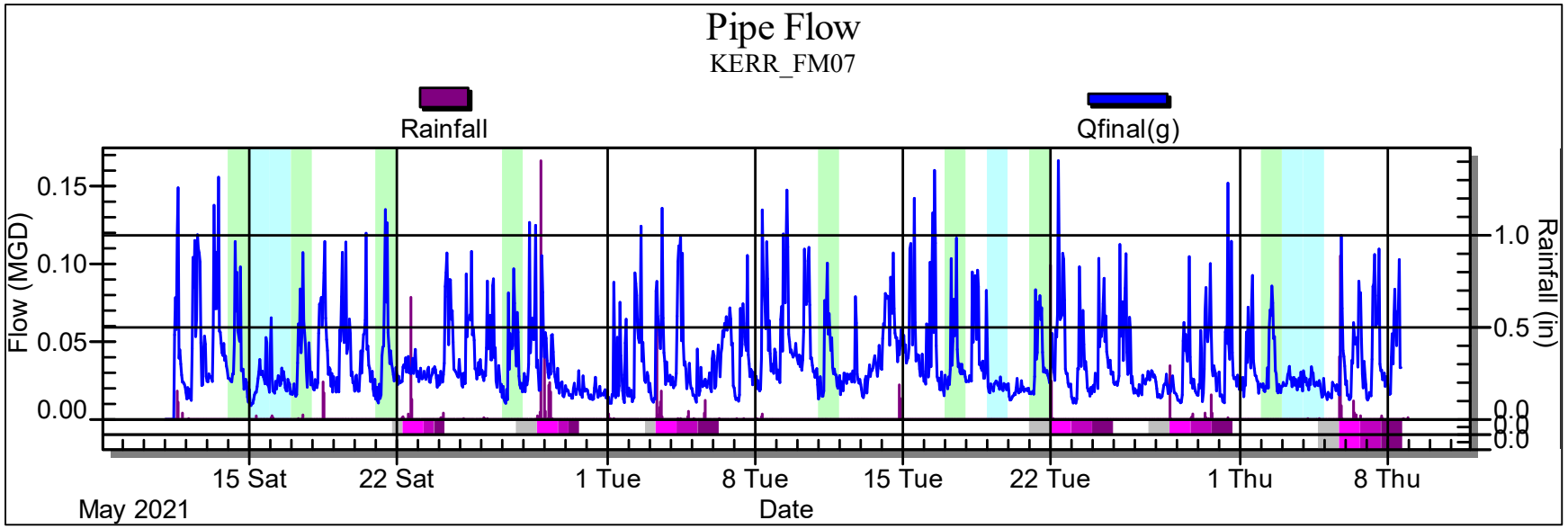

Storm Event - 6/3/2021 7:00:00 AM
KERR_FM06
Rainfall
Gross Q
Gross I/I
Precomp(+)
Weekdays
Weekends
Flow (MGD)
Rainfall (in)
Storms
2 Wed
Jun 2021
3 Thu
4 Fri
5 Sat
6 Sun
7 Mon
Date

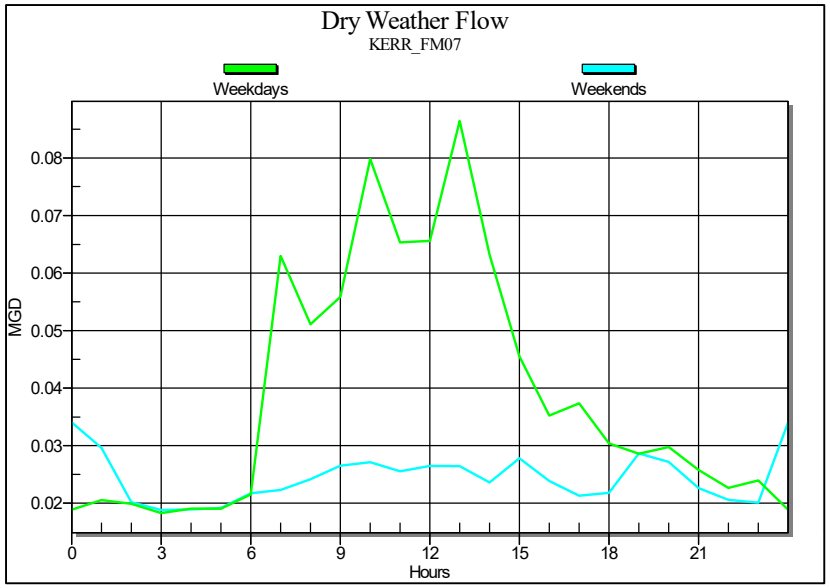

Storm Event - 6/22/2021
KERR_FM06
Rainfall
Gross Q
Gross I/I
Precomp(-)
Weekdays
Flow (MGD)
Rainfall (in)
Storms
21 Mon
Jun 2021
22 Tue
23 Wed
24 Thu
25 Fri
26 Sat
Date

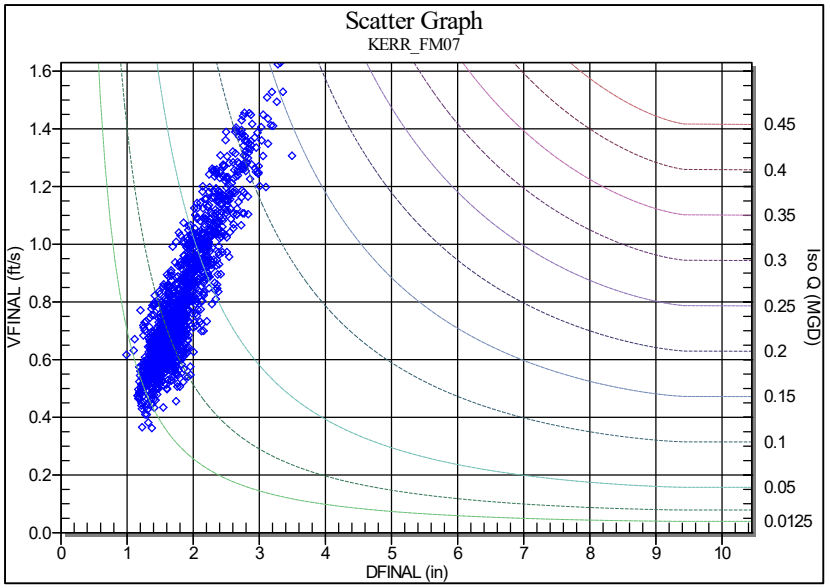

Storm Event - 6/27/2021 4:00:00 PM
KERR_FM06
Rainfall
Gross Q
Gross I/I
Precomp(-)
Weekends
Weekdays
Flow (MGD)
Rainfall (in)
Storms
26 Sat
Jun 2021
27 Sun
28 Mon
29 Tue
30 Wed
1 Thu
Date

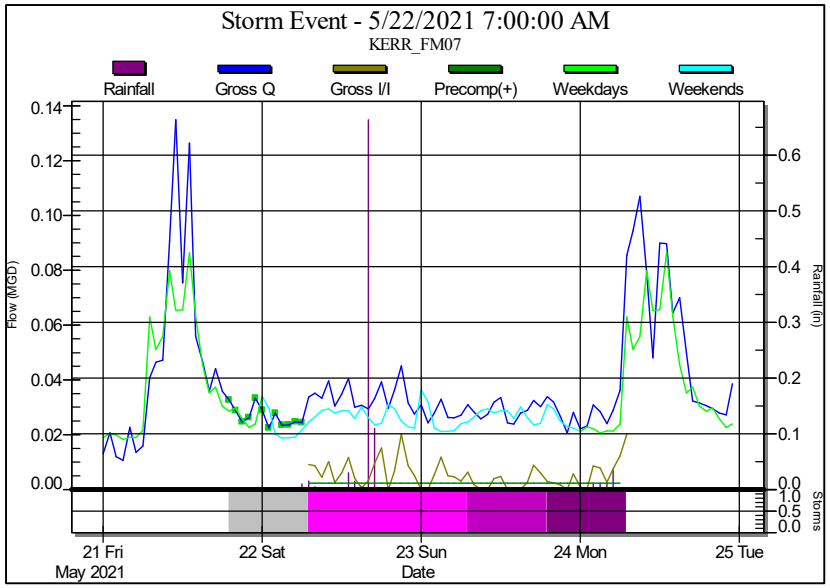

Storm Event - 7/5/2021 5:00:00 PM
KERR_FM06
Rainfall
Gross Q
Gross I/I
Precomp(+)
Weekends
Weekdays
Flow (MGD)
Rainfall (in)
Storms
4 Sun
Jul 2021
5 Mon
6 Tue
7 Wed
8 Thu
9 Fri
Date

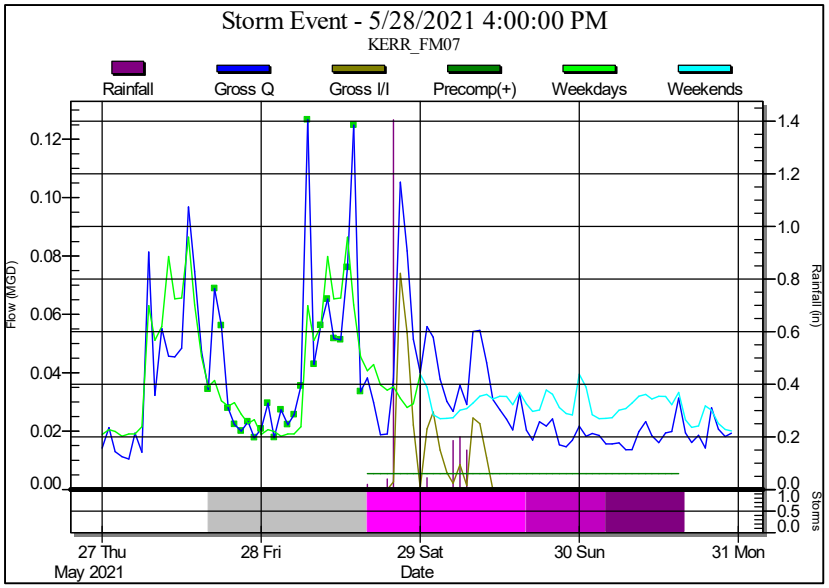

Q vs i - KERR_FM04
Total Event Net RDII Volume vs. Rainfall Depth
AllStorms
Total Event Net RDII Volume (mg)
Total Event Rainfall Depth (in)
(6/27/2021)
(5/22/2021)
(6/22/2021)
(6/27/2021)
(7/5/2021)
(5/28/2021)

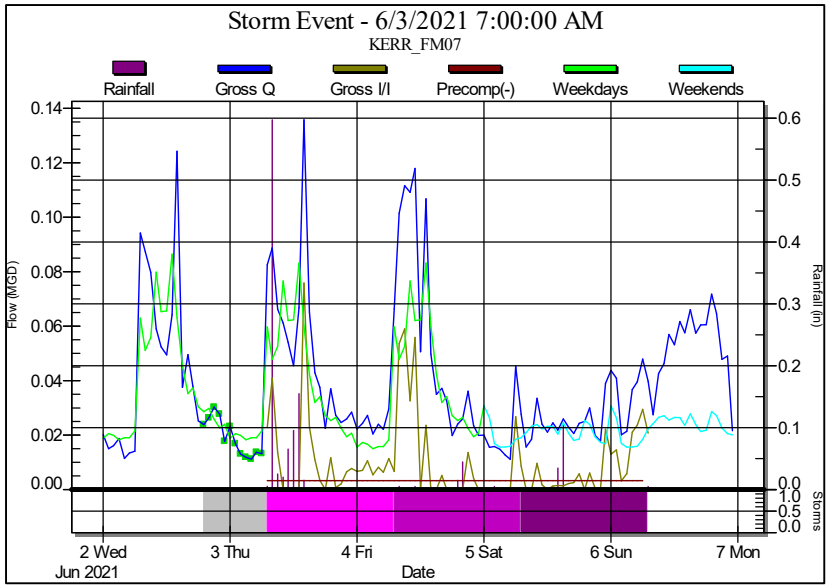

Pipe Flow
KERR_FM07
Rainfall
Qfinal(g)
Flow (MGD)
0.15
0.10
0.05
0.00
Rainfall (in)
1.0
0.5
0.0
15 Sat
22 Sat
1 Tue
8 Tue
15 Tue
22 Tue
1 Thu
8 Thu
May 2021
Date

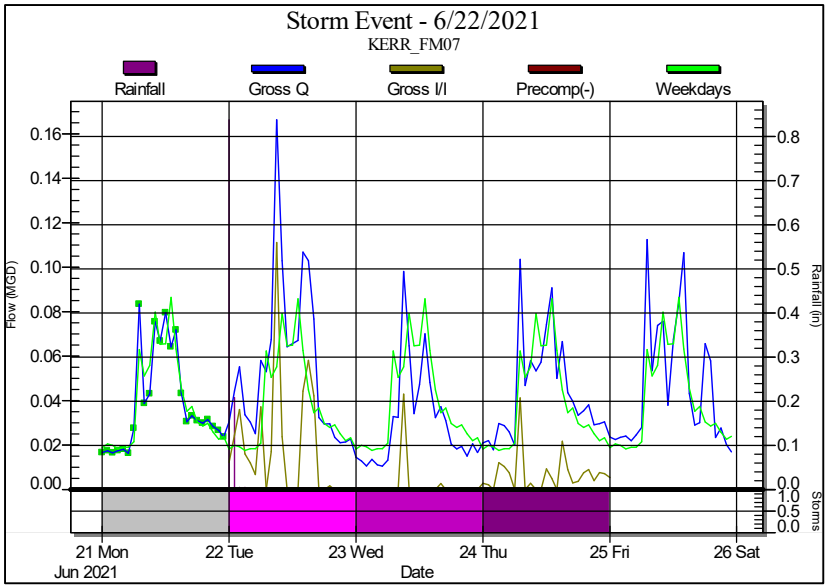

Dry Weather Flow
KERR_FM07
Weekdays
Weekends
MGD
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0
3
6
9
12
15
18
21
Hours

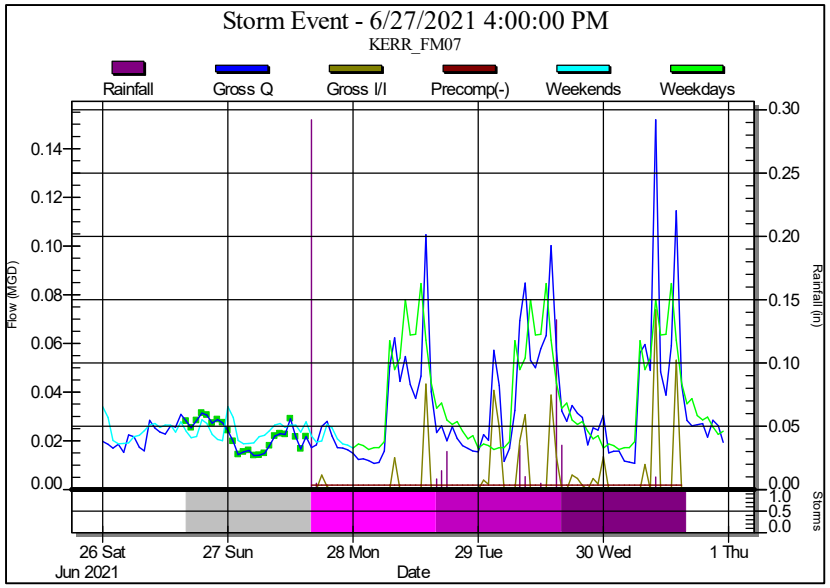

Scatter Graph
KERR_FM07
VFINAL (ft/s)
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Iso Q (MGD)
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0.0125
0
1
2
3
4
5
6
7
8
9
10
DFINAL (in)

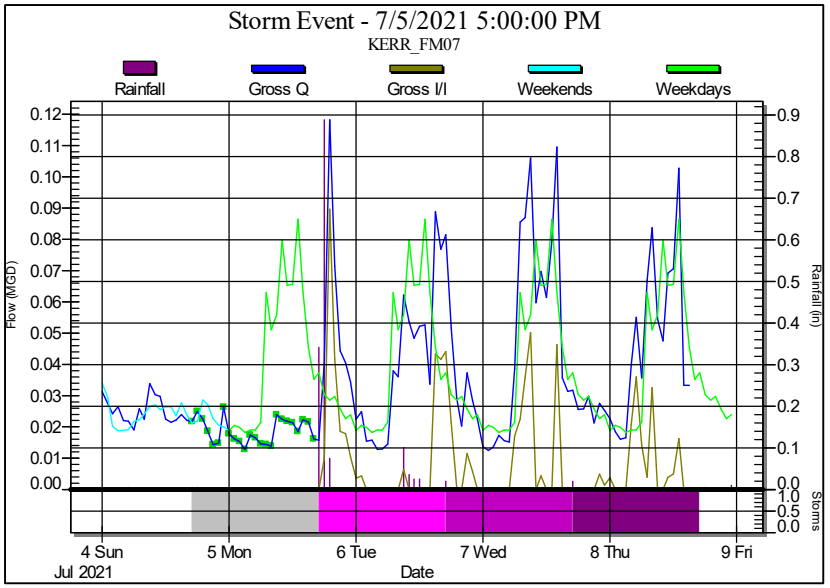

Storm Event - 5/22/2021 7:00:00 AM
KERR_FM07
Rainfall
Gross Q
Gross I/I
Precomp(+)
Weekdays
Weekends
Flow (MGD)
Rainfall (in)
Storms
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
0.6
0.5
0.4
0.3
0.2
0.1
0.0
1.0
0.5
0.0
21 Fri
May 2021
22 Sat
23 Sun
24 Mon
25 Tue
Date

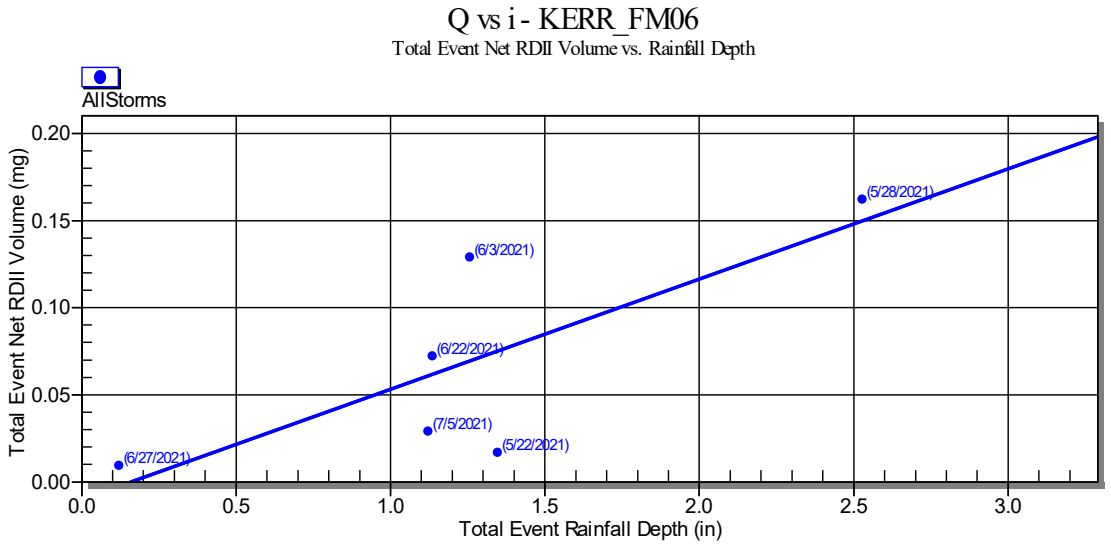

Storm Event - 5/28/2021 4:00:00 PM
KERR_FM07
Rainfall
Gross Q
Gross I/I
Precomp(+)
Weekdays
Weekends
Flow (MGD)
Rainfall (in)
Storms
0.12
0.10
0.08
0.06
0.04
0.02
0.00
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
1.0
0.5
0.0
27 Thu
May 2021
28 Fri
29 Sat
30 Sun
31 Mon
Date

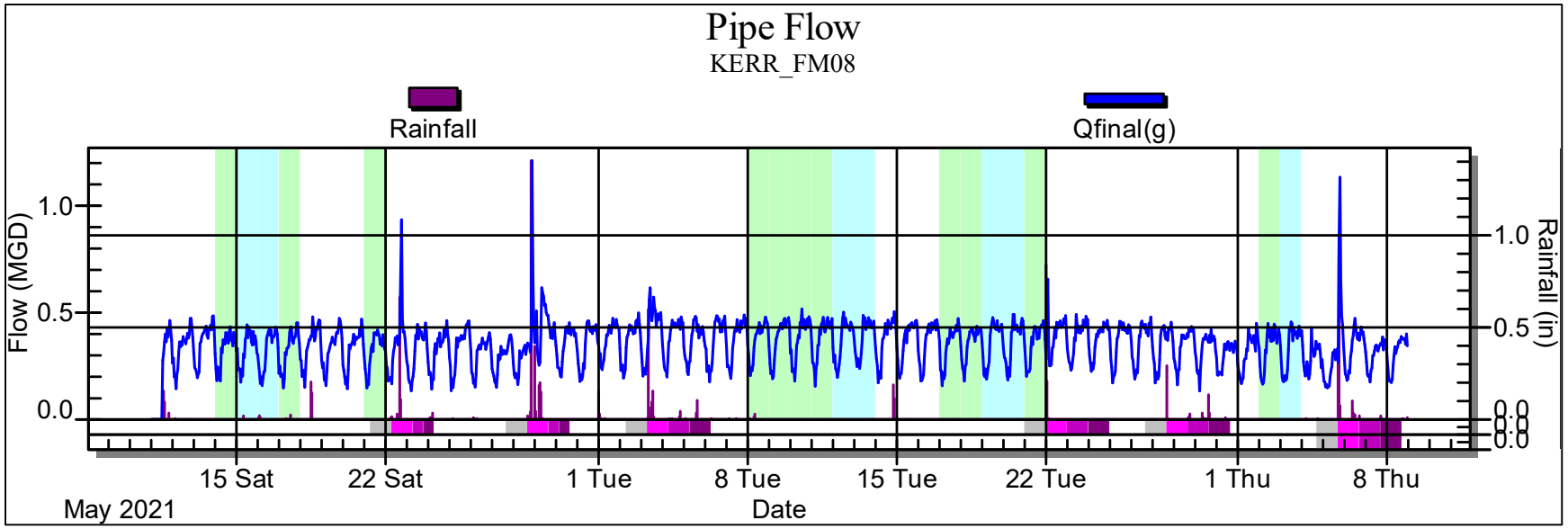

Storm Event - 6/3/2021 7:00:00 AM
KERR_FM07
Rainfall
Gross Q
Gross I/I
Precomp(-)
Weekdays
Weekends
Flow (MGD)
Rainfall (in)
Storms
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
0.6
0.5
0.4
0.3
0.2
0.1
0.0
1.0
0.5
0.0
2 Wed
Jun 2021
3 Thu
4 Fri
5 Sat
6 Sun
7 Mon
Date

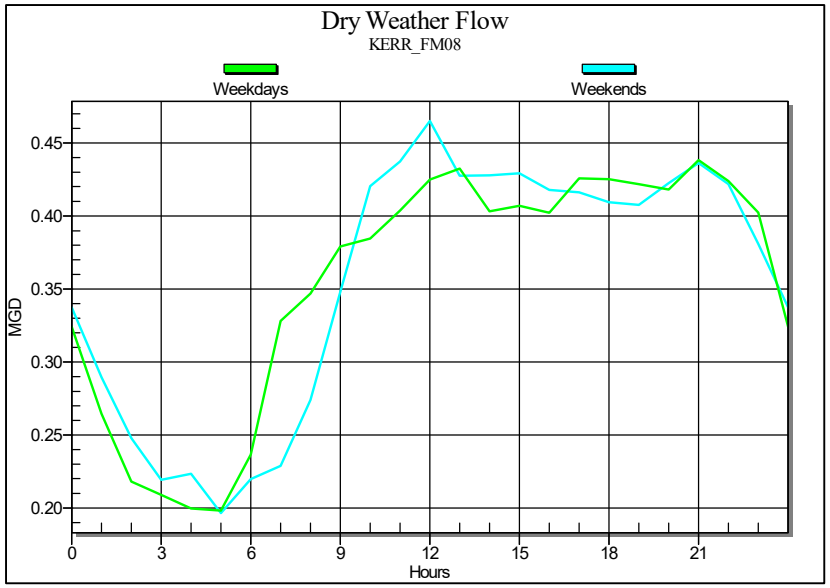

Storm Event - 6/22/2021
KERR_FM07
Rainfall
Gross Q
Gross I/I
Precomp(-)
Weekdays
Flow (MGD)
Rainfall (in)
Storms
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
1.0
0.5
0.0
21 Mon
Jun 2021
22 Tue
23 Wed
24 Thu
25 Fri
26 Sat
Date

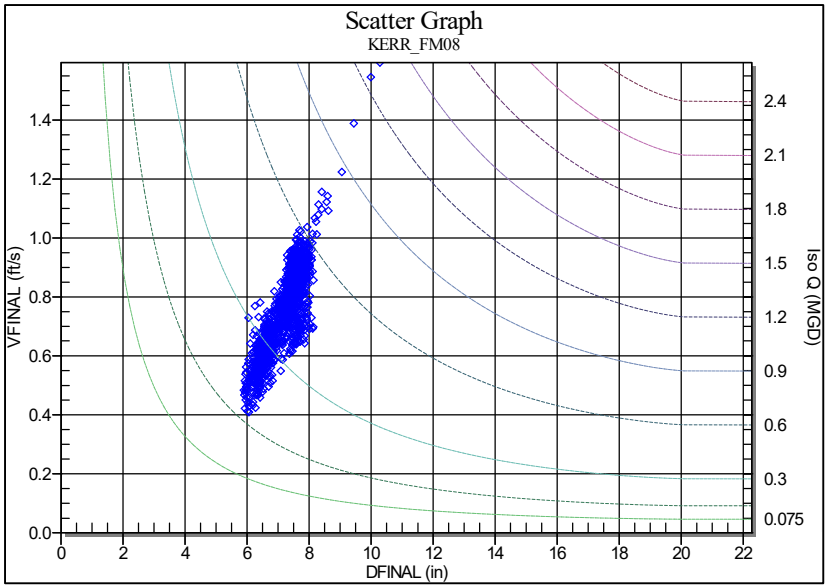

Storm Event - 6/27/2021 4:00:00 PM
KERR_FM07
Rainfall
Gross Q
Gross I/I
Precomp(-)
Weekends
Weekdays
Flow (MGD)
Rainfall (in)
Storms
26 Sat
Jun 2021
27 Sun
28 Mon
29 Tue
30 Wed
1 Thu
Date

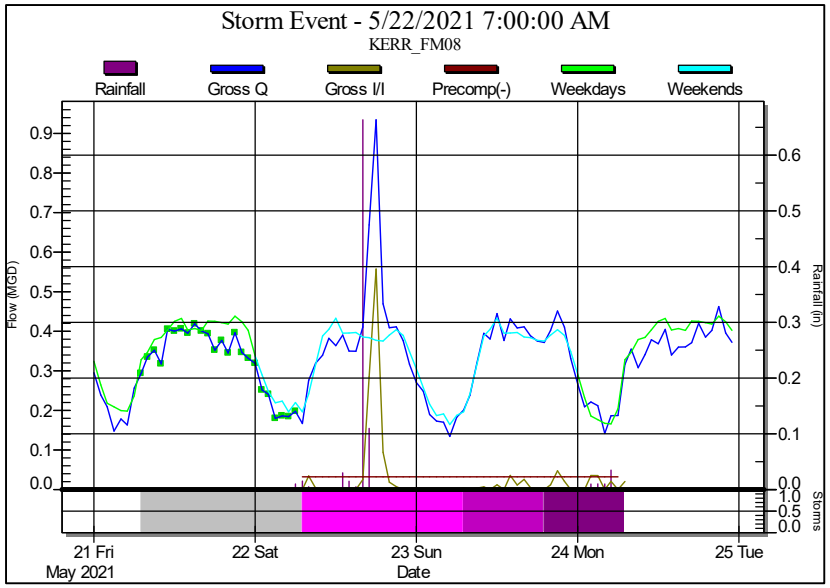

Storm Event - 7/5/2021 5:00:00 PM
KERR_FM07
Rainfall
Gross Q
Gross I/I
Weekends
Weekdays
Flow (MGD)
Rainfall (in)
Storms
4 Sun
Jul 2021
5 Mon
6 Tue
7 Wed
8 Thu
9 Fri
Date

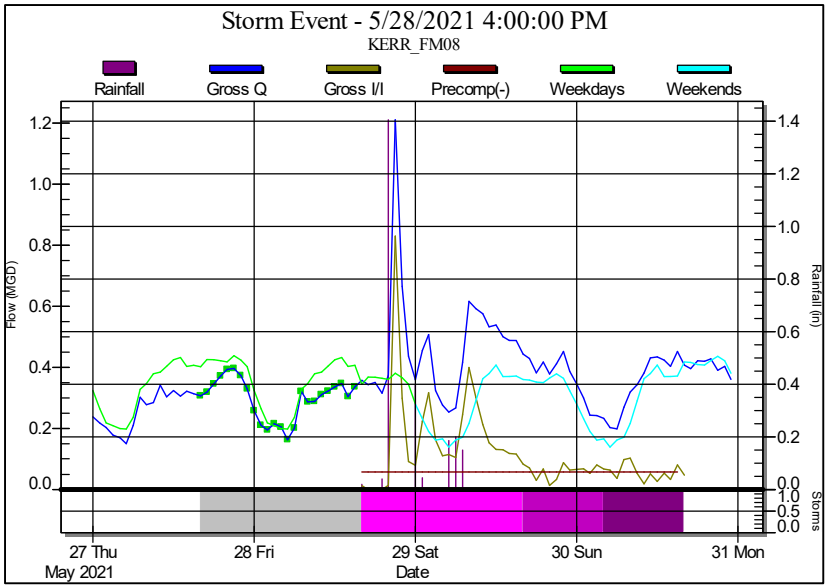

Q vs i - KERR_FM06
Total Event Net RDII Volume vs. Rainfall Depth
AllStorms
Total Event Net RDII Volume (mg)
Total Event Rainfall Depth (in)
(5/28/2021)
(6/3/2021)
(6/22/2021)
(7/5/2021)
(5/22/2021)
(6/27/2021)

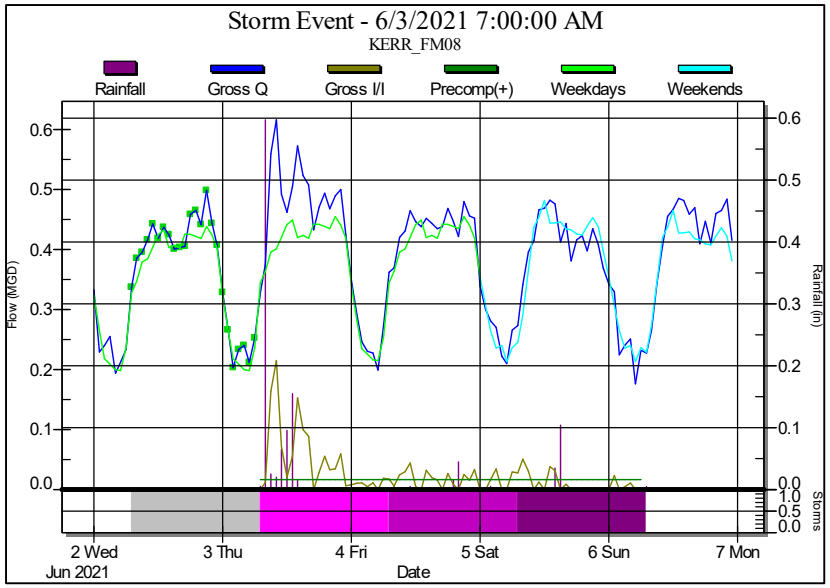

Pipe Flow
KERR_FM08
Rainfall
Qfinal(g)
Flow (MGD)
1.0
0.5
0.0
Rainfall (in)
1.0
0.5
0.0
15 Sat
22 Sat
1 Tue
8 Tue
15 Tue
22 Tue
1 Thu
8 Thu
May 2021
Date

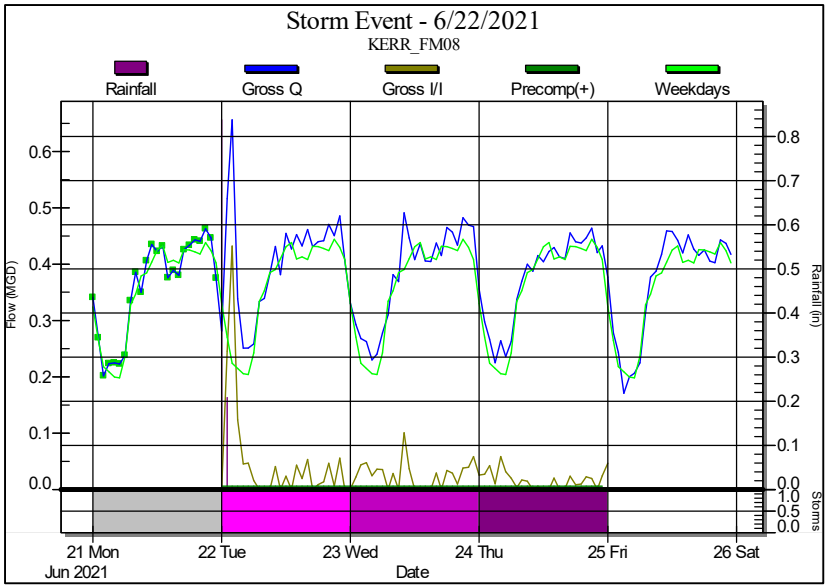

Dry Weather Flow
KERR_FM08
Weekdays
Weekends
MGD
0.45
0.40
0.35
0.30
0.25
0.20
0
3
6
9
12
15
18
21
Hours

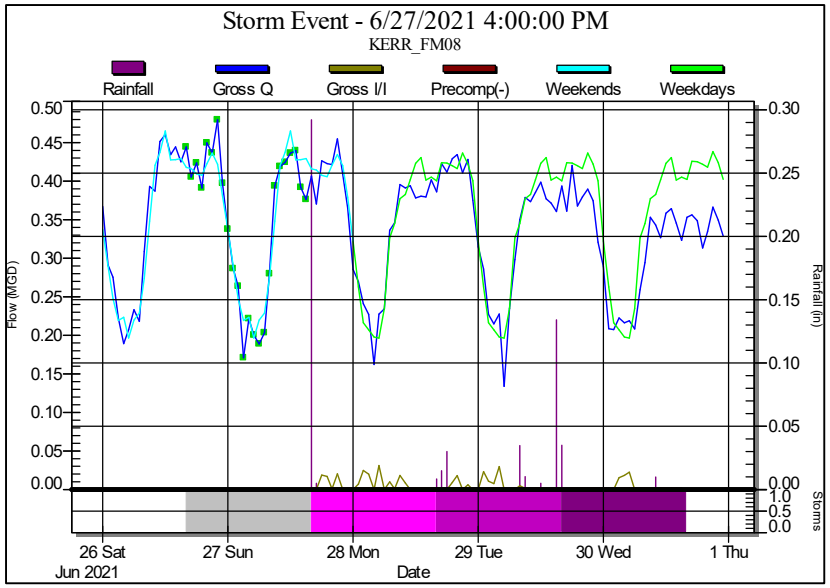

Scatter Graph
KERR_FM08
VFINAL (ft/s)
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0
2
4
6
8
10
12
14
16
18
20
22
DFINAL (in)
Iso Q (MGD)
2.4
2.1
1.8
1.5
1.2
0.9
0.6
0.3
0.075

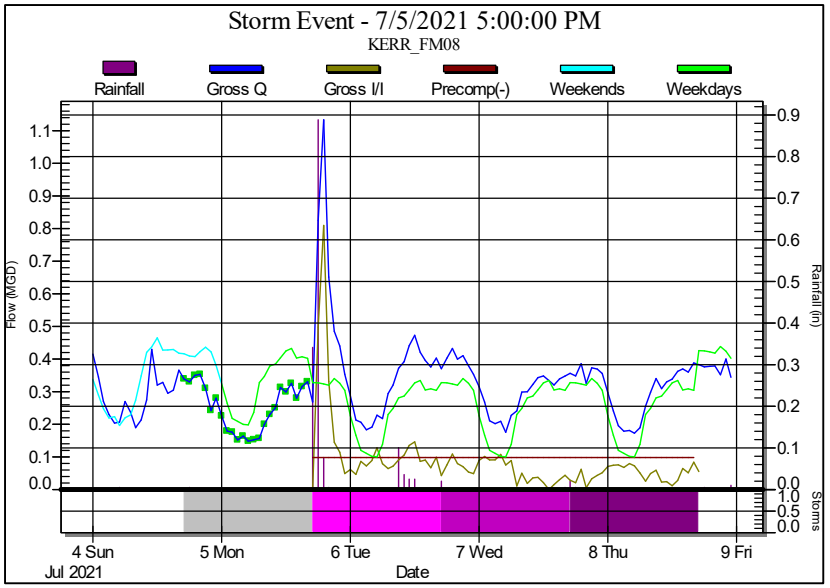

Storm Event - 5/22/2021 7:00:00 AM
KERR_FM08
Rainfall
Gross Q
Gross I/I
Precomp(-)
Weekdays
Weekends
Flow (MGD)
Rainfall (in)
Storms
21 Fri
May 2021
22 Sat
23 Sun
24 Mon
25 Tue
Date

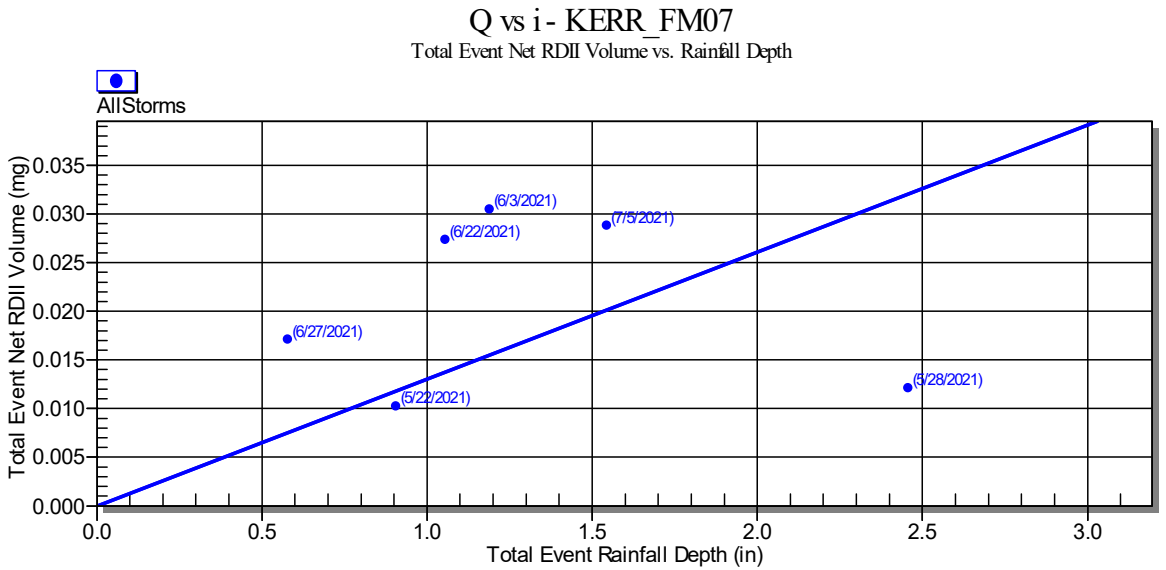

Storm Event - 5/28/2021 4:00:00 PM
KERR_FM08
Rainfall
Gross Q
Gross I/I
Precomp(-)
Weekdays
Weekends
Flow (MGD)
Rainfall (in)
Storms
27 Thu
May 2021
28 Fri
29 Sat
30 Sun
31 Mon
Date

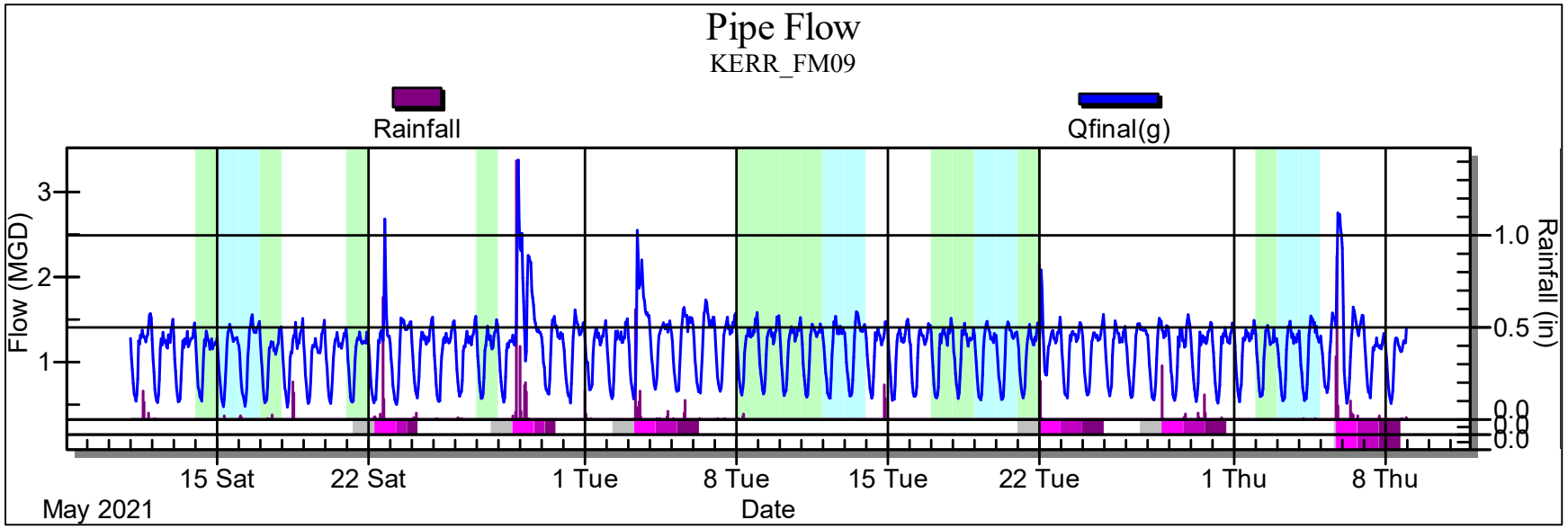

Storm Event - 6/3/2021 7:00:00 AM
KERR_FM08
Rainfall
Gross Q
Gross I/I
Precomp(+)
Weekdays
Weekends
Flow (MGD)
Rainfall (in)
Storms
2 Wed
Jun 2021
3 Thu
4 Fri
5 Sat
6 Sun
7 Mon
Date

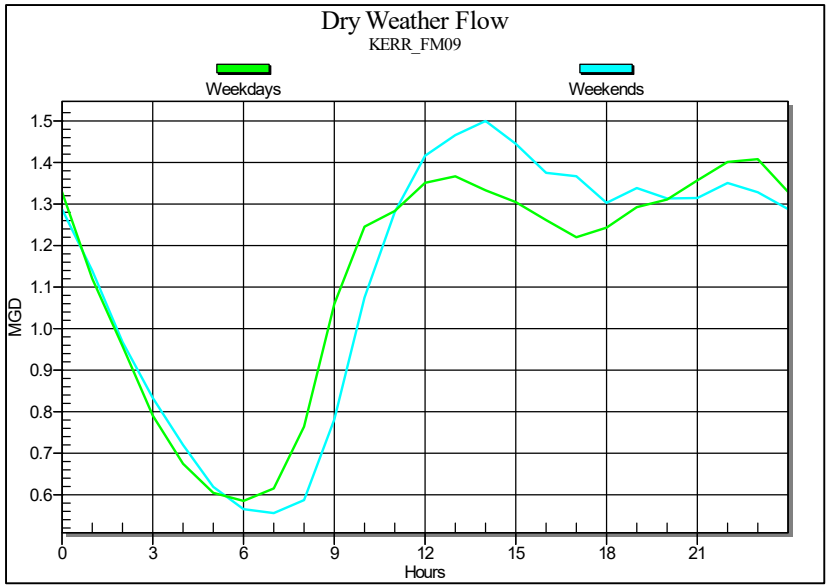

Storm Event - 6/22/2021
KERR_FM08
Rainfall
Gross Q
Gross I/I
Precomp(+)
Weekdays
Flow (MGD)
Rainfall (in)
Storms
21 Mon
Jun 2021
22 Tue
23 Wed
24 Thu
25 Fri
26 Sat
Date

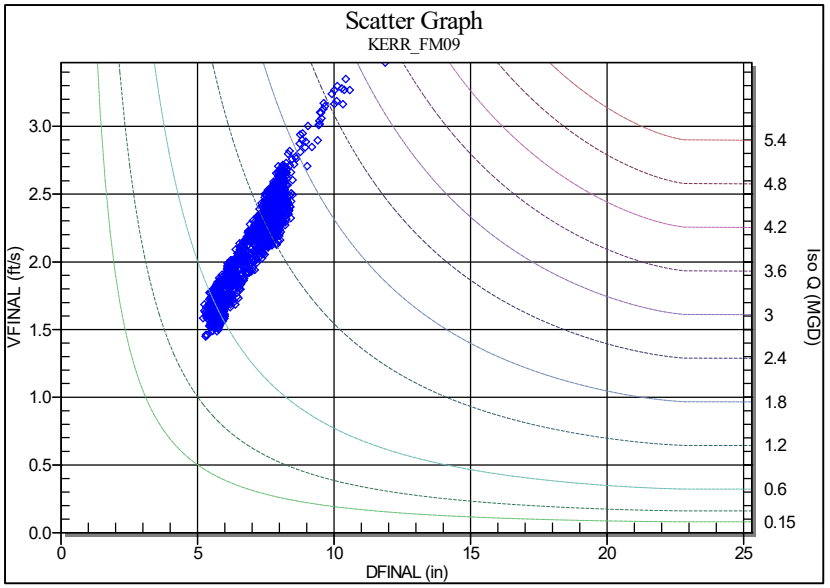

Storm Event - 6/27/2021 4:00:00 PM
KERR_FM08
Rainfall
Gross Q
Gross I/I
Precomp(-)
Weekends
Weekdays
Flow (MGD)
Rainfall (in)
Storms
26 Sat
Jun 2021
27 Sun
28 Mon
29 Tue
30 Wed
1 Thu
Date

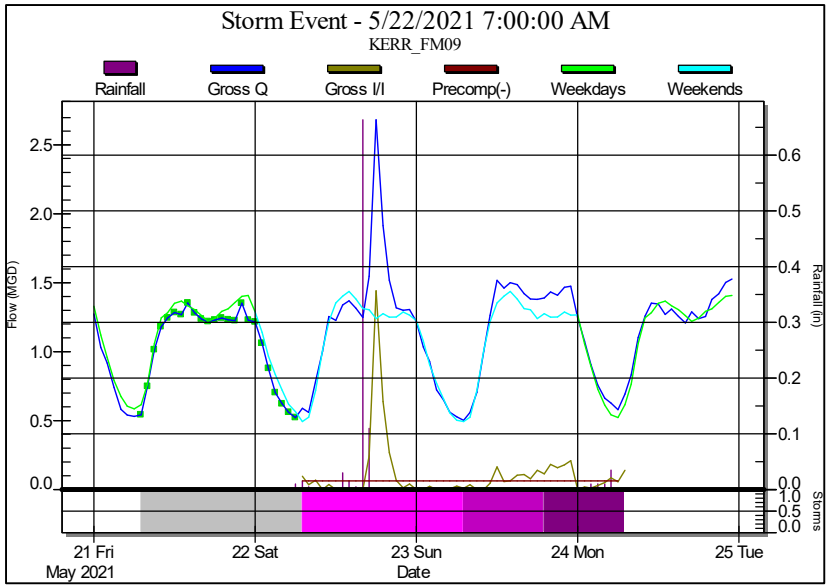

Storm Event - 7/5/2021 5:00:00 PM
KERR_FM08
Rainfall
Gross Q
Gross I/I
Precomp(-)
Weekends
Weekdays
Flow (MGD)
Rainfall (in)
Storms
4 Sun
Jul 2021
5 Mon
6 Tue
7 Wed
8 Thu
9 Fri
Date

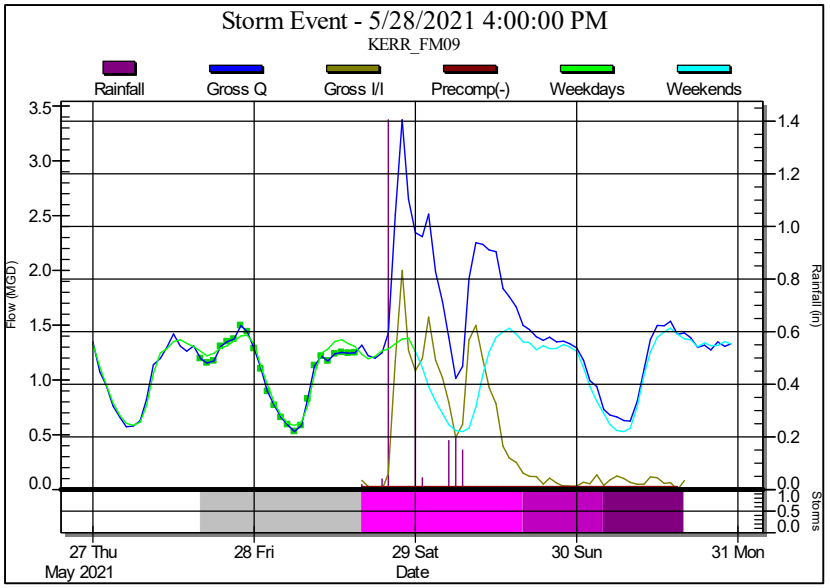

Q vs i - KERR_FM07
Total Event Net RDII Volume vs. Rainfall Depth
AllStorms
Total Event Net RDII Volume (mg)
Total Event Rainfall Depth (in)
(6/3/2021)
(6/22/2021)
(7/5/2021)
(6/27/2021)
(5/22/2021)
(5/28/2021)

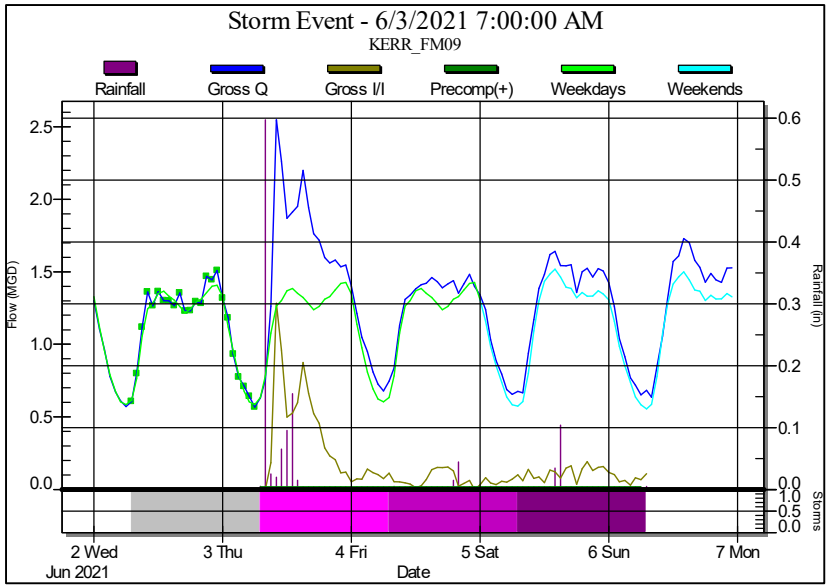

Pipe Flow
KERR_FM09
Rainfall
Qfinal(g)
Flow (MGD)
Rainfall (in)
3
2
1
1.0
0.5
0.0
15 Sat
22 Sat
1 Tue
8 Tue
15 Tue
22 Tue
1 Thu
8 Thu
May 2021
Date

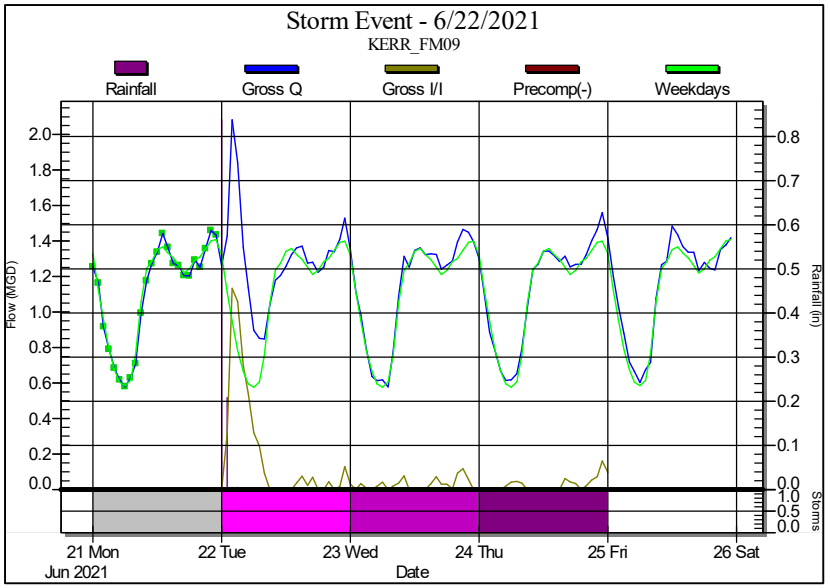

Dry Weather Flow
KERR_FM09
Weekdays
Weekends
MGD
1.5
1.4
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0
3
6
9
12
15
18
21
Hours

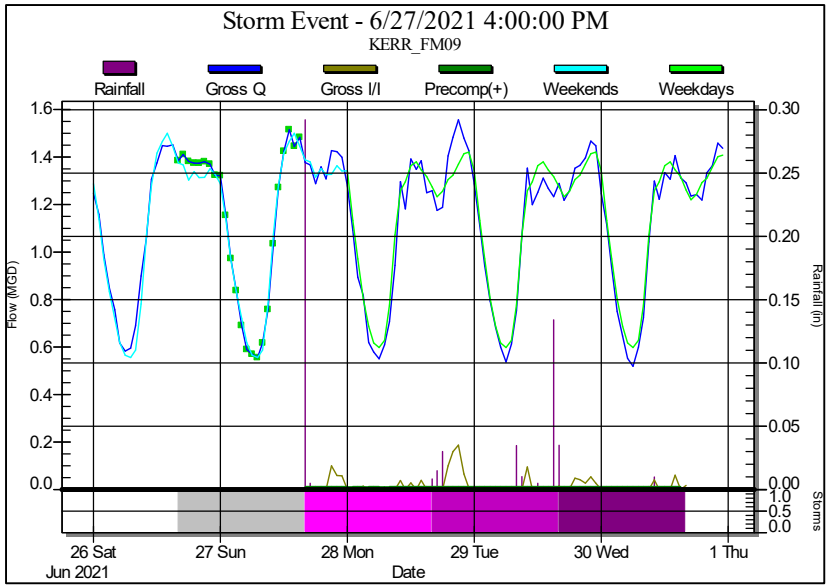

Scatter Graph
KERR_FM09
VFINAL (ft/s)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0
5
10
15
20
25
DFINAL (in)
Iso Q (MGD)
5.4
4.8
4.2
3.6
3
2.4
1.8
1.2
0.6
0.15

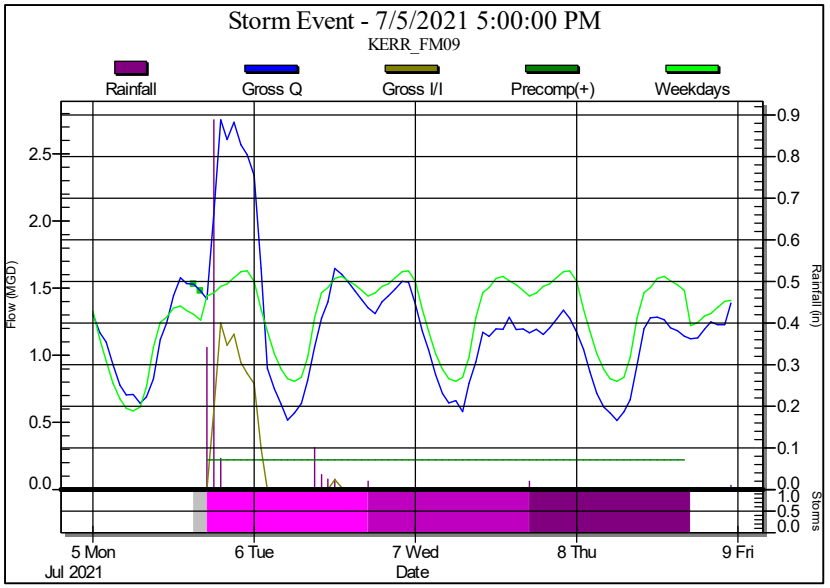

Storm Event - 5/22/2021 7:00:00 AM
KERR_FM09
Rainfall
Gross Q
Gross I/I
Precomp(-)
Weekdays
Weekends
Flow (MGD)
Rainfall (in)
Storms
21 Fri
May 2021
22 Sat
23 Sun
24 Mon
25 Tue
Date

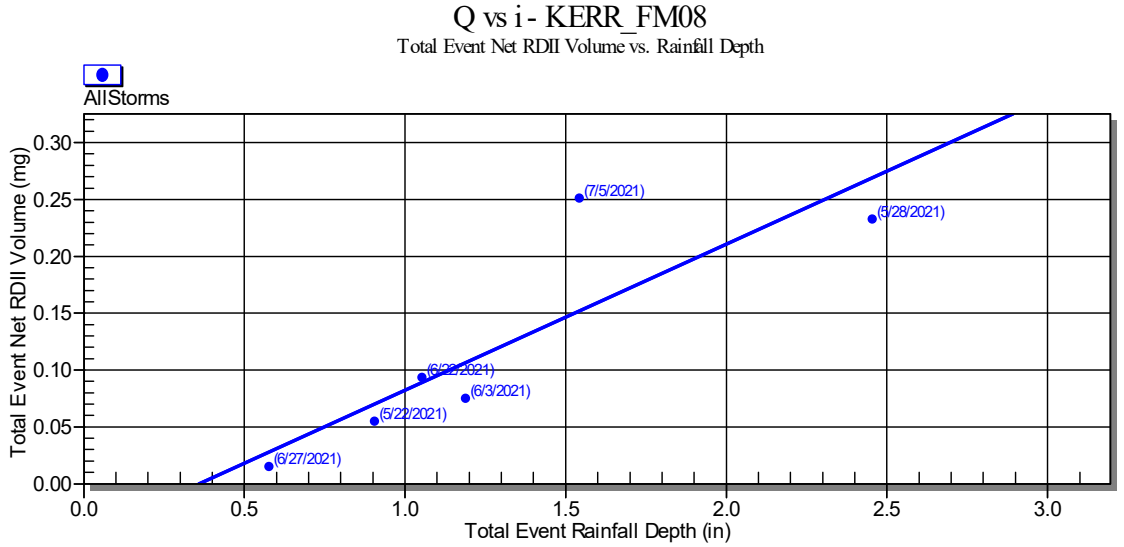

Storm Event - 5/28/2021 4:00:00 PM
KERR_FM09
Rainfall
Gross Q
Gross I/I
Precomp(-)
Weekdays
Weekends
Flow (MGD)
Rainfall (in)
Storms
27 Thu
May 2021
28 Fri
29 Sat
30 Sun
31 Mon
Date

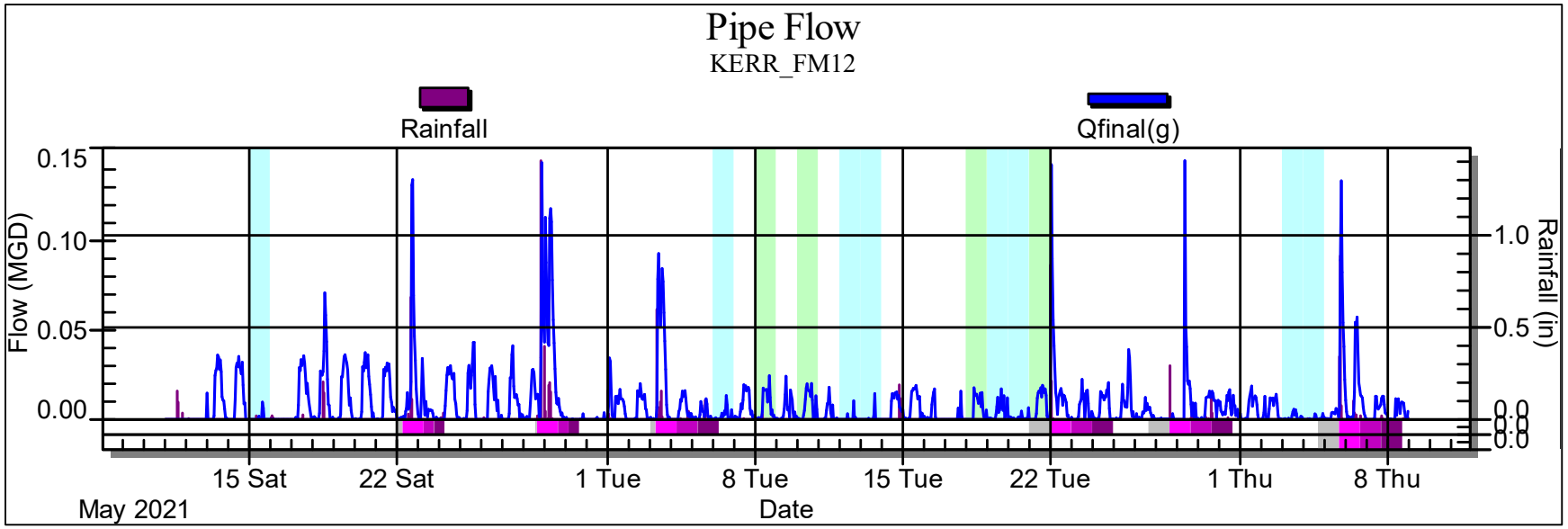

Storm Event - 6/3/2021 7:00:00 AM
KERR_FM09
Rainfall
Gross Q
Gross I/I
Precomp(+)
Weekdays
Weekends
Flow (MGD)
Rainfall (in)
Storms
2 Wed
Jun 2021
3 Thu
4 Fri
5 Sat
6 Sun
7 Mon
Date

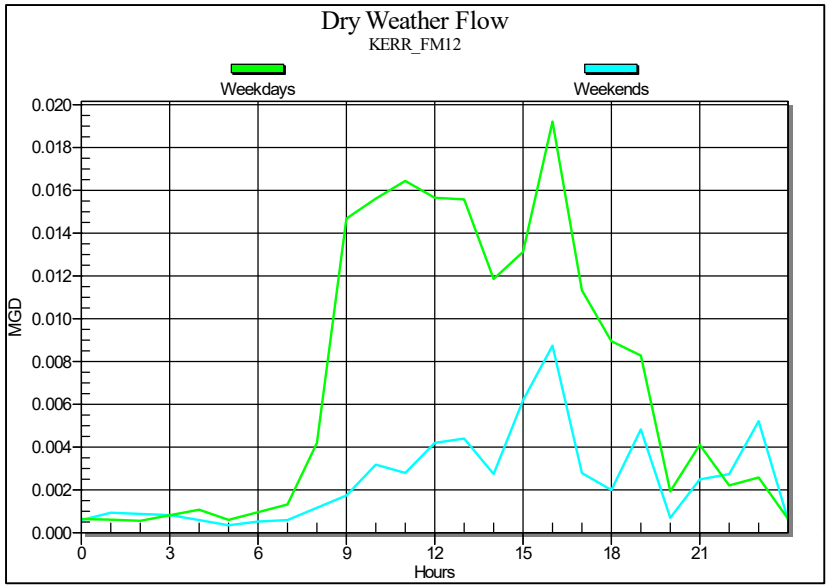

Storm Event - 6/22/2021
KERR_FM09
Rainfall
Gross Q
Gross I/I
Precomp(-)
Weekdays
Flow (MGD)
Rainfall (in)
Storms
21 Mon
Jun 2021
22 Tue
23 Wed
24 Thu
25 Fri
26 Sat
Date

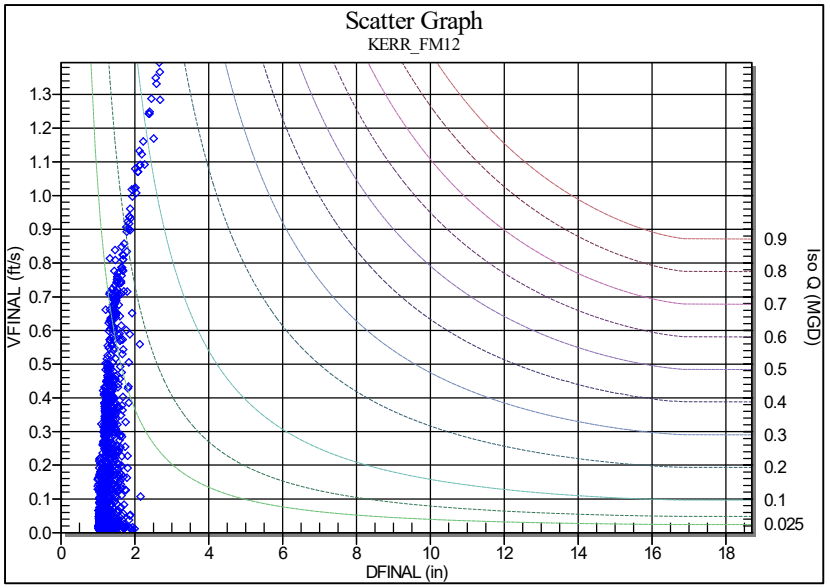

Storm Event - 6/27/2021 4:00:00 PM
KERR_FM09
Rainfall
Gross Q
Gross I/I
Precomp(+)
Weekends
Weekdays
Flow (MGD)
Rainfall (in)
Storms
26 Sat
Jun 2021
27 Sun
28 Mon
29 Tue
30 Wed
1 Thu
Date

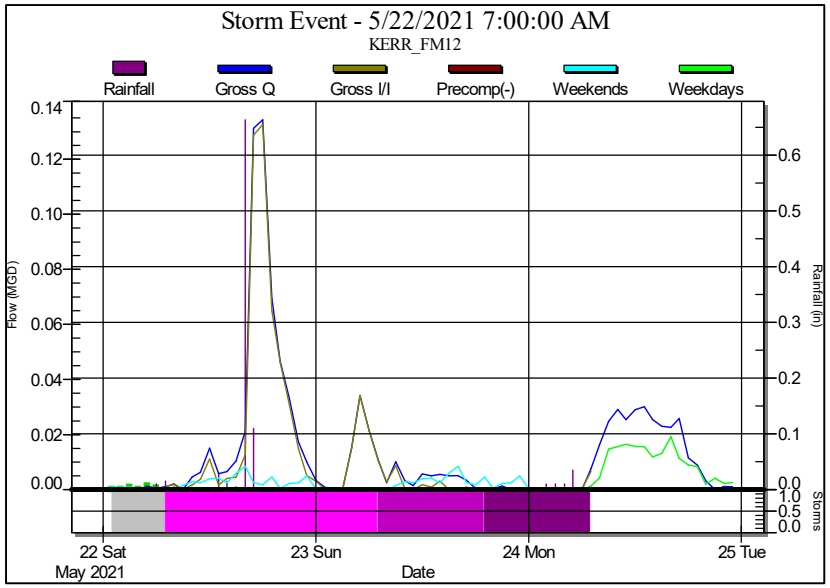

Storm Event - 7/5/2021 5:00:00 PM
KERR_FM09
Rainfall
Gross Q
Gross I/I
Precomp(+)
Weekdays
Flow (MGD)
Rainfall (in)
Storms
5 Mon
Jul 2021
6 Tue
7 Wed
8 Thu
9 Fri
Date

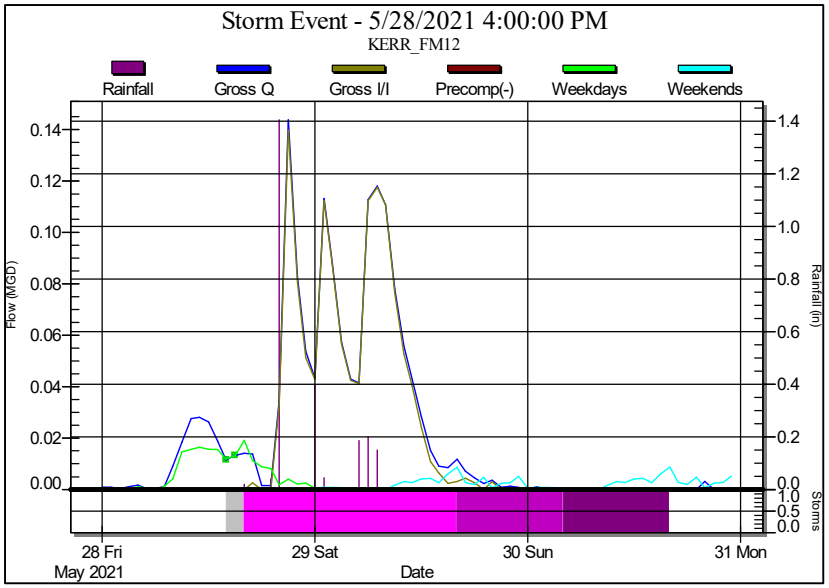

Q vs i - KERR_FM08
Total Event Net RDII Volume vs. Rainfall Depth
AllStorms
Total Event Net RDII Volume (mg)
Total Event Rainfall Depth (in)
(7/5/2021)
(6/28/2021)
(6/3/2021)
(5/22/2021)
(6/27/2021)

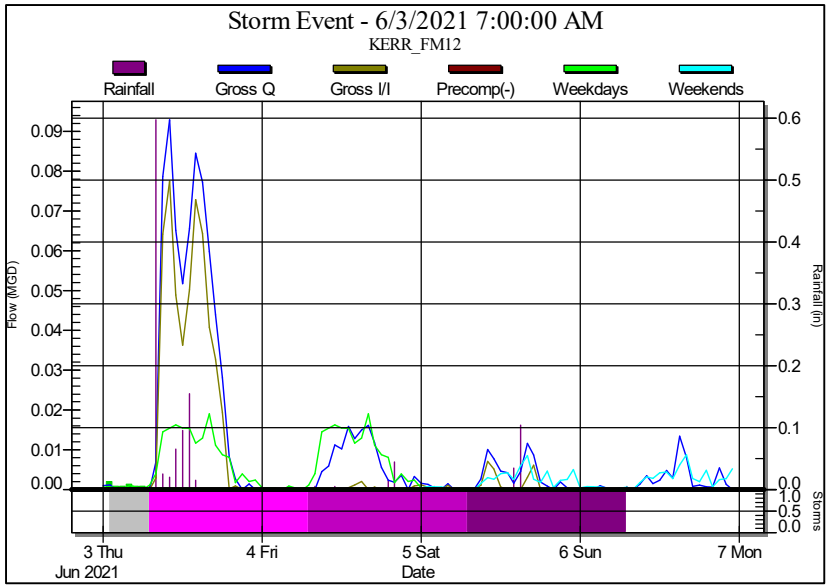

Pipe Flow
KERR_FM12
Rainfall
Qfinal(g)
Flow (MGD)
0.15
0.10
0.05
0.00
Rainfall (in)
1.0
0.5
0.0
15 Sat
22 Sat
1 Tue
8 Tue
15 Tue
22 Tue
1 Thu
8 Thu
May 2021
Date

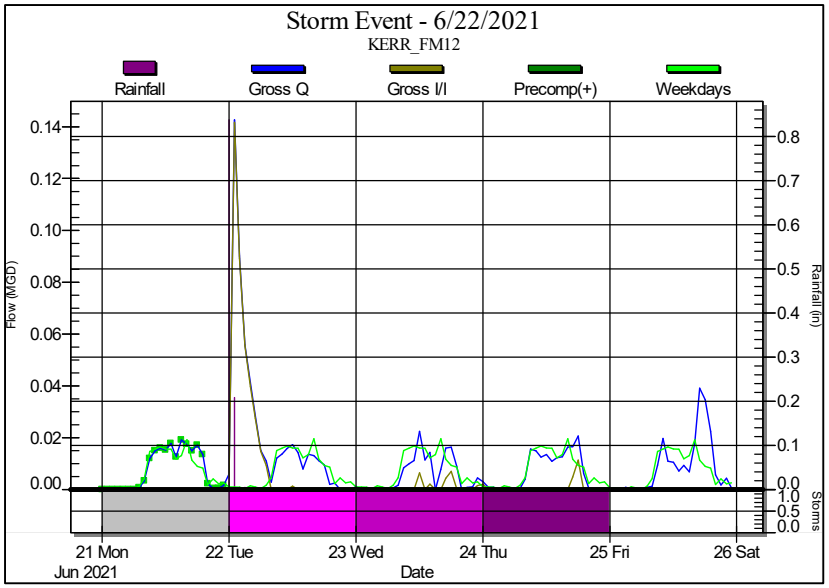

Dry Weather Flow
KERR_FM12
Weekdays
Weekends
MGD
0.020
0.018
0.016
0.014
0.012
0.010
0.008
0.006
0.004
0.002
0.000
0
3
6
9
12
15
18
21
Hours

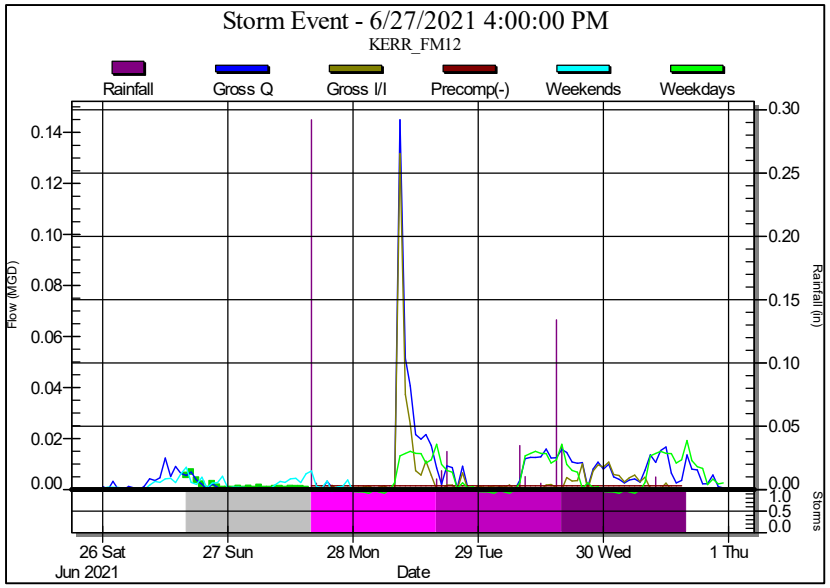

Scatter Graph
KERR_FM12
VFINAL (ft/s)
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Iso Q (MGD)
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.025
0
2
4
6
8
10
12
14
16
18
DFINAL (in)

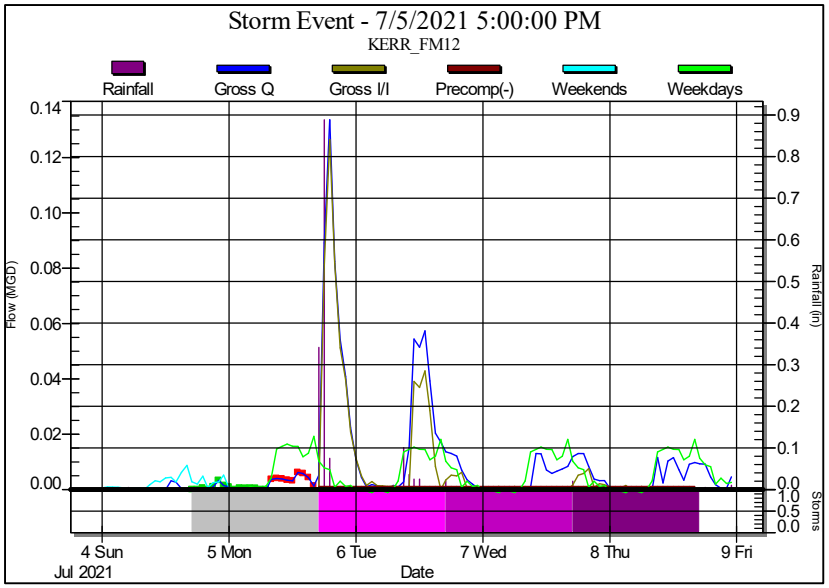

Storm Event - 5/22/2021 7:00:00 AM
KERR_FM12
Rainfall
Gross Q
Gross I/I
Precomp(-)
Weekends
Weekdays
Flow (MGD)
Rainfall (in)
Storms
22 Sat
May 2021
23 Sun
24 Mon
25 Tue
Date

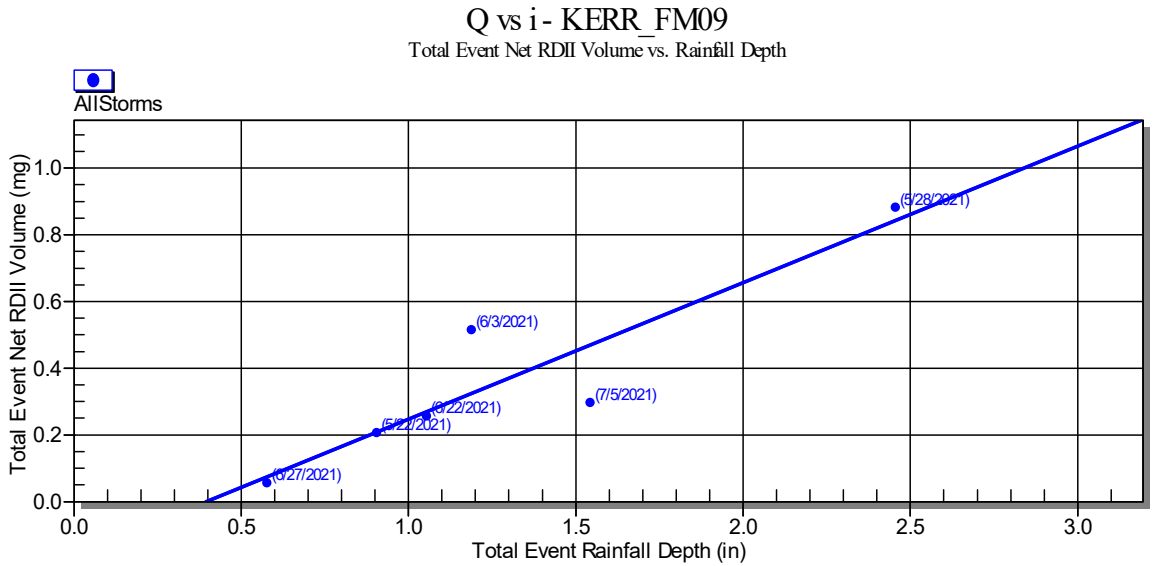

Storm Event - 5/28/2021 4:00:00 PM
KERR_FM12
Rainfall
Gross Q
Gross I/I
Precomp(-)
Weekdays
Weekends
Flow (MGD)
Rainfall (in)
Storms
28 Fri
May 2021
29 Sat
30 Sun
31 Mon
Date

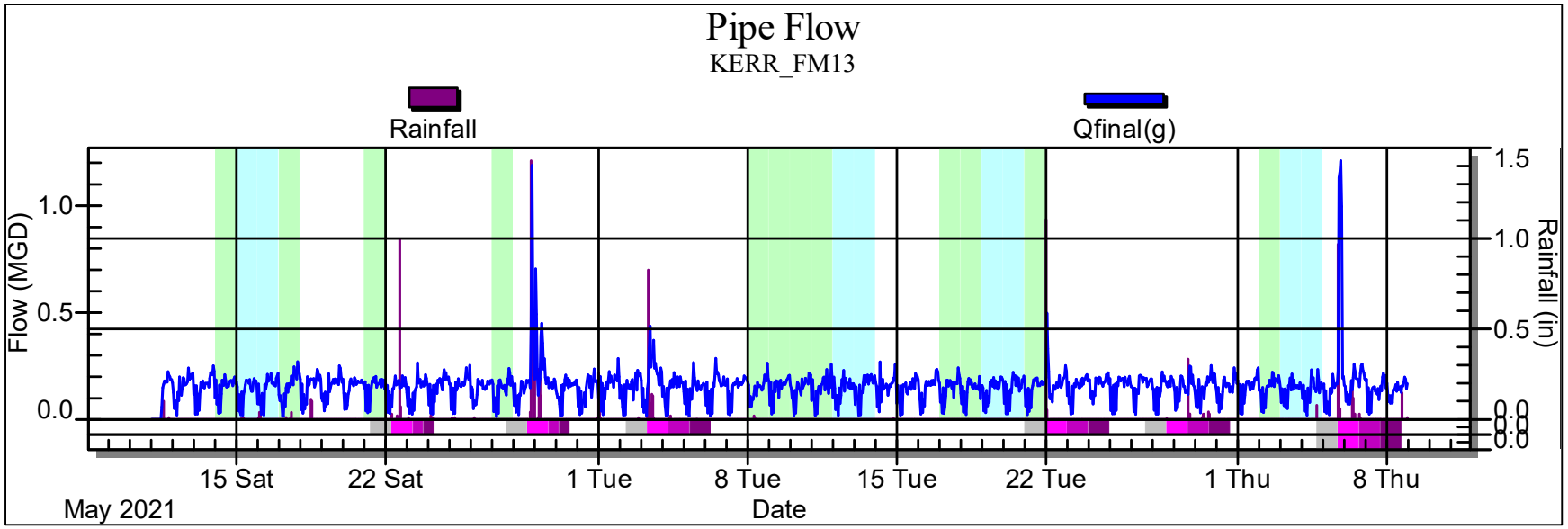

Storm Event - 6/3/2021 7:00:00 AM
KERR_FM12
Rainfall
Gross Q
Gross I/I
Precomp(-)
Weekdays
Weekends
Flow (MGD)
Rainfall (in)
Storms
3 Thu
Jun 2021
4 Fri
5 Sat
6 Sun
7 Mon
Date

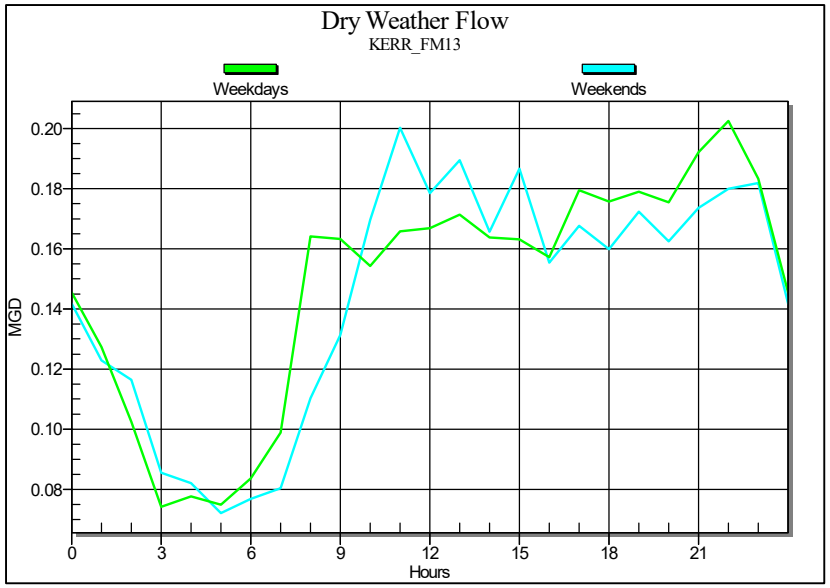

Storm Event - 6/22/2021
KERR_FM12
Rainfall
Gross Q
Gross I/I
Precomp(+)
Weekdays
Flow (MGD)
Rainfall (in)
Storms
21 Mon
Jun 2021
22 Tue
23 Wed
24 Thu
25 Fri
26 Sat
Date

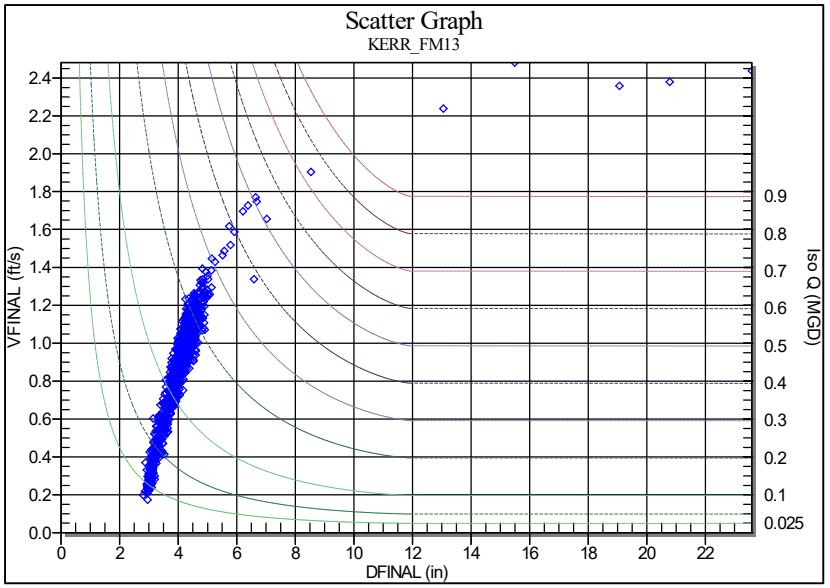

Storm Event - 6/27/2021 4:00:00 PM
KERR_FM12
Rainfall
Gross Q
Gross I/I
Precomp(-)
Weekends
Weekdays
Flow (MGD)
Rainfall (in)
Storms
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
0.30
0.25
0.20
0.15
0.10
0.05
0.00
1.0
0.5
0.0
26 Sat
Jun 2021
27 Sun
28 Mon
29 Tue
30 Wed
1 Thu
Date

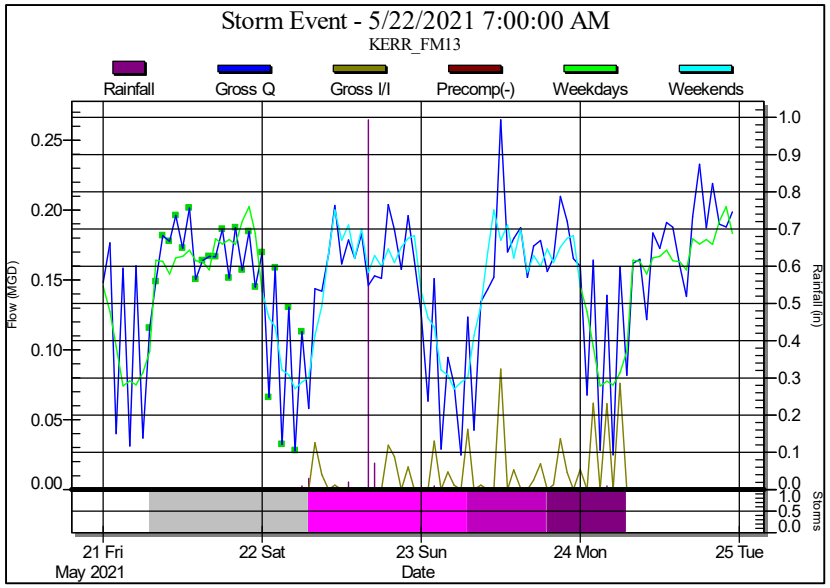

Storm Event - 7/5/2021 5:00:00 PM
KERR_FM12
Rainfall
Gross Q
Gross I/I
Precomp(-)
Weekends
Weekdays
Flow (MGD)
Rainfall (in)
Storms
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
1.0
0.5
0.0
4 Sun
Jul 2021
5 Mon
6 Tue
7 Wed
8 Thu
9 Fri
Date

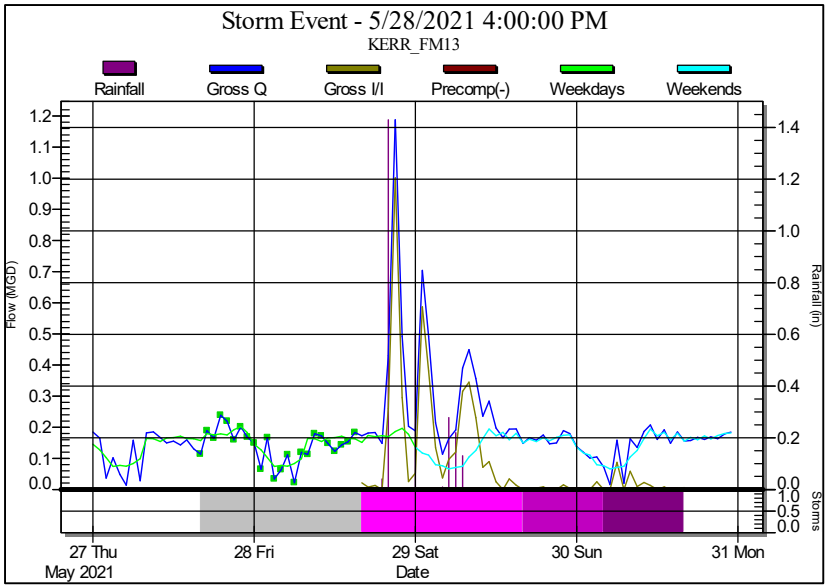

Q vs i - KERR_FM09
Total Event Net RDII Volume vs. Rainfall Depth
AllStorms
Total Event Net RDII Volume (mg)
1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
Total Event Rainfall Depth (in)
(6/3/2021)
(7/5/2021)
(6/22/2021)
(5/27/2021)

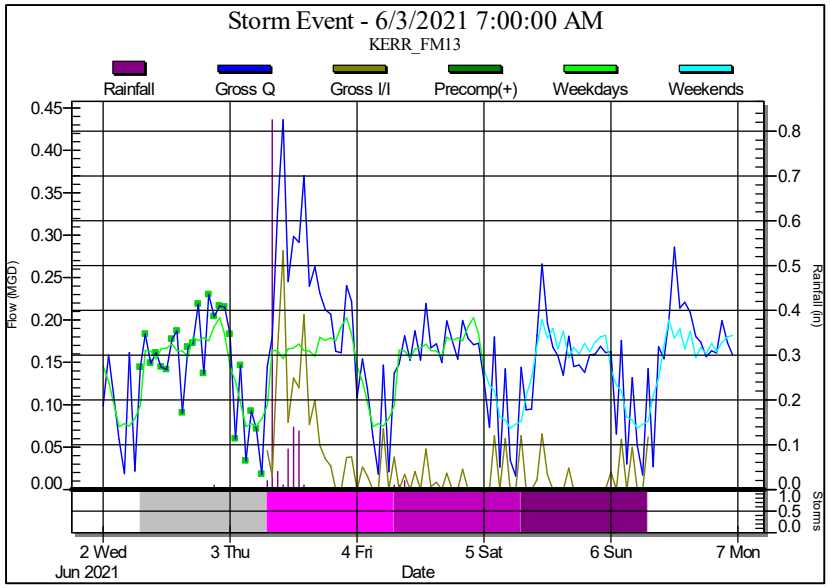

Pipe Flow
KERR_FM13
Rainfall
Qfinal(g)
Flow (MGD)
1.0
0.5
0.0
1.5
1.0
0.5
0.0
Rainfall (in)
15 Sat
22 Sat
1 Tue
8 Tue
15 Tue
22 Tue
1 Thu
8 Thu
May 2021
Date

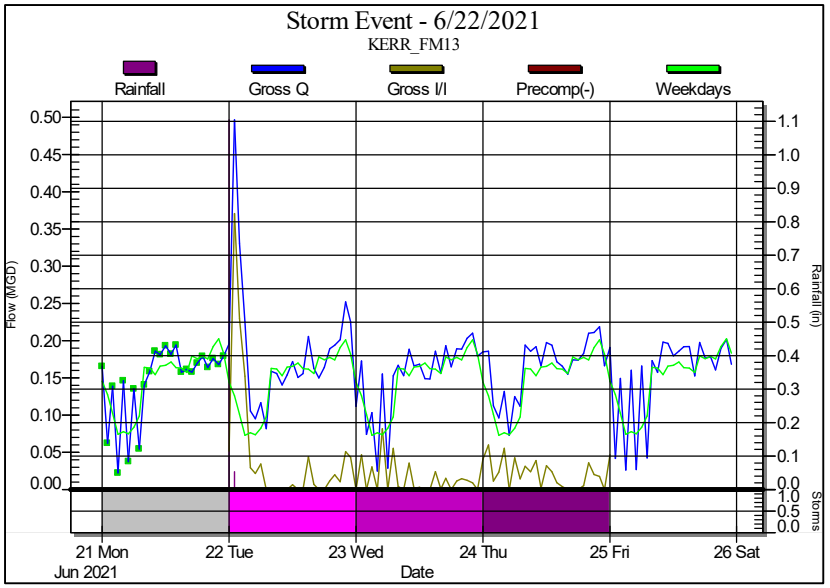

Dry Weather Flow
KERR_FM13
Weekdays
Weekends
MGD
0.20
0.18
0.16
0.14
0.12
0.10
0.08
0
3
6
9
12
15
18
21
Hours

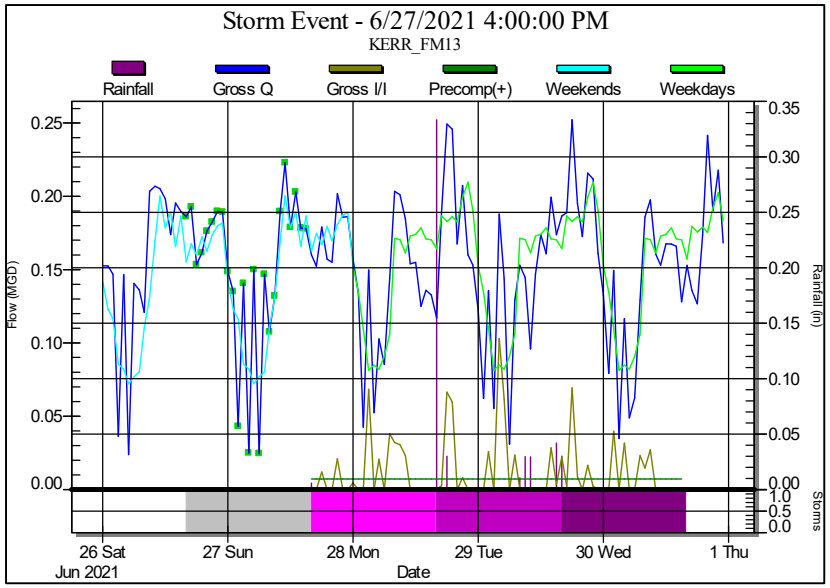

Scatter Graph
KERR_FM13
VFINAL (ft/s)
2.4
2.2
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0
2
4
6
8
10
12
14
16
18
20
22
DFINAL (in)
Iso Q (MGD)
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.025

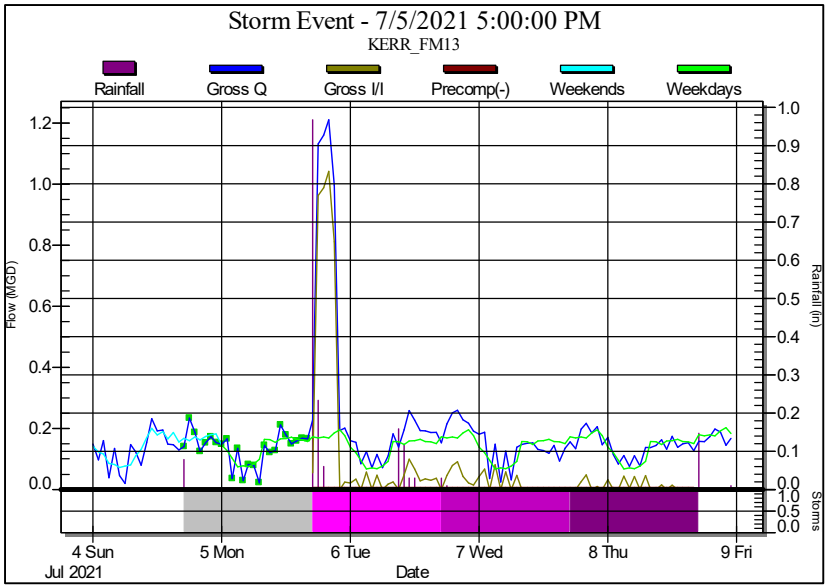

Storm Event - 5/22/2021 7:00:00 AM
KERR_FM13
Rainfall
Gross Q
Gross I/I
Precomp(-)
Weekdays
Weekends
Flow (MGD)
Rainfall (in)
Storms
21 Fri
May 2021
22 Sat
23 Sun
24 Mon
25 Tue
Date

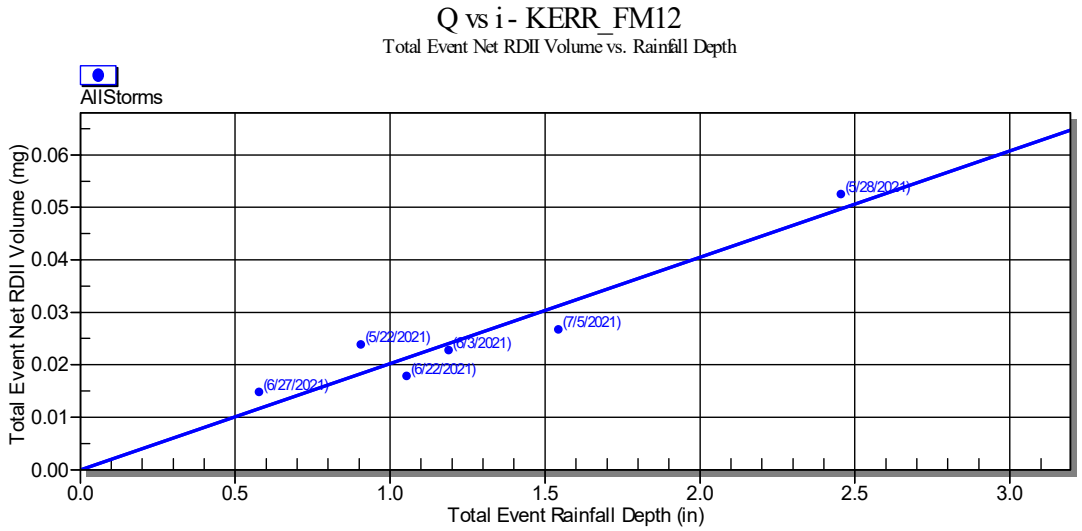

Storm Event - 5/28/2021 4:00:00 PM
KERR_FM13
Rainfall
Gross Q
Gross I/I
Precomp(-)
Weekdays
Weekends
Flow (MGD)
Rainfall (in)
Storms
27 Thu
May 2021
28 Fri
29 Sat
30 Sun
31 Mon
Date

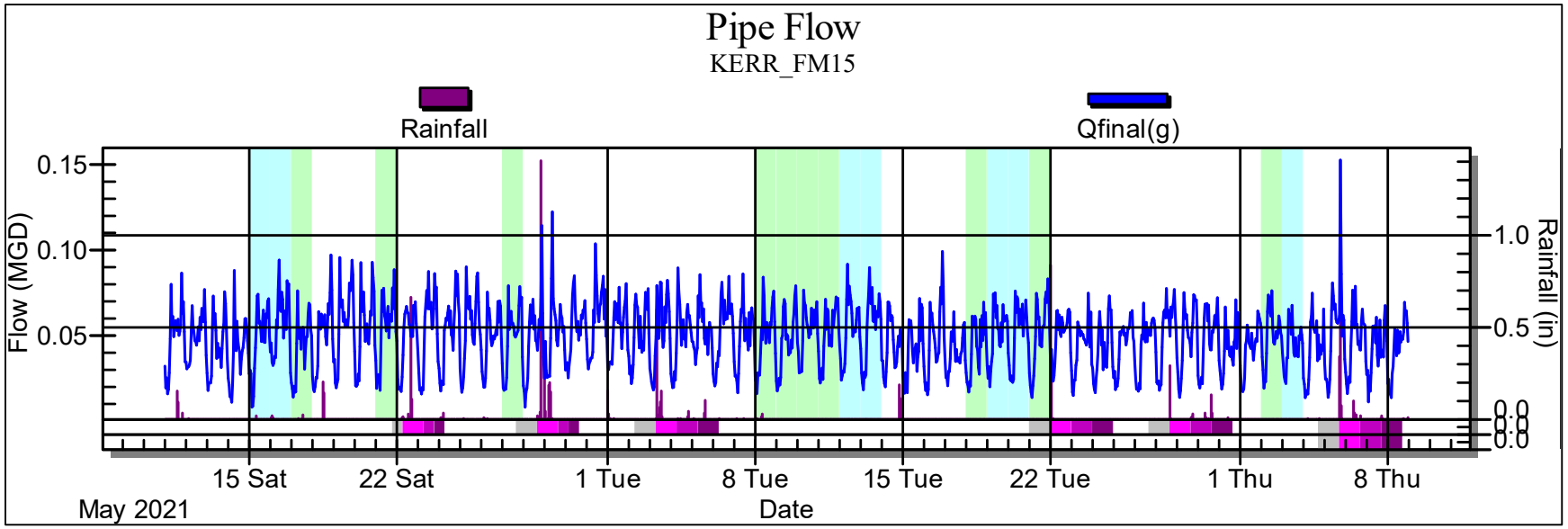

Storm Event - 6/3/2021 7:00:00 AM
KERR_FM13
Rainfall
Gross Q
Gross I/I
Precomp(+)
Weekdays
Weekends
Flow (MGD)
Rainfall (in)
Storms
2 Wed
Jun 2021
3 Thu
4 Fri
5 Sat
6 Sun
7 Mon
Date

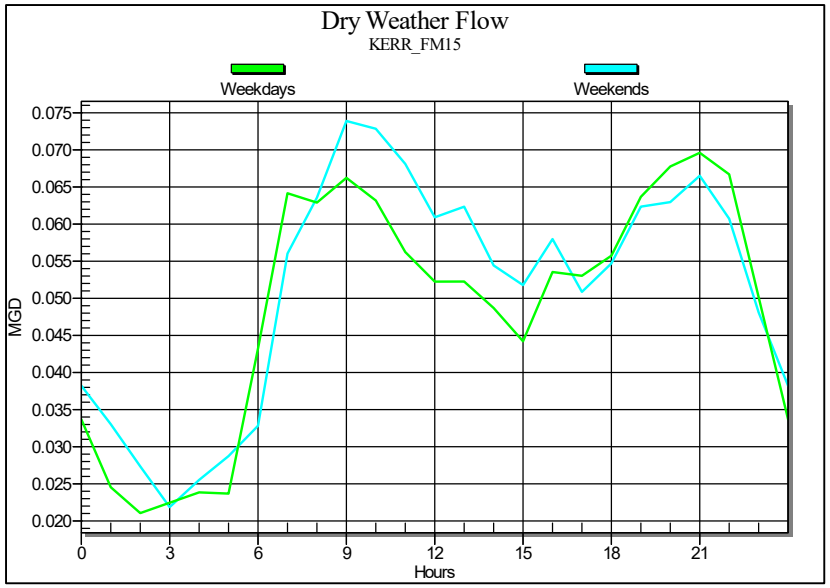

Storm Event - 6/22/2021
KERR_FM13
Rainfall
Gross Q
Gross I/I
Precomp(-)
Weekdays
Flow (MGD)
Rainfall (in)
Storms
21 Mon
Jun 2021
22 Tue
23 Wed
24 Thu
25 Fri
26 Sat
Date

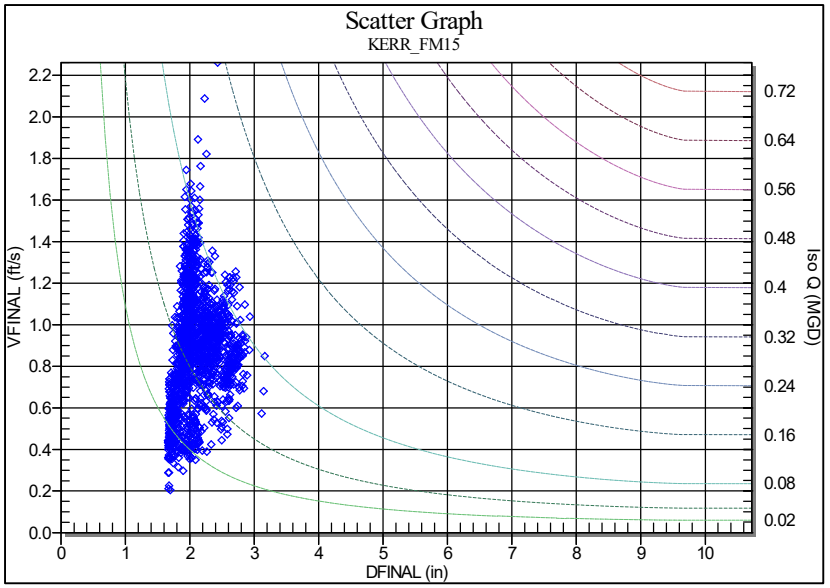

Storm Event - 6/27/2021 4:00:00 PM
KERR_FM13
Rainfall
Gross Q
Gross I/I
Precomp(+)
Weekends
Weekdays
Flow (MGD)
Rainfall (in)
Storms
0.25
0.20
0.15
0.10
0.05
0.00
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
1.0
0.5
0.0
26 Sat
Jun 2021
27 Sun
28 Mon
29 Tue
30 Wed
1 Thu
Date

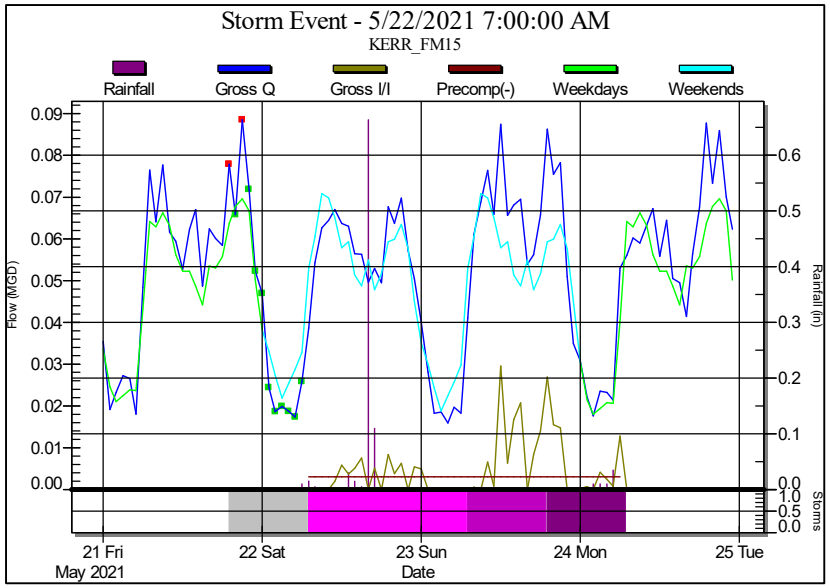

Storm Event - 7/5/2021 5:00:00 PM
KERR_FM13
Rainfall
Gross Q
Gross I/I
Precomp(-)
Weekends
Weekdays
Flow (MGD)
Rainfall (in)
Storms
1.2
1.0
0.8
0.6
0.4
0.2
0.0
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
1.0
0.5
0.0
4 Sun
Jul 2021
5 Mon
6 Tue
7 Wed
8 Thu
9 Fri
Date

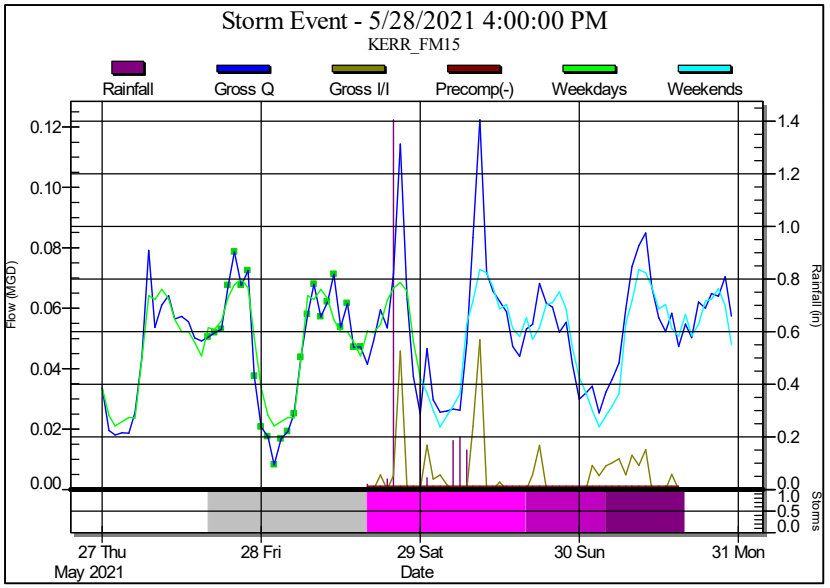

Q vs i - KERR_FM12
Total Event Net RDII Volume vs. Rainfall Depth
AllStorms
Total Event Net RDII Volume (mg)
0.06
0.05
0.04
0.03
0.02
0.01
0.00
0.0
0.5
1.0
1.5
2.0
2.5
3.0
Total Event Rainfall Depth (in)
(5/28/2021)
(7/5/2021)
(5/22/2021)
(6/3/2021)
(6/22/2021)
(6/27/2021)

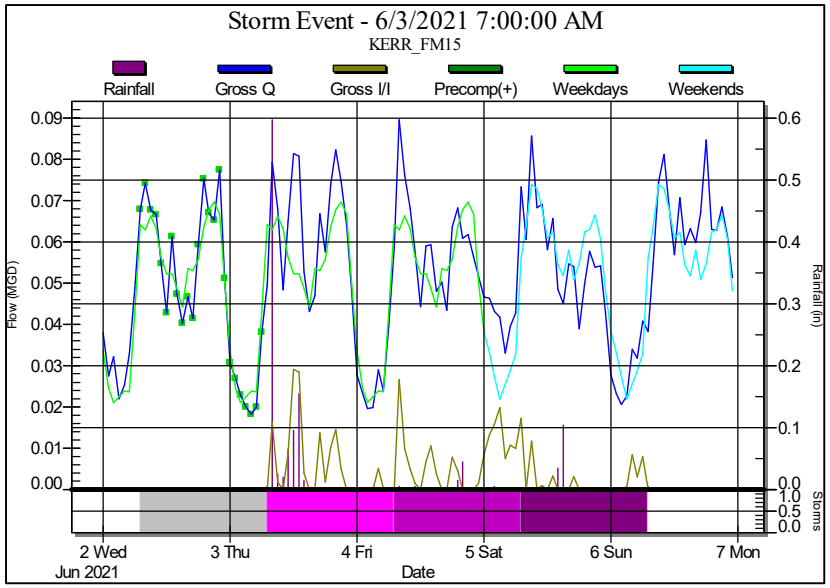

Pipe Flow
KERR_FM15
Rainfall
Qfinal(g)
Flow (MGD)
0.15
0.10
0.05
1.0
0.5
0.0
Rainfall (in)
15 Sat
22 Sat
1 Tue
8 Tue
15 Tue
22 Tue
1 Thu
8 Thu
May 2021
Date

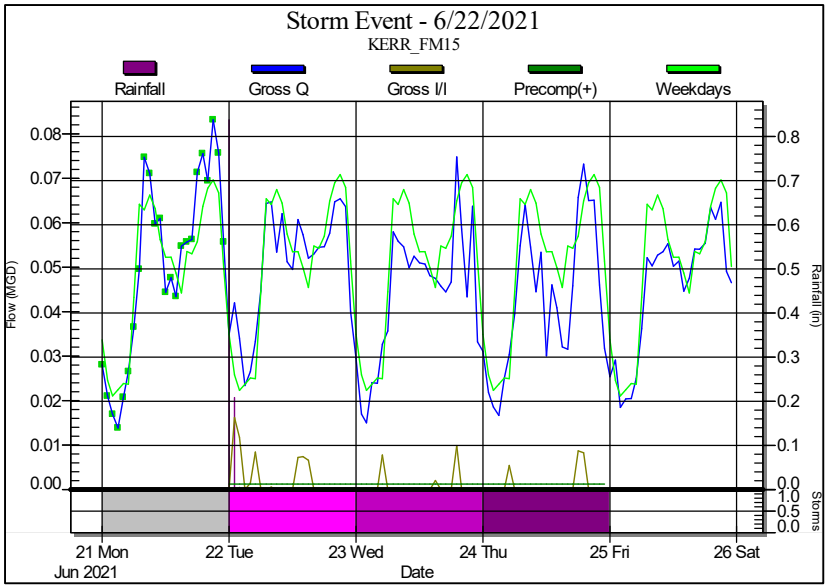

Dry Weather Flow
KERR_FM15
Weekdays
Weekends
MGD
0.075
0.070
0.065
0.060
0.055
0.050
0.045
0.040
0.035
0.030
0.025
0.020
0
3
6
9
12
15
18
21
Hours

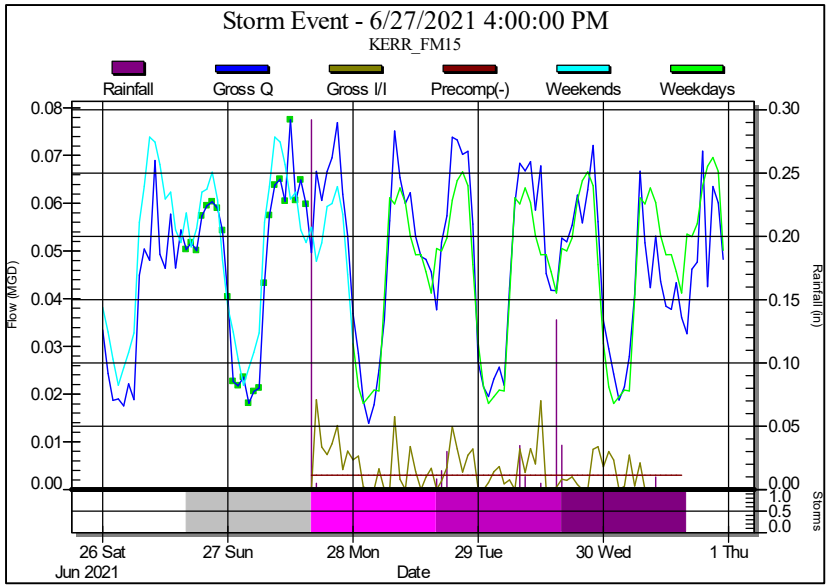

Scatter Graph
KERR_FM15
VFINAL (ft/s)
2.2
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0
1
2
3
4
5
6
7
8
9
10
DFINAL (in)
Iso Q (MGD)
0.72
0.64
0.56
0.48
0.4
0.32
0.24
0.16
0.08
0.02

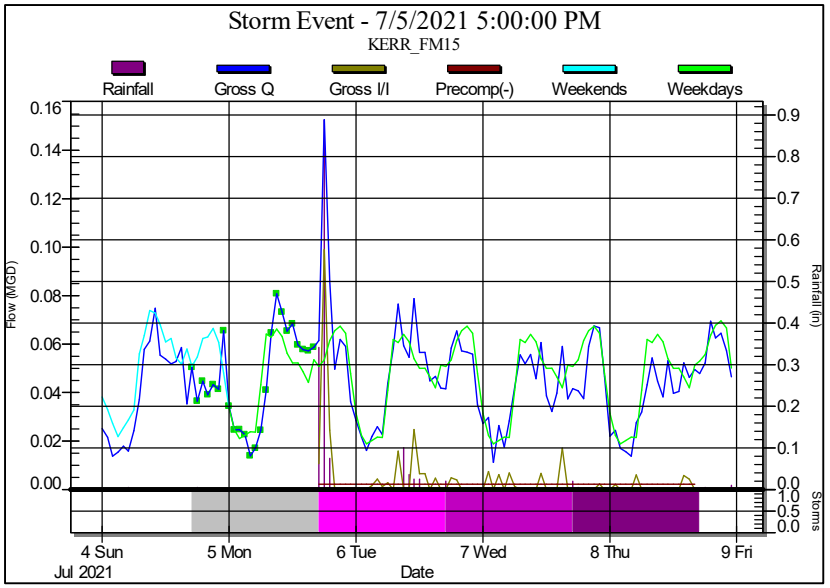

Storm Event - 5/22/2021 7:00:00 AM
KERR_FM15
Rainfall
Gross Q
Gross I/I
Precomp(-)
Weekdays
Weekends
Flow (MGD)
Rainfall (in)
Storms
21 Fri
May 2021
22 Sat
23 Sun
24 Mon
25 Tue
Date

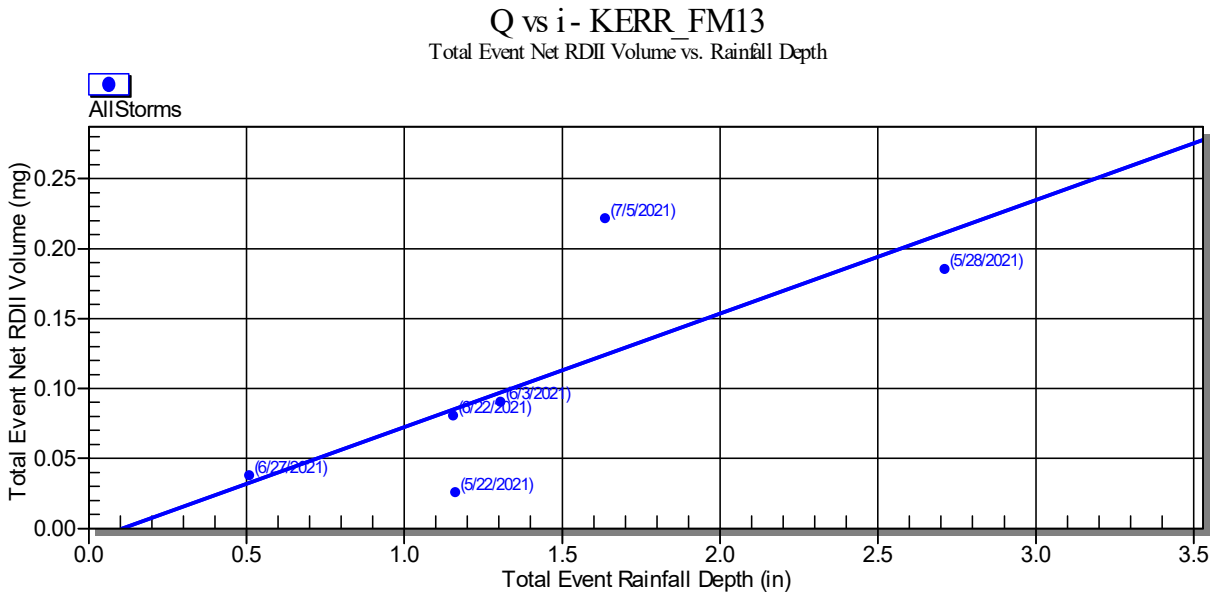

Storm Event - 5/28/2021 4:00:00 PM
KERR_FM15
Rainfall
Gross Q
Gross I/I
Precomp(-)
Weekdays
Weekends
Flow (MGD)
Rainfall (in)
Storms
27 Thu
May 2021
28 Fri
29 Sat
30 Sun
31 Mon
Date

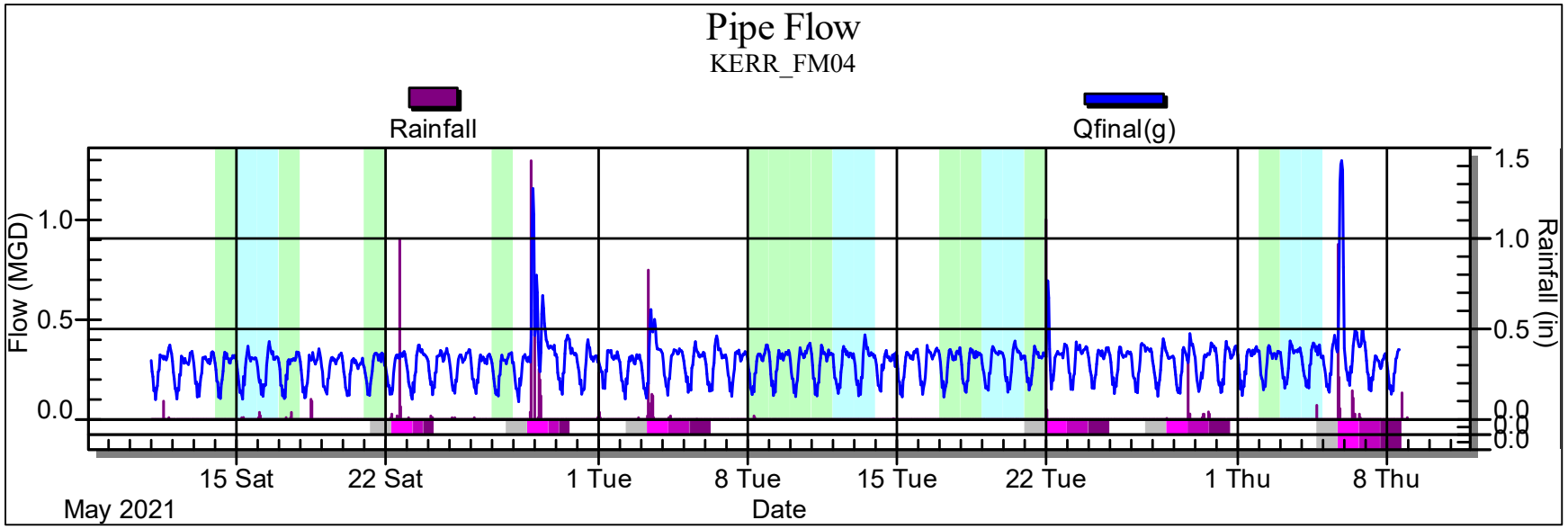

Storm Event - 6/3/2021 7:00:00 AM
KERR_FM15
Rainfall
Gross Q
Gross I/I
Precomp(+)
Weekdays
Weekends
Flow (MGD)
Rainfall (in)
Storms
2 Wed
Jun 2021
3 Thu
4 Fri
5 Sat
6 Sun
7 Mon
Date

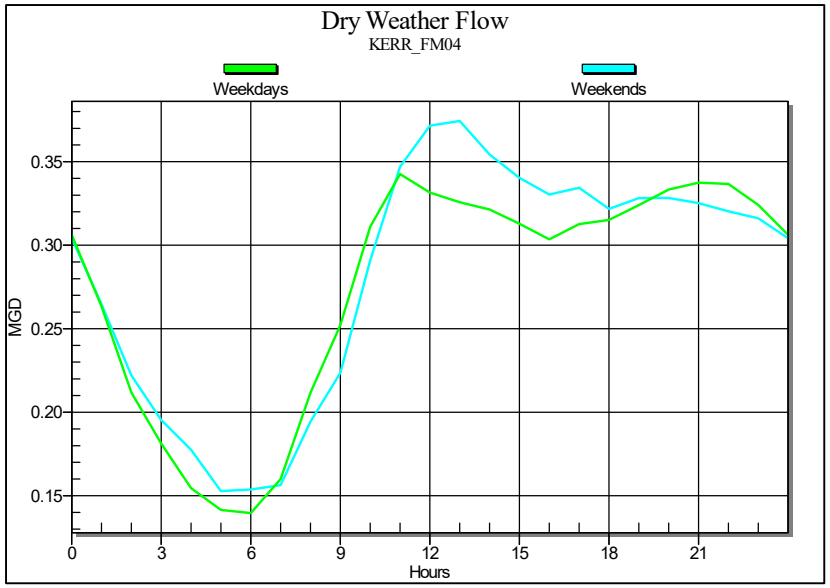

Storm Event - 6/22/2021
KERR_FM15
Rainfall
Gross Q
Gross I/I
Precomp(+)
Weekdays
Flow (MGD)
Rainfall (in)
Storms
21 Mon
Jun 2021
22 Tue
23 Wed
24 Thu
25 Fri
26 Sat
Date

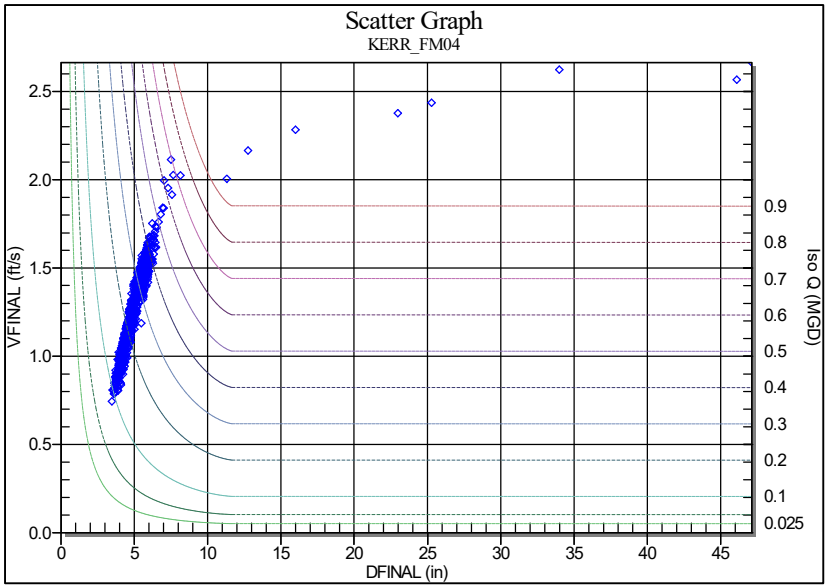

Storm Event - 6/27/2021 4:00:00 PM
KERR_FM15
Rainfall
Gross Q
Gross I/I
Precomp(-)
Weekends
Weekdays
Flow (MGD)
Rainfall (in)
Storms
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
0.30
0.25
0.20
0.15
0.10
0.05
0.00
1.0
0.5
0.0
26 Sat
Jun 2021
27 Sun
28 Mon
29 Tue
30 Wed
1 Thu
Date

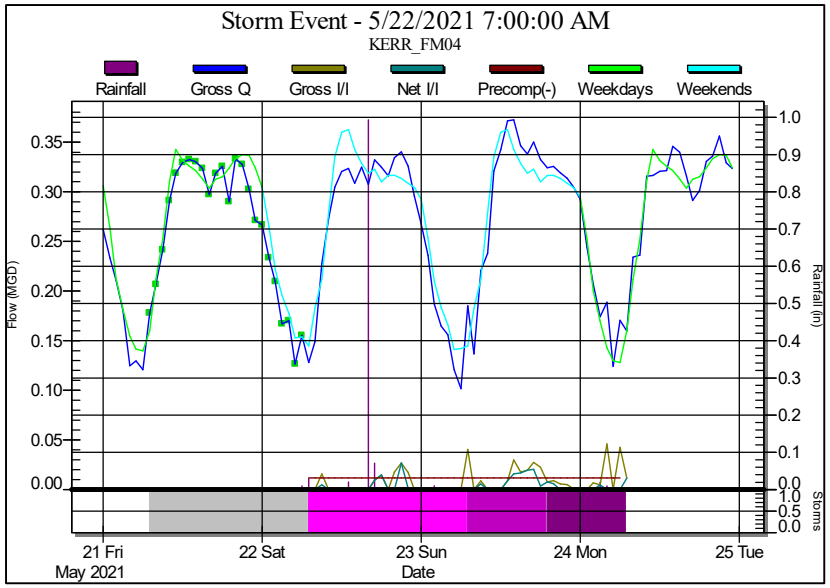

Storm Event - 7/5/2021 5:00:00 PM
KERR_FM15
Rainfall
Gross Q
Gross I/I
Precomp(-)
Weekends
Weekdays
Flow (MGD)
Rainfall (in)
Storms
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
1.0
0.5
0.0
4 Sun
Jul 2021
5 Mon
6 Tue
7 Wed
8 Thu
9 Fri
Date

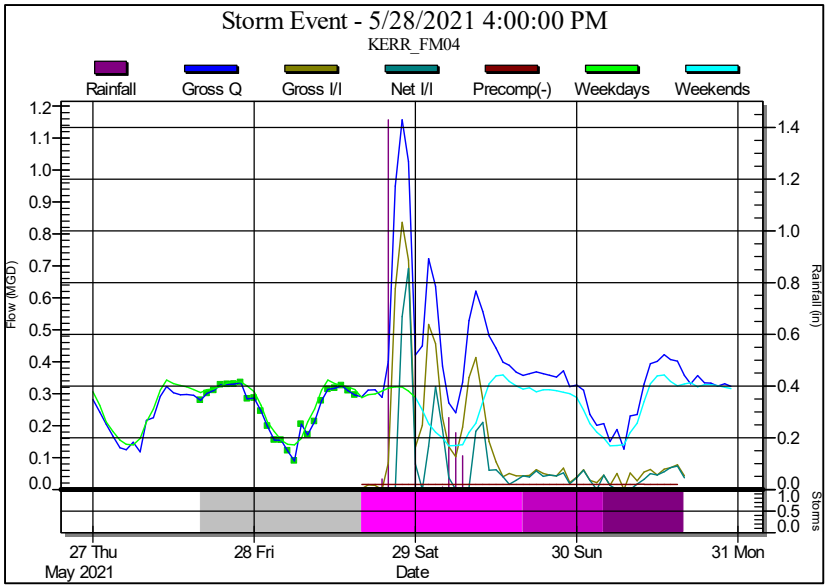

Q vs i - KERR_FM13
Total Event Net RDII Volume vs. Rainfall Depth
AllStorms
Total Event Net RDII Volume (mg)
0.25
0.20
0.15
0.10
0.05
0.00
(7/5/2021)
(5/28/2021)
(6/3/2021)
(6/22/2021)
(6/27/2021)
(5/22/2021)
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
Total Event Rainfall Depth (in)

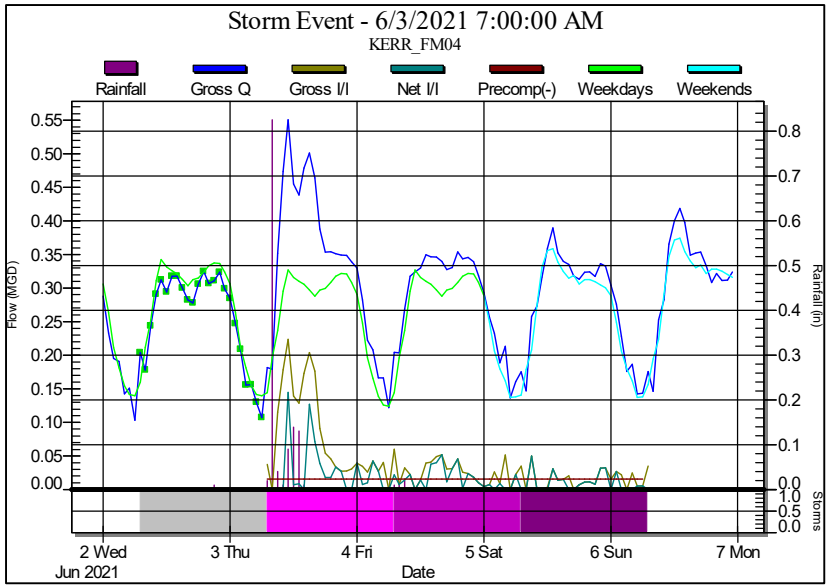

Pipe Flow
KERR_FM04
Rainfall
Qfinal(g)
Flow (MGD)
1.0
0.5
0.0
1.5
1.0
0.5
0.0
Rainfall (in)
15 Sat
22 Sat
1 Tue
8 Tue
15 Tue
22 Tue
1 Thu
8 Thu
May 2021
Date

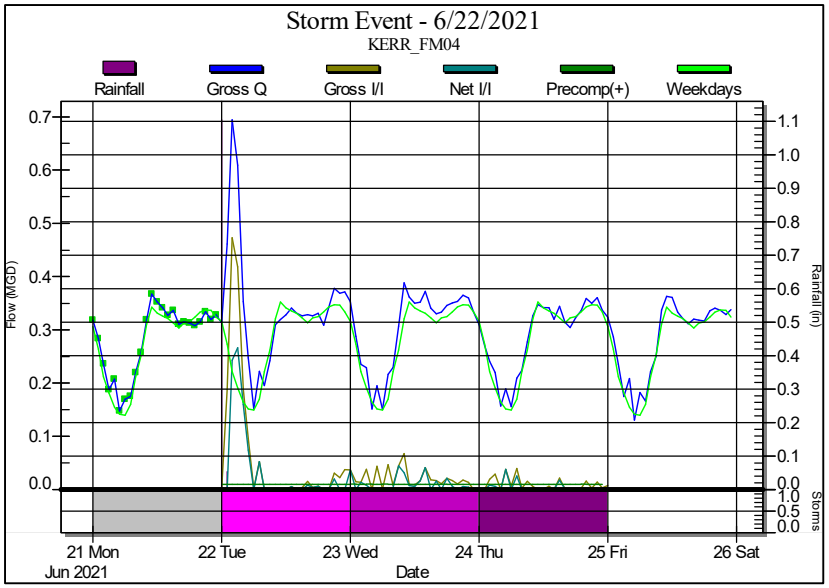

Dry Weather Flow
KERR_FM04
Weekdays
Weekends
MGD
0.35
0.30
0.25
0.20
0.15
0
3
6
9
12
15
18
21
Hours

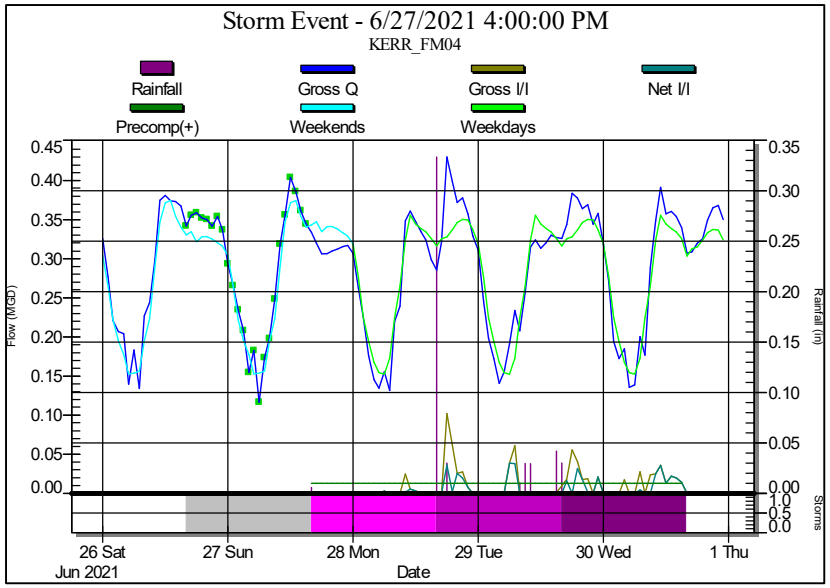

Scatter Graph
KERR_FM04
VFINAL (ft/s)
2.5
2.0
1.5
1.0
0.5
0.0
0
5
10
15
20
25
30
35
40
45
DFINAL (in)
Iso Q (MGD)
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.025

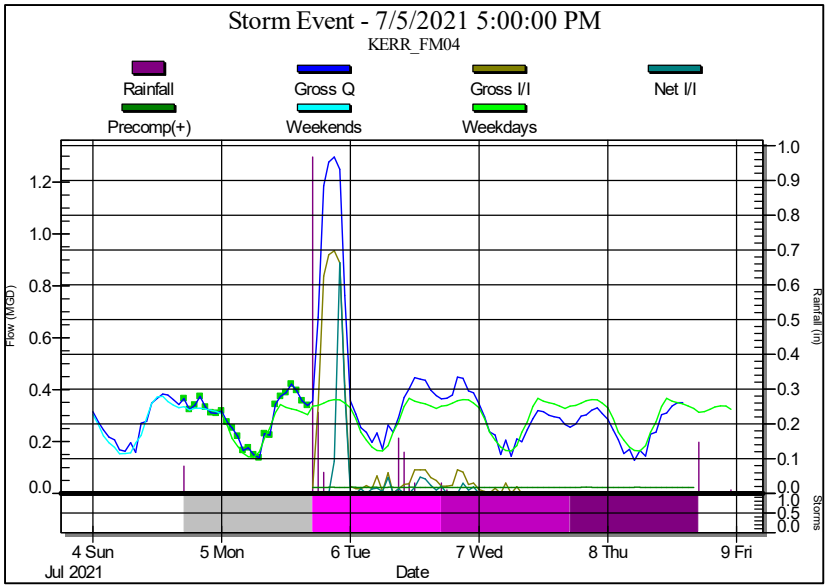

Storm Event - 5/22/2021 7:00:00 AM
KERR_FM04
Rainfall
Gross Q
Gross I/I
Net I/I
Precomp(-)
Weekdays
Weekends
Flow (MGD)
Rainfall (in)
Storms
21 Fri
May 2021
22 Sat
23 Sun
24 Mon
25 Tue
Date

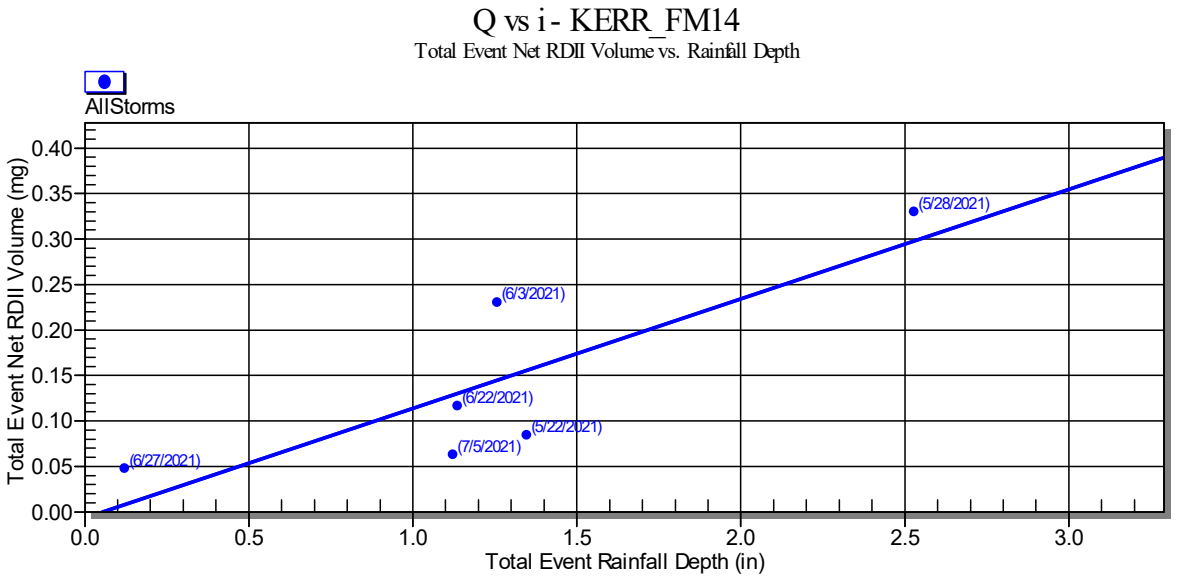

Storm Event - 5/28/2021 4:00:00 PM
KERR_FM04
Rainfall
Gross Q
Gross I/I
Net I/I
Precomp(-)
Weekdays
Weekends
Flow (MGD)
Rainfall (in)
Storms
27 Thu
May 2021
28 Fri
29 Sat
30 Sun
31 Mon
Date

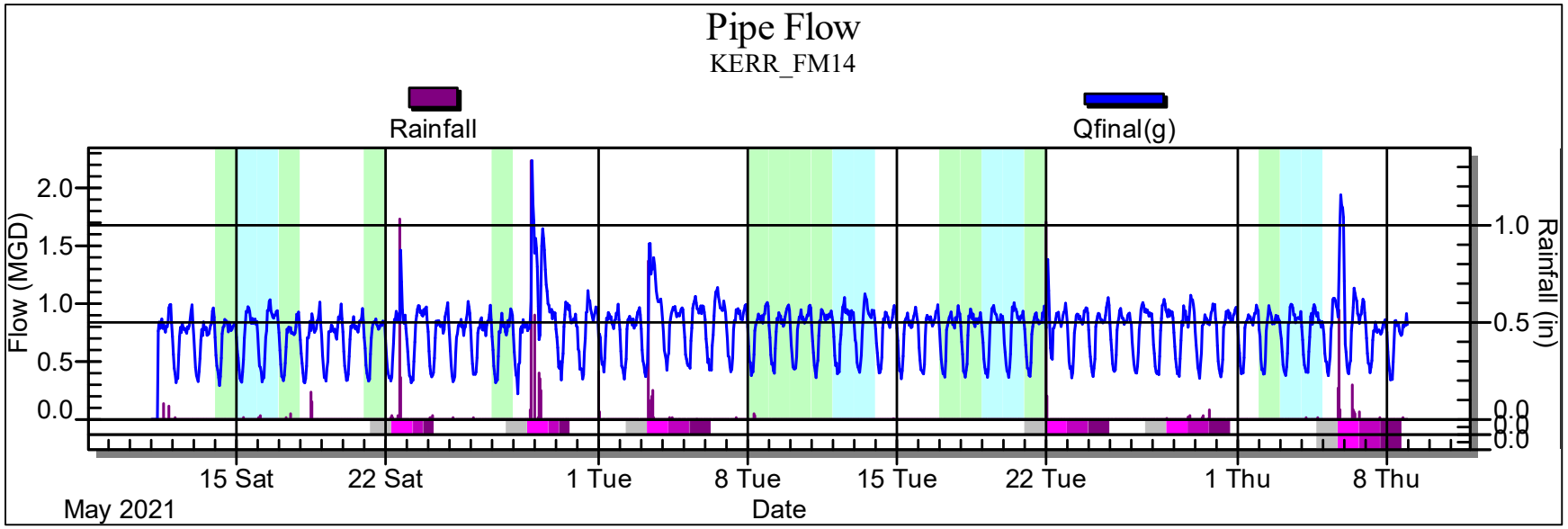

Storm Event - 6/3/2021 7:00:00 AM
KERR_FM04
Rainfall
Gross Q
Gross I/I
Net I/I
Precomp(-)
Weekdays
Weekends
Flow (MGD)
Rainfall (in)
Storms
2 Wed
Jun 2021
3 Thu
4 Fri
5 Sat
6 Sun
7 Mon
Date

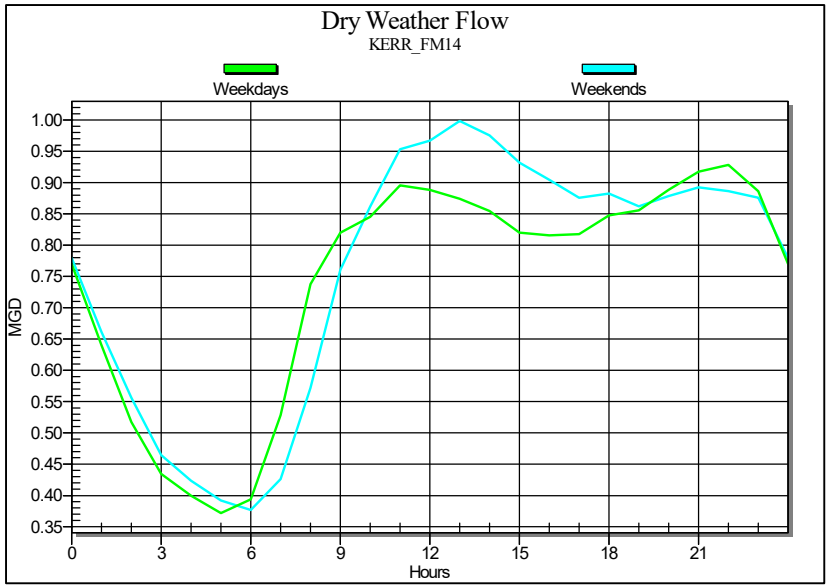

Storm Event - 6/22/2021
KERR_FM04
Rainfall
Gross Q
Gross I/I
Net I/I
Precomp(+)
Weekdays
Flow (MGD)
Rainfall (in)
Storms
21 Mon
Jun 2021
22 Tue
23 Wed
24 Thu
25 Fri
26 Sat
Date

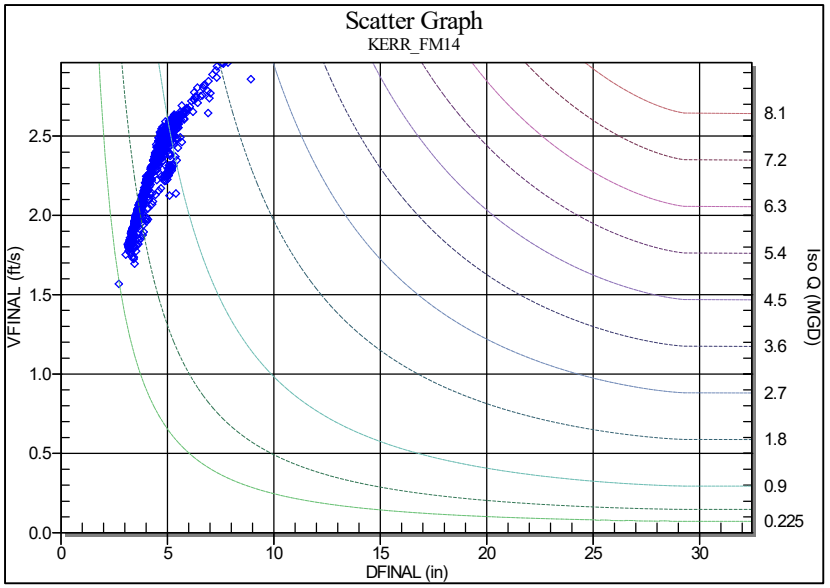

Storm Event - 6/27/2021 4:00:00 PM
KERR_FM04
Rainfall
Gross Q
Gross I/I
Net I/I
Precomp(+)
Weekends
Weekdays
Flow (MGD)
Rainfall (in)
Storms
26 Sat
Jun 2021
27 Sun
28 Mon
29 Tue
30 Wed
1 Thu
Date

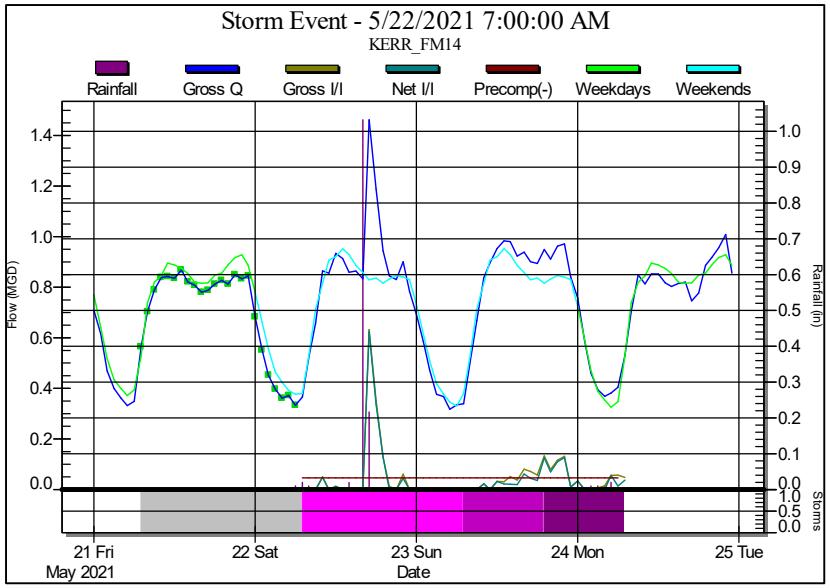

Storm Event - 7/5/2021 5:00:00 PM
KERR_FM04
Rainfall
Gross Q
Gross I/I
Net I/I
Precomp(+)
Weekends
Weekdays
Flow (MGD)
Rainfall (in)
Storms
4 Sun
Jul 2021
5 Mon
6 Tue
7 Wed
8 Thu
9 Fri
Date

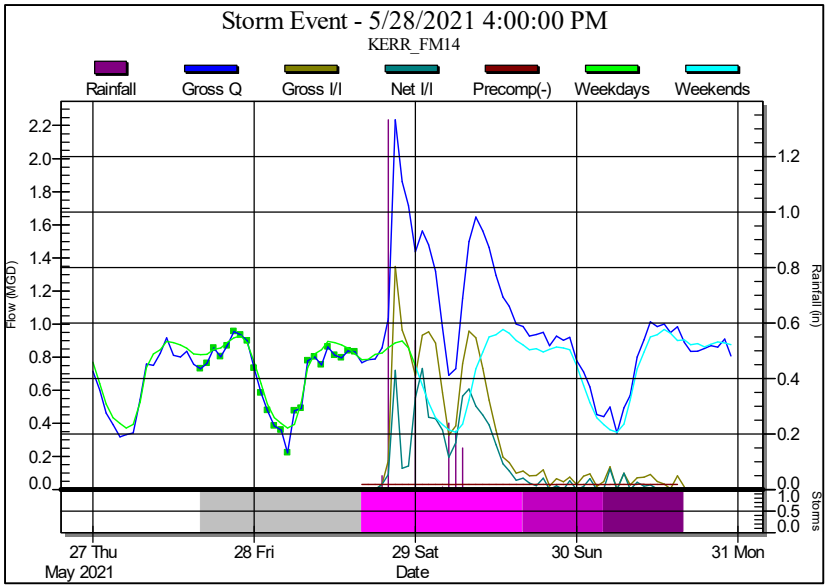

Q vs i - KERR_FM14
Total Event Net RDII Volume vs. Rainfall Depth
AllStorms
Total Event Net RDII Volume (mg)
Total Event Rainfall Depth (in)
(6/27/2021)
(6/3/2021)
(6/22/2021)
(5/22/2021)
(7/5/2021)
(5/28/2021)


Pipe Flow
KERR_FM14
Rainfall
Qfinal(g)
Flow (MGD)
Rainfall (in)
2.0
1.5
1.0
0.5
0.0
15 Sat
22 Sat
1 Tue
8 Tue
15 Tue
22 Tue
1 Thu
8 Thu
May 2021
Date


Dry Weather Flow
KERR_FM14
Weekdays
Weekends
MGD
Hours


Scatter Graph
KERR_FM14
VFINAL (ft/s)
DFINAL (in)
Iso Q (MGD)


Storm Event - 5/22/2021 7:00:00 AM
KERR_FM14
Rainfall
Gross Q
Gross I/I
Net I/I
Precomp(-)
Weekdays
Weekends
Flow (MGD)
Rainfall (in)
Storms
21 Fri
May 2021
22 Sat
23 Sun
24 Mon
25 Tue
Date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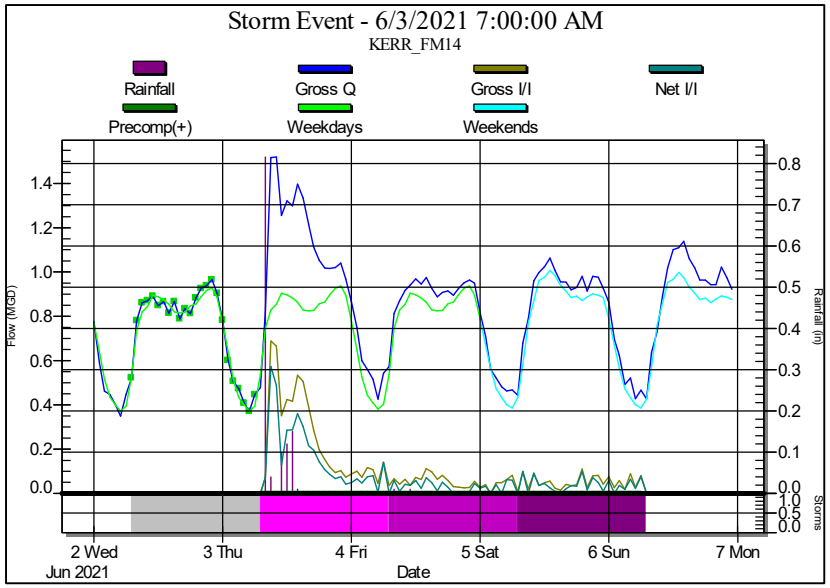
Rainfall
Gross Q
Gross I/I
Net I/I
Precomp(-)
Weekdays
Weekends
Flow (MGD)
Rainfall (in)
Storms
27 Thu
May 2021
28 Fri
29 Sat
30 Sun
31 Mon
Date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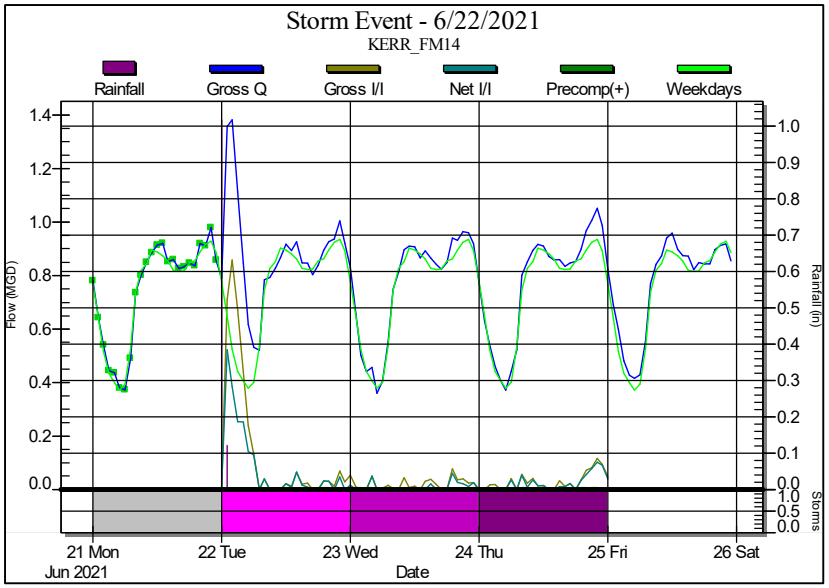
Rainfall
Gross Q
Gross I/I
Net I/I
Precomp(+)
Weekdays
Weekends
Flow (MGD)
Rainfall (in)
Storms
2 Wed
Jun 2021
3 Thu
4 Fri
5 Sat
6 Sun
7 Mon
Date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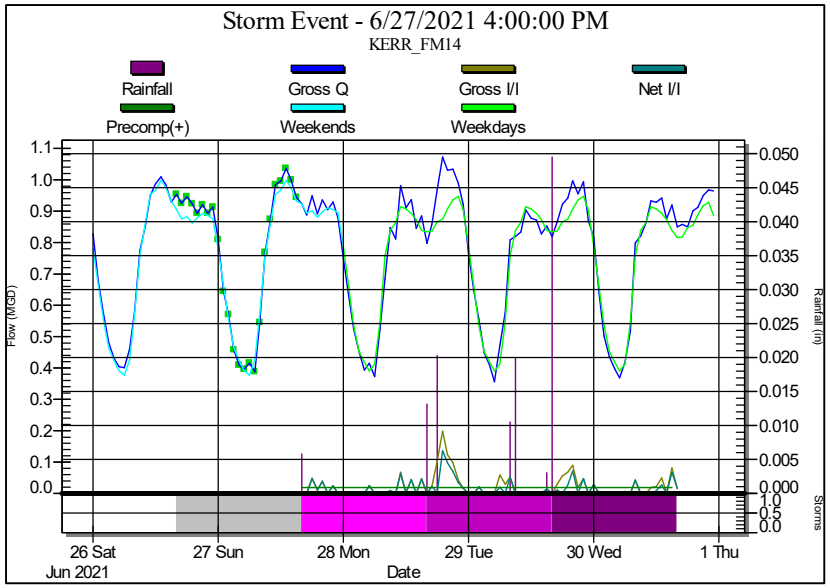
KERR_FM14
Rainfall
Gross Q
Gross I/I
Net I/I
Precomp(+)
Weekdays
Flow (MGD)
Rainfall (in)
Storms
21 Mon
Jun 2021
22 Tue
23 Wed
24 Thu
25 Fri
26 Sat
Date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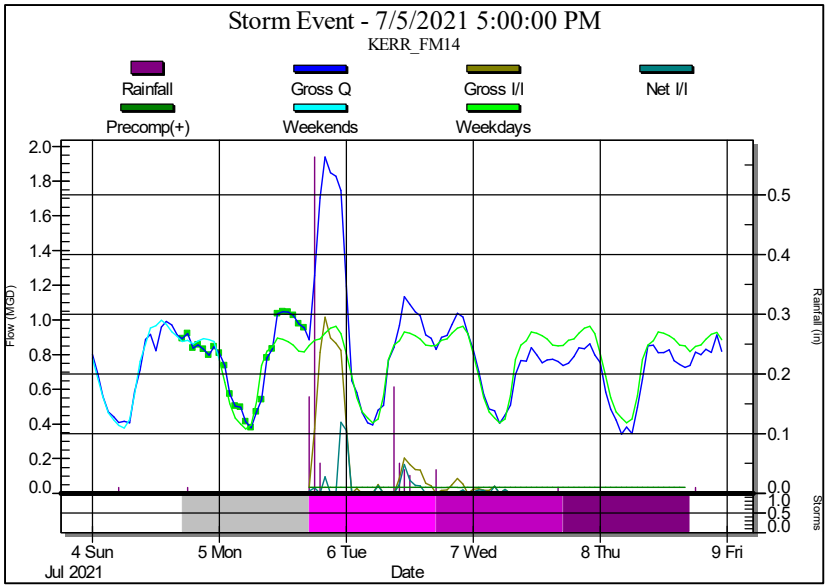
KERR_FM14
Rainfall
Gross Q
Gross I/I
Net I/I
Precomp(+)
Weekends
Weekdays
Flow (MGD)
Rainfall (in)
Storms
26 Sat
Jun 2021
27 Sun
28 Mon
29 Tue
30 Wed
1 Thu
Date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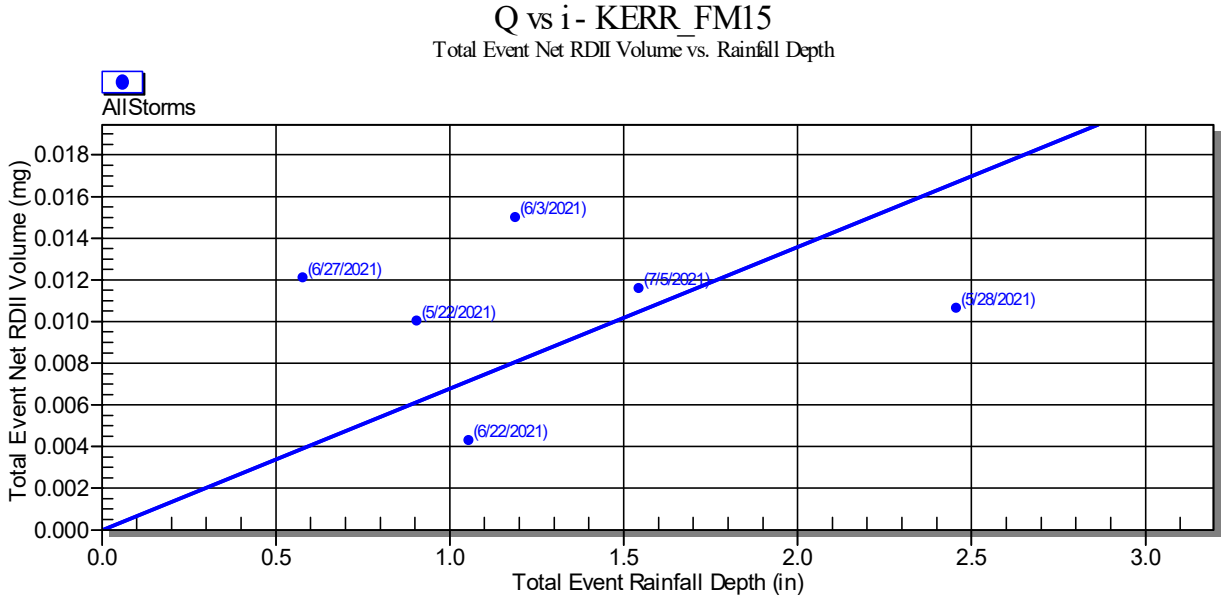
Rainfall
Gross Q
Gross I/I
Net I/I
Precomp(+)
Weekends
Weekdays
Flow (MGD)
Rainfall (in)
Storms
4 Sun
Jul 2021
5 Mon
6 Tue
7 Wed
8 Thu
9 Fri
Date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Total Event Net RDII Volume vs. Rainfall Depth
AllStorms
Total Event Net RDII Volume (mg)
Total Event Rainfall Depth (in)
(6/3/2021)
(6/27/2021)
(5/22/2021)
(7/5/2021)
(6/28/2021)
(6/22/2021)

APPENDIX D
Field Inspection Summary Sheets

City of Kerrville
Water and Wastewater Master Plan
Facility Site Visits
March 30-31, 2022

Order	Facility Name	Facility Type	Address	Completed
1	Lois Street	Pump Station	1417 Lois St	3/30/2022
2	River Hills	Pump Station	260 Fairway Dr	3/30/2022
3	Stadium	Pump Station	145 Holdsworth Dr	3/30/2022
4	Summit	Pump Station	1941 Summit Top Dr	3/30/2022
5	Travis Street	Pump Station	799 Travis St	3/30/2022
6	High Service	Pump Station	1000 Thompson Dr	3/30/2022
7	The Heights	Hydropneumatic Tank	634 East Ln	3/30/2022
8	Hilltop	Hydropneumatic Tank	948 Panorama Dr	3/30/2022
9	West Bluff	Hydropneumatic Tank	536 West Crest Dr	3/30/2022
10	Alpine Drive	Production Well	743 Alpine Dr	3/30/2022
11	H Street	Production Well	1795 Water St	3/30/2022
12	Harper Road	Production Well	199 Magical Ln	3/30/2022
13	Hays Park	Production Well	112 Park Ln	3/30/2022
14	Lois Street	Production Well	1417 Lois St	3/30/2022
15	Meadow View Lane	Production Well	240 Meadowview Ln	3/30/2022
16	Methodist Encampment	Production Well	948 Panorama Dr	3/30/2022
17	Airport Commerce Park	Lift Station	5315 TX-27	3/31/2022
18	Al Mooney	Lift Station	105 Al Mooney Rd	3/31/2022
19	Comanche Trace	Lift Station	2984 Bandera Hwy	3/31/2022
20	Knapp	Lift Station	1000 N Knapp Rd	3/31/2022
21	Loop 534	Lift Station	3650 Loop 534	3/31/2022
22	Quinlan	Lift Station	1427 1st St	3/31/2022
23	Turtle Creek	Lift Station	1032 Lower Turtle Creek Rd	3/31/2022

Lift Station Field Assessments
Condition Score Summary

Facility Name	Pumps and Motors	Electrical	Instrumentation	Structure	Piping and Valves	Mechanical	Site	Condition Rating
Lois Street PS	3	4	3	2	3	-	1	2.90
River Hills	2	3	2	3	2	-	1	2.30
Stadium	3	2	2	2	3	-	3	2.45
Summit	3	1	2	2	3	-	1	2.00
Travis Street PS	2	2	3	2	2	-	1	2.05
High Service	2	1	1	1	2	-	1	1.35
The Heights	1	2	2	1	1	-	1	1.40
Hilltop	2	2	2	1	1	-	1	1.65
West Bluff	3	2	3	2	2	-	3	2.50
Alpine Drive	2	2	1	2	2	-	1	1.75
H Street	5	2	3	3	2	-	1	2.95
Harper Road	2	2	1	2	2	-	2	1.85
Hays Park	2	2	1	2	2	-	1	1.75
Lois Street Well	3	2	1	2	1	-	1	1.90
Meadow View Lane	1	2	1	2	2	-	1	1.50
Methodist Encampment	1	2	1	1	1	-	1	1.25
Airport Commerce Park	3	4	3	4	1	3	2	3.10
Al Mooney	3	3	4	5	4	3	2	3.45
Comanche Trace	2	2	2	4	1	2	1	2.10
Knapp	2	2	2	4	2	2	3	2.40
Loop 534	1	1	1	4	1	2	1	1.50
Quinlan	3	2	4	4	2	2	3	2.90
Turtle Creek	2	3	2	1	1	2	1	1.90
Weight	**20%**	**25%**	**15%**	**15%**	**10%**	**5%**	**10%**	**100%**
Average	**2.30**	**2.17**	**2.04**	**2.43**	**1.87**	**2.29**	**1.48**	**1.96**

*Mechanical was not included in water system facilities, 5% weight was added to Pumps and Motors.

General Notes:
General recommendation for water facilities include replacing gaseous chlorine with liquid bleach, constructing appropriate buildings to protect production well pumps and piping similar to Methodist Encampment, provide lighted canopies over exposed electrical boxes, consider conducting electrical power system study, and recoating exposed piping and valves.
Specific water facility recommendations include replacing hydropneumatic facilities if feasible and restoring service to H Street well.
General recommendations for wastewater facilities include implementing backup power and backup controls for critical, high flow, or remote sites.
Specific wastewater facility recommendations include addressing corrosion issues at Airport Lift Stations (Al Mooney and Commerce), addressing debris issues at Quinlan, and addressing capacity restrictions at Knapp.
Additional wastewater renewal recommendations include repairing and replacing fiberglass manholes within roadways to restore structural integrity (e.g. upstream of Quinlan LS).

Lois Street Pump Station

Inspection Date: March 30, 2022 Address: 1417 Lois St

Facility Information			
Install Year:	-	Rated Pump Capacity (gpm):	1,150
Service Area:	Water	Total Pumping Capacity (gpm):	3,450
Force/Transmission Main Diameter (in):		Storage Volume (MG/gal):	1.0
Number of Pumps:	3	Monitoring/SCADA:	Pump Run Status
Pump Brand:		Electrical Service:	
Horsepower:		Generator/Quick Connect:	

City Score:

Scoring Guidelines	
1	New condition, no improvements recommended to maintain function
2	Good condition, minor improvements recommended to enhance performance
3	Fair condition, improvements recommended to improve performance or efficiency
4	Poor condition, improvements recommended to maintain reliability
5	Eminent failure, rehabilitation or replacement required

CONDITION ASSESSMENT

Component Group	Component Condition Rating	Weight Factor	Weighted Component Rating	Comments
Pumps and Motors	3	20%	0.60	General wear from significant use
Electrical – MCC, Back-up Power, Cables	4	25%	1.00	General safety converns
Instrumentation - SCADA, Alarms, Controls	3	15%	0.45	
Structure - Hatches, Corrosion, Cracks, Leaking	2	15%	0.30	Control building, but pumps and valves are uncovered.
Piping and Valves	3	10%	0.30	General corrosion/weathering
Mechanical - Ventilation, Odor Control	-	5%		-
Site - Drainage, Access Drive, Security, Fencing	1	10%	0.10	Chainlink fence, large site, dirt access.
Condition Rating	-	100%	**2.75**	

Additional Notes:

Improvements plans to the tank and booster station are ongoing, includes full electrical replacement.

River Hills Pump Station

Inspection Date: March 30, 2022

Address: 260 Fairway Dr

Facility Information			
Install Year:	-	Rated Pump Capacity (gpm):	1,350
Service Area:	Water	Total Pumping Capacity (gpm):	2,700
Force/Transmission Main Diameter (in):		Storage Volume (MG/gal):	0.2
Number of Pumps:	2	Monitoring/SCADA:	
Pump Brand:		Electrical Service:	480V, 3 Phase, Pad-mounted XFMR
Horsepower:	60	Generator/Quick Connect:	Yes

City Score:

Scoring Guidelines	
1	New condition, no improvements recommended to maintain function
2	Good condition, minor improvements recommended to enhance performance
3	Fair condition, improvements recommended to improve performance or efficiency
4	Poor condition, improvements recommended to maintain reliability
5	Eminent failure, rehabilitation or replacement required

CONDITION ASSESSMENT

Component Group	Component Condition Rating	Weight Factor	Weighted Component Rating	Comments
Pumps and Motors	2	20%	0.40	No issues, approximately 12 years old. Old pumps (2) still on site as backup, exercised regularly.
Electrical – MCC, Back-up Power, Cables	3	25%	0.75	2011 VFDs and new pumps, other equipment 20-30 years old
Instrumentation - SCADA, Alarms, Controls	2	15%	0.30	2 cabinets, DFS
Structure - Hatches, Corrosion, Cracks, Leaking	3	15%	0.45	Minor rust/corrosion, pumps and controls in uncovered, generator and EST panels are covered. Hole in EST
Piping and Valves	2	10%	0.20	Minor corrosion/weathering
Mechanical - Ventilation, Odor Control	-	5%		-
Site - Drainage, Access Drive, Security, Fencing	1	10%	0.10	Chainlink fence, gravel access, open site.
Condition Rating	-	100%	**2.20**	

Additional Notes:

Old pumps (2) (40 hp) from previous MUD still on site, exercised regularly. Feed the standpipe adjacent to Ridgewood EST, can service Ridgewood PP as backup at lower pressure. No flush line, old pumps flush into the system.

Stadium Pump Station

Inspection Date: March 30, 2022 Address: 145 Holdsworth Dr

Facility Information			
Install Year:	2/17/2000	Rated Pump Capacity (gpm):	1,000
Service Area:	Water	Total Pumping Capacity (gpm):	3,000
Force/Transmission Main Diameter (in):		Storage Volume (MG/gal):	2.0
Number of Pumps:	3	Monitoring/SCADA:	Pump Run Status
Pump Brand:	US Motor	Electrical Service:	480V, 3 Phase, OHE (25kVA X 3)
Horsepower:	20	Generator/Quick Connect:	TryStar

City Score:

Scoring Guidelines	
1	New condition, no improvements recommended to maintain function
2	Good condition, minor improvements recommended to enhance performance
3	Fair condition, improvements recommended to improve performance or efficiency
4	Poor condition, improvements recommended to maintain reliability
5	Eminent failure, rehabilitation or replacement required

CONDITION ASSESSMENT

Component Group	Component Condition Rating	Weight Factor	Weighted Component Rating	Comments
Pumps and Motors	3	20%	0.60	General wear from significant use
Electrical – MCC, Back-up Power, Cables	2	25%	0.50	
Instrumentation - SCADA, Alarms, Controls	2	15%	0.30	DFS/Radio
Structure - Hatches, Corrosion, Cracks, Leaking	2	15%	0.30	Pumps and electrical panels are uncovered.
Piping and Valves	3	10%	0.30	General corrosion/weathering, recommended recoating.
Mechanical - Ventilation, Odor Control	-	5%		-
Site - Drainage, Access Drive, Security, Fencing	3	10%	0.30	Chainlink fence, gravel access, constrained site, site is cut into hill and poses minor runoff issues. Pumps are
Condition Rating	-	100%	**2.30**	

Additional Notes:

Piping cast in 1976. Difficult access to the pumps.

Summit Pump Station

Inspection Date: March 30, 2022

Address: 1941 Summit Top Dr

Facility Information			
Install Year:	-	Rated Pump Capacity (gpm):	450
Service Area:	Water	Total Pumping Capacity (gpm):	900
Force/Transmission Main Diameter (in):		Storage Volume (MG/gal):	0.2
Number of Pumps:	2	Monitoring/SCADA:	Pump Run Status
Pump Brand:		Electrical Service:	
Horsepower:	15/20	Generator/Quick Connect:	

City Score:

Scoring Guidelines	
1	New condition, no improvements recommended to maintain function
2	Good condition, minor improvements recommended to enhance performance
3	Fair condition, improvements recommended to improve performance or efficiency
4	Poor condition, improvements recommended to maintain reliability
5	Eminent failure, rehabilitation or replacement required

CONDITION ASSESSMENT

Component Group	Component Condition Rating	Weight Factor	Weighted Component Rating	Comments
Pumps and Motors	3	20%	0.60	General wear from use, 20hp is 20+ years old, 15hp is 15+ years old
Electrical – MCC, Back-up Power, Cables	1	25%	0.25	200 A, 480 V Disconnect
Instrumentation - SCADA, Alarms, Controls	2	15%	0.30	DFS/Radio
Structure - Hatches, Corrosion, Cracks, Leaking	2	15%	0.30	Pumps and electrical panels are uncovered. Bypass and valves are located in vault.
Piping and Valves	3	10%	0.30	General corrosion/weathering, recommended recoating.
Mechanical - Ventilation, Odor Control	-	5%		-
Site - Drainage, Access Drive, Security, Fencing	1	10%	0.10	Chainlink fence, large site, dirt access.
Condition Rating	-	100%	**1.85**	

Additional Notes:

Recently repainted both tanks.

Travis Street Pump Station

Inspection Date: March 30, 2022 Address: 799 Travis St

Facility Information			
Install Year:	11/14/1977	Rated Pump Capacity (gpm):	250
Service Area:	Water	Total Pumping Capacity (gpm):	500
Force/Transmission Main Diameter (in):		Storage Volume (MG/gal):	
Number of Pumps:	2	Monitoring/SCADA:	
Pump Brand:		Electrical Service:	480V, 3 Phase, OHE (25kVA X 3)
Horsepower:		Generator/Quick Connect:	No

City Score:

Scoring Guidelines	
1	New condition, no improvements recommended to maintain function
2	Good condition, minor improvements recommended to enhance performance
3	Fair condition, improvements recommended to improve performance or efficiency
4	Poor condition, improvements recommended to maintain reliability
5	Eminent failure, rehabilitation or replacement required

CONDITION ASSESSMENT

Component Group	Component Condition Rating	Weight Factor	Weighted Component Rating	Comments
Pumps and Motors	2	20%	0.40	No known issues
Electrical – MCC, Back-up Power, Cables	2	25%	0.50	
Instrumentation - SCADA, Alarms, Controls	3	15%	0.45	DFS/Radio. Production well is equipped with SCADA but pump station is not.
Structure - Hatches, Corrosion, Cracks, Leaking	2	15%	0.30	Pipes are uncovered, controls and chlorine in vented building. Standing water in bypass vault.
Piping and Valves	2	10%	0.20	No valve vault, recently coated.
Mechanical - Ventilation, Odor Control	-	5%		-
Site - Drainage, Access Drive, Security, Fencing	1	10%	0.10	Chainlink fence, large site, gravel access.
Condition Rating	-	100%	**1.95**	

Additional Notes:

Production well offline, GST has been decommissioned, no onsite storage.

High Service Pump Station

Inspection Date: March 30, 2022 Address: 1000 Thompson Dr

Facility Information			
Install Year:	-	Rated Pump Capacity (gpm):	varies
Service Area:	Water	Total Pumping Capacity (gpm):	6,800
Force/Transmission Main Diameter (in):	varies	Storage Volume (MG/gal):	0.4
Number of Pumps:	5	Monitoring/SCADA:	
Pump Brand:		Electrical Service:	
Horsepower:		Generator/Quick Connect:	

City Score:

Scoring Guidelines	
1	New condition, no improvements recommended to maintain function
2	Good condition, minor improvements recommended to enhance performance
3	Fair condition, improvements recommended to improve performance or efficiency
4	Poor condition, improvements recommended to maintain reliability
5	Eminent failure, rehabilitation or replacement required

CONDITION ASSESSMENT

Component Group	Component Condition Rating	Weight Factor	Weighted Component Rating	Comments
Pumps and Motors	2	20%	0.40	No known issues, well maintained at WTP.
Electrical – MCC, Back-up Power, Cables	1	25%	0.25	Pad mounted switch gear is at ground level, potential flood risk.
Instrumentation - SCADA, Alarms, Controls	1	15%	0.15	
Structure - Hatches, Corrosion, Cracks, Leaking	1	15%	0.15	Pump building located on elevated clear well structure.
Piping and Valves	2	10%	0.20	Minor corrosion/wear
Mechanical - Ventilation, Odor Control	-	5%		-
Site - Drainage, Access Drive, Security, Fencing	1	10%	0.10	Located onsite of WTP
Condition Rating	-	100%	**1.25**	

Additional Notes:

5 pumps, plus 1 open slot. Plans ongoing to build additional clear well with ability to provide secondary pumping facility.

The Heights Hydropneumatic Tank

Inspection Date: March 30, 2022 Address: 634 East Ln

Facility Information			
Install Year:	-	Rated Pump Capacity (gpm):	530
Service Area:	Water	Total Pumping Capacity (gpm):	1,060
Force/Transmission Main Diameter (in):		Storage Volume (MG/gal):	0.0
Number of Pumps:	2	Monitoring/SCADA:	
Pump Brand:		Electrical Service:	
Horsepower:		Generator/Quick Connect:	

City Score:

Scoring Guidelines	
1	New condition, no improvements recommended to maintain function
2	Good condition, minor improvements recommended to enhance performance
3	Fair condition, improvements recommended to improve performance or efficiency
4	Poor condition, improvements recommended to maintain reliability
5	Eminent failure, rehabilitation or replacement required

CONDITION ASSESSMENT

Component Group	Component Condition Rating	Weight Factor	Weighted Component Rating	Comments
Pumps and Motors	1	20%	0.20	Pumps are undersized for service area
Electrical – MCC, Back-up Power, Cables	2	25%	0.50	
Instrumentation - SCADA, Alarms, Controls	2	15%	0.30	
Structure - Hatches, Corrosion, Cracks, Leaking	1	15%	0.15	well maintained pump and valve building
Piping and Valves	1	10%	0.10	Well maintained
Mechanical - Ventilation, Odor Control	-	5%		-
Site - Drainage, Access Drive, Security, Fencing	1	10%	0.10	Chainlink fence, gravel access, adequate site size.
Condition Rating	-	100%	**1.35**	

Additional Notes:

Facility is in good condition, but hydropneumatic system is difficult to operate. Max pump pressure is approximately 125 psi, max hydro tank pressure is approximately 180 psi. Site includes small ground storage tank. Site does not appear to provide adequate pressure to the higher elevations in the service area.

Hilltop Hydropneumatic Tank

Inspection Date: March 30, 2022

Address: 948 Panorama Dr

Facility Information			
Install Year:	-	Rated Pump Capacity (gpm):	0
Service Area:	Water	Total Pumping Capacity (gpm):	0
Force/Transmission Main Diameter (in):		Storage Volume (MG/gal):	
Number of Pumps:	2	Monitoring/SCADA:	
Pump Brand:		Electrical Service:	480V, 3 Phase, OHE (50kVA X 3)
Horsepower:		Generator/Quick Connect:	Provisions for mobile generator installed i

City Score:

Scoring Guidelines	
1	New condition, no improvements recommended to maintain function
2	Good condition, minor improvements recommended to enhance performance
3	Fair condition, improvements recommended to improve performance or efficiency
4	Poor condition, improvements recommended to maintain reliability
5	Eminent failure, rehabilitation or replacement required

CONDITION ASSESSMENT

Component Group	Component Condition Rating	Weight Factor	Weighted Component Rating	Comments
Pumps and Motors	2	20%	0.40	No known issues
Electrical – MCC, Back-up Power, Cables	2	25%	0.50	
Instrumentation - SCADA, Alarms, Controls	2	15%	0.30	
Structure - Hatches, Corrosion, Cracks, Leaking	1	15%	0.15	well maintained pump and valve building
Piping and Valves	1	10%	0.10	Well maintained
Mechanical - Ventilation, Odor Control	-	5%		-
Site - Drainage, Access Drive, Security, Fencing	1	10%	0.10	Located onsite of Methodist Tank and Production well. Large site with good access and security.
Condition Rating	-	100%	**1.55**	

Additional Notes:

Facility is in good condition, but hydropneumatic system is difficult to operate. Hilltop hydro tank provides adequate pressure for service area.

West Bluff Hydropneumatic Tank

Inspection Date: March 30, 2022

Address: 536 West Crest Dr

Facility Information			
Install Year:	-	Rated Pump Capacity (gpm):	0
Service Area:	Water	Total Pumping Capacity (gpm):	0
Force/Transmission Main Diameter (in):		Storage Volume (MG/gal):	
Number of Pumps:	2	Monitoring/SCADA:	
Pump Brand:		Electrical Service:	
Horsepower:		Generator/Quick Connect:	

City Score:

Scoring Guidelines	
1	New condition, no improvements recommended to maintain function
2	Good condition, minor improvements recommended to enhance performance
3	Fair condition, improvements recommended to improve performance or efficiency
4	Poor condition, improvements recommended to maintain reliability
5	Eminent failure, rehabilitation or replacement required

CONDITION ASSESSMENT

Component Group	Component Condition Rating	Weight Factor	Weighted Component Rating	Comments
Pumps and Motors	3	20%	0.60	Pump are 5-6 years old and appear worn, small.
Electrical – MCC, Back-up Power, Cables	2	25%	0.50	
Instrumentation - SCADA, Alarms, Controls	3	15%	0.45	No SCADA
Structure - Hatches, Corrosion, Cracks, Leaking	2	15%	0.30	Adequate pump and valve building.
Piping and Valves	2	10%	0.20	Minor corrosion/aging
Mechanical - Ventilation, Odor Control	-	5%		-
Site - Drainage, Access Drive, Security, Fencing	3	10%	0.30	Chainlink fence, small compact site, difficult to access.
Condition Rating	-	100%	**2.35**	

Additional Notes:

Very small service area, less than 10 connections, tank is worn and aging. Hydropneumatic system is difficult to operate.

Alpine Drive Production Well

Inspection Date: March 30, 2022 Address: 743 Alpine Dr

Facility Information			
Install Year:	-	Rated Pump Capacity (gpm):	125
Service Area:	Water	Total Pumping Capacity (gpm):	125
Force/Transmission Main Diameter (in):		Storage Volume (MG/gal):	
Number of Pumps:	1	Monitoring/SCADA:	WTP/Prod
Pump Brand:		Electrical Service:	480V, 3 Phase, OHE (25kVA X 3)
Horsepower:	40	Generator/Quick Connect:	No

City Score:

Scoring Guidelines	
1	New condition, no improvements recommended to maintain function
2	Good condition, minor improvements recommended to enhance performance
3	Fair condition, improvements recommended to improve performance or efficiency
4	Poor condition, improvements recommended to maintain reliability
5	Eminent failure, rehabilitation or replacement required

CONDITION ASSESSMENT

Component Group	Component Condition Rating	Weight Factor	Weighted Component Rating	Comments
Pumps and Motors	2	20%	0.40	No recent issues, 20+ years old
Electrical – MCC, Back-up Power, Cables	2	25%	0.50	Motor starter in good condition
Instrumentation - SCADA, Alarms, Controls	1	15%	0.15	DFS/Radio
Structure - Hatches, Corrosion, Cracks, Leaking	2	15%	0.30	No valve vault, control and ventilated chlorine building, junction boxes are uncovered.
Piping and Valves	2	10%	0.20	Minor corrosion/weathering
Mechanical - Ventilation, Odor Control	-	5%		Mechanical vent in chlorine room
Site - Drainage, Access Drive, Security, Fencing	1	10%	0.10	Chainlink fence, paced access in retail parking lot, adjacent to fire station.
Condition Rating	-	100%	**1.65**	

Additional Notes:

Boosted gaseous chlorine onsite, tap located at fire station. Monthly operation.

H Street Production Well

Inspection Date: March 30, 2022

Address: 1795 Water St

Facility Information			
Install Year:	-	Rated Pump Capacity (gpm):	537
Service Area:	Water	Total Pumping Capacity (gpm):	537
Force/Transmission Main Diameter (in):		Storage Volume (MG/gal):	
Number of Pumps:	1	Monitoring/SCADA:	
Pump Brand:		Electrical Service:	
Horsepower:		Generator/Quick Connect:	

City Score:

Scoring Guidelines	
1	New condition, no improvements recommended to maintain function
2	Good condition, minor improvements recommended to enhance performance
3	Fair condition, improvements recommended to improve performance or efficiency
4	Poor condition, improvements recommended to maintain reliability
5	Eminent failure, rehabilitation or replacement required

CONDITION ASSESSMENT

Component Group	Component Condition Rating	Weight Factor	Weighted Component Rating	Comments
Pumps and Motors	5	20%	1.00	Out of service, pump pulled due to failed motor. Plan ongoing to repair with no timeline.
Electrical – MCC, Back-up Power, Cables	2	25%	0.50	No issues
Instrumentation - SCADA, Alarms, Controls	3	15%	0.45	No SCADA
Structure - Hatches, Corrosion, Cracks, Leaking	3	15%	0.45	Exposed valves and taps, separate control and chlorine building, junction boxes are uncovered. Chlorine building
Piping and Valves	2	10%	0.20	General corrosion/weathering, issues with valves and taps freezing
Mechanical - Ventilation, Odor Control	-	5%		Mechanical vent in chlorine room
Site - Drainage, Access Drive, Security, Fencing	1	10%	0.10	Chainlink fence, gravel access, large site, adjacent to bed and breakfast.
Condition Rating	-	100%	**2.70**	

Additional Notes:

Out of service since July 2021, typically a good producer. Gaseous chlorine is risk to neighboring customer.

Harper Road Production Well

Inspection Date: March 30, 2022 Address: 199 Magical Ln

Facility Information			
Install Year:	-	Rated Pump Capacity (gpm):	340
Service Area:	Water	Total Pumping Capacity (gpm):	340
Force/Transmission Main Diameter (in):		Storage Volume (MG/gal):	
Number of Pumps:	1	Monitoring/SCADA:	WTP/Prod
Pump Brand:		Electrical Service:	
Horsepower:		Generator/Quick Connect:	

City Score:

Scoring Guidelines	
1	New condition, no improvements recommended to maintain function
2	Good condition, minor improvements recommended to enhance performance
3	Fair condition, improvements recommended to improve performance or efficiency
4	Poor condition, improvements recommended to maintain reliability
5	Eminent failure, rehabilitation or replacement required

CONDITION ASSESSMENT

Component Group	Component Condition Rating	Weight Factor	Weighted Component Rating	Comments
Pumps and Motors	2	20%	0.40	No known issues
Electrical – MCC, Back-up Power, Cables	2	25%	0.50	10 years old, good condition
Instrumentation - SCADA, Alarms, Controls	1	15%	0.15	
Structure - Hatches, Corrosion, Cracks, Leaking	2	15%	0.30	Exposed valves and taps, separate control and chlorine building, junction boxes are uncovered.
Piping and Valves	2	10%	0.20	General corrosion/weathering, issues with valves and taps freezing
Mechanical - Ventilation, Odor Control	-	5%		Mechanical vent in chlorine room
Site - Drainage, Access Drive, Security, Fencing	2	10%	0.20	Chainlink fence, gravel access, site located behind electrical substation with long gravel access road, minor
Condition Rating	-	100%	**1.75**	

Additional Notes:

Boosted gaseous chlorine onsite.

Hays Park Production Well

Inspection Date: March 30, 2022 Address: 112 Park Ln

Facility Information			
Install Year:	-	Rated Pump Capacity (gpm):	350
Service Area:	Water	Total Pumping Capacity (gpm):	350
Force/Transmission Main Diameter (in):		Storage Volume (MG/gal):	
Number of Pumps:	1	Monitoring/SCADA:	WTP/Prod
Pump Brand:		Electrical Service:	480V, 3 Phase, OHE 200A
Horsepower:	125	Generator/Quick Connect:	No

City Score:

Scoring Guidelines	
1	New condition, no improvements recommended to maintain function
2	Good condition, minor improvements recommended to enhance performance
3	Fair condition, improvements recommended to improve performance or efficiency
4	Poor condition, improvements recommended to maintain reliability
5	Eminent failure, rehabilitation or replacement required

CONDITION ASSESSMENT

Component Group	Component Condition Rating	Weight Factor	Weighted Component Rating	Comments
Pumps and Motors	2	20%	0.40	No known issues
Electrical – MCC, Back-up Power, Cables	2	25%	0.50	10-15 years old
Instrumentation - SCADA, Alarms, Controls	1	15%	0.15	DFS, no level instruments, no issues. Installed in 2018.
Structure - Hatches, Corrosion, Cracks, Leaking	2	15%	0.30	Exposed valves and taps, separate control and chlorine building, junction boxes are uncovered.
Piping and Valves	2	10%	0.20	General corrosion/weathering
Mechanical - Ventilation, Odor Control	-	5%		Mechanical vent in chlorine room
Site - Drainage, Access Drive, Security, Fencing	1	10%	0.10	Chainlink fence, large site, dirt access.
Condition Rating	-	100%	**1.65**	

Additional Notes:

Regular use, pulled for maintenance twice in the last 5 years, but generally reliable. No issues during winter storm Uri, shares electrical grid with hospital. Ongoing SB3 improvements to install onsite generator. Gaseous chlorine.

Lois Street Production Well

Inspection Date: March 30, 2022 Address: 1417 Lois St

Facility Information			
Install Year:	-	Rated Pump Capacity (gpm):	560
Service Area:	Water	Total Pumping Capacity (gpm):	560
Force/Transmission Main Diameter (in):		Storage Volume (MG/gal):	1.0
Number of Pumps:	1	Monitoring/SCADA:	WTP/Prod
Pump Brand:		Electrical Service:	
Horsepower:		Generator/Quick Connect:	

City Score:

Scoring Guidelines	
1	New condition, no improvements recommended to maintain function
2	Good condition, minor improvements recommended to enhance performance
3	Fair condition, improvements recommended to improve performance or efficiency
4	Poor condition, improvements recommended to maintain reliability
5	Eminent failure, rehabilitation or replacement required

CONDITION ASSESSMENT

Component Group	Component Condition Rating	Weight Factor	Weighted Component Rating	Comments
Pumps and Motors	3	20%	0.60	Pumps/motors wear quickly from heavy use, replaced every approximately 2 years
Electrical – MCC, Back-up Power, Cables	2	25%	0.50	
Instrumentation - SCADA, Alarms, Controls	1	15%	0.15	
Structure - Hatches, Corrosion, Cracks, Leaking	2	15%	0.30	Separate control building, shared chlorine and valve building, junction boxes are uncovered.
Piping and Valves	1	10%	0.10	Minimal weathering, valves in good condition
Mechanical - Ventilation, Odor Control	-	5%		Mechanical vent in chlorine room
Site - Drainage, Access Drive, Security, Fencing	1	10%	0.10	Chainlink fence, large site, dirt access. Onsite of Lois GST and booster pump station.
Condition Rating	-	100%	**1.75**	

Additional Notes:

Improvements plans to the tank and booster station are ongoing, includes full electrical replacement, but the production well and controls will remain. Gaseous chlorine.

Meadow View Lane Production Well

Inspection Date: March 30, 2022

Address: 240 Meadowview Ln

Facility Information			
Install Year:	-	Rated Pump Capacity (gpm):	730
Service Area:	Water	Total Pumping Capacity (gpm):	730
Force/Transmission Main Diameter (in):		Storage Volume (MG/gal):	
Number of Pumps:	1	Monitoring/SCADA:	WTP/Prod
Pump Brand:		Electrical Service:	480V, 3 Phase, OHE (50kVA X 3)
Horsepower:	200	Generator/Quick Connect:	Kohler Gen, 2021, 350 kW

City Score:

Scoring Guidelines	
1	New condition, no improvements recommended to maintain function
2	Good condition, minor improvements recommended to enhance performance
3	Fair condition, improvements recommended to improve performance or efficiency
4	Poor condition, improvements recommended to maintain reliability
5	Eminent failure, rehabilitation or replacement required

CONDITION ASSESSMENT

Component Group	Component Condition Rating	Weight Factor	Weighted Component Rating	Comments
Pumps and Motors	1	20%	0.20	New motor from 2019
Electrical – MCC, Back-up Power, Cables	2	25%	0.50	
Instrumentation - SCADA, Alarms, Controls	1	15%	0.15	DFS, no issues
Structure - Hatches, Corrosion, Cracks, Leaking	2	15%	0.30	Exposed valves and taps, separate control and chlorine building, junction boxes are uncovered.
Piping and Valves	2	10%	0.20	Minor corrosion/weathering
Mechanical - Ventilation, Odor Control	-	5%		Mechanical vent in chlorine room
Site - Drainage, Access Drive, Security, Fencing	1	10%	0.10	Chainlink fence, large site, dirt access.
Condition Rating	-	100%	**1.45**	

Additional Notes:

Regular operations, gaseous chlorine.

Methodist Encampment Production Well

Inspection Date: March 30, 2022 Address: 948 Panorama Dr

Facility Information			
Install Year:	-	Rated Pump Capacity (gpm):	900
Service Area:	Water	Total Pumping Capacity (gpm):	900
Force/Transmission Main Diameter (in):		Storage Volume (MG/gal):	1.0
Number of Pumps:	1	Monitoring/SCADA:	WTP/Prod
Pump Brand:		Electrical Service:	480V, 3 Phase, OHE (50kVA X 3)
Horsepower:		Generator/Quick Connect:	Provisions for mobile generator installed i

City Score:

Scoring Guidelines	
1	New condition, no improvements recommended to maintain function
2	Good condition, minor improvements recommended to enhance performance
3	Fair condition, improvements recommended to improve performance or efficiency
4	Poor condition, improvements recommended to maintain reliability
5	Eminent failure, rehabilitation or replacement required

CONDITION ASSESSMENT

Component Group	Component Condition Rating	Weight Factor	Weighted Component Rating	Comments
Pumps and Motors	1	20%	0.20	Pump and motor are in good condition
Electrical – MCC, Back-up Power, Cables	2	25%	0.50	
Instrumentation - SCADA, Alarms, Controls	1	15%	0.15	
Structure - Hatches, Corrosion, Cracks, Leaking	1	15%	0.15	Entire facility is enclosed in custom building.
Piping and Valves	1	10%	0.10	Recently coated, minor surface rust on exposed valves and joints.
Mechanical - Ventilation, Odor Control	-	5%		-
Site - Drainage, Access Drive, Security, Fencing	1	10%	0.10	Located onsite of Methodist Tank and Production well. Large site with good access and security.
Condition Rating	-	100%	**1.20**	

Additional Notes:

Significant odor issues, not used regularly, chemical boosting to GST.

Airport Commerce Park Lift Station

Inspection Date: March 30, 2022 Address: 5315 TX-27

Facility Information			
Install Year:	4/21/2002	Rated Pump Capacity (gpm):	150
Service Area:	Wastewater	Total Pumping Capacity (gpm):	300
Force/Transmission Main Diameter (in):	8	Storage Volume (MG/gal):	1503.9
Number of Pumps:	2	Monitoring/SCADA:	Derived Flow Report
Pump Brand:	Fairbanks Morse	Electrical Service:	3 Phase, 460 V
Horsepower:	40	Generator/Quick Connect:	Generator

City Score:

Scoring Guidelines	
1	New condition, no improvements recommended to maintain function
2	Good condition, minor improvements recommended to enhance performance
3	Fair condition, improvements recommended to improve performance or efficiency
4	Poor condition, improvements recommended to maintain reliability
5	Eminent failure, rehabilitation or replacement required

CONDITION ASSESSMENT

Component Group	Component Condition Rating	Weight Factor	Weighted Component Rating	Comments
Pumps and Motors	3	20%	0.60	Have had sludge issues due to industrial user that damaged pumps in the past, started chemical dosing and
Electrical – MCC, Back-up Power, Cables	4	25%	1.00	Severe corrosion, not adequately sealed from wet well. No fuse at service entrance. Corroded insulation
Instrumentation - SCADA, Alarms, Controls	3	15%	0.45	
Structure - Hatches, Corrosion, Cracks, Leaking	4	15%	0.60	No safety grates over wet well, minor corrosion on hatches.
Piping and Valves	1	10%	0.10	Valve vault in good condition
Mechanical - Ventilation, Odor Control	3	5%	0.15	Have had sludge issues due to industrial user, started chemical dosing and seems to addressed the issue.
Site - Drainage, Access Drive, Security, Fencing	2	10%	0.20	Chainlink fence, paved access. Adjacent to the highway.
Condition Rating	-	100%	**3.10**	

Additional Notes:

Clean and vacced for sludge regularly, requires regular maintenance, but fair condition in general. Chemical feed appears to adequately address sludge and corrosion.

Al Mooney Lift Station

Inspection Date: March 30, 2022 Address: 105 Al Mooney Rd

Facility Information			
Install Year:	10/15/1998	Rated Pump Capacity (gpm):	210
Service Area:	Wastewater	Total Pumping Capacity (gpm):	420
Force/Transmission Main Diameter (in):	8	Storage Volume (MG/gal):	3965.5
Number of Pumps:	2	Monitoring/SCADA:	Derived Flow Report
Pump Brand:	Fairbanks Morse	Electrical Service:	3 Phase, 460 V, OHE (50kVA X 3)
Horsepower:	10	Generator/Quick Connect:	Generator

City Score:

Scoring Guidelines	
1	New condition, no improvements recommended to maintain function
2	Good condition, minor improvements recommended to enhance performance
3	Fair condition, improvements recommended to improve performance or efficiency
4	Poor condition, improvements recommended to maintain reliability
5	Eminent failure, rehabilitation or replacement required

CONDITION ASSESSMENT

Component Group	Component Condition Rating	Weight Factor	Weighted Component Rating	Comments
Pumps and Motors	3	20%	0.60	No known issues
Electrical – MCC, Back-up Power, Cables	3	25%	0.75	Minor corrosion, adequately sealed from wet well. No noted issues.
Instrumentation - SCADA, Alarms, Controls	4	15%	0.60	Recommend replacing floats/controls.
Structure - Hatches, Corrosion, Cracks, Leaking	5	15%	0.75	No safety grates over wet well, severe corrosion.
Piping and Valves	4	10%	0.40	Severe corrosion on risers in wet well due to off gassing, minimal corrosion in valve vault so connections are
Mechanical - Ventilation, Odor Control	3	5%	0.15	Static wet well vent, onsite pump crane. Chemical dosing to address corrosion issues.
Site - Drainage, Access Drive, Security, Fencing	2	10%	0.20	Chainlink fence, paved access. Adjacent to the highway.
Condition Rating	-	100%	**3.45**	

Additional Notes:

Al Mooney is an aircraft manufacturer that has violated pretreatment permits in the past, likely cause of corrosion. Staff is address immediate corrosion concerns, but only short-term solutions. Chemical feed does not appear to impact the corrosion cause, but sludge/debris is not an issue.

Comanche Trace Lift Station

Inspection Date: March 30, 2022

Address: 2984 Bandera Hwy

Facility Information			
Install Year:	8/28/2002	Rated Pump Capacity (gpm):	600
Service Area:	Wastewater	Total Pumping Capacity (gpm):	1,200
Force/Transmission Main Diameter (in):	10	Storage Volume (MG/gal):	1503.9
Number of Pumps:	2	Monitoring/SCADA:	Derived Flow Report
Pump Brand:	Myers	Electrical Service:	3 Phase, 460 V
Horsepower:	20	Generator/Quick Connect:	Generator

City Score:

Scoring Guidelines	
1	New condition, no improvements recommended to maintain function
2	Good condition, minor improvements recommended to enhance performance
3	Fair condition, improvements recommended to improve performance or efficiency
4	Poor condition, improvements recommended to maintain reliability
5	Eminent failure, rehabilitation or replacement required

CONDITION ASSESSMENT

Component Group	Component Condition Rating	Weight Factor	Weighted Component Rating	Comments
Pumps and Motors	2	20%	0.40	No known issues
Electrical – MCC, Back-up Power, Cables	2	25%	0.50	
Instrumentation - SCADA, Alarms, Controls	2	15%	0.30	
Structure - Hatches, Corrosion, Cracks, Leaking	4	15%	0.60	No safety grates over wet well, minor corrosion on hatches.
Piping and Valves	1	10%	0.10	Valve vault in good condition
Mechanical - Ventilation, Odor Control	2	5%	0.10	Static wet well vent, no pump crane or chemical dosing.
Site - Drainage, Access Drive, Security, Fencing	1	10%	0.10	Wooden fence, paved access, large site.
Condition Rating	-	100%	**2.10**	

Additional Notes:

Fair debris in wet well, but hasn't been cleaned for 3-4 months, debris not typically an issue. Site was includes in an traffic accident in 2020, but no significant damage to operations.

Knapp Lift Station

Inspection Date: March 30, 2022 Address: 1000 N Knapp Rd

Facility Information			
Install Year:	4/1/1998	Rated Pump Capacity (gpm):	1,600
Service Area:	Wastewater	Total Pumping Capacity (gpm):	6,400
Force/Transmission Main Diameter (in):	6	Storage Volume (MG/gal):	3524.9
Number of Pumps:	4	Monitoring/SCADA:	Derived Flow Report
Pump Brand:	Hydromatic	Electrical Service:	3 Phase, 460 V, OHE (50kVA X 3)
Horsepower:	15	Generator/Quick Connect:	Portable

City Score:

Scoring Guidelines	
1	New condition, no improvements recommended to maintain function
2	Good condition, minor improvements recommended to enhance performance
3	Fair condition, improvements recommended to improve performance or efficiency
4	Poor condition, improvements recommended to maintain reliability
5	Eminent failure, rehabilitation or replacement required

CONDITION ASSESSMENT

Component Group	Component Condition Rating	Weight Factor	Weighted Component Rating	Comments
Pumps and Motors	2	20%	0.40	Known capacity restriction, but no maintenance/operational issues.
Electrical – MCC, Back-up Power, Cables	2	25%	0.50	
Instrumentation - SCADA, Alarms, Controls	2	15%	0.30	
Structure - Hatches, Corrosion, Cracks, Leaking	4	15%	0.60	No safety grates over wet well, minor corrosion on hatches, wet well in good condition.
Piping and Valves	2	10%	0.20	Minor corrosion, specifically on wet well cross members, valves in good condition, water in valve vault.
Mechanical - Ventilation, Odor Control	2	5%	0.10	Static wet well vent, no pump crane or chemical dosing.
Site - Drainage, Access Drive, Security, Fencing	3	10%	0.30	Chainlink fence, paved/gravel access. Site is adjacent to boat ramp and in floodplain. Electrical and controls are
Condition Rating	-	100%	**2.40**	

Additional Notes:

Known capacity restriction. Flood in 2002 wiped out above ground facilities, resulted in significant improvements, including new wet well, pumps, and electrical. Original wet well and influent lines were left in place and act as a prechamber or settlement vault, vacced and cleaned quarterly, but releases gases and settles debris to protect main wet well and pumps. In general, new components are in good condition, old wet well has significant corrosion, easy to maintain and operation, but significant capacity restriction.

Loop 534 Lift Station

Inspection Date: March 30, 2022 Address: 3650 Loop 534

Facility Information			
Install Year:	-	Rated Pump Capacity (gpm):	1,023
Service Area:	Wastewater	Total Pumping Capacity (gpm):	2,046
Force/Transmission Main Diameter (in):	12	Storage Volume (MG/gal):	3524.9
Number of Pumps:	2	Monitoring/SCADA:	Derived Flow Report
Pump Brand:	Flygt	Electrical Service:	3 Phase, 460 V, OHE
Horsepower:	60	Generator/Quick Connect:	Generator

City Score:

Scoring Guidelines	
1	New condition, no improvements recommended to maintain function
2	Good condition, minor improvements recommended to enhance performance
3	Fair condition, improvements recommended to improve performance or efficiency
4	Poor condition, improvements recommended to maintain reliability
5	Eminent failure, rehabilitation or replacement required

CONDITION ASSESSMENT

Component Group	Component Condition Rating	Weight Factor	Weighted Component Rating	Comments
Pumps and Motors	1	20%	0.20	Good condition, 3-5 years old
Electrical – MCC, Back-up Power, Cables	1	25%	0.25	
Instrumentation - SCADA, Alarms, Controls	1	15%	0.15	
Structure - Hatches, Corrosion, Cracks, Leaking	4	15%	0.60	No safety grates over wet well, wet well in good condition.
Piping and Valves	1	10%	0.10	Surface rust on ductile iron risers.
Mechanical - Ventilation, Odor Control	2	5%	0.10	Static wet well vent, no pump crane or chemical dosing.
Site - Drainage, Access Drive, Security, Fencing	1	10%	0.10	Located onsite of WWTP
Condition Rating	-	100%	**1.50**	

Additional Notes:

Managed by treatment staff, no known issues, good condition.

Quinlan Lift Station

Inspection Date: March 30, 2022 Address: 1427 1st St

Facility Information			
Install Year:	3/6/2007	Rated Pump Capacity (gpm):	2,400
Service Area:	Wastewater	Total Pumping Capacity (gpm):	7,200
Force/Transmission Main Diameter (in):	20	Storage Volume (MG/gal):	2120.8
Number of Pumps:	3	Monitoring/SCADA:	Derived Flow Report
Pump Brand:	Fairbanks Morse	Electrical Service:	3 Phase, 460 V
Horsepower:	60	Generator/Quick Connect:	Generator

City Score:

Scoring Guidelines	
1	New condition, no improvements recommended to maintain function
2	Good condition, minor improvements recommended to enhance performance
3	Fair condition, improvements recommended to improve performance or efficiency
4	Poor condition, improvements recommended to maintain reliability
5	Eminent failure, rehabilitation or replacement required

CONDITION ASSESSMENT

Component Group	Component Condition Rating	Weight Factor	Weighted Component Rating	Comments
Pumps and Motors	3	20%	0.60	Significant debris issues, but pumps operate well.
Electrical – MCC, Back-up Power, Cables	2	25%	0.50	
Instrumentation - SCADA, Alarms, Controls	4	15%	0.60	Severe debris causes wear and maintenance issues for controls.
Structure - Hatches, Corrosion, Cracks, Leaking	4	15%	0.60	No safety grates over wet well, wet well in good condition. New generator building.
Piping and Valves	2	10%	0.20	Minor corrosion on risers, clean valve vault.
Mechanical - Ventilation, Odor Control	2	5%	0.10	Static wet well vent, no pump crane or chemical dosing.
Site - Drainage, Access Drive, Security, Fencing	3	10%	0.30	Chainlink fence, gravel access, large site. Significant tress within site, may inhibit overhead crane access.
Condition Rating	-	100%	**2.90**	

Additional Notes:

Significant debris issues and high turbulence lead to increased wear on pumps and transducers and additional maintenance issues. Lost power during winter storm Uri, generator froze, led to construction of new generator building.

Turtle Creek Lift Station

Inspection Date: March 30, 2022 Address: 1032 Lower Turtle Creek Rd

Facility Information			
Install Year:	8/3/2007	Rated Pump Capacity (gpm):	400
Service Area:	Wastewater	Total Pumping Capacity (gpm):	800
Force/Transmission Main Diameter (in):	8	Storage Volume (MG/gal):	3524.9
Number of Pumps:	2	Monitoring/SCADA:	Derived Flow Report
Pump Brand:	Myers	Electrical Service:	3 Phase, 460 V, Bander Electric Coop
Horsepower:	60	Generator/Quick Connect:	125kW Portable

City Score:

Scoring Guidelines	
1	New condition, no improvements recommended to maintain function
2	Good condition, minor improvements recommended to enhance performance
3	Fair condition, improvements recommended to improve performance or efficiency
4	Poor condition, improvements recommended to maintain reliability
5	Eminent failure, rehabilitation or replacement required

CONDITION ASSESSMENT

Component Group	Component Condition Rating	Weight Factor	Weighted Component Rating	Comments
Pumps and Motors	2	20%	0.40	No known issues
Electrical – MCC, Back-up Power, Cables	3	25%	0.75	
Instrumentation - SCADA, Alarms, Controls	2	15%	0.30	
Structure - Hatches, Corrosion, Cracks, Leaking	1	15%	0.15	Safety net over wet well and valve vault. Wet well and valve vault in good condition.
Piping and Valves	1	10%	0.10	Minor corrosion on risers, clean valve and cutoff vaults.
Mechanical - Ventilation, Odor Control	2	5%	0.10	Static wet well vent, onsite pump crane, no chemical dosing.
Site - Drainage, Access Drive, Security, Fencing	1	10%	0.10	Chainlink, paved/gravel access, large site. Ongoing residential development on adjacent site, has caused runoff
Condition Rating	-	100%	**1.90**	

Additional Notes:

Three pump slots, but only 2 pumps installed.

APPENDIX E
Short-term CIP Water Cost Sheets

City of Kerrville
Water Master Plan
CIP Project Cost Estimates

Project Number	Project Name			Project Cost
Capital Improvement Plan				
1	High Service Pump Station Expansion			$661,800
2	Targeted Pipeline Replacement			$5,254,900
3	12-inch Legion Dr Water Line			$3,454,400
4	12-inch Veterans Highway Water Line Guadalupe River Crossing			$511,900
5	Ridgewood Fire Flow Improvements			$923,900
6	College Cove Fire Flow Improvements			$688,000
7	H Street Well Renewal			$385,100
8	Methodist Encampment Well Renewal			$491,400
9	Comanche Trace PRV Replacement			$982,800
10	Hydropneumatic Zone Replacement			$4,266,000
			Capital Improvement Plan Total	**$17,620,200**
Annual Renewal Plan				
		Annual Cost	**Years**	**Total Cost**
11	General Water Distribution System Renewal	$100,000	10	$1,000,000
12	Annual Pipeline Replacement Program	$2,009,948	25	$50,248,700
			Annual Renewal Plan Total	**$51,248,700**

Note: Proposed projects were prioritized based on impact to the water distribution system and should be constructed generally in the order listed. The water treatment plant was not evaluated as part of this study so previously identified improvements to the plant should be incorporated into the project list as needed. Cost estimates are provided in 2022 dollars and are for planning and budgeting purposes only. Costs do not include allowances for land acquisition, individual service connections, permitting, or other unique project specific costs.

Water Master Plan

Capital Improvement Plan Cost Estimate			August 2022
Project Number:	**1**	**Phase:**	**Capital Improvement**
Project Name:	**High Service Pump Station Expansion**	**Pressure Plane:**	**Stadium**

Project Description:

This project includes a new 1,500 gpm pump and appurtenances in the available pump slot of the existing high service pump station. The new pump will expand firm pumping capacity to the Stadium Pressure Plane. This project also includes additional piping to connect to the existing Stadium and Riverhills pump headers.

Project Driver:

This project provides firm pumping capacity for the Stadium High Service Pump Station.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	1500 gpm Pump	1	EA	$ 324,000	$ 324,000
2	Pump Station Header Piping & Appurtenances	1	LS	$ 80,000	$ 80,000
Water Facility Condition Rating:				**SUBTOTAL:**	**$ 404,000**
1.35		MOBILIZATION		5%	$ 20,200
				SUBTOTAL:	**$ 424,200**
		CONTINGENCY		30%	$ 127,300
				SUBTOTAL:	**$ 551,500**
		ENG/SURVEY		20%	$ 110,300
				SUBTOTAL:	**$ 661,800**
				Estimated Project Total:	**$ 661,800**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

FREESE AND NICHOLS

Water Master Plan

Capital Improvement Plan Cost Estimate			August 2022
Project Number:	2	**Phase:**	Capital Improvement
Project Name:	Targeted Pipeline Replacement	**Pressure Plane:**	--

Project Description:

This project includes replacement of existing cast-iron water mains identified by the City in their January 2021 Water Main Installation and Replacement Report. Cast-iron pipes are at a higher risk of failure due to corrosion and chemical weathering. Replacement of these pipes is recommended to maintain functionality and reduce the risk of emergency repairs. This project would allow for replacement of approximately 14,600 linear feet of pipeline.

Project Driver:

The purpose of this project is to proactively replace water lines that are projected to fail based on RBA analysis.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	Galbraith Water Main Replacement	1	LS	$ 967,500	$ 967,500
2	West Main Water Main Replacement	1	LS	$ 460,000	$ 460,000
3	Westminister Water Main Replacement	1	LS	$ 540,000	$ 540,000
4	Gilmer Water Main Replacement	1	LS	$ 540,000	$ 540,000
5	Myrta Water Main Replacement	1	LS	$ 440,000	$ 440,000
6	Fourth Water Main Replacement	1	LS	$ 400,000	$ 400,000
Water Facility Condition Rating:				**SUBTOTAL:**	**$ 3,347,500**
--		MOBILIZATION		5%	$ 167,400
				SUBTOTAL:	**$ 3,514,900**
		CONTINGENCY		30%	$ 1,054,500
				SUBTOTAL:	**$ 4,569,400**
		ENG/SURVEY		15%	$ 685,500
				SUBTOTAL:	**$ 5,254,900**
				Estimated Project Total:	**$ 5,254,900**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

Water Master Plan

Capital Improvement Plan Cost Estimate			August 2022
Project Number:	3	**Phase:**	Capital Improvement
Project Name:	12-inch Legion Dr Water Line	**Pressure Plane:**	Stadium

Project Description:

This project includes a new 12-inch water line to replace the existing 6-inch and 8-inch water line along Legion Drive from Meadowview Lane to Spur 100.

Project Driver:

This project is intended to increase the capacity of the existing water line, improving service from the new Loop 534 groundwater well to be distributed throughout the pressure plane.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	12" WL & Appurtenances - by Open Cut	6,900	LF	$ 225	$ 1,552,500
2	Pavement Repair	5,400	LF	$ 120	$ 648,000
Water Facility Condition Rating:				**SUBTOTAL:**	**$ 2,200,500**
--		MOBILIZATION		5%	$ 110,100
				SUBTOTAL:	**$ 2,310,600**
		CONTINGENCY		30%	$ 693,200
				SUBTOTAL:	**$ 3,003,800**
		ENG/SURVEY		15%	$ 450,600
				SUBTOTAL:	**$ 3,454,400**
				Estimated Project Total:	**$ 3,454,400**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

Water Master Plan

Capital Improvement Plan Cost Estimate			August 2022
Project Number:	4	**Phase:**	Capital Improvement
Project Name:	12-inch Veterans Highway Water Line Guadalupe River Crossing	**Pressure Plane:**	Stadium

Project Description:

This project includes a new 12-inch water line to replace the existing 8-inch water line across the Guadalupe River at Veterans Highway.

Project Driver:

This project is intended to increase transmission capacity across the river, allowing for better connectivity within the Stadium Pressure Plane.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	12" Aerial River Crossing	500	LF	$ 600	$ 300,000
Water Facility Condition Rating:				**SUBTOTAL:**	**$ 300,000**
--		MOBILIZATION		5%	$ 15,000
				SUBTOTAL:	**$ 315,000**
		CONTINGENCY		30%	$ 94,500
				SUBTOTAL:	**$ 409,500**
		ENG/SURVEY		25%	$ 102,400
				SUBTOTAL:	**$ 511,900**
				Estimated Project Total:	**$ 511,900**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

Water Master Plan

Capital Improvement Plan Cost Estimate			August 2022
Project Number:	**5**	**Phase:**	**Capital Improvement**
Project Name:	**Ridgewood Fire Flow Improvements**	**Pressure Plane:**	**Ridgewood**

Project Description:

This project includes a new 8-inch water line near Medina Highway and Ridge Road to create looping within the Ridgewood distribution system.

Project Driver:

This project increases available fire flow within the Ridgewood Pressure Plane.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	8" WL & Appurtenances - by Open Cut	700	LF	$ 200	$ 140,000
2	Pavement Repair	200	LF	$ 120	$ 24,000
3	8" WL by Bore with 20" Steel Casing	500	LF	$ 800	$ 400,000
Water Facility Condition Rating:				**SUBTOTAL:**	**$ 564,000**
--		MOBILIZATION		5%	$ 28,200
				SUBTOTAL:	**$ 592,200**
		CONTINGENCY		30%	$ 177,700
				SUBTOTAL:	**$ 769,900**
		ENG/SURVEY		20%	$ 154,000
				SUBTOTAL:	**$ 923,900**
				Estimated Project Total:	**$ 923,900**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

Water Master Plan

Capital Improvement Plan Cost Estimate			August 2022
Project Number:	6	**Phase:**	Capital Improvement
Project Name:	College Cove Fire Flow Improvements	**Pressure Plane:**	College Cove

Project Description:

This project includes a new 12-inch water line along Loop 534 near Paragon Place to create looping within the College Cove Pressure Plane.

Project Driver:

This project increases available fire flow within the College Cove Pressure Plane.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	12" WL & Appurtenances - by Open Cut	1,600	LF	$ 225	$ 360,000
2	Pavement Repair	500	LF	$ 120	$ 60,000
Water Facility Condition Rating:				**SUBTOTAL:**	**$ 420,000**
--		MOBILIZATION		5%	$ 21,000
				SUBTOTAL:	**$ 441,000**
		CONTINGENCY		30%	$ 132,300
				SUBTOTAL:	**$ 573,300**
		ENG/SURVEY		20%	$ 114,700
				SUBTOTAL:	**$ 688,000**
				Estimated Project Total:	**$ 688,000**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

Water Master Plan

Capital Improvement Plan Cost Estimate			August 2022
Project Number:	**7**	**Phase:**	**Capital Improvement**
Project Name:	**H Street Well Renewal**	**Pressure Plane:**	**Stadium**

Project Description:

This project restores service to the existing H Street Well. This project includes a new pump and motor and equipping the facility with SCADA.

Project Driver:

This project provides additional production pumping capacity to the Stadium Pressure Plane.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	600 gpm Pump	1	EA	$ 130,000	$ 130,000
2	Replace Existing Motor	1	EA	$ 25,000	$ 25,000
3	SCADA System Improvements	1	LS	$ 80,000	$ 80,000
Water Facility Condition Rating:				**SUBTOTAL:**	**$ 235,000**
2.95		MOBILIZATION		5%	$ 11,800
				SUBTOTAL:	**$ 246,800**
		CONTINGENCY		30%	$ 74,100
				SUBTOTAL:	**$ 320,900**
		ENG/SURVEY		20%	$ 64,200
				SUBTOTAL:	**$ 385,100**
				Estimated Project Total:	**$ 385,100**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

Water Master Plan

Capital Improvement Plan Cost Estimate			August 2022
Project Number:	8	**Phase:**	Capital Improvement
Project Name:	Methodist Encampment Well Renewal	**Pressure Plane:**	Methodist

Project Description:

This project restores service to the existing Methodist Encampment Well. Currently, the well is only approved for emergency use because of water quality issues. This project is for the re-routing of the well discharge piping from the outlet piping of the Methodist ground storage tank to the top of the GST. This re-routing is intended to blend the groundwater with the stored treated surface water and help maintain water quality in the system.

Project Driver:

This project restores production pumping capacity to the Methodist Pressure Plane.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	Piping and Valving Improvements	1	LS	$ 300,000	$ 300,000
Water Facility Condition Rating:				**SUBTOTAL:**	**$ 300,000**
1.20		MOBILIZATION		5%	$ 15,000
				SUBTOTAL:	**$ 315,000**
		CONTINGENCY		30%	$ 94,500
				SUBTOTAL:	**$ 409,500**
		ENG/SURVEY		20%	$ 81,900
				SUBTOTAL:	**$ 491,400**
				Estimated Project Total:	**$ 491,400**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

Water Master Plan

Capital Improvement Plan Cost Estimate			August 2022
Project Number:	9	**Phase:**	Capital Improvement
Project Name:	Comanche Trace PRV Replacement	**Pressure Plane:**	Comanche Trace PRV

Project Description:

This project involves the replacement of the existing PRVs in the Comanche Trace PRV zones. The project involves replacement of valve and valve box.

Project Driver:

This project enhances service reliability and ease of maintenance and operation of the Comanche Trace PRVs.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	Pressure Reducing Valve	3	LS	$ 100,000	$ 300,000
2	Valve Vault	3	LS	$ 100,000	$ 300,000
Water Facility Condition Rating:				**SUBTOTAL:**	**$ 600,000**
--		MOBILIZATION		5%	$ 30,000
				SUBTOTAL:	**$ 630,000**
		CONTINGENCY		30%	$ 189,000
				SUBTOTAL:	**$ 819,000**
		ENG/SURVEY		20%	$ 163,800
				SUBTOTAL:	**$ 982,800**
				Estimated Project Total:	**$ 982,800**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

Water Master Plan

Capital Improvement Plan Cost Estimate			August 2022
Project Number:	**10**	**Phase:**	**Capital Improvement**
Project Name:	**Hydropneumatic Zone Replacement**	**Pressure Plane:**	**Methodist**

Project Description:

This project creates a new pressure plane to replace the existing Hilltop and The Heights Hydropneumatic Zones. This project includes a new 300 gpm pump station and 0.15 MG EST with an overflow elevation of 2,092 feet at the existing Methodist Encampment site. This project also includes a new 12-inch transmission line and new 8-inch lines to connect the existing Hilltop and The Heights Zones. Once the new pump station, EST, and water lines are in service, the existing hydropneumatic facilities may be decommissioned.

Project Driver:

This project enhances service reliability and capacity to The Heights and Hilltop Zones. This project also addresses maintenance and operation issues with the existing hydropneumatic facilities. This project is sized for existing demand but may also provide additional capacity for potential future development in the area that may participate in project implementation.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	12" WL & Appurtenances - by Open Cut	2,300	LF	$ 225	$ 517,500
2	8" WL & Appurtenances - by Open Cut	3,900	LF	$ 200	$ 780,000
3	300 gpm Pump	2	EA	$ 65,000	$ 130,000
4	Valve with Vault	3	LS	$ 200,000	$ 600,000
5	0.15 MG Elevated Storage Tank	1	LS	$ 640,000	$ 640,000
6	Demolition of Hydropnuematic Tank	2	LS	$ 25,000	$ 50,000
Water Facility Condition Rating:				**SUBTOTAL:**	**$ 2,717,500**
1.65		MOBILIZATION		5%	$ 135,900
				SUBTOTAL:	**$ 2,853,400**
		CONTINGENCY		30%	$ 856,100
				SUBTOTAL:	**$ 3,709,500**
		ENG/SURVEY		15%	$ 556,500
				SUBTOTAL:	**$ 4,266,000**
				Estimated Project Total:	**$ 4,266,000**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

Water Master Plan

Capital Improvement Plan Cost Estimate			August 2022
Project Number:	**11**	**Phase:**	**Annual Renewal**
Project Name:	**General Water Distribution System Renewal**	**Pressure Plane:**	**--**

Project Description:

This project consists of general water system renewal projects. General water system renewal improvements are needed to maintain functionality and reduce the risk of emergency repairs. Recommended water renewal projects may include, but are not limited to, water main inspections, a water loss study, replacing gaseous chlorine with liquid bleach at distribution system facilities, production well buildings/enclosures, lighted canopies over electrical boxes, recoating exposed piping and valves, or other water distribution system improvements best implemented as capital projects.

Project Driver:

The purpose of this project is to allocate additional annual budget for potential renewal projects to allow the City's existing water distribution system to continue to operate at a high level of service.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	Annual General Distribution Facility Renewal	10	YR	$ 100,000	$ 1,000,000
Water Facility Condition Rating:				**SUBTOTAL:**	**$ 1,000,000**
--		MOBILIZATION		0%	$ -
				SUBTOTAL:	**$ 1,000,000**
		CONTINGENCY		0%	$ -
				SUBTOTAL:	**$ 1,000,000**
		ENG/SURVEY		0%	$ -
				SUBTOTAL:	**$ 1,000,000**
				Estimated Project Total:	**$ 1,000,000**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

Water Master Plan

Capital Improvement Plan Cost Estimate			August 2022
Project Number:	12	**Phase:**	Annual Renewal
Project Name:	Annual Pipeline Replacement Program	**Pressure Plane:**	--

Project Description:

This project includes replacement of existing cast-iron water mains. Cast-iron pipes are at a higher risk of failure due to corrosion and chemical weathering. Replacement of these pipes is recommended to maintain functionality and reduce the risk of emergency repairs. According to the City's GIS database, approximately 189,522 linear feet of cast-iron water mains are documented within the existing water distribution system. Where existing cast-iron mains are less than 8-inch in diameter, pipes will be replaced with minimum 8-inch diameter mains. 14,614 linear feet will be replaced as part of the Targeted Pipeline Replacement Project. Accounting for the Targeted Pipeline Replacement Project and the pavement replacement program leaves approximately 157,763 linear feet of cast-iron main that is recommended to be replaced. FNI developed 25 project areas, containing approximately 6,300 linear feet of cast-iron main, prioritized based on work order density and pipeline diameter.

Project Driver:

The purpose of this project is to proactively replace small diameter, cast-iron water lines.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	Annual Pipeline Replacement Program	25	YR	$ 1,280,420	$ 32,010,500
Water Facility Condition Rating:		**SUBTOTAL:**			**$ 32,010,500**
--		MOBILIZATION		5%	$ 1,600,600
		SUBTOTAL:			**$ 33,611,100**
		CONTINGENCY		30%	$ 10,083,400
		SUBTOTAL:			**$ 43,694,500**
		ENG/SURVEY		15%	$ 6,554,200
		SUBTOTAL:			**$ 50,248,700**
		Estimated Project Total:			**$ 50,248,700**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

APPENDIX F
Short-term CIP Wastewater Cost Sheets

City of Kerrville
Wastewater Master Plan
CIP Project Cost Estimates

Project Number	Project Name			Project Cost
Capital Improvement Plan				
1	Knapp FM and Interceptor			$6,374,692
2	New Knapp Lift Station			$3,049,500
3	Al Mooney Lift Station Renewal			$765,600
4	Airport Commerce Lift Station Renewal			$464,600
5	Quinlan Manhole Replacement			$894,400
6	Quinlan Lift Station Renewal			$206,400
7	Quinlan Interceptor Reroute			$4,790,400
8	Comanche Trace Lift Station Expansion			$499,000
9	Ingram Interceptor Expansion			$19,068,700
			Capital Improvement Plan Total	**$36,113,292**
Annual Renewal Plan				
		Annual Cost	**Years**	**Total Cost**
10	Annual Wastewater System Renewal	$100,000	10	$1,000,000
			Annual Renewal Plan Total	**$1,000,000**

Note: Proposed projects were prioritized based on impact to the wastewater collection system and should be constructed generally in the order listed. The wastewater treatment plant was not evaluated as part of this study so previously identified improvements to the plant should be incorporated into the project list as needed. Cost estimates are provided in 2022 dollars and are for planning and budgeting purposes only. Costs do not include allowances for land acquisition, individual service connections, permitting, or other unique project specific costs.

FREESE AND NICHOLS

Innovative approaches
Practical results
Outstanding service

OPINION OF PROBABLE COSTS

PROJECT TITLE	**KNAPP FORCE MAIN AND INTERCEPTOR IMPROVEMENTS**	DATE	4/18/2022
PROJECT DESCRIPTION	New 12" Force Main and 12", 18", and 24" Interceptors to replace the existing between Knapp Lift Station to Jefferson Lift Station along Lois, Woodlawn, Central and W. Main.		
CLIENT	City of Kerville	GROUP	1147
% OF SUBMITTAL	100%	PM	Anne Hoskins
ESTIMATOR		CHECKED BY	FNI PROJECT NO.
Rachel Coker		Jeidaris Sanchez-Nieves	KER21359

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
	FORCE MAIN				**$726,200**
1	Clearing and Grubbing	1	LS	$ 10,000	$ 10,000.00
2	Erosion Control	1	LS	$ 7,190	$ 7,189.81
3	12-inch C900, DR14 PVC	2,050	LF	$ 180	$ 369,000.00
4	36-inch Steel Casing (Bored)	105	LF	$ 1,000	$ 105,000.00
5	Asphalt Pavement Repair	1,300	SY	$ 80	$ 104,000.00
6	Concrete Sidewalk Repair	150	SF	$ 30	$ 4,500.00
7	CLSM Encasement	50	LF	$ 95	$ 4,750.00
8	Curb and Gutter Repair	40	LF	$ 45	$ 1,800.00
9	CAV Assembly	2	EA	$ 8,000	$ 16,000.00
10	Traffic Control	1	LS	$ 30,000	$ 30,000.00
11	12-inch Gate Valve	2	EA	$ 9,000	$ 18,000.00
12	6-inch Gate Valve	2	EA	$ 2,500	$ 5,000.00
13	Clay Trench Dam	4	CY	$ 40	$ 155.56
14	Bypass Pumping	1	LS	$ 40,000	$ 40,000.00
15	Trench Safety	2,155	LF	$ 5	$ 10,775.00
	INTERCEPTOR				**$3,941,000**
16	Clearing and Grubbing	1	LS	$ 10,000	$ 10,000.00
17	Erosion Control	1	LS	$ 39,019	$ 39,019.30
18	3-inch Water line Relocated	50	LF	$ 100	$ 5,000.00
19	3-inch Water line Removed	20	LF	$ 75	$ 1,500.00
20	18-inch ASTM F679 PS115 Wastewater Line	916	LF	$ 200	$ 183,200.00
21	24-inch ASTM F679 PS115 Wastewater Line	5,880	LF	$ 240	$ 1,411,200.00
22	6-inch ASTM D3034 SDR 26 Wastewater Line	30	LF	$ 120	$ 3,600.00
23	8-inch ASTM D3034 SDR 26 Wastewater Line	50	LF	$ 160	$ 8,000.00
24	12-inch ASTM D3034 SDR 26 Wastewater Line	30	LF	$ 210	$ 6,300.00
25	6-inch ASTM D3034 SDR 26 Wastewater Line Pressure Pipe	120	LF	$ 170	$ 20,400.00
26	12-inch ASTM D3034 SDR 26 Wastewater Line Pressure Pipe	430	LF	$ 220	$ 94,600.00
27	24-inch ASTM D2241 SDR 26 Wastewater Line Pressure Pipe	900	LF	$ 370	$ 333,000.00
28	48-inch Diameter Manhole	5	EA	$ 11,500	$ 57,500.00
29	60-inch Diameter Manhole	6	EA	$ 17,000	$ 102,000.00
30	60-inch Diameter Drop Manhole	4	EA	$ 20,000	$ 80,000.00
31	72-inch Diameter Manhole	16	EA	$ 18,000	$ 288,000.00
32	72-inch Diameter Drop Manhole	11	EA	$ 25,750	$ 283,250.00
33	36-inch Steel Casing (Bored)	260	LF	$ 1,000	$ 260,000.00
34	CLSM Encasement	300	LF	$ 100	$ 30,000.00
35	Asphalt Pavement Repair	5,370	SY	$ 80	$ 429,600.00
36	Concrete Pavement Repair	190	SY	$ 95	$ 18,050.00
37	Concrete Sidewalk Repair	390	SF	$ 30	$ 11,700.00
38	Curb and Gutter Repair	140	LF	$ 45	$ 6,300.00
39	Flexible Base Driveway	250	SY	$ 45	$ 11,250.00
40	Cleanout Installation on Existing 8-inch Wastewater Line	1	EA	$ 1,400	$ 1,400.00
41	Sewer Lateral Connections	20	EA	$ 1,500.00	$ 30,000.00
42	6-inch Wastewater Line (Capped and Abandoned In Place)	7	EA	$ 1,000	$ 7,000.00
43	8-inch Wastewater Line (Capped and Abandoned In Place)	4	EA	$ 1,000	$ 4,000.00
44	10-inch Wastewater Line (Capped and Abandoned In Place)	4	EA	$ 1,000	$ 4,000.00
45	12-inch Wastewater Line (Capped and Abandoned In Place)	20	EA	$ 1,000	$ 20,000.00
46	15-inch Wastewater Line (Capped and Abandoned In Place)	4	EA	$ 1,000	$ 4,000.00
47	Existing Manhole Abandoned	14	EA	$ 3,000	$ 42,000.00
48	Existing Manhole Removed	11	EA	$ 3,000	$ 33,000.00
49	Traffic Control	1	LS	$ 20,000.00	$ 20,000.00
50	Miscellaneous Items and Tie-ins	1	LS	$ 40,000	$ 40,000.00
51	Clay Trench Dam	40	CY	$ 40	$ 1,600.00
52	Trench Safety	8,096	LF	$ 5	$ 40,480.00
			SUBTOTAL:		$4,667,200
			CONTINGENCY	10%	$ 466,720
			SUBTOTAL:		$5,133,920
			MOBILIZATION	5%	$ 256,696
			SUBTOTAL:		$5,390,616
			OVERHEAD AND PROFIT	18%	$ 970,311
PROJECT TOTAL (2022 COSTS)					**$6,360,927**
COST ESCALATION FACTOR				9.0%	$572,483.42
PROJECT TOTAL (2023 COSTS)					**$6,933,410**

FREESE AND NICHOLS

Wastewater Master Plan

Capital Improvement Plan Cost Estimate			October 2022
Project Number:	**2**	**Phase:**	**Capital Improvement**
Project Name:	**New Knapp Lift Station**	**WW Basin:**	**Knapp**

Project Description:

This project involves construction of a new 1.75 MGD Knapp Lift Station on or adjacent to the existing site. The new lift station includes three 600 gpm pumps with an additional slot for a fourth pump to be installed during a future expansion.

Project Driver:

This project is triggered by an existing capacity restriction at the lift station. This project is intended to increase capacity for existing peak flows but also provides additional capacity for potential future development in the area that may participate in project implementation. This project increases wastewater service capacity for both City of Kerrville and City of Ingram customers.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	1.75 MGD Lift Station	1	EA	$ 1,750,000	$ 1,750,000
2	Lift Station - Decomm	1	LS	$ 100,000	$ 100,000
Lift Station Condition Rating:				**SUBTOTAL:**	**$ 1,850,000**
2.40		TEMPORARY BYPASS PUMPING		5%	$ 92,500
				SUBTOTAL:	**$ 1,942,500**
		MOBILIZATION		5%	$ 97,200
				SUBTOTAL:	**$ 2,039,700**
		CONTINGENCY		30%	$ 612,000
				SUBTOTAL:	**$ 2,651,700**
		ENG/SURVEY		15%	$ 397,800
				SUBTOTAL:	**$ 3,049,500**
				Estimated Project Total:	**$ 3,049,500**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

FREESE AND NICHOLS

Wastewater Master Plan

Capital Improvement Plan Cost Estimate				October 2022
Project Number:	**3**	**Phase:**	**Capital Improvement**	
Project Name:	**Al Mooney Lift Station Renewal**		**WW Basin:**	**Al Mooney**

Project Description:

This project replaces the existing pumps at the Al Mooney Lift Station with two new 300 gpm pumps. This project also includes upgrades to enhance the condition of the facility, such as wet well, pump control, and electrical improvements.

Project Driver:

This project is triggered by an existing capacity restriction and by existing condition issues noted during the lift station site visit. This project is intended to increase capacity for existing peak flows but also provides additional capacity for potential future development in the area that may participate in project implementation.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	New 300 gpm Pump	2	EA	$ 40,000	$ 80,000
2	Clean, Repair, and Coat Wet Well	1	LS	$ 50,000	$ 50,000
3	Wet Well Hatch including Safety Grate	1	LS	$ 10,000	$ 10,000
4	Replace Influent and Effluent Site Piping	1	LS	$ 200,000	$ 200,000
5	Replace Pump Floats/Controls	1	LS	$ 50,000	$ 50,000
6	Miscellaneous Electrical Wiring Replacement	1	LS	$ 30,000	$ 30,000
7	Lift Station Site Cleanup and General Improvements	1	LS	$ 25,000	$ 25,000
Lift Station Condition Rating:				**SUBTOTAL:**	**$ 445,000**
3.45		TEMPORARY BYPASS PUMPING		5%	$ 22,300
				SUBTOTAL:	**$ 467,300**
		MOBILIZATION		5%	$ 23,400
				SUBTOTAL:	**$ 490,700**
		CONTINGENCY		30%	$ 147,300
				SUBTOTAL:	**$ 638,000**
		ENG/SURVEY		20%	$ 127,600
				SUBTOTAL:	**$ 765,600**
				Estimated Project Total:	**$ 765,600**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

Wastewater Master Plan

Capital Improvement Plan Cost Estimate			October 2022
Project Number:	4	**Phase:**	Capital Improvement
Project Name:	Airport Commerce Lift Station Renewal	**WW Basin:**	Airport Commerce

Project Description:

This project includes condition upgrades to the Airport Commerce Lift Station. Upgrades include improvements to the wet well, electrical system, and control panels.

Project Driver:

This project is triggered by existing condition issues noted during the lift station site visit.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	Clean, Repair, and Coat Wet Well	1	LS	$ 50,000	$ 50,000
2	Wet Well Hatch including Safety Grate	1	LS	$ 10,000	$ 10,000
3	Electrical Junction Box	1	EA	$ 5,000	$ 5,000
4	Electrical Distribution Panel	1	EA	$ 10,000	$ 10,000
5	Pump Control Panel	1	EA	$ 100,000	$ 100,000
6	Service Disconnect	1	EA	$ 10,000	$ 10,000
7	Miscellaneous Electrical Wiring Replacement	1	LS	$ 30,000	$ 30,000
8	Cable and Conduit	1	LS	$ 30,000	$ 30,000
9	Lift Station Site Cleanup and General Improvements	1	LS	$ 25,000	$ 25,000
Lift Station Condition Rating:				**SUBTOTAL:**	**$ 270,000**
3.10		TEMPORARY BYPASS PUMPING		5%	$ 13,500
				SUBTOTAL:	**$ 283,500**
		MOBILIZATION		5%	$ 14,200
				SUBTOTAL:	**$ 297,700**
		CONTINGENCY		30%	$ 89,400
				SUBTOTAL:	**$ 387,100**
		ENG/SURVEY		20%	$ 77,500
				SUBTOTAL:	**$ 464,600**
				Estimated Project Total:	**$ 464,600**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

Wastewater Master Plan

Capital Improvement Plan Cost Estimate			October 2022
Project Number:	**5**	**Phase:**	**Capital Improvement**
Project Name:	**Quinlan Manhole Replacement**	**WW Basin:**	**Quinlan**

Project Description:

This project includes in-place replacement of approximately 16 fiberglass manholes within the 1st Street roadway, upstream of the Quinlan Lift Station. According to City Staff, these manholes are not adequate to sustain repeated dynamic loads from vehicular traffic on the roadway. New manholes should be installed with appropriate structural conditions to support heavy vehicle loading. This project also include repaving approximately 1000 lf of 1st Street once the new manholes are in place.

Project Driver:

According to City Staff, poor structural conditions of the existing manholes are causing the roadway to deteriorate and fail.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	60" Diameter Concrete Manhole	16	EA	$ 25,000	$ 400,000
2	Pavement Repair	1,000	LF	$ 120	$ 120,000
Lift Station Condition Rating:				**SUBTOTAL:**	**$ 520,000**
--		TEMPORARY BYPASS PUMPING		5%	$ 26,000
				SUBTOTAL:	**$ 546,000**
		MOBILIZATION		5%	$ 27,300
				SUBTOTAL:	**$ 573,300**
		CONTINGENCY		30%	$ 172,000
				SUBTOTAL:	**$ 745,300**
		ENG/SURVEY		20%	$ 149,100
				SUBTOTAL:	**$ 894,400**
				Estimated Project Total:	**$ 894,400**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

FREESE AND NICHOLS

Wastewater Master Plan

Capital Improvement Plan Cost Estimate			October 2022
Project Number:	6	**Phase:**	Capital Improvement
Project Name:	Quinlan Lift Station Renewal	**WW Basin:**	Quinlan

Project Description:

This project includes addressing debris issues at the Quinlan Lift Station. Debris control may include wet well recirculation, grinder pumps, or screening to be determined by the design engineer. This project also includes a new wet well hatch and safety grate, new pump controls, and enhanced wet well ventilation.

Project Driver:

Results from the Lift Station Site Visits noted severe debris and ragging issues of the pumps at Quinlan Lift Station, verified by City Staff. Debris causes maintenance and operational issues, but lift station capacity is not identified as deficient.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	Debris Control	1	EA	$ 50,000	$ 50,000
2	Wet Well Hatch including Safety Grate	1	LS	$ 10,000	$ 10,000
3	Replace Pump Floats/Controls	1	LS	$ 50,000	$ 50,000
4	Wet Well Ventilation	1	LS	$ 10,000	$ 10,000
Lift Station Condition Rating:				**SUBTOTAL:**	**$ 120,000**
2.90		TEMPORARY BYPASS PUMPING		5%	$ 6,000
				SUBTOTAL:	**$ 126,000**
		MOBILIZATION		5%	$ 6,300
				SUBTOTAL:	**$ 132,300**
		CONTINGENCY		30%	$ 39,700
				SUBTOTAL:	**$ 172,000**
		ENG/SURVEY		20%	$ 34,400
				SUBTOTAL:	**$ 206,400**
				Estimated Project Total:	**$ 206,400**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

FREESE AND NICHOLS

Wastewater Master Plan

Capital Improvement Plan Cost Estimate			October 2022
Project Number:	7	**Phase:**	Capital Improvement
Project Name:	Quinlan Interceptor Reroute	**WW Basin:**	Quinlan

Project Description:

This project includes a new 18-inch Quinlan Interceptor along a new alignment on the east side of Quinlan Creek. This project will connect to the existing 12-inch line near Quinlan Creek Drive and the existing 18-inch line at 3rd Street. This project will connect to existing the 6-inch and 8-inch lines along the alignment where feasible. Once this project is in service, the existing 10-inch line under Quinlan Creek may be cut and capped or abandoned in place.

Project Driver:

This project is triggered by a projected capacity restriction in the existing Quinlan Interceptor. This project is intended to increase capacity for existing peak flows but also provides additional capacity for potential future development in the area that may participate in project implementation.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	18" Pipe and Appurtenances 8- 16 feet deep	5,900	LF	$ 430	$ 2,537,000
2	8" Pipe and Appurtenances 8- 16 feet deep	1,000	LF	$ 200	$ 200,000
3	60" Diameter Manhole	15	EA	$ 17,000	$ 251,600
4	Pavement Repair	500	LF	$ 120	$ 60,000
5	Cap and Abandon-In-Place 6-inch Wastewater Line	2	EA	$ 1,000	$ 2,000
6	Cap and Abandon-In-Place 10-inch Wastewater Line	1	EA	$ 1,000	$ 1,000
Lift Station Condition Rating:				**SUBTOTAL:**	**$ 3,051,600**
--		TEMPORARY BYPASS PUMPING		0%	$ -
				SUBTOTAL:	**$ 3,051,600**
		MOBILIZATION		5%	$ 152,600
				SUBTOTAL:	**$ 3,204,200**
		CONTINGENCY		30%	$ 961,300
				SUBTOTAL:	**$ 4,165,500**
		ENG/SURVEY		15%	$ 624,900
				SUBTOTAL:	**$ 4,790,400**
				Estimated Project Total:	**$ 4,790,400**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

Wastewater Master Plan

Capital Improvement Plan Cost Estimate			October 2022
Project Number:	**8**	**Phase:**	**Capital Improvement**
Project Name:	**Comanche Trace Lift Station Expansion**	**WW Basin:**	**Comanche Trace**

Project Description:

This project expands the capacity of the existing Comanche Trace Lift Station. The existing pumps will be replaced with two 900 gpm pumps. This project also replaces the existing floats and controls. Pumps are sized according to existing peak flows through the pump station. Approximately 544 connections currently contribute to existing peak flows. Future growth will drive additional lift station expansion.

Project Driver:

This project is triggered by an existing capacity restriction and is sized to convey existing peak flows. As the Comanche Trace Lift Station solely serves the Comanche Trace development, it is assumed that the developer will be primarily responsible for the implementation of this project.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	New 900 gpm Pump	2	EA	$ 120,000	$ 240,000
2	Replace Pump Floats/Controls	1	LS	$ 50,000	$ 50,000
Lift Station Condition Rating:				**SUBTOTAL:**	**$ 290,000**
2.10		TEMPORARY BYPASS PUMPING		5%	$ 14,500
				SUBTOTAL:	**$ 304,500**
		MOBILIZATION		5%	$ 15,300
				SUBTOTAL:	**$ 319,800**
		CONTINGENCY		30%	$ 96,000
				SUBTOTAL:	**$ 415,800**
		ENG/SURVEY		20%	$ 83,200
				SUBTOTAL:	**$ 499,000**
				Estimated Project Total:	**$ 499,000**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

Wastewater Master Plan

Capital Improvement Plan Cost Estimate			October 2022
Project Number:	9	**Phase:**	Capital Improvement
Project Name:	Ingram Interceptor Expansion	**WW Basin:**	Knapp

Project Description:

This project is intended to increase the capacity of the existing interceptor downstream of the Ingram Lift Station. This project replaces the existing 12-inch gravity main with a new 15-inch and 18-inch line from the Ingram Lift Station to the Knapp Lift Station.

Project Driver:

This project is triggered by a projected existing capacity restriction. This project is intended to increase capacity for existing peak flows but also provides additional capacity for potential future development in the area that may participate in project implementation. This project increases wastewater service capacity for both City of Kerrville and City of Ingram customers.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	15" Pipe and Appurtenances 8- 16 feet deep	700	LF	$ 350	$ 245,000
2	18" Pipe and Appurtenances 8- 16 feet deep	16,300	LF	$ 430	$ 7,009,000
3	60" Diameter Manhole	35	EA	$ 17,000	$ 595,000
4	Pavement Repair	16,000	LF	$ 120	$ 1,920,000
5	18" WW Line by Boring with 30" Casing	1,500	LF	$ 1,200	$ 1,800,000
Lift Station Condition Rating:				**SUBTOTAL:**	**$ 11,569,000**
--		TEMPORARY BYPASS PUMPING		5%	$ 578,500
				SUBTOTAL:	**$ 12,147,500**
		MOBILIZATION		5%	$ 607,400
				SUBTOTAL:	**$ 12,754,900**
		CONTINGENCY		30%	$ 3,826,500
				SUBTOTAL:	**$ 16,581,400**
		ENG/SURVEY		15%	$ 2,487,300
				SUBTOTAL:	**$ 19,068,700**
				Estimated Project Total:	**$ 19,068,700**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

Wastewater Master Plan

Capital Improvement Plan Cost Estimate			October 2022
Project Number:	10	**Phase:**	Annual Renewal
Project Name:	Annual Wastewater System Renewal	**WW Basin:**	--

Project Description:

This project allocates additional annual budget for the renewal of the City's wastewater system. General wastewater system renewal improvements are needed to maintain functionality and reduce the risk of emergency repairs. Budget may be used towards general lift station renewal, gravity main CCTV inspection, main replacement, or any additional operation and maintenance concern. General lift station renewal may include, but is not limited to, cleaning and coating wet wells or valve vaults, general electrical improvements, addressing corrosion or debris issues, accommodations for back-up power supply, or other lift station improvements. CCTV inspection may be used to assess the condition of a gravity main of interest, collect invert elevation data, and pipe material data.

Project Driver:

The purpose of this project is to allocate additional annual budget to allow the City's existing facilities to continue to operate at a high level of service.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	Annual Wastewater System Renewal	10	YR	$ 100,000	$ 1,000,000
Lift Station Condition Rating:				**SUBTOTAL:**	**$ 1,000,000**
--		TEMPORARY BYPASS PUMPING		0%	$ -
				SUBTOTAL:	**$ 1,000,000**
		MOBILIZATION		0%	$ -
				SUBTOTAL:	**$ 1,000,000**
		CONTINGENCY		0%	$ -
				SUBTOTAL:	**$ 1,000,000**
		ENG/SURVEY		0%	$ -
				SUBTOTAL:	**$ 1,000,000**
				Estimated Project Total:	**$ 1,000,000**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

APPENDIX G
Growth Driven CIP Water Cost Sheets

City of Kerrville
Water Master Plan
Development Project Cost Estimates

Project Number	Project Name	Project Cost
Development Scenario A		
A1	8-inch Trinity Circle Water Main	$1,676,600
A2	12-inch Sidney Baker St S Water Main	$3,202,300
A3	8-inch Overlook Dr E Water Main	$1,193,100
A4	Kerrville South Pressure Plane	$21,329,900
	Development Scenario A Total	**$27,401,900**
Development Scenario B		
B1	12-inch Bear Creek Rd Water Main	$10,560,600
B2	8-inch Jade Loop Water Main	$596,600
B3	Keystone Hydropneumatic Tank	$557,000
	Development Scenario B Total	**$11,714,200**
Development Scenario C		
C1	10-inch Fredericksburg Rd N Water Main	$1,660,200
C2	8-inch Benson Dr N Water Main	$1,821,000
C3	Stadium Pump Station Expansion	$982,800
C4	South Summit Transmission and EST	$7,601,800
C5	South Summit South-eastern Water Main	$6,624,400
C6	South Summit South-western Water Main	$5,808,100
C7	Travis Street Pump Station	$557,000
C8	College Cove Pressure Transfer	$1,146,600
C9	8-inch Hal Peterson Middle School Water Main	$910,500
	Development Scenario C Total	**$27,112,400**
Development Scenario D		
D1	12-inch Highway 27 Water Main	$3,084,700
D2	12-inch Bandera Highway Water Main	$6,353,700
D3	12-inch Wharton Rd E Water Main	$2,990,500
	Development Scenario D Total	**$12,428,900**
	Growth Driven Projects Total	**$78,657,400**

Note: Proposed projects were prioritized based on impact to the water distribution system and should be constructed generally in the order listed. The water treatment plant was not evaluated as part of this study so previously identified improvements to the plant should be incorporated into the project list as needed. Cost estimates are provided in 2022 dollars and are for planning and budgeting purposes only. Costs do not include allowances for land acquisition, individual service connections, permitting, or other unique project specific costs.

Water Master Plan

Development Improvement Plan Cost Estimate			October 2022
Project Number:	**A1**	**Phase:**	**Development Scenario A**
Project Name:	**8-inch Trinity Circle Water Main**	**Pressure Plane:**	**Stadium**

Project Description:

This project includes construction of 3,600 linear feet of 8-inch water main connecting to the existing 12-inch water main South of Thompson Dr. The new water main connects to the existing 12-inch main at Sheppard Rees Rd S and Texas Dr S.

Project Driver:

The purpose of this project is to provide service to any new developments in the existing Kerrville State Hospital parcels. Alignments are provided for planning purposes only, final alignments may be subject to change.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	8" WL & Appurtenances - by Open Cut	3,600	LF	$ 200	$ 720,000
2	Pavement Repair	2,900	LF	$ 120	$ 348,000
Water Facility Condition Rating:				**SUBTOTAL:**	**$ 1,068,000**
--		MOBILIZATION		5%	$ 53,400
				SUBTOTAL:	**$ 1,121,400**
		CONTINGENCY		30%	$ 336,500
				SUBTOTAL:	**$ 1,457,900**
		ENG/SURVEY		15%	$ 218,700
				SUBTOTAL:	**$ 1,676,600**
				Estimated Project Total:	**$ 1,676,600**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

Water Master Plan

Development Improvement Plan Cost Estimate			October 2022
Project Number:	**A2**	**Phase:**	**Development Scenario A**
Project Name:	**12-inch Sidney Baker St S Water Main**	**Pressure Plane:**	**Stadium**

Project Description:

This project includes construction of 6,600 linear feet of 12-inch water main connecting to the existing 12-inch main along Hill Country Dr S and Bandera Highway. The new water main connects to the existing at the intersection of Hill Country Dr S and Granada Pl S and near the intersection Bandera Highway and Chapman Dr E.

Project Driver:

The purpose of this project is to provide service to any developments along Sidney Baker St S. Alignments are provided for planning purposes only, final alignments may be subject to change.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	8" WL & Appurtenances - by Open Cut	6,100	LF	$ 200	$ 1,220,000
2	8" WL by Bore with 20" Steel Casing	500	LF	$ 800	$ 400,000
3	Pavement Repair	3,500	LF	$ 120	$ 420,000
Water Facility Condition Rating:				**SUBTOTAL:**	**$ 2,040,000**
--		MOBILIZATION		5%	$ 102,000
				SUBTOTAL:	**$ 2,142,000**
		CONTINGENCY		30%	$ 642,600
				SUBTOTAL:	**$ 2,784,600**
		ENG/SURVEY		15%	$ 417,700
				SUBTOTAL:	**$ 3,202,300**
				Estimated Project Total:	**$ 3,202,300**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

FREESE AND NICHOLS

Water Master Plan

Development Improvement Plan Cost Estimate			October 2022
Project Number:	**A3**	**Phase:**	**Development Scenario A**
Project Name:	**8-inch Overlook Dr E Water Main**	**Pressure Plane:**	**Ridgewood**

Project Description:

This project includes construction of 3,500 linear feet of 8-inch water main connecting to the existing 6-inch water main along Overlook Dr E and Highridge Dr E.

Project Driver:

The purpose of this project is to provide service to projected developments north of the Overlook Dr E neighborhood. Alignments are provided for planning purposes only, final alignments may be subject to change.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	8" WL & Appurtenances - by Open Cut	3,500	LF	$ 200	$ 700,000
2	Pavement Repair	500	LF	$ 120	$ 60,000
Water Facility Condition Rating:				**SUBTOTAL:**	**$ 760,000**
--		MOBILIZATION		5%	$ 38,000
				SUBTOTAL:	**$ 798,000**
		CONTINGENCY		30%	$ 239,400
				SUBTOTAL:	**$ 1,037,400**
		ENG/SURVEY		15%	$ 155,700
				SUBTOTAL:	**$ 1,193,100**
				Estimated Project Total:	**$ 1,193,100**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

Water Master Plan

Development Improvement Plan Cost Estimate			October 2022
Project Number:	**A4**	**Phase:**	**Development Scenario A**
Project Name:	**Kerrville South Pressure Plane**	**Pressure Plane:**	**Kerrville South**

Project Description:

This project includes construction of a new EST and 12-inch waterlines south west of the river, to establish a new pressure plane. A pump station expansion will also be required to serve the new pressure plane.

Project Driver:

The purpose of this project is to provide service to developments south west of the river. Alignments are provided for planning purposes only, final alignments may be subject to change.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	12" WL & Appurtenances - by Open Cut	48,600	LF	$ 225	$ 10,935,000
2	0.5 MG Elevated Storage Tank	1	LS	$ 2,135,000	$ 2,135,000
3	1200 gpm Pump	2	EA	$ 259,000	$ 518,000
Water Facility Condition Rating:				**SUBTOTAL:**	**$ 13,588,000**
--		MOBILIZATION		5%	$ 679,400
				SUBTOTAL:	**$ 14,267,400**
		CONTINGENCY		30%	$ 4,280,300
				SUBTOTAL:	**$ 18,547,700**
		ENG/SURVEY		15%	$ 2,782,200
				SUBTOTAL:	**$ 21,329,900**
				Estimated Project Total:	**$ 21,329,900**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

FREESE AND NICHOLS

Water Master Plan

Development Improvement Plan Cost Estimate			October 2022
Project Number:	**B1**	**Phase:**	**Development Scenario B**
Project Name:	**12-inch Bear Creek Rd Water Main**	**Pressure Plane:**	**Methodist**

Project Description:

This project includes construction of 19,500 linear feet of new 12-inch water main connecting to the existing 12-inch water main along Junction Highway. The water main loops from the intersection of Arcadia Loop S and Junction Highway, along Bear Creek Rd, and connects to the end of the existing 12-inch water main along Junction Highway.

Project Driver:

The purpose of this project is to provide service to any developments between Junction Highway and Bear Creek Rd. Alignments are provided for planning purposes only, final alignments may be subject to change.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	12" WL & Appurtenances - by Open Cut	19,500	LF	$ 225	$ 4,387,500
2	Pavement Repair	19,500	LF	$ 120	$ 2,340,000
Water Facility Condition Rating:				**SUBTOTAL:**	**$ 6,727,500**
--		MOBILIZATION		5%	$ 336,400
				SUBTOTAL:	**$ 7,063,900**
		CONTINGENCY		30%	$ 2,119,200
				SUBTOTAL:	**$ 9,183,100**
		ENG/SURVEY		15%	$ 1,377,500
				SUBTOTAL:	**$ 10,560,600**
				Estimated Project Total:	**$ 10,560,600**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

FREESE AND NICHOLS

Water Master Plan

Development Improvement Plan Cost Estimate			October 2022
Project Number:	**B2**	**Phase:**	**Development Scenario B**
Project Name:	**8-inch Jade Loop Water Main**	**Pressure Plane:**	**Stadium**

Project Description:

This project includes construction of 1,150 linear feet of new 8-inch water main connecting to the existing 12-inch main along Thompson Dr. The new 8-inch main connects to the existing near the intersection of Jade Loop and Thompson Dr.

Project Driver:

The purpose of this project is to provide service to any developments near Jade Loop. Alignments are provided for planning purposes only, final alignments may be subject to change.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	8" WL & Appurtenances - by Open Cut	900	LF	$ 200	$ 180,000
2	8" WL by Bore with 20" Steel Casing	250	LF	$ 800	$ 200,000
Water Facility Condition Rating:				**SUBTOTAL:**	**$ 380,000**
--		MOBILIZATION		5%	$ 19,000
				SUBTOTAL:	**$ 399,000**
		CONTINGENCY		30%	$ 119,700
				SUBTOTAL:	**$ 518,700**
		ENG/SURVEY		15%	$ 77,900
				SUBTOTAL:	**$ 596,600**
				Estimated Project Total:	**$ 596,600**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

FREESE AND NICHOLS

Water Master Plan

Development Improvement Plan Cost Estimate			October 2022
Project Number:	**B3**	**Phase:**	**Development Scenario B**
Project Name:	**Keystone Hydropneumatic Tank**	**Pressure Plane:**	**Keystone Hydropneuma**

Project Description:

This project includes replacing existing pumps at the Keystone Hydropneumatic Tank to expand capacity. A capacity expansion is recommended to provide service to proposed future developments.

Project Driver:

The purpose of this project is to provide service to any developments in the Keystone Hydropneumatic Zone and to satisfy TCEQ pumping requirements. Alignments are provided for planning purposes only, final alignments may be subject to change.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	600 gpm Pump	2	EA	$ 130,000	$ 260,000
2	Pump Station Header Piping & Appurtenances	1	LS	$ 80,000	$ 80,000
Water Facility Condition Rating:				**SUBTOTAL:**	**$ 340,000**
--		MOBILIZATION		5%	$ 17,000
				SUBTOTAL:	**$ 357,000**
		CONTINGENCY		30%	$ 107,100
				SUBTOTAL:	**$ 464,100**
		ENG/SURVEY		20%	$ 92,900
				SUBTOTAL:	**$ 557,000**
				Estimated Project Total:	**$ 557,000**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

FREESE AND NICHOLS

Water Master Plan

Development Improvement Plan Cost Estimate			October 2022
Project Number:	**C1**	**Phase:**	**Development Scenario C**
Project Name:	**10-inch Fredericksburg Rd N Water Main**	**Pressure Plane:**	**Kerrville North**

Project Description:

This project includes construction of 4,700 linear feet of 10-inch water main north of I-10. The new main will extend the exising 10-inch water main further along Fredericksburg Rd N.

Project Driver:

The purpose of this project is to provide service to any developments north of I-10. Alignments are provided for planning purposes only, final alignments may be subject to change.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	10" WL & Appurtenances - by Open Cut	4,700	LF	$ 225	$ 1,057,500
Water Facility Condition Rating:				**SUBTOTAL:**	**$ 1,057,500**
--		MOBILIZATION		5%	$ 52,900
				SUBTOTAL:	**$ 1,110,400**
		CONTINGENCY		30%	$ 333,200
				SUBTOTAL:	**$ 1,443,600**
		ENG/SURVEY		15%	$ 216,600
				SUBTOTAL:	**$ 1,660,200**
				Estimated Project Total:	**$ 1,660,200**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

Water Master Plan

Development Improvement Plan Cost Estimate			October 2022
Project Number:	**C2**	**Phase:**	**Development Scenario C**
Project Name:	**8-inch Benson Dr N Water Main**	**Pressure Plane:**	**Kerrville North**

Project Description:

This project includes construction of 5,800 linear feet of new 8-inch water main. This project replaces the existing 6-inch main on Benson Dr N and loops to connect to the existing 6-inch main on Mathison St N.

Project Driver:

The purpose of this project is to improve service and available fire flow to developments in the Kerrville North Pressure Plane. Alignments are provided for planning purposes only, final alignments may be subject to change.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	8" WL & Appurtenances - by Open Cut	5,800	LF	$ 200	$ 1,160,000
Water Facility Condition Rating:				**SUBTOTAL:**	**$ 1,160,000**
--		MOBILIZATION		5%	$ 58,000
				SUBTOTAL:	**$ 1,218,000**
		CONTINGENCY		30%	$ 365,400
				SUBTOTAL:	**$ 1,583,400**
		ENG/SURVEY		15%	$ 237,600
				SUBTOTAL:	**$ 1,821,000**
				Estimated Project Total:	**$ 1,821,000**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

FREESE AND NICHOLS

Water Master Plan

Development Improvement Plan Cost Estimate			October 2022
Project Number:	**C3**	**Phase:**	**Development Scenario C**
Project Name:	**Stadium Pump Station Expansion**	**Pressure Plane:**	**Kerrville North**

Project Description:

This project includes expansion of the existing Stadium Pump Station Pumps to increase capacity. A capacity expansion is recommended to provide service to proposed future developments.

Project Driver:

The purpose of this project is to add distribution pumping capacity to meet TCEQ minimum requirements for projected developments. Alignments are provided for planning purposes only, final alignments may be subject to change.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	Pump Station - Expans 2 MGD	1	LS	$ 600,000	$ 600,000
Water Facility Condition Rating:				**SUBTOTAL:**	**$ 600,000**
--		MOBILIZATION		5%	$ 30,000
				SUBTOTAL:	**$ 630,000**
		CONTINGENCY		30%	$ 189,000
				SUBTOTAL:	**$ 819,000**
		ENG/SURVEY		20%	$ 163,800
				SUBTOTAL:	**$ 982,800**
				Estimated Project Total:	**$ 982,800**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

Water Master Plan

Development Improvement Plan Cost Estimate			October 2022
Project Number:	C4	**Phase:**	Development Scenario C
Project Name:	South Summit Transmission and EST	**Pressure Plane:**	Summit

Project Description:

This project includes construction of 10,700 linear feet of new 12-inch water main, 0.5 MG elevated storage tank and 1.0 MGD pump in the Summit Pressure Plane. The new pump will be added to the existing pump station. The 12-inch water main will connect the pump station and the new elevated storage tank. This project expands the service provided by the Summit Pressure Plane to potential future connections.

Project Driver:

The purpose of this project is to provide additional storage to the Summit Pressure Plane in the case that it develops. Sizing of the pump station and elevated storage tank are based on future demand projections. Alignments are provided for planning purposes only, final alignments may be subject to change.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	12" WL & Appurtenances - by Open Cut	10,700	LF	$ 225	$ 2,407,500
2	0.5 MG Elevated Storage Tank	1	LS	$ 2,135,000	$ 2,135,000
3	1.0 MGD Pump	2	EA	$ 150,000	$ 300,000
Water Facility Condition Rating:				**SUBTOTAL:**	**$ 4,842,500**
--		MOBILIZATION		5%	$ 242,200
				SUBTOTAL:	**$ 5,084,700**
		CONTINGENCY		30%	$ 1,525,500
				SUBTOTAL:	**$ 6,610,200**
		ENG/SURVEY		15%	$ 991,600
				SUBTOTAL:	**$ 7,601,800**
				Estimated Project Total:	**$ 7,601,800**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

FREESE AND NICHOLS

Water Master Plan

Development Improvement Plan Cost Estimate			October 2022
Project Number:	**C5**	**Phase:**	**Development Scenario C**
Project Name:	**South Summit South-eastern Water Main**	**Pressure Plane:**	**Summit**

Project Description:

This project includes construction of 17,100 linear feet of new 8-inch water main. The new main is recommended to connect to the proposed 12-inch water main in project C4, extending the Summit Pressure Plane service.

Project Driver:

The purpose of this project is to provide service to developments occuring to the East of Veterans Highway. Alignments are provided for planning purposes only, final alignments may be subject to change.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	8" WL & Appurtenances - by Open Cut	17,100	LF	$ 200	$ 3,420,000
2	8" WL by Bore with 20" Steel Casing	1,000	LF	$ 800	$ 800,000
Water Facility Condition Rating:				**SUBTOTAL:**	**$ 4,220,000**
--		MOBILIZATION		5%	$ 211,000
				SUBTOTAL:	**$ 4,431,000**
		CONTINGENCY		30%	$ 1,329,300
				SUBTOTAL:	**$ 5,760,300**
		ENG/SURVEY		15%	$ 864,100
				SUBTOTAL:	**$ 6,624,400**
				Estimated Project Total:	**$ 6,624,400**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

FREESE AND NICHOLS

Water Master Plan

Development Improvement Plan Cost Estimate			October 2022
Project Number:	**C6**	**Phase:**	**Development Scenario C**
Project Name:	**South Summit South-western Water Main**	**Pressure Plane:**	**Summit**

Project Description:

This project includes construction of 14,000 linear feet of new 8-inch water main. The new main is recommended to connect to the proposed 12-inch water main in project C4, extending the Summit Pressure Plane service.

Project Driver:

The purpose of this project is to provide service to developments occuring to the West of Veterans Highway. Alignments are provided for planning purposes only, final alignments may be subject to change.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	8" WL & Appurtenances - by Open Cut	12,500	LF	$ 200	$ 2,500,000
2	8" WL by Bore with 20" Steel Casing	1,500	LF	$ 800	$ 1,200,000
Water Facility Condition Rating:				**SUBTOTAL:**	**$ 3,700,000**
--		MOBILIZATION		5%	$ 185,000
				SUBTOTAL:	**$ 3,885,000**
		CONTINGENCY		30%	$ 1,165,500
				SUBTOTAL:	**$ 5,050,500**
		ENG/SURVEY		15%	$ 757,600
				SUBTOTAL:	**$ 5,808,100**
				Estimated Project Total:	**$ 5,808,100**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

Water Master Plan

Development Improvement Plan Cost Estimate			October 2022
Project Number:	**C7**	**Phase:**	**Development Scenario C**
Project Name:	**Travis Street Pump Station**	**Pressure Plane:**	**College Cove**

Project Description:

This project includes replacement of existing Travis Street Pump Station pumps to increase capacity. A capacity expansion is recommended to provide service to proposed future developments.

Project Driver:

The purpose of this project is to add distribution pumping capacity to meet TCEQ minimum requirements for projected developments. Alignments are provided for planning purposes only, final alignments may be subject to change.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	600 gpm Pump	2	EA	$ 130,000	$ 260,000
2	Pump Station Header Piping & Appurtenances	1	LS	$ 80,000	$ 80,000
Water Facility Condition Rating:				**SUBTOTAL:**	**$ 340,000**
--		MOBILIZATION		5%	$ 17,000
				SUBTOTAL:	**$ 357,000**
		CONTINGENCY		30%	$ 107,100
				SUBTOTAL:	**$ 464,100**
		ENG/SURVEY		20%	$ 92,900
				SUBTOTAL:	**$ 557,000**
				Estimated Project Total:	**$ 557,000**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

Water Master Plan

Development Improvement Plan Cost Estimate			October 2022
Project Number:	**C8**	**Phase:**	**Development Scenario C**
Project Name:	**College Cove Pressure Transfer**	**Pressure Plane:**	**College Cove**

Project Description:

This project includes construction of 1,500 linear feet of new 8-inch water main along Veterans Highway connecting to existing 8-inch water mains on Laurel Heights Bvld N and near the intersection of Veterans Highway and 1351 N. The project also includes installation of two new valves, isolating the pressure planes.

Project Driver:

The purpose of this project is to transfer the Ivy Ln and Jasper Ln neighborhood from the Summit Pressure Plane to the College Cove Pressure Plane to improve pressures at service connections. Alignments are provided for planning purposes only, final alignments may be subject to change.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	8" WL & Appurtenances - by Open Cut	1,500	LF	$ 200	$ 300,000
2	Valve with Vault	2	LS	$ 200,000	$ 400,000
Water Facility Condition Rating:				**SUBTOTAL:**	**$ 700,000**
--		MOBILIZATION		5%	$ 35,000
				SUBTOTAL:	**$ 735,000**
		CONTINGENCY		30%	$ 220,500
				SUBTOTAL:	**$ 955,500**
		ENG/SURVEY		20%	$ 191,100
				SUBTOTAL:	**$ 1,146,600**
				Estimated Project Total:	**$ 1,146,600**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

Water Master Plan

Development Improvement Plan Cost Estimate			October 2022
Project Number:	**C9**	**Phase:**	**Development Scenario C**
Project Name:	**8-inch Hal Peterson Middle School Water Main**	**Pressure Plane:**	**College Cove**

Project Description:

This project includes construction of 2,900 linear feet of 8-inch water main. The proposed new water main connects to the existing 12-inch water main on Veterans Highway and loops to connect to the existing 8-inch water main west of the highway.

Project Driver:

The purpose of this project is to provide service to developments occuring around the old Middle School. Alignments are provided for planning purposes only, final alignments may be subject to change.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	8" WL & Appurtenances - by Open Cut	2,900	LF	$ 200	$ 580,000
Water Facility Condition Rating:				**SUBTOTAL:**	**$ 580,000**
--		MOBILIZATION		5%	$ 29,000
				SUBTOTAL:	**$ 609,000**
		CONTINGENCY		30%	$ 182,700
				SUBTOTAL:	**$ 791,700**
		ENG/SURVEY		15%	$ 118,800
				SUBTOTAL:	**$ 910,500**
				Estimated Project Total:	**$ 910,500**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

FREESE AND NICHOLS

Water Master Plan

Development Improvement Plan Cost Estimate			October 2022
Project Number:	**D1**	**Phase:**	**Development Scenario D**
Project Name:	**12-inch Highway 27 Water Main**	**Pressure Plane:**	**Stadium**

Project Description:

This project includes construction of 8,200 linear feet of new 12-inch water main along Highway 27. The proposed main connects to the existing 12-inch water main at the intersection of Creekwood Rd N and Peterson Farm Rd N and at the intersection of Al Mooney Rd N and Highway 27.

Project Driver:

The purpose of this project is to add looping and capacity to the lower Stadium Pressure Plane. Alignments are provided for planning purposes only, final alignments may be subject to change.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	12" WL & Appurtenances - by Open Cut	8,200	LF	$ 225	$ 1,845,000
2	Pavement Repair	1,000	LF	$ 120	$ 120,000
Water Facility Condition Rating:				**SUBTOTAL:**	**$ 1,965,000**
--		MOBILIZATION		5%	$ 98,300
				SUBTOTAL:	**$ 2,063,300**
		CONTINGENCY		30%	$ 619,000
				SUBTOTAL:	**$ 2,682,300**
		ENG/SURVEY		15%	$ 402,400
				SUBTOTAL:	**$ 3,084,700**
				Estimated Project Total:	**$ 3,084,700**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

FREESE AND NICHOLS

Water Master Plan

Development Improvement Plan Cost Estimate			October 2022
Project Number:	**D2**	**Phase:**	**Development Scenario D**
Project Name:	**12-inch Bandera Highway Water Main**	**Pressure Plane:**	**Stadium**

Project Description:

This project includes construction of 16,300 linear feet of new 12-inch water main along Bandera Highway. The proposed main will connect to the existing 12-inch water main at the intersection of Bandera Highway and Comanche Trace Dr E and to the existing 8-inch water main at the end of Pinnacle View Dr E.

Project Driver:

The purpose of this project is to provide service to developments on the western side of the lower Stadium Pressure Plane. Alignments are provided for planning purposes only, final alignments may be subject to change.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	12" WL & Appurtenances - by Open Cut	16,300	LF	$ 225	$ 3,667,500
2	Pavement Repair	1,500	LF	$ 120	$ 180,000
3	Valve with Vault	1	LS	$ 200,000	$ 200,000
Water Facility Condition Rating:				**SUBTOTAL:**	**$ 4,047,500**
--		MOBILIZATION		5%	$ 202,400
				SUBTOTAL:	**$ 4,249,900**
		CONTINGENCY		30%	$ 1,275,000
				SUBTOTAL:	**$ 5,524,900**
		ENG/SURVEY		15%	$ 828,800
				SUBTOTAL:	**$ 6,353,700**
				Estimated Project Total:	**$ 6,353,700**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

Water Master Plan

Development Improvement Plan Cost Estimate			October 2022
Project Number:	**D3**	**Phase:**	**Development Scenario D**
Project Name:	**12-inch Wharton Rd E Water Main**	**Pressure Plane:**	**Stadium**

Project Description:

This project includes construction of 5,200 linear feet of new 12-inch water main along Wharton Rd E, connecting the proposed 12-inch Highway 27 and Bandera Highway water mains.

Project Trigger:

The purpose of this project it to provide looping to the proposed 12-inch water mains and increase transmission capacity across the river, allowing for better connectivity within the Stadium Pressure Plane. Alignments are provided for planning purposes only, final alignments may be subject to change.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	12" WL & Appurtenances - by Open Cut	4,200	LF	$ 225	$ 945,000
2	12'' WL by Bore with 24" Steel Casing	1,000	LF	$ 960	$ 960,000
Water Facility Condition Rating:				**SUBTOTAL:**	**$ 1,905,000**
--		MOBILIZATION		5%	$ 95,300
				SUBTOTAL:	**$ 2,000,300**
		CONTINGENCY		30%	$ 600,100
				SUBTOTAL:	**$ 2,600,400**
		ENG/SURVEY		15%	$ 390,100
				SUBTOTAL:	**$ 2,990,500**
				Estimated Project Total:	**$ 2,990,500**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

APPENDIX H
Growth Driven CIP Wastewater Cost Sheets

City of Kerrville
Wastewater Master Plan
Development Project Cost Estimates

Project Number	Project Name	Project Cost
Development Scenario A		
A1	8-inch Medina Highway Gravity Main	$1,310,400
A2	8-inch Camp Meeting Rd Gravity Main	$1,310,400
A3	12-inch Birkdale Ln Gravity Main	$707,700
A4	8-inch Cully Drive Gravity Main	$1,146,600
A5	8-inch Texas Drive Gravity Main	$2,919,800
	Development Scenario A Total	**$7,394,900**
Development Scenario B		
B1	12-inch James Road Gravity Main	$5,136,300
B2	8-inch Landing Lane Gravity Main	$1,915,100
B3	Bear Creek Rd Gravity Main and LS	$4,621,400
B4	12-inch Yorktown Blvd Gravity Main	$1,620,100
	Development Scenario B Total	**$13,292,900**
Development Scenario C		
C1	8-inch Fredericksburg Rd N	$1,539,800
C2	12-inch Veterans Highway Gravity Main	$3,089,400
C3	12-inch Third Creek Gravity Main	$1,620,100
	Development Scenario C Total	**$6,249,300**
Development Scenario D		
D1	Comanche Trace Lift Station	$163,800
D2A	Comanche Trace Gravity Main	$5,454,600
D3	12-inch Bandera Highway Gravity Main	$2,298,200
D4	12-inch Turtle Creek Gravity Main & LS	$2,602,700
D5	8-inch Guadalupe River Gravity Main	$1,664,000
D6	Triple Root Lift Station	$6,994,900
D7	Bandera Highway Lift Station	$1,445,900
D8	18-inch Bandera Highway Gravity Main	$1,772,800
D9	Airport Regional Lift Station	$11,564,200
D10	8-inch Silver Creek Gravity Main	$1,251,500
	Development Scenario D Total	**$35,212,600**
	Growth Driven Projects Total	**$62,149,700**

Note: Proposed projects were prioritized based on impact to the wastewater collection system and should be constructed generally in the order listed. Cost estimates are provided in 2022 dollars and are for planning and budgeting purposes only. Costs do not include allowances for land acquisition, individual service connections, permitting, or other unique project specific costs.

Wastewater Master Plan

Development Improvement Plan Cost Estimate			October 2022
Project Number:	**A1**	**Phase:**	**Development Scenario A**
Project Name:	**8-inch Medina Highway Gravity Main**	**WW Basin:**	**Birkdale**

Project Description:

This project includes 4,000 linear feet of new 8-inch gravity main along Medina Highway. The new gravity main is proposed to tie into the existing 10-inch gravity main near Castlepines Dr E.

Project Trigger:

This project is designed to provide wastewater service to the projected developments in Development Scenario A. Alignments are provided for planning purposes only, final alignments may be subject to change.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	8" Pipe and Appurtenances 8- 16 feet deep	4,000	LF	$ 200	$ 800,000
Lift Station Condition Rating:				**SUBTOTAL:**	**$ 800,000**
--		TEMPORARY BYPASS PUMPING		0%	$ -
				SUBTOTAL:	**$ 800,000**
		MOBILIZATION		5%	$ 40,000
				SUBTOTAL:	**$ 840,000**
		CONTINGENCY		30%	$ 252,000
				SUBTOTAL:	**$ 1,092,000**
		ENG/SURVEY		20%	$ 218,400
				SUBTOTAL:	**$ 1,310,400**
					$ 1,310,400

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

Wastewater Master Plan

Development Improvement Plan Cost Estimate			October 2022
Project Number:	**A2**	**Phase:**	**Development Scenario A**
Project Name:	**8-inch Camp Meeting Rd Gravity Main**	**WW Basin:**	**Birkdale**

Project Description:

This project includes 4,000 linear feet of new 8-inch gravity main running along Loma Vuelta Rd S and Camp Meeting Rd. The new gravity main is proposed to flow into the existing 8-inch gravity main along Camp Meeting Rd S, crossing Medina Highway.

Project Driver:

This project is designed to provide wastewater service to the projected developments in Development Scenario A. Alignments are provided for planning purposes only, final alignments may be subject to change.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	8" Pipe and Appurtenances 8- 16 feet deep	4,000	LF	$ 200	$ 800,000
Lift Station Condition Rating:				**SUBTOTAL:**	**$ 800,000**
--		TEMPORARY BYPASS PUMPING		0%	$ -
				SUBTOTAL:	**$ 800,000**
		MOBILIZATION		5%	$ 40,000
				SUBTOTAL:	**$ 840,000**
		CONTINGENCY		30%	$ 252,000
				SUBTOTAL:	**$ 1,092,000**
		ENG/SURVEY		20%	$ 218,400
				SUBTOTAL:	**$ 1,310,400**
				Estimated Project Total:	**$ 1,310,400**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

Wastewater Master Plan

Development Improvement Plan Cost Estimate			October 2022
Project Number:	**A3**	**Phase:**	**Development Scenario A**
Project Name:	**12-inch Birkdale Ln Gravity Main**	**WW Basin:**	**Birkdale**

Project Description:

This project includes 1,800 linear feet of new 12-inch gravity main. This new main is recommended to replace the existing 10-inch gravity main upstream of the Birkdale Lift Station through the Riverhill Country Club and along Camp Meeting Creek.

Project Driver:

This project is designed to provide wastewater service to the projected developments in Development Scenario A. Alignments are provided for planning purposes only, final alignments may be subject to change.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	12" Pipe and Appurtenances 8- 16 feet deep	1,800	LF	$ 240	$ 432,000
Lift Station Condition Rating:				**SUBTOTAL:**	**$ 432,000**
--		TEMPORARY BYPASS PUMPING		0%	$ -
				SUBTOTAL:	**$ 432,000**
		MOBILIZATION		5%	$ 21,600
				SUBTOTAL:	**$ 453,600**
		CONTINGENCY		30%	$ 136,100
				SUBTOTAL:	**$ 589,700**
		ENG/SURVEY		20%	$ 118,000
				SUBTOTAL:	**$ 707,700**
				Estimated Project Total:	**$ 707,700**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

Wastewater Master Plan

Development Improvement Plan Cost Estimate			October 2022
Project Number:	**A4**	**Phase:**	**Development Scenario A**
Project Name:	**8-inch Cully Drive Gravity Main**	**WW Basin:**	**Birkdale**

Project Description:

This project includes a new 8-inch gravity main connecting to the existing 8-inch gravity main at the Peterson Regional Medical Center, near the intersection of Hill County Dr and Cully Dr.

Project Driver:

This project is designed to provide wastewater service to the projected developments in Development Scenario A. Alignments are provided for planning purposes only, final alignments may be subject to change.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	8" Pipe and Appurtenances 8- 16 feet deep	3,500	LF	$ 200	$ 700,000
Lift Station Condition Rating:				**SUBTOTAL:**	**$ 700,000**
--		TEMPORARY BYPASS PUMPING		0%	$ -
				SUBTOTAL:	**$ 700,000**
		MOBILIZATION		5%	$ 35,000
				SUBTOTAL:	**$ 735,000**
		CONTINGENCY		30%	$ 220,500
				SUBTOTAL:	**$ 955,500**
		ENG/SURVEY		20%	$ 191,100
				SUBTOTAL:	**$ 1,146,600**
				Estimated Project Total:	**$ 1,146,600**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

Wastewater Master Plan

Development Improvement Plan Cost Estimate			October 2022
Project Number:	**A5**	**Phase:**	**Development Scenario A**
Project Name:	**8-inch Texas Drive Gravity Main**	**WW Basin:**	**Birkdale**

Project Description:

This project includes 9,300 linear feet of new 8-inch gravity mainbetween Peterson Regional Medical Center and Kerrville State Hospital. The main is proposed to flow into the existing 8-inch main at the intersection of Eric Dr S and Thompson Dr.

Project Driver:

This project is designed to provide wastewater service to the projected developments in Development Scenario A. Alignments are provided for planning purposes only, final alignments may be subject to change.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	8" Pipe and Appurtenances 8- 16 feet deep	9,300	LF	$ 200	$ 1,860,000
Lift Station Condition Rating:				**SUBTOTAL:**	**$ 1,860,000**
--		TEMPORARY BYPASS PUMPING		0%	$ -
				SUBTOTAL:	**$ 1,860,000**
		MOBILIZATION		5%	$ 93,000
				SUBTOTAL:	**$ 1,953,000**
		CONTINGENCY		30%	$ 585,900
				SUBTOTAL:	**$ 2,538,900**
		ENG/SURVEY		15%	$ 380,900
				SUBTOTAL:	**$ 2,919,800**
				Estimated Project Total:	**$ 2,919,800**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

Wastewater Master Plan

Development Improvement Plan Cost Estimate			October 2022
Project Number:	**B1**	**Phase:**	**Development Scenario B**
Project Name:	**12-inch James Road Gravity Main**	**WW Basin:**	**James Road**

Project Description:

This project includes 5,300 linear feet of new 12-inch gravity main, flowing into the James Road Lift Station. This project also includes expanding the existing James Road Lift Station to a 2.0 MGD firm capacity.

Project Driver:

This project is designed to provide wastewater service to the projected developments in Development Scenario B. Alignments are provided for planning purposes only, final alignments may be subject to change.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	12" Pipe and Appurtenances 8- 16 feet deep	5,300	LF	$ 240	$ 1,272,000
2	2 MGD Lift Station	1	EA	$ 2,000,000	$ 2,000,000
Lift Station Condition Rating:				**SUBTOTAL:**	**$ 3,272,000**
--		TEMPORARY BYPASS PUMPING		0%	$ -
				SUBTOTAL:	**$ 3,272,000**
		MOBILIZATION		5%	$ 163,600
				SUBTOTAL:	**$ 3,435,600**
		CONTINGENCY		30%	$ 1,030,700
				SUBTOTAL:	**$ 4,466,300**
		ENG/SURVEY		15%	$ 670,000
				SUBTOTAL:	**$ 5,136,300**
				Estimated Project Total:	**$ 5,136,300**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

Wastewater Master Plan

Development Improvement Plan Cost Estimate			October 2022
Project Number:	**B2**	**Phase:**	**Development Scenario B**
Project Name:	**8-inch Landing Lane Gravity Main**	**WW Basin:**	**James Road**

Project Description:

This project includes 6,100 linear feet of new 8-inch gravity main flowing into the James Road Lift Station. The new 8-inch main flows into an existing 8-inch near the intersection of Thompson Dr and Landing Ln.

Project Driver:

This project is designed to provide wastewater service to the projected developments in Development Scenario B. Alignments are provided for planning purposes only, final alignments may be subject to change.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	8" Pipe and Appurtenances 8- 16 feet deep	6,100	LF	$ 200	$ 1,220,000
Lift Station Condition Rating:				**SUBTOTAL:**	**$ 1,220,000**
--		TEMPORARY BYPASS PUMPING		0%	$ -
				SUBTOTAL:	**$ 1,220,000**
		MOBILIZATION		5%	$ 61,000
				SUBTOTAL:	**$ 1,281,000**
		CONTINGENCY		30%	$ 384,300
				SUBTOTAL:	**$ 1,665,300**
		ENG/SURVEY		15%	$ 249,800
				SUBTOTAL:	**$ 1,915,100**
				Estimated Project Total:	**$ 1,915,100**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

Wastewater Master Plan

Development Improvement Plan Cost Estimate			October 2022
Project Number:	**B3**	**Phase:**	**Development Scenario B**
Project Name:	**Bear Creek Rd Gravity Main and LS**	**WW Basin:**	**James Road**

Project Description:

This project includes 7,000 linear feet of 8-inch gravity main, new 0.5 MGD lift station, and 5,800 linear feet of 8-inch force main along Bear Creek Rd S. The force main is proposed to convey flow to the James Rd Lift Station downstream.

Project Driver:

This project is designed to provide wastewater service to the projected developments in Development Scenario B. Alignments are provided for planning purposes only, final alignments may be subject to change.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	8" Pipe and Appurtenances 8- 16 feet deep	7,000	LF	$ 200	$ 1,400,000
2	8" Force Main < 8 feet deep	5,800	LF	$ 180	$ 1,044,000
3	0.5 MGD Lift Station	1	EA	$ 500,000	$ 500,000
Lift Station Condition Rating:				**SUBTOTAL:**	**$ 2,944,000**
--		TEMPORARY BYPASS PUMPING		0%	$ -
				SUBTOTAL:	**$ 2,944,000**
		MOBILIZATION		5%	$ 147,200
				SUBTOTAL:	**$ 3,091,200**
		CONTINGENCY		30%	$ 927,400
				SUBTOTAL:	**$ 4,018,600**
		ENG/SURVEY		15%	$ 602,800
				SUBTOTAL:	**$ 4,621,400**
				Estimated Project Total:	**$ 4,621,400**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

Wastewater Master Plan

Development Improvement Plan Cost Estimate			October 2022
Project Number:	**B4**	**Phase:**	**Development Scenario B**
Project Name:	**12-inch Yorktown Blvd Gravity Main**	**WW Basin:**	**Quinlan**

Project Description:

This project includes 4,300 linear feet of new 12-inch gravity main along Yorktown Blvd N, upsizing the existing 8-inch gravity main for increased capacity.

Project Driver:

This project is designed to provide wastewater service to the projected developments in Development Scenario B. Alignments are provided for planning purposes only, final alignments may be subject to change.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	12" Pipe and Appurtenances 8- 16 feet deep	4,300	LF	$ 240	$ 1,032,000
Lift Station Condition Rating:				**SUBTOTAL:**	**$ 1,032,000**
--		TEMPORARY BYPASS PUMPING		0%	$ -
				SUBTOTAL:	**$ 1,032,000**
		MOBILIZATION		5%	$ 51,600
				SUBTOTAL:	**$ 1,083,600**
		CONTINGENCY		30%	$ 325,100
				SUBTOTAL:	**$ 1,408,700**
		ENG/SURVEY		15%	$ 211,400
				SUBTOTAL:	**$ 1,620,100**
				Estimated Project Total:	**$ 1,620,100**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

Wastewater Master Plan

Development Improvement Plan Cost Estimate			October 2022
Project Number:	**C1**	**Phase:**	**Development Scenario C**
Project Name:	**8-inch Fredericksburg Rd N**	**WW Basin:**	**Quinlan**

Project Description:

This project includes 4,700 linear feet of new 8-inch gravity main along Fredericksburg Rd N. The proposed 8-inch gravity main flows into the existing 10-inch gravity main on Sydney Baker St, on the North side of Interstate-10.

Project Driver:

This project is designed to provide wastewater service to the projected developments in Development Scenario C. Alignments are provided for planning purposes only, final alignments may be subject to change.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	8" Pipe and Appurtenances 8- 16 feet deep	4,700	LF	$ 200	$ 940,000
Lift Station Condition Rating:				**SUBTOTAL:**	**$ 940,000**
--		TEMPORARY BYPASS PUMPING		0%	$ -
				SUBTOTAL:	**$ 940,000**
		MOBILIZATION		5%	$ 47,000
				SUBTOTAL:	**$ 987,000**
		CONTINGENCY		30%	$ 296,100
				SUBTOTAL:	**$ 1,283,100**
		ENG/SURVEY		20%	$ 256,700
				SUBTOTAL:	**$ 1,539,800**
				Estimated Project Total:	**$ 1,539,800**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

Wastewater Master Plan

Development Improvement Plan Cost Estimate			October 2022
Project Number:	**C2**	**Phase:**	**Development Scenario C**
Project Name:	**12-inch Veterans Highway Gravity Main**	**WW Basin:**	**Loop 534**

Project Description:

This project includes 8,200 linear feet of new 12-inch parallel to Veterans Highway, along Third Creek. The proposed 12-inch connects to the existing 18-inch along Landfill Rd N.

Project Driver:

This project is designed to provide wastewater service to the projected developments in Development Scenario C. Alignments are provided for planning purposes only, final alignments may be subject to change.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	12" Pipe and Appurtenances 8- 16 feet deep	8,200	LF	$ 240	$ 1,968,000
Lift Station Condition Rating:				**SUBTOTAL:**	**$ 1,968,000**
--		TEMPORARY BYPASS PUMPING		0%	$ -
				SUBTOTAL:	**$ 1,968,000**
		MOBILIZATION		5%	$ 98,400
				SUBTOTAL:	**$ 2,066,400**
		CONTINGENCY		30%	$ 620,000
				SUBTOTAL:	**$ 2,686,400**
		ENG/SURVEY		15%	$ 403,000
				SUBTOTAL:	**$ 3,089,400**
				Estimated Project Total:	**$ 3,089,400**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

Wastewater Master Plan

Development Improvement Plan Cost Estimate			October 2022
Project Number:	**C3**	**Phase:**	**Development Scenario C**
Project Name:	**12-inch Third Creek Gravity Main**	**WW Basin:**	**Loop 534**

Project Description:

This project includes 4,300 linear feet of new 12-inch gravity main along Third Creek. The new main is proposed to connect to the existing 18-inch along Landfill Rd N.

Project Trigger:

This project is designed to provide wastewater service to the projected developments in Development Scenario C. Alignments are provided for planning purposes only, final alignments may be subject to change.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	12" Pipe and Appurtenances 8- 16 feet deep	4,300	LF	$ 240	$ 1,032,000
Lift Station Condition Rating:				**SUBTOTAL:**	**$ 1,032,000**
--		TEMPORARY BYPASS PUMPING		0%	$ -
				SUBTOTAL:	**$ 1,032,000**
		MOBILIZATION		5%	$ 51,600
				SUBTOTAL:	**$ 1,083,600**
		CONTINGENCY		30%	$ 325,100
				SUBTOTAL:	**$ 1,408,700**
		ENG/SURVEY		15%	$ 211,400
				SUBTOTAL:	**$ 1,620,100**
				Estimated Project Total:	**$ 1,620,100**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

Wastewater Master Plan

Development Improvement Plan Cost Estimate			October 2022
Project Number:	**D1**	**Phase:**	**Development Scenario D**
Project Name:	**Comanche Trace Lift Station**	**WW Basin:**	**Comanche Trace**

Project Description:

A capacity increase is suggested for the Comanche Trace Lift Station. A new 600 gpm pump for the lift station is recommended as part of this project.

Project Trigger:

This project is designed to provide wastewater service to the projected developments in the Comanche Trace Lift Station Basin. Alignments are provided for planning purposes only, final alignments may be subject to change.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	New 600 gpm Pump	1	EA	$ 100,000	$ 100,000
Lift Station Condition Rating:				**SUBTOTAL:**	**$ 100,000**
--		TEMPORARY BYPASS PUMPING		0%	$ -
				SUBTOTAL:	**$ 100,000**
		MOBILIZATION		5%	$ 5,000
				SUBTOTAL:	**$ 105,000**
		CONTINGENCY		30%	$ 31,500
				SUBTOTAL:	**$ 136,500**
		ENG/SURVEY		20%	$ 27,300
				SUBTOTAL:	**$ 163,800**
				Estimated Project Total:	**$ 163,800**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

Wastewater Master Plan

Development Improvement Plan Cost Estimate			October 2022
Project Number:	**D2A**	**Phase:**	**Development Scenario D**
Project Name:	**Comanche Trace Gravity Main**	**WW Basin:**	**Comanche Trace**

Project Description:

This project includes upsizing the existing gravity main through the Comanche Trace Neighborhood, from the outfall of the Turtle Creek force main to the existing 12-inch line near Pinnacle Club Drive. Peak flows from the Turtle Creek Lift Station are projected to overwhelm the existing Comanche Trace gravity main system, requiring the capacity to be increased.

Project Trigger:

This project is triggered by projected capacity restrictions within the Comanche Trace gravity main system. As the new Comanche Trace Gravity Main solely serves the Comanche Trace development, it is assumed that the developer will be primarily responsible for the implementation of this project. Alignments are provided for planning purposes only, final alignments may be subject to change.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	12" Pipe and Appurtenances 8- 16 feet deep	9,300	LF	$ 240	$ 2,232,000
2	60" Diameter Manhole	20	EA	$ 17,000	$ 333,200
3	Pavement Repair	6,200	LF	$ 120	$ 744,000
Lift Station Condition Rating:				**SUBTOTAL:**	**$ 3,309,200**
--		TEMPORARY BYPASS PUMPING		5%	$ 165,500
				SUBTOTAL:	**$ 3,474,700**
		MOBILIZATION		5%	$ 173,800
				SUBTOTAL:	**$ 3,648,500**
		CONTINGENCY		30%	$ 1,094,600
				SUBTOTAL:	**$ 4,743,100**
		ENG/SURVEY		15%	$ 711,500
				SUBTOTAL:	**$ 5,454,600**
				Estimated Project Total:	**$ 5,454,600**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

Wastewater Master Plan

Development Improvement Plan Cost Estimate			October 2022
Project Number:	**D2B**	**Phase:**	**Development Scenario D**
Project Name:	**Turtle Creek Force Main Reroute**	**WW Basin:**	**Comanche Trace**

Project Description:

This project is an alternative to upsizing the existing Comanche Trace gravity lines. This project reroutes the existing 8-inch Turtle Creek Force Main with a new 8-inch force main along a new alignment around the existing Comanche Trace neighborhood. Peak flows from the Turtle Creek Lift Station are projected to overwhelm the existing Comanche Trace gravity main system. This project removes the Turtle Creek flow from the Comanche Trace gravity system and conveys flow directly to the existing 15-inch line upstream of the Comanche Trace Lift Station. Force main alignment is recommended for planning purposes only and final alignment is subject to change pending detailed design. This cost estimate does not include provisions for easement acquisition.

Project Trigger:

This project is triggered by projected capacity restrictions within the Comanche Trace gravity main system. As the Turtle Creek Lift Station solely serves the Comanche Trace development, it is assumed that the developer will be primarily responsible for the implementation of this project. Alignments are provided for planning purposes only, final alignments may be subject to change.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	8" Force Main < 8 feet deep	11,800	LF	$ 180	$ 2,124,000
2	Pavement Repair	6,000	LF	$ 120	$ 720,000
Lift Station Condition Rating:				**SUBTOTAL:**	**$ 2,844,000**
--		TEMPORARY BYPASS PUMPING		0%	$ -
				SUBTOTAL:	**$ 2,844,000**
		MOBILIZATION		5%	$ 142,200
				SUBTOTAL:	**$ 2,986,200**
		CONTINGENCY		30%	$ 895,900
				SUBTOTAL:	**$ 3,882,100**
		ENG/SURVEY		15%	$ 582,400
				SUBTOTAL:	**$ 4,464,500**
				Estimated Project Total:	**$ 4,464,500**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

Wastewater Master Plan

Development Improvement Plan Cost Estimate			October 2022
Project Number:	**D3**	**Phase:**	**Development Scenario D**
Project Name:	**12-inch Bandera Highway Gravity Main**	**WW Basin:**	**Comanche Trace**

Project Description:

This project includes 6,100 linear feet of new 12-inch gravity main along Bandera Highway, conveying flow into the Comanche Trace Lift Station.

Project Trigger:

This project is designed to provide wastewater service to the projected developments in Development Scenario D. Alignments are provided for planning purposes only, final alignments may be subject to change.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	12" Pipe and Appurtenances 8- 16 feet deep	6,100	LF	$ 240	$ 1,464,000
Lift Station Condition Rating:				**SUBTOTAL:**	**$ 1,464,000**
--		TEMPORARY BYPASS PUMPING		0%	$ -
				SUBTOTAL:	**$ 1,464,000**
		MOBILIZATION		5%	$ 73,200
				SUBTOTAL:	**$ 1,537,200**
		CONTINGENCY		30%	$ 461,200
				SUBTOTAL:	**$ 1,998,400**
		ENG/SURVEY		15%	$ 299,800
				SUBTOTAL:	**$ 2,298,200**
				Estimated Project Total:	**$ 2,298,200**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

Wastewater Master Plan

Development Improvement Plan Cost Estimate			October 2022
Project Number:	**D4**	**Phase:**	**Development Scenario D**
Project Name:	**12-inch Turtle Creek Gravity Main & LS**	**WW Basin:**	**Turtle Creek**

Project Description:

This project includes 6,700 linear feet of new 12-inch gravity main to the east of the lower Comanche Trace neighborhood, conveying flow into the Turtle Creek Lift Station. A capacity increase at the Turtle Creek Lift station is also suggested. A new 400 gpm is recommended as part of this project.

Project Trigger:

This project is designed to provide wastewater service to the projected developments in Development Scenario D. Alignments are provided for planning purposes only, final alignments may be subject to change.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	12" Pipe and Appurtenances 8- 16 feet deep	6,700	LF	$ 240	$ 1,608,000
2	New 400 gpm Pump	1	EA	$ 50,000	$ 50,000
Lift Station Condition Rating:				**SUBTOTAL:**	**$ 1,658,000**
--		TEMPORARY BYPASS PUMPING		0%	$ -
				SUBTOTAL:	**$ 1,658,000**
		MOBILIZATION		5%	$ 82,900
				SUBTOTAL:	**$ 1,740,900**
		CONTINGENCY		30%	$ 522,300
				SUBTOTAL:	**$ 2,263,200**
		ENG/SURVEY		15%	$ 339,500
				SUBTOTAL:	**$ 2,602,700**
				Estimated Project Total:	**$ 2,602,700**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

Wastewater Master Plan

Development Improvement Plan Cost Estimate			October 2022
Project Number:	**D5**	**Phase:**	**Development Scenario D**
Project Name:	**8-inch Guadalupe River Gravity Main**	**WW Basin:**	**Comanche Trace**

Project Description:

This project includes 5,300 linear feet of new 8-inch gravity main to convey flow from projected development to Comanche Trace Lift Station.

Project Trigger:

This project is designed to provide wastewater service to the projected developments in Development Scenario D. Alignments are provided for planning purposes only, final alignments may be subject to change.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	8" Pipe and Appurtenances 8- 16 feet deep	5,300	LF	$ 200	$ 1,060,000
Lift Station Condition Rating:				**SUBTOTAL:**	**$ 1,060,000**
--		TEMPORARY BYPASS PUMPING		0%	$ -
				SUBTOTAL:	**$ 1,060,000**
		MOBILIZATION		5%	$ 53,000
				SUBTOTAL:	**$ 1,113,000**
		CONTINGENCY		30%	$ 333,900
				SUBTOTAL:	**$ 1,446,900**
		ENG/SURVEY		15%	$ 217,100
				SUBTOTAL:	**$ 1,664,000**
				Estimated Project Total:	**$ 1,664,000**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

Wastewater Master Plan

Development Improvement Plan Cost Estimate			October 2022
Project Number:	D6	**Phase:**	Development Scenario D
Project Name:	Triple Root Lift Station	**WW Basin:**	Triple Root LS

Project Description:

This project involves construction of a new 2.2 MGD lift station on the Triple Root site and associated force main. The 12,000 linear feet of new 12-inch force main will carry flow from the lift station to the proposed connection point upstream of the existing Birkdale Lift Station.

Project Trigger:

This project is designed to provide wastewater service to the proposed Triple Root Development and convey flow to the existing wastewater system. Alignments are provided for planning purposes only, final alignments may be subject to change.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	2.2 MGD Lift Station	1	EA	$ 2,200,000	$ 2,200,000
2	12" Force Main < 8 feet deep	12,000	LF	$ 180	$ 2,160,000
3	Pavement Repair	800	LF	$ 120	$ 96,000
Lift Station Condition Rating:				**SUBTOTAL:**	**$ 4,456,000**
--		TEMPORARY BYPASS PUMPING		0%	$ -
				SUBTOTAL:	**$ 4,456,000**
		MOBILIZATION		5%	$ 222,800
				SUBTOTAL:	**$ 4,678,800**
		CONTINGENCY		30%	$ 1,403,700
				SUBTOTAL:	**$ 6,082,500**
		ENG/SURVEY		15%	$ 912,400
				SUBTOTAL:	**$ 6,994,900**
				Estimated Project Total:	**$ 6,994,900**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

Wastewater Master Plan

Development Improvement Plan Cost Estimate			October 2022
Project Number:	**D7**	**Phase:**	**Development Scenario D**
Project Name:	**Bandera Highway Lift Station**	**WW Basin:**	**Bandera Highway LS**

Project Description:

This project involves construction of a new 0.3 MGD lift station on the Triple Root site and associated force main. The 3,500 linear feet of new 6-inch force main will convey flow from the lift station to the proposed connection point upstream of the Birkdale Lift Station.

Project Trigger:

This project is designed to provide wastewater service to the proposed Triple Root Development and convey flow to the existing wastewater system. Alignments are provided for planning purposes only, final alignments may be subject to change.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	0.3 MGD Lift Station	1	EA	$ 300,000	$ 300,000
2	6" Force Main < 8 feet deep	3,500	LF	$ 150	$ 525,000
3	Pavement Repair	800	LF	$ 120	$ 96,000
Lift Station Condition Rating:				**SUBTOTAL:**	**$ 921,000**
--		TEMPORARY BYPASS PUMPING		0%	$ -
				SUBTOTAL:	**$ 921,000**
		MOBILIZATION		5%	$ 46,100
				SUBTOTAL:	**$ 967,100**
		CONTINGENCY		30%	$ 290,200
				SUBTOTAL:	**$ 1,257,300**
		ENG/SURVEY		15%	$ 188,600
				SUBTOTAL:	**$ 1,445,900**
				Estimated Project Total:	**$ 1,445,900**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

Wastewater Master Plan

Development Improvement Plan Cost Estimate			October 2022
Project Number:	**D8**	**Phase:**	**Development Scenario D**
Project Name:	**18-inch Bandera Highway Gravity Main**	**WW Basin:**	**Birkdale**

Project Description:

This project includes replacement of 2,100 linear feet of the existing 10-inch and 12-inch gravity main upstream of the Birkdale Lift Station. The existing gravity main will be upsized to 18-inches in anticipation of additional flow from the Triple Root Development.

Project Trigger:

This project is triggered by projected capacity restrictions within the gravity main due to additional flow from the Triple Root Development. Alignments are provided for planning purposes only, final alignments may be subject to change.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	18" Pipe and Appurtenances 8- 16 feet deep	2,100	LF	$ 430	$ 903,000
2	60" Diameter Manhole	5	EA	$ 17,000	$ 88,400
3	Pavement Repair	700	LF	$ 120	$ 84,000
Lift Station Condition Rating:				**SUBTOTAL:**	**$ 1,075,400**
--		TEMPORARY BYPASS PUMPING		5%	$ 53,800
				SUBTOTAL:	**$ 1,129,200**
		MOBILIZATION		5%	$ 56,500
				SUBTOTAL:	**$ 1,185,700**
		CONTINGENCY		30%	$ 355,800
				SUBTOTAL:	**$ 1,541,500**
		ENG/SURVEY		15%	$ 231,300
				SUBTOTAL:	**$ 1,772,800**
				Estimated Project Total:	**$ 1,772,800**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

Wastewater Master Plan

Development Improvement Plan Cost Estimate			October 2022
Project Number:	**D9**	**Phase:**	**Development Scenario D**
Project Name:	**Airport Regional Lift Station**	**WW Basin:**	**Al Mooney**

Project Description:

This project includes decomissioning of the existing two airport lift stations and replacement with a new regional lift station and force main. New 12-inch gravity mains will connect the collection system upstream of both decomissioned lift stations to the new Regional Lift Stations.

Project Trigger:

This project is triggered by capacity restrictions at the two existing lift stations and poor condition assessments. Alignments are provided for planning purposes only, final alignments may be subject to change.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	Lift Station - Decomm	2	LS	$ 100,000	$ 200,000
2	2.3 MGD Lift Station	1	EA	$ 2,400,000	$ 2,400,000
3	12" Force Main < 8 feet deep	19,600	LF	$ 180	$ 3,528,000
4	12" Pipe and Appurtenances 8- 16 feet deep	3,700	LF	$ 240	$ 888,000
Lift Station Condition Rating:				**SUBTOTAL:**	**$ 7,016,000**
--		TEMPORARY BYPASS PUMPING		5%	$ 350,800
				SUBTOTAL:	**$ 7,366,800**
		MOBILIZATION		5%	$ 368,400
				SUBTOTAL:	**$ 7,735,200**
		CONTINGENCY		30%	$ 2,320,600
				SUBTOTAL:	**$ 10,055,800**
		ENG/SURVEY		15%	$ 1,508,400
				SUBTOTAL:	**$ 11,564,200**
				Estimated Project Total:	**$ 11,564,200**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.

Wastewater Master Plan

Development Improvement Plan Cost Estimate			October 2022
Project Number:	**D10**	**Phase:**	**Development Scenario D**
Project Name:	**8-inch Silver Creek Gravity Main**	**WW Basin:**	**Al Mooney**

Project Description:

This project includes 3,100 linear feet of new 8-inch gravity main along Silver Creek and Al Mooney Rd N, conveying flow into the Al Mooney Lift Station. This project also includes replacing 600 linear feet of existing 8-inch gravity main conveying flow to the Al Mooney Lift Station with a 12-inch gravity main.

Project Trigger:

This project is designed to provide wastewater service to the projected developments in Development Scenario D. Alignments are provided for planning purposes only, final alignments may be subject to change.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	8" Pipe and Appurtenances 8- 16 feet deep	3,100	LF	$ 200	$ 620,000
2	12" Pipe and Appurtenances 8- 16 feet deep	600	LF	$ 240	$ 144,000
Lift Station Condition Rating:				**SUBTOTAL:**	**$ 764,000**
--		TEMPORARY BYPASS PUMPING		0%	$ -
				SUBTOTAL:	**$ 764,000**
		MOBILIZATION		5%	$ 38,200
				SUBTOTAL:	**$ 802,200**
		CONTINGENCY		30%	$ 240,700
				SUBTOTAL:	**$ 1,042,900**
		ENG/SURVEY		20%	$ 208,600
				SUBTOTAL:	**$ 1,251,500**
				Estimated Project Total:	**$ 1,251,500**

*Cost estimates are for planning and budgeting purposes only, in 2022 dollars.