Innovative approaches
Practical results
Outstanding service

WASTEWATER MASTER PLAN

Prepared for:

City of Weatherford

March 2017

Prepared by:

FREESE AND NICHOLS, INC.
4055 International Plaza, Suite 200
Fort Worth, Texas 76109
817-735-7300

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STATE OF TEXAS
CULLEN CARLSON
111316
LICENSED
PROFESSIONAL ENGINEER

3/30/2017

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

STATE OF TEXAS
JESSICA L. BROWN
90098
LICENSED
PROFESSIONAL ENGINEER

3/30/17

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

Prepared by:

FREESE AND NICHOLS, INC.
4055 International Plaza, Suite 200
Fort Worth, Texas 76109
817-735-7300

FNI Project No.: WEA15175

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EXECUTIVE SUMMARY

1.0 INTRODUCTION

The City of Weatherford retained Freese and Nichols, Inc. (FNI) to update and prepare a comprehensive Wastewater Master Plan and Lift Station Condition Assessment. The goal of the study was to evaluate and analyze the collection system to measure existing performance, identify deficiencies, and determine improvements needed to meet projected future conditions. As part of this study, FNI reviewed historical wastewater flows to establish trends and project flows for future system evaluations. Based on the evaluation, FNI developed a 10-year Capital Improvement Plan (CIP) and two buildout CIP alternatives to serve growth through the 10-year and buildout planning periods. The recommended improvements will serve as a basis for the design, construction and financing of lines and facilities required to meet Weatherford's future system needs.

2.0 POPULATION AND FLOW PROJECTIONS

In order to plan future residential and non-residential flows, FNI utilized historical flow data and input from City of Weatherford staff to develop population and land-use projections. FNI used service area boundaries provided by the City to plan for 5-year (2020), 10-year (2025), and buildout planning periods. FNI maintained the annual population growth rate of 2.5% adopted in the *2013 Water Master Plan* as the basis for growth, but adjusted the 5-year projections based on input from planning staff based on known developments. FNI used zoning shapefiles provided by the City along with geocoded billing meter data to determine existing and future total non-residential acreage.

Average daily wastewater flows for the 2015, 2020, 2025, and buildout planning periods were developed by analyzing historical average daily flow rates and future growth areas, as well as flow contributions from the City of Hudson Oaks. FNI used historical wastewater treatment plant reports, billing meter data, and flow meter data to develop existing and future wastewater flows per capita and system flows. The peak wet weather flow (WWF) to average daily flow (ADF) peaking factors were developed for each planning period based on the assumption that ongoing rehabilitation efforts to the system would reduce infiltration and inflow, therefore decreasing the WWF peaking factor. A recommendation for rehabilitating 2.0% of the collection system each year is included in the CIP to assist in decreasing the existing peaking factor. **Table ES-1** displays existing and projected population and flows for the City of Weatherford's wastewater system. The peak wet weather flow and the peak wet weather to average day peaking factors were determined based on the flow meter data and are presented as instantaneous values.

Table ES-1: Population and Wastewater Flow Projections

Year	Served Wastewater Population	Average Day Flow (MGD)	Peak WWF to ADF Peaking Factor	Peak Wet Weather Flow (MGD)
2015	25,318	2.34	5.5	12.86
2020	29,834	2.84	5.0	14.20
2025	33,725	3.34	4.5	15.05
Buildout	143,927	12.95	4.0	51.82

3.0 EXISTING WASTEWATER SYSTEM

The City of Weatherford's wastewater collection system consists of 24 lift stations and the associated force mains, a wastewater treatment plant and a network of gravity mains ranging in size from 4-inches to 24-inches. The total length of wastewater pipelines in the City is 204 miles. The wastewater treatment plant has an average day wastewater permitted capacity of 4.5 MGD with a 14.3 MGD peak 2-hour flow (P2HF) capacity based on the ability to divert 2.1 MG of flow to a peak flow storage basin located on the WWTP site during high flow events. The peak flow storage basin at the WWTP has a storage volume of 0.75 MG. The plant consists of two treatment trains to allow one train to be taken out of service for maintenance while the plant remains operational.

4.0 WASTEWATER FLOW MONITORING

FNI retained Interra Hydro, Inc. (Interra) to conduct flow monitoring within selected portions of the existing wastewater system for a period of 30 days from April 13, 2015 to May 12, 2015. **Figure 4-1** in Chapter 4 of this report is a map of the locations where the flow meters were installed. Evaluation of the results of the temporary flow monitoring allows for the characterization of dry weather and wet weather flows within the wastewater system, the ranking of the relative severity of observed infiltration and inflow, and the evaluation of key performance indicators to direct subsequent condition assessment and rehabilitation activities. The flow monitoring data from the five installed meters was also used to determine the inflow and infiltration in the collection system and to conduct a hydraulic model validation.

Flow depth, velocity, and rate data from each flow monitor were collected and evaluated to provide insight into sewer performance, revealing important information about how the existing wastewater system accommodates observed flow rates. 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. Wet weather flow conditions are characterized by evaluating flow monitor data observed during each storm event that occurred during the study period.

A summary of the average dry and peak wet weather flows at each temporary flow monitoring location can be found in **Table ES-2**.

Table ES-2: Summary of Temporary Flow Monitoring

Flow Meter	Discrete Average Dry Weather Flow (MGD)	Discrete Maximum Wet Weather Flow (MGD)	Wet Weather to Dry Weather Peaking Factor	Net RDII (gal)	Basin Size (LF)	Net RDII (gal/in/LF)
Flow Meter 1	0.18	1.20	6.68	267,892	108,014	1.46
Flow Meter 2	0.25	0.45	1.80	102,065	95,939	0.63
Flow Meter 3	0.58	2.78	4.79	337,791	173,012	1.15
Flow Meter 4	0.06	0.39	6.50	279,776	31,797	5.18
Flow Meter 5	0.53	2.95	5.57	473,838	189,644	1.47

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 inversely proportional to the population served and generally decrease as average dry weather flow increases. The two highest peaking factors observed during the flow monitoring period were values of 6.68 at Flow Monitor (FM) 1 and 6.50 at FM 4, which occurred during the storm event on May 10, 2015.

The City provided FNI with effluent metering data at the wastewater treatment plant from the duration of the flow monitoring period. The meter data from the plant effluent was used in conjunction with the temporary flow monitoring data to calibrate the wastewater hydraulic model for dry and wet weather events. The wastewater hydraulic model was then used to identify existing system capacity deficiencies and to develop a CIP.

A detailed analysis of dry weather and wet weather periods was performed and included an evaluation of various key performance indicators including: dry weather d/D ratios, wet weather peaking factors, and rainfall derived inflow and infiltration (RDII) allowances. Specific recommendations for further planning, evaluation, or condition assessment activities are provided below.

ASCE and WEF recommend that wastewater lines with diameters up to 15-inches be designed to flow with dry weather d/D ratios less than 50%, and larger diameter lines be designed to flow with dry weather d/D ratios less than 75%. The additional capacity in the wastewater lines should be allocated for allowable RDII within an aging collection system. During wet weather events, RDII can enter a sewer system through defects in manholes and wastewater pipes causing surcharging and, in some cases, sanitary sewer overflows (SSOs). A comparison of flow meter data from the dry weather and wet weather periods provides information on areas where RDII is entering the collection system.

Another indicator of the collection system being influenced by high levels of RDII can be seen in the high peaking factors. Peaking factors are the ratio of the highest recorded flow divided by the average dry day weather flow and are an important factor in determining the capacity required for collection system improvements. Typical peaking factors for the North Texas region range between 3.0 and 5.0; however, the peaking factors recorded during the flow monitoring period ranged from 3.34 to 6.67.

5.0 WASTEWATER MODEL DEVELOPMENT

FNI utilized the hydraulic modeling software H2OMAP Sewer by Innovyze, which combines a relational database with geographic analysis to provide a single environment that integrates asset planning with hydraulic modeling. The model developed as part of this study consists of pipes 4-inches and larger, along with some crucial smaller diameter pipes. The model of the existing system consists of 2,082 links and 2,071 nodes, including one outfall, 23 lift stations (Lift Station #4 was not included in the existing wastewater system), and 47 pumps. The modeled pipes range in size from 4-inches to 24-inches in diameter.

FNI updated existing infrastructure GIS data based on provided as-builts, input from City staff, and interpolation between known invert elevations where available. FNI will be providing updated GIS data to the City. FNI included known attribute data (such as diameter, length, invert and rim elevations) where available and relied on GIS, H2OMAP inference tools, or engineering judgment where data were not available. Pipe roughness coefficients are parameters used by the model to perform hydraulic calculations, such as determining the hydraulic grade line of a sewer line. Manhole headloss type and coefficient are used in H2OMAP Sewer to account for the headloss that occurs as flow passes through a manhole. Manning's "n" values were used for the pipe roughness coefficient. Average roughness coefficients for wastewater collection systems range from 0.012 to 0.015 depending on the pipe wall conditions and age of the pipe. A Manning's "n" roughness coefficient of 0.013 was assigned to each pipe while constructing the model, in the absence of other available data. Ground level for each manhole node, where unknown, was established using ground contour data or as-built drawings.

FNI added lift station facilities and force mains to the model based on data provided by the City. Wet well dimensions, inlet and outlet pipes, and invert elevations were modeled to represent the facilities according to available data. The existing system model includes all of the City's lift stations except for Lift Station #4, which was under construction during the flow monitoring period, and the Hudson Oaks lift stations. Lift Station #4 was modeled as in-service for the existing system analysis and all future planning analysis.

The City provided FNI with water meter billing data from the City for retail customers that were assigned spatial coordinates using a process known as "geocoding" to assign addresses to each customer. FNI used the geocoded billing meter data to allocate existing system flows throughout the hydraulic model. The allocated flows provide the basis for the dry weather flows in the hydraulic model from which the dry weather calibration was performed.

6.0 HYDRAULIC MODEL VALIDATION

FNI validated the wastewater collection system hydraulic model using a steady state model run in the H2OMAP sewer software. Model validation involves verifying that the flow and level conditions within the hydraulic model reflect conditions observed during the flow monitoring period. A properly validated model serves as the foundation for any future modeling scenarios. FNI utilized Interra flow monitoring data for dry and wet weather events to validate the H2OMAP Sewer model.

FNI first validated the model's performance against data from the week of April 13, 2015, which represented a week of dry weather flow data. FNI adjusted the flows per capita in the model to match observed flow volumes. FNI matched the dry weather flows in the model within a tolerance of +/- 5%, standard for a planning-level model.

The validated dry weather scenario was utilized to validate the wet weather scenario as a representation of the existing system's response to a wet weather event. The application of the validated dry weather scenario allowed for graphical identification of the magnitude of I/I responses during wet weather validation. FNI achieved a close correlation for both the dry and wet weather validations (+/- 10%), and therefore is confident that the model closely reflects real-world conditions and is suitable to use for hydraulic analysis and CIP development. **Table ES-3** presents the results of the hydraulic model validation. The validated wastewater model was used to identify current system issues as well as future upgrades and expansions to the City's wastewater system.

Table ES-3: Calibration Results

Flow Meter	Observed Average Day Flow (MGD)	Modeled Average Day Flow (MGD)	Observed Peak Wet Weather Flow (MGD)	Modeled Peak Wet Weather Flow (MGD)
FM 1	0.18	0.19	1.20	1.20
FM 2	0.43	0.45	1.65	1.64
FM 3	0.58	0.57	2.78	2.76
FM 4	0.49	0.51	2.04	1.97
FM 5	0.53	0.55	2.95	2.90

7.0 EXISTING WASTEWATER SYSTEM ANALYSIS

Hydraulic analyses were conducted to identify deficiencies in the City of Weatherford's existing wastewater collection system and to establish a capital improvement plan to improve the existing system and accommodate projected wastewater flows through buildout. Various combinations of improvements and modifications were investigated to determine the approach for conveying projected flows. Criteria used in developing the improvements plan included increasing system reliability, simplifying system operations, conveying peak wet weather flows, maintaining proper velocities, and reducing surcharging and sanitary sewer overflows.

For the existing system analysis, FNI allocated existing system flows within the hydraulic model using geocoded billing meter data. FNI applied a 5.5 instantaneous peak wet weather to average day flow peaking factor to the system based on results of the flow monitoring data. Locations where the model indicates that surcharging occurs, but did not surcharge within three feet of the manhole rim were not identified as requiring improvements. These lines were identified and analyzed closely in the future planning scenarios to verify if future projects are necessary due to growth in the basin upstream.

8.0 FUTURE SYSTEM ANALYSIS

Wastewater system improvements were developed to accommodate the anticipated residential and non-residential growth over the next 10 years and through buildout. To serve the future growth, the City of

Weatherford must rehabilitate, replace, or upsize existing infrastructure and extend to areas of growth where little or no infrastructure currently exists.

For the purposes of sizing infrastructure to accommodate peak instantaneous wet weather flows, FNI identified improvements to address areas with surcharging within 3 feet of the manhole rim, overflows and where the firm capacity of lift stations met or exceeded the peak flow. To analyze the peak instantaneous wet weather flow, FNI utilized steady state simulations for each planning period. The steady state simulation provides a representation of the peak instantaneous flow in order to size infrastructure.

Flow projections assumed a proactive system of replacing and rehabilitating infrastructure would result in a reduction of I/I with each successive planning period. To accomplish this reduction of I/I, it is recommended that the City rehabilitate 2% of the wastewater infrastructure each year. Rehabilitation of 2% of the infrastructure each year results in a complete rehabilitation of the system every 50 years which is the typical design life expectancy of a wastewater pipe when properly installed. FNI applied the peak wet weather to average daily flow peaking factor to projected flows for each planning period in order to determine the steady state peak instantaneous flow in the hydraulic model.

FNI used TCEQ criteria to size infrastructure for the 2020, 2025, and buildout planning periods. Lift station capacity was also analyzed under proposed future peak wet weather flow conditions. FNI recommends new lift station and expansion sizing to meet TCEQ requirements. For planning purposes, FNI sized new lift stations and lift station expansion capacities for 110% of the peak wet weather flow.

FNI used peak wet weather flows for each planning period to analyze results and identify areas of the existing system projected to experience surcharging as a result of the increased projected wet weather flows. The 2025 and buildout planning periods project an expansion in the wastewater service area. The City previously has conveyed wastewater from the Brazos River basin to the City's WWTP in the Trinity River basin. The areas may be geographically located in the Brazos River Basin, but the water supply came from the Trinity River Basin. As the City's wastewater service boundary has expanded to the southwest, the City has decommissioned the lift stations at the edge of the existing boundary to accommodate customers further downstream in the Brazos River Basin.

Given that the City's wastewater service area exists across two major river basins, FNI analyzed the buildout system with two alternatives:

- A second wastewater treatment plant to serve customers in the Brazos River basin

- A new series of lift stations to convey wastewater flows back to the current WWTP in the Trinity River basin

FNI also evaluated the wastewater treatment plant capacity for future planning periods. Based on the population and flow projections, additional treatment capacity is needed in the future. The existing plant capacity is 4.5 MGD. Based on the TCEQ "75/90 rule," (Title 30, TAC 305.126(a)) the WWTP could potentially reach the 75% capacity level in 2027 and 90% of capacity in 2032. By the year 2037, the average daily flow to the plant is projected to exceed the existing capacity. For this master plan, FNI has recommended three phases of expansion of the WWTP to the ultimate capacity of 12.9 MGD by the buildout planning period.

9.0 LIFT STATION RISK BASED ASSESSMENT

A risk based assessment was performed on the City's 24 lift stations to develop a prioritized list of maintenance and improvement projects. A risk based assessment consists of a condition assessment and a criticality assessment. The condition assessment included a visual inspection of each lift station. The criticality, or consequence of failure, assessment included an analysis of the proximity of each lift station to critical areas, as well as the residential population served. Each lift station was assigned condition and criticality scores were used to assign a risk category (high, medium, or low) to each asset. Lift station rehabilitation projects were developed based on the result of the assessment and included in the wastewater capital improvement plan.

Condition assessments of the 24 lift stations were performed between October 26, 2015, and November 25, 2015. The first four lift station inspections were conducted by a team which consisted of members from FNI and the City's administration, engineering, inspections, and maintenance groups to normalize the scoring parameters. City staff then completed the remaining 20 lift station inspections. Inspection scoring sheets were developed for each lift station. The inspection sheets included details of the lift station such as number of pumps, design capacity, and the condition components. The following components were assessed during each site visit:

- Pumps and Motors
- Electrical
- Instrumentation
- Structure

- Piping and Valves
- Mechanical
- Site Conditions

In addition to condition scores, each lift station was assigned a criticality score based on the following three categories:

- Proximity to Environmentally Sensitive Areas
- Residential Population Served
- Proximity to High Impact Areas

FNI utilized the results of the condition and criticality assessments to develop a risk based assessment of the 24 lift stations the City currently operates. Risk scores were calculated by the summation of the condition and criticality of each asset. Each lift station was assigned risk of failure of extreme, high, moderate, or low risk. The risk scores of each lift station were utilized to group the lift stations into a risk matrix shown in **Table ES-4**.

Table ES-4: Lift Station Risk Rating Matrix

		Condition				
		Very Good	Good	Fair	Poor	Very Poor
Criticality	Very Low Impact	LS#4	LS#13, LS#22	LS#23, LS#24	LS#3	LS#10
	Low Impact	-	LS#5	-	-	-
	Moderate Impact	LS#6	LS#21	LS#18, LS#7, LS#19	-	LS#2, LS#1, LS#15
	High Impact	-	LS#11	LS#16	LS#12	-
	Very High Impact	LS#8	LS#17, LS#14	-	LS#20	LS#9

Lift stations with medium, high, and very high impact with a fair or poor condition should be evaluated for rehabilitation or decommissioning. It is recommended that Lift Stations #1, #3, #9, #12, #15 and #20 be rehabilitated, while Lift Stations #2 and #10 will be decommissioned by constructing new gravity mains in the future. Several lift stations received a moderate or high risk rating even while having a good condition score due to the high criticality score. These lift stations should continue to be well maintained to minimize lift station downtime given the high consequence of failure of these facilities.

10.0 CAPITAL IMPROVEMENTS PLAN

FNI developed a 10-year CIP and two buildout alternatives to serve existing and future growth in the City of Weatherford, including:

- Buildout Brazos Wastewater Treatment Plant CIP
- Buildout Brazos Lift Station CIP

The 10-year CIP projects are similar in location in each of the alternatives; however, the proposed sizing is different between the 10-year CIP and the buildout alternatives due to projected population served. The 10-year CIP was developed to provide the City a baseline for what size project is needed to serve growth in the next 10-years. Growth trends change over time, and timing of projects will vary with the growth. The 10-year CIP will serve as the baseline, but the buildout alternative sizing should be considered before moving forward in design. The buildout alternatives provide the ultimate pipe size needed to serve projected growth into the buildout planning period. **Table ES-5** is a cost comparison of each of the CIP alternatives. Costs are in 2017 dollars.

Table ES-5: CIP Alternative Cost Comparison

Planning Period	10-year CIP	Buildout Brazos Wastewater Treatment Plant Alternative	Buildout Brazos Lift Station Alternative
2020	$11,756,700	$11,756,700	$11,756,700
2025	$27,235,600	$27,235,600	$27,235,600
Buildout	-	$192,432,200	$192,751,000
Total	**$38,992,300**	**$231,424,500**	**$231,743,300**

Buildout Alternative Recommendation

An expansion at the existing WWTP is not needed until 2032 at the current projected growth rate. Given the projected growth rate in the Trinity basin, the existing WWTP will need to be expanded by 2041 (approximately) regardless of the City's decision to construct a second WWTP in the Brazos basin. Due to the unpredictable nature of growth patterns, FNI recommends that the City explore the acquisition of land for the new WWTP in the near future while continuing the current strategy of pumping wastewater flows back to the Trinity basin. The expansion of the existing WWTP can take place in the near term to accommodate flows, while the new plant can be constructed as growth in the southwestern portion of the City provides conditions suitable for its use.

1.0 INTRODUCTION

The City of Weatherford is located in the west portion of the Dallas-Fort Worth Metroplex. The City provides wastewater service to an area of approximately 30 square miles. Growth into the extraterritorial jurisdiction (ETJ) will increase the service area to 90 square miles by the buildout planning period. The population within the wastewater service area is projected to increase 33% over the next 10 years and be more than five times larger than the current population at buildout. Accommodating this growth in an efficient and cost effective manner, while maintaining a safe wastewater collection system for the citizens of Weatherford, was the focus of the 2015 Wastewater Collection System Master Plan.

1.1 PURPOSE

This report presents the analysis approach, findings and results of the Wastewater Master Plan performed by Freese and Nichols, Inc. (FNI) for the City of Weatherford. The purpose of the Master Plan was to build a wastewater collection system hydraulic model, incorporate a risk based assessment of the existing system lift station facilities and develop a capital improvement plan through a combination of analysis of the existing system conditions and the future capacity needs.

1.2 SCOPE OF WORK

The City of Weatherford retained FNI in 2015 to develop a Wastewater Collection System Master Plan. The goals of this project were to evaluate the existing wastewater collection system and recommend a phased Capital Improvements Plan through the buildout planning period. The recommended improvements will serve as a basis for the design, construction and financing of facilities required to meet the City's wastewater service area needs as a result of projected population growth. The major elements of the scope of this project included:

- Population and Flow Projections
- Flow Monitoring
- Hydraulic Model Development and Calibration
- Existing and Future System Analyses
- Lift Station Condition Assessment
- Wastewater Collection System Capital Improvements Plan
- Wastewater Master Plan Report

1.3 ABBREVIATIONS

Table 1-1 provides a list of abbreviations used in this report.

Table 1-1: Abbreviations

Abbreviation	Full Nomenclature
AADF	Average Annual Daily Flow
ASCE	American Society of Civil Engineers
Avg.	AverageHF
CIP	Capital Improvement Plan
d/D	Depth to Diameter Ratio
EPA	Environmental Protection Agency
ETJ	Extraterritorial Jurisdiction
FM	Flow monitor
FNI	Freese and Nichols, Inc.
GIS	Geographic Information Systems
gpad	Gallons per acre per day
gpcd	Gallons per capita per day
HGL	Hydraulic Grade Line
I/I	Infiltration and Inflow
in	Inches
Interra	Interra Hydro, Inc.
LF	Linear Feet
Max.	Maximum
Min.	Minimum
MG	Million Gallons
MGD	Million Gallons per Day
NCTCOG	North Central Texas Council of Governments
P2HF	Peak 2-Hour Flow
RDII	Rainfall-Dependent Infiltration and Inflow
TCEQ	Texas Commission on Environmental Quality
TSZ	Traffic Survey Zone
The City	City of Weatherford
WEF	Water Environment Federation
WWTP	Wastewater Treatment Plant

2.0 POPULATION AND FLOW PROJECTIONS

Population and land use are important elements in the analysis of wastewater collection systems. Wastewater flows depend on the residential population and commercial development served by the collection system. Thorough analyses of historical and projected population and land use data provide the basis for the analysis of future wastewater flows.

In the following sections, it is important to note the difference between the “total” population and the “population served”. There are a number of residences in and around the City of Weatherford that have private septic systems. The “population served” is the population served by the City’s wastewater collection system. For the purpose of projecting the “wastewater” population into the buildout planning period, it was assumed that all existing septic customers will remain on septic sewer systems through buildout.

2.1 SERVICE AREA

Delineating the wastewater collection system service area is an important aspect for any wastewater master plan. The wastewater service area determines where and the extent to which the collection system will extend. FNI worked with the City to define the five-year, ten-year, and buildout wastewater service areas. The city limits and ETJ boundaries for the City of Weatherford and surrounding retail water suppliers were considered when delineating the service areas. **Figure 2-1** identifies the projected five-year, ten-year, and buildout service areas for this study. The wastewater service area is impacted by areas served by individual septic systems, as some of these areas may never be connected to the sewer system network.

2.2 POPULATION PROJECTIONS

2.2.1 Historical Population

The City of Weatherford provided yearly population data from 2000 through 2010 as part of the 2013 Water Master Plan. The historical population in the 2013 Water Master Plan refers to the total population within the City. Total population data for 2011 through 2014 was obtained through the North Central Texas Council of Governments (NCTCOG) population estimates. The average annual growth rate since 2000 was 2.33%. This growth rate is similar to the growth rate of 2.5% used in the 2012 Water Master Plan. **Table 2-1** presents the total historical population for the City of Weatherford.

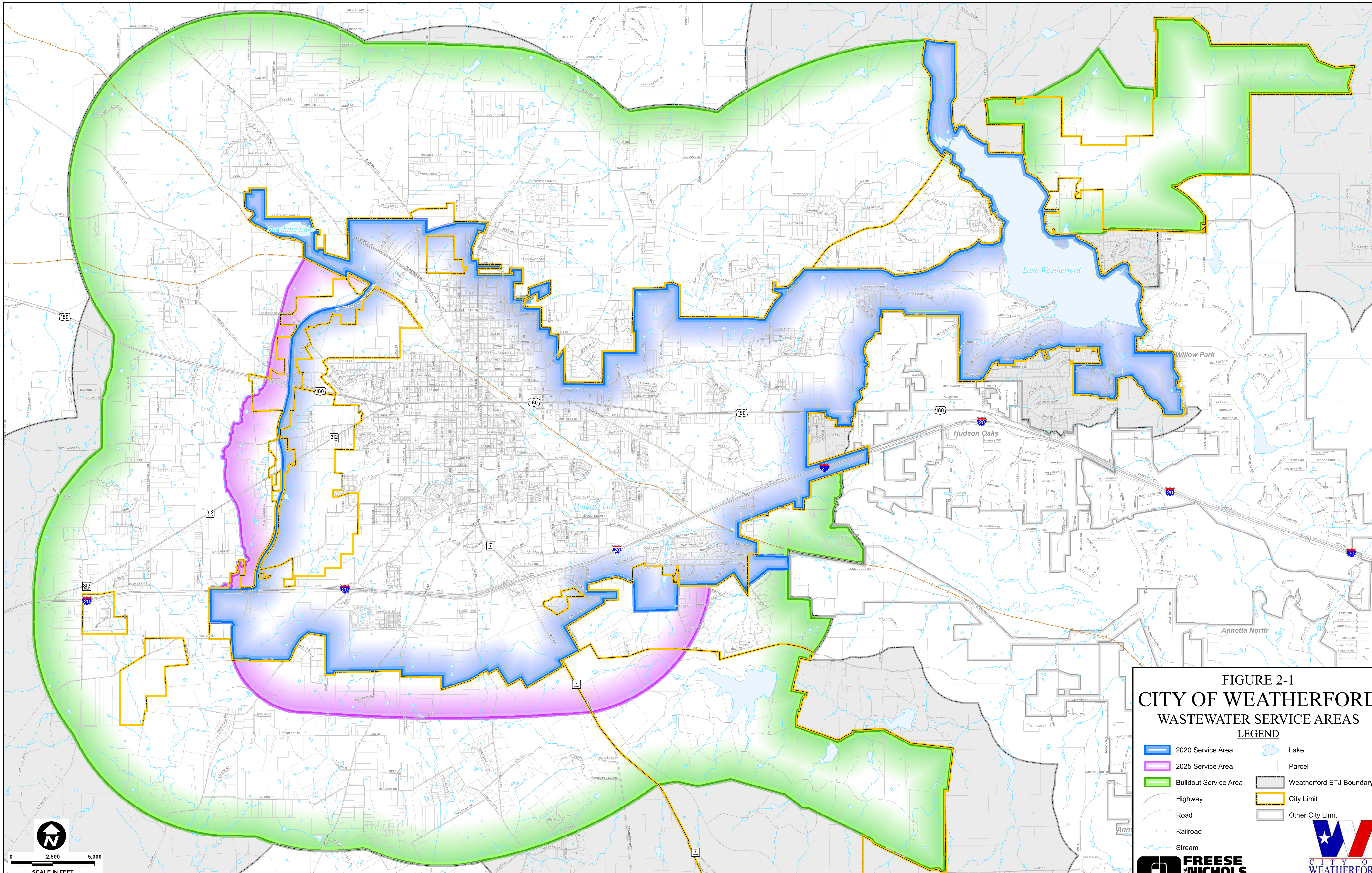


FIGURE 2-1
CITY OF WEATHERFORD
WASTEWATER SERVICE AREAS
LEGEND
2020 Service Area
2025 Service Area
Buildout Service Area
Highway
Road
Railroad
Stream
Lake
Parcel
Weatherford ETJ Boundary
City Limit
Other City Limit
FREESE AND NICHOLS
CITY OF WEATHERFORD
Lake Weatherford
Willow Park
Hudson Oaks
Holland Lake
Sunshine Lake
Annetta North
0
2,500
5,000
SCALE IN FEET

Table 2-1: Historical Population

Year	Citywide Population	Growth Rate
2000	19,000	-
2001	19,296	1.56%
2002	19,699	2.09%
2003	20,203	2.56%
2004	21,252	5.19%
2005	22,144	4.20%
2006	22,882	3.33%
2007	23,658	3.39%
2008	24,396	3.12%
2009	24,939	2.23%
2010	25,250	1.25%
2011	25,300	0.20%
2012	25,440	0.55%
2013	25,940	1.97%
2014	26,200	1.00%
Average	**-**	**2.33%**

2.2.2 Projected Population

The NCTCOG 2015 total population estimate for the City of Weatherford is 26,600. FNI utilized water billing meter data to determine the number of customers who have water and wastewater service vs. customers who only have water service. This provided the number and location of all the customers with septic sewer systems. There are 11,226 water meters in the City of Weatherford. The people per water meter density based on the 26,600 population and 11,226 meters is 2.37 people per water meter. There are a total of 10,685 meters with water and wastewater service. Applying the 2.37 people per meter to the 10,685 water and wastewater service meters results in a wastewater population served of 25,318.

The 2013 Water Master Plan recommended a projected annual growth rate of 2.5% for the 2020 and the 2025 planning periods. FNI maintained the average 2.5% growth rate for the population served as a base through the 2025 planning period. The City also provided information on various ongoing developments throughout the City that are currently under construction or will be in the next 5 to 10 years. Based on this information, the growth rate in the 5-year planning period is projected to be slightly higher at 3.3%. This assumes that all new developments in Weatherford will receive wastewater service from the City. The projected population for each planning year is presented in **Table 2-2**.

Table 2-2: Wastewater Population Served Projections

Year	Population Served	Growth Rate
2015	25,318	-
2020	29,834	3.3%
2025	33,725	2.5%
Buildout	143,927	-
Average	**-**	**2.5%**

The buildout population was estimated by determining the future acreage within the buildout service area that will be residential. It was determined that the area in and around the core of the City would develop at a density of 3 units per acre and 2.5 people per unit, resulting in 7.5 people per acre. Areas outside the core of the City that stretch into the ETJ in the future were projected to have a density of 2 units per acre and 2 people per unit, resulting in 4 people per acre. Developed areas outside of the current city limits where residents are currently served by septic systems are assumed to remain on septic systems through buildout. Thus, the resulting projected buildout population of 143,927 is lower than the projected buildout population of 160,720 from the 2013 Water Master Plan. The Buildout population of 160,720 also matches the 2070 projection for the City of Weatherford in the *2016 Region C Water Plan*.

The population for each planning year was then distributed throughout the City using two sources of data: modified Traffic Survey Zones (TSZs) and the geocoded water billing meter data. Geocoding is a process in which a field or group of fields of a table collectively signify an address that can be assigned a spatial location using corresponding streets or small area polygons, such as parcels, that are descriptive of an area. The geocoded billing data provided FNI the basis for distributing the population throughout the City.

NCTCOG develops population projections using smaller planning areas called TSZs. A TSZ is a type of data collection zone that was established by NCTCOG for all counties within the North Texas region. The TSZs in the City of Weatherford were too large to provide enough detail for the distribution of the population. Therefore, FNI split the existing TSZs, making them smaller to better facilitate the population and wastewater load distribution.

The existing population was distributed and assigned to a TSZ using the geocoded billing meter data. The 10,685 geocoded residential wastewater meters were intersected with and summarized by TSZ and then multiplied by the citywide density of 2.37 people per meter to determine the existing population by TSZ.

The intermediate year population distribution was determined using information on large planned developments obtained through discussions with City staff. Most of the growth in the 5-year and 10-year planning periods is projected to occur within the Ric Williamson Memorial Highway, encircling the City. **Figure 2-2** shows the population by TSZ for each planning period. The buildout service area to the southwest and the southeast of the City does not include the entire ETJ. The area southwest of the City was recently annexed as this master plan was being finalized. The area to the southeast is the Moncrief Reserve property and development is not anticipated in the future.

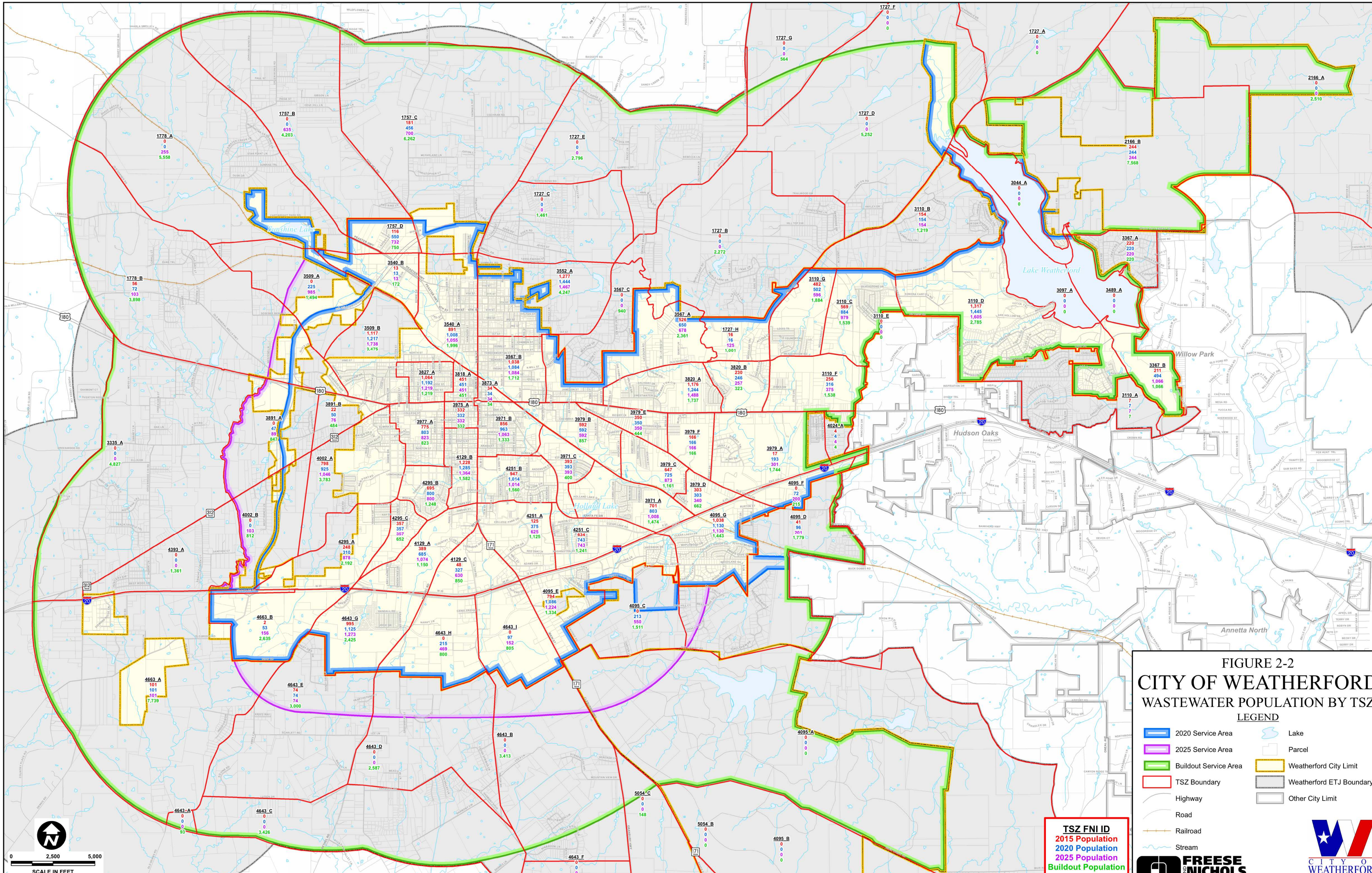


FIGURE 2-2
CITY OF WEATHERFORD
WASTEWATER POPULATION BY TSZ
LEGEND
2020 Service Area
2025 Service Area
Buildout Service Area
TSZ Boundary
Highway
Road
Railroad
Stream
Lake
Parcel
Weatherford City Limit
Weatherford ETJ Boundary
Other City Limit
TSZ FNI ID
2015 Population
2020 Population
2025 Population
Buildout Population
FREESE AND NICHOLS
CITY OF WEATHERFORD
SCALE IN FEET
0
2,500
5,000
Lake Weatherford
Willow Park
Hudson Oaks
Annetta North
Holland Lake
Sunshine Lake

2.2.3 Land Use

The City provided zoning shapefiles, which include the current zoning for the City of Weatherford. This 2010 zoning data along with the geocoded billing meter data was used to determine the existing and future total non-residential acreage. To determine the existing non-residential acreage, the geocoded billing data was intersected with the Weatherford parcel data. Every parcel that contained a non-residential water meter was considered a non-residential parcel. The sum of the areas of the existing developed non-residential parcels is 1,575 acres. The existing acres and the developed acreage projections account for the entire proposed land use area from the future land use plan. These acreage numbers do not account for any floor to area ratios that limit the size of buildings on any given parcel; therefore, the effective acreage (the actual building size) of existing and future non-residential infrastructure will be less than the total numbers presented in this section.

To determine the buildout non-residential acreage, FNI and the City determined locations of future commercial and industrial centers. It was assumed that new commercial areas will develop along the Ric Williamson Memorial Highway on the west side of the City. Other locations, such as the Weatherford College property in the south and the industrial area in the northwest, were also taken into account. The projected buildout non-residential acreage is 6,435 acres.

For the intermediate planning years, an annual growth rate similar to the population growth rate of 2.5% was assumed for the 2020 planning period. The growth rate in non-residential acreage was increased to 4.0% based on the proposed commercial developments for the 2025 planning period. **Table 2-3** and **Figure 2-3** present the non-residential acreage by planning year for the wastewater service area.

Table 2-3: Non-Residential Acreage

Year	Commercial Acreage (Acres)	Commercial Growth Rate
2015	1,575	-
2020	1,782	2.5%
2025	2,168	4.0%
Buildout	6,435	-

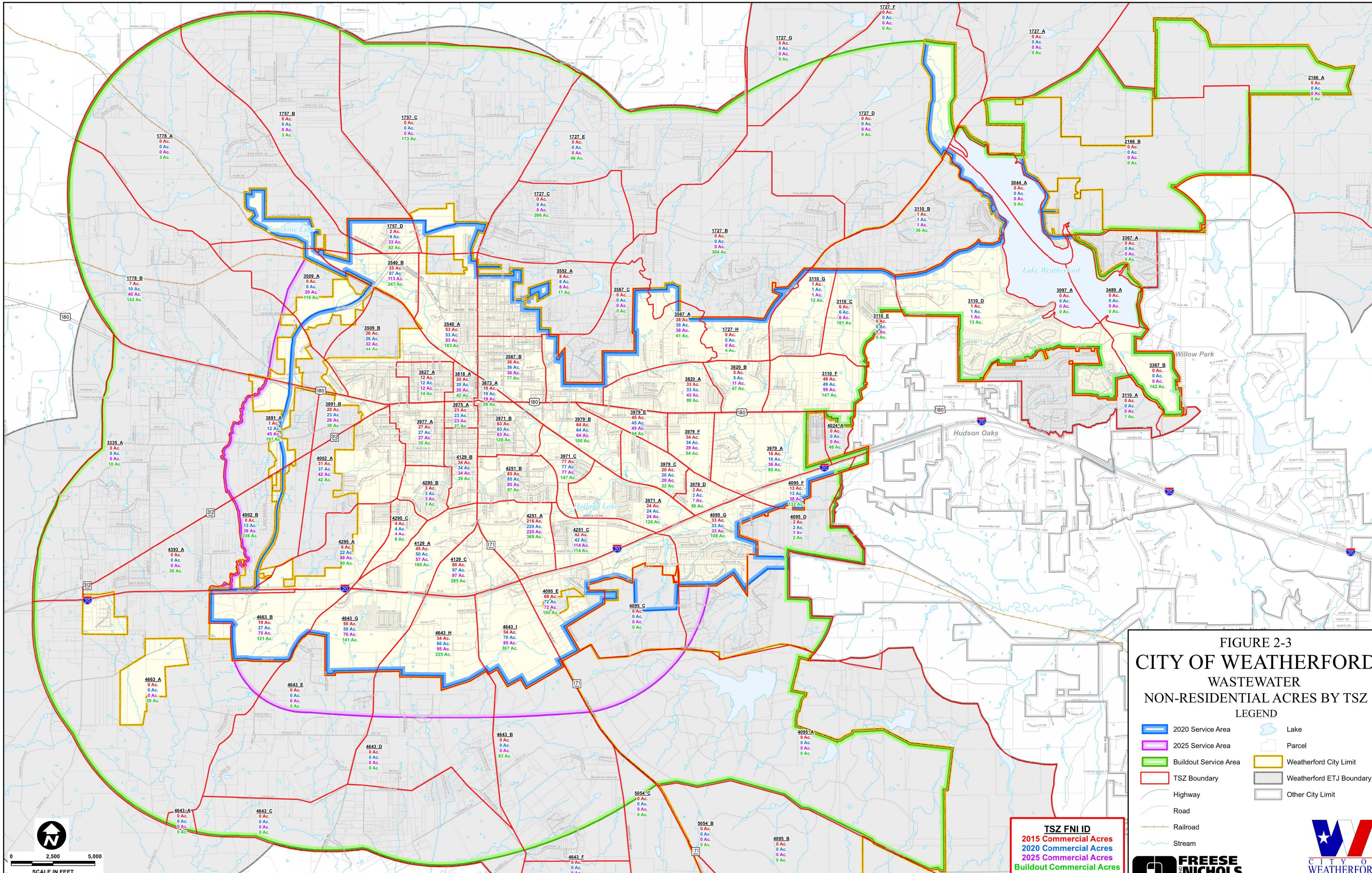


FIGURE 2-3
CITY OF WEATHERFORD
WASTEWATER
NON-RESIDENTIAL ACRES BY TSZ
LEGEND
2020 Service Area
2025 Service Area
Buildout Service Area
TSZ Boundary
Highway
Road
Railroad
Stream
Lake
Parcel
Weatherford City Limit
Weatherford ETJ Boundary
Other City Limit
TSZ FNI ID
2015 Commercial Acres
2020 Commercial Acres
2025 Commercial Acres
Buildout Commercial Acres
FREESE AND NICHOLS
CITY OF WEATHERFORD
SCALE IN FEET
0 2,500 5,000
Lake Weatherford
Willow Park
Hudson Oaks
Holland Lake
Sunshine Lake

2.3 WASTEWATER FLOWS

The City of Weatherford's wastewater system conveys wastewater flows through the collection system to the wastewater treatment plant (WWTP). Wastewater flows vary throughout the year based on many variables; the most impactful typically being rainfall.

2.3.1 Historical Wastewater Flows

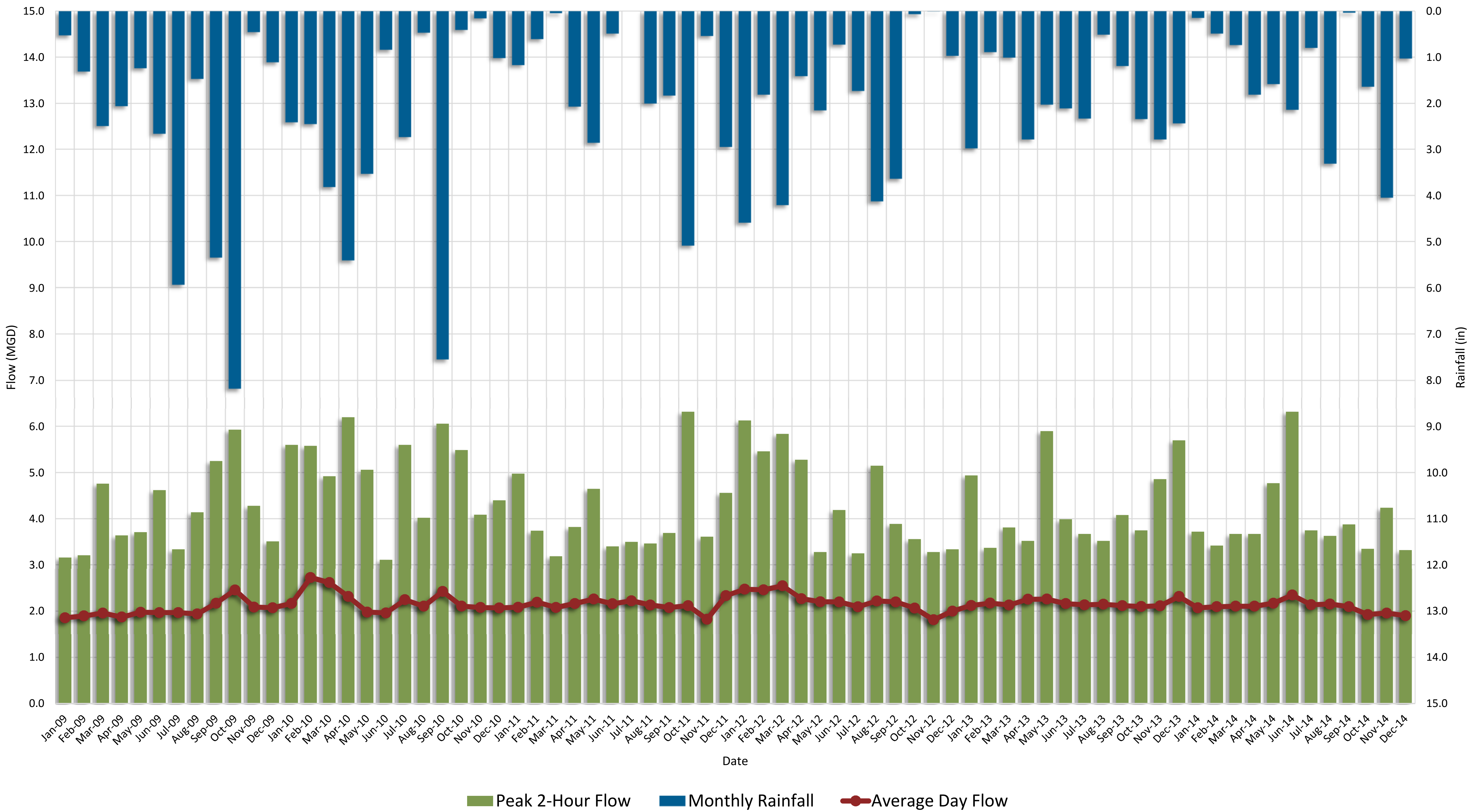
FNI reviewed historical wastewater treatment plant daily reports from 2009 through 2014. **Figure 2-4** displays the historical wastewater data at the treatment plant summarized on a monthly basis. The average daily flow rate varied each month. The average day flows ranged from a minimum of 1.81 MGD in November 2012 to a maximum of 2.73 MGD in February 2010. The rainfall total in November of 2012 was negligible at 0.01 inches and followed a very dry October when only 0.07 inches of rain fell. The average daily flow for the entire five year period was 2.14 MGD. The peak 2-hour flow varies based on the rainfall each month. Higher rainfall totals generally result in a greater amount of infiltration and inflow (I/I) into the wastewater collection system. The peak 2-hour wastewater flow of 6.32 MGD occurred on October 9, 2011, when a total of 4.44 inches of rain fell on the collection system over a span of two days beginning on October 8, 2011. The peak 2-hour flow at the wastewater treatment plant is attenuated in the wastewater system. The hydraulic grade line (HGL) at the WWTP causes flow in the collection system upstream to backup. This storage of wastewater in the collection system results in surcharging around the WWTP. The attenuation and the surcharging in the system result in a peak 2-hour wet weather to dry weather flow peaking factor at the WWTP of less than 3.0. A 0.75 MG peak flow basin at the wastewater treatment plant allows the City to attenuate the peak flow through the treatment plant during peak wet weather events, so the peak 2-hour flow is attenuated through the WWTP and lower than what would be seen in the collection system. **Table 2-4** summarizes the average day and peak wet weather flows at the WWTP effluent meter from 2009 through 2014.

Table 2-4: Historical Wastewater Flow Data

Year	Average Day Flow (MGD)[1]	Peak 2-Hour Flow (MGD)[1]	Peak 2-Hour to Average Day Flow Peaking Factor	Annual Rainfall (in)
2009	2.02	5.93	2.94	32.80
2010	2.23	6.20	2.78	30.80
2011	2.14	6.32	2.96	19.66
2012	2.21	6.13	2.77	25.45
2013	2.17	5.90	2.72	23.38
2014	2.09	6.32	3.03	17.78
Average	**2.14**	**6.13**	**2.86**	**24.98**

[1]WWTP Effluent Meter Data

Figure 2-4
Monthly Average Day vs. Peak 2-Hour Flow
2009 - 2014



The average day wastewater flow rate was divided by the served population to determine the total per capita per day flow (gpcd). The average per capita over the last five years was 86 gpcd. This per capita does not account for the split in the commercial vs. residential flow throughout the City. **Table 2-5** shows the total average per capita flow rates for the last five years.

Table 2-5: Historical Average Per Capita Wastewater Flow

Year	Population Served	Weatherford Average Day Flow (MGD)	Hudson Oaks Average Day Flow (MGD)	Total Average Day Flow (MGD)	Total Weatherford Flow Per Capita (gpcd)
2009	23,737	2.02	-	2.02	85
2010	24,033	2.23	-	2.23	93
2011	24,081	2.06	0.08	2.14	85
2012	24,214	2.13	0.08	2.21	88
2013	24,690	2.09	0.08	2.17	85
2014	24,937	2.04	0.05	2.09	82
Average	**-**	**-**	**-**	**2.14**	**86**

(1)Hudson Oaks flow data was not available for 2009-2010.

The billing meter data was also utilized in the analysis of historical wastewater flows. The metered water usage from the last three years was reviewed and evaluated based on usage type. The residential consumption accounted for approximately 63% of the total. This ratio was assumed for the last five years and used to determine the residential wastewater flow per capita. The average non-residential flow per acre was calculated using the observed 2015 non-residential acreage with the assumption that a 2% increase in non-residential acreage occurred since 2009. The average non-residential wastewater flow per acre over the last five years was 539 gallons per acre per day (gpad). **Table 2-6** is a summary of the breakdown between the residential and commercial flow over the last five years.

Table 2-6: Historical Residential vs. Non-Residential Wastewater Flow

Year	Population Served	Non-Res. Acreage	Hudson Oaks ADF (MGD)	Res. ADF (MGD)	Res. Flow Per Capita (gpcd)	Non-Res. ADF (MGD)	Non-Res. Flow Per Acre (gpad)	Total ADF (MGD)
2009	23,737	1,405	-	1.31	55	0.71	503	2.02
2010	24,033	1,434	-	1.45	60	0.78	544	2.23
2011	24,081	1,463	0.08	1.34	56	0.80	547	2.14
2012	24,214	1,482	0.08	1.39	57	0.83	557	2.21
2013	24,690	1,513	0.08	1.36	55	0.81	537	2.17
2014	24,937	1,544	0.05	1.33	53	0.76	495	2.09
Avg.	**-**	**-**	**0.07**	**1.36**	**56**	**0.78**	**530**	**2.14**
Min.	**-**	**-**	**0.05**	**1.31**	**53**	**0.71**	**495**	**2.02**
Max.	**-**	**-**	**0.08**	**1.45**	**60**	**0.83**	**557**	**2.23**

A preliminary review of flow metering data in conjunction with billing meter data provided a summary of flows by flow meter basin in **Table 2-7**. The residential vs. commercial flow split was determined using the geocoded water billing meter data.

Table 2-7: Flows by Flow Meter Basin

Flow Meter Basin	Population[1]	Discrete Total Average Day Flow (mgd)	Discrete Residential Flow (mgd)	Discrete Commercial Flow[1] (mgd)	Flow Per Capita (gpcd)
1	3,137	0.18	0.12	0.06	38
2	3,286	0.25	0.22	0.03	67
3	5,297	0.58	0.41	0.17	78
4[2]	514	0.06	0.05	0.01	97
5	3,735	0.57	0.21	0.36	57

[1] *Information derived from geocoded billing meter data*
[2]*The Parker County Jail is located upstream of Flow Meter 4.*

The flow meter basins include all connections upstream of each flow meter and do not include the entire served population. The per capita flow in meter basin FM 4 is larger than the other flow basins due to the Parker County Jail upstream. The billing meter data indicates that a large portion of the flow in Flow Meter Basin 4 is generated by the jail. The diurnal pattern of a jail is similar to a typical residential diurnal pattern. However, the population of the jail at the time of flow monitoring was unknown and not included in the population projections and may be the cause of the higher per capita flow rate in Flow Meter Basin 4. A further analysis of the wastewater flow monitoring data is presented in **Section 4.0**. The wastewater flow monitoring data, along with the geocoded billing meter data, served as the basis for the distribution of the existing wastewater flows in the collection system.

2.3.2 Projected Wastewater Flows

Wastewater flows were projected for 2015, 2020, 2025 and buildout conditions. The evaluation of historical data provided a basis for determining the design criteria used to project wastewater flows. A per capita residential flow of 55 gpcd was utilized for 2015 flows. For each of the following planning periods, all future growth was conservatively assumed to have a flow per capita of 65 gpcd based on the historical flow data, as well as project closer to TCEQ recommendations of 75-100 gpcd for residential flow ("Table B.1 – Design Organic Loadings and Flows for a New Facility", 217.32(3)), while holding the existing development at 55 gpcd. This results in an increasing flow per capita over time due to growth. For non-residential areas, it was assumed that similar types of industries will continue to develop into the future, so the non-residential gallons per acre per day (gpad) rate was held constant at 550 gpad for each planning year.

The wholesale wastewater flow for the City of Hudson Oaks was calculated based on the population projections from the Texas Water Development Board (TWDB). The TWDB provides projections for each decade from 2020 through 2070. The 2025 population projection was interpolated between the 2020 and 2030 projection. The City of Hudson Oaks is predominately residential so a per capita of 65 gpcd was applied to the TWDB population projections to determine the future wholesale wastewater flows to the City of Weatherford.

Based on the results from the flow monitoring data that is presented in **Section 4.0**, FNI utilized a 5.5 instantaneous peak wet weather to average day flow peaking factor for the existing planning period. An instantaneous peaking factor is utilized to verify the capacity of the infrastructure in the collection system. However, attenuation in the collection system will reduce the observed peaking factor at the WWTP. It is also important to consider that wastewater treatment plants are permitted on a peak 2-hour basis. These factors account for the difference in the 5.5 instantaneous peaking factor based on the flow meter data and the maximum observed peak 2-hour flow in the past 5 years of 2.98. Based on ongoing rehabilitation and renewal efforts by the City, the instantaneous peaking factor is projected to decrease in the future planning periods to a 4.0 peak wet weather to average day flow peaking factor by the buildout planning period. The projected average day and peak wet weather wastewater flows are provided in **Table 2-8**.

Table 2-8
Wastewater Flow Projections

Year	Served Wastewater Population	Residential Per Capita (gpcd)	Residential Average Day Flow (MGD)	Non-Residential Acreage (Acres)	Non-Residential per Acre Flow (gpad)	Commercial Average Day Flow (MGD)	Hudson Oaks Average Day Flow (MGD)	Total Average Day Flow (MGD)	Peak WWF to ADF Peaking Factor	Peak Wet Weather Flow (MGD)
2015	25,318	55	1.39	1,575	550	0.87	0.08	**2.34**	5.5	12.86
2020	29,834	57	1.69	1,782	550	0.98	0.17	**2.84**	5.0	14.20
2025	33,725	57	1.94	2,168	550	1.19	0.21	**3.34**	4.5	15.05
Buildout	143,927	63	9.10	6,435	550	3.54	0.31	**12.95**	4.0	51.82

3.0 EXISTING WASTEWATER SYSTEM

The City of Weatherford's wastewater collection system consists of 24 lift stations and the associated force mains, a wastewater treatment plant and a network of gravity mains ranging in size from 4-inches to 24-Inches. The wastewater treatment plant has an average day wastewater permitted capacity of 4.5 MGD. The existing wastewater system is shown on **Figure 3-1**.

3.1 WASTEWATER TREATMENT PLANT

The City of Weatherford owns and operates one wastewater treatment plant located along Town Creek southeast of the city center. The plant has a rated capacity of 4.5 MGD average annual daily flow (AADF) and a 14.3 MGD peak 2-hour flow (P2HF) capacity based on the ability to divert 2.1 MGD to the peak flow storage basin at the WWTP. The maximum permitted effluent flow into Town Creek is 12.2 MGD. The plant consists of two treatment trains to allow one train to be taken out of service for maintenance while the plant remains operational. The "Old Plant" is rated to treat a design flow capacity of 1.7 MGD and a maximum flow of 4.2 MGD. The "New Plant" has a design flow capacity of 4.5 MGD and a maximum flow capacity of 8.0 MGD. The flow to the treatment plant is conveyed through a mechanical screening structure before entering a splitter box that splits the flow between the New Plant and the Old Plant. Flow to the New Plant is conveyed to an influent lift station before being pumped to further treatment processes or the peak flow storage basin during peak flow events.

3.2 LIFT STATIONS

The City owns and maintains 24 collection system lift stations. **Table 3-1** provides a summary of each lift station along with the existing firm capacity (maximum pumping rate with the largest pump in reserve). Many of the lift stations provide service solely to certain subdivisions or commercial/industrial facilities. Available information from each lift station can be found in Appendix A.

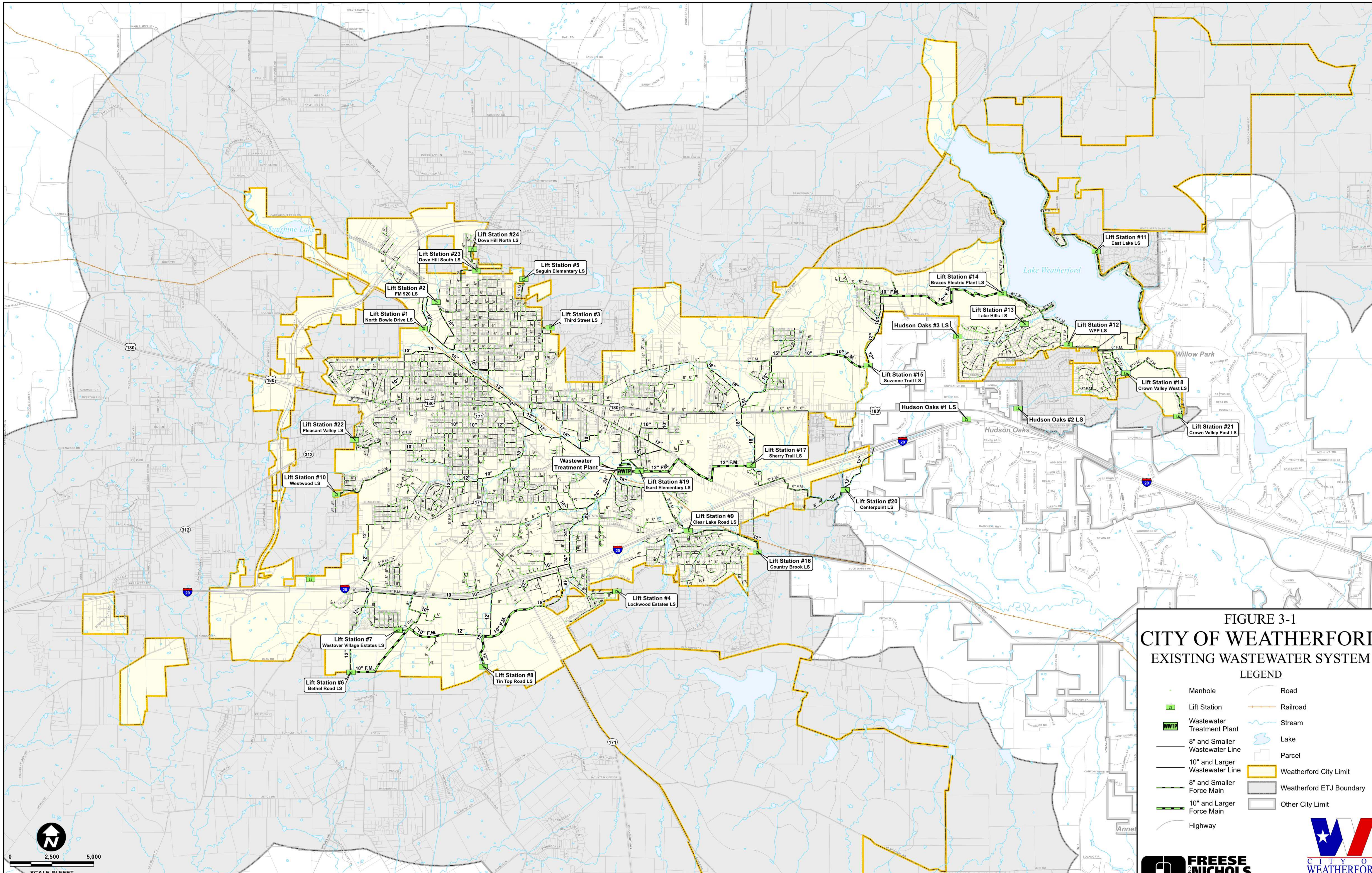


FIGURE 3-1
CITY OF WEATHERFORD
EXISTING WASTEWATER SYSTEM

Table 3-1: Lift Station Capacities

Lift Station #	Lift Station Name	Address	Rated Firm Pumping Capacity (MGD)	Total Dynamic Head (ft.)	Number of Pumps	Wet Well Size
1	Mastershield	1200 N. Bowie	0.40	25	2	8' X 22'
2	Nursing Home	525 HWY. 920	0.14	25	2	6' X 13'
3	Third Street	900 BLK.E.SECOND	0.22	56	2	8' X 19'6"
4	Lockwood Estates	653 Ethan Dr.	0.43	27	2	7' X 12'6"
5	North Elementary	501 E. Eighth	0.14	70	2	5' X 15'2"
6	Bethel Road	2800 Bethel Rd.	1.01	140	2	10' X 22'
7	Westover Village Estates	750 I-20W/BETHEL	0.58	143	2	8' X 23'
8	Westover Village Estates	2607 Tin Top Rd	1.22	175	2	8' X 28.5'
9	Cheveron	2050 I-20E/CHEVRON	0.65	84	2	6' X 22'8"
10	Westwood	1550 OAK TREE LN.	0.18	160	2	5' X 12'
11	East Lake	1523 E.LAKE	0.20	50	2	6' X 12'
12	Water Treatment Plant	114 W.LAKE	0.65	97	2	6' X 12'
13	Lake Hills	3611 FOOTHILLS	0.41	71	2	8'X8'X23'
14	Brazos Electric Plant	601 W. LAKE	1.73	210	3	9'X7'6"X13'8"
15	Suzanne Trail	2620 SUZANNE TR.	0.72	98	2	8' X 9' X 16'
16	Love Country Brook	2440 SCOTTS MEADOW	0.50	72	2	8' X 29'8"
17	Sherry Trail	325 SHERRY TR.	0.79	95	2	10' X 16' X 11'
18	Crown Valley West	1100 BLK. REATA CT	0.56	150	2	8' X 17'6"
19	Bankhead Elementary	1100 TERRY TR.	0.14	50	2	5' X 19'6"
20	Centerpoint	CENTERPOINT	0.50	120	2	6' X 28'7"
21	Crown Valley	CROWN RD.	0.26	85	2	8' X 19'
22	Pleasant Valley	302 SENCA	0.43	112	2	8' X 11'2"
23	Dove Hill South	1723 N.MAIN	0.14	46	2	6' X 10'2"
24	Dove Hill North	1823 SANDPIPER	0.14	46	2	6' X 9'6"

3.3 WASTEWATER COLLECTION SYSTEM

The City of Weatherford's existing wastewater system consists of approximately 204 miles of collector mains, interceptors, and force mains. Pipeline diameters range from 4 to 24-inches. **Table 3-2** provides a breakdown of the linear footage by diameter of pipe. The majority of the system is comprised of 6-inch and 8-inch wastewater lines that commonly serve subdivisions, neighborhoods, and small commercial areas throughout the City. The main interceptors along Town Creek and Holland Lake are 18-inch and 24-inch wastewater lines, respectively.

Table 3-2: Linear Footage of Wastewater Pipe

Pipe Diameter (in)	Length (LF)	Percent of System
4	49,214	5%
6	491,071	46%
8	362,145	34%
10	73,855	7%
12	62,354	6%
15	7,360	1%
18	22,623	2%
21	1,761	0%
24	8,152	1%
Total	**1,078,535**	**100%**

The collection system is comprised of mostly clay and PVC pipe. A small portion of the collection system pipes is ductile iron. **Table 3-3** provides a breakdown of linear footage by pipe material.

Table 3-3: Pipeline Material

Pipe Material	Length (LF)	Percent of System
Clay	438,855	41%
PVC	635,152	59%
Ductile Iron	138	0%
Unknown	4,390	0%
Total	**1,078,535**	**100%**

4.0 WASTEWATER FLOW MONITORING

FNI retained Interra Hydro, Inc. (Interra) to conduct flow monitoring within selected portions of the existing wastewater system. Evaluation of the results of the temporary flow monitoring allows for the characterization of dry weather and wet weather flows within the wastewater system, the ranking of the relative severity of observed infiltration and inflow, and the evaluation of key performance indicators to direct subsequent condition assessment and rehabilitation activities. The flow monitoring data was also used in the hydraulic model validation.

Dry weather and wet weather performance within the existing wastewater system were evaluated by installing sewer flow monitors to observe and document existing flow conditions. FNI met with the City staff in February, 2015 to identify locations for the temporary flow monitors. The locations were strategically selected to allow the temporary flow monitors to capture the system's performance during rain events and provide data for hydraulic model calibration. **Figure 4-1** shows the locations of the five temporary area-velocity style flow monitors and one tipping-bucket rainfall gauge. The flow monitoring data were used to complete the inflow and infiltration study and model validation. The temporary flow monitors and rain gauge were deployed for a period of 30 days from April 13, 2015, to May 12, 2015. Accurate identification of areas with high rainfall-dependent infiltration and inflow (RDII) and calibration of the hydraulic model during wet weather conditions require wet weather flow monitoring data. During the flow monitoring period, rain events occurred within the study area on April 24, April 26, May 7 and May 10, with a maximum observed rainfall at the temporary rain gauge of 1.94 inches on May 7.

4.1 FLOW MONITORING DATA

Sewer flow monitoring was performed using area-velocity flow monitors manufactured, installed, and maintained by Interra. Each flow monitor was mounted near the top of a manhole and connected to flow depth and velocity sensors positioned in an incoming sewer line. Each flow monitor was equipped with an ultrasonic depth sensor mounted at the crown of the sewer line and a velocity sensor mounted at or near the invert of the sewer line. A pressure depth sensor was also mounted at or near the inverts to measure surcharge depths.

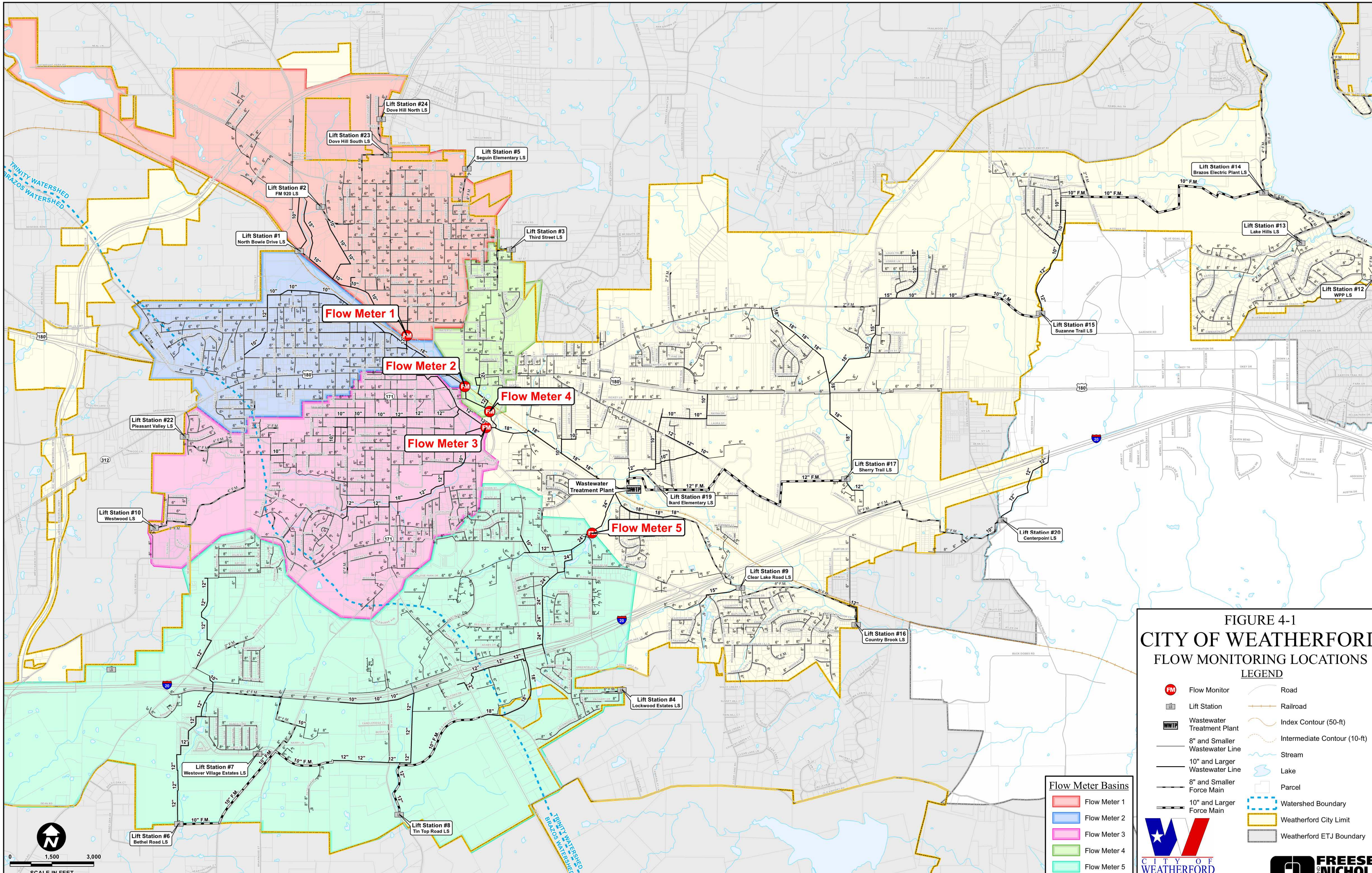


FIGURE 4-1
CITY OF WEATHERFORD
FLOW MONITORING LOCATIONS
LEGEND
Flow Monitor
Lift Station
Wastewater Treatment Plant
8" and Smaller Wastewater Line
10" and Larger Wastewater Line
8" and Smaller Force Main
10" and Larger Force Main
Road
Railroad
Index Contour (50-ft)
Intermediate Contour (10-ft)
Stream
Lake
Parcel
Watershed Boundary
Weatherford City Limit
Weatherford ETJ Boundary
Flow Meter Basins
Flow Meter 1
Flow Meter 2
Flow Meter 3
Flow Meter 4
Flow Meter 5
CITY OF WEATHERFORD
FREESE AND NICHOLS
SCALE IN FEET
0
1,500
3,000
Flow Meter 1
Flow Meter 2
Flow Meter 3
Flow Meter 4
Flow Meter 5
Wastewater Treatment Plant
Lift Station #1 North Bowie Drive LS
Lift Station #2 FM 920 LS
Lift Station #3 Third Street LS
Lift Station #4 Lockwood Estates LS
Lift Station #5 Seguin Elementary LS
Lift Station #6 Bethel Road LS
Lift Station #7 Westover Village Estates LS
Lift Station #8 Tin Top Road LS
Lift Station #9 Clear Lake Road LS
Lift Station #10 Westwood LS
Lift Station #12 WPP LS
Lift Station #13 Lake Hills LS
Lift Station #14 Brazos Electric Plant LS
Lift Station #15 Suzanne Trail LS
Lift Station #16 Country Brook LS
Lift Station #17 Sherry Trail LS
Lift Station #19 Ikard Elementary LS
Lift Station #20 Centerpoint LS
Lift Station #22 Pleasant Valley LS
Lift Station #23 Dove Hill South LS
Lift Station #24 Dove Hill North LS
TRINITY WATERSHED
BRAZOS WATERSHED

Flow depth, velocity, and rate data from each flow monitor were collected and evaluated to provide insight into sewer performance, revealing important information about how the existing wastewater system accommodates observed flow rates.

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 resulting from the collective daily habits of residential, commercial, institutional, and industrial users, along with any base infiltration. Land use within a particular area affects the shape of the diurnal pattern. The diurnal patterns observed during the flow monitoring for each flow meter are shown on **Figure 4-2**.

Wet weather flow conditions are characterized by evaluating flow monitor data observed during each storm event that occurred during the study period. A wet weather storm hydrograph is provided on **Figure 4-3** and shows the observed flow rate during a storm event compared to the average dry day diurnal pattern for Flow Meter 4. The difference between the two is the RDII measured by the flow monitor.

The following sections evaluate the flow monitor data observed during both dry weather and wet weather periods using a variety of key performance indicators.

Figure 4-2
Dry Weather Diurnal Patterns

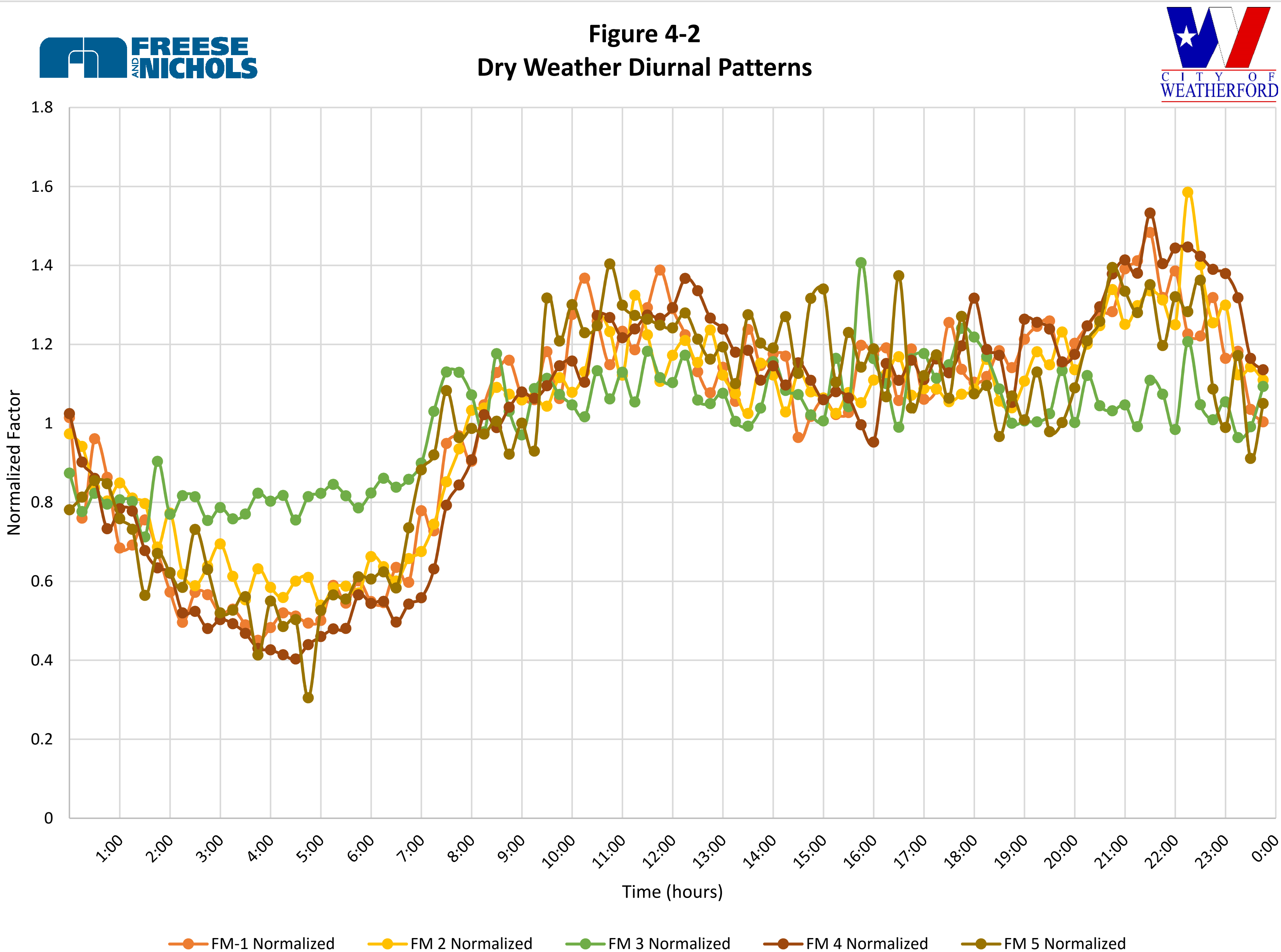
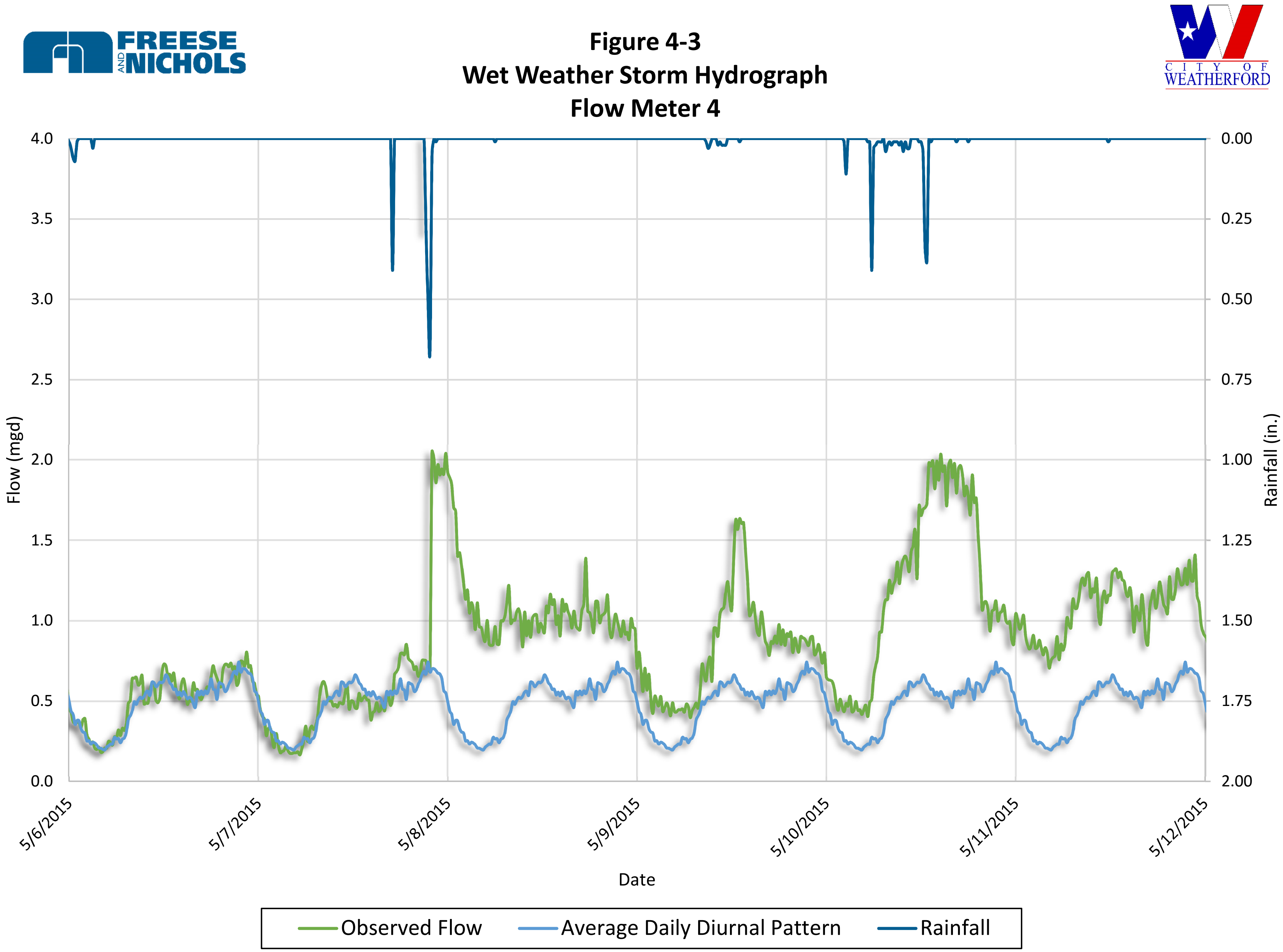


Figure 4-3
Wet Weather Storm Hydrograph
Flow Meter 4



4.2 FLOW MONITORING RESULTS

A summary of the average dry and peak wet weather flows at each temporary flow monitoring location can be found in **Table 4-1** below. The Interra flow monitoring report can be found in its entirety in **Appendix B**.

Table 4-1: Summary of Temporary Flow Monitoring

Flow Meter	Discrete Average Daily Dry Weather (mgd)	Discrete Maximum Wet Weather Flow (mgd)	Wet Weather to Dry Weather Peaking Factor	Net RDII (gal.)	Basin Size (LF)	Normalized Net RDII (gal/in/LF)
Flow Meter 1	0.18	1.20	6.68	267,892	108,014	1.46
Flow Meter 2	0.25	0.45	1.80	102,065	95,939	0.63
Flow Meter 3	0.58	2.78	4.79	337,791	173,012	1.15
Flow Meter 4	0.06	0.39	6.50	279,776	31,797	5.18
Flow Meter 5	0.53	2.95	5.57	473,838	189,644	1.47

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 inversely proportional to the population served and generally decrease as average dry weather flow increases. The two highest peaking factors observed during this project were values of 6.68 at Flow Monitor (FM) 1 and 6.50 at FM 4, which occurred during the storm event on May 10, 2015. Net rainfall dependent inflow and infiltration (RDII) is the amount of inflow and infiltration that enters the collection system during a rain event. The net RDII was normalized to compare the amount of RDII across meter basins of different size and rainfall events of differing intensities. **Figure 4-4** provides a graphical representation of the ranking of the amount of I/I by the basin upstream of each flow meter. Additionally, the peaking factor ratio of average day flows to the flows on the day of the largest observed storm is provided for each flow meter basin.

The City provided FNI with effluent metering data at the wastewater treatment plant from the duration of the flow monitoring period. The meter data from the plant effluent was used in conjunction with the temporary flow monitors for the I/I analysis to identify basins with high RDII. In addition to the I/I analysis, the temporary flow monitoring data was used to calibrate the wastewater hydraulic model for dry and wet weather events. The wastewater hydraulic model was then used to identify existing system capacity deficiencies and to develop a capital improvement plan.

4.3 SUMMARY OF FLOW MONITORING ANALYSIS

A detailed analysis of dry weather and wet weather periods was performed and included an evaluation of various key performance indicators including: dry weather d/D ratios, wet weather peaking factors, and rainfall derived inflow and infiltration (RDII) allowances. Specific recommendations for further planning, evaluation, or condition assessment activities are provided below.

4.3.1 Dry Weather Performance

During the flow monitoring period, the depth-to-diameter (d/D) ratios, or dry weather capacity utilization, at Flow Meter 1 was observed to be greater than 50%. The pipe where Flow Meter 1 was installed measured a d/D ratio of 59% full under dry weather conditions. ASCE and WEF recommend that wastewater lines with diameters up to 15-inches be designed to flow with dry weather d/D ratios of 50%, and larger diameter lines be designed to flow with dry weather d/D ratios of 75%. Flow Meter 1 was installed on a 12-inch wastewater line and therefore was operating at or higher than the recommended capacity. When pipes have a d/D ratio of greater than 50%, the concern is the available capacity for conveying wet weather flows. The additional capacity in the wastewater lines should be allocated for allowable RDII within an aging collection system. However, the flow meter installation report for Flow Meter 1, indicated that there was a moderate to high amount of silt/gravel in the pipe. It is recommended that the City inspect the interceptor at the location of Flow Meter 1 to determine the impact of silt on the depth of flow. If present, it is recommended that the City perform cleaning of the line to remove the debris. The peak daily average day flows and peak capacity utilization values for all meter locations are provided in **Table 4-2**.

Table 4-2: Dry Weather d/D Ratios

Site Name	Pipe Diameter (in.)	Average Dry Weather Depth (in.)	Flow Depth/ Pipe Diameter (d/D)
Flow Meter 1	12	7.1	59%
Flow Meter 2	18	6.0	34%
Flow Meter 3	18	2.9	16%
Flow Meter 4	12	5.2	43%
Flow Meter 5	24	2.6	11%

4.3.2 Wet Weather Performance

During wet weather events, RDII can enter a sewer system through defects in manholes and wastewater pipes causing surcharging and, in some cases, sanitary sewer overflows (SSOs). A comparison of flow meter data from the dry weather and wet weather periods provides information on areas where RDII is entering the collection system.

An evaluation of the discrete RDII contributions in **Table 4-1** indicates that over 50% of the RDII measured during the flow monitoring period was captured in FM 4 and FM 5. FM 2 recorded less than 10% overall. The highest (worst) ranked basin from a normalized RDII standpoint is FM 4. The peaking factor was the second highest and the volume of RDII contributed considering the size of the basin was much higher than the other four basins. It is recommended that the City investigate the collection system in Flow Meter Basin 4 to locate high I/I sources. Flow Meter Basin 4 is much smaller in size than the other flow meter basins, thus the high I/I indicates a potential significant issue such as a broken or missing manhole lid near Town Creek or an inadvertent storm sewer cross-connection.

Another indicator of the collection system being influenced by high levels of RDII can be seen in the high peaking factors. Peaking factors are the ratio of the highest recorded flow divided by the average dry day weather flow and are an important factor in determining the capacity required for collection system improvements. Typical peaking factors for the region range between 3.0 and 5.0, however, the peaking factors recorded during the flow monitoring period ranged from 3.34 to 6.67 as can be seen in **Table 4-1**.

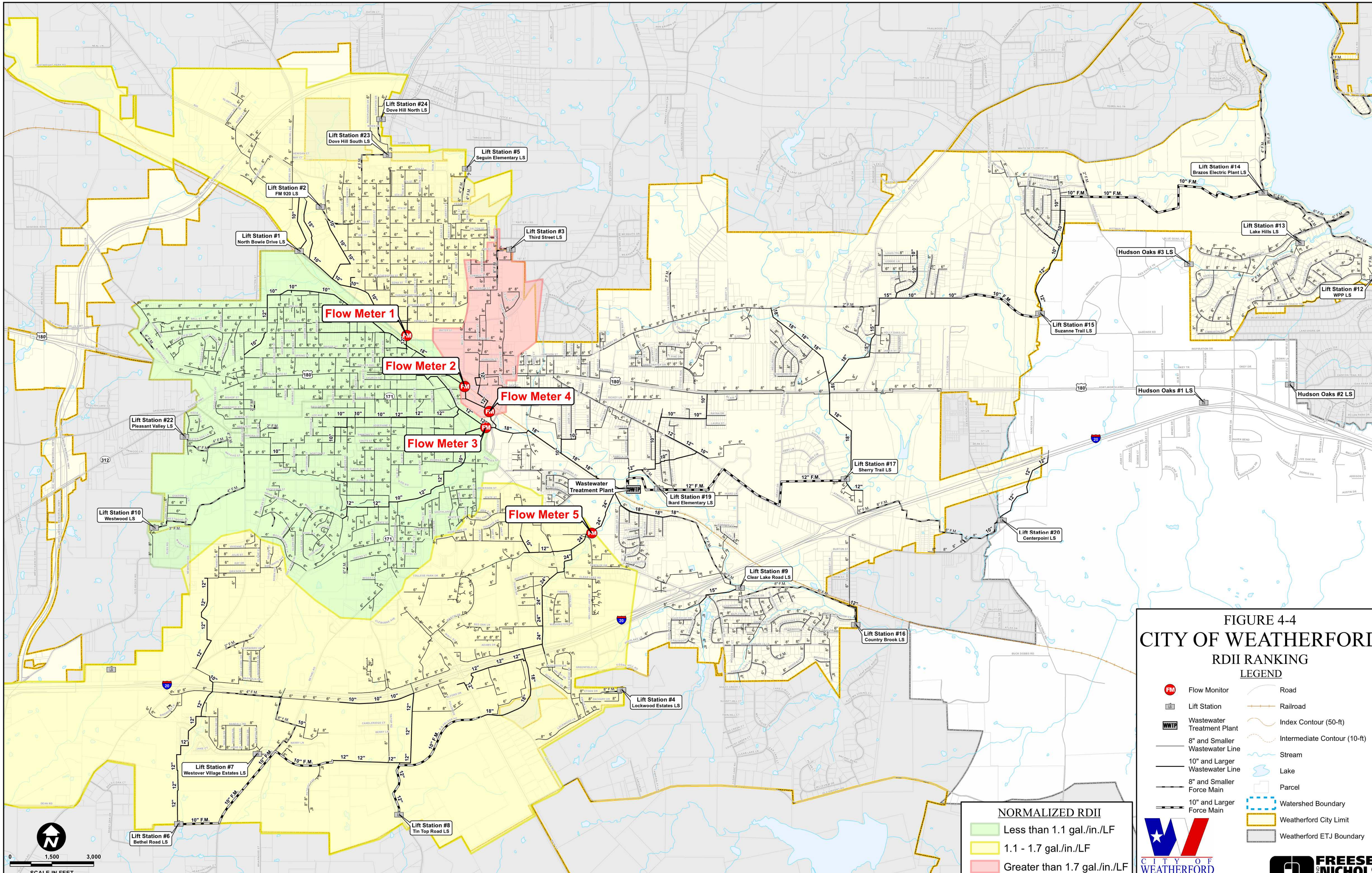


FIGURE 4-4
CITY OF WEATHERFORD
RDII RANKING

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5.0 WASTEWATER MODEL DEVELOPMENT

5.1 MODELED NETWORK

FNI selected the hydraulic modeling software H2OMAP Sewer by Innovyze, which combines a relational database with geographic analysis to provide a single environment that integrates asset planning with hydraulic modeling. The software makes use of engineering equations and mathematical algorithms to determine the flows and velocities that occur in a collection system under a specified set of conditions. The model consists of pipes 4-inches and larger, along with some crucial smaller diameter pipes. The model of the existing system consists of 2,082 links and 2,071 nodes, including 1 outfall, 23 lift stations, and 47 pumps. The modeled pipes range in size from 4-inches to 24-inches in diameter.

5.2 GIS TO MODEL INTEGRATION

FNI updated existing infrastructure GIS data based on provided as-builts, input from City staff, and interpolation between known invert elevations where available. Attribute data such as rim elevations were imported to the modeled manholes or assumed based on ground contour elevation data. Sewer lines were imported to the model and assigned a model identifier (ID) with a numerical suffix wherever a unique identifier had not already been assigned. The asset ID field was populated with a unique identifier to link the model to the GIS database. Pipe attributes imported into the model include diameter, material (where available), and upstream and downstream invert elevations. FNI will be providing updated GIS data to the City.

5.3 TOPOLOGY

Network topology defines how elements (links, nodes, etc.) of a network are connected. In H2OMAP Sewer, a node defines the first and last vertex of a line. Two lines that are connected will share a node to create topology. Correct topology ensures accurate modeled flow direction and pipe connectivity. Proper connectivity was verified by utilizing the following H2OMAP Sewer tools:

- Upstream/Downstream Network Trace – traces from any node or link in the network to the upstream/downstream extents of the network. This tool addresses possible errors with disconnected pipes and wrong flow direction.

- Pipe Direction Trace – traces upstream from a chosen pipe and tests the direction of a selection of links in relation to the chosen downstream pipe. As a result of the test, links that are potentially drawn in the wrong direction are selected and highlighted to be evaluated.
- Connectivity Trace – scans the model and finds all the physically separate sub-networks within it. This tool ensures the model network is fully connected.

Any topology discrepancies found during the model development process were rectified in the model.

5.4 ATTRIBUTE INFORMATION

5.4.1 Gravity Mains

Attributes included in the model were: diameter, length, material (where available), and invert elevations. The pipe diameter and material were imported from the developed GIS data or added to the model based on as-built information or input from City staff. The length of each pipe was calculated based on GIS, as built data or the line's spatial location determined during the importing process. The pipe slope was determined from as-built information or invert elevation data entered into the model using GIS, H2OMAP inference tools, or engineering judgement. Pipe inverts were calculated using inference tools for areas where field inspection data and as-built records were not available. The inference tool interpolates the invert elevations based on known pipe slopes upstream and downstream of the pipe with missing invert data. This inference data provides an acceptable estimate of the pipe slope and invert elevations in the absence of any information.

Pipe roughness coefficients are parameters used by the model to perform hydraulic calculations, such as determining the hydraulic grade line of a sewer line. Manhole headloss type and coefficient are used in H2OMAP Sewer to account for the headloss that occurs as flow passes through a manhole. Manning's "n" values were used for the pipe roughness coefficient. Average roughness coefficients for wastewater collection systems range from 0.012 to 0.015 depending on the pipe wall conditions and age of the pipe. A Manning's "n" roughness coefficient of 0.013 was assigned to each pipe while constructing the model, in the absence of other available data.

5.4.2 Nodes

Three types of nodes were used within the model network: chambers, outfalls, and manholes. Chamber nodes provide a connection between force mains and pumps. Chamber nodes provide no storage capacity in the model. Outfall nodes simulate the point where flow leaves the system and also have no storage capabilities. The most common type of node is a manhole, which provides a storage volume based on the depth and diameter of the manhole barrel and chamber. The standard four foot diameter manhole area of 12.6 square feet was used for the manhole barrel and chamber area. The ground level for each node was established using ground contour data or as-built drawings.

5.4.3 Lift Stations and Force Mains

FNI added lift station facilities and force mains to the model based on data provided by the City. As-built wet well data, pump curve data, and pump "on/off" sensor levels were provided by City staff or determined during lift station condition assessments. Wet well dimensions, inlet and outlet pipes, and invert elevations were modeled to represent the facilities according to available data. The existing system model includes all of the City's lift stations except for Lift Station 4, which was under construction during the flow monitoring period. Lift Station 4 was included in all subsequent model runs. The Hudson Oaks lift stations were not included in the model. Their respective flows were allocated to the model at the outfall of each lift station's force main.

5.5 FLOW ALLOCATION

The City provided FNI with water meter billing data from the City for retail customers that were assigned spatial coordinates using a process known as "geocoding". Geocoding is a process in which a field or group of fields of a table collectively signifies an address that can be assigned a spatial location using corresponding streets or small area polygons, such as parcels, that are descriptive of an area. Once geocoded, the meter billing data was used to calculate commercial loads for the wastewater system by determining the average of three months of winter water usage for meters denoted as commercial, industrial, multi-use, or municipal in type. Residential water meters were also geocoded and used to determine a people per meter based on the 2015 projected population of 25,318. This calculation led to a factor of 2.37 people per water meter for both residential and multifamily. **Figure 5-1** displays a map of the City's geocoded billing meters.

FNI used the adjusted geocoded billing meter data to allocate existing system flows throughout the hydraulic model. The allocated flows provide the basis for the dry weather flows in the hydraulic model from which the dry weather calibration was performed.

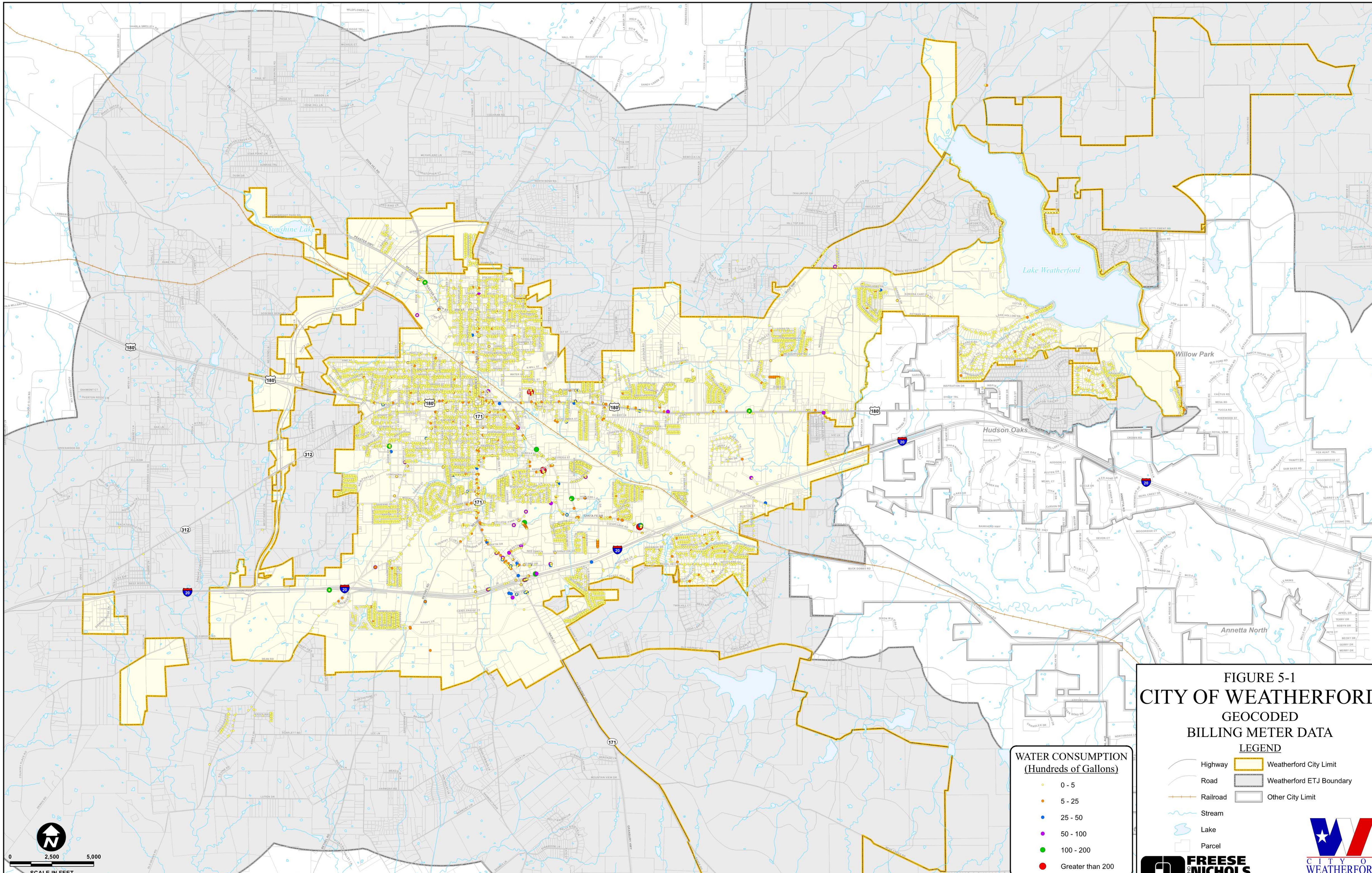


FIGURE 5-1
CITY OF WEATHERFORD
GEOCODED
BILLING METER DATA
LEGEND
Highway
Road
Railroad
Stream
Lake
Parcel
Weatherford City Limit
Weatherford ETJ Boundary
Other City Limit
WATER CONSUMPTION
(Hundreds of Gallons)
0 - 5
5 - 25
25 - 50
50 - 100
100 - 200
Greater than 200
FREESE AND NICHOLS
CITY OF WEATHERFORD
0
2,500
5,000
SCALE IN FEET
Lake Weatherford
Sunshine Lake
Willow Park
Hudson Oaks
Annetta North

6.0 HYDRAULIC MODEL VALIDATION

FNI validated the wastewater collection system hydraulic model using a steady state model run in the H2OMAP Sewer software. Model validation involves verifying that the flow and level conditions within the hydraulic model reflect conditions observed during the flow monitoring period. A properly validated model serves as the foundation for any future modeling scenarios. FNI utilized the Interra flow monitoring data for dry and wet weather events to validate the H2OMAP Sewer model.

6.1 DRY WEATHER VALIDATION

FNI created subcatchments within each flow meter basin to which collection system loads were assigned. Diurnal patterns that dictate how flows vary throughout the day in each flow meter basin were created to match the maxima and minima of the observed flow data. FNI first validated the model's performance against data from the week of April 13, 2015, which represented a week of dry weather flow data. During dry weather model validation, the flows per capita were adjusted to match observed flow volumes. Iterations were performed until the model results closely reflected the observed dry weather flow data at each flow meter site. H2OMAP Sewer results provide the average flow rate and total volume over the dry weather validation period, which FNI matched to the flow metering results within the tolerance of +/-5%. This tolerance is standard for a planning-level model dry weather validation.

6.2 WET WEATHER VALIDATION

The validated dry weather scenario was utilized to validate the wet weather scenario as a representation of the existing system's response to a wet weather event. The application of the validated dry weather scenario allowed for graphical identification of the magnitude of I/I responses during wet weather validation. The wet weather period selected for the wastewater model validation was May 7, 2015. The rain event on May 7^{th} totaled 1.94 inches and resulted in large system responses in the collection system. During the model validation, I/I contributions were adjusted on top of the allocated dry weather flow to match the peak flow observed at each of the flow meter sites. FNI achieved a close correlation for both the dry and wet weather validations, and therefore is confident that the model closely reflects real-world conditions and is suitable to use for hydraulic analysis and CIP development. The validated wastewater model was used to identify current system issues as well as future upgrades and expansions to the City's wastewater system. **Table 6-1** shows the results of the dry and wet weather calibration.

Table 6-1: Model Calibration Results

Flow Meter	Observed Average Day Flow (MGD)	Modeled Average Day Flow (MGD)	Observed Peak Wet Weather Flow (MGD)	Modeled Peak Wet Weather Flow (MGD)
FM 1	0.18	0.19	1.20	1.20
FM 2	0.43	0.45	1.65	1.64
FM 3	0.58	0.57	2.78	2.76
FM 4	0.49	0.51	2.04	1.97
FM 5	0.53	0.55	2.95	2.90

7.0 EXISTING WASTEWATER SYSTEM ANALYSIS

Hydraulic analyses were conducted to identify deficiencies in the City of Weatherford's existing wastewater collection system and to establish a capital improvement plan to improve the existing system and accommodate projected wastewater flows through buildout. Various combinations of improvements and modifications were investigated to determine the most appropriate approach for conveying projected flows. Criteria used in developing the improvements plan included increasing system reliability, simplifying system operations, conveying peak wet weather flows, maintaining proper velocities, and reducing surcharging and sanitary sewer overflows.

7.1 METHODOLOGY

For the existing system analysis, FNI allocated existing system flows within the hydraulic model using geocoded billing meter data. FNI applied the 5.5 instantaneous peak wet weather to average day flow peaking factor to the system. **Figure 7-1** displays a color-coded map that illustrates the surcharge state of modeled lines and manholes under the projected peak wet weather conditions for the 2015 planning period. The red wastewater lines indicate surcharging due to the flow being 1.5 times or greater than the capacity of the pipe. Green lines indicate flows 1.0 to 1.5 times larger than the capacity of the pipe, while the blue wastewater lines convey flow without surcharging. Modeled overflow locations as a result of projected peak wet weather flows are shown as red circles on the map. The yellow circles represent locations where the hydraulic grade line (HGL) is within 3 feet of the given manhole rim.

Hydraulic analysis indicates that the system experiences surcharging and overflows in the following areas:

- The 18/21-inch interceptor along Town Creek proceeding to the WWTP.
- The 6-inch line along Russell Street, Elm Street, and Eureka Street.
- The 10 and 12-inch lines north and northeast of the WWTP, downstream of the 12-inch force main.
- The 8-inch line upstream of Lift Station #19
- The 6, 10, and 12-inch lines along Elm, Front, Main, Edna, and Franklin Streets.

Additionally, the following lines experience surcharging and HGL levels within 3 feet of the manhole rim elevation:

- The 8-inch line along Cottonwood Street

- The 12-inch northeast of Bois d'Arc Street and the 18-inch along Town Creek

Locations where the model indicates that surcharging occurs, but did not surcharge within three feet of the manhole rim were not identified as requiring improvements. These lines were identified and analyzed closely in the future planning scenarios to verify if future projects are necessary due to growth.

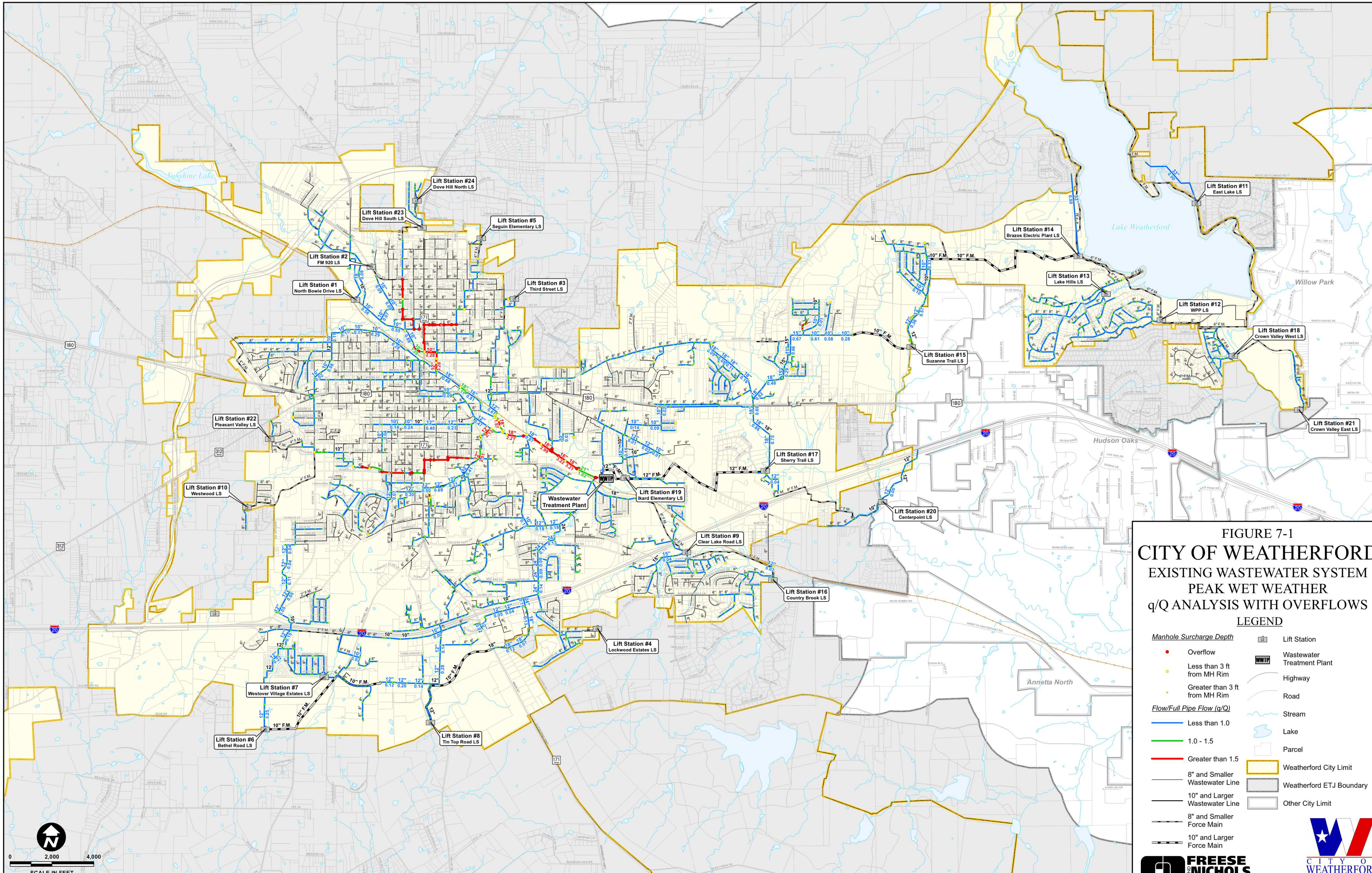


FIGURE 7-1
CITY OF WEATHERFORD
EXISTING WASTEWATER SYSTEM
PEAK WET WEATHER
q/Q ANALYSIS WITH OVERFLOWS
LEGEND
Manhole Surcharge Depth
Overflow
Less than 3 ft from MH Rim
Greater than 3 ft from MH Rim
Flow/Full Pipe Flow (q/Q)
Less than 1.0
1.0 - 1.5
Greater than 1.5
8" and Smaller Wastewater Line
10" and Larger Wastewater Line
8" and Smaller Force Main
10" and Larger Force Main
Lift Station
Wastewater Treatment Plant
Highway
Road
Stream
Lake
Parcel
Weatherford City Limit
Weatherford ETJ Boundary
Other City Limit
FREESE AND NICHOLS
CITY OF WEATHERFORD
SCALE IN FEET
0
2,000
4,000
Lift Station #1 North Bowie Drive LS
Lift Station #2 FM 920 LS
Lift Station #3 Third Street LS
Lift Station #4 Lockwood Estates LS
Lift Station #5 Seguin Elementary LS
Lift Station #6 Bethel Road LS
Lift Station #7 Westover Village Estates LS
Lift Station #8 Tin Top Road LS
Lift Station #9 Clear Lake Road LS
Lift Station #10 Westwood LS
Lift Station #11 East Lake LS
Lift Station #12 WPP LS
Lift Station #13 Lake Hills LS
Lift Station #14 Brazos Electric Plant LS
Lift Station #15 Suzanne Trail LS
Lift Station #16 Country Brook LS
Lift Station #17 Sherry Trail LS
Lift Station #18 Crown Valley West LS
Lift Station #19 Ikard Elementary LS
Lift Station #20 Centerpoint LS
Lift Station #21 Crown Valley East LS
Lift Station #22 Pleasant Valley LS
Lift Station #23 Dove Hill South LS
Lift Station #24 Dove Hill North LS
Wastewater Treatment Plant
WWTP
Sunshine Lake
Lake Weatherford
Willow Park
Hudson Oaks
Annetta North

8.0 FUTURE SYSTEM ANALYSIS

Wastewater system improvements were developed to accommodate the anticipated residential and non-residential growth over the next 10 years and through buildout. To serve the future growth, the City of Weatherford must rehabilitate, replace, or upsize existing infrastructure and extend to areas of growth where little or no infrastructure currently exists.

For the purposes of sizing infrastructure to accommodate peak instantaneous wet weather flows, FNI identified improvements to address areas with surcharging within 3 feet of the manhole rim, overflows and where the firm capacity of lift stations met or exceeded the peak flow. To analyze the peak instantaneous wet weather flow, FNI utilized steady state simulations for each planning period. The steady state simulation provides a representation of the peak instantaneous flow in order to size infrastructure.

Flow projections assumed a proactive system of replacing and rehabilitating infrastructure would result in a reduction of I/I with each successive planning period. To accomplish this reduction of I/I, it is recommended that the City rehabilitate 2% of the wastewater infrastructure each year. Rehabilitation of 2% of the infrastructure each year results in a complete rehabilitation of the system every 50 years which is the typical design life expectancy of a wastewater pipe when properly installed. FNI applied the peak wet weather to average daily flow peaking factor to projected flows for each planning period in order to determine the steady state peak instantaneous flow in the hydraulic model.

When determining the size of proposed wastewater lines, the following TCEQ design criteria were used:

- §217.53(l)(1) dictates that gravity sewer lines shall be sized to maintain a minimum velocity of 2 feet/second. Maintaining these velocities discourages settling of solids.
- §217.67(a) states that force mains shall be sized to convey the lift station pumping capacity at a minimum velocity of 3 feet/second for duplex lift stations and 2 feet/second with one pump operating at a lift station with three or more pumps.
- §217.53(j)(3) states that "A collection system must be designed to prevent a surcharge in any pipe at the expected peak flow." Therefore, all proposed lines are sized to convey peak flows without surcharge conditions. TCEQ slope requirements, as shown in **Table 8-1**, were utilized for new lines in undeveloped areas, except where doing so would result in pipe depths greater than 15 feet. If proposed lines are constructed at a different slope then modeled, the proposed line size should be evaluated based on the updated capacity.

Table 8-1: TCEQ Slope Requirements

Pipe Size (in)	Minimum Slope (ft./ft.)	Maximum Slope (ft./ft.)
6	0.00500	12.35
8	0.00330	8.40
10	0.00250	6.23
12	0.00200	4.88
15	0.00150	3.62
18	0.00110	2.83
21	0.00090	2.30
24	0.00080	1.93
27	0.00060	1.65
30	0.00055	1.43

Lift station capacity was also analyzed under proposed future peak wet weather flow conditions. FNI recommends new lift station and expansion sizing to meet TCEQ requirements. TCEQ §217.61 (c) states that "the firm pumping capacity of a lift station must handle the expected peak flow." Firm pumping capacity is defined as the maximum pumping capacity with the largest pumping unit out of service. For planning purposes, FNI sized new lift stations and lift station expansion capacities for 110% of the peak wet weather flow.

Hydraulic analyses were performed on the existing wastewater collection system under future peak flow conditions. A simulation was performed for the 2020, 2025, and buildout planning periods to identify the timing of recommended improvements. The projected peak wet weather to average daily flow peaking factors for each planning period are projected as 5.0, 4.5, and 4.0, respectively.

8.1 2020 SYSTEM ANALYSIS

FNI conducted a hydraulic analysis of the City's wastewater collection system using projected 2020 instantaneous peak wet weather flows. FNI used the projected 2020 peak wet weather to average daily flow peaking factor of 5.0 for the steady state analysis. FNI analyzed the results to identify areas of the existing system projected to experience surcharging as a result of the increased projected peak wet weather flows.

Instantaneous peak wet weather flow is projected to increase from 12.86 to 14.20 MGD from 2015 to 2020. Modeled results indicate that the same areas of the system that experienced surcharging in the existing system analysis experienced issues in the 2020 analysis.

8.2 2025 SYSTEM ANALYSIS

FNI conducted a hydraulic capacity analysis of the City's wastewater collection system using projected 2025 instantaneous peak wet weather flows. FNI used the projected 2025 peak wet weather to average daily flow peaking factor of 4.5 for the steady state analysis. FNI analyzed the results to identify areas of the existing system projected to experience surcharging as a result of the increased projected peak wet weather flows.

Peak wet weather flow is projected to increase from 14.20 to 15.05 MGD from 2020 to 2025. Modeled results indicate that the same areas of the system experienced surcharging as in the 5-year and existing system analyses, albeit to a greater extent due to the increase in flow. Additionally, FNI and the City developed an expanded wastewater service area boundary for the 10-year planning period based on growth trends and future annexations. FNI used the expanded boundary, ground contour elevation data, population projections by TSZ, and input from City staff to plan alignments and sizes of infrastructure to size new growth.

The City previously has conveyed wastewater from the Brazos River basin to the City's WWTP in the Trinity River basin. The areas are geographically located in the Brazos River Basin, but the City of Weatherford water supply is from the Trinity River Basin. As the City's wastewater service boundary has expanded to the southwest, the City has decommissioned the lift stations at the edge of the existing boundary to accommodate customers further downstream in the Brazos River basin. FNI modeled the projected lift stations in place of Lift Stations 6, 7, 8, and 25, sizing the lift stations to accommodate projected flows.

8.3 BUILDOUT SYSTEM ANALYSIS

FNI conducted a hydraulic capacity analysis of the City's wastewater collection system using projected buildout instantaneous peak wet weather flows. FNI used the projected 2025 peak wet weather to average daily flow peaking factor of 4.0 for the steady state analysis. FNI analyzed the results to identify areas of the existing system projected to experience surcharging as a result of the increased projected peak wet weather flows.

Peak wet weather flow is projected to increase from 15.05 to 51.82 MGD from 2025 to buildout. FNI analyzed the buildout system with two alternatives:

- A second wastewater treatment plant to serve customers in the Brazos River basin

- A new series of lift stations to convey wastewater flows back to the current WWTP in the Trinity River basin

Figures 8-1 and 8-2 display color coded maps that illustrate the surcharge state of modeled lines and manholes with the buildout peak wet weather flows applied to the existing system with each alternative modeled in the projected buildout wastewater service area. The red wastewater lines on **Figures 8-1 and 8-2** indicate surcharging due to the flow pipe being 1.5 times or greater than the capacity of the pipe. Green lines indicate flows 1.0 to 1.5 times larger than the capacity of the pipe, while the blue wastewater lines convey flow without surcharging. Modeled overflow locations as a result of projected peak wet weather flows are shown as red circles on the map. The yellow circles represent locations where the hydraulic grade line (HGL) is greater than 3 feet from the given manhole rim. The buildout flow scenarios presented areas with a greater hydraulic grade line than the manhole rim, indicating an overflow or a sealed manhole under pressure. A detailed discussion of the two alternatives is provided in Section 10.4.

Miscellaneous areas in the system exceed the design criteria, but are not considered “problematic” given that these are shallow manholes and the HGL is within the pipe. Portions of lines are also exceeding capacity, but are not surcharging within three feet of the manhole rim.

8.4 WASTEWATER TREATMENT PLANT EVALUATION

Based on the population and flow projections, additional treatment capacity is needed in the future. The existing plant capacity is 4.5 MGD. **Figure 8-3** shows the current permitted AADF, along with 75% and 90% of permitted AADF capacity. **Figure 8-3** also shows the projected dates for triggers of the TCEQ “75/90 rule”(Title 30, TAC 305.126(a)). The 75/90 rules states that when a plant exceeds 75% of its permitted annual average flow (3.4 MGD for Weatherford) for three consecutive months, the facility must begin planning for its next WWTP expansion. In addition, the rule states that when a facility exceeds 90% of its permitted annual average flow (4.1 MGD), the facility must be in construction of its next expansion. According to **Figure 8-3**, the WWTP could potentially reach the 75% capacity level in 2027 and the 90% capacity level in 2032. By the year 2037, the average daily flow to the plant is projected to exceed the existing capacity. For this master plan, FNI has recommended three phases of expansion of the WWTP to the ultimate capacity of 12.9 MGD by the buildout planning period.

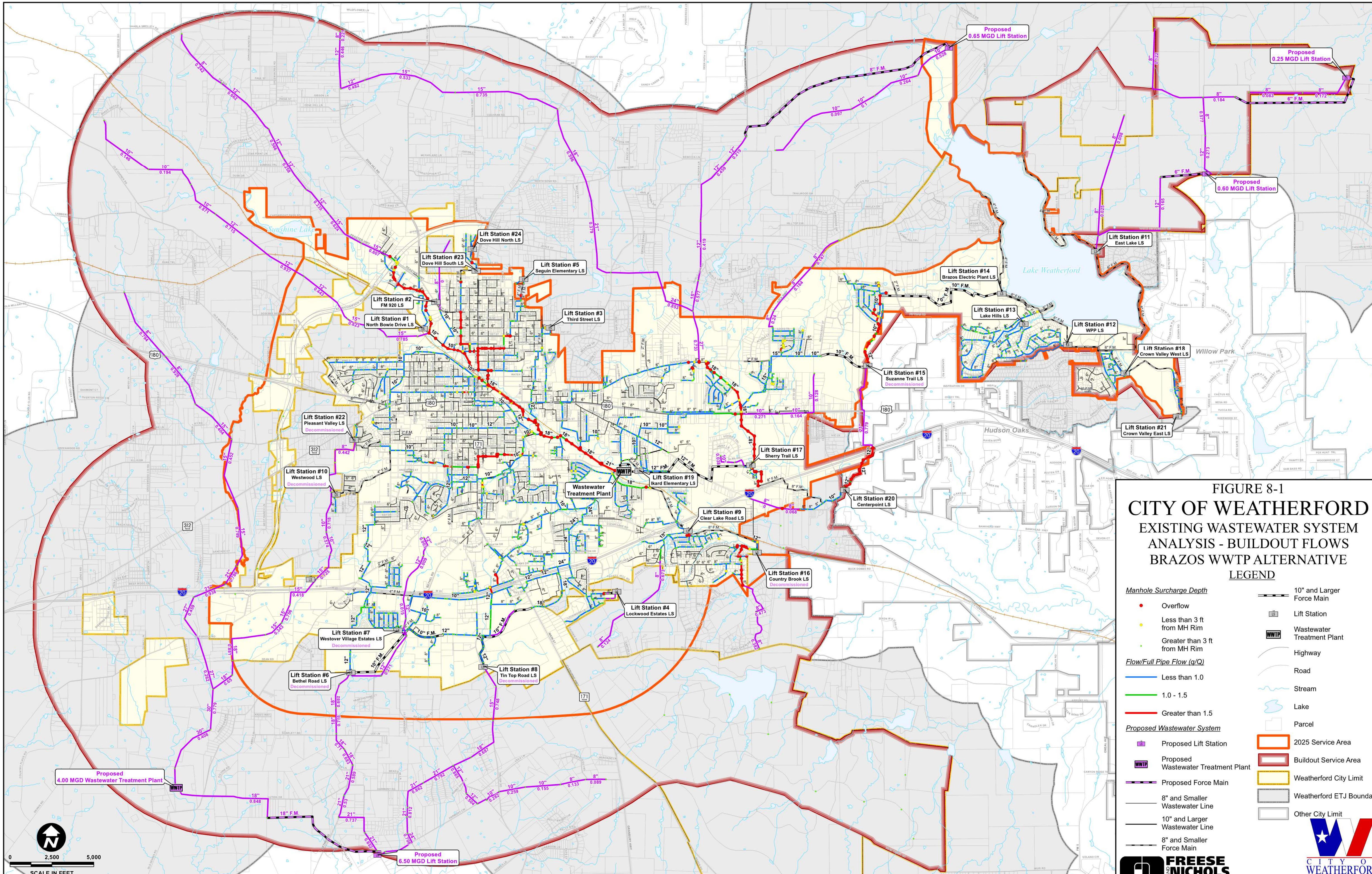


FIGURE 8-1
CITY OF WEATHERFORD
EXISTING WASTEWATER SYSTEM ANALYSIS - BUILDOUT FLOWS
BRAZOS WWTP ALTERNATIVE
LEGEND
Manhole Surcharge Depth
Overflow
Less than 3 ft from MH Rim
Greater than 3 ft from MH Rim
Flow/Full Pipe Flow (q/Q)
Less than 1.0
1.0 - 1.5
Greater than 1.5
Proposed Wastewater System
Proposed Lift Station
Proposed Wastewater Treatment Plant
Proposed Force Main
8" and Smaller Wastewater Line
10" and Larger Wastewater Line
8" and Smaller Force Main
10" and Larger Force Main
Lift Station
Wastewater Treatment Plant
Highway
Road
Stream
Lake
Parcel
2025 Service Area
Buildout Service Area
Weatherford City Limit
Weatherford ETJ Boundary
Other City Limit
FREESE AND NICHOLS
CITY OF WEATHERFORD
Lift Station #1 North Bowie Drive LS
Lift Station #2 FM 920 LS
Lift Station #3 Third Street LS
Lift Station #4 Lockwood Estates LS
Lift Station #5 Seguin Elementary LS
Lift Station #6 Bethel Road LS Decommissioned
Lift Station #7 Westover Village Estates LS Decommissioned
Lift Station #8 Tin Top Road LS Decommissioned
Lift Station #9 Clear Lake Road LS
Lift Station #10 Westwood LS Decommissioned
Lift Station #11 East Lake LS
Lift Station #12 WPP LS
Lift Station #13 Lake Hills LS
Lift Station #14 Brazos Electric Plant LS
Lift Station #15 Suzanne Trail LS Decommissioned
Lift Station #16 Country Brook LS Decommissioned
Lift Station #17 Sherry Trail LS
Lift Station #18 Crown Valley West LS
Lift Station #19 Ikard Elementary LS
Lift Station #20 Centerpoint LS
Lift Station #21 Crown Valley East LS
Lift Station #22 Pleasant Valley LS Decommissioned
Lift Station #23 Dove Hill South LS
Lift Station #24 Dove Hill North LS
Wastewater Treatment Plant
Proposed 0.65 MGD Lift Station
Proposed 0.25 MGD Lift Station
Proposed 0.60 MGD Lift Station
Proposed 4.00 MGD Wastewater Treatment Plant
Proposed 6.50 MGD Lift Station
Lake Weatherford
Sunshine Lake
Willow Park
Hudson Oaks
SCALE IN FEET
0 2,500 5,000

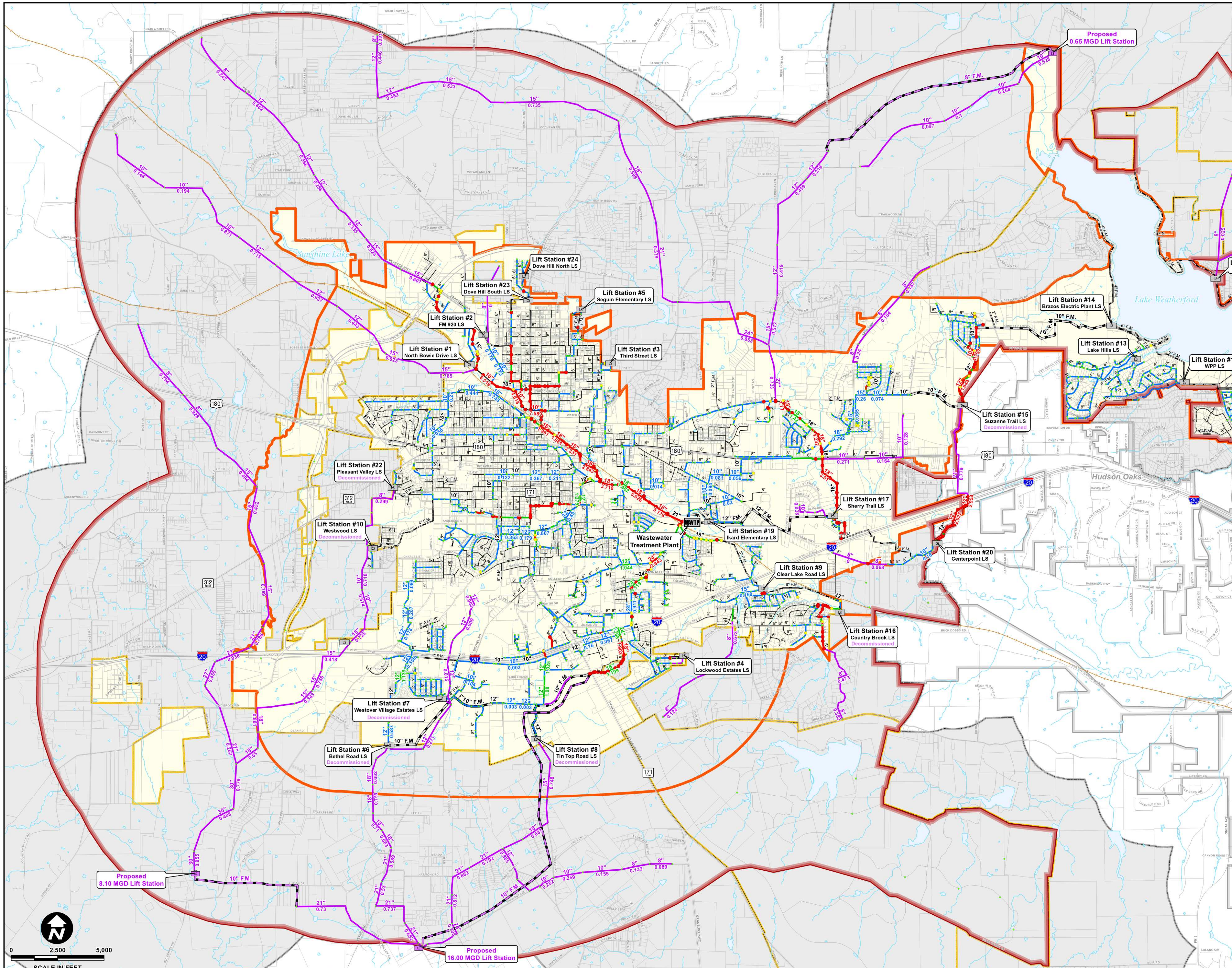


FIGURE 8-2

CITY OF WEATHERFORD

EXISTING WASTEWATER SYSTEM ANALYSIS - BUILDOUT FLOWS BRAZOS LS ALTERNATIVE

LEGEND

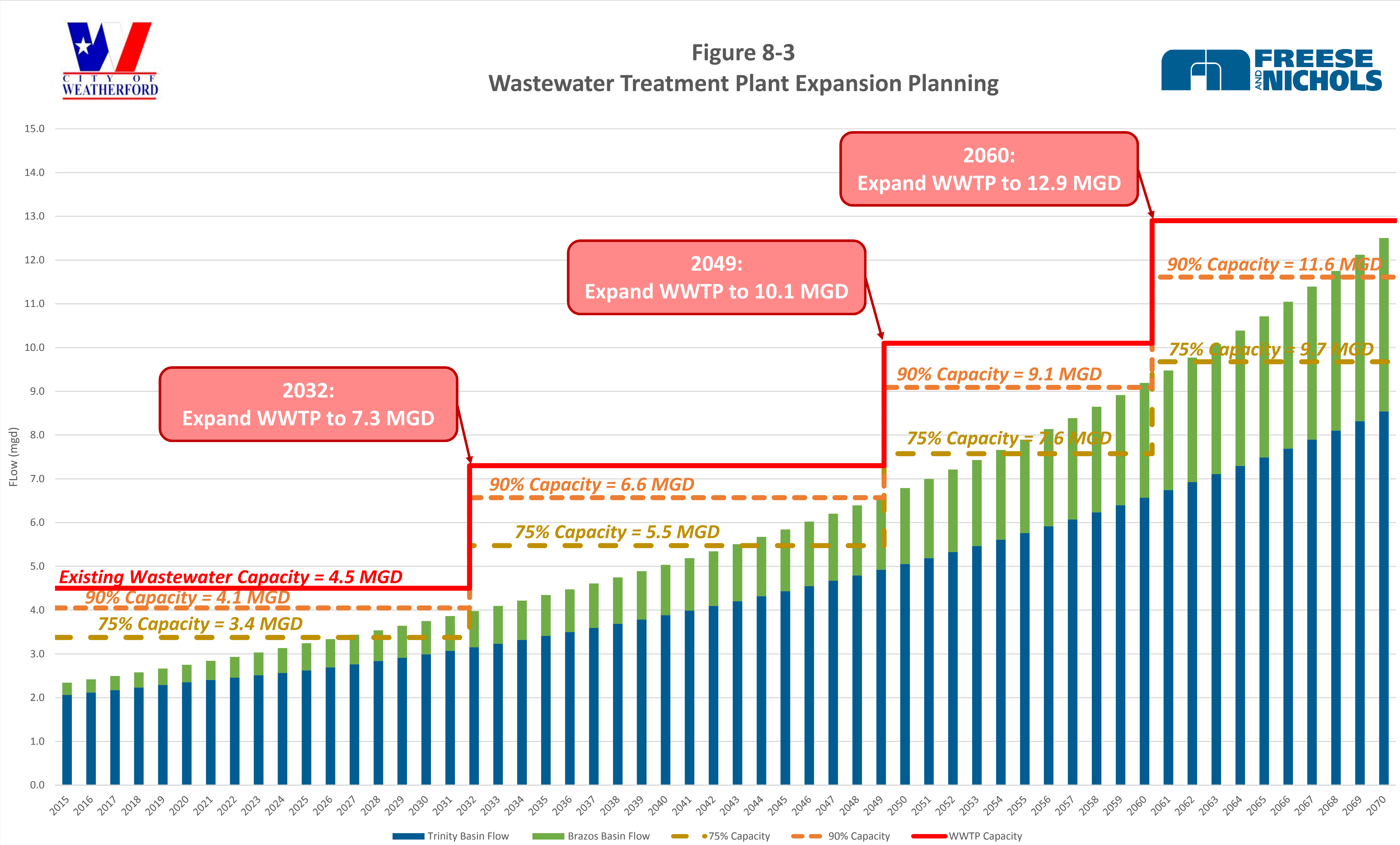
Manhole Surcharge Depth
- Overflow
- Less than 3 ft from MH Rim
- Greater than 3 ft from MH Rim

Flow/Full Pipe Flow (q/Q)
- Less than 1.0
- 1.0 - 1.5
- Greater than 1.5

Proposed Wastewater System
- Proposed Lift Station
- Proposed Wastewater Line
- Proposed Force Main
- 8" and Smaller Wastewater Line
- 10" and Larger Wastewater Line
- 8" and Smaller Force Main
- 10" and Larger Force Main
- Lift Station
- Wastewater Treatment Plant
- Highway
- Road
- Stream
- Lake
- Parcel
- 2025 Service Area
- Buildout Service Area
- Weatherford City Limit
- Weatherford ETJ Boundary
- Other City Limit

FREESE AND NICHOLS

CITY OF WEATHERFORD


CITY OF WEATHERFORD
Figure 8-3
Wastewater Treatment Plant Expansion Planning
FREESE AND NICHOLS
2060:
Expand WWTP to 12.9 MGD
2049:
Expand WWTP to 10.1 MGD
2032:
Expand WWTP to 7.3 MGD
90% Capacity = 11.6 MGD
75% Capacity = 9.7 MGD
90% Capacity = 9.1 MGD
75% Capacity = 7.6 MGD
90% Capacity = 6.6 MGD
75% Capacity = 5.5 MGD
Existing Wastewater Capacity = 4.5 MGD
90% Capacity = 4.1 MGD
75% Capacity = 3.4 MGD
FLow (mgd)
Trinity Basin Flow
Brazos Basin Flow
75% Capacity
90% Capacity
WWTP Capacity

9.0 LIFT STATION RISK BASED ASSESSMENT

A risk based assessment was performed on all of the City's 24 lift stations to develop a prioritized list of maintenance and improvement projects. A risk based assessment consists of a condition assessment and a criticality assessment. The condition assessment included a visual inspection of each lift station. The criticality, or consequence of failure, assessment included an analysis of the proximity of each lift station to critical areas, as well as the residential population served. Each lift station was assigned condition and criticality scores based on the results on the assessments. The condition and criticality scores were used to assign a risk category (high, medium, or low) to each asset. Lift station rehabilitation projects were developed based on the results of the risk based assessment and included in the wastewater capital improvement plan.

9.1 CONDITION ASSESSMENT

FNI developed a list of electrical, structural, mechanical, and site components to be inspected at each lift station site. A condition weighting factor was assigned to each component group based on the importance of the component to the overall function of the lift stations. Major components in each of these categories were evaluated separately. **Table 9-1** illustrates the condition component groups, parameters, and weighting for the lift station facilities.

Table 9-1: Condition Assessment Component Group and Weighting

Component Group	Weight Factor
Pumps and Motors	20%
Electrical – MCC, Back-up Power, Cables,	20%
Instrumentation - SCADA, Alarms	15%
Structure - Hatches, Corrosion, Cracks, Leaking	15%
Piping and Valves	10%
Mechanical - Ventilation, Odor Control, Crane	10%
Site - Drainage, Access Drive, Security, Fencing	10%
Total Weighting	**100%**

Numerical scores were assigned to each component based on the physical condition as seen during the inspection and information provided by City staff relating to its operational performance. Each component group received a score between 1 and 5. **Table 9-2** shows the guidelines used during assignments of numerical scores for component group conditions.

Table 9-2: Scoring Guideline for Condition Assessment for Lift Stations

Condition Rating	Description
1	New, perfect condition
2	Good condition, no improvements recommended to maintain function
3	Fair condition, improvements recommended to improve performance or efficiency
4	Poor condition, improvements recommended to maintain reliability
5	Imminent failure, rehabilitation or replacement required

Site visits of the 24 lift stations were performed between October 26, 2015 and November 25, 2015. The first four condition inspections were conducted by a team which consisted of members from FNI and the City's administration, engineering, inspections, and maintenance staff to normalize the scoring parameters. City staff then completed the remaining 20 lift station inspections. Inspection scoring sheets were developed for each lift station. The inspection sheets included details of the lift station such as number of pumps, design capacity, and the condition components. Each member of the team was provided with a scoring sheet for each lift station to be inspected. As a group, inspectors assigned final scores to each component and recorded written comments. The condition assessment sheets for each lift station are included in **Appendix A**.

Once the site visits for all the lift stations were completed, ranges were assigned for the condition scores, and categories were designated from very good to very poor as shown in **Table 9-3**. Final condition scores for each lift station are shown in **Table 9-4**. Based on the results of the condition assessment, Lift Stations #1, #2, #9, #10, and #15 were all rated in very poor condition.

Table 9-3: Facility Condition Ratings

Condition Rating	Minimum	Maximum
Very Good	0.00	1.40
Good	1.41	2.50
Fair	2.51	3.00
Poor	3.01	3.40
Very Poor	3.41	5.00

Table 9-4: Lift Station Condition Scoring Results

Lift Station	Condition Score	Condition Rating
Lift Station #1	3.50	Very Poor
Lift Station #2	3.50	Very Poor
Lift Station #3	3.10	Poor
Lift Station #4	1.10	Very Good
Lift Station #5	2.30	Good
Lift Station #6	1.30	Very Good
Lift Station #7	2.60	Fair
Lift Station #8	1.20	Very Good
Lift Station #9	3.50	Very Poor
Lift Station #10	3.45	Very Poor
Lift Station #11	2.50	Good
Lift Station #12	3.15	Poor
Lift Station #13	2.00	Good
Lift Station #14	2.45	Good
Lift Station #15	3.75	Very Poor
Lift Station #16	2.75	Fair
Lift Station #17	2.50	Good
Lift Station #18	2.65	Fair
Lift Station #19	2.70	Fair
Lift Station #20	3.20	Poor
Lift Station #21	2.30	Good
Lift Station #22	2.40	Good
Lift Station #23	2.55	Fair
Lift Station #24	2.60	Fair

9.2 CRITICALITY ASSESSMENT

In addition to condition scores, each lift station was assigned a criticality score based on the following three categories:

- Proximity to Environmentally Sensitive Areas
- Residential Population Served
- Proximity to High Impact Areas

These categories were weighted based on input from City staff. **Table 9-5** shows the scoring parameters used and the weighting factors assigned to each lift station criticality category.

Table 9-5: Criticality Scoring Categories and Weighting

CRITICALITY PARAMETERS & WEIGHTING	
Proximity to High Impact Areas (20%)	**Population Served (40%)**
≤ 500 ft from Hospital, School, or University = 5	> 2,000 = 5
≤ 500 ft from Attractions (Mall or Golf Course) = 4	1,501 – 2,000 = 4
≤ 250 ft from Residential or Commercial Structure = 3	1,001 – 1,500 = 3
251 – 1,000 ft from Any Structure = 2	501 – 1,000 = 2
No Criteria Met = 1	≤ 500 = 1
Proximity to Environmentally Sensitive Areas (40%)	
≤ 500 ft from Town Creek, Sanchez Creek, Lake Weatherford = 5	
501 – 1,000 ft from Town Creek, Sanchez Creek or Lake Weatherford = 4	
≤ 1,000 ft from Any Water Body = 3	
No Criteria Met = 1	

FNI developed a shapefile for each of the high impact areas and environmentally sensitive areas. GIS tools were utilized to determine the distance from each lift station to the high impact and environmentally sensitive areas. The hydraulic model was used to determine the existing population served by each lift station.

Similar to the condition scores, the criticality scores were grouped in categories from low impact to very high impact. **Table 9-6** shows the scores associated with rating categories of the criticality assessment. The criticality scores for the lift stations are shown in **Table 9-7**. Lift Stations #8, #9, #14, #17, #20 were scored as very high impact.

Table 9-6: Criticality Score Ranges

Criticality Rating	Minimum	Maximum
Very Low	0.00	1.50
Low	1.51	2.00
Moderate	2.01	3.00
High	3.01	3.50
Very High	3.51	5.00

Table 9-7: Lift Station Criticality Scoring Results

Lift Station	Criticality Score	Criticality Rating
Lift Station #1	2.80	Moderate
Lift Station #2	2.60	Moderate
Lift Station #3	1.40	Very Low
Lift Station #4	1.40	Very Low
Lift Station #5	1.80	Low
Lift Station #6	2.20	Moderate
Lift Station #7	2.60	Moderate
Lift Station #8	3.80	Very High
Lift Station #9	3.80	Very High
Lift Station #10	1.40	Very Low
Lift Station #11	3.00	High
Lift Station #12	3.20	High
Lift Station #13	1.40	Very Low
Lift Station #14	4.00	Very High
Lift Station #15	2.60	Moderate
Lift Station #16	3.40	High
Lift Station #17	3.60	Very High
Lift Station #18	2.20	Moderate
Lift Station #19	2.80	Moderate
Lift Station #20	3.80	Very High
Lift Station #21	2.40	Moderate
Lift Station #22	1.40	Very Low
Lift Station #23	1.20	Very Low
Lift Station #24	1.40	Very Low

9.3 RISK ASSESSMENT

FNI utilized the results of the condition and criticality assessments to develop a risk based assessment of the 24 lift stations the City currently operates. Risk scores were calculated by the summation of the condition and criticality of each asset. Each lift station was assigned risk of failure (extreme, high, moderate, or low risk) based on the combined condition and criticality scores as shown in **Table 9-8**. The risk scores of each lift station were utilized to group the lift stations into a risk matrix shown in **Table 9-9**. Based on the results of the lift station risk assessment, FNI developed lift station rehabilitation projects that are incorporated into the wastewater capital improvement plan.

Table 9-8: Risk Score Ranges

Risk Rating	Minimum	Maximum
Low	0.00	4.50
Moderate	4.51	6.00
High	6.01	6.50
Extreme	6.51	10.00

Table 9-9: Lift Station Risk Rating Matrix

		Condition				
		Very Good	Good	Fair	Poor	Very Poor
Criticality	Very Low Impact	LS#4	LS#13, LS#22	LS#23, LS#24	LS#3	LS#10
	Low Impact	-	LS#5	-	-	-
	Moderate Impact	LS#6	LS#21	LS#18, LS#7, LS#19	-	LS#2, LS#1, LS#15
	High Impact	-	LS#11	LS#16	LS#12	-
	Very High Impact	LS#8	LS#17, LS#14	-	LS#20	LS#9

Lift stations with moderate, high, and very high impact with a poor or very poor condition should be evaluated for rehabilitation or decommissioning. It is recommended that Lift Stations #1, #3, #9, #12 and #20 be rehabilitated in the near term. Lift Station #15 has been programmed into the CIP as part of a rehabilitation and expansion project to serve projected around Lake Weatherford. Lift Station #2 is proposed to be decommissioned due to collection system improvements in the near term. Lift Station #10 is proposed to be decommissioned by constructing new gravity mains in the 5-year planning period. Several lift stations received a moderate or high risk rating even while having a good condition score due to the high criticality score. These lift stations should continue to be well maintained to minimize lift station downtime given the high consequence of failure of these facilities.

10.0 CAPITAL IMPROVEMENTS PLAN

The following section outlines the 10-year CIP and two buildout capital improvement plan alternatives that were developed to serve existing and future growth in the City of Weatherford. The buildout alternatives include:

- Buildout Brazos Wastewater Treatment Plant CIP
- Buildout Brazos Lift Station CIP

The 10-year CIP projects are similar in location in each of the alternatives, however, the proposed sizing is different between the 10-year alternative and the buildout alternatives due to projected population served. The 10-year CIP was developed to provide the City a baseline for what size project is needed to serve growth in the next 10-years. Growth trends change over time and timing of projects will vary with the growth. The 10-year CIP will serve as the baseline, but the buildout alternative sizing should be considered before moving forward in design. The buildout alternatives provide the ultimate pipe size needed to serve growth into the buildout planning period.

10.1 10-YEAR CIP

A capital improvements plan was developed for the City of Weatherford to enable the wastewater collection system to effectively and efficiently convey flow to the wastewater treatment plant in the 5-year, and 10-year planning periods. The recommended improvements will provide the required capacity and reliability to meet projected wastewater flows through the 2025 planning period and are shown on **Figure 10-1**. Locations shown for new collector mains and other recommended improvements were investigated for feasibility, but generalized for hydraulic analyses. Specific alignments and sites will be determined as part of the design process. It is recommended that these projects be constructed generally in the order listed; however, development patterns may make it necessary to construct some projects sooner or later than anticipated.

Capital costs were calculated for the major wastewater facilities and lines and do not include individual service connections or subdivision lines. The costs are provided as estimates based on previous similar engineering experience in 2016 dollars and include an allowance for engineering, surveying, and contingencies. **Table 10-1** summarizes the costs by phase for the 2025 planning period of the wastewater system capital improvements plan. Detailed descriptions of the projects and associated costs of the three alternatives are included in **Appendix C**.

Table 10-1: 10-Year Capital Improvements Plan Summary

Project Number	Project Name	Cost
5-Year CIP		
1	Old Brock Road Gravity Main and Lift Stations 10 and 22 Decommission	$ 2,131,700
2A	42-inch Influent Line to the WWTP	$ 256,700
3A	21-inch, 24-inch, and 30-inch Town Creek Interceptor	$ 2,491,500
4A	12-inch, 15-inch and 18-inch Gravity Mains near North Elm Street and State Highway 180	$ 789,200
5	0.5 MGD Lift Station and 6-inch Force Main near IH 20 and Ric Williamson Memorial Highway	$ 1,155,300
6	12-inch, 18-inch, 21-inch, and 24-inch Gravity Main Near Ric Williamson Memorial Highway	$ 3,069,900
7A	8-inch Gravity Main near FM 920	$ 658,100
8	8-inch and 12-inch Gravity Mains near North Main Street	$ 1,204,300
	5-Year CIP Total	**$ 11,756,700**
10-Year CIP		
9	12-inch Gravity Main near Bethel Road	$ 1,243,400
10	12-inch and 15-inch Gravity Main in Northwest Weatherford	$ 1,900,700
11	8-inch Gravity Main near FM 920 and Lift Station Decommission	$ 900,800
12	2.25 MGD Lift Station and 12-inch Force Main near Tin Top Road	$ 3,658,700
13	15-inch Gravity Main near Tin Top Road	$ 1,146,700
14	1.75 MGD Lift Station and 12-inch Force Main near Scarlett Road and Bethel Road	$ 3,181,500
15	12-inch and 18-inch Gravity Main near Bethel Road	$ 2,186,000
16	15-inch Gravity Main near IH-20 and Dean Road	$ 856,200
17	1.25 MGD Lift Station and 8-inch Force Main near Dean Road	$ 1,479,400
18	15-inch and 18-inch Gravity Main near Scarlett Road	$ 2,173,900
19	8-inch Gravity Main near Lakecrest Drive	$ 1,070,700
20	Lift Station 17 Expansion to 4.0 MGD	$ 2,870,400
21	8-inch Gravity Main Near FM 730	$ 1,038,400
22	Lift Station 15 Rehabilitation and Expansion to 2.0 MGD	$ 1,304,100
23	8-inch Gravity Main near Bankhead Highway	$ 657,800
24	12-inch Gravity Main near State Highway 180	$ 1,566,900
	10-Year CIP Total	**$ 27,235,600**
	CIP Total	**$ 38,992,300**
Rehabilitation		
R1	Annual Wastewater Line Rehabilitation ($2.7M per year)	$ 2,691,000
R2	Lift Station 9 Rehabilitation	$ 156,800
R3	Lift Station 20 Rehabilitation	$ 84,000
R4	Lift Station 1 Rehabilitation	$ 131,600
R5	Lift Station 3 Rehabilitation	$ 126,000
R6	Lift Station 12 Rehabilitation	$ 100,800
	Rehabilitation Total	**$ 3,290,200**

FIGURE 10-1
CITY OF WEATHERFORD
2025 WASTEWATER SYSTEM
CAPITAL IMPROVEMENT PLAN
LEGEND
2020 Proposed Wastewater Improvements
Proposed Lift Station
Proposed Wastewater Treatment Plant
Proposed Wastewater Line
Proposed Force Main
2025 Proposed Wastewater Improvements
Proposed Lift Station
Proposed Wastewater Line
Proposed Force Main
Under Design/Construction Improvements
Under Design/Construction Lift Station
Under Design/Construction Wastewater Line
Under Design/Construction Force Main
Existing Wastewater System
Lift Station
8" and Smaller Wastewater Line
10" and Larger Wastewater Line
8" and Smaller Force Main
10" and Larger Force Main
Highway
Road
Railroad
Stream
Lake
Parcel
2025 Service Area
Buildout Service Area
Weatherford City Limit
Weatherford ETJ Boundary
Other City Limit
All Alignments are for Planning Purposes Only
R1 Rehabilitate or Replace 2% of Existing Infrastructure Annually
CITY OF WEATHERFORD
FREESE AND NICHOLS
SCALE IN FEET
0
2,500
5,000
Lift Station #24 Dove Hill North LS Firm Capacity = 0.14 MGD
Lift Station #23 Dove Hill South LS Firm Capacity = 0.14 MGD
Lift Station #2 FM 920 LS Firm Capacity = 0.14 MGD Decommission
Lift Station #5 Seguin Elementary LS Firm Capacity = 0.14 MGD
Lift Station #1 North Bowie Drive LS Firm Capacity = 0.40 MGD Rehabilitation
Lift Station #3 Third Street LS Firm Capacity = 0.22 MGD Rehabilitation
Lift Station #14 Brazos Electric Plant LS Firm Capacity = 1.73 MGD
Lift Station #11 East Lake LS Firm Capacity = 0.20 MGD
Lift Station #13 Lake Hills LS Firm Capacity = 0.41 MGD
Lift Station #15 Suzanne Trail LS Firm Capacity = 0.72 MGD Rehab & Expand to 2.0 MGD
Lift Station #12 WPP LS Firm Capacity = 0.65 MGD Rehabilitation
Lift Station #18 Crown Valley West LS Firm Capacity = 0.56 MGD
Lift Station #21 Crown Valley East LS Firm Capacity = 0.26 MGD
Lift Station #22 Pleasant Valley LS Firm Capacity = 0.43 Decommission
Lift Station #17 Sherry Trail LS Firm Capacity = 0.79 MGD Expand to 4.0 MGD
Lift Station #10 Westwood LS Firm Capacity = 0.18 MGD Decommission
Wastewater Treatment Plant Permitted Average Day Capacity = 4.5 MGD Expand to 42-inch Influent Line
Lift Station #19 Ikard Elementary LS Firm Capacity = 0.14 MGD
Lift Station #20 Centerpoint LS Firm Capacity = 0.50 MGD Rehabilitation
Lift Station #9 Clear Lake Road LS Firm Capacity = 0.65 Rehabilitation
Lift Station #16 Country Brook LS Firm Capacity = 0.50 MGD
Proposed 0.50 MGD Lift Station
Lift Station #25 Decommission
Lift Station #4 Lockwood Estates LS Firm Capacity = 0.43 MGD
Lift Station #7 Westover Village Estates LS Firm Capacity = 0.58 MGD Decommission
Lift Station #6 Bethel Road LS Firm Capacity = 1.01 MGD Decommission
Lift Station #8 Tin Top Road LS Firm Capacity = 1.22 MGD Decommission and Convert Force Main to Gravity Line
Proposed 1.25 MGD Lift Station
Proposed 1.75 MGD Lift Station
Proposed 2.25 MGD Lift Station
Lake Weatherford
Willow Park
Hudson Oaks
Sunshine Lake

10.2 WASTEWATER PROJECTS FROM 2015 TO 2020

Projects recommended within the first phase are the most critical to the system. These projects resolve existing deficiencies or accommodate impending growth. A detailed description of each project is provided below:

Project 1: Old Brock Road Gravity Main and Lift Station Decommission

This project includes an 8-inch line from Lift Station #22 to Lift Station #10 and a 12-inch line from Lift Station #10 to Lift Station #25. Following the construction of this project and Lift Station #25, Lift Stations #22 and #10 can be decommissioned. The new sewer line provided in this project will provide sewer service needed for new development in the area and provide flow to Lift Station #25.

Project 2A: 42-inch Influent Line to the WWTP

This project includes a 42-inch line that conveys flow directly into the WWTP, replacing the existing 30-inch influent line. This project provides additional capacity at the inlet of the WWTP. The existing 30-inch influent line does not have capacity to convey existing peak and future wet weather flow.

Project 3A: 21-inch, 24-inch, and 30-inch Town Creek Interceptor

This project consists of a 21, 24, and 30-inch line downstream of the existing 12-inch line near Jack Borden Way. This project replaces the existing 18-inch interceptor that conveys flows to the WWTP. This project provides additional capacity for flow from the northwest area of the city into the WWTP. Hydraulic analysis indicated surcharging in this line during existing peak flow events. The increased capacity this project provides will alleviate surcharging and potential overflows.

Project 4A: 12-inch, 15-inch and 18-inch Gravity Mains near North Elm Street and State Highway 180

This project includes a new 18-inch line connecting to the existing 18-inch interceptor near North Elm Street and State Highway 180. This 18-inch line connects to new 15-inch and 12-inch lines upstream. These new lines replace the existing lines in the area north of downtown Weatherford. Hydraulic analysis indicates that the existing lines replaced by this project experience surcharging and overflows during peak wet weather events. This project will increase capacity and alleviate surcharging in this area.

Project 5: 0.5 MGD Lift Station and 6-inch Force Main near IH 20 and Ric Williamson Memorial Highway

This project includes a new 0.5 MGD Lift Station and corresponding 6" force main. Following the completion of the lift station and force main, Lift Station #25 can be decommissioned. This proposed lift station is required to serve development along Ric Williamson Memorial Highway.

Project 6: 12-inch, 18-inch, 21-inch, and 24-inch Gravity Mains near Ric Williamson Memorial Highway

This project includes a new gravity main for the proposed lift station near IH-20 and Ric Williamson Memorial Highway. This wastewater line starts as a 12-inch line near State Highway 180 and flows south to a 18-inch line near Greenwood Road. The 18-inch line then connects to a 21-inch and 24-inch line north of IH 20 which flows into the proposed 0.5 MGD Lift Station from Project 5. Both Projects 5 and 6 provide capacity for expected development in the area.

Project 7A: 8-inch Gravity Main near FM 920

This project includes an 8-inch line along FM 920 and Ric Williamson Memorial Highway that connects to and replaces part of the existing line. This project provides additional capacity for future growth in the northwest area of Weatherford.

Project 8: 8-inch and 12-inch Gravity Mains near North Main Street

This project includes a new 8-inch and 12-inch line near Franklin Street and a new 8-inch line near Edna Street that connect to the proposed 12-inch line downstream. These lines replace the existing 6-inch lines. Hydraulic analysis indicates that the existing lines in the area are shown to surcharge under peak flows in the model. Increasing the diameter of these lines will provide additional capacity and relief in combination with the proposed lines in the project downstream.

10.3 WASTEWATER PROJECTS FROM 2020 TO 2025

Projects recommended within the second phase are primarily on growth related projects. A detailed description of each project is provided below:

Project 9: 12-inch Gravity Main near Bethel Road

This project includes a new 12-inch line that begins south of Park Avenue and proceeds south to Lift Station #7 near Bethel Road. The new line will serve new development along Bethel Road north of IH-20.

Project 10: 12-inch and 15-inch Gravity Main in Northwest Weatherford

This project includes a 15-inch and 12-inch line west of Lift Station 1 near Ric Williamson Memorial Highway. This line conveys flow from the west to the gravity main downstream of Lift Station 1. The purpose of this project is to provide capacity for future growth in the northwest area of Weatherford, including the King development.

Project 11: 8-inch Gravity Main near FM 920 and Lift Station Decommission

This project includes an 8-inch line along Wendy Lane near FM 920 that connects to the existing 10-inch line near Lift Station #2. Once this line is in service, Lift Station #2 can be decommissioned. This project provides additional capacity for future growth in the northwest area of Weatherford.

Project 12: 2.25 MGD Lift Station and 12-inch Force Main near Tin Top Road

This project includes the proposed 2.25 MGD Lift Station and 12-inch force main near Tin Top Road south of Lift Station #8. The force main will run north from the lift station and connect to the existing 18-inch line near South Main Street. This lift station provides capacity for future growth in the southwest portion of Weatherford.

Project 13: 15-inch Gravity Main near Tin Top Road

This project includes a new 15-inch line that connects the existing line upstream of Lift Station #8 to the proposed lift station from Project 12 to the south. Following the completion of this project and the downstream lift station, Lift Station #8 can be decommissioned and the 10-inch force main from Lift Station #8 can be converted to a gravity main. This line conveys flow from the existing 12-inch line to the proposed lift station downstream and provides capacity for additional growth in the area.

Project 14: 1.75 MGD Lift Station and 12-inch Force Main near Scarlett Road and Bethel Road

This project includes a new 1.75 MGD lift station and 12-inch force main north of Scarlet Road near Bethel Road. The force main connects the proposed lift station to the proposed lift station from Project 12 to the east. This project provides additional capacity for future growth in the area.

Project 15: 12-inch and 18-inch Gravity Main near Bethel Road

This project includes a new 12-inch line connecting to the existing lines near Lift Station #7 and Lift Station #6 and a new 18-inch line that connects the existing line near Lift Station #6 to the proposed lift station from Project 14to the south. Following the completion of this project and the downstream lift station from Project 14, Lift Stations #6 and #7 can be decommissioned.

Project 16: 15-inch Gravity Main near Scarlett Road

This project includes a 15-inch line west of the proposed lift station from Project 14. This project services the proposed lift station from Project 14 and provides additional capacity to the west of the lift station.

Project 17: 1.25 MGD Lift Station and 8-inch Force Main near Dean Road

This project includes a new 1.25 MGD lift station at the west end of Dean Road and an 8-inch force main to convey flow from the lift station to the west end of the proposed 15-inch sewer line from Project 16. This lift station provides capacity for additional growth in the southwest area of Weatherford.

Project 18: 15-inch and 18-inch Gravity Main near IH-20 and Dean Road

This project includes a 15-inch gravity line that expands to an 18-inch line connecting Lift Station #25 to the lift station near Dean Road. Once this line is in service, Lift Station 25 can be decommissioned.

Project 19: 8-inch Gravity Main near Lakecrest Drive

This project includes an 8-inch sewer line that begins near Old Airport Road and flows east to Lakecrest Drive where it connects to the existing 12-inch line. This project provides service for the future service area in southeast Weatherford.

Project 20: Expansion of Lift Station #17 to 4.0 MGD

This project includes the expansion of the Lift Station #17 from a firm capacity of 0.79 MGD to 4.0 MGD. The Lift Station #17 is a high impact lift station that was observed to be in good condition. In the 2025 planning period, the flow conveyed to the lift station will exceed the capacity of the lift station. Therefore, the expansion will provide additional capacity for future growth in east Weatherford.

Project 21: 8-inch Gravity Main near FM 730

This project includes a new 8-inch line that connects to the existing 8-inch line near FM 730 and Old Foundry Road and serves the area north of Bedinger Place. This project provides service for future growth to the area north of Bedinger Place in north Weatherford.

Project 22: Rehabilitation and Expansion of Lift Station #15 to 2.0 MGD

Lift Station #15 was observed to be in very poor condition during the condition assessment of the lift station facilities. This project includes the rehabilitation and expansion of the Lift Station #15 from a firm capacity of 0.72 MGD to 2.0 MGD. This project provides additional capacity for growth in the area around Lake Weatherford.

Project 23: 8-inch Gravity Main near Bankhead Highway

This project includes an 8-inch line that begins near IH 20 and Bankhead Highway and proceeds east to connect to the existing 8-inch line near Center Point Road. This project provides service to the area near IH 20 and Bankhead Highway.

Project 24: 12-inch Gravity Main near State Highway 180

This project includes a new 12-inch line along State Highway 180 near FM 730. This line proceeds east from FM 730 parallel to the existing 6-inch line and proceeds north near Center Point Road. This project provides additional service to the area east of Tison Middle School.

Project R1: Annual Wastewater Line Rehabilitation

This project includes the rehabilitation or replacement of 2% of the wastewater infrastructure each year. The cost of $2,691,000 is per year for the next ten years. An emerging industry trend recommends that a utility rehabilitate 2% of the wastewater infrastructure each year. Rehabilitation of 2% of the infrastructure each year results in a complete rehabilitation of the system every 50 years which is the typical design life expectancy of a wastewater pipe when properly installed. The City of Weatherford has 628,287 LF of existing wastewater pipe. Rehabilitation of 2% of the collection system equates to approximately 13,000 LF of rehabilitated pipe each year. There are many forms of rehabilitation that range in cost.

Project R2: Lift Station 9 Rehabilitation

Lift Station 9, located near the intersection of IH-20 and Clear Lake Road, was evaluated to be in very poor condition. This lift station serves a large residential neighborhood south of IH-20 and is located along the banks of Town Creek. During the condition assessment site visit, Lift Station 9 showed issues requesting improvements to increase reliability. The check valves are located at the pumps making it very difficult to access. Currently, there is no odor control at the lift station. The security fence is rotting and the access road is eroding. There have also been recent issues with the electrical components reported by the utility maintenance staff.

Project R3: Lift Station 20 Rehabilitation

Lift Station 20 is located near the intersection of Center Point Road and East Bankhead Highway along a creek. This Lift station conveys flows from Hudson Oaks. This lift station was identified in the condition and criticality assessment to be in "poor" condition with "very high impact" criticality. During the condition assessment, it was identified that this lift station had corroded rail brackets, no fall protection or no awning, PVC pigging points, no odor control or ventilation, and poor site fencing.

Project R4: Lift Station 1 Rehabilitation

Lift Station 1 is located in North West Weatherford near North Bowie Drive within the Heritage Plastics site. The lift station is located near Town Creek. This lift station was identified in the condition and criticality assessment to be in "very poor" condition and "moderate impact" criticality. During the condition assessment, it was identified that this lift station had aging pumps, minor structural issues, dry vault leaking, a broken sump pump, and poor site fencing. The criticality assessment showed this lift station to be located in an environmentally sensitive area near Town Creek. Access to the lift station is difficult since it is located within the Heritage Plastics Security Fence.

Project R5: Lift Station 3 Rehabilitation

Lift Station 3 is located just off 2nd Street in North Weatherford. The lift station serves a very small area. This lift station was identified in the condition and criticality assessment to be in "poor" condition and "very low impact" criticality. During the condition assessment, it was identified that this lift station had loose belts, poor foundation conditions, and failing check valves. There are no locks and poor fencing to prevent access to the lift station. The priming system that is in use provides difficulties from a maintenance standpoint.

Project R6: Lift Station 12 Rehabilitation

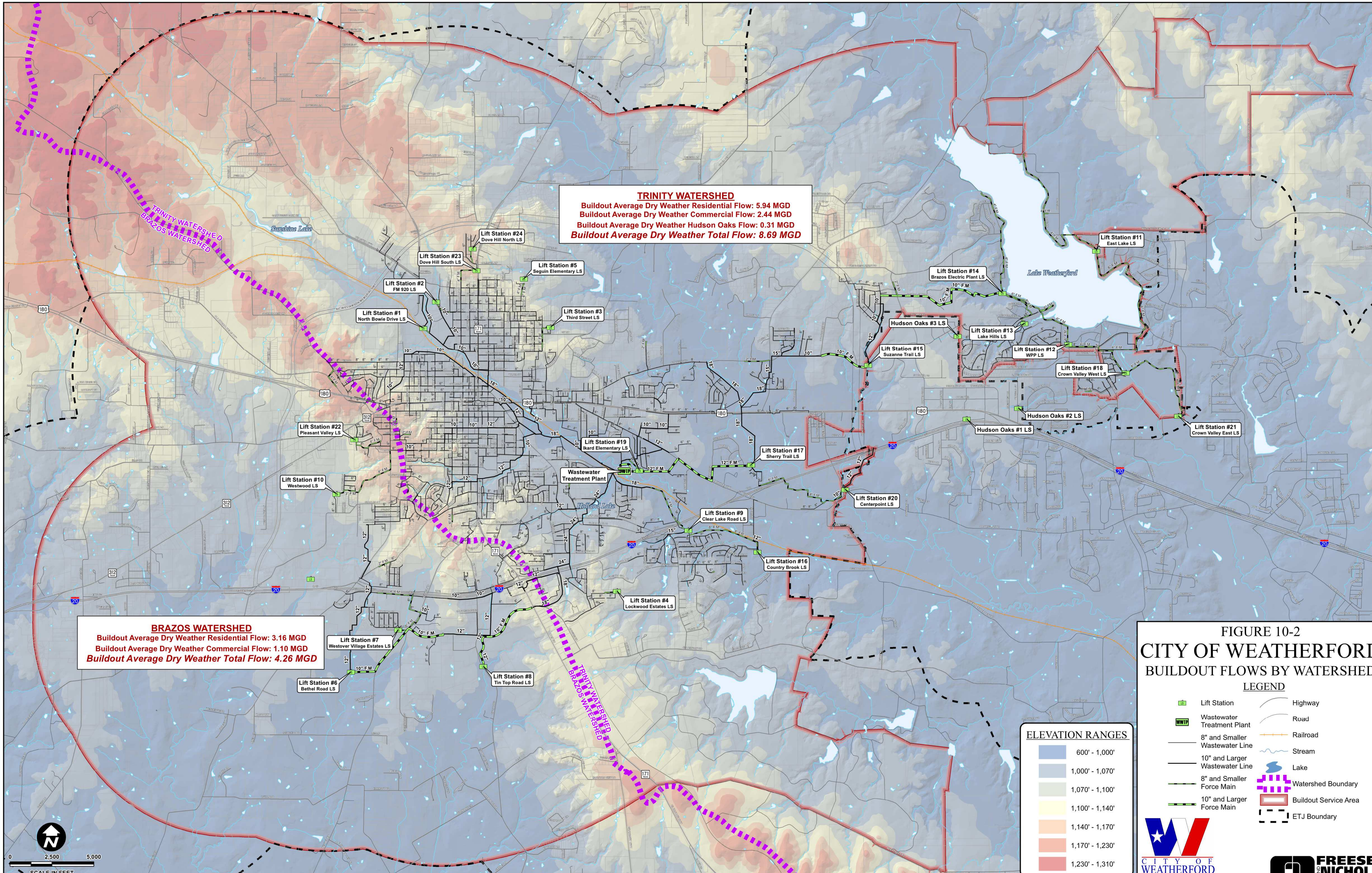
Lift Station 12 is located next to the Weatherford Water Treatment Plant near Lake Weatherford. The lift station serves residential customers east and south of the lake. This lift station was identified in the condition and criticality assessment to be in "poor" condition and "high impact" criticality. During the condition assessment, it was identified that this lift station had corrosion issues, minor structural issues, and poor pipe and valve conditions. The lift station experiences high levels of H2S due to a large number of seasonal users around the lake.

10.4 BUILDOUT ALTERNATIVES ANALYSIS

With the City's wastewater service area boundary projected to expand to include a large area of the Brazos River basin by buildout, the City's buildout population will be further divided by separate drainage basins. **Figure 10-2** displays the projected buildout flows for each drainage basin. The City's existing infrastructure in the Brazos River basin is currently served by a series of lift stations that pump wastewater to be treated at the existing WWTP in the Trinity River basin.

As the wastewater service area boundary continues to expand further into the Brazos basin, the City will need to either continue to decommission existing lift stations and construct new lift stations or construct a new WWTP in the Brazos basin to serve new growth. FNI developed capital improvements plans for both alternatives in order to provide a recommendation on the City's buildout CIP.

For each alternative, FNI used projections by TSZ, existing ground contour data, and street alignments to identify locations for critical infrastructure in the expanded service area. TCEQ minimum slope values were used to size the pipes where practical; in other areas, FNI assumed manhole depths no deeper than 10 feet below the estimated manhole rim elevation.



TRINITY WATERSHED
Buildout Average Dry Weather Residential Flow: 5.94 MGD
Buildout Average Dry Weather Commercial Flow: 2.44 MGD
Buildout Average Dry Weather Hudson Oaks Flow: 0.31 MGD
Buildout Average Dry Weather Total Flow: 8.69 MGD
BRAZOS WATERSHED
Buildout Average Dry Weather Residential Flow: 3.16 MGD
Buildout Average Dry Weather Commercial Flow: 1.10 MGD
Buildout Average Dry Weather Total Flow: 4.26 MGD
TRINITY WATERSHED
BRAZOS WATERSHED
Sunshine Lake
Lake Weatherford
Holland Lake
Lift Station #1 North Bowie Drive LS
Lift Station #2 FM 920 LS
Lift Station #3 Third Street LS
Lift Station #4 Lockwood Estates LS
Lift Station #5 Seguin Elementary LS
Lift Station #6 Bethel Road LS
Lift Station #7 Westover Village Estates LS
Lift Station #8 Tin Top Road LS
Lift Station #9 Clear Lake Road LS
Lift Station #10 Westwood LS
Lift Station #11 East Lake LS
Lift Station #12 WPP LS
Lift Station #13 Lake Hills LS
Lift Station #14 Brazos Electric Plant LS
Lift Station #15 Suzanne Trail LS
Lift Station #16 Country Brook LS
Lift Station #17 Sherry Trail LS
Lift Station #18 Crown Valley West LS
Lift Station #19 Ikard Elementary LS
Lift Station #20 Centerpoint LS
Lift Station #21 Crown Valley East LS
Lift Station #22 Pleasant Valley LS
Lift Station #23 Dove Hill South LS
Lift Station #24 Dove Hill North LS
Hudson Oaks #1 LS
Hudson Oaks #2 LS
Hudson Oaks #3 LS
Wastewater Treatment Plant
FIGURE 10-2
CITY OF WEATHERFORD
BUILDOUT FLOWS BY WATERSHED
LEGEND
Lift Station
Wastewater Treatment Plant
8" and Smaller Wastewater Line
10" and Larger Wastewater Line
8" and Smaller Force Main
10" and Larger Force Main
Highway
Road
Railroad
Stream
Lake
Watershed Boundary
Buildout Service Area
ETJ Boundary
ELEVATION RANGES
600' - 1,000'
1,000' - 1,070'
1,070' - 1,100'
1,100' - 1,140'
1,140' - 1,170'
1,170' - 1,230'
1,230' - 1,310'
0 2,500 5,000
SCALE IN FEET
CITY OF WEATHERFORD
FREESE AND NICHOLS

10.4.1 Brazos Wastewater Treatment Plant Alternative

FNI developed a scenario in the hydraulic model in which the flows in each basin are conveyed to the respective wastewater treatment plant. FNI sited the location along the projected buildout service area boundary at Sanchez Creek. Using projected flows by TSZ, ground contour data, and minimum slope where practical, FNI developed buildout infrastructure in both the Brazos and Trinity basins. FNI proposed improvements for existing and proposed 2020 and 2025 infrastructure where design criteria indicated in the hydraulic model. **Table 10-2** summarizes the costs by phase for the Brazos Wastewater Treatment Plant Alternative. **Figure 10-3** displays a map of the Brazos WWTP alternative CIP. Opinions of probable construction cost are provided in **Appendix D**.

Table 10-2: Brazos Wastewater Treatment Plant Summary

Project Number	Project Name	Cost
	5-Year CIP Total	$ 11,756,700
	10-Year CIP Total	$ 27,235,060
	WWTP Build-Out Alternative CIP	
2B	60-inch WWTP Influent Line	$ 356,100
3B	30-inch, 32-inch, and 42-inch Town Creek Interceptor	$ 3,732,700
4B	12-inch, 24-inch, and 30-inch Gravity Mains Near North Elm Street and State Highway 180	$ 1,017,700
7B	15-inch Gravity Main near FM 920	$ 914,200
25	8-inch, 12-inch, and 27-inch Gravity Main Near Russell Street and Santa Fe Drive	$ 2,710,000
26B	Existing WWTP Expansion to 5.6 MGD	$ 12,144,000
27	4.0 MGD Wastewater Treatment Plant Near Old Dennis Road	$ 55,200,000
28	18-inch, 27-inch, and 30-inch Gravity Mains Near Old Dennis Road	$ 5,086,000
29	Lift Stations Decommission Near IH-20 and Dean Road	$ 552,000
30	18-inch Gravity Main Near Lution Drive	$ 2,050,300
31B	6.5 MGD Lift Station and 18-inch Force Main Near Bethel Road	$ 7,672,500
32	18-inch and 21-inch Gravity Main Near Bethel Road	$ 3,024,800
33	18-inch, 21-inch, and 24-inch Gravity Main Near Tin Top Road and Harmony Circle	$ 4,079,700
34	Lift Stations Decommission Near Scarlett Road and Tin Top Road	$ 552,000
35	8-inch and 12-inch Gravity Main Near Harmony Road and Tin Top Road	$ 1,911,300
36	15-inch Gravity Main Near Westover Village Estates	$ 1,159,200
37	12-inch and 15-inch Gravity Main Near Tin Top Road and IH-20	$ 2,690,800
38	8-inch and 15-inch Gravity Main Near Greenwood Road	$ 2,413,600
39	12-inch Gravity Main Near State Highway 180	$ 667,300
40	30-inch Town Creek Interceptor	$ 1,918,900
41	18-inch and 21-inch Progue Branch Interceptor	$ 1,350,600
42	15-inch and 18-inch Gravity Main Near Peaster Highway	$ 1,717,000
43	12-inch Gravity Main in Northwest Weatherford	$ 2,822,700
44	8-inch, 12-inch, and 15-inch Gravity Main Near Peaster Highway	$ 4,253,100
45	Lift Station 17 and Force Main Expansion	$ 15,056,100
46	12-inch, 18-inch, and 27-inch Gravity Mains Serving Lift Station 17	$ 1,000,900
47	8.2 MGD Lift Station and 16-inch Force Main Near Center Point Road	$ 9,264,400
48	12-inch and 21-inch Gravity Mains Near Bankhead Road	$ 1,859,500
49	21-inch Gravity Main Near Center Point Road and Lift Stations Decommission	$ 4,010,900
50	8-inch Gravity Main Near Arapahoe Ridge	$ 1,095,000
51	8-inch, 12-inch, 27-inch and 30-inch Gravity Mains Near Old Dicey Road and State Highway 180	$ 5,306,500
52	15-inch and 12-inch Gravity Main Near Upper Denton Road	$ 2,463,900

Table 10-2: Brazos Wastewater Treatment Plant Summary Continued

Project Number	Project Name	Cost
53	18-inch, 21-inch, and 24-inch Gravity Main in North Weatherford	$ 5,201,200
54	8-inch, 12-inch, and 15-inch Gravity Main Near Zion Hill Road	$ 3,535,600
55	0.65 MGD Lift Station and 8-inch Force Main Near Lake Drive	$ 2,608,800
56	12-inch Gravity Main Near Trailwood Drive	$ 2,147,300
57	15-inch and 18-inch Gravity Main near Silverstone Subdivision	$ 1,252,400
58	Lift Station 14 Expansion to 3.3 MGD	$ 1,435,200
59	Lift Station 12 Expansion to 2.2 MGD and 12-inch Force Main	$ 3,099,400
60	8-inch Gravity Main Near FM 730	$ 700,600
61	15-inch Gravity Main Near Holland Lake Park	$ 319,500
62	Lift Station 11 Expansion to 2.0 MGD and 12-inch Force Main	$ 5,495,600
63	8-inch and 12-inch Gravity Mains Near Lake Weatherford	$ 2,301,200
64	0.6 MGD Lift Station and 6-inch Force Main Near Pearson Ranch Road	$ 1,256,500
65	0.25 MGD Lift Station, 6-inch Force Main, and 8-inch and 12-inch Gravity Mains Near FM 1886	$ 3,025,200
	Build-Out CIP Total	**$ 192,432,200**
	CIP Total	**$ 231,424,500**

FIGURE 10-3
CITY OF WEATHERFORD
BUILDOUT CAPITAL IMPROVEMENT PLAN
BRAZOS WWTP ALTERNATIVE
LEGEND
2020 Proposed Wastewater Improvements
Proposed Lift Station
Proposed Wastewater Line
Proposed Force Main
2025 Proposed Wastewater Improvements
Proposed Lift Station
Proposed Wastewater Line
Proposed Force Main
Buildout Proposed Wastewater Improvements
Proposed Lift Station
Proposed Wastewater Treatment Plant
Proposed Wastewater Line
Proposed Force Main
Under Design/Construction Improvements
Under Design/Construction Lift Station
Under Design/Construction Wastewater Line
Under Design/Construction Force Main
Existing Wastewater System
Lift Station
8" and Smaller Wastewater Line
10" and Larger Wastewater Line
8" and Smaller Force Main
10" and Larger Force Main
Highway
Road
Railroad
Stream
Lake
Parcel
Buildout Service Area
Weatherford City Limit
Weatherford ETJ Boundary
Other City Limit
All Alignments are for Planning Purposes Only
R1 Rehabilitate or Replace 2% of Existing Infrastructure Annually
FREESE AND NICHOLS
CITY OF WEATHERFORD
SCALE IN FEET
0 2,500 5,000
Wastewater Treatment Plant
Permitted Average Day Capacity = 4.5 MGD
Expand to 60-inch Influent Line (2B)
Expand to 5.6 MGD (26B)
Lift Station #1
North Bowie Drive LS
Firm Capacity = 0.40 MGD
Rehabilitation
Lift Station #2
FM 920 LS
Firm Capacity = 0.14 MGD
Decommission
Lift Station #3
Third Street LS
Firm Capacity = 0.22 MGD
Rehabilitation
Lift Station #4
Lockwood Estates LS
Firm Capacity = 0.43 MGD
Lift Station #5
Seguin Elementary LS
Firm Capacity = 0.14 MGD
Lift Station #6
Bethel Road LS
Firm Capacity = 1.01 MGD
Decommission
Lift Station #7
Westover Village Estates LS
Firm Capacity = 0.58 MGD
Decommission
Lift Station #8
Tin Top Road LS
Firm Capacity = 1.22 MGD
Decommission and Convert Force Main to Gravity Line
Lift Station #9
Clear Lake Road LS
Firm Capacity = 0.65 MGD
Rehabilitation
Lift Station #10
Westwood LS
Firm Capacity = 0.18 MGD
Decommission
Lift Station #11
East Lake LS
Firm Capacity = 0.20 MGD
Expand to 2.00 MGD Firm Capacity
Lift Station #12
WPP LS
Firm Capacity = 0.65 MGD
Rehabilitation
Expand to 2.20 MGD Firm Capacity
Lift Station #13
Firm Capacity = 0.41 MGD
Lake Hills LS
Lift Station #14
Brazos Electric Plant LS
Firm Capacity = 1.73 MGD
Expand to 3.30 MGD Firm Capacity
Lift Station #15
Suzanne Trail LS
Firm Capacity = 0.72 MGD
Rehab & Expand to 2.0 MGD
Decommission
Lift Station #16
Country Brook LS
Firm Capacity = 0.50 MGD
Decommission
Lift Station #17
Sherry Trail LS
Firm Capacity = 0.79 MGD
Expand to 4.0 MGD
Expand to 18.00 MGD Firm Capacity
Lift Station #18
Crown Valley West LS
Firm Capacity = 0.56 MGD
Lift Station #19
Ikard Elementary LS
Firm Capacity = 0.14 MGD
Lift Station #20
Centerpoint LS
Firm Capacity = 0.50 MGD
Rehabilitation
Decommission
Lift Station #21
Crown Valley East LS
Firm Capacity = 0.26
Lift Station #22
Pleasant Valley LS
Firm Capacity = 0.43 MGD
Decommission
Lift Station #23
Dove Hill South LS
Firm Capacity = 0.14 MGD
Lift Station #24
Dove Hill North LS
Firm Capacity = 0.14 MGD
Lift Station #25
Decommission
Proposed 0.50 MGD Lift Station
Decommission
Proposed 1.25 MGD Lift Station
Decommission
Proposed 1.75 MGD Lift Station
Decommission
Proposed 2.25 MGD Lift Station
Decommission
Proposed 4.00 MGD Wastewater Treatment Plant
Proposed 6.50 MGD Lift Station
Proposed 8.20 MGD Lift Station
Proposed 0.65 MGD Lift Station
Proposed 0.25 MGD Lift Station
Proposed 0.60 MGD Lift Station
Lake Weatherford
Willow Park
Hudson Oaks
Sunshine Lake

10.4.2 Brazos Lift Station Alternative

FNI developed a scenario in the hydraulic model in which all the flows in both basins are conveyed to the existing wastewater treatment plant. FNI sited lift stations along the buildout service area boundary as contour data permitted. The proposed configuration pumps wastewater from the southwest area of the boundary along Sanchez Creek to the southern area of the boundary and finally to the existing 18-inch interceptor to the east of Main Street. Using projected flows by TSZ, ground contour data, and minimum slope where practical, FNI developed buildout infrastructure in both the Brazos and Trinity basins. FNI proposed improvements for existing and proposed 2020 and 2025 infrastructure where design criteria indicated in the hydraulic model. **Table 10-3** summarizes the costs by phase for the Brazos Lift Station Alternative. Only the projects that are different between the Buildout Lift Station Alternative and the Buildout Wastewater Treatment Plant Alternative are presented in the table. **Figure 10-4** displays a map of the Brazos Lift Station alternative CIP. Opinions of probable construction cost are provided in **Appendix E**.

Table 10-3: Brazos Lift Station CIP Summary

Project Number	Project Name	Cost
	5-Year CIP Total	**$ 11,756,700**
	10-Year CIP Total	**$ 27,235,600**
WWTP Build-Out Alternative CIP		
2C	66-inch WWTP Influent Line	$ 389,200
26C	Existing WWTP Expansion to 8.4 MGD	$ 43,056,000
LS-1	Holland Creek Interceptor Expansion	$ 5,405,300
31C	16.0 MGD Lift Station and 12-inch Force Main Near Harmony Road	$ 17,994,100
LS-2	21-inch Gravity Main Near Bethel Road	$ 2,073,000
LS-3	8.1 MGD Lift Station and 12-inch Force Main Near Old Dennis Road	$ 8,824,100
27	*No Project in this Alternative*	$ -
30	*No Project in this Alternative*	$ -
	Total Cost of Projects 3B, 4B, 7B, 25, 28-29, and 32-65 Similar to WWTP Alt.	$ 115,009,300
	Build-Out CIP Total	**$ 192,751,000**
	CIP Total	**$ 231,743,300**

FIGURE 10-4
CITY OF WEATHERFORD
BUILDOUT CAPITAL IMPROVEMENT PLAN
BRAZOS LS ALTERNATIVE
LEGEND
2020 Proposed Wastewater Improvements
Proposed Lift Station
Proposed Wastewater Line
Proposed Force Main
2025 Proposed Wastewater Improvements
Proposed Lift Station
Proposed Wastewater Line
Proposed Force Main
Buildout Proposed Wastewater Improvements
Proposed Lift Station
Proposed Wastewater Treatment Plant
Proposed Wastewater Line
Proposed Force Main
Under Design/Construction Improvements
Under Design/Construction Lift Station
Under Design/Construction Wastewater Line
Under Design/Construction Force Main
Existing Wastewater System
Lift Station
8" and Smaller Wastewater Line
10" and Larger Wastewater Line
8" and Smaller Force Main
10" and Larger Force Main
Highway
Road
Railroad
Stream
Lake
Parcel
Buildout Service Area
Weatherford City Limit
Weatherford ETJ Boundary
Other City Limit
All Alignments are for Planning Purposes Only
R1 Rehabilitate or Replace 2% of Existing Infrastructure Annually
FREESE AND NICHOLS
CITY OF WEATHERFORD
SCALE IN FEET
0 2,500 5,000
Wastewater Treatment Plant
Permitted Average Day Capacity = 4.5 MGD
Expand to 66-inch Influent Line (2C)
Expand to 8.4 MGD (26C)
Lift Station #1 North Bowie Drive LS Firm Capacity = 0.40 MGD Rehabilitation
Lift Station #2 FM 920 LS Firm Capacity = 0.14 MGD Decommission
Lift Station #3 Third Street LS Firm Capacity = 0.22 MGD Rehabilitation
Lift Station #4 Lockwood Estates LS Firm Capacity = 0.43 MGD
Lift Station #5 Seguin Elementary LS Firm Capacity = 0.14 MGD
Lift Station #6 Bethel Road LS Firm Capacity = 1.01 MGD Decommission
Lift Station #7 Westover Village Estates LS Firm Capacity = 0.58 MGD Decommission
Lift Station #8 Tin Top Road LS Firm Capacity = 1.22 MGD Decommission and Convert Force Main to Gravity Line
Lift Station #9 Clear Lake Road LS Firm Capacity = 0.65 MGD Rehabilitation
Lift Station #10 Westwood LS Firm Capacity = 0.18 MGD Decommission
Lift Station #11 East Lake LS Firm Capacity = 0.20 MGD Expand to 2.00 MGD Firm Capacity
Lift Station #12 WPP LS Firm Capacity = 0.65 MGD Rehabilitation Expand to 2.20 MGD Firm Capacity
Lift Station #13 Lake Hills LS Firm Capacity = 0.41 MGD
Lift Station #14 Brazos Electric Plant LS Firm Capacity = 1.73 MGD Expand to 3.30 MGD Firm Capacity
Lift Station #15 Suzanne Trail LS Firm Capacity = 0.72 MGD Rehab & Expand to 2.0 MGD Decommission
Lift Station #16 Country Brook LS Firm Capacity = 0.50 MGD Decommission
Lift Station #17 Sherry Trail LS Firm Capacity = 0.79 MGD Expand to 4.0 MGD Expand to 18.00 MGD Firm Capacity
Lift Station #18 Crown Valley West LS Firm Capacity = 0.56 MGD
Lift Station #19 Ikard Elementary LS Firm Capacity = 0.14 MGD
Lift Station #20 Centerpoint LS Firm Capacity = 0.50 MGD Rehabilitation Decommission
Lift Station #21 Crown Valley East LS Firm Capacity = 0.26 MGD
Lift Station #22 Pleasant Valley LS Firm Capacity = 0.43 MGD Decommission
Lift Station #23 Dove Hill South LS Firm Capacity = 0.14 MGD
Lift Station #24 Dove Hill North LS Firm Capacity = 0.14 MGD
Lift Station #25 Decommission
Proposed 0.65 MGD Lift Station
Proposed 0.25 MGD Lift Station
Proposed 0.60 MGD Lift Station
Proposed 8.20 MGD Lift Station
Proposed 0.50 MGD Lift Station Decommission
Proposed 1.25 MGD Lift Station Decommission
Proposed 1.75 MGD Lift Station Decommission
Proposed 2.25 MGD Lift Station Decommission
Proposed 8.10 MGD Lift Station
Proposed 16.00 MGD Lift Station
2C
26C
31C
LS-1
LS-2
LS-3
Lake Weatherford
Sunshine Lake
Willow Park
Hudson Oaks

10.4.3 Buildout Recommendations

A wastewater treatment plant in the Brazos River basin would allow the City to avoid the construction, operation and maintenance of high capacity lift stations and force mains to serve customers in the basin. The WWTP would also allow for the decommissioning of the existing and proposed lift stations in operation to convey flow from the Brazos basin to the Trinity basin. The existing Trinity River basin infrastructure would also require upsizing to convey and treat flow at the existing WWTP.

The new WWTP would require a new permit with TCEQ as opposed to an amendment to the existing permit. The operation of a second WWTP would incur additional maintenance costs and compliance sampling at two plants as opposed to one. The second plant would also require additional staff or the same staff having to move between two plants and relying heavily on SCADA and remote operation.

The potential implementation of a wastewater reuse system would be complicated by a second plant if no large reuse water customers develop in the Brazos Basin. Pumping treated WWTP effluent to the Trinity basin to augment water supply would incur additional capital costs.

Wastewater solids handling often accounts for approximately 50% of the capital cost of a WWTP. Many cities with two or more WWTPs will transport solids to a single plant for processing. With a consolidated solids treatment plant, the second WWTP would require a lift station to convey the solids to the single location, unless each plant had the capability to process solids on-site.

Ample space exists at the existing WWTP site to expand to two to three times the existing plant size. The previous plant expansions accounted for new TCEQ regulations, so there will be no derating of the existing plant under current regulations.

An expansion at the existing WWTP is not needed until 2032 at the current projected growth rate. Given the projected growth rate in the Trinity basin, the existing WWTP will need to be expanded by 2041 (approximately) regardless of the City's decision to construct a second WWTP in the Brazos basin. Due to the unpredictable nature of growth patterns, FNI recommends that the City explore the acquisition of land for the new WWTP in the near future while continuing the current strategy of pumping wastewater flows back to the Trinity basin. The expansion of the existing WWTP can take place in the near term to accommodate flows, while the new plant can be constructed as growth in the southwestern portion of the City provides conditions suitable for its use.

APPENDIX A
LIFT STATION CONDITION ASSESSMENT INFORMATION

Lift Station #1

North Bowie Dr.

Inspection Date: 11/2/2015

Facility Information	
Year in Service:	2009
Type of Facility:	Submersible
Number of Pumps:	2
Design Point:	100 gpm @ 57 feet
Horsepower:	5
Monitoring:	SCADA
Generator:	No

CONDITION ASSESSMENT

Component Group	Component Condition Rating	Weight Factor	Weighted Component Rating	Comments
Pumps and Motors	4	20%	0.80	Old, original pump that could fail at any time.
Electrical – MCC, Back-up Power, Cables	3	20%	0.60	
Instrumentation - SCADA, alarms	2	15%	0.30	
Structure - Hatches, Corrosion, Cracks, Leaking	4	15%	0.60	Concrete pad cracked near stairs; no awning on some of site; dry vault leaks
Piping and Valves	4	10%	0.40	Sump pump piping broken, discharges outside on ground; valves do not fully close in dry vault
Mechanical - Ventilation, Odor Control	3	10%	0.30	Has mechanical ventilation; no odor control.
Site - Drainage, Access Drive, Security, Fencing	5	10%	0.50	No site fence; located within Heritage Plastics which has security fence; restricted access at times.
Condition Rating	-	**100%**	**3.50**	

CRITICALITY ASSESSMENT

Component Group	Component Criticality Rating	Weight Factor	Weighted Component Rating	Comments
Environmentally Sensitive Areas	5	40%	2.00	Town Creek < 500 feet
Population Served	1	40%	0.40	
High Impact Areas	2	20%	0.40	
Criticality Rating	-	**100%**	**2.80**	

RISK BASED ASSESSMENT

	Condition Rating	Criticality Rating	Overall Risk Rating	Risk Category
Lift Station #1 Risk Rating	3.50	2.80	6.30	High

Lift Station #2

FM 920

Inspection Date: 11/2/2015

Facility Information	
Year in Service:	1971
Type of Facility:	
Number of Pumps:	2
Design Point:	100 gpm @ 25 TDH
Horsepower:	
Monitoring:	SCADA
Generator:	No

CONDITION ASSESSMENT

Component Group	Component Condition Rating	Weight Factor	Weighted Component Rating	Comments
Pumps and Motors	4	20%	0.80	Old; maintenance issues; bolts stripped out on inspection plate and motor pump to volute. Sump pump not working.
Electrical – MCC, Back-up Power, Cables	3	20%	0.60	Conduit penetrating well has separated.
Instrumentation - SCADA, alarms	2	15%	0.30	
Structure - Hatches, Corrosion, Cracks, Leaking	4	15%	0.60	Wet well in poor condition; brick; leaks.
Piping and Valves	4	10%	0.40	Piping rusted and leaks; Valves do not fully close.
Mechanical - Ventilation, Odor Control	3	10%	0.30	Has mechanical ventilation; no odor control.
Site - Drainage, Access Drive, Security, Fencing	5	10%	0.50	No fence.
Condition Rating	-	**100%**	**3.50**	

CRITICALITY ASSESSMENT

Component Group	Component Criticality Rating	Weight Factor	Weighted Component Rating	Comments
Environmentally Sensitive Areas	4	40%	1.60	Town Creek <1000 feet
Population Served	1	40%	0.40	
High Impact Areas	3	20%	0.60	
Criticality Rating	-	**100%**	**2.60**	

RISK BASED ASSESSMENT

	Condition Rating	Criticality Rating	Overall Risk Rating	Risk Category
Lift Station #2 Risk Rating	3.50	2.60	6.10	High

Lift Station #3

Third Street

Inspection Date: 10/26/2015

Facility Information	
Year in Service:	1995
Type of Facility:	Submersible
Number of Pumps:	2
Design Point:	150 gpm @ 60 TDH
Horsepower:	
Monitoring:	SCADA
Generator:	3-way Switch

CONDITION ASSESSMENT

Component Group	Component Condition Rating	Weight Factor	Weighted Component Rating	Comments
Pumps and Motors	3	20%	0.60	Belt loose
Electrical – MCC, Back-up Power, Cables	2	20%	0.40	Electical panels are not explosion proof.
Instrumentation - SCADA, alarms	1	15%	0.15	
Structure - Hatches, Corrosion, Cracks, Leaking	5	15%	0.75	The foundation is settling causing cracks and corrosion outside.
Piping and Valves	3	10%	0.30	Priming system is difficult from maintenance standpoint. Check valves need to be replaced (failing).
Mechanical - Ventilation, Odor Control	5	10%	0.50	
Site - Drainage, Access Drive, Security, Fencing	4	10%	0.40	No latching or locks.
Condition Rating	-	**100%**	**3.10**	

CRITICALITY ASSESSMENT

Component Group	Component Criticality Rating	Weight Factor	Weighted Component Rating	Comments
Environmentally Sensitive Areas	1	40%	0.40	
Population Served	1	40%	0.40	
High Impact Areas	3	20%	0.60	
Criticality Rating	-	100%	**1.40**	

RISK BASED ASSESSMENT

	Condition Rating	Criticality Rating	Overall Risk Rating	Risk Category
Lift Station #3 Risk Rating	3.10	1.40	4.50	Low

Lift Station #4

Lockwood Estates

Inspection Date: 11/25/2015

Facility Information	
Year in Service:	2015
Type of Facility:	
Number of Pumps:	2
Design Point:	
Horsepower:	
Monitoring:	SCADA
Generator:	No

CONDITION ASSESSMENT

Component Group	Component Condition Rating	Weight Factor	Weighted Component Rating	Comments
Pumps and Motors	1	20%	0.20	
Electrical – MCC, Back-up Power, Cables	1	20%	0.20	
Instrumentation - SCADA, alarms	1	15%	0.15	
Structure - Hatches, Corrosion, Cracks, Leaking	1	15%	0.15	
Piping and Valves	1	10%	0.10	
Mechanical - Ventilation, Odor Control	1	10%	0.10	
Site - Drainage, Access Drive, Security, Fencing	2	10%	0.20	Narrow driveway.
Condition Rating	-	**100%**	**1.10**	

CRITICALITY ASSESSMENT

Component Group	Component Criticality Rating	Weight Factor	Weighted Component Rating	Comments
Environmentally Sensitive Areas	1	40%	0.40	
Population Served	1	40%	0.40	
High Impact Areas	3	20%	0.60	
Criticality Rating	-	**100%**	**1.40**	

RISK BASED ASSESSMENT

	Condition Rating	Criticality Rating	Overall Risk Rating	Risk Category
Lift Station #4 Risk Rating	1.10	1.40	2.50	Low

Lift Station #5

Seguin Elementary

Inspection Date: 11/2/2015

Facility Information	
Year in Service:	2001
Type of Facility:	Submersible
Number of Pumps:	2
Design Point:	100 gpm @ 70 TDH
Horsepower:	
Monitoring:	SCADA
Generator:	No

CONDITION ASSESSMENT

Component Group	Component Condition Rating	Weight Factor	Weighted Component Rating	Comments
Pumps and Motors	2	20%	0.40	
Electrical – MCC, Back-up Power, Cables	3	20%	0.60	
Instrumentation - SCADA, alarms	2	15%	0.30	
Structure - Hatches, Corrosion, Cracks, Leaking	2	15%	0.30	
Piping and Valves	2	10%	0.20	
Mechanical - Ventilation, Odor Control	3	10%	0.30	No mechanical ventilation or odor control. No complaints of odor.
Site - Drainage, Access Drive, Security, Fencing	2	10%	0.20	Minor fence repair.
Condition Rating	-	**100%**	**2.30**	

CRITICALITY ASSESSMENT

Component Group	Component Criticality Rating	Weight Factor	Weighted Component Rating	Comments
Environmentally Sensitive Areas	1	40%	0.40	
Population Served	1	40%	0.40	
High Impact Areas	5	20%	1.00	Juan Seguin Elementary School
Criticality Rating	-	**100%**	**1.80**	

RISK BASED ASSESSMENT

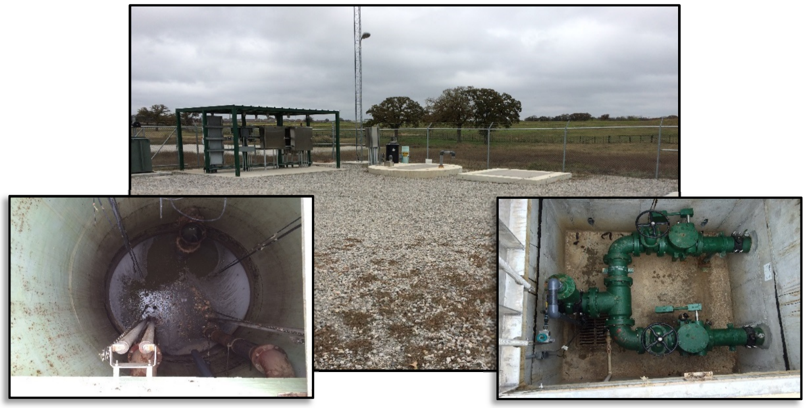
	Condition Rating	Criticality Rating	Overall Risk Rating	Risk Category
Lift Station #5 Risk Rating	2.30	1.80	4.10	Low

Lift Station #6

Bethel Road

Inspection Date: 11/2/2015

Facility Information	
Year in Service:	
Type of Facility:	Submersible
Number of Pumps:	2
Design Point:	735 gpm @ 135 TDH
Horsepower:	
Monitoring:	SCADA
Generator:	3-way Switch



CONDITION ASSESSMENT

Component Group	Component Condition Rating	Weight Factor	Weighted Component Rating	Comments
Pumps and Motors	1	20%	0.20	
Electrical – MCC, Back-up Power, Cables	1	20%	0.20	
Instrumentation - SCADA, alarms	1	15%	0.15	
Structure - Hatches, Corrosion, Cracks, Leaking	1	15%	0.15	
Piping and Valves	1	10%	0.10	
Mechanical - Ventilation, Odor Control	2	10%	0.20	Change filter material in odor control device.
Site - Drainage, Access Drive, Security, Fencing	3	10%	0.30	Significant erosion threatening to wash out access road.
Condition Rating	-	**100%**	**1.30**	

CRITICALITY ASSESSMENT

Component Group	Component Criticality Rating	Weight Factor	Weighted Component Rating	Comments
Environmentally Sensitive Areas	1	40%	0.40	
Population Served	4	40%	1.60	Serves Lift Station #7 and customers west of Bethel Rd.
High Impact Areas	1	20%	0.20	
Criticality Rating	-	**100%**	**2.20**	

RISK BASED ASSESSMENT

	Condition Rating	Criticality Rating	Overall Risk Rating	Risk Category
Lift Station #6 Risk Rating	1.30	2.20	3.50	Low

Lift Station #7

Westover Village Estates

Inspection Date: 11/2/2015

Facility Information	
Year in Service:	2007
Type of Facility:	Submersible
Number of Pumps:	2
Design Point:	400 gpm @ 143 TDH
Horsepower:	
Monitoring:	SCADA
Generator:	No

CONDITION ASSESSMENT

Component Group	Component Condition Rating	Weight Factor	Weighted Component Rating	Comments
Pumps and Motors	2	20%	0.40	
Electrical – MCC, Back-up Power, Cables	3	20%	0.60	Float conduit requires sealing; reset mechanism is broken.
Instrumentation - SCADA, alarms	2	15%	0.30	
Structure - Hatches, Corrosion, Cracks, Leaking	2	15%	0.30	
Piping and Valves	2	10%	0.20	
Mechanical - Ventilation, Odor Control	5	10%	0.50	Odor control device not in operation.
Site - Drainage, Access Drive, Security, Fencing	3	10%	0.30	6' fence requires moderate repairs.
Condition Rating	-	**100%**	**2.60**	

CRITICALITY ASSESSMENT

Component Group	Component Criticality Rating	Weight Factor	Weighted Component Rating	Comments
Environmentally Sensitive Areas	3	40%	1.20	
Population Served	2	40%	0.80	
High Impact Areas	3	20%	0.60	
Criticality Rating	-	**100%**	**2.60**	

RISK BASED ASSESSMENT

	Condition Rating	Criticality Rating	Overall Risk Rating	Risk Category
Lift Station #7 Risk Rating	2.60	2.60	5.20	Moderate

Lift Station #8

Tin Top Road

Inspection Date: 10/26/2015

Facility Information	
Year in Service:	2011
Type of Facility:	Submersible
Number of Pumps:	2
Design Point:	850 gpm @ 175 TDH
Horsepower:	100
Monitoring:	SCADA
Generator:	3-way Switch

CONDITION ASSESSMENT

Component Group	Component Condition Rating	Weight Factor	Weighted Component Rating	Comments
Pumps and Motors	1	20%	0.20	New. Low maintenance.
Electrical – MCC, Back-up Power, Cables	1	20%	0.20	Soft start
Instrumentation - SCADA, alarms	1	15%	0.15	
Structure - Hatches, Corrosion, Cracks, Leaking	1	15%	0.15	
Piping and Valves	1	10%	0.10	
Mechanical - Ventilation, Odor Control	2	10%	0.20	
Site - Drainage, Access Drive, Security, Fencing	2	10%	0.20	Blind turn out of drive
Condition Rating	-	**100%**	**1.20**	

CRITICALITY ASSESSMENT

Component Group	Component Criticality Rating	Weight Factor	Weighted Component Rating	Comments
Environmentally Sensitive Areas	5	40%	2.00	Threemile Branch Creek
Population Served	4	40%	1.60	Two lift stations pump to LS #8. Soon to be 3.
High Impact Areas	1	20%	0.20	
Criticality Rating	-	**100%**	**3.80**	

RISK BASED ASSESSMENT

	Condition Rating	Criticality Rating	Overall Risk Rating	Risk Category
Lift Station #8 Risk Rating	1.20	3.80	5.00	Moderate

Lift Station #9

Clear Lake Road

Inspection Date: 10/26/2015

Facility Information	
Year in Service:	1984
Type of Facility:	Submersible
Number of Pumps:	2
Design Point:	430 gpm @ 84 TDH
Horsepower:	
Monitoring:	SCADA
Generator:	No

CONDITION ASSESSMENT

Component Group	Component Condition Rating	Weight Factor	Weighted Component Rating	Comments
Pumps and Motors	2	20%	0.40	Recently replaced
Electrical – MCC, Back-up Power, Cables	4	20%	0.80	Recent issues.
Instrumentation - SCADA, alarms	2	15%	0.30	
Structure - Hatches, Corrosion, Cracks, Leaking	4	15%	0.60	Improvements needed to improve reliability.
Piping and Valves	5	10%	0.50	Original piping. The check valves are at the pumps making them difficult to access.
Mechanical - Ventilation, Odor Control	5	10%	0.50	No odor control (currently a secluded area).
Site - Drainage, Access Drive, Security, Fencing	4	10%	0.40	Fence rotting. Access road eroding. Drainage around base.
Condition Rating	-	**100%**	**3.50**	

CRITICALITY ASSESSMENT

Component Group	Component Criticality Rating	Weight Factor	Weighted Component Rating	Comments
Environmentally Sensitive Areas	5	40%	2.00	Town Creek
Population Served	4	40%	1.60	Serves area south of SH 20
High Impact Areas	1	20%	0.20	
Criticality Rating	-	**100%**	**3.80**	

RISK BASED ASSESSMENT

	Condition Rating	Criticality Rating	Overall Risk Rating	Risk Category
Lift Station #9 Risk Rating	3.50	3.80	7.30	**Very High**

Lift Station #10

Westwood

Inspection Date: 11/2/2015

Facility Information	
Year in Service:	1987
Type of Facility:	Submersible
Number of Pumps:	2
Design Point:	122 gpm @ 160 TDH
Horsepower:	
Monitoring:	SCADA
Generator:	No

CONDITION ASSESSMENT

Component Group	Component Condition Rating	Weight Factor	Weighted Component Rating	Comments
Pumps and Motors	4	20%	0.80	Grinder pumps; old with high run times; specialty pumps
Electrical – MCC, Back-up Power, Cables	4	20%	0.80	Panel has electrical issues with "arcing"; obsolete materials and components.
Instrumentation - SCADA, alarms	2	15%	0.30	
Structure - Hatches, Corrosion, Cracks, Leaking	3	15%	0.45	Hatch severely corroded.
Piping and Valves	5	10%	0.50	Piping broken; repaired with several clamps; check valves inside wet well.
Mechanical - Ventilation, Odor Control	3	10%	0.30	No mechanical ventilation; no screen on vent.
Site - Drainage, Access Drive, Security, Fencing	3	10%	0.30	No drive approach, required to mount curb; fence only 6'.
Condition Rating	-	**100%**	**3.45**	

CRITICALITY ASSESSMENT

Component Group	Component Criticality Rating	Weight Factor	Weighted Component Rating	Comments
Environmentally Sensitive Areas	1	40%	0.40	
Population Served	1	40%	0.40	
High Impact Areas	3	20%	0.60	Middle of culdesac, surrounded by houses.
Criticality Rating	-	**100%**	**1.40**	

RISK BASED ASSESSMENT

	Condition Rating	Criticality Rating	Overall Risk Rating	Risk Category
Lift Station #10 Risk Rating	3.45	1.40	4.85	Moderate

Lift Station #11

East Lake

Inspection Date: 11/2/2015

Facility Information	
Year in Service:	1990
Type of Facility:	Submersible
Number of Pumps:	2
Design Point:	140 gpm @ 50 TDH
Horsepower:	
Monitoring:	SCADA
Generator:	No

CONDITION ASSESSMENT

Component Group	Component Condition Rating	Weight Factor	Weighted Component Rating	Comments
Pumps and Motors	2	20%	0.40	
Electrical – MCC, Back-up Power, Cables	2	20%	0.40	Water in panel. Door seals need replacement.
Instrumentation - SCADA, alarms	2	15%	0.30	
Structure - Hatches, Corrosion, Cracks, Leaking	4	15%	0.60	Hatches do not lock; one rail has separated from edge of well.
Piping and Valves	2	10%	0.20	
Mechanical - Ventilation, Odor Control	3	10%	0.30	No mechanical ventilation.
Site - Drainage, Access Drive, Security, Fencing	3	10%	0.30	No parking available.
Condition Rating	-	**100%**	**2.50**	

CRITICALITY ASSESSMENT

Component Group	Component Criticality Rating	Weight Factor	Weighted Component Rating	Comments
Environmentally Sensitive Areas	5	40%	2.00	
Population Served	1	40%	0.40	
High Impact Areas	3	20%	0.60	
Criticality Rating	-	**100%**	**3.00**	

RISK BASED ASSESSMENT

	Condition Rating	Criticality Rating	Overall Risk Rating	Risk Category
Lift Station #11 Risk Rating	2.50	3.00	5.50	Moderate

Lift Station #12

WPP

Inspection Date: 10/26/2015

Facility Information	
Year in Service:	1996
Type of Facility:	Submersible
Number of Pumps:	2
Design Point:	450 gpm @ 97 TDH
Horsepower:	
Monitoring:	SCADA
Generator:	No

CONDITION ASSESSMENT

Component Group	Component Condition Rating	Weight Factor	Weighted Component Rating	Comments
Pumps and Motors	2	20%	0.40	
Electrical – MCC, Back-up Power, Cables	4	20%	0.80	Corrosion, wire breaks in panel in 2007. High H2S is a concern for corrosion in panel.
Instrumentation - SCADA, alarms	3	15%	0.45	
Structure - Hatches, Corrosion, Cracks, Leaking	4	15%	0.60	Hatches do not lock; one rail has separated from edge of well. Replaced floor of wet well (not coated).
Piping and Valves	4	10%	0.40	
Mechanical - Ventilation, Odor Control	3	10%	0.30	High H2S issues (serves grinder pumps from around lake that sit idle for long portions of the year). Time to replace filter.
Site - Drainage, Access Drive, Security, Fencing	2	10%	0.20	Retaining wall shifting. Brass locks rusting. Raised 4 ft to stop flooding from creek.
Condition Rating	-	**100%**	**3.15**	

CRITICALITY ASSESSMENT

Component Group	Component Criticality Rating	Weight Factor	Weighted Component Rating	Comments
Environmentally Sensitive Areas	4	40%	1.60	
Population Served	3	40%	1.20	
High Impact Areas	2	20%	0.40	
Criticality Rating	-	**100%**	**3.20**	

RISK BASED ASSESSMENT

	Condition Rating	Criticality Rating	Overall Risk Rating	Risk Category
Lift Station #12 Risk Rating	3.15	3.20	6.35	High

Lift Station #13

Lake Hills

Inspection Date: 11/9/2015

Facility Information	
Year in Service:	1996
Type of Facility:	Submersible
Number of Pumps:	2
Design Point:	282 gpm @ 71 TDH
Horsepower:	
Monitoring:	SCADA
Generator:	No

CONDITION ASSESSMENT

Component Group	Component Condition Rating	Weight Factor	Weighted Component Rating	Comments
Pumps and Motors	2	20%	0.40	
Electrical – MCC, Back-up Power, Cables	2	20%	0.40	No sacrificial panel.
Instrumentation - SCADA, alarms	2	15%	0.30	
Structure - Hatches, Corrosion, Cracks, Leaking	2	15%	0.30	No lock on dry vault, difficult to close properly.
Piping and Valves	2	10%	0.20	
Mechanical - Ventilation, Odor Control	2	10%	0.20	
Site - Drainage, Access Drive, Security, Fencing	2	10%	0.20	No access easement
Condition Rating	-	**100%**	**2.00**	

CRITICALITY ASSESSMENT

Component Group	Component Criticality Rating	Weight Factor	Weighted Component Rating	Comments
Environmentally Sensitive Areas	1	40%	0.40	
Population Served	2	40%	0.80	
High Impact Areas	1	20%	0.20	
Criticality Rating	-	**100%**	**1.40**	

RISK BASED ASSESSMENT

	Condition Rating	Criticality Rating	Overall Risk Rating	Risk Category
Lift Station #13 Risk Rating	2.00	1.40	3.40	Low

Lift Station #14

Brazos Electric Plant

Inspection Date: 11/9/2015

Facility Information	
Year in Service:	1990
Type of Facility:	Submersible
Number of Pumps:	3
Design Point:	600 gpm @ 210 TDH
Horsepower:	
Monitoring:	SCADA
Generator:	No

CONDITION ASSESSMENT

Component Group	Component Condition Rating	Weight Factor	Weighted Component Rating	Comments
Pumps and Motors	2	20%	0.40	
Electrical – MCC, Back-up Power, Cables	2	20%	0.40	
Instrumentation - SCADA, alarms	2	15%	0.30	
Structure - Hatches, Corrosion, Cracks, Leaking	3	15%	0.45	Water in valve vault.
Piping and Valves	2	10%	0.20	
Mechanical - Ventilation, Odor Control	4	10%	0.40	Blower of odor control device needs repair.
Site - Drainage, Access Drive, Security, Fencing	3	10%	0.30	Fence in need of repairs.
Condition Rating	-	**100%**	**2.45**	

CRITICALITY ASSESSMENT

Component Group	Component Criticality Rating	Weight Factor	Weighted Component Rating	Comments
Environmentally Sensitive Areas	5	40%	2.00	
Population Served	4	40%	1.60	
High Impact Areas	2	20%	0.40	
Criticality Rating	-	**100%**	**4.00**	

RISK BASED ASSESSMENT

	Condition Rating	Criticality Rating	Overall Risk Rating	Risk Category
Lift Station #14 Risk Rating	2.45	4.00	6.45	**High**

Lift Station #15

Suzanne Trail

Inspection Date: 11/9/2015

Facility Information	
Year in Service:	1990
Type of Facility:	Submersible
Number of Pumps:	2
Design Point:	550 gpm @ 95 TDH
Horsepower:	
Monitoring:	SCADA
Generator:	No

CONDITION ASSESSMENT

Component Group	Component Condition Rating	Weight Factor	Weighted Component Rating	Comments
Pumps and Motors	4	20%	0.80	Will need new pumps with increased demand; pump will not seal;
Electrical – MCC, Back-up Power, Cables	5	20%	1.00	High risk electric panel; transformer bank is bad.
Instrumentation - SCADA, alarms	2	15%	0.30	
Structure - Hatches, Corrosion, Cracks, Leaking	3	15%	0.45	No awning.
Piping and Valves	2	10%	0.20	
Mechanical - Ventilation, Odor Control	5	10%	0.50	No vent or blower.
Site - Drainage, Access Drive, Security, Fencing	5	10%	0.50	Driveway in very poor condition due to significant storm water drainage;
Condition Rating	-	**100%**	**3.75**	

CRITICALITY ASSESSMENT

Component Group	Component Criticality Rating	Weight Factor	Weighted Component Rating	Comments
Environmentally Sensitive Areas	1	40%	0.40	
Population Served	5	40%	2.00	
High Impact Areas	1	20%	0.20	
Criticality Rating	-	**100%**	**2.60**	

RISK BASED ASSESSMENT

	Condition Rating	Criticality Rating	Overall Risk Rating	Risk Category
Lift Station #15 Risk Rating	3.75	2.60	6.35	High

Lift Station #16

Country Brook

Inspection Date: 11/2/2015

Facility Information	
Year in Service:	1996
Type of Facility:	Submersible
Number of Pumps:	2
Design Point:	350 gpm @ 72 TDH
Horsepower:	
Monitoring:	SCADA
Generator:	No

CONDITION ASSESSMENT

Component Group	Component Condition Rating	Weight Factor	Weighted Component Rating	Comments
Pumps and Motors	3	20%	0.60	Pumps catch many rags; frequent "seal fail" alarms.
Electrical – MCC, Back-up Power, Cables	2	20%	0.40	Broken handle on panel.
Instrumentation - SCADA, alarms	2	15%	0.30	
Structure - Hatches, Corrosion, Cracks, Leaking	3	15%	0.45	Valve vault has crack and breaks exposing rebar.
Piping and Valves	2	10%	0.20	
Mechanical - Ventilation, Odor Control	5	10%	0.50	No ventilation.
Site - Drainage, Access Drive, Security, Fencing	3	10%	0.30	Area where a large gap exists between ground and fence.
Condition Rating	-	**100%**	**2.75**	

CRITICALITY ASSESSMENT

Component Group	Component Criticality Rating	Weight Factor	Weighted Component Rating	Comments
Environmentally Sensitive Areas	5	40%	2.00	
Population Served	2	40%	0.80	
High Impact Areas	3	20%	0.60	
Criticality Rating	-	**100%**	**3.40**	

RISK BASED ASSESSMENT

	Condition Rating	Criticality Rating	Overall Risk Rating	Risk Category
Lift Station #16 Risk Rating	2.75	3.40	6.15	**High**

Lift Station #17

Sherry Trail

Inspection Date: 11/9/2015

Facility Information	
Year in Service:	1990
Type of Facility:	Submersible
Number of Pumps:	2
Design Point:	1200 gpm @ 95 TDH
Horsepower:	
Monitoring:	SCADA
Generator:	No

CONDITION ASSESSMENT

Component Group	Component Condition Rating	Weight Factor	Weighted Component Rating	Comments
Pumps and Motors	2	20%	0.40	
Electrical – MCC, Back-up Power, Cables	3	20%	0.60	Sacrificial panel conduits need sealing.
Instrumentation - SCADA, alarms	2	15%	0.30	Needs SCADA pac.
Structure - Hatches, Corrosion, Cracks, Leaking	2	15%	0.30	Wet well needs to be pumped.
Piping and Valves	4	10%	0.40	Check valves need to be replaced, heavily corroded, cushion in poor condition.
Mechanical - Ventilation, Odor Control	2	10%	0.20	
Site - Drainage, Access Drive, Security, Fencing	3	10%	0.30	Trim trees along access road; repair pot hole.
Condition Rating	-	**100%**	**2.50**	

CRITICALITY ASSESSMENT

Component Group	Component Criticality Rating	Weight Factor	Weighted Component Rating	Comments
Environmentally Sensitive Areas	3	40%	1.20	
Population Served	5	40%	2.00	
High Impact Areas	2	20%	0.40	
Criticality Rating	-	**100%**	**3.60**	

RISK BASED ASSESSMENT

	Condition Rating	Criticality Rating	Overall Risk Rating	Risk Category
Lift Station #17 Risk Rating	2.50	3.60	6.10	High

Lift Station #18

Crown Valley West

Inspection Date: 11/9/2015

Facility Information	
Year in Service:	2002
Type of Facility:	Submersible
Number of Pumps:	2
Design Point:	388 gpm @ 150 TDH
Horsepower:	
Monitoring:	SCADA
Generator:	No



CONDITION ASSESSMENT

Component Group	Component Condition Rating	Weight Factor	Weighted Component Rating	Comments
Pumps and Motors	2	20%	0.40	
Electrical – MCC, Back-up Power, Cables	3	20%	0.60	Panel has corrosion because it is not sealed.
Instrumentation - SCADA, alarms	2	15%	0.30	
Structure - Hatches, Corrosion, Cracks, Leaking	3	15%	0.45	No awning. Rails are corroded.
Piping and Valves	3	10%	0.30	Piping corroded.
Mechanical - Ventilation, Odor Control	4	10%	0.40	
Site - Drainage, Access Drive, Security, Fencing	2	10%	0.20	Not a security fence.
Condition Rating	-	**100%**	**2.65**	

CRITICALITY ASSESSMENT

Component Group	Component Criticality Rating	Weight Factor	Weighted Component Rating	Comments
Environmentally Sensitive Areas	3	40%	1.20	
Population Served	1	40%	0.40	
High Impact Areas	3	20%	0.60	
Criticality Rating	-	**100%**	**2.20**	

RISK BASED ASSESSMENT

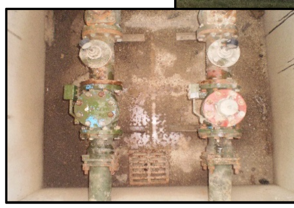
	Condition Rating	Criticality Rating	Overall Risk Rating	Risk Category
Lift Station #18 Risk Rating	2.65	2.20	4.85	Moderate

Lift Station #19

Ikard Elementary

Inspection Date: 11/9/2015

Facility Information	
Year in Service:	2000
Type of Facility:	Submersible
Number of Pumps:	2
Design Point:	100 gpm @ 50 TDH
Horsepower:	
Monitoring:	SCADA
Generator:	No


CONDITION ASSESSMENT

Component Group	Component Condition Rating	Weight Factor	Weighted Component Rating	Comments
Pumps and Motors	2	20%	0.40	
Electrical – MCC, Back-up Power, Cables	4	20%	0.80	Insects and corrosion; panel needs to be sealed.
Instrumentation - SCADA, alarms	2	15%	0.30	
Structure - Hatches, Corrosion, Cracks, Leaking	2	15%	0.30	
Piping and Valves	2	10%	0.20	
Mechanical - Ventilation, Odor Control	4	10%	0.40	No mechanical ventilation
Site - Drainage, Access Drive, Security, Fencing	3	10%	0.30	Need to grade site to be level and adjust fence and gate.
Condition Rating	-	**100%**	**2.70**	

CRITICALITY ASSESSMENT

Component Group	Component Criticality Rating	Weight Factor	Weighted Component Rating	Comments
Environmentally Sensitive Areas	5	40%	2.00	
Population Served	1	40%	0.40	
High Impact Areas	2	20%	0.40	
Criticality Rating	-	**100%**	**2.80**	

RISK BASED ASSESSMENT

	Condition Rating	Criticality Rating	Overall Risk Rating	Risk Category
Lift Station #19 Risk Rating	2.70	2.80	5.50	Moderate

Lift Station #20

Centerpoint

Inspection Date: 11/9/2015

Facility Information	
Year in Service:	2002
Type of Facility:	Submersible
Number of Pumps:	2
Design Point:	350 gpm @ 120 TDH
Horsepower:	
Monitoring:	SCADA
Generator:	No

CONDITION ASSESSMENT

Component Group	Component Condition Rating	Weight Factor	Weighted Component Rating	Comments
Pumps and Motors	2	20%	0.40	
Electrical – MCC, Back-up Power, Cables	3	20%	0.60	No sacrificial panel; panel needs to be sealed.
Instrumentation - SCADA, alarms	2	15%	0.30	
Structure - Hatches, Corrosion, Cracks, Leaking	4	15%	0.60	No fall protection; corroded rail brackets; no awning.
Piping and Valves	4	10%	0.40	Pigging point is PVC.
Mechanical - Ventilation, Odor Control	4	10%	0.40	No odor control; no mechanical ventilation.
Site - Drainage, Access Drive, Security, Fencing	5	10%	0.50	No fence other than property fence; gate needs to be adjusted.
Condition Rating	-	**100%**	**3.20**	

CRITICALITY ASSESSMENT

Component Group	Component Criticality Rating	Weight Factor	Weighted Component Rating	Comments
Environmentally Sensitive Areas	5	40%	2.00	
Population Served	4	40%	1.60	
High Impact Areas	1	20%	0.20	
Criticality Rating	-	**100%**	**3.80**	

RISK BASED ASSESSMENT

	Condition Rating	Criticality Rating	Overall Risk Rating	Risk Category
Lift Station #20 Risk Rating	3.20	3.80	7.00	**Very High**

Lift Station #21

Crown Valley East

Inspection Date: 11/9/2015

Facility Information	
Year in Service:	2005
Type of Facility:	Submersible
Number of Pumps:	2
Design Point:	178 gpm @ 85 TDH
Horsepower:	
Monitoring:	SCADA
Generator:	No

CONDITION ASSESSMENT

Component Group	Component Condition Rating	Weight Factor	Weighted Component Rating	Comments
Pumps and Motors	2	20%	0.40	
Electrical – MCC, Back-up Power, Cables	3	20%	0.60	Conduit needs to be sealed in panel.
Instrumentation - SCADA, alarms	2	15%	0.30	
Structure - Hatches, Corrosion, Cracks, Leaking	2	15%	0.30	Rail corroded.
Piping and Valves	2	10%	0.20	
Mechanical - Ventilation, Odor Control	3	10%	0.30	No mechanical ventilation; no odor control; no odor complaints; no screen on vent.
Site - Drainage, Access Drive, Security, Fencing	2	10%	0.20	Minor settling of fence and retaining wall; pothole in driveway.
Condition Rating	-	**100%**	**2.30**	

CRITICALITY ASSESSMENT

Component Group	Component Criticality Rating	Weight Factor	Weighted Component Rating	Comments
Environmentally Sensitive Areas	3	40%	1.20	
Population Served	1	40%	0.40	
High Impact Areas	4	20%	0.80	Oeste Ranch Golf Course
Criticality Rating	-	**100%**	**2.40**	

RISK BASED ASSESSMENT

	Condition Rating	Criticality Rating	Overall Risk Rating	Risk Category
Lift Station #21 Risk Rating	2.30	2.40	4.70	Moderate

Lift Station #22

Pleasant Valley

Inspection Date: 11/9/2015

Facility Information	
Year in Service:	2002
Type of Facility:	Submersible
Number of Pumps:	2
Design Point:	300 gpm @ 112 TDH
Horsepower:	
Monitoring:	SCADA
Generator:	No

CONDITION ASSESSMENT

Component Group	Component Condition Rating	Weight Factor	Weighted Component Rating	Comments
Pumps and Motors	2	20%	0.40	
Electrical – MCC, Back-up Power, Cables	3	20%	0.60	
Instrumentation - SCADA, alarms	2	15%	0.30	
Structure - Hatches, Corrosion, Cracks, Leaking	2	15%	0.30	No awning.
Piping and Valves	2	10%	0.20	
Mechanical - Ventilation, Odor Control	3	10%	0.30	No mechanical ventilation; no odor control; no odor complaints; no screen on vent.
Site - Drainage, Access Drive, Security, Fencing	3	10%	0.30	Fence not to security fence specs; poor access.
Condition Rating	-	**100%**	**2.40**	

CRITICALITY ASSESSMENT

Component Group	Component Criticality Rating	Weight Factor	Weighted Component Rating	Comments
Environmentally Sensitive Areas	1	40%	0.40	
Population Served	1	40%	0.40	
High Impact Areas	3	20%	0.60	
Criticality Rating	-	**100%**	**1.40**	

RISK BASED ASSESSMENT

	Condition Rating	Criticality Rating	Overall Risk Rating	Risk Category
Lift Station #22 Risk Rating	2.40	1.40	3.80	Low

Lift Station #23

Dove Hill South

Inspection Date: 11/2/2015

Facility Information	
Year in Service:	2003
Type of Facility:	Submersible
Number of Pumps:	2
Design Point:	100 gpm @ 46 TDH
Horsepower:	
Monitoring:	SCADA
Generator:	No

CONDITION ASSESSMENT

Component Group	Component Condition Rating	Weight Factor	Weighted Component Rating	Comments
Pumps and Motors	2	20%	0.40	
Electrical – MCC, Back-up Power, Cables	3	20%	0.60	Panel handle missing.
Instrumentation - SCADA, alarms	2	15%	0.30	
Structure - Hatches, Corrosion, Cracks, Leaking	3	15%	0.45	Groundwater leaking into wet well.
Piping and Valves	2	10%	0.20	
Mechanical - Ventilation, Odor Control	3	10%	0.30	No mechanical ventilation; no odor control; no odor complaints; no screen on vent.
Site - Drainage, Access Drive, Security, Fencing	3	10%	0.30	Fence not to security fence specs; poor access; Poor drainage.
Condition Rating	-	**100%**	**2.55**	

CRITICALITY ASSESSMENT

Component Group	Component Criticality Rating	Weight Factor	Weighted Component Rating	Comments
Environmentally Sensitive Areas	1	40%	0.40	
Population Served	1	40%	0.40	
High Impact Areas	2	20%	0.40	
Criticality Rating	-	**100%**	**1.20**	

RISK BASED ASSESSMENT

	Condition Rating	Criticality Rating	Overall Risk Rating	Risk Category
Lift Station #23 Risk Rating	2.55	1.20	3.75	Low

Lift Station #24

Dove Hill North

Inspection Date: 11/2/2015

Facility Information	
Year in Service:	2003
Type of Facility:	Submersible
Number of Pumps:	2
Design Point:	100 gpm @ 46 TDH
Horsepower:	
Monitoring:	SCADA
Generator:	No

CONDITION ASSESSMENT

Component Group	Component Condition Rating	Weight Factor	Weighted Component Rating	Comments
Pumps and Motors	2	20%	0.40	
Electrical – MCC, Back-up Power, Cables	3	20%	0.60	Rust in bottom of panel, needs to be sealed; light does not work.
Instrumentation - SCADA, alarms	2	15%	0.30	
Structure - Hatches, Corrosion, Cracks, Leaking	4	15%	0.60	Groundwater leak in valve vault.
Piping and Valves	2	10%	0.20	
Mechanical - Ventilation, Odor Control	3	10%	0.30	No mechanical ventilation; no odor control; no odor complaints; no screen on vent.
Site - Drainage, Access Drive, Security, Fencing	2	10%	0.20	Fence not to security fence specs; poor access;
Condition Rating	-	**100%**	**2.60**	

CRITICALITY ASSESSMENT

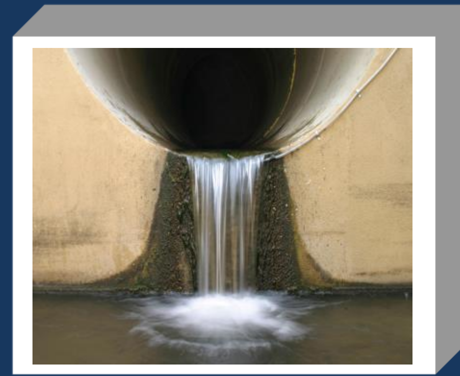
Component Group	Component Criticality Rating	Weight Factor	Weighted Component Rating	Comments
Environmentally Sensitive Areas	1	40%	0.40	
Population Served	1	40%	0.40	
High Impact Areas	3	20%	0.60	
Criticality Rating	-	**100%**	**1.40**	

RISK BASED ASSESSMENT

	Condition Rating	Criticality Rating	Overall Risk Rating	Risk Category
Lift Station #24 Risk Rating	2.60	1.40	4.00	Low

APPENDIX B
INTERRA HYDRO FLOW MONITORING INVESTIGATION

Prepared for:
Prepared for:



City of Weatherford, Texas

Master Plan Flow Monitoring Project

July 2015

Prepared by:

Interra Hydro

2802 Flintrock Trace, #265
Austin, Texas 78738
(888) 360-7737
www.interrahydro.com

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EXECUTIVE SUMMARY

Interra Hydro, Inc. (Interra), in cooperation with Freese and Nichols, was contracted by the City of Weatherford, Texas (the City) to perform a flow monitoring investigation, hydraulic evaluation, and prioritization for the five (5) predefined basins. The wastewater flow meter basins are highlighted in **Figure ES-1**. The flow meters were installed on April 13, 2015 and were monitored for a period of 30 days using five (5) area-velocity style flow monitors and one (1) tipping-bucket rainfall gauge. The information acquired during this period was analyzed first for dry weather flow conditions, and then against captured rainfall data to determine the direct Rainfall Dependent Inflow/Infiltration (RDII) response components to each of the four (4) captured storm events. The principal goals of this flow monitoring investigation as identified in the project scope were to:

- Establish dry weather baseline flows for weekday and weekend conditions,
- Identify rainfall events and correlate flow impacts on the sanitary sewer collection system,
- Quantify the Inflow/Infiltration components from baseline flows under varying rainfall intensities,
- Provide hydrograph components for collection system hydraulic modeling calibration.

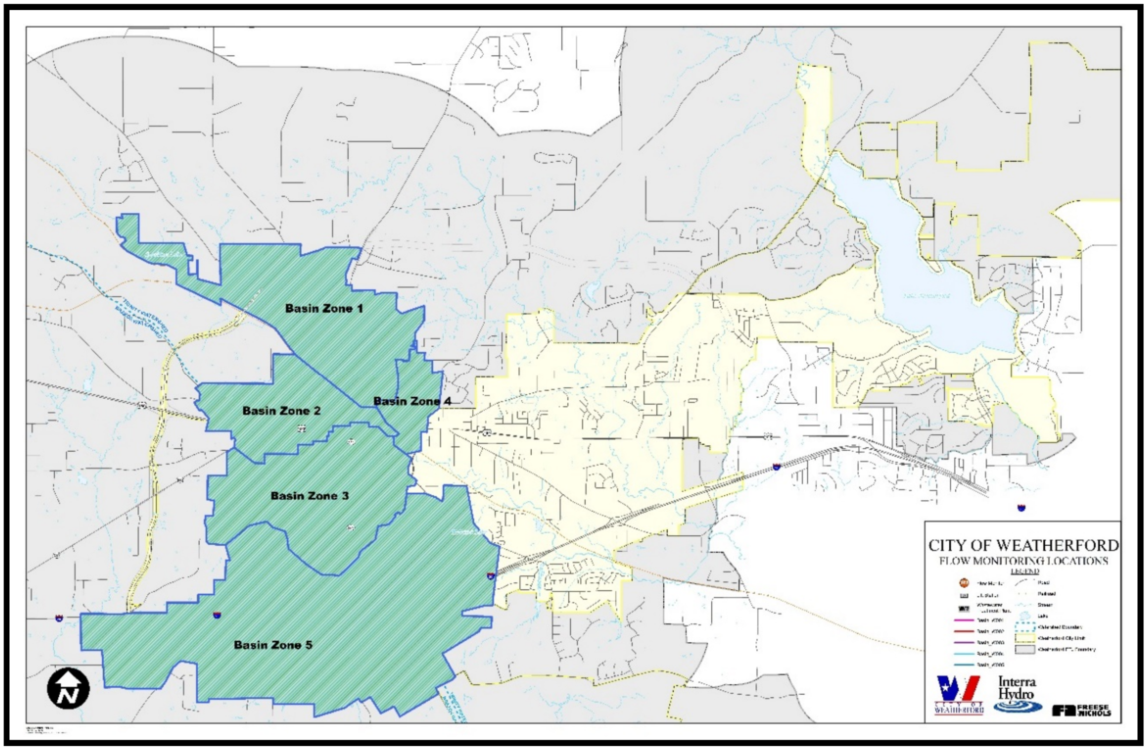


Figure ES-1: Flow Meter Basin Boundaries

During the flow investigation and RDII analysis, a pattern of moderate to heavy capacity utilization within Basin 1 and Basin 4 for dry weather flow conditions was discovered. The dry weather flow characteristics for Basin 1 indicated heavy capacity utilization (> 70%), and moderate utilization (50%-70%) in Basin 4. Capacity utilization is defined as the flow in the pipe divided by the insitu full pipe capacity (q/Q). **Figure ES-2** presents the capacity utilization for each basin. Moderate to heavy utilization is characterized when peak daily average day flows exceed 50% of the pipe's insitu-capacity. Typically, collection system operating standards for dry weather conditions adhere to a maximum in-pipe flow capacity at or below 50% of full pipe capacity. Subsequently, this reserve conveyance capacity is allocated for allowable RDII within an aging collection system. These peak daily average day flows and peak capacity utilization values are provided in **Table ES-1**.

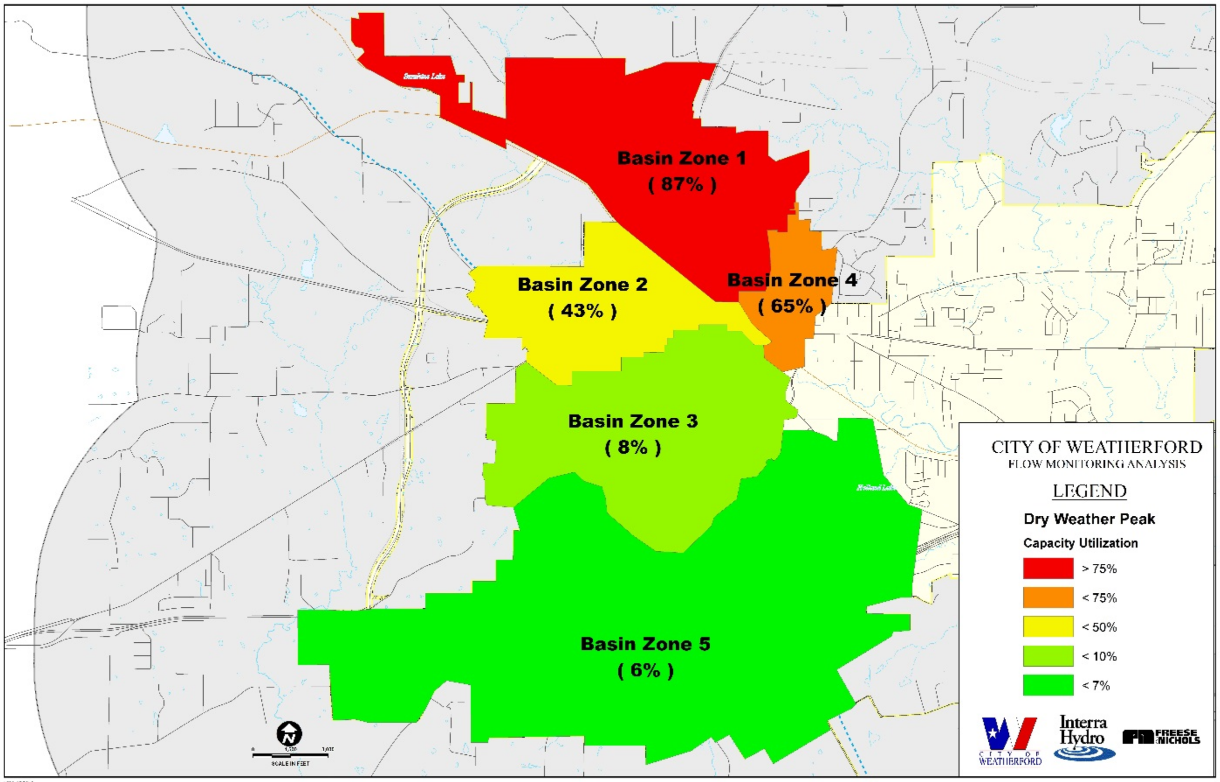


Figure ES-2: Dry Weather Capacity Utilization

Table ES-1: Peak Capacity Utilization

Flow Meter	Peak Dry Weather Flow (mgd)	Insitu Pipe Full Capacity (mgd)	Peak Flow/ Full Pipe Capacity (q/Q)
W001	0.34	0.39	87%
W002	0.70	1.61	43%
W003	0.84	10.77	8%
W004	0.84	1.28	66%
W005	1.19	21.14	6%

Three of the five monitored basins were found to contribute moderate to heavy levels of Normalized RDII (gallons of RDII/inches of rainfall/linear footage of basin). **Figure ES-3** shows the normalized RDII rates for each basin and **Figure ES-4** summarizes the percent contribution of RDII by basin. Basin 4 exhibited significant normalized RDII values from the outset of each wet weather event and would then escalate with subsequent rainfall events. A review of GIS collection system information revealed a potential 6 inch pipe connection from outside the predefined basin boundary, as well as possible inflow sources from Town Creek that crosses key collection system infrastructure. These possible sources will need to be evaluated during the model calibration phase to replicate the monitor's response to each rainfall event.

Rainfall response characteristics are critical to Interra's specialized investigative approach. The response from each rainfall event was evaluated against the insitu-full pipe capacity for each monitored basin, as well as depth over diameter and cumulative versus discrete RDII volumes. The following reviewed and approved evaluation toolsets were used in this investigation:

- Wet Weather Flow monitoring and rain gauge site investigation
- Flow meter calibration and verification
- Basin identification and Prioritization
- GIS Geodatabase Overlay

Program objectives as identified included:

- Identify capacity restrictions within monitored pipe segments
- Basin base flow patterns and capacity utilization
- Basin RDII determination and ranking
- Anticipated wet weather peak flows for optimum infrastructure modifications
- Baseline contributory RDII for comparison against post rehab performance data
- Identify potential target regions for additional sanitary sewer investigation/rehabilitation for continued I/I reduction programs
- Prepare Technical Report of all findings

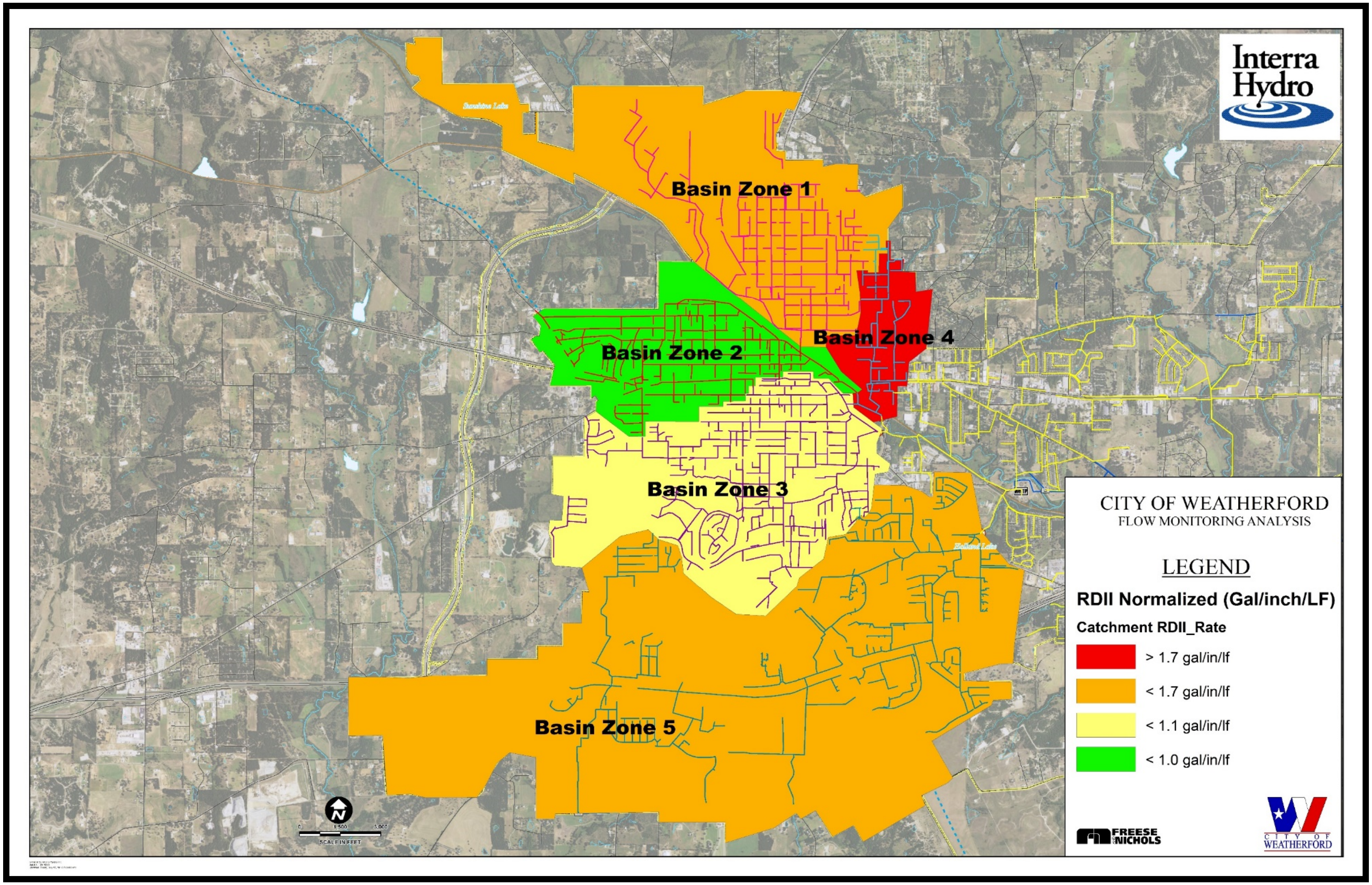


Figure ES-3: Normalized RDII Rates

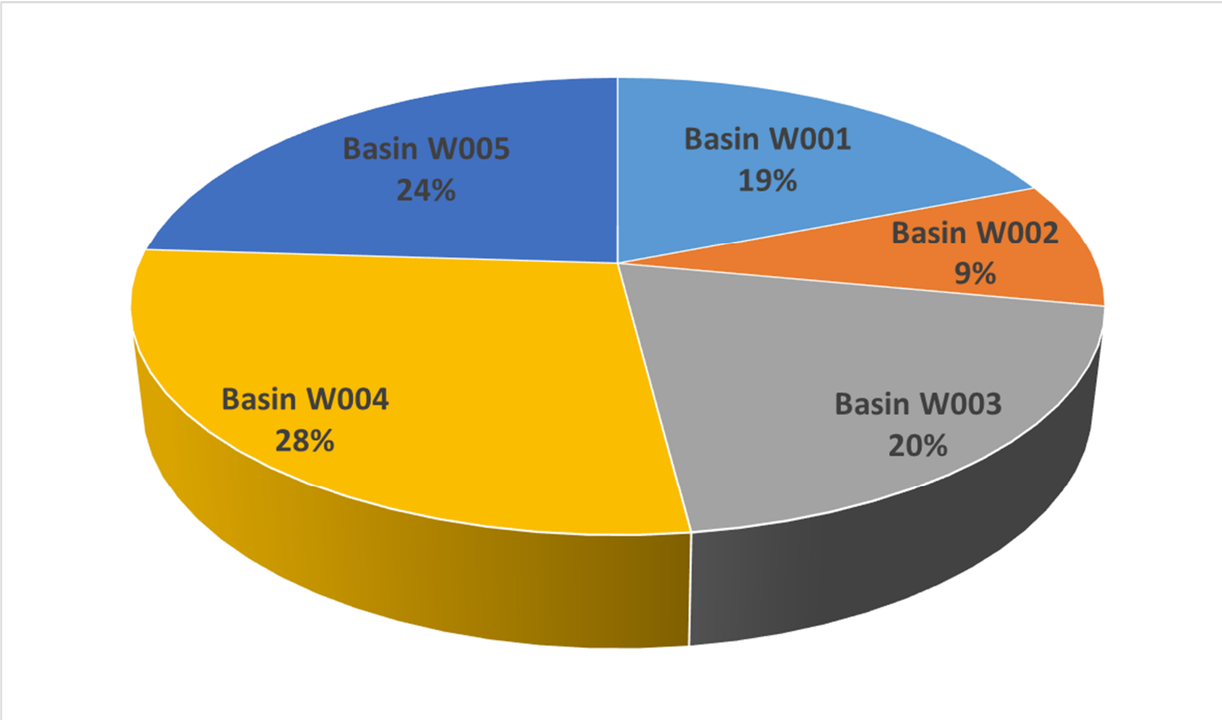


Figure ES-4: RDII Percent Contribution

An evaluation of the discrete RDII contributions showed that over 50% of the extraneous water was captured in two of the basins, Basin 4 and Basin 5. Basin 2 recorded less than 10% overall. For Basin 2, the combination of a moderate dry weather utilization (43% of pipe capacity) and low Normalized RDII Rate indicates that it is a moderately populated basin that does not experience high extraneous RDII contributions during rainfall events. The remaining four basins are recommended to be scheduled for a comprehensive Sanitary Sewer Rehabilitation Program, involving manhole inspections, smoke testing, dye-flooding, and CCTV investigation for identifying excessive inflow and infiltration sources, as well as direct storm water cross connections that are contributing to the heavy rainfall inundation of the collection system.

1.0 SCOPE OF WORK

The general activities and methodologies used for this project were outlined under the Scope of Work provided by City at the project's outset. These activities included project planning, preliminary evaluation and data collection, monitor site selection, wet weather flow monitoring, reporting and recommendations. The following is a summary of the tasks performed as part of this study:

1.1 TASK 1: PROJECT MANAGEMENT AND REPORTING

- General project management activities (project initiation, management oversight, general communications, etc.).
- Prepare status reports that outline project progress, problems encountered and proposed solutions and percentage of project completion.
- Conduct project planning and attend kickoff and/or other planned meetings.

1.2 TASK 2: PROJECT PLANNING

- Review available information on existing sanitary sewer network, geodatabase structure, and reporting capabilities.
- Identify and label sanitary sewer collection system assets in accordance with the labeling system imported from the City's files.
- Asset database evaluation
- GIS mapping for field investigation crews

1.3 TASK 3: RAINFALL RESPONSE HYDRAULIC EVALUATION

- Identify, site investigate, and establish flow monitoring and rainfall data collection points that provide even distribution and accurate response information.
- Delineate basin boundaries and review collection system assets within each boundary
- Perform routine site calibrations, data interrogation, and standard equipment verification to maintain targeted 90% monitor up-time.
- Ascertain dry-weather baseline flow conditions for each basin
- Determine dry weather available capacity of each basin interceptor
- Utilize rainfall-intensity data, quantify wet weather or Rainfall Dependent Inflow/Infiltration conditions for each basin
- Determine wet weather available capacity of each basin interceptor

1.4 TASK 4: REPORTING AND RECOMMENDATIONS

Prepare and submit this Technical Report detailing findings and observations of the investigation, along with the development of maps that illustrate the pertinent hydraulic characteristics of each basin.

Deliverables include:

- Wet weather, Dry weather, and RDII basin data
- Completed monitor site investigation forms
- Summary of investigation results
- Normalized RDII basin ranking

2.0 RAINFALL RESPONSE HYDRAULIC EVALUATION

A comprehensive collection system rainfall response and hydraulic evaluation requiring the installation of five (5) flow monitors and one (1) rain gauge, was conducted as part of the basin investigation. This level of monitoring was necessary to adequately deliver the resolution needed to quantify the base flow conditions versus the rainfall dependent inflow and infiltration (RDII) component during wet weather events. Based upon historical rainfall records for the City of Weatherford, it was determined that a monitoring period of approximately 30 days would be initially attempted to capture the necessary dry versus wet weather responses. This period from April 13, 2015 through May 12, 2015 provided both a 4 day period of dry weather flow diurnals and at least four significant rainfall events that triggered a wet weather response within each of the sanitary sewer collection system basins.

As part of the RDII evaluation, results from the Rainfall Response phase provided the necessary pre-model calibration basin data for:

- Individual basin base flow patterns and capacity utilization
- Individual basin RDII determination and ranking
- Anticipated wet weather peak flows for optimum infrastructure modifications
- Baseline contributory RDII for comparison against model performance data
- Identify potential target regions for future sanitary sewer investigation/rehabilitation for future I/I reduction programs

2.1 FLOW MONITOR BASIN DELINEATION

The City of Weatherford flow investigation used a density of one monitor per roughly every 120,000 linear feet based upon piping network and flow monitor placement. This high level of monitor density may serve for some hydraulic modeling calibration purposes, however caution must be exercised due to unforeseen losses through sanitary sewer overflows, system interconnections, and broad basin distribution of RDII components throughout the vast upstream network.

Flow monitor site selection was provided during the initial field preparation phase of project scope development and finalized with the submittal and approval of all site installation forms. **Table 2-1** lists the five flow monitor sites selected for basin investigation, along with assigned site id, address, and recorded pipe diameter. After the flow monitoring sites were evaluated, a delineation was provided of all upstream public pipe segments (excluding building service laterals) through GIS database records. Each pipe segment length was then added to generate a total basin linear footage (LF).

Table 2-1: Flow Meter and Rainfall Gauge Locations

Site Name	Address	Nominal Pipe Diameter (in.)	Basin Linear Footage (LF)
W001	385 N. Elm St.	12	108,014
W002	567 E. Oak St.	18	95,939
W003	Jack Borden Way	18	173,012
W004	Jack Borden Way	12	31,797
W005	1460 Holland Lake Dr.	24	189,644
RG101	567 E. Oak St.	Rain Gauge	N/A

A comparison of wet weather flow, RDII contributions and collection system responses to increasingly higher rainfall intensities required normalization in order to accurately evaluate each rainfall intensity against:

- The basin's conveyance capabilities
- Overall collection system responses
- RDII prioritization ranking
- The proper distribution of RDII components within the hydraulic model calibration

This normalization by total linear footage is the best comparative for collection systems as the monitored basins very greatly in area and collective pipe footage. The total rainfall induced RDII quantities are separated from baseline dry flows, then divided by the amount of rainfall recorded at the associated rainfall gauge, and then divided by the basin's collection system linear footage to yield a normalized RDII Rate in gallons/inch of rainfall/linear foot.

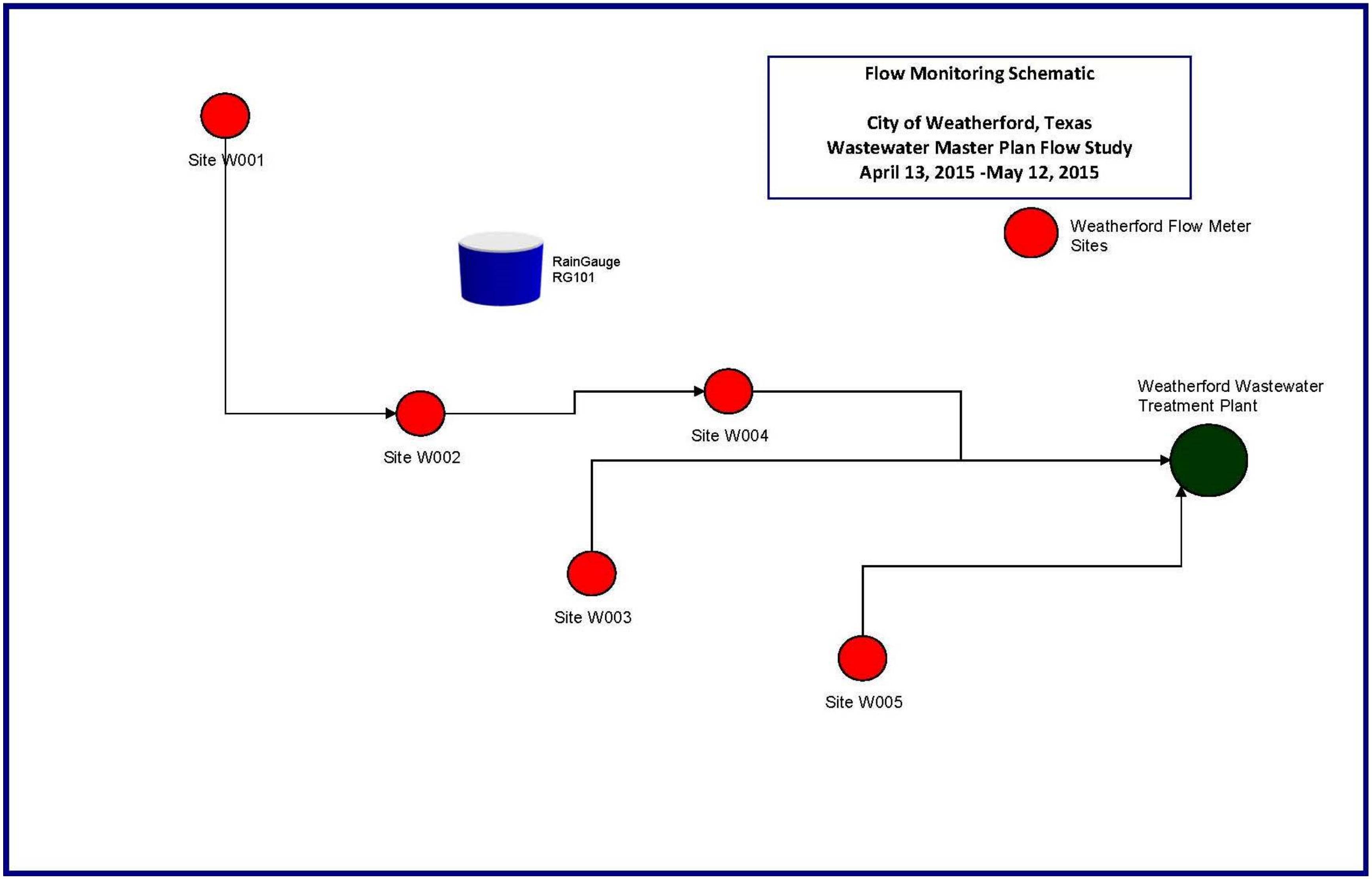


Figure 2-1: Flow Monitoring Schematic

2.2 RAINFALL RETURN-FREQUENCY EVALUATION

A tipping bucket style rainfall gauge was positioned within the investigation boundary to capture rainfall amounts in the study area. The rainfall gauge was synchronized with the flow monitors to measure rainfall amounts to the nearest 0.01 inch. All flow monitors and the rain gauge were synchronized and started recording data on 5 minute intervals prior to April 13, 2015. Typically, at least 3 to 5 wet weather events are necessary to accurately quantify all extraneous RDII, high groundwater and other wet weather flow influences from the underlying dry weather base flows.

As illustrated in the Intensity-Duration-Frequency (IDF) graph, in **Figure 6**, all four of the recorded events were below the *1-Yr Return Frequency* line for their given duration. An evaluation of the running average across all standard durations, in **Figure 7**, revealed the highest IDF points may have occurred during the shorter time periods of 15 to 60 minutes, where rainfall totals reached 0.90 inches. The recorded longer duration events did not yield any higher return frequency event conditions.

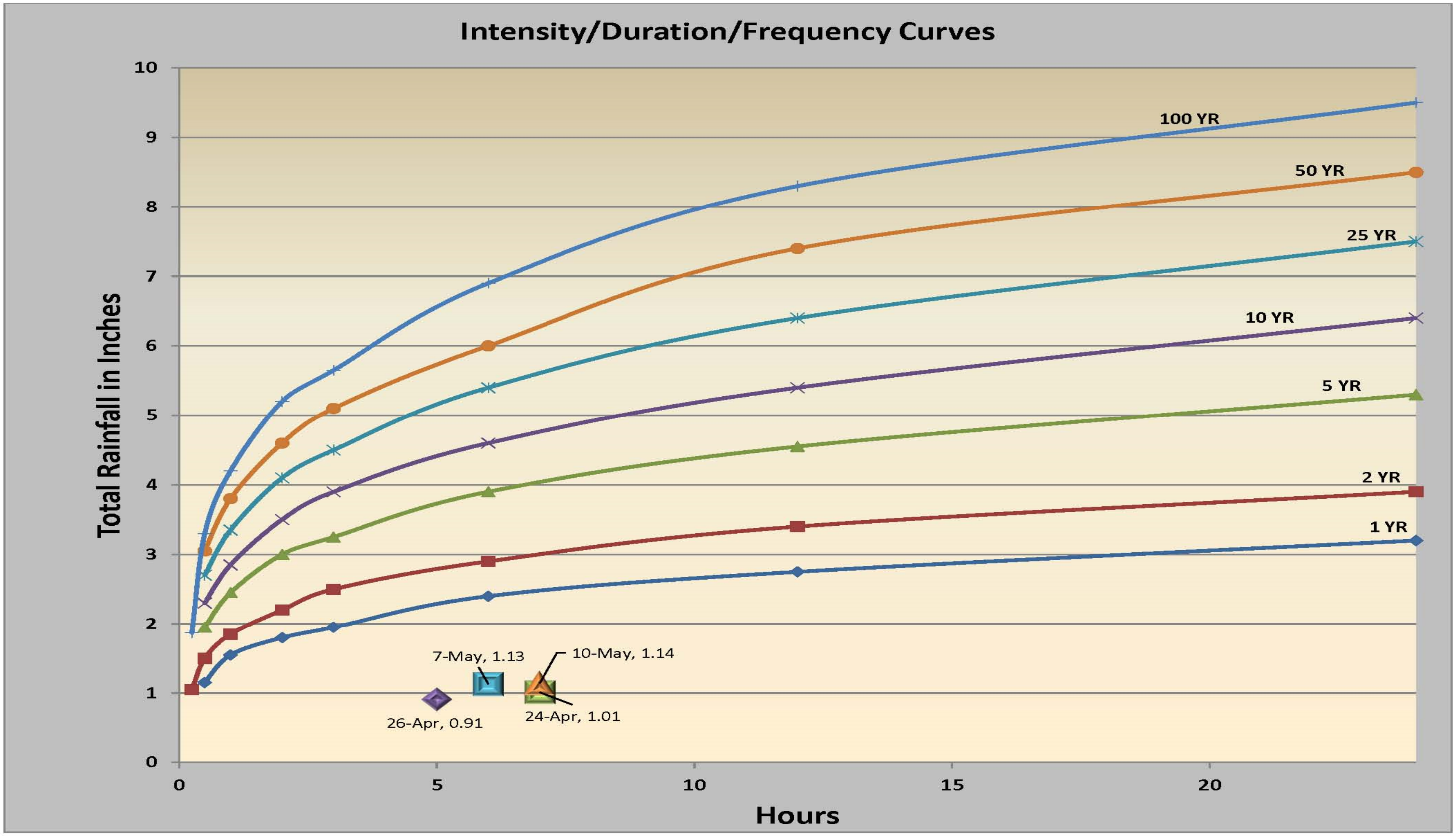


Figure 2-2: Rainfall I-D-F Curves

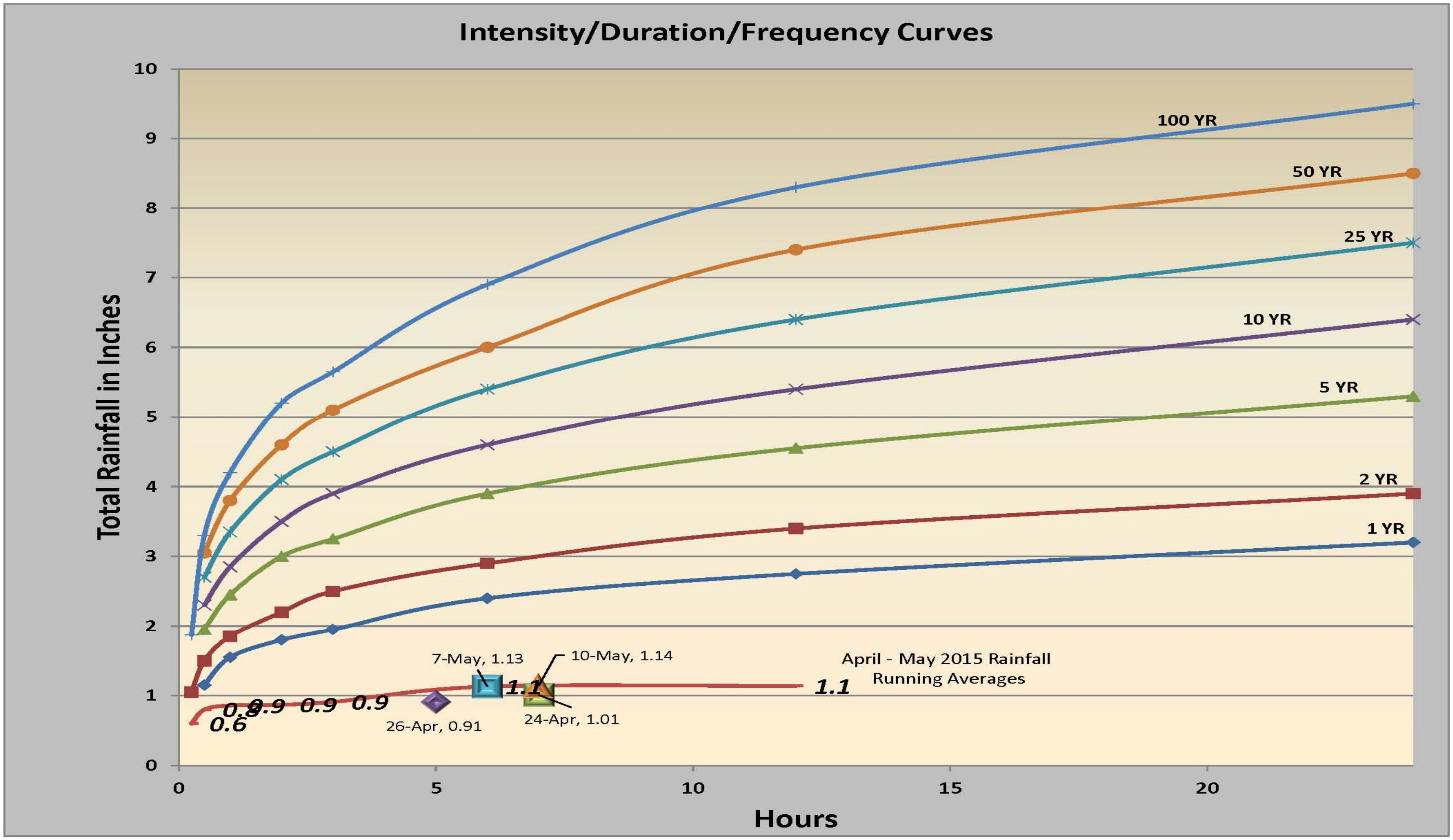


Figure 2-3: Rainfall I-D-F Running Average

2.3 WEATHERFORD RDII EVALUATION

Due to the abbreviated flow monitoring period, the dry weather investigation of the City's collection system required a shorter than normal diurnal pattern development. Typically, a full 7-day dry weather pattern is necessary for accurate weekday and weekend determination against the recorded wet weather responses. This baseline dry weather flow pattern yields more defined resolutions in RDII determination, as well as higher accuracy in hydraulic model calibration information.

The dry weather flow analysis revealed two basins were well over the standard of 50% utilization for their peak daily diurnal. This condition would indicate a strong likelihood of excessive backwater or surcharged conditions during moderate to heavy rainfall events. Figure 8 below prioritizes the three most northern basins with basin 2 being near this 50% level, more critically Basin 1 and Basin 4 are in excess of normal utilization levels.

Table 2-2: Typical Dry Weather Capacity

Site Information	W001	W002	W003	W004	W005
Insitu Pipe Capacity (mgd)	0.39	1.61	10.77	1.28	21.14
Pipe Dia (in)	12.13	17.50	18.00	11.88	23.56
Silt level (in)	1.00	1.00	0.00	0.00	0.00
Average Velocity (fps)	0.58	1.37	4.92	2.26	4.21
Cumulative Dry Weather Summary					
Selected Period	April 13-16, 2015	April 13-16, 2015	April 13-16, 2015	April 13-16, 2015	April 13-16, 2015
Daily Average Dry Depth (in)	7.05	6.04	2.88	5.16	2.57
Daily Average Flow (mgd.)	0.18	0.43	0.58	0.49	0.53
Maximum Depth (in)	8.83	7.92	3.70	6.56	4.10
Maximum Flow (mgd)	0.34	0.70	0.84	0.84	1.19
Minimum Depth (in)	5.59	4.34	2.18	3.30	1.25
Minimum Flow (mgd)	0.03	0.18	0.34	0.16	0.08
Average Percent Depth Used	58%	35%	16%	43%	11%
Average Percent Capacity Used	46%	27%	5%	38%	2%
Peak Percent of Depth Used	73%	45%	21%	55%	17%
Peak Percent of Capacity Used	87%	43%	8%	65%	6%

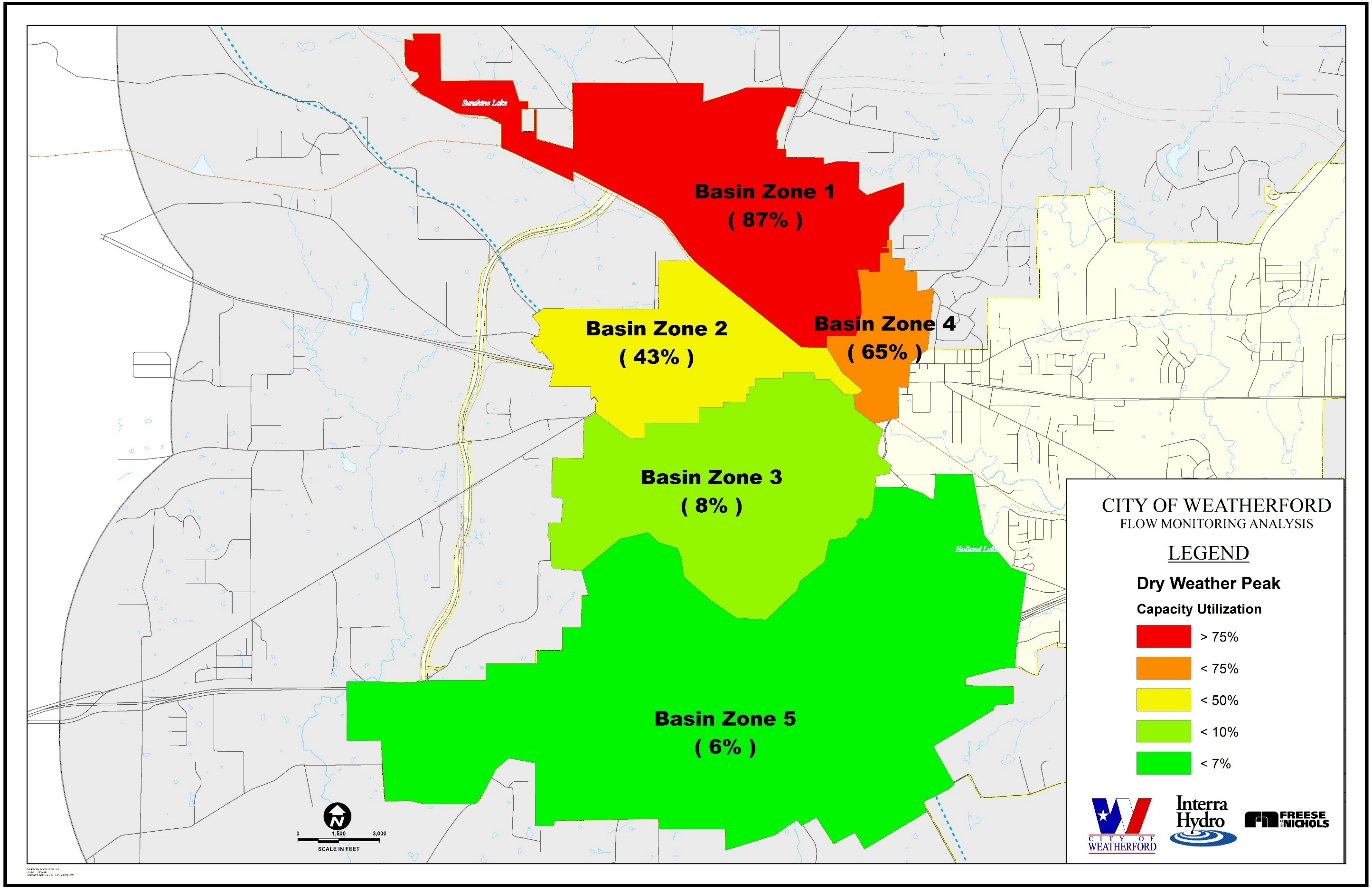


Figure 2-4: **Peak Dry Weather Capacity**

The City of Weatherford's discrete basin flow components, in **Table 3**, were determined for each rainfall event and correlated with wet weather flow responses to determine the extraneous RDII, capacity utilization, and normalized RDII values. **Tables 4 through 7** provide the individual basin's response characteristics per storm event. Since the rainfall events varied in both intensity and duration, these normalized RDII numbers were then averaged to generate the mean RDII value reflective for all return-frequencies.

Table 2-3: Normalized RDII by Basin

Site Meter	Date	Total Event Rainfall (in.)	Event Depth Average (in.)	Event Depth Peak (in.)	Cumulative-RDII Volume	Discrete-RDII Volume	Normalized RDII Rate (gal/in.)	Normalized RDII Rate (gal/in./ft)	Average Normalized RDII (gal/in)	Average Normalized RDII Rate (gal/in/ft)
W001	24-Apr-2015	1.21	7.79	12.57	67,626	67,626	55,890	0.52		
	26-Apr-2015	1.56	7.95	19.72	284,217	284,217	182,190	1.69		
	7-May-2015	1.94	7.92	23.94	273,369	273,369	140,912	1.30		
	10-May-2015	1.7	8.75	20.95	535,784	535,784	315,167	2.92	173,540	1.61
W002	24-Apr-2015	1.21	9.06	39.97	139,811	72,185	59,657	0.62		
	26-Apr-2015	1.56	10.51	57.05	1,078,611	144,550	92,660	0.97		
	7-May-2015	1.94	11.44	65.81	345,812	72,443	37,342	0.39		
	10-May-2015	1.7	16.61	66.61	739,913	204,129	120,076	1.25	77,434	0.81
W003	24-Apr-2015	1.21	4.14	33.36	63,164	63,164	52,202	0.30		
	26-Apr-2015	1.56	6.07	29.69	216,961	216,961	139,078	0.80		
	7-May-2015	1.94	3.84	30.91	268,983	268,983	138,651	0.80		
	10-May-2015	1.7	4.46	22.83	675,581	675,581	397,401	2.30	181,833	1.05
W004	24-Apr-2015	1.21	8.87	40.77	228,489	88,677	73,287	2.30		
	26-Apr-2015	1.56	10.17	49.85	2,622,351	673,904	431,990	13.59		
	7-May-2015	1.94	8.58	38.22	682,059	336,247	173,323	5.45		
	10-May-2015	1.7	14.54	35.89	1,299,464	559,551	329,148	10.35	251,937	7.92
W005	24-Apr-2015	1.21	2.82	4.30	119,096	119,096	98,427	0.52		
	26-Apr-2015	1.56	2.78	4.24	149,647	149,647	95,928	0.51		
	7-May-2015	1.94	2.87	4.88	237,916	237,916	122,637	0.65		
	10-May-2015	1.7	3.71	6.78	947,676	947,676	557,456	2.94	218,612	1.15

The wet weather analysis of the individual events from April 24, 2015 and May 7, 2015 yielded slight to moderate normalized RDII rates of 0.5 to 2.3 gal/in/lf, as each event was preceded by a period of dry flow conditions. However, the collection system RDII response due to the sequenced rainfall events of April 26, 2015 and May 10, 2015 yielded increases in normalized RDII rates on the order of 5x to 6x. This RDII response pattern was evident in both sets of sequential rainfall periods and should be considered critical in accurately calibrating the hydraulic model application and capital improvement planning. While increases in RDII rates are expected with such sequenced events, the high order of increase within these basins would suggest either heavy direct inflow sources as water levels rise within area storm drains or creeks, or a series of collection system interconnects between these and un-monitored basins. In either case, a comprehensive field investigation with RDII source evaluation and collection system connectivity determination is critical to hydraulic model replication.

Table 2-4: April 24, 2015 Event

Site Wet Weather Information	W001	W002	W003	W004	W005
Sub-Basin Linear PipeFootage (ft.)	108,014	95,939	173,012	31,797	189,644
Insitu Pipe Capacity (mgd)	0.39	1.61	10.77	1.28	21.14
Pipe Dia (in.)	12.13	17.50	18.00	11.88	23.56
Comparison Dry Depth (in.)	7.05	6.04	2.88	5.16	2.57
Event(mgd)	0.18	0.43	0.58	0.49	0.53
Wet Weather Event	April 24, 2015	April 24, 2015	April 24, 2015	April 24, 2015	April 24, 2015
Event Depth Average (in.)	7.79	9.06	4.14	8.87	2.82
Event Depth Peak (in.)	12.57	39.97	33.36	40.77	4.30
Event Cumlative Avg Flow (mgd)	0.24	0.57	0.65	0.72	0.65
Event Peak Flow Rate (mgd.)	0.59	1.60	2.12	1.54	1.41
Average Percent of Depth Used	64%	52%	23%	75%	12%
Average Percent of Capacity Used	63%	35%	6%	56%	3%
Peak Percent of Depth Used	104%	228%	185%	343%	18%
Peak Percent Flow Capacity Used	153%	99%	20%	120%	7%
Wet Weather RDII					
Total Event Rainfall (in)	1.21	1.21	1.21	1.21	1.21
Cumulative RDII Volume (gal)	67,626	139,811	63,164	228,489	119,096
Discrete RDII Volume (gal)	67,626	72,185	63,164	88,677	119,096
Normalized RDII Rate (gal/ in)	55,890	59,657	52,202	73,287	98,427
Normalized RDII Rate (gal/ in/lf)	0.52	0.62	0.30	2.30	0.52

Table 2-5: April 26, 2015 Event

Site Wet Weather Information	W001	W002	W003	W004	W005
Sub-Basin Linear PipeFootage (ft.)	108,014	95,939	173,012	31,797	189,644
Insitu Pipe Capacity (mgd)	0.39	1.61	10.77	1.28	21.14
Pipe Dia (in.)	12.13	17.50	18.00	11.88	23.56
Comparison Dry Depth (in.)	7.05	6.04	2.88	5.16	2.57
Event(mgd)	0.18	0.43	0.58	0.49	0.53
Wet Weather Event	April 26-27, 2015	April 26-27, 2015	April 26-27, 2015	April 26-27, 2015	April 26-27, 2015
Event Depth Average (in.)	7.95	10.51	6.07	10.17	2.78
Event Depth Peak (in.)	19.72	57.05	29.69	49.85	4.24
Event Cumlative Avg Flow (mgd)	0.32	0.65	0.69	1.01	0.60
Event Peak Flow Rate (mgd.)	1.11	1.64	1.99	1.90	1.49
Average Percent of Depth Used	66%	60%	34%	86%	12%
Average Percent of Capacity Used	83%	40%	6%	79%	3%
Peak Percent of Depth Used	163%	326%	165%	420%	18%
Peak Percent Flow Capacity Used	287%	101%	18%	149%	7%
Wet Weather RDII					
Total Event Rainfall (in)	1.56	1.56	1.56	1.56	1.56
Cumulative RDII Volume (gal)	284,217	1,078,611	216,961	2,622,351	149,647
Discrete RDII Volume (gal)	284,217	144,550	216,961	673,904	149,647
Normalized RDII Rate (gal/ in)	182,190	92,660	139,078	431,990	95,928
Normalized RDII Rate (gal/ in/lf)	1.69	0.97	0.80	13.59	0.51

Table 2-6: May 7, 2015 Event

Site Wet Weather Information	W001	W002	W003	W004	W005
Sub-Basin Linear PipeFootage (ft.)	108,014	95,939	173,012	31,797	189,644
Insitu Pipe Capacity (mgd)	0.39	1.61	10.77	1.28	21.14
Pipe Dia (in.)	12.13	17.50	18.00	11.88	23.56
Comparison Dry Depth (in.)	7.05	6.04	2.88	5.16	2.57
Event(mgd)	0.18	0.43	0.58	0.49	0.53
Wet Weather Event	May 7, 2015	May 7, 2015	May 7, 2015	May 7, 2015	May 7, 2015
Event Depth Average (in.)	7.92	11.44	3.84	8.58	2.87
Event Depth Peak (in.)	23.94	65.81	30.91	38.22	4.88
Event Cumlative Avg Flow (mgd)	0.31	0.60	0.72	0.83	0.64
Event Peak Flow Rate (mgd.)	1.19	1.56	3.45	2.05	1.88
Average Percent of Depth Used	65%	65%	21%	72%	12%
Average Percent of Capacity Used	81%	37%	7%	65%	3%
Peak Percent of Depth Used	197%	376%	172%	322%	21%
Peak Percent Flow Capacity Used	307%	97%	32%	160%	9%
Wet Weather RDII					
Total Event Rainfall (in)	1.94	1.94	1.94	1.94	1.94
Cumulative RDII Volume (gal)	136,684	172,906	134,492	341,030	118,958
Discrete RDII Volume (gal)	136,684	36,222	134,492	168,123	118,958
Normalized RDII Rate (gal/ in)	70,456	18,671	69,326	86,662	61,319
Normalized RDII Rate (gal/ in/lf)	0.65	0.19	0.40	2.73	0.32

Table 2-7: May 10, 2015 Event

Site Wet Weather Information	W001	W002	W003	W004	W005
Sub-Basin Linear PipeFootage (ft.)	108,014	95,939	173,012	31,797	189,644
Insitu Pipe Capacity (mgd)	0.39	1.61	10.77	1.28	21.14
Pipe Dia (in.)	12.13	17.50	18.00	11.88	23.56
Comparison Dry Depth (in.)	7.05	6.04	2.88	5.16	2.57
Event(mgd)	0.18	0.43	0.58	0.49	0.53
Wet Weather Event	May 10, 2015	May 10, 2015	May 10, 2015	May 10, 2015	May 10, 2015
Event Depth Average (in.)	8.75	16.61	4.46	14.54	3.71
Event Depth Peak (in.)	20.95	66.61	22.83	35.89	6.78
Event Cumlative Avg Flow (mgd)	0.45	0.80	0.92	1.14	1.00
Event Peak Flow Rate (mgd.)	1.20	1.65	2.78	2.04	2.95
Average Percent of Depth Used	72%	95%	25%	122%	16%
Average Percent of Capacity Used	115%	50%	9%	89%	5%
Peak Percent of Depth Used	173%	381%	127%	302%	29%
Peak Percent Flow Capacity Used	309%	102%	26%	159%	14%
Wet Weather RDII					
Total Event Rainfall (in)	1.70	1.70	1.70	1.70	1.70
Cumulative RDII Volume (gal)	267,892	369,957	337,791	649,732	473,838
Discrete RDII Volume (gal)	267,892	102,065	337,791	279,776	473,838
Normalized RDII Rate (gal/ in)	157,583	60,038	198,700	164,574	278,728
Normalized RDII Rate (gal/ in/lf)	1.46	0.63	1.15	5.18	1.47

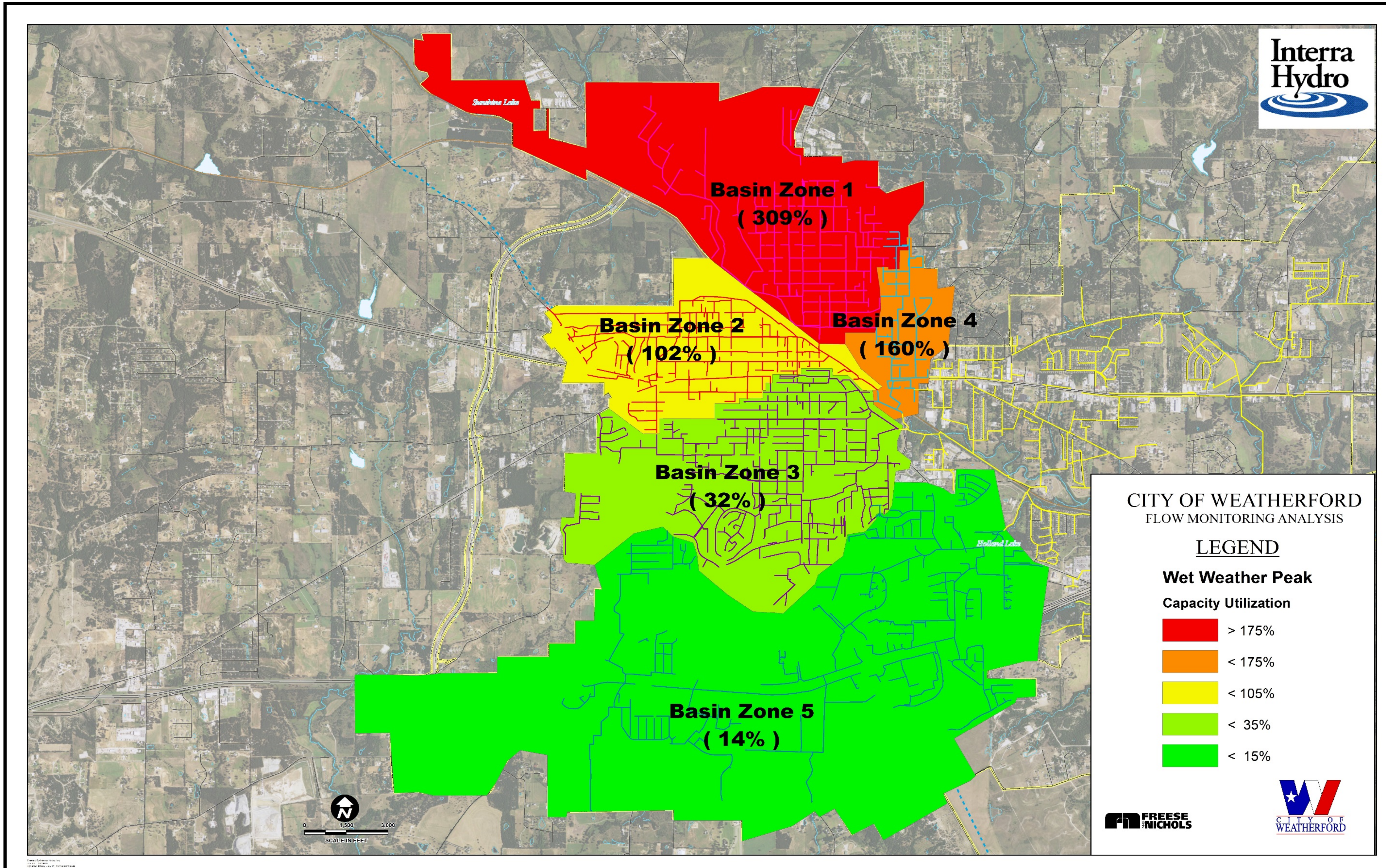


Figure 2-5: **Wet Weather Capacity Utilization**

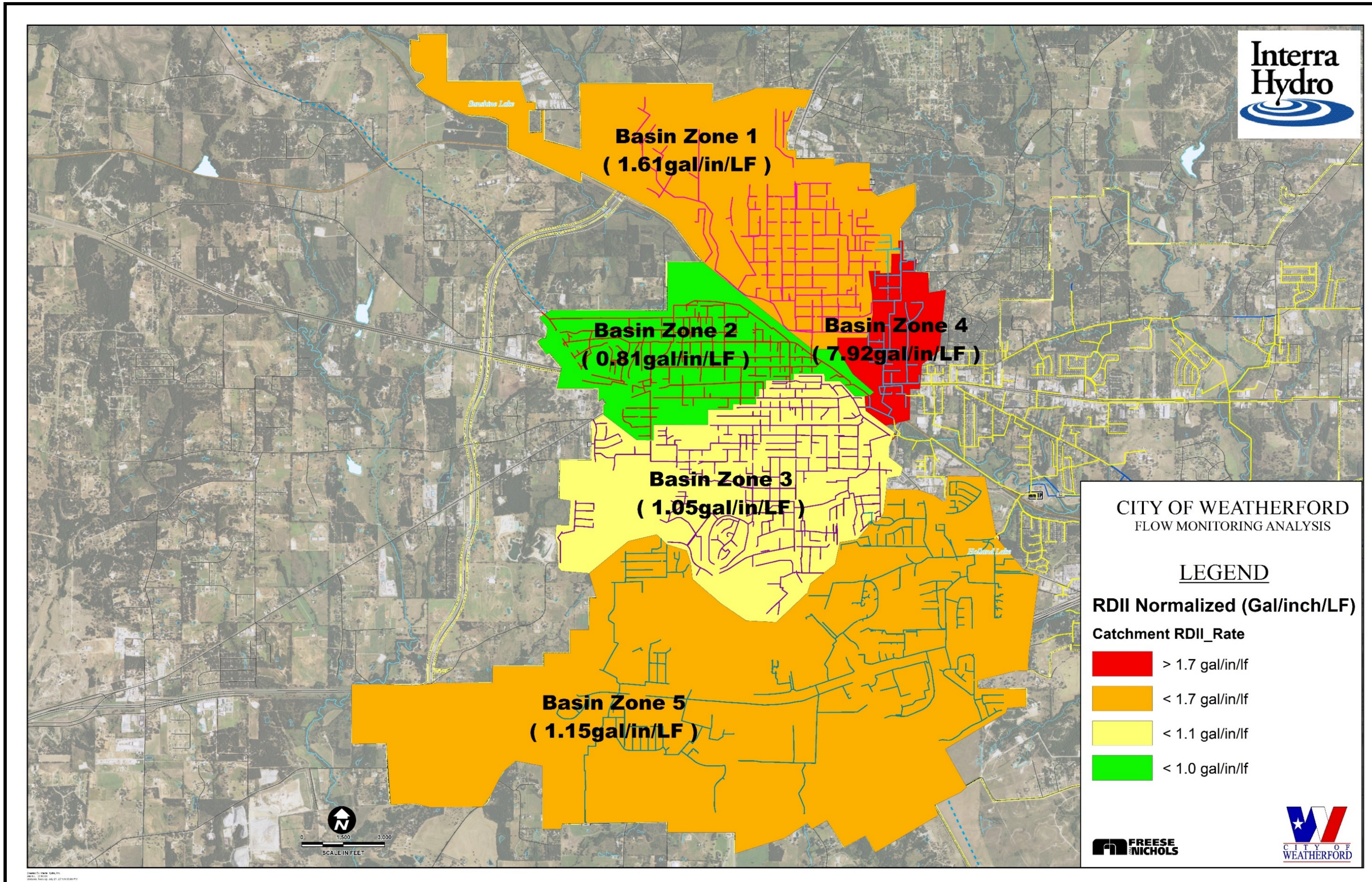


Figure 2-6: RDII – Normalized by Basin

3.0 BASIN EVALUATION

The wet weather capacity utilization for Basin 1 was significantly higher, 309% of pipe capacity, than the other basins which would be reflective of higher collection system surcharging and potential overflow conditions during heavier rainfall events. Basin 4 was within the moderate utilization range for four analyzed rainfall events and could also experience surcharge conditions during heavier rainfall events.

The Weatherford collection system basins had even distribution across all of the Heavy, Moderate, and Slight RDII Rankings as monitored and analyzed under this study. Successive rainfall patterns, totalizer monitoring and heavy surcharge conditions presented a challenge, but the conditions are indicative of an aging collection system expanded to accommodate growth. Basin 4 was rated as a Heavy RDII Contributor at 7.92 gal/inch/lf, while Basin 1 and Basin 5 were rated in the Moderate Range for RDII Contribution at 1.61 gal/inch/lf and 1.15 gal/inch/lf, respectively.

Basin 2 exhibited moderate dry weather utilization, the low normalized RDII contribution rate, placed this basin as the lowest priority for follow-up investigation or extensive model calibration verification. The mainline pipe diameter through the monitored area for Basin 2 provided sufficient capacity to accommodate each of the recorded rainfall events

Basin 3 and Basin 5 each experienced moderate normalized RDII contribution rates with very low capacity utilization during the recorded rainfall events. This combination indicates an under-development aspect for these areas with potential for growth without hindrance of capacity restrictions.

4.0 PROGRAM RECOMMENDATIONS

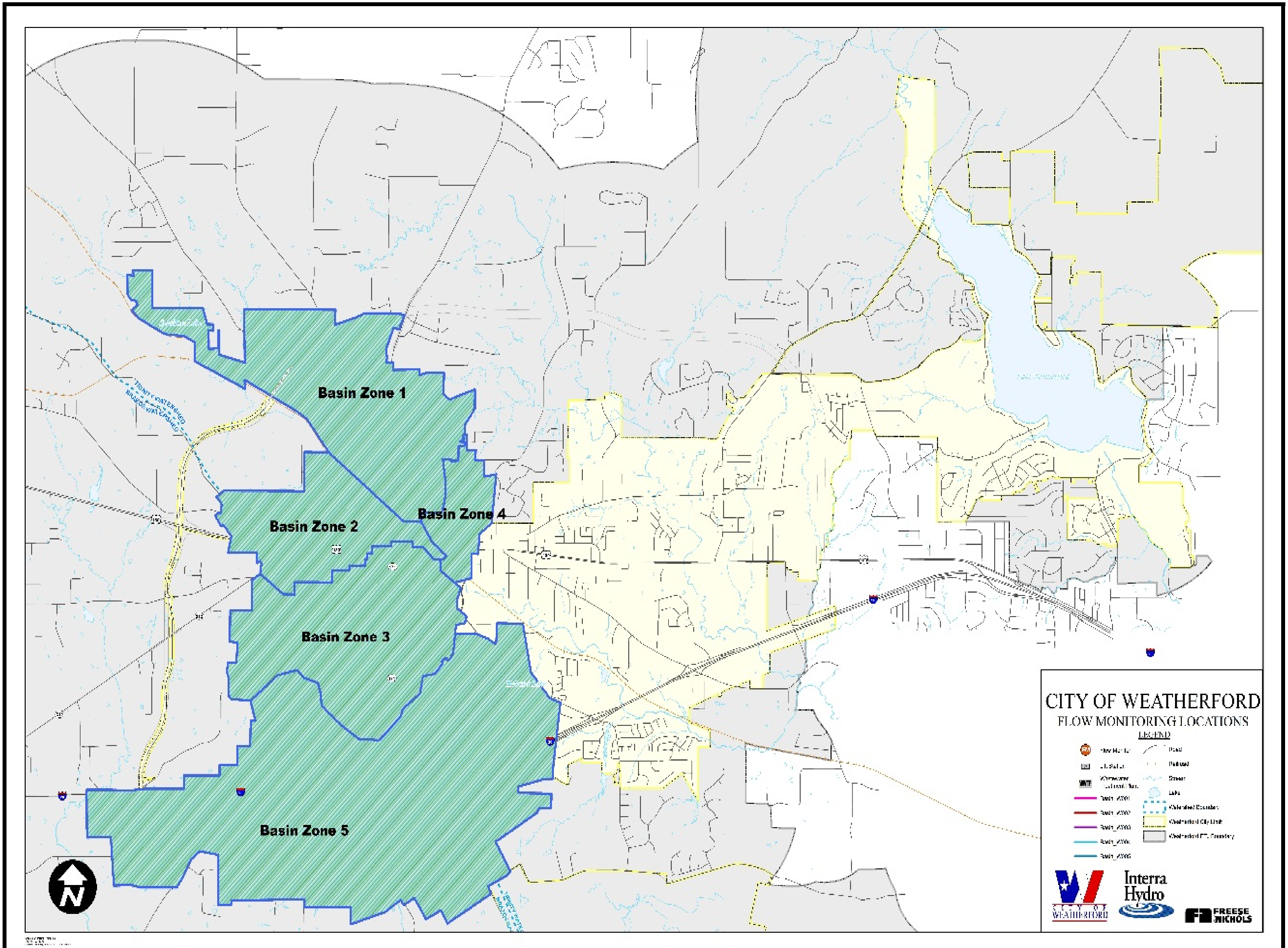
After reviewing the dry weather, wet weather analysis and collection system responses to isolated and successive rainfall events, the focus of the hydraulic model calibration, Master Plan effort, as well as recommended collection system improvements should be tailored to those basins exhibiting stressed conditions due either to city growth and expansion in upstream directions, or due to aging and deteriorated pipe conditions contributing to the higher RDII Rates. The relative number of moderate to heavy dry weather capacity utilization basin, which indicates some level of higher than planned population densities, may prove challenging for hydraulic model calibration. However, once calibrated, the model should provide a more definitive outlook on future growth projections and provide a schedule of projects to alleviate these overburdened collection system mainlines and interceptors.

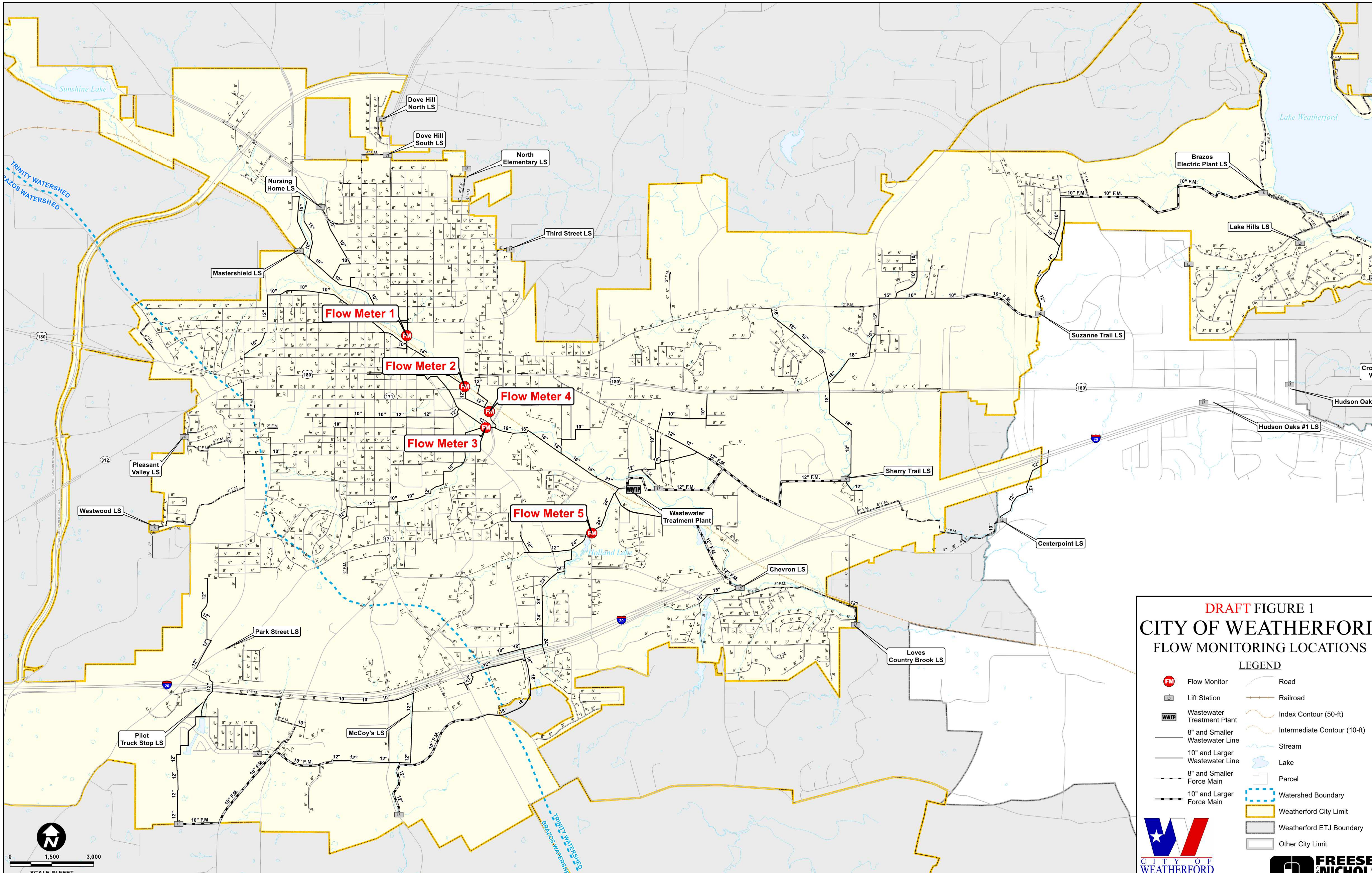
As part of the Master Plan recommendations, a comprehensive collection system investigation should be incorporated to provide the City of Weatherford with the definitive schedule of capital projects to address RDII contributions from within the deteriorated basins. This effort would include a review of existing collection system information, manhole inspections, smoke testing investigations, dye-flooding and CCTV investigations for identifying excessive inflow and infiltration sources. The study would also include evaluation of both direct storm water cross connections as well as interconnection within the collection system to better monitor and correct RDII contributions during heavy rainfall inundations of the collection system.

Appendix A

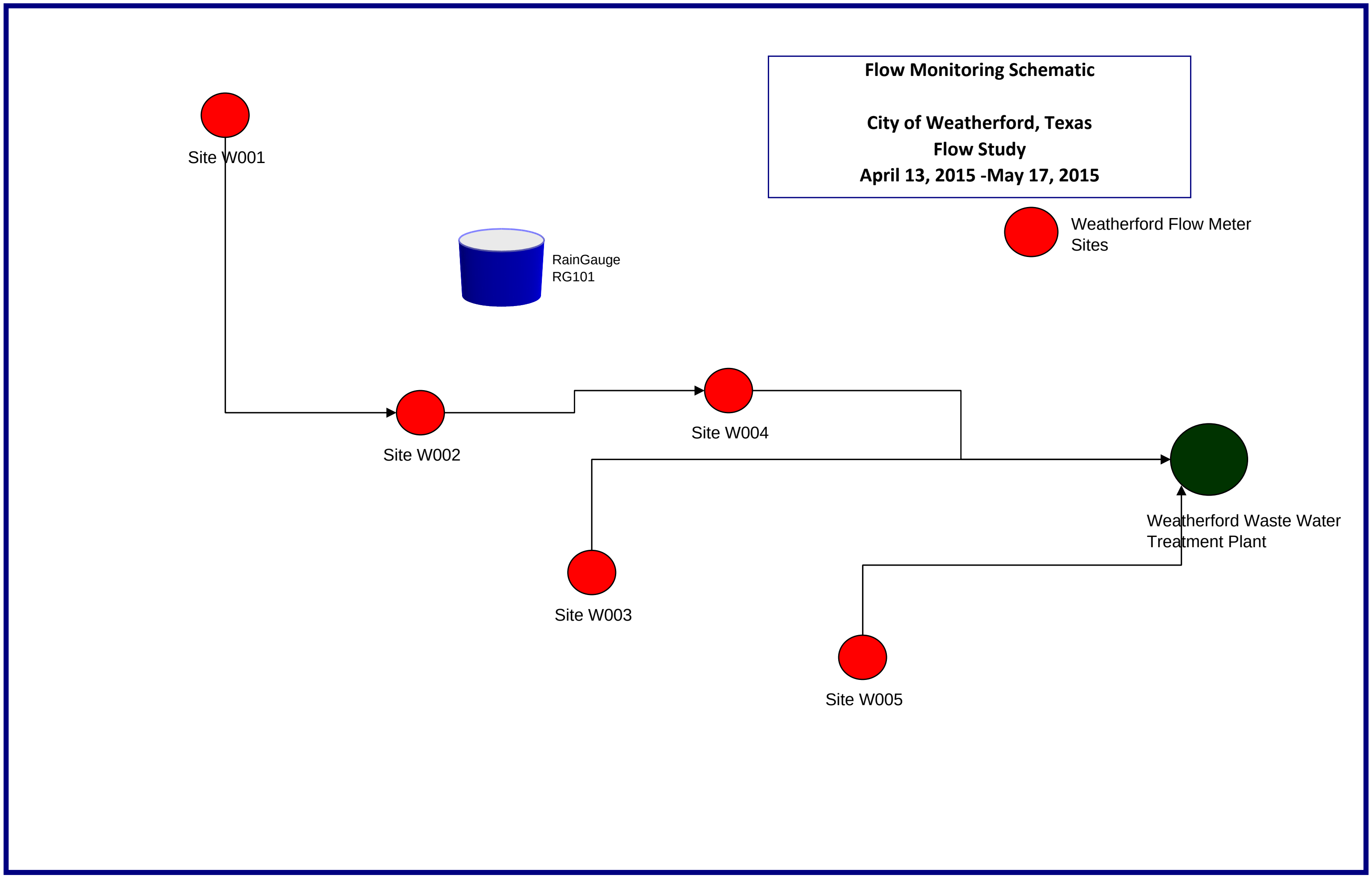
Summary of Appendix A:

- Delineated Basin/Project Image
- Flow Monitoring Site Inspection Forms
- Catchment Flow Monitoring Summary Reports
- Scatter Plots
- Monthly, Hourly, and 15min D,V,Q Site Hydrographs


Basin Zone 1
Basin Zone 2
Basin Zone 3
Basin Zone 4
Basin Zone 5
CITY OF WEATHERFORD
FLOW MONITORING LOCATIONS
LEGEND
Interra Hydro
FREESE NICHOLS



DRAFT FIGURE 1
CITY OF WEATHERFORD
FLOW MONITORING LOCATIONS
LEGEND
Flow Monitor
Lift Station
Wastewater Treatment Plant
8" and Smaller Wastewater Line
10" and Larger Wastewater Line
8" and Smaller Force Main
10" and Larger Force Main
Road
Railroad
Index Contour (50-ft)
Intermediate Contour (10-ft)
Stream
Lake
Parcel
Watershed Boundary
Weatherford City Limit
Weatherford ETJ Boundary
Other City Limit
CITY OF WEATHERFORD
FREESE AND NICHOLS
Flow Meter 1
Flow Meter 2
Flow Meter 3
Flow Meter 4
Flow Meter 5
Dove Hill North LS
Dove Hill South LS
North Elementary LS
Nursing Home LS
Third Street LS
Mastershield LS
Brazos Electric Plant LS
Lake Hills LS
Suzanne Trail LS
Hudson Oaks #1 LS
Sherry Trail LS
Wastewater Treatment Plant
Centerpoint LS
Chevron LS
Loves Country Brook LS
Pleasant Valley LS
Westwood LS
Park Street LS
Pilot Truck Stop LS
McCoy's LS
Sunshine Lake
Lake Weatherford
Holland Lake
TRINITY WATERSHED
BRAZOS WATERSHED
0
1,500
3,000
SCALE IN FEET


Flow Monitoring Schematic
City of Weatherford, Texas
Flow Study
April 13, 2015 -May 17, 2015
Weatherford Flow Meter Sites
RainGauge RG101
Site W001
Site W002
Site W004
Site W003
Site W005
Weatherford Waste Water Treatment Plant

Weatherford Site Location Information

Site Name	*Site ID*	*Site Address*	*Nominal Pipe Size (in.)*
Site W001	15003-001	385 N. Elm St.	12"
Site W002	15003-002	567 E. Oak St.	18"
Site W003	15003-003	Jack Borden Way	18"
Site W004	15003-004	Jack Borden Way	12"
Site W005	15003-005	1460 Holland Lake Dr.	24"
RG 101	15003-101	567 E. Oak St.	RainGauge

Flow Monitoring Site Sheet

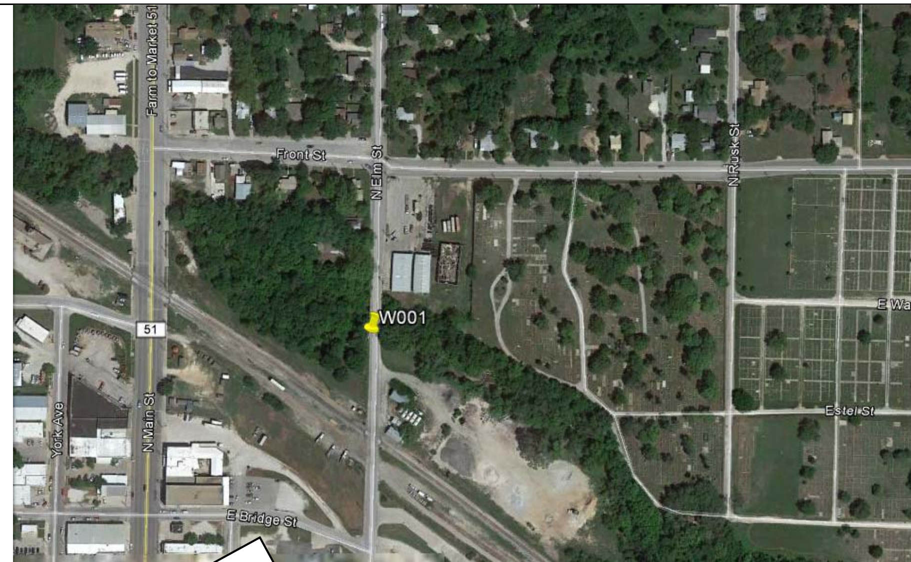
Interra Hydro

Flow Service Provider

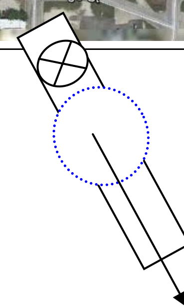
Project Name	Weatherford MP Flow Monitoring	Job #	2015003
Personnel	BD/AH/CR	Date	04/12/2015

Site Location Information

Site Name	W001		
Meter ID	15003001		
Site Location	Roadside		
Address	385 N Elm St.		
Traffic Cond	Medium		
Mh Number	4776		
Mh Depth	7.20”	Gas	O2



Rotate View



Planar View

N

Meter configuration Information

Meter Serial	20500000729
Sensor Serial	40200003922
Power	Battery
Logging Cycle	15 min
Telemetry	RS232
Site Status	Running

Site Characteristics

Pipe Diameter	12.25”H x 12”W	Pipe Type	DI
Pipe Shape	Circular	Surcharge	0
Turbulence	Smooth	Silt level	Gravel
Hydraulics	Good		

Install Calibration and Profile

Avg. Velocity	Time	DOF	Meter Level	Meter Velocity
1 fps	13:24	7.75”	7.723”	.74 fps

Site name W001

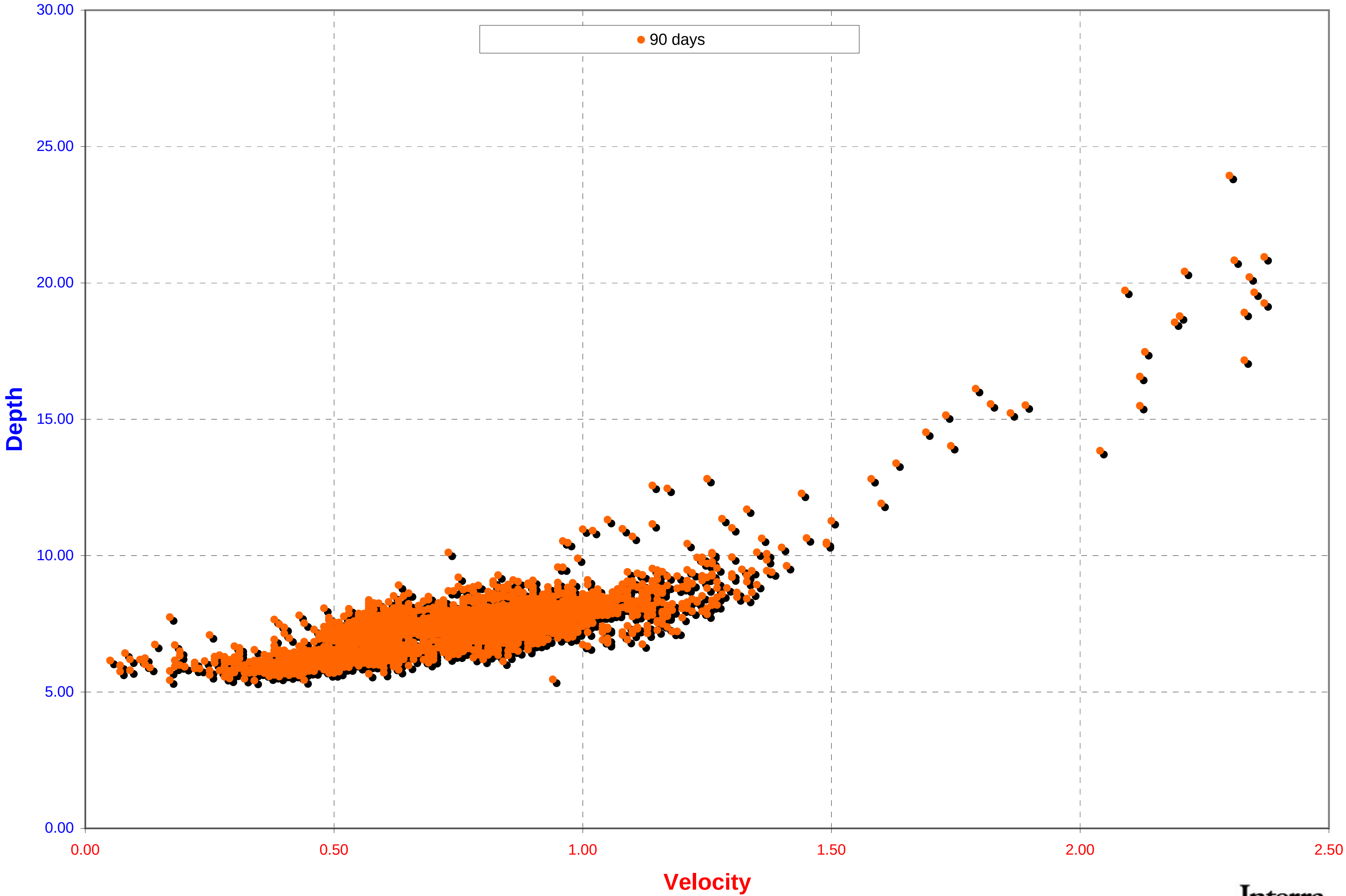
Daily Flow Summary
Site W001

Date	Depth Average (inches)	Flow Average (mgd)	Depth Maximum (in.)	Flow Maximum (mgd)	Depth Minimum (in.)	Flow Minimum (mgd)	Velocity Average (fps)	Velocity Maximum (fps)	Daily Rain (in)
13-Apr-15	7.12	0.178	8.80	0.341	5.75	0.031	0.57	0.90	0.21
14-Apr-15	7.12	0.183	9.11	0.348	5.74	0.013	0.59	0.91	0.13
15-Apr-15	6.98	0.171	8.77	0.330	5.44	0.031	0.56	0.87	0.00
16-Apr-15	7.00	0.176	8.65	0.332	5.42	0.048	0.58	0.87	0.00
17-Apr-15	7.17	0.184	9.09	0.363	5.43	0.021	0.58	0.94	0.47
18-Apr-15	7.10	0.185	8.65	0.329	5.71	0.068	0.60	0.88	0.44
19-Apr-15	7.28	0.202	8.76	0.353	5.77	0.064	0.63	0.98	0.00
20-Apr-15	7.29	0.193	8.91	0.326	5.89	0.028	0.60	0.95	0.00
21-Apr-15	7.09	0.175	8.92	0.317	5.75	0.064	0.57	0.92	0.01
22-Apr-15	7.30	0.197	9.20	0.330	5.67	0.054	0.61	0.97	0.12
23-Apr-15	7.15	0.181	8.69	0.343	5.57	0.016	0.58	0.95	0.16
24-Apr-15	7.79	0.245	12.57	0.591	5.87	0.013	0.69	1.17	1.21
25-Apr-15	7.31	0.241	8.92	0.365	6.04	0.108	0.76	0.97	0.01
26-Apr-15	7.95	0.289	19.72	1.111	5.96	0.053	0.82	2.20	1.08
27-Apr-15	7.94	0.350	11.70	0.664	6.26	0.200	1.00	1.36	0.48
28-Apr-15	7.34	0.291	8.50	0.420	6.19	0.158	0.91	1.12	0.05
29-Apr-15	7.32	0.270	8.57	0.405	5.97	0.123	0.85	1.10	0.00
30-Apr-15	7.21	0.249	8.66	0.412	5.86	0.051	0.80	1.09	0.00
1-May-15	7.02	0.234	8.03	0.336	5.67	0.106	0.77	1.04	0.08
2-May-15	7.12	0.234	8.38	0.362	5.75	0.082	0.76	0.99	0.00
3-May-15	7.40	0.251	8.84	0.403	5.95	0.105	0.77	1.10	0.00
4-May-15	7.39	0.238	8.51	0.365	6.08	0.094	0.74	1.03	0.00
5-May-15	7.30	0.231	8.49	0.374	5.81	0.081	0.72	1.00	0.16
6-May-15	7.32	0.247	8.51	0.356	5.86	0.093	0.77	0.98	0.21
7-May-15	8.12	0.306	23.94	1.187	5.86	0.102	0.86	2.35	1.93
8-May-15	7.72	0.322	12.81	0.798	6.12	0.168	0.95	1.58	0.01
9-May-15	7.39	0.279	8.89	0.440	5.97	0.111	0.86	1.13	0.16
10-May-15	9.51	0.492	20.95	1.197	6.35	0.084	1.20	2.37	1.69
11-May-15	7.98	0.398	9.54	0.539	6.68	0.282	1.14	1.34	0.01
12-May-15	8.00	0.346	9.77	0.538	6.58	0.185	0.98	1.26	0.13
13-May-15	8.49	0.406	11.55	0.724	6.15	0.140	1.06	1.50	0.90
14-May-15	8.15	0.377	9.48	0.518	6.50	0.237	1.05	1.25	0.04
15-May-15	7.84	0.345	8.84	0.439	6.41	0.217	1.01	1.14	0.00
16-May-15	7.71	0.332	8.95	0.470	6.32	0.178	0.98	1.27	0.00
17-May-15	7.98	0.356	9.72	0.557	6.57	0.193	1.01	1.37	0.46

Interterra Hydro

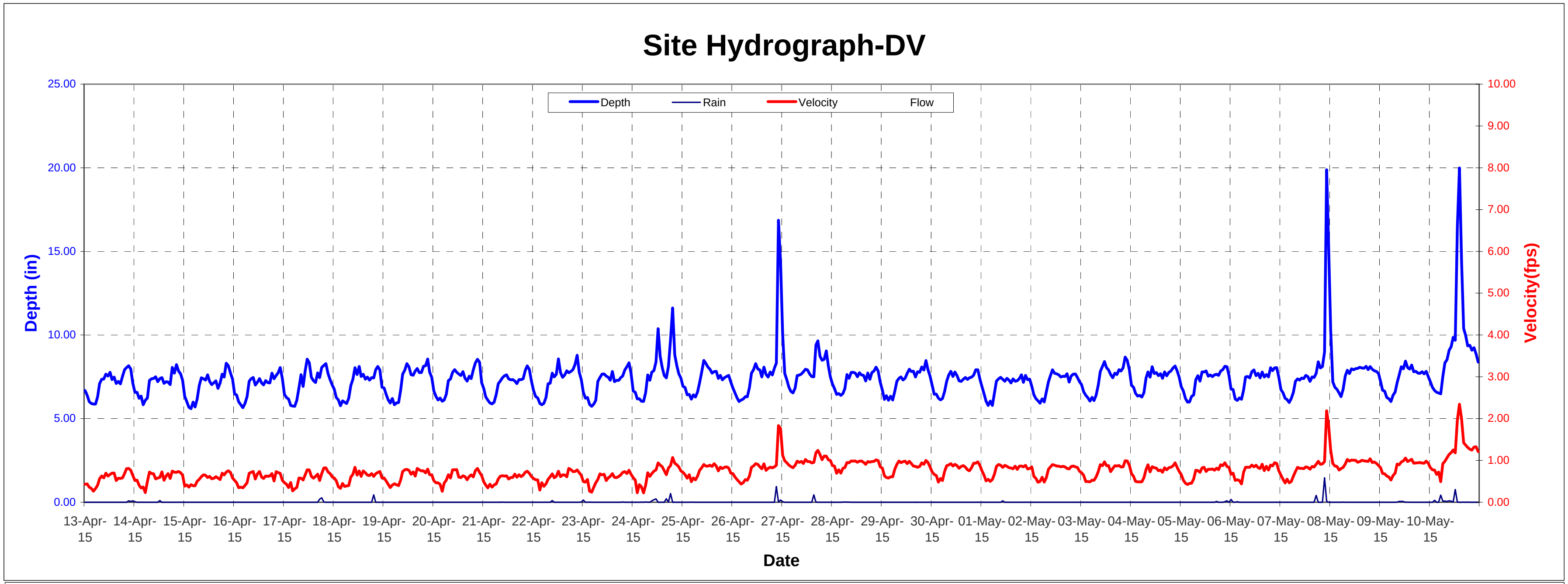
Site 1 HyGraph

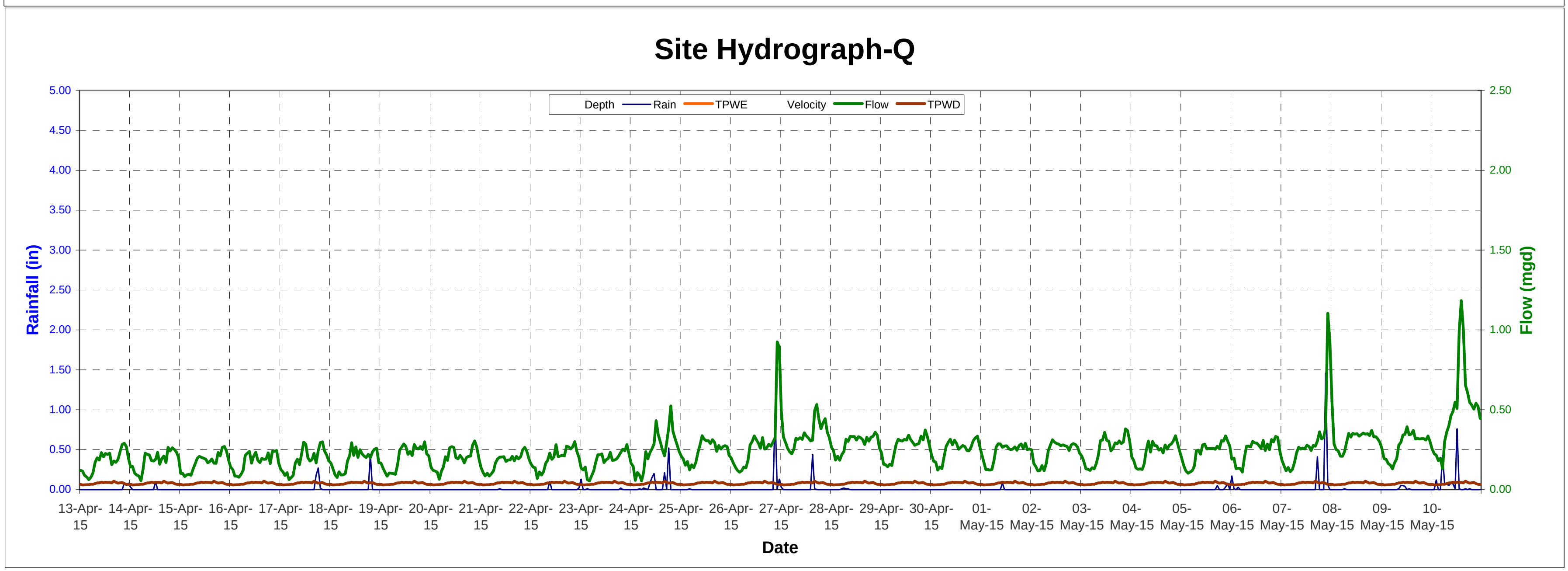
Site Scatter Graph



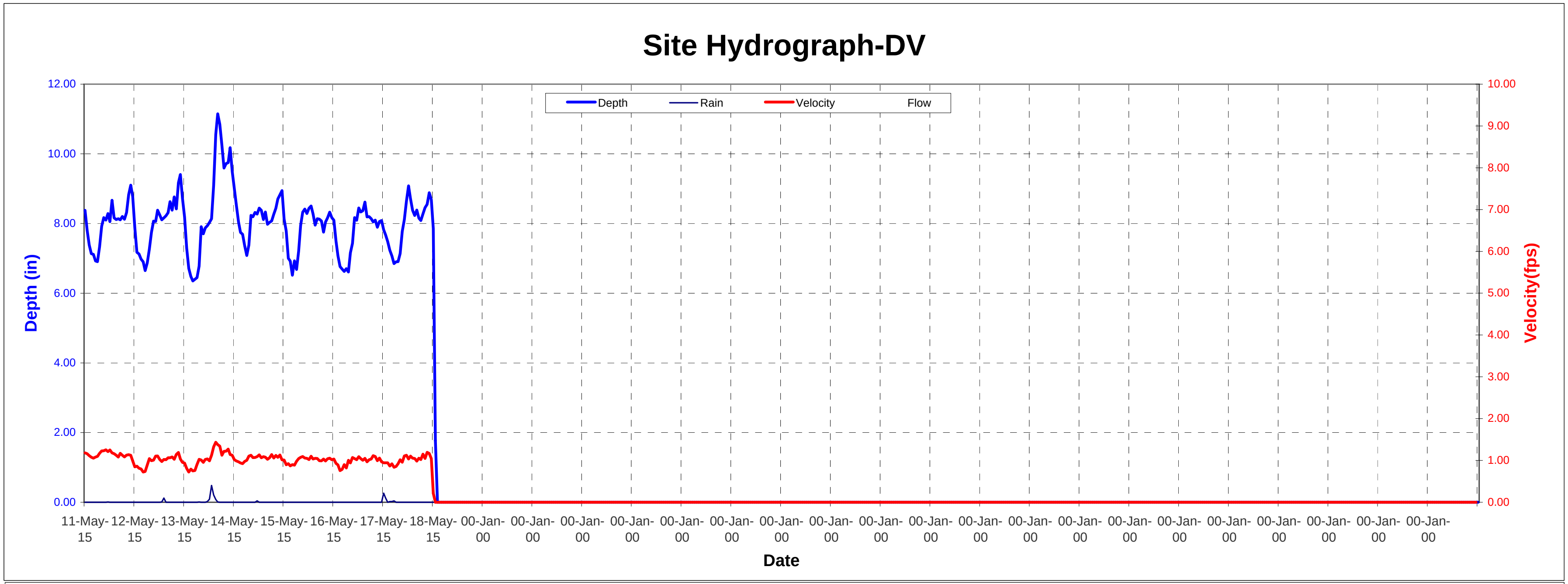
Interra Hydro

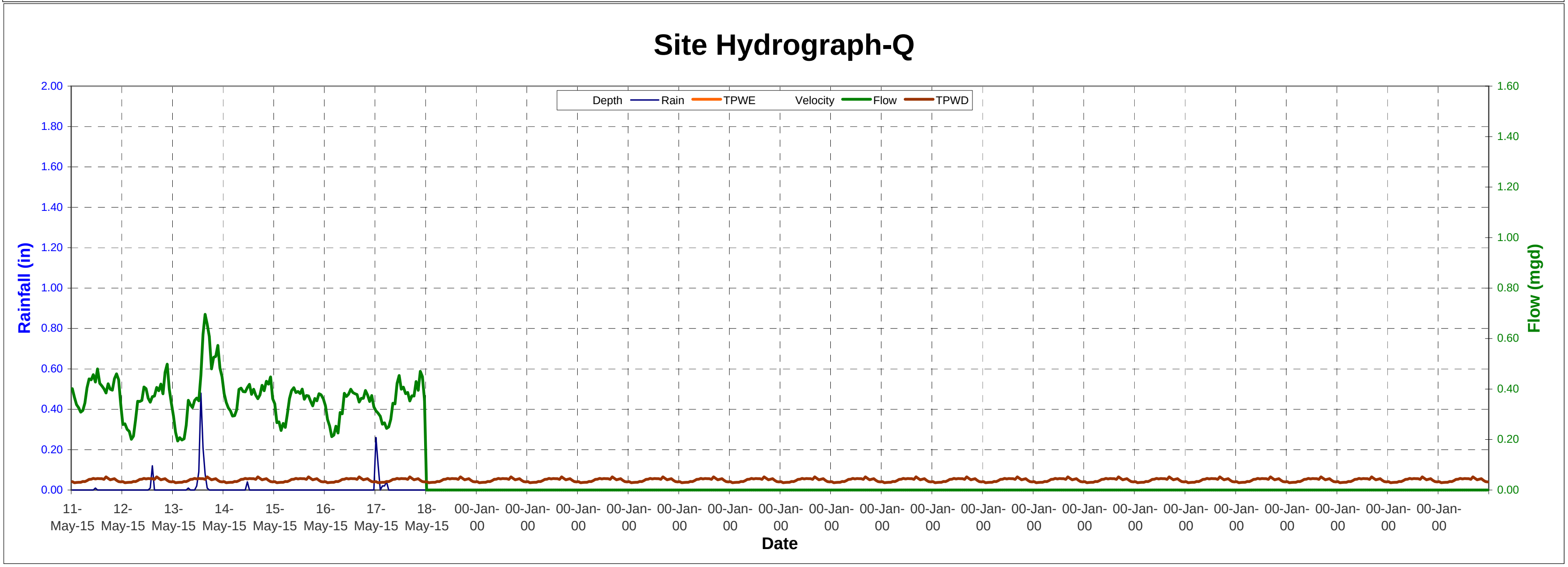
Site 1 HyGraph



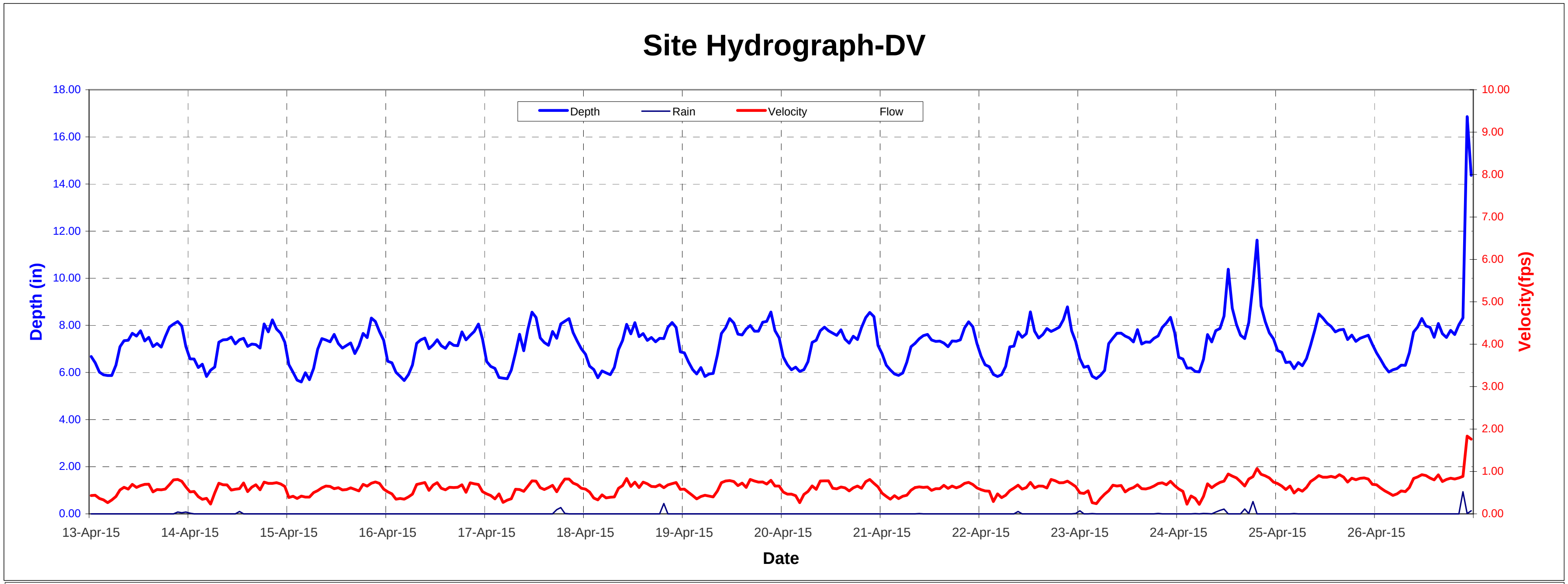


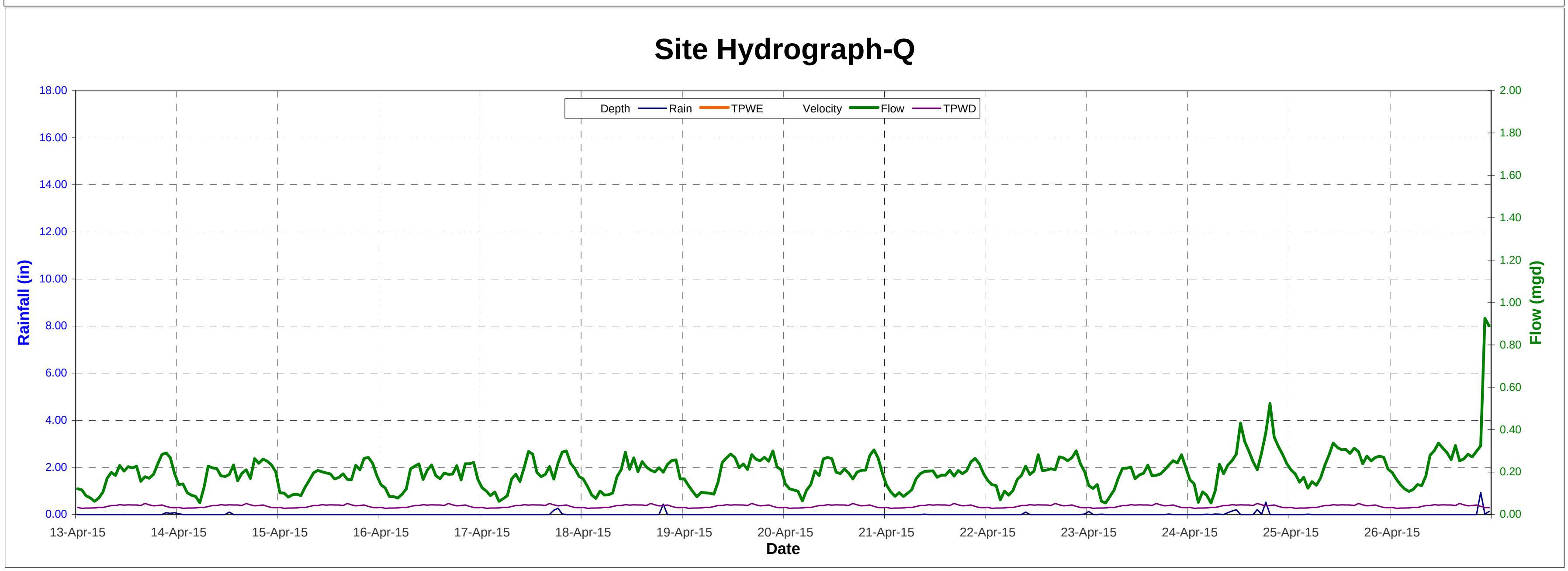
Site 1 HyGraph



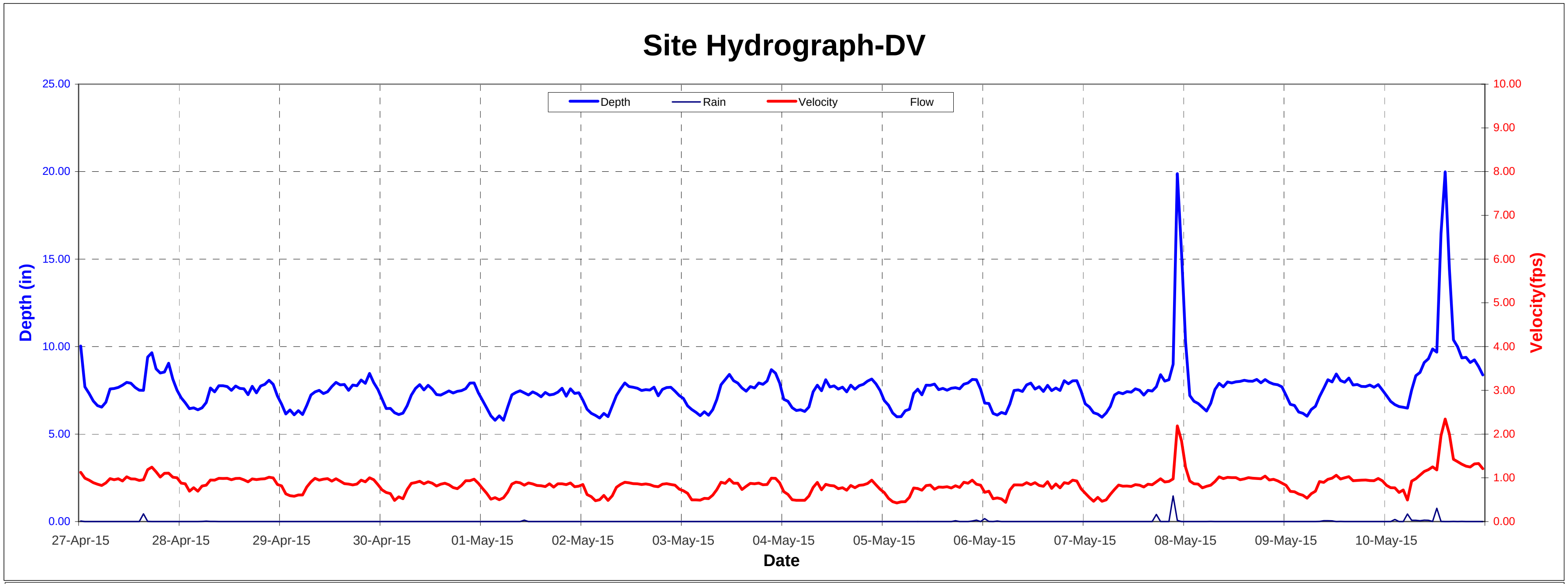


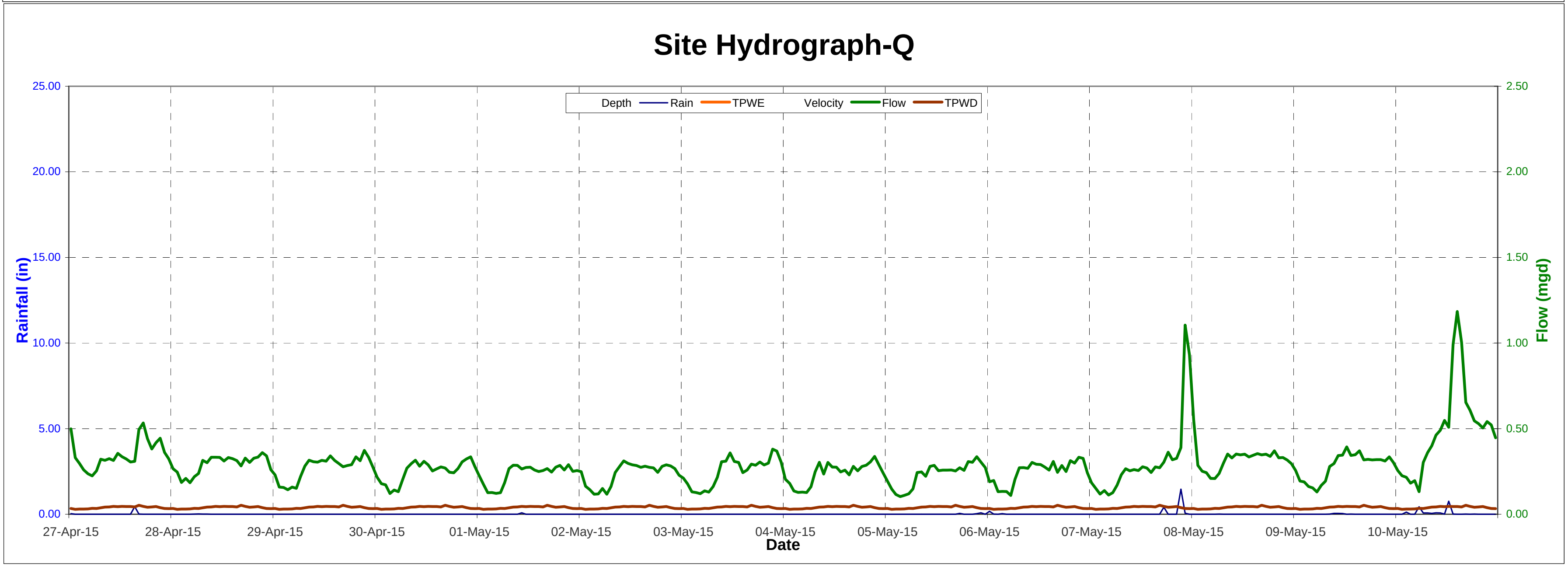
Site 1 HyGraph



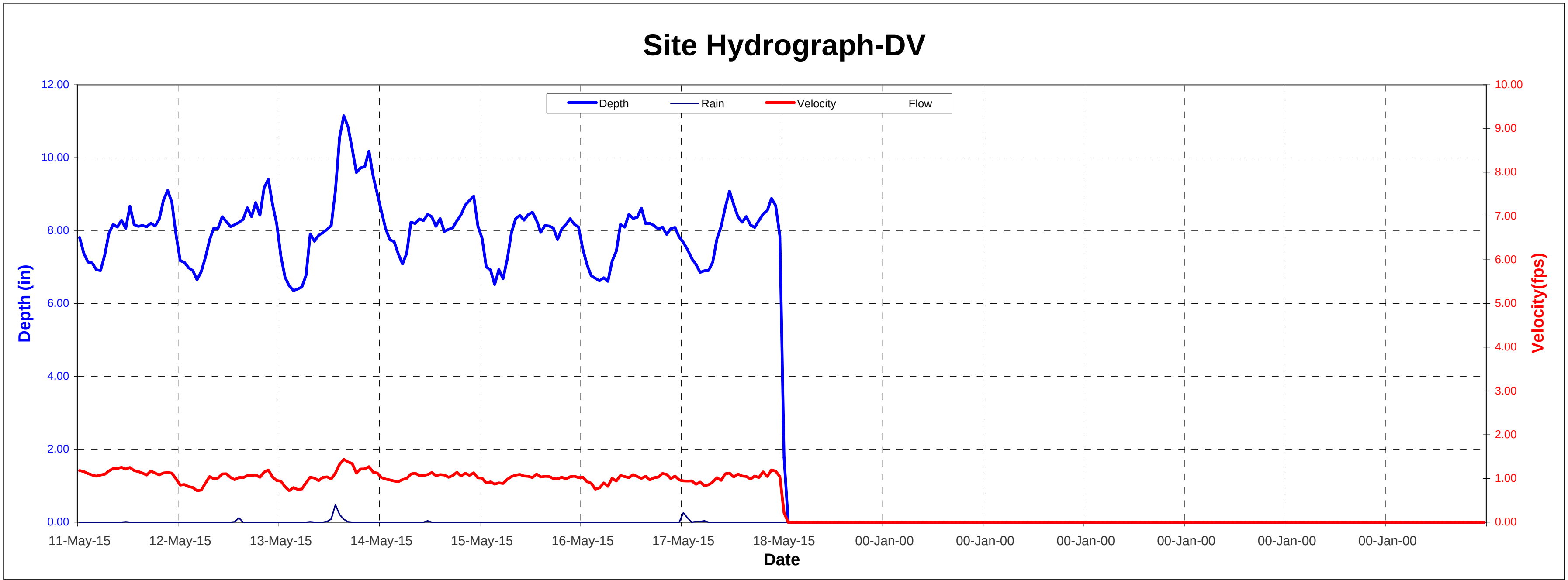


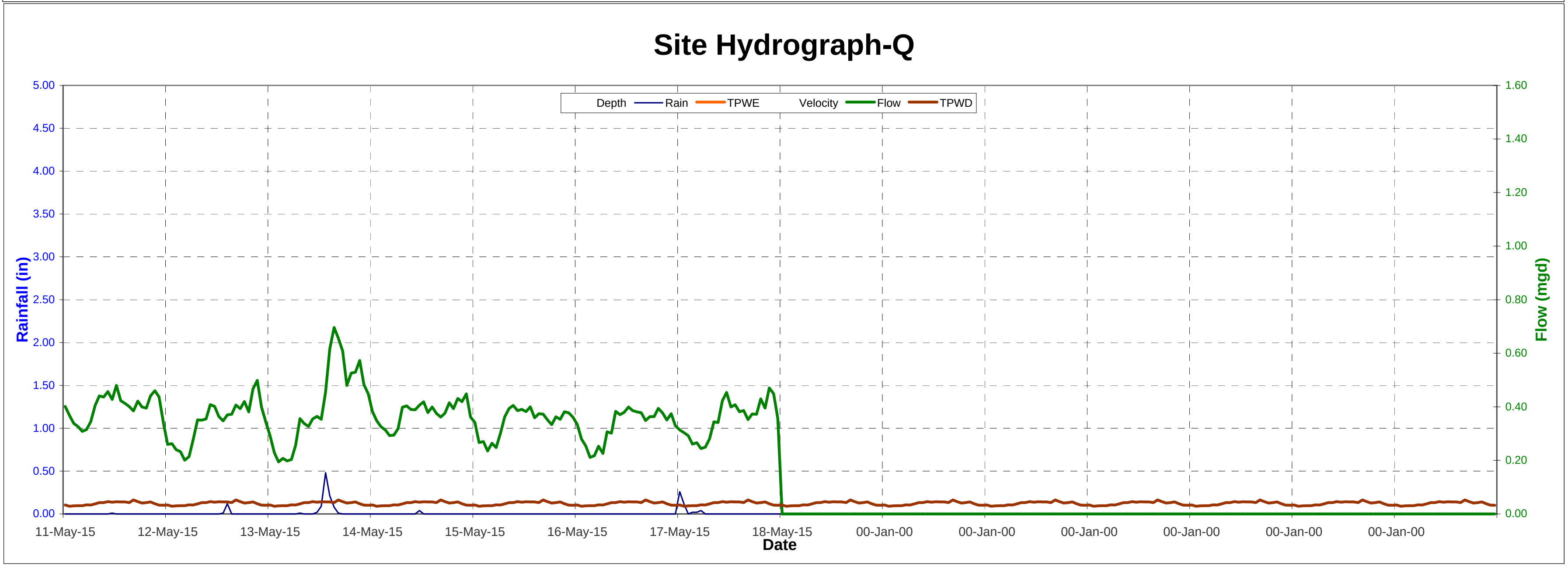
Site 1 HyGraph



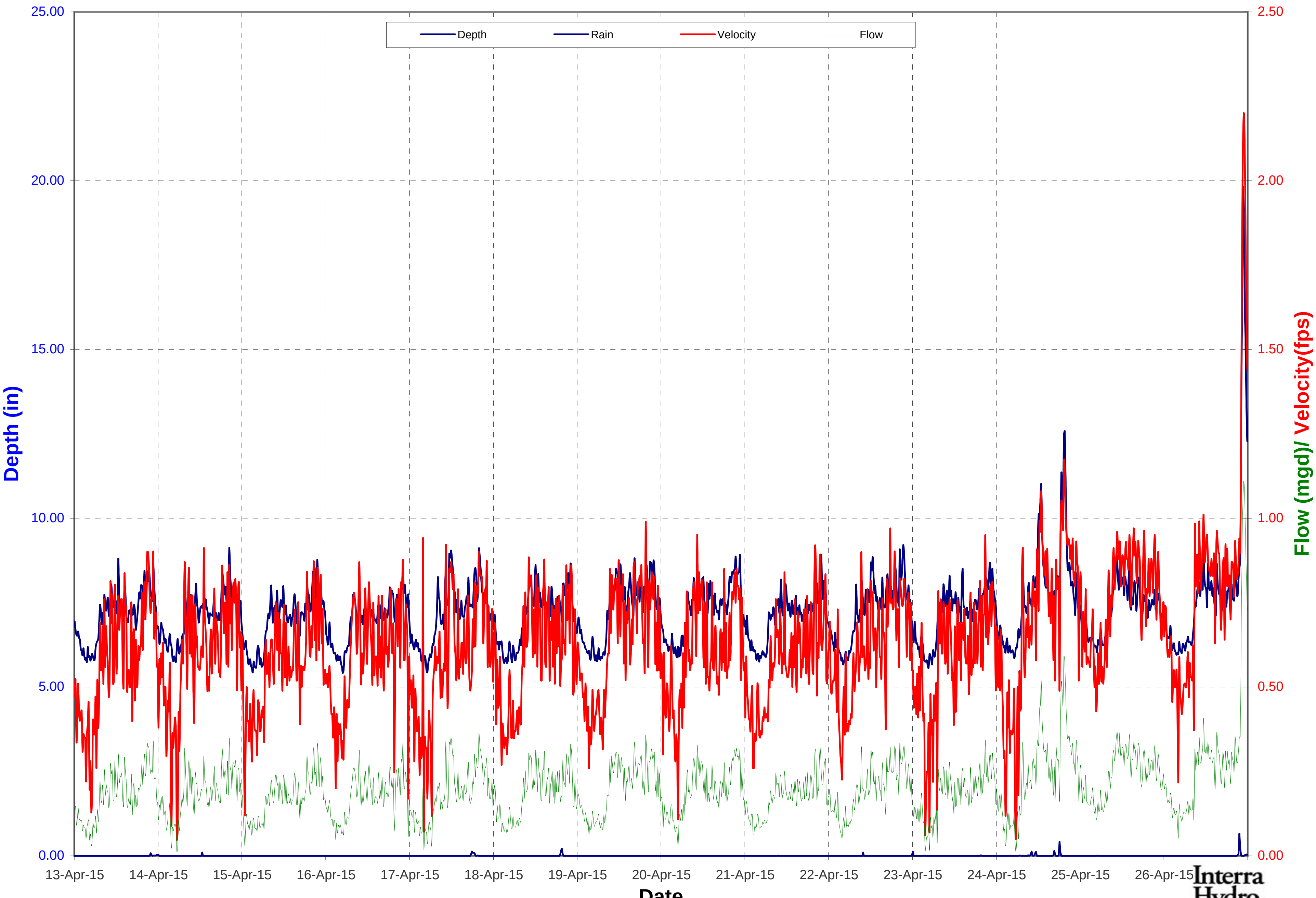


Site 1 HyGraph





Site 1 HyGraph

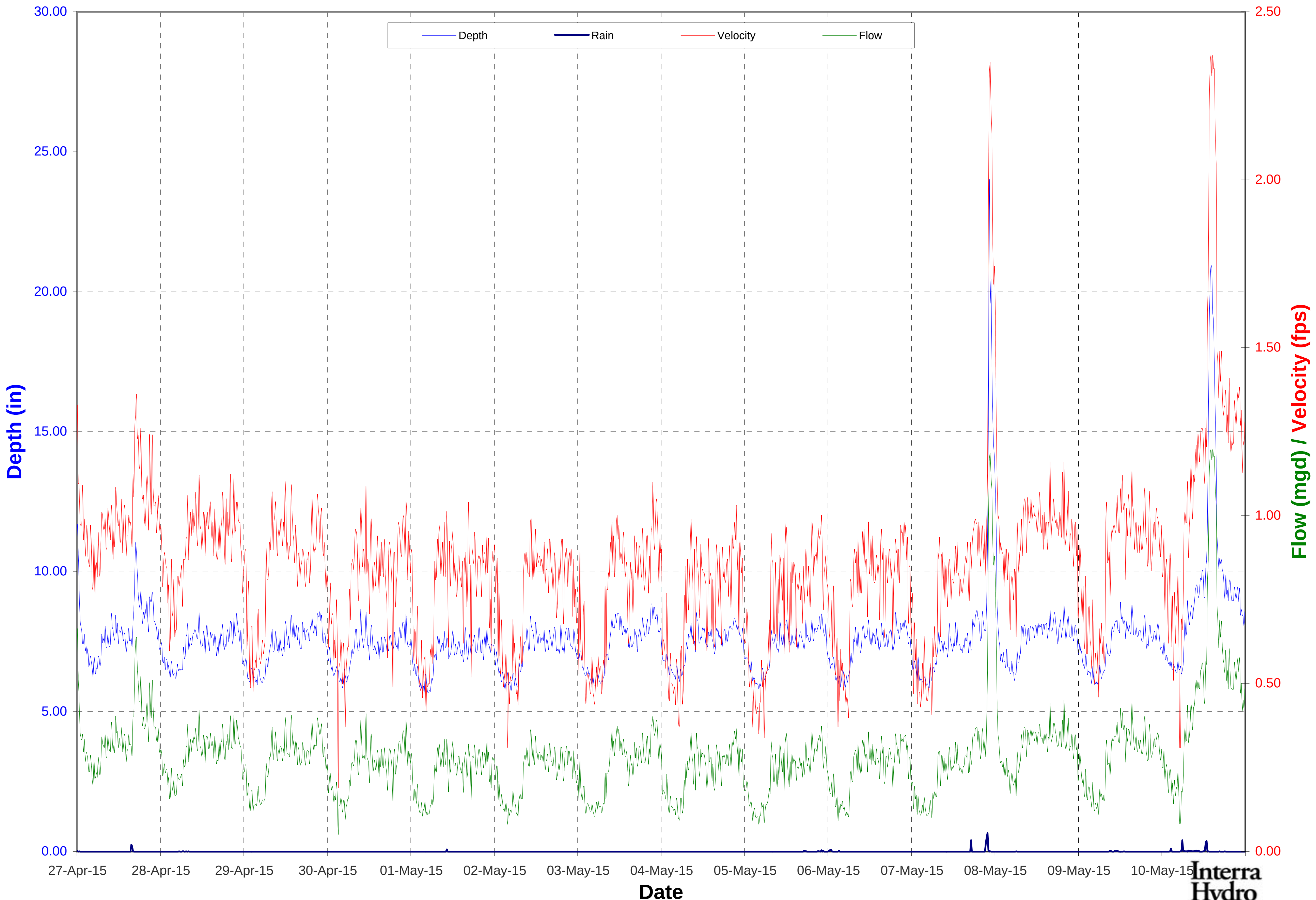


2Wks (1)

Weekly- 15 Min Data

Interra Hydro

Site 1 HyGraph

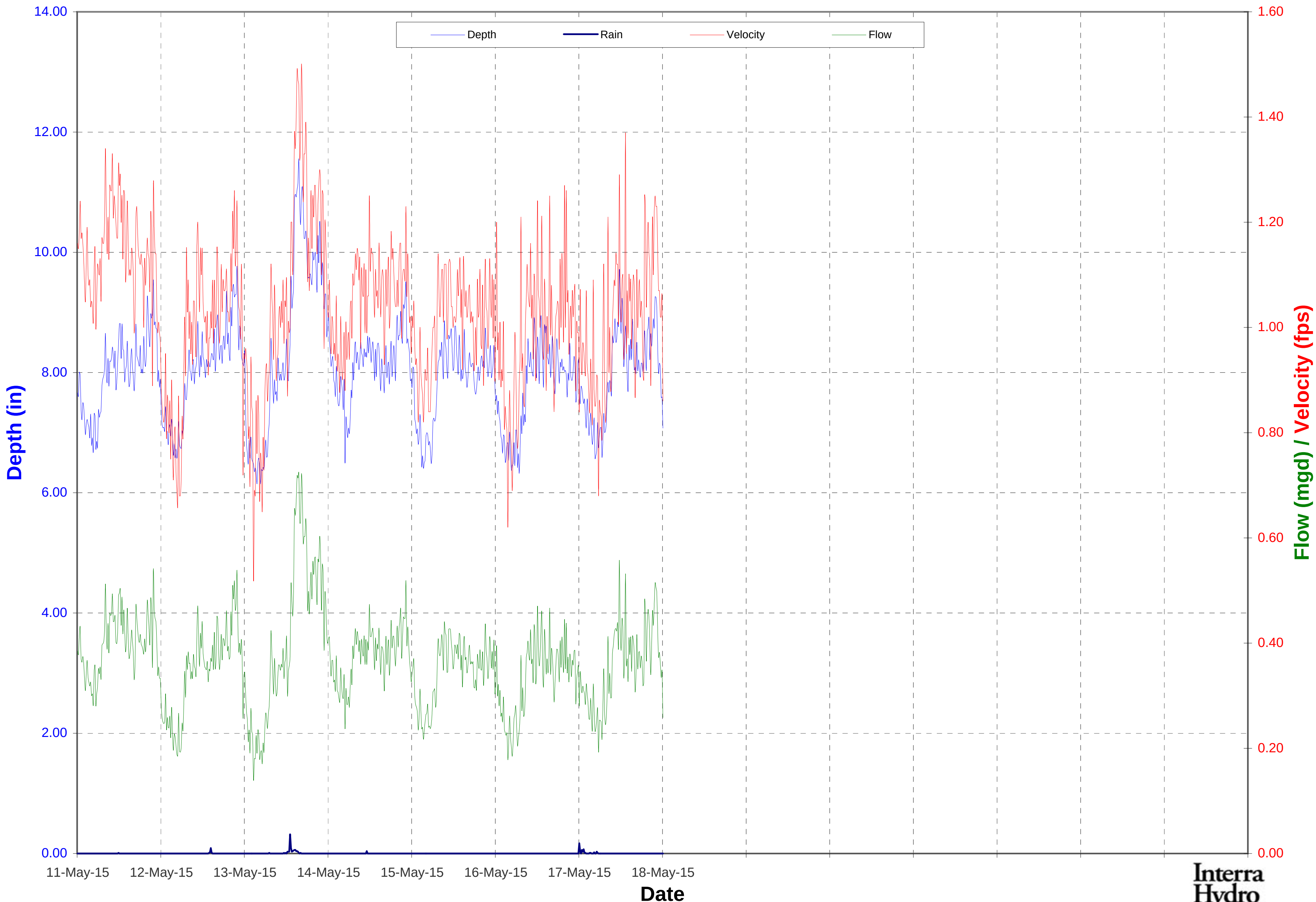


2Wks (2)

Weekly- 15 Min Data

Interra Hydro

Site 1 HyGraph



2Wks (3)

Weekly- 15 Min Data

Interra Hydro

Interra Hydro

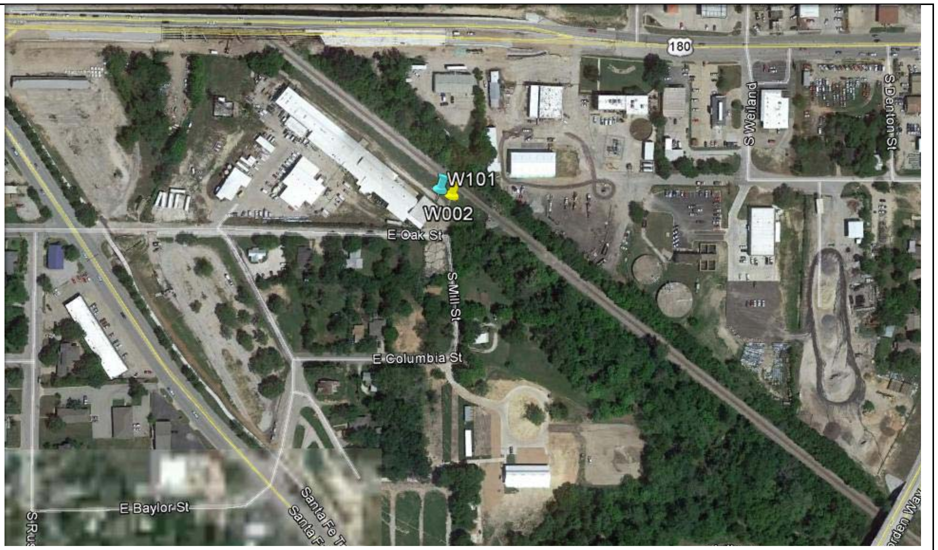
Flow Service Provider

Flow Monitoring Site Sheet

Project Name	Weatherford MP Flow Monitoring	Job #	2015003
Personnel	BD/AH/CR	Date	04/12/2015

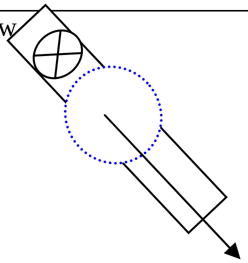
Site Location Information

Site Name	W002		
Meter ID	15003002		
Site Location	Field		
Address	567 E. Oak St.		
Traffic Cond	None		
Mh Number	432		
Mh Depth	6.50’	Gas	O2



Meter configuration Information

Meter Serial	20900000961
Sensor Serial	41100000533
Power	Battery
Logging Cycle	15 min
Telemetry	RS232
Site Status	Running



Site Characteristics

Pipe Diameter	16.5”H x 18.50”W	Pipe Type	PVC
Pipe Shape	Circular	Surcharge	0
Turbulence	Smooth	Silt level	2.5” and Gravel
Hydraulics	Fair		

Install Calibration and Profile

Avg. Velocity	Time	DOF	Meter Level	Meter Velocity
1.6 fps	13:00	6.125”	6.226”	1.25 fps

Site name W002

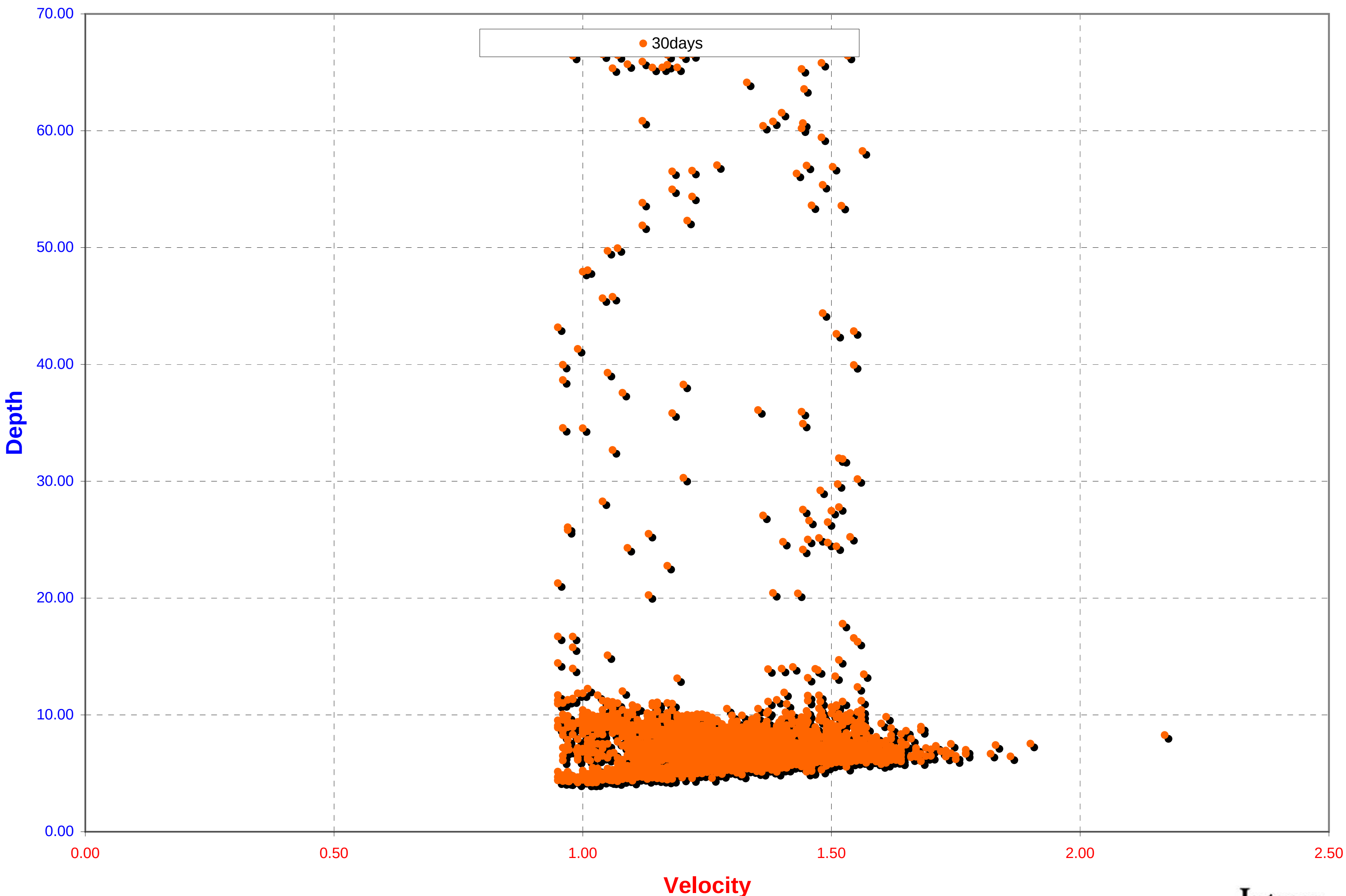
Daily Flow Summary
Site W002

Date	Depth Average (inches)	Flow Average (mgd)	Depth Maximum (in.)	Flow Maximum (mgd)	Depth Minimum (in.)	Flow Minimum (mgd)	Velocity Average (fps)	Velocity Maximum (fps)	Daily Rain (in)
13-Apr-15	6.05	0.415	8.04	0.685	4.21	0.174	1.32	1.71	0.21
14-Apr-15	6.12	0.446	7.61	0.677	4.62	0.207	1.40	1.70	0.13
15-Apr-15	5.98	0.428	8.11	0.692	4.23	0.180	1.37	1.82	0.00
16-Apr-15	6.01	0.431	7.92	0.729	4.31	0.177	1.38	1.74	0.00
17-Apr-15	6.18	0.450	9.63	0.836	4.27	0.177	1.38	1.71	0.47
18-Apr-15	6.43	0.478	9.28	0.762	4.56	0.204	1.39	1.75	0.44
19-Apr-15	6.59	0.490	8.23	0.799	4.95	0.231	1.38	1.90	0.00
20-Apr-15	6.34	0.462	8.17	0.709	4.85	0.212	1.38	1.66	0.00
21-Apr-15	6.04	0.429	8.16	0.689	4.50	0.195	1.37	1.77	0.01
22-Apr-15	6.23	0.439	8.48	0.692	4.57	0.197	1.34	1.86	0.12
23-Apr-15	6.20	0.429	7.99	0.665	4.67	0.213	1.33	1.63	0.16
24-Apr-15	9.06	0.570	39.97	1.598	4.57	0.211	1.28	1.77	1.21
25-Apr-15	7.10	0.543	10.04	0.966	5.44	0.324	1.40	1.65	0.01
26-Apr-15	10.28	0.544	57.05	1.593	5.01	0.245	1.30	1.58	1.08
27-Apr-15	17.10	0.879	53.83	1.638	6.92	0.443	1.25	1.68	0.48
28-Apr-15	9.13	0.683	11.85	1.026	6.88	0.432	1.26	1.53	0.05
29-Apr-15	8.37	0.604	12.39	1.230	6.01	0.367	1.25	1.62	0.00
30-Apr-15	7.67	0.519	10.20	0.812	5.59	0.300	1.21	1.57	0.00
1-May-15	7.07	0.479	8.95	0.656	5.30	0.266	1.25	1.53	0.08
2-May-15	6.98	0.469	8.96	0.675	5.24	0.259	1.23	1.69	0.00
3-May-15	7.02	0.463	9.96	0.793	4.95	0.228	1.20	1.54	0.00
4-May-15	6.86	0.452	9.83	0.732	4.84	0.211	1.22	1.59	0.00
5-May-15	6.58	0.435	8.73	0.755	4.67	0.197	1.24	1.63	0.16
6-May-15	6.71	0.456	8.58	0.655	4.84	0.230	1.27	1.73	0.21
7-May-15	11.37	0.510	65.81	1.561	4.61	0.206	1.24	1.56	1.93
8-May-15	11.51	0.696	64.13	1.530	7.41	0.472	1.23	1.62	0.01
9-May-15	8.15	0.580	11.01	0.997	5.87	0.298	1.24	1.58	0.16
10-May-15	25.07	0.990	66.61	1.648	6.23	0.371	1.33	1.57	1.69
11-May-15	8.15	0.611	10.43	1.036	6.65	0.349	1.29	2.17	0.01
12-May-15	7.64	0.536	10.06	0.818	6.09	0.321	1.25	1.60	0.13
13-May-15	9.31	0.722	16.72	1.577	5.84	0.291	1.28	1.66	0.90
14-May-15	8.20	0.560	9.97	0.876	6.78	0.381	1.19	1.51	0.04
15-May-15	7.29	0.472	8.66	0.775	5.72	0.278	1.17	1.58	0.00
16-May-15	7.25	0.454	9.27	0.835	5.52	0.263	1.13	1.50	0.00
17-May-15	7.65	0.496	10.65	0.961	5.84	0.290	1.15	1.51	0.46

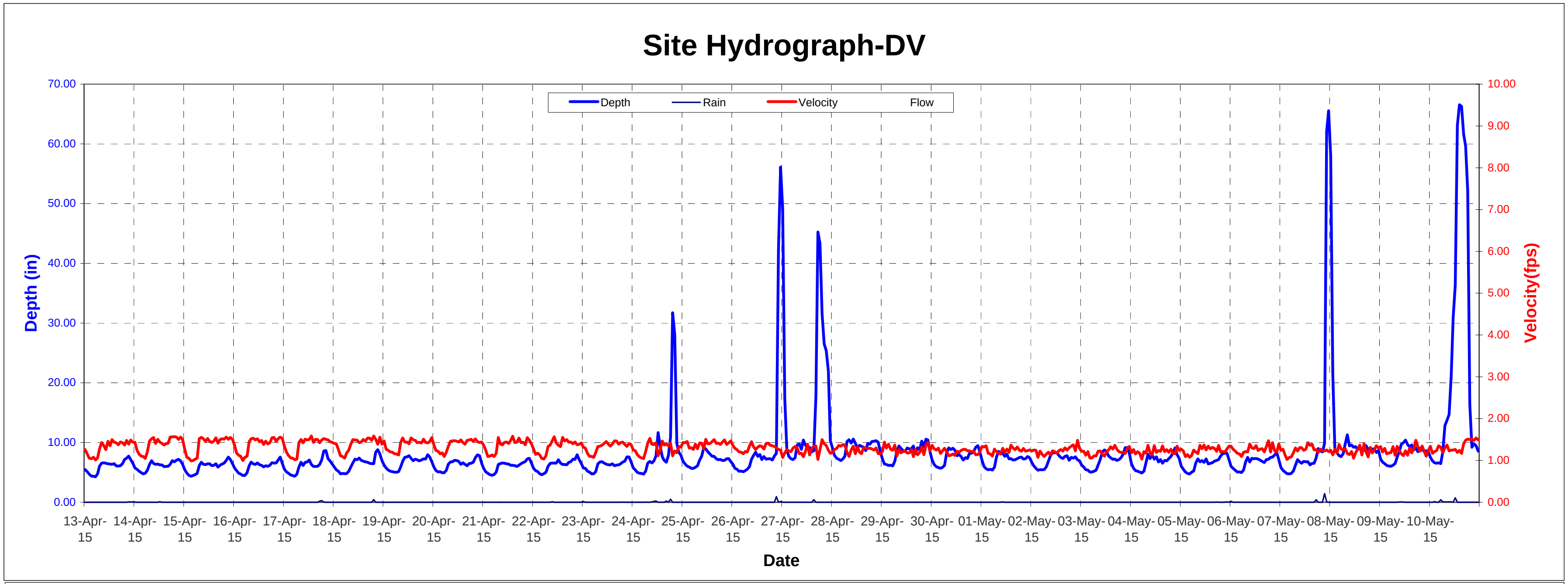
Interra Hydro

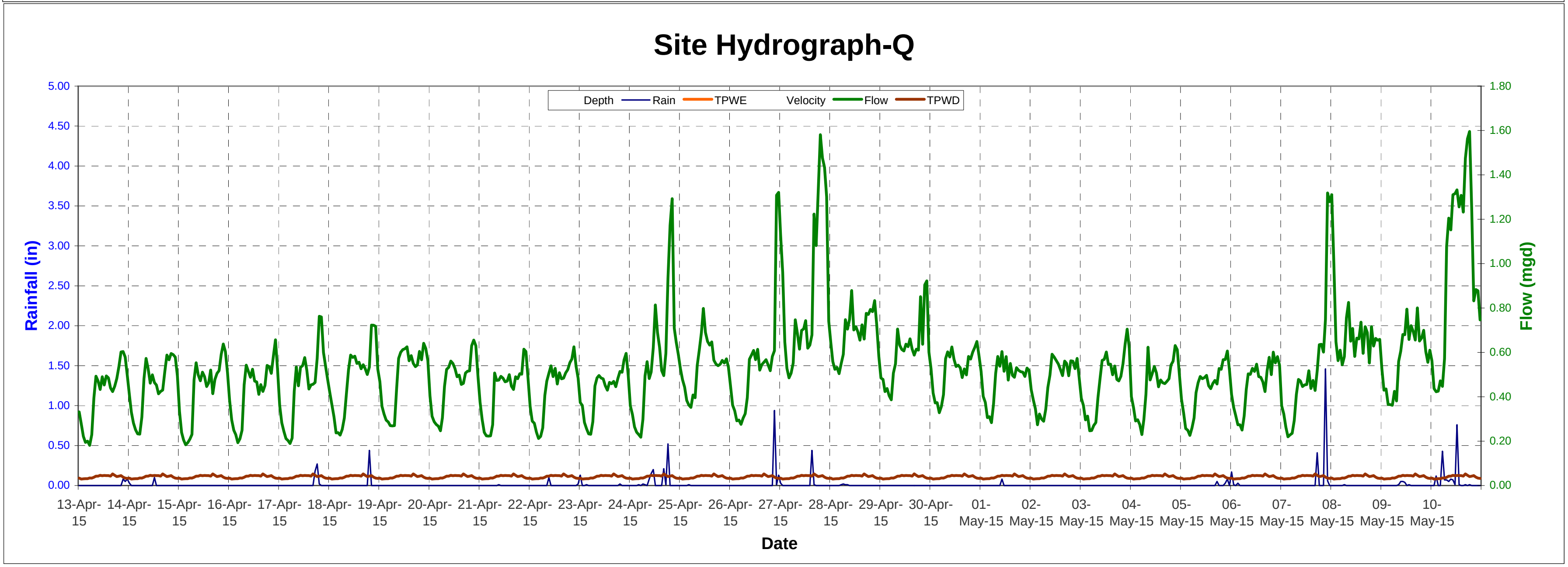
Site 2 HyGraph

Site Scatter Graph

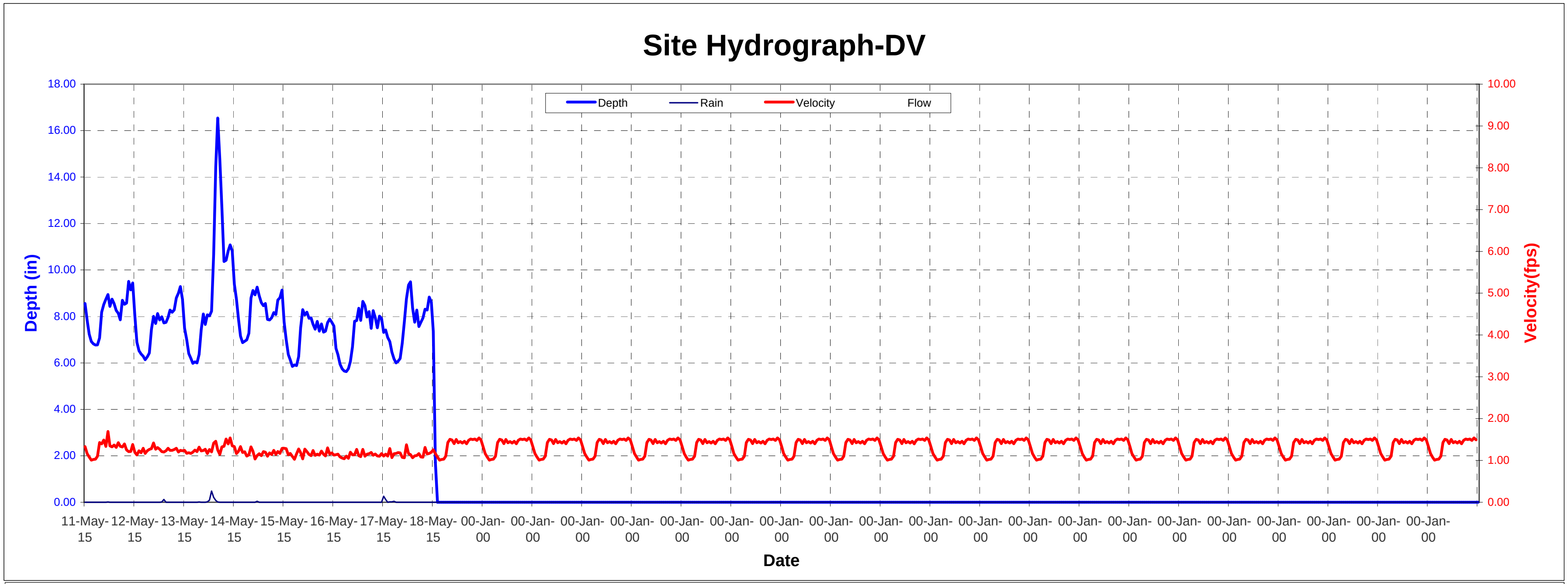


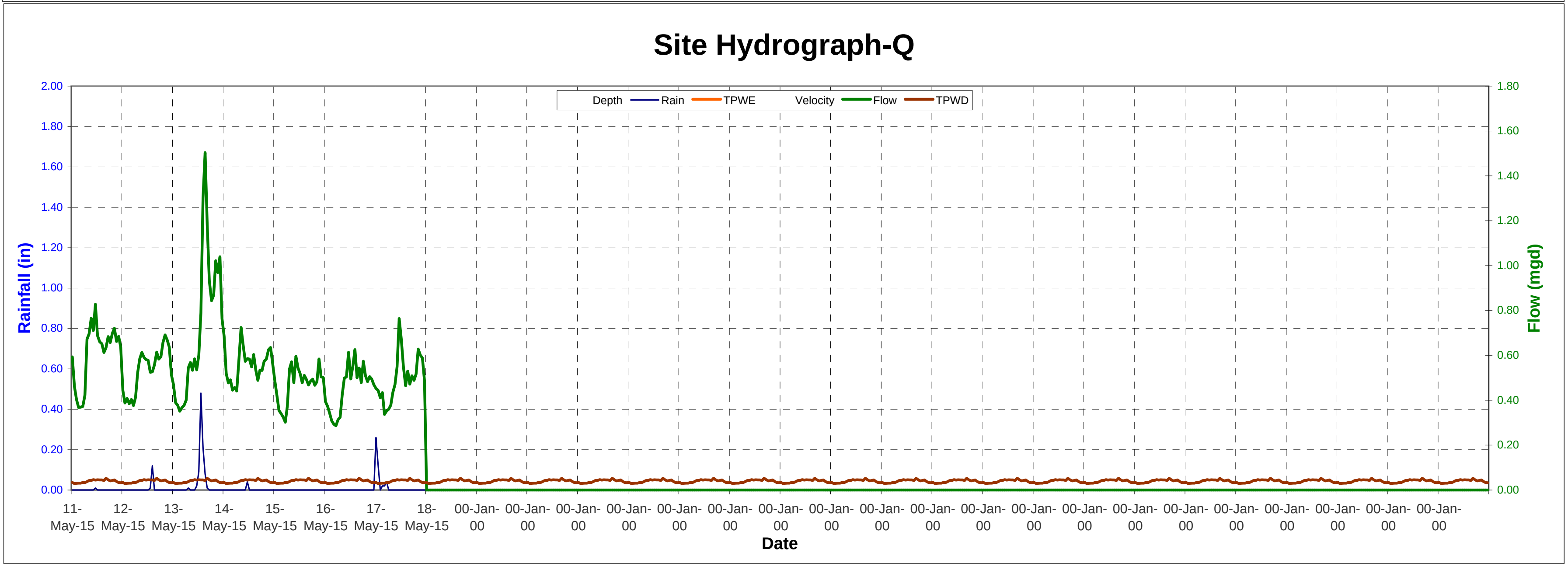
Site 2 HyGraph



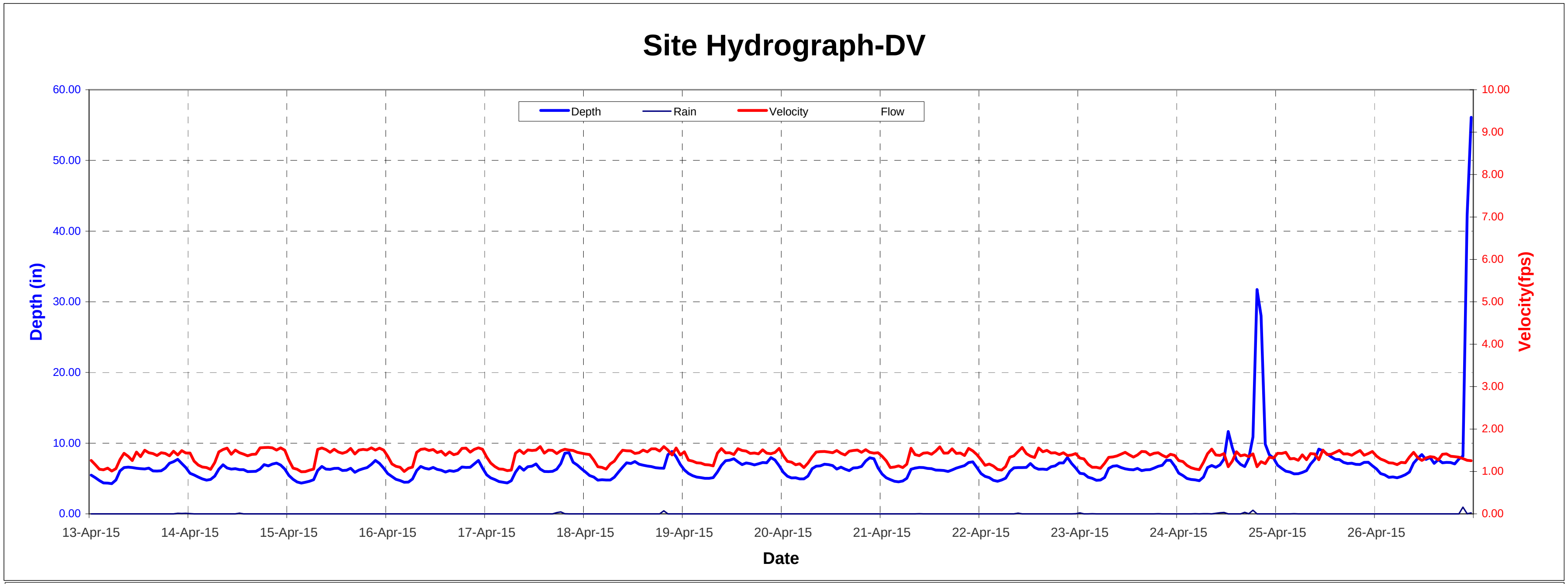


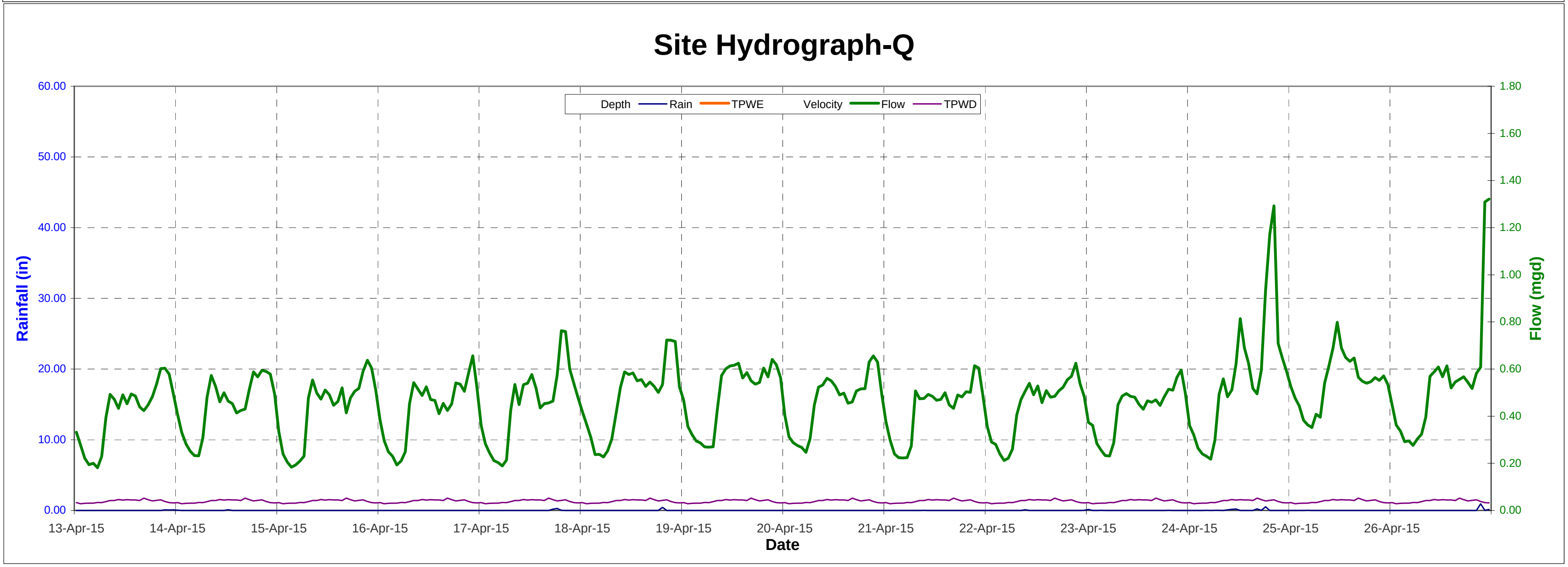
Site 2 HyGraph





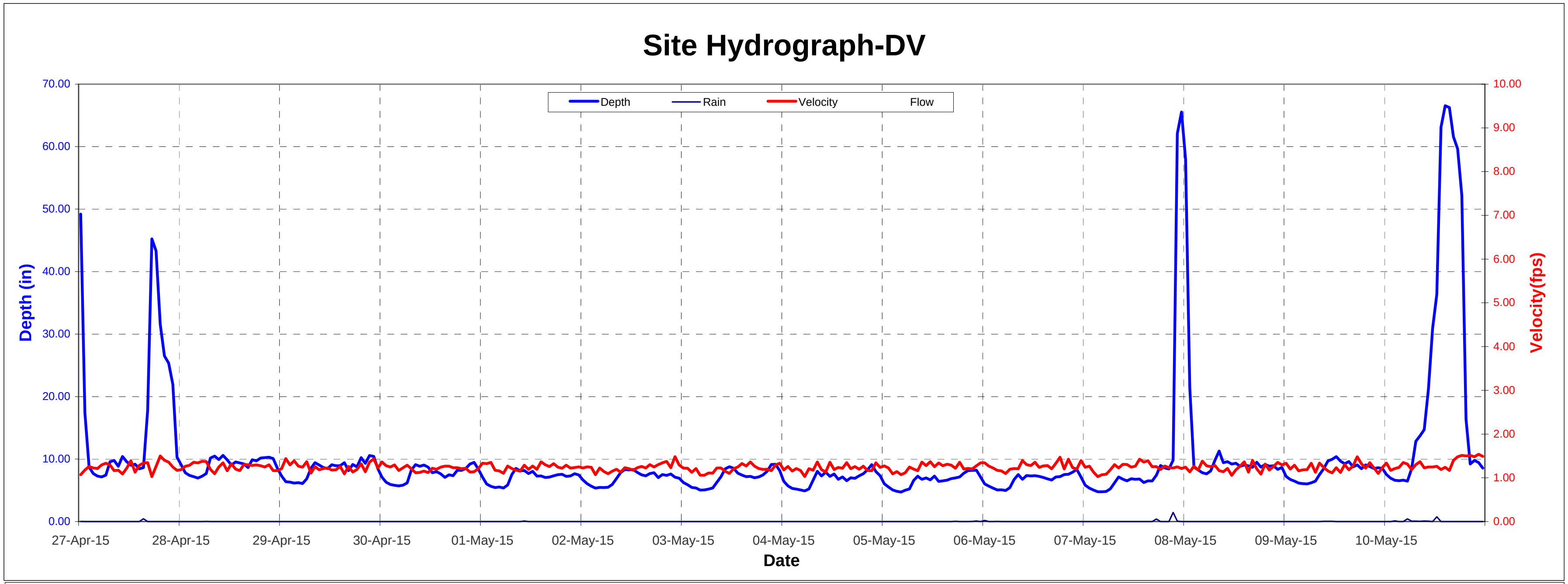
Site 2 HyGraph

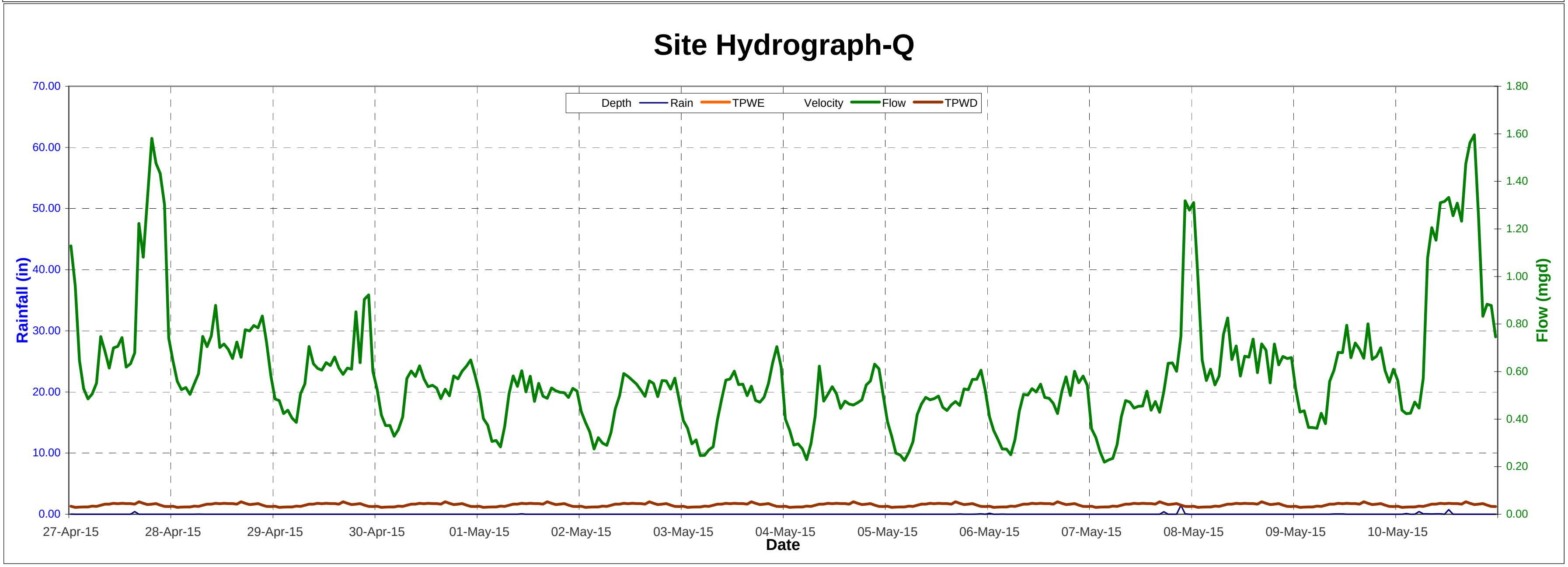




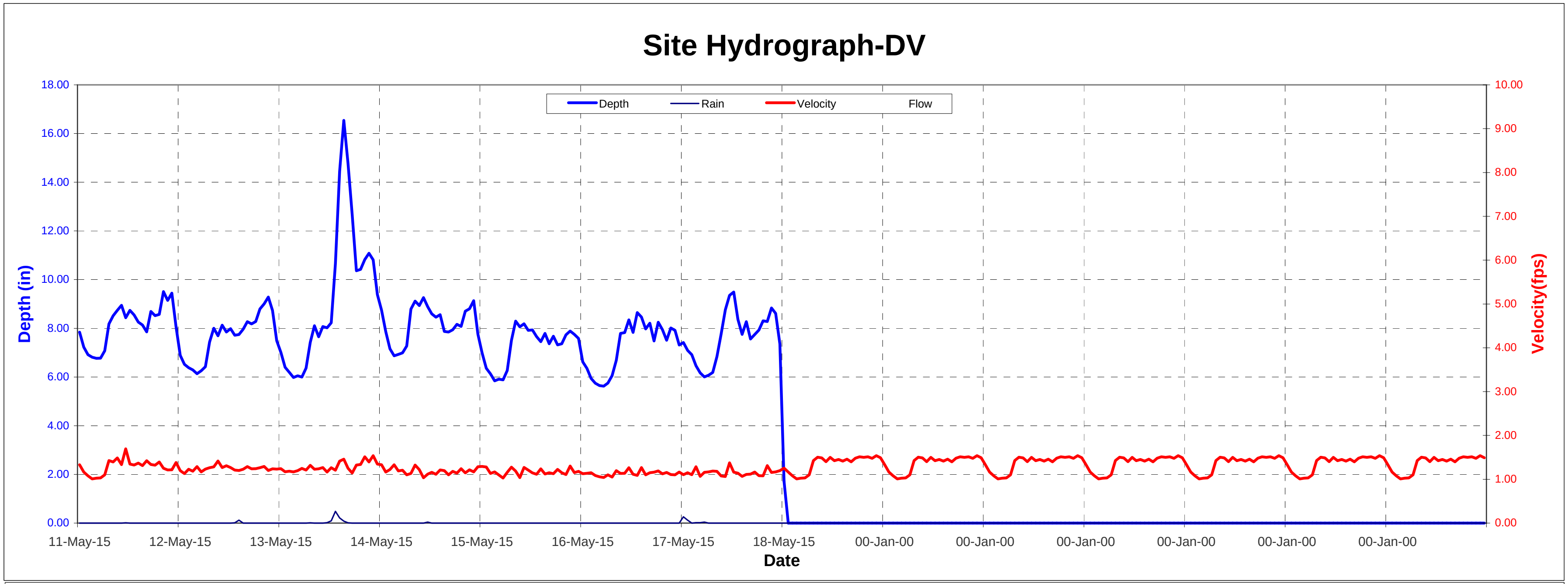
Interra Hydro

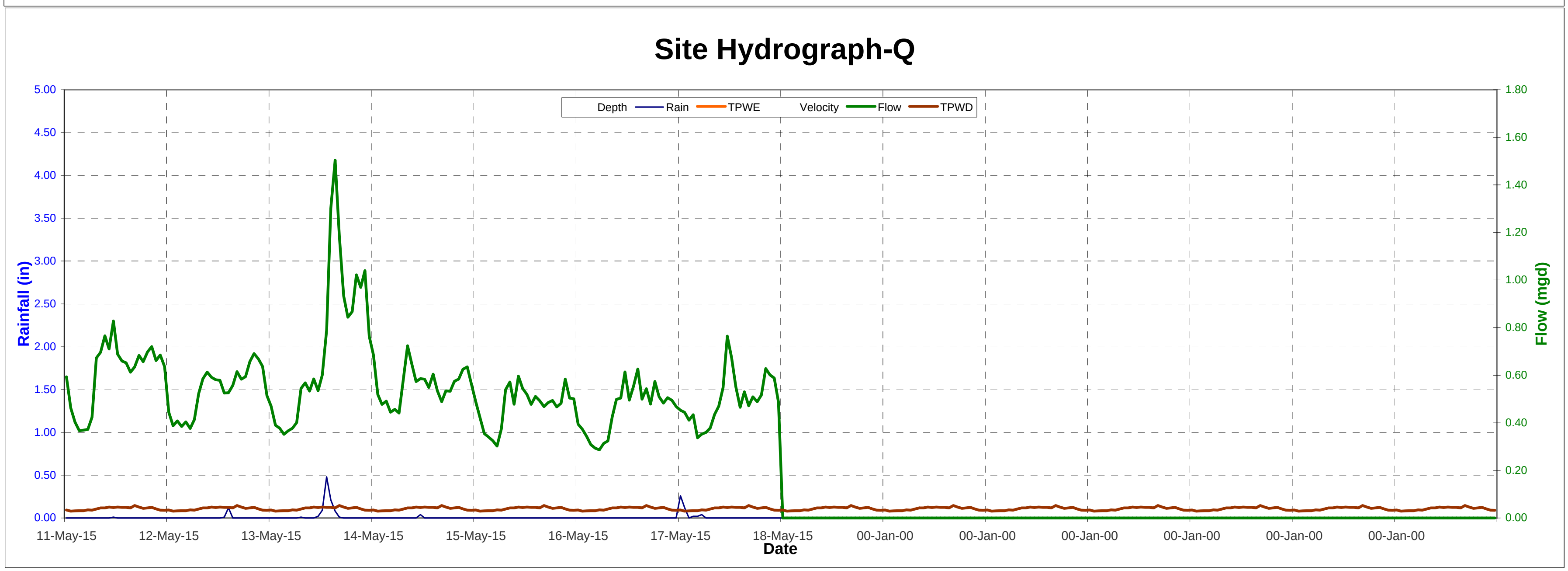
Site 2 HyGraph



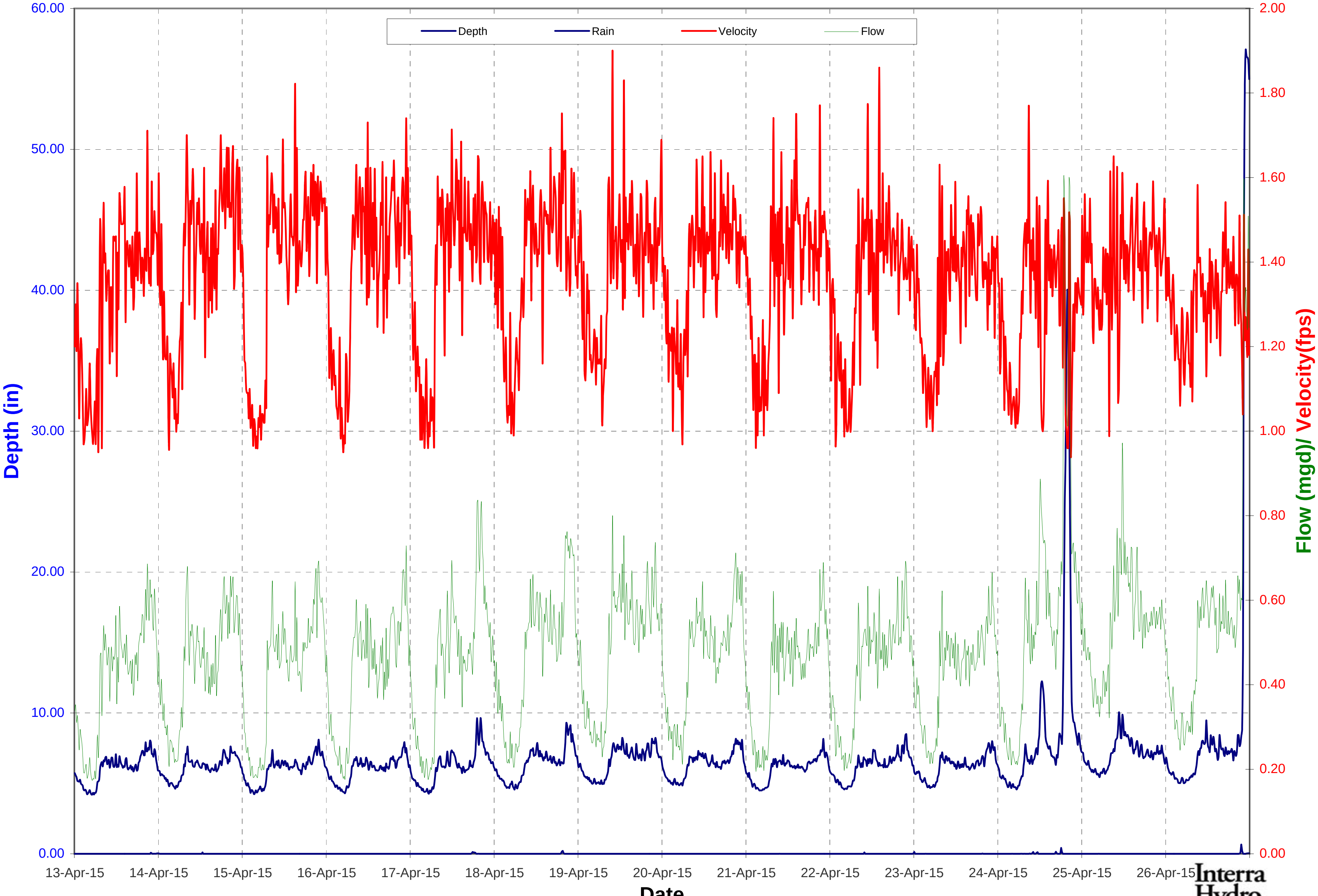


Site 2 HyGraph





Site 2 HyGraph

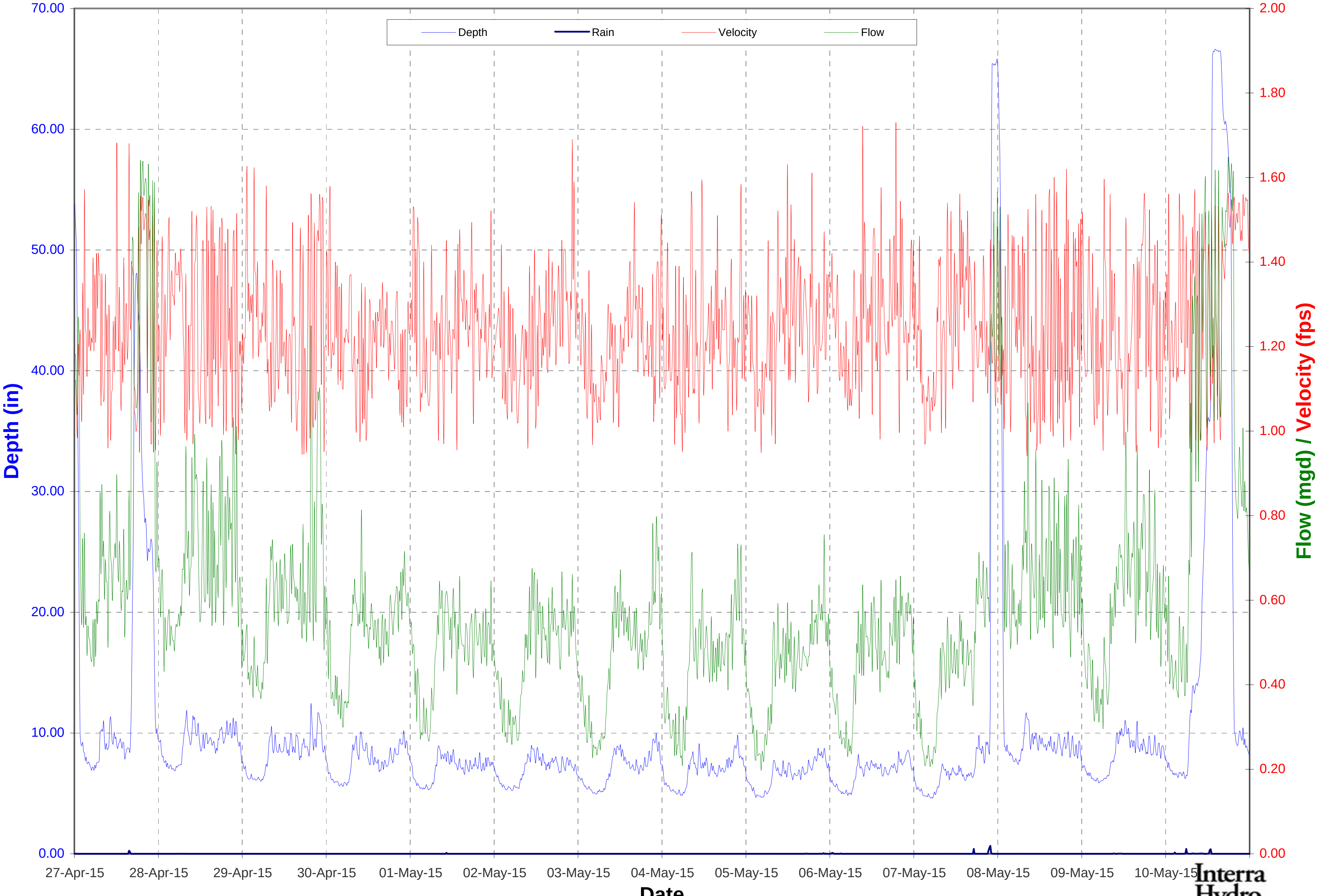


Interra Hydro

2Wks (1)

Weekly- 15 Min Data

Site 2 HyGraph

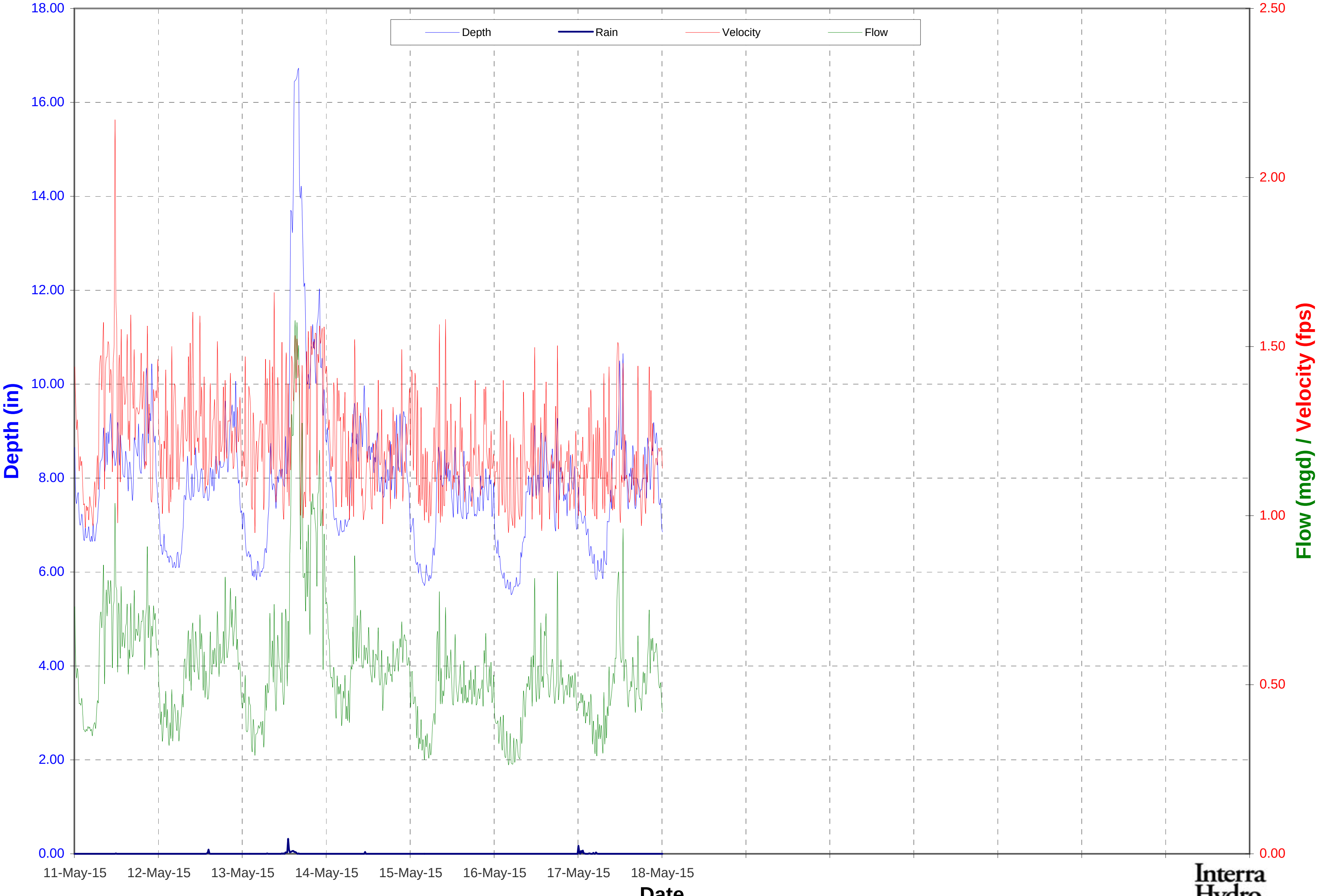


2Wks (2)

Weekly- 15 Min Data

Interra Hydro

Site 2 HyGraph



2Wks (3)

Weekly- 15 Min Data

Interra Hydro

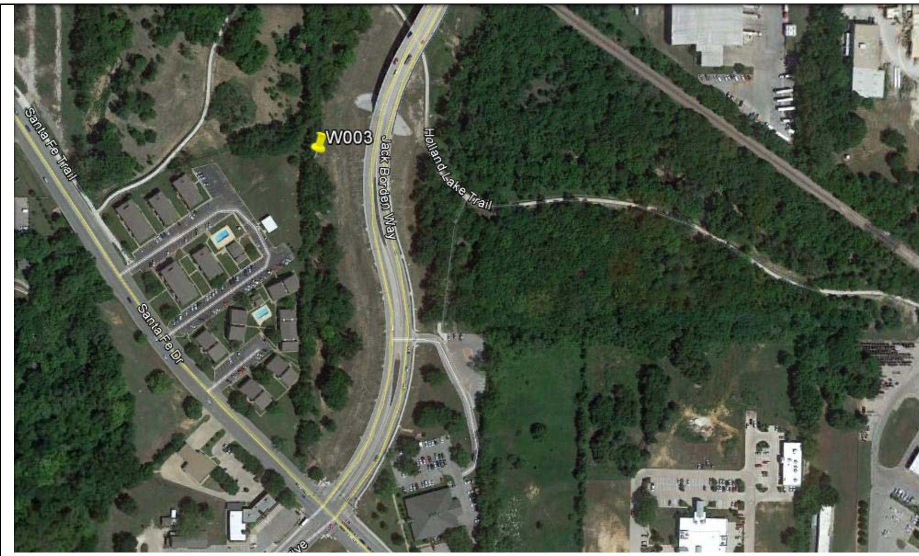
Flow Monitoring Site Sheet

Flow Service Provider

Project Name	Weatherford MP Flow Monitoring	Job #	2015003
Personnel	BD/AH/CR	Date	04/12/2015

Site Location Information

Site Name	W003		
Meter ID	15003003		
Site Location	Field/Trees		
Address	Jack Borden Way		
Traffic Cond	None		
Mh Number	1046		
Mh Depth	11.65’	Gas	O2

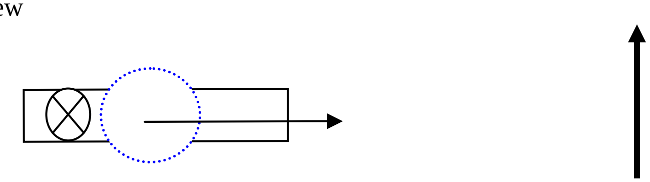


Meter configuration Information

Meter Serial	30400001254
Sensor Serial	40200003928
Power	Battery
Logging Cycle	15 min.
Telemetry	RS232
Site Status	Running

Rotate View

Planar View



N

Site Characteristics

Pipe Diameter	18”H x 18”W	Pipe Type	VC
Pipe Shape	Circular	Surcharge	0
Turbulence	Mild	Silt level	0
Hydraulics	Fair / Fast		

Install Calibration and Profile

Avg. Velocity	Time	DOF	Meter Level	Meter Velocity
5.6 fps	11:50	3.825”	4.112”	5.27 fps

Site name W003

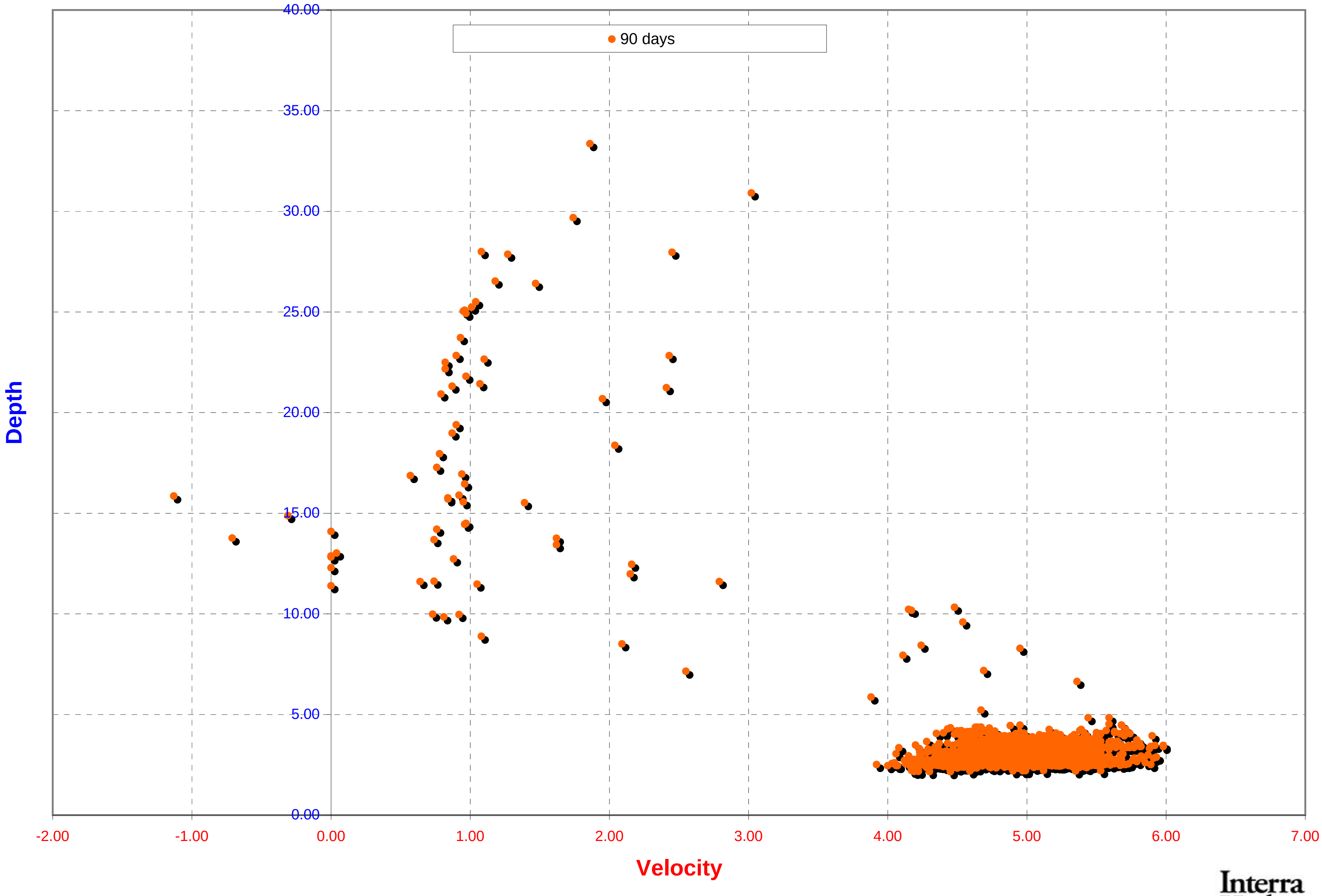
Daily Flow Summary
Site W003

Date	Depth Average (inches)	Flow Average (mgd)	Depth Maximum (in.)	Flow Maximum (mgd)	Depth Minimum (in.)	Flow Minimum (mgd)	Velocity Average (fps)	Velocity Maximum (fps)	Daily Rain (in)
13-Apr-15	2.85	0.577	3.75	0.851	2.17	0.327	4.92	5.41	0.21
14-Apr-15	2.84	0.575	3.79	0.855	2.20	0.383	4.94	5.46	0.13
15-Apr-15	2.90	0.588	3.54	0.797	2.16	0.334	4.90	5.35	0.00
16-Apr-15	2.92	0.599	3.70	0.855	2.18	0.331	4.92	5.40	0.00
17-Apr-15	3.09	0.652	4.12	0.976	2.19	0.332	4.92	5.41	0.47
18-Apr-15	3.05	0.633	4.17	0.957	2.16	0.345	4.91	5.37	0.44
19-Apr-15	2.96	0.605	3.67	0.874	2.33	0.424	4.92	5.26	0.00
20-Apr-15	2.99	0.614	4.09	0.895	2.34	0.386	4.90	5.30	0.00
21-Apr-15	3.04	0.628	3.72	0.899	2.36	0.396	4.91	5.49	0.01
22-Apr-15	2.94	0.600	3.65	0.865	2.37	0.396	4.90	5.35	0.12
23-Apr-15	2.87	0.586	3.59	0.837	2.38	0.401	4.97	5.58	0.16
24-Apr-15	4.14	0.648	33.36	2.124	2.21	0.401	4.68	5.60	1.21
25-Apr-15	2.90	0.581	3.61	0.878	2.20	0.398	4.88	5.53	0.01
26-Apr-15	4.14	0.630	28.00	1.679	2.39	0.424	4.53	5.35	1.08
27-Apr-15	8.00	0.756	29.69	1.987	2.48	0.496	3.90	5.71	0.48
28-Apr-15	2.81	0.586	3.38	0.756	2.19	0.424	5.15	5.69	0.05
29-Apr-15	2.95	0.625	3.83	0.866	2.21	0.444	5.12	5.60	0.00
30-Apr-15	2.96	0.618	3.71	0.857	2.21	0.412	5.04	5.54	0.00
1-May-15	2.92	0.605	3.69	0.860	2.19	0.364	5.01	5.37	0.08
2-May-15	3.01	0.630	3.80	0.912	2.38	0.432	5.00	5.50	0.00
3-May-15	2.97	0.621	3.73	0.898	2.39	0.437	5.03	5.41	0.00
4-May-15	3.03	0.643	3.73	0.869	2.38	0.408	5.04	5.52	0.00
5-May-15	3.02	0.637	3.78	0.907	2.22	0.337	4.99	5.50	0.16
6-May-15	2.93	0.609	3.68	0.860	2.50	0.471	5.03	5.49	0.21
7-May-15	4.36	0.678	30.91	3.449	2.42	-1.203	4.60	5.44	1.93
8-May-15	3.33	0.760	9.59	2.809	2.47	0.536	5.25	5.93	0.01
9-May-15	3.14	0.680	3.69	0.798	2.72	0.575	5.08	5.57	0.16
10-May-15	5.49	1.047	22.83	2.778	2.94	-0.666	4.81	5.90	1.69
11-May-15	3.44	0.798	4.12	1.062	2.78	0.530	5.23	5.98	0.01
12-May-15	3.85	0.877	4.37	1.001	3.31	0.711	4.91	5.53	0.13
13-May-15	3.51	0.813	4.37	1.095	3.09	0.667	5.17	5.57	0.90
14-May-15	3.33	0.762	3.80	0.859	3.15	0.667	5.24	5.93	0.04
15-May-15	3.05	0.663	3.54	0.749	2.72	0.583	5.17	5.66	0.00
16-May-15	2.94	0.630	3.59	0.765	2.39	0.474	5.19	5.74	0.00
17-May-15	3.00	0.655	3.57	0.886	2.53	0.536	5.24	5.66	0.46

Interterra Hydro

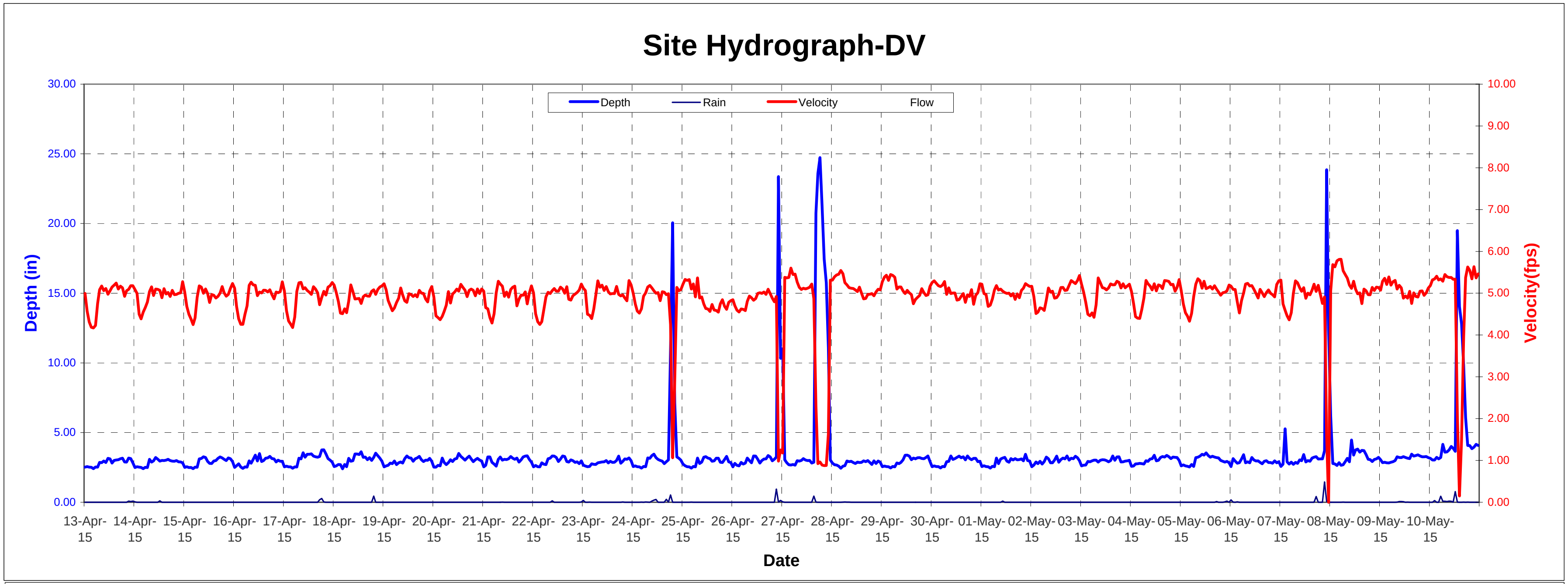
Site 3 HyGraph

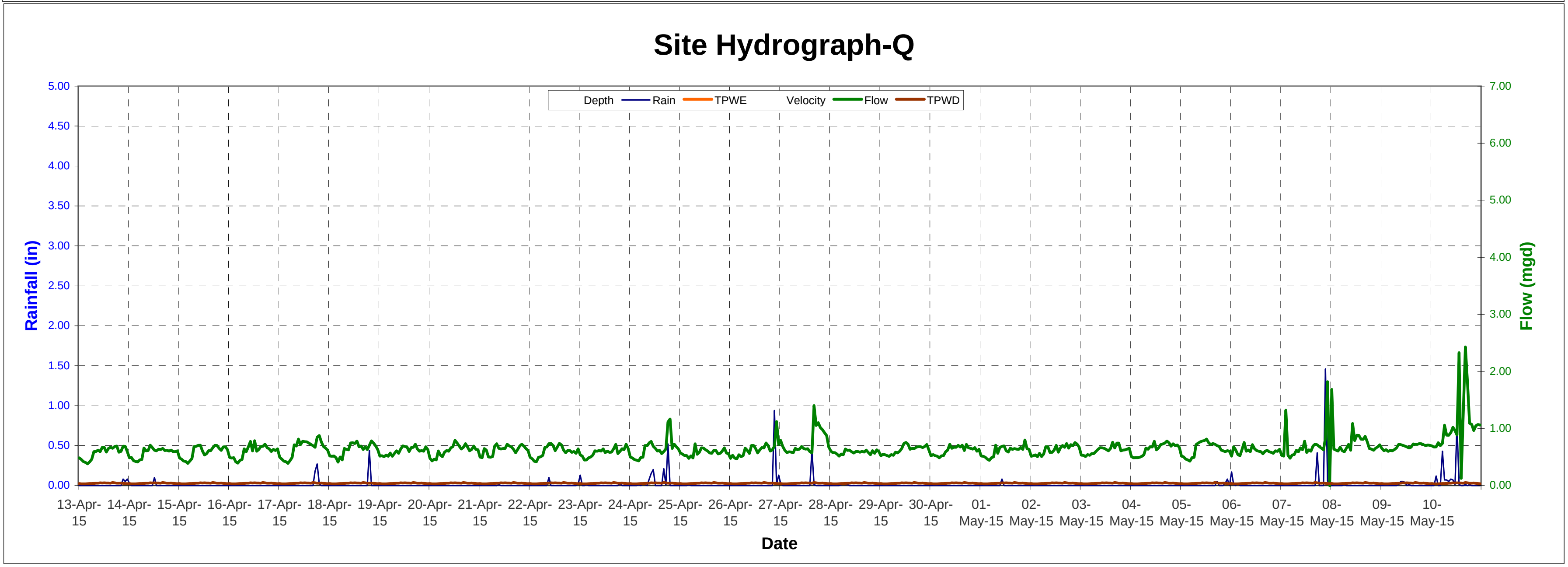
Site Scatter Graph



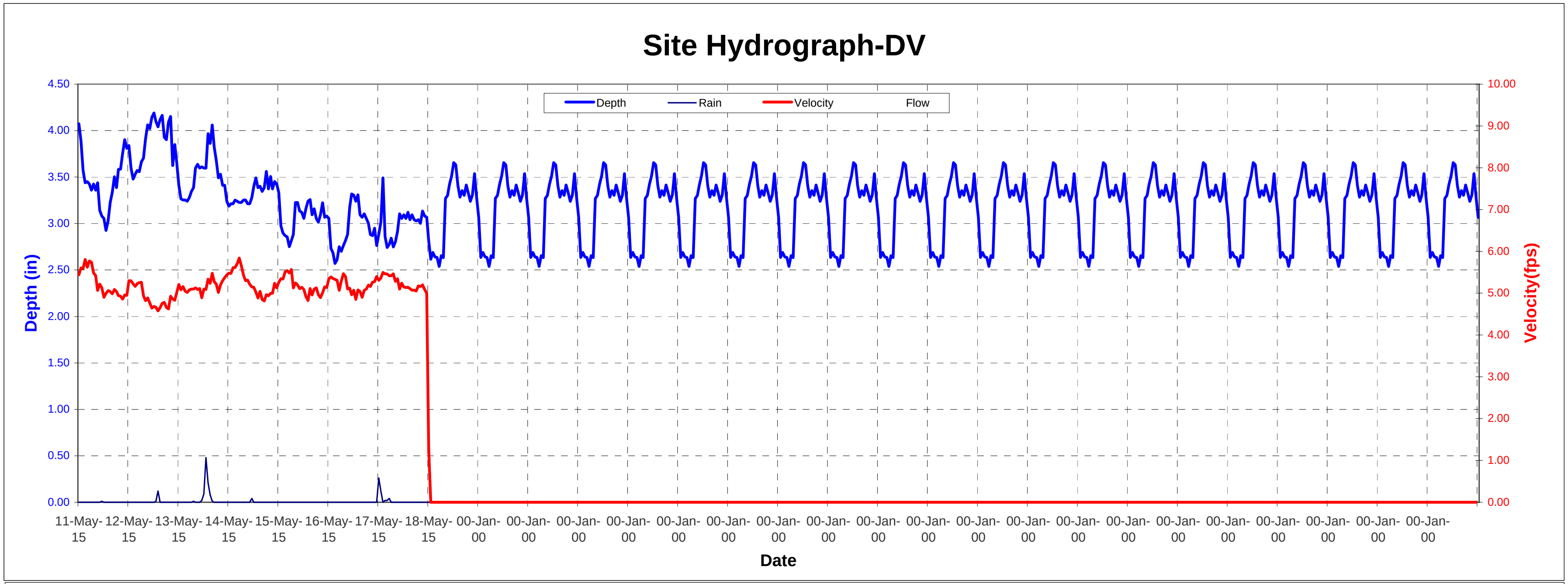
Interra Hydro

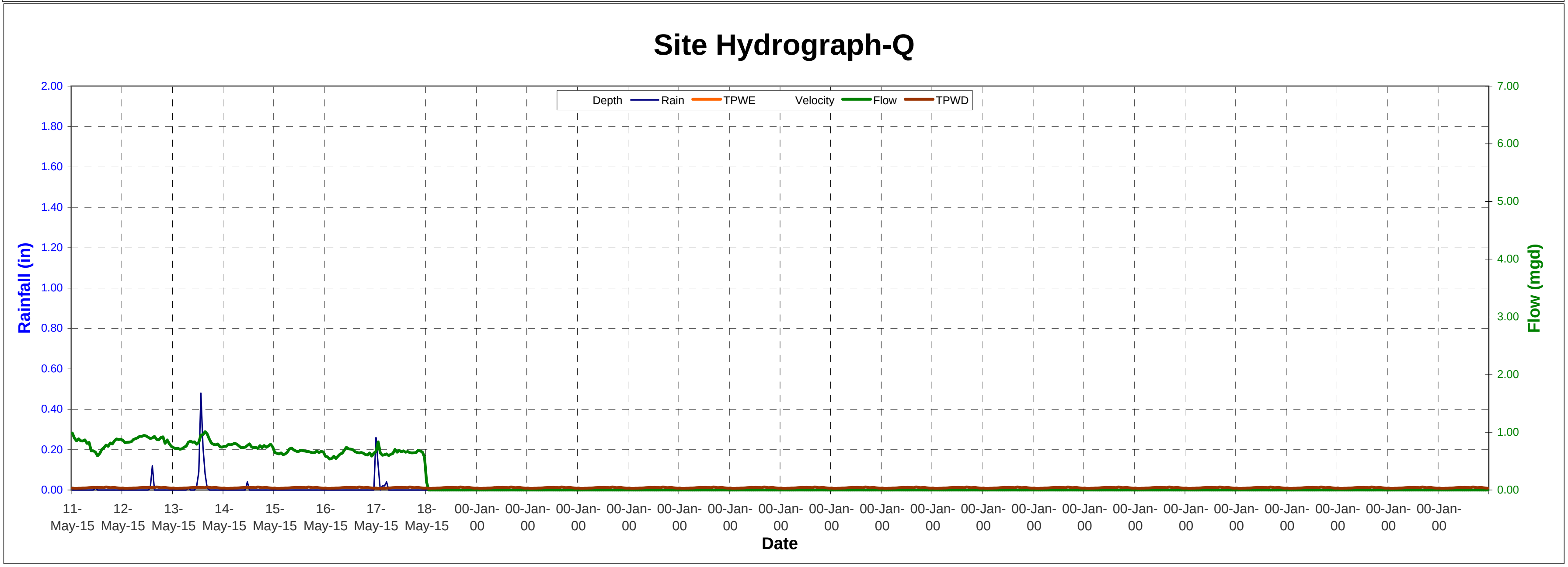
Site 3 HyGraph



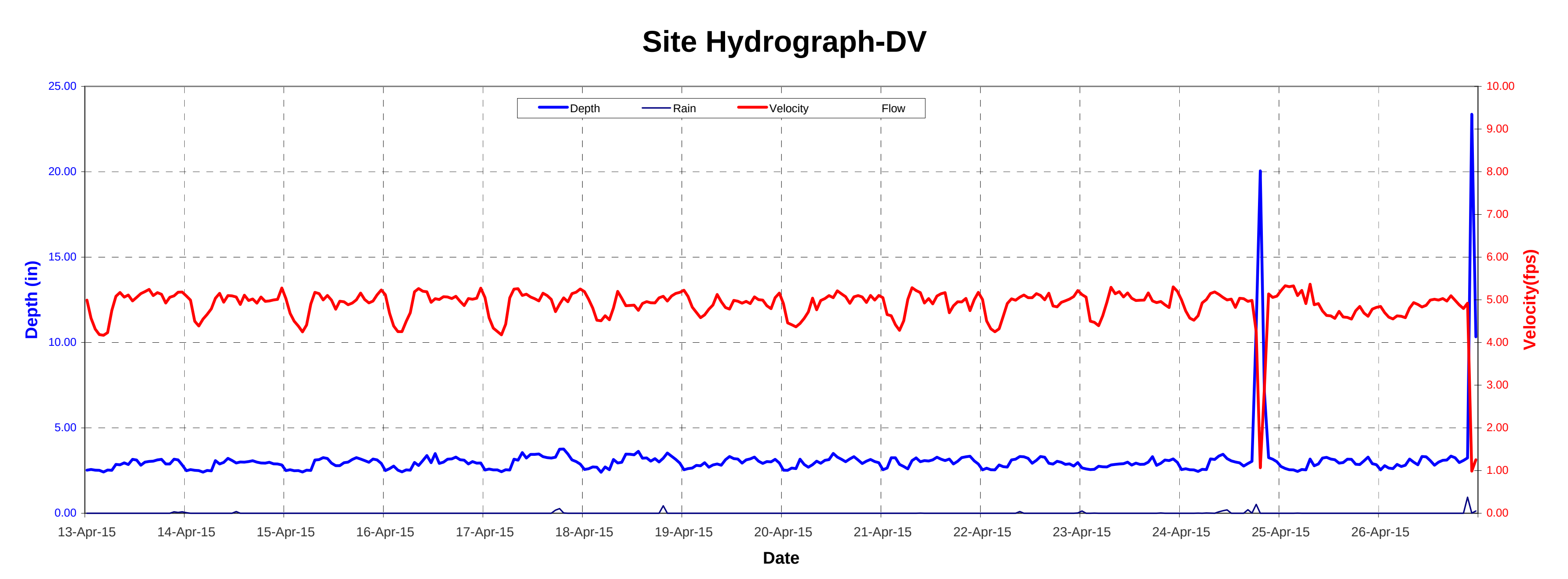


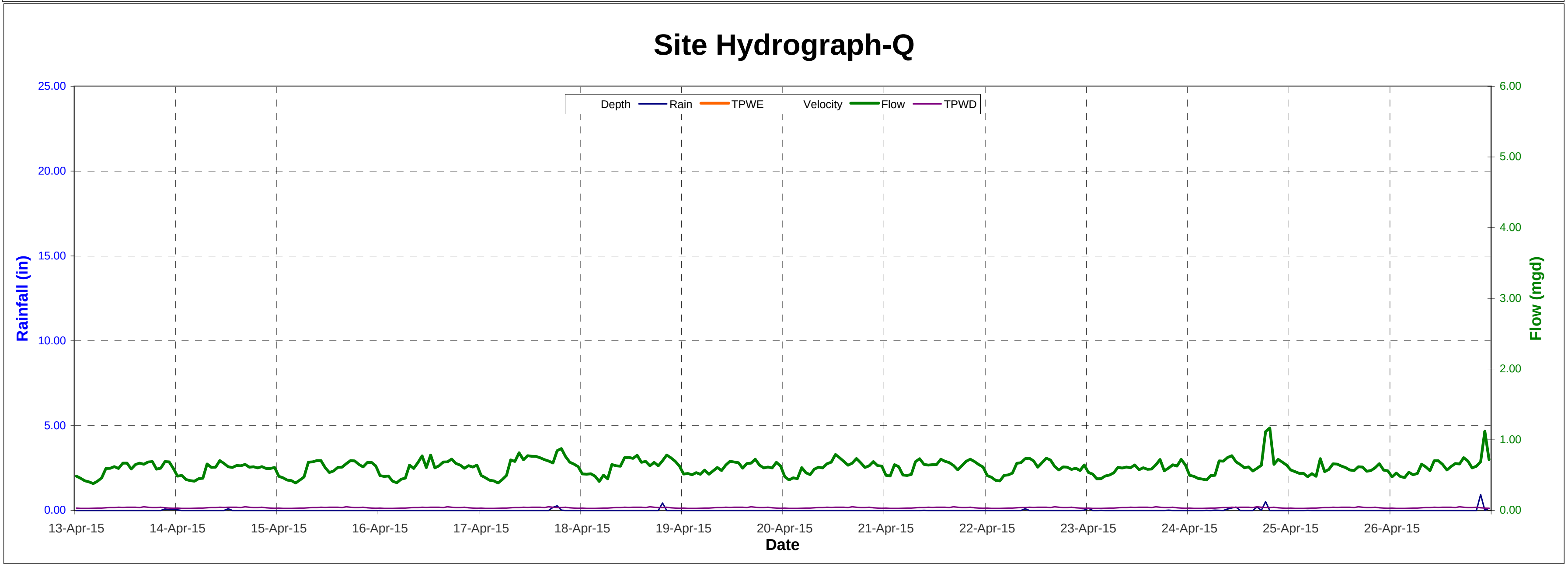
Site 3 HyGraph



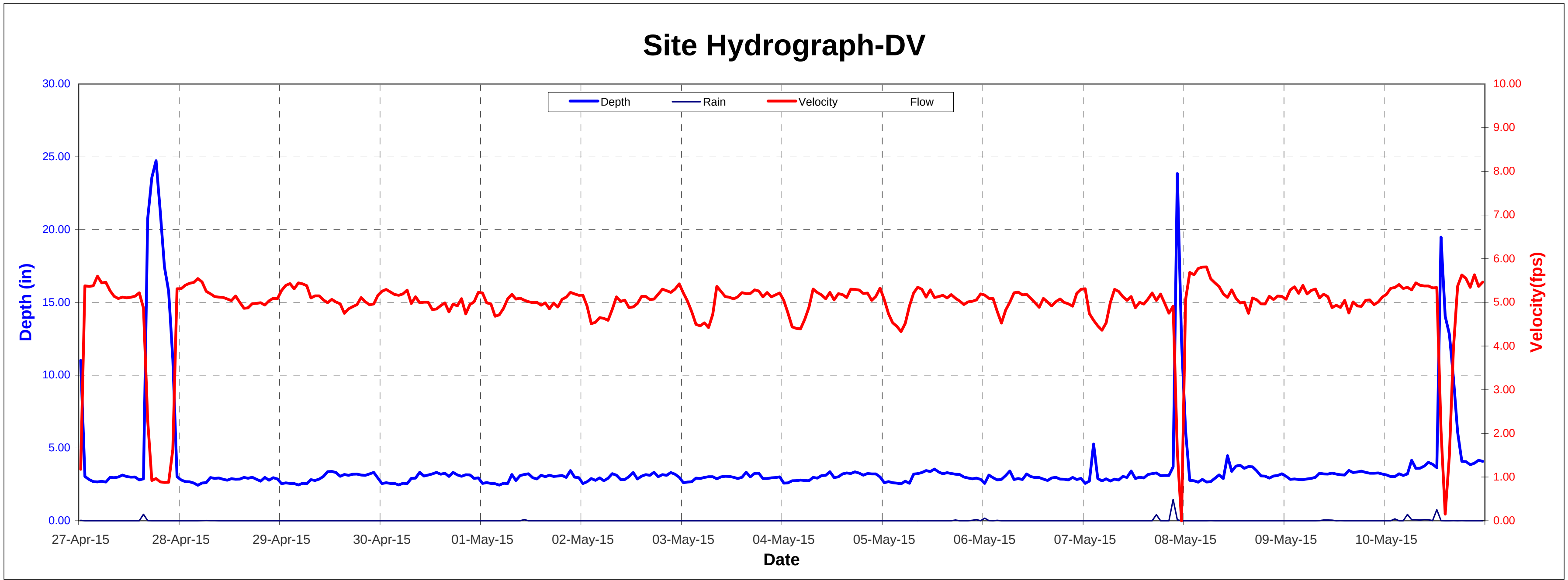


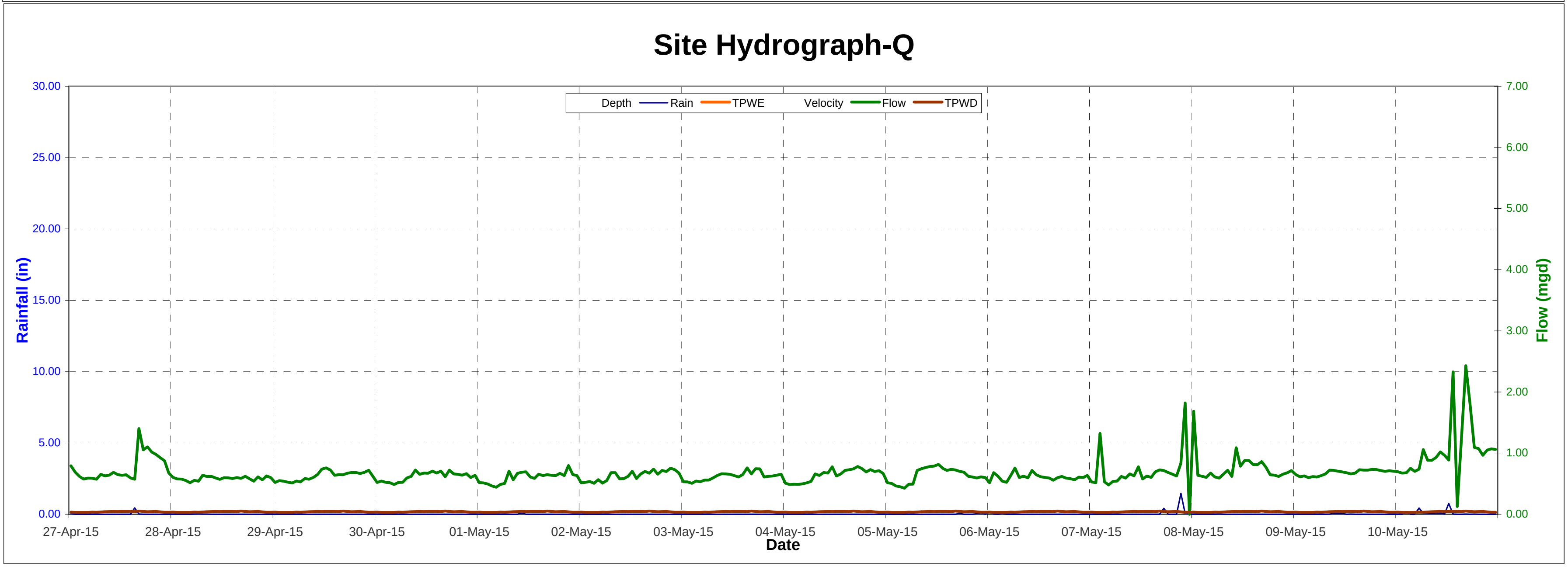
Site 3 HyGraph



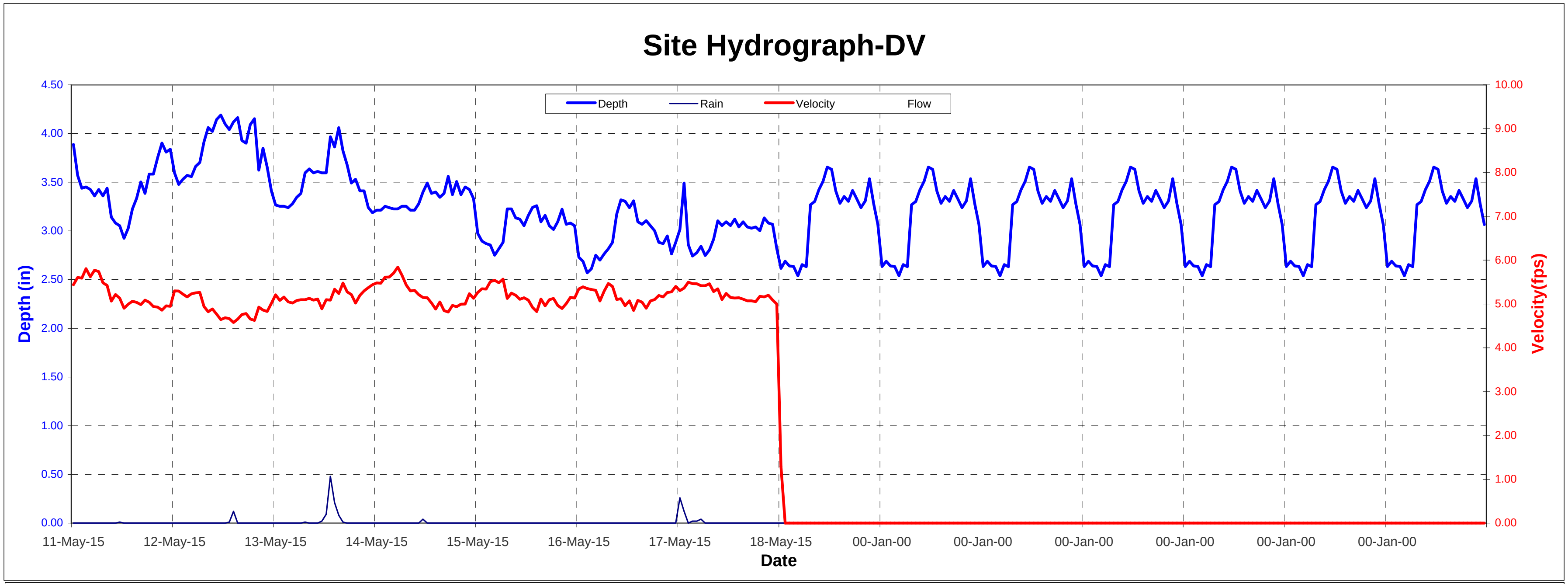


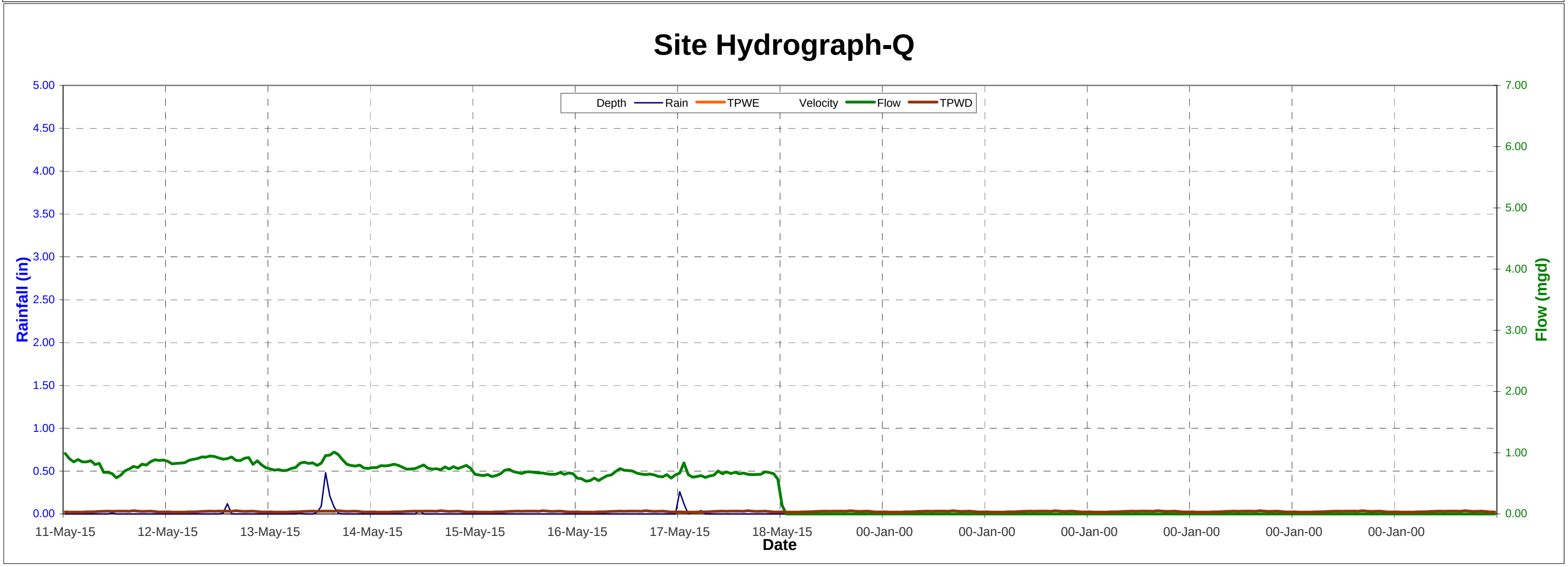
Site 3 HyGraph



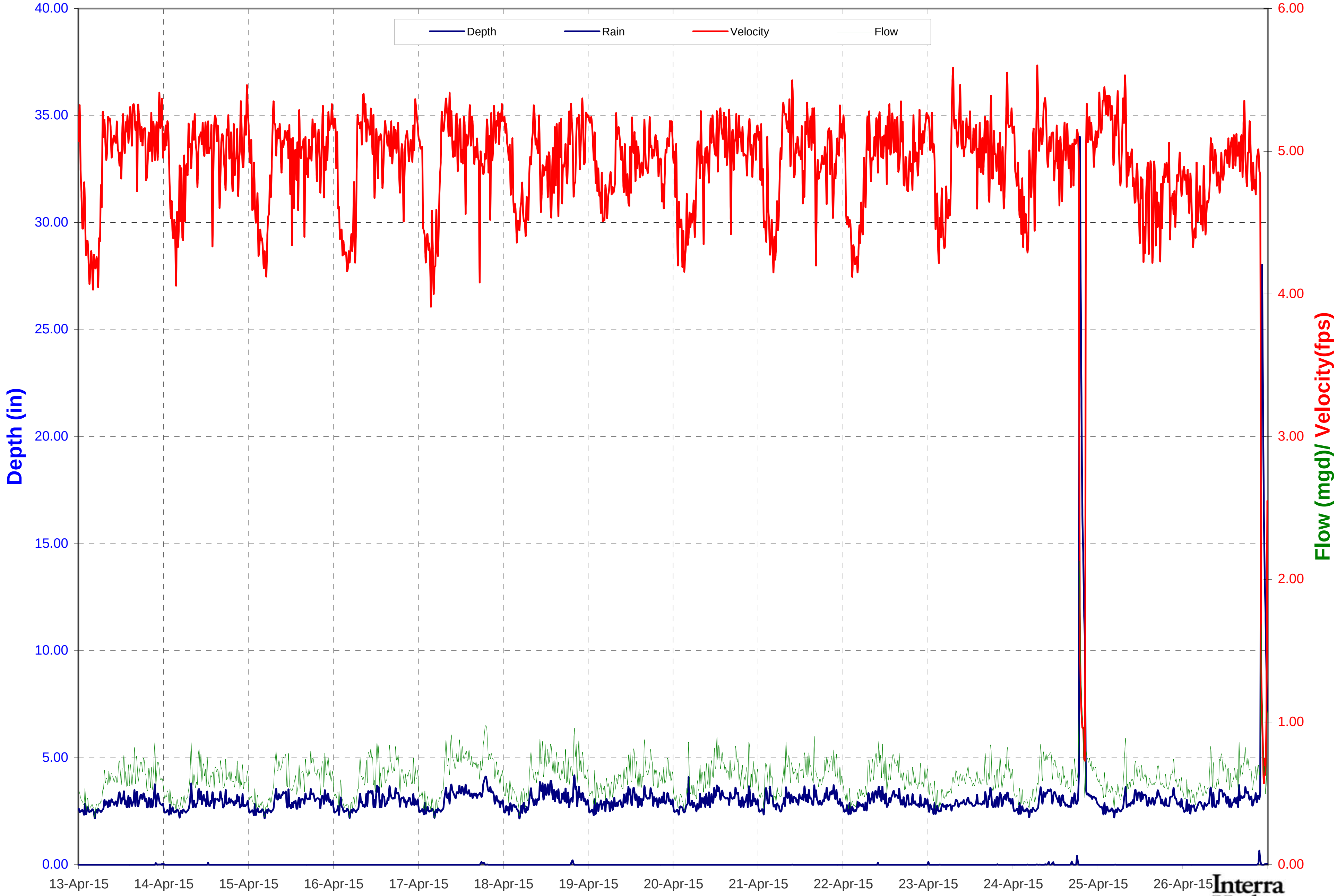


Site 3 HyGraph





Site 3 HyGraph



Interra Hydro

2Wks (1)

Weekly- 15 Min Data

Site 3 HyGraph

Interra Hydro

2Wks (2)

Weekly- 15 Min Data

Site 3 HyGraph

2Wks (3)

Weekly- 15 Min Data

Interra Hydro

Flow Monitoring Site Sheet

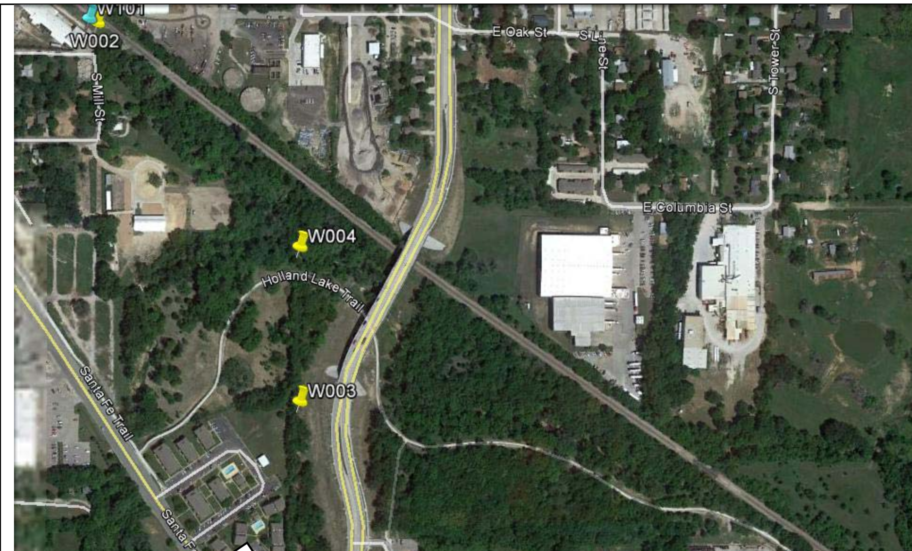
Interra Hydro

Flow Service Provider

Project Name	Weatherford MP Flow Monitoring	Job #	2015003
Personnel	BD/AH/CR	Date	04/12/2015

Site Location Information

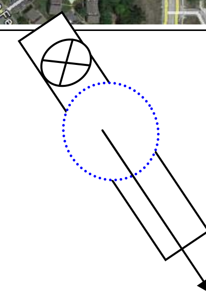
Site Name	W004		
Meter ID	15003004		
Site Location	Woods		
Address	Jack Borden Way		
Traffic Cond	None		
Mh Number	578		
Mh Depth	4.30’	Gas	H2S



Meter configuration Information

Meter Serial	080400001256
Sensor Serial	ITH-A-S009
Power	Battery
Logging Cycle	15 min
Telemetry	RS232
Site Status	Running

Rotate View



Planar View

N

Site Characteristics

Pipe Diameter	12”H x 11.75”W	Pipe Type	VC
Pipe Shape	Circular	Surcharge	0
Turbulence	Smooth	Silt level	0
Hydraulics	Good		

Install Calibration and Profile

Avg. Velocity	Time	DOF	Meter Level	Meter Velocity
2.5 fps	12:20	5.5”	5.615”	2.17 fps

Site name W004

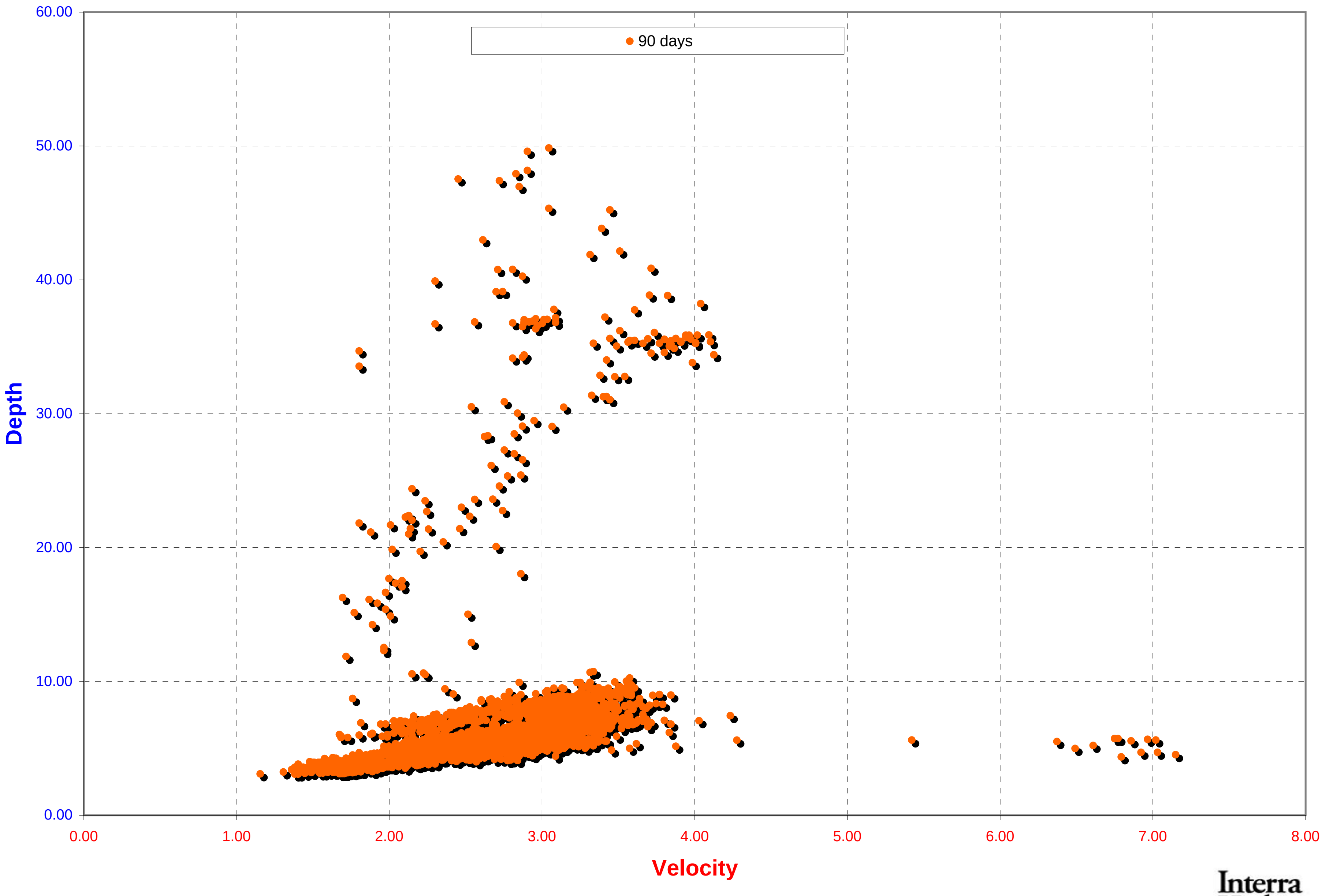
Daily Flow Summary
Site W004

Date	Depth Average (inches)	Flow Average (mgd)	Depth Maximum (in.)	Flow Maximum (mgd)	Depth Minimum (in.)	Flow Minimum (mgd)	Velocity Average (fps)	Velocity Maximum (fps)	Daily Rain (in)
13-Apr-15	5.03	0.484	6.33	0.843	3.26	0.161	2.30	3.21	0.21
14-Apr-15	5.25	0.505	6.76	0.836	3.50	0.189	2.30	2.93	0.13
15-Apr-15	5.17	0.485	6.63	0.854	3.08	0.119	2.21	2.99	0.00
16-Apr-15	5.18	0.482	6.54	0.812	3.37	0.168	2.22	3.00	0.00
17-Apr-15	5.23	0.518	7.34	1.034	3.20	0.161	2.31	3.42	0.47
18-Apr-15	5.47	0.558	7.22	0.991	3.43	0.176	2.36	3.15	0.44
19-Apr-15	5.48	0.571	6.73	0.947	3.75	0.211	2.44	3.26	0.00
20-Apr-15	5.40	0.540	6.67	0.845	3.67	0.202	2.37	3.03	0.00
21-Apr-15	5.09	0.472	6.45	0.790	3.38	0.172	2.23	2.96	0.01
22-Apr-15	5.18	0.499	6.62	0.837	3.26	0.163	2.30	2.98	0.12
23-Apr-15	5.15	0.485	6.26	0.749	3.49	0.185	2.27	2.84	0.16
24-Apr-15	8.87	0.717	40.77	1.537	3.43	0.176	2.75	7.15	1.21
25-Apr-15	5.39	0.635	6.81	1.134	4.12	0.346	2.84	3.84	0.01
26-Apr-15	7.91	0.633	45.34	1.848	3.48	0.206	2.74	3.72	1.08
27-Apr-15	19.39	1.247	49.85	1.902	6.94	0.807	3.08	3.82	0.48
28-Apr-15	9.08	1.321	10.68	1.633	8.04	0.993	3.23	3.84	0.05
29-Apr-15	7.59	1.010	8.41	1.405	6.69	0.635	2.99	3.79	0.00
30-Apr-15	6.88	0.854	8.38	1.265	5.80	0.540	2.85	3.46	0.00
1-May-15	5.51	0.590	7.81	1.058	3.99	0.378	2.63	3.57	0.08
2-May-15	4.56	0.474	5.45	0.803	3.44	0.226	2.63	3.88	0.00
3-May-15	4.64	0.499	6.21	0.861	3.12	0.176	2.63	3.49	0.00
4-May-15	4.69	0.487	5.80	0.799	3.22	0.174	2.58	3.62	0.00
5-May-15	4.69	0.480	5.78	0.797	3.12	0.164	2.53	3.37	0.16
6-May-15	4.88	0.515	6.29	0.805	3.28	0.182	2.59	3.26	0.21
7-May-15	7.24	0.595	38.22	2.052	3.12	0.165	2.63	4.13	1.93
8-May-15	9.92	1.065	34.88	1.923	6.31	0.837	3.16	4.23	0.01
9-May-15	5.87	0.817	7.15	1.635	4.53	0.397	3.29	7.02	0.16
10-May-15	20.74	1.201	35.89	2.036	4.75	0.404	2.89	4.09	1.69
11-May-15	8.34	1.076	12.54	1.409	7.40	0.706	2.89	3.49	0.01
12-May-15	7.67	0.919	8.47	1.230	6.79	0.545	2.69	3.35	0.13
13-May-15	11.96	0.911	27.89	1.467	5.89	0.436	2.41	3.40	0.90
14-May-15	6.61	0.802	7.89	1.080	5.36	0.553	2.82	3.76	0.04
15-May-15	5.52	0.600	6.23	0.805	4.55	0.347	2.62	3.28	0.00
16-May-15	5.31	0.554	6.30	0.834	4.11	0.265	2.52	3.22	0.00
17-May-15	5.94	0.691	7.11	1.022	4.61	0.369	2.73	3.37	0.46

Interra Hydro

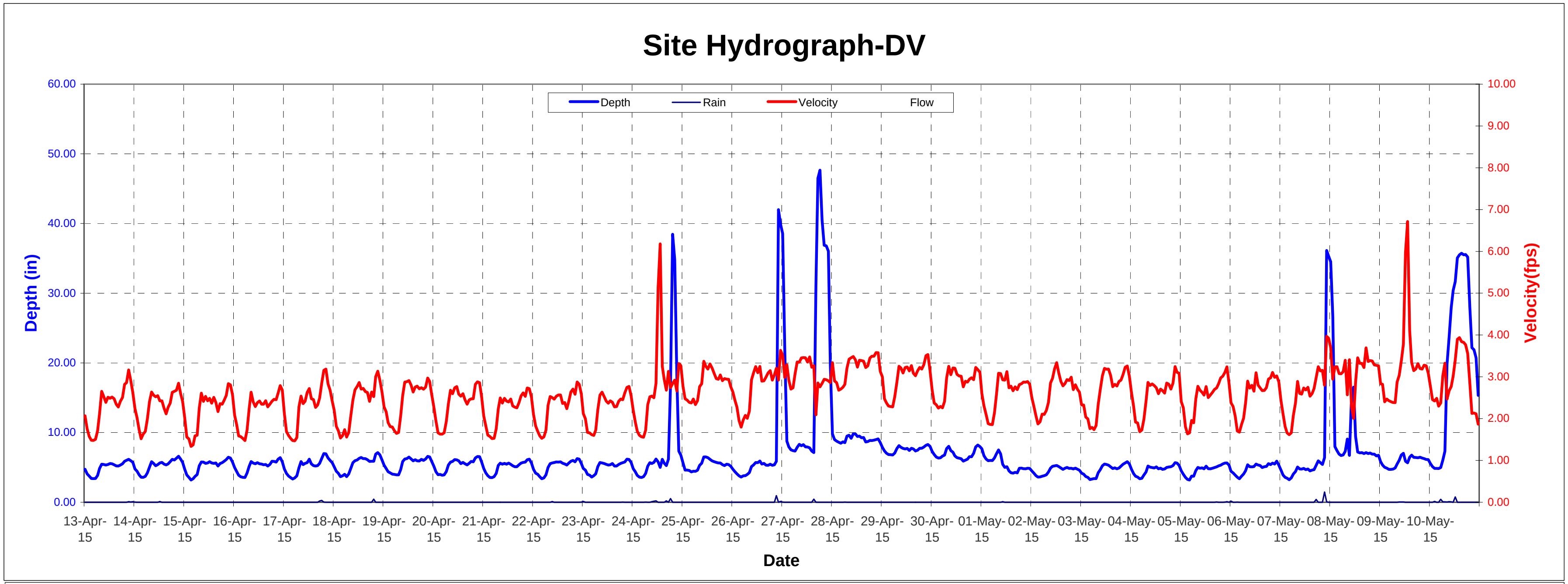
Site 4 HyGraph

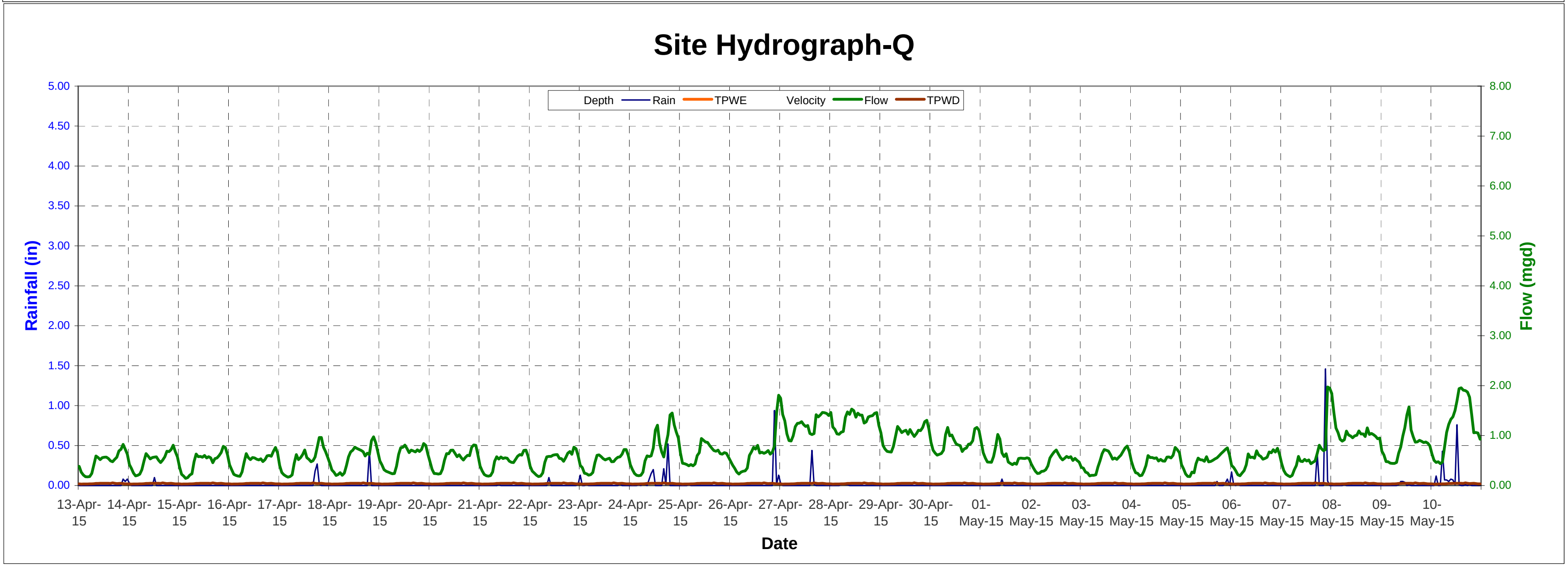
Site Scatter Graph



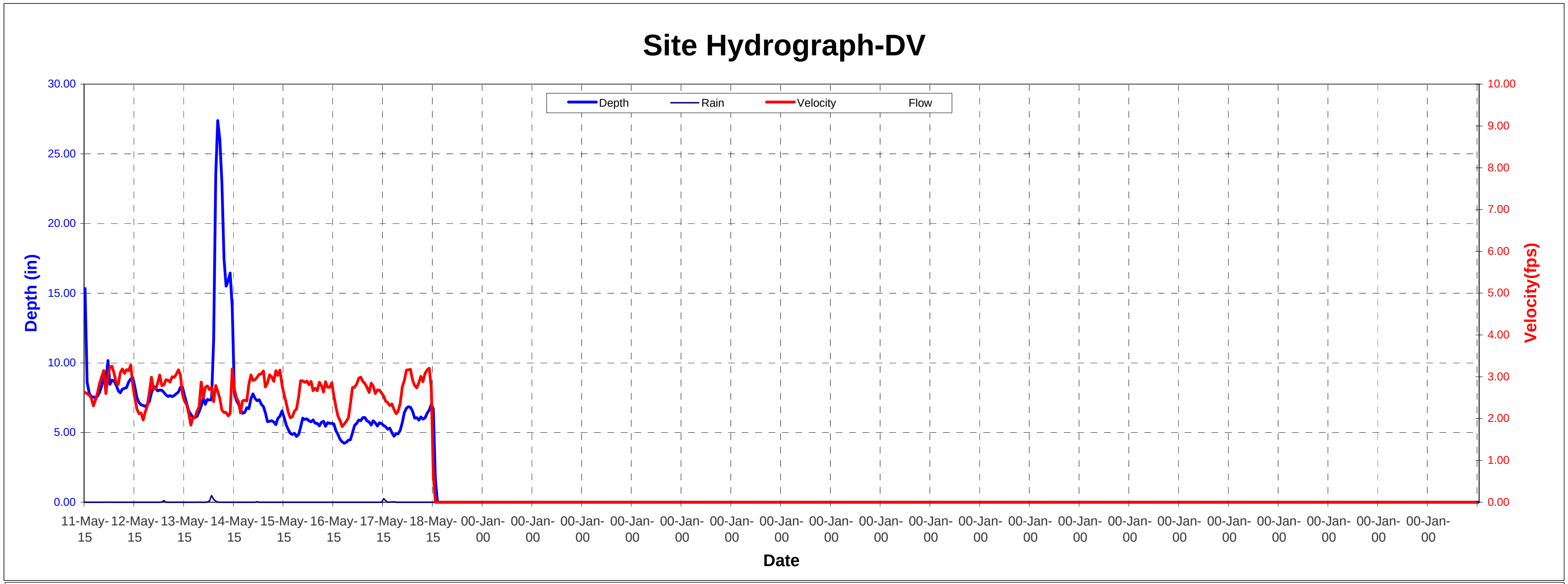
Interra Hydro

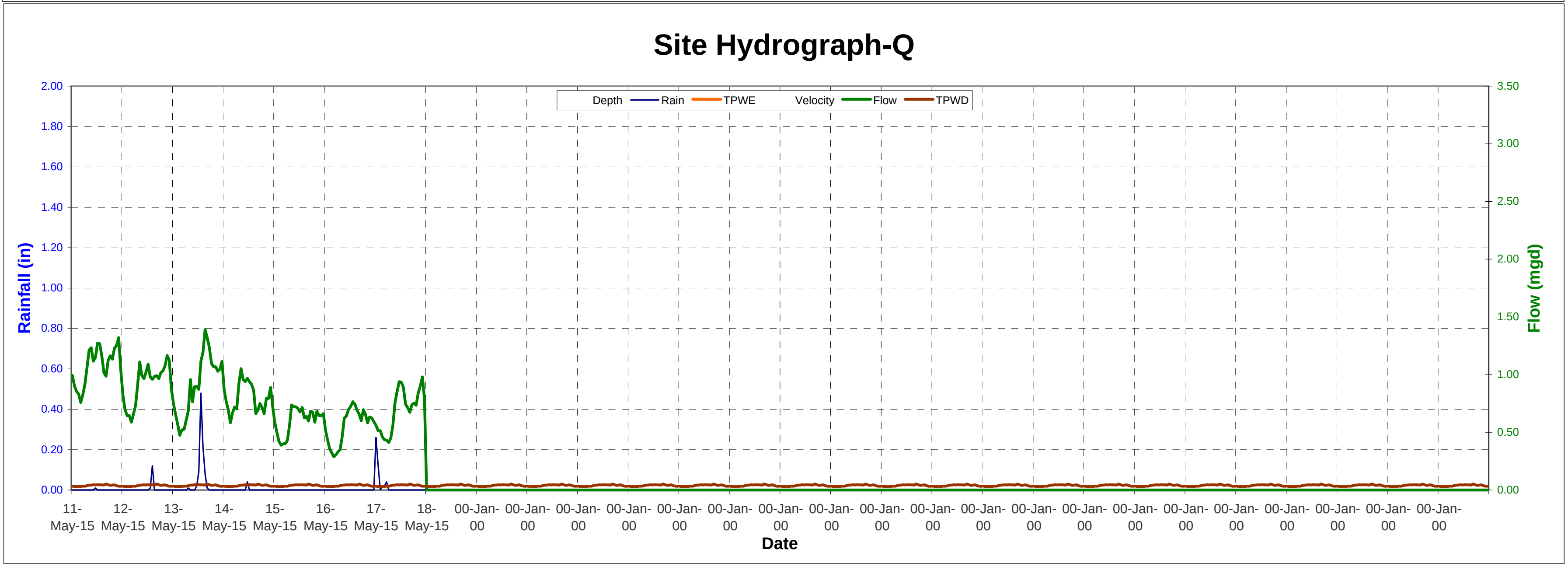
Site 4 HyGraph





Site 4 HyGraph





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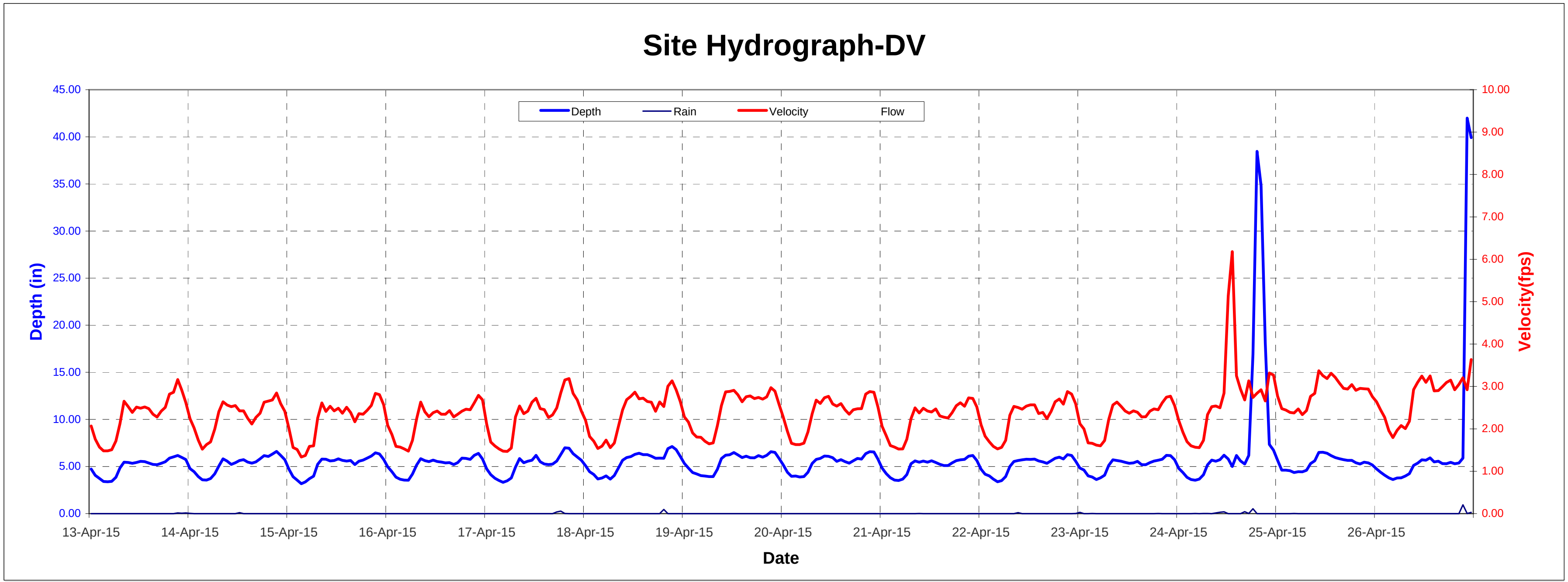

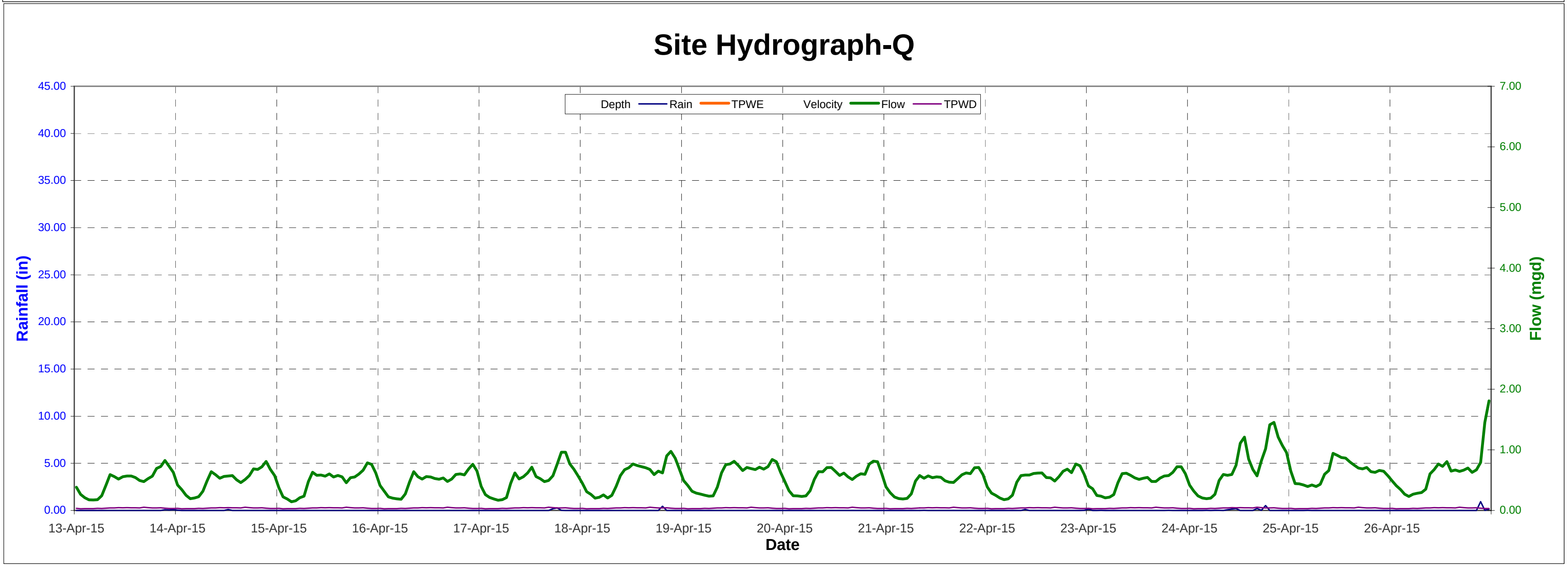

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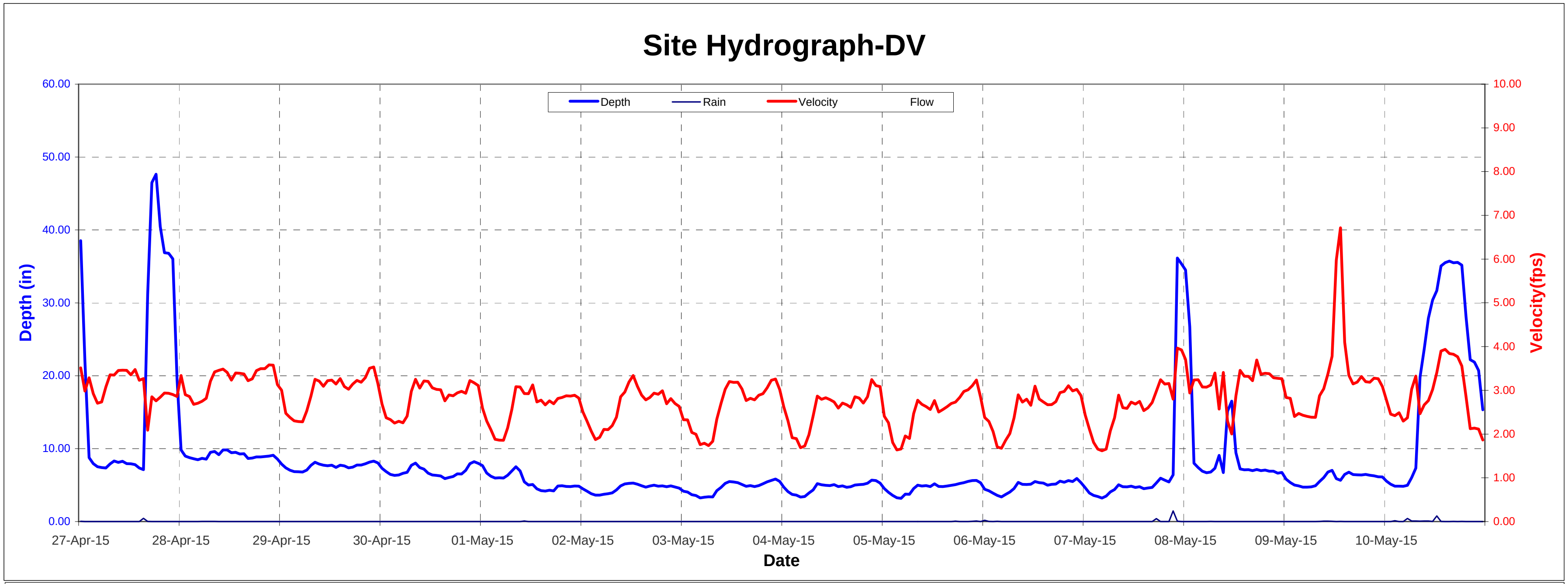

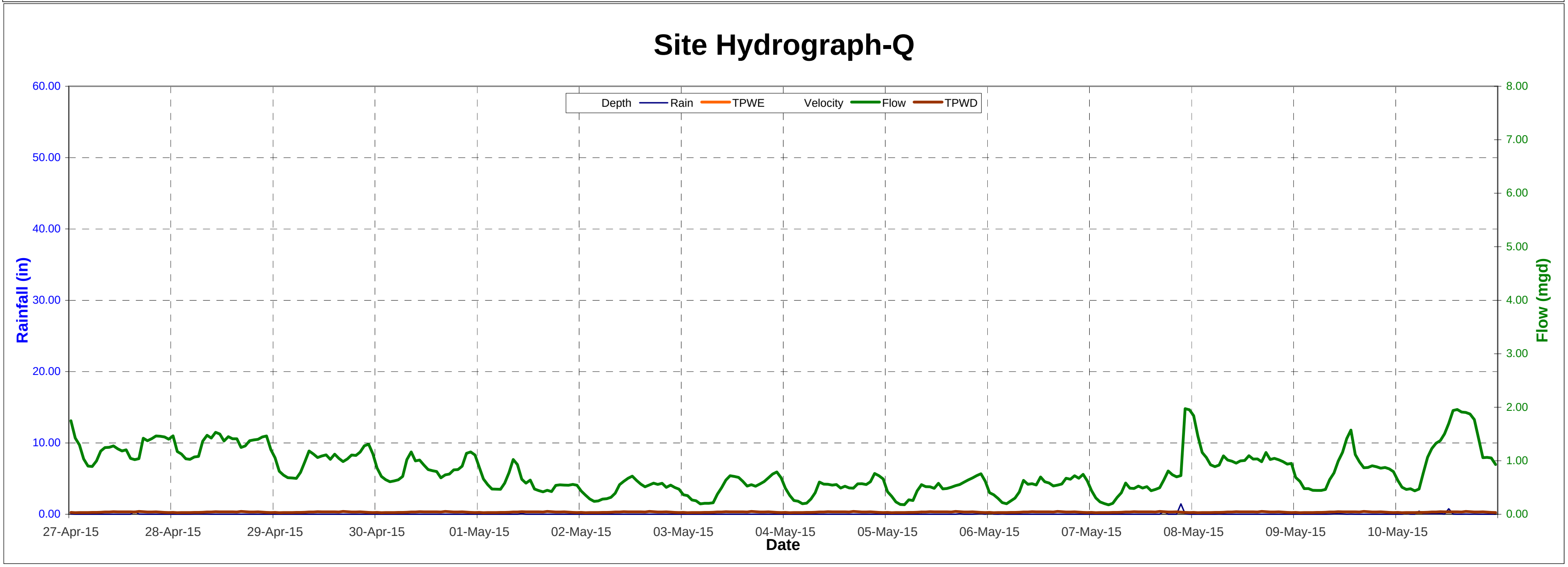

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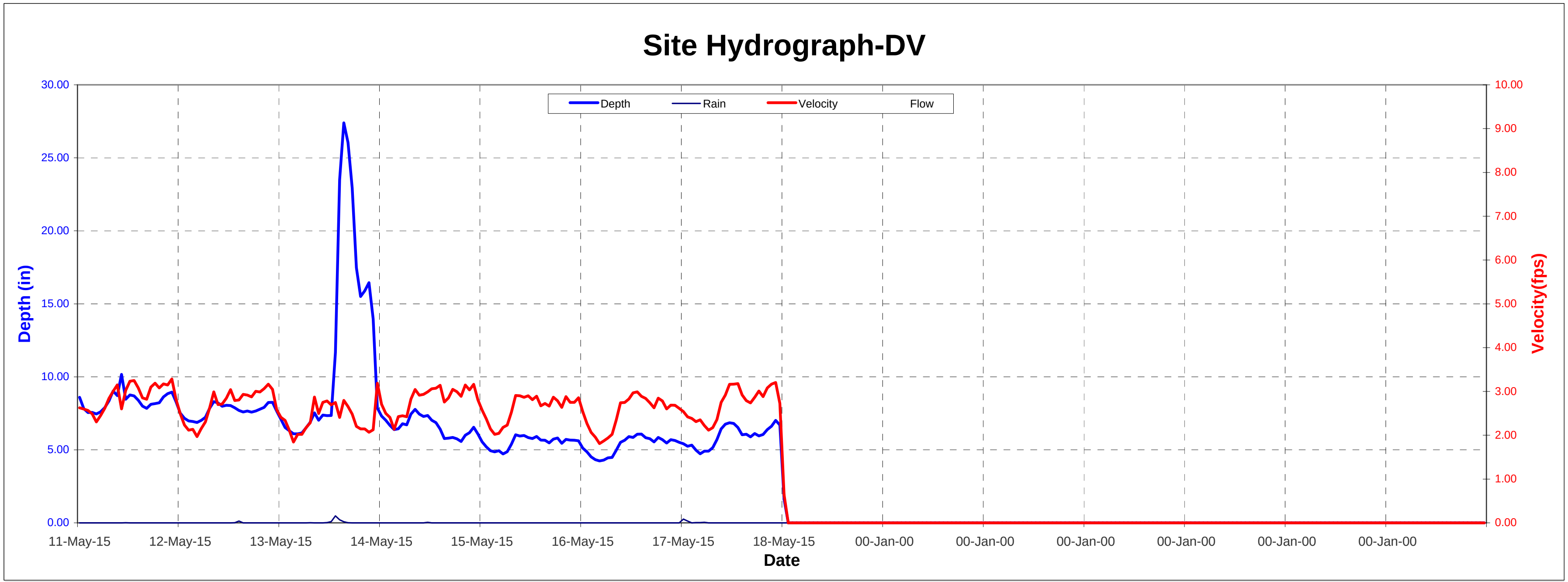

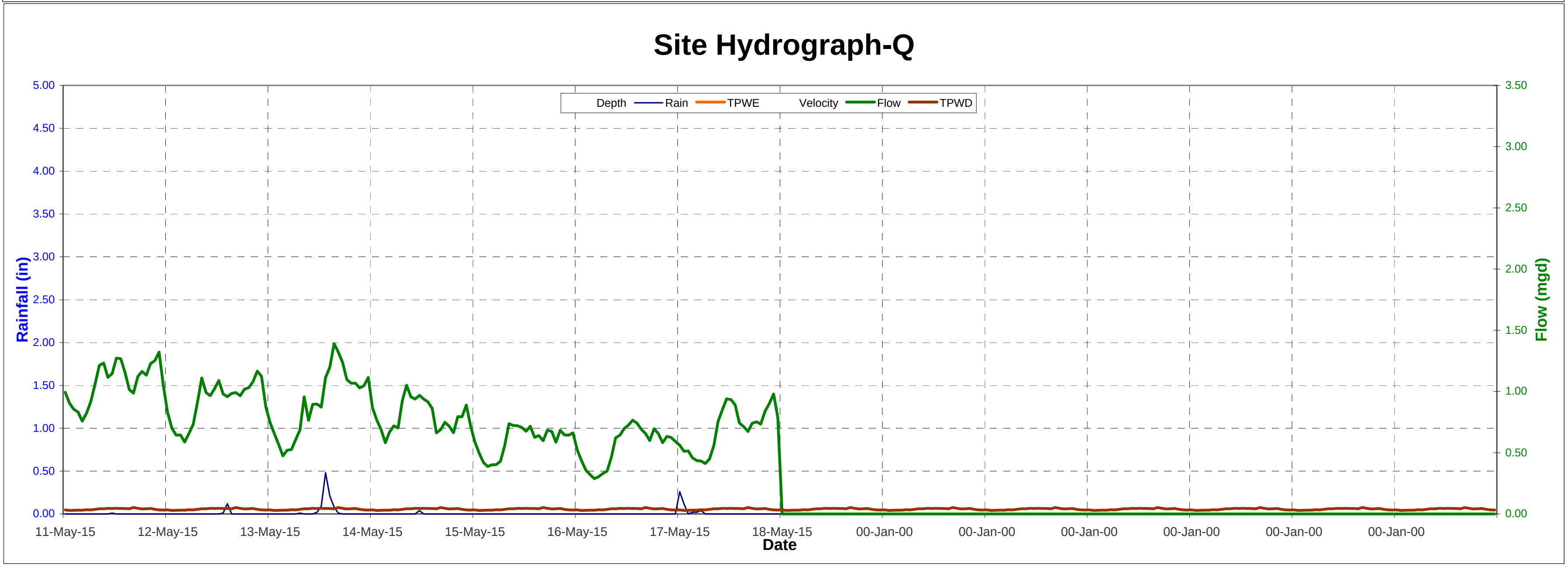

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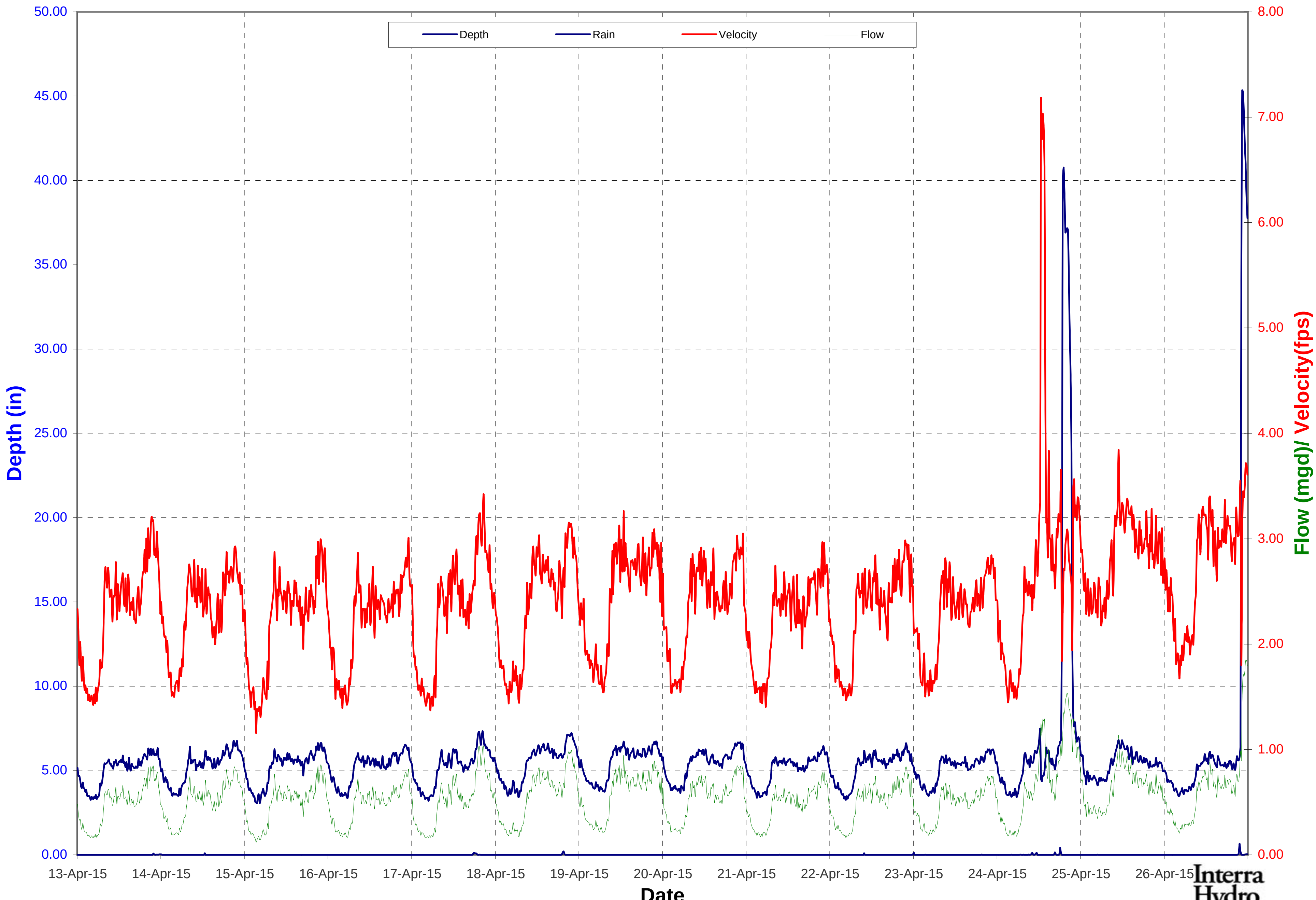
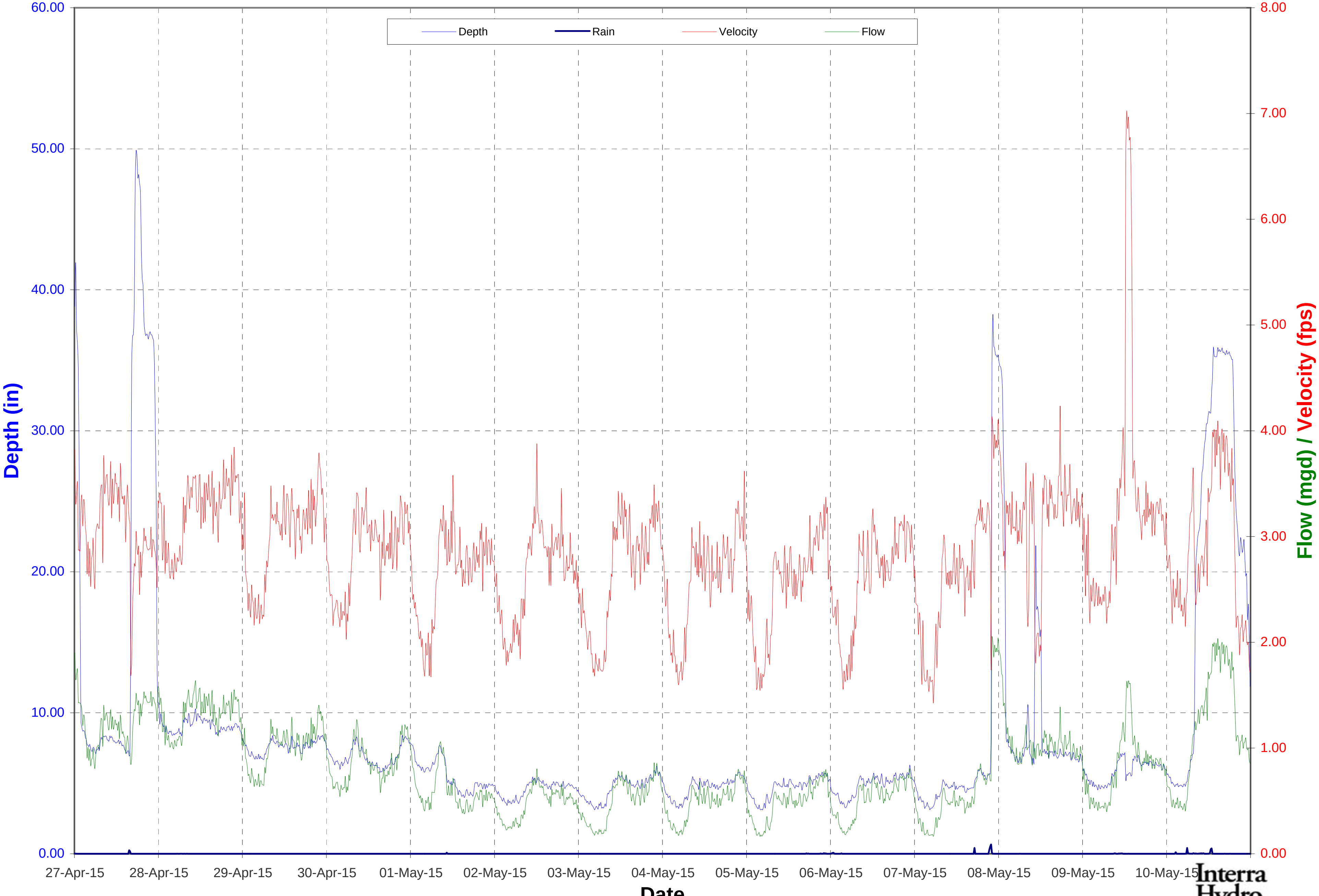


Interra Hydro

2Wks (1)

Weekly- 15 Min Data

Site 4 HyGraph



2Wks (2)

Weekly- 15 Min Data

Interra Hydro

Site 4 HyGraph

2Wks (3)

Weekly- 15 Min Data

Interra Hydro

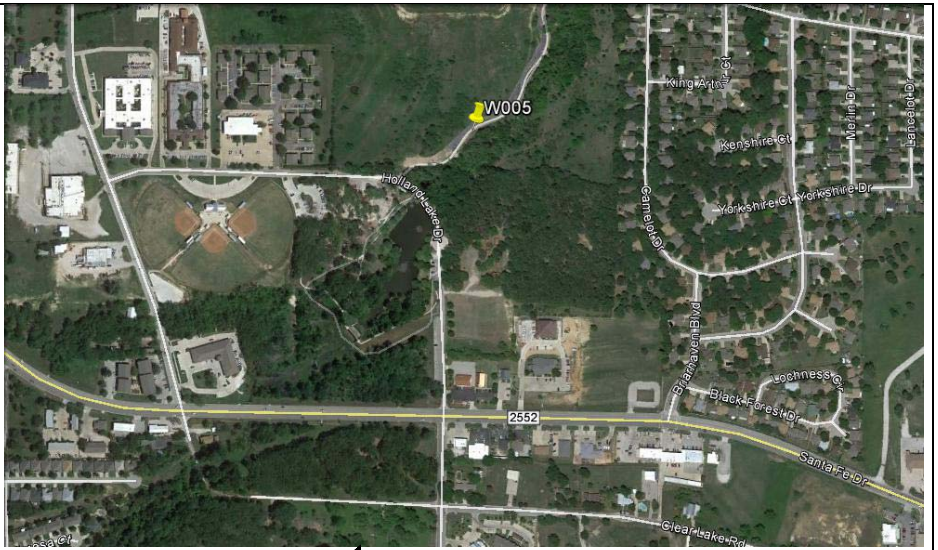
Flow Monitoring Site Sheet

Interra Hydro
Flow Service Provider

Project Name	Weatherford MP Flow Monitoring	Job #	2015003
Personnel	BD/AH/CR	Date	04/12/2015

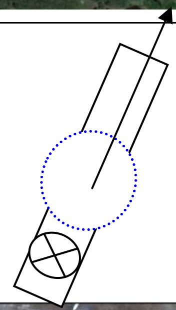
Site Location Information

Site Name	W005		
Meter ID	15003005		
Site Location	Park/Sidewalk		
Address	1460 Holland Lake Dr.		
Traffic Cond	Foot Traffic		
Mh Number	4573		
Mh Depth	11.7’	Gas	O2



Meter configuration Information

Meter Serial	40900002051
Sensor Serial	ITH-A-S1691
Power	Battery
Logging Cycle	15 min.
Telemetry	RS232
Site Status	Running



Site Characteristics

Pipe Diameter	23”H x 24.125W	Pipe Type	PVC
Pipe Shape	Circular	Surcharge	0
Turbulence	Mild	Silt level	0
Hydraulics	Fair / Fast		

Install Calibration and Profile

Avg. Velocity	Time	DOF	Meter Level	Meter Velocity
5.7	23:15	3	2.764	5.73

Site name W005

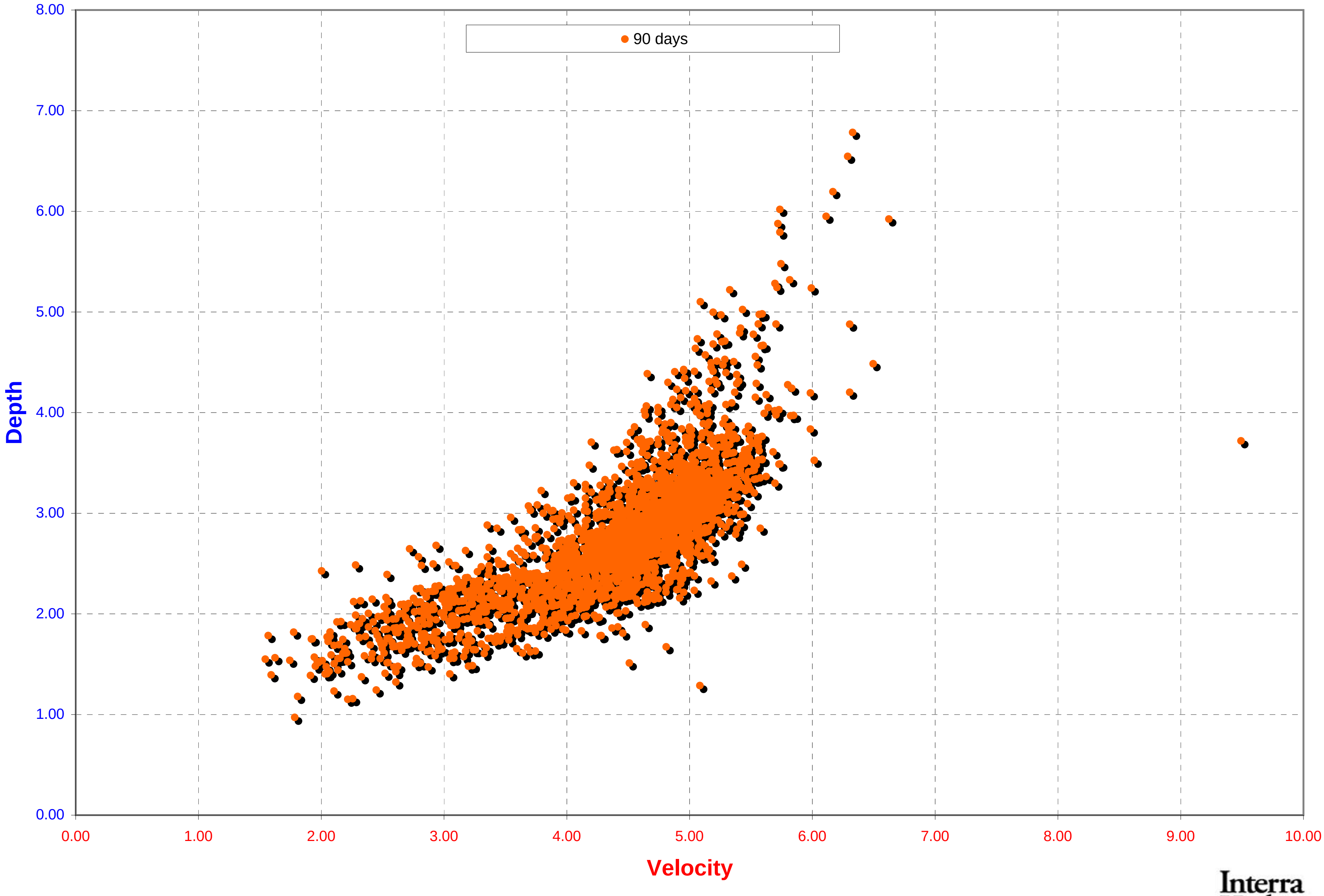
Daily Flow Summary
Site W005

Date	Depth Average (inches)	Flow Average (mgd)	Depth Maximum (in.)	Flow Maximum (mgd)	Depth Minimum (in.)	Flow Minimum (mgd)	Velocity Average (fps)	Velocity Maximum (fps)	Daily Rain (in)
13-Apr-15	2.60	0.546	4.47	1.363	0.97	0.049	4.16	5.40	0.21
14-Apr-15	2.60	0.524	4.41	1.256	1.39	0.075	4.19	5.32	0.13
15-Apr-15	2.53	0.512	4.20	1.268	1.23	0.082	4.16	5.39	0.00
16-Apr-15	2.54	0.522	3.33	0.878	1.40	0.095	4.31	5.23	0.00
17-Apr-15	2.59	0.545	3.53	1.029	1.41	0.097	4.40	5.59	0.47
18-Apr-15	2.66	0.568	3.97	1.274	1.53	0.085	4.39	6.02	0.44
19-Apr-15	2.82	0.616	3.68	1.040	1.94	0.238	4.47	5.49	0.00
20-Apr-15	2.60	0.532	3.42	0.945	1.61	0.126	4.31	5.42	0.00
21-Apr-15	2.34	0.454	3.31	0.841	1.52	0.090	4.28	5.58	0.01
22-Apr-15	2.81	0.585	4.01	1.121	1.73	0.126	4.17	5.34	0.12
23-Apr-15	3.00	0.651	3.86	1.094	2.01	0.198	4.33	5.43	0.16
24-Apr-15	2.82	0.645	4.30	1.411	1.39	0.089	4.50	5.98	1.21
25-Apr-15	2.68	0.563	3.99	1.128	1.88	0.201	4.37	5.62	0.01
26-Apr-15	2.63	0.503	3.66	1.042	1.77	0.137	4.01	5.45	1.08
27-Apr-15	2.93	0.699	4.24	1.490	1.77	0.182	4.73	6.30	0.48
28-Apr-15	2.47	0.512	4.45	1.328	1.62	0.171	4.51	5.47	0.05
29-Apr-15	2.55	0.530	3.54	1.030	1.75	0.181	4.48	5.59	0.00
30-Apr-15	2.87	0.634	3.98	1.245	1.87	0.173	4.46	5.70	0.00
1-May-15	2.76	0.589	3.58	0.963	1.85	0.163	4.42	5.39	0.08
2-May-15	2.86	0.623	3.62	0.995	1.98	0.198	4.46	5.42	0.00
3-May-15	2.73	0.563	3.42	0.887	1.78	0.106	4.30	5.25	0.00
4-May-15	2.68	0.535	3.63	1.015	1.89	0.165	4.19	5.31	0.00
5-May-15	2.77	0.580	3.74	1.067	1.90	0.160	4.34	5.35	0.16
6-May-15	2.75	0.570	3.31	0.948	1.99	0.181	4.34	5.70	0.21
7-May-15	2.80	0.611	4.88	1.881	1.29	0.180	4.37	9.49	1.93
8-May-15	2.95	0.679	3.70	1.084	2.01	0.242	4.69	5.52	0.01
9-May-15	2.99	0.696	4.40	1.350	1.83	0.172	4.62	5.54	0.16
10-May-15	4.22	1.243	6.78	2.950	2.25	0.268	4.92	6.62	1.69
11-May-15	3.19	0.756	4.47	1.436	2.24	0.410	4.71	5.55	0.01
12-May-15	2.41	0.498	3.46	0.875	1.64	0.180	4.57	5.42	0.13
13-May-15	2.78	0.655	4.21	1.447	1.63	0.152	4.68	6.31	0.90
14-May-15	3.08	0.708	3.78	1.088	2.29	0.325	4.61	5.36	0.04
15-May-15	3.39	0.828	4.21	1.324	2.34	0.282	4.64	5.69	0.00
16-May-15	2.37	0.504	4.39	1.409	1.00	0.129	4.62	5.59	0.00
17-May-15	1.00	0.138	1.00	0.160	1.00	0.108	4.81	5.57	0.46

Interterra Hydro

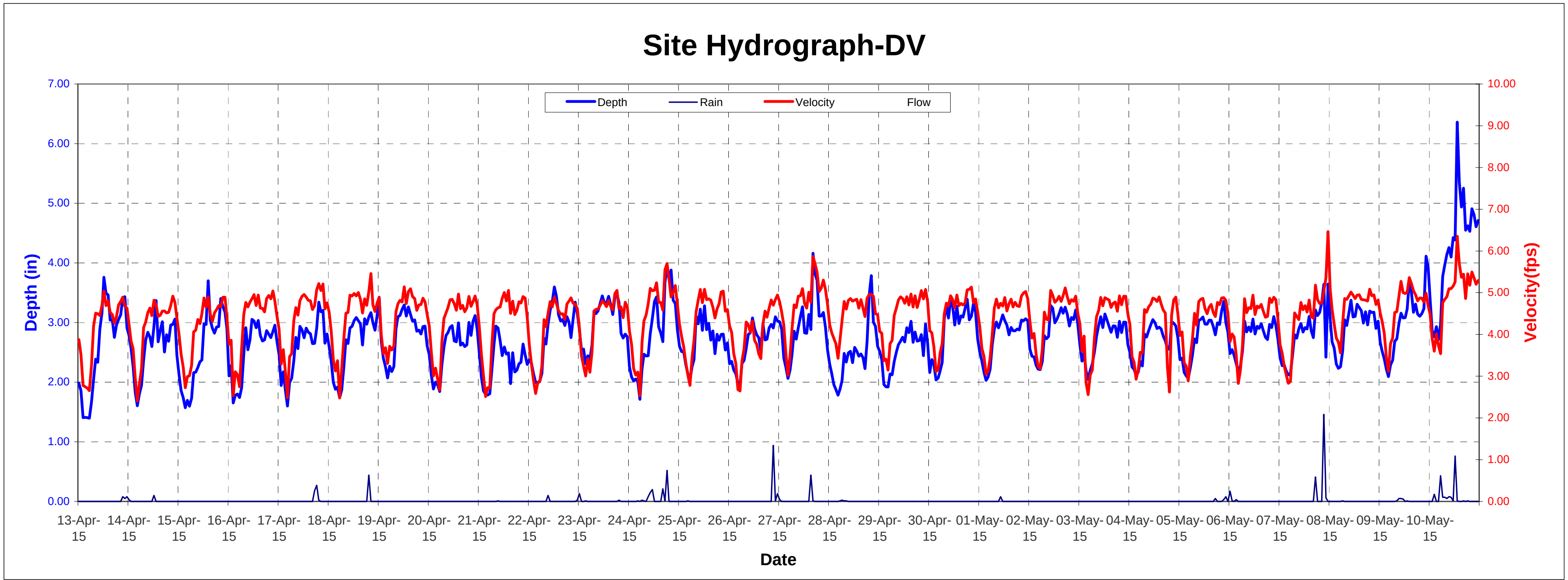
Site 5 HyGraph

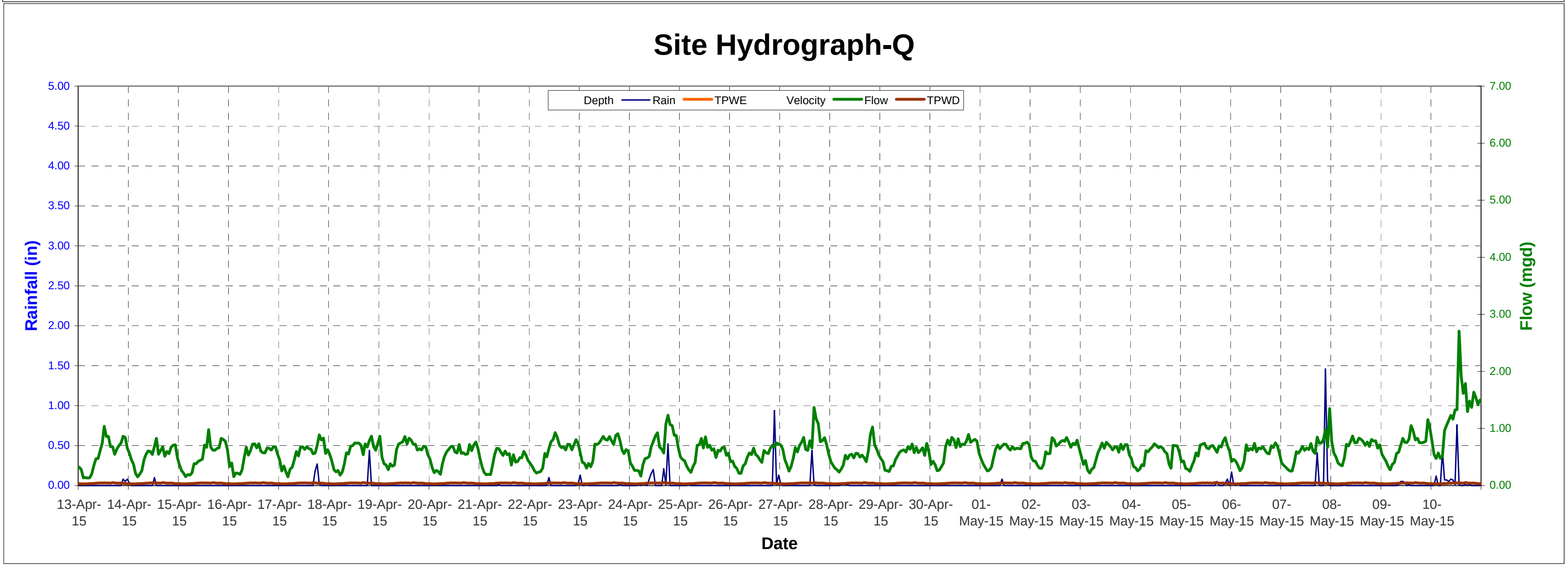
Site Scatter Graph



Interra Hydro

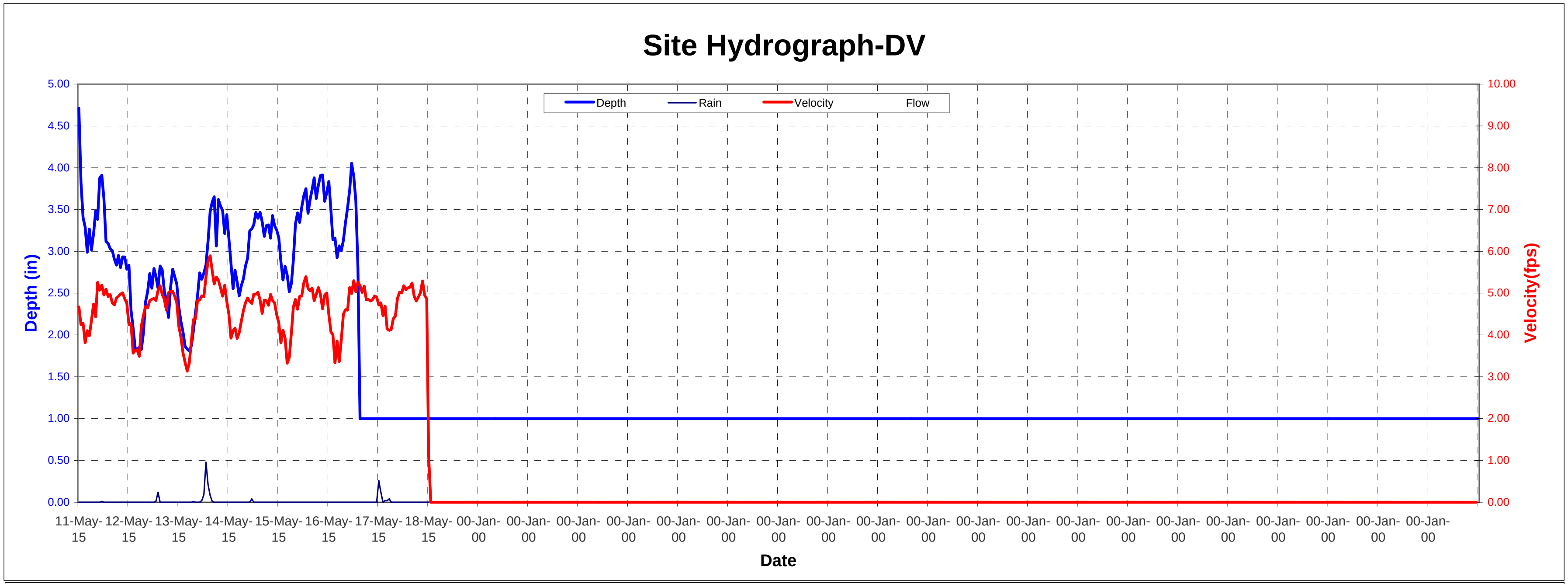
Site 5 HyGraph

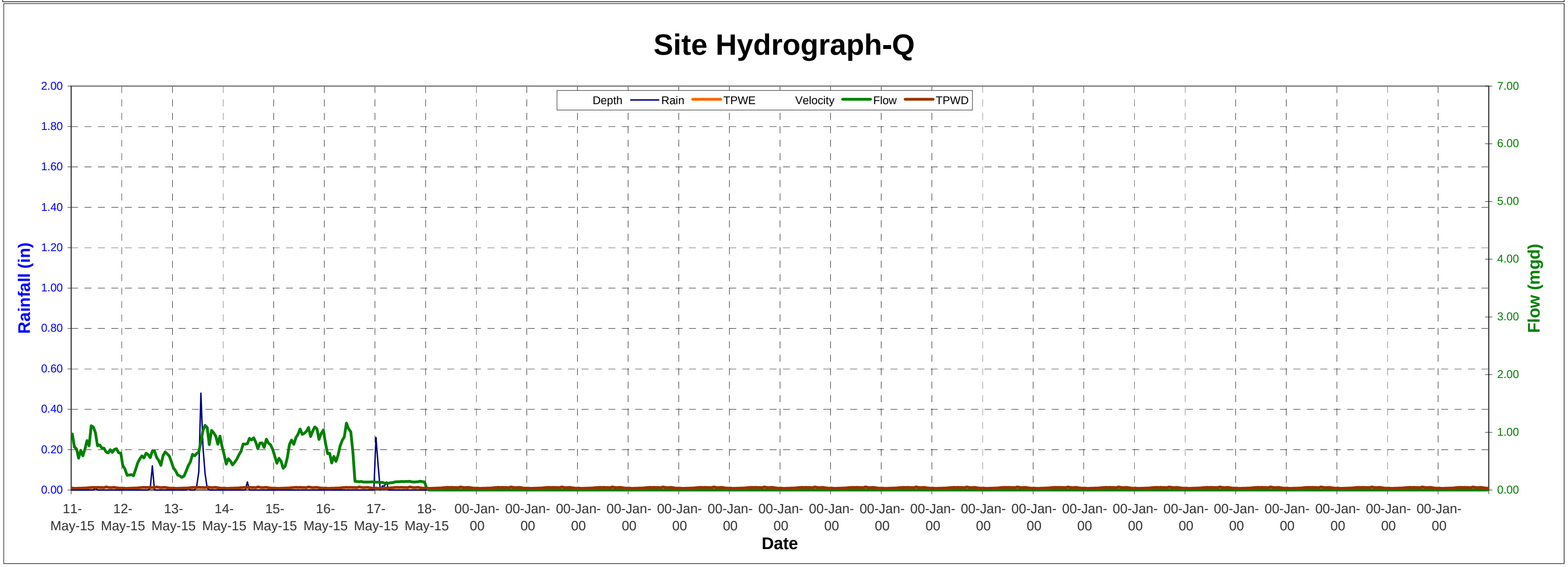




Interra Hydro

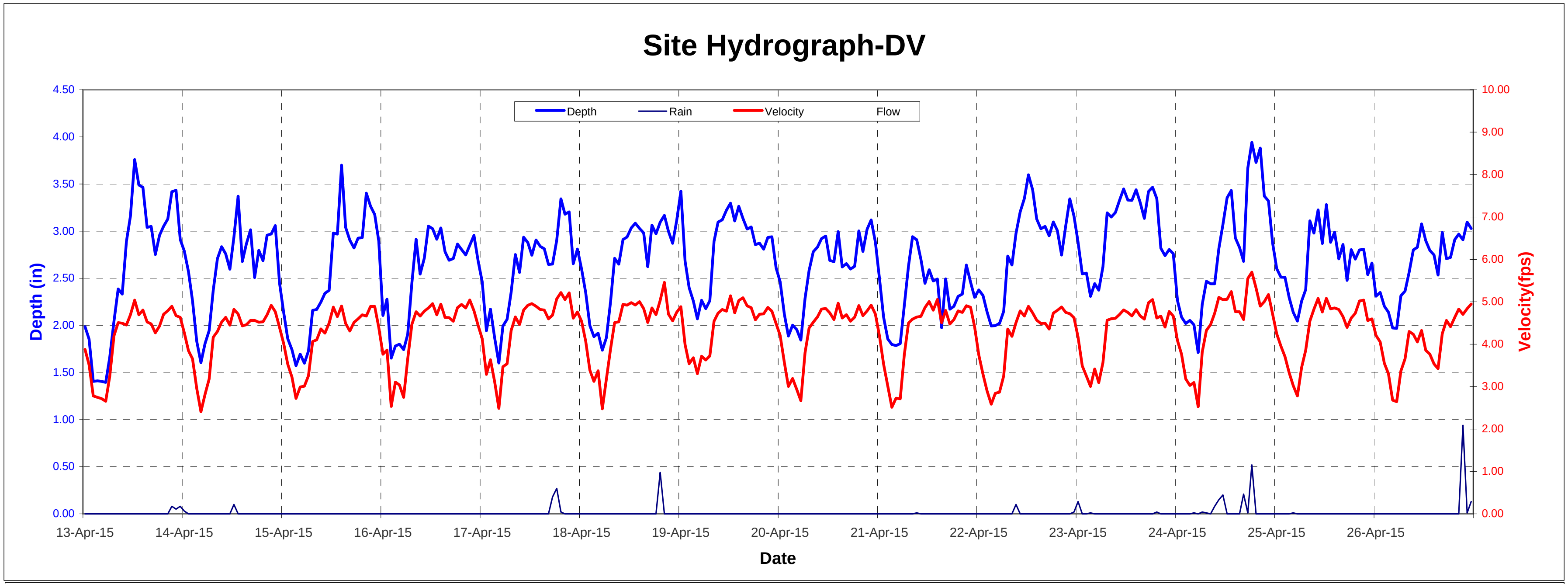
Site 5 HyGraph

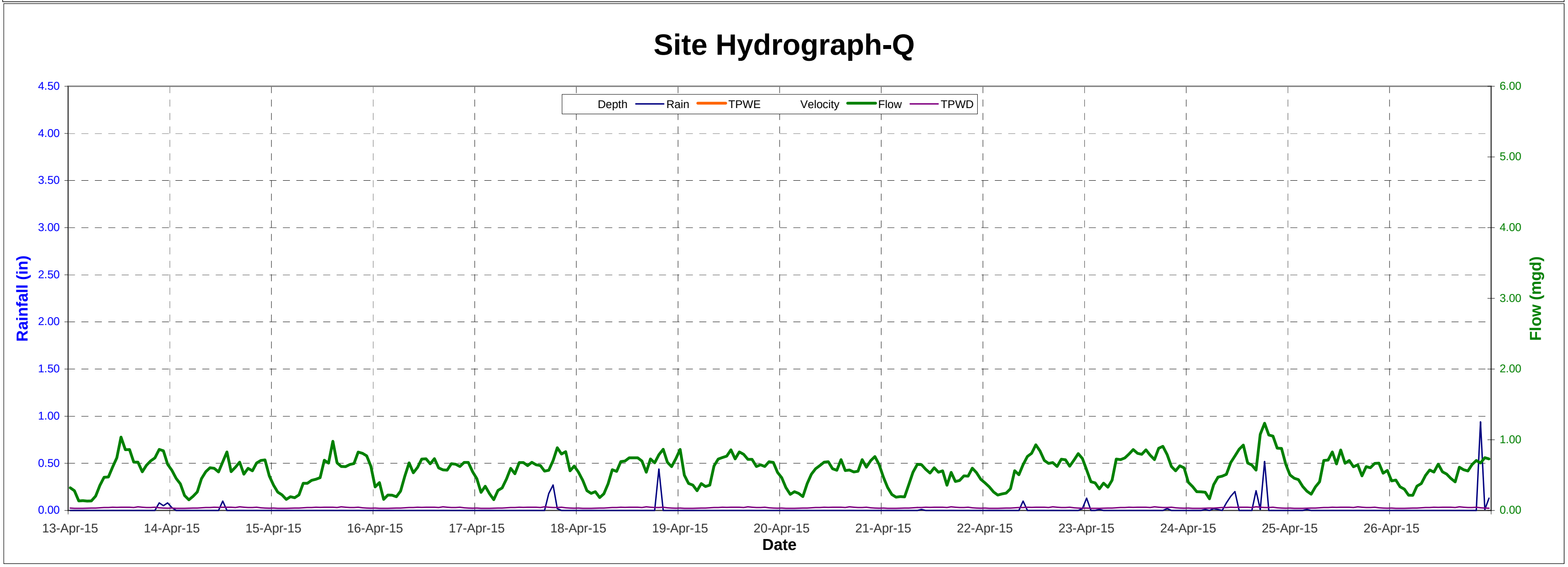




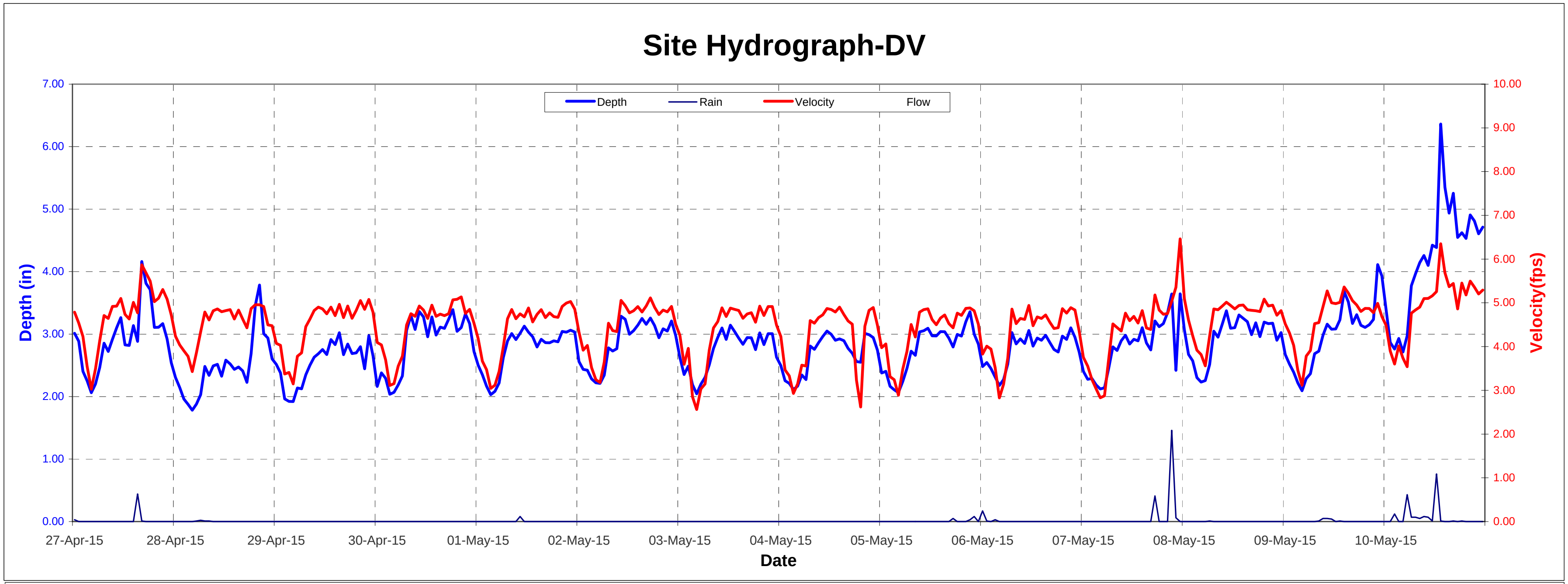
Interra Hydro

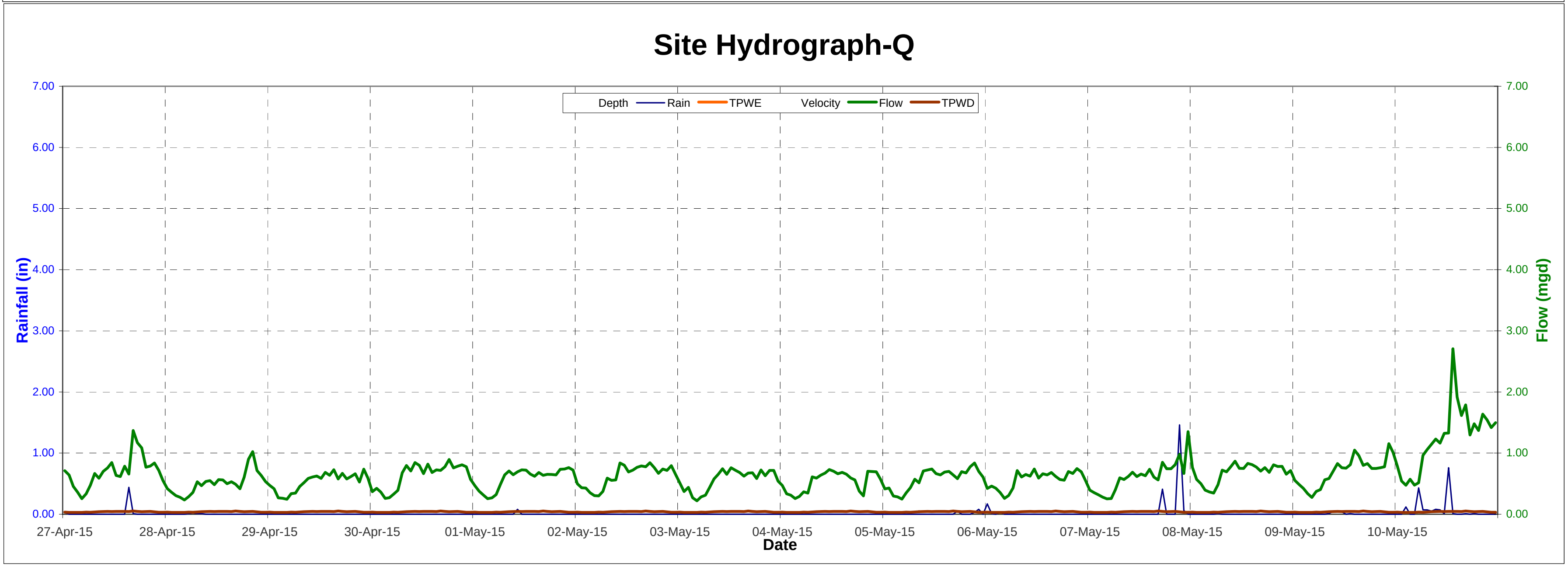
Site 5 HyGraph





Site 5 HyGraph





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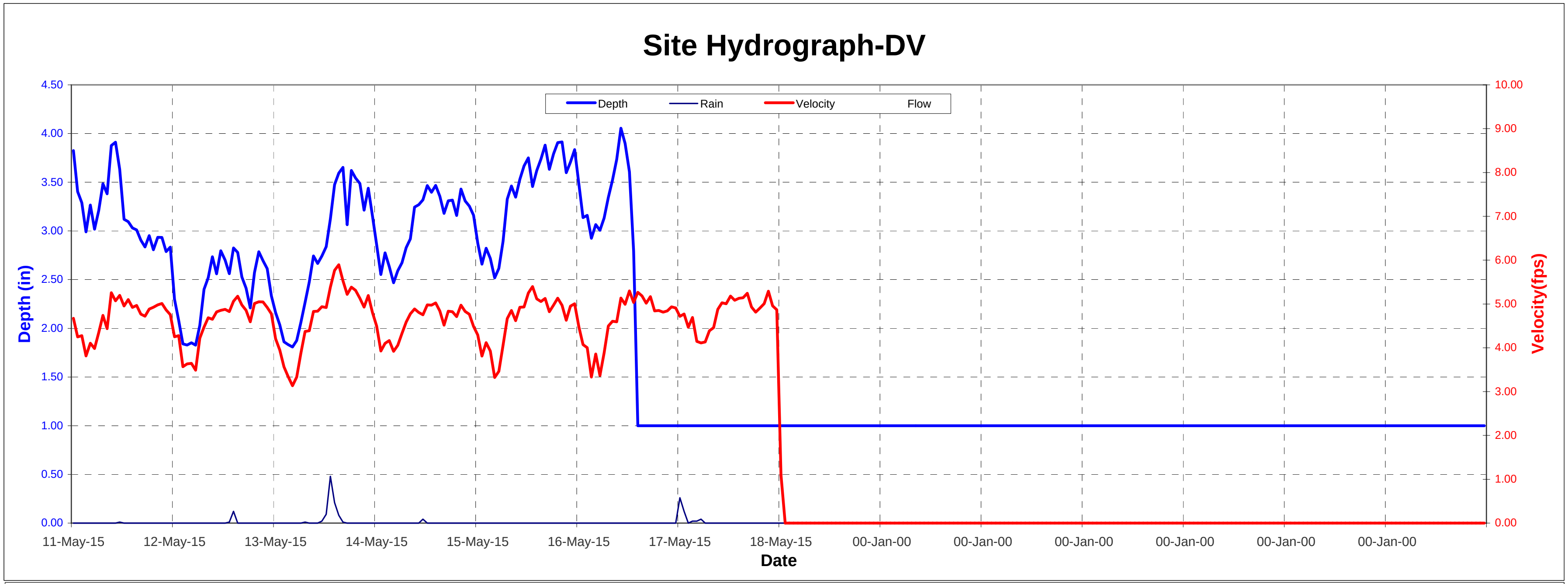

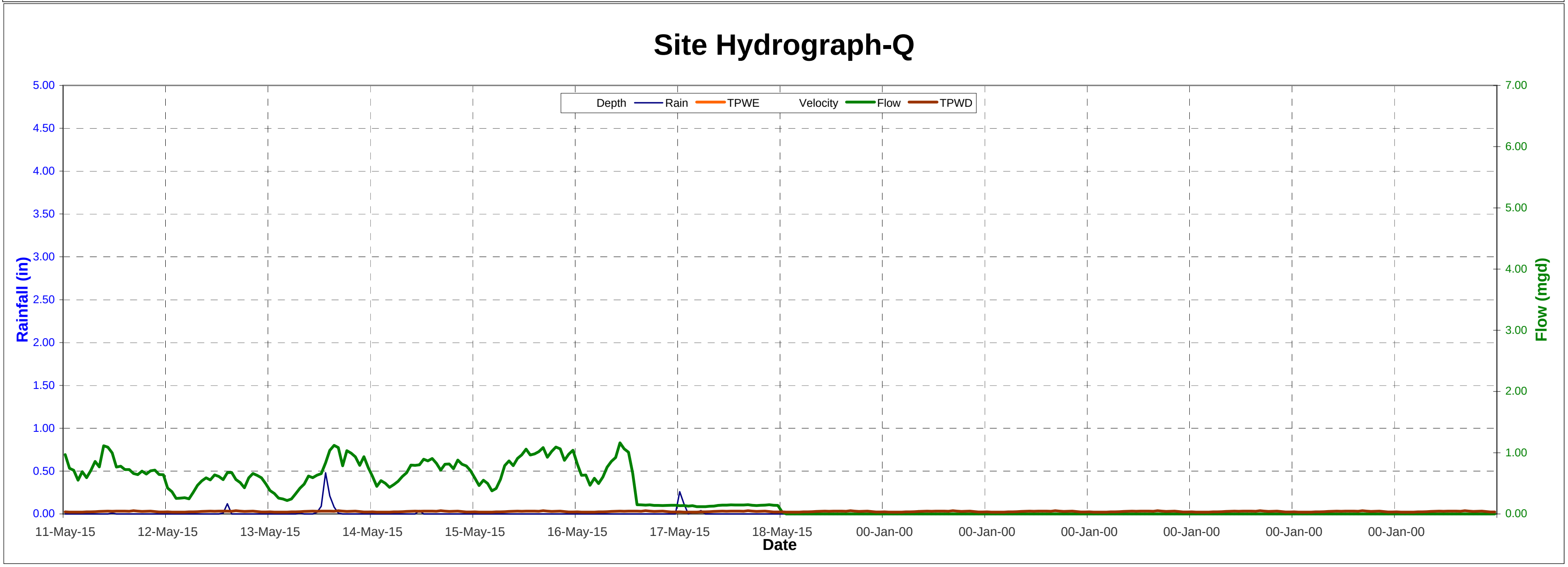

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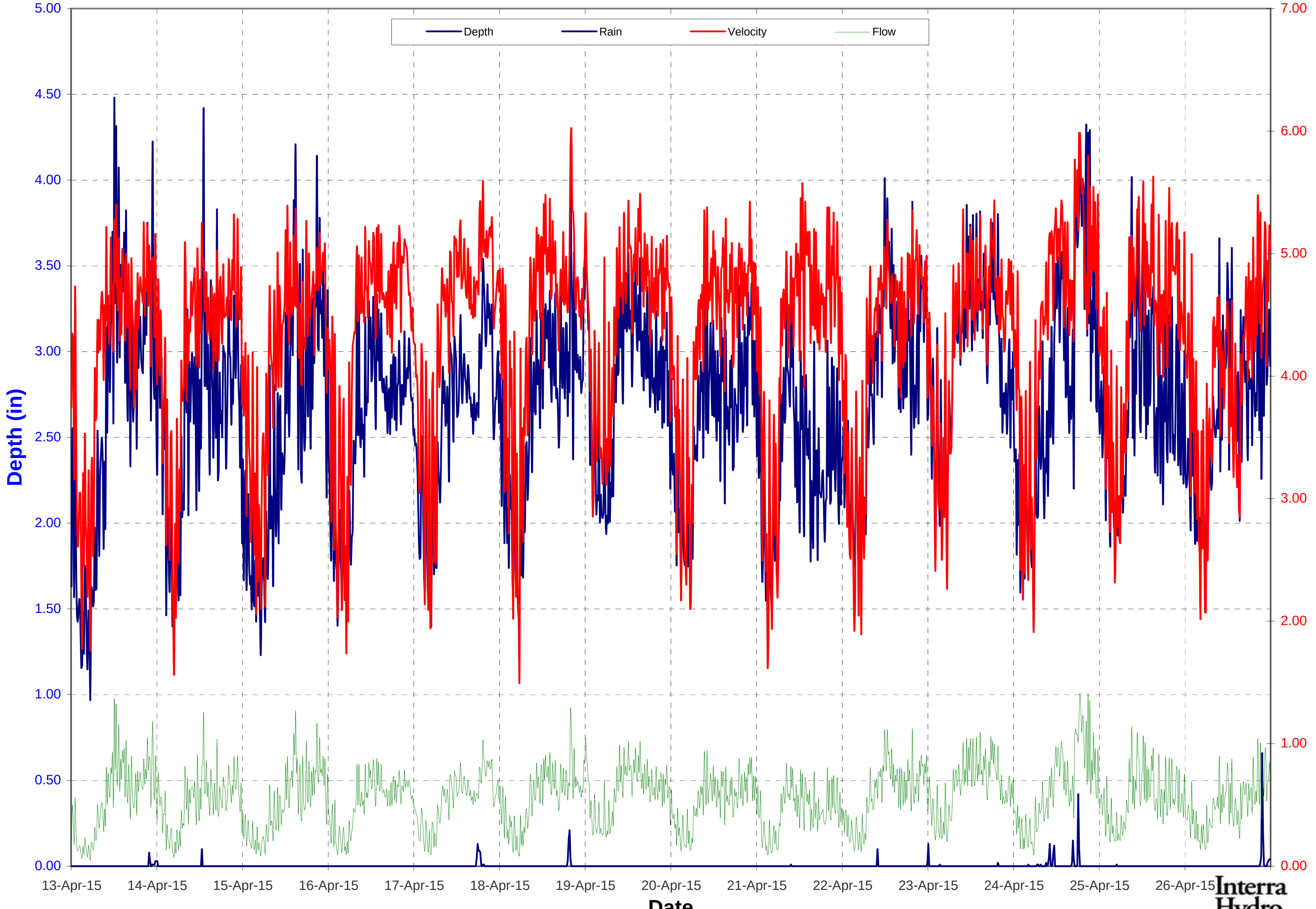
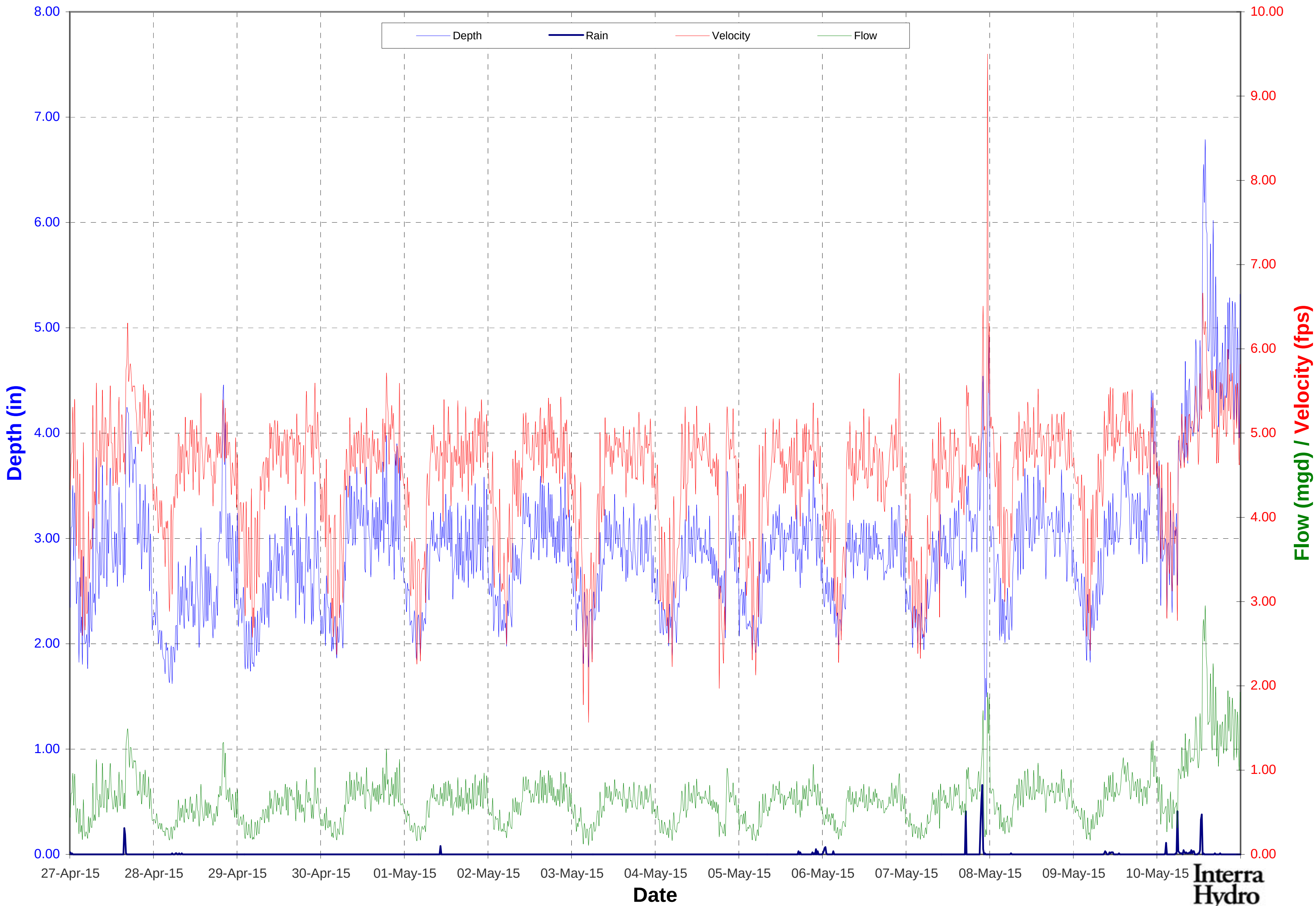


2Wks (1)

Weekly- 15 Min Data

Interra Hydro

Site 5 HyGraph



Interra Hydro

2Wks (2)

Weekly- 15 Min Data

Site 5 HyGraph

2Wks (3)

Weekly- 15 Min Data

Interra Hydro

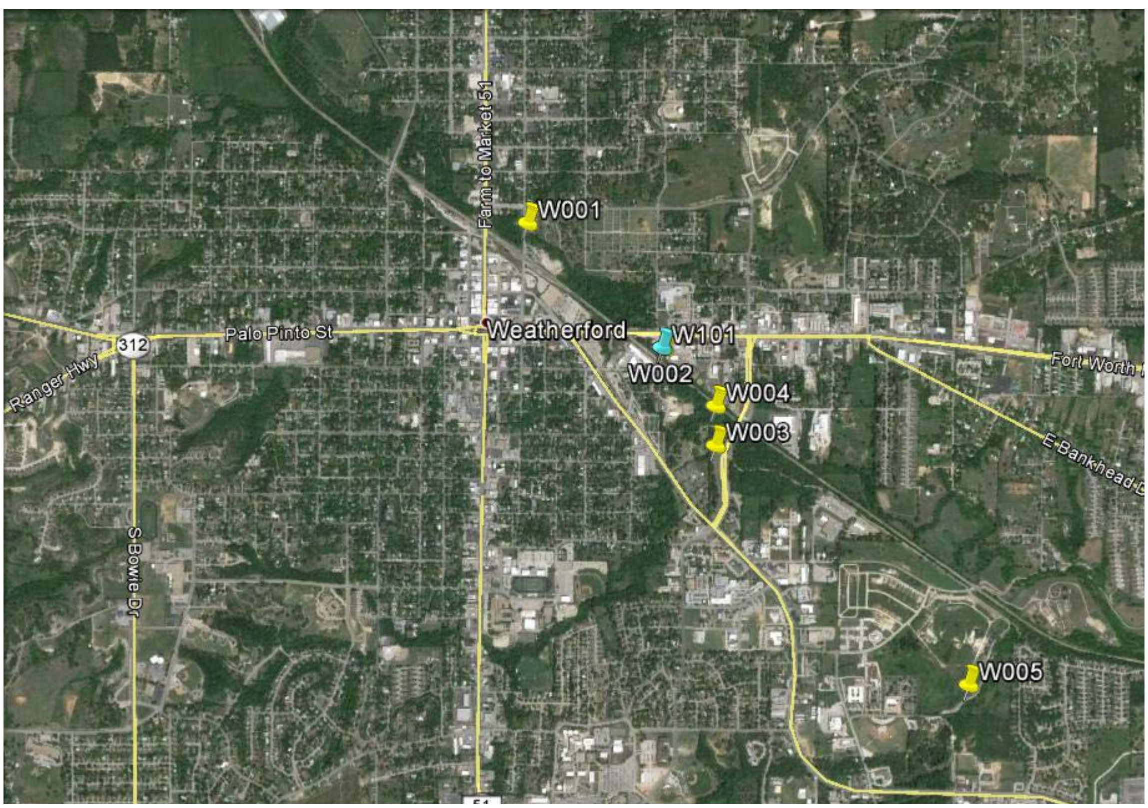
Interra Hydro

Rain Gauge Site Sheet

Flow Service Provider

Project Name	Weatherford MP Flow Monitoring	Date	4-12-2015
Project #	2015003	Crew	BD/AH
Rain Gauge Name	15003101		
Address/ Loc	567 E. Oak St.		
Contact Person	N/A		
Special Requirements			
Tip bucket SN#	ITH-TB004		
Logging Intervals	5 min		
Rain Logger SN#	ITH-RL004		

Location Map



Date	Time	Crew	Collected Data	Comments
4-12-2015		BD/AH	10 Test Tips	Hach Reader
				W101

APPENDIX C
DETAILED 2025 CAPITAL IMPROVEMENT PROJECT COST ESTIMATES

Project Number	Project Name	Cost
	5-Year CIP	
1	Old Brock Road Gravity Main and Lift Stations 10 and 22 Decommission	$ 2,131,700
2A	42-inch Influent Line to the WWTP	$ 256,700
3A	21-inch, 24-inch, and 30-inch Town Creek Interceptor	$ 2,491,500
4A	12-inch, 15-inch and 18-inch Gravity Mains near North Elm Street and State Highway 180	$ 789,200
5	0.5 MGD Lift Station and 6-inch Force Main near IH 20 and Ric Williamson Memorial Highway	$ 1,155,300
6	12-inch, 18-inch, 21-inch, and 24-inch Gravity Main Near Ric Williamson Memorial Highway	$ 3,069,900
7A	8-inch Gravity Main near FM 920	$ 658,100
8	8-inch and 12-inch Gravity Mains near North Main Street	$ 1,204,300
	5-Year CIP Total	**$ 11,756,700**
	10-Year CIP	
9	12-inch Gravity Main near Bethel Road	$ 1,243,400
10	12-inch and 15-inch Gravity Main in Northwest Weatherford	$ 1,900,700
11	8-inch Gravity Main near FM 920 and Lift Station Decommission	$ 900,800
12	2.25 MGD Lift Station and 12-inch Force Main near Tin Top Road	$ 3,658,700
13	15-inch Gravity Main near Tin Top Road	$ 1,146,700
14	1.75 MGD Lift Station and 12-inch Force Main near Scarlett Road and Bethel Road	$ 3,181,500
15	12-inch and 18-inch Gravity Main near Bethel Road	$ 2,186,000
16	15-inch Gravity Main near IH-20 and Dean Road	$ 856,200
17	1.25 MGD Lift Station and 8-inch Force Main near Dean Road	$ 1,479,400
18	15-inch and 18-inch Gravity Main near Scarlett Road	$ 2,173,900
19	8-inch Gravity Main near Lakecrest Drive	$ 1,070,700
20	Lift Station 17 Expansion to 4.0 MGD	$ 2,870,400
21	8-inch Gravity Main Near FM 730	$ 1,038,400
22	Lift Station 15 Rehabilitation and Expansion to 2.0 MGD	$ 1,304,100
23	8-inch Gravity Main near Bankhead Highway	$ 657,800
24	12-inch Gravity Main near State Highway 180	$ 1,566,900
	10-Year CIP Total	**$ 27,235,600**
	CIP Total	**$ 38,992,300**
	Rehabilitation	
R1	Annual Wastewater Line Rehabilitation	$ 2,691,000
R2	Lift Station 9 Rehabilitation	$ 156,800
R3	Lift Station 20 Rehabilitation	$ 84,000
R4	Lift Station 1 Rehabilitation	$ 131,600
R5	Lift Station 3 Rehabilitation	$ 126,000
R6	Lift Station 12 Rehabilitation	$ 100,800
	Rehabilitation Total	**$ 3,290,200**

City of Weatherford

FREESE AND NICHOLS

CITY OF WEATHERFORD

DRAFT Wastewater System Capital Improvement Cost Estimate **March 14, 2017**

Construction Project Number: 1 **Phase: 2020**

Project Name: **Old Brock Road Gravity Main and Lift Stations 10 and 22 Decommission**

Project Description:

This project includes an 8-inch line from Lift Station 22 to Lift Station 10 and a 12-inch line from Lift Station 10 to Lift Station 25. Following the construction of this project and Lift Station 25, Lift Stations 22 and 10 can be decommissioned.

Project Drivers:

The new sewer line provided in this project will provide sewer service needed for new development in the area and provide flow to Lift Station #25.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	12" Pipe 8- 16 feet deep	5,900	LF	$ 96	$ 566,400
2	8" Pipe 8- 16 feet deep	5,800	LF	$ 64	$ 371,200
3	Pavement Repair	1,200	LF	$ 75	$ 90,000
4	48" Diameter Manhole	23	EA	$ 5,000	$ 117,000
5	Lift Station - Decommission	2	LS	$ 200,000	$ 400,000
				SUBTOTAL:	**$ 1,544,600**
		CONTINGENCY		20%	$ 309,000
				SUBTOTAL:	**$ 1,853,600**
		ENG/SURVEY		15%	$ 278,100
				SUBTOTAL:	**$ 2,131,700**
				Estimated Project Total:	**$ 2,131,700**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate **March 14, 2017**

Construction Project Number: 2A **Phase: 2020**

Project Name: **42-inch Influent Line to the WWTP**

Project Description:

This project includes a 42-inch line that conveys flow directly into the WWTP, replacing the existing 30-inch influent line.

Project Drivers:

This project provides additional capacity at the inlet of the WWTP. The existing 30-inch influent line does not have capacity to convey existing peak and future wet weather flow.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	42" Pipe 8- 16 feet deep	500	LF	$ 336	$ 168,000
2	72" Diameter Manhole	2	EA	$ 9,000	$ 18,000
				SUBTOTAL:	**$ 186,000**
		CONTINGENCY		20%	$ 37,200
				SUBTOTAL:	**$ 223,200**
		ENG/SURVEY		15%	$ 33,500
				SUBTOTAL:	**$ 256,700**
				Estimated Project Total:	**$ 256,700**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate **March 14, 2017**

Construction Project Number: 3A **Phase: 2020**

Project Name: 21-inch, 24-inch, and 30-inch Town Creek Interceptor

Project Description:

This project consists of a 21, 24, and 30-inch line downstream of the existing 12-inch line near Jack Borden Way. This project replaces the existing 18-inch interceptor that conveys flows to the WWTP.

Project Drivers:

This project provides additional capacity for flow from the northwest area of the city into the WWTP. Hydraulic analysis indicated surcharging in this line during existing peak flow events. The increased capacity this project provides will alleviate surcharging and potential overflows.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	30" Pipe 8- 16 feet deep	3,400	LF	$ 240	$ 816,000
2	24" Pipe 8- 16 feet deep	2,300	LF	$ 192	$ 441,600
3	21" Pipe 8- 16 feet deep	700	LF	$ 168	$ 117,600
4	42" WW Boring and Casing	100	LF	$ 630	$ 63,000
5	36" WW Boring and Casing	500	LF	$ 540	$ 270,000
6	72" Diameter Manhole	7	EA	$ 9,000	$ 61,200
7	60" Diameter Manhole	6	EA	$ 6,000	$ 36,000
				SUBTOTAL:	**$ 1,805,400**
		CONTINGENCY		20%	$ 361,100
				SUBTOTAL:	**$ 2,166,500**
		ENG/SURVEY		15%	$ 325,000
				SUBTOTAL:	**$ 2,491,500**
				Estimated Project Total:	**$ 2,491,500**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate **March 14, 2017**

Construction Project Number: **4A** **Phase: 2020**

Project Name: **12-inch, 15-inch and 18-inch Gravity Mains near North Elm Street and State Highway 180**

Project Description:

This project includes a new 18-inch line connecting to the existing 18-inch interceptor near North Elm Street and State Highway 180. This 18-inch line connects to new 15-inch and 12-inch lines upstream. These new lines replace the existing lines in the area north of downtown Weatherford.

Project Drivers:

Hydraulic analysis indicates that the existing lines replaced by this project experience surcharging and overflows during peak wet weather events. This project will increase capacity and alleviate surcharging in this area.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	18" Pipe 8- 16 feet deep	900	LF	$ 144	$ 129,600
2	15" Pipe 8- 16 feet deep	600	LF	$ 120	$ 72,000
3	12" Pipe 8- 16 feet deep	1,200	LF	$ 96	$ 115,200
4	Pavement Repair	1,800	LF	$ 75	$ 135,000
5	30" WW Boring and Casing	200	LF	$ 450	$ 90,000
6	60" Diameter Manhole	3	EA	$ 6,000	$ 18,000
7	48" Diameter Manhole	2	EA	$ 5,000	$ 12,000
				SUBTOTAL:	**$ 571,800**
		CONTINGENCY		20%	$ 114,400
				SUBTOTAL:	**$ 686,200**
		ENG/SURVEY		15%	$ 103,000
				SUBTOTAL:	**$ 789,200**
				Estimated Project Total:	**$ 789,200**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate — **March 14, 2017**

Construction Project Number: 5 — **Phase:** 2020

Project Name: **0.5 MGD Lift Station and 6-inch Force Main near IH 20 and Ric Williamson Memorial Highway**

Project Description:

This project includes a new 0.5 MGD Lift Station and corresponding 6" force main.

Project Drivers:

This proposed lift station is required to serve development along Ric Williamson Memorial Highway.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	0.5 MGD Lift Station	1	EA	$ 325,000	$ 325,000
2	6" Force Main < 8 feet deep	7,400	LF	$ 54	$ 399,600
3	Pavement Repair	1,500	LF	$ 75	$ 112,500
				SUBTOTAL:	**$ 837,100**
		CONTINGENCY		20%	$ 167,500
				SUBTOTAL:	**$ 1,004,600**
		ENG/SURVEY		15%	$ 150,700
				SUBTOTAL:	**$ 1,155,300**
				Estimated Project Total:	**$ 1,155,300**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate **March 14, 2017**

Construction Project Number: 6 **Phase: 2020**

Project Name: **12-inch, 18-inch, 21-inch, and 24-inch Gravity Main Near Ric Williamson Memorial Highway**

Project Description:

This project includes a new gravity main for the proposed lift station near IH-20 and Ric Williamson Memorial Highway. This project starts as a 12-inch line near State Highway 180 and flows south to an 18-inch line near Greenwood Road. The 18-inch line then connects to a 21-inch and 24-inch line north of IH 20 which flows into the lift station.

Project Drivers:

This project provides capacity for development in the area.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	24" Pipe 8- 16 feet deep	2,500	LF	$ 192	$ 480,000
2	21" Pipe 8- 16 feet deep	1,100	LF	$ 168	$ 184,800
3	18" Pipe 8- 16 feet deep	7,500	LF	$ 144	$ 1,080,000
4	12" Pipe 8- 16 feet deep	3,000	LF	$ 96	$ 288,000
5	Pavement Repair	300	LF	$ 75	$ 22,500
6	60" Diameter Manhole	28	EA	$ 6,000	$ 169,200
				SUBTOTAL:	**$ 2,224,500**
		CONTINGENCY		20%	$ 444,900
				SUBTOTAL:	**$ 2,669,400**
		ENG/SURVEY		15%	$ 400,500
				SUBTOTAL:	**$ 3,069,900**
				Estimated Project Total:	**$ 3,069,900**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate **March 14, 2017**

Construction Project Number: 7A **Phase: 2020**

Project Name: **8-inch Gravity Main near FM 920**

Project Description:

This project includes an 8-inch line along FM 920 and Ric Williamson Memorial Highway that connects to and replaces part of the existing line.

Project Drivers:

This project provides additional capacity for future growth in the northwest area of Weatherford.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	8" Pipe 8- 16 feet deep	3,200	LF	$ 64	$ 204,800
2	Pavement Repair	3,200	LF	$ 75	$ 240,000
3	48" Diameter Manhole	6	EA	$ 5,000	$ 32,000
				SUBTOTAL:	**$ 476,800**
		CONTINGENCY		20%	$ 95,400
				SUBTOTAL:	**$ 572,200**
		ENG/SURVEY		15%	$ 85,900
				SUBTOTAL:	**$ 658,100**
				Estimated Project Total:	**$ 658,100**

City of Weatherford

FREESE AND NICHOLS

CITY OF WEATHERFORD

DRAFT Wastewater System Capital Improvement Cost Estimate **March 14, 2017**

Construction Project Number: 8 **Phase: 2020**

Project Name: **8-inch and 12-inch Gravity Mains near North Main Street**

Project Description:

This project includes a new 8-inch and 12-inch line near Franklin Street and a new 8-inch line near Edna Street that connect to the proposed 12-inch line downstream. These lines replace the existing 6-inch lines.

Project Drivers:

Hydraulic analysis indicates that the existing lines in the area are shown to surcharge under peak flows in the model. Increasing the diameter of these lines will provide additional capacity and relief in combination with the proposed lines in the project downstream.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	12" Pipe 8- 16 feet deep	2,600	LF	$ 96	$ 249,600
2	8" Pipe 8- 16 feet deep	3,000	LF	$ 64	$ 192,000
3	Pavement Repair	5,000	LF	$ 75	$ 375,000
4	48" Diameter Manhole	11	EA	$ 5,000	$ 56,000
				SUBTOTAL:	**$ 872,600**
		CONTINGENCY		20%	$ 174,600
				SUBTOTAL:	**$ 1,047,200**
		ENG/SURVEY		15%	$ 157,100
				SUBTOTAL:	**$ 1,204,300**
				Estimated Project Total:	**$ 1,204,300**

City of Weatherford

FREESE AND NICHOLS

CITY OF WEATHERFORD

DRAFT Wastewater System Capital Improvement Cost Estimate **March 14, 2017**

Construction Project Number: **9** **Phase: 2025**

Project Name: **12-inch Gravity Main near Bethel Road**

Project Description:

This project includes a new 12-inch line that begins south of Park Avenue and proceeds south to Lift Station 7 near Bethel Road.

Project Drivers:

The new line will serve new development along Bethel Road north of IH-20.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	12" Pipe 8- 16 feet deep	7,000	LF	$ 96	$ 672,000
2	24" WW Boring and Casing	400	LF	$ 360	$ 144,000
3	Pavement Repair	200	LF	$ 75	$ 15,000
4	48" Diameter Manhole	14	EA	$ 5,000	$ 70,000
				SUBTOTAL:	**$ 901,000**
		CONTINGENCY		20%	$ 180,200
				SUBTOTAL:	**$ 1,081,200**
		ENG/SURVEY		15%	$ 162,200
				SUBTOTAL:	**$ 1,243,400**
				Estimated Project Total:	**$ 1,243,400**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate — **March 14, 2017**

Construction Project Number: 10 — **Phase:** 2025

Project Name: 12-inch and 15-inch Gravity Main in Northwest Weatherford

Project Description:

This project includes a 15-inch and 12-inch line west of Lift Station 1 near Ric Williamson Memorial Highway. This line conveys flow from the west to the gravity main downstream of Lift Station 1.

Project Drivers:

The purpose of this project is to provide capacity for future growth in the northwest area of Weatherford, including the King development.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	15" Pipe 8- 16 feet deep	5,800	LF	$ 120	$ 696,000
2	12" Pipe 8- 16 feet deep	4,100	LF	$ 96	$ 393,600
3	Pavement Repair	200	LF	$ 75	$ 15,000
4	30" WW Boring and Casing	200	LF	$ 450	$ 90,000
5	24" WW Boring and Casing	200	LF	$ 360	$ 72,000
6	60" Diameter Manhole	12	EA	$ 6,000	$ 69,600
7	48" Diameter Manhole	8	EA	$ 5,000	$ 41,000
				SUBTOTAL:	**$ 1,377,200**
		CONTINGENCY		20%	$ 275,500
				SUBTOTAL:	**$ 1,652,700**
		ENG/SURVEY		15%	$ 248,000
				SUBTOTAL:	**$ 1,900,700**
				Estimated Project Total:	**$ 1,900,700**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate — **March 14, 2017**

Construction Project Number: 11 — **Phase:** 2025

Project Name: **8-inch Gravity Main near FM 920 and Lift Station Decommission**

Project Description:

This project includes an 8-inch line along Wendy Lane near FM 920 that connects to the existing 10-inch line near Lift Station 2. Once the 8-inch line is in service, Lift Station 2 can be decommissioned.

Project Drivers:

This project provides additional capacity for future growth in the northwest area of Weatherford.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	8" Pipe 8- 16 feet deep	4,800	LF	$ 64	$ 307,200
2	Pavement Repair	1,300	LF	$ 75	$ 97,500
3	48" Diameter Manhole	10	EA	$ 5,000	$ 48,000
4	Lift Station - Decommission	1	LS	$ 200,000	$ 200,000
				SUBTOTAL:	**$ 652,700**
		CONTINGENCY		20%	$ 130,600
				SUBTOTAL:	**$ 783,300**
		ENG/SURVEY		15%	$ 117,500
				SUBTOTAL:	**$ 900,800**
				Estimated Project Total:	**$ 900,800**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate | **March 14, 2017**

Construction Project Number: 12 | **Phase:** 2025

Project Name: 2.25 MGD Lift Station and 12-inch Force Main near Tin Top Road

Project Description:

This project includes the proposed 2.25 MGD Lift Station and 12-inch force main near Tin Top Road south of Lift Station 8. The force main will run north from the lift station and connect to the existing 18-inch line near South Main Street.

Project Drivers:

This lift station provides capacity for future growth in the southwest portion of Weatherford.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	2.25 MGD Lift Station	1	EA	$ 1,462,500	$ 1,462,500
2	12" Force Main < 8 feet deep	10,200	LF	$ 108	$ 1,101,600
3	Pavement Repair	200	LF	$ 75	$ 15,000
4	24" WW Boring and Casing	200	LF	$ 360	$ 72,000
				SUBTOTAL:	**$ 2,651,100**
		CONTINGENCY		20%	$ 530,300
				SUBTOTAL:	**$ 3,181,400**
		ENG/SURVEY		15%	$ 477,300
				SUBTOTAL:	**$ 3,658,700**
				Estimated Project Total:	**$ 3,658,700**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate **March 14, 2017**

Construction Project Number: 13 **Phase: 2025**

Project Name: 15-inch Gravity Main near Tin Top Road

Project Description:

This project includes a new 15-inch line that connects the existing line upstream of Lift Station 8 to the proposed lift station from Project 12 to the south. Following the completion of this project and the downstream lift station, Lift Station 8 can be decommissioned and the 10-inch force main from Lift Station 8 can be converted to a gravity main.

Project Drivers:

This line conveys flow from the existing 12-inch line to the proposed lift station downstream and provides capacity for additional growth in the area.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	15" Pipe 8- 16 feet deep	3,700	LF	$ 120	$ 444,000
2	Pavement Repair	1,300	LF	$ 75	$ 97,500
3	30" WW Boring and Casing	100	LF	$ 450	$ 45,000
4	60" Diameter Manhole	7	EA	$ 6,000	$ 44,400
5	Lift Station - Decommission	1	LS	$ 200,000	$ 200,000
				SUBTOTAL:	**$ 830,900**
		CONTINGENCY		20%	$ 166,200
				SUBTOTAL:	**$ 997,100**
		ENG/SURVEY		15%	$ 149,600
				SUBTOTAL:	**$ 1,146,700**
				Estimated Project Total:	**$ 1,146,700**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate — March 14, 2017

Construction Project Number: 14 — Phase: 2025

Project Name: **1.75 MGD Lift Station and 12-inch Force Main near Scarlett Road and Bethel Road**

Project Description:

This project includes a new 1.75 MGD lift station and 12-inch force main north of Scarlet Road near Bethel Road. The force main connects the proposed lift station to the proposed lift station from Project 12 to the east.

Project Drivers:

This project provides additional capacity for future growth in the area.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	1.75 MGD Lift Station	1	EA	$ 1,137,500	$ 1,137,500
2	12" Force Main < 8 feet deep	9,800	LF	$ 108	$ 1,058,400
3	Pavement Repair	500	LF	$ 75	$ 37,500
4	24" WW Boring and Casing	200	LF	$ 360	$ 72,000
				SUBTOTAL:	**$ 2,305,400**
		CONTINGENCY		20%	$ 461,100
				SUBTOTAL:	**$ 2,766,500**
		ENG/SURVEY		15%	$ 415,000
				SUBTOTAL:	**$ 3,181,500**
				Estimated Project Total:	**$ 3,181,500**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate **March 14, 2017**

Construction Project Number: 15 **Phase: 2025**

Project Name: **12-inch and 18-inch Gravity Main near Bethel Road**

Project Description:

This project includes a new 12-inch line connecting to the existing lines near Lift Station 7 and Lift Station 6 and a new 18-inch line that connects the existing line near Lift Station 6 to the proposed lift station from Project 14 to the south. Following the completion of this project and the downstream lift station from Project 14, Lift Stations 6 and 7 can be decommissioned.

Project Drivers:

This lift station provide additional capacity and replaces Lift Stations #6 and #7.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	18" Pipe 8- 16 feet deep	3,200	LF	$ 144	$ 460,800
2	12" Pipe 8- 16 feet deep	5,300	LF	$ 96	$ 508,800
3	Pavement Repair	200	LF	$ 75	$ 15,000
4	24" WW Boring and Casing	300	LF	$ 360	$ 108,000
5	60" Diameter Manhole	6	EA	$ 6,000	$ 38,400
6	Lift Station - Decommission	2	LS	$ 200,000	$ 400,000
7	48" Diameter Manhole	11	EA	$ 5,000	$ 53,000
				SUBTOTAL:	**$ 1,584,000**
		CONTINGENCY		20%	$ 316,800
				SUBTOTAL:	**$ 1,900,800**
		ENG/SURVEY		15%	$ 285,200
				SUBTOTAL:	**$ 2,186,000**
				Estimated Project Total:	**$ 2,186,000**

City of Weatherford

FREESE AND NICHOLS

CITY OF WEATHERFORD

DRAFT Wastewater System Capital Improvement Cost Estimate	March 14, 2017
Construction Project Number: 16	Phase: 2025
Project Name:	15-inch Gravity Main near IH-20 and Dean Road

Project Description:

This project includes a 15-inch line west of the proposed lift station from Project 14.

Project Drivers:

This project services the lift station near Scarlett Road and Bethel Road and provides additional capacity to the west of the lift station.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	15" Pipe 8- 16 feet deep	4,700	LF	$ 120	$ 564,000
2	60" Diameter Manhole	9	EA	$ 6,000	$ 56,400
				SUBTOTAL:	**$ 620,400**
		CONTINGENCY		20%	$ 124,100
				SUBTOTAL:	**$ 744,500**
		ENG/SURVEY		15%	$ 111,700
				SUBTOTAL:	**$ 856,200**
				Estimated Project Total:	**$ 856,200**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate — **March 14, 2017**

Construction Project Number: 17 — **Phase:** 2025

Project Name: 1.25 MGD Lift Station and 8-inch Force Main near Dean Road

Project Description:

This project includes a new 1.25 MGD lift station at the west end of Dean Road and an 8-inch force main to convey flow from the lift station to the west end of the proposed 15-inch sewer line.

Project Drivers:

This lift station provides capacity for additional growth in the southwest area of Weatherford.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	1.25 MGD Lift Station	1	EA	$ 812,500	$ 812,500
2	8" Force Main < 8 feet deep	3,500	LF	$ 72	$ 252,000
3	Pavement Repair	100	LF	$ 75	$ 7,500
				SUBTOTAL:	**$ 1,072,000**
		CONTINGENCY		20%	$ 214,400
				SUBTOTAL:	**$ 1,286,400**
		ENG/SURVEY		15%	$ 193,000
				SUBTOTAL:	**$ 1,479,400**
				Estimated Project Total:	**$ 1,479,400**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate — **March 14, 2017**

Construction Project Number: 18 — **Phase:** 2025

Project Name: 15-inch and 18-inch Gravity Main near Scarlett Road

Project Description:

This project includes a 15-inch gravity line that expands to a 18-inch line connecting Lift Station 25 to the lift station near Dean Road. Once this line is in service, Lift Station 25 can be decommissioned.

Project Drivers:

This project services the lift station in Project 17 and provides capacity for future growth in the area.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	18" Pipe 8- 16 feet deep	3,500	LF	$ 144	$ 504,000
2	15" Pipe 8- 16 feet deep	5,600	LF	$ 120	$ 672,000
3	30" WW Boring and Casing	200	LF	$ 450	$ 90,000
4	60" Diameter Manhole	18	EA	$ 6,000	$ 109,200
5	Lift Station - Decommission	1	LS	$ 200,000	$ 200,000
				SUBTOTAL:	**$ 1,575,200**
		CONTINGENCY		20%	$ 315,100
				SUBTOTAL:	**$ 1,890,300**
		ENG/SURVEY		15%	$ 283,600
				SUBTOTAL:	**$ 2,173,900**
				Estimated Project Total:	**$ 2,173,900**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate **March 14, 2017**

Construction Project Number: 19 **Phase: 2025**

Project Name: **8-inch Gravity Main near Lakecrest Drive**

Project Description:

This project includes an 8-inch sewer line that begins near Old Airport Road and flows east to Lakecrest Drive where it connects to the existing 12-inch line.

Project Drivers:

This project provides service for the future service area in southeast Weatherford.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	8" Pipe 8- 16 feet deep	8,700	LF	$ 64	$ 556,800
2	21" WW Boring and Casing	300	LF	$ 315	$ 94,500
3	Pavement Repair	500	LF	$ 75	$ 37,500
4	48" Diameter Manhole	17	EA	$ 5,000	$ 87,000
				SUBTOTAL:	**$ 775,800**
		CONTINGENCY		20%	$ 155,200
				SUBTOTAL:	**$ 931,000**
		ENG/SURVEY		15%	$ 139,700
				SUBTOTAL:	**$ 1,070,700**
				Estimated Project Total:	**$ 1,070,700**

City of Weatherford

FREESE AND NICHOLS | CITY OF WEATHERFORD

DRAFT Wastewater System Capital Improvement Cost Estimate				**March 14, 2017**	
Construction Project Number:	**20**			**Phase: 2025**	
Project Name:	**Lift Station 17 Expansion to 4.0 MGD**				

Project Description:

This project includes the expansion of the Lift Station 17 from a firm capacity of 0.79 MGD to 4.0 MGD.

Project Drivers:

Lift Station 17 is a high impact lift station that was observed to be in good condition. In the 2025 planning period, the flow conveyed to the lift station will exceed the capacity of the lift station. Therefore, the expansion will

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	3.2 MGD Lift Station Expansion	1	EA	$ 2,080,000	$ 2,080,000
				SUBTOTAL:	**$ 2,080,000**
		CONTINGENCY		20%	$ 416,000
				SUBTOTAL:	**$ 2,496,000**
		ENG/SURVEY		15%	$ 374,400
				SUBTOTAL:	**$ 2,870,400**
				Estimated Project Total:	**$ 2,870,400**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate **March 14, 2017**

Construction Project Number: 21 **Phase: 2025**

Project Name: **8-inch Gravity Main Near FM 730**

Project Description:

This project includes a new 8-inch line that connects to the existing 8-inch line near FM 730 and Old Foundry Road and serves the area north of Bedinger Place.

Project Drivers:

This project provides service for future growth to the area north of Bedinger Place in North Weatherford.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	8" Pipe 8- 16 feet deep	5,100	LF	$ 64	$ 326,400
2	Pavement Repair	5,000	LF	$ 75	$ 375,000
3	48" Diameter Manhole	10	EA	$ 5,000	$ 51,000
				SUBTOTAL:	**$ 752,400**
		CONTINGENCY		20%	$ 150,500
				SUBTOTAL:	**$ 902,900**
		ENG/SURVEY		15%	$ 135,500
				SUBTOTAL:	**$ 1,038,400**
				Estimated Project Total:	**$ 1,038,400**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate — **March 14, 2017**

Construction Project Number: 22 — **Phase:** 2025

Project Name: Lift Station 15 Rehabilitation and Expansion to 2.0 MGD

Project Description:

This project includes the rehabilitation and expansion of Lift Station 15 from a firm capacity of 0.72 MGD to 2.0 MGD.

Project Drivers:

The Lift Station 15 was observed to be in very poor condition during the condition assessment of the lift station facilities. This project provides additional capacity for growth in the area around Lake Weatherford.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	1.3 MGD Lift Station Expansion	1	EA	$ 845,000	$ 845,000
2	Lift Station - Rehabilitation	1	LS	$ 100,000	$ 100,000
				SUBTOTAL:	**$ 945,000**
		CONTINGENCY		20%	$ 189,000
				SUBTOTAL:	**$ 1,134,000**
		ENG/SURVEY		15%	$ 170,100
				SUBTOTAL:	**$ 1,304,100**
				Estimated Project Total:	**$ 1,304,100**

City of Weatherford

FREESE AND NICHOLS

CITY OF WEATHERFORD

DRAFT Wastewater System Capital Improvement Cost Estimate	March 14, 2017
Construction Project Number: 23	Phase: 2025
Project Name:	8-inch Gravity Main near Bankhead Highway

Project Description:

This project includes an 8-inch line that begins near IH 20 and Bankhead Highway and proceeds east to connect to the existing 8-inch line near Center Point Road.

Project Drivers:

This project provides service to the area near IH 20 and Bankhead Highway.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	8" Pipe 8- 16 feet deep	3,400	LF	$ 64	$ 217,600
2	Pavement Repair	3,000	LF	$ 75	$ 225,000
3	48" Diameter Manhole	7	EA	$ 5,000	$ 34,000
				SUBTOTAL:	**$ 476,600**
		CONTINGENCY		20%	$ 95,400
				SUBTOTAL:	**$ 572,000**
		ENG/SURVEY		15%	$ 85,800
				SUBTOTAL:	**$ 657,800**
				Estimated Project Total:	**$ 657,800**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate — **March 14, 2017**

Construction Project Number: 24 — **Phase:** 2025

Project Name: 12-inch Gravity Main near State Highway 180

Project Description:

This project includes a new 12-inch line along State Highway 180 near FM 730. This line proceeds east from FM 730 parallel to the existing 6-inch line and proceeds north near Center Point Road.

Project Drivers:

This project provides additional service to the area east of Tison Middle School.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	12" Pipe 8- 16 feet deep	7,400	LF	$ 96	$ 710,400
2	Pavement Repair	4,200	LF	$ 75	$ 315,000
3	24" WW Boring and Casing	100	LF	$ 360	$ 36,000
4	48" Diameter Manhole	15	EA	$ 5,000	$ 74,000
				SUBTOTAL:	**$ 1,135,400**
		CONTINGENCY		20%	$ 227,100
				SUBTOTAL:	**$ 1,362,500**
		ENG/SURVEY		15%	$ 204,400
				SUBTOTAL:	**$ 1,566,900**
				Estimated Project Total:	**$ 1,566,900**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate **March 14, 2017**

Construction Project Number: R1 **Phase: Annual**

Project Name: Annual Wastewater Line Rehabilitation

Project Description:

This project includes the rehabilitation or replacement of 2% of the wastewater infrastructure each year. The City of Weatherford has 628,287 LF of existing wastewater pipe. Rehabilitation of 2% of the collection system equates to approximately 13,000 LF of rehabilitated pipe each year. There are many forms of rehabilitation that range in cost.

Project Drivers:

An emerging industry trend recommends that a utility rehabilitate 2% of the wastewater infrastructure each year. Rehabilitation of 2% of the infrastructure each year results in a complete rehabilitation of the system every 50 years which is the typical design life expectancy of a wastewater pipe when properly installed.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	Collection System Rehabilitation	13,000	LF	$ 180	$ 2,340,000
				SUBTOTAL:	**$ 2,340,000**
		CONTINGENCY		15%	$ 351,000
				SUBTOTAL:	**$ 2,691,000**
		ENG/SURVEY		0%	$ -
				SUBTOTAL:	**$ 2,691,000**
				Estimated Project Total:	**$ 2,691,000**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate — **March 14, 2017**

Construction Project Number: R2 — **Phase:** Annual

Project Name: Lift Station 9 Rehabilitation

Project Description:

Lift Station 9, located near the intersection of IH-20 and Clear Lake Road, was evaluated to be in very poor condition. This lift station serves a large residential neighborhood south of IH-20 and is located along the banks of Town Creek.

Project Drivers:

During the condition assessment site visit, Lift Station 9 showed issues requesting improvements to increase reliability. The check valves are located at the pumps making it very difficult to access. Currently, there is no odor control at the lift station. The security fence is rotting and the access road is eroding. There have also been recent issues with the electrical components reported by the utility maintenance staff.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	Lift Station 9 Rehabilitation	1	LS	$ 112,000	$ 112,000
				SUBTOTAL:	**$ 112,000**
		CONTINGENCY		40%	$ 44,800
				SUBTOTAL:	**$ 156,800**
		ENG/SURVEY		0%	$ -
				SUBTOTAL:	**$ 156,800**
				Estimated Project Total:	**$ 156,800**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate — **March 14, 2017**

Construction Project Number: R3 — **Phase:** Annual

Project Name: **Lift Station 20 Rehabilitation**

Project Description:

Lift Station 20 is located near the intersection of Center Point Road and East Bankhead Highway along a creek. This Lift station conveys flows from Hudson Oaks.

Project Drivers:

This lift station was identified in the condition and criticality assessment to be in "poor" condition with "very high impact" criticality. During the condition assessment, it was identified that this lift station had corroded rail brackets, no fall protection or no awning, PVC pigging points, no odor control or ventilation, and poor site fencing.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	Lift Station 20 Rehabilitation	1	LS	$ 60,000	$ 60,000
				SUBTOTAL:	**$ 60,000**
		CONTINGENCY		40%	$ 24,000
				SUBTOTAL:	**$ 84,000**
		ENG/SURVEY		0%	$ -
				SUBTOTAL:	**$ 84,000**
				Estimated Project Total:	**$ 84,000**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate — **March 14, 2017**

Construction Project Number: R4 — **Phase:** Annual

Project Name: Lift Station 1 Rehabilitation

Project Description:

Lift Station 1 is located in North West Weatherford near North Bowie Drive within the Heritage Plastics site. The lift station is located near Town Creek.

Project Drivers:

This lift station was identified in the condition and criticality assessment to be in "very poor" condition and "moderate impact" criticality. During the condition assessment, it was identified that this lift station had aging pumps, minor structural issues, dry vault leaking, a broken sump pump, and poor site fencing. The criticality assessment showed this lift station to be located in an environmentally sensitive area near Town Creek. Access to the lift station is difficult since it is located within the Heritage Plastics Security Fence.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	Lift Station 1 Rehabilitation	1	LS	$ 94,000	$ 94,000
				SUBTOTAL:	**$ 94,000**
		CONTINGENCY		40%	$ 37,600
				SUBTOTAL:	**$ 131,600**
		ENG/SURVEY		0%	$ -
				SUBTOTAL:	**$ 131,600**
				Estimated Project Total:	**$ 131,600**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate **March 14, 2017**

Construction Project Number: **R5** **Phase: Annual**

Project Name: **Lift Station 3 Rehabilitation**

Project Description:

Lift Station 3 is located just off 2nd Street in North Weatherford. The lift station serves a very small area.

Project Drivers:

This lift station was identified in the condition and criticality assessment to be in "poor" condition and "very low impact" criticality. During the condition assessment, it was identified that this lift station had loose belts, poor foundation conditions, and failing check valves. There are no locks and poor fencing to prevent access to the lift station. The priming system that is in use provides difficulties from a maintenance standpoint.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	Lift Station 3 Rehabilitation	1	LS	$ 90,000	$ 90,000
				SUBTOTAL:	**$ 90,000**
		CONTINGENCY		40%	$ 36,000
				SUBTOTAL:	**$ 126,000**
		ENG/SURVEY		0%	$ -
				SUBTOTAL:	**$ 126,000**
				Estimated Project Total:	**$ 126,000**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate — **March 14, 2017**

Construction Project Number: R6 — **Phase:** Annual

Project Name: Lift Station 12 Rehabilitation

Project Description:

Lift Station 12 is located next to the Weatherford Water Treatment Plant near Lake Weatherford. The lift station serves residential customers east and south of the lake.

Project Drivers:

This lift station was identified in the condition and criticality assessment to be in "poor" condition and "high impact" criticality. During the condition assessment, it was identified that this lift station had corrosion issues, minor structural issues, and poor pipe and valve conditions. The lift station experiences high levels of H2S due to a large number of seasonal users around the lake.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	Lift Station 12 Rehabilitation	1	LS	$ 72,000	$ 72,000
				SUBTOTAL:	**$ 72,000**
		CONTINGENCY		40%	$ 28,800
				SUBTOTAL:	**$ 100,800**
		ENG/SURVEY		0%	$ -
				SUBTOTAL:	**$ 100,800**
				Estimated Project Total:	**$ 100,800**

APPENDIX D
DETAILED BUILDOUT CAPITAL IMPROVEMENT PROJECT COST ESTIMATES
BRAZOS WWTP ALTERNATIVE

Project Number	Project Name	Cost
5-Year CIP		
1	Old Brock Road Gravity Main and Lift Station Decommission	$ 2,131,700
2A	42-inch Influent Line to the WWTP	$ 256,700
3A	21-inch, 24-inch, and 30-inch Town Creek Interceptor	$ 2,491,500
4A	12-inch, 15-inch and 18-inch Gravity Mains near North Elm Street and State Highway	$ 789,200
5	0.5 MGD Lift Station and 6-inch Force Main near IH 20 and Ric Williamson Memorial Highway	$ 1,155,300
6	12-inch, 18-inch, 21-inch, and 24-inch Gravity Main Near Ric Williamson Memorial Highway	$ 3,069,900
7A	8-inch Gravity Main near FM 920	$ 658,100
8	8-inch and 12-inch Gravity Mains Near North Main Street	$ 1,204,300
	5-Year CIP Total	**$ 11,756,700**
10-Year CIP		
9	12-inch Gravity Main Near Bethel Road	$ 1,243,400
10	12-inch and 15-inch Gravity Main in Northwest Weatherford	$ 1,900,700
11	8-inch Gravity Main Near FM 920 and Lift Station Decommission	$ 900,800
12	2.25 MGD Lift Station and 12-inch Force Main near Tin Top Road	$ 3,658,700
13	15-inch Gravity Main Near Tin Top Road	$ 1,146,700
14	1.75 MGD Lift Station and 12-inch Force Main near Scarlett Road and Bethel Road	$ 3,181,500
15	12-inch and 18-inch Gravity Main Near Bethel Road	$ 2,186,000
16	15-inch Gravity Main near IH-20 and Dean Road	$ 856,200
17	1.25 MGD Lift Station and 8-inch Force Main near Dean Road	$ 1,479,400
18	15-inch and 18-inch Gravity Main near Scarlett Road	$ 2,173,900
19	8-inch Gravity Main Near Lakecrest Drive	$ 1,070,700
20	Lift Station 17 Expansion to 4.0 MGD	$ 2,870,400
21	8-inch Gravity Main Near FM 730	$ 1,038,400
22	Lift Station 15 Rehabilitation and Expansion to 2.0 MGD	$ 1,304,100
23	8-inch Gravity Main near Bankhead Highway	$ 657,800
24	12-inch Gravity Main Near State Highway 180	$ 1,566,900
	10-Year CIP Total	**$ 27,235,600**
WWTP Build-Out Alternative CIP		
2B	60-inch WWTP Influent Line	$ 356,100
3B	30-inch, 32-inch, and 42-inch Town Creek Interceptor	$ 3,732,700
4B	12-inch, 24-inch, and 30-inch Gravity Mains Near North Elm Street and State Highway	$ 1,017,700
7B	15-inch Gravity Main near FM 920	$ 914,200
25	8-inch, 12-inch, and 27-inch Gravity Main Near Russell Street and Santa Fe Drive	$ 2,710,000
26B	Existing WWTP Expansion to 5.6 MGD	$ 12,144,000
27	4.0 MGD Wastewater Treatment Plant Near Old Dennis Road	$ 55,200,000
28	18-inch, 27-inch, and 30-inch Gravity Mains Near Old Dennis Road	$ 5,086,000
29	Lift Stations Decommission Near IH-20 and Dean Road	$ 552,000
30	18-inch Gravity Main Near Lution Drive	$ 2,050,300
31B	6.5 MGD Lift Station and 18-inch Force Main Near Bethel Road	$ 7,672,500
32	18-inch and 21-inch Gravity Main Near Bethel Road	$ 3,024,800

33	18-inch, 21-inch, and 24-inch Gravity Main Near Tin Top Road and Harmony Circle	$ 4,079,700
34	Lift Stations Decommission Near Scarlett Road and Tin Top Road	$ 552,000
35	8-inch and 12-inch Gravity Main Near Harmony Road and Tin Top Road	$ 1,911,300
36	15-inch Gravity Main Near Westover Village Estates	$ 1,159,200
37	12-inch and 15-inch Gravity Main Near Tin Top Road and IH-20	$ 2,690,800
38	8-inch and 15-inch Gravity Main Near Greenwood Road	$ 2,413,600
39	12-inch Gravity Main Near State Highway 180	$ 667,300
40	30-inch Town Creek Interceptor	$ 1,918,900
41	18-inch and 21-inch Progue Branch Interceptor	$ 1,350,600
42	15-inch and 18-inch Gravity Main Near Peaster Highway	$ 1,717,000
43	12-inch Gravity Main in Northwest Weatherford	$ 2,822,700
44	8-inch, 12-inch, and 15-inch Gravity Main Near Peaster Highway	$ 4,253,100
45	Lift Station 17 and Force Main Expansion	$ 15,056,100
46	12-inch, 18-inch, and 27-inch Gravity Mains Serving Lift Station 17	$ 1,000,900
47	8.2 MGD Lift Station and 16-inch Force Main Near Center Point Road	$ 9,264,400
48	12-inch and 21-inch Gravity Mains Near Bankhead Road	$ 1,859,500
49	21-inch Gravity Main Near Center Point Road and Lift Stations Decommission	$ 4,010,900
50	8-inch Gravity Main Near Arapahoe Ridge	$ 1,095,000
51	8-inch, 12-inch, 27-inch and 30-inch Gravity Mains Near Old Dicey Road and State Highway 180	$ 5,306,500
52	15-inch and 12-inch Gravity Main Near Upper Denton Road	$ 2,463,900
53	18-inch, 21-inch, and 24-inch Gravity Main in North Weatherford	$ 5,201,200
54	8-inch, 12-inch, and 15-inch Gravity Main Near Zion Hill Road	$ 3,535,600
55	0.65 MGD Lift Station and 8-inch Force Main Near Lake Drive	$ 2,608,800
56	12-inch Gravity Main Near Trailwood Drive	$ 2,147,300
57	15-inch and 18-inch Gravity Main near Silverstone Subdivision	$ 1,252,400
58	Lift Station 14 Expansion to 3.3 MGD	$ 1,435,200
59	Lift Station 12 Expansion to 2.2 MGD and 12-inch Force Main	$ 3,099,400
60	8-inch Gravity Main Near FM 730	$ 700,600
61	15-inch Gravity Main Near Holland Lake Park	$ 319,500
62	Lift Station 11 Expansion to 2.0 MGD and 12-inch Force Main	$ 5,495,600
63	8-inch and 12-inch Gravity Mains Near Lake Weatherford	$ 2,301,200
64	0.6 MGD Lift Station and 6-inch Force Main Near Pearson Ranch Road	$ 1,256,500
65	0.25 MGD Lift Station, 6-inch Force Main, and 8-inch and 12-inch Gravity Mains Near FM 1886	$ 3,025,200
	Build-Out CIP Total	**$ 192,432,200**
	CIP Total	**$ 231,424,500**
	Rehabilitation	
R1	Annual Wastewater Line Rehabilitation	$ 2,691,000
R2	Lift Station 9 Rehabilitation	$ 156,800
R3	Lift Station 20 Rehabilitation	$ 84,000
R4	Lift Station 1 Rehabilitation	$ 131,600
R5	Lift Station 3 Rehabilitation	$ 126,000
R6	Lift Station 12 Rehabilitation	$ 100,800
	Rehabilitation Total	**$ 3,290,200**

City of Weatherford

FREESE AND NICHOLS

CITY OF WEATHERFORD

DRAFT Wastewater System Capital Improvement Cost Estimate **March 15, 2017**

Construction Project Number: **2B** **Phase: Buildout**

Project Name: **60-inch WWTP Influent Line**

Project Description:

This project includes the expansion of the influent line that conveys flow directly into the WWTP to 60-inches. The extents of this project are similar to project 2A in the 5-year CIP, but this project is increased in size to account for buildout conditions.

Project Drivers:

The purpose of this project is to provide additional treatment capacity for future growth in Weatherford.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	60" Pipe 8- 16 feet deep	500	LF	$ 480	$ 240,000
2	72" Diameter Manhole	2	EA	$ 9,000	$ 18,000
				SUBTOTAL:	**$ 258,000**
		CONTINGENCY		20%	$ 51,600
				SUBTOTAL:	**$ 309,600**
		ENG/SURVEY		15%	$ 46,500
				SUBTOTAL:	**$ 356,100**
				Estimated Project Total:	**$ 356,100**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate | **March 15, 2017**

Construction Project Number: 3B | **Phase:** Buildout

Project Name: 30-inch, 32-inch, and 42-inch Town Creek Interceptor

Project Description:

This project consists of the expansion of the existing town creek interceptor to a 30-inch, 36-inch, and 42-inch line near Jack Borden Way. The extents of this project are similar to project 3A in the 5-year CIP, but this project is increased in size to account for buildout conditions.

Project Drivers:

This project provides additional capacity for flow from the northwest area of the city into the WWTP.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	42" Pipe 8- 16 feet deep	4,700	LF	$ 336	$ 1,579,200
2	36" Pipe 8- 16 feet deep	1,400	LF	$ 288	$ 403,200
3	30" Pipe 8- 16 feet deep	700	LF	$ 240	$ 168,000
4	48" WW Boring and Casing	600	LF	$ 720	$ 432,000
5	72" Diameter Manhole	14	EA	$ 9,000	$ 122,400
				SUBTOTAL:	**$ 2,704,800**
		CONTINGENCY		20%	$ 541,000
				SUBTOTAL:	**$ 3,245,800**
		ENG/SURVEY		15%	$ 486,900
				SUBTOTAL:	**$ 3,732,700**
				Estimated Project Total:	**$ 3,732,700**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate **March 15, 2017**

Construction Project Number: 4B **Phase: Buildout**

Project Name: **12-inch, 24-inch, and 30-inch Gravity Mains Near North Elm Street and State Highway**

Project Description:

This project includes a new 30-inch line connecting to the existing interceptor near North Elm Street and State Highway 180. This 30-inch line connects to a new 24-inch and 12-inch line upstream. These new lines replace the existing lines in the area north of downtown Weatherford. The extents of this project are similar to project 4A in the 5-year CIP, but this project is increased in size to account for buildout conditions.

Project Drivers:

This project will increase capacity in the area.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	30" Pipe 8- 16 feet deep	900	LF	$ 240	$ 216,000
2	24" Pipe 8- 16 feet deep	600	LF	$ 192	$ 115,200
3	12" Pipe 8- 16 feet deep	1,200	LF	$ 96	$ 115,200
4	42" WW Boring and Casing	200	LF	$ 630	$ 126,000
5	Pavement Repair	1,800	LF	$ 75	$ 135,000
6	60" Diameter Manhole	3	EA	$ 6,000	$ 18,000
7	48" Diameter Manhole	2	EA	$ 5,000	$ 12,000
				SUBTOTAL:	**$ 737,400**
		CONTINGENCY		20%	$ 147,500
				SUBTOTAL:	**$ 884,900**
		ENG/SURVEY		15%	$ 132,800
				SUBTOTAL:	**$ 1,017,700**
				Estimated Project Total:	**$ 1,017,700**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate	March 15, 2017
Construction Project Number: 7B	Phase: Buildout
Project Name:	15-inch Gravity Main near FM 920

Project Description:

This project includes a 15-inch line along FM 920 and Ric Williamson Memorial Highway that connects to and replaces part of the existing line. The extents of this project are similar to project 7A in the 5-year CIP, but this project is increased in size to account for buildout conditions.

Project Drivers:

This project provides additional capacity for future growth in the northwest area of Weatherford.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	15" Pipe 8- 16 feet deep	3,200	LF	$ 120	$ 384,000
2	Pavement Repair	3,200	LF	$ 75	$ 240,000
3	60" Diameter Manhole	6	EA	$ 6,000	$ 38,400
				SUBTOTAL:	**$ 662,400**
		CONTINGENCY		20%	$ 132,500
				SUBTOTAL:	**$ 794,900**
		ENG/SURVEY		15%	$ 119,300
				SUBTOTAL:	**$ 914,200**
				Estimated Project Total:	**$ 914,200**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate — **March 15, 2017**

Construction Project Number: 25 — **Phase: Buildout**

Project Name: **8-inch, 12-inch, and 27-inch Gravity Main Near Russell Street and Santa Fe Drive**

Project Description:

This project includes an 8-inch line along Russell Street starting near Lamar Street expanding to a 12-inch and 27-inch line that connects to the proposed 36-inch line near Santa Fe Drive.

Project Drivers:

This project provides capacity for future growth in the southern area of downtown Weatherford.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	27" Pipe 8- 16 feet deep	2,600	LF	$ 216	$ 561,600
2	12" Pipe 8- 16 feet deep	3,600	LF	$ 96	$ 345,600
3	8" Pipe 8- 16 feet deep	3,500	LF	$ 64	$ 224,000
4	42" WW Boring and Casing	300	LF	$ 630	$ 189,000
5	Pavement Repair	7,100	LF	$ 75	$ 532,500
6	48" Diameter Manhole	15	EA	$ 5,000	$ 75,000
7	60" Diameter Manhole	6	EA	$ 6,000	$ 36,000
				SUBTOTAL:	**$ 1,963,700**
		CONTINGENCY		20%	$ 392,800
				SUBTOTAL:	**$ 2,356,500**
		ENG/SURVEY		15%	$ 353,500
				SUBTOTAL:	**$ 2,710,000**
				Estimated Project Total:	**$ 2,710,000**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate				**March 15, 2017**	
Construction Project Number:	**26B**			**Phase: Buildout**	
Project Name:	**Existing WWTP Expansion to 5.6 MGD**				

Project Description:

This project includes the expansion of the central WWTP from the existing permitted capacity of 4.5 MGD to 5.6 MGD

Project Drivers:

The purpose of this project is to provide additional treatment capacity for future growth in Weatherford.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	1.1 MGD WWTP Expansion	1	LS	$ 8,800,000	$ 8,800,000
				SUBTOTAL:	**$ 8,800,000**
		CONTINGENCY		20%	$ 1,760,000
				SUBTOTAL:	**$ 10,560,000**
		ENG/SURVEY		15%	$ 1,584,000
				SUBTOTAL:	**$ 12,144,000**
				Estimated Project Total:	**$ 12,144,000**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate **March 15, 2017**

Construction Project Number: **27** **Phase: Buildout**

Project Name: **4.0 MGD Wastewater Treatment Plant Near Old Dennis Road**

Project Description:

This project includes the construction of a 4.0 MGD WWTP near Old Dennis Road south of IH-20.

Project Drivers:

The purpose of this project is to create treatment capacity for future growth in the southwest area of Weatherford.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	New 4.0 MGD WWTP	1	LS	$ 40,000,000	$ 40,000,000
				SUBTOTAL:	**$ 40,000,000**
		CONTINGENCY		20%	$ 8,000,000
				SUBTOTAL:	**$ 48,000,000**
		ENG/SURVEY		15%	$ 7,200,000
				SUBTOTAL:	**$ 55,200,000**
				Estimated Project Total:	**$ 55,200,000**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate **March 15, 2017**

Construction Project Number: 28 **Phase: Buildout**

Project Name: 18-inch, 27-inch, and 30-inch Gravity Mains Near Old Dennis Road

Project Description:

This project includes the installation of a new 27-inch and 30-inch gravity main from the lift station near IH-20 to the proposed wastewater treatment plant near Old Dennis Road. This project also includes the construction of a new 18-inch gravity main from the existing 18-inch line at the proposed lift station near Dean Road to the proposed 27-inch and 30-inch gravity line.

Project Drivers:

This project services the area north of the proposed wastewater treatment plant. The purpose of this project is to remove flow from the existing and proposed lift stations and provide additional capacity for future growth by connecting to the downstream proposed wastewater treatment plant.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	30" Pipe 8- 16 feet deep	7,400	LF	$ 240	$ 1,776,000
2	27" Pipe 8- 16 feet deep	6,500	LF	$ 216	$ 1,404,000
3	18" Pipe 8- 16 feet deep	2,500	LF	$ 144	$ 360,000
4	Pavement Repair	500	LF	$ 75	$ 37,500
5	60" Diameter Manhole	18	EA	$ 6,000	$ 108,000
				SUBTOTAL:	**$ 3,685,500**
		CONTINGENCY		20%	$ 737,100
				SUBTOTAL:	**$ 4,422,600**
		ENG/SURVEY		15%	$ 663,400
				SUBTOTAL:	**$ 5,086,000**
				Estimated Project Total:	**$ 5,086,000**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate **March 15, 2017**

Construction Project Number: 29 **Phase: Buildout**

Project Name: **Lift Stations Decommission Near IH-20 and Dean Road**

Project Description:

This project consists of the decommissioning of the lift station near IH-20 and the lift station near Dean Road. This project may only be initiated after the completion of the 27-inch and 20-inch gravity mains from project 28.

Project Drivers:

This project removes the lift stations from service.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	Lift Station - Decommission	2	LS	$ 200,000	$ 400,000
				SUBTOTAL:	**$ 400,000**
		CONTINGENCY		20%	$ 80,000
				SUBTOTAL:	**$ 480,000**
		ENG/SURVEY		15%	$ 72,000
				SUBTOTAL:	**$ 552,000**
				Estimated Project Total:	**$ 552,000**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate **March 15, 2017**

Construction Project Number: 30 **Phase: Buildout**

Project Name: **18-inch Gravity Main Near Lution Drive**

Project Description:

This project includes an 18-inch gravity main near Lution Drive and Bethel Road that proceeds to the proposed WWTP.

Project Drivers:

This project will convey flow from the east to the proposed WWTP.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	18" Pipe 8- 16 feet deep	7,400	LF	$ 144	$ 1,065,600
2	Pavement Repair	4,400	LF	$ 75	$ 330,000
3	60" Diameter Manhole	15	EA	$ 6,000	$ 90,000
				SUBTOTAL:	**$ 1,485,600**
		CONTINGENCY		20%	$ 297,200
				SUBTOTAL:	**$ 1,782,800**
		ENG/SURVEY		15%	$ 267,500
				SUBTOTAL:	**$ 2,050,300**
				Estimated Project Total:	**$ 2,050,300**

City of Weatherford

FREESE AND NICHOLS

CITY OF WEATHERFORD

DRAFT Wastewater System Capital Improvement Cost Estimate **March 15, 2017**

Construction Project Number: **31B** **Phase: Buildout**

Project Name: **6.5 MGD Lift Station and 18-inch Force Main Near Bethel Road**

Project Description:

This project includes a 6.5 MGD lift station near Pleasant Valley Lane and Bethel Road and an 18-inch force main from the proposed lift station to the proposed 18-inch gravity main neat Lution Drive.

Project Drivers:

This project will convey flow from the north to the proposed WWTP in the Brazos Basin.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	6.5 MGD Lift Station	1	EA	$ 4,225,000	$ 4,225,000
2	18" Force Main < 8 feet deep	8,100	LF	$ 162	$ 1,312,200
3	Pavement Repair	300	LF	$ 75	$ 22,500
				SUBTOTAL:	**$ 5,559,700**
		CONTINGENCY		20%	$ 1,112,000
				SUBTOTAL:	**$ 6,671,700**
		ENG/SURVEY		15%	$ 1,000,800
				SUBTOTAL:	**$ 7,672,500**
				Estimated Project Total:	**$ 7,672,500**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate | **March 15, 2017**

Construction Project Number: 32 | **Phase:** Buildout

Project Name: 18-inch and 21-inch Gravity Main Near Bethel Road

Project Description:

This project includes the construction of a 18-inch and 21-inch gravity main from the existing 18-inch line at the proposed lift station near Scarlett Road and Bethel Road to the lift station near Bethel Road from project 31.

Project Drivers:

The purpose of this project is to remove flow from the existing lift station and provide additional capacity for future growth by connecting to the downstream proposed lift station.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	21" Pipe 8- 16 feet deep	7,800	LF	$ 168	$ 1,310,400
2	18" Pipe 8- 16 feet deep	3,600	LF	$ 144	$ 518,400
3	Pavement Repair	3,000	LF	$ 75	$ 225,000
4	60" Diameter Manhole	23	EA	$ 6,000	$ 138,000
				SUBTOTAL:	**$ 2,191,800**
		CONTINGENCY		20%	$ 438,400
				SUBTOTAL:	**$ 2,630,200**
		ENG/SURVEY		15%	$ 394,600
				SUBTOTAL:	**$ 3,024,800**
				Estimated Project Total:	**$ 3,024,800**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate **March 15, 2017**

Construction Project Number: 33 **Phase: Buildout**

Project Name: **18-inch, 21-inch, and 24-inch Gravity Main Near Tin Top Road and Harmony Circle**

Project Description:

This project includes the installation of a new 18-inch, 21-inch, and 24-inch gravity line from the existing 12-inch line at the lift station near Tin Top Road to the proposed lift station near Bethel Road from project 31.

Project Drivers:

The purpose of this project is to provide additional capacity for future growth in the southern area of Weatherford.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	24" Pipe 8- 16 feet deep	4,100	LF	$ 192	$ 787,200
2	21" Pipe 8- 16 feet deep	5,200	LF	$ 168	$ 873,600
3	18" Pipe 8- 16 feet deep	4,600	LF	$ 144	$ 662,400
4	Pavement Repair	6,200	LF	$ 75	$ 465,000
5	60" Diameter Manhole	28	EA	$ 6,000	$ 168,000
				SUBTOTAL:	**$ 2,956,200**
		CONTINGENCY		20%	$ 591,300
				SUBTOTAL:	**$ 3,547,500**
		ENG/SURVEY		15%	$ 532,200
				SUBTOTAL:	**$ 4,079,700**
				Estimated Project Total:	**$ 4,079,700**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate **March 15, 2017**

Construction Project Number: **34** **Phase: Buildout**

Project Name: **Lift Stations Decommission Near Scarlett Road and Tin Top Road**

Project Description:

This project consits of the decommissioning of the proposed lift stations near Scarlett Road and Tin Top Road. These lift stations may only be decommissioned after the lines from project 32 and 33 are in service.

Project Drivers:

This project removes the proposed lift stations from service.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	Lift Station - Decommission	2	LS	$ 200,000	$ 400,000
				SUBTOTAL:	**$ 400,000**
		CONTINGENCY		20%	$ 80,000
				SUBTOTAL:	**$ 480,000**
		ENG/SURVEY		15%	$ 72,000
				SUBTOTAL:	**$ 552,000**
				Estimated Project Total:	**$ 552,000**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate **March 15, 2017**

Construction Project Number: 35 **Phase: Buildout**

Project Name: **8-inch and 12-inch Gravity Main Near Harmony Road and Tin Top Road**

Project Description:

This project consists of a 8 and 12-inch gravity line starting near Mountain View Road and connecting the proposed 21-inch line from project 33 near Harmony Road.

Project Drivers:

This project services future growth areas in the southern area of Weatherford.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	12" Pipe 8- 16 feet deep	8,700	LF	$ 96	$ 835,200
2	8" Pipe 8- 16 feet deep	3,200	LF	$ 64	$ 204,800
3	Pavement Repair	3,000	LF	$ 75	$ 225,000
4	48" Diameter Manhole	24	EA	$ 5,000	$ 120,000
				SUBTOTAL:	**$ 1,385,000**
		CONTINGENCY		20%	$ 277,000
				SUBTOTAL:	**$ 1,662,000**
		ENG/SURVEY		15%	$ 249,300
				SUBTOTAL:	**$ 1,911,300**
				Estimated Project Total:	**$ 1,911,300**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate **March 15, 2017**

Construction Project Number: 36 **Phase: Buildout**

Project Name: **15-inch Gravity Main Near Westover Village Estates**

Project Description:

This project includes the expansion of the existing 12-inch line to a 15-inch line southwest of Westover Village Estates subdivision near Bethel Road.

Project Drivers:

This project provides additional capacity for future growth in the southern area of Weatherford.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	15" Pipe 8- 16 feet deep	5,200	LF	$ 120	$ 624,000
2	Pavement Repair	2,000	LF	$ 75	$ 150,000
3	60" Diameter Manhole	11	EA	$ 6,000	$ 66,000
				SUBTOTAL:	**$ 840,000**
		CONTINGENCY		20%	$ 168,000
				SUBTOTAL:	**$ 1,008,000**
		ENG/SURVEY		15%	$ 151,200
				SUBTOTAL:	**$ 1,159,200**
				Estimated Project Total:	**$ 1,159,200**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate — **March 15, 2017**

Construction Project Number: 37 — **Phase: Buildout**

Project Name: **12-inch and 15-inch Gravity Main Near Tin Top Road and IH-20**

Project Description:

This project includes the expansion of the existing line near Tin Top Road from IH-20 to Lift Station 8 to 15-inches.

Project Drivers:

This project provides additional capacity for future growth in the southern area of Weatherford.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	15" Pipe > 16 feet deep	6,900	LF	$ 200	$ 1,380,000
2	12" Pipe 8- 16 feet deep	1,300	LF	$ 96	$ 124,800
3	30" WW Boring and Casing	800	LF	$ 450	$ 360,000
4	48" Diameter Manhole	17	EA	$ 5,000	$ 85,000
				SUBTOTAL:	**$ 1,949,800**
		CONTINGENCY		20%	$ 390,000
				SUBTOTAL:	**$ 2,339,800**
		ENG/SURVEY		15%	$ 351,000
				SUBTOTAL:	**$ 2,690,800**
				Estimated Project Total:	**$ 2,690,800**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate **March 15, 2017**

Construction Project Number: 38 **Phase: Buildout**

Project Name: 8-inch and 15-inch Gravity Main Near Greenwood Road

Project Description:

This project includes the construction of a 8-inch and 15-inch gravity main starting near Old Mineral Wells Highway and connecting to the proposed line near Greenwood Road.

Project Drivers:

The purpose of this project is to service future growth in the western area of Weatherford.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	15" Pipe > 16 feet deep	3,400	LF	$ 200	$ 680,000
2	8" Pipe 8- 16 feet deep	7,600	LF	$ 64	$ 486,400
3	30" WW Boring and Casing	700	LF	$ 450	$ 315,000
4	21" WW Boring and Casing	500	LF	$ 315	$ 157,500
5	48" Diameter Manhole	22	EA	$ 5,000	$ 110,000
				SUBTOTAL:	**$ 1,748,900**
		CONTINGENCY		20%	$ 349,800
				SUBTOTAL:	**$ 2,098,700**
		ENG/SURVEY		15%	$ 314,900
				SUBTOTAL:	**$ 2,413,600**
				Estimated Project Total:	**$ 2,413,600**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate — **March 15, 2017**

Construction Project Number: 39 — **Phase:** Buildout

Project Name: 12-inch Gravity Main Near State Highway 180

Project Description:

This project extends the proposed 12-inch line near State Highway 180 to the north near Garner Road.

Project Drivers:

This project services future growth in the western area of Weatherford.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	12" Pipe 8- 16 feet deep	3,500	LF	$ 96	$ 336,000
2	Pavement Repair	1,500	LF	$ 75	$ 112,500
3	48" Diameter Manhole	7	EA	$ 5,000	$ 35,000
				SUBTOTAL:	**$ 483,500**
		CONTINGENCY		20%	$ 96,700
				SUBTOTAL:	**$ 580,200**
		ENG/SURVEY		15%	$ 87,100
				SUBTOTAL:	**$ 667,300**
				Estimated Project Total:	**$ 667,300**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate | **March 15, 2017**

Construction Project Number: 40 | **Phase:** Buildout

Project Name: 30-inch Town Creek Interceptor

Project Description:

This project extends the proposed expansion of the Town Creek Interceptor from Columbia Street to Elm Street.

Project Drivers:

This project provides additional capacity for future growth near downtown Weatherford.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	30" Pipe 8- 16 feet deep	4,100	LF	$ 240	$ 984,000
2	Pavement Repair	500	LF	$ 75	$ 37,500
3	42" WW Boring and Casing	500	LF	$ 630	$ 315,000
4	60" Diameter Manhole	9	EA	$ 6,000	$ 54,000
				SUBTOTAL:	**$ 1,390,500**
		CONTINGENCY		20%	$ 278,100
				SUBTOTAL:	**$ 1,668,600**
		ENG/SURVEY		15%	$ 250,300
				SUBTOTAL:	**$ 1,918,900**
				Estimated Project Total:	**$ 1,918,900**

City of Weatherford

FREESE AND NICHOLS

CITY OF WEATHERFORD

DRAFT Wastewater System Capital Improvement Cost Estimate **March 15, 2017**

Construction Project Number: 41 **Phase: Buildout**

Project Name: 18-inch and 21-inch Progue Branch Interceptor

Project Description:

This project includes the 21-inch expansion of the Progue Branch Interceptor near Peaster Highway. This project also includes an 18-inch line connecting to the existing 18-inch line near Main Street.

Project Drivers:

This project provides additional capacity for future growth in the northwest area of Weatherford.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	21" Pipe 8- 16 feet deep	4,300	LF	$ 168	$ 722,400
2	18" Pipe 8- 16 feet deep	800	LF	$ 144	$ 115,200
3	Pavement Repair	1,000	LF	$ 75	$ 75,000
4	60" Diameter Manhole	11	EA	$ 6,000	$ 66,000
				SUBTOTAL:	**$ 978,600**
		CONTINGENCY		20%	$ 195,800
				SUBTOTAL:	**$ 1,174,400**
		ENG/SURVEY		15%	$ 176,200
				SUBTOTAL:	**$ 1,350,600**
				Estimated Project Total:	**$ 1,350,600**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate — **March 15, 2017**

Construction Project Number: 42 — **Phase:** Buildout

Project Name: 15-inch and 18-inch Gravity Main Near Peaster Highway

Project Description:

This project includes a 15-inch and 18-inch line connecting the proposed 15-inch and 21-inch lines near Peaster Highway.

Project Drivers:

This project provides additional capacity for future growth in the northern area of Weatherford.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	18" Pipe 8- 16 feet deep	2,900	LF	$ 144	$ 417,600
2	15" Pipe 8- 16 feet deep	4,000	LF	$ 120	$ 480,000
3	30" WW Boring and Casing	500	LF	$ 450	$ 225,000
4	Pavement Repair	500	LF	$ 75	$ 37,500
5	60" Diameter Manhole	14	EA	$ 6,000	$ 84,000
				SUBTOTAL:	**$ 1,244,100**
		CONTINGENCY		20%	$ 248,900
				SUBTOTAL:	**$ 1,493,000**
		ENG/SURVEY		15%	$ 224,000
				SUBTOTAL:	**$ 1,717,000**
				Estimated Project Total:	**$ 1,717,000**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate **March 15, 2017**

Construction Project Number: 43 **Phase: Buildout**

Project Name: **12-inch Gravity Main in Northwest Weatherford**

Project Description:

This project extends the proposed 12-inch line near Ric Williamson Memorial Highway in Northeast Weatherford to near Shady Grove Lane.

Project Drivers:

This project provides additional capacity for future growth in the northwest area of Weatherford.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	12" Pipe 8- 16 feet deep	17,900	LF	$ 96	$ 1,718,400
2	24" WW Boring and Casing	200	LF	$ 360	$ 72,000
3	Pavement Repair	1,000	LF	$ 75	$ 75,000
4	48" Diameter Manhole	36	EA	$ 5,000	$ 180,000
				SUBTOTAL:	**$ 2,045,400**
		CONTINGENCY		20%	$ 409,100
				SUBTOTAL:	**$ 2,454,500**
		ENG/SURVEY		15%	$ 368,200
				SUBTOTAL:	**$ 2,822,700**
				Estimated Project Total:	**$ 2,822,700**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate **March 15, 2017**

Construction Project Number: 44 **Phase: Buildout**

Project Name: 8-inch, 12-inch, and 15-inch Gravity Main Near Peaster Highway

Project Description:

This project extends the proposed 15-inch line near Peaster Highway as a 15, 12, and 8-inch line to near Sharla Smelley Road.

Project Drivers:

This project provides additional capacity for future growth in the northwest area of Weatherford.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	15" Pipe 8- 16 feet deep	1,500	LF	$ 120	$ 180,000
2	12" Pipe 8- 16 feet deep	12,200	LF	$ 96	$ 1,171,200
3	8" Pipe 8- 16 feet deep	3,800	LF	$ 64	$ 243,200
4	Pavement Repair	17,500	LF	$ 75	$ 1,312,500
5	48" Diameter Manhole	35	EA	$ 5,000	$ 175,000
				SUBTOTAL:	**$ 3,081,900**
		CONTINGENCY		20%	$ 616,400
				SUBTOTAL:	**$ 3,698,300**
		ENG/SURVEY		15%	$ 554,800
				SUBTOTAL:	**$ 4,253,100**
				Estimated Project Total:	**$ 4,253,100**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate — March 15, 2017

Construction Project Number: 45 — Phase: Buildout

Project Name: Lift Station 17 and Force Main Expansion

Project Description:

This project includes the expansion of Sherry Trails Lift Station from a firm capacity of 4.0 MGD to 18.0 MGD and the expansion of the corresponding force main to 24-inches.

Project Drivers:

This project provides capacity for future growth in the area served by Sherry Trails Lift Station.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	14 MGD Lift Station Expansion	1	EA	$ 9,100,000	$ 9,100,000
2	24" Force Main < 8 feet deep	6,800	LF	$ 216	$ 1,468,800
3	Pavement Repair	4,550	LF	$ 75	$ 341,250
				SUBTOTAL:	**$ 10,910,100**
		CONTINGENCY		20%	$ 2,182,100
				SUBTOTAL:	**$ 13,092,200**
		ENG/SURVEY		15%	$ 1,963,900
				SUBTOTAL:	**$ 15,056,100**
				Estimated Project Total:	**$ 15,056,100**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate **March 15, 2017**

Construction Project Number: 46 **Phase: Buildout**

Project Name: 12-inch, 18-inch, and 27-inch Gravity Mains Serving Lift Station 17

Project Description:

This project includes a new 12-inch line north of Sherry Trails Lift Station and a new 18-inch and 27-inch line connecting Sherry Trails Lift Station to the force main from Center Point Lift Station.

Project Drivers:

This project provides additional service and capacity for future growth in the area served by Sherry Trails Lift Station.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	27" Pipe 8- 16 feet deep	900	LF	$ 216	$ 194,400
2	12" Pipe 8- 16 feet deep	1,100	LF	$ 96	$ 105,600
3	12" Pipe 8- 16 feet deep	2,200	LF	$ 96	$ 211,200
4	Pavement Repair	2,200	LF	$ 75	$ 165,000
5	60" Diameter Manhole	4	EA	$ 6,000	$ 24,000
6	48" Diameter Manhole	5	EA	$ 5,000	$ 25,000
				SUBTOTAL:	**$ 725,200**
		CONTINGENCY		20%	$ 145,100
				SUBTOTAL:	**$ 870,300**
		ENG/SURVEY		15%	$ 130,600
				SUBTOTAL:	**$ 1,000,900**
				Estimated Project Total:	**$ 1,000,900**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate **March 15, 2017**

Construction Project Number: 47 **Phase:** Buildout

Project Name: **8.2 MGD Lift Station and 16-inch Force Main Near Center Point Road**

Project Description:

This project consists of a new 8.20 MGD lift station and corresponding force main near Center Point Road connecting to the proposed line near IH-20.

Project Drivers:

This project services future growth near the Morgan Manor subdivision.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	8.2 MGD Lift Station	1	EA	$ 5,330,000	$ 5,330,000
2	16" Force Main < 8 feet deep	8,200	LF	$ 144	$ 1,180,800
3	30" WW Boring and Casing	200	LF	$ 450	$ 90,000
4	Pavement Repair	1,500	LF	$ 75	$ 112,500
				SUBTOTAL:	**$ 6,713,300**
		CONTINGENCY		20%	$ 1,342,700
				SUBTOTAL:	**$ 8,056,000**
		ENG/SURVEY		15%	$ 1,208,400
				SUBTOTAL:	**$ 9,264,400**
				Estimated Project Total:	**$ 9,264,400**

City of Weatherford

FREESE AND NICHOLS

CITY OF WEATHERFORD

DRAFT Wastewater System Capital Improvement Cost Estimate **March 15, 2017**

Construction Project Number: 48 **Phase: Buildout**

Project Name: 12-inch and 21-inch Gravity Mains Near Bankhead Road

Project Description:

This project includes a new 12-inch line from the existing Lift Station 16 to the proposed lift station from the project 44 and a new 21-inch line from Lift Station 20 to the proposed lift station from the project 47.

Project Drivers:

The project provides addition capacity for future growth in the south-east area of Weatherford.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	21" Pipe 8- 16 feet deep	3,600	LF	$ 168	$ 604,800
2	12" Pipe 8- 16 feet deep	4,600	LF	$ 96	$ 441,600
3	36" WW Boring and Casing	200	LF	$ 540	$ 108,000
4	24" WW Boring and Casing	300	LF	$ 360	$ 108,000
5	48" Diameter Manhole	17	EA	$ 5,000	$ 85,000
				SUBTOTAL:	**$ 1,347,400**
		CONTINGENCY		20%	$ 269,500
				SUBTOTAL:	**$ 1,616,900**
		ENG/SURVEY		15%	$ 242,600
				SUBTOTAL:	**$ 1,859,500**
				Estimated Project Total:	**$ 1,859,500**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate **March 15, 2017**

Construction Project Number: 49 **Phase: Buildout**

Project Name: **21-inch Gravity Main Near Center Point Road and Lift Stations Decommission**

Project Description:

This project includes a new 21-inch line starting at the 12-inch line up stream of Lift Station 15 and connecting to the 21-inch line from project 48 near Lift Station 20. Once this project and projects 47 and 48 are in service, Lift Stations 15, 16, and 20 can be decommissioned.

Project Drivers:

The project provides addition capacity for future growth in the east area of Weatherford.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	21" Pipe 8- 16 feet deep	9,800	LF	$ 168	$ 1,646,400
2	36" WW Boring and Casing	1,000	LF	$ 540	$ 540,000
3	60" Diameter Manhole	20	EA	$ 6,000	$ 120,000
4	Lift Station - Decommission	3	LS	$ 200,000	$ 600,000
				SUBTOTAL:	**$ 2,906,400**
		CONTINGENCY		20%	$ 581,300
				SUBTOTAL:	**$ 3,487,700**
		ENG/SURVEY		15%	$ 523,200
				SUBTOTAL:	**$ 4,010,900**
				Estimated Project Total:	**$ 4,010,900**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate **March 15, 2017**

Construction Project Number: **50** **Phase: Buildout**

Project Name: **8-inch Gravity Main Near Arapahoe Ridge**

Project Description:

This project includes a new 8-inch line near Arapahoe Ridge starting near Circleview Drive and connecting to the existing 8-inch line near Woodland Hills Lane.

Project Drivers:

This project provides services to future growth near Arapahoe Ridge Subdivision.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	8" Pipe 8- 16 feet deep	5,600	LF	$ 64	$ 358,400
2	Pavement Repair	5,000	LF	$ 75	$ 375,000
3	48" Diameter Manhole	12	EA	$ 5,000	$ 60,000
				SUBTOTAL:	**$ 793,400**
		CONTINGENCY		20%	$ 158,700
				SUBTOTAL:	**$ 952,100**
		ENG/SURVEY		15%	$ 142,900
				SUBTOTAL:	**$ 1,095,000**
				Estimated Project Total:	**$ 1,095,000**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate **March 15, 2017**

Construction Project Number: **51** **Phase: Buildout**

Project Name: **8-inch, 12-inch, 27-inch and 30-inch Gravity Mains Near Old Dicey Road and State Highway 180**

Project Description:

This project includes expansion of the existing 6-inch line to an 8-inch line and expansion of the existing 18-inch line to a 30-inch line near State Highway 180. This project also includes expanding the existing 18-inch line to 30-inch and 27-inches from IH-20 to Old Dicey Road, a 12-inch line near Old Dicey Road, and a new 27-inch line from Old Dicey Road to De La Cruz Street near Willow Creek.

Project Drivers:

This project provides additional capacity for future growth near Lift Station 17 and in the northern area of Weatherford.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	30" Pipe 8- 16 feet deep	6,500	LF	$ 240	$ 1,560,000
2	27" Pipe 8- 16 feet deep	5,300	LF	$ 216	$ 1,144,800
3	12" Pipe 8- 16 feet deep	300	LF	$ 96	$ 28,800
4	8" Pipe 8- 16 feet deep	1,900	LF	$ 64	$ 121,600
5	Pavement Repair	2,400	LF	$ 75	$ 180,000
6	42" WW Boring and Casing	1,000	LF	$ 630	$ 630,000
7	60" Diameter Manhole	25	EA	$ 6,000	$ 150,000
8	48" Diameter Manhole	6	EA	$ 5,000	$ 30,000
				SUBTOTAL:	**$ 3,845,200**
		CONTINGENCY		20%	$ 769,100
				SUBTOTAL:	**$ 4,614,300**
		ENG/SURVEY		15%	$ 692,200
				SUBTOTAL:	**$ 5,306,500**
				Estimated Project Total:	**$ 5,306,500**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate **March 15, 2017**

Construction Project Number: 52 **Phase: Buildout**

Project Name: **15-inch and 12-inch Gravity Main Near Upper Denton Road**

Project Description:

This project consists of a 12-inch and 15-inch line starting near the intersection of Upper Denton Road and Green Branch Road and connecting to the proposed 27-inch line from project 51.

Project Drivers:

This project provides service for future growth in northern Weatherford.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	15" Pipe 8- 16 feet deep	3,000	LF	$ 120	$ 360,000
2	12" Pipe 8- 16 feet deep	9,900	LF	$ 96	$ 950,400
3	Pavement Repair	4,000	LF	$ 75	$ 300,000
4	30" WW Boring and Casing	100	LF	$ 450	$ 45,000
5	48" Diameter Manhole	26	EA	$ 5,000	$ 130,000
				SUBTOTAL:	**$ 1,785,400**
		CONTINGENCY		20%	$ 357,100
				SUBTOTAL:	**$ 2,142,500**
		ENG/SURVEY		15%	$ 321,400
				SUBTOTAL:	**$ 2,463,900**
				Estimated Project Total:	**$ 2,463,900**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate	March 15, 2017
Construction Project Number: 53	Phase: Buildout
Project Name:	18-inch, 21-inch, and 24-inch Gravity Main in North Weatherford

Project Description:

This project includes an 18-inch line that starts near the intersection of FM 51 and Misty Ridge Lane and expands to a 21-inch and 24-inch line that connects to the proposed line near De La Cruz Street from project 51.

Project Drivers:

This project provides service for future growth in northern Weatherford.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	24" Pipe 8- 16 feet deep	8,000	LF	$ 192	$ 1,536,000
2	21" Pipe 8- 16 feet deep	4,500	LF	$ 168	$ 756,000
3	18" Pipe 8- 16 feet deep	6,600	LF	$ 144	$ 950,400
4	60" Diameter Manhole	39	EA	$ 6,000	$ 234,000
5	Pavement Repair	300	LF	$ 75	$ 22,500
6	36" WW Boring and Casing	500	LF	$ 540	$ 270,000
				SUBTOTAL:	**$ 3,768,900**
		CONTINGENCY		20%	$ 753,800
				SUBTOTAL:	**$ 4,522,700**
		ENG/SURVEY		15%	$ 678,500
				SUBTOTAL:	**$ 5,201,200**
				Estimated Project Total:	**$ 5,201,200**

City of Weatherford

FREESE AND NICHOLS

CITY OF WEATHERFORD

DRAFT Wastewater System Capital Improvement Cost Estimate **March 15, 2017**

Construction Project Number: **54** **Phase: Buildout**

Project Name: **8-inch, 12-inch, and 15-inch Gravity Main Near Zion Hill Road**

Project Description:

This project includes an 8-inch line that starts on Zion Road near Timber Ridge Trail and expands to a 12-inch and 15-inch line that connects to the proposed 18-inch line near FM 51.

Project Drivers:

This project provides service for future growth in northern Weatherford.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	15" Pipe 8- 16 feet deep	12,200	LF	$ 120	$ 1,464,000
2	12" Pipe 8- 16 feet deep	5,600	LF	$ 96	$ 537,600
3	8" Pipe 8- 16 feet deep	1,100	LF	$ 64	$ 70,400
4	Pavement Repair	4,000	LF	$ 75	$ 300,000
5	48" Diameter Manhole	38	EA	$ 5,000	$ 190,000
				SUBTOTAL:	**$ 2,562,000**
		CONTINGENCY		20%	$ 512,400
				SUBTOTAL:	**$ 3,074,400**
		ENG/SURVEY		15%	$ 461,200
				SUBTOTAL:	**$ 3,535,600**
				Estimated Project Total:	**$ 3,535,600**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate — March 15, 2017

Construction Project Number: 55 — **Phase:** Buildout

Project Name: 0.65 MGD Lift Station and 8-inch Force Main Near Lake Drive

Project Description:

This project includes the construction of a new lift station and corresponding 8-inch force main near Lake Drive and connects to the proposed 12-inch line near Upper Denton Road from project 52.

Project Drivers:

This project provides service for future growth in northern Weatherford.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	0.65 MGD Lift Station	1	EA	$ 422,500	$ 422,500
2	8" Force Main < 8 feet deep	15,700	LF	$ 72	$ 1,130,400
3	Pavement Repair	4,500	LF	$ 75	$ 337,500
				SUBTOTAL:	**$ 1,890,400**
			CONTINGENCY	20%	$ 378,100
				SUBTOTAL:	**$ 2,268,500**
			ENG/SURVEY	15%	$ 340,300
				SUBTOTAL:	**$ 2,608,800**
				Estimated Project Total:	**$ 2,608,800**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate — **March 15, 2017**

Construction Project Number: 56 — **Phase:** Buildout

Project Name: 12-inch Gravity Main Near Trailwood Drive

Project Description:

This project consists of a new 12-inch line that starts near Trailwood Drive and connects to the proposed lift station near Lake Road from project 55.

Project Drivers:

This project provides service for future growth in northern Weatherford.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	12" Pipe 8- 16 feet deep	14,000	LF	$ 96	$ 1,344,000
2	24" WW Boring and Casing	200	LF	$ 360	$ 72,000
3	48" Diameter Manhole	28	EA	$ 5,000	$ 140,000
				SUBTOTAL:	**$ 1,556,000**
		CONTINGENCY		20%	$ 311,200
				SUBTOTAL:	**$ 1,867,200**
		ENG/SURVEY		15%	$ 280,100
				SUBTOTAL:	**$ 2,147,300**
				Estimated Project Total:	**$ 2,147,300**

City of Weatherford

FREESE AND NICHOLS

CITY OF WEATHERFORD

DRAFT Wastewater System Capital Improvement Cost Estimate **March 15, 2017**

Construction Project Number: 57 **Phase: Buildout**

Project Name: 15-inch and 18-inch Gravity Main near Silverstone Subdivision

Project Description:

This project includes the expansion of the existing line that starts near Silverstone Drive and connects to the proposed 21-inch line near Suzanne Trail to a 15-inch and 18-inch line.

Project Drivers:

This project provides additional capacity for future growth near the Silver Stone Subdivision.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	18" Pipe 8- 16 feet deep	3,000	LF	$ 144	$ 432,000
2	15" Pipe 8- 16 feet deep	2,100	LF	$ 120	$ 252,000
3	Pavement Repair	2,100	LF	$ 75	$ 157,500
4	60" Diameter Manhole	11	EA	$ 6,000	$ 66,000
				SUBTOTAL:	**$ 907,500**
			CONTINGENCY	20%	$ 181,500
				SUBTOTAL:	**$ 1,089,000**
			ENG/SURVEY	15%	$ 163,400
				SUBTOTAL:	**$ 1,252,400**
				Estimated Project Total:	**$ 1,252,400**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate **March 15, 2017**

Construction Project Number: **58** **Phase: Buildout**

Project Name: **Lift Station 14 Expansion to 3.3 MGD**

Project Description:

This project expands the existing Brazos Electric Plant Lift Station from a firm capacity of 1.73 MGD to 3.3 MGD.

Project Drivers:

This project provides additional lift station capacity for future growth in the area around Lake Weatherford.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	1.6 MGD Lift Station Expansion	1	EA	$ 1,040,000	$ 1,040,000
				SUBTOTAL:	**$ 1,040,000**
		CONTINGENCY		20%	$ 208,000
				SUBTOTAL:	**$ 1,248,000**
		ENG/SURVEY		15%	$ 187,200
				SUBTOTAL:	**$ 1,435,200**
				Estimated Project Total:	**$ 1,435,200**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate — **March 15, 2017**

Construction Project Number: 59 — **Phase:** Buildout

Project Name: **Lift Station 12 Expansion to 2.2 MGD and 12-inch Force Main**

Project Description:

This project includes the expansion of the existing WTP Lift Station from a firm capacity of 0.65 MGD to 2.2 MGD and the subsequent expansion of the force main to 12-inches.

Project Drivers:

This project provides additional lift station capacity for future growth in the area around Lake Weatherford.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	1.55 MGD Lift Station Expansion	1	EA	$ 1,007,500	$ 1,007,500
2	12" Force Main < 8 feet deep	6,300	LF	$ 108	$ 680,400
3	Pavement Repair	6,000	LF	$ 75	$ 450,000
4	24" WW Boring and Casing	300	LF	$ 360	$ 108,000
				SUBTOTAL:	**$ 2,245,900**
		CONTINGENCY		20%	$ 449,200
				SUBTOTAL:	**$ 2,695,100**
		ENG/SURVEY		15%	$ 404,300
				SUBTOTAL:	**$ 3,099,400**
				Estimated Project Total:	**$ 3,099,400**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate — **March 15, 2017**

Construction Project Number: 60 — **Phase:** Buildout

Project Name: 8-inch Gravity Main Near FM 730

Project Description:

This project includes an 8-inch line near FM 730 extending project 21 to near Tailwood Drive

Project Drivers:

This project provides additional capacity for future growth near FM 730.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	8" Pipe 8- 16 feet deep	3,400	LF	$ 64	$ 217,600
2	Pavement Repair	3,400	LF	$ 75	$ 255,000
3	48" Diameter Manhole	7	EA	$ 5,000	$ 35,000
				SUBTOTAL:	**$ 507,600**
		CONTINGENCY		20%	$ 101,600
				SUBTOTAL:	**$ 609,200**
		ENG/SURVEY		15%	$ 91,400
				SUBTOTAL:	**$ 700,600**
				Estimated Project Total:	**$ 700,600**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate					March 15, 2017
Construction Project Number: 61					Phase: Buildout
Project Name:	15-inch Gravity Main Near Holland Lake Park				

Project Description:

This project consists of the expansion of the existing 10-inch line near Holland Lake Park to a 15-inch line.

Project Drivers:

This project provides additional capacity for future growth in the area.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	15" Pipe 8- 16 feet deep	1,700	LF	$ 120	$ 204,000
2	Pavement Repair	100	LF	$ 75	$ 7,500
3	48" Diameter Manhole	4	EA	$ 5,000	$ 20,000
				SUBTOTAL:	**$ 231,500**
		CONTINGENCY		20%	$ 46,300
				SUBTOTAL:	**$ 277,800**
		ENG/SURVEY		15%	$ 41,700
				SUBTOTAL:	**$ 319,500**
				Estimated Project Total:	**$ 319,500**

City of Weatherford

FREESE AND NICHOLS

CITY OF WEATHERFORD

DRAFT Wastewater System Capital Improvement Cost Estimate — **March 15, 2017**

Construction Project Number: 62 — **Phase:** Buildout

Project Name: Lift Station 11 Expansion to 2.0 MGD and 12-inch Force Main

Project Description:

This project includes the expansion of the existing East Lake Lift Station from a firm capacity of 0.2 MGD to 2.0 MGD and the subsequent expansion of the force main to 12-inches.

Project Drivers:

This project provides additional lift station capacity for future growth in the area around Lake Weatherford.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	1.8 MGD Lift Station Expansion	1	EA	$ 1,170,000	$ 1,170,000
2	12" Force Main < 8 feet deep	14,900	LF	$ 108	$ 1,609,200
3	Pavement Repair	14,600	LF	$ 75	$ 1,095,000
4	24" WW Boring and Casing	300	LF	$ 360	$ 108,000
				SUBTOTAL:	**$ 3,982,200**
		CONTINGENCY		20%	$ 796,500
				SUBTOTAL:	**$ 4,778,700**
		ENG/SURVEY		15%	$ 716,900
				SUBTOTAL:	**$ 5,495,600**
				Estimated Project Total:	**$ 5,495,600**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate — **March 15, 2017**

Construction Project Number: 63 — **Phase:** Buildout

Project Name: 8-inch and 12-inch Gravity Mains Near Lake Weatherford

Project Description:

This project includes the installation of a new 8-inch line and a new 12-inch line that start near Pearson Ranch Road and connect to the East Lake Lift Station.

Project Drivers:

This project provides service for future growth in the northeast area around Lake Weatherford.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	12" Pipe 8- 16 feet deep	8,700	LF	$ 96	$ 835,200
2	8" Pipe 8- 16 feet deep	8,200	LF	$ 64	$ 524,800
3	Pavement Repair	4,100	LF	$ 75	$ 307,500
				SUBTOTAL:	**$ 1,667,500**
		CONTINGENCY		20%	$ 333,500
				SUBTOTAL:	**$ 2,001,000**
		ENG/SURVEY		15%	$ 300,200
				SUBTOTAL:	**$ 2,301,200**
				Estimated Project Total:	**$ 2,301,200**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate — **March 15, 2017**

Construction Project Number: 64 — **Phase:** Buildout

Project Name: **0.6 MGD Lift Station and 6-inch Force Main Near Pearson Ranch Road**

Project Description:

This project consists of the construction of a new 0.6 MGD lift station near Pearson Ranch Road and the corresponding 6-inch force main. This project may only be initiated after the installation of the 12-inch gravity main from project 63.

Project Drivers:

This project provides service for future growth in the north-east area around Lake Weatherford.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	0.6 MGD Lift Station	1	EA	$ 390,000	$ 390,000
2	6" Force Main < 8 feet deep	9,500	LF	$ 54	$ 513,000
3	Pavement Repair	100	LF	$ 75	$ 7,500
				SUBTOTAL:	**$ 910,500**
		CONTINGENCY		20%	$ 182,100
				SUBTOTAL:	**$ 1,092,600**
		ENG/SURVEY		15%	$ 163,900
				SUBTOTAL:	**$ 1,256,500**
				Estimated Project Total:	**$ 1,256,500**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate — **March 15, 2017**

Construction Project Number: 65 — **Phase:** Buildout

Project Name: 0.25 MGD Lift Station, 6-inch Force Main, and 8-inch and 12-inch Gravity Mains Near FM 1886

Project Description:

This project includes two new 8-inch lines that connect to a new 12-inch line near Pearson Ranch Road that connects to the proposed lift station from project 64. This project also includes of the construction of a new 0.25 MGD lift station near FM 1886 and the corresponding 6-inch force main that connects to the proposed 8-inch gravity main. This project also includes the installation of a new 8-inch gravity main that starts near Pearson Ranch Road and connects to the proposed lift station. This project may only be completed after the proposed lift station from project 64 is in service.

Project Drivers:

This project provides service for future growth in the north-east area around Lake Weatherford.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	12" Pipe 8- 16 feet deep	3,000	LF	$ 96	$ 288,000
2	8" Pipe 8- 16 feet deep	18,900	LF	$ 64	$ 1,209,600
3	Pavement Repair	2,000	LF	$ 75	$ 150,000
4	48" Diameter Manhole	44	EA	$ 5,000	$ 220,000
5	0.25 MGD Lift Station	1	EA	$ 162,500	$ 162,500
6	6" Force Main < 8 feet deep	3,000	LF	$ 54	$ 162,000
				SUBTOTAL:	**$ 2,192,100**
		CONTINGENCY		20%	$ 438,500
				SUBTOTAL:	**$ 2,630,600**
		ENG/SURVEY		15%	$ 394,600
				SUBTOTAL:	**$ 3,025,200**
				Estimated Project Total:	**$ 3,025,200**

APPENDIX E
DETAILED BUILDOUT CAPITAL IMPROVEMENT PROJECT COST ESTIMATES
BRAZOS LIFT STATION ALTERNATIVE

Project Number	Project Name	Cost
	5-Year CIP	
1	Old Brock Road Gravity Main and Lift Station Decommission	$ 2,131,700
2A	42-inch Influent Line to the WWTP	$ 256,700
3A	21-inch, 24-inch, and 30-inch Town Creek Interceptor	$ 2,491,500
4A	12-inch, 15-inch and 18-inch Gravity Mains near North Elm Street and State Highway 180	$ 789,200
5	0.5 MGD Lift Station and 6-inch Force Main near IH 20 and Ric Williamson Memorial Highway	$ 1,155,300
6	12-inch, 18-inch, 21-inch, and 24-inch Gravity Main Near Ric Williamson Memorial Highway	$ 3,069,900
7A	8-inch Gravity Main near FM 920	$ 658,100
8	8-inch and 12-inch Gravity Mains Near North Main Street	$ 1,204,300
	5-Year CIP Total	**$ 11,756,700**
	10-Year CIP	
9	12-inch Gravity Main Near Bethel Road	$ 1,243,400
10	12-inch and 15-inch Gravity Main in Northwest Weatherford	$ 1,900,700
11	8-inch Gravity Main Near FM 920 and Lift Station Decommission	$ 900,800
12	2.25 MGD Lift Station and 12-inch Force Main near Tin Top Road	$ 3,658,700
13	15-inch Gravity Mains Near Tin Top Road	$ 1,146,700
14	1.75 MGD Lift Station and 12-inch Force Main near Scarlett Road and Bethel Road	$ 3,181,500
15	12-inch and 18-inch Gravity Main Near Bethel Road	$ 2,186,000
16	15-inch Gravity Main near IH-20 and Dean Road	$ 856,200
17	1.25 MGD Lift Station and 8-inch Force Main near Dean Road	$ 1,479,400
18	15-inch and 18-inch Gravity Main near Scarlett Road	$ 2,173,900
19	8-inch Gravity Main Near Lakecrest Drive	$ 1,070,700
20	Lift Station 17 Expansion to 4.0 MGD	$ 2,870,400
21	8-inch Gravity Main Near FM 730	$ 1,038,400
22	Lift Station 15 Rehabilitation and Expansion to 2.0 MGD	$ 1,304,100
23	8-inch Gravity Main near Bankhead Highway	$ 657,800
24	12-inch Gravity Main Near State Highway 180	$ 1,566,900
	10-Year CIP Total	**$ 27,235,600**
	WWTP Build-Out Alternative CIP	
2C	66-inch WWTP Influent Line	$ 389,200
3B	30-inch, 32-inch, and 42-inch Town Creek Interceptor	$ 3,732,700
4B	12-inch, 24-inch, and 30-inch Gravity Mains Near North Elm Street and State Highway	$ 1,017,700
7B	15-inch Gravity Main near FM 920	$ 914,200
25	8-inch, 12-inch, and 27-inch Gravity Main Near Russell Street and Santa Fe Drive	$ 2,710,000
26C	Existing WWTP Expansion to 8.4 MGD	$ 43,056,000
LS-1	Holland Creek Interceptor Expansion	$ 5,405,300
31C	16.0 MGD Lift Station and 12-inch Force Main Near Harmony Road	$ 17,994,100
LS-2	21-inch Gravity Main Near Bethel Road	$ 2,073,000
LS-3	8.1 MGD Lift Station and 12-inch Force Main Near Old Dennis Road	$ 8,824,100
27	*No Project in this Alternative*	$ -
28	18-inch, 27-inch, and 30-inch Gravity Mains Near Old Dennis Road	$ 5,086,000
29	Lift Stations Decommission Near IH-20 and Dean Road	$ 552,000
30	*No Project in this Alternative*	$ -
32	18-inch and 21-inch Gravity Main Near Bethel Road	$ 3,024,800
33	18-inch, 21-inch, and 24-inch Gravity Main Near Tin Top Road and Harmony Circle	$ 4,079,700
34	Lift Stations Decommission Near Scarlett Road and Tin Top Road	$ 552,000
35	8-inch and 12-inch Gravity Main Near Harmony Road and Tin Top Road	$ 1,911,300
36	15-inch Gravity Main Near Westover Village Estates	$ 1,159,200

37	12-inch and 15-inch Gravity Main Near Tin Top Road and IH-20	$ 2,690,800
38	8-inch and 15-inch Gravity Main Near Greenwood Road	$ 2,413,600
39	12-inch Gravity Main Near State Highway 180	$ 667,300
40	30-inch Town Creek Interceptor	$ 1,918,900
41	18-inch and 21-inch Progue Branch Interceptor	$ 1,350,600
42	15-inch and 18-inch Gravity Main Near Peaster Highway	$ 1,717,000
43	12-inch Gravity Main in Northwest Weatherford	$ 2,822,700
44	8-inch, 12-inch, and 15-inch Gravity Main Near Peaster Highway	$ 4,253,100
45	Lift Station 17 and Force Main Expansion	$ 15,056,100
46	12-inch and 16-inch Gravity Mains Serving Lift Station 17	$ 1,000,900
47	8.2 MGD Lift Station and 16-inch Force Main Near Center Point Road	$ 9,264,400
48	12-inch and 21-inch Gravity Mains Near Bankhead Road	$ 1,859,500
49	21-inch Gravity Main Near Center Point Road and Lift Stations Decommission	$ 4,010,900
50	8-inch Gravity Main Near Arapahoe Ridge	$ 1,095,000
51	8-inch, 12-inch, 27-inch and 30-inch Gravity Mains Near Old Dicey Road and State Highway 180	$ 5,306,500
52	15-inch and 12-inch Gravity Main Near Upper Denton Road	$ 2,463,900
53	18-inch, 21-inch, and 24-inch Gravity Main in North Weatherford	$ 5,201,200
54	8-inch, 12-inch, and 15-inch Gravity Main Near Zion Hill Road	$ 3,535,600
55	0.65 MGD Lift Station and 8-inch Force Main Near Lake Drive	$ 2,608,800
56	12-inch Gravity Main Near Trailwood Drive	$ 2,147,300
57	15-inch and 18-inch Gravity Main near Silverstone Subdivision	$ 1,252,400
58	Lift Station 14 Expansion to 3.3 MGD	$ 1,435,200
59	Lift Station 12 Expansion to 2.2 MGD and 12-inch Force Main	$ 3,099,400
60	8-inch Gravity Main Near FM 730	$ 700,600
61	15-inch Gravity Main Near Holland Lake Park	$ 319,500
62	Lift Station 11 Expansion to 2.0 MGD and 12-inch Force Main	$ 5,495,600
63	8-inch and 12-inch Gravity Mains Near Lake Weatherford	$ 2,301,200
64	0.6 MGD Lift Station and 6-inch Force Main Near Pearson Ranch Road	$ 1,256,500
65	0.25 MGD Lift Station, 6-inch Force Main, and 8-inch and 12-inch Gravity Mains Near FM 1886	$ 3,025,200
	Build-Out CIP Total	**$ 192,751,000**
	CIP Total	**$ 231,743,300**
	Rehabilitation	
R1	Annual Wastewater Line Rehabilitation	$ 2,691,000
R2	Lift Station 9 Rehabilitation	$ 156,800
R3	Lift Station 20 Rehabilitation	$ 84,000
R4	Lift Station 1 Rehabilitation	$ 131,600
R5	Lift Station 3 Rehabilitation	$ 126,000
R6	Lift Station 12 Rehabilitation	$ 100,800
	Rehabilitation Total	**$ 3,290,200**

City of Weatherford

FREESE AND NICHOLS

CITY OF WEATHERFORD

DRAFT Wastewater System Capital Improvement Cost Estimate	March 15, 2017
Construction Project Number: 2C	Phase: Buildout
Project Name:	66-inch WWTP Influent Line

Project Description:

This project includes the expansion of the influent line that conveys flow directly into the WWTP to 66-inches. The extents of this project are similar to project 2A in the 5-year CIP, but this project is increased in size to account for buildout conditions.

Project Drivers:

The purpose of this project is to provide additional treatment capacity for future growth in Weatherford.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	66" Pipe 8 - 16 feet deep	500	LF	$ 528	$ 264,000
2	72" Diameter Manhole	2	EA	$ 9,000	$ 18,000
				SUBTOTAL:	**$ 282,000**
		CONTINGENCY		20%	$ 56,400
				SUBTOTAL:	**$ 338,400**
		ENG/SURVEY		15%	$ 50,800
				SUBTOTAL:	**$ 389,200**
				Estimated Project Total:	**$ 389,200**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate **March 15, 2017**

Construction Project Number: **26C** **Phase: Buildout**

Project Name: **Existing WWTP Expansion to 8.4 MGD**

Project Description:

This project includes the expansion of the central WWTP from an existing permitted capacity of 4.5 MGD to 8.4 MGD. This project differs from project 26B in the WWTP alternative as the Town Creek WWTP remains the sole method of treatment in this buildout alternative.

Project Drivers:

The purpose of this project is to provide additional treatment capacity for future growth in Weatherford.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	3.9 MGD WWTP Expansion	1	LS	$ 31,200,000	$ 31,200,000
				SUBTOTAL:	**$ 31,200,000**
		CONTINGENCY		20%	$ 6,240,000
				SUBTOTAL:	**$ 37,440,000**
		ENG/SURVEY		15%	$ 5,616,000
				SUBTOTAL:	**$ 43,056,000**
				Estimated Project Total:	**$ 43,056,000**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate **March 15, 2017**

Construction Project Number: **LS-1** **Phase: Buildout**

Project Name: **Holland Creek Interceptor Expansion**

Project Description:

This project includes a 36-inch and 30-inch interceptor from the existing WWTP to the existing 10-inch force main near South Main Street along Holland Creek. This project replaces the existing 24-inch and 18-inch interceptor.

Project Drivers:

The purpose of this project is to add addition capacity to the interceptor for future growth in the southern area of Weatherford.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	36" Pipe 8- 16 feet deep	3,600	LF	$ 288	$ 1,036,800
2	30" Pipe 8- 16 feet deep	9,400	LF	$ 240	$ 2,256,000
3	Pavement Repair	1,000	LF	$ 75	$ 75,000
4	42" WW Boring and Casing	500	LF	$ 630	$ 315,000
5	72" Diameter Manhole	26	EA	$ 9,000	$ 234,000
				SUBTOTAL:	**$ 3,916,800**
		CONTINGENCY		20%	$ 783,400
				SUBTOTAL:	**$ 4,700,200**
		ENG/SURVEY		15%	$ 705,100
				SUBTOTAL:	**$ 5,405,300**
				Estimated Project Total:	**$ 5,405,300**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate **March 15, 2017**

Construction Project Number: **31C** **Phase: Buildout**

Project Name: **16.0 MGD Lift Station and 12-inch Force Main Near Harmony Road**

Project Description:

This project includes a 16.0 MGD lift station near Pleasant Valley Lane and Bethel Road and a 12-inch force main from the proposed lift station to the proposed Holland Creek Interceptor near South Main Street. While the location of this lift station is the same as project 31B in the WWTP buildout alternative, the sizing and force main differ as the purpose of this project is to convey nearly all flow in the southern area of Weatherford back to the Town Creek WWTP. In this alternative, project 31C must come after project LS-1 and before projects LS-2, LS-3, 28, and 29.

Project Drivers:

This project conveys flow from the southern area of Weatherford to the existing WWTP.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	16 MGD Lift Station	1	EA	$ 10,400,000	$ 10,400,000
2	12" Force Main < 8 feet deep	23,700	LF	$ 108	$ 2,559,600
3	Pavement Repair	100	LF	$ 75	$ 7,500
4	24" WW Boring and Casing	200	LF	$ 360	$ 72,000
				SUBTOTAL:	**$ 13,039,100**
		CONTINGENCY		20%	$ 2,607,900
				SUBTOTAL:	**$ 15,647,000**
		ENG/SURVEY		15%	$ 2,347,100
				SUBTOTAL:	**$ 17,994,100**
				Estimated Project Total:	**$ 17,994,100**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate **March 15, 2017**

Construction Project Number: **LS-2** **Phase: Buildout**

Project Name: **21-inch Gravity Main Near Bethel Road**

Project Description:

This project includes a 21-inch gravity main that starts near Lution Drive and runs east and connects to the proposed 21-inch line upstream of proposed lift station near Pleasant Valley Lane from project LS-B.

Project Drivers:

The purpose of this project is to convey flow from future growth in the southwest area of Weatherford to the proposed lift station.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	21" Pipe 8- 16 feet deep	8,200	LF	$ 168	$ 1,377,600
2	Pavement Repair	300	LF	$ 75	$ 22,500
3	60" Diameter Manhole	17	EA	$ 6,000	$ 102,000
		SUBTOTAL:			**$ 1,502,100**
		CONTINGENCY		20%	$ 300,500
		SUBTOTAL:			**$ 1,802,600**
		ENG/SURVEY		15%	$ 270,400
		SUBTOTAL:			**$ 2,073,000**
		Estimated Project Total:			**$ 2,073,000**

City of Weatherford

DRAFT Wastewater System Capital Improvement Cost Estimate **March 15, 2017**

Construction Project Number: **LS-3** **Phase: Buildout**

Project Name: **8.1 MGD Lift Station and 12-inch Force Main Near Old Dennis Road**

Project Description:

This project includes a 8.1 MGD lift station near Old Dennis Road and a 12-inch force main that runs from the lift station to the proposed 21-inch gravity main near Lution Drive.

Project Drivers:

This project conveys flow from the proposed 30-inch gravity main in the western area of Weatherford to the proposed lift station near Pleasant Valley Lane.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	8.1 MGD Lift Station	1	EA	$ 5,265,000	$ 5,265,000
2	12" Force Main < 8 feet deep	7,400	LF	$ 108	$ 799,200
3	Pavement Repair	4,400	LF	$ 75	$ 330,000
		SUBTOTAL:			**$ 6,394,200**
		CONTINGENCY		20%	$ 1,278,900
		SUBTOTAL:			**$ 7,673,100**
		ENG/SURVEY		15%	$ 1,151,000
		SUBTOTAL:			**$ 8,824,100**
		Estimated Project Total:			**$ 8,824,100**