APPENDIX A
MODEL CALIBRATION

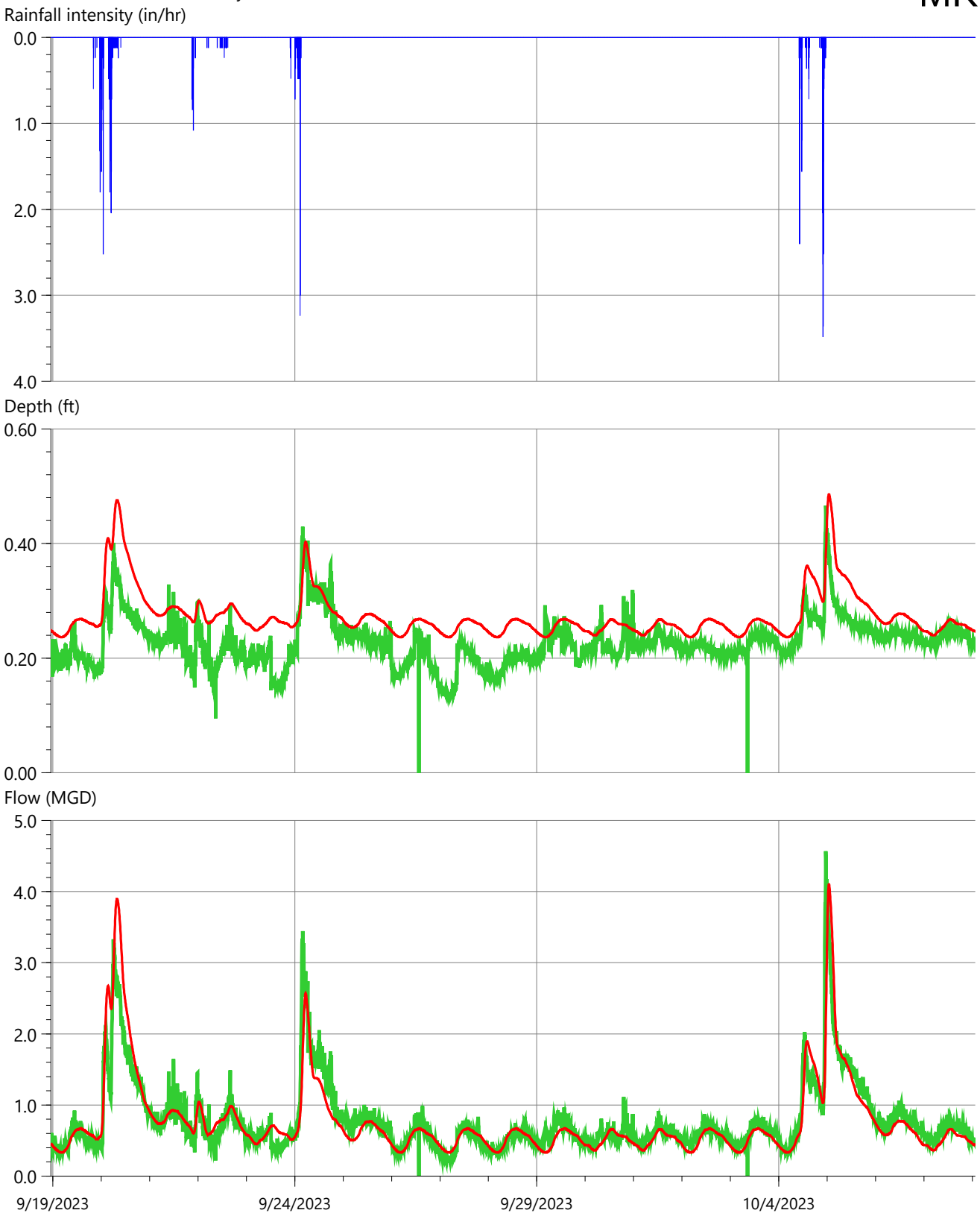
Flow Survey Location (Obs.) MK1, Model Location (Pred.) D/S 236-6811.1, Rainfall Profile: 2

MK1

	Rainfall			Depth		Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (ft)	Max (ft)	Min (ft3/s)	Max (ft3/s)	Volume (US Mgal)
Rainfall	7.990	4.800	0.017					
Meter Data				0.000	2.505	0.000	2.486	4.952
Model Results				0.137	0.748	0.107	2.461	4.445

Flow Survey Location (Obs.) MK10, Model Location (Pred.) D/S 402-2471.1, Rainfall Profile: 3

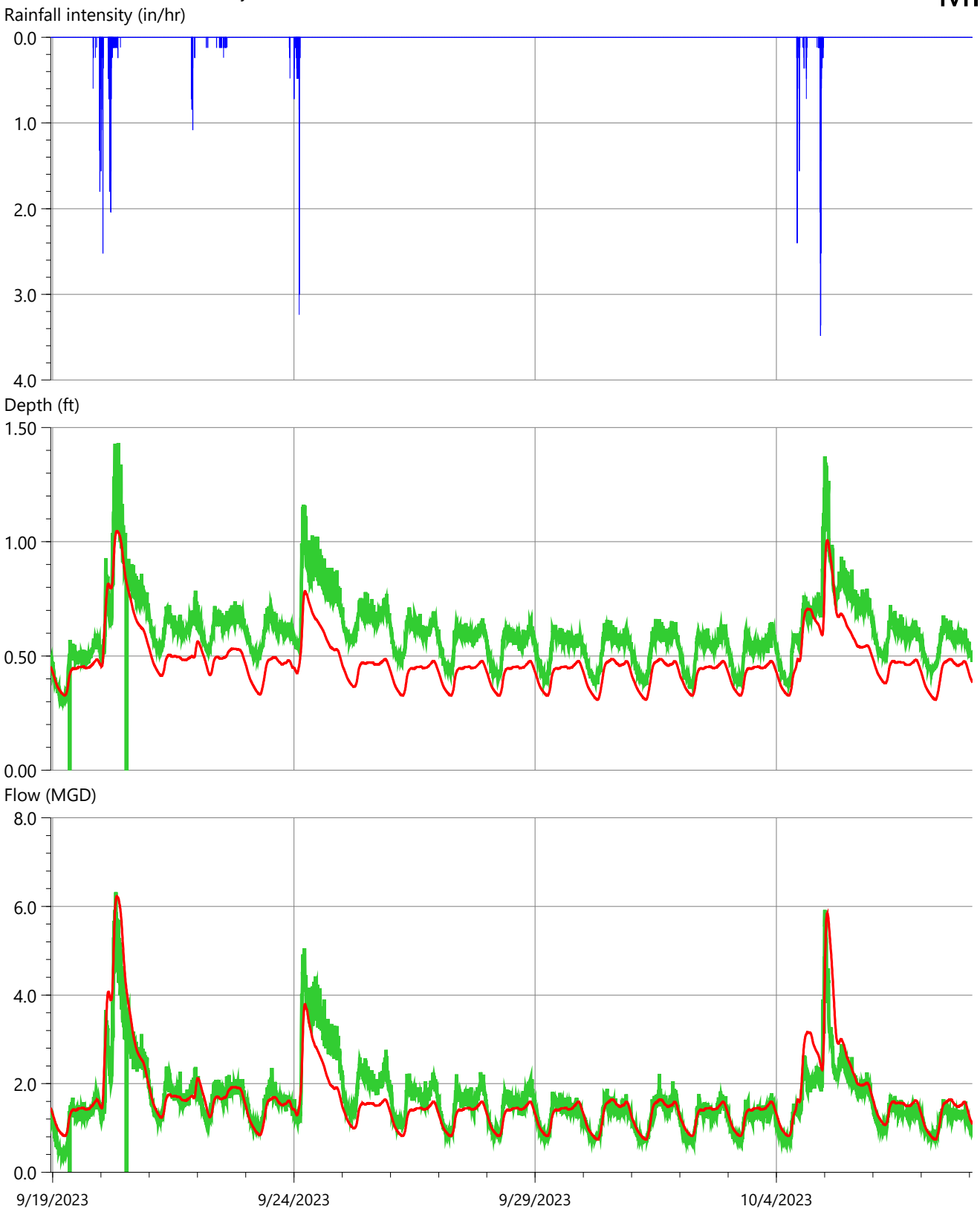
MK10



	Rainfall			Depth		Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (ft)	Max (ft)	Min (ft3/s)	Max (ft3/s)	Volume (US Mgal)
Rainfall	7.600	3.480	0.017					
Meter Data				0.000	0.466	0.000	4.568	9.727
Model Results				0.236	0.486	0.332	4.102	9.404

Flow Survey Location (Obs.) MK2, Model Location (Pred.) D/S 276-6660.1, Rainfall Profile: 3

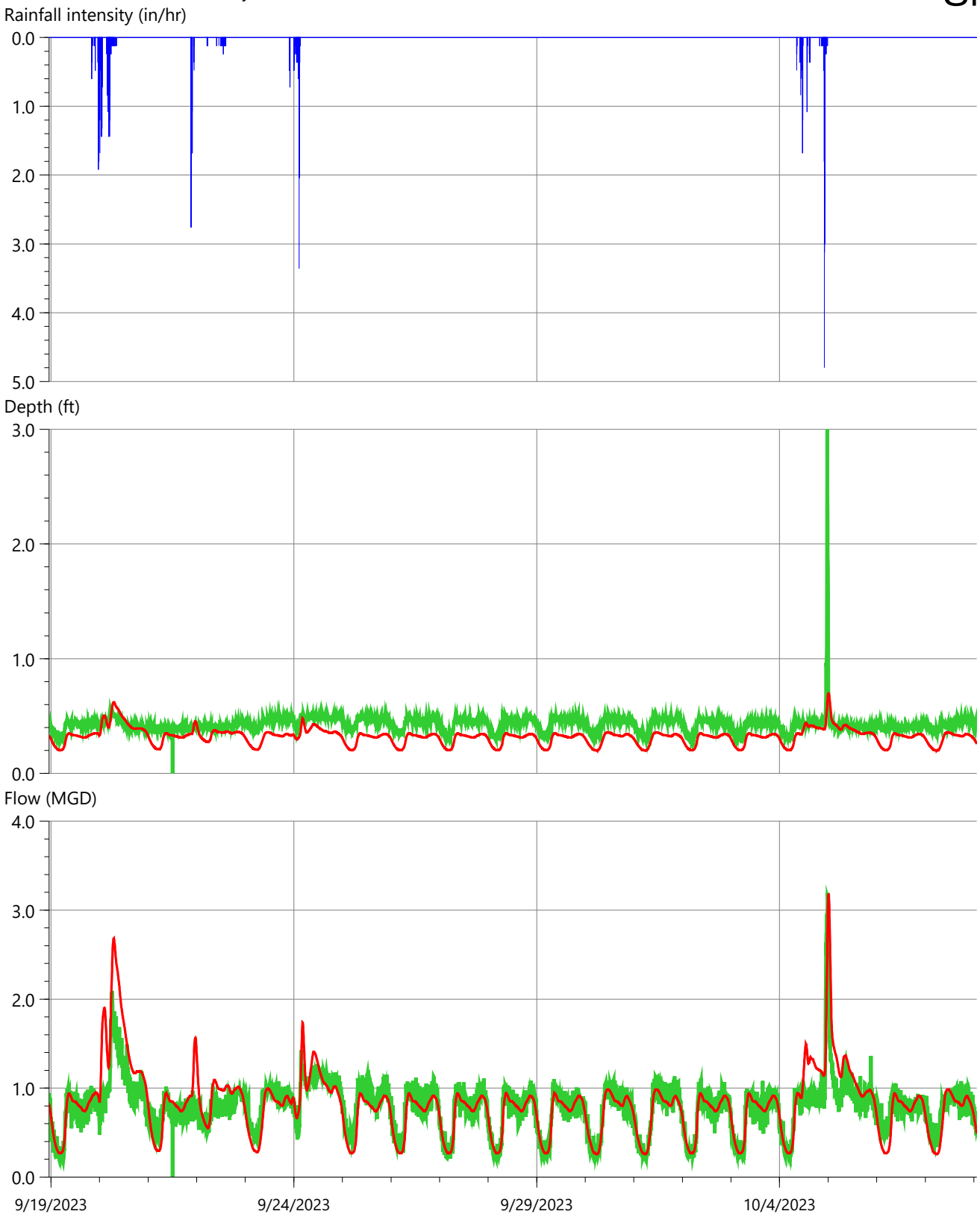
MK2



	Rainfall			Depth		Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (ft)	Max (ft)	Min (ft3/s)	Max (ft3/s)	Volume (US Mgal)
Rainfall	7.600	3.480	0.017					
Meter Data				0.000	1.432	0.000	6.322	20.231
Model Results				0.309	1.046	0.740	6.227	20.330

Flow Survey Location (Obs.) SM1, Model Location (Pred.) D/S 320-3402.1, Rainfall Profile: 2

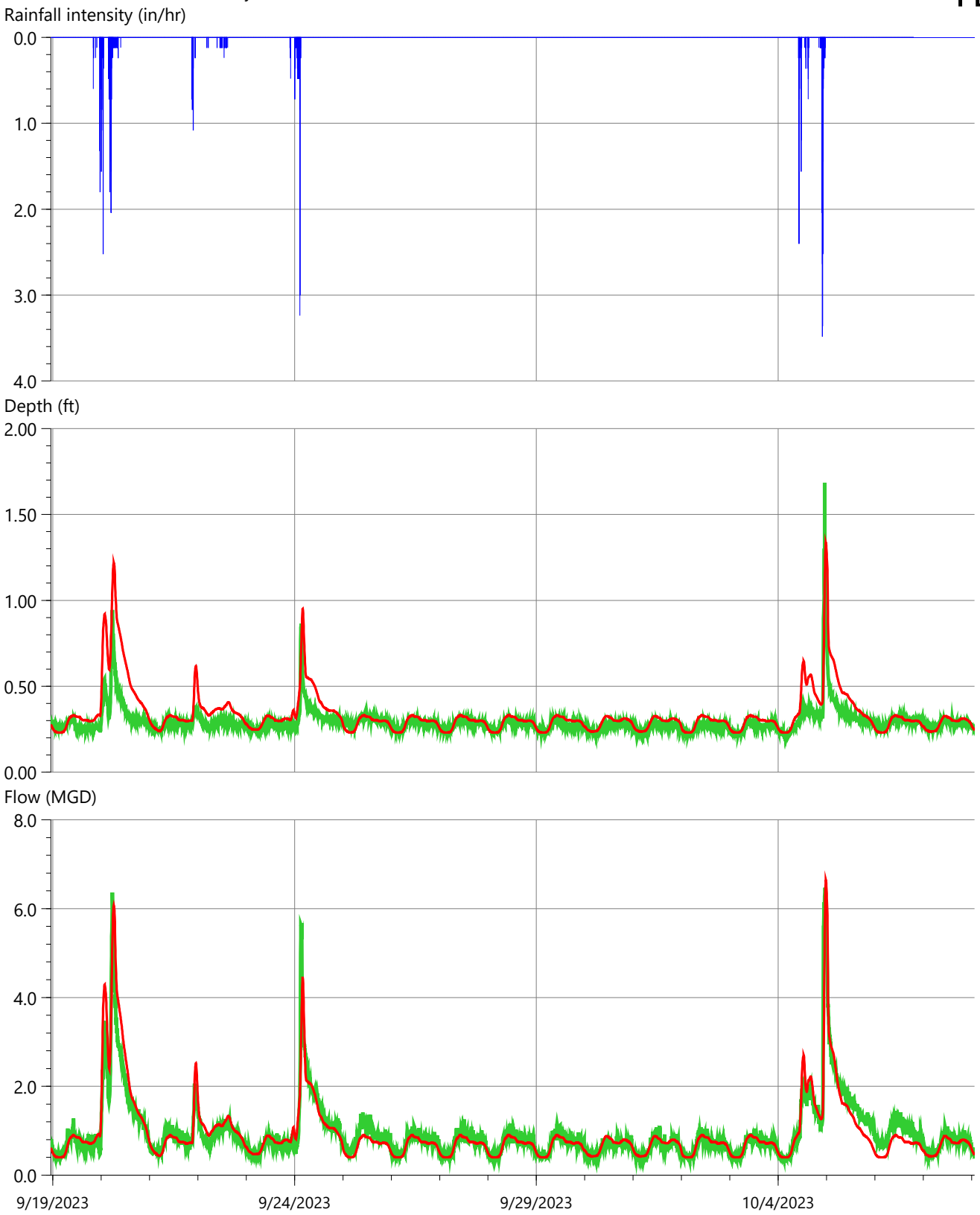
SM1



	Rainfall			Depth		Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (ft)	Max (ft)	Min (ft3/s)	Max (ft3/s)	Volume (US Mgal)
Rainfall	7.990	4.800	0.017					
Meter Data				0.000	3.000	0.000	3.192	9.741
Model Results				0.199	0.698	0.256	3.176	10.118

Flow Survey Location (Obs.) TB1, Model Location (Pred.) D/S 319-3436.1, Rainfall Profile: 3

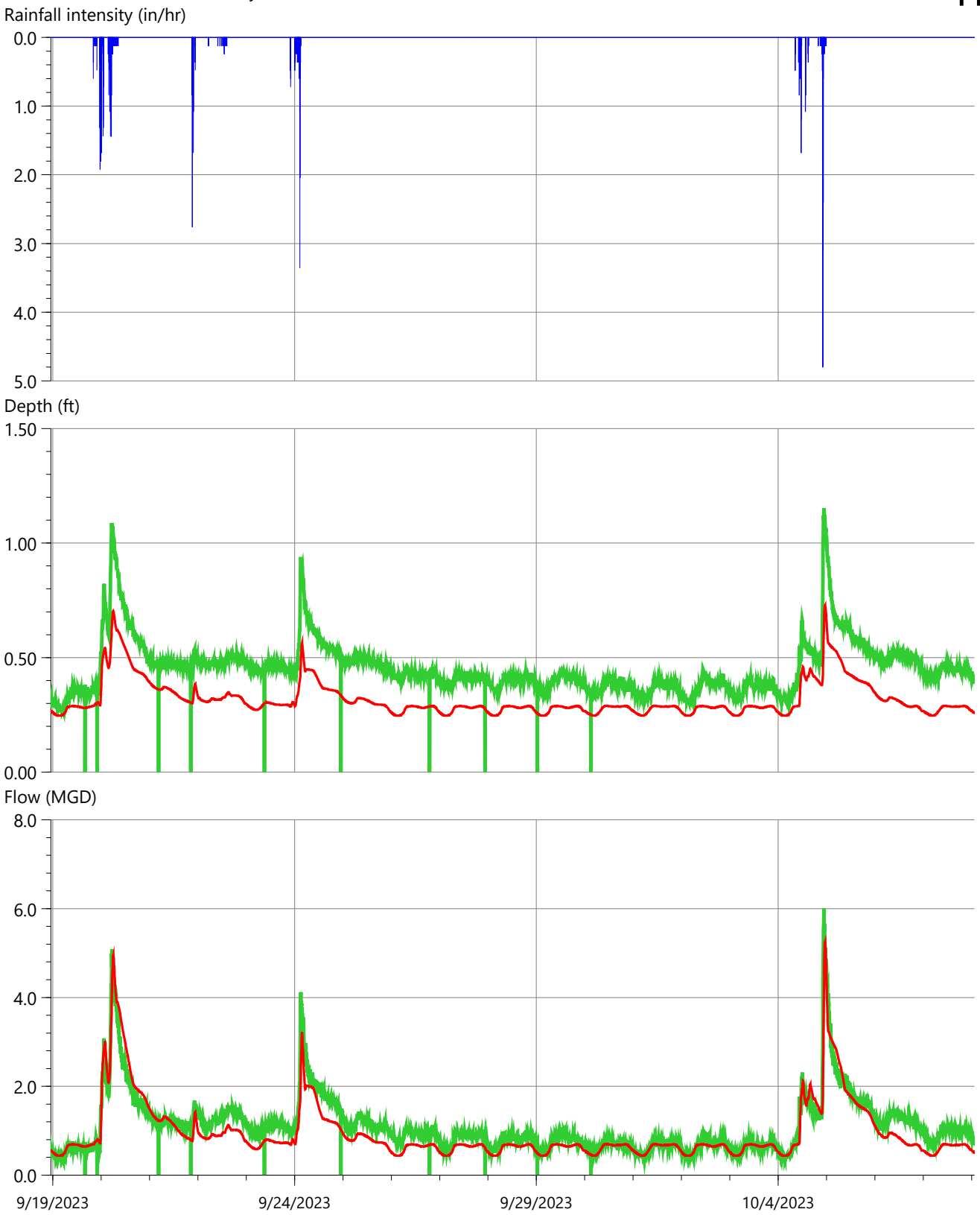
TB1



	Rainfall			Depth		Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (ft)	Max (ft)	Min (ft3/s)	Max (ft3/s)	Volume (US Mgal)
Rainfall	7.600	3.480	0.017					
Meter Data				0.212	1.685	0.343	6.468	11.785
Model Results				0.230	1.337	0.401	6.648	11.650

Flow Survey Location (Obs.) TB6, Model Location (Pred.) D/S 404-234.1, Rainfall Profile: 2

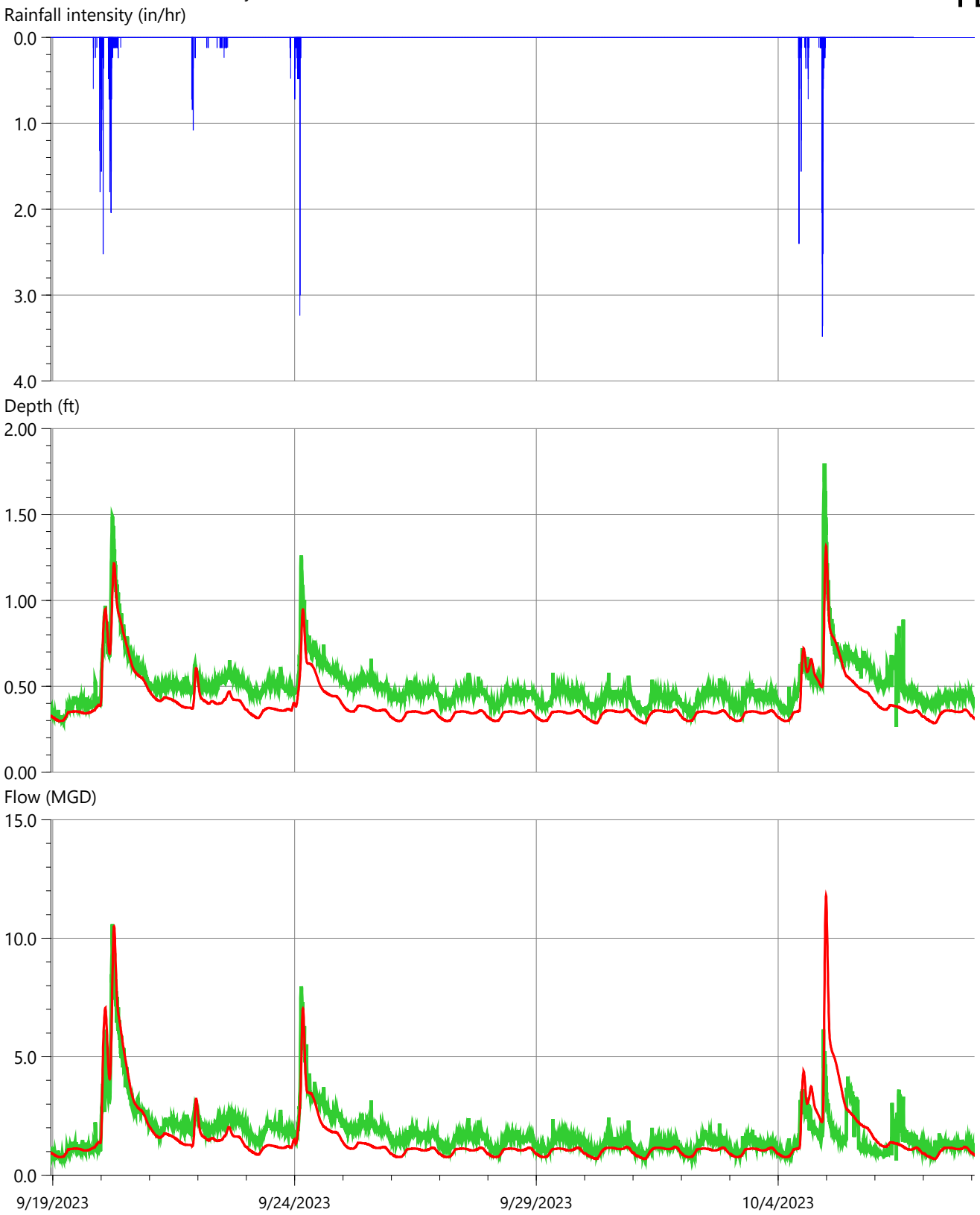
TB6



	Rainfall			Depth		Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (ft)	Max (ft)	Min (ft3/s)	Max (ft3/s)	Volume (US Mgal)
Rainfall	7.990	4.800	0.017					
Meter Data				0.000	1.153	0.000	6.002	13.689
Model Results				0.246	0.727	0.438	5.258	11.712

Flow Survey Location (Obs.) TB2, Model Location (Pred.) D/S 320-5492.1, Rainfall Profile: 3

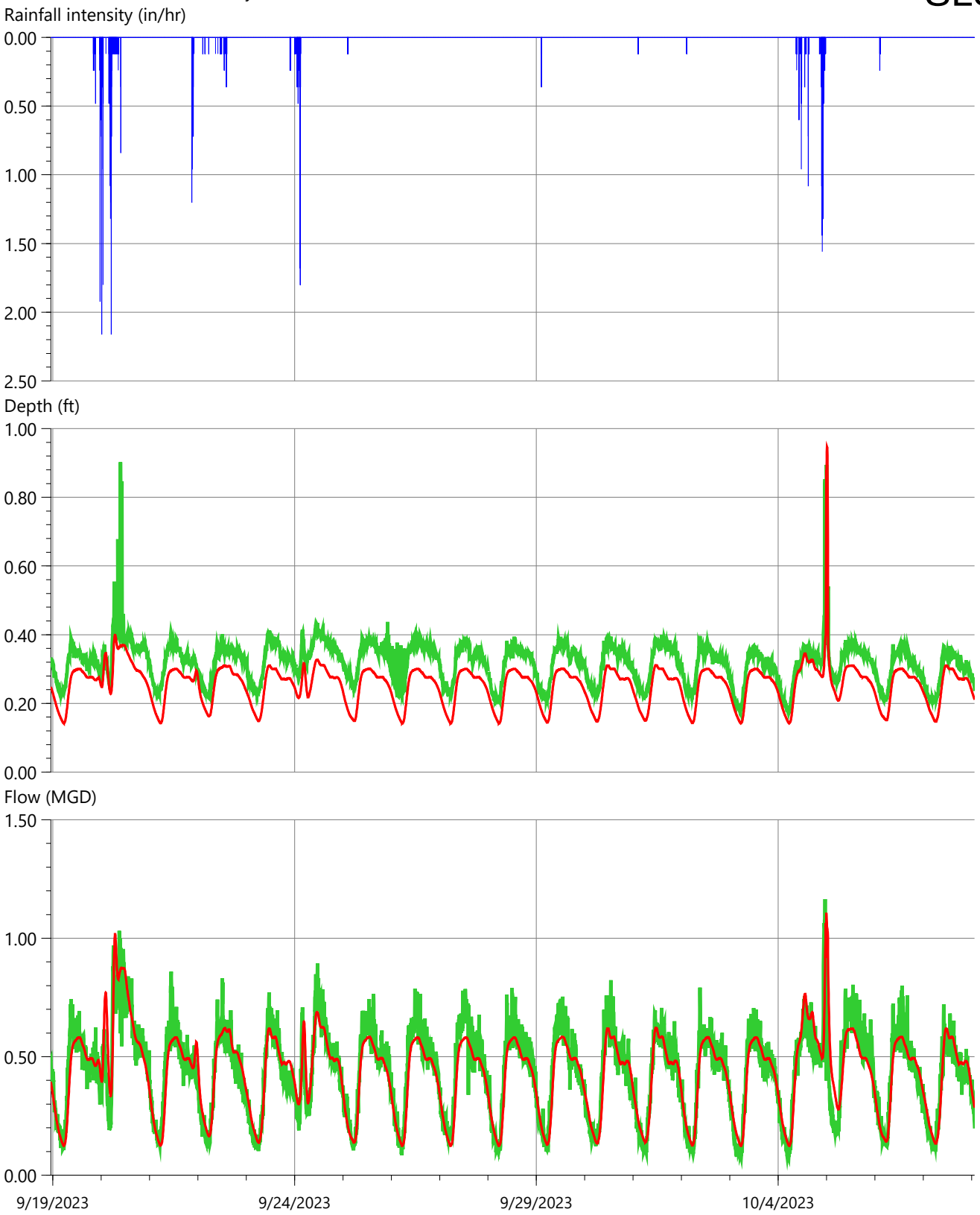
TB2



	Rainfall			Depth		Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (ft)	Max (ft)	Min (ft3/s)	Max (ft3/s)	Volume (US Mgal)
Rainfall	7.600	3.480	0.017					
Meter Data				0.262	1.798	0.612	10.590	22.292
Model Results				0.284	1.315	0.688	11.790	19.501

Flow Survey Location (Obs.) LS1, Model Location (Pred.) D/S 486-5075.1, Rainfall Profile: 6

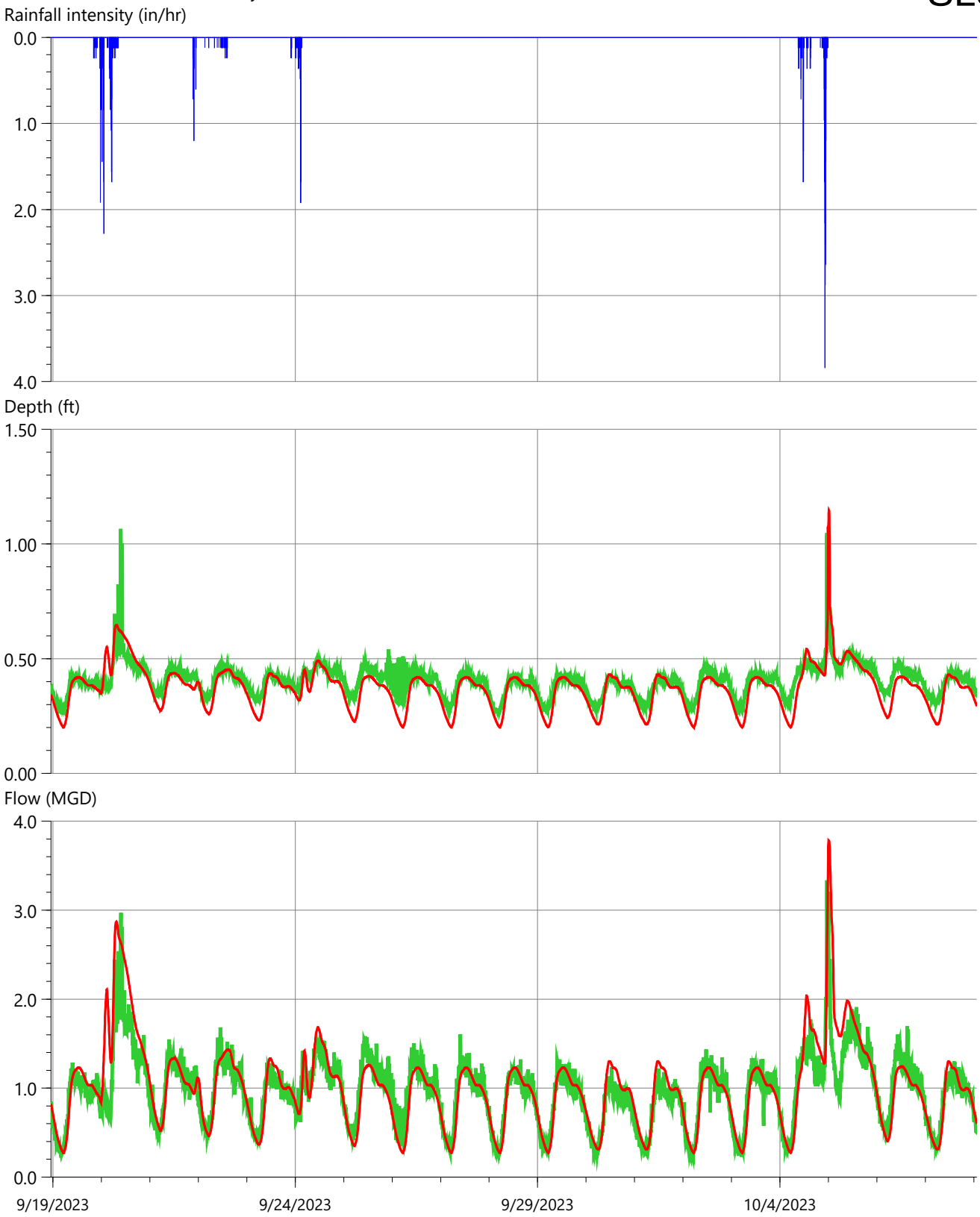
SLS1



	Rainfall			Depth		Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (ft)	Max (ft)	Min (ft3/s)	Max (ft3/s)	Volume (US Mgal)
Rainfall	6.160	2.160	0.013					
Meter Data				0.175	0.902	0.073	1.165	5.449
Model Results				0.142	0.947	0.124	1.106	5.342

Flow Survey Location (Obs.) LS2, Model Location (Pred.) D/S 486-999.1, Rainfall Profile: 5

SLS2



	Rainfall			Depth		Flow		
	Depth (in)	Peak (in/hr)	Average (in/hr)	Min (ft)	Max (ft)	Min (ft3/s)	Max (ft3/s)	Volume (US Mgal)
Rainfall	6.540	3.840	0.014					
Meter Data				0.264	1.075	0.229	3.336	11.892
Model Results				0.200	1.147	0.271	3.783	12.482

APPENDIX B
TREKK SSES DELIVERABLES

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City of Bentonville, AR – Priority Basins SSES Phase 2

Presented to: City of Bentonville, Arkansas

Prepared by: TREKK Design Group

March 2025

P.N. 22-0415

STATE OF ARKANSAS
LICENSED PROFESSIONAL ENGINEER
No. 22493
NATHAN A. ADAMS

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Abbreviations

City	City of Bentonville, Arkansas
CCTV	Closed Circuit Television
Dia.	Diameter
DWF	Dry Weather Flow
Ft	Feet
GIS	Graphical Interface System
GAL	Gallons
gpad	Gallons per Acre per Day
Gpcd	Gallons per Capita per Day
Gpd	Gallons per Day
gpd/IDM	Gal. Per Day Per Inch (dia) X Length of Pipe (mi)
Gpm	Gallons per Minute
GPS	Global Positioning System
Hr	Hour
Hrs	Hours
H2S	Hydrogen Sulfide
i	Rainfall Intensity
i.e.	That is
I/I	Infiltration and Inflow
IN or in	Inches
LF or lf	Linear Feet
MG	Million Gallons
mgd	Million Gallons per Day
min	Minute
misc	Miscellaneous
O&M	Operation and Maintenance
%	Percent
Q	Flow Rate
RDII	Rainfall Induced Inflow and Infiltration
Sec	Seconds or Section
SSES	Sanitary Sewer Evaluation Study
TREKK	TREKK Design Group
WWF	Wet Weather Flow
WWTF	Wastewater Treatment Facility
Yr	Year

1 Executive Summary

1.1 General Overview

This executive summary is a general overview of TREKK Design Group's (TREKK) findings, conclusions, and recommendations of the Sanitary Sewer Evaluation Study (SSES) conducted in an effort to identify defective manholes and sewer mains in need of repair and to reduce inflow and infiltration (I/I) in the City's collection system. Field tasks performed as part of this SSES included: manhole inspections and global positioning system (GPS) survey, visual pipe inspections, mainline closed circuit television (CCTV) inspection, acoustic sound testing and smoke testing, for the McKisic and Town Branch sub-basins. Results from the SSES and field inspection activities were used to generate a defect cost analysis and recommendations for collection system improvements within the study area.

The study area covers approximately 2,041 acres and encompasses five sub-basins of Town Branch (2-6) and two sub-basins of McKisic (10 & 12). The study area is primarily comprised of downtown commercial and corporate businesses, residential single and multifamily housing with portions of recreational, and school complexes. The Town Branch Basin is generally described as being bounded on the north by Tiger Blvd, on the east by N. Walton Blvd, on the south by SW/SE 8th St., and on the west by NE J St. The McKisic Basin is generally described as being bounded on the north by SW/SE 8th St, on the east by SW O St, on the south by SW/SE 14th St, and on the west by SE J St. A map of the study area is shown in Figure 1-1.

This report also includes information from a previous Phase 1 of this project. Phase 1 of this project consisted of manhole inspections that were completed in 2019. The City of Bentonville asked TREKK to give manhole recommendations on these manholes and include this information in this report. While reviewing this report it will be clearly defined when Phase 1 data is being used since this report's main focus is on Phase 2.

1.2 Findings

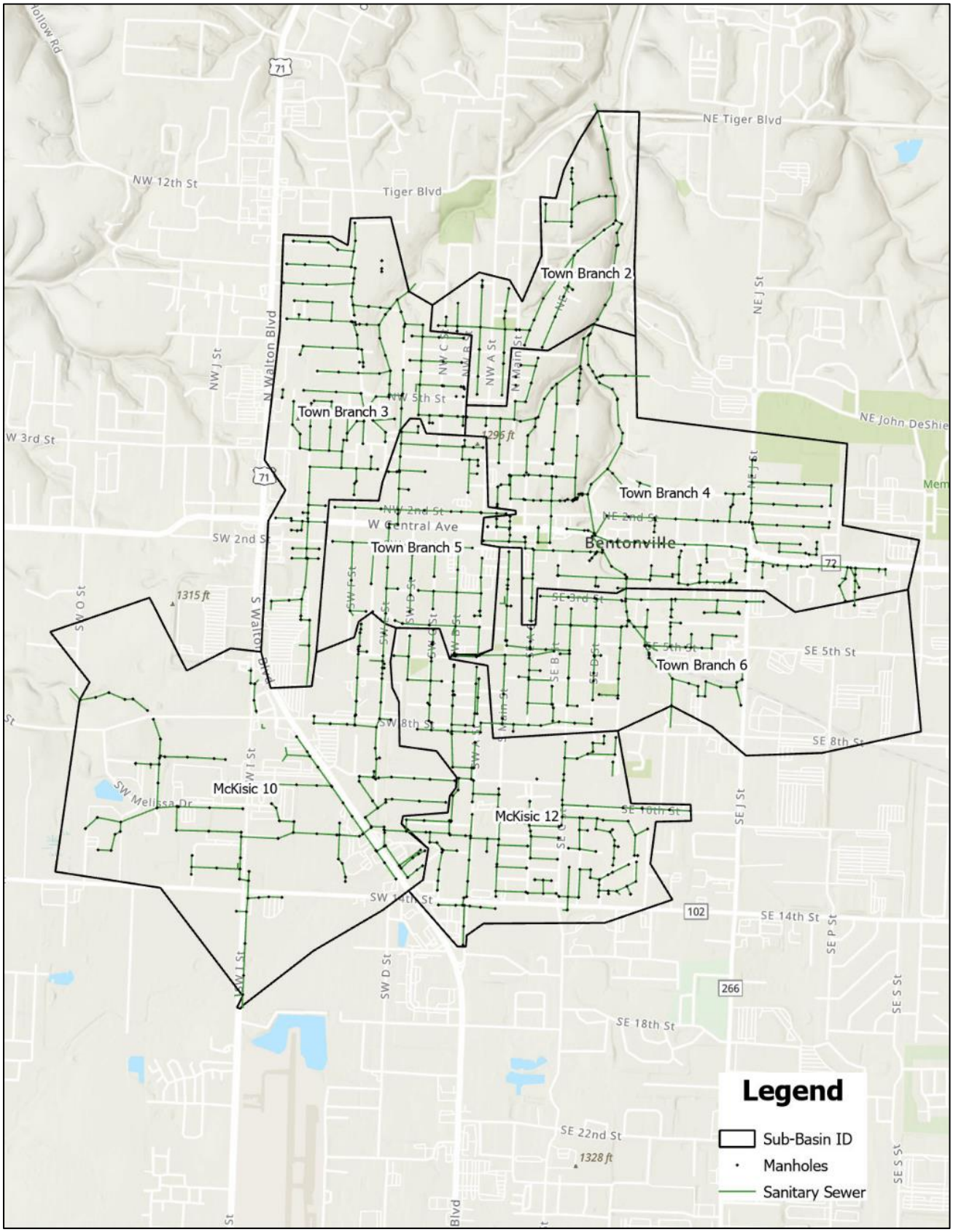
Phase 2 field inspection activities were conducted to locate, quantify, and evaluate defective infrastructure and I/I entering the City's collection system. The following paragraphs briefly discuss the work activities and findings of TREKK's phase 2 SSES evaluation.

- The sub-basins inspected in Town Branch and McKisic include approximately 215,000 linear feet of sanitary sewers.
- A total of 793 manholes and 56 cleanouts were inspected and GPS surveyed. During these manhole inspections, 1,033 defects were found.
- A total of 1,995 visual pipe inspections at the manholes were performed identifying 57 potential pipe structural defects and 118 potential pipe seal defects.
- Approximately 209,000 LF of sanitary sewer was smoke tested. The smoke testing identified 72 potential I/I source defects in the public-sector and 168 potential source defects in the private-sector. Most of the defects found during smoke testing included uncapped/broken cleanouts and defective service laterals.
- A total of 166,100 LF of pipe was inspected using acoustic sound testing. 33% of the pipes tested came back with a fair or worse rating.
- Based on the results of the smoke testing, acoustic sound testing, and visual pipe inspections, 98 line segments totaling 21,021 LF of sanitary sewer were identified for cleaning and CCTV inspection. TREKK was able to televise a total of 19,886 LF of pipe.

There were 8 line segments unable to be fully televised due to roots and blockages. All but 2 of these 8 line segments were able to be evaluated for rehabilitation.

- A total of 722 public-sector defects identified during field investigations are contributing an estimated 725 gpm of I/I flow. A total of 168 private-sector I/I defects identified during field investigations are contributing an estimated 514 gpm of I/I flow.

Figure 1-1: Project Study Area



1.3 Recommendations

The total estimated cost to rehabilitate all priority 1 and 2 I/I defects for Phase 1 and 2 within the study area is approximately $4,120,000. Completing these rehabilitation recommendations will reduce wet weather flow rates (10yr, 24hr storm event) by 945 gpm. This cost includes improvements to both the public and private-sector infrastructure. Summaries of each phase of the recommended I/I reduction plan are as follows:

1.3.1 Private-Sector Smoke Testing Defect Rehabilitation

A total of 168 private I/I defects were found during smoke testing. **The projected cost to remove the identified I/I from the private-sector is estimated at $232,000.** This planning estimate includes a 20% contingency cost of $39,000 to administer the private I/I abatement program. Removal of private-sector I/I can be achieved by capping or repairing cleanouts, service laterals, area drains, and foundation drains.

1.3.2 Manhole Rehabilitation Program

Phase 1 Manhole Rehabilitation

There are 248 priority 1 and 2 manhole structures recommended for rehabilitation. **The total estimated cost to complete the priority 1 and 2 manhole rehabilitation is estimated at $1,670,000**. This cost includes a 30% contingency fee of $385,000 for estimated engineering and administration fees along with possible inspection, and construction overages.

Phase 2 Manhole Rehabilitation

There are 157 priority 1 and 2 manholes recommended for rehabilitation. **The total estimated cost to complete the priority 1 and 2 manhole rehabilitation is estimated at $674,000**. This cost includes a 30% contingency fee of $156,000 for estimated engineering and administration fees along with possible inspection, and construction overages.

1.3.3 Pipeline Rehabilitation Program

There are 47 priority 1 and 2 line segments in need of rehabilitation. **The total estimated cost to complete the priority 1 and 2 pipeline rehabilitation program is $1,544,000.** This cost includes a 20% contingency fee of $257,000 for estimated engineering and administration fees along with possible inspection, and construction overages.

1.4 Recommended Improvement Cost Summary

The recommended improvement cost summary for the study area is provided in Table 1-1. All costs are based on current Midwest pricing of recent TREKK projects.

Table 1-1: Recommended Improvement Cost Summary

Description of Improvements	Flow Reduction (gpm)	Cost Estimate ($)
Private-Sector I/I Abatement Program	513.74	232,000
Phase 1 Manhole Rehabilitation Program **(Priority 1 and 2)**	104.00	1,670,000
Phase 2 Manhole Rehabilitation Program **(Priority 1 and 2)**	108.73	674,000
Pipeline Rehabilitation Program **(Priority 1 and 2)**	218.99	1,544,000
Totals:	**945.46**	**4,120,000**

2 Project Background and Description

2.1 Project Objectives

This SSES project includes several important objectives. Primary among these are the following:

- Identify structural and I/I defects within the sanitary sewer collection system through field inspection activities.
- Perform defect flow analysis on identified I/I defects.
- Develop prioritized manhole and mainline rehabilitation schedules for cost-effective manhole and mainline rehabilitation.
- Document work in an electronic format compatible with the City's GIS.

2.2 Project Background

The study area covers approximately 2,041 acres and encompasses five sub-basins of Town Branch (2-6) and two sub-basins of McKisic (10 & 12). The study area is primarily comprised of downtown commercial and corporate businesses, residential single and multifamily housing with portions of recreational, and school complexes. A map of the study area is shown in Figure 1-1. Tables 2-1 through 2-8 summarize the pipe inventory within each sub-basin of the study area. Visual pipe inspections and CCTV inspections that are discussed in Section 3.5 and 3.6 were used to verify GIS pipe materials observed during inspections.

Table 2-1: Pipe Inventory - Study Area Town Branch 2

Material	Line Segments	Length	Percentage of Pipe Footage
Ductile Iron Pipe	7	1,157	7%
Polyvinyl Chloride Pipe	40	9,179	58%
Vitrified Clay Pipe	12	3,545	23%
Unknown	10	1,809	12%
Totals:	**69**	**15,691**	**100%**

Table 2-2: Pipe Inventory - Study Area Town Branch 3

Material	Line Segments	Length	Percentage of Pipe Footage
Polyvinyl Chloride Pipe	108	20,222	57%
Vitrified Clay Pipe	55	13,192	37%
Unknown	16	1,961	6%
Totals:	**179**	**35,375**	**100%**

Table 2-3: Pipe Inventory - Study Area Town Branch 4

Material	Line Segments	Length	Percentage of Pipe Footage
Clamp Together	4	1,116	2%
Ductile Iron Pipe	6	1,180	2%
Polyvinyl Chloride Pipe	198	35,234	68%
Vitrified Clay Pipe	28	6,496	13%
Unknown	44	7,982	15%
Totals:	**280**	**52,008**	**100%**

Table 2-4: Pipe Inventory - Study Area Town Branch 5

Material	Line Segments	Length	Percentage of Pipe Footage
Cast Iron Pipe	1	401	2%
Polyvinyl Chloride Pipe	66	15,457	71%
Vitrified Clay Pipe	12	3,716	17%
Unknown	7	2,316	11%
Totals:	**86**	**21,890**	**100%**

Table 2-5: Pipe Inventory - Study Area Town Branch 6

Material	Line Segments	Length	Percentage of Pipe Footage
Ductile Iron Pipe	2	264	1%
Polyvinyl Chloride Pipe	103	20,743	62%
Vitrified Clay Pipe	41	8,202	25%
Unknown	26	4,112	12%
Totals:	**172**	**33,321**	**100%**

Table 2-6: Pipe Inventory - Study Area McKisic 10

Material	Line Segments	Length	Percentage of Pipe Footage
Clamp Together Pipe	1	151	0%
Ductile Iron Pipe	6	1,192	3%
Polyvinyl Chloride Pipe	134	26,221	70%
Vitrified Clay Pipe	23	5,956	16%
Unknown	24	4,061	11%
Totals:	**188**	**37,580**	**100%**

Table 2-7: Pipe Inventory - Study Area McKisic 12

Material	Line Segments	Length	Percentage of Pipe Footage
Clamp Together Pipe	2	140	0%
Polyvinyl Chloride Pipe	157	29,272	68%
Vitrified Clay Pipe	31	6,604	16%
Unknown	24	7,023	16%
Totals:	**214**	**43,039**	**100%**

Table 2-8: Pipe Inventory - Study Area - Total

Material	Line Segments	Length	Percentage of Pipe Footage
Cast Iron Pipe	1	401	0%
Clamp Together Pipe	7	1,407	1%
Ductile Iron Pipe	21	3,793	2%
Polyvinyl Chloride Pipe	806	156,328	65%
Vitrified Clay Pipe	202	47,711	20%
Unknown	151	29,264	12%
Totals:	**1,188**	**238,904**	**100%**

3 Field Investigations

3.1 Flow Monitoring

TREKK was contracted by the City of Bentonville to perform ongoing flow metering to monitor hydraulic performance of the system in targeted areas. Twelve (12) flow meters and six (6) rainfall gauges were installed throughout the City in September of 2023 and are still installed and actively monitoring as of this report, in October of 2024. These meters are scheduled for removal on January 5th, 2025. During the monitoring period, some changes in the project scope occurred and should be discussed. Meters 1 and 3 were removed during the monitoring period, at the discretion of Olsson, due to low flow and inaccurate data. Meter 8 was relocated upstream of Meter 6 in manhole 361-506 to verify that the flows being observed were accurate. This meter in manhole 361-506 is now known as Meter 12. Details of the study area flow monitoring sites are presented in Table 3-1 and details of the study area rain gauge sites are presented in Table 3-2.

Table 3-1: Flow Meter Site Summary

Meter ID / Manhole	Manhole Number	Pipe Dia. (in)
Meter 1 / 236-3842	236-3842	12
Meter 2 / 236-3842	236-3842	17
Meter 3 / 276-6659	276-6659	8
Meter 4 / 276-6659	276-6659	31
Meter 5 / 278-4437	278-4437	12
Meter 6 / 319-3414	319-3414	12
Meter 7 / 320-3374	320-3374	24
Meter 8 / 402-2478	402-2478	24
Meter 9 / 404-6952	404-6952	18
Meter 10 / 486-5074	486-5074	18
Meter 11 / 486-5074	486-5074	19
Meter 12 / 361-506	361-506	12

Table 3-2: Rain Gauge Site Inventory

Rain Gauge Number	Location
M1	3690 Peach Orchard Rd
M2	200 NW A St
M3	700 SW I St
M4	1603 NW 12th St
S1	1007 Water Tower Rd
SLS2	3200 SW Municipal Dr

3.2 Smoke Testing

Line segments within the study area were smoke tested to detect I/I sources in the public and private sectors. Smoke testing was performed by injecting, through the vaporization of oil, into an isolated line segment with high-capacity blowers. The use of oil, instead of smoke candles, allows for continuous smoke production while field crews canvass the area and conduct a perimeter check of all buildings in close proximity for evidence of smoke.

A thorough public relations and notification program was implemented to minimize public concerns raised by smoke testing. The notification program included distribution of door-hanger notifications, street signs indicating smoke testing activities within the area, and daily communication with the City's Fire, Police and Public Works Department. Smoke testing activities included a minimum of 48 hours advance notification to all residents and businesses within the Study Area. The telephone numbers of TREKK Design Group's Project Manager were provided on all pamphlets enabling residents to contact TREKK for more information or with any special needs and concerns they may have.

Typically, smoke testing does not reveal all sources of excessive I/I since factors such as traps, sags, leaves and deposition, and high-water levels may restrict smoke migration to the source in question. Other investigative techniques such as building inspections, CCTV inspections and dyed-water tracing may be used in those circumstances in order to find additional I/I sources. A total of 208,667 linear feet of sanitary sewers were smoke tested. 2,551 linear feet of sanitary sewer pipe could not be smoke tested due to surcharging and abandoned manholes. Table 3-3 summarizes the quantities of pipe smoke tested in the Study Area.

Table 3-3: Smoke Testing Inspection Summary

Study Area Basin ID	Total Segments	Total Footage Unable to be Smoke Tested[1]	Total Smoked Footage[2]	Total Scope Footage[3]	% Total Smoked
McKisic 10	170	1,009	33,308	34,317	**97.1%**
McKisic 12	181	408	34,826	35,234	**98.8%**
Town Branch 2	63	0	12,414	12,414	**100%**
Town Branch 3	172	0	33,522	33,522	**100%%**
Town Branch 4	254	1,134	45,420	46,554	**97.6%**
Town Branch 5	86	0	20,222	20,222	**100%**
Town Branch 6	142	0	28,955	28,955	**100%**
Total:	**1,068**	**2,551**	**208,667**	**211,218**	**98.8%**

Notes:

[1] Does not include "Do Not Smoke" line segments.

[2] Private line segments in the study area were not smoke tested.

[3] The total basin footage was calculated based on GIS pipe information.

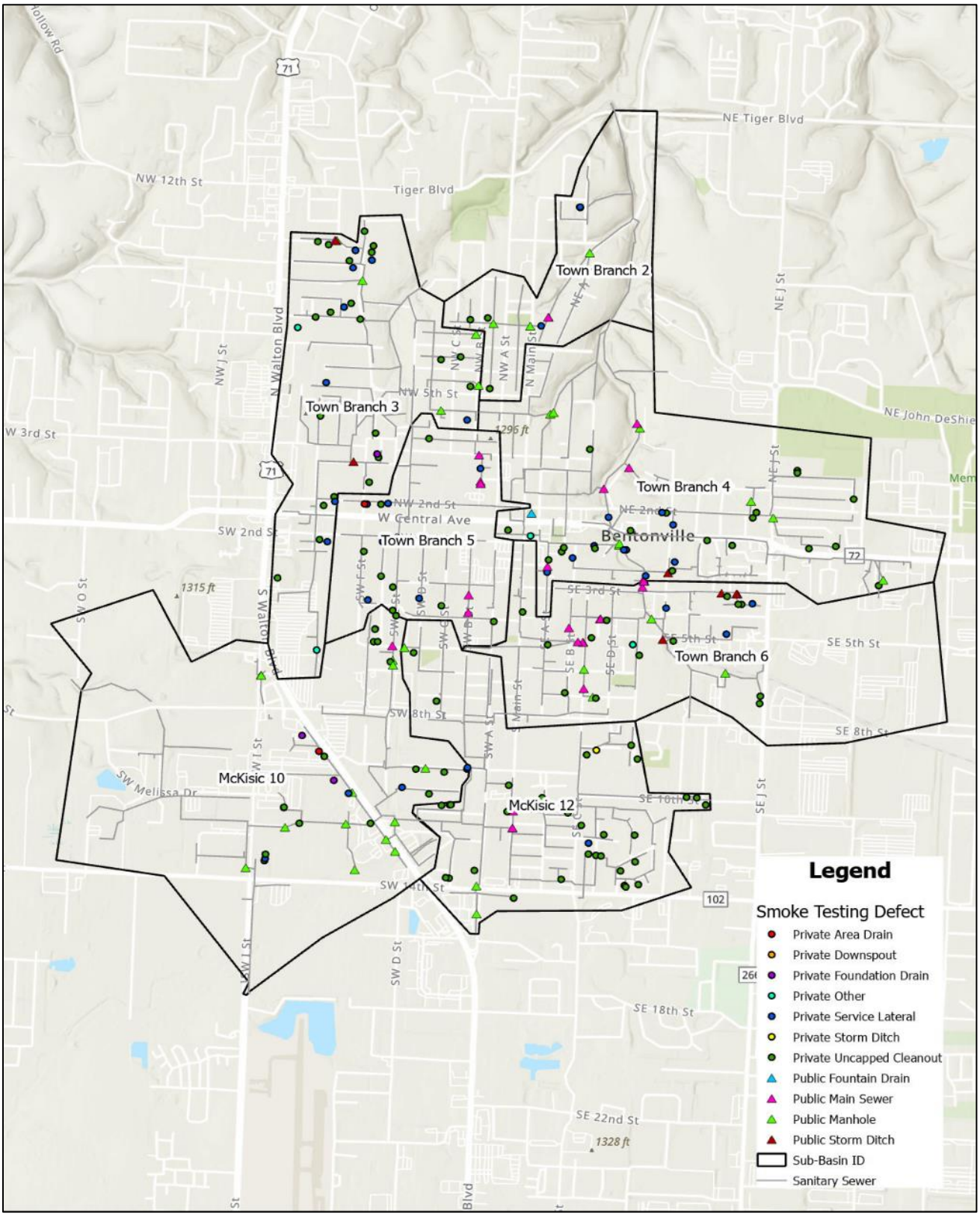
Each positively identified source was photographically documented and located using GPS. A shapefile was developed in ArcGIS to show the location of the smoke testing defects. All defect information is stored in the database. The use of GPS units ensure that all defect sources are referenced to allow for efficient repair. Line segments exhibiting smoke from public sources other than manholes, were used to help determine line segments for CCTV. Figure 3-2 includes a map of the identified defects and a summary of the smoke testing defects is shown in Table 3-4.

Table 3-4: Results of Smoke Testing

Private-Sector Smoke Defects by Sub-Basin								
Sub-Basin	Area Drain	Downspout	Foundation Drain	Service Lateral	Storm Ditch	Uncapped Cleanout	Other	Total Sources
McKisic 10	1	0	2	6	0	16	0	25
McKisic 12	0	0	0	1	1	32	0	34
Town Branch 2	1	0	0	3	0	4	0	8
Town Branch 3	0	0	1	10	0	24	2	37
Town Branch 4	0	0	0	10	0	19	1	30
Town Branch 5	1	1	1	6	0	8	0	17
Town Branch 6	0	0	0	3	0	13	1	17
Total:	**3**	**1**	**4**	**39**	**1**	**116**	**4**	**168**
Note: Only positive smoke sources are included in this table.								

Public-sector Smoke Defects by Sub-Basin					
Sub-Basin	Fountain Drain	Main Sewer	Manhole Defect	Storm Ditch	Total Sources
McKisic 10	0	1	14	0	15
McKisic 12	0	3	3	0	6
Town Branch 2	0	2	3	0	5
Town Branch 3	0	1	5	2	8
Town Branch 4	1	5	8	1	15
Town Branch 5	0	5	0	0	5
Town Branch 6	0	10	4	4	18
Total:	**1**	**27**	**37**	**7**	**72**
Note: Only positive smoke sources are included in this table.					

Figure 3-1: Smoke Testing Defect Summary



3.3 Acoustic Sounding

Acoustic sound testing is a method used to quickly analyze the hydraulic performance of a pipe and if maintenance activities such as cleaning may be needed to restore the capacity of the pipe. The data may also be used to determine the cleaning efforts that may be needed prior to CCTV inspections. TREKK's field crew utilized the Sewer Line Rapid Assessment Tool (SL-Rat) made by InfoSense, Inc. to complete acoustic sounding inspections of 166,100 linear feet of pipe. Table 3-5 shows how many linear feet were inspected in each sub-basin. The SL-Rat has a transmitter end that is placed over the open upstream manhole and a receiver end that is over the downstream manhole. Once turned on, the transmitter will send acoustic frequencies from one end of the pipe to the receiver at the other end of the pipe. Based on the number of blockages the acoustic sound encountered, the SL-Rat will give a raw data score from 0 to 10, with 0 being blocked and 10 being clear. These raw scores are then translated into ranges based on their score: Blocked (0), Poor (1-3), Fair (4-6), Good (7-10). Table 3-6 breaks down the inspections of the SL-Rat by sub-basin.

Table 3-5: Acoustic Sounding Inspection Status

Study Area Basin ID	Total Segments	Total Footage Inspected	Total Footage Not Inspected	Total Basin Footage[1]	% Total
McKisic 10	175	22,018	12,266	34,284	**64.2%**
McKisic 12	196	33,057	3,748	36,805	**89.8%**
Town Branch 2	65	9,894	5,090	14,983	**66.0%**
Town Branch 3	176	28,291	6,145	34,436	**82.2%**
Town Branch 4	270	34,076	11,765	45,840	**74.3%**
Town Branch 5	90	15,221	5,336	20,557	**74.0%**
Town Branch 6	151	23,544	4,914	28,459	**82.7%**
Total:	**1,123**	**166,100**	**49,264**	**215,364**	**77.1%**

Notes:[1] The total basin footage was calculated based on GIS pipe information.

Table 3-6: Acoustic Sounding Results

Study Area Basin ID	Total Footage "Good"	Total Footage "Fair"	Total Footage "Poor"	Total Footage "Blocked"
McKisic 10	19,155	2,696	0	166
McKisic 12	27,367	4,292	1,018	381
Town Branch 2	3,046	3,001	1,373	2,474
Town Branch 3	20,665	4,867	2,240	518
Town Branch 4	21,930	3,746	3,743	4,656
Town Branch 5	6,603	2,097	1,646	4,875
Town Branch 6	11,731	2,940	3,237	5,637
Total:	**110,497**	**23,639**	**13,257**	**18,707**

3.4 Manhole Inspections

Manhole inspections were conducted to identify I/I sources and structural/maintenance defects in the manholes. Manhole inspections were conducted using a two-person crew using the TREKK360 camera to collect panoramic photos. Each structural component of the manhole was inspected and assigned a condition rating. An initial rehabilitation recommendation was assigned to each manhole. Photographic records were used to supplement and substantiate manhole inspection observations and recommendations. All manhole inspections were recorded on TREKK's field forms and input into a database compatible with ArcGIS software.

A total of 849 structures were inspected in the study area. There were 29 structures that could not be inspected due to reasons specified in Table 3-7 or were abandoned. The approximate location of these manholes can be found in the attachments alongside this report.

Table 3-7: Phase 2 Manhole Inspection Status Summary

Basin ID	Sanitary MH Inspected	Cleanout Inspected	Total			Total
			Could Not Locate	No Access	MH Abandoned	
McKisic 10	125	0	1	3	0	**129**
McKisic 12	161	11	3	0	2	**177**
Town Branch 2	33	3	0	3	0	**39**
Town Branch 3	131	19	1	3	0	**154**
Town Branch 4	186	9	7	6	0	**208**
Town Branch 5	59	8	0	0	0	**67**
Town Branch 6	98	6	1	0	0	**105**
Total:	**793**	**56**	**12**	**15**	**2**	**879**

3.5 Visual Pipe Inspections

All incoming and outgoing sanitary sewer lines, including service laterals, were inspected at each manhole. Where the pipe is clear, up to the first 10 feet of pipe are visible through the inspection. Data collected was recorded on standard TREKK field forms.

Inspection results were used to identify sections of pipe that are structurally defective or require some form of maintenance. Visual pipe inspections yielded 175 defects out of a total 1,995 inspections. Prioritization of the sewer lines for follow-up cleaning and CCTV inspections were determined from sewer lines that showed structural and/or maintenance defects during line visual pipe inspections and lines that exhibited smoke during smoke testing activities indicating sources of I/I. The results of the visual pipe inspections are shown in Table 3-8. Pipe material characteristics observed during these inspections were used to update pipe materials in the TREKK's GIS deliverable associated with this report. Photographs were taken of each visual pipe inspection and can be found in the manhole inspection report associated with the visual pipe defect.

Table 3-8: Results of Visual Pipe Inspections (Fair or Poor Rating)

	Quantity
Total Visual Pipe Inspections:	**1,995**
Observation and Defect Type[1]	
Pipe Condition	57
Pipe Seal Condition	118
Total Observations and Defects:	**175**
[1]Observations shown are of visual pipe inspections in Fair or Poor condition.	

The following photos show some of the defects identified during visual pipe inspections:

404-6866: Roots in Line

403-586: Debris in Line

3.6 CCTV Inspections

The best method of accurately identifying the exact location of I/I entry into pipelines in the collection system is through the use of CCTV. Since smoke may migrate through cracks in the soil, an exact measurement may not be possible during smoke testing. A CCTV list was generated by assigning a point value to line segments for defects identified during smoke testing, acoustic sound testing, and visual pipe inspections. Line segments were then ranked from highest to lowest according to these points to generate a list of line segments in need of CCTV inspections. The complete CCTV list represented 98 line segments and approximately 21,021 LF based upon the GIS. TREKK was able to

complete CCTV investigations on 19,886 LF of the pipe. There were eight (8) line segments unable to be fully televised due to roots, blockages, and high water levels in the pipe. All but two (2) of these eight (8) line segments were able to be evaluated for rehabilitation even though they were not completely televised. The two (2) line segments in question did not receive recommendations due to high water levels in the pipe. All CCTV inspection videos have been provided to the City.

CCTV inspection results were used to identify sections of pipe that are structurally defective or require some form of maintenance. All inspection video was reviewed according to the National Association of Sewer Service Companies (NASSCO) Pipeline Assessment and Certification Program (PACP), based on their structural condition and operational and maintenance (O&M) needs. Each PACP defect code is assigned a condition grade from 1 to 5. Grades are assigned based on their potential for further deterioration or pipe failure. The structural and O&M PACP scores for each pipe segment can be found on the observation report, and the pipe run report is included alongside this deliverable. The NASSCO PACP grades and corresponding descriptions are shown in Table 3-9 and Table 3-10 shows how these scores correspond to the pipes inspected. Pipe material characteristics observed during these inspections were also used to update pipe materials in the TREKK's GIS deliverable associated with this report.

NASSCO PACP scores were used to identify defects and classify the possible severity of the pipes. NASSCO scoring was not used to prioritize the rehabilitation of the pipes. These scores are not an exact science since other factors can play into priority, such as location, pipe diameter, pipe material, and city rehabilitation wants. For this project specifically the City of Bentonville has given TREKK a prioritization guide. This guide prioritizes: impact of repair (emergency to preventative), $/gpm efficiency (high to low), and how the rehab will impact the collection system (immediate to long-term).

Table 3-9: NASSCO Defect Grading

Grade		Description	Urgency
1	Excellent	Minor Defects	Failure unlikely in the foreseeable future
2	Good	Defects that have not begun to deteriorate	Pipe unlikely to fail for at least 20 years
3	Fair	Moderate defects that will continue to deteriorate	Pipe may fail in 10 to 20 years
4	Poor	Sever defects that will become Grade 5 defects with in the foreseeable future	Pipe will probably fail in 5 to 10 years
5	Immediate Attention	Defects requiring immediate attention	Pipe has failed or will likely fail within the next 5 years

Table 3-10 CCTV NASSCO Rating

NASSCO PACP Pipe Rating	Town Branch 2	Town Branch 3	Town Branch 4	Town Branch 5	Town Branch 6	Mckisic 10	Mckisic 12	Number of Pipes
0	0	1	3	0	1	0	0	5
1	0	1	0	0	0	0	0	1
2	3	2	4	0	0	0	0	9
3	4	3	4	4	1	0	0	16
4	8	3	9	3	7	1	1	32
5	6	0	4	2	3	0	0	15

4 Field Data Analysis and I/I Quantification

4.1 Objective

Although the type and quantity of data is important, it is equally important to evaluate and use the data in a manner that will yield the greatest benefit. Smoke inspections located defects which may contribute I/I to the system, depending on their type and/or location. Based on the information gathered in the field, it was possible to estimate I/I flows that the defects contribute to the system. This section will summarize the analysis of I/I sources that were located in the study area.

4.2 I/I Flow Calculation

An I/I flow rate was calculated for each defect based on following the rational method and formula.

Q = CiA

- Q (Flow) – Calculated I/I flow rate
- C (Runoff Coefficient) – The runoff coefficient considers both the surface type of the drainage area to the defect and the smoke intensity observed during the smoke testing inspections.
- I (Rainfall Intensity) – This variable represents the rainfall intensity of the design storm event. The design storm event selected by TREKK was a 10-year, 24-hour storm for the immediate Bentonville, Arkansas area. The NOAA Precipitation Frequency Data Server was used to determine a rainfall depth of 5.18" for the 10-year, 24-hour storm.
- A (Area) – This variable represents the tributary area draining to the defect. During smoke testing activities, the field inspectors made observations to estimate how much water in the area will flow into each defect during a storm event.

4.3 Public-Sector Inflow/Infiltration Sources

Unit I/I rates (gpm) were assigned to each source type based on a rating condition used in the field and/or the estimated runoff area that is tributary to the inflow source. A summary of quantities and estimated flow rates from public-sector I/I sources are presented in Table 4-1.

Table 4-1: Summary of Public-Sector Inflow/Infiltration

Inflow/Infiltration Source	Number of Sources	Flow Rate (gpm)
Manhole	616	240.58
Main Sewer	98	278.12
Fountain Drain	1	15.00
Storm Ditch - Mainline	5	120.30
Storm Ditch – Storm Inlet	2	70.65
Total Public-Sector I/I:	**722**	**724.65**

4.4 Private-Sector Inflow/Infiltration Sources

Unit I/I rates (gpm) were calculated for each source using methods similar to those described for public-sector I/I. A summary of quantities and estimated flow rates from private-sector I/I sources are presented in Table 4-2.

Table 4-2: Summary of Private-Sector Inflow/Infiltration

Inflow/Infiltration Source	Number of Sources	Flow Rate (gpm)
Area Drain	3	6.55
Downspout	1	13.19
Foundation Drain	4	16.69
Grease Trap	2	2.00
Septic	2	15.00
Service Lateral	39	76.85
Storm Ditch – Service Lateral	1	2.29
Uncapped Cleanout	116	381.17
Total Private-Sector I/I:	**168**	**513.74**

4.5 I/I Source Summary

Total quantification of I/I from individual sources identified under the field inspection activities is shown in Table 4-3. All identified I/I sources were evaluated for rehab based on the prioritization schedule given to TREKK by the City of Bentonville. If the defect did not need rehabilitation, then a priority was not given. Rehab recommendations are further elaborated on in Section 5.

Table 4-3: Summary of I/I Source Quantification

Source Type	Number of Sources	Flow Rate (gpm)	% GPM of Total
Public-Sector	722	724.65	59%
Private-Sector	168	513.74	41%
Total:	**890**	**1,238.39**	**100%**

5 Rehabilitation Recommendations

The following paragraphs discuss the improvements recommended for the study area for both the public and private-sectors. The manhole and sanitary sewer recommendations are prioritized from Priority 1 to 3 for rehabilitation, priority classification is explained at the bottom of the recommendation charts. These recommendations also contain two (2) phases of manhole inspections. Phase 1 was completed in 2019 but did not receive rehabilitation recommendations. Phase 2 was completed in 2024. Manhole rehabilitation recommendations were given Phase 1 & 2 manholes. All other recommendations in this report are associated with Phase 2 field investigations.

5.1 Manhole Rehabilitation Program

Table 5-1 summarizes the manholes recommended for rehabilitation from the **Phase 2** inspections. A listing of manholes requiring rehabilitation is included alongside this report. This detailed list includes the manhole name, type of recommended rehabilitation, and the estimated costs associated with performing the rehabilitation for each manhole. **A total of $674,000 has been estimated for the recommended Phase 2 manhole rehabilitation program for Priority 1 & 2 manholes.** Of this total, $156,000 has been included for estimated engineering and administration fees along with possible inspection, and construction overages.

Table 5-1: Phase 2 Recommended Manhole Rehabilitation Summary

Type of Rehabilitation	Priority 1	Priority 2	Priority 3	Unit	Unit Cost ($)	Total Cost ($)
Replace Frame / Gasket Cover / Frame Seal / External Wrap – Paved	4	3	52	EA	$4,500	$265,500
Replace Frame / Gasket Cover / Frame Seal / External Wrap – Unpaved	10	10	53	EA	$2,200	$160,600
Reset Frame / Cover / Frame Seal / External Wrap – Paved	3	0	6	EA	$3,800	$34,200
Reset Frame / Cover / Frame Seal / External Wrap – Unpaved	1	0	4	EA	$1,900	$9,500
Replace Riser / Extension Ring – Paved	1	0	6	EA	$3,000	$15,000
Replace Riser / Extension Ring – Unpaved	1	1	8	EA	$1,500	$12,000
Raise Manhole – Paved	0	0	0	VF	$3000	$0
Raise Manhole – Unpaved	2	0	0	VF	$1,500	$3,000
Manhole Lining, Cementitious	50.7	26.6	13.2	VF	$270	$24,435
Manhole Lining, Epoxy	298.0	192.9	189.1	VF	$600	$408,000
Flexible Chimney Seal	9	1	0	EA	$600	$6,000
Point Injection Grouting	0	7	4	EA	$1,900	$20,900
Curtain Grouting, 48" Diameter Base and Wall Joints	6	2	6	EA	$2,500	$35,000
Bench and Invert Rehab	8	11	11	EA	$1,500	$40,500
Pipe Seal Rehab	14	4	9	EA	$475	$13,300
Replace Manhole	1	1	0	EA	$12,000	$24,000
Abandon Manhole	1	0	2	EA	$5,000	$15,000
Replace Bolt Down Casting Bolts (x4)	0	0	0	EA	$300	$0
Priority 1 Costs w/ 30% Contingency:						**$402,000**
Priority 2 Costs w/ 30% Contingency:						**$272,000**
Priority 1 and 2 Total Cost*:						**$674,000**

*Cost are rounded to the nearest thousand dollars – based on current Midwest pricing of recent TREKK projects
Priority Level 1 – Rehabilitate Immediately
Priority Level 2 – Needs Rehabilitation but no Immediate Structural Concerns - Clean, Root Cut and/or Repair and Monitor
Priority Level 3 – Needs Periodic repair and monitoring, continue to gauge deterioration

Table 5-2 summarizes the manholes recommended for rehabilitation from the **Phase 1** inspections. Phase 1 inspections were completed under a separate project in 2019 but recommendations were asked to be included in this report by the City. **A total of $1,670,000 has been estimated for the recommended Phase 2 manhole rehabilitation program for Priority 1 & 2 manholes.** Of this total, $385,000 has been included for estimated engineering and administration fees along with possible inspection, and construction overages.

Table 5-2: Phase 1 Recommended Manhole Rehabilitation Summary

Type of Rehabilitation	Priority 1	Priority 2	Priority 3	Unit	Unit Cost ($)	Total Cost ($)
Replace Frame / Gasket Cover / Frame Seal / External Wrap – Paved	3	4	10	EA	$4,500	$76,500
Replace Frame / Gasket Cover / Frame Seal / External Wrap – Unpaved	50	106	72	EA	$2,200	$501,600
Reset Frame / Cover / Frame Seal / External Wrap – Paved	0	1	3	EA	$3,800	$15,200
Reset Frame / Cover / Frame Seal / External Wrap – Unpaved	2	0	4	EA	$1,900	$11,400
Replace Riser / Extension Ring – Paved	0	2	3	EA	$3,000	$15,000
Replace Riser / Extension Ring – Unpaved	5	7	7	EA	$1,500	$28,500
Raise Manhole – Paved	0	0	0	VF	$3000	$0
Raise Manhole – Unpaved	2	4	4	VF	$1,500	$15,000
Manhole Lining, Cementitious	4.59	25.71	4.4	VF	$270	$9,369
Manhole Lining, Epoxy	359.01	655.98	184.48	VF	$600	$719,682
Flexible Chimney Seal	0	0	0	EA	$600	$0
Point Injection Grouting	14	11	5	EA	$1,900	$57,000
Curtain Grouting, 48" Diameter Base and Wall Joints	16	14	8	EA	$2,500	$95,000
Bench and Invert Rehab	3	9	3	EA	$1,500	$22,500
Pipe Seal Rehab	10	14	5	EA	$475	$13,775
Replace Manhole	7	0	0	EA	$12,000	$84,000
Abandon Manhole	0	0	0	VF	$5,000	$0
Replace Bolt Down Casting Bolts (x4)	11	43	0	EA	$300	$16,200
Priority 1 Costs w/ 30% Contingency*:						**$673,000**
Priority 2 Costs w/ 30% Contingency*:						**997,000**
Priority 1 and 2 Total Cost*:						**1,670,000**

*Cost are rounded to the nearest thousand dollars – based on current Midwest pricing of recent TREKK projects
Priority Level 1 – Rehabilitate Immediately
Priority Level 2 – Needs Rehabilitation but no Immediate Structural Concerns - Clean, Root Cut and/or Repair and Monitor
Priority Level 3 – Needs Periodic repair and monitoring, continue to gauge deterioration

Hydrogen Sulfide (H2S) was also a prominent issue observed during manhole inspections, with 233 manholes reporting that H2S was present. Epoxy lining was recommended for most H2S positively identified if it was deemed cost-effective and structurally needed. Epoxy lining was also recommended for brick manholes after observing the deterioration of recently installed (estimated at around 20 years ago, usually) cementitious liners during Phase 1 & 2 manhole inspections.

5.2 Pipeline Rehabilitation Program

A review of the CCTV data identified line segments in need of rehabilitation. Line segments were given a priority ranking level of 1 through 3. A priority level ranking of 1 indicates the line segment requires immediate rehabilitation, a level of 2 indicates the pipe should be considered for repair in the near future, and a level ranking of 3 indicates the line segment requires periodic monitoring to gauge deterioration.

The total estimated cost to complete Priority 1 & 2 of the pipeline rehabilitation program is $1,544,000. This cost includes a 20% contingency fee of $257,000 which has been included for estimated engineering and administration fees along with possible inspection, and construction overages. A general breakdown of the quantity and cost to implement the recommended pipeline rehabilitation program is shown in Table 5-3. The rehabilitation cost summary includes the upstream and downstream manhole names, pipe diameter, pipe length, and rehabilitation type and cost. There are also an additional two (2) line segments that were unable to be fully televised due to high flows and did not receive a rehab recommendation. These line segments should be evaluated again at a time when flows are down in this area.

Table 5-3: Pipeline Rehabilitation Recommendations

Priority	Lining/CIPP		Pipe-Burst		Open Cut Replacement		Point Repair		Total Cost ($)*
	Number of Lines	*Total Linear Ft*	*Number of Lines*	*Total Linear Ft*	*Number of Lines*	*Total Linear Ft*	*Number of Point Repairs*	*Total Linear Ft*	
Priority 1	24	5,940	1	432	3	814	6	35	**895,340**
Priority 2	20	4,306	0	0	0	0	1	5	**$391,062**
Priority 3	22	5,159	0	0	0	0	5	30	**$385,822**
Priority 1 and 2 Total*:									**$1,287,000**
Contingencies (20%)*:									**$257,000**
Total Costs w/ Contingencies*:									**$1,544,000**

*Cost are rounded to the nearest thousand dollars - based on current Midwest pricing of recent TREKK projects
Priority Level 1 – Rehabilitate Immediately
Priority Level 2 – Needs Rehabilitation but no Immediate Structural Concerns - Clean, Root Cut and/or Repair and monitor
Priority Level 3 – Needs Periodic repair and monitoring, continue to gauge deterioration

5.3 Private-sector I/I Abatement Program

The United States Environmental Protection Agency (EPA) estimates that between 23,000 and 75,000 sanitary sewer overflow (SSO) events occur per year in the United States (excluding basement backups). Studies conducted by the Water Environment Research Foundation (WERF), estimate that some municipalities experience up to 80% of the I/I entering the sanitary sewers is contributed from private property. The Water Environment Federation (WEF) Collection System Committee has compiled a virtual library of municipalities that have established and are currently developing Private Property Rehabilitation Programs (PPRP). Detailed information on these PPRP's can be found on the Water Environment web site located at www.wef.org.

It is recommended that the City consider prioritizing and repairing cost-effective private I/I sources as part of a PPRP. Allowing these sources to remain connected increases the cost of relief sewers, maintenance related cost, transportation and treatment costs. If the City chooses to adopt a PPRP, the defects summarized in Table 5-4 should be considered for repair. In addition, internal and external plumbing evaluations are recommended for the properties in the area to identify additional I/I sources and determine the required repairs to address the problem.

Table 5-4: Recommended Private I/I Repairs

Inflow/Infiltration Source	Number of Sources	Unit Cost ($)	Total
Area Drain	3	$3,000	$9,000
Downspout	1	$750	$750
Foundation Drain	4	$6,000	$24,000
Grease Trap	2	$1,500	$3,000
Septic	2	$1,500	$3,000
Service Lateral	39	$3,500	$136,500
Storm Ditch – Service Lateral	1	$3,500	$3,500
Uncapped Cleanout	116	$113	$13,108
Sub-Total*:			**$193,000**
Contingencies (20%*):			**$39,000**
Total Cost*:			**$232,000**

*Cost are rounded to the nearest thousand dollars - based on current Midwest pricing of recent TREKK projects

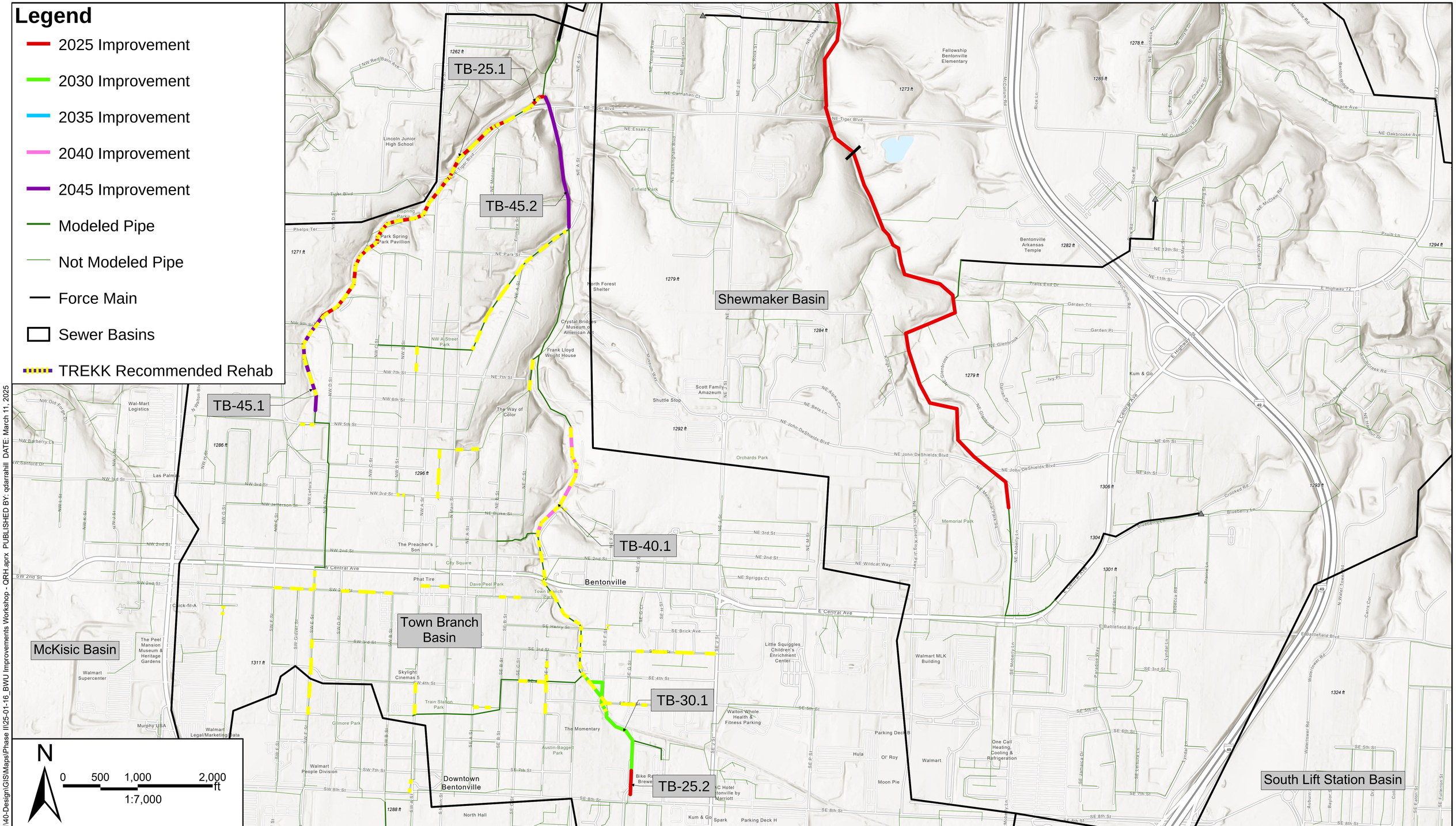
5.4 Rehabilitation Summary

The estimated cost to perform the recommended improvements is $4,120,000. This cost includes improvements and investigation work to the public and private-sector infrastructure. All costs are based on current Midwest pricing of recent TREKK projects. Table 5-5 summarizes the recommended improvement plan and provides a cost estimate for each task.

Table 5-5: Recommended Improvement Cost Summary

Description of Improvements	Flow Reduction (gpm)	Cost Estimate ($)
Private-Sector I/I Abatement Program	513.74	232,000
Phase 1 Manhole Rehabilitation Program **(Priority 1 and 2)**	104.00	1,670,000
Phase 2 Manhole Rehabilitation Program **(Priority 1 and 2)**	108.73	674,000
Pipeline Rehabilitation Program **(Priority 1 and 2)**	218.99	1,544,000
Totals:	**945.46**	**4,120,000**

TREKK's rehabilitation and abatement recommendations will be incorporated into the final report associated with this project, which Olsson will deliver. Olsson's final report will take into account capacity improvements and the year in which they need to be completed (2025, 2030, and 2035. If capacity improvements are needed by 2025, then all rehab recommendations will be excluded from the project's scope. If capacity improvements are needed by 2030, then priority 2 and 3 rehab recommendations will be excluded. Finally, if capacity improvements are needed by 2035, then priority 3 rehab recommendations will be excluded from the project's scope.



TREKK Recommended Pipe Rehab & Proposed Improvement Locations

BWU Modeled Improvements
TREKK REHAB
February 2025
Bentonville, AR

Figure 1

Basemap: ESRI World Imagery

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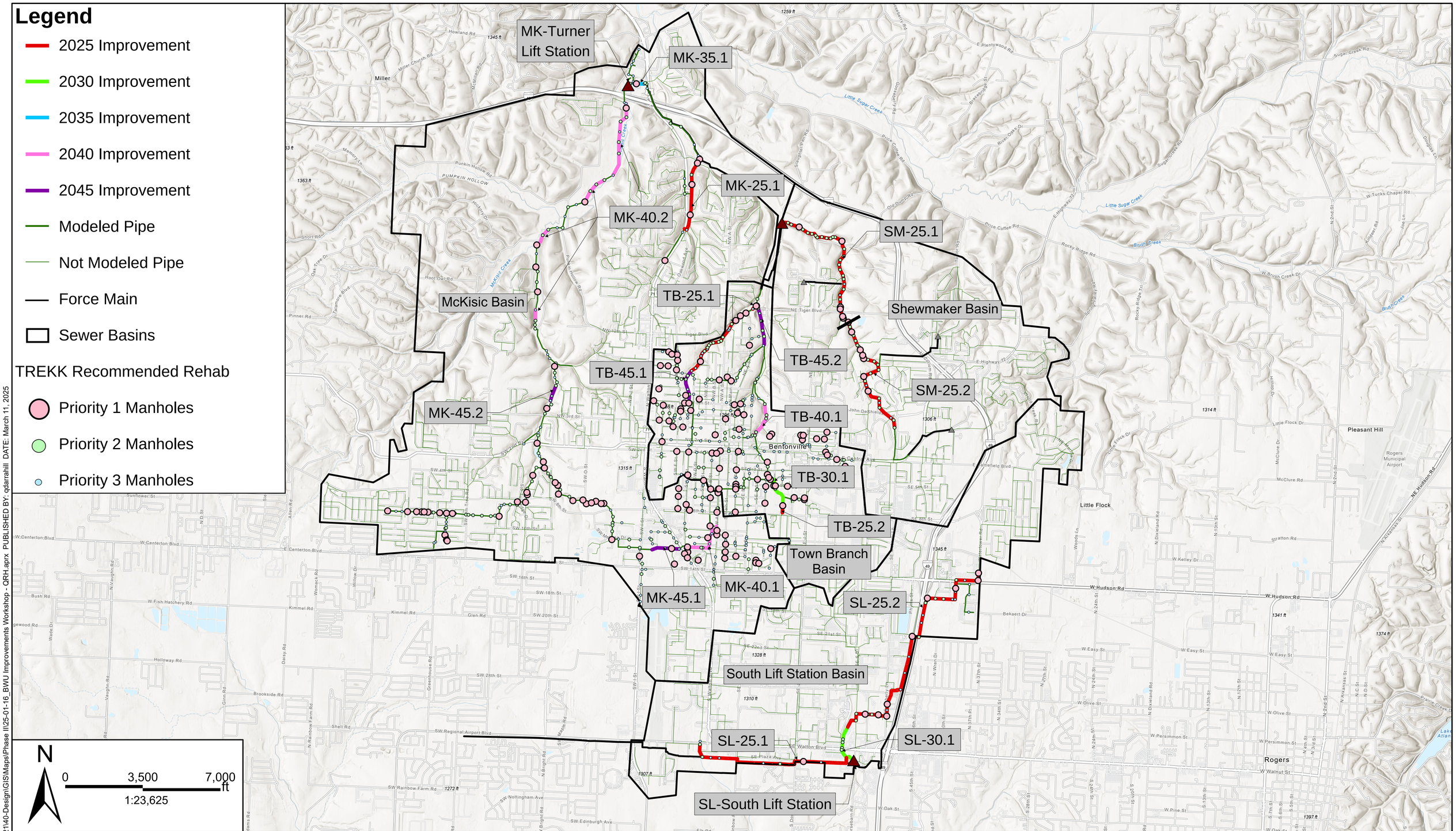

TREKK Recommended Manhole Rehab & Proposed Improvement Locations

BWU Modeled Improvements
TREKK REHAB
February 2025
Bentonville, AR

Figure 2

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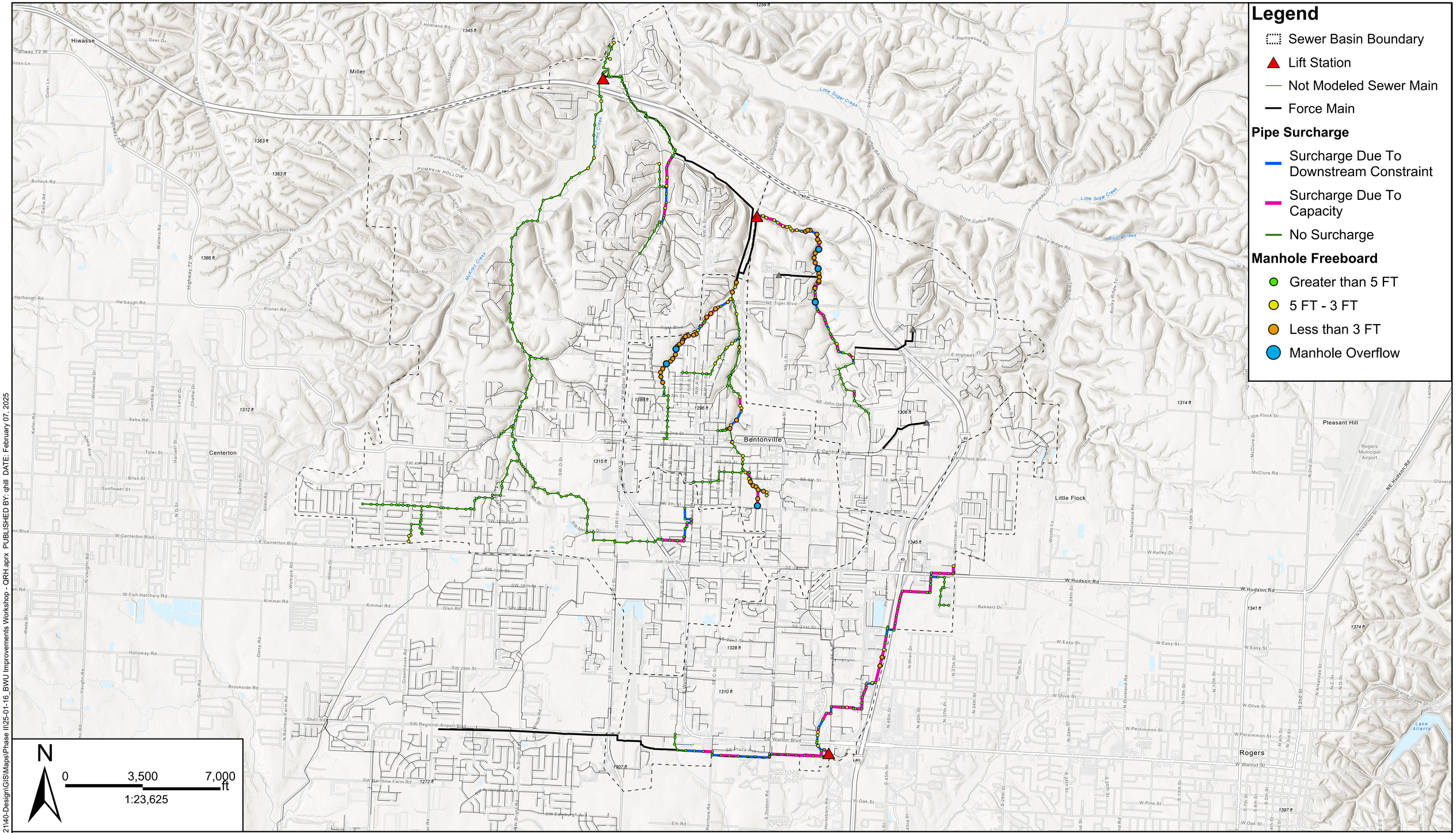
Basemap: ESRI World Imagery

APPENDIX C
SYSTEM EVALUATION MAPS

TABLE OF CONTENTS



Wet Weather Flow Capacity Evaluation

Current System; Existing Population

olsson

BWU Modeled Improvements
System Evaluation
February 2025
Bentonville, AR

Figure 1

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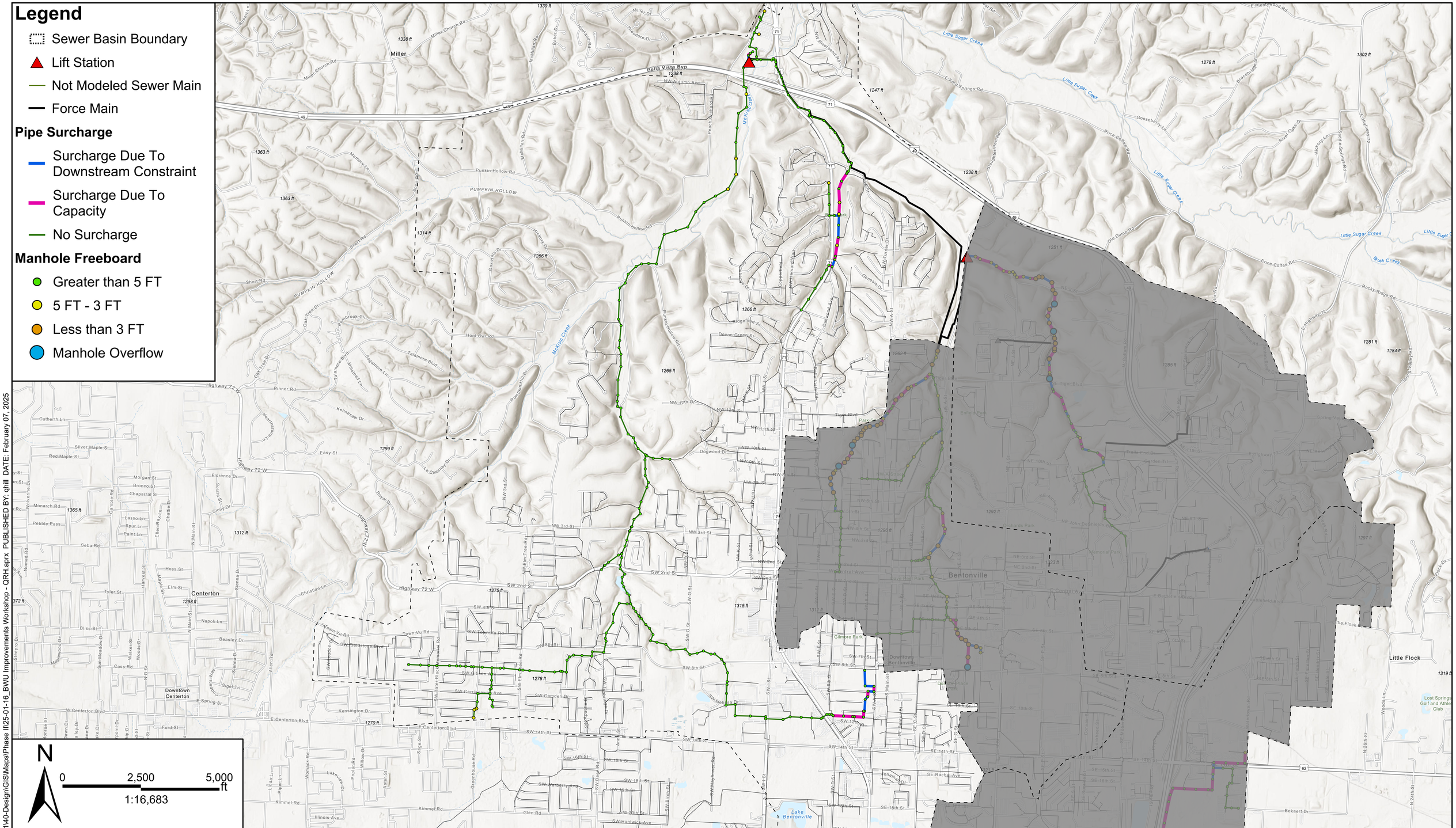

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Wet Weather Flow Capacity Evaluation

Current McKisic; Existing Population

BWU Modeled Improvements
System Evaluation
February 2025
Bentonville, AR

Figure 2

Basemap: ESRI World Imagery

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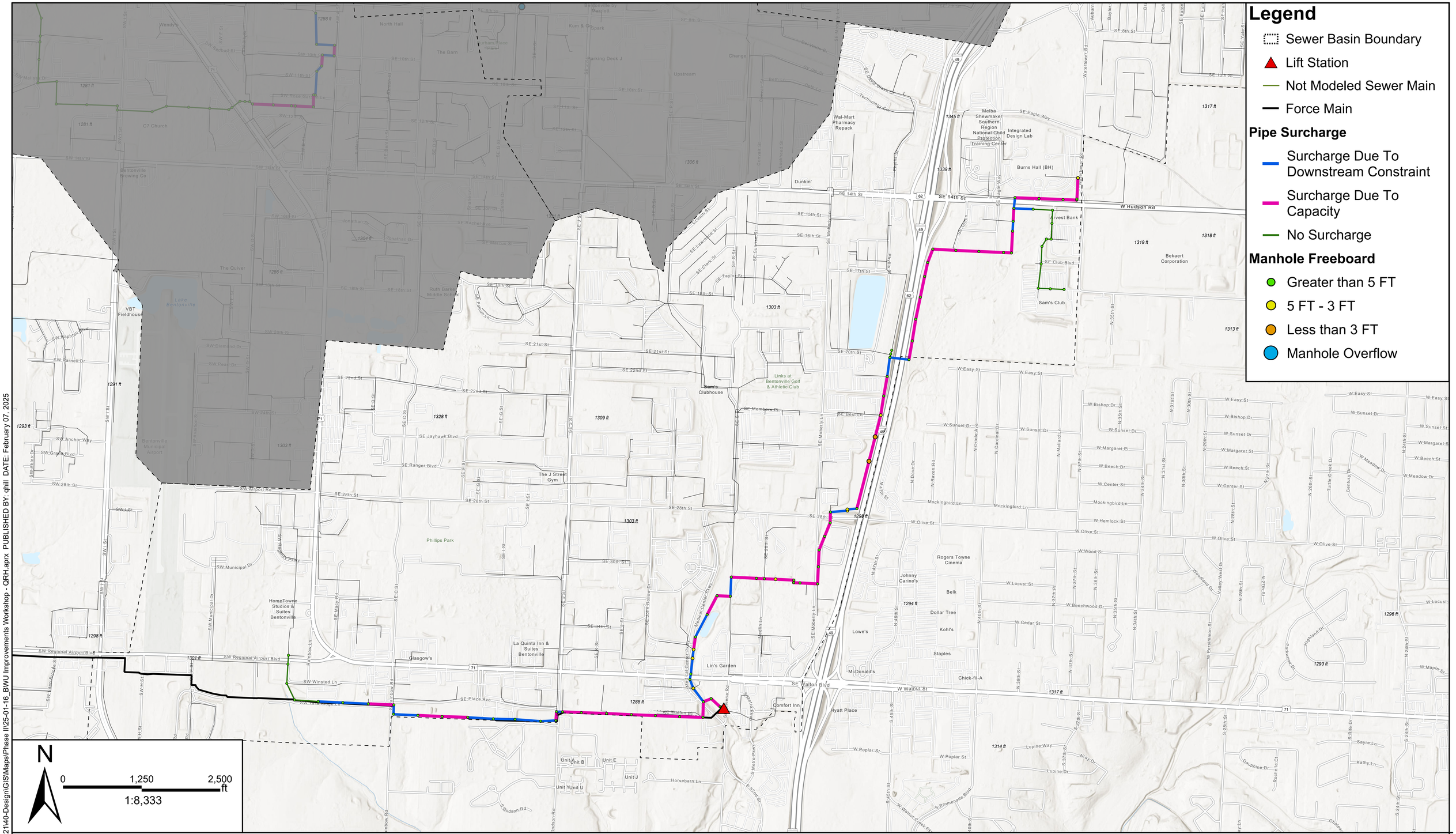

Wet Weather Flow Capacity Evaluation

Current South Lift Station; Existing Population

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BWU Modeled Improvements
System Evaluation
February 2025
Bentonville, AR

Figure 3

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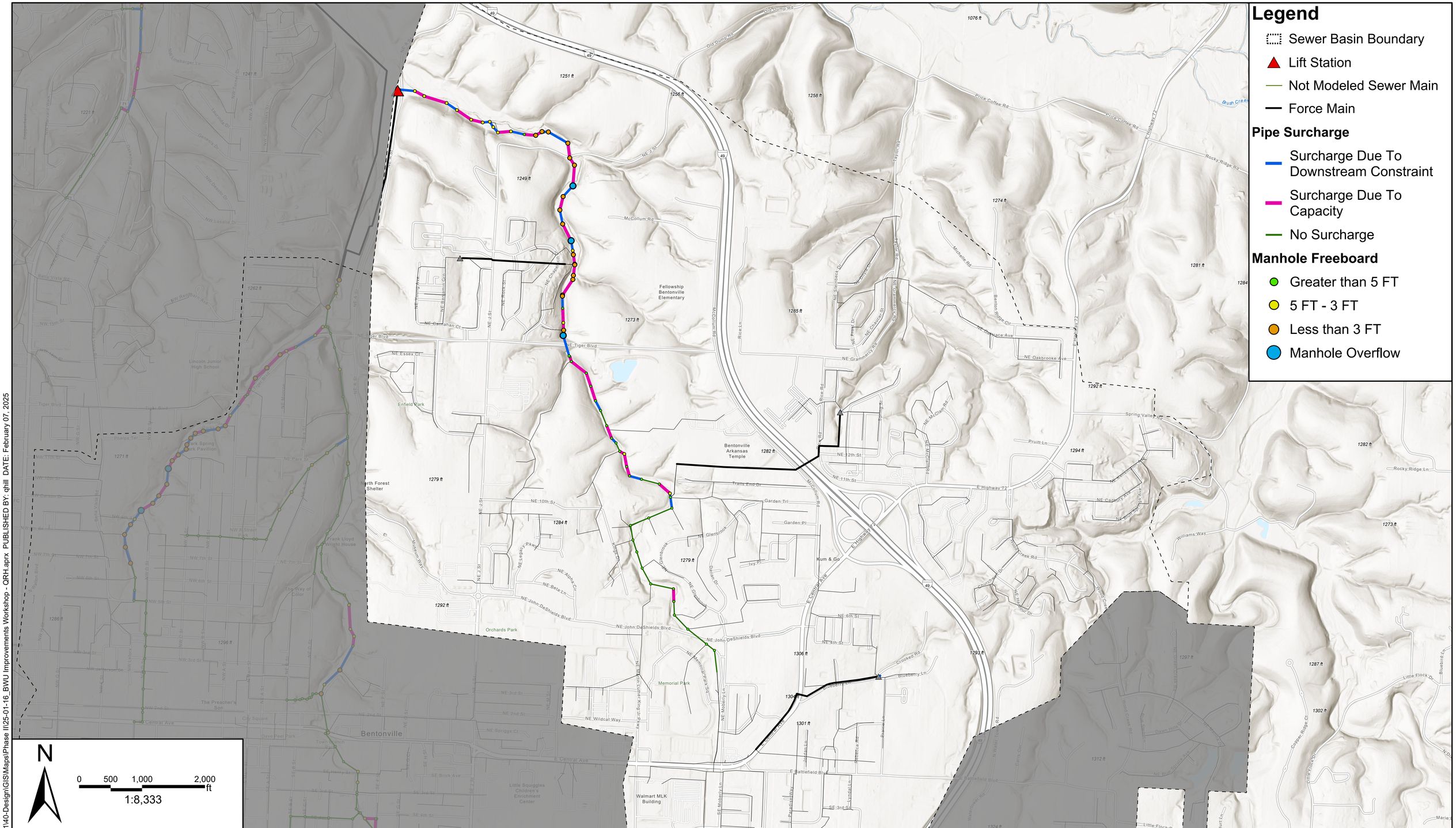
Basemap: ESRI World Imagery



Wet Weather Flow Capacity Evaluation

Current Shewmaker; Existing Population

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BWU Modeled Improvements
System Evaluation
February 2025
Bentonville, AR

Figure 4

Basemap: ESRI World Imagery

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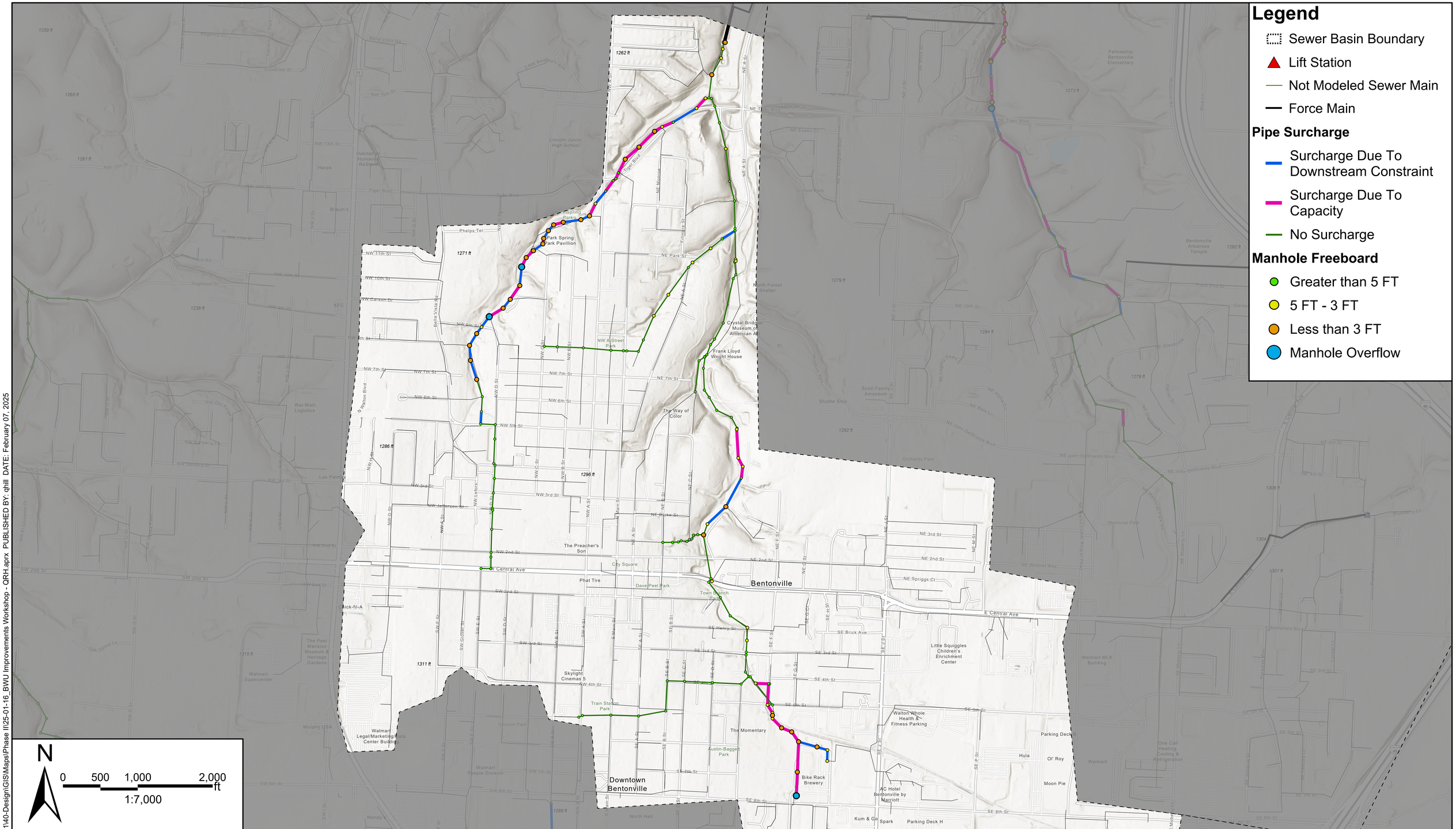

Wet Weather Flow Capacity Evaluation

Current Town Branch; Existing Population

olsson

BWU Modeled Improvements
System Evaluation
February 2025
Bentonville, AR

Figure 5

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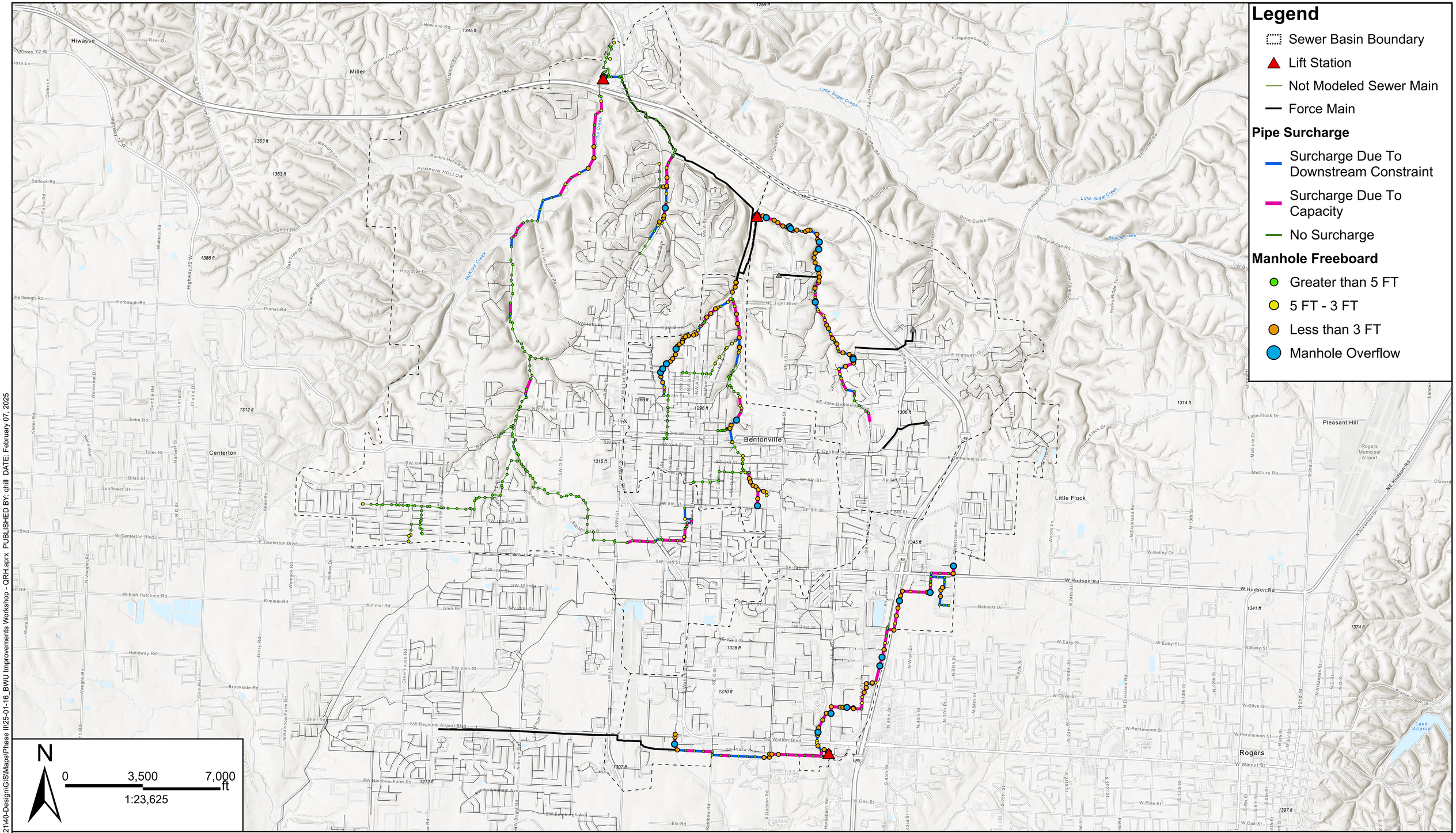
Basemap: ESRI World Imagery



Wet Weather Flow Capacity Evaluation

Current System; 2050 Projected Population

olsson

BWU Modeled Improvements
System Evaluation
February 2025
Bentonville, AR

Figure 6

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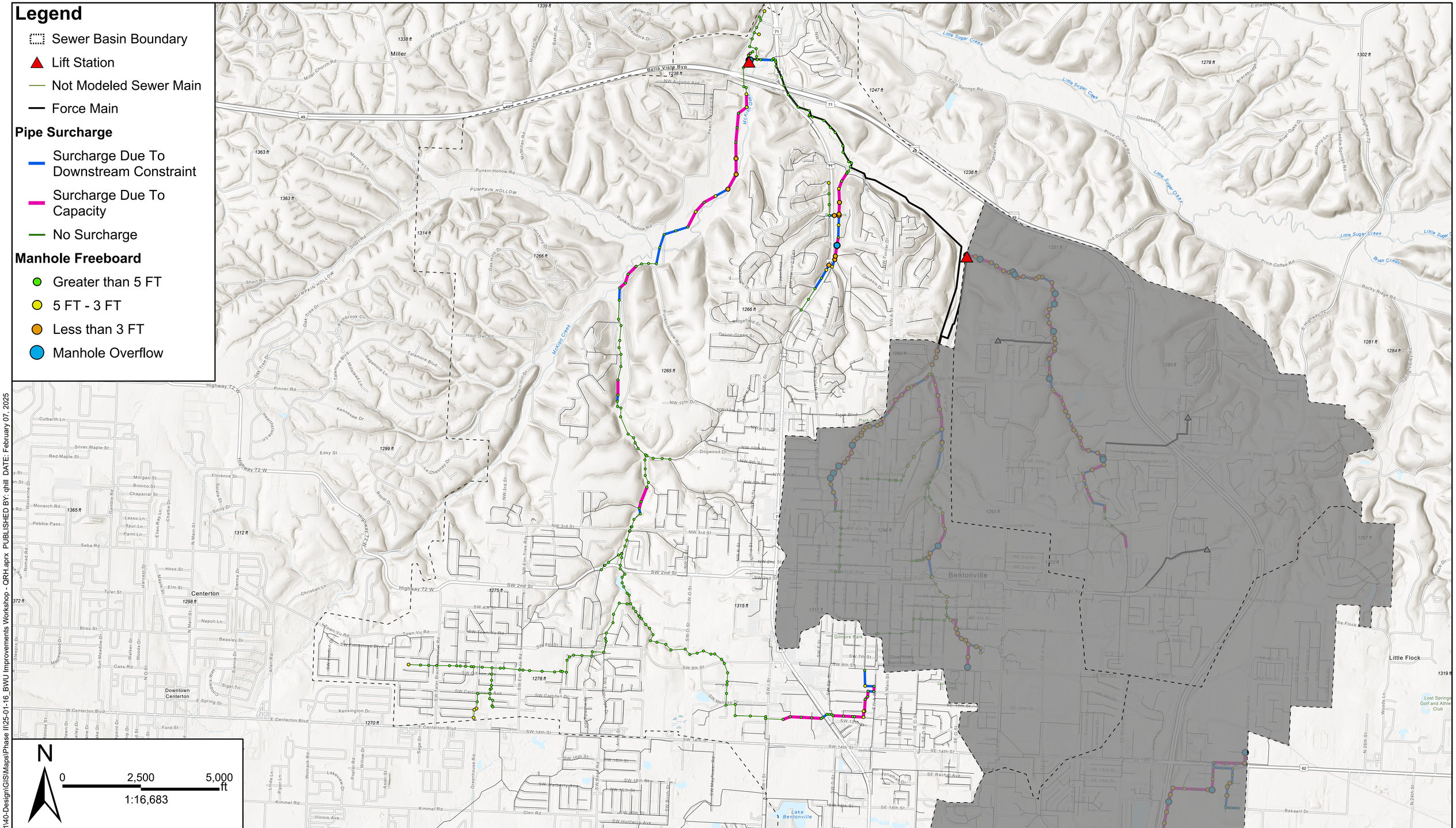
Basemap: ESRI World Imagery



Wet Weather Flow Capacity Evaluation

Current McKisic; 2050 Projected Population

BWU Modeled Improvements
System Evaluation
February 2025
Bentonville, AR

Figure 7

Basemap: ESRI World Imagery

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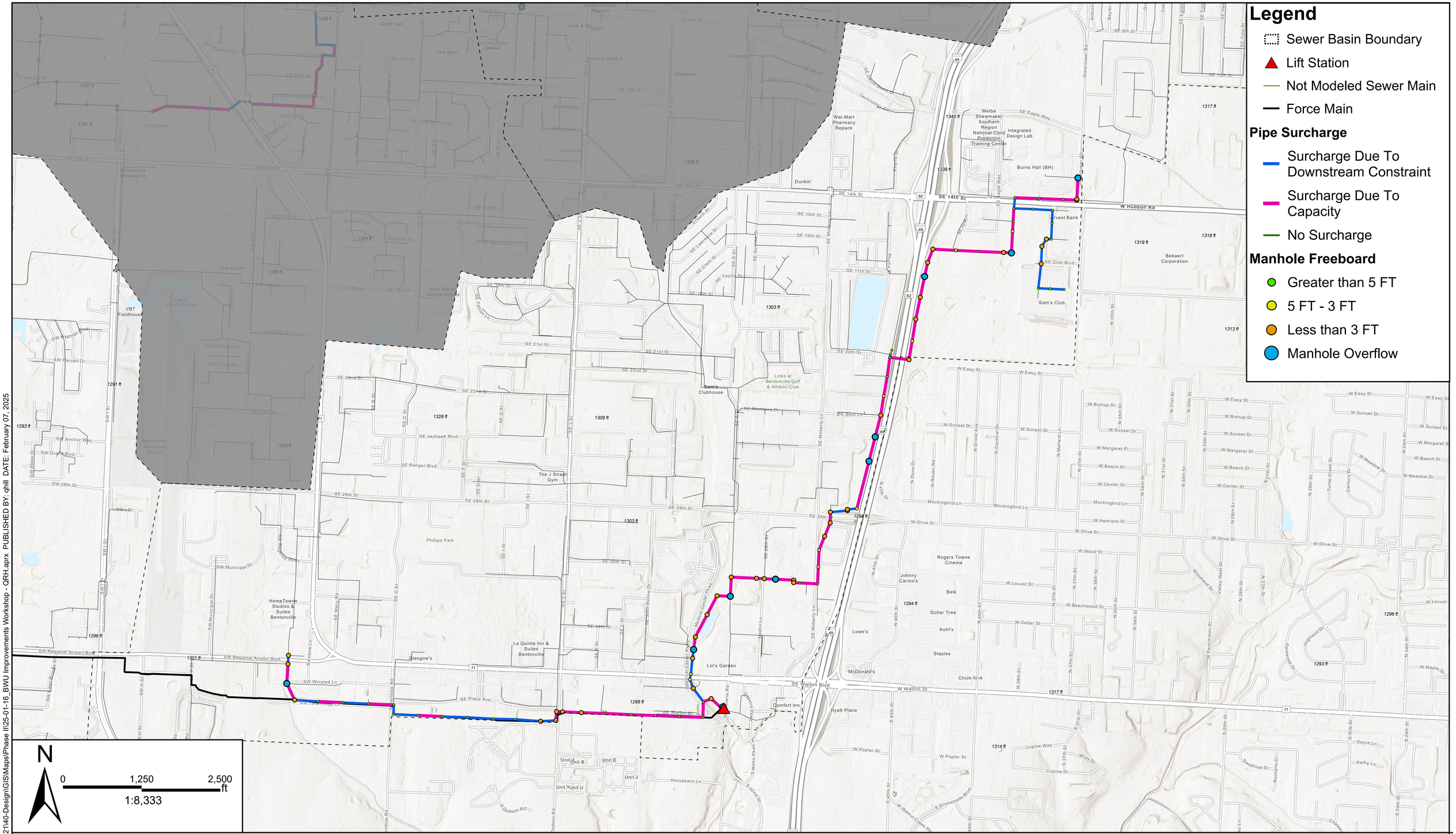

Wet Weather Flow Capacity Evaluation

Current South Lift Station; 2050 Projected Population

BWU Modeled Improvements
System Evaluation
February 2025
Bentonville, AR

Figure 8

Basemap: ESRI World Imagery

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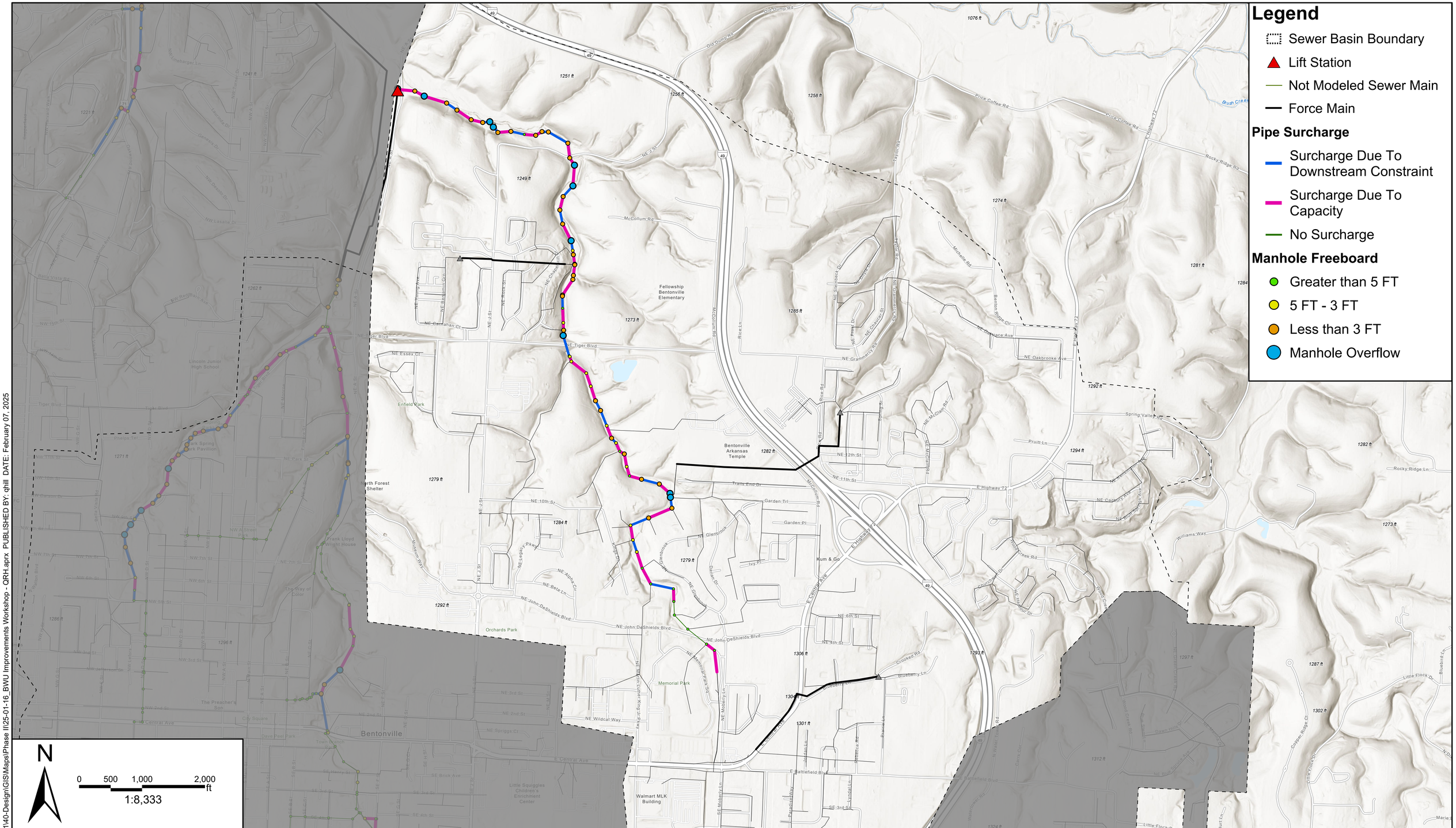

Wet Weather Flow Capacity Evaluation

Current Shewmaker; 2050 Projected Population

BWU Modeled Improvements
System Evaluation
February 2025
Bentonville, AR

Figure 9

Basemap: ESRI World Imagery

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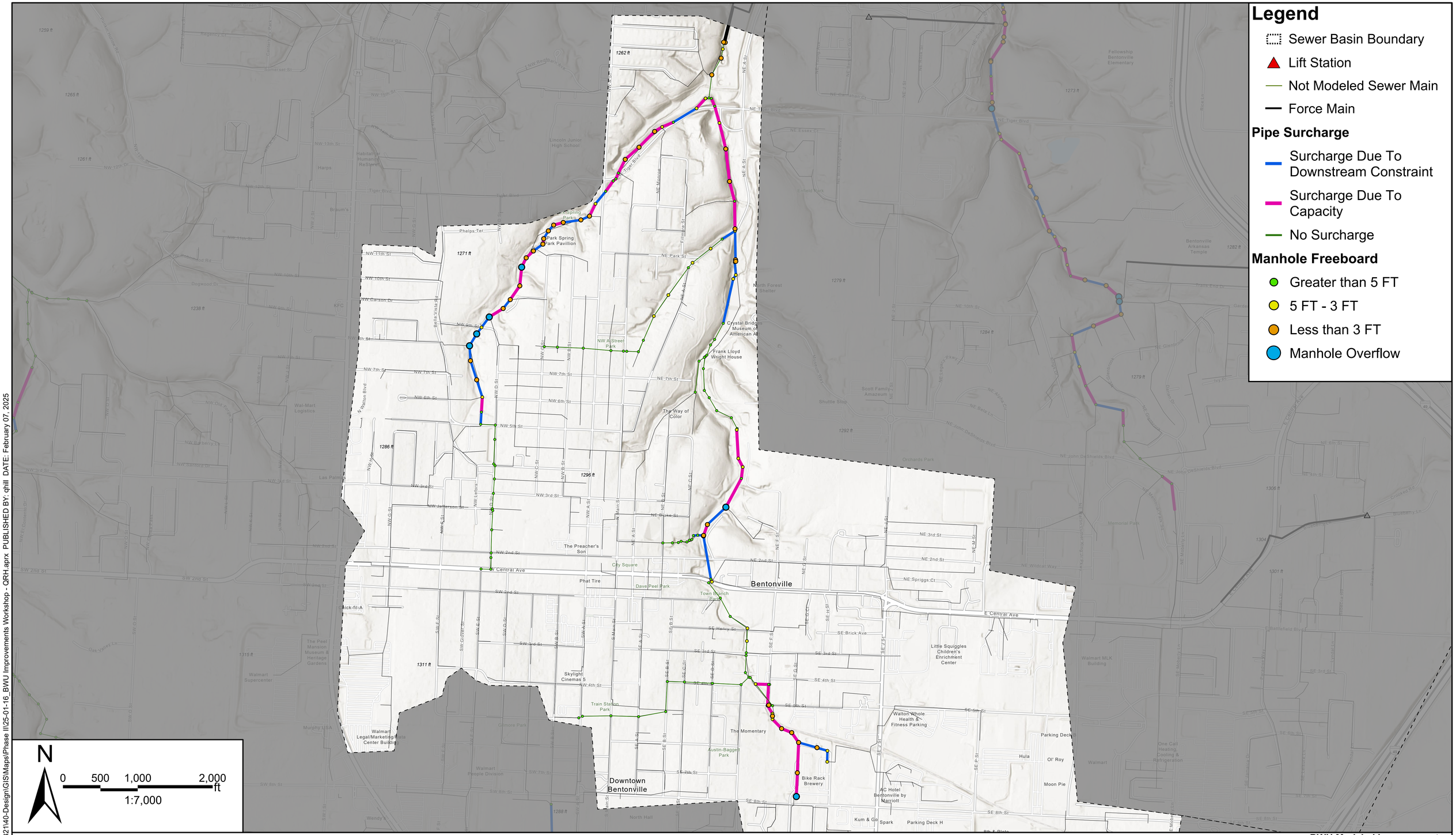

Wet Weather Flow Capacity Evaluation

Current Town Branch; 2050 Projected Population

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BWU Modeled Improvements
System Evaluation
February 2025
Bentonville, AR

Figure 10

Basemap: ESRI World Imagery

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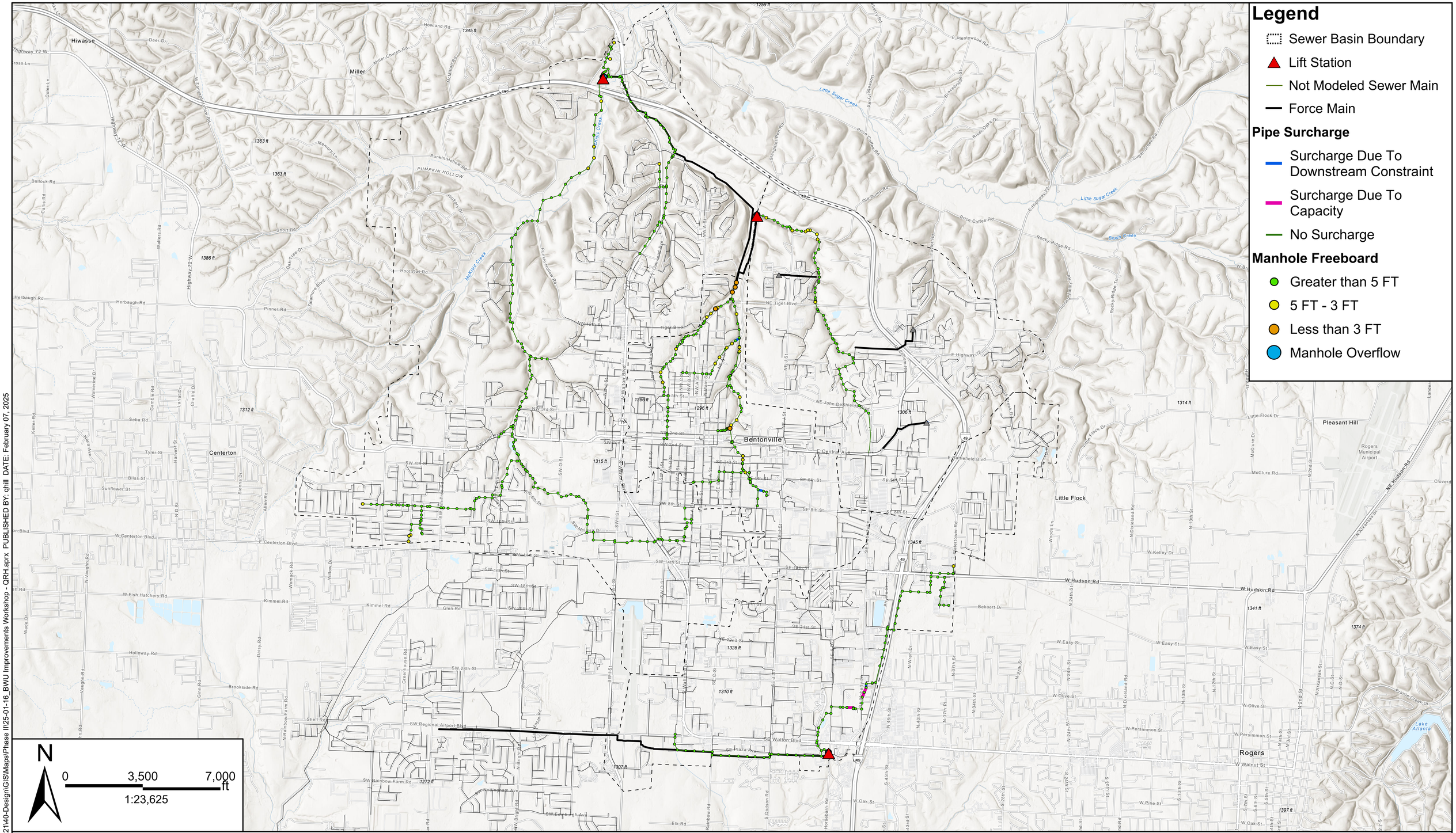

Wet Weather Flow Capacity Evaluation

System with Recommended Improvements; 2050 Projected Population

BWU Modeled Improvements
System Evaluation
February 2025
Bentonville, AR

Figure 11

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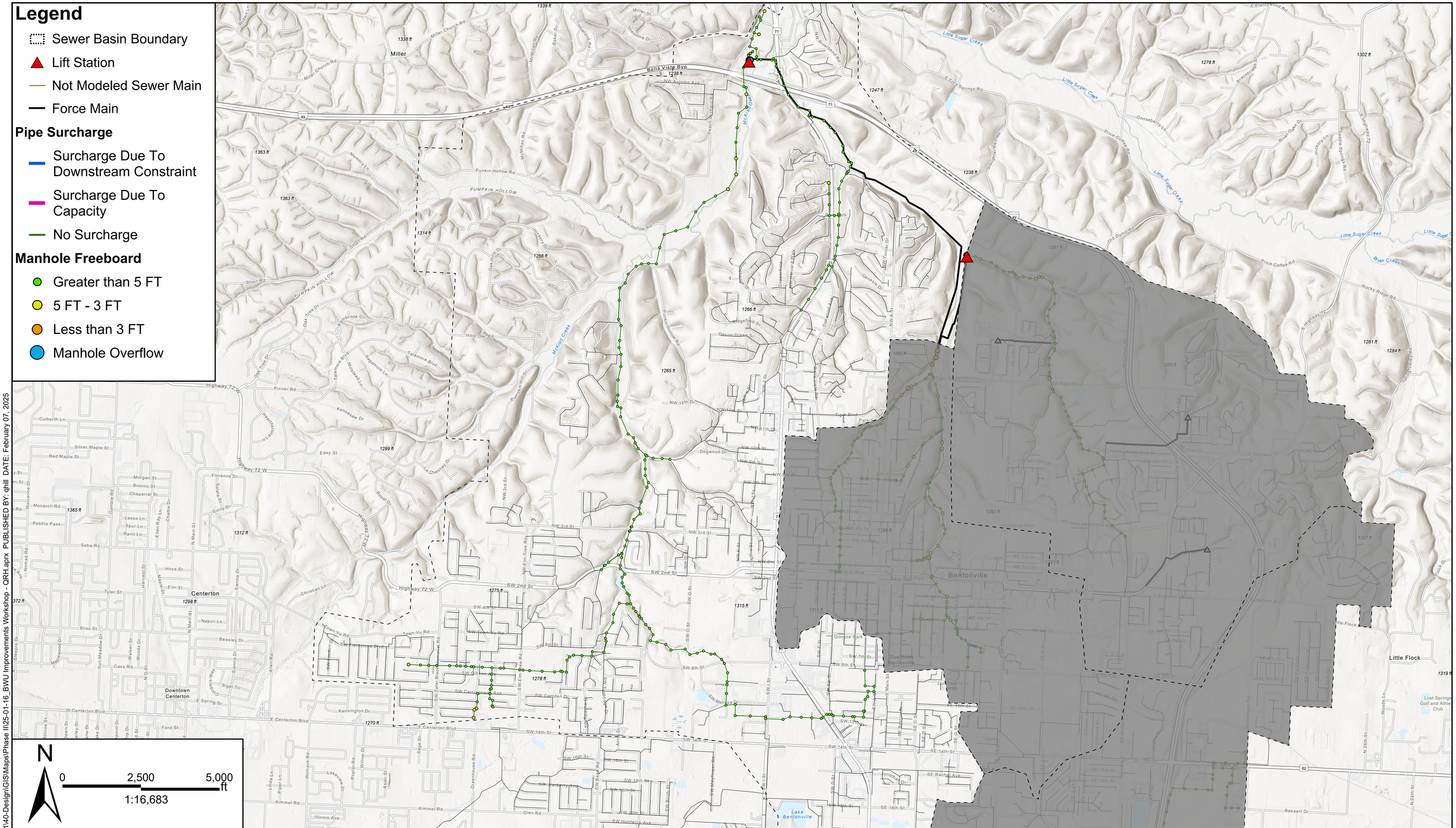
Basemap: ESRI World Imagery



Wet Weather Flow Capacity Evaluation

McKisic with Recommended Improvements; 2050 Projected Population

BWU Modeled Improvements
System Evaluation
February 2025
Bentonville, AR

Figure 12

Basemap: ESRI World Imagery

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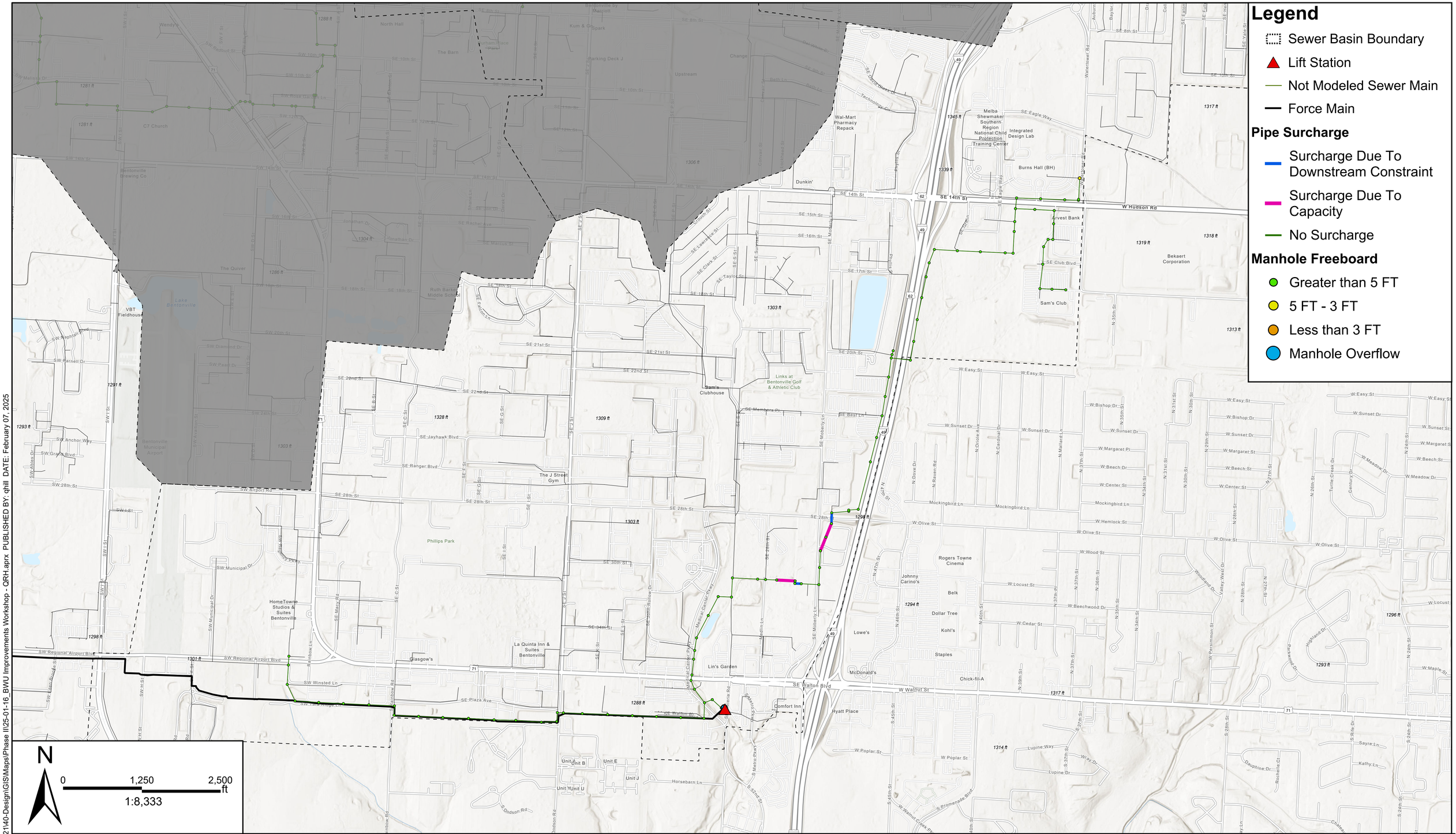

Wet Weather Flow Capacity Evaluation

South Lift Station with Recommended Improvements; 2050 Projected Population

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BWU Modeled Improvements
System Evaluation
February 2025
Bentonville, AR

Figure 13

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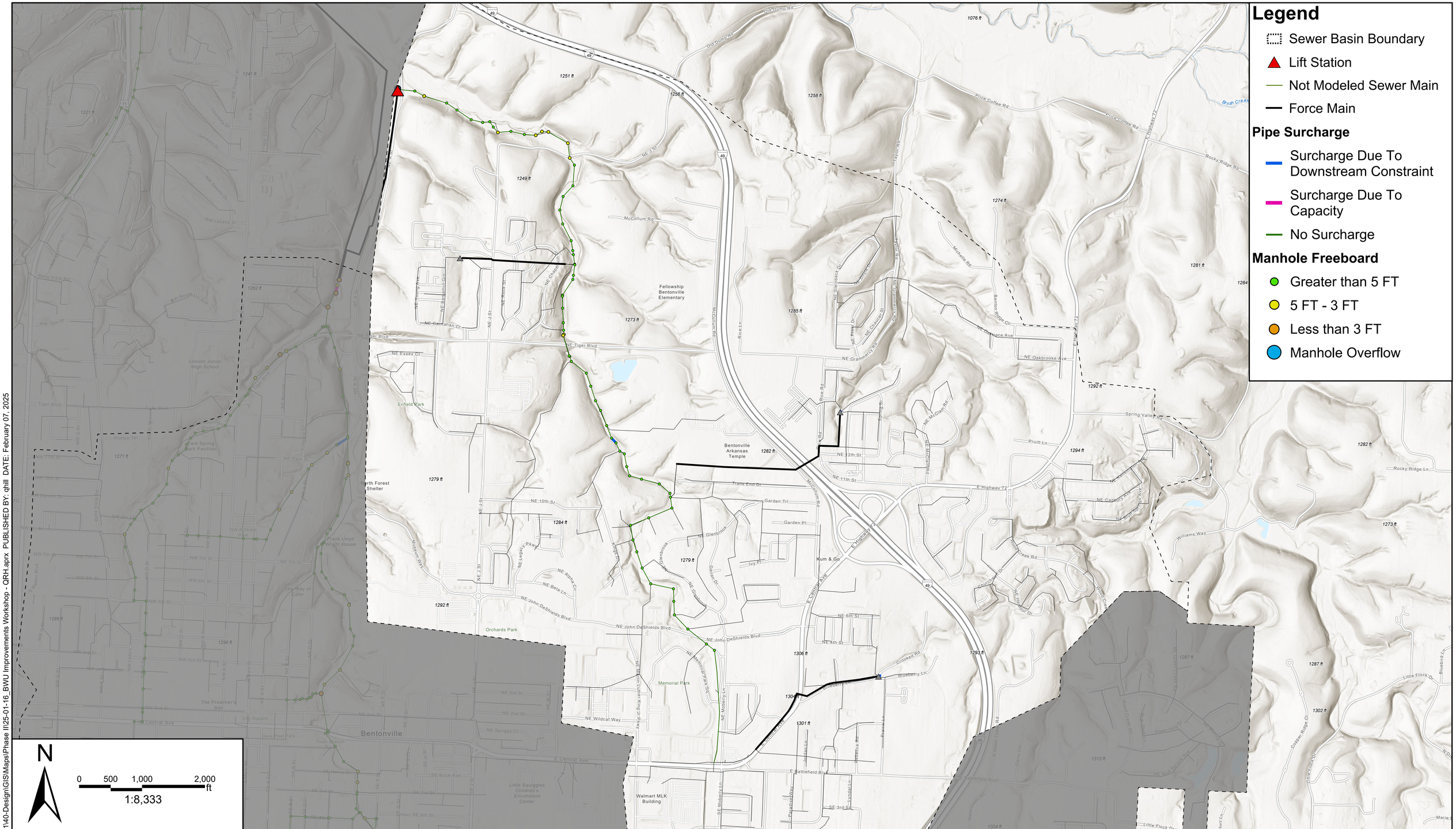
Basemap: ESRI World Imagery



Wet Weather Flow Capacity Evaluation

Shewmaker with Recommended Improvements; 2050 Projected Population

BWU Modeled Improvements
System Evaluation
February 2025
Bentonville, AR

Figure 14

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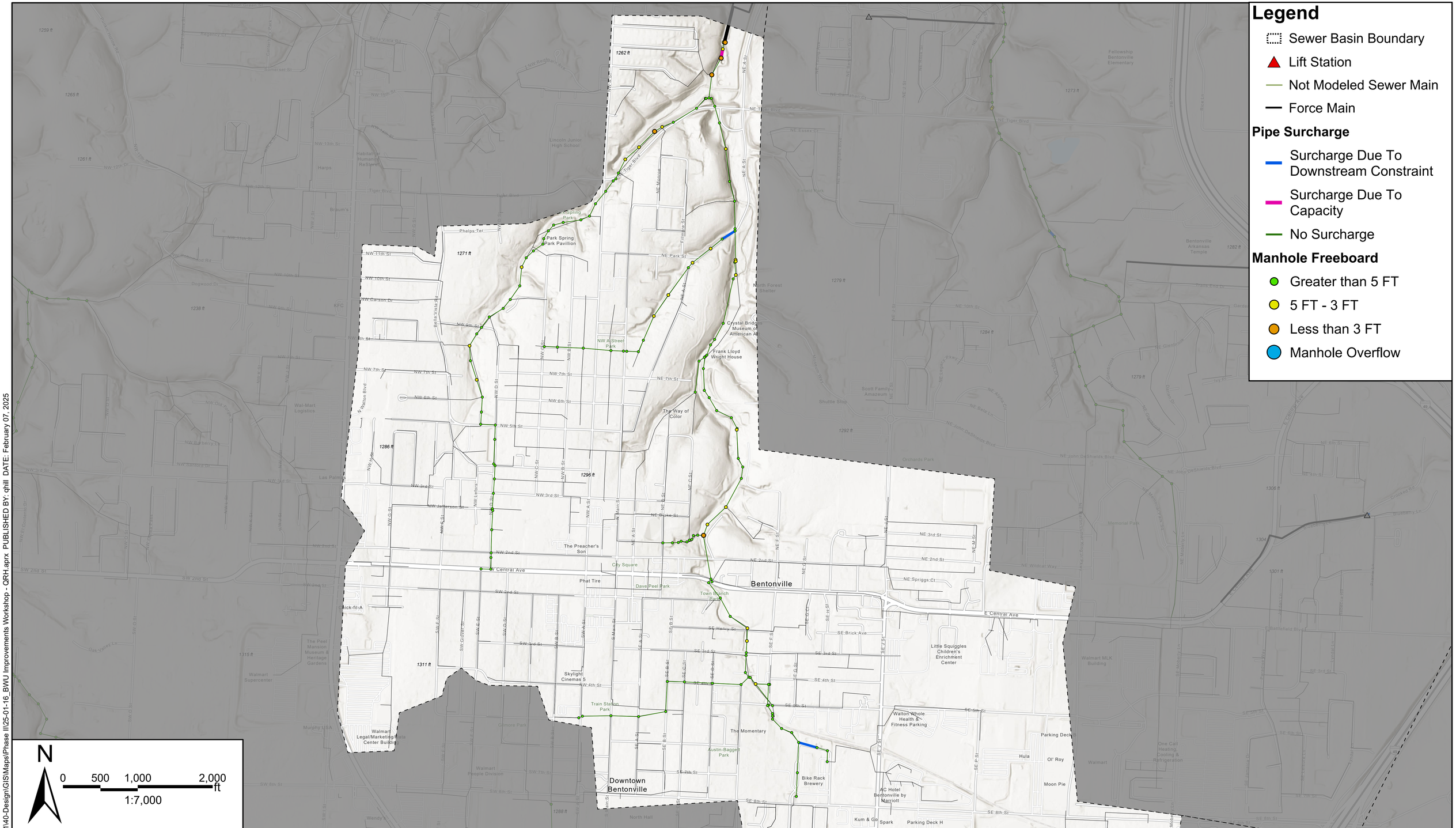
Basemap: ESRI World Imagery



Legend

- ⬚ Sewer Basin Boundary
- ▲ Lift Station
- — Not Modeled Sewer Main
- — Force Main

Pipe Surcharge

- — Surcharge Due To Downstream Constraint
- — Surcharge Due To Capacity
- — No Surcharge

Manhole Freeboard

- ● Greater than 5 FT
- ● 5 FT - 3 FT
- ● Less than 3 FT
- ● Manhole Overflow

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Wet Weather Flow Capacity Evaluation

Town Branch with Recommended Improvements; 2050 Projected Population

BWU Modeled Improvements
System Evaluation
February 2025
Bentonville, AR

Figure 15

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Basemap: ESRI World Imagery

APPENDIX D
10 STATES ANALYSIS SPREADSHEET

Branch Name	US MH	DS MH	Existing Slope (ft/ft)	Length (feet)	Exisiting Diameter (inch)	Existing Pipe Capacity (mgd)	MH Pop.	MH Flow (mgd)	Total Flow (mgd)	Total Pop.	Peak Factor	2050 Peak Flow (mgd)	2050 Peak Flow (cfs)	Proposed Slope (ft/ft)	Proposed Diameter (Inch)	10 States Required Size (inch)	Proposed Pipe Capacity (mgd)	Capacity Limited?	% Full
MK1-G01	236-3997	236-3998	0.0049	315	12	1.58	0	0.000	0	0	4.0	0.000	0.000	0.0049	12	8	1.58	No	0%
	236-3998	236-4000.01	0.0022	266	12	1.06	310	0.031	0.031	310	4.0	0.124	0.192	0.0022	12	8	1.06	No	12%
	236-4000.01	236-4000	0.0022	184	12	1.06	0	0.000	0.031	310	4.0	0.124	0.192	0.0022	12	8	1.06	No	12%
	236-4000	236-3843	0.0029	207	12	1.21	0	0.000	0.031	310	4.0	0.124	0.192	0.0029	12	8	1.21	No	10%
	236-3843	236-4001	0.0022	259	12	1.05	0	0.000	0.031	310	4.0	0.124	0.192	0.0022	12	8	1.05	No	12%
	236-4001	236-4002	0.0022	217	12	1.07	0	0.000	0.031	310	4.0	0.124	0.192	0.0022	12	8	1.07	No	12%
	236-4002	236-4003	0.0020	253	12	1.01	0	0.000	0.031	310	4.0	0.124	0.192	0.0020	12	8	1.01	No	12%
	236-4003	236-3842	0.1276	102	12	8.06	0	0.000	0.031	310	4.0	0.124	0.192	0.1276	12	8	8.06	No	2%
MK1-G02	236-6663	236-3850	0.0012	64	12	0.77	541	0.054	0.0541	541	4.0	0.216	0.335	0.0012	12	8	0.77	No	28%
MK1-G03	277-5532	277-3798	0.0020	348	12	1.00	161	0.016	0.0161	161	4.0	0.064	0.100	0.0020	12	8	1.00	No	6%
	277-3798	277-5531	0.0027	344	12	1.18	122	0.012	0.0283	283	4.0	0.113	0.175	0.0027	12	8	1.18	No	10%
	277-5531	277-3797	0.0167	349	12	2.92	0	0.000	0.0283	283	4.0	0.113	0.175	0.0167	12	8	2.92	No	4%
	277-3797	277-6795	0.0235	162	8	1.17	739	0.074	0.1022	1022	3.8	0.388	0.601	0.0235	8	8	1.17	No	33%
	277-6795	277-3807	0.0274	146	8	1.27	0	0.000	0.1022	1022	3.8	0.388	0.601	0.0274	8	8	1.27	No	31%
MK1-G04	319-3551	319-5516	0.0194	413	8	1.07	2900	0.290	0.29	2900	3.5	1.015	1.570	0.0194	8	8	1.07	No	95%
	319-5516	319-3581	0.0194	398	8	1.07	0	0.000	0.29	2900	3.5	1.015	1.570	0.0194	8	8	1.07	No	95%
	319-3581	319-5517	0.0196	393	8	1.07	68	0.007	0.2968	2968	3.4	1.009	1.561	0.0196	8	8	1.07	No	94%
	319-5517	319-5518	0.0197	304	8	1.08	0	0.000	0.2968	2968	3.4	1.009	1.561	0.0197	8	8	1.08	No	93%
	319-5518	319-3604	0.0184	173	8	1.04	0	0.000	0.2968	2968	3.4	1.009	1.561	0.0184	8	8	1.04	No	97%
	319-3604	319-3587	0.0013	114	8	0.27	0	0.000	0.2968	2968	3.4	1.009	1.561	0.0111	12	18	2.38	No	42%
	319-3587	319-5512	0.0196	242	10	1.94	0	0.000	0.2968	2968	3.4	1.009	1.561	0.0111	12	8	2.38	No	42%
	319-5512	319-5513	0.0127	110	8	0.86	1847	0.185	0.4815	4815	3.3	1.589	2.458	0.0111	12	12	2.38	No	67%
	319-5513	277-3863	0.0084	347	10	1.27	405	0.041	0.522	5220	3.2	1.670	2.584	0.0111	12	12	2.38	No	70%
	277-3863	277-3786	0.0102	258	8	0.77	0	0.000	0.522	5220	3.2	1.670	2.584	0.0102	12	12	2.28	No	73%
	277-3786	277-3803	0.0101	392	10	1.39	0	0.000	0.522	5220	3.2	1.670	2.584	0.0101	12	12	2.26	No	74%
	277-3803	277-3807	0.0121	301	10	1.53	0	0.000	0.522	5220	3.2	1.670	2.584	0.0121	12	12	2.48	No	67%
MK1-G05	277-3807	277-6799	0.0126	51	10	1.56	0	0.000	0.6242	6242	3.2	1.997	3.090	0.0126	12	12	2.53	No	79%
	277-6799	277-3808	0.0123	373	10	1.54	0	0.000	0.6242	6242	3.2	1.997	3.090	0.0123	12	12	2.51	No	80%
	277-3808	277-3790	0.0133	437	10	1.60	0	0.000	0.6242	6242	3.2	1.997	3.090	0.0133	12	12	2.60	No	77%
	277-3790	277-3852	0.0101	256	10	1.40	110	0.011	0.6352	6352	3.1	1.969	3.047	0.0101	12	12	2.27	No	87%
	277-3852	277-3861	0.0108	288	10	1.44	0	0.000	0.6352	6352	3.1	1.969	3.047	0.0108	12	12	2.34	No	84%
	277-3861	277-6588	0.0415	53	18	13.56	630	0.063	0.6982	6982	3.1	2.164	3.349	0.0415	18	12	13.56	No	16%
	277-6588	277-6589	0.0313	49	18	11.77	510	0.051	0.7492	7492	3.1	2.323	3.593	0.0313	18	12	11.77	No	20%
	277-6589	277-3896	0.0069	156	18	5.52	0	0.000	0.7492	7492	3.1	2.323	3.593	0.0069	18	18	5.52	No	42%
	277-3896	277-3882	0.0233	120	18	10.16	0	0.000	0.7492	7492	3.1	2.323	3.593	0.0059	18	12	5.11	No	45%
	277-3882	277-3890	0.0003	103	18	1.10	0	0.000	0.7492	7492	3.1	2.323	3.593	0.0059	18	24	5.11	No	45%
	277-3890	277-3891	0.0011	351	18	2.19	0	0.000	0.7492	7492	3.1	2.323	3.593	0.0059	18	24	5.11	No	45%
	277-3891	277-3883	0.0012	201	18	2.34	0	0.000	0.7492	7492	3.1	2.323	3.593	0.0012	18	18	2.34	No	99%
	277-3883	277-3892	0.0058	493	18	5.07	626	0.063	0.8118	8118	3.0	2.435	3.768	0.0058	18	18	5.07	No	48%
	277-3892	277-3884	0.0166	219	18	8.58	0	0.000	0.8118	8118	3.0	2.435	3.768	0.0110	18	12	6.97	No	35%
	277-3884	277-5545	0.0010	301	18	2.14	0	0.000	0.8118	8118	3.0	2.435	3.768	0.0110	18	24	6.97	No	35%
	277-5545	277-3876	0.0158	384	18	8.35	0	0.000	0.8118	8118	3.0	2.435	3.768	0.0110	18	12	6.97	No	35%
	277-3876	277-5544	0.0030	113	18	3.65	0	0.000	0.8118	8118	3.0	2.435	3.768	0.0030	18	18	3.65	No	67%
	277-5544	277-6652	0.0582	31	18	16.06	0	0.000	0.8118	8118	3.0	2.435	3.768	0.0582	18	12	16.06	No	15%
	277-6652	277-6653	0.0030	137	18	3.62	0	0.000	0.8118	8118	3.0	2.435	3.768	0.0030	18	18	3.62	No	67%
	277-6653	277-6654	0.0022	372	18	3.09	0	0.000	0.8118	8118	3.0	2.435	3.768	0.0022	18	18	3.09	No	79%

Branch Name	US MH	DS MH	Existing Slope (ft/ft)	Length (feet)	Exisiting Diameter (inch)	Existing Pipe Capacity (mgd)	MH Pop.	MH Flow (mgd)	Total Flow (mgd)	Total Pop.	Peak Factor	2050 Peak Flow (mgd)	2050 Peak Flow (cfs)	Proposed Slope (ft/ft)	Proposed Diameter (Inch)	10 States Required Size (inch)	Proposed Pipe Capacity (mgd)	Capacity Limited?	% Full
	277-6654	276-6655	0.0033	502	18	3.81	0	0.000	0.8118	8118	3.0	2.435	3.768	0.0033	18	18	3.81	No	64%
	276-6655	276-6656	0.0020	325	18	2.96	0	0.000	0.8118	8118	3.0	2.435	3.768	0.0020	18	18	3.00	No	81%
	276-6656	236-6657	0.0009	271	18	2.04	0	0.000	0.8118	8118	3.0	2.435	3.768	0.0020	18	24	3.00	No	81%
	236-6657	236-6658	0.0016	401	18	2.68	0	0.000	0.8118	8118	3.0	2.435	3.768	0.0020	18	18	3.00	No	81%
	236-6658	236-3994	0.0011	128	18	2.19	7	0.001	0.8125	8125	3.0	2.438	3.771	0.0020	18	24	3.00	No	81%
	236-3994	236-3993	0.0588	71	18	16.14	0	0.000	0.8125	8125	3.0	2.438	3.771	0.0588	18	12	16.14	No	15%
	236-3993	236-3850	0.0044	110	18	4.40	0	0.000	0.8125	8125	3.0	2.438	3.771	0.0044	18	18	4.40	No	55%
MK1-G06	236-3850	236-6811	0.0017	351	18	2.73	0	0.000	0.8666	8666	3.0	2.600	4.022	0.0017	24	18	5.97	No	44%
	236-6811	236-3842	0.0019	110	18	2.64	0	0.000	0.8666	8666	3.0	2.600	4.022	0.0017	24	18	5.62	No	46%
MK1-G07	236-3842	236-4013	0.0015	171	18	2.36	0	0.000	0.8976	8976	3.0	2.693	4.166	0.0017	24	24	5.97	No	45%
	236-4013	McKisicSmallLS	0.0119	57	18	7.26	0	0.000	0.8976	8976	3.0	2.693	4.166	0.0119	18	18	7.26	No	37%

Branch Name	US MH	DS MH	Existing Slope (ft/ft)	Length	Exisiting Diameter	Existing Pipe Capacity (mgd)	MH Pop.	MH Flow (mgd)	Total Flow (mgd)	Total Pop.	Peak Factor	2050 Peak Flow (mgd)	2050 Peak Flow (cfs)	Proposed Slope	Proposed Diameter (inch)	10 States Required Size, in	Proposed Pipe Capacity (mgd)	Capacity Limited?	% Full
MK2-G01	401-2266	401-2267	0.00239	254.1	12	1.1	149	0.0149	0.0149	149	4.0	0.0596	0.0922148	0.00239	12	8	1	No	5%
	401-2267	401-2257	0.00164	80.1	12	0.9	0	0	0.0149	149	4.0	0.06	0.09	0.00	12	8	1	No	7%
	401-2257	401-2268	0.00274	216.3	12	1.2	0	0	0.0149	149	4.0	0.06	0.09	0.00	12	8	1	No	5%
	401-2268	401-2269	0.00177	263.9	12	1.0	0	0	0.0149	149	4.0	0.06	0.09	0.00	12	8	1	No	6%
	401-2269	401-2272	0.00247	393.3	12	1.1	0	0	0.0149	149	4.0	0.06	0.09	0.00	12	8	1	No	5%
MK2-G02	400-2003	400-2001	0.01997	379.4	12	3.2	2018	0.2018	0.2018	2018	3.6	0.72648	1.1240307	0.01997	12	8	3	No	23%
	400-2001	400-2005	0.01225	265.9	12	2.5	0	0	0.2018	2018	3.6	0.73	1.12	0.01	12	8	3	No	29%
	400-2005	400-2054	0.01224	251.4	12	2.5	0	0	0.2018	2018	3.6	0.73	1.12	0.01	12	8	3	No	29%
	400-2054	401-2278	0.00599	407.1	15	3.2	0	0	0.2018	2018	3.6	0.73	1.12	0.01	15	12	3	No	23%
	401-2278	401-2236	0.00577	229	15	3.1	0	0	0.2018	2018	3.6	0.73	1.12	0.01	15	12	3	No	23%
	401-2236	401-2275	0.00236	114.2	15	2.0	0	0	0.2018	2018	3.6	0.73	1.12	0.00	15	12	2	No	37%
	401-2275	401-2239	0.00825	174.7	15	3.7	0	0	0.2018	2018	3.6	0.73	1.12	0.01	15	12	4	No	20%
	401-2239	401-2203	0.00702	177.3	15	3.4	0	0	0.2018	2018	3.6	0.73	1.12	0.01	15	12	3	No	21%
	401-2203	401-2253	0.00374	73.8	15	2.5	0	0	0.2018	2018	3.6	0.73	1.12	0.00	15	12	3	No	29%
	401-2253	401-2204	0.00654	277.3	15	3.3	253	0.0253	0.2271	2271	3.5	0.79	1.23	0.01	15	12	3	No	24%
	401-2204	401-2276	0.00596	309.6	15	3.2	146	0.0146	0.2417	2417	3.5	0.85	1.31	0.01	15	12	3	No	27%
MK2-G03	401-2271	401-2270	0.00243	49.6	18	3.3	95	0.0095	0.0095	95	4.0	0.038	0.0587947	0.00243	18	8	3	No	1%
	401-2270	401-2259	0.00221	175.1	18	3.1	0	0	0.0095	95	4.0	0.04	0.06	0.00	18	8	3	No	1%
	401-2259	401-2222	0.00264	105.3	18	3.4	0	0	0.0095	95	4.0	0.04	0.06	0.00	18	8	3	No	1%
	401-2222	401-2272	0.00217	159.5	18	3.1	0	0	0.0095	95	4.0	0.04	0.06	0.00	18	8	3	No	1%
MK2-G04	401-2272	401-2218	0.00135	140.8	18	2.5	0	0	0.0244	244	4.0	0.0976	0.1510095	0.00135	18	8	2	No	4%
	401-2218	401-2280	0.00518	42.4	18	4.8	0	0	0.0244	244	4.0	0.10	0.15	0.01	18	8	5	No	2%
	401-2280	401-2209	0.00099	100.8	18	2.1	0	0	0.0244	244	4.0	0.10	0.15	0.00	18	8	2	No	5%
	401-2209	401-2279	0.00182	164.9	18	2.8	0	0	0.0244	244	4.0	0.10	0.15	0.00	18	8	3	No	3%
	401-2279	401-2232	0.00193	197.1	18	2.9	0	0	0.0244	244	4.0	0.10	0.15	0.00	18	8	3	No	3%
	401-2232	401-2276	0.00049	200.9	18	1.5	0	0	0.0244	244	4.0	0.10	0.15	0.00	18	8	1	No	7%
MK2-G05	401-2276	401-2277	0.00627	265.8	18	5.3	0	0	0.2661	2661	3.5	0.93135	1.4410114	0.00627	18	12	5	No	18%
	401-2277	401-2219	0.00444	109.8	18	4.4	0	0	0.2661	2661	3.5	0.93	1.44	0.00	18	12	4	No	21%
	401-2219	401-2220	0.00479	507.8	18	4.6	27	0.0027	0.2688	2688	3.5	0.94	1.46	0.00	18	12	5	No	20%
	401-2220	401-2221	0.00885	107.9	18	6.3	0	0	0.2688	2688	3.5	0.94	1.46	0.01	18	12	6	No	15%
	401-2221	401-1961	0.0032	210	18	3.8	258	0.0258	0.2946	2946	3.4	1.00	1.55	0.00	18	12	4	No	27%
	401-1961	401-1962	0.00534	398.9	18	4.9	639	0.0639	0.3585	3585	3.4	1.22	1.89	0.01	18	12	5	No	25%
	401-1962	401-1999	0.00493	401.7	18	4.7	0	0	0.3585	3585	3.4	1.22	1.89	0.00	18	12	5	No	26%
	401-1999	401-1963	0.0043	192.1	18	4.4	0	0	0.3585	3585	3.4	1.22	1.89	0.00	18	12	4	No	28%
	401-1963	401-6629	0.0043	55.3	18	4.4	320	0.032	0.3905	3905	3.3	1.29	1.99	0.00	18	12	4	No	29%
	401-6629	401-1950	0.0043	132.2	18	4.4	0	0	0.3905	3905	3.3	1.29	1.99	0.00	18	12	4	No	29%
	401-1950	401-1959	0.00673	383.6	18	5.5	0	0	0.3905	3905	3.3	1.29	1.99	0.01	18	12	5	No	24%
	401-1959	401-1960	0.00648	131.7	18	5.4	0	0	0.3905	3905	3.3	1.29	1.99	0.01	18	12	5	No	24%
	401-1960	401-1967	0.00588	139.6	18	5.1	0	0	0.3905	3905	3.3	1.29	1.99	0.01	18	12	5	No	25%
	401-1967	401-1958	0.00496	266.8	18	4.7	0	0	0.3905	3905	3.3	1.29	1.99	0.00	18	12	5	No	27%
	401-1958	401-1957	0.00552	315.9	18	4.9	0	0	0.3905	3905	3.3	1.29	1.99	0.01	18	12	5	No	26%
	401-1957	401-4622	0.01965	138.9	18	9.3	555	0.0555	0.446	4460	3.3	1.47	2.28	0.02	18	12	9	No	16%
	401-4622	401-4621	0.00722	365.8	18	5.7	0	0	0.446	4460	3.3	1.47	2.28	0.01	18	12	6	No	26%

Branch Name	US MH	DS MH	Existing Slope (ft/ft)	Length	Exisiting Diameter	Existing Pipe Capacity (mgd)	MH Pop.	MH Flow (mgd)	Total Flow (mgd)	Total Pop.	Peak Factor	2050 Peak Flow (mgd)	2050 Peak Flow (cfs)	Proposed Slope	Proposed Diameter (inch)	10 States Required Size, in	Proposed Pipe Capacity (mgd)	Capacity Limited?	% Full
	401-4621	401-4603	0.00522	358.5	18	4.8	0	0	0.446	4460	3.3	1.47	2.28	0.01	18	12	5	No	31%
	401-4603	401-4654	0.00797	93.5	18	5.9	0	0	0.446	4460	3.3	1.47	2.28	0.01	18	12	6	No	25%
	401-4654	401-4606	0.00587	174.5	18	5.1	0	0	0.446	4460	3.3	1.47	2.28	0.01	18	12	5	No	29%
	401-4606	402-2407	0.00669	393.2	18	5.5	129	0.0129	0.4589	4589	3.3	1.51	2.34	0.01	18	12	5	No	28%
	402-2407	402-2483	0.00609	267	18	5.2	0	0	0.4589	4589	3.3	1.51	2.34	0.01	18	12	5	No	29%
	402-2483	402-2493	0.00588	398	18	5.1	0	0	0.4589	4589	3.3	1.51	2.34	0.01	18	12	5	No	30%
	402-2493	402-2494	0.008	251.6	18	6.0	0	0	0.4589	4589	3.3	1.51	2.34	0.01	18	12	6	No	25%
	402-2494	402-2495	0.21875	111.8	18	31.1	0	0	0.4589	4589	3.3	1.51	2.34	0.22	18	8	31	No	5%
MK2-G06	359-2761	359-2760	0.01771	165.3	12	3.0	1730	0.173	0.173	1730	3.6	0.6228	0.963614	0.01771	12	8	3	No	21%
	359-2760	359-2777	0.08056	17.3	12	6.4	129	0.0129	0.1859	1859	3.6	0.67	1.04	0.08	12	8	6	No	10%
	359-2777	359-2808	0.02117	151.3	12	3.3	0	0	0.1859	1859	3.6	0.67	1.04	0.02	12	8	3	No	20%
	359-2808	360-2985	0.02079	394.8	12	3.3	0	0	0.1859	1859	3.6	0.67	1.04	0.02	12	8	3	No	21%
	360-2985	360-2987	0.00657	103.7	18	5.4	0	0	0.1859	1859	3.6	0.67	1.04	0.01	18	12	5	No	12%
MK2-G07	360-6521	360-6520	0.02059	247.6	12	3.2	2905	0.2905	0.2905	2905	3.5	1.01675	1.5731447	0.02059	12	8	3	No	31%
	360-6520	360-6519	0.01571	285.8	12	2.8	0	0	0.2905	2905	3.5	1.02	1.57	0.02	12	12	3	No	36%
	360-6519	360-6518	0.01178	213.4	12	2.5	0	0	0.2905	2905	3.5	1.02	1.57	0.01	12	12	2	No	42%
	360-6518	360-3179	0.01551	10.8	12	2.8	0	0	0.2905	2905	3.5	1.02	1.57	0.02	12	12	3	No	36%
	360-3179	360-3187	0.10052	48.5	12	7.2	0	0	0.2905	2905	3.5	1.02	1.57	0.10	12	8	7	No	14%
MK2-G08	403-15	403-17	0.00248	495.8	12	1.1	794	0.0794	0.0794	794	3.9	0.30966	0.4791148	0.00248	12	8	1	No	27%
	403-17	403-18	0.00233	286.5	12	1.1	1631	0.1631	0.2425	2425	3.5	0.85	1.31	0.00	12	12	1	No	78%
	403-18	403-26	0.00141	168.7	12	0.9	0	0	0.2425	2425	3.5	0.85	1.31	0.00	18	12	3	No	34%
	403-26	403-9	0.00239	187.2	12	1.1	0	0	0.2425	2425	3.5	0.85	1.31	0.00	18	12	3	No	26%
	403-9	403-25	0.00104	175.4	12	0.7	0	0	0.2425	2425	3.5	0.85	1.31	0.00	18	18	2	No	39%
	403-25	403-7	0.00152	117.1	12	0.9	0	0	0.2425	2425	3.5	0.85	1.31	0.00	18	12	3	No	33%
	403-7	403-3	0.00205	377.1	12	1.0	0	0	0.2425	2425	3.5	0.85	1.31	0.00	18	12	3	No	28%
	403-3	403-35	0.00245	29.4	12	1.1	1372	0.1372	0.3797	3797	3.4	1.29	2.00	0.00	18	18	3	No	39%
	403-35	403-4	0.0014	190.6	12	0.8	0	0	0.3797	3797	3.4	1.29	2.00	0.00	18	18	2	No	52%
	403-4	403-656	0.00279	288.1	12	1.2	0	0	0.3797	3797	3.4	1.29	2.00	0.00	18	18	4	No	37%
	403-656	403-21.01	0.00279	60.2	12	1.2	476	0.0476	0.4273	4273	3.3	1.41	2.18	0.00	18	18	4	No	40%
	403-21.01	403-21	0.00279	290.1	12	1.2	0	0	0.4273	4273	3.3	1.41	2.18	0.00	18	18	4	No	40%
	403-21	403-149	0.00372	330.2	12	1.4	0	0	0.4273	4273	3.3	1.41	2.18	0.00	18	18	4	No	35%
	403-149	403-148	0.00245	60	18	3.3	0	0	0.4273	4273	3.3	1.41	2.18	0.00	18	18	3	No	43%
	403-148	403-155	0.00376	73.5	18	4.1	2526	0.2526	0.6799	6799	3.1	2.11	3.26	0.00	18	18	4	No	52%
	403-155	403-154	0.00318	79.4	18	3.8	0	0	0.6799	6799	3.1	2.11	3.26	0.00	18	18	4	No	56%
	403-154	403-2138	0.01357	162.6	18	7.8	0	0	0.6799	6799	3.1	2.11	3.26	0.01	18	12	8	No	27%
	403-2138	403-2142	0.01064	58.8	18	6.9	1527	0.1527	0.8326	8326	3.0	2.50	3.86	0.01	18	18	7	No	36%
	403-2142	403-2151	0.0014	305.1	18	2.5	6	0.0006	0.8332	8332	3.0	2.50	3.87	0.00	24	18	5	No	47%
	403-2151	403-6576	0.00169	336.2	18	2.7	0	0	0.8332	8332	3.0	2.50	3.87	0.00	24	18	6	No	42%
	403-6576	403-2155	0.00119	352.4	18	2.3	0	0	0.8332	8332	3.0	2.50	3.87	0.00	24	24	5	No	51%
	403-2155	403-2137	0.00236	243.2	18	3.2	0	0	0.8332	8332	3.0	2.50	3.87	0.00	24	18	7	No	36%
	403-2137	402-1918	0.00286	555.2	18	3.6	192	0.0192	0.8524	8524	3.0	2.56	3.96	0.00	18	18	4	No	72%
	402-1918	402-1917	0.00285	68	24	7.7	0	0	0.8524	8524	3.0	2.56	3.96	0.00	24	18	8	No	33%
	402-1917	402-1920	0.00128	487.1	24	5.1	0	0	0.8524	8524	3.0	2.56	3.96	0.00	24	24	5	No	50%

Branch Name	US MH	DS MH	Existing Slope (ft/ft)	Length	Exisiting Diameter	Existing Pipe Capacity (mgd)	MH Pop.	MH Flow (mgd)	Total Flow (mgd)	Total Pop.	Peak Factor	2050 Peak Flow (mgd)	2050 Peak Flow (cfs)	Proposed Slope	Proposed Diameter (inch)	10 States Required Size, in	Proposed Pipe Capacity (mgd)	Capacity Limited?	% Full
	402-1920	402-1911	0.00128	486.4	24	5.1	0	0	0.8524	8524	3.0	2.56	3.96	0.00	24	24	5	No	50%
	402-1911	402-1913	0.00128	357.9	24	5.1	0	0	0.8524	8524	3.0	2.56	3.96	0.00	24	24	5	No	50%
	402-1913	402-1928	0.00128	299.3	24	5.1	0	0	0.8524	8524	3.0	2.56	3.96	0.00	24	24	5	No	50%
	402-1928	402-1929	0.00128	372.4	24	5.1	2886	0.2886	1.141	11410	2.9	3.31	5.12	0.00	24	24	5	No	65%
	402-1929	402-1916	0.00117	279.6	24	4.9	0	0	1.141	11410	2.9	3.31	5.12	0.00	24	24	5	No	67%
	402-1916	402-1914	0.00076	93.7	24	3.9	0	0	1.141	11410	2.9	3.31	5.12	0.00	24	24	4	No	84%
	402-1914	402-1915	0.00026	285.4	24	2.3	0	0	1.141	11410	2.9	3.31	5.12	0.00	24	24	4	No	84%
	402-1915	402-1915A	0.00122	314.5	24	5.0	0	0	1.141	11410	2.9	3.31	5.12	0.00	24	24	4	No	84%
	402-1915A	402-1922	0.00363	159.1	24	8.6	0	0	1.141	11410	2.9	3.31	5.12	0.00	24	18	9	No	38%
	402-1922	402-4588	0.00394	277.1	24	9.0	293	0.0293	1.1703	11703	2.9	3.39	5.25	0.00	24	18	9	No	38%
	402-4588	402-4592	0.01031	119.5	24	14.6	0	0	1.1703	11703	2.9	3.39	5.25	0.01	24	18	15	No	23%
	402-4592	402-4591	0.02163	261.4	24	21.1	0	0	1.1703	11703	2.9	3.39	5.25	0.02	24	18	21	No	16%
	402-4591	402-4593	0.01649	211	24	18.4	0	0	1.1703	11703	2.9	3.39	5.25	0.02	24	18	18	No	18%
	402-4593	402-2471	0.01649	234.7	24	18.4	0	0	1.1703	11703	2.9	3.39	5.25	0.02	24	18	18	No	18%
	402-2471	402-2478	0.01649	226.3	24	18.4	0	0	1.1703	11703	2.9	3.39	5.25	0.02	24	18	18	No	18%
	402-2478	402-2403	0.02274	454.7	24	21.6	0	0	1.1703	11703	2.9	3.39	5.25	0.02	24	12	22	No	16%
	402-2403	402-2404	0.02921	240.4	24	24.5	805	0.0805	1.2508	12508	2.9	3.63	5.61	0.03	24	12	25	No	15%
	402-2404	402-2479	0.00995	293.5	24	14.3	0	0	1.2508	12508	2.9	3.63	5.61	0.01	24	18	14	No	25%
	402-2479	402-2480	0.00982	210.9	24	14.2	0	0	1.2508	12508	2.9	3.63	5.61	0.01	24	18	14	No	26%
	402-2480	402-2472	0.02886	208.2	24	24.4	0	0	1.2508	12508	2.9	3.63	5.61	0.03	24	12	24	No	15%
	402-2472	402-2473	0.02461	232.5	24	22.5	58	0.0058	1.2566	12566	2.9	3.64	5.64	0.02	24	18	22	No	16%
	402-2473	402-2475	0.02396	169.8	24	22.2	0	0	1.2566	12566	2.9	3.64	5.64	0.02	24	18	22	No	16%
	402-2475	402-2474	0.02452	227.8	24	22.5	0	0	1.2566	12566	2.9	3.64	5.64	0.02	24	18	22	No	16%
	402-2474	402-2497	0.01225	87.5	24	15.9	0	0	1.2566	12566	2.9	3.64	5.64	0.01	24	18	16	No	23%
	402-2497	402-2496	0.00514	37	24	10.3	191	0.0191	1.2757	12757	2.8	3.57	5.53	0.01	24	18	10	No	35%
	402-2496	402-2405	0.02566	167.4	24	23.0	0	0	1.2757	12757	2.8	3.57	5.53	0.03	24	12	23	No	16%
	402-2405	402-2484	0.00324	134.2	24	8.2	0	0	1.2757	12757	2.8	3.57	5.53	0.00	24	18	8	No	44%
	402-2484	402-2495	0.01515	167	24	17.6	0	0	1.2757	12757	2.8	3.57	5.53	0.02	24	18	18	No	20%
MK2-G09	402-2495	402-2492	0.01118	280.3	24	15.2	0	0	1.478	17346	2.7	3.9906	6.1743707	0.01118	24	18	15	No	26%
	402-2492	402-2491	0.04435	88.4	24	30.2	67	0.0067	1.4847	17413	2.7	4.01	6.20	0.04	24	12	30	No	13%
	402-2491	402-2481	0.00151	231	24	5.6	0	0	1.4847	17413	2.7	4.01	6.20	0.00	24	24	6	No	72%
	402-2481	402-2482	0.00188	133.6	24	6.2	0	0	1.4847	17413	2.7	4.01	6.20	0.00	24	24	6	No	62%
	402-2482	402-5402	0.00059	177.8	24	3.5	0	0	1.4847	17413	2.7	4.01	6.20	0.00	24	24	6	No	62%
	402-5402	402-6677	0.00335	132.4	24	8.3	0	0	1.4847	17413	2.7	4.01	6.20	0.00	24	24	6	No	62%
	402-6677	360-2963	0.04272	226.6	24	29.6	0	0	1.4847	17413	2.7	4.01	6.20	0.04	24	12	30	No	14%
	360-2963	360-2964	0.00475	110.2	24	9.9	0	0	1.4847	17413	2.7	4.01	6.20	0.00	24	18	10	No	41%
	360-2964	360-2965	0.02412	248.6	24	22.3	0	0	1.4847	17413	2.7	4.01	6.20	0.02	24	18	22	No	18%
	360-2965	360-2987	0.04002	115.1	24	28.7	0	0	1.4847	17413	2.7	4.01	6.20	0.04	24	12	29	No	14%
MK2-G10	360-2987	360-2986	0.00987	15.3	24	14.2	0	0	1.6706	19272	2.7	4.51062	6.9789605	0.00987	24	18	14	No	32%
	360-2986	360-2948	0.00145	256.8	24	5.5	0	0	1.6706	19272	2.7	4.51	6.98	0.00	24	24	5	No	83%
	360-2948	360-2966	0.02341	198.3	24	21.9	0	0	1.6706	19272	2.7	4.51	6.98	0.02	24	18	22	No	21%
	360-2966	360-2983	0.02251	297.7	24	21.5	0	0	1.6706	19272	2.7	4.51	6.98	0.02	24	18	22	No	21%
	360-2983	360-6837	0.02815	22.7	24	24.1	686	0.0686	1.7392	19958	2.7	4.70	7.27	0.03	24	18	24	No	20%

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	360-6837	360-6838	0.00378	128	24	8.8	0	0	1.7392	19958	2.7	4.70	7.27	0.00	24	24	9	No	53%
	360-6838	360-6839	0.01132	22.1	24	15.3	0	0	1.7392	19958	2.7	4.70	7.27	0.01	24	18	15	No	31%
	360-6839	360-2981	0.00163	239.8	24	5.8	0	0	1.7392	19958	2.7	4.70	7.27	0.00	24	24	6	No	81%
	360-2981	360-3005	0.02094	269.7	24	20.7	0	0	1.7392	19958	2.7	4.70	7.27	0.02	24	18	21	No	23%
	360-3005	360-3002	0.00469	178.6	24	9.8	0	0	1.7392	19958	2.7	4.70	7.27	0.00	24	24	10	No	48%
	360-3002	360-3004	0.00117	216.5	24	4.9	194	0.0194	1.7586	20152	2.6	4.57	7.07	0.00	30	24	9	No	51%
	360-3004	360-3184	0.00117	500.3	24	4.9	0	0	1.7586	20152	2.6	4.57	7.07	0.00	30	24	9	No	51%
	360-3184	360-3185	0.01332	161.4	24	16.6	0	0	1.7586	20152	2.6	4.57	7.07	0.01	24	18	17	No	28%
	360-3185	360-3186	0.0126	242.5	24	16.1	155	0.0155	1.7741	20307	2.6	4.61	7.14	0.01	24	18	16	No	29%
	360-3186	360-3177	0.00739	209.8	24	12.3	0	0	1.7741	20307	2.6	4.61	7.14	0.01	24	18	12	No	37%
	360-3177	360-3178	0.00745	288.4	24	12.4	0	0	1.7741	20307	2.6	4.61	7.14	0.00	24	18	10	No	46%
	360-3178	360-3187	0.00041	162.7	24	2.9	0	0	1.7741	20307	2.6	4.61	7.14	0.00	24	18	10	No	46%
MK2-G11	360-3187	360-3176	0.00973	308.4	24	14.1	0	0	2.0646	23212	2.6	5.36796	8.3054615	0.00973	24	18	14	No	38%
	360-3176	360-3175A	0.00985	203.3	24	14.2	0	0	2.0646	23212	2.6	5.37	8.31	0.01	24	18	14	No	38%
	360-3175A	360-3175	0.00862	171.8	24	13.3	0	0	2.0646	23212	2.6	5.37	8.31	0.01	24	18	13	No	40%
	360-3175	360-3196	0.00229	211.2	24	6.9	0	0	2.0646	23212	2.6	5.37	8.31	0.00	24	24	7	No	78%
	360-3196	360-3194	0.00506	599	24	10.2	0	0	2.0646	23212	2.6	5.37	8.31	0.01	24	24	10	No	53%
	360-3194	360-3195	0.01323	279.3	24	16.5	428	0.0428	2.1074	23640	2.6	5.48	8.48	0.01	24	18	16	No	33%
	360-3195	317-3718	0.01369	119.3	24	16.8	0	0	2.1074	23640	2.6	5.48	8.48	0.01	24	18	17	No	33%
	317-3718	317-3720	0.00949	165.3	24	14.0	0	0	2.1074	23640	2.6	5.48	8.48	0.01	24	18	14	No	39%
	317-3720	317-3721	0.01228	197.5	24	15.9	0	0	2.1074	23640	2.6	5.48	8.48	0.01	24	18	16	No	34%
	317-3721	317-3722	0.00163	483.6	24	5.8	0	0	2.1074	23640	2.6	5.48	8.48	0.00	30	24	11	No	52%
	317-3722	318-3694	0.00579	437.4	24	10.9	0	0	2.1074	23640	2.6	5.48	8.48	0.01	24	24	11	No	50%
	318-3694	318-3695	0.01036	390.8	24	14.6	0	0	2.1074	23640	2.6	5.48	8.48	0.01	24	18	15	No	38%
	318-3695	317-3723	0.00915	220.2	24	13.7	0	0	2.1074	23640	2.6	5.48	8.48	0.01	24	18	14	No	40%
	317-3723	317-3719	0.00873	229.7	24	13.4	0	0	2.1074	23640	2.6	5.48	8.48	0.01	24	18	13	No	41%
	317-3719	317-3724	0.00552	478	24	10.7	0	0	2.1074	23640	2.6	5.48	8.48	0.01	24	24	11	No	51%
	317-3724	317-5022	0.00424	219.5	24	9.3	0	0	2.1074	23640	2.6	5.48	8.48	0.00	24	24	9	No	59%
	317-5022	317-5023	0.0033	602.8	24	8.2	628	0.0628	2.1702	24268	2.6	5.64	8.73	0.00	24	24	8	No	68%
	317-5023	317-5021	0.01783	391.1	24	19.1	0	0	2.1702	24268	2.6	5.64	8.73	0.02	24	18	19	No	29%
	317-5021	318-3696	0.00252	235.5	24	7.2	288	0.0288	2.199	24556	2.6	5.72	8.85	0.00	30	24	13	No	44%
	318-3696	318-3697	0.00263	300.3	24	7.4	0	0	2.199	24556	2.6	5.72	8.85	0.00	30	24	13	No	43%
	318-3697	318-3698	0.00177	354.1	24	6.0	0	0	2.199	24556	2.6	5.72	8.85	0.00	30	24	11	No	52%
	318-3698	318-3699	0.0027	190.1	24	7.5	0	0	2.199	24556	2.6	5.72	8.85	0.00	24	24	7	No	77%
	318-3699	318-3701	0.00293	223.1	24	7.8	0	0	2.199	24556	2.6	5.72	8.85	0.00	24	24	8	No	74%
	318-3701	318-3702	0.00426	250.9	24	9.4	0	0	2.199	24556	2.6	5.72	8.85	0.00	24	24	9	No	61%
	318-3702	318-3700	0.00837	528.1	24	13.1	377	0.0377	2.2367	24933	2.6	5.82	9.00	0.01	24	18	13	No	44%
	318-3700	276-3957	0.00374	439.6	24	8.8	0	0	2.2367	24933	2.6	5.82	9.00	0.00	24	24	9	No	66%
	276-3957	276-3954	0.00383	391.7	24	8.9	14	0.0014	2.2381	24947	2.6	5.82	9.00	0.00	24	24	9	No	66%
	276-3954	276-3958	0.00401	401.7	24	9.1	0	0	2.2381	24947	2.6	5.82	9.00	0.00	24	24	9	No	64%
	276-3958	276-3956	0.00213	546.7	24	6.6	0	0	2.2381	24947	2.6	5.82	9.00	0.00	30	24	12	No	48%
	276-3956	276-3955	0.00201	401.7	24	6.4	586	0.0586	2.2967	25533	2.5	5.74	8.88	0.00	30	24	12	No	49%
	276-3955	276-3931	0.00189	417.6	24	6.2	0	0	2.2967	25533	2.5	5.74	8.88	0.00	30	24	11	No	51%

Branch Name	US MH	DS MH	Existing Slope (ft/ft)	Length	Exisiting Diameter	Existing Pipe Capacity (mgd)	MH Pop.	MH Flow (mgd)	Total Flow (mgd)	Total Pop.	Peak Factor	2050 Peak Flow (mgd)	2050 Peak Flow (cfs)	Proposed Slope	Proposed Diameter (inch)	10 States Required Size, in	Proposed Pipe Capacity (mgd)	Capacity Limited?	% Full
	276-3931	276-3916	0.00402	450.6	24	9.1	0	0	2.2967	25533	2.5	5.74	8.88	0.00	24	24	9	No	63%
	276-3916	276-3918	0.00273	538.1	24	7.5	0	0	2.2967	25533	2.5	5.74	8.88	0.00	30	24	14	No	42%
	276-3918	276-4441	0.00128	506.1	24	5.1	364	0.0364	2.3331	25897	2.5	5.83	9.02	0.00	30	30	9	No	63%
	276-4441	276-5722	0.00267	516.6	24	7.4	0	0	2.3331	25897	2.5	5.83	9.02	0.00	30	24	13	No	43%
	276-5722	276-5723	0.00205	463.4	24	6.5	0	0	2.3331	25897	2.5	5.83	9.02	0.00	30	24	12	No	50%
	276-5723	276-4444	0.00267	466.3	24	7.4	0	0	2.3331	25897	2.5	5.83	9.02	0.00	30	24	13	No	43%
	276-4444	276-5724	0.00174	327	24	6.0	0	0	2.3331	25897	2.5	5.83	9.02	0.00	30	24	11	No	54%
	276-5724	276-5725	0.00262	416	24	7.3	0	0	2.3331	25897	2.5	5.83	9.02	0.00	30	24	12	No	48%
	276-5725	276-6660	0.00163	205.5	24	5.4	0	0	2.3331	25897	2.5	5.83	9.02	0.00	30	24	12	No	48%
	276-6660	276-6659	0.00311	80.6	30	13.9	0	0	2.3331	25897	2.5	5.83	9.02	0.00	30	24	14	No	42%
	276-6659	236-6662	0.00134	600.7	30	9.1	317	0.0317	2.3648	26214	2.5	5.91	9.15	0.00	30	30	9	No	65%
	236-6662	236-4008	0.0015	238.8	36	16.4	0	0	2.3648	26214	2.5	5.91	9.15	0.00	36	30	16	No	36%

Branch Name	US MH	DS MH	Existing Slope (ft/ft)	Length (feet)	Exisiting Diameter (inch)	Existing Pipe Capacity (mgd)	MH Pop.	MH Flow (mgd)	Total Flow	Total Pop.	Peak Factor	2050 Peak Flow (mgd)	2050 Peak Flow (cfs)	Proposed Slope (ft/ft)	Proposed Diameter	10 States Required Size, in	Proposed Capacity	Capacity Limited?	% Full
TB-G01	404-191	404-213	0.0138	146.4	10	1.63	3	0.0003	0.0003	3	4.0	0.0012	0.00186	0.0138	18	8	7.81	No	0%
	404-213	404-6313	0.0112	145.3	10	1.47	0	0.0000	0.0003	3	4.0	0.0012	0.00186	0.0112	18	8	7.05	No	0%
	404-6313	404-680	0.0039	255.4	10	0.86	0	0.0000	0.0003	3	4.0	0.0012	0.00186	0.0039	18	8	4.14	No	0%
TB-G02	404-225	404-226	0.0564	18.2	12	5.36	226	0.0226	0.0226	226	4.0	0.0904	0.13987	0.0564	12	8	5.36	No	2%
TB-G04	404-194	404-199	0.0529	15.3	12	5.19	46	0.0046	0.0046	46	4.0	0.0184	0.02847	0.0529	12	8	5.19	No	0%
TB-G05	404-210	404-192	0.0011	317.1	12	0.74	3148	0.3148	0.3148	3148	3.4	1.0703	1.65603	0.0011	24	18	4.69	No	23%
	404-192	404-680	0.0044	405.4	12	1.49	5	0.0005	0.3153	3153	3.4	1.0720	1.65866	0.0044	18	12	4.39	No	24%
TB-G06	404-680	404-6461	0.0045	161	12	1.52	0	0.0000	0.3156	3156	3.4	1.0730	1.66024	0.0045	24	12	9.63	No	11%
	404-6461	404-6460	0.0045	145.3	12	1.52	0	0.0000	0.3156	3156	3.4	1.0730	1.66024	0.0045	24	12	9.65	No	11%
	404-6460	404-228	0.0045	175.1	12	1.52	0	0.0000	0.3156	3156	3.4	1.0730	1.66024	0.0045	24	12	9.65	No	11%
	404-228	404-682	0.0045	41.6	12	1.52	0	0.0000	0.3156	3156	3.4	1.0730	1.66024	0.0045	24	12	9.65	No	11%
	404-682	404-221	0.0045	32.7	12	1.52	208	0.0208	0.3364	3364	3.4	1.1438	1.76966	0.0045	24	12	9.65	No	12%
	404-221	404-226	0.0098	126.1	12	2.24	0	0.0000	0.3364	3364	3.4	1.1438	1.76966	0.0098	18	12	6.59	No	17%
TB-G07	404-226	404-199	0.0034	283	12	1.32	0	0.0000	0.3590	3590	3.4	1.2206	1.88855	0.0034	24	12	8.37	No	15%
TB-G08	404-199	404-193	0.0112	172.5	12	2.39	0	0.0000	0.3636	3636	3.4	1.2362	1.91275	0.0112	24	12	15.19	No	8%
TB-G09	404-681	404-193	0.0038	367.8	15	2.52	0	0.0000	0.3636	3636	3.4	1.2362	1.91275	0.0038	15	12	2.52	No	49%
TB-G10	404-193	404-198	0.0063	112.3	15	3.26	0	0.0000	0.3361	3636	3.4	1.1427	1.76808	0.0044	24	12	9.48	No	12%
	404-198	404-171	0.0063	19.8	15	3.26	0	0.0000	0.3361	3636	3.4	1.1427	1.76808	0.0063	24	12	11.40	No	10%
TB-G11	403-566	403-552	0.0031	52.6	12	1.25	29	0.0029	0.0029	29	4.0	0.0116	0.01795	0.0031	12	8	1.25	No	1%
	403-552	403-598	0.0039	381	8	0.48	0	0.0000	0.0029	29	4.0	0.0116	0.01795	0.0039	8	8	0.48	No	2%
	403-598	403-597	0.0026	370.4	12	1.14	0	0.0000	0.0029	29	4.0	0.0116	0.01795	0.0026	12	8	1.14	No	1%
	403-597	403-545	0.0028	368.6	12	1.2	0	0.0000	0.0029	29	4.0	0.0116	0.01795	0.0028	12	8	1.20	No	1%
	403-545	403-544	0.0072	403	12	1.92	1149	0.1149	0.1178	1178	3.8	0.4476	0.69260	0.0072	12	8	1.92	No	23%
	403-544	403-584	0.0040	229.3	12	1.43	341	0.0341	0.1519	1519	3.7	0.5620	0.86959	0.0040	12	12	1.43	No	39%
	403-584	404-205	0.0041	373.4	12	1.45	0	0.0000	0.1519	1519	3.7	0.5620	0.86959	0.0041	12	12	1.45	No	39%
	404-205	404-176	0.0041	384.2	12	1.44	251	0.0251	0.1770	1770	3.6	0.6372	0.98589	0.0041	12	12	1.44	No	44%
	404-176	404-171	0.0285	143.8	12	3.81	0	0.0000	0.1770	1770	3.6	0.6372	0.98589	0.0285	12	8	3.81	No	17%
TB-G12	361-314	361-293	0.0777	128.5	12	6.29	586	0.0586	0.0586	586	3.9	0.2285	0.35360	0.0777	12	8	6.29	No	4%
	361-293	361-282	0.1577	78.5	12	8.97	0	0.0000	0.0586	586	3.9	0.2285	0.35360	0.1577	12	8	8.97	No	3%
	361-282	361-338	0.0475	41.1	12	4.92	0	0.0000	0.0586	586	3.9	0.2285	0.35360	0.0475	12	8	4.92	No	5%
	361-338	362-714.06	0.0515	78	12	5.12	0	0.0000	0.0586	586	3.9	0.2285	0.35360	0.0515	12	8	5.12	No	4%
	362-714.06	362-714.05	0.0476	40	12	4.93	0	0.0000	0.0586	586	3.9	0.2285	0.35360	0.0476	12	8	4.93	No	5%
	362-714.05	362-714.04	0.0407	33.9	12	4.56	257	0.0257	0.0843	843	3.8	0.3203	0.49564	0.0407	12	8	4.56	No	7%
	362-714.04	362-714.03	0.0039	57.1	12	1.41	0	0.0000	0.0843	843	3.8	0.3203	0.49564	0.0039	12	8	1.41	No	23%
	362-714.03	362-714.02	0.0442	56.8	12	4.74	0	0.0000	0.0843	843	3.8	0.3203	0.49564	0.0442	12	8	4.74	No	7%
	362-714.02	362-714.01	0.0082	79.1	12	2.04	0	0.0000	0.0843	843	3.8	0.3203	0.49564	0.0082	12	8	2.04	No	16%
TB-G13	361-4709	361-4708	0.0212	417.8	24	20.88	624	0.0624	0.0624	624	3.9	0.2434	0.37653	0.0212	24	8	20.88	No	1%
	361-4708	362-3167.01	0.0090	87.7	24	13.62	0	0.0000	0.0624	624	3.9	0.2434	0.37653	0.0090	24	8	13.62	No	2%
	362-3167.01	362-3167	0.0502	12.7	24	32.13	0	0.0000	0.0624	624	3.9	0.2434	0.37653	0.0502	24	8	32.13	No	1%
TB-G14	361-609	361-618	0.0013	175.8	12	0.81	10	0.0010	0.0010	10	4.0	0.0040	0.00619	0.0013	12	8	0.81	No	0%
	361-618	361-620	0.0023	346.4	12	1.08	274	0.0274	0.0284	284	4.0	0.1136	0.17577	0.0023	12	8	1.08	No	11%
	361-620	361-623	0.0008	371.5	12	0.65	0	0.0000	0.0284	284	4.0	0.1136	0.17577	0.0008	12	8	0.65	No	17%
	361-623	361-624A	0.0078	167.6	12	2	235	0.0235	0.0519	519	4.0	0.2076	0.32120	0.0078	12	8	2.00	No	10%

Branch Name	US MH	DS MH	Existing Slope (ft/ft)	Length (feet)	Exisiting Diameter (inch)	Existing Pipe Capacity (mgd)	MH Pop.	MH Flow (mgd)	Total Flow	Total Pop.	Peak Factor	2050 Peak Flow (mgd)	2050 Peak Flow (cfs)	Proposed Slope (ft/ft)	Proposed Diameter	10 States Required Size, in	Proposed Capacity	Capacity Limited?	% Full
	361-624A	361-624	0.0323	43.6	12	4.06	0	0.0000	0.0519	519	4.0	0.2076	0.32120	0.0323	12	8	4.06	No	5%
	361-624	361-642	0.0018	155.9	12	0.96	0	0.0000	0.0519	519	4.0	0.2076	0.32120	0.0018	12	8	0.96	No	22%
	361-642	361-645	0.0056	166.9	10	1.04	200	0.0200	0.0719	719	3.9	0.2804	0.43386	0.0056	10	8	1.04	No	27%
	361-645	361-646	0.0933	351.7	10	4.24	0	0.0000	0.0719	719	3.9	0.2804	0.43386	0.0933	10	8	4.24	No	7%
	361-646	361-616	0.0071	341.8	10	1.17	0	0.0000	0.0719	719	3.9	0.2804	0.43386	0.0071	10	8	1.17	No	24%
	361-616	361-627	0.0098	453.2	10	1.37	0	0.0000	0.0719	719	3.9	0.2804	0.43386	0.0098	10	8	1.37	No	20%
	361-627	361-626	0.0212	86.7	10	2.02	263	0.0263	0.0982	982	3.8	0.3732	0.57736	0.0212	10	8	2.02	No	18%
	361-626	362-522	0.0530	306.7	8	1.76	0	0.0000	0.0982	982	3.8	0.3732	0.57736	0.0530	8	8	1.76	No	21%
	362-522	362-3162	0.0960	198.9	8	2.37	0	0.0000	0.0982	982	3.8	0.3732	0.57736	0.0960	8	8	2.37	No	16%
	362-3162	362-3161	0.1111	204.9	8	2.55	0	0.0000	0.0982	982	3.8	0.3732	0.57736	0.1111	8	8	2.55	No	15%
TB-G15	361-357	361-356	0.0017	131	12	0.92	1503	0.1503	0.1503	1503	3.7	0.5561	0.86043	0.0017	12	12	0.92	No	60%
	361-356	361-6080	0.0014	155.5	12	0.85	0	0.0000	0.1503	1503	3.7	0.5561	0.86043	0.0014	12	12	0.85	No	65%
	361-6080	361-359	0.0041	62.4	10	0.89	0	0.0000	0.1503	1503	3.7	0.5561	0.86043	0.0041	10	12	0.89	No	62%
	361-359	361-697	0.0080	308.5	12	2.02	254	0.0254	0.1757	1757	3.6	0.6325	0.97865	0.0080	12	8	2.02	No	31%
	361-697	361-709	0.0059	257.6	12	1.74	407	0.0407	0.2164	2164	3.6	0.7790	1.20535	0.0059	12	12	1.74	No	45%
	361-709	361-355	0.0059	25.1	12	1.74	0	0.0000	0.2164	2164	3.6	0.7790	1.20535	0.0059	12	12	1.74	No	45%
	361-355	361-708	0.0059	205.6	12	1.74	0	0.0000	0.2164	2164	3.6	0.7790	1.20535	0.0059	12	12	1.74	No	45%
	361-708	361-396	0.0060	193.2	12	1.75	0	0.0000	0.2164	2164	3.6	0.7790	1.20535	0.0060	12	12	1.75	No	45%
	361-396	361-399	0.0064	177.1	12	1.8	0	0.0000	0.2164	2164	3.6	0.7790	1.20535	0.0064	12	12	1.80	No	43%
	361-399	361-706	0.0053	28.6	12	1.64	96	0.0096	0.2260	2260	3.5	0.7910	1.22386	0.0053	12	12	1.64	No	48%
	361-706	361-705	0.0066	328.1	12	1.84	0	0.0000	0.2260	2260	3.5	0.7910	1.22386	0.0066	12	12	1.84	No	43%
	361-705	361-703	0.0094	191.9	12	2.19	0	0.0000	0.2260	2260	3.5	0.7910	1.22386	0.0094	12	12	2.19	No	36%
	361-703	361-702	0.0094	196.4	12	2.19	0	0.0000	0.2260	2260	3.5	0.7910	1.22386	0.0094	12	12	2.19	No	36%
	361-702	361-379	0.0376	163.9	12	4.38	3586	0.3586	0.5846	5846	3.2	1.8707	2.89443	0.0376	12	12	4.38	No	43%
	361-379	361-378	0.0088	199.8	12	2.12	0	0.0000	0.5846	5846	3.2	1.8707	2.89443	0.0088	18	12	6.25	No	30%
	361-378	361-490	0.0203	243.1	12	3.22	332	0.0332	0.6178	6178	3.2	1.9770	3.05881	0.0203	12	12	3.22	No	61%
	361-490	361-510	0.0202	268	12	3.21	0	0.0000	0.6178	6178	3.2	1.9770	3.05881	0.0202	12	12	3.21	No	62%
	361-510	361-492	0.0175	200.5	12	2.99	0	0.0000	0.6178	6178	3.2	1.9770	3.05881	0.0175	12	12	2.99	No	66%
	361-492	361-493	0.0160	185.3	12	2.86	619	0.0619	0.6797	6797	3.1	2.1071	3.26012	0.0160	18	12	8.42	No	25%
	361-493	361-6584	0.0158	108.6	12	2.84	0	0.0000	0.6797	6797	3.1	2.1071	3.26012	0.0158	18	12	8.37	No	25%
	361-6584	361-503	0.0163	172.5	12	2.89	359	0.0359	0.7156	7156	3.1	2.2184	3.43231	0.0163	18	12	8.51	No	26%
	361-503	361-506	0.0156	218.4	12	2.6	389	0.0389	0.7545	7545	3.1	2.3390	3.61889	0.0156	18	12	7.96	No	29%
	361-506	361-507	0.0148	151.3	12	2.75	0	0.0000	0.7545	7545	3.1	2.3390	3.61889	0.0148	18	12	8.10	No	29%
	361-507	361-499	0.0124	224.2	12	2.52	358	0.0358	0.7903	7903	3.1	2.4499	3.79060	0.0124	18	12	7.43	No	33%
	361-499	361-509	0.0158	250.4	12	2.84	0	0.0000	0.7903	7903	3.1	2.4499	3.79060	0.0158	18	12	8.36	No	29%
	361-509	361-508	0.0110	138.9	12	2.36	0	0.0000	0.7903	7903	3.1	2.4499	3.79060	0.0110	18	18	6.97	No	35%
	361-508	361-635	0.0143	133.6	12	2.7	0	0.0000	0.7903	7903	3.1	2.4499	3.79060	0.0143	18	12	7.95	No	31%
	361-635	361-636.01	0.0150	155.9	12	2.77	0	0.0000	0.7903	7903	3.1	2.4499	3.79060	0.0150	18	12	8.16	No	30%
	361-636.01	361-636	0.0092	73.3	12	2.16	0	0.0000	0.7903	7903	3.1	2.4499	3.79060	0.0092	18	18	6.38	No	38%
	361-636	361-612	0.0145	121.6	12	2.71	0	0.0000	0.7903	7903	3.1	2.4499	3.79060	0.0145	18	12	8.00	No	31%
	361-612	361-634.01	0.0152	104.6	12	2.78	0	0.0000	0.7903	7903	3.1	2.4499	3.79060	0.0152	18	12	8.21	No	30%
	361-634.01	361-634	0.0084	133	12	2.06	0	0.0000	0.7903	7903	3.1	2.4499	3.79060	0.0084	18	18	6.09	No	40%
	361-634	361-644.01	0.0144	238.6	12	2.71	0	0.0000	0.7903	7903	3.1	2.4499	3.79060	0.0144	18	12	7.99	No	31%

Branch Name	US MH	DS MH	Existing Slope (ft/ft)	Length (feet)	Exisiting Diameter (inch)	Existing Pipe Capacity (mgd)	MH Pop.	MH Flow (mgd)	Total Flow	Total Pop.	Peak Factor	2050 Peak Flow (mgd)	2050 Peak Flow (cfs)	Proposed Slope (ft/ft)	Proposed Diameter	10 States Required Size, in	Proposed Capacity	Capacity Limited?	% Full
	361-644.01	361-644	0.0176	125.2	12	2.99	0	0.0000	0.7903	7903	3.1	2.4499	3.79060	0.0176	18	12	8.82	No	28%
	361-644	361-731	0.0129	183.2	12	2.56	311	0.0311	0.8214	8214	3.0	2.4642	3.81268	0.0129	18	12	7.55	No	33%
	361-731	319-524	0.0173	215.5	12	2.97	0	0.0000	0.8214	8214	3.0	2.4642	3.81268	0.0173	18	12	8.75	No	28%
	319-524	319-523	0.0152	170.7	12	2.78	0	0.0000	0.8214	8214	3.0	2.4642	3.81268	0.0152	18	12	8.20	No	30%
	319-523	319-526	0.0083	45.7	12	2.06	0	0.0000	0.8214	8214	3.0	2.4642	3.81268	0.0083	18	18	6.07	No	41%
	319-526	319-3421	0.0152	84.4	12	2.78	0	0.0000	0.8214	8214	3.0	2.4642	3.81268	0.0152	18	12	8.21	No	30%
	319-3421	319-3434.01	0.0133	204	12	2.61	0	0.0000	0.8214	8214	3.0	2.4642	3.81268	0.0133	18	12	7.69	No	32%
	319-3434.01	319-3434	0.0124	245.7	12	2.51	0	0.0000	0.8214	8214	3.0	2.4642	3.81268	0.0124	18	12	7.41	No	33%
	319-3434	319-3439	0.0147	296.5	12	2.73	0	0.0000	0.8214	8214	3.0	2.4642	3.81268	0.0147	18	12	8.06	No	31%
	319-3439	319-3412	0.0148	117.5	12	2.75	0	0.0000	0.8214	8214	3.0	2.4642	3.81268	0.0148	18	12	8.09	No	30%
	319-3412	319-3438	0.0135	161.5	12	2.63	180	0.0180	0.8394	8394	3.0	2.5182	3.89623	0.0135	18	12	7.75	No	32%
	319-3438	319-3436	0.0451	362.2	12	4.8	0	0.0000	0.8394	8394	3.0	2.5182	3.89623	0.0451	21	12	4.80	No	52%
	319-3436	319-3414	0.0144	178.3	12	2.65	55	0.0055	0.8449	8449	3.0	2.5347	3.92176	0.0252	18	12	10.45	No	24%
	319-3414	319-3414.01	0.0055	7.4	12	1.64	0	0.0000	0.8449	8449	3.0	2.5347	3.92176	0.0252	18	12	10.45	No	24%
	319-3414.01	319-3433	0.0516	39.6	12	5.02	0	0.0000	0.8449	8449	3.0	2.5347	3.92176	0.0252	18	12	10.45	No	24%
TB-G16	404-171	404-187	0.0063	76.1	18	5.3	0	0.0000	0.1770	5406	3.2	0.5664	0.87635	0.0063	24	8	11.40	No	5%
	404-187	404-174	0.0117	228.8	18	7.21	0	0.0000	0.1770	5406	3.2	0.5664	0.87635	0.0117	24	8	15.53	No	4%
	404-174	404-6679	0.0121	36.7	18	7.33	123	0.0123	0.1893	5529	3.2	0.6058	0.93725	0.0121	24	8	15.79	No	4%
	404-6679	404-234	0.0126	156.7	18	7.46	0	0.0000	0.1893	5529	3.2	0.6058	0.93725	0.0126	24	8	16.07	No	4%
	404-234	404-216	0.0127	170.7	18	7.25	341	0.0341	0.2234	5870	3.2	0.7149	1.10608	0.0127	24	8	15.79	No	5%
	404-216	404-214	0.0106	278.9	18	6.62	144	0.0144	0.2378	6014	3.2	0.7610	1.17738	0.0106	24	8	14.43	No	5%
	404-214	362-435	0.0124	277.8	18	7.42	0	0.0000	0.2378	6014	3.2	0.7610	1.17738	0.0124	24	8	15.99	No	5%
	362-435	362-434	0.0097	258.8	18	6.57	397	0.0397	0.2775	6411	3.1	0.8603	1.33100	0.0097	24	12	14.14	No	6%
	362-434	362-425	0.0195	56.8	18	9.3	0	0.0000	0.2775	6411	3.1	0.8603	1.33100	0.0195	18	8	9.30	No	9%
TB-G03	362-442	362-425	0.0152	38	8	0.94	1697	0.1697	0.1697	1697	3.6	0.6109	0.94523	0.0152	12	8	2.79	No	22%
TB-G17	362-425	362-713	0.0161	586.4	18	8.45	0	0.0000	0.4472	6411	3.1	1.3863	2.14495	0.0161	24	12	18.20	No	8%
	362-713	362-714.01	0.0220	6.9	18	9.88	0	0.0000	0.4472	6411	3.1	1.3863	2.14495	0.0220	18	12	9.88	No	14%
TB-G18	362-714.01	362-714	0.0116	153.9	18	7.17	0	0.0000	0.5315	7254	3.1	1.6477	2.54929	0.0116	24	12	15.44	No	11%
	362-714	362-452	0.0207	338.9	18	9.58	0	0.0000	0.5315	7254	3.1	1.6477	2.54929	0.0207	24	12	20.64	No	8%
	362-452	362-711	0.0142	435.7	18	7.93	222	0.0222	0.5537	7476	3.1	1.7165	2.65577	0.0142	24	12	17.08	No	10%
	362-711	362-451	0.0079	154.2	18	5.92	0	0.0000	0.5537	7476	3.1	1.7165	2.65577	0.0079	24	12	12.74	No	13%
	362-451	362-439	0.0106	128.9	18	6.87	0	0.0000	0.5537	7476	3.1	1.7165	2.65577	0.0106	24	12	14.79	No	12%
	362-439	362-6069	0.0123	383.4	18	7.39	16	0.0016	0.5553	7492	3.1	1.7214	2.66345	0.0123	24	12	15.91	No	11%
	362-6069	362-710	0.0123	17.7	24	15.91	0	0.0000	0.5553	7492	3.1	1.7214	2.66345	0.0123	24	12	15.91	No	11%
	362-710	362-2946	0.0123	163.6	24	15.91	0	0.0000	0.5553	7492	3.1	1.7214	2.66345	0.0123	24	12	15.91	No	11%
	362-2946	362-5448	0.0075	217.4	24	12.44	180	0.0180	0.5733	7672	3.1	1.7772	2.74978	0.0075	24	12	12.44	No	14%
	362-5448	362-5470.01	0.0082	199.9	24	13	0	0.0000	0.5733	7672	3.1	1.7772	2.74978	0.0082	24	12	13.00	No	14%
	362-5470.01	362-5470	0.0079	116.9	24	12.73	0	0.0000	0.5733	7672	3.1	1.7772	2.74978	0.0079	24	12	12.73	No	14%
	362-5470	362-3154	0.0247	291	24	22.53	0	0.0000	0.5733	7672	3.1	1.7772	2.74978	0.0247	24	12	22.53	No	8%
	362-3154	362-3167	0.0821	160.9	24	41.07	0	0.0000	0.5733	7672	3.1	1.7772	2.74978	0.0821	24	8	41.07	No	4%
TB-G19	362-3167	362-3166.02	0.0129	30.9	24	16.26	0	0.0000	0.6357	8296	3.0	1.9071	2.95072	0.0129	24	12	16.26	No	12%
	362-3166.02	362-3166.01	0.0185	145.1	36	57.49	0	0.0000	0.6357	8296	3.0	1.9071	2.95072	0.0185	36	12	57.49	No	3%
	362-3166.01	362-3166	0.0177	91.1	36	56.23	0	0.0000	0.6357	8296	3.0	1.9071	2.95072	0.0177	36	12	56.23	No	3%

Branch Name	US MH	DS MH	Existing Slope (ft/ft)	Length (feet)	Exisiting Diameter (inch)	Existing Pipe Capacity (mgd)	MH Pop.	MH Flow (mgd)	Total Flow	Total Pop.	Peak Factor	2050 Peak Flow (mgd)	2050 Peak Flow (cfs)	Proposed Slope (ft/ft)	Proposed Diameter	10 States Required Size, in	Proposed Capacity	Capacity Limited?	% Full
	362-3166	362-3152	0.0209	244	36	61.11	0	0.0000	0.6357	8296	3.0	1.9071	2.95072	0.0209	36	12	61.11	No	3%
	362-3152	362-3153.01	0.0093	608.2	36	40.76	0	0.0000	0.6357	8296	3.0	1.9071	2.95072	0.0093	36	12	40.76	No	5%
	362-3153.01	362-3153	0.0018	64	36	18.1	0	0.0000	0.6357	8296	3.0	1.9071	2.95072	0.0018	36	18	18.10	No	11%
	362-3153	362-3163.01	0.0039	169.7	36	26.35	0	0.0000	0.6357	8296	3.0	1.9071	2.95072	0.0039	36	18	26.35	No	7%
	362-3163.01	362-3163	0.0104	18.4	36	43.12	0	0.0000	0.6357	8296	3.0	1.9071	2.95072	0.0104	36	12	43.12	No	4%
	362-3163	362-3161.01	0.0196	21.3	36	59.21	0	0.0000	0.6357	8296	3.0	1.9071	2.95072	0.0196	36	12	59.21	No	3%
	362-3161.01	362-3161	0.0081	385.6	36	38.03	0	0.0000	0.6357	8296	3.0	1.9071	2.95072	0.0081	36	12	38.03	No	5%
TB-G20	362-3161	362-3168	0.0106	28.8	24	14.76	0	0.0000	0.7339	9278	3.0	2.2017	3.40653	0.0106	24	12	14.76	No	15%
	362-3168	320-3370	0.0074	367.9	24	12.3	0	0.0000	0.7339	9278	3.0	2.2017	3.40653	0.0074	30	18	22.31	No	10%
	320-3370	320-3397	0.0044	272.5	24	9.52	231	0.0231	0.7570	9509	3.0	2.2710	3.51376	0.0044	30	18	17.26	No	13%
	320-3397	320-3376	0.0071	437.8	24	12.1	0	0.0000	0.7570	9509	3.0	2.2710	3.51376	0.0071	30	18	21.94	No	10%
	320-3376	320-5492	0.0066	357.2	24	11.65	0	0.0000	0.7570	9509	3.0	2.2710	3.51376	0.0066	30	18	21.13	No	11%
	320-5492	320-3374	0.0064	231.8	24	11.49	0	0.0000	0.7570	9509	3.0	2.2710	3.51376	0.0064	30	18	20.84	No	11%
	320-3374	319-3437	0.0043	113.2	24	9.37	0	0.0000	0.7570	9509	3.0	2.2710	3.51376	0.0043	30	18	16.99	No	13%
	319-3437	319-3433	0.0026	33.5	30	13.3	0	0.0000	0.7570	9509	3.0	2.2710	3.51376	0.0026	30	18	13.30	No	17%
TB-G21	319-3433	319-3416	0.0061	311.1	30	20.32	0	0.0000	1.6019	17958	2.7	4.3251	6.69197	0.0061	30	18	20.32	No	21%
	319-3416	320-5494	0.0060	255.6	30	20.21	46	0.0046	1.6065	18004	2.7	4.3376	6.71118	0.0060	30	18	20.21	No	21%
	320-5494	320-3375	0.0015	122.6	30	10.11	0	0.0000	1.6065	18004	2.7	4.3376	6.71118	0.0015	30	24	10.11	No	43%
	320-3375	12	0.0111	82.8	30	27.42	0	0.0000	1.6065	18004	2.7	4.3376	6.71118	0.0111	30	18	27.42	No	16%

Branch Name	US MH	DS MH	Existing Slope (ft/ft)	Length (Feet)	Exisiting Diameter (inch)	Pipe Capacity (mgd)	MH Pop.	MH Flow (mgd)	Total Flow (mgd)	Total Pop.	Peak Factor	2050 Peak Flow (mgd)	2050 Peak Flow (cfs)	Proposed Slope (ft/ft)	Proposed Diameter	10 States Required Size (inch)	Proposed Capacity	Capacity Limited?	% Full
SM-G01	363-2869	363-2917	0.00782	344.7	10	1.23	376	0.0376	0.0376	376	4.0	0.1504	0.2327	0.0078	12	8	2	No	8%
	363-2917	363-2918	0.00862	161.0	10	1.29	487	0.0487	0.0863	863	3.8	0.3279	0.5074	0.0086	12	8	2.1	No	16%
	363-2918	363-2903	0.01453	380.9	10	1.67	0	0.0000	0.0863	863	3.8	0.3279	0.5074	0.0145	12	8	2.72	No	12%
	363-2903	363-2908	0.01592	310.2	10	1.75	0	0.0000	0.0863	863	3.8	0.3279	0.5074	0.0159	12	8	2.85	No	12%
	363-2908	363-3089	0.01618	216.9	10	1.77	0	0.0000	0.0863	863	3.8	0.3279	0.5074	0.0162	12	8	2.87	No	11%
	363-3089	363-3086	0.00426	200.4	10	0.91	0	0.0000	0.0863	863	3.8	0.3279	0.5074	0.0043	18	8	4.34	No	8%
	363-3086	362-4729	0.02418	370.5	10	2.16	0	0.0000	0.0863	863	3.8	0.3279	0.5074	0.0242	10	8	2.16	No	15%
	362-4729	362-4728	0.01006	285.4	10	1.39	0	0.0000	0.0863	863	3.8	0.3279	0.5074	0.0101	12	8	2.26	No	15%
	362-4728	362-4727	0.00938	271.8	10	1.35	0	0.0000	0.0863	863	3.8	0.3279	0.5074	0.0094	12	8	2.19	No	15%
	362-4727	362-4759	0.02987	200.9	10	2.4	0	0.0000	0.0863	863	3.8	0.3279	0.5074	0.0299	10	8	2.4	No	14%
	362-4759	362-5755	0.00591	234.8	10	1.07	0	0.0000	0.0863	863	3.8	0.3279	0.5074	0.0059	18	8	5.12	No	6%
	362-5755	362-4773	0.01286	312.3	10	1.57	0	0.0000	0.0863	863	3.8	0.3279	0.5074	0.0129	12	8	2.56	No	13%
	362-4773	363-3066	0.01009	401.1	10	1.39	91	0.0091	0.0954	954	3.8	0.3625	0.5609	0.0101	12	8	2.27	No	16%
	363-3066	363-2832	0.02024	173.8	10	1.98	0	0.0000	0.0954	954	3.8	0.3625	0.5609	0.0202	12	8	3.21	No	11%
	363-2832	363-2831	0.02133	62.4	12	3.3	1015	0.1015	0.1969	1969	3.6	0.7088	1.0967	0.0213	18	8	9.72	No	7%
	363-2831	363-2851	0.00755	226.5	12	1.96	0	0.0000	0.1969	1969	3.6	0.7088	1.0967	0.0076	18	12	5.79	No	12%
	363-2851	362-4717	0.01946	292.9	12	3.15	0	0.0000	0.1969	1969	3.6	0.7088	1.0967	0.0195	18	8	9.29	No	8%
	362-4717	362-4715	0.01611	198.0	12	2.87	0	0.0000	0.1969	1969	3.6	0.7088	1.0967	0.0161	18	8	8.45	No	8%
	362-4715	362-4751	0.00442	154.0	12	1.5	0	0.0000	0.1969	1969	3.6	0.7088	1.0967	0.0044	18	12	4.42	No	16%
	362-4751	362-4720	0.00771	206.1	12	1.98	0	0.0000	0.1969	1969	3.6	0.7088	1.0967	0.0077	18	12	5.85	No	12%
	362-4720	362-4721	0.00356	84.2	10	0.83	0	0.0000	0.1969	1969	3.6	0.7088	1.0967	0.0036	18	12	3.97	No	18%
	362-4721	362-4722	0.01249	145.0	12	2.52	255	0.0255	0.2224	2224	3.5	0.7784	1.2044	0.0125	18	8	7.44	No	10%
	362-4722	362-4736	0.05905	103.1	12	5.49	0	0.0000	0.2224	2224	3.5	0.7784	1.2044	0.0591	12	8	5.49	No	14%
	362-4736	320-3321	0.00533	213.8	12	1.65	0	0.0000	0.2224	2224	3.5	0.7784	1.2044	0.0053	18	12	4.86	No	16%
	320-3321	320-3322	0.0203	260.5	12	3.22	106	0.0106	0.2330	2330	3.5	0.8155	1.2618	0.0203	18	8	9.49	No	9%
	320-3322	320-3298	0.02309	174.5	12	3.43	0	0.0000	0.2330	2330	3.5	0.8155	1.2618	0.0231	18	8	10.12	No	8%
	320-3298	320-3299	0.00926	242.9	12	2.17	0	0.0000	0.2330	2330	3.5	0.8155	1.2618	0.0093	18	12	6.41	No	13%
	320-3299	320-3323	0.01102	220.4	12	2.37	0	0.0000	0.2330	2330	3.5	0.8155	1.2618	0.0110	18	8	6.99	No	12%
	320-3323	320-3331	0.00436	302.5	12	1.49	0	0.0000	0.2330	2330	3.5	0.8155	1.2618	0.0044	18	12	4.4	No	19%
	320-3331	320-6926	0.0124	80.7	12	2.51	2165	0.2165	0.4495	4495	3.3	1.4834	2.2951	0.0124	18	12	7.41	No	20%
	320-6926	320-6927	0.06359	16.7	18	16.79	0	0.0000	0.4495	4495	3.3	1.4834	2.2951	0.0636	18	8	16.79	No	9%
	320-6927	320-6930	0.00425	337.4	18	4.34	0	0.0000	0.4495	4495	3.3	1.4834	2.2951	0.0043	24	12	9.34	No	16%
	320-6930	320-3332	0.00425	20.1	18	4.34	0	0.0000	0.4495	4495	3.3	1.4834	2.2951	0.0043	18	12	4.34	No	34%
	320-3332	320-3329	0.00425	66.6	12	1.47	0	0.0000	0.4495	4495	3.3	1.4834	2.2951	0.0043	18	12	4.34	No	34%
	320-3329	320-5489	0.00259	118.3	12	1.15	0	0.0000	0.4495	4495	3.3	1.4834	2.2951	0.0026	24	18	7.3	No	20%
	320-5489	320-5490	0.00257	231.5	12	1.14	0	0.0000	0.4495	4495	3.3	1.4834	2.2951	0.0026	24	18	7.27	No	20%
	320-5490	320-5491	0.0126	193.2	12	2.53	0	0.0000	0.4495	4495	3.3	1.4834	2.2951	0.0126	18	12	7.47	No	20%
	320-5491	320-3324	0.02941	16.7	12	3.87	0	0.0000	0.4495	4495	3.3	1.4834	2.2951	0.0294	18	12	11.42	No	13%
	320-3324	320-3325	0.00332	298.2	12	1.3	0	0.0000	0.4495	4495	3.3	1.4834	2.2951	0.0033	24	18	8.27	No	18%
	320-3325	320-7246	0.01474	65.9	12	2.74	59	0.0059	0.4554	4554	3.3	1.5028	2.3252	0.0147	18	12	8.08	No	19%
	320-7246	320-6929	0.00959	169.5	12	2.21	0	0.0000	0.4554	4554	3.3	1.5028	2.3252	0.0096	18	12	6.52	No	23%
	320-6929	320-5771	0.01116	9.2	12	2.39	199	0.0199	0.4753	4753	3.3	1.5685	2.4268	0.0112	18	12	7.03	No	22%
	320-5771	320-4853	0.01116	153.0	12	2.39	0	0.0000	0.4753	4753	3.3	1.5685	2.4268	0.0112	18	12	7.03	No	22%
	320-4853	320-5772	0.00742	66.6	12	1.95	0	0.0000	0.4753	4753	3.3	1.5685	2.4268	0.0074	18	12	5.74	No	27%

Branch Name	US MH	DS MH	Existing Slope (ft/ft)	Length (Feet)	Exisiting Diameter (inch)	Pipe Capacity (mgd)	MH Pop.	MH Flow (mgd)	Total Flow (mgd)	Total Pop.	Peak Factor	2050 Peak Flow (mgd)	2050 Peak Flow (cfs)	Proposed Slope (ft/ft)	Proposed Diameter	10 States Required Size (inch)	Proposed Capacity	Capacity Limited?	% Full
	320-5772	320-5773	0.02404	159.7	12	3.5	0	0.0000	0.4753	4753	3.3	1.5685	2.4268	0.0240	18	12	10.32	No	15%
	320-5773	320-5774	0.01044	298.4	12	2.31	0	0.0000	0.4753	4753	3.3	1.5685	2.4268	0.0104	18	12	6.8	No	23%
	320-5774	320-5775	0.01619	226.1	12	2.87	0	0.0000	0.4753	4753	3.3	1.5685	2.4268	0.0162	18	12	8.47	No	19%
	320-5775	320-5776	0.00514	220.9	12	1.62	0	0.0000	0.4753	4753	3.3	1.5685	2.4268	0.0051	24	12	10.28	No	15%
	320-5776	320-4860	0.01394	230.8	12	2.67	0	0.0000	0.4753	4753	3.3	1.5685	2.4268	0.0139	18	12	7.86	No	20%
	320-4860	320-4861	0.00348	330.0	12	1.33	371	0.0371	0.5124	5124	3.2	1.6397	2.5370	0.0035	24	18	8.45	No	19%
	320-4861	320-5777	0.00539	137.6	12	1.66	0	0.0000	0.5124	5124	3.2	1.6397	2.5370	0.0054	24	12	10.53	No	16%
	320-5777	320-4865	0.0018	236.8	12	0.96	0	0.0000	0.5124	5124	3.2	1.6397	2.5370	0.0018	24	18	6.08	No	27%
	320-4865	320-4862	0.01115	357.6	12	2.38	184	0.0184	0.5308	5308	3.2	1.6986	2.6281	0.0112	18	12	7.03	No	24%
	320-4862	320-6928	0.01204	102.1	12	2.48	0	0.0000	0.5308	5308	3.2	1.6986	2.6281	0.0120	18	12	7.31	No	23%
	320-6928	320-4863	0.00371	116.2	12	1.38	0	0.0000	0.5308	5308	3.2	1.6986	2.6281	0.0037	24	18	8.73	No	19%
	320-4863	320-4866	0.00114	181.2	12	0.76	0	0.0000	0.5308	5308	3.2	1.6986	2.6281	0.0011	24	18	4.84	No	35%
	320-4866	320-4864	0.01975	219.9	12	3.17	0	0.0000	0.5308	5308	3.2	1.6986	2.6281	0.0198	18	12	9.36	No	18%
	320-4864	320-3408	0.0078	207.8	12	1.99	0	0.0000	0.5308	5308	3.2	1.6986	2.6281	0.0078	18	12	5.88	No	29%
	320-3408	320-5495	0.02225	112.7	12	3.37	0	0.0000	0.5308	5308	3.2	1.6986	2.6281	0.0223	18	12	9.93	No	17%
	320-5495	320-3403	0.01266	102.1	12	2.54	0	0.0000	0.5308	5308	3.2	1.6986	2.6281	0.0127	18	12	7.49	No	23%
	320-3403	320-3404	0.01276	113.0	12	2.55	0	0.0000	0.5308	5308	3.2	1.6986	2.6281	0.0128	18	12	7.52	No	23%
	320-3404	320-3409	0.00811	189.1	12	2.03	0	0.0000	0.5308	5308	3.2	1.6986	2.6281	0.0083	18	12	6.07	No	28%
	320-3409	320-3410	0.00571	273.4	12	1.71	0	0.0000	0.5308	5308	3.2	1.6986	2.6281	0.0083	18	12	6.07	No	28%
	320-3410	320-3405	0.01168	198.3	12	2.44	0	0.0000	0.5308	5308	3.2	1.6986	2.6281	0.0083	18	12	6.07	No	28%
	320-3405	320-3402	0.00912	373.6	12	2.16	0	0.0000	0.5308	5308	3.2	1.6986	2.6281	0.0091	18	12	6.36	No	27%
	320-3402	278-4437	0.01252	169.6	12	2.26	2784	0.2784	0.8092	8092	3.0	2.4276	3.7561	0.0125	18	12	7.01	No	35%
	278-4437	278-4438	0.01294	248.4	12	2.3	3711	0.3711	1.1803	11803	2.9	3.4229	5.2960	0.0129	18	18	7.13	No	48%

Branch Name	US MH	DS MH	Existing Slope (ft/ft)	Length	Exisiting Diameter (inch)	Pipe Capacity (MGD)	MH Pop	MH Flow (mgd)	Total Flow (mgd)	Total Pop.	Peak Factor	2050 Peak Flow (mgd)	2050 Peak Flow (cfs)	Proposed Slope (ft/ft)	Proposed Diameter	10 States Required Size (inch)	Proposed Capacity	Capacity Limited?	% Full
SLS-G01	446-5615	446-5614	0.00279	219.4	12	1.19	0	0.0000	0.0000	0	4.0	0.0000	0.0000	0.0028	12	8	1.19	No	0%
	446-5614	446-5613	0.00303	191.4	12	1.24	0	0.0000	0.0000	0	4.0	0.0000	0.0000	0.0028	12	8	1.24	No	0%
	446-5613	446-6054	0.00087	391.1	12	0.66	0	0.0000	0.0000	0	4.0	0.0000	0.0000	0.0028	12	8	0.66	No	0%
	446-6054	446-6055	0.00518	278.2	12	1.63	0	0.0000	0.0000	0	4.0	0.0000	0.0000	0.0028	12	8	1.63	No	0%
	446-6055	446-6056	0.00518	136.1	12	1.63	0	0.0000	0.0000	0	4.0	0.0000	0.0000	0.0028	12	8	1.63	No	0%
	446-6056	446-4191	0.00518	76.3	12	1.63	0	0.0000	0.0000	0	4.0	0.0000	0.0000	0.0028	12	8	1.63	No	0%
	446-4191	446-4175A	0.00518	249.6	8	0.55	0	0.0000	0.0000	0	4.0	0.0000	0.0000	0.0028	8	8	0.55	No	0%
	446-4175A	446-4175	0.00491	210.5	8	0.54	0	0.0000	0.0000	0	4.0	0.0000	0.0000	0.0028	8	8	0.54	No	0%
	446-4175	446-4178.01	0.00634	308.7	8	0.61	0	0.0000	0.0000	0	4.0	0.0000	0.0000	0.0028	8	8	0.61	No	0%
	446-4178.01	446-4178	0.00554	307	8	0.57	0	0.0000	0.0000	0	4.0	0.0000	0.0000	0.0028	8	8	0.57	No	0%
SLS-G02	446-1701	446-6074	0.01455	63.5	12	2.72	296	0.0296	0.0296	296	4.0	0.1184	0.1832	0.0028	12	8	2.72	No	4%
	446-6074	446-1702	0.00911	55.9	12	2.16	0	0.0000	0.0296	296	4.0	0.1184	0.1832	0.0028	12	8	2.16	No	5%
SLS-G03	485-4139	485-1163	0.00579	139.6	12	1.72	5093	0.5093	0.5093	5093	3.2	1.6298	2.5216	0.0028	18	18	5.06	No	32%
	485-1163	485-1168	0.00261	309	12	1.15	1811	0.1811	0.6904	6904	3.1	2.1402	3.3114	0.0028	18	18	3.40	No	63%
	485-1168	485-1169	0.00191	289.5	12	0.99	472	0.0472	0.7376	7376	3.1	2.2866	3.5378	0.0028	18	18	2.91	No	79%
	485-1169	485-1164	0.00221	376.5	12	1.06	0	0.0000	0.7376	7376	3.1	2.2866	3.5378	0.0028	18	18	3.13	No	73%
	485-1164	485-1165	0.00168	391.8	12	0.93	0	0.0000	0.7376	7376	3.1	2.2866	3.5378	0.0028	18	18	2.73	No	84%
	485-1165	485-1170	0.00247	406	12	1.12	246	0.0246	0.7622	7622	3.1	2.3628	3.6558	0.0028	18	18	3.24	No	73%
	485-1170	485-1172	0.00130	405.6	12	0.81	718	0.0718	0.8340	8340	3.0	2.5020	3.8712	0.0028	18	18	3.24	No	77%
	485-1172	485-1173	0.00222	148.5	12	1.06	0	0.0000	0.8340	8340	3.0	2.5020	3.8712	0.0028	18	18	3.24	No	77%
	485-1173	486-5115	0.00256	389.4	12	1.14	496	0.0496	0.8836	8836	3.0	2.6508	4.1014	0.0028	18	18	3.37	No	79%
	486-5115	486-1203	0.00193	385.1	12	0.99	0	0.0000	0.8836	8836	3.0	2.6508	4.1014	0.0028	18	18	2.92	No	91%
	486-1203	486-1184	0.00187	408.1	12	0.98	0	0.0000	0.8836	8836	3.0	2.6508	4.1014	0.0028	18	18	2.88	No	92%
	486-1184	486-1187	0.00248	406.7	12	1.12	0	0.0000	0.8836	8836	3.0	2.6508	4.1014	0.0028	18	18	3.31	No	80%
	486-1187	486-1185	0.00250	346	12	1.13	0	0.0000	0.8836	8836	3.0	2.6508	4.1014	0.0028	18	18	3.33	No	80%
	486-1185	486-1186	0.00250	407.5	12	1.13	0	0.0000	0.8836	8836	3.0	2.6508	4.1014	0.0028	18	18	3.33	No	80%
	486-1186	486-1188	0.00250	244.9	12	1.13	0	0.0000	0.8836	8836	3.0	2.6508	4.1014	0.0028	18	18	3.33	No	80%
	486-1188	486-1189	0.00084	140.1	12	0.66	0	0.0000	0.8836	8836	3.0	2.6508	4.1014	0.0028	24	18	6.20	No	43%
	486-1189	486-6833	0.00272	95.6	12	1.18	6844	0.6844	1.5680	15680	2.8	4.3904	6.7930	0.0028	24	24	6.20	No	71%
	486-6833	486-1009	0.00148	300.3	12	0.87	0	0.0000	1.5680	15680	2.8	4.3904	6.7930	0.0028	24	24	6.20	No	71%
	486-1009	486-1008	0.00182	401.9	12	0.96	0	0.0000	1.5680	15680	2.8	4.3904	6.7930	0.0028	24	24	6.11	No	72%
	486-1008	486-1007	0.00182	394.3	12	0.96	660	0.0660	1.6340	16340	2.7	4.4118	6.8261	0.0028	24	24	6.11	No	72%
	486-1007	486-1006	0.00182	383	12	0.96	0	0.0000	1.6340	16340	2.7	4.4118	6.8261	0.0028	24	24	6.11	No	72%
	486-1006	486-1010	0.00181	385.5	12	0.96	0	0.0000	1.6340	16340	2.7	4.4118	6.8261	0.0028	24	24	6.11	No	72%
	486-1010	486-5075	0.00145	370	12	0.86	0	0.0000	1.6340	16340	2.7	4.4118	6.8261	0.0028	24	24	5.46	No	81%
	486-5075	486-5074	0.00120	247.6	12	0.74	0	0.0000	1.6340	16340	2.7	4.4118	6.8261	0.0028	24	24	4.87	No	91%
SLS-G04	405-1898	405-6829	0.01473	336.7	8	0.93	3696	0.3696	0.3696	3696	3.4	1.2566	1.9443	0.0028	18	18	8.08	No	16%
	405-6829	405-1901	0.08811	16	8	2.27	0	0.0000	0.3696	3696	3.4	1.2566	1.9443	0.0028	18	18	19.76	No	6%
	405-1901	405-5309	0.00494	218.4	8	0.54	0	0.0000	0.3696	3696	3.4	1.2566	1.9443	0.0028	18	18	4.68	No	27%
	405-5309	405-5310	0.00495	383	8	0.54	0	0.0000	0.3696	3696	3.4	1.2566	1.9443	0.0028	18	18	4.68	No	27%
	405-5310	405-1896	0.00244	382	8	0.38	0	0.0000	0.3696	3696	3.4	1.2566	1.9443	0.0028	18	18	3.29	No	38%
	405-1896	446-4178	0.00244	170.8	12	1.12	16	0.0016	0.3712	3712	3.4	1.2621	1.9527	0.0028	18	18	3.29	No	38%
SLS-G05	446-4178	446-6587	0.00244	206.3	12	1.12	31	0.0031	0.3743	3743	3.4	1.2726	1.9690	0.0028	18	18	3.29	No	39%
	446-6587	446-4179	0.00472	157.3	12	1.55	0	0.0000	0.3743	3743	3.4	1.2726	1.9690	0.0028	18	18	4.57	No	28%

Branch Name	US MH	DS MH	Existing Slope (ft/ft)	Length	Exisiting Diameter (inch)	Pipe Capacity (MGD)	MH Pop	MH Flow (mgd)	Total Flow (mgd)	Total Pop.	Peak Factor	2050 Peak Flow (mgd)	2050 Peak Flow (cfs)	Proposed Slope (ft/ft)	Proposed Diameter	10 States Required Size (inch)	Proposed Capacity	Capacity Limited?	% Full
	446-4179	446-5616	0.00136	345.4	12	0.83	0	0.0000	0.3743	3743	3.4	1.2726	1.9690	0.0028	18	18	2.45	No	52%
	446-5616	446-4180	0.00161	125.3	12	0.91	0	0.0000	0.3743	3743	3.4	1.2726	1.9690	0.0028	18	18	2.67	No	48%
	446-4180	446-4181	0.00226	394.4	12	1.07	0	0.0000	0.3743	3743	3.4	1.2726	1.9690	0.0028	18	18	3.17	No	40%
	446-4181	446-4176	0.00347	366.1	12	1.33	0	0.0000	0.3743	3743	3.4	1.2726	1.9690	0.0028	18	18	3.92	No	32%
	446-4176	446-5617	0.00251	365.7	12	1.13	0	0.0000	0.3743	3743	3.4	1.2726	1.9690	0.0028	18	18	3.33	No	38%
	446-5617	446-5618	0.00321	227.8	12	1.28	0	0.0000	0.3743	3743	3.4	1.2726	1.9690	0.0028	18	18	3.77	No	34%
	446-5618	446-4182	0.00302	228.1	12	1.24	0	0.0000	0.3743	3743	3.4	1.2726	1.9690	0.0028	18	18	3.66	No	35%
	446-4182	446-5619	0.00332	336.6	12	1.30	0	0.0000	0.3743	3743	3.4	1.2726	1.9690	0.0028	18	18	3.83	No	33%
	446-5619	446-5620	0.00220	356.9	12	1.06	0	0.0000	0.3743	3743	3.4	1.2726	1.9690	0.0028	18	18	3.13	No	41%
	446-5620	446-1728	0.00271	350.3	12	1.18	0	0.0000	0.3743	3743	3.4	1.2726	1.9690	0.0028	18	18	3.47	No	37%
	446-1728	446-1729	0.00283	302.1	12	1.20	104	0.0104	0.3847	3847	3.3	1.2695	1.9642	0.0028	18	18	3.54	No	36%
	446-1729	446-1702	0.00366	306.3	12	1.37	0	0.0000	0.3847	3847	3.3	1.2695	1.9642	0.0028	18	18	4.03	No	32%
SLS-G06	446-1702	446-5211	0.00420	305.3	12	1.46	33	0.0033	0.4176	4176	3.3	1.3781	2.1322	0.0028	18	18	4.31	No	32%
	446-5211	446-1586	0.00186	314.2	12	0.97	0	0.0000	0.4176	4176	3.3	1.3781	2.1322	0.0028	18	18	2.87	No	48%
	446-1586	446-1590	0.00279	309.6	12	1.19	0	0.0000	0.4176	4176	3.3	1.3781	2.1322	0.0028	18	18	3.51	No	39%
	446-1590	446-1584	0.00238	355.7	12	1.10	0	0.0000	0.4176	4176	3.3	1.3781	2.1322	0.0028	18	18	3.25	No	42%
	446-1584	446-1589	0.00281	399.8	12	1.20	0	0.0000	0.4176	4176	3.3	1.3781	2.1322	0.0028	18	18	3.53	No	39%
	446-1589	446-1583	0.00227	777.6	12	1.08	0	0.0000	0.4176	4176	3.3	1.3781	2.1322	0.0028	18	18	3.17	No	43%
	446-1583	446-1601	0.00402	152.3	12	1.43	0	0.0000	0.4176	4176	3.3	1.3781	2.1322	0.0028	18	18	4.22	No	33%
	446-1601	446-1600	0.00402	19.9	12	1.43	0	0.0000	0.4176	4176	3.3	1.3781	2.1322	0.0028	18	18	4.22	No	33%
	446-1600	446-1585	0.00402	271.9	12	1.43	0	0.0000	0.4176	4176	3.3	1.3781	2.1322	0.0028	18	18	4.22	No	33%
	446-1585	487-1399	0.00336	171.7	12	1.31	73	0.0073	0.4249	4249	3.3	1.4022	2.1695	0.0028	18	18	3.86	No	36%
	487-1399	487-1400	0.00234	232.3	12	1.09	0	0.0000	0.4249	4249	3.3	1.4022	2.1695	0.0028	18	18	3.22	No	44%
	487-1400	487-1398	0.00093	233.8	12	0.69	0	0.0000	0.4249	4249	3.3	1.4022	2.1695	0.0028	18	18	2.03	No	69%
	487-1398	487-1412	0.00173	267	12	0.94	0	0.0000	0.4249	4249	3.3	1.4022	2.1695	0.0028	18	18	2.77	No	51%
	487-1412	487-1410	0.00232	271.6	12	1.09	0	0.0000	0.4249	4249	3.3	1.4022	2.1695	0.0028	18	18	3.21	No	44%
	487-1410	487-1407	0.00305	280.5	12	1.25	0	0.0000	0.4249	4249	3.3	1.4022	2.1695	0.0028	18	18	3.68	No	38%
	487-1407	487-1409	0.00305	101.2	12	1.25	0	0.0000	0.4249	4249	3.3	1.4022	2.1695	0.0028	18	18	3.68	No	38%
	487-1409	487-1408	0.00305	40.1	12	1.25	0	0.0000	0.4249	4249	3.3	1.4022	2.1695	0.0028	18	18	3.68	No	38%
	487-1408	487-1406	0.00101	291.2	12	0.72	0	0.0000	0.4249	4249	3.3	1.4022	2.1695	0.0028	18	18	2.12	No	66%
	487-1406	487-5136	0.00230	178.9	12	1.08	0	0.0000	0.4249	4249	3.3	1.4022	2.1695	0.0028	18	18	3.19	No	44%
	487-5136	487-1405	0.00108	125.3	12	0.74	0	0.0000	0.4249	4249	3.3	1.4022	2.1695	0.0028	18	18	2.19	No	64%
	487-1405	486-4029	0.00381	400.6	12	1.39	0	0.0000	0.4249	4249	3.3	1.4022	2.1695	0.0028	18	18	4.11	No	34%
	486-4029	486-4036	0.00296	305.4	18	3.62	8267	0.8267	1.2516	12516	2.9	3.6296	5.6159	0.0028	24	24	7.79	No	47%
	486-4036	486-5584	0.00089	211.6	18	1.99	454	0.0454	1.2970	12970	2.8	3.6316	5.6189	0.0028	24	24	4.29	No	85%
	486-5584	486-4031	0.00140	339.4	18	2.49	0	0.0000	1.2970	12970	2.8	3.6316	5.6189	0.0028	24	24	5.36	No	68%
	486-4031	486-4030	0.00281	401.5	18	3.53	705	0.0705	1.3675	13675	2.8	3.8290	5.9243	0.0028	24	24	7.60	No	50%
	486-4030	486-4052	0.00181	201.8	18	2.83	1189	0.1189	1.4864	14864	2.8	4.1619	6.4394	0.0028	24	24	6.10	No	68%
	486-4052	486-4053	0.00296	139.4	18	3.62	0	0.0000	1.4864	14864	2.8	4.1619	6.4394	0.0028	24	24	7.80	No	53%
	486-4053	486-4055	0.00390	252.4	18	4.16	0	0.0000	1.4864	14864	2.8	4.1619	6.4394	0.0028	24	24	8.95	No	47%
	486-4055	486-4056	0.00390	88.1	18	4.16	0	0.0000	1.4864	14864	2.8	4.1619	6.4394	0.0028	24	24	8.95	No	47%
	486-4056	486-999	0.00390	150	18	4.16	0	0.0000	1.4864	14864	2.8	4.1619	6.4394	0.0028	24	24	8.95	No	47%
	486-999	486-5074	0.00226	267.4	18	3.16	0	0.0000	1.4864	14864	2.8	4.1619	6.4394	0.0028	24	24	6.81	No	61%

Branch Name	US MH	DS MH	Existing Slope (ft/ft)	Length	Exisiting Diameter (inch)	Pipe Capacity (MGD)	MH Pop	MH Flow (mgd)	Total Flow (mgd)	Total Pop.	Peak Factor	2050 Peak Flow (mgd)	2050 Peak Flow (cfs)	Proposed Slope (ft/ft)	Proposed Diameter	10 States Required Size (inch)	Proposed Capacity	Capacity Limited?	% Full
SLS-G07	486-5074	486-1005	0.00179	133.7	18	2.81	0	0.0000	3.1204	31204	2.5	7.8010	12.0699	0.0028	30	30	10.98	No	71%
	486-1005	486-5076	0.00334	194.2	18	3.85	0	0.0000	3.1204	31204	2.5	7.8010	12.0699	0.0028	30	30	15.02	No	52%
	486-5076	SouthLS	0.00333	43.2	18	3.84	798	0.0798	3.2002	32002	2.4	7.6805	11.8835	0.0028	24	24	8.27	No	93%

APPENDIX E
RECOMMENDED CAPACITY IMPROVEMENTS

TABLE OF CONTENTS

Cost Estimation Methodology and Definitions

A comprehensive cost estimate, or Opinion of Probable Cost (OPC), was prepared for each recommended improvement project. Costs were estimated using AACE Class 3 guidelines. AACE Class 3 cost estimates are typically used for budget, authorization, or control and are estimated using semi-detailed unit costs with assembly level line items. The expected accuracy of an AACE Class 3 cost estimate ranges from 10% - 20% low or 10% - 30% high.

Regional construction pricing experienced a sharp uptick from 2021 to 2023 due to COVID and large demand in the area. Prices have stabilized but demand is still high and forecasted to stay high which will continue to escalate construction pricing. Due to these observations and assumptions, a 5% per year escalation is used in this study to project future project costs.

Unit Costs and Formulas for each line item are discussed below:

Contingency: A 30% contingency of project costs was included to remain consistent with the expected accuracy range of AACE Class 3 cost estimates.

Design, Acquisitions, Bid, Construction Services: Design, Acquisitions, Bid, Construction Services includes design, acquisition and construction services. Estimated at not to exceed 15% for gravity line projects and 18% for lift station projects.

Pipe: Includes material and installation costs and was estimated per linear foot of pipe.

Pipe Size	Cost Per Linear Foot
12”	$ 200
18”	$ 250
24”	$ 325
30”	$ 425

Trenching Additional Depth: Additional costs for pipe with depths greater than 15 feet were estimated per linear foot.

Depth	Cost Per Linear Foot of Pipe
15’ – 20’	$ 100
25’ – 25’	$ 150
25’ – 30’	$ 200

Remove/Replace Manhole: Includes manhole material and installation costs and was estimated as a lump sum cost of $ 20,000 per manhole

Additional Manhole Depth: Includes additional costs for manholes with depths greater than 15 feet were estimated at $500 per vertical foot of additional depth.

Surface Repair: Includes costs for surface repair estimated at $ 250 per linear foot.

Bypass Pumping: Bypass Pumping was estimated at 35% of the material and installation costs of new gravity lines.

Clearing and Grubbing: Clearing and Grubbing was estimated at $ 15 per linear foot of visible foliage.

Construction Control: Construction control was estimated as $ 5 per linear foot of pipe or a lump sum of $10,000, whichever is higher.

Bored Steel Encasement: Includes material costs and installation costs for bored steel encasement and was estimated per linear foot of pipe. Encasement size was determined with Bentonville Water Utilities' Encasement Detail, GWS01.

Encasement Size	Cost Per Linear Foot
24"	$ 2,000
30"	$ 2,500
36"	$ 3,000
42"	$ 3,500

Rock Excavation: Rock Excavation was estimated at $ 250 per cubic yard determined by linear feet of pipe. Quantity is assumed to be 8 cubic feet per linear feet of pipe installation.

Sediment Control: Sediment Control was estimated at $ 20 per linear foot of pipe.

Environmental Permitting: Environmental Permitting was estimated at a lump sum cost of $ 50,000 for projects with significant visible foliage and creek crossings.

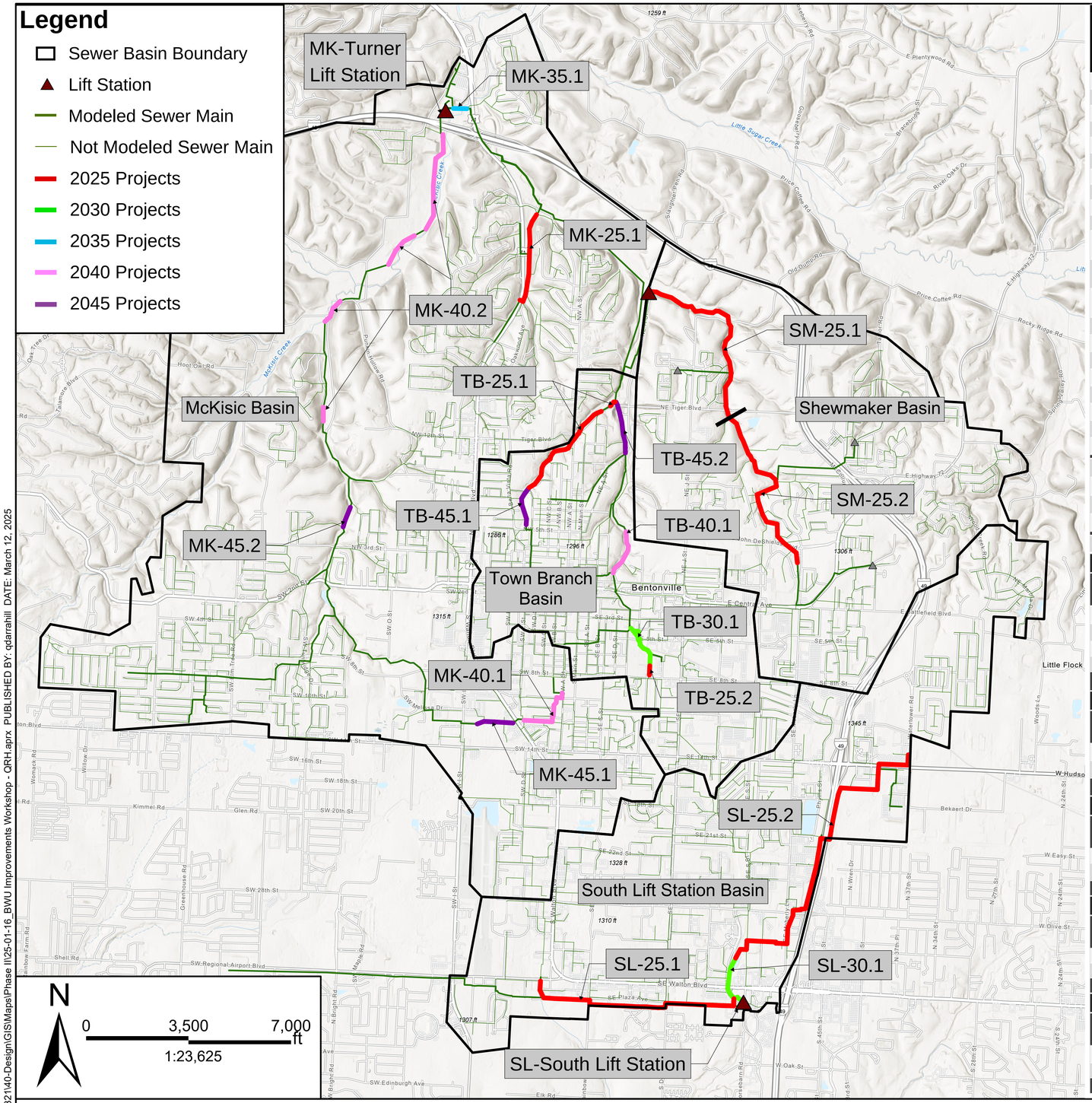
Traffic Control: Traffic Control was estimated as a lump sum cost of $ 25,000 per road crossing.

Trench Safety: Trench safety costs was estimated based on project size.

Project Size (Linear Feet of Pipe)	Trench Safety Cost
Less than 1,000'	$ 10,000
1,000' – 5,000'	$ 50,000
Greater than 5,000'	$ 100,000

Mobilization/Bonds & Insurance: Mobilization/Bonds & Insurance were estimated at 5% of project costs (except for Easement, Contingency, and Design, Acquisitions, Bid, Construction Services)

Easement (20' wide): Easements are estimated at 20' for 25% of the length of the project and can include temporary or permanent easement costs.



Project ID	Projected Horizon	Total Length (Feet)	Existing Diameter (Inch)	Proposed Diameter (Inch)	Easement Cost	Design, Acquisition, Bid, and Construction Services	Total Project Cost[8]	Escalated Total Project Cost[9]
MK-25.1	2025	3,167	8/10	12	$ 79,175	$ 434,000	$ 3,327,000	$ 3,852,000
MK-35.1	2035	462	18	24	$ 11,550	$ 150,000	$ 1,150,000	$ 1,874,000
MK-40.1	2040	2,214	12	18/24	$ 55,350	$ 373,000	$ 2,857,000	$ 5,940,000
MK-40.2	2040	6,179	24	30	$ 154,475	$ 1,199,000	$ 9,189,000	$ 19,104,000
MK-45.1	2045	1,237	18	24	$ 30,925	$ 846,000	$ 6,488,000	$ 17,215,000
MK-45.2	2045	717	24	30	$ 17,925	$ 160,000	$ 1,225,000	$ 3,251,000
MK-Turner Lift Station[1]	2025	-	-	-	-	$ 74,000	$ 484,000	$ 561,000
SL-25.1	2025	7,633	12	18	$ 190,825	$ 1,831,000	$ 14,037,000	$ 16,250,000
SL-25.2	2025	11,916	8/12/18	18/24	$ 297,900	$ 1,831,000	$ 17,431,000	$ 20,179,000
SL-30.1	2030	1,872	18	24/30	$ 46,800	$ 460,000	$ 3,528,000	$ 4,503,000
SL-South Lift Station Option 1[2]	2025	18,300	-	24	$ 457,500	$ 7,371,000	$ 48,320,000	$ 55,937,000
SL-South Lift Station Option 2, Part 1[3]	2025	-	-	-	$ 935,600	$ 4,598,000	$ 30,140,000	$ 34,891,000
SL-South Lift Station Option 2, Part 2[4]	2035	-	-	-	-	$ 860,000	$ 5,638,000	$ 9,184,000
SM-25.1	2025	6,915	12/18	24	$ 172,875	$ 1,330,000	$ 10,199,000	$ 11,807,000
SM-25.2	2025	6,449	10/12	18	$ 161,225	$ 951,000	$ 7,294,000	$ 8,444,000
TB-25.1	2025	4,019	12	18	$ 100,475	$ 714,000	$ 5,472,000	$ 6,335,000
TB-25.2	2025	317	12	18	$ 7,925	$ 82,000	$ 629,000	$ 729,000
TB-30.1	2030	2,043	12/15	18	$ 51,075	$ 447,000	$ 3,429,000	$ 4,377,000
TB-40.1	2040	1,595	18	24	$ 39,875	$ 260,000	$ 1,990,000	$ 4,138,000
TB-45.1	2045	1,378	12	18	$ 34,450	$ 246,000	$ 1,884,000	$ 4,999,000
TB-45.2	2045	1,780	24	30	$ 44,500	$ 405,000	$ 3,103,000	$ 8,234,000
MK Total[5]	-	13,976	-	-	$ 349,400	$ 3,236,000	$ 24,720,000	$ 51,797,000
SL Total[6]	-	21,421	-	-	$ 1,471,125	$ 9,580,000	$ 70,774,000	$ 85,007,000
SM Total[7]	-	13,364	-	-	$ 334,100	$ 2,281,000	$ 17,493,000	$ 20,251,000
TB Total	-	11,132	-	-	$ 278,300	$ 2,154,000	$ 16,507,000	$ 28,812,000
Total	-	59,893	-	-	$ 2,432,925	$ 17,251,000	$ 129,494,000	$ 185,867,000

2025 Recommended Project Summary

Basin	Total Length (Feet)	Total Project Cost[8]	Escalated Total Project Cost[9]
McKisic Basin[5]	3,167	$ 3,811,000	$ 4,413,000
South Lift Station[10]	19,549	$ 61,608,000	$ 71,320,000
Town Branch Basin	4,336	$ 6,101,000	$ 7,064,000
Shewmaker Basin	13,364	$ 17,493,000	$ 20,251,000
2025 Total	40,416	$ 89,013,000	$ 103,048,000

2030 Recommended Project Summary

Basin	Total Length (Feet)	Total Project Cost[8]	Escalated Total Project Cost[9]
South Lift Station	1,872	$ 3,528,000	$ 4,503,000
Town Branch Basin	2,043	$ 3,429,000	$ 4,377,000
2030 Total	3,915	$ 6,957,000	$ 8,880,000

2035 Recommended Project Summary

Basin	Total Length (Feet)	Total Project Cost[8]	Escalated Total Project Cost[9]
McKisic Basin	462	$ 1,150,000	$ 1,874,000
South Lift Station[11]	-	$ 5,638,000	$ 9,184,000
2035 Total	462	$ 6,788,000	$ 11,058,000

2040 Recommended Project Summary

Basin	Total Length (Feet)	Total Project Cost[8]	Escalated Total Project Cost[9]
McKisic Basin	8,393	$ 12,046,000	$ 25,044,000
Town Branch Basin	1,595	$ 1,990,000	$ 4,138,000
2040 Total	9,988	$ 14,036,000	$ 29,182,000

2045 Recommended Project Summary

Basin	Total Length (Feet)	Total Project Cost[8]	Escalated Total Project Cost[9]
McKisic Basin	1,954	$ 7,713,000	$ 20,466,000
Town Branch Basin	3,158	$ 4,987,000	$ 13,233,000
2045 Total	5,112	$ 12,700,000	$ 33,699,000

[1] Improvements include upsizing four lift station pumps to 15hp.
[2] Not included in cost totals. Improvements include a new lift station and 24" forcemain.
[3] Improvements include a 1 MG Flow Equalization Basin Tank.
[4] Improvements include upsizing three lift station pumps to 55hp.
[5] Includes the MK-Turner Lift Station project costs.
[6] Includes the SL-South Lift Station Option 2, Part 1 & Part 2 project costs.
[7] Shewmaker Lift Station Improvements are needed but are not included with this report. Improvements to LS are being analyzed as part of a separate study.
[8] Total project costs (including Design, Acquisition, Bid, and Construction Services) in 2025 dollars.
[9] Total project costs (including Design, Acquisition, Bid, and Construction Services) escalated at a rate of 5% per year to the projected project horizon.
[10] Includes the SL-South Lift Station Option 2, Part 1 project costs.
[11] Includes the SL-South Lift Station Option 2, Part 2 project costs.

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Recommended Capital Improvement Projects

City of Bentonville Sewer Collection System

BWU Modeled Improvements
Opinion of Probable Cost
January 2025
Bentonville, AR

Figure 1

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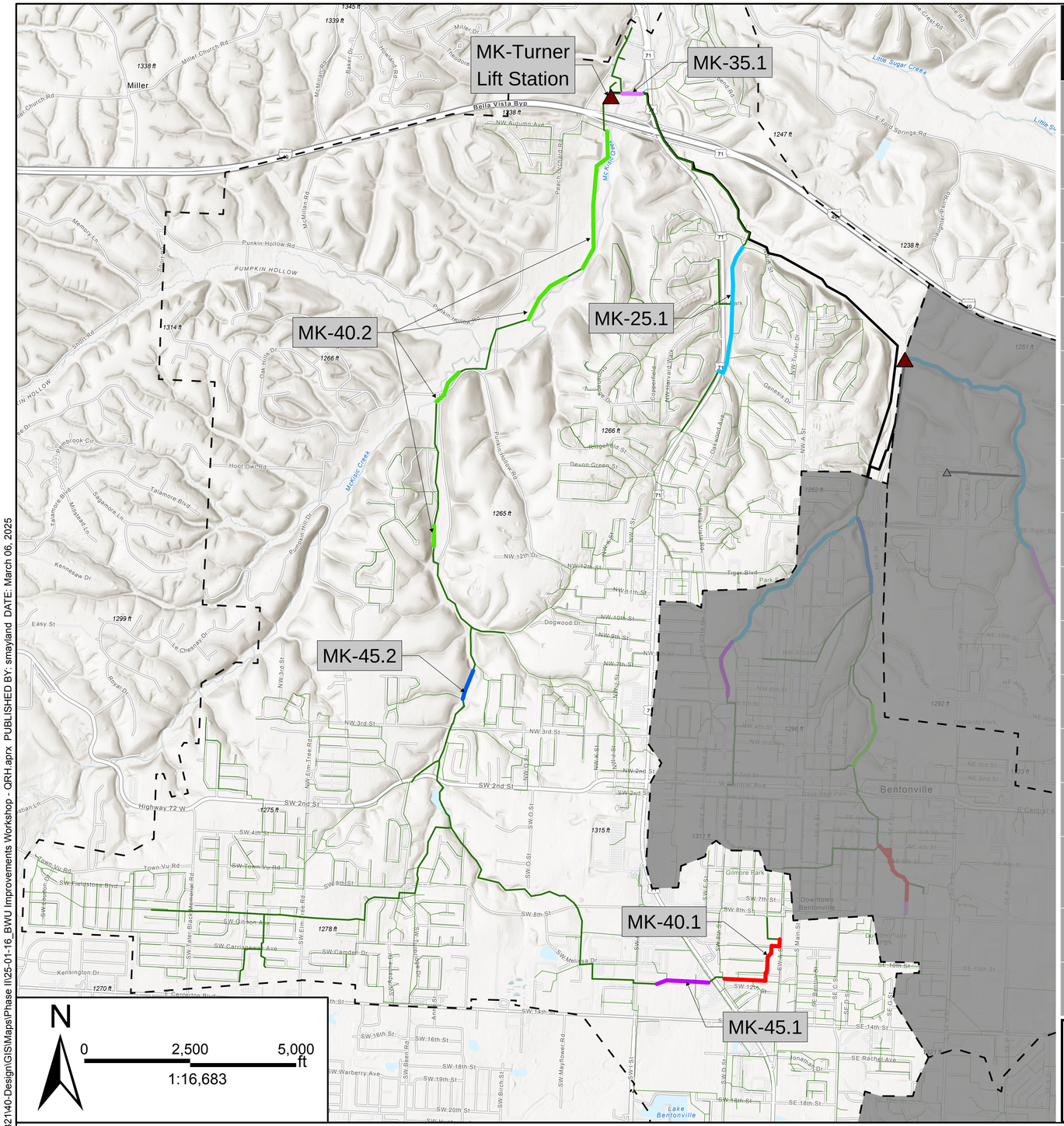
Basemap: ESRI World Imagery



Project ID	MK-25.1	MK-Turner Lift Station[9]	MK-35.1	MK-40.1	MK-40.2	MK-45.1	MK-45.2	
Projected Horizon	2025	2025	2035	2040	2040	2045	2045	
Total Length (Feet)	3,167	-	462	2,214	6,179	1,237	717	
Existing Diameter (Inch)	8/10	-	18	12	24	18	24	
Proposed Diameter (Inch)	12	-	24	18	30	24	30	
Dry Weather Flow Trigger (MGD)[1]	0.02	-	0.29	0.11	0.99	0.38	0.90	
Limiting Upstream Manhole ID[2]	319-3604	-	236-6811	403-9	276-3918	403-6576	360-3002	
80% of Full Pipe Capacity (MGD)[3]	0.216	-	2.112	0.584	4.096	1.832	3.928	
Initiation/Pre-Design (Months)[4]	3	3	3	3	3	3	3	
Design (Months)[5]	6	3	5	5	10	5	5	
Bid/ Construction (Months)[6]	9	8	6	7	14	6	6	
Total Duration (Months)	18	14	14	15	27	14	14	Basin Total
Construction Subtotal	$ 2,893,000	$ 410,000	$ 1,000,000	$ 2,484,000	$ 7,990,000	$ 5,642,000	$ 1,065,000	$ 21,484,000
Easement	$ 79,175	-	$ 11,550	$ 55,350	$ 154,475	$ 30,925	$ 17,925	$ 349,400
Contingency	$ 668,000	$ 95,000	$ 231,000	$ 573,000	$ 1,844,000	$ 1,302,000	$ 246,000	$ 4,959,000
Design, Acquisition, Bid, and Construction Services	$ 434,000	$ 74,000	$ 150,000	$ 373,000	$ 1,199,000	$ 846,000	$ 160,000	$ 3,236,000
Total Project Cost[7]	$ 3,327,000	$ 484,000	$ 1,150,000	$ 2,857,000	$ 9,189,000	$ 6,488,000	$ 1,225,000	$ 24,720,000
Escalated Total Project Cost[8]	$ 3,852,000	$ 561,000	$ 1,874,000	$ 5,940,000	$ 19,104,000	$ 17,215,000	$ 3,251,000	$ 51,797,000

[1] When the dry weather flow equals this value the recommended improvements should considered.
[2] The ID of the upstream manhole for the pipe with lowest capacity.
[3] 80% of the full pipe capacity for the pipe with lowest capacity.
[4] Assumed at 3 Months
[5] Calculated at 1 Month per 800 feet of Improvement (or a Minimum of 5 Months)
[6] Calculated at 1 Month per 600 feet of Improvement (or a Minimum of 6 Months)
[7] Total project costs (including Design, Acquisition, Bid, and Construction Services) in 2025 dollars.
[8] Total project costs (including Design, Acquisition, Bid, and Construction Services) escalated at a rate of 5% per year to the projected project horizon.
[9] Improvements include upsizing four lift station pumps to 15hp.

Legend

- Sewer Basin Boundary
- Lift Station
- Modeled Sewer Main
- Not Modeled Sewer Main
- Forcemain
- Projects are color coded by Project ID

olsson

Recommended Capital Improvement Projects: McKisic Basin

City of Bentonville Sewer Collection System

BWU Modeled Improvements
Opinion of Probable Cost
January 2025
Bentonville, AR

Figure 2

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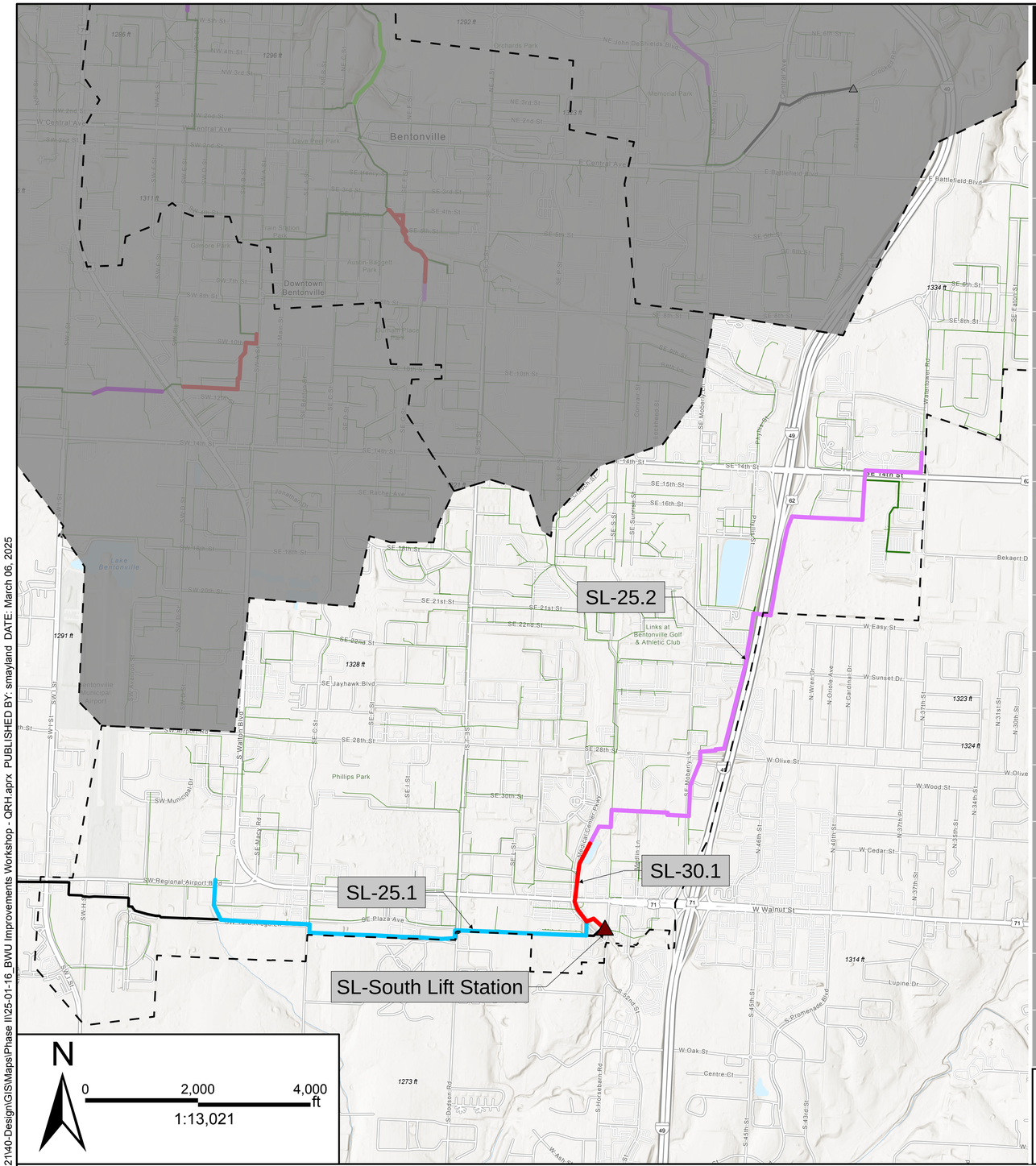
Basemap: ESRI World Imagery



Project ID	SL-25.1	SL-25.2	SL-South Lift Station Option 1[9]	SL-South Lift Station Option 2, Part 1[10]	SL-30.1	SL-South Lift Station Option 2, Part 2[11]	Basin Total[12]
Projected Horizon	2025	2025	2025	2025	2030	2035	
Total Length (Feet)	7,633	11,916	18,300	-	1,872	-	
Existing Diameter (Inch)	12	8/12/18	-	-	18	-	
Proposed Diameter (Inch)	18/24	18/24	24	-	24/30	-	
Peak Flow Trigger (MGD)[1]	0.11	0.06	-	-	0.56	-	
Limiting Upstream Manhole ID[2]	486-1188	405-5310	-	-	486-5074	-	
80% of Full Pipe Capacity (MGD)[3]	0.528	0.304	-	-	2.248	-	
Initiation/Pre-Design (Months)[4]	3	3	3	3	3	3	
Design (Months)[5]	12	17	15	12	5	8	
Bid/ Construction (Months)[6]	16	23	18	15	7	12	
Total Duration (Months)	31	43	36	30	15	23	
Construction Subtotal	$ 12,206,000	$ 15,157,000	$ 40,949,000	$ 25,542,000	$ 3,068,000	$ 4,778,000	$ 60,751,000
Easement	$ 190,825	$ 297,900	$ 7,101,000	$ 8,712,000	$ 46,800	-	$ 9,247,525
Contingency	$ 2,817,000	$ 3,498,000	$ 9,450,000	$ 5,894,000	$ 708,000	$ 1,103,000	$ 14,020,000
Design, Acquisition, Bid, and Construction Services	$ 1,831,000	$ 2,274,000	$ 7,371,000	$ 4,598,000	$ 460,000	$ 860,000	$ 10,023,000
Total Project Cost[7]	$ 14,037,000	$ 17,431,000	$ 48,320,000	$ 30,140,000	$ 3,528,000	$ 5,638,000	$ 70,774,000
Escalated Total Project Cost[8]	$ 16,250,000	$ 20,179,000	$ 55,937,000	$ 34,891,000	$ 4,503,000	$ 9,184,000	$ 85,007,000

[1] When the dry weather flow equals this value the recommended improvements should considered.
[2] The ID of the upstream manhole for the pipe with lowest capacity.
[3] 80% of the full pipe capacity for the pipe with lowest capacity.
[4] Assumed at 3 Months
[5] Calculated at 1 Month per 800 feet of Improvement (or a Minimum of 5 Months)
[6] Calculated at 1 Month per 600 feet of Improvement (or a Minimum of 6 Months)
[7] Total project costs (including Design, Acquisition, Bid, and Construction Services) in 2025 dollars.
[8] Total project costs (including Design, Acquisition, Bid, and Construction Services) escalated at a rate of 5% per year to the projected project horizon.
[9] Not included in cost totals. Improvements include a new lift station and 24" forcemain.
[10] Improvements include a 1 MG Flow Equalization Tank.
[11] Improvements include upsizing three lift station pumps to 55hp.
[12] Includes the SL-South Lift Station Option 2, Part 1 & Part 2 project costs.

Legend

- Sewer Basin Boundary
- Lift Station
- Modeled Sewer Main
- Not Modeled Sewer Main
- Forcemain
- Projects are color coded by Project ID

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Recommended Capital Improvement Projects: South Lift Station Basin

City of Bentonville Sewer Collection System

BWU Modeled Improvements
Opinion of Probable Cost
January 2025
Bentonville, AR

Figure 3

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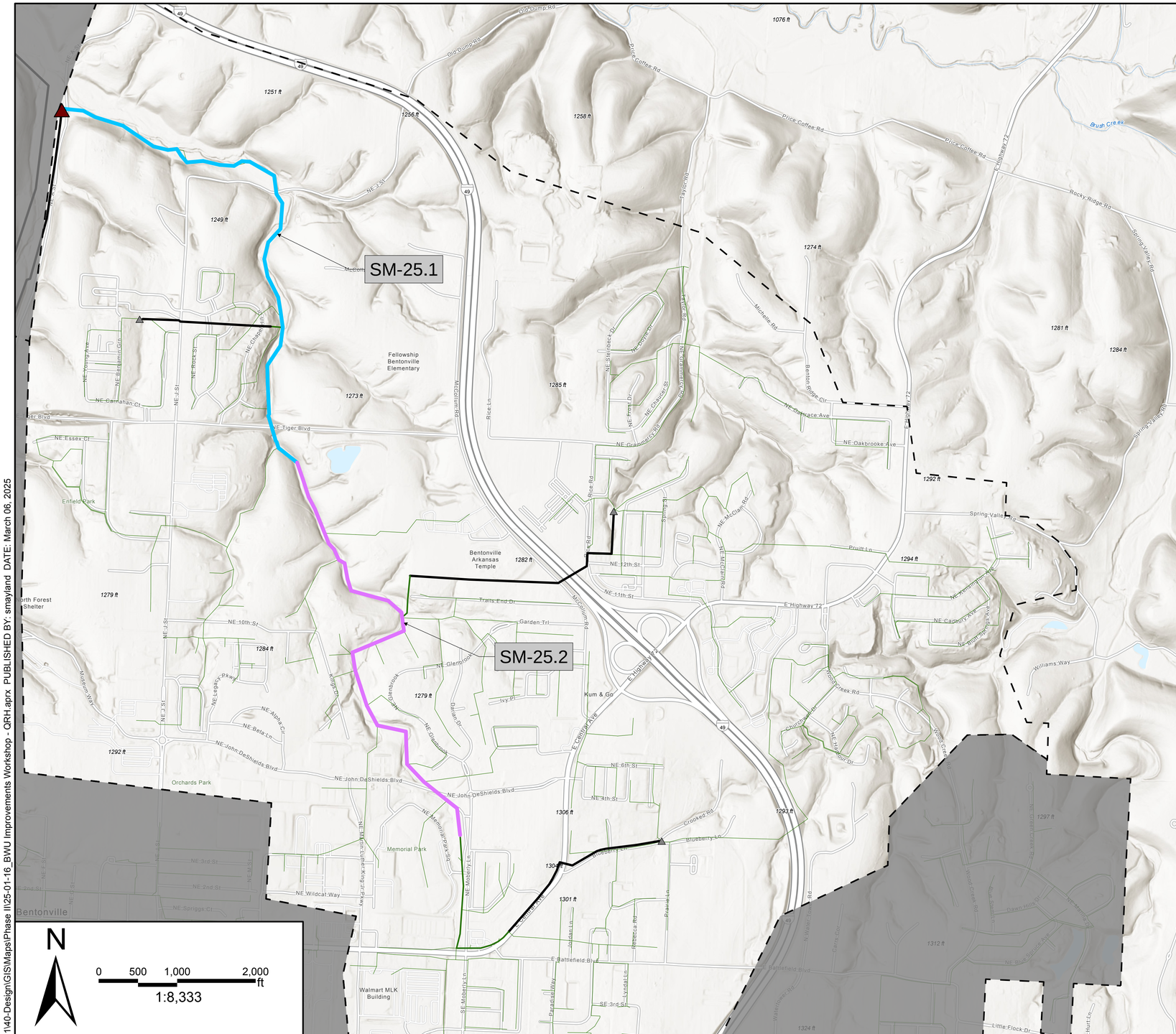
Basemap: ESRI World Imagery



Project ID	SM-25.1	SM-25.2	Basin Total[9]
Projected Horizon	2025	2025	
Total Length (Feet)	6,915	6,449	
Existing Diameter (Inch)	12/18	10/12	
Proposed Diameter (Inch)	24	18	
Peak Flow Trigger (MGD)[1]	0.13	0.14	
Limiting Upstream Manhole ID[2]	320-4863	362-4720	
80% of Full Pipe Capacity (MGD)[3]	0.608	0.664	
Initiation/Pre-Design (Months)[4]	3	3	
Design (Months)[5]	11	11	
Bid/ Construction (Months)[6]	15	14	
Total Duration (Months)	29	28	
Construction Subtotal	$ 8,869,000	$ 6,343,000	$ 15,212,000
Easement	$ 172,875	$ 161,225	$ 334,100
Contingency	$ 2,047,000	$ 1,464,000	$ 3,511,000
Design, Acquisition, Bid, and Construction Services	$ 1,330,000	$ 951,000	$ 2,281,000
Total Project Cost[7]	$ 10,199,000	$ 7,294,000	$ 17,493,000
Escalated Total Project Cost[8]	$ 11,807,000	$ 8,444,000	$ 20,251,000

Legend

- Sewer Basin Boundary
- Lift Station
- Modeled Sewer Main
- Not Modeled Sewer Main
- Forcemain
- Projects are color coded by Project ID

[1] When the dry weather flow equals this value the recommended improvements should considered.
[2] The ID of the upstream manhole for the pipe with lowest capacity.
[3] 80% of the full pipe capacity for the pipe with lowest capacity.
[4] Assumed at 3 Months
[5] Calculated at 1 Month per 800 feet of Improvement (or a Minimum of 5 Months)
[6] Calculated at 1 Month per 600 feet of Improvement (or a Minimum of 6 Months)
[7] Total project costs (including Design, Acquisition, Bid, and Construction Services) in 2025 dollars.
[8] Total project costs (including Design, Acquisition, Bid, and Construction Services) escalated at a rate of 5% per year to the projected project horizon.
[9] Shewmaker Lift Station Improvements are needed but are not included with this report. Improvements to LS are being analyzed as part of a separate study.

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Recommended Capital Improvement Projects: Shewmaker Basin

City of Bentonville Sewer Collection System

BWU Modeled Improvements
Opinion of Probable Cost
January 2025
Bentonville, AR

Figure 4

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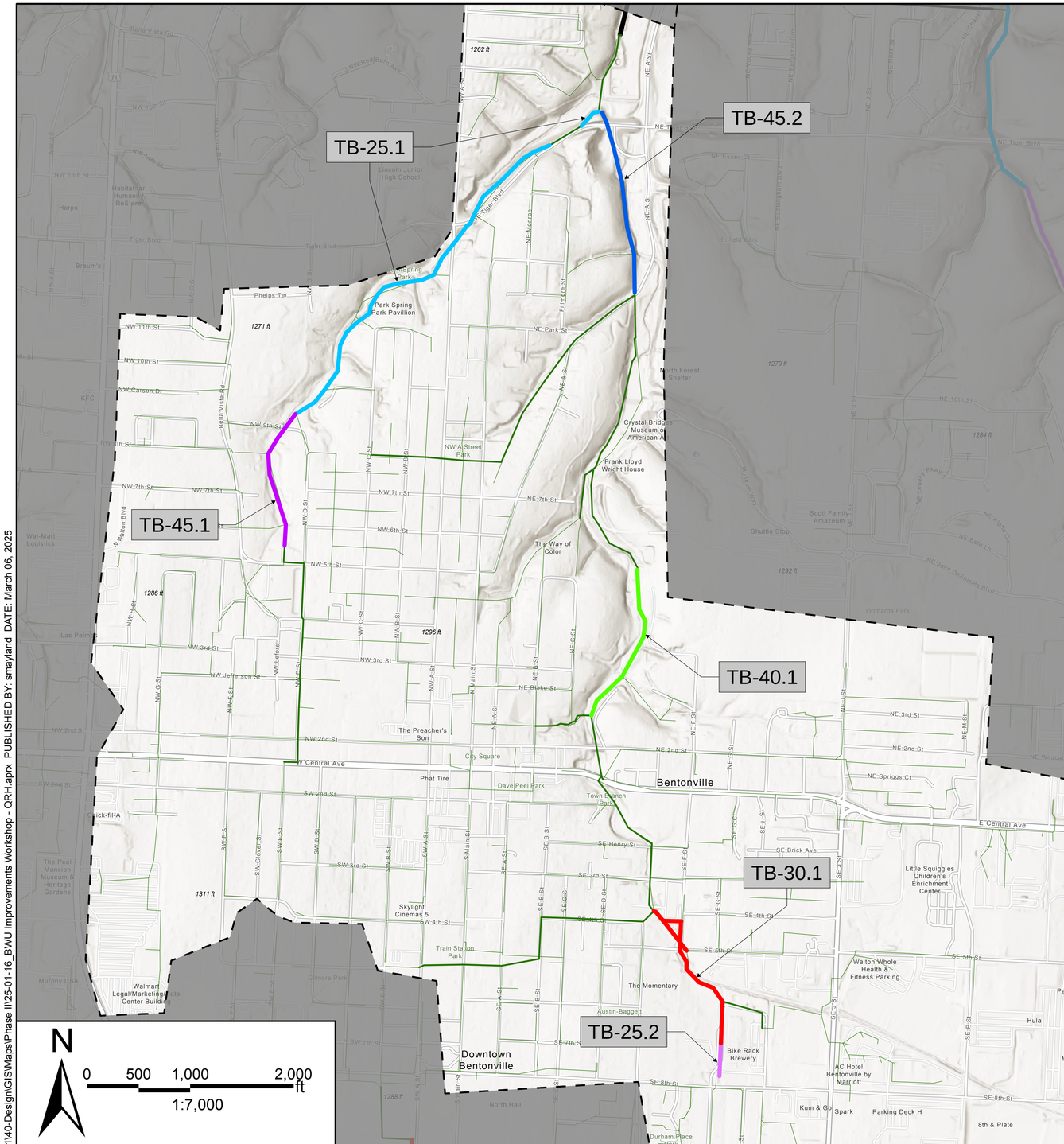
Basemap: ESRI World Imagery



Project ID	TB-25.1	TB-25.2	TB-30.1	TB-40.1	TB-45.1	TB-45.2	
Projected Horizon	2025	2025	2030	2040	2045	2045	
Total Length (Feet)	4,019	317	2,043	1,595	1,378	1,780	
Existing Diameter (Inch)	12	12	12/15	18	12	24	
Proposed Diameter (Inch)	18	18	18	24	18	30	
Peak Flow Trigger (MGD)[1]	0.25	0.12	0.22	0.15	0.34	1.39	
Limiting Upstream Manhole ID[2]	319-3414	404-210	404-226	362-442	361-379	320-3374	
80% of Full Pipe Capacity (MGD)[3]	1.312	0.592	1.056	0.752	1.696	7.496	
Initiation/Pre-Design (Months)[4]	3	3	3	3	3	3	
Design (Months)[5]	8	5	5	5	5	5	
Bid/ Construction (Months)[6]	10	6	7	6	6	6	
Total Duration (Months)	21	14	15	14	14	14	Basin Total
Construction Subtotal	$ 4,758,000	$ 547,000	$ 2,982,000	$ 1,730,000	$ 1,638,000	$ 2,698,000	$ 14,353,000
Easement	$ 100,475	$ 7,925	$ 51,075	$ 39,875	$ 34,450	$ 44,500	$ 278,300
Contingency	$ 1,098,000	$ 126,000	$ 688,000	$ 399,000	$ 378,000	$ 623,000	$ 3,312,000
Design, Acquisition, Bid, and Construction Services	$ 714,000	$ 82,000	$ 447,000	$ 260,000	$ 246,000	$ 405,000	$ 2,154,000
Total Project Cost[7]	$ 5,472,000	$ 629,000	$ 3,429,000	$ 1,990,000	$ 1,884,000	$ 3,103,000	$ 16,507,000
Escalated Total Project Cost[8]	$ 6,335,000	$ 729,000	$ 4,377,000	$ 4,138,000	$ 4,999,000	$ 8,234,000	$ 28,812,000

Legend

- Sewer Basin Boundary
- Lift Station
- Modeled Sewer Main
- Not Modeled Sewer Main
- Forcemain
- Projects are color coded by Project ID

[1] When the dry weather flow equals this value the recommended improvements should considered.
[2] The ID of the upstream manhole for the pipe with lowest capacity.
[3] 80% of the full pipe capacity for the pipe with lowest capacity.
[4] Assumed at 3 Months
[5] Calculated at 1 Month per 800 feet of Improvement (or a Minimum of 5 Months)
[6] Calculated at 1 Month per 600 feet of Improvement (or a Minimum of 6 Months)
[7] Total project costs (including Design, Acquisition, Bid, and Construction Services) in 2025 dollars.
[8] Total project costs (including Design, Acquisition, Bid, and Construction Services) escalated at a rate of 5% per year to the projected project horizon.

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Recommended Capital Improvement Projects: Town Branch Basin

City of Bentonville Sewer Collection System

BWU Modeled Improvements
Opinion of Probable Cost
January 2025
Bentonville, AR

Figure 5

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Basemap: ESRI World Imagery

Figure E1. McKisic Detailed Cost Table 2025.

2025				
MK-25.1				
Item	**QTY**	**Unit**	**Cost/Unit**	**Total Cost**
Replace 8" with 12" PVC Pipe	482	LF	$ 200	$ 96,400
Replace 10" with 12" PVC Pipe	2,685	LF	$ 200	$ 537,000
Remove/Replace Manhole	13	EA	$ 20,000	$ 260,000
Surface Repair	120	LF	$ 250	$ 30,000
Bypass Pumping (35% of New Gravity Line)	1	LS	$ 313,000	$ 313,000
Clearing and Grubbing	3,200	LF	$ 15	$ 48,000
Construction Control	1	LS	$ 20,000	$ 20,000
24" Bored Steel Encasement	150	LF	$ 2,000	$ 300,000
Rock Excavation	1000	CY	$ 250	$ 250,000
Sediment Control	3,200	LF	$ 20	$ 64,000
Environmental Permitting	1	LS	$ 50,000	$ 50,000
Traffic Control (per crossing)	1	Each	$ 25,000	$ 25,000
Trench Safety	1	LS	$ 50,000	$ 50,000
Mobilization/Bonds & Insurance (5%)	1	LS	$ 102,170	$ 102,170
Easement (20' wide)	15,835	SF	$ 5	$ 79,175
Subtotal				**$ 2,225,000**
Contingency	30%			$ 668,000
Construction Subtotal				**$ 2,893,000**
Design, Acquisition, Bid, and Construction Services	15%			$ 434,000
Total Project OPC				**$ 3,327,000**
Escalation to estimated horizon	3	Years @ 5%		$ 524,418
Escalated Total Project OPC				**$ 3,852,000**

Figure E1. McKisic Detailed Cost Table 2025 Cont.

MK-Turner Lift Station Improvements				
Item	**QTY**	**Unit**	**Cost/Unit**	**Total Cost**
Increase Capacity (upsizing 5hp to 15hp)	4	EA	$75,000	$300,000
Mobilization/Bonds & Insurance (5%)	1	LS	$ 15,000	$15,000
Subtotal				**$ 315,000**
Contingency	30%			$ 95,000
Construction Subtotal				**$ 410,000**
Design, Acquisition, Bid, and Construction Services	18%			$ 74,000
Total Project OPC				**$ 484,000**
Escalation to estimated horizon	3	Years @ 5%		$ 76,291
Escalated Total Project OPC				**$ 561,000**
Total Basin OPC (2025 Dollars)				**$ 3,811,000**
Escalated Total Basin OPC				**$ 4,413,000**

Figure E2. McKisic Detailed Cost Table 2035.

2035				
MK-35.1				
Item	**QTY**	**Unit**	**Cost/Unit**	**Total Cost**
Replace 18" with 24" PVC Pipe	462	LF	$ 325	$ 150,150
Remove/Replace Manhole	3	EA	$ 20,000	$ 60,000
Surface Repair	0	LF	$ 250	$ -
Bypass Pumping (35% of New Gravity Line)	1	LS	$ 74,000	$ 74,000
Clearing and Grubbing	500	LF	$ 15	$ 7,500
Construction Control	1	LS	$ 10,000	$ 10,000
36" Bored Steel Encasement	100	LF	$ 3,000	$ 300,000
Rock Excavation	200	CY	$ 250	$ 50,000
Sediment Control	500	LF	$ 20	$ 10,000
Environmental Permitting	1	LS	$ 50,000	$ 50,000
Trench Safety	1	LS	$ 10,000	$ 10,000
Mobilization/Bonds & Insurance (5%)	1	LS	$ 36,083	$ 36,083
Easement (20' wide)	2310	SF	$ 5	$ 11,550
Subtotal				**$ 769,000**
Contingency	30%			$ 231,000
Construction Subtotal				**$ 1,000,000**
Design, Acquisition, Bid, and Construction Services	15%			$ 150,000
Total Project OPC				**$ 1,150,000**
Escalation to estimated horizon	10	Years @ 5%		$ 723,229
Escalated Total Project OPC				**$ 1,874,000**

Figure E3. McKisic Detailed Cost Table 2040.

2040				
MK-40.1				
Item	**QTY**	**Unit**	**Cost/Unit**	**Total Cost**
Replace 12" with 18" PVC Pipe	2,214	LF	$ 250	$ 553,500
Remove/Replace Manhole	12	EA	$ 20,000	$ 240,000
Surface Repair	100	LF	$ 250	$ 25,000
Bypass Pumping (35% of New Gravity Line)	1	LS	$ 278,000	$ 278,000
Clearing and Grubbing	2300	LF	$ 15	$ 34,500
Construction Control	1	LS	$ 15,000	$ 15,000
30" Bored Steel Encasement	100	LF	$ 2,500	$ 250,000
Rock Excavation	700	CY	$ 250	$ 175,000
Sediment Control	2300	LF	$ 20	$ 46,000
Environmental Permitting	1	LS	$ 50,000	$ 50,000
Traffic Control (per crossing)	2	Each	$ 25,000	$ 50,000
Trench Safety	1	LS	$ 50,000	$ 50,000
Mobilization/Bonds & Insurance (5%)	1	LS	$ 88,350	$ 88,350
Easement (20' wide)	11070	SF	$ 5	$ 55,350
Subtotal				**$ 1,911,000**
Contingency	30%			$ 573,000
Construction Subtotal				**$ 2,484,000**
Design, Acquisition, Bid, and Construction Services	15%			$ 373,000
Total Project OPC				**$ 2,857,000**
Escalation to estimated horizon	15	Years @ 5%		$ 3,082,498
Escalated Total Project OPC				**$ 5,940,000**

Figure E3. McKisic Detailed Cost Table 2040 Cont.

MK-40.2				
Item	**QTY**	**Unit**	**Cost/Unit**	**Total Cost**
Replace 24" with 30" PVC Pipe	6,179	LF	$ 425	$ 2,626,075
Remove/Replace Manhole	17	EA	$ 20,000	$ 340,000
Surface Repair	200	LF	$ 250	$ 50,000
Bypass Pumping (35% of New Gravity Line)	1	LS	$ 1,038,000	$ 1,038,000
Clearing and Grubbing	6200	LF	$ 15	$ 93,000
Construction Control	1	LS	$ 35,000	$ 35,000
42" Bored Steel Encasement	200	LF	$ 3,500	$ 700,000
Rock Excavation	1900	CY	$ 250	$ 475,000
Sediment Control	6200	LF	$ 20	$ 124,000
Environmental Permitting	1	LS	$ 50,000	$ 50,000
Traffic Control (per crossing)	3	Each	$ 25,000	$ 75,000
Trench Safety	1	LS	$ 100,000	$ 100,000
Mobilization/Bonds & Insurance (5%)	1	LS	$ 285,304	$ 285,304
Easement (20' wide)	30895	SF	$ 5	$ 154,475
Subtotal				**$ 6,146,000**
Contingency	30%			$ 1,844,000
Construction Subtotal				**$ 7,990,000**
Design, Acquisition, Bid, and Construction Services	15%			$ 1,199,000
Total Project OPC				**$ 9,189,000**
Escalation to estimated horizon	15	Years @ 5%		$ 9,914,271
Escalated Total Project OPC				**$ 19,104,000**
Total Basin OPC (2025 Dollars)				**$12,046,000**
Escalated Total Basin OPC				**$25,044,000**

Figure E4. McKisic Detailed Cost Table 2045.

2045				
MK-45.1				
Item	**QTY**	**Unit**	**Cost/Unit**	**Total Cost**
Replace 18" with 24" PVC Pipe	1,237	LF	$ 325	$ 402,025
Remove/Replace Manhole	5	EA	$ 20,000	$ 100,000
Surface Repair	800	LF	$ 250	$ 200,000
Bypass Pumping (35% of New Gravity Line)	1	LS	$ 176,000	$ 176,000
Construction Control	1	LS	$ 50,000	$ 50,000
36" Bored Steel Encasement	1000	LF	$ 3,000	$ 3,000,000
Rock Excavation	400	CY	$ 250	$ 100,000
Sediment Control	1300	LF	$ 20	$ 26,000
Trench Safety	1	LS	$ 50,000	$ 50,000
Mobilization/Bonds & Insurance (5%)	1	LS	$ 205,201	$ 205,201
Easement (20' wide)	6185	SF	$ 5	$ 30,925
Subtotal				**$ 4,340,000**
Contingency	30%			$ 1,302,000
Construction Subtotal				**$ 5,642,000**
Design, Acquisition, Bid, and Construction Services	15%			$ 846,000
Total Project OPC				**$ 6,488,000**
Escalation to estimated horizon	20	Years @ 5%		$ 10,726,596
Escalated Total Project OPC				**$ 17,215,000**

Figure E4. McKisic Detailed Cost Table 2045 Cont.

MK-45.2				
Item	**QTY**	**Unit**	**Cost/Unit**	**Total Cost**
Replace 24" with 30" PVC Pipe	717	LF	$ 425	$ 304,725
Trenching Additional Depth 15'-20'	717	LF	$ 100	$ 71,700
Remove/Replace Manhole	3	EA	$ 20,000	$ 60,000
Additional Manhole Depth	9	VF	$ 500	$ 4,500
Surface Repair	100	LF	$ 250	$ 25,000
Bypass Pumping (35% of New Gravity Line)	1	LS	$ 154,000	$ 154,000
Clearing and Grubbing	800	LF	$ 15	$ 12,000
Construction Control	1	LS	$ 10,000	$ 10,000
Rock Excavation	300	CY	$ 250	$ 75,000
Sediment Control	800	LF	$ 20	$ 16,000
Environmental Permitting	1	LS	$ 20,000	$ 20,000
Trench Safety	1	LS	$ 10,000	$ 10,000
Mobilization/Bonds & Insurance (5%)	1	LS	$ 38,146	$ 38,146
Easement (20' wide)	3585	SF	$ 5	$ 17,925
Subtotal				**$ 819,000**
Contingency	30%			$ 246,000
Construction Subtotal				**$ 1,065,000**
Design, Acquisition, Bid, and Construction Services	15%			$ 160,000
Total Project OPC				**$ 1,225,000**
Escalation to estimated horizon	20	Years @ 5%		$ 2,025,290
Escalated Total Project OPC				**$ 3,251,000**
Total Basin OPC (2025 Dollars)				**$ 7,713,000**
Escalated Total Basin OPC				**$ 20,466,000**

Figure E5. South Lift Station Detailed Cost Table 2025.

2025				
SL-25.1				
Item	**QTY**	**Unit**	**Cost/Unit**	**Total Cost**
Replace 12" with 18" PVC Pipe	4,915	LF	$ 250	$ 1,228,750
Replace 12" with 24" PVC Pipe	2,718	LF	$ 325	$ 883,350
Trenching Additional Depth 20'-25'	7,633	LF	$ 150	$ 1,144,950
Remove/Replace Manhole	24	EA	$ 20,000	$ 480,000
Additional Manhole Depth	216	VF	$ 500	$ 108,000
Surface Repair	4,100	LF	$ 250	$ 1,025,000
Bypass Pumping (35% of New Gravity Line)	1	LS	$ 1,346,000	$ 1,346,000
Construction Control	1	LS	$ 40,000	$ 40,000
30" Bored Steel Encasement	150	LF	$ 2,500	$ 375,000
36" Bored Steel Encasement	400	LF	$ 3,000	$ 1,200,000
Rock Excavation	2,300	CY	$ 250	$ 575,000
Sediment Control	7,700	LF	$ 20	$ 154,000
Traffic Control (per crossing)	4	Each	$ 25,000	$ 100,000
Trench Safety	1	LS	$ 100,000	$ 100,000
Mobilization/Bonds & Insurance (5%)	1	LS	$ 438,003	$ 438,003
Easement (20' wide)	38,165	SF	$ 5	$ 190,825
Subtotal				**$ 9,389,000**
Contingency	30%			$ 2,817,000
Construction Subtotal				**$ 12,206,000**
Design, Acquisition, Bid, and Construction Services	15%			$ 1,831,000
Total Project OPC				**$ 14,037,000**
Escalation to estimated horizon	3	Years @ 5%		$ 2,212,582
Escalated Total Project OPC				**$ 16,250,000**

Figure E5. South Lift Station Detailed Cost Table 2025 Cont.

SL-25.2				
Item	**QTY**	**Unit**	**Cost/Unit**	**Total Cost**
Replace 8" with 18" PVC Pipe	1,320	LF	$ 250	$ 330,000
Replace 12" with 18" PVC Pipe	9,740	LF	$ 250	$ 2,435,000
Replace 18" with 24" PVC Pipe	856	LF	$ 325	$ 278,200
Trenching Additional Depth 15'-20'	11,916	LF	$ 100	$ 1,191,600
Remove/Replace Manhole	44	EA	$ 20,000	$ 880,000
Additional Manhole Depth	88	VF	$ 500	$ 44,000
Surface Repair	1,300	LF	$ 250	$ 325,000
Bypass Pumping (35% of New Gravity Line)	1	LS	$ 1,806,000	$ 1,806,000
Clearing and Grubbing	2,000	LF	$ 15	$ 30,000
Construction Control	1	LS	$ 60,000	$ 60,000
30" Bored Steel Encasement	800	LF	$ 2,500	$ 2,000,000
Rock Excavation	3,600	CY	$ 250	$ 900,000
Sediment Control	12,000	LF	$ 20	$ 240,000
Environmental Permitting	1	LS	$ 50,000	$ 50,000
Traffic Control (per crossing)	6	Each	$ 25,000	$ 150,000
Trench Safety	1	LS	$ 100,000	$ 100,000
Mobilization/Bonds & Insurance (5%)	1	LS	$ 540,990	$ 540,990
Easement (20' wide)	59,580	SF	$ 5	$ 297,900
Subtotal				**$ 11,659,000**
Contingency	30%			$ 3,498,000
Construction Subtotal				**$ 15,157,000**
Design, Acquisition, Bid, and Construction Services	15%			$ 2,274,000
Total Project OPC				**$ 17,431,000**
Escalation to estimated horizon	3	Years @ 5%		$ 2,747,561
Escalated Total Project OPC				**$ 20,179,000**

Figure E5. South Lift Station Detailed Cost Table 2025 Cont.

2025 Continued South Lift Station Improvements Option 1 - New Pump Station and Force Main				
Item	**QTY**	**Unit**	**Cost/Unit**	**Total Cost**
New Lift Station	1	LS	$ 7,500,000	$ 7,500,000
24" Force Main	18,300	LF	$ 450	$ 8,235,000
Surface Repair	3,800	LF	$ 250	$ 950,000
Clearing and Grubbing	1,000	LF	$ 15	$ 15,000
Construction Control	1	LS	$ 95,000	$ 95,000
36" Bored Steel Encasement	1,400	LF	$ 3,000	$ 4,200,000
Rock Excavation	5,500	CY	$ 250	$ 1,375,000
Sediment Control	18,300	LF	$ 20	$ 366,000
Environmental Permitting	1	LS	$ 50,000	$ 50,000
Traffic Control (per crossing)	14	Each	$ 25,000	$ 350,000
Trench Safety	1	LS	$ 100,000	$ 100,000
Mobilization/Bonds & Insurance (5%)	1	LS	$ 1,161,800	$ 1,161,800
Lift Station real estate	21,780	SF	$ 200	$ 4,356,000
Forcemain permanent 20' Easement	91,500	SF	$ 25	$ 2,287,500
Easement (20' wide)	91,500	SF	$ 5	$ 457,500
Subtotal				**$ 31,499,000**
Contingency	30%			$ 9,450,000
Construction Subtotal				**$ 40,949,000**
Design, Acquisition, Bid, and Construction Services	18%			$ 7,371,000
Total Option 1 Project OPC				**$ 48,320,000**
Escalation to estimated horizon	3	Years @ 5%		$ 7,616,440
Escalated Total Project OPC				**$ 55,937,000**

Figure E5. South Lift Station Detailed Cost Table 2025 Cont.

South Lift Station Improvements Option 2, Part 1 - 2025 Storage Improvements				
Item	**QTY**	**Unit**	**Cost/Unit**	**Total Cost**
1 MG Storage Tank	1	LS	$ 10,000,000	$ 10,000,000
Real estate	43,560	SF	$ 200.00	$ 8,712,000
Mobilization/Bonds & Insurance (5%)	1	LS	$ 935,600	$ 935,600
Subtotal				**$ 19,648,000**
Contingency	30%			$ 5,894,000
Construction Subtotal				**$ 25,542,000**
Design, Acquisition, Bid, and Construction Services	18%			$ 4,598,000
Total Option 2, Part 1 Project OPC				**$ 30,140,000**
Escalation to estimated horizon	3	Years @ 5%		$ 4,750,818
Escalated Total Project OPC				**$ 34,891,000**
Total Basin OPC (2025 Dollars)				**$ 61,608,000**
Escalated Total Basin OPC				**$ 71,320,000**

Figure E6. South Lift Station Detailed Cost Table 2030.

2030				
SL-30.1				
Item	**QTY**	**Unit**	**Cost/Unit**	**Total Cost**
Replace 18" with 24" PVC Pipe	1,544	LF	$ 325	$ 501,800
Replace 18" with 30" PVC Pipe	328	LF	$ 425	$ 139,400
Trenching Additional Depth 15'-20'	330	LF	$ 100	$ 33,000
Remove/Replace Manhole	11	EA	$ 20,000	$ 220,000
Additional Manhole Depth	12	VF	$ 500	$ 6,000
Surface Repair	200	LF	$ 250	$ 50,000
Bypass Pumping (35% of New Gravity Line)	1	LS	$ 315,000	$ 315,000
Clearing and Grubbing	1000	LF	$ 15	$ 15,000
Construction Control	1	LS	$ 10,000	$ 10,000
36" Bored Steel Encasement	200	LF	$ 3,000	$ 600,000
Rock Excavation	600	CY	$ 250	$ 150,000
Sediment Control	1900	LF	$ 20	$ 38,000
Environmental Permitting	1	LS	$ 50,000	$ 50,000
Traffic Control (per crossing)	1	Each	$ 25,000	$ 25,000
Trench Safety	1	LS	$ 50,000	$ 50,000
Mobilization/Bonds & Insurance (5%)	1	LS	$ 110,160	$ 110,160
Easement (20' wide)	9360	SF	$ 5	$ 46,800
Subtotal				**$ 2,360,000**
Contingency	30%			$ 708,000
Construction Subtotal				**$ 3,068,000**
Design, Acquisition, Bid, and Construction Services	15%			$ 460,000
Total Project OPC				**$ 3,528,000**
Escalation to estimated horizon	5	Years @ 5%		$ 974,721
Escalated Total Project OPC				**$ 4,503,000**

Figure E7. South Lift Station Detailed Cost Table 2035.

2035				
South Lift Station Improvements Option 2, Part 2 - 2035 Pump Improvements to Existing Station				
Item	**QTY**	**Unit**	**Cost/Unit**	**Total Cost**
Pump, piping and electrical upgrades	1	LS	$ 3,500,000	$ 3,500,000
Mobilization/Bonds & Insurance (5%)	1	LS	$ 175,000	$ 175,000
Subtotal				**$ 3,675,000**
Contingency	30%			$ 1,103,000
Construction Subtotal				**$ 4,778,000**
Design, Acquisition, Bid, and Construction Services	18%			$ 860,000
Total Project OPC (2025 dollars)				**$ 5,638,000**
Escalation to estimated horizon	10	Years @ 5%		$ 3,545,708
Escalated Total Project OPC				**$ 9,184,000**

Figure E8. Shewmaker Detailed Cost Table 2025.

2025				
SM-25.1				
Item	**QTY**	**Unit**	**Cost/Unit**	**Total Cost**
Replace 12" with 24" PVC Pipe	6,578	LF	$ 325	$ 2,137,850
Replace 18" with 24" PVC Pipe	337	LF	$ 325	$ 109,525
Remove/Replace Manhole	39	EA	$ 20,000	$ 780,000
Surface Repair	300	LF	$ 250	$ 75,000
Bypass Pumping (35% of New Gravity Line)	1	LS	$ 1,060,000	$ 1,060,000
Clearing and Grubbing	7,000	LF	$ 15	$ 105,000
Construction Control	1	LS	$ 35,000	$ 35,000
36" Bored Steel Encasement	400	LF	$ 3,000	$ 1,200,000
Rock Excavation	2100	CY	$ 250	$ 525,000
Sediment Control	7,000	LF	$ 15	$ 105,000
Environmental Permitting	1	LS	$ 50,000	$ 50,000
Traffic Control (per crossing)	2	Each	$ 25,000	$ 50,000
Trench Safety	1	LS	$ 100,000	$ 100,000
Mobilization/Bonds & Insurance (5%)	1	LS	$ 316,619	$ 316,619
Easement (20' wide)	34,575	SF	$ 5	$ 172,875
Subtotal				**$ 6,822,000**
Contingency	30%			$ 2,047,000
Construction Subtotal				**$ 8,869,000**
Design, Acquisition, Bid, and Construction Services	15%			$ 1,330,000
Total Project OPC				**$ 10,199,000**
Escalation to estimated horizon	3	Years @ 5%		$ 1,607,617
Escalated Total Project OPC				**$ 11,807,000**

Figure E8. Shewmaker Detailed Cost Table 2025 Cont.

SM-25.2				
Item	**QTY**	**Unit**	**Cost/Unit**	**Total Cost**
Replace 10" with 18" PVC Pipe	3,949	LF	$ 250	$ 987,250
Replace 12" with 18" PVC Pipe	2,500	LF	$ 250	$ 625,000
Remove/Replace Manhole	27	EA	$ 20,000	$ 540,000
Surface Repair	200	LF	$ 250	$ 50,000
Bypass Pumping (35% of New Gravity Line)	1	LS	$ 753,000	$ 753,000
Clearing and Grubbing	6,500	LF	$ 15	$ 97,500
Construction Control	1	LS	$ 35,000	$ 35,000
36" Bored Steel Encasement	200	LF	$ 3,000	$ 600,000
Rock Excavation	2000	CY	$ 250	$ 500,000
Sediment Control	6,500	LF	$ 20	$ 130,000
Environmental Permitting	1	LS	$ 50,000	$ 50,000
Traffic Control (per crossing)	1	Each	$ 25,000	$ 25,000
Trench Safety	1	LS	$ 100,000	$ 100,000
Mobilization/Bonds & Insurance (5%)	1	LS	$ 224,638	$ 224,638
Easement (20' wide)	32,245	SF	$ 5	$ 161,225
Subtotal				**$ 4,879,000**
Contingency	30%			$ 1,464,000
Construction Subtotal				**$ 6,343,000**
Design, Acquisition, Bid, and Construction Services	15%			$ 951,000
Total Project OPC				**$ 7,294,000**
Escalation to estimated horizon	3	Years @ 5%		$ 1,149,717
Escalated Total Project OPC				**$ 8,444,000**
Total Basin OPC (2025 Dollars)				**$17,493,000**
Escalated Total Basin OPC				**$20,251,000**

Figure E9. Town Branch Detailed Cost Table 2025.

2025				
TB-25.1				
Item	**QTY**	**Unit**	**Cost/Unit**	**Total Cost**
Replace 12" with 18" PVC Pipe	4,019	LF	$ 250	$ 1,004,750
Trenching Additional Depth 15'-20'	500	LF	$ 100	$ 50,000
Remove/Replace Manhole	26	EA	$ 20,000	$ 520,000
Additional Manhole Depth	20	VF	$ 500	$ 10,000
Surface Repair	200	LF	$ 250	$ 50,000
Bypass Pumping (35% of New Gravity Line)	1	LS	$ 555,000	$ 555,000
Clearing and Grubbing	7,900	LF	$ 15	$ 118,500
Construction Control	1	LS	$ 25,000	$ 25,000
30" Bored Steel Encasement	200	LF	$ 2,500	$ 500,000
Rock Excavation	1300	CY	$ 250	$ 325,000
Sediment Control	4,100	LF	$ 20	$ 82,000
Environmental Permitting	1	LS	$ 50,000	$ 50,000
Traffic Control (per crossing)	2	Each	$ 25,000	$ 50,000
Trench Safety	1	LS	$ 50,000	$ 50,000
Mobilization/Bonds & Insurance (5%)	1	LS	$ 169,513	$ 169,513
Easement (20' wide)	20,095	SF	$ 5	$ 100,475
Subtotal				**$ 3,660,000**
Contingency	30%			$ 1,098,000
Construction Subtotal				**$ 4,758,000**
Design, Acquisition, Bid, and Construction Services	15%			$ 714,000
Total Project OPC				**$ 5,472,000**
Escalation to estimated horizon	3	Years @ 5%		$ 862,524
Escalated Total Project OPC				**$ 6,335,000**

Figure E9. Town Branch Detailed Cost Table 2025 Cont.

TB-25.2				
Item	**QTY**	**Unit**	**Cost/Unit**	**Total Cost**
Replace 12" with 18" PVC Pipe	317	LF	$ 250	$ 79,250
Remove/Replace Manhole	4	EA	$ 20,000	$ 80,000
Surface Repair	300	LF	$ 250	$ 75,000
Bypass Pumping (35% of New Gravity Line)	1	LS	$ 56,000	$ 56,000
Construction Control	1	LS	$ 10,000	$ 10,000
Rock Excavation	200	CY	$ 250	$ 50,000
Sediment Control	400	LF	$ 20	$ 8,000
Traffic Control (per crossing)	1	Each	$ 25,000	$ 25,000
Trench Safety	1	LS	$ 10,000	$ 10,000
Mobilization/Bonds & Insurance (5%)	1	LS	$ 19,663	$ 19,663
Easement (20' wide)	1,585	SF	$ 5	$ 7,925
Subtotal				**$ 421,000**
Contingency	30%			$ 126,000
Construction Subtotal				**$ 547,000**
Design, Acquisition, Bid, and Construction Services	15%			$ 82,000
Total Project OPC				**$ 629,000**
Escalation to estimated horizon	3	Years @ 5%		$ 99,146
Escalated Total Project OPC				**$ 729,000**
Total Basin OPC (2025 Dollars)				**$ 6,101,000**
Escalated Total Basin OPC				**$ 7,064,000**

Figure E10. Town Branch Detailed Cost Table 2030.

2030				
TB-30.1				
Item	**QTY**	**Unit**	**Cost/Unit**	**Total Cost**
Replace 12" with 18" PVC Pipe	1,543	LF	$ 250	$ 385,750
Replace 15" with 18" PVC Pipe	500	LF	$ 250	$ 125,000
Remove/Replace Manhole	13	EA	$ 20,000	$ 260,000
Surface Repair	600	LF	$ 250	$ 150,000
Bypass Pumping (35% of New Gravity Line)	1	LS	$ 270,000	$ 270,000
Clearing and Grubbing	900	LF	$ 15	$ 13,500
Construction Control	1	LS	$ 15,000	$ 15,000
30" Bored Steel Encasement	200	LF	$ 2,500	$ 500,000
Rock Excavation	700	CY	$ 250	$ 175,000
Sediment Control	2,100	LF	$ 20	$ 42,000
Environmental Permitting	1	LS	$ 50,000	$ 50,000
Traffic Control (per crossing)	4	Each	$ 25,000	$ 100,000
Trench Safety	1	LS	$ 50,000	$ 50,000
Mobilization/Bonds & Insurance (5%)	1	LS	$ 106,813	$ 106,813
Easement (20' wide)	10,215	SF	$ 5	$ 51,075
Subtotal				**$ 2,294,000**
Contingency	30%			$ 688,000
Construction Subtotal				**$ 2,982,000**
Design, Acquisition, Bid, and Construction Services	15%			$ 447,000
Total Project OPC				**$ 3,429,000**
Escalation to estimated horizon	5	Years @ 5%		$ 947,369
Escalated Total Project OPC				**$ 4,377,000**

Figure E11. Town Branch Detailed Cost Table 2040.

2040				
TB-40.1				
Item	**QTY**	**Unit**	**Cost/Unit**	**Total Cost**
Replace 18" with 24" PVC Pipe	1,595	LF	$ 325	$ 518,375
Remove/Replace Manhole	7	EA	$ 20,000	$ 140,000
Surface Repair	200	LF	$ 250	$ 50,000
Bypass Pumping (35% of New Gravity Line)	1	LS	$ 230,000	$ 230,000
Clearing and Grubbing	1600	LF	$ 15	$ 24,000
Construction Control	1	LS	$ 10,000	$ 10,000
Rock Excavation	500	CY	$ 250	$ 125,000
Sediment Control	1600	LF	$ 20	$ 32,000
Environmental Permitting	1	LS	$ 50,000	$ 50,000
Trench Safety	1	LS	$ 50,000	$ 50,000
Mobilization/Bonds & Insurance (5%)	1	LS	$ 61,469	$ 61,469
Easement (20' wide)	7975	SF	$ 5	$ 39,875
Subtotal				**$ 1,331,000**
Contingency	30%			$ 399,000
Construction Subtotal				**$ 1,730,000**
Design, Acquisition, Bid, and Construction Services	15%			$ 260,000
Total Project OPC				**$ 1,990,000**
Escalation to estimated horizon	15	Years @ 5%		$ 2,147,067
Escalated Total Project OPC				**$ 4,138,000**

Figure E12. Town Branch Detailed Cost Table 2045.

2045				
TB-45.1				
Item	**QTY**	**Unit**	**Cost/Unit**	**Total Cost**
Replace 12" with 18" PVC Pipe	1,378	LF	$ 250	$ 344,500
Remove/Replace Manhole	9	EA	$ 20,000	$ 180,000
Surface Repair	100	LF	$ 250	$ 25,000
Bypass Pumping (35% of New Gravity Line)	1	LS	$ 184,000	$ 184,000
Clearing and Grubbing	1400	LF	$ 15	$ 21,000
Construction Control	1	LS	$ 10,000	$ 10,000
30" Bored Steel Encasement	50	LF	$ 2,500	$ 125,000
Rock Excavation	500	CY	$ 250	$ 125,000
Sediment Control	1400	LF	$ 20	$ 28,000
Environmental Permitting	1	LS	$ 50,000	$ 50,000
Traffic Control (per crossing)	1	Each	$ 25,000	$ 25,000
Trench Safety	1	LS	$ 50,000	$ 50,000
Mobilization/Bonds & Insurance (5%)	1	LS	$ 58,375	$ 58,375
Easement (20' wide)	6890	SF	$ 5	$ 34,450
Subtotal				**$ 1,260,000**
Contingency	30%			$ 378,000
Construction Subtotal				**$ 1,638,000**
Design, Acquisition, Bid, and Construction Services	15%			$ 246,000
Total Project OPC				**$ 1,884,000**
Escalation to estimated horizon	20	Years @ 5%		$ 3,114,813
Escalated Total Project OPC				**$ 4,999,000**

Figure E12. Town Branch Detailed Cost Table 2045 Cont.

TB-45.2				
Item	**QTY**	**Unit**	**Cost/Unit**	**Total Cost**
Replace 24" with 30" PVC Pipe	1,780	LF	$ 425	$ 756,500
Remove/Replace Manhole	7	EA	$ 20,000	$ 140,000
Surface Repair	100	LF	$ 250	$ 25,000
Bypass Pumping (35% of New Gravity Line)	1	LS	$ 314,000	$ 314,000
Clearing and Grubbing	1800	LF	$ 15	$ 27,000
Construction Control	1	LS	$ 10,000	$ 10,000
42" Bored Steel Encasement	100	LF	$ 3,500	$ 350,000
Rock Excavation	600	CY	$ 250	$ 150,000
Sediment Control	1800	LF	$ 20	$ 36,000
Environmental Permitting	1	LS	$ 50,000	$ 50,000
Traffic Control (per crossing)	1	Each	$ 25,000	$ 25,000
Trench Safety	1	LS	$ 50,000	$ 50,000
Mobilization/Bonds & Insurance (5%)	1	LS	$ 96,675	$ 96,675
Easement (20' wide)	8900	SF	$ 5	$ 44,500
Subtotal				**$ 2,075,000**
Contingency	30%			$ 623,000
Construction Subtotal				**$ 2,698,000**
Design, Acquisition, Bid, and Construction Services	15%			$ 405,000
Total Project OPC				**$ 3,103,000**
Escalation to estimated horizon	20	Years @ 5%		$ 5,130,183
Escalated Total Project OPC				**$ 8,234,000**
Total Basin OPC (2025 Dollars)				**$ 4,987,000**
Escalated Total Basin OPC				**$ 13,233,000**