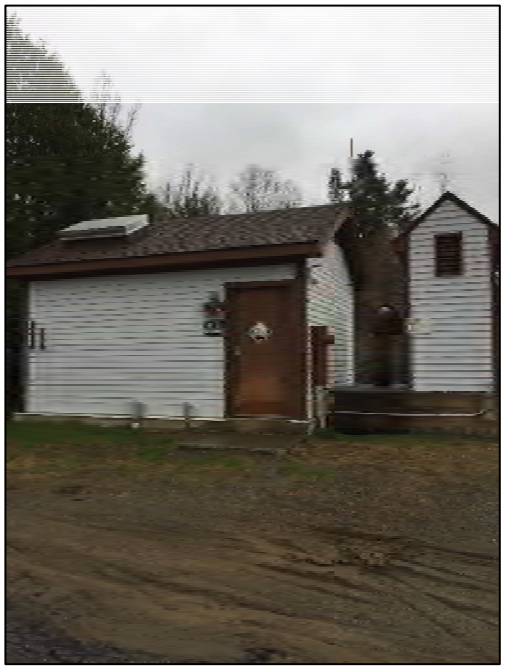

Town of Enfield, New Hampshire

Wastewater System Asset Management Plan

Updated Draft

December 2019

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…progressive solutions for municipal infrastructure

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1. INTRODUCTION AND BACKGROUND

1.1 PROJECT OVERVIEW

The Town of Enfield owns and operates a wastewater collection system that currently serves approximately 619 sewer users in Enfield. The Town does not own and operate a wastewater treatment facility, but instead discharges wastewater to the Lebanon Wastewater Treatment Plant (WWTP) for treatment. Wastewater flows are conveyed to Lebanon via a force main, and flows travel through the City of Lebanon's collection system before reaching the Lebanon WWTP for treatment and disposal.

1.2 PLANNING AREA BACKGROUND

1.2.1 Background

The Town is located in the southwestern corner of Grafton County, New Hampshire, a part of the Upper Valley Region of the State, approximately 11 miles east of the Connecticut River and the State of Vermont. The Town is approximately 43.1 square miles is size, with a population of approximately 4,582 as of the 2010 United States Census.

The Town is bordered to the west by Lebanon, the regional commercial and population center. The Sullivan County Towns of Plainfield, Grantham and Springfield lie to the south, while Canaan and Hanover are to the north, and Grafton to the east. Interstate 89 travels through the relatively undeveloped southwestern portion of Town and State Highways 4 and 4A form the major arteries for the various villages that comprise Enfield. Mascoma Lake represents Enfield's lowest elevation at 751 feet above sea level, while the highest elevation is over 2,000 feet in a small area near Halfmile Pond.

The Route 4 and Route 4A corridors are served by the Town's sanitary sewer collection system which conveys wastewater to the City of Lebanon's WWTP. The Enfield collection system was constructed in 1988. Prior to construction of the wastewater collection system, untreated sewage from Enfield was a major source of pollution to the Mascoma River and Lake.

1.2.2 Organizational Profile

The Town is governed by an elected three-member Board of Selectmen. The Board of Selectmen, meets regularly to review budgets, capital projects, and hold public hearings. The Town also has several other Boards, Committees and Departments of both elected and appointed members that carry out municipal activities, set policies, and hold public forums to solicit resident and business input. Town Meetings are held throughout the year to approve the budget and other warrant articles.

Town Departments and Boards directly involved in wastewater asset management planning include the Board of Selectmen, the Town Manager, and the Department of Public Works. The responsibility of the Department of Public Works is oversight, management and operation of the Sanitary Sewer Wastewater Collection System and Wastewater Pump Stations. For parcels not served by the sanitary sewer system, property owners are responsible for the operation and maintenance of their on-site wastewater disposal systems (septic systems).

1.2.3 Geographic Profile

The Town is intersected by Interstate 89 as it travels North/South through the southwestern portion of Town. The nearest major urban population centers in the State of New Hampshire include the City of Concord, which is 55 miles to the southeast, and the City of Manchester, which is 75 miles to the southeast.

The Town was incorporated in 1761. The total land area is approximately 40.3 square miles. The Town has mostly been developed in the vicinity of the Route 4 and Route 4A corridors. The Town is primarily a rural residential community with some commercial development centered along the Route 4 and Route 4A corridors. The majority of undeveloped areas are zoned for agricultural use and a large portion of the agricultural land is permanently protected from development.

1.2.4 Demographic Profile

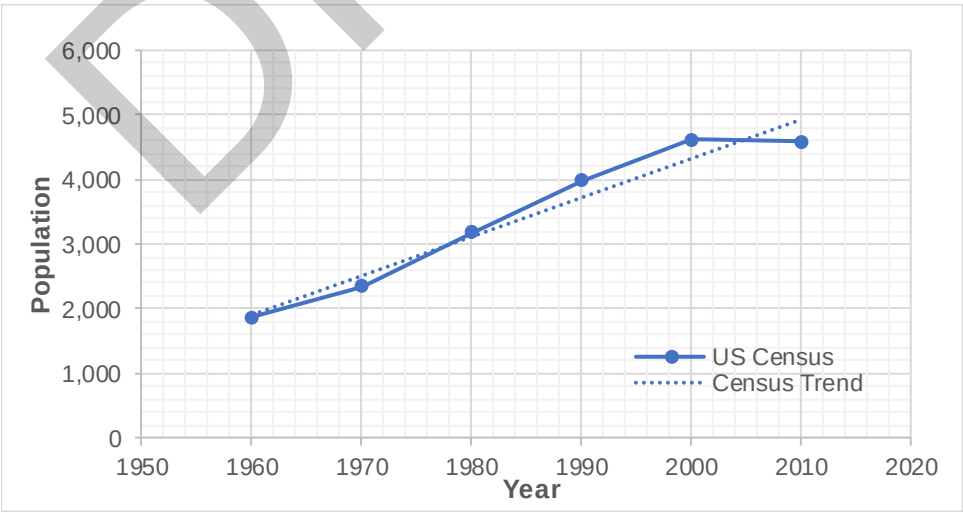
Historical population information provided by the United States Census Bureau from 1960 to 2010 is provided in **Table 1-1**. The Town experienced a 15.8% increase in population in the 1960s, followed by a 25.6% increase in population in the 1970s and a 35.4% increase in the 1980s. The population increased again during the 1990s by 25.3% and by 16.1% in the 2000s. Over the past 60-years the United States Census Bureau data indicates that the Town has an increasing population trend, which is contrary to the population trends for other rural communities throughout New England as a whole. A summary of the population trends for the Town based on the populations reported in the United States Census Bureau are presented below in **Table 1-1**.

Table 1-1: Population Trends (1960 – 2010)

Year	Population	% Change
1960	1,867	15.8%
1970	2,345	25.6%
1980	3,175	35.4%
1990	3,979	25.3%
2000	4,618	16.1%
2010	4,582	- 0.8%

A graph of the population trends for the Town is presented below in **Figure R1**.

Figure R1: Population Trends (1960 – 2010)



1.3 PLANNING PERIOD

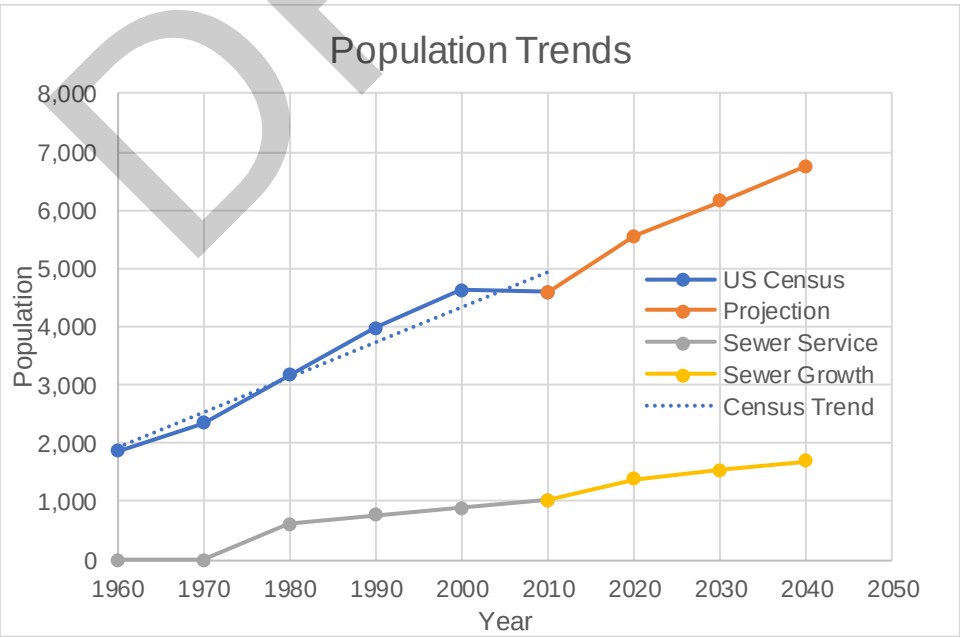
The planning period for this Project is from 2020 to 2040. To date, the collection system expansion has been limited to the areas in the vicinity of Route 4 and Route 4A. The current sewer service population is estimated at 1,387. Based on historical population trends provided by the United States Census Bureau, it is estimated that the population will increase 47.5% by the year 2040. This projected population increase may result in an estimated sewer service population of 1,689 for the sanitary sewer service area. A summary of the Town population and the sewer service population projections is presented below in **Table 1-2**.

Table 1-2: Town and Sewer Service Area Population Trends

Year	Town Population	Estimated Sewer Service Population
1960	1,867	0
1970	2,345	0
1980	3,175	614
1990	3,979	770
2000	4,618	893
2010	4,582	1,017
2020	*5,548*	1,387
2030	*6,154*	*1,538*
2040	*6,760*	*1,689*

A graph of the Town and sewer service population projections are presented in **Figure R2**.

Figure R2: Town and Sewer Service Area Population Trends



The projected sewer service population shown on **Figure R2** includes infill with limited sewer extensions within the existing sanitary sewer system. The projected sewer service population does not include major expansions of the collection system.

1.4 PROJECT GOALS/VISION STATEMENT

The goal of the Asset Management Plan is to provide a wastewater planning document that provides a roadmap for the Town's wastewater infrastructure for the next 20-years. The Asset Management Plan is a streamlined and focused process that aids the Town in defining and prioritizing the capital improvements that are needed within the existing infrastructure. The Asset Management Plan maximizes capital investment by prioritizing the capital needs based on the criticality of the asset. The Town of Enfield is committed to improving and maintaining the public health, protection, and performance of their wastewater collection infrastructure assets, and minimizing the long-term costs of operating these assets. The Town has developed the following vision statement to guide their ongoing asset management efforts:

> *The Town of Enfield will meet the standard of care for current sewer customers, facilitate opportunities for additional sewer customers, and balance annual program needs with sustainable customer costs.*

1.5 LEVEL OF SERVICE GOALS

The foundation of an asset management plan relies on the establishment of level of service (LOS) goals, which establish sewer customer expectations and outline the commitments of the Town. These LOS goals should have SMART (specific, measurable, attainable, relevant, time-based) criteria to ensure their successful implementation and completion. Through an internal LOS workshop on October 1, 2019, and subsequent public informational meeting on October 8, 2019, the following LOS goals and SMART criteria were established to guide the Town in their ongoing asset management efforts:

1. Maintain adequate system capacity for all current and future sewer customers.
    a. No surcharging of sewers due to hydraulic capacity.
    b. Institute an annual proactive/preventative sewer system maintenance program.
2. Minimize system bottlenecks due to pipe blockages.
    a. Sonar test 20% of the sewer system annually – prioritize cleaning and CCTV-inspection based on sonar results.
3. Reduce non-sanitary flows to Lebanon.
    a. Reduce extraneous flows [infiltration/inflow (I/I)] by 10% over a 5-year period.
    b. Explore a flow offset program (reduction of I/I to facilitate new sewer connections).
    c. Evaluate composition of flows (sanitary versus I/I) to Lebanon on an annual basis to evaluate the effectiveness of I/I removal efforts.
4. Maintain system access to facilitate service response.
    a. Clear easements within the next five-year period.
    b. Uncover buried manholes within the next five-year period.
    c. Institute an annual program to maintain access.
5. Develop integrated funding, finance and revenue model.

a. Establish a 5-year capital plan and rate projections and update annually.
b. Continue to seek grant and low-interest loan opportunities.
c. Recover the full cost of doing business.
d. Balance standard of care, system needs, and customers costs.

6. Grow sewer customer base by 10% over a 10-year period.
    a. Prioritize infilling of new customers adjacent to the existing sewer system to increase revenue.

1.6 SCOPE OF WORK

The scope of work of the asset management plan focuses on the following wastewater infrastructure components:

Sanitary Sewer Collection System: The sanitary sewer collection system asset management plan included the following:

1. Development of a sanitary sewer collection system map utilizing GPS coordinate locations of the existing sanitary sewer manholes.
2. Flow monitoring of the sanitary sewer collection system using in-situ insertable open-channel flow meters.
3. At-grade inspections for each of the accessible manholes within the sanitary sewer collection system.
4. At-grade sonar testing of accessible gravity sewer mains within the sanitary sewer collection system.
5. Development of an asset management database, based on the targeted field work, to help the Town prepare for future repairs and upgrades of its sanitary sewer collection system.
6. Rank and prioritize the assets based on level of service (LOS) and asset criticality rankings as developed by the Operations Staff and the Town Stakeholders.
7. Development of a prioritized capital improvement plan (CIP) for the sanitary sewer collection system based on the asset rankings, discussions with the system operators, Town stakeholders and targeted field work.

Wastewater Pump Stations: The pump station asset management plan included the following:

1. Evaluation of the pump station existing conditions assessment including structural integrity, capacity and operational issues based on visual observations and discussions with the system operators.
2. Evaluation of wastewater pump station improvements necessary to maintain the continued operation of the pump stations.
3. Development of an asset management database, based on the evaluations, to help the Town prepare for future repairs and upgrades of its wastewater pump stations.
4. Rank and prioritize the assets based on level of service (LOS) and asset criticality rankings as developed by the Operations Staff and the Town Stakeholders.
5. Development of a prioritized CIP for the wastewater pump stations based on the asset rankings, discussions with the system operators and Town stakeholders.

Financial Evaluation: The evaluation of the wastewater system finances included the following:

1. Evaluation of current costs of service associated with the operations and maintenance of the wastewater system
2. Identification of potential funding sources and the impacts of varying levels of debt service on the cost of service
3. Development of future opinions of probable costs of service associated with the operations and maintenance of the wastewater system including the debt service associated with the recommended capital improvements plan.

The three components of the wastewater infrastructure assessment are integrated into this Asset Management Plan that culminates in a recommended plan to address the identified needs and capital improvements. The recommended plan includes conceptual planning level opinions of probable cost, a proposed implementation schedule, potential funding sources and a project financing plan.

1.7 PUBLIC INVOLVEMENT

Throughout the Project, regular meetings were held with Town stakeholders including the DPW Director, the Town Manager, and the New Hampshire Department of Environmental Services (NHDES). The meetings were conducted to provide updates on project progress and receive input and feedback on tasks and deliverables from the Town stakeholders. A summary of the meetings with Town stakeholders is presented below in **Table 1-3**.

Table 1-3: Schedule of Public Involvement

Date	Board/Staff	Reason for Meeting
January 7, 2019	DPW/Town Manager/NHDES	Wastewater Asset Management Plan Project kickoff meeting
April 30, 2019	DPW	Site visit and walkthrough of the six (6) Town-owned pump stations with the operations staff
October 1, 2019	Internal Level of Service (LOS) Workshop	Conducted a LOS workshop at the DPW Offices with the DPW Director, the Operations staff, the Town Manager and NHDES
October 8, 2019	Public Informational Meeting	Conducted a public informational meeting of the Asset Management Plan and LOS goals at Community Lutheran Church with the DPW Director, the Operations staff and the Town Manager
November 22, 2019	Internal Workshop	Conducted a workshop at the DPW Offices with the DPW Director and Town Manager to review the Draft Report.

Ongoing public communication, including meetings with the Board of Selectmen, as well as future public informational sessions, to present the project results are planned. The handout from the Public Informational Meeting on October 9, 2019 is included in **Appendix G**.

2. SANITARY SEWER COLLECTION SYSTEM

2.1 EXISTING CONDITIONS

The Enfield sanitary sewer collection system includes approximately 45,260 linear feet (lf) of gravity sewer and 226 manholes. The collection system converges to the Route 4A Pump Station, before being pumped into the Lebanon collection system, flowing by gravity to the Lebanon WWTP for treatment and disposal. There are six (6) pump stations in the Enfield collection system. The collection system, shown in **Figure 2-1**, is comprised of 6 to 16-inch diameter gravity sewers, constructed of DI and PVC pipe materials. The majority of the Enfield collection system was constructed in the late 1980s with extensions in 1992 and 1997 to serve the Flanders Street area and Prospect Hill area. Overall, the collection system is comprised of approximately 12% DI gravity sewer mains, and 88% PVC gravity sewer mains. A summary of the collection system by pipe type and pipe diameter is presented in **Table 2-1**.

Table 2-1: Enfield Collection System Composition

Pipe Type	Pipe Diameter (in)	Pipe Length (lf)	Percent of Total System
DI	6	1,052	2.5%
	8	778	1.8%
	12	2,630	6.2%
	16	838	2.0%
PVC	8	30,679	72.1%
	10	1,355	3.2%
	12	3,076	7.2%
	15	2,151	5.0%
	Total =	**42,560**	**100.0%**

2.1.1 Mapping

GPS location and GIS mapping of the Enfield collection system commenced in February 2019 and was completed in the Spring of 2019. A handheld GPS unit with sub-meter accuracy was used to locate manholes. Of the 226 manholes in the Town's collection system, 208 were located in the field and their positions were recorded. The remaining 18 manholes, which could not be located in the field due to inaccessibility or possibly being buried or paved over, were estimated based on available information and discussions with the Town. The Town's GIS mapping was updated to include sanitary sewer attributes including pipe type, pipe diameter, connectivity, and flow direction.

2.2 INFILTRATION AND INFLOW

The City of Lebanon's wastewater collection system and WWTP are regulated through a National Pollutant Discharge Elimination System (NPDES) permit issued by the United States Environmental Protection Agency (US EPA). The Town of Enfield is considered a co-permittee under this NPDES permit through their Intermunicipal Agreement (IMA) with Lebanon, and is held to the same standards for operation and maintenance of their wastewater collection system. A requirement of the NPDES permit is the control of infiltration and inflow (I/I) into the sewer system to prevent high-flow related unauthorized discharges. In order to evaluate the level of I/I entering

the Enfield collection system, this Project included flow monitoring during high groundwater periods, manhole inspections, and sonar testing.

Wastewater is comprised of three major components:

1. Base sanitary flows;
2. Infiltration (including RII); and
3. Inflow.

Base sanitary flow includes residential and non-residential discharges. Infiltration is defined as the groundwater that enters a sewer system through such means as defective pipes, pipe joints, connections, and manhole walls and cones. Infiltration usually varies during the year in relation to groundwater levels. Inflow is directly related to a rainfall event and consists of sources such as catch basins, roof leaders, cellar drains, yard drains, area and foundation drains, and seepage through manhole covers. In addition to infiltration and inflow, a third type of extraneous flow, rainfall-induced infiltration (RII), occurs when groundwater enters a sewer system via the same means as infiltration, but is caused by the temporary rise in groundwater levels after a storm event, lasting anywhere from several days to several weeks. RII and inflow appear similar in terms of their initial short-terms flow patterns, but RII only occurs during a precipitation event when groundwater levels are elevated, and flows do not recover to base levels for an extended period of time. Inflow occurs, in theory, during every precipitation event and is a short-term response. For this Report, we classified I/I as either infiltration, inflow, on RII.

I/I reduces the effective hydraulic capacities of sanitary sewer collection system conveyance and treatment facilities. I/I also decreases the efficiency of WWTP processes and can hydraulically overload and in some cases wash-out the WWTP processes during wet weather events. The benefits of removing excess I/I are an increase in the available hydraulic capacity of the sanitary sewer collection system conveyance and treatment systems to accommodate future needs, a reduction in the overall cost of processing and treatment, decreased risks associated with system backups and possible sanitary sewer overflows (SSOs), and decreased risks associated with weather-related NPDES violations at the WWTP. I/I mitigation is also an important part of wastewater discharge permitting requirements.

2.2.1 Flow Monitoring

In order to determine the amount of I/I in the Enfield collection system, a continuous flow monitoring program was implemented in April 2019. The collection system was divided into six (6) Sub-Areas, and open-channel flow meters were installed at the outlet of each Sub-Areas. The portion of gravity sewer that flows directly into Lebanon on Route 4A, and the portions of gravity sewer tributary to the Route 4A PS were not metered as part of this study. The Sub-Areas, flow meter locations, and pump stations are shown in **Figure 2-2**. The goal of the collection system flow monitoring was to isolate the Town's collection system into smaller sewersheds and monitor flows at each meter location. Flows were monitored at the following locations:

1. Route 4A
2. Route 4
3. Main Street
4. Union Street
5. Shaker Hill Road
6. Baltic Street

Isco 2150 Flow Meter

Continuous flow monitoring commenced on April 27, 2019 and concluded on June 27, 2019. During this 8-week period, depths (inches) and velocities (feet/second) were recorded at 15-minute intervals using six (6) open-channel flow meters. Six Isco 2150 flow meters, coupled with AV sensors, were used. Data recorded by these meters was used to determine the flow rate (GPM) at each site. Weekly site visits were conducted to download the meter data and check meter functionality. The Shaker Hill Road flow meter failed to collect data from 4/27/2019 to 4/29/2019 due to a wastewater debris on the sensor. The Baltic Street flow failed to collect data from 5/11/2019 to 5/21/2019 due to an issue with the sensor. The sensor was reset on 5/21/2019 and performed well for the duration of the flow monitoring period.

Throughout the flow monitoring period, data from each meter was plotted against regional groundwater depths and local rainfall data (see Figures in **Appendix A**). Rainfall has an impact on I/I, particularly through inflow sources such as roof leaders and catch basins that are directly connected to the sanitary sewer system. Rainfall also impacts RII when precipitation raises groundwater levels leading to increased infiltration (i.e. sump pumps). Rising groundwater levels have an impact on I/I which occurs when groundwater infiltrates the sewer system through cracked sewer mains, leaking manholes, open joints, and other structural defects. GIS was used to estimate the total length of pipe, in both linear feet and inch-diameter-miles, for each Sub-Area. The flow monitoring data was used to: (1) quantify how much I/I is present in each Sub-Area; and (2) determine what type(s) of I/I, including infiltration, inflow, and RII, are present in each Sub-Area**.**

2.2.1.1 Summary of Observations

2.2.1.1.1 Infiltration

Aside from using base sanitary flow, infiltration can be measured using nighttime flows during dry weather and high groundwater periods to estimate peak infiltration rates. Flows were averaged from 12:00 A.M. to 6:00 A.M., when sanitary flows can be assumed to be minimal, over a three-day period of dry weather (June 7, 2019 to June 9, 2019). Average nighttime flows were then converted to a unit flow to estimate peak infiltration rates. The unit flow is expressed as gallons per day of infiltration per mile of mainline pipe length per inch of pipe diameter (GPD/IDM). A summary of peak infiltration is provided in **Table 2-2**.

Table 2-2: Estimated Peak Infiltration by Sub-Area (June 7, 2019 – June 9, 2019)

Sub-Area	Meter Location	Peak Infiltration (GPD)	Unit Peak Infiltration Rate (GPD/IDM)
1	Route 4A	3,740	340
2	Route 4	7,550	830
3	Main Street	28,770	1,160
4	Union Street	10,880	930
5	Shaker Hill Road	930	250
6	Baltic Street	9,070	2,160
	Total =	**60,940**	**N/A**

While NHDES has not established an infiltration threshold value to be used to determine excessive infiltration, the Massachusetts Department of Environmental Protection has established a threshold of 4,000 GPD/IDM to be used to determine if follow-up investigative field work is

warranted to locate discrete sources of infiltration. According to *TR-16, Guides for the Design of Wastewater Treatment* Works, a normal range of infiltration is 250 to 500 GPD/IDM for newly-installed pipe. The unit peak infiltration rates observed were low to moderate. The total peak infiltration for Sub-Areas 1 through 6 was approximately 60,940 GPD. The average total daily flow at the Shaker Bridge PS and Lower Shaker Village PS was 115,000 GPD for the second quarter in 2019, with the total peak infiltration from Sub-Areas 1 through 6 accounting for approximately 53% of the average total daily flow for the second quarter. Daily flow data was not available for the pump stations; therefore, the projected averages could vary.

The total I/I was estimated for each Sub-Area for the flow monitoring period by subtracting the base sanitary flow from the total average daily flow for that Sub-Area. Total unit I/I rates were found to be low to moderate throughout the collection system. A summary of total I/I is provided in **Table 2-3**. The total I/I for the six Sub-Areas was approximately 64,170 GPD. The average total daily flow at the Shaker Bridge PS and Lower Shaker Village PS was 115,000 GPD for the second quarter in 2019, with the total I/I accounting for 56% of the average total daily flow for the second quarter. Daily flow data was not available for the pump stations; therefore, the projected averages could vary. A comparison of the peak infiltration rate and total I/I to the flows through the permanent flow meter to Lebanon is provided in **Table 2-4**.

Table 2-3: Total I/I by Sub-Area (April 27, 2019 – June 27, 2019)

Sub-Area	Meter Location	Total I/I (GPD)	Total Unit I/I Rate (GPD/IDM)
1	Route 4A	6,680	610
2	Route 4	7,280	800
3	Main Street	34,110	1,380
4	Union Street	10,140	870
5	Shaker Hill Road	3,120	840
6	Baltic Street	2,840	680
	Total =	**64,170**	**N/A**

Table 2-4: Peak Infiltration and Total I/I

I/I Determination	Total (GPD)	Average Daily Flow Shaker Bridge PS and Lower Shaker Village PS (GPD)	I/I as a Percentage of Total Flow
Peak Infiltration (6/7/19-6/9/19)	60,940	115,000	53%
Total I/I (4/27/19-6/27/19)	64,170	115,000	56%

2.2.1.1.2 Rainfall-Induced Infiltration

RII occurs when heavy precipitation events cause a temporary rise in groundwater levels leading to excessive infiltration. RII can be observed when rainfall events produce an increase in flows, followed by a gradual decrease in flows, before returning to base flow levels. Precipitation events throughout the monitoring period correlated with a sharp increase in groundwater levels of greater

than three feet. Three storm events were chosen throughout the monitoring period, and rainfall intensity for each storm was plotted against the flow data, as well as the estimated dry weather flow pattern. Typical examples of RII observed during the flow monitoring period are shown in **Figure R1**, **Figure R2** and **Figure R3**. Flow data for all meters during the three storm events are shown in **Appendix A.**

The total RII was estimated for each Sub-Area by subtracting the dry weather flow preceding a precipitation event from the total daily flow for that Sub-Area on the day following a precipitation event (6/20/2019). Total unit RII rates were found to be low to moderate throughout the collection system. The total RII for the six Sub-areas was approximately 85,620 GPD. A summary of total RII is provided in **Table 2-5**.

Table 2-5: Total Rainfall Induced Infiltration by Sub-Area (Precipitation Event on 6/20/2019)

Sub-Area	Meter Location	Total RII (GPD)	Unit RII Rate (GPD/IDM)
1	Route 4A	4,310	390
2	Route 4	11,680	1,280
3	Main Street	55,330	2,230
4	Union Street	8,790	750
5	Shaker Hill Road	2,220	600
6	Baltic Street	3,290	780
Total =		**85,620**	**N/A**

Figure R3
RII Storm Event (5/19/2019)
Flow Meter #3 - Main Street (Enfield, NH)

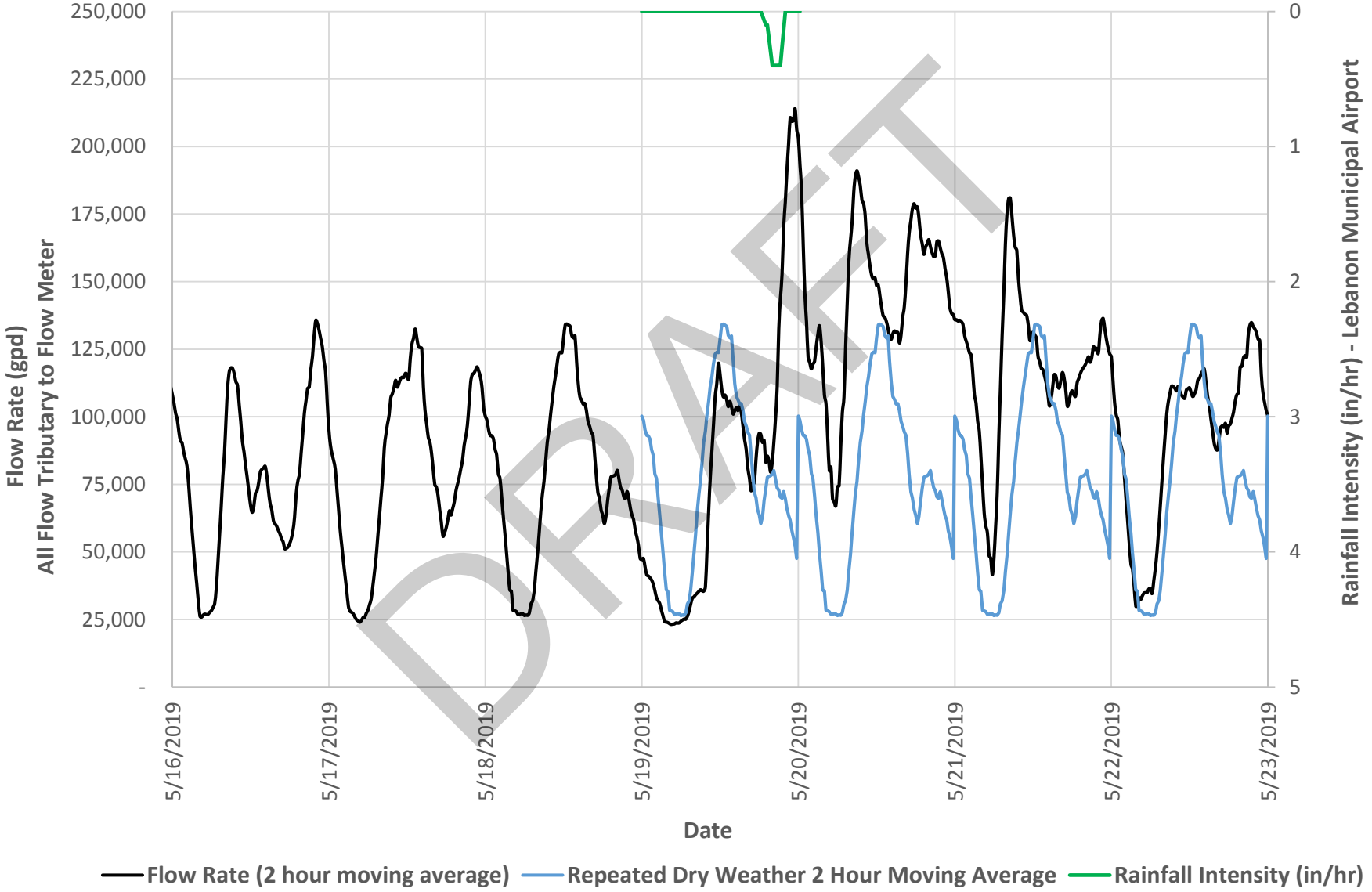


Figure R4
RII Storm Event (5/19/2019)
Flow Meter #4 - Union Street (Enfield, NH)

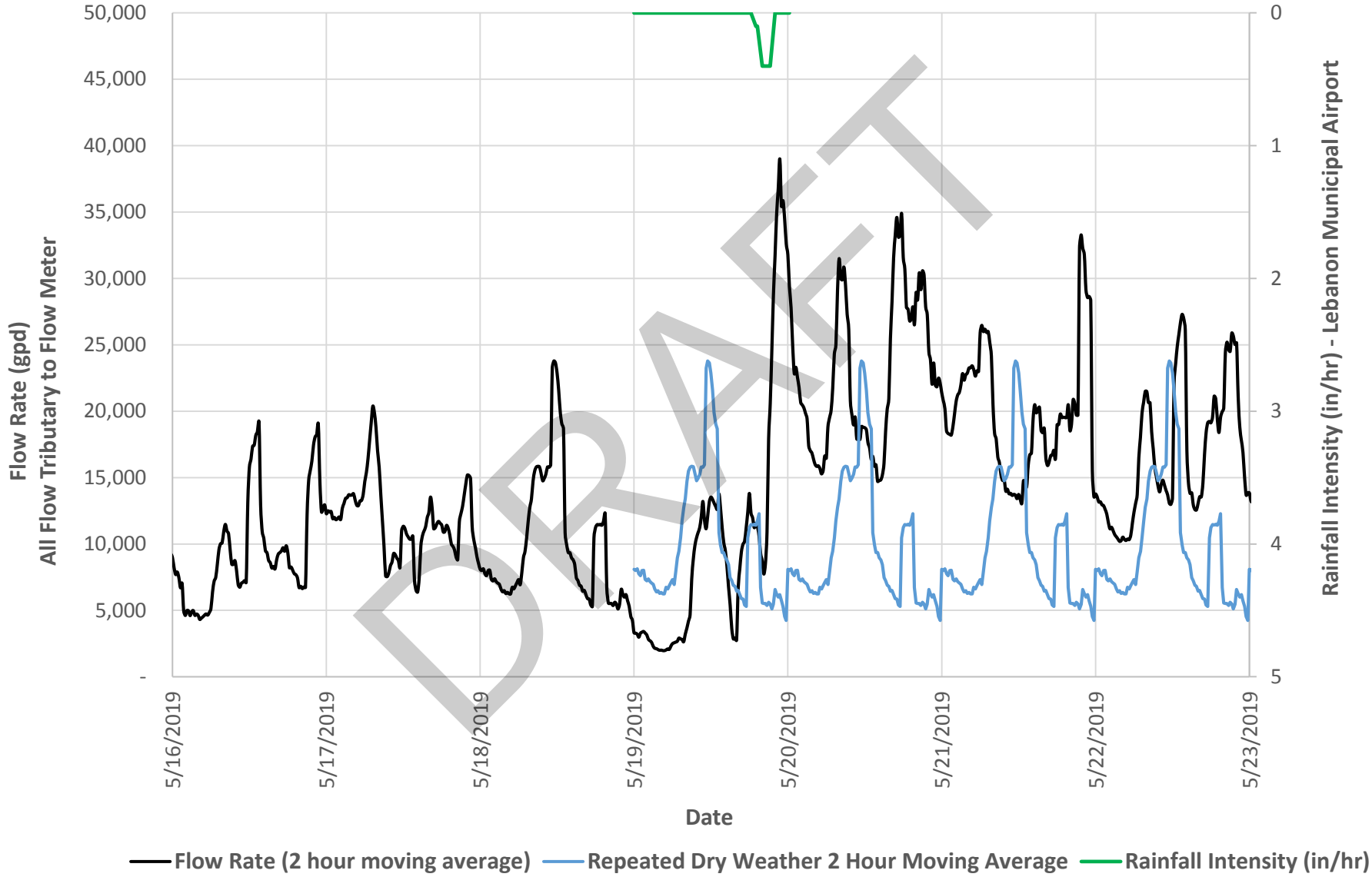
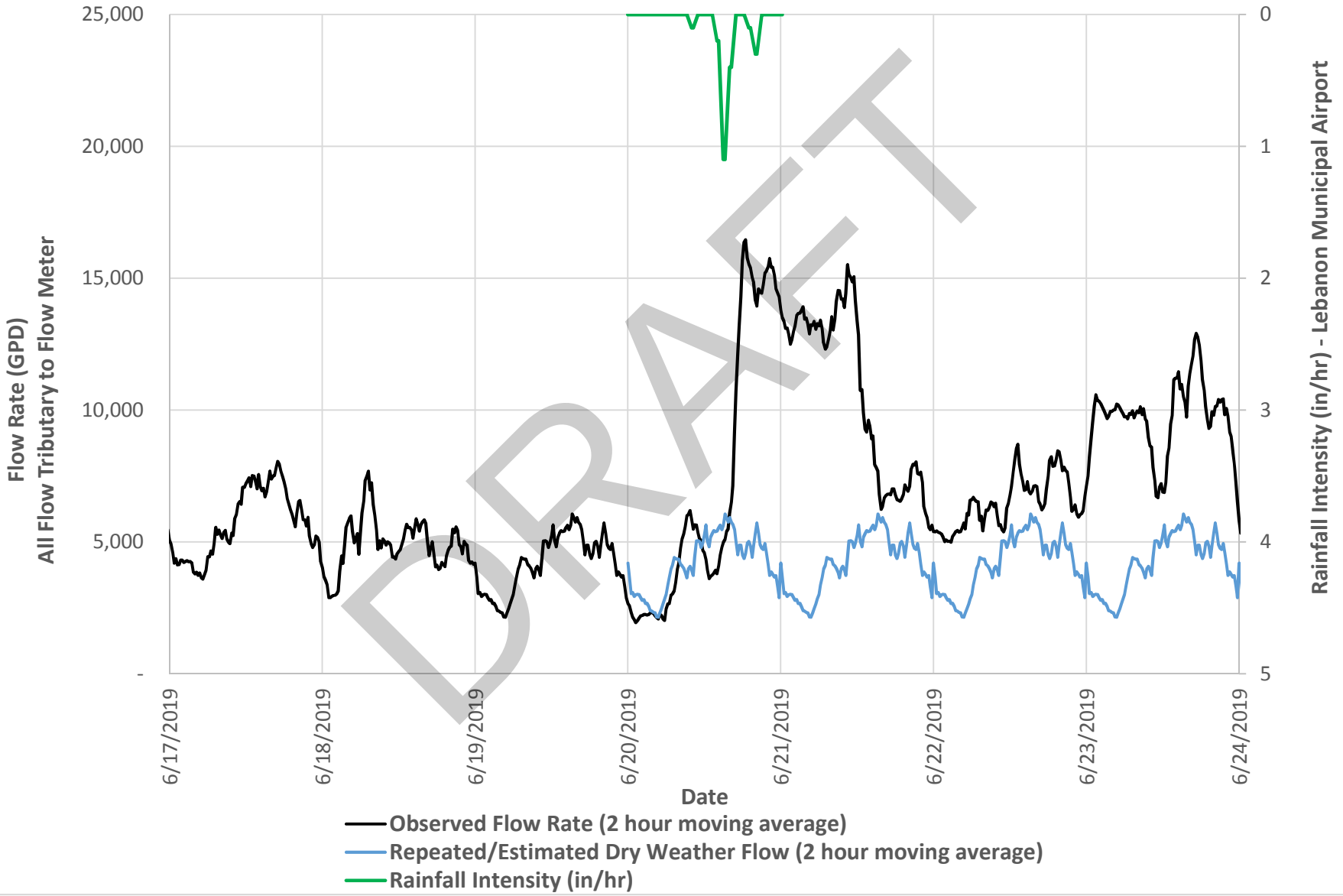


Figure R5
RII Storm Event (6/20/2019)
Flow Meter #6 - Baltic Street (Enfield, NH)



2.2.1.1.3 Inflow

Inflow is observed as a quick spike in flows during a precipitation event. In order to estimate whether any inflow is present in the collection system, the storm event figures in **Appendix A** were analyzed. Inflow was observed in Sub-Areas 1, 2, 3, 4, and 5. Typical examples of inflow observed during the flow monitoring period are shown in **Figure R4, Figure R5, and Figure R5**. A summary of the types of I/I observed in each Sub-Area is provided in **Table 2-6**.

Table 2-6: Types of Observed Infiltration and Inflow by Sub-Area

Sub-Area	Infiltration	Inflow	RII
1		X	
2	X	X	X
3	X	X	X
4	X	X	X
5		X	X
6	X		X

Figure R6
Inflow Storm Event (6/20/2019)
Flow Meter #1 - Route 4A (Enfield, NH)

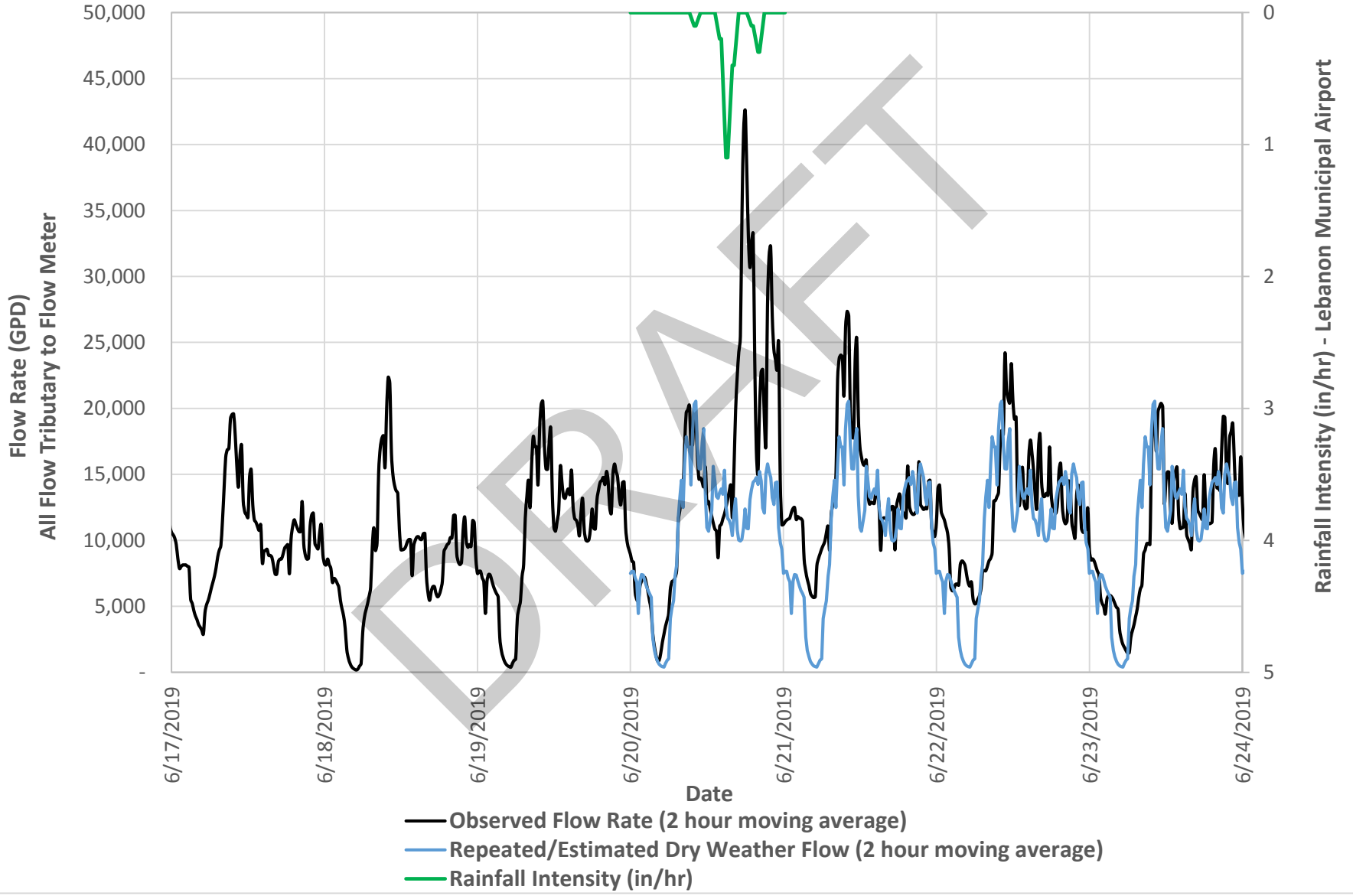


Figure R7
Inflow Storm Event (6/20/2019)
Flow Meter #2 - Route 4 (Enfield, NH)

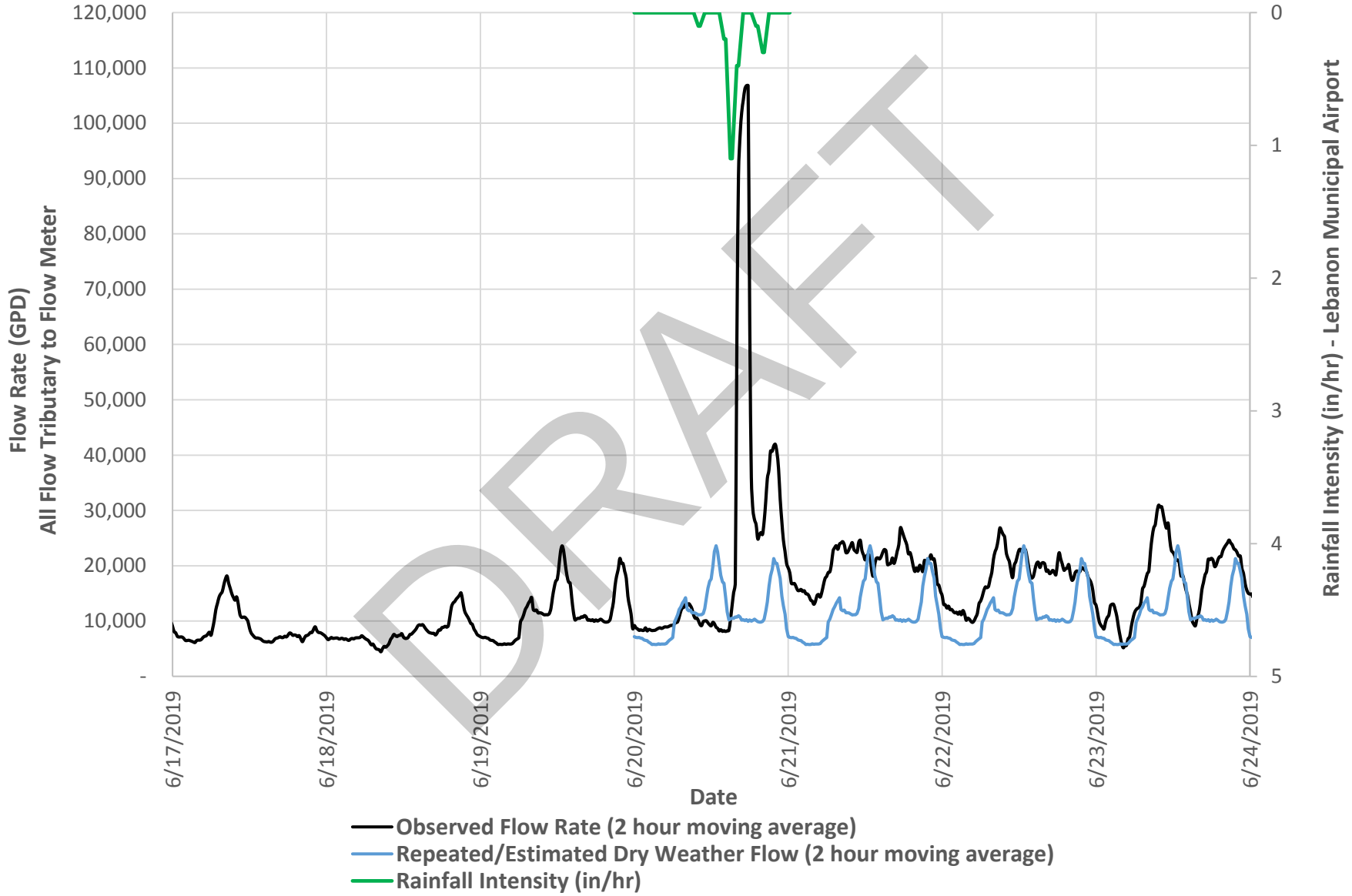
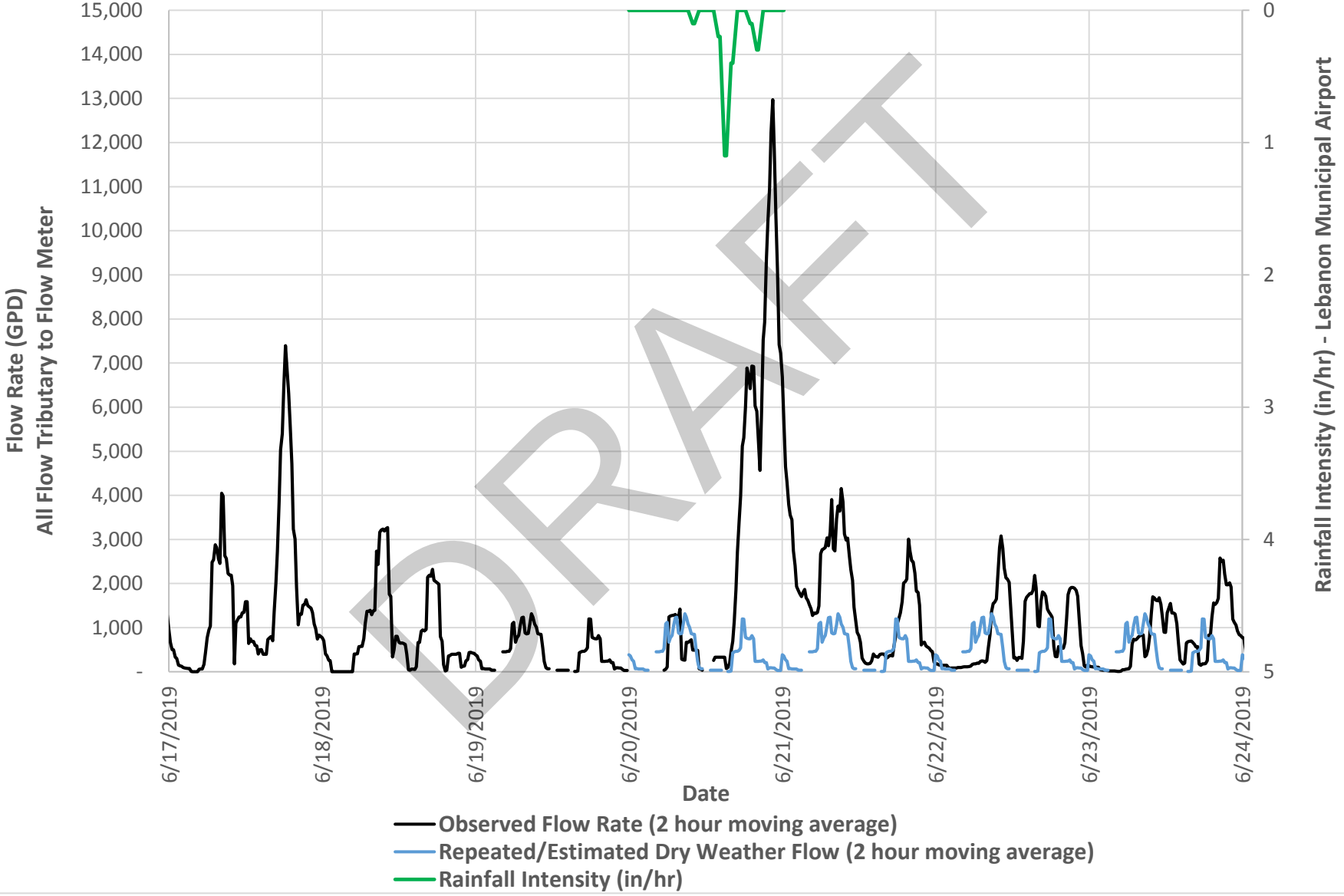


Figure R8
Inflow Storm Event (6/20/2019)
Flow Meter #5 - Shaker Hill Road (Enfield, NH)



2.2.2 Manhole Inspections

Manhole inspections were performed on accessible manholes in the collection system. The inspections included opening manholes covers, and recording observations including type, overall depth, pipe types and diameters, condition, and any observed structural defects and/or operation and maintenance needs. Overall, the conditions of the manholes in the collection system are fair. Signs of infiltration, roots, blockages, and structural defects including loose/fallen bricks from the riser were observed on numerous occasions. A large portion of manholes could not be inspected due to accessibility issues including being paved over, sealed shut, bolted, or along cross-country easements that could not be accessed due to excessive growth. The Town was informed of the accessibility issues and made multiple attempts to locate and open the inaccessible manholes. The results of the manhole inspections, including wall type, condition, and observed infiltration were used to prioritize the manholes in the asset management ranking. A summary of the manhole inspections and manhole defects observed during the inspections are shown in **Figure 2-3**. A summary of notable defects found during the manhole inspections are summarized in **Table 2-7**, and a copy of the manhole inspection forms and photos can be found in **Appendix B.**

Table 2-7: Enfield Collection System Manhole Inspection Summary

Category	Observed Defect	Total Number of Manholes with Observed Conditions
I/I	Active-Moderate I/I	16
	Active-Light I/I	2
O&M	Backup/Blockage	1
	Bolted Cover	7
	Could Not Locate	18
	Could Not Open	20
	Paved Over	23
	Roots	2
	Surcharged	2
Structural Defects	Loose/Falling Bricks from Riser	5

2.2.3 Sonar Testing

Sonar testing was conducted on all accessible gravity sewer mains in conjunction with the manhole inspections. The testing was performed with the Sewer Line Rapid Assessment Tool (SL-RAT), by InfoSense. The sonar testing included transmitting sound waves from a transmitter to a receiver through accessible manholes and pipe segments. Readings were recorded by the receiver at the end of pipe sections opposite the transmitter, and pipes were scored on a scale of 0-10. A score of zero represents a pipe that was fully blocked, while a score of ten represents a clear pipe. Scores were further categorized as poor (0-3), fair (4-6), and good (7-10).

Overall the pipes in the collection system performed well. Of the pipes that were sonar tested, approximately 94% of the pipes scoring in the good range (7-10), 3% of the pipes scoring in the fair range (4-6), and 3% of the pipes scoring in the poor range (0-3). Approximately 50% of the pipes could not be sonar tested due to restrictions including manholes that were bolted, buried, paved, inaccessible along the cross-country easements, or not located. A significant portion of the manholes that could not be accessed were paved over, particularly on the State Roads. The Town made multiple attempts to locate and uncover these manholes. A summary of the sonar score distribution can be found in **Table 2-8**. The sonar scores were utilized as a component in the asset management ranking system, and a summary of the sonar inspection forms and data are included in **Appendix C**. A summary of the sonar inspections and sonar ratings are shown in **Figure 2-4.**

Sonar Testing Equipment (SL-RAT by InfoSense)

Table 2-8: Distribution of Sonar Scores

Sonar Category	Sonar Score	Count	Percent
Poor	0	3	1.3%
	1	0	0.0%
	2	0	0.0%
	3	1	0.5%
Fair	4	0	0.0%
	5	0	0.0%
	6	3	1.3%
Good	7	10	4.4%
	8	39	17.0%
	9	50	21.8%
	10	9	3.9%
N/A		114	49.8%
	Total =	**1,056**	**100%**

2.3 ASSET MANAGEMENT SYSTEM

The data collected during the targeted field work was used to rank and prioritize the collection system assets based on need. The two major components of the Town's collection system, manholes and gravity sewer mains, were scored and ranked based on the results of the field work. The primary considerations when ranking the assets included construction material (type), condition, and I/I observations.

2.3.1 Asset Criticality and Ranking

The asset management database was utilized to rank each of the assets and prioritize recommendations for improvements for pipes and manholes in the collection system. The criteria provided in **Table 2-9** were utilized to prioritize manholes, and the criteria provided in **Table 2-10** were utilized to prioritize gravity sewer mains.

Table 2-9: Manhole Asset Prioritization Criteria

Criteria	Minimum Score	Maximum Score
Wall Type (Brick, Block, Precast)	1	5
Wall Condition (Poor, Fair, Good)	1	5
Observed Manhole Wall I/I (Light, Moderate, High)	1	5
I/I Ranking (Flow Monitoring)	1	5
Asset Criticality & Scoring Range =	**4**	**20**

Table 2-10: Gravity Sewer Main Asset Prioritization Criteria

Criteria	Minimum Score	Maximum Score
Pipe Type (AC, DI, PVC, VC)	1	10
Sonar Score (1 – 10)	1	5
I/I Ranking (Flow Monitoring)	1	5
Asset Criticality & Scoring Range =	**3**	**20**

Manholes were assigned a score according to the following criteria, **Wall Type**: precast = 1 point, block/other = 3 points, and brick = 5 points. **Wall Condition**: good = 1 point, fair = 3 points, poor = 5 points. **Wall I/I**: no I/I = 1 point, past-inactive I/I = 2 points, active light I/I = 3 point, active moderate I/I = 4 points, and active heavy I/I = 5 points. The **I/I ranking** was determined by averaging the peak infiltration rate, total unit I/I rate, and unit RII rate, and ranking the Sub-Areas according to the average. Sub-Areas with average unit rates greater than 2,000 GPD/IDM were given 5 points, Sub-Areas with average unit rates between 1,000 to 2,000 GPD/IDM were given 3 points, and sub-areas with average unit rates less than 1,000 GPD/IDM were given 1 point, including manholes in the non-metered areas. The complete list of manhole asset scores and ranking is provided in **Appendix D.**

Gravity sewer mains were scored according to the following criteria, **Pipe Type**: DI/PVC = 1 point, AC = 5 points, VC = 10 points. **Sonar Score**: 0-1 = 5 points, 2-3 = 4 points, 4-6 = 3 points, 7-8 = 2 points, 9-10 = 1 point. The **I/I ranking** was determined according to the same characteristics as the manholes. Pipe segments that were not in a metered Sub-Area were given an infiltration score based on the pipe type. Sonar testing was only completed on accessible gravity sewer mains within the collection system. Pipes that could not be tested were not assigned a score for this section. After assigning a score to each gravity sewer main segment, they were further prioritized by the percent of system that they serve. The complete list of gravity sewer main asset scores and ranking is provided in **Appendix D.**

Utilizing the asset management database and the ranking criteria provided in **Table 2-9** and **Table 2-10**, the sanitary sewer system assets with the highest criticality score were determined. The

asset management system was used to develop an implementation plan, which includes opinions of probable costs for collection system rehabilitation work, which is summarized in **Section 4**.

For the most part, the asset management database rankings coincide with what was observed in the field. Manholes that were observed to have active infiltration and structural deficiencies rank toward the top of the list, while manholes that were not noted as having any defects are ranked toward the bottom of the list. There are a number of manholes that were not noted as having structural deficiencies or active I/I that rank high on the list due to their wall type and location in the collection system. These manholes should be prioritized below manholes where deficiencies were observed, but monitored for potential future issues. The asset management database rankings for pipes correlated well with pipe type and sonar score. Generally, pipes with low sonar scores ranked the highest. These pipes should be prioritized for flushing and CCTV inspection.

2.4 SUMMARY OF OBSERVATIONS

The Enfield sanitary sewer collection system is primarily comprised of PVC pipe and precast concrete sewer manholes. The sanitary sewer collection system was originally constructed in the late 1980s. Since the completion of the sewer system additional connections have been provided periodically for residential developments within the sewer service area. No major replacement and/or rehabilitation efforts have been made within the sanitary sewer collection systems. The flow monitoring concluded that infiltration is low to moderate throughout most of the collection system. Infiltration rates were highest in Sub-Areas 3 and 6, where estimated peak unit rates ranged from 1,160 to 2,160 GPD/IDM. During periods of high groundwater, peak infiltration can account for up to 53% of flows in the collection system. RII is low to moderate throughout the collection system. RII rates were highest in Sub-Areas 2 and 3, where estimated RII unit rates ranged from 1,280 to 2,230 GPD/IDM. Inflow was observed in Sub-Areas 1, 2, 3, 4, and 5.

The manhole inspections revealed that approximately 40% of the manholes in the Enfield collection system have immediate needs. These defects ranged from light, to moderate active I/I, to structural and O&M needs such as deteriorating risers, backups, surcharging, and root intrusion. Some manholes were observed to have multiple defects. Approximately 30% of the manholes in the collection system could not be inspected due to accessibility issues including being bolted, paved over, buried, sealed shut, or unable to locate and access along cross-county easements.

Based on sonar testing of the gravity sewer mains, approximately 94% of the pipes tested scored in the “good” range (7-10), while 3% of the pipes scored in the “fair” range (4-6), and 3% of pipes scored in the “poor” (0-3) range. Approximately 50% of the pipes could not be sonar tested due to accessibility issues. Manhole and sanitary sewer main access is challenging due to paved over manholes, manholes being sealed shuts, and inaccessibility along portions of the easements. We recommend that the Town secure permitting approval to clear the easements, and uncover and raise manholes where necessary. Inaccessible manholes present significant O&M challenges should any issues occur, such as backups of sanitary sewer mains that require flushing.

2.5 RECOMMENDATIONS

We recommend follow-up investigations including CCTV inspection of the sanitary sewer collection system. The follow-up investigations should be completed prior to any rehabilitation efforts. Additionally, access should be provided to the manholes that could not be located, and manhole inspections and sonar tests should be completed on adjacent pipe segments. Smoke testing is recommended throughout the collection system to identify potential sources of inflow. Updates to the GIS mapping is also recommended upon completion of the follow up work. The CCTV work should be prioritized based on the results of the follow-up collection system field work

and the updated asset management database. This will allow the Town to establish a baseline condition for each pipe, and identify any pipes that warrant rehabilitation/replacement. The results of the CCTV investigations should be integrated with the asset management database developed as part of this Report. Pending the identification of any major structural deficiencies during the CCTV work, the most cost-effective approach is to utilize trenchless technologies that allow for in-situ rehabilitation. The typical useful life of sanitary sewer system components without proper maintenance and repair is 50 to 75 years. With proper maintenance and repairs the useful life of the sanitary sewer system components can be extended significantly.

Rehabilitation of manholes is also recommended. Of the manholes inspected, 22 were found to be in need of rehabilitation. Active I/I and/or structural deficiencies, such as loose and fallen bricks from the risers, were observed in these manholes. Loose bricks provide areas where infiltration can enter into the manholes, and fallen bricks can present significant O&M challenges including clogged pipes and backups in the inverts of the manholes. We recommend that the bricks in the risers of these manholes be grouted. We also recommend that manholes noted as having active I/I are rehabilitated through the use of a chemical grout and cementitious lining. A number of manholes, including the ones recommended for rehabilitation, have O&M needs including roots, backups/blockages, and surcharging. We recommended that the Town address these O&M needs with internal resources, as laid out in the asset management database. The recommended plan for further inspection/rehabilitation of the assets within the sanitary sewer collection system is provided in **Table 2-11**. The approach has been broken into two phases, discussed further as part of an overall implementation plan in **Section 4**.

Table 2-11: Sanitary Sewer Collection System – Recommended Plan

Phase	Task	Recommendations
Phase 1	Locate, Uncover and Open Inaccessible Manholes	Locate, uncover, open, and raise inaccessible manholes where necessary. This includes manholes that have been paved over, sealed shut, buried, or are inaccessible along the easements.
	Manhole Inspections and Sonar Testing of Inaccessible Manholes and Pipes	Locate/uncover remaining manholes. Perform manhole inspections on the manholes that could not be accessed during this Study, as well as sonar testing of the adjacent gravity sewer mains.
	Smoke Testing	Conduct smoke testing throughout the collection system. Smoke testing will identify discrete sources of inflow that can be re-directed to the storm drain system.
	CCTV Inspection (In-Road)	Conduct closed circuit television inspections of in-road sewer mains to identify structural defects and sources of I/I. Piping with the lowest sonar results to be prioritized. Update the asset management and GIS systems accordingly.
	CCTV Inspection (Cross-County Easements)	Conduct closed circuit television inspections of accessible gravity sewer mains located along the easements to identify structural defects and sources of I/I. Piping with the lowest sonar results to be prioritized. Update the asset management and GIS systems accordingly. This will also yield data to prioritize the order of the more costly easement clearing activities over a multi-year period.

Phase	Task	Recommendations
Phase 1 (continued)	GIS Mapping Updates	Update GIS Mapping of the sewer system once additional field work has been completed.
	Field Work Summary, Annual Report and Asset Management Database Updates	Update the Asset Management Database based on the results of the additional field work. Update the multi-year implementation plan accordingly.
	Annual Flow Monitoring	Conduct annual flow monitoring, to continuously evaluated the sanitary sewer collection system, and guide future I/I evaluation.
Phase 2	Manhole O&M Program	Perform O&M on manholes noted in the asset management database with internal resources. This includes addressing blockages/backups, surcharging, and roots.
	Manhole Rehabilitation	Conduct in-situ rehabilitation of manholes. 22manholes in the collection system were noted as being in need of rehabilitation as outlined in **Section 2.6**. Additional manholes may be in need of rehabilitation after completion of the remaining manhole inspections.
	Pipe Rehabilitation	Conduct in-situ rehabilitation of sanitary sewer piping. Pipe rehabilitation to be prioritized based on the results of the Phase 1 sonar testing and future CCTV work. Pending the results of the CCTV, the complete replacement of gravity sewer sections may be required if structural deficiencies cannot be fixed via in-situ rehabilitation methods.
	Asset Management Plan Updates	Update the Asset Management Plan and Asset Management Databases based on the rehabilitation work.

The planning level opinion of probable costs for the recommended plan for further inspection of the assets within the sanitary sewer collection system is provided in **Table 2-12**.

Table 2-12: Sanitary Sewer Collection System – OPC

Phase	Task	Phase 1 OPC	Phase 2 OPC
Phase 1	Locate, Uncover and Open Inaccessible Manholes	$111,000	N/A
	Manhole Inspections and Sonar Testing of Inaccessible Manholes and Pipes	$15,000	N/A
	Smoke Testing	$18,000	N/A
	CCTV Inspection (In-Road)	$104,000	N/A
	CCTV Inspection (Cross-County Easements)	$28,000	N/A
	GIS Mapping Updates	$15,000	N/A
	Annual Flow Monitoring	$50,000	N/A
	Field Work Summary, Annual Report and Asset Management Database Updates	$47,000	N/A

Phase	Task	Phase 1 OPC	Phase 2 OPC
Phase 2	Annual Sonar Program	N/A	TBD
	Annual CCTV Program	N/A	TBD
	Manhole O&M Program	N/A	TBD
	Manhole Rehabilitation	N/A	TBD
	Pipe Rehabilitation	N/A	TBD
	Asset Management Plan Updates	N/A	TBD
	Total =	**$388,000**	**TBD**

The costs presented in **Table 2-12** are to be used for planning purposes only. Opinions of probable costs have been developed based on similar recent projects. Our opinion of cost includes soft costs such as engineering and contingency. The costs for the Tasks provided in **Table 2-12** are in 2019 dollars. The OPC does not include costs associated with manhole and pipe rehabilitation/replacement. An OPC for manhole rehabilitation will be developed upon completion of the Phase 1 work. An OPC for pipe rehabilitation, and pipe replacement, if necessary, will be developed upon completion of the CCTV work. The implementation plan for the proposed work are shown in **Table 2-13** and **Figure R7** and further discussed in **Section 4**.

Table 2-13: Sanitary Sewer Collection System – 5-Year Implementation Plan

Phase	Task	CY2020	CY2021	CY2022	CY2023	CY2024
Phase 1	Locate, Uncover and Open Inaccessible Manholes	$37,000	$37,000	$37,000	$-	$-
	Manhole Inspections and Sonar Testing of Inaccessible Manholes and Pipes	$5,000	$5,000	$5,000	$-	$-
	Smoke Testing	$-	$-	$-	$18,000	$-
	CCTV Inspection (In-Road)	$-	$26,000	$26,000	$26,000	$26,000
	CCTV Inspection (Cross-County Easements)	$-	$-	$-	$28,000	$-
	GIS Mapping Updates	$3,000	$3,000	$3,000	$3,000	$3,000
	Annual Flow Monitoring	$-	$-	$-	$-	$50,000
	Field Work Summary, Annual Report and Asset Management Database Updates	$8,000	$9,000	$10,000	$10,000	$10,000
Phase 2	Annual Sonar Program	TBD	TBD	TBD	TBD	TBD
	Annual CCTV Program	TBD	TBD	TBD	TBD	TBD
	Manhole O&M Program	TBD	TBD	TBD	TBD	TBD
	Manhole Rehabilitation	TBD	TBD	TBD	TBD	TBD
	Pipe Rehabilitation	TBD	TBD	TBD	TBD	TBD
	Asset Management Plan Updates	TBD	TBD	TBD	TBD	TBD
	Total =	**$53,000**	**$80,000**	**$81,000**	**$85,000**	**$89,000**

Note:

OPC does not include costs associated with manhole and pipe rehabilitation/replacement. These costs will be updated upon completion of Phase 1.

3. WASTEWATER PUMP STATIONS

3.1 LAKEVIEW PUMP STATION

The Lakeview Pump Station was originally constructed in 2016 to serve the Lakeview Condominiums. **Table 3-1** provides an existing conditions summary of the pump station. A copy of the pump station inspection summary is provided in **Appendix F**.

Table 3-1: Lakeview Pump Station Summary

Component/Feature	Lakeview PS
Station Configuration	Submersible
Pump Manufacturer	Barnes
Pump Type	Submersible
Number of Pumps (Duty / Total)	1 / 2
Nameplate Unit Pumping Rate	260 gpm @ 111' TDH
Motor Size	25 hp
Motor Speed	Constant Speed
Electrical Rating	480V, 3-Phase
SCADA	None, alarm transmission only
Level Control	Radar level sensor with backup floats
Flow Measurement	Magnetic Flow Meter

3.1.1 Existing Conditions Assessment

No upgrades to the pump station have been completed since its construction and the major equipment and components are still well-within their intended 20-year design life and functioning well. A building is provided to house the electrical and control equipment. A bypass header is provided off of the pump discharge within the valve vault exterior to the pump station. No fall protection is provided for the wetwell or valve vault access hatches. A backup generator and automatic transfer switch are provided for emergency operations. An underground propane tank exists onsite to power the backup generator.

The Lakeview Pump Station is interlocked with Lebanon's Shaker Landing Pump Station so that both do not operate simultaneously, in order to prevent potential hydraulic overloading at the common discharge manhole. A 50-gallon drum of sodium permanganate and peristaltic metering pump are installed for odor control during warmer months of the year. A trash basket is installed on the influent pipe to the wetwell to collect rags/debris, and operators clean this approximately three times per week.

3.1.2 Summary of Needs

The existing pump station is relatively new with equipment and controls that are still within their design life. The major equipment and controls will not require any major upgrades within the planning period. Fall protection should be provided as part of any future upgrade. Overall the pump station is generally in good condition.

3.1.3 Summary of Capital Improvements

No capital improvements are anticipated to this pump station within the planning period.

3.2 LOWER SHAKER VILLAGE PUMP STATION

The Lower Shaker Village Pump Station was originally constructed in 1987 to serve the southern portion of the Town along Route 4A. **Table 3-2** provides an existing conditions summary of the pump station. A copy of the pump station inspection summary is provided in **Appendix F**.

Table 3-2: Lower Shaker Village Pump Station Summary

Component/Feature	Lower Shaker Village PS
Station Configuration	Wet Pit/Dry Pit Can
Pump Manufacturer	Crown
Pump Type	Vertical Centrifugal
Number of Pumps (Duty / Total)	1 / 2
Nameplate Unit Pumping Rate	425 gpm @ 104' TDH
Motor Size	20 hp
Motor Speed	Constant Speed
Electrical Rating	480V, 3-Phase
SCADA	None, alarm transmission only
Level Control	Radar level sensor with backup floats
Flow Measurement	Magnetic Flow Meter

3.2.1 Existing Conditions Assessment

No upgrades to the pump station have been completed since its construction and the major equipment and components are approaching the end of their intended 20-year design life. A shed is provided to house the electrical and control equipment. No bypass header is provided off of the pump discharge to bypass the force main under emergency conditions. Based on visual observations and discussions with the operations staff, the pump station has a recurring problem with rag accumulation in the wetwell. No fall protection is provided for the wetwell or valve vault access hatches. A backup generator and automatic transfer switch are provided for emergency operations. An aboveground propane tank exists onsite to power the backup generator.

The Lower Shaker Village Pump Station handles approximately 20% of system flows, and is interlocked with the Shaker Bridge Pump Station so that both do not operate simultaneously, in order to prevent potential hydraulic overloading at the common discharge manhole. The Town has safety concerns related to making entries into the steel prefabricated "can" type drywell. A manually-cleaned bar rack is installed prior to the wetwell, which is cleaned approximately three times per week. A carbon odor control drum and fan system is installed for odor control, but is not currently used. A hydrogen sulfide sensor is installed but is not functioning. There are three individual storage tanks installed that can receive flow by gravity on high wetwell levels.

3.2.2 Summary of Needs

The existing pump station has equipment and controls that have reached the end of their design life and are approaching the end of their intended useful life. Due to the age of the major equipment and components upgrades will be required within the planning period. Fall protection and other means of operator safety should be provided as part of any upgrade. Overall the pump station is generally in fair condition.

3.2.3 Summary of Capital Improvements

The proposed capital improvements include conversion of the existing wet pit/dry pit pump station to a submersible pump station, reusing the existing wetwell. The planning level opinion of probable costs for these capital improvements is $3,360,000. Pump station recommendations are summarized in **Section 3.8**.

3.3 MCCONNELL ROAD PUMP STATION

The McConnell Road Pump Station was originally constructed in 2013 to serve the northeast extent of the sanitary sewer collection system. **Table 3-3** provides an existing conditions summary of the pump station. A copy of the pump station inspection summary is provided in **Appendix F**.

Table 3-3: McConnell Road Pump Station Summary

Component/Feature	McConnell Road PS
Station Configuration	Submersible
Pump Manufacturer	Cornell
Pump Type	Submersible
Number of Pumps (Duty / Total)	1 / 2
Nameplate Unit Pumping Rate	275 gpm @ 106' TDH
Motor Size	20 hp
Motor Speed	Constant Speed
Electrical Rating	480V, 3-Phase
SCADA	None, alarm transmission only
Level Control	Radar level sensor with backup floats
Flow Measurement	Magnetic Flow Meter

3.3.1 Existing Conditions Assessment

No upgrades to the pump station have been completed since its construction and the major equipment and components are still well-within their intended 20-year design life and functioning well. A building is provided to house the electrical and control equipment. No bypass header is provided off of the pump discharge to bypass the force main under emergency conditions. No fall protection is provided for the wetwell or valve vault access hatches and manholes. A backup generator and automatic transfer switch are provided for emergency operations. An underground propane tank exists onsite to power the backup generator.

The pump station site is located directly adjacent to the 100-year floodplain, and the valve vault that houses the magnetic flow meter floods during spring and other high groundwater conditions, requiring pumping down of the structure to access. The wetwell concrete top slab is severely damaged from snow plowing operations.

3.3.2 Summary of Needs

The existing pump station is relatively new with equipment and controls that are still within their design life. The major equipment and controls will not require any major upgrades within the planning period. The valve vault should be replaced to prevent flooding, and the concrete top slab of the wetwell should be replaced. Fall protection should be provided as part of any future upgrade. Overall the pump station is generally in good condition.

3.3.3 Summary of Capital Improvements

The proposed capital improvements include replacement of pumps/rails, piping/valves, and controls/instrumentation; installation of a bypass header; installation of new top slab for the wetwell and hatches with fall protection; replacement of the existing valve vault; electrical upgrades; and replacement of the backup generator. The planning level opinion of probable costs for these capital improvements is $1,235,000. Pump station recommendations are summarized in **Section 3.8**.

3.4 ROUTE 4A ENFIELD PUMP STATION

The Route 4A Enfield Pump Station was originally constructed in 1986 to serve a small area in the northwestern portion of Town, and pumps directly into the Lebanon gravity sewer collection system. **Table 3-4** provides an existing conditions summary of the pump station. A copy of the pump station inspection summary is provided in **Appendix F**.

Table 3-4: Route 4A Enfield Pump Station Summary

Component/Feature	Route 4A Enfield PS
Station Configuration	Submersible
Pump Manufacturer	Enpo
Pump Type	Submersible
Number of Pumps (Duty / Total)	1 / 2
Nameplate Unit Pumping Rate	100 gpm @ 27’ TDH
Motor Size	3 hp
Motor Speed	Constant Speed
Electrical Rating	240V, 3-Phase
SCADA	None, alarm transmission only
Level Control	Radar level sensor with backup floats
Flow Measurement	Magnetic Flow Meter

3.4.1 Existing Conditions Assessment

No upgrades to the pump station have been completed since its construction and the major equipment and components are approaching the end of their intended 20-year design life. No building is provided to house the electrical and control equipment, which are situated adjacent to the station in locked cabinets. A bypass header is provided off of the pump discharge within the valve vault exterior to the pump station. No fall protection is provided for the wetwell or valve vault access hatches. There is no backup generator provided for emergency operations.

Based on a visual surface inspection of the wetwell, there was evidence of past infiltration at the joints of the precast structure. The Town has brought the majority of controls and electrical equipment above-grade out of the valve vault, but the flow meter controls remain in the valve vault. There is severe concrete degradation of the top slab of the valve vault and rebar is exposed.

3.4.2 Summary of Needs

The existing pump station has equipment and controls that have reached the end of their design life and are approaching the end of their intended useful life. Due to the age of the major equipment and components upgrades will be required within the planning period. Fall protection

and other means of operator safety should be provided as part of any upgrade. Overall the pump station is generally in fair condition.

3.4.3 Summary of Capital Improvements

The proposed capital improvements include replacement of pumps/rails, piping/valves, and controls/instrumentation; installation of new top slab and hatches with fall protection for wetwell and valve vault; relocation of flow meter controls above-grade from the valve vault; electrical upgrades; and repairs to the wetwell to make structure watertight. The planning level opinion of probable costs for these capital improvements is $810,000. Pump station recommendations are summarized in **Section 3.8**.

3.5 SHAKER BRIDGE PUMP STATION

The Shaker Bridge Pump Station was originally constructed in 1986 to serve the portion of the Town on the north side of Mascoma Lake. **Table 3-5** provides an existing conditions summary of the pump station. A copy of the pump station inspection summary is provided in **Appendix F**.

Table 3-5: Shaker Bridge Pump Station Summary

Component/Feature	Lower Shaker Village PS
Station Configuration	Wet Pit/Dry Pit
Pump Manufacturer	Barnes Crown
Pump Type	Suction-Lift
Number of Pumps (Duty / Total)	1 / 2
Nameplate Unit Pumping Rate	406 gpm @ 91’ TDH
Motor Size	25 hp
Motor Speed	Constant Speed
Electrical Rating	208V, 3-Phase
SCADA	None, alarm transmission only
Level Control	Radar level sensor with backup floats
Flow Measurement	Magnetic Flow Meter

3.5.1 Existing Conditions Assessment

No upgrades to the pump station have been completed since its construction and the major equipment and components are approaching the end of their intended 20-year design life. There is a two-level building with cedar siding provided to house the backup generator and electrical/control equipment (upper level) and pumps (lower level). There is a smaller shed structure provided to house potassium permanganate storage and feed equipment used for odor control during warmer months. No bypass header is provided off of the pump discharge to bypass the force main under emergency conditions. No fall protection is provided for the access hatches. A backup generator and automatic transfer switch are provided for emergency operations. A diesel fuel day tank exists inside the building to power the backup generator.

A grit tank is installed ahead of the wetwell, which is cleaned approximately twice per year. The wetwell is constructed directly below the floor of the lower pump level of the station, limiting access to the wetwell for inspection and maintenance. Discussion with operators indicated that there was one occasion where a high wetwell level resulted in sewage backing up through the pump suction pipe floor penetrations.

3.5.2 Summary of Needs

The existing pump station has equipment and controls that have reached the end of their design life and are approaching the end of their intended useful life. Due to the age of the major equipment and components upgrades will be required within the planning period. Fall protection and other means of operator safety should be provided as part of any upgrade. Overall the pump station is in poor condition.

3.5.3 Summary of Capital Improvements

The proposed capital improvements include construction of a replacement wetpit/drypit pump station and abandonment of the existing pump station. The planning level opinion of probable costs for these capital improvements is $5,039,000. Pump station recommendations are summarized in **Section 3.8**.

3.6 WELLS STREET PUMP STATION

The Wells Street Pump Station was originally constructed in 1986 to serve a small residential neighborhood. **Table 3-6** provides an existing conditions summary of the pump station. A copy of the pump station inspection summary is provided in **Appendix F**.

Table 3-6: Wells Street Pump Station Summary

Component/Feature	Wells Street PS
Station Configuration	Submersible
Pump Manufacturer	Enpo
Pump Type	Submersible
Number of Pumps (Duty / Total)	1 / 2
Nameplate Unit Pumping Rate	100 gpm @ 23' TDH
Motor Size	2 hp
Motor Speed	Constant Speed
Electrical Rating	230V, Single-Phase
SCADA	None, alarm transmission only
Level Control	Radar level sensor with backup floats
Flow Measurement	None

3.6.1 Existing Conditions Assessment

No upgrades to the pump station have been completed since its construction and the major equipment and components are approaching the end of their intended 20-year design life. No building is provided to house the electrical and control equipment, which are contained within the valve vault in a confined space. A bypass header is provided off of the pump discharge within the valve vault exterior to the pump station. No fall protection is provided for the wetwell or valve vault access hatches. There is no backup generator provided for emergency operations.

A trash basket is installed on the influent pipe to the wetwell, which was completely full at the time of inspection. There is severe concrete degradation of the top slab of the valve vault and rebar is exposed.

3.6.2 Summary of Needs

The existing pump station has equipment and controls that have reached the end of their design life and are approaching the end of their intended useful life. Due to the age of the major

equipment and components upgrades will be required within the planning period. Fall protection and other means of operator safety should be provided as part of any upgrade. Electrical and control components should be moved above-grade outside of a confined space. Overall the pump station is generally in fair condition.

3.6.3 Summary of Capital Improvements

The proposed capital improvements include replacement of pumps/rails, piping/valves, and controls/instrumentation; installation of new top slabs and hatches with fall protection for wetwell and valve vault; relocation of electrical and control components above-grade from the valve vault; and electrical upgrades. The planning level opinion of probable costs for these capital improvements is $810,000. Pump station recommendations are summarized in **Section 3.8**.

3.7 ASSET MANAGEMENT SYSTEM

The data collected during the field investigations was used to rank and prioritize the pump station assets based on need. The pump stations were scored and ranked based on the results of the field investigations. The primary considerations when ranking the assets included age, condition, operation & maintenance, access/safety, and percent of the overall system served.

3.7.1 Asset Criticality and Ranking

The asset management database was utilized to rank each of the assets and prioritize recommendations for improvements to each of the pump stations. The criteria provided in **Table 3-7** were developed by the project stakeholders and were utilized to prioritize the pump station assets.

Table 3-7: Pump Station Asset Prioritization Criteria

Criteria	Minimum Score	Maximum Score
Age	1	5
Energy Efficiency / Return on Investment	1	5
Function / Impact on Downstream Sewers	1	10
Operations & Maintenance	1	5
Access	1	5
Safety	1	5
Percent of System Served	1	10
Asset Criticality & Scoring Range =	**7**	**45**

The assets with the highest criticality score are the assets with the highest need are prioritized for improvements. The complete pump station asset database is provided in **Appendix E**.

3.8 RECOMMENDATIONS

In general, the mechanical and electrical equipment and components at most of the pump stations has reached the end of their useful life, and a system-wide renewal of pump stations is warranted over the planning period.

The recommended plan for the upgrade of the pump stations is provided in **Table 3-8.**

Table 3-8: Wastewater Pump Stations – Recommended Plan

Pump Station	Recommendations
Lakeview	-
Lower Shaker Village	Convert to submersible pump station, reusing existing wetwell
McConnell Road	Replace pumps/rails, piping/valves, and controls/instrumentation; install bypass header; install new top slab for wetwell and hatches with fall protection; replace the existing valve vault; electrical upgrades; replace backup generator
Route 4A Enfield	Replace pumps/rails, piping/valves, and controls/instrumentation; install new top slab and hatches with fall protection for wetwell and valve vault; relocate flow meter controls above-grade from valve vault; electrical upgrades; repair wetwell to make structure watertight
Shaker Bridge	Construct a replacement wetpit/drypit pump station and abandon the existing pump station
Wells Street	Replace pumps/rails, piping/valves, and controls/instrumentation; install new top slabs and hatches with fall protection for wetwell and valve vault; relocate electrical and control components above-grade from valve vault; electrical upgrades

The project planning level opinion of probable costs for the recommended plan for the renewal of the pump stations is provided in **Table 3-9**.

Table 3-9: Wastewater Pump Stations – OPC

Pump Station	OPC
Lakeview	-
Lower Shaker Village	$3,360,000
McConnell Road	$1,235,000
Route 4A Enfield	$810,000
Shaker Bridge	$5,039,000
Wells Street	$810,000
Total	**$11,254,000**

The costs presented in **Table 3-9** were developed without benefit of final design drawings and may not reflect actual installed costs; these costs are to be used for planning purposes only. Opinions of probable costs have been developed based on similar recent projects and equipment manufacturers' cost data. Line item costs are to be considered installed costs, including contractor OH&P and start-up and operator training. The opinion of cost includes soft costs such as engineering and contingency. The costs provided in **Table 3-9** have not been escalated to the years of construction. All project costs are presented in 2019 dollars and need to be escalated to the midpoint of construction.

4. IMPLEMENTATION PLAN

4.1 RECOMMENDED PLAN

4.1.1 Wastewater Collection System

Overall, the Enfield collection system is in fair condition. The system is composed of PVC and DI pipes and precast concrete manholes, and of the components inspected, the majority are in good condition. However, access is difficult throughout a significant portion of the collection system. Approximately one half of the manholes and gravity sewer mains in the collection system could not be inspected due to these challenges. The majority of the access issues are from manholes that have been paved over or are sealed shut. There are also a portion of manholes that are buried and/or inaccessible along the cross-country easements.

The recommended plan for Enfield collection system includes locating, uncovering, and raising the inaccessible manholes and performing manhole inspections and sonar testing on the adjected gravity sewer mains. Following the uncovering of the manholes, we recommend that the Town CCTV their collection system based on the results of the sonar testing. This will allow the Town to establish a baseline condition of their collection system assets. We also recommend that the Town perform smoke testing. Inflow was observed throughout the collection system. Following the completion of the follow-up work, we recommend that the Town update its asset management database, and prioritize rehabilitation efforts based on the results. Updates to the GIS mapping are also recommended. Upon completion of the follow-up work in Years 1 through 5, we recommend that the Town implement an annual sonar testing and CCTV program to continuously monitoring its collection system and identify any needs. The Town should sonar test one fifth and CCTV inspect one tenth of its collection system every year.

4.1.2 Wastewater Pump Stations

The majority of the mechanical equipment and components in operation at the pump stations are approximately 20-30 years old. The typical useful life of mechanical equipment is 20 years. The mechanical equipment and components at the facilities have reached the end of their useful lives. The typical useful life of structural components without proper maintenance and repair is 50 to 75 years. With proper maintenance and repair the useful life of structural components can be extended indefinitely. Overall the majority of the equipment and components are beyond their intended design and useful life and upgrades are warranted. The recommended plan for the renewal of the pump stations includes upgrades to the mechanical equipment and components as well as the physical structures. The upgrades to the wastewater pump stations are presented in **Section 3.8**. The recommended plan for the wastewater pump stations has been broken down into a multiple year program.

4.2 PLANNING LEVEL OPINION OF PROBABLE COSTS

The planning level opinion of probable costs for the recommended capital improvements for the wastewater infrastructure are provided in **Table 4-1**. The recommended plan by calendar year is provided in **Table 4-2**.

Table 4-1: Recommended Improvements Plan and OPPC

Component	OPCC
Sanitary Sewer System (Year 1 through 5)	$388,000
Pump Stations	$11,254,000
Total =	**$11,642,000**

The costs presented in **Table 4-1** were developed without benefit of final design drawings and may not reflect actual installed costs; these costs are to be used for planning purposes only. Opinions of probable costs have been developed based on similar recent projects and preliminary equipment manufacturers' cost data. Line item costs are to be considered installed costs, including contractor OH&P and start-up and operator training. The opinion of cost includes soft costs such as engineering and contingency. The costs for the Project provided in **Table 4-1** have not been escalated to the years of construction. All project costs are presented in 2019 dollars and need to be escalated to the midpoint of construction. The recommended improvements phasing by calendar year and proposed implementation plan are shown in **Table 4-2** and **Table 4-3**.

Table 4-2: Recommended Improvements Phasing Plan by Calendar Year

Component	OPCC	Starting Calendar Year	Ending Calendar Year
Sanitary Sewer System	$388,000	2021	2025
Pump Stations	$11,254,000	2021	2040
Total =	**$11,642,000**	**2021**	**2040**

Table 4-3: Sanitary Sewer Collection System and Pump Stations – 5-Year Implementation Plan

Phase	Task	CY2020	CY2021	CY2022	CY2023	CY2024
Phase 1 Collection System	Locate, Uncover and Open Inaccessible Manholes	$38,000	$39,000	$41,000	$-	$-
	Manhole Inspections and Sonar Testing of Inaccessible Manholes and Pipes	$6,000	$6,000	$6,000	$-	$-
	Smoke Testing	$-	$-	$-	$21,000	$-
	CCTV Inspection (In-Road)	$-	$28,000	$29,000	$29,000	$30,000
	CCTV Inspection (Cross-County Easements)	$-	$-	$-	$31,000	$-
	GIS Mapping Updates	$3,000	$3,000	$3,000	$3,000	$3,000
	Annual Flow Monitoring	$-	$-	$-	$-	$58,000
	Field Work Summary, Annual Report and Asset Management Database Updates	$8,000	$9,000	$10,000	$10,000	$10,000
Phase 2 Collection System	Annual Sonar Program	TBD	TBD	TBD	TBD	TBD
	Annual CCTV Program	TBD	TBD	TBD	TBD	TBD
	Manhole O&M Program	TBD	TBD	TBD	TBD	TBD
	Manhole Rehabilitation	TBD	TBD	TBD	TBD	TBD
	Pipe Rehabilitation	TBD	TBD	TBD	TBD	TBD
	Asset Management Plan Updates	TBD	TBD	TBD	TBD	TBD
Pump Stations	McConnel Road	$-	$-	$9,000	$30,000	$51,000
	Lower Shaker Village	$-	$-	$-	$-	$41,000
	Total =	**$55,000**	**$85,000**	**$98,000**	**$124,000**	**$193,000**

Note:

OPC does not include costs associated with manhole and pipe rehabilitation/replacement. These costs will be updated upon completion of Phase 1. OPC is escalated to year of implementation. OPC for pump stations bonded at 3% per year over 20 years.

4.3 FUNDING ALTERNATIVES

Funding and financing of the proposed recommendations can be raised through sewer user fees, borrowing, and grants. This section provides a brief description of various funding and financing alternatives.

4.3.1 Sources of Funding

Capital costs to build the required infrastructure will be significant. Potential funding sources for the project include:

1. Municipal Sewer Enterprise Fund
2. Municipal Bonding
3. Clean Water State Revolving Fund (NHDES)
4. United States Department of Agriculture – Rural Development
5. Development-targeted funding programs

Potential funding programs are discussed in more detail the following subsections. Generally, State and Federal earmarked appropriations and grant funding are limited for municipal wastewater projects in New Hampshire.

4.3.2 Municipal Sewer Enterprise Fund

Municipalities typically have sewer enterprise funds. The money collected from sewer users is used for the payment of operational expenses as well as capital improvements to the system. Short term and/or recurring capital improvement expenses are typically budgeted for in each calendar year and funded directly from the annual sewer enterprise funds. The annualized debt payments associated with large capital expenses are typically funded directly from the annual sewer enterprise funds. However, some communities include all or a portion of these annualized debt payments on the general fund.

4.3.3 Municipal Bonding

Municipalities have the ability to borrow funds for capital projects through bonds. Issues that can impact municipal borrowing capacity are existing debt, the length of borrowing period, the structure of the debt service, and opportunities to modify short-term impacts of the debts service. Careful planning for municipal borrowing that takes into account other capital expenditures in Town is imperative to maximize ability to borrow for major capital projects and minimize adverse fiscal impacts to the Town's bond rating and budgets. Municipal bonds are typically issued at an interest rate of 4%.

4.3.4 Clean Water State Revolving Fund

The New Hampshire Clean Water State Revolving Fund (CWSRF) is administered by NHDES. The fund provides low-interest loans to communities, nonprofits and other local government entities for qualifying planning and construction projects. Currently, 2% loans are available for 5, 10, 15 and 20-year terms.

The SRF Program does offer limited principal forgiveness. This Program was continued in the current Intended Use Plan.

To be considered for SRF funding, a community must submit a pre-application, which typically has an annual deadline in mid-June. Based on the forms, applicants are ranked based on a set of criteria that rates the project's impact on public health and state and federal water quality.

Applicants also receive points for incorporating green infrastructure, energy efficiency and renewable energy components, as well as sustainability aspects, in the project. The ranked projects are published in the Intended Use Plan (IUP) Project Listing, which is typically released in July.

Once a project has been placed on the IUP Project List, the municipality needs to complete a loan application. The loan applications are due by May 1 (for communities with town meeting/local funding authority votes by March 31) or June 30 (for communities with town meeting/local funding authority votes on or after April 1), of the upcoming year and must include information about funding authorization, repayment ability, and project schedule.

The following are additional subsidy opportunities through the CWSRF program:

4.3.4.1 Planning

New Hampshire CWSRF will award loan recipients 100% principal forgiveness, up to $75,000, for wastewater planning evaluations that address conveyance and treatment needs while considering solutions that promote energy efficiency, water conservation and flood resiliency. Planning efforts included in a final design project may also be eligible, typically through 30% design.

4.3.4.2 Energy Audits

New Hampshire CWSRF will award loan recipients 100% principal forgiveness, up to $20,000, for the completion of pre-approved comprehensive process energy audits for wastewater treatment facilities and pumping stations.

4.3.4.3 Comprehensive Energy Audit Measure Implementation

New Hampshire CWSRF will award loan recipients 50% principal forgiveness, up to $200,000, for project components that implement recommendations from a comprehensive energy audit conducted within the past three years. Applications for electric and gas utility incentives are required to qualify for NH CWSRF principal forgiveness, and this forgiveness will be calculated on project costs prior to utility company incentives being applied.

4.3.5 United States Department of Agriculture – Rural Development

The United States Department of Agriculture - Rural Development (USDA) provides grants and loans to rural communities, counties, special-purpose districts and Indian tribes with populations less than 10,000 people. Based on population, the Town qualifies for the Rural Utilities Services - Water and Waste Disposal program (RUS). The USDA – RUS program provides a combination of grants and low interest loans for wastewater projects.

Eligibility for grants is dependent upon the current sewer rates as well as the median household income for the Town relative to the poverty line and the state non-metropolitan median household income. Typically, the underwriting threshold to maximize grant eligibility is to have the current sewer rates at or above 1% of median household income for the Town. For entities that do not qualify for grants because their median income is too high, USDA offers below market rate low interest loans. Similar to the grant program, the median household income for the Town is used to determine the loan category that the entity is eligible for. The Town's eligibility in comparison to the USDA metrics is presented below in **Table 4-3**.

Table 4-4: USDA Funding Eligibility Guidelines

Category	Town	USDA Guideline	Eligibility
Population (2010 Census)	4,582	Less than 10,000	Eligible
Median Household Income (MHI)	$45,577 (CDP)	$82,128	Eligible
Annual Sewer Rate	$921	-	-
Annual Sewer Rate as a Percent of MHI	2.02%	1.0%	Eligible

Based on the metrics provided in **Table 4-3**, the Town is eligible for grants. The USDA loan categories and percentages are presented below in **Table 4-4**.

Table 4-5: USDA Loan Categories

Category	Income Threshold	Income Threshold	Interest Rate
Poverty Rate	-	Less than $49,144	1.750%
Intermediate Rate	$49,145	$82,128	2.375%
Market	-	-	3.000%

Based on the metrics provided in **Table 4-4**, the Town (Enfield CDP) falls into the "poverty" interest rate category for loans, which are rates reduced below market rate. The interest rates are adjusted quarterly. USDA may offer a lower Interest Rate Category to communities to improve project affordability.

4.3.6 Development-Targeted Grant Programs

Many grant programs that are targeted toward development allow for funding to be used for wastewater infrastructure upgrades associated with the project. These programs are not anticipated to be a primary source of funding, but there may be opportunities to take advantage of this funding when it can be associated with specific development projects in town.

4.3.6.1 Community Development Block Grants (CDBG)

Community Development Block Grants (CDBG) are overseen by the Department of Housing and Community Development (DHCD) Division of Community Services. These are competitive grants that address a broad range of community development needs including infrastructure. Funds can be used for housing, community, and economic development projects that assist low and moderate-income residents, or that revitalize areas of slum or blight. Funds may also be used for the construction, reconstruction, or installation (including design features and improvements with respect to such construction, reconstruction, or installation that promote energy efficiency) of infrastructure facilities.

4.4 PROJECT FUNDING

4.4.1 Current Rate System

The Town utilizes an Enterprise Fund for its wastewater utility. The revenues for the Enterprise Fund are generated through a sewer user fee system based on the water consumption of each customer. The revenues are utilized for funding the annual operation and maintenance (O&M) costs of the wastewater utility as well as capital expenditures and debt service. A summary of the calendar year budgets is provided in **Table 4-5**.

Table 4-6: Annual Wastewater Utility Budget (Pre-Projects)

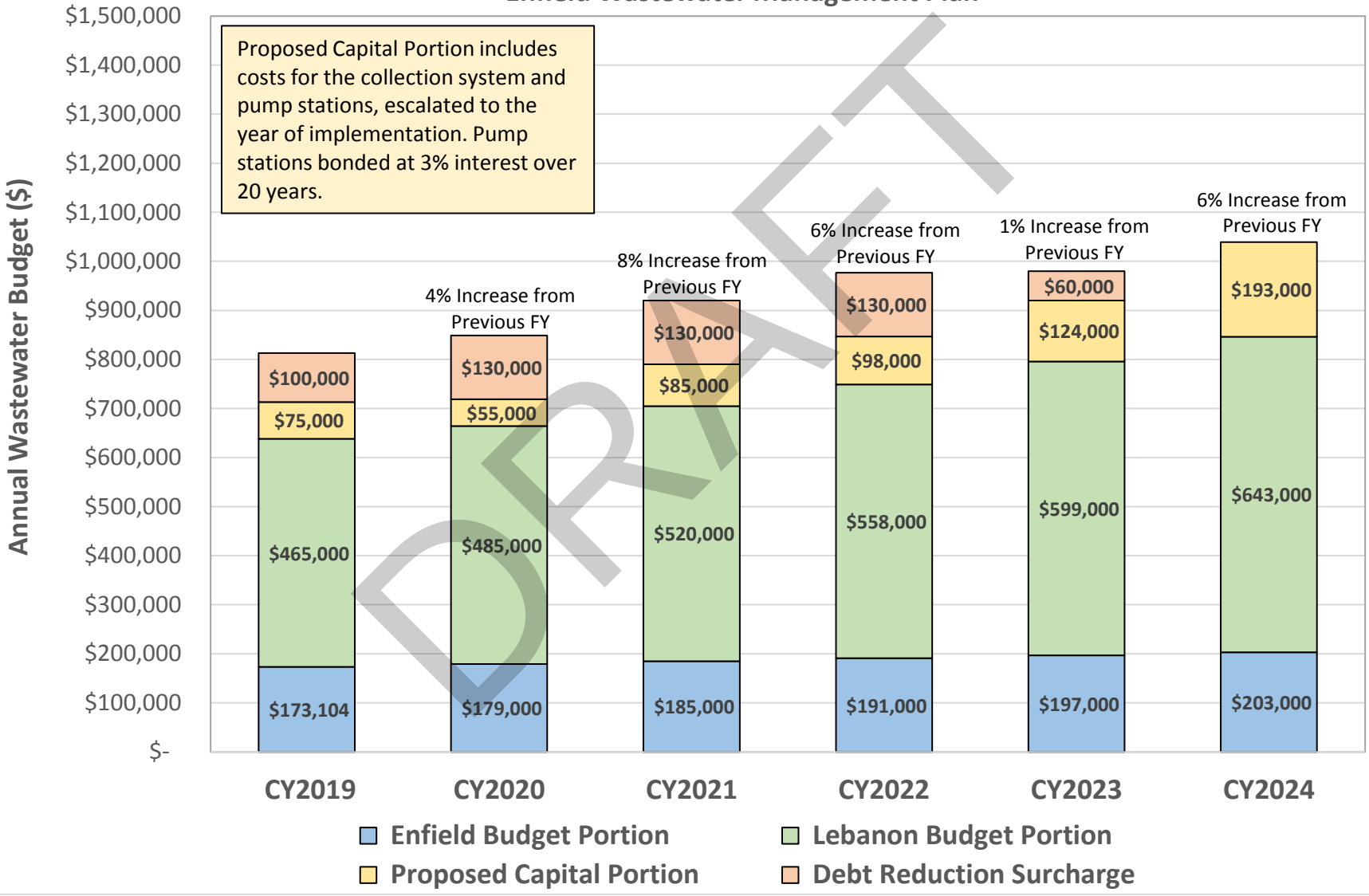
Calendar Year	Annual Budget	Average Annual Sewer Cost Per EDU	MHI (2010 Census)	Annual Costs (as a % MHI)
2018	$513,028	$882	$45,577	1.94%
2019	$713,104	$921	$45,577	2.02%

The Town currently has a "sewer deficit charge" in place to generate additional revenue to cover deficits from previous calendar years. The deficit charge is scheduled to expire on December 31, 2022. The current average annual sewer charge per equivalent dwelling unit (EDU) is $921, as compared to the estimated current New Hampshire State-wide average of $679, as published by in the 2018 New Hampshire Water & Wastewater Rates Report.

4.4.2 Project Funding

Projected impacts to the Town's wastewater budget based on the proposed implementation plan are shown in Figure R5. Impacts to the Town's sewer rates and average annual wastewater costs will be developed as part of a future project. We recommend that the Town review the contents of this report before developing the rate projections.

Figure R9
Projected Current and Future Annual Wastewater Budget
CY2019 - CY2024
Enfield Wastewater Management Plan



4.5 PUBLIC PARTICIPATION

Throughout the project, regular meetings were held with NHDES, the DPW Director, and Town Manager to provide updates on project progress and receive feedback on tasks and deliverables. Refer to **Section 1.7** for additional information.

4.6 NEXT STEPS

One of the recommended next steps in the recommended plan is to evaluate and secure funding for the infrastructure improvements. In addition to the SRF program, it is recommended that the Town meet with USDA to discuss opportunities for funding for the projects. USDA funding applications can be submitted throughout the year. Often, USDA funding is pursued in tandem with SRF funding. It also is recommended that the Town work with NHDES to take advantage of energy efficiency and rebate programs that may be available.

Another recommended next step is to communicate this Asset Management Plan to the interested parties, including Town boards and departments, the rate payers, regulatory agencies and the interested public through public meetings.

It is expected that the proposed implementation of the capital improvements may change based on available funding, Town priorities, input from stakeholders, and changing conditions within the system.

Figures

0 750 1,500 3,000 4,500 Feet

N

Route 4A Lebanon Pump Station
(Not owned by Town)

Route 4A Enfield Pump Station

Wells Street
Pump Station

Shaker Bridge Pump Station

Lower Shaker Village Pump Station

Shaker Landing Pump Station
(Not owned by Town)

McConnell Road Pump Station

Lakeview Pump Station

Lebanon

Enfield

Canaan

DRAFT

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend

- Manhole
- Pump Station
- Lebanon Pump Station
- Gravity Sewer
- Siphon
- Force Main
- Lebanon Gravity Sewer
- Lebanon Force Main
- Parcel

Town of Enfield, NH

Figure 2-1
Collection System

DPC Engineering, LLC

JOB NO: Enfield, NH	DRAWN BY: GF
DATE: November 2019	

0 750 1,500 3,000 4,500 Feet

N

Route 4A Lebanon Pump Station
(Not owned by Town)

Route 4A Enfield Pump Station

Shaker Bridge Pump Station

Wells Street
Pump Station

Lower Shaker Village Pump Station

Shaker Landing Pump Station
(Not owned by Town)

McConnell Road Pump Station

Lakeview Pump Station

Lebanon

Enfield

Canaan

1

2

3

4

5

6

DRAFT

Legend

- Flow Meter
- Manhole
- Pump Station
- Lebanon Pump Station
- Gravity Sewer
- Siphon
- Force Main
- Lebanon Gravity Sewer
- Lebanon Force Main
- Sub-Area
- Parcel

Town of Enfield, NH

Figure 2-2
Flow Monitoring Sub-Areas

DPC Engineering, LLC

JOB NO: Enfield, NH	DRAWN BY: GF
DATE: November 2019	

0 750 1,500 3,000 4,500 Feet

N

Route 4A Lebanon Pump Station
(Not owned by Town)

Route 4A Enfield Pump Station

Wells Street
Pump Station

Shaker Bridge Pump Station

McConnell Road Pump Station

Lower Shaker Village Pump Station

Shaker Landing Pump Station
(Not owned by Town)

Lakeview Pump Station

Lebanon

Enfield

Canaan

DRAFT

Legend

- Active Light I/I
- Active Moderate I/I
- Paved Over
- Could Not Open
- Could Not Locate
- Bolted Cover
- Could Not Access
- Roots
- Backup/Blockage
- Surcharged
- Loose/Missing Bricks from Riser
- Manhole
- Pump Station
- Lebanon Pump Station
- Gravity Sewer
- Siphon
- Force Main
- Lebanon Gravity Sewer
- Lebanon Force Main
- Parcel

Town of Enfield, NH

Figure 2-3
Manhole Defects from Manhole Inspections

DPC Engineering, LLC

JOB NO: Enfield, NH	DRAWN BY: GF
DATE: November 2019	

0 750 1,500 3,000 4,500 Feet

N

Route 4A Lebanon Pump Station
(Not owned by Town)

Route 4A Enfield Pump Station

Shaker Bridge Pump Station

Wells Street
Pump Station

McConnell Road Pump Station

Lower Shaker Village Pump Station

Shaker Landing Pump Station
(Not owned by Town)

Lakeview Pump Station

Lebanon

Canaan

Enfield

DRAFT

Legend

- Manhole
- Pump Station
- Lebanon Pump Station
- Siphon
- Force Main
- Lebanon Gravity Sewer
- Lebanon Force Main
- Parcel

Sonar Score

- 0 - 3
- 4 - 6
- 7 - 10
- Not Fully Accessible

Town of Enfield, NH

Figure 2-4
Sonar Scores from Sonar Testing

DPC Engineering, LLC

JOB NO: Enfield, NH	DRAWN BY: GF
DATE: November 2019	