TATA & HOWARD

June 4, 2020

Mr. Mike Heidorn, Superintendent
Hooksett Village Water Precinct
7 Riverside Street
Hooksett, NH 03106

Subject: Asset Management Condition Assessment
Hooksett Village Water Precinct
T&H No. 5919

Dear Mr. Heidorn:

In accordance with our agreement, Tata & Howard, Inc. has completed an Asset Management Condition Assessment of the water distribution system for the Hooksett Village Water Precinct. This assessment summarizes the work completed under the New Hampshire Department of Environment Services (NHDES) 2019 Asset Management Planning Grant Project No. AM-77.

In summary, the Hooksett Village Water Precinct (Precinct), Granite State Rural Water Association (GSRWA), and Brown Engineering collaborated on the project to collect inventory data for the water distribution system piping, hydrants, and valves and develop a GIS platform for the distribution system. Tata & Howard (T&H) was retained to perform a condition assessment for the water mains, hydrants, and valves that were part of the inventory taken by the Precinct, GSRWA, and Brown Engineering. Estimated replacement costs, useful life estimates, funding strategies, levels of service, critical risk scoring and outreach strategies were also provided by T&H as part of this study.

The primary goal of the Asset Management Condition Assessment portion of the project was to identify areas of the water distribution system in need of rehabilitation, repair, or replacement; and prioritize improvements to make the most efficient use of the Precinct's capital budget. Other goals of the project included creating a comprehensive GIS database of the Precinct's horizontal assets to use as a tool in planning system improvements and maintenance schedules, and improving the long-term sustainability of the Precinct in accordance with the core tenets of NHDES's asset management program.

Asset Inventory

The initial step of the process was to create a comprehensive GIS map of the distribution system. In 2019, Staff of the Precinct organized and reviewed seven decades of historical records, then located and field marked mains, hydrants, gate valves, and some service connections in the distribution system. Brown Engineering used a drone to fly over the boundaries of the Precinct to identify the locations of marked and unmarked infrastructure. This was completed throughout the project but was focused on during the spring and fall

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seasons to obtain optimal imagery with the least amount of vegetation and tree coverage. While Brown Engineering was collecting imagery, the Precinct's ArcGIS Online platform was created and optimized by GSRWA with input from Precinct staff. Once the entire distribution system was captured by the drone, the drone imagery was processed and input into ArcGIS by GSRWA and Brown Engineering.

GSRWA provided training sessions to the Precinct staff to allow GPS data points, lines, and attributes to be entered into ArcGIS purchased by the Precinct. ArcGIS was installed on the Precinct computers and an iPad, which allowed Precinct staff to field verify areas of the distribution system and to add locations of unmarked assets. Precinct staff verified the sizes, ages and materials of the mains and input the data into the shapefile attribute tables in ArcGIS. Ages of hydrants and valves were also added to the shapefile attributes in ArcGIS. Flow testing equipment was purchased by the Precinct, and every hydrant was flow tested. The resulting observed flow rates were added as hydrant attributes. Break history was researched back to 1980 and provided to T&H to add as an additional attribute for specific pipe segments.

Once the mapping and data compilation was completed, T&H assisted the Precinct in categorizing and analyzing their data for the asset management/condition assessment phase of the project. The project team reviewed the properties associated with the GIS data and created maps visualizing the distribution of pipe characteristics as described in the following section. This information was used to develop a scoring system to help guide the Precinct in locating key areas of their system to improve over the next ten years. Additionally, T&H performed a level of service analysis to help pinpoint any key benchmarks that the Precinct could use to track their effectiveness in customer service. This identified other areas outside of asset replacement that the Precinct could use to improve their system as a whole. Lastly, a preliminary evaluation of the current water rate structure was conducted to determine the ability to fund Phase I asset management recommendations.

A basic GIS water distribution system map is provided in Appendix A, showing the system as it currently exists as mapped during this project. The GIS data used to create the map is being continuously updated. However, copies of GIS inventory information and shapefiles can be shared with NHDES under separate cover as needed or required.

Water Main Condition Assessment

Information regarding the water main diameters, materials, installation years, break history, and known soil conditions, was provided by Precinct personnel and reviewed during a workshop with system managers, operators, contractors and affiliates of the Water Department nearing retirement. Water main static pressures were obtained by Precinct personnel during mapping and flow testing of the hydrants.

To prioritize water main replacement or rehabilitation, a water main grading system has been established. The grading system uses the water main characteristics such as age, material, break history, diameter, static pressures, and soil characteristics to assign point values to each pipe in the system. Each category is assigned a rating between zero and 100 with zero being the most favorable and 100 being the worst case within the category. Each category is then given a weighted percentage, which represents priorities within the system. It is at the client's discretion to adjust the weight based on system performance and condition. Our recommendation is to assign a maximum of 30 percent to any one category. The rating is then multiplied by the weight. The weighted rating for each performance criteria will be utilized to determine the overall rating per pipe within the system. Those pipes with the highest grade are most in need of replacement or rehabilitation.

To establish a rating system specific to the Hooksett Village Precinct water system, a workshop was held with the system management, operators, and retired members of the Water Department. During the discussion, it was determined that break history and material are of primary concern to the Precinct. Also, it was determined that water quality was not an issue, however, a performance criteria for water quality was added to the rating system to be used to update the asset management scores in the future, if water quality becomes an issue. The grading system is shown in Table No. 1.

The Hooksett Village Precinct has multiple locations with older iron services that have historically experienced multiple leaks. During discussions with Precinct members at the workshop, it was determined that the service pipes are failing for a variety of reasons including corrosion of the corporation stop or service saddle, poorly connected curb stops to newly replaced portions of service pipes, or unknown sections of cast iron pipe in services. Pipes with a history of multiple service leaks should be prioritized in considering the areas of the Precinct's water system that should be replaced in the immediate future.

Based on the asset management ratings, there are several areas of concern in the system. Water mains with a total rating less than 25 are considered to be in good to excellent condition. Mains with a total rating between 25 and 44 are considered to be in fair to good condition, and mains with a total rating of 45 or greater are considered to be in poor to fair condition. This rating system is specific to the Hooksett Water Precinct system and reflects the Precinct's priorities of replacing mains with a history of breaks and those with poor material. Asset management ratings are presented graphically in Appendix B and as a table in Appendix C.

Hydrant and Valve Condition Assessment

Installation dates for all gate valves and hydrants of the water system were provided by the Precinct. Estimated replacement dates were calculated for each valve and hydrant assuming an estimated useful life of 40 years for a hydrant and 50 years for a valve. It should be

noted that a more detailed assessment of hydrants and valves would take into account factors such as valve or hydrant type, valve size, and frequency of use.

Hydrants and gate valves in the system that are past their estimated useful life are presented in Appendix D. These lists also take into consideration any hydrant or valve listed as being in poor condition by the Precinct personnel during the GPS data collection of these assets. The hydrant rating scale is as follows: 1 – New; 2 – Good; 3 – Moderate; 4 – Bad; 5 – Failed. Hydrants are operated, tested, and maintained on a semi-annual basis and therefore are kept in a state of operable readiness regardless of condition. Gate valves have been historically been operated less frequently, but Precinct staff have begun the process of operating and assessing valve readiness.

Table No. 1
Asset Management Grading System

Weight	Performance Criteria	Rating	Weighted Rating
25%	Break History		
	Two or More Breaks	100	25
	One Break	75	18.75
	No History of Breaks	0	0
15%	Material		
	Asbestos Cement	100	15
	Plastic	80	12
	Copper	20	3
	Ductile Iron	10	1.5
	PVC/HDPE	5	0.75
15%	Installation Date		
	1950-1979	100	15
	1980-1989	90	13.5
	1990-1999	40	6
	2000-2010	10	1.5
	2010-present	0	0
15%	Poor Soils		
	Known Corrosive Soils	100	15
	Potentially corrosive soils	80	12
	Gravel, sand	0	0
20%	Diameter		
	Less than 4-inch	100	20
	4-inch water main	90	18
	6-inch water main	70	14
	8-inch water main	30	6
	10-inch water main	20	4
	12-inch water main	10	2
	16-inch water main	5	1
10%	Static Pressure		
	Greater than 100 psi	100	10
	80 to 100 psi	80	8
	60 to 80 psi	60	6
	Less than 60 psi	0	0
5%	Water Quality		
	Water Quality Concerns	100	5
	No Water Quality Concerns	0	0

Critical Assets

Critical areas served are locations in the distribution system that require continual water supply for public health, welfare, or financial reasons. Because water storage tanks and sources provide water and maintain pressure to critical service areas, tanks and primary sources are also considered critical components. Additional categories of critical assets include those mains that are the sole transmission main from a source or tank, and main transmission lines without a redundant main. The evaluation included a visual review of the water mains leading into and out of the critical areas and the transmission grid. Table No. 2 presents critical components of the Precinct distribution system.

Table No. 2
Critical Areas

Critical Area	
Water Storage, Source, And Distribution System Components	
	East Well
	East Pump Station
	South Well
	South Well Pump Station
	South Well Back-Up
	North Well
	North Well Pump Station
	West (Quarry) Tank
	Thompson Corner Tank
	Manor Drive Tank
	Booster Pump Station
Water Distribution Transmission Mains	
	12-inch water main from West (Quarry) Tank to Pinnacle Street
	8-inch water main from South Well to Pinnacle Street
	8-inch water main from East Well to Ardon Drive
	6-inch water main from North Well to Pine Street
	8-inch water main from Thompson Corner Tank to Main Street
	16-inch water main from Manor Drive Tank to Post Road
	12-inch water main starting at Vista Drive Connection
	12-inch water main from Booster Station to Manor Drive Tank
	12-inch water main on College Park, North Main Street, and Lilac Bridge
	12-inch water main on north end of Route 3
	6-inch water main on south end of Route 3

Recommended Improvements

Based on the asset management score of water mains, a prioritized list of improvements was created. Table No. 3 and Table No. 4 include prioritized lists of water main improvements with the associated asset management status and estimated cost. These water mains should be addressed based on available funding. Existing 6-inch diameter water mains and smaller should be replaced with 8-inch diameter water mains. It should be noted that a 6-inch diameter water main and smaller classified as in poor condition may be able to be replaced with a new 6-inch pipe and provide sufficient service for the area without increasing the diameter. Additionally, existing 8-inch diameter water mains that are considered transmission mains (i.e. Route 3 water main) were upsized to 12 inches in diameter. The diameter of the recommended water main replacement may be changed upon the completion of a hydraulic evaluation of the water distribution system, which is recommended. Cost estimates include costs associated with water services, hydrants, and other appurtenances, permanent and temporary trench pavement, and a 25 percent allowance for engineering and contingencies. Estimates do not include costs for land acquisition, easements, or legal fees. Unit costs when installing less than 1,000 feet of water main incur a higher unit rate and are accounted for in the recommendations. The recommended improvements map is included in Appendix E.

It should be noted that paving schedules and other changes to roadways were not evaluated as part of this study. These items may dramatically delay water asset improvements, or present cost obstacles or opportunities depending on the timing of the projects.

It is intended that the Phase I Improvements should be prioritized for replacement over the next ten years (2020 – 2029) with the Phase II Improvements to be prioritized for replacement in the following twenty years (2030 – 2049). Sections of water main included in Phase I all have asset management scores of above 60 and represent the areas of the Precinct system that are the most in need of attention. Sections of water main included in Phase II have asset management scores between 45 to 59 and have all had at least one break. These areas are in need of attention but are not as critical as those areas in Phase I, based on currently available data, so can be used to plan projects up to the next twenty years. Fifty three percent of the pipes have scores between 30 and 44, most located in the Pinnacle Street and Thompson Avenue neighborhoods. These areas were all developed around the same time and therefore should be all replaced around the same time. It is recommended that these areas be included in a Phase III as the Precinct moves forward beyond in Phases I and II. These areas can be re-evaluated at a later date.

It is recommended that a formal hydrant and valve maintenance program be developed. This program would assist the Precinct in exercising existing hydrants and valves and documenting hydrants and valves in need of replacement. The program would include summarizing existing maintenance procedures, identifying priority areas, and developing a hydrant and valve maintenance report form for use during the program and for recordkeeping purposes. The latest AWWA guidelines and recommendations would be

used to develop a 5-year hydrant and valve maintenance program that would include maps showing a sequenced approach by street. To the extent possible this program would incorporate lessons learned and priorities determined from existing maintenance sequences. By continuing to focus on regular maintenance and the replacement of old or broken hydrants, the Precinct will improve fire protection in the system and eliminate potential leaks. Furthermore, identifying and repairing or replacing lost, broken or partially inoperable valves in the system will continue to improve the transmission capacity of the system.

Other recommended planning and improvement programs that the Precinct should develop and implement are a service replacement program and an above ground (vertical) asset inventory. During the workshop, it was noted and discussed that service leaks are a prevalent concern for the Precinct. It is recommended that the Precinct review historical tie cards and field locate services to create a GIS database of services which can then be used to develop a phased replacement program. In addition, an above ground (vertical) asset inventory and condition assessment would help the Precinct catalog equipment at the wells, pump stations, and tanks to plan replacement and maintenance of those items.

Hydraulic Improvements

The Precinct does not currently have a hydraulic model of the distribution system, therefore the improvements recommended in the previous section were based only on physical pipe characteristics. Through field operations experience and an examination of the hydraulics and water quality dynamics associated with the current distribution system configuration, the Precinct has assembled a vision for hydraulic improvements that would improve transmission, reduce stagnation, and dramatically enhance system reliability. This vision is shown on the map included in Appendix F. The vision includes completion of five sections of water main, two interconnections, and repair or replacement of the Precinct's oldest tank. Some of these projects are currently being pursued as part of existing development or compliance initiatives, while others have yet to enter the planning stage. A Water Supply and Usage Evaluation Assessment released in May 2020 by Lewis Engineering identifies at least five of the above-referenced projects as a priority for the Precinct.

It is recommended that the Precinct's proposed hydraulic improvements be evaluated as part of a hydraulic model of the distribution system and that the Phase I and II Improvements identified in this report be re-evaluated and reprioritized as needed in light of the modeling results.

Table No. 3
Phase I Improvements

Item No.	Location	From	To	Asset Management Rating	Recommended Diameter (in)	Length (LF)	Estimated Cost
1	Route 3	69 Main Street	1580 Hooksett Road	61-69	≥12	6,800	$ 2,125,000
2	Highland Street	Dundee Avenue	Granite Street	50-72	8	1,300	$ 325,000
3	Granite Street	Merrimack Street	Route 3	63	8	3,600	$ 900,000
	Otterson Street	Granite Street	Bert Street	55			
	Chase Street	Highland Street	Granite Street	50			
4	Heather Drive	Ardon Drive	End of Heather Drive	61	8	600	$ 188,000
Total Estimated Phase I Cost:							**$ 3,538,000**

Table No. 4
Phase II Improvements

Item No.	Location	From	To	Asset Management Rating	Recommended Diameter (in)	Length (LF)	Estimated Cost
5	Scott Avenue	West River Road	Scott Avenue	57	8	2,600	$ 650,000
	Green Street	Scott Avenue	Scott Avenue	57			
6	Veterans Drive and Merrimack Street	Veterans Drive	Dundee Avenue	52-61	≥12	2,100	$ 657,000
7	Bullard Drive	Steven Drive	End of Bullard Drive	54	8	700	$ 219,000
8	West River Road	Pinnacle Street	Riverside Street	50	12	1,000	$ 344,000
9	Dale Road	Morse Drive	Wedgewood Circle	45	8	4,900	$ 1,225,000
10	West River Road	The Common Man	Windsor Terrace Apartments	46	≥8	2,100	$ 525,000
11	Bayview Terrace Road and West Bank Road	West River Road	End of West Bank Road	47	8	2,300	$ 575,000
						Total Estimated Phase II Cost:	**$ 4,195,000**

Level of Service

Level of service (LOS) defines the way in which the utility managers and operators want the system to perform over the long term and under normal circumstances. Quality, quantity, reliability, and meeting regulatory requirements are elements that can define the level of service and associated system performance goals can be developed. Performance measures established should also be relevant, achievable, and in line with customers' expectations. These performance goals can be modified as a utility's asset management program is implemented. Determining a utility's LOS helps communicate service expectations to customers and concentrate efforts and resources to meet certain performance measures.

LOS criteria to be considered include meeting state and federal drinking water standards, providing adequate water quantity and pressure to the distribution system, and providing reliable service to the customers. In 2013, the United States Environmental Protection Agency (EPA) and the United States Department of Agriculture (USDA) jointly produced a *Rural and Small Systems Guidebook to Sustainable Utility Management (Guidebook)*. Within the Guidebook there are ten key management areas identified as important to sustainably managing both the operations and infrastructure of a water utility. The key management areas were used to develop a level of service statement specific to the Hooksett Village Water Precinct's water system. A table of recommended LOS criteria and benchmarks is included in Appendix G.

Funding Strategy

As stated in the American Water Works Association (AWWA) Manual for Water Supply Practices, a water supplier must provide adequate water service to its customers as well as receive sufficient revenue to provide for operation and maintenance, system upgrades, and maintenance of the supplier's financial integrity. This includes covering all cash needs, debt obligations, and basic expenses required for a water system.

The Precinct currently charges all consumers on a quarterly basis based on the volume of water metered each quarter and the size of their service. The current water rates and service charge structure effective 1/1/20 are shown in Table Nos. 6 and 7.

In addition, there are sprinkler system charges, hydrant usage charges, connection charges and miscellaneous fees that generate revenue to fund the water system.

Miscellaneous fees typically generate approximately 8% of the Precinct's revenue, but that number rose to 12% in 2019 due in large part to expansions of backflow testing and bulk water sales programs according to Precinct staff. This demonstrates how the Precinct seeks to find creative ways to fund its operations while minimizing customer rate increases. The Precinct's ascending tier usage rate structure also generates significant revenue from high irrigation users while sending a strong conservation signal in accordance with their

NHDES-approved Water Conservation Plan. Discretionary irrigation significantly impacts the Precinct's seasonal water demand and associated operational costs.

Table No. 5
Existing Quarterly Water Usage Rate Structure

Water Usage (gallons)	Rate ($/1000 gallons)
0-10,000	$4.65
10,000 – 25,000	$5.05
25,001 – 75,000	$6.60
75,001 – 150,000	$7.15
150,001-300,000	$7.25
300,001 - 500,000	$7.35
>500,000	$8.05

Table No. 6
Existing Quarterly Service Charge Structure

Domestic Service Size (inches)	Charge ($/quarter)
¾	$66.00
1	$92.40
1 ¼	$105.60
1 ½	$118.80
2	$191.40
3	$726.00
4	$924.00
6	$1,386.00
8	$1,980.00
10	$2,508.00

The Precinct's current fee system has evolved significantly over the past five years as the Water Commissioners have embarked on an ambitious and dedicated effort to improve the overall technical, financial, and managerial capacity of the agency, with a special focus on capital improvements. A 10 Year Capital Improvement Plan was developed in 2016-17 and every rate and fee began to be reviewed, updated, and optimized annually. Since 2016, the operating budget has increased from $637,060 to $1,354,191, an average of approximately 14 percent per year. These increases covered significant investments in staffing, training/licensing, accounting, operations, recordkeeping, maintenance, engineering, and capital projects such as metering/SCADA technology, pump station rehabilitation and tank installation.

Based primarily on the water rate structure, the Precinct generates revenue to fund their operating budget, including debt service and capital improvements projects outlined in their 10 Year Capital Improvement Plan for FY2020 – 2029 provided in Appendix H. That plan and the existing rate structure already include approximately $1,885,000 for Phase I water main improvements due to the proactive planning at the Precinct. Therefore, while additional sources of revenue may be needed to address the asset management recommendations the Precinct is in the highly commendable position of being prepared to act almost immediately on the Phase I recommendations of this report, unlike most water systems of its size and age.

The estimated cost of the Phase I asset management recommendations listed in Table No. 3 is $3,538,000. These recommendations could be funded in different ways.

One funding method would be to break up all but the Route 3 project into smaller projects tackled on an annual or biennial basis over a ten-year period using nothing but existing budget-generated revenues. The Route 3 project would be simultaneously funded through a combination of leveraged partnership(s), development agreement(s) and/or loan(s). Assuming the $2,125,000 Route 3 project would be completely funded through a standard 20-year loan at an estimated two percent interest, the Precinct would need additional revenues of approximately $130,000 per year for the twenty years for debt service. Assuming those new revenues would be borne by all water users equally without consideration of water usage or miscellaneous offsetting sources of funding, the rate per service connection (assuming 1,155 connections) would increase by approximately $9 per month.

Another funding scenario would be to seek a 20-year loan at two percent for all the Phase I asset management recommendations listed in Table No. 3. In this case, the Precinct would need revenues of approximately $217,000 per year for the twenty years of debt service. Assuming that this was not paid for using existing budget-generated revenues and that the new revenues are borne by all users uniformly without the beneficial effects of miscellaneous funds (e.g. other departmental revenues, capital reserve subsidies, developer contributions, etc.), the rate per service connection would increase by approximately $15 per month. Under this scenario, the Precinct incurs additional interest charges over the twenty years totaling $474,000. However, the Precinct retains its existing budget-generated revenues averaging $189,000 per year to potentially implement all of its proposed hydraulic improvements.

After the projects in Phase I are completed, a new rate evaluation should be completed to determine if further adjustments to the rate structure are needed to fund Phase II recommendations. Also, it is our recommendation that the long-term funding strategy be revisited upon completion of the hydraulic modeling analysis discussed earlier in this report. It is possible that reprioritization of the Phase I and II Improvements may occur based on potential impacts of proposed hydraulic improvements. The overlap of proposed

areas of hydraulic priority with some of the Phase I and II asset management project areas may present opportunities for completing multiple goals at once at a significant savings.

Implementation & Outreach Strategy

As noted earlier, over the last five years the Precinct has made significant investments in improving the overall technical, financial, and managerial capacity of the water system. A key component to the success of the associated budget increases has been a concerted effort by the staff and Water Commissioners to educate themselves, their customers, and stakeholders about the value of water, the story behind the infrastructure needs, and improvement opportunities at the Precinct.

Over the past few years, these educational efforts have included website creation, public meetings to discuss Capital Improvement Plan initiatives, meetings with key customers and local boards, periodic newsletters, billing inserts, sharing of asset attribute data and mapping with other Town agencies, working with the Fire Department on hydrant maintenance and testing, installation and promotion of cellular meters with web-based customer portals, presentations and publications about the recent storage tank project, historical research at the Precinct, phased SCADA installation, internal mechanical and financial systems tracking and analysis, as well as many other projects. Looking forward, the Precinct is committed to continuing to foster internal and external collaboration.

Regarding this asset management project, the Precinct has already completed several key milestones. The Precinct has presented a project overview to the Water Commissioners at an Open Meeting on January 28, 2020; held a public workshop at the Hooksett Library on March 3, 2020 to describe Precinct assets, this project and the draft report; and completed this report with the associated summary brochure. The Precinct also plans to:

- Maintain and improve the asset inventory and mapping.
- Include a project description and promotion in a Precinct newsletter.
- Present the final report to the Water Commissioners at an Open Meeting.
- Review and revise the funding strategy and rate structure annually.
- Use report as source material in budget work sessions and hearings.

On behalf of T&H, we wish to express our appreciation to the Hooksett Village Water Precinct, GSRWA, Brown Engineering, and NHDES on their participation in this project and for their help in collecting information and data. During the course of this project, Ms. Eyleen Izaguirre served as Engineer, Ms. Jenna O'Connell served as Assistant Project Engineer, Ms. Justine Carroll, P.E. provided technical reviews and conducted the workshop and the undersigned served as Project Manager. If you have any questions, please do not hesitate to contact our office.

Sincerely,

TATA & HOWARD, INC.



Jenna W. Rzasa, P.E.
Co-President

Enclosure

cc: Luis Adorno, NHDES

Appendix A

TATA & HOWARD

Allenstown

Bow

Hooksett Village

Dunbarton

Goffstown

Manchester

North Pump Station

North Well

East Pump Station

East Well

South Well Back-Up

South Pump Station

South Well

West (Quarry) Tank
Capacity: 1.0 mg

Booster Pump Station

Manor Drive Tank
Capacity: 1.0 mg

Thompson Corner Tank
Capacity: 0.2 mg

Merrimack River

West River Rd

Edgewater Dr

Merrimack St

Pleasant St

Hooksett Rd

Post Rd

Beaver Way

Deer Run

Pine St

Brickadyewine Dr

Spencer Rd

Heather Dr

Ardon Dr

Main St

Maple St

Rosedale St

Riverside St

Veterans Dr

N Main St

Pinnacle St

Donald Pl

Summit Dr

Vista Dr

Birch Hill Rd

College Park Dr

Campus Dr

University Dr

Thompson Ave

Roy Dr

Grant Dr

Morgan Dr

Pleasant View Dr

Blackwater Dr

Crawford Ln

Albell Ave

Morse Dr

Mulberry Ln

Dale Rd

Avon Rd

Dover Rd

Wedgewood Cir

Memorial Dr

Shannon Rd

Tay Rd

Trent Rd

Eggwes Dr

Maidstone Rd

Thames Rd

Northview Ter

Bert St

Granite St

Highland St

Bernice St

Dundee Ave

Chase St

Stevens Dr

Bullard Dr

Knights Ave

Mountain View Rd

Almeda Ln

Roy Rd

Grandview Dr

South Bow Rd

Viewpoint Dr

Orchard Dr

Mason Ave

Hilton Cir

Pearl Dr

Country Mountain Rd

Morningside Dr

Brown Rd

Goffstown Rd

Valley View Dr

Corriveau Dr

Cate Rd

Water Precinct Access Rd

Mill House Access Rd

Snow Hill Rd

Pauzzi Rd

Bayview Terrace Rd

West Bank Rd

Cross Rd

Meadowcrest Rd

Scott Ave

Green St

Gosselin Ave

Technology Dr

Quality Dr

Kimball Dr

Briar Ct

Hackett Hill Rd

Poore Rd

Bemis Savoie Rd

Riverbank Rd

Goonan Rd

Central Park Dr

Sunrise Blvd

West River Rd

Hidden Ranch Dr

Lehoux Dr

Peters Brook Dr

Industrial Park Dr

Oak Hill Rd

Legends Dr

Westview Terr

Julia Dr

Sterling Ave

Burbank Way

Virginia Ct

Nancy Ln

Gary Ave

Marlette Ave

Dartmouth St

Howard Ave

Hunt St

Kerri Ln

Maidstone Rd

Thames Rd

Depot Rd

Martins Ferry Rd

McAllister St

Whitehall Rd

Benton Rd

Glenath Ave

Harvest Dr

Menifee Dr

Jefferson Dr

Sherwood Dr

Lancelot Dr

Camelot Dr

N River Rd

No Name

Vindale Rd

Matthew Rd

3

93

N

Legend

- Blow Off Valve

Water Main Diameter

- Smaller than 4-inch
- 4-inch
- 6-inch
- 8-inch
- 10-inch
- 12-inch
- 16-inch

Water Distribution System
Hooksett Village Water Precinct
Hooksett, New Hampshire

TATA & HOWARD

Approximate Scale: 1" = 1,000'
June 2020

Appendix B

TATA & HOWARD

N

Allenstown

Bow

Hooksett Village

Dunbarton

Goffstown

Manchester

North Pump Station

North Well

East Pump Station

East Well

South Well Back-Up

South Pump Station

South Well

West (Quarry) Tank
Capacity: 1.0 mg

Booster Pump Station

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Merrimack River

West River Rd

Edgewater Dr

Merrimack St

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Beaver Way

Deer Run

Dudley Ave

Chase St

Highland St

Bernice St

Bart St

Granite St

Stevens Dr

Ballard Dr

Knights Ave

Northview Ter

Ardon Dr

Heather Dr

Maple St

Rosedale St

Riverside St

Pinnacle St

Summit Dr

Donald St

Vista Dr

Birch Hill Rd

Veterans Dr

N Main St

College Park Dr

Campus Dr

University Dr

Blackwater Dr

Crawford Ln

Thompson Ave

Roy Dr

Grant Dr

Morgan Dr

Pleasant View Dr

Albert Ave

Main St

Morse Dr

Mayberry Ln

Pohl Rd

Avon Rd

Dove Rd

Shannon Rd

Tay Rd

Trent Rd

Maidstone Rd

Thames Rd

Gary Ave

Marlette Ave

Dartmouth St

Hazlett Ave

Hunt St

Kerri Ln

Lehoux Dr

Peters Brook Dr

Industrial Park Dr

Oak Hill Rd

Julia Dr

Stirling Ave

Westview Terr

Burbank Way

Virginia Ct

Nancy Ln

Legends Dr

Wedgewood Cir

Memorial Dr

Eggwes Dr

Bayview Terrace Rd

West Bank Rd

Scott Ave

Green St

Meadowcrest Rd

Cross Rd

Sunrise Blvd

Westwicker Rd

Hidden Ranch Dr

Palmer Rd

Saw Hill Rd

Pine St

Brighdywine Dr

Sprinter Rd

Water Precinct Access Rd

Pol House Access Rd

Cate Rd

Mountain View Rd

Almeda Ln

Roy Rd

Grandview Dr

Pearl Dr

Country Mountain Rd

South Bow Rd

Viewpoint Dr

Orchard Dr

Mason Ave

Hilton Cir

Morningside Dr

Brown Rd

Goffstown Rd

Valley View Dr

Corriveau Dr

Hackett Hill Rd

Briar Ct

Poore Rd

Bemis Savoie Rd

W Riverbank Rd

Gosselin Ave

Technology Dr

Quality Dr

Kimball Dr

Central Park Dr

Goonan Rd

Benton Rd

Chestnut Ave

Whitehall Rd

McAllister St

Martins Ferry Rd

Depot Rd

N River Rd

Sherwood Dr

Lancelot Dr

Camelot Dr

Harvest Dr

Monroe Dr

Jefferson Dr

Madison

Legend

- Blow Off Valve

Asset Management Score

- No Score
- Good to Excellent
- Good to Fair
- Fair to Poor

Asset Management Scores
Hooksett Village Water Precinct
Hooksett, New Hampshire

TATA & HOWARD

Approximate Scale: 1" = 1,000'
June 2020

Appendix C

TATA & HOWARD

Pipe Input Data
Asset Management Plan
Hooksett Village Water Precinct
Hooksett, New Hampshire

FID	Location	Length (ft)	Diameter (in)	Material	Installation Year	Pressure (psi)	Breaks	Soil Info	Asset Management Score
0	North Well	691	6	AC	2004	70	0	Gravel/Sand	31
1	Pine Street	256	6	PVC	2008	54	0	Gravel/Sand	16
2	Pine Street	271	1	Plastic		70	0	Gravel/Sand	0
3	Hummingbird Lane	302	8	AC	1966	86	0	Gravel/Sand	42
4	Heather Drive	521	8	AC	1966	85	1	Gravel/Sand	61
5	West River Road	783	12	PVC	2002	82	2	Gravel/Sand	35
6	West River Road	994	8	AC	1978	78	0	Gravel/Sand	36
7	West River Road	2,027	8	AC	1978	60	0	Gravel/Sand	36
8	Windsor Terrace Apartments	244	8	PVC	2002	74	0	Gravel/Sand	8
9	Windsor Terrace Apartments	558	8	PVC	2002	74	0	Gravel/Sand	8
10	Windsor Terrace Apartments	628	8	PVC	2003	70	0	Gravel/Sand	8
11	West River Road	1,410	12	DI	2001	82	0	Gravel/Sand	11
12	Ardon Drive	2,103	8	PVC	2006	52	0	Gravel/Sand	8
13	West River Road	1,816	12	DI	1990	84	0	Gravel/Sand	16
14	Rosedale Street	641	8	DI	1990	90	0	Gravel/Sand	20
15	Maple Street	693	6	AC		84	1	Gravel/Sand	0
16	West River Road	925	6	AC	1972	88	0	Gravel/Sand	50
17	Riverside Street	1,348	12	PVC	1982	96	0	Potentially Corrosive	32
18	North Main Street	1,365	12	DI	1990	90	1	Potentially Corrosive	44
19	Veterans Drive	490	12	HDPE	2018	92	0	Potentially Corrosive	19
20	Lafond Avenue	601	6	PVC	2002	92	0	Gravel/Sand	22
21	Lafond Avenue	496	4	PVC	2002	92	0	Gravel/Sand	26
22	Pinnacle Street	1,718	6	AC	1985	68	0	Gravel/Sand	43
23	Donald Street	460	6	AC	1963	70	0	Gravel/Sand	44
24	Vista Drive	696	8	AC	1965	70	0	Gravel/Sand	36
25	Donald Street	1,401	6	AC	1963	70	0	Gravel/Sand	44
26	Summit Drive	642	6	AC	1965	59	0	Gravel/Sand	44
27	Birch Hill Road	665	6	PVC	1992	47	0	Gravel/Sand	21
28	Birch Hill Road	781	6	AC	1957	52	0	Gravel/Sand	44
29	West Quarry Tank	2,076	12	DI	2018	68	0	Gravel/Sand	4
30	South Well	410	8	DI	1986	78	0	Gravel/Sand	21
31	West River Road	11,745	12	PVC	1982	100	0	Potentially Corrosive	34
32	Dundee Avenue	1,511	12	DI	1992	98	0	Gravel/Sand	16
33	Veterans Drive	445	8	AC	1950	98	1	Gravel/Sand	61
34	Main Street	2,867	8	AC	1958	78	0	Gravel/Sand	36
35	College Park Drive	2,607	12	DI	2006	86	0	Gravel/Sand	11

Pipe Input Data
Asset Management Plan
Hooksett Village Water Precinct
Hooksett, New Hampshire

FID	Location	Length (ft)	Diameter (in)	Material	Installation Year	Pressure (psi)	Breaks	Soil Info	Asset Management Score
36	Route 3	3,042	12	DI	1985	50	0	Gravel/Sand	17
37	Route 3	688	6	AC	1958	50	0	Gravel/Sand	44
38	Grant Drive/Morgan Drive	2,085	8	AC	1963	76	0	Gravel/Sand	36
39	Grant Drive	597	8	AC	1962	74	0	Gravel/Sand	36
40	Kennedy Drive/Albert Avenue	591	6	AC	1962	74	0	Gravel/Sand	44
41	Beauchesne Drive	671	6	AC	1963	50	0	Gravel/Sand	44
42	Thompson Avenue/Ray Drive	1,244	6	AC	1962	70	0	Gravel/Sand	44
43	Short Avenue	390	6	AC	1962	70	0	Gravel/Sand	44
44	Thompson Corner Tank	883	8	AC	1950	50	0	Gravel/Sand	36
45	Hooksett Road	3,917	6	AC	1958	66	0	Gravel/Sand	44
46	St Mary's Condominiums	654	10	DI		46	0	Gravel/Sand	0
47	Route 3	2,276	12	DI	1996	50	0	Gravel/Sand	10
48	University Circle	424	12	PVC	2016	114	0	Gravel/Sand	11
49	University Circle	668	8	PVC	2016	126	0	Gravel/Sand	17
50	University Circle	1,645	12	PVC	2006	106	0	Gravel/Sand	12
51	Blackwater Road	741	12	PVC	2006	90	0	Gravel/Sand	10
52	Crawford Lane	1,602	8	PVC	2006	52	0	Gravel/Sand	8
53	Crawford Lane	854	8	PVC	2016	63	0	Gravel/Sand	7
54	Crawford Lane	617	8	PVC	2006	84	0	Gravel/Sand	14
55	Crawford Lane	183	8	PVC	2015	100	0	Gravel/Sand	15
56	Crawford Lane	1,611	8	PVC	2015	94	0	Gravel/Sand	13
57	Blackwater Drive	1,063	12	PVC	2012	67	0	Gravel/Sand	3
58	Blackwater Drive	227	12	PVC	2012	72	0	Gravel/Sand	3
59	Balckwater Drive	460	12	PVC	2012	67	0	Gravel/Sand	3
60	University Circle	3,608	12	PVC	2006	140	0	Gravel/Sand	14
61	Hooksett Public Library	891	8	PVC	2007	126	0	Gravel/Sand	18
62	Post Road	2,704	12	PVC	2004	134	0	Gravel/Sand	14
63	Manor Drive Tank	1,193	16	PVC	2007	65	0	Gravel/Sand	3
64	Manor Drive Tank	826	8	PVC	2007	63	0	Gravel/Sand	8
65	Post Road	4,997	16	PVC	2006	132	0	Gravel/Sand	13
66	Northview Terrace	877	8	PVC	2005	89	0	Gravel/Sand	14
67	Merrimack Street	1,077	8	AC	1950	98	0	Potentially Corrosive	52
68	Highland Street	437	2	Plastic	1950	86	1	Gravel/Sand	72
69	Granite Street	2,732	6	AC	1955	56	1	Gravel/Sand	63
70	Stevens Drive/Bullard Drive	1,513	6	PVC	1968	68	0	Known Corrosive Soil	40
71	Bullard Drive	696	6	AC	1968	64	0	Known Corrosive Soil	54

Pipe Input Data
Asset Management Plan
Hooksett Village Water Precinct
Hooksett, New Hampshire

FID	Location	Length (ft)	Diameter (in)	Material	Installation Year	Pressure (psi)	Breaks	Soil Info	Asset Management Score
72	Benice Street	455	8	AC	1960	68	0	Gravel/Sand	36
73	Benice Street	1,788	8	DI	1986	68	0	Gravel/Sand	21
74	Beaver Way	319	8	DI	1986	40	0	Gravel/Sand	21
75	Bert Street	1,433	6	AC	1960	56	0	Gravel/Sand	44
76	Route	239	12	DI	1996	50	0	Gravel/Sand	10
77	Route 3	169	12	DI	1996	50	0	Gravel/Sand	10
78	Dogwood Drive	792	8	DI	2005	52	0	Gravel/Sand	9
79	Ash Street	385	8	DI	1996	50	0	Gravel/Sand	14
80	Ash Street	183	8	DI	1996	50	0	Gravel/Sand	14
81	Cedar Street	915	8	DI	2005	50	0	Gravel/Sand	9
82	Chestnut Lane	234	8	DI	2005	52	0	Gravel/Sand	9
83	West River Road	1,833	12	PVC	1995	100	0	Gravel/Sand	17
84	Scott Avenue	1,866	6	PVC	1982	74	1	Known Corrosive Soil	57
85	Scott Avenue	438	8	DI	1988	88	0	Gravel/Sand	27
86	Green Street	651	6	PVC	1982	70	1	Known Corrosive Soil	57
87	Meadowcrest Road	371	6	PVC	1992	70	0	Gravel/Sand	21
88	Sunrise Boulevard	1,012	10	PVC	1998	55	0	Gravel/Sand	11
89	Sunrise Boulevard	1,246	8	PVC	1995	102	0	Gravel/Sand	21
90	Gullane Road	444	8	PVC	1995	76	0	Gravel/Sand	13
91	Gullane Road	505	8	PVC	1995	100	0	Gravel/Sand	21
92	Bayview Terrace Road/West Bank Road	2,295	8	PVC	1983	86	1	Gravel/Sand	45
93	Memorial Drive	2,843	6	AC	1958	62	0	Gravel/Sand	44
94	Hooksett Road	671	12	DI	1985	66	0	Gravel/Sand	17
95	Dale Road	675	8	PVC	1985	66	0	Gravel/Sand	20
96	Wedgewood Circle	735	6	PVC	1986	72	0	Potentially Corrosive	38
97	Dale Road	4,815	8	PVC	1985	84	1	Gravel/Sand	45
98	Otterson Street	323	8	AC	1960	52	1	Gravel/Sand	55
99	Knights Avenue	409	6	PVC	1981	62	0	Gravel/Sand	28
100	Chase Street	499	6	AC	1960	86	0	Gravel/Sand	50
101	Highland Street	225	6	AC	1950	86	0	Gravel/Sand	50
102	Merrimack Street	529	8	AC	1950	96	0	Potentially Corrosive	52
103	Pleasant View Drive	689	6	AC	1963	58	0	Gravel/Sand	44
104	Pine Street	819	6	AC		70	2	Gravel/Sand	0
105	Summit Drive	181	6	AC	1965	59	0	Gravel/Sand	44
106	Pinnacle Street	6	12	DI	2018	92	0	Gravel/Sand	10
107	Route 3	125	12	DI	2006	134	0	Gravel/Sand	15

Pipe Input Data
Asset Management Plan
Hooksett Village Water Precinct
Hooksett, New Hampshire

FID	Location	Length (ft)	Diameter (in)	Material	Installation Year	Pressure (psi)	Breaks	Soil Info	Asset Management Score
108	Merrimack Street	420	8	PVC	2006	86	0	Gravel/Sand	14
109	Memory Lane	173	1	Copper	1985	76	0	Gravel/Sand	37
110	St Mary's Condominium	72	10	DI		46	0	Gravel/Sand	0
111	Crawford Lane	476	8	PVC	2019	50	0	Gravel/Sand	7
112	Crawford Lane	512	8	PVC	2019	94	0	Gravel/Sand	13
113	Crawford Lane	1,160	8	PVC	2019	50	0	Gravel/Sand	7
114	University Circle	49	12	PVC	2006	140	0	Gravel/Sand	14
115	Deer Run	426	2	PVC	1986	48	0	Gravel/Sand	34
116	Deer Run	179	2	PVC	1986	48	0	Gravel/Sand	34
117	Deer Run	199	2	PVC	1986	48	0	Gravel/Sand	34
118	Windsor Terrace Apartments	268	8	PVC	2002	70	0	Gravel/Sand	8
119	Windsor Terrace Apartments	127	8	PVC	2003	68	0	Gravel/Sand	8
120	Windsor Terrace Apartments	244	6	PVC	2003	70	0	Gravel/Sand	16
121	Windsor Terrace Apartments	158	6	PVC	2003	68	0	Gravel/Sand	16
122	Windsor Terrace Apartments	157	4	PVC	2003	68	0	Gravel/Sand	20
123	Windsor Terrace Apartments	38	4	PVC	2003	68	0	Gravel/Sand	20
124	Windsor Terrace Apartments	33	4	PVC	2003	68	0	Gravel/Sand	20
125	Windsor Terrace Apartments	119	4	PVC	2003	68	0	Gravel/Sand	20
126	Windsor Terrace Apartments	15	4	PVC	2003	68	0	Gravel/Sand	20
127	Windsor Terrace Apartments	20	4	PVC	2003	68	0	Gravel/Sand	20
128	Windsor Terrace Apartments	13	4	PVC	2003	68	0	Gravel/Sand	20
129	Windsor Terrace Apartments	48	4	PVC	2003	70	0	Gravel/Sand	20
130	Windsor Terrace Apartments	66	4	PVC	2003	74	0	Gravel/Sand	20
131	Windsor Terrace Apartments	47	4	Plastic	2002	74	0	Gravel/Sand	32
132	Windsor Terrace Apartments	112	4	Plastic	2002	74	0	Gravel/Sand	32
133	Windsor Terrace Apartments	63	4	Plastic	2002	70	0	Gravel/Sand	32
134	Windsor Terrace Apartments	161	4	Plastic	2002	70	0	Gravel/Sand	32
135	Windsor Terrace Apartments	39	4	Plastic	2002	70	0	Gravel/Sand	32
136	Windsor Terrace Apartments	37	4	Plastic	2002	60	0	Gravel/Sand	32
137	Windsor Terrace Apartments	80	4	Plastic	2002	66	0	Gravel/Sand	32
138		899	8	PVC	1996	100	0	Gravel/Sand	21
139	West River Road	428	8	PVC	2006	90	0	Gravel/Sand	14
140	West River Road	582	6	PVC	2015	100	0	Gravel/Sand	23
141	Rosedale Street	385	8	AC	1981	90	0	Gravel/Sand	41
142	Rosedale Street	142	6		2016	94	0	Gravel/Sand	0
143	Thompson Avenue	58	6	AC	1962	78	0	Gravel/Sand	44

Pipe Input Data
Asset Management Plan
Hooksett Village Water Precinct
Hooksett, New Hampshire

FID	Location	Length (ft)	Diameter (in)	Material	Installation Year	Pressure (psi)	Breaks	Soil Info	Asset Management Score
144	West River Road	82	6	PVC	1995	100	0	Gravel/Sand	29
145	Meadowcrest Road	123	8	Plastic		98	0	Gravel/Sand	0
146		4	8	PVC	1982	60	0	Gravel/Sand	20
147	Highland Street	632	2	Plastic	1955	66	1	Gravel/Sand	66
148	Highland Street	31	6	AC		52	0	Gravel/Sand	0
149	Route 3	254	12	DI	2018	92	0	Gravel/Sand	10
150	Veterans Drive	67	12	DI	2018	92	0	Gravel/Sand	10
151	Veterans Drive	145	8	DI	1990	92	0	Gravel/Sand	20
152	Morse Drive	4,815	8	PVC	1985	76	1	Gravel/Sand	39
153	Cyr Drive	1,401	6	AC	1957	50	0	Gravel/Sand	44
154	Hooksett Road	4,997	16	PVC	2006	134	0	Potentially Corrosive	23
155	Route 3	3,042	12	DI	1985	48	0	Potentially Corrosive	27
156	Route 3	3,042	12	DI	1985	46	0	Gravel/Sand	17
157	West River Road	2,027	8	AC	1978	74	0	Potentially Corrosive	46
158	West River Road	11,745	12	PVC	1982	103	0	Potentially Corrosive	34
159	West River Road	11,745	12	PVC	1982	100	0	Potentially Corrosive	34
160	West River Road	11,745	12	PVC	1982	97	0	Potentially Corrosive	32
161	West River Road	11,745	12	PVC	1982	97	0	Potentially Corrosive	32
162	West River Road	11,745	12	PVC	1982	97	0	Potentially Corrosive	32
163	Main Street	1,816	12	DI	1990	84	1	Gravel/Sand	34
164	Hooksett Road	3,917	6	AC	1958	66	2	Gravel/Sand	69
165	Main Street	2,867	8	AC	1958	78	2	Gravel/Sand	61
166	Main Street	2,867	8	AC	1958	78	0	Gravel/Sand	36

Appendix D

TATA & HOWARD

Hydrants Past Their Useful Life Ranked by Age
Hooksett Village Water Precinct

FID	Rating	Installation Date	Location	Estimated Useful Life	Estimated Replacement Date
99	4	1/1/1950	Merrimack Street at Granite Street	40	1/1/1990
101	4	1/1/1950	Highland Street at Chase Street	40	1/1/1990
155	3	1/1/1950	23 Main Street	40	1/1/1990
171	3	1/1/1950	69 Main Street	40	1/1/1990
97	4	1/1/1955	Highland Street at Granite Street	40	1/1/1995
31	3	1/1/1956	15 Birch Hill Road	40	1/1/1996
91	4	1/1/1956	73 Granite Street	40	1/1/1996
186	3	1/1/1956	1600 Hooksett Road / Rt. 3	40	1/1/1996
28	3	1/1/1957	7 Birch Hill Road	40	1/1/1997
32	5	1/1/1957	11 Cyr Drive	40	1/1/1997
187	3	1/1/1958	1568 Hooksett Road / Rt. 3 (CD Boil)	40	1/1/1998
194	3	1/1/1959	Memorial Drive / Rt. 3	40	1/1/1999
92	4	1/1/1959	18 Bert Street	40	1/1/1999
98	3	1/1/1960	Granite Street at Chase Street	40	1/1/2000
167	3	1/1/1962	4 Ray Drive	40	1/1/2002
196	3	1/1/1962	5 Memorial Drive (Mem. Sch.)	40	1/1/2002
168	3	1/1/1962	25 Grant Street	40	1/1/2002
175	3	1/1/1963	15 Morgan Drive	40	1/1/2003
34	3	1/1/1963	20 Donald Street	40	1/1/2003
172	2	1/1/1963	10 Beauchesne Drive	40	1/1/2003
174	2	1/1/1963	7 Morgan Drive	40	1/1/2003
35	4	1/1/1965	8 Vista Drive	40	1/1/2005
181	3	1/1/1966	12 Morse Drive	40	1/1/2006
94	4	1/1/1968	7 Bullard Street	40	1/1/2008
95	2	1/1/1970	23 Bullard Street	40	1/1/2010
27	2	1/1/1972	456 West River Rd. / Rt. 3A	40	1/1/2012
100	2	1/1/1973	30 Merrimack Street	40	1/1/2013
148	2	1/1/1976	Hooksett Road / Rt. 3 @ Campus Driv	40	1/1/2016
0	2	1/1/1977	530 West River Road	40	1/1/2017
9	3	1/1/1978	500 West River Road / Rt. 3A	40	1/1/2018
176	2	1/1/1979	Hooksett Road / Rt. 3 @ Pleasant Viev	40	1/1/2019

Valves Past Their Useful Life Ranked by Year
Hooksett Villagw Water Precinct

FID	Installation Date	Location	Diameter	Estimated Useful Life	Estimated Replacement Date
43	1/1/1950	Granite St. @ Merrimack St.	6	50	1/2/2000
66	1/1/1950	Old Tank Line @ Main St.	8	50	1/2/2000
78	1/1/1950	Highland St. @ Dundee Ave.	6	50	1/2/2000
228	1/1/1950	Hooksett Rd. @ Thompson Corner Tank	6	50	1/2/2000
230	1/1/1950	Thompson Corner Tank Line	8	50	1/2/2000
42	1/1/1955	Granite St. @ Chase St.	6	50	1/1/2005
46	1/1/1955	Bernice St. @ Granite St.	6	50	1/1/2005
75	1/1/1955	Granite St. @ Highland St.	6	50	1/1/2005
34	1/1/1956	Granite St. West Of Hooksett Rd.	6	50	1/1/2006
44	1/1/1956	Granite St. @ #73	6	50	1/1/2006
80	1/1/1957	Birch Hill Rd. @ Pinnacle St.	6	50	1/2/2007
81	1/1/1957	Cyr St. To Donald St.	6	50	1/2/2007
82	1/1/1957	Birch Hill Rd. @ #7	6	50	1/2/2007
191	1/1/1957	Pinnacle St. @ West River Rd.		50	1/2/2007
26	1/1/1960	Otterson St. @ Bert St.	6	50	1/1/2010
40	1/1/1960	Chase St. @ Highland St.	6	50	1/1/2010
41	1/1/1960	Chase St. @ Granite St.	6	50	1/1/2010
67	1/1/1960	Bernice St. @ Bert St.	8	50	1/1/2010
68	1/1/1960	Bert St. @ Bernice St.	6	50	1/1/2010
164	1/1/1960	Bert St.	6	50	1/1/2010
21	1/1/1960	Otterson St. @ Granite St.	6	50	1/1/2010
69	1/1/1960	Bert St. @ Otterson St.	6	50	1/1/2010
70	1/1/1960		6	50	1/1/2010
74	1/1/1960	Bert St. East of Otterson St.	6	50	1/1/2010
53	1/1/1962	Grant Dr. @ Morgan Dr.	6	50	1/2/2012
56	1/1/1962	Grant @ Main St.	8	50	1/2/2012
58	1/1/1962	Grant Dr. @ Thompson Ave.	8	50	1/2/2012
59	1/1/1962	Ray Dr. @ Grant Dr.		50	1/2/2012
60	1/1/1962	Kennedy Dr. @ Grant Dr.	6	50	1/2/2012
62	1/1/1962	Grant Dr. @ Short Ave.	6	50	1/2/2012
233	1/1/1962	Memorial Dr.	6	50	1/2/2012
61	1/1/1963	Albert Ave. @ Kennedy Dr.	6	50	1/1/2013
63	1/1/1963	Beauchesne Dr.	6	50	1/1/2013
64	1/1/1963	Pleasant View Dr. @ Morgan Dr.	6	50	1/1/2013
65	1/1/1963	Albert Ave. @ Morgan Dr.	8	50	1/1/2013
79	1/1/1963	Pleasant View Dr. @ Morgan Dr.	8	50	1/1/2013
257	1/1/1963	Donald St. @ Vista Dr.	6	50	1/1/2013
83	1/1/1965	Pine St. East of Ardon Dr.	6	50	1/2/2015
85	1/1/1965	Heather Dr. @ Ardon Dr.	6	50	1/2/2015
86	1/1/1965	Ardon Dr. @ Heather Dr.	8	50	1/2/2015
87	1/1/1965	Hummingbird Ln. @ Ardon Dr.	6	50	1/2/2015

Valves Past Their Useful Life Ranked by Year
Hooksett Villagw Water Precinct

94	1/1/1965	Donald St. @ Pinnacle St.	6	50	1/2/2015
95	1/1/1965	Pinnacle St. West of Donald St.	8	50	1/2/2015
96	1/1/1965	Pinnacle St. East of Donald St.	8	50	1/2/2015
108	1/1/1965	Vista Dr. @ Summit Dr.	8	50	1/2/2015
114	1/1/1966	Morse Dr. @ Hooksett Rd.		50	1/2/2016
115	1/1/1966	Memory Ln. @ Morse Dr.		50	1/2/2016
38	1/1/1968	Bullard Dr. @ #17	6	50	1/1/2018
39	1/1/1968	Stevens Dr. @ Granite St.	6	50	1/1/2018
36	1/1/1968	Bullard Dr. @ Granite St.	6	50	1/1/2018
37	1/1/1968	Stevens Dr. @ Bullard Dr.	6	50	1/1/2018

Appendix E

TATA & HOWARD

N

Allenstown

Bow

Hooksett Village

Dunbarton

Goffstown

Manchester

10. West River Road
New ≥8-inch water main

4. Heather Drive
New 8-inch water main

2. Highland Street
New 8-inch water main

3. Granite Street, Otterson Street, Chase Street
New 8-inch water main

Booster Pump Station

Manor Drive Tank
Capacity: 1.0 mg

7. Bullard Drive
New 8-inch water main

6. Veterans Drive and Merrimack Street
New ≥12-inch water main

Thompson Corner Tank
Capacity: 0.2 mg

1. Route 3
New ≥12-inch water main

9. Dale Road
New 8-inch water main

11. Bayview Terrace Road and West Bank Road
New 8-inch water main

5. Scott Avenue and Green Street
New 8-inch water main

North Pump Station

North Well

East Pump Station

East Well

South Well Back-Up

South Pump Station

South Well

West (Quarry) Tank
Capacity: 1.0 mg

8. West River Road
New 12-inch water main

Merrimack River

West River Rd

Edgewater Dr

Merrimack St

Pleasant St

Hooksett Rd

Post Rd

Beaver Way

Deer Run

Bernie St

Bullard Dr

Knights Way

Northview Ter

Maple St

Main St

Roosevelt Ave

Riverside St

Veterans Dr

College Park Dr

Thompson Ave

Roy Dr

Grant Dr

McBean Dr

Pleasant View Dr

Blackwater Dr

University Cir

Crawford Ln

Campos Dr

Abbott Ave

Moose Dr

Mahony Ln

Dale Rd

Wedgewood Cir

Memorial Dr

Shannon Rd

Tay Rd

Frost Rd

Maidstone Rd

Thomas Rd

Bayview Terrace Rd

West Bank Rd

Eggwes Dr

Meadowcrest Rd

Scott Ave

Green St

Gary Ave

Marlette Ave

Dartmouth St

Hosford Ave

Hunt St

Kerri Ln

Lehoux Dr

Industrial Park Dr

Peters Brook Dr

Oak Hill Rd

Julia Dr

Stirling Ave

Westview Terr

Burbank Way

Virginia Ct

Nancy Ln

Legends Dr

Sunrise Blvd

Hidden Ranch Dr

Gosselin Ave

Technology Dr

Quality Dr

Kimball Dr

Central Park Dr

Depot Rd

Martins Ferry Rd

McAllister St

Whitehall Rd

Benton Rd

Chouah Ave

Harvest Dr

Monroe Dr

Jefferson Dr

Lancelot Dr

Camelot Dr

Sherwood Dr

N River Rd

Pine St

Bridgewater Dr

Spencer Rd

Ardon Dr

Heather Dr

Pinnacle St

Donald St

Summit Dr

Vista Dr

Birch Hill Rd

Water Precinct Access Rd

Fox House Access Rd

Cate Rd

Palmer Rd

Saw Hill Rd

Mountain View Rd

South Bow Rd

Almada Ln

Roy Rd

Grandview Dr

Viewpoint Dr

Orchard Dr

Mason Ave

Hilltop Cir

Pearl Dr

Quarry Mountain Rd

Morningside Dr

Brown Rd

Goffstown Rd

Valley View Dr

Corriveau Dr

Cross Rd

Hackett Hill Rd

Briar Ct

Poore Rd

Bemis Savoie Rd

W Riverdale Rd

Goonan Rd

93

3

Legend

- Blow Off Valve

Recommended Improvements

- Phase I Improvements
- Phase II Improvements

Water Main Diameter

- Less than 4-inch
- 4-inch
- 6-inch
- 8-inch
- 10-inch
- 12-inch
- 16-inch

Recommended Improvements
Hooksett Village Water Precinct
Hooksett, New Hampshire

TATA & HOWARD

Approximate Scale: 1" = 1,000'

June 2020

Appendix F

TATA & HOWARD

N

Allenstown

Bow

Hooksett Village

Dunbarton

Goffstown

Manchester

Proposed Bow Interconnection

Replace with 12-inch water main

Replace with 12-inch water main

North Pump Station

North Well

East Pump Station

East Well

South Well Back-Up

South Pump Station

South Well

West (Quarry) Tank
Capacity: 1.0 mg

Replace with 12-inch water main

12-inch
Transmission loop

Replace with 12-inch water main

Booster Pump Station

Manor Drive Tank
Capacity: 1.0 mg

Replace with 12-inch water main

Replace Thompson Corner Tank

Thompson Corner Tank
Capacity: 0.2 mg

Replace with 12-inch water main

Existing Central Hookset Water Precinct Interconnection

Install 12-inch river crossing

Proposed Manchester Water Works Interconnection

Edgewater Dr
West River Rd
Merrimack St
Pleasant St
Hooksett Rd
Post Rd
Beaver Way
Deer Run
Pine St
Brighdywine Dr
Spring Rd
Main St
Heather Dr
Ardon Dr
Merrimack River
Douglas Ave
Steven Dr
Bullard Dr
Knights Ave
Granite St
Northview Ter
Maple St
Rosedale St
Reverende St
Pinnacle St
Donald St
Summit Dr
Birch Hill Rd
Veterans Dr
N Main St
College Park Dr
Campus Dr
University Cir
Thompson Ave
Roy Dr
Grant Dr
Morgan Dr
Pleasant View Dr
Albert Ave
Blackwater Dr
Crawford Ln
Main St
Mountain View Rd
Almeda Ln
Roy Rd
Grandview Dr
Pearl Dr
Quimby Mountain Rd
South Bow Rd
Viewpoint Dr
Orchard Dr
Mason Ave
Hilltop Cir
Morningside Dr
Brown Rd
Golf House Access Rd
Cate Rd
Turf Precinct Access Rd
Saw Mill Rd
Baker Rd
Dale Rd
Mouse Dr
Mouse Dr
Longboat Key Cir
Memorial Dr
Eagles Dr
Avon Rd
Dove Rd
Shannon Rd
Tay Rd
Grant Rd
Maidstone Rd
Thames Rd
Bayview Terrace Rd
West Bank Rd
Cross Rd
Meadowcrest Rd
Scott Ave
Green St
Gary Ave
Marlette Ave
Dartmouth St
Hosford Ave
Hunt St
Kerri Ln
Lehoux Dr
Peters Brook Dr
Industrial Park Dr
Oak Hill Rd
Griffin Ave
Julia Dr
Westview Terr
Burbank Way
Virginia Ct
Nancy Ln
Legends Dr
Sunrise Blvd
Golden Ranch Dr
Gosselin Way
Clough Ave
Benton Rd
Whitehall Rd
McAllister St
Martins Ferry Rd
Depot Rd
Harvey Dr
Monroe Dr
Madison
Jefferson Dr
Sherwood Dr
Lancelot Dr
Camelot Dr
N River Rd
Technology Dr
Quality Dr
Kimball Dr
Hackett Hill Rd
Briar Ct
Poore Rd
Bemis Savoie Rd
Goonan Rd
Central Park Dr
Goffstown Rd
Valley View Dr
Corriveau Dr

Legend

- Blow Off Valve

Water Main Diameter

- Smaller than 4-inch
- 4-inch
- 6-inch
- 8-inch
- 10-inch
- 12-inch
- 16-inch

Hydraulic Improvement Plan
Hooksett Village Water Precinct
Hooksett, New Hampshire

TATA & HOWARD

Approximate Scale: 1" = 1,000'
June 2020

Appendix G

TATA & HOWARD

No.	Key Management Area	Levels of Service	
		Performance Measures	**Performance Targets**
1	Water Resource Adequacy	Provide an adequate supply for customer demand.	$\frac{Current\ Capacity}{Peak\ Daily\ Demand} \geq 1$ $\frac{Current\ Capacity\ with\ Largest\ Well\ Offline}{Average\ Daily\ Demand} \geq 1$
2	Product Quality	Compliance with Federal and State drinking water regulations.	Maintain 99% or greater days in compliance. Determine and reassess annually. $\frac{No.\ of\ Days\ in\ Full\ Compliance}{Total\ Days\ in\ a\ Year} * 100 = \%\ of\ Days\ in\ Compliance$
3	Stakeholder Support	Improve public understanding of utility matters.	Share asset management plan information in newsletter and brochure. Quarterly update of website. Annual update and publication of Capital Improvement Plan.

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No.	Key Management Area	Levels of Service	
		Performance Measures	**Performance Targets**
4	Customer Satisfaction	Maintain a customer complaint (quality, quantity, pressure) log.	Minimize complaints. Determine and assess annually. $$\frac{No.\,of\ Complaints}{No.\,Accounts} \leq 2\%$$
		Provide accurate customer billing information.	Issue 95% or greater correct bills. Determine and reassess annually. $$\frac{Total\ Bills - \ No.\ Error - Driven\ Billing\ Adjustments}{Total\ Bills} * 100 = \%\ Correct\ Bills$$
5	Community Sustainability & Economic Development	Maintain affordable rates.	Maintain an average user cost of less than 2.5% of MHI.

TATA & HOWARD

No.	Key Management Area	Levels of Service	
		Performance Measures	**Performance Targets**
6	Employee & Leadership Development	Maintain employee satisfaction.	Complete an annual satisfaction level check in with employees.
		Maintain certification coverage.	Maintain 100% certification coverage. Determine and reassess annually. $\frac{No.\ Employee\ Certifications}{No. Required\ Certifications} * 100 = \%\ Certification\ Coverage$
7	Financial Viability	Obtain adequate revenue to cover overall expenditures.	Revenue to cover total expenditures is 95% or greater. Determine and reassess annually. $\frac{Total\ Revenue}{Total\ Expenditures} * 100 = \%\ revenue\ to\ cover\ total\ expenditures$
		Maintain sufficient reserves.	Maintain capital reserves funds of at least 30% of budget. Re-evaluate the reserves to budget ratio annually.
		Ensure financial management integrity.	Complete annual financial statement audit with the goal to present a clean opinion indicating that the financial statements fairly represent the finances of the Precinct.

TATA & HOWARD

No.	Key Management Area	Levels of Service	
		Performance Measures	**Performance Targets**
8	Operational Optimization	Provide efficient water delivery. Implement leak detection and repair program.	Water balance is 15% or less. Determine and reassess annually through a water balance reporting. $\frac{Water\ Balance}{System\ Input\ Volume} * 100 = \%\ water\ balance$
		Maintain meter functionality. Continue water meter replacement program.	Maintain 95% or greater functioning meters. Determine and reassess annually. $\frac{Total\ No. Active\ Billable\ Meters - Stopped\ or\ Malfunctioning\ Meters}{Total\ No. of\ Active\ Billable\ Meters} * 100 = \%\ Functioning\ Meter$
		Maintain efficient distribution system and treatment systems.	Achieve treatment goals of pH ≥ 7.2 and free Cl ≤ 0.2 mg/L > 90% of the time leaving treatment plants. Review annually. Complete a hydraulic model. Evaluate looping to eliminate dead ends in system with the hydraulic model, and optimize pump/tank operations. Conduct energy audit.

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No.	Key Management Area	Levels of Service	
		Performance Measures	**Performance Targets**
9	Infrastructure Stability	Complete 'Critical' asset identification.	Complete recommendations outlined in the asset management report, including the identification and assessment of remaining above and below ground assets.
10	Operational Resiliency	Minimize water main breaks and leaks.	10 or less water main breaks per 30 miles of pipe per year. $\frac{No.\,Breaks/Leaks\,per\,Year}{Total\,Miles\,of\,Pipe} * 30 = No.\,Breaks/Leaks\,per\,Mile\,of\,Pipe$
		Maintain an all hazards emergency response plan.	Complete an all hazards vulnerability assessment. Update emergency response plan with vulnerability assessment. Complete health and safety training for all employees.

TATA & HOWARD

Appendix H

TATA & HOWARD

Long-Term Project Description	Year± of Last Purchase	Year± of Next Purchase	FY2020	FY2021	FY2022	FY2023	FY2024	FY2025	FY2026	FY2027	FY2028	FY2029	10-Year Project Cost	25-Year Project Cost
Tanks: (a) Installation of new correctly sized tank for Low Pressure Zone (LPZ) (via $1.8M loan in 2019-20)	2019	--	$110,119	$110,119	$110,119	$110,119	$110,119	$110,119	$110,119	$110,119	$110,119	$110,119	$1,101,195	$2,299,833
(b) Repair/re-purposing of old LPZ tank	1950	2021	$0	$200,000	$0	$0	$0	$0	$0	$0	$0	$0	$200,000	$200,000
(c) Repair/upgrade High PZ (HPZ) tank	2007	2022	$0	$0	$60,000	$0	$0	$0	$0	$0	$0	$0	$60,000	$60,000
New Source Installation: For drought-contamination protection and growth (estimated $1M loan in 2024)	2007	2023-24	$25,000	$25,000	$50,000	$50,000	$60,000	$60,000	$60,000	$60,000	$60,000	$60,000	$510,000	$1,350,000
Main Replacement/improvement: 30 miles pipe @ 1,000'/yr x $250/ft + $25K engr = $275K/yr (160-yr life cycle)	0 - 70 yrs±	Annual	$150,000	$0	$150,000	$240,000	$220,000	$255,000	$245,000	$205,000	$210,000	$210,000	$1,885,000	$5,380,000
Emergency Interconnection: Backup for west LPZ (estimated $1M loan in 2022)	1985±	2021-22	$25,000	$25,000	$60,000	$60,000	$60,000	$60,000	$60,000	$60,000	$60,000	$60,000	$530,000	$1,257,500
Meters/Transmitters: Routine upgrades/replacements (10-20 year cycle)	0 - 68 yrs±	2020-23	$60,000	$60,000	$60,000	$40,000	$5,000	$5,000	$5,000	$5,000	$35,000	$35,000	$310,000	$720,000
Pump Stations: Improvements for efficiency/safety/damage prev./SCADA	10-35 yrs±	2020	$65,000	$10,000	$10,000	$0	$0	$0	$0	$0	$0	$0	$85,000	$230,525
Vehicles: Routine replacement before major repairs (12-year cycle)	1-12 yrs	2021	$0	$45,000	$0	$0	$45,000	$0	$0	$35,000	$0	$0	$125,000	$350,800
Projected CIP totals:		*$346,269 (FY2019)*	***$435,119***	***$475,119***	***$500,119***	***$500,119***	***$500,119***	***$490,119***	***$480,119***	***$475,119***	***$475,119***	***$475,119***	***$4,806,195***	***$11,848,658***
Breakdown of CIP Sources: *Trust funds:*		*$101,000*	*$40,000*	*$40,000*	*$35,000*	*$25,000*	*$25,000*	*$15,000*	*$5,000*	*$0*	*$0*	*$0*	*$185,000*	*$286,000*
Prior year surplus:		*$0*	*$45,000*	*$20,000*	*$5,000*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$70,000*	*$70,000*
Taxes:		*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*
Rates & fees:		*$245,269*	*$350,119*	*$415,119*	*$460,119*	*$475,119*	*$475,119*	*$475,119*	*$475,119*	*$475,119*	*$475,119*	*$475,119*	*$4,551,195*	*$11,492,658*
Projected Budget ▲ due to CIP:		*$152,456*	*$104,851*	*$65,000*	*$45,000*	*$15,000*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*		
Breakdown of Budget Needs: *CIP ▲:*		*$152,456*	*$104,851*	*$65,000*	*$45,000*	*$15,000*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*		
+ Routine O&M (inflation) ▲:		*$15,000*	*$15,000*	*$15,000*	*$15,000*	*$15,000*	*$15,000*	*$15,000*	*$15,000*	*$15,000*	*$15,000*	*$15,000*		
+ Planned trust fund deposit:		*$0*	*$0*	*$10,000*	*$25,000*	*$25,000*	*$25,000*	*$25,000*	*$25,000*	*$25,000*	*$25,000*	*$25,000*		
+ Water usage factor:		*$2,350*	*$2,350*	*$2,350*	*$2,350*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*		
Approx. add'l. revenue needs ▲:		*$169,806*	*$122,201*	*$92,350*	*$87,350*	*$55,000*	*$40,000*	*$40,000*	*$40,000*	*$40,000*	*$40,000*	*$40,000*		