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WOODARD &CURRAN

Via Electronic Mail

March 7, 2017

Gerry M. Moody, Esq.
Town of Milford
52 Main Street
Milford, MA 01757-2679

RE: Milford Water Company
Water Facilities Conditions Assessment and Water System Replacement Cost Estimate – January 2017

Dear Mr. Moody:

Woodard & Curran presents herein the results of our evaluations and estimates relative to the water supply storage, pumping, treatment and distribution systems and related appurtenances owned and operated by the Milford Water Company (MWC). This letter and the included attachments present our findings and determinations, the principal assumptions used to prepare our estimates, and related backup documentation.

Our evaluation included a site visit to complete a high-level condition assessment of each facility in the distribution system and a review of the Master Plan and Capital Improvement Plan (CIP) developed by Tata & Howard to gain an understanding of the age and pipe materials in the distribution system. In preparation of the replacement cost estimates provided herein, Woodard & Curran made certain assumptions and relied on information provided or developed by others. The principal assumptions used in the development of these cost estimates are listed below. The information used to develop the estimated replacement cost of new water mains, service connections, hydrants, meters, pump stations, storage tanks, wells, treatment plants and dams are as follows:

- The Commonwealth of Massachusetts, Annual Return of the Milford Water Company to the Department of Public Utilities of Massachusetts, for the year ending December 31, 2013.
- Master Plan and Capital Improvements Plan, Milford Water Company, prepared by Tata & Howard, December 2010.
- MWC FY2017 thru FY2027 Annual Capital Budgets.
- Feasibility Study, Town of Milford, Massachusetts, prepared by Russell Consulting, LLC, 15 Titcomb Street, Newburyport, MA, dated June 2, 2014.
- RS Means Heavy Construction Cost Data, 2010, RS Means Construction Publishers & Consultants, Construction Plaza, 63 Smiths Lane, Kingston, MA 02364-0800.
- An Excel spreadsheet provided by the MWC titled "Asset Inventory Compilation".
- Recent bid prices and cost estimates for similar types of facilities.

Water Supply, Storage and Treatment Plants

On February 3, 2017, representatives of Woodard & Curran and the MWC, including David Condrey, General Manager, conducted site visits to the MWC water supply sources, water storage tanks and water treatment plants. The purpose of the visits was to conduct a high-level condition assessment of these facilities by a visual inspection and to rate these facilities as good, fair or poor. For the purposes of this assessment good, fair and poor are defined below:

- Good – Facilities are operational and no immediate improvements are necessary
- Fair – Facilities are operational but are likely to require rehabilitation or other improvements in five to ten years to ensure long term operability/reliability
- Poor – Facilities are operational, but are likely to require repairs/rehabilitation in five years or less to maintain long term operability/reliability

The following summarizes the site visits and the high-level conditions assessment that were completed. In addition, estimated replacement costs for each of the facilities included in the assessment are provided in Table 1.

Water Supply Sources

<u>*Clark's Island Wellfield*</u>

Summary

The Clark's Island Wellfield consists of two directionally drilled, naturally developed angle wells installed to replace an abandoned tubular wellfield. Water is withdrawn from the angle wells via a horizontal split case pump with a vacuum priming system. The pump and associated fittings, valves, piping and electrical/controls are located in a concrete building. Water from the wellfield is pumped to the Dilla Street Water Treatment Plant. The reported approved maximum daily pumping volume is 0.80 million gallons per day (mgd).

Condition

A visual assessment of the wells could not be performed. Based on the angle wells being relatively new, the Clark's Island Wellfield Angle Wells are rated as Good. However, despite this rating, it is best management practice that the wells be periodically cleaned/rehabilitated, as necessary, to maintain their original approved pumping capacity.

The Clark's Island Wellfield pump station is rated as Poor/Fair due to our understanding that the vacuum priming system requires replacement, the older age of the electrical and piping system components and lack of standby power capabilities. The Supervisory Control And Data Acquisition (SCADA) panel and pump motor appear relatively new. Possible improvements to the pump station to upgrade its condition to Good include replacement of the vacuum priming system, electrical upgrades, painting, valve replacement, heating system upgrades and adding provisions for standby power. The estimated cost for these possible improvements could range from $100,000 to $150,000. The most critical improvement would be the replacement of the vacuum priming system.

The MWC's current capital budget plan does not include any projects for improvements to the Clark's Island Wellfield pump station at this time.

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Dilla Street Wells

Summary

The Dilla Street Wells consist of two gravel packed wells with submersible pumps and pitless adapters. The wells were reported to have been installed in 1984 and have an approved maximum daily pumping volume of 0.675 mgd. The water from the Dilla Street Wells is pumped to the Dilla Street Water Treatment Plant for treatment.

Condition

Since the wells contain submersible pumps with pitless adapters, a visual assessment of the wells could not be performed. Based on input from the MWC it is our understanding that the wells are operating at a reduced pumping capacity and require cleaning/rehabilitation. Based on this understanding, the Dilla Street Wells are assessed as Fair.

Improving the wells to a Good condition would require returning the wells to their original pumping capacity. This could be accomplished by cleaning/rehabilitating the wells or if that does not provide the desired results, replacement or satellite wells could be installed. As discussed previously, routine well cleaning and rehabilitation is a best management practice which may occur on a yearly or less frequent basis in order to maintain the wells original pumping capacity. Cleaning/rehabilitation of the two Dilla Street wells is estimated to cost up to $50,000. Total replacement of the wells, including pumps, piping and appurtenances estimated to cost up to $450,000.

The MWC's current capital budget plan does not include any projects for improvements to the Dilla Street Wells.

Godfrey Brook Wells

Summary

The Godfrey Brook Wells consist of five gravel packed wells with submersible pumps and pitless adaptors. The wells were reported to have an approved maximum daily pumping volume of 0.79 mgd. The water from the Godfrey Brook Wells is pumped to the Godfrey Brook Water Treatment Plant for treatment.

Condition

Since the Godfrey Brook Wells consist of wells with submersible pumps and pitless adapters, a visual assessment of the wells could not be performed. Based on input from the MWC it is our understanding that the Godfrey Brook Wells are operating at a reduced pumping capacity and because of this reduced capacity, the Godfrey Brook Wells are assessed as Fair.

Improving the wells to a Good condition would require returning the wells to their original pumping capacity. This could be accomplished by cleaning/rehabilitating the wells or if that does not provide the desired results replacement or satellite wells could be installed.

To address the declining production from the Godfrey Brook Wells, the MWC has included a budget of $350,000 in their FY2017 capital budget to assess the condition of the wells and identify the necessary improvements. The costs for those improvements would be identified once the study is completed.

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Cedar Swamp Well

Summary

The Cedar Swamp Well consists of one gravel packed well with a submersible pump and pitless adaptor. The well is currently inactive.

Condition

Since the Cedar Swamp Well consists of a well with a submersible pump, a visual assessment of the well could not be performed. Due to the inactivity of this well, we were unable to render an assessment. It is our understanding that MWC does not have control/ownership of the Massachusetts Department of Environmental Protection (MassDEP) required 400-foot protective radius surrounding the well. Therefore, the well must remain inactive.

Charles River Raw Water Pump Station

Summary

The Charles River Raw Water Pump Station consists of a masonry CMU block building with flat roof and below grade wet well. The intake for the wet well includes a new stainless steel drum screen and air burst compressed air, screen cleaning system. The pump station contains one vertical turbine pump and associated valves, fittings and piping for pumping the raw water to the Dilla Street Water Treatment Plant.

Condition

Visual inspection indicates that the Charles River Raw Water Pump Station is in Fair condition. The pump station has a new intake, including a new stainless steel drum screen and air burst compressed air, screen cleaning system, including a new air compressor but due to the apparent age of the building and roofing system and older pump and motor, the pump station was rated in Fair condition. Future possible improvements to the station could include assessing and replacing the roof, if necessary, replacement of the pump and motor, and general aesthetic improvements, such as painting. The estimated cost for these improvements could range from $50,000 to $100,000. Although it is reported that no significant flooding of the station has occurred in the past it may be beneficial in the long term, to assess this pump station for its vulnerability to damage from flooding by the Charles River and if necessary, provide the required vulnerability improvements.

The MWC's current capital budget plans do not include any projects for improvements to the Charles River Raw Water Pump Station.

Echo Lake Reservoir

Summary

The Echo Lake Reservoir consists of an impoundment constructed of stone. Flow from the reservoir is by gravity to the Dilla Street Water Treatment Plant. The MWC is planning on rehabilitating the spillway and safety rail and will be replacing the intake structure with a new stainless steel drum screen and air burst system, similar to the intake structure installed at the Charles River Raw Water Pump Station.

Condition

The Echo Lake Reservoir impoundment appears to be in Good condition. No additional improvements over and above what the MWC has planned, were identified by this visual assessment.

The MWC's current capital budget plans do not include any projects for improvements to the Echo Lake Reservoir.

Water Storage Tanks

Bear Hill Tank

Summary

The Bear Hill Tank consists of a welded steel tank with a reported capacity of approximately 2.65 million gallons (mg). The tank was reported to have been constructed in 1987. It was also reported that the interior and exterior surfaces of the Bear Hill Tank were recoated in 2006.

Condition

Overall, the Bear Hill Tank and the exterior coating system appear to be in Good condition based on the visual observations. No improvements were identified as being necessary from this visual assessment. This should be confirmed by reviewing the most recent tank inspection report.

The MWC has budgeted $750,000 in their FY2020 annual capital budget for rehabilitation of the Bear Hill Tank. This appears to be consistent with best management practices which recommends recoating/rehabilitating steel storage tanks every 15 to 20 years.

Congress Street Tank

Summary

The Congress Street Tank consists of a riveted steel tank that was reported to have been constructed in 1927 and has a reported capacity of 1.1 mg. The height of the tank was extended with a welded steel extension and an aluminum roof added in 2009.

Condition

Based on visual observations, the Congress Street Tank appears to be in Fair/Good condition with the exterior coating system requiring recoating. Since the interior could not be observed the most recent tank inspection report should be reviewed to determine if the interior coating system requires recoating and to identify any other necessary improvements. After providing the necessary exterior recoating (and interior recoating, if necessary), the tank should return to a Good condition. The estimated cost for exterior recoating is $300,000 – $400,000. If both the interior and exterior require recoating, the estimated cost could range from $500,000 - $600,000. The MWC has budgeted $500,000 in FY2018 for the rehabilitation of the Congress Street Tank, including both the interior and exterior coating systems.

Highland Street Tank

Summary

The Highland Street Tank consists of a riveted steel tank that was reported to have been constructed in 1964 and has a reported capacity of 0.271 mg. Based on visual inspection and input from the MWC, the tank requires recoating of both the interior and exterior coating systems.

Condition

Overall, the condition of the water storage tank appears to be in Fair condition and requires recoating of both the interior and exterior coating systems. This should be confirmed by reviewing the most recent tank inspection report. After providing the necessary interior and exterior recoating and any necessary improvements identified by the tank inspection report, the tank should return to a Good condition. The estimated cost for the interior and exterior recoating may range from approximately $500,000 – $600,000. The MWC has budgeted $500,000 in their FY2017 Annual Capital Budget for the Highland Street Tank rehabilitation.

Booster Pump Stations

Summary

The MWC has one booster pump station, the Congress Street Booster Station, located at the Congress Street Water Storage Tank. The booster pump station consists of a masonry CMU block building with a wood framed gable roof with asphalt shingles. The station is surrounded by a chain link fence. The booster station contains two 800 gallons per minute (gpm) end suction centrifugal pumps; one reported to be installed in April of 2016 and the second in January of 2017. The booster pumps are located in the basement of the building. Access to the basement is provided by an aluminum ladder. SCADA communications are through phone lines. A sodium hypochlorite feed and monitoring system is no longer being used.

It is reported that when the Highland Street tank is taken offline for repairs/maintenance, it is necessary to provide a temporary, skid-mounted booster pump in order to maintain acceptable pressures in the distribution system. To eliminate this requirement, it would be necessary for the Congress Street Booster Station to increase its pump capacity.

Condition

Based on the visual inspection and apparent age of the building, the booster pump station appears to be in Poor/Fair condition. Improvements that may be necessary to improve the overall assessment of the station to Good include roof replacement, painting, fence replacement, basement access, controls and communications improvements. The estimated cost for these improvements could range from $75,000 to $100,000.

In addition, in order to eliminate the need for a temporary skid-mounted booster pump when the Highland Street Tank is off-line, the Congress Street Booster Station would require rehabilitation/replacement to increase pump capacity. A total replacement of the Congress Street Booster Station is estimated to cost up to $500,000.

The MWC's current capital plan does not include any projects for improvements to the Congress Street Booster Station.

Water Treatment Plants

Godfrey Brook Water Treatment Plant

Summary

The Godfrey Brook Water Treatment Plant treats water produced from the Godfrey Brook Wells. It's reported that the plant was originally designed with a capacity of 1.44 mgd but due to lost capacity in the Godfrey Brook Wells the current output is approximately 0.72 mgd. The lost capacity is reported to be due to elevated levels of iron/manganese. The Plant consists of a CMU block building with a two-level flat roof. The building contains two aeration towers for pH adjustment, a clearwell located beneath the building and two vertical turbine pumps for pumping from the clearwell and into the distribution system. The building has space for adding a third vertical turbine pump. Potassium hydroxide is added for additional pH adjustment, zinc orthophosphate for corrosion control and sodium hypochlorite for disinfection. The plant has a connection for a portable standby generator. SCADA communications is via radio.

It was reported that the MWC is considering a new biological water treatment plant for iron/manganese removal.

Condition

The condition of the Godfrey Brook Water Treatment Plant is in Good condition but is operating at a reduced capacity due to a reduced pumping capacity at the Godfrey Brook Wells. As discussed previously, to address this issue, it is our understanding that the MWC has included $350,000 in their FY2017 Annual Capital Budget to investigate rehabilitation/replacement of the Godfrey Brook Wells and replacement of the existing water treatment plant with a new biological water treatment plant for iron/manganese removal. The estimated costs for both the well and treatment plant improvements would be developed as part of this study.

Dilla Street Water Treatment Plant

The Dilla Street Water Treatment Plant treats all of the water supply sources with the exception of the Godfrey Brook Wells. The treatment plant contains two pre-engineered metal buildings with concrete foundation and floors and one combination pre-engineered metal building and brick and block building which includes the high lift pumps and, also serves as storage and office space. The treatment plant was constructed in 2013 and has a peak capacity of 5.0 mgd. The 2013 plant includes two pre-engineered metal buildings; one building houses the backwash water supply clearwell and backwash pumps and the second houses the main process equipment including the rapid mix basins, flocculation basins, dissolved air floatation (DAF) units, three granulated activated carbon filters (GAC) and associated chemical storage and feed equipment; zinc orthophosphate, potassium permanganate, potassium hydroxide, PAC and sodium hypochlorite. After passing through the GAC filters, the filtered water flows to an exterior chlorine contact tank and then pumped by the high lift pumps into the distribution system.

Condition

High Lift Pump Station – The High Lift Pump Station is located in an older brick and block building that is also used as a garage, for storage and office/crew space. MWC reported that the roof requires repair. MWC indicated that three of the high service pumps including motors and VFD's are relatively new. The original brick floor in the pump area has been partially replaced with a concrete floor. Based on the age of the building, mechanical and electrical systems and the need for a new roof, the condition of the High Lift Pump Station is assessed as Fair. Improvements necessary to improve the assessment of the High

Lift Pump Station to Good, include providing a detailed assessment and repairs to the building and support systems, replacement of the roof and replacement of the brick floor. The MWC has included a budget of $45,000 in their FY2018 capital budget for replacement of the existing roof, which is the most critical of the potential improvements.

Dilla Street Water Treatment Plant (exclusive of High Lift Pump Station) – The Dilla Street Water Treatment Plant was built in 2013 and due to its relatively new age and the visual assessment that was performed, the plant appears to be in Good condition. No improvements were identified as being necessary from this visual assessment. The MWC has included $105,000 in the FY2017 Annual Capital Budget for replacing the media in GAC Filter No. 1. Replacement of the media in GAC Filter No. 2 and No. 3 at a cost of $65,000 each are included in the FY2018 and FY2019 Annual Capital Budgets respectively. This is all part of routine maintenance of the GAC filters.

Summary

Overall, the existing MWC water supply, storage and treatment plants appear to be in Fair to Good Condition with two facilities in Poor/Fair Condition. There are no facilities that appear to be in Poor Condition.

In general, facilities rated in Fair to Good condition are operational and may require rehabilitation or other improvements in five to ten years or later for those in Good condition. Facilities rated as Poor/Fair should be addressed within five years.

Facilities rated as Fair include the following:

- Dilla Street Wells
- Godfrey Brook Wells
- Charles River Raw Water Pump Station
- Highland Street Water Storage Tank; and
- High Lift Pump Station

Of the five facilities rated as Fair, the MWC has included budgets in the Annual Capital Budgets for Godfrey Brook, a study of the Godfrey Brook Wells ($350,000), which will determine what improvements and associated costs are necessary, the roof replacement at the High Lift Pump Station ($45,000) and rehabilitation of the Highland Street Water Storage Tank ($500,000). Once the Godfrey Brook Well study is completed we would anticipate that additional costs would be identified for replacement or improvements to the Godfrey Brook Wells. In addition to the roof replacement at the High Lift Pump Station this assessment recommends that a detailed assessment of the building and support systems be performed to determine if there are any additional improvements needed.

The MWC did not identify any capital budgets for the Dilla Street Wells and Charles River Raw Water Pump Station, where recommended improvements were identified by this assessment.

The potential improvements to the Dilla Street Wells that this assessment identified, could range from an estimated $50,000 for well cleaning and rehabilitation to an estimated $450,000 for replacement of both wells and pumps and associated appurtenances.

Potential improvements identified for the Charles River Raw Water Pump Station are estimated to range from $50,000 to $100,000.

Facilities rated as Good or Fair/Good include the following;

- Clark's Island Wellfield
- Echo Lake Reservoir
- Bear Hill Tank
- Congress Street Tank
- Godfrey Brook Water Treatment Plant
- Dilla Street Water Treatment Plant (exclusive of High Lift Pump Station)

Although all of these facilities were rated Good or Fair/Good, the MWC did include budgets in the Annual Capital Budgets for rehabilitation of the Bear Hill Tank ($750,000 in FY2020) and Congress Street Tank ($500,000 in FY2018). We would expect that once the Godfrey Brook Well study is complete, additional capital budgets would be identified for the replacement of the Godfrey Brook Water Treatment Facility.

Facilities rated as Poor/Fair include the following;

- Clark's Island Wellfield Pump Station
- Congress Street Booster Station

The MWC did not identify any capital budget for any possible improvements to these two facilities that this assessment identified.

Potential improvements that this assessment identified for the Clark's Island Wellfield Pump Station are estimated to range from $100,000 to $150,000. The most critical improvement would be the replacement of the vacuum priming system.

Potential improvements that this assessment identified for the Congress Street Booster Station are estimated to range from $75,000 to $100,000.

A summary of the estimated costs of the potential improvements to the Water Supply, Storage and Treatment Plants identified above, is provided in Table 1 below.

TABLE 1: ESTIMATED COSTS OF POTENTIAL FACILITY IMPROVEMENTS

Facility Description	Estimated Cost of Improvements
Dilla Street Wells Cleaning/Rehabilitation	$50,000
Charles River Raw Water Pump Station Improvements	$50,000 – $100,000
Clark's Island Wellfield Pump Station Improvements	$100,000 – $150,000
Congress Street Booster Station Improvements	$75,000 – $100,000
TOTAL	**$225,000 – $400,000**

Distribution System Evaluation

Woodard & Curran's evaluation of the distribution system was limited to a review of the Master Plan and CIP developed by Tata & Howard relative to pipe age and material type. This information was used to estimate replacement cost new for the distribution system and its components. A hydraulic evaluation of the distribution system including hydraulic modeling, assessment of water storage needs, projected demands and fire flow requirements was beyond the scope of this evaluation.

The CIP indicates the distribution system consists of varying pipe materials including cast iron, cement lined cast iron, asbestos cement (AC), plastic/polyvinyl chloride (PVC), ductile iron and a small percentage of other material types. Approximately 22.4% of the distribution system is noted to have an installation year of 1939 or earlier, the majority being unlined cast iron with a small percentage (2.8%) of the pipe installed during this timeframe noted as cement lined cast iron. The CIP also indicates approximately 28.3% of the distribution system is constructed of AC pipe, with approximately 97% of this AC pipe having an installation year between 1950 and 1979. Approximately 43.2% of the distribution system is constructed of plastic/PVC or ductile iron pipe installed between 1970 and 2010, based on information provided in the CIP. Cast iron, PVC and ductile iron pipe are generally considered to have a 90-year useful life. AC pipe is generally considered to have a 40-year useful life. However, factors such as break history, fire flow requirements and water quality should be the primary consideration in determining replacement needs for the distribution system.

Woodard & Curran recommends the Town follow the recommendations in the CIP relative to prioritization of distribution system improvements. The MWC has budgeted approximately $400,000 to $1.2M annually in the capital budget plan to construct 1,200 to 3,600 linear feet of water main improvements each year. The capital budget also includes between $50,000 and $100,000 annually to replace broken gate valves and hydrants and $900,000 in 2017 to replace lead services in the distribution system. The estimates provided in the MWC's Annual Capital Budget plan appear reasonable for the improvements identified. In general, the planned improvements in the capital budget plan appear to follow the CIP recommendations for basic fire flow improvements.

Replacement Costs:

The CIP prepared by Tata & Howard and the Feasibility Study prepared by Russell Consulting, LLC indicate the distribution system consists of approximately 130 miles of water main. However, the *"Asset Inventory Compilation"* spreadsheet provided by the Town indicates the system consists of approximately 116.5 miles of water main. Data relative to pipe diameter, material type and linear feet of pipe per diameter provided in the *"Asset Inventory Compilation"* spreadsheet appeared most consistent with data included in the Annual Return of the MWC to the Department of Public Utilities of Massachusetts for year ending December 31, 2013. Therefore, data from this spreadsheet was used to develop estimates for the replacement cost, new, of pipes, valves, hydrants and services in the distribution system. This data can be found in Attachment 1.

Based on the data in the *"Asset Inventory Compilation"* spreadsheet, the distribution system consists of approximately 116.5 miles of varying pipe diameter, primarily ranging in size from 2-inch through 24-inch, 1,757 valves, 904 hydrants, 8,871 water service 1-inch or less in diameter, and 184 water services 1-1/4 inch to 2-inch in diameter.

In developing replacement costs, new, for the distribution system, Woodard & Curran assumed the following:

- Distribution system water mains would be replaced with new cement lined, ductile iron pipe.
- Existing water mains 6-inch or less in diameter would be replaced with 6-inch pipe.
- Water services would be replaced with Type K copper tubing.
- Water services 1-inch in diameter or less would be replaced with a 1-inch service.
- Water services 1-1/4 inch in diameter to 2-inches in diameter would be replaced with a 2-inch service.
- All pavement restoration would consist of hot-mix asphalt pavement.
- Pavement restoration would be limited to temporary trench pavement (4-foot width) to restore a driving surface during construction activities and permanent trench pavement (6-foot width) as final pavement restoration.

The estimate for replacement cost, new, of the distribution system can be found in Table 2 below. Backup documentation used to develop this estimate can be found in Attachment 1.

Replacement Cost New

In addition to the estimated cost for potential improvements that were identified in the previous sections, Woodard & Curran estimated the replacement cost, new, of each of the MWC's subject assets in 2017 dollars. The actual historical cost indices included in RS Means for 2010 were utilized to determine the 2017 estimates for all pipes, hydrants, service connections, and water main fittings. Woodard & Curran estimated the replacement cost new of the storage tanks, pump stations, wells, and treatment plants utilizing past bid prices and cost estimates for similar types of facilities.

A summary of the replacement cost for the subject assets is summarized in Table 2 below.

TABLE 2: 2017 WATER SYSTEM REPLACEMENT COST NEW

Asset Description	Replacement Cost New
Distribution System	$132,300,000
Meters	$1,478,887
Clark's Island Wellfield (Angle Wells)	$450,000
Clark's Island Pump Station	$500,000
Dilla Street Wells and Pumps (2)	$450,000
Godfrey Brook Wells and Pumps (5)	$1,125,000
Cedar Swamp Well and Pump (1)	$225,000
Charles River Raw Water Pump Station	$500,000
Echo Lake Reservoir Intake Structure	$150,000
Bear Hill Tank	$5,000,000
Congress Street Tank	$2,100,000
Highland Street Tank	$520,000
Congress Street Booster Station	$500,000
Dilla Street Water Treatment Plant	$20,000,000
Godfrey Brook Water Treatment Plant	$8,000,000
TOTAL	**$173,298,887**

We are confident that the figures included in the tables above are an accurate representation of the replacement cost new for the subject assets based on the information provided to Woodard & Curran and a group of reasonable assumptions.

Should you have any questions or concerns, please do not hesitate to contact me at 978-482-7878.

Sincerely,

WOODARD & CURRAN

James R. Rivard, P.E.
Senior Vice President

ADL/ams

Enclosure(s): Attachment 1: Distribution System Cost Estimate A

PN: 229514

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ATTACHMENT NO. 1: DISTRIBUTION SYSTEM COST ESTIMATE A

Town of Milford, Massachusetts
Replacement Cost New Estimate – Distribution System and Meters
January 2017

Description	Quantity	UM	Material	Labor	Equipment	Tot. Unit Cost	Total Cost	Notes	RSMeans 2010 Page No	Division Title	MasterFormat Level 4	4-Digit Means Code
						Transmission System Pipe Replacement						
Asbestos Cement Pipe and Cast Iron Pipe Removal												
Pipe Removal, Sewer/Water, No Excavation, 21"-24" Diameter	11,030	LF		$ 7.15	$ 2.82	$ 9.97	$ 109,969.10		24	Minor Site Demolition	02 41 13.33	2960
Ductile Iron Pipe Removal												
Selective Demolition, Ductile Iron Pipe, 14"-24" Diameter	4,055	LF		$ 11.90	$ 5.45	$ 17.35	$ 70,354.25		25	Selective Demolition, Water & Sewer Piping And Fittings	02 41 13.38	1200
Selective Demolition, Ductile Iron Pipe, 6"-12" Diameter	937	LF		$ 8.15	$ 3.75	$ 11.90	$ 11,150.30		25	Selective Demolition, Water & Sewer Piping And Fittings	02 41 13.38	1100
Furnish and Install 24" Cement Lined Ductile Iron Pipe	11,919	LF	$ 84.50	$ 21.50	$ 8.50	$ 114.50	$ 1,364,725.50		316	Water Supply, Ductile Iron Pipe	33 11 13.15	3180
Furnish and Install 20" Cement Lined Ductile Iron Pipe	3,078	LF	$ 71.00	$ 18.55	$ 7.40	$ 96.95	$ 298,412.10		316	Water Supply, Ductile Iron Pipe	33 11 13.15	3160
Furnish and Install 16" Cement Lined Ductile Iron Pipe	88	LF	$ 58.00	$ 14.45	$ 5.75	$ 78.20	$ 6,881.60		316	Water Supply, Ductile Iron Pipe	33 11 13.15	3120
Furnish and Install 12" Cement Lined Ductile Iron Pipe	937	LF	$ 33.00	$ 10.30	$ 4.10	$ 47.40	$ 44,413.80		316	Water Supply, Ductile Iron Pipe	33 11 13.15	3080
Hauling Existing Pipe	1187	CY		$ 1.27	$ 1.93	$ 3.20	$ 3,797.81		230	Hauling	31 23 23.20	0018
Pavement Sawcutting	32,044	LF	$ 1.01	$ 1.71	$ 1.39	$ 4.11	$ 131,700.84		75	Concrete Floor/Slab Cutting	03 81 13.50	0420
Furnish and Install Ductile Iron Water Main Fittings	33092	LB				$ 5.00	$ 165,459.19			Based on LF/LB Rate		
Provide 3,000 psi Concrete for Thrust Restraint and Encasement	183	CY	$ 90.00			$ 90.00	$ 16,503.46		66	Conrete, Field Mix	03 31 05.30	0020
Furnish and Install Temporary Trench Pavement	798	TON	$ 65.00	$ 3.52	$ 2.85	$ 71.37	$ 56,920.40		277	Plant-Mix Asphalt Paving	32 12 16.13	0813
Furnish and Install Permanent Trench Pavement	2393	TON	$ 65.00	$ 3.52	$ 2.85	$ 71.37	$ 170,761.19		277	Plant-Mix Asphalt Paving	32 12 16.13	0813
Excavation												
Trench Excavtion	16615.40741	CY		$ 2.48	$ 2.26	$ 4.74	$ 78,757.03		211	Excavating, Trench	31 23 16.13	0100
Hauling Native Earth	4747.259259	CY		$ 1.27	$ 1.93	$ 3.20	$ 15,191.23		230	Hauling	31 23 23.20	0018
Utility Bedding Backfill	8307.703704	CY	$ 25.00	$ 5.75	$ 2.25	$ 33.00	$ 274,154.22		228	Fill By Borrow Utility Bedding	31 23 23.16	0050
Compacting Backfill	16615.40741	CY		$ 2.94	$ 0.38	$ 3.32	$ 55,163.15		228	Fill By Borrow Utility Bedding	31 23 23.16	0500
Hauling New Backfill	3560.444444	CY		$ 1.27	$ 1.93	$ 3.20	$ 11,393.42		230	Hauling	31 23 23.20	0018
						Distribution System Pipe Replacement						
Asbestos Cement Pipe Removal												
Pipe Removal, Sewer/Water, No Excavation, 15"-18" Diameter	4,203	LF		$ 5.75	$ 2.25	$ 8.00	$ 33,624.00		24	Minor Site Demolition	02 41 13.33	2930
Pipe Removal, Sewer/Water, No Excavation, 4"-12" Diameter	199,365	LF		$ 4.91	$ 1.93	$ 6.84	$ 1,363,656.60		24	Minor Site Demolition	02 41 13.33	2900
Cast Iron Pipe Removal												
Pipe Removal, Sewer/Water, No Excavation, 15"-18" Diameter	23,460	LF		$ 5.75	$ 2.25	$ 8.00	$ 187,680.00		24	Minor Site Demolition	02 41 13.33	2930
Pipe Removal, Cast Iron Pipe, 8" to 15" Diameter	64,682	LF		$ 7.95		$ 7.95	$ 514,221.90		26	Selective Demolition, Water & Sewer Piping And Fittings	02 41 13.38	2900
Pipe Removal, Cast Iron Pipe, 5" to 6" Diameter	58,310	LF		$ 5.85		$ 5.85	$ 341,113.50		26	Selective Demolition, Water & Sewer Piping And Fittings	02 41 13.38	2800
Pipe Removal, Cast Iron Pipe, 4" Diameter	30,284	LF		$ 3.75		$ 3.75	$ 113,565.00		26	Selective Demolition, Water & Sewer Piping And Fittings	02 41 13.38	2700
Ductile Iron Pipe Removal												
Selective Demolition, Ductile Iron Pipe, 14"-24" Diameter	4,879	LF		$ 11.90	$ 5.45	$ 17.35	$ 84,650.65		25	Selective Demolition, Water & Sewer Piping And Fittings	02 41 13.38	1200
Selective Demolition, Ductile Iron Pipe, 6"-12" Diameter	158,812	LF		$ 8.15	$ 3.75	$ 11.90	$ 1,889,862.80		25	Selective Demolition, Water & Sewer Piping And Fittings	02 41 13.38	1100
Selective Demolition, Ductile Iron Pipe, 4" Diameter	1,265	LF		$ 7.15	$ 3.28	$ 10.43	$ 13,193.95		25	Selective Demolition, Water & Sewer Piping And Fittings	02 41 13.38	1000
Plastic Pipe Removal												
Pipe Removal Plastic Pipe, 3/4" to 4" Diameter	3,485	LF		$ 1.27		$ 1.27	$ 4,425.95		25	Selective Demolition, Water & Sewer Piping And Fittings	02 41 13.38	1600
Pipe Removal Plastic Pipe, 6"-8" Diameter	23,395	LF		$ 1.77		$ 1.77	$ 41,409.15		25	Selective Demolition, Water & Sewer Piping And Fittings	02 41 13.38	1700
Pipe Removal Plastic Pipe, 10"-18" Diameter	8,807	LF		$ 2.95		$ 2.95	$ 25,980.65		25	Selective Demolition, Water & Sewer Piping And Fittings	02 41 13.38	1800
Copper Pipe Removal												
Pipe Removal, Copper Pipe, 3/4"-2"Diameter	11,133	LF		$ 1.50		$ 1.50	$ 16,699.50		26	Selective Demolition, Water & Sewer Piping And Fittings	02 41 13.38	2300
Steel Pipe Removal												
Pipe Removal, Steel Pipe 3/4"-4" Diameter	7,801	LF		$ 5.35	$ 2.11	$ 7.46	$ 58,195.46		24	Minor Site Demolition	02 41 13.33	3200
Pipe Removal, Steel Pipe 10"-12" Diameter	33	LF		$ 10.75	$ 4.22	$ 14.97	$ 494.01		24	Minor Site Demolition	02 41 13.33	3300
Water Main Replacement												
Furnish and Install 16" Cement Lined Ductile Iron Pipe	13,290	LF	$ 58.00	$ 14.45	$ 5.75	$ 78.20	$ 1,039,278.00		316	Water Supply, Ductile Iron Pipe	33 11 13.15	3120
Furnish and Install 14" Cement Lined Ductile Iron Pipe	19,252	LF	$ 36.00	$ 12.40	$ 4.92	$ 53.32	$ 1,026,516.64		316	Water Supply, Ductile Iron Pipe	33 11 13.15	3100
Furnish and Install 12" Cement Lined Ductile Iron Pipe	94,424	LF	$ 33.00	$ 10.30	$ 4.10	$ 47.40	$ 4,475,697.60		316	Water Supply, Ductile Iron Pipe	33 11 13.15	3080
Furnish and Install 10" Cement Lined Ductile Iron Pipe`	35,580	LF	$ 31.00	$ 9.10	$ 3.61	$ 43.71	$ 1,555,201.80		316	Water Supply, Ductile Iron Pipe	33 11 13.15	3060
Furnish and Install 8"Cement Lined Ductile Iron Pipe	280,235	LF	$ 22.00	$ 8.25	$ 3.28	$ 33.53	$ 9,396,279.55		316	Water Supply, Ductile Iron Pipe	33 11 13.15	3040
Furnish and Install 6"Cement Lined Ductile Iron Pipe	157,133	LF	$ 15.85	$ 4.95	$ 1.97	$ 22.77	$ 3,577,918.41		316	Water Supply, Ductile Iron Pipe	33 11 13.15	3020
Furnish and Install Ductile Iron Water Main Fittings	1239062	LB				$ 5.00	$ 6,195,311.88			Based on LF/LB Rate		
Hauling Existing Pipe	22219	CY		$ 1.27	$ 1.93	$ 3.20	$ 71,100.92		230	Hauling	31 23 23.20	0018
Pavement Sawcutting	1,562,028	LF	$ 1.01	$ 1.71	$ 1.39	$ 4.11	$ 6,419,935.08		75	Concrete Floor/Slab Cutting	03 81 13.50	0420
Provide 3,000 psi Concrete for Thrust Restraint and Encasement	6866	CY	$ 90.00			$ 90.00	$ 617,941.42		66	Conrete, Field Mix	03 31 05.30	0020
Furnish and Install 1-inch Corporation Stop	8871	EA	$ 50.50	$ 26.00		$ 76.50	$ 678,631.50		321	Water Supply, Copper Pipe	33 11 13.45	7040
Furnish and Install 2-inch Corporation Stop	184	EA	$ 185.00	$ 38.00		$ 223.00	$ 41,032.00		321	Water Supply, Copper Pipe	33 11 13.45	7080
Furnish and Install 1-inch Curb Stop	8871	EA	$ 77.00	$ 26.00		$ 103.00	$ 913,713.00		321	Water Supply, Copper Pipe	33 11 13.45	7120
Furnish and Install 2-inch Curb Stop	184	EA	$ 360.00	$ 38.00		$ 398.00	$ 73,232.00		321	Water Supply, Copper Pipe	33 11 13.45	7160
Furnish and Install 1-inch Curb Box	8871	EA	$ 133.00	$ 34.50		$ 167.50	$ 1,485,892.50		321	Water Supply, Copper Pipe	33 11 13.45	7180
Furnish and Install 2-inch Curb Box	184	EA	$ 218.00	$ 52.00		$ 270.00	$ 49,680.00		321	Water Supply, Copper Pipe	33 11 13.45	7200
Furnish and Install 1-inch Type K Copper Tubing	177420	LF	$ 7.15	$ 2.34		$ 9.49	$ 1,683,715.80		320	Water Supply, Copper Pipe	33 11 13.45	2200
Furnish and Install 2-inch Type K Copper Tubing	3680	LF	$ 17.90	$ 3.26		$ 21.16	$ 77,868.80		320	Water Supply, Copper Pipe	33 11 13.45	3020
Disinfection, Pressure and Bacteria Testing of Water Mains	1	LS					$ 500,000.00			Based on LF Rate		

Town of Milford, Massachusetts

Replacement Cost New Estimate - Distribution System and Meters

January 2017

Description	Quantity	UM	Material	Labor	Equipment	Tot. Unit Cost	Total Cost	Notes	RSMeans 2010 Page No.	Division Title	MasterFormat Level 4	4-Digit Means Code
Excavation												
Trench Excavtion												
Hauling Native Earth	694234.6667	CY		$ 2.48	$ 2.26	$ 4.74	$ 3,290,672.32		211	Excavating, Trench	31 23 16.13	0100
Utility Bedding Backfill	231411.5556	CY		$ 1.27	$ 1.93	$ 3.20	$ 740,516.98		230	Hauling	31 23 23.20	0018
Compacting Backfill	289264.4444	CY	$ 25.00	$ 5.75	$ 2.25	$ 33.00	$ 9,545,726.67		228	Fill By Borrow Utility Bedding	31 23 23.16	0050
Hauling New Backfill	694234.6667	CY		$ 2.94	$ 0.38	$ 3.32	$ 2,304,859.09		228	Fill By Borrow Utility Bedding	31 23 23.16	0500
Earthwork	173558.6667	CY		$ 1.27	$ 1.93	$ 3.20	$ 556,387.73		230	Hauling	31 23 23.20	0018
Boulders (drilled/blasted)												
Excavate and load boulders (.5-1.0 CY)	2644	CY	$ 2.81	$ 8.75	$ 14.80	$ 26.36	$ 69,685.23		218	Drilling And Blasting Rock	31 23 16.30	2900
Haul Boulders, 25 Ton off-highway dump	2644	CY		$ 4.76	$ 9.95	$ 14.71	$ 38,887.32		218	Drilling And Blasting Rock	31 23 16.30	5020
Remove and Dispose of Unsuitables Below Normal Grade	2644	CY		$ 0.96	$ 5.10	$ 6.06	$ 16,020.20		218	Drilling And Blasting Rock	31 23 16.30	5420
Remove and Dispose of Unsuitables Above Normal Grade	40000	CY		$ 2.82	$ 2.57	$ 5.39	$ 215,600.00		215	Excavating, Trench	31 23 16.13	7090
Hauling Unsuitable Material	88876	CY				$ 22.75	$ 2,021,932.37			Based on LF Rate		
Furnish and Install Temporary Trench Pavement	40000	CY		$ 1.27	$ 1.93	$ 3.20	$ 128,000.00		230	Hauling	31 23 23.20	0018
Furnish and Install Permanent Trench Pavement	30660	TON	$ 65.00	$ 3.52	$ 2.85	$ 71.37	$ 2,188,198.87		277	Plant-Mix Asphalt Paving	32 12 16.13	0813
	91980	TON	$ 65.00	$ 3.52	$ 2.85	$ 71.37	$ 6,564,586.61		277	Plant-Mix Asphalt Paving	32 12 16.13	0813
						Gate Valve Replacement						
Furnish and Install 24-Inch Gate Valve and Box	3	EA	$ 17,800.00	$ 215.00	$ 84.50	$ 18,099.50	$ 54,298.50		323	Water Utility Distribution Valves	33 12 16.10	3830
Furnish and Install 20-Inch Gate Valve and Box	3	EA	$ 11,800.00	$ 215.00	$ 84.50	$ 12,099.50	$ 36,298.50		323	Water Utility Distribution Valves	33 12 16.10	3828
Furnish and Install 16-Inch Gate Valve and Box	27	EA	$ 5,475.00	$ 215.00	$ 84.50	$ 5,774.50	$ 155,911.50		322	Water Utility Distribution Valves	33 12 16.10	3824
Furnish and Install 14-Inch Gate Valve and Box	26	EA	$ 3,650.00	$ 179.00	$ 70.50	$ 3,899.50	$ 101,387.00	Interpolation	322	Water Utility Distribution Valves	33 12 16.10	n/a
Furnish and Install 12-Inch Gate Valve and Box	131	EA	$ 1,825.00	$ 143.00	$ 56.50	$ 2,024.50	$ 265,209.50		322	Water Utility Distribution Valves	33 12 16.10	3820
Furnish and Install 10-Inch Gate Valve and Box	55	EA	$ 1,425.00	$ 143.00	$ 56.50	$ 1,624.50	$ 89,347.50	Interpolation	322	Water Utility Distribution Valves	33 12 16.10	n/a
Furnish and Install 8-Inch Gate Valve and Box	707	EA	$ 1,025.00	$ 143.00	$ 56.50	$ 1,224.50	$ 865,721.50		322	Water Utility Distribution Valves	33 12 16.10	3816
Furnish and Install 6-Inch Gate Valve and Box	805	EA	$ 800.00	$ 143.00	$ 56.50	$ 999.50	$ 804,597.50		322	Water Utility Distribution Valves	33 12 16.10	3814
						Hydrant Replacement						
Furnish and Install Hydrants (Public)	791	EA	$ 1,575.00	$ 152.00	$ 19.70	$ 1,746.70	$ 1,381,639.70		323	Water Utility Distribution Fire Hydrants	32 12 19.10	2160
Hydrant Removal (Public)	791	EA		$ 330.00	$ 131.00	$ 461.00	$ 364,651.00		24	Minor Site Demolition	02 41 13.33	0900
Furnish and Install Hydrants (Private, Billed)	84	EA	$ 1,575.00	$ 152.00	$ 19.70	$ 1,746.70	$ 146,722.80		323	Water Utility Distribution Fire Hydrants	32 12 19.10	2160
Hydrant Removal (Private, Billed)	84	EA		$ 330.00	$ 131.00	$ 461.00	$ 38,724.00		24	Minor Site Demolition	02 41 13.33	0900
Furnish and Install Hydrants (Private, Unbilled)	29	EA	$ 1,575.00	$ 152.00	$ 19.70	$ 1,746.70	$ 50,654.30		323	Water Utility Distribution Fire Hydrants	32 12 19.10	2160
Hydrant Removal (Private, Unbilled)	29	EA		$ 330.00	$ 131.00	$ 461.00	$ 13,369.00		24	Minor Site Demolition	02 41 13.33	0900
						Meter Replacement						
Furnish and Install 12" Turbine/flanged Meter	2	EA	$ 6,775.00	$ 685.00		$ 7,460.00	$ 14,920.00		169	Water Supply Meters	22 11 19.38	2680
Furnish and Install 8" Compund Meter	4	EA	$ 10,500.00	$ 935.00		$ 11,435.00	$ 45,740.00		169	Water Supply Meters	22 11 19.38	2700
Furnish and Install 6" Compund Meter	7	EA	$ 6,675.00	$ 750.00		$ 7,425.00	$ 51,975.00		169	Water Supply Meters	22 11 19.38	2680
Furnish and Install 4" Compund Meter	13	EA	$ 4,200.00	$ 500.00		$ 4,700.00	$ 61,100.00		169	Water Supply Meters	22 11 19.38	2660
Furnish and Install 3" Compund Meter	19	EA	$ 2,625.00	$ 250.00		$ 2,875.00	$ 54,625.00		169	Water Supply Meters	22 11 19.38	2640
Furnish and Install 2" Threaded/flanged Meter	45	EA	$ 385.00	$ 69.50		$ 454.50	$ 20,452.50		169	Water Supply Meters	22 11 19.38	2360
Furnish and Install 1 1/2" Threaded/flanged Meter	139	EA	$ 284.00	$ 52.00		$ 336.00	$ 46,704.00		169	Water Supply Meters	22 11 19.38	2340
Furnish and Install 1" Domestic/threaded Meter	125	EA	$ 116.00	$ 34.50		$ 150.50	$ 18,812.50		169	Water Supply Meters	22 11 19.38	2100
Furnish and Install 3/4" Domestic/threaded Meter	94	EA	$ 76.50	$ 29.50		$ 106.00	$ 9,964.00		169	Water Supply Meters	22 11 19.38	2080
Furnish and Install 5/8" Domestic/threaded Meter	8652	EA	$ 42.00	$ 26.00		$ 68.00	$ 588,336.00		169	Water Supply Meters	22 11 19.38	2060

Distribution System

Total	$ 79,502,044.30
Total w/ OH&P 20%	$ 95,402,453.16
w/ 10% Contingency	$ 104,942,698.48
110.2 Location Index (RS Means)	$ 115,646,853.72
114.4 Year Index (RS Means)	$ 132,300,000.66

Meters

Total (Meter Replacement)	$ 912,629.00
Total w/ OH&P 20%	$ 1,095,154.80
w/ 10% Contingency	$ 1,204,670.28
110.2 Location Index (RS Means)	$ 1,327,546.65
114.4 Year Index (RS Means)	$ 1,478,886.97

Nominal Diameter, Inches	Kind of Pipe	LENGTH IN FEET				
		In Use at Beginning of Year	Taken Up Since	Abandoned But Not Taken Up	Laid Since	In Use at Close of Year
TRANSMISSION SYSTEM:						
24	Ductile Iron (Louisa Lake)	3,211				3,211
24	Ductile Iron (Echo Lake - Wildcat)	271				271
24	Ductile Iron (Chlorine Chamber)	485				485
16	Ductile Iron (Chlorine Chamber)	88				88
12	Ductile Iron (Clarks Island)	917				917
12	Ductile Iron (Chlorine Chamber)	20				20
24	Asbestos Cement (Echo Lake - Wildcat)	7,952				7,952
20	Asbestos Cement (Wildcat - Dilla Street)	2,438				2,438
20	Cast Iron (Wildcat - Dilla Street)	640				640
DISTRIBUTION SYSTEM						
16	Cast Iron	4,216				4,216
14	Cast Iron	19,244				19,244
12	Cast Iron	11,932				11,932
10	Cast Iron	13,242				13,242
8	Cast Iron	39,508				39,508
6	Cast Iron	58,310				58,310
4	Cast Iron	29,202				29,202
2	Cast Iron	1,082				1,082
16	Ductile Iron	4,871				4,871
14	Ductile Iron	8				8
12	Ductile Iron	54,068				54,068
10	Ductile Iron	4,276		3	3	4,276
8	Ductile Iron	93,471			500	93,971
6	Ductile Iron	5,350			100	5,450
4	Ductile Iron	1,265				1,265
8	Ductile Iron	1,047				1,047
16	Class 350 Asbestos Cement	4,203				4,203
12	Asbestos Cement	24,054				24,054
10	Asbestos Cement	13,592				13,592
8	Asbestos Cement	122,548				122,548
6	Asbestos Cement	39,171				39,171
12	Permastran	680				680
8	C-909	2,445				2,445
12	C-900	3,657				3,657
10	C-900	4,470				4,470
8	C-900	20,716				20,716
6	C-900	234				234
4	Steel	20				20
12	Steel	33				33
2	Steel	5,525				5,525
1 1/2	Steel	793				793
1 1/4	Steel	538				538
1	Steel	734				734
3/4	Steel	191				191
2	Plastic (PE)	2152			412	2564
1 1/2	Plastic (PE)	782				782
1	Plastic (PE)	139				139
2	Copper	403				403
1 1/2	Copper	495				495
1 1/4	Copper	0				0
1	Copper	9,079		43	706.5	9,743
3/4	Copper	492		5	5	492
	TOTALS	614,859	0	51	1,727	615,935

Nominal Diameter Inches	Kind of Valve	Number in Use at Beginning of Year	Removed Since	Installed Since	Number in Use at Close of Year
24"	Butterfly valve	3			3
20"	Double Disc	3			3
16"	Butterfly Valve	20			20
16"	Double Disc	7			7
14"	Butterfly Valve	1			1
14"	Double Disc	25			25
12"	Butterfly Valve	9			9
12"	Double	122			122
10"	Double	55			55
8"	Double	706		1	707
8"	Check Valve	0			0
6"	Double	710			710
6"	Check Valve	0			0
4"	Double	95			95
4"	Check Valve	0			0
2"	Double Disc	51			51
2"	Curb Stop	6			6
1.5"	Double Disc	5			5
1.25"	Curb Stop	4			4
1"	Gate Valve	1			1
0.75"	Curb Stop	3			3
	TOTALS	**1826**		**1**	**1827**

Public Hydrants

Nominal Diameter Inches	Hose Outlets	Number in Use at Beginning of Year	Removed Since	Installed Since	Number in Use at Close of Year
6"	2, 2.5"	14			14
6"	2, 2.5", 1, 4.5"	769	3	5	771
6"	2, 2.5" 2, 4.5"	1			1
6"	3, 2.5"	1			1
6"	3, 2.5" 1, 4.5"	2			2
6"	4, 2.5" 2, 4.5"	2			2
TOTALS		789	3	5	791

Private Hydrants

Nominal Diameter Inches	Hose Outlets	Number in Use at Beginning of Year	Removed Since	Installed Since	Number in Use at Close of Year
6" Billed	2, 2.5" 1, 4.5"	83		1	84
6" Unbilled	2, 2.5" 1, 4.5"	31	2		29
TOTALS		114	2	1	113

Nominal Diameter Inches	Kind of Pipe	Number Installed and in Use at Beginning of Year	Taken Up Since	Laid Since	Installed and in Use at Close of Year
	Lead	157	3		154
	Steel/Cement	343	4		339
	Copper	5649	5	34	5678
	Plastic	2526	5		2521
	Cast Iron/Ductile	104			104
	Asbestos-Cement	8			8
	TOTALS	8787	17	34	8804

Maker	Type	Size												
		12"	5/8"	3/4"	1"	1 1/2"	2"	3"	4"	6"	8"	1 1/4"	2 1/2"	TOTALS
Badger	Disc		112	8	9	8		2					1	140
	Disc w/ Remote		1880	42	51	45	4	2						2024
	Turbine						4							4
	Compound		2	1										3
Hersey	Disc		99	2	6	7	5	1				1		121
	Disc w/ Remote		19			1								20
	Her/Bad Disc w/Remote		51		2									53
	Compound		11				10	3	5	4				33
	Turbine													0
Kent	Disc w/ Remote		42											42
Neptune	Disc		4											4
	Disc w/ Remote		2											2
	Compound													0
Primary	Venturi													0
Rockwell	Disc		18										2	20
	Disc w/ Remote		68	3	3	9								83
	Propeller													0
	Turbine													0
	Compound		5											5
Worthingt	Disc		6									1		7
	Disc w/ Wor-Bad Rom		6											6
	Compound		1											1
Gamon	Disc			1										1
	TOTALS	0	2326	57	71	70	23	8	5	4	0	2	3	2569

Historical Cost Indexes

The table below lists both the RSMeans® historical cost index based on Jan. 1, 1993 = 100 as well as the computed value of an index based on Jan. 1, 2017 costs. Since the Jan. 1, 2017 figure is estimated, space is left to write in the actual index figures as they become available through the quarterly *RSMeans Construction Cost Indexes*.

To compute the actual index based on Jan. 1, 2017 = 100, divide the historical cost index for a particular year by the actual Jan. 1, 2017 construction cost index. Space has been left to advance the index figures as the year progresses.

Year	Historical Cost Index Jan. 1, 1993 = 100		Current Index Based on Jan. 1, 2017 = 100		Year	Historical Cost Index Jan. 1, 1993 = 100	Current Index Based on Jan. 1, 2017 = 100		Year	Historical Cost Index Jan. 1, 1993 = 100	Current Index Based on Jan. 1, 2017 = 100	
	Est.	Actual	Est.	Actual		Actual	Est.	Actual		Actual	Est.	Actual
Oct 2017*					July 2002	128.7	61.7		July 1984	82.0	39.3	
July 2017*					2001	125.1	60.0		1983	80.2	38.4	
April 2017*					2000	120.9	58.0		1982	76.1	36.5	
Jan 2017*	208.5		100.0	100.0	1999	117.6	56.4		1981	70.0	33.6	
July 2016		207.3	99.4		1998	115.1	55.2		1980	62.9	30.2	
2015		206.2	98.9		1997	112.8	54.1		1979	57.8	27.7	
2014		204.9	98.3		1996	110.2	52.9		1978	53.5	25.7	
2013		201.2	96.5		1995	107.6	51.6		1977	49.5	23.7	
2012		194.6	93.3		1994	104.4	50.1		1976	46.9	22.5	
2011		191.2	91.7		1993	101.7	48.8		1975	44.8	21.5	
2010		183.5	88.0		1992	99.4	47.7		1974	41.4	19.9	
2009		180.1	86.4		1991	96.8	46.4		1973	37.7	18.1	
2008		180.4	86.5		1990	94.3	45.2		1972	34.8	16.7	
2007		169.4	81.2		1989	92.1	44.2		1971	32.1	15.4	
2006		162.0	77.7		1988	89.9	43.1		1970	28.7	13.8	
2005		151.6	72.7		1987	87.7	42.1		1969	26.9	12.9	
2004		143.7	68.9		1986	84.2	40.4		1968	24.9	11.9	
2003		132.0	63.3		1985	82.6	39.6		1967	23.5	11.3	

Adjustments to Costs

The "Historical Cost Index" can be used to convert national average building costs at a particular time to the approximate building costs for some other time.

Time Adjustment Using the Historical Cost Indexes:

$$\frac{\text{Index for Year A}}{\text{Index for Year B}} \times \text{Cost in Year B} = \text{Cost in Year A}$$

Example:

Estimate and compare construction costs for different years in the same city.

To estimate the national average construction cost of a building in 1970, knowing that it cost $900,000 in 2017:

INDEX in 1970 = 28.7

INDEX in 2017 = 208.5

$$\frac{\text{INDEX 1970}}{\text{INDEX 2017}} \times \text{Cost 2017} = \text{Cost 1970}$$

$$\frac{28.7}{208.5} \times \$900{,}000 = .138 \times \$900{,}000 = \$124{,}200$$

The construction cost of the building in 1970 was $124,200.

Note: The city cost indexes for Canada can be used to convert U.S. national averages to local costs in Canadian dollars.

Example:

To estimate and compare the cost of a building in Toronto, ON in 2017 with the known cost of $600,000 (US$) in New York, NY in 2017:

INDEX Toronto = 110.6

INDEX New York = 134.6

$$\frac{\text{INDEX Toronto}}{\text{INDEX New York}} \times \text{Cost New York} = \text{Cost Toronto}$$

$$\frac{110.6}{134.6} \times \$600{,}000 = .822 \times \$600{,}000 = \$493{,}200$$

The construction cost of the building in Toronto is $493,200 (CN$).

*Historical Cost Index updates and other resources are provided on the following website:
http://info.thegordiangroup.com/RSMeans.html