TATA & HOWARD

January 22, 2018

Mr. David L. Condrey, Manager
Milford Water Company
66 Dilla Street
Milford, MA 01757-1177

Subject: Birch Street Place Water Service Review
Milford, Massachusetts

Dear Mr. Condrey:

As requested, Tata & Howard, Inc. has performed a review of the water infrastructure and service in the Comprehensive Permit Site Approval Application and supplemental material submitted by 88 Corp., for the Birch Street Place properties. The project includes one site of approximately 21 acres with residential housing. Based on the Site Plans prepared by Allen Engineering, LLC dated December 6, 2017 the site, located on Birch Street between Stallbrook Road and Industrial Road, includes four, three story residential buildings with a total of 162 dwelling units. The units are comprised of 64 one-bedrooms, 78 two-bedrooms, and 20 three-bedrooms. The site also includes a single story clubhouse/pool building, a single story maintenance/bike storage building, and four detached 8-bay parking garages. As part of this review we have reviewed the Site Plans prepared by Allen Engineering, LLC dated December 6, 2017.

In addition, the review includes an evaluation of the proposed water service in relation to the existing water distribution system. This evaluation utilizes the Milford Water Company's (MWC) hydraulic model to evaluate potential impacts to the distribution system and review the potential impacts the estimated domestic water usage would have on the existing and projected water distribution system demands and on the capacity requirements set forth in MWC's most recent Water Management Act Permit.

Determination of Flow

No water usage estimate was provided as part of the Comprehensive Permit Site Approval Application prepared by 88 Corp. To evaluate the development's impact on existing and projected system demands, we have considered two methods to estimate the average day demand (ADD) water usage for a development of this size. The first method utilizes Massachusetts Title 5, which uses a flow of 110 gallons per day per bedroom. For the 280 bedroom Birch Street Place, this method results in a total daily flow of 30,800 gallons per day (gpd). The second method considers water conservation standards for residential water usage approved and adopted by the Massachusetts Water Resource Commission (MWRC) for all water supplies with a Water Management Act permit or

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registration. The MWRC uses performance standards which includes a maximum residential consumption of 65 gallons per capita per day (gpcd). However, because of the strict regulations the MWC places on water use during summer months, residential consumption in MWC is less than the performance standards. According to MWC's 2012 through 2016 Annual Statistical Reports (ASR), the residential consumption for MWC ranged from 45 gpcd to 49 rgpcd, with the average being 47 gpcd. Based on the data collected during the 2010 US Census, the average household size for renter occupied units in Milford is 2.33 people per unit. Using the 47 gpcd and 2.33 persons per dwelling, the anticipated daily water usage in the development is approximately 17,700 gpd. Because the average residential consumption in Milford is less than the performance standards, we believe that the second method is a more appropriate method when estimating water usage at Birch Street Place. The estimated demand of 17,700 gpd does not include water usage associated with irrigation. The Milford Water Company does not allow the use of automatic irrigation sprinklers, however, if the proponent plans to use water for any irrigation purposes, the proponent should provide the information on anticipated irrigation useage to further evaluate the estimated demands in comparison to the available supply.

Site Plans

Based on the preliminary water main configuration presented by the proponent in the Site Plans, we offer the following comments and recommendations.

1. The plans show that the proposed 8-inch ductile iron (DI) water main to service the Birch Street Place apartments will connect into an existing 12-inch DI water main on Birch Street, but does not indicate the type of connection. We recommend using a 12-inch by 8-inch tee and installing a gate valve on the proposed water main and on the main line on Birch Street southwest of the connection.

2. In general, fire hydrants should be placed at an interval of approximately 500 feet and isolation valves at an interval of 1,000 feet, in accordance with standard waterworks practice. Currently, the plans show an interval greater than 500 feet between hydrants. We recommend moving the hydrant at the southeast corner of Building #4 to within 500 feet of the first hydrant from the entrance. Final hydrant locations should be approved by the Milford Fire Department. The plans do not show any proposed water gates. We recommend installing valves at intervals of 1,000 feet to allow for isolated shut downs if necessary in the future. In addition, the domestic and fire services for each building should be separated to allow for isolation, if necessary.

Hydraulic Evaluation

Tata & Howard conducted hydraulic simulations using the model of the existing Milford water distribution system. The model was updated to include approximately 1,400 linear feet of 8-inch diameter water main that will tie into existing water main on Birch Street.

According to the Grading, Drainage and Utility Plan, the maximum ground elevation is approximately 310 feet above mean seal level (MSL) at the street level.

The estimated ADD for the project is approximately 17,700 gpd based on MWC average residential demand. Typically, the highest observed maximum daily demand (MDD) to ADD ratio is used to predict future MDD. According to the Town's Annual Statistical Reports from 2012 to 2016, the highest MDD/ADD ratio in the past five years occurred in 2012 before the impact of the water conservation measures were fully in place. The next highest MDD/ADD ratio was observed in 2016. Because this was an extreme drought year, the MDD/ADD ratio may be high. The ADD was fairly consistent from 2013 to 2015, therefore, the 2013 MDD/ADD ratio of 1.64 was used to estimate the MDD. Using this factor, the estimated MDD is 29,000 gpd for the development.

The model simulations were completed using the existing MDD for the MWC system. The Bear Hill Tank was set at a hydraulic gradeline elevation of 515 feet, the Congress Street Tank was set at a hydraulic gradeline elevation of 518 feet, and the Water Treatment Facility was operating. The results of the simulations show that the static pressure at street level within the development is approximately 90 pounds per square inch (psi) under both ADD and MDD conditions. The Massachusetts Department of Environmental Protection (MassDEP) published Guidelines for Public Water Systems recommend a minimum pressure of 35 psi at ground level under average day, maximum day, and peak hour demand condition. For mains or individual service lines where static pressure is above 100 psi, it is recommended that pressure reducing devices be utilized. The proposed domestic demands do not appear to have an impact on static pressures within the area.

It is recommended that a distribution system provide a minimum pressure of 20 psi at ground level throughout the system under MDD during a fire event. Information obtained from the hydraulic model indicates that an estimated available fire flow of approximately 2,000 gpm will be available at the development while maintaining 20 psi throughout the distribution system under MDD conditions.

Information on flows and pressures required for the proposed fire protection system and subsequent hose stream demands were not provided at the time of this evaluation. The 2014 ISO Guidelines for Determination of Needed Fire Flow states that where evidence is available from local fire or building officials to document the installation, approval, testing, and maintenance of the sprinkler system as defined in Chapter 6 of the NFPA Standard, the needed fire flow shall be the greater of the demand at the base of the sprinkler system riser or 1,000 gpm at 20 psi. The recommended fire flow for these buildings would need to be determined during the design of the fire protection system.

Water Management Act Permit

The current Milford system is comprised of three active groundwater supply sources and two active surface water supplies to meet system demands. Table No. 1 below provides the MassDEP approved maximum daily withdrawal rates for each supply based on the 2010 Draft Water Management Act Permit, the existing maximum daily pumping rate, and the annual available withdrawal rate for each of the supply sources. The existing maximum daily withdrawal rate column reflects the maximum volume of water that can be pumped from each source based on current pumps, piping configuration, and well production capacities. Some sources have decreased capacities and are unable to be pumped at their approved withdrawal rate. The Godfrey Brook Wells are currently not being used. A Preliminary Investigation of the Godfrey Brook Wellfield was completed for MWC by GZA GeoEnvironmental, Inc. in November 2017. The purpose of the investigation was to complete a hydrogeologic investigation of the causes of loss of pumping capacity at the Godfrey Brook Wellfield and to develop recommendations for addressing supply capacity at the wellfield.

Water from the surface water supplies, Clarks Island Wellfield, and the Dilla Street Wells must be treated at the Dilla Street Water Treatment Plant (WTP). The maximum allowable withdrawal rate from the surface water supplies is restricted by the Dilla Street WTP which can reportedly produce up to 6.0 mgd. Based on the Dilla Street Water Treatment Plant, the total approved maximum withdrawal volume is 6.79 mgd.

While the approved maximum withdrawal volume of the surface water supplies is 6.0 mgd, the firm yield for the Charles River and Echo Lake is a combined volume of 1.57 mgd. These two sources combined cannot exceed 1.57 mgd as an annual daily average. This annual average and the potential for drought conditions restrict the amount of water the MWC can withdraw from the surface water supplies. Louisa Lake can be used as an emergency supply. According to the MWC's Draft Water Management Act (WMA) Permit, if the MWC decides to pursue Louisa Lake as an active surface water supply, a firm yield study must be completed within two years of the issuance of the WMA Permit.

Based on the available withdrawal rates and the status of the Godfrey Brook Wells, the existing maximum daily withdrawal volume from the sources is approximately 6.0 mgd, and the total annual available withdrawal rate is 2.39 mgd.

Table No. 1
Approved and Available Withdrawal Volumes

Source Name	Approved Maximum Daily Withdrawal Rate (mgd)	Existing Available Maximum Daily Withdrawal Rate (mgd)	Annual Available Withdrawal Rate (mgd)
Charles River*	6.0	6.0	1.57**
Echo Lake*			
Louisa Lake (emergency)*			
Clarks Island Wellfield*	0.80	0.72	0.72
Godfrey Brook Well 1	0.79	0.0***	0.0
Godfrey Brook Well 1A			
Godfrey Brook Well 2			
Godfrey Brook Well 2A			
Godfrey Brook Well 4			
Dilla Street Well No. 1*	0.675	0.1	0.1
Dilla Street Well No. 2*			
Total	**6.79**	**6.00**	**2.39**

*Treated at Dilla Street Water Treatment Plant. Maximum reported capacity of plant is approximately 6.0 mgd.
**The firm yield for the Charles River and Echo Lake is a combined annual volume of 1.57 mgd.
***The Godfrey Brook Wells are currently offline due to capacity and water quality issues. MWC had conducted a hydrogeologic investigation to develop a plan to regain capacity and develop plans to potentially treat this source.

In addition to Birch Street Place, there are two other residential developments being proposed for the Town of Milford: Robsham Village and the Residences at Stone Ridge. Applications for Robsham Village, Birch Street Place, and Residences at Stone Ridge were submitted November 1, 2017, December 11, 2017, and December 18, 2017, respectively. Reviews of the water infrastructure and estimated water usage for these developments have been completed by Tata & Howard, Inc. All three developments were evaluated for their impact on existing and projected system demands. The average ADD demand for the past five years was used as the estimated existing system ADD. The average MDD for the past five years was used as the estimated existing system MDD.

The Massachusetts Department of Conservation and Recreation (DCR) completed water demand projections through the year 2028 for the MWC in November 2008 as part of the WMA Permitting process. The DCR projections were completed using the MWRC residential water usage performance standard of 65 gpcd. These projections were also

developed before the 2010 US Census and before MWC water conservation measures went into effect. The demand projections were updated in the Demand Projections Update and Available Supply Calculations prepared by Tata & Howard, Inc., dated June, 2017 to account for Population and Housing Demand Projections for Metro Boston published in January 2014 by the Metropolitan Area Planning Council and MWC's residential per capita water usage.

Table No. 2 represents historic and projected ADD and MDD values of the system without the three proposed facilities. Table No. 3 represents projected ADD and MDD values for the entire system including the three proposed facilities. The projected demands presented in Table No. 3 use both current trends and DCR estimates. The MDD was estimated using the MDD/ADD ratio of 1.64.

Table No. 2
Historic and Projected Water Use Without Facilities

Year	ADD (mgd)	MDD (mgd)
2012	2.58	5.08
2013	2.47	4.06
2014	2.56	3.52
2015	2.55	3.56
2016	2.16	3.68
Average 2012 through 2016	2.46	3.98
2027 (current trends)	2.85	4.67
2027 (DCR projections)	3.26	5.35
2037 (current trends)	3.18	5.22
2037 (DCR projections)	3.56	5.84

Table No. 3
Projected Water Use With Facilities

Development	ADD (mgd)	MDD (mgd)
Existing Water Demands	2.46	3.98
Robsham Village	0.033	0.054
Birch Street Place	0.018	0.029
Residences at Stone Ridge	0.030	0.049
Year	**ADD with Proposed Facilities (mgd)**	**MDD with Proposed Facilities (mgd)**
Existing	2.54	4.11
2027 (current trends)	2.93	4.80
2027 (DCR projections)	3.34	5.48
2037 (current trends)	3.26	5.35
2037 (DCR projections)	3.64	5.97

The approved maximum daily withdrawal rate of all sources of 6.79 mgd is sufficient for the system's projected 2037 MDD based on current trends and DCR projections. However, based on the estimated current ADD with the proposed facilities included, the current annual available withdrawal rate of the system's supplies of 2.39 mgd is not sufficient to meet demands with the development of the Birch Street Place, Robsham Village, and Residences at Stone Ridge. This is assuming the Godfrey Brook Wells are offline. However, based on the results of the Preliminary Investigation of Godfrey Brook Wellfield, it is believed that with improvements and new infrastructure, the well site is capable of producing the approved maximum daily withdrawal rate of 0.79 mgd. Once the improvements are completed and the Godfrey Brook Wellfield capacity is available, the total annual available withdrawal rate would be 3.18 mgd. This would be sufficient for the estimated 2027 ADD with the proposed developments of 2.93 mgd based on current trends, but not sufficient for the estimated 2027 ADD of 3.34 based on DCR projections or either of the projected 2037 ADDs with the proposed developments.

While the Preliminary Investigation of Godfrey Brook Wellfield does state that the well site can produce the approved maximum withdrawal rate for the Godfrey Brook Wellfield, there are significant improvements that need to be made for both short term and long term to regain the capacity. These improvements can be time consuming and costly to implement.

There are currently five individual wells at the wellfield (Well Nos. 1, 1A, 2, 2A, and 4). The short-term recommendations focus on Well Nos. 1, 1A, 2, and 2A, as it has been determined that Well No. 4 will need treatment. Pilot testing is currently being completed to review treatment options at the site, however, water treatment would be a long-term improvement as MWC is only in the preliminary investigation of water treatment options at the site.

The following recommendations were presented to address Well Nos. 1, 1A, 2 and 2A:

- Make repairs to the wellhead and replace the pump discharge piping and pitless adaptor for Well No. 1A. Also, inspect the pump, motor starter and wiring and redevelop the well.
- Make repairs to the wellhead, pump discharge piping, and pitless adaptor for Well No. 2A. Also, inspect the pump, motor starter and wiring and redevelop the well.
- Make repairs to the wellhead, pump discharge piping, and pitless adaptor for Well No. 1. Also replace the well screen and well pump and redevelop the well.
- Make repairs to the wellhead, pump discharge piping, and pitless adaptor for Well No. 2. Also replace the well screen and well pump and redevelop the well.
- The motors starters and wiring for all four wells should be inspected and repaired, if necessary.
- Once any of the wells are online, a routine schedule of well redevelopment once every two years to maintain capacity should be implemented. Well redevelopment should include considering the use of alternative innovative technologies in combination with conventional redevelopment to potentially improve well redevelopment results (e.g. sonic, carbon dioxide freezing, Pantonite®, gas surging).

The estimated budgetary cost to complete the recommendations to address Well Nos. 1, 1A, 2, and 2A, including engineering and contingencies is between $275,000 and $300,000. This cost is based on the information in the preliminary investigation and could change based on the inspections of the wells and results of initial redevelopment efforts. Once the wells are returned to service, to complete well redevelopment every two years, a minimum of two wells should be redeveloped each year. This estimated cost is approximately $40,000 per year.

Well No. 4 is the highest yielding well in the wellfield, despite lost capacity since constructed. However, until a treatment plant is constructed, it is recommended that this well remain out of service. Once treatment is available, the well would need to be rehabilitated, including wellhead, pump discharge piping, and pitless adaptor rehabilitation. The pump, motor starter, and wiring would need to be inspected and the well would need to be redeveloped. The estimated budgetary cost to complete rehabilitation of Well No. 4, including engineering and contingencies is $100,000.

The report offers the following recommendations for source maintenance:

- Implement a more proactive wellhead protection program, and enlist the support of the Milford Board of Health, Zoning Board, Planning Board and the public, and include implementation of WSEI's 2004 monitoring well program.
- Complete pump inspections and replace worn parts as needed, or fully replace, with the next well redevelopment/restoration.
- Explore options for increasing pumping system efficiency during pump replacement/rehabilitation with consideration given to the possibility of pumping to a filtration treatment facility in the future.
- Continue monitoring sodium and chloride concentrations from the wellfield, and increase the frequency of sampling if concentrations should increase.
- Proceed with a feasibility study of alternative filtration treatment technologies and finalize piloting of filtration treatment technologies at the Godfrey Brook Wellfield.

The estimated budgetary cost to complete the source maintenance recommendations is between $75,000 and $100,000. The costs to repair and replace pumps as needed, is not included in this estimate and costs could vary depending on the options to increase pumping system efficiency.

In addition, the report offers several long-term recommendations to maintain the production capacity and allow for more flexibility within the wellfield.

- Further explore the additional identified areas of deeper saturated thickness for wellhead protection, potential yield, and water quality. If subsequent exploration confirms a more extensive aquifer, the Zone II area should be redelineated accordingly.
- Redelineate Zone II to account for multi-directional groundwater flow towards the wellfield, to account for the higher withdrawal rate than the conceptual model, and to respond to MassDEP conditions.
- Develop a new plan of Zone I(s) after additional production well locations have been determined, utilizing the MassDEP-required Zone I, 250-foot protective radii for each well in a wellfield.
- Proceed with the exploration, siting, design, permitting and installation of additional production wells to augment redeveloped-restored production well capacity up to at least the MassDEP permitted daily withdrawal rate for the Godfrey Brook Wellfield of 549 gpm (0.79 mgd) under the Water Management Act, and to allow for ongoing cycles of well aging and declining specific capacity.
- Evaluate additional federal, state, and local permitting requirements for applicability to expansion of the wellfield, appurtenant access and piping within the wetlands and riverfront area.

- Explore innovative options for augmenting water supply within Milford's hydrogeology, by using aquifer storage as a water bank.
- Design and construct a new water filtration plant at the site for future water treatment for iron and manganese.

The costs for the long-term recommendations would depend on the type of treatment selected, the size of the treatment plant constructed, the number of replacement wells, and the results of any exploration and evaluations. The estimated long-term costs could be between $5,000,000 and $9,000,000.

We appreciate the opportunity to assist you on this important matter. If you have any questions regarding this letter, please contact our office.

Sincerely,

TATA & HOWARD, INC.

Karen Gracey

Karen L. Gracey, P.E.
Co-President