ONSITE ENGINEERING INC.

Water, Wastewater and Stormwater Specialists

March 26, 2021

Mr. Jeffrey W. Howland, Director
Department of Public Works
Town of Shrewsbury
100 Maple Avenue
Shrewsbury, MA 01545

Re: The Pointe at Hills Farm Development, Shrewsbury, Massachusetts
Sewer Capacity Evaluation Update - 526 Hartford Turnpike Road (Phase 2)

Dear Jeff:

As requested by the project proponent, Onsite Engineering has reviewed the previous studies prepared by AECOM related to The Pointe at Hills Farm development and re-evaluated the required sewage collection system and pump station upgrades based on revised sewage generation estimates related to the 63% reduced project build-out schedule for the Project. The purpose of this update to the previously performed studies is because of a significant decrease of 21,996 gallons per day in projected sewage flows related to the Phase 1 residential development.

Based on information provided by the project proponent, the project will no longer consist of 156 residential housing units associated with the previous Phase 1 and Phase 2 residential developments. As for Phase 2 detailed in previous studies, this project will remain identical to the previously proposed residential housing development with a build-out schedule consisting to 92 units. This evaluation is based on reviewing and updating the previous calculations detailed in studies performed by AECOM and providing an updated summary of the required upgrades/mitigation items, based on the Town of Shrewsbury's consultant's (Weston & Sampson) benchmark capacity of 80% of the pipe segment's full theoretical capacity, in order to accommodate the current sewage flows from the now scaled down Project.

EXECUTIVE SUMMARY

This evaluation was undertaken to compile and summarize the previously prepared analyses performed by the developer's consultant AECOM and the Town of Shrewsbury's peer review consultant (Weston & Sampson) and compare the results of those analyses with the recent evaluation of sewage flows from our evaluation of the reduced sewage flows from only Phase 2 of The Pointe at Hills Farm Development. The format of this letter report is intended to provide a succinct and direct approach to comparing the

previously identified deficient segments (both pre-development (i.e., existing conditions) and post-development) to the revised sewage flows.

Based on the updated evaluation, there are a total of five (5) sewer segments, three segments in the pre-development condition and two segments in the post-developed condition (i.e., result of the new development), that are identified as deficient per the Town of Shrewsbury's consultant's (Weston & Sampson) benchmark capacity of 80% of the pipe segment's full theoretical capacity. In addition, the new 63% reduced sewage flows from The Pointe at Hills Farm will require that the pump systems at the Stoney Hill and Cherry Street pump stations be upgraded with larger impellers in order to accommodate the new peak hour flow rates.

GRAVITY SEWER CAPACITY ANALYSIS

As detailed in the "*Update No. 4 to Proposed Sewer Service Connection – Hydraulic Capacity Study & Report for the Pointe at Hills Farm Chapter 40 B Development*" prepared by AECOM dated November 14, 2016 (included as Attachment A), AECOM provided a summary of the Town's existing gravity collection system sewer segments that were either 1) presently under capacity without the addition of The Pointe at Hills Farm development; 2) under capacity with the addition of The Pointe at Hills Farm development - Phase 2; and 3) under capacity with the addition of The Pointe at Hills Farm development Phase 2 and original Phase 1 development, which is now eliminated. A summary of the AECOM previously identified deficient segments of the gravity sewer are summarized in Table 1.

Table 1
2016 AECOM Deficient Gravity Sewer Segments Analysis Summary
The Pointe at Hills Farm
Shrewsbury, Massachusetts

Gravity Sewer Segment	Existing Town Conditions Flow - Under Capacity Volume (Gallons per Day)	Addition of Phase 2 Flow – Under Capacity Volume (Gallons per Day)	Addition of Phase 2 and Former Phase 1 Flow – Under Capacity (Gallons per Day)
2B-23 to 2B-22	527,702	584,263	677,044
2B-17 to 2B-16		10,733	103,260
2B-16 to 2B-16A			53,069
2B-16A to 2B-15		31,642	124,169
2B-12 to 2B-11			37,624
2B-11 to 2B-9	264,311	320,603	412,325
2B-9 to 2B-8	14,528	69,126	158,625
2B-8 to 2B-7	66,205	120,802	210,301
2E-16A to 2E-16			4,742
2E-16 to 2E-15			4,742
2E-15 to 2E-14			4,742
2E-14 to 2E-13			4,742
2E-13 to 2E-12			4,742
2E-12 to 2E-11			4,742

Table 1 - Continued
2016 AECOM Deficient Gravity Sewer Segments Analysis Summary
The Pointe at Hills Farm
Shrewsbury, Massachusetts

Gravity Sewer Segment	Existing Town Conditions Flow - Under Capacity Volume (Gallons per Day)	Addition of Phase 2 Flow – Under Capacity Volume (Gallons per Day)	Addition of Phase 2 and Former Phase 1 Flow – Under Capacity (Gallons per Day)
2E-11 to 2E-10			4,742
2E-9 to 2E-8			89,784
2E-8 to 2E-7			34,925

Using the identical methodology and capacity analysis approach by AECOM, at the 80% of the pipe segment's theoretical full flow capacity as proposed by Weston & Sampson, Onsite Engineering has updated the sewer capacity calculations using the revised The Pointe at Hills Farm sewage generation based on 92 units at 141 gal/unit (12,972 gallons). A summary of the updated previously identified deficient gravity sewer segments are summarized in Table 2 with a copy of the updated capacity calculations located in Attachment B.

As shown in the Table 2, as anticipated, the previously identified deficient sewer segments associated with flow from The Pointe at Hills Farm - Phase 2 remained deficient. Consistent with the AECOM memorandum, the previously identified recommended mitigation actions for the deficient sections of sewer are still required in order to address the deficiencies noted.

Table 2
Updated Deficient Gravity Sewer Segments Summary
The Pointe at Hills Farm
Shrewsbury, Massachusetts

Gravity Sewer Segment[1]	Amended Existing Town Conditions Flow - Under Capacity Volume (Gallons per Day)	The Pointe at Hills Farm Flow– Under Capacity Volume (Gallons per Day)	Mitigation Action per AECOM Memorandum
2B-23 to 2B-22[2]			
2B-17 to 2B-16		13,264	Provide 12-inch Sewer
2B-16 to 2B-16A			
2B-16A to 2B-15		34,104	Provide 12-inch Sewer
2B-12 to 2B-11			
2B-11 to 2B-9	264,311	322,616	Provide 10-inch Sewer
2B-9 to 2B-8	14,528	72,119	Provide 12-inch Sewer
2B-8 to 2B-7	66,205	123,631	Provide 12-inch Sewer
2E-16A to 2E-16			
2E-16 to 2E-15			

Table 2 - Continued
Updated Deficient Gravity Sewer Segments Summary
The Pointe at Hills Farm
Shrewsbury, Massachusetts

Gravity Sewer Segment[1]	Amended Existing Town Conditions Flow - Under Capacity Volume (Gallons per Day)	The Pointe at Hills Farm Flow– Under Capacity Volume (Gallons per Day)	Mitigation Action per AECOM Memorandum
2E-15 to 2E-14			
2E-14 to 2E-13			
2E-13 to 2E-12			
2E-12 to 2E-11			
2E-11 to 2E-10			
2E-9 to 2E-8			
2E-8 to 2E-7			

[1] Gravity sewer segments identified in the AECOM November 14, 2016 memorandum.

[2] Deficiencies associated with segment 2B-23 to 2B-22 were mitigated as part of the force main relocation project.

PUMP STATION CAPACITY ANALYSIS

As detailed in the "*Update No 3 to Proposed Sewer Service Connection – Hydraulic Capacity Study & Report for the Pointe at Hills Farm Chapter 40B Development*" memorandum prepared by AECOM dated June 28, 2016 (included as Attachment C), the capacity of the Quail Hollow Pump Station, Stoney Hill Pump Station, and the Cherry Street Pump Station were evaluated based on criteria established during a June 9, 2016 technical workshop with the Town of Shrewsbury and Weston & Sampson. The capacity analysis of each pump station was based on the peak hour flow rate capacity using the estimated average daily flows, inflow/infiltration volumes, and draw down tests performed by Weston & Sampson. Using this data, AECOM established design parameters and completed their analyses using the existing conditions without the developments and then with the addition of The Pointe at Hills Farm Phase 2 and Phase 1 developments. Table 3 below summarizes the Pump Station Design Criteria without the Proposed Developments (i.e., existing conditions analysis) results by AECOM as listed in their June 28, 2016 memorandum.

Table 3
Pump Station Capacity Analysis
Design Criteria without the Proposed Developments
The Pointe at Hills Farm
Shrewsbury, Massachusetts

Description	Stoney Hill Pump Station	Cherry Street Pump Station
Average Daily Flow (gallons per day)	42,800	93,400
Peaking Factor	6.73	5.68
Peak Daily Flow (gallons per day)	287,700	530,300
Infiltration/Inflow (gallons per day)	11,900	24,100
Peak Daily Flow with Infiltration/Inflow	299,600	554,400
Rated Pump Capacity (gallons per minute)	210	385
6" Force Main Velocity (feet per second)	2.38	4.37

Using the data in Table 3, we have updated the capacity evaluation results for each pump station (summarized in Tables 4 and 5 below) using the revised The Pointe at Hills Farm Development build-out schedule, along with an estimated additional I/I allowance of 1,212 gallons per day from the proposed development (consistent with the conditions proposed in the AECOM memorandum). Please note, that because the sewage flow from The Pointe at Hills Farm only passes through the Stoney Hill and Cherry Street Pump Stations, respectively, the evaluation of the Quail Hollow pump station was eliminated from further review.

As shown in the Tables below, the projected flows, using the AECOM analysis criteria, exceed the pump rated capacities at the two stations. While rated capacity is important, the actual pump capacity of the system, as installed and operating, is much more important relative to the potential impacts of adding additional connections and flow to the system. The actual pump capacity of each station was determined by Weston and Sampson draw down tests on April 6, 2016.

In conjunction with the draw down test information, on June 21, 2018, Onsite Engineering met with the Town of Shrewsbury Sewer Department staff and Tom Valorose, Russell Resources, Inc., to review the above-mentioned pump stations to observe the condition of each pump station, to obtain the pump serial numbers/name plate data in order to confirm the rated capacity of each pump, and to assist with determining what upgrade options might be available to increase the rated capacity of the pumps at the stations.

Table 4
Updated Stoney Hill Pump Station Capacity Analysis
Preliminary Design with Proposed Development Flows
The Pointe at Hills Farm
Shrewsbury, Massachusetts

Description	Stoney Hill Pump Station – Existing Conditions	The Pointe at Hills Farm (13,254 gallons per day)
Average Daily Flow (gallons per day)	42,800	55,772
Peaking Factor	6.73	6.42
Peak Daily Flow (gallons per day)	287,700	358,056
Infiltration/Inflow (gallons per day)	11,900	13,112
Peak Daily Flow with Infiltration/Inflow	299,600	371,168
Rated Pump Capacity (gallons per minute)	210	258
6" Force Main Velocity (feet per second)	2.38	2.94

Table 5
Updated Cherry Street Pump Station Capacity Analysis
Preliminary Design with Proposed Development Flows
The Pointe at Hills Farm
Shrewsbury, Massachusetts

Description	Cherry Street Pump Station – Existing Conditions	The Pointe at Hills Farm (13,254 gallons per day)
Average Daily Flow (gallons per day)	93,400	106,372
Peaking Factor	5.68	5.56
Peak Daily Flow (gallons per day)	530,300	591,728
Infiltration/Inflow (gallons per day)	24,100	25,312
Peak Daily Flow with Infiltration/Inflow	554,400	617,040
Rated Pump Capacity (gallons per minute)	385	429
6" Force Main Velocity (feet per second)	4.37	4.88

For informational purposes, a summary of the existing rated capacity of each station's pump system, the Weston & Sampson drawdown test results, and corresponding peak hour flow calculations for each connection scenario are summarized in Table 6. As indicated in Table 6, the addition of flow from The Pointe at Hills Farm itself results in calculated peak hour flow rates that exceed the nameplate rated capacity and drawdown test rated capacity of the Stoney Hill and Cherry Street Pump Stations. As a

result, the Stoney Hill and Cherry Street Pump Stations will require modifications to the pump systems in order to meet the new peak hour flow rates.

Table 6
Pump Station Capacity Analysis
Existing Pump Station Rated Capacity Data &
Updated Peak Hour Flow Rates
The Pointe at Hills Farm
Shrewsbury, Massachusetts

Description	Stoney Hill Pump Station	Cherry Street Pump Station
Installation Date	1987	2005
Pump Model	6C3B	4B2D
Motor Size	30 HP, 1,760 rpm, 460 volt/60 HZ/3 phase	15 HP, 1,760 rpm, 208 volt/60 HZ/3 phase
Nameplate Rated Capacity	250 gpm @ 117' TDH	200 gpm @ 93' TDH
Drawdown Test Result (April 6, 2016)	168 gpm	415 gpm
Existing Service Area Peak Hour Flow Rate	210 gpm	385 gpm
Existing Service Area and The Pointe at Hills Farm Peak Hour Flow Rate	259 gpm	430 gpm

Using the information from the studies, as well as the field observations of the existing pump stations in June 2018 by Onsite Engineering and Russell Resources, we prepared requests for pump modification proposals from Smith & Loveless, who is the manufacturer of the pump systems at both Stoney Hill and Cherry Street Pump Stations. Based on that information, we have identified pump system modifications/upgrades that would be necessary to meet the new revised peak hour flow requirements. Once we had this information, we used it to develop a comprehensive scope of work that was used to estimate the associated costs for modifying the pump systems to accommodate the increased peak hour flows for Phase 2 only. Table 7 below identifies the necessary pump station infrastructure upgrades to accommodate the 63% reduction of sewage flows based on the new Project built-out schedule, as well as presents updated budgetary cost to address the pump modifications.

Table 7
Pump Station Capacity Analysis
Pump Station Upgrade Summary
The Pointe at Hills Farm
Shrewsbury, Massachusetts

Pump Station	Modifications for The Pointe at Hills Farm Flow	Opinion of Cost Budget
Stoney Hill Pump Station	Calculated peak hour flow rate exceeds rated capacity of pump; upgrade motor (40 HP) and impeller to accommodate new flow rate of 265 gpm @ 116' TDH	$55,000 to $65,000
Cherry Street Pump Station	Calculated peak hour flow rate exceeds rated capacity of pump; upgrade motor (20 HP) and impeller to accommodate new flow rate	$45,000 to $55,000

We trust that this submission provides the Town with the necessary information to complete their review of the updated sewer capacity analysis. If you have any questions or require any additional information, please feel free to contact us.

Sincerely,

Onsite Engineering, Inc.

Raymond L. Willis, III, P.E.
Vice President

Enclosures

CC: Fran Zarette, P.E., Smart Growth Design, LLC
Wayne Belec, Land Design Collaborative
Andy Truman, P.E., Town of Shrewsbury