Project Memo

H373095

2024-05-28

To: Mr. Ryan Clapp and Mr. David Morgan, Environmental Planner + Conservation Agent

From: Rob Kenneally, PE
Elizabeth Adamowicz, PE

cc: Duke Bitsko, Ross Mullen

Town of Arlington
Thorndike Place Stormwater Review

Hatch reviewed the Updated Test Pit Summary Report presented in a letter from BSC Group made March 13, 20024 and the Additional Soil Test Pits and Groundwater Monitoring report dated April 24, 2024. In April 5, additional test pits and additional groundwater monitoring wells were installed. The additional test pits were conducted in or near proposed large infiltration system footprint. The Estimated Seasonal High Groundwater (ESHGW) elevations determined in the additional test pits range from 3.21 to 3.97. The monitoring well observations were conducted on April 1, 17 and 24, with the additional results observed in the first week of May and reported by email form Dominic Rinaldi to David Morgan on May 13, 2024. The results from monitoring wells are relatively consistent and range from 2.74 to 3.78. BSC Group utilizes ESHGW elevation of 4.0 in their stormwater management modeling. Considering results form the recently performed additional test and observations, we agree that elevation 4.0 can be used in the design.
The April 24, 2024 Additional Soil Test Pits and Groundwater Monitoring report states that *"This information further confirms that our use of hydrologic soil group (HSG) C soils and a lower infiltration rate than standard for sandy loam is indeed a conservative design."*
That statement is consistent with the modeling methodology of Massachusetts Stormwater Handbook (MSWH) and leads us to provide additional comments related to the stormwater management compliance outlined below.

Standard 3. Stormwater Recharge

1. Required Recharge Volume calculations are performed using "Static" method. This method does not require in-situ hydraulic conductivity rate testing and allows use of the minimum infiltration rate specified by Rawls 1982 (See Table 2.3.3 of the MSWH) for the corresponding NRCS Hydrologic Soil Group (HSG). The soil group can be determined by NRCS Soil Survey and confirmed by the Competent Soil Professional. The project Stormwater Report (last revised September 2023) includes Soil Survey Report identifying on site soils to be *Udorthents, wet substratum.* Hydrologic soil group(HGS) was not assigned by the Soil Survey (Udorthents can be in HSG B or C). Considering "*wet substratum"* and the fact that this is a hydric soil often present in wetlands, we agree with the determination to utilize **HGS C** in the design (per BSC Group Additional Soil Test Pits and Groundwater Monitoring report dated April 24, 2024.)
2. The Required Recharge volume calculations correctly use the Target Depth Factor, F=0.25 inch, for soil type C, obtained from MSWH, table 2.3.2. However, the Saturated Hydraulic Conductivity factor (K) used in the subsequent Drawdown calculations is incorrect. The value used in model was 0.043 ft/hr (0.52 in/hr) corresponds to B type soils. Per the Rawls Rate table 2.3.3, the value of 0.0225 ft/hr (0.27in/hr) should be used in drawdown equation.

Applying the corrected factor, the drawdown time is calculated as:

Table 2.3.3. 1982 Rawls Rates[18]

Texture Class	NRCS Hydrologic Soil Group (HSG)	Infiltration Rate Inches/Hour
Sand	A	8.27
Loamy Sand	A	2.41
Sandy Loam	B	1.02
Loam	B	0.52
Silt Loam	C	0.27
Sandy Clay Loam	C	0.17
Clay Loam	D	0.09
Silty Clay Loam	D	0.06
Sandy Clay	D	0.05
Silty Clay	D	0.04
Clay	D	0.02

- 57 hours for Pond1P, large infiltration system (30 hours shown in SWM report)
- 116.4 hours for TD2 to TD6, driveway infiltration systems (61 hours shown in SWM report)
- 61 hours for rain garden (32 hours shown in SWM report)

The required drawdown time is 72 hours, and this requirement is met for the large infiltration system and rain garden but not for the driveway trenches. The driveway trench system should be revised to a larger footprint to meet the requirement.

Groundwater Mounting Analysis

1. We request clarifications and modifications to the Mounting analysis. The recharge (infiltration) rate listed in the printouts from Hantush spreadsheet (pg.167 of the Stormwater Report) is 0.67 in/hr (1.33 ft/day) but on the summary on pg. 166, the hydraulic soil conductivity is shown as 1.04 ft/day or 0.52 in/hr.
    a. Please explain this inconsistency between the two pages
    b. As indicated in the previous section of this letter, the infiltration rate for Soil type C of 0.27 in/hr (0.54 ft/day) should be used.
2. Please explain why duration of infiltration period is selected as 36 hours. The MSWH (Volume 3, Chapter 1, pg. 28) states that *"Mounding analysis is required when the vertical separation from the bottom of an exfiltration system to seasonal high groundwater is less than four (4) feet and the recharge system is proposed to attenuate the peak discharge from a 10-year or higher 24-hour storm (e.g., 10-year, 25-year, 50-year, or 100-year 24-hour storm). In such cases, the mounding analysis must demonstrate that the Required Recharge Volume (e.g., infiltration basin storage) is fully dewatered within **72 hours** (so the next storm can be stored for exfiltration)."*

Standard 2. Peak Rate Attenuation

Based on the recently added information and detailed review of the SWM report we provide additional comments related to Standard 2.

1. Stormwater quantity analyses were performed using HydroCad program that is based on the accepted NRCS TR20 methodology. The peak discharge control is provided by the infiltration of

runoff into the ground combined with the stormwater detention within the chambers. The infiltration factor used in the pond routing is 0.52 in/hr which corresponds to soil group B per table 2.3.3. The computations should be revised using soil group C factor of 0.27 in/hr for the large infiltration system (Stormtrap) and driveway systems (R-tanks). That change might affect the size of the system.

2. We understand that based on the recent ESHGW readings, the elevations of the driveway systems are being modified. Please update the plans and the report accordingly.
3. The Peak Rate Attenuation analysis indicate no increase of flow toward Dorothy Road. This is achieved by re-directing all rooftop runoff from six duplex townhouses to the Stormtrap infiltration tank in the back of those buildings. This is an important element of the site stormwater controls. At the building permit stage, it must be verified that all roof drains are properly conveyed to the back of each building.

Prevention of Flooding

1. We previously commented on a need to maintain proper setback for infiltration systems to building wall. Table RR of the MSWH (Volume 1, Chapter 1, pg. 8) specifies setbacks for Groundwater recharge facilities as 10 ft to 100 ft depending on the type of BMP. While Volume 2, Chapter 2 does not specify setback for the manufactured subsurface structures, these systems function as infiltration trenches and the prescribed setback for them is 20' (table IT-1, Volume 2, Chapter 2, pg. 97). We recommend 20' setback from building is used for the Stormtrap system per infiltration trench standard, and a minimum of 10' is used for the driveway R-tank trenches.
2. We reviewed the Updated Foundation Design Recommendations dated February 28, 2024, prepared by McPhail Associates. This memo provides recommendation for foundation design and excavation support for construction within or near flood zone. We recommend that this memo and other waterproofing guidelines contained in FEMA NFIP Technical Bulletin 10 are required element of the foundation design for all structures in this project.
3. We understand that the floodplain impact areas and the compensatory flood storage areas were reviewed under the Comprehensive Plan review process. However, we would like to clarify site grading within the building notch on the south side of the building. The finished grade elevations along this building walls are proposed to be EL.7.0 with the ground elevations of 6.8 (equal to the 100-yr Base Flood Elevation) being only 2' away from the building walls. This area is labeled as OpenSpace/Flood Storage. Having flood limits so close to the building wall is unconventional and not recommended. FEMA NFIP Technical Bulletin 10 recommends: *"The setback is the distance from the edge of the SFHA to the nearest wall of the basement - the minimum allowable setback distance is 20 feet*". We recommend a plan modification to comply with the setback distance.

For Rob Kenneally, PE

Elizabeth Adamowicz, PE (MD)