March 04, 2021

Christian Klein, Zoning Board of Appeals

Town of Arlington
50 Pleasant Street
Arlington, MA 02476

Re: Thorndike Place - Arlington, MA
Comprehensive Permit NOAA 14+ Stormwater Analysis

Dear Mr. Klein:

As requested, BETA Group, Inc. (BETA) has conducted an analysis of the proposed stormwater management system for the Thorndike Place development using National Oceanic and Atmospheric Administration (NOAA) 14+ rainfall data. The stormwater analysis submitted with the current application uses rainfall data from the National Resource Conservation Service (NRCS). Use of the NRCS data is consistent with the current requirements of the Massachusetts Stormwater Policy. The Massachusetts Stormwater Management Advisory Committee is considering revising the rainfall data requirement to utilize NOAA 14+ data.

Section 31 of Arlington's local Wetland Regulations require addressing the impact of climate change on surface runoff. Section 31, B.2 states "Describe project stormwater surface runoff, which may increase due to storm surges and extreme weather events, and how this will be managed / mitigated to prevent pollution (including nutrients from fertilizers, roadway runoff, etc.) from entering the resource area with consideration of eliminating impervious surfaces as feasible." Using NOAA 14+ rainfall data in the analysis could be considered as addressing this requirement.

Analysis

The Applicant has provided a stormwater model as part of the site stormwater analysis. The latest model was included with the revised Stormwater Report dated January 2021 submitted to the Board on January 22, 2021. The proposed stormwater design incorporates three (3) separate stormwater BMP's to mitigate increases in peak runoff rates and volumes from the development. Infiltration Basin 1 is a subsurface system located under the proposed surface parking located on the west side of the site. BMP 2 is proposed detention utilizing the building roof area. Infiltration Basin 3 is a subsurface basin located south of the underground garage entrance.

BETA re-created the stormwater model using HydroCAD software, the same software used for the Applicant's model. Both Predevelopment and Post development models were re-created. The models were calibrated using the NRCS rainfall data in the Applicant's model to ensure that the results were the same. The models were then run using the NOAA 14+ rainfall data for the 2-year, 10-year, 25-year, 50-year and 100-year storm events. No changes to the model design input were made except that the invert for the discharge from Infiltration Basin 3 was adjusted to match the invert shown on the plan of elevation 5.70. The Applicant's model incorrectly showed the invert as elevation 7.38.

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The following table provides a comparison of the NRCS rainfall data used in the Applicant's analysis and the NOAA 14+ data.

Storm Frequency	NRCS Rainfall (inches)	NOAA 14+ Rainfall (inches)
2-year	3.23	3.64
10-year	4.90	5.79
25-year	6.20	7.49
50-year	7.43	8.72
100-year	8.89	10.35

The results of both predevelopment and post development analysis were compared to evaluate the functionality of the system and to determine if post development peak flow rates and volumes were mitigated to predevelopment rates.

The following table provides the results of the analysis and compares the NRCS results and the NOAA 14+ results for overall flow from the site to the adjacent wetlands.

Storm - Frequency	Rainfall (inches)		1S - Existing flow to Wetlands		1L - Proposed Flow to Wetlands		Proposed to existing comparison	
			Runoff (cfs)		Runoff (cfs)			
	NRCS	NOAA+	NNRCS	NOAA +	NRCS	NOAA +	NCRR	NOAA+
2	3.23	3.64	2.13	2.86	2.12	2.68	-0.01	-0.18
10	4.9	5.79	5.4	7.39	4.5	5.89	-0.9	-1.5
25	6.2	7.49	8.3	11.41	6.5	8.6	-1.8	-2.81
50	7.43	8.72	11.3	14.44	8.5	10.98	-2.8	-3.46
100	8.89	10.35	14.86	18.52	11.36	15.69	-3.5	-2.83

As shown in the table, overall post development peak flow rates from the site using the NOAA 14+ rainfall data are reduced below existing predevelopment conditions for both NRCS data and NOAA 14+ data.

In addition to the overall site comparison, each BMP was evaluated to assess any potential issues with the design using NOAA 14+ data. The analysis indicates that the proposed stormwater systems function adequately for storms up to the 100-year event. The peak water surface elevation within Infiltration Basin 1 and Infiltration Basin 3 remains below the top of the Stormtrap chambers. This indicates that sufficient storage is available within the systems for these storms.

The analysis for the 100-year storm indicates that the peak water surface elevation for both infiltration Basin 1 and Infiltration Basin 3 exceeds the top elevation of the Stormtrap chambers. The potential impact of this includes:

- Potential surcharging of runoff above the rim elevation at CB-1 resulting in ponding in the driveway and surface parking area.
- Potential surcharging above the rim elevation at Trench Drain-1 (underground garage entrance) resulting in additional storm runoff entering the garage.
- Higher peak flows and velocities at the outfall from Infiltration Basin 1 resulting in increased potential for scour and erosion at FES-1.
- It is unclear how the increase water surface elevation in Infiltration Basin 1 might affect the roof detention as limited detail is available for the roof design.

Conclusion

The proposed stormwater management system for the Thorndike Place development was analyzed using NOAA 14+ rainfall data. NOAA 14+ rainfall data is higher than the NRCS rainfall data used in the Applicant's stormwater analysis. The revised analysis indicates that overall post development peak flows continue to be mitigated below predevelopment runoff rates. However, both Infiltration Basin 1 and Infiltration Basin 3 experience higher water surface elevations during the 100-year storm that may result in negative impacts to the site drainage.

It appears that both Infiltration Basin 1 and Infiltration Basin 3 would need deign revisions to accommodate increased flows using the NOAA 14+ analysis.

If you have questions about any of these comments, please feel free to contact us.

Very truly yours,
BETA Group, Inc.

William P. McGrath, P.E.
Senior Associate

cc: Jenny Raitt, Arlington
Paul Haverty