Kathy Baskin
Assistant Commissioner, Bureau of Water Resources
Massachusetts DEP
1 Winter St, Boston, MA 02108

Re: Stormwater Advisory Committee

June 11, 2021

Dear Assistant Commissioner Baskin,

Thank you for the opportunity to contribute to discussions on updating rainfall data in the Stormwater Handbook to represent current and future projections. We are municipal engineers from ten municipalities: Arlington, Cambridge, Everett, Lexington, Malden, Medford, Melrose, Watertown, Winchester, and Woburn. We are responsible for managing local stormwater flooding to keep people and property safe. We cannot emphasize strongly enough the need to update rainfall data to reflect climatic conditions during the life cycle of current and new structures.

This issue was one of the key concerns that brought us together in September 2018 to form the Resilient Mystic Collaborative. Our group met multiple times to form the following recommendations based on the best available science, including downscaled Global Climate Model data for Greater Boston. **We strongly support using the full NOAA14 90th percentile confidence interval, without the 0.9 multiplier.** Using lower rainfall estimates that do not reflect actual conditions will shift the burden of managing stormwater away from new developments onto existing taxpayers. Our recommendations are below.

1. **MassDEP needs to develop statewide downscaled rainfall projections based on global climate models.** We strongly support Mass DEP's efforts to develop statewide downscaled future projections of extreme precipitation based on global climate models. This would be the best science to use for stormwater management and modelling efforts.

2. **Until statewide downscaled rainfall projections can be completed, using the upper bound of NOAA 14 90% confidence interval could be used as a proxy for 2070 rainfall projections. Using 90% of the upper bound of NOAA 14 90% confidence interval could be used as a proxy for 2030 rainfall projections.** Mass DEP staff have floated using 90% of the upper bound of NOAA Atlas 14 (NOAA14) 90% confidence interval values as a "safety factor" to take into account climate change-enhanced rainfall intensity.

Working with climate scientist Dr. Katharine Hayhoe, Cambridge has completed a downscale model.[1] Figure 1 and Table 1 compare downscaled precipitation projections (in inches) with TP-40, NOAA14 and other measures of rainfall intensity.

At least for Cambridge, 90% of the upper bound of the NOAA14 90% confidence interval values closely match 2030 downscaled rainfall projections. Similarly, the upper bound of the NOAA14 90% confidence interval values closely match 2070 downscaled rainfall projections. These relationships may not hold in other regions of Massachusetts, but is likely an appropriate proxy for Greater Boston communities. We

[1] The report on how Cambridge conducted the downscaled model for precipitation is available at https://bit.ly/39uYEpt

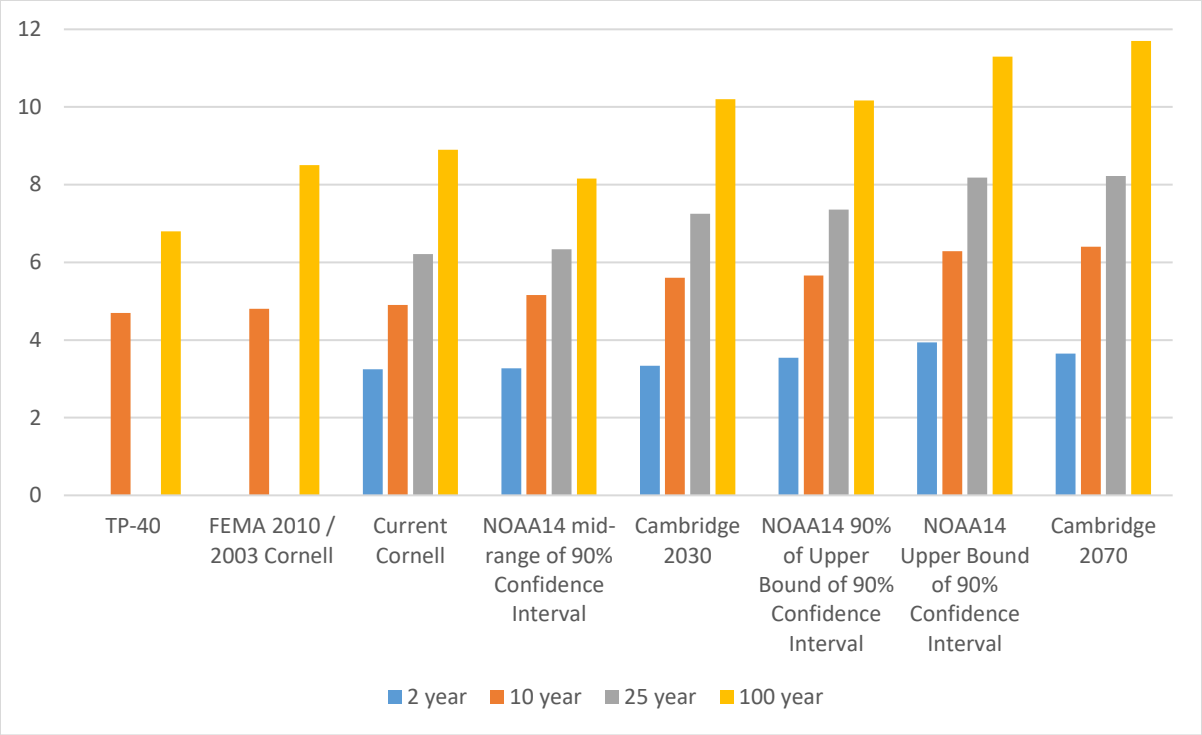

Figure 1. Cambridge, MA rainfall data (in inches)

recommend checking the validity of these proxies for other areas of the state, though do not know if these downscaled projections have been done elsewhere.[2]

Table 1. Cambridge, MA Rainfall Data

Source	2 year	10 year	25 year	100 year
TP-40		4.70		6.80
FEMA 2010 / 2003 Cornell		4.80		8.50
Current Cornell	3.25	4.90	6.21	8.90
NOAA Atlas 14 mid-range of 90% Confidence Interval	3.27	5.16	6.34	8.16
Cambridge 2030	3.34	5.60	7.25	10.20
NOAA Atlas 14 90% of Upper Bound of 90% Confidence Interval	3.55	5.66	7.36	10.17
NOAA Atlas 14 Upper Bound of 90% Confidence Interval	3.94	6.29	8.18	11.30
Cambridge 2070	3.65	6.40	8.22	11.70

[2] From NOAA: Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.

3. **Current DEP regulations require that new large developments show that they do not increase stormwater flooding over current conditions. Instead, post-development discharge rates need to decrease in order to make up for the higher rainfall rates that have occurred since TP-40.**
For example, Cambridge requires that the post-development discharge hydrograph for the 25-year event is less than or equal to the 2-year rainfall event pre-development (see Figure 2). Developments must store or recharge this difference in volume on site.

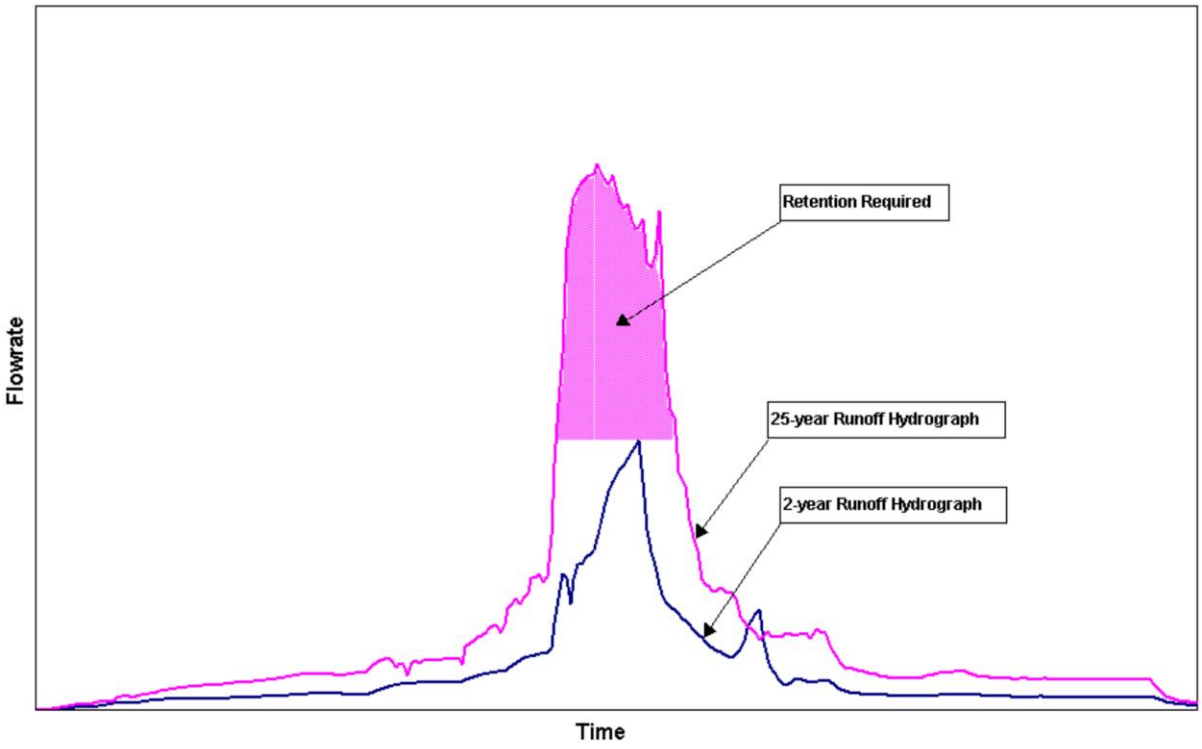

Figure 2 Cambridge Post-development discharge requirements

In addition, post-development peak discharge rates cannot exceed pre-development peak discharge rates. Again, this may not be the right approach for other communities, but new DEP regulations are needed to require that new development actually improves stormwater management, not just does no harm.

4. **Communities need to be able to use consistent, sufficiently conservative rainfall data across different regulations and project types.**
Among our five communities, we use a mixture of Cornell and NOAA14 data for Conservation Commission and general stormwater permits, even within the same municipality. One challenge is that, in our area of the state, mid-point NOAA14 data are higher for smaller storms and lower for 1% storms (Table 2 shows Winchester data). This problem would go away if the upper limit

Table 1. NOAA Atlas 14 and Cornell Data for Winchester

	24-hour Precipitation (inches)	
Annual Probability (%)	Cornell Data (inches)	NOAA14 (inches)
50	3.2	3.29
10	4.9	5.18
4	6.2	6.37
1	**8.9**	**8.19**

NOAA14 data were used. We were glad to see that the Stormwater Advisory Committee will be examining how this plays out in floodplains to ensure the same analyses are no longer using different data.

In order for these updated data to be used effectively, we have several additional recommendations:

5. **Since current projects will experience future storms, municipalities need to be able to require that they be resilient to those higher rainfall projections.** For example, Cambridge requires new developments to not be flooded by a 2070 10% storm and to be able to recover from a 2070 100% storm.

6. **Given that TP-40 data are sixty years out of date, we are concerned that these data also would not be regularly updated.** We would like to see DEP commit to updating these data every three to five years, or sooner if significantly different new consensus data become available. We would like to see a default mechanism to allow municipalities to use more conservative data for large development projects if the Stormwater Handbook data significantly diverge from the latest available standard precipitation data.

7. **Finally, given concerns regarding disruption of climate science at the federal level, we would like to see the Stormwater Handbook not exclusively reference NOAA14 data.** Perhaps it could also reference "the latest available standard precipitation data," whether it be updated Cornell data, downscaled global data, or other reliable sources. In this way, data delays beyond municipal control should not prevent communities from requiring that the best available data be used in enforcing regulations.

Thank you for your consideration. We look forward to answering any questions or concerns.

Sincerely,

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