

**International Dark-Sky Association
Massachusetts Chapter**

James Lowenthal, President
181 Crescent Street
Northampton MA 01060
jamesastron@gmail.com



April 10, ~~2020~~²⁰²¹

To: Gautam Sen, Massachusetts Dept. of Transportation

Re: Lighting at I-91 Interchange 19 roundabout, project # 604597, in Northampton, MA

Dear Mr. Sen:

Thank you for your letter of October 23, 2020 in response to my letter from the month before regarding lighting at the above-referenced project in Northampton. I appreciate your thoughtful reply. However, several serious problems with the current plan remain unresolved. The plan should be revised significantly to protect public health and safety and wildlife.

Can we please arrange a meeting by Zoom (or other video platform) to discuss the project lighting further?

Here are the main concerns, following the list of comments in my original letter and your response:

1. Lighting zone should be LZ-1, not LZ-3.

You responded that “Lighting zones reflect the base (or ambient) light levels desired by a community. The lighting design for the roadway area is based on IES recommendations. We understand that these are not standards or regulations; however, based on our engineering judgment, following the IES recommendations results in the most appropriate lighting design utilizing the requested decorative light poles.”

This misses the point and the benefit of lighting zones. There is no “base (or ambient) light level desired by a community” that Northampton has specified – instead, there is a large range of human uses, zoning, development, natural areas, wildlife activity within Northampton’s 36 square miles, from downtown and industrial to remote nature preserve. Outdoor lighting should be designed to respect the local environment. I confirmed with The City of Northampton’s Office of Planning and Sustainability and the Department of Public Works that they did not specify lighting zones for this or any other project, nor did they request the excessive level of lighting in the MassDOT plan.

On the contrary, the City’s Energy and Sustainability Commission has endorsed the IDA/IES 5 Principles of Responsible Outdoor Lighting, which are violated seriously by the current lighting plan.

The decorative light poles will look fine during the day, but the currently-planned fixtures will produce hazardous glare and uplighting by night. Nobody in Northampton has expressed a desire for that.

2. Total illumination level should be at least 7 times lower than planned.

You write: “We question the calculation of total lumens in the roundabout area. The calculation states that there are 31 single fixtures and 1 double fixture over the roundabout area of

approximately 45,000 sf. The 32 fixtures are throughout the entire project area which includes Route 9 to the project limits, Damon Road, and a portion of the off and on ramps. There are only 10 fixtures within the 45,000-sf roundabout area. The resulting total lumens calculation would be 131,199 lumens as opposed to the 435,580 lumens reported."

I accept your correction that only 10 lights should be counted within the roundabout area. However, my estimate of the roundabout area included the three roadway sections within the project area, which should then include all 32 light fixtures.

In fact, if we restrict our calculation to only the roundabout itself, then the overlighting remains a serious problem. With the 10 lights currently planned, the total lumens would be 10 x 13,199.4 or about 131,000, as you wrote. According to ANSI/IES RP-8-18 Section 12.4.6.2, "[t]he areas of the splitter island and central island should be excluded from the calculation grid." I estimate from the MassDOT plans that the area within the outer ring of the roundabout is about 32,017 SF, while the area of the central island and the small section of the bridge-side splitter island that falls within the outer ring amount to about 14,362 SF. So the total area of hardscape that should enter the calculation should only be 17,655 SF, not 45,000 SF, assuming the same principle of excluding the central and splitter islands applies.

The Base Allowance for Lighting Zone 1 in the IES/IDA MLO (Table B, p. 24) is 1.25 lumens per square foot of hardscape, and for Lighting Zone 3 it is 5.0 lumens per square foot. For Lighting Zone 1, the IDA/IES Model Lighting Ordinance would then recommend **no more than 22,069 lumens**. Even for Lighting Zone 3, the MLO would recommend **no more than 88,275 lum**. The planned lighting levels are **1.5 to 6 times brighter than those levels**.

You also write: "Additionally, maximum lighting levels of 9.5 fc are cited and appear to be the basis for the statement that the levels are 10 times higher than they should be. These levels are single point values that occur directly below the fixture at a height of 5 feet above the ground surface. The lighting level drops off quickly as you move out from directly under the luminaire. If the lighting level directly below the fixture is dropped to 0.8 fc as is suggested, the lighting levels for the remainder of the roundabout would be significantly lower than required."

This seems to miss the point that the goal should be actual safety, achieved through enhanced visibility. As I wrote in my original letter, that visibility is achieved through careful lighting design that minimizes glare – not by making the lights brighter than they need to be. In fact, Bhagavathula, Gibbons, & Nussbaum (2019, TRBJ, DOI: 10.1177/0361198119827928) find that visibility of pedestrians by drivers plateaus when the illumination level in intersections is 7-10 lux, or 0.7-1.0 fc, and when glare is minimized – there is no additional benefit from higher illumination level.

3. Glare and uplighting should be eliminated.

You write, "The Lumark fixtures are decorative teardrop fixtures with shallow skirts agreed upon with the City. We have reviewed other fixtures from this manufacturer and have found that the fixtures with lower B/U/G ratings have initial lumens which are much lower than the proposed design. Without re-running the photometrics, we anticipate that using these luminaires would require additional poles to meet the required lighting levels set forth by IES."

This misses the point that glare always reduces visibility and therefore safety, and eliminating glare will enhance visibility and safety. There is zero benefit from glare, only adverse effects. The American Medical Association recommends that "[a]ll LED lighting should be properly shielded to minimize glare and detrimental human and environmental effects." There are plenty of well-shielded streetlights

currently available on the market with significantly better BUG ratings than the ones currently in the plan. By eliminating glare we can use significantly lower illumination levels, such as in our calculation above, to achieve better visibility and safety.

4. Blue light should be minimized, with maximum CCT 2700K.

You write, “The CCT can be reduced from 4000K to 3000K to reduce the blue light level and still meet the current lighting criteria of 3000K, based upon the recommendations from the AMA. This is consistent with the approach we have been taking on other lighting projects currently under design.”

We appreciate your willingness to change from 4000K to 3000K, which will reduce harmful blue light emission by tens of percent. But we can do better. 2700K is now the de facto standard CCT for new municipal LED streetlight installations around Massachusetts, and that number is steadily decreasing towards the 2000K typical of the legacy high-pressure sodium streetlights that served the world well for over 50 years until the current LED revolution. There is no consensus that higher CCT provides more safety, and higher CCT is no longer significantly higher efficiency than lower CCT. We note that the American Medical Association advice is not to install 3000K lights; it is to use “3000K or lower lighting for outdoor installations such as roadways” (emphasis added). The International Dark-Sky Association recommends that “[t]he correlated color temperature of lighting used in most outdoor applications **should not exceed 2200K**” (emphasis added).

The lighting at the Northampton roundabout should adhere to these best practices, and employ only lighting with the minimum blue content possible.

5. The lights should be controlled with timers that dim the light levels significantly late at night when motor vehicle and pedestrian traffic volumes are much reduced.

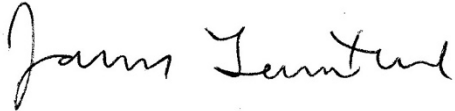
You write, “Adding electronic dimmers would require adding infrastructure depending on the desired technology (conduit, cable, radars/sensors, etc.) to the contract. At this stage of construction, it would not be practical to add this infrastructure. However, MassDOT could consider retrofitting the light poles later.”

While “smart” controllers that are networked and remotely controlled would be ideal and are becoming increasingly standard for LED streetlight installations, there are also relatively simple and inexpensive units available that mount on top of each light and can be set to dim the lights by a fixed amount at a pre-determined time, e.g. after midnight. For example: SunTech, a highly trusted and widely used supplier of lighting controllers (<https://www.sun-tech.biz/>) offers such products. Those products require no additional wiring, conduit, or sensors.

Finally, your letter does not address the serious damage the proposed lighting plan will cause to human health and well-being in the residential neighborhood abutting the roundabout, nor does it address the serious harm it will cause to fish, birds, amphibians, mammals, insects, and plants in the sensitive riparian habitat of the Connecticut River and its west bank immediately adjacent to the roundabout project. A major new report to the United Nations (<https://www.iau.org/news/announcements/detail/ann21002/>) details the abundant and incontrovertible scientific evidence of such damage to humans, flora, and fauna from excessive and poorly controlled outdoor lighting; the report makes specific recommendations consistent with or more stringent than those we propose here.

Can we please set up a video meeting in the near future to discuss alternatives to the current plan? I am confident that together we can produce a better lighting plan that will provide safe and effective street lighting while minimizing the adverse and unwanted effects of overlighting, glare, and excessive blue light at night.

Sincerely,

A handwritten signature in black ink that reads "James Lowenthal". The signature is written in a cursive, flowing style.

**James Lowenthal, President
IDA-MA**

**CC: Rep. Lindsay Sabadosa
Sen. Jo Comerford
Mayor David Narkewicz
City Councilor Jim Nash
City Councilor Michael Quinlan
City Councilor Alex Jarrett
City Councilor Karen Foster
City Councilor Rachel Maiore
Wayne Feiden, Director of Planning and Sustainability
Donna LaScaleia, Director of Public Works
Peter Cavicchi, District 2 Highway Director
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