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July 8, 2021

**SUBJECT- NORTHAMPTON** - Improvements on I-91 Interchange 19 at Rte. 9 & Damon Road  
Project File No. 604597

James D. Lowenthal, President  
International Dark Sky Association, Massachusetts Chapter  
181 Crescent Street  
Northampton, MA 01060

Dear Mr. Lowenthal,

Thank you for your letter regarding the I-91 Interchange 19 roundabout project. We appreciate the need to minimize excessive lighting outside of the roadway area and feel that our current design achieves this objective. As we have stated, the design is based on IES standards for roundabouts which has been adopted by MassDOT for their criteria in designing roundabouts. IES considers the IDA in formulas and design guidance, and this is reflected in the current design.

Our primary concern is the safety of all users of the roadway system (motor vehicles, cyclists, pedestrians) and the lighting levels need to meet the minimum requirements provided in the industry accepted IES lighting standards. Construction on the project is nearing completion; the lighting equipment has been either installed or purchased. There may be some minor changes that could be incorporated, but wholesale changes at this stage of the project are not practical.

Below are specific responses to items included in your letter:

**Item 1 Response:**

As you have confirmed, the City of Northampton did not specify lighting zones for this or any other project. LZ-3 was determined to be the design basis for the area based on discussions with a lighting manufacturer familiar with the area, although our design (based on IDA formulas of Lumens per SF) falls within the LZ-2 range. LZ-2 and LZ-3 are described in the IES guidelines as:

- **LZ-2: Moderate ambient lighting**  
Areas of human activity where the vision of human residents and users is adapted to moderate light levels. Lighting may typically be used for safety, security and/or convenience but it is not necessarily uniform or continuous. After curfew, lighting may be extinguished or reduced as activity levels decline.

- **LZ-3: Moderately high ambient lighting**

Areas of human activity where the vision of human residents and users is adapted to moderately high light levels. Lighting is generally desired for safety, security and/or convenience and it is often uniform and/or continuous. After curfew, lighting may be extinguished or reduced in most areas as activity levels decline.

Your letter states that the IDA/IES five principles of responsible outdoor lighting are violated seriously by the current lighting plan. These principles are subjective, and we believe that the approved design, using IES standards and LZ-3 parameters fall within these principles; please provide specific examples of where the principals are violated seriously.

The five Principles as they apply to the project are:

USEFUL – All light should have a clear purpose.

*The roadway intersections, pedestrian activity, and engineering best practices following IES standards for safety of motorist and pedestrians is a clear purpose.*

TARGETED – Light should be directed only to where needed.

*The requested decorative light pole and luminaire with the skirt directs the lighting downward, eliminating uplighting directly from the luminaire and directing it where needed at crosswalks, drive lanes, and merge points.*

LOW LIGHT LEVELS – Light should be no brighter than necessary.

*The design meets IES recommended illuminance averages for collector/local classified roundabouts and the pedestrian crosswalks are within the recommended vertical illuminance range of 2 to 4 fc at 5 ft. above the roadway. Our design based on IDA calculations is 2.7 lumens per square foot over the total project hardscape of 158,000 SF (see calculation in Item 2 below). This falls within LZ-2 zoning and is below the base allowance of LZ-3 which is 5 lumens per square foot. We are using LZ-3 due to the need to have the lighting uniform and continuous at intersections and the roundabout.*

CONTROLLED – Light should be used only when it is useful.

*With high vehicle traffic and pedestrian activity, reducing light levels below best practice and IES roundabout standards at any time would increase exposure to liability. Dimming lights during off-peak hours may lead to a less safe condition. When traffic is lower such as late at night, speeds can be expected to increase through the area. In addition, late at night, there is a higher likelihood that both drivers and pedestrians/cyclists could be impaired; from a liability standpoint, an argument could be made that maintaining proper lighting levels is more critical during off-peak hours.*

COLOR – Use warmer color lights where possible.

*The accepted design included 4000K CCT luminaires that are very typically used in roundabout designs. This principal is very general in nature and does not define color ranges.*

**Item 2 Response:**

It appears that there may be some confusion in developing the calculation; specifically, regarding which lights are being included in the calculations, as well as what hardscape areas are being lit. Please see Figure 1 below:

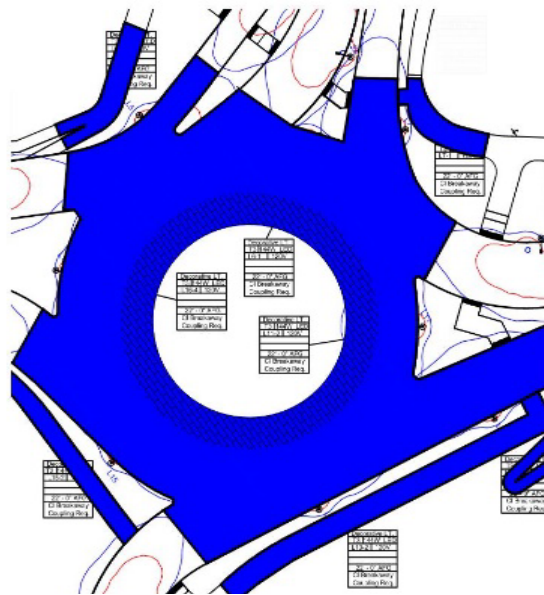


Figure 1 - Roundabout Lighting

In the figure, the blue area represents the extent of lighting provided by the 8 light fixtures that are called out in the figure. The total lumens produced by these 8 fixtures is  $8 \times 13,199 = 105,592$  lumens. Measuring from CADD, the blue area is 37,553 SF. This results in 2.81 Lumens per SF.

Similarly, Figure 2 on page 4 of 5 shows the extent of lighting for all 33 fixtures. The total area of hardscape subject to new lighting (blue area in Figure 2) is 158,000 SF as measured from project CADD files. Using 33 light fixtures (one double head) at 13,199 lumens per fixture results in a total of 435,567 lumens. Based on IDA's calculation, 435,567 lumens divided by 158,000 SF equals 2.7 lumens per SF..

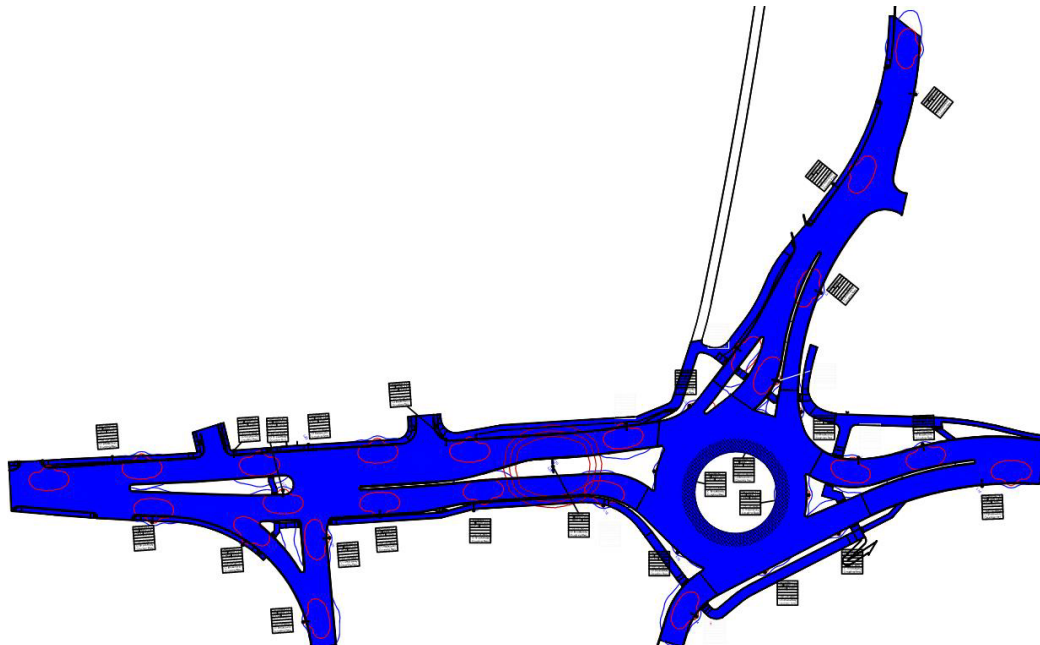


Figure 2 - Overall Lighting

Both the roundabout area and overall project area fall within Lighting Zone 2 according to Section IX Table B in the IDA MLO, while meeting IES criteria for roundabouts. Providing lower lighting levels other than best practices using IES standards would place pedestrians and motorists in unsafe conditions and potentially expose MassDOT and the City of Northampton to liability in the event of a crash caused by inadequate lighting. We continue to feel that the current design is appropriate in terms of both safety and suitability with the surrounding environment.

**Item 3 Response:**

The pole and luminaire were selected by MassDOT, through the design progress submittals. The fixture was approved, released for bid, and has been ordered. All lighting has a degree of glare and as such, it cannot be eliminated. The uplighting directly from the fixture is eliminated using skirting; however, reflective uplight will exist as it does in all lighting conditions. The only way to eliminate the glare and uplight as you have requested is to eliminate all light.

**Item 4 Response:**

The approved design included 4000K CCT luminaires that are very typically used in roundabout designs. You have stated a desire to be as low as 2200 CCT, however, the lighting approved during the shop drawing submittal process has the lowest CCT of 2700.

**Item 5 Response:**

Based on IES's recommendations, in order to provide criteria that will adequately address the visibility of the roadway, pedestrians, and hazards through a roundabout, a combination of horizontal illuminance for the roadway and vertical illuminance in the crosswalks shall be used. IES provides recommended minimum average-maintained lighting levels for roundabouts based on road classification and pedestrian volumes. Lighting at the roundabout should be constant to provide increased awareness and visibility to the motorists and pedestrians, ultimately reducing conflict. Timers should not be used due to the inability to determine when recommended light levels are required. The best way to control lighting properly in this condition would be to install occupancy sensors, which would increase the cost of the installation for communication and network software not to mention maintenance and serviceability costs.

We agree that the safety of motorist and pedestrians needs to be the priority in all projects. Lowering light levels for hardscape areas below the IES recommended levels to eliminate impacts to wildlife would place all parties in a less safe condition. Our design is at an acceptable limit of lighting and is appropriate for the project.

If you have any questions regarding this project, please contact the Project Manager, Gautam Sen, at [Gautam.sen@dot.state.ma.us](mailto:Gautam.sen@dot.state.ma.us).

On all correspondence to the Highway Division, please include the Project File Number and the MassDOT Project Manager's name in the subject heading.

Sincerely,



Marie Joyce Rose, P.E.  
Director of Project Management

MJR/gs

cc: Peter Cavicchi, District 2 Highway Director  
Jim Danila, Assistant Traffic Engineer  
Paula Simmons, District 2 Projects Engineer  
Rob Hicks, Transystems