

Durham Street Lighting Observations

Meeting Date/Time: September 17, 2026 at 9:00pm – 10:0pm

Location: Neighborhood West of the North Carolina School of Science & Mathematics

Meeting Attendees		
Name	Organization	Role
☐ Fred Broadwell	N/A	Concerned Community Member
☐ Dane Sanders, PE, MIES	Clanton & Associates	President & CEO

At the invitation of Fred Broadwell, I met with a group of concerned Durham community members to present responsible design approach to street lighting and our work in developing street lighting master plans. My presentation introduced the Five Principles of Responsible Outdoor Lighting (developed as a collaboration of the Illuminating Engineering Society (IES) and DarkSky International) and highlighted a Street Lighting Master Plan case study from Santa Ana, California.

Five Principles of Responsible Outdoor Lighting

Developed jointly by the Illuminating Engineering Society (IES) and DarkSky International, the Five Principles provide a practical framework for meeting nighttime needs while reducing glare, light trespass, skyglow, energy waste, and disruption to people and wildlife:

- **Useful:** Use outdoor light only when it serves a clear and necessary purpose, considering effects on the surrounding area, wildlife, and habitat.
- **Targeted:** Aim and shield light so it falls only where needed, minimizing spill beyond the intended area and limiting uplight.
- **Low level:** Provide no more light than necessary for the task, recognizing that bright or reflective surfaces can increase glare and skyglow.
- **Controlled:** Use timers, dimming, motion sensors, or other controls so lighting is available when needed and reduced or turned off when it is not.
- **Warm-colored:** Favor warmer-spectrum light and minimize short-wavelength blue-violet emissions to reduce impacts on the night sky, people, and wildlife.

Santa Ana Street Lighting Master Plan

The central message was that more or brighter light does not necessarily produce better visibility or safety. At night, the human visual system is highly sensitive to broad-spectrum LED lighting, where excessive light levels and glare can force the eyes to adapt to brightness, then require several minutes to readjust when

returning to darker conditions, reducing visibility during the transition. By matching light levels to the surrounding land use and level of nighttime activity, and by minimizing glare, lower light levels provide more appropriate illumination that support improved vision by preserving dark adaptation.

The **Santa Ana Street Lighting Master Plan** applies nine guiding principles to balance safety, community needs, environmental responsibility, and long-term system performance:

- **Public Safety:** Address inadequate light levels and glare that reduce nighttime visibility.
- **Visual Comfort:** Provide uniform, comfortable lighting that supports users of all ages and abilities.
- **Neighborhood Equity:** Identify and correct historic gaps in lighting service among neighborhoods.
- **Ecological Responsibility:** Reduce light pollution and protect sensitive habitats and natural areas.
- **Energy Conservation:** Minimize electricity use through efficient equipment, appropriate light levels, and controls.
- **Operational Feasibility:** Standardize practical equipment and strategies that support efficient maintenance.
- **Urban Character:** Reinforce neighborhood and district identity through appropriate lighting design.
- **Transportation Systems:** Serve drivers, pedestrians, cyclists, and transit users with context-appropriate lighting.
- **Education:** Build resident and staff understanding of responsible outdoor lighting.

Together, citywide photometric analysis, GIS mapping, and community engagement apply these principles to identify priority areas and 24 example projects, directing investment toward safer, more equitable, efficient, and environmentally responsible street lighting.

Nighttime Walking Tour

Following this presentation, I joined Fred on a walking tour of the neighborhood just West of the North Carolina School of Science and Mathematics. Along this tour, we experienced, photographed and measured multiple locations where the street lighting was excessively bright for a residential neighborhood. In fact the light levels measured at these sites exceed the highest light levels recommended by the IES for the busiest intersections near major event centers. This level of brightness in a residential community is disruptive to healthy sleep, creates safety concerns from glare and adaptation issues and is an excessive waste of energy.

IES Street and Intersection Lighting Criteria

The following tables are excerpts from the Illuminating Engineering Society (IES) RP-8-25 – Recommended Practice for Lighting Roadway and Parking Facilities. The streets that we visited in our nighttime walking tour are classified as Local Streets with Low Pedestrian Activity. The average light levels at Local/Local street intersections should be targeted at an average of 0.7 footcandles (fc) with light levels on sidewalks targeted at an average of 0.2 fc.

Table 12-1. Pavement Illuminance Criteria for Full Intersection Lighting

Functional Classification	Pedestrian Activity Level Classification			E_{avg}/E_{min}
	High lux (fc)	Medium lux (fc)	Low lux (fc)	
Major/Major	34 (3.2)	26 (2.4)	18 (1.7)	3.0
Major/Collector	29 (2.7)	22 (2.0)	15 (1.4)	3.0
Major/Local	26 (2.4)	20 (1.9)	13 (1.2)	3.0
Collector/Collector	24 (2.2)	18 (1.7)	12 (1.1)	4.0
Collector/Local	21 (2.0)	16 (1.5)	10 (0.9)	4.0
Local/Local	18 (1.7)	14 (1.3)	8 (0.7)	6.0

Table 11-2. Design Criteria for Pedestrian Walkways and Shared-Use Pathways Within Roadway Right-of-Way, and Alleyways (a.k.a. Laneways)

Condition	E_{avg} , lux (fc)	Uniformity,* E_{avg}/E_{min}	$E_{v,avg}$ lux (fc)
High pedestrian activity	10 (0.9)	5.0	5 (0.5)
Medium pedestrian activity	5 (0.5)	5.0	2 (0.2)
Low pedestrian activity	2 (0.2)	10.0	1 (0.1)

Light Trespass, Spectrum and Impacts to Human & Environmental Health

Light trespass from street lighting can introduce elevated levels of light into homes and natural areas, extending daytime conditions into the night and disrupting normal biological rhythms. Short-wavelength, blue-rich light is especially effective at suppressing melatonin and shifting circadian timing. Nighttime exposure to light, especially in the blue spectrum, has been associated with sleep disruption and other adverse health outcomes, while excessive brightness and glare can further reduce visual comfort. Wildlife also relies on natural light-dark cycles, and poorly controlled nighttime lighting can alter breeding, foraging, orientation, and migration patterns in birds, insects, fish, turtles, and other species. In response, the American Medical Association's policy on LED community lighting recommends outdoor roadway lighting at 3000K CCT or lower, with minimal blue-light emissions, shielding, and dimming where appropriate. More recent responsible-lighting guidance from IES & DarkSky International and municipal practices increasingly favor even warmer sources (commonly 2700K, 2200K, or amber) in sensitive residential and ecological settings, together with lower light levels, low glare ratings, improved optics, shielding, and controls that limit lighting to the times and places it is needed.

Location #1: Maryland Ave & Woodrow St

This photo was taken on Maryland Ave, along the West edge of the campus for the North Carolina School of Science and Mathematics. This local street is adjacent to residential properties and has a low level of pedestrian activity at night. The street lighting here is a 150W, 4000K CCT LED streetlight with a very wide and forward-throw distribution, evidenced by the intensity of illumination on the building façade.

The Illuminating Engineering Society (IES) criteria for this intersection for Local/Local classification with Low Pedestrian Activity is 0.7 footcandles (fc). On site measurements ranged from 3.0 – 5.0 fc, more than 5-times brighter than is appropriate for this intersection. The measured light levels even exceed the criteria for a Major/Major with High Pedestrian Activity which would be experienced in a busy downtown shopping center or near Duke University stadiums and sports facilities. The recommended streetlights for this area would be in the range of 25W – 35W LED (3,000 – 5,000 lumens) and be shielded to limit light trespass onto private properties.



Location #2: Woodrow Street just West of NC School of Science and Mathematics

Similar excessive light levels and glare from 150W, 4000K CCT LED streetlights were experienced here on (Street Name). These high light levels and glare create visual adaptation issues, which create poor visibility into darker areas adjacent to the street. Reducing light levels and glare would improve visibility into areas with lower light.



Location #3: Alabama Ave & Lawndale Ave

With homes located very close to the street right-of-way, these 150W LED streetlights create extraordinary levels of light trespass of over 8.0 fc, which is over 80-times the IES's maximum level of allowable light trespass for single family residents of 0.1 fc

