International Dark-Sky Association

"…to preserve and protect the nighttime environment and our heritage of dark skies through environmentally responsible outdoor lighting."

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March 2, 2015

Mr. Leif A. Dormsjo
Acting Director
District of Columbia Department of Transportation
55 M Street SE, Suite 400
Washington, DC 20003

Re: Smarter, Safer Streetlighting for Washington

Dear Mr. Dormsjo:

Summary

I am writing, on behalf of the D.C. members of the International Dark-Sky Association, to express profound concerns about your Department's (DDOT's) RFP No. DCKA-2011-R-0150, in which DDOT seeks to award a contract to maintain and rehabilitate more than 70,000 streetlights, incorporating new LED technology, throughout the District of Columbia.

We acknowledge that the planned shift to LED streetlights holds great promise for reducing energy use and costs to D.C. taxpayers. But if it is not done carefully, the shift could lead to an increase in light pollution on the City's streets – with the concomitant adverse effects on public safety, human health and the environment – and with no reductions in energy use or fiscal outlays.

Background

Streetlighting is essential to public safety, to the promotion of commerce and, in short, to the full enjoyment of modern life as we know it. But there can be too much of a good thing.

Excessively bright lighting is a waste of energy and money that produces no extra safety benefit. Lights that shine directly into one's eyes can actually reduce visibility as it triggers a defensive reaction by our visual and neurological systems. Light that splashes needlessly into

parks and into the sky can have serious adverse effects on ecosystems – and on our children's ability to enjoy the starry night sky. And light that enters our bedrooms and living spaces at night creates well-documented threats to human health, as our bodies have evolved to fight off cancer and other ailments during the dark of night.

Light pollution – usually defined to include lighting that is excessive or which shines onto property where it's not needed – is recognized as an "environmental hazard" by the District of Columbia Comprehensive Plan.[1] And D.C. residents are concerned about light pollution, as indicated by discussion threads on community blogs and coverage of the issue by local news media. (See Appendix A.)

IDA'S CONCERNS ABOUT THE ANTICIPATED RFP

DDOT's RFP for a streetlight contract was first issued in August 2011, more than three years ago. It should be revised to reflect advances in lighting technology, current best practices within the industry, and new scientific understanding of the impact on human health of artificial light – especially the sort of blue-rich light emitted by LEDs.

Moreover, the RFP must be revised to comply with the Environmentally Preferable Purchasing Policy promulgated by the D.C. Office of Contracting and Procurement. That policy requires contract specifications – to the "*maximum extent possible and feasible*" – to "have a lesser or reduced effect on human health and the environment."[2] (Emphasis added.)

Revision of the RFP specifications should incorporate three objectives:

I. FULLY SHIELDED LIGHT FIXTURES

The worst street lighting, from the perspective of light pollution, is caused by light fixtures that needlessly emit light upward into the sky. For that reason, fully shielded fixtures, which block light from escaping above the light source, have been the gold standard for controlling light pollution for more than a decade.

Properly shielded fixtures (also called full-cutoff fixtures) also reduce glare, which can range from unpleasant to debilitating. Glare impairs the vision of pedestrians and motorists alike and makes it more difficult for police officers to monitor public space for criminal activity. In 2012, the American Medical Association's Council on Science and Public

Health called for all future streetlights to incorporate fully shielded or similar non-glare design to improve roadway safety, especially for vision-impaired and older drivers.[3]

DDOT's contract RFP should specify full-cutoff streetlight fixtures as the only acceptable design in the District of Columbia.

This objective requires an urgent reassessment of the Washington Globe streetlight fixture. Seemingly ubiquitous in the District, the Washington Globe is a deliberately anachronistic design that sheds light indiscriminately, wasting energy, causing blinding glare, and adding significantly to sky glow that obscures the stars.

The Washington Globe design is so problematic that a consulting team headed by researchers at Carnegie Mellon University advised the city of Pittsburgh to eliminate such fixtures before embarking on an LED conversion project. The researchers noted that Minneapolis had banned such fixtures. (See Appendix B.)

Short of a moratorium on Washington Globe fixtures, their worst qualities may be partially mitigated by recent advances in LED technology. These include semi-cutoff versions of the design and internal reflectors that direct illumination downward. LED arrays of 40 watts or less should be specified, with supplemental full-cutoff fixtures mounted above the Washington Globes if necessary to meet standards established by the American Association of State Highway and Transportation Officials.

II. LOWEST LIGHT LEVELS CONSISTENT WITH AASHTO SAFETY STANDARDS

Light levels on the District's roadways are determined according to "average maintained illuminance levels" recommended by the American Association of State Highway and Transportation Officials.[4] The AASHTO standards represent light levels sufficient to meet safety needs, considering such factors as land use (residential or commercial), traffic volume, and the reflective properties of different pavements.

In practice, because the AASHTO standards do not specify *maximum* light levels, DDOT often exceeds the recommended average levels. Moreover, DDOT's Streetlight Policy and Design Guidelines give DDOT unilateral authority to exempt so-called "special areas" from the AASHTO standards. There is no limit on the size and number of exempted areas, which can include "Monumental Core Areas," all nine of the city's Business Improvement Districts, and 55 "Gateways of the City."[5]

DDOT's approach to the AASHTO standards ignores the environmental hazard of light pollution and floods District streets with excessive light far beyond what AASHTO recommends for safety.

Compliance with OCP's Environmentally Preferable Purchasing Policy requires DDOT's RFP to specify that the AASHTO standards apply everywhere within the District of Columbia and are *targets* for light levels, not minimums or "thresholds."

To meet AASHTO standards at any given location, where numerous variables exist, it is simply unacceptable to estimate the amount of light needed or to rely on folkloric tradition within the engineering profession. Instead, current best practices require the use of standard photometric software, such as AGi32, to determine AASHTO-compliant lighting design on a street-by-street or block-by-block basis. The amount of light initially emitted by LED lamps should not exceed recommended AASHTO levels by more than 30 percent to account for light-loss depreciation over time.

Wasteful, unnecessary light should be further reduced by requiring that all LED luminaires have the ability for individual remote control, either by radio frequency (e.g., Wi-Fi) or hard-wired systems. This will allow time-management systems to dim or extinguish streetlights when they are not needed in selected locations, an additional energy savings.

III. WARM-HUED LED LIGHTS WITH COLOR CORRELATED TEMPERATURES NO GREATER THAN 3000º KELVIN.

LED streetlights produce more light output in the blue portion of the light spectrum compared to older incandescent and high-pressure-sodium streetlights, which tend to be "warmer." Blue light causes more glare – a particular problem for older people – and increases sky glow compared to high-pressure-sodium lights.

Even more disturbing, exposure to artificial light at night, particularly blue light, suppresses the production of the hormone melatonin, which mediates the sleep-wake cycle in humans. Chronic disruption of the circadian cycle has the potential to yield serious long-term health consequences.[6] (A detailed discussion of problems associated with blue-rich light is in the International Dark-Sky Association's monograph *Seeing Blue*. See Appendix C.)

Based on multiple research studies, the AMA's Council on Science and Public Health has stated that even low levels of blue-spectrum light

disrupt melatonin production. Primary concerns with nighttime lighting, according to the AMA, are "disability glare" (a hazard for drivers and pedestrians) and "potential carcinogenic effects related to melatonin suppression, especially breast cancer."[7]

While the AMA's concern focused primarily on nighttime shift workers, the scientific findings have important implications for all residents of a city bathed in blue-rich LED light every night. And research published since the AMA statement was issued in 2012 has shown more evidence of the adverse health effects of nighttime exposure to blue-rich light.[8]

To mitigate the harmful effects of blue-rich light, DDOT's RFP should specify LED streetlights in warmer hues that produce less radiation in the blue portion of the light spectrum. The International Dark-Sky Association's current recommendation is that LED lights have a color-correlated temperature no greater than 3000º Kelvin.

Revising DDOT's RFP to achieve these three objectives will comply with the OCP's Environmentally Preferable Purchasing Policy and ensure that LED streetlights play a positive role in the life of District residents without exacerbating light pollution.

The Sustainable DC Plan envisions the District of Columbia as "the healthiest, greenest, and most livable city in the United States" and a "model of innovative practices and policies" that improve quality of life.[9] Residents of the District should expect no less of DDOT's streetlight-upgrade project.

I look forward to meeting with you and DDOT staff at your earliest convenience to discuss how we can work together to achieve these objectives.

Sincerely,

Jim Dougherty

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202-488-1140

cc: Jama Abdi
Mayor Muriel Bowser

Chairman Phil Mendelson
Councilmember Elissa Silverman
Councilmember Anita Bonds
Councilmember David Grosso
Councilmember Vincent Orange
Councilmember Brianne Nadeau
Councilmember Charles Allen
Councilmember Kenyan McDuffie
Councilmember Jack Evans
Councilmember Mary M. Cheh
Councilmember Yvette Alexander

[1] District of Columbia Comprehensive Plan, Vol. 1, Chap. 6, p. 41.

[2] OCP Directive No. 7000.00 (Jan. 1, 2015). The policy was promulgated pursuant to D.C. Official Code §§2-352.04 and 2-361.01, and Mayor's Order 2009-60.

[3] *Light Pollution: Adverse Health Effects of Nighttime Lighting,* American Medical Association, Proceedings of the 2012 Annual Meeting of the House of Delegates, p 273, https://download.ama-assn.org/resources/doc/hod/x-pub/a12-csaph-reports.pdf

[4] District of Columbia Streetlight Policy and Design Guidelines, D.C. Department of Transportation, February 2013, Section 4.1, p. 27.

[5] Ibid., Section 4.3, p. 30.

[6] *Breast cancer and circadian disruption from electric lighting in the modern world* CA: A Cancer Journal for Clinicians, Vol. 64, Issue 3, pp. 207–218, May/June 2014, http://onlinelibrary.wiley.com/doi/10.3322/caac.21218/full

[7] *Light Pollution: Adverse Health Effects of Nighttime Lighting*, American Medical Association, REPORT 4 OF THE COUNCIL ON SCIENCE AND PUBLIC HEALTH (A-12) (SUMMARY) (2012) https://download.ama-assn.org/resources/doc/csaph/x-pub/a12-csaph4-lightpollution-summary.pdf

[8] *Evening use of light-emitting eReaders negatively affects sleep, circadian timing, and next-morning alertness,* Proceedings of the National Academy of Sciences, Dec. 22, 2014, http://www.pnas.org/content/early/2014/12/18/1418490112.abstract?sid=53c1e608-7a2e-4631-ba59-1635d5b5f222

[9] Sustainable DC Plan, p. 5.

APPENDIX

LIGHT POLLUTION IN THE MEDIA

"Blacking Out Blinding Lights," Prince of Petworth blog discussion thread Feb. 19, 2014, http://www.popville.com/?s=street+light+BLARE&submit=Search (Original poster complains that "street lights BLARE into the windows all night long" (with photo of Washington Globe streetlight fixture).)

"Chevy Chase debates LED streetlights," The Northwest Current, Jan. 22, 2014, p.1, http://www.currentnewspapers.com/archiveweek.php?n=1&year=2014 (Residents complain of light shining into bedroom windows.)

"Tuesday Topics: Light Pollution," Diane Rehm Show (WAMU-FM), Sept. 3, 2013, http://thedianerehmshow.org/shows/2013-09-03/environmental-outlook-combating-light-pollution

"K Street Reconstruction Misses Key Ped and Bike Features," Greater Greater Washington blog discussion thread, June 11, 2013, http://greatergreaterwashington.org/post/19060/k-street-reconstruction-misses-key-ped-and-bike-features (Multiple commenters criticize new Washington Globe streetlight installations on K Street N.W. (e.g., "[D]id the city really install new street lamps that are pointing up instead of down? WHY?"))

PITTSBURGH, PA., STREET LIGHT STUDY

LED Street Light Research Project, Remaking Cities Institute, Pittsburgh, Pa., Sept. 2011, http://www.cmu.edu/rci/documents/led-updated-web-report.pdf

SEEING BLUE

Seeing Blue, International Dark-Sky Association, Nightscape Newsletter, Issue No. 80, Spring 2010, http://www.darksky.org/resources-54