

DATE: July 10, 2020

TO: Wyatt Shields, City Manager

CC: Zak Bradley, Interim Director of Public Works; Paul Stoddard, Director of Planning; Cindy Mester, Deputy City Manager

FROM: Andrew Young, Chair, Environmental Sustainability Council; Tim Stevens, Chair, Energy Transition Subcommittee

SUBJECT: LED Streetlight Replacement CIP Project

The City's latest Capital Improvement Plan includes funds to convert all streetlights and park lighting to LED technology. The Environmental Sustainability Council's (ESC) Energy Technology Subcommittee (ETS) submitted a letter to the City Council advocating for this investment decision and the adoption of a public input process for decisions on such factors as style, cost, color, and ability to reduce light pollution. Their recommendation for such a process was supported by City Council members at their meeting on June 8th and committed to by the City Manager.

In support of the City Council's request, we have reviewed the plans presented to ESC in the context of energy efficiency, light pollution, and prudent investing. The ESC would like to raise two issues, which are expanded upon in the remainder of this letter:

1. The plan calls for park lighting to be replaced with "Basic Acorn"-style LED luminaires. We infer from spreadsheets provided by DPW that these have a higher monthly service cost and energy usage than the LED replacements for the "Colonial Cutoff" style that is currently installed in, for example, Cherry Hill Park. They also send more than half their light upward ("uplight," above the horizontal), adversely affecting neighborhood and atmospheric light pollution as well as affecting wildlife such as birds, fireflies and other insects. Selecting the Colonial Cutoff style would eliminate uplight in parks and cut project-wide uplight by at least 65%. It would also save an estimated \$2,400 per year.
2. With roughly 1000 luminaires to be replaced, the plan calls for distinguishing portions along the 'Great Streets' by selecting a "premium" style ("Cutoff Acorn") for up to 100 fixtures. While this would apparently cut the project's aggregate uplight slightly (< 8%), we infer from the data provided that indicate it would increase the project's simple payback period from 3.4 years to about 6 years. This is due to higher upfront and monthly service costs of this subset of lights. While the City may value this aesthetic differentiation along the Great Streets enough to pay an extra \$15k/yr, the ESC hereby expresses its sense that the minimal reduction in uplighting should not be assigned any significant value in that decision process.

The ESC and ETS are grateful to City staff for their presentations and prompt responses to us on this topic and look forward to supporting City staff with additional input as appropriate.

Andrew Young
Chair, Environmental Sustainability Council

Tim Stevens
Chair, ESC Energy Transition Subcommittee

Supporting Analysis & Discussion:

At the May 2020 ESC meeting, Zak Bradley (DPW) presented the City’s plan for replacing streetlights with LEDs. He presented a table showing the style of fixtures planned for 4 different location types. Based on email discussions with DPW and review of the spreadsheet he presented, the approximate quantities of these lights are:

Style	Location	Qty
Cobra Shoebox	Corridors	183
Basic Acorn	Parks	213
Carlyle Acorn	Residential & Great Streets (non-premium)	~522
Cutoff Acorn	Great Streets premium	~100

In the May meeting, ESC members asked about dark-sky issues. The Cutoff Acorn and the Shoebox designs have zero uplight (rays above horizontal). The next table shows the approximate contribution of total lumens from each style. The Basic Acorn sends over 50% of its lumens above the horizon.

Style	Location	Uplight %	Qty	Million lumens, aggregate	% of total lumens
Cobra Shoebox	Corridors	0%	183	2.77	40.5 %
Basic Acorn	Parks	53.0%	213	1.70	24.9%
Carlyle Acorn	Residential & Great Streets (non-premium)	20.4 %	522 to 622	1.86 to 2.36	27.3 to 34.6 %
Cutoff Acorn	Great Streets (premium)	0%	0 to 100	0 to 0.5	0 to 7.3 %
Total		n/a	1018	6.84	100 %

Since about 25% of total planned lumens would be from Basic Acorns, they alone would send about 13% of City-wide LED lumens above the horizon. Likewise, Carlyle Acorns will send up 5.5% (20.4% uplight * 27.3% of total lumens) to 7.1%. So, in the baseline plan, about 20% of total new LED lumens would be sent above the horizon.

Issues:

1. The Basic Acorn planned for the parks appears to be a 8494-lumen fixture. But 53% of that shines above the horizontal, lighting leaves and sky during summer and the surroundings and sky in winter. Thus, only 3992 lumens are below the horizontal. This fixture’s high lumen rating puts it in Billing Tier 3. Cherry Hill Park seems to have Colonial Cutoffs currently, with some already replaced with Colonial Cutoff LEDs.

An LED Colonial Cutoff emitting 3656 lumens (all below the horizon) is Billing Tier 2 and costs \$0.94/month less than a Basic Acorn. So using Colonial Cutoffs instead of Basic Acorns would save \$11.28/yr/fixture, or \$2.4k/yr assuming 213 fixtures; it would match the style currently in the parks; and it would eliminate at least 65% of the uplighting that is in the latest plan.

An LED Cutoff Colonial with 7124 lumens would be Billing Tier 3, cost the same as a Basic Acorn, and again eliminate the uplighting.

2. The spreadsheet Zak presented showed a 3.4-yr simple payback period, but that assumed no Cutoff Acorns (a Premium style). Per fixture, a Cutoff Acorn costs \$295.57 more than a Carlyle Acorn. So, 100 will cost \$29.6k more. Their monthly cost is also \$11.80 - \$12.71 more than the Carlyle Acorn. This amounts to an extra \$14.2k to \$15.3k per year, every year for the life of the fixtures. Installing 100 Cutoff Acorns will lengthen the overall payback period to about 6 years. Over 10 years, the present value of those extra monthly payments is roughly \$125k (more if they last longer), plus the \$30k extra up-front.

Cameron Gahres (City staff) reported that the rationale for Cutoff Acorns "...Partly [is] flourish of design aesthetic, these are streets we're trying to celebrate and distinguish from other residential streets. They also are Dark Sky Compliant which is not a City requirement but has been recommended."

Our question is whether the extra at-least-\$155k present-value commitment is justified by these benefits.