LED LIGHTING NEIGHBORHOOD STUDY

Saint Paul Public Works

October 2017

LED LIGHTING NEIGHBORHOOD STUDY TABLE OF CONTENTS

LED STUDY EXECUTIVE SUMMARY

The City of Saint Paul has over 37,000 lights that help illuminate public spaces. The vast majority of the City's current fixtures, approximately 31,500, have a lighting system that utilizes High Pressure Sodium (HPS) fixture lightbulbs. However, the City has begun transitioning its lighting fixtures to systems that make use of Light Emitting Diode (LED) bulbs.

LED lights require 50% less energy which is a significant step in reducing the City's carbon footprint. LED bulbs last longer (10 years or more in some cases), meaning less maintenance over time. Unlike other bulbs, LED bulbs do not contain mercury, so there are fewer concerns about disposal. The longer lifecycle for LED bulbs also means less waste going into landfills.

In the summer of 2016, Public Works undertook a project in the Lexington-Hamline neighborhood to refurbish old style lantern fixtures that were in need of repair. As was the protocol, Public Works transitioned these fixtures to LED lighting. This transition led to complaints from the neighborhood.

Based on this response from the community and the recognition that the technology around LED lighting was rapidly changing to allow for more options that would work with the City's lighting infrastructure, Public Works decided to conduct a study of LED lighting in residential neighborhoods to determine which LED lighting systems would work in our light fixtures and which characteristics of LED lighting systems would be better received by residents.

This report details the study, the resulting resident feedback, and outlines Public Works' anticipated direction moving forward.

STUDY GOALS

Public Works convened a team of staff members from the Traffic Engineering, Traffic Operations, and Resident & Employee Services divisions to develop and conduct the study.

The Public Works team identified the primary goal of the study as the identification of resident preferred LED characteristics to assist in the writing of performance specs for Requests for Proposals (RFPs) in the future.

A secondary goal was to evaluate the performance, in the City's existing lighting infrastructure, of different LED system technology from a variety of manufacturers. The study was conducted with a clear statement to manufacturers that the results would lead to the issuance of an RFP and did not guarantee the City's future use of their products.

NEIGHBORHOOD SELECTION

It was determined that the City would seek resident feedback on a variety of characteristics in two different lantern fixtures common to the City's residential areas. The fixtures included older, lantern-style fixtures that needed to be refurbished and newer lantern-style fixtures that were being installed during street reconstruction (SPS) projects.

Neighborhoods for the study were selected based on the availability of these fixtures over multiple blocks and a general topography of the study area that would lead to a consistent experience of lighting in the adjacent houses.

In the end, three neighborhoods were selected for study areas:

- **Lexington-Hamline Neighborhood.** This neighborhood contained the older, lantern-style fixtures and had generated more feedback on the transition to LED. The neighborhood is centrally located within the City.

- **Payne-Phalen Neighborhood.** This neighborhood had the newer fixtures recently installed and was located on the East side of the City, allowing for easier access to residents on that side of the City.

- **Hamline-Midway Neighborhood.** This neighborhood had newer fixtures recently installed. The neighborhood is centrally located and north of the Lexington-Hamline neighborhood.

BULB SELECTION

The study team discussed the advantages and disadvantages of the different lighting systems to be tested. The team talked about the lighting systems as "bulbs" since this term would be more easily understood by neighborhood residents and made for an easy way to identify the different systems.

Since the color temperature, Kelvin (K), had been raised as an issue from the neighborhood, the team wanted to test bulbs at the current 4000°K level as well as a lower 3000°K level in order to determine if there was a perceptible difference to residents and what resident preference would be among the tested options.

Eight bulbs were selected to test in the Lexington-Hamline Neighborhood which contained the older lantern-style fixtures. Six bulbs were selected to test in the Payne-Phalen and Hamline-Midway neighborhoods, both neighborhoods having the newer fixtures.

SURVEY

Residents were asked to fill out a survey providing their feedback on a number of different factors related to the test bulbs including: Brightness of light; Evenness of light; Glare; Perception of colors in the light; Overall like/dislike of each test bulb.

The survey was provided in both paper and online versions (via the City's Open Saint Paul forum for civic engagement).

COMMUNITY OUTREACH

Public Works employed a number of outreach tools to encourage participation in the study including direct mail; communication with the City's 17 district councils; communications with the City's elected officials; neighborhood meetings; Facebook posts; and outreach to the local press.

Because the Lexington-Hamline neighborhood had the largest number of residents who had a strong reaction to the installation of LED bulbs in the older-style historic lanterns, Public Works staff met with representatives of the Lexington-Hamline neighborhood association early to discuss the study and its design. Lexington-Hamline residents provided feedback on the study design and the survey questions prior to making the study and the survey questions public.

CONCLUSIONS AND NEXT STEPS

LEXINGTON-HAMLINE NEIGHBORHOOD

It is clear from the data collected for the bulbs in the Lexington-Hamline neighborhood that **Bulb B (Apadana Cover Mount 3000K)** was most preferred by residents. It received the highest marks for overall preference. It also received the highest marks for overall comfort, color likeability, ability to differentiate colors, and feelings of safe navigation. The survey information was backed up by neighborhood comments which indicated a preference for the downward direction of the light and the "warmer" color of Bulb B. **Bulb H (Phillips Corncob 3000K)** was ranked second in terms of preference.

Bulbs A (Silvermere Corncob 4000K) and E (Apadana Light Emitter 4000K) were least preferred overall and in several of the survey categories. Residents felt strongly that these bulbs were too bright and glaring.

After reviewing this data, the staff team determined that a request for proposals should be drafted to develop a lighting system for the older, lantern style fixtures that incorporates the key characteristics of Bulb B – a top mounted system with the warmth of 3000K.

Bulbs on the test blocks will be switched over to this new system when it becomes available through the RFP process, likely sometime in early to mid-2018.

HAMLINE-MIDWAY AND PAYNE-PHALEN NEIGHBORHOODS

Many fewer residents provided feedback on the bulbs in the Hamline-Midway and Payne-Phalen neighborhoods and therefore the data collected is much less definitive than in the Lexington-Hamline neighborhood.

This difference in response could be due to differences in the two styles of fixtures. The light fixtures in Hamline-Midway and Payne-Phalen are newer fixtures that were specifically designed for an electric light bulb, while the older, lantern style fixtures in Lexington-Hamline are not. This means that in the newer fixtures the light is dispersed much more efficiently to areas that are to be lit.

It appears that **Bulb 5 (Phillips Corncob 3000K)** received the most positive responses for overall comfort, color, glare, navigation and brightness. **Bulb 3 (Apadana Light Emitter 3000K)** received similarly high marks in most of these areas.

Bulb 6 (Phillips Corncob 4000K) and **Bulb 1 (Halophane Cover Mount 4000K)** were least preferred overall and in most categories.

After reviewing the data and comments from neighbors, it was determined that Bulb 5 (Phillips Corncob 3000K) was preferred in the neighborhoods with replacement fixtures. Since Bulb 5 and similar 3000K corncob designed bulbs are readily available off-the-shelf, an RFP would not be required to acquire these bulbs.

Bulbs on the test blocks in these two areas will be reinstalled with 3000K corncob style bulbs and the City will use 3000K corncob style bulbs in new fixture installations.

The City of Saint Paul has made a commitment to installing LED lighting systems because of their environmental and economic benefits to our residents. Public Works is continuing to monitor this changing technology and will continue to employ best practices as they relate to the installation of lighting throughout the City.

LED STUDY REPORT

BACKGROUND

The City of Saint Paul has over 37,000 lights that help illuminate public spaces. Lighting fixtures include overhang, globe, and decorative lantern style lights.

The vast majority of the City's current fixtures, approximately 31,500, have a lighting system that utilizes High Pressure Sodium (HPS) fixture lightbulbs. However, the City has begun transitioning its lighting fixtures to systems that make use of Light Emitting Diode (LED) bulbs.

LED use in the United States has grown exponentially over the past few years. Local, County, State and Federal agencies across the country have been transitioning to LED lights at higher rates as the technology becomes less expensive and the environmental benefits become more apparent.

LED lights require 50% less energy which is a significant step in reducing the City's carbon footprint. LED bulbs last longer (10 years or more in some cases), meaning less maintenance over time. Unlike other bulbs, LED bulbs do not contain mercury, so there are fewer concerns about disposal. The longer lifecycle for LED bulbs also means less waste going into landfills.

Public Works began installing LED lights in 2008 when initial interest was raised by residents after hearing about similar conversion projects in Anchorage Alaska; Ann Arbor, Michigan; and Austin Texas. In July of that year, Public Works conducted a test of energy efficient lighting in a residential area. They installed LED lighting on Iowa Avenue between Chatsworth and Milton and Induction Lamp lighting on Iowa between Milton and Victoria. They requested that residents in the area provide feedback on the different lighting sources by comparison to the HPS lights on the rest of Iowa Avenue. While there were minor differences in the subjective criteria rated by residents, they were not significant enough to rule out the use of any particular lighting style.

Following that study, with the assistance of federal stimulus funds, Public Works began installing LED lighting in downtown globes. Globes were chosen because the technology had developed to a point where Public Works felt that LEDs worked well enough to replace HPS. Globe areas are typically pedestrian level lighting that is often lit at a different (higher) standard than what would be required for the street and also often augmented with roadway lighting.

A second rollout of LED bulbs occurred along the City's high speed arterial streets. These streets were chosen for the quick return on investment. Because of the added measures needed to work along the high speed arterial areas, the maintenance costs are typically higher.

Public Works then began installing LEDs in our residential neighborhoods. The first group of installations was on residential streets where the lighting was being completely reconstructed.

These areas were selected because the only cost recovery necessary was the difference between the cost of HSP and LED bulbs, which dramatically increased the City's return on investment.

The old style lanterns in residential areas were the next to be converted. These areas were selected solely based on our infrastructure repair program. Areas of old style fixtures were identified that were in desperate need of repair and put on a priority list based on this need. Public Works found that LED bulbs at 4000° Kelvin closely matched the lighting of the HPS in those areas for light level delivered to the ground. It was decided that one of the most cost effective times to make the transition to LED lighting was during the refurbishing the old style lantern fixtures.

The transition to LED lighting in the residential setting began to spark commentary and concern from some Saint Paul residents. Until the fall of 2016, the City had received minimal commentary on the transition to LED lighting other than a few contacts with residents who had questions about the transition and had expressed some dislike for the appearance/color of the lights and voiced concern about light proliferation. The few complaints about directionality of the new bulbs had been addressed on an individual basis with light shields.

In the summer of 2016, Public Works undertook a project in the Lexington-Hamline neighborhood to refurbish old style lantern fixtures that were in need of repair. As was the protocol, Public Works transitioned these fixtures to LED lighting. This transition led to more complaints from the neighborhood.

Lexington-Hamline residents expressed concern about the intensity, glare, color of the light, loss of charm or warm glow of the HPS bulbs, direction of the light, dark sky/light proliferation; and the American Medical Association (AMA) advisory on LED bulbs. The concerns culminated in a neighborhood meeting that was held in late November where residents expressed their frustrations with the transition and indicated to the City that new LED lighting was significantly impacting their quality of life.

Based on this response from the community and the recognition that the technology around LED lighting was rapidly changing to allow for more options that would work with the City's lighting infrastructure, Public Works decided to conduct a study of LED lighting in residential neighborhoods to determine which LED lighting systems would work in our light fixtures and which characteristics of LED lighting systems would be better received by residents.

This report details that study, the resulting neighborhood feedback, and outlines Public Works' anticipated direction moving forward.

STUDY METHODOLOGY

STUDY GOALS

Public Works convened a team of staff members from the Traffic Engineering, Traffic Operations, and Resident & Employee Services divisions to develop and conduct the study.

The Public Works team identified the primary goal of the study as the identification of resident preferred LED characteristics and technology to assist in the writing of performance specs for Requests for Proposals (RFPs) in the future.

A secondary goal was to evaluate the performance, in the City's existing lighting infrastructure, of different LED system technology from a variety of manufacturers. The study was conducted with a clear statement to manufacturers that the results would lead to the issuance of an RFP and did not guarantee the City's future use of their products.

NEIGHBORHOOD SELECTION

It was determined that the City would seek resident feedback on a variety of characteristics in two different lighting fixtures common to the City's residential areas. The fixtures included older, lantern-style fixtures that needed to be refurbished and newer lantern-style fixtures that were being installed during street reconstruction (SPS) projects. It appeared that the City was receiving more complaints and feedback on the older, lantern-style fixtures, perhaps related to the glass faces of the older fixtures which were clear, as opposed to the newer fixtures that had a beveled glass face.

Neighborhoods for the study were selected based on the availability of these fixtures over multiple blocks and a general topography of the study area that would lead to a consistent experience of lighting in the adjacent houses. Initially, the study team thought it would be best to have a linear study area with HSP bulbs used as a test buffer between blocks. However, as neighborhoods were evaluated for suitability for the study, it was determined that a more compact area would create an easier environment for residents to view and evaluate the bulbs. General topography related to adjacent housing was also considered in selecting the study areas. The team made an effort to select neighborhoods in different parts of the City to make it easier for residents from across the City to participate.

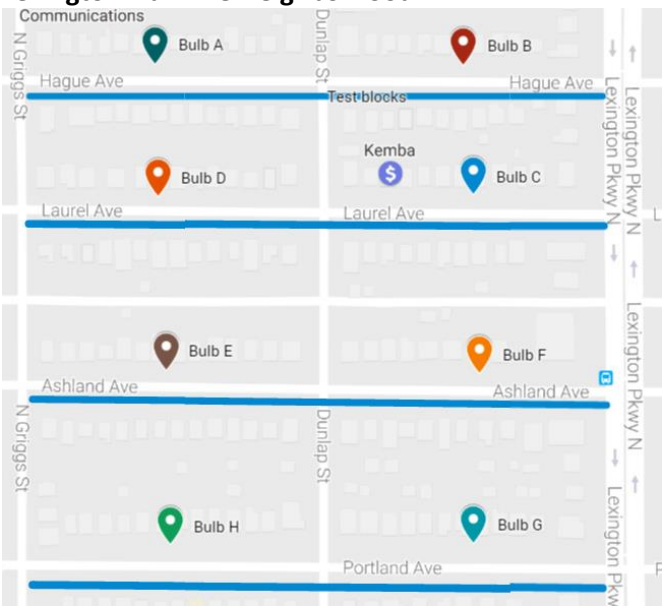
In the end, three neighborhoods were selected for study areas (maps on following page):

- **Lexington-Hamline Neighborhood.** This neighborhood contained the older, lantern-style fixtures and had generated more feedback on the transition to LED. The neighborhood is centrally located within the City.

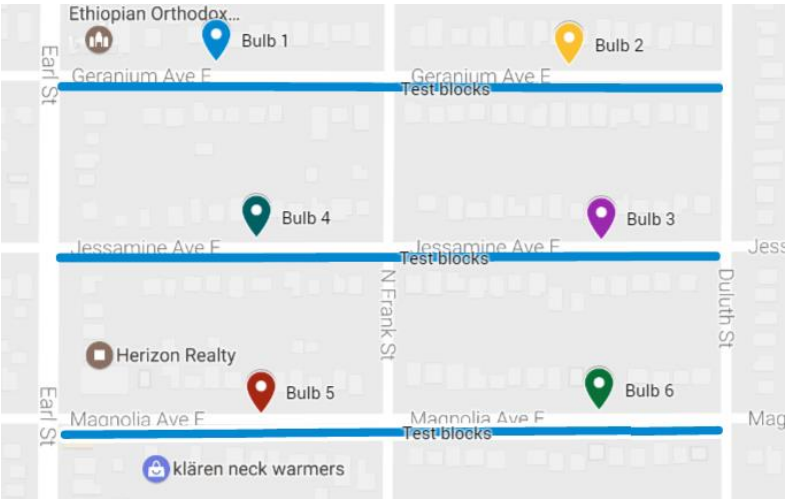
- **Payne-Phalen Neighborhood.** This neighborhood had the newer fixtures recently installed and was located on the East side of the City, allowing for easier access to residents on that side of the City.

- **Hamline-Midway Neighborhood.** This neighborhood had newer fixtures recently installed. The neighborhood is centrally located and north of the Lexington-Hamline neighborhood.

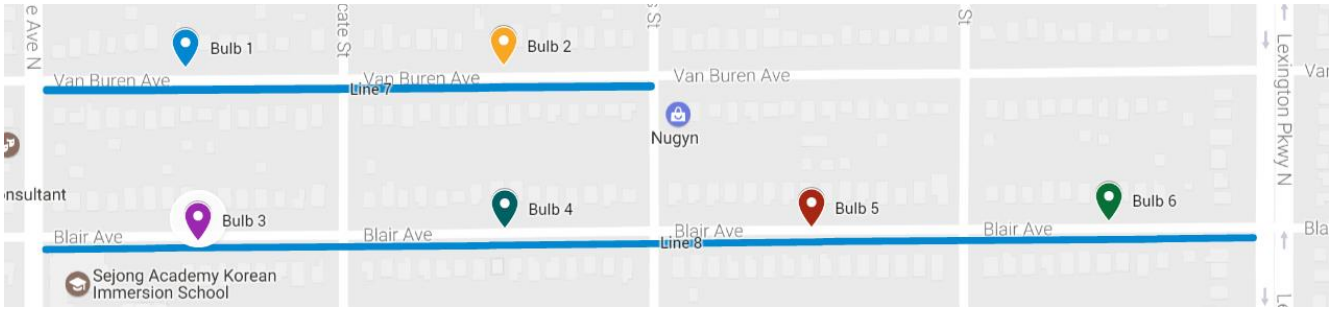
Lexington-Hamline Neighborhood



Payne-Phalen Neighborhood



Hamline-Midway Neighborhood



BULB SELECTION

The study team discussed the advantages and disadvantages of the different bulbs to be tested. The team talked about the lighting systems as “bulbs” since this term would be more easily understood by neighborhood residents and made for an easy way to identify the different systems.

Since the color temperature, Kelvin (K), had been raised as an issue from the neighborhood, the team wanted to test bulbs at the current 4000°K level as well as a lower 3000°K level in order to determine if there was a perceptible difference to residents and if there was any significant loss in efficiency at the lower temperature level.

The Traffic Operations and Traffic Engineering staff had also been approached by a number of bulb manufacturers interested in having the City test their products. There were also newer products from a few manufacturers the City had reliably worked with in the past.

Each of the bulbs selected for the study was initially tested in-house by Public Works Traffic Engineering and Traffic Operations staff to ensure that they met City standards for on-street lighting.

Eight bulbs were selected to test in the Lexington-Hamline Neighborhood which contained the older lantern-style fixtures:

A. Silvermere Corncob 4000K (Bulb in use prior to study)
B. Apadana Cover Mount 3000K
C. Apadana Cover Mount 4000K
D. Apadana Light Emitter 3000K
E. Apadana Light Emitter 4000K
F. ESI Sundance Energy Solutions Directional 3000K
G. Phillips Corncob 4000K
H. Phillips Corncob 3000K

Six bulbs were selected to test in the Payne-Phalen and Hamline-Midway neighborhoods, both neighborhoods having the newer fixtures:

1. Halophane Cover Mount 4000K (Bulb in use prior to the study)
2. Halophane Cover Mount 3000K
3. Apadana Light Emitter 3000K
4. Apadana Light Emitter 4000K
5. Phillips Corncob 3000K
6. Phillips Corncob 4000K

Each bulb was assigned either a letter (Lexington-Hamline) or a number (Payne-Phalen and Hamline-Midway) and installed on a single block within the study area. Each block was signed at both ends to indicate that the block was a study area and each sign provided the letter or number of the bulb that was installed. The signs were designed to provide residents with contact information and a link to the survey.

SURVEY

Residents were asked to fill out a survey providing their feedback on a number of different factors related to the test bulbs including:

- Brightness of light
- Evenness of light
- Glare
- Perception of colors in the light
- Overall like/dislike of each test bulb

The survey was provided in both paper and online versions (via the City's Open Saint Paul forum for civic engagement). See Exhibit A for a copy of the survey.

Residents who lived on test blocks were contacted by letter prior to the commencement of the study and were provided with a paper copy of the survey. The study team felt it was important to have feedback from residents who were living adjacent to the test bulbs, in addition to the general public, as their experience may be different than those who experience the bulbs short-term. See Exhibit B for a copy of the letter to test neighborhood residents.

Residents rated each bulb for different factors on a 10 point scale. Residents were also able to provide comments about the different bulbs.

COMMUNITY OUTREACH

Public Works employed a number of outreach tools to encourage participation in the study including direct mail; communication with the City's 17 district councils; communications with the City's elected officials; neighborhood meetings; Facebook posts; and outreach to the local press.

Because the Lexington-Hamline neighborhood had the largest number of residents who had a strong reaction to the installation of LED bulbs in the older-style historic lanterns, Public Works staff met with representatives of the Lexington-Hamline neighborhood association early to discuss the study and its design. Lexington-Hamline residents provided feedback on the study design and the survey questions prior to making the study and the survey questions public.

Households on each of the study blocks (686 households) received direct mail pieces from Public Works related to the study. A first letter, sent to the Hamline-Midway and Payne –Phalen neighborhoods (412 households) provided information about the study and invited residents to

a meeting to learn more about the project. The Lexington-Hamline neighborhood association invited residents to a meeting within their neighborhood. A second letter, sent to all households within the three study areas (686 households) provided information about the study and supplied residents with a paper copy of the survey. This letter also included information about completing the survey online. See Exhibit C for a copy of the letter to test neighborhood residents with survey included.

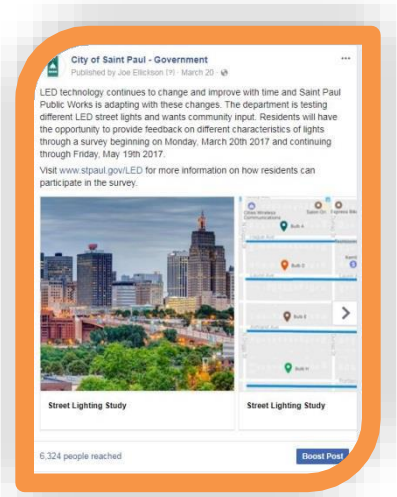
Information about the study was provided to each of the City's 17 district councils. Public Works requested that the district councils share information about the study with residents through their information channels and encourage City-wide participation in the study. See Exhibit D for email to District Councils.

Information was also provided to the Mayor's Office and the seven City Council Ward Offices. Again, it was requested that these offices share the information using their communication channels. See Exhibit E for email to the Mayor and City Council.

Public meetings were held in each of the three test neighborhoods to provide more information about the study. Nine individuals participated in the Lexington-Hamline neighborhood meeting which was advertised by the neighborhood association. Outreach was also conducted at the Annual Lexington-Hamline Spaghetti Dinner. An additional meeting was held onsite in the Lexington-Hamline study neighborhood so neighbors could observe the bulbs together and complete surveys on the spot, if desired.

Despite invitations sent to all households in the two other study neighborhoods and communication with the district councils, the meetings in the Hamline-Midway and Payne-Phalen neighborhoods were not widely attended. One resident attended the meeting in the Hamline-Midway neighborhood and two individuals participated in the Payne-Phalen neighborhood meeting.

Public Works also employed social media to encourage City residents to participate in the study. Public Works posted multiple times on Facebook and Twitter. This information was targeted to Saint Paul residents and viewed by approximately 12,216 people. See Exhibit F for screen shots of social media posts.

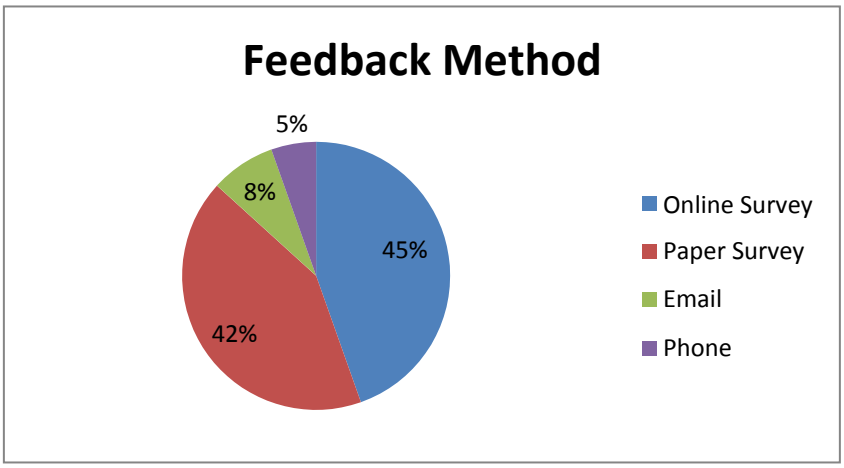


Traditional media was also employed to widely disseminate information about the study and encourage participation. Public Works issued a media advisory which garnered coverage from the two major local newspapers, the Pioneer Press and the Star Tribune. In addition, a local online media source, MinnPost, also covered the study. See Exhibit G for media advisory and Exhibit H for stories.

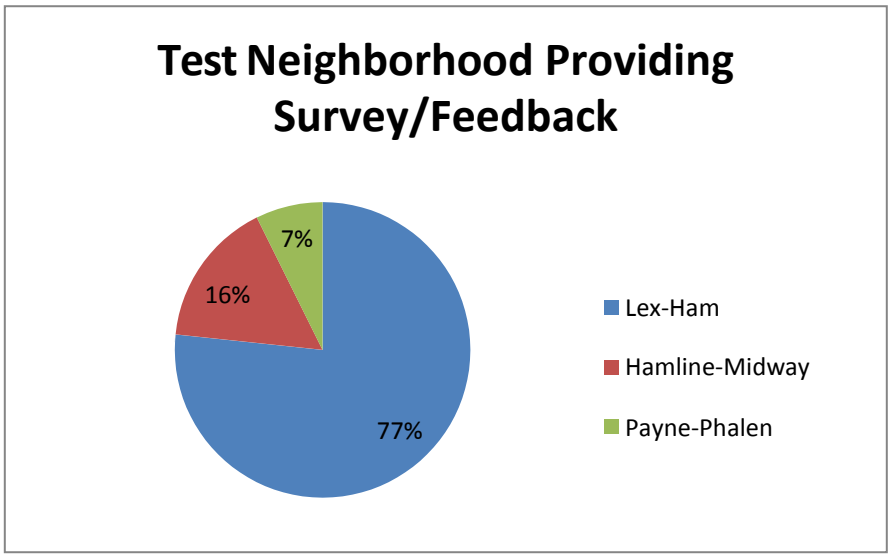
SURVEY RESULTS

PARTICIPATION

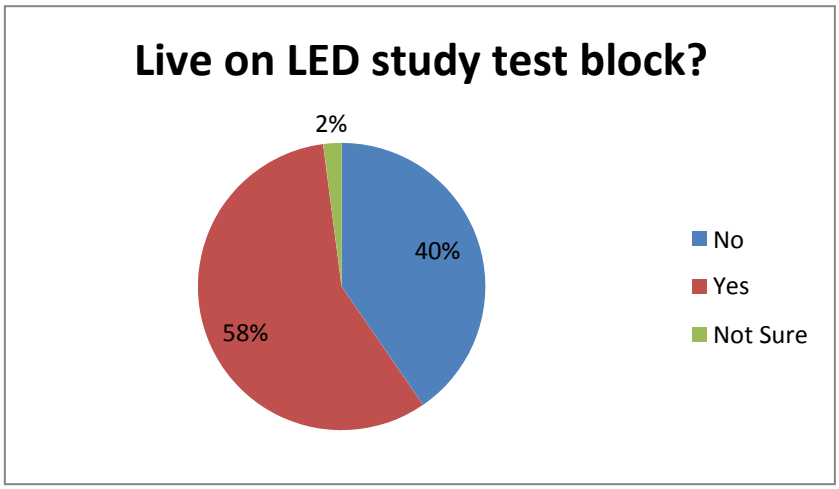
One hundred and fifteen surveys (115) were submitted by residents. The Public Works department also accepted phone calls and e-mails that included resident input. Survey responses were relatively evenly split between the online (45%) and paper (42%) versions of the survey. A smaller percentage of residents provided feedback via email (8%) and phone (5%). Most of the input provided by email and phone was not in the standard format of the study questions, but was collected through resident comments on the bulbs.



The largest number of surveys and comments were generated by the Lexington-Hamline neighborhood (77%). This was not surprising to the study team, as this neighborhood had the largest number of residents expressing concern about the transition to LED bulbs prior to the start of the study and the Lexington-Hamline District Council had worked more closely with the Public Works staff to provide outreach to residents in the neighborhood. This neighborhood also contained the older, lantern-style fixtures with the clear glass faces.



The survey also requested residents to identify if they lived on one of the LED study blocks. A slightly larger percentage of surveys were submitted by residents identifying themselves as living on study test blocks (58%) than other residents (40%) or residents who were not sure (2%). This again was not surprising to the study team, as adjacent residents had received a letter describing the study, a paper copy of the survey, and had the opportunity to observe the bulbs over the full study period.



LEXINGTON-HAMLINE NEIGHBORHOOD; BULBS A-H

The survey asked residents to rate the bulbs on a number of characteristics and to identify which bulbs they preferred most and least. The following are results from the Lexington-Hamline neighborhood. The charts reflect the number of times each response was selected for each bulb.

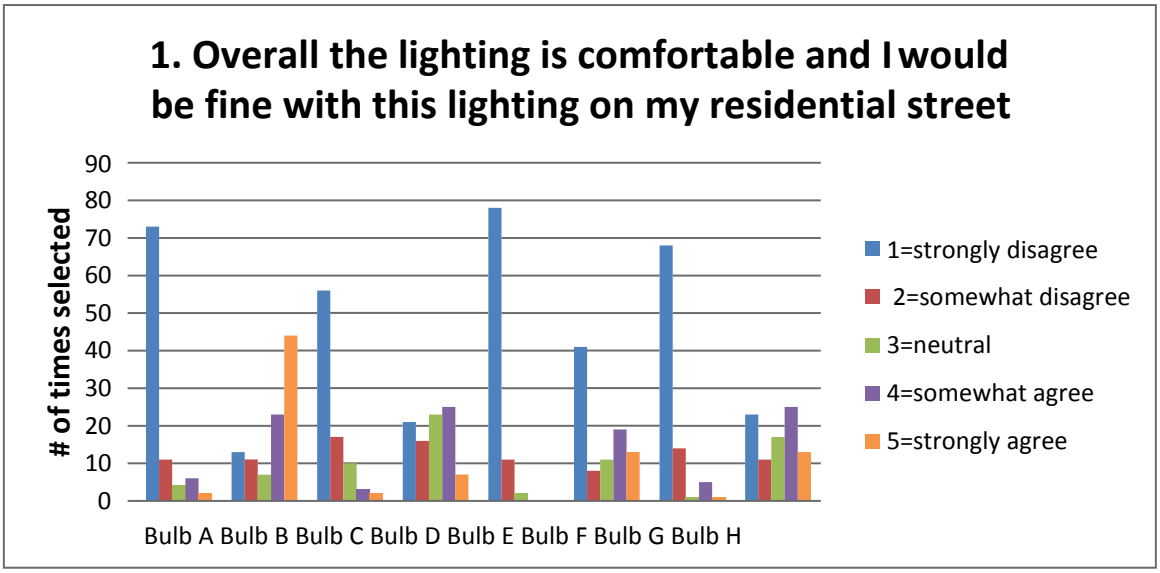


Chart 1 indicates a preference for Bulb B (Apadana Cover Mount 3000K) with the most responses agreeing that the light is comfortable. Bulb H (Phillips Corncob 3000K) was rated second with numbers agreeing and fewer numbers strongly disagreeing. People strongly disagreed with the comfort level of Bulb A (Silvermere Corncob 4000K; Bulb in use prior to study); Bulb E (Apadana Light Emitter 4000K); and Bulb G (Phillips Corncob 4000K).

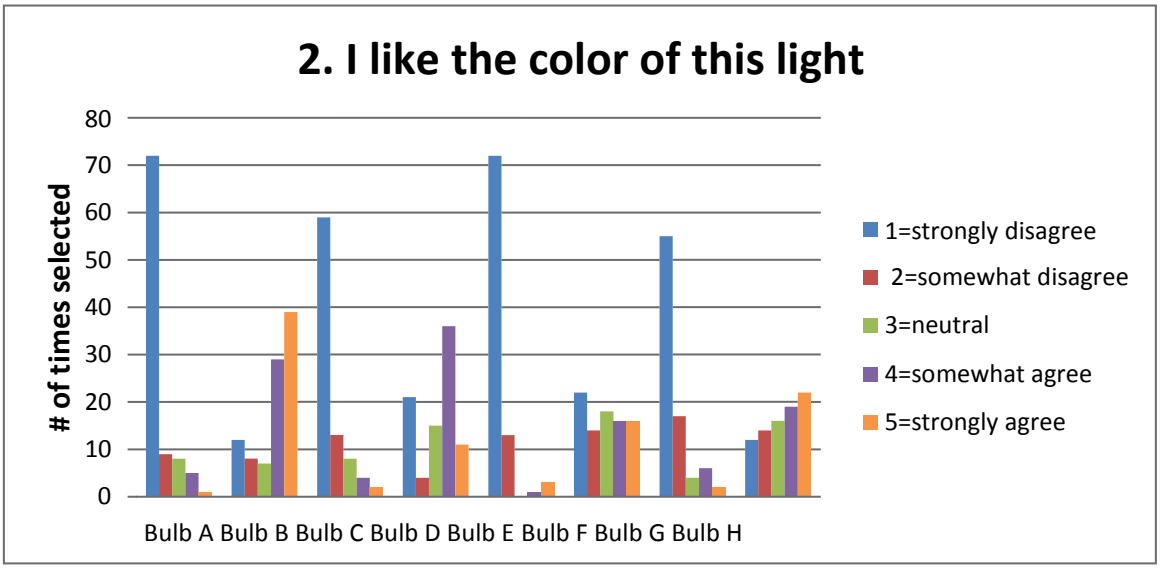


Chart 2 again indicates a preference for the color of Bulb B (Apadana Cover Mount 3000K) with a secondary preference for Bulb H (Phillips Corncob 3000K). The color of Bulb A (Silvermere Corncob 4000K) and Bulb E (Apadana Light Emitter 4000K) were least preferred.

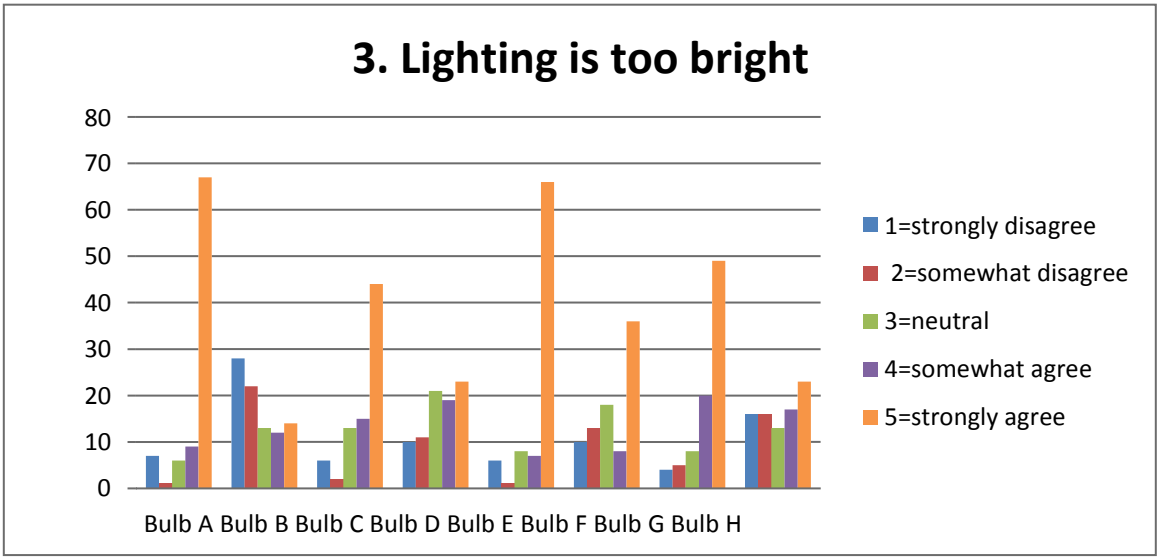


Chart 3 indicates that residents found the light from Bulb A (Silvermere Corncob 4000K) and Bulb E (Apadana Light Emitter 4000K) to be too bright. Bulb B (Apadana Cover Mount 3000K) and Bulb H (Phillips Corncob 3000K) had the most residents disagreeing with this statement.

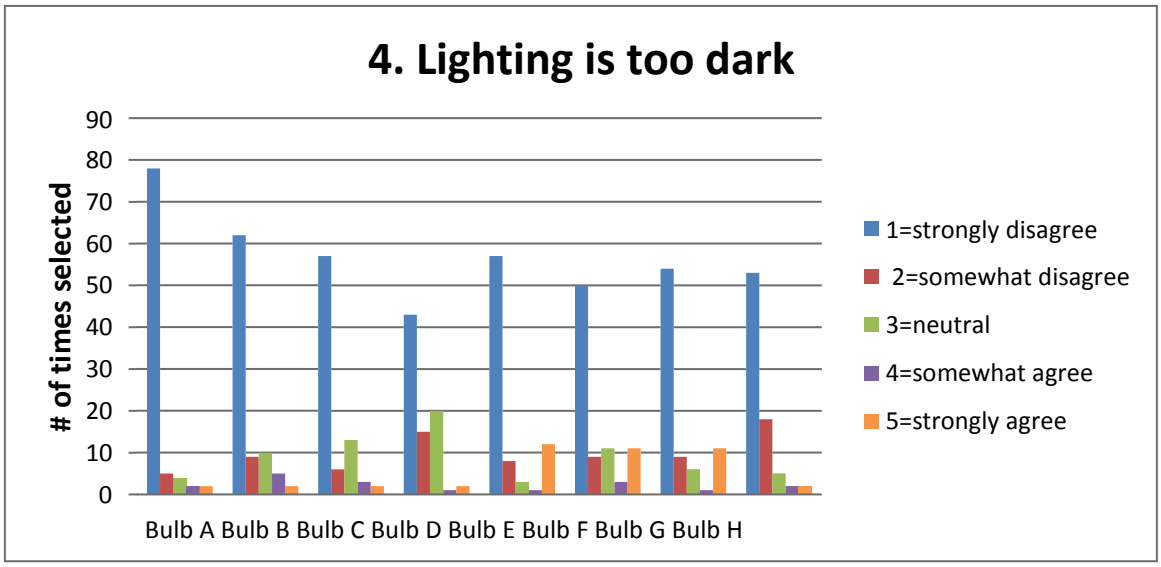


Chart 4 indicates that relatively few people felt that any of the bulbs provided lighting that was too dark.

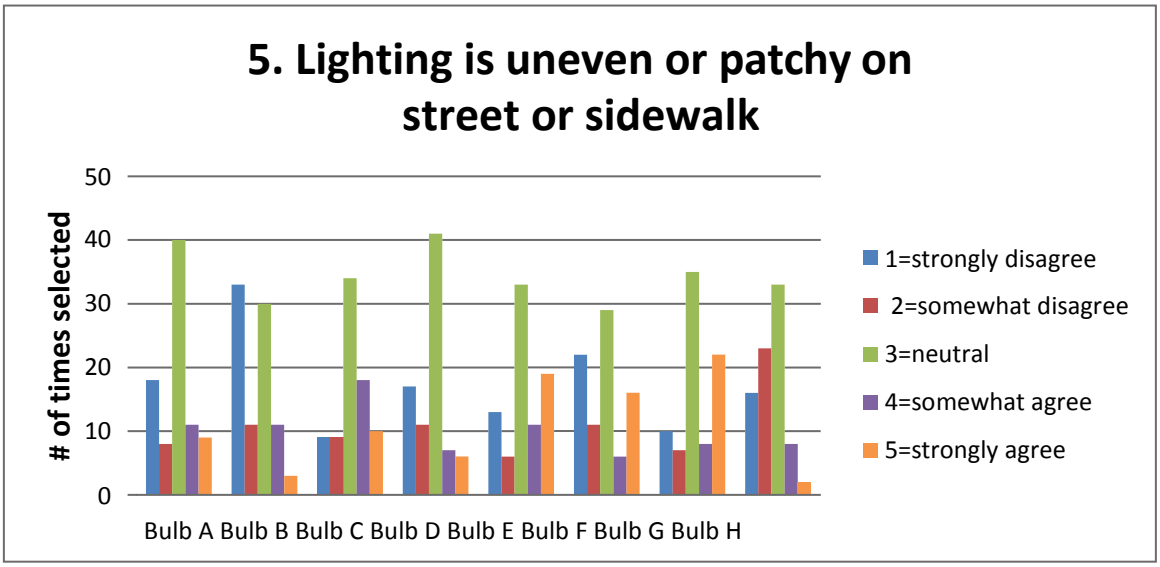


Chart 5 indicates that residents mostly felt neutral about the evenness or patchiness of the lighting across all of the bulbs. They most strongly disagreed with the unevenness or patchiness of Bulb B (Apadana Cover Mount 3000K).

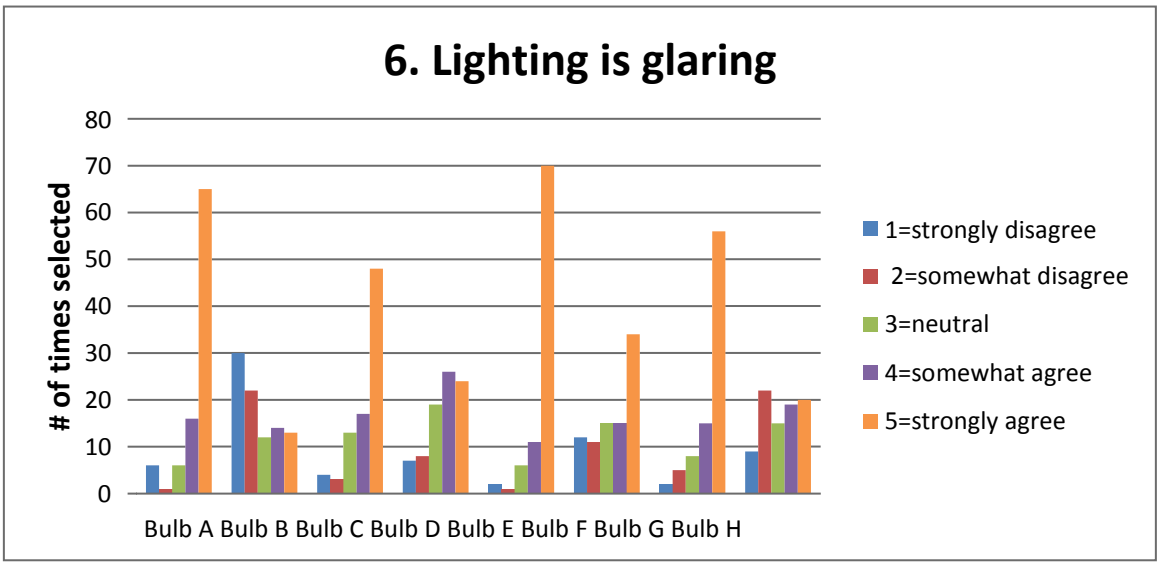


Chart 6 indicates that residents found Bulb E (Apadana Light Emitter 4000K), Bulb A (Silvermere Corncob 4000K), and Bulb G (Phillips Corncob 4000K) to be most glaring. Residents found Bulb B (Apadana Cover Mount 3000K) to be least glaring.

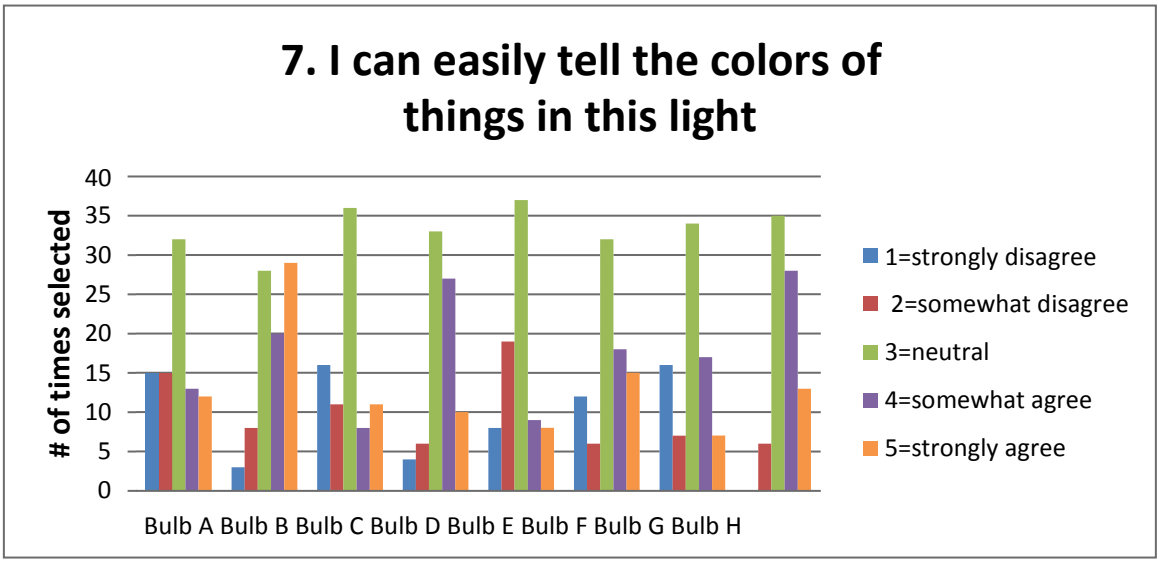


Chart 7 indicates that residents were mostly neutral about the ability to differentiate colors in the lighting from the bulbs. However, residents did indicate an agreement with the ability to see colors in the lighting from Bulb B (Apadana Cover Mount 3000K). Bulbs H (Phillips Corncob 3000K) and D (Apadana Light Emitter 3000K) also received some agreement with the ability to differentiate colors.

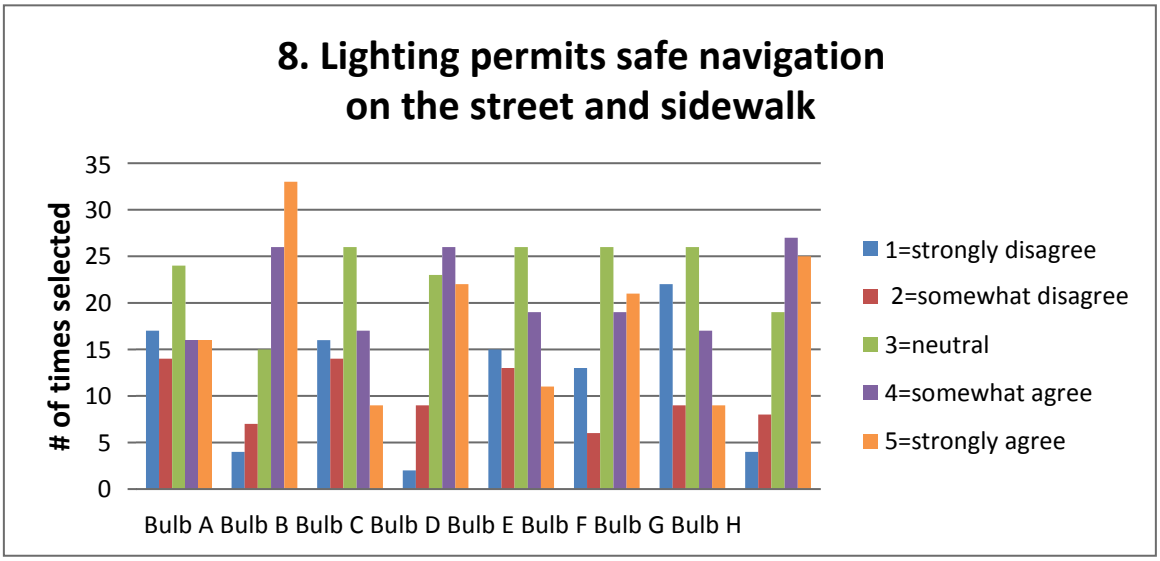


Chart 8 indicates that people agreed that Bulb B (Apadana Cover Mount 3000K) and Bulb H (Phillips Corncob 3000K) permitted safe navigation on the street and sidewalk. A large number of residents were also neutral on this issue, which is not surprising since Public Works tested all of the bulbs prior to the study to ensure that safe navigation would be possible.

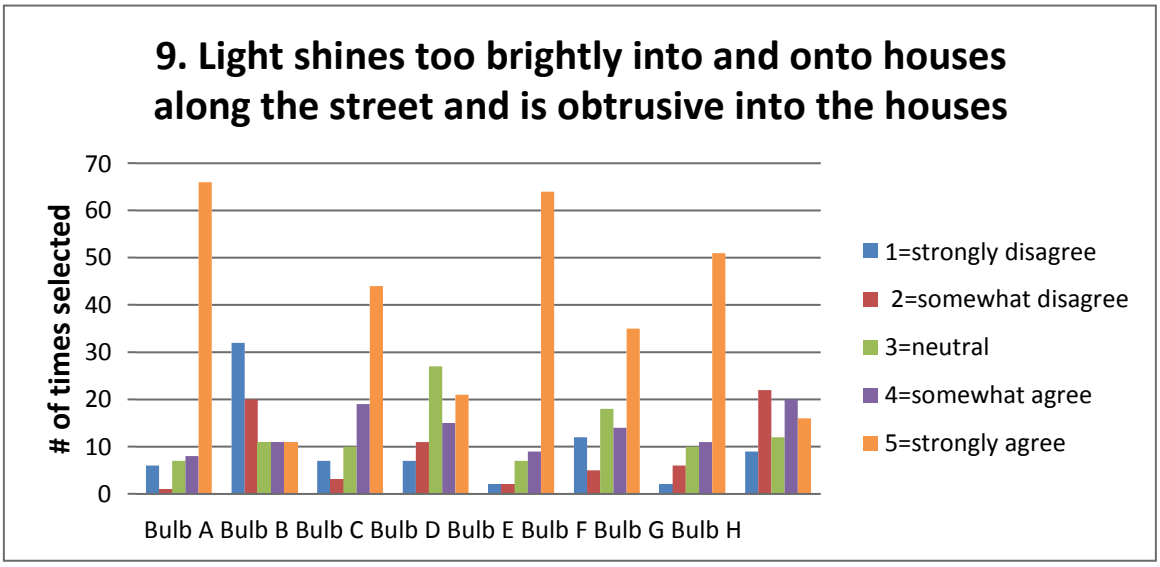


Chart 9 indicates that Bulbs A (Silvermere Corncob 4000K), E (Apadana Light Emitter 4000K), and G (Phillips Corncob 4000K) were considered to be too bright and obtrusive. Bulb B (Apadana Cover Mount 3000K) was considered less bright and obtrusive.

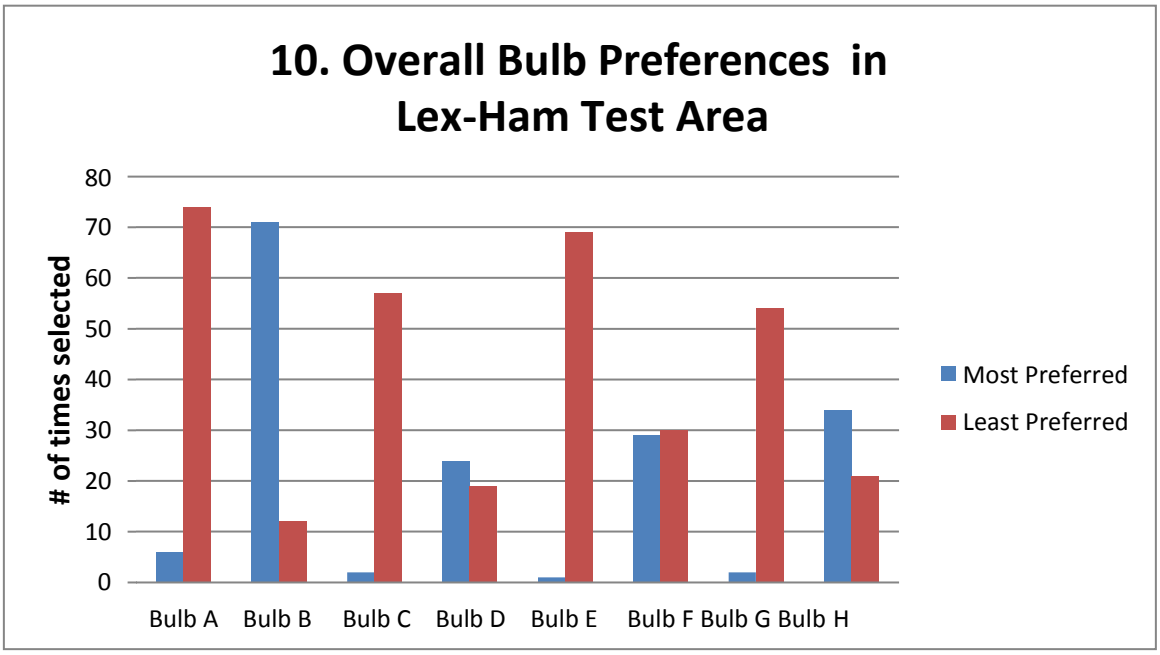


Chart 10 indicates that residents had an overall preference for Bulb B (Apadana Cover Mount 3000K). Bulb H (Phillips Corncob 3000K) and Bulb F (ESI Sundance Energy Solutions Directional 3000K) also seemed to rate higher numbers for preference, but had more of a mixed review from residents with a significant number of residents also indicating that those bulbs were least preferred. Bulb A(Silvermere Corncob 4000K) , Bulb E (Apadana Light Emitter 4000K) and Bulb C (Apadana Cover Mount 4000K) were least preferred among the residents.

HAMLINE-MIDWAY AND PAYNE-PHALEN NEIGHBORHOODS; BULBS 1-6

The team decided to combine the feedback responses for the Hamline-Midway and Payne–Phalen neighborhood because the same bulbs were used in those test areas and the response numbers were significantly lower than those in the Lexington-Hamline neighborhood. The survey questions remained the same. The following are results from the Hamline-Midway and Payne-Phalen neighborhoods. The charts reflect the number of times each response was selected for each bulb.

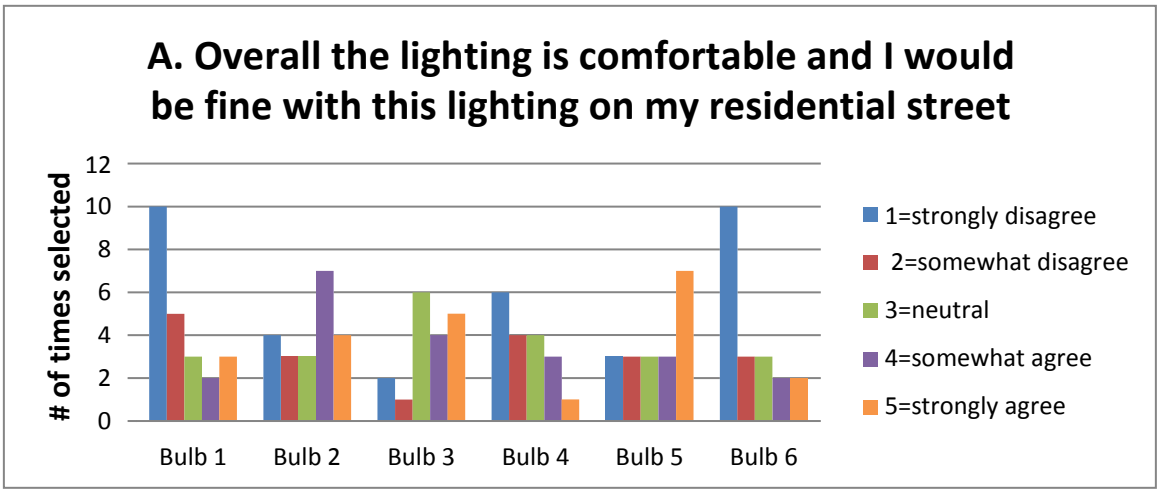


Chart A indicates a mixed response to the overall comfort with the different bulbs. Bulb 5 (Phillips Corncob 3000K) Bulb 3 (Apadana Light Emitter 3000K) and Bulb 2 (Halophane Cover Mount 3000K) generated the most agreement with overall comfort with the lighting. However both bubs had responses across the scale. Bulb 1 (Halophane Cover Mount 4000K) and Bulb 6 (Phillips Corncob 4000K) had the highest number of people expressing their disagreement with the light's comfort.

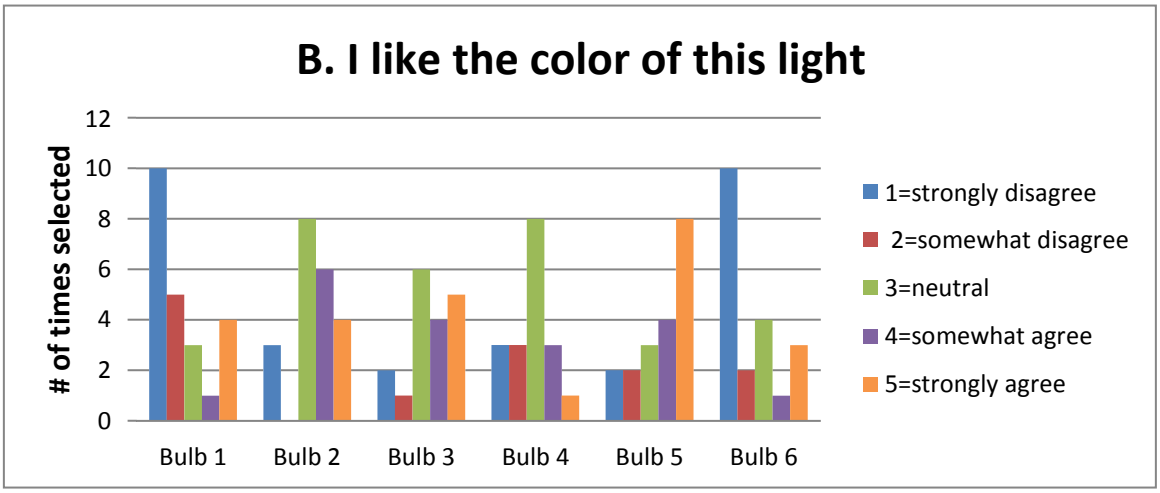


Chart B indicates that Bulb 5 (Phillips Corncob 3000K) had the most positive responses for light color. Bulb 2 (Halophane Cover Mount 3000K) also generated positive responses. Bulbs 1 (Halophane Cover Mount 4000K) and 6 (Phillips Corncob 4000K) received the most negative responses on color.

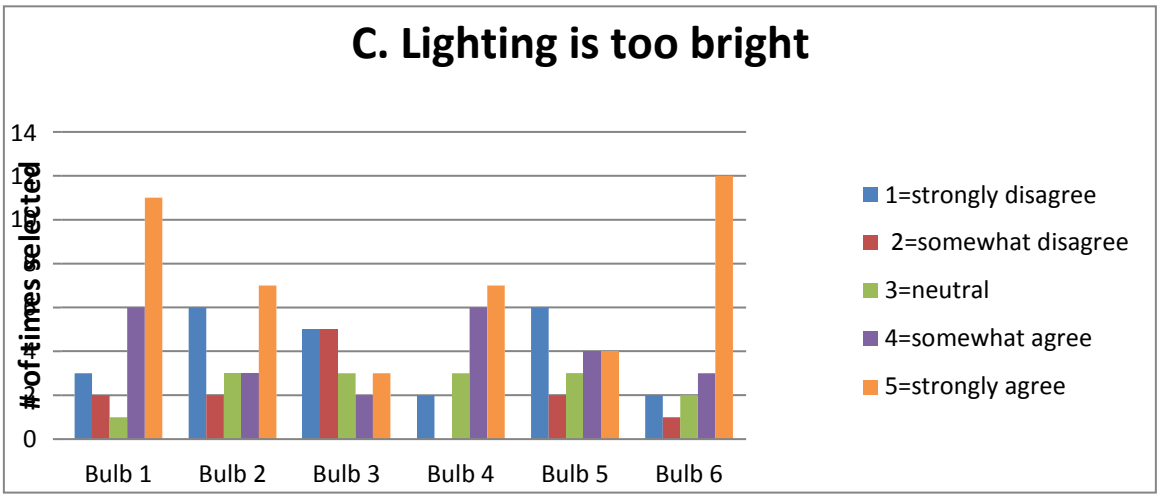


Chart C indicates that residents felt that Bulbs 6 (Phillips Corncob 4000K) and 1 (Halophane Cover Mount 4000K) had light that was too bright. Bulbs 2 (Halophane Cover Mount 3000K) and 5 (Phillips Corncob 3000K) had the highest number of individuals who did not feel the lighting was too bright.

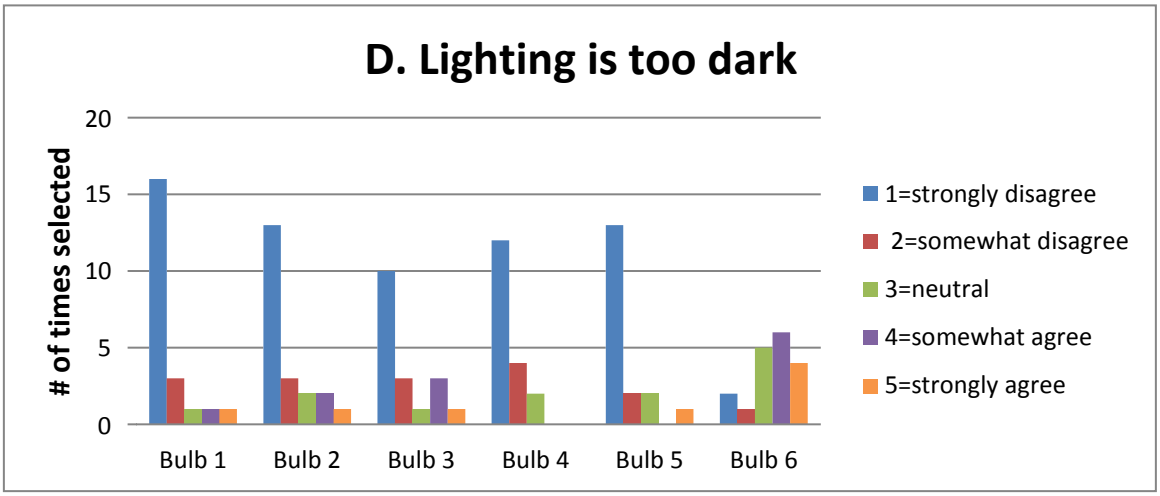


Chart D indicates that most residents did not find any of the bulbs to be too dark. Bulb 6 (Phillips Corncob 4000K) received the most responses indicating that the lighting was too dark.

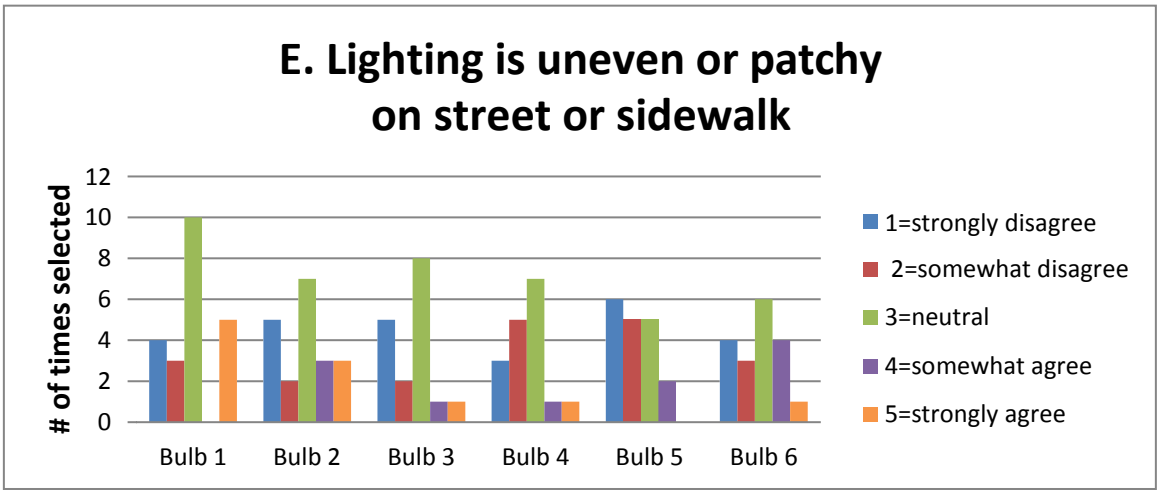


Chart E indicates that most residents were neutral about the patchiness of the lighting from the bulbs. The majority of residents felt all options were acceptable in this case.

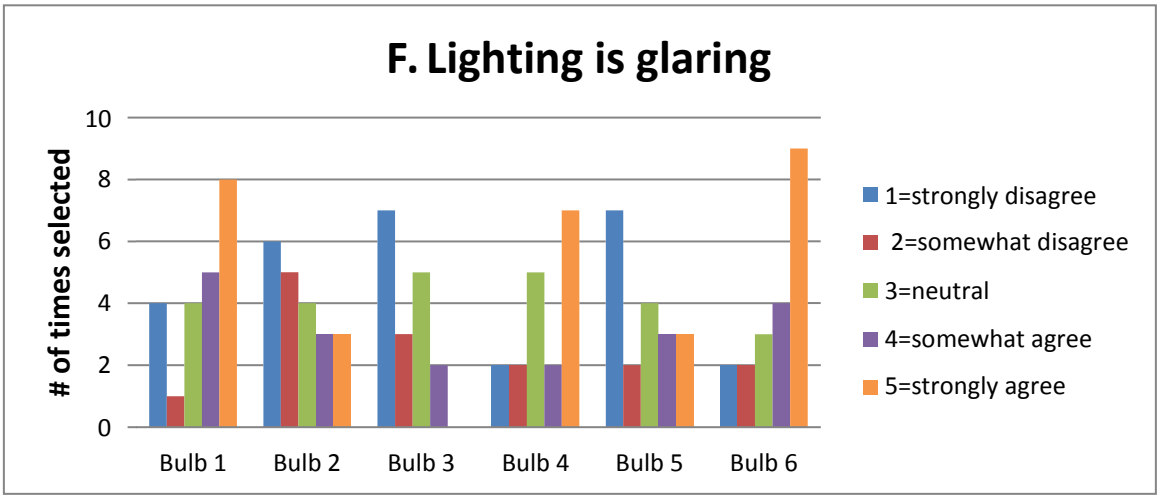


Chart F indicates that Bulbs 6 (Phillips Corncob 4000K) and 1 (Halophane Cover Mount 4000K) had the most responses that the light was glaring. Bulb 3 (Apadana Light Emitter 3000K) and Bulb 5 (Phillips Corncob 3000K) received the most responses in disagreement with the statement.

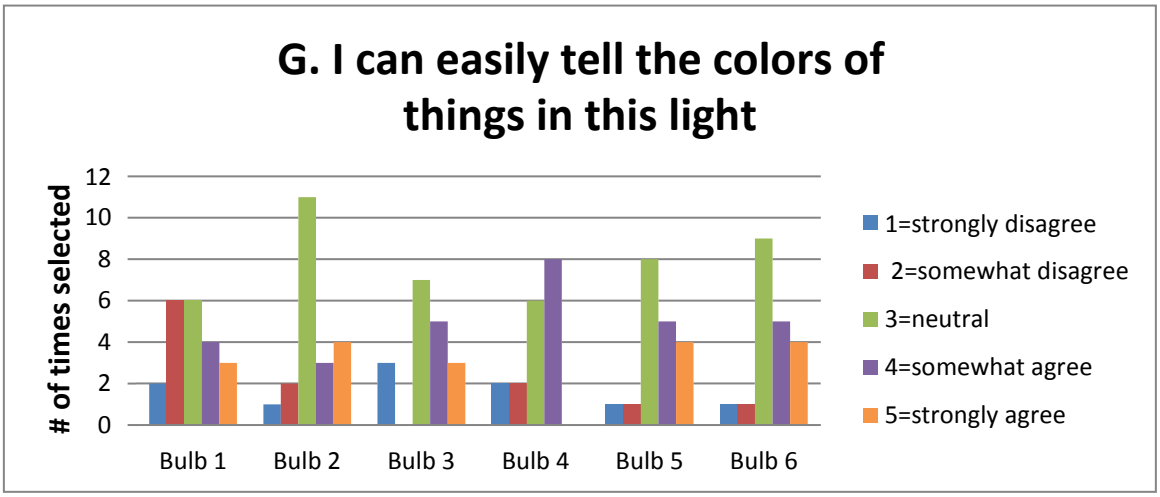


Chart G indicates that most residents were neutral about the ease of seeing color in the various bulbs.

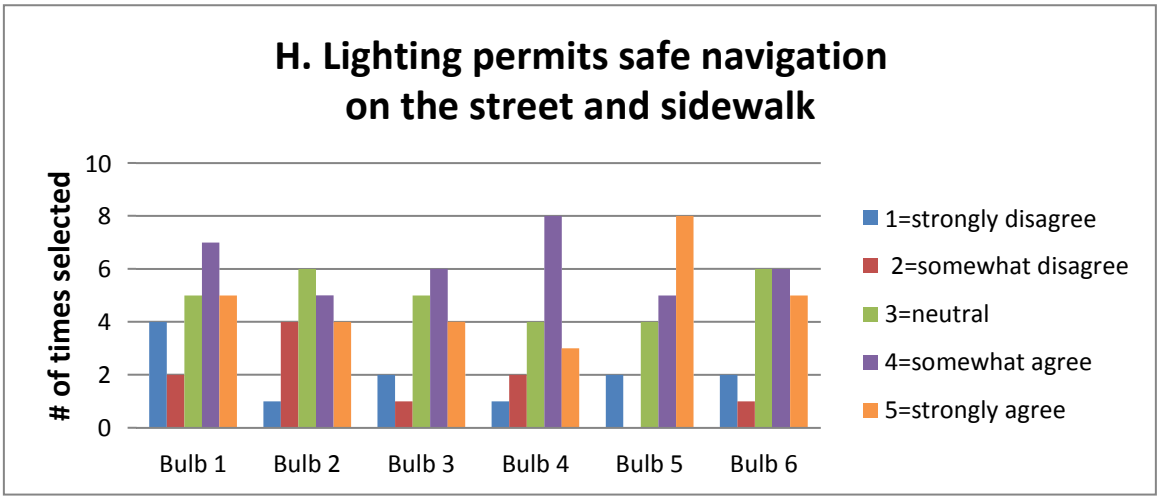


Chart H indicates that the highest number of respondents indicated that they strongly agreed that Bulb 5 (Phillips Corncob 3000K) permitted safe navigation. However, Bulbs 4 (Apadana Light Emitter 4000K), 6 (Phillips Corncob 4000K), and 3 (Apadana Light Emitter 3000K) also had a number of residents somewhat agreeing with the statement.

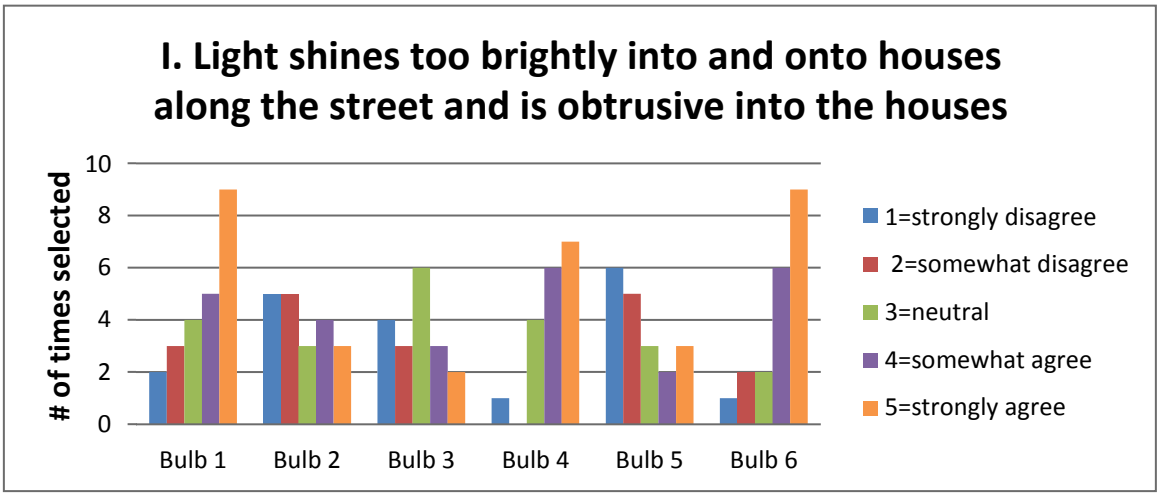


Chart I indicates that Bulb 1 (Halophane Cover Mount 4000K) and Bulb 6 (Phillips Corncob 4000K) were most considered to shine too brightly into and onto houses and the street. Bulb 5 (Phillips Corncob 3000K) has the largest number of individuals disagreeing with the statement. Bulb 2 (Halophane Cover Mount 3000K) and Bulb 3 (Apadana Light Emitter 3000K) also had a large number of residents indicating disagreement with this statement.

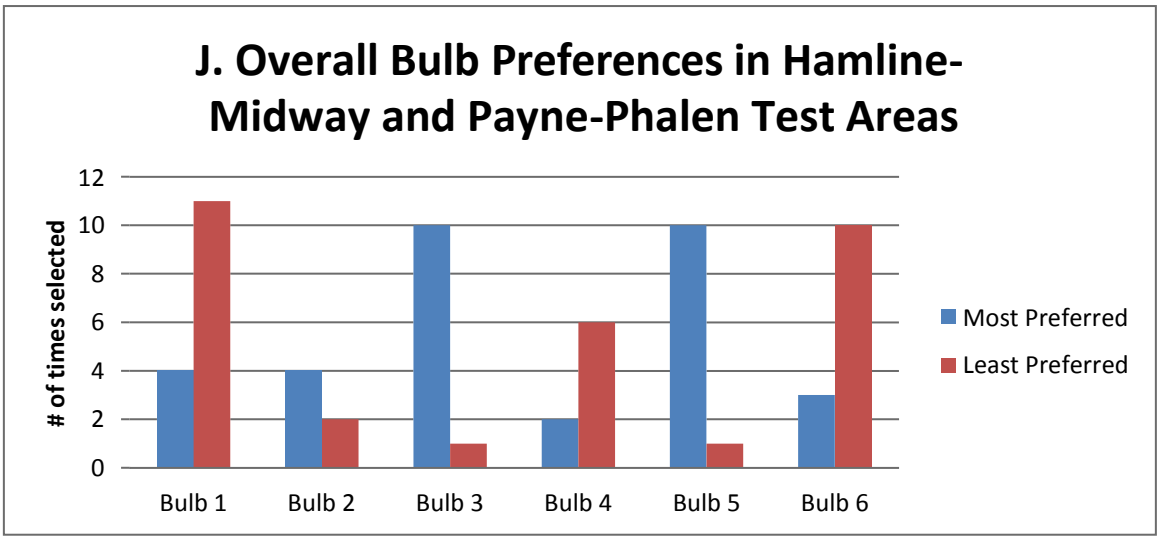


Chart J indicates that Bulb 3 (Apadana Light Emitter 3000K) and Bulb 5 (Phillips Corncob 3000K) were most preferred. Bulb 1 (Halophane Cover Mount 4000K) and Bulb 6 (Phillips Corncob 4000K) were preferred least overall.

RESIDENT COMMENTS

Residents were also afforded the opportunity to comment on the specific bulbs and bulb characteristics. Those comments were aggregated and sorted into predominantly positive and negative comments. The full collection of comments on each of the bulbs is available in Exhibit I.

CONCLUSIONS AND NEXT STEPS

As stated at the beginning of this report, the Public Works team identified the primary goal of the study as the identification of resident preferred LED characteristics to assist in the writing of performance specs for future lighting systems for residential lantern lights within the City.

The Public Works staff committee reviewed the data collected from the survey and the comments provided by neighborhood residents to determine which bulb types and characteristics were better received by community members.

Both resident participation in the study and fixture style varied amongst our different test areas and our results indicate that different solutions are preferred by residents in the different fixtures.

LEXINGTON-HAMLINE NEIGHBORHOOD

It is clear from the data collected for the bulbs in the Lexington-Hamline neighborhood that **Bulb B (Apadana Cover Mount 3000K)** was most preferred by residents. It received the highest marks for overall preference. It also received the highest marks for overall comfort, color likeability, ability to differentiate colors, and feelings of safe navigation. Residents didn't find it to be too bright, too dark, too glaring, or too brightly shining. Residents felt that all of the bulb choices provided ample light and they were largely ambivalent about the patchiness of all of the bulbs. The survey information was backed up by neighborhood comments which indicated a preference for the downward direction of the light and the "warmer" color of Bulb B. **Bulb H (Phillips Corncob 3000K)** was ranked second in terms of preference.

Bulbs A (Silvermere Corncob 4000K) and E (Apadana Light Emitter 4000K) were least preferred overall and in several of the survey categories. Residents felt strongly that these bulbs were too bright and glaring.

It should be noted that test Bulb B was not an off-the-shelf system and needed to be manipulated by Public Works staff in order to work within the older, lantern style fixtures.

After reviewing this data, the staff team determined that a request for proposals should be drafted to develop a retrofit system for the older, lantern style fixtures that incorporates the key characteristics of Bulb B – a top mounted system with the warmth of 3000K.

Bulbs on the test blocks will be switched over to this new system when it becomes available through the RFP process, likely sometime in early to mid-2018.

HAMLINE-MIDWAY AND PAYNE-PHALEN NEIGHBORHOODS

Fewer residents provided feedback on the bulbs in the Hamline-Midway and Payne-Phalen neighborhoods and therefore the data collected is much less definitive than in the Lexington-Hamline neighborhood. It appears that residents in these two neighborhoods do not share the strong feelings regarding the nature of the street lighting that have been expressed by residents

in the Lexington-Hamline neighborhood. This is also borne out by fewer complaints to the Public Works department about the change to LED from these neighborhoods. We did have responses from individuals in this neighborhood who expressed a strong desire for minimal or no lighting whatsoever.

This difference in response could be due to differences in the two styles of fixtures, with the replacement fixtures in Hamline-Midway and Payne-Phalen having beveled glass faces as opposed to clear glass faces.

It appears that **Bulb 5 (Phillips Corncob 3000K)** received the most positive responses for overall comfort, color, glare, navigation and brightness. **Bulb 3 (Apadana Light Emitter 3000K)** received similarly high marks in most of these areas.

Bulb 6 (Phillips Corncob 4000K) and **Bulb 1 (Halophane Cover Mount 4000K)** were least preferred overall and in most categories.

After reviewing the data and comments from neighbors, it was determined that **Bulb 5 (Phillips Corncob 3000K)** was preferred in the neighborhoods with replacement fixtures. Since Bulb 5 and similar 3000K corncob designed bulbs are readily available off-the-shelf, an RFP would not be required to acquire these bulbs.

Bulbs on the test blocks in these two areas will be reinstalled with 3000K corncob style bulbs and the City will use 3000K corncob style bulbs in new fixture installations.

The City of Saint Paul has made a commitment to installing LED lighting systems because of their environmental and economic benefits to our residents. Public Works is continuing to monitor this changing technology and will continue to employ best practices as they relate to the installation of lighting throughout the City.

City of Saint Paul Street Lighting Study – Lex-Ham Neighborhood

Saint Paul Public Works is testing different Light Emitting Diodes (LED) street light bulbs and wants your feedback. Please complete this survey about the different bulbs that can be seen in the Lex-Ham Neighborhood on Portland, Ashland, Laurel and Hague Avenues between Lexington and Griggs. Look for street signs on these blocks indicating the test bulb letter. The study runs from March 20 to May 19, 2017.

Your input will help inform the City's decisions about LED light bulbs by identifying lighting characteristics that are important to residents. Note that this is not a vote on which LED bulb the City should use, but will help inform the City's selection of LEDs in the future.

Saint Paul is moving to LED street lights throughout the City because they are more energy efficient and environmentally friendly, longer lasting and will save the City money.

Additional information is available at www.stpaul.gov/LED. Questions or comments, contact Jeannette Rebar at jeannette.rebar@ci.stpaul.mn.us or 651-266-6125.

1. What is your zip code? _____

2. Do you live on one of the LED street light test blocks? (circle one) Yes No Not Sure

3. If you answered yes, which test block do you live on? _____

4. **Please complete the grid on the back about each test bulb before answering the rest of the questions.**

5. Provide any additional comments about any of the test bulbs. Please indicate which test bulbs your comments are about. (Add additional pages if needed.)

   _____

   _____

   _____

6. Thinking about all 8 test bulbs and the lighting they provide, which test bulb(s) provide the lighting you most prefer? (circle all that apply)

   Bulb A Bulb B Bulb C Bulb D Bulb E Bulb F Bulb G Bulb H

7. Please provide any additional comments about why you most prefer the bulb(s) you do.

   _____

   _____

8. Thinking about all 8 test bulbs and the lighting they provide, which test bulb(s) provide the lighting that you least prefer? (circle all that apply)

   Bulb A Bulb B Bulb C Bulb D Bulb E Bulb F Bulb G Bulb H

9. Please provide any additional comments about why you least prefer the bulb(s) you selected.

   _____

   _____

Thinking about each test bulb and the lighting on the street during darkness, please rate your level of agreement with each of the following statements about the lighting on each test block on a scale of 1 to 5 (1=strongly disagree, 2=somewhat disagree, 3=neutral, 4=somewhat agree 5=strongly agree). Circle the rating that best matches your level of agreement with each statement about each test bulb.

	Bulb A	**Bulb B**	**Bulb C**	**Bulb D**	**Bulb E**	**Bulb F**	**Bulb G**	**Bulb H**
Overall the lighting is comfortable and I would be fine with this lighting on my residential street.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
I like the color of this light.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
The lighting is too bright.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
The lighting is too dark.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
The lighting is uneven or patchy on the street or sidewalk.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
The lighting is glaring.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
I can easily tell the colors of things in this light.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
The lighting permits safe navigation on the street or sidewalk.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
The light shines too brightly into and onto houses along the street and is obtrusive into the houses.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

Please complete the rest of the questions on the other side.

Thank you for taking the time to provide your feedback about LED street light bulbs.

Mail completed survey to:

Street Lighting Study
Saint Paul Public Works
25 West 4th St., CHA 1500
Saint Paul, MN 55102

City of Saint Paul Street Lighting Study – Hamline-Midway Neighborhood

Saint Paul Public Works is testing different Light Emitting Diodes (LED) street light bulbs and wants your feedback. Please complete this survey about the different bulbs that can be seen in the Hamline-Midway Neighborhood on Blair Avenue between Hamline and Lexington and Van Buren Avenue between Hamline and Griggs. Look for street signs on these blocks indicating the test bulb number. The study runs from March 20 to May 19, 2017.

Your input will help inform the City's decisions about LED light bulbs by identifying lighting characteristics that are important to residents. Note that this is not a vote on which LED bulb the City should use, but will help inform the City's selection of LEDs in the future.

Saint Paul is moving to LED street lights throughout the City because they are more energy efficient and environmentally friendly, longer lasting and will save the City money.

Additional information is available at www.stpaul.gov/LED. Questions or comments, contact Jeannette Rebar at jeannette.rebar@ci.stpaul.mn.us or 651-266-6125.

1. What is your zip code? _____

2. Do you live on one of the LED street light test blocks? (circle one) Yes No Not Sure

3. If you answered yes, which test block do you live on? _____

4. **Please complete the grid on the back about each test bulb before answering the rest of the questions.**

5. Provide any additional comments about any of the test bulbs. Please indicate which test bulbs your comments are about. (Add additional pages if needed.)

   _____

   _____

   _____

6. Thinking about all 6 test bulbs and the lighting they provide, which test bulb(s) provide the lighting you most prefer? (circle all that apply)

   Bulb 1 Bulb 2 Bulb 3 Bulb 4 Bulb 5 Bulb 6

7. Please provide any additional comments about why you most prefer the bulb(s) you do.

   _____

   _____

8. Thinking about all 6 test bulbs and the lighting they provide, which test bulb(s) provide the lighting that you least prefer? (circle all that apply)

   Bulb 1 Bulb 2 Bulb 3 Bulb 4 Bulb 5 Bulb 6

9. Please provide any additional comments about why you least prefer the bulb(s) you selected.

   _____

   _____

Thinking about each test bulb and the lighting on the street during darkness, please rate your level of agreement with each of the following statements about the lighting on each test block on a scale of 1 to 5 (1=strongly disagree, 2=somewhat disagree, 3=neutral, 4=somewhat agree 5=strongly agree). Circle the rating that best matches your level of agreement with each statement about each test bulb.

	Bulb 1	**Bulb 2**	**Bulb 3**	**Bulb 4**	**Bulb 5**	**Bulb 6**
Overall the lighting is comfortable and I would be fine with this lighting on my residential street.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
I like the color of this light.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
The lighting is too bright.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
The lighting is too dark.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
The lighting is uneven or patchy on the street or sidewalk.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
The lighting is glaring.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
I can easily tell the colors of things in this light.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
The lighting permits safe navigation on the street or sidewalk.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
The light shines too brightly into and onto houses along the street and is obtrusive into the houses.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

Please complete the rest of the questions on the other side.

Thank you for taking the time to provide your feedback about LED street light bulbs.

Mail completed survey to:

Street Lighting Study
Saint Paul Public Works
25 West 4th St., CHA 1500
Saint Paul, MN 55102

EXHIBIT B - LETTER TO TEST NEIGHBORHOOD RESIDENTS

DEPARTMENT OF PUBLIC WORKS
Kathy Lantry, Director

CITY OF SAINT PAUL
Christopher B. Coleman, Mayor

1500 City Hall Annex
25 W. Fourth Street
Saint Paul, MN 55102-1660

Fax: 651-266-6222

LED Street light test happening in your neighborhood starting March 2017

Join us at a community meeting about the LED street light test on Wednesday, March 1 at 6:30 p.m. at Hamline Midway Library – 1558 W. Minnehaha Ave., Saint Paul, MN 55104 if you would like more information.

February 23, 2017

Dear Saint Paul Resident:

Public Works will be testing different LED street light bulbs in your neighborhood and we want your feedback.

When and Where is Testing Happening?
We will be testing LED street light bulbs in the Lex-Ham, Hamline-Midway and Payne-Phalen neighborhoods. See the map on the backside of this letter for the specific streets in your neighborhood. Each block will have a different test bulb.

The test will occur from March 15 to May 17, 2017. New bulbs and signs about the test will be installed in the test areas beginning March 6, 2017. The test bulbs may be in place beyond the resident feedback period.

How the Testing Impacts You?
Crews will be in your area installing bulbs and signs about the street light test between March 6 and March 15, 2017.

You will have the opportunity to provide feedback on the different characteristics of the bulbs to help inform the City's selection of LED bulbs in the future.

You may see a few more people on your street in the evening as they are looking at the test bulbs and completing feedback surveys.

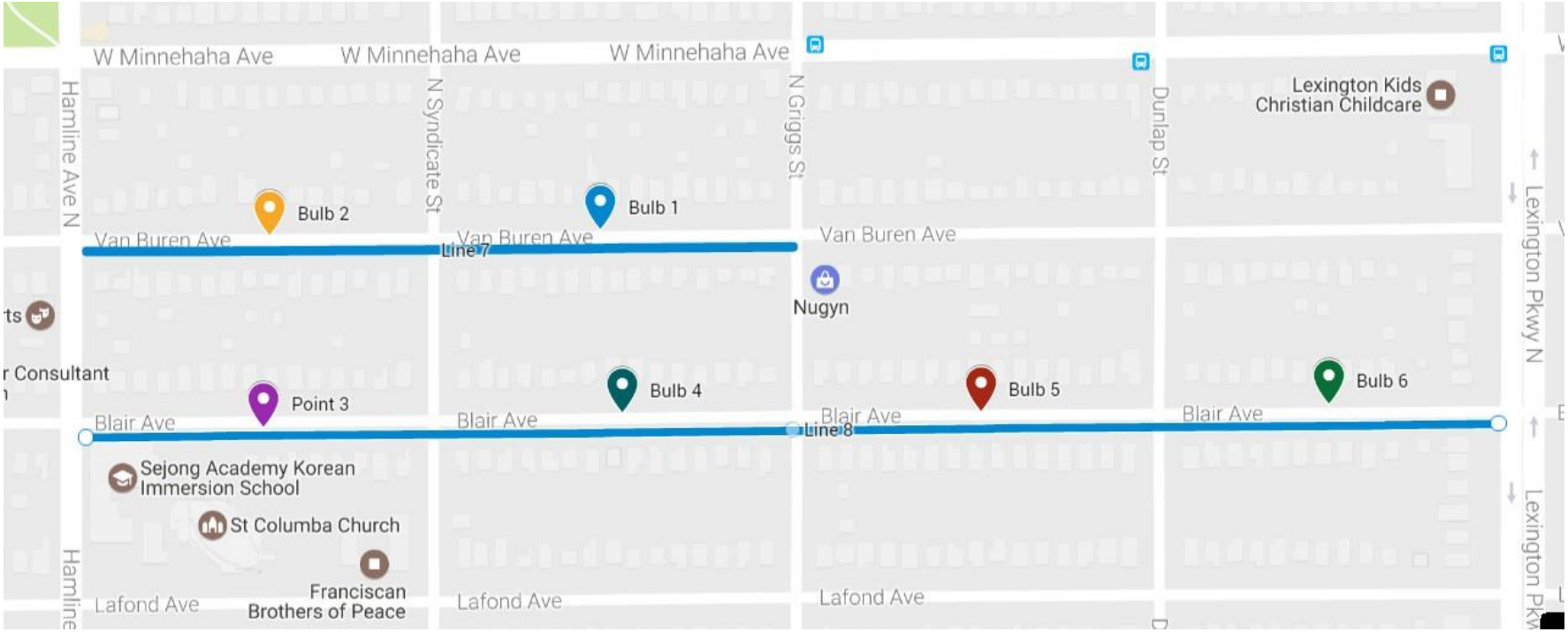
Why LED street lights?
The City of Saint Paul is moving to LED street lights throughout the City because they are more energy efficient, longer lasting and will save the City money.

Questions:
If you have questions or comments, feel free to contact me at jeannette.rebar@ci.stpaul.mn.us or 651-266-6125.

Sincerely,

Jeannette Rebar

LED street light test blocks in Hamline-Midway Neighborhood



Blue line indicates LED street light test blocks.

DEPARTMENT OF PUBLIC WORKS
Kathy Lantry, Director

CITY OF SAINT PAUL
Christopher B. Coleman, Mayor

1500 City Hall Annex
25 W. Fourth Street
Saint Paul, MN 55102-1660

Fax: 651-266-6222

LED Street light test happening in your neighborhood starting March 2017

Join us at a community meeting about the LED street light test on Thursday, March 2 at 6:30 p.m. at Duluth and Case Recreation Center – 1020 Duluth St., Saint Paul, MN 55106 if you would like more information.

February 23, 2017

Dear Saint Paul Resident:

Public Works will be testing different LED street light bulbs in your neighborhood and we want your feedback.

When and Where is Testing Happening?
We will be testing LED street light bulbs in the Lex-Ham, Hamline-Midway and Payne-Phalen neighborhoods. See the map on the backside of this letter for the specific streets in your neighborhood. Each block will have a different test bulb.

The test will occur from March 15 to May 17, 2017. New bulbs and signs about the test will be installed in the test areas beginning March 6, 2017. The test bulbs may be in place beyond the resident feedback period.

How the Testing Impacts You?
Crews will be in your area installing bulbs and signs about the street light test between March 6 and March 15, 2017.

You will have the opportunity to provide feedback on the different characteristics of the bulbs to help inform the City's selection of LED bulbs in the future.

You may see a few more people on your street in the evening as they are looking at the test bulbs and completing feedback surveys.

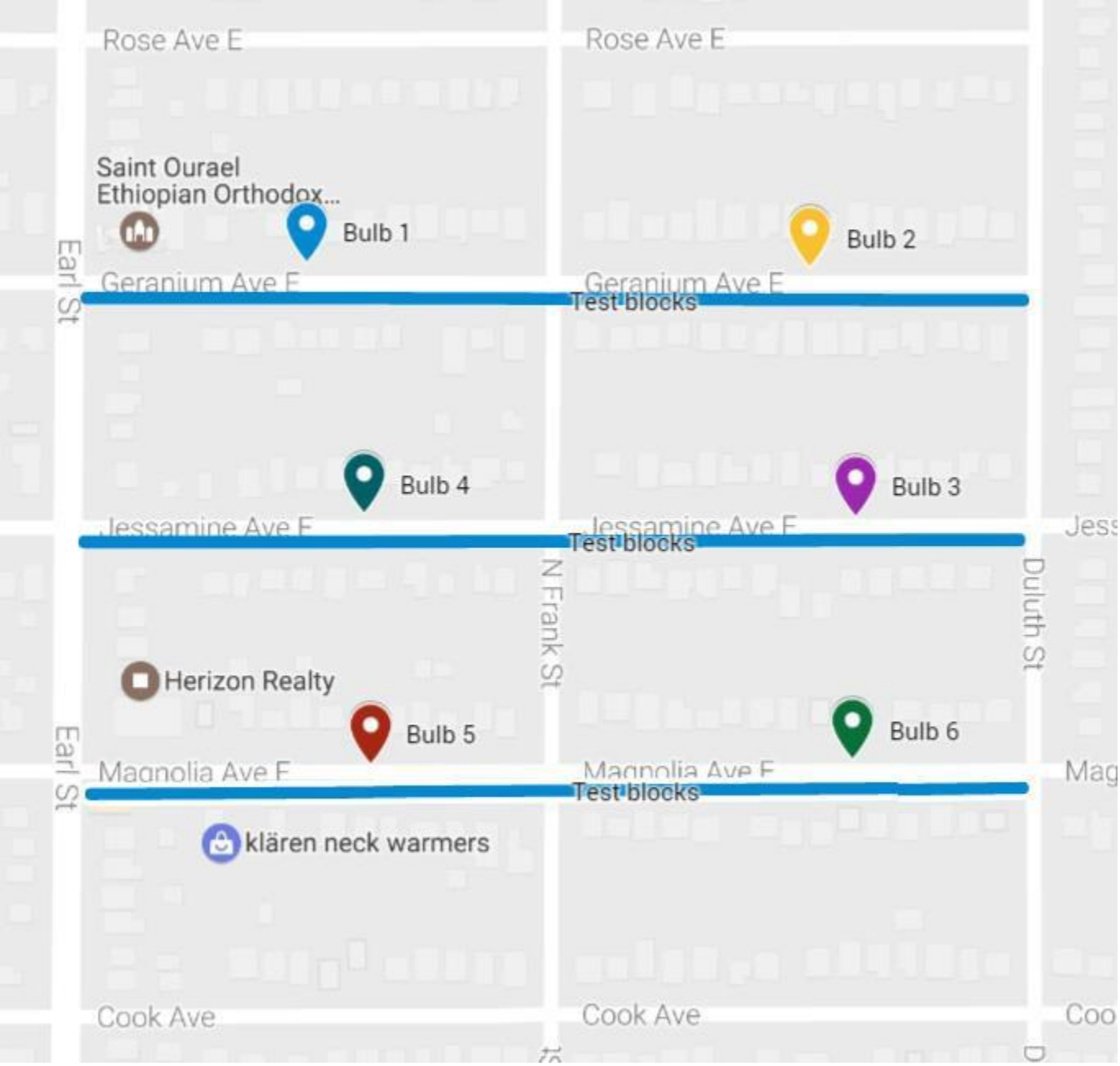
Why LED street lights?
The City of Saint Paul is moving to LED street lights throughout the City because they are more energy efficient, longer lasting and will save the City money.

Questions:
If you have questions or comments, feel free to contact me at jeannette.rebar@ci.stpaul.mn.us or 651-266-6125.

Sincerely,

Jeannette Rebar

LED street light test blocks in Payne-Phalen Neighborhood



Blue lines indicate LED street light test blocks.

EXHIBIT C - LETTER TO TEST NEIGHBORHOOD RESIDENTS WITH SURVEY

DEPARTMENT OF PUBLIC WORKS
Kathy Lantry, Director

CITY OF SAINT PAUL
Christopher B. Coleman, Mayor

1500 City Hall Annex
25 W. Fourth Street
Saint Paul, MN 55102-1660

Fax: 651-266-6222

Street lighting test happening in your neighborhood starting mid-March 2017

March 8, 2017

Dear Saint Paul Resident:

Public Works will be testing different Light Emitting Diodes (LED) street light bulbs in your neighborhood and we want your feedback.

When and Where is Testing Happening?
We will be testing LED street light bulbs in the Lex-Ham, Hamline-Midway and Payne-Phalen neighborhoods. See the map on the backside of this letter for the specific streets in your neighborhood. Each block will have a different test bulb.

The test will occur from approximately March 20 to May 17, 2017. New bulbs and signs about the test will be installed in the test areas beginning March 13, 2017. The test bulbs may be in place beyond the resident feedback period.

How the Testing Impacts You?
Crews will be in your area installing bulbs and signs about the street light test between March 13 and March 20, 2017.

You may see a few more people on your street in the evening as they are looking at the test bulbs and completing feedback surveys.

How to Provide Feedback about the Street Lights?
You will have the opportunity to provide feedback on the different characteristics of the bulbs. Note that this is not a vote on which LED bulb the City should use, but will help inform the City's selection of LEDs in the future.

Once the test bulbs and signs are installed after March 20, 2017, please complete and return the enclosed survey or go to stpaul.gov/LED for an online version of the survey to provide your feedback about the different street light bulbs.

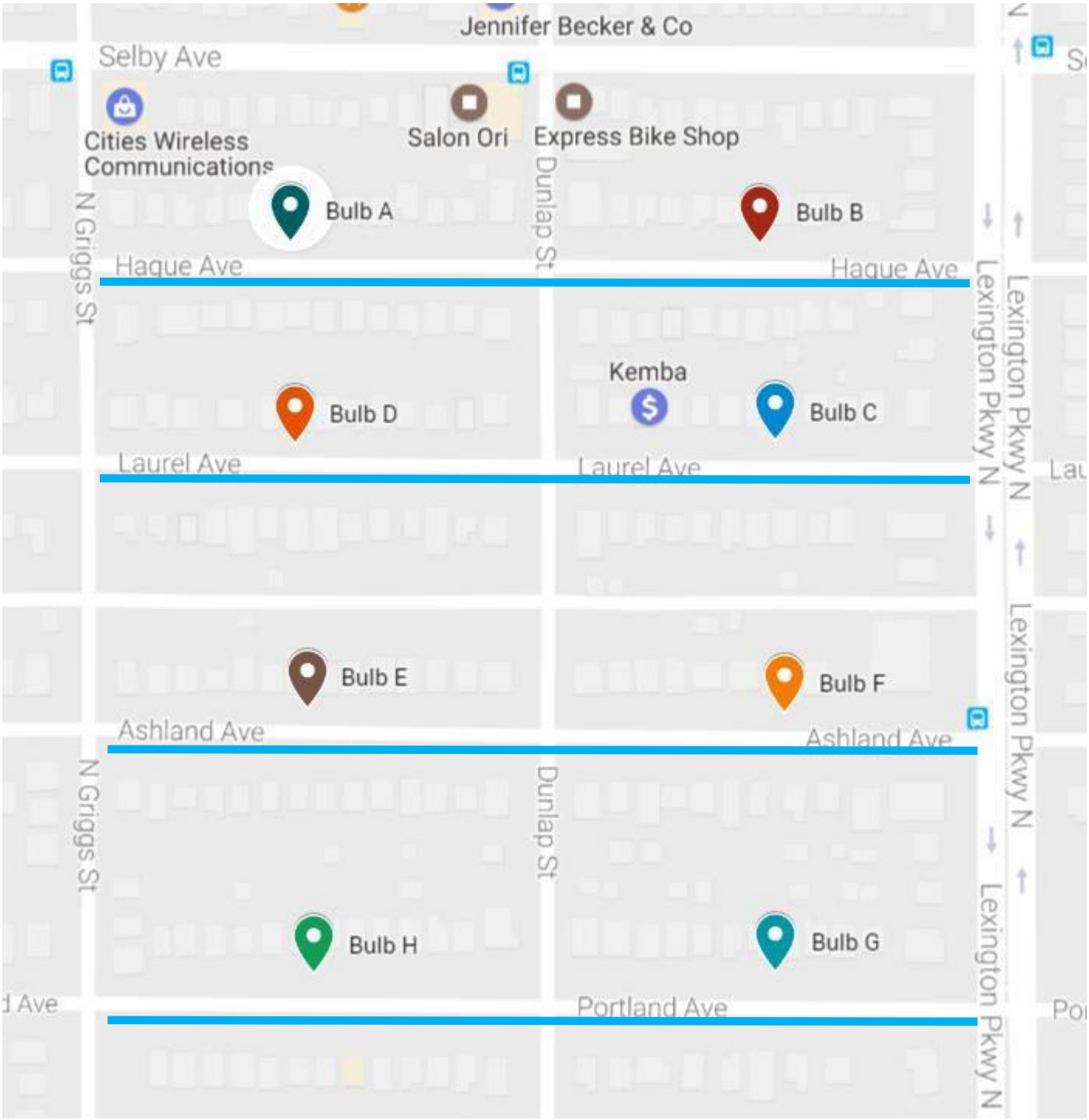
Why LED street lights?
The City of Saint Paul is moving to LED street lights throughout the City because they are more energy efficient, longer lasting and will save the City money.

Questions:
If you have questions or comments, feel free to contact me at jeannette.rebar@ci.stpaul.mn.us or 651-266-6125.

Sincerely,

Jeannette Rebar

LED street light test blocks in Lex-Ham Neighborhood



Blue lines indicate LED street light test blocks. Test bulbs are also indicated.

EXHIBIT D – EMAIL TO THE DISTRICT COUNCILS REGARDING THE SURVEY

Subject: Saint Paul Street Lighting Study

Hi all,

Public Works will be testing different Light Emitting Diodes (LED) street light bulbs in three neighborhoods and is seeking community input. We are working to gather feedback from residents citywide and would appreciate your help in letting residents know about the lighting study and survey.

When and Where is Testing Happening?
We will be testing LED street light bulbs in the Lex-Ham, Hamline-Midway and Payne-Phalen neighborhoods. In the Lex-Ham neighborhood the test will be on Portland, Laurel and Hague Avenues between Lexington and Griggs. In the Hamline-Midway neighborhood the test will be on Blair Avenue between Lexington and Hamline and on Van Buren Avenue between Griggs and Hamline. In the Payne-Phalen neighborhood the test will be on Magnolia, Jessamine and Geranium Avenues between Earl and Duluth. Each block will have a different test bulb and will have signs indicating this.

The test will occur from Monday, March 20 to Friday, May 19, 2017. New bulbs and signs about the test are currently being installed on the test blocks.

How to Provide Feedback about the Street Lights?
Residents will have the opportunity to provide feedback on the different characteristics of the bulbs. Note that this is not a vote on which LED bulb the City should use, but will help inform the City's selection of LEDs in the future.

Please go to www.stpaul.gov/LED for an online or paper version of the survey to provide feedback about the different street light bulbs. Public Works will also be hosting events on the test blocks to answer questions and distribute and collect paper surveys. We'll be in touch once the events are scheduled

Why LED street lights?
The City of Saint Paul is moving to LED street lights throughout the City because they are more energy efficient, longer lasting and will save the City money.

If you have questions or comments, feel free to contact me at jeannette.rebar@ci.stpaul.mn.us or 651-266-6125. Thanks again for your help in sharing the information about the lighting study.

Thanks,
Jeannette Rebar

EXHIBIT E – EMAIL TO MAYOR AND CITY COUNCIL

Subject: LED street light study

Dear Council Members,

In response to some residents' requests to provide input on LED street bulb options, Public Works will be conducting a test of LED street light bulbs in three neighborhoods from mid-March through May 2017. Residents will be asked to provide feedback via paper or online survey on a number of different factors about the lights including brightness, evenness, glare, perception of colors in the light, and overall like/dislike of the lights.

Within the three test areas, each block will have a different light bulb. Test areas will be clearly labeled with signs and information about how to provide feedback.

Test Areas

Three neighborhoods were selected as test sites in the City. These neighborhoods were selected based on their existing street light infrastructure, topography and accessibility to residents throughout the City. The test areas are in the Lex-Ham, Hamline-Midway and Payne-Phalen neighborhoods.

In the Lex-Ham neighborhood the test will be on Portland, Laurel and Hague Avenues between Lexington and Griggs. In the Payne-Phalen neighborhood the test will be on Magnolia, Jessamine and Geranium Avenues between Earl and Duluth. In the Hamline-Midway neighborhood the test will be on Blair Avenue between Lexington and Pascal.

Timeline

Public Works will begin installing the test bulbs and signs indicating test blocks in early March. Before test bulbs and signs are installed, residents along the test blocks will be informed about the study through a letter and invited to a community meeting.

Once the test bulbs are installed, Public Works will promote the study and solicit resident feedback from Mid-March through Mid-May 2017.

Community Engagement Process

To solicit feedback from residents throughout the City, we will promote the LED study through media, the district councils, and direct outreach to residents. Residents living along the test blocks will receive a letter notifying them of the process. Public Works will host community events on the test blocks to encourage participation in the study and address questions. We

hope that you will help promote the study to residents and encourage them to provide feedback.

The plan is not to replace LED bulbs that have already been installed throughout the City. Residents' feedback about the characteristics of the LED test bulbs will be used to inform Public Works' decisions about LED bulbs going forward.

We will share more information about the study as it progresses. In the meantime, if you need more information or have any questions, please feel free to contact me.

Sincerely,
Jeannette Rebar

EXHIBIT F – SCREEN SHOTS OF SOCIAL MEDIA POSTS

City of Saint Paul - Government
Published by Joe Ellickson [?] · March 20 ·

LED technology continues to change and improve with time and Saint Paul Public Works is adapting with these changes. The department is testing different LED street lights and wants community input. Residents will have the opportunity to provide feedback on different characteristics of lights through a survey beginning on Monday, March 20th 2017 and continuing through Friday, May 19th 2017.

Visit www.stpaul.gov/LED for more information on how residents can participate in the survey.

Street Lighting Study

Street Lighting Study

6,324 people reached

Boost Post

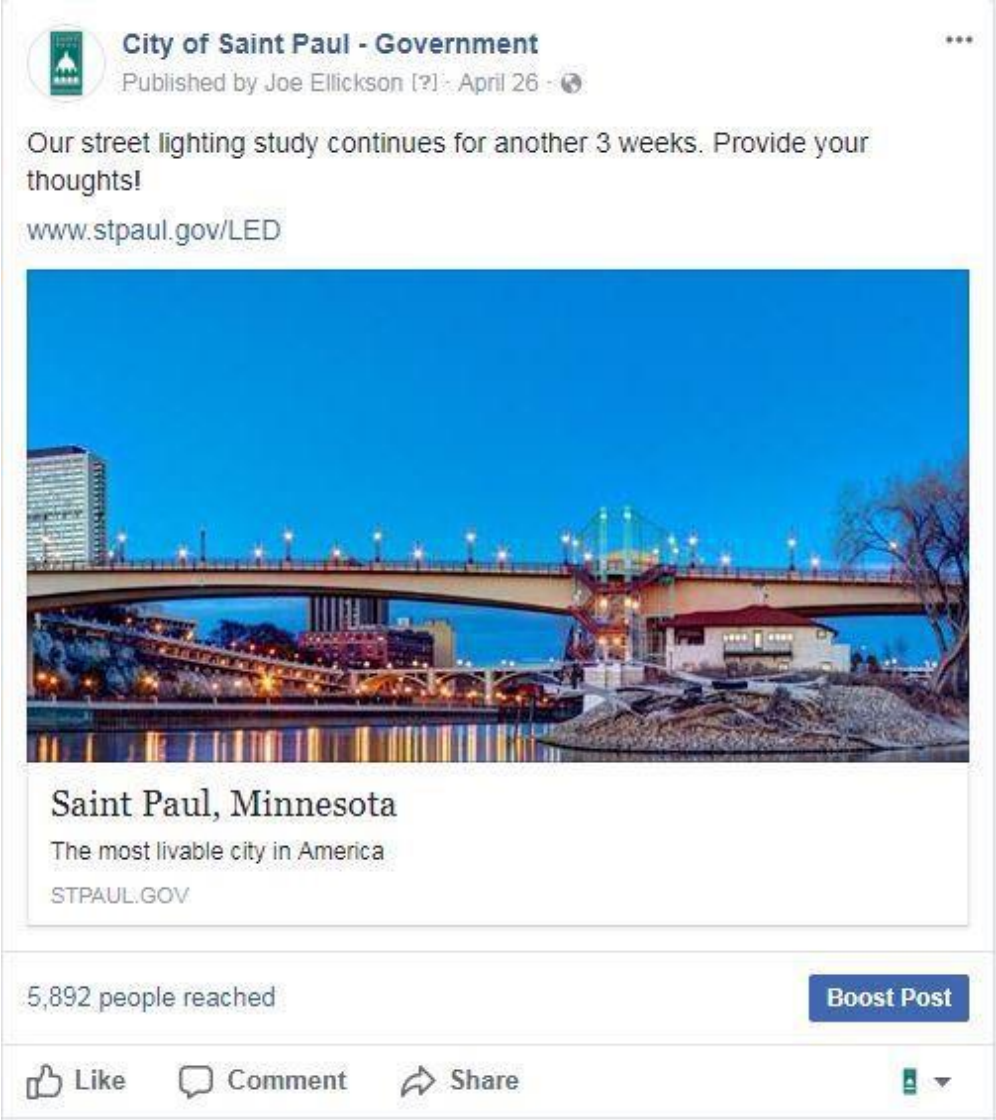

City of Saint Paul - Government
Published by Joe Ellickson [?] · April 26 ·
Our street lighting study continues for another 3 weeks. Provide your thoughts!
www.stpaul.gov/LED
Saint Paul, Minnesota
The most livable city in America
STPAUL.GOV
5,892 people reached
Boost Post
Like
Comment
Share

EXHIBIT G – MEDIA ADVISORY

Media Advisory

Monday, March 20th 2017
Contact:
Jeannette Rebar, City of Saint Paul, Public Works 651-266-6125,
jeannette.rebar@ci.stpaul.mn.us

City of Saint Paul seeks resident feedback on street lights

City to conduct LED street lighting survey

SAINT PAUL, MN – Light Emitting Diode (LED) technology continues to change and improve with time and Saint Paul Public Works is adapting with these changes. The department is testing different LED street lights and wants community input. Residents will have the opportunity to provide feedback on different characteristics of lights through a survey beginning on Monday, March 20th 2017 and continuing through Friday, May 19th 2017.

Visit www.stpaul.gov/LED for more information on how residents can participate in the survey.

Lighting Study Details:
The Public Works Department is testing different LED street lights in 3 neighborhoods:

- Lex-Ham – on Portland, Ashland, Laurel & Hague Aves between Lexington & Griggs
- Payne-Phalen – on Magnolia, Jessamine & Geranium Aves between Earl & Duluth
- Hamline-Midway – on Blair Ave between Lexington & Hamline and Van Buren Ave between Griggs & Hamline

A different LED bulb has been installed on each block so that residents can compare and contrast them to provide input on such characteristics as color, glare, and coverage. Residents can provide feedback to the Public Works Department through a paper form or on-line survey. This input will help inform the department as it continues its program to transition the city's street lights to LED technology.

About Saint Paul's Street Lights:
The City of Saint Paul has over 37,000 lights that help illuminate public areas throughout the city. Public Works began installing LED lights in 2010 as a part of the Sustainable Saint Paul initiative and continues to install them throughout the city at a rate of about 1,500 to 2,000 bulbs per year. The city is moving to this technology because of the economic and environmental benefits of LED lighting.

Benefits of LED Lighting:

- Cost Savings
    - LEDs require 50% less energy which lowers the City's electricity bill
    - LEDs last longer so the City saves costs on the purchasing of new bulbs

    - LEDs require less maintenance over time
- Environmentally Friendly
    - LEDs use 50% less energy
    - LEDs do not contain mercury
    - LEDs have a longer lifecycle which means less waste

Visit www.stpaul.gov/LED for more information and to participate in the survey.

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EXHIBIT H – MEDIA STORIES

St. Paul wants feedback during neighborhood lighting experiments

By FREDERICK MELO | fmelo@pioneerpress.com | Pioneer Press
PUBLISHED: March 20, 2017 at 7:24 pm | UPDATED: March 21, 2017 at 2:18 pm

St. Paul officials have been switching out streetlight bulbs for longer-lasting, energy-efficient light-emitting diode lights since 2010, at the rate of about 1,500 lights per year.

With new types of bulbs being added to the market, city officials have begun experimenting with different types of lighting on different blocks and are asking for public feedback on the characteristics of the bulbs.

On a handful of streets in the Lexington-Hamline, Hamline-Midway and Payne-Phalen neighborhoods, St. Paul Public Works has installed different LED bulbs — and in some cases, new lighting structures — per block. The city maintains some 37,000 lights in the public right-of-way.

Residents are invited to fill out a survey with their reactions at stpaul.gov/LED. The survey, which began Monday, continues through May 19.

“This study is specifically around our residential lighting,” said Jeanette Rebar, a community-engagement coordinator for the city. “The LED technology continues to change. Are there certain lights they find glaring? Do some of the lights we might be testing create patchiness on the streets?”

In recent years, reactions to various types of LED lighting have run the gamut. Some residents specifically request them, while others say their street feels less safe because the glare causes them to spend less time on their lawns and forces them to shut their blinds at night.

Public Works is testing different LED street lights on Blair Avenue between Lexington Parkway and Hamline Avenue; on Van Buren Avenue between Griggs Street and Hamline Avenue; on Portland, Ashland, Laurel and Hague avenues between Lexington Parkway and Griggs Street; and on Magnolia, Jessamine and Geranium avenues between Earl and Duluth streets. Maps are available online.

http://www.twincities.com/2017/03/20/st-paul-wants-feedback-after-neighborhood-lighting-experiments/

St. Paul asks residents to rate the glow of different LED streetlights

The city wants feedback before further expansion.

By Jessie Van Berkel Star Tribune

MARCH 23, 2017 — 9:29PM

RICHARD TSONG-TAATARII, RICHARD TSONG-TAATARII

Gary Hornseth does not like these LED lights on Griggs Street in St. Paul. He says they are too daylight balanced for a nighttime feel and cast too much light into homes.

It was a beautiful summer night, the type Gary Hornseth would usually spend on his front porch, relaxing and talking to neighbors. But instead he was "blasted" with white light as he stepped out of his St. Paul home last summer.

The city's effort to reduce energy use and save money by putting LED bulbs in streetlights has had some unexpected side effects, particularly in neighborhoods like Hornseth's, where old lantern-style lights direct the glow out, not down. Residents started avoiding their front yards and stopped lingering to chat with neighbors on the street.

"It's preventing people from coming together," Hornseth said.

So before St. Paul takes the new lights citywide, it's asking residents to take a stroll and weigh some options. In three neighborhoods, the city has set up demos with different combinations of light bulbs and fixtures. Residents can travel the streets in the Payne-Phalen, Hamline-Midway and Lexington-Hamline areas and fill out a survey by May 19.

The city is not asking people to stare at bulbs, community engagement coordinator Jeannette Rebar said. They just want overall impressions: Does a certain bulb create glare? Are there dark patches due to gaps between lights?

"Do they feel this lighting is comfortable and they would want it on their street?" she asked.

RICHARD TSONG-TAATARII, RICHARD TS ONG-TAATARII
This corner light in St. Paul has the original bulbs, not LED ones.

Frustrated Lexington-Hamline residents, like Hornseth, helped prompt the study. The neighborhood held a town-hall meeting on streetlights in November and petitioned the city. They asked officials to get residents' feedback before continuing to add the LEDs, which are expected to last for 20 years.

"St. Paul is out of step with major municipalities nationwide who have partnered with their residents in the early stages of adopting LED street lighting," the Lexington-Hamline Community Council wrote.

So far, St. Paul has added LEDs in 6,100 of the city's 37,000 streetlights. For years, the city has been adding LED bulbs, which have a "whiter moonlight color," Rebar said.

Xcel Energy, which is replacing 90,000 streetlights across Minnesota, is using similar bulbs. It started the project a few months ago and overall feedback has been positive, said Bob Schommer, LED street lighting program manager. He said the shift to LEDs saves cities 4 to 7 percent on their electricity bills.

However, Xcel has been putting the bulbs in "cobra" or "gooseneck" streetlights, Schommer said, which point the light down and do not cause glare in residents' windows.

A few years ago, Xcel added the bulbs in West St. Paul as part of a pilot program. The switch has reduced electricity costs and maintenance, said Duane Schneider, the city's parks and public works superintendent. Some residents complained about the light the first couple weeks after the change, he said, but he has not heard concerns since then.

Both Xcel and St. Paul staff said they are evaluating new technology as it comes on the market, like LEDs that are warmer in color. The city is using those less intense bulbs in its neighborhood study and is also redirecting light with different fixtures, Rebar said.

Hornseth, whose block is part of the study, said he noticed the difference immediately this week.

"It's just more pleasant," he said. "It's not as much of an imposition."

His family and neighbors had bought new blinds and draperies to block the light that flooded their windows, he said, noting an American Medical Association warning that the light could disrupt sleep patterns. They spent more time hanging out in backyards or indoors, he said.

Hornseth credited the city for doing the study, and said the response to neighborhood concerns has been timely and sincere. He and Amy Gundermann, executive director of the Lexington-Hamline Community Council, said they hope the city comes up with a solution that doesn't hurt communities.

"Every neighborhood will be affected by this," Gundermann said. "It will definitely make a difference in how livable our city is going to be long-term."

http://www.startribune.com/st-paul-asks-residents-to-rate-the-glow-of-different-led-streetlights/416973424/

St. Paul’s LED test illuminates the complexity of light itself

By Bill Lindeke | 06/13/17

Photo by Bill Lindeke

“The new light has changed the character of the neighborhood at night,” said Gary, a Lex-Ham resident, during a meeting last winter. “There’s light intrusion in people’s homes, and a fixture on the opposite side of the street that’s also blasting into my house so that when evening comes, the shade goes down.”

The paradox of infrastructure is that when it’s truly working well, it’s invisible. We take our most reliable systems for granted — things like tap water, a smooth road, or a flushing toilet. We only really notice these elaborate systems when they break, when the toilet clogs or the bridge falls down. Suddenly, the background appears in sharp focus.

Nothing reveals the infrastructure paradox better than lighting itself, the thing that we rely on to see the world. Right now, an opportunity to witness the backdrop of urban infrastructure is wrapping up in a quiet St. Paul neighborhood where, for the last few months, the city has been gathering input about LED streetlights. The test

emerged from a unique collision of historic preservation, technological change, and governmental efficiency that, perhaps for the first time, forced neighbors to examine the light around them.

The Lex-Ham streetlight mystery

For almost 10 years now, St. Paul has been installing LED light bulbs into city light fixtures at every chance they get. The reasoning is simple: LED light bulbs are at least 20 percent more efficient and last longer than older lights, saving millions of dollars over the long term. So far, the staff has installed more than 6,000 of the new bulbs around the city during construction and rehab projects; during that time, they received few complaints about the new light.

Photo by Bill Lindeke

A lamp post mid-replacement.

But everything changed last fall when the city refurbished streetlights in the tight-knit Lexington-Hamline neighborhood.

“The new light has changed the character of the neighborhood at night,” said Gary, a Lex-Ham resident, during a meeting last winter. “There’s light intrusion in people’s homes, and a fixture on the opposite side of the street that’s also blasting into my house so that when evening comes, the shade goes down.”

Gary was not alone. Dozens of his neighbors had been so upset by the new lights that they made significant changes to their homes: writing their council member, buying new window shades, and even moving bedrooms away from the street.

At a packed meeting at in the Central High School library last winter, city staff, including Public Works Director Kathy Lantry, Deputy Mayor Kristin Beckmann, and Council Member Dai Thao, were on hand to take the measure of neighborhood concerns. For the upset neighbors, the issue boiled down to three key points: aesthetics, health, and community. For example, many people brought up a 2016 AMA study that points to harmful effects of more “blue” or “white” light on people’s health.

“When the lights came one, everyone sitting on the porch would groan and turn away,” one woman testified. “We’d all have to move our chairs, and we’re front-porch people. So what are the city’s options if we stick with an LED light?”

In the end, one key idea emerged. For urban neighborhoods like Lex-Ham, where many of the streets are designed around sidewalk interactions, driving people away from their windows and porches can have a detrimental effect on public safety and the social life of the street. This is particularly noticeable in neighborhoods like Lex-Ham, with stronger social ties.

“We have always had a block party active,” Diana Scimeca, who lives off Dunlap Street, told me last month. “On our block it’s always gone late into the night, but the minute the lights came on, we said, ‘We can’t sit out here. It’s just horrible, it’s blinding.”

St. Paul streetlight explainer

A key part of the problem is that not all lampposts are made equal. To the keen eye, there are dozens of differences.

Photos by Bill Lindeke

St. Paul has long been proud of its distinctive lampposts.

One of St. Paul's unique charms is its manmade canopy of human-scale lamps that line nearly every street. The city has long been proud of its distinctive lampposts, sturdy metal fluted poles topped with historic hexagonal lanterns, and if you wander the streets of St. Paul and begin to notice them, the posts come in a surprising array of styles.

The thing that made Lex-Ham's LEDs upgrades different is that not all St. Paul lampposts are alike. Most of the streetlights that received LED light upgrades in the first years of the city's rollout were not historic vintage lamps. Instead, the new bulbs had been put into "cobra head" fixtures (a pole curving over the street with a bulging bulb at the end) or "globe lights" (self-explanatory) in the downtown core. Neither of these styles have the lighting dynamics of the city's more classic model.

Even when the city began installing LEDs in the city's distinctive "classic" street lamps, there were still a bunch of subtle differences. Most of the old-fashioned-looking lampposts in the city are actually modern retro replacements — new fixtures designed to look like the old ones. But a few neighborhoods, like Summit Avenue, Irvine Park and Lex-Ham, kept their original vintage lamp fixtures, many of which are almost a century old.

"In replica lanterns, the way that the diode directs light is not straight out, like into houses," explained Christine Boulware, an historic preservation expert who happens to live in Lex-Ham, and attended last fall's meeting. "With these historic lanterns

that our neighborhood fought very hard to keep, the direction of light is more into people's homes than lights on Montreal [Avenue] or Ford Parkway."

(Fun fact: The Lex-Ham Community Council proudly boasts that it's the oldest community council in the city. It got started back in the 1970s organizing around an effort to save their historic lampposts.)

In Lex-Ham, the tiny details between the lampposts ended up making a big difference in the street.

Deep inside history of street lighting

It turns out that the history of urban street lighting is secretly fascinating, and once you open up Pandora's light bulb, a complex world appears. The first wide-scale urban lighting in St. Paul were gas lamps, installed in the late 19th century beginning in upscale neighborhoods. (For example, the old "island station" power plant that was torn down in the river valley a few years ago was originally called Saint Paul Gas & Light Company, beginning as a gas supplier before moving to coal-fired electricity.) Since the shift to municipal electricity, lights have been constantly evolving in the name of efficiency and safety.

According to Kathy Lantry, who heads the city's Public Works department, there are some older city staff members who remember all the way back to when the city switched to HPS lighting in the first place starting in the late '80s, gradually replacing the (whiter) mercury vapor lamps.

"There are people in Public Works who have been there a long time," Lantry explained at the winter meeting. "When we went from old mercury lights that were really bright to the HPS we have now. Back then, a lot of people thought that everybody looked jaundiced. So part of this is very different color light, and managing that change."

And the issues do not stop with color. Here's a sample of some more lighting terminology: "Color temperature" refers to the precise temperature and spectrum at which the light shines, measured in degrees on the Kelvin scale; "wattage" refers to how much energy it consumes; and "intensity" refers to its brightness, measured in lumens from various distances.

(There's also "voltage," but to be honest, this is over my head. LED works at a much lower voltage than HPS, for what it's worth.)

Each kind of technology and bulb has specific properties along these different spectra, and where it becomes problematic is that, while LED does very well in terms of having a low wattage and high lumens, its default color temperature is a "white" light around 4,000°K. High-pressure sodium vapor lighting, on the other hand, ranges around 2,000 to 2,300°K. That color temperature gives it a distinctive — I find it pallid — yellowish hue.

"[In 2008,] the only readily available hues were 5K and 4K," explained City Lighting Engineer John McNamara last fall. "The year we decided on 4K was when we did the downtown globe lights. 4K is neutral light, and part of reason we chose it is it's closest to color-neutral light. It was readily available at the lowest temperature that we felt appropriate."

Years later, the 4,000K bulbs do not seem to be rubbing people the right way. After the outcry, the city discontinued the bulb replacement and began a lighting test this spring. Engineers chose three neighborhoods on the East Side and central St. Paul, and installed eight kinds of LED bulbs, many of which were new models that have appeared on the market. Some of the bulbs burn at different color temperatures, or have different shapes. Neighbors were invited to send feedback to the city about which they liked and disliked.

https://www.minnpost.com/politics-policy/2017/06/st-paul-s-led-test-illuminates-complexity-light-itself

Photos by Bill Lindeke

Subtle differences between old and new lamp enclosures in nearby Merriam Park.

The test ended last week, but so far the results are mixed.

According to Amy Gundermann, the director of the Lex-Ham Community Council, many people remain unhappy with their options.

“Neighbors have told me that they are disappointed in all of the options,” Gundermann explained this week. “Of the eight bulbs tested in Lex-Ham, four are still 4000K bulbs, which is the Kelvin level of the LED bulb installed last year. It seemed unnecessary to test those bulbs in light of the AMA report and resident reaction. I hope the results of the surveys are helpful to Public Works in determining a lighting solution that is both efficient and livable. Our city is safer when people enjoy their front yards.”

Still, designing lighting that works for the entire city is a staggering task when you have more than 37,000 light bulbs hanging over city streets. Engineers are very reluctant to adopt what they call "a piecemeal approach", where each neighborhood has a different kind of bulb. For logistical reasons, they would prefer to have a single

bulb that works for everyone. But with the diversity of lampposts, environments, and urban design details, that might prove to be an impossible challenge.

For her part, Diana Scimeca has low grades for the new light bulbs.

“There are two that are just a pitch more yellow, a lower kelvin,” Scimeca said. “They’re better on a relative scale — they’re like a 2 for livability as opposed to a 1 — but they’re still not yellow enough or shielded enough. It’s a little frustrating.”

Scimeca hopes St. Paul has a bright idea up its sleeve that will bring back her nighttime block parties. Meanwhile, the test bulbs are still up in Lex-Ham and the other neighborhoods. If you're curious about subtle distinctions of LED technology, check them out for yourself. It’s an enlightening experience.

EXHIBIT I – RESIDENT SURVEY COMMENTS

Bulb A Comments

- Neutral light color is ok-- not as pleasing as the warm bulbs (B, D, F, H) but ok."
- Of the two lights on Hague, this one was better.
- I like the fact that the light bulb points "down."
- While still bright, it lights our bedroom less than the original LED. And we have noticed significant decrease in sleeping issues, my wife in waking early (like 4-5 a.m., and myself with falling asleep in 10 minutes instead of an hour. Still, a preference would be for the warmer color of the old HPS lights.
- Yuck
- Too bright and too white/blue
- Jarringly blue and bright. Light appears as a bright spot, hard on the eyes.
- "The last question is difficult to answer because I have not been in a house on this block; I would want to know what the residents of this block think.
- The blue-white light is very uncomfortable and the light spills onto the adjacent lawns and houses.
- Too glary, the bulb is in the middle of the lantern, shining directly into my eyes, not directing down to the street.
- The worst. This light as installed has no place in any residential area. It is big box retail parking lot. Dreadful. An absolute affront in all levels.
- Feels like a Walmart parking lot.
- Terrible
- When driving this light was so bright it made it difficult to see other objects. It is like a car with its brights on.
- Equally unacceptable.
- The glaring quality of the light makes it harder, not easier, to look ahead down the sidewalk. The harsh light actually hurts my eyes. This is true on every one of the test blocks. There is not much variation in the harshness or brightness of the bulbs, just the placement of the bulbs inside the lanterns. There should be more choices, there are LED bulbs that are not harsh blue, but you have not used them in your test.
- This light has that bright white fluorescent look which is not good for residential area.
- Worst one.
- Way too bright
- The light is sharp, piercing, and cold. It is a huge downgrade from the existing warm, rosy tone lights.
- Cold, harsh, painful to the eyes.
- Nasty color, way too bright. Makes me want to stay home and not go out at night.
- Ugly
- "This one was way too glaring and brightly, blindingly white.
- Bad
- I do not like the Bulb A at all. It is so bright...It shines into our house. It is like we are in a parking lot.
- The first thing you see when looking down the street is the glare from the TOO BRIGHT, COOL WHITE LIGHT. Isn't welcoming.

Bulb B Comments

- I really felt ALL the choices were too bright but I liked this light's color.
- This is one of the more pleasing lights my top 1 or 2-- it has a nice ambiance and makes the block/ neighborhood feel charming because of the top-mount style and warm color. Not sure if it is a bit too dim for safety? Would want to know what police officers think about this."
- Best option for our neighborhood.
- This is my favorite bulb of the choices. The color of this bulb is best, and the mounting of the bulb tends to send the light down where it is needed. Many others projected too much harsh light onto the houses--porches and windows (even on the second floor) included.
- This is my favorite bulb! I love the warm yellow hue, the top mounting of the bulb, the charming resonance with the former bulbs used with these historic lamps in the Lex-Ham neighborhood. I strongly recommend its use. Thank you so much!
- The warmer color temperature and the downward light direction of this option are preferred characteristics for lighting in residential neighborhoods.
- This is the best bulb by far. the color is ok, the light is directed downward, away from eyes and homes, and it's not too intense.
- "Of the two on this street, I liked this one least.
- May be the best of the lot but only ok.
- This is in the right track. It could still be angled and shielded better. But if I had to choose between this and A I would choose this 100 times out or 100. I do think the top mounted bulb makes sense in these lanterns to limit light intrusion into homes. Worth more evaluation.
- Best color overall. Does the best job of illuminating the street but not the houses.
- This is the least worst bulb of all the blocks.
- These bulbs are slightly less horrible than bulbs A
- While still too powerful to the eye and too bright, this is the best of the 8 options in my opinion. A less bright version of this would work very well.
- Of all the test bulbs, this one appeared to have a hint of warmth to the color spectrum. It is still far too cold and glaring compared to incandescent bulbs, but was the best of the test bulbs...which isn't saying too much.
- This is the best of the bunch (tied with F). I don't really like any of them. But this one is better than the others. Warmer light. Not as glaring bright.
- "Although this bulb is still too bright, white and somewhat glaring, it was the best of all eight choices."
- A light bulb by which to raise a family.
- Best
- The key is that the light is a warm white, not a cool white. Nice single bulb; classic looking. THIS IS MY FIRST CHOICE.
- Better than others
- "Good color, direction
- 1st choice"
- Not true color, a little spotty, doesn't carry very far which means it doesn't seem to shine into houses too bad but it also does not illuminate the best.

- The color is a little overly pink, and the bulb appears smallish, but mounted high in the enclosure gives it better coverage than the other smaller bulbs, but not as good as the taller bulbs.
- Bulb seems to be mounted at the top of the housing, for greatest efficiency in illuminating the sidewalk.
- Liked this one
- "The last question is difficult to answer because I have not been in a house on this block; I would want to know what the residents of this block think.
- I found this whole survey hard to follow. I spent the time to go out to see the test sights. I think it might have been easier to put them all together. IT was hard to find the signs. I had to drive the area rather than walk it."
- Too dark
- Seems very industrial.
- I like the yellow color but the bulb is too high in the lamp, looks odd.
- I drove by on a sloppy sleety night. My neighborhood (Como RSVP project of 2016) has new awful harsh white and glaring lights that are sending light into our homes. Walking in my neighborhood, I feel the need to shield my eyes from the brightness. My eyes "adjust" to the bright, and then the contrasting dark as I walk out of the footprint is difficult to see in. Driving through a neighborhood is a bit different. I believe the that design of the "B" bulb and the "C" bulb, (with the bulb being more hooded by the top of the fixture) diminishes the exposure of the bulb and thereby some glare when looking at the light. (Like bulbs H and G look very exposed to me...cute but kind of glaring.)
- Slightly warmer, but still casting a sad, cold light.
- Ufly

Bulb C

- Of the rounded bulbs this one is more centered in the lamp. Prefer yellow color, less harsh.
- Cool white light, but not as glaring.
- Yuck
- Not as bad as test bulb A, but still too bright, too white/blue
- Not as bad as A, but pretty bad.
- "I didn't take great notes on this and do not want to bias the survey.
- The last question is difficult to answer because I have not been in a house on this block; I would want to know what the residents of this block think."
- The blue-white light is very uncomfortable and the light spills onto the adjacent lawns and houses.
- too glaring, too intense, too white
- I did not like this one. I think most of these lights look very industrial and are not warm or friendly looking.
- This one is bad.
- Ugh. Nearly as bad as A. Non-starter.
- Wrong color light
- The lighting points down, which is nice, but it seems a little white. Prefer a softer color.
- No improvement from glaring white current lights
- Better than A but still too bright.

- Not a calming effect.
- WAY too bright
- Super nova bright. I pity the homeowners on this street and pray that the city comes to it's senses before you get to my neighborhood if this is your choice.
- The cold light is depressing and dangerous to one's health. Studies prove the damaging impact of blue spectrum light. Please reconsider using any of these type bulbs. It must be possible to get closer to the warm tones of the incandescent bulbs.
- too bright, horrid color. I want to run away and pull my blinds.
- Ugly

Bulb D

- Again, too bright (as they all are) but I like the color better.
- Softer but still too bright, not as blue or bright white
- Color is better than A and C, but still on the overly bright appearance side of things.
- The last question is difficult to answer because I have not been in a house on this block; I would want to know what the residents of this block think.
- The color temperature of this light is better than most, but the direction of the light spills too much into yards and onto the adjacent houses.
- ok color, since it's in the middle of the lantern it's too intense.
- Of the two test lights on this street, I liked this one better.
- This is also on the right track like B. More could be done with angling and shielding. This seems closest to the old amber lights although still very far off.
- Best overall
- Another glaring bulb with a very unpleasant color
- Don't like white bulbs in general. This one sits too high. Aargh I may have mixed bulb c and d up.
- Better off-white color
- Favorite one!!
- Slightly softer but it doesn't even matter. The overall effect continues to be unpleasant and not an upgrade in terms of visibility.
- Maybe slightly softer, but nearly imperceptible. I was hoping for a true range of colors. The test bulbs are all at the same end of the spectrum.
- This is my 2nd choice. B an F are tied for 1st place. It is a bit warmer and not so glaring that I want to wear sunglasses.
- Tolerable
- Great for prom pictures.
- Looks like a "double bulb;" doesn't have as classic a look. I like the warm white color. My third choice.
- 2nd choice

Bulb E

- Yuck
- Way too bright - was seeing spots after walking down this street
- The bulb is small point source and very glaring - look at it once and you are blinded.

- I live on this block and feel somewhat unsafe with this light-- I'm not sure how to describe that it is too dim on the sidewalk but shining brightly up into our windows. Of all the options, this one seems least ideal and casts off somewhat of a "cheap" look.
- This light is unacceptably glaring. It shines too brightly onto our porch and into living room and bedrooms--compromising sleep. I strongly recommend not using this bulb in our street lamps.
- The blue-white light is very uncomfortable and the light spills onto the adjacent lawns and houses.
- Glare
- Nearly as bad as the dreaded A. Abysmal lighting. Garish. No place in residential area.
- Similar light quality to A. Really unpleasant.
- Too cold and bright
- Too white and glaring
- Least favorite. Too bright and sits too high in lamp.
- Similar to Bulb C
- Can't read street sign because the light is too glaring.
- NO so bad
- Ultra bright. Studies have proven that blue spectrum light such as all of these LED bulbs can lead to physical and mental health issues. It's not a good choice.
- Insanely white bright. Pilots will start thinking these are MSP landing lights if you go this route.
- Ugh. Too blue white and glaring. Makes me think the zombie apocalypse is at hand. But at least we would see them coming.
- Ugly
- Felt like I was being interrogated on a daytime cop show.
- Again, a COOL WHITE that is too bright.

Bulb F

- Color isn't as bad as A, C, E, and G but still too bright. I like the color of D better.
- Bright but doesn't seem too bright; doesn't seem as harsh; good coverage, like the taller bulb - provides much more even light; not spotty
- The taller bulb style gives good coverage without being too bright of a spot or too glaring. I really like the tall bulb style and this color and brightness level has good even coverage.
- The last question is difficult to answer because I have not been in a house on this block; I would want to know what the residents of this block think. This my #3 choice and would really want some opinions from residents on this block. The light seems warm and bright but not glaring.
- WE FIND THIS BULB TO BE THE BEST OF THE TEST BULBS, BUT OVERALL, WE HATE THE LED LIGHTS AND WOULD GLADLY PAY EXTRA TO NOT CONVERT!!!!
- While this color temperature is a bit warmer than the blue-white light it is still very uncomfortable and the light spills onto the adjacent lawns and houses.
- The color is still too white, but the large cob design isn't quite as glaring, but still glaring.
- I thought this one was ugly looking bulb, but was not too bright which is what I care most about.

- Reasonable color but super intense and intrusive. A much worse riff on the basic idea of D. Hard to drive into.
- Decent color, but so bright it seems like it would be a distraction when driving.
- Bulb shape unattractive
- These long double bulbs are the brightest and their light is the worst of any of the test blocks.
- Very unpleasant.
- I will reluctantly give this bulb the rating of the best bulb during the trial, as it is not quite as white and not quite as glaring. I would love to see us head in the direction of this bulb, with even more yellow of a bulb, with better shading of the lamps to direct the light properly. Thanks
- This one looks nice in the lamp. Oblong and fills it nicely. Like yellow color. My favorite
- Best one. Like the longer tubular light source versus the small point-source like other bulbs.
- Softer than the others. Better.
- Ok
- Slightly yellower tone, but the overall effect feels like some poor east bloc country that can't afford proper lighting.
- A hint of yellow in the bulb but somehow even brighter despite that improvement.
- This is my 1st choice - ties with B. Less glaring and warmer than most. Doesn't make me want to move to the country as much.
- Decent
- Made me need to stay up all night, hindered plant growth, and made me cancel the BBQ.
- I think the elongated bulb helps to spread the light better throughout the block. At the same time it is less intense, making it easier to look at.
- A nice yellow / warm color, but kind of a strange diffuse bulb.

Bulb G

- Yuck
- Too blue and harsh; spot bright - doesn't carry very far.
- Too bright, too blue.
- The last question is difficult to answer because I have not been in a house on this block; I would want to know what the residents of this block think. Bulb G and E are my least favorite as they are so blue and somewhat cheap looking.
- The blue-white light is very uncomfortable and the light spills onto the adjacent lawns and houses.
- oh my god this bulb is horrible, their should be a 0 and 6 on the survey.
- This light is obnoxious in our house.
- Rivaling A for replicating a Wal Mart environment Just seems clumsy. Depressing. Looks terrible. Hard to drive into.
- Tolerable but still too bright
- This bulb glares into my bedroom window and onto my front porch. I hate it. I don't sit on my porch after dark anymore. I cannot have the window open.
- These lights don't seem quite as blue and harsh as the others, but they still fall under the "shopping mall parking lot lighting" category.

- I have lived with this bulb since it was installed last year, and it is absolutely the worst of the study. It makes me sad every night when they come on. We have ended block parties early b.c of these lights. They are so unpleasant. SO glaring, white, blinding and industrial feeling.
- Probably second favorite. Yellow glow round but centered in lamp.
- White, too bright, like Bulb C and Bulb E
- Too bright. !!!!!
- Harsh
- Crisp white light. And that's not a good thing. Compare it to the nearby old/existing lights and tell me this change is worth the cost savings.
- So crisp and white it seems to come from another planet. Is it necessary to take this course? Please look for alternatives that keep our lights in a warm, soft range. The damage from light pollution is physical and emotional. Spend a few extra dollars to preserve our health.
- too ugly-blue and glaring. Please please no.
- D
- Looked like Sin City.
- Second from the least offensive
- Such a remarkable contrast to look at the COOL WHITE, HARSH LIGHT of this bulb compared to the original bulbs across Lexington, on our block between Lex & Oxford, which haven't been replaced by any of the LED test bulbs yet. The harsh white light is so much less inviting and the glare is particularly obvious when comparing to the warm amber glow of the original bulbs.

Bulb H

- Not as bad as ACEG but close
- Not too bad; not too blue (like some of the others); more color true but a little spotty.
- Lots of coverage without being harsh.
- The last question is difficult to answer because I have not been in a house on this block; I would want to know what the residents of this block think. This is my top 1-2 choices along with B. The light is warm and bright.
- THIS IS OUR 2ND CHOICE IN THE NOT TOO GOOD CHOICES AVAILABLE.
- This is my second favorite bulb!
- While this color temperature is a bit warmer than the blue-white light it is still very uncomfortable and the light spills onto the adjacent lawns and houses.
- pretty glaring, too white, too intense
- Of all the lights I liked H best
- Better than G
- This isn't too bad. Maybe after experiencing so many sad bulbs this is looking better by comparison. It actually seems like it could be promising woth attention to shielding.
- Nearly as good as B for approximating our old lighting.
- 2nd best option
- These bulbs are too blue.
- Generally really like this light.
- Not the worst bulb of the lot, but certainly not something I would want to live with.
- White so on the bright side but favorite of white bulbs. Round but centered.

- Second best light. Pretty good color.
- Nicer yellow color. Less glaring.
- Ok
- No. Please. No.
- Sigh.
- Nope nope nope. Not this one. Too cool. Too bright. Please no.
- "Decent"
- Least offensive
- This is my second choice; I like the warm white color, so even though it appears to have the same brightness as Bulb G, it has a much more welcoming feel.
- It is hard to get used to the extreme whiteness of the bulbs the old ones felt warm these new bulbs need to balance comfort and saftey and also efficenecy.
- idnt like the original replacement lit up the whole front of house like the new one
- Bulb B is the best choice
- Bulb H gives a softer light so i could sleep with it

Bulb 1

- Best level of warmth over-all
- Too much blue in the color
- I do not live in the St. Paul area, but my night sky in the Stillwater area is greatly affected by what St. Paul chooses to do. For the sake of decreasing 'blue light pollution' which would negatively effect the communities around St. Paul, please consider installing 2700K fixtures, not 4000K fixtures, and installing full cut-off fixtures as well. Please protect the valuable resource of our night sky. Thank you.
- bright point source destroys dark adaption: someone could be waiting by the light to attack and you'd never see them due to the glare; softer, even light (light along Blair between Hamline and Snelling) is much better; also, please be sure that any new lighting meets the guidelines from the Dark Sky association (darksky.org)
- "Gawdawful, blaringly bright and cast sickly pallor.
- Liability: a disrupt citizen health [see AMA warning released June 2016]"
- "I am providing feedback on the LED bulbs installed in my neighborhood during Q1 in 2016, NOT on these new test bulbs. I live on Beech Street near Johnson Parkway. I really love the concept of using LED lighting -- I have worked with engineers developing & using them, so I am a big believer in the cost and energy savings. That said, PLEASE give some thought to lighting spectrum. The spectrum of light that is used has a huge impact on human, animal, and plant life, health and behavior. I noticed immediately when the new LED lights went ""live"" on my street, because within a week I had trouble falling asleep and I am still struggling with that. My bedroom faces the street, and it seems like the only recourse will be to buy heavy draperies that would block out morning light as well as
- Why are the new LEDs such a problem? Two reasons. First, the lights have a ""glare"" to them. With no shielding to ""soften"" or scatter the light, the full glare shines right in a person's face when the look from the proper angle. I can't help if that angle happens to be the one that occurs when I am lying in bed, but I imagine light shields or adjustment of the angle might help. Second, the lighting spectrum contains far more blue light compared to the old sodium vapor lamps. I can understand why a person might assume that ""daylight"" is the best light spectrum for street lighting, and on a

freeway that may be true. In a residential neighborhood, however, it is inappropriate for health reasons. The more blue-colored the light released from LED lighting is, the more strongly it suppresses melatonin, the hormone that regulates the sleep/wake cycle (http://jap.physiology.org/content/110/3/619.short). The result is disruption of circadian rhythms in the people exposed to it. Exposure to nighttime lighting has directly been identified as a health concern with ties to breast cancer (http://www.ajpmonline.org/article/S0749-3797(13)00322-X/abstract?cc=y=). Circadian rhythm disruption has more generally been tied to increased growth of lung tumors (http://www.sciencedirect.com/science/article/pii/S1550413116303126), initiation of metabolic syndrome/pre-diabetes and worsening of inflammation (http://www.sciencedirect.com/science/article/pii/S1262363613002358), and exacerbation of severe mental illness (http://www.sciencedirect.com/science/article/pii/S0959438813000858).

- Please, for the health and well being of all of St. Paul, I strongly urge you to ONLY install in residential neighborhoods the sorts of LED lighting that exclude all blue wavelengths. A dozen or more types of LEDs are available now, with various light spectra for different purposes. Since LED lighting is a long-term investment, it's critically important to make the right decision now for future public health purposes. The science in this area is still emerging, but the results so far are clear and consistent -- in terms of public health consequences, using blue wavelengths in nighttime residential lighting is about as wise as using lead pipes to deliver city water to our homes."
- There appears to be an additional test bulb across the street, which is not depicted on the map provided. The bulb is two houses off Syndicate on south side of Van Buren. My comments above also apply to this bulb.
- New Lights are great ! I could barely see my car from across the street Now I can see it fine ! New lighting on the Wheelock parkway project turned out great ! Nice job on the lighting keep up the good work !! thanks again !!
- We prefer Bulb 3 because of its warm color and moderate intensity. Slightly less desirable are bulbs 2 and 5. Bulbs 1, 4 and 6 are too cool-colored and too intense. We dislike them.
- "#1 - feels like a Walmart parking lot
- #6 - glaring
- #3 - feeling is calmer
- Note: can glass be tinted to soften effect; support idea of LED"
- "I like Bulb 5. Some look the same.
- Bulb 2 is good also"
- 1 was so nice we figured it might not even be LED . 1&3 were LED
- Two of us did the tour and we both thought Lex ham bulb Band Payne Phalen bulb 1 & 3 bulb 5 in ham midway was ok to.

Bulb 2

- It was difficult to drive with how glaringly bright and white these lights are.
- "color is better than #1 lighting somewhat blobby"
- "Gawdawful, blaringly bright and cast sickly pallor;
- Liability: a disrupt citizen health [see AMA warning released June 2016]"
- sorry ?

Bulb 3

- "color is roughly the same as #2 light seems more on street/sidewalk and less out/up/wasted"
- "Gawdawful, blaringly bright and cast sickly pallor. Liability: a disrupt citizen health [see AMA warning released June 2016]"
- No comment

Bulb 4

- Most glare of the 6
- "Gawdawful, blaringly bright and cast sickly pallor. Liability: a disrupt citizen health [see AMA warning released June 2016]"
- No comment

Bulb 5

- "color almost OK slightly more glare than #2 and #3"
- This was my favorite!
- Liability: a disrupt citizen health [see AMA warning released June 2016]
- no comment

Bulb 6

- The light given off by test bulb 6 is something I would expect to find in communist Russia in the 80s. It is offensive and makes me feel depressed.
- color is too blue
- "Gawdawful, blaringly bright and cast sickly pallor. Liability: a disrupt citizen health [see AMA warning released June 2016]"

General Comments from paper survey, email & phone calls

- Yellow , not white please
- Bulb B is the most acceptable based on Warmth of color and light at top of the lamp
- All the warmer tones - even the harsh ones are better that the blue tones
- Generally, i prefer the warmer bulbs over the cooler bulbs. the higher the bulb in the lantern, the less glare it seems to emit.
- of all the bulbs we like H the most . they are still to bright which is making it difficult to open windows & shade at night
- I believe bulb B is the best choice
- I believe bulb B is the best choice
- The small bulbs are too bright a point source. I liked the bulbs in top of fixture but not enough light & the 4k color to point source
- I prefer the "top mounted" bulbs on Hague (Bulb B) but would prefer a warmer color like Bulb F - which has a slight yellowish hue.

- The biggest problem with the lights are the intense white color and the excessive brightness which makes it hard to sleep in our house.
- "Warmer tones preferred B, D, F, H
- H: Good, even distribution
- B: Good tones, like downlighting but somewhat intense at light base"
- "The bulbs that are white are HORRIBLE (A, C, E, G)
- Too harsh AND Not the atmosphere originally/traditionally desired
- Laurel to W of Griggs (orig) still the best"
- "The bulbs that are white are HORRIBLE (A, C, E, G)
- Too harsh AND Not the atmosphere originally/traditionally desired"
- "I am a resident of Saint Paul, former board member of Lexington Hamline Community Council, a licensed attorney, and I do not agree with your decision to implement the LED bulbs as currently proposed.
    - - Residents did not like the 4,000 kelvin bulbs. We petitioned the Mayor and asked for bulbs in the 2,000 kelvin range, thus leading to this study. What did the City use for testing bulbs? Almost all 4,000 kelvin bulbs. I was told that 2,000 kelvin bulbs aren't really available.
    - - An environmental impact statement has not been performed to assess the effect of LEDs on the health and wellbeing of migratory birds, insects, animals, and even people. There is emerging science that LEDs can lead to blindness by damaging the cells in the eye's retina.
    - - There is evidence that crime actually increases because fewer people sit outside with bulbs they find uncomfortable and the shadows they cast create dark zones perfect for crime.
    - I am unable to pick any of these bulbs; I performed the study several times (and developed several migraines from it). Forcing residents to choose with of the 8 mediocre, baseball-stadium-hard bulbs they like is an exercise in bureaucratic hostility and ignoring the people who pay your salaries. I have spoken with environmentalists, city historical preservationists, and environmental attorneys and we are prepared to file injunctive action to halt your activity and request that an EIS is performed. Knowing this, you should consider these facts before you spend more taxpayer money to just plow ahead. The City can't even fix Ayd Mill Rd and its war-torn Mogadishu conditions - maybe the City should focus on that. The supposed monetary savings generated from these bulbs are outweighed by their horrendous aesthetic and health concerns. It's penny wise, pound foolish."
- Most of the bulbs are really too bright. I wouldn't want them in front of my house.
- My neighbors and I hated the white lights you installed on our blocks. We didn't want to be out in our yards anymore. It has affected our sense of community.
- "Bulbs A, C, D, E, F & G are shockingly bright. Bulb H is slightly better.Bulb B is the best of the bunch."
- We would prefer to keep the bulbs that are currently in our streetlights. The yellow hue is much better than white.
- The bulb you installed on my block is better than the rest. I would be ok with this one. Bulb B
- Environment AMA / nocturnal animals
- We live on Portland Ave,East & Dunlap (block G) . The trees on the boulevard have seen severely pruned.The result is that the street light in front of 5b our house shines directly into the house . all night long . The new high intensity bulbs are over whelming , very

disturbing . three modifications to the new bulbs are helpful : lower the intensity or candle power of the lights. place shields around lights to direct light down to sidewalk / street area the place use bulbs with blackened upper portion of bulb . It appears that several of the bulb options build on the foregoing principles . We prefer the greatest limit in bulbs . However , the test bulbs are still too bright , even with their limits. At the same time the city has newer lights in the alley behind own home . These high and incredibly bright . They shine into and illuminate the south facing portion of the house . In some of our neighborhood suffers from light pollution .More modest city lights coupled with modest home owner or occupant lights should be a equate to discourage crime and enhance personal & property /security having to pay taxes for light pollution adds insult to injury.

- Bulb B was the best , Hem midway 5 was good too
- All were similar to "A" - Too bright . no real color difference
- I am leaving town and wanted to submit my feedback from Blair Ave near Syndicate about the new street light bulbs. They are terrible. They are way too dim. There is always a lot of activity near this corner and lots of cars. These bulbs are so dim that little light is provided. The elderly, kids and those with poor vision deserve better. Others have stated this to me as well so please go back to the brighter bulbs.
- I live on the West Side over on Page Street East, near Oakdale Avenue. I noticed when the street lights on Oakdale were replaced with very harsh LED lighting last summer. I am very disturbed by this and am worried that these lights will be installed on my street. I do not want to replace my window shades in my house in order to block this invasive light from entering my home. There are studies that show that people who are exposed to this LED lighting do not sleep as well because this light interferes with sleep patterns. I was reading in the Star Tribune today about some residents who organized a community meeting around the street lamp replacements in the Lex-Ham neighborhood and I am wondering if we might be able to convene a meeting like this.
- I am a homeowner in St Paul (at 1011 Stinson St) and also represent Sub-District 4 on the District 10 Como Community Council. I am writing to encourage the city to adopt LED bulbs with the lowest available Kelvin temperatures, meaning as close to 2000K as possible. This will lessen the possibility of our residents' sleep cycles being disrupted, and will make sure that the nighttime character of our neighborhoods is retained. With so much evidence regarding the negative health effects of exposure to blue lights, especially at night, it would be extremely troubling if the city adopted anything with a Kelvin temperature of over 2700.
- I moved into St. Paul in the middle of September. I live at 1266 Como Blvd. E. I have looked at the new lights, and find it very hard to make a decision on their quality, however I am sure that the LED lights would be better for the city as a cost saving and energy factor. My question is whether they will be placed where the old lights are now or changed to the old fashioned looking lights that are closer to the lake. I love the look of those lights. They are very charming and keep the character of the community. I have a light directly outside my living room window, and it shines right into my home all night . It is on a tall post that shines so brightly as it is, I can only imagine what it would be if it were replaced with an LED. My greatest wish is that the new lights be placed in positions that do not shine directly into houses. Is this possible? I would be more that happy to have you stop by and see what I am concerned about. I welcome a response to my question. Perhaps you have an answer to my problem.
- I am going to mail mine in today for the Hamline-Midway test area but I wanted to offer further comments that would be hard to include in the survey as it is presented. While I

greatly appreciate the efforts the city made to set up the test areas and put the survey tool out, I must say I found it very difficult to do this. I drove over to the area two times and observed the lighting from my car. Looking at the survey instrument I had printed out, it was difficult in the dark in the car to fill it out. I also believe there are very fine discriminations requested here, and I found it hard to determine gradations in the dimensions we were asked to comment on. Since I don't live on those blocks, I assume that harsh light can go into someone's windows but I am not sure. I would think that even people who lived on those blocks would have difficulties making some of these fine comparisons. I am sure you have heard much of this before, but for the record, it is misleading to say that this change to LED lighting is environmentally friendly. It is not. There is much research about the negative effects that bright lights have on human sleep cycles and the life cycles of animals and insects. For instance, owls, who live in the city of St. Paul, are negatively impacted by bright lights when they hunt. They cast more dramatic shadows that scare off their prey. There are insects and animals that only feed, breed or navigate under the safety of darkness. And the effect of bright light on the human production of melatonin is well documented. That said, what I experienced after driving around in the test area was relief driving back into neighborhoods that had the old sodium vapor lamps. Our lamp posts in my neighborhood in St. Paul were meant to mimic gaslights which were soft amber flames. Because our lamps are lower to the ground in order to look like gaslights, the glare from them is worse than if they were much higher. As an older person, I can tell you I feel assaulted by LED lights in many ways these days. The LED headlights of some cars are absolutely blinding. As you age, and your lenses become more cloudy, they disperse light so that a halo forms around them. The LED lights are terrible for this. There are LED lights people are putting around their private property. I find it very unpleasant when I set off motion detectors just walking down the sidewalk and have these harsh lights blinding me. I am not happy with the glaring lights replaced in Highland Village. That bright white light makes everything look flat, grey, and dull and lifeless. I don't know if there is any way to get more amber color in the lighting. Can some amber colored film be placed over the glass in the lantern style fixtures to give it more of a yellow hue? Are there actual bulbs manufactured that are more yellow? Most of the lights the city offered are very white and harsh in my opinion.

- Jeff and I walked around the neighborhood the other night to participate in the LED study. I won’t speak for him even though we shared much the same opinion. I tried two different ways to submit my feedback on line but was unable to do so, adding to my level of frustration on this light bulb issue so I’m just writing you instead. I wonder how many people have attempted to provide feedback only to run into the same technical issues. (I did write the survey company.) There seemed to be no distinguishing features on any of the light bulbs. In fact, with the exception of D and maybe G – we could see no difference - which made me question the survey entirely. I really don’t care for any of the lights – not one single one – not even close. I hate what these lights have done to our neighborhood outside and inside my house. It is especially hard to take when we see some of our neighbors still have the cozy lights from before. That difference is striking. The glare was so strong the other night we had to look down the whole time. I resent the real change in the quality of our neighborhood and the fact that we aren’t sure how we can resolve it. It also feels unimportant compared to so many other issues but again, we didn’t have any say in the selection and it is in fact a quality of life issue that affects all of us. I have not talked to ONE person in Lex-Ham who likes the bulbs. I would also assume that my neighbors care deeply about efficiency and environmental

stewardship. There must be some way to meet these shared values. I urge you to continue to look for ways we can find a solution that works for everyone. I am happy to help in any way I can. Thank you for your consideration. I appreciate your working on this.

- Thanks for the opportunity to comment. I just quickly would say that I would echo Margaret's comments that the only two lights that I thought were better than the rest were D and G. I thought those cast enough light without the extreme glare of the others. I also could not distinguish between the other lights. We look forward to hearing the results of the survey. Thanks for all your work on this.
- I am in favor of the type B bulbs for the Midway. I have a light on my property at 1397 Hewitt Ave, right outside our picture window. I would hate to have one of the more glaring light bulbs in that location.
- I am grateful that the city of Saint Paul is seeking input on the new light bulbs. I drove around the area at night. I really do not like the harshness of the LED lights - they are too white and blaring. Given the choices, however, the least harsh lights are letter " B", in my opinion. They are positioned toward the top of the lantern and cast the light more downward. I will miss the warm yellow glow of the old lights and continue to hope for a return to that warmth on the streets of Saint Paul.
- You have eagerly received my calls and answered my questions over the last several weeks regarding the LED light study. As this is the last day of the study, I would like to encapsulate my input. My preferred bulb in the Lex-Ham neighborhood is bulb "B." This particular bulb is warmer in hue and rises to the top of the canopy of the fixture. The canopy acts like an umbrella bending the directionality of the light downward instead of outward. But bulb "B" is still a bit too white-bright. I understand that the city has a large enough market to work with a manufacturer to develop a different bulb. I hope the city of St. Paul will not be persuaded by the notion that "warm LED street light technology has not yet been developed," but, rather, will Insist that a manufacturer develop a warm toned LED bulb. (Someone will invent one.) I find the blue white light bulbs that have recently been installed on Snelling Avenue and the southwestern edge of Como Lake and along the Grand Round to be blinding. I believe the white-brightness of some of the LED lights actually may cause the pupil of the eye to close thereby reducing sight. I dread the day when the street lamp bulb in front of our house will be updated While citizens ask for lighting because of safety and to reduce energy costs, let us not sacrifice the ambience and charm that our lovely St. Paul lanterns have afforded with their warm glowing light. In the past I have enjoyed lovely evening walks in my St. Paul neighborhood. Now days I calculate my route so as to avoid feeling as though I am walking in a well lit parking lot.
- I'm a St. Paul resident and homeowner, and wanted to provide some comments on your LED street light bulb project. I won't have a chance to weigh in specifically on the test bulbs, so wanted am relaying these comments by email rather than your form. As I'm sure you know, serious environmental and health concerns have been raised about the color temperature used by some communities during their conversion to LED street lights. The American Medical Association has issued an official policy statement that street lighting should have a color temperature of no greater than 3000 Kelvin at the absolute maximum. In addition to the health, safety and environmental effects of higher temperature bulbs, the harsh and sterile light provided by cooler lights would detract from the character of our neighborhoods. I hope you will select bulbs that have a warm color temperature, below 3000 Kelvin at the absolute maximum. To reduce light pollution, I also hope any new fixtures deployed with LEDs are properly shielded and

directed down and away from residences and the skies. Finally, many LED bulbs have a very poor color rendering index (CRI). I hope you will be mindful of choosing a bulb that has a good CRI number. In some places, such as Davis, California, a belated realization of these problems have lead to costly replacement of brand new light bulbs. I appreciate this public input process, and hope it ensures that we get this right the first time.

- These bulbs may save money but does little for quality of life. What is timeframe for industry to start producing acceptable colored lights!! COMMENTS FOR ALL BULBS!! I have viewed all the bulbs on several occasions & NONE meet the standards that are critical to a healthy, vibrant, community. A few bulbs were less Offensive but all would inhibit outdoor sitting & take eyes off the street. Additionally, they are too bright to open my shades at night both downstairs & upstairs. I do not have conditioning therefore my windows being open is important for cooling purposes. My recommendation is that old sodium vapor lights be reinstalled until technology advances to include 'softer yellow' lighting!!
- Generally, I find the LED lights much too bright.
- Please don't do that I hate LEDs. These are terrible. Prefer glowing amber that we have. Assaulting. Shines directly into living room.
- Just pick the light that is closest to what the light looks like now; match what we have now
- Know its an ecological concern to have these types of lights
- Lights give off a weird shadow; can't see pedestrians until right on them; someone could easily sneak up on you; bright and dark spaces; really bright especially when it rains
- Likes Bulb B in Lex-Ham; likes that the bulb is closer to the top of fixture and the way the light is cast onto the street
- Lights are quite bright; it takes away from the ambience; possible to replace the glass to amber color to give it an old world look like gaslighting; into the environmental impact – appreciate that but don’t like the bright color
- Like Bulb B – 1st choice, 2nd choice H, 3rd choice D – but awfully bright
- street light right outside my house which is terrible; different than all the other on the street, glaring light, shines into my house
- Like #1 light the best – wife & self

Comments about most preferred bulbs A-H

- D has the best color and seemed not quite as bright. But they all seemed too bright to me.
- Bulb F was the one I most preferred. The tall bulb shape seemed to distribute light better - was less spotty with more even coverage. It wasn't as bright white/blue as the others however it still could be a softer light.
- "The taller bulbs have better, more even coverage, less spotty, less harsh brightness.
- The slightly less blue ones are very much more appealing. "
- warm yellow glow that is easy on the eyes and glowing rather than glaring; charming look for beautiful St. Paul. I would want to know what residents on these blocks think and also what the SPPD thinks about the options, if they are safe.
- WE THINK LED LIGHTS ARE A HORRIBLE OPTION.
- The three most important aspects are color of light, intensity, and directionality (i.e., directing light down where it is needed and not out to houses). Bulbs B and H were the

only ones that had combinations of these that were acceptable. If the intensity is lower, directionality is less important.

- I love the yellow-tinged warmth of Bulb B along with its top mounting, which sends the light in a comfortable direction while maintaining safety. I also like the yellow-warmth of Bulb H. I strongly recommend Bulb B as the bulb of choice in St. Paul.
- The warmer color temperature and the with blub b, the light is directed at the street and sidewalk and does not spill onto the houses and yards.
- nice color, functionally the most effective
- b is by far the best choice. I like the location in the lantern, and how it directs the light downward, it's not too intense, yet provides adequate light.
- This was a hard survey to complete. I found it challenging to see the differences. Overall I do not want bright lights or harsh lighting or ugly bulbs. I hope we can have softer lighting and one with a warm soft glow. I realize this is subjective. I prefer the old lights we had.
- All of the bulbs are brighter than I would like but the bulbs in the lots B and F are the least glaring and least harsh. The rest of the lights would discourage neighbors from walking around, hanging out on their porches, and being about the streets at night and would disturb people in their homes at night.
- B and H, followed by D. These come the closest to something that could respect the neighborhood as a livable place for people. Some of these options get after the color temp to a degree. We still need to solve for direction and light intrusion generally. This was a worthwhile thing to do and a very necessary start to solving this issue for the city. Thank you.
- These have the best color and least light shed on houses.
- Bulb D clearly the best. Good mix of brightness for safety but warmth for neighborhood feeling.
- Least worst, least glaring and bright.
- The qualities I rate the highest are if the lack of patchiness in lighting on sidewalks, allows for safe navigation, and liking the color of the light bulb.
- Bulb H seemed to cast the least egregious light of all, but it is hard to compare when these brightly lit blocks all look pretty much the same both when you drive by on a N/S street and look down the block, and when you are walking down the sidewalk. The harsh blue glare from them is pretty blinding, and it will no doubt be much worse in the winter with no leaves on the trees. We walkers and dog owners are familiar with the blinding blue glare from car headlights that are the same kind of light, you are temporarily blinded until your eyes recover. This kind of street lighting is not an improvement to our everyday lives, and isn't that what should matter most?
- F is the most yellow and the least glaring---I'm not sure it is the right bulb, but it is moving in that direction...please continue to explore an option similar, but more yellow
- Oblong bulb looks better in lamp. High round looks worse
- Softer light than the others.
- Really dislike the bright ones. Keep the softer yellow ones. The others will disrupt animal welfare and people's ability to sleep!!
- None of these choices is acceptable. Please keep the existing lighting or as close to it as possible.
- Besides B,D, and F they are awful.
- These were a warmer tone but still glared too much.
- Bulb B: I believe these are bulbs on Hague, closer to Lexington (East) Bulb D: I believe these are on Laurel, closer to Griggs (West). Both bulbs are WARMER light. I most

prefer the bulb on Hague (B) because it appears more hooded (bulb is at the top of the lamp, I think) and less glaring. "D" is also warm. My next favorite was "F", also warm. My NEXT favorite was "C", because of less glare from the more hooded (bulb at the top of the lamp design), even though is was a cooler less natural light. The bright round bulbs in the middle of the lamp, on Portland are too glaring to me.

- I can't in good conscience choose any. The LED may provide a cost saving to the city and energy companies, but it is the residents who will pay the price - with their health.
- "Bulb B was the best as far as light, brightness, and most of all the direction of the light. While B & H (and to a somewhat lesser extent, D & F) were similar in color and brightness, B appears to do a much better job of directing the light down where it needs to be.
- H was my second choice, just felt like a smaller less intrusive light. Some of my rating bunched together, I'd say it went: B (gap) H (gap) D,F (very big gap) A,C,E,G."
- Please don't misunderstand my answer. I object to all of these lights. .
- Choose the warmest, softest, most gentle light. Better yet, don't go LED.
- Bulb 'B' would be my preference among the eight blocks I viewed based on it's warmer color.
- All bulbs are too white.
- The color is too white in all of them. Isn't there any LED bulb that has a more yellow or pink tint? What about changing (or painting?) the glass panels?
- "1) The most important criteria is choosing a WARM white color, which is more like the classic amber glow our old-fashioned street lamps were supposed to have
- 2) Secondly, it would be nice to have a bulb that looks classic, & not something that looks like a Coleman camping lantern or some weird double bulb."
- This lightning is quite romantic . A is nice warm and yellow
- Not blue , dimmer bulb , light at top of lamp
- I like the less bright & warmer lights
- Yellow , mild light , not too bright
- Not offense
- Not offense
- Warmer light
- Prefer less brighter bulbs
- Blue at top of lamp provides light that is illuminating but not harsh on the eyes . Its warm tone is pleasing
- Provided adequate lighting without being too bright
- Warm, less glaring
- Mostly for warmer light and less intensity up close (less blinding as a pedestrian)
- This is the least obnoxious of all of them
- Has a yellow light and the light shines down
- Has a yellow light and the light shines down
- the 2nd bulb
- has a yellow light and the light shines down
- Bulb E is for too bright it shines into my 2nd floor bedroom
- The light is not as harsh as other bulbs does seem to shine into houses as much
- The light is not as harsh as other bulbs does seem to shine into houses as much
- The length of the bulb and it has nice color
- None the bubs on laurel between Griggs and Syndicate are the best. That are the ones on grand between Lex and Victoria

- Prefer less brighter bulbs
- "Bulb F - filled the fixture well, gave good light
- Bulb A - 2nd choice, bright"
- The long vertical bar gives enough light at 3k with distribution that does not glare
- These lights appear to aim downward more then others - so the light isn't directed into houses front windows but still illuminates street and sidewalks.
- "F 1st and D 2nd
- The dimmer yellow one was the best"
- "H #1
- We preferred the warmer toned lights
- Thought H had even distribution
- We liked B for color but light was intense at light base"
- "Bulb B #1
- Bulb H #2
- Better color - softer - still provide safe lighting"
- "Bulb B #1
- Bulb H #2
- Better color - softer - still provide safe lighting"
- Nice color and shape and not too bright.
- None. I don't like any of them.
- I prefer the color (more yellow, not as starkly white) and the positioning of the light within the fixture (middle of fixture rather higher up)
- The bulbs on Hague Ave seem to be ok with my neighbors.
- Bulb B is best
- Bulb B is best because it sits high the fixture so doesn't blind you or light up your living room like a walmart parking lot. The color is more yellow than the others.
- Bulb B is okay but still not yellow enough.
- No at bright as ones before. Doesn't shine in my house as much.
- Color both , direction b
- best color, , best sidewalk + non-house combo
- Seems the least glaring and intrusive
- None of above , Inhibits outdoor sitting and feels to .

Comments about least preferred bulbs A-H

- Too white and too bright
- Too bright and white, harsh to look at
- Too harsh & brights
- Too harsh & brights
- Odd shapes and too bright
- Because they are harsh, uncomfortable, and headache-inducing.
- Too stark white and glaring. Oddly positioned within the fixture, not in the middle.
- These were too bright.
- "All terrible!
- These bulbs are way too bright and white. They hurt my eyes and would be dangerous to drivers because of glare. They would also be harmful to the health of humans and animals.

- Bulb E is worst."
- The white hue is hard on my eyes. I have cataracts and it is very bad glare.
- Too bright
- blue - white light suck blue –shared
- A was the worst at all 3 sites
- Too bright!
- glaring quality , eyes cant adjust to road when driving , can't see well for walking due to glare .
- These Bulbs "takes eyes " off the street

Comments about most preferred bulbs 1-6

- sweet spot between color, intrusiveness, glare and safety
- I prefer warmer hues of light to cooler hues.
- Ugh, horrid. I'm bummed out that all of St Paul is about to look like a cheap drugstore with these visually assaulting LED lights. I much prefer the warm glow of our beautiful amber street lights. Hasn't technology figured out how to give us an energy efficient light with a preferable amber glow; the kind that won't look like a police unit is shining search light directly into my living room? Oh dear, these LEDs are the worst. Help. Please find some amber LEDs!
- Thanks
- Lights can be brighter - some areas are so dark still! Not safe.
- The brightness is a good determent against criminals and trouble makers and yes you can see good everywhere with the white bulb instead of the orange one
- Bulb 3 is a warm-colored bulb with moderate intensity, and its light is least obtrusive.
- Less glare, not so bright, softer color
- Easy on the eye
- Yellower, lights sidewalk well but doesn't light up houses .

Comments about least preferred bulbs 1- 6

- Test bulb 6 is too bright. It is a harsh, offensive light that creates a gloomy, ominous feeling.
- The whiter bulbs are too bright and are distracting by negatively affecting night vision while driving. Several made me feel as if I could not see things in the shadows just because of the extreme contrast created by the lights. After leaving these blocks I had to blink several times to let my eyes adjust (and I do not have night-vision issues).
- "ALL lamps are too blue (even #3 & #5) ALL lamps have quite a lot of glare ALL lamps are brighter than needed"
- too dark or too bright
- "Also, it is wise to be ahead of the curve of the health concerns surfacing due to these high intensity LED street lights: https://www.washingtonpost.com/national/health-science/some-cities-are-taking-another-look-at-led-lighting-after-ama-warning/2016/09/21/98779568-7c3d-11e6-bd86-b7bbd53d2b5d_story.html?utm_term=.3cd97035738a https://www.ama-assn.org/ama-adopts-guidance-reduce-harm-high-intensity-street-lights"

- The light color from these bulbs is too cool and the intensity is too high. These lights are obtrusive for homeowners.
- Glare, excessive light into homes, harsh feel
- Dark bulb 3
- Bulb 6 was very harsh
- To bright @ houses sidewalk well lit