

Report for  
**Louisville-Jefferson County  
Metro Government, Kentucky**

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Urban Services District Lighting Study



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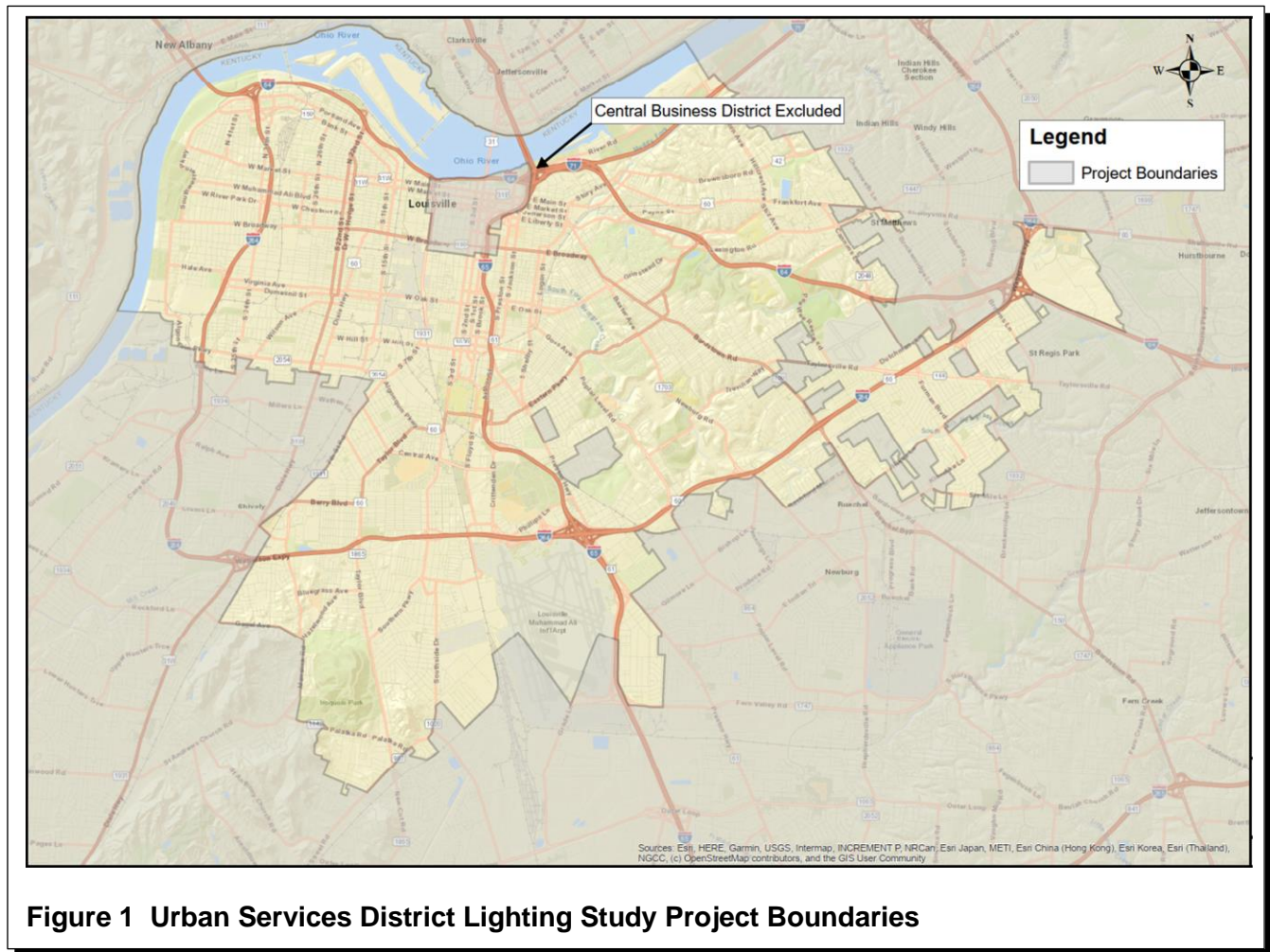
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**BACKGROUND**

In accordance with the Agreement for Planning, Design and Construction of Capital Improvement projects Request for Qualifications (RFQ) #200054, Strand Associates, Inc.® (Strand) is conducting a light study in the Urban Service District for Louisville Jefferson County Metro Government and Public Works and Assets. The goal of this lighting study is to determine areas within the Urban Service District that may benefit from additional lighting because of existing crime or crash trends. The study considers crash and crime data within the Urban Service District and compares it to the location of existing light pole locations to determine the areas that may benefit from increased or improved lighting levels. The central business district is excluded from this evaluation. The overall study area is shown in Figure 1.



**Figure 1 Urban Services District Lighting Study Project Boundaries**

This report describes that process used to conduct this light study. The final output to determine the locations to consider for lighting implementation are a series of Geographic Information System (GIS) map included in the appendices.

## DATA COLLECTION

The data sources that were collected and used for this study are described below.

### A. Light Pole Data

Light pole location data was received from Louisville Gas and Electric (LG&E). The data contained LG&E leased lights and is updated to reflect locations that were active in 2018. This data contained the following parameters: customer name, lamp size, lamp type, fixture type, customer type, location description, county, location X, location Y, and ID. The location information was used to place these light poles for the GIS evaluation.

### B. Crash Data

Crash data was downloaded from crashinformationky.org, a Web site provided by the Kentucky State Police. The data was queried to be downloaded by month for the years of 2016 through 2020. The monthly data was then compiled into one Microsoft Excel file for each year. The data contained the following parameters: incident ID, agency originating agency identifier (ORI), agency name, incident status, county, roadway information, intersection roadway information, latitude, longitude, mile point, collision date, collision time, units involved, motor vehicles involved, number killed, number injured, weather, roadway condition code, hit and run indication, manner of collision, roadway character, light condition, accepted date, indication if it is a secondary collision, owner badge, and incident status.

### C. Crime Data

The crime data was downloaded from Louisville Open Data Web site and was provided from the Louisville Metro Police Divisions (LMPD). These datasets are preliminary in nature and may not have been investigated by a detective by the time of download and thus the data is subject to change. The data also only represents calls for police service where a police incident was reported. The data contains the following parameters: incident number, date reported, date occurred, uniform offense reporting code, crime type, the national incident-based reporting system (NIBRS) code, the Federal Bureau of Investigation (FBI) Uniform Crime Reporting hierarchy, status of attempted or completed crime, the LMPD division, the LMPD beat, premise type, block address, city, zip code, and ID.

## DATA FILTERING

The crash and crime data collected was processed and filtered within GIS to account for the existing lighting locations within the City of Louisville (City). This process was completed to assist with determining potential new lighting locations.

### A. Crash Data

In order for the crash data to properly represent lighting deficiencies, it needed to be filtered to represent environmental conditions that would require lighting. To achieve this, the light condition parameter was used to filter the crashes that were in the daylight. The following light conditions were filtered out of the data set:

1. Daylight
2. Other
3. Unknown

The following light conditions were kept in the data set:

1. Dark–Highway Not Lighted
2. Dark (Unknown Roadway Lighting)
3. Dark– Highway Lighted/On
4. Dark– Highway Lighted/Off
5. Dawn
6. Dusk

Dawn and dusk were kept in the analysis because, while they are not absolutely dark or at night, lighting is still needed during these times.

The interstate system roadways were filtered out because they are not owned by the City and the responsibility of improvements for that system is with the Kentucky Transportation Cabinet. The roadway attribute was used to complete the filtering and data on Interstates 65, 71, 264 and 265 were removed from the data set.

After the data was filtered, it was then imported into an ESRI, Inc. ArcMap GIS shapefile and positioned based on the given latitude and longitude values. A shapefile was made for each year of data (from 2016 to 2020).

### B. Crime Data

In order for the crime data to properly represent lighting deficiencies it also needed to be filtered to represent environmental conditions that would require lighting. Since the crime data did not have a lighting condition parameter, the lighting conditions needed to be determined based on the time the crime happened. To determine the lighting conditions in the City, the civil twilight, sunrise, and sunset times were observed on <https://www.timeanddate.com/sun/usa/louisville> . The timeframes shown in Table 1 were then developed for daylight start and end times and filtered out of the data set.

2016	Daylight Start	Daylight End
January Daylight Savings (March 13):	7:30	18:00
Daylight Savings to May:	7:00	20:30
June to July:	6:30	21:00
August to September:	7:15	20:15
October Daylight Savings (November 6):	8:00	19:00
Daylight Savings to December:	7:30	17:30

**Table 1 Daylight Time Frames**

The data set was also filtered to represent crimes that only happened in areas that could be impacted by better street lighting. The study team reviewed with the client and LMPD to determine the crime types to be included in the analysis. The following crime types were determined to not be impacted by street lighting and filtered out:

1. Driving Under the Influence (DUI)
2. Fraud
3. Sex Crimes
4. Weapons

The following crime types were determined to be impacted by streetlights and kept in the data:

1. Arson
2. Assault
3. Burglary
4. Homicide
5. Motor Vehicle Theft
6. Other
7. Robbery
8. Theft/Larceny
9. Vandalism
10. Vehicle Break-In/Theft
11. Disturbing the Peace
12. Drugs/Alcohol Violations

After the data was filtered, it was then geocoded based off of the block address given and imported into an ESRI ArcMap GIS shapefile. A shapefile was made for each year of data (from 2016 to 2020).

### C. Use of Street Light Data as Filter

The light pole location data was imported into ArcMap GIS shapefile and positioned based on the given X and Y coordinate locations.

The crime, crash, and lighting shapefiles were all uploaded into an ESRI ArcMap. The crime and crash data were filtered based off their proximity to the existing streetlights to account for lighting impacts from the existing facilities. A lit radius of 50-feet from each existing light pole was filtered out of the shapefile

for the crash and crime data sets as most lighting fixtures will illuminate at least this much area around the light location. A version of each crime and crash data set that did not have the 50-foot radius filtered out was kept for comparison with the filtered datasets.

## HEAT MAP DEVELOPMENT

Heat maps were developed using ESRI ArcGIS Pro for each shapefile. In this program the heat map symbology displays the relative density of points as a dynamic visualization using a color scheme to indicate density values. The density is kept constant regardless of map extent, meaning the heat map will display the same intensity on different areas of the map at the same scale. The radius, which is the control area searched when calculating the density, was changed for the different dataset to accurately show high- and low-point density areas.

A set of maps were also developed from a data set that incorporated all crash or crime data that was observed for the 2016 to 2020 period. This allows the data from each year to be compiled into one dataset and for the heat map to show high concentrated areas for the total amount of years (2016 through 2020) instead of individually.

A total of 100 maps were developed. These heat maps are attached in Appendix A through D and described below:

1. Yearly crime maps for 2016 through 2020 with a heat map radius of 11:
  - a. Citywide Maps of Crime Data (one map for each year, a total of five maps)
  - b. Zoomed Crime Data Maps of the Northwest, Northeast, and South portions of the urban service district (three maps for each year, a total of 15 maps)
  - c. Citywide Maps Crime Data with lighting filtered out using assumptions mentioned above (one map for each year)
  - d. Zoomed Crime Data Maps of the Northwest, Northeast, and South portions of the urban service district with lighting filtered out using assumptions mentioned above (three maps for each year, a total of 15 maps)
2. Overall crime maps with 2016 through 2020 data merged and a heat map radius of eight:
  - a. Citywide Map of Crime Data for 2016 to 2020 (a total of one map)
  - b. Zoomed Crime Data Maps for 2016 to 2020 of the Northwest, Northeast, and South portions of the urban service district (a total of three maps)
  - c. Citywide Maps of Crime Data for 2016 to 2020 with lighting filtered out (a total of one map)

- d. Zoomed Crime Data with lighting filtered out maps for 2016 to 2020 of the Northwest, Northeast, and South portions of the urban service district (a total of three maps)
3. Yearly crash maps 2016 through 2020 with a heat map radius of eight:
    - a. Citywide Maps of Crash Data (one map for each year, a total of five maps)
    - b. Zoomed Crash Data Maps of the Northwest, Northeast, and South portions of the urban service district (three maps for each year, a total of 15 maps)
    - c. Citywide Maps Crash Data with lighting filtered out (one map for each year)
    - d. Zoomed Crash Data with lighting filtered out Maps of the Northwest, Northeast, and South portions of the urban service district (three maps for each year, a total of 15 maps)
  4. Overall crash maps with 2016 through 2020 data merged and heat map radius of eight:
    - a. Citywide Map of Crash Data for 2016 to 2020 (a total of one map)
    - b. Zoomed Crash Data Maps for 2016 to 2020 of the Northwest, Northeast, and South portions of the urban service district (a total of three maps)
    - c. Citywide Map that includes only fatal Crash Data for 2016 to 2020 (a total of one map)
    - d. Citywide Map that includes only injury Crash Data for 2016 to 2020 (a total of one map)
    - e. Citywide Map of Crash Data with lighting filtered out for 2016 to 2020 (a total of one map)
    - f. Zoomed Crash Data Maps with lighting filtered out for 2016 to 2020 of the Northwest, Northeast, and South portions of the urban service district (a total of three maps)
    - g. Citywide Map for fatal Crash Data only with lighting filtered out for 2016 to 2020 (a total of one map)
    - h. Citywide Map for injury Crash Data only with lighting filtered out for 2016 to 2020 (a total of one map)

## LOCATIONS IDENTIFIED FOR POTENTIAL LIGHTING IMPROVEMENT

The heat maps described above were used to identify locations where lighting improvements may mitigate existing issues associated with frequent crash and crime incidents. Locations with high-point



densities were observed and recorded for each of the filtered maps. The locations were then ranked based off the number of maps they reoccurred in. The top 15 crime and crash locations are listed in Tables 2 and 3.

Top 15 Crime Locations							
Location	Total	2016 to 2020 Crime Data	2020 Crime Data	2019 Crime Data	2018 Crime Data	2017 Crime Data	2016 Crime Data
1525 East Breckinridge Street	6	X	X	X	X	X	X
West Broadway and Southwestern Parkway	6	X	X	X	X	X	X
3306 Bardstown Road	4	X	X			X	X
3422 Taylor Boulevard	4			X	X	X	X
Algonquin Parkway and South 41st Street	4	X	X		X		X
Bardstown Road and Grinstead Drive	4	X	X	X	X		
1650 Lucia Avenue	3	X	X			X	
West Broadway and S 27th Street	3	X				X	X
115 Breckenridge Lane	2	X		X			
1361 South Preston Street	2				X		X
1701 Patton Court	2	X	X				
3020 West Kentucky Street	2	X	X				
3100 South 2nd Street	2	X	X				
3620 Greenwood Avenue	2	X	X				
4100 Taylor Boulevard	2	X	X				

**Table 2 Top 15 Crime Locations**

Top 15 Crash Locations								
Location	Total	2016 to 2020 Fatal Crash Data	2016-2020 Injury Crash Data	2020 Crash Data	2019 Crash Data	2018 Crash Data	2017 Crash Data	2016 Crash Data
Bardstown Road and Goldsmith Lane	7	X	X	X	X	X	X	X
Algonquin Parkway and South 7th Street	6		X	X	X	X	X	X
Bardstown Road and Grinstead Drive	6		X	X	X	X	X	X
Taylor Boulevard and Ashland Avenue/I-264 Eastbound Ramps	6		X	X	X	X	X	X
Taylorsville Road and Breckenridge Lane	6		X	X	X	X	X	X
Eastern Parkway and Bradley Avenue	5		X	X	X		X	X
Taylor Boulevard and Bluegrass Avenue	5		X	X		X	X	X
3rd Street Road/Southside Drive and New Cut Road	4		X		X	X		X
Central Avenue and Taylor Boulevard	4		X	X	X		X	
East Broadway and South Hancock Street	4	X		X	X			X
Longfield Avenue and Taylor Boulevard	4		X	X	X	X		
Palatka Road and New Cut Road	4		X		X	X		X
West Broadway and South 22nd Street	4		X		X	X		X
West Broadway and South 26th Street	4		X	X			X	X
West Broadway and South 28th Street	4		X	X		X		X

**Table 3 Top 15 Crash Locations**

These locations were then observed to determine areas that had both high crash and crime point densities. The locations were then combined are listed in Table 4 below.

Combined Crash and Crime Locations		
Crash Location	Crime Location	Total
Bardstown Road and Goldsmith Lane	3306 Bardstown Road	11
3rd Street Road/Southside Drive and New Cut Road	3rd Street Road/Southside Drive and New Cut Road and 7400 3rd Street Road	6
Longfield Avenue and Taylor Boulevard	3400 to 3422 Taylor Boulevard	6
Palatka Road and New Cut Road	5400 New Cut Road	5
West Broadway and South 26th Street	728 South 26th Street	5
Central Avenue and South 3rd Street	3100 South 2nd Street	5
Grade Lane and Preston Highway	4700 Preston Highway and 4800 Preston Highway	3
Creel Avenue and South 4th Street	Creel Avenue and South 4th Street	2

**Table 4 Combined Locations**

Finally, a list of the top 20 areas was developed by combining the information in Tables 2, 3 and 4. This list can be observed in Table 5 below and is included in Appendix E. These areas were further investigated to determine the surrounding lighting information (if applicable), the crime premise types, and other observations. These notes can also be observed in the table in Appendix E.

Top 20 Locations			
Rank	Crash Location	Crime Location	Total
1	Bardstown Road and Goldsmith Lane	3306 Bardstown Road	11
2	Longfield Avenue and Taylor Boulevard	3400 to 3422 Taylor Boulevard	10
3	3rd Street Road/Southside Drive and New Cut Road	3rd Street Road/Southside Drive and New Cut Road and 7400 3rd Street Road	6
4	Algonquin Parkway and South 7th Street		6
5	Taylor Boulevard and Ashland Avenue/I-264 EB Ramps		6
6	Taylorville Road and Breckenridge Lane		6
7		Baxter Avenue and East Breckinridge Street	6
8		West Broadway and Southwestern Parkway	6
9	Palatka Road and New Cut Road	5400 New Cut Road	5
10	West Broadway and South 26th Street	728 South 26th Street	5
11	Eastern Parkway and Bradley Avenue		5
12	Taylor Boulevard and Bluegrass Avenue		5
13		1361 South Preston Street and South Jackson Street and South Preston Street	4
14	Central Avenue and Taylor Boulevard		4
15	East Broadway and South Hancock Street		4
16	West Broadway and South 22nd Street		4
17	West Broadway and South 28th Street		4
18	West Broadway and Drive W. J. Hodge Street		4
19		Algonquin Parkway and South 41st Street	4
20	Grade Lane and Preston Highway	4700 Preston Highway and 4800 Preston Highway	3

**Table 5 Top 20 Locations**

Exhibits for each of these top 20 locations are located in Appendix F. Exhibits for 13 and 18 are not included because, after further investigation, it was noted that these areas had crime data geocoded for all of Preston Street and Algonquin Parkway. This resulted in a higher concentration of crimes geocoded to one area, when in reality, it was dispersed over many areas. All other locations were checked to make sure the locations were accurately represented by the geocoded data. Each location will have an exhibit that represents existing light conditions, proposed light improvements, and lighting calculation tables. These exhibits were created by modeling the lighting conditions (existing and proposed) in AGI32 and displaying this information from ESRI, Inc. ArcMap GIS maps. The lighting calculations are given in table format and provide more detailed information on assumptions and calculation results.