CUTR
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# Street Lighting Level Measurement and Analysis on SR 546, Polk County

**SR 546 (US 92 / Memorial Boulevard)**
**From Wabash Avenue to N. Gary Road**

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## 1. Project Information and Data Collection

A. Project Limitation:

SR 546 (US 92/Memorial Boulevard)
From: Wabash Avenue
To: Gary Road
Including:
Seg.1: From Wabash Avenue to N Walker Ave – 1.4 miles with four lanes
Seg.2: From N Walker Ave to N Kentucky Ave – 0.7 miles with six lanes
Seg.3: From N Kentucky Ave to N Gary Road – 1.2 miles with four lanes
Total Center-miles: 3.3 mi
Measurement Mileage: 14.6 mi

B. Date of Data Collection: February 9th, 2016

C. Time of Data Collection: 12:30 AM - 1:30 AM

D. Weather of Data Collection: Clear

E. County: Polk

## 2. FDOT Conventional Roadway Lighting Requirements

Most recently, the Florida Department of Transportation (FDOT) published the *Plans Preparation Manual (2016 Edition)* establishing the light level criteria given by the *AASHTO Roadway Lighting Design Guide.* These maintained values, as shown in Tables 1 & 2, have been adjusted for Department assigned light loss and maintenance factors.

**Table 1: Conventional Lighting – Roadways and Signalized Intersections**

| Road Classification | Illumination Level Average Initial Horizontal Foot Candle (FC) | Uniformity Ratios | |
|---|---|---|---|
| | | Avg/ Min | Max/Min |
| Interstate, Expressway, Freeway and Major Arterials | 1.5 | 4:1 or less | 10:1 or less |
| All Other Roadways | 1.0 | 4:1 or less | 10:1 or less |
| *Sidewalks and Shared Used Paths | 2.5 | 4:1 or less | 10:1 or less |

**These values are intended for facilities separate from the roadway; Source: FDOT Plans Preparation Manual, 2016 Edition – Table 7.3.1*

**Table 2: Signalized Intersection Lighting Urban 3 to Urban 5 Designated Areas**

| Road Classification | Illumination Level Average Initial Foot Candle (FC) | Uniformity Ratios | |
|---|---|---|---|
| | | Avg/ Min | Max/Min |
| Major Arterials | Horizontal – 3.0 | 4:1 or less | 10:1 or less |
| | Vertical – 2.3* | N/A | N/A |

***** *Only valid for new projects or reconstruction only; Source: FDOT Plans Preparation Manual, 2016 Edition – Table 7.3.3*

## 3. Data Collection Methodology

The Advanced Illumination Measurement System (ALMS) was used in this project. The data collection procedure is described below:

- Data Collection

  The ALMS collected lighting level data (illumination in foot-candles, FC) was collected simultaneously by two light meters that were installed on the left and right sides of the vehicles' roof. The point illuminations were measured every 10 feet, for each lane. The specific events, such as a crosswalk, street pole, tree, etc., were also recorded. (The details of these events are given in the Appendix).

- Data Process

  The raw data (FC) were measured at the height of the measurement vehicle (about 5 feet). The CUTR team transferred the raw data to a standard format (FC_6, FC at 6 inches above the ground) based on a predefined relationship. The transferred data were imported into ArcGIS as a point-data layer and a heat-map layer.

## 4. Collected Data and Lighting Level Analysis

The lighting dataset is provided in ArcGIS format. It is now possible to read and write shapefiles (.shp) using a variety of free and paid programs (ArcGIS). In addition, a heat map of illumination with statistics is also provided to describe the density of the measured lighting level on SR 546.

Figure 1 shows the heat map (lighting level density) with statistics based on *FC_6* (illumination at 6 inches above ground) of the collected data on the study roadway segments along SR 546. More detailed information can be found in the 410.shp file in the deliverable. The deliverable package contains point data in GIS format and the heat map in PDF format (SR546.pdf). The definitions of the basic statistics shown in Figure 1 are provided below.

- Min: Minimum Illumination (Foot-candles, FC_6)
- Max: Maximum Illumination (Foot-candles, FC_6)
- Avg: Average Illumination for the Whole Segment(Foot-candles, FC_6)
- Avg/Min: Average-Minimum Ratio
- Max/Min: Maximum-Minimum Ratio

SR 546 is a principal arterial. Based on the statistics, the lighting levels at SR 546/US92/Memorial Boulevard from Wabash Avenue to Gary Road (0.8021) do not meet the FDOT Conventional Roadway Lighting Requirements (average foot-candles = 1.5 for major arterials).

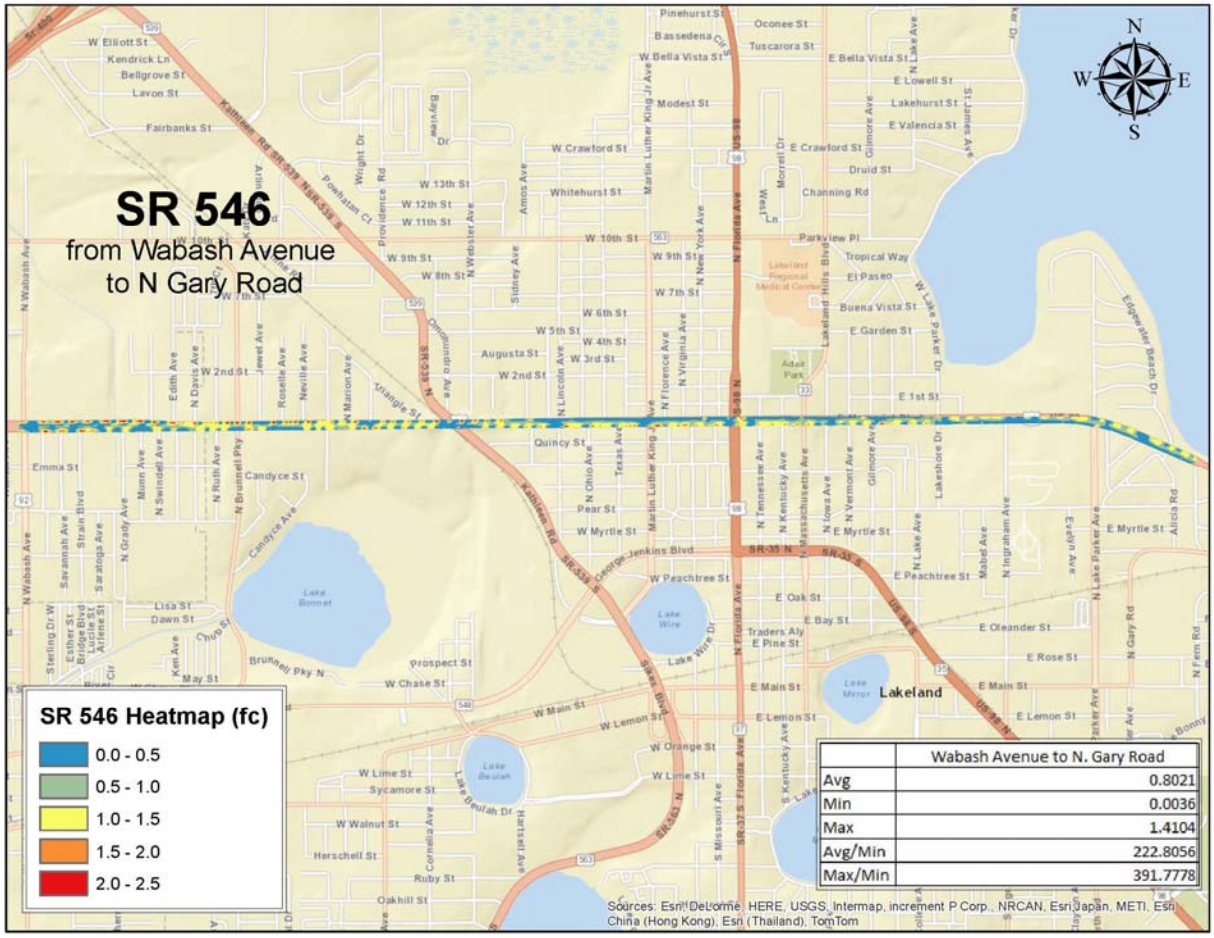


**Figure 1: Light Level Density Distribution for Study Segments along State Road 546 (US 92/Memorial Boulevard)**

## Appendix - Data Fields

### *1 EVENT*

The “EVENT” variable indicates the log of important events that occurred while collecting data. The definition of the event codes is given in Table A-1 and Figure A-1.

**Table A-1: Event Codes**

| Event Code | Type | Description |
|---|---|---|
| -1 | - | Automated Data Record (every 10 feet) |
| 1 | Intersection | Beginning of intersection |
| 2 | Intersection | End of intersection |
| 3 | Light Pole | Location of luminaire |
| 4 | Blockage | Blockage of luminaire (tree, etc.) |
| 5 | Crosswalk | Location of crosswalk |
| 6 | Special Source | Any light source other than luminaire (car dealer, advertising signage, etc.) |
| 7 | Vehicle | Oncoming vehicle light, either in front or behind |

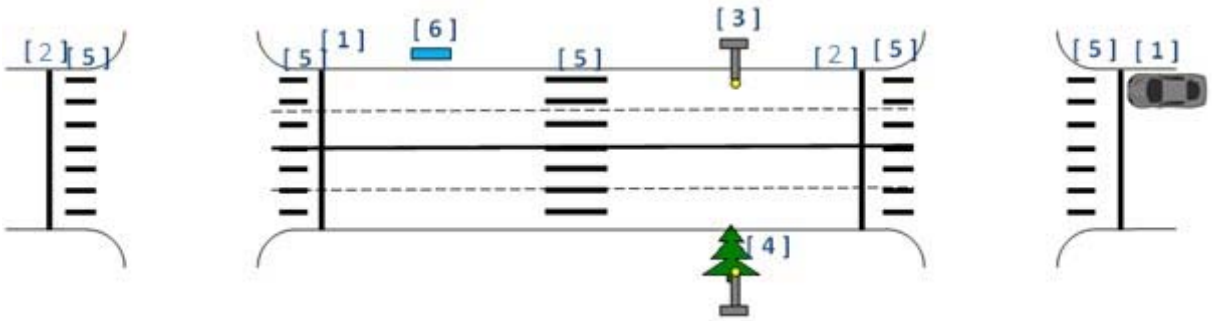


**Figure A-1: Example of Events (Measuring from Right to Left)**

***2 DISTANCE***

The item indicates the spatial distance between the measurement/event point and the starting point at foot.

***3 FC***

The item indicates the original illumination value measured at the top of the testing vehicle. Unit is foot-candle, FC.

***4 FC_6***

The item indicates the converted illumination value at six (6) inches. Unit is foot-candle, FC.