LEE COUNTY MPO
METROPOLITAN PLANNING ORGANIZATION

Fort Myers Beach Lighting Report

Prepared by

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FMB Lighting Report Outline

1. **Introduction**
    a. Describe the study area
    b. Talk about turtle impacts
    c. Provide overall site area map
    d. Mention crashes, hurricanes, etc

2. **Project Purpose and Goals**
    a. Purpose statement
        i. Something like make travel safer for residents and visitors
    b. Goals
        i. Mobility
        ii. Environment
        iii. Reduce impacts
        iv. Etc

3. **Existing Conditions**
    a. Roadway
        i. Describe roadway characteristics
    b. Multimodal
        i. Describe existence of bike/ped and transit facilities
    c. Land Use
        i. Major developments and redevelopments
    d. Crash Analysis
            i. Summarize crash data by mode, characteristics (day/night, etc), severity
    e. Lighting
        i. Existing system
            1. Types of lights, locations, characteristics
            2. Ownership, maintenance responsibilities
        ii. Lighting analysis
            1. Data collection
        2. Dark spots
    f. Other plans and initiatives
        i. FMB Streetscape
        ii. Estero Blvd reconstruction

4. **Lighting Analysis**
    a. Introduction
    b. Lighting needs
    c. Sea Turtle Compatibility
    d. Dark Skies Criteria
    e. Light System Alternatives
        i. Existing Lighting System
        ii. Options for Improvements

        1. Supplement
        2. Replace Whole System
        3. Town owned
    iii. Recommendations
        1. Leased from FPL
        2. Types of fixtures/lights
        3. Combo that uses different ones at different times of year (like Archibald)
    iv. Summary of where, what, types, ownership, and costs (cap and o/m)

5. **Potential Funding Sources**
    a. Local funds
    b. State and Federal funds
    c. Safety funds
        i. Describe benefit/cost analysis and potential justification for safety funding

6. **Implementation Action Plan**
    a. Detailed plan of implementation
    b. Next steps

1. Introduction

The Town of Fort Myers Beach is situated on a barrier island to the west of Ft. Myers, FL. The Town has a resident population of approximately 7,100, and hosts approximately 1.8 million visitors per year. As with most West Coast towns, tourism has become a year-round event, meaning the Town's effective population fluctuates greatly, and the quantity of tourists outnumbers local population. The large number of tourists generates significant pedestrian activity. Much of this activity occurs after dark.

The Town's beaches also draw aquatic visitors. Fort Myers Beach is an active turtle nesting area, and plays host each summer to large populations of endangered sea turtles. Turtle-friendly lighting is a key issue along Estero Boulevard so as not to disorient hatchling turtles as they migrate back to the Gulf upon emergence.

Because it lies on a barrier island, the Town's roadway network is limited. Estero Boulevard is the main transportation facility, and runs in a north-south direction. To the north, Estero Boulevard becomes San Carlos Boulevard, and connects to Fort Myers.

As the economy has rebounded, and tourism has picked back up, the Town of Fort Myers Beach has experienced increasing traffic congestion, increasing bicyclists and pedestrians, and increasing conflicts and crashes where travel modes conflict.

In September, 2017, Hurricane Irma hit near Fort Myers Beach as a Category 4 hurricane, damaging much of its infrastructure. Along Estero Boulevard, much of the lighting system was damaged by this storm.

The study area is identified in Figure 1.

2. Project Purpose and Goals

The purpose of this study is evaluate lighting conditions along Estero Boulevard and how those conditions affect safety in the corridor. Specifically, this report will provide the background information, analysis, and justification to support lighting improvements in the study corridor.

The Goals of this study, consistent with the purpose, are:

- Evaluate lighting levels to determine their adequacy, and develop a remediation plan if needed
- Develop cost estimates for any recommended improvements
- Identify causes of bicycle and pedestrian crashes
- Develop mitigation strategies for these crashes

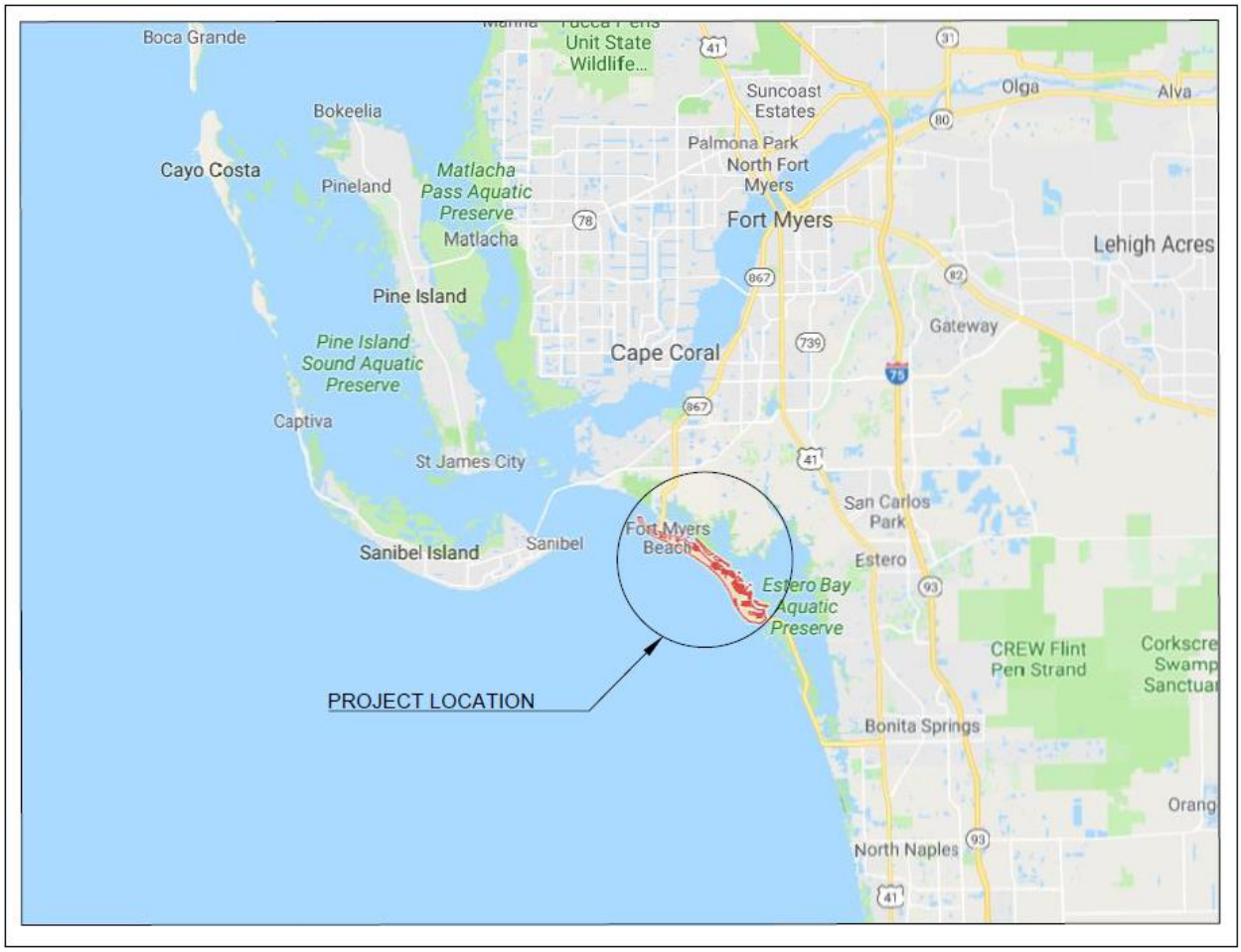
3. Existing Conditions

To develop an analysis baseline, existing conditions along the corridor were analyzed. To provide as much context as possible, several factors were analyzed, including:

- Roadway conditions
- Multimodal facilities
- Land uses
- Crash data
- Lighting conditions, and
- Ongoing plans and initiatives

The following sections provide a summary of the existing conditions.

Figure 1
Project Location Map



3.1 Roadway Conditions

As shown in Figure 1, Estero Boulevard is the principal travel corridor through Fort Myers Beach. Estero Boulevard enters Fort Myers Beach via the San Carlos Bridge. This bridge carries San Carlos Boulevard from Fort Myers over the Intracoastal Waterway onto the island.

North Estero Boulevard north of Times Square received a complete makeover after the renovation to its right of way in 2011. The roadway south of San Carlos Boulevard and within the study limits, is a county road. It is a two lane arterial with a posted speed limit of 35 mph. The roadway is characterized by frequent driveway access points and crossovers, with significant side friction. The reFresh Fort Myers Beach Master Plan includes plans to reconstruct Estero Boulevard south of Times Square to the Big Carlos Pass Bridge. Roadway, utility, pedestrian safety and bicycle improvements were identified within six one mile segments. Segment One from Crescent Street to Lovers Lane has been completed. Segment Two from Lovers Lane to Strandview Avenue is currently under construction.

3.1. Multimodal Facilities

Historically, sidewalks and paved shoulders have been provided along Estero Boulevard. However, these facilities are being improved as part of the project described in Section 3.5.

LeeTran provides a Fort Myers Beach Shuttle along the island that provides circulation along Fort Myers Beach. The Shuttle also provides connections off the island to Fort Myers and to Bonita Springs. Figure 2 illustrates the existing LeeTran routes. The Trolley typically operates on one hour headways.

The Fort Myers Beach Tram is a new service recently instituted by LeeTran to provide circulation on the island itself. This service travels up and down the island to provide more frequent service than is provided by the Trolley.

3.2. Land Use Summary

Land uses along Fort Myers Beach includes a variety of retail and residential uses. The Estero Boulevard project has divided the island into 6 segments, as shown in Figure 3. They are generally summarized as follows:

- North end – comprised of residential and resort areas, and generally quieter than other high turnover areas.
- Core Area – consists of the Times Square commercial area, as well as other numerous stand alone commercial uses. Mixed residential uses are also present.
- Civic Complex – is where the Town government offices, as well as nature parks, preserves, elementary school, and other public uses. This area also has residential and resort uses.
- The Quiet Center – is characterized principally by single family residential uses.
- High Rise Resort area – is characterized by high rise condos and resorts along the Gulf side, with single family and other residential uses on the east side.
- South End area – is characterized by a broad mix of uses, including beachfront resorts, commercial, beach, and single family uses.

Figure 2
LeeTran Shuttle Service Map

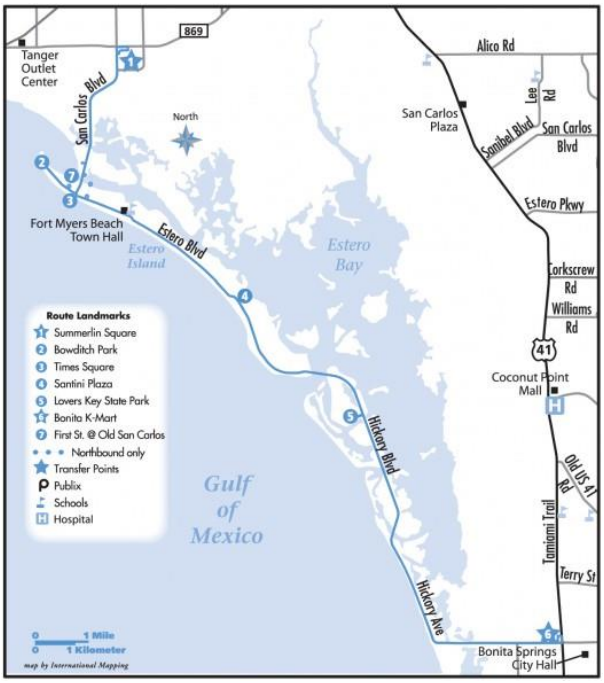
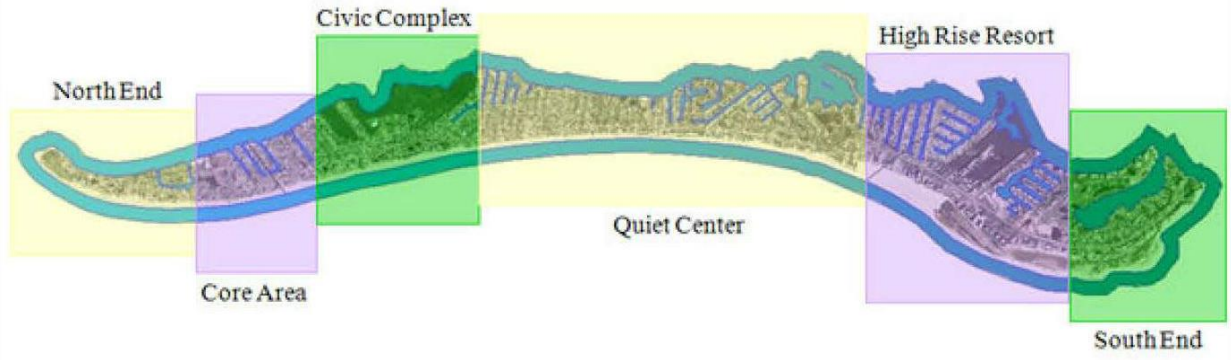


Figure 3
Fort Myers Beach Character Areas



3.3. Crash Analysis

Crash data along Estero Boulevard were analyzed to identify crash frequency, location, severity, and potential mitigation strategies. Since Estero Boulevard is being improved by Lee County, this analysis focused on bicycle and pedestrian crashes, and particularly evaluated the potential effects of lighting conditions on the crash history.

Crash data were obtained from the Signal 4 crash database. Data were collected for the years 2013-2017. Table 1 presents an overall summary of crash data by year.

Review of Table 1 indicates that a significant portion, nearly 25%, of all crashes occur during nighttime. Approximately 10% of the bicycle crashes, and nearly half of the pedestrian crashes occur at night.

Based on these crash analyses, there appears to be a strong indication that lighting may be a contributing factor to a significant number of overall crashes, and pedestrian crashes in particular.

3.4. Lighting conditions

Existing lighting along Estero Boulevard was evaluated to determine adequacy of the existing system. The following sections provide more detail on this analysis.

3.4.1. Existing Lighting Conditions

CPWG Engineering, Inc. performed an existing street lighting conditions assessment of the main traffic corridor in Fort Myers Beach, Florida, Estero Boulevard. The goal is to conduct a study to evaluate lighting conditions along Estero Boulevard from Estrellita Drive to Old San Carlos Boulevard, a corridor of just over 6 miles. The Town of Fort Myers Beach is undertaking strategic planning to enhance the pedestrian safety on this corridor; the length is illuminated by approximately 143 light fixtures. Field measurements were conducted along the corridor during the Spring of 2018. All light measurements were conducted on clear nights. The analysis was conducted after the peak spring break period.

For the measurements, a TES-1339R Data Logger Light Meter Pro was utilized to sample field data. The meter was newly calibrated, with resolution to .001 foot-candle. Multiple field visits were required to acquire all the data. Sampling locations were identified for projected concentration of usage, and existing lighting, with specific intent to quantify the light levels leading into heavy usage areas, as well as identify projected travel times between differing illumination levels.

The method of reviewing the existing light levels is the illumination method, as defined by the Illumination Engineering Society of North America (IESNA). This is a measurement of the light density falling on a surface, independent of light source, or the surface itself. The IESNA has developed a Standard for recommended level of illumination for classified roadways, walkways, and parking areas, identifying minimal foot-candle levels for these travel ways. The Standard outlines recommended minimum levels, as well as emphasizes the need to maintain illumination uniformity over the roadways.

The FDOT Manual for Minimum Standards for Streets and Highways, commonly known as the Greenbook follows the IESNA Standard, outlining light levels recommended in order to avoid vision problems due to varying illumination from the street lights. The Greenbook Standard outlines recommended minimum levels, as well as emphasizes the need to maintain illumination uniformity over the roadways.

Table 6-1, Level of Illumination, Roadway and Walkway Classification, of the FDOT Guidelines provide illumination criteria by facility type and area type. Estero Boulevard is classified as a minor arterial and

the Road Surface classification being R3; which is an asphalt road surface with dark aggregates. From the north end of the island to Lovers Lane, the land uses are categorized as Intermediate. From Loves Lane south to the end of the project, the land uses are categorized as residential.

Under these classifications, the Average Maintained Illuminance should be a minimum of 1.0 foot-candles for the Intermediate classification areas north of Bay Road, and 0.7 foot-candles for residential areas south of Bay Road. The Illuminance Uniformity ratio (maximum to minimum) should be 4:1 in both sections. A foot-candle is a non-SI unit of illuminance or light intensity and it can be defined as the amount of illumination the inside surface of a one-foot-radius sphere would be receiving if there were a uniform point source of one candela in the exact center of the sphere.

The data collected is reported in Table 2. Table 2 summarizes light level samples in foot-candles, distance between sample points, and estimated travel times. Travel times are in reference to distance travelled and rate of travel based on the posted speed limits. The intent is to reinforce that drastically differing light intensity affects the eye's ability to receive data. Close samples in excess of max/min ration are common along this corridor.

A map of the locations where readings were taken is provided in Appendix 2 in Green.

Review of Table 2 indicates that the minimum levels drop significantly below the minimum recommendation of 1.0 and .7 foot-candles, in the respective areas, below the minimum recommended foot-candle threshold, as well as in excess of the maximum to minimum ratio. Based upon this analysis, the light level along a majority of the corridor is below the minimum recommended.

3.5. Ongoing plans and initiatives

There are a few ongoing initiatives that could significantly affect the need for lighting plans along the corridor, as described in the following sections.

3.5.1. Estero Boulevard Reconstruction

Lee County, in cooperation with the Town of Fort Myers Beach, is in the process of improving Estero Boulevard along the entire length of the island. An Estero Boulevard Master Plan was completed in 2014 that developed concepts for each section of the corridor. Significant public outreach was included as part of this plan, with the Town and the county developing the final options.

As shown in Figure 2, the County has divided Estero Boulevard into 6 distinct segments. The proposed cross sections vary, as shown in Figure 4.

As shown, each typical section along the corridor includes improved bicycle, pedestrian, and trolley facilities along the corridor. However, lighting upgrades are not a significant component of the project.

This project is being built from north to south, one section at a time. Work is underway along much of the corridor, with the southern two sections not yet begun.

3.5.2. Town of Fort Myers Beach Bicycle and Pedestrian Master Plan

In 2017, the Town completed a Bicycle and Pedestrian Master Plan. This Plan reviewed the current and proposed networks, and developed plans for improvements to those networks through an interactive public engagement program. The Plan recommends further development of the bicycle and pedestrian

trails along Estero Boulevard, and provided for connections from Estero Boulevard to the residential areas, shopping and commercial districts, and beach and recreation areas along the island.

3.5.3. TPI-FMB Redevelopment Project

A company called TPI has recently assembled major portions of the northern area of the Town into one large land holding. This land has recently received approval to begin development. At buildout, the project will change the character of the northern end of the Town by redevelopment of outdated and underutilized properties into a cohesive community redevelopment featuring resorts, retail, and other uses. As part of this project, significant bicycle and pedestrian traffic is expected to be generated. The project will provide for connections to the Town's multimodal network.

Table 1
Crash Data Summary by Year

Year	Motorized Vehicles			Bicycles			Pedestrians			Total Crashes	Fatalities
	Day	Night	Lighting not reported	Day	Night	Lighting not reported	Day	Night	Lighting not reported		
2013	74	3	10	1	0	1	0	0	0	89	0
2014	89	30	12	6	1	0	1	1	0	140	0
2015	121	40	6	16	0	0	4	2	0	189	0
2016	70	33	0	9	1	0	6	2	0	121	0
2017	78	32	0	6	1	0	1	6	0	124	1
TOTALS	**432**	**138**	**28**	**38**	**3**	**1**	**12**	**11**	**0**	**663**	**1**

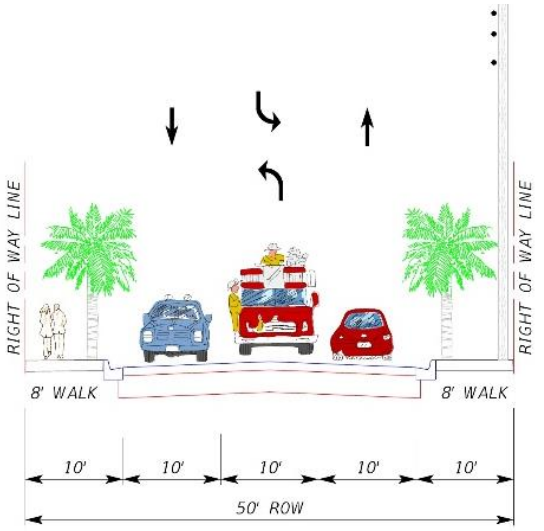
Table 2
Existing Light Levels

Reading Number	Footcandle Reading	Offset Distance	Time to Travel	Reading Number	Footcandle Reading	Offset Distance	Time to Travel
1	0.385	0	0	41	0.85	124.488	0:02
2	0.592	196.384	0:04	42	0.004	327.56	0:06
3	0.629	174.9	0:03	43	0	327.864	0:06
4	3.513	68.096	0:01	44	0.0012	397.784	0:08
5	0.251	189.696	0:04	45	0.0035	850.592	0:17
6	0.342	451.592	0:09	46	0.013	260.832	0:05
7	0.047	407.664	0:08	47	0.312	163.096	0:03
8	1.934	32.376	0:01	48	0.036	270.408	0:05
9	0.29	545.376	0:11	49	0.005	208.24	0:04
10	1.54	205.2	0:04	50	3.681	167.2	0:03
11	0.404	241.832	0:05	51	0.0075	208.848	0:04
12	1.727	197.6	0:04	52	3.573	170.088	0:03
13	0.26	139.992	0:03	53	0	218.424	0:04
14	4.532	66.88	0:01	54	1.049	197.752	0:04
15	0.094	295.944	0:06	55	0.5481	317.528	0:06
16	0.907	348.536	0:07	56	3.846	344.128	0:07
17	0.128	347.472	0:07	57	0.25	82.84	0:02
18	0.46	122.208	0:02	58	3.845	354.008	0:07
19	0.337	182.856	0:04	59	0.238	302.328	0:06
20	3.024	156.712	0:03	60	3.999	354.16	0:07
21	0.049	254.144	0:05	61	0.064	285.76	0:06
22	0.134	106.096	0:02	62	0.489	199.424	0:04
23	1.177	178.296	0:03	63	0	232.712	0:05
24	0.013	251.408	0:05	64	1.277	335.16	0:07
25	0.013	155.952	0:03	65	0.0017	177.688	0:03
26	3.253	354.008	0:07	66	4.029	314.336	0:06
27	0.17	200.792	0:04	67	0.025	590.672	0:12
28	1.547	154.28	0:03	68	0.586	169.024	0:03
29	0.035	122.968	0:02	69	0.026	191.824	0:04
30	0.011	118.56	0:02	70	1.873	195.624	0:04
31	0.853	475.76	0:09	71	3.264	388.512	0:08
32	0.091	241.376	0:05	72	0.03	282.264	0:06
33	2.792	186.808	0:04	73	1.78	103.056	0:02
34	0.165	333.64	0:06	74	0.221	429.4	0:08
35	0.031	300.808	0:06	75	0.037	269.344	0:05
36	1.753	386.384	0:08	76	3.307	251.104	0:05
37	0.059	553.888	0:11	77	0.082	232.256	0:04
38	3.399	262.504	0:05	78	2.106	186.96	0:04
39	1.067	324.368	0:06	79	0.013	163.4	0:03
40	0.035	112.632	0:02	80	0.011	1132.4	0:22

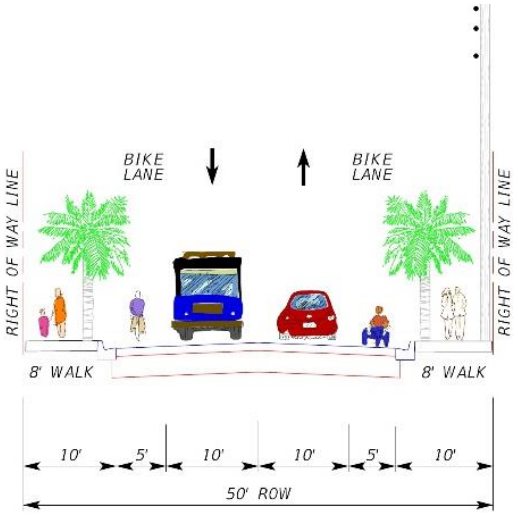
Table 2 (Continued)
Existing Light Levels

Reading Number	Footcandle Reading	Offset Distance	Time to Travel	Reading Number	Footcandle Reading	Offset Distance	Time to Travel
81	2.59	269.344	0:05	101	0.012	760	0:15
82	0.005	267.824	0:05	102	0.892	554.952	0:11
83	0.014	265.392	0:05	103	2.81	213.256	0:04
84	0.0025	667.432	0:13	104	4.312	542.64	0:11
85	1.004	882.816	0:17	105	0.601	288.344	0:06
86	0.012	288.648	0:06	106	0.001	446.728	0:09
87	4.58	1011.408	0:20	107	0.066	935.864	0:18
88	0.005	215.08	0:04	108	0.0109	834.936	0:16
89	0.036	909.264	0:18	109	3.221	233.928	0:05
90	0.0371	252.624	0:05	110	0.101	2804.704	0:55
91	0.081	302.48	0:06	111	0.003	478.2	0:09
92	2.53	739.632	0:14	112	3.214	1752.56	0:34
93	0.114	422.256	0:08	113	0.0431	2001.5	0:39
94	0.018	224.504	0:04	114	3.421	1452.1	0:28
95	0.075	887.984	0:17	115	0.891	375.288	0:07
96	0.012	625.968	0:12	116	0.1012	1790.2	0:35
97	1.949	175.104	0:03	117	4.112	854.2	0:17
98	0.069	568.328	0:11				
99	0.107	951.064	0:19				
100	0.027	788.728	0:15				

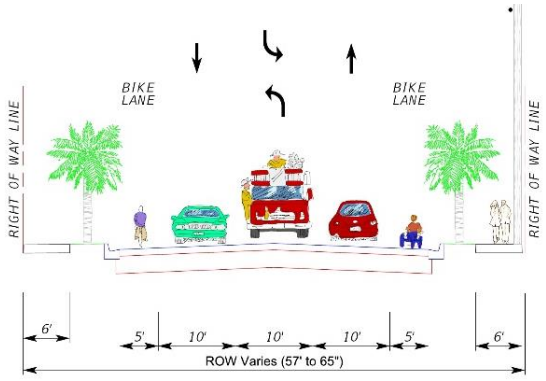
Figure 4
Estero Boulevard Typical Sections



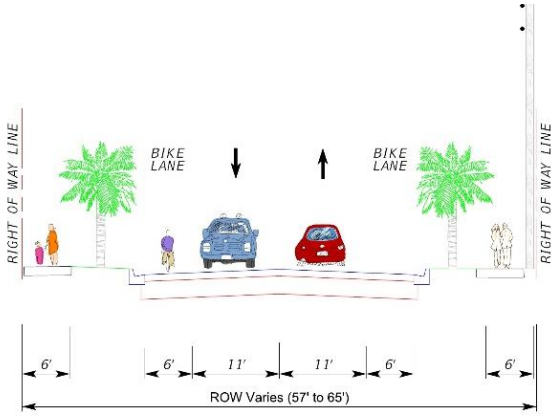
CORE/CIVIC AREA
3 LANE OPTION



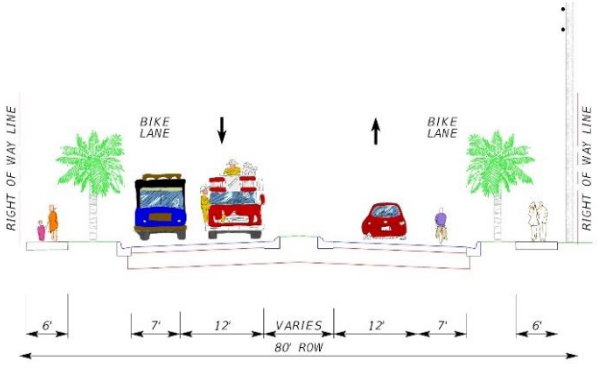
CORE/CIVIC AREA
2 LANE OPTION



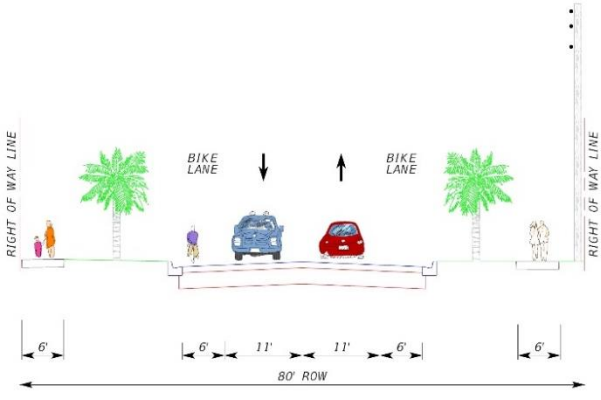
QUIET AREA



QUIET AREA



HIGH RISE
AREA



SOUTH END
AREA

4. Lighting Analysis

Based upon the existing conditions analysis presented in Section 3, the corridor has been analyzed to determine the need for lighting, and options to provide that lighting. This analysis is summarized below.

4.1. Lighting Need

The existing lighting along Estero Boulevard has been identified as deficient according to Florida Greenbook roadway lighting standards. It is deficient in terms of variability – moving quickly between better lit and low lighting areas – as well as total lighting output. Many of the existing street lights have light sources and reflectors that are visible to drivers, which creates a hot-spot of light intensity that creates eye confusion, causes squinting, and yields adverse effects to the driver.

The significant number of night time crashes further supports the need for more effective roadway lighting in the corridor.

This section summarizes potential lighting types, general capital costs, and general maintenance costs to be considered.

4.2. Sea Turtle Compatibility

Fort Myers Beach is an active sea turtle nesting area. As such, caution must be used in the development of lighting alternatives so as not to interfere with nesting and hatchlings returning to the Gulf upon birth. No light source should be visible, so that turtles are not confused as to the direction they should travel when nesting and returning to the water.

CPWG Engineering, Inc. reviewed related documentation for minimizing impact on Sea Turtles through the nesting season. The State of Florida Fish and Wildlife Commission (FWC) has generated extensive documentation on solutions to decrease light pollution affecting Sea Turtles, especially during nesting season. The Town has prepared Ordinances to supplement the FWC, assisting the Town staff to protect nesting sea turtles.

The Ordinance references Turtle Nesting Habitat, which is not defined. It is recommended that a broad definition of this habitat be included, that covers any public or private lands, accessible directly from the water's edge, to the first legal man-made development.

Field survey work performed along the length of this project revealed no fewer than 22 lights that are in place to illuminate Estero Boulevard are negatively impacting turtle nesting habitat, with direct visibility of the source. This can cause disorientation, confusion, and lead to mortality. The 22 lights are very specifically installed to illuminate Estero Boulevard, this does not include side street lighting, parking lot lighting, or privately owned lighting. These lights are in direct conflict with existing Town Ordinances.

For purposes of the development of a lighting plan for Estero Boulevard, care will be taken to ensure that lights are turtle friendly, and will not encourage turtle confusion.

4.3. Dark Skies Criteria

The Town of Fort Myers Beach ordinances also reference compliance with the International Dark Skies Association (IDSA) guidelines to reduce light pollution. These guidelines provide recommendations related to the reduction of light pollution, known commonly as photo-pollution.

The definition of light pollution, is the excessive, misdirected or invasive use of artificial outdoor lighting. Mismanaged lighting alters the color and contrast of the nighttime sky, eclipses natural starlight, and disrupts circadian rhythms (the 24-hour processes of most living organisms), which affects the environment, energy resources, wildlife, and humans. The threat of light pollution continues to grow as the demand for artificial light increases each year.

While the conclusion of the light study indicates the need for more artificial street lighting, as well as the replacement of existing street lighting, these recommendations can actually reduce the existing light pollution by the use of full cut-off light fixtures, normalizing to a single color (temperature) of light, and will also eliminate existing violations of the Turtle Light visibility on turtle nesting habitat.

Full cut-off fixtures is a lighting industry term meaning the luminous intensity (visible light source or reflector) at or above an angle of 90° above nadir is zero, and the luminous intensity (in candelas) at or above a vertical angle of 80° above nadir does not numerically exceed 10% of the of the lamp or lamps in the luminaire. Essentially, no light escapes above the line parallel to the horizon, and the majority of light is directed downward.

IDSA guidelines has added benefits for driver safety, as this will eliminate visible hot-spots (glare) for car drivers that create vision impairment. Reducing the glare gives drivers greater ability to see in dark conditions, and eases eye confusion.

4.4. Lighting Alternatives

The existing lighting along the corridor is inconsistent in its type and placement, which leads to some of the lighting variation present along the corridor. The existing lighting structures are primarily cobra-head style fixtures, with varying types of light sources.

High Pressure Sodium, Metal Halide, and LED lighting were all observed, each with a differing color spectrum, as well as older fixture types where the light source and reflectors can be seen. This creates definitive glare and discomfort to the eye, and create a delay in human eye adjustment to varying levels of light, and even temporarily hinder the eye's Dark Adaption. Dark Adaption is a natural phenomenon in the eye where lower levels of light cause the eye to amend to utilize data from Rod cells, and disregard Cone cells data. This manifests as ability to only discriminate between shades of black and white. Disruption to dark adaptation refers to how the eye recovers its sensitivity in the dark, following exposure to bright lights.

These are not the only findings. Artificial light color is defined in terms of temperature. Color Temperature (CT) is a measure of the spectral content of the light source, the lower the CT, in the neighborhood of 2400-3000 degrees Kelvin are more of a yellow and red color, where light sources with a higher CT, in the neighborhood of 4000K-5000K are blue, or white. These colors are due to the wavelength of the light perceived by the human eye. The higher the CT, the shorter the wavelength of the light. Blue light scatters more in the human eye than the longer wavelengths of yellow and red, and

sufficient levels can damage the retina. This can cause problems seeing clearly for safe driving or walking at night, commonly perceived as glare from the light source.

Option 1 – Supplemental FPL lighting - To provide adequate lighting, supplemental lighting should be added to existing FPL fixtures to provide uniform light levels compliant with the FDOT Greenbook, and to minimize the maximum light level to minimum light level ratio. A conservative estimate number of additional fixtures along this corridor to attempt to reach Greenbook Standards is 80 fixtures. Proposed additional fixtures are identified on Attachment 2 in red, to reach uniform light levels throughout the corridor. All supplemental lighting should standardize to full-cut-off, low glare, standard CT fixture. This would not eliminate the different CT lighting, or the higher glare fixtures, however, the overall illumination increase should improve driver/pedestrian safety.

Option 2 - Complete lighting replacement. This would involve complete street lighting system replacement, standardizing on full cut-off, low glare, adjustable cant LED light fixture, to create the safest driving condition, eliminate infractions to Town Ordinances for Turtle lighting, and improve driver/pedestrian safety. Proposed street lighting change out allows consistent spacing to be installed. The recommended light fixture proposed by FPL, is an industry leading low-glare, LED source to match lumen output equivalent light output low-wattage street light, mounted on mast extension on existing utility wooden poles. Along project 6+ mile corridor, this fixture recommended spacing is 120 linear foot maximum spacing, yielding approximately 260 total fixtures (currently 143 fixtures serve the project area), or an increase of about 120 fixtures. The scope recommended is to determine a logical starting point, and consistently illuminate the corridor.

Option 3 – Town Owned Street Lighting. The Town could purchase and install Town owned lighting throughout this corridor, which would give the Town the ability to standardize the lighting in terms of CT, with full cut-off, glare reduced fixtures. This would also allow for better light distribution, and minimizing the hot-spots and create uniform lighting distribution and better maximum to minimum ratios along the corridor. A drawback from this option is the Town would be responsible for all the maintenance of their own fixtures, however newer LED technology has a projected 10 year life span with no interruption in service, unless acted on be external forces, like a high-wind event. Monthly fees associated with Town owned street lighting would be reduced on the order of 80 percent, but first cost are quite high.

Cost estimates for varying solutions are evaluated in several alternatives were considered. Capital and maintenance costs vary between the alternatives, as summarized below.

4.4.1. Option 1 – Adding Supplemental Lighting. The lighting is on a lease/use basis, owned and maintained by FPL. Standard tariffs dictate the cost per month, included as Attachment 1. OL-1 Outdoor Lighting, SL-1 Street Lighting, as well as PL-1 Premium Lighting. Monthly fees are based primarily on energy consumption, and fixture type, and range from $9 to $20 per fixture. Additional light is recommended as indicated above. Projected costs are broken into (2) categories, First Costs, and Monthly Fees:

First cost - $14/fixture,	Monthly Fee - $10/month
Total – 81 x $14 = $1150	Additional Cost/month $810/month

4.4.2. Option 2 – Complete Replacement. This plan is based on the PL-1 Premium Lighting Tariff. This plan is centered on reduction of Carbon Dioxide generation, a federally incentivized strategic plan to reduce energy consumption by replacing antiquated devices with more efficient models. This plan reduces first cost for replacement fixtures, and reduces the monthly usage and operational costs. This plan would require extensive work with electrical utility, utilizing their fixtures, and existing utility poles, with a few supplemental poles where required. Initiating a starting point just south of the intersection Fifth Street and Estero Boulevard, where Estero Boulevard runs parallel to the beach, and extending to south end of Fort Myers Beach, this proposed method would include systemic replacement of all street lighting fixtures along this path, totaling 113, and supplementing additional fixtures on existing poles, with a few added poles, totaling 87. The first cost for this method would be minimal, with only cost of installing conduit to FPL specified locations, and the addition of 4 poles. The change of costs for this area changing from 113 lights to 200 lights. FPL currently charges the town $10/month according to the existing tariff for energy consumption, and the proposed tariff will cost $8.86 per fixture (inclusive of fixture costs, maintenance, and energy consumption), projections indicate an overall increase in current total FPL monthly street lighting costs from $1130, to $1772, or an increase of approximately $600 per month for this section of Estero Boulevard. FPL has performed a preliminary review of the Town total street lighting, and noted that a Town wide change of existing fixtures to energy efficient LED fixtures with equivalent light output would reduce the current monthly expenditure on street lighting from $4036 to $3450. Combining this Town-wide change out and adding new lighting along the project corridor would result in new monthly projection increase of less than 2 percent. Based on this information, CPWG strongly recommends the Town to engage talks with FPL for Energy Reduction Based LED Street Lighting Conversion.

All information for Option 2 is based on new PL-1 Tariff, a new tariff plan recently rolled out by FPL. This option required a new photometric design, performed for the specified project length, by FPL lighting department. This lighting photometric design is included in Attachment 3, and yielded a final additional lighting fixture quantity. The light levels, fixture locations and elevations are included. We have extrapolated the totals to include addition of 4 new poles, and a total fixture increase of 87 to reach specified light levels.

4.4.3. Option 3 – Town Owned Lighting. This option would reduce the monthly charges by FPL by approximately 80 percent, but comes with a first cost of approximately $400/fixture. The Town could install standard CT, low glare fixtures where they proposed, and create uniform light distribution. The Town would have to create a continuing service contract with a licensed electrical contractor, as well as a colocation agreement with FPL. The Town would be solely responsible for all maintenance of new fixtures. Complete corridor replacement would be projected at:

First cost - $400/fixture,	Monthly Fee - $3.00/month
Total – 140 x $400 = $56,000	140 x $3 = $420 – a savings of approx. $1700/month

4.5. Conceptual Lighting Plan

To comply with Town ordinances, adequately provide for roadway lighting, and to provide the most cost efficient solution to the Town, CPWG recommends Option 2. This costs is weighed with the actual life safety improvements along the corridor, and meeting Town Ordinances related to lighting. This option developed a preliminary lighting plan standardizing light spacing to the manufacturer's recommended distance for optimum lighting performance, maintained light levels, and minimizing maximum to minimum ration for light intensity. The plans are provided in Attachment 3 to this report, identifying the fixture locations, elevations, and lighting density, with the design standard for:

- Lighting type – Lumen output equivalent, low-wattage LED fixture
- Lighting spacing – for lower Watt fixture, standardized spacing approximately 120'
- Special considerations – mounted on existing utility poles, spacing based on availability
- Annual Maintenance is included in the monthly cost of fixture

With the provided plan implemented, lighting along the corridor will be improved increasing pedestrian safety, turtle nesting will not be disturbed, and night time crashes may be reduced.

4.6. Lighting Justification Analysis

A Lighting Justification Report was prepared in accordance with Chapter 14 of the Florida Manual on Uniform Traffic Studies (MUTS).

The analysis is a two-step process. Step 1 provides a lighting warrant analysis consistent with criteria developed by the Transportation Association of Canada (TAC) Guide for the Design of Roadway Lighting. If lighting is determined to be warranted, then a Net Present Value (NPV) analysis is performed consistent with the guidelines provided in the MUTS. The NPV analysis evaluates savings related to crashes based upon providing highway lighting, compared with the cost to implement the lighting. If the savings is greater than the cost, then Lighting Justification Criteria are satisfied.

The TAC Guide provides a warranting system based on data for four key criteria:

- Geometric conditions
- Operational conditions
- Environmental conditions, and
- Crash conditions

Multiple items in each criteria are evaluated, and each item is assigned a scoring criterion and a weighting factor. The scores for all areas are summed, and a score greater than 60 is deemed to meet lighting warrants per the TAC Guidelines. The Estero Boulevard corridor scored 72, meaning that roadway lighting is warranted, and that NPV calculations should be conducted to determine justification.

The NPV was conducted utilizing analysis criteria provided for in the MUTS. Since the corridor has lighting in some sections, the base non-lighted No-Build condition is estimated based upon Highway Safety Manual (HSM) crash predictive analysis. The lighted Build Condition also utilizes HSM predictive analysis, but also incorporates existing crash experience.

Based upon the analysis conducted, roadway lighting in the corridor also meets Justification Criteria.

A stand-alone Lighting Justification Report is provided in Attachment 4.

5. Potential Funding Sources

To implement the lighting plan, there are two main sources of funding that could be made available: local funds and state/federal funds.

5.1. Local Funds

Local funds consist of those funds provided by the Town of Fort Myers Beach, or from Lee County. Typically, these funds would be sourced from existing general revenues. Possible local sources could include:

- development impact fees related to the redevelopment activities along the Beach
- general funds

Each of these sources will be more fully evaluated as part of next steps.

5.2. State and Federal Funds

The most likely source of state or federal funding would be Federal Safety Funds. To qualify for these funds, the proposed project must meet the criteria outlined in the Florida Manual on Uniform Traffic Studies (MUTS). The MUTS provides a procedure to estimate the reduction in crashes expected, and then to compare this reduction to the costs of the system to develop a benefit-cost (BC) ratio for the proposed project. If the BC ratio is greater than 1.0, then the project could qualify. As discussed previously, the BC ration for this corridor exceeds 1, and the lighting is justified.

6. Next Steps

The non-existence of consistent lighting levels, with minimal maximum to minimum ratios, the varied color of the light sources, the light source visibilities all create impediments to traffic and pedestrian safety. Each can contribute to visual impairment while driving. Recommendations are as follows:

Primarily, a systemic lighting system replacement (removal of all fixtures of different sources, standardizing to only one source, and light spectrum, different sources include Metal Halide, High Pressure Sodium, and Light Emitting Diode (LED), and replacement with FP&L new LED lighting fixture that is both low wattage, and has leading glare reduction technology. FPL has multiple manufacturers that produce fixtures that have internal adjustments to cant the angle of the fixture, which will eliminate light overflow in unwanted directions, such as towards turtle nesting habitats. This eliminates the requirement of shielding on lamps which reduce the light output and require a penetration of the housing of the fixture which can damage the life expectancy, as well as reduces the need to have FPL turn off street lights in turtle nesting season.

Removal and replacement of all fixtures, standardizing to a minimum full cut-off, and standardizing to a single Color Temperature will yield best results. This eliminates glare, and will have a definitive improvement on turtle nesting habitats.

-- Update: January 17, 2020 –

Presentation to Fort Myers Beach Town Council

The Consultant presented the findings in this lighting study report to the Fort Myers Beach Town Council at its November 4th 2019 meeting. During the public comments period after the presentation, Town Council received requests from some residents and environmentalists to modify implementation of findings in this Report to change the light source recommended to a light source that has a wavelength above 580 nm. These Color Temperature light sources, along the higher end of the visible light spectrum, appear amber to red in color, and are understood to be outside the visible spectrum for sea-turtles. This can eliminate the dis-orientation to turtles due to street lighting.

Lighting metrics are used to understand and predict how a lighting system will operate. They deal with quantity of light (light output measured in Lumens and light levels measured in footcandles), quality of light (brightness and color), and fixture efficiency (electrical efficiency and how much light leaves the fixture).

The fixture proposed by the Consultant in the Report has a lumen output of 15,453, to meet the light levels recommended and the spacing dictated by existing pole locations, with a final fixture count of 200. The input wattage is 118 watts, yielding approximately 131 lumens/watt. This falls within the energy efficiency upgrade Tariff put forth by FP&L, to allow for a zero cost implementation this report recommended. As stated in the Report, the proposed fixture is a full cutoff fixture, with a concealed light source that will not be visible from the turtle nesting habitat. The visibility of the light source is the prime factor in disorientation. The proposed fixture is also adjustable without disturbing the light distribution, so any adjustments can easily be made and still maintain adequate light levels in the desired locations.

Following the Presentation, the Consultant reviewed the lighting source options offered by FP&L through their street lighting options. The only option available that is listed as “Turtle Friendly” has a light distribution that is much lower than proposed in this report. The “Turtle Friendly” fixture has a lumen output of 3,715, meaning to meet the light levels recommended, would require more fixtures, with additional poles, transformers, and wiring required, with a final fixture count of 688. The input wattage is 92 watts, yielding approximately 40 lumens/watt. This does not fall within the energy efficiency upgrade Tariff put forth by FP&L, therefore all associated firsts costs would be required to be paid. A projected, and non-binding cost estimation provided by FP&L Lighting Solutions department to Town Staff on November 5th, 2019, indicates the associated costs could be as high as $7,740,000. This is only a projection. To determine specific costs, the Town will have to engage and contract FP&L.

ATTACHMENT 1

ATTACHMENT 2

ATTACHMENT 3

ATTACHMENT 4