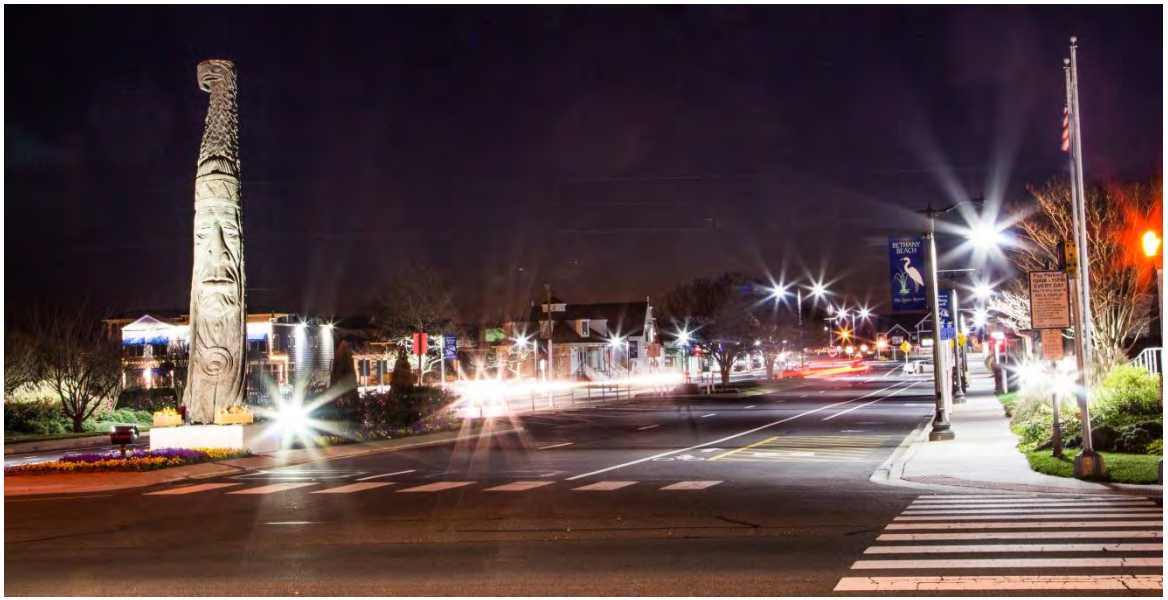
DelDOT Roadway Lighting

Presentation to:

Delaware Pedestrian Council

Built Environment Subcommittee

September 28, 2016

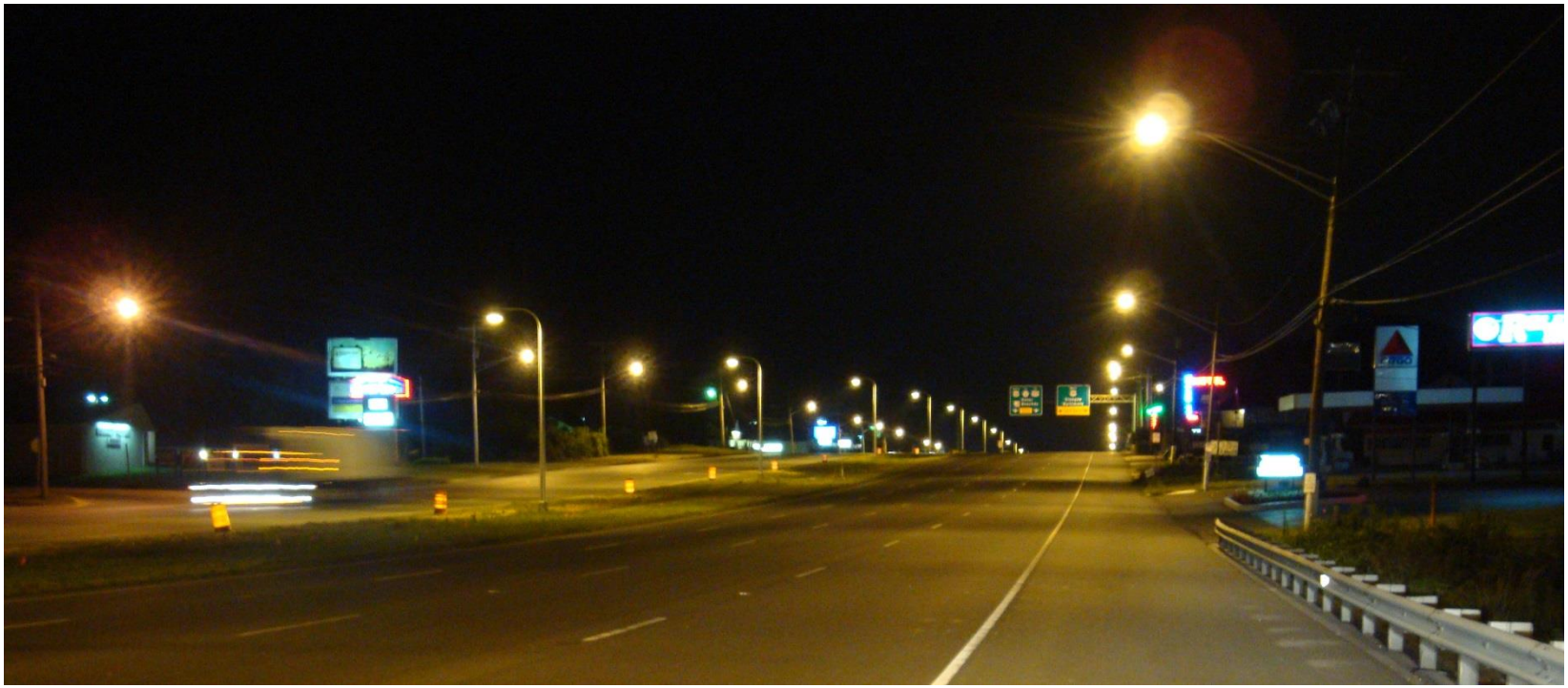


Agenda

- Purposes of Lighting
- Safety Benefits
- Cost & Other Considerations
- DelDOT Guidelines / Warrants
- Lighting Design
- New Technologies
- US 13 Before / After Study

Purposes of Lighting

- Roadway Safety (reduce crashes)
- Personal Security (reduce crime)
- Aesthetics



Safety Benefits

- National studies show very high safety benefits:

- Intersections, crash reduction:
  - 40% nighttime injury
  - 77% nighttime fatality
  - 50% pedestrian injury
  - 80% pedestrian fatality

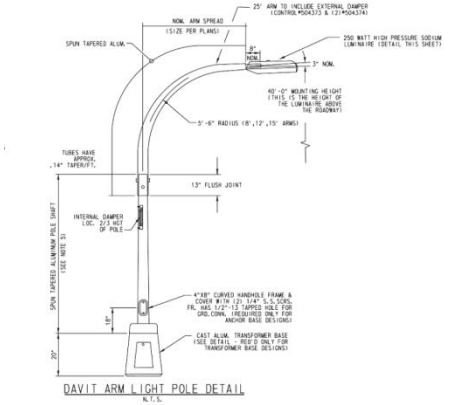
- Roadways, crash reduction:
  - 20% property damage
  - 30% injury
  - 70% fatality

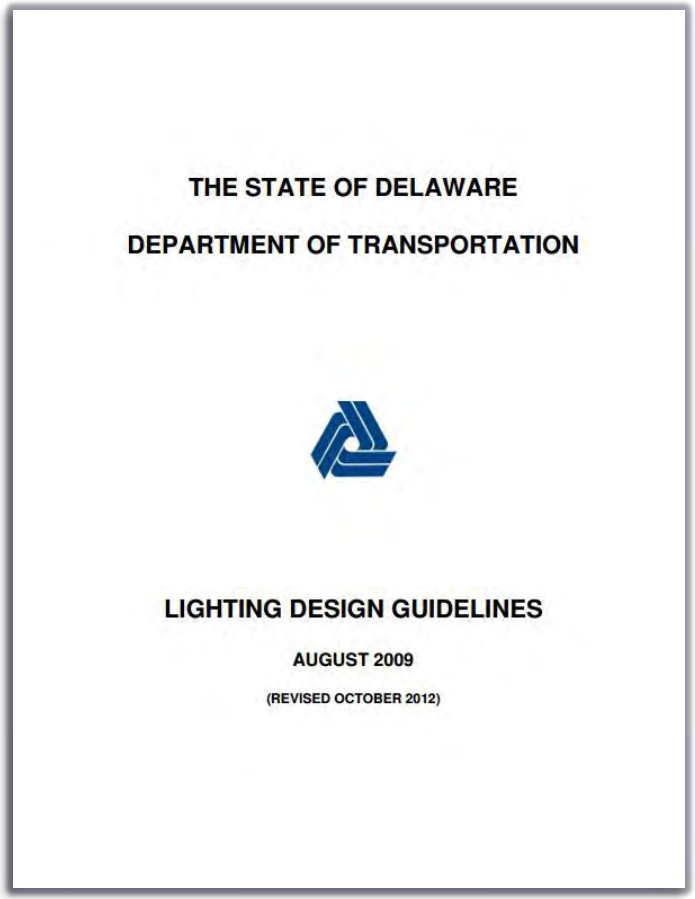
Cost & Other Considerations

- Capital Cost - $650,000 per mile (four lane divided highway)
- Maintenance Cost
- Operating Cost - $1,300,000 DelDOT annual electric bill
- Other Considerations:
  - Energy Use / Carbon Emissions
  - Sky Glow / Light Trespass / Light Pollution
  - Delaware Code, Title 7, Chapter 71A: Regulation of Outdoor Lighting

DelDOT Guidelines

- http://www.deldot.gov/information/pubs_forms/manuals/lighting/lighting_guidelines_2012-10-01.pdf
- Ch. 1: Introduction
- Ch. 2: Warrants
- Ch. 3: Process
- Ch. 4: Lighting Design
- Ch. 5: Electrical Design
- Ch. 6: Design Preferences





Warrants

Warrant Conditions - Shall vs. Should vs. May

- Shall: Requires Installation
- Should: Requires Consideration
- May: Installation is Acceptable

Lighting **shall** be installed for:

A. Interstate and Controlled Access Highways (In conducting lighting analyses, freeways and interstates shall follow the same guidelines as expressways)

1. Junctions among mainline routes
2. Ramp terminals with the mainline route
3. Ramp terminals with crossing roadways

B. Other Highways

1. Intersections of U.S. Routes with U.S. Routes (Does not include Alternate or Business Routes)
2. Intersections of U.S. Routes with Delaware Routes (Does not include Alternate or Business Routes)

C. Other Specialized Areas

1. Toll Plazas
2. Rest Areas
3. Weigh Stations

DelDOT Lighting Design Guidelines (Oct. 2012 Rev.) – Pages 6 & 7

Warrants

Warrant Conditions - Shall vs. Should vs. May

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Lighting **should** be installed for:

A. U.S. Routes

1. Intersections of U.S. Routes with U.S. Alternate and Business Routes
2. Intersections of U.S. Routes with Delaware Alternate and Business Routes

B. Delaware Routes

1. Intersections of Delaware Routes with Delaware Routes
2. Intersections of Delaware Route with Delaware Alternate or Business Route
3. Intersection of Delaware Route with unnumbered road where the traffic volume on the Delaware Route is greater than 10,000 ADT and the nighttime crash percentage is greater than 40 percent
4. Intersection of Delaware Route with unnumbered road where the traffic volume on the Delaware Route is greater than 11,000 ADT and the traffic volume on the unnumbered road is greater than 4,000 ADT

C. Other Locations

1. Locations where crash patterns indicate that lighting may reduce crashes and where the percentage of nighttime accidents is 40 percent or greater
2. At residential development entrances where the internal streets are lighted and there are at least 75 homes
3. All public transit stops

DelDOT Lighting Design Guidelines (Oct. 2012 Rev.) – Pages 6 & 7

Warrants

Warrant Conditions - Shall vs. Should vs. May

- Shall: Requires Installation
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Justification of lighting for pedestrian safety purposes

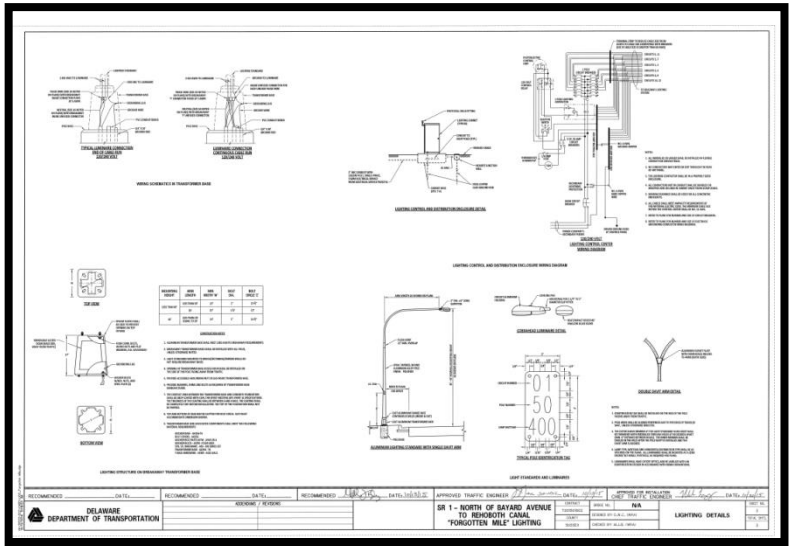
Lighting **may** be installed for:

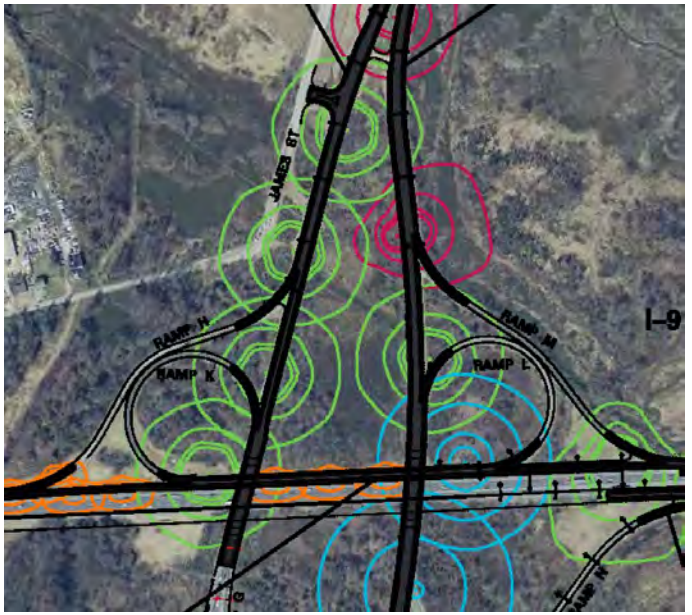
1. Intersections of Delaware Routes with unnumbered roads where the traffic volumes are greater than 8,500 ADT and 2,000 ADT, respectively
2. Locations where crash patterns indicate that lighting may reduce crashes and where the percentage of nighttime accidents is 35 percent or greater
3. Locations where better nighttime visibility is needed
4. At residential development entrances where there are at least 100 homes
5. At locations where a combination of favorable factors exist and Engineering Judgment indicates that lighting would be useful.

DelDOT Lighting Design Guidelines (Oct. 2012 Rev.) – Pages 6 & 7

Lighting Design

- Ownership
  - Utility
  - DelDOT
  - Other (typically municipal)
- Photometrics
  - Fixture type, wattage
  - Spacing
- Detailed Design





Photometric Design

Illuminance Design:

- Values Determined Based on Functional Classification Map
- Required Output Parameters From Lighting Design Software
  - Average
  - Minimum
  - Average/Minimum Ratio

Table 4-2: Illuminance Design Values

Roadway and Walkway Classification	Off-Roadway Light Sources	Illuminance Method		
		Average Maintained Illuminance	Minimum Illuminance	Illuminance Uniformity Ratio
	General Land Use	(foot-candles) (min)	(foot-candles)	avg/min (max)
Principal Arterials - Interstate and other freeways	Commercial	0.6 to 1.1	0.2	3:1 or 4:1
	Intermediate	0.6 to 0.9	0.2	3:1 or 4:1
	Residential	0.6 to 0.8	0.2	3:1 or 4:1
Other Principal Arterials (partial or no control of access)	Commercial	1.6	As uniformity ratio allows	3:1
	Intermediate	1.2		3:1
	Residential	0.8		3:1
Minor Arterials	Commercial	1.4		4:1
	Intermediate	1.0		4:1
	Residential	0.7		4:1
Collectors	Commercial	1.1		4:1
	Intermediate	0.8		4:1
	Residential	0.6		4:1
Local	Commercial	0.8		6:1
	Intermediate	0.7		6:1
	Residential	0.4		6:1
Alleys	Commercial	0.6		6:1
	Intermediate	0.4		6:1
	Residential	0.3		6:1
Sidewalks	Commercial	1.3		3:1
	Intermediate	0.8		4:1
	Residential	0.4		6:1
Pedestrian Ways and Bicycle Ways [1]	All	2.0		3:1

Notes:
1. Assumes a separate facility. For Pedestrian Ways and Bicycle Ways adjacent to roadway, use roadway design values.
2. There may be situations where a higher level of Illuminance is justified. The higher values for freeways may be justified when deemed advantageous by DelDOT to mitigate off-roadway sources.
3. Physical roadway conditions may require adjustment of spacing determined from the base levels of Illuminance indicated above.
4. Table adapted from AASHTO publication "Roadway Lighting Design Guide," 2005.
5. Illuminance values shown are equal to values for R2-R3 surface materials requirements as defined by AASHTO. The values shown in Table 4-2 shall be used for design unless otherwise directed by the Chief Traffic Engineer or his/her designee.

New Technologies

- Light Emitting Diode (LED)
  - Promising new technology
  - Rapidly evolving
  - Light color is whiter/bluer, compared to yellow/orange of traditional High Pressure Sodium fixtures
  - Capital costs are slightly higher
  - Electrical costs are somewhat lower
  - Maintenance costs may be lower

US 13 Before / After Study

- Pedestrian Safety Study completed in 2009
- Short-term upgrades implemented between 2010 and 2013
- Full corridor lighting implemented in 2011

Pedestrian Safety Study Recommendations
US 13 and US 40
New Castle County, Delaware

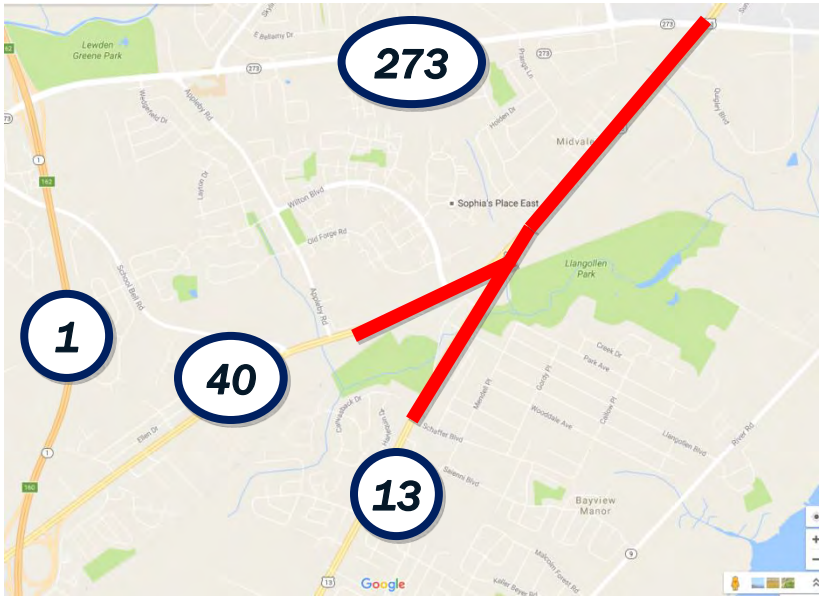
Short Term Recommendations

	Location	Recommendation	Status
1	US 13 & US 40 Corridors	Install pedestrian warning signs	Complete - installed in Summer 2010
2	US 13 @ DE 273	Install pedestrian crosswalks and countdown pedestrian signals	Complete - installed and operational
3	US 13 @ Firehouse	Install pedestrian crosswalks and countdown pedestrian signals	Complete - installed and operational - Summer 2013
		Eliminate bus stop at Exxon Station and move bus stop from Wilson to new sidewalk in front of fire house	On hold until signal is installed 3/28/14 - needs coordination with DTC
4	US 13 @ Llangollen Blvd	Install pedestrian crosswalks and countdown pedestrian signals on all approaches. Sidewalk improvements between the bus stop and crosswalks	Complete - installed and operational
5	US 13 @ Saienni Blvd	Install pedestrian crosswalks and countdown pedestrian signals	Complete - installed and operational
6	US 40 @ Wilton Blvd	Pedestrian improvements: additional crosswalks and countdown pedestrian signals	Complete - installed and operational
		Additional lighting at intersection	Complete - installed and operational
7	US 40, US 13 to Wilton Blvd	Improve roadway lighting	Complete - installed and operational - Fall 2010
8	US 13, US 40 to DE 273	Improve roadway lighting	Complete - installed and operational - Summer 2011
9	US 13 @ 2nd Ave/3rd Ave	Install pedestrian crosswalks and countdown pedestrian signals	Complete - installed and operational - September 2013

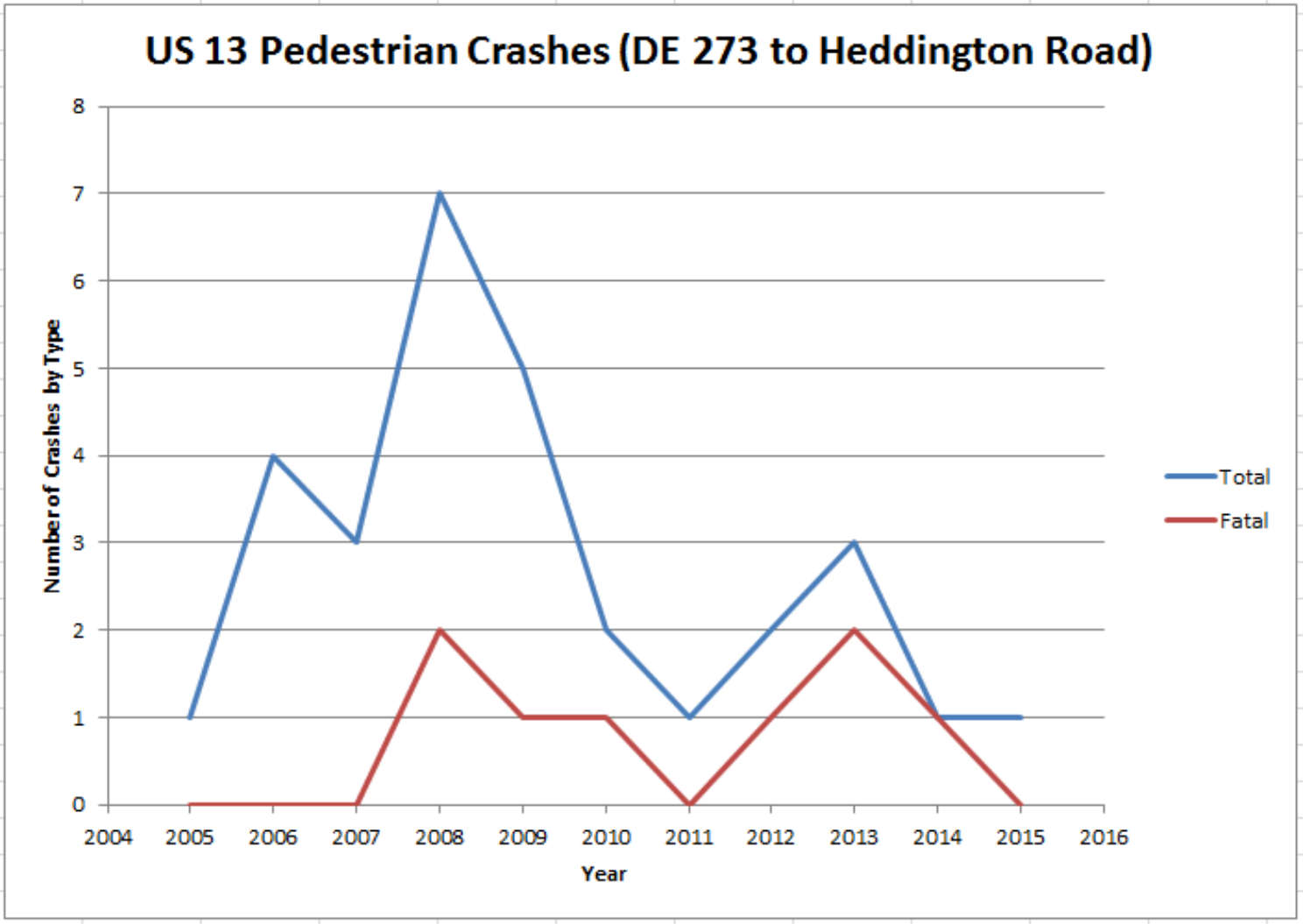
Long Term Recommendations

	Location	Recommendation	Status
1	US 40 @ Wilton Blvd	Median Barrier/Fencing	Will re-evaluate need following implementation of other improvements
2	US 40 @ Fir Avenue	Further study required to determine the need for a traffic signal at this location	On hold
3	US 13 @ Buena Vista Drive	Combine southbound bus stop with that at Saienni and provide connecting sidewalk. Move northbound bus stop closer to crosswalk	Based on recommended location of sidewalk, relocating these bus stops is no longer recommended
		Connect sidewalk between Buena Vista and Saienni on southbound side	Complete
4	Sidewalk Improvements	Sidewalk improvement project to connect existing sidewalks, improve existing sidewalks, tighten up driveway radii and install new sidewalks where feasible	Prepared and submitted project nomination forms
5	US 13, US 40 to DE 273	Use fencing to deter pedestrians from crossing US 13 at inappropriate locations	Will re-evaluate need following implementation of other improvements
6	Bus Route Modification	Modify bus routes #25 southbound and northbound to create a "loop" to drop off and pick up passengers on their desired side of US 13.	After discussions with DTC, "Loop" option is infeasible for several reasons. However, DTC will further investigate bus stop usage and determine if route modifications can accomplish the same goal
			No action at this time. Will re-evaluate need for pedestrian upgrades in this area once other recommendations have been implemented
7	US 13 @ Lisa Drive	Install signalized pedestrian crosswalk	

Updated: 3/28/2014 *Delaware Department of Transportation* 1



US 13 Before / After Study



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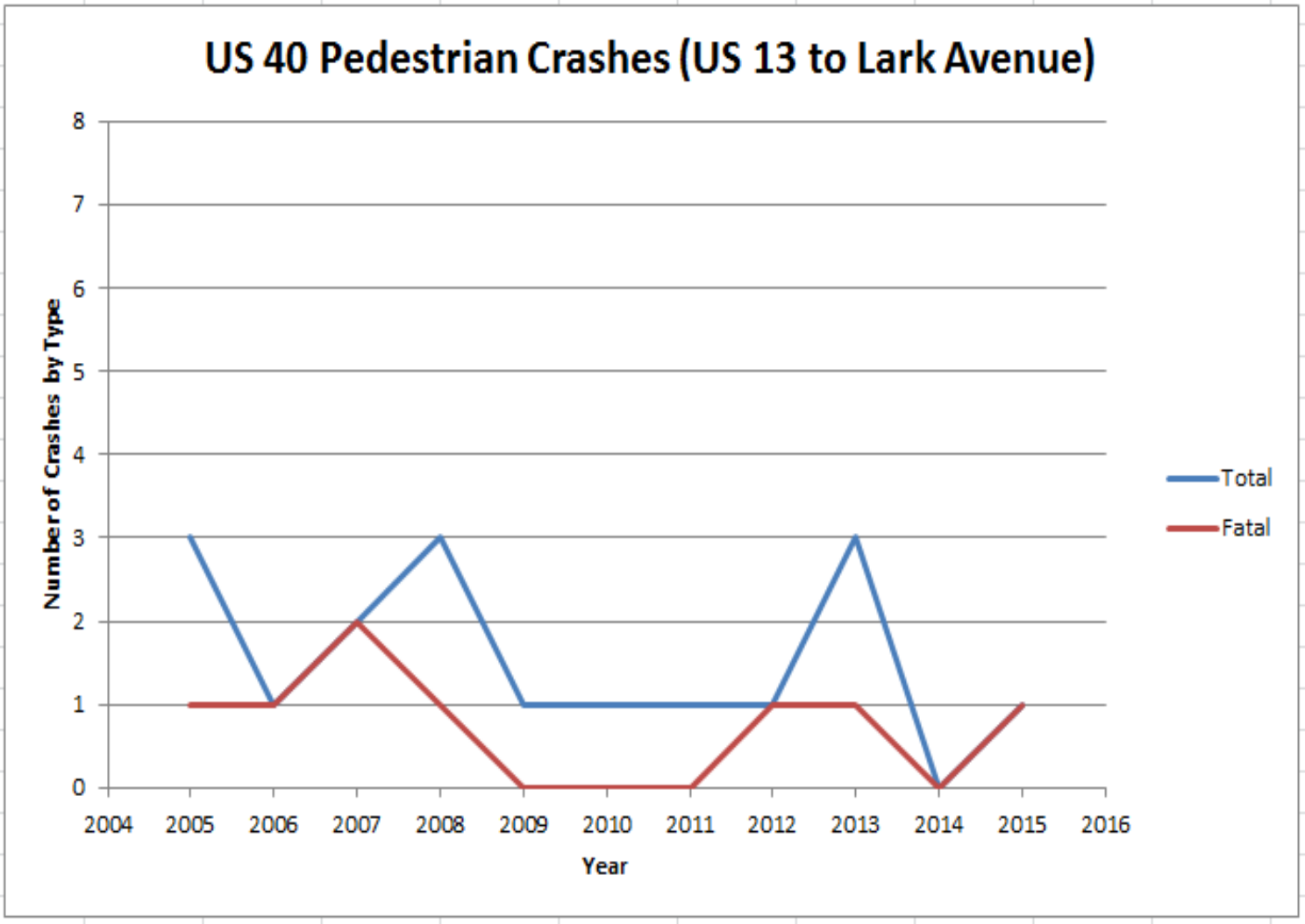

DelDOT Roadway Lighting

Thank You!

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