Pedestrian Safety Action Plan

Osceola, Orange, and Seminole Counties, Florida

September 2019

Prepared for MetroPlan Orlando

Prepared by Kittelson & Associates, Inc.

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1.0 Introduction

The Orlando Metropolitan Area has consistently ranked as one of the highest in the nation for pedestrian fatalities, ranking as the metro area with the highest "Pedestrian Danger Index" in the 2019 Dangerous by Design report, and sixth highest in pedestrian fatalities per capita. For bicycling, the bicyclist per capita fatality rate for this metro area is roughly equal to that for the rest of the state (0.67 per 100,000 population for the Orlando area versus 0.69 for the state as a whole). According to NHTSA, in 2015 Florida's 0.74 cyclist deaths per capita was the highest of all states.

While the Dangerous by Design report focused only on pedestrians, 71 percent of the bicyclist injury crashes involved bicyclists operating as pedestrians, either cycling on sidewalks or crosswalks when struck, crossing mid-block as a pedestrian would, or cycling facing traffic when on the roadway. *Some* countermeasures to improve pedestrian safety therefore may also have some positive effect for bicyclists.

More needs to be done to reduce injuries and fatalities for our pedestrians and bicyclists, and past efforts have not reduced either our numbers or our per capita rates. Comparing the years 2007 through 2011 with the years 2012 through 2016, the number and rates of pedestrian and bicyclist crashes have increased:

	2007 through 2011	2012 through 2016	Change in Number	Change in Rate*
Pedestrian Injury Crashes	3,441	4,011	17%	8%
Pedestrian Fatality Crashes	245	297	21%	12%
Bicyclist Injury Crashes	2,356	3,350	42%	32%
Bicyclist Fatality Crashes	59	65	10%	2%

* Per 100,000 population

While there are many on-going activities in the Orlando Metropolitan Area to improve pedestrian and bicyclist safety, a more comprehensive and targeted approach is still needed to support MetroPlan's performance-based prioritization process and complement the safety performance measures in the Fast-ACT. The area's Best Foot Forward pedestrian safety program has resulted in increased awareness and understanding of traffic laws supporting pedestrian safety, as well as a documented improvement in motorist yield rates at marked crosswalks on lower-speed streets, mostly near downtown Orlando. The Florida Department of Transportation and several local governments have adopted Complete Streets policies and are also developing pedestrian and bicyclist safety action plans as well.

However, area-wide pedestrian fatalities continue to climb precipitously, with the area experiencing 84 deaths during 2017, a 43 percent increase over the average for the prior five years. Bicyclist injuries and deaths appear to have leveled off at around 670 and 14 per year respectively. The goal of the Pedestrian and Bicyclist Safety Action Plans are to provide a data driven approach which helps identify countermeasures to reduce all types of pedestrian/bicycle related crashes. This specific Safety Action Plan focuses on pedestrian strategies, whereas the Bicyclist Safety Action Plan (under a separate cover), focuses on bicycle-related strategies.

The structure of the Safety Action Plans will entail adopting some concepts that are new to traffic safety. Rather than simply defining solutions as tools coming from the disciplines of “engineering, education, and enforcement,” there will be a more direct and practical connection between the problems and the solutions, by:

- Reviewing historical crash information to identify “hot spots”
- Identifying and categorizing countermeasures by their type: behavioral, design, and control
- Identifying *Critical Safety Success Factors* for each crash type
- Verifying countermeasures and *Critical Safety Success Factors* by performing safety field reviews on 9 high crash corridors
- Selecting countermeasures that improve the greatest number of Critical Safety Success Factors
- Maximizing agreement between behavioral, design, and control countermeasures

The remainder of this Pedestrian Safety Action Plan will provide an overview of past studies and historical crash information, review crash typing and cause profiling, discuss Critical Safety Success Factors, identify pedestrian countermeasures and opportunity for impact, and review next steps.

2.0 Working Group and Project Presentations

A Working Group was assembled to advise the Project Team on the development of the Pedestrian Safety Action Plan. The Working Group includes members of the Technical Advisory Committee, Community Advisory Committee, and Transportation Systems Management and Operations Committee, as well as other safety stakeholders such as Bike/Walk Central Florida. The following members and organizations participated in the Working Group meetings (in alphabetical order by organization):

- Shelby Villatoro, Bike-Walk Central Florida
- Richard Earp, City of Apopka
- Kelly Brock, City of Casselberry
- Randy Schrader, City of Kissimmee
- John Hambley, City of Kissimmee
- Nabil Muhaisen, City of Kissimmee
- Anjum Mukherjee, City of Longwood
- Ian Sikonia, City of Orlando
- Lisa Portelli, Community Advisory Committee/Bike-Walk Central Florida
- RJ Mueller, Community Advisory Committee
- Dan Stephens, Community Advisory Committee
- P J Smith, East Central Florida Regional Planning Council
- Rakinya Hinson, Florida Department of Transportation
- Doug Robinson, LYNX
- Myles O'Keefe, LYNX
- Brian Sanders, Orange County
- Jamie Boerger, Orange County Public Schools
- Justin Eason, Osceola County
- Glen Hammer, Osceola County Public Schools
- Lee Pulham, Reedy Creek Improvement District
- Frank Consoli, Seminole County
- Mike Rigby, Seminole County Public Schools
- Susan Hutson, University of Central Florida

The project working group met on three occasions during the course of the project: 1. June 12, 2018; 2. August 16, 2018; and 3. May 24, 2019.

The first meeting on June 12, 2018 served as the kick-off meeting for the Working Group. During this meeting, the Working Group was introduced to the project, including the study area, primary goal, schedule, and the planned approach to reach the goal. A summary of the historical crash analysis was also presented, as well as an overview of Critical Success Safety Factors (CSSFs) and their role in determining applicable countermeasure types. Included in the next steps was identifying high crash locations within the study area.

The second meeting on August 18, 2018 was held to explain the corridor crash data collection process and the identification of the Top 50 locations from which corridors could be selected for further analysis and field reviews. Potential field review corridors were presented for each of the three counties. A table of potential countermeasures and their relation to each CSSF were reviewed by the Working Group, with suggestions made regarding their impacts to each CSSF. Included in the next steps were beginning safety field reviews and subsequently beginning development of the Safety Action Plans.

The third meeting on May 24, 2019 was held to review the findings and recommendations from the safety field reviews and discuss CSSF countermeasure scores. During the meeting, each field review corridor was presented with a brief overview and a few highlighted issues and recommendations. Corridor wide issues of the selected field review locations were also discussed. The CSSF countermeasure scoring process was introduced and an example explaining how a quantifiable score was developed for each countermeasure relating to the impact potential was reviewed. Included in the next steps were completing the development of the Safety Action Plans and discussing a Phase II for the project, which includes implementation of the Safety Action Plans.

Complete meeting notes and materials presented during these meetings is provided in **Appendix A**. **Figure 1** shows Working Group members in action during the second meeting.

Figure 1. Working Group Members

In addition to the Working Group meetings, project presentations were given to the Community Advisory Committee on June 26, 2019, the Technical Advisory Committee/Transportation Systems Management and Operations Committee on June 28, 2019, and the MetroPlan Board on July 10, 2019. The presentations from these meetings can also be found in **Appendix A**.

3.0 Review of Past Road Safety Audits

The 2012 MetroPlan Orlando Pedestrian Safety Action Plan developed a priority list for pedestrian and bicyclist focused road safety audits. The completed road safety audits for SR 436, SR 527, and SR 424 were reviewed in order to determine the types of countermeasures that have been previously recommended in the study area and to verify if any previously recommended countermeasures have been implemented. Additionally, in an effort to not duplicate prior work, sites identified for road safety audits in the 2012 Pedestrian Safety Action Plan were not selected for safety field reviews in this study. The three completed road safety audits reviewed were: 1) SR 436 from Old Cheney Road to SR 50, 2) SR 527 from Gore Street to Kaley Street, and 3) SR 424 from SR 423 to SR 434. A summary of the countermeasures and their current implementation status are provided in **Table 1**, **Table 2**, and **Table 3**.

Table 1. SR 436 Road Safety Audit Summary

Location	Countermeasure Recommendation	Status
SR 50 (Colonial Drive)	Consider replacing the button cap on the pedestrian push button under the bridge in the southwest corner.	Complete, new button installed
SR 50 (Colonial Drive)	Consider revising the signal timing plan to operate crosswalks in the northwest and southeast quadrants of the interchange in separate pedestrian phases, eliminating potential vehicle/pedestrian conflicts and allowing for additional "Walk/FDW" phase opportunities within each cycle.	Not complete
O.C. Fire Station 66	Consider repairing the sidewalk/driveway to eliminate the trip hazard.	Complete, filler material added, and hazard ground down
Medical/Office Bldg.	Consider repairing the sidewalk to eliminate the trip hazard.	Complete, filler material added
Old Cheney Highway	Consider adding hard surface around the pedestrian push button poles on the northeast and southeast corners in accordance with ADA requirements as part of the next 3R project on this corridor.	Complete, new push buttons and walk indicators installed
Corridor Wide	It is suggested that the Department consider a project to construct a raised median on SR 436 from the north side of SR 50 and extending ½ mile north to the existing 6-lane divided cross section. Pedestrian refuge islands at targeted locations may also be considered as a cost-effective alternative to a full median along the section.	Complete
Medical/Office Bldg.	Consider reconstructing the driveway to adhere to ADA sidewalk cross-slope standards and the FDOT Standard Index No. 515 for turnouts with sidewalks.	Not complete
Citgo Gasoline Station	Consider reconstructing the driveway to adhere to ADA sidewalk cross-slope standards and the FDOT Standard Index No. 515 for turnouts with sidewalks.	Not complete

Table 2. SR 527 Road Safety Audit Summary

Location	Suggestion	Status
Kaley Street	Determine the cause of the pedestrian push button malfunction and repair.	Unknown
Lake Beauty Drive	Speak to the property owner to consider replacement of the shrubbery with something of lower elevation or ground cover.	Not complete
Miller Street	Determine the cause of the pedestrian signal malfunction and repair. The City of Orlando representative reported this to the City's signal shop during the field review.	Unknown
Columbia Street	Consider removal of the shrubbery and replacement with ground cover vegetation or sidewalk.	Not complete
Corridor Wide	Consider the installation of truncated domes at each crosswalk in accordance with ADA, potentially as part of the next 3R project.	Not complete
Corridor Wide	Consider conducting a detailed review of bicycle usage along the corridor and in the surrounding neighborhoods and consider treatments that will increase shared use of the road for bicycles or promote alternative bicycle routes.	Unknown
Kaley Street	Consider the installation of "Turning Vehicles Yield to Pedestrians" signage (MUTCD R10-15) to raise awareness of the vehicle-pedestrian conflict point on the eastbound approach. This may also be a good location for additional law enforcement of "Yield to Pedestrians".	Not complete
Kaley Street	Install proper marking to identify loop detector location for bicyclists.	Not complete
Hollenbeck Street	Consider re-striping the crosswalk on the westbound approach.	Not complete
Sturtevant Street	Consider repairing the sidewalk to eliminate the trip hazard	Complete
Copeland Drive	Consider the installation of "Yield to Pedestrian" signage at this intersection. Internally illuminated signage that is activated during appropriate pedestrian phases is recommended. Investigate the potential utilization of half signal cycles when pedestrians call on the signal to shorten pedestrian wait time.	Not complete
Columbia Street	Consider as part of the next 3R project the installation of a pedestrian handicapped ramp for the crosswalk on the southeast corner of the intersection.	Not complete
Columbia Street	Consider as part of the next 3R project the relocation of the pedestrian pole on the northwest corner out of the direct path of the ramp access.	Not complete
Annie Street	Consider the relocation of the pedestrian handicapped ramps to create a more direct path to cross Annie Street. The presence of drainage structures will present a challenge. Also consider adding crosswalk pavement markings on the approach.	Crosswalk marking is complete
Kaley Street	Due to the frequency of trucks at this intersection making an eastbound to southbound right turn, consider intersection design improvements to increase the right turn radius at the southwest corner. A potential option is to reduce the westbound receiving lanes to a single lane and shift the eastbound only lanes to the north.	Not complete

Table 2 Continued. SR 527 Road Safety Audit Summary

Location	Suggestion	Status
Miller Street / Wisteria Avenue	Consider reducing the curb radius on the northeast corner of the intersection to make it a sharper corner, bringing the curb further south. It is also suggested that a raised island be considered between Miller Street and Wisteria Avenue to provide pedestrians with a refuge.	Not complete
Miller Street / Wisteria Avenue	For the south crosswalk, consider moving the northbound approach stop bar back and reconstructing the pedestrian ramp to allow the crosswalk to have a perpendicular orientation to Orange Avenue. Consider implementing "No RTOR" on the northbound approach. For the north crosswalk, consider re-orienting the crosswalk to cross Orange Avenue at a perpendicular angle as part of the northeast curb modification that was previously suggested.	Not complete
Fernwood Street	Consider conducting a study to explore the need for a mid-block pedestrian crossing in the vicinity of Fernwood Street. The study should consider hospital access (including emergency vehicle access), the advantages and disadvantages of a median refuge island at this location, the types of potential mid-block crossing treatments, and the optimal locations for Lynx bus stops in this area.	Unknown
Columbia Street	Consider as part of the next 3R project the relocation of the pedestrian signal with push button to the south side of the crosswalk for better protection for wheelchair users.	Not complete
Columbia Street	Consider evaluating the need for street lighting on the west side of the intersection.	Unknown
Silver Court	Consider imposing building setbacks to ensure adequate intersection sight distance is provided as properties on the west side of Orange Avenue redevelop.	Unknown
Gore Street	Consider reconstructing a portion of the sidewalk, in front of the medical supply building, using a constant cross slope from building to roadway to meet ADA	Not complete
Gore Street	Consider reconstructing the sidewalk and ramps on the northeast corner to include the bulb-out area and shorten the pedestrian crossing distance on the north side of the intersection.	Not complete

Table 3. SR 424 Road Safety Audit Summary

Location	Suggestion	Status
SR 423	Relocate or remove periodical publication distribution boxes.	Complete
Satel Drive	Check sight triangle at this intersection and zoning compliance of fence installation. Clear necessary sight triangle if zoning/setback violation is present. RESOLVED	Resolved prior to RSA report
Forest City Road	Consider one ADA ramp per crosswalk and orient detectable warning surfaces aligned with crosswalk.	Complete
Forest City Road	Stagger stop bar locations to improve vehicular sight distance.	Not complete
SR 423	Consider the installation of "Yield to Pedestrian" signage to raise awareness at this intersection. Internally illuminated signage that is activated during appropriate pedestrian phases is recommended. Signs should be placed according to future study considering turning volumes and enforcement.	Not complete
SR 423	If/when major construction or expansion occurs, orient detectable warning surfaces with direction of crosswalk.	Not complete
Aloha Street	Consider the installation of a median island that could serve as a pedestrian refuge near Lynx stop 5066, approximately 200 feet south of Satel Drive. If the median island is constructed as part of a mid-block crossing, then Chapter 3B18 of the 2009 Manual of Uniform Traffic Control Devices (MUTCD) should be consulted in regard to whether crosswalk striping should be provided. Additionally, Section 3.8 of the FDOT Traffic Engineering Manual should be consulted to aid in identifying applicable crosswalk treatments for consideration.	Not complete
2nd Street	Consider the consolidating transit stops at this location such that they are more directly across from each other if Lynx ridership data indicates high transit boardings and alightings at this location. A potential location to consider for the transit stops is just south of 2nd Street. Consider installation of a median island on SR 424 on the north side of 2nd Street. If the median island is constructed as part of a mid-block crossing, then Chapter 3B18 of the 2009 Manual of Uniform Traffic Control Devices (MUTCD) should be consulted in regard to whether crosswalk striping should be provided. Additionally, Section 3.8 of the FDOT Traffic Engineering Manual should be consulted to aid in identifying applicable crosswalk treatments for consideration.	Not complete
Corridor Wide	Install street lighting along corridor.	Not complete

The review of these road safety audits and their recommended countermeasures provided example countermeasures that are directly relevant to the MetroPlan region. Common issues that were found across these three corridors are anticipated to also be present on the corridors selected for safety field reviews in this project. The current status of previously recommended countermeasures was used to understand implementation timeframes, because future emphasis can be placed on recommended countermeasures that can be implemented quickly and at a low cost.

4.0 Historical Crash Overview and Trends

Pedestrian crash data was received from MetroPlan Orlando for the 2011 through 2017 time period, including data for each of the three counties in the study area (Osceola, Orange, and Seminole). In total, 6,178 pedestrian crashes occurred during the seven-year study period, including 595 property damage only (PDO) crashes, 5,150 injury crashes, and 433 fatal crashes. The crashes per year by severity are shown in **Figure 2** and a rolling five-year average is provided in **Figure 3**. The total pedestrian crashes per year showed an increasing trend from 2011 through 2015, before decreasing in 2016. A five-year rolling average of the annual total pedestrian crashes shows an increasing trend over the course of the three five-year averages. This increasing trend is driven by an increase in the rolling average of injury crashes per year, while the average fatal crashes remained constant and the average PDO crashes decreased.

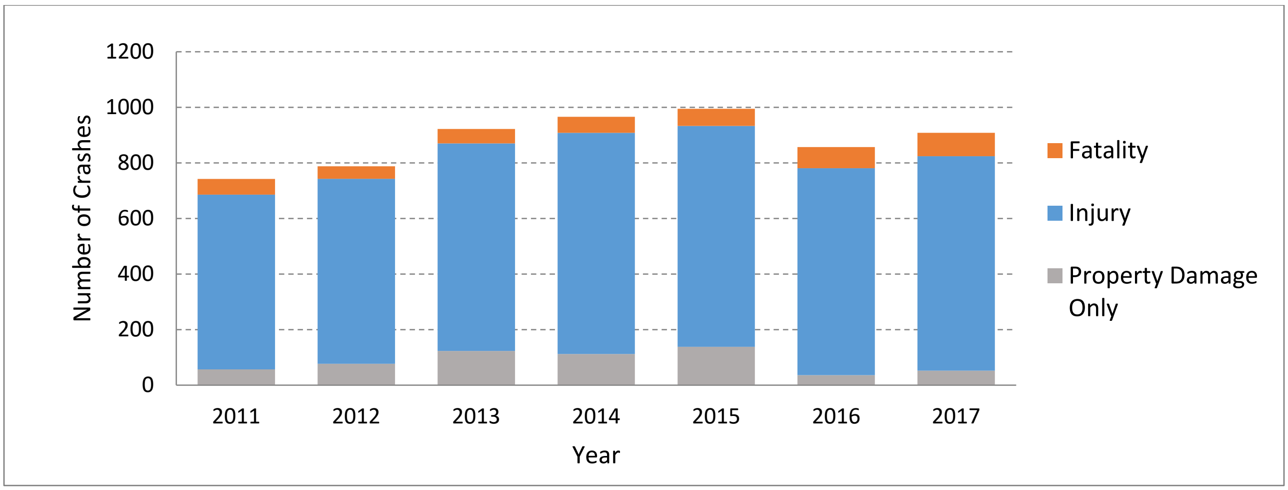


Figure 2. Pedestrian Crashes by Year and Severity

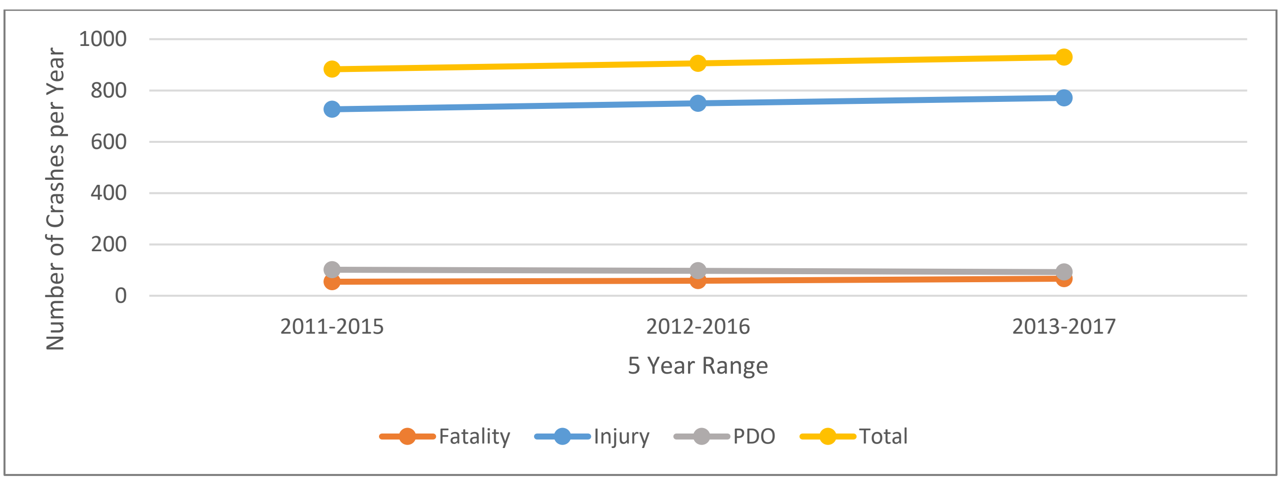


Figure 3. Pedestrian Five Year Rolling Average by Crash Severity

Pedestrian crash trends summarized by month, day of week, and crash time are shown in **Figure 4**, **Figure 5**, and **Figure 6**, respectively. These time period based crash trends may mirror peak pedestrian walking times. Months with the most pedestrian crashes (October through March) are generally cooler and drier than the summer months, and these months would also include children walking to school. Crashes by day of week are generally consistent throughout the work week, with the peak on Friday possibly associated with increased nighttime and entertainment activities. Crash trends based on the time of day show a small peak associated with morning commute time periods and a greater increase in the evenings.

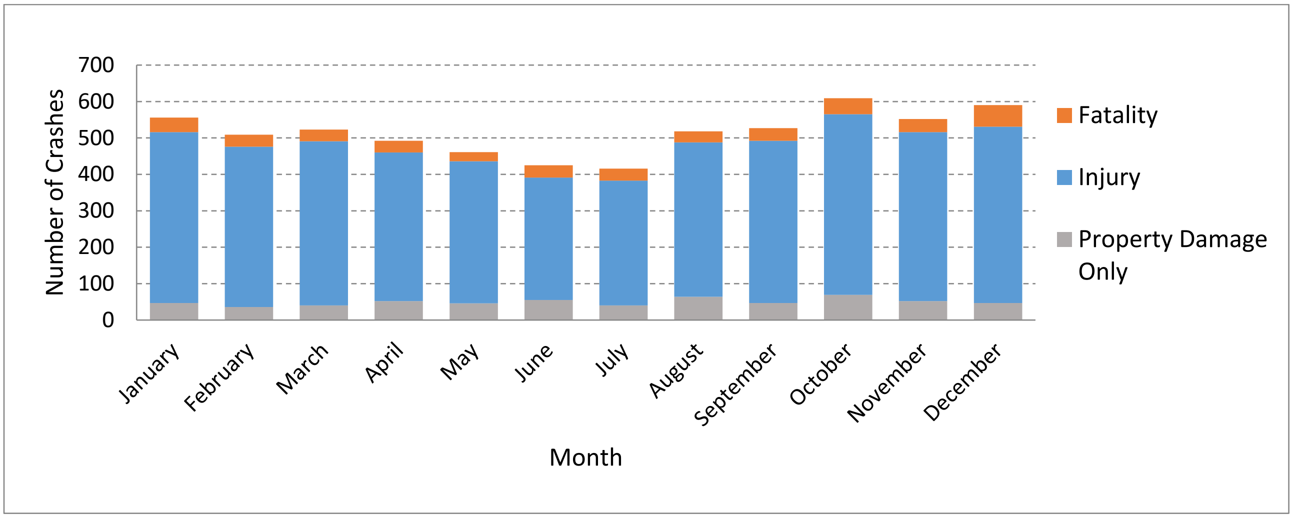


Figure 4. Pedestrian Crashes by Month and Severity

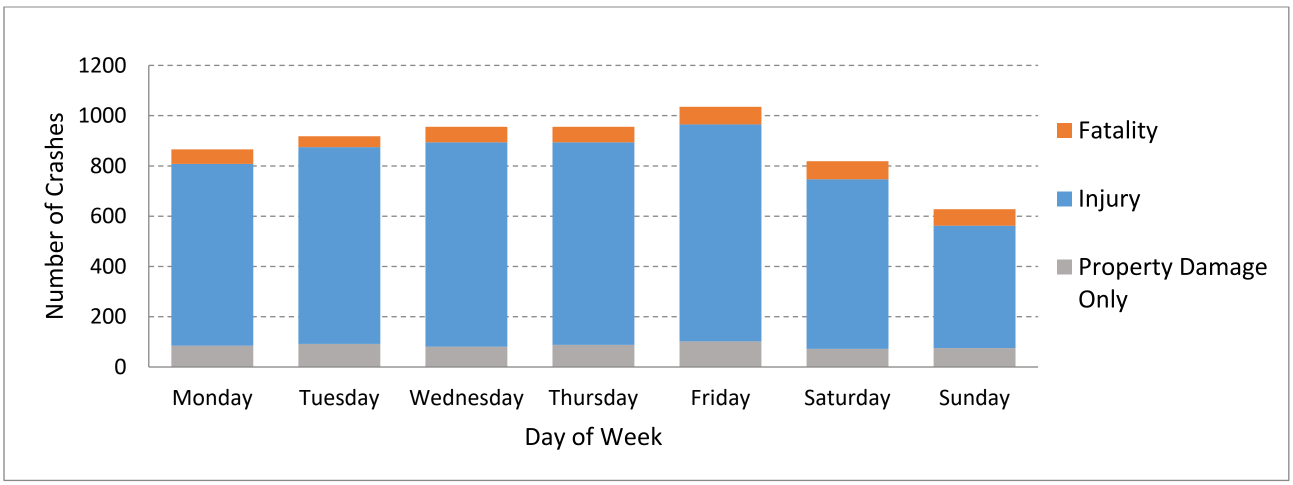


Figure 5. Pedestrian Crashes by Day of Week and Severity

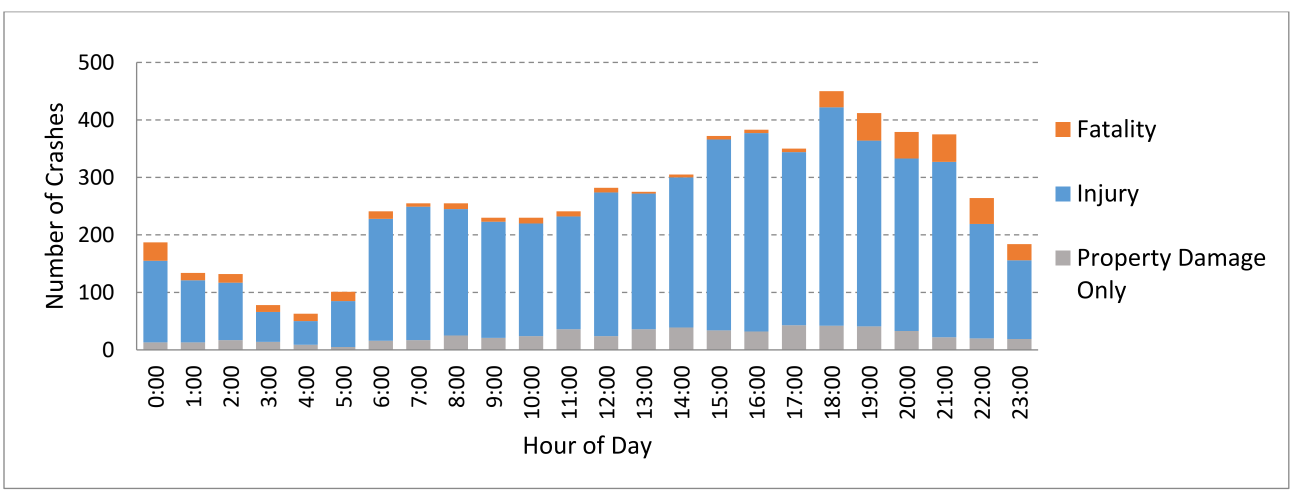


Figure 6. Pedestrian Crashes by Time of Day and Severity

It is also evident that fatal crashes are more proportionally prevalent during the evening and night hours when roadway visibility is reduced. Crashes by lighting condition are summarized in **Figure 7**. Forty-five percent of the pedestrian crashes took place during non-daylight conditions, of which 13 percent were fatal crashes. Of the remaining 55 percent of the crashes occurring during daylight conditions, two percent were fatal crashes.

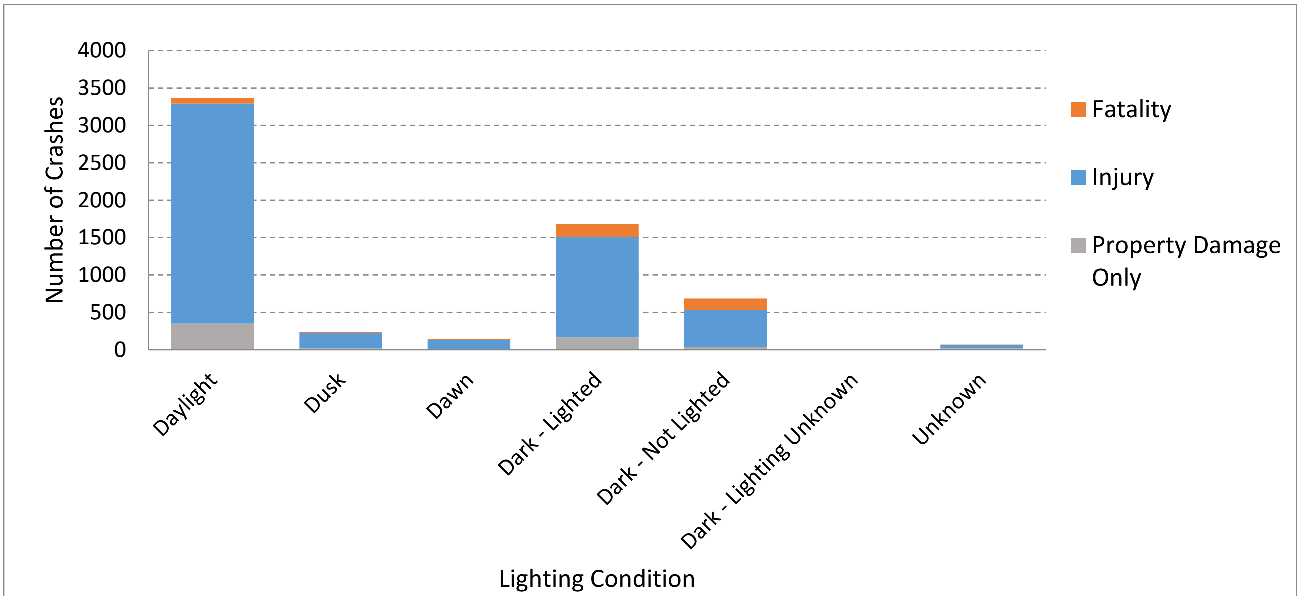


Figure 7. Pedestrian Crashes by Lighting Condition and Severity

Additional relevant data collected from the historical pedestrian crash analysis is included as follows:

- Alcohol & Drug Related Crashes
  - From police report indications: 6.9% alcohol and/or drug involved (5.4% alcohol)
  - From recorded testing results: 2.9% alcohol involved (17% from the driver, 84% from the pedestrian)
- Hit-and-Run Crashes (with no further detailed data available): 23%
- Surface Condition: 10% of crashes occurred in non-dry conditions

Within the three-county study area, Orange County experiences approximately five times more pedestrian crashes than Osceola County and Seminole County. This difference could be attributed to the population, total lane-miles, and vehicle miles traveled differences in these counties. The pedestrian crashes by year and severity for each county are provided in **Figure 8**, **Figure 9**, and **Figure 10**. The influence that Orange County crashes play in the overall study area trends is evident in these figures, as the smaller number of pedestrian crashes in Osceola County and Seminole County results in less yearly fluctuation and more consistency across the seven-year time frame.

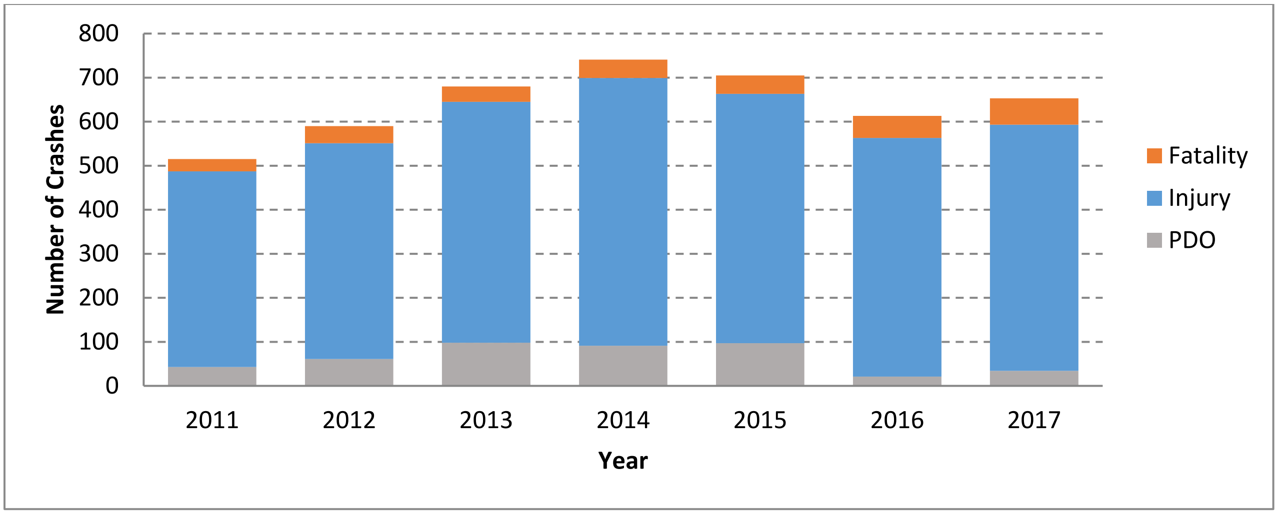


Figure 8. Orange County Pedestrian Crashes by Year and Severity

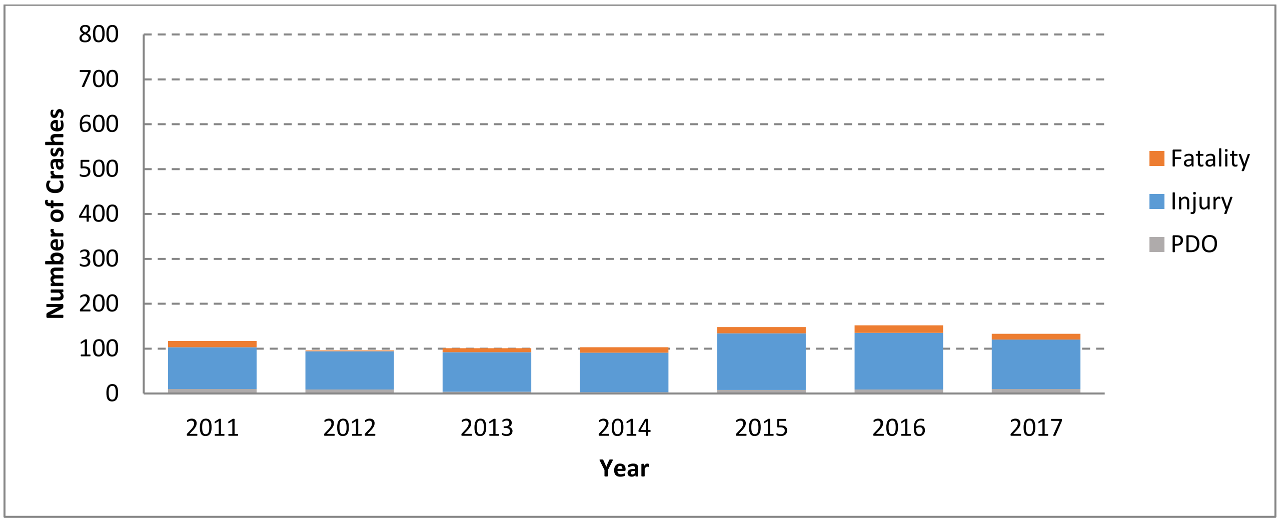


Figure 9. Osceola County Pedestrian Crashes by Year and Severity

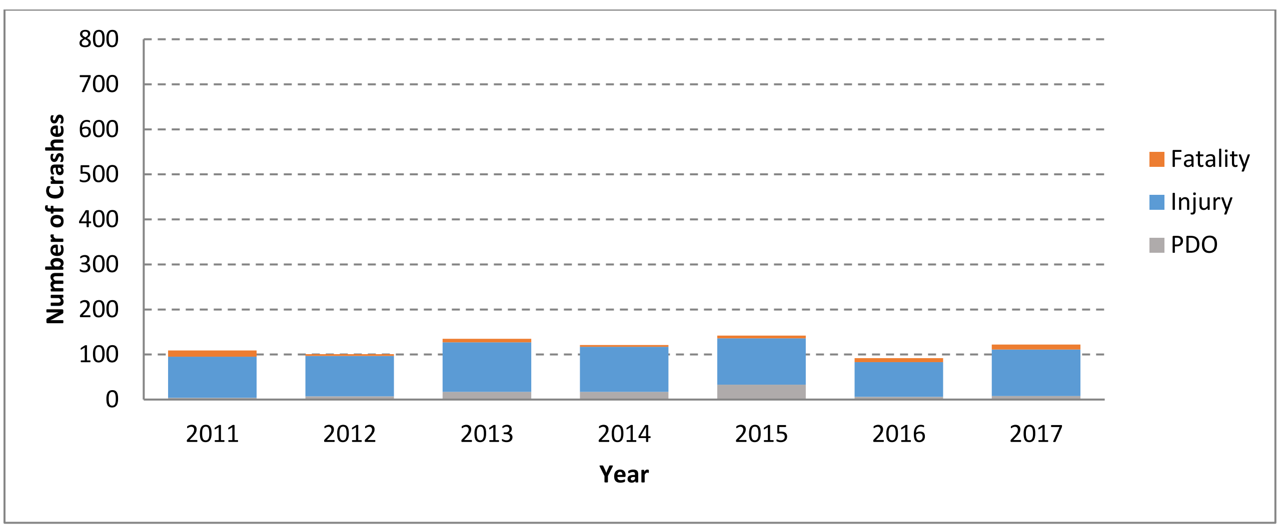


Figure 10. Seminole County Pedestrian Crashes by Year and Severity

To compare pedestrian crashes across the three counties, crash rates were calculated by normalizing the population, as shown in **Figure 11**. After adjusting for population differences, Orange County experiences a higher pedestrian crash rate than Osceola County and Seminole County for each year in the study period. Further historical crash data summary tables and charts for both the entire MetroPlan Orlando region and each individual county are included in **Appendix B**.

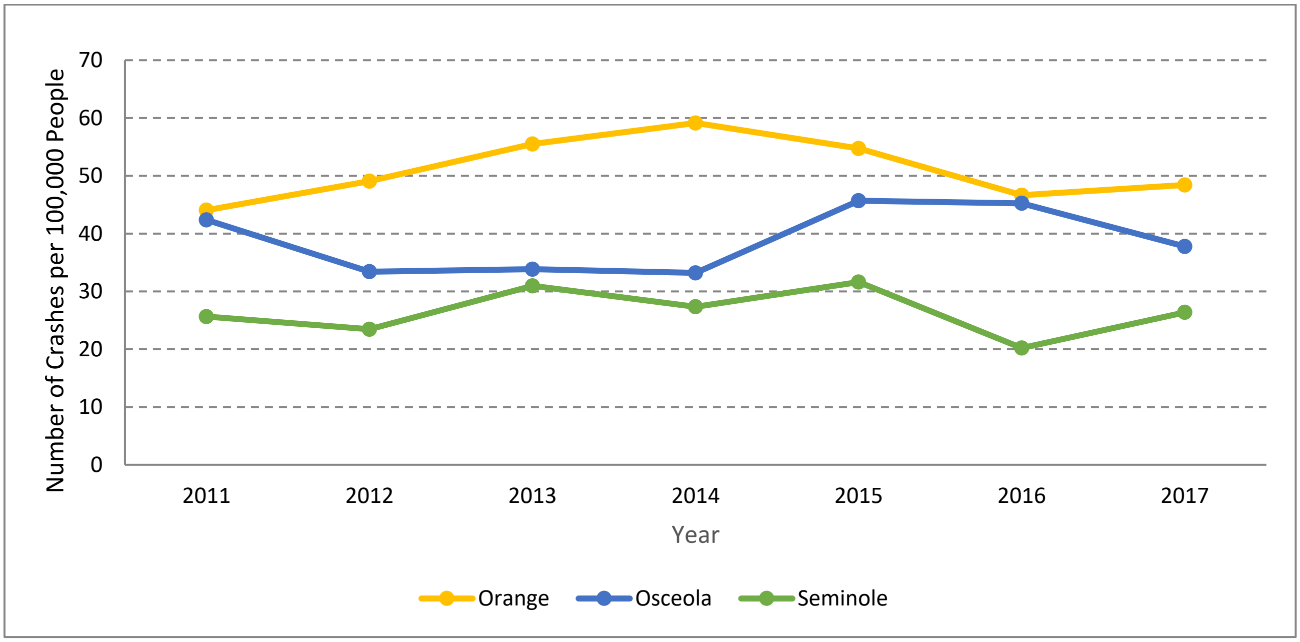


Figure 11. Pedestrian Crashes per 100,000 People by County

5.0 Crash Type and Cause Profiling

Crash type and cause profiling utilizes manual data collection from the crash report form to provide additional details regarding the pedestrian and motorist actions, movements, and location at the time of the crash. The provided pedestrian crashes were crash typed by FDOT and MetroPlan Orlando in the University of Florida's Signal Four Analytics Crash Database. Crash typing provides additional details of the crash, including information regarding the pedestrian actions and location at the time of the crash. Data provided for each pedestrian crash includes the crash group, crash type, crash location, pedestrian position, pedestrian age, and driver age. The full list of crash typing definitions as provided by the Pedestrian and Bicycle Crash Analysis Tool is provided in **Appendix C**.

The most prevalent pedestrian crash type involved a pedestrian crossing a roadway with a non-turning vehicle, accounting for 29 percent of all pedestrian crashes and 49 percent of all fatal pedestrian crashes. This crash type is typically associated with higher speed crashes, resulting in higher proportion of fatal crashes. **Figure 12** provides a list of the prevalent pedestrian crash types, while **Figure 13** shows the distribution of five of the most common crash types by age group. This distribution by age group highlights the increased prominence of non-crossing roadway crashes among vulnerable users, as compared to other age groups, notably Dash/Dart-Out and Off-Roadway crashes for younger users (28% of crashes for pedestrians under 12 years old and 21 percent of crashes for pedestrians between 12 and 18 years old, while only accounting for 9 to 14 percent of crashes in other age groups), and Backing Vehicle crashes for users older than 65 years old (22 percent of crashes for pedestrians over 65 years old, while only accounting for 6 to 14 percent of crashes in other age groups).

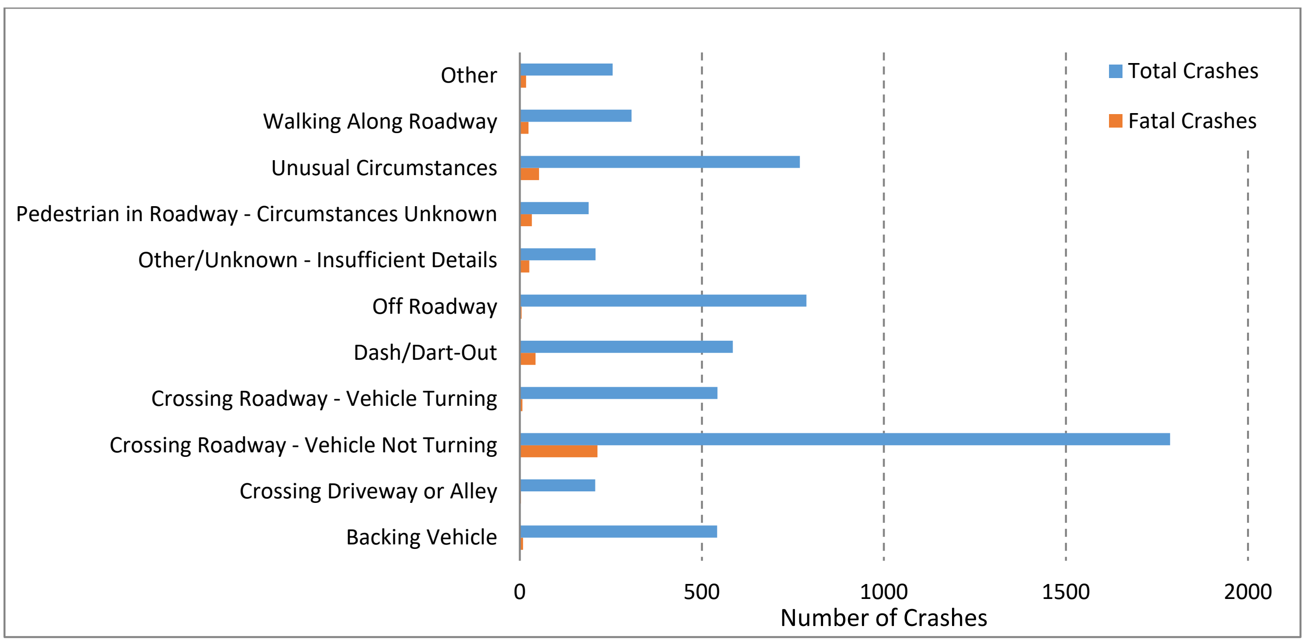


Figure 12. Prevalent Pedestrian Crash Types

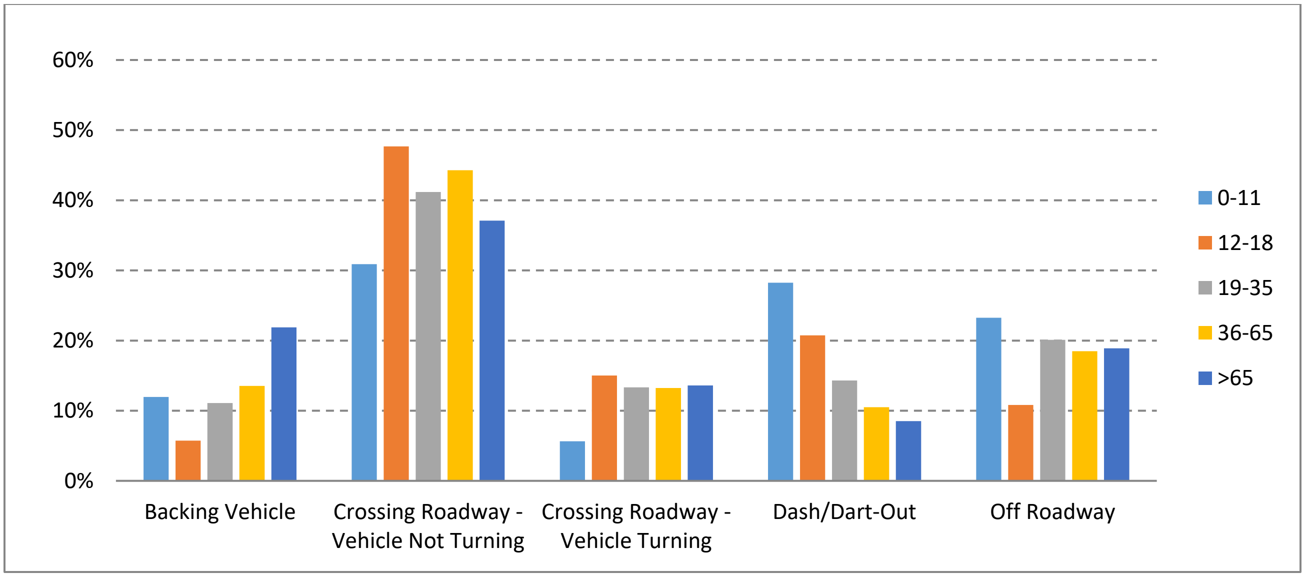


Figure 13. Crash Type Proportions by Age Group for Top Five Crash Types

Among the Crossing-Roadway Non-Turning crashes, the crash is further identified as either motorist or pedestrian failed to yield. These crashes can occur at either intersection (36 percent) or non-intersection (64 percent) locations, and the distribution by fault and location is provided in **Figure 14**. The party identified as failing to yield varies depending on the location. At intersections, where marked or unmarked crosswalks are more prevalent, the motorist is noted as failing to yield in 65 percent of the crashes (35 percent pedestrian failed to yield). However, at non-intersection locations the motorist is noted as failing to yield in 29 percent of the crashes (71 percent pedestrian failed to yield).

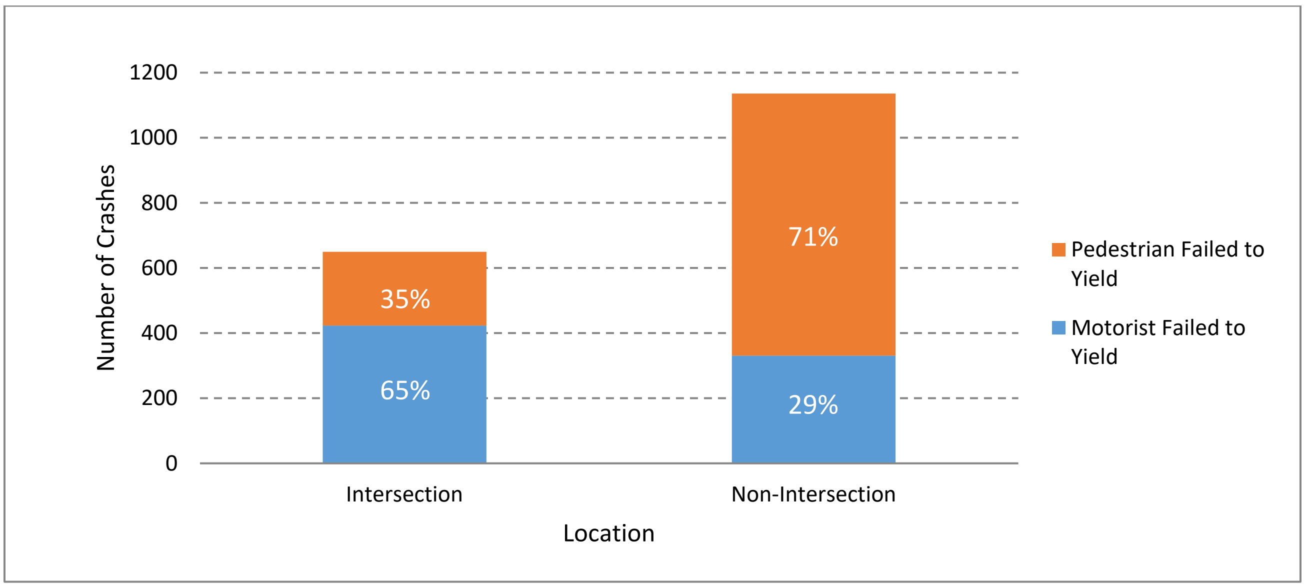


Figure 14. Non-Turning Roadway Crossing Crashes by Fault

The location of the crash can be generalized into one of three broad categories for the purposes of crash causes and countermeasures: (1) at an intersection, (2) at a non-intersection, or (3) at a non-roadway location. While there are a substantial number of non-roadway crashes (1,439 crashes, 23 percent), they are primarily parking lot crashes (68 percent) and less likely to be fatal (17 fatal crashes, four percent of all fatal pedestrian crashes). The primary crash type for these non-roadway crashes are Backing Vehicles, accounting for 469 crashes (33 percent of non-roadway crashes and 38 percent of parking lot crashes).

Intersection Pedestrian Crashes

The total number of intersection crashes is similar to the non-roadway crashes (1,446 crashes, 23 percent). The most common intersection crash types are all associated with roadway crossings (Crossing Roadway – Vehicle Not Turning, Crossing Roadway – Vehicle Turning, and Dash/Dart-Out). The complete distribution of intersection crash types is provided in **Figure 15**. Fatal crashes are more frequent when the vehicle is traveling at higher speeds (Crossing Roadway – Vehicle Not Turning, 63 fatal crashes) rather than turning (five fatal crashes). Among the Crossing Roadway – Vehicle Turning crashes, a motorist left turn with the pedestrian traveling on a parallel path is the most frequent. The complete distribution of pedestrian-vehicle interactions for the Crossing Roadway – Vehicle Turning crashes is provided in **Figure 16**. Motorist left-turning crashes are more frequent than right turning crashes (252 compared to 185), and crashes with motorists and pedestrians travelling on parallel paths are more frequent than when traveling on perpendicular paths (314 compated to 123).

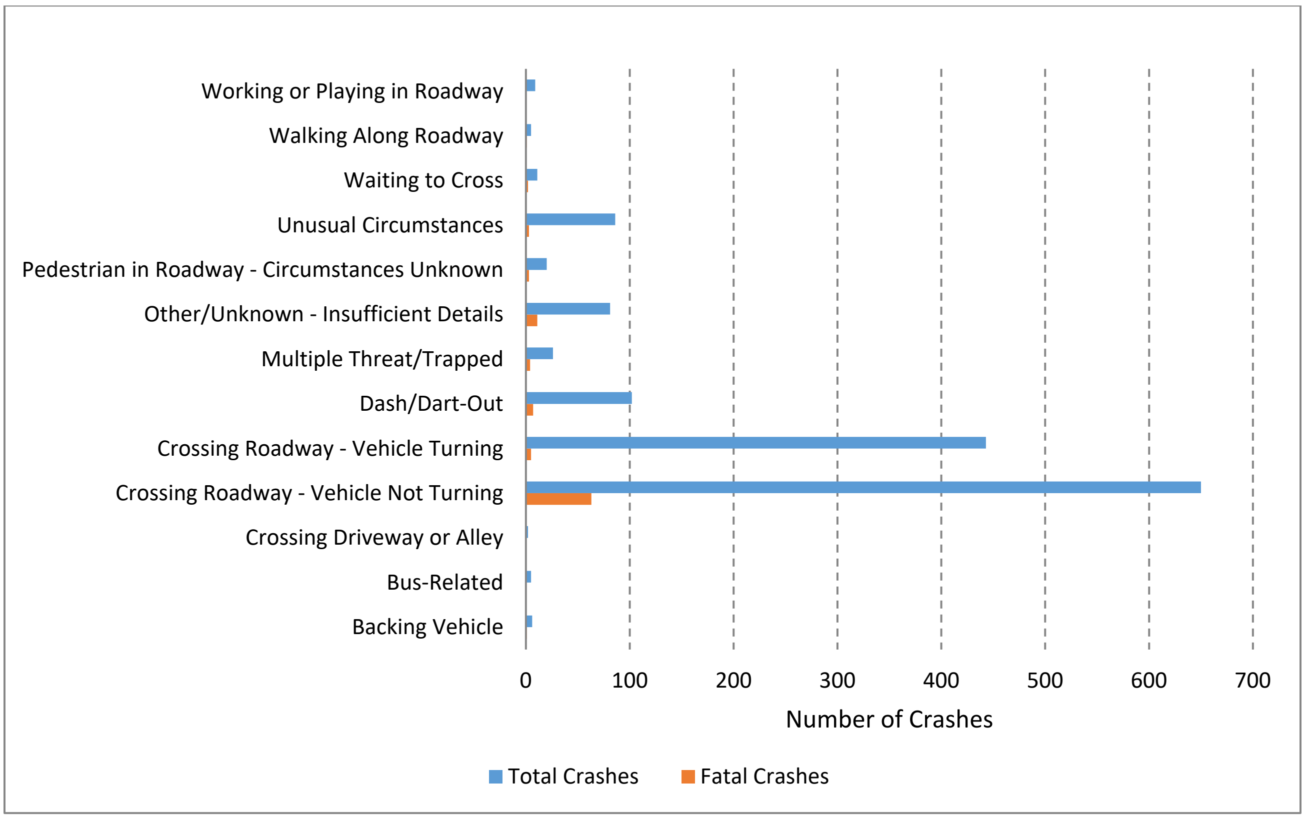


Figure 15. Crash Types at Intersections

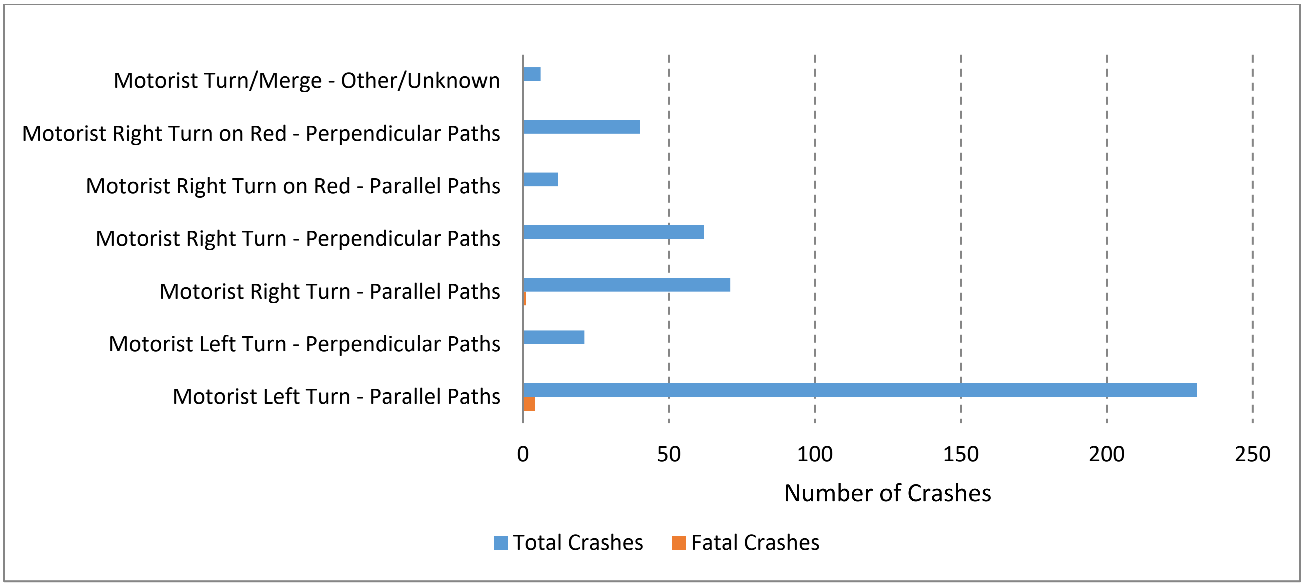


Figure 16. Actions in Crossing Roadway - Vehicle Turning Crashes

Non-Intersection Pedestrian Crashes

Non-intersection locations (mid-block more than 50 feet away from an intersection) are the most common place for a pedestrian crash to occur, totalling 3,204 crashes (52 percent) and 316 fatal crashes (73 percent). Similar to intersection crashes, the most common crash types are associated with pedestrian crossings (Crossing Roadway – Vehicle Not Turning and Dash/Dart-Out) and with roadside crashes (Walking Along Roadway and Crossing Driveway or Alley). The complete distribution of crash types at non-intersection locations is provided in **Figure 17**.

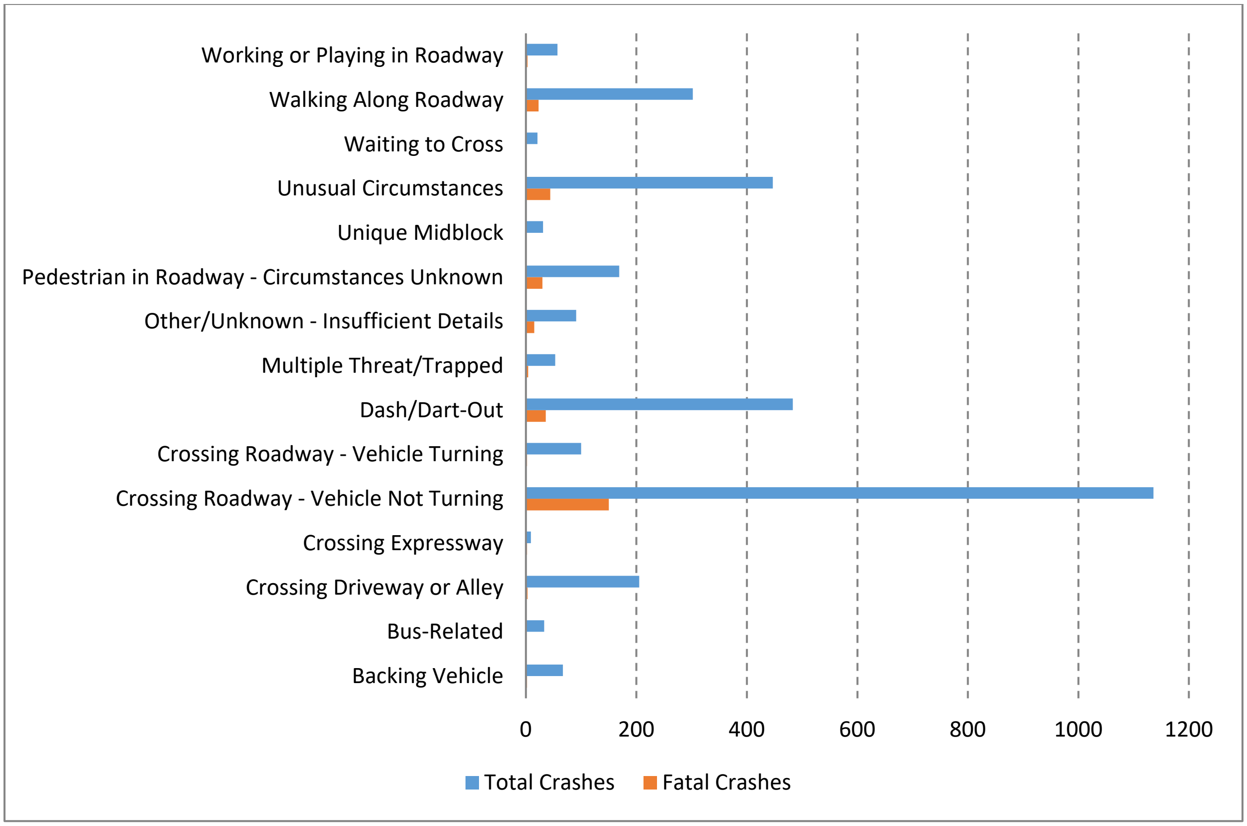


Figure 17. Crash Types at Non-Intersection Locations

Among the most prevalent crossing crashes (Crossing Roadway – Vehicle Not Turning and Dash/Dart-Out) occuring at non-intersection locations, 43 percent occurred during daylight conditions compared to 55 percent of all pedestrian crashes that occurred during daylight conditions. Lighting conditions or time-of-day also impacted the party more likely to be identified as failing to yield in the Crossing Roadway – Vehicle Not Turning crashes. During daylight conditions, the pedestrian was identified as failing to yield in 64 percent of crashes; however, during non-daylight conditions the pedestrian was identified as failing to yield in 76 percent of crashes.

The third most frequent non-intersection crash type was Unusual Circumstances, which can include events such as disabled vehicles, police pursuits, intentional crashes, and anything else determined to be unusual. Due to the unusual and varying nature of these crashes, further analysis of these crash characteristics did not yield any notable results. The fourth and fifth most frequent non-intersection crash types were Walking Along the Roadway and Crossing a Driveway or Alley, both crash types that are associated with roadside crashes. Walking Along the Roadway crashes were more frequent during non-daylight conditions (66 percent) and more frequently occurred with a pedestrian traveling with traffic than against traffic (77 percent compared to 22 percent). Driveway or Alley Crossing crashes occurred primarily during daylight conditions (67 percent) and more frequently involved the motorist exiting the driveway or alley than entering (80 percent exiting, 20 percent entering).

Alcohol and/or Drug Related Pedestrian Crashes

Alcohol and/or drug related crashes are identified by two different methods in the crash data; through a police reported indicator for alcohol and/or drug involvement and/or through results of alcohol or drug testing. Police reporting showed approximately seven percent of pedestrian crashes were alcohol or drug related (5.4 percent alcohol), while testing results indicated approximately three percent of pedestrian crashes were alcohol or drug involved, with 84 percent of those positive tests performed on the pedestrian instead of the motorist. These reported results are likely lower than the true values due to missing testing or alcohol involvement data in the event of hit-and-run crashes. Hit-and-run crashes accounted for 23 percent of all pedestrian crashes.

Driver Distraction

Driver distraction is a cause that is often thought to be associated with crashes; however, it is difficult to track due to low reporting rates on the crash reports. Driver distraction is typically only noted on the crash report form if it is directly observed by the reporting officer or admitted to by the offending driver. There were 709 pedestrian crashes (11 percent) identified with a distracted driver. There are no discernable trends related to distraction by phone or electronic device usage, as 76 percent of the distracted driving crashes are identified as driver inattentiveness, with no further details provided as to the cause of the distraction.

Play Vehicles

Play vehicles such as scooters or skateboards are included as pedestrian crashes in the dataset, although the distinct actions of the pedestrian (such as crossing the roadway or playing in the roadway) are unknown. There were 107 crashes (two percent) identified with a play vehicle over the course of the seven-year study period, including one fatal crash. The trend of play vehicle crashes per year is displayed in **Figure 18**. While the number of crashes in each year is relatively low, leading random yearly fluctuations to potentially obscure any conclusions into yearly trends, the increasing number of observed play vehicle crashes in 2016 and 2017 may indicate an increasing crash trend in recent years. Due to the scooter or skateboard use that defines play vehicle crashes, these crashes tend to trend towards younger pedestrians. The age group distribution for pedestrians involved in these crashes is given in **Figure 19**. When viewing the annual trends of crashes within these age groups, displayed in **Figure 20**, it is evident that the recent increase in play vehicle crashes in 2016 and 2017 is a result of increasing crashes primarily in the 12-18 year-old and 19-25 year-old age groups.

Play vehicle crashes primarily occurred at non-intersection locations (65 crashes, 61 percent of all play vehicle crashes) and intersection locations (37 crashes, 35 percent of all play vehicle crashes), rather than non-roadway locations. Play vehicle crashes were also more common during daylight conditions (72 crashes, 67 percent of all play vehicle crashes), greater than the 55 percent of all pedestrian crashes observed during daylight conditions. While only 33 percent of all play vehicle crashes occurred during non-daylight conditions, the 19-25 year-old and 36-49 year-old age groups were particularly susceptible to non-daylight crashes. These age groups experienced 57 percent and 56 percent, respectively, of play vehicle crashes occurring in non-daylight conditions.

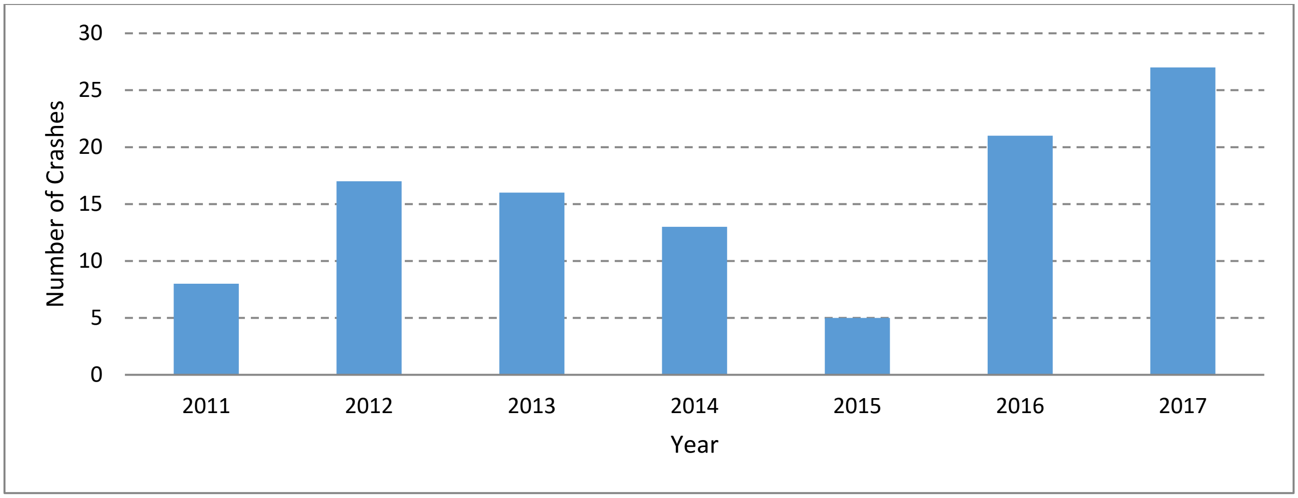


Figure 18. Play Vehicle Crashes by Year

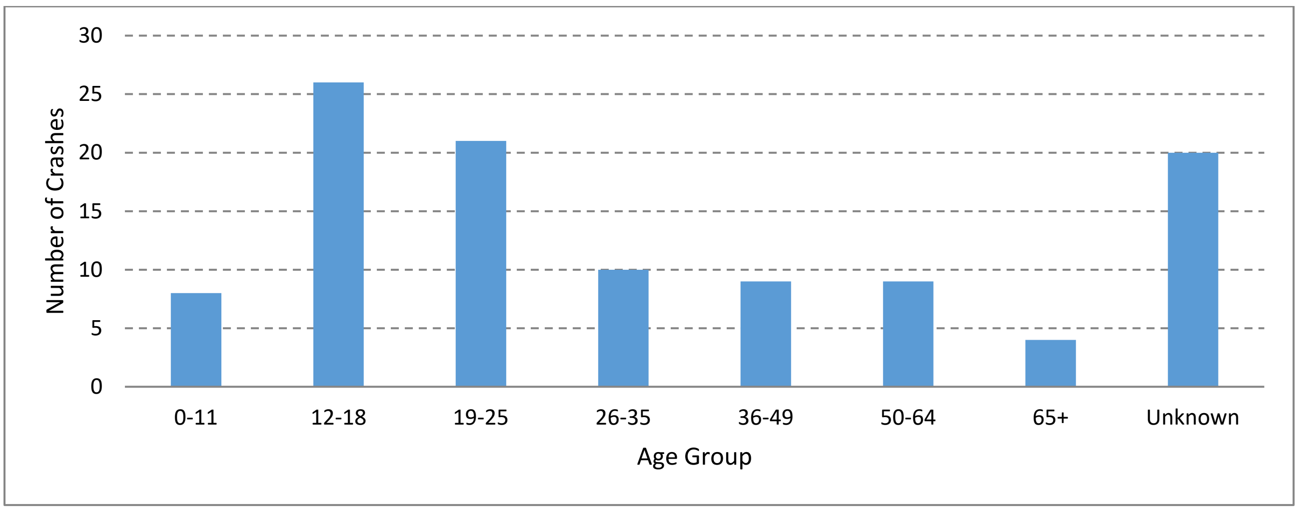


Figure 19. Age Distribution of Play Vehicle Crashes

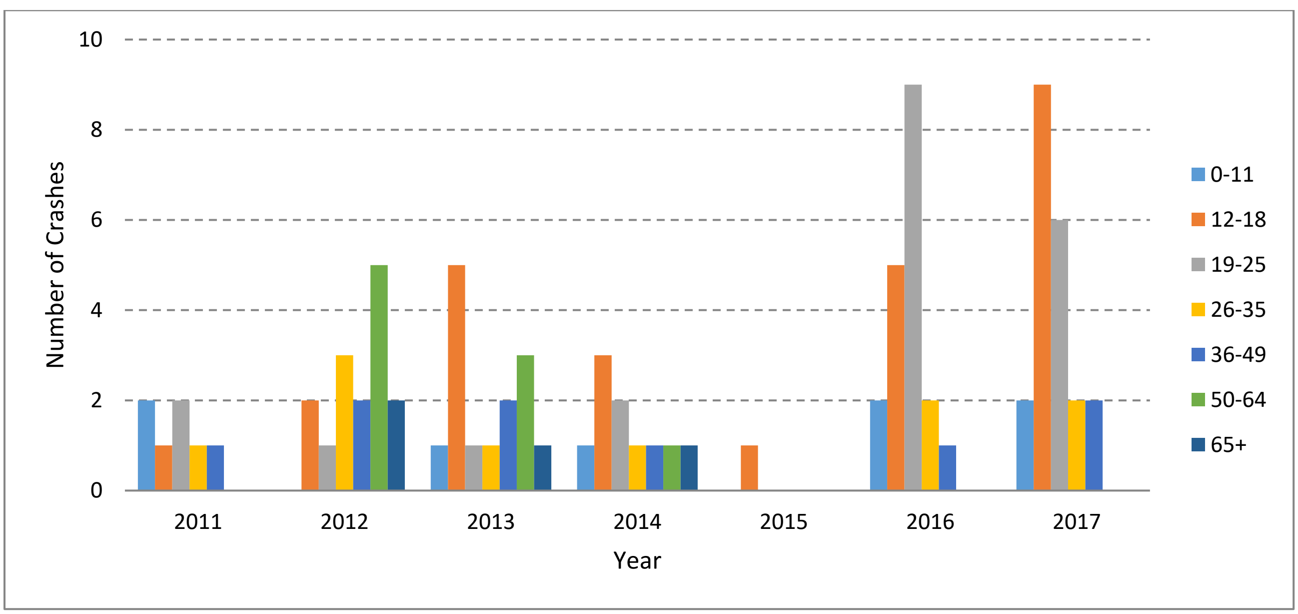


Figure 20. Play Vehicle Crashes by Age Group and Year

6.0 Safety Field Reviews

Safety field reviews were performed on nine corridors throughout the Orlando metropolitan area; three in Osceola County, three in Orange County, and three in Seminole County. These safety field reviews were not formal Road Safety Audits (RSAs) and included representatives from the Study Team and Working Group. These field reviews were performed during both day and night conditions to document different operating conditions for each of the study corridors. The safety field review teams walked and drove each of the study corridors to gain an all user perspective.

To identify the nine corridors for study, a sliding window analysis, which analyzes segments based on historical crash frequency and severity, was performed. This section will review the sliding window analysis process, the selection process for choosing safety field review corridors, and the key findings from the safety field reviews.

Sliding Window Analysis

Using GIS software, the sliding window analysis reviewed crash frequencies and severities along half-mile windows that were moved in increments of one-quarter mile, creating 7,532 unique half mile windows for analysis across the three counties (1,712 in Osceola, 4,399 in Orange, and 1,421 in Seminole). **Figure 21** displays a graphic illustrating the sliding window analysis. In the case of **Figure 21**, the first half mile window has one crash. When the half mile window is moved by one-quarter mile, the new half mile window has two crashes.

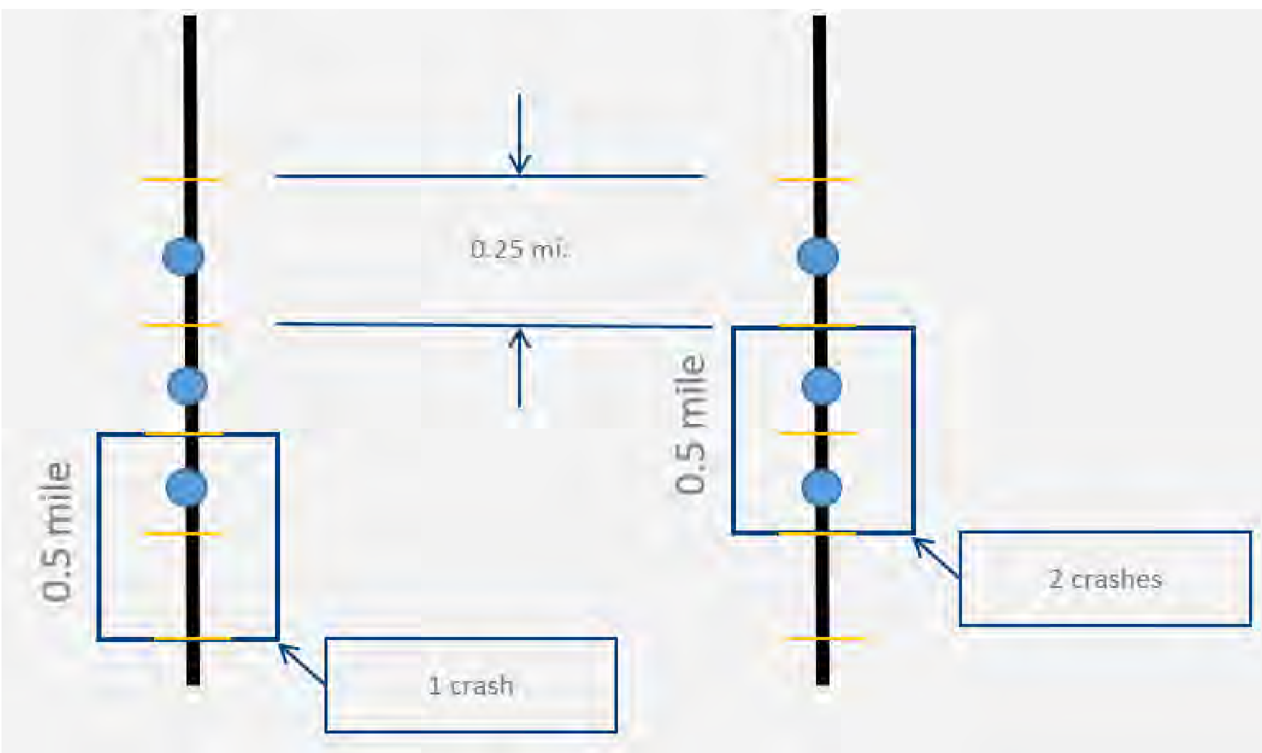


Figure 21. Sliding Window Analysis

The 11,300 pedestrian/bicycle crashes, along with their injury severity, were assigned across the 7,532 half mile windows. Two lists were generated from this analysis:

1. Ranking the 7,532 one-half mile segments by total crash frequency; and
2. Ranking the 7,532 one-half mile segments by a crash severity score, which was calculated based on the Highway Safety Manual's Equivalent Property Damage Only (EPDO) Average Crash Frequency method. This method considers the FDOT crash costs for property damage, injury, and fatal crashes and applies a weighting factor based on the ratio between those different crash costs. Locations with a higher crash severity score have experienced more severe crashes, based on the FDOT typical crash costs. **Table 4** provides the weighting factors for the severity score. **Table 5** provides an example between two locations of how the severity score is calculated.

Table 4. Weighting Factors for Crash Severity Score

Severity	Crash Cost[1]	Ratio	Weighting Factor
Fatal	$10,560,000	$10,560,000 / $7,600	1,389
Incapacitating Injury	$599,040	$599,040 / $7,600	79
Non-Incapacitating Injury	$162,240	$162,240 / $7,600	21
Possible Injury	$100,800	$100,800 / $7,600	13
PDO	$7,600	$7,600 / $7,600	1

Table 5. Crash Severity Score Example

Crash Severity	Location A			Location B		
	Crashes	Weighting Factor	Severity Score	Crashes	Weighting Factor	Severity Score
Fatal	2	1,389	2,778	5	1,389	6,945
Incapacitating Injury	4	79	316	8	79	632
Non-Incapacitating Injury	19	21	399	22	21	462
Possible Injury	25	13	325	26	13	338
PDO	49	1	49	38	1	38
Total	**99**		**3,867**	**99**		**8,415**

The 7,532 one-half mile segments were paired down to the top 50 crash frequency and crash severity segments in each county. If the 50th segment had the same crash frequency or severity score as segments beyond number 50, these segments were also included in the review. For example, if the 50th segment in

[1] January 2016 FDOT Plans Preparation Manual, Volume 1, Chapter 23, Section 5.y.1

the crash frequency review had seven crashes, but so did segments 51 through 60, then the top 60 segments were reviewed in this analysis.

Each top 50 segment for crash frequency and severity was then individually mapped and reviewed by hand and overlapping segments were noted. Starting from the segments with the highest crash frequency or severity, potential one-mile study corridors were created based on these overlapping segments as discussed in the next section. **Appendix D** displays the top 50 crash frequency and severity segments for each of the three counties: Osceola, Orange, and Seminole.

Selection of Safety Field Review Corridors

In reviewing the top 50 crash frequency and top 50 crash severity maps, overlapping roadways were identified that had both a high number of crashes and crashes resulting in more serious injuries or fatalities. Based on review of previous studies and local knowledge of the three County area, some roadways were removed from consideration for the safety field reviews. Ultimately five corridors were selected from each County as potential safety field review corridors:

- Osceola County –
  - Michigan Avenue from US 192 to Donegan Avenue in Kissimmee
  - US 192 from Siesta Lago Drive to Old Vineland Road in Kissimmee
  - Michigan Avenue from Michigan Avenue Elementary School to 8th Street in St. Cloud
  - Carroll Street from John Young Parkway to US 17-92 in Kissimmee
  - Oak Street from John Young Parkway to Lawrence Silas Boulevard in Kissimmee
- Orange County –
  - Orange Blossom Trail from Holden Avenue to I-4 in Orlando
  - Orange Blossom Trail from Doss Avenue to Americana Boulevard in Orlando
  - John Young Parkway from Presidents Drive to ~2,000 North of Oak Ridge Road in Orlando
  - Silver Star Road from Golf Club Parkway to Princeton Street in Orlando
  - SR 50 from Paul Street to Mission Road in Orlando
- Seminole County –
  - Oxford Road from Carolton Road to SR 436 in Casselberry
  - Red Bug Lake Road from Dodd Road to Tuskawilla Road and Tuskawilla Road from Willa Springs Drive to Red Bug Lake Road in Winter Springs
  - Lake Mary Boulevard from Rinehart Road to North 7th Street in Lake Mary
  - SR 434 from McCulloch Road to Remington Drive in Oviedo
  - SR 46 from Monroe Road to Martin Luther King Jr. Boulevard in Sanford

Through discussions with Working Group representatives from the various local jurisdictions, the following corridors were selected in Osceola and Seminole Counties:

- Osceola County –
  - Michigan Avenue from US 192 to Donegan Avenue in Kissimmee
  - US 192 from Siesta Lago Drive to Old Vineland Road in Kissimmee
  - Michigan Avenue from Michigan Avenue Elementary School to 8th Street in St. Cloud
- Seminole County –
  - Red Bug Lake Road from Dodd Road to Tuskawilla Road and Tuskawilla Road from Willa Springs Drive to Red Bug Lake Road in Winter Springs
  - Lake Mary Boulevard from Rinehart Road to North 7th Street in Lake Mary
  - SR 434 from McCulloch Road to Remington Drive in Oviedo

In discussions with Orange County representatives, it was determined to perform safety field reviews on corridors where upcoming construction projects were occurring. The hope is recommendations identified from the safety field reviews may potentially be incorporated into those future projects. The list of Orange County safety field review corridors is as follows:

- Pershing Avenue from Dixie Bell Drive to Goldenrod Road in Orlando
- Michigan Street from the Railroad Crossing to Mills Avenue in Orlando
- Washington Street from John Young Parkway to Orange Blossom Trail in Orlando

A map showing the nine selected safety field review corridors is shown in **Figure 22**.

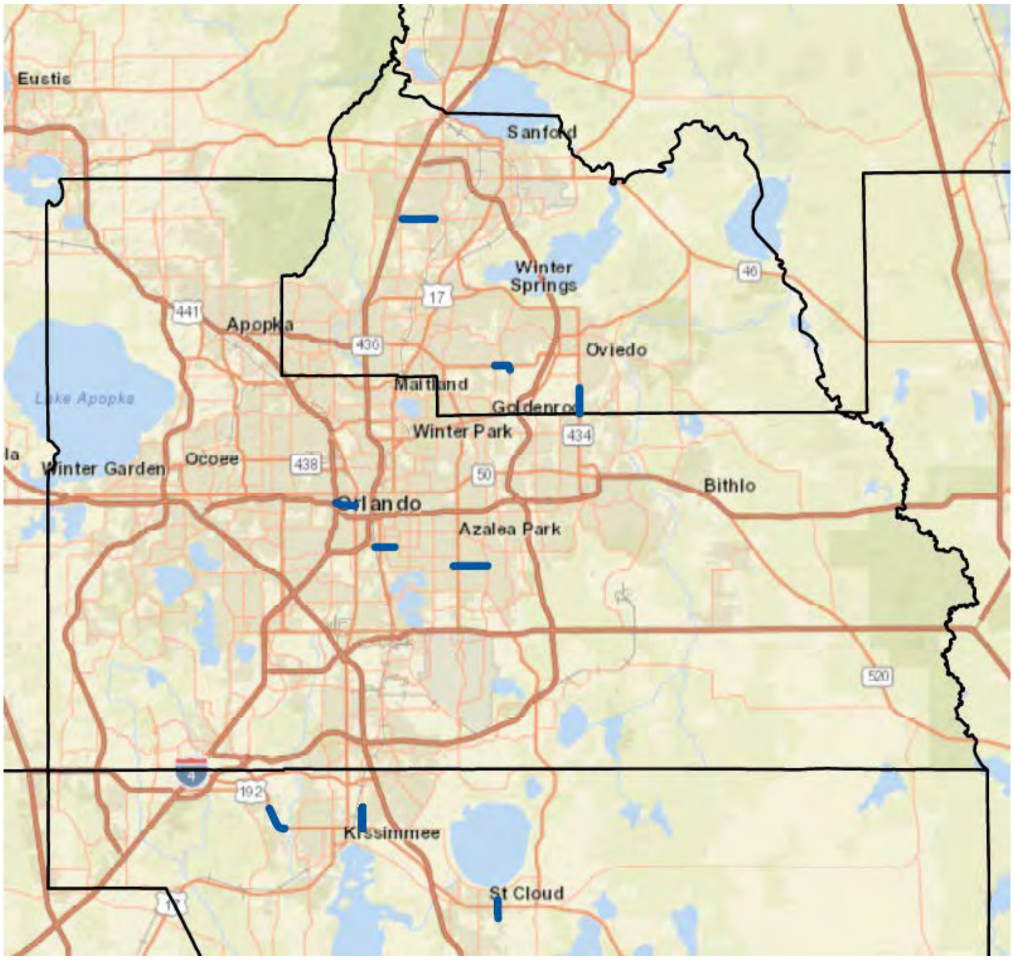


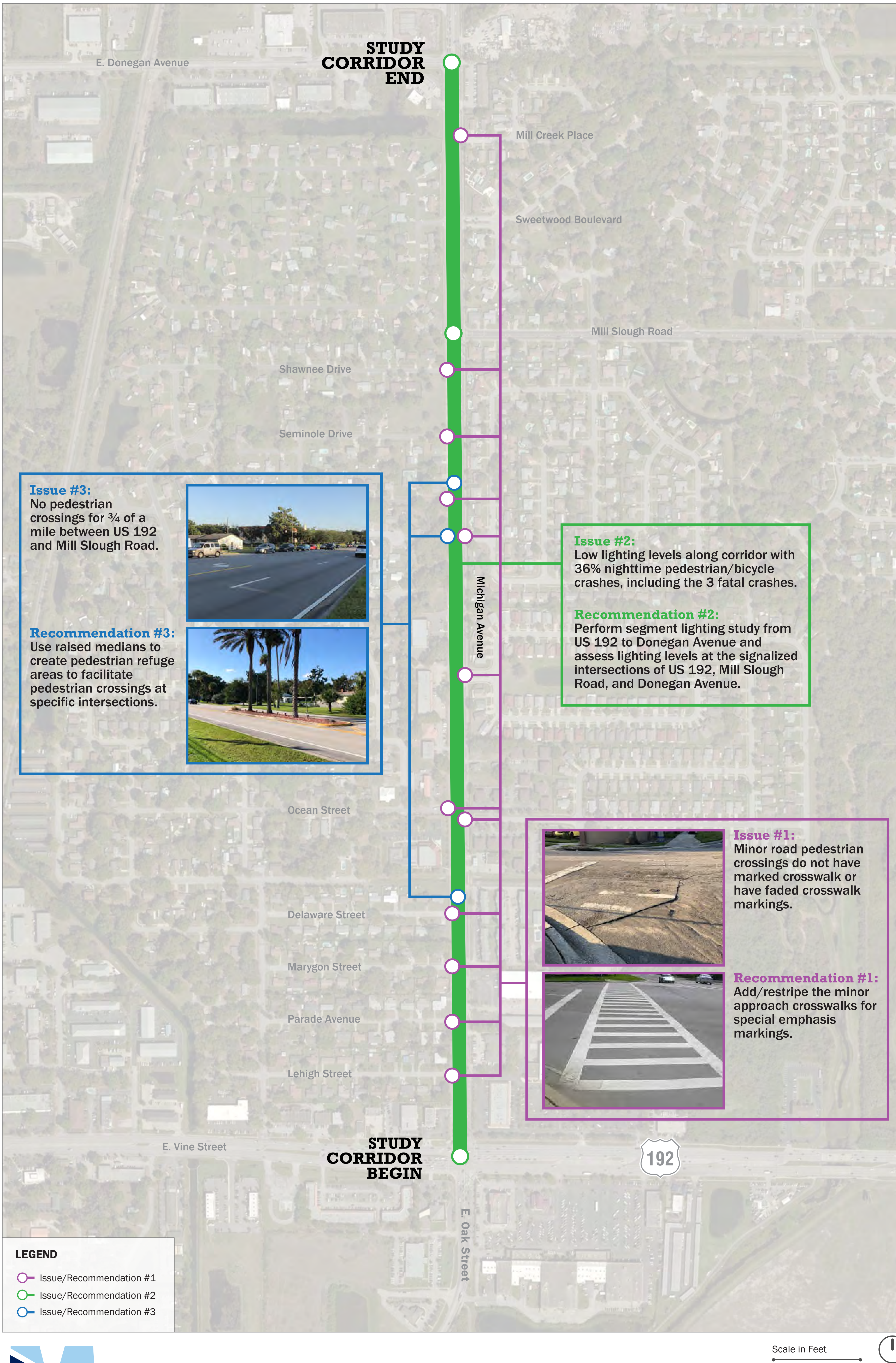
Figure 22. Safety Field Review Corridor Locations

For each safety field review corridor, crash data was summarized, and crash maps were created to help aid the field review team during the review. The summary packages for each corridor can be found in **Appendix E**.

Safety Field Review Recommendations

Once the safety field reviews were completed, each of the field review teams compiled recommendations based on the observed issues along each of the corridors. **Figure 23** through **Figure 28** display the recommendations maps for the three Osceola County corridors. **Figure 29** through **Figure 34** display the recommendations maps for the three Orange County corridors. **Figure 35** through **Figure 40** display the recommendations maps for the three Seminole County corridors.

Note that right-of-way (ROW) was not explicitly reviewed for the recommendations thus further ROW review may be needed for some of the recommendations prior to implementation.



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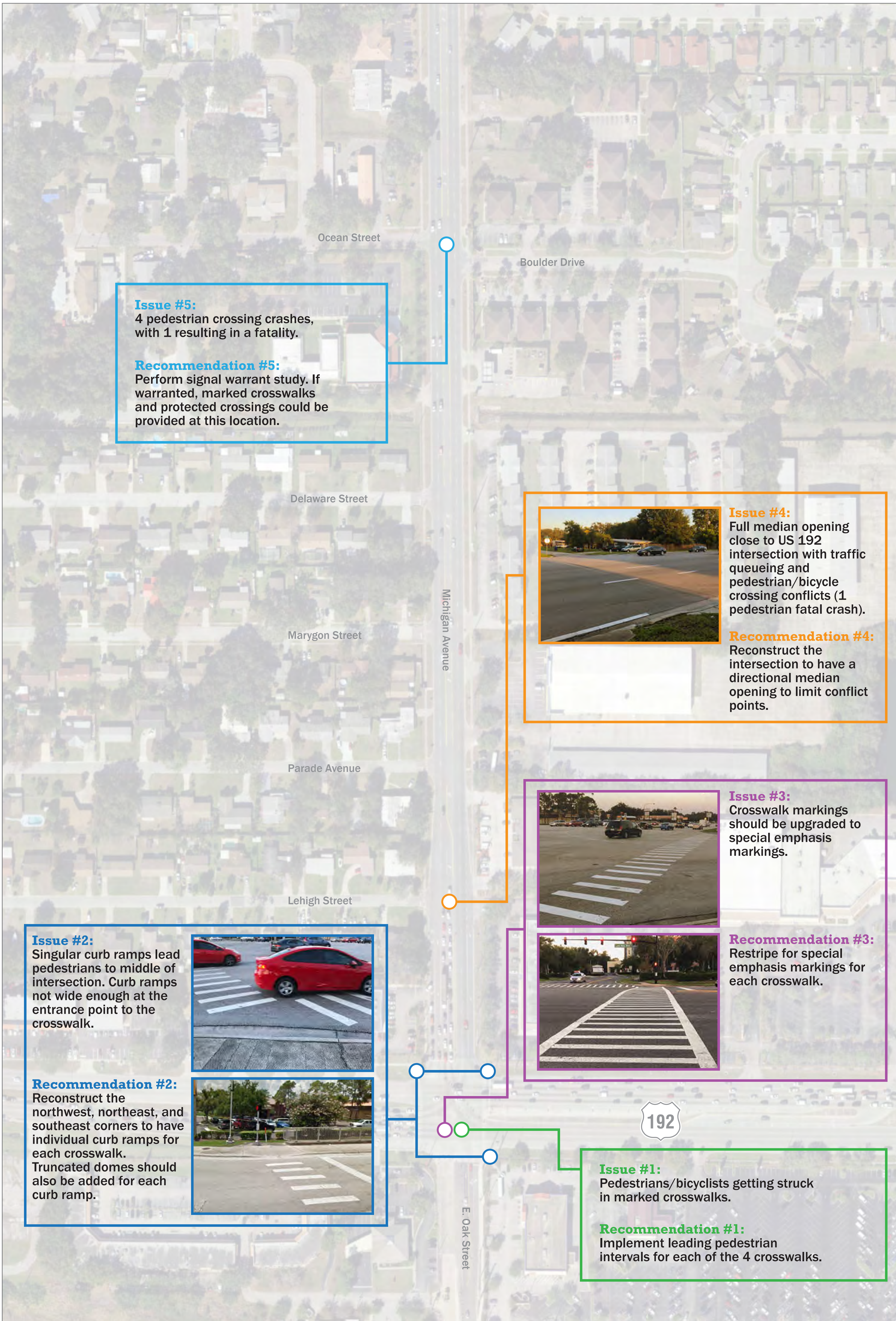
Pedestrian/Bicyclist Safety Action Plan
Corridor-Wide Map

FIGURE 23
Michigan Avenue (Kissimmee) Issues and Recommendations



Scale in Feet
0 200
North

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Pedestrian/Bicyclist Safety Action Plan
Location Specific Map #1 - US 192 to Mill Creek Place

FIGURE 24 (1 of 3)
Michigan Avenue (Kissimmee) Issues and Recommendations

Issue #15:
Pedestrians/bicyclists getting struck in west leg marked crosswalk.

Recommendation #15:
Install a "Yield Here to Pedestrians" (MUTCD R1-5 or R1-5a) or "Yield to Pedestrians in Crosswalk" sign on the west leg.

Issue #14:
No crosswalk on the north leg.

Recommendation #14:
Add special emphasis crosswalk with curb ramps and truncated domes on north leg.

Issue #13:
Pedestrians/bicyclists getting struck in south leg marked crosswalk.

Recommendation #13:
Implement leading pedestrian intervals for the north and south leg crosswalks.

Issue #11:
Large turning radius for southwest corner can lead to westbound right turning vehicles making a higher speed right turn or not stopping at stop bar on a red light.

Recommendation #11:
Reconstruct the southwest corner to reduce the curb return radius. Individual curb ramps can also be constructed for the west and south leg crosswalks.

Issue #12:
Inaccessible pedestrian push buttons in southeast corner.

Recommendation #12:
Add concrete sidewalk in area around signal pole and connect to existing sidewalk.

Issue #10:
Crosswalk markings should be upgraded to special emphasis markings. East leg crosswalk markings are faded.

Recommendation #10:
Restripe for special emphasis markings for the west, south, and east leg crosswalks.

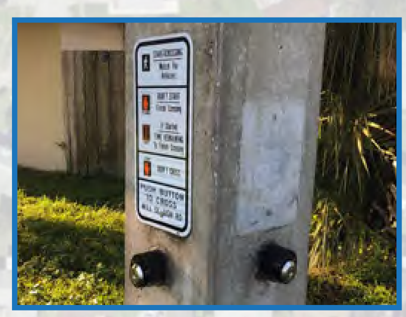
Issue #9:
Permissive northbound left turn vehicles conflict with pedestrians/bicyclists crossing west leg crosswalk.

Recommendation #9:
Implement a flashing yellow arrow signal head for the northbound left turn lane.

Michigan Avenue

Issue #8:
Missing pedestrian push button signage on southeast corner for south leg crosswalk.

Recommendation #8:
Add pedestrian push button signage.



Issue #7:
Inaccessible pedestrian push buttons in southeast and northeast corners.

Recommendation #7:
Add concrete sidewalk in area around signal pole and connect to existing sidewalk.

Mill Slough Road

Issue #6:
Curb ramps for south leg and east leg crosswalks missing truncated domes.

Recommendation #6:
Install truncated domes for the curb ramps.

Seminole Drive

Scale in Feet
0 200
North

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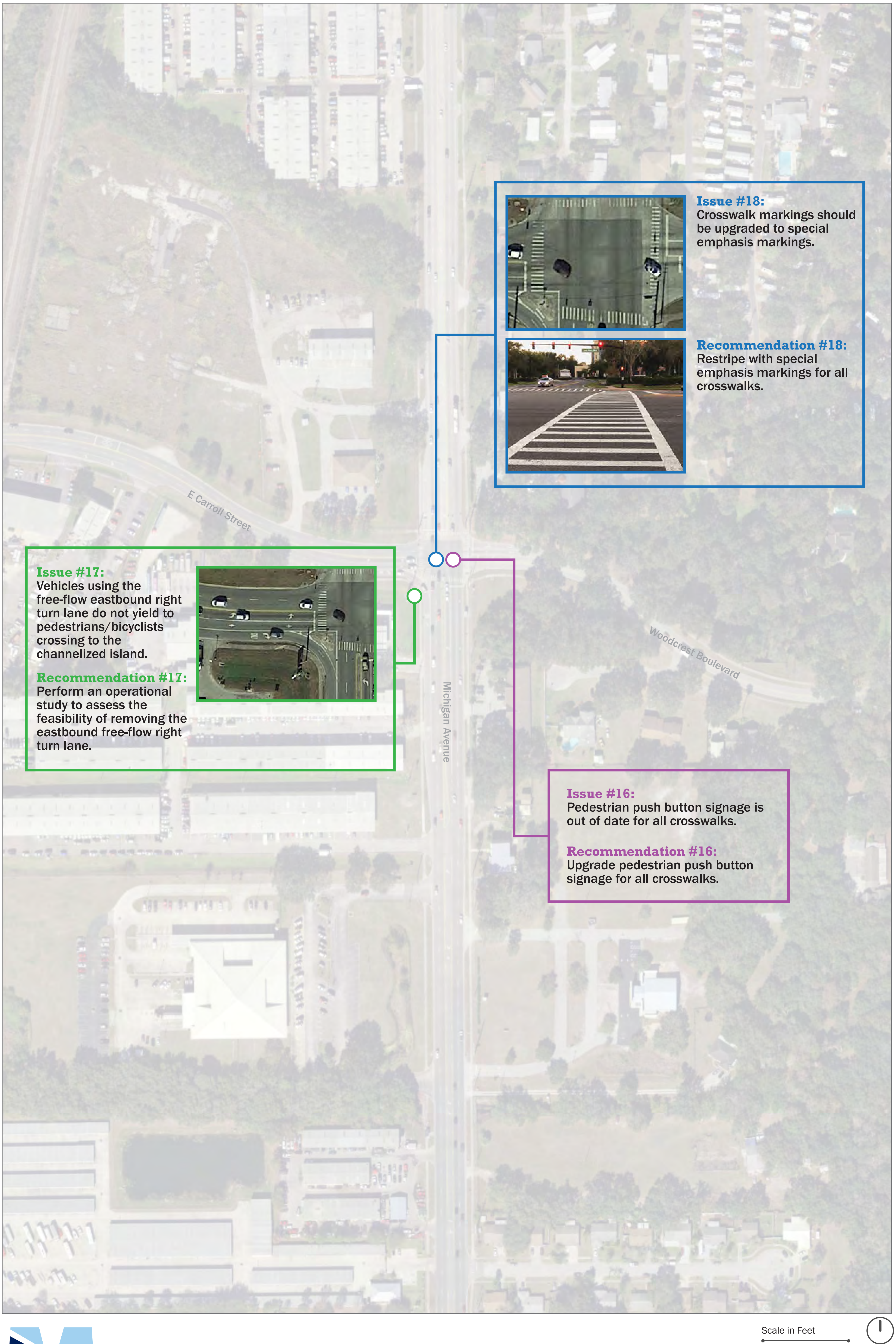
Pedestrian/Bicyclist Safety Action Plan
Location Specific Map #2 - Mill Creek Place to Donegan Avenue

FIGURE 24 (2 of 3)
Michigan Avenue (Kissimmee) Issues and Recommendations



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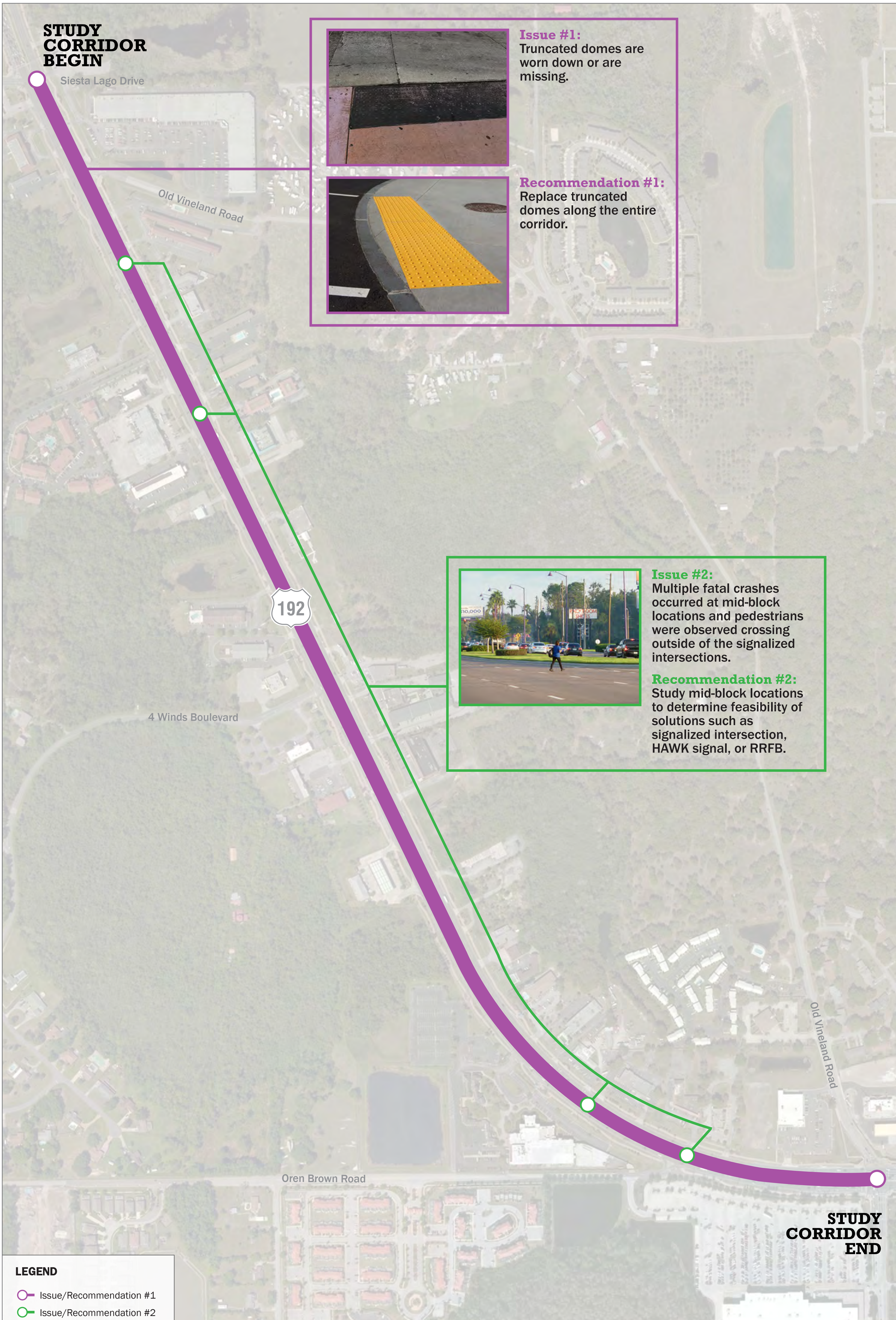
Pedestrian/Bicyclist Safety Action Plan
Location Specific Map #3 - Carroll Street

FIGURE 24 (3 of 3)
Michigan Avenue (Kissimmee) Issues and Recommendations



Scale in Feet
0 500
North

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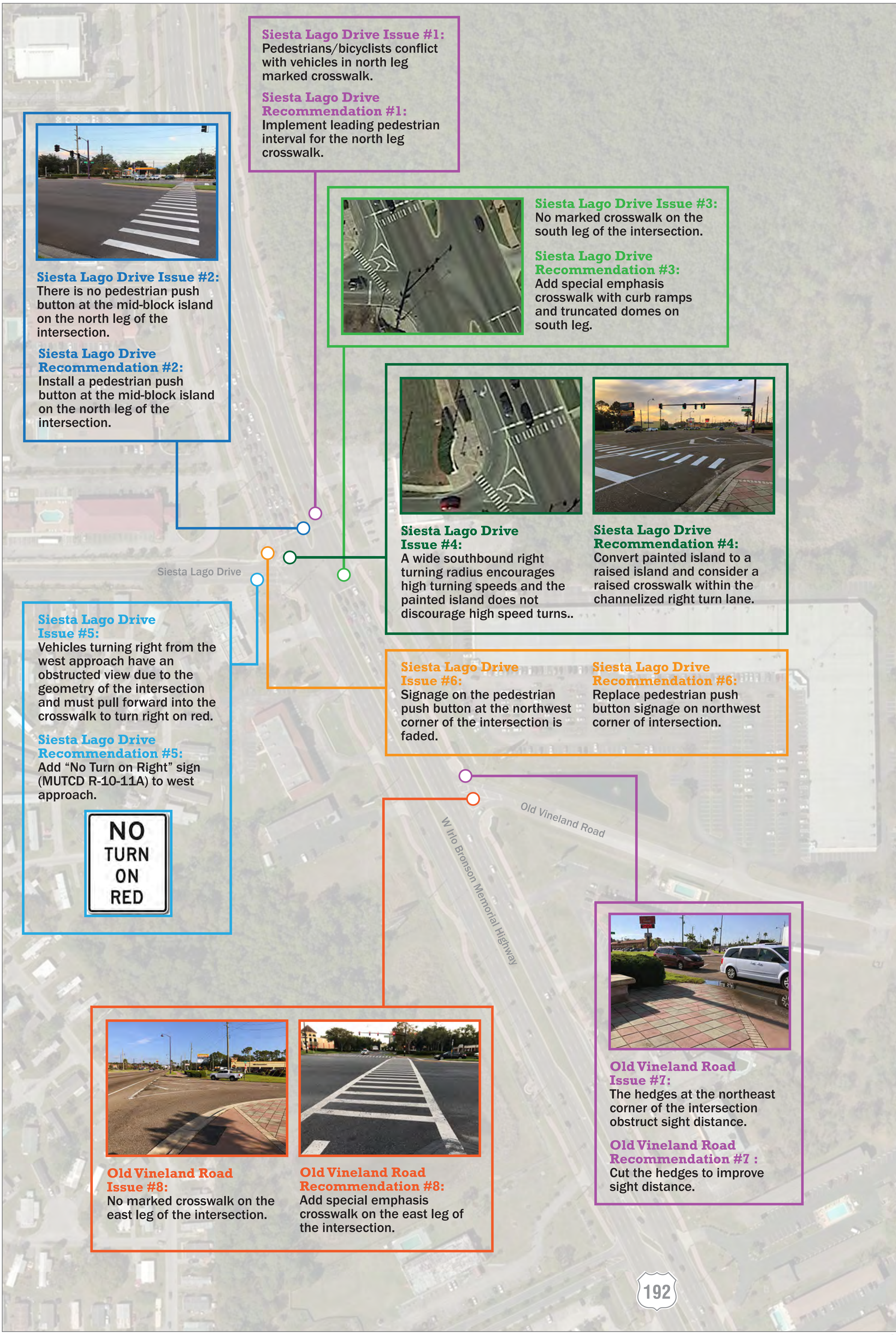
Pedestrian/Bicyclist Safety Action Plan
Corridor-Wide Map

FIGURE 25
US 192 Issues and Recommendations



Siesta Lago Drive Issue #1:
Pedestrians/bicyclists conflict with vehicles in north leg marked crosswalk.

Siesta Lago Drive Recommendation #1:
Implement leading pedestrian interval for the north leg crosswalk.

Siesta Lago Drive Issue #2:
There is no pedestrian push button at the mid-block island on the north leg of the intersection.

Siesta Lago Drive Recommendation #2:
Install a pedestrian push button at the mid-block island on the north leg of the intersection.

Siesta Lago Drive Issue #3:
No marked crosswalk on the south leg of the intersection.

Siesta Lago Drive Recommendation #3:
Add special emphasis crosswalk with curb ramps and truncated domes on south leg.

Siesta Lago Drive Issue #4:
A wide southbound right turning radius encourages high turning speeds and the painted island does not discourage high speed turns..

Siesta Lago Drive Recommendation #4:
Convert painted island to a raised island and consider a raised crosswalk within the channelized right turn lane.

Siesta Lago Drive Issue #5:
Vehicles turning right from the west approach have an obstructed view due to the geometry of the intersection and must pull forward into the crosswalk to turn right on red.

Siesta Lago Drive Recommendation #5:
Add "No Turn on Right" sign (MUTCD R-10-11A) to west approach.

Siesta Lago Drive Issue #6:
Signage on the pedestrian push button at the northwest corner of the intersection is faded.

Siesta Lago Drive Recommendation #6:
Replace pedestrian push button signage on northwest corner of intersection.

Old Vineland Road Issue #7:
The hedges at the northeast corner of the intersection obstruct sight distance.

Old Vineland Road Recommendation #7 :
Cut the hedges to improve sight distance.

Old Vineland Road Issue #8:
No marked crosswalk on the east leg of the intersection.

Old Vineland Road Recommendation #8:
Add special emphasis crosswalk on the east leg of the intersection.

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Pedestrian/Bicyclist Safety Action Plan
Location Specific Map #1 - Siesta Lago Drive to Old Vineland Road

FIGURE 26 (1 of 4)
US 192 Issues and Recommendations

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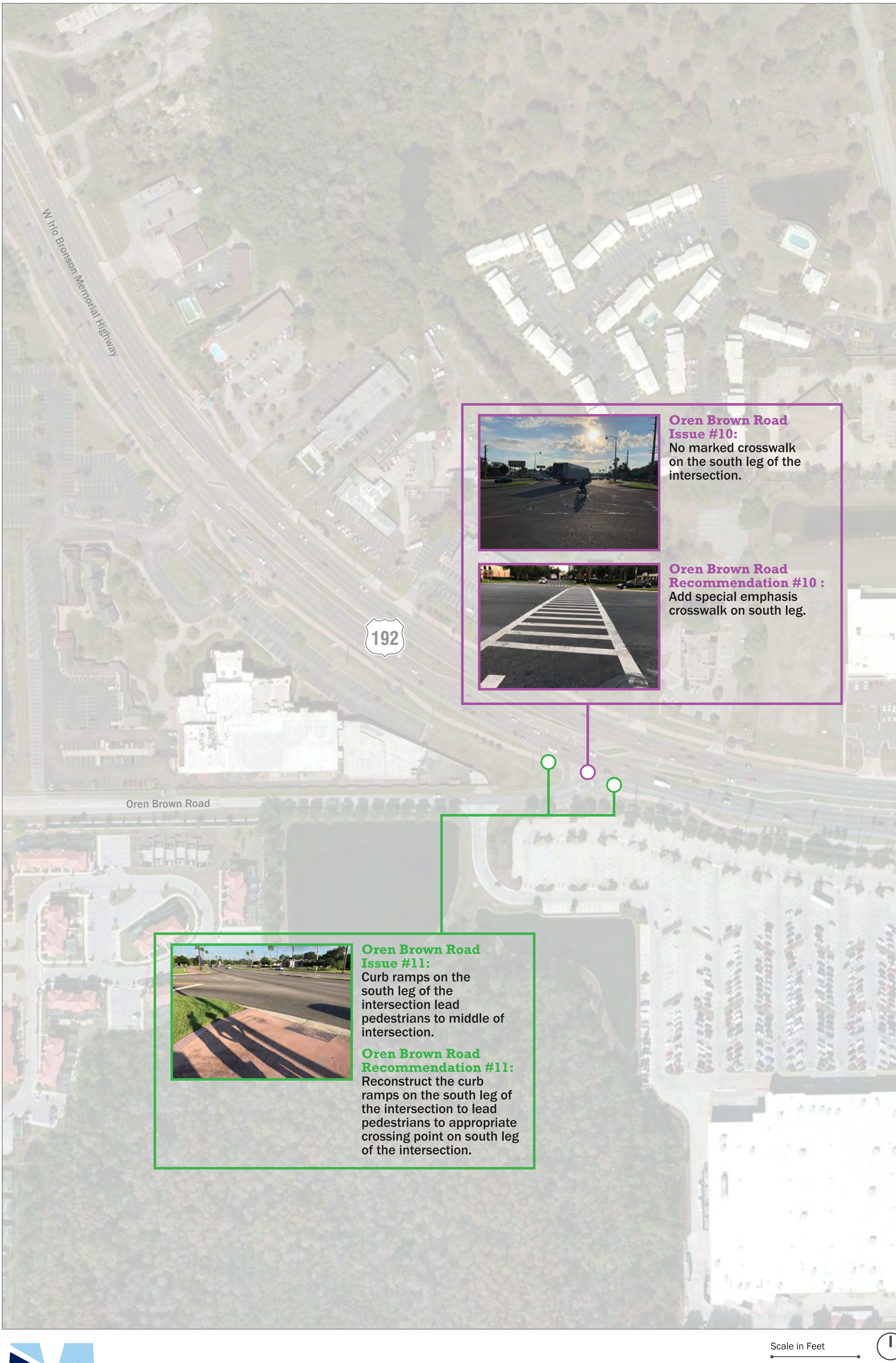
Pedestrian/Bicyclist Safety Action Plan

Location Specific Map #2 - West of Four Winds Boulevard to East of Four Winds Boulevard

FIGURE 26 (2 of 4)

US 192 Issues and Recommendations



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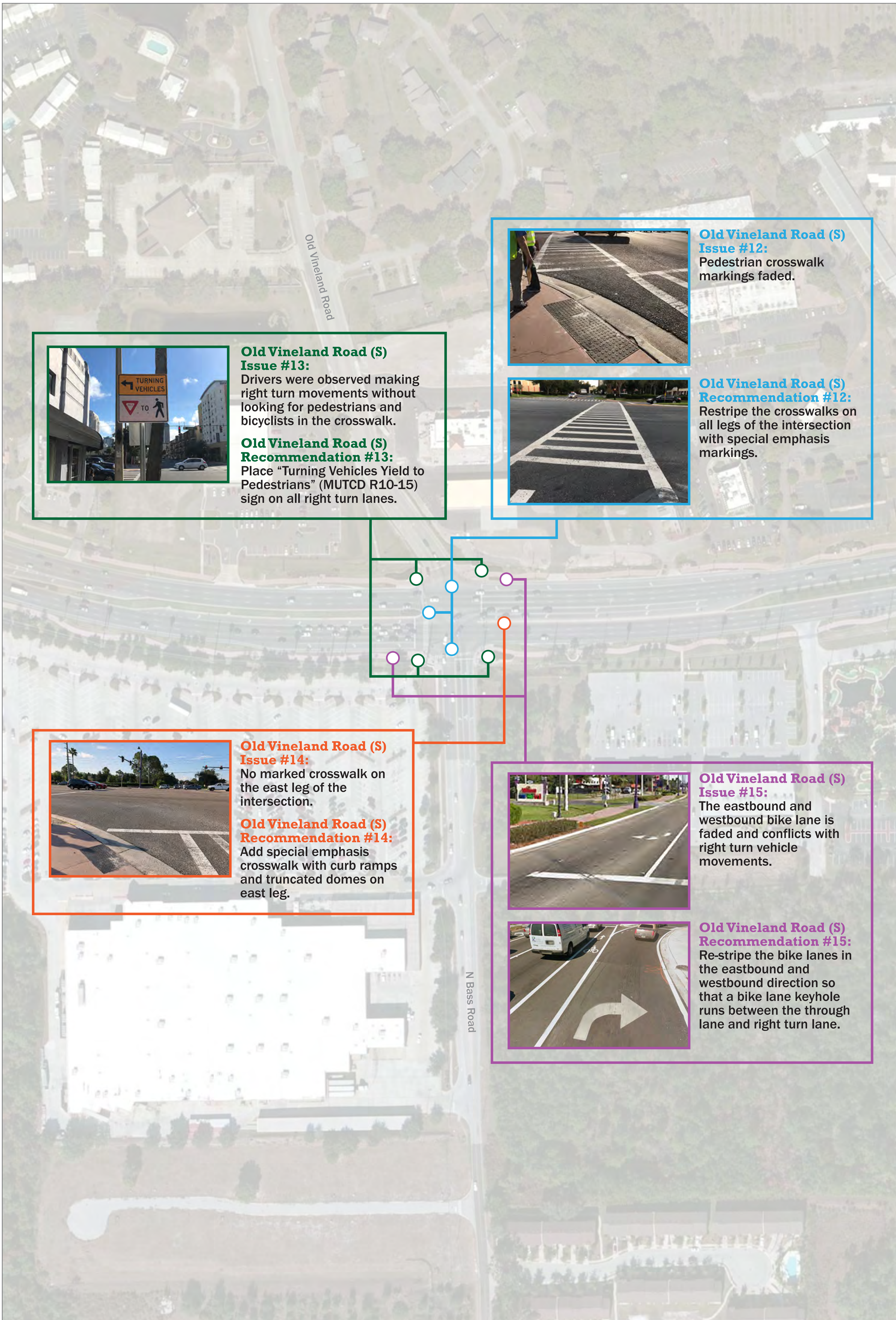
Pedestrian/Bicyclist Safety Action Plan

Location Specific Map #3 - West of Oren Brown Road to East of Oren Brown Road

FIGURE 26 (3 of 4)

US 192 Issues and Recommendations



Old Vineland Road (S)
Issue #12:
Pedestrian crosswalk markings faded.

Old Vineland Road (S)
Recommendation #12:
Restripe the crosswalks on all legs of the intersection with special emphasis markings.

Old Vineland Road (S)
Issue #13:
Drivers were observed making right turn movements without looking for pedestrians and bicyclists in the crosswalk.

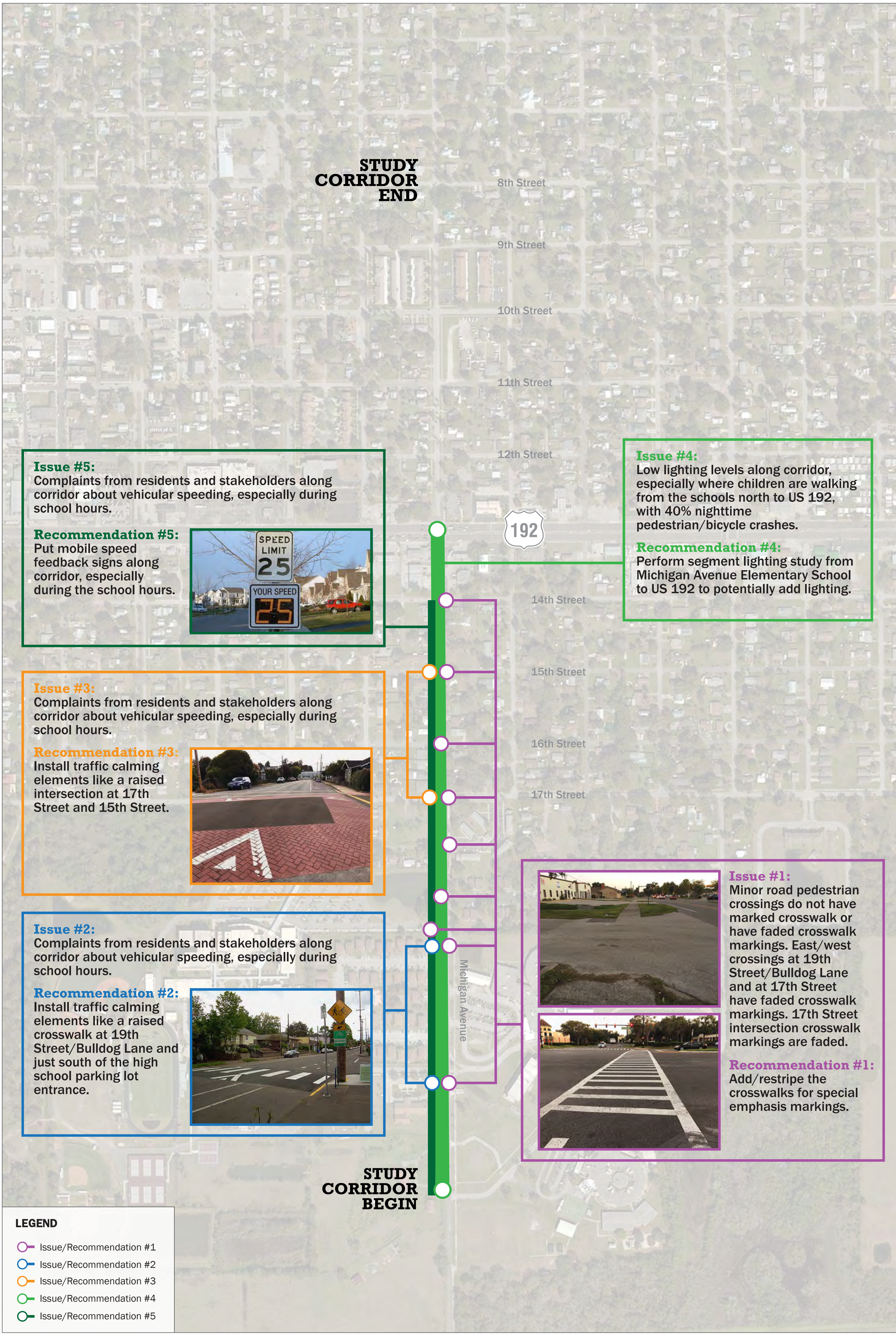
Old Vineland Road (S)
Recommendation #13:
Place "Turning Vehicles Yield to Pedestrians" (MUTCD R10-15) sign on all right turn lanes.

Old Vineland Road (S)
Issue #14:
No marked crosswalk on the east leg of the intersection.

Old Vineland Road (S)
Recommendation #14:
Add special emphasis crosswalk with curb ramps and truncated domes on east leg.

Old Vineland Road (S)
Issue #15:
The eastbound and westbound bike lane is faded and conflicts with right turn vehicle movements.

Old Vineland Road (S)
Recommendation #15:
Re-stripe the bike lanes in the eastbound and westbound direction so that a bike lane keyhole runs between the through lane and right turn lane.



Scale in Feet
0 500
North

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Pedestrian/Bicyclist Safety Action Plan

Corridor-Wide Map

FIGURE 27

Michigan Avenue (St. Cloud) Issues and Recommendations

Scale in Feet
0 200
North

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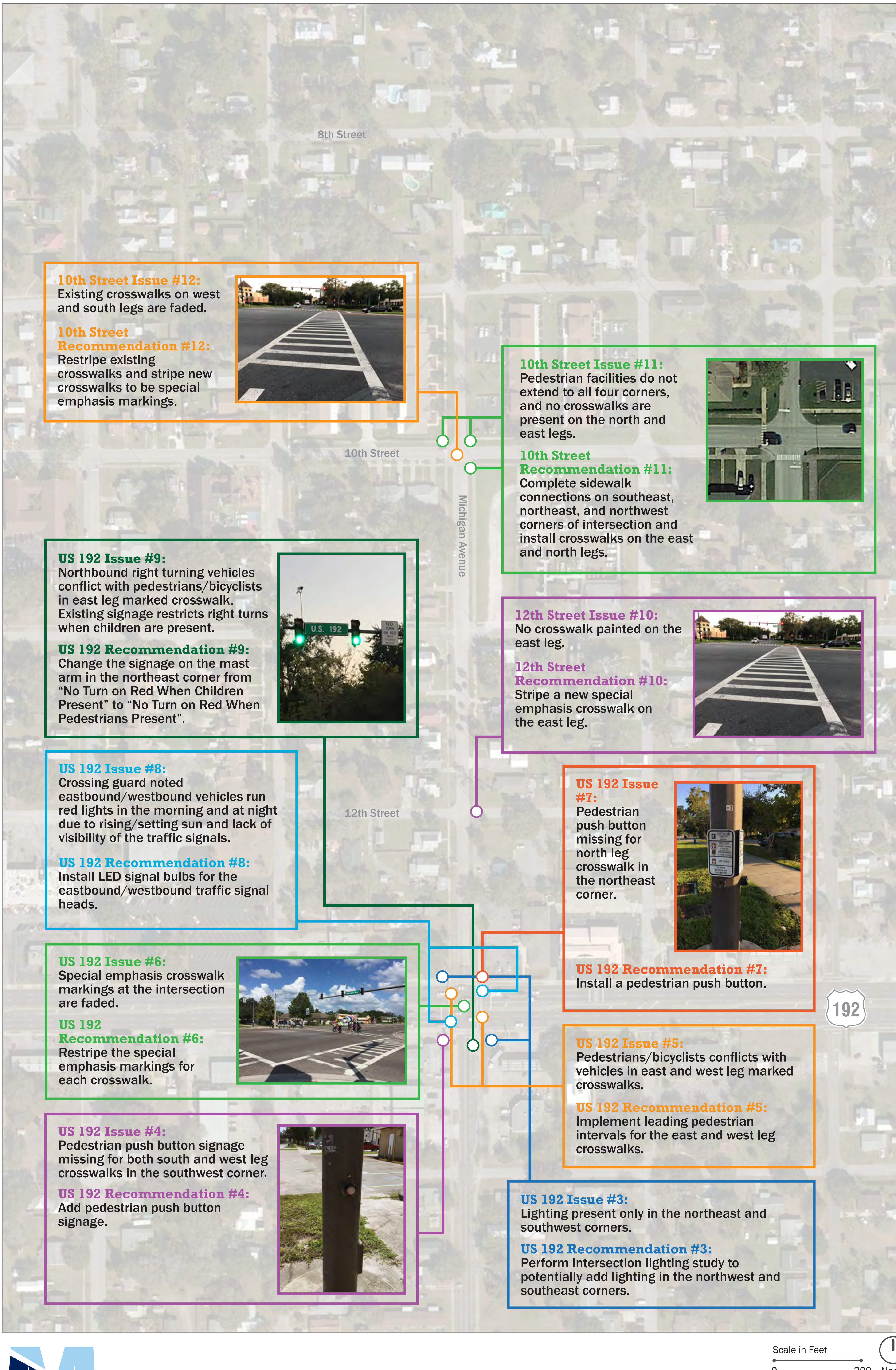
Pedestrian/Bicyclist Safety Action Plan

Location Specific Map #1 - Michigan Street Elementary to 15th Street

FIGURE 28 (1 of 2)

Michigan Avenue (St. Cloud) Issues and Recommendations



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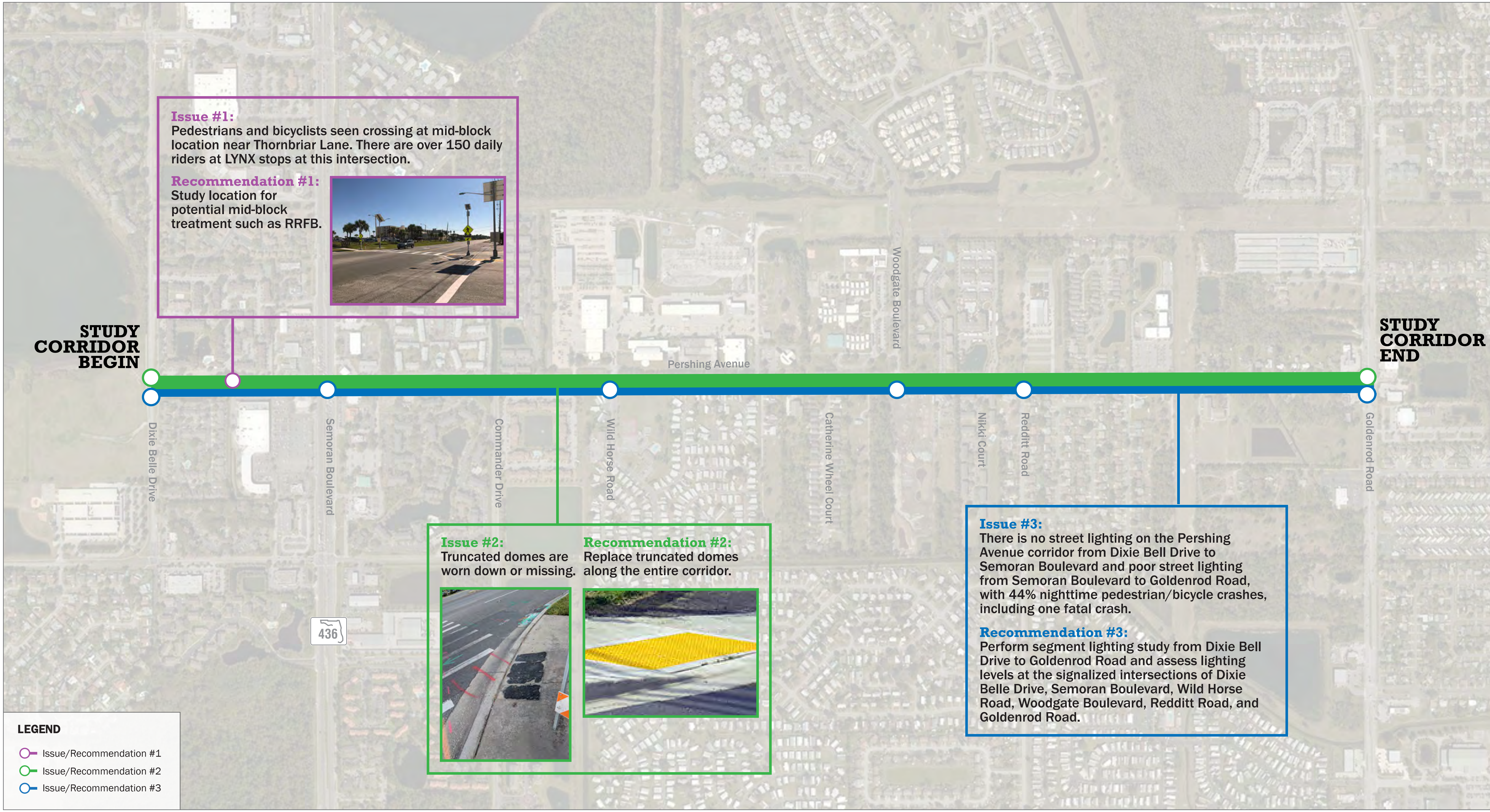
Pedestrian/Bicyclist Safety Action Plan

Location Specific Map #2 - 14th Street to 8th Street

FIGURE 28 (2 of 2)

Michigan Avenue (St. Cloud) Issues and Recommendations



Scale in Feet
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North

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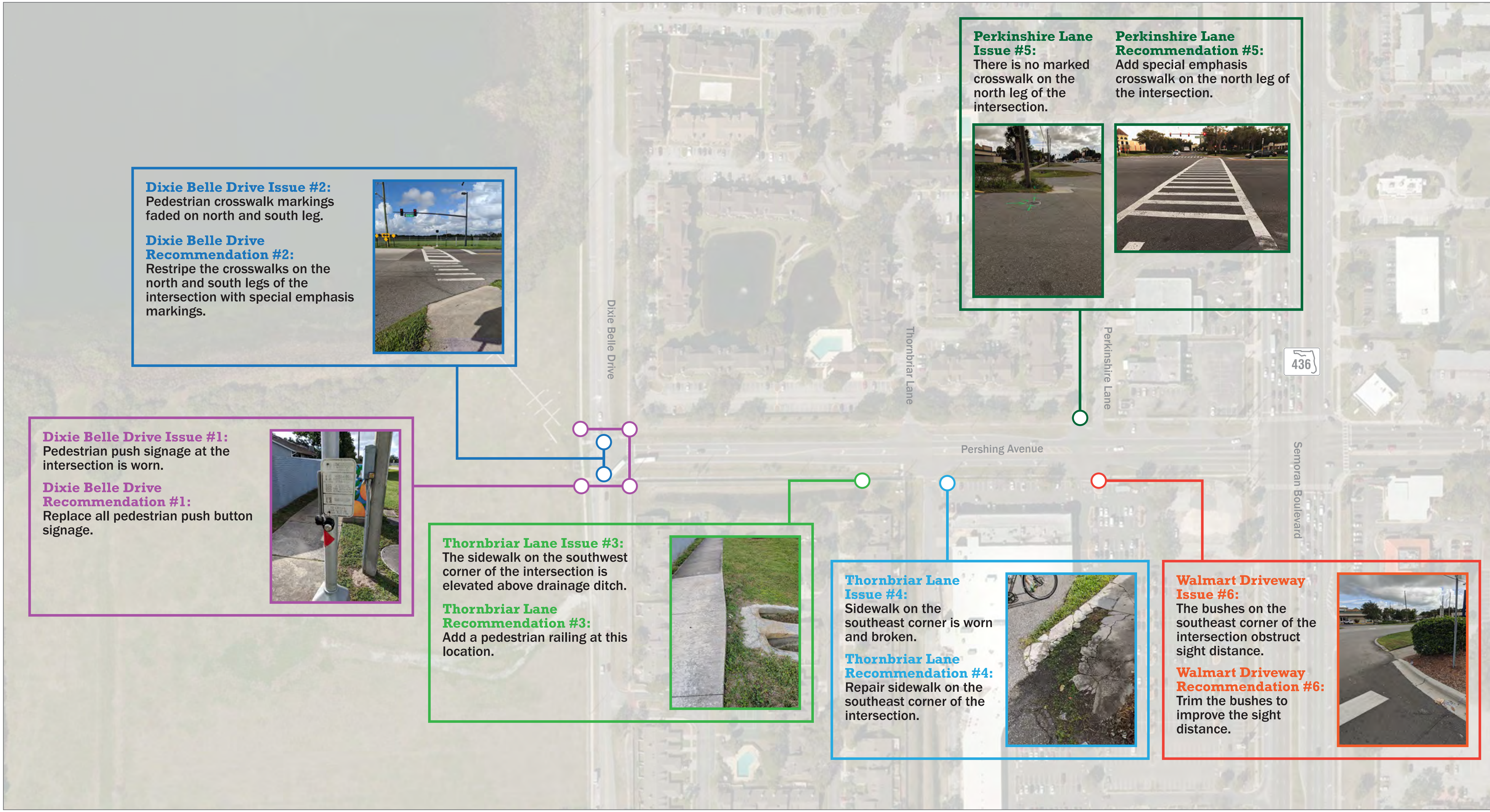
Pedestrian/Bicyclist Safety Action Plan

Corridor-Wide Map

FIGURE 29

Pershing Avenue Issues and Recommendations



Dixie Belle Drive Issue #2:
Pedestrian crosswalk markings faded on north and south leg.

Dixie Belle Drive Recommendation #2:
Restripe the crosswalks on the north and south legs of the intersection with special emphasis markings.

Dixie Belle Drive Issue #1:
Pedestrian push signage at the intersection is worn.

Dixie Belle Drive Recommendation #1:
Replace all pedestrian push button signage.

Thornbriar Lane Issue #3:
The sidewalk on the southwest corner of the intersection is elevated above drainage ditch.

Thornbriar Lane Recommendation #3:
Add a pedestrian railing at this location.

Thornbriar Lane Issue #4:
Sidewalk on the southeast corner is worn and broken.

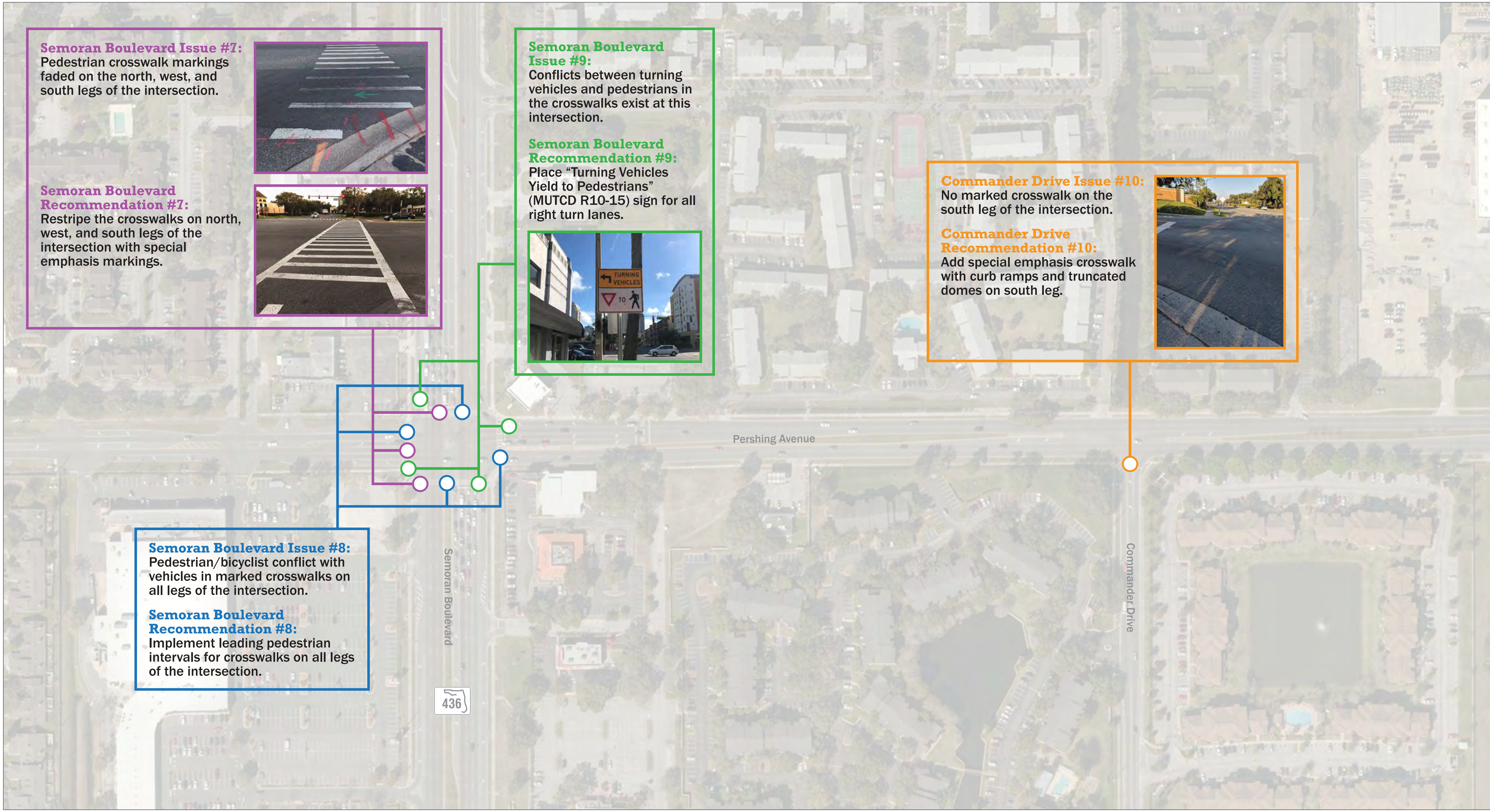
Thornbriar Lane Recommendation #4:
Repair sidewalk on the southeast corner of the intersection.

Perkinshire Lane Issue #5:
There is no marked crosswalk on the north leg of the intersection.

Perkinshire Lane Recommendation #5:
Add special emphasis crosswalk on the north leg of the intersection.

Walmart Driveway Issue #6:
The bushes on the southeast corner of the intersection obstruct sight distance.

Walmart Driveway Recommendation #6:
Trim the bushes to improve the sight distance.



Scale in Feet
0 200
North

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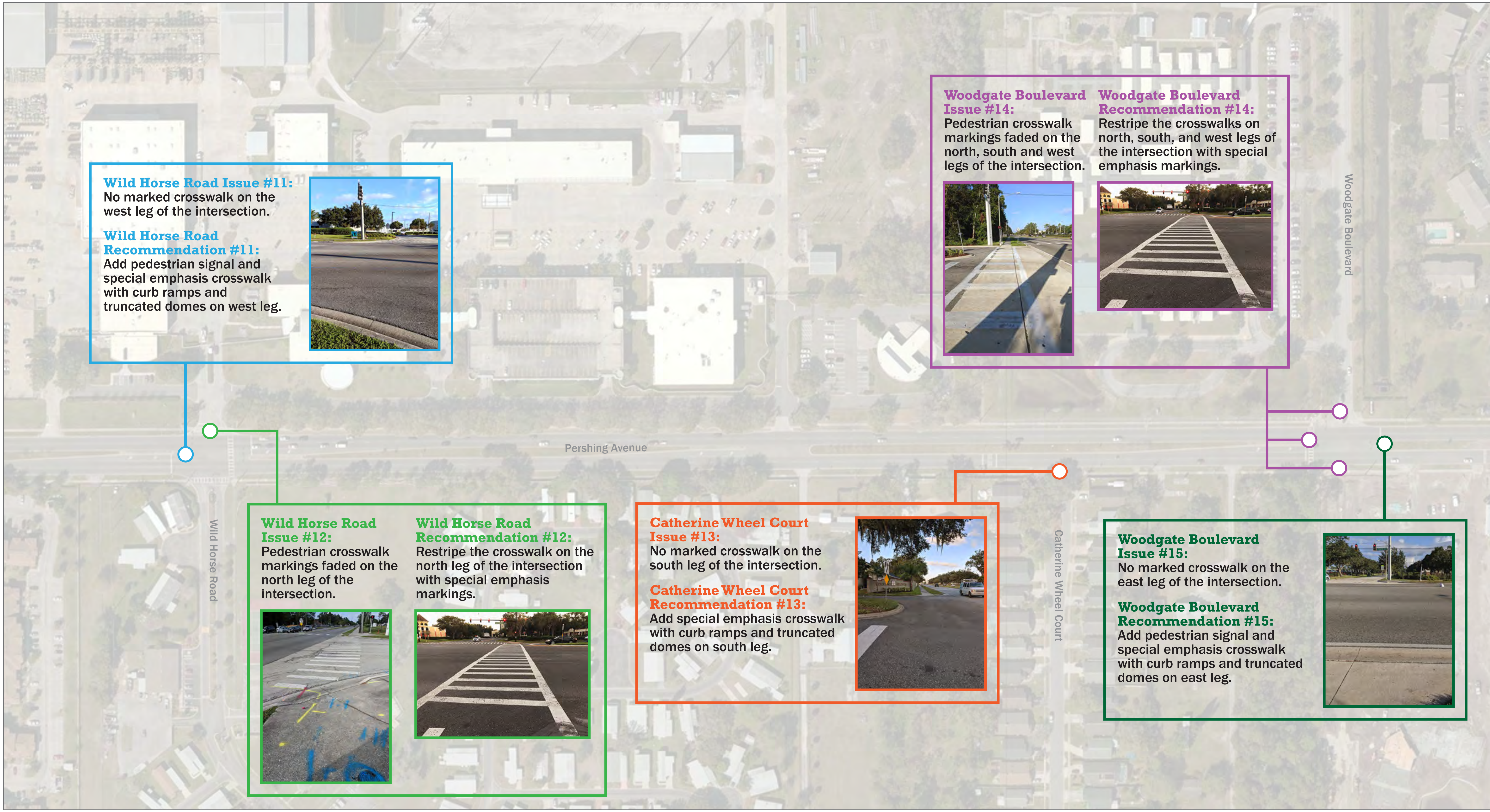
Pedestrian/Bicyclist Safety Action Plan

Location Specific Map #2 - Semoran Boulevard to Commander Drive

FIGURE 30 (2 of 5)

Pershing Avenue Issues and Recommendations



Scale in Feet
0 200
North

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Pedestrian/Bicyclist Safety Action Plan

Location Specific Map #3 - Wild Horse Road to Woodgate Boulevard

FIGURE 30 (3 of 5)

Pershing Avenue Issues and Recommendations

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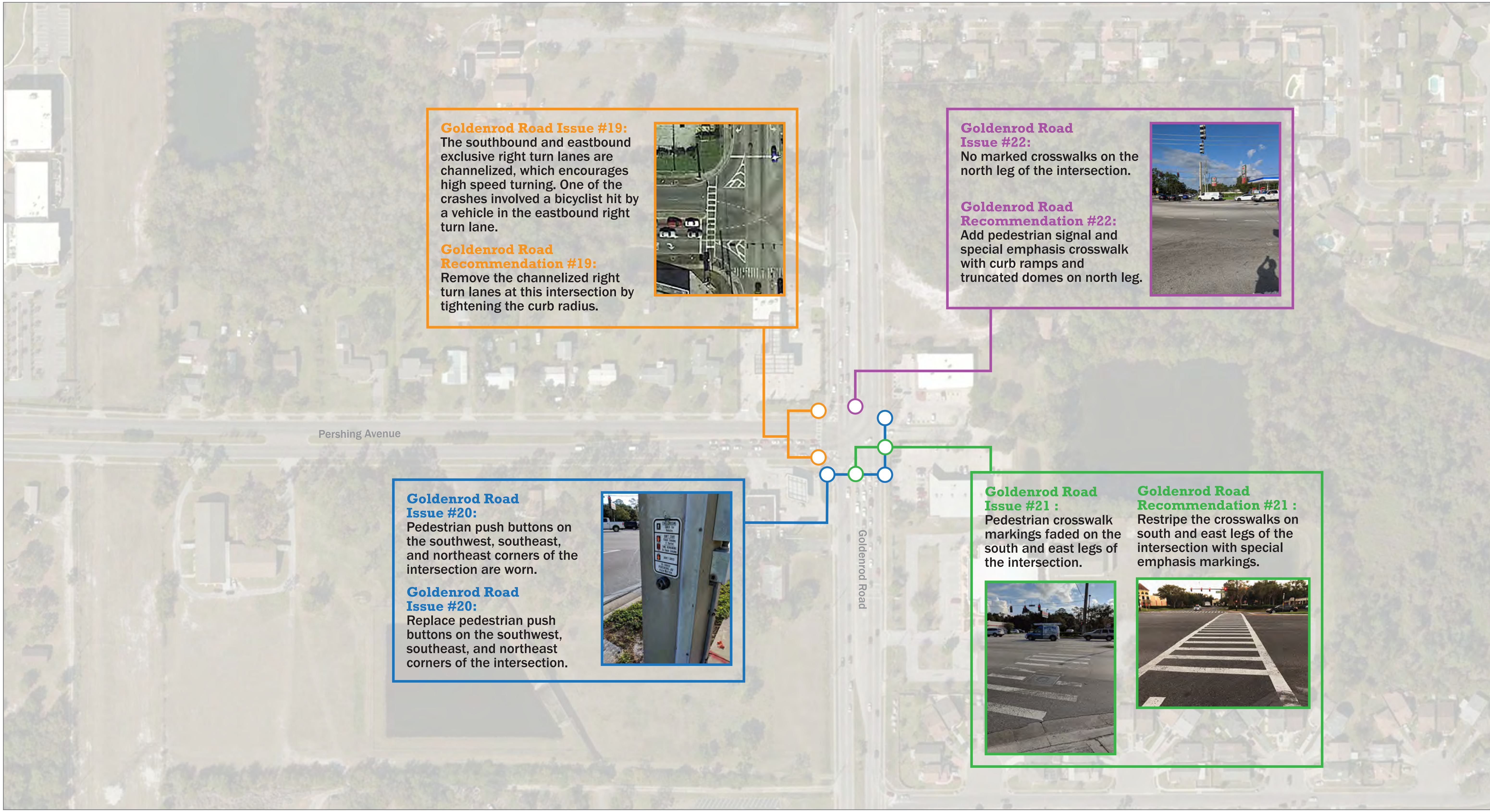
Pedestrian/Bicyclist Safety Action Plan

Location Specific Map #4 - Redditt Road to 7-11 Driveway

FIGURE 30 (4 of 5)

Pershing Avenue Issues and Recommendations



Scale in Feet
0 200
North

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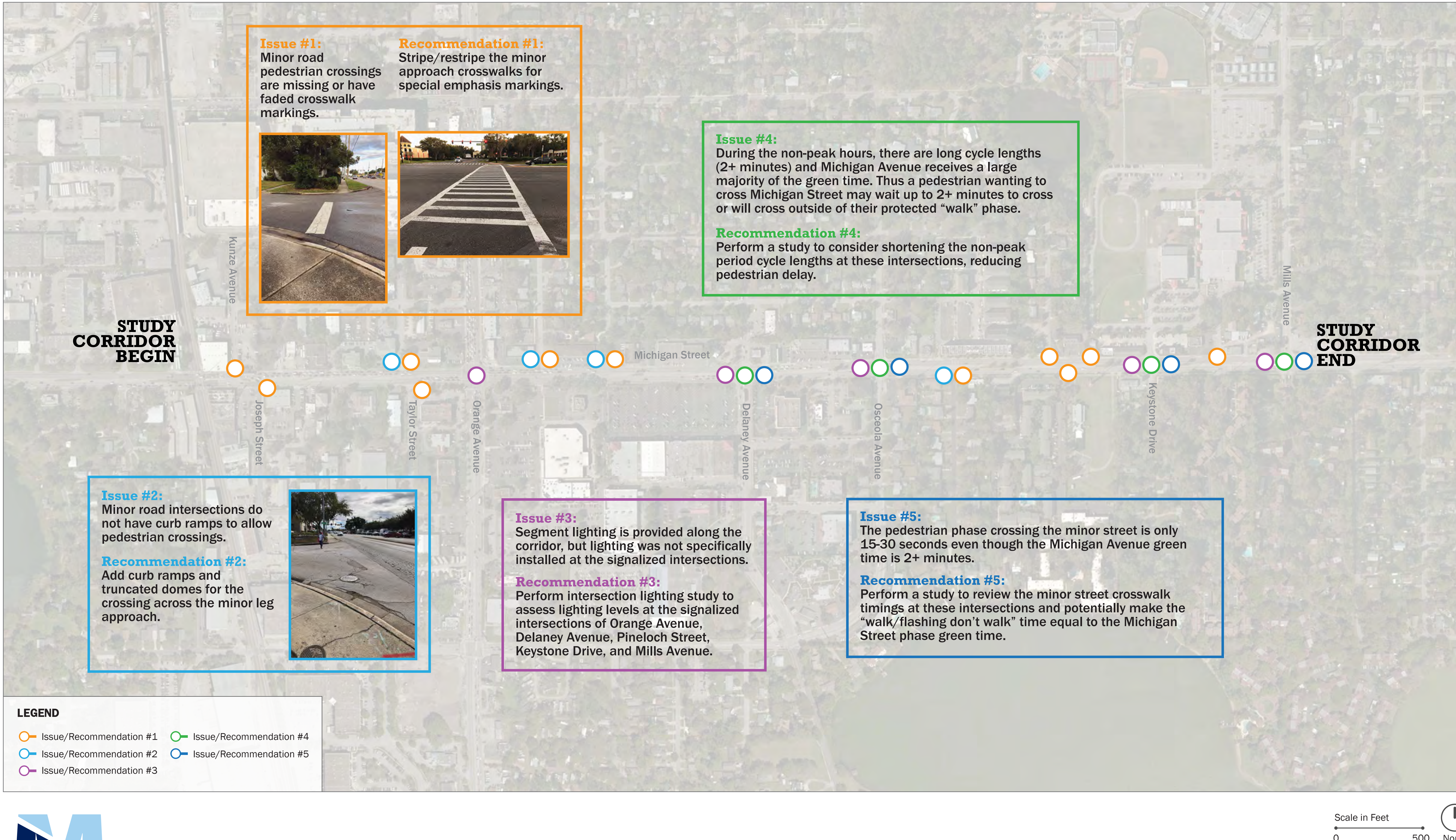
Pedestrian/Bicyclist Safety Action Plan

Location Specific Map #5 - Goldenrod Road

FIGURE 30 (5 of 5)

Pershing Avenue Issues and Recommendations



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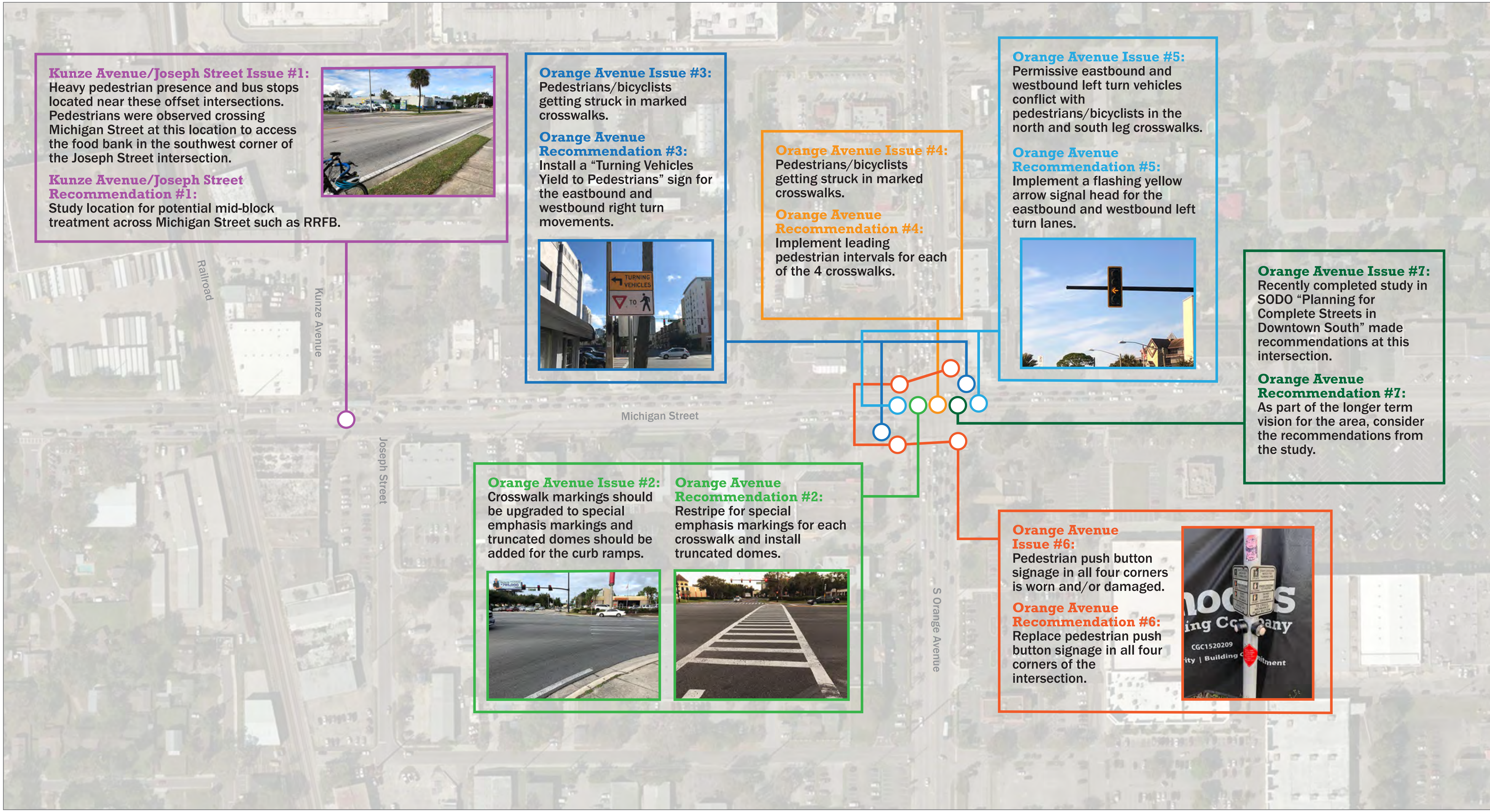
Pedestrian/Bicyclist Safety Action Plan

Corridor-Wide Map

FIGURE 31

Michigan Street Issues and Recommendations



Kunze Avenue/Joseph Street Issue #1: Heavy pedestrian presence and bus stops located near these offset intersections. Pedestrians were observed crossing Michigan Street at this location to access the food bank in the southwest corner of the Joseph Street intersection.

Kunze Avenue/Joseph Street Recommendation #1: Study location for potential mid-block treatment across Michigan Street such as RRFB.

Orange Avenue Issue #3: Pedestrians/bicyclists getting struck in marked crosswalks.

Orange Avenue Recommendation #3: Install a "Turning Vehicles Yield to Pedestrians" sign for the eastbound and westbound right turn movements.

Orange Avenue Issue #4: Pedestrians/bicyclists getting struck in marked crosswalks.

Orange Avenue Recommendation #4: Implement leading pedestrian intervals for each of the 4 crosswalks.

Orange Avenue Issue #5: Permissive eastbound and westbound left turn vehicles conflict with pedestrians/bicyclists in the north and south leg crosswalks.

Orange Avenue Recommendation #5: Implement a flashing yellow arrow signal head for the eastbound and westbound left turn lanes.

Orange Avenue Issue #7: Recently completed study in SODO "Planning for Complete Streets in Downtown South" made recommendations at this intersection.

Orange Avenue Recommendation #7: As part of the longer term vision for the area, consider the recommendations from the study.

Orange Avenue Issue #2: Crosswalk markings should be upgraded to special emphasis markings and truncated domes should be added for the curb ramps.

Orange Avenue Recommendation #2: Restripe for special emphasis markings for each crosswalk and install truncated domes.

Orange Avenue Issue #6: Pedestrian push button signage in all four corners is worn and/or damaged.

Orange Avenue Recommendation #6: Replace pedestrian push button signage in all four corners of the intersection.

Scale in Feet
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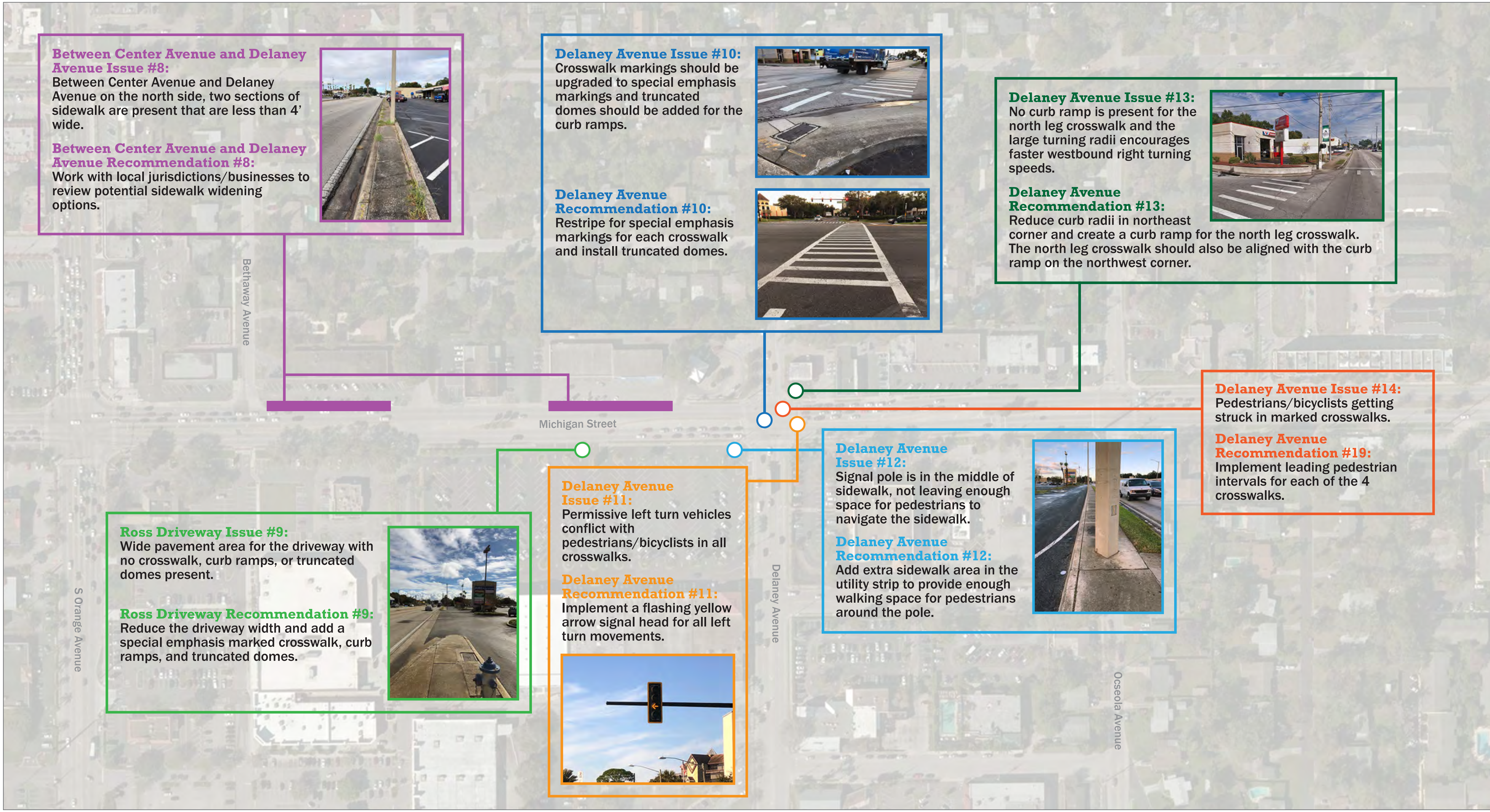
North



Between Center Avenue and Delaney Avenue Issue #8:
Between Center Avenue and Delaney Avenue on the north side, two sections of sidewalk are present that are less than 4' wide.

Between Center Avenue and Delaney Avenue Recommendation #8:
Work with local jurisdictions/businesses to review potential sidewalk widening options.

Delaney Avenue Issue #10:
Crosswalk markings should be upgraded to special emphasis markings and truncated domes should be added for the curb ramps.

Delaney Avenue Recommendation #10:
Restripe for special emphasis markings for each crosswalk and install truncated domes.

Delaney Avenue Issue #13:
No curb ramp is present for the north leg crosswalk and the large turning radii encourages faster westbound right turning speeds.

Delaney Avenue Recommendation #13:
Reduce curb radii in northeast corner and create a curb ramp for the north leg crosswalk. The north leg crosswalk should also be aligned with the curb ramp on the northwest corner.

Delaney Avenue Issue #14:
Pedestrians/bicyclists getting struck in marked crosswalks.

Delaney Avenue Recommendation #19:
Implement leading pedestrian intervals for each of the 4 crosswalks.

Ross Driveway Issue #9:
Wide pavement area for the driveway with no crosswalk, curb ramps, or truncated domes present.

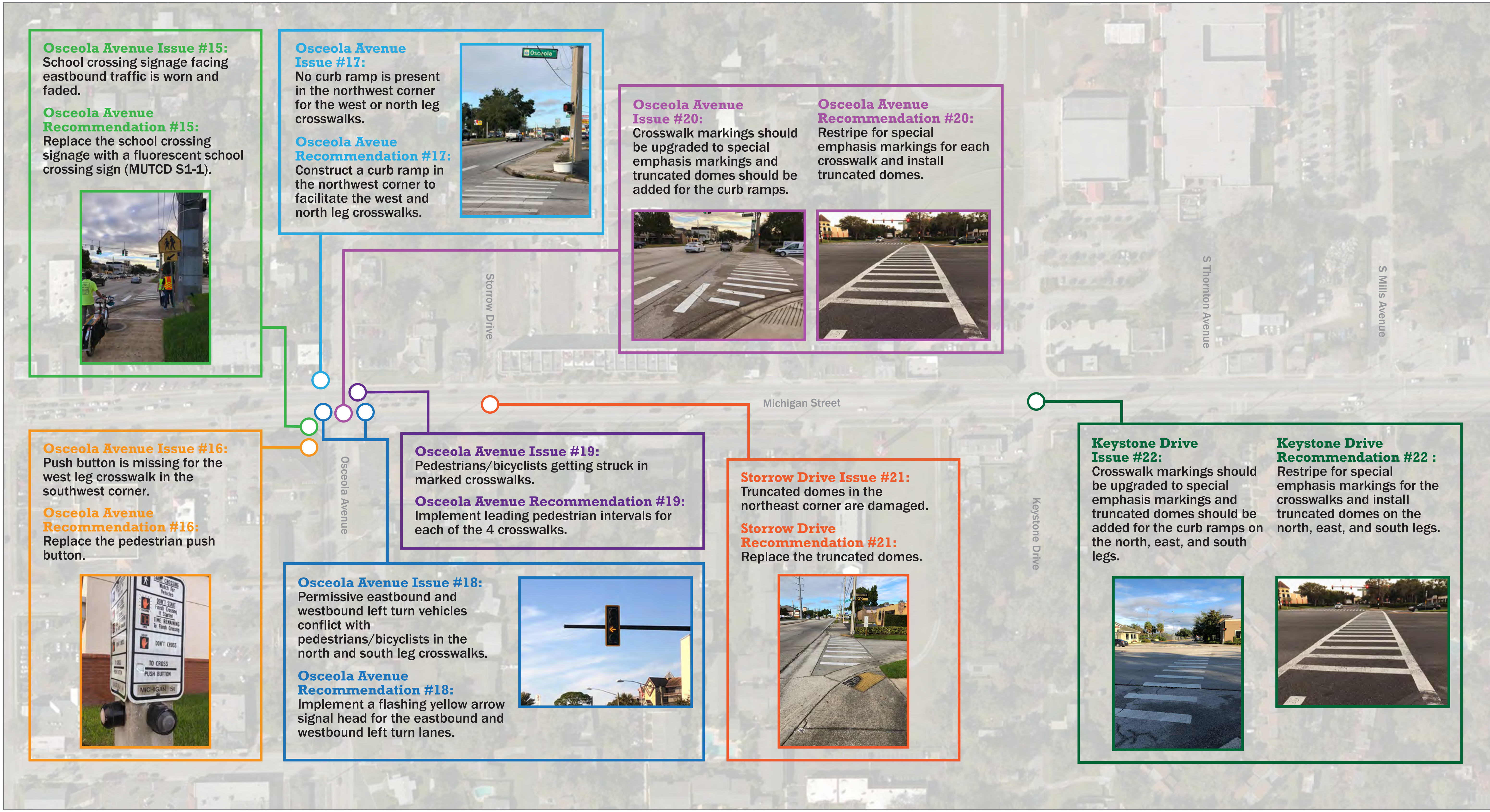
Ross Driveway Recommendation #9:
Reduce the driveway width and add a special emphasis marked crosswalk, curb ramps, and truncated domes.

Delaney Avenue Issue #11:
Permissive left turn vehicles conflict with pedestrians/bicyclists in all crosswalks.

Delaney Avenue Recommendation #11:
Implement a flashing yellow arrow signal head for all left turn movements.

Delaney Avenue Issue #12:
Signal pole is in the middle of sidewalk, not leaving enough space for pedestrians to navigate the sidewalk.

Delaney Avenue Recommendation #12:
Add extra sidewalk area in the utility strip to provide enough walking space for pedestrians around the pole.



Osceola Avenue Issue #15: School crossing signage facing eastbound traffic is worn and faded.

Osceola Avenue Recommendation #15: Replace the school crossing signage with a fluorescent school crossing sign (MUTCD S1-1).

Osceola Avenue Issue #17: No curb ramp is present in the northwest corner for the west or north leg crosswalks.

Osceola Aveue Recommendation #17: Construct a curb ramp in the northwest corner to facilitate the west and north leg crosswalks.

Osceola Avenue Issue #20: Crosswalk markings should be upgraded to special emphasis markings and truncated domes should be added for the curb ramps.

Osceola Avenue Recommendation #20: Restripe for special emphasis markings for each crosswalk and install truncated domes.

Osceola Avenue Issue #16: Push button is missing for the west leg crosswalk in the southwest corner.

Osceola Avenue Recommendation #16: Replace the pedestrian push button.

Osceola Avenue Issue #19: Pedestrians/bicyclists getting struck in marked crosswalks.

Osceola Avenue Recommendation #19: Implement leading pedestrian intervals for each of the 4 crosswalks.

Osceola Avenue Issue #18: Permissive eastbound and westbound left turn vehicles conflict with pedestrians/bicyclists in the north and south leg crosswalks.

Osceola Avenue Recommendation #18: Implement a flashing yellow arrow signal head for the eastbound and westbound left turn lanes.

Storrow Drive Issue #21: Truncated domes in the northeast corner are damaged.

Storrow Drive Recommendation #21: Replace the truncated domes.

Keystone Drive Issue #22: Crosswalk markings should be upgraded to special emphasis markings and truncated domes should be added for the curb ramps on the north, east, and south legs.

Keystone Drive Recommendation #22 : Restripe for special emphasis markings for the crosswalks and install truncated domes on the north, east, and south legs.

Michigan Street
Keystone Drive
S Mills Avenue

Keystone Drive Issue #23:
Permissive eastbound and westbound left turn vehicles conflict with pedestrians/bicyclists in the north and south leg crosswalks.

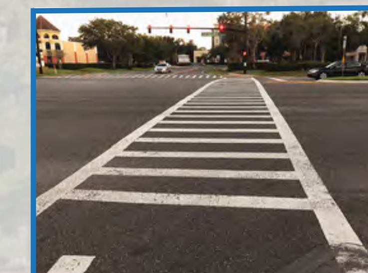
Keystone Drive Recommendation #23:
Implement a flashing yellow arrow signal head for the eastbound and westbound left turn lanes.

Mills Avenue Issue #26:
Pedestrians/bicyclists getting struck in marked crosswalks.

Mills Avenue Recommendation #26:
Implement leading pedestrian intervals for each of the 4 crosswalks.

Mills Avenue Issue #28:
Crosswalk markings should be upgraded to special emphasis markings and truncated domes should be added for the curb ramps.

Mills Avenue Recommendation #28:
Restripe for special emphasis markings for each crosswalk and install truncated domes.



Keystone Drive Issue #24:
No marked crosswalk on the west leg of the intersection.

Keystone Drive Recommendation #24 :
Add special emphasis crosswalk with curb ramps, truncated domes, and pedestrian signal on west leg.

Keystone Drive Issue #25:
Pedestrians/bicyclists getting struck in marked crosswalks.

Keystone Drive Recommendation #25:
Implement leading pedestrian intervals for each of the 4 crosswalks.

Mills Avenue Issue #27:
Permissive eastbound and westbound left turn vehicles conflict with school children and other pedestrians/bicyclists in the north and south leg crosswalks.

Mills Avenue Recommendation #27:
Implement a flashing yellow arrow signal head for the eastbound and westbound left turn lanes. During school drop off and pick up times, restrict the eastbound/westbound left turn movements to be protected only (no permissive phase).

Mills Avenue Issue #29:
No curb ramps are present in the southwest and southeast corners for the west or east leg crosswalks.

Mills Avenue Recommendation #29:
Construct curb ramps in the southwest and southeast corners to facilitate the west and east leg crosswalks.

Scale in Feet
0
200
North

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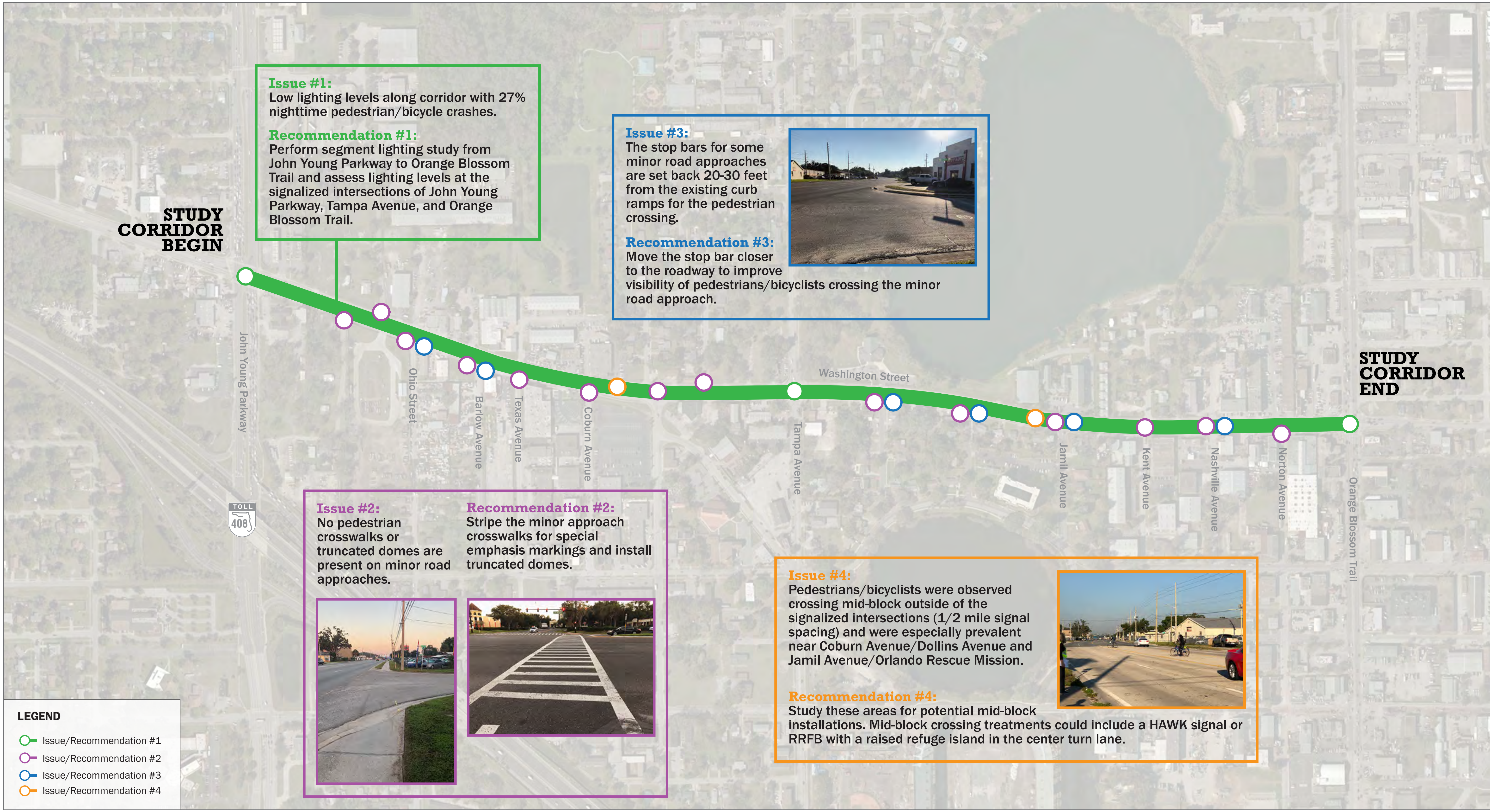

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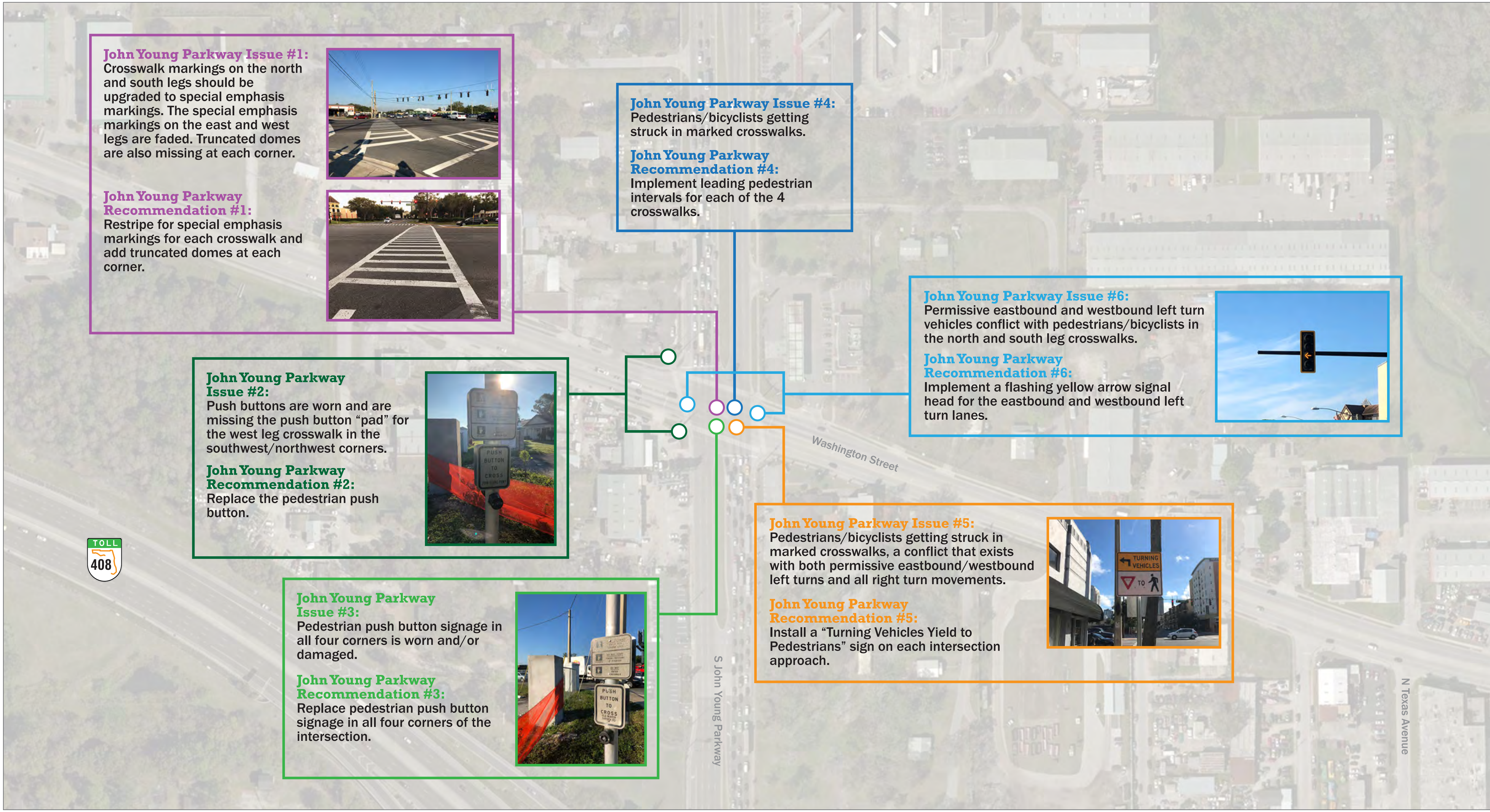
Pedestrian/Bicyclist Safety Action Plan

Corridor-Wide Map

FIGURE 33

Washington Street Issues and Recommendations



John Young Parkway Issue #1:
Crosswalk markings on the north and south legs should be upgraded to special emphasis markings. The special emphasis markings on the east and west legs are faded. Truncated domes are also missing at each corner.

John Young Parkway Recommendation #1:
Restripe for special emphasis markings for each crosswalk and add truncated domes at each corner.

John Young Parkway Issue #2:
Push buttons are worn and are missing the push button "pad" for the west leg crosswalk in the southwest/northwest corners.

John Young Parkway Recommendation #2:
Replace the pedestrian push button.

John Young Parkway Issue #3:
Pedestrian push button signage in all four corners is worn and/or damaged.

John Young Parkway Recommendation #3:
Replace pedestrian push button signage in all four corners of the intersection.

John Young Parkway Issue #4:
Pedestrians/bicyclists getting struck in marked crosswalks.

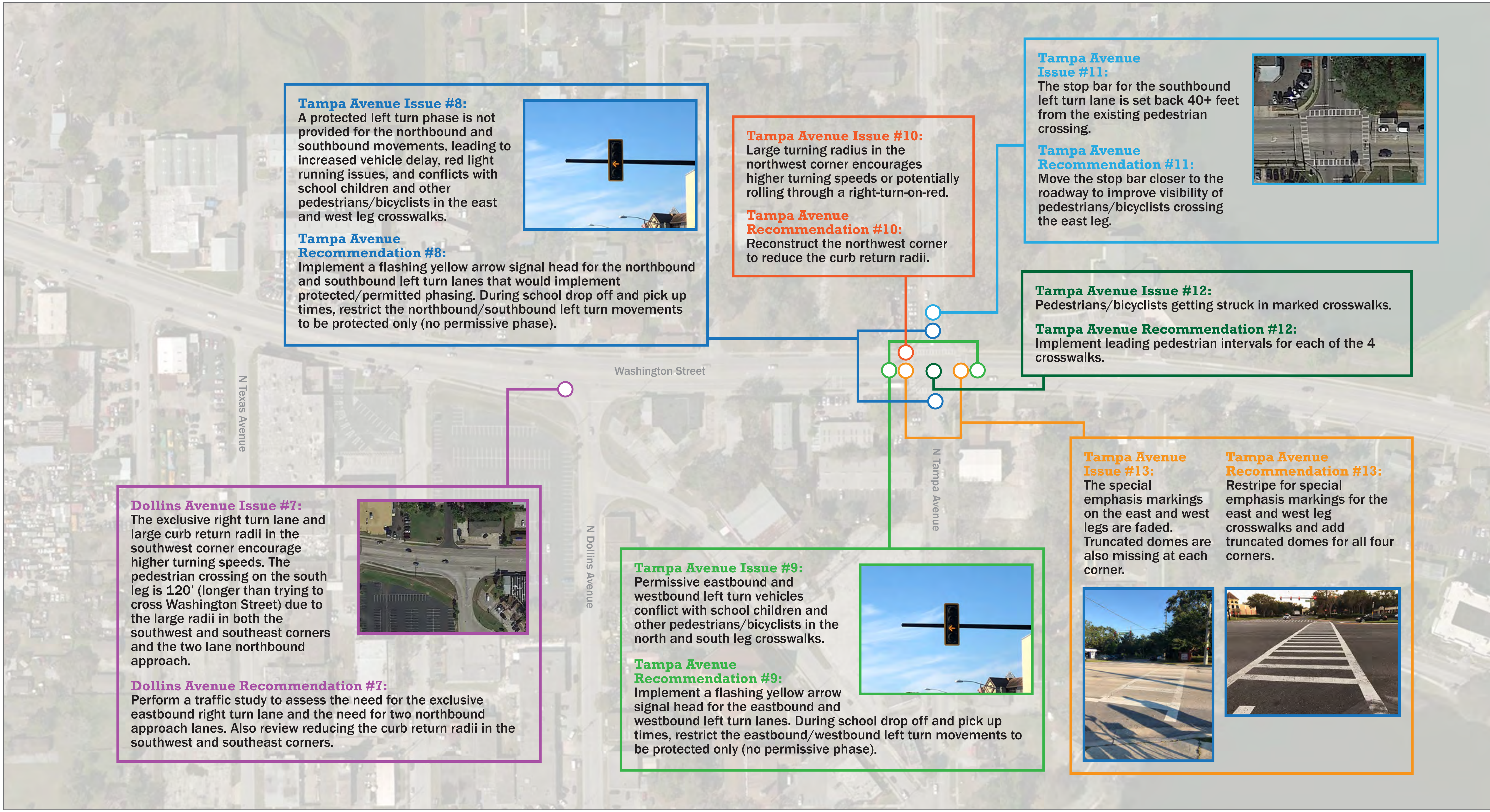
John Young Parkway Recommendation #4:
Implement leading pedestrian intervals for each of the 4 crosswalks.

John Young Parkway Issue #5:
Pedestrians/bicyclists getting struck in marked crosswalks, a conflict that exists with both permissive eastbound/westbound left turns and all right turn movements.

John Young Parkway Recommendation #5:
Install a "Turning Vehicles Yield to Pedestrians" sign on each intersection approach.

John Young Parkway Issue #6:
Permissive eastbound and westbound left turn vehicles conflict with pedestrians/bicyclists in the north and south leg crosswalks.

John Young Parkway Recommendation #6:
Implement a flashing yellow arrow signal head for the eastbound and westbound left turn lanes.



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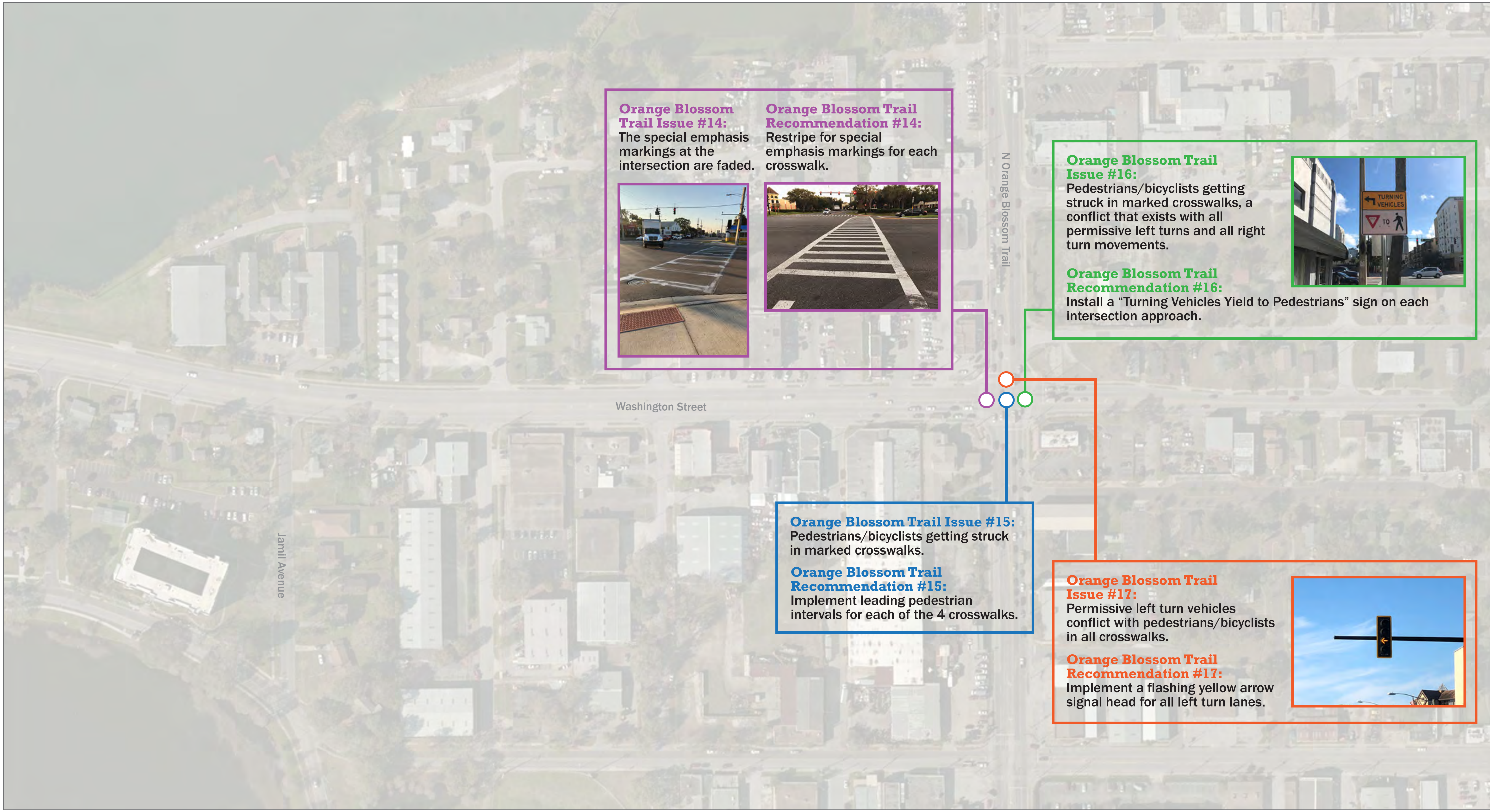
Pedestrian/Bicyclist Safety Action Plan

Location Specific Map #2 - Texas Avenue to Tampa Avenue

FIGURE 34 (2 of 3)

Washington Street Issues and Recommendations



Scale in Feet
0 200
North

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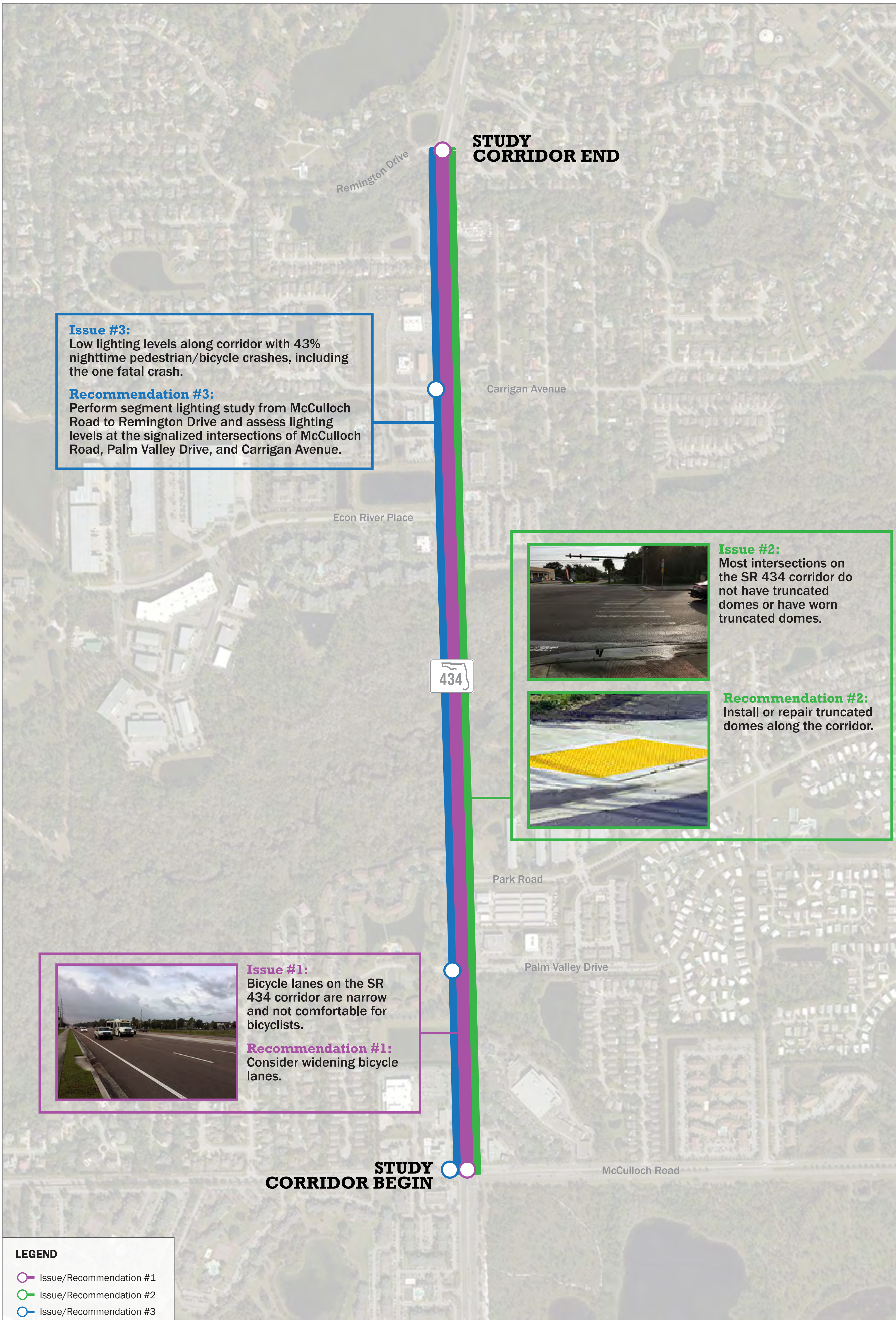
Pedestrian/Bicyclist Safety Action Plan

Location Specific Map #3 - Jamil Avenue to Orange Blossom Trail

FIGURE 34 (3 of 3)

Washington Street Issues and Recommendations



Scale in Feet
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North

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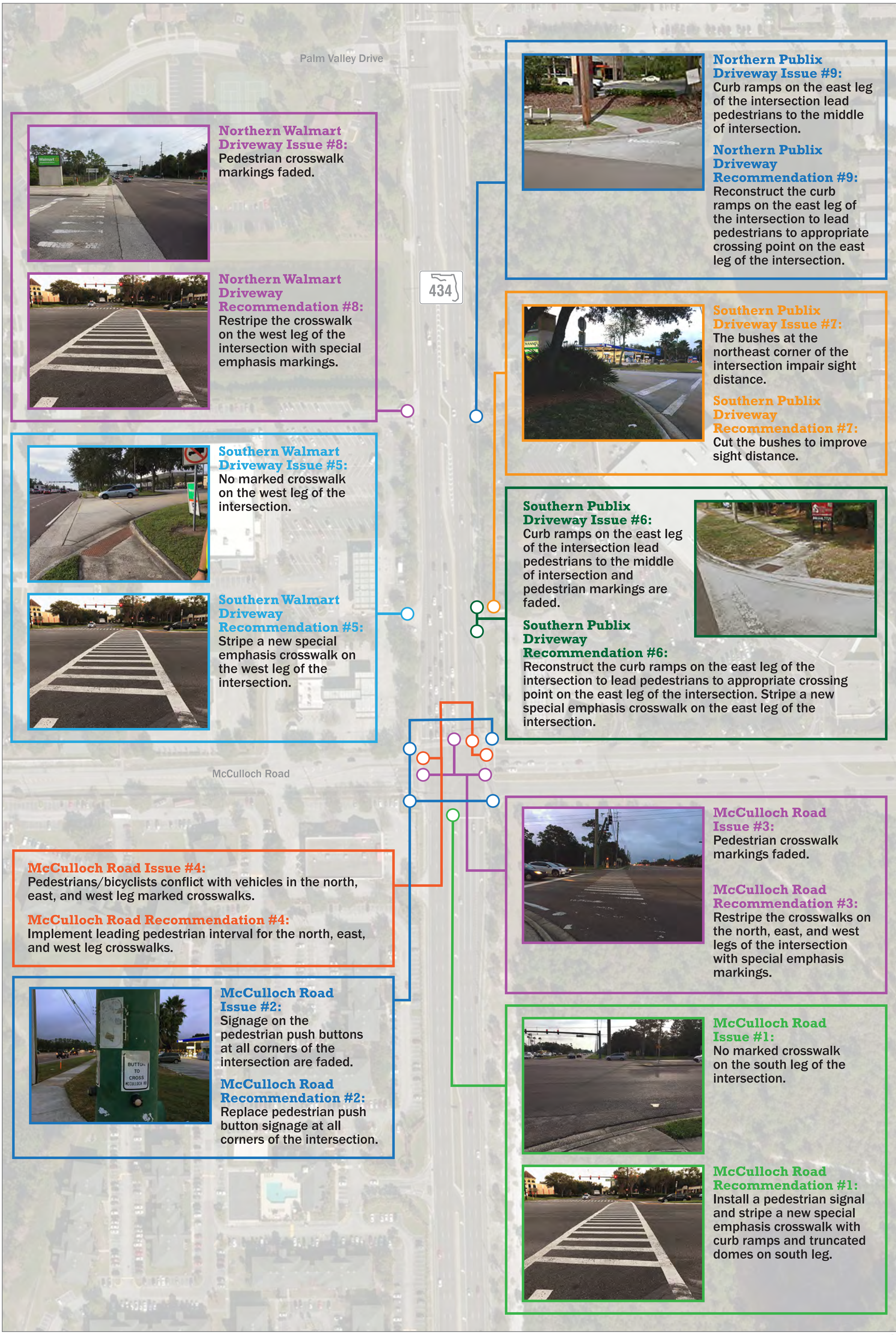
Pedestrian/Bicyclist Safety Action Plan

Corridor-Wide Map

FIGURE 35

SR 434 Issues and Recommendations



Northern Walmart Driveway Issue #8:
Pedestrian crosswalk markings faded.

Northern Walmart Driveway Recommendation #8:
Restripe the crosswalk on the west leg of the intersection with special emphasis markings.

Northern Publix Driveway Issue #9:
Curb ramps on the east leg of the intersection lead pedestrians to the middle of intersection.

Northern Publix Driveway Recommendation #9:
Reconstruct the curb ramps on the east leg of the intersection to lead pedestrians to appropriate crossing point on the east leg of the intersection.

Southern Publix Driveway Issue #7:
The bushes at the northeast corner of the intersection impair sight distance.

Southern Publix Driveway Recommendation #7:
Cut the bushes to improve sight distance.

Southern Walmart Driveway Issue #5:
No marked crosswalk on the west leg of the intersection.

Southern Walmart Driveway Recommendation #5:
Stripe a new special emphasis crosswalk on the west leg of the intersection.

Southern Publix Driveway Issue #6:
Curb ramps on the east leg of the intersection lead pedestrians to the middle of intersection and pedestrian markings are faded.

Southern Publix Driveway Recommendation #6:
Reconstruct the curb ramps on the east leg of the intersection to lead pedestrians to appropriate crossing point on the east leg of the intersection. Stripe a new special emphasis crosswalk on the east leg of the intersection.

McCulloch Road Issue #4:
Pedestrians/bicyclists conflict with vehicles in the north, east, and west leg marked crosswalks.

McCulloch Road Recommendation #4:
Implement leading pedestrian interval for the north, east, and west leg crosswalks.

McCulloch Road Issue #3:
Pedestrian crosswalk markings faded.

McCulloch Road Recommendation #3:
Restripe the crosswalks on the north, east, and west legs of the intersection with special emphasis markings.

McCulloch Road Issue #2:
Signage on the pedestrian push buttons at all corners of the intersection are faded.

McCulloch Road Recommendation #2:
Replace pedestrian push button signage at all corners of the intersection.

McCulloch Road Issue #1:
No marked crosswalk on the south leg of the intersection.

McCulloch Road Recommendation #1:
Install a pedestrian signal and stripe a new special emphasis crosswalk with curb ramps and truncated domes on south leg.

Scale in Feet
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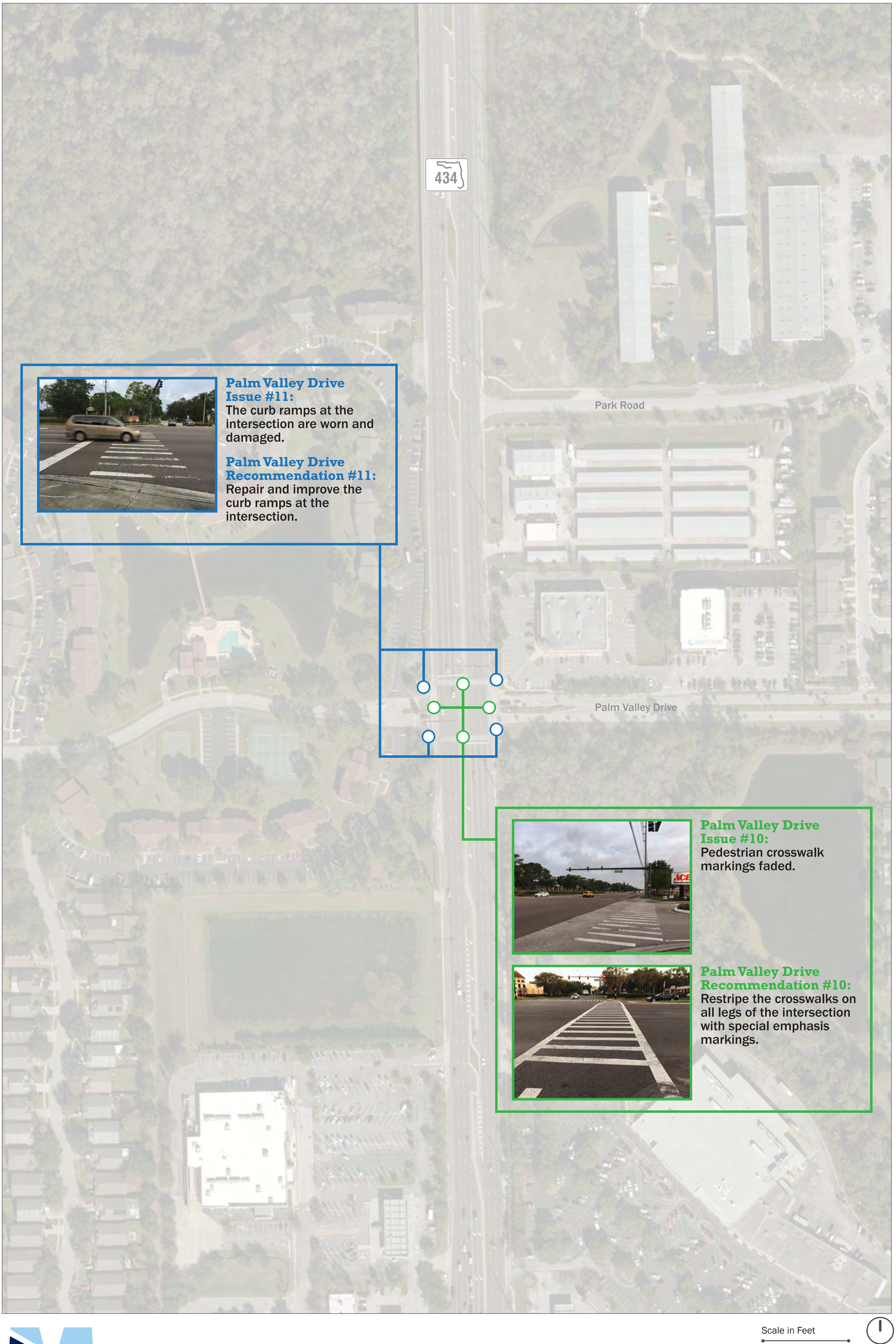
North



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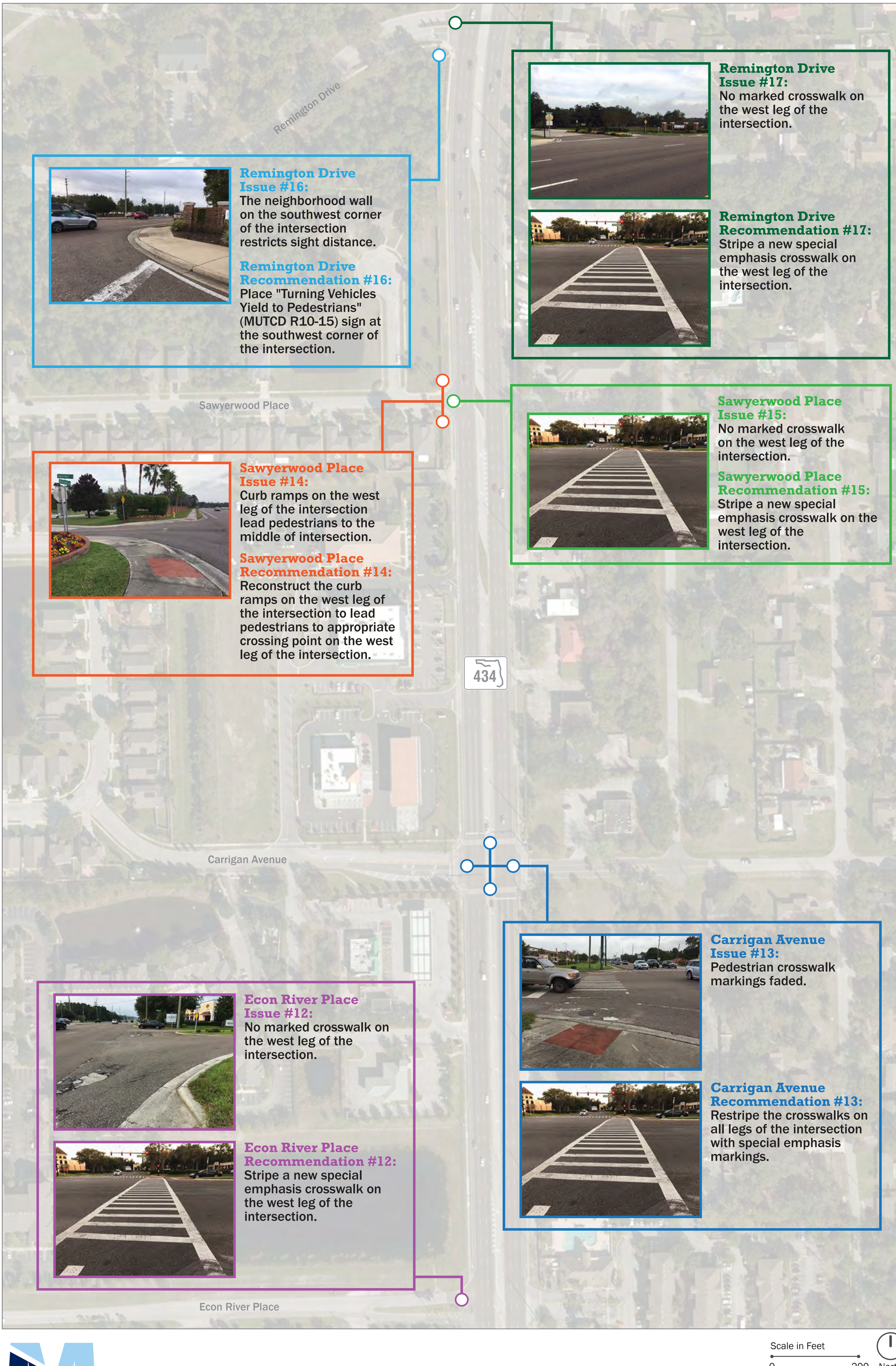
Pedestrian/Bicyclist Safety Action Plan

Location Specific Map #2 - Palm Valley Drive to Park Road

FIGURE 36 (2 of 3)

SR 434 Issues and Recommendations



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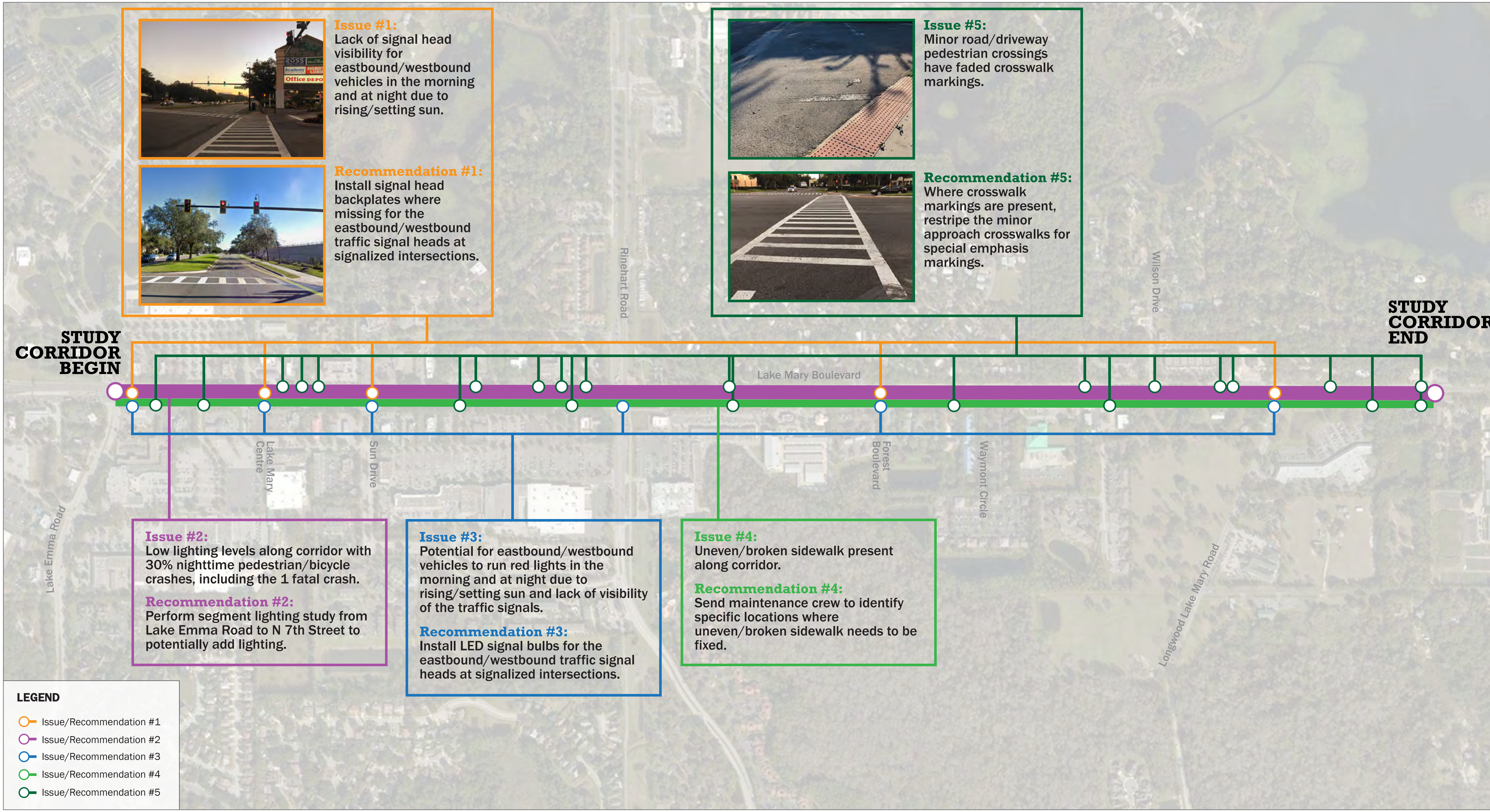
Pedestrian/Bicyclist Safety Action Plan

Location Specific Map #3 - Econ River Place to Remington Drive

FIGURE 36 (3 of 3)

SR 434 Issues and Recommendations



Scale in Feet
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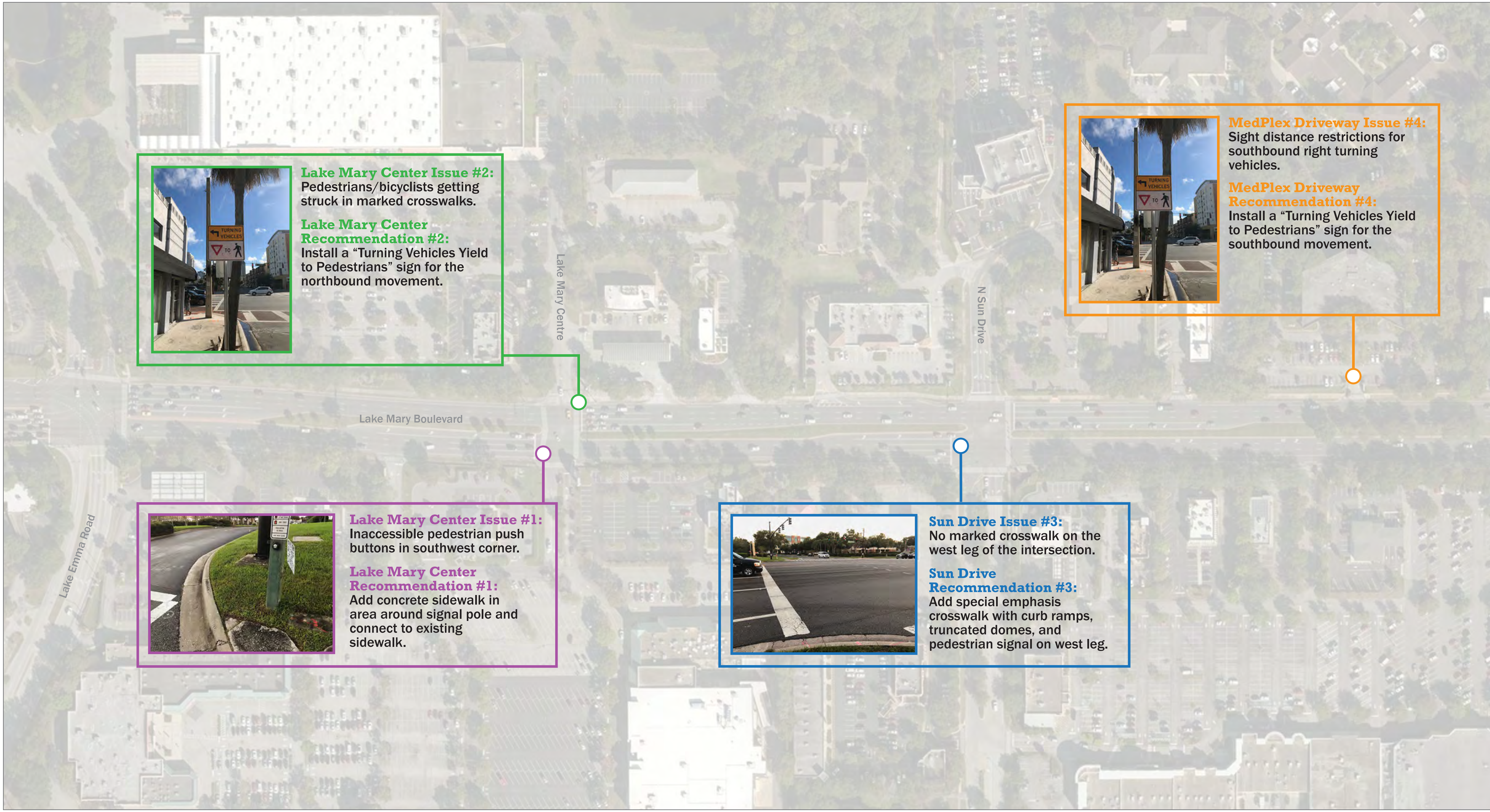
Pedestrian/Bicyclist Safety Action Plan

Corridor-Wide Map

FIGURE 37

Lake Mary Boulevard Issues and Recommendations



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Pedestrian/Bicyclist Safety Action Plan

Location Specific Map #1 - Lake Emma Road to Rinehart Road

FIGURE 38 (1 of 3)

Lake Mary Boulevard Issues and Recommendations

Scale in Feet
0 200
North

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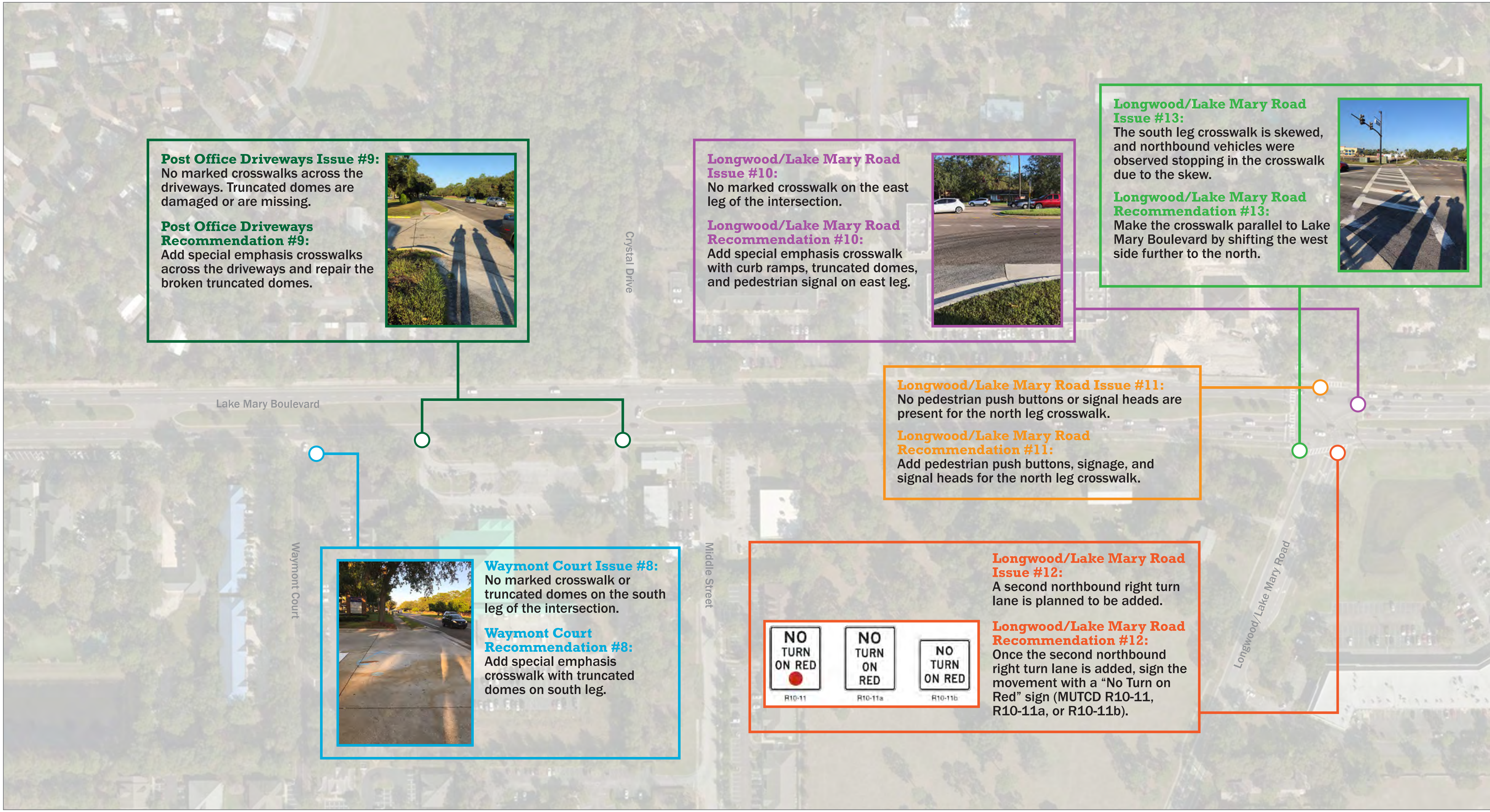
Pedestrian/Bicyclist Safety Action Plan

Location Specific Map #2 - Rinehart Road to Forest Boulevard

FIGURE 38 (2 of 3)

Lake Mary Boulevard Issues and Recommendations



Scale in Feet
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North

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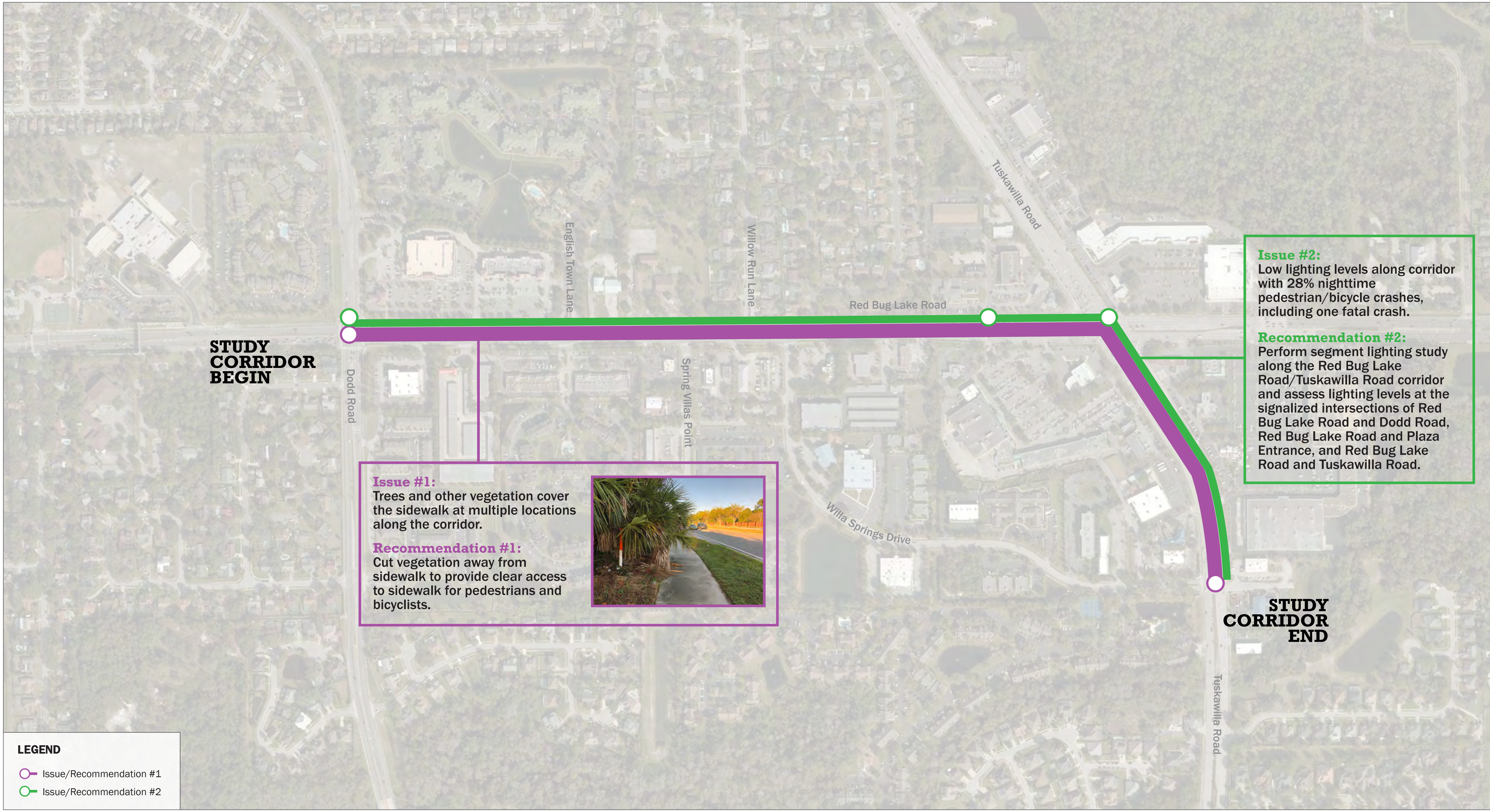
Pedestrian/Bicyclist Safety Action Plan

Location Specific Map #3 - Waymont Court Road to Longwood/Lake Mary Road

FIGURE 38 (3 of 3)

Lake Mary Boulevard Issues and Recommendations



Scale in Feet
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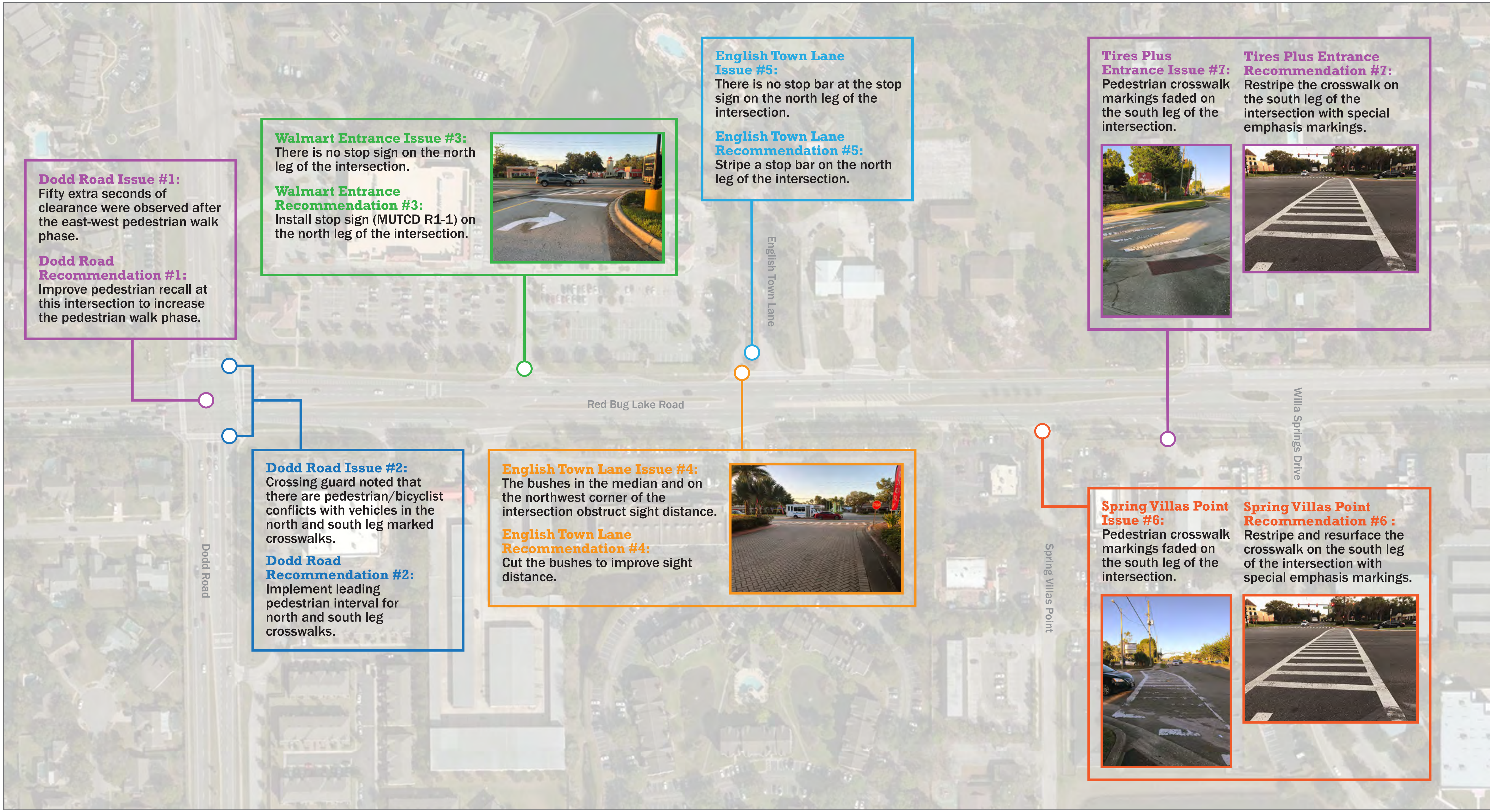
North

Pedestrian/Bicyclist Safety Action Plan

Corridor-Wide Map

FIGURE 39

Red Bug Lake Road/Tuskawilla Road Issues and Recommendations



Dodd Road Issue #1:
Fifty extra seconds of clearance were observed after the east-west pedestrian walk phase.

Dodd Road Recommendation #1:
Improve pedestrian recall at this intersection to increase the pedestrian walk phase.

Walmart Entrance Issue #3:
There is no stop sign on the north leg of the intersection.

Walmart Entrance Recommendation #3:
Install stop sign (MUTCD R1-1) on the north leg of the intersection.

English Town Lane Issue #5:
There is no stop bar at the stop sign on the north leg of the intersection.

English Town Lane Recommendation #5:
Stripe a stop bar on the north leg of the intersection.

Tires Plus Entrance Issue #7:
Pedestrian crosswalk markings faded on the south leg of the intersection.

Tires Plus Entrance Recommendation #7:
Restripe the crosswalk on the south leg of the intersection with special emphasis markings.

Dodd Road Issue #2:
Crossing guard noted that there are pedestrian/bicyclist conflicts with vehicles in the north and south leg marked crosswalks.

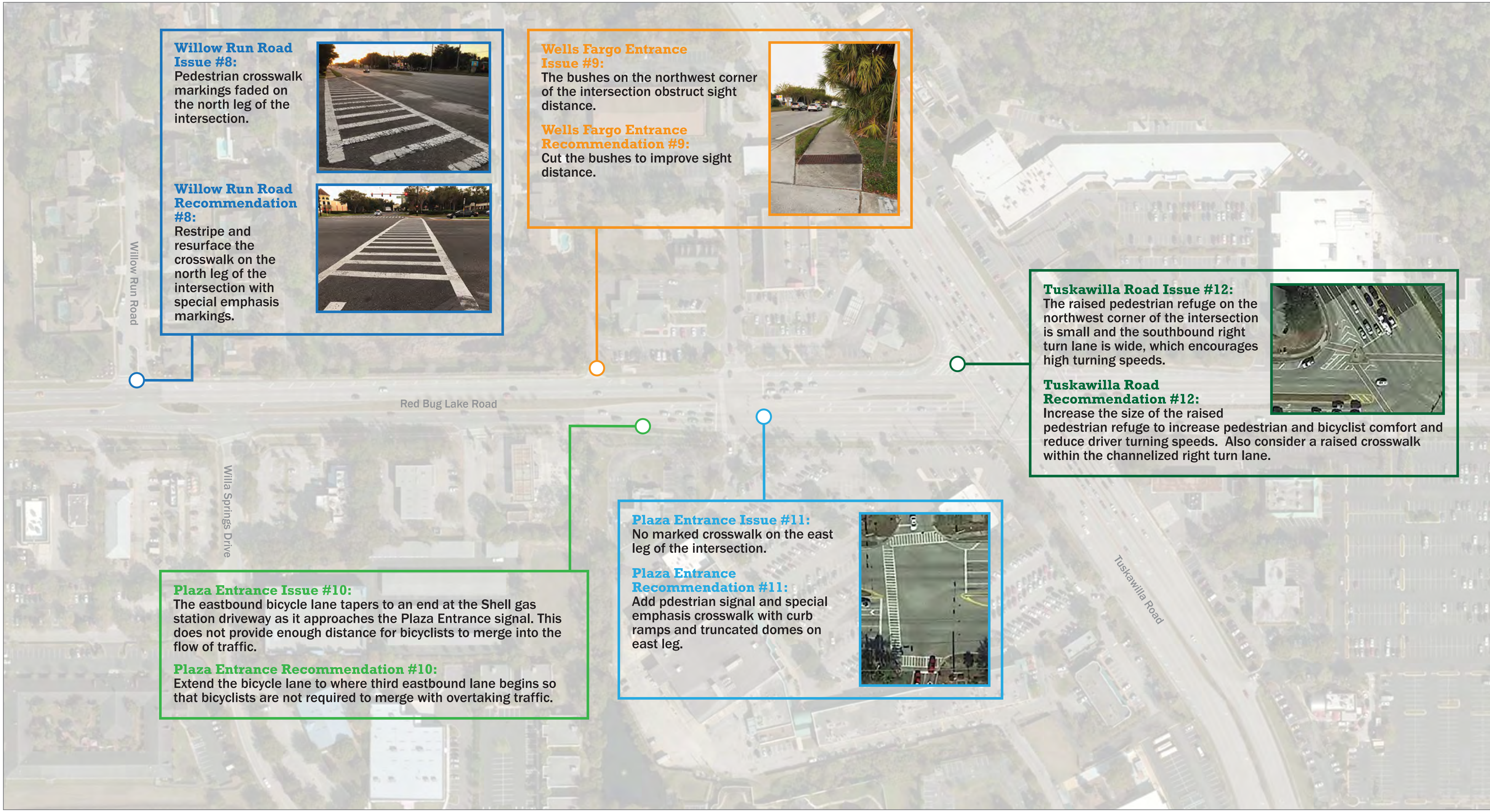
Dodd Road Recommendation #2:
Implement leading pedestrian interval for north and south leg crosswalks.

English Town Lane Issue #4:
The bushes in the median and on the northwest corner of the intersection obstruct sight distance.

English Town Lane Recommendation #4:
Cut the bushes to improve sight distance.

Spring Villas Point Issue #6:
Pedestrian crosswalk markings faded on the south leg of the intersection.

Spring Villas Point Recommendation #6 :
Restripe and resurface the crosswalk on the south leg of the intersection with special emphasis markings.



Willow Run Road Issue #8:
Pedestrian crosswalk markings faded on the north leg of the intersection.

Willow Run Road Recommendation #8:
Restripe and resurface the crosswalk on the north leg of the intersection with special emphasis markings.

Wells Fargo Entrance Issue #9:
The bushes on the northwest corner of the intersection obstruct sight distance.

Wells Fargo Entrance Recommendation #9:
Cut the bushes to improve sight distance.

Tuskawilla Road Issue #12:
The raised pedestrian refuge on the northwest corner of the intersection is small and the southbound right turn lane is wide, which encourages high turning speeds.

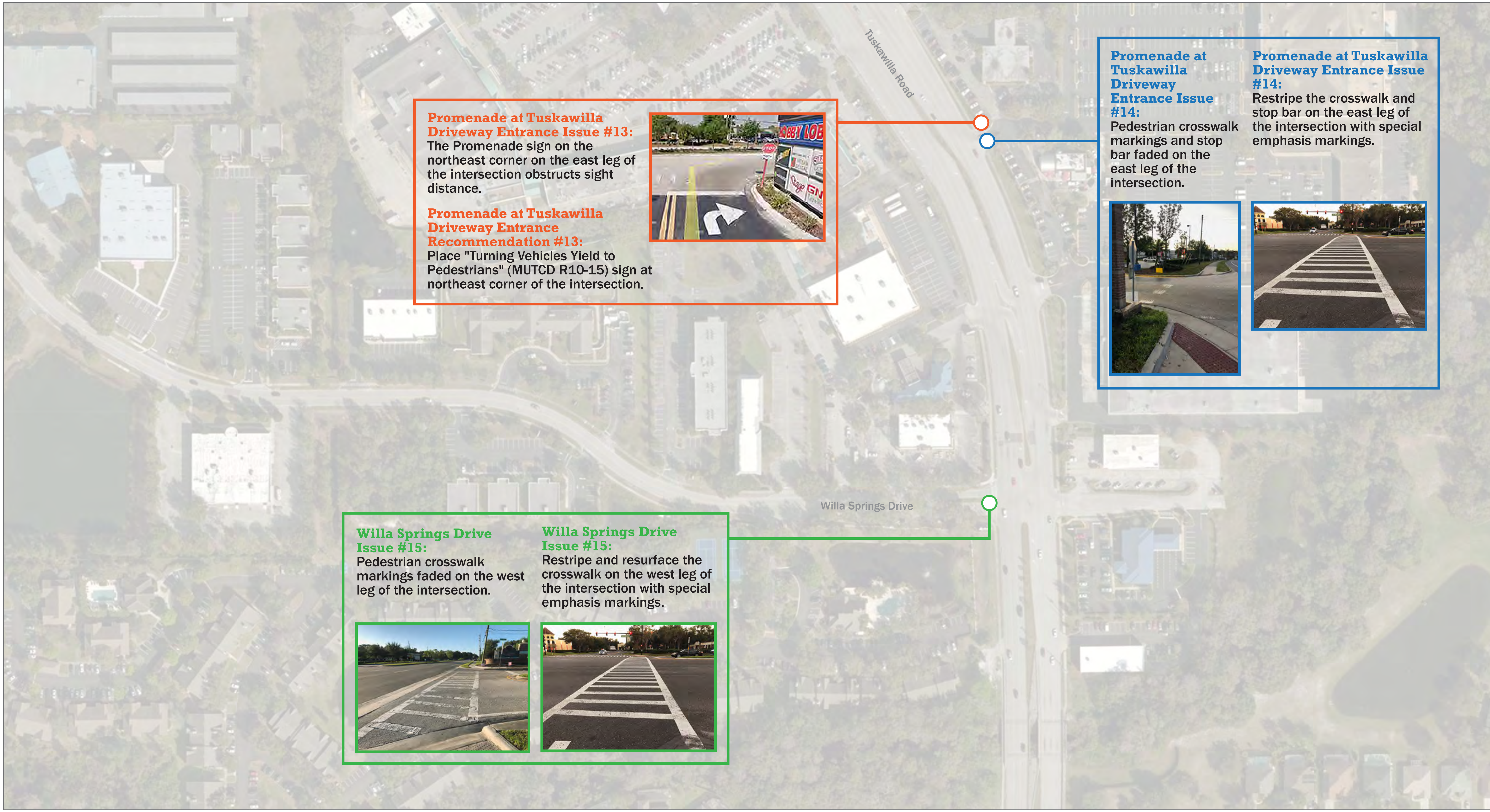
Tuskawilla Road Recommendation #12:
Increase the size of the raised pedestrian refuge to increase pedestrian and bicyclist comfort and reduce driver turning speeds. Also consider a raised crosswalk within the channelized right turn lane.

Plaza Entrance Issue #10:
The eastbound bicycle lane tapers to an end at the Shell gas station driveway as it approaches the Plaza Entrance signal. This does not provide enough distance for bicyclists to merge into the flow of traffic.

Plaza Entrance Recommendation #10:
Extend the bicycle lane to where third eastbound lane begins so that bicyclists are not required to merge with overtaking traffic.

Plaza Entrance Issue #11:
No marked crosswalk on the east leg of the intersection.

Plaza Entrance Recommendation #11:
Add pdestrian signal and special emphasis crosswalk with curb ramps and truncated domes on east leg.



Scale in Feet
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North

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Pedestrian/Bicyclist Safety Action Plan

Location Specific Map #3 - South of Red Bug Lake Road to Willa Springs Drive

FIGURE 40 (3 of 3)

Tuskawilla Road Issues and Recommendations

Upon reviewing the issues/recommendations from the nine safety field review corridors, a few common issues/recommendations were observed across most or all of the roadways:

- Issue – Majority of fatal crashes along safety field review corridors occurred at mid-block locations with pedestrian/bicyclist crossing main roadway outside of a marked crosswalk (**Figure 41**).
    - Recommendation – Perform mid-block crossing studies along corridors with mid-block fatal crashes to potentially increase the number of protected, marked crosswalks across the main roadway.
- Issue – Little to no street lighting along corridors, with nighttime pedestrian/bicycle related crashes accounting for 25 to 45 percent of crashes along the safety field review corridors.
    - Recommendation – Perform lighting justification studies along these corridors and review feasibility of installing intersection and segment lighting (**Figure 42**).
    - Note that in Orange County, Duke Energy will be performing the lighting assessments.
- Issue – Truncated domes worn down or missing at curb ramps for signalized intersections (**Figure 43**).
    - Recommendation – Work with the roadway maintaining agency to replace or install new truncated domes.
- Issue – Pedestrian crosswalk markings were faded at signalized intersections (**Figure 44**).
    - Recommendation – Work with the roadway maintaining agency to restripe crosswalks at regular intervals.
- Issue – No marked crosswalks across public street approaches at unsignalized intersections (**Figure 45**).
    - Recommendation – Install marked crosswalks across the public street approaches at unsignalized intersections.

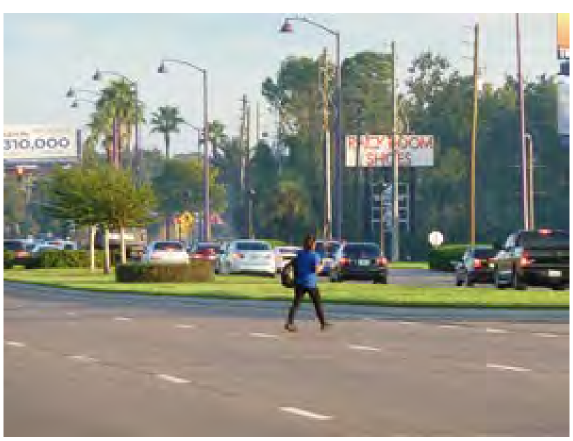


Figure 41. Mid-Block Crossing Issue

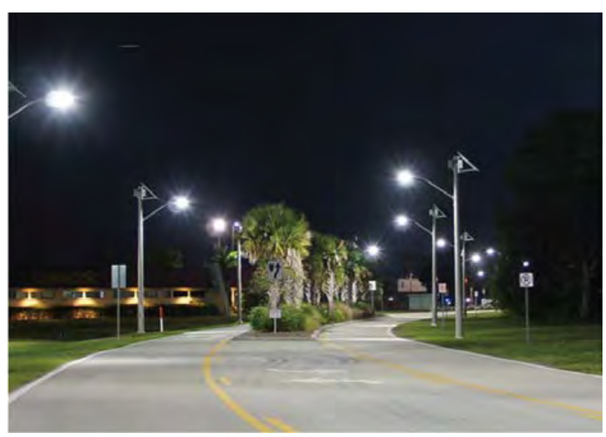


Figure 42. Lighting Recommendation

Figure 43. Curb Ramp Issue

Figure 44. Faded Crosswalk Issue

Figure 45. No Marked Crosswalks Issue

7.0 Pedestrian Crash Countermeasures

The range of potential pedestrian crash countermeasures includes both infrastructure related modifications to the roadway or surrounding environment and behavioral changes from either the pedestrian or the driver. This section provides a brief summary of pedestrian crash countermeasures, with expanded countermeasure details available in **Appendix F**.

Infrastructure Related Countermeasures

- Perpendicular Crosswalk Orientation – realignment of skewed crosswalks to be perpendicular to the vehicle travel direction of the road being crossed.
- Raised Intersections or Raised Crosswalks – provide a vertical deflection for vehicles crossing through a given intersection or crosswalk.
- Leading Pedestrian Interval – at a signalized intersection, provide an extended all red clearance interval at the beginning of each phase where the walk indication will be displayed for pedestrians crossing in the upcoming phase.
- Remove Obstructions or Improve Sight Triangles – remove vegetation or other obstacles that block drivers' vision of pedestrians approaching an intersection, minor street, or driveway.
- Pedestrian-Only Phase – at a signalized intersection, provide a phase where all vehicles are stopped, and all pedestrian crossing movements are indicated to walk.
- Stop Bar Relocation – relocate the indicated vehicle stopping location at a two-way stop-controlled intersection or signalized intersection.
- Install or Upgrade Crosswalk Pavement Markings – at signalized intersections or existing marked crosswalks, provide a marked crosswalk or improve the visibility of an existing marked crosswalk through special emphasis or other high visibility pavement markings.
- Left-Turn Protected-Only Signal Phasing – at signalized intersections, allow for only protected left-turn movements.
- Pedestrian Barrier – a physical barrier or fence provided in the median or between the edge of pavement and sidewalk to deter mid-block pedestrian crossing.
- Marked Mid-Block Crossing – provide a marked crosswalk at a mid-block location or uncontrolled intersection approach, including the possibility of a Z crossing crosswalk orientation.
- Restrict On-Street Parking – restriction of on-street parking near intersections or driveways through signs and/or pavement markings.
- Pedestrian Warning Signs – provide advanced and/or crossing pedestrian warning signs.
- Provide LED Lighting – throughout the corridor or at a specific intersection, provide LED lighting to illuminate pedestrians crossing intersections and/or driveways.
- Lighting Maintenance – replace inoperable luminaries.
- Provide Adequate Drainage – provide adequate drainage at curb ramps or other sidewalk locations so pooled water does not block the pedestrian crossing.

- Traffic Calming – reduce vehicle speeds through a given corridor using a variety of traffic calming methods.
- Spot Medians – provide short medians at targeted locations on roadways that are currently undivided or with a center two-way left-turn lane to help facilitate pedestrian crossings.
- Bulb-Outs or Curb Extensions – extend the curb into the parking lane to reduce pedestrian crossing distances at intersections.
- Pedestrian Activated Warning Device – at mid-block crossing locations, provide a pedestrian activated warning to alert approaching drivers of the pedestrian's crossing (e.g. Rectangular Rapid Flashing Beacon (RRFB)).
- Lane Elimination – removal of a travel lane along a corridor to reduce crossing distances, manage speeds, and create space for other uses (e.g., on-street parking, bicycle lanes, wider sidewalks).
- Pedestrian Overpass or Tunnel – provide a grade separated pedestrian crossing.
- Remove Driveways – consolidate driveway access along a road by providing internal circulation and removing driveways, reducing potential conflict areas between pedestrians and vehicles.
- Reconstruct Driveways – reconstruct the sidewalk across existing driveways to remove steep cross-slopes.
- Right-Turn on Red Restrictions – at signalized intersections, do not allow vehicles to make a right-turn on red movement.
- Remove/Redesign Channelized Right-Turn Lanes – remove channelized or free-flow right-turn lanes, requiring vehicles to come under signal control prior to making the turning movement.
- Alternative Intersections – transform an existing two-way stop-controlled or signalized intersection into an alternative intersection design (roundabout, restricted crossing U-turn, median U-turn, or other) to reduce conflict points.
- Pedestrian Countdown Indicators – at a signalized intersection, provide a visual or audible indication of the time remaining in the flashing don't walk pedestrian phase.
- Roadway Network Enhancements – provide vehicle or pedestrian improvements on the surrounding roadway network to spread out demand and reduce potential conflicts in a specific location(s).
- Sidewalk Connectivity – provide pedestrian connections between the sidewalk and adjacent parcels.
- Sidewalk Continuity – provide sidewalk connections through existing sidewalk gaps.
- Reduce Posted Speed – in combination with speed management design elements, reduce the posted speed through the corridor to lower travel speeds.

Pedestrian Behavior Countermeasures

- Yielding – improve pedestrian yielding to vehicles at intersections or mid-block when they do not have the right-of-way.

- Communicating with Drivers – encourage pedestrians to engage in non-verbal communication with approaching drivers prior to crossing an intersection or driveway.
- Conspicuity – encourage the use of lights, reflectors, and/or brightly colored clothing by pedestrians, especially during dusk/nighttime conditions.
- Walking Facing Traffic – when a sidewalk is not present, encourage pedestrians to walk along the roadway facing oncoming vehicular traffic.

Driver Behavior Countermeasures

- Yielding – educate drivers to yield to pedestrians when they do not have the right-of-way.
- Scanning – educate drivers to attentively look for pedestrians at potential crossing locations.
- Speed – encourage drivers to reduce their travel speed, both through the corridor and while performing turning movements.

8.0 Critical Safety Success Factors

An essential component of the Pedestrian Safety Action Plan is the identification of Critical Safety Success Factors (CSSFs). These factors are the nexuses between the crash type behaviors, environmental factors, and the potential countermeasures. CSSFs are comprised of functions that address the behavioral failures leading to crashes.

Countermeasure Types

Rather than simply defining solutions as tools coming from the disciplines of "engineering, education and enforcement," crash countermeasures in the Bicycle Safety Action Plan are categorized as Behavioral, Design, and Control:

- Behavioral countermeasures are specific behavioral strategies implemented by the road users themselves: motorists, pedestrians, and bicyclists. Effective behavior means not only obeying the rules, but also using defensive driving, walking, and bicycling strategies to counter the mistakes of others.
- Design countermeasures include everything from the planning level (e.g. a dense street grid provides the same capacity with fewer lanes to cross and lower operating speeds) to design speeds, roadway cross sections, intersection design, street lighting, and pedestrian- or bicyclist-specific facilities.
- Control countermeasures include traffic control devices and the laws that prescribe and proscribe road user behaviors.

For maximum effectiveness, Behavioral, Design, and Control countermeasures should be complementary rather than contradictory. This categorization provides a more direct and practical connection between the problems and the solutions, by:

- Identifying *Critical Safety Success Factors* for each crash type;
- Selecting countermeasures that improve the greatest number of Critical Safety Success Factors;
- Maximizing agreement between Behavioral, Design and Control countermeasures;
- Assigning the most effective roles and entities to advance the countermeasures; and
- Identifying priority geographic areas on which to focus the countermeasures.

Critical Safety Success Factors

Critical Safety Success Factors are not countermeasures, but are factors that will be improved by effective countermeasures. The factor groups are Visibility, Predictability, Conflicts, and Speed. Within each group are:

- Visibility Factors – Vantage, Seeing Conditions & Conspicuity
- Predictability Factors – Passive Communication & Active Communication
- Conflicts Factors – Crossing, Turning, Merging & Overtaking/Head-on
- Speed is the sole factor in its group.

These factors apply to both pedestrian and bicyclist crashes and under each factor are specific functions. Examples include position, direction, line of sight, lighting, crossing conflicts, number of lanes, traffic volumes, and perception/reaction/braking distance. Factor Functions under each Factor Group are shown in **Table 6**.

Table 6. Factor Groups, Factors, and Factor Functions

Factor Group	**Visibility**									
Factors	**Vantage**				**Seeing Conditions**			**Conspicuity**		
Factor Functions	Position	Direction	Line of Sight	Blind Spots	Lighting	Weather	Visual Complexity	Lights	Reflectors	Color

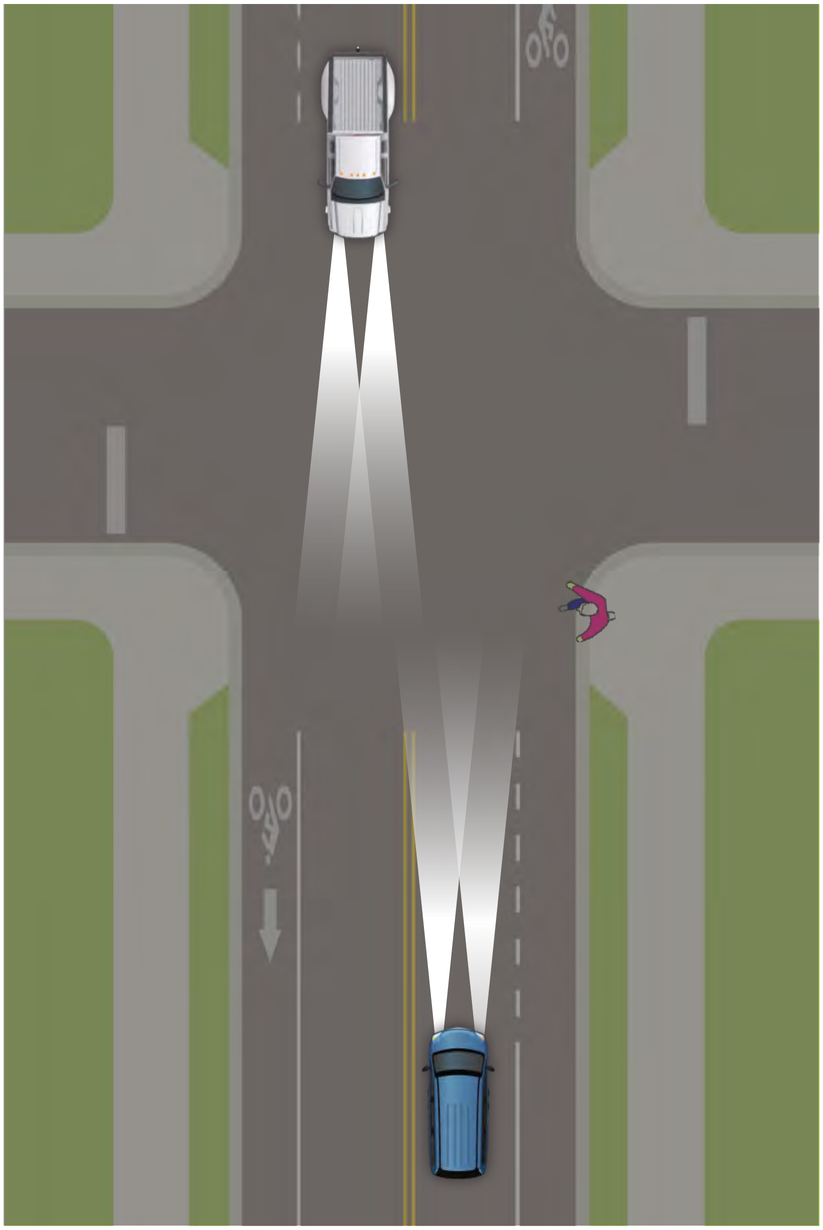
Factor Group	**Predictability**			
Factors	**Passive Communication**			**Active Communication**
Factor Functions	Mode	Position	Direction	Signaling

Factor Group	**Conflicts**						
Factors	**Crossing**		**Turning**				
Factor Functions	Crossing Conflict Points	Traffic Volumes	Turning Conflict Points	Destination Positioning	Direction	Number of Lanes	Traffic Volumes
Factors	**Merging**		**Overtaking/Head-On**				
Factor Functions	Destination Positioning		Width	Position		Number of Lanes	Traffic Volumes

Factor	**Speed**		
Factor Functions	Perception/Reaction/Braking Distance	Turning Speed	Impact Speed

Tying Countermeasures to CSSFs

Assigning countermeasures to crash types entails assessing how each countermeasure improves (or degrades) a CSSF. Countermeasures that positively impact the greatest number of CSSFs and crash types should be the most effective overall. Infrastructure countermeasures will be identified and added to the Project Priority List.



For example, in the illustration on the left, the pedestrian crash type is a Motorist Failure to Yield occurring at night on an unlit road. For the CSSF of Seeing Conditions in the Factor Group Visibility, one of the Factor Functions is Lighting. The Design Countermeasure of Roadway Lighting would improve seeing conditions, and therefor visibility, and reduce the potential for this particular crash type.

The number and severity of this type of crash would contribute to the effectiveness score for the Lighting countermeasure. Similar calculations have been conducted for all of the most common crash types and the various proposed countermeasures.

CSSFs can be used to assess the impact of each countermeasure, related to how each countermeasure improves (or degrades) a CSSF. Countermeasures that positively impact the greatest number of CSSFs have the potential to be among the most effective due to their broad impact potential. **Table 7** through **Table 10** provides a "menu" of various countermeasures their relationship to the various factor groups/functions.

Table 7. "Menu" of Countermeasures Relating to Visibility Factors

Factors		**Vantage**				**Seeing Conditions**			**Conspicuity**		
Factor Functions		Position	Direction	Line of Sight	Blind Spots	Lighting	Weather	Visual Complexity	Lights	Reflectors	Color
Pedestrian Infrastructure	Pedestrian barrier	X		X	X			X			
	Raised intersection / crossing	X		X							
	Marked mid-block crossing (includes Z-crossing)	X	X	X		X		X			
	Leading pedestrian interval			X							
	Improve sight triangles			X	X			X			
	Stop bar relocation			X							
	Restrict on-street parking			X	X			X			
	Lighting					X					
	Drainage improvements						X				
	Pedestrian warning signage							X			
	Spot medians							X			
	Traffic calming							X			
Pedestrian Behavior	Lights, reflectors, clothing								X	X	X

Table 8. "Menu" of Countermeasures Relating to Predictability Factors

Factors		Passive Communication			Active Communication
Factor Functions		Mode	Position	Direction	Signaling
Pedestrian Infrastructure	Marked mid-block crossing (includes Z-crossing)	X	X		
	Pedestrian warning signage	X			
	Pedestrian activated warning device	X			
Pedestrian Behavior	Communicating with drivers				X
Driver Behavior	Yielding				X

Table 9. "Menu" of Countermeasures Relating to Conflict Factors

Factors		**Crossing**		**Turning**					**Merging**	**Overtaking/Head-On**			
Factor Functions		Crossing Conflict Points	Traffic Volumes	Turning Conflict Points	Destination Positioning	Direction	Number of Lanes	Traffic Volumes	Destination Positioning	Width	Position	Number of Lanes	Traffic Volumes
Pedestrian Infrastructure	Pedestrian barrier	X											
	Raised intersection / crossing			X									
	Marked mid-block crossing (includes Z-crossing)	X											
	Leading pedestrian interval			X									
	Improve sight triangles			X									
	Pedestrian only phasing			X									
	Stop bar relocation			X									
	Restrict on-street parking			X									
	Pedestrian warning signage	X		X									
	Spot medians	X	X				X						

Table 9 Cont. "Menu" of Countermeasures Relating to Conflict Factors

Factors		**Crossing**		**Turning**					**Merging**	**Overtaking/Head-On**			
Factor Functions		Crossing Conflict Points	Traffic Volumes	Turning Conflict Points	Destination Positioning	Direction	Number of Lanes	Traffic Volumes	Destination Positioning	Width	Position	Number of Lanes	Traffic Volumes
Pedestrian Infrastructure	Pedestrian activated warning device	X											
	Lane elimination	X	X	X			X	X					
	Pedestrian overpass / tunnel	X		X									
	Install / upgrade crosswalk markings			X									
	Protected signal phasing			X									
	Reconstruct / remove driveways			X									
	Right-turn on red restrictions			X									
	Remove channelized right-turn			X		X							
	Alternative intersections			X			X						

Table 9 Cont. "Menu" of Countermeasures Relating to Conflict Factors

Factors		**Crossing**		**Turning**					**Merging**	**Overtaking/Head-On**			
Factor Functions		Crossing Conflict Points	Traffic Volumes	Turning Conflict Points	Destination Positioning	Direction	Number of Lanes	Traffic Volumes	Destination Positioning	Width	Position	Number of Lanes	Traffic Volumes
Pedestrian Infrastructure	Pedestrian countdown signals			X									
	Roadway network enhancements	X	X					X					
	Sidewalk connectivity										X		
	Reduce posted speed	X											
Pedestrian Behavior	Yielding	X		X									
	Communicating with drivers	X		X									
	Walk facing traffic										X		
Driver Behavior	Yielding	X		X									
	Scanning	X		X									

Table 10. "Menu" of Countermeasures Relating to Speed Factors

Factors		**Speed**		
Factor Functions		Perception/Reaction/Braking Distance	Turning Speed	Impact Speed
Pedestrian Infrastructure	Raised intersection / crossing		X	X
	Stop bar relocation		X	
	Pedestrian warning signage	X	X	
	Lighting	X		X
	Lighting maintenance	X		X
	Traffic calming	X	X	X
	Pedestrian activated warning device	X		
	Lane elimination	X	X	X
	Pedestrian overpass / tunnel	X	X	X
	Install / upgrade crosswalk markings		X	
	Protected signal phasing		X	
	Reconstruct / remove driveways		X	
	Remove channelized right-turn		X	
	Roadway network enhancements	X	X	X
	Reduce posted speed	X	X	X
Pedestrian Behavior	Yielding	X		X
Driver Behavior	Scanning	X		X
	Speed	X	X	X

CSSF Countermeasure Scoring

To estimate the influence of each pedestrian crash countermeasure, a scoring system was developed to quantify the impact potential of each countermeasure. The scoring system is based on the crash types influenced by each countermeasure and the observed frequency and severity of crashes for each affected crash type within the study area. Crash severity was weighted using the equivalent property damage only (EPDO) scale, using FDOT crash costs specified in the 2019 FDOT Design Manual (section 122.6.1) and shown in **Table 4**.

Each countermeasure impacts different factor groups and factor functions within the CSSF matrix. A single countermeasure can impact multiple areas and the impact to each factor can either be positive (contributing to a reduction in crashes) or negative (contributing to an increase in crashes).

For example, the countermeasure for pedestrian behavior – yielding affects the factor groups of conflict and speed. Within the conflict factor group, the related factor functions are crossing conflict points and turning conflict points. The related crash type is crashes where the pedestrian has been identified as failing to yield. Within the speed factor group, the related factor functions are perception-reaction braking distance and impact speed. The related crash types are crashes where the speed was 35 mph or greater, the pedestrian is identified as failing to yield, the location is mid-block or at a signalized intersection, and the vehicle is not turning. The number of observed crashes fitting these crash types, and the resulting EPDO crashes are displayed in **Table 11** and **Table 12**.

Table 11. Conflicts Example Score

Factor Group: Conflicts			
Crash Severity	**EPDO Weight**	**Observed Crashes**	**EPDO Crashes**
PDO	1	66	66
Possible Injury	13	364	4,732
Non-Incapacitating Injury	21	545	11,445
Incapacitating Injury	79	452	35,708
Fatality	1,389	221	306,969
		Total	358,920

Note: Observed crashes for the Conflicts Factor Group include pedestrian failure to yield.

Table 12. Speed Example Score

Factor Group: Speed			
Crash Severity	**EPDO Weight**	**Observed Crashes**	**EPDO Crashes**
PDO	1	43	43
Possible Injury	13	229	2,977
Non-Incapacitating Injury	21	329	6,909
Incapacitating Injury	79	298	23,542
Fatality	1,389	173	240,297
		Total	273,768

Note: Observed crashes for the Speed Factor Group include crashes where the speed was 35 mph or greater, the pedestrian is identified as failing to yield, the location is mid-block or signalized intersection, and the vehicle is not making a turning movement.

Continuing the pedestrian behavior – yielding example, the resulting total EPDO number of crashes for each of the affected factor groups are combined and then divided by 1,000 to yield the resulting total score of 633. The resulting sum of the factor group EPDO scores are divided by 1,000 in order to make the resulting score more manageable in comparing results across each countermeasure. These score calculations steps are illustrated in **Table 13**.

Table 13. Countermeasure Example Score Calculation

Pedestrian Behavior - Yielding	
Factor Group	**Score**
Visibility	0
Predictability	0
Conflicts	358,920
Speed	273,768
Total	632,688
	Divide by 1,000
Countermeasure Score	633

Countermeasure scores were calculated for 19 of the 37 pedestrian crash countermeasures. Scores for the remaining countermeasures were unable to be calculated due to the countermeasure related crash types being dependent on the specific application site, such as stop bar relocation, alternative intersections, or installing/upgrading crosswalk markings. Total scores for all available pedestrian countermeasure calculations are displayed in **Table 14**.

Countermeasures with the highest total scores are highlighted in **Table 14**. These highest-ranking pedestrian countermeasures include reducing posted speed, nighttime speed reduction, lighting, pedestrian yielding, motorist yielding, motorist scanning, and motorist speed. These countermeasures with the highest total scores represent the countermeasures with the opportunity to have the greatest influence on observed crashes. These scores present a method of evaluating the relative opportunity potential for each countermeasure relative to each other, but do not address the potential effectiveness of a given countermeasure.

Table 14. Countermeasure Scores

Pedestrian Countermeasure		**Visibility Score**	**Predictability Score**	**Conflicts Score**	**Speed Score**	**Total Score**
Pedestrian Infrastructure	Pedestrian barrier	22	0	22	0	**45**
	Raised crossing	3	0	3	9	**15**
	Leading pedestrian interval	15	0	15	0	**30**
	Pedestrian only phase	0	0	12	0	**12**
	Sidewalk connectivity	0	0	39	0	**39**
	Mid-block crossing <40 mph	21	21	0	0	**41**
	Mid-block crossing 40+ mph	0	163	0	-163	**0**
	Improve sight triangles	11	0	0	0	**11**
	Reduce posted speed	0	0	0	325	**325**
	Night-time speed reduction	0	0	0	273	**273**
	Lighting	223	0	0	194	**417**
	Traffic calming	33	0	0	33	**67**
Pedestrian Behavior	Yielding	0	0	359	274	**633**
	Communicating with drivers	0	14	14	0	**28**
	Lights, reflectors, clothing	68	0	0	0	**68**
	Walk facing traffic	0	0	32	0	**32**
Motorist Behavior	Yielding	0	90	90	0	**181**
	Scanning	0	0	148	128	**276**
	Speed	0	0	0	480	**480**

9.0 Summary and Next Steps

Summary

This Pedestrian Safety Action Plan was developed in order to catalog behaviors and roadway characteristics that contribute to pedestrian crashes in the Metro Orlando area, develop a process for identifying the most promising crash countermeasures, and analyze nine road corridors with a high number of and high severity of pedestrian crashes. With contributions from the Project Working Group and based on top (number and severity) segment and intersection crash locations (Osceola County and Seminole County) or upcoming projects (Orange County), the nine corridors that were selected for detailed field review were as follows:

- Michigan Avenue from US 192 to Donegan Avenue in Kissimmee (Osceola County);
- US 192 from Siesta Lago Drive to Old Vineland Road in Kissimmee (Osceola County);
- Michigan Avenue from Michigan Avenue Elementary School to 8th Street in St. Cloud (Osceola County);
- Red Bug Lake Road from Dodd Road to Tuskawilla Road and Tuskawilla Road from Willa Springs Drive to Red Bug Lake Road in Winter Springs (Seminole County);
- Lake Mary Boulevard from Rinehart Road to North 7th Street in Lake Mary (Seminole County);
- SR 434 from McCulloch Road to Remington Drive in Oviedo (Seminole County);
- Pershing Avenue from Dixie Bell Drive to Goldenrod Road in Orlando (Orange County);
- Michigan Street from the Railroad Crossing to Mills Avenue in Orlando (Orange County); and
- Washington Street from John Young Parkway to Orange Blossom Trail in Orlando (Orange County).

A review of historical crash trends for the study area showed that total pedestrian crashes were increasing from 2011 through 2015, with a decrease in 2016 before increasing again in 2017. Pedestrian crashes were more common during the weekdays and showed small peaks during morning and afternoon peak commuting hours. Fatal and severe pedestrian crashes were more prominent at night, and they occurred on both lit and unlit roadways. Orange County experience more pedestrian crashes than Osceola County or Seminole County, even after comparing on a per population basis.

A review of crash types and causes found that the most prevalent pedestrian crash type involved a pedestrian crossing the roadway being struck by a non-turning vehicle (29 percent of all crashes and 49 percent of fatal crashes). Among these crashes, 36 percent occurred at an intersection. When considering crashes involving vehicles completing a turning movement at an intersection, left-turns resulted in more crashes than right-turns, and pedestrians traveling parallel to the approaching vehicle were involved in more crashes than pedestrians traveling perpendicular to the vehicle. Twenty-three percent of all pedestrian crashes were hit and run crashes. Data for crashes involving distracted driving and play vehicles was not large enough to draw meaningful conclusions, but should continue to be monitored in future years.

The countermeasures identified through the CSSF countermeasure scoring process with the opportunity to have the greatest influence on observed crashes are shown in **Table 15**.

Table 15. Highest Scoring Pedestrian Countermeasures

Pedestrian Countermeasure		Visibility Score	Predictability Score	Conflicts Score	Speed Score	Total Score
Pedestrian Infrastructure	Reduce posted speed	0	0	0	325	**325**
	Night-time speed reduction	0	0	0	273	**273**
	Lighting	223	0	0	194	**417**
Pedestrian Behavior	Yielding	0	0	359	274	**633**
Motorist Behavior	Yielding	0	90	90	0	**181**
	Scanning	0	0	148	128	**276**
	Speed	0	0	0	480	**480**

Next Steps

The next steps to improve pedestrian safety in the MetroPlan Orlando region are to produce implementation plans for the key behavioral, design, and control countermeasures that are identified in the Pedestrian Safety Action Plan.

Behavioral Countermeasures

Based on input from professionals in behavioral change, local law enforcement, local government staff, non-governmental partners, and the general public, the Behavioral Countermeasure plan should identify key messages and message distribution strategies to encourage the motorist, pedestrian, and bicyclist behaviors most likely to reduce crashes.

Design Countermeasures

Based on field reviews and other data collected in this Pedestrian Safety Action Plan, the Design Countermeasures plan should identify locations for infrastructure design changes most likely to reduce crashes. Such countermeasures should be focused on the corridors studied in the Pedestrian Safety Action Plan, and other locations where crash history, crash typology and environmental factors indicate the likelihood of effectiveness. For the corridors identified in this Pedestrian Safety Action Plan, detailed proposals for safety infrastructure projects should be developed.

Control Countermeasures

The Control Countermeasures plan should develop strategies for evaluating current operating speeds and identifying practicable speed-related countermeasures on high severity corridors, where operating speeds and darkness contribute most to pedestrian and bicyclist fatalities and serious injuries. The project should explore the potential for use of the USLIMITS2 speed-setting process developed by the Federal Highway Administration, and the use of reduced night-time speed limits, and make recommendations for implementation of those countermeasures.

Public Crash Type Map

In order to inform and educate the public on the true nature of pedestrian and bicyclist crashes, future projects should develop an interactive web-based map to illustrate not only the locations of crashes, but also the behaviors, environmental factors, severity, and demographics associated with the crashes. Those causal factors have already been associated with the most effective countermeasures through the Critical Safety Success Factors process described in this Pedestrian Safety Action Plan, so effective countermeasures for each crash can also be illustrated within this mapping interface.

APPENDIX A: WORKING GROUP MEETING NOTES AND PROJECT PRESENTATIONS

Meeting Notes

Pedestrian/Bicycle Safety Action Plans

Working Group Kick-Off Meeting

6/12/18; 9:30 – 11:00 AM

MetroPlan Orlando Office – David L. Grovdahl Board Room

A Kick-Off Meeting was held with the Working Group to discuss the project overview and schedule, historical crash analysis, Critical Safety Success Factors, and next steps. The presentation materials can be found attached to these meeting notes. Below are the attendees of this meeting:

- Mighk Wilson – MetroPlan Orlando
- Brian Sanders – Orange County
- Doug Robinson – LYNX
- Frank Consoli – Seminole County
- Glen Hammer – Osceola County Public Schools
- Ian Sikonia – City of Orlando
- Jamie Boerger – Orange County Public Schools
- Justin Eason – Osceola County
- Kelly Brock – City of Casselberry
- Randy Schrader – City of Kissimmee
- Susan Hutson – University of Central Florida
- PJ Smith – East Central Florida Regional Planning Council
- Dan Stephens – Community Advisory Committee
- Lisa Portelli – Community Advisory Committee/Bike-Walk Central Florida
- RJ Mueller – Community Advisory Committee
- Ryan Cunningham – Kittelson & Associates, Inc.
- Phillip Haas – Kittelson & Associates, Inc.
- Travis Hills – Kittelson & Associates, Inc.

The following are the comments, general notes, and questions from the Working Group Kick-Off Meeting:

- On-going related projects
  - City of Kissimmee is currently updating their pedestrian/bicycle/trails master plan
  - City of Orlando is currently developing a bike master plan
  - Orange County is currently developing a pedestrian/bicycle safety action plan
- General project comments and questions
  - Bicyclist/Pedestrian Safety Action Plans will have overall 3-county focus
  - Will there be cost estimates or money tied to identified countermeasures?

    - This is not anticipated to be done as part of the project

- Crash data analysis
  - 2016 Signal Four data is missing data – resulting in lower pedestrian/bicyclist crashes for 2016
  - How do our crash statistics compare to other MPOs?
    - The Project Team has not looked into this
  - How does percentage of bicyclists commuting to work vary by county and time?
    - About 0.5% for the region, no upward trend recently
  - How does alcohol involvement relate to fatal crashes?
    - The Project Team will look into how many alcohol involved crashes resulted in a fatality
  - Driver distraction data would be improved if a police officer could immediately know if a driver was using their phone at the time of a crash
    - If phone use was verifiable/monitored it would be a deterrent to use
  - The Project Team will review age crash distribution normalized for population
  - The Project Team will review skateboard and other “toy” vehicle crashes
  - Mr. Wilson will provide illustrations to explain crash typing [completed]
- Next steps
  - Identify high crash locations
    - Top 3 corridors/areas in each county, with 2 suggested alternatives
    - To be reviewed by Working Group members
  - Survey questions for bicyclists and pedestrians
    - Do bicycle riders have working lights on their bikes?
    - How many have been involved in crashes that were not reported to the police?

These meeting minutes are Travis Hills’ interpretation of the comments, requests, and discussion during the meeting. Questions, additions, and/or clarifications should be directed to him at 407-540-0555 or thills@kittelson.com.

Name	Response
Mighk Wilson	None
Brian Sanders	None
Dan Stephens	None
Doug Robinson	None
Frank Consoli	None
Glen Hammer	None
Ian Sikonia	Accepted
Jamie Boerger	Accepted
Justin T Eason	None
Kelly Brock	Accepted
Lisa Portelli	Accepted
Mike Rigby	None
'pjsmith@ecfrpc.org'	Accepted
Randy Schrader	Accepted
RJ Mueller	None
Sara Elbadri	Accepted
Shelby Villatoro (shelby@bik	Accepted
Susan Hutson	Accepted
Travis Hills	Accepted
Glen Hammer	Accepted
Nick Lepp	Accepted
MuellerMart.com	Accepted
Phillip Haas	Accepted
Ryan Cunningham	Accepted
Carl Kelly	Declined

43 46%
22 24%
23 25%
93

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A REGIONAL TRANSPORTATION PARTNERSHIP

PEDESTRIAN AND BICYCLIST SAFETY ACTION PLANS | METROPLAN ORLANDO

Working Group Kick-Off Meeting | June 12, 2018

1

Agenda

- Project Overview + Schedule
- Historical Crash Analysis
- Critical Safety Success Factors
- Next Steps

2

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Project Overview

Study Area

MetroPlan Orlando: Orange, Osceola, and Seminole Counties

Primary Goal

Develop safety action plans to improve safety for pedestrians and bicyclists by linking countermeasures to crash types through Critical Safety Success Factors (CSSF)

4

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Project Overview

General Approach to Reach Goal

- Perform historical crash analysis
- Crash typing and cause profiling
- Critical Safety Success Factors evaluation and countermeasure identification
- Perform safety field reviews at high crash locations
- Verify systemic countermeasures
- Develop Action Plans

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Project Overview

Role of Working Group

- Provide guidance and input
  - Verifying Critical Safety Success Factors
  - Brainstorming on behavioral change countermeasures
  - Assess countermeasure viability and effectiveness
  - Two additional working group meetings
- Safety field review
- Review of Action Plans

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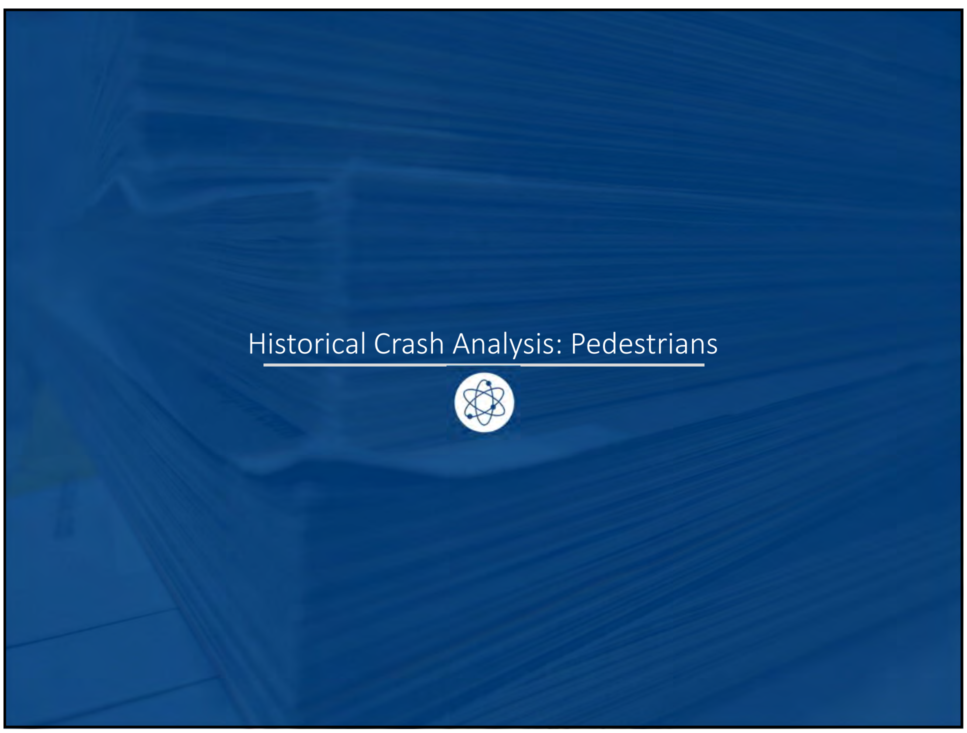

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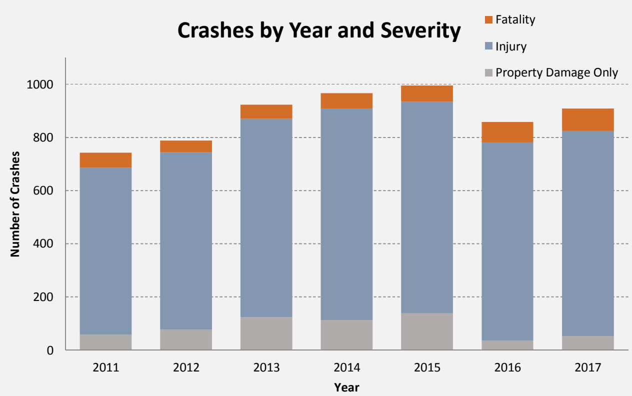
Pedestrian Crash Summary: 2011 – 2017



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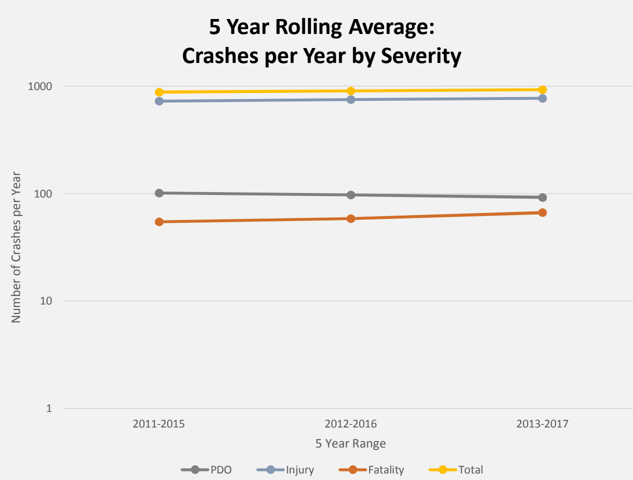
Pedestrian Crash Summary: 2011 – 2017



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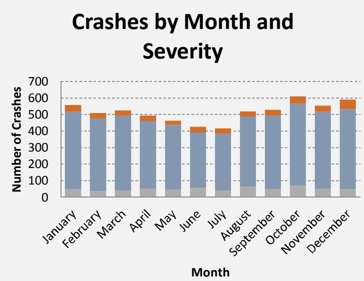
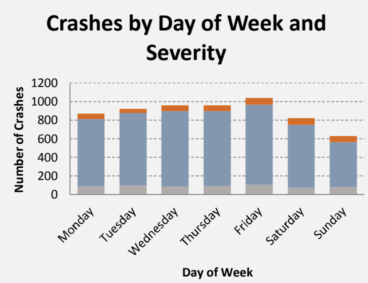
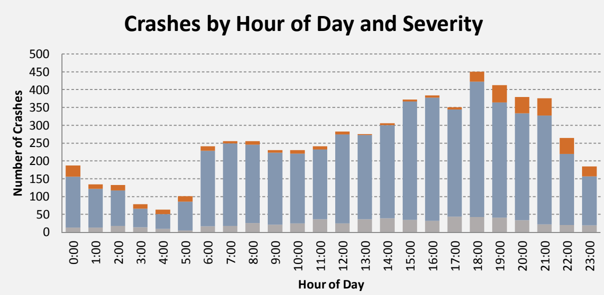
Pedestrian Crash Summary: 2011 – 2017







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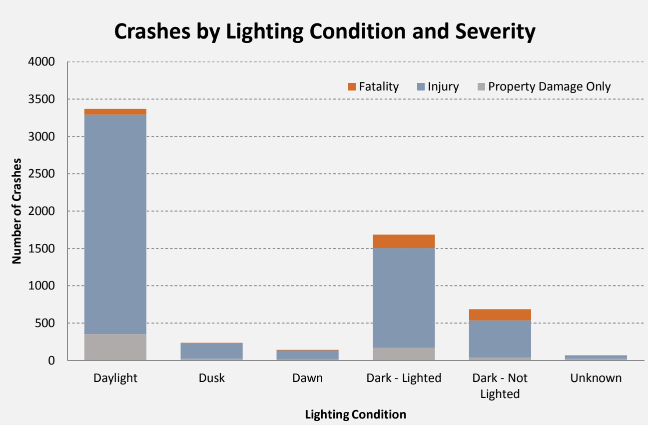
Pedestrian Crash Summary: 2011 – 2017



55% Daylight Crashes: 2% fatal
45% Non-daylight Crashes: 13% fatal

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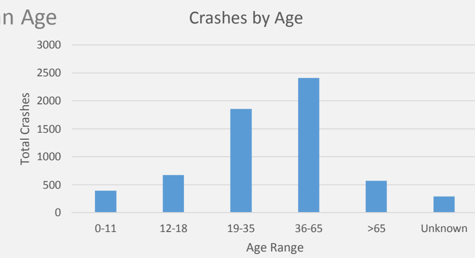
Pedestrian Crash Summary: 2011 – 2017

- Alcohol & Drugs
  - Police Report: 6.9% alcohol and/or drugs involved (5.4% alcohol)
  - Testing Results: 2.9% alcohol involved (17% Driver, 84% ped)
- Hit & Run: 23%
- Surface Condition
  - 10% non-dry conditions
- Pedestrian Age



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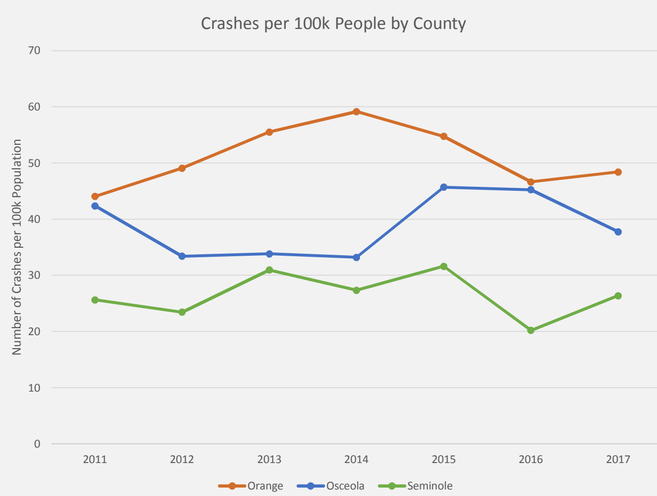
Pedestrian Crash Summary: 2011 – 2017



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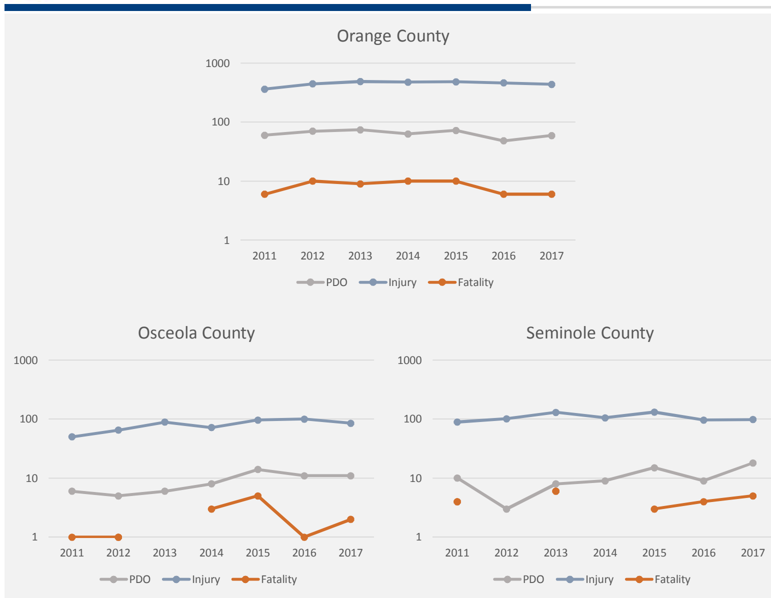
Pedestrian Crash Summary: 2011 – 2017



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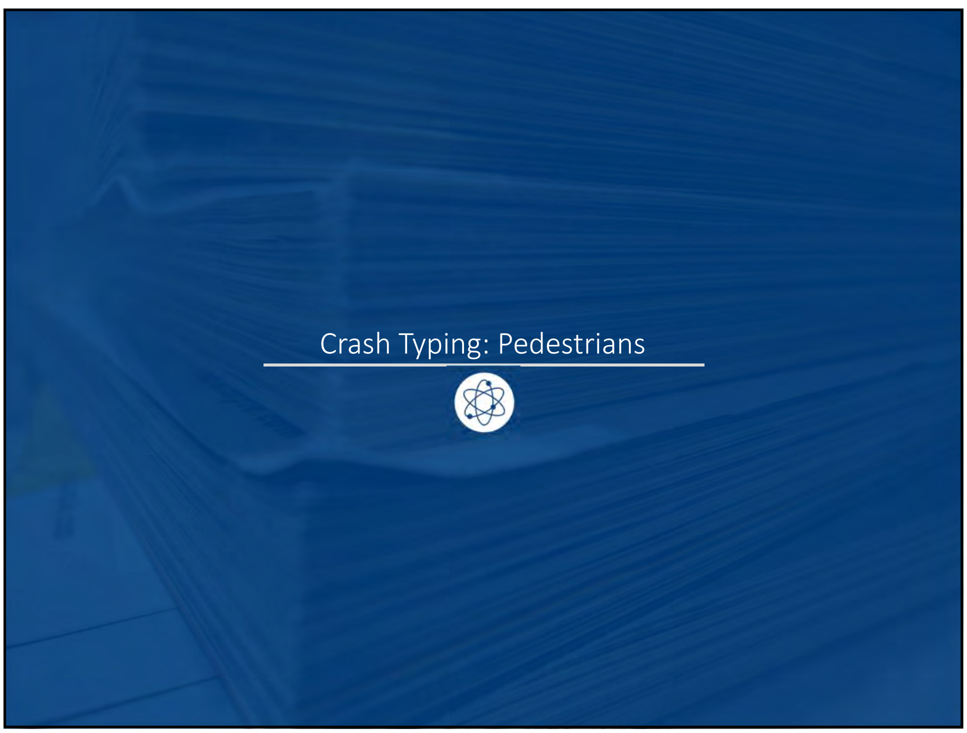

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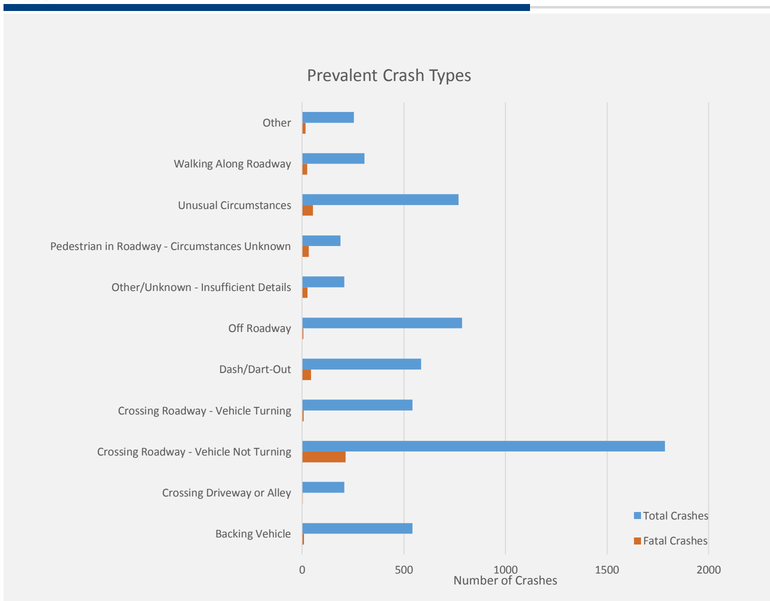
Pedestrian Crash Typing



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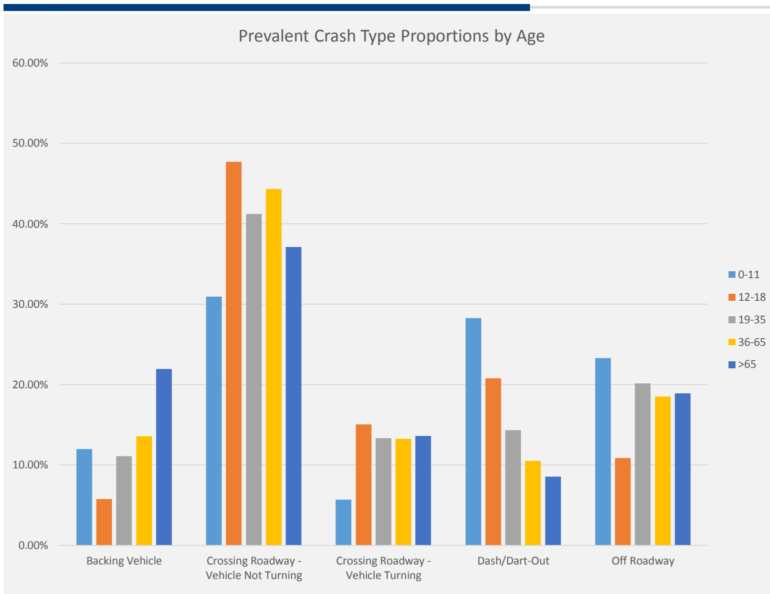
Pedestrian Crash Typing



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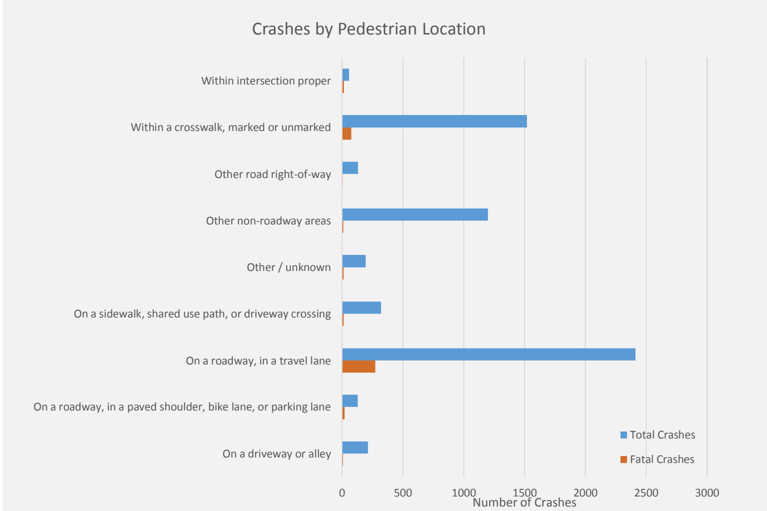
Pedestrian Crash Typing



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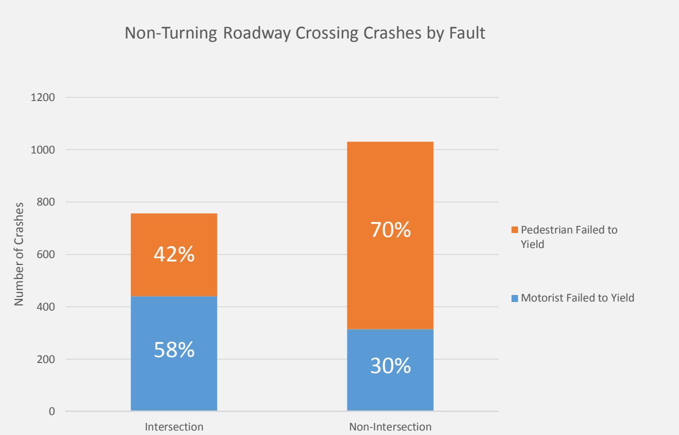
Pedestrian Crash Typing



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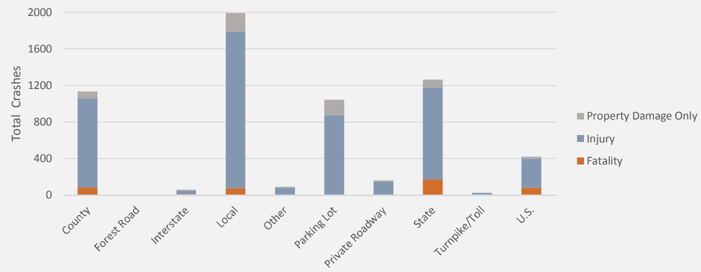
Pedestrian Crash Typing

- Distraction: 11% distracted
  - 76% of distraction is "Inattentive"
- Hit and Run: 23%
- Facility Type: 17% parking lot, 3% private road



- Intersection & intersection-related: 33%

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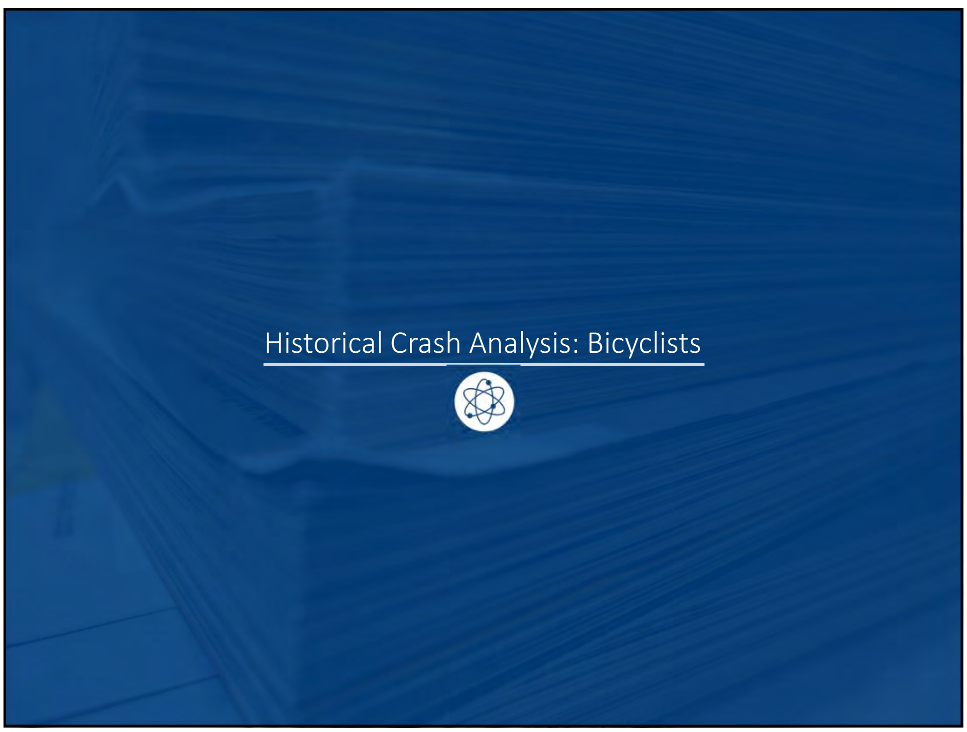

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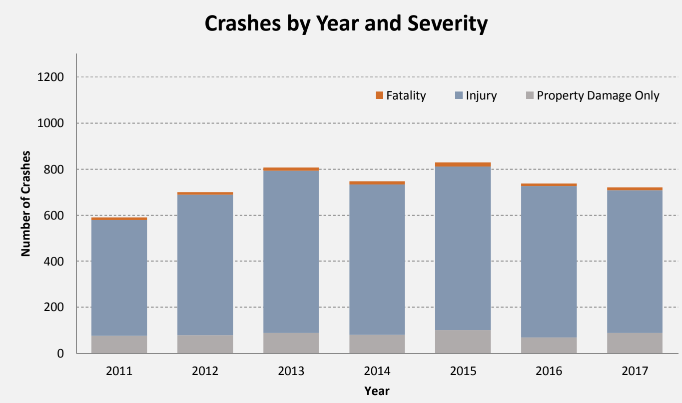
Bicyclist Crash Summary: 2011 – 2017



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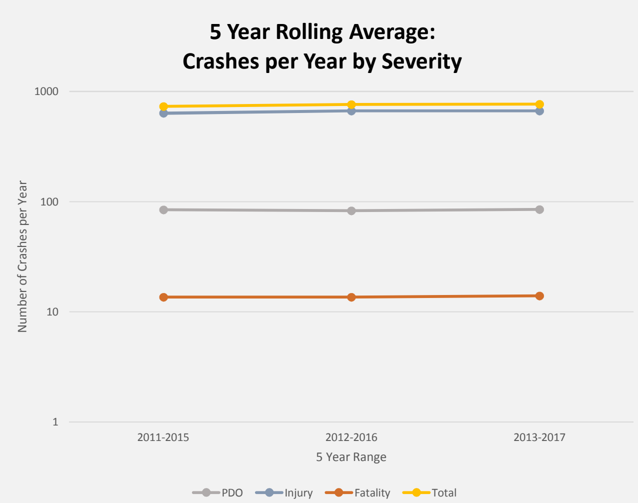
Bicyclist Crash Summary: 2011 – 2017



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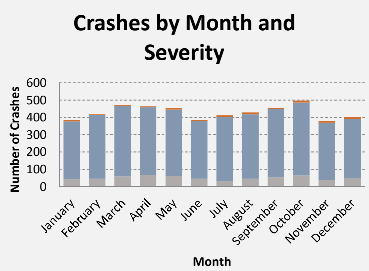
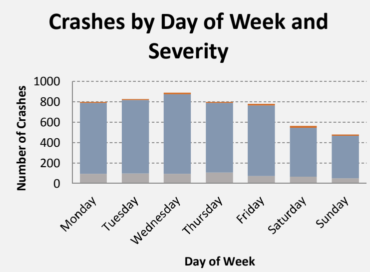
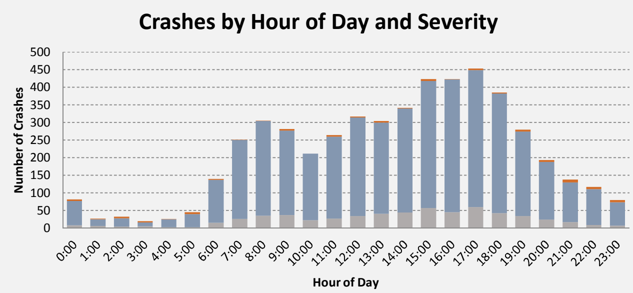
Bicyclist Crash Summary: 2011 – 2017







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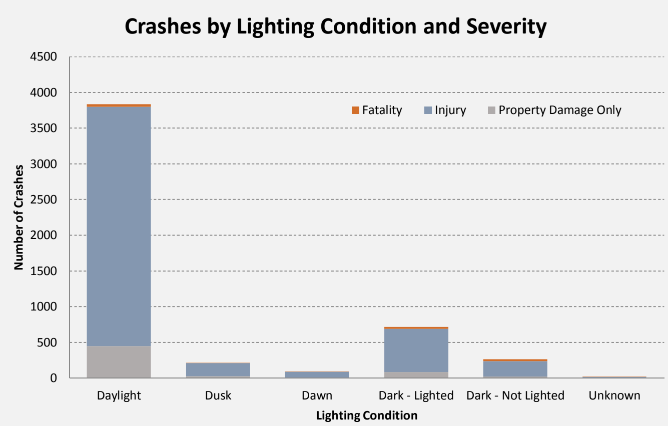
Bicyclist Crash Summary: 2011 – 2017



75% Daylight Crashes: 0.9% fatal
25% Non-daylight Crashes: 4.4% fatal

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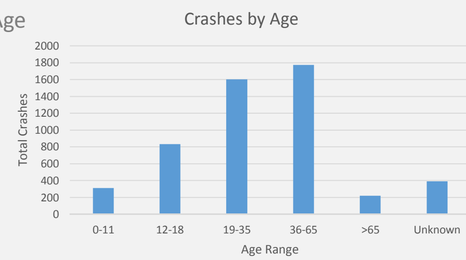
Bicyclist Crash Summary: 2011 – 2017

- Alcohol & Drugs
  - Police Report: 2.7% alcohol and/or drugs involved (2.4% alcohol)
  - Testing Results: 0.7% alcohol involved (35% Driver, 73% bike)
- Hit and Run: 18%
- Surface Condition
  - 6.5% non-dry conditions
- Bicyclist Age



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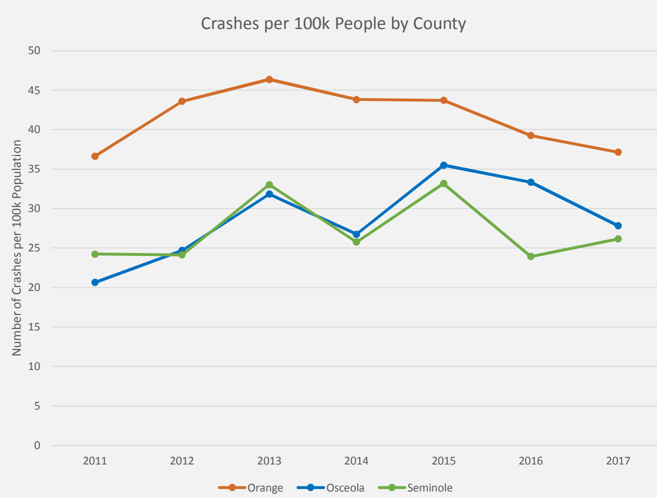
Bicyclist Crash Summary: 2011 – 2017



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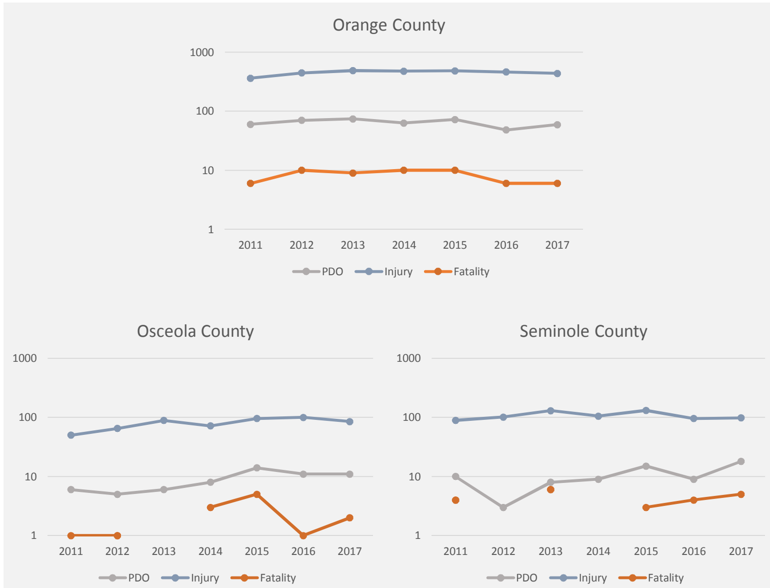
Bicyclist Crash Summary: 2011 – 2017



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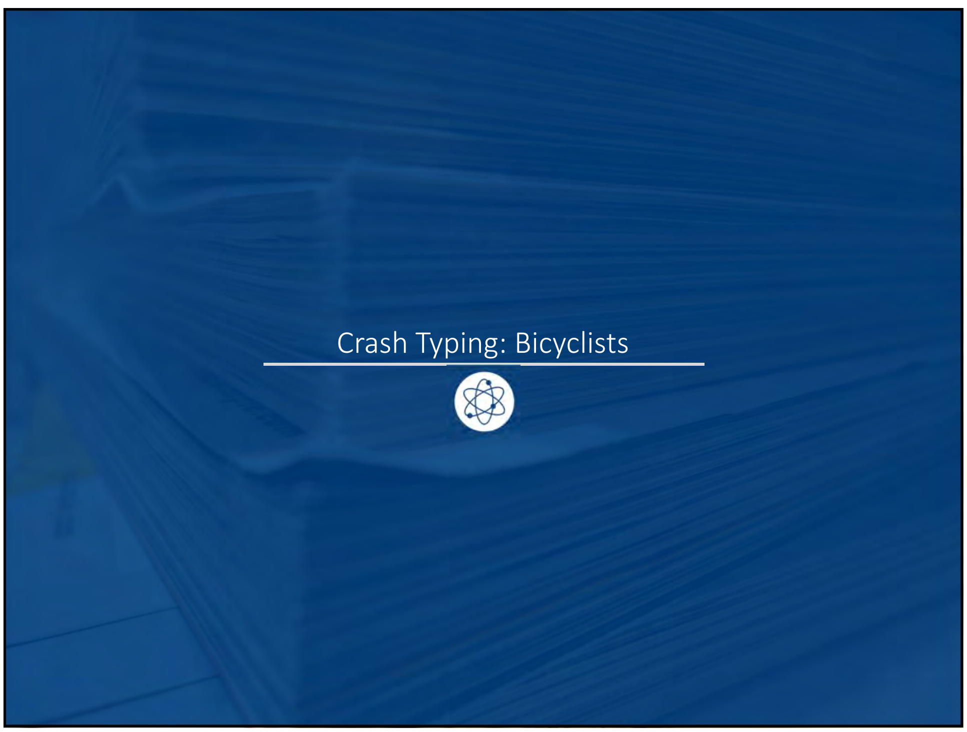

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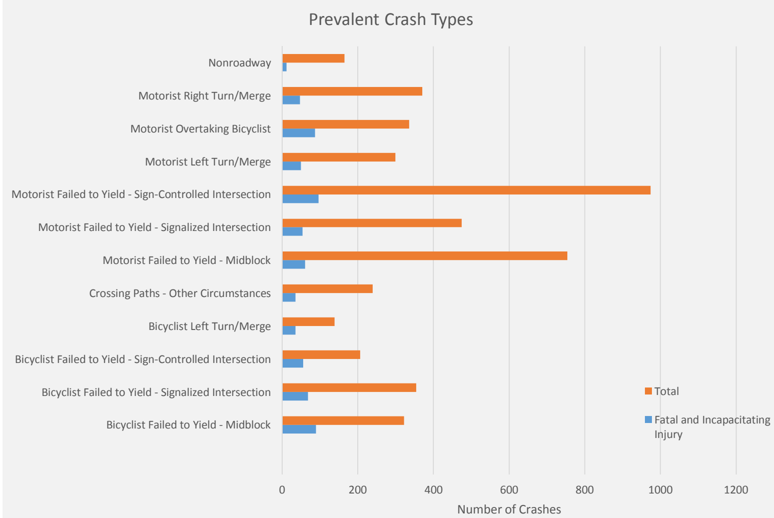
Bicyclist Crash Typing



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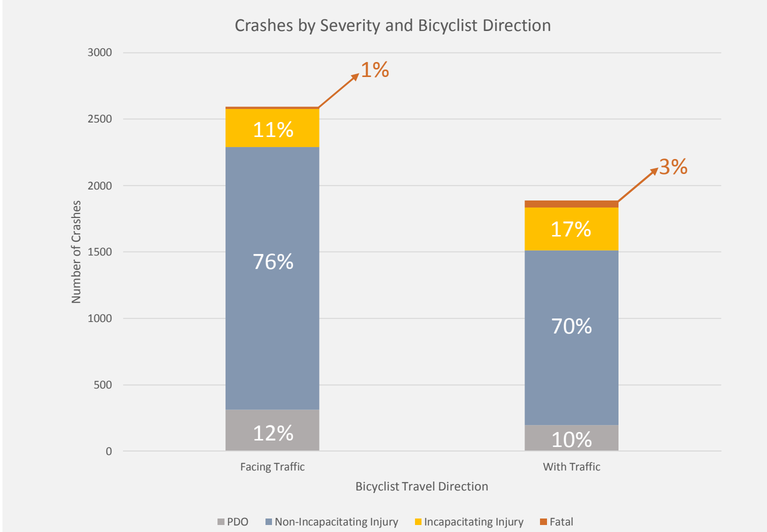
Bicyclist Crash Typing



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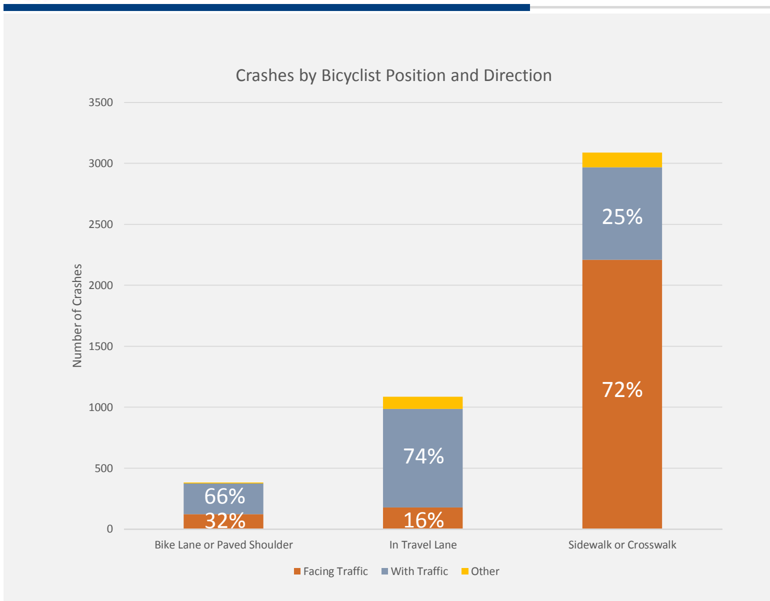
Bicyclist Crash Typing



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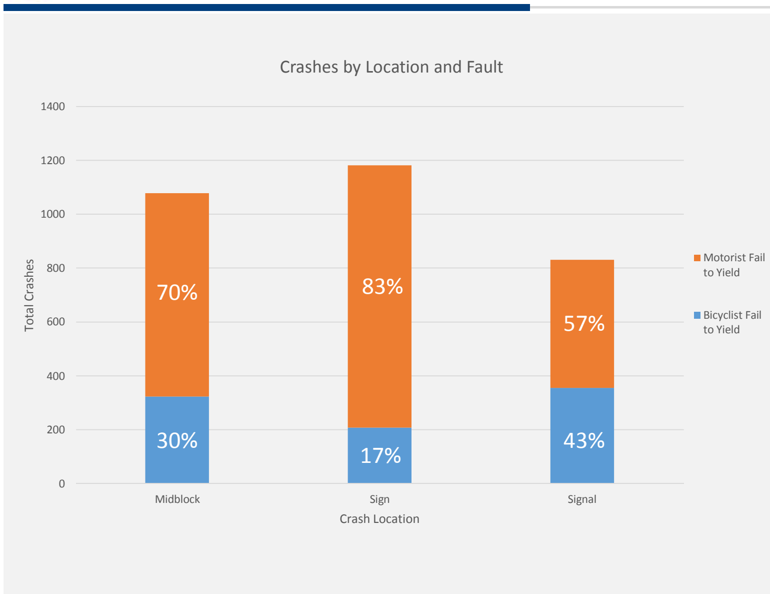
Bicyclist Crash Typing



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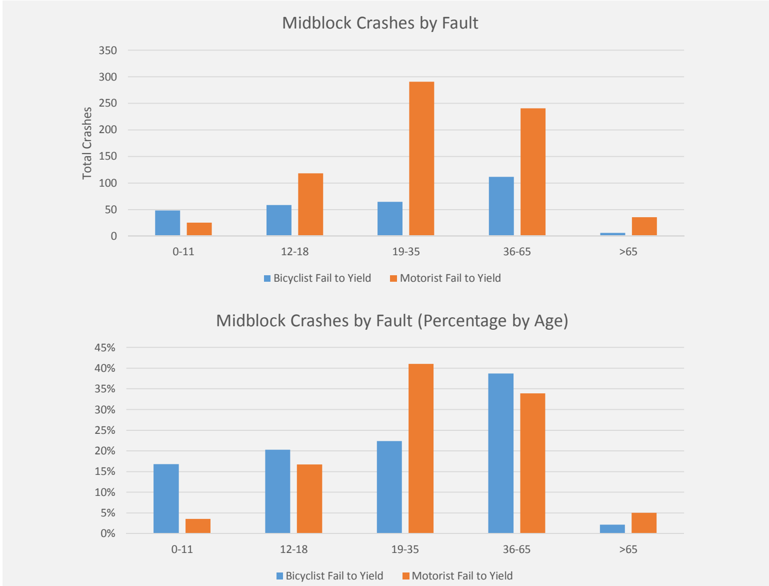
Bicyclist Crash Typing



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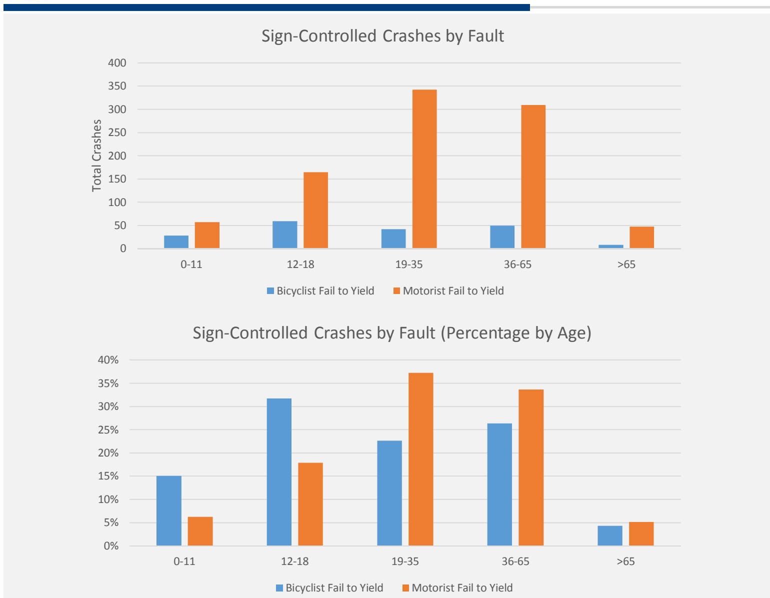
Bicyclist Crash Typing



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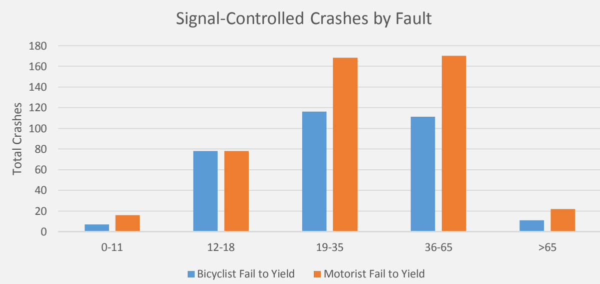
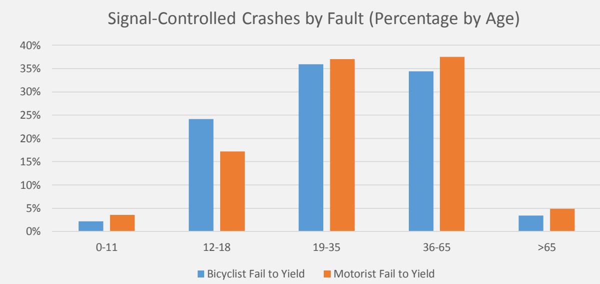
Bicyclist Crash Typing





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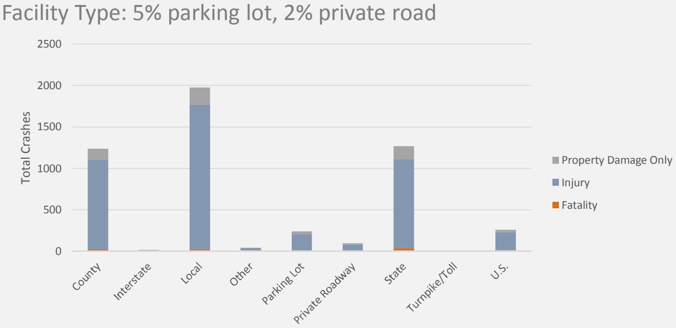
Bicyclist Crash Typing

- Electronic Bicycles: 0.6% (max of 1.5% in 2017)
- Distraction: 13% distracted
  - 86% of distraction is "Inattentive"
- Facility Type: 5% parking lot, 2% private road



- Intersection & intersection-related: 46%

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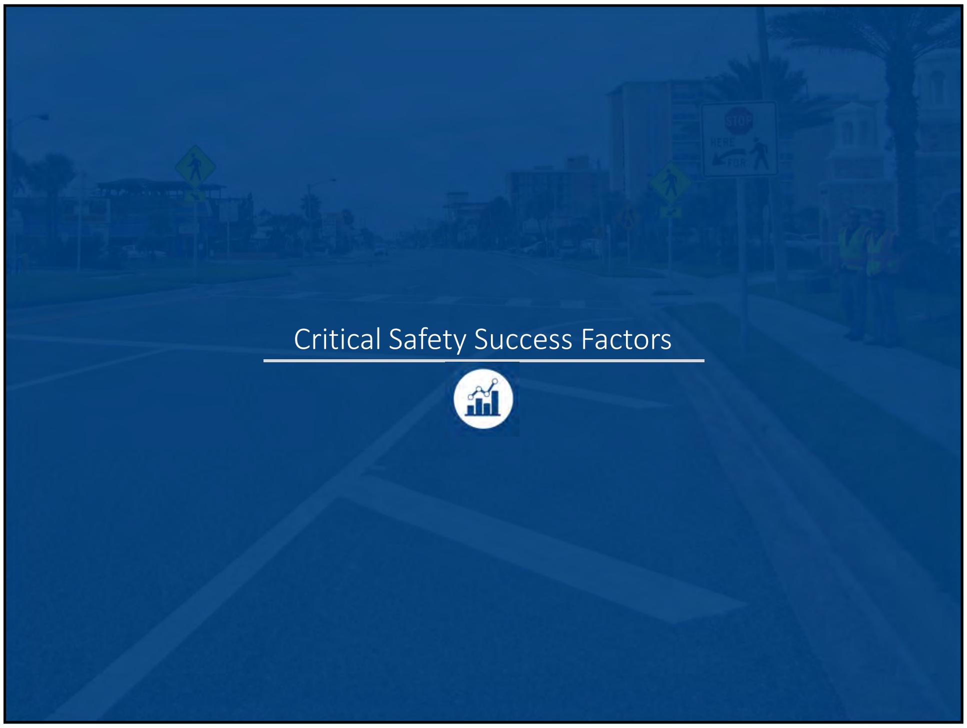

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Vetting Critical Success Safety Factors

Goals of CSSF Task

Determine if proposed countermeasures improve or degrade Factor Functions

- Verify applicable countermeasure types for each Factor Function
- Develop specific countermeasure treatments for each countermeasure example
- Tie countermeasure examples to Factor Functions
- Measure and evaluate each Factor Function
  - Crash data and crash typing
  - User surveys

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Critical Safety Success Factors

	Critical Safety Success Factors													
Factor Groups	Visibility										Predictability			
Factors	Vantage				Seeing Conditions			Conspicuity			Passive Communication			Active Communication
Factor Functions	Position	Direction	Line of Sight	Blind Spots	Lighting	Weather	Visual Complexity	Lights	Reflectors	Color	Mode	Position	Direction	Signaling
	Crash Types and Contributing Factors													
	Do Proposed Countermeasures or Changes Improve or Degrade Critical Safety Success Factor Functions?													
Applicable Countermeasure Types	Behavior	Behavior	Behavior	Behavior	Design	Behavior	Design	Behavior	Behavior	Behavior	Behavior	Behavior	Behavior	Behavior
	Design	Design	Design	Design		Design								
	Control	Control												

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Critical Safety Success Factors

Critical Safety Success Factors														
Conflicts												Speed		
Crossing		Turning					Merging	Overtaking/Head-On						
Crossing Conflict Points	Traffic Volumes	Turning Conflict Points	Destination Positioning	Direction	Number of Lanes	Traffic Volumes	Destination Positioning	Width	Position	Number of Lanes	Traffic Volumes	Perception/ Reaction/ Braking Distance	Turning Speed	Impact Speed
Crash Types and Contributing Factors														
Do Proposed Countermeasures or Changes Improve or Degrade Critical Safety Success Factor Functions?														
Design	Design	Behavior	Behavior	Behavior	Design	Behavior	Design	Design	Behavior	Design	Design	Behavior	Behavior	Behavior
Control	Control	Design	Design	Design		Design	Control		Design			Design	Design	Design
		Control										Control		Control

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Countermeasure Types and Examples

	Countermeasure Types						
Countermeasure Types	Behavioral			Design		Control	
Mode	Pedestrian	Bicyclist	Motorist	Pedestrian	Bicyclist	Pedestrian	Bicyclist
Countermeasure Examples	Scanning	Yielding	Scanning	Lighting	Design Speed	RRFB	Statutory Changes
	Yielding	Direction	Yielding	Crosswalk	Bike Lane	Leading Ped Interval	Bicyclist-Specific Signal
	Active Communication	Positioning	Speed Reduction	Design Speed	Lighting	Ped Signal	Pathway Yield Controls
	Conspicuity	Active Communication	Passing	Median	Median	Hybrid Beacon	Shared Lane Marking

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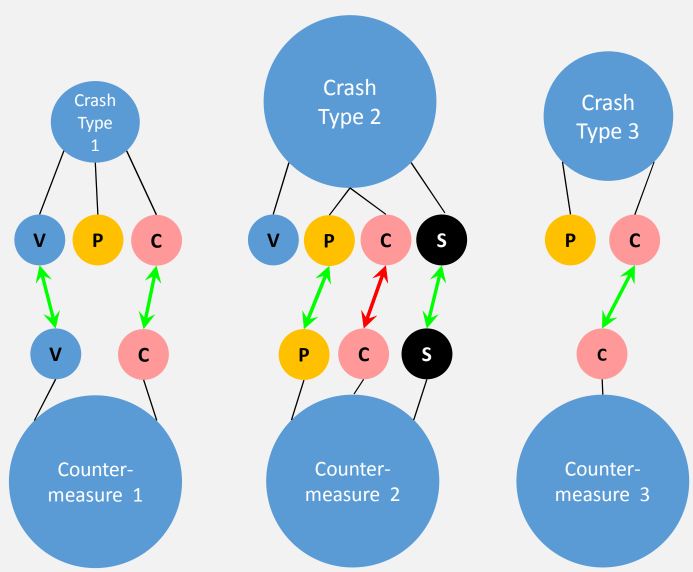
Critical Safety Success Factors



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Next Steps

- Identify high crash locations
- Critical Success Safety Factors evaluation
- Working group meeting #2 in July

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PROJECT CONTACT INFORMATION

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KITTELSON & ASSOCIATES

MetroPlan PROJECT MANAGER:
Mighk Wilson
Transportation Planner
250 S. Orange Avenue
Suite 200
Orlando, FL 32801
Phone: 407.481.5672; Ext. 318
mwilson@metroplanorlando.org

CONSULTANT PROJECT MANAGER:
Travis Hills, P.E.
225 E. Robinson St.
Suite 355
Orlando, FL 32801
Phone: 407.540.0555
thills@kittelson.com

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Meeting Notes

MetroPlan Orlando Pedestrian and Bicycle Safety Action Plans

Working Group Meeting #2

8/16/2018; 9:30 - 11:30 AM

MetroPlan Orlando – David L. Grovdahl Board Room

A Working Group Meeting was held with the project Working Group to discuss the corridor analysis methodology, potential safety field review corridors in Osceola, Seminole, and Orange Counties, Critical Safety Success Factors (CSSFs) for reducing pedestrian and bicycle crashes, and next steps. The presentation materials can be found attached to these meeting notes. The following organizations and individuals attended the meeting:

- Justin Easton (Osceola County)
- Alyssa Torres (Orange County)
- Frank Consoli (Seminole County)
- Ian Sikonia (City of Orlando)
- Kelly Brock (City of Casselberry)
- PJ Smith (East Central Florida Regional Planning Council)
- Lisa Portelli (Bike Walk Central Florida)
- Miles O'Keefe (LYNX)
- RJ Mueller (UCF/Bike Advocate)
- Mighk Wilson, Cynthia Lambert, and Crystal Mercedes (MetroPlan Orlando)
- Travis Hills, Ryan Cunningham, Phillip Haas, and Andrew Garrison (Kittelson & Associates, Inc.)

The following are the comments, general notes, and questions from the Working Group Meeting:

- Corridor Analysis Methodology
    - Crash data collection process reviewed.
    - Analysis process described –
        - Kelly Brock asked if the crash data detailed if the crash occurred on lit or unlit roadways.
            - Mighk Wilson confirmed the data is available; there are more night crashes on lit roads due to what is likely higher exposure (more activity where there is more roadway lighting present).
- Potential Safety Field Review Corridors
    - Osceola County –
        - Selected Michigan Avenue in Kissimmee, US 192 in Kissimmee, and Michigan Avenue in St. Cloud.
        - Justin Easton (Osceola County) confirmed that these corridors are preferred.
    - Seminole County –

- First Potential Corridor: Oxford Road near Casselberry
  - Unusual crash statistics noted for this roadway (More than expected for 2 lane and 25 mph).
  - Oxford Road is an important connector for cyclists, near the Kewannee Trail and is located near a LYNX superstop.
- Second Potential Corridor: Red Bug Lake Road
  - No comments.
- Third Potential Corridor: Lake Mary Boulevard
  - No comments.
- Fourth Potential Corridor: Alafaya Trail near UCF
  - RJ Mueller and Lisa Portelli both emphasized this is a dangerous bike corridor and that many college students commute in this area.
  - Alyssa Torres (Orange County) mentioned a project along SR 434 is now under design.
  - Mr. Mueller also interested in where University Boulevard ranked in Orange County given its similar proximity to UCF and new bicycle program at UCF.
- Fifth Potential Corridor: SR 46 near Sanford
  - No comments.

- Orange County –
  - First Potential Corridor: Orange Blossom Trail (Holden to I-4)
    - Pedestrian hybrid beacons being installed at midblock crossings.
    - Mighk Wilson (MetroPlan) discussed the benefits and shortcomings of HAWKs and their uses.
    - Orange County has a Holden improvement project under design, which may connect to John Young Parkway. This could affect pedestrian and bicycle traffic in this area.
  - Second Potential Corridor: Orange Blossom Trail (Doss to Americana)
    - Texas at Americana intersection Road Safety Audit completed by Orange County ; installed RRFBs.
  - Third Potential Corridor: John Young Parkway (near Oak Ridge Road)
    - May not have roadway lighting south of JYP.
  - Fourth Potential Corridor: Silver Star Road (Pine Hills area)
    - LYNX encourages choosing this corridor as they are placing a new transfer station at Silver Star Road and Belco Drive.
  - Fifth Potential Corridor: Colonial Drive (Pine Hills area)
    - No comments.
  - Notably, all of these Orange County corridors are 6 lane divided sections, which may limit the diversity of the field review results.
  - Another County safety project/plan underway along Universal Boulevard.
- Kelly Brock (City of Casselberry) and Ian Sikonia (City of Orlando) asked for the top 50 segment tables for each County.

- Critical Safety Success Factors
    - Attendees broke into two groups to review printouts of the pedestrian and bicycle CSSFs.
    - Several changes to the CSSFs were recommended –
        - Add bike boxes
        - 2 stage crossings
        - Traffic calming – Consider making lowering the speed limit its own CSSF

The following are the comments, general notes, and questions from the Working Group Meeting:

- Kittelson to share Top 50 crash frequency and crash severity maps for each County with the Working Group.
- Kittelson to share revised CSSF plots with the Working Group.
- Field reviews to be scheduled throughout September and October.

These meeting minutes are Travis Hills' interpretation of the comments, requests, and discussion during the meeting. Questions, additions, and/or clarifications should be directed to him at 407-540-0555 or thills@kittelson.com.

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PEDESTRIAN AND BICYCLIST SAFETY ACTION PLANS | METROPLAN ORLANDO

Working Group Meeting #2 | August 16, 2018

Agenda

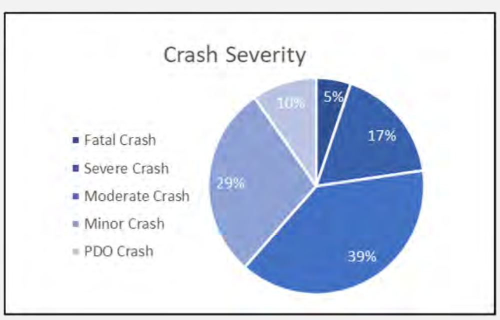
- Corridor Analysis Methodology
- Potential Safety Field Review Corridors
- Critical Safety Success Factors
- Next Steps

2

Corridor Analysis Methodology

Crash Data Collection

- Seven years of pedestrian / bicycle crash data collected 2011-2017 for Osceola, Orange, and Seminole Counties
- 5,138 pedestrian and 4,888 bicycle totaling 10,026 crashes (excluding parking lot crashes)



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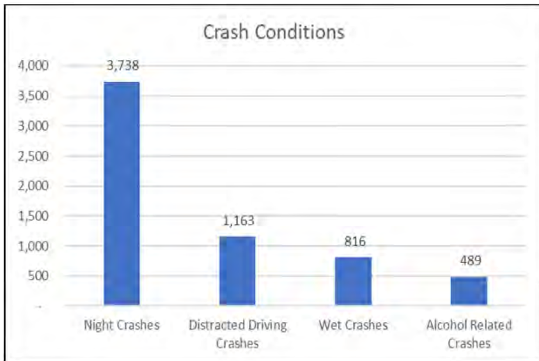
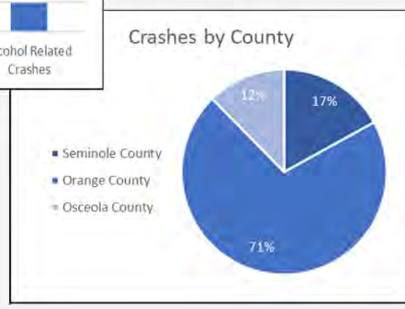
Crash Data Collection





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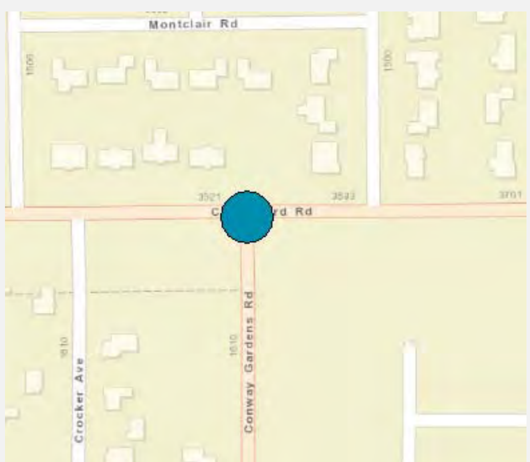
Crash Data Analysis Process

1. Crashes occurring within 50 feet of intersection isolated as intersection crashes using buffers



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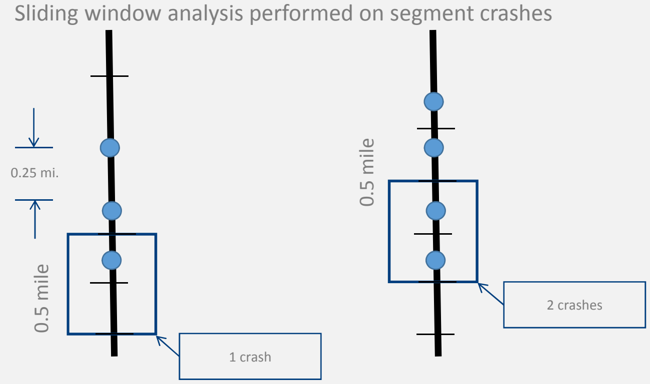
Crash Data Analysis – Sliding Window

Sliding Window Analysis

2. Sliding window analysis performed on segment crashes



- Reviewed each segment for total crash frequency and crash severity weighted by crash costs
- Grouped nearby segments to identify potential safety field review corridors

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Crash Data Analysis Process

3. Analysis focused on crash frequency and severity

Frequency

Severity

FatalScore	SevScore	ModScore	MinScore	PDOScore	EqPDO
190.225564	0	0	1.815789	0	192.041353
0	21.581955	5.845113	0	0	27.427068
190.225564	0	0	0	0	190.225564
0	10.790977	14.612782	1.815789	0	27.219549
190.225564	0	0	0	0	190.225564
0	21.581955	8.767669	7.263158	0	37.612782
0	32.372932	0	0	0	32.372932

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Crash Data Analysis Process

4. Severity score calculated using Highway Safety Manual Equivalent Property Damage Only (EPDO) methodology

- Utilized comprehensive crash cost from FDOT Design Manual (FDM)

Severity	Crash Cost	Ratio	Weighting Factor
Fatal	$10,560,000	$10,560,000 / $7,600	1,389
Severe Injury	$599,040	$599,040 / $7,600	79
Moderate Injury	$162,240	$162,240 / $7,600	21
Minor Injury	$100,800	$100,800 / $7,600	13
PDO	$7,600	$7,600 / $7,600	1

EXAMPLE:

Severity Score Calculation Example

2 fatal crashes x 1,389 = 2,778
4 severe injury crashes x 79 = 316
19 moderate injury crashes x 21 = 399
25 minor injury crashes x 13 = 325
49 PDO crashes x 1 = 49
Total EPDO severity score = **3,867**

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Crash Data Analysis Process

5. Top 50 segments for frequency and severity scores were analyzed by County to determine which corridors should be studied

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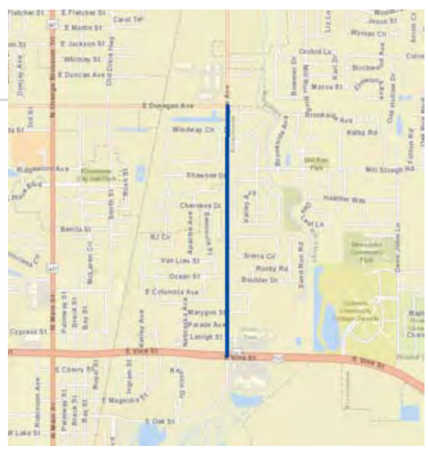
Osceola County Corridors

Potential Corridor #1

Michigan Avenue: US 192 to Donegan Ave. – Kissimmee

- 1.00 miles, 17 bicycle and 11 pedestrian crashes on corridor
  - 3 fatalities, 5 severe crashes
- Segments on corridor rank #1 and #21 for severity, #4 and #15 for frequency
- 5 lane undivided section (TWLTL), 40 mph posted speed, mainly retail and residential land uses



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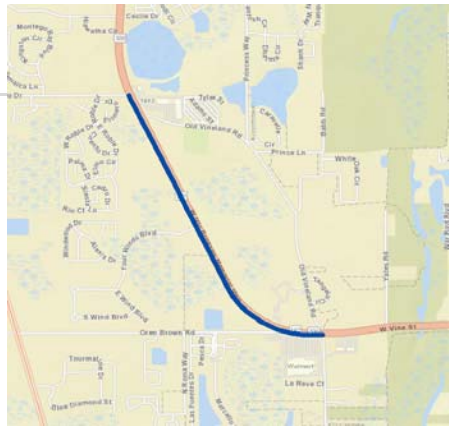
Potential Corridor #2

US 192: Siesta Lago Dr. to Old Vineland Rd. – Kissimmee

- 1.36 miles, 18 bicycle and 26 pedestrian crashes on corridor
  - o 8 fatalities, 12 severe crashes
- Segments on corridor rank #2, #3 and #4 for severity, #9, #13 and #26 for frequency
- 6 lane divided section, 45 mph posted speed, mainly retail and civic land uses



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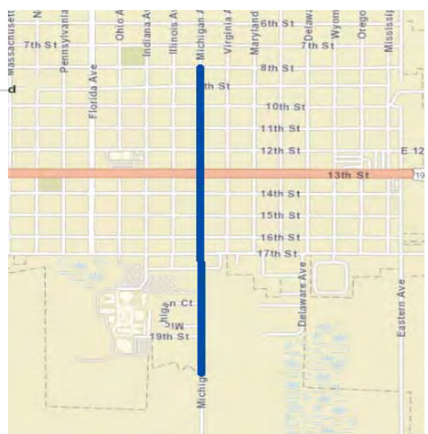
Potential Corridor #3

Michigan Avenue: Michigan Ave. Elem. School Entrance to 8th Street – St. Cloud

- 0.93 miles, 3 bicycle and 2 pedestrian crashes on corridor
  - o 1 fatality, 3 severe crashes
- Segments on corridor rank #47 and #49 for severity, out of Top 50 for frequency
- 2 lane undivided section, 25 mph posted speed, mainly residential and civic land uses



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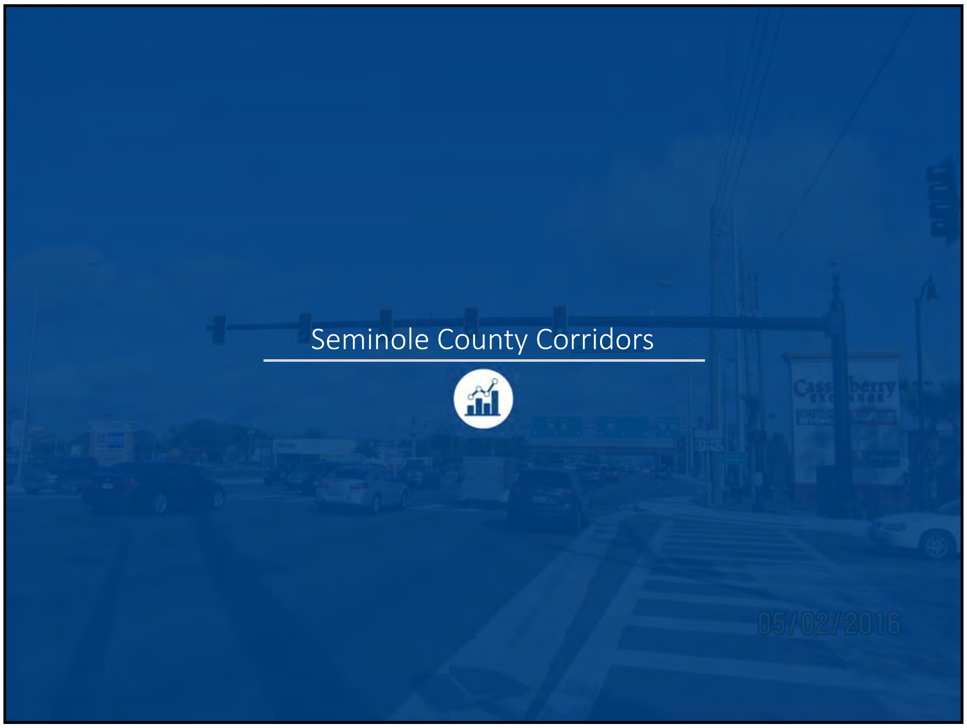
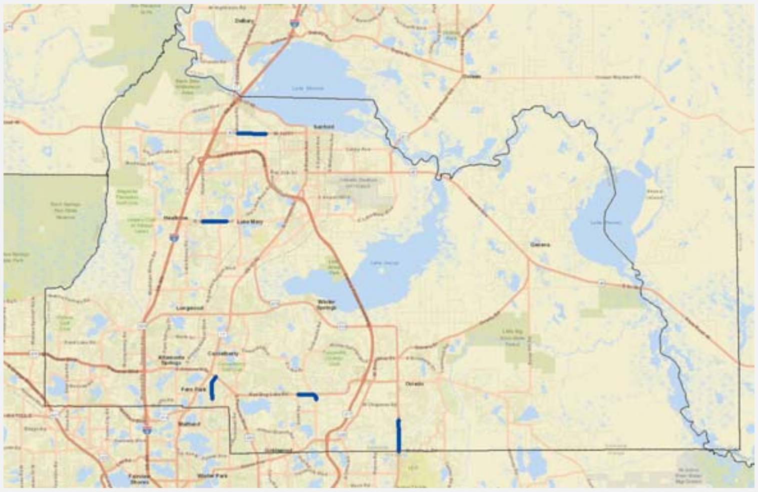


Seminole County Corridors

Corridor Overview

Top 5 Corridors in Seminole County



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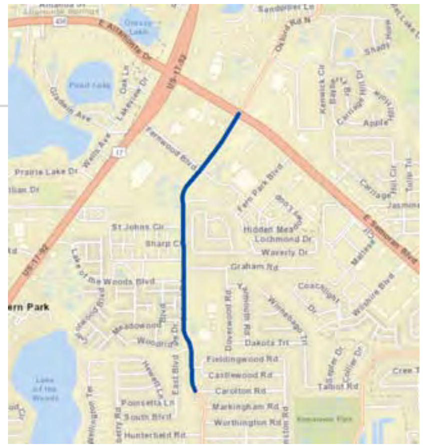
Potential Corridor #1

Oxford Road: Carolton Rd. to SR 436 – Casselberry

- 1.02 miles, 6 bicycle and 12 pedestrian crashes on corridor
  - 1 fatalities, 2 severe crashes
- Segments on corridor rank #13 for severity, #6 for frequency
- 2 lane undivided/3 lane section, 25 mph posted speed, mainly retail and residential land uses



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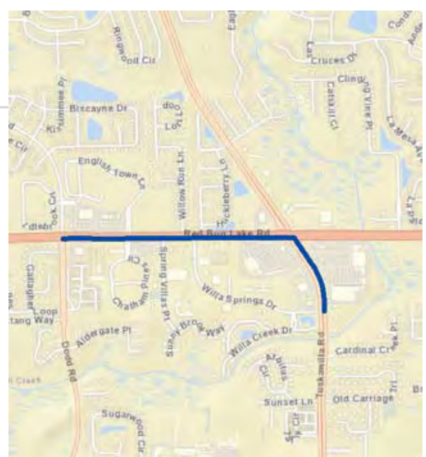
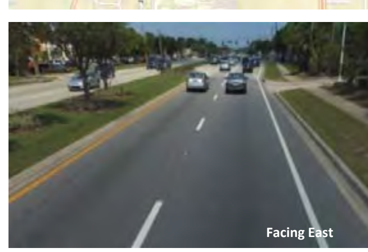
Potential Corridor #2

Red Bug Lake Road: Dodd Rd. to Tuskawilla Rd. / Tuskawilla Road: Willa Springs Dr. to Red Bug Lake Rd. – Winter Springs

- 0.94 miles, 13 bicycle and 5 pedestrian crashes on corridor
  - 1 fatality, 10 moderate crashes
- Segments on corridor rank #30, #35 for severity, #18 and #34
- 6 lane divided section (Tuskawilla), 4 lane divided section (Red Bug Lake) 45 mph posted speed, mainly retail, civic, and residential land uses





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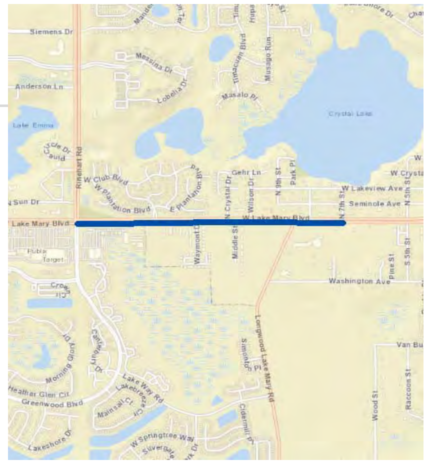
Potential Corridor #3

Lake Mary Boulevard: Rinehart Rd. to N. 7th St. – Lake Mary

- 1.02 miles, 7 bicycle and 4 pedestrian crashes on corridor
  - 1 fatality, 1 severe crash
- Segments on corridor rank #31 and #39 for severity, Out of Top 50 for frequency
- 4 lane divided section, 45 mph posted speed, mainly retail, civic, and residential land uses



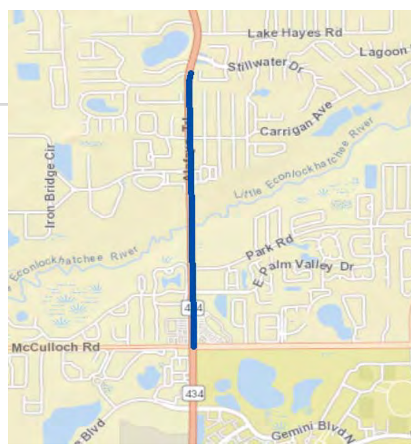
Facing East

19

Potential Corridor #4

Alafaya Trail: McCulloch Rd. to Remington Dr. - Oviedo

- 1.31 miles, 14 bicycle and 7 pedestrian crashes on corridor
  - 1 fatality, 4 severe crashes
- Segments on corridor rank #48 for severity, Out of Top 50 for frequency
- 6 lane divided section, 50 mph posted speed, mainly retail and civic land uses



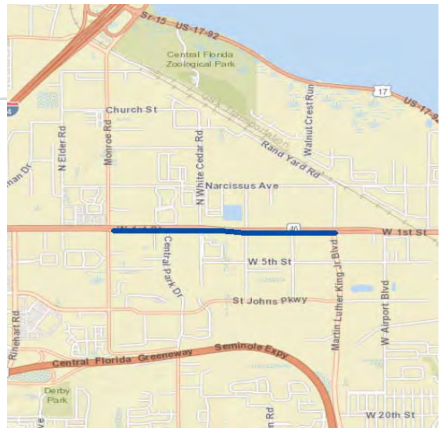
Facing North

20

Potential Corridor #5

SR 46: Monroe Rd. to MLK Blvd. – Sanford

- 1.23 miles, 0 bicycle and 5 pedestrian crashes on corridor
  - 2 fatalities, 0 injury crashes
- Segments on corridor rank #9 for severity, Out of Top 50
- 4 lane divided section, 45 mph posted speed, mainly retail and civic land uses



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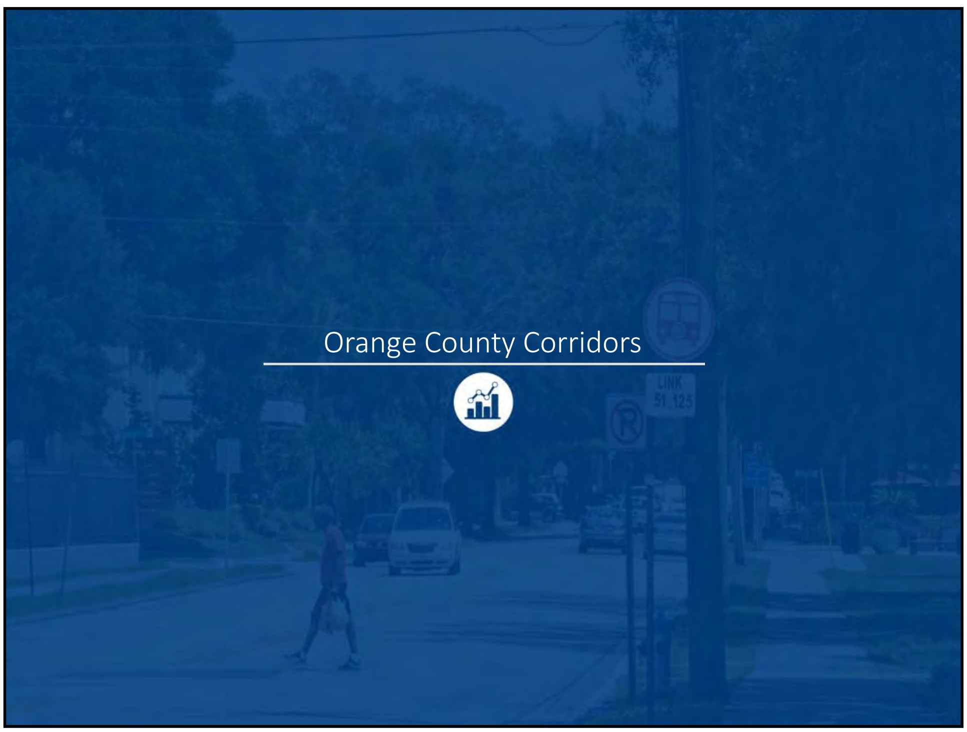


Corridor Overview

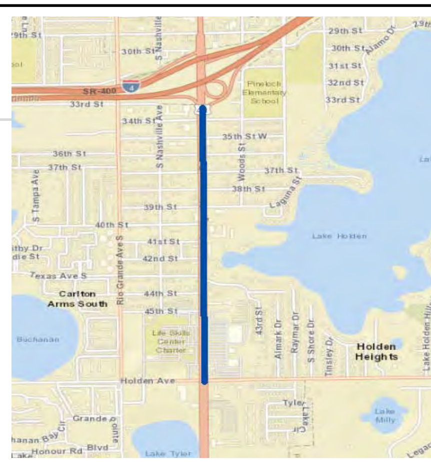
Top 5 Corridors in Orange County

23

Potential Corridor #1

Orange Blossom Trail: Holden Ave. to I-4 - Orlando

- 1.00 miles, 26 bicycle and 65 pedestrian crashes on corridor
  - o 11 fatalities, 29 severe crashes
- Segments on corridor rank #1, #2, and #3 for severity, #1, #2, and #3 for frequency
- 6 lane divided section, 45 mph posted speed, mainly retail, residential and civic land uses



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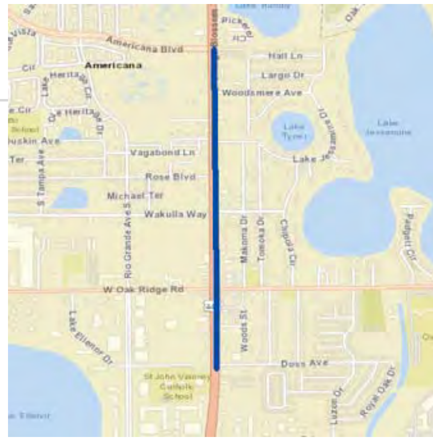
Potential Corridor #2

Orange Blossom Trail: Doss Ave. to Americana Blvd. - Orlando

- 1.05 miles, 35 bicycle and 36 pedestrian crashes on corridor
  - 4 fatalities, 24 severe crashes
- Segments on corridor rank #6 and #7 for severity, #5 and #6 for frequency
- 6 lane divided section, 45 mph posted speed, mainly retail, residential and civic land uses



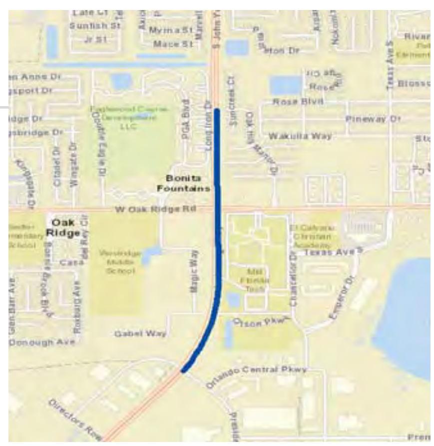
Facing North

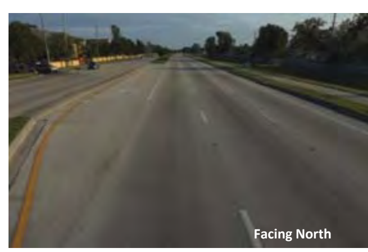
25

Potential Corridor #3

John Young Parkway: Presidents Dr. to 1900 ft. N of Oak Ridge Rd. - Orlando

- 0.96 miles, 12 bicycle and 6 pedestrian crashes on corridor
  - 4 fatalities, 7 severe crashes
- Segments on corridor rank #5 and #44 for severity, out of Top 50 for frequency
- 6 lane divided section, 45 mph posted speed, mainly retail and civic land uses





Facing North

26

Potential Corridor #4

Silver Star Road: Golf Club Pkwy. to Princeton St. - Orlando

- 1.23 miles, 31 bicycle and 42 pedestrian crashes on corridor
  - 5 fatalities, 16 severe crashes
- Segments on corridor rank #8 and #16 for severity, #12 for frequency
- 6 lane divided section, 45 mph posted speed, mainly retail, residential and civic land uses

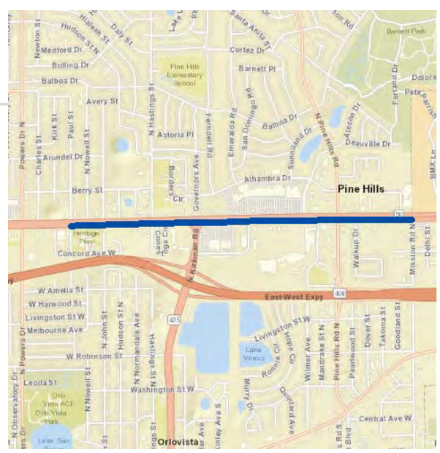
Facing East

27

Potential Corridor #5

Colonial Drive: Paul St. to Mission Rd. - Orlando

- 1.32 miles, 19 bicycle and 36 pedestrian crashes on corridor
  - 9 fatalities, 17 severe crashes
- Segments on corridor rank #9, #12 and #28 for severity, #20, out of Top 50 for frequency
- 6 lane divided section, 45 mph posted speed, mainly retail and civic land uses



Facing West

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Critical Safety Success Factors

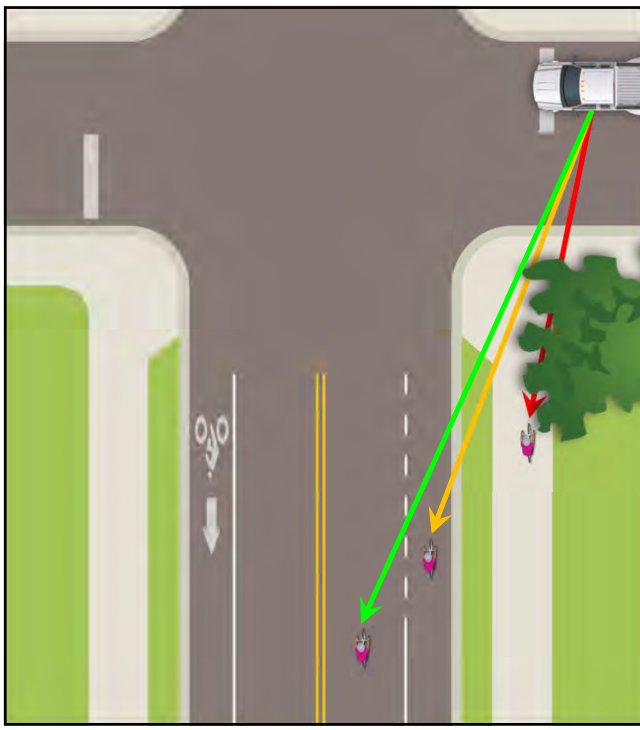
- Split up CSSFs into pedestrian and bicycle
- Reviewed 31 Design/Control and 9 Behavioral countermeasure types for peds
- Reviewed 16 Design/Control and 11 Behavioral countermeasure types for bikes

30

Critical Safety Success Factors – Bicycles

Factor Groups	Visibility									
Factors	Vantage				Seeing Conditions			Conspicuity		
Factor Functions	Position	Direction	Line of Sight	Blind Spots	Lighting	Weather	Visual Complexity	Lights	Reflectors	Color
How To Measure/Track	Crash Data: Bike Position	Crash Data: Bike Direction	Crash Data: All Intersection and Driveway	Crash Data: All Intersection and Driveway	Crash Data: Lighting/Time of Day		Crash Data: Crossing Crashes	User Survey, Night Crashes	User Survey, Night Crashes	User Survey; Dawn/Dusk Crashes
Applicable Countermeasure Types	Behavior Design	Behavior Design	Behavior Design	Behavior Design	Design		Design	Behavior	Behavior	Behavior
Provide keyhole bike lane markings at intersections (if right turn lane is present)	Better than riding on sidewalk			+						
Providing bike lane in both travel directions	Better than riding on sidewalk	Doesn't discourage wrong-way riding. More crashes than riding in travel lane.								
Providing shared use path/cycle track on one side of the roadway		Encourages riding against traffic								
Provide marked mid-block crossing			+							
Remove obstructions/ improve sight triangles			+	+			+			
Bike warning signage							+			
Provide LED corridor/ intersection lighting					+					
Lighting maintenance					+					

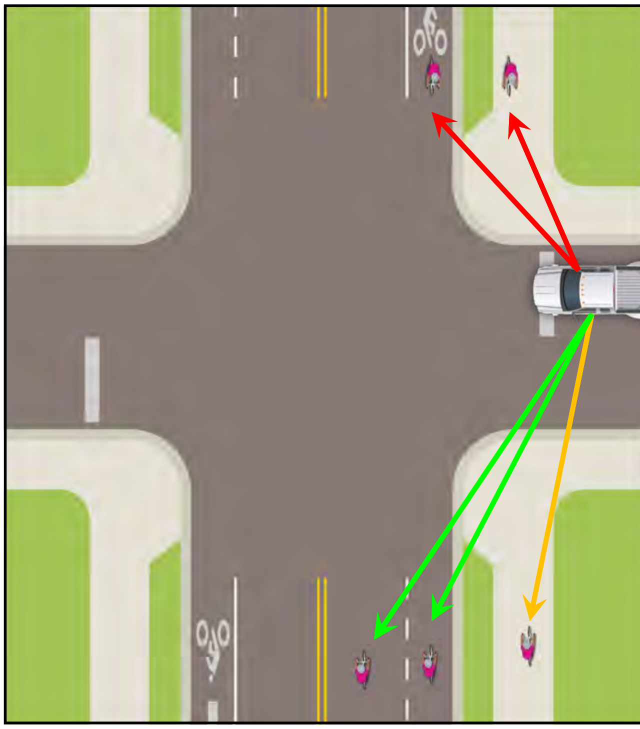
31



Improving Vantage With Position

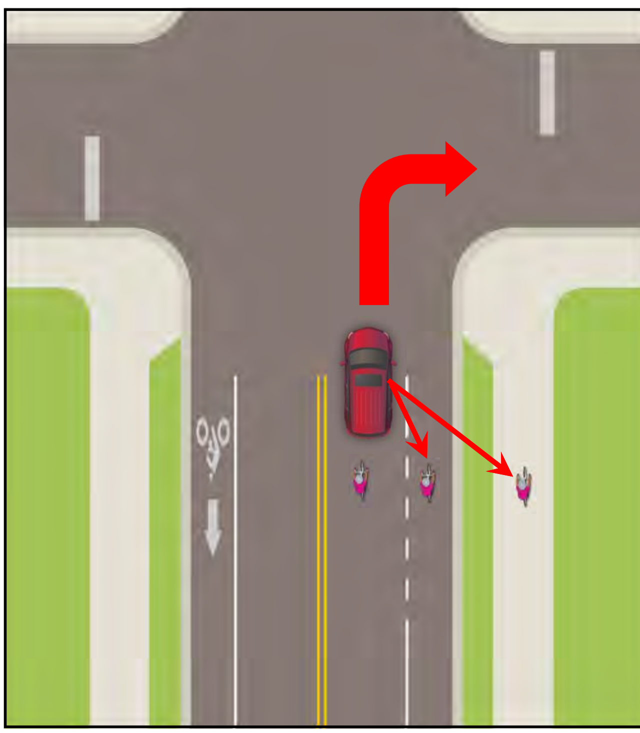
The farther left bicyclists drive, the earlier they can see vehicles approaching from driveways and sidestreets, and the earlier those drivers can see them.

Reduces motorist drive-out conflicts.



Improving Vantage With Direction

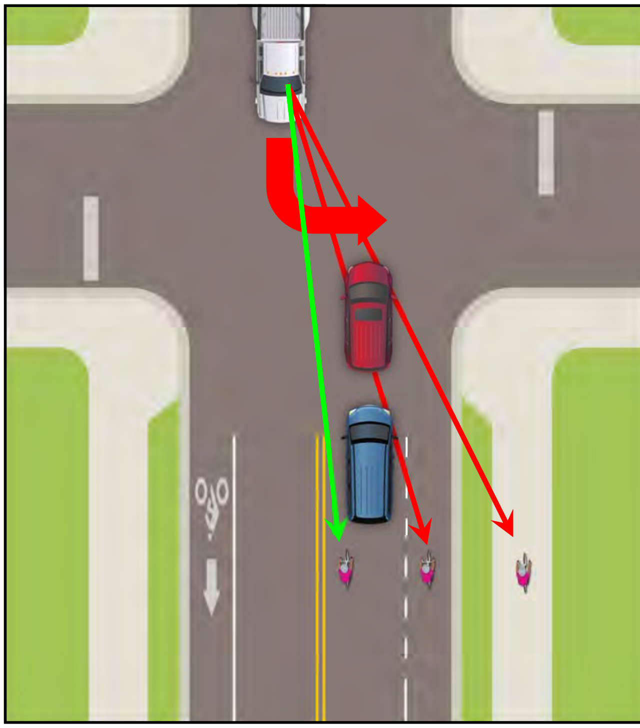
Motorists don't expect vehicles coming from the right on their side of the road. A number of studies have found cycling against the flow increases crash risk by 3 to 4 times.



Eliminating Blind Spots With Position

Being on the right rear side of a vehicle that could turn right decreases the chance that the cyclist will be seen or considered to be relevant.

Positioning in line with the typical driver position eliminates right hook conflicts.



Eliminating Blind Spots With Position

Being to the right of same direction vehicles hides cyclists from view from opposing drivers waiting to turn left. Positioning to the left side of the lane enables motorist and cyclist to see one another before the cyclist enters the intersection.

Critical Safety Success Factors – Group Exercise

- Break into 4 groups
- Spend 15 minutes at each CSSF "station"
- Work with group leaders to modify/update CSSF sheets

Next Steps

- Begin safety field reviews – targeting early September
- Begin developing Safety Action Plans once field reviews are complete

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PROJECT CONTACT INFORMATION

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KITTELSON & ASSOCIATES

MetroPlan PROJECT MANAGER:
Mighk Wilson
Transportation Planner
250 S. Orange Avenue
Suite 200
Orlando, FL 32801
Phone: 407.481.5672; Ext. 318
mwilson@metroplanorlando.org

CONSULTANT PROJECT MANAGER:
Travis Hills, P.E.
225 E. Robinson St.
Suite 355
Orlando, FL 32801
Phone: 407.540.0555
thills@kittelson.com

Meeting Notes

MetroPlan Orlando Pedestrian and Bicyclist Safety Action Plans

Working Group Meeting #3

5/24/19; 11:00 AM – 12:00 PM

MetroPlan Orlando – David L. Grovdahl Board Room

The Third Working Group Meeting was held to review the findings and recommendations from the corridor safety field reviews, discuss Critical Success Safety Factor (CSSF) countermeasure scores, and next steps. The presentation materials can be found attached to these meeting notes. The following organizations and individuals attended the meeting:

- Frank Consoli (Seminole County)
- Richard Earp (City of Apopka)
- Brian Sanders (Orange County)
- Nabil Muhaisen (City of Kissimmee)
- Lee Pulham (RCID)
- Hazem El-Assar (Orange County)
- Krystal Clem (City of Lake Mary)
- Kendall Story (City of Lake Mary)
- Kelly Brock (City of Casselberry)
- Rakinya Hinson (FDOT)
- Anjum Mukherjee (City of Longwood)
- Glen Hammer (Osceola County Schools)
- Dan Stephens (UCF)
- PJ Smith (East Central Florida Regional Planning Council)
- Mighk Wilson (MetroPlan Orlando)
- Travis Hills, Ryan Cunningham, and Phillip Haas (Kittelson & Associates, Inc.)

The following are the comments, general notes, and questions from the Working Group Meeting:

- Summary of corridor safety field reviews (Travis)
    - Corridor overview – brief refresher of each corridor (9 total)
    - Highlighted two unique/corridor specific issues on slides, discussed potential recommendations
        - Orange County Corridor #3 - Washington Street: John Young Pkwy. to Orange Blossom Tr. – Orlando
            - Study for pedestrian crossing with RRFB is in progress near Dollins Ave.
            - Charter school being built

        - Orange County Corridor #2 - Michigan Street: Railroad Crossing to Mills Ave. – Orlando
            - Potential for pedestrian crossing near Orange Ave. through upcoming RRR project
        - Seminole County Corridor #1 - SR 434: McCulloch Rd. to Remington Dr. – Oviedo
            - South of McCulloch Rd., Orange County was successful in reducing the posted speed limit from 50 mph to 45 mph
    - Summary of common corridor wide issues
        - Suggestion to reduce lane width in locations where speed is an issue
- Critical Success Safety Factors (Mighk & Phillip)
    - Overview of CSSFs (Mighk)
    - CSSF Countermeasure Scores (Phillip)
- Next Steps (Mighk)
    - Future Phase 2 – Implementation and additional state road safety field reviews
        - Current Working Group members will be contacted for their potential involvement in Phase 2
    - Prepare drafts for Pedestrian Safety Action Plan & Bicyclist Safety Action Plan
        - Completed drafts will be sent out to Working Group members
    - Upcoming presentations to MetroPlan Committees and at Board Meeting

These meeting minutes are Phillip Haas's interpretation of the comments, requests, and discussion during the meeting. Questions, additions, and/or clarifications should be directed to him at 407-373-1142 or phaas@kittelson.com.

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ATTENDANCE ROSTER

MEETING OF: Bicycle/Pedestrian Safety Action Plan Committee

DATE: Friday, ~~April~~ May 24, 2019 TIME: 12:00 noon or immediately after TAC

LOCATION: MetroPlan Orlando
David L. Grovdahl Board Room
250 S. Orange Avenue, Suite 200
Orlando, Florida 32801

	NAME	AFFILIATION
1.	FRANK CONSOLI	SEMINOLE CO.
2.	Richard Earp	City of Apopka
3.	BRIAN SANDERS	ORANGE CO
4.	Nabil Muhaisen	City of Kissimmee
5.	Lee Pulham	RCID
6.	Hazem El-Assar	Orange Co.
7.	Krystal Clem	City of Lake Mary.
8.	Kendall Story	City of Lake Mary
9.	Kelly Brock	City of Casselberry
10.	Rakinya Hinson	FDOT
11.	Anjum Mukherjee	City of Longwood
12.	~~Christian Lutje~~	~~OC Traffic~~
13.	Glen Hammer	Osceola Schools

NAME		AFFILIATION
14.	Travis Mills	KAI
15.	Phillip Haas	KAI
16.	Ryan Cunningham	Kittelson
17.	Dan Stephens	UCF / CAC
18.	PJ Smith	ECFRPC
19.		
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PEDESTRIAN AND BICYCLIST SAFETY ACTION PLANS | METROPLAN ORLANDO

Working Group Meeting #3 | May 24, 2019

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Agenda

- Safety Field Review Summary
- Critical Safety Success Factors
- Next Steps

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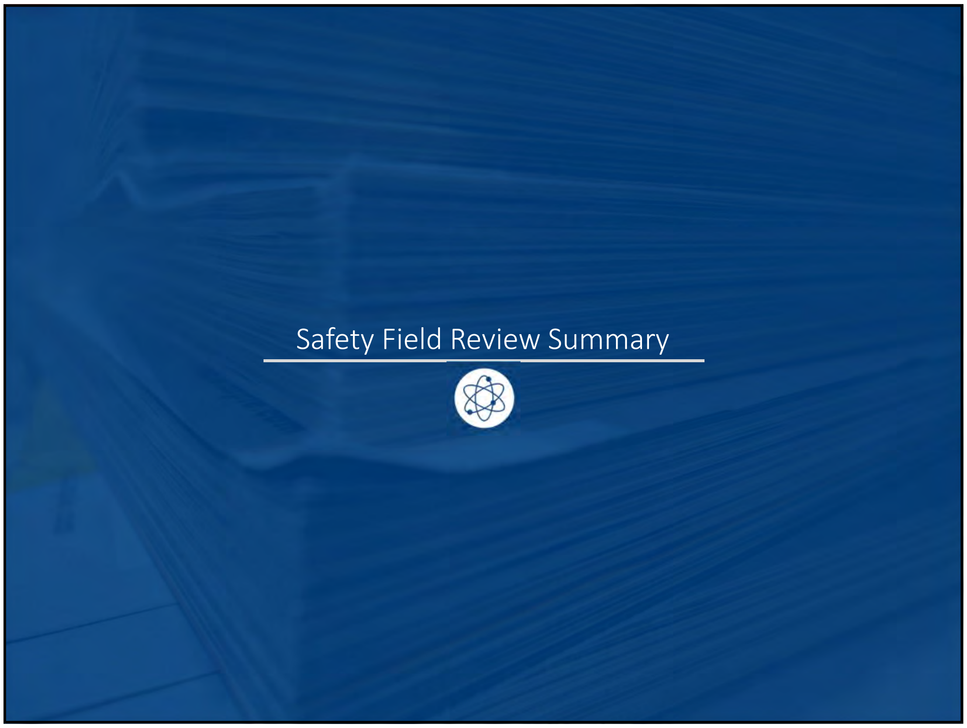

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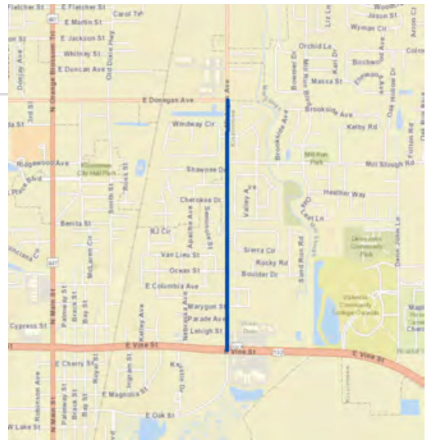
Corridor #1

Michigan Avenue: US 192 to Donegan Ave. – Kissimmee

- 1.00 miles, 17 bicycle and 11 pedestrian crashes on corridor
  - 3 fatalities, 5 severe crashes
- 5 lane undivided section (TWLTL), 40 mph posted speed, mainly retail and residential land uses



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Corridor #1 – Michigan Ave. (Kissimmee) Summary

Full median opening at Lehigh Street with 1 pedestrian fatal crash (Issue #4)

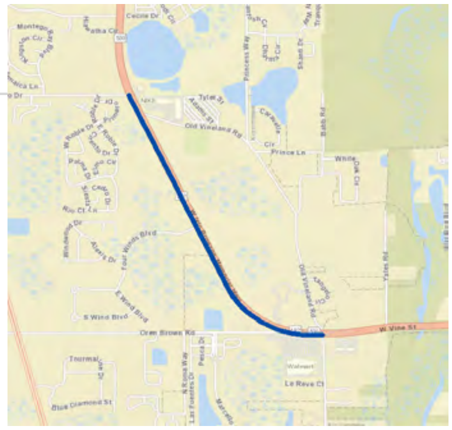
Free-flow eastbound right turn lane at Carroll Street (Issue #17)

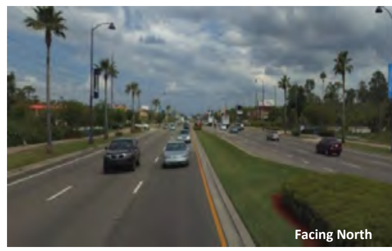
6

Corridor #2

US 192: Siesta Lago Dr. to Old Vineland Rd. – Kissimmee

- 1.36 miles, 18 bicycle and 26 pedestrian crashes on corridor
  - 8 fatalities, 12 severe crashes
- 6 lane divided section, 45 mph posted speed, mainly retail and civic land uses





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Corridor #2 – US 192 Summary

High speed southbound right turning movements at Siesta Lago Drive (Issue # 4)

Bike lane is faded and conflicts with right turn vehicle movements at Old Vineland Road (Issue #15)

8

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Corridor #3

Michigan Avenue: Michigan Ave. Elem. School Entrance to 8th Street – St. Cloud

- 0.93 miles, 3 bicycle and 2 pedestrian crashes on corridor
  - 1 fatality, 3 severe crashes
- 2 lane undivided section, 25 mph posted speed, mainly residential and civic land uses

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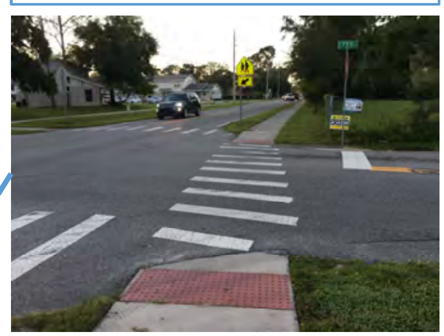
Corridor #3 – Michigan Ave. (St. Cloud) Summary

Vehicular speeding, especially during school hours (Corridor-Wide Issue #5)

Enhance the uncontrolled east/west crossings at 17th Street (Issue #2)



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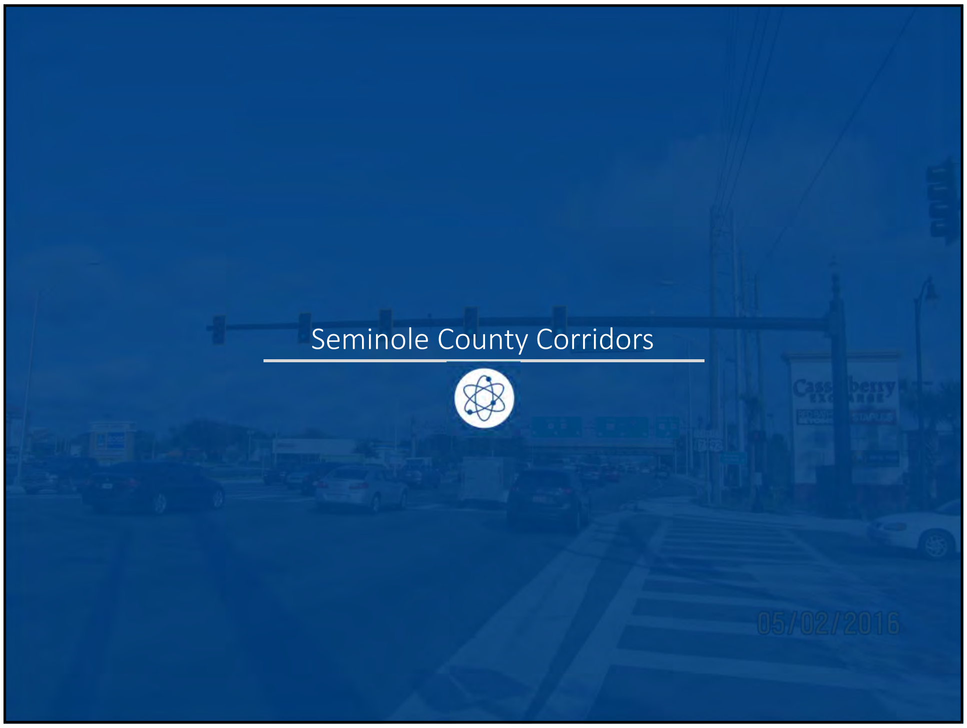


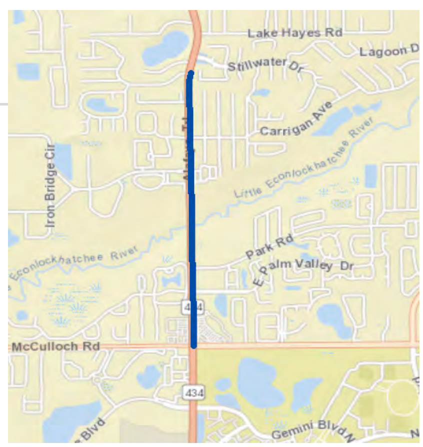
Seminole County Corridors

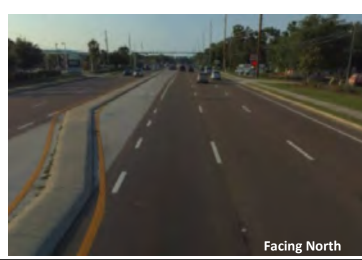
11

Corridor #1

SR 434: McCulloch Rd. to Remington Dr. - Oviedo

- 1.31 miles, 14 bicycle and 7 pedestrian crashes on corridor
    - 1 fatality, 4 severe crashes
- 6 lane divided section, 50 mph posted speed, mainly retail and civic land uses





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Corridor #1 – SR 434 Summary

No marked crosswalk on the south leg of McCulloch Road (Issue #1)

Curb ramps lead pedestrians into SR 434 at Publix Driveway (Issue #6)

13

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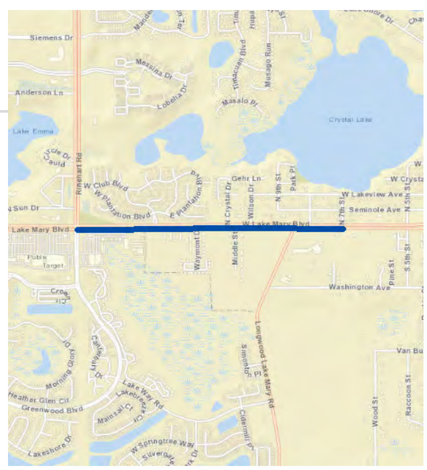
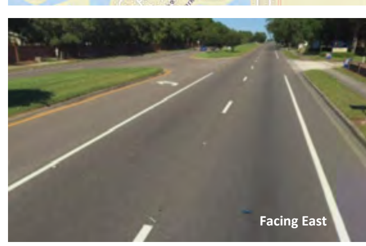
Corridor #2

Lake Mary Boulevard: Lake Emma Rd. to N. 7th St. – Lake Mary

- 1.66 miles, 14 bicycle and 6 pedestrian crashes on corridor
  - 1 fatality, 2 severe crashes
- 4 lane divided section, 45 mph posted speed, mainly retail, civic, and residential land uses





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Corridor #2 – Lake Mary Boulevard Summary

Inaccessible pedestrian push buttons at Lake Mary Center (Issue #1)

Second NB right turn lane is planned at Longwood Lake Mary Road (Issue #12)

15

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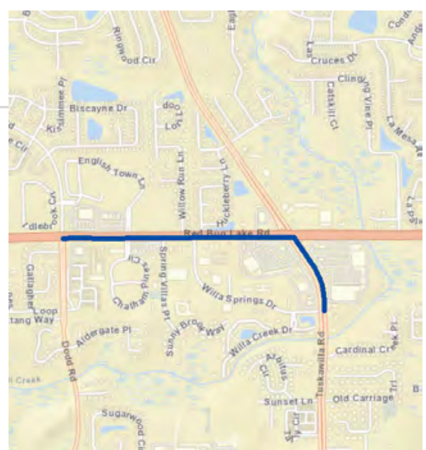
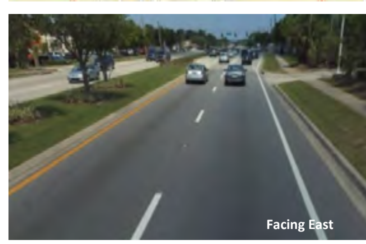
Corridor #3

Red Bug Lake Road: Dodd Rd. to Tuskawilla Rd. / Tuskawilla Road: Willa Springs Dr. to Red Bug Lake Rd. – Winter Springs

- 0.94 miles, 13 bicycle and 5 pedestrian crashes on corridor
  - 2 fatalities, 10 moderate crashes
- 6 lane divided section (Tuskawilla), 4 lane divided section (Red Bug Lake) 45 mph posted speed, mainly retail, civic, and residential land uses





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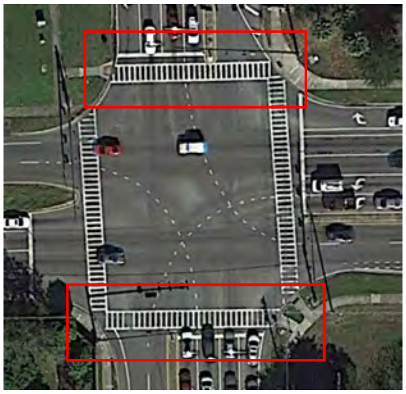
Corridor # 3 – Red Bug Lake Road/Tuskawilla Road Summary

Crossing guard noted ped/bike and vehicle conflicts in north and south crosswalks at Dodd Road (Issue #2)



EB bike lane ends near Shell gas station driveway before reaching Plaza Entrance signal (Issue 10)

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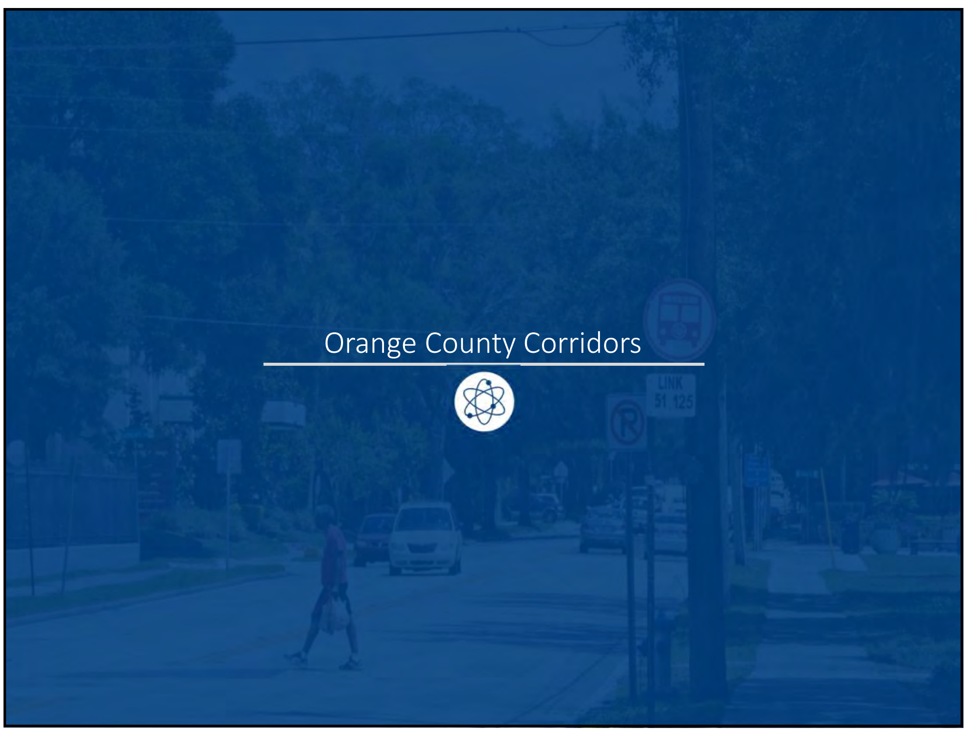

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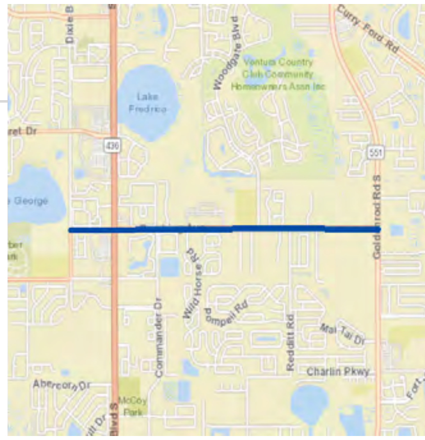
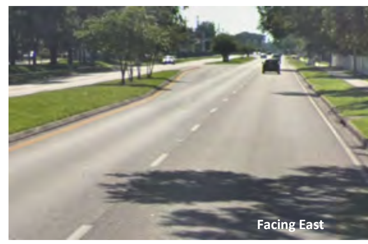
Corridor #1

Pershing Avenue: Dixie Belle Dr. to Goldenrod Rd. - Orlando

- 1.76 miles, 20 bicycle and 12 pedestrian crashes on corridor
  - 2 fatalities, 1 severe crash
- 4 lane divided section, 45 mph posted speed, mainly retail and residential land uses





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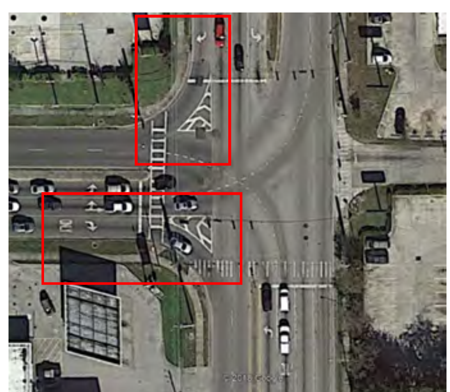
Corridor #1 – Pershing Avenue Summary

Sight distance restrictions at 7/11 driveway (Issue #18)

Channelized right turn lanes encourage higher turning speeds at Goldenrod Road (Issue #19)



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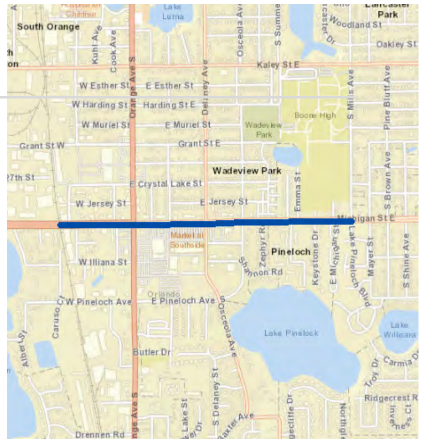
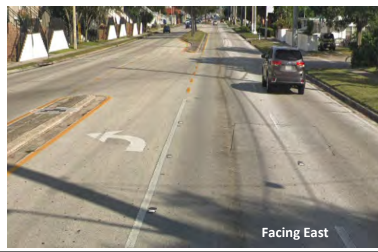
Corridor #2

Michigan Street: Railroad Crossing to Mills Ave. - Orlando

- 1.01 miles, 19 pedestrian and 15 bicycle crashes on corridor
  - 1 fatality, 2 severe crashes
- 4 lane divided section, 30 mph posted speed, mainly retail and residential land uses




Facing East

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Corridor #2 – Michigan Street Summary

Pedestrians observed crossing Michigan Street at Kunze Avenue/Joseph Street (Issue #1)

Permissive EB/WB left turn vehicles conflict with school children at Mills Avenue (Issue #22)

22

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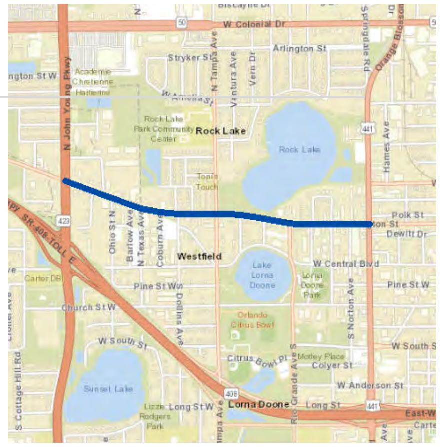
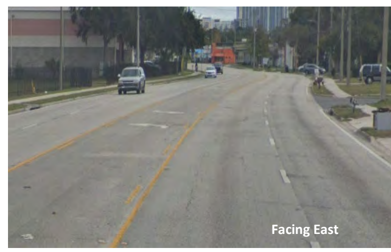
Corridor #3

Washington Street: John Young Pkwy. to Orange Blossom Tr. - Orlando

- 1.02 miles, 12 pedestrian and 10 bicycle crashes on corridor
  - 0 fatalities, 3 severe crashes
- 5 lane undivided section (TWLTL), 40 mph posted speed, mainly retail and civic land uses





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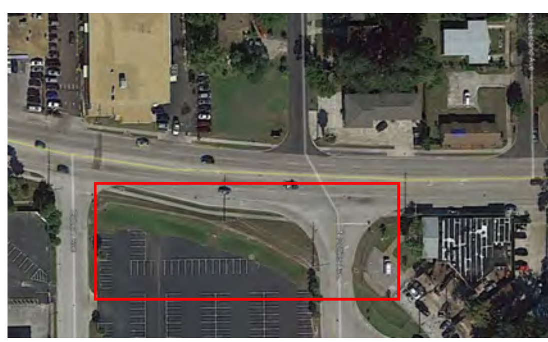
Corridor #3 – Washington Street Summary

Pedestrian push button signage is worn/damaged at John Young Parkway (Issue #2)

EB right turn lane and large curb return radii encourage higher turning speeds. The 2 NB lanes increase pedestrian crossing distance at Dollins Avenue (Issue #7)



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Common Corridor Wide Issues

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Common Corridor Wide Issues

Truncated domes are worn down or missing

Pedestrian crosswalk markings faded at signalized intersection locations

There are no marked crosswalks at most minor street intersection locations

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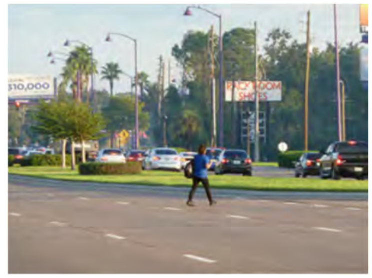
Common Corridor Issues

Multiple fatal crashes occurred with peds/bikes crossing mid-block



Very few corridors with street lighting; nighttime ped/bike crashes between 25 and 45 percent

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Critical Safety Success Factors

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Critical Safety Success Factors

- Split up CSSFs into pedestrian and bicyclist
- Reviewed 31 Design/Control and 7 Behavioral countermeasure types for pedestrians
- Reviewed 12 Design/Control and 11 Behavioral countermeasure types for bicyclists

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Critical Safety Success Factors – Bicycles

Factor Groups	Visibility									
Factors	Vantage				Seeing Conditions			Conspicuity		
Factor Functions	Position	Direction	Line of Sight	Blind Spots	Lighting	Weather	Visual Complexity	Lights	Reflectors	Color
How To Measure/Track	Crash Data: Bike Position	Crash Data: Bike Direction	Crash Data: All Intersection and Driveway	Crash Data: All Intersection and Driveway	Crash Data: Lighting/Time of Day		Crash Data: Crossing Crashes	User Survey, Night Crashes	User Survey, Night Crashes	User Survey; Dawn/Dusk Crashes
Applicable Countermeasure Types	Behavior	Behavior	Behavior	Behavior	Design		Design	Behavior	Behavior	Behavior
	Design	Design	Design	Design						
Provide keyhole bike lane markings at intersections (if right turn lane is present)	Better than riding on sidewalk			+						
Providing bike lane in both travel directions	Better than riding on sidewalk	Doesn't discourage wrong-way riding. More crashes than riding in travel lane.								
Providing shared use path/cycle track on one side of the roadway		Encourages riding against traffic								
Provide marked mid-block crossing			+							
Remove obstructions/ improve sight triangles			+	+			+			
Bike warning signage							+			
Provide LED corridor/ intersection lighting					+					
Lighting maintenance					+					

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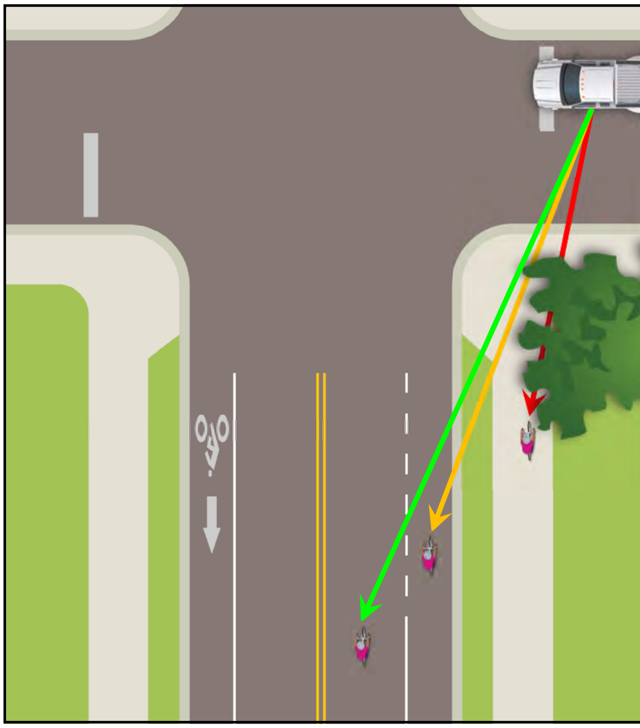

Improving Vantage With Position

The farther left bicyclists drive, the earlier they can see vehicles approaching from driveways and sidestreets, and the earlier those drivers can see them.

Reduces motorist drive-out conflicts.

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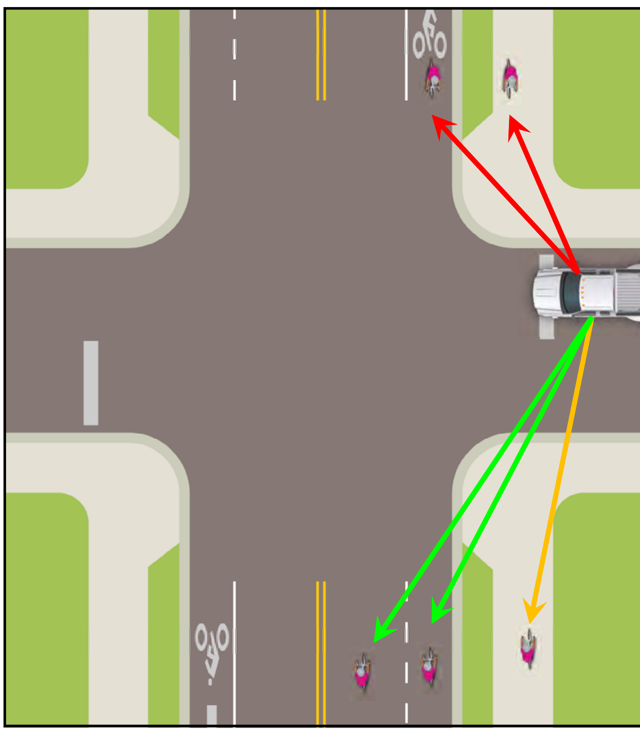

Improving Vantage With Direction

Motorists don't expect vehicles coming from the right on their side of the road. A number of studies have found cycling against the flow increases crash risk by 3 to 4 times.

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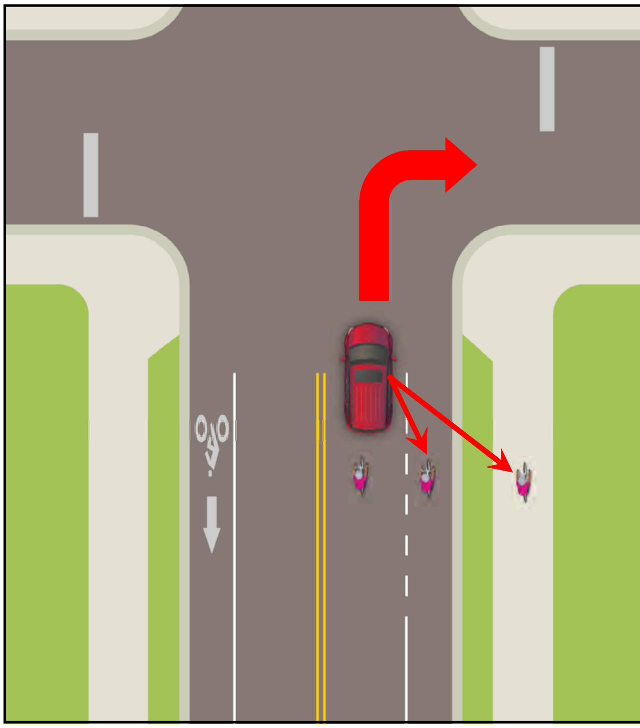

Eliminating Blind Spots With Position

Being on the right rear side of a vehicle that could turn right decreases the chance that the cyclist will be seen or considered to be relevant.

Positioning in line with the typical driver position eliminates right hook conflicts.

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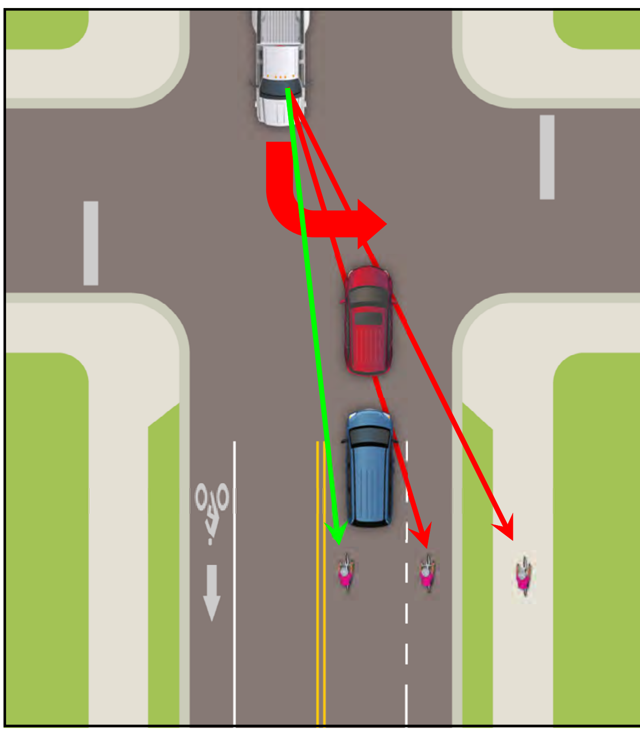

Eliminating Blind Spots With Position

Being to the right of same direction vehicles hides cyclists from view from opposing drivers waiting to turn left. Positioning to the left side of the lane enables motorist and cyclist to see one another before the cyclist enters the intersection.

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CSSF Countermeasure Scores

- Each countermeasure impacts different factor groups and factor functions
  - Can impact multiple areas
  - Translates to specific crash types or crash characteristics
- Score quantifies the impact potential of each countermeasure across factor groups
  - Both positive and negative
  - Weighted by severity – Equivalent Property Damage Only
- Calculated based on observed crash history

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Score Calculation Example

Example Countermeasure: Pedestrian Behavior – Yielding

Factor Group: Conflicts

- Factors: Crossing & Turning
- Factor Functions: Crossing Conflict Points & Turning Conflict Points
- Crash type: Pedestrian failure to yield

Factor Group: Speed

- Factor Functions: Perception/Reaction/Braking Distance & Impact Speed
- Crash type: Speed 35 mph or greater, pedestrian failure to yield, mid-block or signal, vehicle not turning

Crash Severity	Number of Crashes	EPDO Crashes
PDO	66	66
Possible Injury	364	4,732
Non-Incapacitating Injury	545	11,445
Incapacitating Injury	452	35,708
Fatality	221	306,969
	Total	**358,920**

Crash Severity	Number of Crashes	EPDO Crashes
PDO	43	43
Possible Injury	229	2,977
Non-Incapacitating Injury	329	6,909
Incapacitating Injury	298	23,542
Fatality	173	240,297
	Total	**273,768**

Total Score = 358,920 + 273,768 = 632,688/1,000 → **633**

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Pedestrian Countermeasures

Countermeasure		Visibility Score	Predictability Score	Conflicts Score	Speed Score	Total Score
Pedestrian Specific Infrastructure	**Ped Barrier**	22	0	22	0	**45**
	Raised crossing	3	0	3	9	**15**
	Leading pedestrian interval	15	0	15	0	**30**
	Ped only phase	0	0	12	0	**12**
	Sidewalk Connectivity	0	0	39	0	**39**
Other Countermeasures	**Mid-block crossing <40 mph**	21	21	0	0	**41**
	Mid-block crossing 40+ mph	0	163	0	-163	**0**
	Improve sight triangles	11	0	0	0	**11**
	Reduce Posted Speed	0	0	0	325	**325**
	Night-time Speed Reduction	0	0	0	273	**273**
	Lighting	223	0	0	194	**417**
	Traffic Calming	33	0	0	33	**67**
Pedestrian Behavior	**Yielding**	0	0	359	274	**633**
	Communicating with drivers	0	14	14	0	**28**
	Lights, reflectors, clothing	68	0	0	0	**68**
	Walk facing traffic	0	0	32	0	**32**
Motorist Behavior	**Yielding**	0	90	90	0	**181**
	Scanning	0	0	148	128	**276**
	Speed	0	0	0	480	**480**

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Bicyclist Countermeasures

Countermeasure		Visibility Score	Predictability Score	Conflicts Score	Speed Score	**Total Score**
Bicyclist-Specific Infrastructure	**Bike Lane**	4	55	25	0	**84**
	2-Way Cycle Track	-45	55	12	0	**22**
	One-Way Cycle Track	4	55	25	0	**84**
	Bike Lane Pocket	1	0	2	0	**3**
	Sharrow	4	4	4	0	**12**
Bicyclist Behavior	**Bicycling With Traffic**	45	45	7	0	**98**
	Lane Control	23	57	51	0	**131**
	Lane Choice	5	5	5	0	**14**
	Scanning & Signaling	0	11	11	0	**23**
	Yielding	0	0	96	65	**161**
	Conspicuity	87	0	0	0	**87**
Motorist Behavior	**Yielding**	0	23	68	0	**91**
	Scanning	0	0	68	53	**121**
	Safe Passing	0	0	20	0	**20**
	Reduced Speed	0	0	0	81	**81**
Other Countermeasures	**Reducing Posted Speed**	0	0	0	94	**94**
	Night-time Speed Reduction	0	0	0	58	**58**
	Mid-Block Crossing	24	0	0	-19	**5**
	LED Lighting	106	0	0	13	**119**
	Lighting	106	0	0	13	**119**
	Lane Elimination	0	0	39	36	**75**

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Combined Countermeasure Scores

Countermeasure		Pedestrian Score	Bicyclist Score	**Combined Score**
Pedestrian/Bicyclist Behavior	**Scanning & Signaling**	28	23	**51**
	Yielding	633	161	**794**
	Conspicuity	68	87	**155**
Motorist Behavior	**Yielding**	181	91	**272**
	Scanning	276	121	**397**
	Reduced Speed	480	81	**561**
Other Countermeasures	**Reducing Posted Speed**	325	94	**419**
	Night-time Speed Reduction	273	58	**331**
	Mid-Block Crossing	41	5	**46**
	Lighting	417	119	**536**

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CSSF Countermeasure Scores – Summary

- Countermeasure Evaluation
  - **Opportunity** – Quantify the impact potential of each countermeasure
  - **Effectiveness** – Does not address the degree to which a countermeasure impacts a specific crash type (CMF)
- Scores are relative to each other, should be used for comparison purposes only

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Next Steps

- Continue developing Safety Action Plans
- Phase 2 – Implementation
  - Speed Reduction Strategies
  - FDOT Corridor Studies
  - Behavioral Change Strategies

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Next Steps

Speed Reduction Strategies

- Explore statutory and policy limitations and options
- Targeting high-crash corridors
- Comprehensive approach with outreach to public, law enforcement and courts
- Night-time speed reductions in select corridors

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Next Steps

FDOT Corridor Studies

- Replicate approach used for three counties for three FDOT roads

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Next Steps

Behavioral Change Strategies

Motorists

- Crosswalk Yielding
- Speed
- Scanning

Pedestrians

- Communicating at Crosswalks
- Understanding Mid-Block Risks

Bicyclists

- Roadway Position
- Lighting at Night
- Go With the Flow

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Project Contact Information

metroplan orlando
A REGIONAL TRANSPORTATION PARTNERSHIP

KITTELSON & ASSOCIATES

MetroPlan PROJECT MANAGER:
Mighk Wilson
Transportation Planner
250 S. Orange Avenue
Suite 200
Orlando, FL 32801
Phone: 407.481.5672; Ext. 318
mwilson@metroplanorlando.org

CONSULTANT PROJECT MANAGER:
Travis Hills, P.E.
225 E. Robinson St.
Suite 355
Orlando, FL 32801
Phone: 407.540.0555
thills@kittelson.com

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metroplan orlando

A REGIONAL TRANSPORTATION PARTNERSHIP

PEDESTRIAN AND BICYCLIST SAFETY ACTION PLANS | METROPLAN ORLANDO

CAC/TSMO/TAC Meetings| June 26 & 28, 2019

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Agenda

- Project Overview + Schedule
- Historical Crash Analysis and Crash Typing
- Safety Field Review Summary
- Critical Safety Success Factors
- Next Steps

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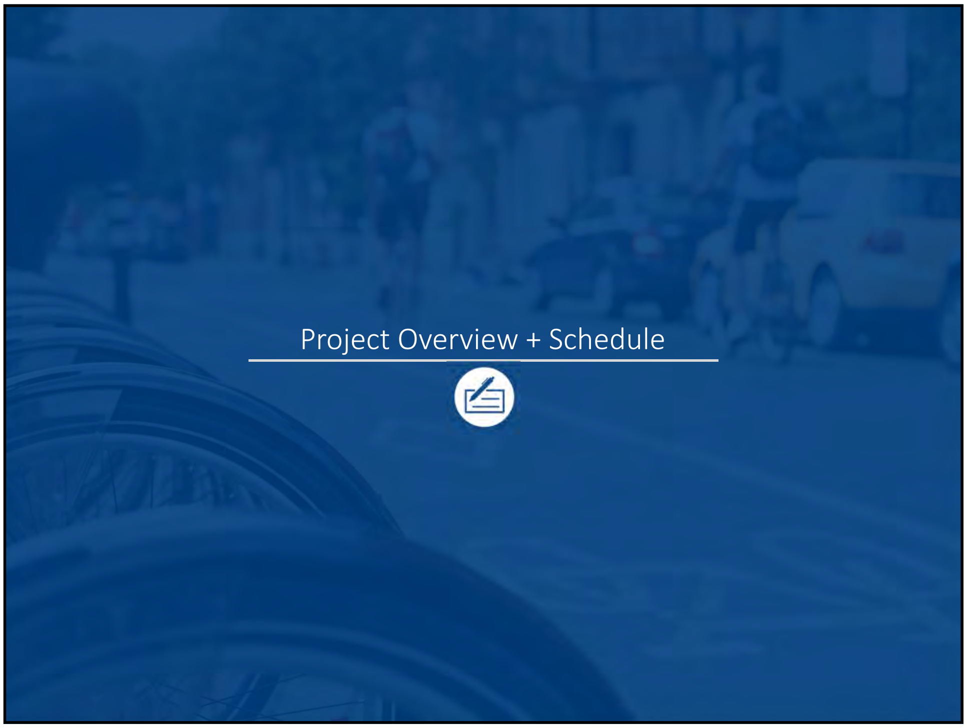

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Project Overview

Study Area

MetroPlan Orlando: Orange, Osceola, and Seminole Counties

Primary Goal

Develop safety action plans to improve safety for pedestrians and bicyclists by linking countermeasures to crash types through Critical Safety Success Factors (CSSF)

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Project Overview

General Approach to Reach Goal

- Perform historical crash analysis
- Crash typing and cause profiling
- Critical Safety Success Factors evaluation and countermeasure identification
- Perform safety field reviews at high crash locations
- Verify systemic countermeasures
- Develop Action Plans

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Project Overview

Working Group

- Comprised of County, City, and LYNX staff, and MetroPlan Committee members
- Provided guidance and input
- Participated safety field review
- Review of Action Plans

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Project Overview

Project Schedule

- **Working Group Meetings |** June 2018, August 2018, May 2019
- **Previous Studies Research & Crash Data Analysis |** April – May 2018
- **Crash Typing & Cause Profiling |** May – July 2018
- **Identification of Focus Areas & Field Reviews |** July 2018 – March 2019
- **Develop Critical Safety Success Factors |** June 2018 – May 2019
- **Develop Safety Action Plans |** June – July 2019

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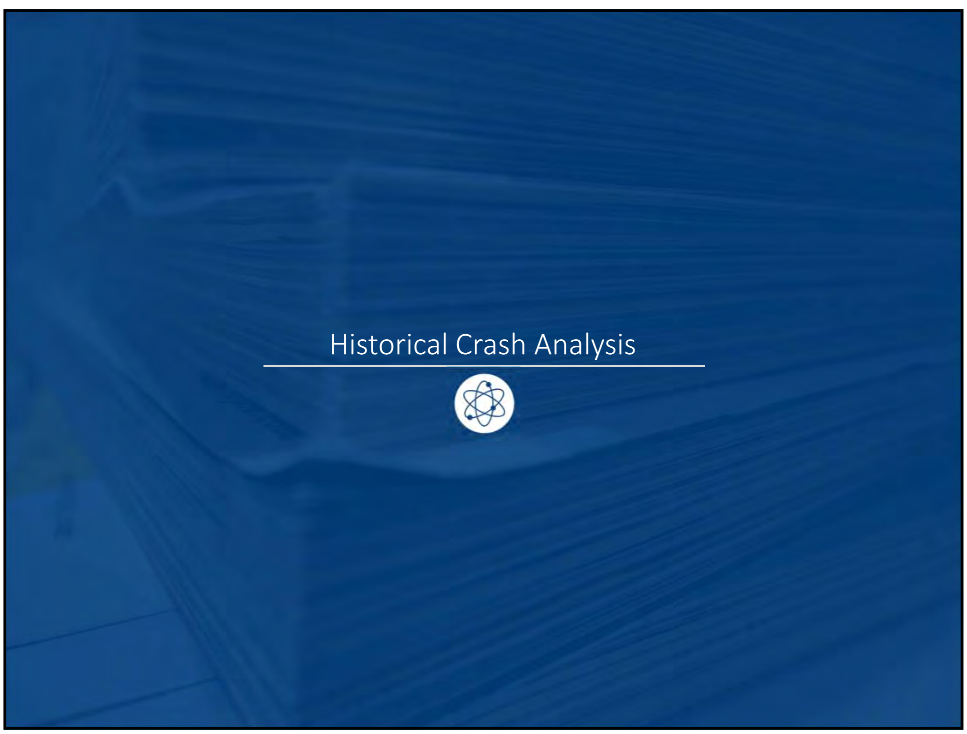

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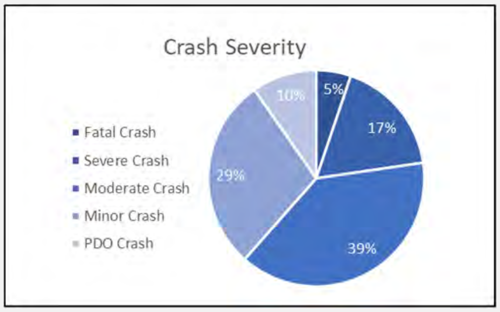
Crash Data Collection

- Seven years of pedestrian / bicyclist crash data collected 2011-2017 for Osceola, Orange, and Seminole Counties
- 5,138 pedestrian and 4,888 bicyclist totaling 10,026 crashes (excluding parking lot crashes)



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Crash Typing

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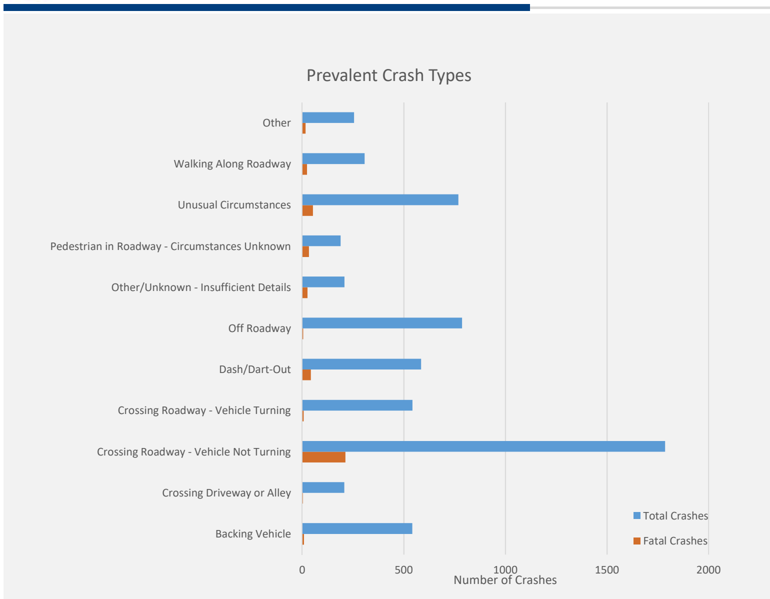
Pedestrian Crash Typing



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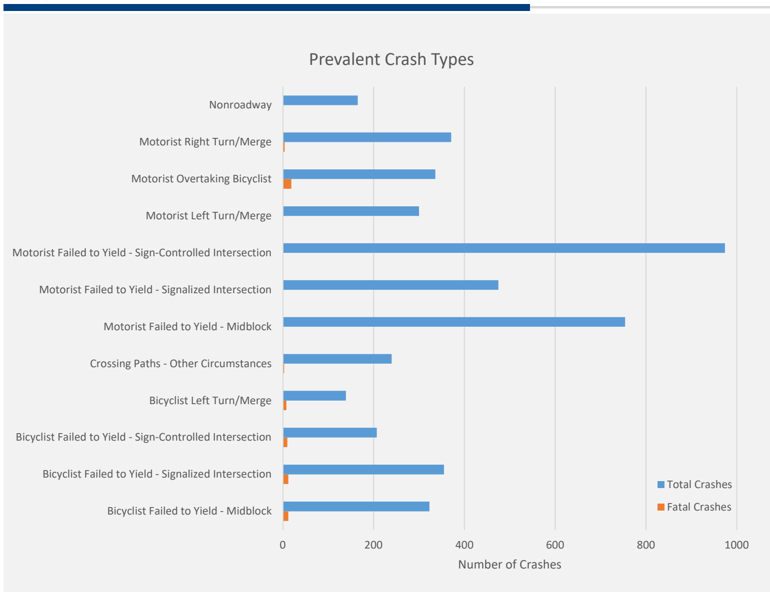
Bicyclist Crash Typing



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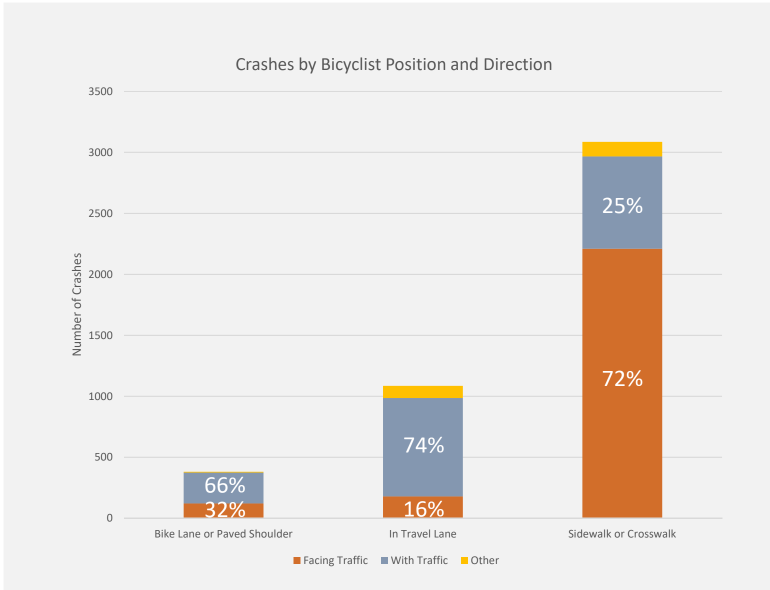
Bicyclist Crash Typing



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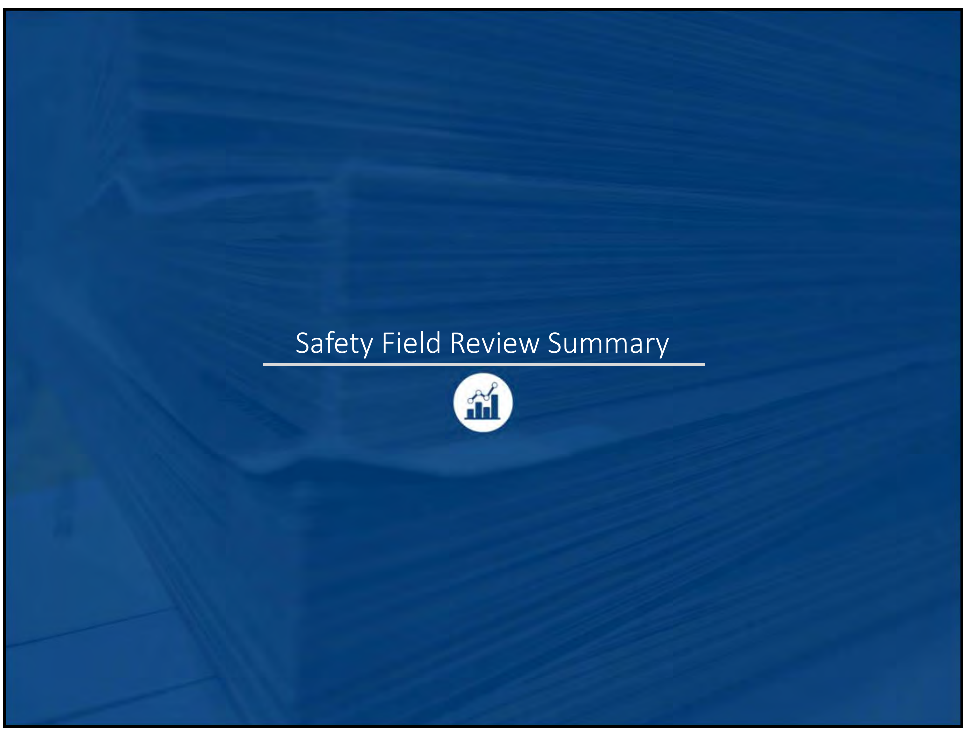

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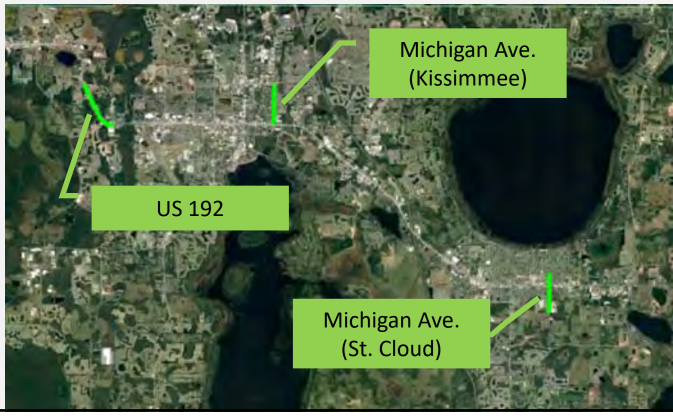
Safety Field Review Summary

- Reviewed 9 total corridors in Osceola, Seminole, and Orange Counties
- Osceola County Corridors – Michigan Avenue (Kissimmee), US 192, Michigan Avenue (St. Cloud)



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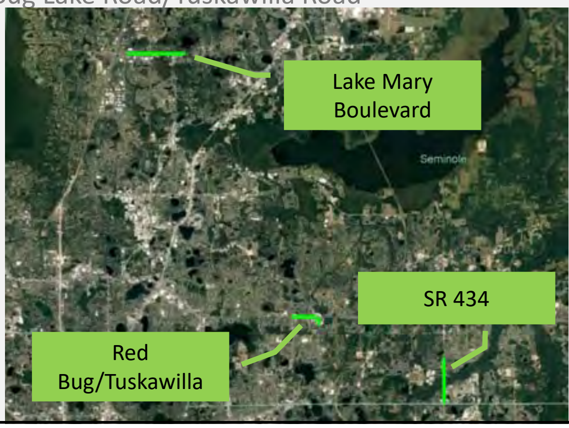
Safety Field Review Summary

- Reviewed 9 total corridors in Osceola, Seminole, and Orange Counties
- Seminole County Corridors – SR 434, Lake Mary Boulevard, Red Bug Lake Road/Tuskawilla Road



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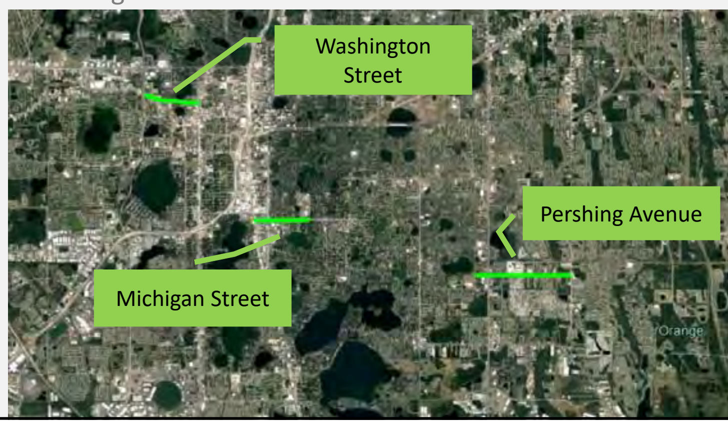
Safety Field Review Summary

- Reviewed 9 total corridors in Osceola, Seminole, and Orange Counties
- Orange County Corridors – Pershing Avenue, Michigan Street, Washington Street



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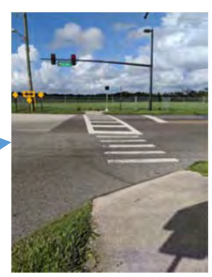
Common Corridor Wide Issues

Truncated domes are worn down or missing

Pedestrian crosswalk markings faded at signalized intersection locations



There are no marked crosswalks at most minor street intersection locations

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Common Corridor Wide Issues

Multiple fatal crashes occurred with peds/bikes crossing mid-block

Very few corridors with street lighting; nighttime ped/bike crashes between 25 and 45 percent

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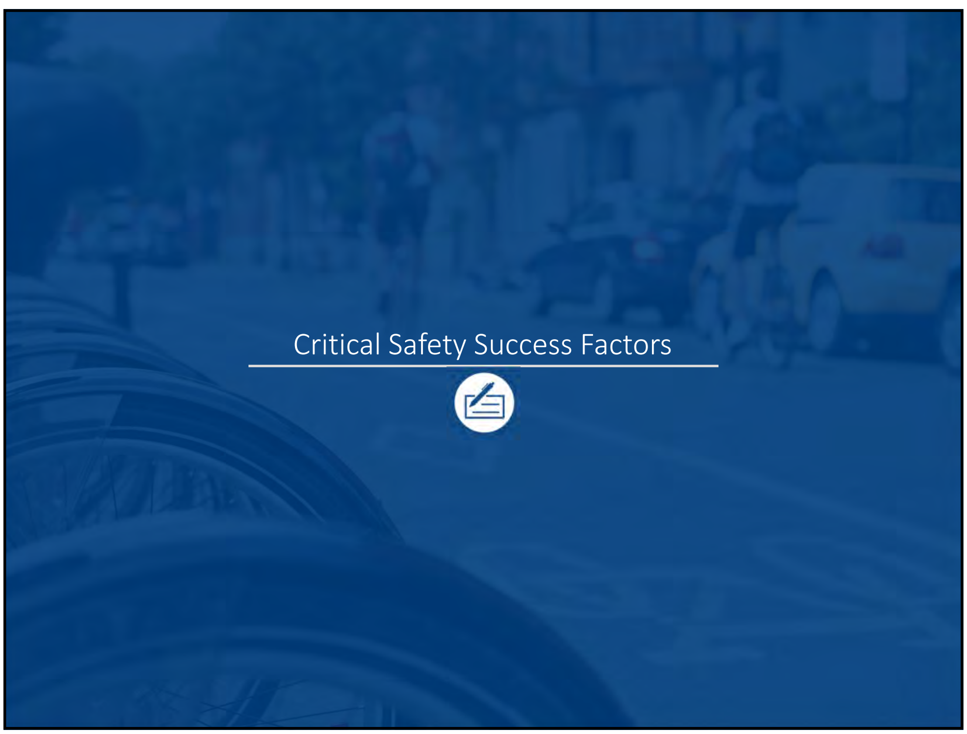

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Critical Safety Success Factors

	Critical Safety Success Factors													
Factor Groups	Visibility										Predictability			
Factors	Vantage				Seeing Conditions			Conspicuity			Passive Communication			Active Communication
Factor Functions	Position	Direction	Line of Sight	Blind Spots	Lighting	Weather	Visual Complexity	Lights	Reflectors	Color	Mode	Position	Direction	Signaling
	Crash Types and Contributing Factors													
	Do Proposed Countermeasures or Changes Improve or Degrade Critical Safety Success Factor Functions?													
Applicable Countermeasure Types	Behavior	Behavior	Behavior	Behavior	Design	Behavior	Design	Behavior	Behavior	Behavior	Behavior	Behavior	Behavior	Behavior
	Design	Design	Design	Design		Design								
	Control	Control												

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Critical Safety Success Factors

	Critical Safety Success Factors														
Factor Groups	Conflicts												Speed		
Factors	Crossing		Turning					Merging	Overtaking/Head-On						
Factor Functions	Crossing Conflict Points	Traffic Volumes	Turning Conflict Points	Destination Positioning	Direction	Number of Lanes	Traffic Volumes	Destination Positioning	Width	Position	Number of Lanes	Traffic Volumes	Perception/ Reaction/ Braking Distance	Turning Speed	Impact Speed
	Crash Types and Contributing Factors														
	Do Proposed Countermeasures or Changes Improve or Degrade Critical Safety Success Factor Functions?														
Applicable Countermeasure Types	Design	Design	Behavior	Behavior	Behavior	Design	Behavior	Design	Design	Behavior	Design	Design	Behavior	Behavior	Behavio
	Control	Control	Design	Design	Design		Design	Control		Design			Design	Design	Design
			Control										Control		Control

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Vetting Critical Success Safety Factors

Goals of CSSF Task

Determine if proposed countermeasures improve or degrade Factor Functions

- Verify applicable countermeasure types for each Factor Function
- Develop specific countermeasure treatments for each countermeasure example
- Tie countermeasure examples to Factor Functions
- Measure and evaluate each Factor Function
  - Crash data and crash typing

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Countermeasure Types and Examples

Countermeasure Types

Behavioral	Design	Control
(Education, Enforcement)	(Planning, Engineering)	(Laws, Traffic Control Devices)
Motorists, Pedestrians, Bicyclists	Planners, Engineers	Legislature, Law Enforcement, Engineers

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24

Critical Safety Success Factors

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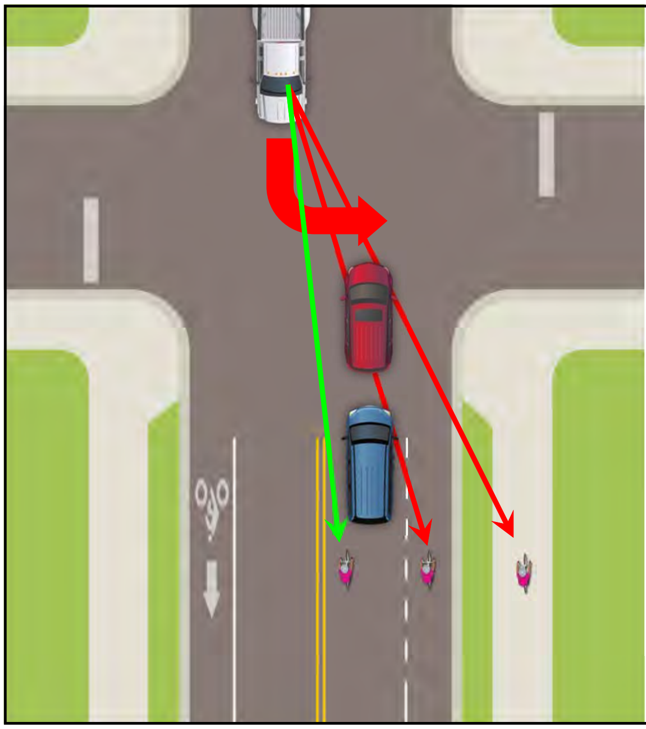

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TH15

CSSF Countermeasure Scores

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Score Calculation Example

Example Countermeasure: Pedestrian Behavior – Yielding

Factor Group: Conflicts

- Factors: Crossing & Turning
- Factor Functions: Crossing Conflict Points & Turning Conflict Points
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Fatality	173	240,297
	Total	**273,768**

Total Score = 358,920 + 273,768 = 632,688/1,000 → **633**

28

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Slide 27

TH15 The CSSF Countermeasure Scores may be too detailed for these meetings, but wanted to leave the decision up to Mighk if he wanted them in there.
Travis Hills, 6/11/2019

Pedestrian Countermeasures

Countermeasure		Visibility Score	Predictability Score	Conflicts Score	Speed Score	Total Score
Pedestrian Specific Infrastructure	**Ped Barrier**	22	0	22	0	**45**
	Raised crossing	3	0	3	9	**15**
	Leading pedestrian interval	15	0	15	0	**30**
	Ped only phase	0	0	12	0	**12**
	Sidewalk Connectivity	0	0	39	0	**39**
Other Countermeasures	**Mid-block crossing <40 mph**	21	21	0	0	**41**
	Mid-block crossing 40+ mph	0	163	0	-163	**0**
	Improve sight triangles	11	0	0	0	**11**
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	Scanning	0	0	148	128	**276**
	Speed	0	0	0	480	**480**

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Bicyclist Countermeasures

Countermeasure		Visibility Score	Predictability Score	Conflicts Score	Speed Score	**Total Score**
Bicyclist-Specific Infrastructure	**Bike Lane**	4	55	25	0	**84**
	2-Way Cycle Track	-45	55	12	0	**22**
	One-Way Cycle Track	4	55	25	0	**84**
	Bike Lane Pocket	1	0	2	0	**3**
	Sharrow	4	4	4	0	**12**
Bicyclist Behavior	**Bicycling With Traffic**	45	45	7	0	**98**
	Lane Control	23	57	51	0	**131**
	Lane Choice	5	5	5	0	**14**
	Scanning & Signaling	0	11	11	0	**23**
	Yielding	0	0	96	65	**161**
	Conspicuity	87	0	0	0	**87**
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	Lane Elimination	0	0	39	36	**75**

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Combined Countermeasure Scores

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- Countermeasure Evaluation
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Next Steps

- Complete Safety Action Plans
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  - Behavioral Change Strategies

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Next Steps

Speed Reduction Strategies

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- Comprehensive approach with outreach to public, law enforcement and courts
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Next Steps

FDOT Corridor Studies

- Replicate this approach for three FDOT corridors

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Next Steps

Behavioral Change Strategies

Motorists

- Crosswalk Yielding
- Speed
- Scanning

Pedestrians

- Communicating at Crosswalks
- Understanding Mid-Block Risks

Bicyclists

- Roadway Position
- Lighting at Night
- Go With the Flow

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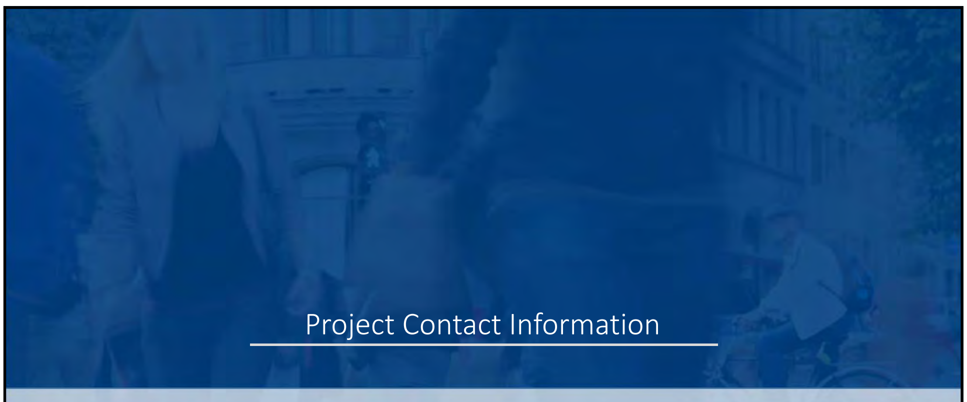

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A REGIONAL TRANSPORTATION PARTNERSHIP

KITTELSON & ASSOCIATES

MetroPlan PROJECT MANAGER:
Mighk Wilson
Transportation Planner
250 S. Orange Avenue
Suite 200
Orlando, FL 32801
Phone: 407.481.5672; Ext. 318
mwilson@metroplanorlando.org

CONSULTANT PROJECT MANAGER:
Travis Hills, P.E.
225 E. Robinson St.
Suite 355
Orlando, FL 32801
Phone: 407.540.0555
thills@kittelson.com

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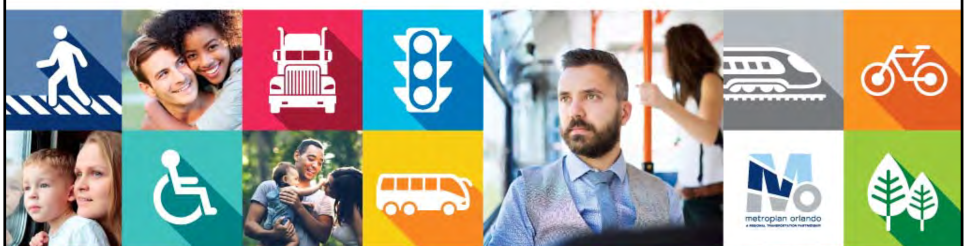
Pedestrian and Bicyclist Safety Action Plans



July 2019

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This Presentation

- Project Overview + Schedule
- Historical Crash Analysis and Crash Typing
- Safety Field Review Summary
- Critical Safety Success Factors
- Top Countermeasures + Next Steps

2

2

Project Overview

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Project Overview

Improve safety for pedestrians and bicyclists by linking ***countermeasures*** to ***crash types*** through ***Critical Safety Success Factors*** (CSSF)

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Project Overview

Catalog Crash Types and Causes

Evaluate and Rank Countermeasures through Critical Safety Success Factors & their relation to Crash Types

Perform safety field reviews along high crash corridors

Guidance and input from Working Group comprised of City, County, LYNX and Committee representatives

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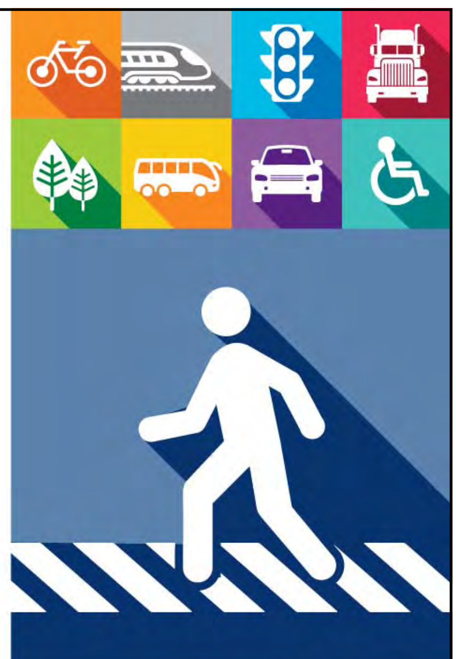
Crash Typing & Analysis



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Pedestrian & Bicyclist Crash Analysis

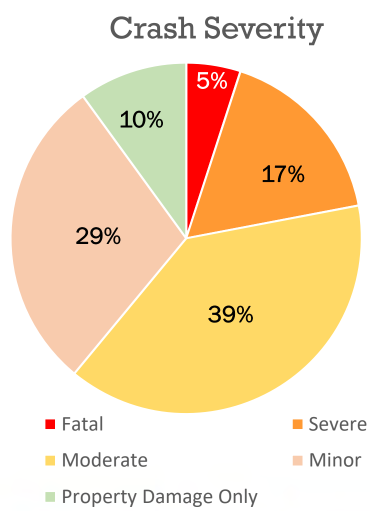
7 years of data

Pedestrian & bicyclist crashes in three-county area; 2011-2017

10,026 total crashes

= 5,138 + 4,888

(excluding parking lot crashes)



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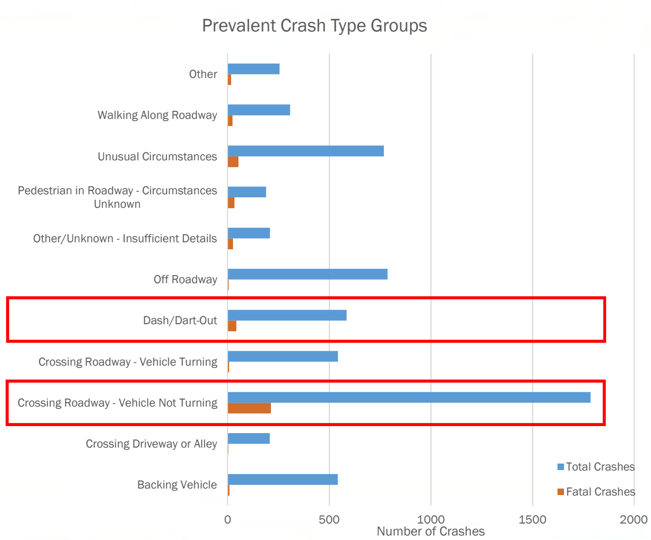
Pedestrian Crash Typing



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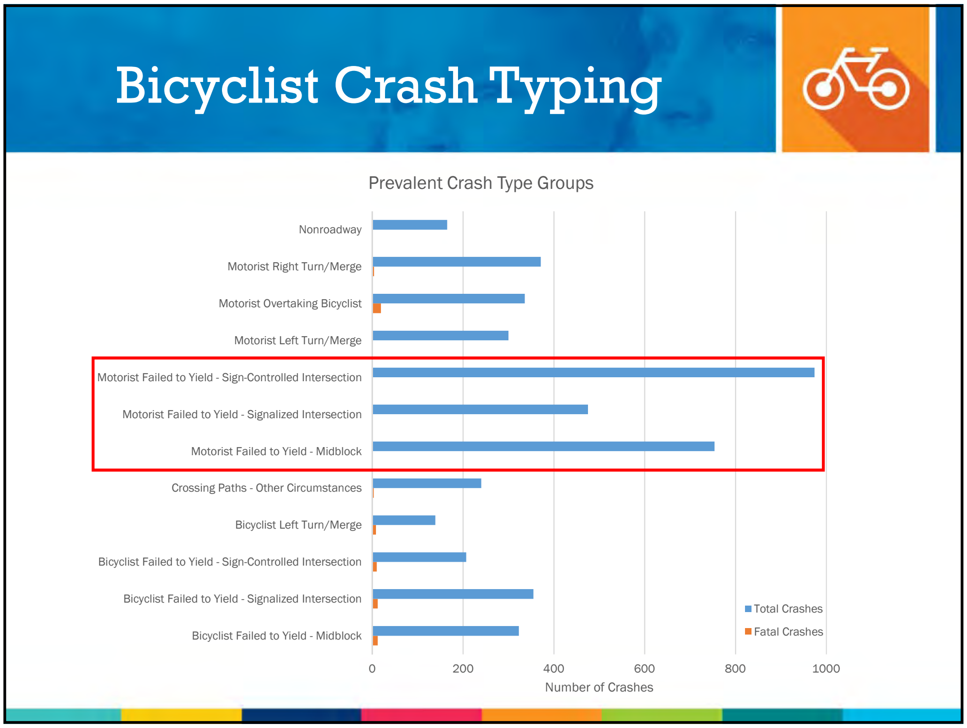
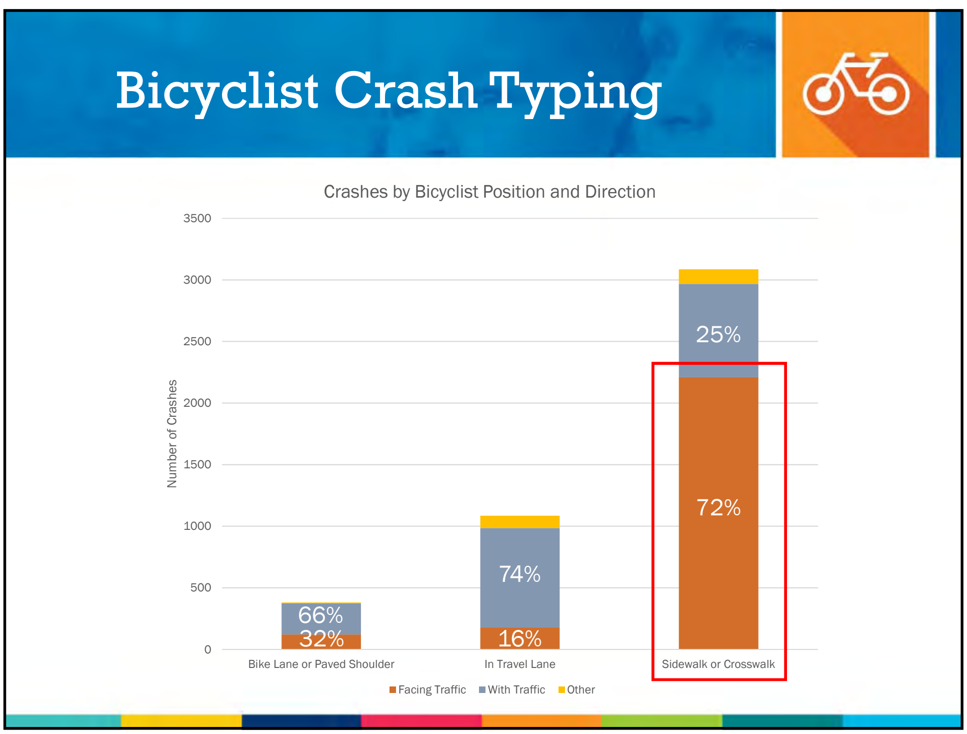

Bicyclist Crash Typing
Prevalent Crash Type Groups
Nonroadway
Motorist Right Turn/Merge
Motorist Overtaking Bicyclist
Motorist Left Turn/Merge
Motorist Failed to Yield - Sign-Controlled Intersection
Motorist Failed to Yield - Signalized Intersection
Motorist Failed to Yield - Midblock
Crossing Paths - Other Circumstances
Bicyclist Left Turn/Merge
Bicyclist Failed to Yield - Sign-Controlled Intersection
Bicyclist Failed to Yield - Signalized Intersection
Bicyclist Failed to Yield - Midblock
Total Crashes
Fatal Crashes
0
200
400
600
800
1000
Number of Crashes

9


Bicyclist Crash Typing
Crashes by Bicyclist Position and Direction
3500
3000
2500
2000
1500
1000
500
0
Number of Crashes
66%
32%
74%
16%
25%
72%
Bike Lane or Paved Shoulder
In Travel Lane
Sidewalk or Crosswalk
Facing Traffic
With Traffic
Other

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Safety Field Review Summary

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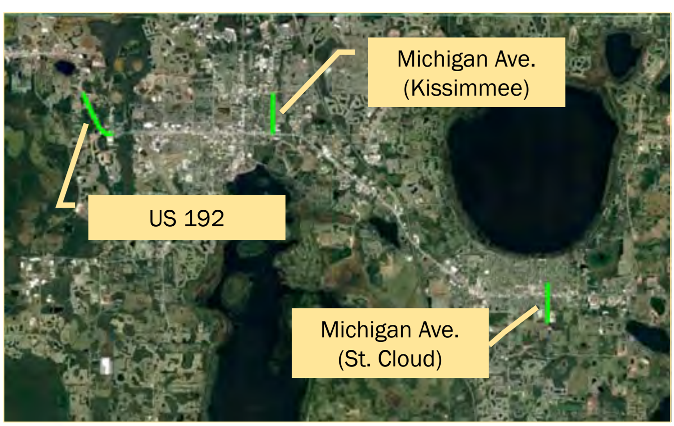
Safety Field Review Summary

Osceola County Corridors – Michigan Avenue (Kissimmee), US 192, Michigan Avenue (St. Cloud)



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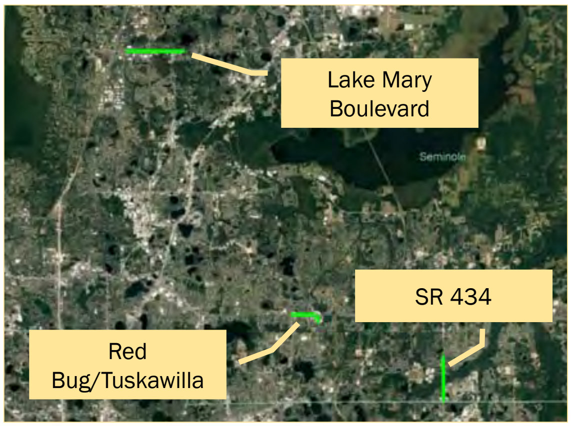
Safety Field Review Summary

Seminole County Corridors – SR 434, Lake Mary Boulevard, Red Bug Lake Road/Tuskawilla Road



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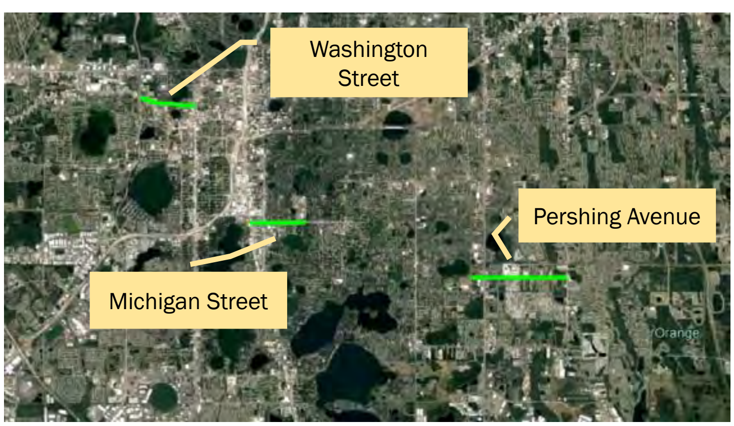
Safety Field Review Summary

Orange County Corridors – Pershing Avenue, Michigan Street, Washington Street



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Common Issues

Truncated domes worn down or missing

Crosswalk markings faded at signalized intersection locations

Crosswalks not marked at most minor street intersections

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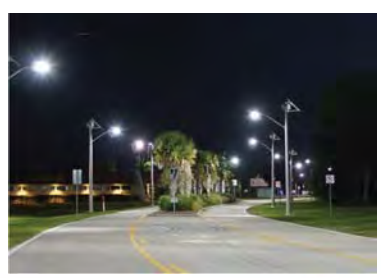
Common Issues

Multiple fatal crashes occurred with peds/bikes crossing mid-block

Few of these corridors have street lighting; night-time ped/bike crashes between 25 and 45 percent



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Critical Safety Success Factors

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Critical Safety Success Factors

Factor Groups

Visibility Predictability Conflicts Speed

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Critical Safety Success Factors

Visibility									
Vantage				Seeing Conditions			Conspicuity		
Position	Direction	Line of Sight	Blind Spots	Lighting	Weather	Visual Complexity	Lights	Reflectors	Color

Factor Group
Factors
Factor Functions

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Critical Safety Success Factors

Predictability			
Passive Communication			Active Communication
Mode	Position	Direction	Signaling

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Critical Safety Success Factors

Conflicts												
Crossing		Turning					Merging	Overtaking/ Head-On			
Crossing Conflict Points	Traffic Volumes	Turning Conflict Points	Destination Positioning	Direction	Number of Lanes	Traffic Volumes	Destination Positioning	Width	Position	Number of Lanes	Traffic Volumes

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Critical Safety Success Factors

Speed		
Perception/ Reaction/ Braking Distance	Turning Speed	Impact Speed

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Critical Safety Success Factors

Countermeasure Types

Behavioral	Design	Control
Motorist, Pedestrian & Bicyclist Behaviors	Built Environment	Laws, Traffic Control Devices
Educators, Law Enforcement	Planners, Engineers	Legislature, Law Enforcement, Engineers

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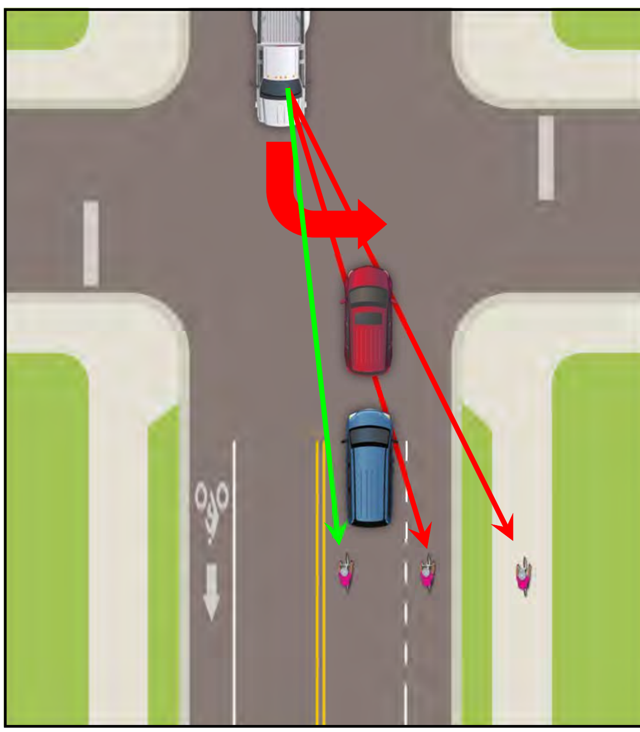

Example:

Bicyclist Crash Type:
Motorist Left Cross

Critical Safety Success Factor:
Visibility

Factor Function:
Position

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CSSF Countermeasure Scores

- Each countermeasure likely to impact multiple crash types, factor groups and factor functions
- Score quantifies the impact potential of each countermeasure across factor groups
  - Both positive and negative
  - Weighted by number and severity of relevant crash types

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Pedestrian Countermeasures

Motorist Behavior	**Pedestrian Behavior**	**Pedestrian Infrastructure**	**Other**
Reduced Speed	Yielding	Pedestrian Barriers	Street Lighting
Scanning		Sidewalk Connectivity	Reduced Posted Speed
Yielding			Night-time Speed Reduction

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Bicyclist Countermeasures

Motorist Behavior	Bicyclist Behavior	Bicyclist Infrastructure	Other
Scanning	Yielding	Bike Lane or One-way Cycle Track	Street Lighting
	Lane Control		
	Going With the Flow		
	Conspicuity		

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Combined Countermeasures

Motorist Behavior	Pedestrian/ Bicyclist Behavior	Other
Reduced Speed	Yielding	Street Lighting
		Reducing Posted Speed
		Night-time Speed Reduction

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Countermeasure Summary

Quantifies the broad impact potential of each countermeasure

Does not provide a firm crash modification factor

Scores are relative to each other, should be used for comparison purposes only

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Next Steps

Phase 2: Implementation

- Speed Reduction Strategies
- FDOT Corridor Studies
- Behavioral Change Strategies

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Thank You
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APPENDIX B: REGION AND COUNTY CRASH SUMMARIES

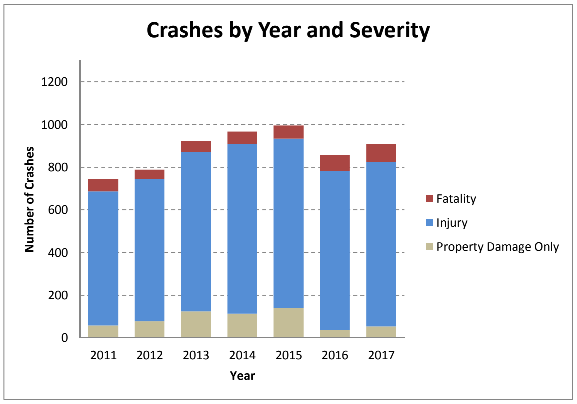
CRASH ANALYSIS - MetroPlan Areawide 2011-2017

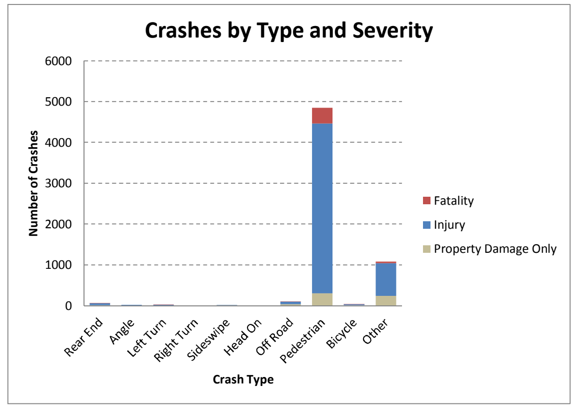
									Severity					
		2011	2012	2013	2014	2015	2016	2017	Property Damage Only	Injury	Fatality	Total	Average	Percent
Type of Crash	Rear End	4	10	13	12	13	8	6	12	48	6	66	10.40	1.1%
	Angle	1	4	1	2	2	5	2	2	15	0	17	2.00	0.3%
	Left Turn	2	1	4	3	1	0	6	2	12	3	17	2.20	0.3%
	Right Turn	0	0	0	0	0	0	0	0	0	0	0	0.00	0.0%
	Sideswipe	2	1	6	5	2	1	1	8	10	0	18	3.20	0.3%
	Head On	0	2	0	1	0	1	1	0	5	0	5	0.60	0.1%
	Off Road	16	19	21	17	19	1	7	29	67	4	100	18.40	1.6%
	Pedestrian	639	626	701	728	732	701	716	299	4159	385	4843	685.20	78.4%
	Bicycle	6	1	7	7	6	2	10	6	30	3	39	5.40	0.6%
	Other	72	124	169	191	220	138	159	237	804	32	1073	155.20	17.4%
	Total Crashes	**742**	**788**	**922**	**966**	**995**	**857**	**908**	**595**	**5150**	**433**	**6178**	**854.50**	**100.0%**
Crash Severity	Property Damage Only	57	77	123	112	138	36	52				595	101.40	9.6%
	Injury	629	666	747	796	795	745	772				5150	726.60	83.4%
	Fatality	56	45	52	58	62	76	84				433	54.60	7.0%
Light Conditions	Daylight	382	429	530	519	564	451	491	349	2943	74	3366	484.80	54.5%
	Dusk	34	34	39	35	34	31	28	18	204	13	235	35.20	3.8%
	Dawn	19	18	18	25	18	12	31	11	121	9	141	19.60	2.3%
	Dark - Lighted	206	210	214	278	247	269	258	165	1340	177	1682	231.00	27.2%
	Dark - Not Lighted	92	91	107	93	121	91	91	34	499	153	686	100.80	11.1%
	Dark - Lighting Unknown	0	0	0	0	0	0	0	0	0	0	0	0.00	0.0%
	Unknown	9	6	14	16	11	3	9	18	43	7	68	11.20	1.1%
Surface Condition	Dry	674	715	820	852	886	769	844	523	4652	385	5560	789.40	90.0%
	Wet	59	67	93	107	103	84	63	59	470	47	576	85.80	9.3%
	Other	9	6	9	7	6	4	1	13	28	1	42	7.40	0.7%
Month	January	59	70	70	83	105	90	79	47	469	40	Age	77.40	#VALUE!
	February	73	52	70	96	72	78	68	36	440	33	363	72.60	5.9%
	March	66	58	72	82	73	75	97	40	451	32	351	70.20	5.7%
	April	52	61	72	87	92	56	72	52	408	32	364	72.80	5.9%
	May	62	51	85	69	68	66	60	46	390	25	335	67.00	5.4%
	June	53	67	54	62	67	64	58	55	336	34	303	60.60	4.9%
	July	51	60	69	61	53	67	55	40	343	33	294	58.80	4.8%
	August	60	66	79	74	82	74	83	64	424	30	361	72.20	5.8%
	September	61	68	81	86	83	79	69	47	445	35	379	75.80	6.1%
	October	69	91	96	87	111	70	85	69	496	44	454	90.80	7.3%
	November	72	67	80	92	100	58	83	52	464	36	411	82.20	6.7%
	December	64	77	94	87	89	80	99	47	484	59	411	82.20	6.7%
Day of Week	Monday	101	106	151	137	126	120	125	85	723	58	621	124.20	10.1%
	Tuesday	114	133	120	161	156	106	128	92	783	43	684	136.80	11.1%
	Wednesday	119	99	135	157	157	152	137	81	813	62	667	133.40	10.8%
	Thursday	101	115	136	138	169	151	146	88	806	62	659	131.80	10.7%
	Friday	148	132	161	141	161	135	157	102	863	70	743	148.60	12.0%
	Saturday	99	106	118	126	138	111	121	72	675	72	587	117.40	9.5%
	Sunday	60	97	101	106	88	82	94	75	487	66	452	90.40	7.3%

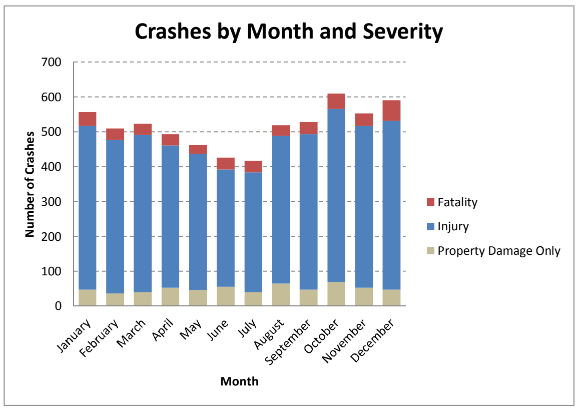
CRASH ANALYSIS - MetroPlan Areawide 2011-2017

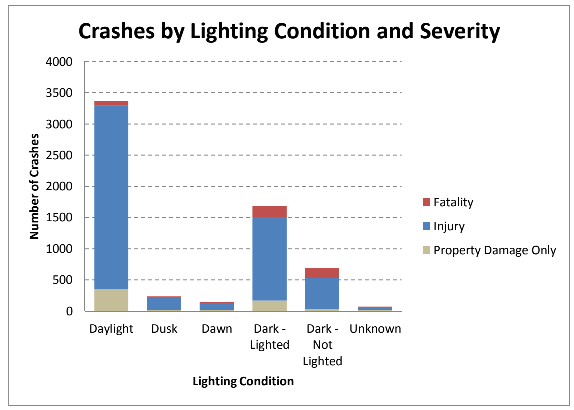
									Severity					
		2011	2012	2013	2014	2015	2016	2017	Property Damage Only	Injury	Fatality	Total	Average	Percent
Hour of Day	0:00	27	33	24	32	31	24	16	13	142	32	147	29.40	2.4%
	1:00	19	20	20	21	23	16	15	13	108	13	103	20.60	1.7%
	2:00	21	23	24	19	13	16	16	17	100	15	100	20.00	1.6%
	3:00	10	7	7	16	11	14	13	14	52	12	51	10.20	0.8%
	4:00	6	11	11	9	7	11	8	9	41	13	44	8.80	0.7%
	5:00	15	10	14	14	20	11	17	5	80	16	73	14.60	1.2%
	6:00	23	26	34	36	27	45	50	16	212	13	146	29.20	2.4%
	7:00	28	29	28	37	47	30	56	17	232	6	169	33.80	2.7%
	8:00	35	35	37	40	40	33	35	25	220	10	187	37.40	3.0%
	9:00	33	36	32	29	39	30	31	21	202	7	169	33.80	2.7%
	10:00	25	35	42	32	41	26	29	24	196	10	175	35.00	2.8%
	11:00	45	26	30	40	37	33	30	36	196	9	178	35.60	2.9%
	12:00	27	36	44	47	53	30	45	24	250	8	207	41.40	3.4%
	13:00	23	39	50	37	37	41	48	36	236	3	186	37.20	3.0%
	14:00	26	38	52	53	55	39	42	39	261	5	224	44.80	3.6%
	15:00	47	50	66	52	59	37	61	34	332	6	274	54.80	4.4%
	16:00	44	44	58	65	63	60	49	32	345	6	274	54.80	4.4%
	17:00	30	38	61	52	62	63	44	43	301	6	243	48.60	3.9%
	18:00	54	60	66	75	77	57	61	42	380	28	332	66.40	5.4%
	19:00	60	45	71	62	62	49	63	41	323	48	300	60.00	4.9%
	20:00	59	48	47	61	64	46	54	33	300	46	279	55.80	4.5%
	21:00	36	51	43	66	53	67	59	22	305	48	249	49.80	4.0%
	22:00	31	30	36	44	38	43	42	20	199	45	179	35.80	2.9%
	23:00	18	18	25	27	36	36	24	19	137	28	124	24.80	2.0%
Time Period	12AM-6AM	98	104	100	111	105	92	85	71	523	101	518	103.60	8.4%
	6AM-12PM	189	187	203	214	231	197	231	139	1258	55	1024	204.80	16.6%
	12PM-6PM	197	245	331	306	329	270	289	208	1725	34	1408	281.60	22.8%
	6PM-12AM	258	252	288	335	330	298	303	177	1644	243	1463	292.60	23.7%
Alcohol & Drugs	None	666	730	853	904	933	808	860	571	4843	340	5754	822.00	93.1%
	Alcohol Involved	60	51	46	51	53	38	34	18	266	49	333	47.57	5.4%
	Drugs Involved	4	2	5	0	1	2	6	2	14	4	20	2.86	0.3%
	Alcohol and Drugs	12	5	18	11	8	9	8	4	27	40	71	10.14	1.1%
	Undetermined	0	0	0	0	0	0	0	0	0	0	0	0.00	0.0%
Distraction Related	Y	88	98	112	112	101	88	112	53	628	30	711	102.20	11.5%
	N	654	690	810	854	894	769	796	542	4522	403	5467	780.40	88.5%

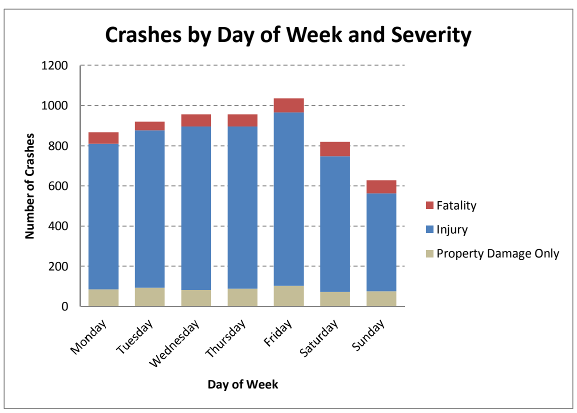
CRASH ANALYSIS - MetroPlan Areawide 2011-2017

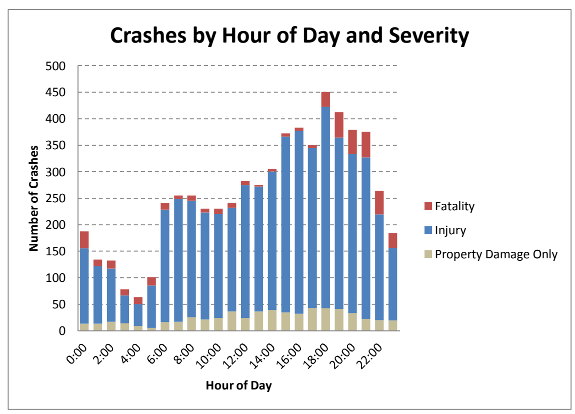


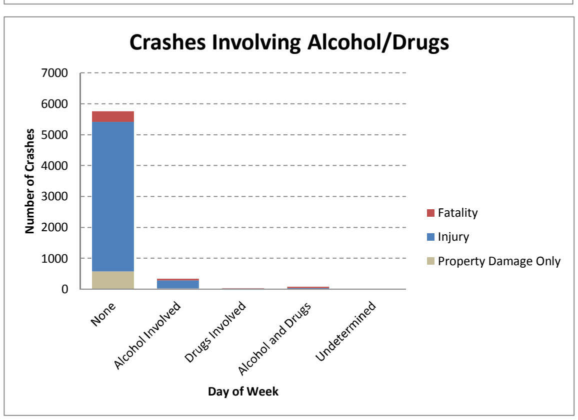


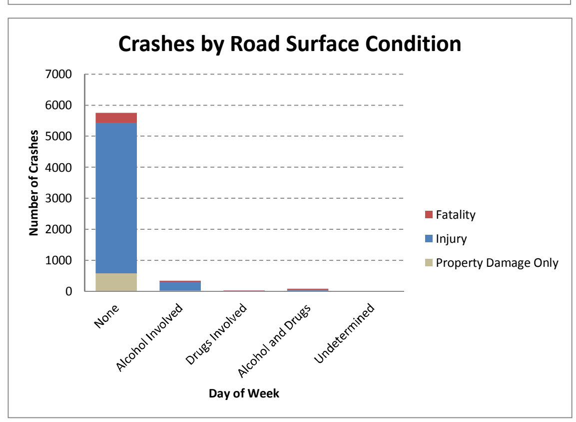












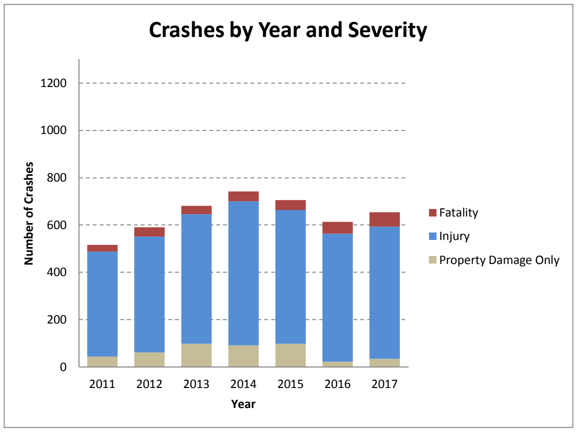
CRASH ANALYSIS - Orange County 2011-2017

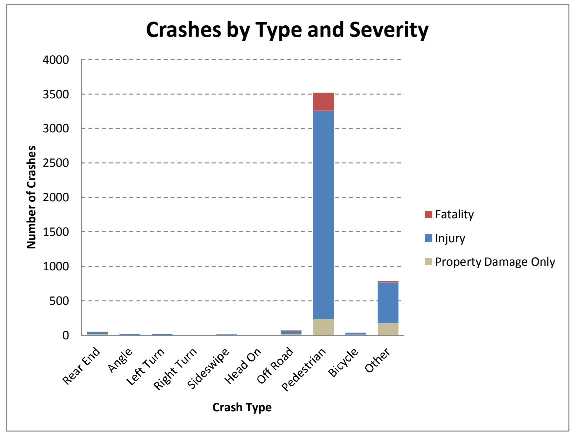
									Severity					
		2011	2012	2013	2014	2015	2016	2017	Property Damage Only	Injury	Fatality	Total	Average	Percent
Type of Crash	Rear End	4	9	8	11	9	4	3	9	34	5	48	8.20	1.1%
	Angle	1	2	1	2	1	4	2	2	11	0	13	1.40	0.3%
	Left Turn	2	1	3	2	1	0	6	2	10	3	15	1.80	0.3%
	Right Turn	0	0	0	0	0	0	0	0	0	0	0	0.00	0.0%
	Sideswipe	1	1	6	4	2	1	0	8	7	0	15	2.80	0.3%
	Head On	0	2	0	0	0	0	0	0	2	0	2	0.40	0.0%
	Off Road	10	12	16	11	10	1	7	17	47	3	67	11.80	1.5%
	Pedestrian	443	475	506	547	532	510	504	227	3031	259	3517	500.60	78.2%
	Bicycle	4	1	6	7	6	2	6	5	24	3	32	4.80	0.7%
	Other	50	87	134	157	144	91	125	175	590	23	788	114.40	17.5%
	Total Crashes	**515**	**590**	**680**	**741**	**705**	**613**	**653**	**445**	**3756**	**296**	**4497**	**631.50**	**100.0%**
Crash Severity	Property Damage Only	43	61	98	91	97	21	34				445	78.00	9.9%
	Injury	444	490	547	608	566	542	559				3756	531.00	83.5%
	Fatality	28	39	35	42	42	50	60				296	37.20	6.6%
Light Conditions	Daylight	277	312	403	406	394	319	353	255	2153	56	2464	358.40	54.8%
	Dusk	25	27	26	24	27	25	21	14	151	10	175	25.80	3.9%
	Dawn	11	17	15	21	9	7	19	9	84	6	99	14.60	2.2%
	Dark - Lighted	140	163	158	215	185	204	188	128	1005	120	1253	172.20	27.9%
	Dark - Not Lighted	57	69	65	62	82	55	63	25	330	98	453	67.00	10.1%
	Dark - Lighting Unknown	0	0	0	0	0	0	0	0	0	0	0	0.00	0.0%
	Unknown	5	2	13	13	8	3	9	14	33	6	53	8.20	1.2%
Surface Condition	Dry	465	535	603	662	628	555	609	395	3396	266	4057	578.60	90.2%
	Wet	46	51	71	76	74	55	43	43	344	29	416	63.60	9.3%
	Other	4	4	6	3	3	3	1	7	16	1	24	4.00	0.5%
Month	January	43	47	49	58	63	70	52	31	321	30	Age	52.00	#VALUE!
	February	45	36	50	73	59	50	50	32	308	23	263	52.60	5.8%
	March	45	41	53	65	50	55	67	27	326	23	254	50.80	5.6%
	April	40	47	58	69	63	46	50	41	307	25	277	55.40	6.2%
	May	49	40	66	52	45	44	46	38	284	20	252	50.40	5.6%
	June	38	53	40	50	54	42	45	42	260	20	235	47.00	5.2%
	July	37	48	56	48	41	54	31	31	261	23	230	46.00	5.1%
	August	42	51	54	51	56	54	61	46	307	16	254	50.80	5.6%
	September	34	48	53	68	56	63	57	36	322	21	259	51.80	5.8%
	October	50	71	71	67	79	44	63	47	369	29	338	67.60	7.5%
	November	49	51	60	70	72	39	61	37	341	24	302	60.40	6.7%
	December	43	57	70	70	67	52	70	37	350	42	307	61.40	6.8%
Day of Week	Monday	71	84	115	99	89	85	93	71	521	44	458	91.60	10.2%
	Tuesday	82	101	83	130	103	66	93	66	561	31	499	99.80	11.1%
	Wednesday	86	71	98	129	103	114	98	61	596	42	487	97.40	10.8%
	Thursday	69	94	108	104	128	115	100	64	610	44	503	100.60	11.2%
	Friday	103	94	119	99	117	97	116	74	629	42	532	106.40	11.8%
	Saturday	72	70	88	96	101	73	86	53	485	48	427	85.40	9.5%
	Sunday	32	76	69	84	64	63	67	56	354	45	325	65.00	7.2%

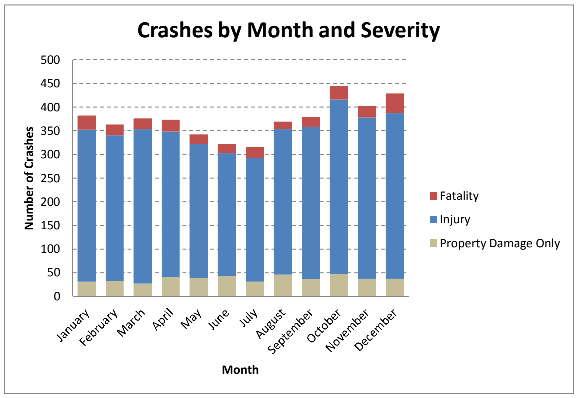
CRASH ANALYSIS - Orange County 2011-2017

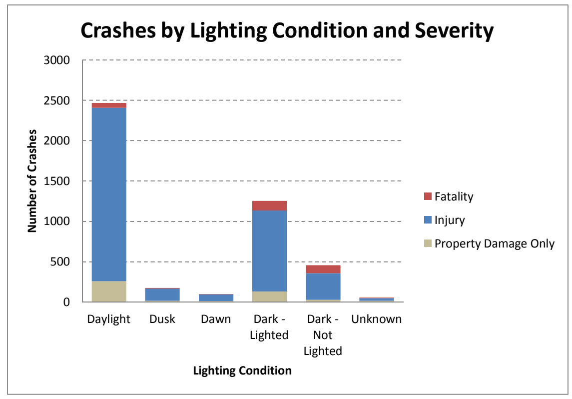
									Severity					
		2011	2012	2013	2014	2015	2016	2017	Property Damage Only	Injury	Fatality	Total	Average	Percent
Hour of Day	0:00	19	25	19	25	24	19	12	10	109	24	112	22.40	2.5%
	1:00	18	17	16	17	20	12	12	12	91	9	88	17.60	2.0%
	2:00	18	19	19	16	12	14	16	15	87	12	84	16.80	1.9%
	3:00	8	6	6	11	11	13	10	13	44	8	42	8.40	0.9%
	4:00	5	10	8	6	5	10	6	7	34	9	34	6.80	0.8%
	5:00	11	10	8	13	14	9	12	5	61	11	56	11.20	1.2%
	6:00	14	18	27	34	17	29	42	15	158	8	110	22.00	2.4%
	7:00	17	21	26	27	30	22	40	14	165	4	121	24.20	2.7%
	8:00	27	28	26	36	27	21	26	22	160	9	144	28.80	3.2%
	9:00	24	29	21	25	31	21	22	16	154	3	130	26.00	2.9%
	10:00	18	23	36	22	25	19	23	17	142	7	124	24.80	2.8%
	11:00	33	17	19	33	23	23	19	27	133	7	125	25.00	2.8%
	12:00	21	29	33	35	39	16	32	20	178	7	157	31.40	3.5%
	13:00	14	27	38	29	22	22	34	23	161	2	130	26.00	2.9%
	14:00	15	23	34	37	43	29	25	23	179	4	152	30.40	3.4%
	15:00	33	35	50	44	44	26	42	25	244	5	206	41.20	4.6%
	16:00	36	31	46	54	43	44	34	24	258	6	210	42.00	4.7%
	17:00	22	27	45	37	43	47	35	31	223	2	174	34.80	3.9%
	18:00	33	48	52	51	56	42	39	30	271	20	240	48.00	5.3%
	19:00	35	37	50	44	42	40	41	28	227	34	208	41.60	4.6%
	20:00	37	32	29	44	40	34	42	21	210	27	182	36.40	4.0%
	21:00	21	40	25	45	41	49	38	15	213	31	172	34.40	3.8%
	22:00	21	24	27	38	27	29	30	15	154	27	137	27.40	3.0%
	23:00	15	14	20	18	26	23	21	17	100	20	93	18.60	2.1%
Time Period	12AM-6AM	79	87	76	88	86	77	68	62	426	73	416	83.20	9.3%
	6AM-12PM	133	136	155	177	153	135	172	111	912	38	754	150.80	16.8%
	12PM-6PM	141	172	246	236	234	184	202	146	1243	26	1029	205.80	22.9%
	6PM-12AM	162	195	203	240	232	217	211	126	1175	159	1032	206.40	22.9%
Alcohol & Drugs	None	473	546	637	694	661	580	617	430	3534	244	4208	601.14	93.6%
	Alcohol Involved	34	40	31	39	37	26	26	12	194	27	233	33.29	5.2%
	Drugs Involved	2	1	2	0	1	0	4	1	8	1	10	1.43	0.2%
	Alcohol and Drugs	6	3	10	8	6	7	6	2	20	24	46	6.57	1.0%
	Undetermined	0	0	0	0	0	0	0	0	0	0	0	0.00	0.0%
Distraction Related	Y	53	72	85	85	70	63	81	41	448	20	509	73.00	11.3%
	N	462	518	595	656	635	550	572	404	3308	276	3988	573.20	88.7%

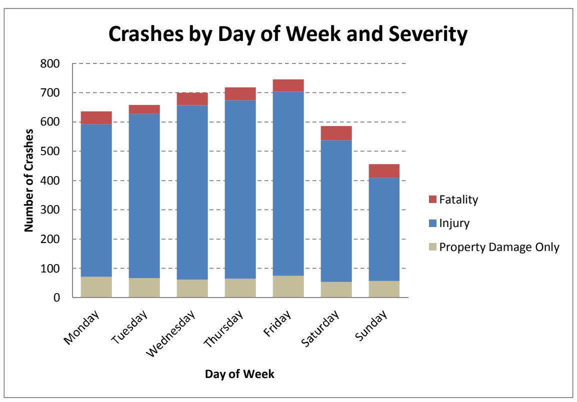
CRASH ANALYSIS - Orange County 2011-2017

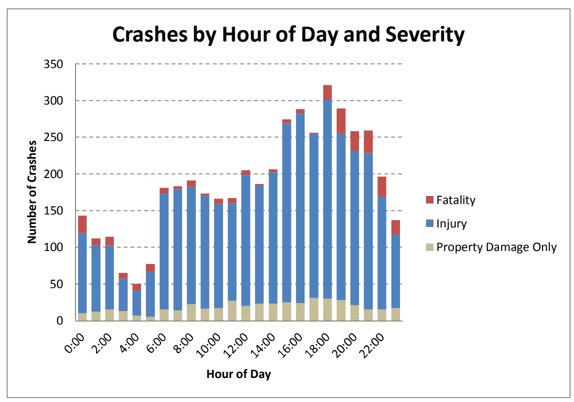


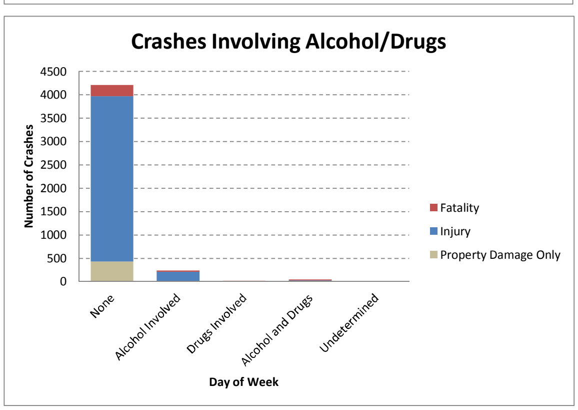


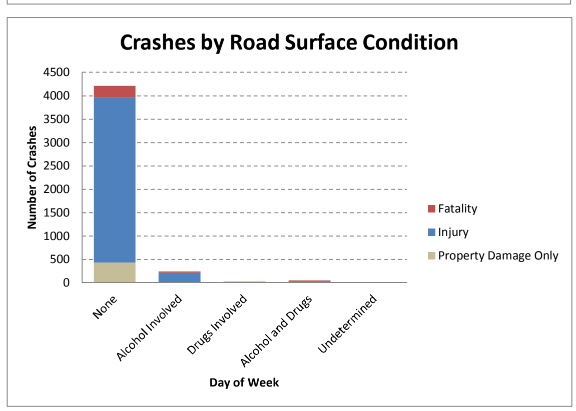












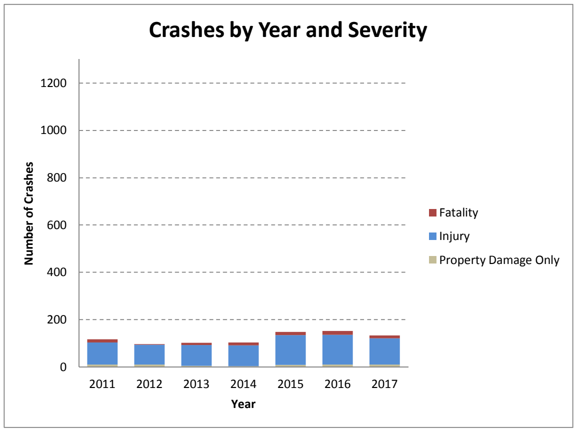
CRASH ANALYSIS - Osceola County 2011-2017

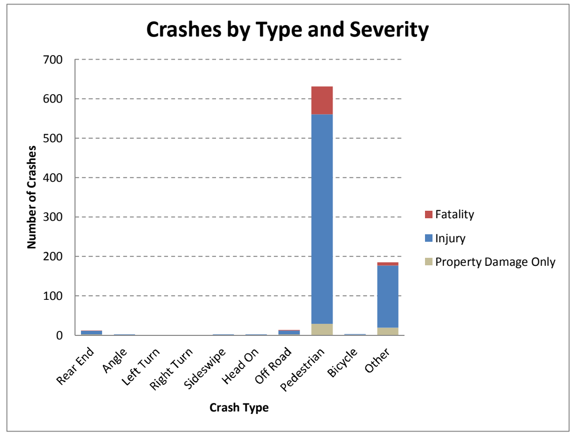
									Severity					
		2011	2012	2013	2014	2015	2016	2017	Property Damage Only	Injury	Fatality	Total	Average	Percent
Type of Crash	Rear End	0	0	4	0	3	3	2	2	9	1	12	1.40	1.4%
	Angle	0	1	0	0	1	0	0	0	2	0	2	0.40	0.2%
	Left Turn	0	0	0	0	0	0	0	0	0	0	0	0.00	0.0%
	Right Turn	0	0	0	0	0	0	0	0	0	0	0	0.00	0.0%
	Sideswipe	1	0	0	0	0	0	1	0	2	0	2	0.20	0.2%
	Head On	0	0	0	1	0	0	1	0	2	0	2	0.20	0.2%
	Off Road	1	3	1	3	5	0	0	2	10	1	13	2.60	1.5%
	Pedestrian	102	69	81	79	93	112	95	29	531	71	631	84.80	74.2%
	Bicycle	0	0	0	0	0	0	3	1	2	0	3	0.00	0.4%
	Other	13	23	15	20	46	37	31	19	158	8	185	23.40	21.8%
	Total Crashes	**117**	**96**	**101**	**103**	**148**	**152**	**133**	**53**	**716**	**81**	**850**	**104.25**	**100.0%**
Crash Severity	Property Damage Only	10	9	4	3	8	9	10				53	6.80	6.2%
	Injury	93	85	88	88	126	126	110				716	96.00	84.2%
	Fatality	14	2	9	12	14	17	13				81	10.20	9.5%
Light Conditions	Daylight	49	55	47	41	87	76	67	33	380	9	422	55.80	49.6%
	Dusk	6	5	9	8	4	4	5	3	37	1	41	6.40	4.8%
	Dawn	7	1	1	4	6	2	6	2	24	1	27	3.80	3.2%
	Dark - Lighted	36	25	30	36	30	46	39	12	190	40	242	31.40	28.5%
	Dark - Not Lighted	17	7	13	14	21	24	16	2	81	29	112	14.40	13.2%
	Dark - Lighting Unknown	0	0	0	0	0	0	0	0	0	0	0	0.00	0.0%
	Unknown	2	3	1	0	0	0	0	1	4	1	6	1.20	0.7%
Surface Condition	Dry	108	85	90	89	135	135	123	45	651	69	765	101.40	90.0%
	Wet	7	9	8	12	12	16	10	5	57	12	74	9.60	8.7%
	Other	2	2	3	2	1	1	0	3	8	0	11	2.00	1.3%
Month	January	4	12	11	11	23	11	14	6	77	3	Age	12.20	#VALUE!
	February	14	7	8	12	8	16	7	1	64	7	49	9.80	5.8%
	March	12	11	11	7	9	11	16	4	68	5	50	10.00	5.9%
	April	4	10	5	6	13	7	11	0	51	5	38	7.60	4.5%
	May	9	5	6	9	11	12	6	2	53	3	40	8.00	4.7%
	June	9	7	5	5	8	19	7	5	43	12	34	6.80	4.0%
	July	9	4	6	2	8	5	12	2	35	9	29	5.80	3.4%
	August	8	5	8	11	14	16	15	8	60	9	46	9.20	5.4%
	September	14	9	11	11	13	10	7	5	64	6	58	11.60	6.8%
	October	11	10	7	12	15	17	13	11	69	5	55	11.00	6.5%
	November	13	7	11	10	14	9	10	5	63	6	55	11.00	6.5%
	December	10	9	12	7	12	19	15	4	69	11	50	10.00	5.9%
Day of Week	Monday	8	11	16	17	23	22	15	3	102	7	75	15.00	8.8%
	Tuesday	18	16	15	14	21	28	18	11	114	5	84	16.80	9.9%
	Wednesday	14	16	14	12	28	23	22	7	109	13	84	16.80	9.9%
	Thursday	18	9	8	18	19	23	20	8	97	10	72	14.40	8.5%
	Friday	29	20	22	17	20	23	19	11	122	17	108	21.60	12.7%
	Saturday	18	16	14	16	23	21	21	8	105	16	87	17.40	10.2%
	Sunday	12	8	12	9	14	12	18	5	67	13	55	11.00	6.5%

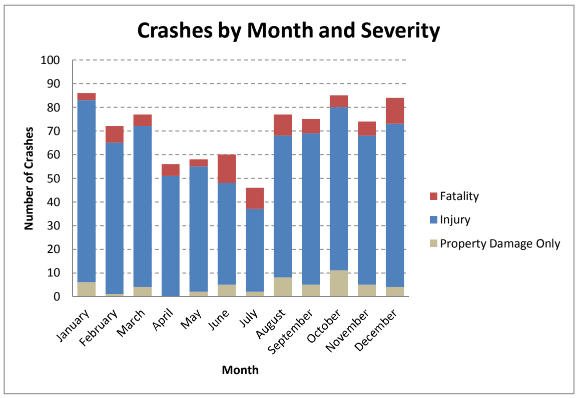
CRASH ANALYSIS - Osceola County 2011-2017

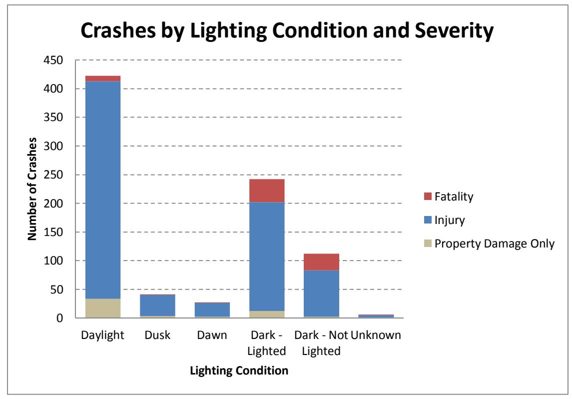
									Severity					
		2011	2012	2013	2014	2015	2016	2017	Property Damage Only	Injury	Fatality	Total	Average	Percent
Hour of Day	0:00	5	6	3	4	5	3	1	1	22	4	23	4.60	2.7%
	1:00	0	2	3	1	1	3	1	0	8	3	7	1.40	0.8%
	2:00	2	1	2	1	1	1	0	0	6	2	7	1.40	0.8%
	3:00	0	0	1	1	0	1	2	0	3	2	2	0.40	0.2%
	4:00	0	1	0	2	0	0	1	0	2	2	3	0.60	0.4%
	5:00	2	0	2	1	5	1	3	0	10	4	10	2.00	1.2%
	6:00	4	5	3	2	7	14	4	1	36	2	21	4.20	2.5%
	7:00	7	7	1	5	9	5	8	3	38	1	29	5.80	3.4%
	8:00	1	5	8	2	6	6	6	0	34	0	22	4.40	2.6%
	9:00	3	4	3	2	5	8	5	2	25	3	17	3.40	2.0%
	10:00	3	8	3	5	10	3	3	4	30	1	29	5.80	3.4%
	11:00	4	3	4	1	9	8	6	4	30	1	21	4.20	2.5%
	12:00	2	5	1	5	8	5	4	1	29	0	21	4.20	2.5%
	13:00	4	5	6	2	7	11	4	5	33	1	24	4.80	2.8%
	14:00	8	6	5	6	6	5	8	4	40	0	31	6.20	3.6%
	15:00	7	4	6	4	6	5	8	2	38	0	27	5.40	3.2%
	16:00	5	5	5	3	5	9	9	5	36	0	23	4.60	2.7%
	17:00	6	2	8	6	9	9	5	4	38	3	31	6.20	3.6%
	18:00	9	7	5	11	11	10	14	3	61	3	43	8.60	5.1%
	19:00	15	4	9	8	8	6	13	5	50	8	44	8.80	5.2%
	20:00	14	6	11	9	13	6	7	6	51	9	53	10.60	6.2%
	21:00	8	6	7	12	4	13	12	3	48	11	37	7.40	4.4%
	22:00	7	2	3	5	8	11	8	0	28	16	25	5.00	2.9%
	23:00	1	2	2	5	5	9	1	0	20	5	15	3.00	1.8%
Time Period	12AM-6AM	9	10	11	10	12	9	8	1	51	17	52	10.40	6.1%
	6AM-12PM	22	32	22	17	46	44	32	14	193	8	139	27.80	16.4%
	12PM-6PM	32	27	31	26	41	44	38	21	214	4	157	31.40	18.5%
	6PM-12AM	54	27	37	50	49	55	55	17	258	52	217	43.40	25.5%
Alcohol & Drugs	None	97	90	92	96	138	139	124	50	672	54	776	110.86	91.3%
	Alcohol Involved	15	4	4	4	10	9	6	2	37	13	52	7.43	6.1%
	Drugs Involved	1	0	1	0	0	2	1	0	2	3	5	0.71	0.6%
	Alcohol and Drugs	4	2	4	3	0	2	2	1	5	11	17	2.43	2.0%
	Undetermined	0	0	0	0	0	0	0	0	0	0	0	0.00	0.0%
Distraction Related	Y	21	19	14	21	15	16	18	4	113	7	124	18.00	14.6%
	N	96	77	87	82	133	136	115	49	603	74	726	95.00	85.4%

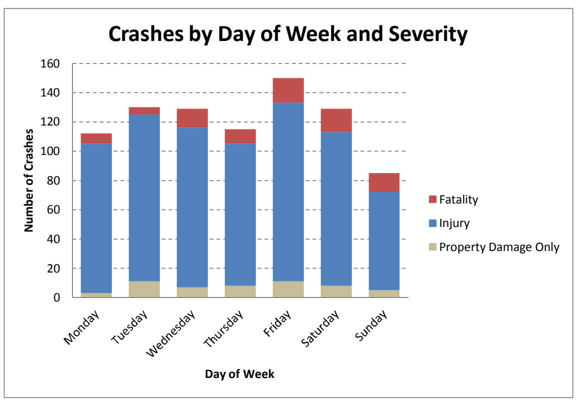
CRASH ANALYSIS - Osceola County 2011-2017

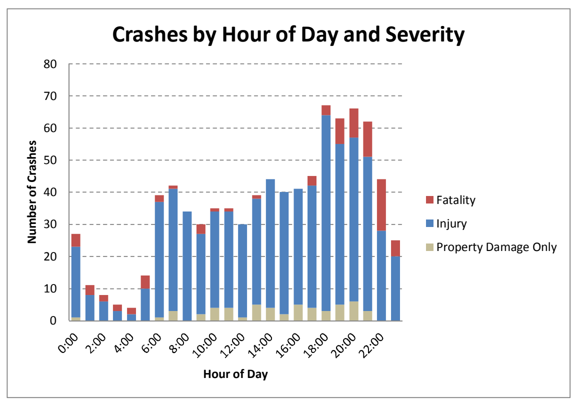


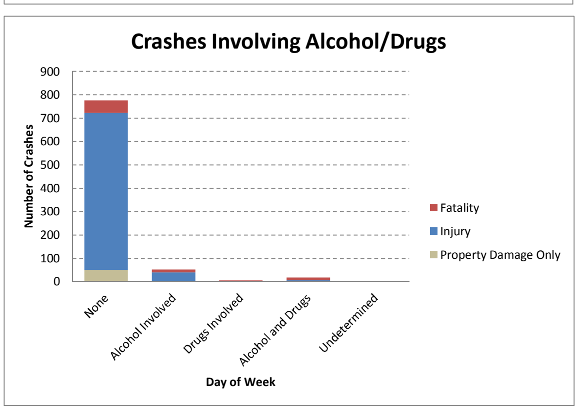


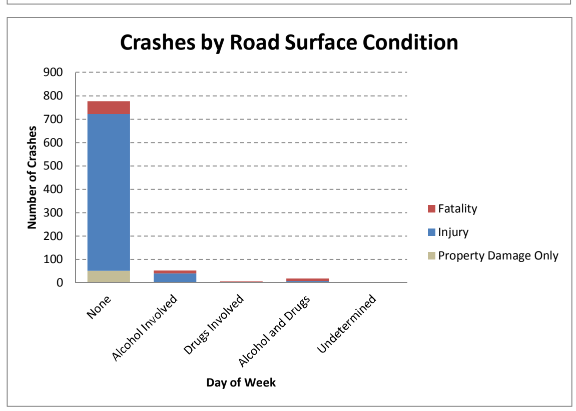












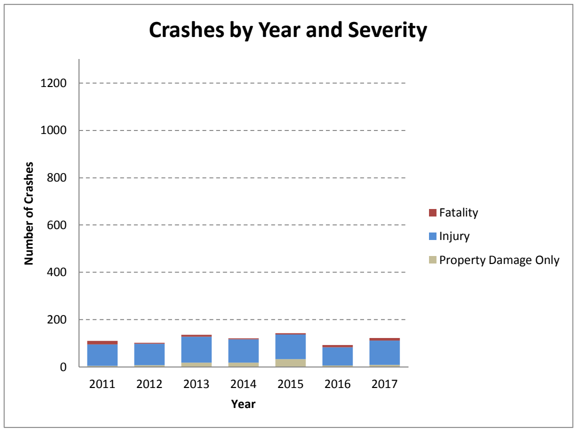
CRASH ANALYSIS - Seminole County 2011-2017

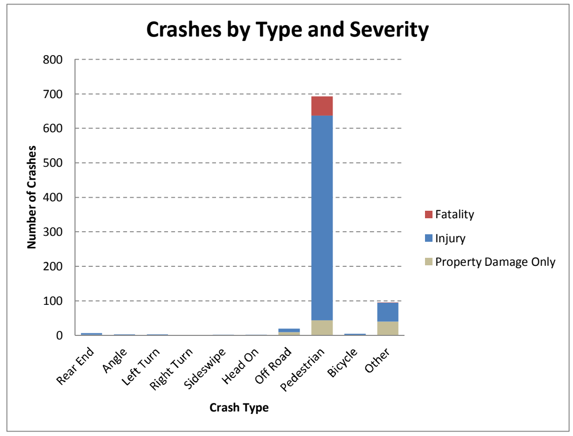
		2011	2012	2013	2014	2015	2016	2017	Severity: Property Damage Only	Severity: Injury	Severity: Fatality	Total	Average	Percent
Type of Crash	Rear End	0	1	1	1	1	1	1	1	5	0	6	0.80	0.7%
	Angle	0	1	0	0	0	1	0	0	2	0	2	0.20	0.2%
	Left Turn	0	0	1	1	0	0	0	0	2	0	2	0.40	0.2%
	Right Turn	0	0	0	0	0	0	0	0	0	0	0	0.00	0.0%
	Sideswipe	0	0	0	1	0	0	0	0	1	0	1	0.20	0.1%
	Head On	0	0	0	0	0	1	0	0	1	0	1	0.00	0.1%
	Off Road	5	4	3	3	4	0	0	9	10	0	19	3.80	2.3%
	Pedestrian	93	81	113	102	107	79	117	43	594	55	692	99.20	84.2%
	Bicycle	2	0	1	0	0	0	1	0	4	0	4	0.60	0.5%
	Other	9	14	16	13	30	10	3	39	55	1	95	16.40	11.6%
	Total Crashes	**109**	**101**	**135**	**121**	**142**	**92**	**122**	**92**	**674**	**56**	**822**	**116.50**	**100.0%**
Crash Severity	Property Damage Only	4	7	17	17	33	6	8				92	15.60	11.2%
	Injury	91	90	110	100	103	77	103				674	98.80	82.0%
	Fatality	14	4	8	4	6	9	11				56	7.20	6.8%
Light Conditions	Daylight	56	61	76	72	83	56	71	58	408	9	475	69.60	57.8%
	Dusk	3	2	4	3	3	2	2	1	16	2	19	3.00	2.3%
	Dawn	1	0	2	0	3	3	6	0	13	2	15	1.20	1.8%
	Dark - Lighted	29	22	25	26	32	19	31	23	144	17	184	26.80	22.4%
	Dark - Not Lighted	18	15	28	17	18	12	12	7	87	26	120	19.20	14.6%
	Dark - Lighting Unknown	0	0	0	0	0	0	0	0	0	0	0	0.00	0.0%
	Unknown	2	1	0	3	3	0	0	3	6	0	9	1.80	1.1%
Surface Condition	Dry	100	94	121	101	123	79	112	79	601	50	730	107.80	88.8%
	Wet	6	7	14	18	17	13	10	10	69	6	85	12.40	10.3%
	Other	3	0	0	2	2	0	0	3	4	0	7	1.40	0.9%
Month	January	12	11	10	14	19	9	13	10	71	7	Age	13.20	#VALUE!
	February	14	9	11	11	5	12	11	2	68	3	50	10.00	6.1%
	March	9	6	8	10	14	9	14	9	57	4	47	9.40	5.7%
	April	7	3	9	12	16	3	11	11	48	2	47	9.40	5.7%
	May	4	6	13	7	12	10	8	5	53	2	42	8.40	5.1%
	June	6	7	9	7	5	3	6	8	33	2	34	6.80	4.1%
	July	5	8	7	11	4	8	12	7	47	1	35	7.00	4.3%
	August	10	10	16	12	12	4	7	9	57	5	60	12.00	7.3%
	September	13	11	17	7	14	6	5	6	59	8	62	12.40	7.5%
	October	8	10	17	8	17	9	9	10	58	10	60	12.00	7.3%
	November	10	9	8	12	14	10	12	10	59	6	53	10.60	6.4%
	December	11	11	10	10	10	9	14	5	64	6	52	10.40	6.3%
Day of Week	Monday	22	11	18	21	14	13	17	10	99	7	86	17.20	10.5%
	Tuesday	14	16	21	17	32	12	17	14	108	7	100	20.00	12.2%
	Wednesday	19	11	22	16	26	15	17	13	106	7	94	18.80	11.4%
	Thursday	14	12	19	16	22	13	26	15	99	8	83	16.60	10.1%
	Friday	16	18	20	24	24	15	22	16	112	11	102	20.40	12.4%
	Saturday	9	20	15	14	14	17	14	10	85	8	72	14.40	8.8%
	Sunday	15	13	20	13	10	7	9	14	65	8	71	14.20	8.6%

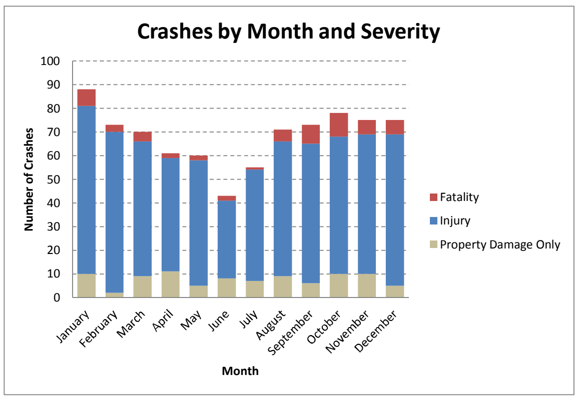
CRASH ANALYSIS - Seminole County 2011-2017

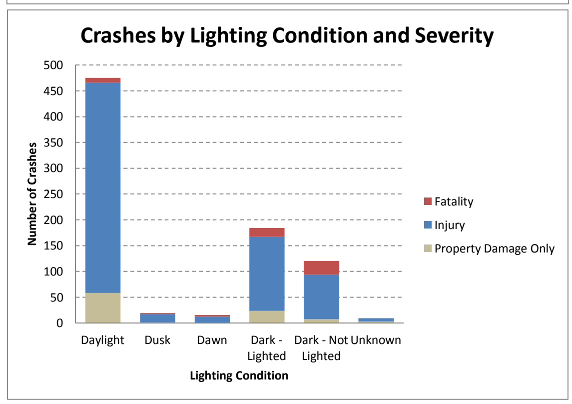
									Severity					
		2011	2012	2013	2014	2015	2016	2017	Property Damage Only	Injury	Fatality	Total	Average	Percent
Hour of Day	0:00	3	2	2	3	2	2	3	2	11	4	12	2.40	1.5%
	1:00	1	1	1	3	2	1	2	1	9	1	8	1.60	1.0%
	2:00	1	3	3	2	0	1	0	2	7	1	9	1.80	1.1%
	3:00	2	1	0	4	0	0	1	1	5	2	7	1.40	0.9%
	4:00	1	0	3	1	2	1	1	2	5	2	7	1.40	0.9%
	5:00	2	0	4	0	1	1	2	0	9	1	7	1.40	0.9%
	6:00	5	3	4	0	3	2	4	0	18	3	15	3.00	1.8%
	7:00	4	1	1	5	8	3	8	0	29	1	19	3.80	2.3%
	8:00	7	2	3	2	7	6	3	3	26	1	21	4.20	2.6%
	9:00	6	2	8	2	3	1	4	3	22	1	21	4.20	2.6%
	10:00	4	4	3	5	6	4	3	3	24	2	22	4.40	2.7%
	11:00	8	6	7	6	5	2	5	5	33	1	32	6.40	3.9%
	12:00	4	2	9	7	6	9	9	2	43	1	28	5.60	3.4%
	13:00	5	7	5	6	8	8	10	8	41	0	31	6.20	3.8%
	14:00	3	9	12	10	6	5	9	11	42	1	40	8.00	4.9%
	15:00	7	11	10	4	9	6	11	7	50	1	41	8.20	5.0%
	16:00	3	8	7	8	15	7	6	3	51	0	41	8.20	5.0%
	17:00	2	9	8	9	10	7	4	8	40	1	38	7.60	4.6%
	18:00	12	5	9	13	10	5	8	9	48	5	49	9.80	6.0%
	19:00	10	4	10	10	12	3	9	6	46	6	46	9.20	5.6%
	20:00	8	10	7	8	11	6	5	6	39	10	44	8.80	5.4%
	21:00	6	5	11	8	8	5	9	3	43	6	38	7.60	4.6%
	22:00	3	4	5	1	3	3	4	5	16	2	16	3.20	1.9%
	23:00	2	2	3	4	5	4	2	2	17	3	16	3.20	1.9%
Time Period	12AM-6AM	10	7	13	13	7	6	9	8	46	11	50	10.00	6.1%
	6AM-12PM	34	18	26	20	32	18	27	14	152	9	130	26.00	15.8%
	12PM-6PM	24	46	51	44	54	42	49	39	267	4	219	43.80	26.6%
	6PM-12AM	41	30	45	44	49	26	37	31	209	32	209	41.80	25.4%
Alcohol & Drugs	None	95	93	118	113	134	89	119	86	633	42	761	108.71	92.6%
	Alcohol Involved	11	7	11	8	6	3	2	4	35	9	48	6.86	5.8%
	Drugs Involved	1	1	2	0	0	0	1	1	4	0	5	0.71	0.6%
	Alcohol and Drugs	2	0	4	0	2	0	0	1	2	5	8	1.14	1.0%
	Undetermined	0	0	0	0	0	0	0	0	0	0	0	0.00	0.0%
Distraction Related	Y	14	7	13	6	16	9	13	8	67	3	78	11.20	9.5%
	N	95	94	122	115	126	83	109	84	607	53	744	110.40	90.5%

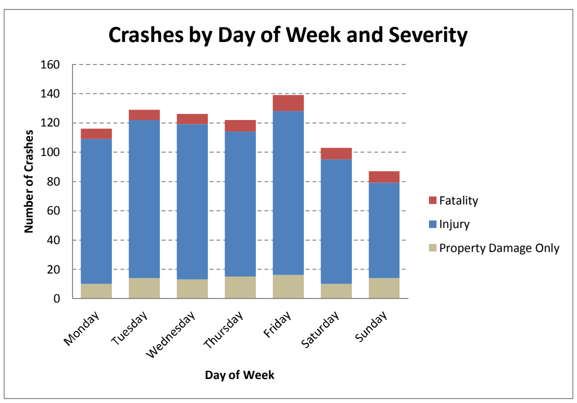
CRASH ANALYSIS - Seminole County 2011-2017

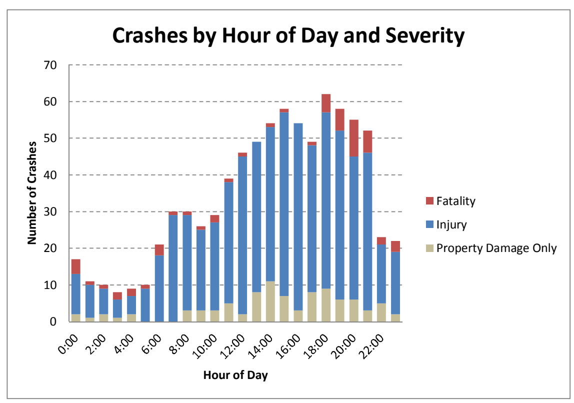


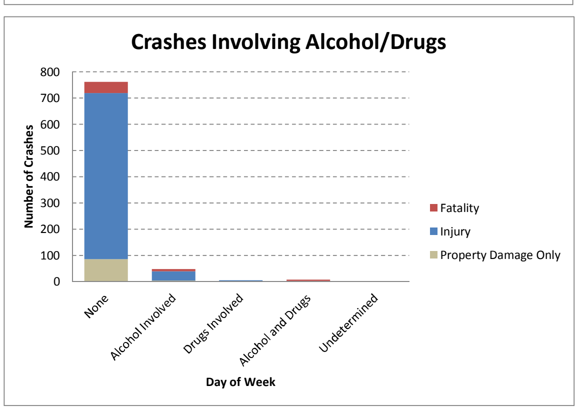


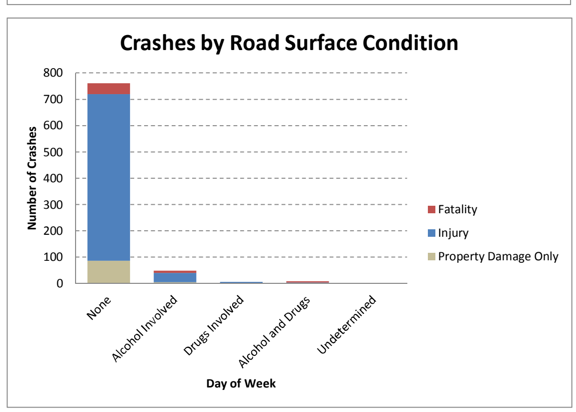












APPENDIX C: CRASH TYPING DEFINITIONS

Table 8. Pedestrian Crash Location Definitions

Crash_Location_Desc (Crash Location)	Crash_Location (Crash Location)	Definition
Intersection	1	The crash occurred within the intersection proper or within the crosswalk area. **Note: Driveways controlled by signals or signs should be coded as intersections. Uncontrolled driveways should be coded as nonintersection locations.**
Intersection-Related	4	The crash occurred outside the intersection crosswalk area but within 15 m (50 ft) of the intersection.
Nonintersection	2	The crash occurred on or along the roadway and more than 15 m (50 ft) away from an intersection.
Nonroadway	3	The crash occurred off the roadway, including parking lots, driveways, private roads, yards, alleys, and other open areas. **Note: Crashes occurring on paved shoulders, sidewalks, or driveway crossings are considered to be "roadway" crashes and should not be placed in the nonroadway classification.**
Unknown	9	There is insufficient information to determine where the crash occurred.

Pedestrian Position Definitions

Pedestrian_Position_Desc (Pedestrian Position Description)	Pedestrian_Position (Pedestrian Position)	Definition
Intersection	1	Within intersection proper
Crosswalk area	2	Within a crosswalk, marked or unmarked
Travel Lane	3	On a roadway, in a travel lane
Paved Shoulder/Bike Lane/Parking Lane	4	On a roadway, in a paved shoulder or bike lane, or parking lane
Sidewalk/Shared-Use Path/Driveway Crossing	5	On a sidewalk, shared-use path, or driveway crossing
Unpaved Right-of-Way	6	Other road right-of-way (unpaved shoulder, etc.)
Driveway/Alley	7	On a driveway or alley
Nonroadway—Parking lot/Other	8	Other nonroadway areas (parking lot, non-right-of-way sidewalk or multi-use path, yard, open areas, etc.)
Other/Unknown	9	Other/unknown

Table 9. Bicyclist Crash Location Definitions

Crash_Location_Desc (Crash Location)	Crash_Location (Crash Location)	Definition
		Where did the crash occur?
Intersection	1	Intersection—The crash occurred within the intersection proper or within the crosswalk area. **Note: Driveways are considered to be nonintersection locations. The exception is signalized commercial driveways which should be coded as intersections.**
Intersection-Related	2	Intersection-Related—The crash occurred outside the intersection proper or crosswalk area but was the related to the presence of the intersection (e.g., the result of queueing traffic).
Nonintersection	3	Nonintersection Location—The crash occurred outside the intersection proper or crosswalk area and was **not** related to the presence of any intersection.
Nonroadway	4	Nonroadway Location—The crash occurred off the street network; this includes parking lots, driveways, alleys, and other open areas. **Note: crashes occurring on paved shoulders, sidewalks, or driveway crossings are considered to be "roadway" crashes and should not be placed in the nonroadway classification.**
Unknown Location	9	Unknown/Insufficient Information—There is insufficient information to determine where the crash occurred.
Bicyclist Position Definitions		
Bicyclist_Position_Desc (Bicyclist Position)	**Bicyclist_Position (Bicyclist Position)**	**Definition**
Travel Lane	1	On a roadway, in a shared travel lane
Bike Lane/Paved Shoulder	2	On a roadway, in a bicycle lane or on a paved shoulder
Sidewalk/Crosswalk/Driveway Crossing	3	On a sidewalk, crosswalk, or driveway crossing
Driveway/Alley	4	On a separate bicycle/multi-use path
Multi-use Path	5	On a driveway or alley
Nonroadway	6	Other nonroadway areas (parking lot, open areas, etc.)
Other	8	Other (e.g., unpaved shoulder, worn path, etc.)
Unknown	9	Unknown

Table 9. Bicyclist Crash Location Definitions *(continued)*

Bicyclist Direction Definitions		
Bicyclist_Direction_Desc (Bicyclist Direction)	**Bicyclist_Direction (Bicyclist Direction)**	**Definition**
With Traffic	1	With traffic
Facing Traffic	2	Facing traffic
Not Applicable	3	Not applicable (e.g., exiting a driveway, parking lot, or other nonroadway area)
Unknown	9	Unknown

Table 10. Pedestrian Crash Type Definitions

Crash_Type_Basic (Crash Type Number)	Crash_Type_Description (Crash Type Description)	Definition
110	Assault with Vehicle	The driver intentionally struck the pedestrian with the vehicle.
120	Dispute-Related	The pedestrian was struck by a vehicle during a domestic altercation or other dispute.
130	Pedestrian on Vehicle	The pedestrian was sitting on, leaning against, or clinging to a vehicle which began to move or was moving.
140	Vehicle-Vehicle/Object	The pedestrian was struck as a result of a prior vehicle-into-vehicle or vehicle-into-object crash.
150	Motor Vehicle Loss of Control	Vehicle lost control due to mechanical failure, surface conditions, driver error or impairment.
160	Pedestrian Loss of Control	The pedestrian stumbled, fell, or rolled into path of vehicle due to surface conditions, impairment or other mishap.
190	Other Unusual Circumstances	The crash involved other unusual circumstances, such as a pedestrian being struck by falling cargo or a loose wheel.
211	Backing Vehicle—Driveway	The pedestrian was struck in a driveway by a vehicle that was backing with a driver at the controls.
212	Backing Vehicle—Driveway/Sidewalk Intersection	The pedestrian was struck in a driveway/sidewalk intersection by a vehicle that was backing with a driver at the controls.
213	Backing Vehicle—Roadway	The pedestrian was struck in a roadway by a vehicle that was backing with a driver at the controls.
214	Backing Vehicle—Parking Lot	The pedestrian was struck in a parking lot by a vehicle that was backing with a driver at the controls.
219	Backing Vehicle—Other/Unknown	The pedestrian was struck in another or unknown location by a vehicle that was backing with a driver at the controls.
220	Driverless Vehicle	The pedestrian was struck by a vehicle that was moving without a driver at the controls or that was set in motion by the actions of a child.

Table 10. Pedestrian Crash Type Definitions *(continued)*

Crash_Type_Basic (Crash Type Number)	Crash_Type_Description (Crash Type Description)	Definition
230	Disabled Vehicle-Related	The pedestrian was struck while near or next to a disabled vehicle (including a vehicle that had been in a crash) or while walking to or from a disabled vehicle. **Note: Crashes involving pedestrians standing near tow trucks responding to the disabled vehicle are also included in this crash type.**
240	Emergency Vehicle-Related	The pedestrian was struck while near an active emergency vehicle, by an active emergency vehicle, or by a vehicle being pursued.
250	Play Vehicle-Related	The pedestrian was struck while riding a play vehicle that was **not** a bicycle (e.g., skates, scooter, wagon, sled, etc.).
311	Working in Roadway	The pedestrian was working in the roadway when struck.
312	Playing in Roadway	The pedestrian was playing in the roadway when struck.
313	Lying in Roadway	The pedestrian was lying in the roadway when struck.
320	Entering/Exiting Parked Vehicle	The pedestrian was in the process of getting into or out of a stopped or parked vehicle. **Note: Does not include crashes involving pedestrian crossing or other movements that occurred after the pedestrian exited the vehicle.**
330	Mailbox-Related	Going to/from or standing at a mailbox or newspaper box.
341	Commercial Bus-Related	The pedestrian was struck crossing in front of a commercial bus stopped at a marked bus stop.
342	School Bus-Related	The pedestrian was struck going to or from or waiting at a school bus or school bus stop.
360	Ice Cream/Vendor Truck-Related	The pedestrian was struck going to or from an ice cream truck or other type of vehicle vending from the curb or roadside.
410	Walking Along Roadway With Traffic—From Behind	The pedestrian was walking/running along the roadway with traffic and was struck from behind.
420	Walking Along Roadway With Traffic—From Front	The pedestrian was walking/running along the roadway with traffic and was struck from the front.
430	Walking Along Roadway Against Traffic—From Behind	The pedestrian was walking/running along the roadway against traffic and was struck from behind.

Table 10. Pedestrian Crash Type Definitions *(continued)*

Crash_Type_Basic (Crash Type Number)	Crash_Type_Description (Crash Type Description)	Definition
440	Walking Along Roadway Against Traffic—From Front	The pedestrian was walking/running along the roadway against traffic and was struck from the front.
459	Walking Along Roadway—Direction/Position Unknown	The pedestrian was walking/running along the roadway, but there is insufficient information to determine either the position or direction of the pedestrian at the time of the crash.
460	Motorist Entering Driveway or Alley	The motor vehicle was turning into a driveway or alley and struck the pedestrian on a sidewalk/walkway or driveway crossing.
465	Motorist Exiting Driveway or Alley	The motor vehicle was exiting a driveway or alley and struck the pedestrian on a sidewalk/walkway or driveway crossing.
469	Driveway Crossing—Other/Unknown	The pedestrian was on a driveway intersection when struck but there were other or unknown circumstances surrounding the crash from those described .
510	Waiting to Cross—Vehicle Turning	The pedestrian was standing near the curb or roadway edge and waiting to cross the roadway when struck by a turning vehicle.
520	Waiting to Cross—Vehicle Not Turning	The pedestrian was standing near the curb or roadway edge and waiting to cross the roadway when struck by a vehicle that was not turning.
590	Waiting to Cross—Vehicle Action Unknown	The pedestrian was standing near the curb or roadway edge and waiting to cross the roadway when struck by a vehicle, but it could not be determined if the vehicle was turning or not.
610	Standing in Roadway	The pedestrian was standing in the roadway prior to the crash, but the crash cannot be further classified.
620	Walking in Roadway	The pedestrian was walking in the roadway prior to the crash, but the crash cannot be further classified.
680	Nonintersection—Other/Unknown	The crash occurred at a nonintersection location, but the actions of the pedestrian prior to the crash cannot be determined.
690	Intersection—Other/Unknown	The crash occurred at an intersection, but the actions of the pedestrian prior to the crash cannot be determined or it cannot be determined who failed to yield.

Table 10. Pedestrian Crash Type Definitions *(continued)*

Crash_Type_Basic (Crash Type Number)	Crash_Type_Description (Crash Type Description)	Definition
710	Multiple Threat	The pedestrian entered the traffic lane in front of stopped or slowing traffic and was struck by a vehicle traveling in the same direction as the stopped or slowing traffic.
730	Trapped	The pedestrian was struck while crossing at a signalized intersection **or signalized mid-block crossing** when the light changed and traffic started moving.
741	Dash	The pedestrian **ran** into the roadway and was struck by a vehicle whose view of the pedestrian was not obstructed.
742	Dart-Out	The pedestrian walked or ran into the roadway and was struck by a motorist whose view of the pedestrian was blocked until an instant before impact.
760	Pedestrian Failed to Yield	The pedestrian failed to yield to the motorist.
770	Motorist Failed to Yield	The motorist failed to yield to the pedestrian.
781	Motorist Left Turn—Parallel Paths	The motorist was initially traveling on a parallel path with the pedestrian before making a left turn and striking the individual.
782	Motorist Left Turn—Perpendicular Paths	The motorist was initially traveling on a crossing path with the pedestrian before making a left turn and striking the individual.
791	Motorist Right Turn—Parallel Paths	The motorist was initially travelling on a parallel path with the pedestrian before making a right turn and striking the individual
792	Motorist Right Turn on Red—Parallel Paths	The motorist was initially traveling on a parallel path with the pedestrian before making a right turn on a red signal, and striking the individual.
794	Motorist Right Turn on Red—Perpendicular Paths	The motorist was initially traveling on a crossing path with the pedestrian before making a right turn on a red signal, and striking the individual.
795	Motorist Right Turn—Perpendicular Paths	The motorist was initially travelling on a crossing path with the pedestrian before making a right turn and striking the individual.
799	Motorist Turn/Merge—Other/Unknown	The motorist turned or merged, but either the approach paths or turn direction are unknown or do not fit with any of the described circumstances.
830	Off Roadway—Parking Lot	The motor vehicle struck a pedestrian in a parking lot.
890	Off Roadway—Other/Unknown	The motor vehicle struck a pedestrian off the roadway, but there were other or unknown circumstances surrounding the crash.

Table 10. Pedestrian Crash Type Definitions *(continued)*

Crash_Type_Basic (Crash Type Number)	Crash_Type_Description (Crash Type Description)	Definition
900	Other—Unknown Location	There is insufficient information to determine where the crash occurred.
910	Crossing an Expressway	The pedestrian was crossing a limited access expressway or expressway ramp.

Table 11. Pedestrian Crash Group Definitions

Crash_Group_Basic (Crash Group Number)	Crash_Group_Desc (Crash Group Description)	Definition
100	Unusual Circumstances	The crash involved a disabled vehicle, emergency vehicle or vehicle in pursuit, play vehicle, driverless vehicle, or the pedestrian was struck intentionally, was clinging to a vehicle, or was struck as a result of other unusual circumstances.
200	Backing Vehicle	The pedestrian was struck by a vehicle that was backing at the time.
310	Working or Playing in Roadway	The pedestrian was working or playing in the roadway.
340	Bus-Related	The pedestrian was struck while crossing/walking to a bus or bus stop or while waiting at a bus stop.
350	Unique Midblock	The crash was associated with a vendor truck, mailbox, or other roadside 'destination' that was not a bus, or the pedestrian was struck while entering or exiting a parked vehicle.
400	Walking Along Roadway	The pedestrian was standing or walking along the roadway on the edge of a travel lane, or on a shoulder or sidewalk.
460	Crossing Driveway or Alley	The pedestrian was crossing a driveway on a sidewalk crossing, shared-use path, shoulder, or edge of the travel lane.
500	Waiting to Cross	The pedestrian was standing on the curb or near the roadway edge waiting to cross the roadway when struck.
600	Pedestrian in Roadway—Circumstances Unknown	The pedestrian was standing, walking, or lying in the road right-of-way at an intersection or midblock location but the circumstances do not otherwise fit any previously described or are unknown.
720	Multiple Threat/Trapped	The pedestrian entered the roadway on a green signal or in front of standing or slowing traffic and was trapped when the signal changed and traffic started moving or was struck by a vehicle traveling in the same direction as the stopped traffic. Note: Multiple threat may occur at nonsignalized locations.
740	Dash/Dart-Out	The pedestrian either ran into the roadway in front of a motorist whose view of the pedestrian was not obstructed or walked or ran into the road and was struck by a motorist whose view of the pedestrian was blocked until an instant before impact.

Table 11. Pedestrian Crash Group Definitions *(continued)*

Crash_Group_Basic (Crash Group Number)	Crash_Group_Desc (Crash Group Description)	Definition
750	Crossing Roadway—Vehicle Not Turning	The pedestrian was struck while crossing the roadway (not an expressway) by a vehicle that was traveling straight through.
790	Crossing Roadway—Vehicle Turning	The pedestrian was struck while crossing a non-expressway road by a vehicle that was turning or about to turn.
800	Off Roadway	The pedestrian was struck in a parking lot, driveway, open area or other or unknown, nonroadway area (vehicle not backing).
910	Crossing Expressway	The pedestrian was on an expressway or expressway ramp when struck by a motor vehicle.
990	Other/Unknown—Insufficient Details	The circumstances do not clearly fit any of the situations described or are unknown.

Table 12. Bicyclist Crash Type Definitions

Crash_Type_Basic (Crash Type Number)	Crash_Type_Desc (Crash Type Description)	Definition
111	Motorist Turning Error—Left Turn	The motorist made a left turn, cut the corner and entered the opposing traffic lane.
112	Motorist Turning Error—Right Turn	The motorist made a right turn, swung too wide and entered the opposing traffic lane.
113	Motorist Turning Error—Other	The motorist made another type of turning error which led them into the path of the bicyclist.
114	Bicyclist Turning Error—Left Turn	The bicyclist made a left turn, cut the corner and entered the opposing traffic lane.
115	Bicyclist Turning Error—Right Turn	The bicyclist made a right turn, swung too wide and entered the opposing traffic lane.
116	Bicyclist Turning Error—Other	The bicyclist made another type of turning error which led them into the path of the motorist.
121	Bicyclist Lost Control—Mechanical Problems	The bicyclist lost control due to mechanical problems.
122	Bicyclist Lost Control—Oversteering, Improper Braking, Speed	The bicyclist lost control due to oversteering, improper braking, or speed too fast for conditions.
123	Bicylist Lost Control—Alcohol/Drug Impairment	The bicyclist lost control due to alcohol or drug impairment.
124	Bicyclist Lost Control—Surface Conditions	The bicyclist lost control due to surface conditions (sand, debris, potholes, ice, etc.).
129	Bicyclist Lost Control—Other/Unknown	The bicyclist lost control due to other or unknown circumstances.
131	Motorist Lost Control—Mechanical Problems	The motorist lost control due to mechanical problems.
132	Motorist Lost Control—Oversteering, Improper Braking, Speed	The motorist lost control due to oversteering, improper braking, or speed too fast for conditions.

Table 12. Bicyclist Crash Type Definitions *(continued)*

Crash_Type_Basic (Crash Type Number)	Crash_Type_Desc (Crash Type Description)	Definition
133	Motorist Lost Control—Alcohol/Drug Impairment	The motorist lost control due to alcohol or drug impairment.
134	Motorist Lost Control—Surface Conditions	The motorist lost control due to surface conditions (potholes, ice, etc.).
139	Motorist Lost Control—Other/Unknown	The motorist lost control due to other or unknown circumstances.
141	Motorist Drive-out Sign-Controlled Intersection	The motorist was facing the sign or flashing signal and drove into the crosswalk area or intersection and collided with the bicyclist after stopping or yielding.
142	Bicyclist Ride-out—Sign-Controlled Intersection	The bicyclist was facing the sign or flashing signal and rode into the intersection and collided with the motorist after stopping or yielding.
143	Motorist Drive-through—Sign-Controlled Intersection	The motorist violated the sign or flashing signal and drove into the crosswalk area or intersection and collided with the bicyclist.
144	Bicyclist Ride Through Sign-Controlled Intersection	The bicyclist violated the sign or flashing signal and rode into the intersection and collided with the motorist.
147	Multiple Threat—Sign-Controlled Intersection	The bicyclist entered a sign-controlled intersection in front of standing or slowing traffic and was struck by another vehicle whose view of the bicyclist was blocked.
148	Sign-Controlled Intersection—Other/Unknown	The crash occurred at a sign-controlled intersection but cannot be further classified.
151	Motorist Drive-out—Right Turn on Red	The motorist was facing a red signal, stopped, and then drove into the crosswalk area or intersection and collided with the bicyclist while attempting to make a right turn on red.
152	Motorist Drive-out—Signalized Intersection	The motorist was facing a red signal, stopped, and then drove into the crosswalk area or intersection and collided with the bicyclist.
153	Bicyclist Ride-out—Signalized Intersection	The bicyclist was facing the red signal, stopped, and then rode into the intersection and collided with the motorist.
154	Motorist Drive-through—Signalized Intersection	The motorist violated the signal and drove into the crosswalk area or intersection and collided with the bicyclist.

Table 12. Bicyclist Crash Type Definitions *(continued)*

Crash_Type_Basic (Crash Type Number)	Crash_Type_Desc (Crash Type Description)	Definition
155	Bicyclist Ride Through—Signalized Intersection	The bicyclist violated the signal and rode into the intersection and collided with the motorist.
156	Bicyclist Failed to Clear—Trapped	The bicyclist lawfully entered the intersection on green but did not clear the intersection before the signal changed to green for the cross-street traffic and was struck by a vehicle whose view was not obstructed by standing or stopped traffic.
157	Bicyclist Failed to Clear—Multiple Threat	The bicyclist lawfully entered the intersection on green but did not clear the intersection before the signal changed to green for the cross-street traffic and was struck by a motorist whose view of the bicyclist was obstructed by standing or stopped traffic.
158	Signalized Intersection—Other/Unknown	The crash occurred at a signal-controlled intersection but cannot be further classified.
159	Bicyclist Failed to Clear—Unknown	The bicyclist failed to clear the intersection and was struck by a motorist, but it is unknown whether the bicyclist was trapped in the intersection by a signal change or if there was a multiple threat situation or other circumstances surrounding the crash.
160	Crossing Paths—Uncontrolled Intersection	The crash occurred at an intersection not controlled by signs or signals.
180	Crossing Paths—Intersection—Other/Unknown	The crash involved a bicyclist and motorist on initial crossing paths but cannot be further classified.
211	Motorist Left Turn—Same Direction	The motorist turned left in front of a bicyclist going in the same direction.
212	Motorist Left Turn—Opposite Direction	The motorist turned left in front of a bicyclist coming from the opposite direction.
213	Motorist Right Turn—Same Direction	The motorist turned right in front of a bicyclist going in the same direction.
214	Motorist Right Turn—Opposite Direction	The motorist turned right in front of a bicyclist coming from the opposite direction.
215	Motorist Drive-in/Out—Parking	The motorist struck the bicyclist while exiting or entering on-street parking.

Table 12. Bicyclist Crash Type Definitions *(continued)*

Crash_Type_Basic (Crash Type Number)	Crash_Type_Desc (Crash Type Description)	Definition
216	Bus/Delivery Vehicle Pullover	The bicyclist was struck by a bus or delivery vehicle pulling into or away from the curb.
217	Motorist Right Turn on Red—Same Direction	The bicyclist and motorist were initially traveling on parallel paths when the motorist turned right on red in front of a bicyclist traveling in the same direction as the motorist.
218	Motorist Right Turn on Red—Opposite Direction	The bicyclist and motorist were initially traveling on parallel paths when the motorist turned right on red in front of a bicyclist traveling in the opposite direction as the motorist.
219	Motorist Turn/Merge—Other/Unknown	The motorist's turning maneuver is other than those described or is unknown.
221	Bicyclist Left Turn—Same Direction	The bicyclist turned or merged left in front of a motorist going in the same direction.
222	Bicyclist Left Turn—Opposite Direction	The bicyclist turned or merged left in front of a motorist coming from the opposite direction.
223	Bicyclist Right Turn—Same Direction	The bicyclist turned or merged right in front of a motorist going in the same direction.
224	Bicyclist Right Turn—Opposite Direction	The bicyclist turned or merged right in front of a motorist coming from the opposite direction.
225	Bicyclist Ride-out—Parallel Path	The bicyclist, initially on a sidewalk or other parallel path, rode into the roadway and into the path of a motor vehicle.
231	Motorist Overtaking—Undetected Bicyclist	The motorist was overtaking the bicyclist and failed to detect the bicyclist.
232	Motorist Overtaking—Misjudged Space	The motorist was overtaking the bicyclist and misjudged the width and distance required to pass the bicyclist.
235	Motorist Overtaking—Bicyclist Swerved	The bicyclist swerved or moved suddenly into the path of an overtaking vehicle.
239	Motorist Overtaking—Other/Unknown	The motorist was overtaking the bicyclist, but the specific circumstances surrounding the overtaking maneuver do not conform to the other situations described or are unknown.

Table 12. Bicyclist Crash Type Definitions *(continued)*

Crash_Type_Basic (Crash Type Number)	Crash_Type_Desc (Crash Type Description)	Definition
241	Bicyclist Overtaking—Passing on Right	The bicyclist struck a motor vehicle in the travel lane while passing on the right.
242	Bicyclist Overtaking—Passing on Left	The bicyclist struck a motor vehicle in the travel lane while passing on the left.
243	Bicyclist Overtaking—Parked Vehicle	The bicyclist struck a parked vehicle while passing.
244	Bicyclist Overtaking—Extended Door	The bicyclist struck an extended door on a parked vehicle while passing.
249	Bicyclist Overtaking—Other/Unknown	The specific circumstances surrounding the overtaking maneuver of the bicyclist do not conform to any of the situations described or are unknown.
250	Head-On—Bicyclist	The bicyclist was traveling the wrong way/wrong side and the two parties collided head-on.
255	Head-On—Motorist	The motorist was traveling the wrong way/wrong side and the two parties collided head-on.
259	Head-On—Unknown	The two parties collided head-on but it is unknown which party was traveling on the wrong side.
280	Parallel Paths—Other/Unknown	The crash involved a bicyclist and motorist on initial parallel paths but cannot be further classified.
311	Bicyclist Ride-out—Residential Driveway	The bicyclist rode into the roadway and into the path of a motor vehicle from a residential driveway.
312	Bicyclist Ride-out—Commercial Driveway/Alley	The bicyclist rode into the roadway and into the path of a motor vehicle from a commercial driveway or alley.
318	Bicyclist Ride-out—Other Midblock	The bicyclist rode into the roadway and into the path of a motor vehicle from a midblock area other than a driveway or alley.
319	Bicyclist Ride-out—Midblock—Unknown	The bicyclist rode into the roadway and into the path of a motor vehicle from an unknown midblock location.
321	Motorist Drive-out—Residential Driveway	The motorist drove into the roadway or sidewalk/driveway crossing area and into the path of a bicyclist from a residential driveway.

Table 12. Bicyclist Crash Type Definitions *(continued)*

Crash_Type_Basic (Crash Type Number)	Crash_Type_Desc (Crash Type Description)	Definition
322	Motorist Drive-out—Commercial Driveway/Alley	The motorist drove into the roadway or sidewalk/driveway crossing area and into the path of a bicyclist from a commercial driveway or alley.
328	Motorist Drive-out—Other Midblock	The motorist drove into the roadway or sidewalk/driveway crossing area and into the path of a bicyclist from a midblock area other than a driveway or alley.
329	Motorist Drive-out—Midblock—Unknown	The motorist drove into the roadway or sidewalk/driveway crossing area and into the path of a bicyclist an unknown midblock area.
357	Multiple Threat—Midblock	The bicyclist entered the roadway in front of standing or slowing traffic at a mid-block location and was struck by a motorist traveling in the same direction as the stopped traffic, and whose view of the bicyclist was blocked.
380	Crossing Paths—Midblock—Other/Unknown	The crash involved a bicyclist and motorist on initial crossing paths at a midblock location but cannot be furter classified.
400	Bicycle Only	The crash involved a bicycle but no motor vehicle.
510	Motorist Intentionally Caused	The motorist intentionally caused the crash.
520	Bicyclist Intentionally Caused	The bicyclist intentionally caused the crash.
600	Backing Vehicle	The crash involved a motor vehicle that was backing and did not involve a play vehicle.
700	Play Vehicle-Related	The bicyclist was riding a child's vehicle such as a tricycle (not an adult tricycle), bicycle with training wheels, or "Big Wheel" type tricycle.
800	Unusual Circumstances	There were other unusual circumstances not defined above (e.g., bicyclist struck by falling cargo).
910	Nonroadway	The crash occurred off the street network (e.g., parking lots, driveways, alleys, trails, and other open areas). **Note: crashes occurring on paved shoulders, bike lanes, sidewalks, or driveway crossings are considered to be "roadway" crashes and should not be placed in the nonroadway classification.**
970	Unknown Approach Paths	There is insufficient information to determine the initial approach paths for the two vehicles.
980	Unknown Location	There is insufficient information to determine where the crash occurred.

152

Table 13. Bicyclist Crash Group Definitions

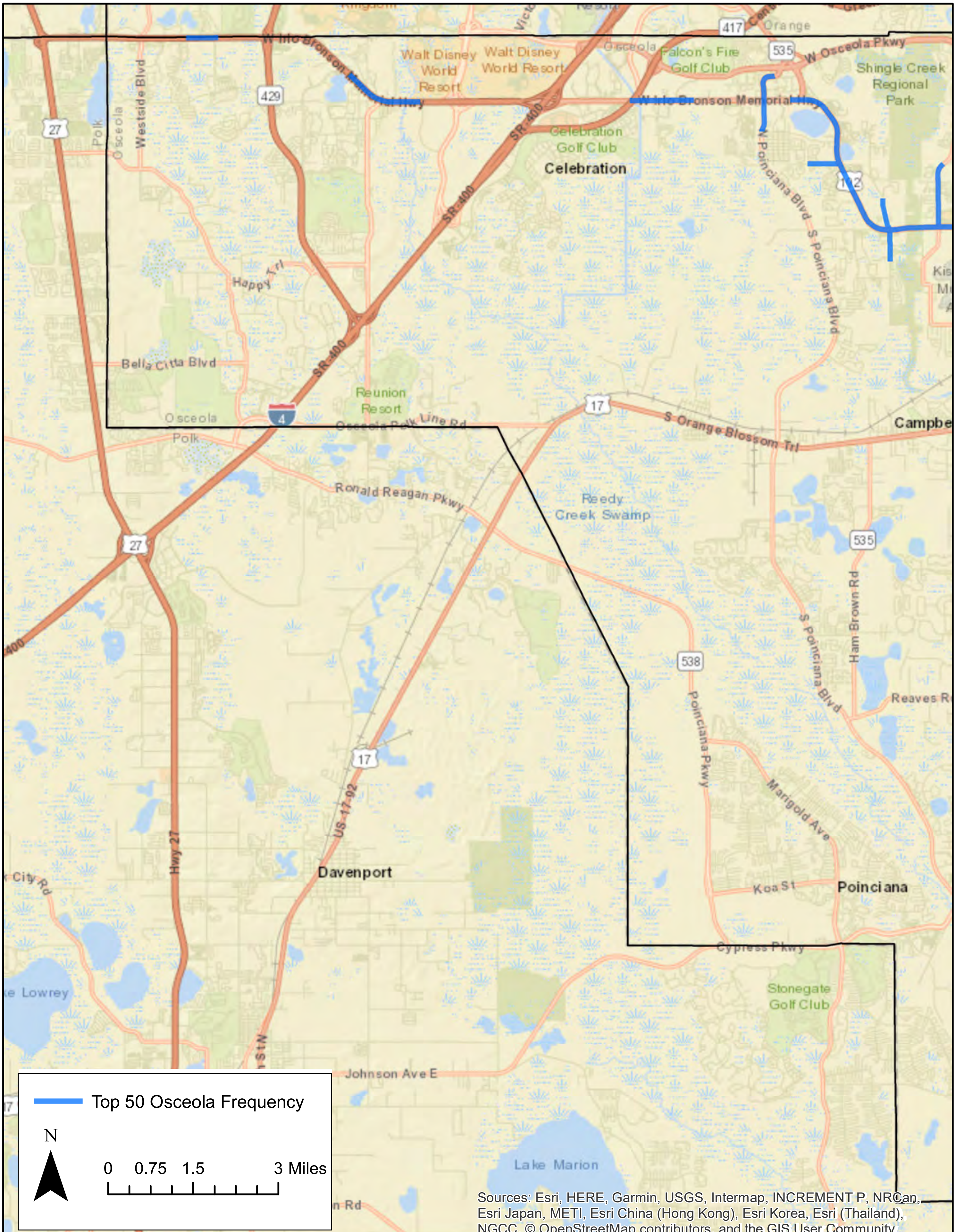
Crash_Group_Basic (Crash Group Number)	Crash_Group_Desc (Crash Group Description)	Definition
110	Loss of Control/Turning Error	Either the motorist or the bicyclist lost control of their vehicle or made a turning error and inadvertently moved into the path of the other operator. **Note: Includes loss of control due to mechanical problems or operator error, or turning errors such as traveling into the opposing lane.**
140	Motorist Failed to Yield—Sign-Controlled Intersection	The motorist drove into the crosswalk area or intersection and collided with the bicyclist. The motorist either violated the sign or did not properly yield right-of-way to the bicyclist. **Note: Crashes at traffic circles or roundabouts with yield control are included here.**
145	Bicyclist Failed to Yield—Sign-Controlled Intersection	The bicyclist rode into the intersection and collided with the motorist. The bicyclist either violated the sign or did not properly yield right-of-way to the motorist. **Note: Crashes at traffic circles or roundabouts with yield control are included here.**
150	Motorist Failed to Yield—Signalized Intersection	The motorist drove into the crosswalk area or intersection and collided with the bicyclist. The motorist either violated the signal or did not properly yield right-of-way to the bicyclist.
158	Bicyclist Failed to Yield—Signalized Intersection	The bicyclist rode into the intersection and collided with the motorist. The bicyclist either violated the signal or did not properly yield right-of-way to the motorist.
190	Crossing Paths—Other Circumstances	The bicyclist and motorist were on intial crossing paths, but the crash cannot be further classified.
210	Motorist Left Turn/Merge	The motorist made a left turn or merge into the path of a bicyclist traveling in the same or opposite direction.
215	Motorist Right Turn/Merge	The motorist made a lright turn or merge into the path of a bicyclist traveling in the same or opposite direction.
219	Parking/Bus-Related	The bicyclist was struck by a motorist entering or exiting a parking space or by a bus or delivery vehicle pulling into or away from the curb.
220	Bicyclist Left Turn/Merge	The bicyclist made a left turn or merge into the path of a motor vehicle traveling in the same or opposite direction.

Table 13. Bicyclist Crash Group Definitions *(continued)*

Crash_Group_Basic (Crash Group Number)	Crash_Group_Desc (Crash Group Description)	Definition
225	Bicyclist Right Turn/Merge	The bicyclist made a right turn or merge into the path of a motor vehicle traveling in the same or opposite direction.
230	Motorist Overtaking Bicyclist	The motorist was overtaking the bicyclist at the time of the crash.
240	Bicyclist Overtaking Motorist	The bicyclist was overtaking the motorist at the time of the crsah. **Note: This group includes crashes involving bicyclists striking parked cars or extended doors.**
258	Head-On	Either operator was going the wrong way, and the two parties collided head-on.
290	Parallel Paths—Other Circumstances	The bicyclist and motorist were on initial parallel paths, but the crash cannot be further classified.
310	Bicyclist Failed to Yield—Midblock	The bicyclist rode into the street from a nonintersection location (including residential or commercial driveway or other midblock location) without yielding to the motorist.
320	Motorist Failed to Yield—Midblock	The motorist drove across the sidewalk or into the street from a nonintersection location (including residential or commercial driveway or other midblock location) without yielding to the bicyclist.
600	Backing Vehicle	The motorist was backing up at the time the crash occurred.
850	Other/Unusual Circumstances	There were unusual circumstances surrounding the crash, but the crash cannot be further classified.
910	Nonroadway	The crash occurred off the road network such as in a parking lot, driveway, on a multi-use path separated from the road right-of-way, in an open grassy area or yard, etc.
990	Other/Unknown—Insufficient Details	There is insufficient information to determine where the crash occurred.

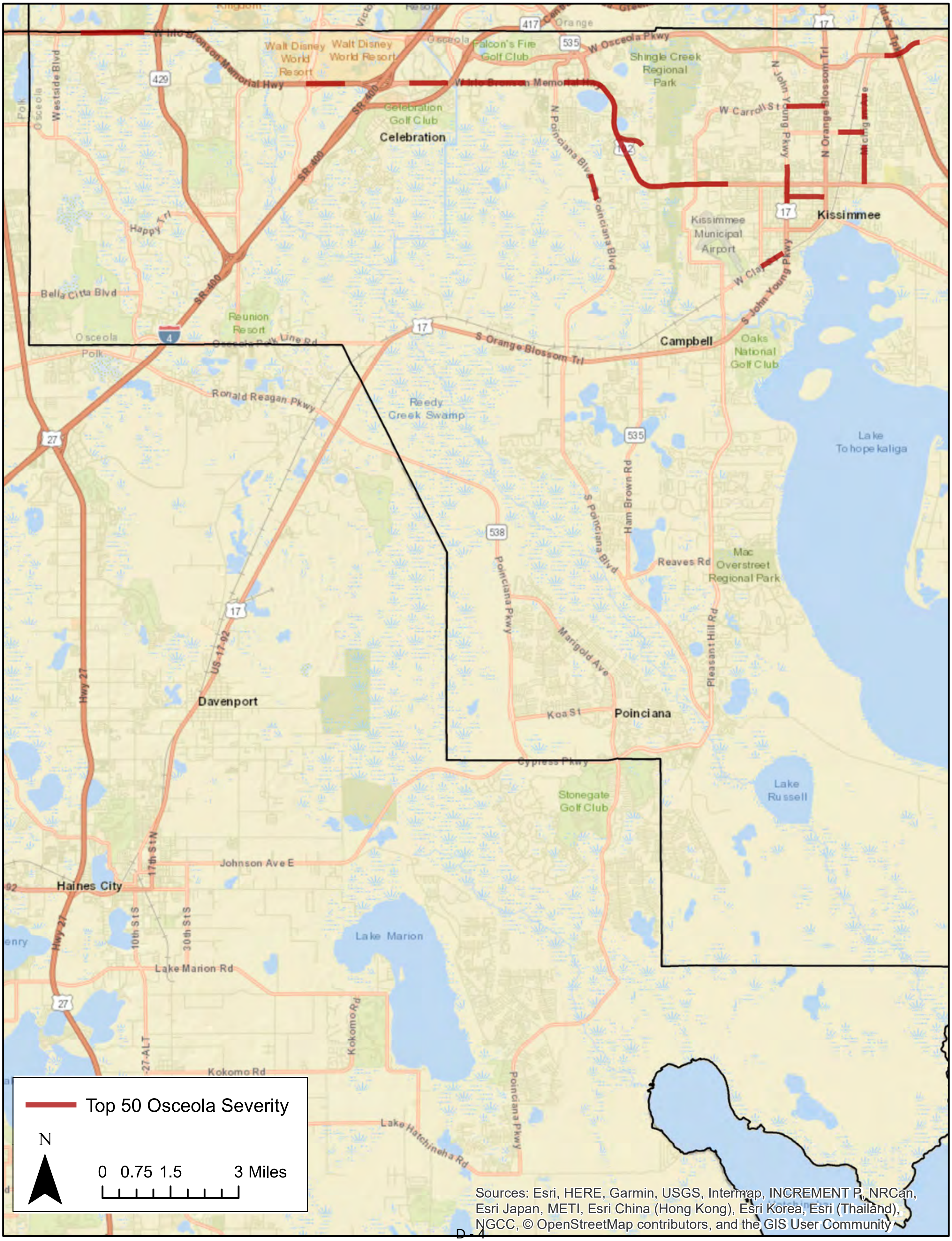
APPENDIX D: TOP 50 CRASH FREQUENCY AND SEVERITY SEGMENTS BY COUNTY

Osceola County Top 50 Frequency (West)



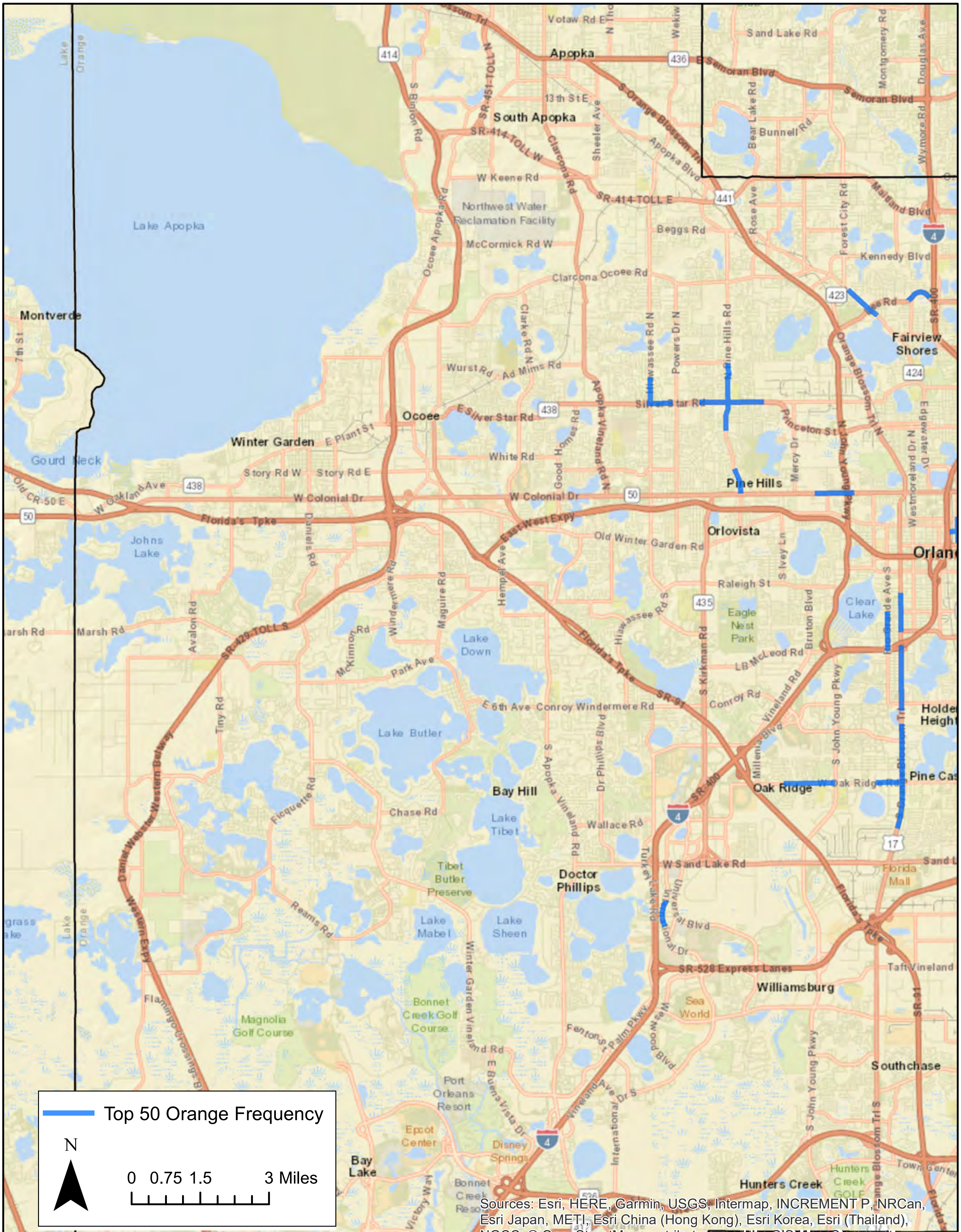
Osceola County Top 50 Frequency (East)

Osceola County Top 50 Severity (West)

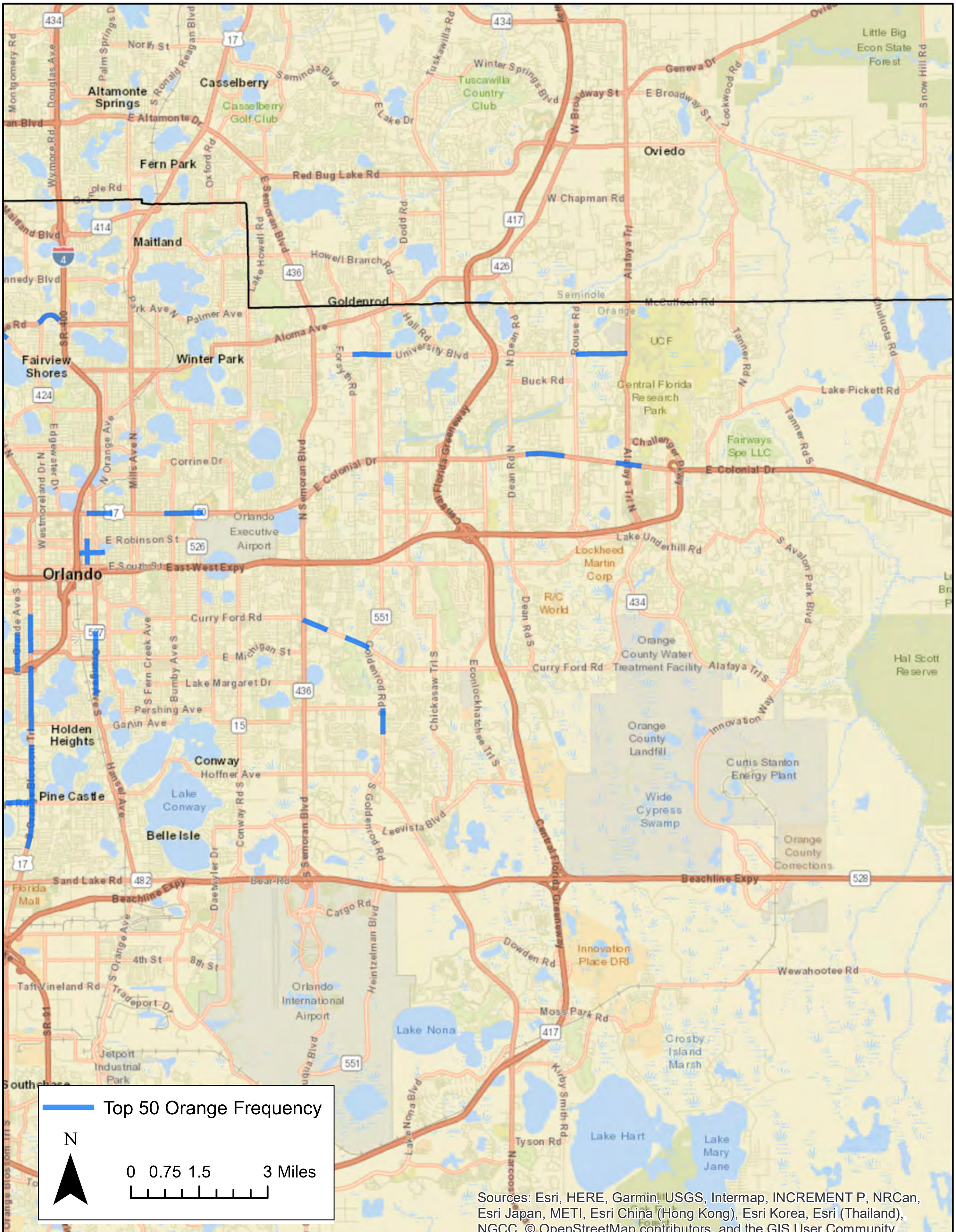


Osceola County Top 50 Severity (East)

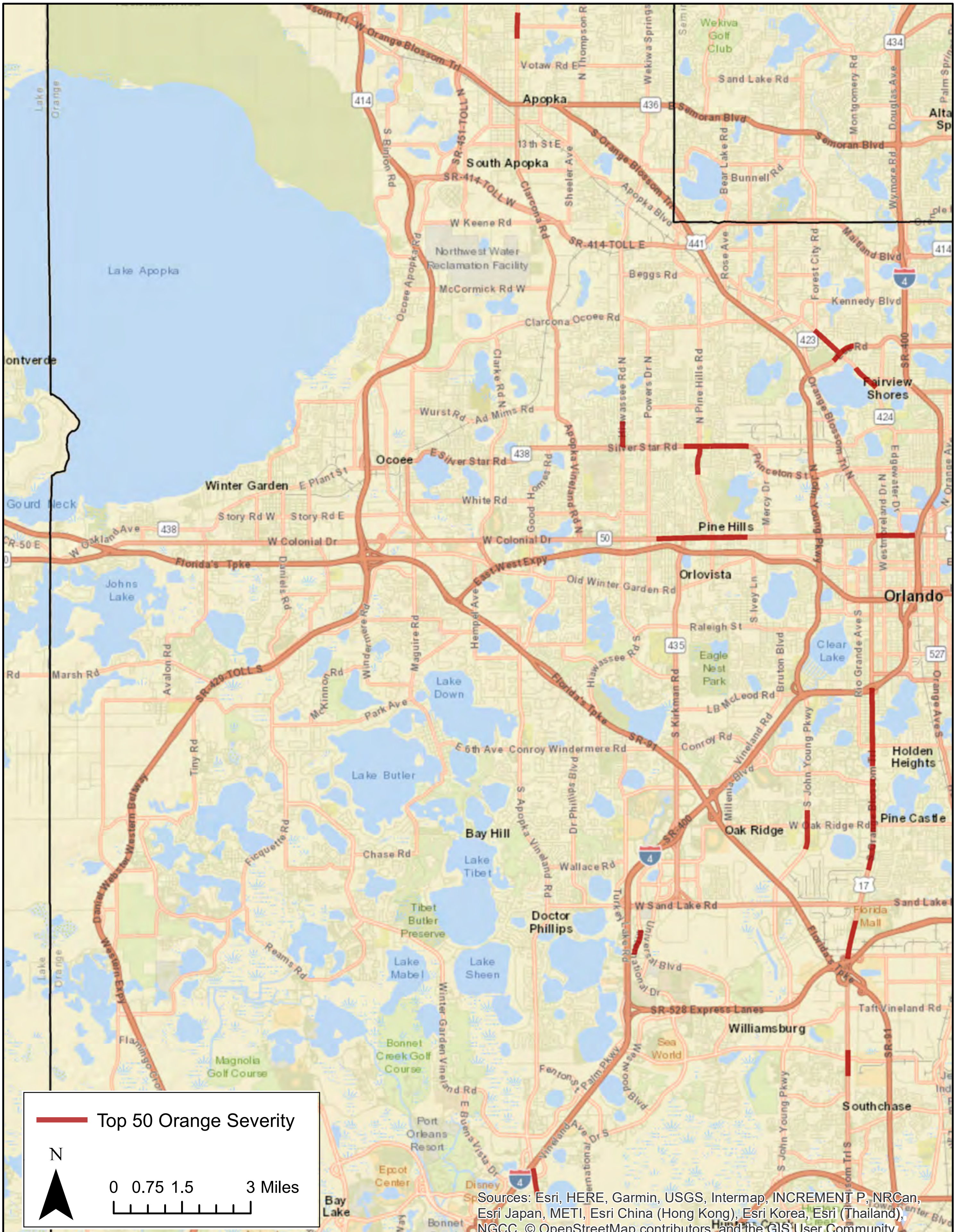
Orange County Top 50 Frequency (West)



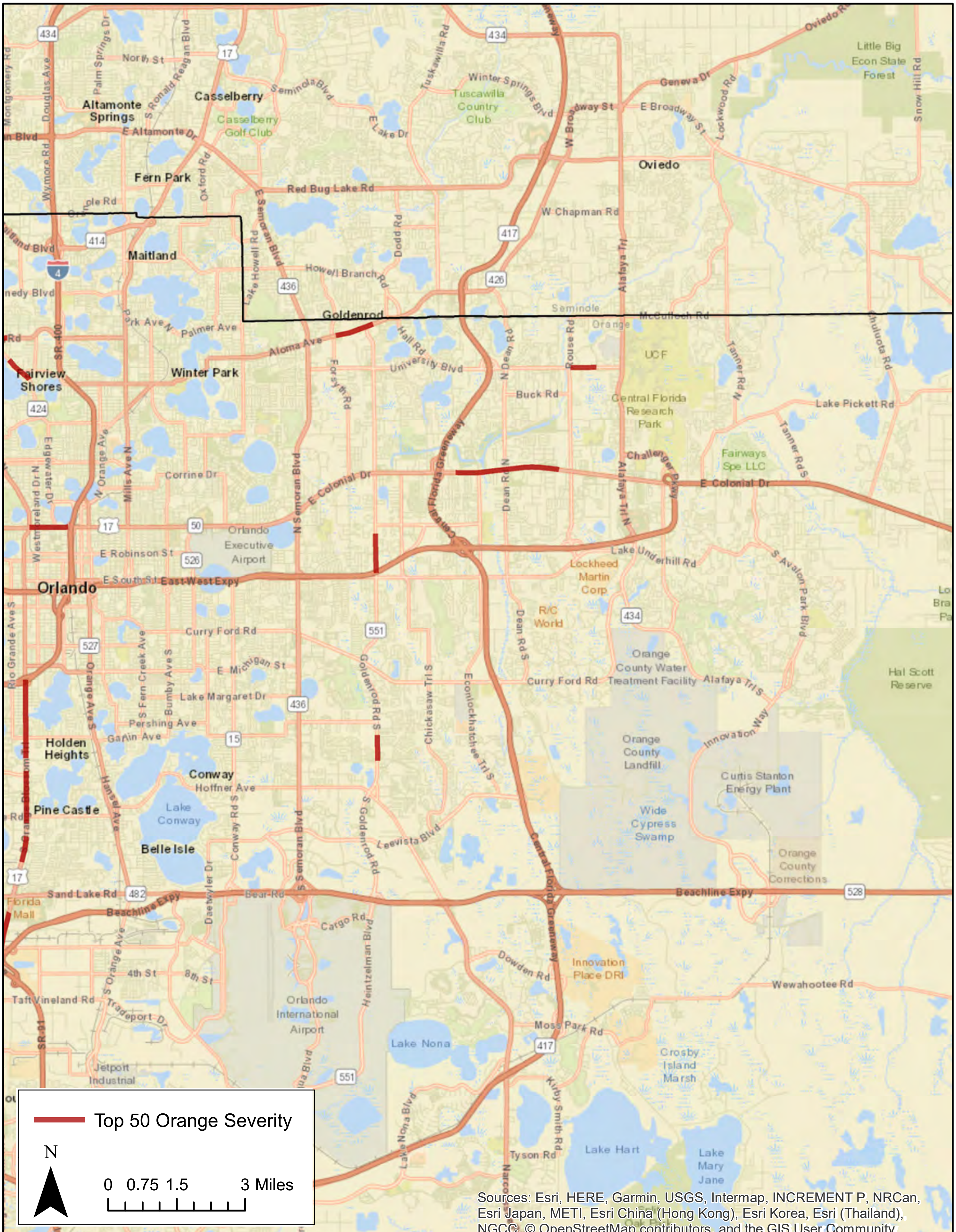
Orange County Top 50 Frequency (East)



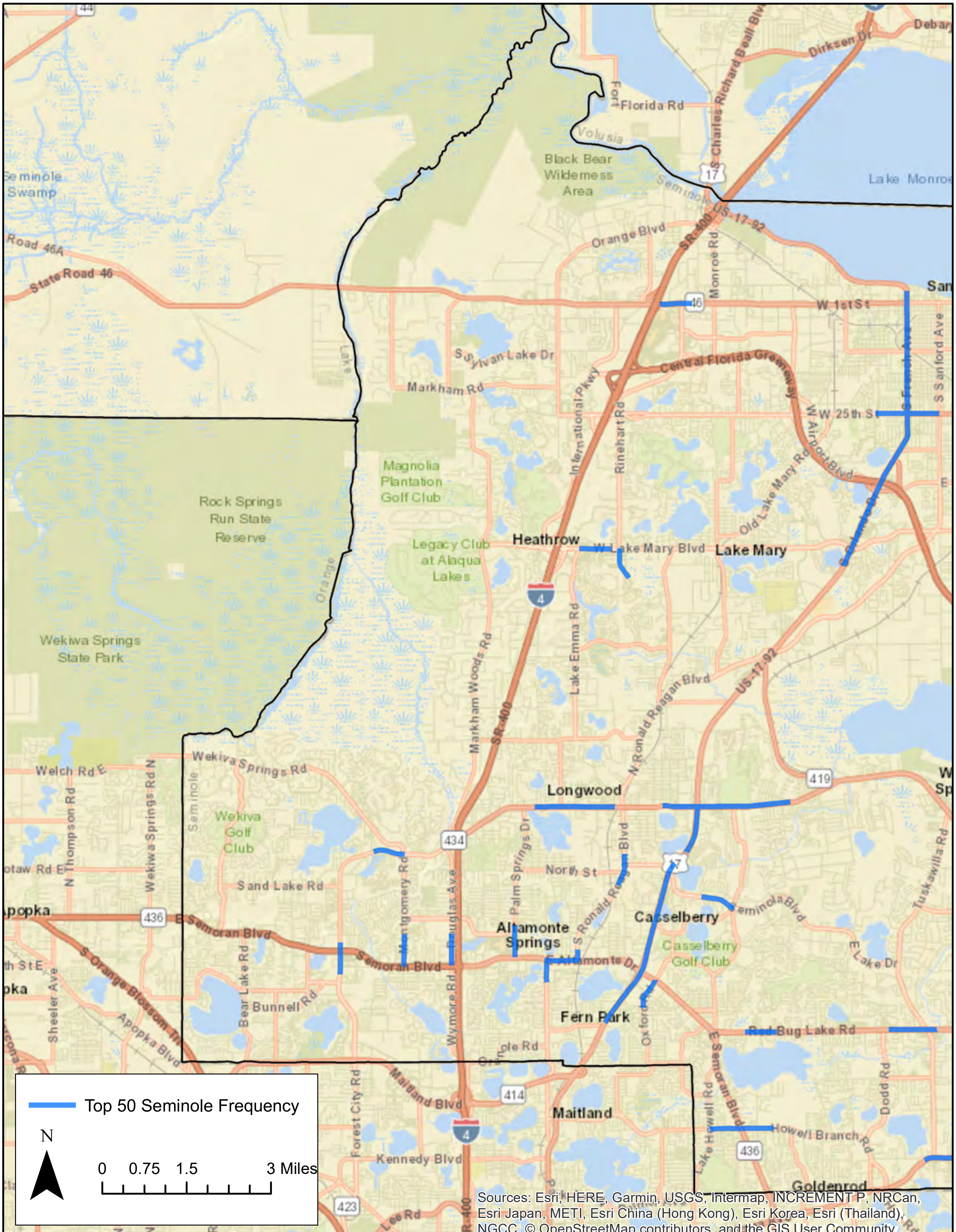
Orange County Top 50 Severity (West)



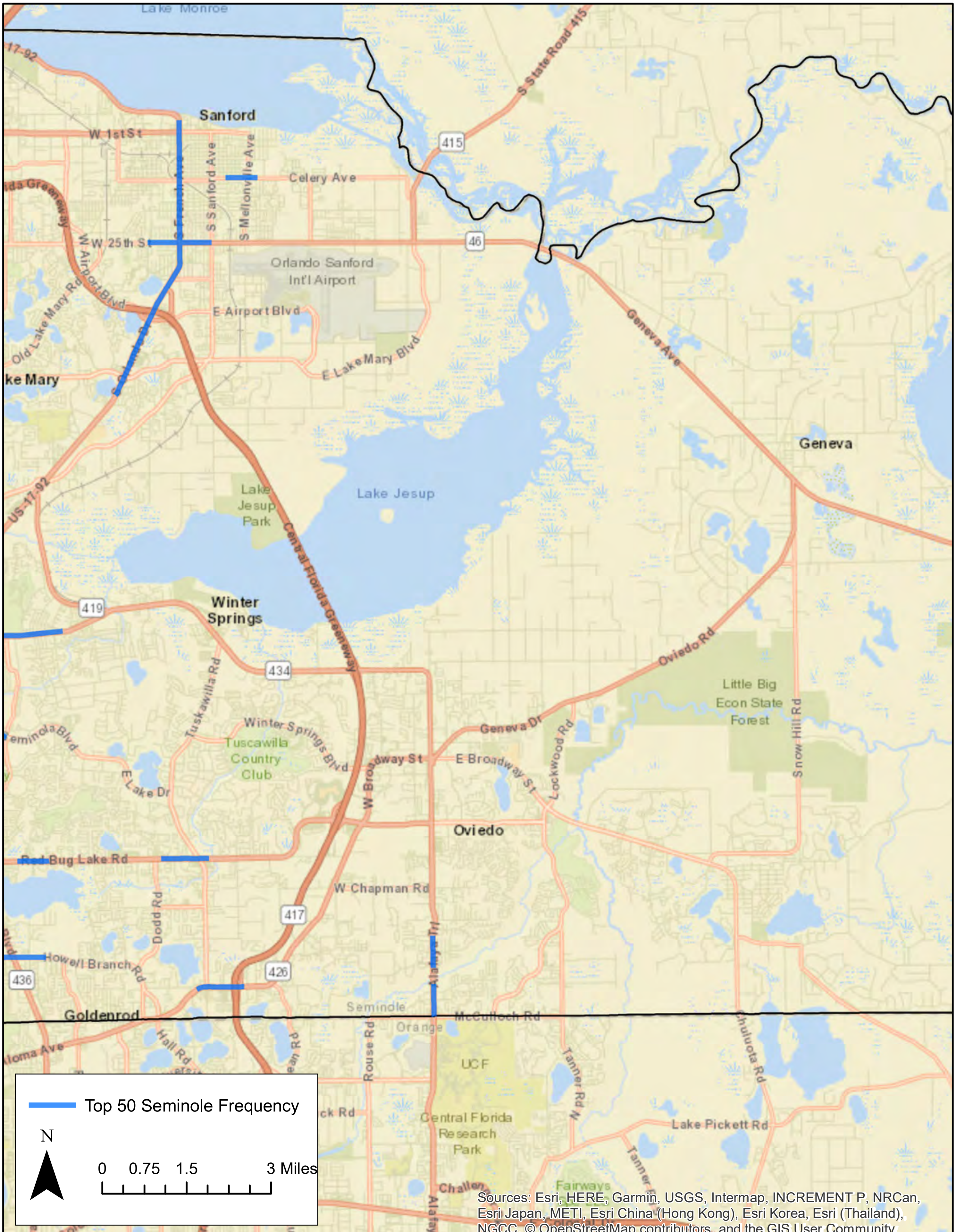
Orange County Top 50 Severity (East)



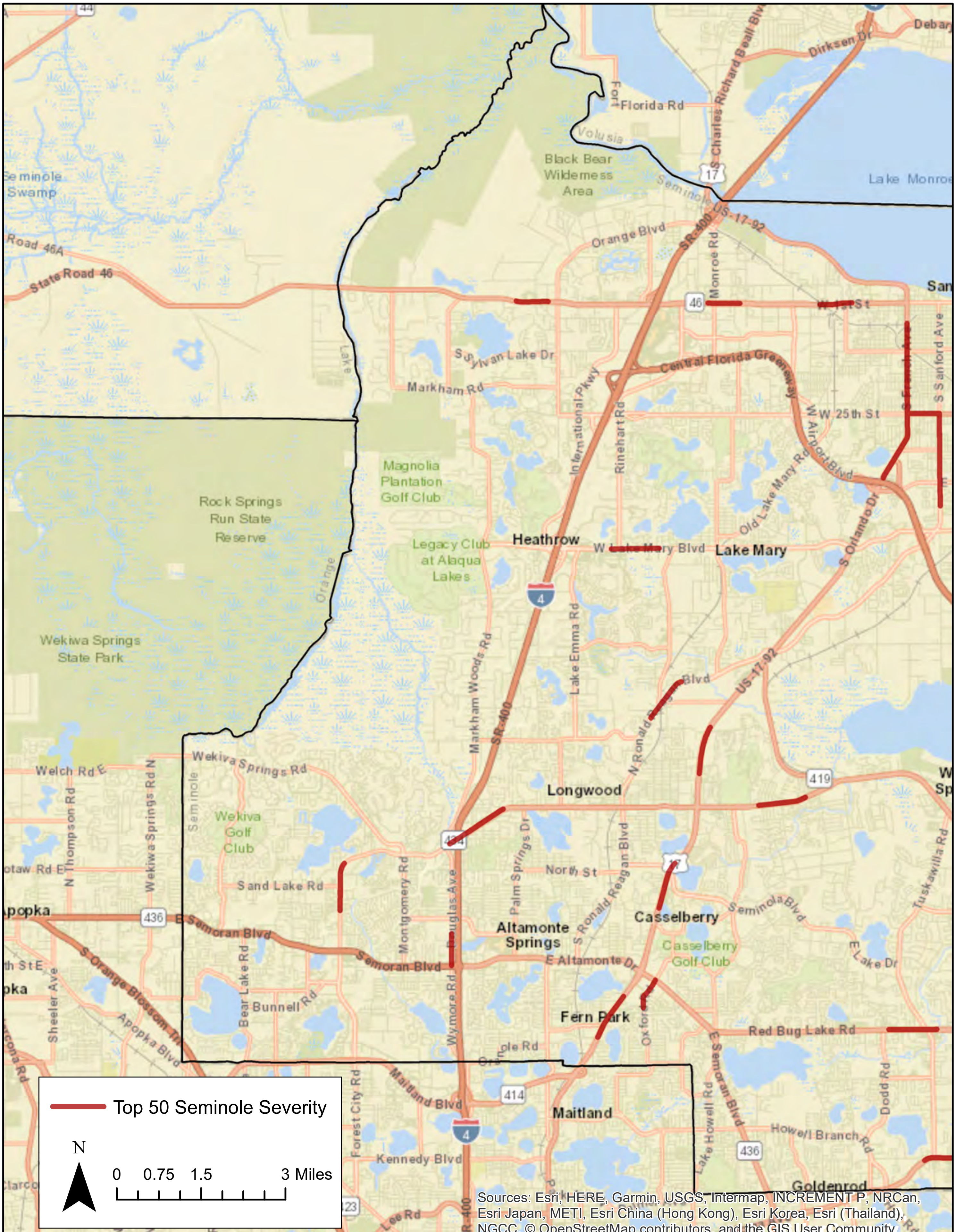
Seminole County Top 50 Frequency (West)



Seminole County Top 50 Frequency (East)



Seminole County Top 50 Severity (West)



Seminole County Top 50 Severity (East)

APPENDIX E: SAFETY FIELD REVIEW CRASH SUMMARIES

Michigan Avenue (Kissimmee) Field Review Agenda

MetroPlan Pedestrian / Bicycle Safety Action Plans

Date:	September 20, 2018	Project #: 21278.03
Meeting Location:	Kissimmee Square, Closed Winn Dixie Parking Lot 1347 E Vine St. (US 192), Kissimmee, FL 34744 Start Time 7:00 AM	
Field Review Location:	Michigan Avenue from US 192 to Donegan Avenue (1.00 mile)	

1. **Kick Off Meeting in Parking Lot (7:00 – 7:15 AM)**
    a. Goals of field review
    b. Historical crash review
    c. Review survey questions
2. **AM Review/Walk Corridor (7:15 – 11:30 AM)**
    a. Walk corridor from south to north
    b. Observe school related ped/bike traffic
    c. Identify ped/bike issues related to AM peak hour
    d. Identify specific ped/bike issues along corridor unrelated to peak hour
    e. Perform surveys on general public walking/biking along corridor
    f. Identify locations for potential ped/bike counts along corridor
3. **Lunch/Afternoon Break (11:30 AM – 4 PM)**
    a. Observe school related ped/bike traffic from 2:45-3:30 at select locations
4. **Afternoon Field Review (4 – 6 PM)**
    a. Identify ped/bike issues related to PM peak hour
    b. Perform surveys on general public walking/biking along corridor

MetroPlan Pedestrian/Bicycle Safety Action Plans Safety Field Review

Michigan Avenue from US 192 to Donegan Ave. (Kissimmee)

Background

The Michigan Avenue (Kissimmee) pedestrian/bicycle safety field review will occur from US 192 to Donegan Avenue in Kissimmee. Segment characteristics are reviewed below:

- Segment Length – 1.00 mile;
- 5 lane roadway with two lanes in each direction and a two-way left-turn lane;
- 3 signalized intersections at US 192, Mill Slough Road, and Donegan Avenue;
- Sidewalks are present along both the west and east sides of the roadway and are separated by an approximately 5 foot or wider landscaped buffer along the length of the corridor;
- No bicycle lanes are provided along the corridor;
- No overhead street lighting is present throughout corridor;
- Curb and gutter present on this corridor;
- Mostly residential land uses along this corridor, with retail uses located at the southern and northern ends of corridor;
- 40 mph speed limit throughout the corridor;
- Lynx bus routes #10 (East US 192/St. Cloud) and #18 (S. Orange Ave./Kissimmee) travel along this corridor, while bus route #407 (Kissimmee/Medical City/OIA Fastlink) travels along US 192 at the southern intersection on this corridor;
    - There are 10 Lynx bus stops along the corridor, which are noted in the crash map for this corridor.
- There is one school located along Michigan Avenue:
    - Osceola Christian Preparatory School near Michigan Avenue and US 192
        - School hours not listed
- There are also several schools within one mile of the study corridor:
    - Denn John Middle School near Denn John Lane and Sunburst Way
        - School Hours: 7:50am - 2:50pm (1:50 pm on Wednesday)
    - Mill Creek Elementary School near Mill Slough Road and Quail Hollow Court
        - School Hours: 8:00am- 3:00pm (2:00 pm on Wednesday)
    - Main Street High School (charter school) at Main Street and Magnolia Street
        - School hours not listed
    - Central Avenue Elementary School near Central Avenue and US 192
        - School Hours: 8:00am- 3:00pm (2:00 pm on Wednesday)

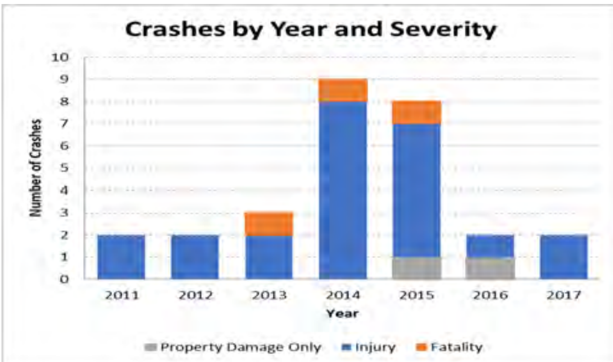
Crash History (2011 – 2017)

Seven (7) years of available pedestrian and bicycle related crash data, 2011 to 2017, were utilized for the Michigan Avenue (Kissimmee) crash analysis. Crash data was obtained from the Signal Four Analytics database maintained by University of Florida.

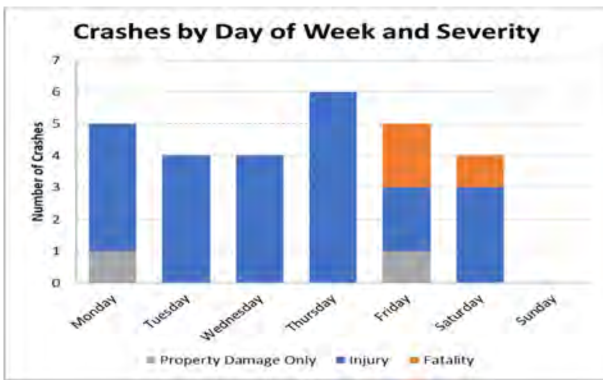
Twenty-eight (28) pedestrian or bicycle-related crashes were reported over the seven-year study period, 61 percent of which involved bicyclists (17). Twenty-three (23) injury crashes (82 percent) resulted in a total of 25 injuries. Three (3) fatal pedestrian crash occurred between US 192 and Donegan Avenue. A summary of each fatal crash is provided below:

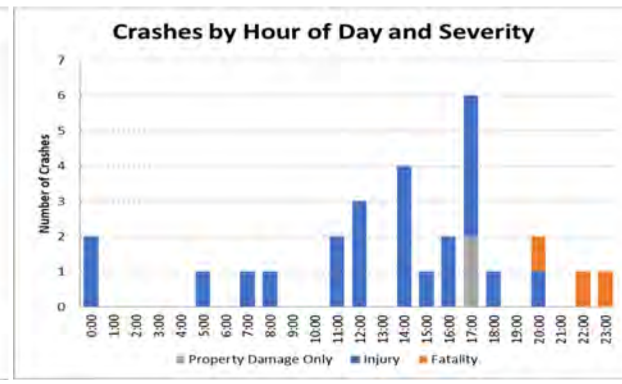
- Crash Number: 82605176 (vehicle-pedestrian)
  - On June 21, 2013, at 10:58 PM, a crash involving a pedestrian occurred at the intersection of Michigan Avenue and Delaware Street under dark lighting conditions. The pedestrian attempted to cross Michigan Avenue from west to east toward Delaware Street. The vehicle was traveling southbound on Michigan Avenue in the right lane when it collided with the pedestrian at approximately 35 miles per hour. The pedestrian was airlifted to Orlando Regional Medical Center, where she was pronounced deceased.
- Crash Number: 82607427 (vehicle-pedestrian)
  - On Jun 7, 2014, at 8:37 PM, a crash involving a pedestrian occurred at the intersection of Michigan Avenue and Lehigh Street under dark lighting conditions. The pedestrian attempted to cross Michigan Avenue from east to west, moving from Lehigh Street to the Kissimmee Square Plaza. The vehicle was traveling northbound on Michigan Avenue in the left lane when it collided with the pedestrian. The pedestrian was pronounced deceased at the scene of the crash.
- Crash Number: 84984977 (vehicle-pedestrian)
  - On January 9, 2015, at 11:04 PM, a crash involving a pedestrian occurred at the intersection of Michigan Avenue and Ocean Street under dark lighting conditions. The pedestrian attempted to cross Michigan Avenue in a wheelchair from west to east toward Boulder Drive. The vehicle was traveling southbound on Michigan Avenue in the right lane when it collided with the pedestrian. After the first collision, another vehicle collided with the pedestrian because he was not seen. The pedestrian was pronounced deceased at the scene of the crash.

Sixty-four (64) percent of the crashes occurred in daylight conditions, and the majority (96 percent) occurred with dry roadway conditions. There were four (4) alcohol and/or drug related crashes. The reported crashes are displayed by different measures of time (year, month, day, and hour) below.



A spike in pedestrian and bicycle crashes occurred in 2014 and 2015 with nine (9) reported crashes in 2014 and eight (8) reported crashes in 2015. February, October, and December were the highest reported crash months, all with four (4) crashes.



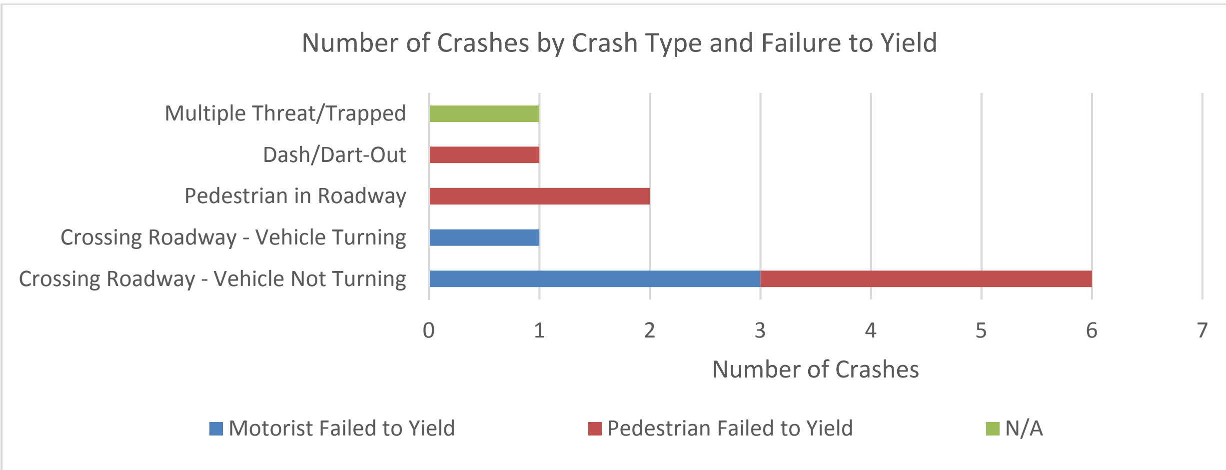


Pedestrian and bicycle-related crashes remain steady throughout the week, with the only anomaly being the lack of crashes on Sunday. By time of day, the majority of crashes (64 percent) occurred between 11:00 AM and 5:00 PM.

Crash Typing

Pedestrian Crashes

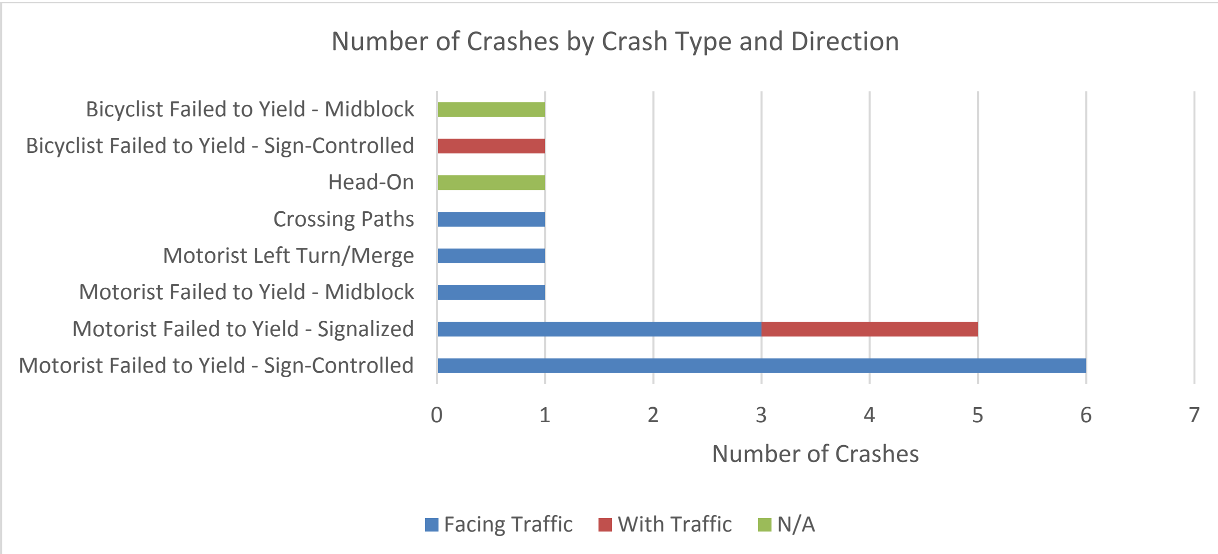
There were 11 pedestrian crashes on the corridor from 2011 through 2017. The most common pedestrian crash type was crossing roadway – vehicle not turning (6 crashes). Three (3) of the crashes occurred within a crosswalk, and all of the crossing roadway – vehicle not turning crashes noted the motorist was marked as failing to yield.



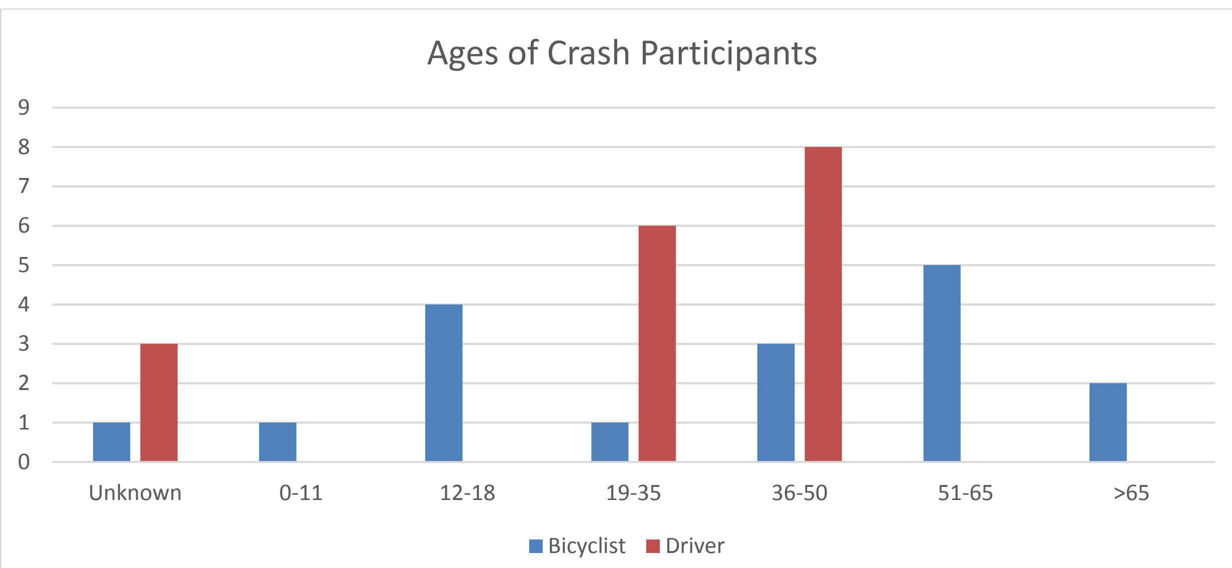
The following graph displays the pedestrian and driver ages as reported in the data. As shown, approximately 64 percent of pedestrians and 64 percent of the drivers involved in crashes are between 36 and 65 years old.

Bicycle Crashes

There were 17 bicycle crashes on the corridor from 2011 through 2017. The most common bicycle crash type was motorist failed to yield – sign-controlled intersection (6 crashes). Eleven (11) of the crashes occurred on a sidewalk, crosswalk, or driveway crossing and two (2) occurred on the roadway in the travel lane.



The following graph displays the bicyclist and driver ages as reported in the data. As shown, approximately 47 percent of bicyclists involved in crashes are between 36 and 65 years old and 29 percent are 18 years old or younger. All drivers involved in crashes are between 19 and 50 years old.



Crash Locations

The locations of reported crashes are shown in the attached crash map and are summarized as follows:

- Signalized Intersections – 10 pedestrian or bicycle-related crashes (36 percent) occurred at or near the three signalized intersections along the corridor. The intersection crash summaries are discussed below:
    - US 192 – 4 total crashes
        - 1 pedestrian crash, resulting in 1 minor injury.
        - 3 bicycle crashes, resulting in 1 severe injury and 2 minor injuries.
    - Mills Slough Road – 2 total crashes
        - 1 pedestrian crash, resulting in 1 severe injury.
        - 1 bicycle crash, resulting in 1 severe injury.
    - Donegan Avenue – 4 total crashes
        - 1 pedestrian crash, resulting in 1 moderate injury.
        - 3 bicycle crashes, resulting in 2 moderate injuries and 1 minor injury.
- Unsignalized Intersections – 17 pedestrian or bicycle-related crashes (61 percent) occurred at or near the unsignalized intersections along the corridor. The high crash/high severity unsignalized intersection locations are summarized below:
    - Lehigh Street – 4 total crashes
        - 1 pedestrian crash, resulting in 1 fatality
        - 3 bicycle crashes, resulting in 2 moderate injuries.
    - Delaware Avenue – 1 total crash
        - 1 pedestrian crash, resulting in 1 fatality.
    - Ocean Street/Boulder Drive – 6 total crashes
        - 4 pedestrian crashes, resulting in 1 fatality, 1 severe injury, and 3 moderate injuries.
        - 2 bicycle crashes, resulting in 1 moderate injury.

One bicycle crash also occurred mid-block between Sweetwater Boulevard and Mill Creek Place, resulting in 1 moderate injury.

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Pedestrian/Bicyclist Safety Action Plan

2011-2017 Crash Locations

US 192 Field Review Agenda

MetroPlan Pedestrian / Bicycle Safety Action Plans

Date:	September 21, 2018	Project #: 21278.03
Meeting Location:	Kissimmee Shopping Center, Parking Lot Near Bealls Outlet 2505 Old Vineland Rd. Kissimmee, FL 34746 Start Time 7:00 AM	
Field Review Location:	US 192 from Siesta Lago Drive to Old Vineland Road (1.36 miles)	

1. **Kick Off Meeting in Parking Lot (7:00 – 7:15 AM)**
   a. Goals of field review
   b. Historical crash review
   c. Review survey questions
2. **AM Review/Walk Corridor (7:15 – 11:30 AM)**
   a. Walk corridor from west to east
   b. Identify ped/bike issues related to AM peak hour
   c. Identify specific ped/bike issues along corridor unrelated to peak hour
   d. Perform surveys on general public walking/biking along corridor
   e. Identify locations for potential ped/bike counts along corridor
3. **Lunch/Afternoon Break (11:30 AM – 4 PM)**
4. **Afternoon Field Review (4 – 6 PM)**
   a. Identify ped/bike issues related to PM peak hour
   b. Perform surveys on general public walking/biking along corridor

MetroPlan Pedestrian/Bicycle Safety Action Plans Safety Field Review

US 192 from Siesta Lago Drive to Old Vineland Road

Background

The US 192 pedestrian/bicycle safety field review will occur from Siesta Lago Drive to Old Vineland Road in Kissimmee. Segment characteristics are reviewed below:

- Segment Length – 1.36 miles;
- 6 lane divided roadway with three lanes in each direction;
- 2 signalized intersections at Siesta Lago Drive and Old Vineland Road;
- Sidewalks are present along both the west and east sides of the roadway and are separated by an approximately 5 foot or wider landscaped buffer along the length of the corridor;
- Bicycle lanes are provided along the entire corridor;
- Overhead street lighting is present along the entire corridor;
- Curb and gutter present on this corridor;
- Residential and retail land uses are common throughout the corridor;
- 45 mph speed limit throughout the corridor;
- Lynx bus routes #56 (West US 192/Magic Kingdom) travels along this corridor, while there are no bus routes that cross US 192; and
  - There are also 6 Lynx bus stops along this corridor that are noted in the crash map for this corridor.
- There are no schools along or within one mile of the study corridor.

Crash History (2011 – 2017)

Seven (7) years of available pedestrian and bicycle related crash data, 2011 to 2017, were utilized for the US 192 crash analysis. Crash data was obtained from the Signal Four Analytics database maintained by University of Florida.

Forty-four (44) pedestrian or bicycle-related crashes were reported over the seven-year study period, 59 percent of which involved pedestrians (26). Thirty-six (36) injury crashes (81 percent) resulted in a total of 39 injuries. Seven (7) fatal pedestrian crashes and one (1) fatal bicycle crash occurred between Siesta Lago Drive and Old Vineland Road. A summary of each fatal crash is provided below:

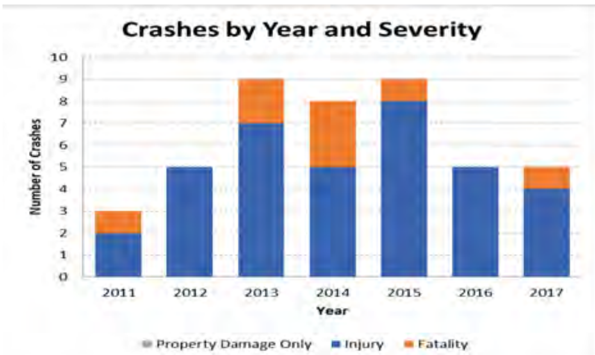
- Crash Number: 82276171 (vehicle-pedestrian)
  - On September 14, 2011, at 11:27 PM, a crash involving a pedestrian occurred at the intersection of US 192 and Oren Brown Road under dark lighting conditions. The pedestrian attempted to cross US 192 from west to east toward the stores opposite of Oren Brown Road. The vehicle was traveling southbound on US 192 in the left lane when

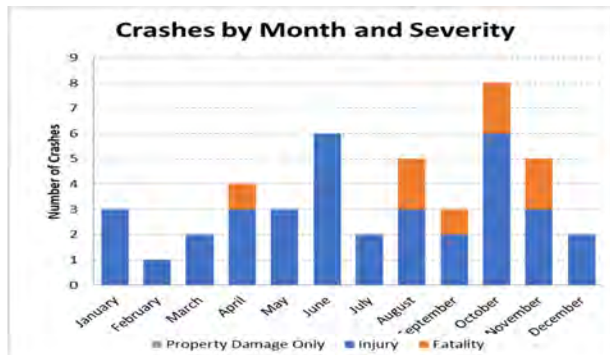
it collided with the pedestrian. The pedestrian was pronounced deceased by Kissimmee Fire Rescue.

- Crash Number: 83699872 (vehicle-pedestrian)
  - On November 15, 2013, at 5:55 PM, a crash involving a pedestrian occurred at the intersection of US 192 and Four Winds Boulevard under dark lighting conditions. The pedestrian attempted to cross US 192 from west to east toward the stores opposite of Four Winds Boulevard. The vehicle was traveling westbound on US 192 in the right lane when it collided with the pedestrian. The pedestrian was transported to Orlando Regional Medical Center, where he later died of his injuries on November 29, 2013.
- Crash Number: 83717305 (vehicle-pedestrian)
  - On November 21, 2013, at 5:42 PM, a crash involving a pedestrian occurred at the intersection of US 192 and Siesta Lago Drive under dark lighting conditions. The pedestrian attempted to cross US 192 from east to west toward Siesta Lago Drive. The pedestrian was using the crosswalk, but during a green vehicle signal. The vehicle was traveling eastbound on US 192 in the center lane when it collided with the pedestrian in the crosswalk. The pedestrian was pronounced deceased at the scene of the crash and had an ethanol level of 0.218 g/dL.
- Crash Number: 83726923 (vehicle-pedestrian)
  - On August 27, 2014, at 8:37 PM, a crash involving a pedestrian occurred 0.25 miles south of the intersection at US 192 and Siesta Lago Drive under dark lighting conditions. The pedestrian attempted to cross US 192 from east to west toward Old Vineland Road. The vehicle was traveling eastbound on US 192 in the center lane when it collided with the pedestrian. The pedestrian was transported to Orlando Regional Medical Center, where he was pronounced deceased. The pedestrian had an ethanol level of 0.418 g/dL.
- Crash Number: 83779810 (vehicle-pedestrian)
  - On April 25, 2014, at 11:30 PM, a crash involving a pedestrian occurred 0.10 miles south of the intersection at US 192 and Old Vineland Road under dark lighting conditions. The pedestrian attempted to cross US 192 from west to east toward Old Vineland Road. The vehicle was traveling eastbound on US 192 in the center lane when it collided with the pedestrian. The pedestrian was pronounced deceased at the scene of the collision.
- Crash Number: 84506241 (vehicle-pedestrian)
  - On October 11, 2014, at 8:16 PM, a crash involving a pedestrian occurred along US 192 north of Oren Brown Road under dark lighting conditions. The pedestrian attempted to cross US 192 from west to east. The vehicle was traveling eastbound on US 192 in the center lane when it collided with the pedestrian. The pedestrian was transported to Osceola Regional Hospital where he was pronounced deceased. The driver tested positive for barbiturates.
- Crash Number: 85162012 (vehicle-bicyclist)
  - On October 16, 2015, at 10:09 PM, a crash involving a bicyclist occurred along US 192 south of Four Winds Boulevard under dark lighting conditions. The bicyclist attempted to cross US 192 from west to east. The vehicle was traveling westbound on US 192 in the right lane when it collided with the bicyclist. The bicyclist was transported to Osceola Regional Hospital where he was pronounced deceased.

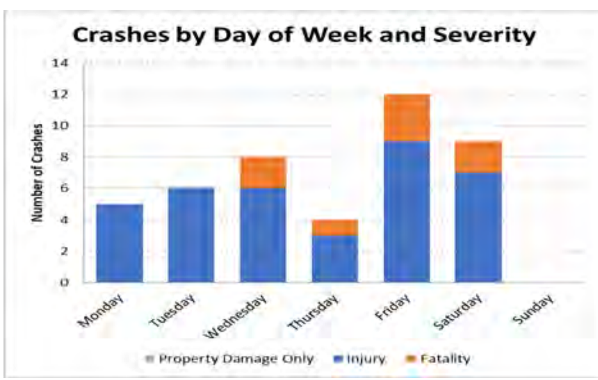
- Crash Number: 85204475 (vehicle-pedestrian)
  - On August 12, 2017, at 10:00 PM, a crash involving a pedestrian occurred along US 192 west of Old Vineland Road under dark lighting conditions. The pedestrian attempted to cross US 192 from north to south. The vehicle was traveling westbound on US 192 in the right lane when it collided with the pedestrian. The pedestrian was pronounced deceased at the scene of the collision.

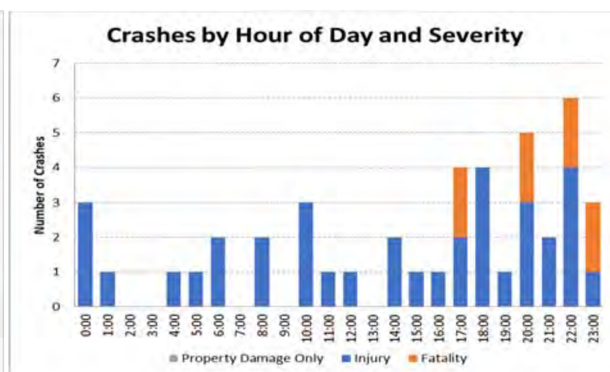
Fifty-four (54) percent of the crashes occurred in dark lighting conditions, including 100 percent of the fatal crashes, and the majority (89 percent) occurred with dry roadway conditions. There were three (3) alcohol and/or drug related crashes. The reported crashes are displayed by different measures of time (year, month, day, and hour) below.





A spike in pedestrian and bicycle crashes occurred from 2013 to 2015 with nine (9) reported crashes in 2013 and 2015 and eight (8) reported crashes in 2014. October was the highest reported crash month, with eight (8) crashes.



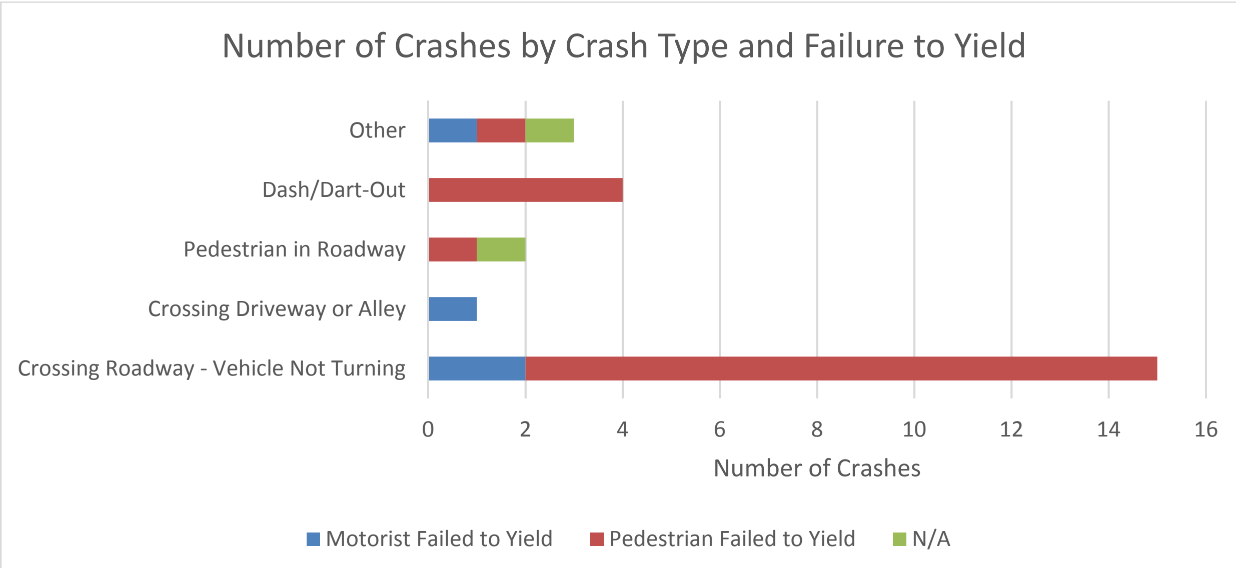


Pedestrian and bicycle-related crashes varied throughout the week, with the most occurring on Friday and no crashes occurring on Sunday. By time of day, the majority of crashes (57 percent) occurred after 5:00 PM. All fatalities occurred after 5:00 PM in dark lighting conditions.

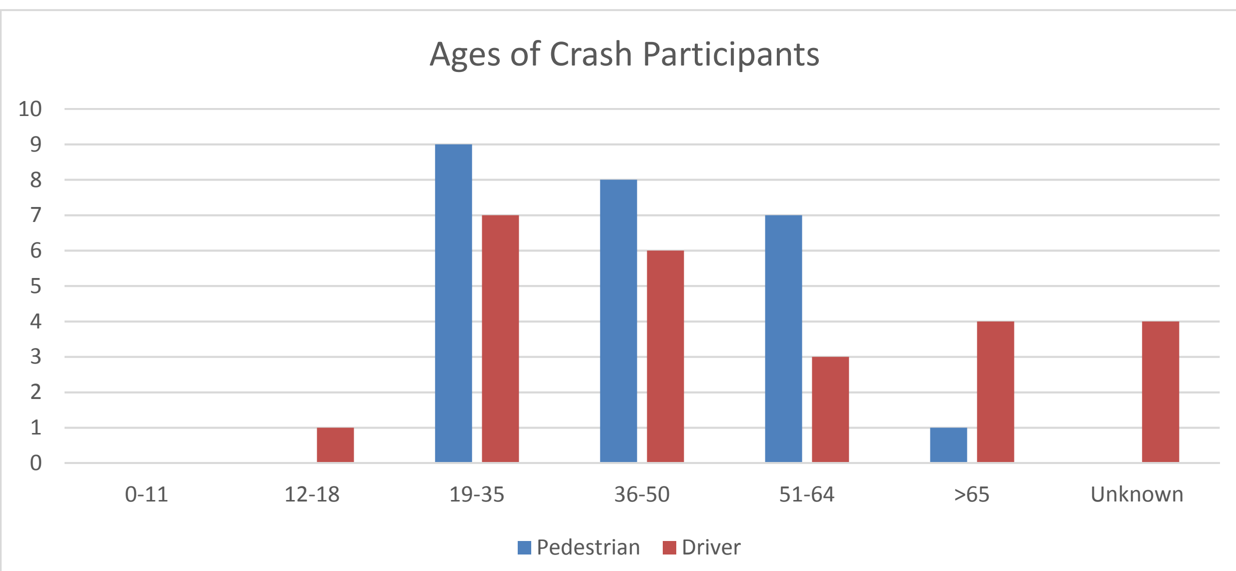
Crash Typing

Pedestrian Crashes

There were 25 pedestrian crashes on the corridor from 2011 through 2017. The most common pedestrian crash type was crossing roadway – vehicle not turning (15 crashes). Three (3) of the pedestrian crashes occurred within a crosswalk, and 13 of the 15 crossing roadway – vehicle not turning crashes noted the pedestrian failed to yield.

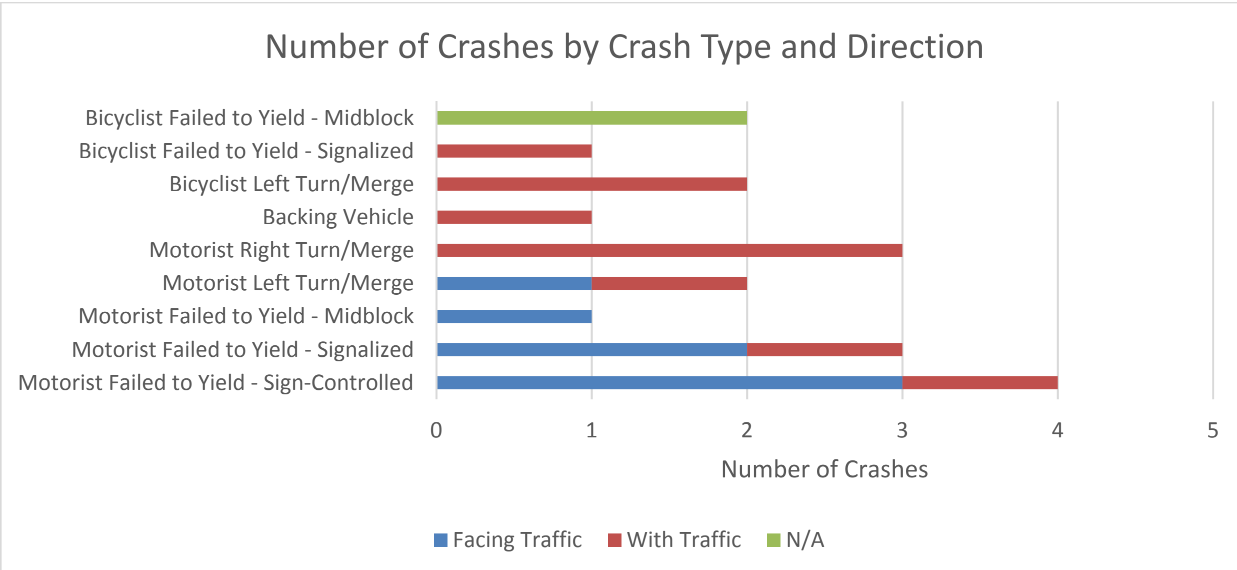


The following graph displays the pedestrian and driver ages as reported in the data. All but one of the pedestrians involved in a crash were between 19 and 64 years old, with fairly consistent spread across those age ranges.

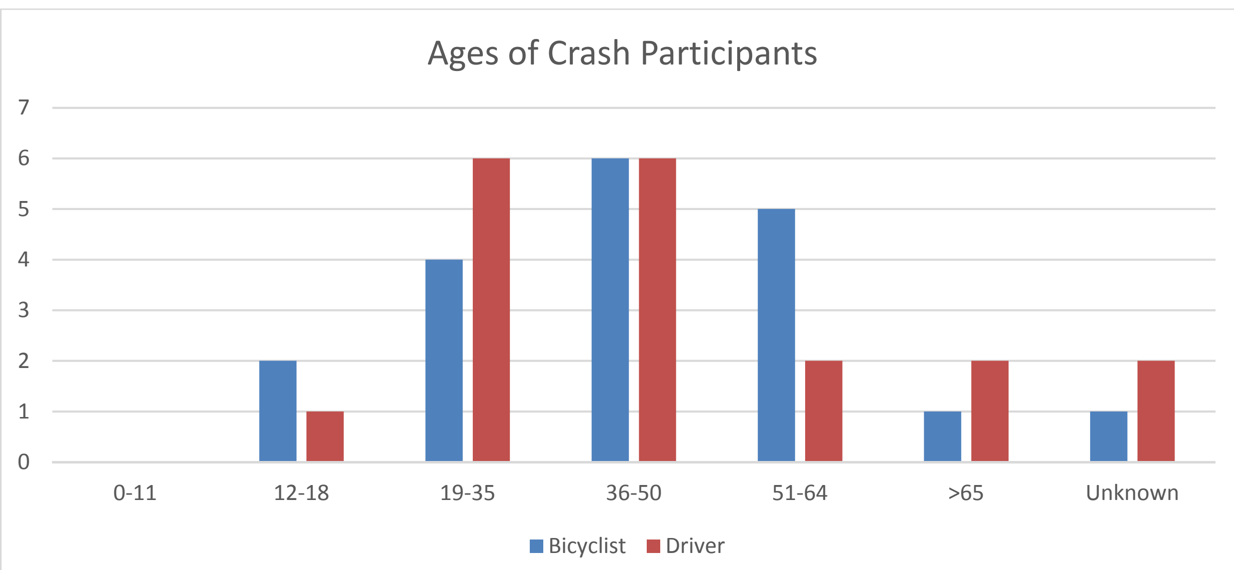


Bicycle Crashes

There were 19 bicycle crashes on the corridor from 2011 through 2017. The most common bicycle crash type was motorist failed to yield – sign-controlled intersection (4 crashes). Ten (10) of the crashes occurred on a sidewalk, crosswalk, or driveway crossing and four (4) occurred on the roadway in the travel lane.



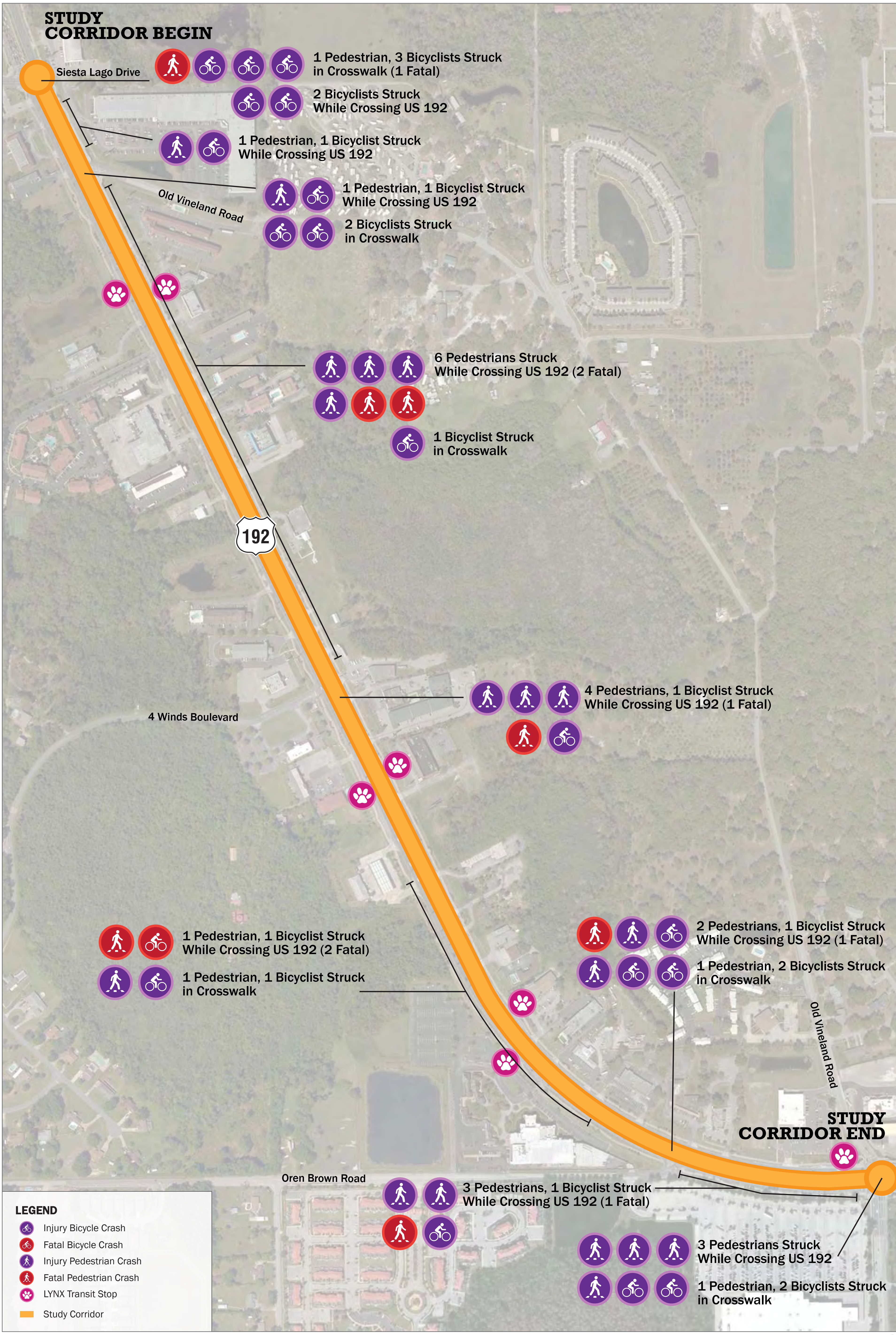
The following graph displays the bicyclist and driver ages as reported in the data. As shown, approximately 58 percent of bicyclists involved in crashes are between 36 and 65 years. Approximately 63 percent of drivers involved in crashes are between 19 and 50 years old.



Crash Locations

The locations of reported crashes are shown in the attached crash map and are summarized as follows:

- Signalized Intersections – 12 pedestrian or bicycle-related crashes (28 percent) occurred at or near the two signalized intersections along the corridor. The intersection crash summaries are discussed below:
  - Old Vineland Road – 6 total crashes
    - 4 pedestrian crashes, resulting in 4 moderate injuries.
    - 2 bicycle crashes, resulting in 2 severe injuries and 1 moderate injury.
  - Siesta Lago Drive – 6 total crashes
    - 1 pedestrian crash, resulting in 1 fatality.
    - 5 bicycle crashes, resulting in 2 severe injuries and 3 minor injuries.
- Unsignalized Intersections – 15 pedestrian or bicycle-related crashes (37 percent) occurred at or near the unsignalized intersections along the corridor. The high crash/high severity unsignalized intersection locations are summarized below:
  - Oren Brown Road – 6 total crashes
    - 3 pedestrian crashes, resulting in 1 fatality, 1 moderate injury, and 1 minor injury.
    - 3 bicycle crashes, resulting in 1 moderate injury and 2 minor injuries.
  - Four Winds Boulevard – 5 total crashes
    - 4 pedestrian crashes, resulting in 1 fatality, 1 severe injury, 1 moderate injury, and 1 minor injury.
    - 1 bicycle crash, resulting in 1 minor injury.
  - Old Vineland Road – 4 total crashes
    - 1 pedestrian crash, resulting in 1 moderate injury.
    - 3 bicycle crashes, resulting in 2 severe injuries and 1 minor injury.
- Midblock crossings – 17 pedestrian or bicycle-related crashes (37 percent) occurred at midblock crossings along the corridor. The high crash/high severity unsignalized intersection locations are summarized below:
  - Old Vineland Road to Oren Brown Road – 4 total crashes
    - 1 fatal pedestrian crash.
  - Oren Brown Road to Four Winds Boulevard – 4 total crashes
    - 2 fatal pedestrian crashes and 1 fatal bicycle crash.
  - Four Winds Boulevard to Old Vineland Road – 7 total crashes
    - 2 fatal pedestrian crashes.
  - Old Vineland Road to Siesta Lago Drive – 2 total crashes
    - No fatal crashes



Scale in Feet
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Pedestrian/Bicyclist Safety Action Plan

2011-2017 Crash Locations

Michigan Avenue (St. Cloud) Field Review Agenda

MetroPlan Pedestrian / Bicycle Safety Action Plans

Date:	September 27, 2018	Project #: 21278.03
Meeting Location:	Veterans Memorial Library, Parking Lot at Intersection of US 192 and Illinois Avenue (across from small liquor/tobacco/gas station) 810 13th St., St Cloud, FL 34769 Start Time 7:00 AM	
Field Review Location:	Michigan Avenue from Michigan Avenue Elementary School Entrance to 8th Street (0.93 miles)	

1. **Kick Off Meeting in Parking Lot (7:00 – 7:15 AM)**
    a. Goals of field review
    b. Historical crash review
    c. Review survey questions
2. **AM Review/Walk Corridor (7:15 – 11:30 AM)**
    a. Walk corridor from south to north
    b. Observe school related ped/bike traffic
    c. Identify ped/bike issues related to AM peak hour
    d. Identify specific ped/bike issues along corridor unrelated to peak hour
    e. Perform surveys on general public walking/biking along corridor
    f. Identify locations for potential ped/bike counts along corridor
3. **Lunch/Afternoon Break (11:30 AM – 4 PM)**
    a. Observe school related ped/bike traffic from 2:00-3:30 at select locations
4. **Afternoon Field Review (4 – 6 PM)**
    a. Identify ped/bike issues related to PM peak hour
    b. Perform surveys on general public walking/biking along corridor

MetroPlan Pedestrian/Bicycle Safety Action Plans
Safety Field Review

Michigan Avenue (St. Cloud) from
Michigan Avenue Elementary School Entrance to 8th Street

Background

The Michigan Avenue (St. Cloud) pedestrian/bicycle safety field review will occur from the Michigan Avenue Elementary School Entrance to 8th Street in St. Cloud. Segment characteristics are reviewed below:

- Segment Length – 0.93 miles;
- 2 lane roadway with one lane in each direction;
- 1 signalized intersection at US 192;
- Sidewalks are present along most of the of the roadway and are separated by an approximately 5 foot or wider landscaped buffer along the length of the corridor;
    - Sidewalks are present on the east side of the roadway from the Michigan Avenue Elementary School entrance to the St. Cloud High School entrance
    - Sidewalks are present on both sides of the roadway from the St. Cloud High School Entrance to 10th Street
    - Sidewalks are present on the west side of the roadway from 10th Street to 8th Street
- No bicycle lanes are provided along the corridor;
- No overhead street lighting is present throughout corridor;
- A flush shoulder is present on this corridor;
- Mostly residential land uses along this corridor, with institutional (school) land uses in the southern portion of the corridor;
- 25 mph speed limit throughout the corridor;
- No Lynx bus routes travel along this corridor, but bus route #10 (East US 192/St. Cloud) crosses the corridor at 10th Street and 17th Street;
    - There are two Lynx bus stops adjacent to the corridor that are noted in the crash map for this corridor.
- There are three schools located along Michigan Avenue:
    - Michigan Avenue Elementary School near Michigan Avenue and Bulldog Lane
        - School Hours: 7:50am - 2:50pm (1:50 pm on Wednesday)
    - St. Cloud Middle School near Michigan Avenue and Bulldog Lane
        - School Hours: 7:35am - 2:40pm (1:40 pm on Wednesday)
    - St. Cloud High School near Michigan Avenue and Bulldog Lane
        - School Hours: 7:10am - 2:15pm (1:15 pm on Wednesday)
- There are also two schools within one mile of the study corridor:
    - Ross E Jeffries Elementary School near Vermont Avenue and US 192
    - St. Cloud Christian Preparatory School near Connecticut Avenue and US 192

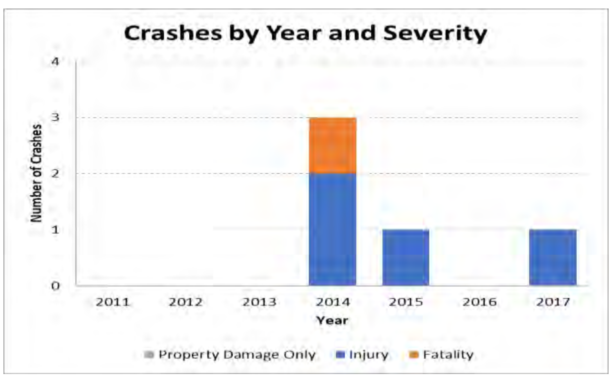
Crash History (2011 – 2017)

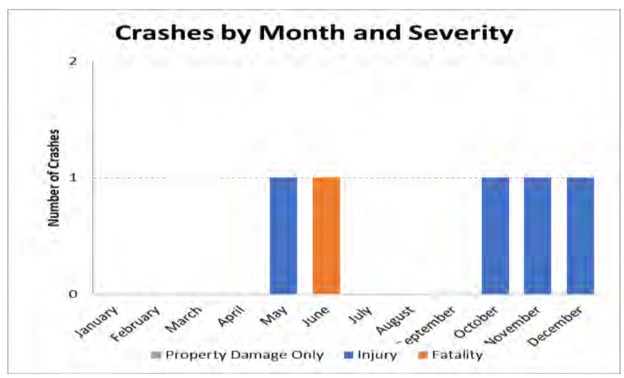
Seven (7) years of available pedestrian and bicycle related crash data, 2011 to 2017, were utilized for the Michigan Avenue (St. Cloud) crash analysis. Crash data was obtained from the Signal Four Analytics database maintained by University of Florida.

Five (5) pedestrian or bicycle-related crashes were reported over the seven-year study period, 60 percent of which involved bicyclists (3). Four (4) injury crashes (80 percent) resulted in a total of four (4) injuries. One (1) fatal pedestrian crash occurred between Michigan Avenue Elementary School Entrance and 8th Street. A summary of each fatal crash is provided below:

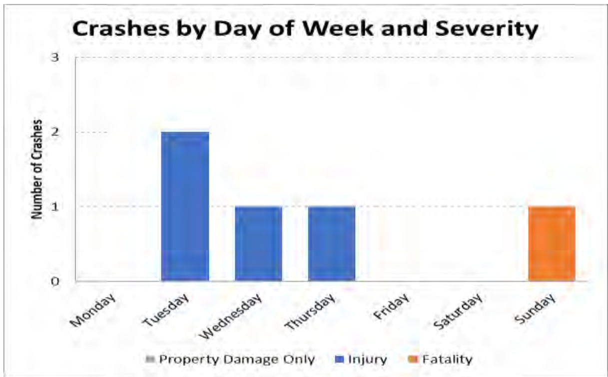
- Crash Number: 84240584 (vehicle-pedestrian)
    - On June 1, 2014, at 6:30 PM, a crash involving a pedestrian occurred at the intersection of Michigan Avenue and 17th Street under daylight lighting conditions. The pedestrian was traveling southbound on the west sidewalk of Michigan Avenue. A vehicle entered the intersection from the stop-controlled 17th Street, causing a second vehicle on Michigan Avenue to swerve and collide with the pedestrian. The pedestrian was pronounced deceased at the scene of the collision.

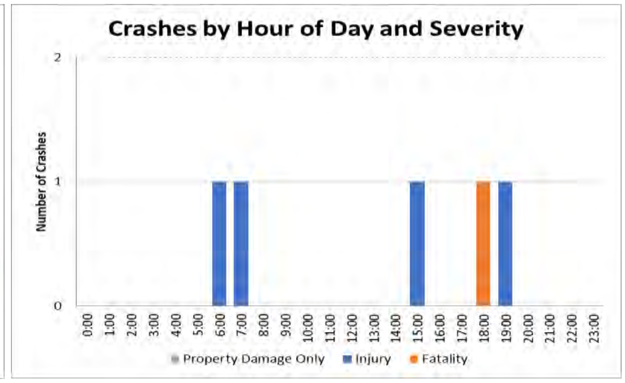
Sixty (60) percent of the crashes occurred in daylight conditions, and the majority (80 percent) occurred with dry roadway conditions. There was one (1) alcohol and/or drug related crash. The reported crashes are displayed by different measures of time (year, month, day, and hour) below.





A spike in pedestrian and bicycle crashes occurred in 2014 with three (3) reported crashes in. Crashes were more common in the last three months of the year.





Pedestrian and bicycle-related crashes were most common in the middle of the week (Tuesday to Thursday). By time of day, the majority of crashes occurred in the early morning or the evening.

Crash Typing

Pedestrian Crashes

There were 2 pedestrian crashes on the corridor from 2011 through 2017.

- One crash was a pedestrian in roadway – circumstances unknown crash, occurring at a non-intersection location with the pedestrian in the roadway travel lane. The driver of this crash was 74 years old, and the pedestrian was 15 years old.
- One crash was marked as unusual circumstances, with a motor vehicle loss of control, related to an intersection, and with the pedestrian noted as on a sidewalk, shared use path, or driveway crossing. The driver of this crash was 27 years old, and the pedestrian was 50 years old.

Bicycle Crashes

There were 3 bicycle crashes on the corridor from 2011 through 2017.

- The three crashes include two crashes marked as bicyclist failed to yield (one at a sign controlled intersection – biking with traffic and one at a signalized intersection – biking facing traffic) and one crash marked as motorist failed to yield (at a sign controlled intersection – biking facing traffic).
- All three crashes occurred at an intersection, with two marked as occurring on a sidewalk, crosswalk, or driveway crossing, and one marked as occurring on the roadway in a shared travel lane.
- Two of the drivers were 17 years old, and one of the drivers was 50 years old. Two of the bicyclists ages are unknown, and one of the bicyclists was 13 years old.

Crash Locations

The locations of reported crashes are shown in the attached crash map and are summarized as follows:

- Signalized Intersections – 1 bicycle-related crash (20 percent) occurred at or near the signalized intersection at US 192, resulting in 1 severe injury.
- Unsignalized Intersections – 4 pedestrian or bicycle-related crashes (80 percent) occurred at or near the unsignalized intersections along the corridor. The high crash/high severity unsignalized intersection locations are summarized below:
    - Russell Street – 1 total crash
        - 1 bicycle crash, resulting in 1 moderate injury.
    - 17th Street – 1 total crash
        - 1 pedestrian crash, resulting in 1 fatality.
    - 10th Street – 1 total crash
        - 1 bicycle crash, resulting in 1 severe injury.
    - 9th Street – 1 total crash
        - 1 pedestrian crash, resulting in 1 severe injury.

No crashes occurred at mid-block crossing locations.

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Pedestrian/Bicyclist Safety Action Plan

2011-2017 Crash Locations

Pershing Avenue Field Review Agenda

MetroPlan Pedestrian / Bicycle Safety Action Plans

Date:	October 19, 2018	Project #: 21278.03
Meeting Location:	Walmart Neighborhood Market, Parking Area Closest to Pershing Avenue 4520 Semoran Boulevard, Orlando, FL 32822 Start Time 8:00 AM	
Field Review Location:	Pershing Avenue from Dixie Belle Drive to Goldenrod Road (1.76 miles)	

1. **Kick Off Meeting in Parking Lot (8:00 – 8:15 AM)**
    a. Goals of field review
    b. Historical crash review
    c. Review survey questions
2. **AM Review/Walk Corridor (8:15 – 11:30 AM)**
    a. Walk corridor from west to east
    b. Observe school related ped/bike traffic
    c. Identify specific ped/bike issues along corridor
    d. Perform surveys on general public walking/biking along corridor
    e. Identify locations for potential ped/bike counts along corridor
3. **Lunch/Early Afternoon Break (11:30 AM – 2:45 PM)**
4. **Afternoon School Field Review (2:45 – 3:30 PM)**
    a. Observe school related ped/bike traffic from 2:45 - 3:30 at select locations

MetroPlan Pedestrian/Bicycle Safety Action Plans Safety Field Review

Pershing Avenue from Dixie Belle Drive to Goldenrod Road

Background

The Pershing Avenue pedestrian/bicycle safety field review will occur from Dixie Belle Drive to Goldenrod Road in Orlando. Segment characteristics are reviewed below:

- Segment Length – 1.76 miles;
- 2 lane undivided roadway with one lane in each direction from Dixie Belle Drive to Semoran Boulevard; 4 lane divided roadway with two lanes in each direction from Semoran Boulevard to Goldenrod Road,
- 6 signalized intersections at Dixie Bell Drive, Semoran Boulevard, Wild Horse Road, Woodgate Boulevard, Redditt Road, and Goldenrod Road;
- Sidewalks are present along both the north and south sides of the roadway and are separated by an approximately 5 foot or wider landscaped buffer along the length of the corridor;
- No bicycle lanes are present along the entire corridor;
- No overhead street lighting is present throughout corridor;
- Curb and gutter present on this corridor;
- Mostly residential land uses along this corridor with some retail/commercial near the Semoran Boulevard and Goldenrod Boulevard intersections;
- 45 mph speed limit throughout the corridor;
- Lynx bus route #3 (Lake Margaret) travels along this corridor;
  - There are 15 Lynx bus stops along the corridor, which are noted in the crash map for this corridor.
- There is one school located along Pershing Avenue;
  - Ventura Elementary School:
    - School Hours: 8:45am – 3:00pm (2:10pm on Wednesday)
- There are three schools within one mile of the study corridor:
  - Michael McCoy Elementary School
    - School Hours: 8:45am – 3:00pm (2:10pm on Wednesday)
  - Lake George Elementary School
    - School Hours: 8:45am – 3:00pm (2:10pm on Wednesday)
  - Conway Middle School
    - School Hours: 9:30am – 3:57pm (2:54pm on Wednesday)

Crash History (2011 – 2017)

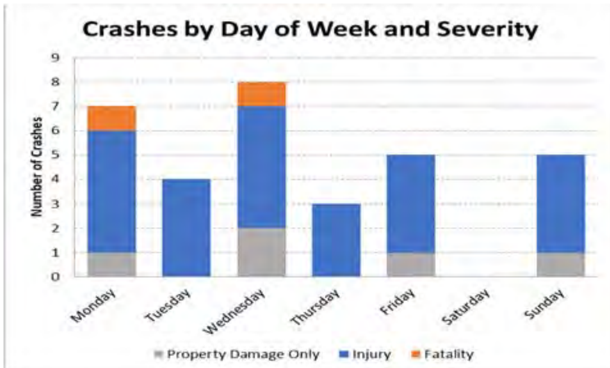
Seven (7) years of available pedestrian and bicycle related crash data, 2011 to 2017, were utilized for the Pershing Avenue crash analysis. Crash data was obtained from the Signal Four Analytics database maintained by University of Florida.

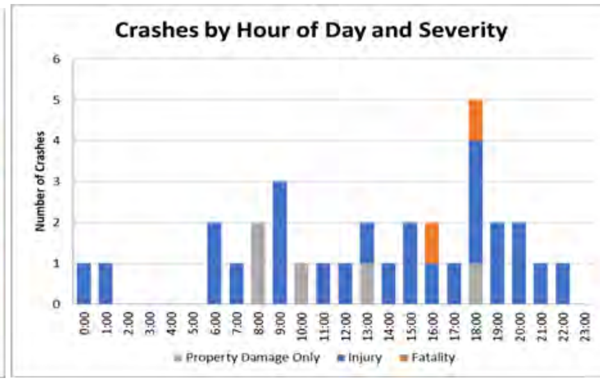
Thirty-two (32) pedestrian or bicycle-related crashes were reported over the seven-year study period, 63 percent of which involved bicyclists (20). Twenty-five (25) injury crashes (78 percent) resulted in a total of 27 injuries. Two (2) fatal pedestrian crashes occurred along this corridor, with one occurring at Wild Horse Road and one occurring at Commander Drive. A summary of the fatal crashes is provided below:

- Crash Number: 83710454 (vehicle-pedestrian)
  - On December 2, 2013, at 4:42 PM, a crash involving a pedestrian occurred at the intersection of Pershing Avenue and Wild Horse Road under daylight lighting conditions. The pedestrian attempted to cross Wild Horse Road from east to west on the north side of the intersection. The first vehicle was travelling eastbound on Pershing Avenue and attempted a left turn onto Wild Horse Road, violating the right of way of the second vehicle, which was travelling westbound on Pershing Avenue. The two vehicles collided, and the pedestrian was struck after this vehicle collision. The pedestrian was airlifted to Arnold Palmer Medical Center, where she was later pronounced deceased.
- Crash Number 86118339 (vehicle-pedestrian)
  - On December 9, 2015, at 6:04 PM, a crash involving a pedestrian occurred at the intersection of Pershing Avenue and Commander Drive under dark lighting conditions. The pedestrian attempted to cross Pershing Avenue from north to south toward Commander Drive. The vehicle was travelling eastbound on Pershing Avenue in the right lane when the pedestrian was struck. The pedestrian was pronounced deceased at the scene of the collision.

Fifty-six (56) percent of the crashes occurred in daylight conditions, and 27 (84 percent) of the crashes occurred with dry roadway conditions. There were no alcohol and/or drug related crashes. The reported crashes are displayed by different measures of time (year, month, day, and hour) below.

A spike in pedestrian and bicycle crashes occurred from 2013 to 2016, with 7 crashes in 2013 and 6 crashes from 2014 to 2016. November was the highest reported crash month, with six (6) crashes.



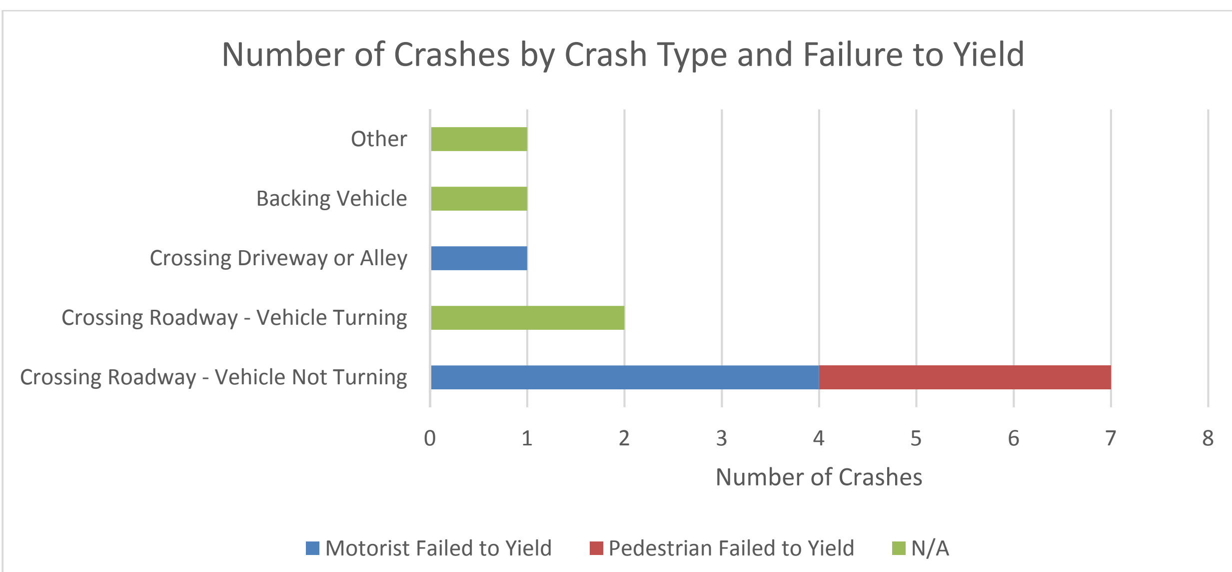


Pedestrian and bicycle-related crashes remained fairly steady throughout the week, with the most crashes on Wednesday (8 crashes). By time of day, the majority of crashes (53 percent) occurred between 11:00 AM and 8:00 PM.

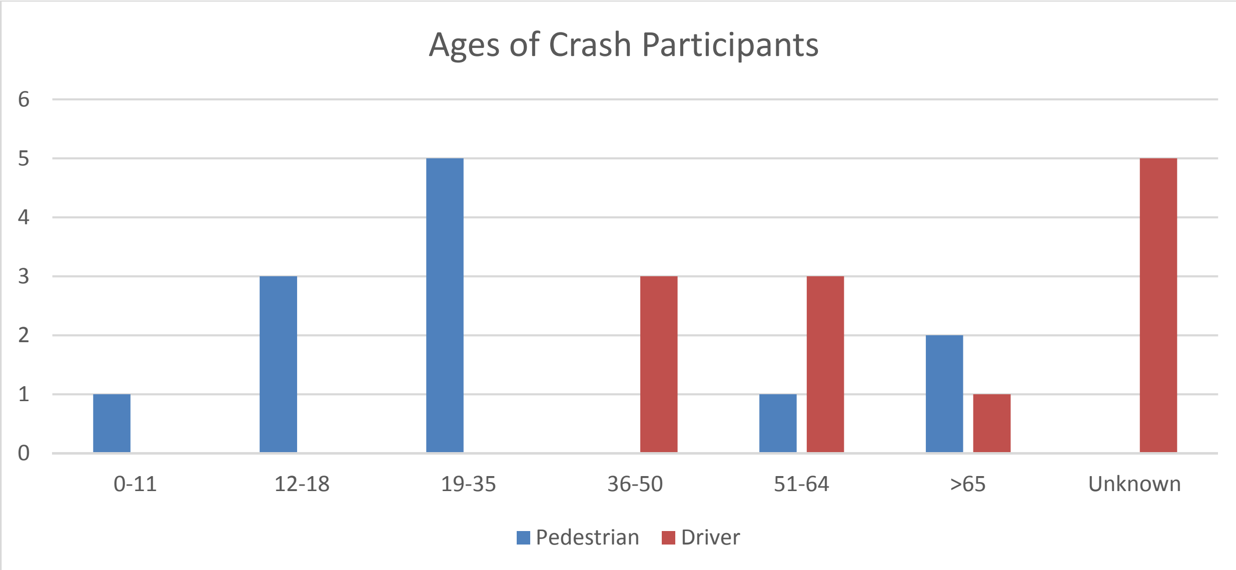
Crash Typing

Pedestrian Crashes

There were 12 pedestrian crashes on the corridor from 2011 through 2017. The most common pedestrian crash type was crossing roadway – vehicle not turning (7 crashes). Five (5) of the crashes occurred within a crosswalk, four occurred on a roadway in a travel lane, and two occurred on a sidewalk, shared use path, or driveway crossing. Four (4) of the crossing roadway – vehicle not turning crashes noted the motorist was marked as failing to yield.

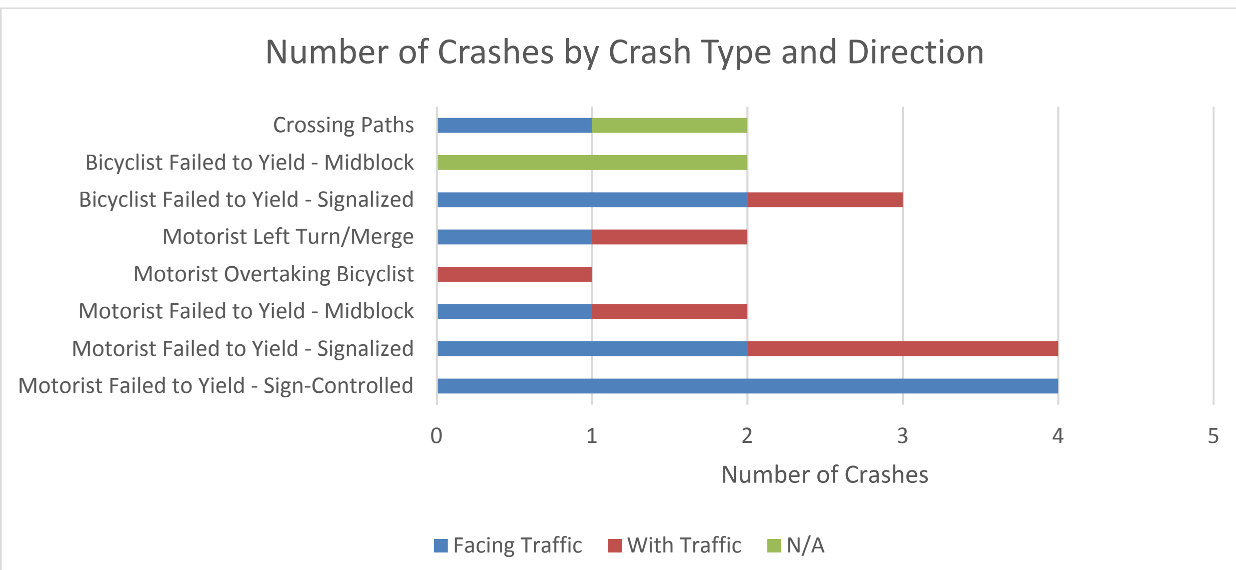


The following graph displays the pedestrian and driver ages as reported in the data. As shown, 75 percent of the pedestrians involved in crashes are under 36 years old, with approximately 33 percent under 19 years old. Approximately 33 percent of the drivers involved in crashes are older than 50 years old.

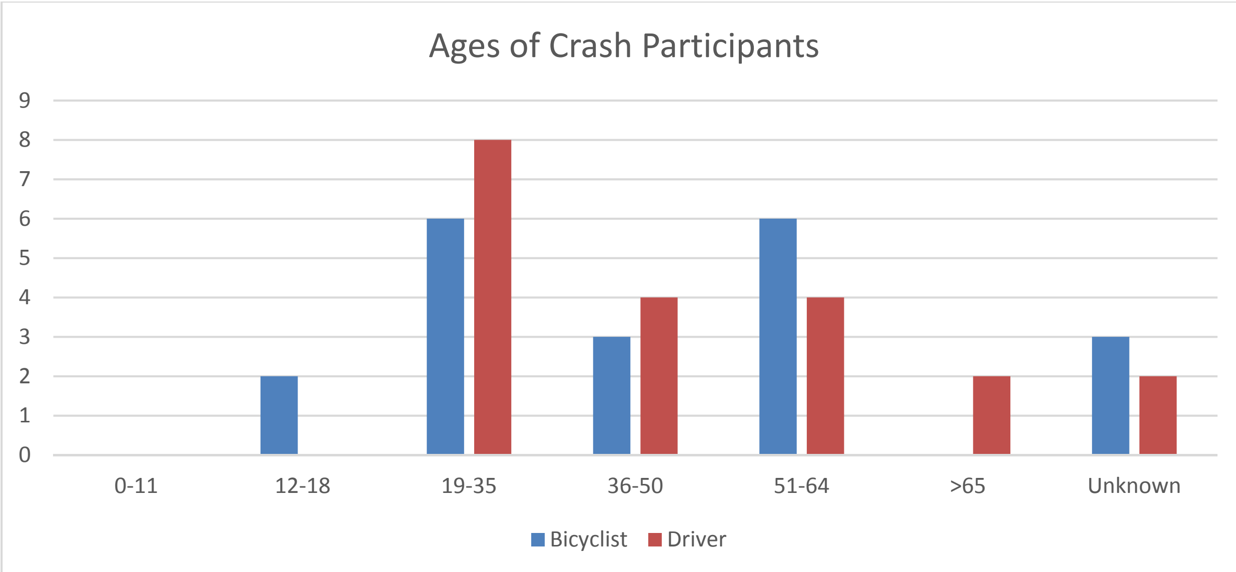


Bicycle Crashes

There were 20 bicycle crashes on the corridor from 2011 through 2017. The most common bicycle crash types were motorist failed to yield – signalized intersection control and motorist failed to yield – sign-controlled intersection (4 crashes each). Sixteen (16) of the crashes occurred on a sidewalk, crosswalk, or driveway crossing and two (2) occurred on the roadway in a shared travel lane.



The following graph displays the bicyclist and driver ages as reported in the data. As shown, 30 percent of bicyclists involved in crashes are between 51 and 64 years old and 10 percent are between 12 and 18 years old. Thirty (30) percent of drivers involved in crashes are 51 years old or older.



Crash Locations

The locations of reported crashes are shown in the attached crash map and are summarized as follows:

- Signalized Intersections – 23 pedestrian or bicycle-related crashes (50 percent) occurred at or near the two signalized intersections along the corridor. The intersection crash summaries are discussed below:
    - Semoran Boulevard – 9 total crashes
        - 4 pedestrian crashes, resulting in 1 severe injury, 1 moderate injury, and 2 minor injuries.
        - 5 bicycle crashes, resulting in 1 moderate injury and 4 PDO crashes.
    - Wild Horse Road – 2 total crashes
        - 1 pedestrian crash, resulting in 1 fatality and 2 moderate injuries.
        - 1 bicycle crash, resulting in 1 moderate injury.
    - Woodgate Boulevard – 1 total crash
        - 1 pedestrian crash, resulting in 1 minor injury.
    - Redditt Road – 4 total crashes
        - 1 pedestrian crash, resulting in 1 moderate injury.
        - 3 bicycle crashes, resulting in 1 moderate injury and 2 minor injuries.
    - Goldenrod Road – 7 total crashes
        - 2 pedestrian crashes, resulting in 2 moderate injuries.
        - 5 bicycle crashes, resulting in 2 moderate injuries and 3 minor injuries.
- Unsignalized Intersections – 7 pedestrian or bicycle-related crashes (44 percent) occurred at or near the unsignalized intersections along the corridor. The high crash/high severity unsignalized intersection locations are summarized below:
        - Commander Drive – 2 total crashes
            - 1 pedestrian crash, resulting in 1 fatality.
            - 1 bicycle crash, resulting in 1 moderate injury.
        - Catherine Wheel Court – 2 total crashes
            - 2 bicycle crashes, resulting in 1 moderate injury and 1 minor injury.

        - Nikki Court – 2 total crashes
            - 1 pedestrian crash, resulting in 1 PDO crash.
            - 1 bicycle crash, resulting in 1 moderate injury.
- There were also 2 crashes (6 percent) at mid-block crossing locations, which are summarized below.
    - Dixie Belle Drive from Semoran Boulevard – 1 total crash
        - 1 pedestrian crash, resulting in 1 moderate injury.
    - Semoran Boulevard from Commander Drive – 1 total crash
        - 1 bicycle crash, resulting in 1 moderate injury.

Scale in Feet
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Pedestrian/Bicyclist Safety Action Plan

2011-2017 Crash Locations

Michigan Street Field Review Agenda

MetroPlan Pedestrian / Bicycle Safety Action Plans

Date:	October 25, 2018	Project #: 21278.03
Meeting Location:	Ross Parking Area Closest to Michigan Street 306 E Michigan St., Orlando, FL 32806 Start Time 8:00 AM	
Field Review Location:	Michigan Street from Railroad Crossing to Mills Avenue (1.01 miles)	

1. **Kick Off Meeting in Parking Lot (8:00 – 8:15 AM)**
    a. Goals of field review
    b. Historical crash review
    c. Review survey questions
2. **AM Review/Walk Corridor (8:15 – 11:30 AM)**
    a. Walk corridor from west to east
    b. Observe school related ped/bike traffic
    c. Identify specific ped/bike issues along corridor
    d. Perform surveys on general public walking/biking along corridor
    e. Identify locations for potential ped/bike counts along corridor
3. **Lunch/Early Afternoon Break (11:30 AM – 2:15 PM)**
4. **Afternoon School Field Review (2:15 – 3:30 PM)**
    a. Observe school related ped/bike traffic from 2:15 - 3:30 at select locations

MetroPlan Pedestrian/Bicycle Safety Action Plans Safety Field Review

Michigan Street from Railroad Crossing to Mills Avenue

Background

The Michigan Street pedestrian/bicycle safety field review will occur from the railroad crossing to Mills Avenue in Orlando. Segment characteristics are reviewed below:

- Segment Length – 1.01 miles;
- 4 lane roadway with two lanes in each direction from the railroad crossing to Mills Avenue;
- 5 signalized intersections at Orange Avenue, Delaney Avenue, Osceola Avenue, Keystone Drive, and Mills Avenue;
- Sidewalks are present along both the north and south sides of the roadway and are separated by an approximately 5 foot or wider landscaped buffer along the length of the corridor;
- No bicycle lanes are present along the entire corridor;
- No overhead street lighting is present throughout corridor;
- Curb and gutter is present on this corridor;
- Mostly residential, retail, and educational land uses along this corridor;
- 35 mph speed limit throughout the corridor;
- Lynx bus route #3 (Lake Margaret) travels along this corridor;
    - There are 7 Lynx bus stops along the corridor, which are noted in the crash map for this corridor.
- There is one school located along Michigan Street;
    - Blankner K-8 School:
        - School Hours: 8:50am – 3:00pm (2:10pm on Wednesday)
- There are four schools within one mile of the study corridor:
    - Boone High School
        - School Hours: 7:20am – 2:20pm (1:10pm on Wednesday)
    - Kaley Elementary School
        - School Hours: 8:45am – 3:00pm (2:10pm on Wednesday)
    - UCP Middle and High School
        - School hours not listed

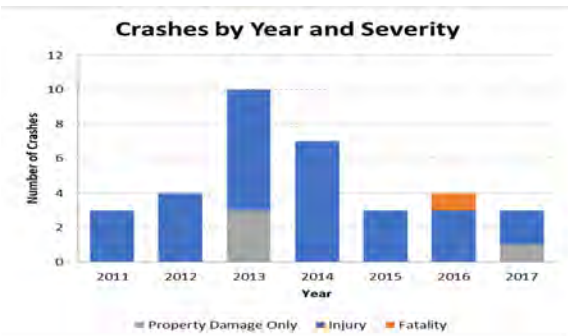
Crash History (2011 – 2017)

Seven (7) years of available pedestrian and bicycle related crash data, 2011 to 2017, were utilized for the Michigan Avenue crash analysis. Crash data was obtained from the Signal Four Analytics database maintained by University of Florida.

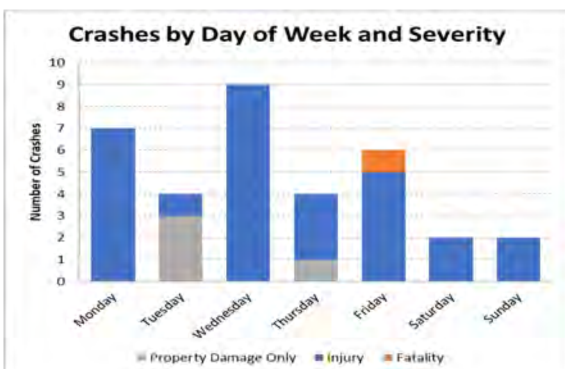
Thirty-four (34) pedestrian or bicycle-related crashes were reported over the seven-year study period, 56 percent of which involved pedestrians (19). Twenty-nine (29) injury crashes (88 percent) resulted in a total of 31 injuries. One (1) fatal pedestrian crash occurred at Osceola Avenue. A summary of the fatal crash is provided below:

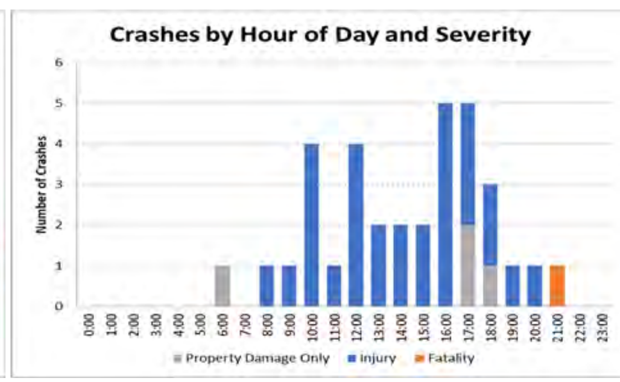
- Crash Number: 86410649 (vehicle-pedestrian)
  - On June 3, 2016, at 9:20 PM, a crash involving a pedestrian occurred at the intersection of Michigan Street and Osceola Avenue under dark lighting conditions. The pedestrian attempted to cross Michigan Street from south to north in the east crosswalk. The vehicle was traveling westbound on Michigan Street in the left lane when it collided with the pedestrian. The pedestrian was pronounced deceased at the scene of the collision.

Eighty-two (82) percent of the crashes occurred in daylight conditions, and 32 of the crashes (94 percent) occurred with dry roadway conditions. There was one (1) alcohol and/or drug related crash. The reported crashes are displayed by different measures of time (year, month, day, and hour) below.



A spike in pedestrian and bicycle crashes occurred in 2013 with ten (10) reported crashes. April was the highest reported crash month, with six (6) crashes.



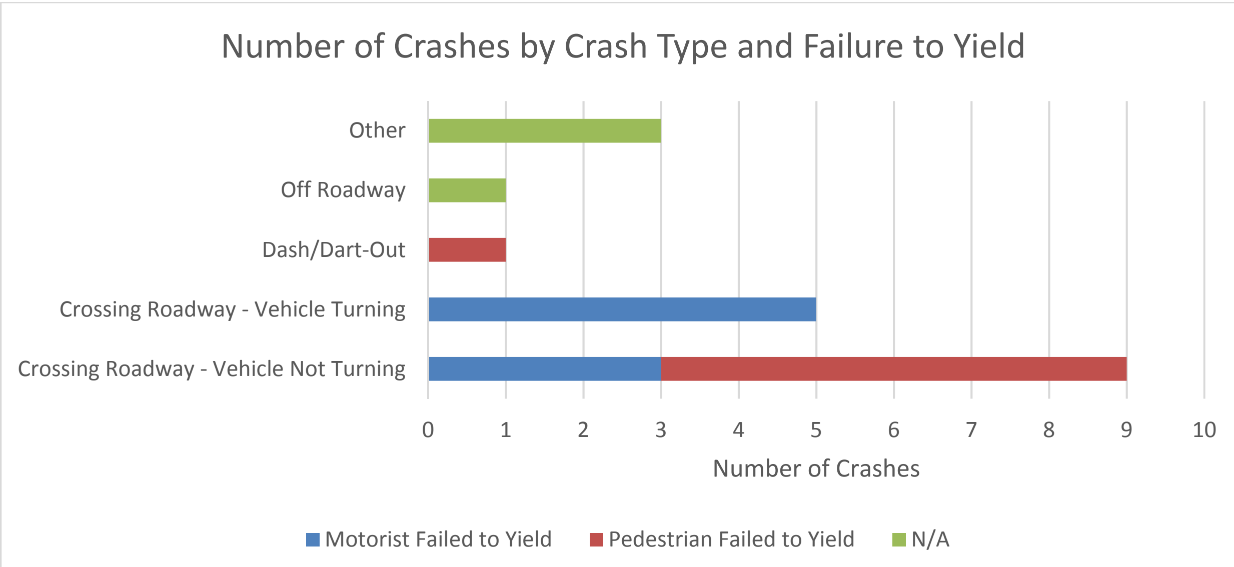


Pedestrian and bicycle-related crashes remain fairly steady throughout the week, with the most crashes on Wednesday (9 crashes). By time of day, the majority of crashes (59 percent) occurred between 12:00 PM and 6:00 PM.

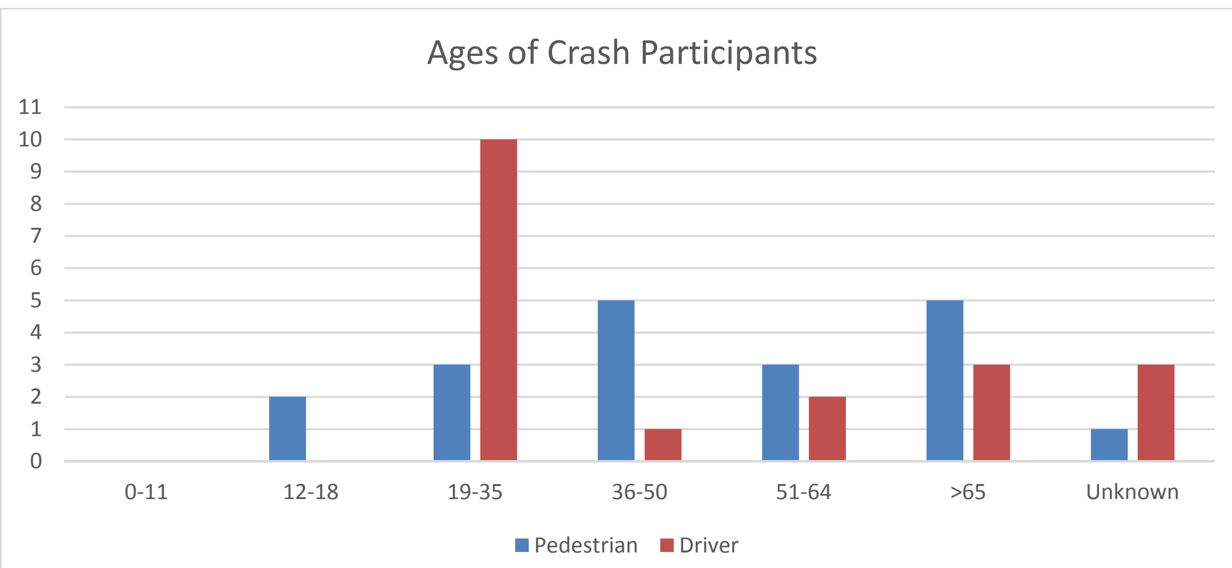
Crash Typing

Pedestrian Crashes

There were 19 pedestrian crashes on the corridor from 2011 through 2017. The most common pedestrian crash type was crossing roadway – vehicle not turning (9 crashes). Ten (10) of the crashes occurred within a crosswalk, and seven crashes occurred on the roadway in a travel lane. All of the crossing roadway – vehicle turning crashes were noted as motorist failed to yield, while six out of the nine crossing roadway – vehicle not turning crashes were noted as pedestrian failed to yield.

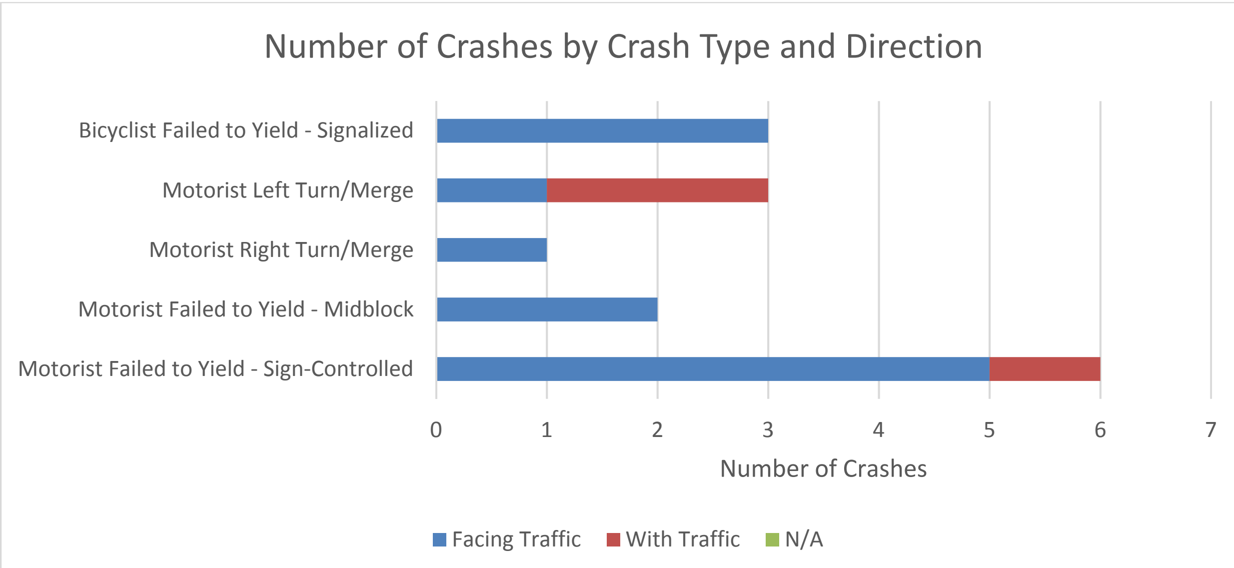


The following graph displays the pedestrian and driver ages as reported in the data. As shown, approximately 42 percent of the pedestrians involved in crashes are 51 years old or older. Approximately 53 percent of the drivers involved in crashes are between 19 and 35 years old, and approximately 26 percent of the drivers involved in crashes are 51 years old or older.

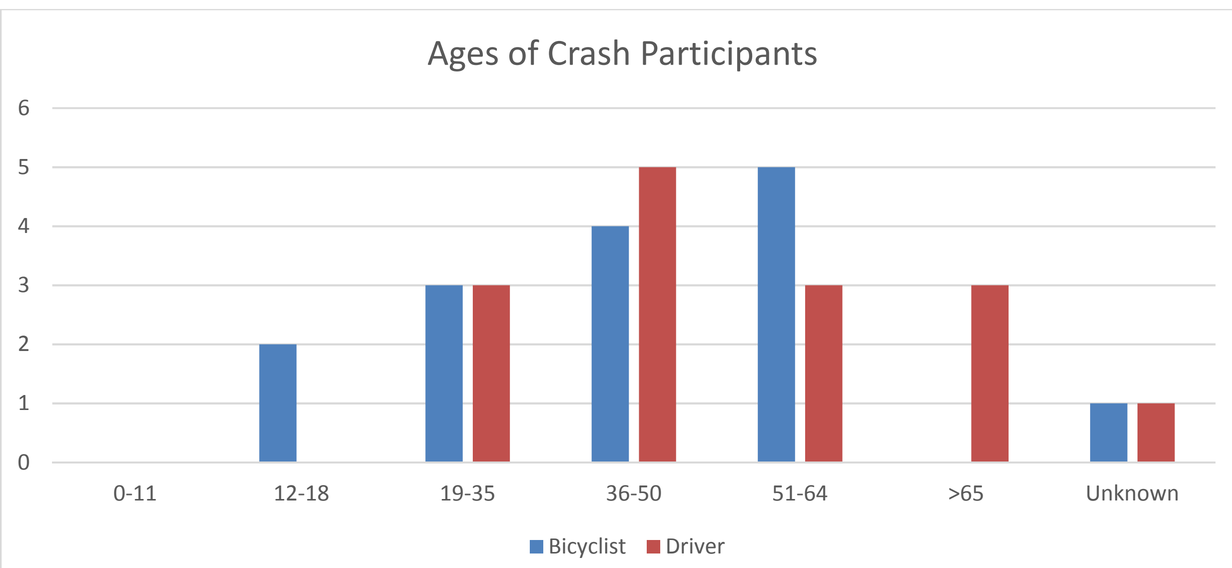


Bicycle Crashes

There were 15 bicycle crashes on the corridor from 2011 through 2017. The most common bicycle crash type was motorist filed to yield – sign-controlled intersection (6 crashes). Fourteen (14) of the crashes occurred on a sidewalk, crosswalk, or driveway crossing and one (1) occurred on the roadway in a shared travel lane.



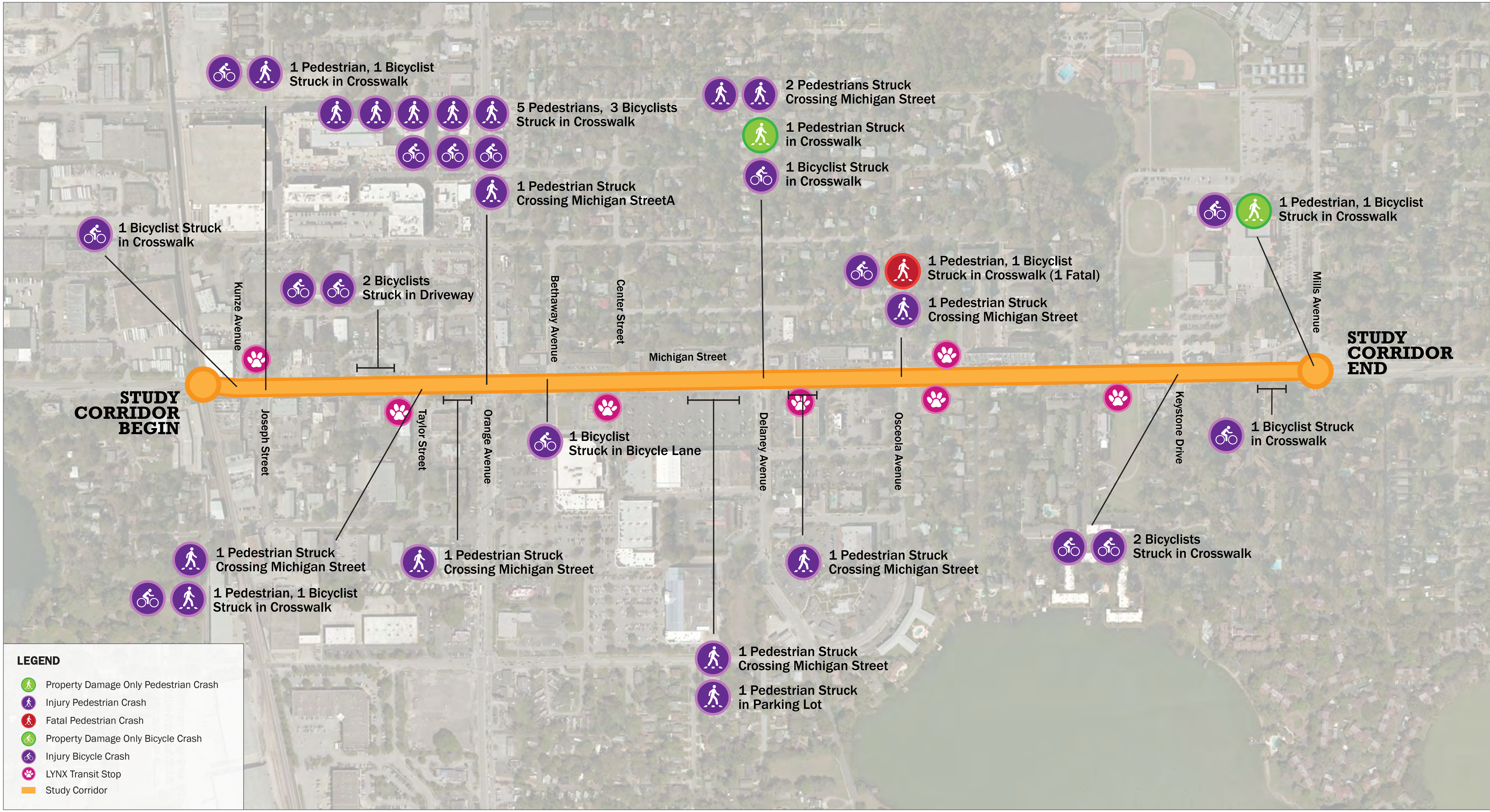
The following graph displays the bicyclist and driver ages as reported in the data. As shown, approximately 33 percent of bicyclists involved in crashes are between 51 and 64 years old. Forty percent of drivers involved in crashes are 51 years old or older.



Crash Locations

The locations of reported crashes are shown in the attached crash map and are summarized as follows:

- Signalized Intersections – 21 pedestrian or bicycle-related crashes (62 percent) occurred at or near the five signalized intersections along the corridor. The intersection crash summaries are discussed below:
  - Orange Avenue – 10 total crashes
    - 7 pedestrian crashes, resulting in 2 moderate injuries, 3 minor injuries, and 2 PDO crashes.
    - 3 bicycle crashes, resulting in 2 moderate injuries and 1 minor injury.
  - Delaney Avenue – 4 total crashes
    - 3 pedestrian crashes, resulting in 1 severe injury, 1 moderate injury, and 1 PDO crash.
    - 1 bicycle crash, resulting in 1 moderate injury.
  - Osceola Avenue – 3 total crashes
    - 2 pedestrian crashes, resulting in 1 fatality and 2 moderate injuries.
    - 1 bicycle crash, resulting in 1 PDO crash.
  - Keystone Drive – 2 total crashes
    - 2 bicycle crashes, resulting in 2 minor injuries.
  - Mills Avenue – 2 total crashes
    - 1 pedestrian crash, resulting in 1 PDO crash.
    - 1 bicycle crash, resulting in 1 minor injury.
- Unsignalized Intersections – 7 pedestrian or bicycle-related crashes (21 percent) occurred at or near the unsignalized intersections along the corridor. The high crash/high severity unsignalized intersection locations are summarized below:
  - Joseph Street – 2 total crashes
    - 1 pedestrian crash, resulting in 1 moderate injury.
    - 1 bicycle crash, resulting in 1 minor injury.
  - Taylor Avenue – 3 total crashes
    - 2 pedestrian crashes, resulting in 2 moderate injuries.
    - 1 bicycle crash, resulting in 1 moderate injury.
- There were also 6 crashes (18 percent) at mid-block crossing locations, which are summarized below.
  - Joseph Street to Taylor Avenue – 2 total crashes
    - 2 bicycle crashes, resulting in 2 minor crashes.
  - Center Avenue to Delaney Avenue – 2 total crashes
    - 2 pedestrian crashes, resulting in 1 moderate injury and 1 minor injury.
  - Delaney Avenue to Osceola Avenue – 1 total crash
    - 1 pedestrian crash, resulting in 1 minor injury.
  - Keystone Drive to Mills Avenue – 1 total crash
    - 1 bicycle crash, resulting in 1 moderate injury.



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Pedestrian/Bicyclist Safety Action Plan

2011-2017 Crash Locations

Washington Street Field Review Agenda

MetroPlan Pedestrian / Bicycle Safety Action Plans

Date:	October 30, 2018	Project #: 21278.03
Meeting Location:	Circle K Parking Lot 401 N John Young Pkwy., Orlando, FL 32805 Start Time 7:30 AM	
Field Review Location:	Washington Street from John Young Parkway to Orange Blossom Trail (1.02 miles)	

1. **Kick Off Meeting in Parking Lot (7:30 – 7:45 AM)**
   a. Goals of field review
   b. Historical crash review
   c. Review survey questions
2. **AM Review/Walk Corridor (7:45 – 11:30 AM)**
   a. Walk corridor from west to east
   b. Observe school related ped/bike traffic
   c. Identify specific ped/bike issues along corridor
   d. Perform surveys on general public walking/biking along corridor
   e. Identify locations for potential ped/bike counts along corridor
3. **Lunch/Early Afternoon Break (11:30 AM – 3:30 PM)**
4. **Afternoon School Field Review (3:30 – 4:00 PM)**
   a. Observe school related ped/bike traffic from 3:30 – 4:00 at select locations

MetroPlan Pedestrian/Bicycle Safety Action Plans
Safety Field Review

Washington Street from
John Young Parkway to Orange Blossom Trail

Background

The Washington Street pedestrian/bicycle safety field review will occur from the John Young Parkway to Orange Blossom Trail in Orlando. Segment characteristics are reviewed below:

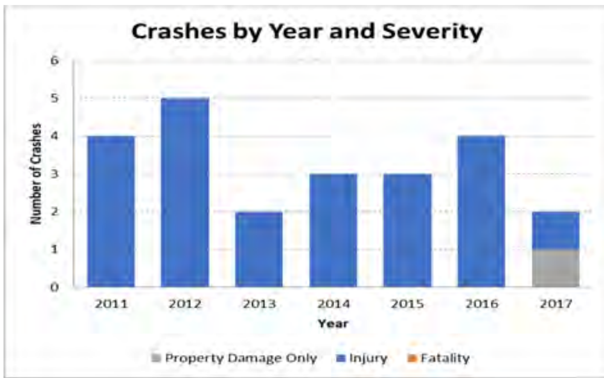
- Segment Length – 1.02 miles;
- 5 lane roadway with two lanes in each direction and a two-way left turn lane from John Young Parkway to Orange Blossom Trail;
- 3 signalized intersections at John Young Parkway, Tampa Avenue, and Orange Blossom Trail;
- Sidewalks are present along both the north and south sides of the roadway and are separated by an approximately 5 foot or wider landscaped buffer along the length of the corridor;
- No bicycle lanes are present along the entire corridor;
- No overhead street lighting is present throughout corridor;
- Curb and gutter is present on this corridor;
- Mostly residential and industrial land uses along this corridor;
- 40 mph speed limit throughout the corridor;
- Lynx bus route #25 (Mercy Drive/Shader Road) travels along this corridor;
  - There are 10 Lynx bus stops along the corridor, which are noted in the crash map for this corridor.
- There are no schools located along Washington Street;
- There are five schools within one mile of the study corridor:
  - Jones High School
    - School Hours: 7:20am – 2:20pm (1:10pm on Wednesday)
  - Rock Lake Elementary School
    - School Hours: 8:15am – 3:30pm (2:30pm on Wednesday)
  - Orange Center Elementary School
    - School Hours: 8:45am – 3:00pm (2:10pm on Wednesday)
  - Bridge to Independence Private School
    - School Hours: 8:45am – 3:00pm (2:10pm on Wednesday)
  - Orlando Science Middle and High School
    - School hours not listed

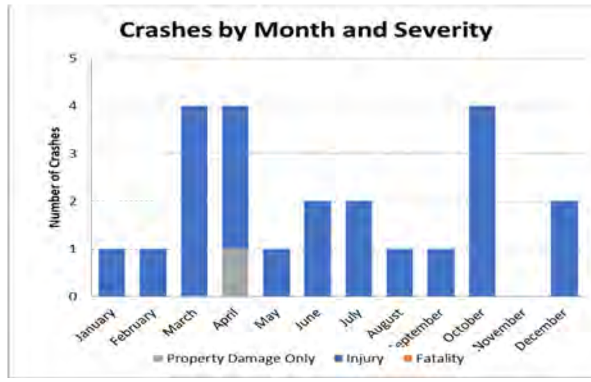
Crash History (2011 – 2017)

Seven (7) years of available pedestrian and bicycle related crash data, 2011 to 2017, were utilized for the Washington Street crash analysis. Crash data was obtained from the Signal Four Analytics database maintained by University of Florida.

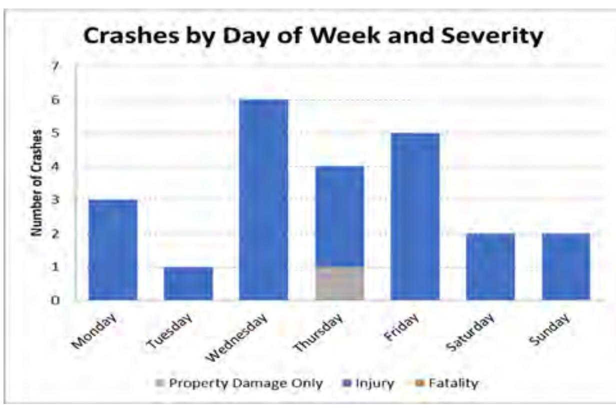
Twenty-three (23) pedestrian or bicycle-related crashes were reported over the seven-year study period, 52 percent of which involved pedestrians (12). Twenty-two (22) injury crashes (96 percent) resulted in a total of 26 injuries. No fatal crashes occurred along this corridor.

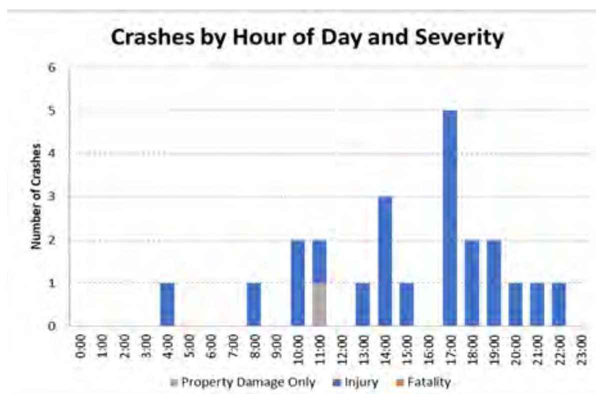
Seventy (70) percent of the crashes occurred in daylight conditions, and 21 of the crashes (91 percent) occurred with dry roadway conditions. There were two (2) alcohol and/or drug related crashes. The reported crashes are displayed by different measures of time (year, month, day, and hour) below.





A spike in pedestrian and bicycle crashes occurred in 2012 with five (5) reported crashes. March, April, and October were the highest reported crash months, with four (4) crashes.



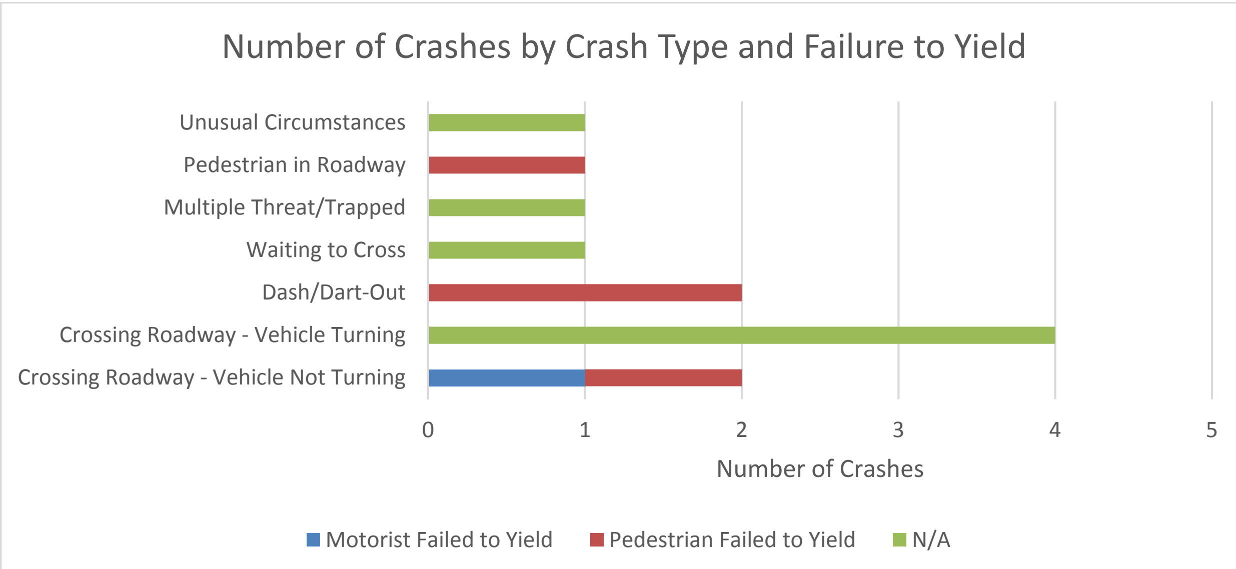


Pedestrian and bicycle-related crashes remain fairly steady throughout the week, with the most crashes on Wednesday (6 crashes). By time of day, the majority of crashes (65 percent) occurred between 5:00 PM to 12:00 AM.

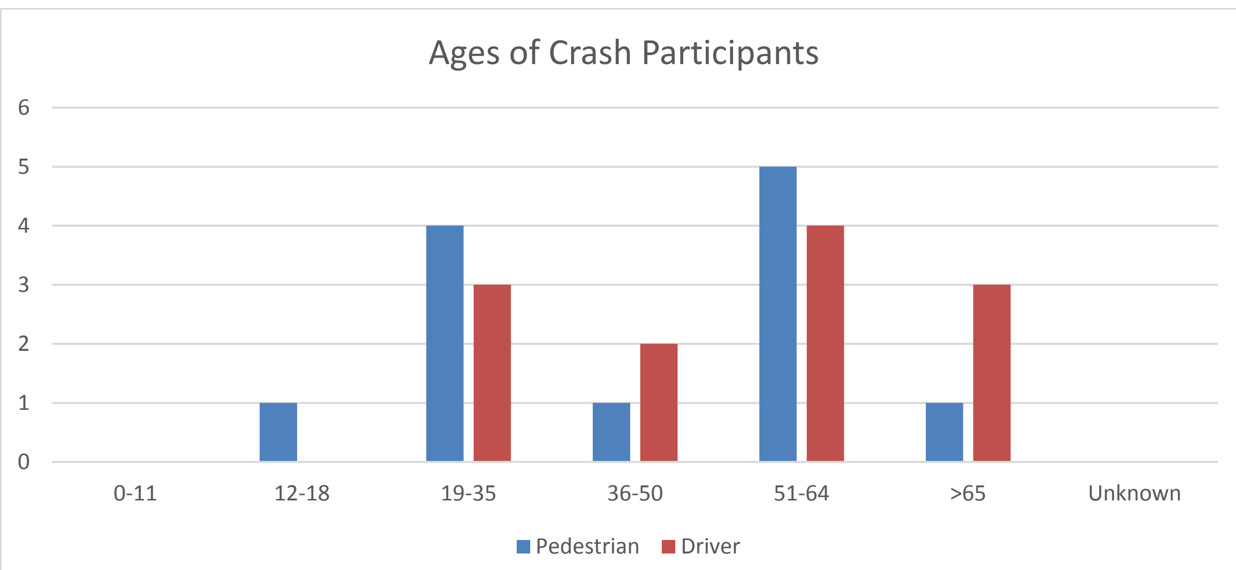
Crash Typing

Pedestrian Crashes

There were 12 pedestrian crashes on the corridor from 2011 through 2017. The most common pedestrian crash type was crossing roadway – vehicle turning (4 crashes). Six (6) of the crashes occurred on a roadway in a travel lane, and five (5) of the crashes occurred within a crosswalk.

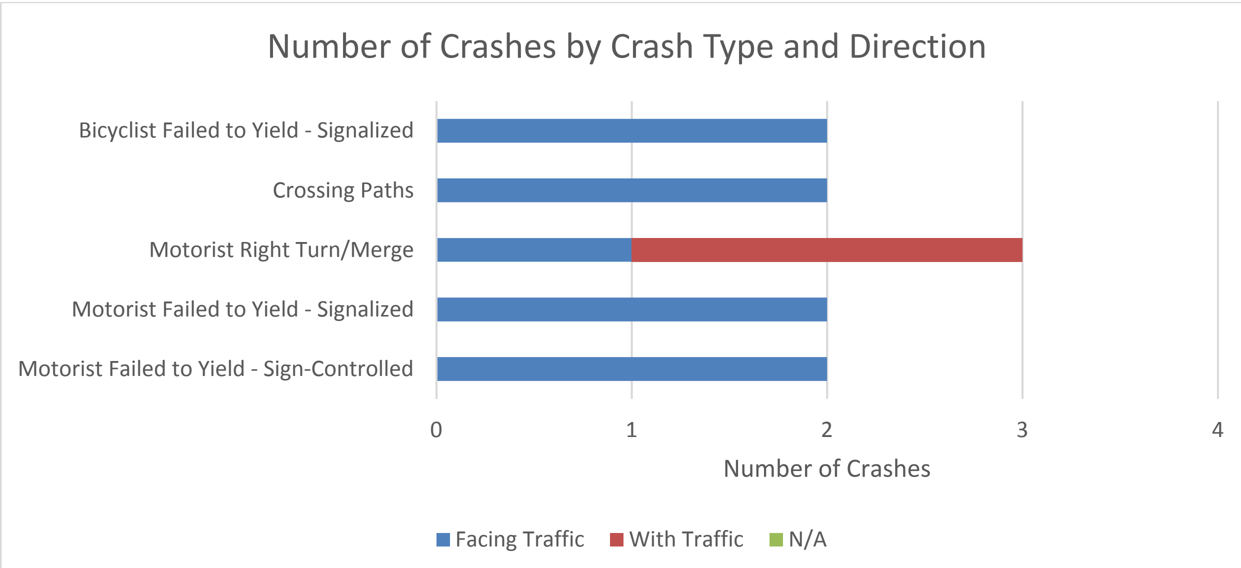


The following graph displays the pedestrian and driver ages as reported in the data. As shown, half of the pedestrians involved in crashes are 51 years old or older. Approximately 58 percent of the drivers involved in crashes are 51 years old or older, with 25 percent older than 65 years old.

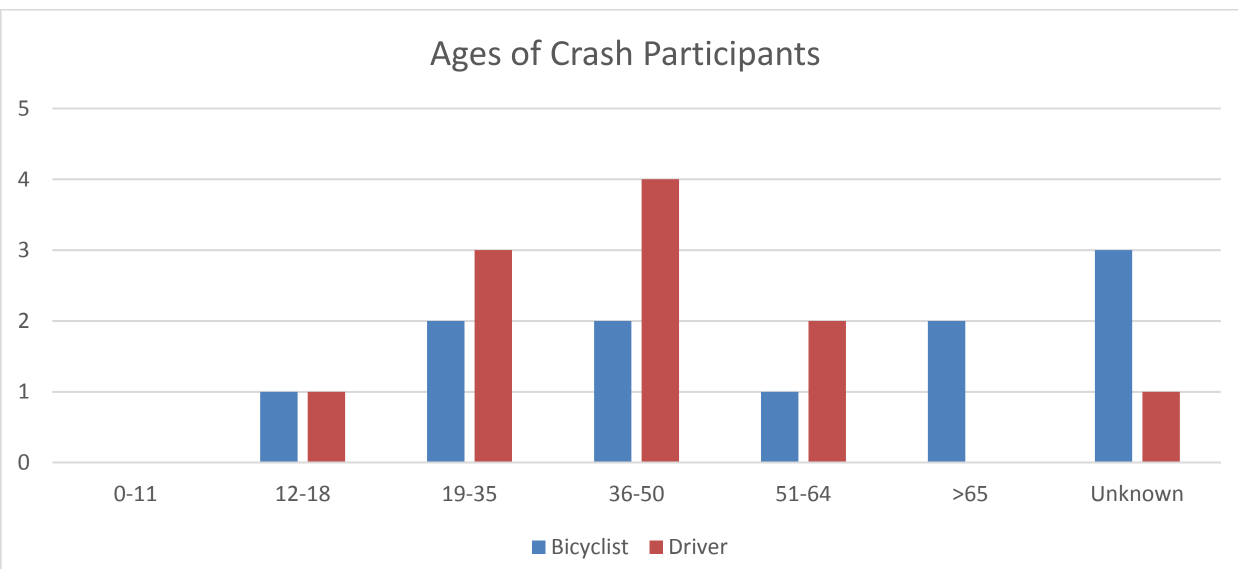


Bicycle Crashes

There were 11 bicycle crashes on the corridor from 2011 through 2017. The most common bicycle crash type was motorist right turn/merge (3 crashes). Nine (9) of the crashes occurred on a sidewalk, crosswalk, or driveway crossing, one (1) occurred on the roadway in a bicycle lane or paved shoulder, and one (1) occurred on the roadway in a shared travel lane.



The following graph displays the bicyclist and driver ages as reported in the data. As shown, approximately 18 percent of bicyclists involved in crashes are older than 65 years old. Approximately 64 percent of drivers involved in crashes are between 19 and 50 years old, with approximately 36 percent between 36 and 50 years old.



Crash Locations

The locations of reported crashes are shown in the attached crash map and are summarized as follows:

- Signalized Intersections – 14 pedestrian or bicycle-related crashes (61 percent) occurred at or near the three signalized intersections along the corridor. The intersection crash summaries are discussed below:
    - John Young Parkway – 6 total crashes
        - 3 pedestrian crashes, resulting in 2 severe injuries and 1 minor injury.
        - 3 bicycle crashes, resulting in 4 moderate injuries and 1 minor injury.
    - Tampa Avenue – 3 total crashes
        - 2 pedestrian crashes, resulting in 1 moderate injury and 1 minor injury.
        - 1 bicycle crash, resulting in 1 minor injury.
    - Orange Blossom Trail – 5 total crashes
        - 2 pedestrian crashes, resulting in 2 moderate injuries.
        - 3 bicycle crashes, resulting in 1 moderate injury, 1 minor injury, and 1 PDO crash.
- Unsignalized Intersections – 9 pedestrian or bicycle-related crashes (39 percent) occurred at or near the unsignalized intersections along the corridor. The high crash/high severity unsignalized intersection locations are summarized below:
    - Texas Avenue – 2 total crashes
        - 1 pedestrian crash, resulting in 1 minor injury.
        - 1 bicycle crash, resulting in 1 moderate injury.
    - Kent Avenue – 2 total crashes
        - 2 bicycle crashes, resulting in 2 moderate injuries.

Scale in Feet
0 700
North

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Pedestrian/Bicyclist Safety Action Plan

2011-2017 Crash Locations

SR 434 Field Review Agenda

MetroPlan Pedestrian / Bicycle Safety Action Plans

Date:	October 11, 2018	Project #: 21278.03
Meeting Location:	University Palms Shopping Center, Publix Parking Lot 4250 Alafaya Trail, Oviedo, FL 32765 Start Time 7:00 AM	
Field Review Location:	SR 434 from McCulloch Road to Remington Drive (1.31 miles)	

1. **Kick Off Meeting in Parking Lot (7:00 – 7:15 AM)**
    a. Goals of field review
    b. Historical crash review
    c. Review survey questions
2. **AM Review/Walk Corridor (7:15 – 11:00 AM)**
    a. Walk corridor from south to north
    b. Identify ped/bike issues related to the peak hour
    c. Identify specific ped/bike issues along corridor unrelated to peak hour
    d. Perform surveys on general public walking/biking along corridor
    e. Identify locations for potential ped/bike counts along corridor

MetroPlan Pedestrian/Bicycle Safety Action Plans Safety Field Review

SR 434 from McCulloch Road to Remington Drive

Background

The SR 434 pedestrian/bicycle safety field review will occur from McCulloch Road to Remington Drive in Oviedo. Segment characteristics are reviewed below:

- Segment Length – 1.31 miles;
- 6 lane roadway with three lanes in each direction;
- 3 signalized intersections at McCulloch Road, Palm Valley Drive, and Carrigan Avenue;
- Sidewalks are present along both the west and east sides of the roadway and are separated by an approximately 5 foot or wider landscaped buffer along the length of the corridor;
- Bicycle lanes (5-foot, no buffer) are provided along the entire corridor;
- No overhead street lighting is present throughout corridor;
- Curb and gutter present on this corridor;
- Mostly residential and retail land uses along this corridor;
  - The corridor is heavily affected by the University of Central Florida to the south;
- 50 mph speed limit throughout the corridor;
- Lynx bus route #434 (SR 434 Crosstown) travels along this corridor;
  - There are 9 Lynx bus stops along the corridor, which are noted in the crash map for this corridor.
- No schools located along SR 434 study corridor, but two schools are located within one mile:
  - University of Central Florida (on SR 434 south of the study corridor)
  - Evans Elementary School (on Chapman Road east of the study corridor)

Crash History (2011 – 2017)

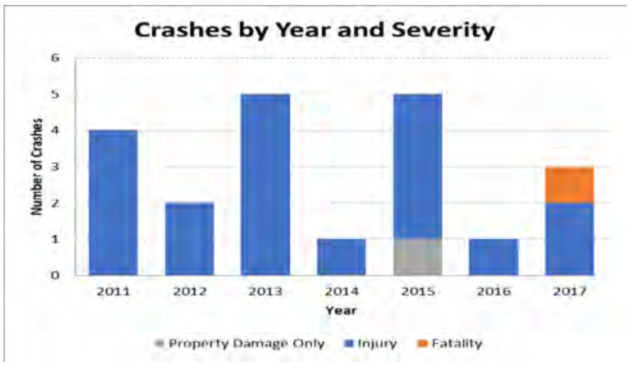
Seven (7) years of available pedestrian and bicycle related crash data, 2011 to 2017, were utilized for the SR 434 crash analysis. Crash data was obtained from the Signal Four Analytics database maintained by the University of Florida.

Twenty-one (21) pedestrian or bicycle-related crashes were reported over the seven-year study period, 67 percent of which involved bicyclists (14). Nineteen (19) injury crashes (90 percent) resulted in a total of 21 injuries. One (1) fatal pedestrian crash occurred near Econ River Place. A summary of the fatal crash is provided below:

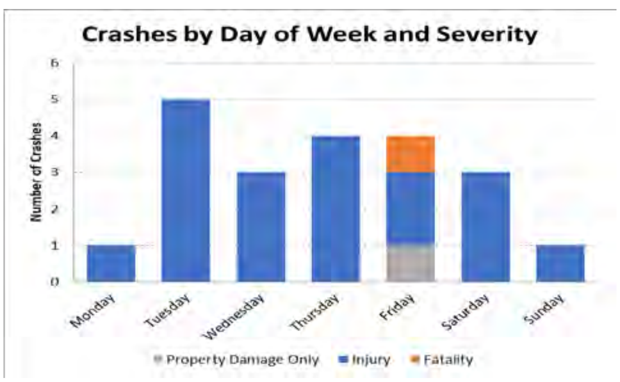
- Crash Number: 85547039 (vehicle-pedestrian)
  - On August 18, 2017, at 4:18 AM, a crash involving a pedestrian occurred at the intersection of SR 434 and Econ River Place under dark lighting conditions. The pedestrian was laying in the middle lane of the northbound roadway before the collision. The vehicle

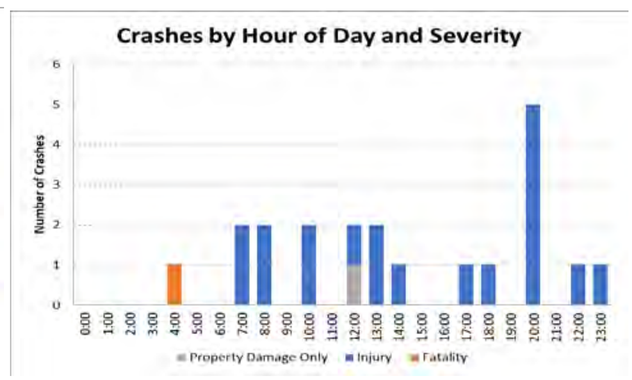
was traveling northbound on SR 434 in the middle lane when it collided with the pedestrian. The pedestrian was pronounced deceased at the scene of the collision.

Fifty-seven (57) percent of the crashes occurred in daylight conditions, and the majority (95 percent) occurred with dry roadway conditions. There were no alcohol and/or drug related crashes. The reported crashes are displayed by different measures of time (year, month, day, and hour) below.



A spike in pedestrian and bicycle crashes occurred in 2013 and 2015 with five (5) reported crashes each year. January, August, and September were the highest reported crash months, with four (4), three (3), and five crashes (5), respectively. These months align with the beginning of the fall and spring semesters at UCF.



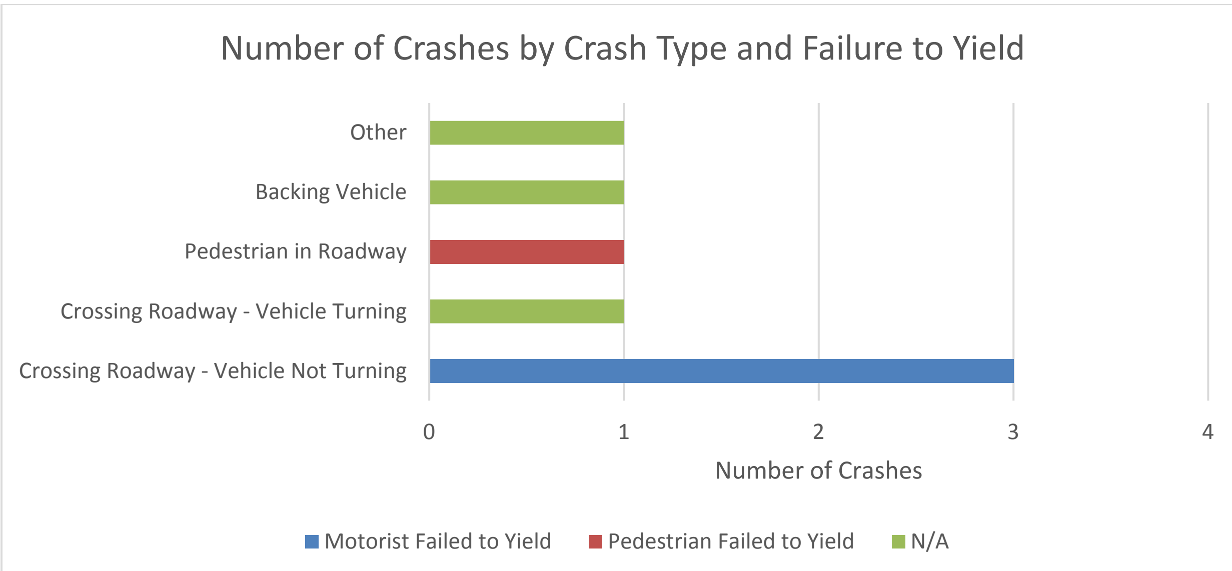


Pedestrian and bicycle-related crashes remain fairly steady throughout the week, with a peak in the middle of the week. Crashes on weekdays are consistently higher than on weekends. By time of day, the highest one-hour period occurred between 8:00 and 9:00 PM, but most crashes (52 percent) occurred between 7:00 AM and 3:00 PM.

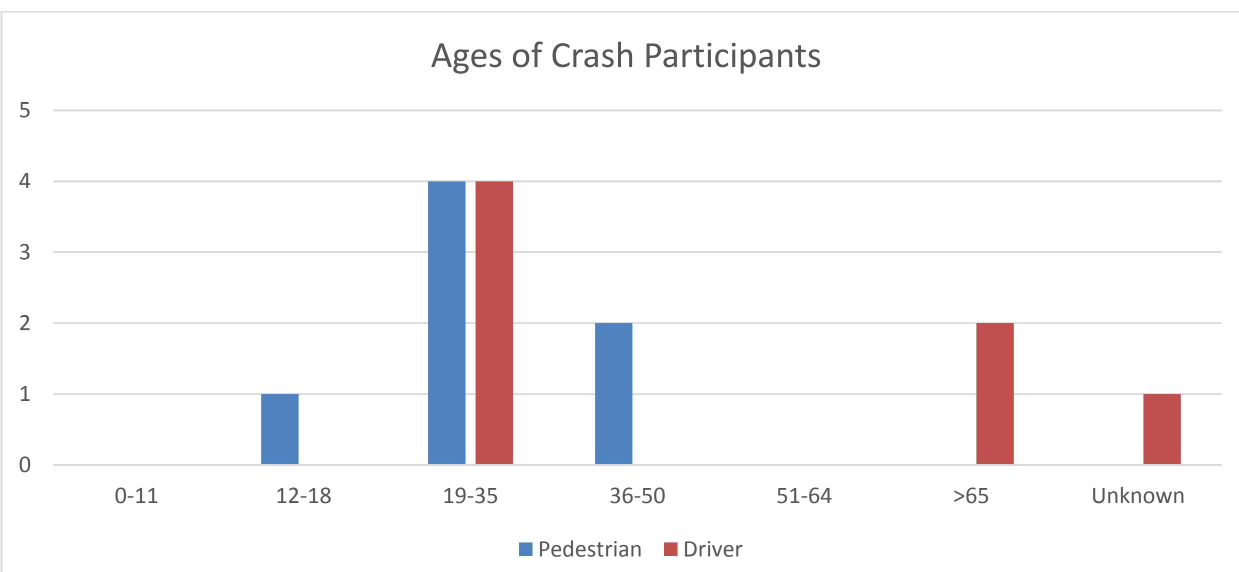
Crash Typing

Pedestrian Crashes

There were seven (7) pedestrian crashes on the corridor from 2011 through 2017. The most common pedestrian crash type was crossing roadway – vehicle not turning (3 crashes), with two occurring at the intersection with McCulloch Road and one at the intersection with Carrigan Avenue. Three (3) of the crashes occurred within a crosswalk, and three (3) of the crashes occurred on a roadway, in a travel lane. All of the crossing roadway – vehicle not turning crashes noted the motorist was marked as failing to yield.

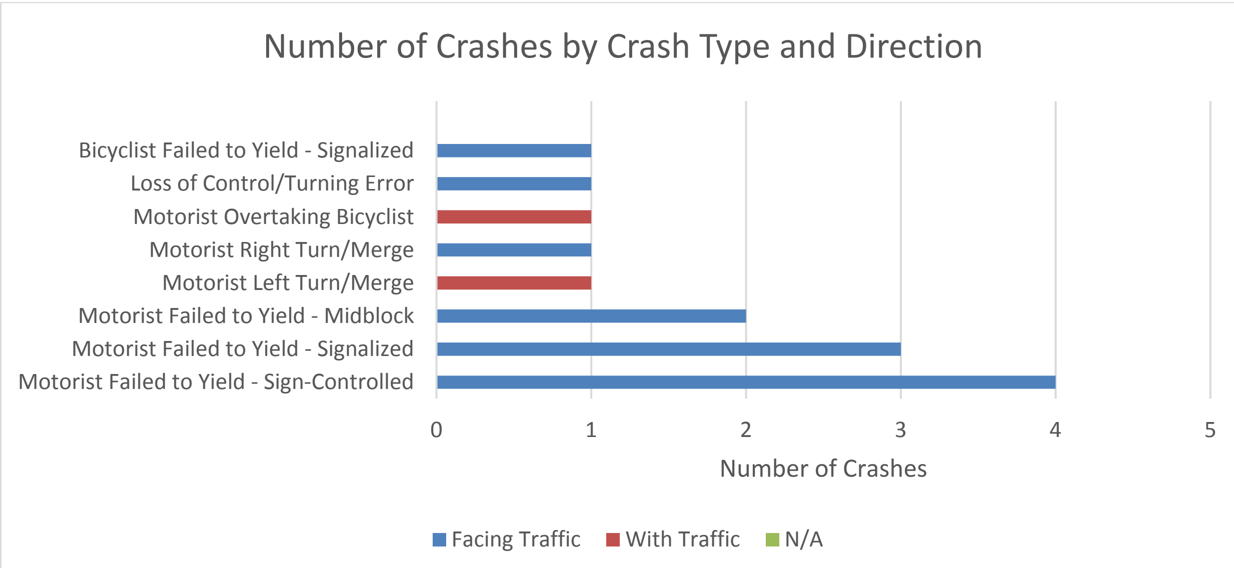


The following graph displays the pedestrian and driver ages as reported in the data. As shown, approximately 57 percent of both pedestrians and drivers involved in crashes are between 19 and 35 years old. Within college aged users (18 to 24 years old), there was one pedestrian and three drivers involved in the crashes.

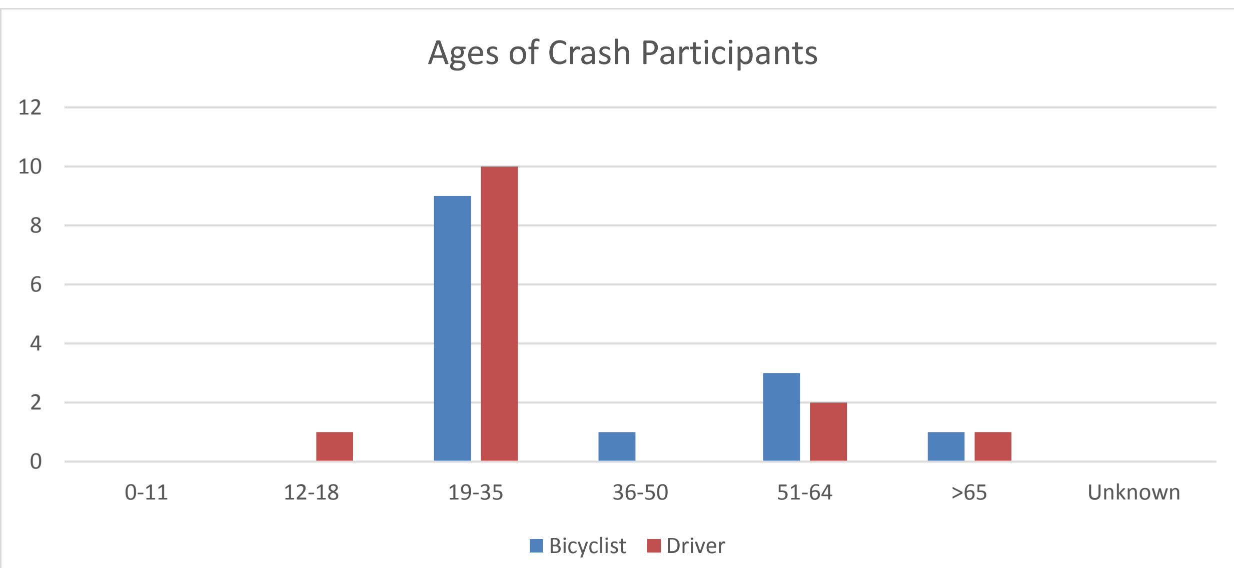


Bicycle Crashes

There were 14 bicycle crashes on the corridor from 2011 through 2017. The most common bicycle crash type was motorist failed to yield – sign-controlled intersection (4 crashes). Twelve (12) of the crashes occurred on a sidewalk, crosswalk, or driveway crossing, one (1) occurred on the roadway in the travel lane, and one (1) occurred on the roadway in a bicycle lane or on a paved shoulder.



The following graph displays the bicyclist and driver ages as reported in the data. As shown, approximately 64 percent of bicyclists and 71 percent of drivers involved in crashes are between 19 and 35 years old. Within the college aged users (18 to 24 years old), there were eight bicyclists and four drivers involved in the crashes.



Crash Locations

The locations of reported crashes are shown in the attached crash map and are summarized as follows:

- Signalized Intersections – 11 pedestrian or bicycle-related crashes (52 percent) occurred at or near the three signalized intersections along the corridor. The intersection crash summaries are discussed below:
  - McCulloch Road – 9 total crashes
    - 2 pedestrian crashes, resulting in 2 minor injuries.
    - 7 bicycle crashes, resulting in 2 severe injuries, 3 moderate injuries, and 3 minor injuries.
  - Carrigan Drive – 2 total crashes
    - 2 pedestrian crashes, resulting in 2 moderate injuries.
- Unsignalized Intersections – 4 pedestrian or bicycle-related crashes (19 percent) occurred at or near the unsignalized intersections along the corridor. The high crash/high severity unsignalized intersection locations are summarized below:
  - Econ River Place – 2 total crashes
    - 1 pedestrian crash, resulting in 1 fatality
    - 1 bicycle crash, resulting in 1 minor injury.

There were also 6 crashes (29 percent) at mid-block locations (i.e., between intersections) throughout the corridor, which are summarized below.

  - McCulloch Road to Palm Valley Drive – 4 total crashes
    - 2 pedestrian crashes, resulting in 2 severe injuries.
    - 2 bicycle crashes, resulting in 1 moderate injury.
  - Park Road to Econ River Place – 2 total crashes
    - 2 bicycle crashes, resulting in 2 minor injuries.

Scale in Feet
0 700
North

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Pedestrian/Bicyclist Safety Action Plan

2011-2017 Crash Locations

Lake Mary Boulevard Field Review Agenda

MetroPlan Pedestrian / Bicycle Safety Action Plans

Date:	October 15, 2018	Project #: 21278.03
Meeting Location:	Lake Mary Centre, Ross Parking Lot 3765 Lake Emma Road, Lake Mary, FL 32746 Start Time 7:00 AM	
Field Review Location:	Lake Mary Boulevard from Lake Emma Road to 7th Street (1.66 miles)	

1. **Kick Off Meeting in Parking Lot (7:00 – 7:15 AM)**
    a. Goals of field review
    b. Historical crash review
    c. Review survey questions
2. **AM Review/Walk Corridor (7:15 – 11:30 AM)**
    a. Walk corridor from west to east
    b. Observe school related ped/bike traffic
    c. Identify specific ped/bike issues along corridor
    d. Perform surveys on general public walking/biking along corridor
    e. Identify locations for potential ped/bike counts along corridor
3. **Lunch/Early Afternoon Break (11:30 AM – 2 PM)**
4. **Afternoon School Field Review (2 – 3:30 PM)**
    a. Observe school related ped/bike traffic from 2:00 -3:30 at select locations

MetroPlan Pedestrian/Bicycle Safety Action Plans
Safety Field Review

Lake Mary Boulevard from
Lake Emma Road to 7th Street

Background

The Lake Mary Boulevard pedestrian/bicycle safety field review will occur from Lake Emma Road to 7th Street in Lake Mary. Segment characteristics are reviewed below:

- Segment Length – 1.66 miles;
- 6 lane roadway with three lanes in each direction from Lake Emma Road to Rinehart Road, 4 lane roadway with two lanes in each direction from Rinehart Road to 7th Street;
- 6 signalized intersections at Lake Emma Road, Lake Mary Centre, Sun Drive, Rinehart Road/Greenwood Boulevard, Forest Boulevard, and Longwood Lake Mary Road;
- Sidewalks are present along both the north and south sides of the roadway and are separated by an approximately 5 foot or wider landscaped buffer along the length of the corridor;
- Paved shoulders (unmarked bicycle lanes) are provided along the entire corridor;
- No overhead street lighting is present throughout corridor;
- Curb and gutter present on this corridor;
- Mostly retail land uses between Lake Emma Road and Rinehart Road. East of Rinehart Road, residential land uses are present along the north side while retail land uses are present along the south side;
- 45 mph speed limit throughout the corridor;
- Lynx bus routes #45 (Lake Mary) travels along this corridor;
  - There are 13 Lynx bus stops along the corridor, which are noted in the crash map for this corridor.
- There are no schools located along Lake Mary Boulevard;
- There are two schools within one mile of the study corridor:
  - Crystal Lake Elementary School
    - School Hours: 7:40am – 2:20pm (1:20pm on Wednesday)
  - Lake Mary Elementary School
    - School Hours: 8:05am – 3:05pm (2:05pm on Wednesday)

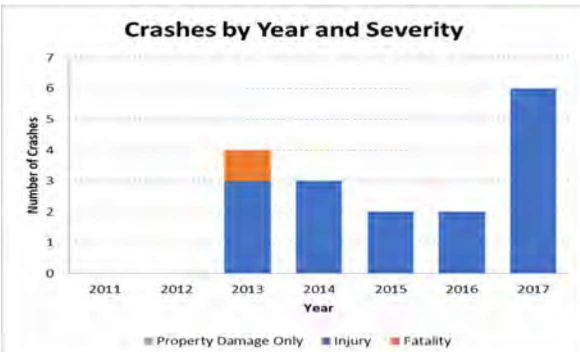
Crash History (2011 – 2017)

Seven (7) years of available pedestrian and bicycle related crash data, 2011 to 2017, were utilized for the Lake Mary Boulevard crash analysis. Crash data was obtained from the Signal Four Analytics database maintained by University of Florida.

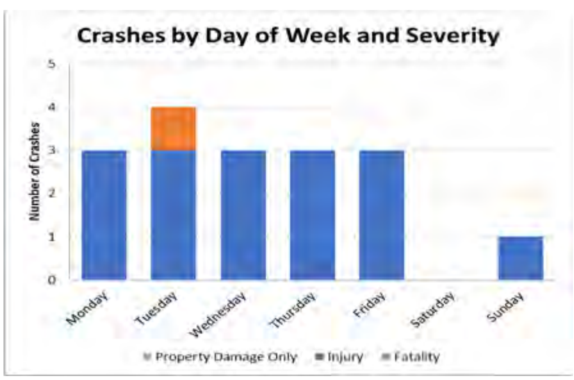
Seventeen (17) pedestrian or bicycle-related crashes were reported over the seven-year study period, 65 percent of which involved bicyclists (11). Sixteen (16) injury crashes (90 percent) resulted in a total of 18 injuries. One (1) fatal pedestrian crash occurred between Lake Emma Road and 7th Street. A summary of the fatal crash is provided below:

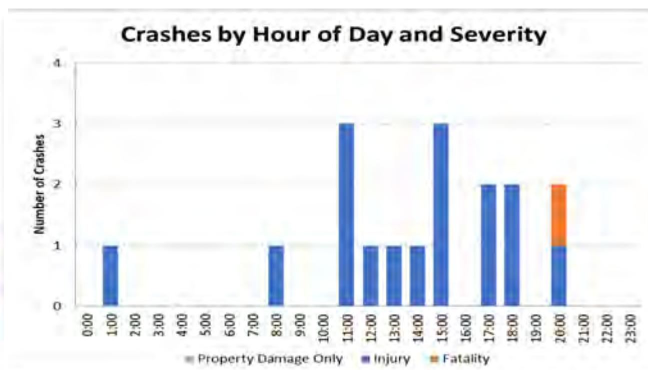
- Crash Number: 81965141 (vehicle-pedestrian)
  - On October 6, 2013, at 8:25 PM, a crash involving a pedestrian occurred near the intersection of Lake Mary Boulevard and Forest Boulevard under dark lighting conditions. The pedestrian attempted to cross Lake Mary Boulevard from south to north toward Forest Boulevard. The vehicle was traveling eastbound on Lake Mary Boulevard in the right lane when it collided with the pedestrian. The pedestrian was transported to South Seminole Hospital, where he was pronounced deceased.

Sixty-five (65) percent of the crashes occurred in daylight conditions, and all of the crashes occurred with dry roadway conditions. There were two (2) alcohol and/or drug related crashes. The reported crashes are displayed by different measures of time (year, month, day, and hour) below.



A spike in pedestrian and bicycle crashes occurred in 2017 with six (6) reported crashes. January and October were the highest reported crash months, with three (3) crashes.



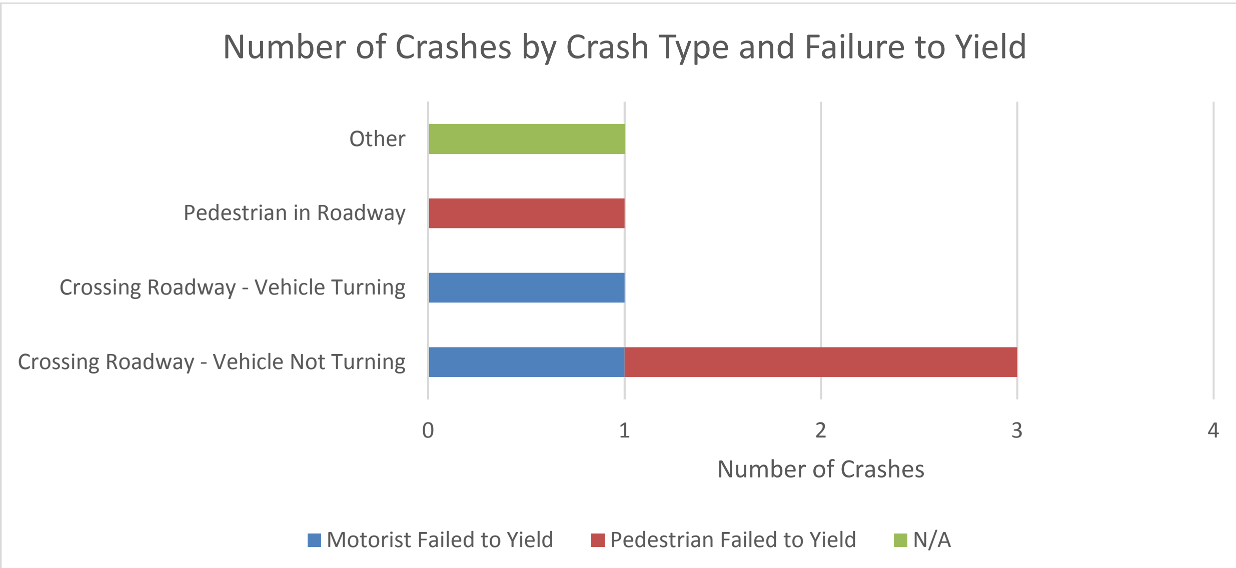


Pedestrian and bicycle-related crashes remain fairly steady throughout the week, with the most crashes on Tuesday (4 crashes). By time of day, the majority of crashes (65 percent) occurred between 11:00 AM and 5:00 PM.

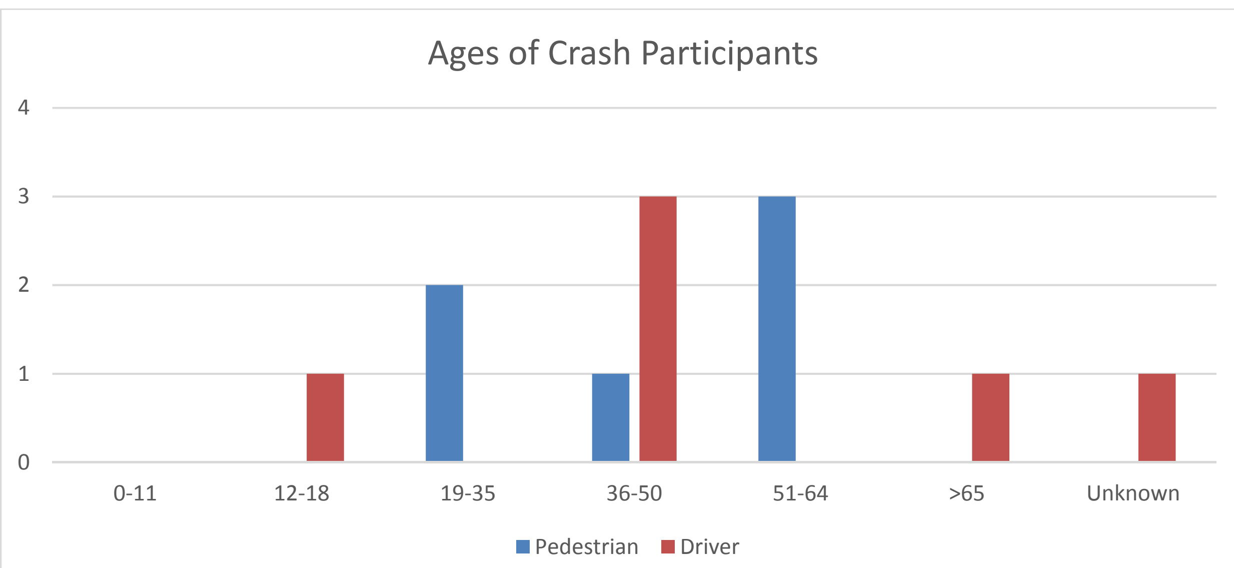
Crash Typing

Pedestrian Crashes

There were six (6) pedestrian crashes on the corridor from 2011 through 2017. The most common pedestrian crash type was crossing roadway – vehicle not turning (3 crashes). Three (3) of the crashes occurred within a crosswalk, and one (1) of the crossing roadway – vehicle not turning crashes noted the motorist was marked as failing to yield.

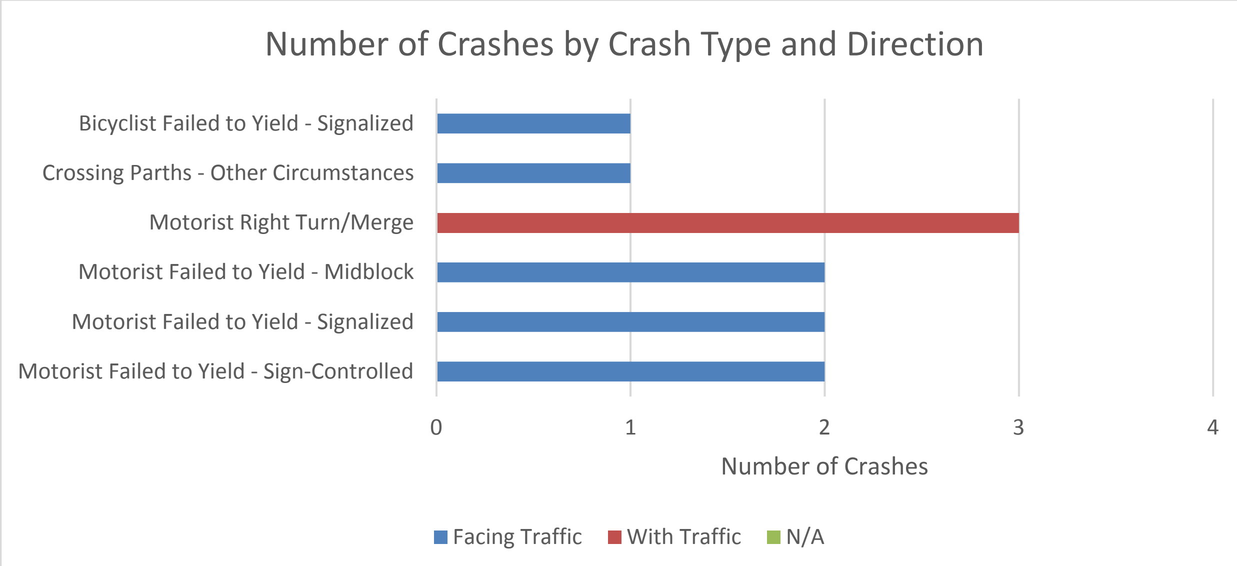


The following graph displays the pedestrian and driver ages as reported in the data. As shown, all of the pedestrians involved in crashes are between 19 and 65 years old, with 50 percent between 51 and 65 years old. Approximately 50 percent of the drivers involved in crashes are between 36 and 50 years old.

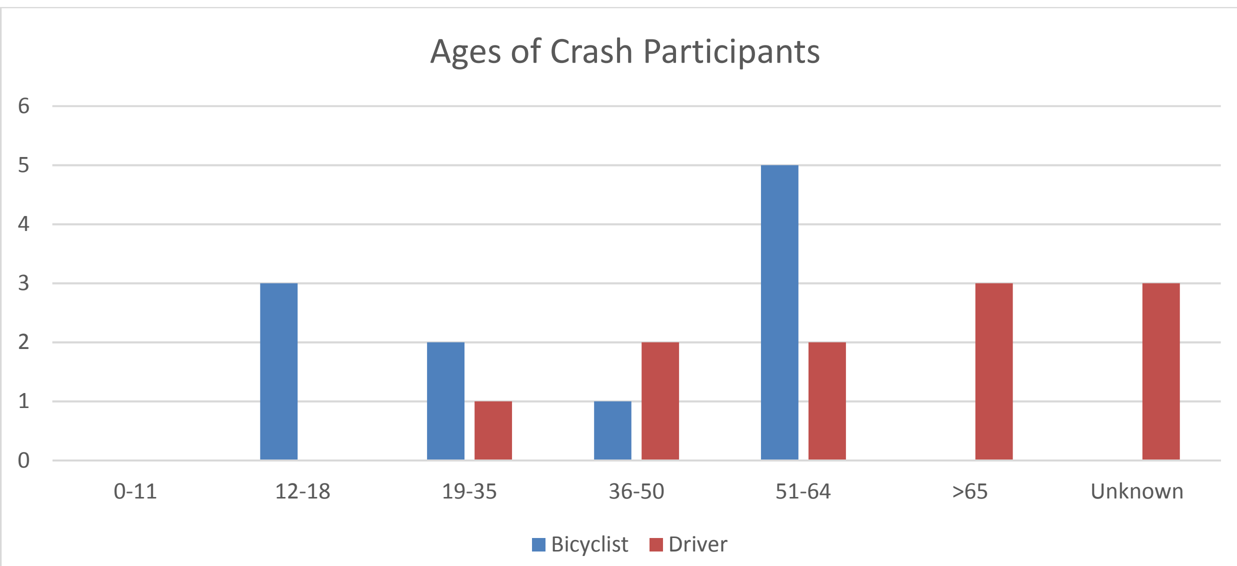


Bicycle Crashes

There were 11 bicycle crashes on the corridor from 2011 through 2017. The most common bicycle crash type was motorist right turn/merge (3 crashes). Eight (8) of the crashes occurred on a sidewalk, crosswalk, or driveway crossing and three (3) occurred on the roadway in a bicycle lane or paved shoulder.



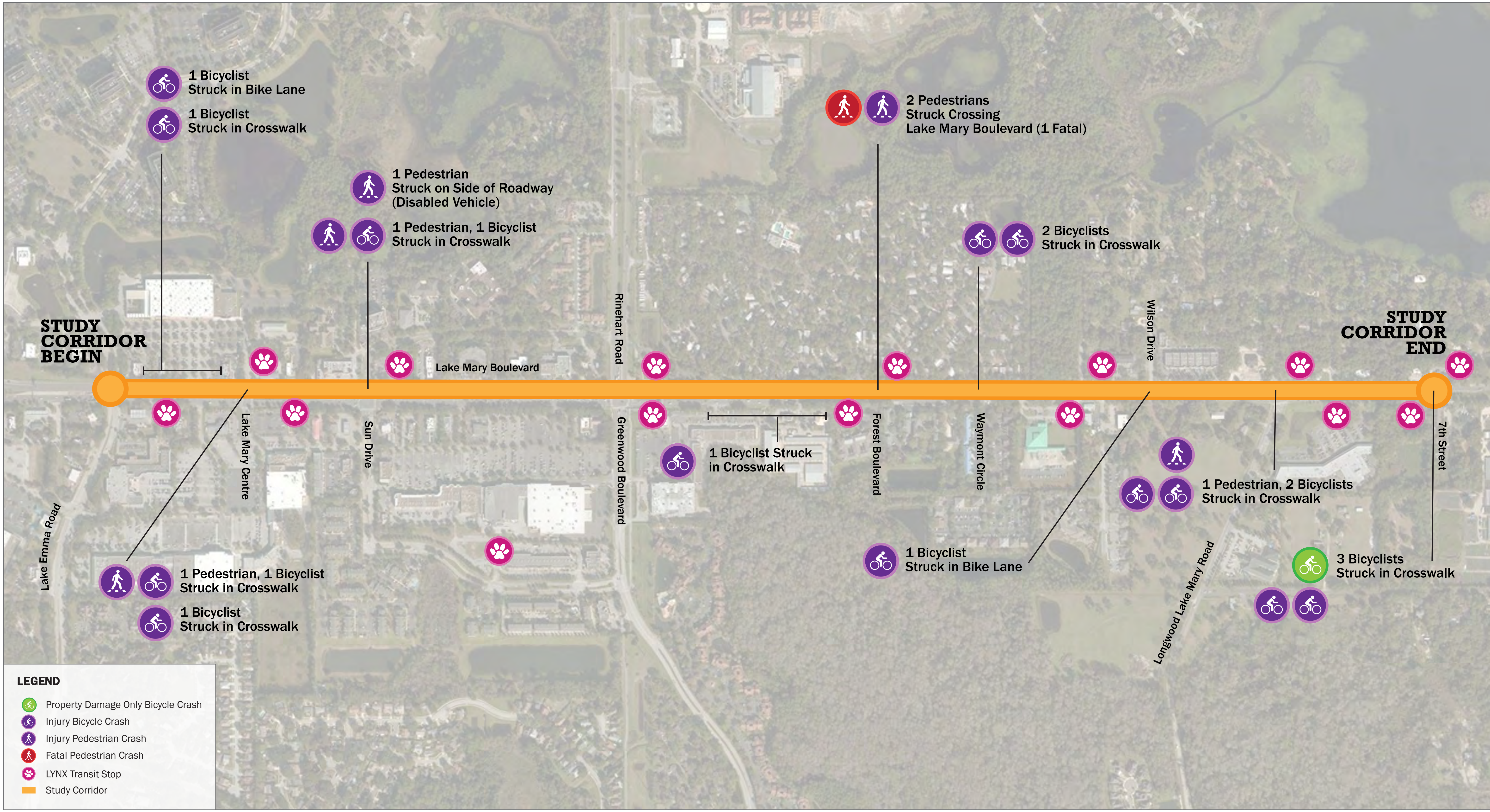
The following graph displays the bicyclist and driver ages as reported in the data. As shown, approximately 45 percent of bicyclists involved in crashes are between 51 and 64 years old and 27 percent are between 12 and 18 years old. Approximately 45 percent of drivers involved in crashes are 51 years old or older, with approximately 27 percent 65 years old or older.



Crash Locations

The locations of reported crashes are shown in the attached crash map and are summarized as follows:

- Signalized Intersections – 9 pedestrian or bicycle-related crashes (53 percent) occurred at or near the six signalized intersections along the corridor. The intersection crash summaries are discussed below:
    - Lake Mary Centre – 3 total crashes
        - 1 pedestrian crash, resulting in 1 minor injury.
        - 2 bicycle crashes, resulting in 2 minor injuries.
    - Sun Drive – 3 total crashes
        - 2 pedestrian crashes, resulting in 3 moderate injuries.
        - 1 bicycle crash, resulting in 1 moderate injury.
    - Longwood Lake Mary Road – 3 total crashes
        - 1 pedestrian crash, resulting in 1 minor injury.
        - 2 bicycle crashes, resulting in 1 moderate injury and 1 minor injury.
- Unsignalized Intersections – 3 pedestrian or bicycle-related crashes (18 percent) occurred at or near the unsignalized intersections along the corridor. The high crash/high severity unsignalized intersection locations are summarized below:
    - Waymont Court – 2 total crashes
        - 2 bicycle crashes, resulting in 1 moderate injury and 1 minor injury.
    - Wilson Drive – 1 total crash
        - 1 bicycle crash, resulting in 1 minor injury.
- There were also 5 crashes (29 percent) at mid-block crossing locations, which are summarized below:
    - Lake Emma Road to Lake Mary Centre – 2 total crashes
        - 2 bicycle crashes, resulting in 1 severe injury and 1 moderate injury
    - Rinehart Road to Forest Boulevard – 3 total crashes
        - 1 pedestrian crash, resulting in 1 severe injury
        - 1 bicycle crash, resulting in 2 moderate injuries
    - Forest Boulevard to Waymont Court – 1 total crash
        - 1 pedestrian crash, resulting in 1 fatality



Scale in Feet
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North

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Pedestrian/Bicyclist Safety Action Plan

2011-2017 Crash Locations

Red Bug Lake Road/Tuskawilla Road Field Review Agenda

MetroPlan Pedestrian / Bicycle Safety Action Plans

Date:	October 16, 2018	Project #: 21278.03
Meeting Location:	Tuskawilla Road Chick-fil-A Parking Lot 1455 Tuskawilla Road, Winter Springs FL 32708 Start Time 7:00 AM	
Field Review Location:	Red Bug Lake Road from Dodd Road to Tuskawilla Road Tuskawilla Road from Willa Springs Drive to Red Bug Lake Road (0.94 miles total)	

1. **Kick Off Meeting in Parking Lot (7:00 – 7:15 AM)**
   a. Goals of field review
   b. Historical crash review
   c. Review survey questions
2. **AM Review/Walk Corridor (7:15 – 11:30 AM)**
   a. Walk corridor from south to north
   b. Observe school related ped/bike traffic
   c. Identify specific ped/bike issues along corridor
   d. Perform surveys on general public walking/biking along corridor
   e. Identify locations for potential ped/bike counts along corridor
3. **Lunch/Early Afternoon Break (11:30 AM – 2 PM)**
4. **Afternoon School Field Review (2 – 3:00 PM)**
   a. Observe school related ped/bike traffic from 2:00 - 3:00 at select locations

MetroPlan Pedestrian/Bicycle Safety Action Plans Safety Field Review

Red Bug Lake Road from Dodd Road to Tuskawilla Road; Tuskawilla Road from Willa Springs Drive to Red Bug Lake Road

Background

The Red Bug Lake Road/Tuskawilla Road pedestrian/bicycle safety field review will occur from Dodd Road to Tuskawilla Road (Red Bug Lake Road) and Willa Springs Road to Red Bug Lake Road (Tuskawilla Road) in Winter Springs. Segment characteristics are reviewed below:

- Segment Length – 0.94 miles;
- 4 lane roadway with two lanes in each direction (Red Bug lake Road) and 6 lane roadway with three lanes in each direction (Tuskawilla Road);
- 3 signalized intersections at Dodd Road and Red Bug Lake Road, Red Bug Lake Road and Plaza Entrance, and Red Bug Lake Road and Tuskawilla Road;
- Sidewalks are present along both sides of Red Bug Lake Road and Tuskawilla Road and are separated by an approximately 5 foot or wider landscaped buffer along each road;
- Paved shoulders (unmarked bicycle lanes) are provided along the majority of the corridor, with a gap in coverage on Red Bug Lake Road from just east of the Plaza Entrance to Tuskawilla Road;
- No overhead street lighting is present throughout corridor;
- Curb and gutter present on this corridor;
- Mostly residential and retail land uses along this corridor;
- There are no bus routes on this corridor;
    - There are no bus stops along the corridor;
- There are no schools located along the corridor;
- There are three schools within one mile of the study corridor:
    - Socrates Preparatory School
        - School Hours: Not Listed
    - Red Bug Lake Elementary School
        - School Hours: 7:50am – 2:20pm (1:20 pm on Wednesday)
    - Tuskawilla Middle School
        - Office Hours: 8:00am – 4:00pm
    - Lake Howell High School
        - School Hours: 7:20 am-2:20pm (1:20 pm on Wednesday)

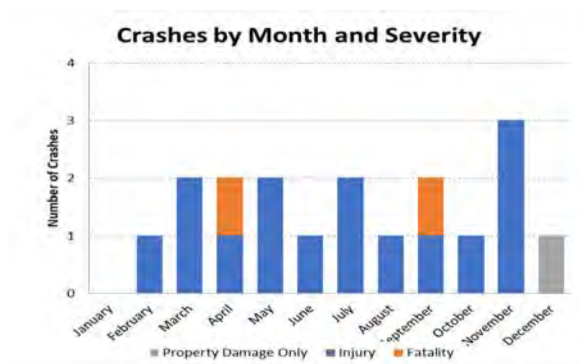
Crash History (2011 – 2017)

Seven (7) years of available pedestrian and bicycle related crash data, 2011 to 2017, were utilized for the Red Bug Lake Road/Tuskawilla Road crash analysis. Crash data was obtained from the Signal Four Analytics database maintained by University of Florida.

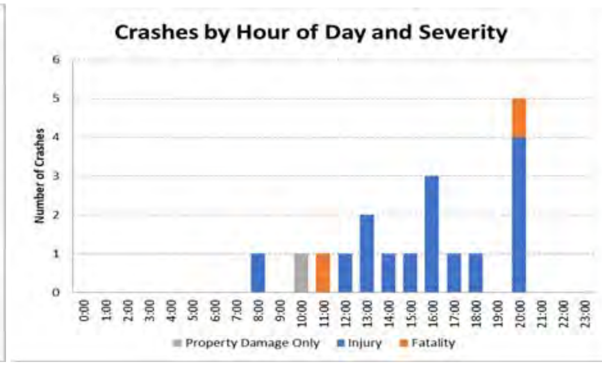
Eighteen (18) pedestrian or bicycle-related crashes were reported over the seven-year study period, 72 percent of which involved bicyclists (13). Fifteen (15) injury crashes (83 percent) resulted in a total of 15 injuries. One (1) fatal pedestrian crash and one (1) fatal bicycle crash occurred on the study corridor. A summary of each fatal crash is provided below:

- Crash Number: 83177278 (vehicle-pedestrian)
    - On September 6, 2012, at 8:40 PM, a crash involving a pedestrian occurred at the intersection of Red Bug Lake Road and Willow Run Lane under dark lighting conditions. The pedestrian attempted to cross Red Bug Lake Road from north to south toward Willa Springs Drive. The vehicle was traveling eastbound on Red Bug Lake Road in the right lane when it collided with the pedestrian. The pedestrian was transported to Florida Hospital Altamonte, where she was pronounced deceased.
- Crash Number: 82907262 (vehicle-bicyclist)
    - On April 3, 2013, at 11:31 AM, a crash involving a bicyclist occurred at the intersection of Tuskawilla Road and Willa Springs Drive under daylight lighting conditions. The bicyclist attempted to cross Tuskawilla Road from east to west toward Willa Springs Drive. The vehicle was traveling southbound on Tuskawilla Road in the right lane when it collided with the bicyclist. The bicyclist was airlifted to Orlando Regional Medical Center, where she was pronounced deceased.

Seventy-two (72) percent of the crashes occurred in daylight conditions, and the majority (94 percent) occurred with dry roadway conditions. There was one (1) alcohol and/or drug related crash. The reported crashes are displayed by different measures of time (year, month, day, and hour) below.



A spike in pedestrian and bicycle crashes occurred in 2012 with seven (7) reported crashes in 2012. November was the highest reported crash month, with three (3) crashes.

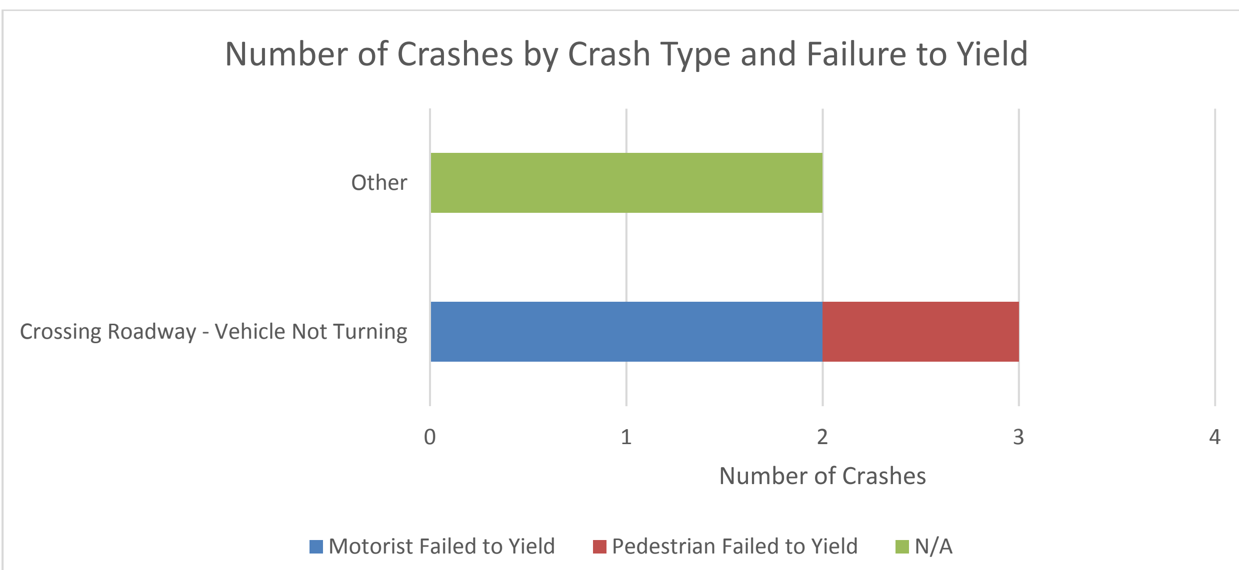


Pedestrian and bicycle-related crashes peak in the middle of the week, with seven (7) crashes on Thursday and five (5) crashes on Wednesday. By time of day, the majority of crashes (56 percent) occurred between 4:00 PM and 9:00 PM.

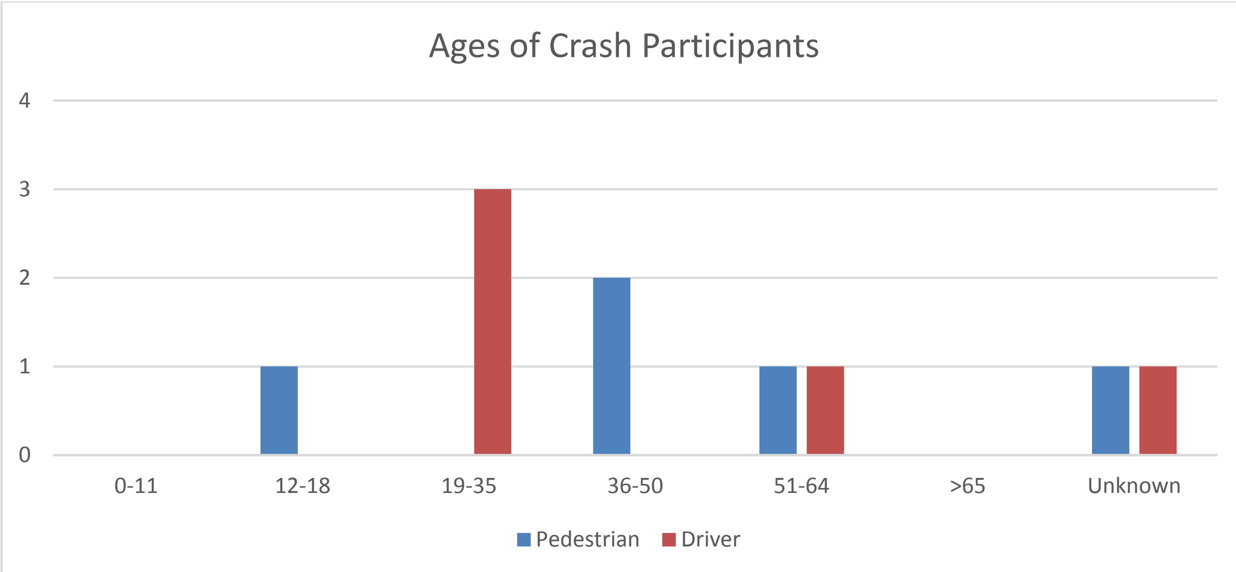
Crash Typing

Pedestrian Crashes

There were five (5) pedestrian crashes on the corridor from 2011 through 2017. The most common pedestrian crash type was crossing roadway – vehicle not turning (3 crashes). Two (2) of the crashes occurred within a crosswalk, two (2) occurred on the roadway in a travel lane, and one (1) occurred on a sidewalk, shared use path, or driveway crossing. Two of the crossing roadway – vehicle not turning crashes noted the motorist was marked as failing to yield.

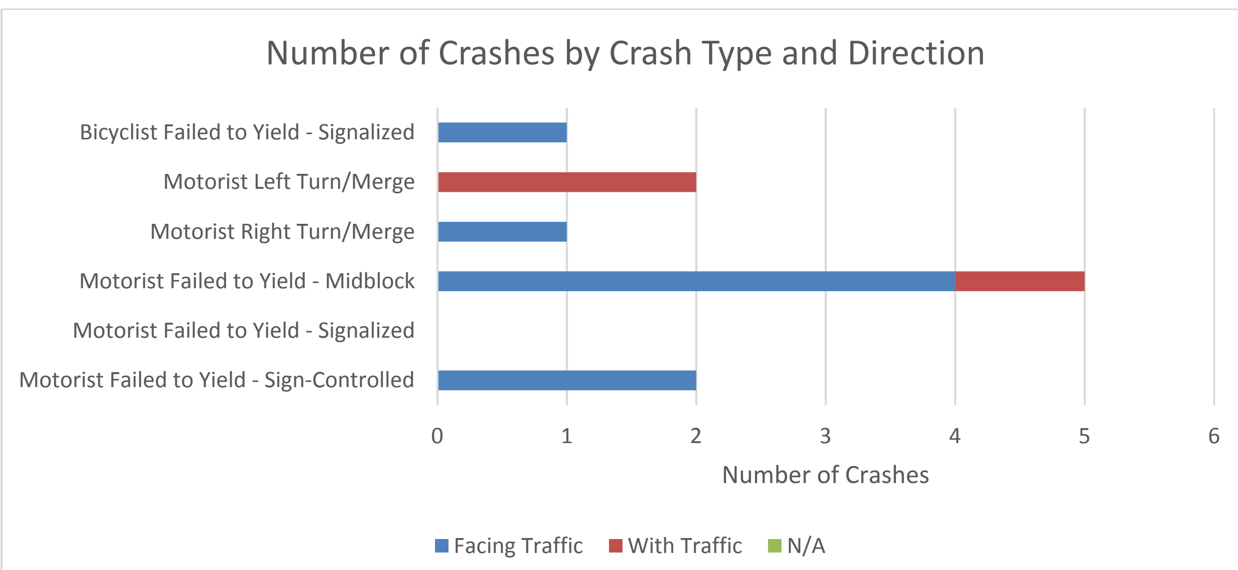


The following graph displays the pedestrian and driver ages as reported in the data. As shown, 60 percent of pedestrians are between 36 and 65 years old, and 60 percent of the drivers involved in crashes are between 19 and 35 years old.

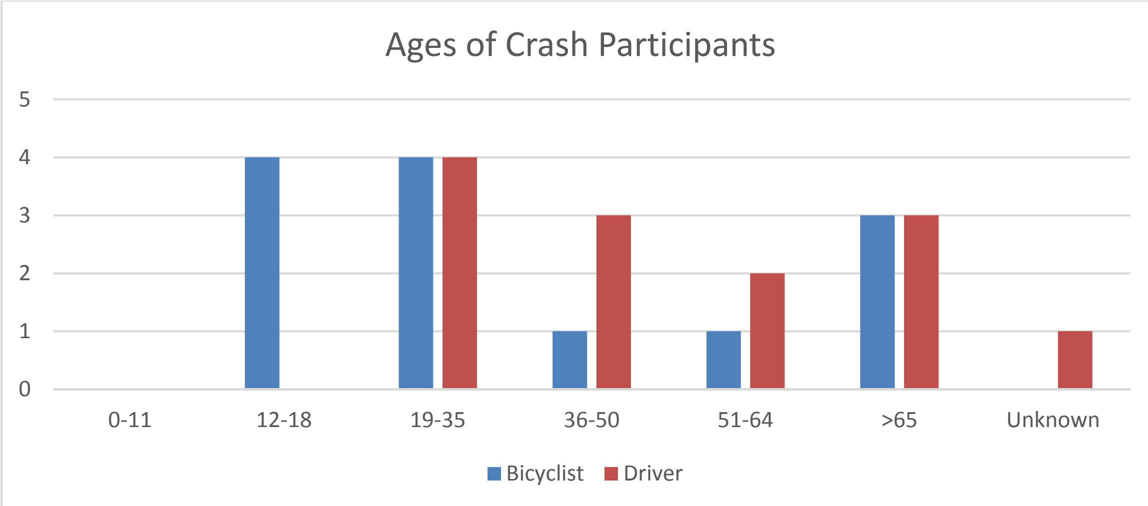


Bicycle Crashes

There were 13 bicycle crashes on the corridor from 2011 through 2017. The most common bicycle crash type was motorist failed to yield – midblock (5 crashes). Eleven (11) of the crashes occurred on a sidewalk, crosswalk, or driveway crossing, one (1) occurred on a roadway in the travel lane, and one (1) occurred on a driveway or alley.



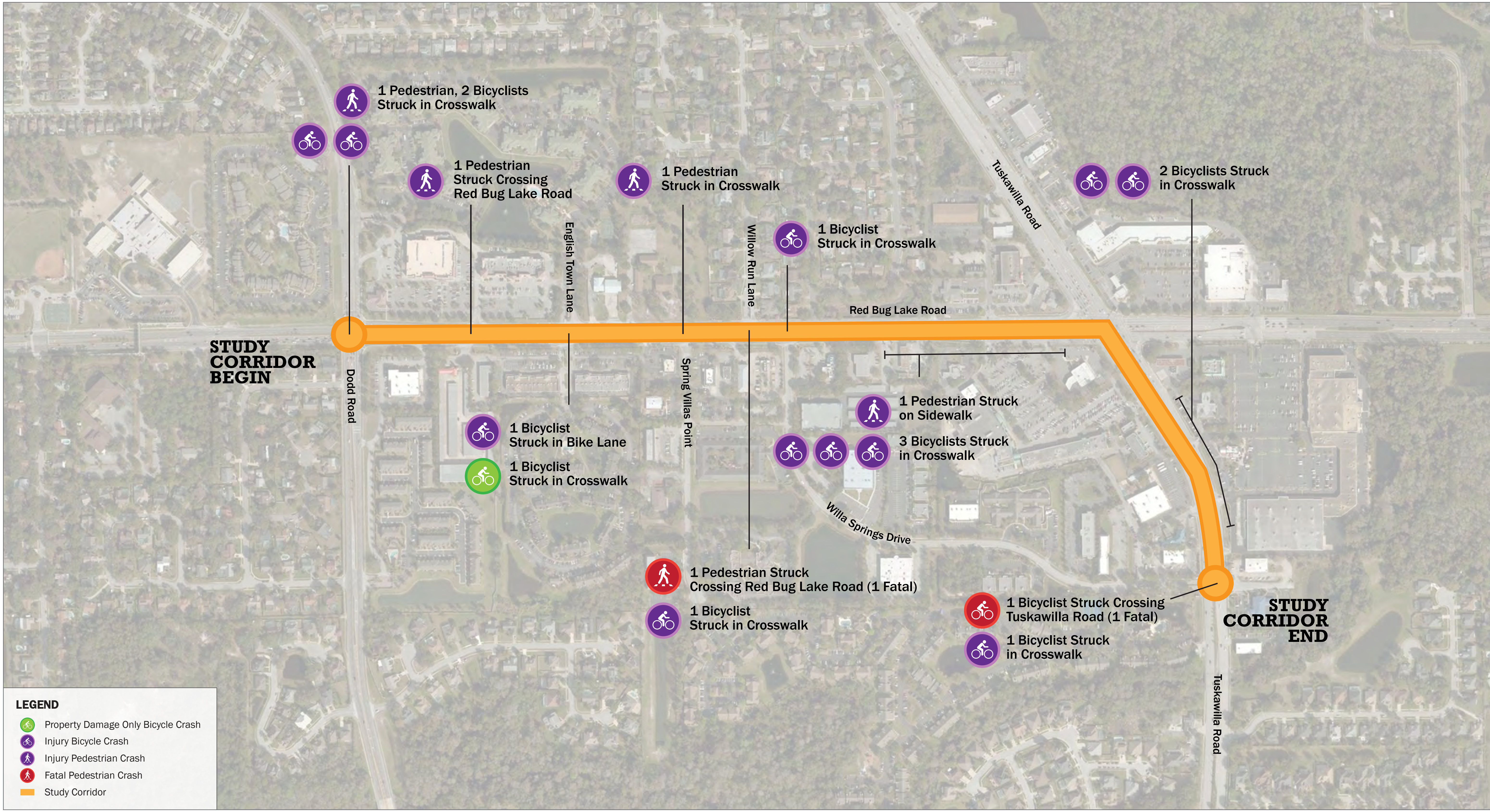
The following graph displays the bicyclist and driver ages as reported in the data. As shown, approximately 62 percent of bicyclists involved in crashes are 35 years old or younger. Approximately 54 percent of drivers involved in crashes are between 19 and 50 years old. Approximately 23 percent of each bicyclists and drivers involved in these crashes are older than 65 years old.



Crash Locations

The locations of reported crashes are shown in the attached crash map and are summarized as follows:

- Signalized Intersections – 4 pedestrian or bicycle-related crashes (22 percent) occurred at or near the three signalized intersections along the corridor. The intersection crash summaries are discussed below:
  - Dodd Road – 3 total crashes
    - 1 pedestrian crash, resulting in 1 minor injury.
    - 2 bicycle crashes, resulting in 1 moderate injury and 1 minor injury.
  - Plaza Entrance – 1 total crash
    - 1 bicycle crash, resulting in 1 moderate injury.
- Unsignalized Intersections – 8 pedestrian or bicycle-related crashes (44 percent) occurred at or near the unsignalized intersections along the corridor. The high crash/high severity unsignalized intersection locations are summarized below:
  - English Town Lane – 2 total crashes
    - 2 bicycle crashes, resulting in 1 moderate injury.
  - Willow Run Lane – 2 total crashes
    - 1 pedestrian crash, resulting in 1 fatality.
    - 1 bicycle crash, resulting in 1 moderate injury.
  - Willa Springs Drive (S) – 2 total crashes
    - 2 bicycle crashes, resulting in 1 fatality and 1 minor injury.
- There were also 6 crashes (33 percent) that occurred at mid-block crossings, which are summarized below.
  - Dodd Road to English Town Lane – 1 total crash
    - 1 pedestrian crash, resulting in 1 moderate injury.
  - Willa Springs Drive to Plaza Entrance – 1 total crash
    - 1 pedestrian crash, resulting in 1 minor injury.
  - Plaza Entrance to Tuskawilla Road – 2 total crashes
    - 2 bicycle crashes, resulting in 1 moderate injury and 1 minor injury.
  - Tuskawilla Road to Willa Springs Drive – 2 total crashes
    - 2 bicycle crashes, resulting in 2 moderate injuries.



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Pedestrian/Bicyclist Safety Action Plan

2011-2017 Crash Locations

APPENDIX F: PEDESTRIAN CRASH COUNTERMEASURES

Crash Countermeasure Index

Infrastructure Related Countermeasures

Perpendicular Crosswalk Orientation

Skewed Crosswalk

Perpendicular Crosswalk

Issue: Crosswalk is not perpendicular to the roadway, creating a longer crossing distance, and potentially distancing crossing pedestrians from their expected crossing position at the intersection.

Description: Realign crosswalks to be perpendicular to the crossed roadway. Exceptions to this recommendation may be made at skewed intersections, where the shortest crossing distance places pedestrians out of the intersection area. At skewed intersections, the crosswalk should be striped parallel to the adjacent roadway.

Sources:

Pedestrian Design for Accessibility Within the Public Right-of-Way. Federal Highway Administration. FHWA-SA-10-005, November 2009.
https://safety.fhwa.dot.gov/intersection/other_topics/fhwasa10005/brief_11.cfm

Raised Intersections or Raised Crosswalks

Raised Crosswalk

Issue: High speeds or poor vehicle yielding/stopping at marked crosswalks.

Description: Provide a vertical deflection for vehicles crossing through an intersection or crosswalk that spans the entire width of the roadway. The raised crossing provides further notification to the vehicle to reduce speeds, makes the pedestrian more prominent in the driver's field of vision, and provides positive enforcement for pedestrians to cross at that specified location. Additionally, accessibility is improved by providing a crossing opportunity at the same grade as the sidewalk, eliminating the need for curb ramps. This countermeasure can be used in conjunction with other traffic calming measures and pedestrian warning signs or flashing beacons. FHWA guidance suggests implementation locations with speed limits of 30 mph or lower and AADT less than 9,000 vpd.

Sources:

Blackburn, L., Zegeer, C., and Brookshire, K. Field Guide for Selecting Countermeasures at Uncontrolled Pedestrian Crossing Locations. Federal Highway Administration. FHWA-SA-18-018. https://www.fhwa.dot.gov/innovation/everydaycounts/edc_4/STEP-field-guide.pdf

Safe Routes to School Online Guide: Raised Pedestrian Crosswalks. National Center for Safety Routes to School. UNC Highway Research Center. http://guide.saferoutesinfo.org/engineering/raised_pedestrian_crosswalks.cfm

Zegeer, C., Nabors, D., and Lagerway, P. Pedestrian Safety Guide and Countermeasure Selection System. Federal Highway Administration. FHWA-SA-04-003. http://www.pedbikesafe.org/pedsafe/countermeasures_detail.cfm?CM_NUM=7

Leading Pedestrian Interval

Leading Pedestrian Interval

Issue: Poor yielding by motorists performing turning movements at signalized intersections or poor visibility of pedestrians prior to beginning their crossing at signalized intersections.

Description: A leading pedestrian interval (LPI) provides pedestrians crossing at a signalized intersection the opportunity to enter an intersection three to seven seconds before vehicles are given a green indication. This advanced start for pedestrians helps to establish their presence in the crosswalk before conflicting turning movements are given a green signal, increasing pedestrian visibility and increasing the likelihood of motorist yielding to pedestrians.

Sources:

Proven Safety Countermeasures: Leading Pedestrian Intervals. Federal Highway Administration. FHWA-SA-17-063. https://safety.fhwa.dot.gov/provencountermeasures/pdfs/fhwasa17063.pdf

Zegeer, C., Nabors, D., and Lagerway, P. Pedestrian Safety Guide and Countermeasure Selection System. Federal Highway Administration. FHWA-SA-04-003. http://www.pedbikesafe.org/pedsafe/countermeasures_detail.cfm?CM_NUM=12

Remove Obstructions / Improve Sight Triangles

Sign Sight Obstruction

Issue: Obstructed visibility of pedestrians in advance of crossing an intersection or driveway.

Description: Remove vegetation, signs, walls, or other obstacles that block motorists' vision of pedestrians approaching an intersection or driveway crossing.

Sources:

Blackburn, L., Zegeer, C., and Brookshire, K. Field Guide for Selecting Countermeasures at Uncontrolled Pedestrian Crossing Locations. Federal Highway Administration. FHWA-SA-18-018. https://www.fhwa.dot.gov/innovation/everydaycounts/edc_4/STEP-field-guide.pdf

HSIP General Crash Pattern and Countermeasures. Virginia Department of Transportation. http://www.virginiadot.org/business/resources/ted_hsip_2011/HSIP_General_Crash_Pattern_and_Countermeasures.pdf

Pedestrian Only Phase

Exclusive Pedestrian Phase

Exclusive Pedestrian Phase with Diagonal Crossing

Issue: High number of pedestrian conflicts with turning vehicles at a signalized intersection or poor motorist yielding rates involving turning movements during concurrent walk phases at signalized intersections.

Description: At a signalized intersection, provide a phase where all vehicles are given a red signal indication, and all pedestrian crossing movements are given a walk indication. Pedestrians may also be permitted to cross diagonally during their exclusive phase. While an exclusive pedestrian phase has been shown to reduce pedestrian crashes by 50 percent in some downtown locations with high pedestrian volumes and low vehicle speeds, this treatment has the potential to extend the waiting time required of pedestrians to cross.

Sources:

Zegeer, C., Nabors, D., and Lagerway, P. Pedestrian Safety Guide and Countermeasure Selection System. Federal Highway Administration. FHWA-SA-04-003.
http://www.pedbikesafe.org/pedsafe/countermeasures_detail.cfm?CM_NUM=47

Stop Bar Relocation

Stop Bar Set Back too Far

Issue: Distance between stop bar and intersecting road or inadequate sight distances at the stop bar result in poor stop bar compliance. Current stop bar location conflicts with crosswalk or does not allow for driver to see approaching pedestrians on the sidewalk.

Description: Relocate the stop bar at a two-way stop-controlled intersection or signalized intersection. The stop bar should be located adjacent to the stop sign and in advance of the crosswalk, vehicles stopped at the stop bar should not block the crosswalk. Stop bars should also be placed perpendicular to the travel lane, not parallel to the adjacent street or crosswalk. When implementing this countermeasure, consideration should also be given to removing vegetation or obstructions to ensure adequate sight distances.

Sources:

Zegeer, C., Nabors, D., and Lagerway, P. Pedestrian Safety Guide and Countermeasure Selection System. Federal Highway Administration. FHWA-SA-04-003. http://www.pedbikesafe.org/pedsafe/countermeasures_detail.cfm?CM_NUM=50

Low-Cost Safety Enhancements for Stop-Controlled and Signalized Intersections. Federal Highway Administration. FHWA-SA-09-020. https://safety.fhwa.dot.gov/intersection/other_topics/fhwasa09020/fhwasa09020.pdf

Urban Street Design Guide: Conventional Crosswalks. National Association of City Transportation Officials. https://nacto.org/publication/urban-street-design-guide/intersection-design-elements/crosswalks-and-crossings/conventional-crosswalks/

Install or Upgrade Crosswalk Pavement Markings

Standard Crosswalk Marking

Special Emphasis Crosswalk Marking

Issue: Existing crosswalk at a stop-controlled or signal-controlled approach is not marked or does not have conspicuous existing markings.

Description: Add or refresh standard or special emphasis crosswalk markings at the crosswalk (FDOT Design Standard 17346 Sheet 9). Special emphasis crosswalk markings should be considered in areas with high pedestrian volumes, near schools or other pedestrian trip generators or attractors, areas with historic pedestrian crash issues, and at signalized intersections.

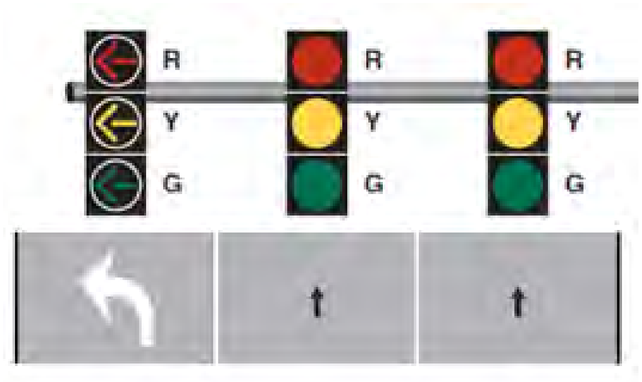
Sources:

Zegeer, C., Nabors, D., and Lagerway, P. Pedestrian Safety Guide and Countermeasure Selection System. Federal Highway Administration. FHWA-SA-04-003. http://www.pedbikesafe.org/pedsafe/countermeasures_detail.cfm?CM_NUM=4

Blackburn, L., Zegeer, C., and Brookshire, K. Field Guide for Selecting Countermeasures at Uncontrolled Pedestrian Crossing Locations. Federal Highway Administration. FHWA-SA-18-018. https://www.fhwa.dot.gov/innovation/everydaycounts/edc_4/STEP-field-guide.pdf

Urban Street Design Guide: Conventional Crosswalks. National Association of City Transportation Officials. https://nacto.org/publication/urban-street-design-guide/intersection-design-elements/crosswalks-and-crossings/conventional-crosswalks/

Left-Turn Protected Only Signal Phasing



Protected Only Signal Phasing

Protected Only Signal Phasing

Issue: At a signalized intersection, left-turning vehicles are not properly yielding to pedestrians who cross during the concurrent walk phase.

Description: Modify the signal operations to only allow protected left turns, allowing pedestrians to cross with the through movement and without any conflicts with left-turning vehicles. Implementation of protected only signal phasing requires an exclusive left-turn lane for each affected approach or split phase signal timing.

Sources:

Zegeer, C., Nabors, D., and Lagerway, P. Pedestrian Safety Guide and Countermeasure Selection System. Federal Highway Administration. FHWA-SA-04-003.
http://www.pedbikesafe.org/pedsafe/countermeasures_detail.cfm?CM_NUM=51

Don't Cut Corners: Left Turn Pedestrian & Bicyclist Crash Study. New York City DOT.
https://nacto.org/wp-content/uploads/2017/11/left-turn-pedestrian-and-bicycle-crash-study-1.pdf

Toolbox of Countermeasures and Their Potential Effectiveness for Pedestrian Crashes. Federal Highway Administration. FHWA-SA-014.
https://safety.fhwa.dot.gov/ped_bike/tools_solve/ped_tctpepc/

Pedestrian Barrier

Median Pedestrian Barrier

Sidewalk Pedestrian Barrier

Issue: Pedestrians attempting to perform mid-block crossings at unsafe locations due to high vehicle volumes, high speeds, or limited sight distances.

Description: Install a barrier in the median to discourage mid-block pedestrian crossing. This countermeasure should be considered for implementation in conjunction with providing adequately spaced locations where pedestrians are permitted to safely cross the roadway. This treatment can also be used adjacent to a marked crosswalk (mid-block or intersection) to channelize pedestrians and encourage use of the crosswalk.

Sources:

Road Safety Toolkit: Pedestrian Fencing. International Road Assessment Program.
http://toolkit.irap.org/default.asp?page=treatment&id=56

State Best Practice Policy for Medians. Federal Highway Administration. FHWA-SA-11-019.
https://safety.fhwa.dot.gov/ped_bike/tools_solve/fhwasa11019/

Marked Mid-Block Crossing

Marked Mid-Block Crosswalk

Marked Mid-Block Crosswalk

Issue: Insufficient safe roadway crossing opportunities due to intersection spacing or specific pedestrian demand.

Description: Provide marked and signed crosswalk at the identified location. Mid-block crossings should be located and designed in accordance with Section 222.2.3.2 of the FDOT Design Manual. Illumination, markings, and signing should be designed in accordance with the MUTCD, Traffic Engineering Manual (Section 3.8), and FDOT Design Manual (Section 230.6).

Sources:

FDOT Design Manual. Florida Department of Transportation. https://www.fdot.gov/roadway/FDM/

Zegeer, C., Nabors, D., and Lagerway, P. Pedestrian Safety Guide and Countermeasure Selection System. Federal Highway Administration. FHWA-SA-04-003. http://www.pedbikesafe.org/pedsafe/countermeasures_detail.cfm?CM_NUM=4

Blackburn, L., Zegeer, C., and Brookshire, K. Field Guide for Selecting Countermeasures at Uncontrolled Pedestrian Crossing Locations. Federal Highway Administration. FHWA-SA-18-018. https://www.fhwa.dot.gov/innovation/everydaycounts/edc_4/STEP-field-guide.pdf

Urban Street Design Guide: Midblock Crosswalks. National Association of City Transportation Officials. https://nacto.org/publication/urban-street-design-guide/intersection-design-elements/crosswalks-and-crossings/midblock-crosswalks/

Restrict On-Street Parking

Restricted On-Street Parking Near Driveways and Intersections

Issue: Limited visibility at intersections, driveways, or mid-block crossings due to on-street parking adjacent to the location.

Description: Restrict on-street parking adjacent to intersections, driveways, or mid-block crossings in order to allow for pedestrians approaching crossings at these locations to be clearly seen by motorists.

Sources:

Toolbox of Countermeasures and Their Potential Effectiveness for Pedestrian Crashes. Federal Highway Administration. FHWA-SA-014.
https://safety.fhwa.dot.gov/ped_bike/tools_solve/ped_tctpepc/

Zegeer, C., Nabors, D., and Lagerway, P. Pedestrian Safety Guide and Countermeasure Selection System. Federal Highway Administration. FHWA-SA-04-003.
http://www.pedbikesafe.org/pedsafe/countermeasures_detail.cfm?CM_NUM=9

Blackburn, L., Zegeer, C., and Brookshire, K. Field Guide for Selecting Countermeasures at Uncontrolled Pedestrian Crossing Locations. Federal Highway Administration. FHWA-SA-18-018.
https://www.fhwa.dot.gov/innovation/everydaycounts/edc_4/STEP-field-guide.pdf

Urban Street Design Guide: Visibility/Sight Distance. National Association of City Transportation Officials. https://nacto.org/publication/urban-street-design-guide/intersection-design-elements/visibility-sight-distance/

Pedestrian Warning Signs

Pedestrian Warning Sign (MUTCD W11-2)

Advance Pedestrian Warning Sign

Issue: Motorists failing to yield to pedestrians or limited visibility of pedestrian crossing locations.

Description: Provide warning signs for motorists to indicate the possible presence of pedestrians at the crossing location and/or in advance of the crossing location (MUTCD Sign W11-2). Advance warning signs should be used where pedestrian crossings may be unexpected or if there are motorists who are unfamiliar with the area.

Sources:

Zegeer, C., Nabors, D., and Lagerway, P. Pedestrian Safety Guide and Countermeasure Selection System. Federal Highway Administration. FHWA-SA-04-003. http://www.pedbikesafe.org/pedsafe/countermeasures_detail.cfm?CM_NUM=56

Blackburn, L., Zegeer, C., and Brookshire, K. Field Guide for Selecting Countermeasures at Uncontrolled Pedestrian Crossing Locations. Federal Highway Administration. FHWA-SA-18-018. https://www.fhwa.dot.gov/innovation/everydaycounts/edc_4/STEP-field-guide.pdf

LED Lighting

Unlit Crosswalk

Crosswalk with LED Lighting

Issue: Dark spots along a corridor at driveway crossings, at stop-controlled intersections, or at signalized intersections. Potential dark spots may exist either on the sidewalk at the approach of a crossing location or mid-crossing.

Description: Provide LED lighting to illuminate both the identified crossing and the pedestrian approach of the crossing. If existing non-LED lighting is present, but nighttime crashes have still been identified as an issue, upgrade to LED lighting. Install lighting to meet specifications given in FDOT Design Manual (Chapter 231).

Sources:

FDOT Design Manual. Florida Department of Transportation. https://www.fdot.gov/roadway/FDM/

Zegeer, C., Nabors, D., and Lagerway, P. Pedestrian Safety Guide and Countermeasure Selection System. Federal Highway Administration. FHWA-SA-04-003. http://www.pedbikesafe.org/pedsafe/countermeasures_detail.cfm?CM_NUM=8

Blackburn, L., Zegeer, C., and Brookshire, K. Field Guide for Selecting Countermeasures at Uncontrolled Pedestrian Crossing Locations. Federal Highway Administration. FHWA-SA-18-018. https://www.fhwa.dot.gov/innovation/everydaycounts/edc_4/STEP-field-guide.pdf

Toolbox of Countermeasures and Their Potential Effectiveness for Pedestrian Crashes. Federal Highway Administration. FHWA-SA-014. https://safety.fhwa.dot.gov/ped_bike/tools_solve/ped_tctpepc/

Lighting Maintenance

Inoperable Luminary

Issue: Dark spots caused by inoperable lights along a corridor at driveway crossings, at stop-controlled intersections, or at signalized intersections. Potential dark spots may exist either on the sidewalk at the approach of a crossing location or mid-crossing.

Description: Coordinate with maintaining agency to repair or replace the inoperable luminaries.

Sources:

FDOT Design Manual. Florida Department of Transportation. https://www.fdot.gov/roadway/FDM/

Zegeer, C., Nabors, D., and Lagerway, P. Pedestrian Safety Guide and Countermeasure Selection System. Federal Highway Administration. FHWA-SA-04-003. http://www.pedbikesafe.org/pedsafe/countermeasures_detail.cfm?CM_NUM=8

Blackburn, L., Zegeer, C., and Brookshire, K. Field Guide for Selecting Countermeasures at Uncontrolled Pedestrian Crossing Locations. Federal Highway Administration. FHWA-SA-18-018. https://www.fhwa.dot.gov/innovation/everydaycounts/edc_4/STEP-field-guide.pdf

Toolbox of Countermeasures and Their Potential Effectiveness for Pedestrian Crashes. Federal Highway Administration. FHWA-SA-014. https://safety.fhwa.dot.gov/ped_bike/tools_solve/ped_tctpepc/

Provide Adequate Drainage

Pedestrian/Bicyclist Water Hazard

Debris Leftover from Pooled Water

Issue: Pooled water forming on the sidewalk or at curb ramps that both renders the sidewalk temporarily impassible and leaves behind debris that can cause a slipping hazard on the sidewalk.

Description: Provide adequate drainage and ensure continued maintenance such that drains are not blocked or clogged.

Sources:

Urban Street Stormwater Guide. National Association of City Transportation Officials. https://nacto.org/publication/urban-street-stormwater-guide/

Traffic Calming

Speed Hump

Intersection Bulb-Outs Combined with On-Street Parking and Stamped Asphalt Crosswalk Markings

Issue: High vehicle speeds and/or poor motorist yielding.

Description: Reduce vehicle speeds through a given corridor using a variety of traffic calming methods. Specific traffic calming treatments typical involve either horizontal or vertical deflection for vehicles, causing drivers to reduce vehicle speeds and become more aware of their surroundings. Examples of traffic calming countermeasures include, chokers, chicanes, bulb-outs, speed humps, speed tables, serpentine roadway design, landscaping, gateways, and alternative pavement types.

Sources:

Urban Street Design Guide: Street Design Elements. National Association of City Transportation Officials. https://nacto.org/publication/urban-street-design-guide/street-design-elements/

Zegeer, C., Nabors, D., and Lagerway, P. Pedestrian Safety Guide and Countermeasure Selection System. Federal Highway Administration. FHWA-SA-04-003. http://www.pedbikesafe.org/pedsafe/countermeasures.cfm

Traffic Calming ePrimer. Federal Highway Administration. https://safety.fhwa.dot.gov/speedmgt/traffic_calm.cfm

Spot Medians

Spot Median

Spot Median with Pedestrian Crossing

Issue: Limited pedestrian crossing opportunities on undivided roadways or roadways with center two-way left-turn lanes.

Description: Provide short medians at targeted locations on roadways that are currently undivided or with a center two-way left-turn lane to help facilitate pedestrian crossings. This serves as a less restrictive alternative to providing a median throughout an entire corridor.

Sources:

Safety Benefits of Raised Medians and Pedestrian Refuge Areas. Federal Highway Administration. https://safety.fhwa.dot.gov/ped_bike/tools_solve/medians_brochure/

Proven Safety Countermeasures: Medians and Pedestrian Crossing Islands in Urban and Suburban Areas. Federal Highway Administration. FHWA-SA-17-064.
https://safety.fhwa.dot.gov/provencountermeasures/ped_medians/

Zegeer, C., Nabors, D., and Lagerway, P. Pedestrian Safety Guide and Countermeasure Selection System. Federal Highway Administration. FHWA-SA-04-003.
http://www.pedbikesafe.org/pedsafe/countermeasures_detail.cfm?CM_NUM=22

Bulb-Outs or Curb Extensions

Curb Extension at Intersection

Conceptual Intersection Curb Extensions

Issue: Large crossing distances or wide roadway cross-section that encourage high speeds.

Description: Extend the curb into the parking lane to reduce pedestrian crossing distances at intersections. Bulb-outs may also be used mid-block at non-marked crossing locations as a traffic calming measure. A bulb-out can also be located at a transit stop location to allow the bus to stop in-lane and provide space for transit riders to access the bus.

Sources:

Urban Street Design Guide: Curb Extensions. National Association of City Transportation Officials. https://nacto.org/publication/urban-street-design-guide/street-design-elements/curb-extensions/

Zegeer, C., Nabors, D., and Lagerway, P. Pedestrian Safety Guide and Countermeasure Selection System. Federal Highway Administration. FHWA-SA-04-003. http://www.pedbikesafe.org/pedsafe/countermeasures_detail.cfm?CM_NUM=16

Zegeer, C., Nabors, D., and Lagerway, P. Pedestrian Safety Guide and Countermeasure Selection System. Federal Highway Administration. FHWA-SA-04-003. http://www.pedbikesafe.org/pedsafe/countermeasures_detail.cfm?CM_NUM=5

Pedestrian Activated Warning Device

Crosswalk with Rectangular Rapid Flashing Beacon

Issue: Mid-block or uncontrolled intersection crossing location.

Description: at mid-block crossing or uncontrolled intersection locations, provide a pedestrian activated warning to alert approaching drivers of the pedestrian's crossing (e.g. Rectangular Rapid Flashing Beacon (RRFB)).

Sources:

Rectangular Rapid Flash Beacon. Federal Highway Administration. FHWA-SA-09-009.
https://safety.fhwa.dot.gov/intersection/conventional/unsignalized/tech_sum/fhwasa09009/

Countermeasure Tech Sheet: Rectangular Rapid Flash Beacon. Federal Highway Administration.
https://safety.fhwa.dot.gov/ped_bike/step/docs/TechSheet_RRFB_508compliant.pdf

Zegeer, C., Nabors, D., and Lagerway, P. Pedestrian Safety Guide and Countermeasure Selection System. Federal Highway Administration. FHWA-SA-04-003.
http://www.pedbikesafe.org/pedsafe/countermeasures_detail.cfm?CM_NUM=54

Blackburn, L., Zegeer, C., and Brookshire, K. Field Guide for Selecting Countermeasures at Uncontrolled Pedestrian Crossing Locations. Federal Highway Administration. FHWA-SA-18-018.
https://www.fhwa.dot.gov/innovation/everydaycounts/edc_4/STEP-field-guide.pdf

Lane Elimination

Conceptual Median and Bicycle Lane with Lane Elimination

Issue: Excessive vehicle speeds, insufficient bicycle or pedestrian facilities, or insufficient pedestrian separation from vehicle traffic.

Description: Removal of a through travel lane along a corridor. The available right-of-way can be converted to a bike lane or multi-use path, used for on street parking, used to widen the sidewalk, converted to a landscaped buffer, or used as a median.

Sources:

Proven Safety Countermeasures: Road Diets. Federal Highway Administration. FHWA-SA-17-066. https://safety.fhwa.dot.gov/provencountermeasures/road_diets/

Zegeer, C., Nabors, D., and Lagerway, P. Pedestrian Safety Guide and Countermeasure Selection System. Federal Highway Administration. FHWA-SA-04-003. http://www.pedbikesafe.org/pedsafe/countermeasures_detail.cfm?CM_NUM=19

Blackburn, L., Zegeer, C., and Brookshire, K. Field Guide for Selecting Countermeasures at Uncontrolled Pedestrian Crossing Locations. Federal Highway Administration. FHWA-SA-18-018. https://www.fhwa.dot.gov/innovation/everydaycounts/edc_4/STEP-field-guide.pdf

Pedestrian Overpass or Tunnel

Pedestrian Overpass

Issue: Unsafe pedestrian crossing opportunities, with distance, speed, or volume factors preventing alternative crossing solutions.

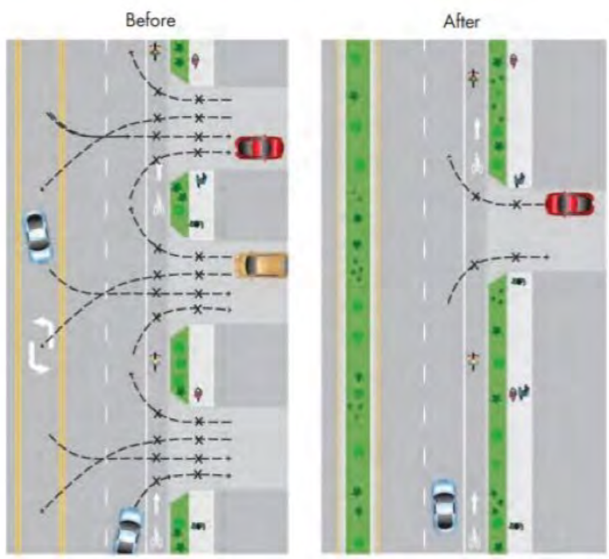
Description: Provide a grade separate pedestrian crossing opportunity, either through an overpass or tunnel.

Sources:

Toolbox of Countermeasures and Their Potential Effectiveness for Pedestrian Crashes. Federal Highway Administration. FHWA-SA-014.
https://safety.fhwa.dot.gov/ped_bike/tools_solve/ped_tctpepc/

Zegeer, C., Nabors, D., and Lagerway, P. Pedestrian Safety Guide and Countermeasure Selection System. Federal Highway Administration. FHWA-SA-04-003.
http://www.pedbikesafe.org/pedsafe/countermeasures_detail.cfm?CM_NUM=10

Remove Driveways



Access Management with Driveway Consolidation

Issue: Pedestrian-vehicle conflicts due to turning movements with vehicles entering or exiting driveways.

Description: Consolidate driveway access along a road by providing internal circulation between parcels and removing driveways. Removing driveways serves to reduce the total number of conflict points for pedestrians along the roadway.

Sources:

Proven Safety Countermeasures: Corridor Access Management. Federal Highway Administration. FHWA-SA-17-052. https://safety.fhwa.dot.gov/provencountermeasures/corridor_access_mgmt/

Access Management in the Vicinity of Intersections. Federal Highway Administration. FHWA-SA-10-002. https://safety.fhwa.dot.gov/intersection/other_topics/fhwasa10002/

Zegeer, C. Pedestrian Facilities Users Guide – Providing Safety and Mobility. Federal Highway Administration. FHWA-RD-01-102. https://www.fhwa.dot.gov/publications/research/safety/01102/01102.pdf

Zegeer, C., Nabors, D., and Lagerway, P. Pedestrian Safety Guide and Countermeasure Selection System. Federal Highway Administration. FHWA-SA-04-003. http://www.pedbikesafe.org/pedsafe/countermeasures_detail.cfm?CM_NUM=20

Reconstruct Driveways

Wide Driveway Entrance with Steep Cross-Slope and
Large Turning Radius

Issue: Steep cross-slopes across driveways, wide driveway entrances, large turning radius at driveways encouraging high speed turning movements.

Description: Reconstruct the sidewalk across existing driveways to remove steep cross-slopes. Reduce turning radii at driveways. Narrow driveways that are wider than needed. Provide consistent sidewalk definition across the driveway (if the sidewalk is concrete, maintain the concrete sidewalk across the driveway).

Sources:

Zegeer, C. Pedestrian Facilities Users Guide – Providing Safety and Mobility. Federal Highway Administration. FHWA-RD-01-102.
https://www.fhwa.dot.gov/publications/research/safety/01102/01102.pdf

Zegeer, C., Nabors, D., and Lagerway, P. Pedestrian Safety Guide and Countermeasure Selection System. Federal Highway Administration. FHWA-SA-04-003.
http://www.pedbikesafe.org/pedsafe/countermeasures_detail.cfm?CM_NUM=20

Right-Turn on Red Restrictions

MUTCD R10-11

Issue: Pedestrian-vehicle conflicts with vehicles attempting to complete a right-turn on red movement. When attempting this turning movement, drivers are frequently looking towards oncoming traffic and do not notice pedestrians who may be using the crosswalk.

Description: At signalized intersections, do not allow vehicles to make a right-turn on red movement. Right-turn on red prohibition can be enforced at all times, during select hours of the day, or on pedestrian activation.

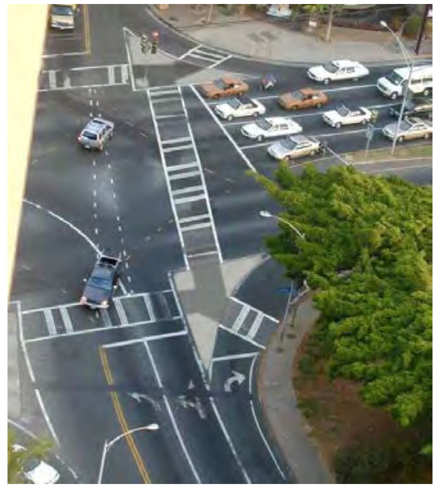
Sources:

Toolbox of Countermeasures and Their Potential Effectiveness for Pedestrian Crashes. Federal Highway Administration. FHWA-SA-014.
https://safety.fhwa.dot.gov/ped_bike/tools_solve/ped_tctpepc/

Zegeer, C., Nabors, D., and Lagerway, P. Pedestrian Safety Guide and Countermeasure Selection System. Federal Highway Administration. FHWA-SA-04-003.
http://www.pedbikesafe.org/pedsafe/countermeasures_detail.cfm?CM_NUM=49

Remove/Redesign Channelized Right-Turn Lanes

Channelized Right-Turn Lane without Improved Pedestrian Accommodations (not enhanced crosswalk, vehicle acceleration lane present)



Channelized Right-Turn Lane with Enhanced Pedestrian Crossing

Issue: Pedestrian-vehicle conflicts due to channelized or free-flow high speed right-turn movements.

Description: Remove channelized or free-flow right-turn lanes, requiring vehicles to come under signal control prior to making the turning movement. If a channelized right-turn lane cannot be removed, it should be designed with consideration for pedestrians by providing a pedestrian refuge island, enhanced crosswalk markings, and the consideration of a raised crosswalk and/or pedestrian activated warning devices. If designed for pedestrian accommodation, a channelized right-turn lane does have the potential benefit of reducing the required pedestrian crossing distance.

Sources:

Design Guidance for Channelized Right-Turn Lanes. National Academies of Sciences, Engineering, and Medicine. https://doi.org/10.17226/22238

Zegeer, C., Nabors, D., and Lagerway, P. Pedestrian Safety Guide and Countermeasure Selection System. Federal Highway Administration. FHWA-SA-04-003. http://www.pedbikesafe.org/pedsafe/countermeasures_detail.cfm?CM_NUM=24

Alternative Intersections

Roundabout with Pedestrian Accommodations

Restricted Crossing U-Turn Intersection with Crosswalks

Issue: Pedestrian-vehicle conflicts at two-way stop control or signalized intersection.

Description: Transform an existing two-way stop-controlled or signalized intersection into an alternative intersection design (roundabout, restricted crossing U-turn, median U-turn, or other) to reduce conflict points and provide improved pedestrian facilities.

Sources:

Proven Safety Countermeasures: Reduced Left-Turn Conflict Intersections. Federal Highway Administration. FHWA-SA-17-054. https://safety.fhwa.dot.gov/intersection/innovative/uturn/fhwasa18048/fhwasa18048.pdf

Zegeer, C., Nabors, D., and Lagerway, P. Pedestrian Safety Guide and Countermeasure Selection System. Federal Highway Administration. FHWA-SA-04-003. http://www.pedbikesafe.org/pedsafe/countermeasures_detail.cfm?CM_NUM=25

Pedestrian Countdown Indicators

Pedestrian Countdown (MUTCD Figure 4E-1)

Issue: Pedestrians entering the crosswalk at a signalized intersection during the flashing don't walk phase without sufficient crossing time.

Description: At a signalized intersection, provide a visual indication of the time remaining in the flashing don't walk pedestrian phase. These pedestrian indicators may also include audible notification to indicate when the walk phase begins and the time remaining in the flashing don't walk phase.

Sources:

Zegeer, C., Nabors, D., and Lagerway, P. Pedestrian Safety Guide and Countermeasure Selection System. Federal Highway Administration. FHWA-SA-04-003. http://www.pedbikesafe.org/pedsafe/countermeasures_detail.cfm?CM_NUM=48

Zegeer, C., Nabors, D., and Lagerway, P. Pedestrian Safety Guide and Countermeasure Selection System. Federal Highway Administration. FHWA-SA-04-003. http://www.pedbikesafe.org/pedsafe/countermeasures_detail.cfm?CM_NUM=46

Toolbox of Countermeasures and Their Potential Effectiveness for Pedestrian Crashes. Federal Highway Administration. FHWA-SA-014. https://safety.fhwa.dot.gov/ped_bike/tools_solve/ped_tctpepc/

Roadway Network Enhancements

Pedestrian/Bicyclist Only Facility

Issue: Complex intersections or insufficient right-of-way availability leading to pedestrian-vehicle conflicts that cannot be addressed through other countermeasures.

Description: Provide vehicle or pedestrian improvements on the surrounding roadway network in order to reduce conflicts at a given location that are otherwise difficult to address. A complex intersection, geographic constraints, or high speeds/volumes may limit countermeasure options at a given location; however, alternative pedestrian routes can be provided/improved on parallel facilities to improve safety and mobility. This may include improving other facilities in the surrounding area or developing new pedestrian trails.

Sources:

Zegeer, C., Nabors, D., and Lagerway, P. Pedestrian Safety Guide and Countermeasure Selection System. Federal Highway Administration. FHWA-SA-04-003. http://www.pedbikesafe.org/pedsafe/countermeasures_detail.cfm?CM_NUM=1

Zegeer, C., Nabors, D., and Lagerway, P. Pedestrian Safety Guide and Countermeasure Selection System. Federal Highway Administration. FHWA-SA-04-003. http://www.pedbikesafe.org/pedsafe/guide_background.cfm

Sidewalk Connectivity

No Sidewalks Provided for Mall Access (pedestrians must walk in road)

Sidewalk Connectivity Provided for Retail Access

Issue: Pedestrians traveling along a corridor are not provided with a sidewalk connection to access a shopping center or business, forcing pedestrians to walk in the driveway or access road.

Description: Provide pedestrian connections between the sidewalk and adjacent parcels. These pedestrian connections should be located to provide the most direct access, either at existing driveways or entrance roads or directly from the sidewalk to the building entrance.

Sources:

Guide to the ADA Standards. United States Access Board. https://www.access-board.gov/guidelines-and-standards/buildings-and-sites/about-the-ada-standards/guide-to-the-ada-standards/chapter-4-accessible-routes

Sidewalk Continuity

Sidewalk Gap

Continuous Sidewalk

Issue: Lack of sidewalk or other pedestrian facility resulting in pedestrians walking in potentially hazardous conditions.

Description: Provide sidewalk or other suitable pedestrian facility through any existing gaps.

Sources:

Zegeer, C., Nabors, D., and Lagerway, P. Pedestrian Safety Guide and Countermeasure Selection System. Federal Highway Administration. FHWA-SA-04-003.
http://www.pedbikesafe.org/pedsafe/countermeasures_detail.cfm?CM_NUM=1

Proven Safety Countermeasures: Walkways. Federal Highway Administration. FHWA-SA-17-067.
https://safety.fhwa.dot.gov/provencountermeasures/walkways/

Reduce Posted Speed

Speed Limit Sign with Driver Feedback Sign

Speed Hump for Speed Management

Issue: Excessive vehicles speeds leading to unsafe pedestrian crossing opportunities and reduced motorist perception-reaction times.

Description: With the reinforcement of traffic calming design elements, reduce the posted speed through the corridor. Posted speed limits can be determined based on context classification of the given roadway and/or USLIMITS2.

Sources:

Zegeer, C., Nabors, D., and Lagerway, P. Pedestrian Safety Guide and Countermeasure Selection System. Federal Highway Administration. FHWA-SA-04-003. http://www.pedbikesafe.org/pedsafe/countermeasures.cfm#trafficcalming

Proven Safety Countermeasures: USLIMITS2. Federal Highway Administration. FHWA-SA-17-070. https://safety.fhwa.dot.gov/provencountermeasures/uslimits2/

Engineering Speed Management Countermeasures. Federal Highway Administration. https://safety.fhwa.dot.gov/speedmgt/ref_mats/eng_count/2014/reducing_speed.cfm

Pedestrian Behavior – Yielding

Issue: Pedestrian-vehicle conflicts either at an intersection or at mid-block locations when the motorist has the right-of-way, such as at an intersection when the Don't Walk indication is displayed or at a mid-block/non-intersection location.

Description: Educate pedestrians with the goal of improving pedestrian yielding to vehicles at intersections or driveways when they do not have the right-of-way. Education campaigns can be targeted to specific age groups or demographics based on the characteristics of the local users or of those involved in crashes within the area.

Sources:

Zegeer, C., Nabors, D., and Lagerway, P. Pedestrian Safety Guide and Countermeasure Selection System. Federal Highway Administration. FHWA-SA-04-003.
http://www.pedbikesafe.org/pedsafe/countermeasures_detail.cfm?CM_NUM=61

Pedestrian Behavior – Communicating with Drivers

Issue: Pedestrian-vehicle conflicts at locations where visibility may be limited, or pedestrians are unexpected.

Description: Educate pedestrians with the goal of improving pedestrian-driver communication through non-verbal communication techniques when approaching vehicles at an intersection or driveway. Non-verbal communication methods can include both eye contact and hand signals.

Sources:

Zegeer, C., Nabors, D., and Lagerway, P. Pedestrian Safety Guide and Countermeasure Selection System. Federal Highway Administration. FHWA-SA-04-003.
http://www.pedbikesafe.org/pedsafe/countermeasures_detail.cfm?CM_NUM=61

Sucha, M., Dostal, D., and Risser, R. Pedestrian-Driver Communication and Decision Strategies at Marked Crossings. Accident Analysis & Prevent. Volume 102, pp. 41-50, May 2017.

Pedestrian Behavior – Conspicuity

Issue: Especially during dusk, nighttime, or inclement weather conditions pedestrians may be difficult to see as motorist visibility diminishes.

Description: Educate pedestrians with the goal of encouraging the use of lights, reflectors, and/or brightly colored clothing by pedestrians, especially during dusk/nighttime conditions.

Sources:

Zegeer, C., Nabors, D., and Lagerway, P. Pedestrian Safety Guide and Countermeasure Selection System. Federal Highway Administration. FHWA-SA-04-003. http://www.pedbikesafe.org/pedsafe/countermeasures_detail.cfm?CM_NUM=61

Levi, S., De Leonardis, D.M., Antin, J., and Angel, L. Identifying Countermeasure Strategies to Increase Safety of Older Pedestrians. National Highway Traffic Safety Administration. DOT HS 811 798. https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/811798.pdf

Pedestrian Behavior – Walking Facing Traffic

Issue: On roadways where sidewalks are not available and pedestrians must walk on the shoulder or on the roadway, presenting potential conflicts with vehicles on the roadway.

Description: Educate pedestrians with the goal of encouraging pedestrians to walk facing oncoming vehicular traffic when a sidewalk is not present.

Sources:

Zegeer, C., Nabors, D., and Lagerway, P. Pedestrian Safety Guide and Countermeasure Selection System. Federal Highway Administration. FHWA-SA-04-003. http://www.pedbikesafe.org/pedsafe/guide_analysis_CrashTypeAnalysis.cfm

Pedestrian Safety. National Highway Traffic Safety Administration. https://www.nhtsa.gov/road-safety/pedestrian-safety

Driver Behavior – Yielding

Issue: Pedestrian-vehicle conflicts either at an intersection or at mid-block locations when the pedestrian has the right-of-way, such as at an intersection when the Walk indication is displayed or at a marked mid-block crosswalk.

Description: Educate drivers with the goal of improving driver yielding to pedestrians at intersections or driveways when they do not have the right-of-way. Education campaigns can be targeted to specific age groups or demographics based on the characteristics of the local users or of those involved in crashes within the area.

Sources:

Zegeer, C., Nabors, D., and Lagerway, P. Pedestrian Safety Guide and Countermeasure Selection System. Federal Highway Administration. FHWA-SA-04-003. http://www.pedbikesafe.org/pedsafe/countermeasures_detail.cfm?CM_NUM=61

Driver Behavior – Scanning

Issue: Pedestrian-vehicle conflicts either at an intersection or at mid-block locations when the pedestrian has the right-of-way, such as at an intersection when the Walk indication is displayed or at a marked mid-block crosswalk.

Description: Educate drivers with the goal of encouraging drivers to be observant and attentively look for pedestrians at potential crossing locations.

Sources:

Zegeer, C., Nabors, D., and Lagerway, P. Pedestrian Safety Guide and Countermeasure Selection System. Federal Highway Administration. FHWA-SA-04-003. http://www.pedbikesafe.org/pedsafe/countermeasures_detail.cfm?CM_NUM=61

Driver Behavior – Speed

Issue: Excessive vehicles speeds leading to unsafe pedestrian crossing opportunities and reduced motorist perception-reaction times.

Description: Educate drivers with the goal of encouraging drivers to reduce their speed in order to see pedestrians approaching crossing locations and react to pedestrians who may be in the roadway or crossing the roadway/driveway.

Sources:

Zegeer, C., Nabors, D., and Lagerway, P. Pedestrian Safety Guide and Countermeasure Selection System. Federal Highway Administration. FHWA-SA-04-003.
http://www.pedbikesafe.org/pedsafe/countermeasures_detail.cfm?CM_NUM=61

A Resident's Guide for Creating Safer Communities for Walking and Biking. Federal Highway Safety Administration. FHWA-SA-14-099.
https://safety.fhwa.dot.gov/ped_bike/ped_cmnity/ped_walkguide/