New Orleans Multi-Tool Pedestrian Safety Study

Final Report

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PEDESTRIAN BICYCLE RESOURCE INITIATIVE

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EXECUTIVE SUMMARY

This exploratory report provides an overview of regional pedestrian and bicycle crash statistics for the period of 2006 to 2010, identifies top crash corridors, intersections, and statistically significant clusters, and evaluates three target pedestrian crash clusters using a variety of tools and techniques previously developed by the Pedestrian Bicycle Resource Initiative (PBRI) at the Merritt C. Becker, Jr. University of New Orleans Transportation Institute. The purpose of this study is to develop a multi-faceted approach to understanding the physical and behavior factors that have contributed to high crash incidence at these and other locations, and to provide recommendations on interventions that should be considered to mitigate those issues.

The New Orleans region has experienced a persistent pedestrian and bicycle crash problem, and has come under federal scrutiny as a result. Since Hurricane Katrina in 2005, crash totals in the region have rebounded along with population. Simultaneously, volumes of pedestrians and bicyclists observed during periodic PBRI manual user counts have increased rapidly. The spatial patterns of crashes, however, have remained relatively stable over time, indicating possible deficiencies in the built environment that create hazardous conditions for users. This report makes use of a set of pedestrian audit instruments to explore those deficiencies and understand how they relate to pedestrian crash incidence, with a focus on crashes that have resulted in severe injury or death.

Analysis of each of the three target crash clusters (approximately centered at the major intersections of Tulane Avenue and South Broad Street; Loyola Avenue and Calliope Street; and Airline Drive and Williams Boulevard) includes the following components:

1. Crash data analysis
2. Pedestrian Sidewalk and Intersection Audit Survey
3. Pedestrian and Bicycle Counts
4. Analysis of area demographics, transit, and land use context
5. Profile of fatal and severe crash incidents
6. Recommendations for mitigating pedestrian hazards

Evaluation of available crash data reveals above all that significant improvements could be made in the collection and reporting of data to more clearly describe the circumstances and actions that lead to pedestrian crashes, using recognized common crash types specific to active modes of transportation. A large proportion of crashes are attributed vaguely to “pedestrian actions,” while another substantial portion are mainly attributed to the impairment of either the driver or pedestrian, without further description regarding how the crash actually occurred.

The pedestrian built environment audits, on the other hand, provide a very descriptive view of conditions at a fine-grain of detail, and suggest clear facility deficiencies that likely contribute (at least in part) to crash occurrence, specifically by 1) failing to promote pedestrian visibility and driver awareness of their potential presence , 2) failing to provide a separated, unobstructed right-of-way for pedestrian use and/or 3) failing to create safe, obvious roadway crossings that provide drivers and pedestrians with sufficient information to avoid conflicts.

Despite limited information on the specific circumstances of individual crashes, this assessment, combined with information on approximate crash locations, allows an efficient means of identifying streets and intersections where interventions are most needed. At all three locations evaluated, accessibility is a serious

constraint, and the absence of even basic pedestrian amenities such as crosswalks, working pedestrian signals, and unobstructed sidewalks is pronounced. Out of 139 intersections and sidewalks segments evaluated, 59 scored either "Poor" or "Very Poor" condition. Only 36 scored a "Good" or "Very Good" ranking.

Counts of active users conducted at two points within each of these crash hot spots reveal heavy pedestrian activity at two of the three locations (both near the downtown core of Orleans Parish) and more limited use at the third in suburban Jefferson Parish. In addition, these counts reveal the demographic makeup of users, as well as information on their behavior and usage of the facilities, further illuminating potential safety concerns (e.g. large numbers of pedestrians observed walking in the roadway, large numbers of bicyclists traveling against traffic or on the sidewalk).

At the two study locations in Orleans Parish, major development projects are either underway or planned: at Tulane Avenue and South Broad Street, the corridor will undergo transformation in conjunction with the development of the LSU and VA hospitals, while a few blocks away on North Broad Street, a new supermarket is under construction. In the upper CBD near Loyola Avenue, a new streetcar line has spurred substantial developer interest, and construction on a major mixed-use development is underway.

These major redevelopment efforts will provide a unique opportunity for coordinated investment in the safety and quality of the pedestrian environment, to the benefit of all current and future users of all modes of transportation. At the Jefferson Parish location, on the other hand, a corridor plan is recommended to guide new and re-development along this major thoroughfare, to encourage less auto-oriented land uses and site planning, and to create safer, multi-modal access for all users.

This report incorporates a variety of approaches to understanding pedestrian safety, identifies relevant data needs, and provides a possible methodology for prioritizing interventions in relationship to local, regional, and state complete streets policies, achieving ADA compliance, and current efforts to develop local and regional Pedestrian Safety Action Plans. Continuing to expand opportunities for non-motorized transportation by creating safer, more comfortable facilities for users will not only aid those efforts, but advance the region's goals of creating healthier, more sustainable, and more livable communities for all.

1.0 INTRODUCTION

For many years, rates of pedestrian and bicycle crashes and fatalities on Louisiana's roadways—and in the New Orleans metro area in particular—have significantly exceeded national averages. As a result of these problematic crash statistics, the Federal Highway Administration designated New Orleans as a Pedestrian Safety Focus City, and consequently also designated Louisiana as a Pedestrian Safety Focus State, in 2011 (Figure 1). The purpose of this designation is to provide states and cities with higher-than-average rates of pedestrian crashes and fatalities with the resources they need to reduce those figures, through the development of Pedestrian Safety Action Plans that provide a framework for identifying safety problems and developing potential engineering, education, and enforcement strategies to mitigate those issues.

The New Orleans Regional Planning Commission has evaluated pedestrian and bicycle crash data from 1999 through 2010,[1] finding that while crash totals have fallen relative to pre-Hurricane Katrina levels and some encouraging safety trends have emerged, active transportation crashes continue to be serious problems in the region, and as the population has rebounded since 2005, so too has crash incidence. Moreover, spatial and demographic patterns of crash occurrence have remained relatively stable over time, indicating systemic safety issues that are unlikely to be resolved without intervention, whether through increased education about safe behavior, increased enforcement of existing laws, and/or through physical improvements to the built environment that address deficiencies that may be contributing to crash rates.

[1] All crash data presented in this report is courtesy of the Louisiana Department of Transportation and Development, provided to PBRI by the New Orleans Regional Planning Commission. For detailed explanation of crash data analysis methodology, see Appendix 1.

Figure 1: FHWA Pedestrian Safety Focus States and Cities. Image Source: http://safety.fhwa.dot.gov/ped_bike/ped_focus/images/focus_cities_states.png

Many of the same corridors, intersections, and statistically-derived crash clusters or "hot spots" have appeared in analyses of crash data year after year, marking areas that are particularly likely to be in need of specific safety interventions. The purpose of this report is to further examine a pilot group of these clusters using multiple analysis tools, in order to identify specific design characteristics, operating conditions, and/or user behaviors that are contributing to frequent crash occurrence, and to recommend mitigation techniques that could be implemented in order to improve safety for all users of these areas.

Although some information on regional bicycle crash patterns is included to provide a broader context on the state of active

transportation in this region and to highlight the fact that both pedestrians and bicycles are vulnerable road users whose safety and comfort depend heavily on the quality of the built environment, this report focuses on comprehensively evaluating factors related to pedestrian crashes only. The three clusters selected for analysis represent areas of statistically significant pedestrian crash totals, and only pedestrian crash data was examined in-depth. This limitation is due to the following factors: 1) bicycle crash distribution tends to be less spatially focused than pedestrian crashes (See: *New Orleans Regional Pedestrian and Bicycle Crash Report 2009-2010*) with crash patterns evident along the length of a corridor, rather than clustered near particular intersections or nodes, necessitating a different methodological approach; and 2) an effective, easy-to-use built environment audit tool focusing on bicyclist comfort and safety had not yet been fully developed at the time of this research, inhibiting quantitative identification of specific design problems and solutions. Future research efforts should expand the development of this multi-tool safety analysis to address these limitations and include areas of high bicycle crash incidence.

This report provides an overview of regional pedestrian and bicycle crash statistics for the period of 2006-2010, identifies pedestrian and bicycle crash clusters as well as top crash corridors and specific crash-prone intersections, and outlines each of the tools and techniques employed in the multi-tool pedestrian safety analysis. Next, a comprehensive overview of the contributing factors identified, as well as recommended improvements to mitigate safety concerns, is provided for each of the three pilot clusters evaluated. Finally, conclusions are drawn about top priorities for crash reduction based on these results, the efficacy of this method of analysis—including current limitations and opportunities for further development of data and analysis tools—is discussed, and policy implications for improving pedestrian safety in the New Orleans region are explored.

2.0 Overview of Regional Pedestrian and Bicycle Crash Statistics, 2006-2010

Following Hurricane Katrina in 2005, the population of the New Orleans metropolitan area dropped sharply. Along with this population loss, pedestrian and bicycle crashes diminished accordingly. However, as the population has returned, regional crash totals (of which crashes in Orleans and Jefferson Parish make up the overwhelming majority) have rebounded as well. This section summarizes regional crash statistics, reviews crash totals for each parish in the region, and explores geospatial crash patterns identified in Orleans and Jefferson Parishes, including crash locations.

Looking broadly at the seven-parish New Orleans metro region, we see that there has been an overall upward trend in both bicycle and pedestrian crashes during the 2006-2010 period (Figure 2). For bicycles, a steady, gradual rise in crash incidence occurred, while pedestrian trends have been somewhat less stable, with a spike in 2008 with pedestrian crashes in the region reaching 556. Notably, the years immediately following Hurricane Katrina represent data for a region in rapid transition. While these figures reflect an upward trend, they are still well below pre-Katrina crash totals, where regional bicycle and pedestrian crash totals sometimes exceeded 500 and 700 crashes per year, respectively.[2] Additional years of data are needed to better evaluate whether these figures continue to increase, or whether they have stabilized or even begun to decline.

[2] *2005 New Orleans Metropolitan Bicycle and Pedestrian Plan* (2006). New Orleans Regional Planning Commission.

Figure 2: Bicycle and Pedestrian Crashes by Year, 2006-2010

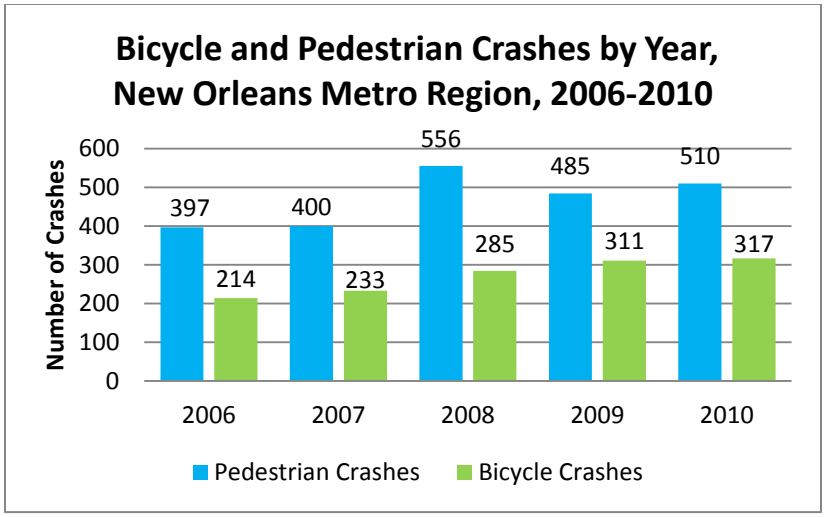
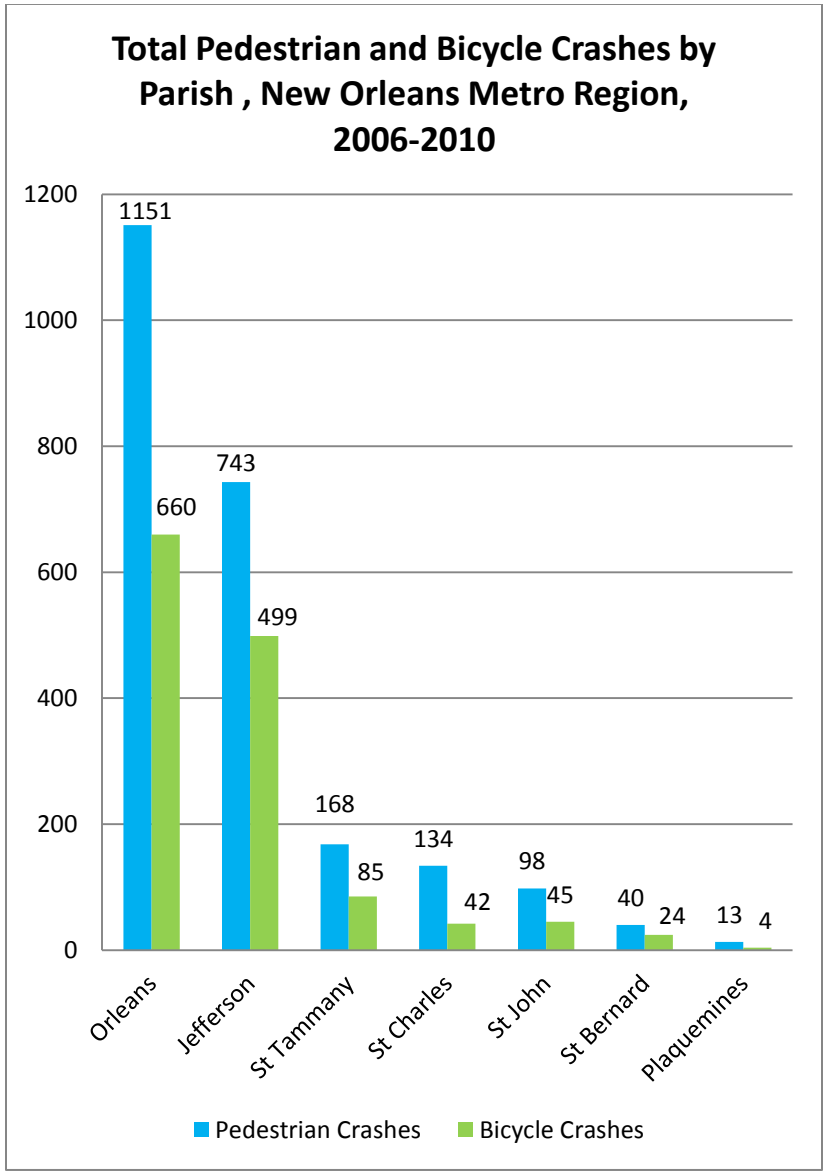


Figure 3: Total Pedestrian and Bicycle Crashes by Parish, 2006-2010



Regardless, it is clear that the region continues to have a significant bicycle and pedestrian crash problem. It is also apparent that the bulk of this crash problem is occurring in Orleans and Jefferson Parishes (Figure 3). These are the two largest parishes in the region, and also those identified as having the largest number of active transportation and transit users. Two of the three clusters evaluated in this report are in Orleans Parish, one is in Jefferson Parish.

In Orleans parish, there were a total of 1,151 pedestrian crashes, including 40 fatalities, 96 severe injuries, and 173 incidents involving children under 18[3]. There were also 660 total crashes involving bicyclists, including eight fatalities, 36 severe injuries, and 70 incidents involving children during this period. As in the region as a whole, we see sharply reduced crash numbers in 2006 and 2007 as the population returned to the city, then stabilization for pedestrians at between 250 and 300 crashes per year for 2008 to 2010, while bicycle crashes have continued to increase each year, potentially linked to the rapid increase in cycling observed in New Orleans over the last four years.[4]

Figure 4: Orleans Parish Pedestrian and Bicycle Crashes, 2006-2010

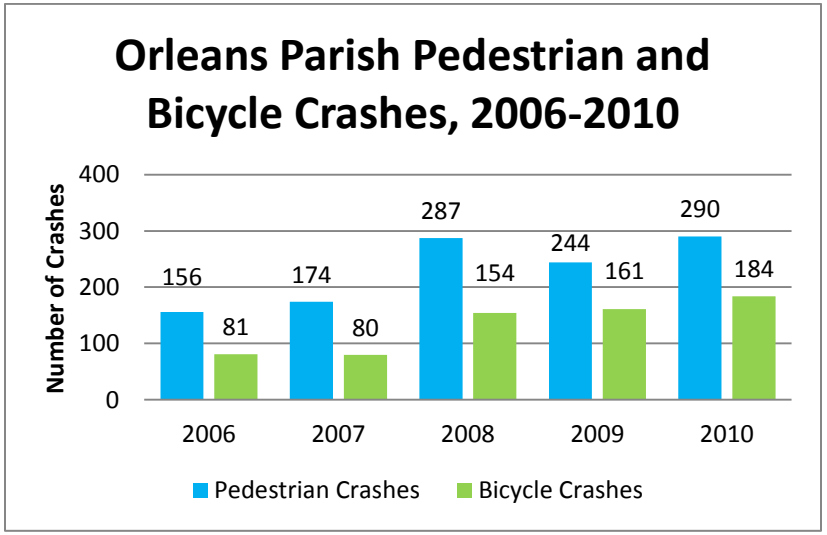


Table 1: Orleans Parish Pedestrian Crashes, 2006-2010

Orleans Parish Pedestrian Crashes, 2006-2010				
	Pedestrian Crashes	Fatalities	Severe Injuries	Children (1-17)
2006	156	0	10	17
2007	174	10	14	25
2008	287	14	27	42
2009	244	15	23	40
2010	290	1	22	49
TOTAL	**1151**	**42**	**100**	**173**

Table 2: Orleans Parish Bicycle Crashes, 2006-2010

Orleans Parish Bicycle Crashes, 2006-2010				
	Bicycle Crashes	Fatalities	Severe Injuries	Children (1-17)
2006	81	2	4	6
2007	80	2	5	10
2008	154	0	10	18
2009	161	1	10	15
2010	184	3	7	21
TOTAL	**660**	**8**	**36**	**70**

[3] Please note that slight discrepancies may exist in the severity reported for injuries from 2006-2008 due to a shift in crash analysis methodology. The injuries of individuals involved in crashes involving multiple pedestrians during this period may be less severe than reported in some cases.
[4] See: *New Orleans 2013 Pedestrian and Bicycle Count Report* (2013). Pedestrian Bicycle Resource Initiative. Available at www.pbriLA.org.

In Jefferson Parish, crash totals were below those recorded in Orleans Parish, but significantly higher than anywhere else in the region with 743 pedestrian crashes from 2006 to 2010, including 46 fatalities, 55 severe injuries, and 230 crashes involving minors. For bicyclists, there were 499 total crashes, including two fatalities, 18 severe injuries, and 140 crashes involving children. These numbers have been relatively stable for both bicyclists and pedestrians since 2006, neither increasing (as in Orleans Parish) nor decreasing substantially during this period.

Figure 5: Jefferson Parish Pedestrian and Bicycle Crashes, 2006-2010

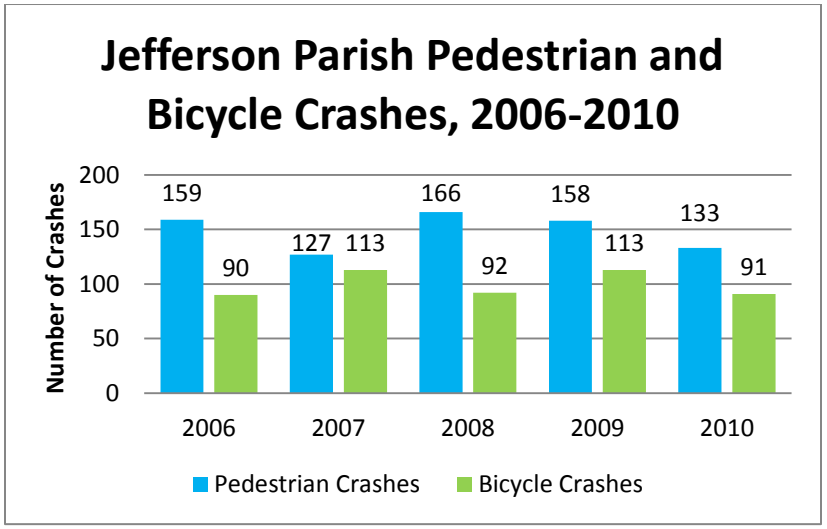


Table 3: Jefferson Parish Pedestrian Crashes, 2006-2010

Jefferson Parish Pedestrian Crashes, 2006-2010				
	Pedestrian Crashes	**Fatalities**	**Severe Injuries**	**Children (1-17)**
2006	159	10	11	53
2007	127	12	12	41
2008	166	10	12	56
2009	158	11	11	48
2010	133	3	9	32
TOTAL	**743**	**46**	**55**	**230**

Table 4: Jefferson Parish Bicycle Crashes, 2006-2010

Jefferson Parish Bicycle Crashes, 2006-2010				
	Bicycle Crashes	**Fatalities**	**Severe Injuries**	**Children (1-17)**
2006	90	1	3	25
2007	113	1	5	29
2008	92	0	5	26
2009	113	0	4	32
2010	91	0	1	28
TOTAL	**499**	**2**	**18**	**140**

3.0 IDENTIFICATION OF SPATIAL CRASH PATTERNS

As mentioned above, mapping of the crash data for this period has thus far been feasible for Orleans and Jefferson Parishes only, due to limitations in the specificity and accuracy of geospatial data for more rural parishes.[5] As technological and reporting improvements have been implemented (e.g. GPS tagging of crashes on-location), future analysis efforts should be able to map a greater extent all pedestrian and bicycle crashes in the region.

The first step in geospatial analysis of the crash data is to pinpoint the location where each crash occurred. The density of crashes makes it difficult to discern clear patterns, though some corridors emerge as potential problem areas, while other areas reflect an evident high frequency and density of crashes requiring further examination. It is important to note that each point on Figures 6 and 7 may represent more than one crash occurring at or near a given intersection.

These figures also demonstrate how pedestrian and bicycle crashes have tended to be very concentrated in New Orleans' downtown. In 2010 for example, 27% of pedestrian crashes and 17% of bicycle crashes in Orleans Parish took place in the French Quarter and CBD.[6] While these crashes tend to occur at slower speeds and include few severe crashes, this clearly indicates a safety issues for the large number of residents and visitors who walk and bike downtown.

[5] For detailed explanation of crash data analysis methodology, see Appendix 1.

[6] *New Orleans Regional Pedestrian and Bicycle Crash Report 2009-2010* (2010). Pedestrian Bicycle Resource Initiative. Available at www.pbriLA.org/research

From this data, we can also identify top crash intersections, permitting identification of locations where multiple incidents have occurred, which Figures 6 and 7 referenced above do not indicate. Few intersections were identified as frequent bicycle crash locations (due to the more dispersed, less intersection-focused nature of bicycle crash types), but several intersections do emerge as top problem points for pedestrian crashes, as listed in Tables 5 and 6. Of these, one (Williams Boulevard at Airline Drive) is evaluated within the multi-tool analysis below. The rest should be the subject of further evaluation and possible infrastructure intervention in order to prevent future occurrences.

Table 5: Top Pedestrian Crash Intersections, Orleans Parish, 2006-2010

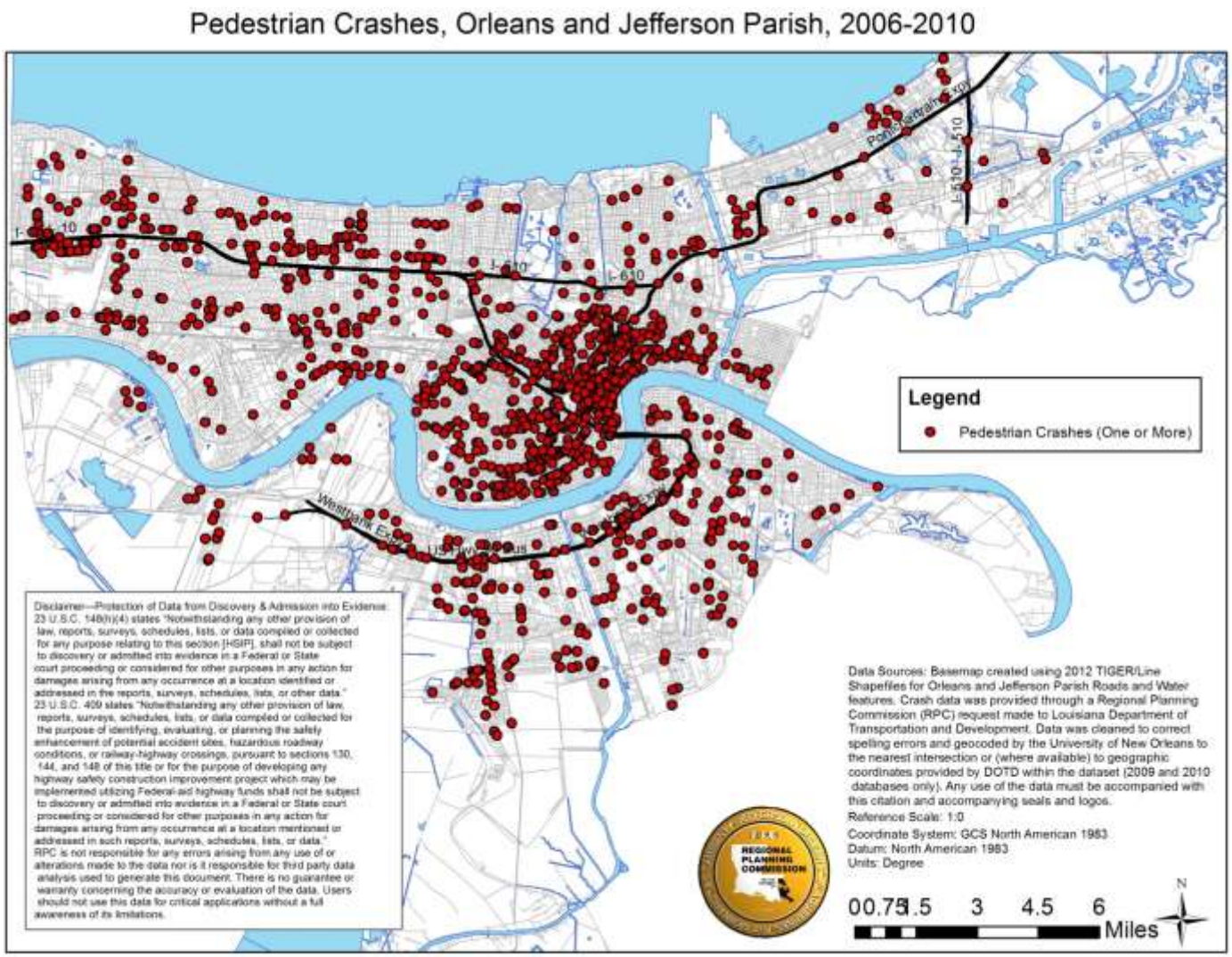
Top Pedestrian Crash Intersections, Orleans Parish, 2006-2010	
Intersection	Number of crashes, 2006-2010
Canal St and Bourbon St/Carondelet St	18
Claiborne Ave and Esplanade Ave	6
Claiborne Ave and Carrollton Ave	6
Claiborne Ave and Leonidas St	6
St Claude Ave and Clouet St	6

Table 6: Top Pedestrian Crash Intersections, Jefferson Parish, 2006-2010

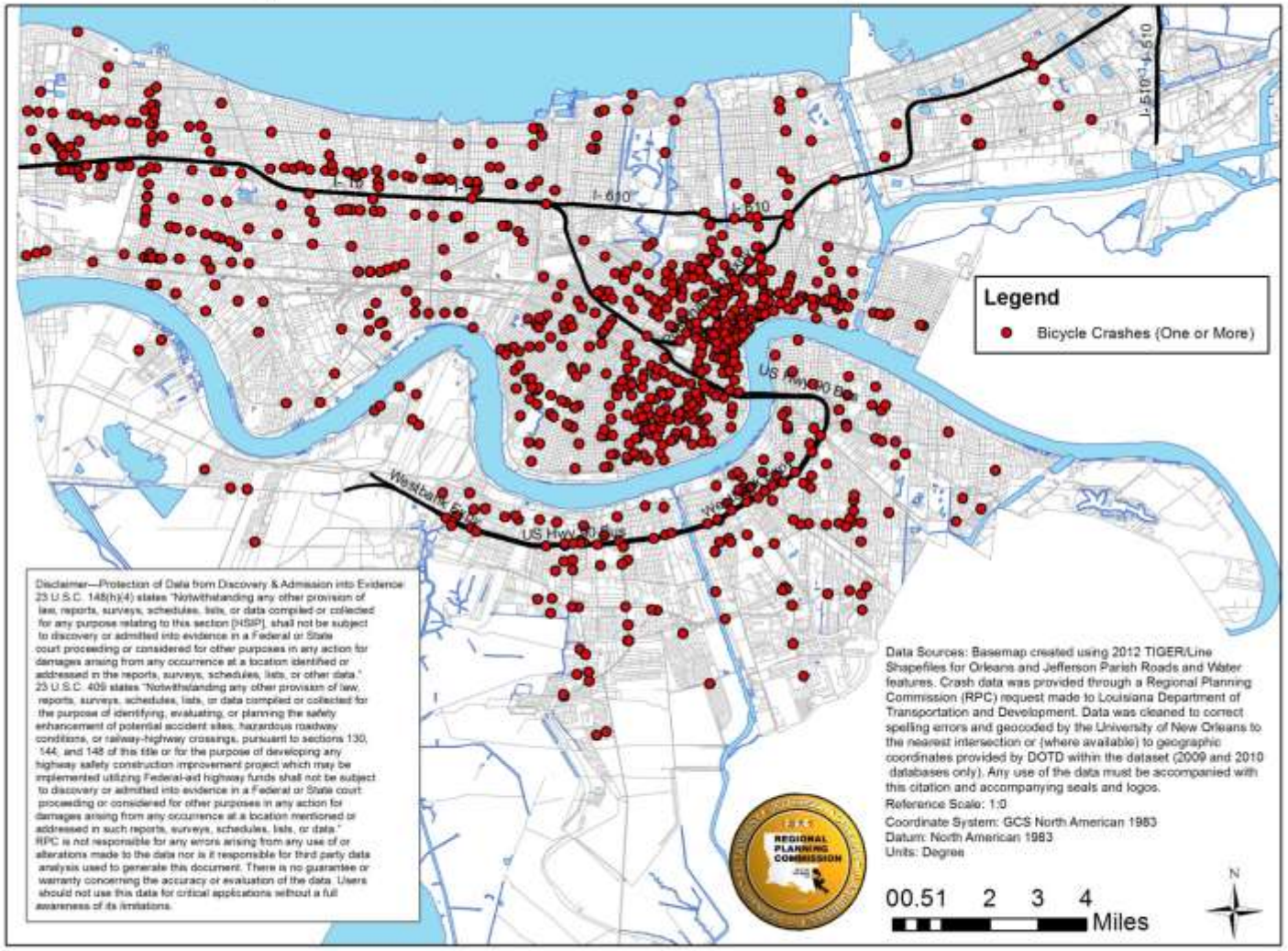
Top Pedestrian Crash Intersections, Jefferson Parish, 2006-2010	
Intersection	Number of crashes, 2006-2010
Westbank Expy and Stumpf Blvd	6
Veterans Blvd and Downs Blvd	5
Williams Blvd and Airline Dr	5
Veterans Blvd and Causeway Blvd	4

Veterans Blvd and David Dr	4

Figure 6: Pedestrian Crashes, Orleans and Jefferson Parish, 2006-2010



Bicycle Crashes, Orleans and Jefferson Parish, 2006-2010



Looking

at crash distribution at the corridor level (although these crash totals have not been normalized to reflect varying corridor lengths), evaluation of crash frequency reveals that there are several problematic arterial roadways in both Orleans and Jefferson Parishes that may have systemic safety issues for pedestrians and bicyclists that need to be addressed (Tables 7 through 10).

Table 7: Top Pedestrian Crash Corridors, Orleans Parish

Top Pedestrian Crash Corridors, Orleans Parish, 2006-2010		
Rank	Corridor	Number of crashes, 2006-2010
1	N/S Claiborne Ave	86
2	Canal St	78
3	St. Charles Ave	54
4	Iberville St	41
5	Magazine St	39
6	Royal St	38
7	Bourbon St	36

Table 8: Top Bicycle Crash Corridors, Orleans Parish

Top Bicycle Crash Corridors, Orleans Parish, 2006-2010		
Rank	Corridor	Number of crashes, 2006-2010
1	N/S Claiborne Ave	54
2	Canal St	44
3	St. Charles Ave	42
4	St. Claude Ave	25
5	Elysian Fields Ave	22
6	Esplanade Ave	22
7	Magazine St	22
8	N/S Broad St	19

Table 9: Top Pedestrian Crash Corridors, Jefferson Parish

Top Pedestrian Crash Corridors, Jefferson Parish, 2006-2010		
Rank	Corridor	Number of crashes, 2006-2010
1	Veterans Blvd	62
2	Westbank Expy	36
3	Airline Dr/Hwy	31
4	Ames Blvd	24
5	Jefferson Hwy	24
6	Williams Blvd	22
7	West Esplanade Ave	21

Table 10: Top Bicycle Crash Corridors, Jefferson Parish

Top Bicycle Crash Corridors, Jefferson Parish, 2006-2010		
Rank	Corridor	Number of crashes, 2006-2010
1	Veterans Blvd	50
2	Westbank Expy	37
3	Williams Blvd	31
4	Airline Dr/Airline Hwy	26
5	Loyola Dr	21
6	West Esplanade Ave	20
7	Jefferson Hwy	20
8	West Napoleon Ave	19

Next, it is important to more closely examine crash severity as a means to prioritize potentially hazardous intersections, corridors, or nodes. Figures 8 and 9 represent pedestrian and bicycle crashes by severity, respectively, while figures 10 and 11 highlight only crashes resulting in fatalities or severe injuries. Region-wide, roughly 65% of pedestrian crashes and 50% of bicycle crashes during the 2006-2010 period resulted in little or no injury. On the other hand, 134 pedestrians and 17 bicyclists died in crashes in the region, while another 61 bicyclists and 191 pedestrians sustained severe injuries. This represents 21% of all bicycle and 27% of all pedestrian fatalities in the state during those five years.[7] Of these, a total of 89 pedestrian fatalities, 156 pedestrian severe injuries, 10 bicyclist fatalities, and 54 bicyclist severe injuries took place in Orleans and Jefferson Parishes.

Finally, the last level of analysis for pedestrian and bicycle crashes is to identify statistically significant clusters of crashes, where a higher number of incidents have occurred than could be expected by change during the study period. This technique, using the Spatial and Temporal Analysis of Crime (STAC) tool from CrimeStat (US Department of Justice) is employed, to map these statistically significant crash "hot spots."[8] This analysis identifies 20 clusters each of bicycle and pedestrian crashes throughout the East Bank Core[9] of Orleans and Jefferson Parishes. The STAC output includes a rubric for determining the statistical significance of each of these clusters, based on either the number of crashes or the density of crashes.

For pedestrian crashes during the 2006-2010 period, 15 of the 20 clusters produced are significant at the 95% confidence level. All fifteen are significant based on the number of points (crashes) identified; three (clusters 1, 3, and 15) are also significant based on the density of the cluster (Figure 12, Table 11, and Appendix 2). Most of these clusters are located near the downtown core of the city, with a few more clusters in Uptown New Orleans, and one at Airline Drive and Williams Boulevard in Jefferson Parish. Three of these clusters (clusters 4, 9 and 11) were selected by the New Orleans Regional Planning Commission for further analysis in this study. Notably, spatial patterns of these crash clusters have not changed substantially since production of the *2005 New Orleans Metropolitan Bicycle and Pedestrian Plan,* which analyzed data from 1999-2002. This suggests that persistent safety problems exist in or near these clusters that should be addressed. Interventions have already taken place at some of these cluster locations; future data will reveal the impacts of those changes on crash incidence and the identification of crash clusters.

[7] Ibid.

[8] For more information on techniques for analyzing spatial statistics, including an explanation of the STAC methodology, see Chapter 7 of the Regional Planning Commission's *2005 New Orleans Metropolitan Bicycle and Pedestrian Plan,* available at www.pbriLA.org/research

[9] Due to software limitations, reliable results are only generated by excluding areas of Orleans and Jefferson Parish on the west bank of the Mississippi River or east of the Industrial Canal; the resulting area is referred to this report as the "East Bank Core" of the city.

Figure 8: Pedestrian Crashes by Severity, 2006-2010

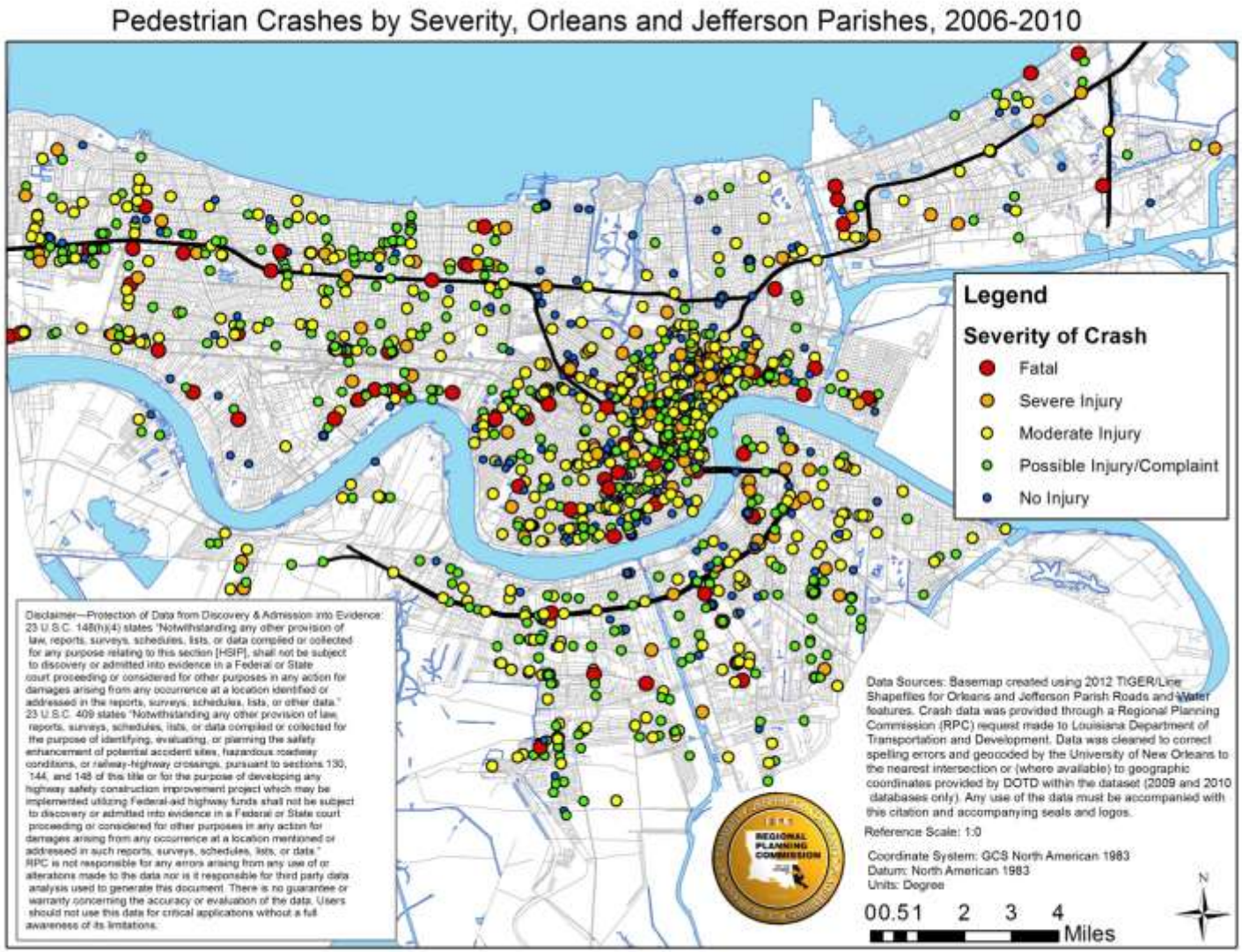


Figure 9: Bicycle Crashes by Severity, 2006-2010

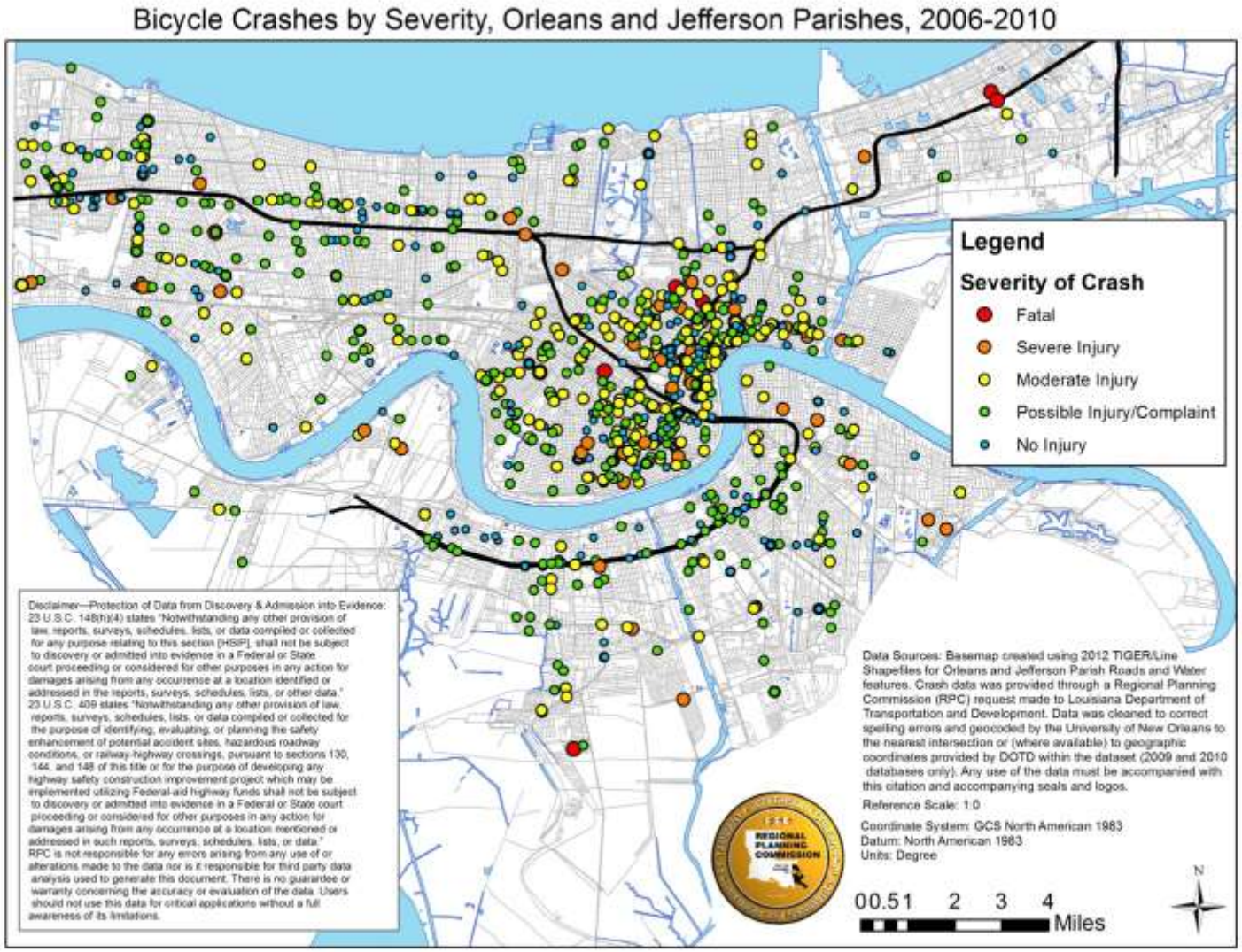


Figure 10: Fatal and Severe Pedestrian Crashes, 2006-2010

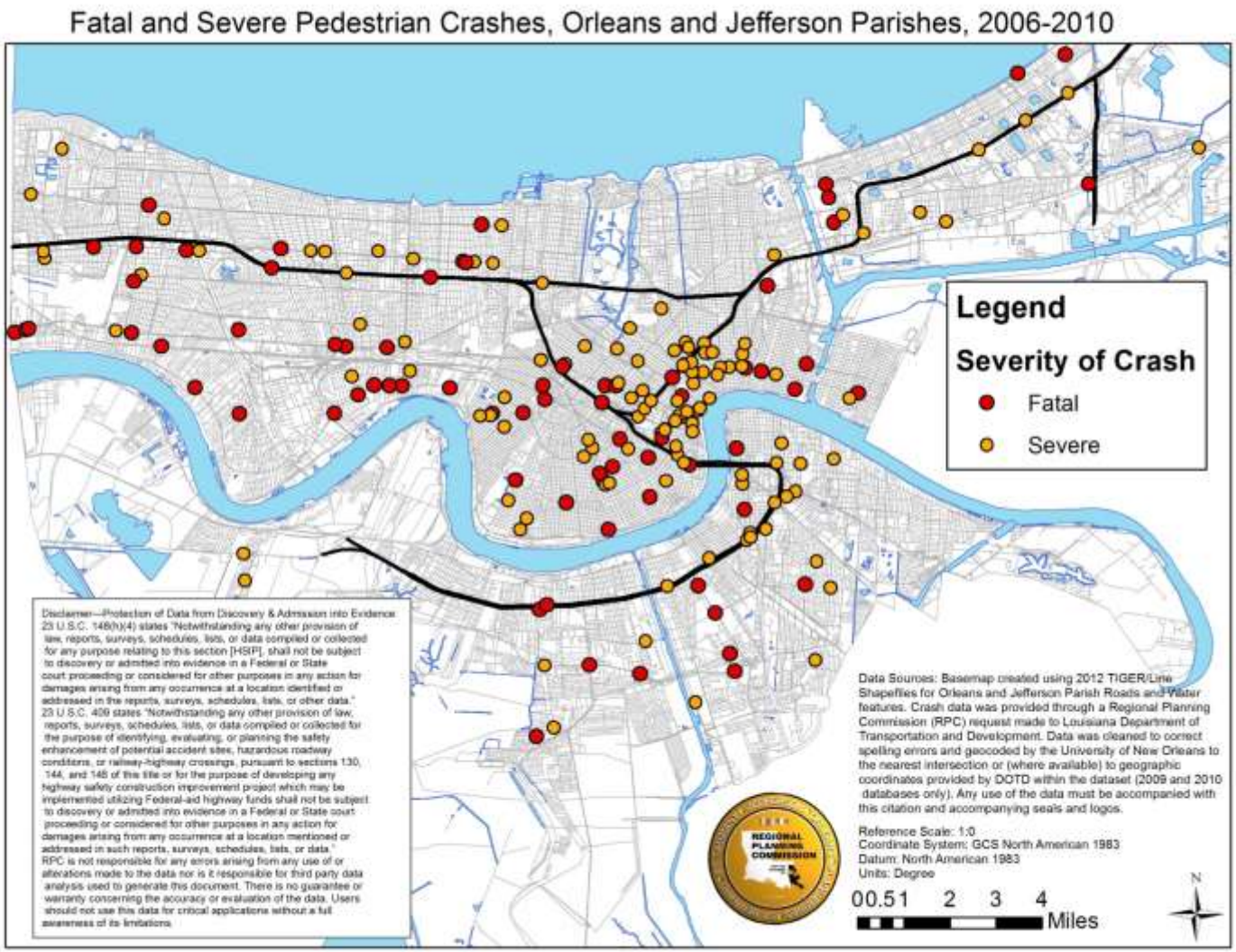


Figure 11: Fatal and Severe Bicycle Crashes, 2006-2010

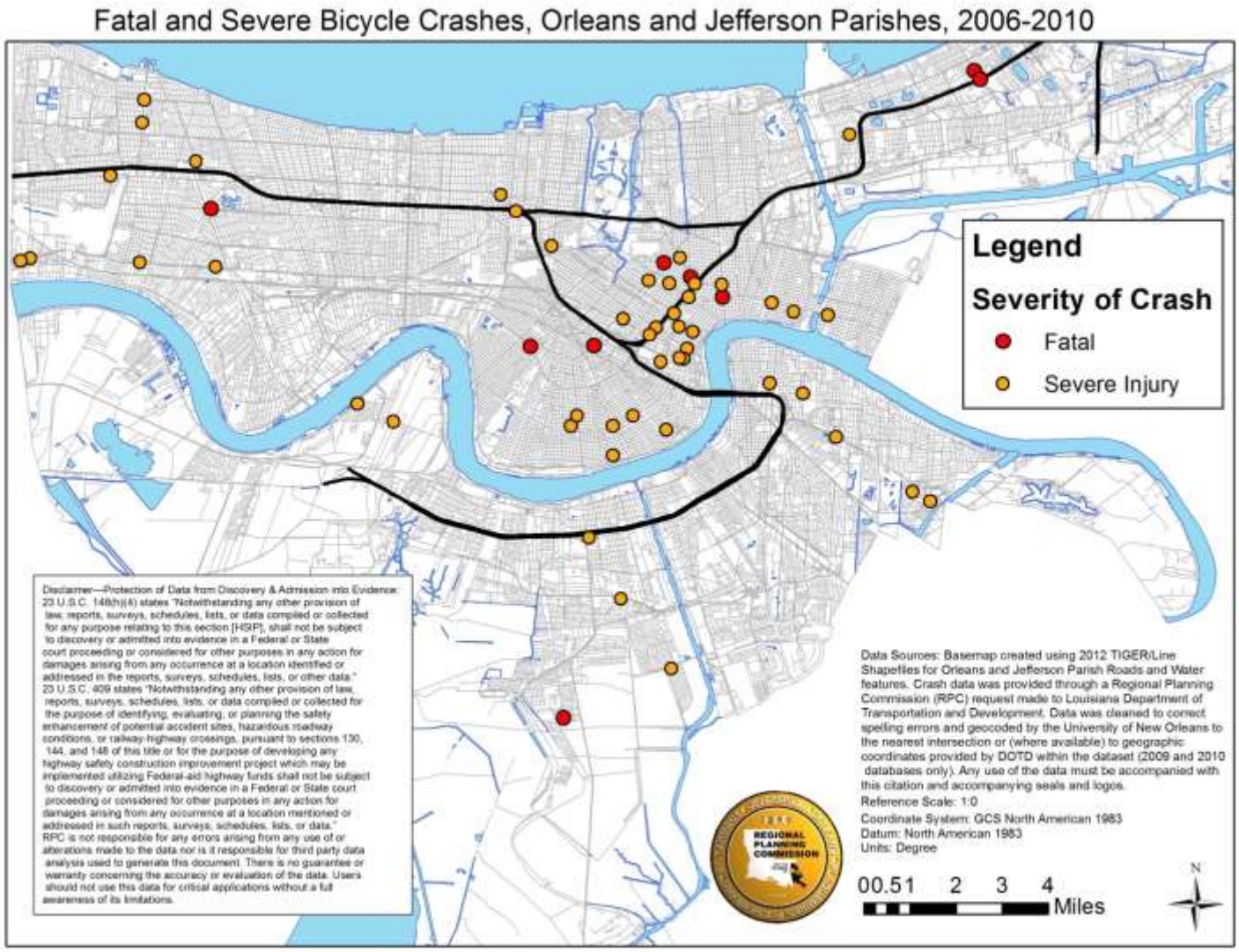


Figure 12: STAC Pedestrian Crash Clusters, 2006-2010

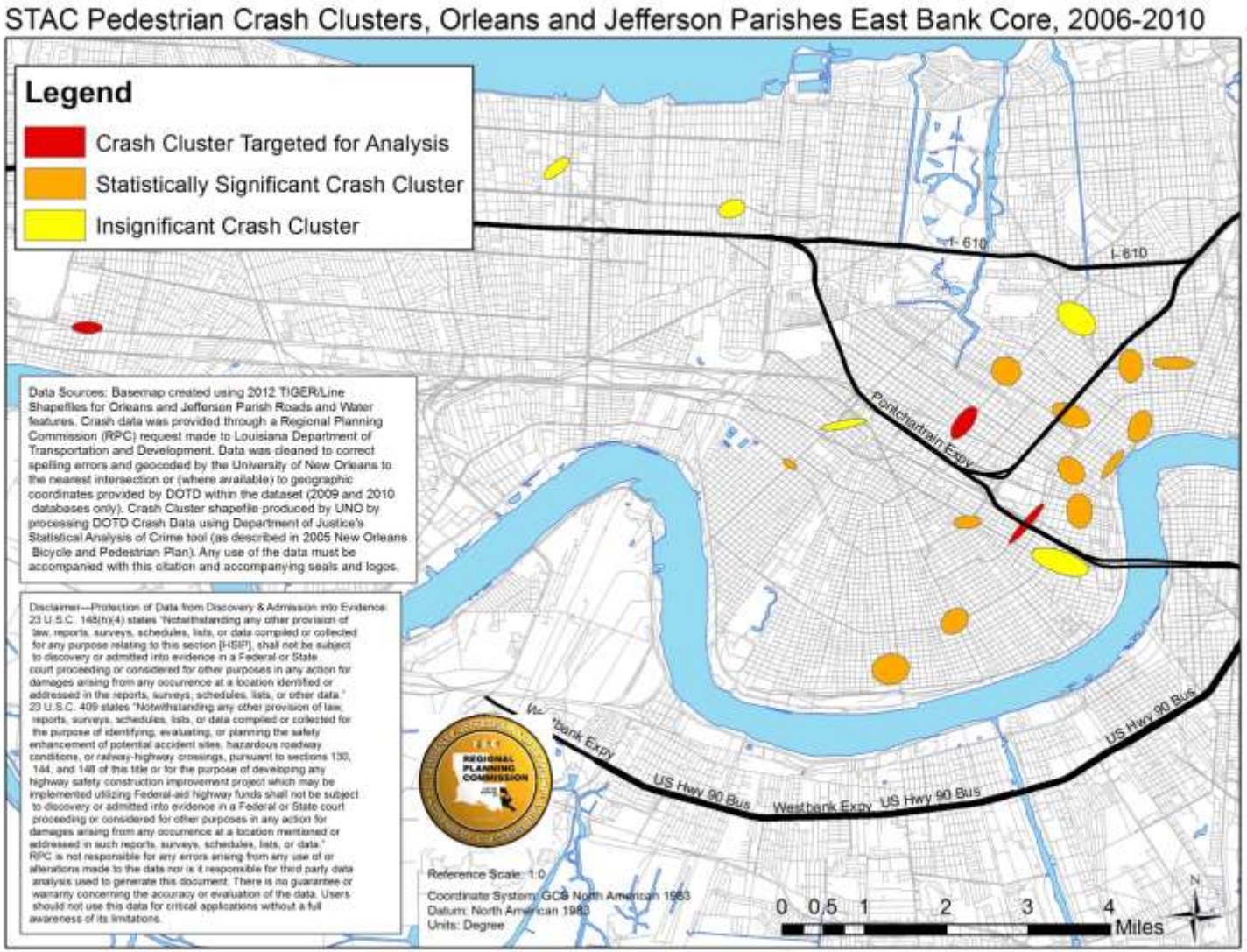
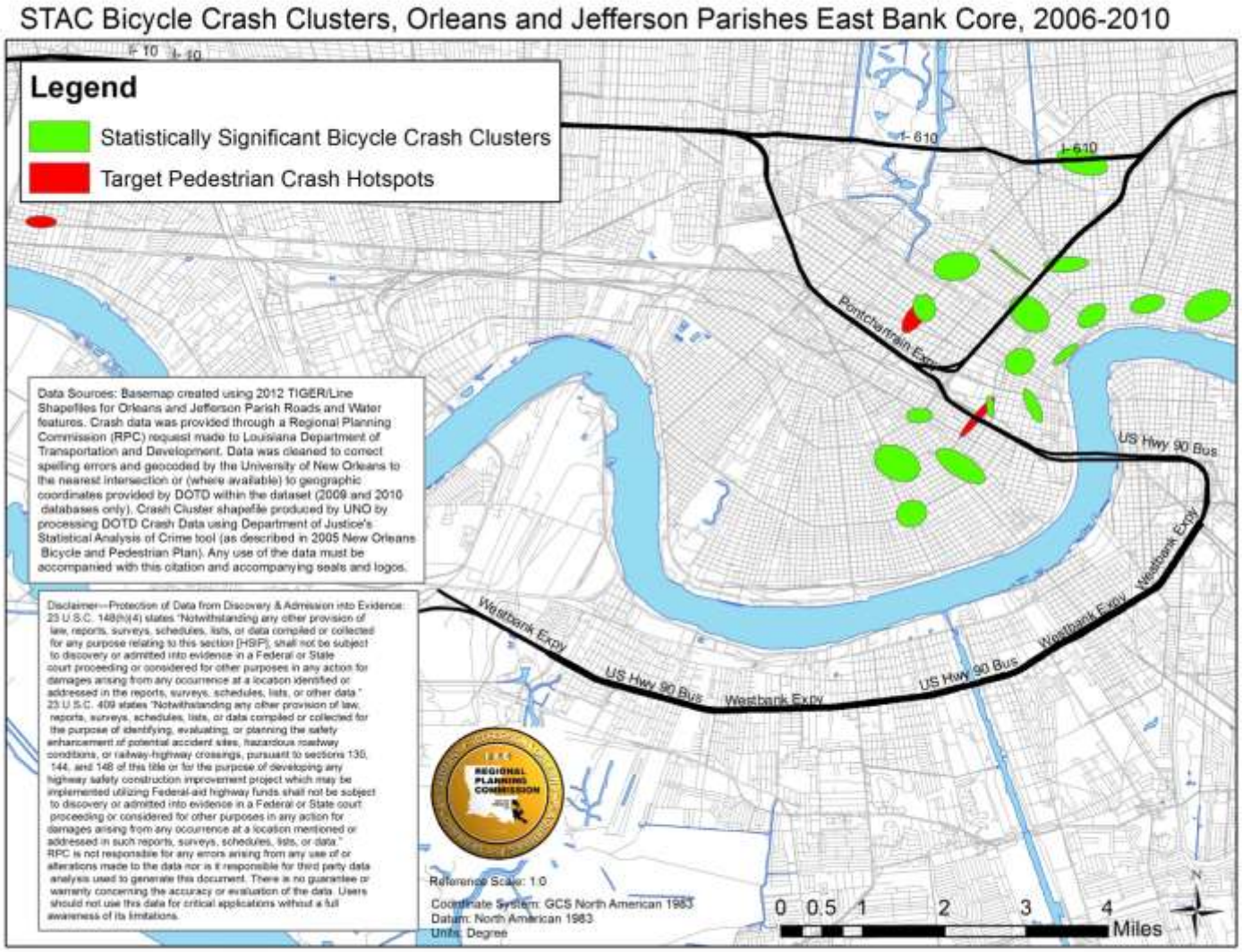


Table 11: STAC Pedestrian Crash Cluster Centers, 2006-2010

Statistically Significant Pedestrian Crash Cluster Approximate Centers, 2006-2010	
Cluster ID	*Approximate Center*
1	Canal St and Dauphine St
2	Camp St and Girod St
3	Decatur St and Toulouse St
4	S Broad St and Tulane Ave
5	Esplanade Ave and Chartres St
6	Louisiana Ave and St. Charles Ave
7	N Claiborne Ave and Pauger St
8	S Claiborne Ave and Josephine St
9	Loyola Ave and Calliope St
10	Dumaine St and N Villere St
11	Airline Dr and Williams Blvd
12	Constance St and Jena St
13	S Broad Street and Dumaine St
14	N Claiborne Ave and St Roch Ave
15	S Claiborne Ave and S Carrollton Ave

Although as noted above, this safety analysis focuses on pedestrian hot spots and crash data, statistical crash cluster analysis was also performed for bicycle crashes from 2006 to 2010. Figure 13 and Appendix 2 highlight the results. Of the 20 clusters identified, 19 of them were statistically significant at the 95% confidence level based on the number of points in the cluster. Two were significant based on cluster density. As a result, all 20 clusters identified are characterized as significant based on one of these two measures. Two of the clusters partially intersect with the pedestrian crash clusters targeted in this report, indicating that safety hazards exist in these areas for multiple types of road users.

Figure 13: STAC Bicycle Crash Clusters, 2006-2010



4.0 Pilot Multi-Tool Pedestrian Crash Cluster Analysis

Of the 15 statistically significant pedestrian crash clusters for the 2006-2010 period, three were selected for further study as test subjects for the development of an analysis methodology incorporating multiple tools and data sources. The goal of this analysis is to comprehensively evaluate contributing factors to crashes and to provide a quantitative basis for recommending safety mitigation measures. These three crash clusters were selected by the New Orleans Regional Planning Commission based on the presence of recent or planned infrastructure investment in the vicinity, overall crash severity (each of the three clusters include one or more pedestrian fatalities), and potential value to concurrent planning efforts.

Each crash cluster analysis includes the following components:

1. Evaluation of crash data from Louisiana Department of Transportation and Development, including an expanded range of attributes relative to previous crash reports,[10] for all pedestrian crashes occurring within or within ¼ mile of the boundaries of the STAC hotspot ellipse
2. Pedestrian audit survey of selected street segments and intersections in and around the cluster using the survey instruments developed by the University of New Orleans for *Auditing Neighborhoods, Streets and Intersections for Pedestrian Safety: A Toolkit for Communities* (2009)[11]
3. Collection and analysis of pedestrian and bicycle counts at two locations within the crash cluster and evaluation of automobile traffic counts where available
4. Evaluation of supplemental contextual information for the area surrounding each crash cluster, including land use and zoning patterns, transit access, and neighborhood demographics
5. A brief profile of the conditions surrounding each fatal or severe crash within the cluster
6. Recommendations for education, enforcement, and engineering solutions to mitigate observed and/or inferred pedestrian safety risks based on recommended best practices in the American Association of State Highway and Transportation Officials (AASHTO) *Guide for the Planning, Design, and Operation of Pedestrian Facilities* (2004) and the Public Rights-of-Way Access Advisory Committee's *Accessible Public Rights of Way: Planning and Designing for Alterations* 2007).

[10] For many attributes evaluated, records are incomplete for a substantial portion of crashes. Missing attributes are reported in tables and figures as "unknown," indicating either that this information was not included in the crash report or it was not accessible to the author at the time of this study. Due to the small sample sizes involved, "Unknown" attributes are included in the percentage breakdowns in this section, to reflect the potential for high margins of error resulting from the missing data.

[11] Accessible at www.pbriLA.org/research

4.1 Tulane Avenue and South Broad Street Pedestrian Crash Cluster

From 2006 to 2010, 29 pedestrian crashes occurred within ¼ mile of the crash cluster roughly centered at Tulane Avenue and South Broad Street. Distribution of these crashes by year is shown in Figure 15. On average, about a half-dozen crashes involving pedestrians occur each year. Of these 29 crashes, two were fatal, one resulted in severe or incapacitating injury, and 13 resulted in moderate injuries (Figure 14). Figure 16 illustrates the geographic distribution of these crashes by severity.

Figure 15: Pedestrian Crashes, Tulane Ave and S Broad St Crash Cluster

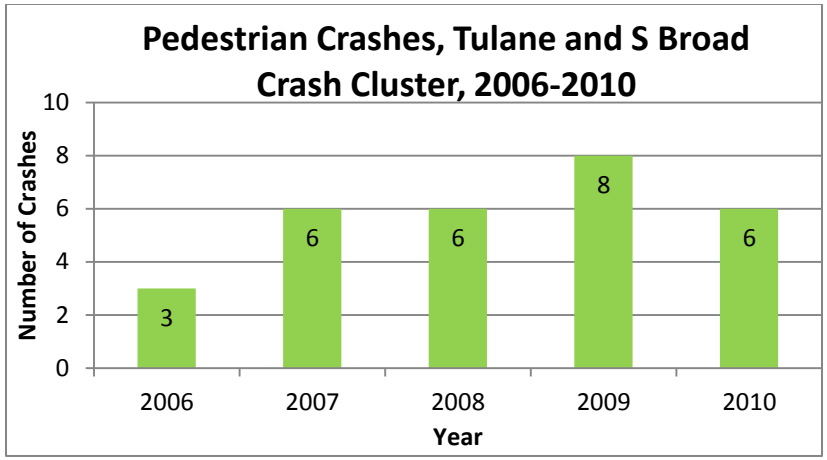


Figure 14: Pedestrian Crashes by Severity, Tulane Ave and S Broad St Crash Cluster

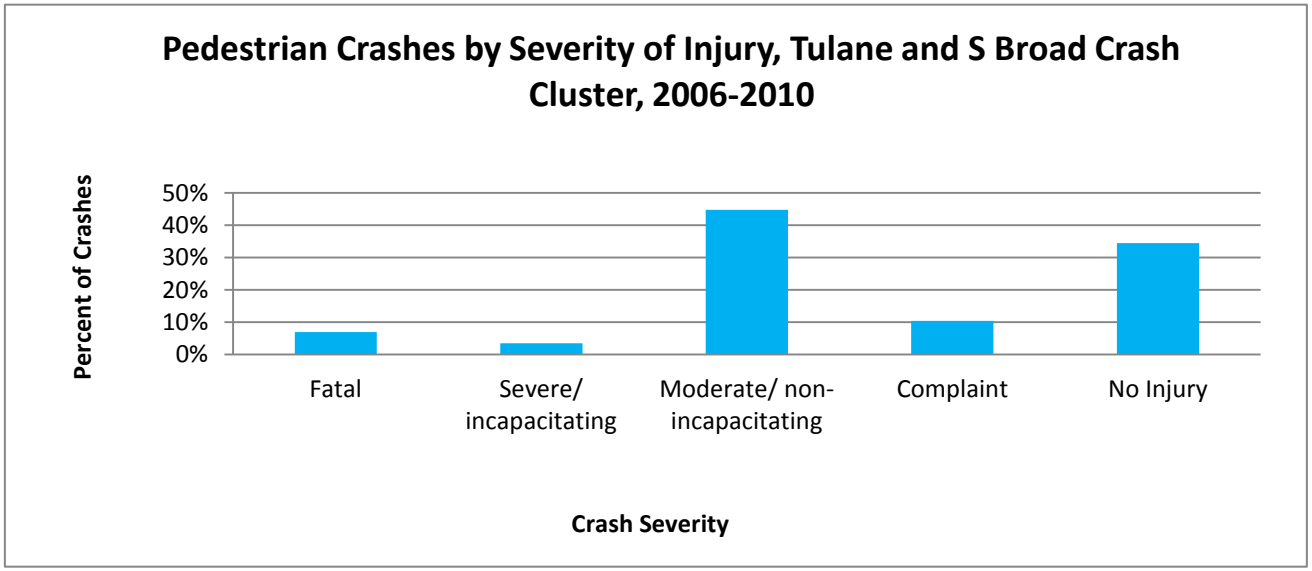
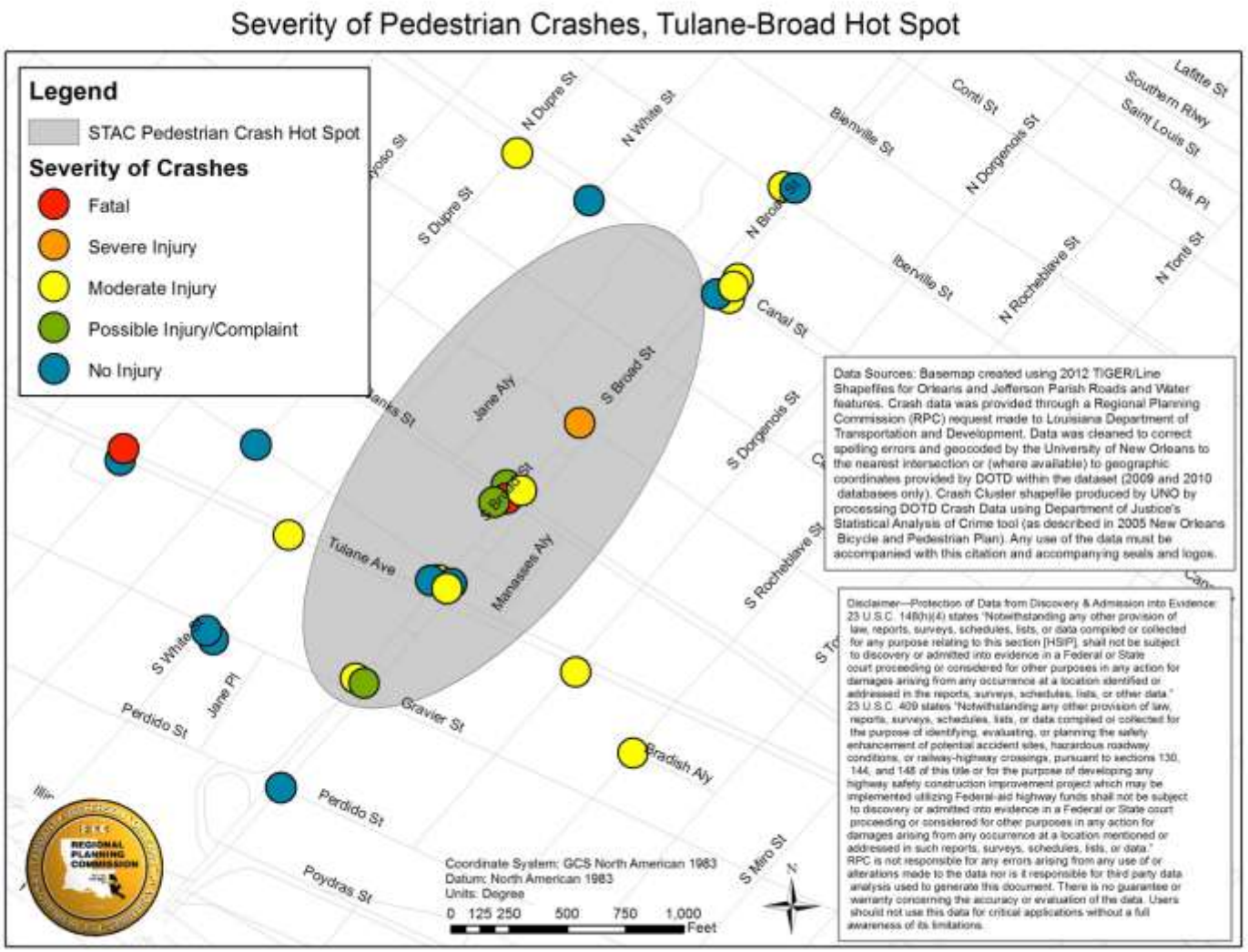


Figure 16: Severity of Pedestrian Crashes, Tulane Ave and S Broad St Crash Cluster



Temporal Factors

Figures 17, 18, and 19 show the crashes broken down by month, day of the week, and hour of the day, illustrating fewer crashes during summer months and on Sundays, and a moderate tendency toward crashes during morning and afternoon commute hours. Given the small sample size, however, these figures may not reflect distinct temporal trends.

Figure 17: Pedestrian Crashes by Hour of Day, Tulane Ave and S Broad St Crash Cluster

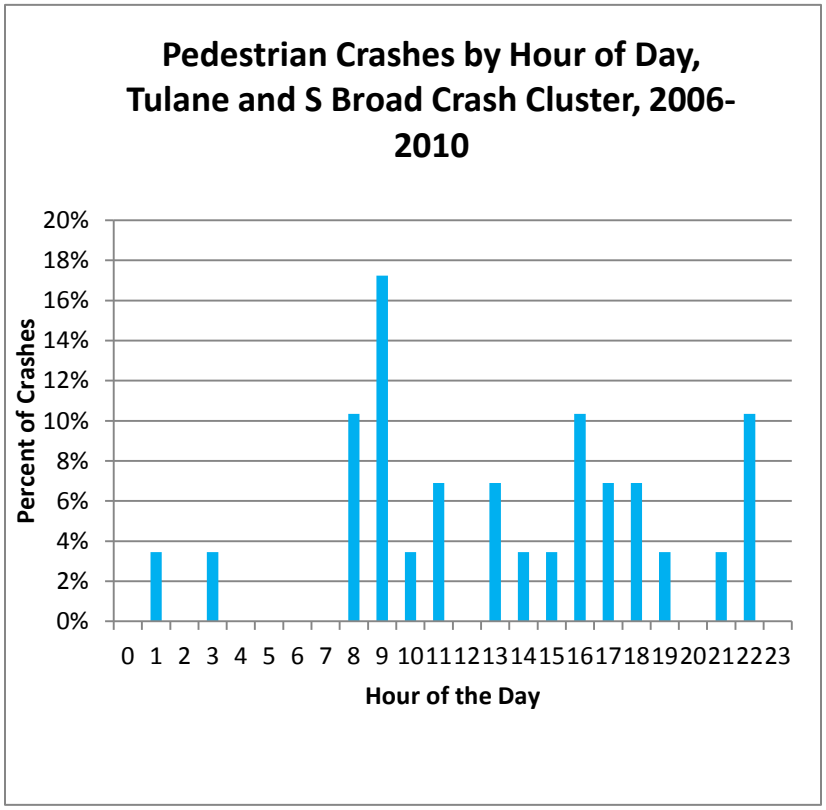


Figure 18: Pedestrian Crashes by Month, Tulane Ave and S Broad St Crash Cluster

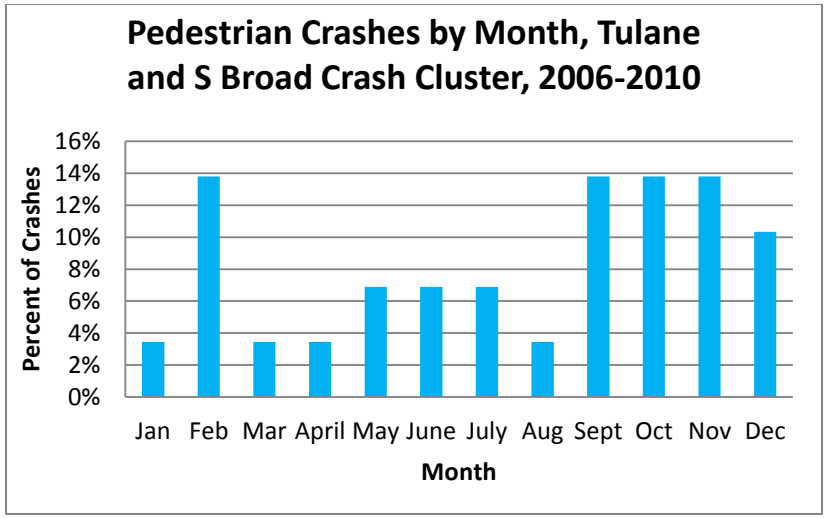
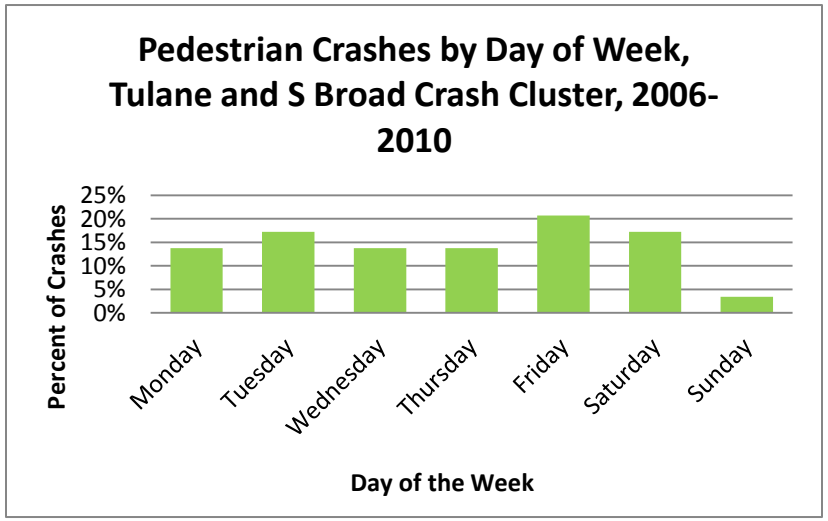


Figure 19: Pedestrian Crashes by Day of Week, Tulane Ave and S Broad St Crash Cluster



Most crashes occur during the day, and only three crashes occurred in the dark under poor street lighting conditions (Figure 20). Among crashes for which road condition was determined, almost all took place on roadways with no abnormalities (Figure 21), and all occurred during reasonably good weather conditions (Figure 22).

Figure 20: Pedestrian Crashes by Lighting Condition, Tulane Ave and S Broad St Crash Cluster

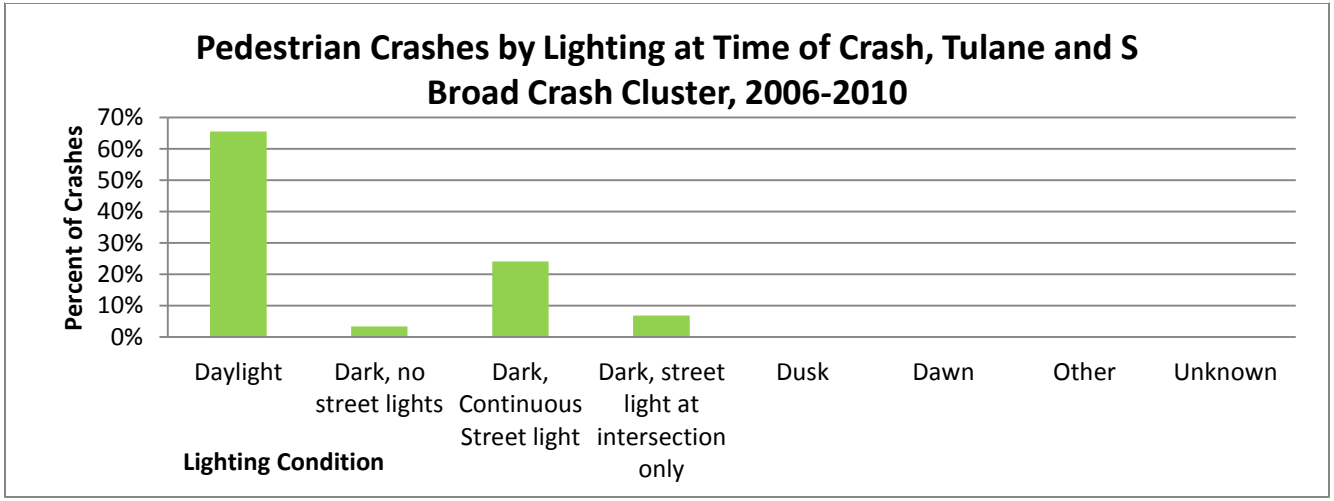


Figure 21: Pedestrian Crash Road Condition, Tulane Ave and S Broad St Crash Cluster

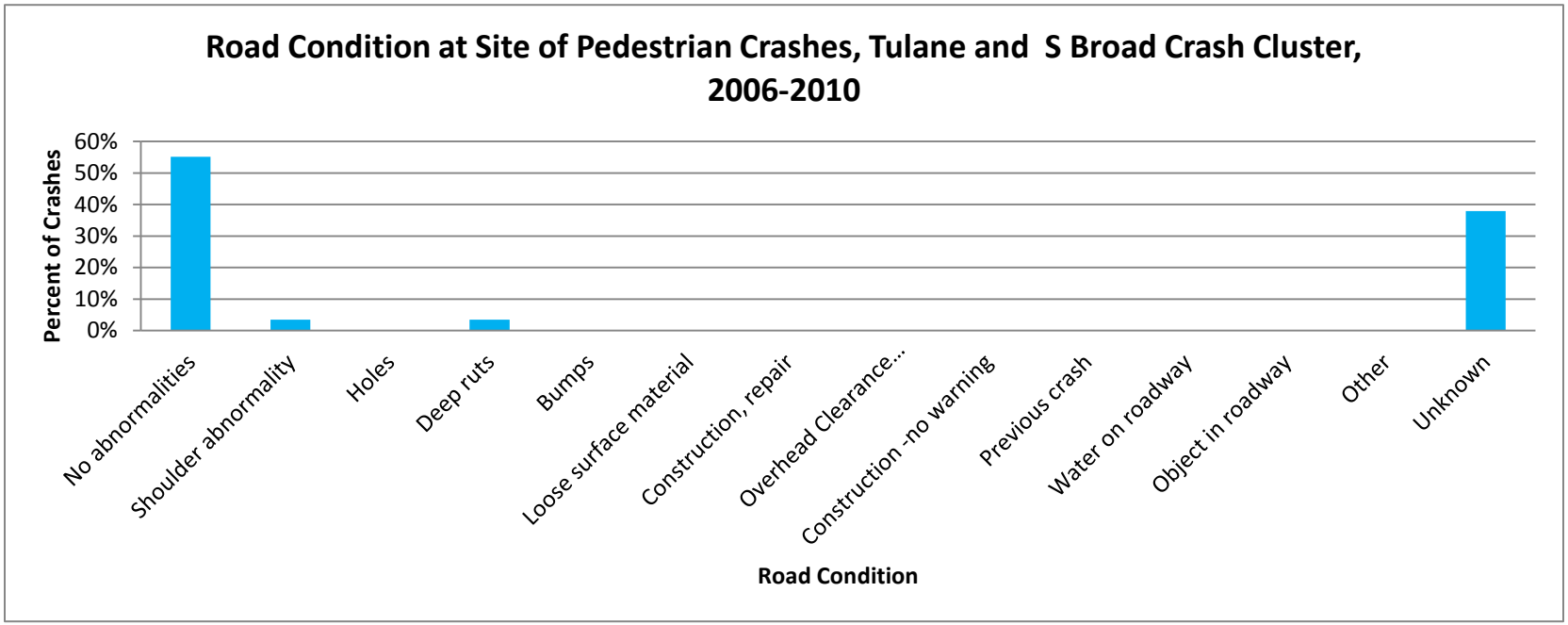
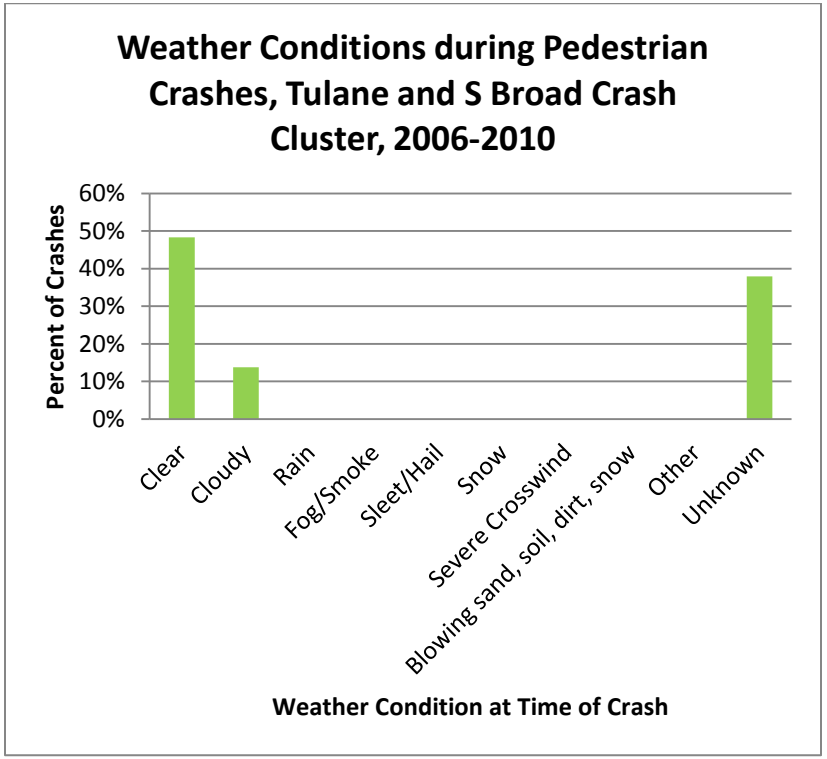


Figure 22: Pedestrian Crash Weather Conditions, Tulane Ave and S Broad St Crash Cluster



Demographic Factors

At least 10% of pedestrians involved in crashes at this location were under the age of 18, and at least one was an adult over 65 (Figure 23). A higher rate of men involved in pedestrian crashes (55%, compared to on 17% identified as female and 28% for whom sex was undetermined) is consistent with regional figures (Figure 24). More than twice as many pedestrians were identified as black than as white, a greater proportional difference than reflected in regional crash demographics (Figure 25).

Figure 23: Pedestrian Crashes by Age, Tulane Ave and S Broad St Crash Cluster

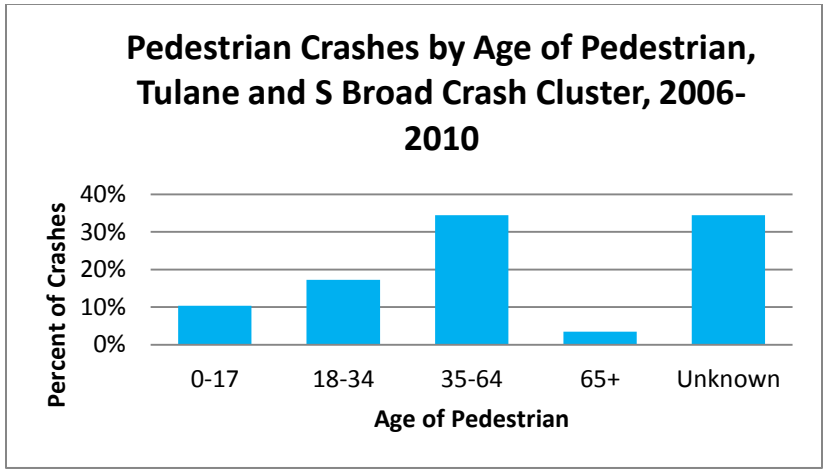


Figure 24: Pedestrian Crashes by Sex, Tulane Ave and S Broad St Crash Cluster

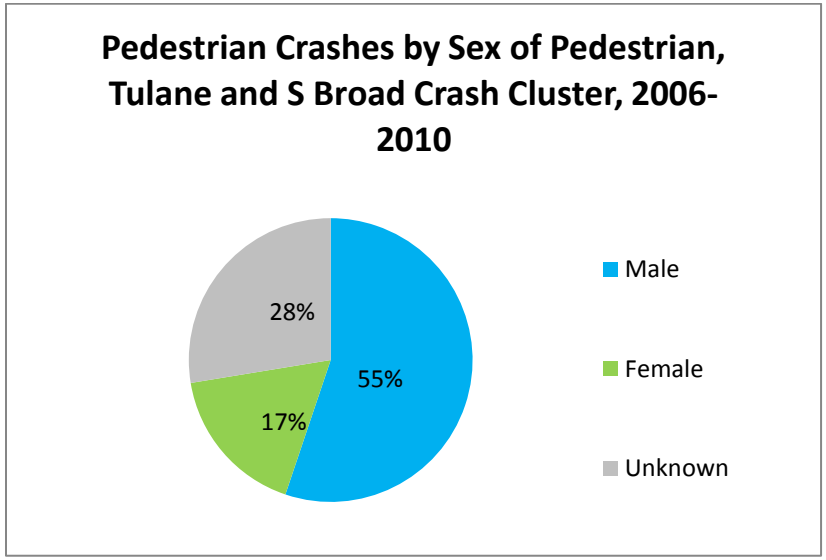
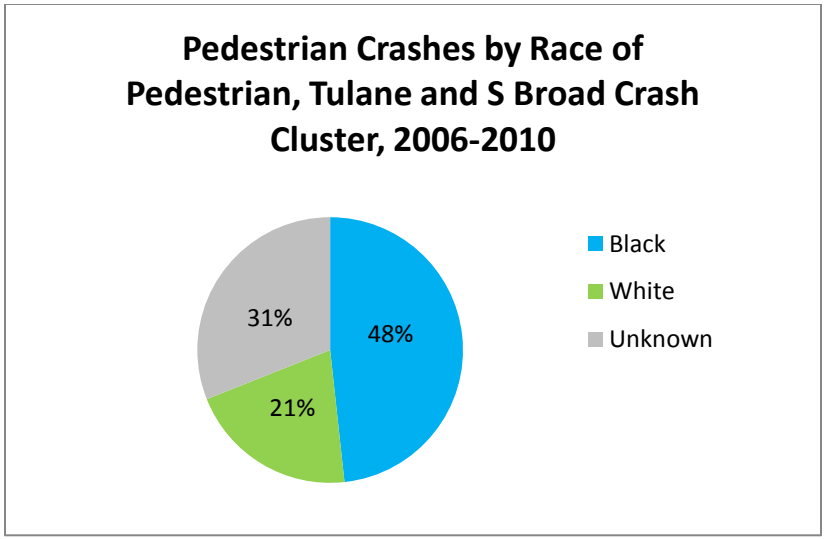


Figure 25: Pedestrian Crashes by Race, Tulane Ave and S Broad St Crash Cluster



Behavioral Factors

DOTD provides a variety of options in crash records for the primary and secondary contributing factors for crashes involving pedestrians. In most cases, these options are insufficiently specific in understanding root causes of pedestrian crashes, but where records are available, they provide valuable information (in conjunction with data about the manner of collision, violations cited, and presence of intoxicants) about the general circumstances under which crashes tend to occur at a given location. At the Tulane Avenue and South Broad Street crash cluster, primary contributing factors were unknown for 11 crash records. "Violations" were identified as the cause for eight, three were caused by "Movement prior to crash" and one by "Condition of driver." The six remaining crashes were attributed to either "Condition of pedestrian" (2) or "pedestrian actions" (4) (Figure 26). Data on secondary contributing factors is even less available; of crashes for which a secondary contributing factor is listed, pedestrian actions or condition of the pedestrian is listed for seven crash records, while movement prior to crash accounts for an additional six (Figure 27).

The manner of collision reported for pedestrian crashes provides somewhat more descriptive information regarding crash geometry, though again, this information is missing for many records in the dataset. Among those for which it is available, five crashes were identified as "non-collision with motor vehicle," four were identified as "right angle" crashes, one as a "sideswipe-opposite direction," one a "head on" collision, and seven as "other" (Figure 28). Notably, the codes for the attribute "Manner of Collision" recorded by DOTD lack specificity regarding the recognized common crash types for bicycles and pedestrians.[12] Improving the quality of this data for crashes involving bicycles and pedestrians would significantly enhance data analysis of this sort. Three of the crashes were identified as hit-and-run collisions (Figure 29), while six were reported to involve alcohol (Figure 30). No crashes in this cluster were reported to involve drug use (Figure 31).

At least nine of the crashes involved a citation for traffic violations; however crash records evaluated provide additional information only for violations involving distracted or aggressive driving. Five drivers were cited for aggressive driving, two for distracted driving, and two for both distracted and aggressive driving (Figure 32).

Information specifically pertaining to the condition or behavior of pedestrians involved in these crashes is also available for some crash records. Among those for which pedestrian actions are known, six pedestrians were struck while crossing at an intersection, four while crossing a road not at an intersection, and two while

[12] See the Pedestrian Bicycle Crash Analysis Tool (PBCAT) for a comprehensive list and diagrams of common pedestrian crash types: http://www.bicyclinginfo.org/facts/pbcat/ped_images.cfm

walking in the roadway (Figure 33). Most pedestrians involved were reported to be in "normal" condition, though one was reported as alcohol-impaired (Figure 34). One additional pedestrian involved was reported as being positive for the presence of alcohol at the time of the crash (Figure 35).

Figure 26: Primary Contributing Factors to Pedestrian Crashes, Tulane Ave and S Broad St Crash Cluster

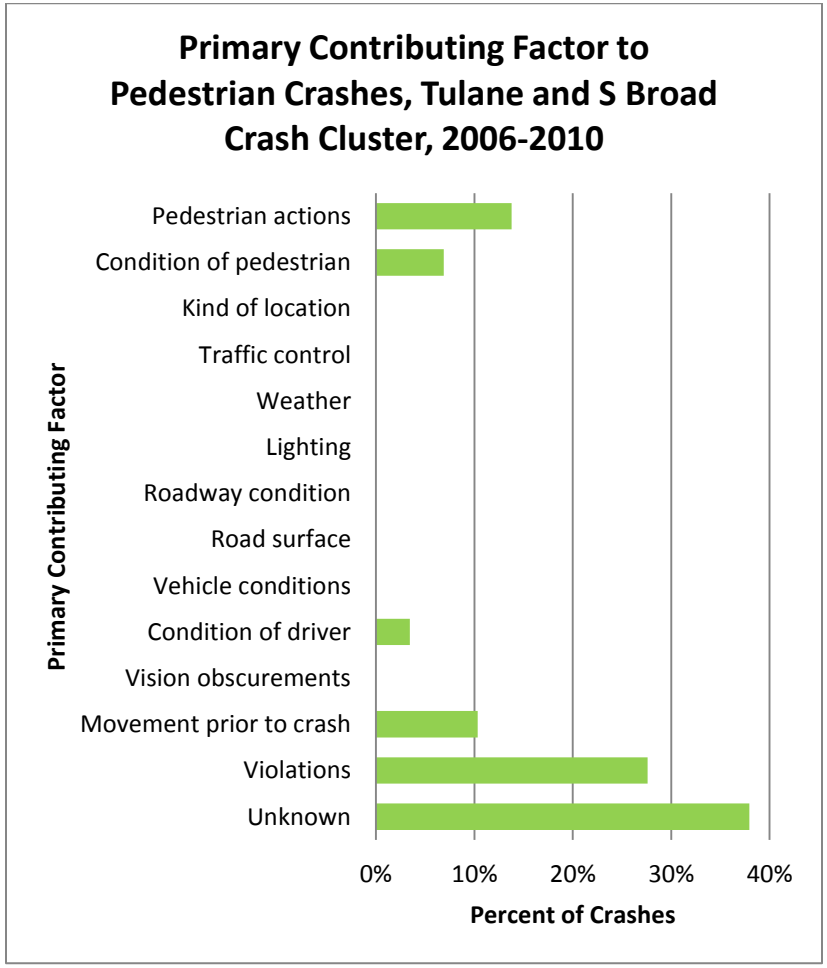


Figure 27: Secondary Contributing Factors to Pedestrian Crashes, Tulane Ave and S Broad St Crash Cluster

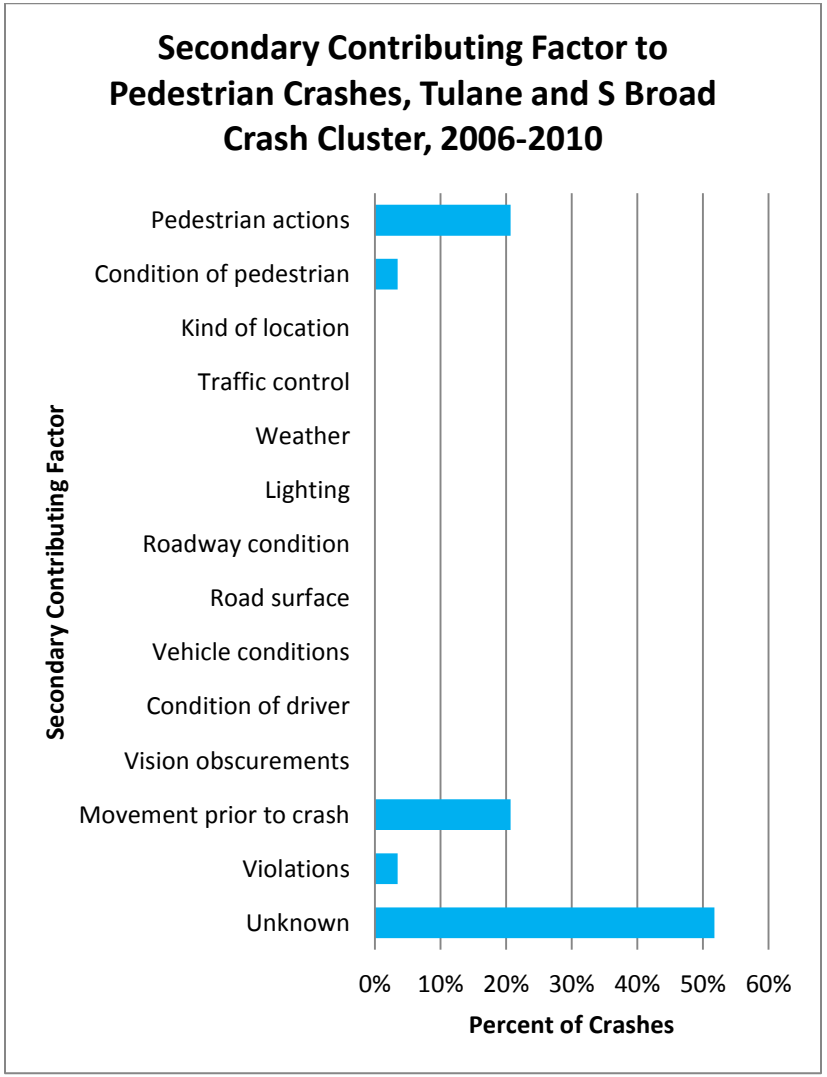


Figure 28: Manner of Collision, Tulane Ave and S Broad St Crash Cluster

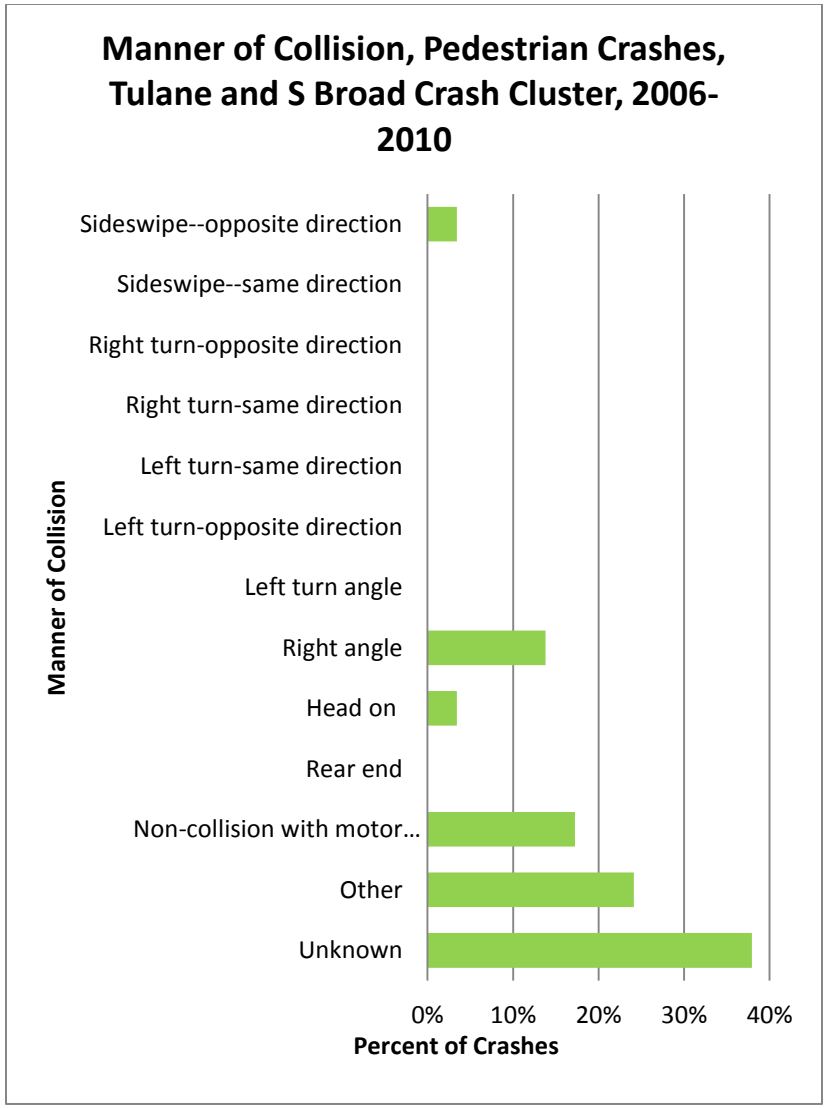


Figure 29: Hit and Run Pedestrian Crashes, Tulane Ave and S Broad St Crash Cluster

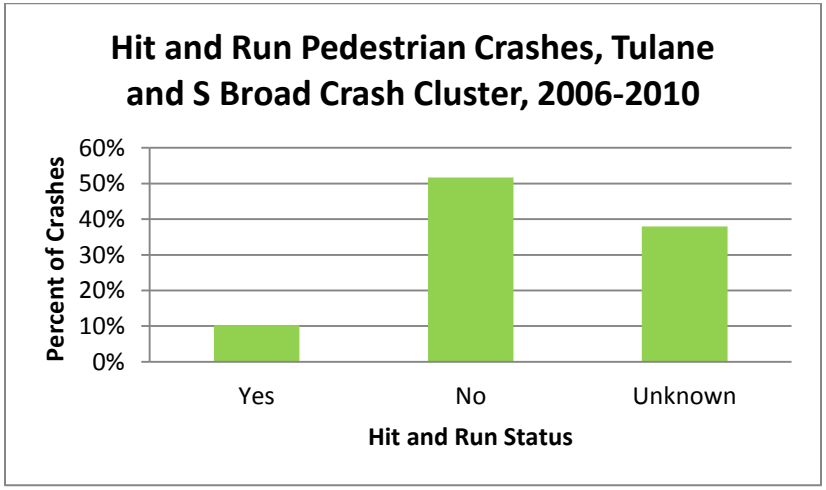


Figure 30: Pedestrian Crashes Involving Alcohol, Tulane Ave and S Broad St Crash Cluster

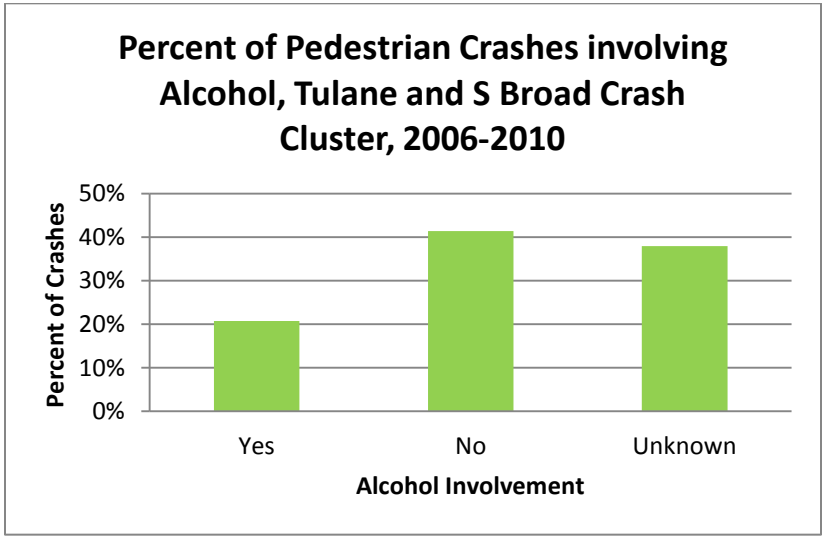


Figure 31: Pedestrian Crashes Involving Drugs Tulane Ave and S Broad St Crash Cluster

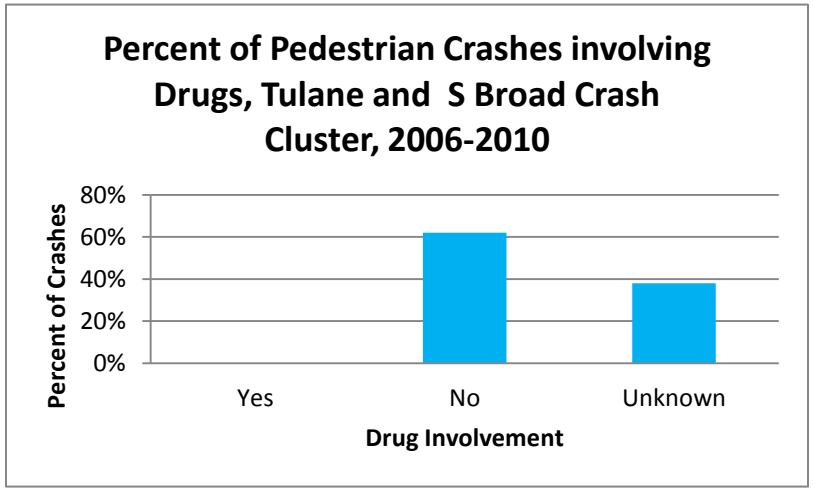


Figure 32: Aggressive and Distracted Driving Citations, Tulane Ave and S Broad St Crash Cluster

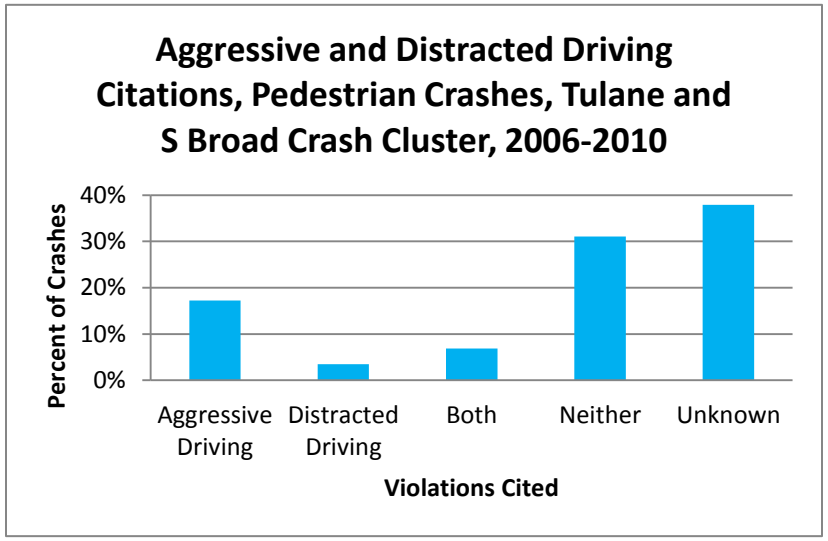


Figure 33: Pedestrian Actions at Time of Crash, Tulane Ave and S Broad St

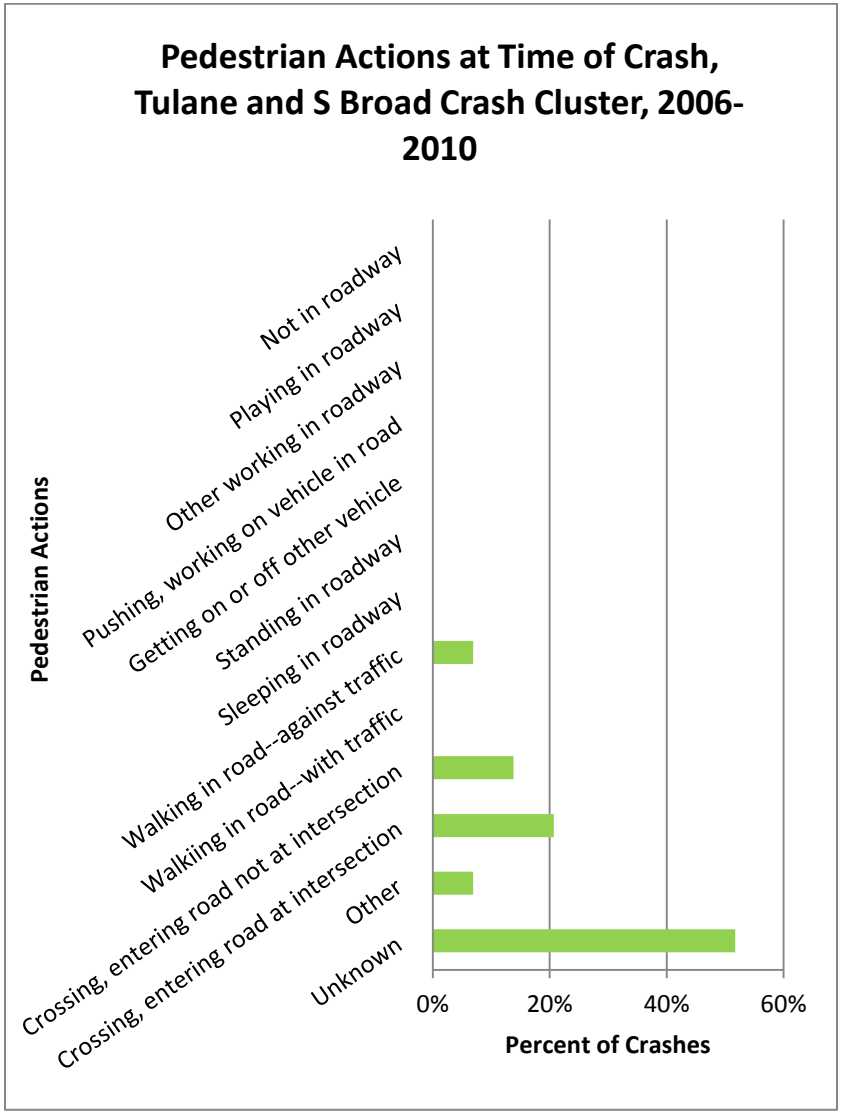


Figure 34: Pedestrian Condition at Time of Crash, Tulane Ave and S Broad St

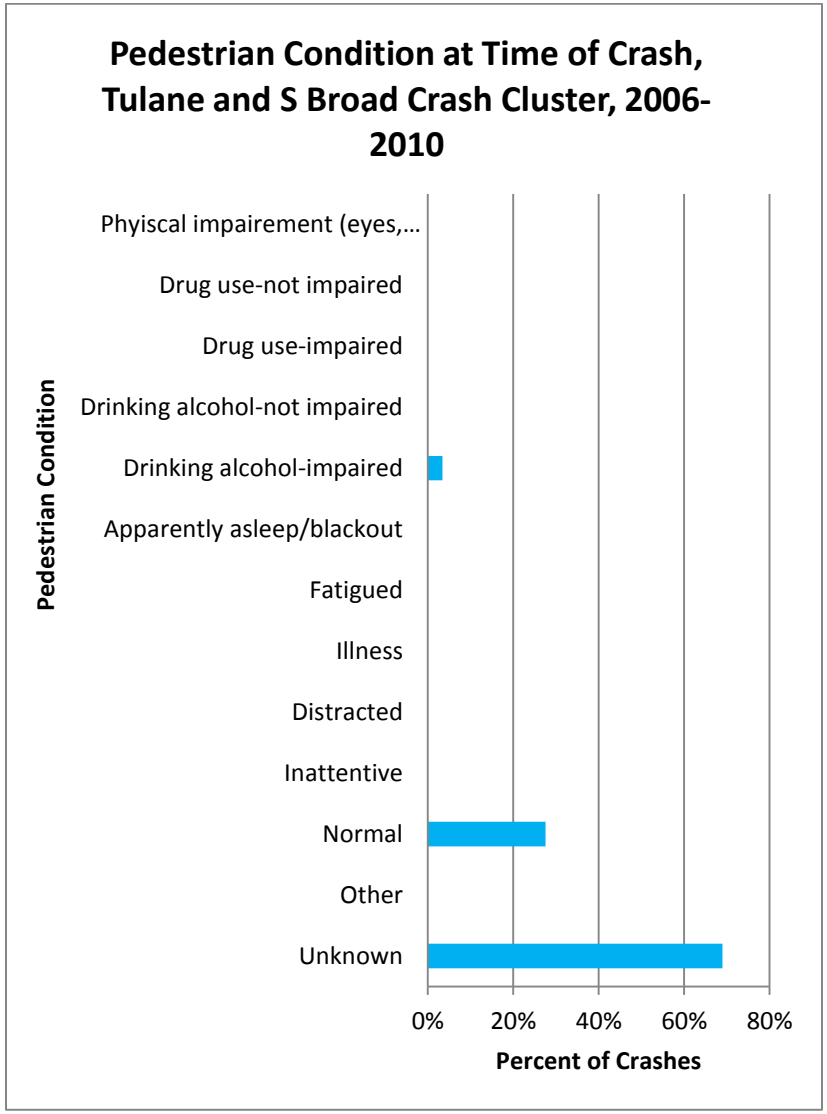
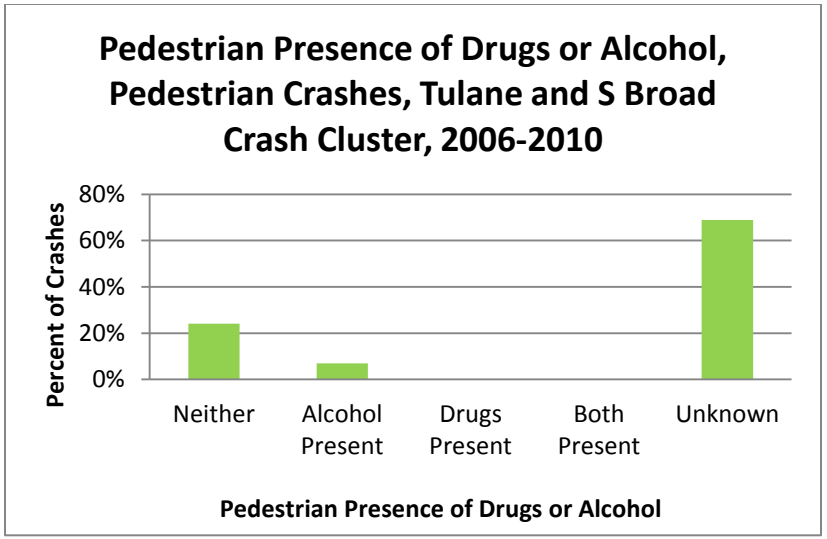


Figure 35: Pedestrian Drugs and Alcohol, Tulane Ave and S Broad St Crash Cluster



Pedestrian Street and Intersection Audit

An audit of the built environment in the vicinity of the Tulane-South Broad crash cluster, including individual sidewalk segments and multiple intersections incorporating the locations of most crashes occurring within ¼ mile of the boundaries of that cluster, was conducted in March 2013, with supplemental audits conducted in June 2013. This audit evaluated both pedestrian attractors (including land use attractors as well as infrastructure comfort and availability) and detractors (including infrastructure deficiencies, maintenance issues, and other factors known to inhibit pedestrian access) in accordance with the methodology described in *Auditing Neighborhoods, Streets, and Intersections for Pedestrian Safety: A Toolkit for Communities* (2009).[13]

Possible audit scores range from -4 to 4 (coded by color as in Figure 36 from red, indicating very poor conditions, to green) for each intersection or one-block sidewalk segment. A score of zero or below means the infrastructure is highly deficient and improvements for the safety and comfort of users are needed immediately. A score from zero to one indicates poor quality infrastructure in clear need of improvements. A score from 1 to 2 represents fair quality infrastructure; there may still be important deficiencies to address but the facility is generally functional. A score from 2 to 3 indicates a facility of reasonably good quality and safety, with only one or two detractors likely to exist. A score above three indicates a high-quality pedestrian facility that is generally free from major defects or safety issues.

At the Tulane Avenue and South Broad Street crash cluster location, audits were conducted for intersections and sidewalk segments along the major arterial corridors of the crash cluster (South Broad Street, Tulane Avenue, and Canal St) where the majority of crashes in the vicinity occurred, as well as on select streets surrounding government buildings at Tulane and South Broad. Audit results varied from a score of -2.3 to a score of 3.75, and a median score of 1.25. Four street segments and seven intersections were rated "Very Poor," 12 segments and five intersections were rated "Poor," 8 segments and 3 intersections were rated "Fair," five segments and one intersection were rated "Good," and three street segments were rated "Very Good" (Figure 36; see Appendix 3 for full audit results).

Of the two fatal crashes that occurred in this vicinity from 2006 to 2010, one occurred at a non-signalized intersection rated "Very

[13] University of New Orleans 2009. Accessible at www.pbriLA.org/research

Poor," while the other, incongruently, occurred at the highest rated intersection in the dataset, Tulane Avenue and Banks Street (although it is not known if improvements were made to this intersection subsequent to the fatality). All but one of the intersections in this audit rated "Very Poor" to "Fair," largely due to a lack of crosswalks or (at signalized intersections) pedestrian signals. In many cases, curb ramps are missing, and wait times at non-signalized intersections for safe crossing are long. At signalized intersections, signals visible to pedestrians (where present) are in some cases not working. There are no dedicated pedestrian "walk" signals present (See figures 37 – 42).

Sidewalk segment deficiencies largely consist of numerous tripping hazards, debris and overgrowth, and lack of a clear furnishing zone buffering pedestrians from the roadway or providing shade. Parking on the curb or sidewalk is common, and the pedestrian access area of the sidewalk narrows at points (particularly where bus shelters are placed), creating accessibility issues. Obstructions (including dumpsters, cars, and fencing) are frequent. Sidewalk segments along Canal Street are generally of good quality; however the intersection of Canal Street and South Broad Street shows serious deficiencies, particularly given the very high volume of pedestrians present at this location. On Tulane Avenue, sidewalk conditions are generally poor to very poor, and four of six intersections audited garnered a very poor ranking, indicating that the entire corridor may be in need of infrastructure investment in order to create a safe walking environment.

Figure 36: Pedestrian Crashes and Pedestrian Infrastructure Audit Scores, Tulane Ave and S Broad St Crash Cluster

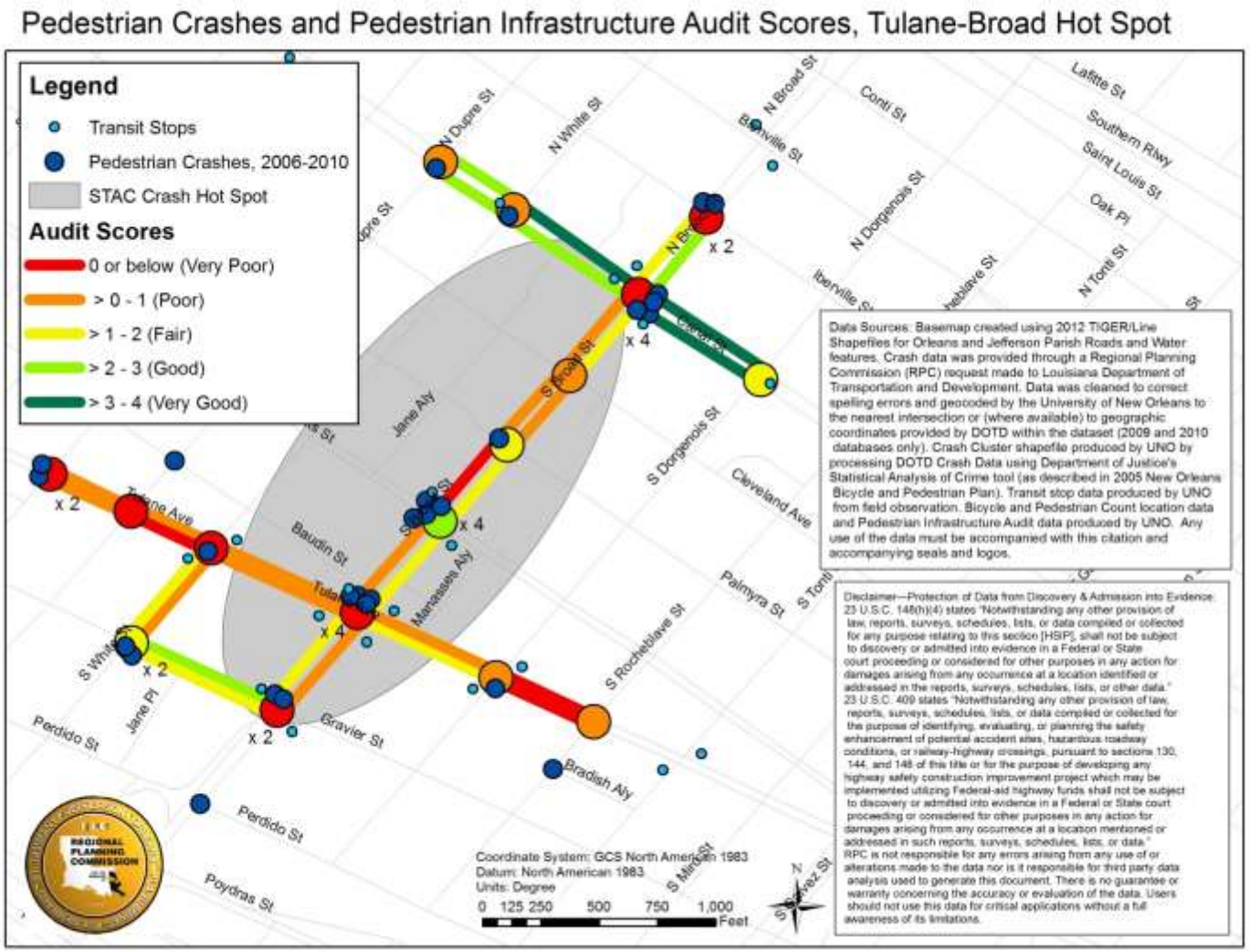


Figure 37: Audit Findings—Tulane and S Broad (1)

Narrow pedestrian access zone on South Broad Street at Canal St impedes accessibility (Photo Credit Lucien Bruno)

Figure 38: Audit Findings—Tulane and S Broad (2)

Pedestrian wait times exceed 60 seconds to cross S South Broad Street at Gravier St (Photo Credit Lucien Bruno)

Figure 39: Audit Findings—Tulane and S Broad (3)

Severe trip hazards on South Broad Street at Tulane Avenue (Photo Credit Lucien Bruno)

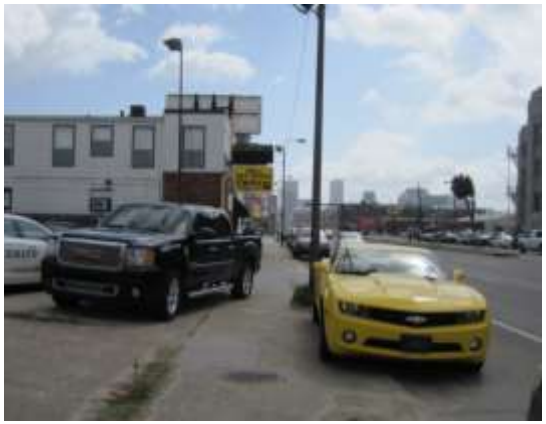
Figure 40: Audit Findings—Tulane and S Broad (4)

Crosswalks are faded and missing; curb and median lack ADA ramps at Tulane Avenue and South Broad Street (Photo Credit Lucien Bruno)

Figure 41: Audit Findings—Tulane and S Broad (5)

Sidewalks are missing or damaged on Tulane Avenue at S Dorgenois St (Photo Credit Lucien Bruno)

Figure 42: Audit Findings—Tulane and S Broad (6)



Cars frequently obstruct sidewalks on South Broad Street (Photo Credit Lucien Bruno)

Pedestrian and Bicycle Counts

Manual counts of the volume and characteristics of pedestrians and bicycles were conducted along two major streets within the STAC pedestrian crash hot spot. For this location, the counts were conducted on Tulane Avenue between South Broad Street and S Dorgenois St, and on South Broad Street between Tulane Avenue and Banks St (Figure 43). A total of eight hours of count data were collected at each location over the course of two days, in accordance with the National Bicycle and Pedestrian Documentation Project count methodology described in *New Orleans 2013 Pedestrian and Bicycle Count Report*.[14]

Compared to the median count total across 26 count sites in Orleans and Jefferson Parishes in 2013, Tulane Avenue and South Broad Street both have higher than average volumes of pedestrians, but lower volumes of bicycles relative to other sites observed (Tables 12 and 13). More male pedestrians and cyclists were observed at both locations, with a much lower proportion of female cyclists than observed in the region as a whole. A greater percentage of pedestrians and bicyclists observed were identified as black, compared to other locations in the city. As elsewhere, the vast majority of users observed at both locations were adults, and most pedestrians were observed using the sidewalk, though a greater than average percentage of pedestrians on South Broad Street (6.7%) were identified as youth 14 and under.

Compared to other locations in city and region, however, a greater proportion of cyclists were observed traveling on sidewalks rather than on-street, potentially creating an additional safety hazard for pedestrians while suggesting that on-street conditions have been deemed inadequate or unsafe by many cyclists. Rates of on-street, wrong-way travel by bicyclists are in line with observed averages.

Together, high volumes of pedestrians (an estimated 3,300 per day on these two blocks alone) paired with heavy use of sidewalks by cyclists indicates substantial demand for the existing infrastructure in this area and a justification for investments toward improving safety for all users.

[14] Accessible at www.pbrila.org/research

Figure 43: Pedestrian-Bicycle Count Locations, Tulane Ave and S Broad St Crash Cluster

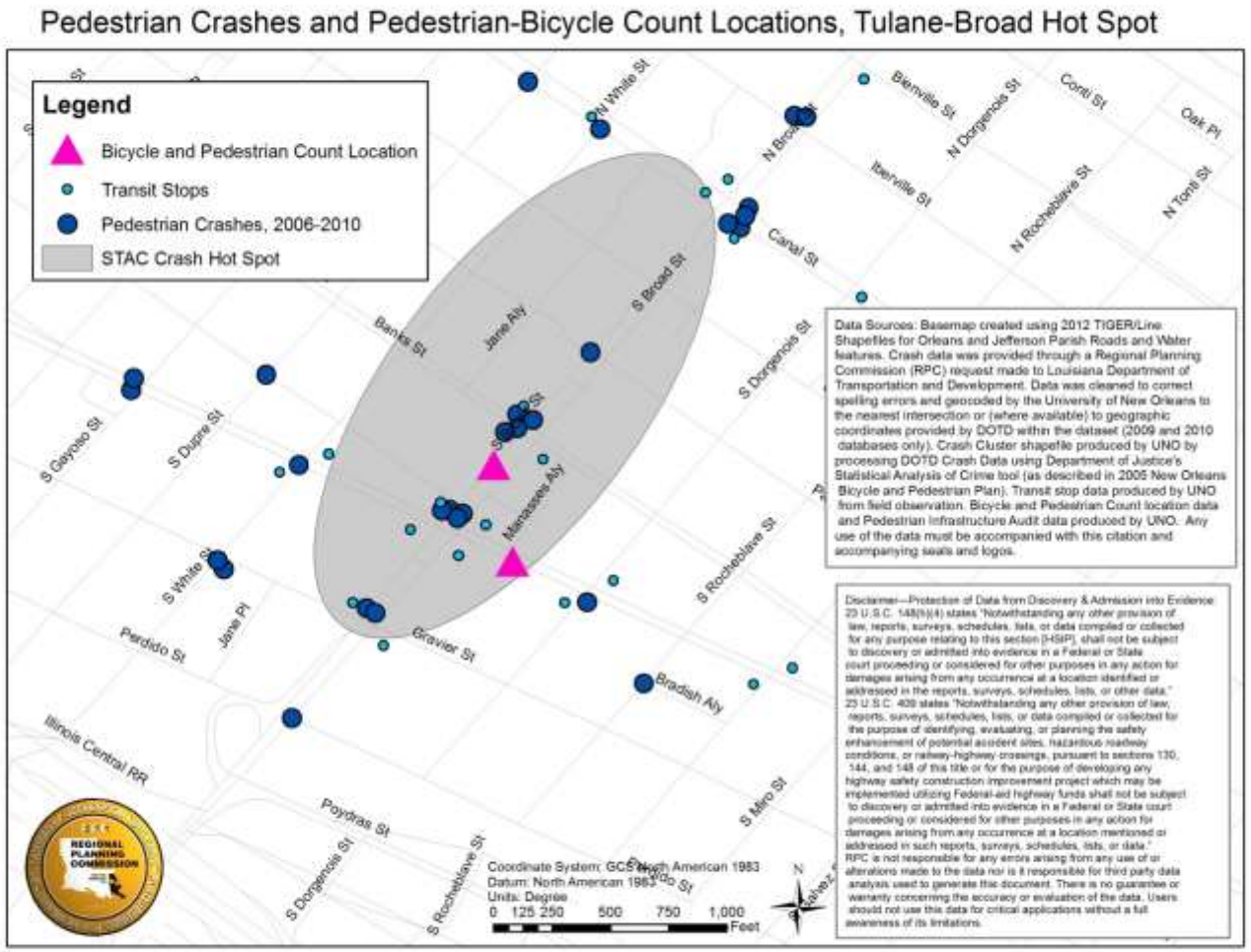


Table 12: Pedestrian and Bicycle Count Summary, Tulane Avenue

Pedestrian and Bicycle Count Summary, Tulane Avenue				
	Pedestrians		Bicycles	
	Tulane Avenue	New Orleans Average* (Observed)	Tulane Avenue	New Orleans Average (Observed)
Total Observed	**468**	**317**	**71**	**114**
Estimated Daily Traffic (EDT)	*1,731*	*928*	*263*	*392*
Gender				
Female	36.8%	40.6%	16.9%	28.7%
Male	63.3%	59.4%	83.1%	71.3%
Race				
White	29.7%	58.4%	50.7%	69.7%
Black	65.7%	36.1%	47.9%	25.7%
Other	4.7%	5.5%	1.4%	4.6%
Age Group				
Adult	96.4%	95.4%	98.6%	98.1%
Youth	3.6%	4.6%	1.4%	1.9%
Travel Orientation				
Street (Pedestrians)	4.9%	4.8%		
Street--Right Way (Bicycles)			43.7%	81.0%
Street--Wrong Way (Bicycles)			5.6%	7.0%
Sidewalk	94.9%	91.3%	50.7%	11.8%
Neutral Ground	0.2%	3.9%	0%	0.2%
Helmet Use (Bicycles)			**8.5%**	**23.0%**

Observation Dates: 3/26/13; 3/28/13

*New Orleans average figures based on median total users observed and estimated daily traffic out of 26 count sites in Orleans and Jefferson Parish, March-May 2013. Demographic and behavioral averages derived from totals at all 26 sites. See *New Orleans 2013 Pedestrian and Bicycle Count Report* for additional information.

Table 13: Pedestrian and Bicycle Count Summary, South Broad Street

Pedestrian and Bicycle Count Summary, South Broad Street				
	Pedestrians		Bicycles	
	South Broad Street	New Orleans Average* (Observed)	South Broad Street	New Orleans Average (Observed)
Total Observed	**492**	**317**	**112**	**114**
Estimated Daily Traffic (EDT)	*1,652*	*928*	*376*	*392*
Gender				
Female	34.8%	40.6%	8.8%	28.7%
Male	65.2%	59.4%	91.2%	71.3%
Race				
White	13.4%	58.4%	35.1%	69.7%
Black	79.7%	36.1%	49.1%	25.7%
Other	6.9%	5.5%	15.8%	4.6%
Age Group				
Adult	93.3%	95.4%	100.0%	98.1%
Youth	6.7%	4.6%	0.0%	1.9%
Travel Orientation				
Street (Pedestrians)	4.9%	4.8%		
Street--Right Way (Bicycles)			70.2%	81.0%
Street--Wrong Way (Bicycles)			8.8%	7.0%
Sidewalk	93.3%	91.3%	21.1%	11.8%
Neutral Ground	1.8%	3.9%	0%	0%
Helmet Use (Bicycles)			**12.3%**	**23.0%**

Observation Dates: 3/12/13; 3/14/13

*New Orleans average figures based on median total users observed and estimated daily traffic out of 26 count sites in Orleans and Jefferson Parish, March-May 2013. Demographic and behavioral averages derived from totals at all 26 sites. See *New Orleans 2013 Pedestrian and Bicycle Count Report* for additional information.

Finally, automobile traffic data for points within or near the crash cluster was collected from the Regional Planning Commission and Louisiana Department of Transportation and Development (Table 14). Table 15 relates these figures to active transportation Estimated Daily Traffic (EDT) to derive an approximate mode share for bicyclists and pedestrians (excluding transit users and high-occupancy vehicles). By this rough estimation, on Tulane Avenue between S South Broad Street and S White St, one block away from the manual count site, pedestrians constitute approximately 7.4% of traffic. On S South Broad Street between Canal St and Tulane Avenue, pedestrians make up about 6.5% of traffic.

Table 14: Automobile ADT, Tulane Ave and S Broad St Crash Cluster

Automobile Average Daily Traffic (ADT) Data, Tulane and South Broad					
Agency	**Corridor**	**Cross Street 1**	**Cross Street 2**	**Year**	**ADT**
RPC	S Broad St	Canal St	Tulane Ave	2008	23,244
RPC	Tulane Ave	S Broad St	S Claiborne Ave	2008	16,180
RPC	Tulane Ave	S Carrollton Ave	S Broad St	2008	16,266
DOTD	Tulane Ave	S Broad St	S White St	2010	21,451

Source: New Orleans Regional Planning Commission; Louisiana Department of Transportation and Development

Table 15: Approximate Mode Share, Tulane Ave and S Broad St

Approximate Pedestrian and Bicycle Mode Share, Tulane and South Broad				
	Tulane Avenue		South Broad Street	
	#	**%**	**#**	**%**
Pedestrian EDT	1731	7.4%	1652	6.5%
Bicycle EDT	263	1.1%	376	1.5%
Automobile ADT	21,451	91.5%	23,244	92.0%
Total	**23,445**		**25,272**	

Area Context

As observed during the pedestrian audits and counts, land use in the vicinity of this crash cluster is mixed, with civic and commercial uses along major arterial corridors, residential use (with pockets of commercial activity) on surrounding local streets, and stretches of industrial activity nearby as illustrated in current zoning classifications for the area (Figure 44). Properties along South Broad Street are also included under the Inner City Urban Corridor Overlay zoning district. Most businesses in the area are oriented toward the street, and driveway cuts are relatively infrequent. Overall, land use in this area is highly conducive to pedestrian activity, and a mix of uses (including government buildings, shopping, and services) ensures heavy foot traffic throughout the area.

Walkscore,[15] an online tool based principally on proximity of businesses and amenities that evaluates walkability for a given location based on a 100-point scale from "Walker's Paradise: Daily errands do not require a car" to "Car-Dependent: almost all errands require a car" was also consulted as an additional way to compare overall conditions for pedestrians and assess potential demand. This score does not, however account for quality or safety of infrastructure, and is thus a limited tool in the context of a safety analysis. The intersection of Tulane Avenue and South Broad Street scores a 78, Very Walkable, based on proximity to restaurants and bars, groceries, parks, schools, health and community facilities. It scores a 61 for bikeability (rated "bikeable") based on flat topography and the limited quantity of bike facilities in the area.

The Tulane-South Broad crash cluster area is well-served by public transit, contributing to pedestrian demand. Two bus lines (Broad Street-94 and Tulane Avenue-39) and the Canal Streetcar line pass

[15] www.walkscore.com

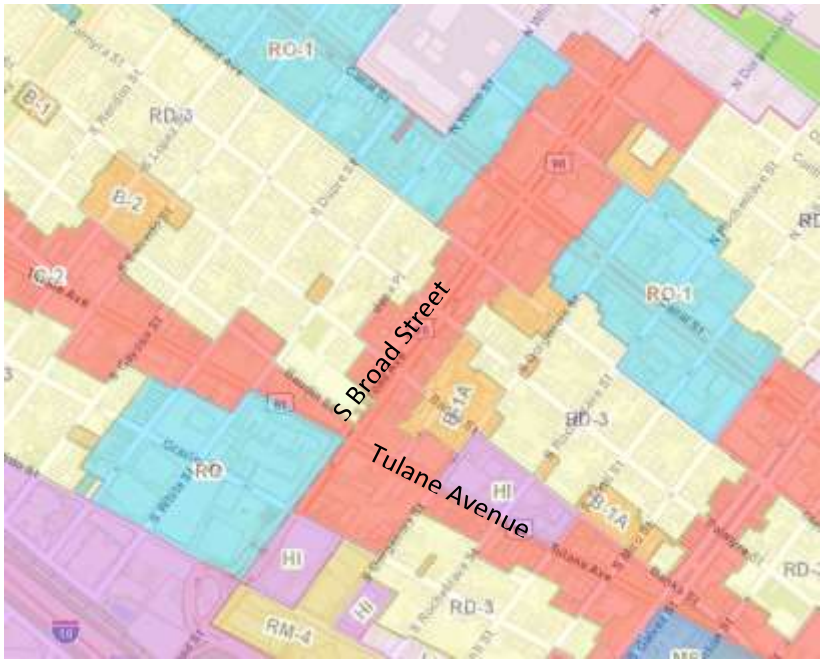
through the area, with major transfer points among these at the intersections of Tulane and South Broad and Canal and North/South Broad.

Finally, American Community Survey data was evaluated at the census tract level to provide demographic context for the neighborhoods surrounding each target crash cluster, including the percent of the population living below the poverty level, the percent of workers that commute to work by an active mode of transport (i.e. walking, biking, or transit), and the percent of workers that do not have access to a vehicle in their households.

In the census tracts surrounding the Tulane and South Broad crash cluster, poverty rates range from 27% to 59% (see Appendix 4: ACS Poverty and Transportation Maps). Unsurprisingly then, a significant portion of the population in these neighborhoods lacks access to a vehicle, ranging from 11% of the workers in one census tract, to 31% of the workers residing in another census tract adjacent (excluding one very small census tract with only 13 workers, none of whom have access to vehicles). Most of the census tracts surrounding the crash cluster, however, range from 20 – 40% of workers with no vehicle access.

Finally, a substantial percentage of workers in the neighborhoods near Tulane Avenue and South Broad Street commute to work via walking, bicycling, or transit, all modes of active transportation that are impacted by the safety and quality of pedestrian infrastructure in the vicinity. From 22% to 42% of residents in the census tracts intersecting the crash cluster commute to work via one of these modes, well above the citywide average, further demonstrating need for adequate multimodal facilities in this area.

Figure 44: Current Zoning Classifications, Tulane and South Broad Crash Cluster



Key:	
RO, RO-1	General Office District
C-1A	General Commercial District
HI	Heavy Industrial District
B-1A	Neighborhood Business District
RD-3	Two Family Residential District

Source: City of New Orleans Planning and Zoning Lookup Tool. http://gis.nola.gov/apps/planningviewer/

Profile of Fatal and Severe Crashes

Three pedestrians involved in crashes in the vicinity of this crash cluster sustained severe or fatal injuries. Of these, two were principally attributed to actions of the pedestrian, however the specific actions prior to the crash that led to these incidents are absent from the dataset. The third is principally attributed to the impairment of the driver, and occurred while the pedestrian was crossing the road mid-block. Both fatal crashes occurred at night, and both involved alcohol; on the part of the driver in Crash 2, and (presumably, as no violations were cited) on the part of the pedestrian in Crash 1.

As Table 16 suggests, however, insufficient information regarding the precise location of the crash (e.g. on which portion of an intersection, or at which location mid-block) as well as the specific movements that preceded each crash, is available. This summary indicates that current crash data records, as made available by DOTD, are lacking in sufficient detail to accurately relate crash incidence to the specific deficiencies detailed in the Pedestrian Audit above. Access to original police reports and/or the inclusion of additional attributes in DOTD's database (i.e. coding for commonly accepted bicycle and pedestrian crash types as described in the *Pedestrian and Bicycle Crash Analysis Tool)* as noted above (p.26) is needed in order to more clearly evaluate crash causation.

Table 16: Fatal or Severe Pedestrian Crash Profiles, Tulane Ave and S Broad St Crash Cluster

Fatal or Severe Pedestrian Crash Profiles: Tulane Avenue and South Broad Street Crash Cluster			
	Crash 1	Crash 2	Crash 3
Location	Banks St & S South Broad Street	Tulane Avenue & S Gayoso St	Palmyra St & S South Broad Street
Severity	Fatal	Fatal	Severe/Incapacitating
Date	7/8/2007	2/24/2009	8/4/2008
Pedestrian Age	55	18	50
Pedestrian Sex	Male	Male	Male
Pedestrian Race	Black	Black	White
Lighting Condition	Dark--Continuous Street Light	Dark--Continuous Street Light	Daylight
Weather	Clear	Clear	Clear
Primary Contributing Factor	Pedestrian Actions	Condition of Driver	Pedestrian Actions
Secondary Contributing Factor	Movement Prior to Crash	Pedestrian Actions	Movement Prior to Crash
Manner of Collision	Right-Angle	Sideswipe--Opposite Direction	Non-Collision with Motor Vehicle
Hit and Run	No	No	No
Drugs or Alcohol	Alcohol	Alcohol	None
Violations Cited	No	Yes (Unspecified)	No
Pedestrian Actions	Unknown	Crossing--Entering Road Not at Intersection	Unknown
Pedestrian Condition	Unknown	Unknown	Unknown

Recommended Interventions

The crash cluster around Tulane Avenue and South Broad Street represents the intersection of two critical corridors in the urban heart of the city. Proximity to several important pedestrian generators and numerous businesses, access to multiple transit routes and transfer hubs, a diverse array of land uses, and a population that relies heavily on walking, biking, and transit all contribute to a very large daily volume of pedestrians traveling through this area.

As in most of Orleans Parish, pedestrian infrastructure is almost universally provided, but in many cases substandard and unsafe. These deficiencies are illustrated by the 29 pedestrian crashes that occurred in the area between 2006 and 2010. Though full details that would allow a comprehensive examination of the specific circumstances leading to these crashes are not presently available for all crashes, we can infer that many collisions have occurred due to a lack of safe, convenient crossings across major arterial corridors. Some crashes attributed to "pedestrian actions" may indirectly indicate areas where deficiencies in the provision of such crossings (e.g. long pedestrian delays, limited visibility, or obstructions) result in risky behaviors. Most critically, pedestrian signals need to be installed at all signalized intersections, particularly those where current signals visible to pedestrians are out of order.

In other cases, motorist violations, including impairment, distracted driving, and aggressive driving are to blame. In addition to education and enforcement to deter these motorist behaviors, engineering solutions should be implemented to maximize awareness of the presence of pedestrians along these corridors, and to physically enhance pedestrian visibility. At both signalized and non-signalized intersections on major corridors, high-visibility crosswalks and signage indicating pedestrian presence and right-of-way should be installed, particularly on South Broad Street at Gravier Street and at Iberville Street, and all along Tulane Avenue.

Accessibility issues are rampant in this area, with numerous curb ramps (and median ramps or cut-throughs) absent, and a multitude of sidewalk repairs needed. Sidewalk widths drop below minimum (4-foot) standards in some places; removal or reinstallation of obsolete street furniture and/or relocation of transit shelters and utilities could help restore continuous access. Additional enforcement is needed to maintain sidewalk access for pedestrians, particularly along South Broad Street, where parked cars and other obstructions are frequent. Consideration should be given to possible road diets where traffic volumes permit. Tulane Avenue may be a good candidate for a lane reduction and reapportionment of the right of way to facilitate improved pedestrian, bicyclist, and transit access without substantially impacting road capacity.

Planned and ongoing development and roadway projects along Tulane Avenue and South Broad Street mean that this is an ideal time to consider possible improvements to the pedestrian environment in this area. Restoring and improving pedestrian access, and creating safer, more visible crossings, can enhance the revitalization of these corridors and improve safety outcomes for all users.

4.2 Loyola Avenue/Simon Bolivar Avenue and Calliope Street Pedestrian Crash Cluster

During the five-year period from 2006 to 2010, 22 pedestrian crashes occurred within ¼ mile of the STAC crash cluster centered at approximately where Loyola Ave and Simon Bolivar Ave connect at Calliope Street/Earhart Blvd. Distribution of these crashes by year is indicated in Figure 45. On average, about 4.4 crashes occur in this vicinity per year, slightly fewer than at the Tulane/South Broad crash cluster. Of these 22 crashes, one was fatal, three resulted in severe or incapacitating injury, and three resulted in moderate injuries (Figure 46). Figure 47 illustrates the geographic distribution of these crashes by severity.

Figure 45: Pedestrian Crashes, Loyola Ave and Calliope St Crash Cluster, 2006-2010

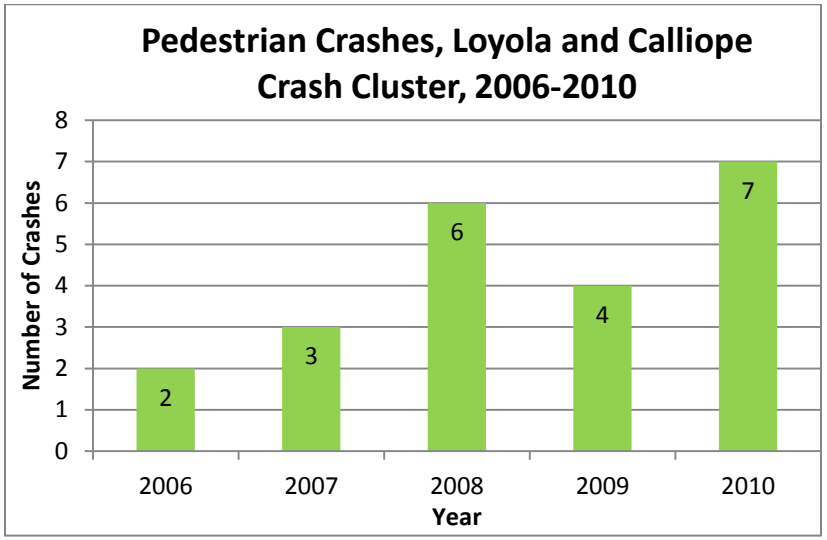


Figure 46: Pedestrian Crashes by Severity, Loyola Ave and Calliope St Crash Cluster

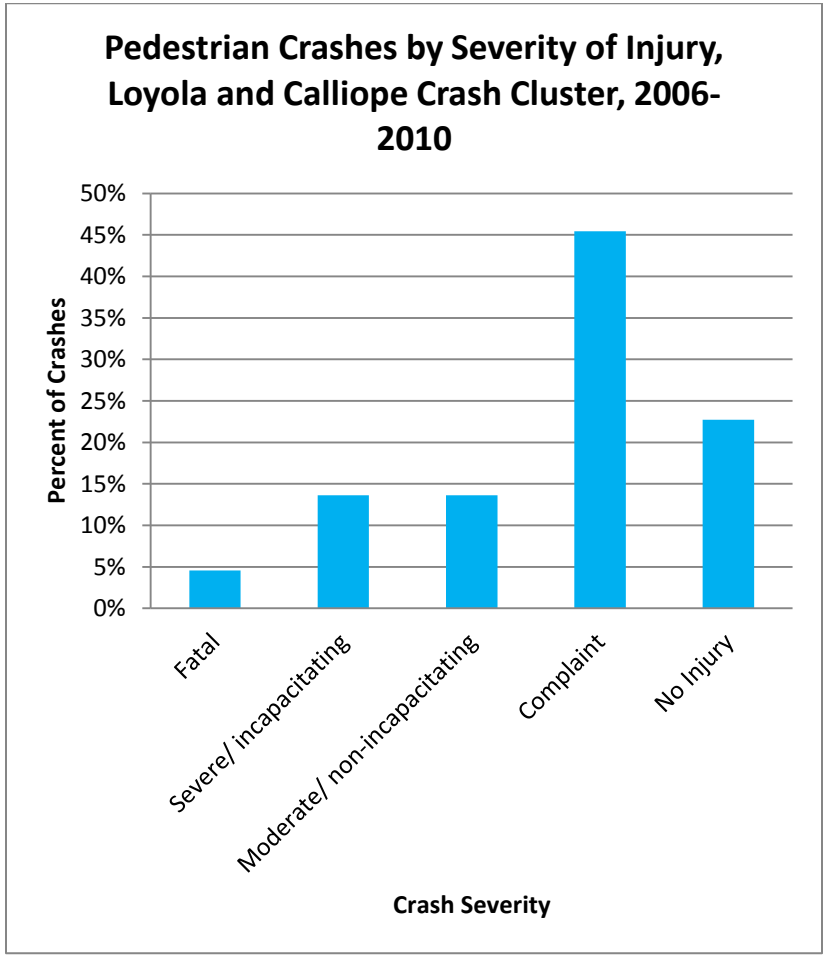
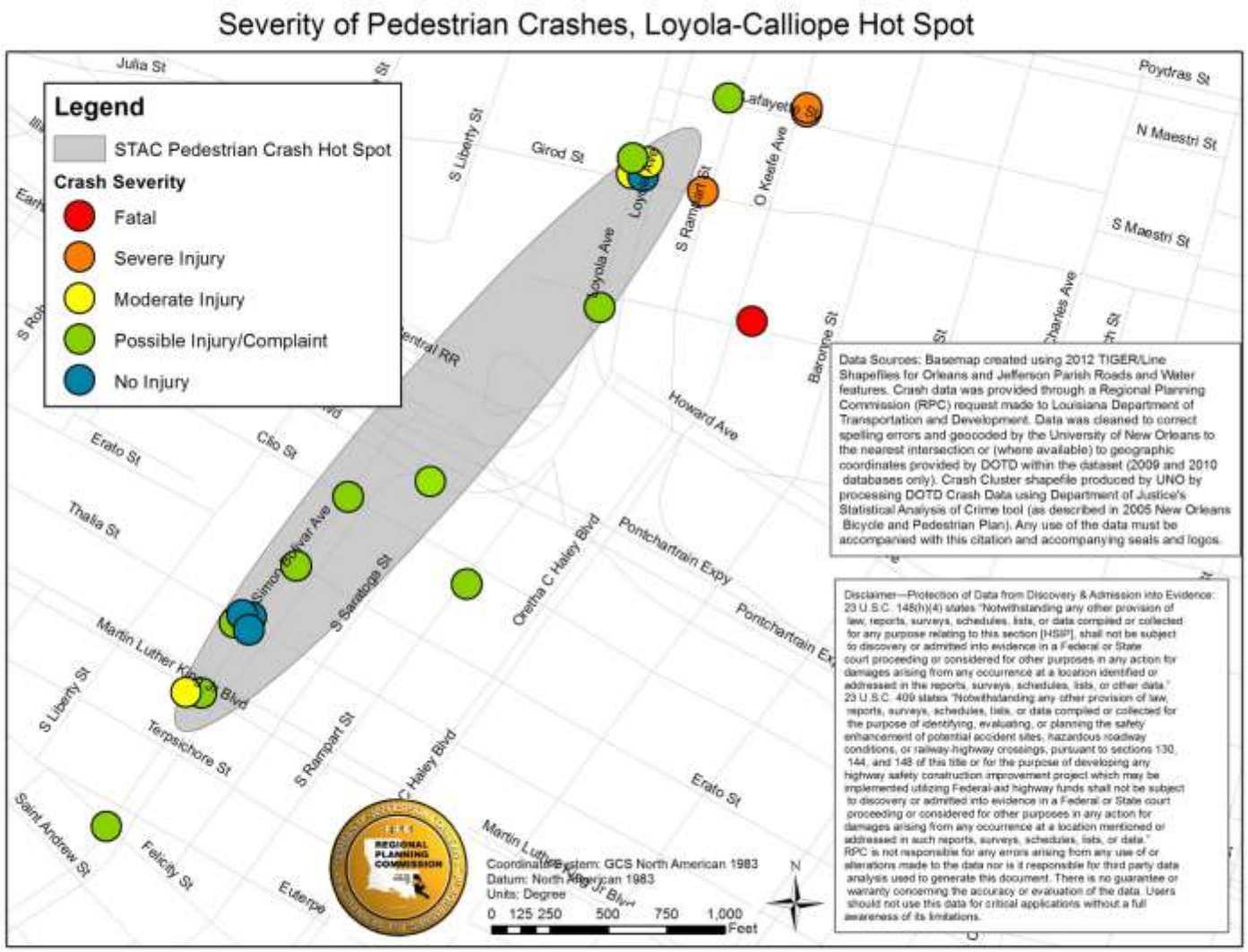


Figure 47: Severity of Pedestrian Crashes, Loyola-Calliope Hot Spot



Temporal Factors

Figures 48, 49, and 50 show the crashes broken down by month, day of the week, and hour of the day. As at the first crash cluster examined, fewer crashes during summer months were documented, and the largest percent of crashes occurred during afternoon peak commute hours. Again, the small sample size discourages analysis of clear temporal trends.

Figure 48: Pedestrian Crashes by Hour of Day, Loyola Ave and Calliope St Crash Cluster

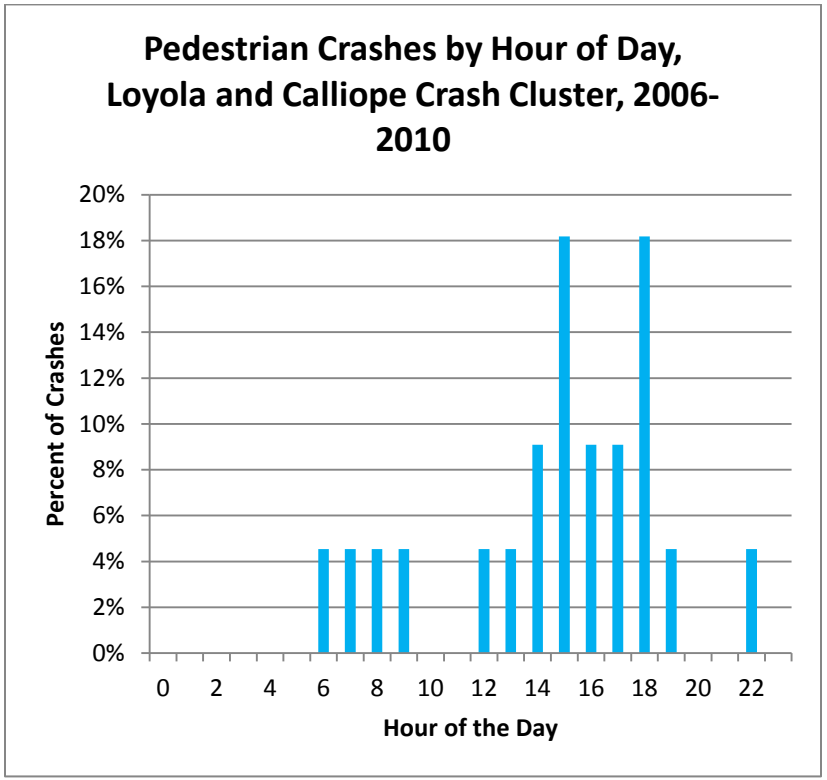


Figure 49: Pedestrian Crashes by Month, Loyola Ave and Calliope St Crash Cluster

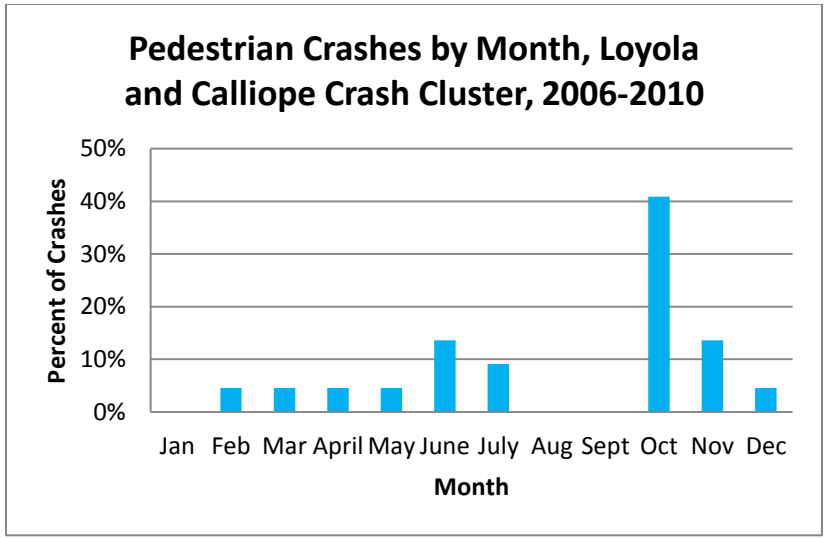
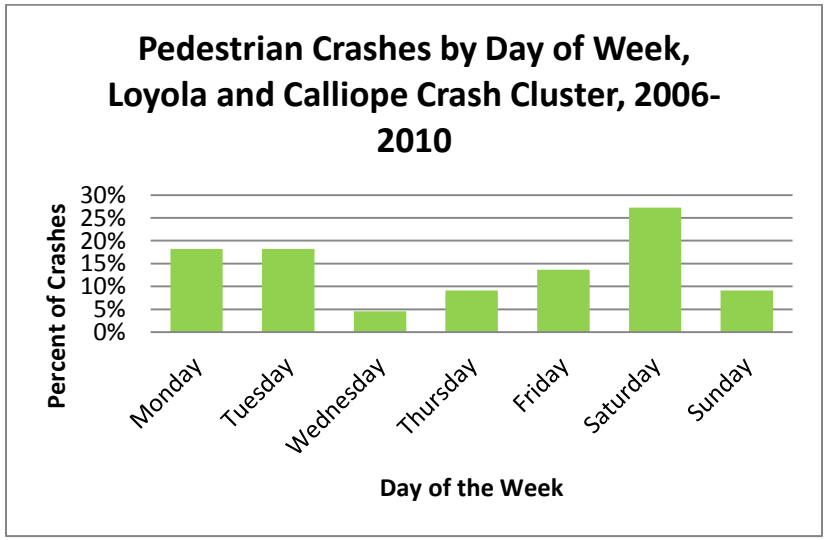


Figure 50: Pedestrian Crashes by Day of Week, Loyola Ave and Calliope St Crash Cluster



All but three crashes occurred during daylight hours, with two in the dark with street lighting present and one at dusk (Figure 51). Among crashes for which road condition was determined, all were determined to have no abnormalities at the time of the crash (Figure 52), and all save one occurred during dry weather conditions (Figure 53).

Figure 51: Lighting Condition, Pedestrian Crashes, Loyola Ave and Calliope St Crash Cluster

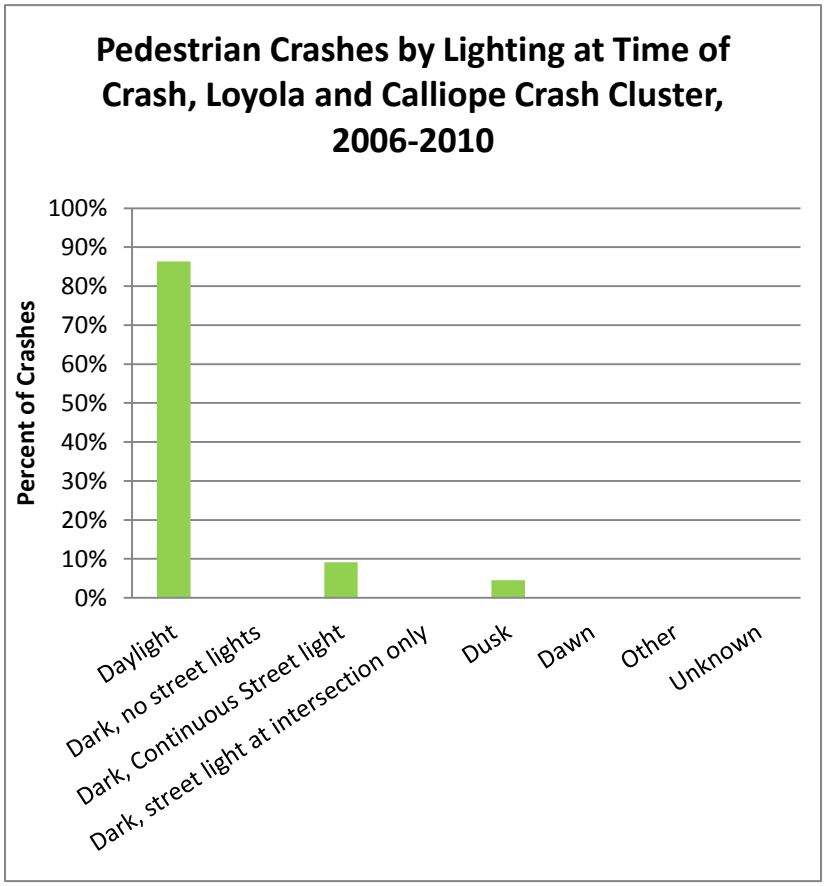


Figure 52: Road Condition, Pedestrian Crashes, Loyola Ave and Calliope St Crash Cluster

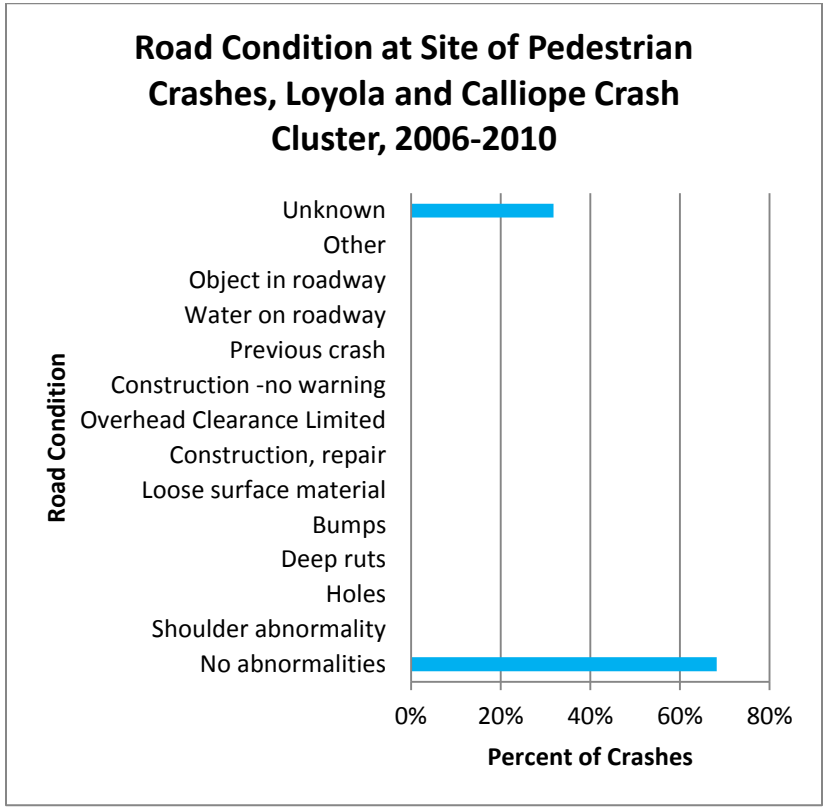


Figure 53: Weather Conditions, Pedestrian Crashes, Loyola Ave and Calliope St Crash Cluster

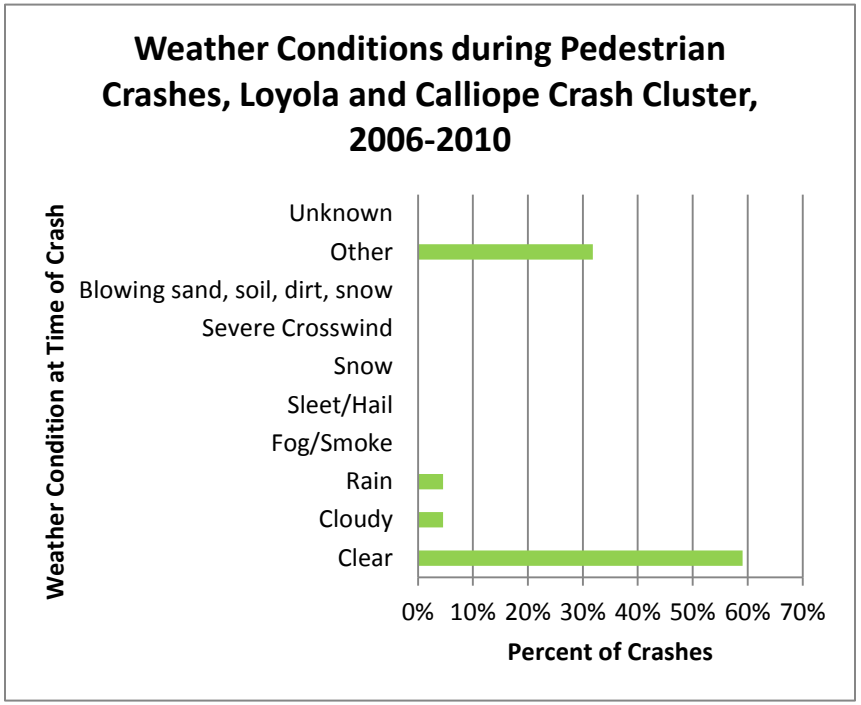


Figure 54: Pedestrian Crashes by Age, Loyola Ave and Calliope St Crash Cluster

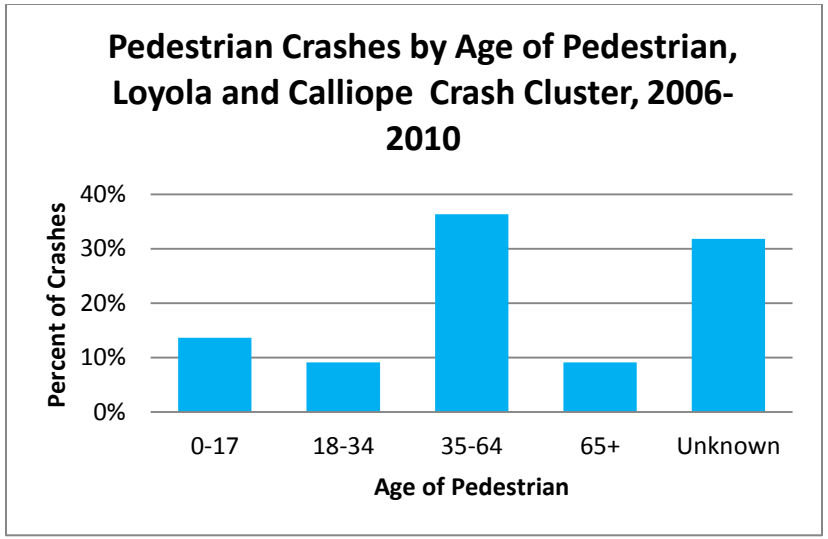
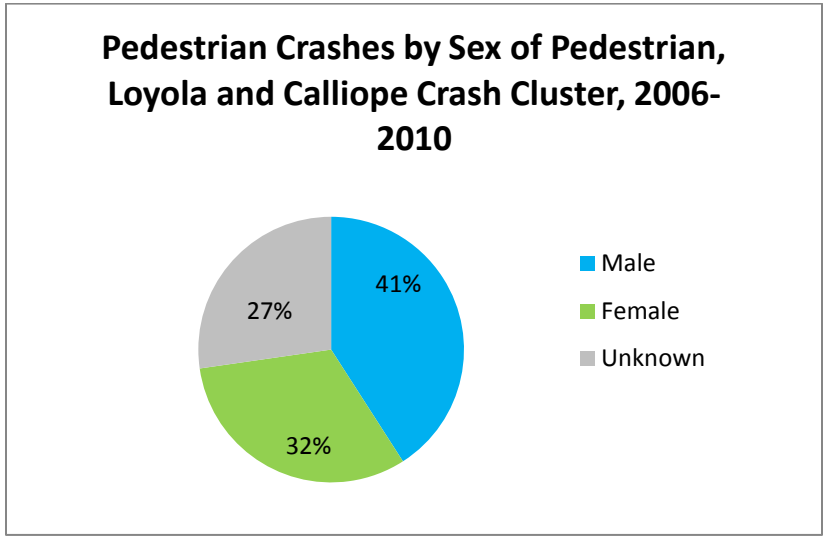


Figure 55: Pedestrian Crashes by Sex, Loyola Ave and Calliope St Crash Cluster



Demographic Factors

About 14% of pedestrians involved in crashes at this location were under the age of 18, and at least two were over age 65 (Figure 54). As was the case at the Tulane/South Broad crash cluster and regionwide, a higher rate of men were involved in pedestrian crashes (41%) at this location, although the discrepancy is less pronounced (Figure 55). Forty-six percent of pedestrians involved in crashes were identified as black , while 27% were identified as white (not accounting for the 27% for whom race is unknown) (Figure 56).

Figure 56: Pedestrian Crashes by Race, Loyola Ave and Calliope St Crash Cluster

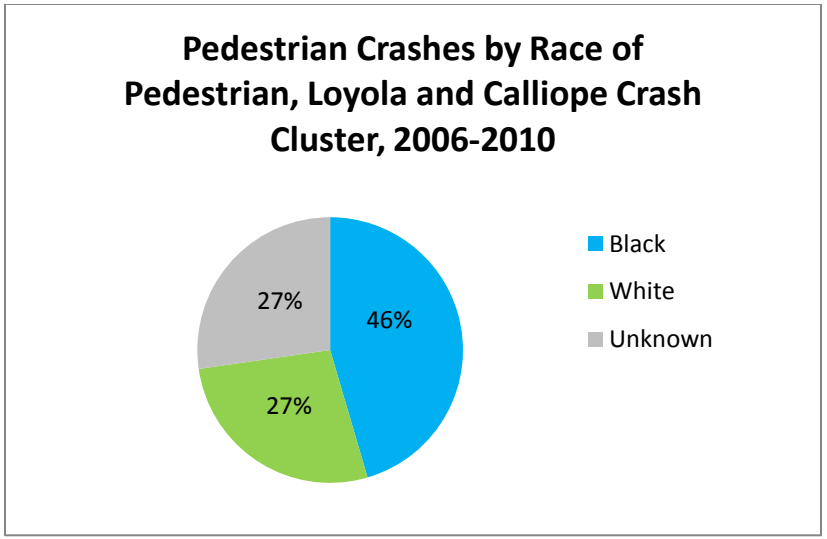
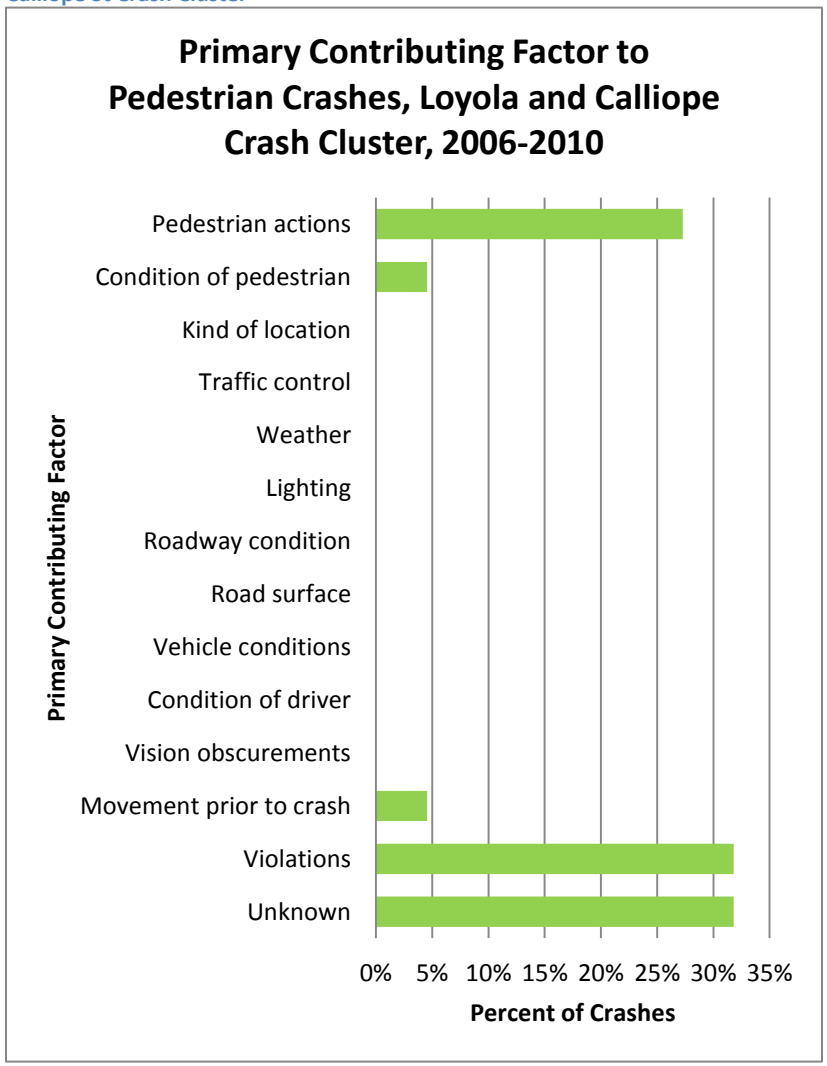


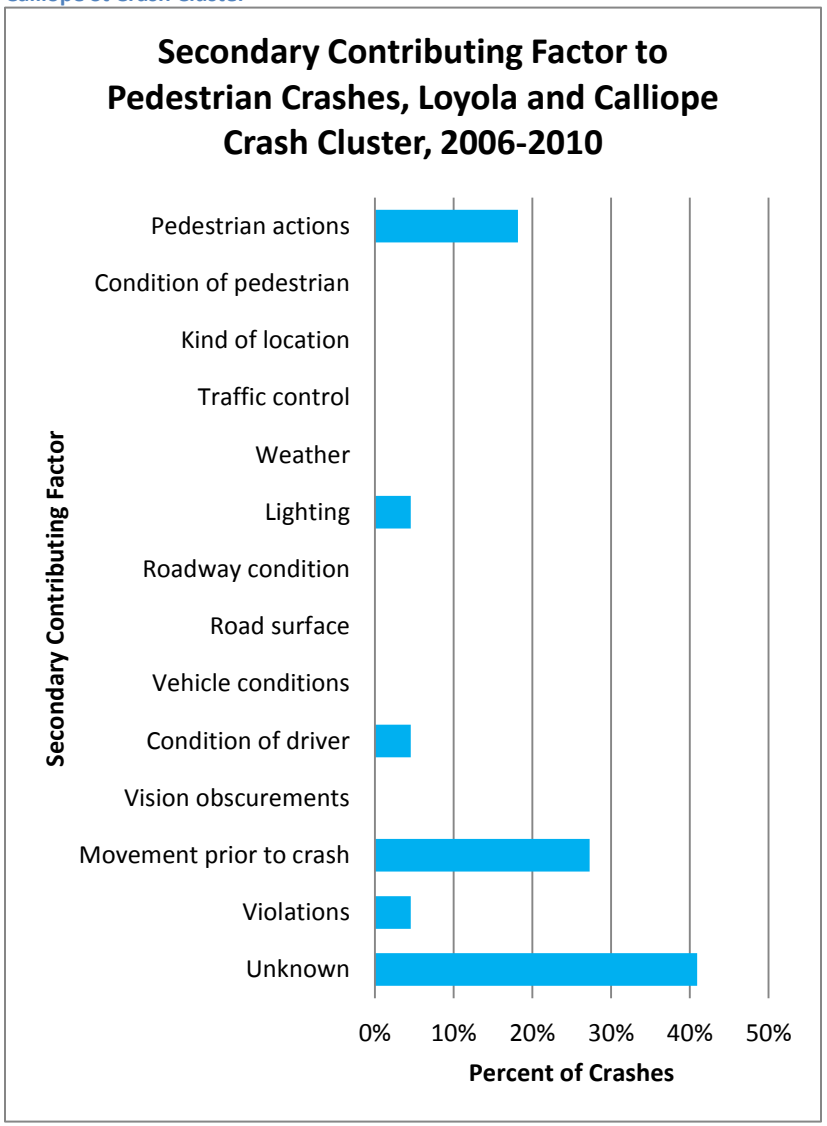
Figure 57: Primary Contributing Factors, Pedestrian Crashes, Loyola Ave and Calliope St Crash Cluster



Behavioral Factors

At the Loyola and Calliope crash cluster, primary contributing factors were unknown for 7 crash records (32%). As above, this inhibits a full analysis of the circumstances leading to many crashes. Of crash records for which this information is available, "violations" are identified as the leading crash cause (32%), followed by "Pedestrian Actions (27%). One crash each was attributed to the condition of the pedestrian and movement prior to crash (Figure 57). Data on secondary contributing factors is available for 59% of crashes. Among these, movements prior to the crash are cited for 27% of incidents, pedestrian crashes for 18%, and violations, the condition of the driver, and lighting listed as contributing factors for one crash each (Figure 58).

Figure 58: Secondary Contributing Factors, Pedestrian Crashes, Loyola Ave and Calliope St Crash Cluster



Information on the manner of collision for pedestrian crashes is available for 68% of crashes at this location. "Non-collision with motor vehicle" is listed for five crashes, three are the result of a right angle collision, one is described as a head-on crash, another as a left turn angle crash, and five are described as "other" (Figure 59). One crash was identified as a hit-and-run, and none were reported to involve drugs or alcohol (Figures 60, 61, and 62). Again, a lack of specificity in these crash types makes it difficult to clearly understand any geometric issues that may be resulting in repeated crashes at a given location.

Figure 59: Manner of Collision, Pedestrian Crashes, Loyola Ave and Calliope St Crash Cluster

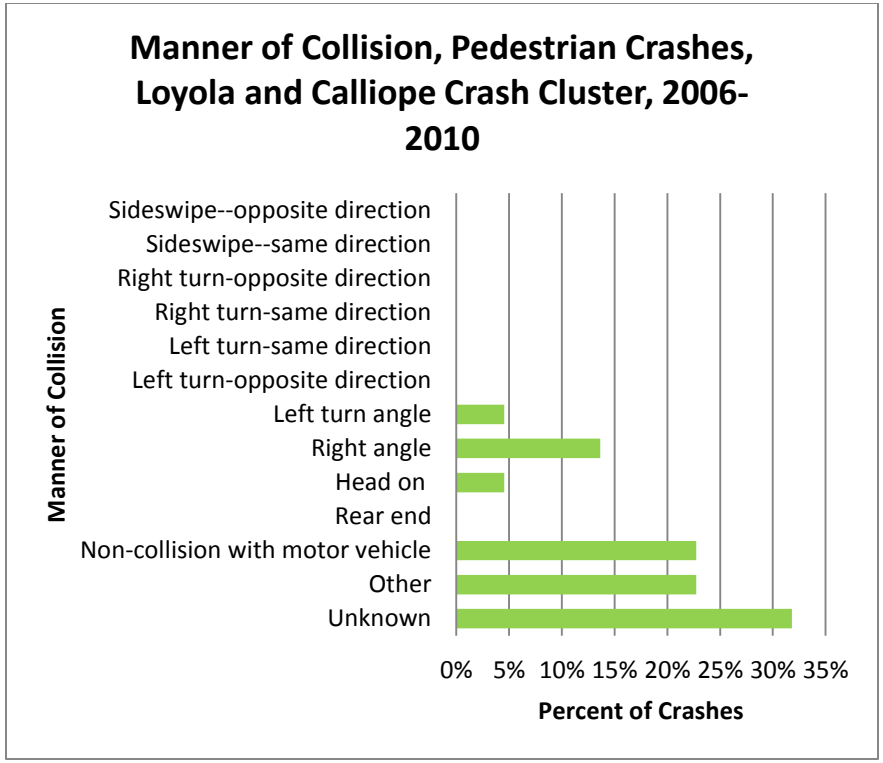


Figure 60: Hit and Run Pedestrian Crashes, Loyola Ave and Calliope St Crash Cluster

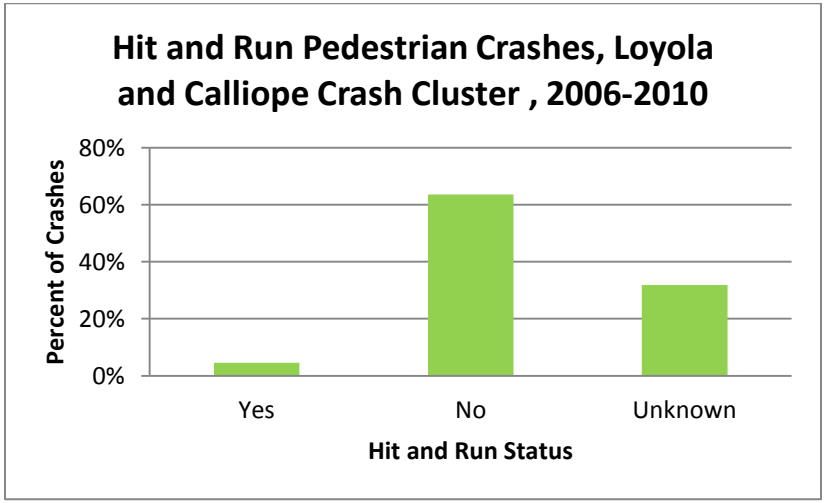


Figure 61: Pedestrian Crashes Involving Drugs, Loyola Ave and Calliope St Crash Cluster

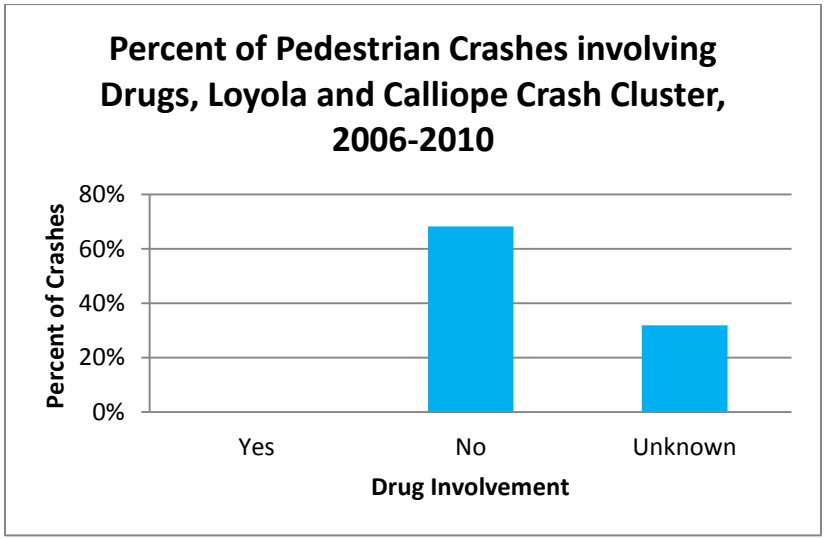


Figure 62: Pedestrian Crashes Involving Alcohol, Loyola Ave and Calliope St Crash Cluster

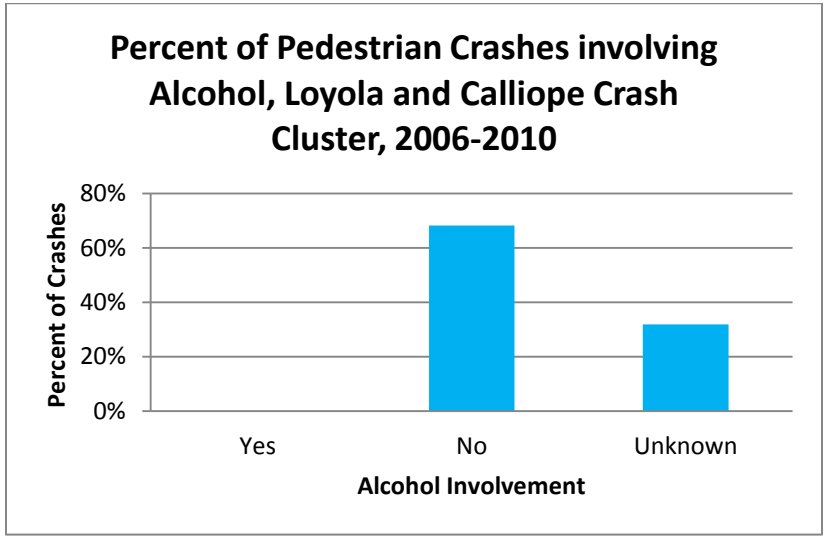
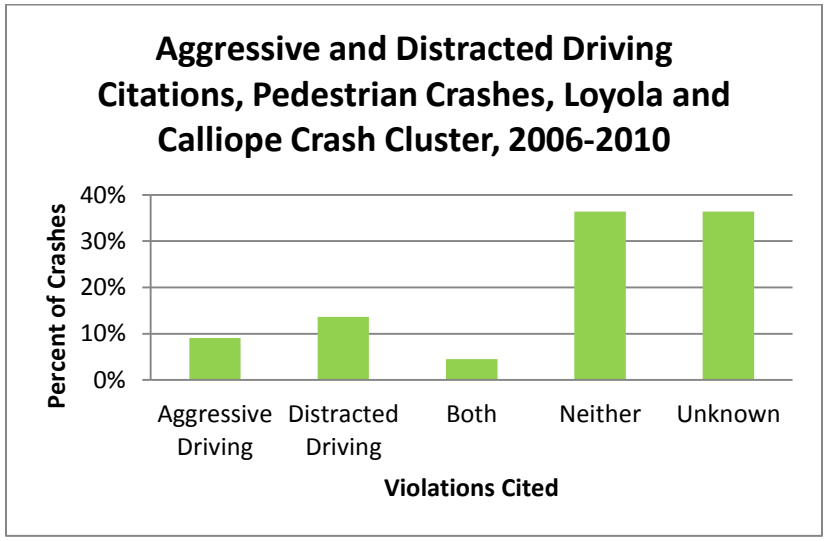


Figure 63: Aggressive and Distracted Driving Citations, Loyola and Calliope Crash Cluster



Traffic violations were issued at least five crashes; two for aggressive driving, three for distracted driving, and one for both violations (Figure 63).

Among crashes for which information on pedestrian actions are available, four pedestrians were described as not in the roadway, indicating they were likely struck while on the sidewalk by a vehicle entering or exiting a driveway, four were struck while crossing at an intersection, one was struck while walking in the roadway in the direction of traffic, and another while playing in the roadway (Figure 65). All but two pedestrians for whom condition is known were described as being in "normal" condition, the other two were listed as "inattentive" (Figure 66). No pedestrians were listed as under the influence of drugs or alcohol at the time of the crash (Figure 64).

Figure 64: Pedestrian Drugs or Alcohol, Loyola Ave and Calliope St Crash Cluster

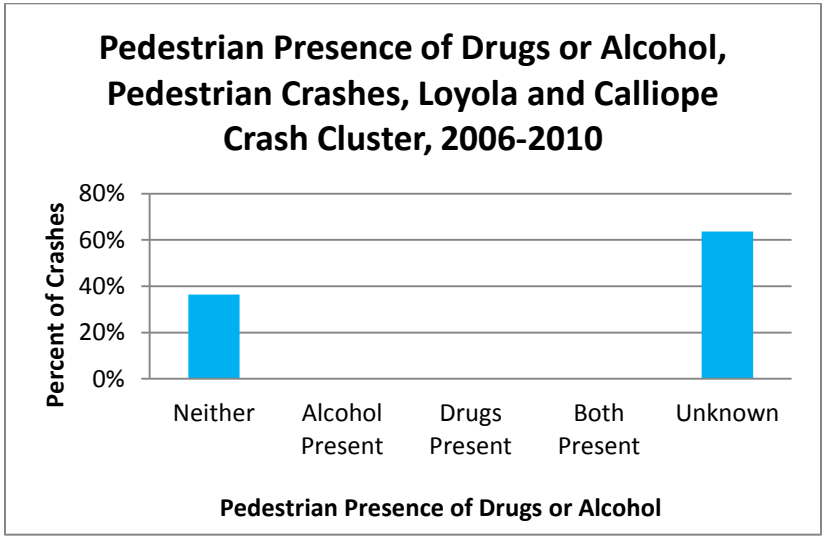


Figure 65: Pedestrian Actions at Time of Crash, Loyola Ave and Calliope St Crash Cluster

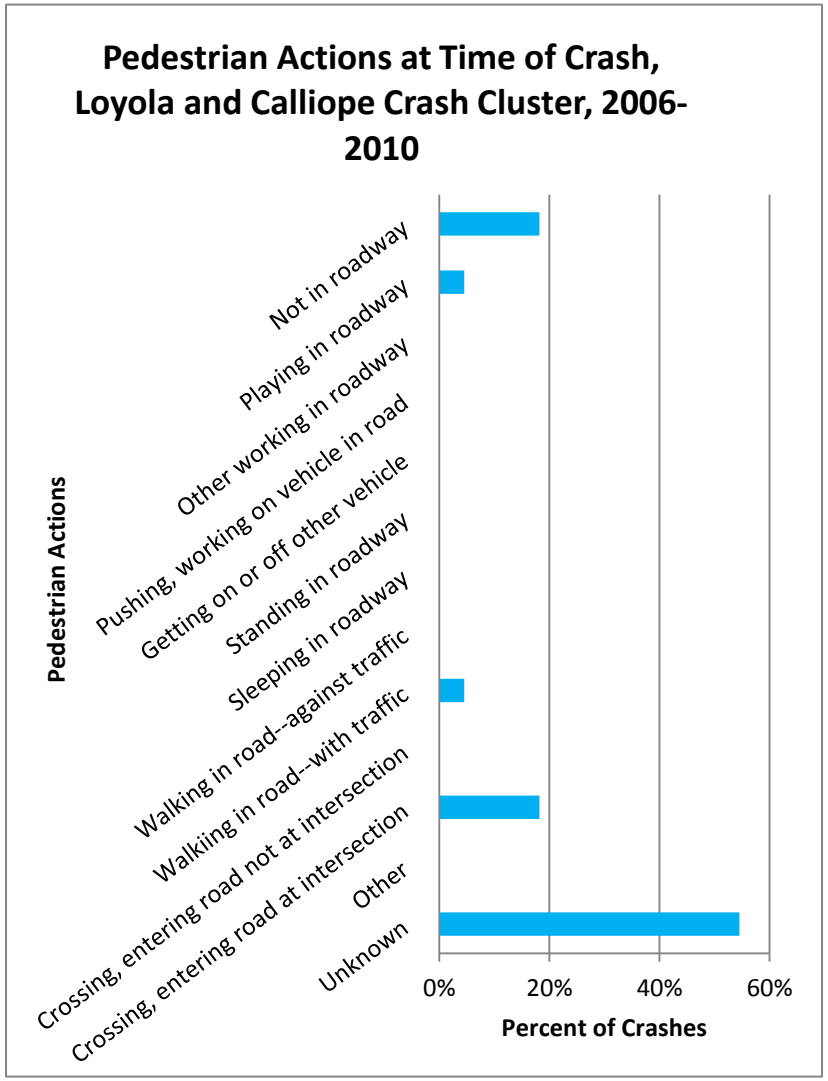
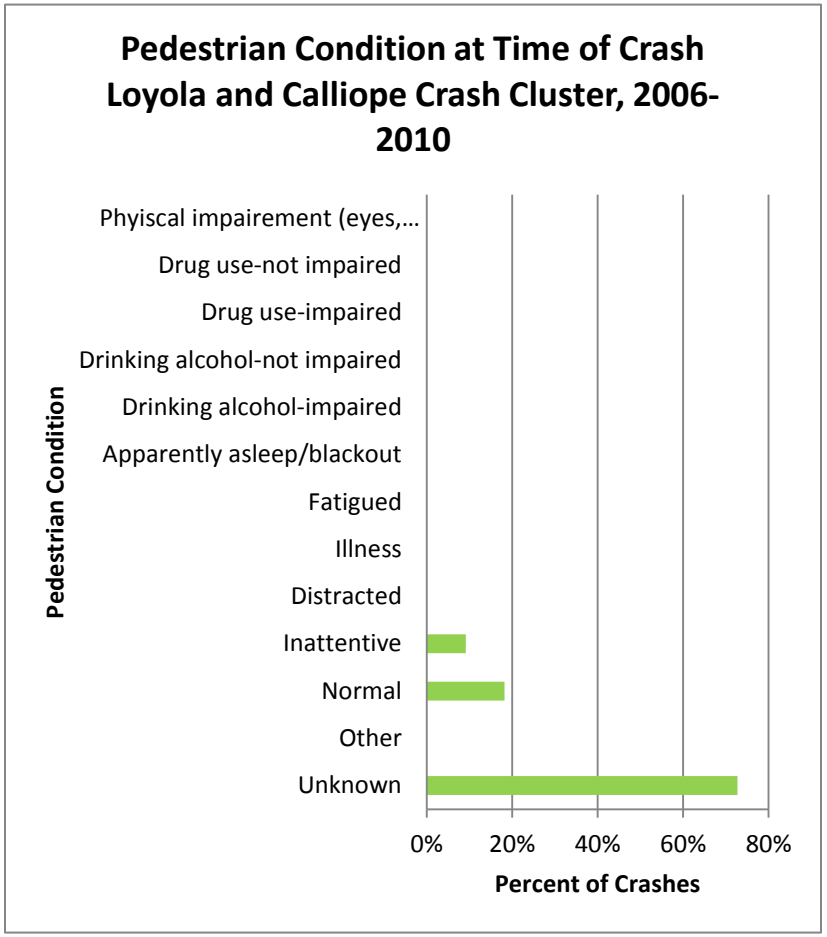


Figure 66: Pedestrian Condition at Time of Crash, Loyola Ave and Calliope St Crash Cluster



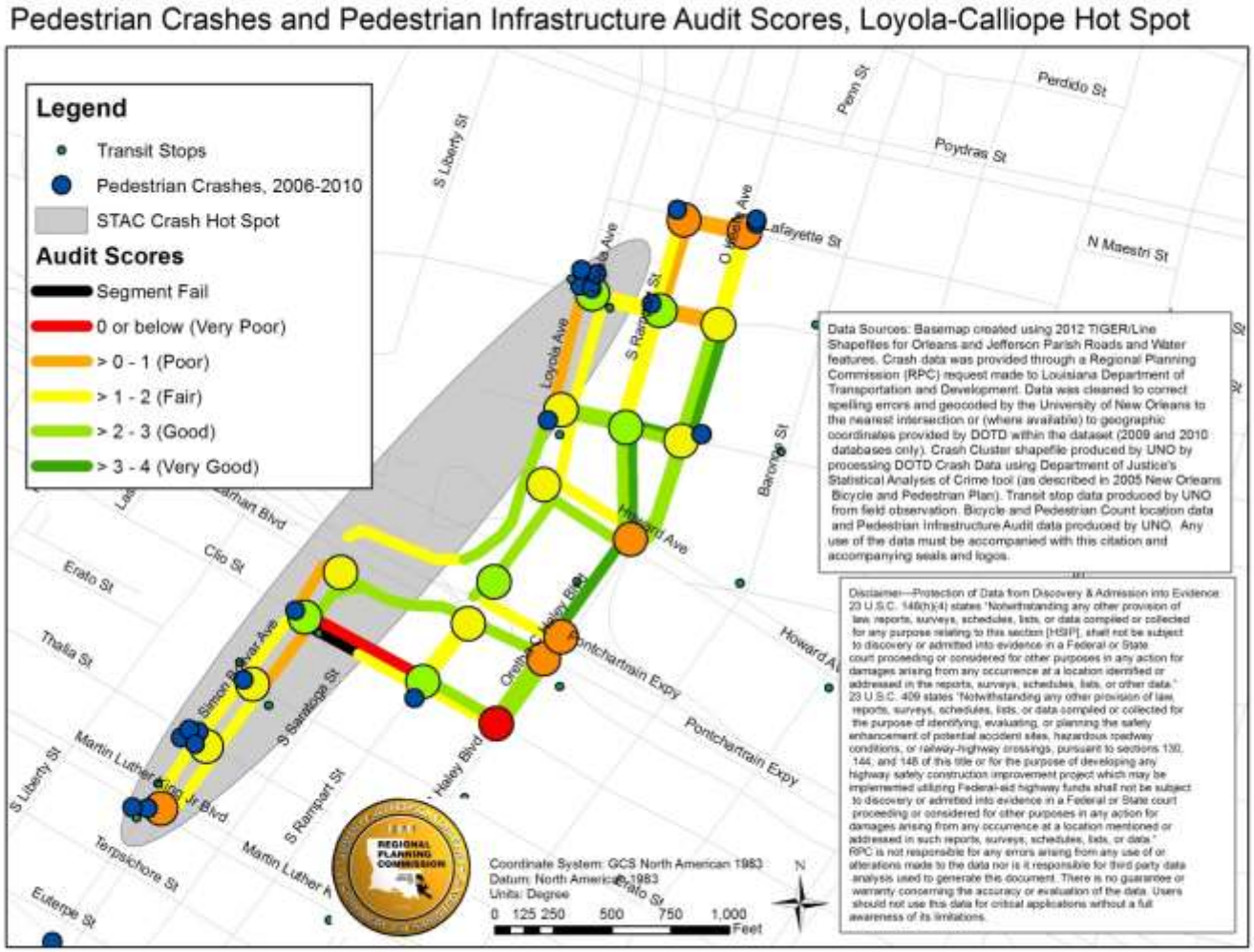
Pedestrian Street and Intersection Audit

An audit of the built environment in the vicinity of the Loyola-Calliope crash cluster, according to the methodology and scoring system described above, was conducted in April 2013. Follow-up audits to expand the geographic area evaluated were conducted in June 2013.

At the Loyola Avenue and Calliope Street crash cluster location, audits were conducted for intersections and sidewalk segments along the major arterial corridors of the crash cluster (Loyola Avenue and Simon Bolivar Avenue) as well as on numerous blocks on adjacent streets, covering a grid roughly approximating the ¼ mile area surrounding the STAC-generated cluster ellipse. This included several blocks on each side of Calliope Street/Earhart Blvd, capturing differences in conditions on either side of the Pontchartrain Expressway, a significant divider between the Central Business District and the neighborhood of Central City.

Audit scores were generally much higher than at the Tulane-South Broad crash cluster location, ranging from -2.37 to a perfect score of 4, with only one intersection (Oretha Castle Haley Blvd at Clio Street) and one sidewalk segment (Clio Street between South Rampart Street and Simon Bolivar Avenue) scoring a zero or below. The median score was 1.68, higher than either of the other two areas audited. One additional sidewalk segment, however, was in such poor condition as to be un-auditable, with almost no sidewalks or clear off-street walking area at all. Six additional intersections and eight sidewalks segments were rated “Poor,” eight intersections and 21 segments were rated “Fair,” six intersections and 16 segments were rated “Good” and four sidewalk segments received a score of more than three, or “Very Good” (Figure 67; see Appendix 3 for full audit results).

Figure 67: Pedestrian Crashes and Pedestrian Infrastructure Audit Scores, Loyola-Calliope Hot Spot



The sole fatal pedestrian crash in this area during the study period occurred at or near the intersection of Julia Street and O Keefe Avenue, which rated as "Fair" according to the audit tool, surrounded by sidewalk segments with ratings of "Good" or "Very Good." The three severe injuries that occurred were within two blocks, two of these at or near intersections with infrastructure rated poor to fair, and the third at a "good" intersection surrounded by fair to poor quality sidewalks.

The apparent misalignment of serious and fatal injuries with infrastructure deficiencies hints at the complexity of factors leading to serious pedestrian crashes including traffic volumes, land uses, possible distractions, and random chance. However, the frequent incidence of crashes resulting in injury, particularly in the blocks bounded by Julia Street, O'Keefe Avenue, Lafayette Street, and Loyola Avenue indicates that more could be done to improve pedestrian safety in this area, especially now that this area is better served by transit via the new Loyola Avenue Streetcar, and as new construction in this previously underdeveloped portion of downtown is completed (bringing even greater foot traffic to the area).

Notably, significant infrastructure improvements have already occurred along portions of the audit area in conjunction with the development of the Loyola Streetcar line. Crashes that occurred during the 2006-2010 period do not reflect the addition of new crosswalks, curb and sidewalk improvements, and a bike lane that were installed in 2012. However, even with these improvements, pedestrian conditions along Loyola Avenue and on surrounding blocks are not ideal. On the downtown side of Calliope Street, many intersections still lack crosswalks, ADA-accessible curb ramps, and clear or dedicated pedestrian signals. Where pedestrian signals do exist, many were out of order at the time of the audit. Obstructions from construction or vehicles are common, and furnishing zones are minimal or non-existent on many blocks, reducing pedestrian comfort. Some complex intersection crossings, as along Loyola Ave, are difficult to understand as a pedestrian and create hazardous conflicts between pedestrians and turning vehicles (Figures 68 – 73).

On the Central City side of Calliope Street, pedestrian safety concerns largely stem from lack of maintenance to sidewalks resulting in accessibility issues and trip hazards, missing sidewalks, and a lack of crosswalks at most intersections. In addition, blight, debris, and foliage overgrowth contribute to personal safety concerns along Clio Street, while vehicles obstructing sidewalks force pedestrians to enter the roadway.

Finally, it was not possible to adequately capture all deficiencies in the pedestrian environment—specifically the division between the two neighborhoods audited—using this pedestrian audit tool. The Pontchartrain Expressway—and the on- and off-ramps underneath it— create a physical barrier and interrupt the pedestrian network on either side of the elevated expressway. Efforts to improve these connections by creating clearer, safer crossing points should be encouraged.

Figure 68: Audit Findings—Loyola and Calliope (1)

Non-functional pedestrian walk signal at Loyola Avenue and Howard Ave (Photo Credit Lucien Bruno)

Figure 69: Audit Findings—Loyola and Calliope (2)

Another broken pedestrian signal at Loyola Avenue and Howard Avenue (Photo Credit Lucien Bruno)

Figure 70: Audit Findings—Loyola and Calliope (3)

Vehicles parked on sidewalk force wheelchair user onto roadway at Simon Bolivar Avenue and Calliope Street (Photo Credit Lucien Bruno)

Figure 71: Audit Findings—Loyola and Calliope (4)

Median lacks accessible curb ramps on Simon Bolivar Ave at Erato St (Photo Credit Lucien Bruno)

Figure 72: Audit Findings—Loyola and Calliope (5)

Missing crosswalks at recently repaved intersection of Loyola Avenue at Calliope (downtown side) (Photo Credit Lucien Bruno)

Figure 73: Audit Findings—Loyola and Calliope (6)

Overgrown lots along Clio St make sidewalks impassible for pedestrians (Photo Credit Lucien Bruno)

Pedestrian and Bicycle Counts

Manual counts for this crash cluster were conducted on each side of the Pontchartrain Expressway, on Simon Bolivar Avenue between Calliope Street and Clio Street, and on Loyola Avenue between Julia Street and Howard Avenue (Figure 74).

Compared to the median count total across 26 count sites in Orleans and Jefferson parish in 2013, Simon Bolivar Avenue and Loyola Avenue both have higher than average volumes of both pedestrians and bicyclists relative to other sites observed (Tables 17 and 18). As at most other count sites, more males were observed than females. Racial variances were very pronounced at Simon Bolivar, with 95% of pedestrians observed identified as black, compared to 61% a few blocks away on Loyola Ave. Relatively few children were observed. Sidewalk use among pedestrians at Loyola Ave is in line with regional averages, though right-way bicycle riding was lower than the citywide average, despite the installation of a new dedicated bike lane.

On Simon Bolivar Ave, a much greater percentage of pedestrians were observed traveling in the street (18%), while only 55% of bicyclists traveled on-street and in the correct direction and very few were observed wearing helmets. These statistics indicate a tendency toward poor safety behaviors that may contribute to crashes on the uptown side of this crash cluster. A combination of improvements to the walking and biking environment, along with targeted educational efforts to encourage safer behavior, are warranted.

Limited automobile ADT data allowed a mode share estimation based on comparisons to manual count estimated daily traffic only on Loyola Avenue, using data from 2009 (Figure 19). Again, this estimate does not include transit or other high-occupancy vehicles. Given those limitations, we estimate that pedestrians make up approximately 6% of traffic on this portion of the Loyola Corridor, and bicycles constitute another 3.4% for an active transportation mode share of almost 10% (Figure 20).

Figure 74: Pedestrian-Bicycle Count Locations, Loyola Ave and Calliope St Crash Cluster

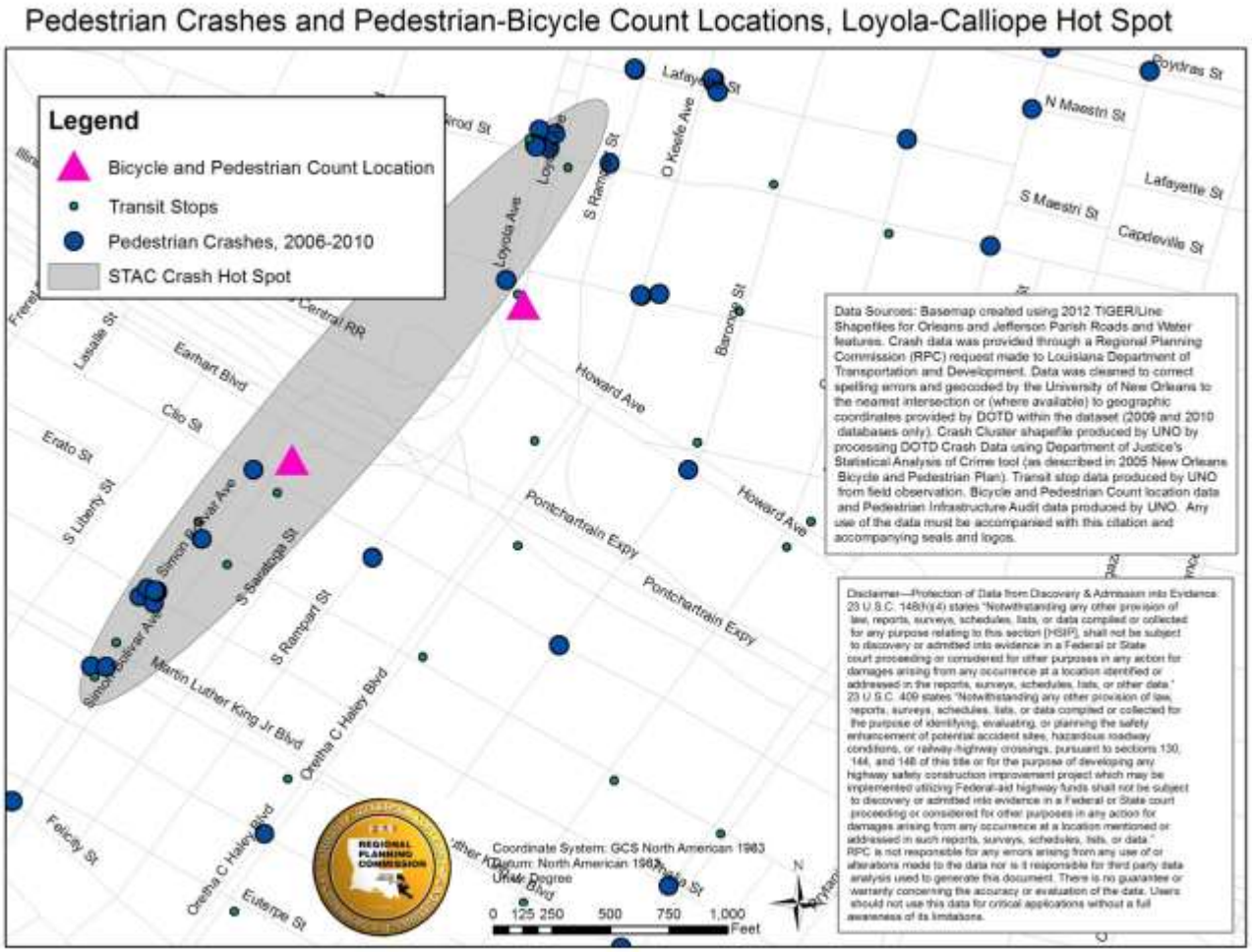


Table 17: Pedestrian and Bicycle Count Summary, Loyola Avenue

Pedestrian and Bicycle Count Summary, Loyola Avenue				
	Pedestrians		Bicycles	
	Loyola Ave	New Orleans Average* (Observed)	Loyola Ave	New Orleans Average (Observed)
Total Observed	**485**	**317**	**267**	**114**
Estimated Daily Traffic (EDT)	*1,620*	*928*	*892*	*392*
Gender				
Female	34.0%	40.6%	9.7%	28.7%
Male	66.0%	59.4%	90.3%	71.3%
Race				
White	32.8%	58.4%	45.7%	69.7%
Black	61.0%	36.1%	49.8%	25.7%
Other	6.2%	5.5%	4.5%	4.6%
Age Group				
Adult	97.5%	95.4%	98.1%	98.1%
Youth	2.5%	4.6%	1.9%	1.9%
Travel Orientation				
Street (Pedestrians)	3.7%	4.8%		
Street--Right Way (Bicycles)			74.9%	81.0%
Street--Wrong Way (Bicycles)			10.5%	7.0%
Sidewalk	94.0%	91.3%	13.9%	11.8%
Neutral Ground	2.3%	3.9%	0.8%	0%
Helmet Use (Bicycles)			**22.9%**	**23.0%**

Observation Dates: 4/2/13; 4/4/13

*New Orleans average figures based on median total users observed and estimated daily traffic out of 26 count sites in Orleans and Jefferson Parish, March-May 2013. Demographic and behavioral averages derived from totals at all 26 sites. See *New Orleans 2013 Pedestrian and Bicycle Count Report* for additional information.

Table 18: Pedestrian and Bicycle Count Summary, Simon Bolivar Avenue

Pedestrian and Bicycle Count Summary, Simon Bolivar Avenue				
	Pedestrians		Bicycles	
	Simon Bolivar Ave	New Orleans Average* (Observed)	Simon Bolivar Ave	New Orleans Average (Observed)
Total Observed	**692**	**317**	**161**	**114**
Estimated Daily Traffic (EDT)	**2,490**	*928*	**579**	*392*
Gender				
Female	24.1%	40.6%	11.8%	28.7%
Male	75.9%	59.4%	88.2%	71.3%
Race				
White	3.8%	58.4%	18.0%	69.7%
Black	94.8%	36.1%	81.4%	25.7%
Other	1.5%	5.5%	6.2%	4.6%
Age Group				
Adult	96.7%	95.4%	98.1%	98.1%
Youth	3.3%	4.6%	1.9%	1.9%
Travel Orientation				
Street (Pedestrians)	17.6%	4.8%		
Street--Right Way (Bicycles)			55.3%	81.0%
Street--Wrong Way (Bicycles)			26.1%	7.0%
Sidewalk	78.3%	91.3%	18.6%	11.8%
Neutral Ground	4.1%	3.9%	0.0%	0.2%
Helmet Use (Bicycles)			**6.2%**	**23.0%**

Observation Dates: 5/1/13; 5/7/13

*New Orleans average figures based on median total users observed and estimated daily traffic out of 26 count sites in Orleans and Jefferson Parish, March-May 2013. Demographic and behavioral averages derived from

totals at all 26 sites. See *New Orleans 2013 Pedestrian and Bicycle Count Report* for additional information.

Table 19: Automobile ADT, Loyola Ave and Calliope St Crash Cluster

Automobile Average Daily Traffic (ADT) Data, Loyola Ave and Calliope St					
Agency	**Corridor**	**Cross Street 1**	**Cross Street 2**	**Year**	**ADT**
RPC	Loyola Ave	Earhart	Poydras St	2009	23,579
RPC	Howard Ave	Loyola Ave	S Rampart St	2007	12,253
RPC	Earhart Blvd	S Claiborne Ave	Loyola Ave	2009	29,504

Source: New Orleans Regional Planning Commission; Louisiana Department of Transportation and Development

Table 20: Approximate Pedestrian and Bicycle Mode Share, Loyola Avenue

Approximate Pedestrian and Bicycle Mode Share, Loyola Avenue		
	Loyola Ave	
	#	**%**
Pedestrian EDT	1620	6.2%
Bicycle EDT	892	3.4%
Automobile ADT	23,579	90.4%
Total	**26,091**	

Area Context

The entirety of the study area on the downtown/East side of the Pontchartrain Expressway is zoned as central business district. Land uses include businesses, transportation facilities (i.e. New Orleans Union Passenger Terminal), and several large surface parking lots. This entire area is also zoned under the HT-U Lafayette Square WDRHP Interim Zoning District. On the uptown/west side of the expressway, zoning around Simon Bolivar Avenue is mostly two-family or multiple-family residential, while Oretha Castle Haley Boulevard is zoned General Commercial. Simon Bolivar Ave also falls under the Central City Multi-Family MDS Interim Zoning District. Land uses include single and multi-family housing, a factory, churches, several food stores, and the New Orleans Mission. Together, this mix of land uses contributes to near-constant pedestrian activity on both sides of the expressway.

Figure 75: Current Zoning Classification, Loyola-Calliope Crash Cluster

Key:	
CBD 2, 5, 7	Central Business District
C-1A	General Commercial District
LI	Light Industrial District
RM-3	Multiple-Family Residential District

Source: City of New Orleans Planning and Zoning Lookup Tool. *http://gis.nola.gov/apps/planningviewer/*

According to Walkscore.com, this area is the most walkable of the three surveyed, with a score of 82 (Very Walkable) at the intersection of Loyola Avenue and Earhart Blvd/Calliope Street. Contributors to the high score include numerous restaurants and bars within walking distance, as well as groceries, parks, schools, and transportation services in the area. This area also received a Bikescore of 88 (Very Bikeable) based on its flat topography and the presence of bicycle facilities nearby.

Transit service to or through this area include the Loyola Streetcar, RTA's 15-Freret, 28-Martin Luther King, 91-Jackson-Esplanade, 100-Algiers Loop Owl, 101-Algiers Loop, 102-General Meyer, and 114/115-General De Gaulle buses, as well as Jefferson Transit (JeT) buses W2-Westbank Expressway, W3-Lapalco, and W8-Terrytown. NOUPT is a major transfer point for transit as well as inter-city train and bus travel.

This neighborhood's demographic characteristics shift sharply at the Pontchartrain Expressway, and also at the census tract boundary at Oretha Castle Haley Blvd dividing Central City from wealthier neighborhoods along St. Charles Avenue. Poverty rates range from 22% closer to St. Charles Avenue, to 49% on Simon Bolivar Avenue. The CBD side of the crash cluster is principally non-residential, but poverty rates in that census tract as a whole reach 33% (See Appendix 4 for details).

Vehicle access follows a similar pattern. Thirty-four percent of workers in the census tract that includes Simon Bolivar Ave lack access to a vehicle, while only 6% of residents in the St. Charles Avenue census tract are so constrained. On the CBD side of Calliope Street, 14% of workers lack vehicle access. On both sides of the expressway, however, active commuting is very common, with 30-40% of workers traveling to work by walking, bicycling, or transit. Even closer to St. Charles Avenue, where car ownership is high, active commuting accounts for 18% of trips. Whether due to lack of vehicle access, good availability of transit services, or close proximity to downtown employment, this area can therefore be expected to have high demand for active transportation infrastructure on all major corridors that link residential neighborhoods to the downtown core.

Profile of Fatal and Severe Crashes

Within the Loyola Ave and Calliope Street crash cluster, one fatal and three severe crashes occurred between 2006 and 2010 (Table 21). Unfortunately, crash records for three of these incidents, including the fatality, are missing most of the relevant circumstantial data. For the remaining crash record, an older male was struck head-on while crossing the roadway at an intersection at night. The crash was attributed to the pedestrian's own actions, and impacted by lighting conditions at the scene. From this limited information, we can infer that visibility at this intersection may be a rectifiable concern that could help prevent similar incidents.

Table 21: Fatal or Severe Pedestrian Crash Profiles, Loyola and Calliope Crash

Fatal or Severe Pedestrian Crash Profiles: Loyola Ave and Calliope Street Crash Cluster				
	Crash 1	Crash 2	Crash 3	Crash 4
Location	Julia St & O'Keefe Ave	S Rampart St & Girod St	O'Keefe Ave & Lafayette St	O'Keefe Ave & Lafayette St
Severity	Fatal	Severe/ Incapacitating	Severe/ Incapacitating	Severe/ Incapacitating
Date	5/3/2008	11/12/2010	10/6/2008	10/6/2008
Pedestrian Age	49	71	31	35
Pedestrian Sex	Male	Male	Male	Male
Pedestrian Race	White	Black	White	White
Lighting Condition	Daylight	Dark--Continuous Street Light	Daylight	Daylight
Weather	Unknown	Clear	Unknown	Unknown
Primary Contributing Factor	Unknown	Pedestrian Actions	Unknown	Unknown
Secondary Contributing Factor	Unknown	Lighting	Unknown	Unknown
Manner of Collision	Unknown	Head-on	Unknown	Unknown
Hit and Run	Unknown	No	Unknown	Unknown
Drugs or Alcohol	Unknown	No	Unknown	Unknown
Violations Cited	Unknown	No	Unknown	Unknown
Pedestrian Actions	Unknown	Crossing, Entering Road at Intersection	Unknown	Unknown
Pedestrian Condition	Unknown	Unknown	Unknown	Unknown

Cluster

Recommended Interventions

The crash cluster encompassing portions of Loyola Avenue and Simon Bolivar Avenue near Calliope Street under the Pontchartrain Expressway in fact represents two distinct pedestrian safety problems in two distinct neighborhoods. On Simon Bolivar Ave, several crashes have occurred at or near non-signalized intersections where vehicle speeds are high and minimal accommodation has been made for pedestrian crossings, despite high observed volumes of pedestrians in the area. Along Loyola Ave and adjoining streets in the vicinity, crashes appear more likely to occur due to turning conflicts (including entrances and exits from driveways), and inattentive or distracted drivers and pedestrians. User volumes are also high due to the area's proximity to the Central Business District, key transit facilities, and several surface parking lots utilized by downtown employees.

Improving the visibility and/or functionality of pedestrian crossings is critical thorough this crash hot spot; as noted above, dedicated pedestrian signals exist in portions of this study area, including along Loyola Avenue, however, most of these were non-functional at the time audits were conducted, presenting a clear and immediate safety hazard. These signals should be replaced with modern countdown signals that provide pedestrians with sufficient information to make safe choices traversing this busy multi-lane arterial.

Outside of Loyola Ave, crosswalks and curb ramps are still absent at many intersections on both sides of Calliope Street, including accessible curb cuts through the neutral ground on Simon Bolivar Avenue. High observed pedestrian demand at several non-signalized intersections (Oretha Castle Haley Boulevard and Clio Street; Simon Bolivar Avenue at Thalia Street; S Rampart Street and Lafayette Street for example) indicates a particular need for high-visibility crosswalks and signage. Along Calliope Street itself, it is not always clear where pedestrians may safely cross, or where pedestrian access routes underneath the expressway are located.

Sidewalk conditions also vary between the two neighborhoods of this crash cluster; on the downtown side, sidewalks are in generally good condition, but numerous obstructions impact pedestrian areas and landscaping and street furnishings are on many blocks too sparse for a CBD setting. On Simon Bolivar Avenue, sidewalk level of service is diminished by maintenance issues and rampant obstruction of pedestrian areas by vehicles, forcing pedestrians into the roadway at regular intervals. On neighboring side streets (e.g. Clio Street) sidewalks are completely absent or so overgrown as to be rendered unusable. Improved enforcement of city codes regulating maintenance of vacant properties as well as sidewalk obstruction are needed most in this area to maximize the utility of the existing infrastructure.

Both neighborhoods impacted by this crash cluster are in the midst of significant development and investment. New housing construction is underway along Simon Bolivar Avenue, while the neighboring Oretha Castle Haley Boulevard is seeing a resurgence in business activity. Along Loyola Avenue, S Rampart St, and O'Keefe Avenue, the completion of the Loyola Streetcar Line has spurred several major new developments now in the planning or construction stages (e.g. Plaza Tower redevelopment, South Market District) that promise to revitalize several blocks within and adjacent to this crash cluster. As these developments move forward, it is essential that pedestrian infrastructure improvements are integrated into project plans in order to improve existing deficiencies and create a safe, comfortable environment for all who come to live, work, and play in New Orleans' downtown.

4.3 Airline Drive and Williams Boulevard Pedestrian Crash Cluster

At the third crash cluster under analysis for this report, centered at the intersection of Airline Drive and Williams Boulevard in Jefferson Parish, there were 13 pedestrian crashes between 2006 and 2010 (Figure 76). At an average of 2.6 crashes per year, this would seem to be a less serious safety concern than the previous two clusters. However, the tight concentration of these crashes at a few key intersections warrants a closer examination of how the built environment around these two critical corridors could better serve all types of users. In addition, this crash cluster includes one fatal and one severe crash (Figures 77 and 78).

Figure 76: Pedestrian Crashes, Airline Dr and Williams Blvd Crash Cluster

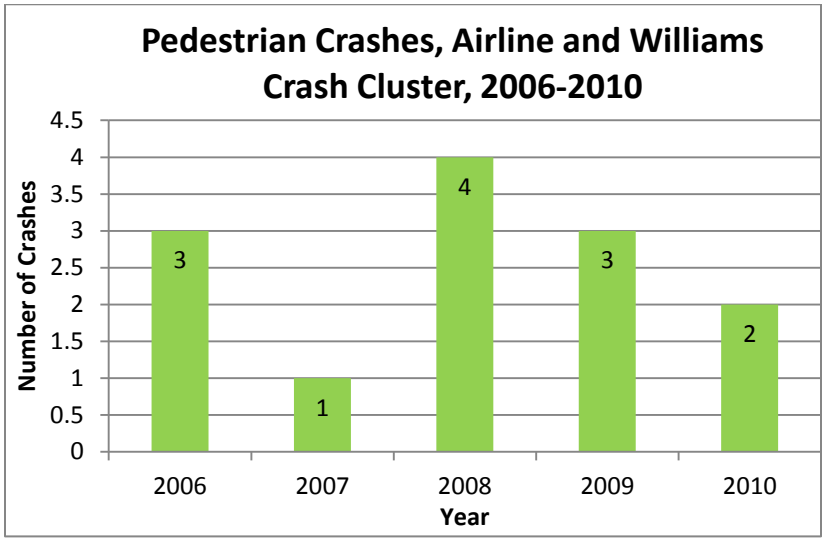


Figure 77: Pedestrian Crashes by Severity, Airline Dr and Williams Blvd Crash Cluster

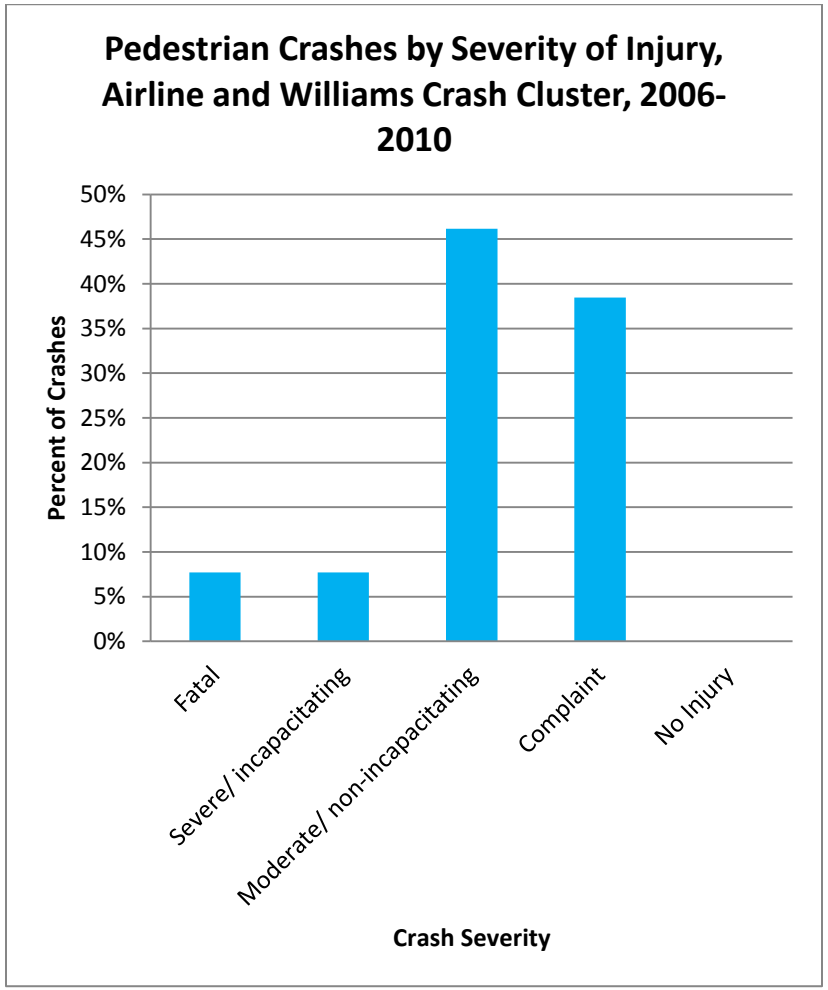
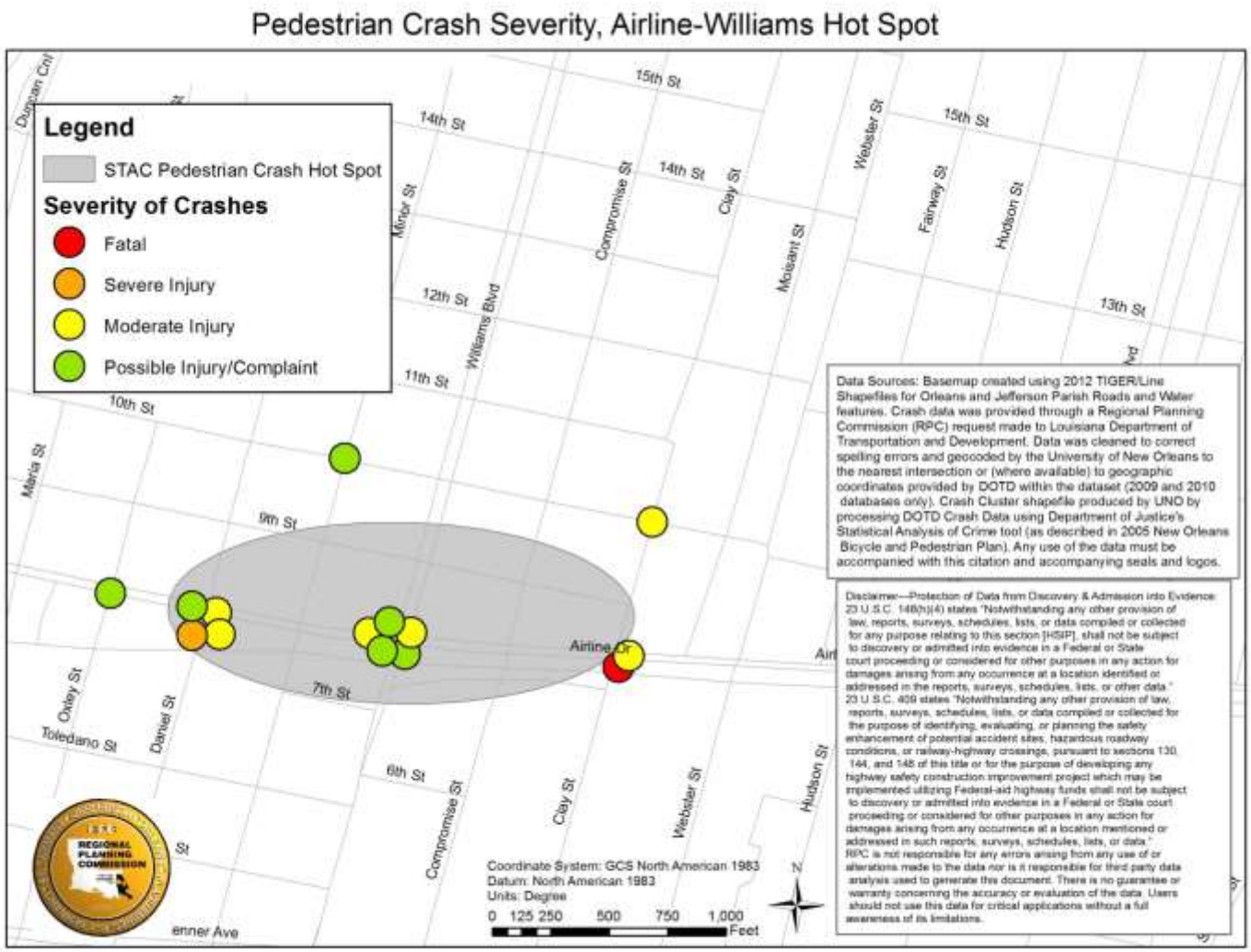


Figure 78: Pedestrian Crash Severity, Airline Dr and Williams Blvd Crash Cluster



Temporal Factors

Figures 79, 80, and 81 show the distribution of crashes by month, day of the week, and hour of the day. Given the small sample size, clear patterns are difficult to discern. Eight of the thirteen crashes took place in August, while unlike at the other two sites evaluated, nighttime and weekend crashes appear to be common.

Figure 79: Pedestrian Crashes by Hour of Day, Airline Dr and Williams Blvd Crash Cluster

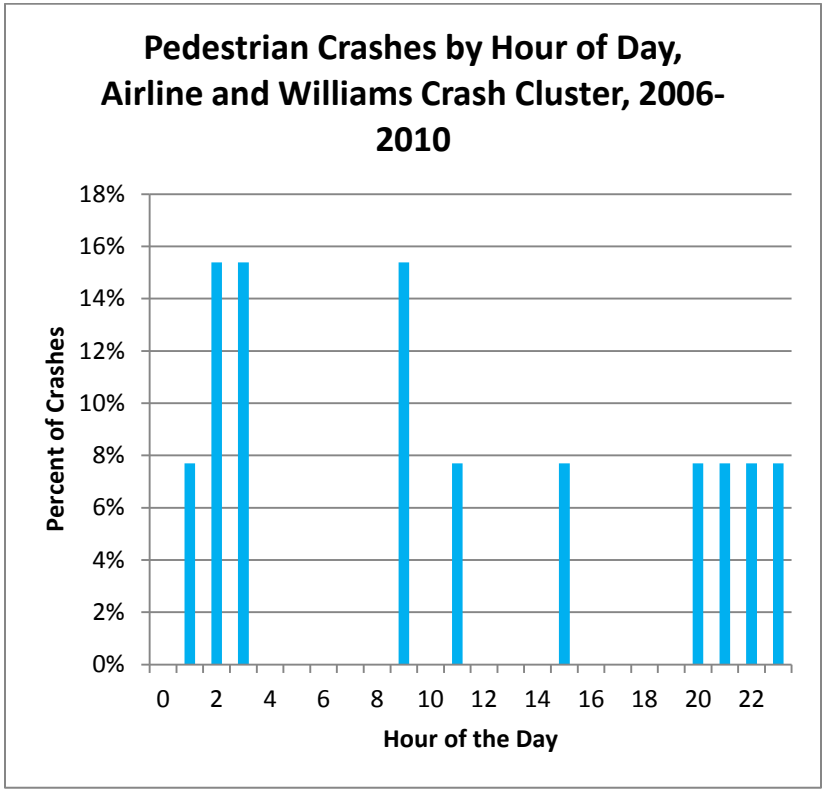


Figure 80: Pedestrian Crashes by Month, Airline Dr and Williams Blvd Crash Cluster

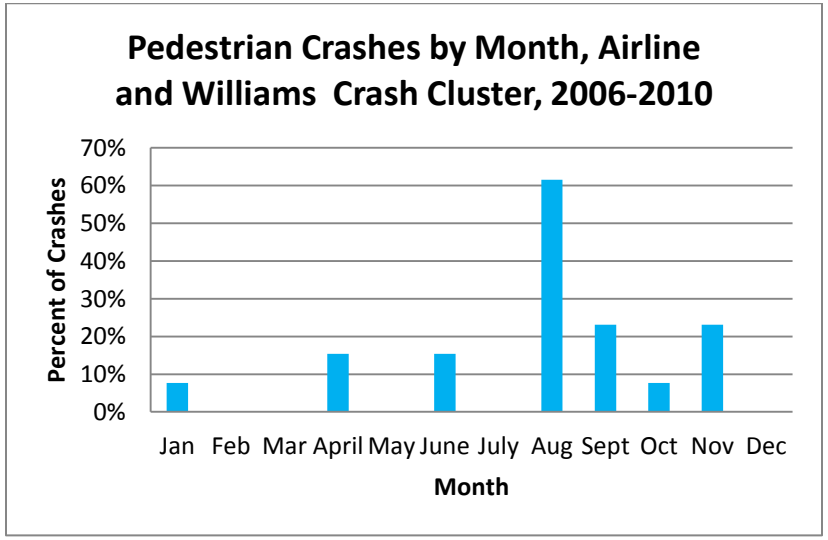
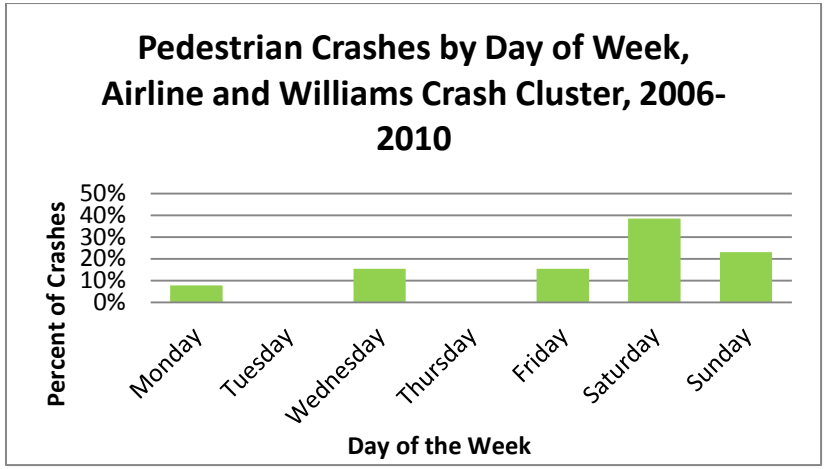


Figure 81: Pedestrian Crashes by Day of Week, Airline Dr and Williams Blvd Crash Cluster



Seven of the crashes occurred at night, in the dark and under continuous street light. Another took place at night, with less street light available (Figure 82). Among crashes for which road condition was determined, all were determined to have no abnormalities at the time of the crash (Figure 83), and all but one occurred during normal weather conditions, with one occurring under foggy or smoky conditions (Figure 84).

Figure 82: Lighting Condition, Pedestrian Crashes, Airline Dr and Williams Blvd Crash Cluster

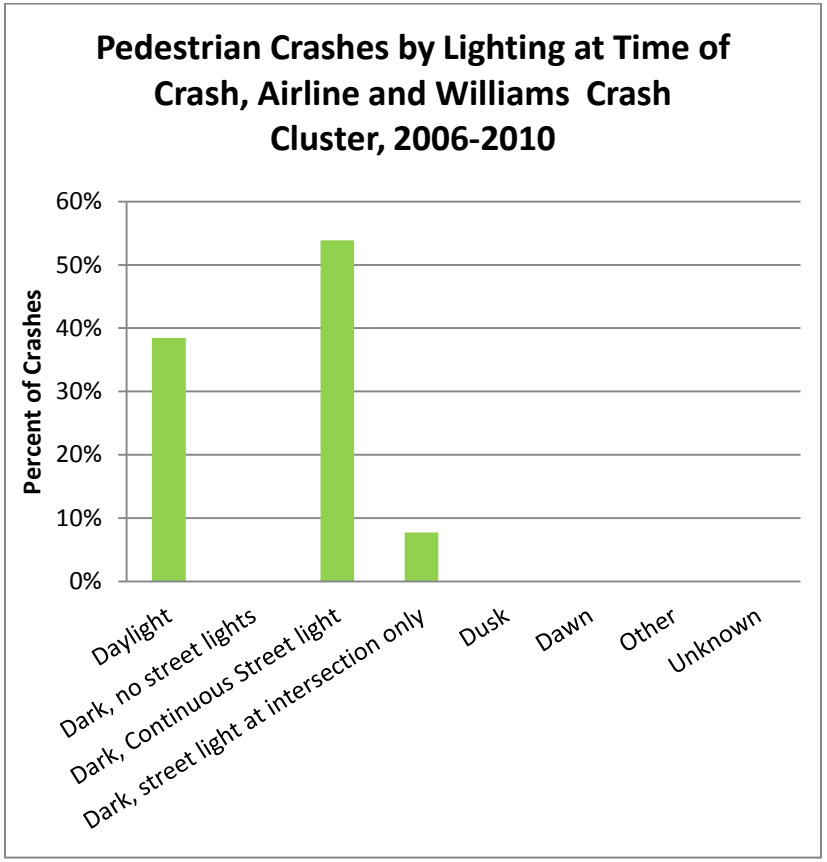


Figure 83: Road Condition, Pedestrian Crashes, Airline Dr and Williams Blvd Crash Cluster

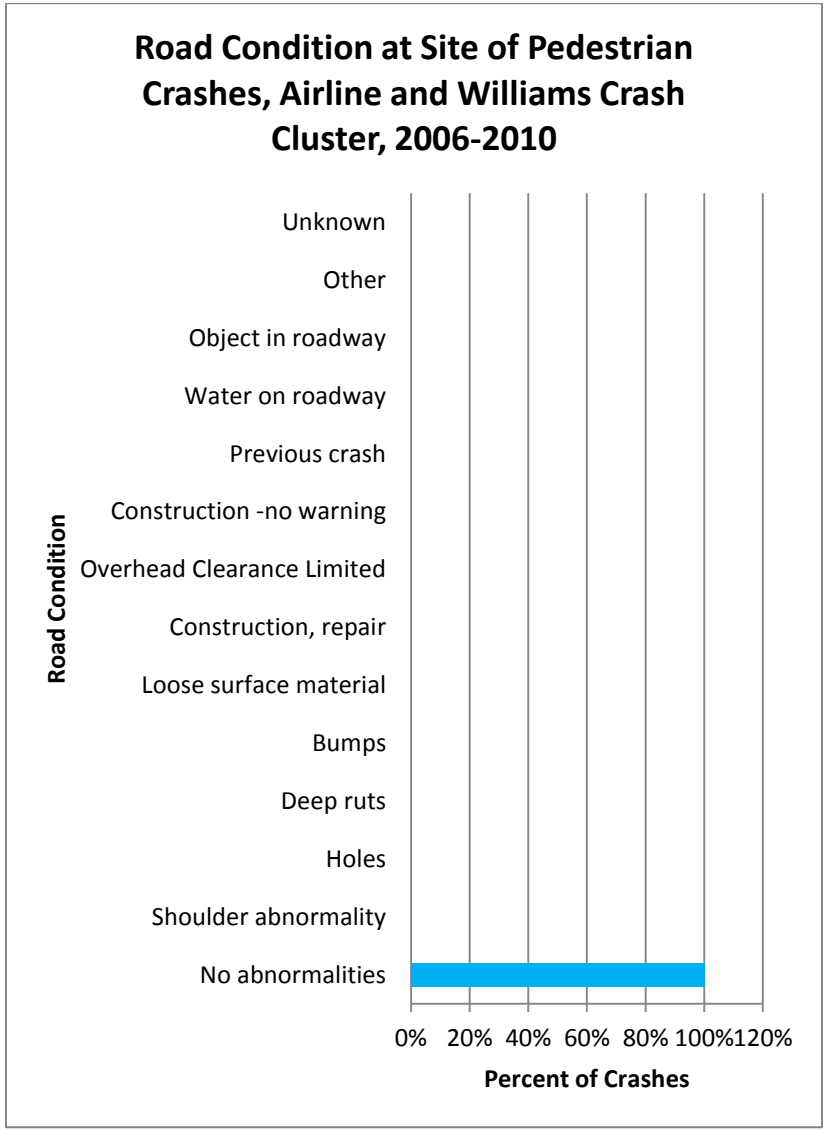
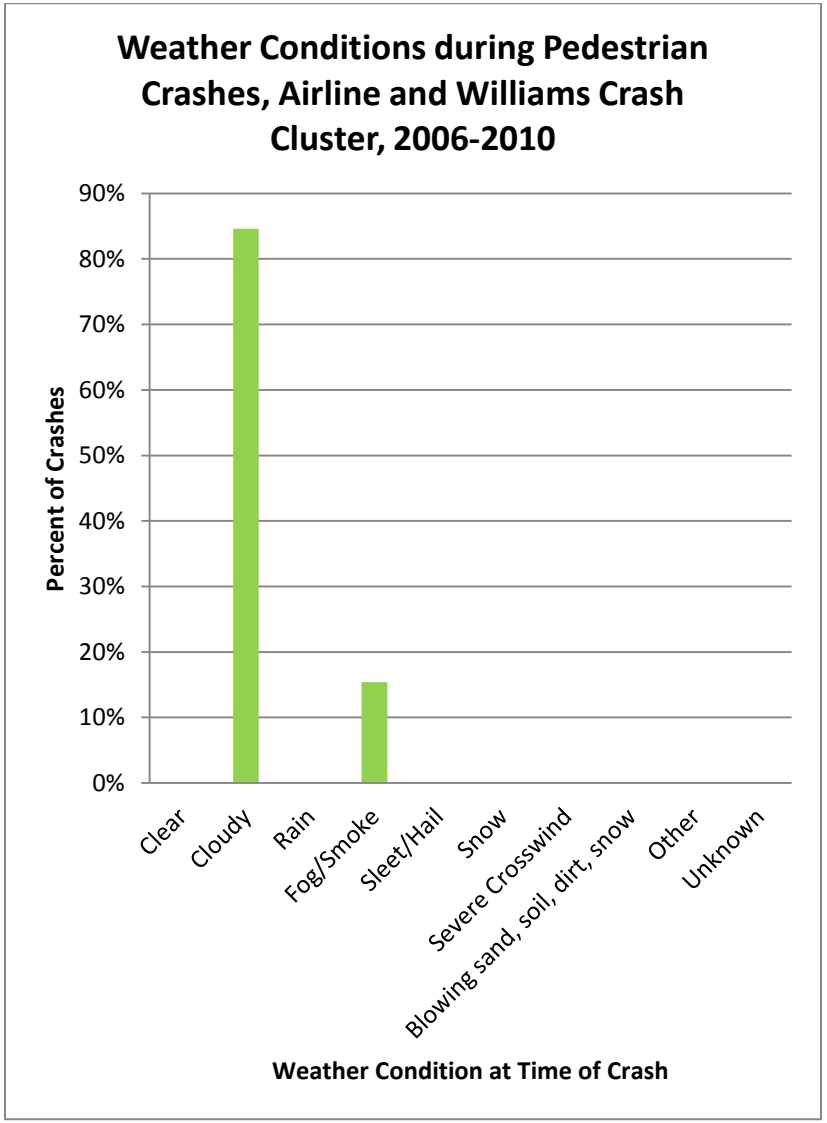


Figure 84: Weather Conditions, Pedestrian Crashes, Airline Dr and Williams Blvd Crash Cluster



Demographic Factors

About 15% of pedestrians (two individuals) involved in crashes at this location were under the age of 18, while the rest were adults ages 18-65 (Figure 85). All but two pedestrians involved were men (Figure 86), and most (77%) were identified as black (Figure 87).

Figure 85: Pedestrian Crashes by Age, Airline Dr and Williams Blvd Crash Cluster

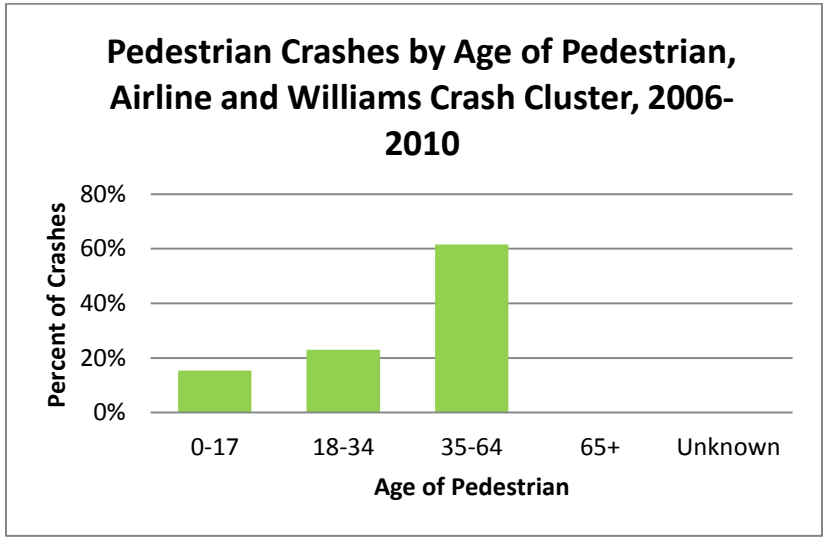


Figure 86: Pedestrian Crashes by Sex, Airline Dr and Williams Blvd Crash Cluster

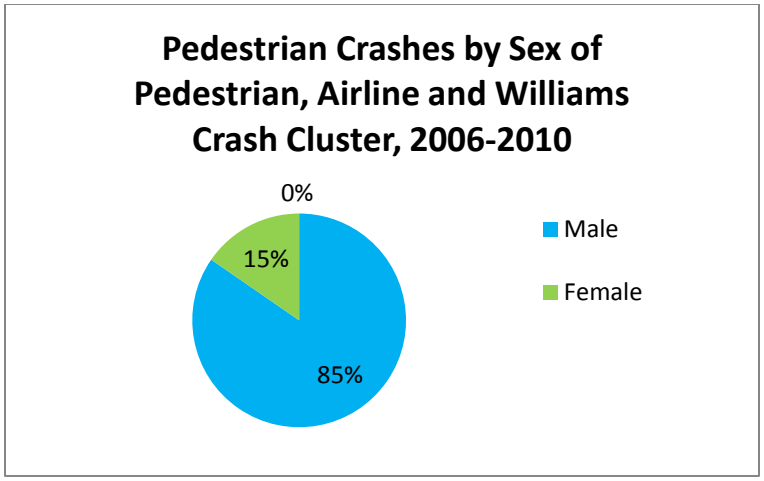
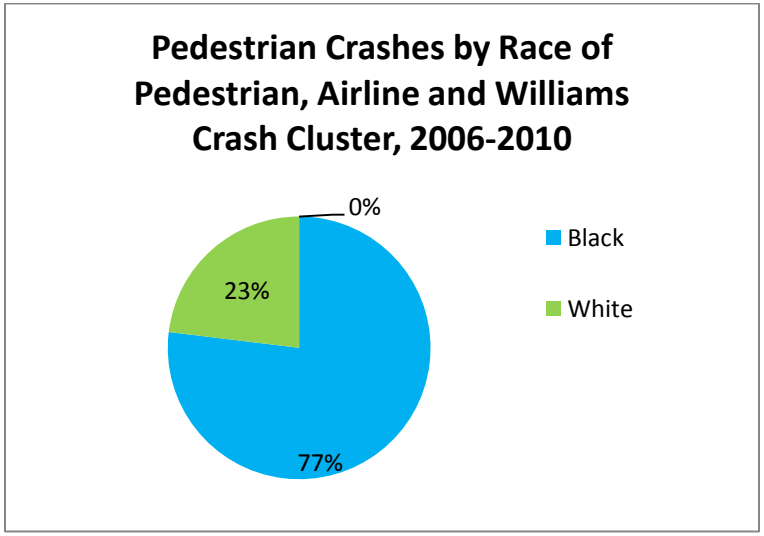


Figure 87: Pedestrian Crashes by Race, Airline Dr and Williams Blvd Crash Cluster



Behavioral Factors

Primary contributing factors were available for all 13 crashes at this location, including two caused by violations, two caused by movements prior to the crash, one crash attributed to the condition of the driver, and eight identified as being primarily due to pedestrian actions (Figure 88). Secondary contributing factors include two violations, three movements prior to crash, one related to weather conditions, and four related to either pedestrian actions or the condition of the pedestrian (Figure 89).

Figure 88: Primary Contributing Factors, Pedestrian Crashes, Airline Dr and Williams Blvd Crash Cluster

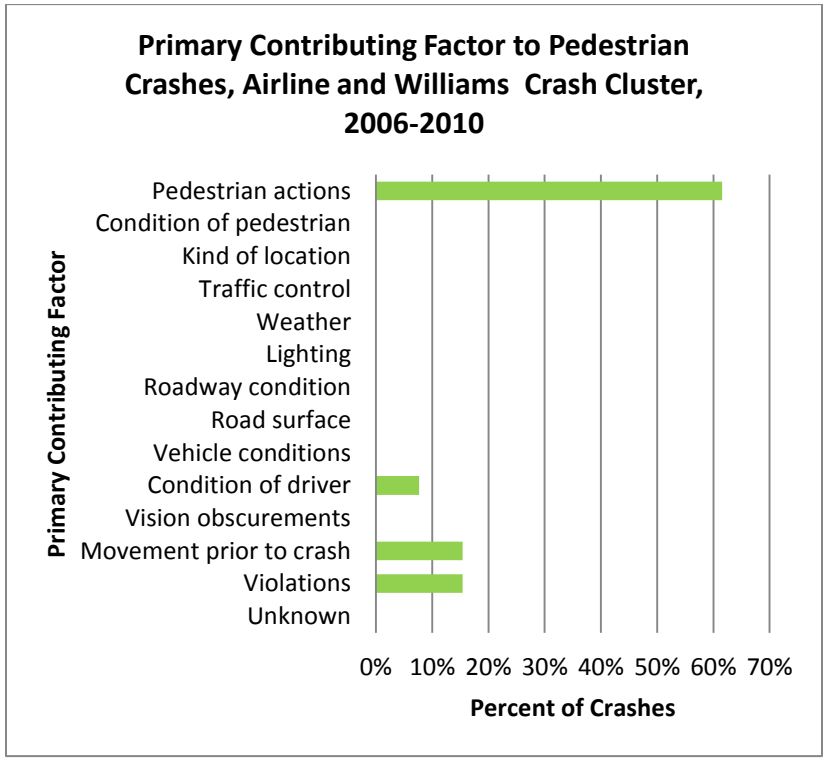
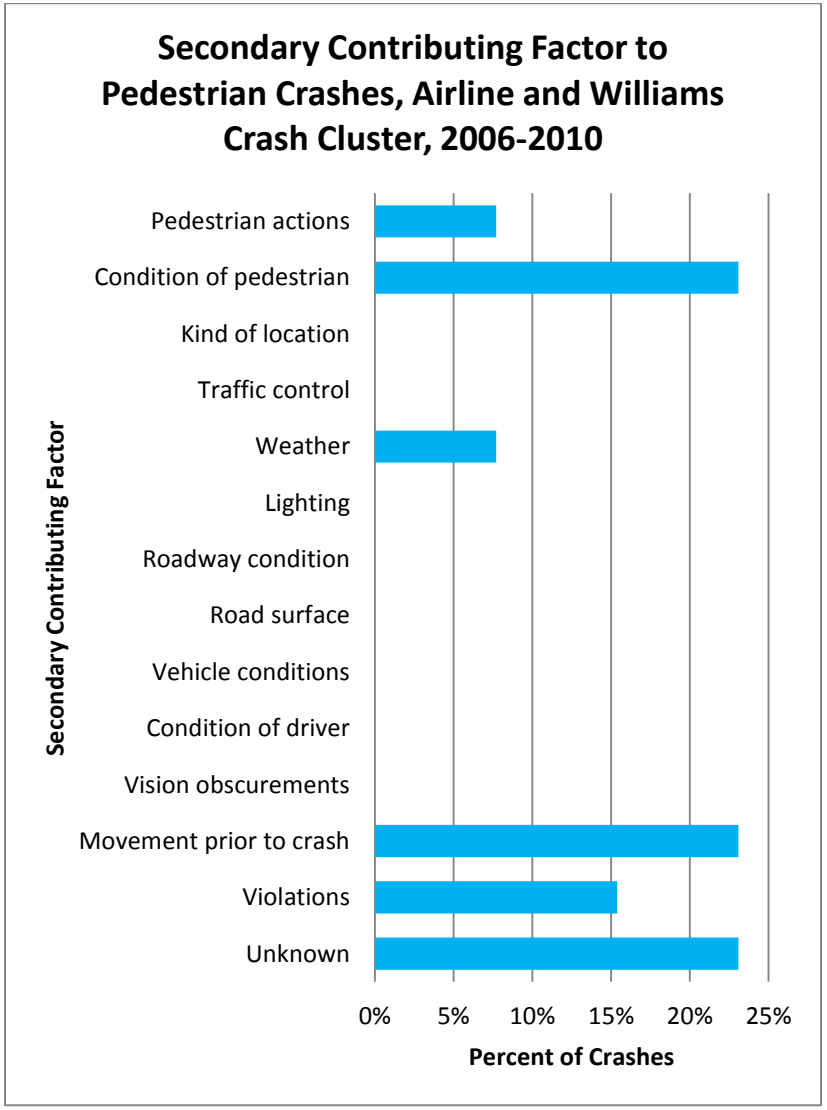


Figure 89: Secondary Contributing Factors, Pedestrian Crashes, Airline Dr and Williams Blvd Crash Cluster



Information on the manner of collision for pedestrian crashes is available for all but one crash at this location. "Non-collision with motor vehicle" is identified for four crashes, two were the result of a right angle collision, one is described as a left turn-opposite direction crash, and two more as sideswipes (Figure 90). Two crashes were identified as a hit-and-run (Figure 91) and five were reported to involve either drugs or alcohol (Figures 92 and 93). Traffic violations were only issued in three cases (Figure 94).

Figure 90: Manner of Collision, Pedestrian Crashes, Airline Dr and Williams Blvd Crash Cluster

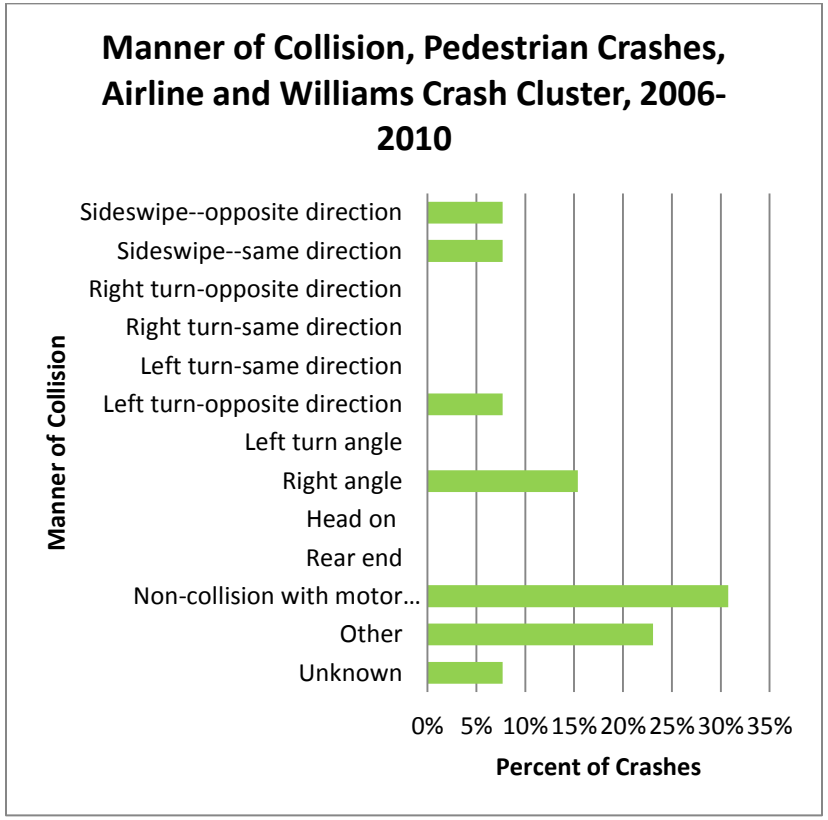


Figure 91: Hit and Run Pedestrian Crashes, Airline Dr and Williams Blvd Crash Cluster

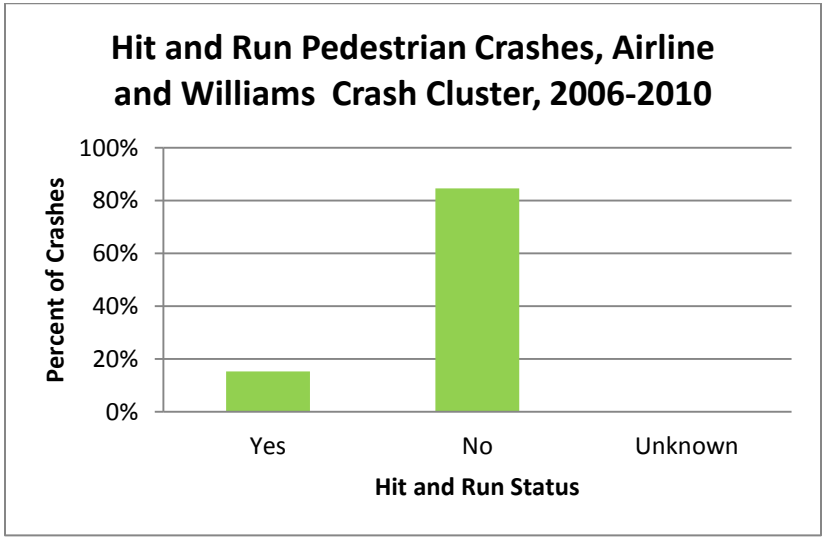


Figure 92: Pedestrian Crashes Involving Drugs, Airline Dr and Williams Blvd Crash Cluster

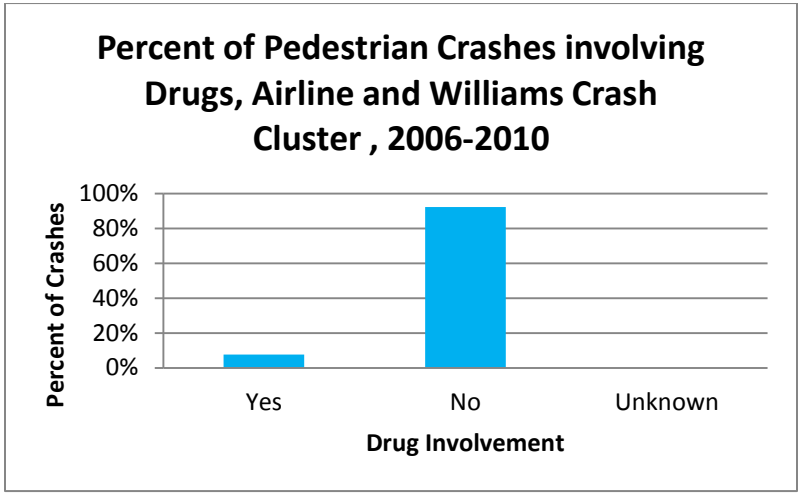


Figure 93: Pedestrian Crashes Involving Alcohol, Airline Dr and Williams Blvd Crash Cluster

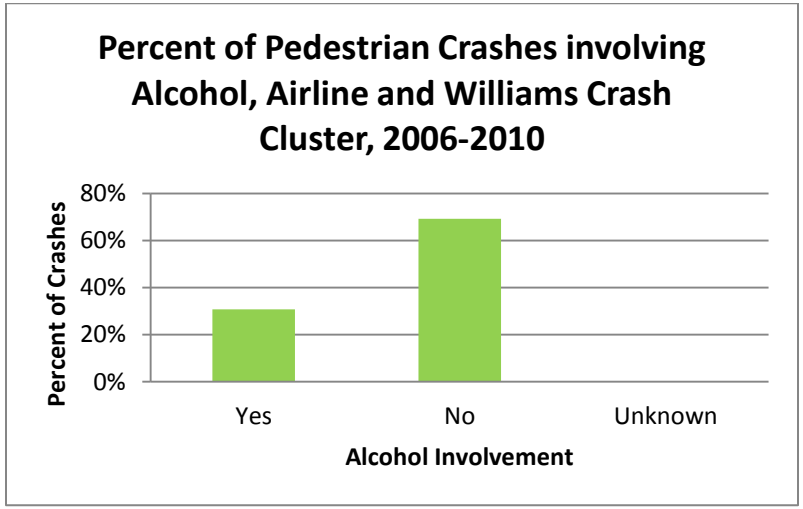
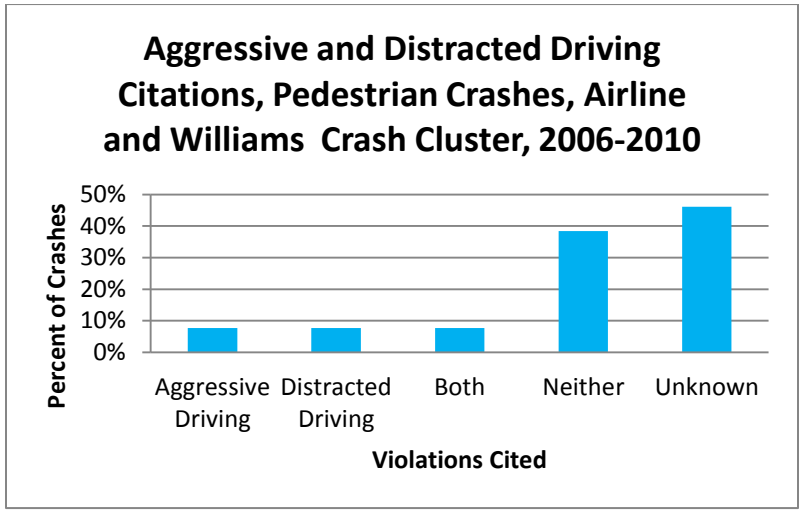


Figure 94: Aggressive and Distracted Driving Citations, Pedestrian Crashes, Airline Dr and Williams Blvd Crash Cluster



Data on pedestrian actions or condition were not available for this set of crashes. However, the high number of crashes which have been attributed to pedestrian actions, as well as the large percentage of crashes where drugs or alcohol involved (whether on the part of the driver or the pedestrian) suggest an environment where pedestrians are routinely putting their lives at risk by traveling across and along the roadway, potentially as a result of poor pedestrian accommodation that does not provide safe spaces for those on foot. Infrastructure in this area does not make it sufficiently clear to pedestrians when and where to cross roadways or walk alongside them, nor does it provide drivers with the visual cues needed to anticipate the likely presence of pedestrians.

Pedestrian Street and Intersection Audit

As described above, a pedestrian built environment audit was conducted in March 2013 along Airline Drive and Williams Boulevard in the blocks surrounding the STAC crash cluster. The more limited scope of this audit reflects the tight concentration of crashes around a few intersections on Airline Drive, though a handful of crashes did occur outside the bounds of this audit and warrant further examination in order to develop recommended solutions for these side streets.

Audit scores along the main corridors of this crash cluster were almost uniformly poor, ranging from -2.16 to 2.25, but with a median score below zero. Five of the seven intersections rated “Very Poor,” while the remaining two were rated “Fair.” Nine sidewalk segments were rated “Very Poor,” with two rated “Fair” and a sole, recently constructed segment rated “Good” (Figure 95; see Appendix 3 for full audit results).

One fatal pedestrian crash occurred at the intersection of Airline Drive and Clay Street, again, curiously, one of the two better-ranked intersections. Interestingly, all of the crashes along Airline Drive (11 of the thirteen captured by the STAC cluster) occurred at or near signalized intersections (although as noted, geospatial data provided with this crash data currently locates crashes according to the nearest intersection, regardless of whether the crash occurred at the intersection or mid-block). The crash resulting in severe injury occurred at Airline Drive and Daniel Street, another signalized intersection identified as being of very poor quality for pedestrians. The largest number of crashes, however, occurred at or near the intersection of Airline Drive and Williams Boulevard, which also received the lowest score of any segment or intersection audited.

Overall, Airline Drive is an extremely hostile environment for pedestrians. Sidewalks, where they exist, are narrow and frequently obstructed. Driveways are very frequent and poorly delineated. In some cases, no sidewalk is present at all and users are forced to use the shoulder or adjacent lawns, even to access transit stops. Curb ramps are missing on many corners and crosswalks are missing from most intersections. Perhaps more critically, the road is extremely difficult to cross at most points. At Airline and Williams, no part of the signal cycle is free from direct conflicts with automobiles. Where signal timing does permit pedestrian crossings, wait times are very long. At non-signalized intersections, pedestrian crossings are clearly not encouraged or anticipated.

Along Williams Boulevard, as traffic speeds and volumes are lower and pedestrian conditions are slightly better. Curb ramps were recently installed at Williams Boulevard and 6th Street/Toledano Street, however as of this audit crosswalks were not included. Sidewalk obstructions are less common on Williams Boulevard. On both corridors, pedestrians are seldom buffered from heavy, fast moving traffic and as noted, at times forced to walk along the shoulder alongside vehicles.

Figure 95: Pedestrian Crashes and Pedestrian Infrastructure Audit Scores, Airline Dr and Williams Blvd Hot Spot

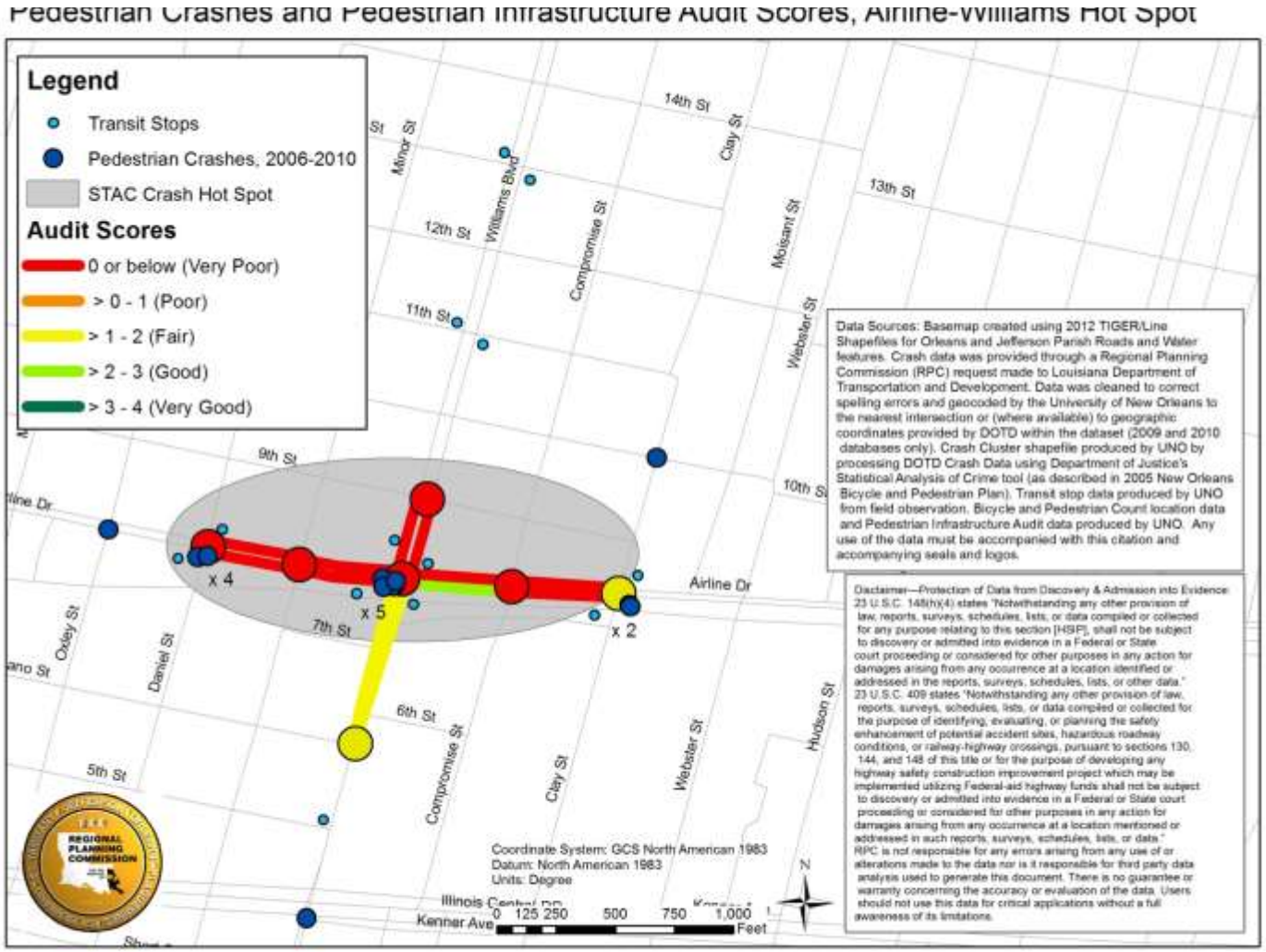


Figure 96: Audit Findings—Airline and Williams (1)

Pedestrians forced to use shoulder of Airline Dr to access transit shelter at Clay St (Photo Credit Lucien Bruno)

Figure 97: Audit Findings—Airline and Williams (2)

Lack of Sidewalk forces users into roadway on Airline Dr (Photo Credit Lucien Bruno)

Figure 98: Audit Findings—Airline and Williams (3)

Sidewalk ends, leading into roadway; no crosswalk or pedestrian signal present, Airline Dr at Clay St (Photo Credit Lucien Bruno)

Figure 99: Audit Findings—Airline and Williams (4)

JeT Transit stop immediately adjacent to roadway, limited pedestrian access, Airline Dr at Daniel St (Photo Credit Lucien Bruno)

Figure 100: Audit Findings—Airline and Williams (5)

Sidewalk fully obstructed by vehicles, Airline Dr at Minor St (Photo Credit Lucien Bruno)

Figure 101: Audit Findings—Airline and Williams (6)

"Porkchop" turn lane leaves pedestrians exposed on roadway; crosswalk in poor condition (Photo Credit Lucien Bruno)

Pedestrian and Bicycle Counts

Manual counts for this crash cluster were conducted on each of the main corridors within the cluster, Airline Drive between Williams Boulevard and Compromise Street, and Williams Boulevard between Airline Drive and 9th Street (Figure 102).

Both Airline Drive and Williams Boulevard have much lower bicycle and pedestrian traffic than the other two hot spots evaluated, and are considerably under the regional average for the 26 count sites observed in 2013 (Tables 24 and 25). Of the limited number of users that were observed, the majority were male, and most were identified as black. However, at Airline Drive a larger percentage of pedestrians were women than at either of the other sites, and at both Airline Drive and Williams Boulevard, greater than 13% were identified as children 14 or younger. The presence of women and children at these locations, despite the severe deficiencies in pedestrian infrastructure, is likely related to the importance of both arterials as transit corridors in Jefferson Parish. Given the lack of infrastructure in the area, it is perhaps unsurprising that a much greater percentage of pedestrians (18%) were observed walking in the roadway on Airline Drive, while a majority of cyclists at the two sites chose to utilize the sidewalk when available. Not a single cyclist was observed wearing a helmet at either location.

Given the very low numbers of pedestrians and cyclists observed, it is unsurprising that active transportation appears to account for a very small share of total traffic on these high-volume arterials (Tables 22 and 23). However, limited pedestrian use also reinforces the fact that a disproportionate number of those who do attempt to travel along these roadways on foot are being injured in the process. Of all the streets and intersections evaluated in this study, the signalized intersections along Airline Drive between Daniel Street and Clay Street may be in the most dire need of intervention in order to prevent future incidents.

Table 22: Automobile ADT, Airline Dr and Williams Blvd

Automobile Average Daily Traffic (ADT) Data, Airline and Williams					
Agency	**Corridor**	**Cross Street 1**	**Cross Street 2**	**Year**	**ADT**
RPC	Williams Blvd	Airline Dr	3rd St	2002	11,980
RPC	Airline Dr	Williams Blvd	David Dr	2008	34,700
RPC	Airline Dr	Parish Line	Williams Blvd	2008	30,268
DOTD	Williams Blvd	10th st	9th st	2011	20,470
DOTD	Williams Blvd	Airline Dr	6th st	2011	9,423
DOTD	Airline Dr	Oxley St	Daniel St	2011	26,372
DOTD	Airline Dr	Calhoun St	Filmore St	2011	25,862

Source: New Orleans Regional Planning Commission; Louisiana Department of Transportation and Development

Table 23: Approximate Mode Share, Airline Dr and Williams Blvd

Approximate Pedestrian and Bicycle Mode Share, Airline and Williams				
	Airline Dr		Williams Blvd	
	#	**%**	**#**	**%**
Pedestrian EDT	163	0.6%	209	2.2%
Bicycle EDT	36	0.1%	28	0.3%
Automobile ADT	26,372	99.3%	9,423	97.5%
Total	26,571		**9,660**	

Figure 102: Pedestrian-Bicycle Count Locations, Airline Dr and Williams Blvd Crash Cluster

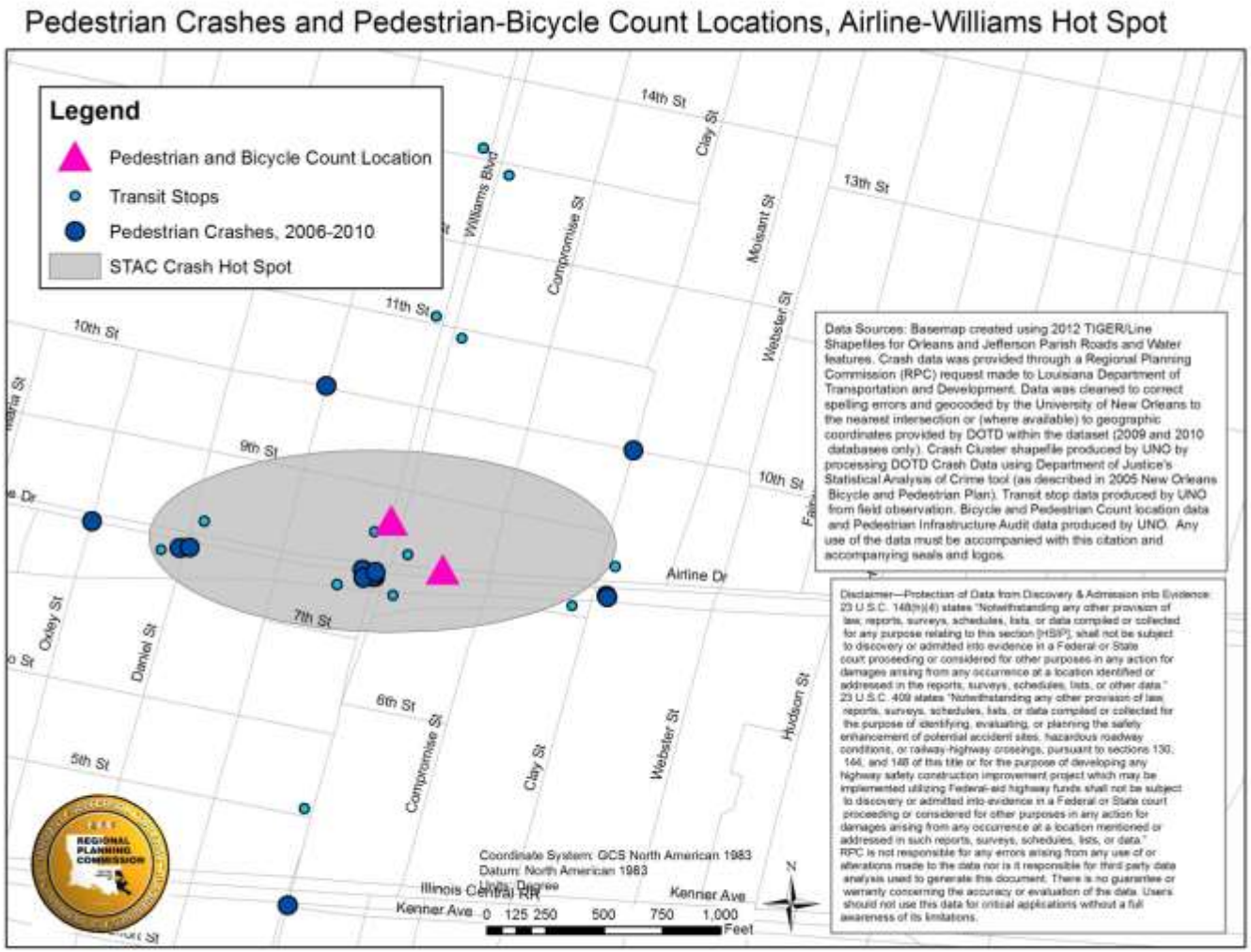


Table 24: Pedestrian and Bicycle Count Summary, Airline Drive

Pedestrian and Bicycle Count Summary, Airline Drive				
	Pedestrians		Bicycles	
	Airline Dr	New Orleans Average (Observed)	Airline Dr	New Orleans Average (Observed)
Total Observed	**45**	**317**	**10**	**114**
Estimated Daily Traffic (EDT)	163	*928*	36	*392*
Gender				
Female	44.4%	40.6%	0.0%	28.7%
Male	55.6%	59.4%	100.0%	71.3%
Race				
White	11.1%	58.4%	20.0%	69.7%
Black	86.7%	36.1%	80.0%	25.7%
Other	1.1%	5.5%	0.0%	4.6%
Age Group				
Adult	86.7%	95.4%	90.0%	98.1%
Youth	13.3%	4.6%	10.0%	1.9%
Travel Orientation				
Street (Pedestrians)	17.8%	4.8%		
Street--Right Way (Bicycles)			10.0%	81.0%
Street--Wrong Way (Bicycles)			40.0%	7.0%
Sidewalk	77.8%	91.3%	50.0%	11.8%
Neutral Ground	4.4%	3.9%	0%	0.2%
Helmet Use (Bicycles)			**0.0%**	**23.0%**

Observation Dates: 3/13/13; 3/21/13

*New Orleans average figures based on median total users observed and estimated daily traffic out of 26 count sites in Orleans and Jefferson Parish, March-May 2013. Demographic and behavioral averages derived from totals at all 26 sites. See *New Orleans 2013 Pedestrian and Bicycle Count Report* for additional information.

Table 25: Pedestrian and Bicycle Count Summary, Williams Boulevard

Pedestrian and Bicycle Count Summary, Williams Boulevard				
	Pedestrians		Bicycles	
	Williams Blvd	New Orleans Average (Observed)	Williams Blvd	New Orleans Average (Observed)
Total Observed	**68**	**317**	**9**	**114**
Estimated Daily Traffic (EDT)	*209*	*928*	*28*	*392*
Gender				
Female	30.9%	40.6%	11.1%	28.7%
Male	69.1%	59.4%	88.9%	71.3%
Race				
White	27.9%	58.4%	22.2%	69.7%
Black	70.6%	36.1%	66.7%	25.7%
Other	1.5%	5.5%	11.1%	4.6%
Age Group				
Adult	85.3%	95.4%	100.0%	98.1%
Youth	14.7%	4.6%	0.0%	1.9%
Travel Orientation				
Street (Pedestrians)	4.4%	4.8%		
Street--Right Way (Bicycles)			0.0%	81.0%
Street--Wrong Way (Bicycles)			0.0%	7.0%
Sidewalk	89.7%	91.3%	100.0%	11.8%
Neutral Ground	5.9%	3.9%	0%	0%
Helmet Use (Bicycles)			**0.0%**	**23.0%**

Observation Dates: 3/26/13; 3/27/13

*New Orleans average figures based on median total users observed and estimated daily traffic out of 26 count sites in Orleans and Jefferson Parish, March-May 2013. Demographic and behavioral averages derived from totals at all 26 sites. See *New Orleans 2013 Pedestrian and Bicycle Count Report* for additional information.

Area Context

Zoning data for this audit area was not readily accessible for inclusion in this report. However, land uses along Airline Drive consist principally of highly auto-oriented commercial uses, including fast food, gas stations, and car lots. Land uses along Williams Boulevard are mixed, and include commercial and residential properties, including two staffing/employment agencies observed to draw pedestrian traffic. Some parcels are currently undeveloped.

Walkability, as measured by Walkscore, is not surprisingly lower in this suburban, auto-oriented area. However, the intersection of Airline Drive and Williams Boulevard still scores a 62 (somewhat walkable), based on the presence of several commercial establishments and proximity to schools, parks, and community facilities. The area surrounding these two corridors does have a fairly well-connected street grid, permitting pedestrian access to a variety of businesses. However, more so here than at the other two sites evaluated, the limitations of this analysis tool are evident as this score cannot account for the pedestrian barrier created by Airline Drive, limiting functional access to those businesses.

This crash hot spot is also served by both RTA and JeT buses; the Kenner Loop Bus along Williams Boulevard, and the E-2 Airport bus on Airline Drive which connects Jefferson Parish directly to downtown New Orleans.

Poverty rates in the census tracts surrounding this crash cluster are lower than those seen in Orleans Parish, ranging from 4% to 32% (See Appendix 4 for detail). Similarly, far fewer workers lack access to a vehicle, ranging from only about 3 – 10%. Although pedestrians, cyclists, and transit users were observed by PBRI staff each time this location was visited, relatively few workers in the surrounding neighborhoods (1-8%) commute via active modes of transportation.

Table 26: Fatal or Severe Pedestrian Crash Profiles, Airline Dr and Williams Blvd Crash Cluster

Fatal or Severe Pedestrian Crash Profiles: Airline Dr and Williams Blvd Crash Cluster		
	Crash 1	Crash 2
Location	Clay St & Airline Dr	Daniel St & Airline Dr
Severity	Fatal	Severe/Incapacitating
Date	11/11/2006	10/22/2010
Pedestrian Age	63	22
Pedestrian Sex	Female	Male
Pedestrian Race	Black	White
Lighting Condition	Dark--Continuous Street Light	Daylight
Weather	Clear	Clear
Primary Contributing Factor	Pedestrian Actions	Condition of Driver
Secondary Contributing Factor	Movement Prior to Crash	Violations
Manner of Collision	Non-Collision with Motor Vehicle	Right Turn--Opposite Direction
Hit and Run	Yes	Yes
Drugs or Alcohol	No	Alcohol and Drugs
Violations Cited	Unknown	Yes (Unspecified)
Pedestrian Actions	Unknown	Unknown
Pedestrian Condition	Unknown	Unknown

Profile of Fatal and Severe Crashes

One fatality and one severe or incapacitating injury occurred within the Airline Drive and Williams Boulevard crash cluster (Table 26). The pedestrian fatality involved an older woman at night, and the crash was attributed to her (unspecified) actions. Crash 2 involved a young adult male during the day, and involved an impaired driver turning right into the pedestrian. Both incidents were classified as hit and run crashes. In neither case can we reasonably assess possible correlations with the numerous pedestrian infrastructure deficiencies identified along Airline Drive without additional information on the location and movements leading to each crash.

Recommended Interventions

Crashes along Airline Drive at and near Williams Boulevard appear to be attributable to two key issues: a near-total lack of pedestrian infrastructure to allow safe passage across and along the corridor, and reckless or unsafe behavior on the part of both pedestrians and drivers. The latter issue requires enforcement solutions to ensure that legal speeds are maintained and impaired drivers are kept off the roadways. The number of crashes attributed to pedestrian behavior, however, could be substantially improved through engineering solutions that create clear pedestrian access routes. If safe, convenient crossings are made available and visible, far fewer pedestrians are likely to engage in risky, unpredictable dart-and-dash crossings through traffic.

Active transportation use along these corridors is low, however, both arterials represent critical links to jobs, businesses, and regional transit services. These users are currently poorly served by the existing infrastructure, which provides very little protection from heavy, fast-moving vehicle traffic. At signalized intersections, pedestrian signals are critically needed. Due to the low user volumes observed, pedestrian actuated signals would be appropriate at these locations, provided that signal phasing included a dedicated pedestrian phase free from turning conflicts. At non-signalized intersections, high-visibility crosswalks and curb ramps (including median cut-throughs) would alert drivers to the possible presence of pedestrians. An expansion of the median to a width sufficient to serve as a pedestrian refuge would significantly ease the difficulty of non-signalized crossings.

Where sidewalks exist, maintenance issues or obstructions are found on almost every segment (save one newly-constructed facility that ends abruptly at end of the block). Sidewalks are intersected by numerous driveways and delineations between the roadway, pedestrian areas, and parking lots are indistinct, in many cases with no curb at all. Along Airline Drive in particular, pedestrians are forced to navigate numerous obstructions and utilize the shoulder of the roadway. New sidewalk construction, as well as use of access management techniques to minimize the number of entrances and exits to commercial properties, should be required of any new or redevelopment projects occurring along this corridor. In the interim, requiring property owners to keep a clear access zone of at least 4 feet to permit off-street pedestrian passage could help reduce incidences of pedestrians struck while traveling in the roadway.

Of the three sites observed, this crash cluster requires the most substantial retrofits in order to create an environment that is safe and comfortable for pedestrians (or bicyclists). While the other two sites have existing sidewalk networks simply in need of repair or expansion, the Airline Drive corridor is mostly missing a cohesive

sidewalk network. Pedestrian facilities, where present, are disconnected and inconsistent. On the other hand, existing building setbacks and ample right of way present an opportunity for a future redesign of this corridor to follow a complete streets approach and integrate bicycle, pedestrian, and transit facilities into a currently automobile-dominated built environment. Such an effort, though costly, could improve health, economic, and livability outcomes for residents and employers in suburban Jefferson Parish.

5.0 CONCLUSIONS

Pedestrians are the most vulnerable of all transportation facility users, and virtually everyone is a pedestrian at some point in their daily lives. Among our most vulnerable populations of all, including the young, the elderly, people of limited financial means, and the physically disabled, many use walking and transit as their primary means of transportation. Creating a built environment where it is feasible and safe to walk permits these groups—and many others—to access employment, shopping, and services, to maintain their independence, and to be physically active on a daily basis.

This report details a few facets of the safety problems facing pedestrians, bicyclists, and transit users (who usually begin and end their trips as one of the former) in three locations in the New Orleans metro area. This is an exploratory effort to understand some of the complexities impacting safety outcomes, through an evaluation of readily available data sources as well as through direct observation of conditions in the built environment. Better understanding the conditions present in this region that affect safety outcomes can help us to more effectively prioritize the use of limited resources for near-term interventions, as well as to holistically plan for programs and policies that will guide transportation planning in the long term.

Although New Orleans has long provided routine accommodation for pedestrians along its roadways, there are still several areas where improvement is needed citywide. Many facilities need to be retrofitted to comply with the American Disabilities Act (including accommodations for the hearing and visually impaired), upgrades to outdated and/or non-functional equipment must be made, and solutions need to be reached for long-term maintenance of infrastructure once constructed in order to maintain accessibility and functionality for all users. In suburban parishes in the New Orleans region, substantial gaps in pedestrian networks exist, creating both a challenge and an opportunity to build high-quality new facilities in accordance with national best practices, making a tremendous impact on overall connectivity.

The American Association of State Highway and Transportation Officials (AASHTO)'s *Guide for the Planning, Design, and Operation of Pedestrian Facilities* (2004) sets the current guidelines for development of effective, accessible pedestrian infrastructure. According to this guide, the key conditions of a high-quality pedestrian environment are a mix of land uses, continuous and connected pedestrian facilities, separated from fast-moving vehicular traffic, safe and convenient street crossings, pedestrian-scale lighting, and a pleasant visual environment.

Establishing priorities in making improvements to achieve those conditions is essential. According to the AASHTO guide, local, regional, and state governments should consider the following criteria in evaluating and ranking possible infrastructure investments:

- Existing pedestrian volumes
- Presence of major pedestrian generators (e.g. hospitals, schools, shopping centers, transit, senior housing, civic buildings, parks)
- Speed of the roadway
- Street classification (priority should be given to major arterials, as they serve greater numbers of users and connect neighborhoods)
- Crash data
- School zones and catchment areas for students walking to school
- Transit routes

- Urban centers and neighborhood commercial areas
- Low income neighborhoods
- Missing links in existing infrastructure networks
- Priorities identified by residents, including requests to correct identified problems
- Diversity of activity types (e.g. recreational, shopping, commuting)
- Established ADA transition plan priorities and programs
- Planned roadway resurfacing projects

Priority intervention areas should include areas that meet more than one of these criteria. Depending on the community's needs, some criteria may be given more emphasis or weight than others. Each of the three crash hot spots evaluated within this report meets several of the criteria for priority investment, in addition to a demonstrated, statistically significant crash problem. Some or all of the tools and techniques employed in evaluating these three sites could be more broadly deployed in order to evaluate a wider variety of nodes and corridors in need of pedestrian infrastructure improvements and establish priorities accordingly.

Notably, there are a number of limitations inherent in both the data available and the techniques employed that should be considered and addressed in future research efforts. First, as noted above, there are considerable limitations in the crash dataset used to evaluate crash locations and contributing factors. A portion of the desired data was missing or otherwise unavailable at the time of this analysis, and the data that is available lacks sufficient specificity to accurately deduce precisely how, where, and why crashes are occurring. The accuracy and specificity of crash data in the New Orleans region has improved considerably already since 2006; future analysis efforts should find it easier to retrieve and evaluate more recent data with advances in use of GPS technology, and an improved awareness of the importance of collecting complete and accurate crash reports.

However, further adjustments to the way that crashes involving pedestrians (and bicyclists) are recorded (and/or to how crash databases are developed and data is disseminated) by incorporating information describing the exact location and pedestrian or bicycle-specific crash type would allow a considerably more detailed level of analysis. The Pedestrian and Bicycle Crash Analysis Tool (PBCAT) developed by the Pedestrian and Bicycle Information Center (PBIC) with support from the Federal Highway Administration,[16] could be employed to produce advanced, interactive data in future research efforts, and also provides a model for how to document pedestrian and bicycle crashes in a way that is conducive to such analysis.

Second, limitations inherent to the pedestrian audit survey instruments should be noted. While these tools were developed to reflect compliance with AASHTO guidelines and other national best practices in pedestrian design, some important elements of pedestrian safety and comfort were necessarily excluded. Certain infrastructure elements were not included, including presence or absence of pedestrian-scale lighting (as audits are assumed to be conducted during daylight), nor were certain elements of ADA compliance scored, such as presence of detectable warnings (or other aids for the visually impaired) or the grades and cross-slopes of facilities. Non-infrastructure considerations including crime, blight and vacancy, land use, and presence of other pedestrians were also outside of the scope of the pedestrian audit.

Finally, as discussed above, although bicycle crash hot spots and high-crash corridors were identified, this report does not attempt to comprehensively evaluate the circumstances surrounding those crashes, nor does it include an audit of the safety and utility of infrastructure for bicyclists. An easy-to-use bikeability audit tool that quantitatively and qualitatively assesses bicyclist comfort is

[16] www.walkinginfo.org; http://safety.fhwa.dot.gov/tools/data_tools/pbst.cfm

currently under development by PBRI, based on current research and best practices for facility design.[17] This tool will enable area-wide or corridor audits, similar to those completed for pedestrian infrastructure in this report. Future research efforts should include deployment of this tool in combination with crash analysis and user counts in order to better understand the relationship between infrastructure suitability, bicyclist demand for the facility, and crash outcomes.

New Orleans has generated considerable momentum around active transportation, specifically focused on the development and improvement of infrastructure and the reduction of crashes. Recent policy changes— including the adoption of local and regional complete streets policies, as well as ongoing local and regional efforts to improve safety and access through the development of Pedestrian Safety Action Plans and the implementation of new ADA Transition Plans in Orleans and Jefferson Parishes—should ensure that the needs of users of active modes of transportation will continue to be prioritized. Identifying sustainable funding sources for the effective implementation of these plans and policies is now critical.

At the project level, considering the needs of these user groups includes: keeping motor vehicle speeds at or below legal or desired limits through traffic calming and geometric solutions, providing integrated pedestrian access anywhere pedestrians are not prohibited by law, increasing comfort by separating and/or buffering pedestrians and bicyclists from high-speed traffic wherever possible, providing frequent, safe, and convenient crossings, maximizing accessible features, and including desired amenities like lighting and landscaping to encourage facility use.

More broadly, however, the concerns of active transportation users must continue to be integrated into all levels of transportation planning, including corridor plans, school plans, transit plans, local comprehensive plans, MPO long-range transportation plans, and even more focused studies such as those evaluating freight mobility. Refining and institutionalizing the collection and use of data pertaining to non-motorized transportation for use in such planning efforts in order to promote and facilitate higher levels of walking, biking, and transit use will have significant long-term impacts on the safety, health, and livability of communities in this region.

[17] For more information, see AASHTO's *Guide for the Development of Bicycle Facilities (4th edition) (*2012), and the National Association of City Transportation Officials *Urban Bikeway Design Guide (2nd edition) (*2012).

APPENDIX 1: CRASH DATA ANALYSIS METHODOLOGY

The Pedestrian Bicycle Resource Initiative (PBRI) has assumed the task of sorting and archiving all available Metropolitan New Orleans pedestrian-bicycle crash data for the years of 1999 through 2010. This section summarizes the methodology used by the University of New Orleans to evaluate and present pedestrian and bicycle crash data provided by Louisiana Department of Transportation and Development (DOTD) to the Regional Planning Commission. This methodology was developed by PBRI in 2009 as documented in "*A Guidebook to Comprehending and Organizing Pedestrian Bicycle Crash Data in the New Orleans Metropolitan Region.*" This document was updated in 2014 to reflect new RPC data use requirements and changes reflecting new versions of the Microsoft and Esri products employed in the analysis.

Part 1. Analyzing Data in Microsoft Access Database
The data were originally collected as crash reports by police agencies in the region, and are stored in the New Orleans Regional Planning Commission's files in two separate formats:

- All data between the years of 1999 and 2002 are available as Microsoft Office spreadsheets. The extension for these files is '.xls'.
- All data between the years of 2003 and 2010 were saved as Microsoft Access tables, or spreadsheets, which were aggregated into databases for each year. The databases are saved in Microsoft Access format as 'crash[year]_plus_dotd.' The extension for these files is '.mdb.'

Each Microsoft Access database (from the years 2003-2010) contains four tables that are relevant to pedestrian/bicycle related crash incidents. Those are:

- **Crash_tb (Crash Table)**
  This table contains general data on all crashes reported in that year
- **Vehic_tb (Vehicle Table)**
  This table contains data on every vehicle involved in a reported crash for that year. The number of records, or rows in the table, should be about double that listed in the crash table, since the overwhelming number of crashes reported involve a collision between two vehicles, and a record is present for both. In the 'VEH_TYPE_CD" (Vehicle type) column, bicycles are coded as 'F.
- **Pedes_tb (Pedestrian Table)**
  This table contains data on any pedestrians involved in a crash. The number of records listed in this table should be small compared to those listed in the crash and vehicle tables.
- **Dotd_tb (DOTD Table)**
  This table contains additional data for all crashes that occur on state roadways. Geographic coordinates from this table should be used wherever they are available for improved accuracy of crash geocoding.

First, a new copy of the original database is saved so that the original, unmodified version is preserved. Second, relationships between tables are created by crash number in order to link the four relevant tables (crash, bicycle, pedestrian, and DOTD coordinates).

In order to create relationships in Access between the four relevant bicycle/pedestrian crash data tables, one must:

a) open a crash database in Microsoft Access
b) Click the 'Database Tools' dropdown menu from the taskbar
c) Click 'Relationships'
d) The relationships screen will open up. The screen should be blank at this point. Right click on the blank screen and choose 'Show Table."
e) Highlight the crash table (Crash_tb) and choose 'Add," followed by the vehicle (vehic_tb), pedestrian (pedes_tb) and DOTD (dotd_tb) tables.
f) Find the 'Crash Number' in the 'Crash_tb" list that appeaers and drag it to the 'Crash Number' in the next list over. When you release the mouse button, a line should appear between the two lists. This symbolizes relationship between the two tables, meaning that Access will now relate them by their common attribute (the crash number). Repeat this step between the crash table, the pedestrian table, and the DOTD table.
g) When complete, changes are saved.

Next, querys are conducted to bring together fields from various tables into a single location based on a common field (thus the necessity of building a relationship between tables before they can be queried.)

The purpose of querying the crash data is to join information from the Vehicle, pedestrian, and DOTD tables together with information in the Crash table. For example, while the Vehicle table contains demographic information about drivers involved in a collision, it does not contain the date or time of the collision. By running a query, the user may bring this separate information into one single location that can then be converted to a table or exported as a spreadsheet.

There are two methods for querying data: using the 'design view' or the 'wizard.' While it is simpler to use the wizard feature, we use the design view, as this method makes *filtering* easier to complete.

The steps necessary to create a single table containing relevant vehicle and crash data are as follows:

a) Open the crash database in MS Access where you performed the relationship exercise; this progress should have been saved in order to complete the following exercise.
b) Click the 'Create' tab at the top of the screen, and click the 'Query design' button. Two screens should appear: the query screen in the background and the 'Show Table' screen in the foreground.
c) In the 'Show Table' screen, double click **Crash_tb** and **Vehicle_Tb** . You may now close out the 'Show Table' screen. The tables you selected should appear in the query screen with a line between them, indicating that they are connected. The boxes representing each table list on ly the fields contained within the tables. Once the query is complete, it will produce a query table with the data for each selected fields.
d) To select fields for the new query, double click each field that you wish to include. The field titles are fairly self explanatory, but users should refer to the **CODE_Tb** table for reference. **Include the crash number from one of the tables, as well as 'Vehic_Type_Cd' (vehicle type code, located in the vehicle table)** in addition to any other data desired for analysis.
e) Once you've added the vehicle type code as a field, go to the bottom half of the query screen and type 'F' into the 'criteria' row, in the 'Vehic_type_cd' column. Remmeber that F represents bicycles. This is one of two ways of

filtering data; when the table is created, it will only include records of bicycle crash incidents.

f) Once you've added all necessary fields, click the X to close the query screen. You will be prompted to save the changes to the query. Save it as 'Bicycle_Crash_Data_[year]_v1.'

The query now appears listed in the query section. Only bicycles are listed under 'vehicle type' for this query.In order to create relationships between queries and tables, the user must turn it into a table. The steps for this process are as follows.

a) Click on the 'Query' tab, and right click on the 'Bicycle_Crash_Data' file that you created in the last exercise. Click on 'Design View.'
b) Once in design view, click the top button 'Make Table,' a screen will prompt you to name the table that will be created. Title it 'Bicycle_Crash_Table_[year]_v1' and click OK.
c) Close the query design table. Save changes when prompted.
d) A table-creation query should be listed in the query secton with the name 'Bicycle_Crash_Table_[year]_v1'; double click it, click 'yes.'

Next, the user creates a query with vehicle crash data **only for motor vehicles involved in a collision with a bicycle**. Therefore, two separate spreadsheets may be created: one for bicycles involved in a collision, and one for motor vehicles involved in that same collision.

In order to do this, we bring together data from the 'Bicycle_Crash_table_[year]_v1' table and the vehicle table. The steps for this process are as follows.

a) Select all the fields from the 'Bicycle_Crash_Table_[year]_v1' table except for vehicle type.
b) Select the vehicle type field from the vehicle table (vehic_tb).
c) In the criteria for this field, type "not F."
d) Run the query. When prompted to save your changes, title it 'Vehicles_that_collided_with_bicycles_[year]_v1'

By using the crash number field of the bicycle crash table that we created in the previous lesson to run the query, and then proceeding to filter out all bicycle entries, a query is created that contains only data for vehicles that collided with bicycles.

Finally, all queries and tables are exported as MS Excel documents for further analysis.

Part 2: Spatial analysis of data in ArcGIS

In order to join data in ArcMap to connect tables, the following steps are completed.

a) Open ArcMap; click on the 'Add Data' Button, navigate to the crash data databases, and add the vehicle, pedestrian, DOTD, and crash tables. (If you click the 'Source' tab at the bottom of the table of contents menu, these tables will be listed. To View their contents, right click on the title of the table you wish to view in the table of contents and click 'Open.')
b) Right click on one of the tables you wish to join, point to 'joins and relates,' and click 'join.'
c) Where it asks you which field you wish to base the join upon, choose 'crash number.' On the second selection, choose which table you wish to join the other to (for example, you may wish to join the Crash table to the Vehicle table. Last, chose the common field between them (Crash number).
d) Click 'ok.'

The two tables will now merge together, so that the first table now contains all the data from the two original tables.

There are three ways to import the geographic attributes of the crash data. The first way is to use the field labeled “lat/lon” that is designed to provide GPS coordinates of the crash location. This field, in theory, could be imported directly into ArcGIS providing geographic coordinates for each crash. This field is often, however, left blank and is known to have been unreliable in past analysis. As more police begin to carry GPS receivers, this situation should improve. At the present time, however, the “lat/lon” column is not adequately populated to be useful for a successful geographic analysis.

However, the DOTD_TB table provides reliable geographic coordinates for crashes along state routes. These coordinates are believed to be accurate, and for records where they are available, they should be used.

The third method for importing geographic attributes of the file, where DOTD coordinates are not available, is to geocode, or geographically represent, the crash data. This will require some preparation.

Step One: Concatenating

Aside from the lat/lon field, there is no single filed that specifies a cradh location. The best alternative in this database is the designation of the closest intersection to the crash location. This can be determined by combining the primary road columns (prim_road_name) with the intersecting road column (Inter_Road). These two columns must be combined (or concatenated) and then saved to move into ArcGIS. This task can be completed in Excel. The steps for this process are as follows:

a) Open a spreadsheet containing the bicycle crash data in Excel.
b) Create a new column by clicking ‘insert’ on the task bar. Scroll down and click ‘Column.’ This will be the column where we will combine primary and intersecting road columns. Name it “INTERSECT.”
c) An example of the basic formula that can be used to concatenate the columns is: =CONCATENATE(A1," ", "&"," ", B1) where A1 represents the primary road and B1 represents the intersecting road
d) Save the file to import to ArcMap in the following step.

Step 2: Creating an address locator

Several important features should be noted about geocoding the bike/ped crash data. First, because of the distance between primary and intersecting roads, this methodology is not recommended for country roads with few cross streets. This is especially important in outlying parishes. Because of this limitation, spatial statistical techniques have only been employed in the core, urbanized parts of the New Orleans region. Second, a good knowledge of local roads is required to effectively geocode the files. Many streets in the New Orleans area have both locally known street names as well as state road number designations. The crash files provided by the state most often use the state road designations, but the ArcGIS files often have the local road designations. This makes local knowledge imperative for accurate geocoding. Finally, there are many spelling mistakes in the crash database files. Setting the spelling tolerance fairly low and then manually evaluating the results is necessary to ensure good return rates. The steps for this process are as follows:

a) Open ArcMap
b) Click on ‘Customize’ from the main menu, point to ‘toolbars’ and click on ‘geocoding.’ A small toolbar will appear. Click on the mailbox button for ‘geocode addresses.’

c) In the "address locator style,' choose the 'US Streets' option.
d) For 'reference data' select the Orleans parish streets shapefile. This shapefile is available through the City of New Orleans GIS Data Portal (https://data.nola.gov)
e) Align the correspondent data in the Field Map screen
f) Select a place on your hard drive to save your address locator. Assign it a recognizable name, such as "New Orleans Streets."

Step Three: Geocoding Addresses

The steps for this process are as follows:

a) Open "geocoding' toolbar, and click 'geocode addresses.'
b) In the 'input table' selection of the window that appears, browse for the table created in step 1 of this section. Select it.
c) In the 'address locator' selection screen, browse for the address locator that you created in step two of this section. Select it.
d) In the right column of the 'input address field' screen, click the blank cell to the right of the 'streets' cell. In the drop down menu, choose the "intersect" selection.
e) Choose an area on your hard drive to export the resultant shapefile and click "ok."

The geocoded shapefile will be added to the work session.

Part 3: Using CrimeState 3.3 for Statistical Analysis of Crashes

This section provides a detailed, step-by-step guide to using the CrimeStat program for bicycle/pedestrian hotspot evaluation. This technique was pioneered in the *2006 RPC Bicycle/Pedestrian Regional Master Plan*. This previous document provides an overview of the theoretical underpinning of the procedure. The current document shows how to replicate the steps used in the hotspot analysis using CrimeStat. The steps for this process are as follows:

Step 1:

Download and install CrimeStat Version 3.3. This program, developed by the National Institute of Justice, is available at: http://www.icpsr.umich.edu/CrimeStat/ .

Step 2:

Once you have downloaded the program, open the program. You should enter the shapefile that you would like to use here. Select the crashes for the defined area and save just the selected crashes as your reference shapefile. Use this as your primary file.

You will also notice a tab labeled "reference file." It is also possible to select a file that tells CrimeStat what your study area is. I have not used this feature before and have instead used the original shapefile as the reference area. You can test this if you would like, but I have found that simply using the primary file works well.

Note: You can also use dbf or other files as well. I have found that shapefiles work well, however.

Select the shapefile location from your computer in the "select files" tab. You will then want to enter the field in the shapefile that has the "x" and the "y" coordinates. Obviously,

you need to make sure that your shapefile has these columns to make the analysis work.

A note on shapefile size: Usually you will want to use a shapefile for a fairly confined area with distinct geographic boundaries. I usually focus on the core area of the New Orleans EastBank area (Orleans from the Industrial Canal to Eastbank Jefferson Parish). I have found that if you include New Orleans East and the Westbank, you will not get focused results. Figuring out how to effectively include these areas in the analysis is something that still needs to be addressed.

Step 3:

Now that you've entered the shapefile for analysis, there are many features available in CrimeStat to choose from. I tested a number of these in the 2006 RPC Regional Plan. The most useful feature for the bicycle/pedestrian hotspot analysis is the Spatial and Temporal Analysis of Crime (STAC) simulation feature. This feature is found in the "Spatial description" tab.

Step 4:

The STAC feature can now be accessed through the "Hot Spot Analysis II" tab.

Step 5:

Now you will set up the parameters for the run. Click on the STAC tab and you see that the parameters tab becomes an option. You will now be able to enter the parameters. Click on "STAC parameters."

Step 6:

You will now enter parameters. I tried just about every conceivable formulation here. Depending on the dataset, you will find that you will need to alter your search radius and number of points to get enough points to make the evaluation run smoothly. Sometimes what you enter will not work and the computer will tell you that it cannot compute with the desired parameters.

Usually, however, a quarter mile search radius with a minimum number of 3 points in a triangular scan with the data set boundary will work well. I also set the simulation run feature to "100."

When you run this, you will see the computer running through simulation runs as it completes the analysis. At the end, you will receive a shapefile with the hotspot clusters that you should be able to open in ArcGIS and you'll get an Excel file with the results from your simulation runs.

Step 7: Analysis

What you should get from this work is a shapefile with a number of clusters. Each one of these clusters is not, however, statistically significant. We ran the simulation run feature to distinguish the significant clusters form the insignificant ones. You will now want to cross-reference the Excel table and identify the significant cluster numbers. I use the 95% confidence threshold. Now, go back to ArcGIS and manually click "identify" on each cluster. You will see a number attached to each one. Cross-reference the numbers from the Excel table with the ones in ArcGIS to determine the statistically significant clusters. Delete the insignificant clusters. The result is an ArcGIS file with the significant clusters.

The reason that STAC was selected with these dimensions was that it returned small, tight clusters that focus attention on neighborhood size areas that can, hopefully, be remediated with improved bicycle and pedestrian infrastructure and programming. Other goals may result in a need to different parameters.

This method results in crash clusters that we can say with 95% confidence did not result by chance. The policy implications of this are that some urban design and/or behavioral factors are leading to this concentration of crashes.

For a detailed description of the underlying theory of this methodology please check *the New Orleans Bicycle and Pedestrian Plan* or, for even greater depth, see the guidebook that accompanies the CrimeStat program.

Appendix 2: STAC Pedestrian and Bicycle Crash Output, 2006-2010

Spatial and Temporal Analysis of Crime: Pedestrian Crash Analysis 2006-2010 Output								
Overview:				**Distribution of the number of clusters found in simulation (percentile):**				
Sample size	1255			Percentile	Clusters	Area	Points	Density
Measurement type	Direct			min	20	0.00444	4	12.21259
Scan type	Triangular			0.5	20	0.00444	4	12.21259
Input units	Degrees			1	20	0.00548	4	12.978184
Output units	Miles, Square Miles, Points per Square Miles			2.5	20	0.00575	4	13.375573
Standard Deviations	1			5	20	0.00968	4	15.307819
Start time	2/1/2013 12:23			10	20	0.01243	4	15.947559
Search radius	402.336			90	20	0.25082	9	349.924345
Boundary	-90.27856,29.91648 to -90.02960,30.03822			95	20	0.2613	9	496.991566
Points inside boundary	1253			97.5	20	0.29905	9	695.871928
Simulation runs	100			99	20	0.30821	9	729.577944
End time	2/1/2013 12:24			99.5	20	0.32753	9	901.495615
				max	20	0.32753	9	901.495615
Cluster	**Mean X**	**Mean Y**	**Rotation**	**X-Axis**	**Y-Axis**	**Area**	**Points**	**Cluster Density**
1	-90.07093	29.95485	63.52673	0.1761	0.13055	0.07223	72	996.83285
2	-90.06947	29.94777	87.57975	0.2126	0.13459	0.08989	26	289.247643
3	-90.06366	29.95602	33.43312	0.04687	0.19976	0.02942	25	849.885059
4	-90.08988	29.96335	31.29439	0.09443	0.22286	0.06611	20	302.513744
5	-90.05885	29.96274	19.82457	0.11439	0.19626	0.07052	17	241.050719
6	-90.09155	29.92831	34.87935	0.13055	0.16899	0.06931	17	245.276125
7	-90.06045	29.97341	88.50098	0.19841	0.12612	0.07862	13	165.361789
8	-90.08929	29.94582	85.66476	0.07685	0.14489	0.03498	13	371.650272
9	-90.07883	29.94551	36.72109	0.04478	0.3044	0.04283	12	280.205995
10	-90.07093	29.96468	28.45136	0.2179	0.12599	0.08624	12	139.139037
11	-90.24476	29.98018	1.33985	0.16369	0.0734	0.03775	12	317.902316
12	-90.10282	29.91985	67.12721	0.18306	0.2004	0.11525	11	95.446979
13	-90.08242	29.97248	79.24445	0.1722	0.15501	0.08386	10	119.246474
14	-90.0529	29.97387	1.68028	0.21778	0.07175	0.04909	9	183.330612
15	-90.12066	29.95604	40.84526	0.08718	0.04368	0.01196	9	752.321969
16	-90.11112	29.96307	77.39614	0.0487	0.24634	0.03769	8	212.267717
17	-90.16188	30.0083	46.05029	0.06955	0.17805	0.0389	8	205.643466
18	-90.13089	30.00115	67.01901	0.10434	0.14831	0.04861	8	164.56906
19	-90.06998	29.98174	45.35743	0.24358	0.15615	0.11949	8	66.951257
20	-90.07287	29.93877	21.78982	0.32071	0.13373	0.13474	8	59.375013

Spatial and Temporal Analysis of Crime: Bicycle Crash Analysis 20006-2010 Output								
Overview:				**Distribution of the number of clusters found in simulation (percentile):**				
				Percentile	Clusters	Area	Points	Density
Sample size	827			min	20	0.00002	3	5.849811
Measurement type	Direct			0.5	20	0.00002	3	5.849811
Scan type	Triangular			1	20	0.00051	3	6.530957
Input units	Degrees			2.5	20	0.00058	3	6.678962
Output units	Miles, Square Miles, Points per Square Miles			5	20	0.00081	3	7.312399
Standard Deviations	1/1/1900 0:00			10	20	0.00168	3	8.08874
Start time	41348.57051			90	20	0.37089	6	1786.00673
Search radius	402.336			95	20	0.41026	6	3690.246622
Boundary	-90.27730,29.91651 to -90.03037,30.04701			97.5	20	0.44917	7	5143.541854
Points inside boundary	825			99	20	0.45935	7	5931.253219
Simulation runs	4/9/1900 0:00			99.5	20	0.51284	8	130860.5584
End time	41348.57072			max	20	0.51284	8	130860.5584
Cluster	**Mean X**	**Mean Y**	**Rotation**	**X-Axis**	**Y-Axis**	**Area**	**Points**	**Cluster Density**
1	-90.07131	29.95533	31.84807	0.15003	0.16718	0.07879	27	342.667974
2	-90.05853	29.96354	45.59703	0.1103	0.17791	0.06165	17	275.746211
3	-90.06321	29.95673	45.88704	0.04731	0.17708	0.02632	15	569.89627
4	-90.09052	29.92843	41.89807	0.15444	0.16806	0.08154	14	171.692475
5	-90.069	29.94758	67.65595	0.21872	0.06491	0.0446	13	291.483092
6	-90.06959	29.96385	51.10177	0.25128	0.17353	0.13699	13	94.896363
7	-90.08823	29.9649	79.73905	0.16535	0.11828	0.06144	12	195.304777
8	-90.08913	29.94582	85.09512	0.08703	0.13772	0.03765	11	292.131189
9	-90.26608	30.00842	77.70472	0.27798	0.07415	0.06476	9	138.977004
10	-90.06309	29.97263	84.72411	0.09007	0.23747	0.06719	8	119.056701
11	-90.03805	29.96532	59.77184	0.16358	0.26392	0.13563	8	58.983105
12	-90.08249	29.97228	77.56229	0.16725	0.24455	0.12849	8	62.259371
13	-90.08182	29.93689	37.67956	0.31343	0.12815	0.12618	8	63.400983
14	-90.07308	29.97259	42.02848	0.28914	0.017	0.01544	7	453.38173
15	-90.09305	29.93739	36.82951	0.26512	0.19528	0.16265	7	43.038243
16	-90.06026	29.99075	17.81464	0.27959	0.14801	0.13001	6	46.151637
17	-90.07657	29.94743	84.02747	0.13145	0.03809	0.01573	6	381.396055
18	-90.04864	29.96557	71.81852	0.10364	0.18505	0.06025	6	99.578793
19	-90.18596	30.00654	79.50154	0.22022	0.00036	0.00025	6	23953.51255
20	-90.04907	29.97326	14.71052	0.00146	0.15805	0.00072	5	6905.887739

APPENDIX 3: PEDESTRIAN AUDIT SCORES

Tulane Avenue and South Broad Street Crash Cluster

Observation Date	Type	Name	Section A Score	Section B Score	Total Score	Notes
6/5/2013	non-signalized intersection	Gayoso and Tulane	0.5	2.8	-2.3	parking at corner Only 1 stop sign at intersection. No cross cut in median for pedestrians. Long crossing distances, near attractions, missing a stop sign, no crosswalks
3/5/2013	segment	Tulane (b/t S Dorgenois and S Rocheblave, odd side)	1.75	2.75	-1	lots of trash and debris, portions of sidewalk missing, severe tripping hazards, needs full sidewalk reconstruction, overgrown
3/5/2013	signalized Intersection	Tulane and South Broad	2.51	3.25	-0.74	needs improved crosswalks, curb ramps, pedestrian walk signals; turning conflicts
3/5/2013	non-signalized intersection	Gravier and South Broad	1.8	2.5	-0.7	traffic too fast, long wait to cross, need new crosswalks, curb cuts
3/5/2013	signalized Intersection	South Broad and Canal	2	2.5	-0.5	"ped" signals mostly broken, need dedicated ped signals, improved crosswalks, curb ramps
3/5/2013	segment	Tulane (b/t S Dorgenois and S Rocheblave, even side)	1.25	1.75	-0.5	construction blocking portion of sidewalk, cars parked on sidewalk, minimal curb/furniture zone, sidewalk narrow at points
6/5/2013	non-signalized intersection	South Broad and Iberville	1.5	2.25	-0.5	Intersection too busy for motorists to care or think about pedestrians. Missing median curb cuts, no crosswalks, parking at intersections, missing curb cuts, driveways,
3/5/2013	non-signalized intersection	S. White and Tulane	0.75	1	-0.25	missing most crosswalks, curb cuts on median, near major attractors
3/5/2013	segment	Tulane (b/t S White and S Dupre, even side)	1.63	1.75	-0.12	lots of trash and debris, minimal curb zone, parking on curb, minimal furniture zone,
3/5/2013	non-signalized intersection	S. Dupre and Tulane	1.75	1.75	0	no crosswalks, near attractors, curb cuts on median, driveway near intersection

3/5/2013	segment	South Broad (b/t Banks and Palmyra, odd side)	1.75	1.75	0	cars parked on sidewalk, sidewalk maintenance needed
3/5/2013	segment	Tulane (b/t South Broad and S White, even Side	1.38	1.25	0.13	trash, cars parked on sidewalk, minimal curb
3/5/2013	segment	Tulane (b/t South Broad and S Dorgenois, odd side)	2.38	1.25	0.13	standing water obstructing sidewalk, cars parked on curb, tripping hazards, minimal furniture zone
3/5/2013	segment	South Broad (b/t Tulane and Banks, odd side)	1.88	1.75	0.13	trash and overgrown lots, sidewalk maintenance needed, tripping hazards, poorly definedcurb/furnishing zone
3/5/2013	non-signalized intersection	Tulane and S Dorgenois	1.75	1.5	0.25	no crosswalks, no curb ramps/cuts
3/5/2013	non-signalized intersection	Tulane and S Rocheblave	1.75	1.5	0.25	needs crosswalks, near attractors,high speeds, parking near intersections, needs curb ramps/cuts
3/5/2013	segment	Tulane (b/t S White and S Dupre, odd side)	1.5	1.25	0.25	sidewalk maintenance, narrow ROW
3/5/2013	segment	South Broad (b/t Palmyra and Cleveland, odd side)	2.25	1.75	0.5	dumpster obstructing sidewalk, cars parked on curb
3/5/2013	segment	South Broad (b/t Cleveland and Canal, odd side)	2.25	1.75	0.5	sidewalk needs repair, cars parked on sidewalk, minimal furniture zone
6/5/2013	non-signalized intersection	Canal and Dupre	1.25	0.75	0.5	crossing is not obvious, no crosswalks
6/5/2013	segment	White (Gravier and Tulane, even side)	2.38	1.75	0.63	1 minor trip hazard; chain fence blocking pedestrian zone for construction, parking on sidewalk
6/5/2013	non-signalized intersection	Canal and White	2.2	1.5	0.7	missing stop sign, has crosswalks, missing curb ramps, long crossing distance
3/5/2013	segment	tulane (b/t South Broad and S White, even side)	1.5	0.75	0.75	PAR well-defined, narrow furnishing zone, parking on sidewalk
6/5/2013	segment	Tulane (b/t Gayoso and Dupre, even side)	1.5	0.75	0.75	grass growing over curb and pedestrian zone; narrow PAR, 2 minor trip hazards; minimal shade from tree
6/5/2013	segment	Tulane (b/t Gayoso and Dupre, odd side)	1.75	1	0.75	narrow furniture zone, narrow Ped zone, trip hazards,parking on curb

3/5/2013	non-signalized intersection	South Broad and Cleveland	1.75	0.75	1	needs crosswalks, many ped attractors
3/5/2013	segment	South Broad (b/t Tulane and Gravier, even side)	2.25	1.25	1	curb largely nonexistent, lots of trash, cars parked on sidewalk, no shade
3/5/2013	segment	South Broad (b/t Palmyra and Cleveland, even side)	2.25	1.25	1	minor obstructions, minimal curb zone
3/5/2013	segment	Tulane (b/t South Broad and S Dorgenois, even side)	1.88	0.75	1.13	cars parked on sidewalk, minimal curb/furniture zone
6/5/2013	non-signalized intersection	Gravier and White	3.2	2.05	1.15	Folks don't stop at stop sign and they park near fire hydrant
3/5/2013	segment	South Broad (b/t Tulane and Gravier, odd side)	1.5	0.25	1.25	Narrow PAR, no shade
3/5/2013	segment	South Broad (b/t Banks and Palmyra, even side)	2.5	1.25	1.25	cars obstructing PAR, some trip hazards
6/5/2013	segment	White (Gravier and Tulane, odd side)	2.25	1	1.25	minor trip hazards; government car blocking pedestrian zone, minimal furniture zone,
3/5/2013	non-signalized intersection	South Broad and Palmyra	2.25	0.75	1.5	needs crosswalks
6/5/2013	segment	Gravier (b/t South Broad and White, even side)	3	1.5	1.5	no furniture zone, trip hazards, cars parked on sidewalk, obstructions
3/5/2013	segment	South Broad (b/t Cleveland and Canal, even side)	2.88	1.25	1.63	payphone and bus shelter create too-narrow PAR, minimal furniture zone
6/5/2013	non-signalized intersection	Canal and Dorgenois	2.2	0.5	1.7	crosswalk exists, need repair, long crossing distance
3/5/2013	segment	South Broad (b/t Tulane and Banks, even side)	2.5	0.75	1.75	PAR narrow behind bus shelter, large debris obstruction
6/5/2013	segment	South Broad (b/t Canal and Iberville, odd side)	2.38	0.5	1.88	trip hazards, missing curb segment
3/5/2013	signalized Intersection	South Broad and Banks	2.85	0.75	2.1	needs dedicated ped signals, new crosswalks
6/5/2013	segment	Canal (b/t Dupre and White, odd side)	3.5	1.25	2.25	trees partially obstruct sidewalk, no shade
6/5/2013	segment	Canal (b/t South Broad and White, even side)	3.5	1	2.5	severe trip hazards,

6/5/2013	segment	Gravier (b/t South Broad and White, odd side)	3.25	0.75	2.5	stop sign inneffective, easy to cross, has crosswalks and curb ramps
6/5/2013	segment	South Broad (b/t Canal and Iberville, even side)	3.25	0.75	2.5	trip hazard, minimal shade
6/5/2013	segment	Canal (b/t Dupre and White, even side)	3.5	0.5	3	trip hazard
6/5/2013	segment	Canal (b/t South Broad and White, odd side)	3.75	1	3.25	trip hazards,
6/5/2013	segment	Canal (b/t South Broad and Dorgenois, even side)	4	0.5	3.5	minor trip hazards
6/5/2013	segment	Canal (b/t South Broad and Dorgenois, odd side)	3.75	0	3.75	no problems

Loyola Avenue and Calliope Street Crash Cluster

Observation Date	Type	Name	Section A Score	Section B Score	Total Score	Notes
6/7/2013	segment	Clio (b/t Saratoga and Simon Bolivar, even side)	Fail	Fail	Fail	Overgrown lot, no clear walking area
6/7/2013	segment	Clio (b/t Rampart and Simon Bolivar, odd side)	0.88	2.25	-2.37	No pedestrian zone for 2/3 of segment; bush overgrown and blocks the pedestrian area that does exist
4/5/2013	non-signalized intersection	OC Haley and Clio	0.75	0.75	0	no crosswalks, long crossing distance, median does not extend to crossing area,feels unsafe to cross, high demand
4/5/2013	segment	Simon Bolivar, (b/t Clio and Calliope, odd side)	1.88	1.75	0.13	cars parked all over sidewalk, no furniture zone, no shade
6/10/2013	non-signalized intersection	Lafayette and O' Keefe	1.25	1.05	0.2	no crosswalk, no stopline setbacks,
4/5/2013	signalized intersection	O Keefe and Howard	1.84	1.5	0.34	no curb cuts on neutral ground, broken signals

6/10/2013	segment	Lafayette (b/t O' Keefe and Rampart, odd side)	1.38	1	0.38	minimal furniture zone, narrow sidewalk, obstructions
4/5/2013	signalized intersection	Calliope and OC Haley	1.47	1	0.47	(partial intersection) needs ladder crosswalks, pedestrian signal, takes long time to cross, no median ped refuge, high demand (mission)
4/5/2013	signalized intersection	Calliope and O Keefe	1.84	1.25	0.59	sidewalk ends at freeway offramp, needs ped-specific signals, median does not extend to crosswalk
6/10/2013	segment	Girod (b/t O' Keefe and Rampart, even side)	1.88	1.25	0.63	minimal furniture zone, obstructions, no shade
4/5/2013	segment	Simon Bolivar (b/t Erato and Clio, even side)	2.5	1.75	0.75	sidewalk needs maintenance, trash and blight spilling onto sidewalk, parking on curb, no shade
6/10/2013	segment	Rampart (b/t Girod and Lafayette, even side)	3	2.25	0.75	minimal furniture zone, severe trip hazards, obstructions, no shade
6/10/2013	segment	Loyola (b/t Girod and julia, odd side)	2.25	1.5	0.75	no furniture zone, trip hazards, obstructions
4/5/2013	signalized intersection	MLK and Simon Bolivar	2.34	1.5	0.84	no curb cuts, no ped-specific signals, crosswalks badly faded
6/10/2013	segment	Lafayette (b/t O' Keefe and Rampart, even side)	1.88	1	0.88	minimal furniture zone, narrow sidewalk, obstructions
6/10/2013	non-signalized intersection	Lafayette and Rampart	2	1.05	0.95	no crosswalks, t-intersection to pedestrian area
6/10/2013	segment	Girod (b/t O' Keefe and Rampart, odd side)	2.25	1.25	1	minimal furniture zone, obstructions, no shade
4/5/2013	signalized intersection	Simon Bolivar and Calliope (uptown side)	1.84	0.75	1.09	needs ped-specific signals,
4/5/2013	segment	Simon Bolivar (b/t MLK and Thalia, odd side)	2.38	1.25	1.13	grass overgrown, large trash on sidewalk, no shade, cars parked on curb
6/10/2013	signalized intersection	Girod and O' Keefe	2.17	1	1.17	no dedicated ped signal, lights difficult to see, faded crosswalks
4/5/2013	segment	Simon Bolivar (b/t MLK and Thalia, even side)	2	0.75	1.25	parking on curb, no shade, grass overgrown on sidewalk
4/5/2013	segment	Simon Bolivar (b/t Thalia and Clio, odd side)	2.25	1	1.25	parking on curb, sidewalk needs maintenance

4/5/2013	segment	Howard (b/t O Keefe/rampart/OC Haley and Loyola, odd side)	2.5	1.25	1.25	bollards partially obstruct sidewalk, no shade,minimal furniture zone
6/10/2013	segment	Loyola (b/t Girod and Julia, even side)	3	1.75	1.25	minimal furniture zone, obstructions, parking on sidewalk, no shade
6/7/2013	segment	Clio (b/t Rampart and Saratoga, even side)	2.5	0.25	1.25	no furniture zone, missing section of sidewalk, no shade
4/5/2013	segment	Simon Bolivar (b/t Thalia and Erato, even side)	2.13	0.75	1.38	parking on curb, minimal furniture zone, no shade
6/10/2013	segment	O' Keefe (b/t Girod and Lafayette, even side)	2.63	1.25	1.38	no furniture zone, obstructions, no shade
6/7/2013	segment	Rampart (b/t Clio and Calliope, odd side)	2.13	0.75	1.38	no furniture zone, trip hazards, no shade
6/7/2013	signalized intersection	Julia and O' Keefe	2.17	0.75	1.42	missing curb ramps, curb ramps not aligned
4/5/2013	segment	Calliope (b/t Simon bolivar and Rampart/Loyola, even side)	1.88	0.25	1.63	no shade
4/5/2013	segment	Calliope (b/t Simon bolivar and Loyola, odd side)	1.88	0.25	1.63	no furniture zone, no shade
4/5/2013	signalized intersection	Loyola and Howard	2.68	1	1.68	ped signals do not work!!! Left turn conflicts evident. Crosswalks meet porkchop at odd angle but visibility is good
4/5/2013	segment	Loyola (b/t Julia and Howard, even side)	2.5	0.75	1.75	lacks shade, minimal furniture zone
6/10/2013	segment	O' Keefe (b/t Girod and Lafayette, odd side)	3	1.25	1.75	no furniture zone, obstructions, no shade
6/10/2013	segment	Girod (b/t Girod and Julia, odd side)	3	1.25	1.75	minimal furniture zone, obstructions, no shade
6/10/2013	segment	Girod (b/t Loyola and Rampart,odd side)	3	1.25	1.75	minimal furniture zone, obstructions, no shade
6/7/2013	segment	Clio (b/t O.C. Haley and Rampart, even side)	1.75	0	1.75	no furniture zone
6/7/2013	segment	Rampart (b/t Clio and Calliope, even side)	2.5	0.75	1.75	no furniture zone, trip hazards, no shade

4/5/2013	signalized intersection	Loyola and Julia	2.84	1	1.84	markings all technically correct, but needs clear ped signals!!!
4/5/2013	segment	Calliope (b/t Loyola and Okeefe, odd side)	2.13	0.25	1.88	no furniture zone, no shade
4/5/2013	non-signalized intersection	Simon Bolivar and Thalia	2.75	0.75	2	no crosswalks, no curb ramps, no stop setback bars
4/5/2013	non-signalized intersection	Simon Bolivar and Erato	2.75	0.75	2	needs crosswalks, no curb ramps, transit stop and numerous pedestrians observed
4/5/2013	non-signalized intersection	Calliope and S Rampart	2	0	2	T intersection at interstate overpass; no ped access to overpass, crossings other than marked crosswalk not encouraged or observed
6/10/2013	segment	Rampart (b/t Girod and Julia, even side)	3	1	2	minimal furniture zone, obstructions
6/10/2013	segment	Girod (b/t Loyola and Rampart, even side)	2.25	0.25	2	minimal furniture zone, no shade
6/10/2013	segment	Rampart (b/t Girod and Lafayette, odd side)	3	1	2	minimal furniture zone, obstructions
4/5/2013	signalized intersection	Calliope and Loyola	2.51	0.5	2.01	, needs ped specific signals, only addresses portions of intersection on downtown side of street, assumes limited access to underpass; key crosswalk missing! Mixed ladder and parallel crosswalks
6/7/2013	signalized intersection	Julia and Rampart	3.35	1.25	2.1	no dedicated ped signal, missing curb ramps, poorly aligned
4/5/2013	non-signalized intersection	Simon Bolivar and clio	3	0.75	2.25	needs crosswalks!
4/5/2013	segment	Simon Bolivar, (b/t Clio and Calliope, even side)	2.5	0.25	2.25	no shade, not very pleasant, but no major issues
4/5/2013	segment	Howard (b/t O Keefe/rampart/OC Haley and Loyola, even side)	3	0.75	2.25	lots of driveway cuts, parking on curb, no shade
6/7/2013	segment	Rampart (b/t Calliope and Julia, odd side)	3	0.75	2.25	obstruction (fence), minimal shade

6/7/2013	segment	Julia (b/t Loyola and Rampart, odd side)	2.75	0.5	2.25	Building on corner is under construction leaving pedestrian zone blocked with chain link fence
6/10/2013	signalized intersection	Girod and Rampart	3.01	0.75	2.26	no dedicated ped signal, missing curb ramps, poorly aligned
6/7/2013	segment	Julia (b/t O' Keefe and Rampart, even side)	2.38	0	2.38	no problems, sidewalk a bit narrow
6/7/2013	segment	O' Keefe (b/t Girod and Julia, odd side)	2.63	0.25	2.38	minimal shade, could be wider
4/5/2013	segment	OC Haley (b/t Calliope and Clio, even side)	2.75	0.25	2.5	no shade, minimal furniture zone
4/5/2013	segment	OC Haley (b/t Calliope and Clio, odd side)	2.75	0.25	2.5	nice wide sidewalk, no furniture zone, no shade
6/7/2013	segment	Clio (b/t O.C. Haley and Rampart, odd side)	2.5	0	2.5	no furniture zone
6/10/2013	signalized intersection	Loyola and Girod	2.51	0	2.51	long crossing distance,needs dedicated ped signal
4/5/2013	segment	Loyola (b/t Julia and Howard, odd side)	2.88	0.25	2.63	no shade
6/7/2013	non-signalized intersection	Clio and Rampart	3.5	0.75	2.75	Bad activity area, no crosswalks, parking at intersection
4/5/2013	segment	Loyola (b/t Howard and Calliope, odd side)	3.5	0.75	2.75	minimal shade, parking on curb
6/7/2013	segment	O' Keefe (b/t Howard and Julia, odd side)	3	0.25	2.75	minimal furniture zone, no shade
6/7/2013	segment	Julia (b/t Loyola and Rampart, even side)	3.25	0.5	2.75	trip hazards
4/5/2013	segment	Calliope (b/t Rampart and OC Haley, even side)	3.25	0.25	3	lacks shade (tiny trees planted)
4/5/2013	segment	Loyola (b/t Howard and Calliope, even side)	3.25	0.25	3	no shade
6/7/2013	segment	O' Keefe (b/t Howard and Julia, even side)	3	0	3	minimal furniture zone, otherwise good
6/7/2013	segment	Julia (b/t O' Keefe and Rampart, odd side)	3.13	0	3.13	No problems!!

6/7/2013	segment	O' Keefe (b/t Girod and Julia, even side)	3.38	0	3.38	no problems
6/7/2013	segment	Rampart (b/t Howard and Julia, even side)	3.5	0	3.5	no problems
4/5/2013	segment	OC Haley (b/t Calliope and Howard, odd side)	4	0	4	No problems!!

Airline Drive and Williams Boulevard Crash Cluster

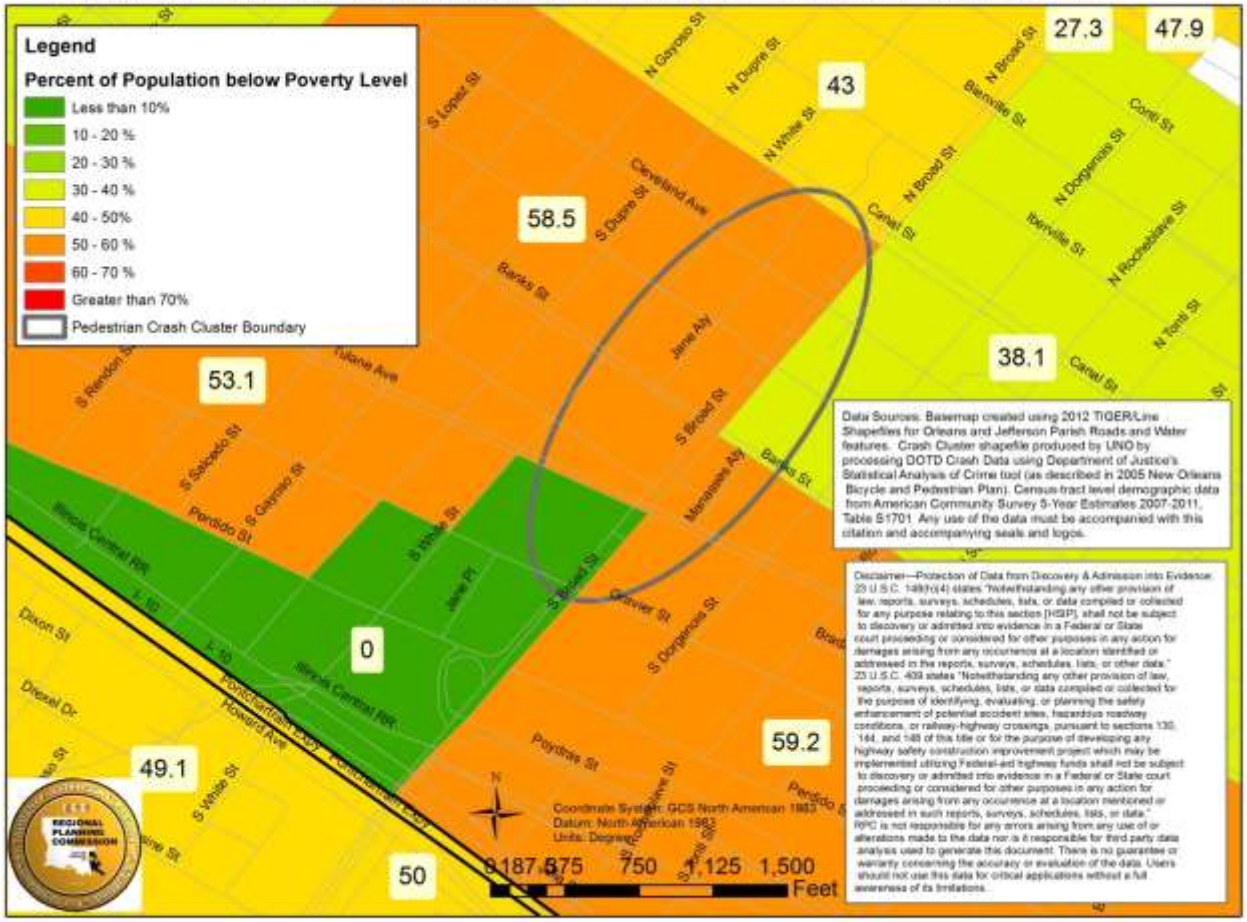
Observation date	Type	Name	Section A Score	Section B Score	Total Score	Notes
3/8/2013	signalized intersection	Airline and Williams	1.34	3.5	-2.16	only one crosswalk terminating at median, lacks curb cuts, no ped signals, no part of auto light cycle fully safe for pedestrians, turning conflicts, extremely difficult to cross
3/8/2013	segment	Airline (b/t Minor and Daniel, even side)	2	2.75	-0.75	sidewalk disappears into parking area, cars parked on sidewalk, narrow sidewalk
3/8/2013	segment	Williams (b/t Airline and 9th, odd side)	1	1.75	-0.75	sidewalk too narrow at points, obstructed by transit bench, curb
3/8/2013	segment	Williams (b/t Airline and 9th, even side)	1	1.75	-0.75	sidewalk too narrow near transit stop, obstructed by cars, disappears into driveways and terminates mid-block
3/8/2013	signalized intersection	Airline and Daniel	0.67	1.25	-0.58	difficult crossing, no ped signals, no crosswalks, no median
3/8/2013	non-signalized intersecion	Airline and Minor	1.5	1.75	-0.25	no signals, no crosswalks, no curb cuts, insufficient median for crossing
3/8/2013	segment	Airline (b/t Williams and Compromise, even side)	1	1.25	-0.25	good furnishing zone, sidewalk narrows and ends, many driveways interesect
3/8/2013	segment	Airline (b/t Compromise and Clay, odd side)	0.5	0.75	-0.25	no sidewalk at all, no curb, just shoulder and ditch, transit stop!

3/8/2013	segment	Airline (b/t Compromise and Clay, even side)	0.5	0.75	-0.25	no sidewalk, just shoulder and parking spaces
3/8/2013	segment	Airline (b/t Williams and Minor, even side	2	2.25	-0.25	no sidewalk, just a narrow area between furnishing zone and parking lot barriers, cars obstruct
3/8/2013	segment	Airline (b/t Minor and Daniel, odd side)	1.5	1.75	-0.25	no clear sidewalk, shoulder, curb, and parking lot, edge of parking lot serves as ped area
3/8/2013	non-signalized intersecion	Airline and Compromise	1.25	1.25	0	no crosswalks, curb ramps missing, difficult to cross
3/8/2013	non-signalized intersecion	Williams and 9th	1.25	1.25	0	no crosswalks, missing curb cuts
3/8/2013	segment	Airline (b/t Williams and Minor, odd side)	1.75	1.75	0	no sidewalk except at transit stop corner, wide grassy area
3/8/2013	signalized intersection	Airline and Clay	1	2.25	1.25	no crosswalks, no ped signals, no curb on one corner, median to narrow to stop on, missing one side, missing curb ramps
3/8/2013	segment	Williams (b/t Airline and 6th/Toledano, odd side)	2	0.75	1.25	sidewalk adequate and well maintained toward airline, no shade, maintenance issues and overgrowth toward Toledano
3/8/2013	segment	Williams (b/t Airline and 6th/Toledano, even side)	1.5	0.25	1.25	narrow sidewalk, width reduced at points
3/8/2013	non-signalized intersecion	Williams and 6th/Toledano	2.25	1.25	1.5	no crosswalks, minimal wait time, missing one curb ramp--UPDATED SCORE: new curb ramps installed on all corners
3/8/2013	segment	Airline (b/t Williams and Compromise, odd side)	2.5	0.25	2.25	narrow sidewalk, no shade

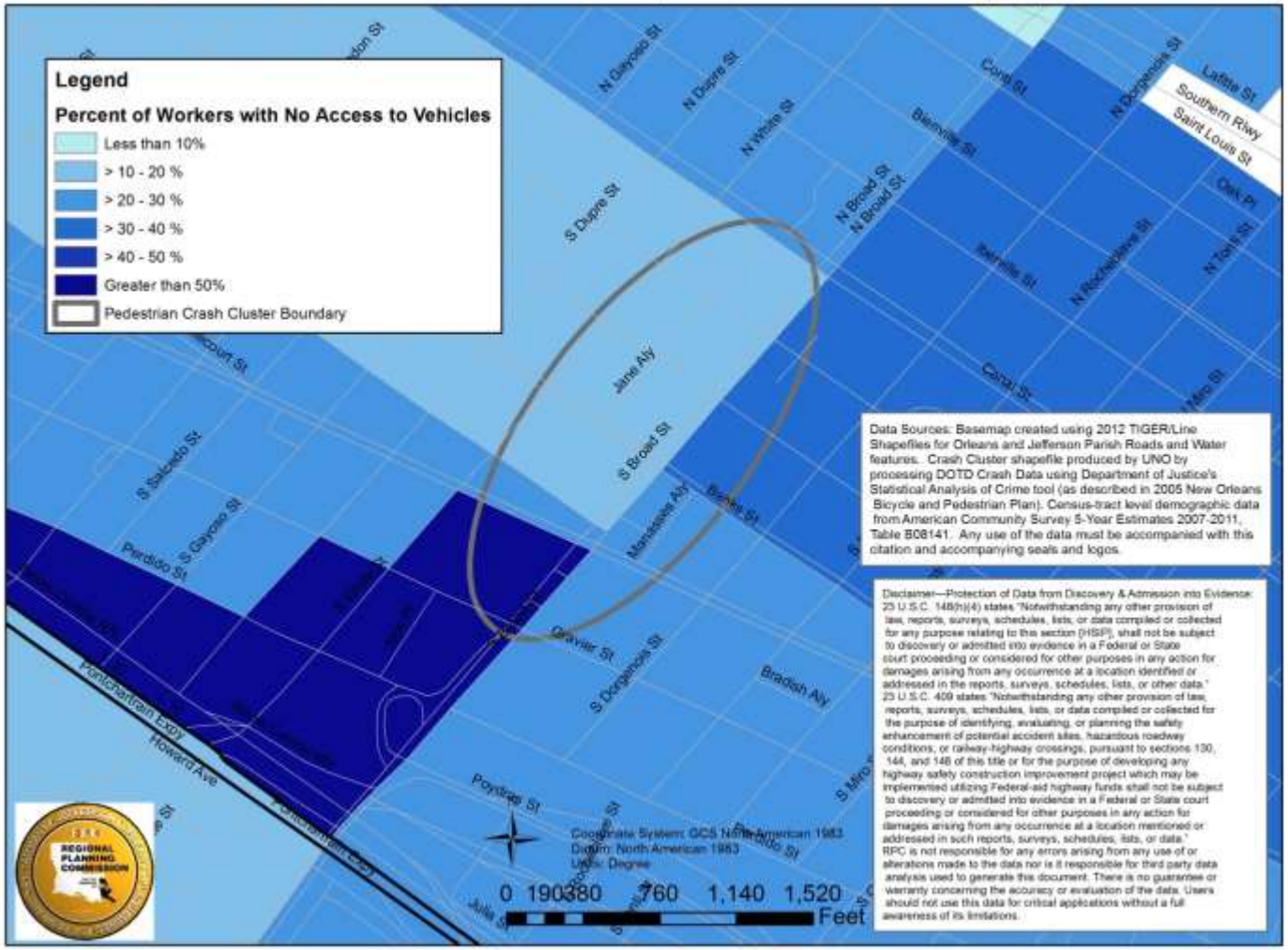
APPENDIX 4: AMERICAN COMMUNITY SURVEY POVERTY AND TRANSPORTATION MAPS

Tulane Avenue and South Broad Street

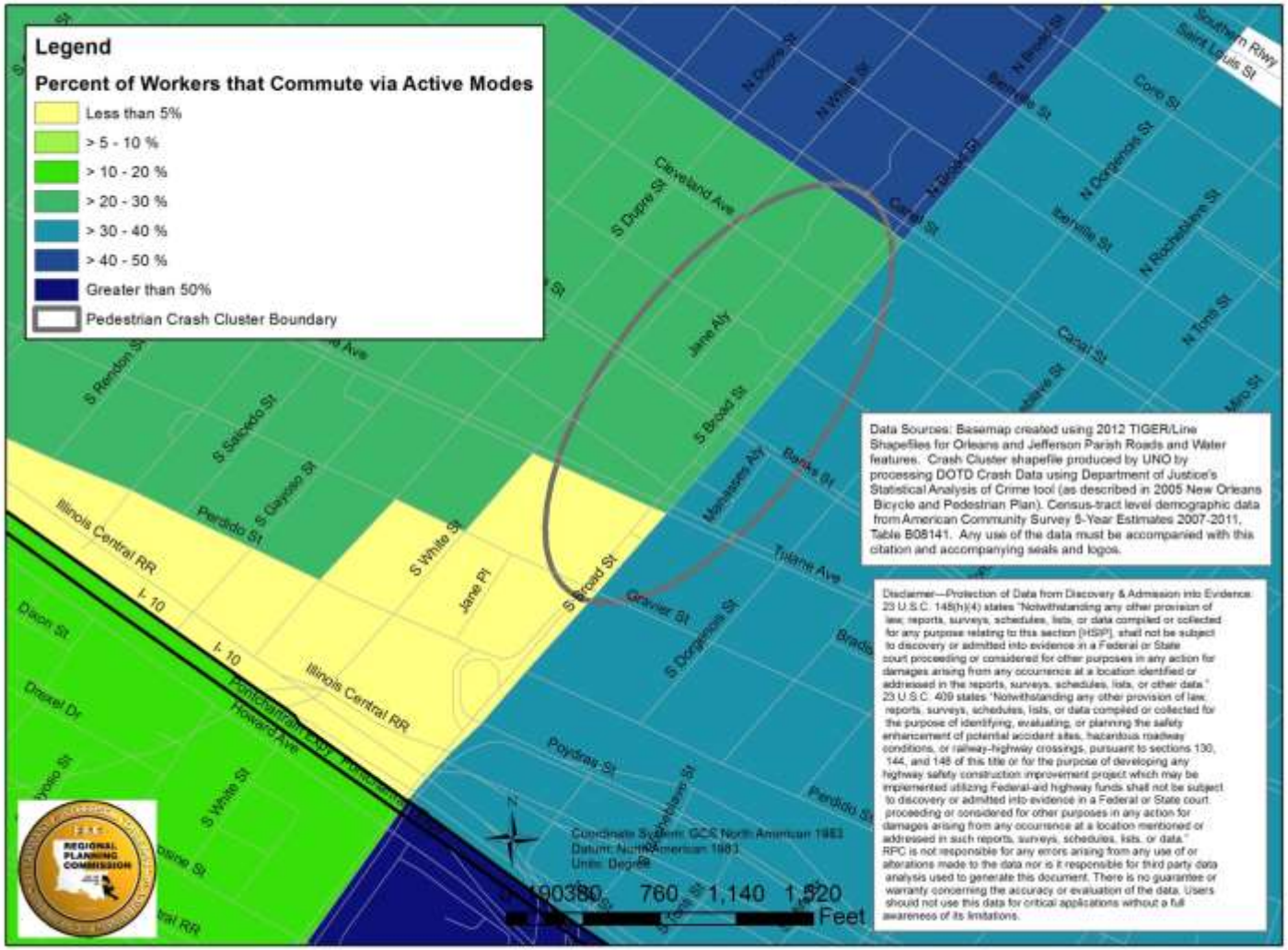
Percent of Population Below Poverty Level, Tulane and Broad Hot Spot, 2007-2011



Percent of Workers with No Access to Vehicles, Tulane and Broad Hot Spot, 2007-2011

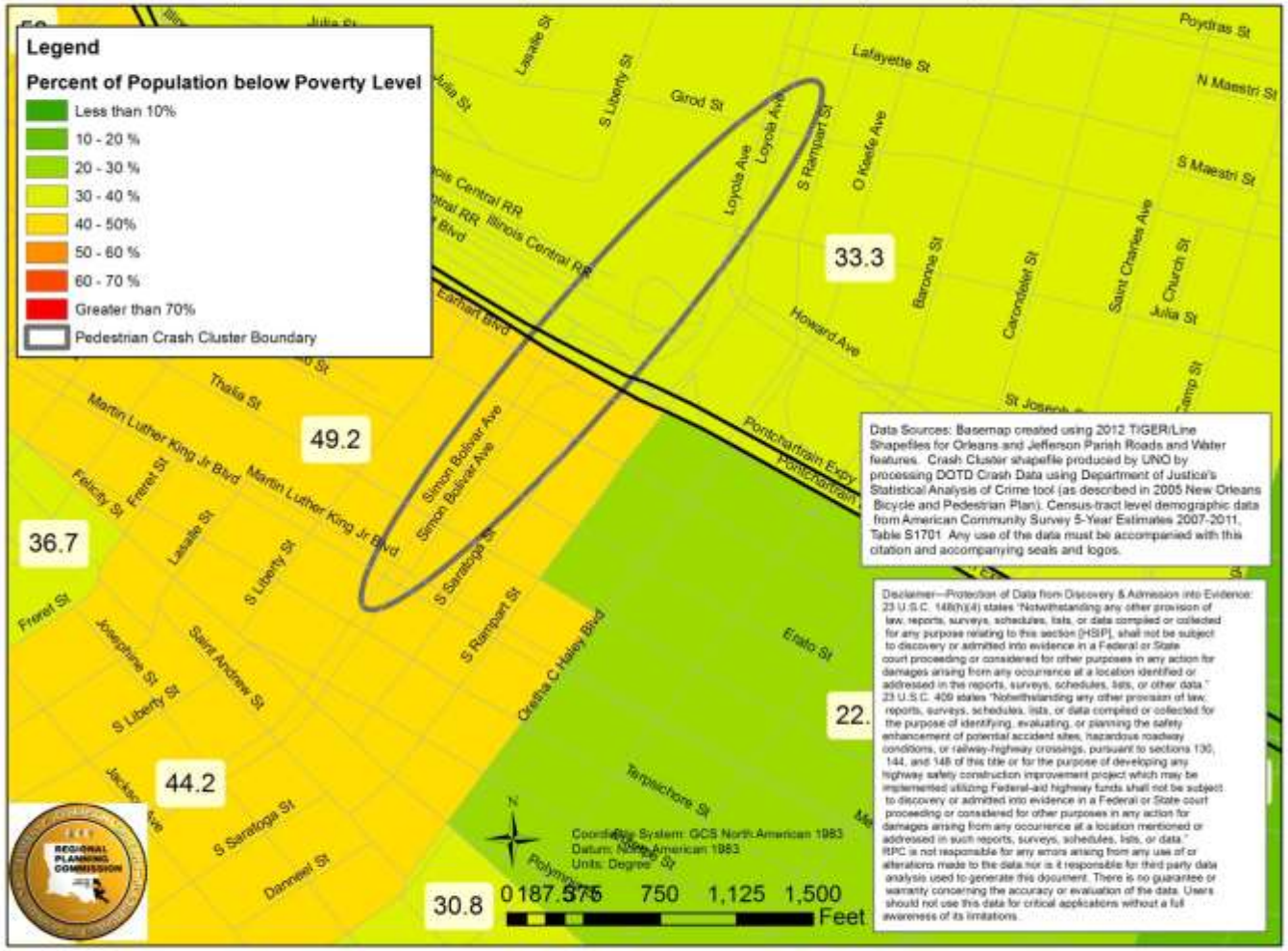


Percent of Workers that Commute via Transit, Walking, or Bicycling, Tulane and Broad Hot Spot, 2007-2011

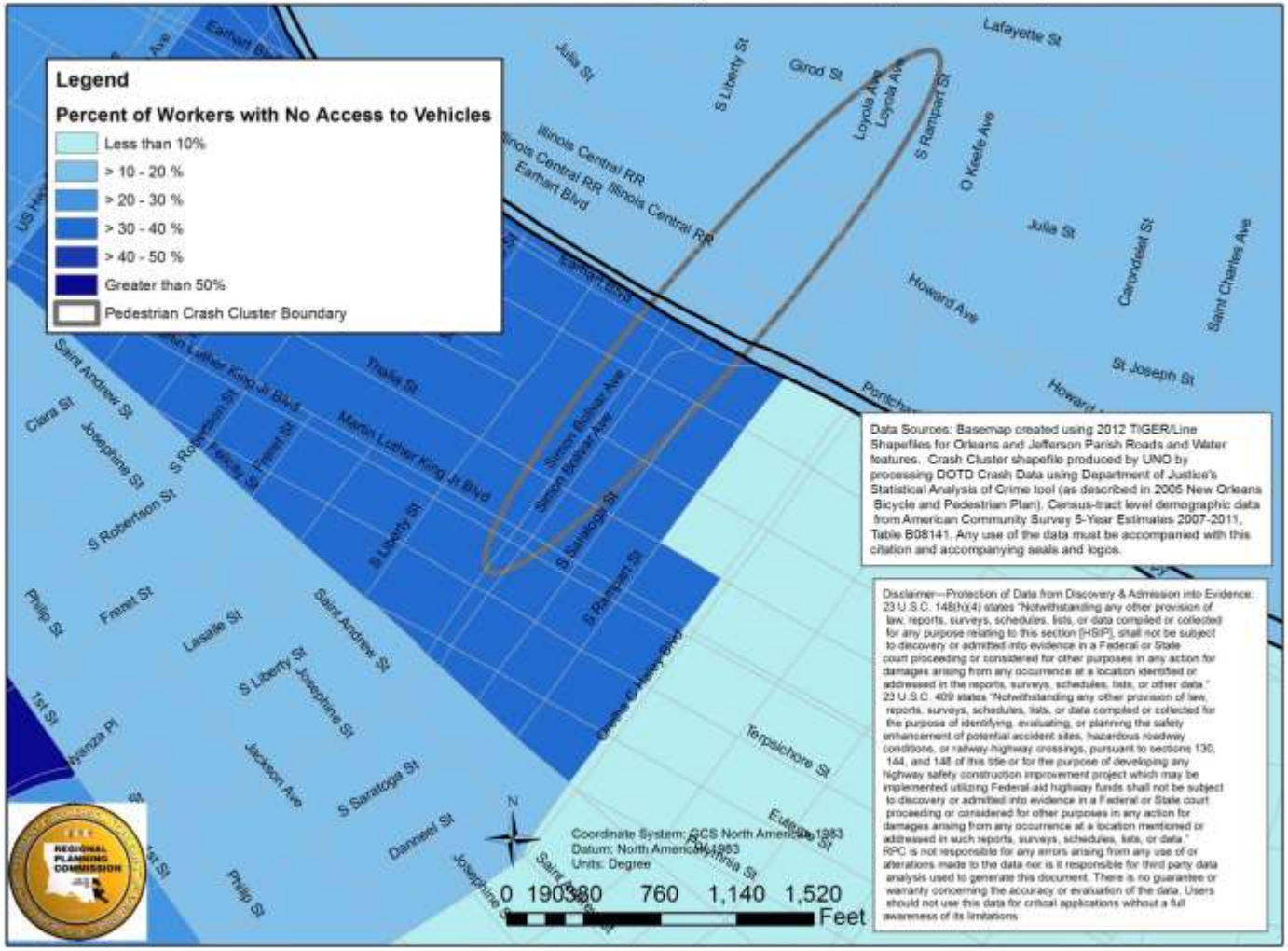


Loyola Avenue and Calliope Street

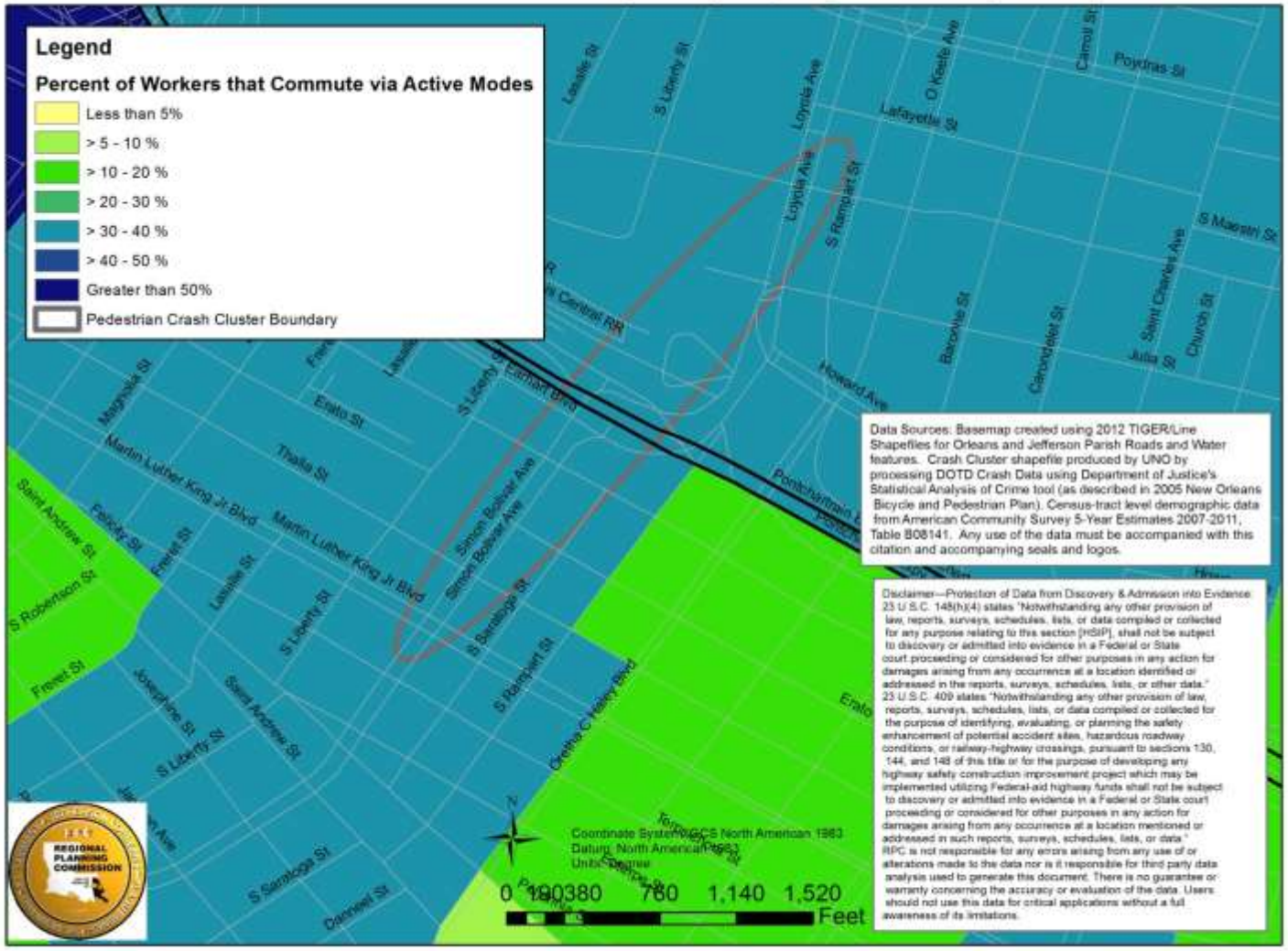
Percent of Population Below Poverty Level, Loyola and Calliope Hot Spot, 2007-2011



Percent of Workers with No Access to Vehicles, Loyola and calliope Hot Spot, 2007-2011

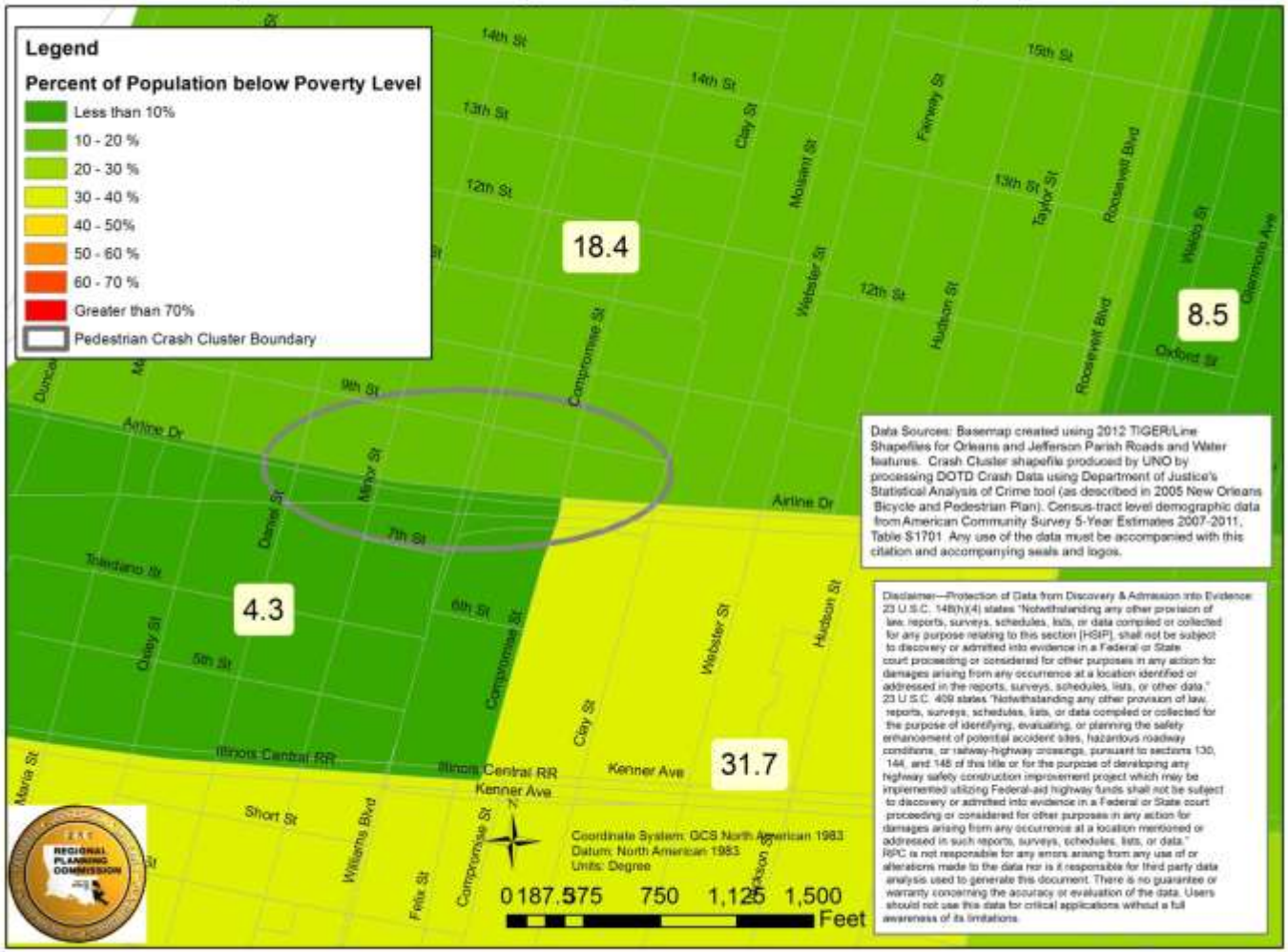


Percent of Workers that Commute via Transit, Walking, or Bicycling, Loyola and Calliope Hot Spot, 2007-2011

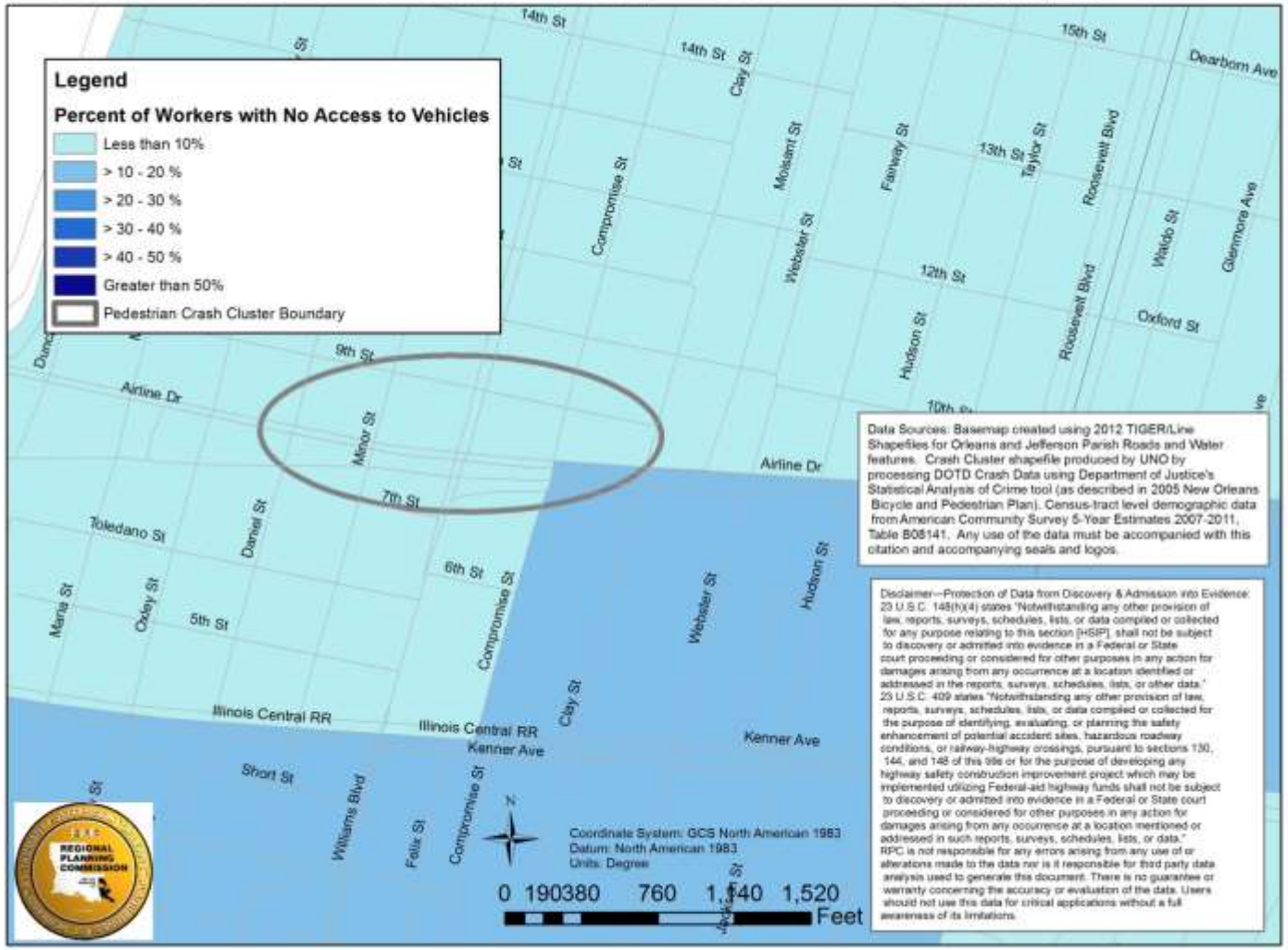


Airline Drive and Williams Boulevard

Percent of Population Below Poverty Level, Airline and Williams Hot Spot, 2007-2011



Percent of Workers with No Access to Vehicles, Airline and Williams Hot Spot, 2007-2011



Percent of Workers that Commute via Transit, Walking, or Bicycling, Airline and Williams Hot Spot, 2007-2011