

Broadway Street Pedestrian/Bicycle Crash Analysis

March 12, 2012
Metroplan

Overview

Historically, Metroplan has incorporated analyses of pedestrian and bicycle crashes into the regional planning efforts through the GIS mapping of crashes, as reported in the Arkansas State Police Database, and review of crash reports, when available. As part of this planning effort, a ten year pedestrian and bicycle crash analysis was updated in 2011. The ten year analysis identified Broadway Street, between Markham St. and I-630, in Little Rock as having the highest concentration of pedestrian crashes in central Arkansas. There were no bicycle crashes along this section of Broadway during the study period. An analysis of the corridor and crashes along the corridor is detailed in this report.

This report is preliminary and was completed as a precursor for a public involvement effort and review by the City of Little Rock Staff. The report may be revised based upon public comment and review by the City of Little Rock.

Pedestrian and Bicycle Facilities

Broadway Street/ US Highway 70, located in Little Rock, is a five lane undivided roadway that carries up to 27,000 vehicles daily. Broadway Street is fully developed and lined with sidewalks for the entire length of the corridor. The roadway is located within the Central Business District of Little Rock and therefore is a location of higher pedestrian traffic. From Markham Street to I-630, a 0.6 mile section of roadway, Broadway Street has 9 (4-legged) intersections, each with a traffic signal, a pedestrian signal with countdown time (i.e. 14 s countdown at Capitol crossing Broadway), four striped crosswalks (4th Street three striped crosswalks), and sidewalk ramps. Two CATA bus benches are located throughout this corridor, while several other non-CATA benches are also located along the corridor. Street lights are located on every block, as well as on every corner of each intersection (intersections with 4th Street and 6th Street only have 3 street lights). With the exception of sidewalk ramps, there are no bicycle specific facilities existing along Broadway Street currently. Two maps displaying the existing pedestrian facilities are shown below. Additionally, the City of Little Rock has recently installed "Turning Vehicles Yield to Pedestrians" signs within the corridor, which are shown in Figure 3.

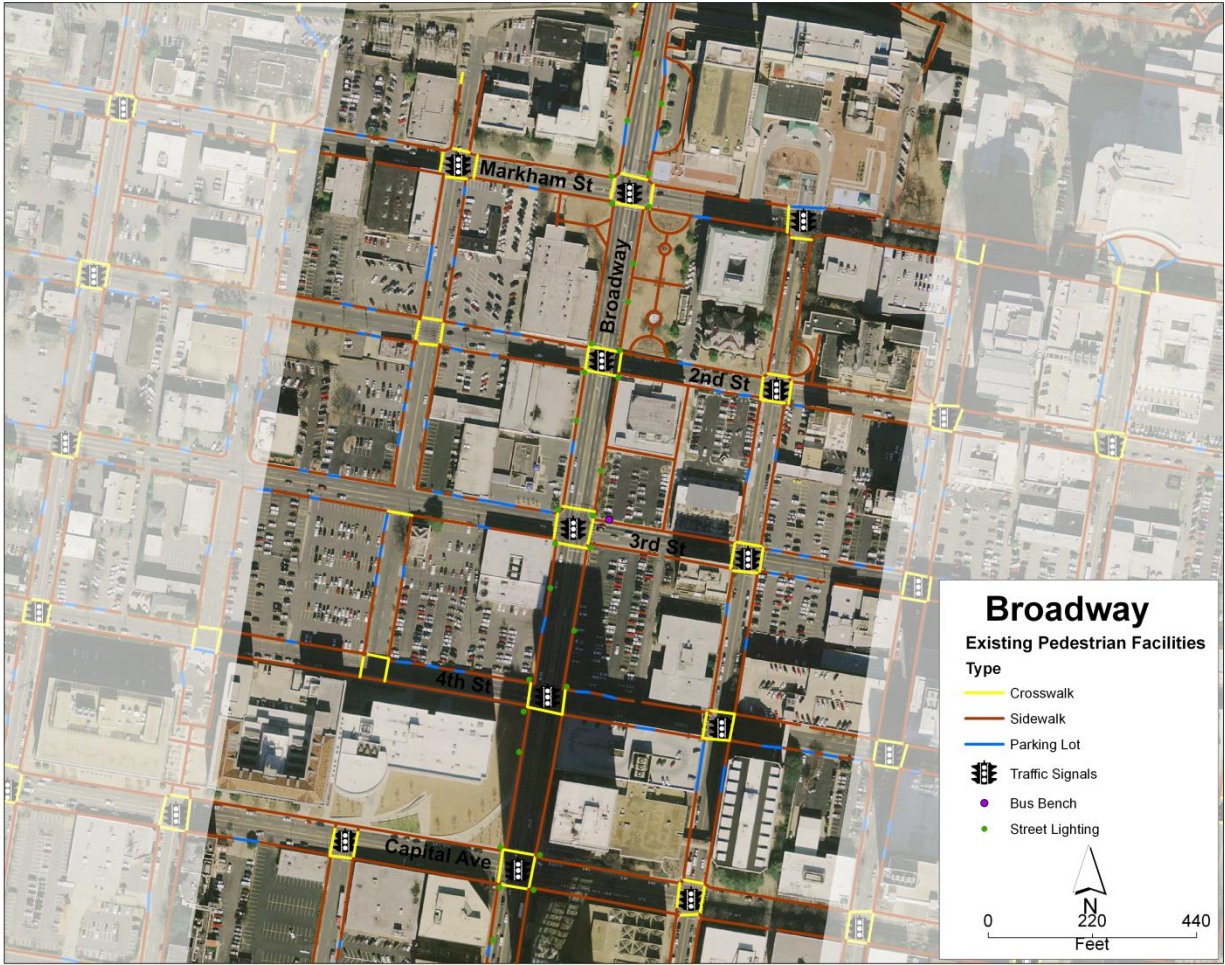


Figure 1: Existing Pedestrian Facilities Markham St. to Capitol Ave.

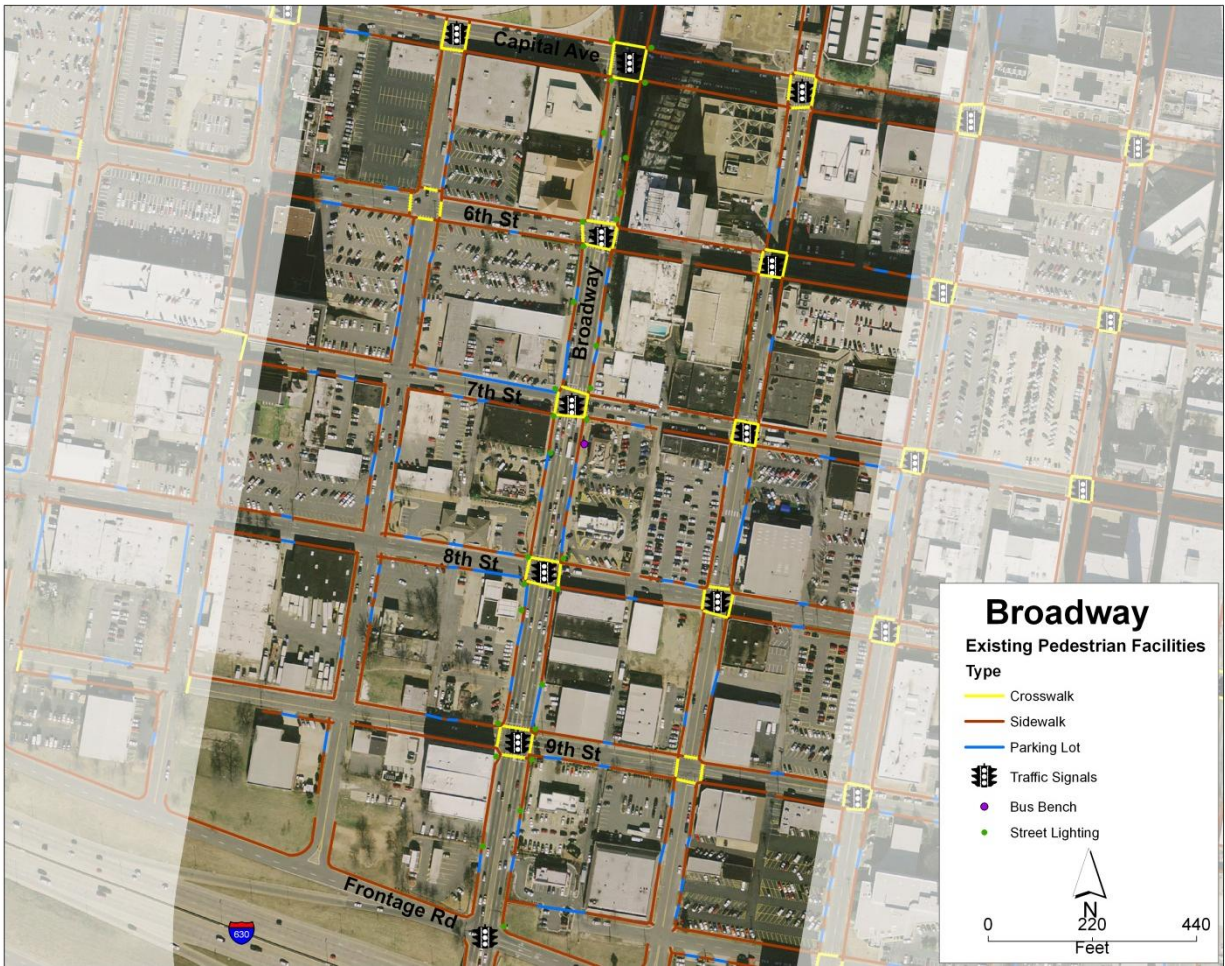


Figure 2: Existing Pedestrian and Bicycle Facilities 6th St. to I-630



Figure 3: Turning Vehicles Yield to Pedestrian Signs

Crash Analysis

Using data provided by the Arkansas State Police, the number of pedestrians and/or bicyclists involved in vehicular crashes along Broadway Street in Little Rock were tabulated for the years 2001 to 2010. Maps of the pedestrian and bicyclist crash locations along Broadway Street are shown in Figure 4 through Figure 8.

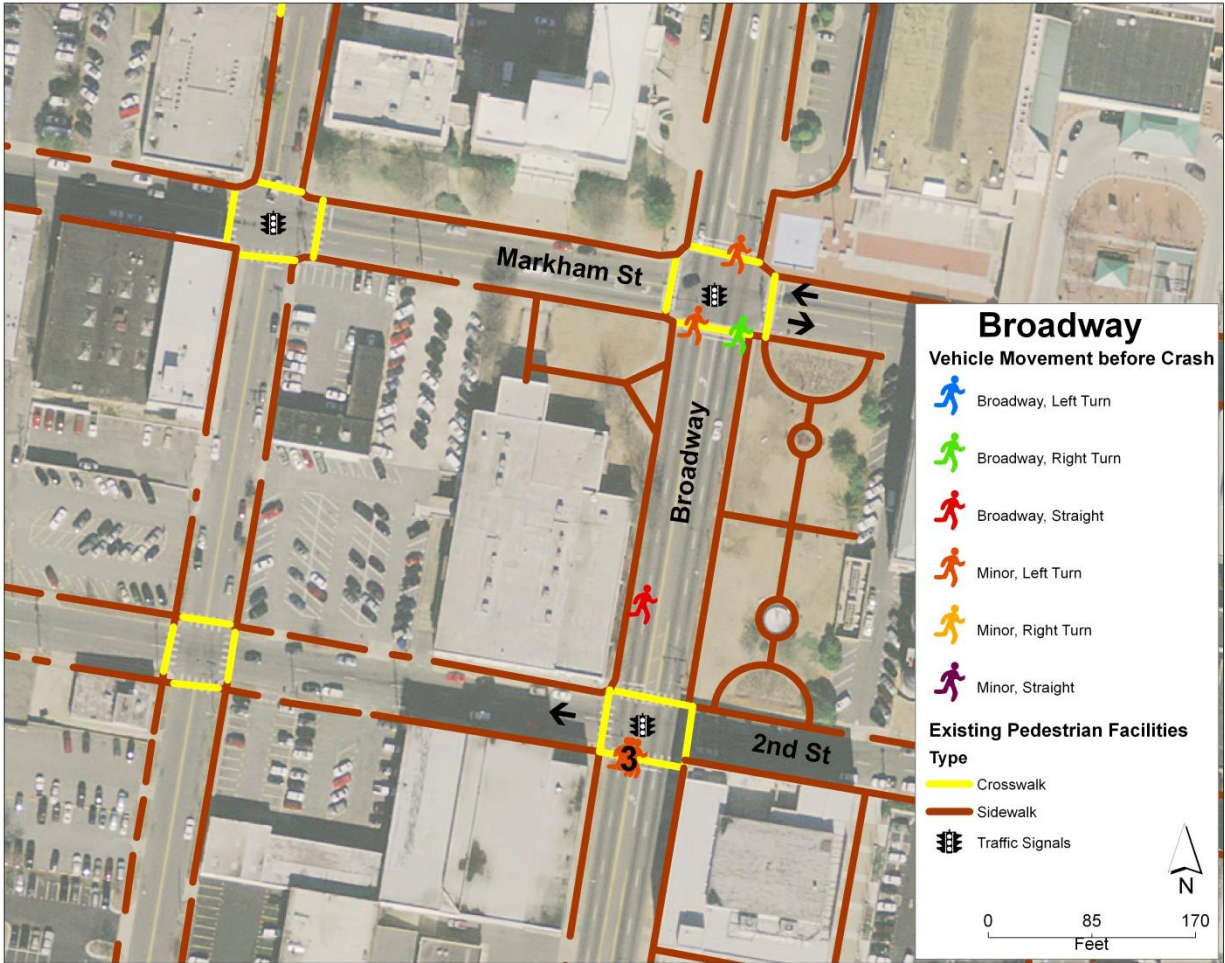


Figure 4: Pedestrian Crash Locations Markham St. to 2nd St.

Figure 4 shows several accidents that occurred in the crosswalks of the Markham St. intersection, as well as a clustering of accidents on the south crosswalk of the 2nd St. intersection. The three accidents that occurred at the south crosswalk at 2nd St. were all caused by a vehicle turning left from WB 2nd St. to SB Broadway St failing to yield. It should be noted that Metroplan staff has noticed a number of crashes at the intersection of Broadway St. and Markham St. that are not recorded in the database (Metroplan office is located at SW corner of Markham St. and Broadway St.). Most of these crashes occur on the northern leg of the intersection caused by right or left-turning traffic.

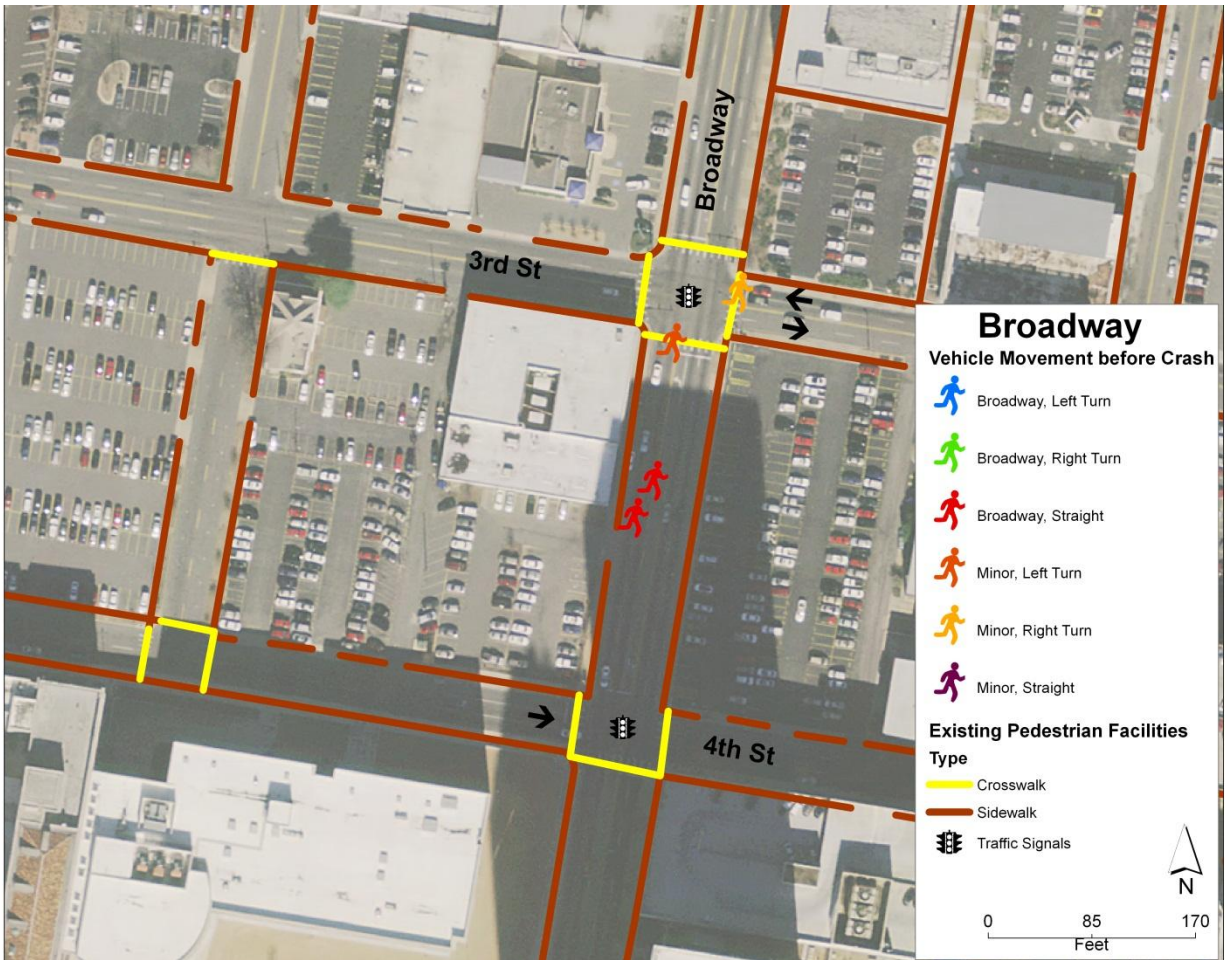


Figure 5: Pedestrian Crash Locations 3rd St. to 4th St.

While mid-block crashes were a small percentage of total crashes, all mid-block crashes occurred between Markham Street and 4th Street. This area of Broadway is more commonly used by those less knowledgeable of the area. Pedestrians unfamiliar with this area tend to be those traveling to the Pulaski County Court House, Little Rock City Hall, or the Robinson Music Center that have parked on one side of Broadway and must walk to the other.

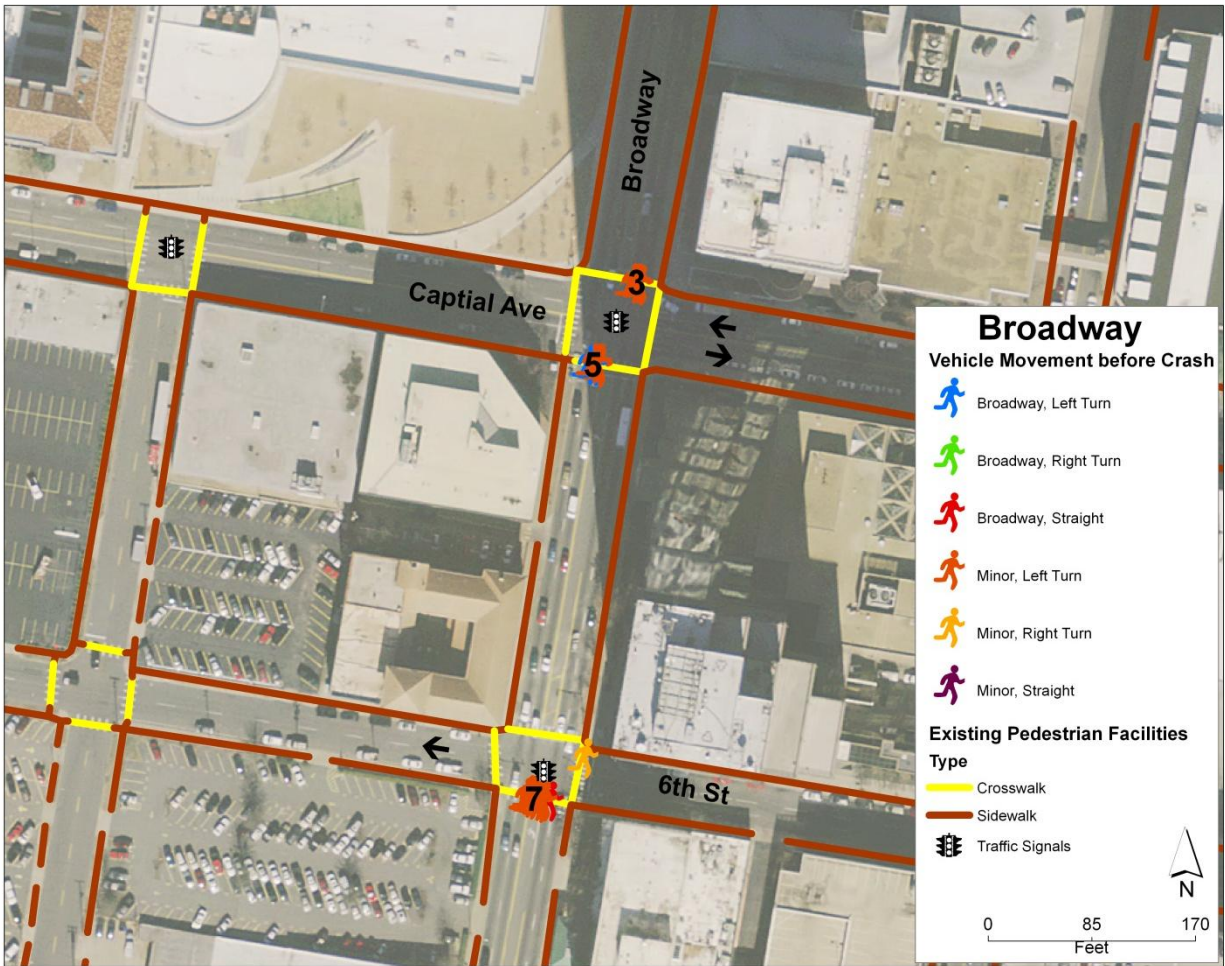


Figure 6: Pedestrian Crash Locations Capitol to 6th St.

Figure 6 shows clustering of crashes at the north and south crosswalks of the Capitol Ave. intersection, as well as the south crosswalk of the 6th St. intersection. The cluster of three crashes on the north crosswalk of the Capitol Ave. intersection were caused by vehicles turning left from EB Capitol Ave. to NB Broadway St. The five crashes on the south crosswalk of the Capitol Ave. intersection were caused by vehicles turning left from both Broadway St. and Capitol Ave. Seven crashes occurred on the south crosswalk of the 6th St. intersection and were caused primarily by vehicles turning left from WB 6th St. to SB Broadway St., but also from vehicles traveling straight on Broadway

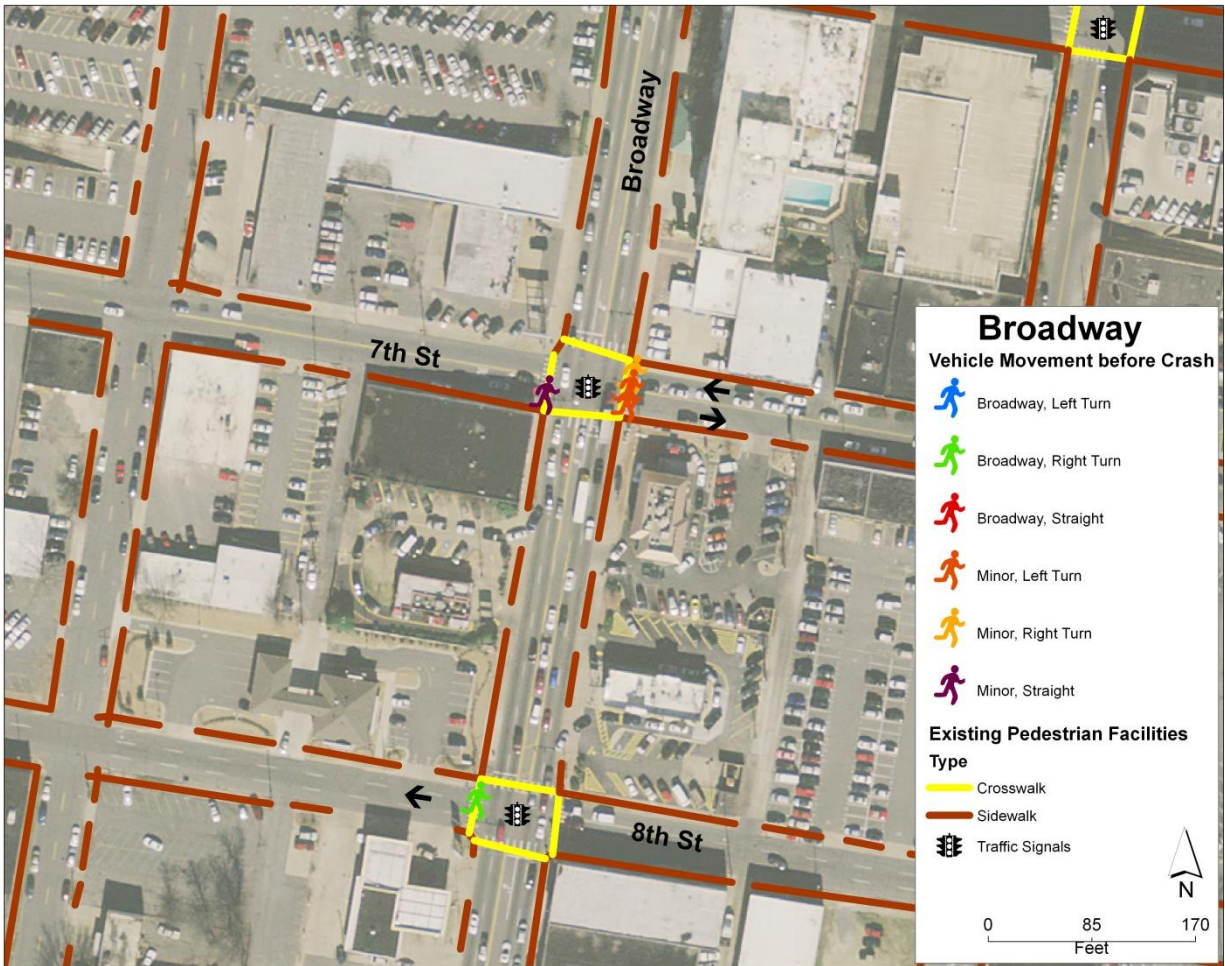


Figure 7: Pedestrian Crashes 7th St. to 8th St.

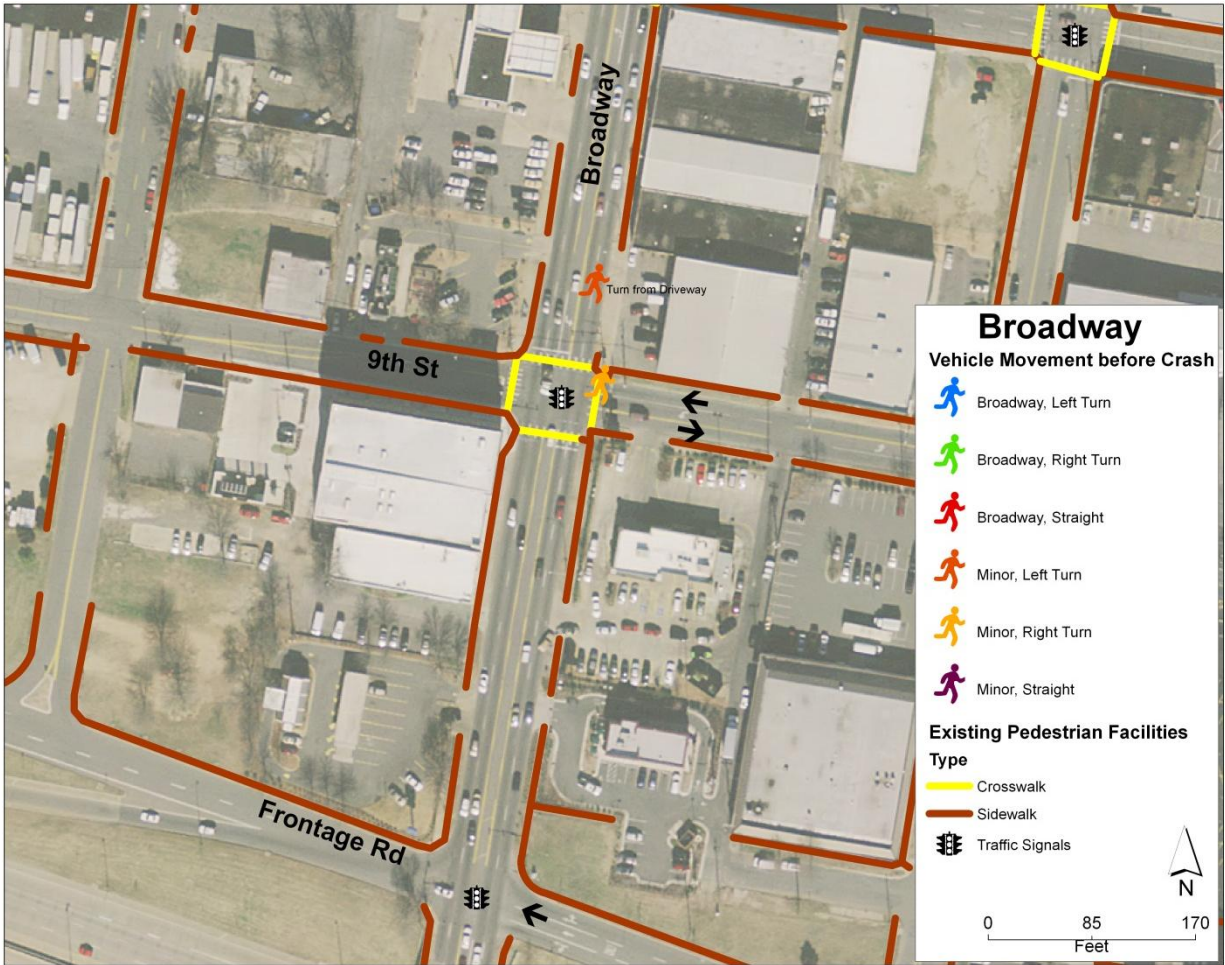


Figure 8: Pedestrian Crashes 9th St. to I-630

During the ten year period a total of 34 pedestrians and 0 bicyclists were involved in crashes on Broadway Street, a combined average of about 3 per year. The pedestrian and bicycle crashes are summarized by injury severity in Table 1.

Table 1: Pedestrian and Bicycle Crashes by Injury Severity

	Pedestrian	Bicycle	Total
No Injury	3	0	3
Possible Injury	6	0	6
Non-Incapacitating Injury	20	0	20
Incapacitating Injury	5	0	5
Fatal	0	0	0
Total	34	0	34

Crash Conditions

The pedestrian action/location, time of day/lighting condition, alcohol/drug involvement, and weather fields were examined to see if there were any identifiable trends with respect to the conditions that

occurred with each crash. While this section of the report provides a summary and aggregation of the crashes, the full crash details are outlined in the Appendix.

The action or location of the pedestrians, as described in the crash reports, was first examined, as shown in Figure 9. **All of the 34 pedestrian accidents occurred while the pedestrian was crossing the roadway, with 88% of all crashes occurring while the user was crossing at an intersection.** Twenty-six of the 34 crashes occurred while crossing Broadway and 8 crashes occurred crossing a minor street.

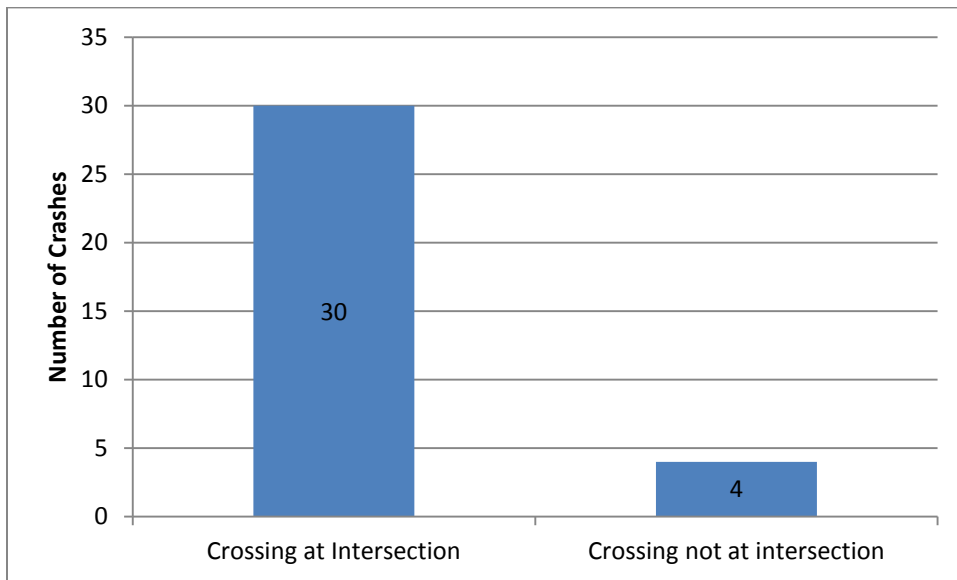
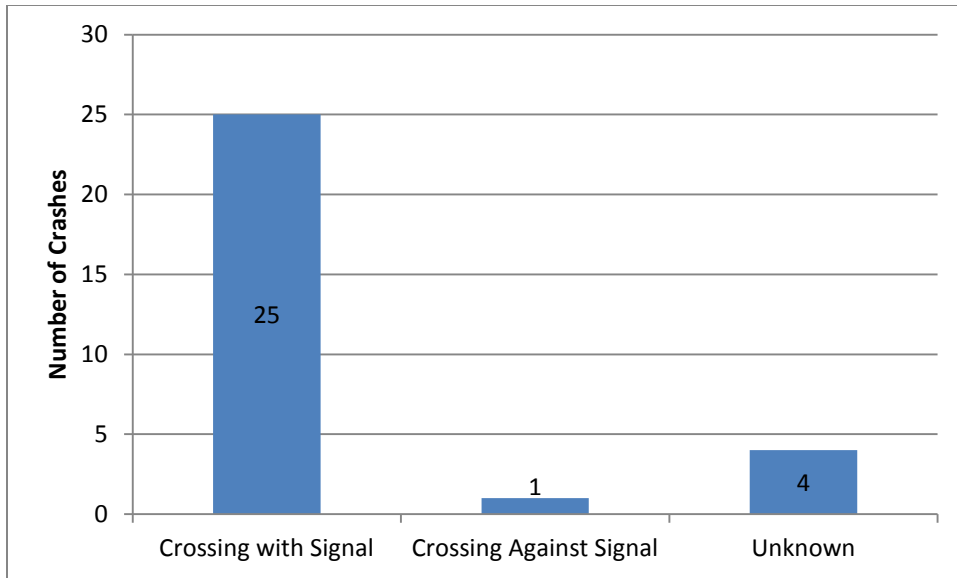


Figure 9: Crashes by Pedestrian Action

Considering most pedestrians cross at intersections, the next question is if they cross with or against the pedestrian signal. The chart below shows that at least 25 of the 30 pedestrians (83%) were crossing with the traffic signal. This supports that the drivers were at fault most of the time, with 15 of the 30 drivers receiving Failure to Yield citations and an additional 7 of the 30 receiving Careless Driving citations.



The action or location of the vehicles, as described in the crash reports, was also examined, as shown in Figure 10. Nearly 68% of the crashes occurred while the vehicle was making a left turn, while 18% occurred while the vehicle was making a right turn and an additional 14% while the vehicle was traveling straight.

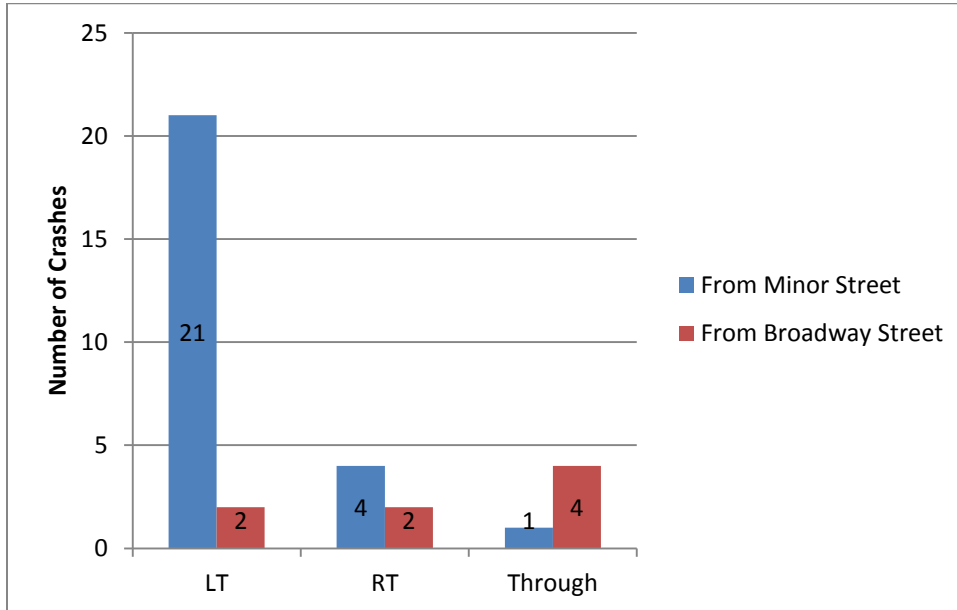


Figure 10: Crashes by Vehicle Action

The time of day of the pedestrian accidents, as given in the crash reports, was examined next, as shown in Figure 11. More accidents occurred between 12 pm and 4 pm than any other time period. When examined by lighting conditions, **91% of the accidents occurred during “daylight” conditions**, while 9% occurred during “dark” or “dark but lighted” conditions.

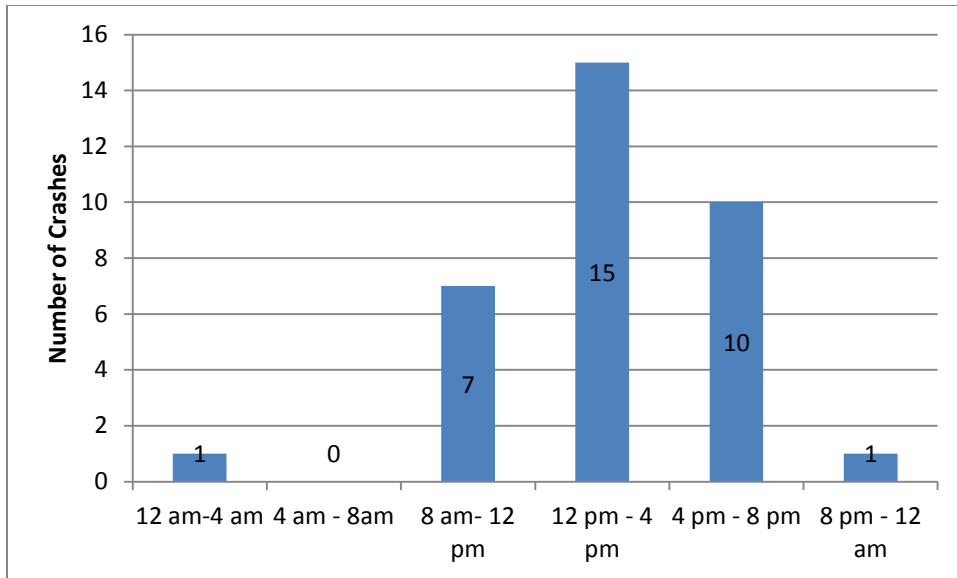


Figure 11: Crashes by Time of Day

The crashes were then analyzed by alcohol or drug involvement. The accident reports included a narrative of the accident description. Two reports stated that the pedestrian appeared to be under the influence of alcohol or drugs. Overall, 9% of the accidents had alcohol or drug involvement or were unknown, while 91% did not. The exact number of crashes is shown in the table below.

Table 2: Crashes by Alcohol/Drug Involvement

Alcohol/Drug Involvement	Number of Crashes
Yes	2
No	31
Unknown	1

When the crashes were examined by the weather conditions, it didn't appear that weather had an impact on accidents. Thirty of the 34 accidents along Broadway Street occurred during clear conditions, while only 3 accidents occurred during rain and one was unknown.

Crash Outcome

Following the analysis of crash conditions, the outcome of the crashes, specifically medical treatment required, was then analyzed. Nearly 74% of the accidents resulted in the non-motorized user being transported to a hospital, while a total of 6 people refused medical treatment after the crashes. Two accidents didn't require medical attention and one accident was unknown.

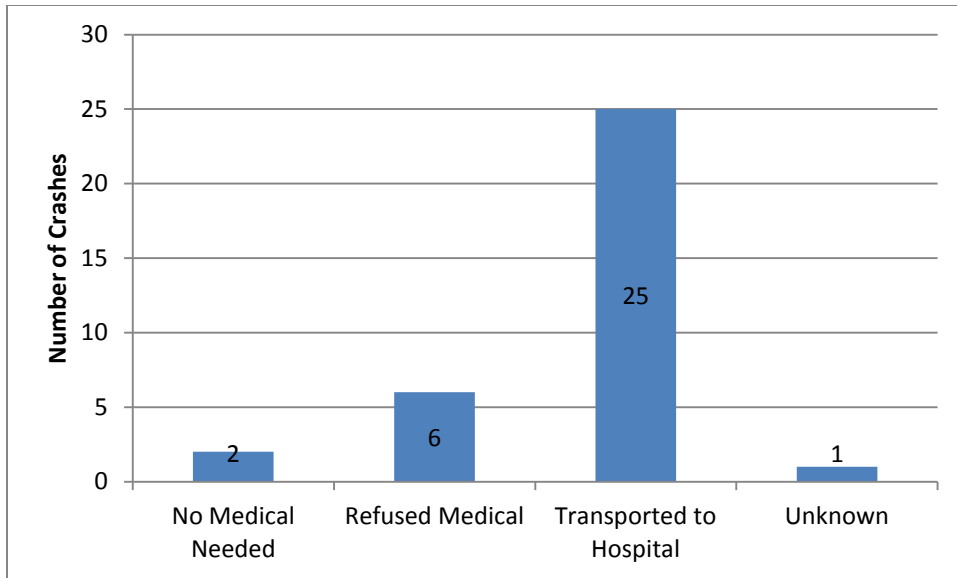


Figure 12: Crashes by Medical Treatment

Risk Factors

Several factors were evaluated as potentially increasing the likelihood of pedestrian and bicycle crashes along Broadway Street. The primary risk factor identified was the signal phasing/timing of the traffic signals due to the high volume of accidents occurring while crossing the roadway at intersections. **100% of the 34 pedestrian accidents occurred while the pedestrian was crossing the roadway, with 88% of all crashes occurring while the user was crossing at an intersection.** Of the crossing accidents at intersections, **21, or 62%, were caused by left turning vehicles from the minor street onto Broadway Street and 26, or 77%, occurred while the pedestrian was crossing Broadway.** This indicates the need for review of the existing signal timing. The signs that have been installed along the corridor telling drivers to yield to pedestrians are primarily visible to right-turning vehicles, while it appears that most crashes are the result of left-turning vehicles.

The second risk factor identified was the land use along the corridor, which is displayed in Figure 13. Because the corridor is located in downtown Little Rock, the land use is primarily commercial with a small amount of institutional, as well as a significant number of parking lots. This results in a substantial number of people walking during the daylight/business hours (**91% of the accidents occurred during "daylight" conditions**).

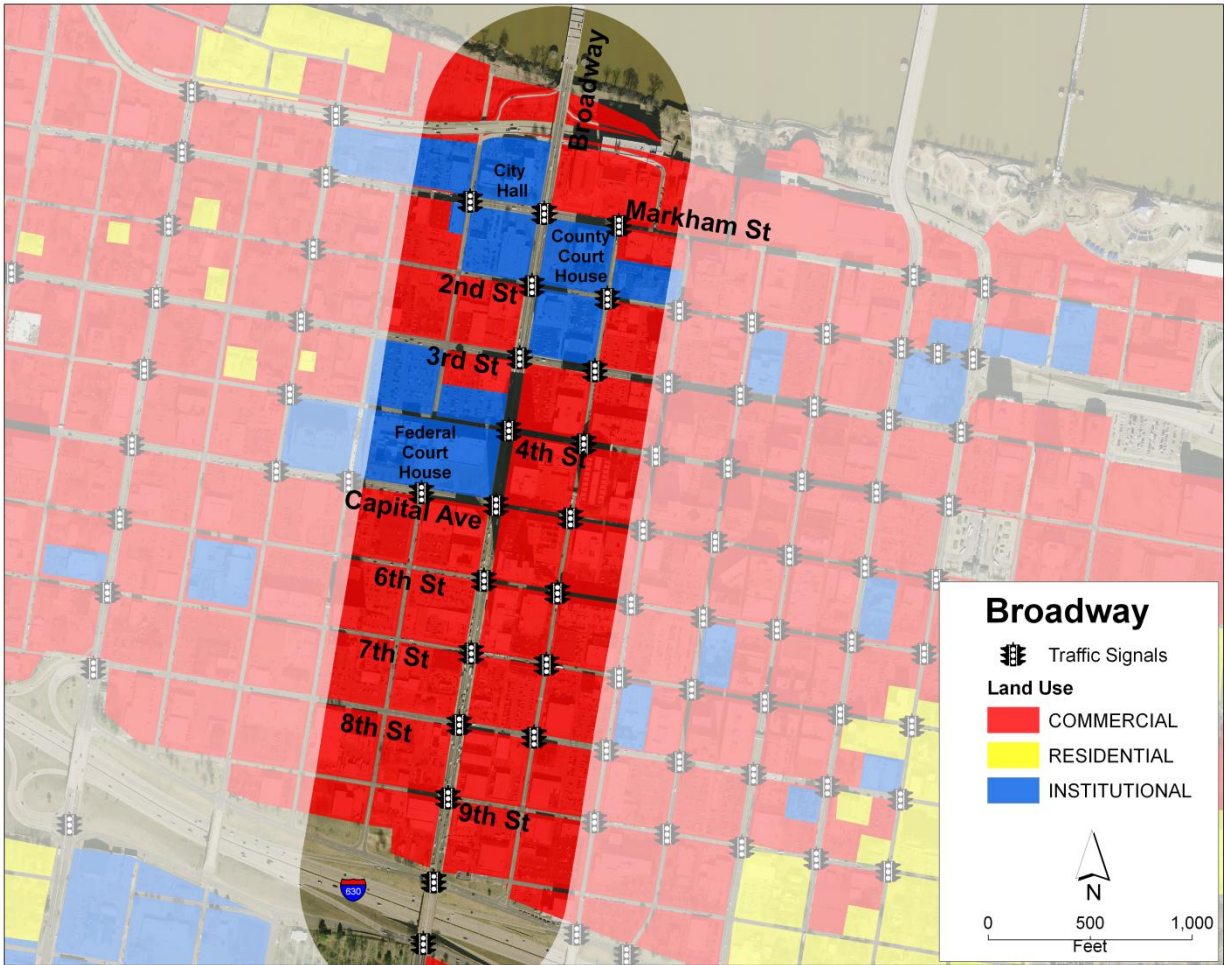


Figure 13: Broadway Street Land Use

Preliminary Design Options

Raised Medians

The addition of a raised median should be considered throughout the corridor. The raised median would provide a refuge for pedestrians allowing them to cross one direction of traffic at a time. In addition, the median would require vehicles to turn further into the intersection resulting in slower speeds and increased visibility for pedestrians.

FHWA has identified nine countermeasures that address crashes that occur in the focus areas of intersections, pedestrians, and roadway departure to improve safety on the Nation's highways. Medians, shown in Figure 14, are one of the nine identified proven safety countermeasures and are applicable at intersections, mid-block crossings, or throughout an entire corridor.¹

¹ FHWA Office of Safety, *Proven Safety Countermeasures: Medians and Pedestrian Crossing Islands in Urban and Suburban Areas*, http://safety.fhwa.dot.gov/provencountermeasures/fhwa_sa_12_011.htm.



Figure 14: Raised Median

Pedestrian Signal Phasing/Countdown Pedestrian Signals

Modifications to the existing signal phasing/timing should be considered to allow for additional protection for pedestrians, particularly those crossing Broadway. **A common complaint received from pedestrians is inadequate walk time while crossing the roadway.** The signal timing and allotted time for pedestrians to cross Broadway should be reviewed. Consideration should also be given to providing pedestrians a head start to increase their visibility within the intersection. Where not used, pedestrian countdown signals should also be used.

Additional Yield to Pedestrian Signs

A number of signs in the MUTCD focus on pedestrian crossings geared towards both the pedestrian and driver. Although the City of Little Rock has recently installed “Turning Vehicles Yield to Pedestrians” signs, they are primarily targeted towards right turning vehicles. Because a majority, or 23, of the 34 accidents were caused when vehicles were turning left, the addition of more “Turning Vehicles Yield to Pedestrians” signs targeting left turning vehicles should be considered. Additionally, signs warning pedestrians to “Beware of Turning Vehicles” should also be considered throughout the corridor.

Enforcement/No Right-turn on Red

As discussed previously, drivers have primarily been at fault. Of the 30 crossing at intersection accidents, 15 of the drivers received Failure to Yield citations and an additional 7 received Careless Driving citations, which shows that additional enforcement of the Yield to Pedestrian law is needed. The City of Little Rock should also consider a no right-turn on red policy for the downtown portion of the city.

Appendix

CRASH H NUM	ATMOS PHERE	LIGHT	RD SURF CON	CRASH DATE	WEE K DAY	CRASH TIME	ROUTE	AT INT	REF POINT	DIST FROM IN	DIR FRO M INT	ALC	PT YP	RA CE	S E X	A G E	INJUR Y SEV	Crossing Broadway	Ped/Bike Action	Ped/Bike Direction	Ped/Bike Medical	From Broadway/ Minor	Vehicle Action	Vehicle Lane	Vehicle Direction	Traffic Control	Comments
200211 343	CLEAR	DAYLIGHT	DRY	2/28/20 02	THU	3:18:00 PM70	N	3RD			U	N	3	B	M	8	3Y		Crossing at Intersection w/Signal	Unknown	Transported to Hospital	Minor	Left Turn	Inside	WB to SB	Signal	Vehicle failed to yield
200230 576	CLEAR	DAYLIGHT	DRY	5/30/20 02	THU	5:34:00 PM70	N	NINTH ST	63 FT		N	N	3	B	F	3	3Y		Crossing not at Intersection	EB	Unknown	Minor	Left Turn	N/A	WB to SB	None	Pedestrian darted out into traffic
200252 613	CLEAR	DAYLIGHT	DRY	10/3/20 02	THU	11:37:0 0 AM70	Y	W 7TH ST			N	N	3	B	F	9	3N		Crossing at Intersection w/Signal	Unknown	Transported to Hospital	Minor	Right Turn	Outsid e	WB to NB	Signal	Vehicle edged forward to turn right on red, hitting pedestrian
200314 479	RAIN	DARK BUT LIGHTED	WET	3/18/20 03	TUE	7:32:00 PM70	Y	6TH ST			Y	N	3	B	M	1	2Y		Crossing at Intersection against Signal	EB	Transported to Hospital	Broadway	Straight	Inside	NB	Signal	Pedestrian Impaired
200352 643	CLEAR	DAYLIGHT	DRY	9/26/20 03	FRI	3:30:00 PM70	Y	BROAD WAY ST			N	N	3	W	F	2	2Y		Crossing at Intersection w/ Signal	EB	Transported to Hospital	Broadway	Left Turn	Unkno wn	WB to SB	Signal	Vehicle had green light, pedestrian had walk signal; vehicle failed to yield
200367 412	CLEAR	DAYLIGHT	DRY	12/4/20 03	THU	4:10:00 PM70	Y	6TH			N	N	3	W	F	1	3Y		Crossing at Intersection w/Signal	Unknown	Transported to Hospital	Minor	Left Turn	Inside	WB to SB	Signal	Conflicting statements by driver/ped about crosswalk; Pedestrian noted with defective eyesight, hearing
200370 953	CLEAR	DAYLIGHT	DRY	12/23/2 003	TUE	12:05:0 0 PM70	Y	CAPITAL AV			N	N	3	W	F	1	3Y		Crossing at Intersection	EB	Transported to Hospital	Minor	Left Turn	Inside	WB to SB	Signal	Vehicle failed to yield
200402 319	CLEAR	DAYLIGHT	DRY	1/18/20 04	SUN	3:20:00 PM70	N	2ND ST	72 FT		N	N	3	W	M	2	4Y		Crossing not at Intersection	EB	Transported to Hospital	Broadway	Straight	Outsid e	SB	None	Pedestrian jumped into traffic
200412 576	CLEAR	DAYLIGHT		3/8/200 4	MON	2:15:00 PM70	Y	CAPIT OL			N	N	3	B	F	9	3Y		Crossing at Intersection w/ Signal	EB	Transported to Hospital	Minor	Left Turn	Inside	WB to SB	Signal	Vehicle failed to yield
200441 381	CLEAR	DAYLIGHT	DRY	7/26/20 04	MON	12:35:0 0 PM70	Y	BROAD WAY ST			N	N	3	W	M	1	2Y		Crossing at Intersection w/Signal	EB	Transported to Hospital	Minor	Left Turn	Inside	WB to SB	Signal	Vehicle view obstructed by large truck in front of it; vehicle failed at yield
200457 397	CLEAR	DAYLIGHT	DRY	10/21/2 04	THU	4:00:00 PM70	Y	W MARKHAM			N	N	3	W	M	5	3Y		Crossing at Intersection	WB	Transported to Hospital	Minor	Left Turn	Outsid e	WB to SB	Signal	Vehicle failed to yield
200463 227	CLEAR	DAYLIGHT	DRY	11/17/2 04	WED	11:12:0 0 AM70	Y	SO BROADWAY			N	N	3	B	F	9	4Y		Crossing at Intersection w/ Signal	WB	Transported to Hospital	Minor	Left Turn	Inside	WB to SB	Signal	Vehicle failed to yield
200469 307	CLEAR	DAYLIGHT	DRY	12/15/2 004	WED	8:15:00 AM70	Y	BROA DWAY ST	4 FT		E	N	3	B	M	1	3N		Crossing at Intersection w/Signal	NB	Transported to Hospital	Minor	Left Turn	Inside	SB to EB	Signal	Sun obstructed vehicle's vision; vehicle failed to yield
200507 481	CLEAR	DAYLIGHT	DRY	1/5/200 5	WED	10:04:0 0 AM70	Y	CAPITOL AV			N	N	3	B	M	2	3Y		Crossing at Intersection w/Signal	EB	Transported to Hospital	Broadway	Left Turn	Inside	WB to SB	Signal	Vehicle failed to yield
200516 589	CLEAR	DAYLIGHT	DRY	4/11/20 05	MON	5:30:00 PM70	Y	CAPITOL ST			N	N	3	W	M	7	4Y		Crossing at Intersection w/Signal	Unknown	Transported to Hospital	Minor	Left Turn	Inside	EB to NB	Signal	Vehicle failed to yield
200541 982	CLEAR	DAYLIGHT	DRY	8/19/20 05	FRI	10:55:0 0 AM70	Y	W MARKHAM			N	N	3	W	F	2	2Y		Crossing at Intersection w/Signal	WB	Transported to Hospital	Minor	Left Turn	Inside	EB to NB	Signal	Vehicle failed to yield
200548 391	CLEAR	DAYLIGHT	DRY	9/22/20 05	THU	3:10:00 PM70	Y	W CAPITOL			N	N	3	W	F	8	3Y		Crossing at Intersection	Unknown	Transported to Hospital	Minor	Left Turn	Inside	EB to NB	Signal	Vehicle failed to yield
200549 875	CLEAR	DAYLIGHT	DRY	9/30/20 05	FRI	2:06:00 PM70	Y	2ND ST 500 BLK			N	N	3	W	M	3	3Y		Crossing at Intersection w/Signal	WB	Refused Medical	Minor	Left Turn	Inside	WB to SB	Signal	Vehicle failed to yield
200551 657	UNKNO WN	DAYLIGHT	DRY	10/7/20 05	FRI	5:10:00 PM70	Y	MARKH AM BROADWAY			N	N	3	W	F	9	3Y		Crossing at Intersection w/Signal	WB	Refused Medical	Broadway	Right Turn	Outsid e	NB to EB	Signal	Vehicle failed to yield
200552 888	CLEAR	DAYLIGHT	DRY	10/12/2 005	WED	12:21:0 0 PM70	Y	W 6TH ST			N	N	3	W	F	9	3N		Crossing at Intersection w/Signal	SB	No medical needed	Minor	Right Turn	Outsid e	WB to NB	Signal	Vehicle failed to yield (RTOR)
200606 375	CLEAR	DAYLIGHT	DRY	2/13/20 06	MON	4:50:00 PM70	Y	BROADWAY			UNK	N	3	W	M	0	4N		Crossing at Intersection w/Signal	SB	Refused Medical	Broadway	Right Turn	Outsid e	SB to WB	Signal	Vehicle failed to yield
200664 293	CLEAR	DAYLIGHT	DRY	12/19/2 006	TUE	4:13:00 PM70	Y	6TH			N	N	3	W	F	0	3Y		Crossing at Intersection w/Signal	WB	Transported to Hospital	Minor	Left Turn	Outsid e	WB to SB	Signal	Vehicle failed to yield
200734 350	RAIN	DAYLIGHT	ICE	7/10/20 07	TUE	4:45:00 PM70	Y	W 6TH ST			N	N	3	B	F	8	3Y		Crossing at Intersection w/Signal	WB	Refused Medical	Minor	Left Turn	Inside	WB to SB	Signal	Vehicle failed to yield
200741 456	CLEAR	DAYLIGHT	DRY	8/21/20 07	TUE	12:30:0 0 PM70	Y	6TH ST			N	N	3	W	F	9	3Y		Crossing at Intersection w/Signal	EB	Transported to Hospital	Minor	Left Turn	Inside	WB to SB	Signal	Vehicle failed to yield
200800 715	CLEAR	DAYLIGHT	DRY	1/8/200 8	TUE	9:29:00 AM70	N	CART ER ST	6 FT		N	N	3	W	F	7	2Y		Crossing at Intersection w/Signal	WB	Transported to Hospital	Minor	Left Turn	Inside	EB to NB	Signal	Vehicle failed to yield
200813 250	CLEAR	DAYLIGHT	DRY	3/25/20 08	TUE	1:53:00 PM70	Y	CAPIT OL			N	N	3	B	M	7	4Y		Crossing at Intersection w/Signal	EB	Refused Medical	Minor	Left Turn	Inside	WB to SB	Signal	Vehicle failed to yield
200862 883	CLEAR	DARK	DRY	11/15/2 008	SAT	11:10:0 0 PM70	N	4TH ST	153 FT		N	N	3	W	M	1	5Y		Crossing not at Intersection	EB	Transported to Hospital	Broadway	Straight	Outsid e	SB	None	Pedestrian ran into traffic
200906 905	CLEAR	DAYLIGHT	DRY	2/16/20 09	MON	4:05:00 PM70	Y	6TH			N	N	3	W	F	1	5Y		Crossing at Intersection w/Signal	WB	Refused Medical	Minor	Left Turn	Inside	WB to SB	Signal	Vehicle failed to yield
200913 253	RAIN	DARK	WET	3/28/20 09	SAT	2:05:00 AM70	N	3RD	150FT		S	N	3	W	F	2	3Y		Crossing not at Intersection	EB	Transported to Hospital	Broadway	Straight	Inside	SB	None	Pedestrian ran into traffic; Pedestrian impaired
200921 072	CLEAR	DAYLIGHT	DRY	5/15/20 09	FRI	1:20:00 PM70	Y	2ND ST			N	N	3	B	F	2	5Y		Crossing at Intersection w/Signal	EB	Transported to Hospital	Minor	Left Turn	Inside	WB to SB	Signal	Vehicle failed to yield
200931 176	CLEAR	DAYLIGHT	DRY	7/16/20 09	THU	10:35:0 0 AM70	Y	THIRD ST			N	N	3	B	F	2	3N		Crossing at Intersection w/Signal	SB	Transported to Hospital	Minor	Right Turn	Outsid e	WB to NB	Signal	Vehicle failed to yield (RTOR)

201013458	CLEAR	DAYLIGHT	DRY	5/2/2010	SUN	1:35:00 PM	70	Y	W 7TH ST		N	3	B	M	3	0	3N	Crossing at Intersection	NB	Transported to Hospital	Minor	Straight	Outside	EB	Signal	Vehicle failed to yield
201020529	CLEAR	DAYLIGHT	DRY	6/18/2010	FRI	12:15:00 PM	70	Y	S BROADWAY		N	3	B	M	2	2	4N	Crossing at Intersection	SB	No medical needed	Minor	Left Turn	Inside	WB to SB	Signal	Vehicle failed to yield
201025567	CLEAR	DAYLIGHT	DRY	8/2/2010	MON	12:50:00 PM	70	Y	9TH STREET		N	3	B	M	5	7	3N	Crossing at Intersection w/Signal	NB	Transported to Hospital	Minor	Right Turn	Outside	WB to NB	Signal	Pedestrian ran in front of car